CHAPTER

30

ICE AND RAIN PROTECTION

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Insert latest revised pages; destroy superseded or deleted pages.

* Asterisk indicates pages revised, added, or deleted by the current revision. The portion of the text affected by the current revision is indicated by a vertical line in the outer margin of the page.

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Revision Number	Status	Date	Location	Insertion Date	Inserter's Initials	Removal Date	Removers Initials
30-1	Inactive	Apr 8/75	30-20-00 Pg. 3	Apr 8/75	LJ	Oct 1/75 Rev 4	LJ
30-2	Inactive	Apr 8/75	30-10-01 *Pg. 202*	Apr 8/75	LJ	Oct 1/75 *Rev 4*	LJ
30-3	Inactive	Apr 8/75	30-10-02 Pg. 202	Apr 8/75	LJ	Oct 1/75 Rev 4	LJ
30-4	Inactive	Sep 20/76	30-40-00 Pg. 1	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-5	Inactive	Sep 20/76	30-40-04 Pg. 201	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-6	Inactive	Sep 20/76	30-40-02 Pg. 201	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-7	Inactive	Sep 20/76	30-40-01 Pg. 201	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-8	Inactive	Sep 20/76	30-40-04 Pg. 202	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-9	Inactive	Sep 20/76	30-40-05 Pg. 202	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-10	Inactive	Sep 20/76	30-40-06 Pg. 202	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-11	Inactive	Sep 20/76	30-40-07 Pg. 202	Sep 20/76	LJ	Apr 6/79 Rev 12	LJ
30-12	Inactive	Mar 24/77	30-21-00 Pg. 5	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-13	Inactive	Mar 24/77	30-40-00 Pg. 1	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ

Revision Number	Status	Date	Location	Insertion Date	Inserter's Initials	Removal Date	Removers Initials
30-14	Inactive	Mar 24/77	30-40-08 Pg. 202	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-15	Inactive	Mar 24/77	30-50-00 Pg. 1	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-16	Inactive	Mar 24/77	30-50-00 Pg. 6	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-17	Inactive	Mar 24/77	30-50-00 Pg. 4	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-18	Inactive	Mar 24/77	30-50-00 Pg. 2	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-19	Inactive	Mar 24/77	30-50-01 Pg.201	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-20	Inactive	Mar 24/77	30-50-02 Pg.201	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
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30-24	Inactive	Mar 24/77	30-50-06 Pg.201	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-25	Inactive	Mar 24/77	30-50-06 Pg. 202	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-26	Inactive	Mar 24/77	30-50-07 Pg. 202	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ

Record of Temporary Revisions

Revision Number	Status	Date	Location	Insertion Date	Inserter's Initials	Removal Date	Removers Initials
30-27	Inactive	Mar 24/77	30-50-08 Pg. 202	Mar 24/77	LJ	Apr 6/79 Rev 12	LJ
30-28	Inactive	Jan 30/78	30-20-00 Pg. 202	Jan 30/78	LJ	Apr 6/79 Rev 12	LJ
30-29	Inactive	May 15/98	30-11-00 Pg. 205	May 15/98	LJ	Feb 11/00 Rev 68	LJ
30-30	Inactive	Mar 14/03	30-50-01 Pg. 206	Mar 14/03	LJ	Jan 17/05 Rev 73	LJ

ICE AND RAIN PROTECTION - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The aircraft is equipped with various systems to prevent the formation of ice and to remove rain. Anti-ice protection is provided for the following areas and components of the aircraft.
   (1) Wing leading edge.
   (2) Horizontal stabilizer leading edge.
   (3) Engine inlet duct and guide vanes.
   (4) Cockpit windshields.
   (5) Pitot tubes, static ports, and angle-of-attack transducer vanes.
   (6) Radome.

B. Engine bleed air is used to prevent ice formation on the wing leading edge, horizontal stabilizer leading edge, nacelle inlet, and the cockpit windshield.

C. Electrical heaters are used to prevent ice formation on the pitot tubes, static ports, and angle-of-attack transducer vanes.

D. The alcohol system prevents ice formation on the radome and is used on the pilot's windshield in case of normal windshield anti-ice system malfunction.

E. Indicating and warning annunciators and readout gages provide visual indications of the various ice protection system conditions.

WING LEADING EDGE ANTI-ICE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Wing leading edge anti-icing is accomplished by directing engine bleed air through a diffuser tube installed in the wing leading edge. Bleed air is exhausted from the wing leading edge through a scupper.

B. The system consists of a wing root diffuser, a wing leading edge diffuser tube, a thermostat, a temperature sensor, a pressure regulator, a wing temperature indicator, an annunciator, a system switch and a circuit breaker. On *Aircraft 36-002 only*, the system also utilizes the anti-ice solenoid on the LH and RH bleed air shutoff and pressure regulator valve.

C. The temperature indicator is divided into three color ranges: red - below 35°F indicates moisture will freeze on surface or that system has failed; green - above 35°F indicates moisture will not freeze to surface or that system is functioning properly; yellow - overheating indicates possible system malfunction.

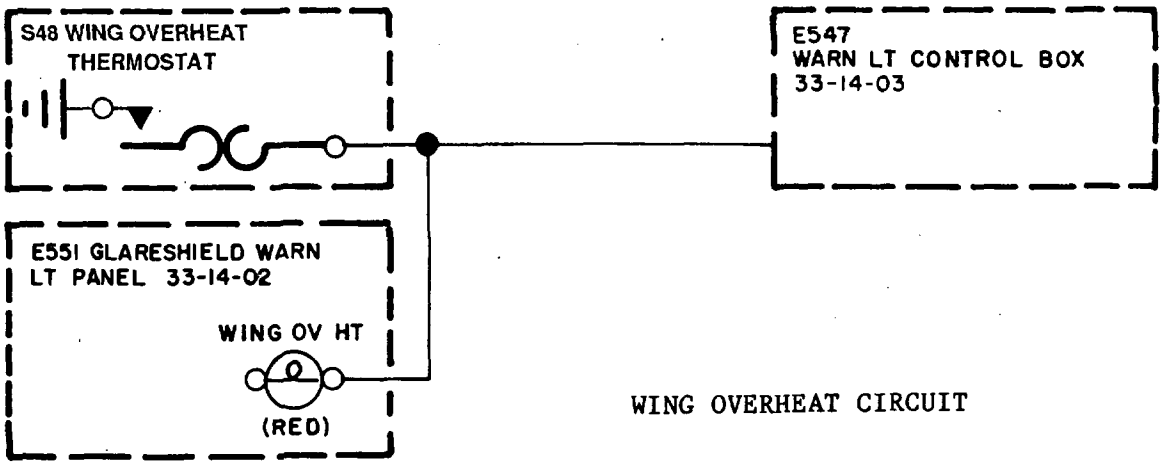
2. OPERATION

NOTE: The Aircraft may be equipped with either a pressure regulator valve (Whittaker) or shutoff valve (Sterer). The pressure regulator regulates the downstream pressure to 16 psig. The shutoff valve does not regulate downstream pressure.

A. On *Aircraft 36-002 only*, with the STAB WING HEAT Switch set to ON, 28 vdc is applied to the wing and stabilizer pressure regulator or shutoff valve and the anti-ice solenoid on each bleed air shutoff and pressure regulator valve. The pressure regulator or shutoff valve opens and allows bleed air to flow through the ducting to the wing leading edge. The anti-ice solenoid on each shutoff and pressure regulator valve is energized and allows the valve to regulate bleed air at a higher temperature than normal (approximately 320°F). A thermostat installed on the wing rib in the RH wing monitors temperature of wing leading edge structure and completes a ground circuit to the WING OV HT annunciator if temperature reaches 215°F. The wing temperature sensor, installed on the inner surface of the wing leading edge, monitors the leading edge surface temperature and provides the crew with a visual readout on the wing temperature indicator.

B. On *Aircraft 35-002 and Subsequent and 36-003 and Subsequent*, with the STAB WING HEAT Switch set to ON, 28 vdc is applied to the wing and stabilizer pressure regulator or shutoff valve. The pressure regulator or shutoff valve opens and allows bleed air to flow through the ducting to the wing leading edge. A thermostat installed on the wing rib in the RH wing monitors temperature of wing leading edge structure and completes a ground circuit to the WING OV HT (RED) annunciator if temperature reaches 215°F. The wing temperature sensor, installed on the inner surface on the wing leading edge, monitors the leading edge surface temperature and provides the crew with a visual readout on the wing temperature indicator.

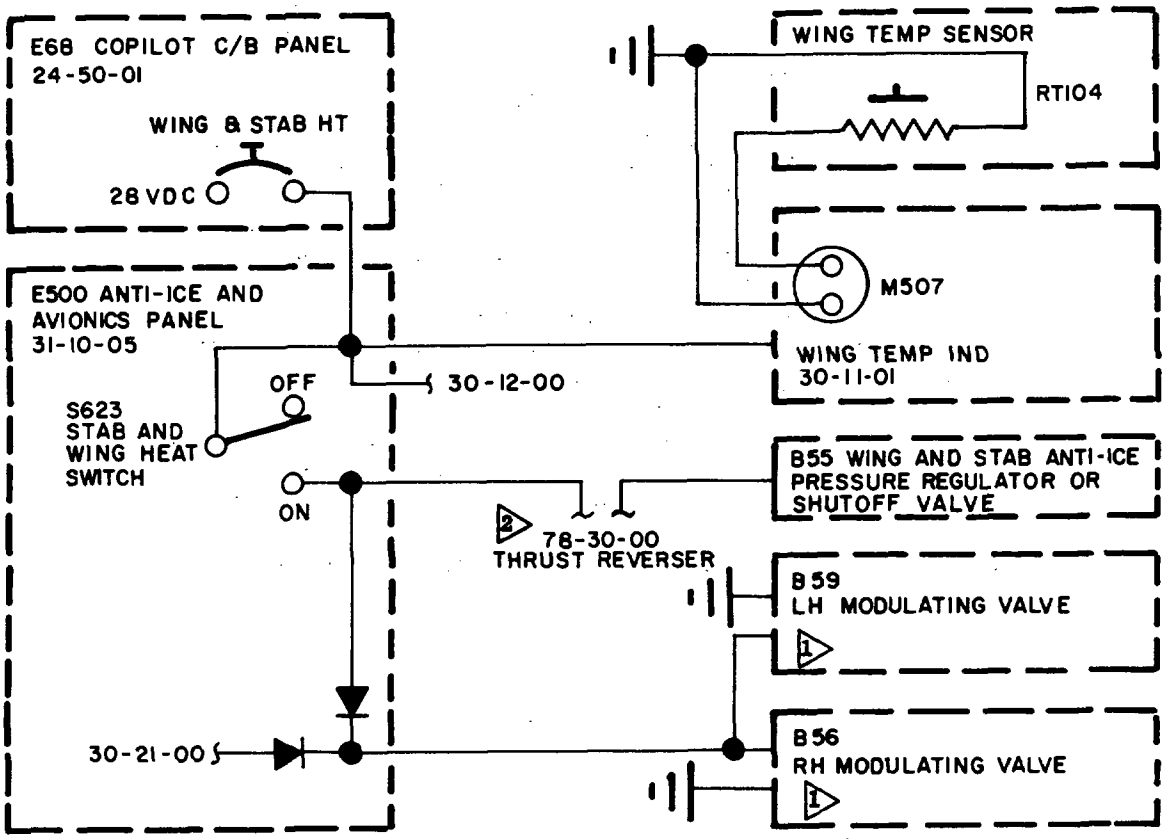
C. On *Aircraft equipped with optional (Aeronca) thrust reversers*, the wing leading edge anti-ice system will be inoperative for approximately three (3) seconds during the thrust reverser deploy and stow cycles.



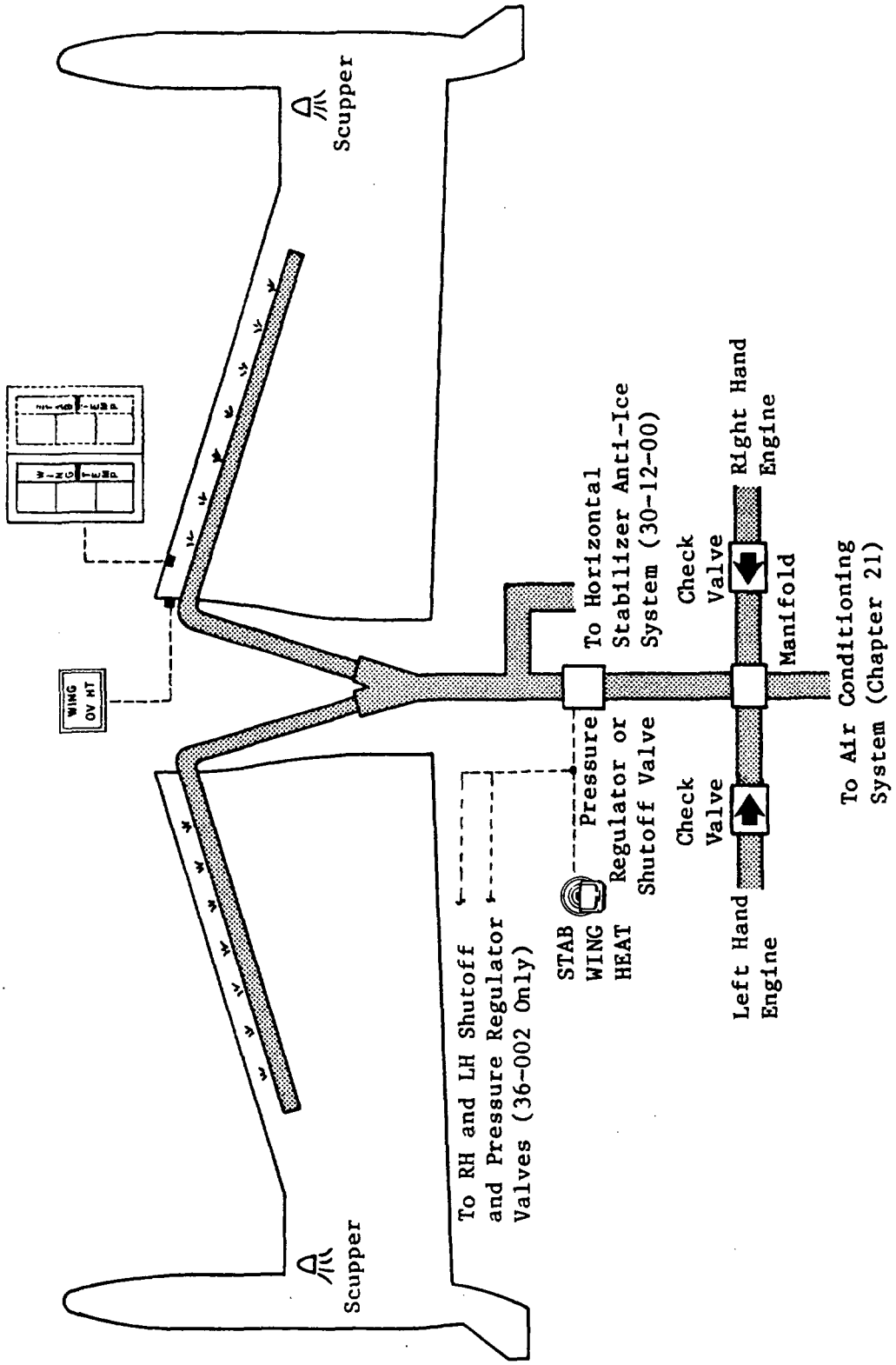
WING OVERHEAT CIRCUIT

1 Effective Aircraft 36-002 Only

2 On Aircraft not equipped with Optional Thrust Reverser System, wing and Stab Anti-Ice Valve (B55) is wired directly to Stab and Wing Heat Switch.



Wing Anti-Ice System Electrical Control Schematic
Figure 1



Wing Leading Edge Anti-Ice System Schematic
Figure 2

WING LEADING EDGE ANTI-ICE - TROUBLE SHOOTING

1. TROUBLE SHOOTING

A. Trouble shooting the wing leading edge anti-ice system can be accomplished by isolating the trouble to the control circuit, bleed air system, or the temperature indicating circuit. As an aid in trouble shooting it should be noted that the horizontal stabilizer anti-ice system utilizes the same bleed air source and control circuit. The temperature indicating circuits use identical components to those used in the horizontal stabilizer temperature indicating circuits. Therefore, if trouble should occur in the bleed air system, both anti-icing systems would experience the same difficulties.

B. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Voltmeter or	#3430A	Hewlett Packard	To check voltage and continuity.
Voltmeter	#260	Simpson	To check voltage and continuity.

C. See figure 101 for trouble shooting procedure.

Trouble	Probable Cause	Trouble Shooting	Repair
1. Air flows from wing scuppers when Stabilizer and Wing Heat Switch is set to OFF.	1. Control valve has failed open.	1. Disconnect electrical connector from valve and check for 28 vdc.	1. Replace control valve if no 28 vdc is present.
	2. An electrical short in control valve wiring has occurred.	2. Disconnect electrical connector from valve and check wiring for 28 vdc.	2. Replace wiring if 28 vdc is present.
2. On aircraft with red, green, and yellow color ranges on temperature indicators, pointer does not move from red zone when switch is set to ON.	1. Temperature indicator is faulty.	1. Refer to 30-11-02 for functional test of indicator.	1. Replace indicator if test requirements are not met.
	2. Lack of continuity in wiring from indicator to temperature sensor.	2. Perform continuity check of wiring	2. Replace wiring if continuity is not present.
On aircraft with blue, green, and red color ranges on indicator, pointer does not move from blue zone when switch is set to ON.	3. Temperature sensor is faulty.	3. Check indicator and continuity of wiring.	3. Replace temperature sensor if wiring and indicator check out OK.
3. Air does not flow from wing scuppers when Stabilizer and Wing Heat Switch is set to ON.	1. Control valve has failed closed.	1. Remove electrical connector from control valve and check for 28 vdc.	1. Replace control valve if 28 vdc is not present.
	2. Lack of continuity in control valve wiring.	2. Check for 28 vdc at control valve electrical connector.	2. Replace wiring if 28 vdc is not present.

Wing Leading Edge Anti-Ice System Trouble Shooting
Figure 101

1. Removal/Installation

NOTE:
- The wing leading edge is normally not removed unless damage has occurred. The thermostat and temperature sensor are accessible by removing the wing-to-fuselage fairing.
- Refer to 30-12-01 for maintenance practices on the pressure regulator and 30-12-02 for the shutoff valve.

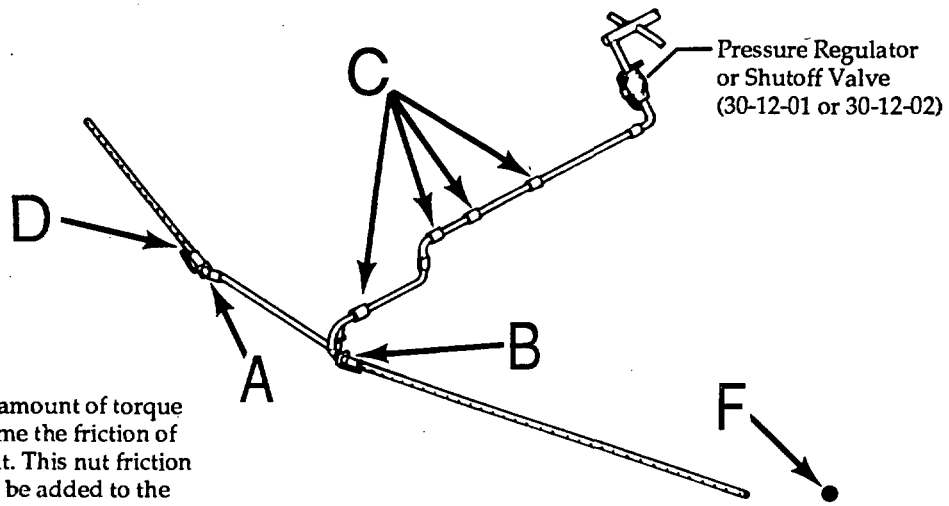
A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items:

NAME	PART NUMBER	MANUFACTURER	USE
Sandpaper	380 grit	Commercially Available	Clean surfaces.
Heat Sink Grease	340	Dow Corning	Install thermostat.
Methyl Ethyl Ketone	TT-M261	Commercially Available	Clean surfaces.
Primer	1200	Dow Corning	Prime surfaces.
Adhesive	Silastic 732 RTV	Dow Corning	Seal wing rib.
Adhesive	RTV 156 or 159	General Electric	Bond sensor.

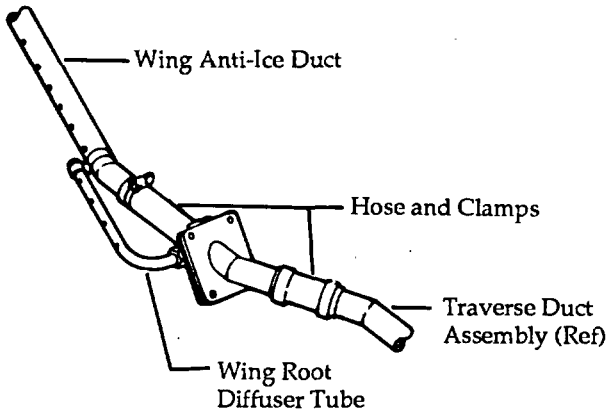
B. Remove Thermostat (See figure 201.)
(1) Remove electrical power from aircraft.
(2) Remove attaching screws and right wing-to-fuselage fairing from aircraft.
(3) Remove clamp securing wing root diffuser tube to wing anti-ice duct (see Details A and B). Loosen and remove wing root diffuser tube from aircraft.
(4) Loosen clamps and disconnect hose from fuselage exit duct and wing anti-ice duct.
(5) Disconnect and identify thermostat wiring at splices.
(6) Remove screws and wing rib from aircraft (see Detail D).
(7) Remove attaching screws, spacers, and thermostat from aircraft (see Detail E).

C. Install Thermostat (See figure 201.)
(1) Scrape sealant from wing rib and immediate area of wing rib installation. Wipe with a clean cloth dampened with methyl ethyl ketone.
(2) Apply heat sink grease (Dow Corning P/N 340) to top of thermostat.
(3) Position thermostat in place and secure with spacers and screws.
(4) Perform Functional Test of Thermostat. (Refer to Adjustment/Test.)
(5) Route wiring through wing rib as shown in Detail H. Identify and connect wiring.
(6) Install wing rib and secure with screws. Seal wing rib as shown in Detail H.
(7) Install hose and secure with clamps. Install wing root diffuser tube and secure with clamp.
(8) Install wing-to-fuselage fairing.
(9) Restore aircraft to normal.

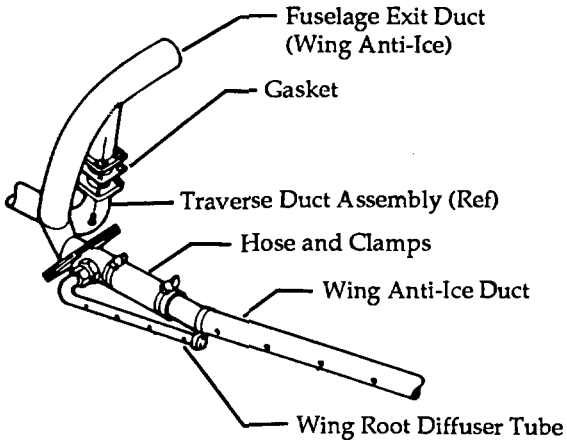


NOTES:

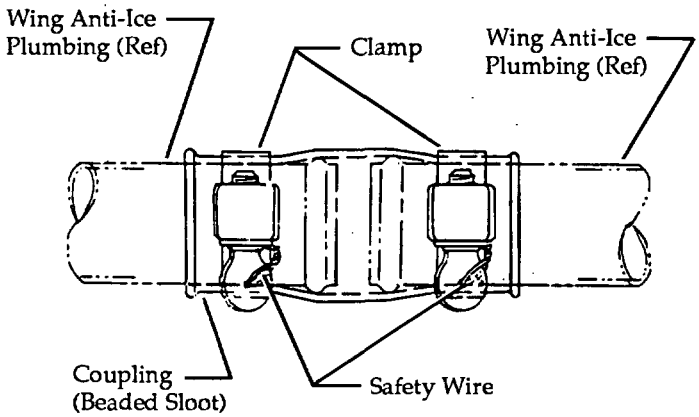
- Drag torque is the amount of torque required to overcome the friction of any self-locking nut. This nut friction (drag torque) must be added to the torque callout.
- Refer to Chapter 20 for Wiggins connector installation.
- On *Aircraft 36-002 and Subsequent,* some couplings may be T-bolt type, which are torqued to 20 inch-pounds plus drag torque.
- On *Aircraft modified per SSK 978 and AMK 90-2, "Replacement of Wing Anti-Ice Plumbing Connectors,"* torque clamps 10 to 20 inch-pounds and safety wire.
- On *Aircraft with Sloots-type connectors,* torque clamps 10 to 20 inch-pounds and safety wire to clamp slot.



Detail A



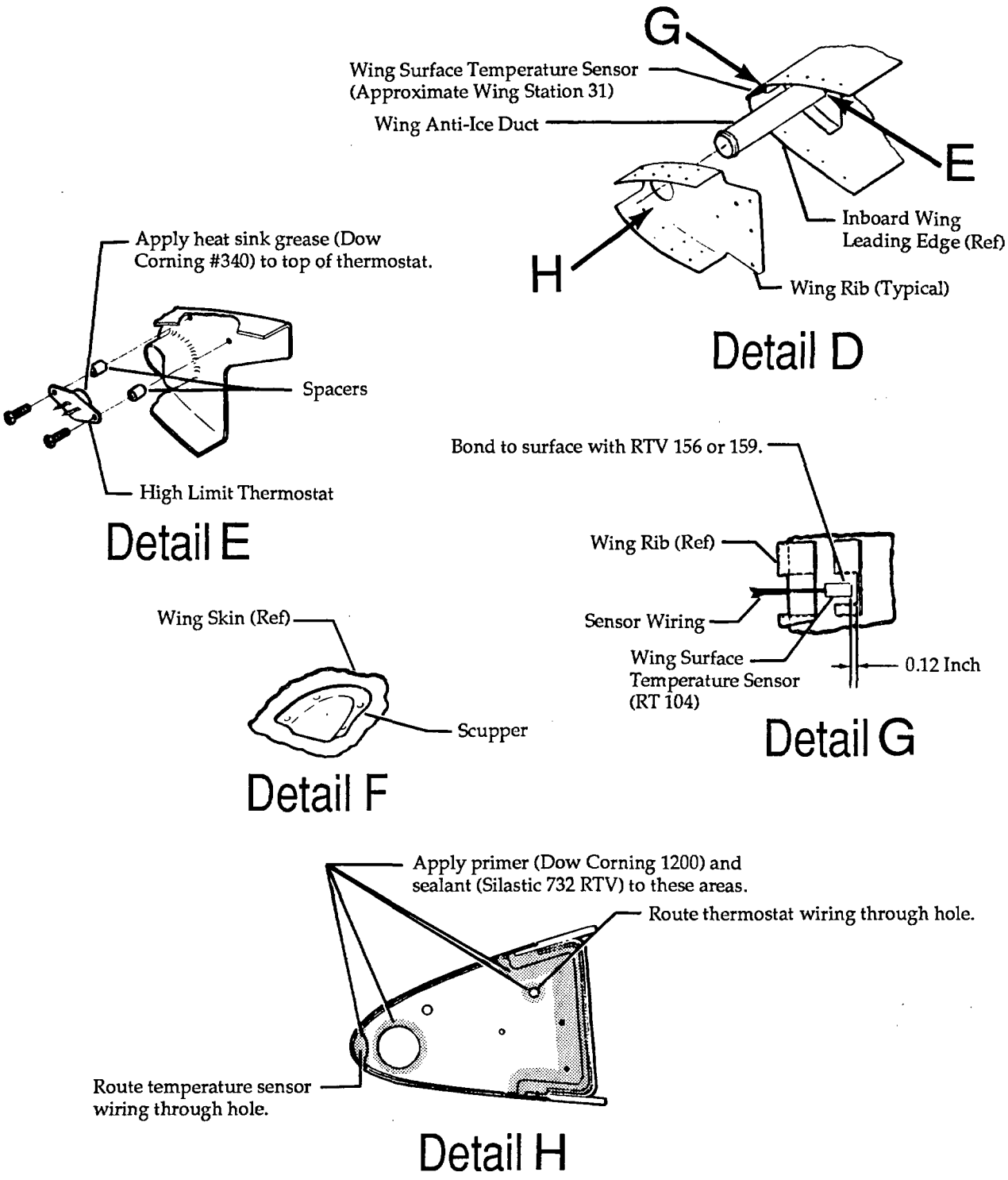
Detail B



(Insulation Blanket Removed)

Detail C

Wing Leading Edge Anti-Ice System Installation
Figure 201 (Sheet 1 of 2)



Wing Leading Edge Anti-Ice System Installation
Figure 201 (Sheet 2 of 2)

D. Remove Temperature Sensor (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove attaching screws and right wing-to-fuselage fairing from aircraft.
   (3) Remove clamp securing wing root diffuser tube to wing anti-ice duct (see Details A and B). Loosen and remove wing root diffuser tube from aircraft.
   (4) Loosen clamps and disconnect hose from fuselage exit duct and wing anti-ice duct.
   (5) Disconnect and identify sensor wiring at splices.
   (6) Remove screws and wing rib from aircraft (see Detail D).
   (7) Break bond and remove sensor from aircraft (see Detail G).

E. Install Temperature Sensor (See figure 201.)
   (1) Clean sensor bonding material from surface with #380 sandpaper. Wipe with a clean cloth dampened with methyl ethyl ketone. Scrape sealant from wing rib and immediate area of wing rib installation. Wipe with a clean cloth dampened with methyl ethyl ketone.

CAUTION: DO NOT ALLOW ADHESIVE TO GET BETWEEN SENSOR AND LEADING EDGE. ERRONEOUS INDICATIONS WILL RESULT.

   (2) Remove finish on inside of skin where sensor is to be installed. Cover sensor with adhesive (RTV 156 or 159, mfd. by G.E., Waterford, N.Y.) and apply around perimeter of sensor.
   (3) Route sensor wiring as shown in Detail H. Identify and connect wiring.
   (4) Install wing rib and secure with screws. Seal wing rib as shown in Detail H.
   (5) Install hose and secure with clamps. Install wing root diffuser tube and secure with clamp.
   (6) Install wing-to-fuselage fairing.
   (7) Perform Functional Test of Temperature Sensing and Indication System. (Refer to Adjustment/Test.)
   (8) Restore aircraft to normal.

2. **Adjustment/Test**
   A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items.

NAME	PART NUMBER	MANUFACTURER	USE
Universal Temperature Probe	M80T-50	Fluke	Measure temperature.
Heat Gun		Commercially Available	Apply heat.
Multimeter	Model 260	Simpson	Check thermostat.
Surface Pyrometer (0°F to 400°F)	31-12-302	Pyro	Measure temperature.
Potentiometer and Thermocouples		Commercially Available	Measure temperature.

B. Functional Test of Thermostat
(1) Remove right-hand wing fairing to gain access to thermostat terminals.
(2) Connect multimeter to thermostat terminals.
(3) Clamp temperature probe to thermostat.
(4) Using heat gun, apply heat to thermostat until multimeter indicates that contacts are closed. Actuation temperature should be 215 (±10)° F.
(5) Remove temperature probe and multimeter leads from thermostat, and reinstall wing fairing.

C. Functional Test of Wing Temperature Sensing and Indication System *On Aircraft 35-002 and Subsequent, Aircraft 36-002 and Subsequent, not modified per SB 35/36-30-10*

NOTE: Perform Functional Test of Wing Temperature Sensing and Indication System in accordance with the current inspection interval specified in Chapter 5.

(1) Set Battery Switches on.
(2) Locate temperature probe to leading edge of each wing, at a point 36 inches [0.9 m] outboard of outboard edge of wing root fairing and 4.5 inches [11.4 cm] forward along contour from top aft edge of leading edge skin.

WARNING: ENGINES WILL BE OPERATING AT FULL THROTTLE, ANY LOOSE OBJECTS WILL BE INGESTED BY THE ENGINE.

(3) Ensure temperature probes are securely attached to wing leading edge.

NOTE: Some tape adhesives may loosen when the leading edge becomes hot.

(4) Observe Wing Temperature Indicator.

NOTE: Temperature indicator shall indicate in red arc if ambient temperature is below 35°F [1.7°C] and in green arc above 35°F [1.7°C].

(5) Start LH and RH engines. (Refer to FAA Approved Airplane Flight Manual.)
(6) Set STAB/WING HEAT Switch to STAB/WING HEAT.
(7) Verify airflow from both leading edge wing tip scuppers is of an equal amount.
(8) Slowly advance engine throttles and monitor wing temperature indicator. Indicator shall pass through green arc and indicate in yellow arc when throttles are advanced to full.
(9) Retard throttles to 70 percent (N1) and allow wing temperature to stabilize.
(10) Record LH and RH leading edge temperatures. Verify LH and RH indicated temperatures are within ±10°F [±5.6°C]. Temperatures beyond specified limits indicates a blockage is unbalancing the system.
(a) If system blockage is indicated, trouble shoot and repair system.
(11) Retard throttles to idle.
(12) Set STAB/WING HEAT Switch off.
(13) Verify airflow at both leading edge wing tip scuppers has stopped.
(14) Shut down LH and RH engines. (Refer to FAA Approved Airplane Flight Manual.)
(15) Set Battery Switches off.

WARNING: LEADING EDGE IS HOT ENOUGH TO CAUSE A SEVERE BURN.

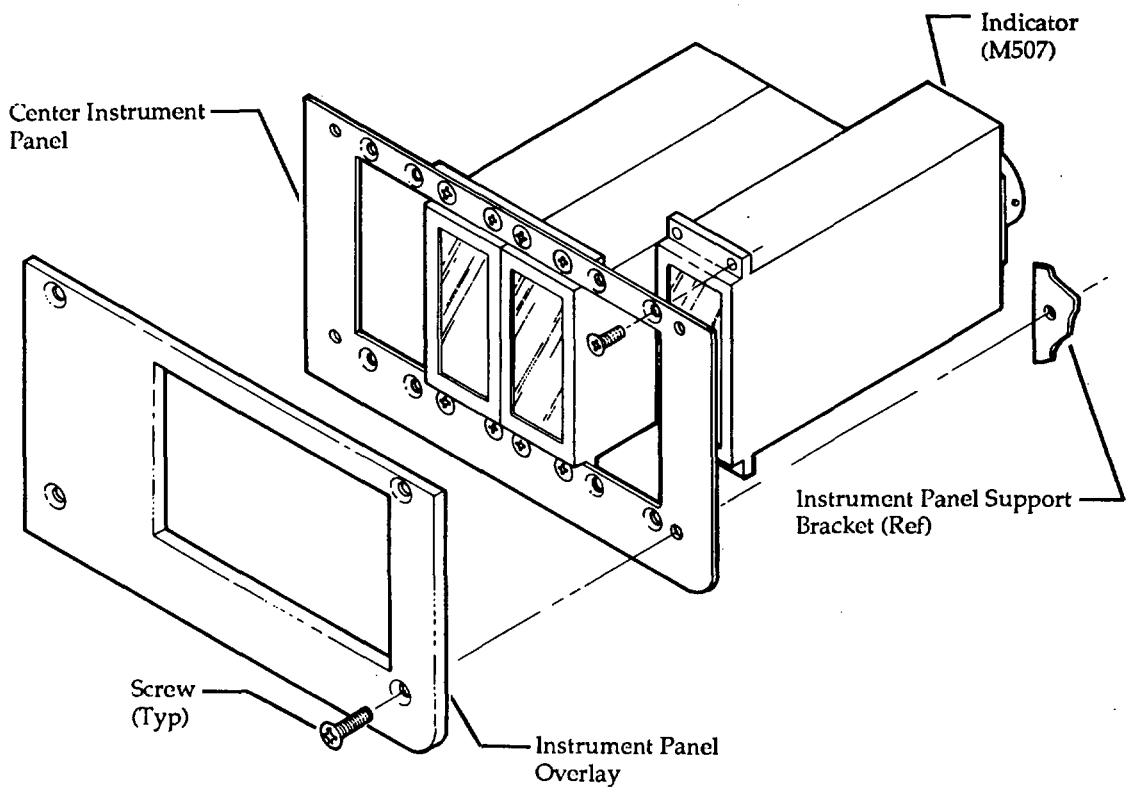
(16) Remove previously attached wing temperature probes.

WING TEMPERATURE INDICATOR - MAINTENANCE PRACTICES

1. Removal/Installation

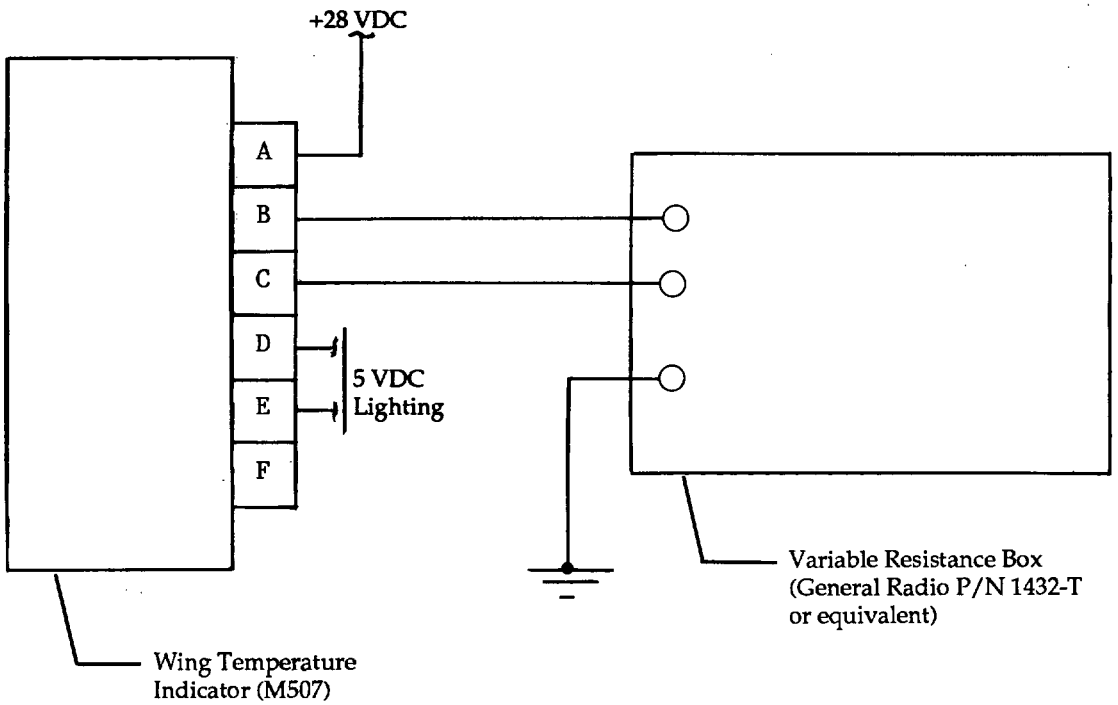
A. Remove Wing Temperature Indicator (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove attaching parts and instrument panel overlay.
   (3) Remove attaching parts and center instrument panel from its supports sufficiently to gain access to indicator electrical connector.
   (4) Disconnect electrical connector from temperature indicator.
   (5) Remove attaching parts and temperature indicator from aircraft.

B. Install Wing Temperature Indicator (See figure 201.)
   (1) Install temperature indicator and attaching parts.
   (2) Connect electrical connector to temperature indicator.
   (3) Install center instrument panel and secure with attaching parts.
   (4) Install instrument panel overlay and secure with attaching parts.
   (5) Restore electrical power to aircraft.



Wing Temperature Indicator Installation
Figure 201

2. Adjustment/Test
   A. Perform Functional Test of Wing Temperature Indicator (See figure 202.)
      (1) Connect variable resistance box (General Radio P/N 1432-T or equivalent) to indicator as shown in figure 202.
      (2) On aircraft with red, green, and yellow color ranges:
         (a) Adjust resistance until temperature indicator pointer is at intersection of red and green bands. Resistance shall be 100.6 (±1) ohms.
         (b) Adjust resistance until temperature indicator pointer is at intersection of green and yellow bands. Resistance shall be 131 (±5) ohms.
      (3) On aircraft with blue, green, and yellow color ranges:
         (a) Adjust resistance until temperature indicator pointer is at intersection of blue and green bands. Resistance shall be 100.6 (±1) ohms.
         (b) Adjust resistance unil temperature indicator pointer is at intersection of green and yellow bands. Resistance shall be 131 (±5) ohms.



Wing Temperature Indicator Functional Test Schematic
Figure 202

Learjet

HORIZONTAL STABILIZER LEADING EDGE ANTI-ICE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Horizontal stabilizer leading edge anti-icing is accomplished by directing engine bleed air through a diffuser tube installed in the stabilizer leading edge. Bleed air is exhausted from the stabilizer leading edge into the horizontal stabilizer tips and then overboard.

B. The system consists of a leading edge diffuser tube, a thermostat, a temperature sensor, a pressure regulator, horizontal stabilizer temperature indicator, an annunciator, a system switch, and a circuit breaker. On *Aircraft 36-002 only*, the system also utilizes the anti-ice solenoid on the LH and RH bleed air shutoff and pressure regulator valve.

C. The temperature indicator is divided into three color ranges: red--below 35°F indicates moisture will freeze on surface or that system has failed; green--above 35°F indicates moisture will not freeze to surface or that system is functioning properly; yellow--overheating indicates possible system malfunction.

D. Component Description

(1) On *Aircraft equipped with Whittaker pressure regulator valve*, the pressure regulator regulates bleed air pressure to the wing leading edge and the horizontal stabilizer anti-ice systems at 16 psig. The regulator is installed between the bleed air manifold and a duct assembly which leads to both anti-ice systems.

(2) On *Aircraft equipped with Sterer shutoff valve*, the shutoff valve is a normally closed, spring-loaded, poppet-type shutoff valve. The valve is controlled by the system switch through the deenergized control relay.

2. OPERATION

NOTE: The Aircraft may be equipped with either a pressure regulator valve (Whittaker P/N 22335) or a shutoff valve (Sterer P/N 55510). The pressure regulator regulates the downstream pressure to 16 psig. The shutoff valve does not regulate downstream pressure.

A. On *Aircraft 36-002 only*, with the STAB WING HEAT Switch set to ON, 28 vdc is applied to the wing and stabilizer pressure regulator or shutoff valve and the anti-ice solenoid on each bleed air shutoff and pressure regulator valve. The pressure regulator or shutoff valve opens and allows bleed air to flow through the ducting to the horizontal stabilizer leading edge. The anti-ice solenoid on each shutoff and pressure regulator valve is energized and allows the valve to regulate bleed air at a higher temperature than normal (approximately 320°F). A thermostat installed on the stabilizer rib in the LH stabilizer monitors temperature of stabilizer leading edge structure and completes a ground circuit to the STAB OV HT annunciator when temperature reaches 215°F. The stabilizer temperature sensor, installed on the inner surface of the stabilizer leading edge, monitors the leading edge surface temperature and provides the crew with a visual indication on the stabilizer temperature indicator.

B. On *Aircraft 35-002 and Subsequent and 36-003 and Subsequent*, with the STAB WING HEAT Switch set to ON, 28 vdc is applied to the wing and stabilizer pressure regulator or shutoff valve. The pressure regulator or shutoff opens and allows bleed air to flow through the ducting to the horizontal stabilizer leading edge. A thermostat installed on the stabilizer rib in the LH stabilizer monitors temperature of stabilizer leading edge structure and completes a ground circuit to the STAB OV HT annunciator when temperature reaches 215°F. The stabilizer temperature sensor, installed on the inner surface of the stabilizer leading edge, monitors the leading edge surface temperature and provides the crew with a visual readout on the stabilizer temperature indicator.

C. On *Aircraft equipped with optional (Aeronca) thrust reverser*, the horizontal stabilizer anti-ice system will be inoperative for approximately three (3) seconds during the thrust reverser deploy and stow cycles.

D. Component Description

(1) The following is applicable to *Aircraft equipped with Whittaker pressure regulator valve*.

(a) Nonregulating Position (Closed)

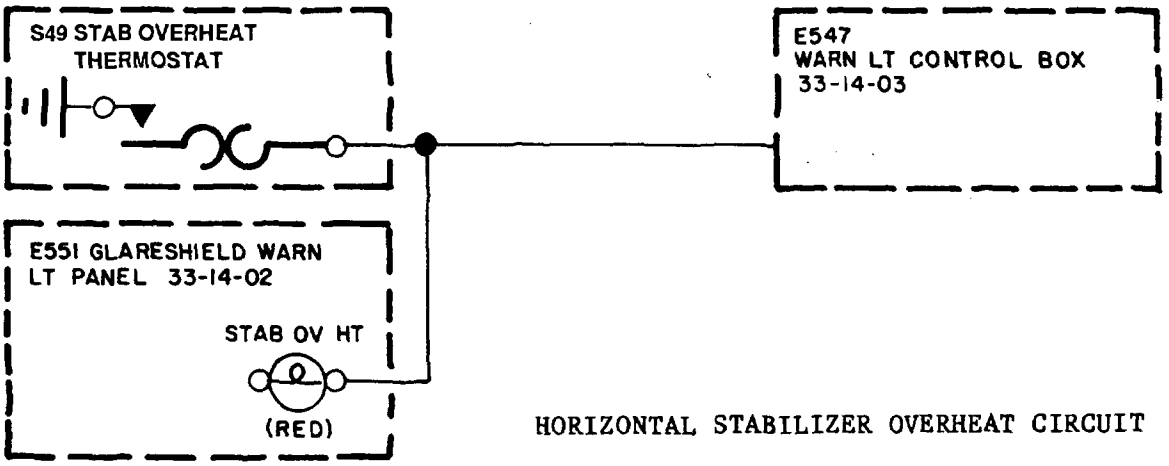
1) With the STAB WING HEAT Switch set to OFF, power is removed from the solenoid, allowing it to close. With the solenoid closed, air pressure is trapped in pressure control chamber (PC2). Air pressure, regulated to 16 psig is metered through the pilot valve chamber to pressure control chamber (PC1). Due to the construction of the valve, bleed air pressure (P1) will bleed into pressure control chamber (PC2) between the valve housing and slider. Pressure in chamber (PC2) increases, overriding the pressure in chamber (PC1) and moves the slider closed.

(b) Regulating Position (Open)

1) With the STAB WING HEAT Switch set to ON, power is applied and the solenoid is opened. With the solenoid valve open, the trapped air in pressure control chamber (PC2) is bled off through the valve probe. As the pressure in chamber (PC2) decreases, pressure in chamber (PC1) overrides the spring in chamber (PC2) and moves the slider open, allowing bleed airflow downstream. As the downstream pressure (P2) increases, it is sensed through the valve probe into chamber (PC2). As pressure in chamber (PC2) increases, the slider moves closed and as pressure decreases, the slider opens.

(2) The following is applicable to *Aircraft equipped with Sterer shutoff valve*.

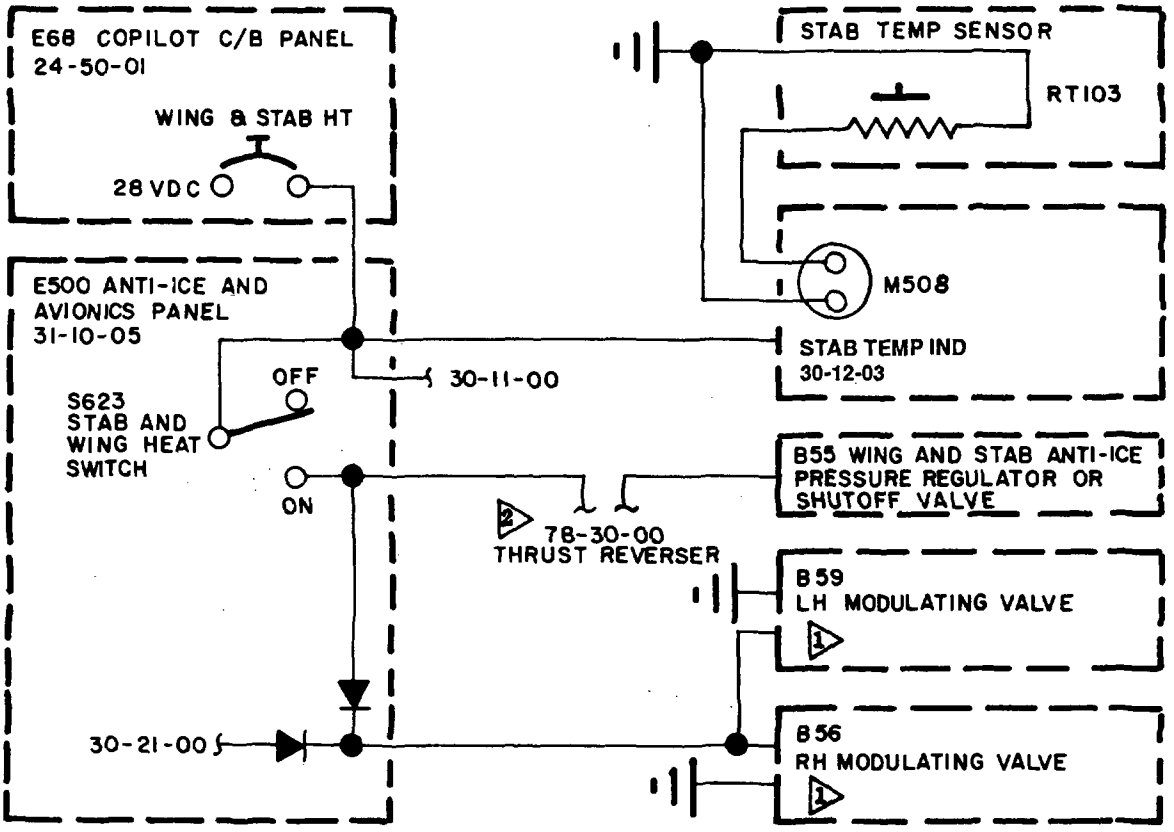
(a) When the STAB WING HEAT Switch is set to OFF, inlet air pressure enters the cavity behind the main poppet through two orifices and the entire valve housing up to the main poppet seat is pressurized. This, in addition to the spring force, keeps the valves closed. When the valve is energized (STAB WING HEAT Switch set to ON), the pilot valve poppet retracts and vents the pressure in the cavity to ambient. Inlet pressure on the outside of the cavity overcomes the spring force and drives the poppet open. This allows bleed air to flow through the valve.



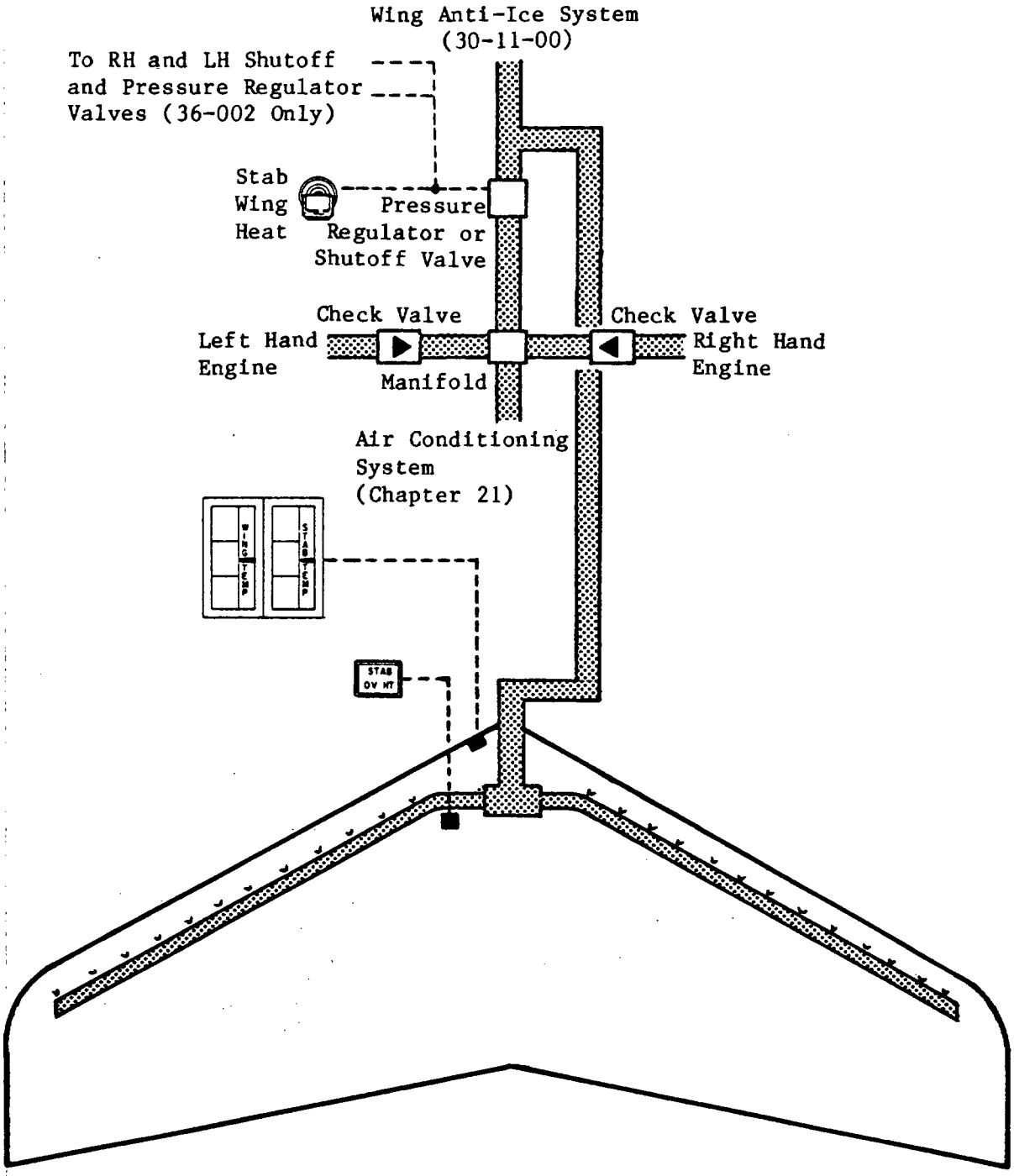
HORIZONTAL STABILIZER OVERHEAT CIRCUIT

1 Effective Aircraft 36-002 Only.

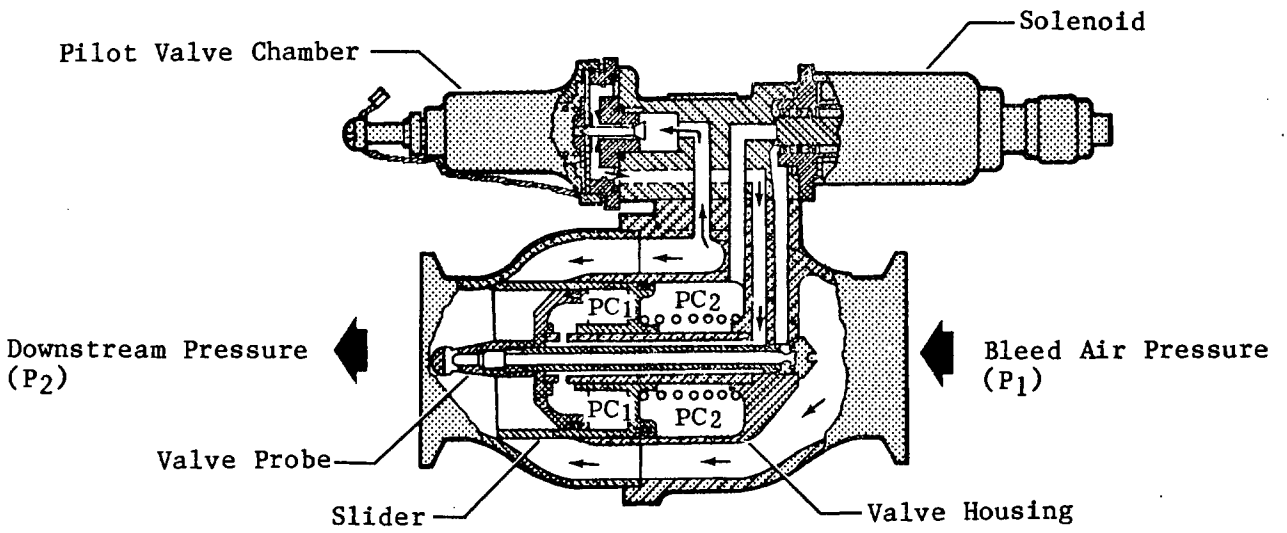
2 On Aircraft not equipped with Thrust Reverser System, Wing & Stab Anti-Ice Valve (B55) is wired directly to Stab & Wing Heat Switch.



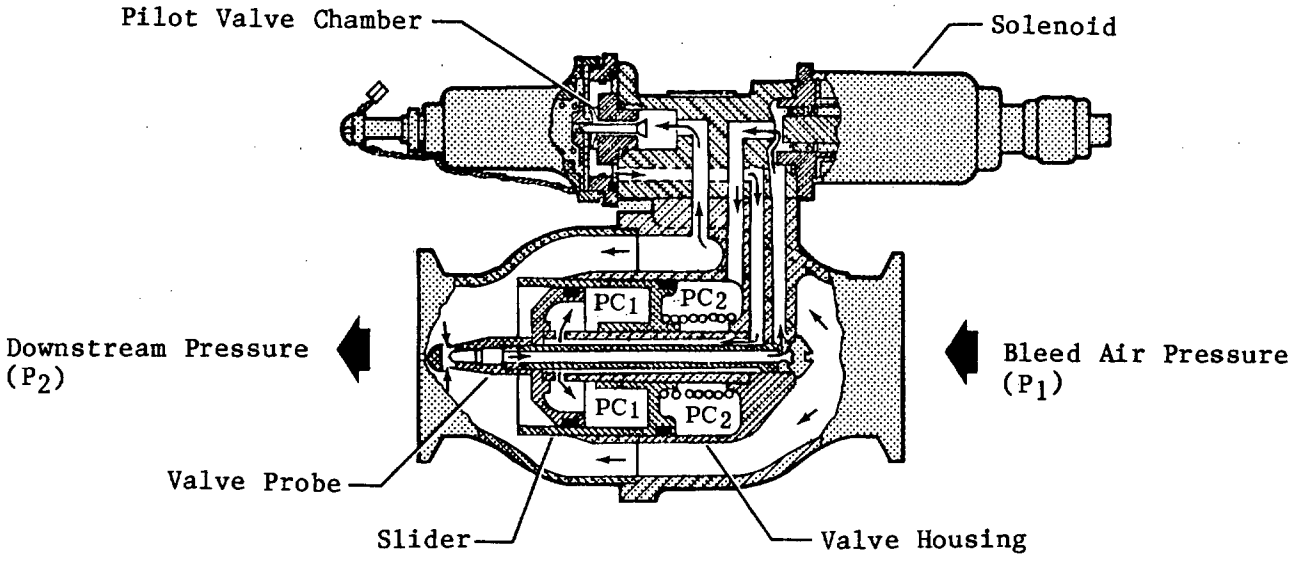
Horizontal Stabilizer Anti-Ice System Electrical Control Schematic
Figure 1



Horizontal Stabilizer Anti-Ice System Schematic
Figure 2

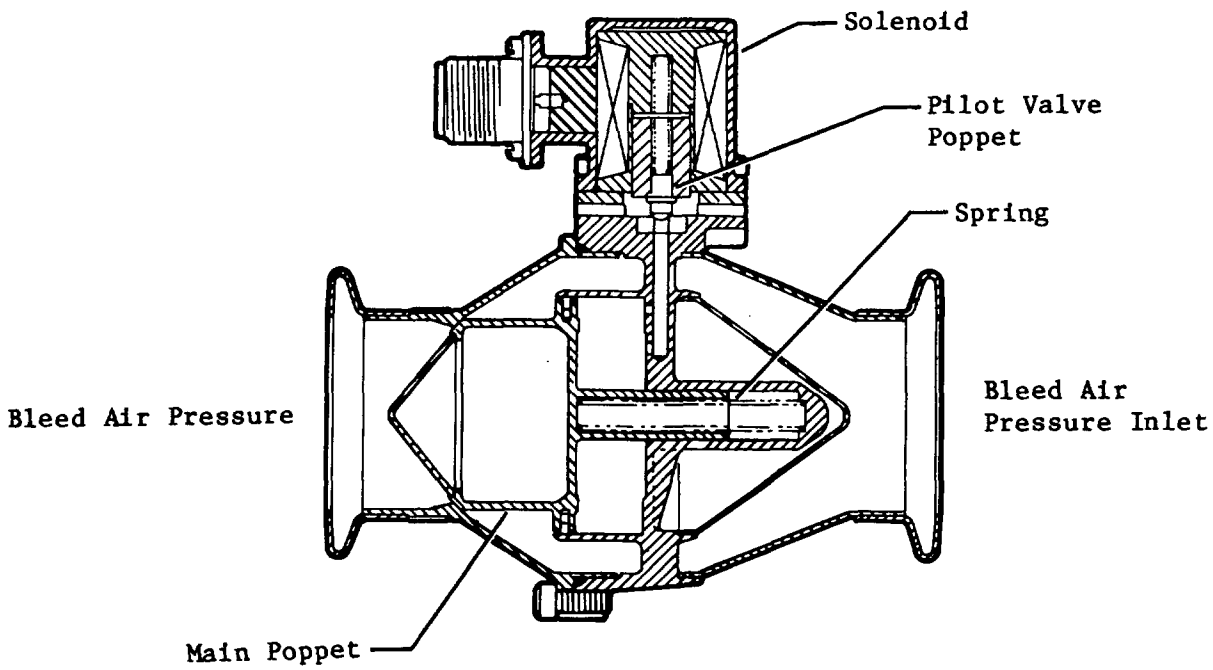


NONREGULATING



REGULATING

Pressure Regulator Valve
Figure 3



Shutoff Valve Schematic
Figure 4

HORIZONTAL STABILIZER LEADING EDGE ANTI-ICE - TROUBLE SHOOTING

1. TROUBLE SHOOTING

A. Trouble shooting the horizontal stabilizer leading edge anti-ice system can be accomplished by isolating the trouble to the control circuit, bleed air system, or the temperature indicating circuit. As an aid in trouble shooting it should be noted that the wing leading edge anti-ice system utilizes the same bleed air source and control circuit. The temperature indicating circuits use identical components to those used in the wing temperature indicating circuits. Therefore, if trouble should occur in the bleed air system, both anti-icing systems would experience the same difficulties.

B. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Voltmeter	3430A	Hewlett Packard	General
or			
Voltmeter	260	Simpson	General

C. See figure 101 for trouble shooting procedure.

Trouble	Probable Cause	Trouble Shooting	Repair
1. Air flows from wing scuppers when Stabilizer and Wing Heat Switch is set to OFF.	1. Control valve has failed open.	1. Disconnect electrical connector from valve and check for 28 vdc.	1. Replace control valve if no 28 vdc is present.
	2. An electrical short in control valve wiring has occurred.	2. Disconnect electrical connector from valve and check wiring for 28 vdc.	2. Replace wiring if 28 vdc is present.
2. On aircraft with red, green, and yellow color ranges on temperature indicators, pointer does not move from red zone when switch is set to ON.	1. Temperature indicator is faulty.	1. Refer to 30-11-02 for functional test of indicator.	1. Replace indicator if test requirements are not met.
	2. Lack of continuity in wiring from indicator to temperature sensor.	2. Perform continuity check of wiring	2. Replace wiring if continuity is not present.
On aircraft with blue, green, and red color ranges on indicator, pointer does not move from blue zone when switch is set to ON.	3. Temperature sensor is faulty.	3. Check indicator and continuity of wiring.	3. Replace temperature sensor if wiring and indicator check out OK.
3. Air does not flow from wing scuppers when Stabilizer and Wing Heat Switch is set to ON.	1. Control valve has failed closed.	1. Remove electrical connector from control valve and check for 28 vdc.	1. Replace control valve if 28 vdc is not present.
	2. Lack of continuity in control valve wiring.	2. Check for 28 vdc at control valve electrical connector.	2. Replace wiring if 28 vdc is not present.

Horizontal Stabilizer Anti-Ice System Trouble Shooting
Figure 101

1. REMOVAL/INSTALLATION

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Sandpaper	380 grit	Commercially Available	Clean surfaces.
Bonding Material	RTV 156 or 159	General Electric	Bond sensor.
Heat Sink Grease	340	Dow Corning	Install thermo-stat.
Methyl Ethyl Ketone	TT-M261	Commercially Available	Clean surfaces.
Rivets	CR2248 and MS20426AD-4	Commercially Available	Secure inboard rib assembly.

B. Remove Stabilizer Anti-Ice Thermostat (See figure 201.)

NOTE: Access to the stabilizer anti-ice thermostat is through an access panel on the upper surface of the stabilizer.

(1) Remove electrical power from aircraft.
(2) Remove upper access cover from upper surface of LH horizontal stabilizer.
(3) Disconnect and identify thermostat wiring at splices.
(4) Loosen and remove screws, spacers, and thermostat from baffle.
(5) Clean surface of baffle with sandpaper. Wipe clean with a clean cloth dampened with methyl ethyl ketone.

C. Install Stabilizer Anti-Ice Thermostat (See figure 201.)
(1) Apply heat sink grease (Dow Corning P/N 340) to top of thermostat.
(2) Position thermostat on baffle and secure with spacers and screws.
(3) Identify and connect wiring. (Refer to Chapter 10 of the Wiring Manual for correct wire splices.)
(4) Install and secure access cover. Repaint affected areas.
(5) Restore electrical power to aircraft.
(6) Perform Functional Test of Horizontal Stabilizer Anti-Ice System. (Refer to Adjustment/Test.)
(7) Restore aircraft to normal.

D. Remove Stabilizer Anti-Ice Temperature Sensor (See figure 201.) *(Aircraft 35-002 thru 35-117 and 36-002 thru 36-033 not modified per AAK 77-1, "Installation of Horizontal Stabilizer Temperature Sensor Access Provision")*

NOTE: The inboard rib assembly will have to be removed to gain access to the stabilizer anti-ice temperature sensor.

(1) Remove electrical power from aircraft.
(2) Remove access covers from vertical stabilizer. This will provide sufficient clearance to allow removal of the LH inboard stabilizer rib.
(3) Drill out rivets and remove rib from stabilizer.

(4) Disconnect and identify electrical wiring from temperature sensor at splice.
(5) Break bond and remove sensor from stabilizer leading edge.
(6) Clean surface with #380 sandpaper. Wipe with a clean cloth dampened with methyl ethyl ketone.

E. Install Stabilizer Anti-Ice Temperature Sensor (See figure 201.) (*Aircraft 35-002 thru 35-117 and 36-002 thru 36-033 not modified per AAK77-1, "Installation of Horizontal Stabilizer Temperature Sensor Access Provision"*)

(1) Position temperature sensor on stabilizer leading edge as shown.

CAUTION: DO NOT ALLOW BONDING MATERIAL TO GET BETWEEN SENSOR AND LEADING EDGE. ERRONEOUS INDICATIONS WILL RESULT.

(2) Apply bonding material over and around perimeter of sensor.
(3) Route wiring through grommet in rib and position stabilizer rib in stabilizer. Secure rib in place with rivets (P/N CR2248 and MS20426AD-4).
(4) Identify and connect electrical wiring to sensor at splice.
(5) Install vertical stabilizer access covers.
(6) Repaint affected areas.
(7) Restore electrical power to aircraft.
(8) Perform Functional Test of Horizontal Stabilizer Anti-Ice System. (Refer to Adjustment/Test.)
(9) Restore aircraft to normal.

F. Remove Stabilizer Anti-Ice Temperature Sensor (See figure 201.) (*Aircraft 35-118 and Subsequent and 36-033 and Subsequent and prior aircraft modified per AAK 77-1, "Installation of Horizontal Stabilizer Temperature Sensor Access Provision"*)

NOTE: An access cover is installed on the baffle along the forward side of the upper access opening.

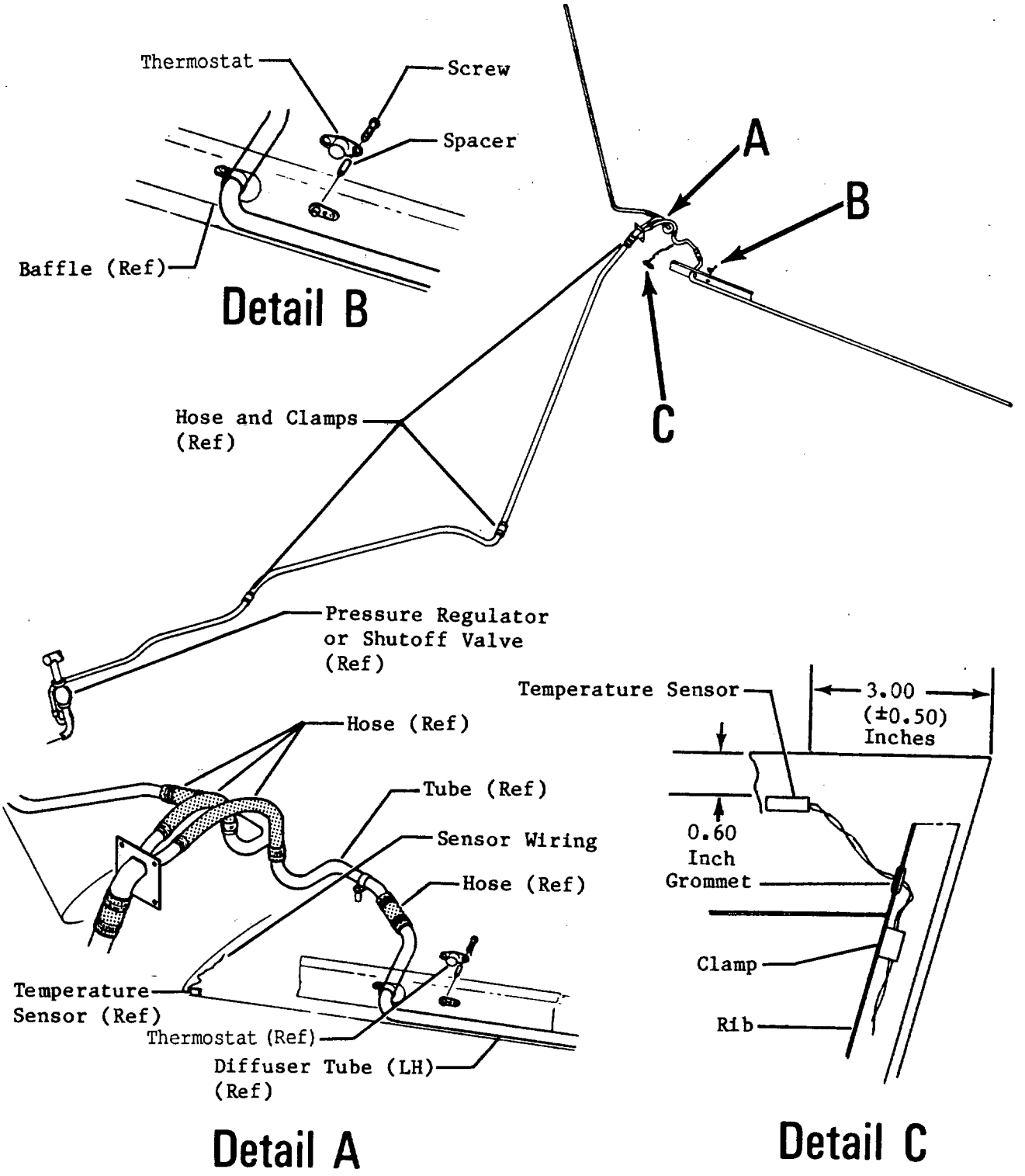
(1) Remove electrical power from aircraft.
(2) Remove access cover from top of LH horizontal stabilizer.
(3) Remove attaching parts and access cover from baffle.
(4) Disconnect and identify electrical wiring at splice.
(5) Break bond and remove sensor from stabilizer leading edge.
(6) Clean surface with #380 sandpaper. Wipe with a clean cloth dampened with methyl ethyl ketone.

G. Install Stabilizer Anti-Ice Temperature Sensor (See figure 201.) (*Aircraft 35-118 and Subsequent and 36-033 and Subsequent and prior aircraft modified per AAK 77-1, "Installation of Horizontal Stabilizer Temperature Sensor Access Provision"*)

(1) Position temperature sensor on stabilizer leading edge as shown.

CAUTION: DO NOT ALLOW BONDING MATERIAL TO GET BETWEEN SENSOR AND LEADING EDGE. ERRONEOUS INDICATIONS WILL RESULT.

(2) Apply bonding material over and around perimeter of sensor.
(3) Identify and connect electrical wiring to sensor at splices.
(4) Install access cover on baffle.
(5) Install access cover on upper surface of horizontal stabilizer.
(6) Repaint affected areas.
(7) Restore electrical power to aircraft.
(8) Perform Functional Test of Horizontal Stabilizer Anti-Ice System. (Refer to Adjustment/Test.)
(9) Restore aircraft to normal.



Horizontal Stabilizer Leading Edge Anti-Ice Installation
Figure 201

2. ADJUSTMENT/TEST

A. Functional Test of Horizontal Stabilizer Anti-Ice System

(1) With engines running at idle power setting, move the STAB WING HEAT Switch to ON. Verify that air is flowing from stabilizer tips.

(2) Slowly advance throttles while monitoring stabilizer temperature indicator. Initially, indicator should show ambient temperature of stabilizer leading edge (red arc if below 35°F, green arc of above 35°F). As stabilizer temperature increases, indicator should read normal (green arc), and with throttles far advanced, indicator should read hot (yellow arc).

(3) Continue to advance throttles and note increase in stabilizer temperature. The STAB OV HT annunciator may illuminate, depending upon ambient temperature. If annunciation occurs, the temperature indicator should read hot (yellow arc).

(4) Retard throttles.

(5) Set STAB WING HEAT Switch to OFF. Verify that no air is flowing from stabilizer tips.

HORIZONTAL STABILIZER ANTI-ICE PRESSURE REGULATOR VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The following procedures are applicable to aircraft equipped with Whittaker valve.

° Maintenance practices on the pressure regulator are limited to replacement of a defective regulator.

A. Remove Pressure Regulator Valve (See figure 201.)

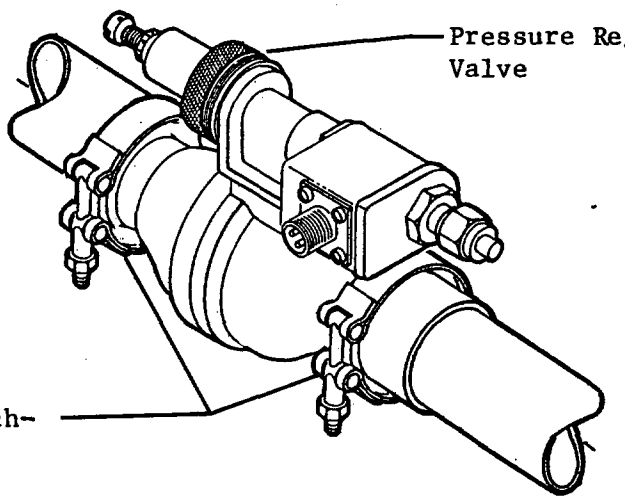
(1) Remove electrical power from aircraft.
(2) Lower tailcone access door.
(3) Remove insulation jackets and disconnect electrical connector from pressure regulator valve solenoid.
(4) Loosen couplings and remove pressure regulator valve from aircraft.

B. Install Pressure Regulator Valve (See figure 201.)

(1) Position regulator in place and secure with couplings. Torque couplings 35 inch-pounds plus drag torque.

NOTE: Drag torque is the amount of torque required to overcome the friction of any self-locking nut. This nut friction (drag torque) must be added to the torque callout to assure proper torquing. The tailcone bleed air ducting incorporates stainless steel clamps, nuts, and bolts which require higher nut friction than the standard self-locking nuts. In some instances, nut friction may exceed the required torque values.

(2) Connect electrical connector and install insulation jackets.
(3) Restore aircraft to normal.
(4) Restore electrical power to aircraft.



Pressure Regulator Valve Installation
Figure 201

HORIZONTAL STABILIZER ANTI-ICE SHUTOFF VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The following procedures are applicable to aircraft equipped with Sterer shutoff valve.

A. Remove Anti-Ice Shutoff Valve (See figure 201.)

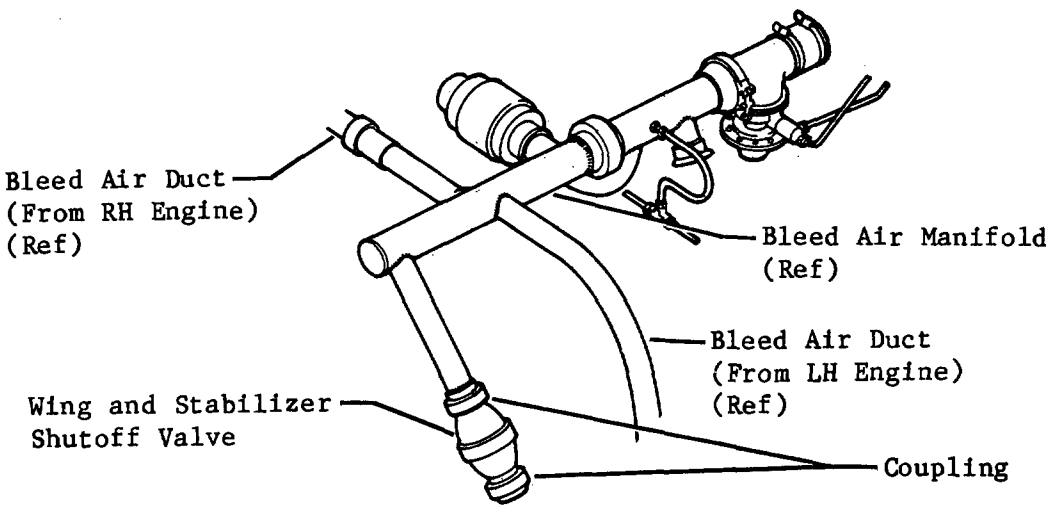
(1) Remove electrical power from aircraft.
(2) Lower tailcone access door.
(3) Remove insulation jackets and disconnect electrical connector from shutoff valve.
(4) Loosen couplings and remove shutoff valve from aircraft.

B. Install Anti-Ice Shutoff Valve (See figure 201.)

(1) Position shutoff valve in place and secure with couplings. Torque couplings to 35 inch-pounds plus drag torque.

NOTE: Drag torque is the amount of torque required to overcome the friction of any self-locking nut. This nut friction (drag torque) must be added to the torque callout to assure proper torquing. The tailcone bleed air ducting incorporates stainless steel clamps, nuts, and bolts which require higher nut friction than the standard self-locking nuts. In some instances, nut friction may exceed the required torque values.

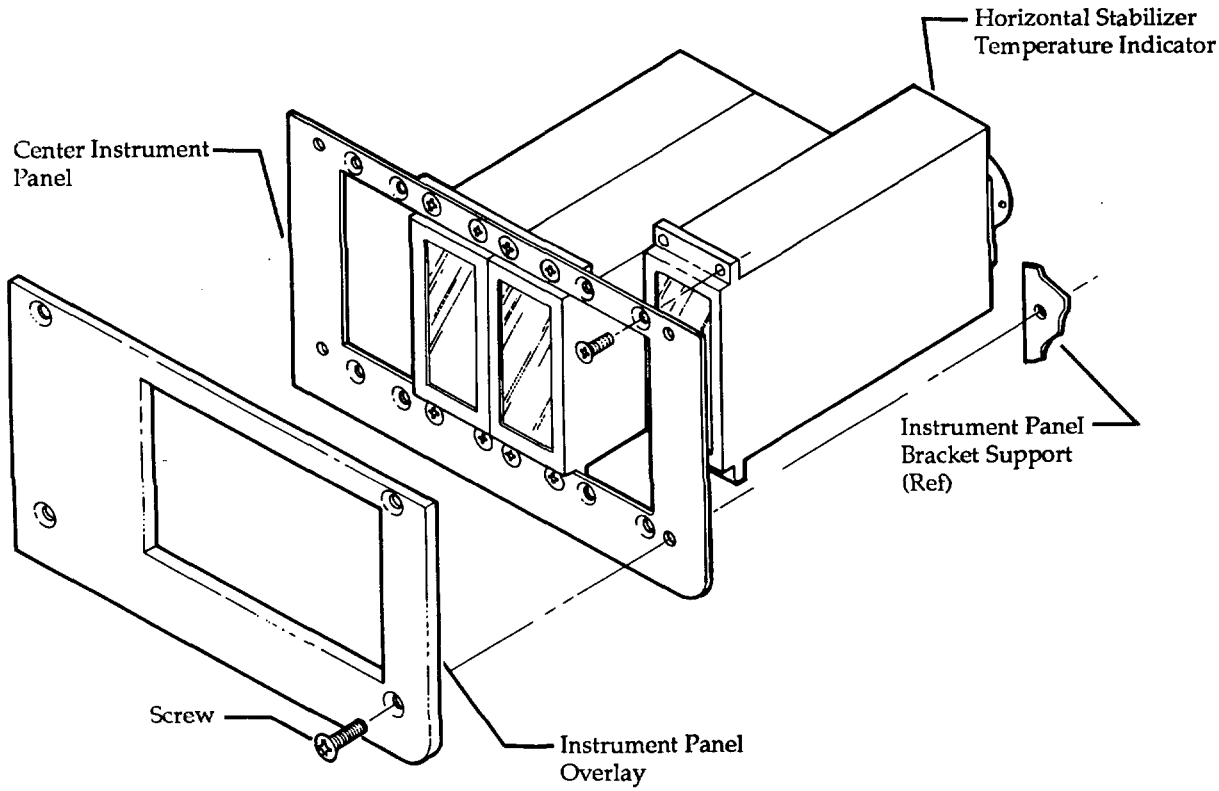
(2) Connect electrical connector and install insulation jackets.
(3) Restore aircraft to normal.
(4) Restore electrical power to aircraft.



Shutoff Valve Installation
Figure 201

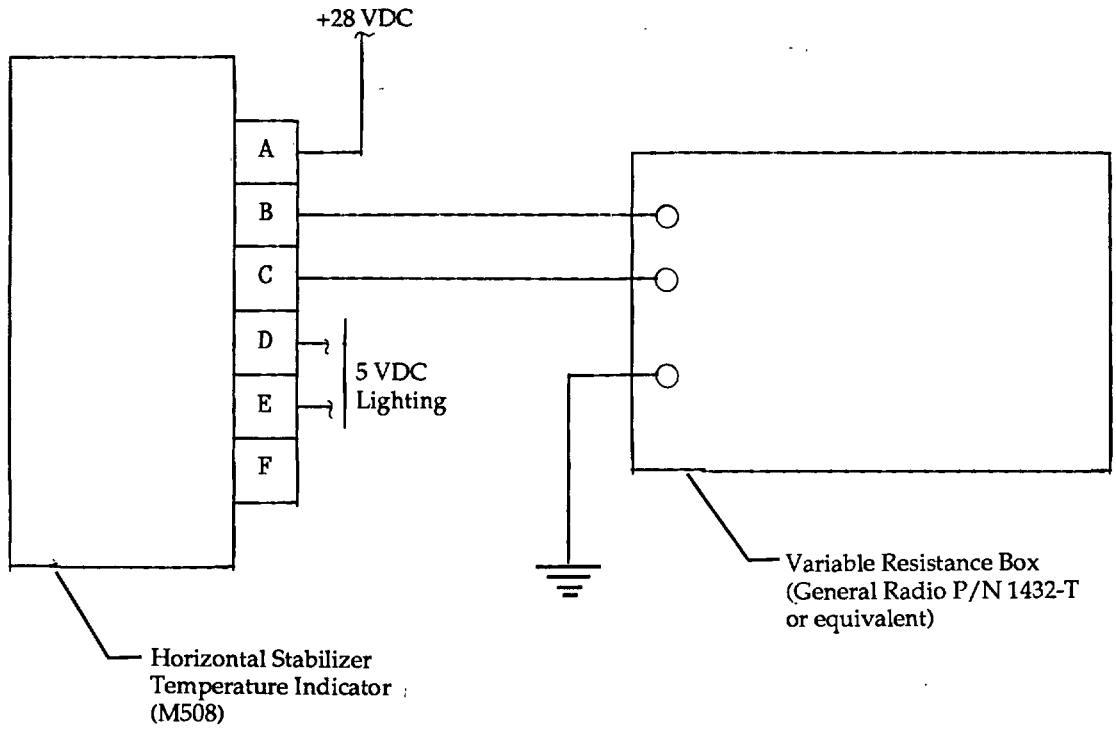
HORIZONTAL STABILIZER TEMPERATURE INDICATOR - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Remove Horizontal Stabilizer Temperature Indicator (See figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Remove attaching parts and instrument panel overlay.
      (3) Remove attaching parts and center instrument panel from its supports sufficiently to gain access to indicator electrical connector.
      (4) Disconnect electrical connector from temperature indicator.
      (5) Remove attaching parts and temperature indicator from aircraft.
   B. Install Horizontal Stabilizer Temperature Indicator (See figure 201.)
      (1) Install temperature indicator and attaching parts.
      (2) Connect electrical connector to temperature indicator.
      (3) Install center instrument panel and secure with attaching parts.
      (4) Install instrument panel overlay and secure with attaching parts.
      (5) Restore electrical power to aircraft.



Horizontal Stabilizer Temperature Indicator Installation
Figure 201

2. **Adjustment/Test**
   A. Perform Functional Test of Horizontal Stabilizer Temperature Indicator (See figure 202.)
      (1) Connect variable resistance box (General Radio P/N 1432-T or equivalent) to indicator as shown in figure 202.
      (2) On aircraft with red, green, and yellow color ranges:
         (a) Adjust resistance until temperature indicator pointer is at intersection of red and green bands. Resistance shall be 100.6 (±1) ohms.
         (b) Adjust resistance until temperature indicator pointer is at intersection of green and yellow bands. Resistance shall be 131 (±5) ohms.
      (3) On aircraft with blue, green, and yellow color ranges:
         (a) Adjust resistance until temperature indicator pointer is at intersection of blue and green bands. Resistance shall be 100.6 (±1) ohms.
         (b) Adjust resistance until temperature indicator pointer is at intersection of green and yellow bands. Resistance shall be 131 (±5) ohms.



Horizontal Stabilizer Temperature Indicator Functional Test Schematic
Figure 202

AIR INTAKE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Nacelle inlet anti-ice is accomplished by directing engine bleed air around the lip of the nacelle inlet.

B. On Aircraft equipped with elliptical spinner engines, engine anti-icing is accomplished by directing engine bleed air to the center hub of the engine. For further information on the engine anti-ice system, refer to Engine Maintenance Manual. On Aircraft equipped with conical spinner engines, engine bleed air is not required for engine anti-icing.

C. The nacelle heat system switch also provides 28 vdc power for a heater in each PT_2 - TT_2 sensor. For further information on the PT_2 - TT_2 sensor, refer to Engine Maintenance Manual.

1. TROUBLE SHOOTING

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items.

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson	Check circuits.
Regulated Pressure Source (2 psi)		Commercially Available	Test pressure switch.
Pressure Gage (2 psi)		Commercially Available	Test pressure switch.

B. Air Intake Trouble Shooting

(1) See figure 101 for air intake trouble shooting. Refer to Chapter 30 of the Wiring Manual for nacelle and engine anti-ice system (air intake) wiring diagrams.

(2) If the procedures in figure 101 do not locate air intake problems, refer to the Engine Maintenance Manual to trouble shoot the PT_2 - TT_2 sensor(s).

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. R ENG ICE or L ENG ICE Annunciator Illuminated with Applicable Nacelle Heat Switch On.		
a. Loss of power to heat switch.	Visually inspect R NAC HT circuit breaker (CB80) on copilot's circuit breaker panel and L NAC HT circuit breaker (CB79) on pilot's circuit breaker panel.	Ensure that circuit breakers are depressed.
b. Defective heat switch(es).	Check mechanical function of switch on anti-ice and avionics panel. Check for 28 vdc output at pin 11 of P616 (right switch) or pin V of P615 (left switch).	Replace defective switch(es).
c. Defective nacelle anti-ice pressure switch(es).	Remove pressure switch from aircraft. Inspect and pressure check switch. (Refer to 30-21-02.)	Replace defective switch(es). (Refer to 30-21-02.)

Air Intake Trouble Shooting
Figure 101 (Sheet 1 of 2)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. R ENG ICE or L ENG ICE Annunciator Illuminated with Applicable Nacelle Heat Switch On (Continued).		
d. Loss of power to nacelle anti-ice shutoff valve(s).	With heat switch off, check for 28 vdc between pins A and B on valve (B57 or B58).	If voltage does not exist, check wiring between valve(s) and anti-ice and avionics panel. Repair wiring if applicable.
e. Defective nacelle anti-ice shutoff valve(s).	Operate applicable engine at idle and check for warm air exhaust from lower side of nacelle inlet.	Replace defective shutoff valve(s). (Refer to 30-21-01.)

Air Intake Trouble Shooting
Figure 101 (Sheet 2 of 2)

NACELLE INLET ANTI-ICE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Each nacelle anti-ice system consists of a system switch, a shutoff valve (N.O.), a pressure switch, an annunciator, and a bleed air diffuser tube around the inside of the nacelle inlet lip. On *Aircraft 35-634 and Subsequent and 36-058 and Subsequent*, an indicator light verifies system operation.

B. Component Description

(1) The shutoff valve is basically a pressure-actuated, solenoid-controlled shutoff valve. The valve is normally open when pressure is applied and with no power applied. When the solenoid is energized (Nacelle Heat Switches set on), a minimum of 3.0 psig is required to open the valve.

(2) The nacelle anti-ice pressure switch is installed adjacent to and downstream of the anti-ice shutoff valve. The pressure switch senses the bleed air pressure in the nacelle diffuser tube.

2. OPERATION

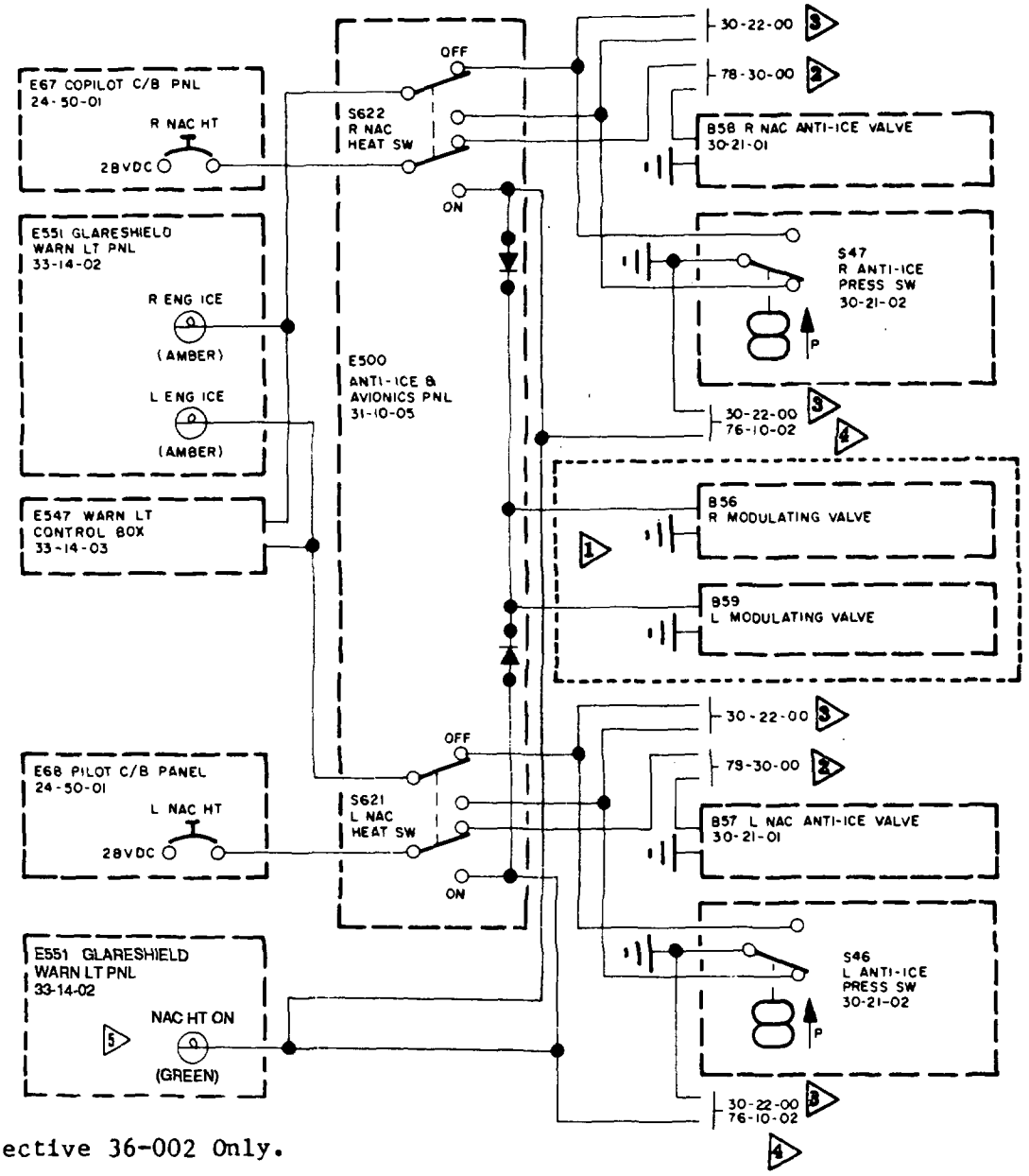
A. On *Aircraft 36-002 only*, when the Nacelle Heat Switches are set on, the applicable anti-ice valve solenoid is deenergized (opened), 28 vdc is applied to the applicable engine anti-ice valve and to the anti-ice solenoid on each bleed air shutoff and pressure regulator valve. With the nacelle anti-ice valve opened, bleed air is directed through a diffuser tube around the perimeter of the nacelle inlet lip. The nacelle anti-ice pressure switch senses bleed air pressure and actuates, breaking the ground circuit to the annunciators. The nacelle anti-ice pressure switch actuates at 2 psi. This provides a positive indication to the crew that the anti-icing system is functioning properly. A heater in the fuel computer P_2 sensing line is also energized when the Nacelle Heat Switches are set on. A drop in bleed air pressure (below 2 psi) will complete the ground circuit and illuminate the annunciators. The annunciators are amber and labeled R ENG ICE and L ENG ICE.

NOTE: Under normal no-ice conditions, the nacelle anti-icing control valves are electrically energized and held to the closed position. When anti-icing is required, the nacelle anti-ice valves are deenergized (opened); therefore, with a complete electrical power failure, nacelle anti-ice is still available.

B. On *Aircraft 35-002 and Subsequent and 36-003 and Subsequent*, when the Nacelle Heat Switches are set on, the applicable nacelle anti-ice valve solenoid is deenergized (opened). With the nacelle anti-ice valve opened, bleed air is directed through a diffuser tube around the perimeter of the nacelle inlet lip. The nacelle anti-ice pressure switch senses bleed air pressure and actuates, breaking the ground circuit to the annunciators. The nacelle anti-ice pressure switch actuates at 2 psi. This provides a positive indication to the crew that the anti-icing systems are functioning properly. A heater in the fuel computer P_2 sensing line is also energized when the Nacelle Heat Switches are set on. A drop in bleed air pressure (below 2 psi) will complete the ground circuit and illuminate the annunciators. The annunciators are amber and labeled R ENG ICE and L ENG ICE.

NOTE: Under normal no-ice conditions, the nacelle anti-icing control valves are electrically energized and held to the closed position. When anti-icing is required, the nacelle anti-ice valves are deenergized (opened); therefore, with a complete electrical power failure, nacelle anti-ice is still available.

C. On *Aircraft 35-634 and Subsequent and 36-058 and Subsequent*, when the Nacelle Heat Switches are set on, a green NAC HT ON annunciator illuminates to indicate system operation.



1> Effective 36-002 Only.

2> On Aircraft not equipped with Thrust Reversers, Anti-Ice Valves are wired directly to switch.

3> Effective on Aircraft 35-002 thru 35-244 and 36-002 thru 36-044.

4> Effective on Aircraft 35-245 and Subsequent and 36-045 and Subsequent.

5> Effective on Aircraft 35-634 and Subsequent and 36-058 and Subsequent.

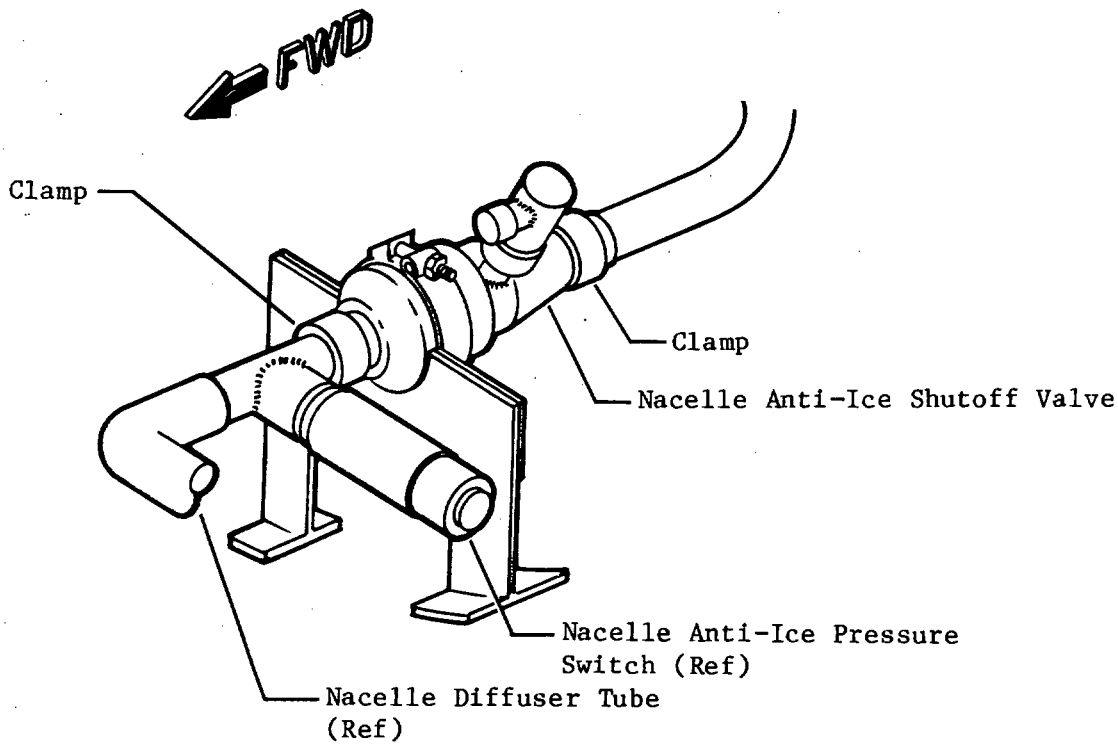
Nacelle Anti-Ice System Electrical Control Schematic
Figure 1

NACELLE ANTI-ICE SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Nacelle Anti-Ice Valve (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove engine lower nacelle, starter, and generator. (Refer to Chapters 24 and 80.)
   (3) Disconnect electrical connector from valve.
   (4) Loosen and remove clamps securing bleed air ducts to valve.
   (5) Loosen clamp tee-bolt and remove valve from bracket.

B. Install Nacelle Anti-Ice Valve (See figure 201.)
   (1) Position valve in place and secure with clamps.
   (2) Install ducts on valve and secure with clamps.
   (3) Connect electrical connector to valve.
   (4) Install generator, starter, and engine lower nacelle. (Refer to Chapters 24 and 80.)
   (5) Restore aircraft to normal.
   (6) Restore electrical power to aircraft.



Nacelle Anti-Ice Shutoff Valve Installation
Figure 201

NACELLE ANTI-ICE PRESSURE SWITCH - MAINTENANCE PRACTICES

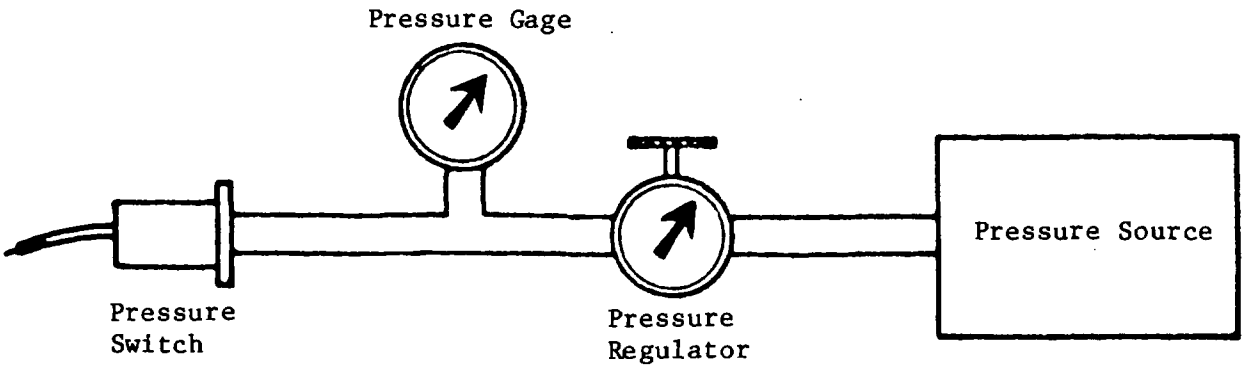
1. REMOVAL/INSTALLATION

A. Remove Nacelle Anti-Ice Pressure Switch (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove engine lower nacelle, starter, and generator. (Refer to Chapters 24 and 80.)
   (3) Disconnect electrical connector from pressure switch.
   (4) Loosen and remove pressure switch from bleed air duct.

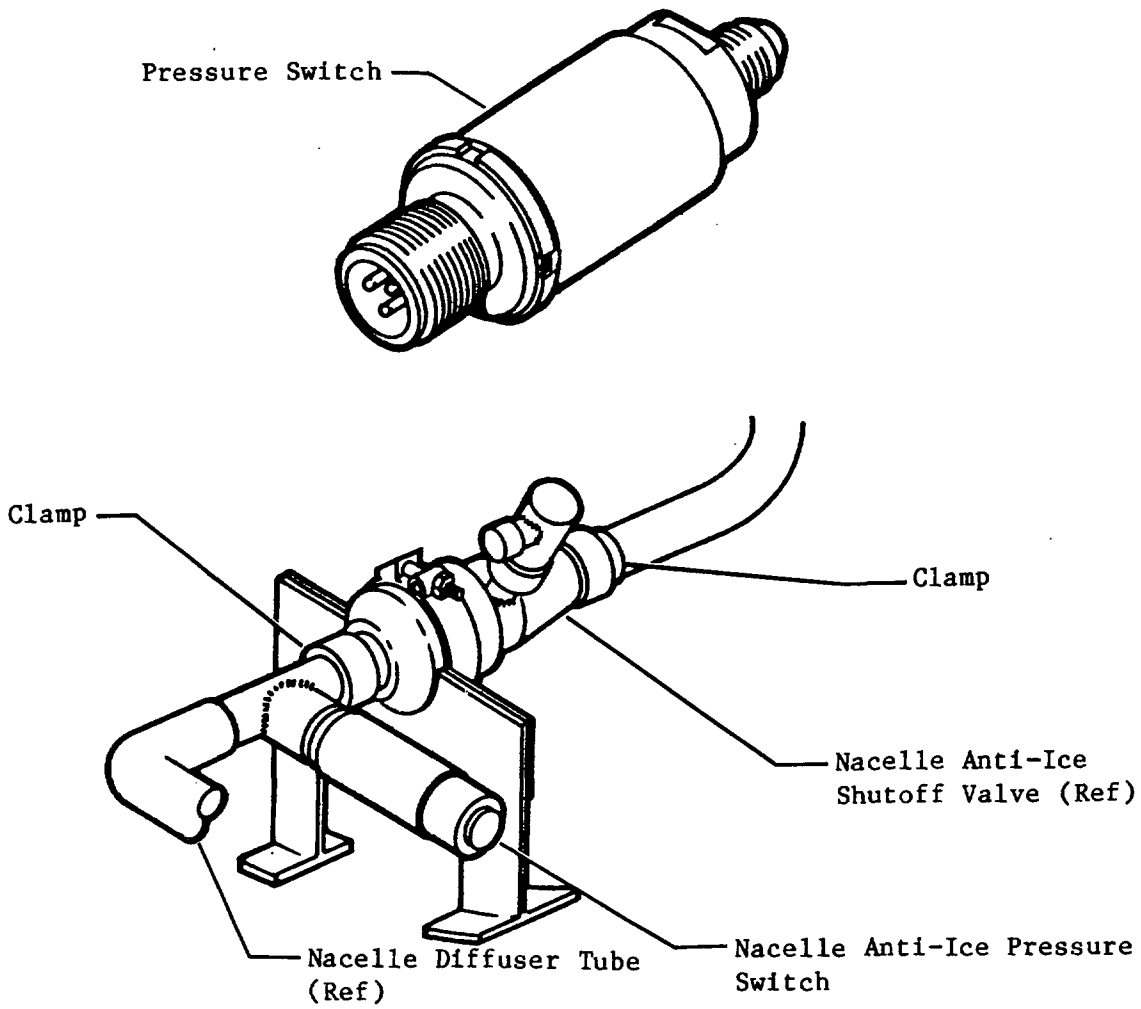
B. Install Nacelle Anti-Ice Pressure Switch (See figure 201.)
   (1) Position pressure switch in bleed air duct and secure with attaching parts.
   (2) Connect electrical connector to switch. (Refer to Wiring Manual, Chapter 30.)
   (3) Install generator, starter, and engine lower nacelle. (Refer to Chapters 24 and 80.)
   (4) Restore aircraft to normal.
   (5) Restore electrical power to aircraft.

2. INSPECTION/CHECK

A. Inspect Nacelle Anti-Ice Pressure Switch (See figure 201.)
   (1) Inspect electrical connector for damage or corrosion.
   (2) Inspect pressure port for foreign matter.
   (3) Check pressure switch as follows:
      (a) Connect variable pressure source to pressure switch.
      (b) Connect a multimeter (preselect ohms mode) across pins A & C of electrical connector. Multimeter shall indicate open circuit with no pressure applied.
      (c) Slowly increase pressure until switch actuates (continuity between pins A & C). Switch actuation shall occur at 2 psi as indicated on test pressure gage.
      (d) Slowly release pressure, remove multimeter, disconnect pressure switch, and install pressure switch in aircraft.



FUNCTIONAL TEST SETUP



Nacelle Anti-Ice Pressure Switch Installation
Figure 201

ENGINE ANTI-ICE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Each engine anti-ice system consists of a system switch, a pressure switch, a shutoff valve (N.O.) and an annunciator.

B. The system switches and annunciators for the engine anti-ice systems are common with nacelle anti-ice system.

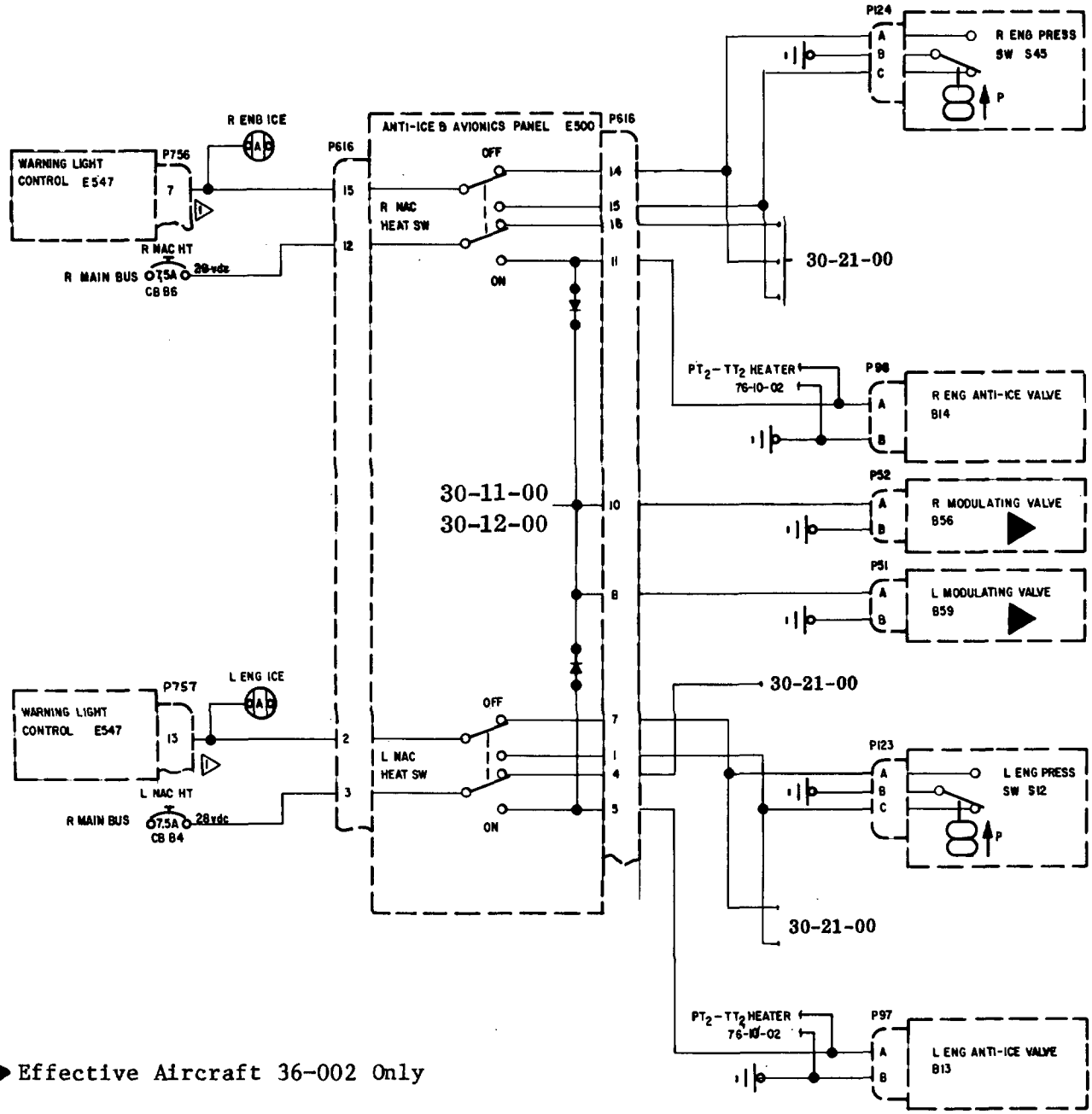
C. For maintenance practices on the engine anti-ice system, refer to Chapter 75 of the Engine Maintenance Manual.

2. OPERATION

A. When the Nacelle Heat Switches are set on, 28 vdc is applied to the engine anti-ice valve. With the engine anti-ice valve open, engine bleed air is directed to the engine inlet bullet nose cone. The engine anti-ice pressure switch is actuated at 6 (±1) psig and turns off the L or R ENG ICE annunciator.

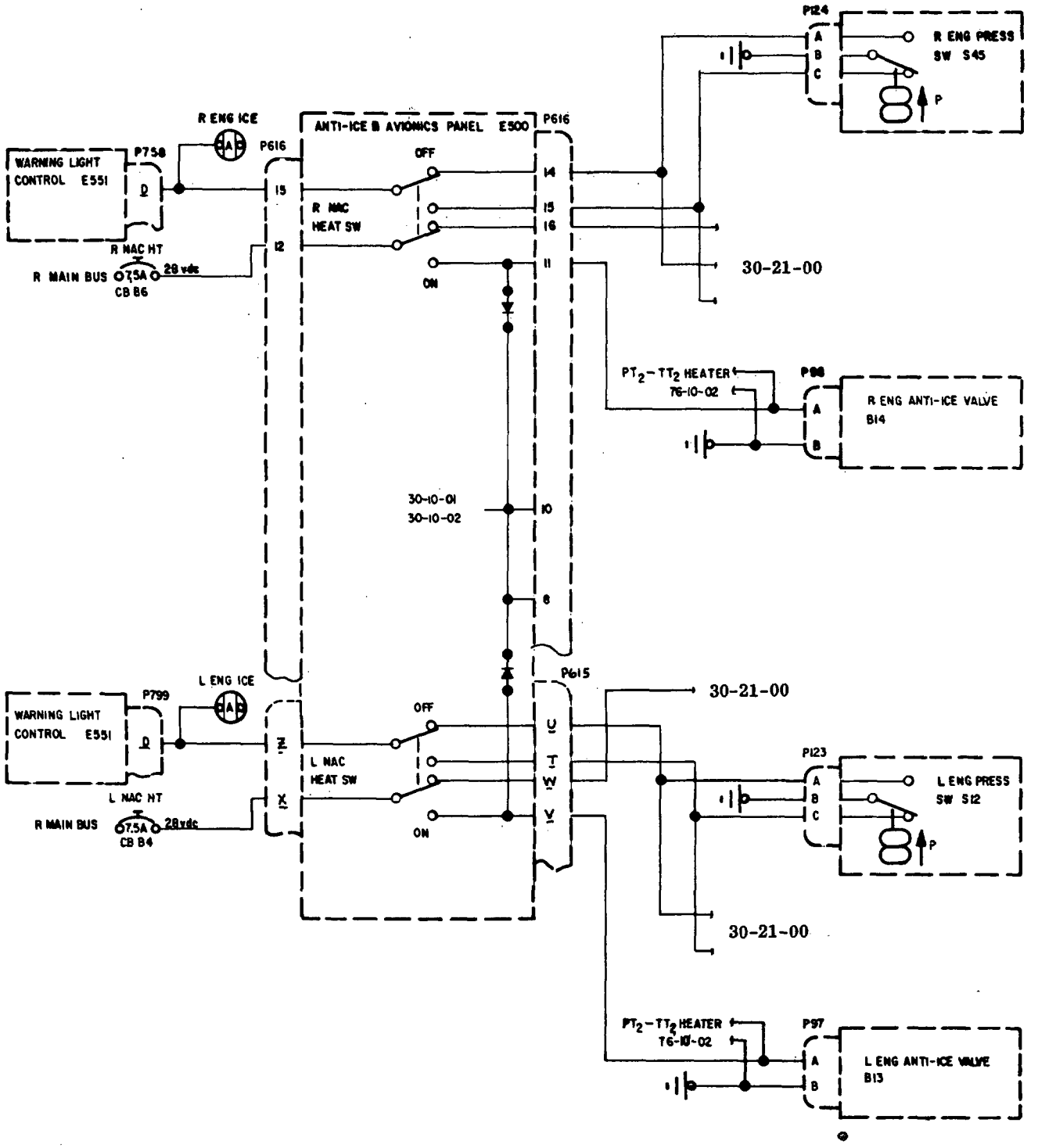
B. For further information on the Engine Anti-Ice System, refer to Chapter 75 of the Engine Maintenance Manual.

1 Effective on Aircraft 35-005 and Subsequent and 36-003 and Subsequent, change P756-7 to P758-D and P757-13 to P799-D.



▶ Effective Aircraft 36-002 Only

Engine Anti-Ice Electrical System Schematic
Figure 1 (Sheet 1 of 2)



Engine Anti-Ice Electrical System Schematic
Figure 1 (Sheet 2 of 2)

PITOT AND STATIC ANTI-ICE SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Aircraft 35-002 thru 35-505, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot," are equipped with integral heating elements in the six static ports, in the two pitot tubes and masts, and in the two angle-of-attack transducers.

B. Aircraft 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot," are equipped with integral heating elements in the two pitot tubes and masts and in the two angle-of-attack transducers. (Refer to Chapter 34 for pitot tube maintenance practices.) (Refer to Chapter 27 for angle-of-attack transducer maintenance practices.)

C. Each pitot tube and pitot mast is equipped with an electrical element to prevent moisture from freezing on the tube and mast. The pitot tubes and masts heating elements are powered by 28 vdc and controlled by Pitot Heat Switches. The pitot tubes and masts are located at FS 137, one tube and mast on each side of the nose compartment. (Refer to Chapter 34 for pitot tube maintenance practices.)

D. On Aircraft 35-002 thru 35-505, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot," each of the six heated static ports is equipped with an electrical heating element to prevent moisture from freezing and obstructing the port openings. Two static ports are located on each side of the aircraft in front of the windshield at BL 18.

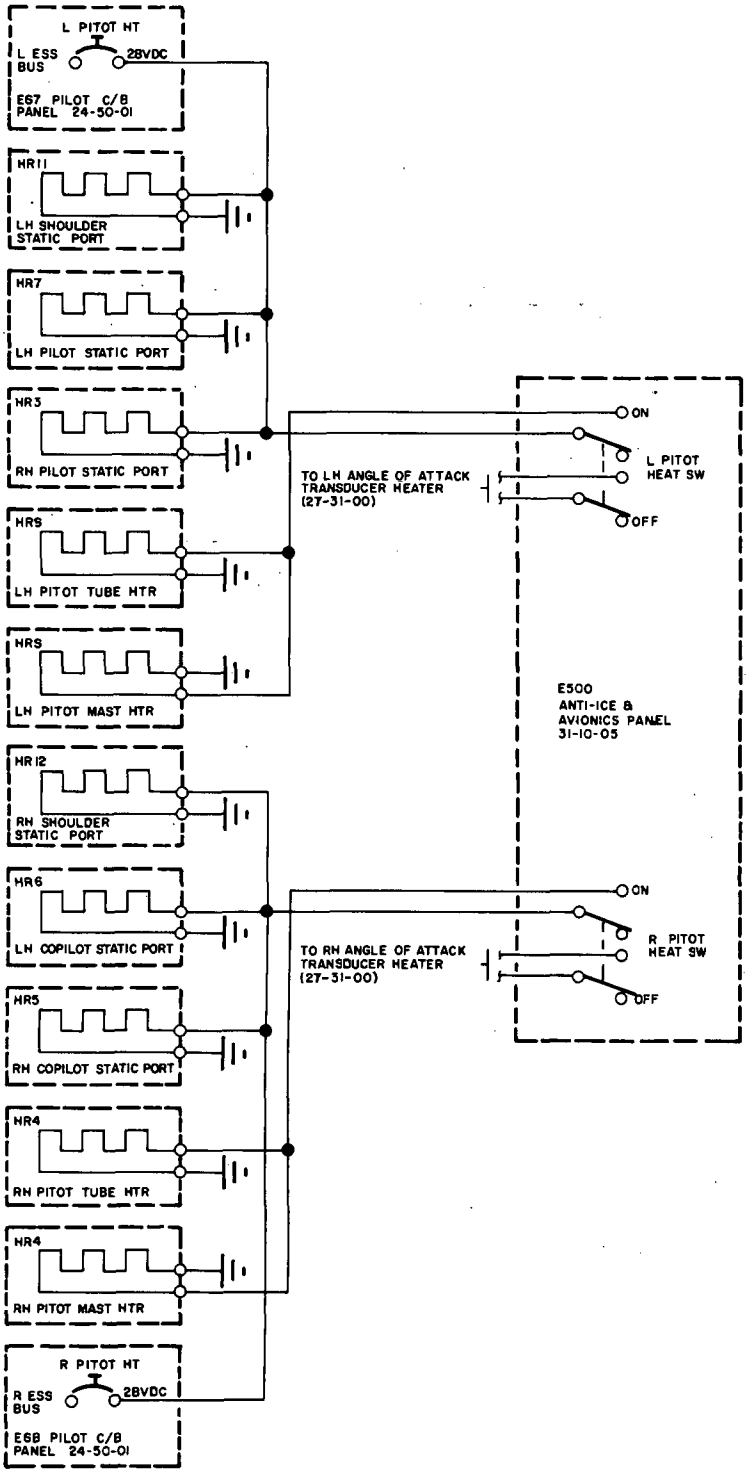
D. Each angle-of-attack transducer is equipped with an electrical heating element to prevent moisture from freezing on the transducer vane. The heater is powered by 28 vdc and is controlled by Pitot Heat Switches. (Refer to Chapter 27 for angle-of-attack transducer maintenance practices.)

E. On Aircraft 35-271 and Subsequent, 36-045 and Subsequent and prior aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System," a pitot current sensor system is installed to monitor the current flow to both pitot tubes and masts. (For pitot current sensor system operation, refer to 30-31-00.)

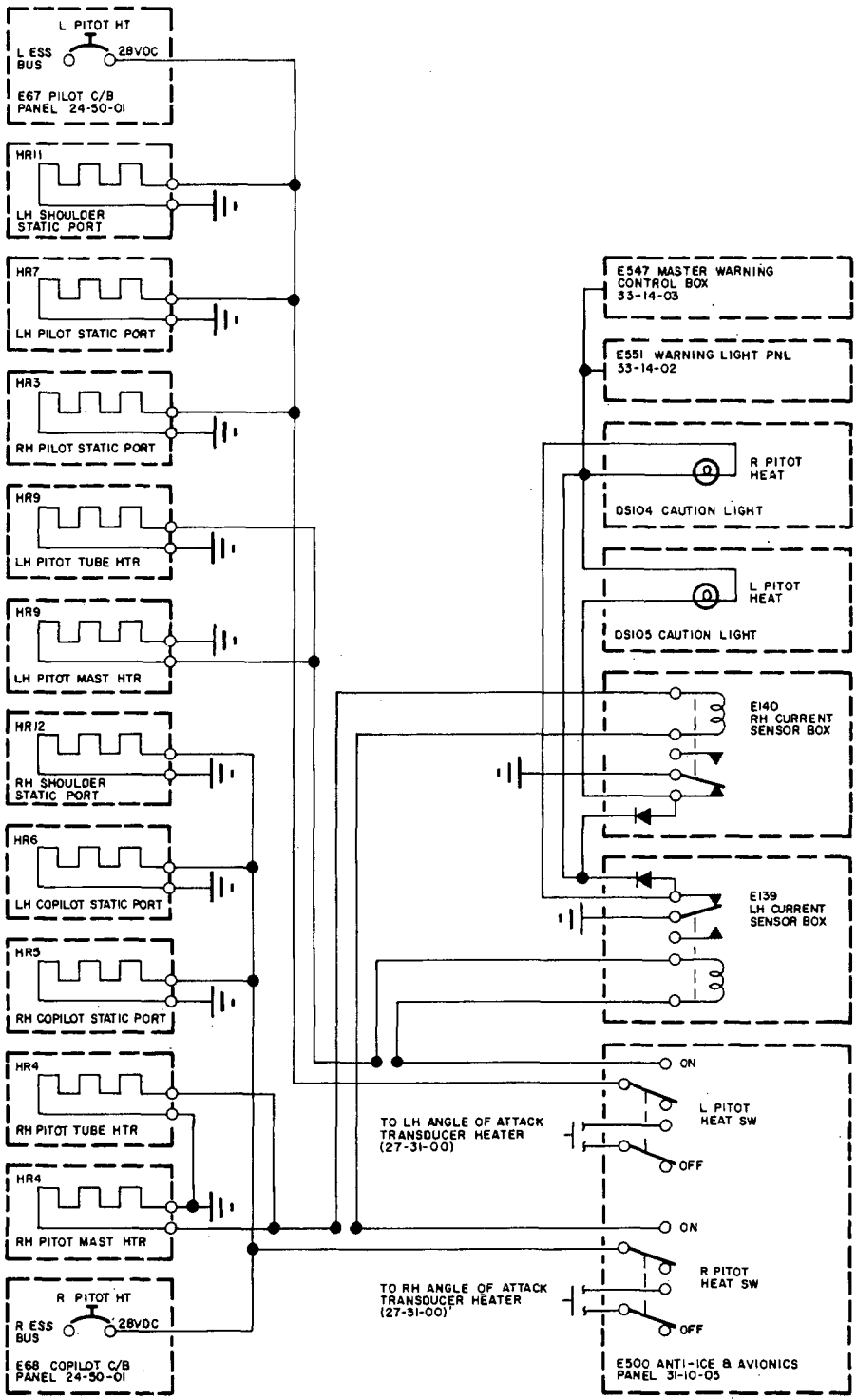
2. OPERATION (See figure 1.)

A. The static ports are powered by 28 vdc and are heated when the Battery Switches are set on.

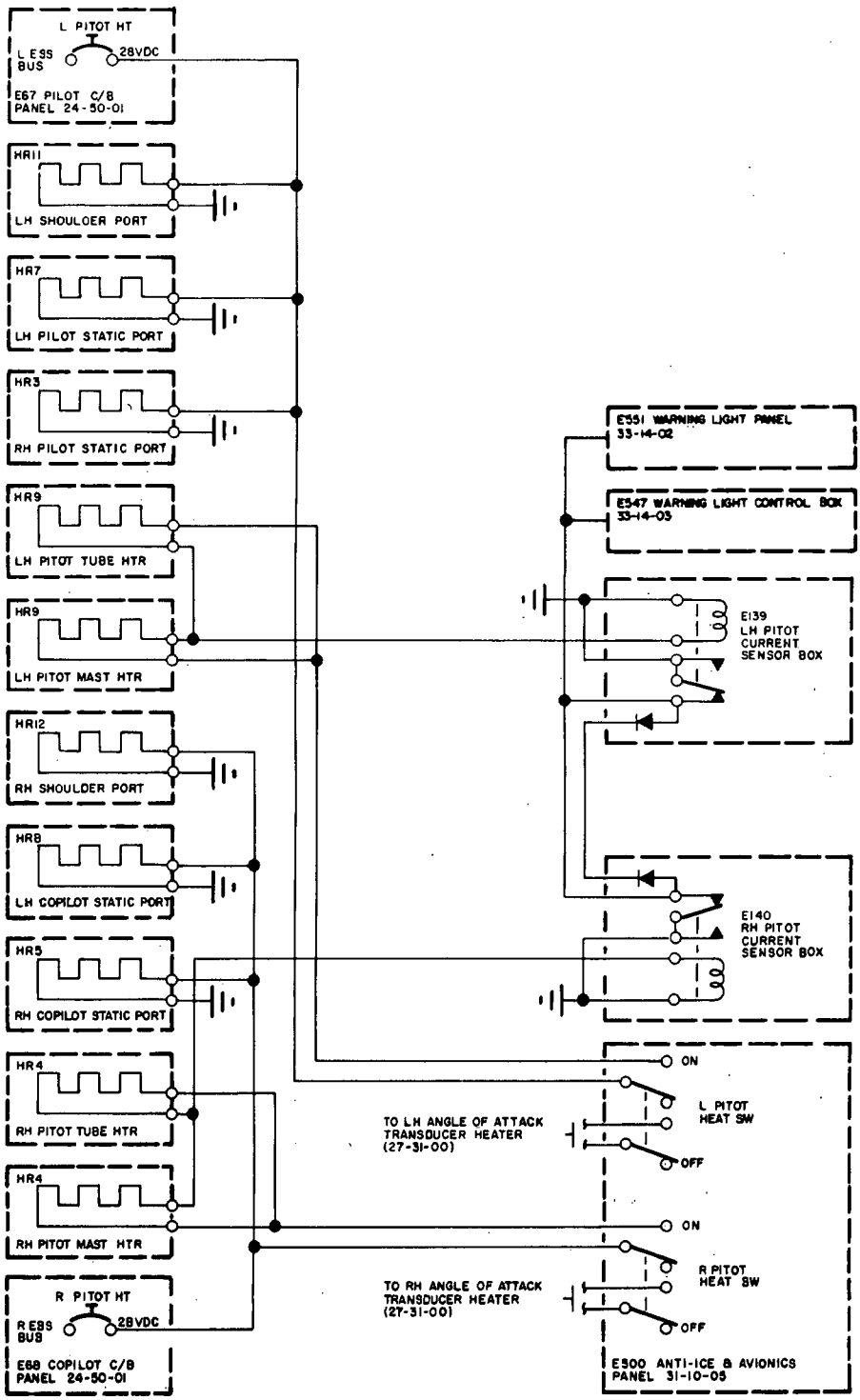
B. The pitot tubes and angle-of-attack transducer vanes will heat when the Pitot Heat Switches are set on.



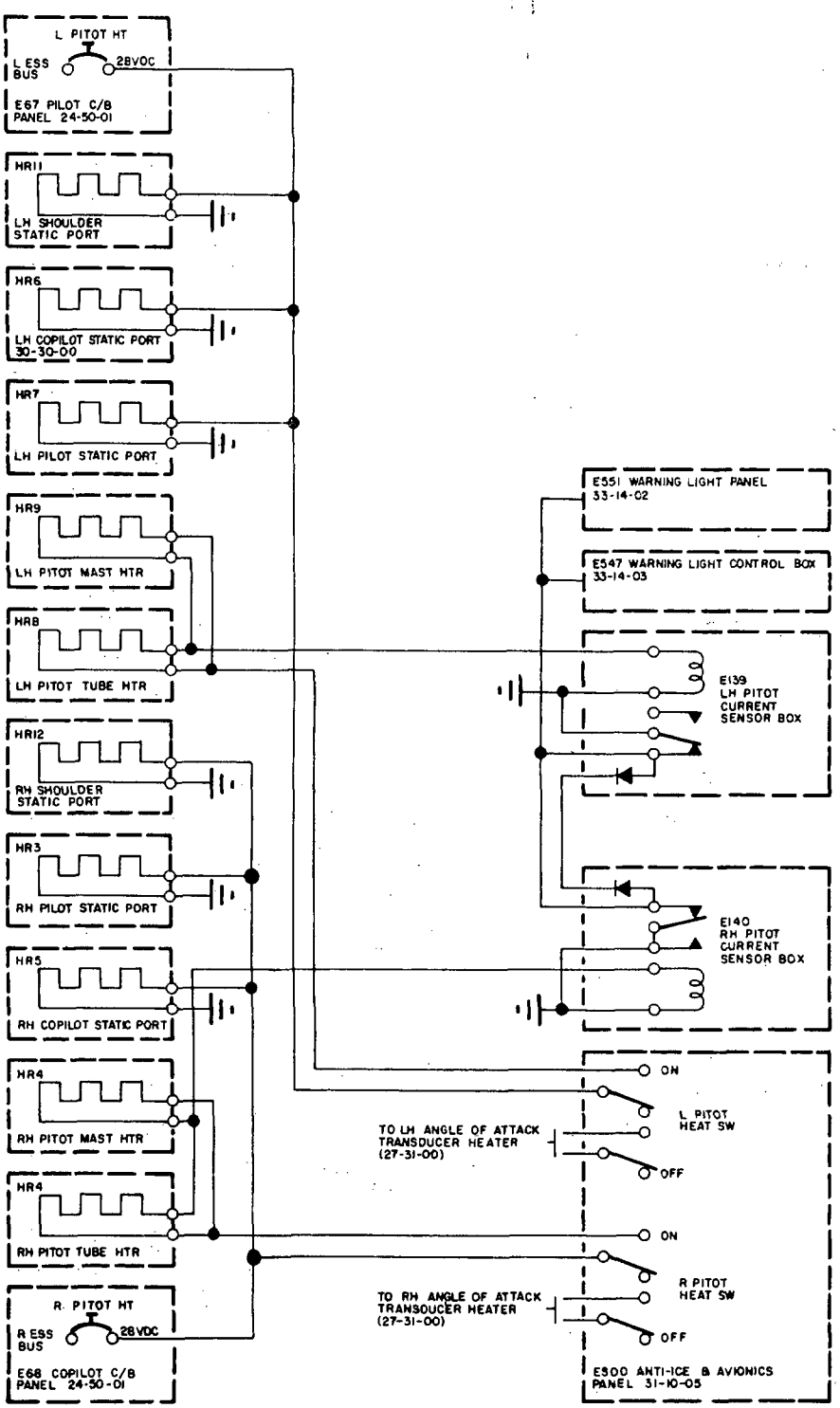
Pitot and Static Anti-Ice System Electrical Control Schematic
Figure 1 (Sheet 1 of 5)



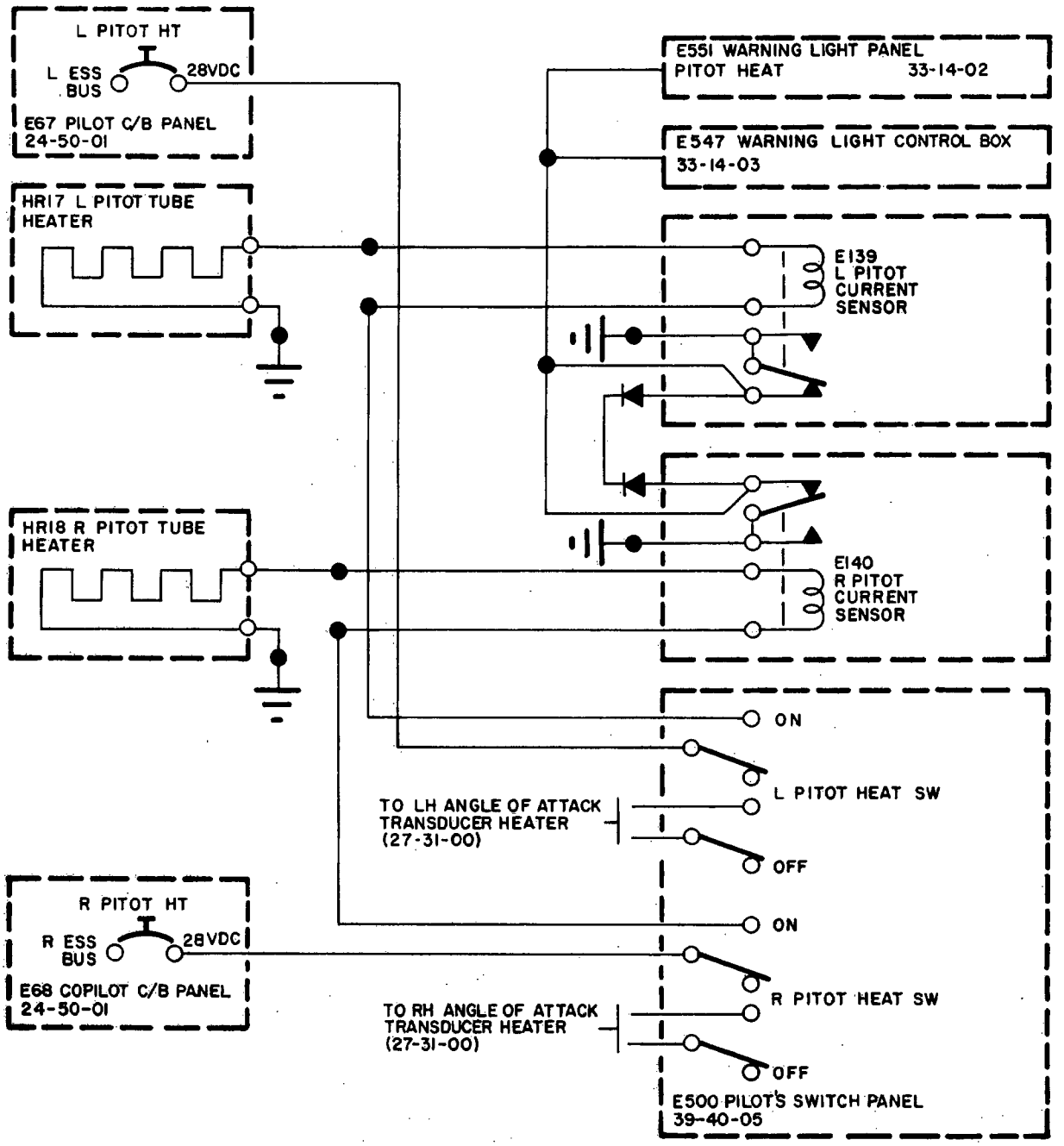
Pitot and Static Anti-Ice System Electrical Control Schematic
Figure 1 (Sheet 2 of 5)



Pitot and Static Anti-Ice System Electrical Control Schematic
Figure 1 (Sheet 3 of 5)



Pitot and Static Anti-Ice System Electrical Control Schematic
Figure 1 (Sheet 4 of 5)



Pitot and Static Anti-Ice System Electrical Control Schematic
Figure 1 (Sheet 5 of 5)

1. TROUBLE SHOOTING

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following.

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson	Check circuits.

B. Pitot and Static Anti-Ice Trouble Shooting

(1) See figure 101 for trouble shooting procedure. Refer to Chapter 30 of the Wiring Manual for pitot and static heater system wiring diagrams.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. Stall Transducer Inoperative in Icing Conditions.		
a. Loss of power to heating element(s).	Visually inspect CB136 on copilot's circuit breaker panel (right side) and CB135 on pilot's circuit breaker panel (left side).	Ensure that circuit breakers are depressed.
b. Open power line(s).	Check continuity and power between P616 and left transducer, and between P798 and right transducer. (Refer to Chapters 30 and 27 of the Wiring Manual for wiring diagrams.)	Repair or replace wiring or components as applicable.
2. Pitot Heat Annunciator(s) Illuminated.		
a. Loss of power to pitot tube heater(s).	Visually inspect CB163 on pilot's circuit breaker panel (left side) and CB180 on copilot's circuit breaker panel (right side).	Ensure that circuit breakers are depressed.
b. Defective pitot heat switch(es).	With heat switch in on position, check for 28 vdc at pins FF and HH of P798 (right side), and at pins 34 and 35 of P616 (left side).	If power exists, replace switch. Otherwise, repair or replace wiring or components as applicable.

Pitot and Static Anti-Ice Trouble Shooting
Figure 101 (Sheet 1 of 2)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
2. Pitot Heat Annunciator(s) Illuminated (Continued).		
c. Defective pitot tube heater(s).	Check for 28 vdc at pin M of P400 (right side) and at pin M of P399 (left side).	If power exists, replace heater. Otherwise, repair or replace wiring or components as applicable.
d. Defective current sensor(s).	Check pull-in and drop-out currents at sensor E139 (left side) and at sensor E140 (right side). Verify that pull-in current is 6.0 ±0.5 amps and that drop-out current is 4.0 amps minimum.	Replace defective sensor. (Refer to 30-31-01.)

Pitot and Static Anti-Ice Trouble Shooting
Figure 101 (Sheet 2 of 2)

PITOT AND STATIC ANTI-ICE SYSTEM - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

A. Remove Static Port (See figure 201.)

(1) Remove electrical power from aircraft.
(2) Remove nose compartment access doors.
(3) Disconnect and identify electrical wiring from static port at splice.
(4) Disconnect tube assembly from static port. Cap tube assembly.
(5) Locate and drill out rivets using a No. 40 (0.098) drill.
(6) Remove static port from aircraft.

B. Install Static Port (See figure 201.)

(1) Install and secure static port with rivets (P/N MS20416AD3). Apply sealant over rivet beads as shown in detail A.
(2) On Aircraft 35-279 thru 35-505, 36-045 thru 36-053, and prior aircraft modified per AAK 79-10 or AMK 83-5, "Installation of Wing Fences, Stall Strips, and Boundary Layer Energizers," measure distance pitot-static button protrudes from skin. The distance of protrusion shall be 0.003 to 0.009 inch. If protrusion distance is less than 0.003 inch, install 2484077-3 shims (as necessary to meet tolerance) using Y-9460 adhesive transfer tape (product of Minnesota Mining and Manufacturing Co.). Ensure that holes in shim align with holes in pitot-static button. Using a No. 52 (0.63 inch) bit as a punch, clear adhesive from shim and pitot-static port holes. Do not drill pitot-static button openings. Allow adhesive to cure at room temperature for 72 hours. Adhesive may be force-cured at 150°F for 1 hour.
(3) Remove cap from tube assembly and connect tube assembly to static port.
(4) Identify and connect electrical wiring to static port.
(5) Perform Plumbing Check of Static System. (Refer to Chapter 34.)

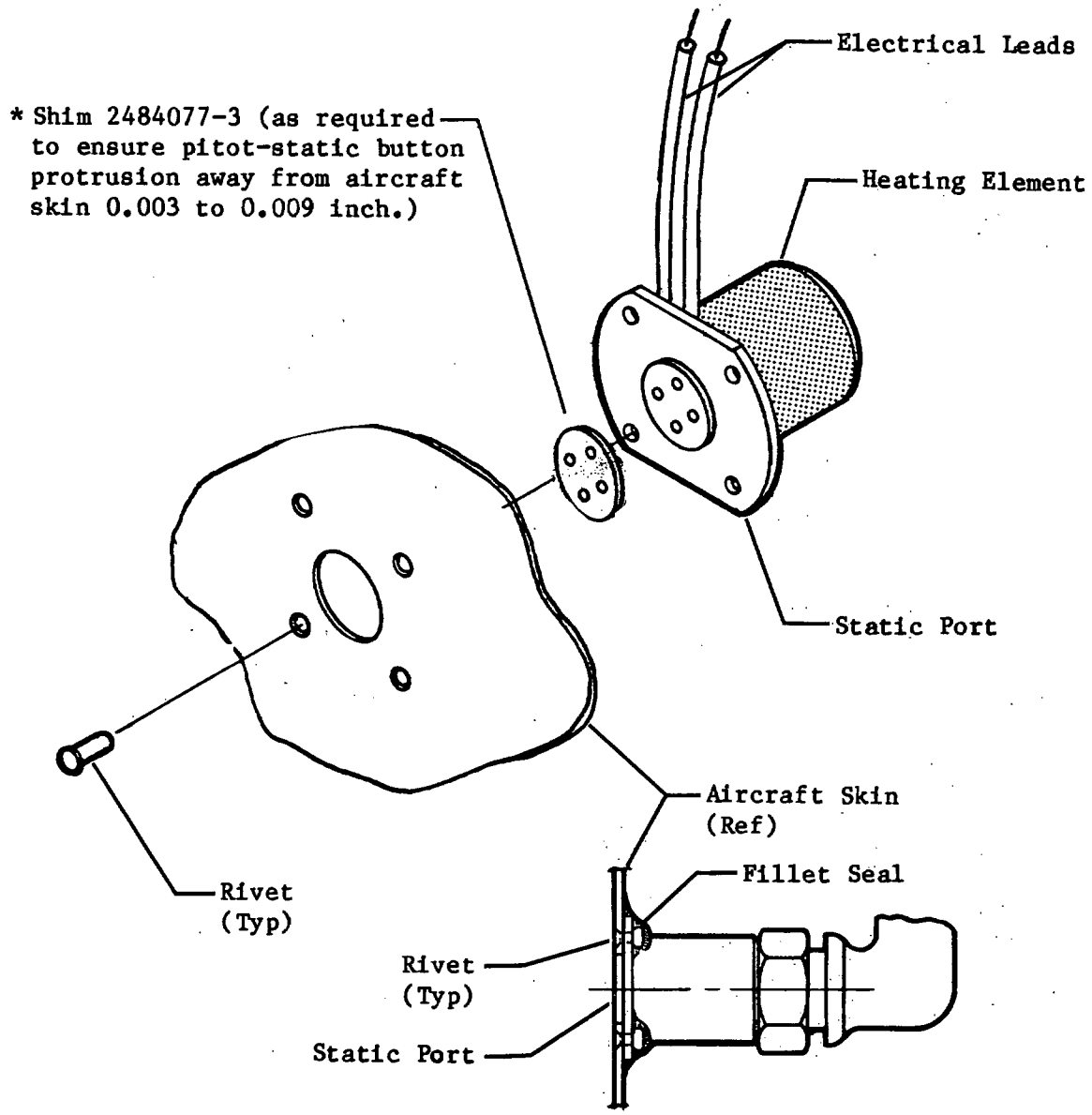
CAUTION: AFTER TOUCH-UP PAINTING HAS BEEN ACCOMPLISHED, ENSURE THAT STATIC PORT OPENINGS ARE NOT PLUGGED.

(6) Touch up aircraft paint as required.
(7) Restore aircraft to normal.
(8) Restore electrical power to aircraft.
(9) Check static port for proper operation.

C. Remove Shoulder Static Port (See figure 202.)

(1) Remove electrical power from aircraft.
(2) Remove nose compartment access doors.
(3) Disconnect and identify electrical wiring from shoulder static port at splice.
(4) Disconnect tube assembly from shoulder static port and cap tube assembly.
(5) Remove shoulder static port and adhesive from aircraft.

* Effective on Aircraft 35-279 & Subsequent, 36-045 and Subsequent, and prior aircraft modified per AAK 79-10 or AMK 83-5, "Installation of Wing Fences, Stall Strips, and Boundary Layer Energizers"



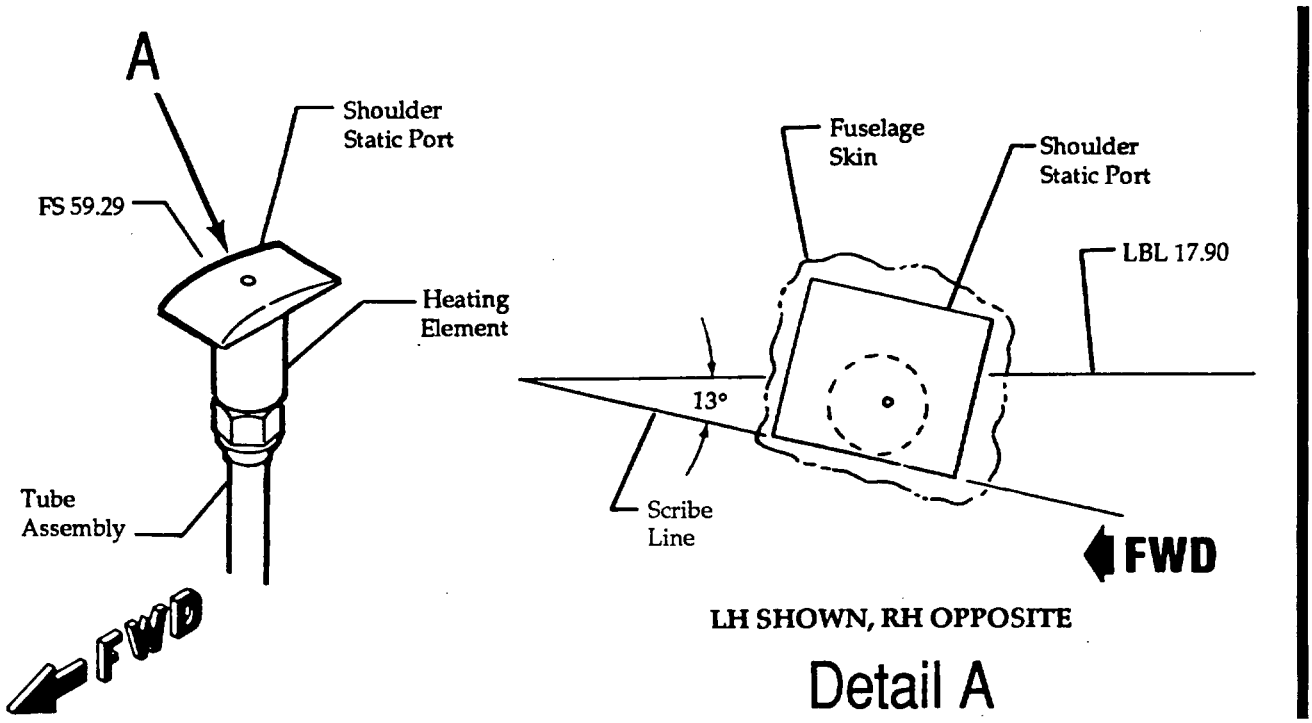
Static Port Installation
Figure 201

D. Install Shoulder Static Port (See figure 202.)

(1) Position shoulder static port along scribe line on fuselage skin. Install shoulder static port using RTV156 or RTV159 adhesive, (General Electric, Waterford, N.Y.).

NOTE: No adhesive is to protrude between port and skin at fore and aft edges of static port.

(2) Remove cap from tube assembly and connect tube assembly to shoulder static port.
(3) Identify and connect electrical wiring to shoulder static port.
(4) Restore electrical power to aircraft.
(5) Set Pitot Heat Switches to ON. LH and RH shoulder static ports shall become warm to touch.
(6) Perform Leak Check of Static System.
(7) Install nose compartment access doors.
(8) Restore aircraft to normal.

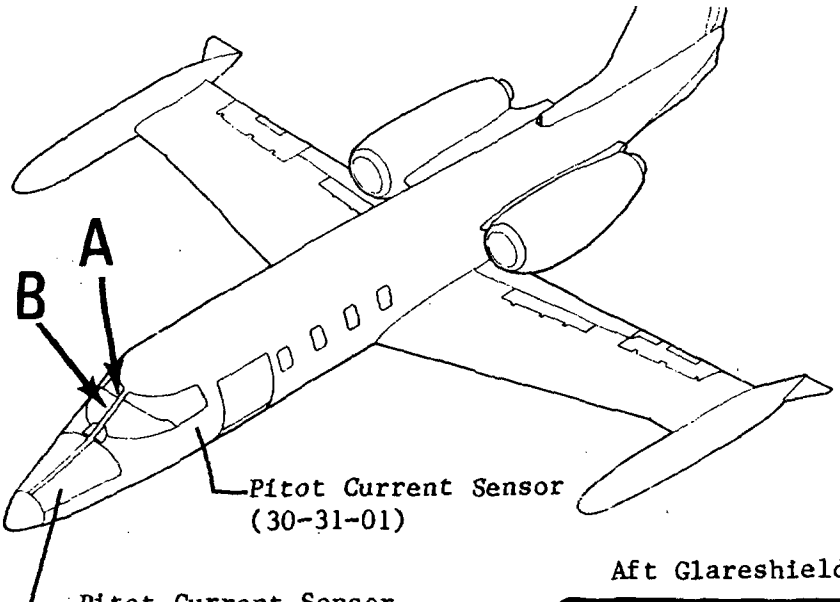


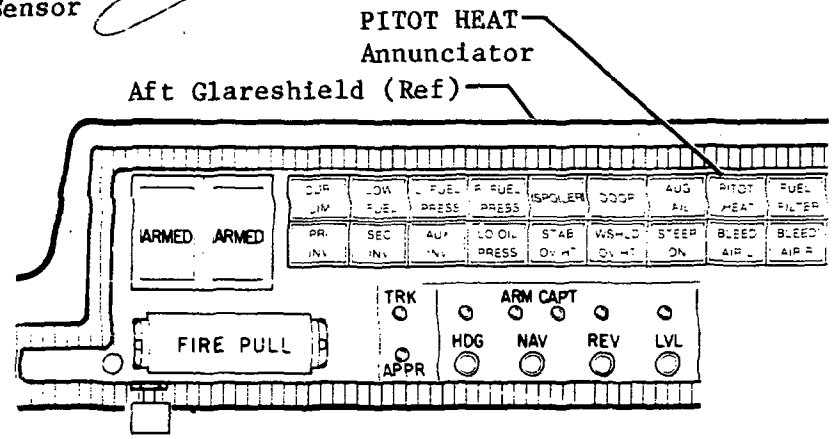
Shoulder Static Port Installation
Figure 202

PITOT CURRENT SENSOR SYSTEM - DESCRIPTION AND OPERATION

1. **DESCRIPTION** (See figure 1.)
   A. The pitot current sensor system is installed to sense current flow to both pitot tubes and masts. On Aircraft 35-271 thru 35-373 and 35-045 thru 36-047, pitot current sensor boxes are located forward of frame 2 at WL 14, one on each side of the nose wheel box. On Aircraft 35-374 and Subsequent, 36-048 and Subsequent and prior aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System," the pitot current sensors are located aft of frame 8 on stringer 12 on right and left sides of the fuselage. The current sensor consists of a relay which is wired in series with the pitot tube heater and ground.
   B. PITOT HEAT annunciators monitor system operation. On Aircraft 35-271 and Subsequent and 36-045 and Subsequent, the PITOT HEAT annunciator is located on the glareshield annunciator panel. On prior Aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System," the annunciator(s) and placard(s) are located on the pilot's panel or the copilot's panel.

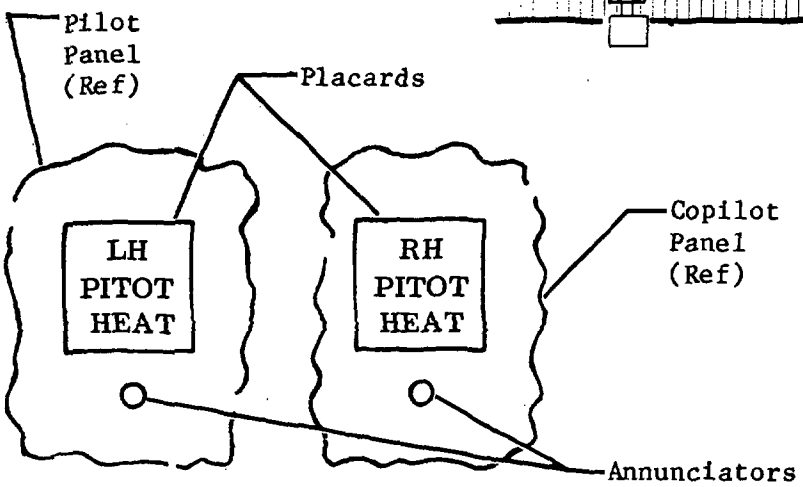
2. **OPERATION** (Refer to 30-30-00, figure 1, for electrical control schematic.)
   A. When the Pitot Heat Switch is set on, 28 vdc is applied through the pitot tube and mast heater elements and the pitot current sensor relay coil to ground. This ground removes ground from the PITOT HEAT annunciator. If pitot tube heater fails or if wiring opens, power is removed from the pitot current sensor relay coil and a ground is applied to illuminate PITOT HT annunciator. When Pitot Heat Switch is set to OFF, no current flows through pitot current sensor (which is normally closed) and a ground is applied to illuminate PITOT HEAT annunciator.
   B. The PITOT HEAT annunciator illuminates when:
      (1) One or both Pitot Heat Switches are set to OFF.
      (2) One or both pitot heat systems fail.
      (3) Either pitot heat system fails. Dual annunciators indicate which system has failed.





35-271 and Subsequent
36-045 and Subsequent

Detail A



TYPICAL DUAL INSTALLATION
Aircraft Modified per AAK 79-2,
"Installation of Pitot Heat Indicating System"

Detail B

Pitot Current Sensor System Locator
Figure 1

1. INSPECTION/CHECK

A. Perform Operational Check of Pitot Heat Indicating System (*Aircraft 35-271 and Subsequent, 36-045 and Subsequent, and prior Aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System"*)

WARNING:
- DO NOT OPERATE PITOT HEAT SYSTEM FOR MORE THAN 30 TO 40 SECONDS, IN ORDER TO PREVENT DAMAGE TO ASSOCIATED EQUIPMENT AND PERSONNEL.
- DO NOT TOUCH PITOT/STATIC TUBES WHILE PITOT HEAT IS IN OPERATION OR BODILY INJURY MAY RESULT.

CAUTION: ENSURE THAT ALL PITOT TUBE AND STALL WARNING VANE COVERS ARE REMOVED PRIOR TO PERFORMING ANY TESTING OR OPERATION OF THE PITOT AND STATIC SYSTEMS.

(1) Set Battery Switches on.
(2) Set Pitot Heat Switches on.
(3) PITOT HEAT annunciators shall not illuminate.
(4) Set Pitot Heat Switches off.
(5) PITOT HEAT annunciators shall illuminate.
(6) Set Battery Switches off.

B. Figure 201 is provided as an aid in trouble shooting the Pitot Heat Indicating System. The current sensor assembly pull-in and drop-out currents may be checked using a current sensing device to help isolate faults in the pitot heat indicating system.

Current Sensor Assy Part Number	Pull-In Current	Drop-Out Current
* 2618296-6	4.3 (±10%) Amp	3.1 (±20%) Amp
* 2618296-10	4.3 (±10%) Amp	3.1 (±20%) Amp
* 2618296-16	4.3 (±10%) Amp	3.1 (±20%) Amp
** 6608317-1	2.0 (±0.2) Amp	1.0 Amp Minimum
** 6608317-2	2.0 (±0.2) Amp	1.0 Amp Minimum
** 6608317-4	4.2 (±0.1) Amp	2.0 (±0.2) Amp
** 6608317-5	2.0 (±0.4) Amp	1.0 Amp Minimum
*** 6608317-7	6.0 (±0.5) Amp	4.0 Amp Minimum

* *Effective 35-271 thru 35-373 and 36-045 thru 36-047*

** *Effective 35-374 thru 35-505, except 35-447 and 35-462; 36-048 thru 35-053 and prior aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System"*

*** *Effective 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot"*

Current Sensor Assembly Current Ratings
Figure 201

PITOT CURRENT SENSOR BOX - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: Removal and installation procedures for right and left pitot current sensor boxes are identical.

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

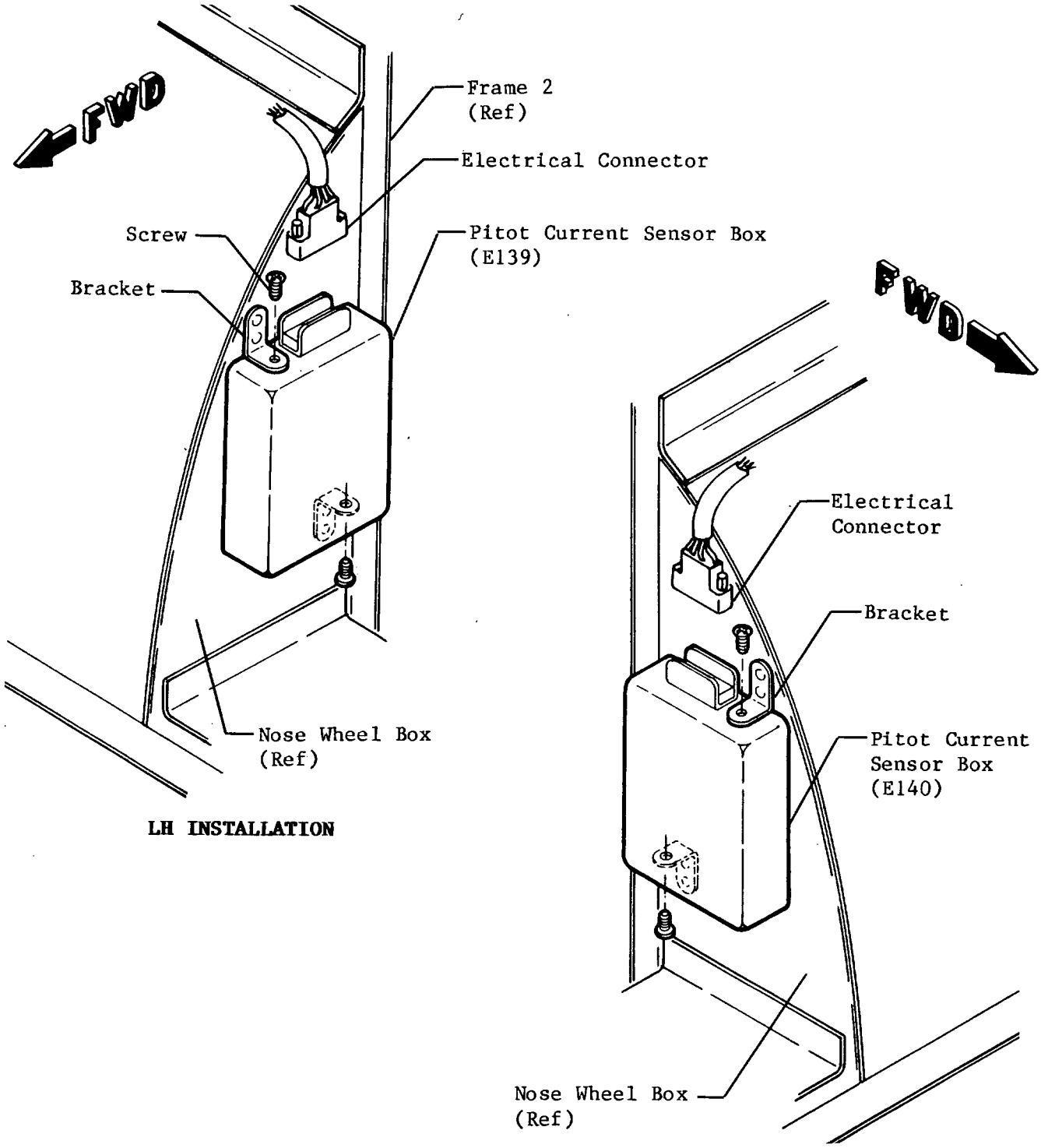
NAME	PART NUMBER	MANUFACTURER	USE
Adhesive	242	Loctite	Secure attaching parts

A. Remove Pitot Current Sensor Box (See figure 201.) *(Aircraft 35-271 thru 35-373 and 36-045 thru 36-047)*
   (1) Remove electrical power from aircraft.
   (2) Gain access to pitot current sensor box through nose compartment access door.
   (3) Remove avionics equipment as necessary to allow removal of pitot current sensor box.
   (4) Disconnect electrical connector from pitot current sensor box.
   (5) Remove attaching parts and pitot current sensor box from aircraft.

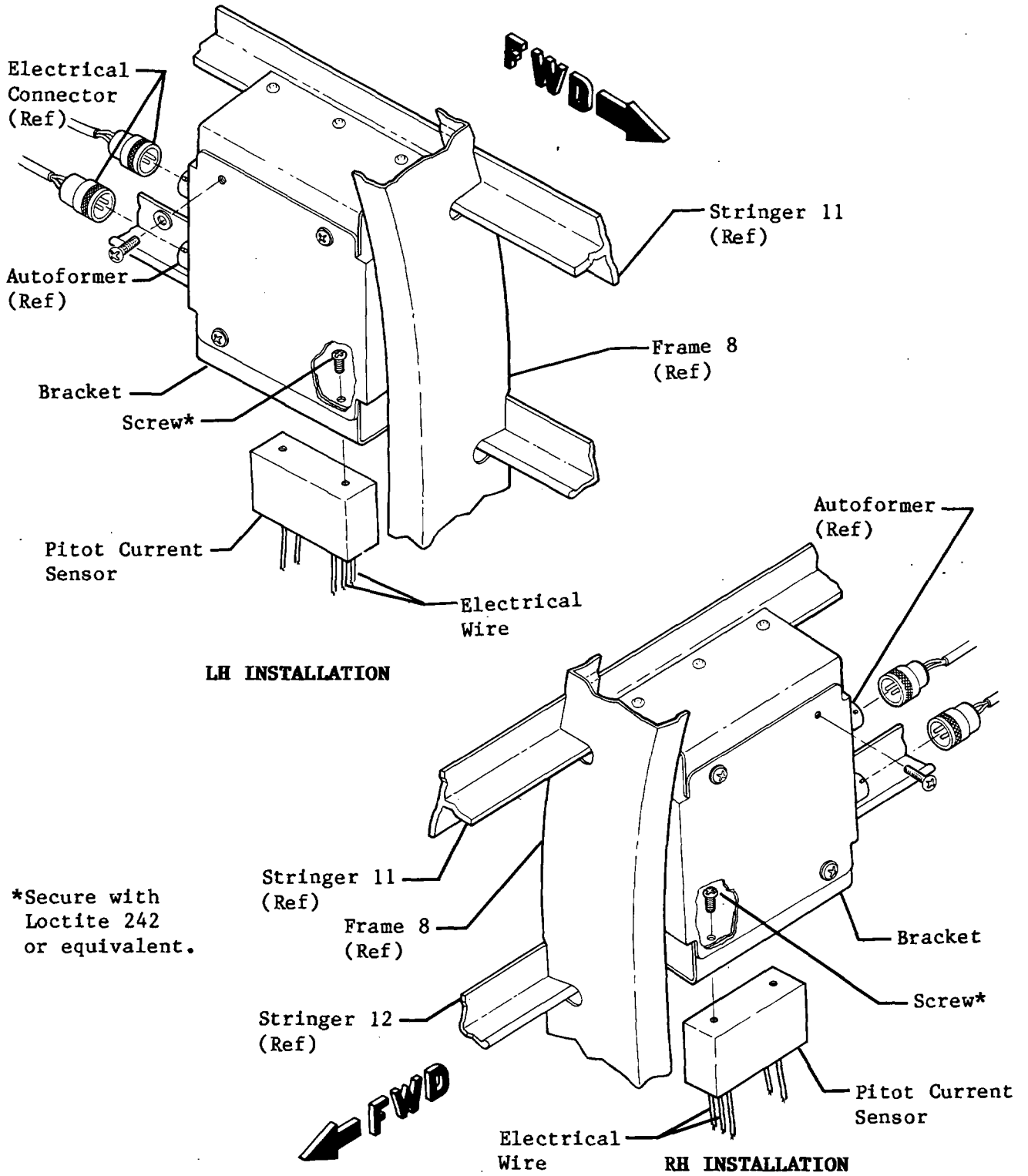
B. Install Pitot Current Sensor Box (See figure 201.) *(Aircraft 35-271 thru 35-373 and 36-045 thru 36-047)*
   (1) Position pitot current sensor box with receptacle up and secure to mounting brackets with attaching parts.
   (2) Connect electrical connector to pitot current sensor box.
   (3) Install previously removed avionics equipment.
   (4) Close and secure nose compartment access door.
   (5) Restore electrical power to aircraft.

C. Remove Pitot Current Sensor (See figure 201.) *(Aircraft 35-374 and Subsequent, 36-048 and Subsequent and prior aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System")*
   (1) Remove electrical power from aircraft.
   (2) Remove cockpit interior liner as required to gain access to frame 8 and stringer 12.
   (3) Disconnect and identify electrical wiring from pitot current sensor.
   (4) On *Aircraft 35-374 and Subsequent and 36-048 and Subsequent*, remove attaching parts and autoformer to gain access to pitot current sensor. (Refer to Chapter 24 for autoformer maintenance practices.)
   (5) Remove attaching parts and current sensor from aircraft.

D. Install Pitot Current Sensor (See figure 201.) *(Aircraft 35-374 and Subsequent, 36-048 and Subsequent and prior aircraft modified per AAK 79-2, "Installation of Pitot Heat Indicating System")*
   (1) Install pitot current sensor and secure with attaching parts. Secure screws with Loctite 242 or equivalent.
   (2) On *Aircraft 35-373 and Subsequent and 36-048 and Subsequent*, install autoformer and secure with attaching parts. (Refer to Chapter 24.)
   (3) Identify and connect electrical wiring to pitot current sensor.
   (4) Install previously removed cockpit interior liner.
   (5) Restore aircraft to normal.
   (6) Restore electrical power to aircraft.



Pitot Current Sensor Installation
Figure 201 (Sheet 1 of 2)



Pitot Current Sensor Installation
Figure 201 (Sheet 2 of 2)

9-223C

WINDSHIELD ANTI-ICE SYSTEM - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)
   A. On *Aircraft 35-002 thru 35-081, 35-083 thru 35-086 and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement,"* windshield anti-ice and rain removal is accomplished by directing engine bleed air through ducting and control valves to the external outlets forward of the windshield. On *Aircraft 35-082, 35-087 and Subsequent and 36-023 and Subsequent and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement,"* windshield anti-ice and rain removal is accomplished by directing precooled engine bleed air through ducting and control valves to the external outlets forward of the windshield.
   B. On *Aircraft 35-002 thru 35-106 and 35-108 thru 35-112*, windshield anti-ice operations can be controlled in either the automatic or manual modes. On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, the windshield anti-ice operation is automatically controlled.
   C. On *Aircraft 35-002 thru 35-081, 35-083 thru 35-086 and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement,"* components of the anti-ice and rain removal system consist of two low-limit thermostats, two high-limit thermostats, a (red) warning light, a (green) advisory light, a manual control valve, two shutoff valves, two system control relays, two system switches and a circuit breaker.
   D. On *Aircraft 35-082, 35-087 thru 35-106, 35-108 thru 35-112 and 36-023 thru 36-031 and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement,"* components of the anti-ice and rain removal system consist of two high-limit thermostats, two low-limit thermostats, a (red) WSHLD OV HT annunciator, a (green) WSHLD HT annunciator, a manual control valve, two shutoff valves, a system control relay, a ram air modulating valve, a temperature sensor, a defog heat exchanger, two system switches and a circuit breaker.
   E. The manual control valve can be manually positioned, utilizing the IN-Normal, OUT-Defog control knob, to direct engine bleed air to the external outlets or to the footwarmers. The manual control valve incorporates a flapper-type check valve which checks the airflow out of the cabin in the event of pressurization system failure.
   F. On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, components of the anti-ice and rain removal system consist of two high-limit thermostats, two low-limit thermostats, a (red) WSHLD OV HT annunciator, a (green) WSHLD HT annunciator, a system shutoff valve, a system control relay, a ram air modulating valve, a temperature sensor, a heat exchanger, a system switch, and a circuit breaker. On *Aircraft 35-643 and Subsequent and 36-058 and Subsequent*, the anti-ice and rain removal system includes a transistor assembly.
   G. On *Aircraft equipped with the optional nose wheel spin-up system*, a manually controlled valve is installed. The valve, located on the RH side of frame 5, is used to divert bleed air from the windshield anti-ice system to the nose wheel spin-up system.
   H. On *Aircraft 35-138 and 35-140 and Subsequent and 36-035 and Subsequent, and Aircraft 35-107, 35-113 thru 35-137, 35-139, and 36-032 thru 36-034 modified per AMK 77-10, "Cabin Temperature Control and Air Distribution Improvement,"* an orifice (0.812 inch diameter) is installed downstream of the windshield anti-ice shutoff valve.
   I. On *Aircraft 35-241 and Subsequent and 36-045 and Subsequent*, an external drain line is installed in the external windshield ducting just forward of frame 5. The drain removes any moisture from the ducting and prevents it from entering the ducting in the cabin.
   J. Component Description
      (1) The windshield anti-ice overheat shutoff valve is a normally closed, spring-loaded, poppet-type shutoff valve. The valve is controlled by the system switch through the de-energized control relay.
      (2) The windshield anti-ice shutoff valve is a motor-driven, butterfly-type valve used to regulate the amount of engine bleed air routed to the external defog outlets.
      (3) The thermostats are installed in the external windshield anti-ice nozzle outlets. Two are installed in each outlet (one high-limit and one low-limit).

(4) The heat exchanger, installed on the aft side of the discharge plenum, precools engine bleed air to approximately 300 (±25)°F before it is routed over the exterior surface of the windshield.
(5) The ram air modulating valve is installed on the aft side of the discharge plenum and is connected to the windshield anti-ice heat exchanger.
(6) The transistor assembly *(effective 35-643 and Subsequent and 36-058 and Subsequent)*, which controls windshield anti-ice shutoff valve motor speed, is located inside the forward pedestal (LH side).

2. Operation (See Figures 2 and 3.)

A. On *Aircraft 35-002 thru 35-081, 35-083 thru 35-086, and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement," and not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, during an automatic mode of operation (Windshield Heat Switch to AUTO), the windshield anti-ice shutoff valve is opened through the de-energized contacts of the control relay and the green WSHLD HT annunciator will be illuminated. If bleed air temperature reaches 215°F in either outlet, the contacts of the low-limit thermostat complete the ground circuit to energize the control relay. This relay removes power from the open side of the shutoff valve and applies power to close the shutoff valve. When the aircraft is on the ground, the low-limit thermostats also apply a ground signal through the squat switch relay panel to illuminate the red WSHLD OV HT annunciator. When airflow temperature falls below 215°F, the contacts of the low-limit thermostats open, breaking the ground circuit to the control relay and de-energizing the relay. With the relay de-energized, power is removed from the closed side of the shutoff valve and applied to the open side of the shutoff valve. When in flight, the automatic operation is the same, except the squat switch relay panel circuit to the WSHLD OV HT annunciator is opened. The high-limit thermostats then complete a ground circuit to illuminate the WSHLD OV HT annunciator and close the windshield anti-ice overheat shutoff valve (pressure regulator) should bleed air temperature in the outlets reach 250°F. *(Aircraft 35-002 thru 35-057 and 36-002 thru 36-017 not modified per AAK 77-6, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement")* or 290 (±8)°F *(Aircraft 35-058 thru 35-081, 35-083 thru 35-086, 36-018 thru 36-022 and prior aircraft modified per AAK 77-6)*.

B. On *Aircraft 35-002 thru 35-081, 35-083 thru 35-086 and 36-002 thru 36-022 not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, the anti-ice and rain removal system may be manually operated by setting the Windshield Heat Switch to MAN and utilizing the Windshield Heat ON-OFF Switch to obtain the desired amount of airflow. If bleed airflow temperature reaches 215°F (on the ground) or 250°F *(Aircraft 35-002 thru 35-057 and 36-002 thru 36-017)* or 290 (±8)°F *(Aircraft 35-058 thru 35-081, 35-083 thru 35-086 and 36-018 thru 36-022)* (in flight), the WSHLD OV HT annunciator will illuminate and energize the pressure regulator control relay, removing power from the pressure regulator, allowing it to close.

C. On *Aircraft 35-082, 35-087 thru 35-106, 35-108 thru 35-112, 36-023 thru 36-031 and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement," and not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, during an automatic mode of operation (Windshield Heat Switch set to AUTO) the windshield anti-ice shutoff valve and the windshield overheat shutoff valve are energized (opened) and the WSHLD HT (green) annunciator will be illuminated. In the AUTO mode of operation, the windshield anti-ice shutoff valve is in the full open position. The volume of air allowed through the windshield anti-ice shutoff valve can be varied by setting the Windshield Heat Switch to MAN and utilizing the Windshield Heat ON-OFF switch until the desired amount of air flow is achieved. The bleed air is admitted through the valves to the windshield anti-ice heat exchanger where the bleed air is precooled to approximately 300 (±25)°F by ram air. A ram air modulating valve, located on the heat exchanger, modulates the bleed air temperature by the amount of ram air allowed through the heat exchanger. If the bleed air temperature in either outlet reaches 250 (±5)°F (on ground) or 290 (±8)°F (in flight) the thermostat contacts close and complete a ground circuit to energize the control relay and illuminate the WSHLD OV HT (red) annunciator. With the control relay energized, the power circuit to the windshield anti-ice overheat shutoff valve is removed and allows the shutoff valve to close. When the bleed air temperature drops to 240 (±5)°F (on ground) or 270 (±8)°F (in flight), the thermostat contacts open and de-energize the control relay. The windshield anti-ice overheat shutoff valve is energized (opened) and WSHLD OV HT an-

nunciator will extinguish. In order to avoid a transitory WSHLD OV HT annunciation upon landing, the 250 (±5)°F thermostat circuitry is disabled for 10 seconds. The system continues to function as previously defined after the 10-second delay.

D. On *Aircraft 35-107, 35-113 thru 35-642 and 36-032 thru 36-057 not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, when power is applied to the aircraft (Battery Switches set ON), the windshield anti-ice overheat shutoff valve (B74) is energized (opened) through the de-energized contacts of the overheat shutoff valve control relay. When the WSHLD HT ON-HOLD-OFF Switch is held to ON, a power and a ground circuit is completed to the windshield anti-ice shutoff valve (B30). As the anti-ice shutoff valve (B30) starts to open, simultaneously the WSHLD HT (green) annunciator illuminates. The annunciator will remain illuminated as long as the anti-ice shutoff valve is open. The anti-ice shutoff valve will continue to open until the WSHLD HT Switch is released to the HOLD position. When the WSHLD HT Switch is released, the valve will remain in its last attained position. The bleed air is admitted through the valves to the windshield anti-ice heat exchanger. The bleed air is precooled to approximately 300 (±25)°F by ram air. A ram air modulating valve, located on the heat exchanger, modulates the bleed air temperature by the amount of ram air allowed through the heat exchanger. If the bleed air temperature in either outlet reaches 250 (±5)°F (on ground) or 290 (±8)°F (in flight) the thermostat contacts close and complete a ground circuit to energize the overheat shutoff valve control relay and illuminate the WSHLD OV HT (red) annunciator. With the overheat shutoff valve control relay energized, the power circuit to the windshield anti-ice overheat shutoff valve is opened and allows the shutoff valve to close. When the bleed air temperature drops to 240 (±5)°F (on ground) or 270 (±8)°F (in flight) the thermostat contacts open and de-energize the control relay. The windshield anti-ice overheat shutoff valve is energized (opened) and the WSHLD OV HT annunciator will extinguish. In order to avoid a transitory WSHLD OV HT annunciation upon landing, the 250 (±5)°F thermostat circuitry is disabled for 10 seconds. The system continues to function as previously defined after the 10-second delay.

E. On *Aircraft 35-643 thru 35-662 and 36-058 thru 36-063 not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, when power is applied to the aircraft (Battery Switches set ON), the windshield anti-ice overheat shutoff valve (B74) is energized (opened) through the de-energized contacts of the overheat shutoff valve control relay. When the WSHLD HT ON-HOLD-OFF Switch is held to ON, a power circuit from the transistor assembly (E619) and a ground circuit through the switch is completed to the windshield anti-ice shutoff valve (B30). The WSHLD HT (green) annunciator illuminates as a result of power from the transistor assembly applied to the warning light control box. The annunciator will remain illuminated as long as the WSHLD HT Switch is in the ON position and a thermostat has not actuated. The anti-ice shutoff valve will continue to open until the WSHLD HT Switch is released to the HOLD position. When the WSHLD HT Switch is released, the valve will remain in its last attained position. The bleed air is admitted through the valves to the windshield anti-ice heat exchanger. The bleed air is precooled to approximately 300 (±25)°F by ram air. A ram air modulating valve, located on the heat exchanger, modulates the bleed air temperature by the amount of ram air allowed through the heat exchanger. If the bleed air temperature in either outlet reaches 250 (±5)°F (on ground) or 290 (±8)°F (in flight) the thermostat contacts close and complete a ground circuit to energize the overheat shutoff valve control relay and illuminate the WSHLD OV HT (red) annunciator. With the overheat shutoff valve control relay energized, the power circuit to the windshield anti-ice overheat shutoff valve is opened and allows the shutoff valve to close. When the bleed air temperature drops to 240 (±5)°F (on ground) or 270 (±8)°F (in flight) the thermostat contacts open and de-energize the control relay. The windshield anti-ice overheat shutoff valve is energized (opened) and the WSHLD OV HT annunciator will extinguish. In order to avoid a transitory WSHLD OV HT annunciation upon landing, the 250 (±5)°F thermostat circuitry is disabled for 10 seconds. The system continues to function as previously defined after the 10-second delay.

F. On *Aircraft 35-663 and Subsequent and 36-064 and Subsequent and prior aircraft modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats"*, when power is applied to the aircraft (Battery Switches set to ON), the windshield anti-ice overheat shutoff valve (B74) is energized (opened) through the de-energized contacts of the overheat shutoff valve control relay (K606). *On Aircraft 35-634 thru 35-673 and 36-058 thru 36-063*, when the WSHLD HT ON-HOLD-OFF Switch is held to ON, a power cir-

cuit from transistor assembly (E619) and a ground circuit through the switch is completed to the windshield anti-ice shutoff valve (B30). The WSHLD HT (green) annunciator illuminates as a result of ground applied to the warning light control box. The annunciator will remain illuminated as long as the WSHLD HT Switch is in the ON position and a thermostat has not actuated. The anti-ice shutoff valve will continue to open until the WSHLD HT Switch is released to the HOLD position. When the WSHLD HT Switch is released, the valve will remain in its last attained position. *On Aircraft 35-674 and Subsequent, 36-064 and Subsequent,* when the WSHLD HT Switch is set to ON, a power circuit from the 28 VDC W/S HT circuit breaker on the pilot's circuit breaker panel and a ground circuit through the switch is completed to the windshield anti-ice shutoff valve (B30). The WSHLD HT annunciator illuminates as a result of ground being applied through the warning light control box. The anti-ice shutoff valve (B30) will continue to open until the WSHLD HT Switch is set to the HOLD position. The anti-ice shutoff valve will remain in its last attained position. The WSHLD HT annunciator will remain illuminated as long as a thermostat has not actuated and the WSHLD HT is in the ON or HOLD position. Engine bleed air is admitted through the shutoff valves to the windshield anti-ice heat exchanger. The bleed air is cooled to approximately 300 (±25)°F by ram air routed through the heat exchanger. A ram air modulating valve and the heat exchanger modulates the amount of ram air through the heat exchanger.

(1) Low-Limit Thermostats

CAUTION: DO NOT ALLOW THERMOSTAT MALFUNCTION TO CONTINUE UNCHECKED, OTHERWISE SERIOUS DAMAGE COULD RESULT TO THE AIRCRAFT.

NOTE: The Squat Switches must be in the Ground Mode for thermostats S71 and S72 to be connected to the overheat circuitry.

(a) If the bleed air temperature in the LH (S71) outlet reaches 250 (±5)°F, or the RH (S72) reaches 215 (±5)°F, the low-limit thermostats (S71, LH or S72, RH) close. When closed, a ground circuit is completed and energizes the overheat shutoff valve control relay (K606). Once energized, the power circuit to the anti-ice overheat shutoff valve (B74) is opened and the shutoff valve closes. Simultaneously, the WSHLD HT (green) annunciator extinguishes. Closing of the LH thermostat (S71) will illuminate the WSHLD OV HT annunciator, however, the RH (S72) thermostat will not. When the LH nozzle air temperature drops to 240 (±5)°F, or the RH to 200 (±5)°F, the low-limit thermostat opens and power returns to the anti-ice overheat shutoff valve. The WSHLD HT annunciator illuminates; and bleed air is allowed to return to the windshield.

NOTE:
- In order to avoid transitory WSHLD OV HT annunciation upon landing, the low-limit thermostat's circuitry is disabled for 10 seconds. The system continues to function as described above after the delay.
- If the electrically heated windshield is installed, the LH (S71) low-limit thermostat closes at 215 (±5)°F, and opens at 200 (±5)°F.

(2) High-Limit Thermostats

CAUTION: DO NOT ALLOW SYSTEM MALFUNCTION TO CONTINUE UNCHECKED, OTHERWISE SERIOUS DAMAGE COULD RESULT TO THE AIRCRAFT.

(a) If the bleed air temperature in the LH outlet reaches 270 (±6)°F, the LH high-limit thermostat (S69) closes. When closed, a ground circuit is completed and energizes the overheat shutoff valve control relay (K606). Once energized, the power circuit to the anti-ice overheat shutoff valve (B74) is opened and the shutoff valve closes. Simultaneously, the WSHLD HT (green) annunciator extinguishes, and the WSHLD OV HT (red) illuminates. When the nozzle air temperature drops to 250 (±8)°F, the LH high-limit thermostat contacts open and de-energizes the control relay. The WSHLD OV HT (red) annunciator extinguishes, the WSHLD HT (green) annunciator illuminates and bleed air is allowed to return to the windshield.

(b) If the bleed air temperature in the RH outlet reaches 250 (±5)°F, the RH high-limit thermostat (S70) closes. When closed, a ground circuit is completed and energizes the overheat shutoff valve control relay (K606). Once energized, the power circuit to the anti-ice overheat shutoff valve (B74) is opened, the shutoff valve closes, and the WSHLD HT (green) annunciator is extinguished. The WSHLD OV HT (red) annunciator will not illuminate. When the nozzle air temperature drops to 240 (±5)°F, the RH high-limit thermostat opens and de-energizes the overheat shutoff valve control relay. The WSHLD HT (green) annunciator illuminates; and bleed air is allowed to return to the windshield.

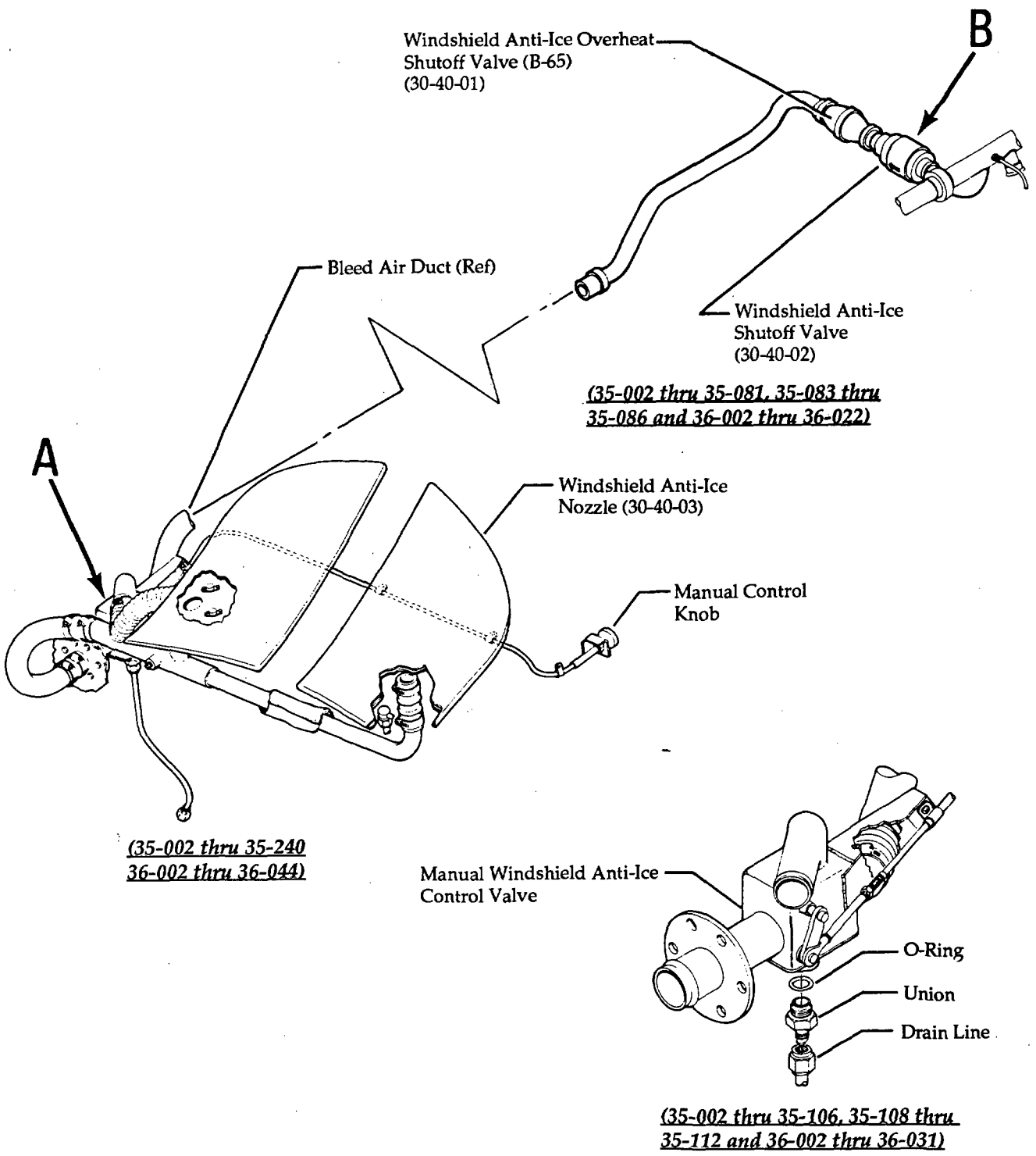
G. On *Aircraft equipped with an optional Nose Wheel Spin-Up System*, the windshield anti-ice system bleed air is utilized to operate the system. When the spin-up system is being utilized, bleed air will not be available for windshield anti-icing. (Refer to Chapter 32.)

H. On *Aircraft equipped with an optional Aeronca Thrust Reverser System*, the windshield anti-ice system will be inoperative during the deployment and stow cycles. (Refer to Chapter 78.)

I. For a description and operation of the internal defog system, refer to Chapter 21.

J. Component Operation

(1) The windshield anti-ice ram air modulating valve is shown static (no servo air pressure applied) (See Figure 4). With no pressure applied, the spring pressure forces the piston up and positions the valve butterfly full open. When pressure is applied, the piston is driven down and positions the valve butterfly to the closed position. The ram air flow is reduced and allows the temperature of the precooled bleed air to increase. The temperature sensor senses the increase in temperature and opens a bleed path for the servo inlet pressure. The modulating valve then maintains sufficient ram air flow to maintain the desired precooled bleed air temperature.

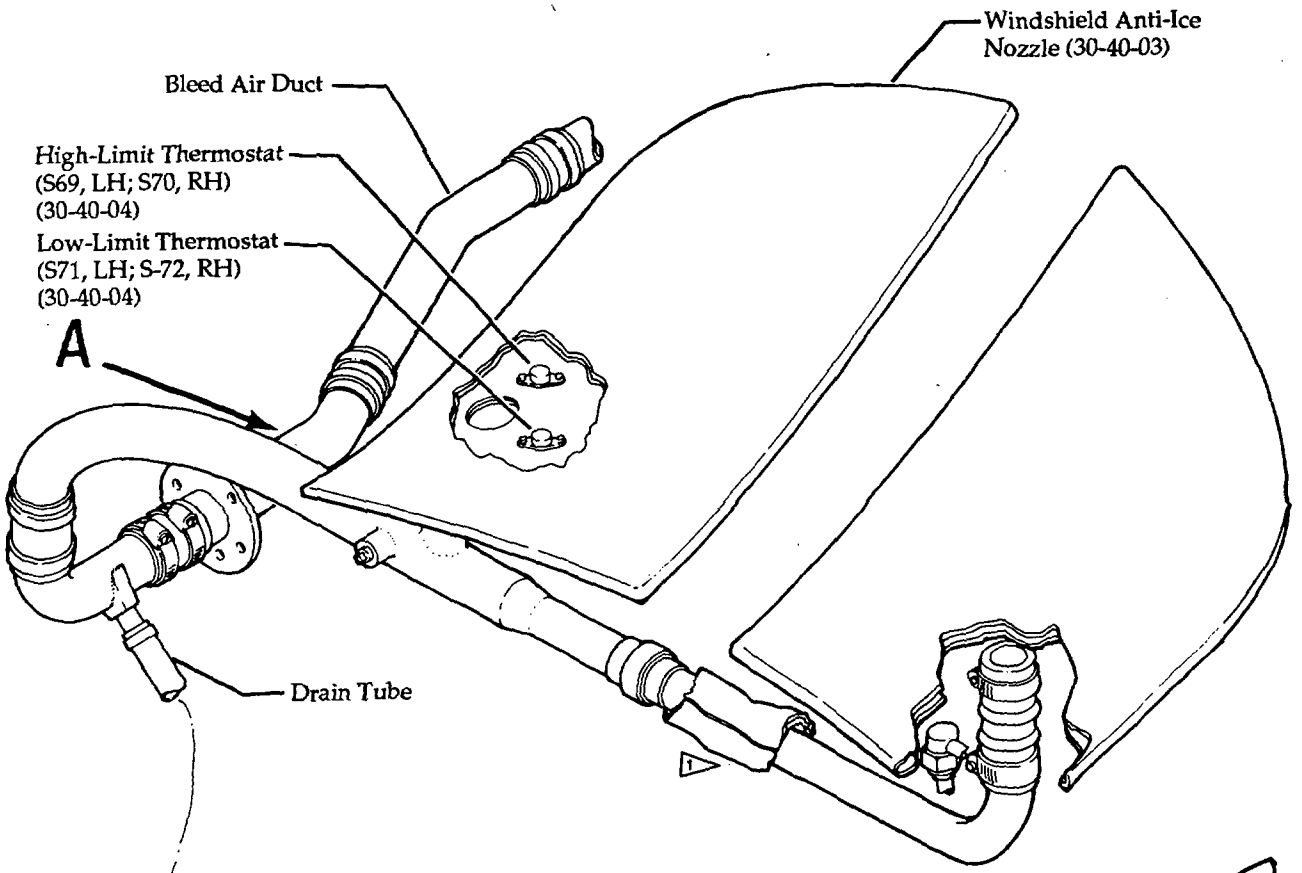


Windshield Anti-Ice System Component Locator
Figure 1 (Sheet 1 of 4)

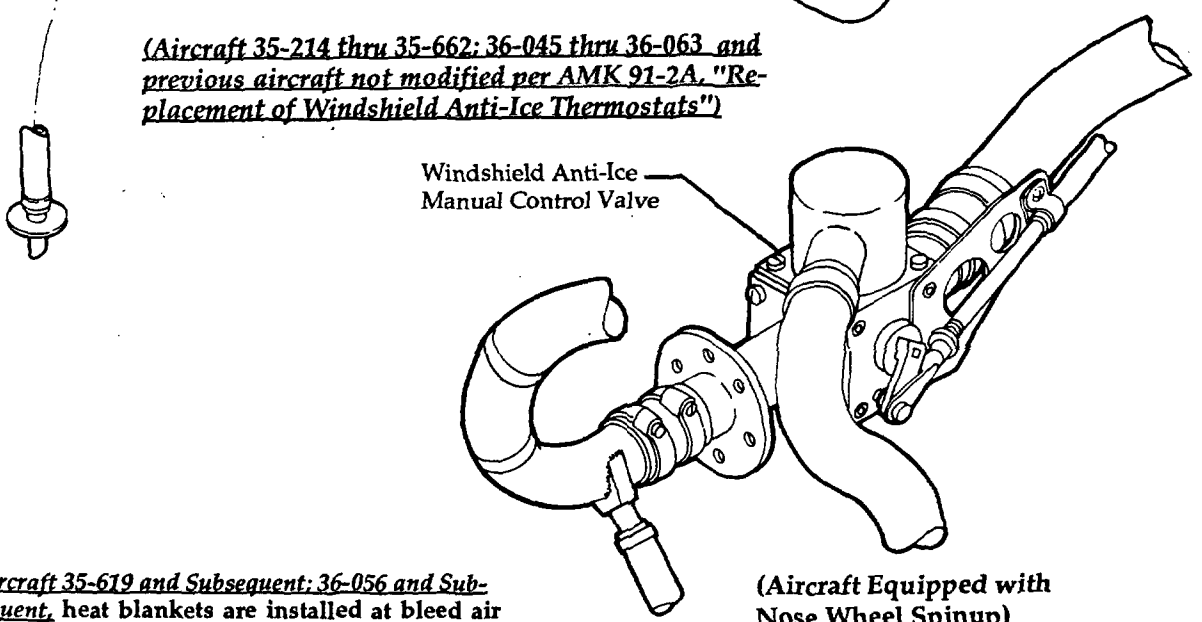
13-34C-5

EFFECTIVITY: NOTED

MM-99



(Aircraft 35-214 thru 35-662; 36-045 thru 36-063 and previous aircraft not modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats")



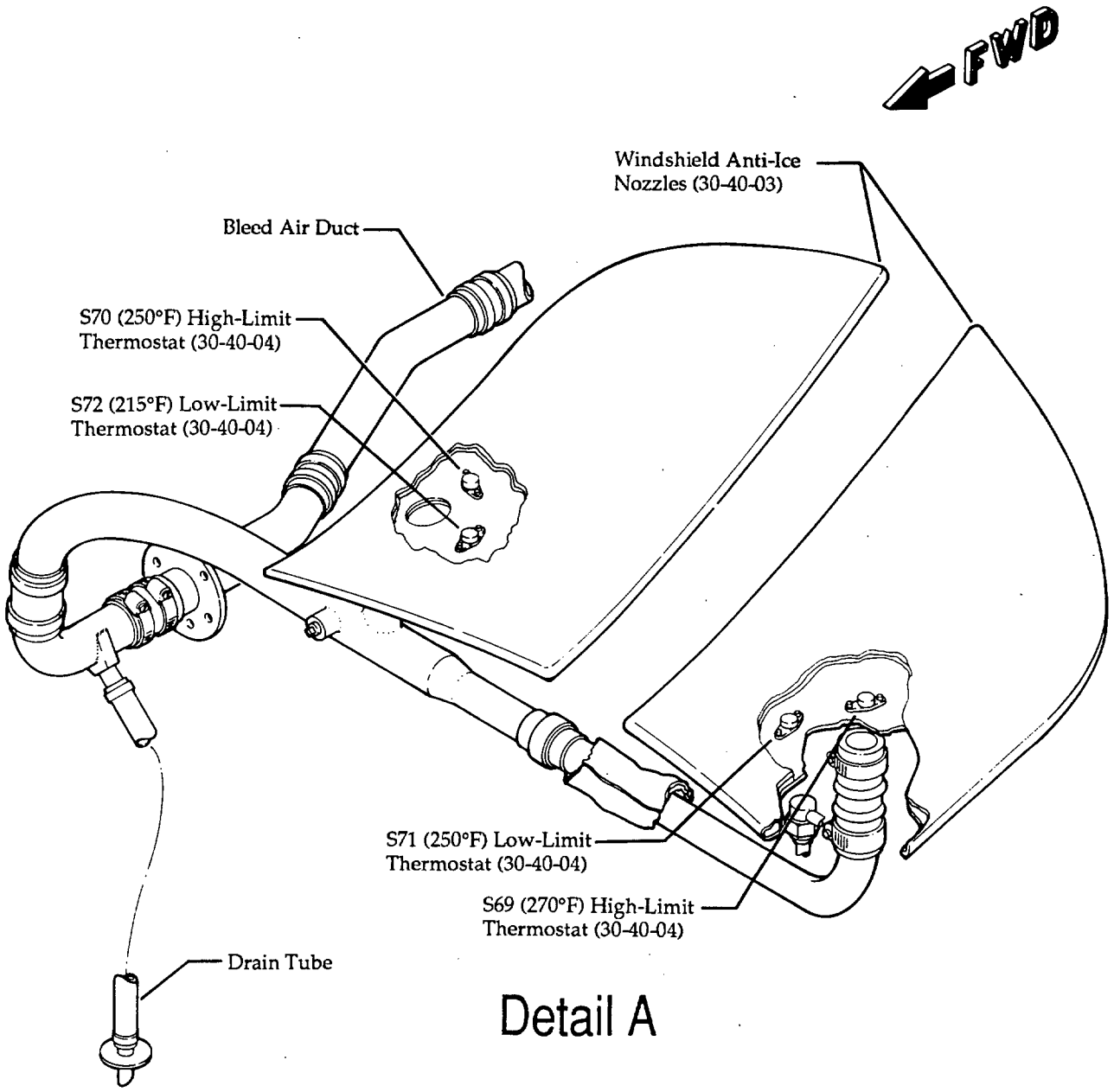
1 *(Aircraft 35-619 and Subsequent; 36-056 and Subsequent,* **heat blankets are installed at bleed air duct connections.)**

(Aircraft Equipped with Nose Wheel Spinup)

Detail A

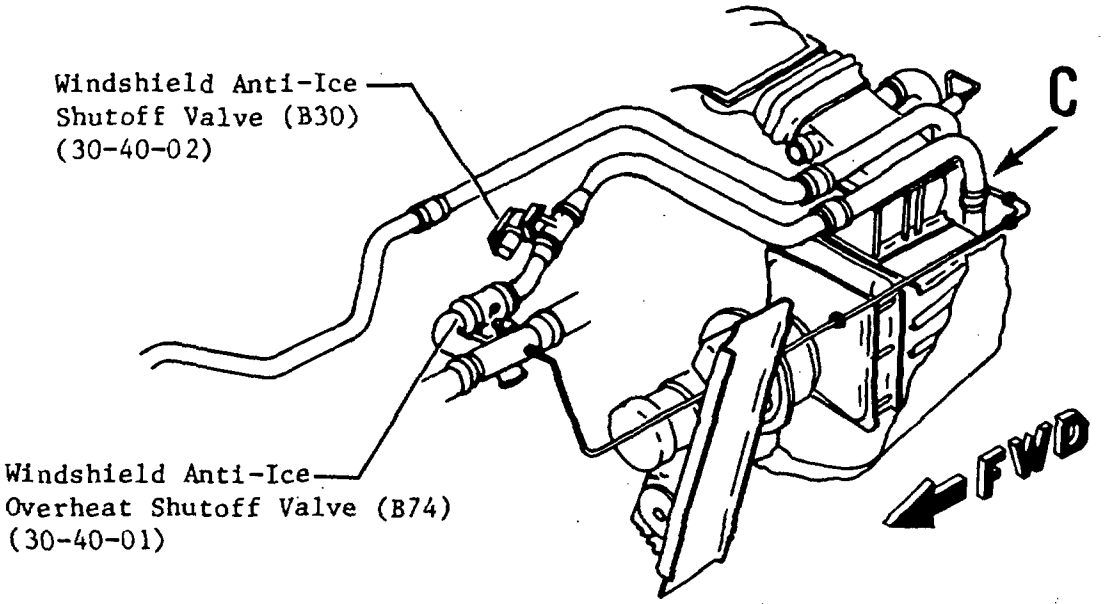
Windshield Anti-Ice System Component Locator
Figure 1 (Sheet 2 of 4)

13-34C-7
A13-34C-6

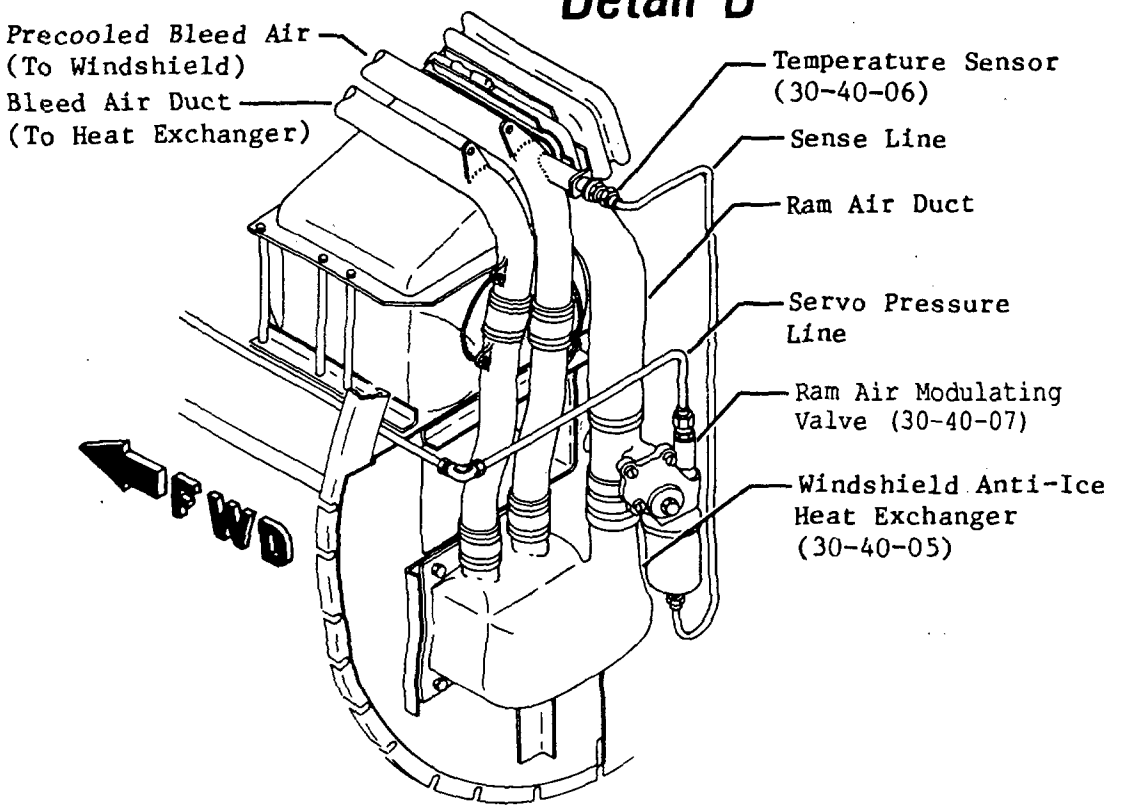


Windshield Anti-Ice System Component Locator
Figure 1 (Sheet 3 of 4)

13-34C-7

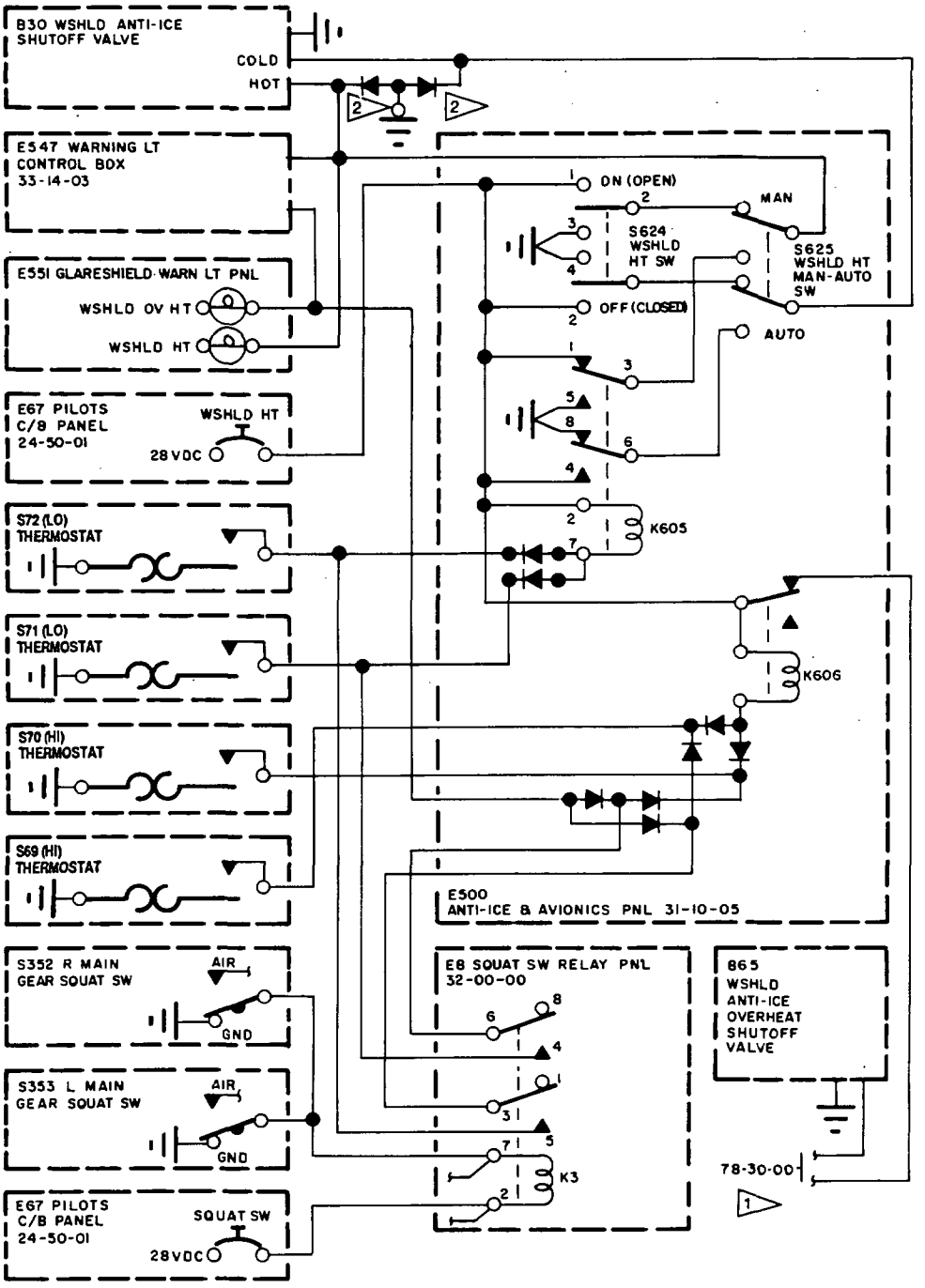


Detail B



Detail C

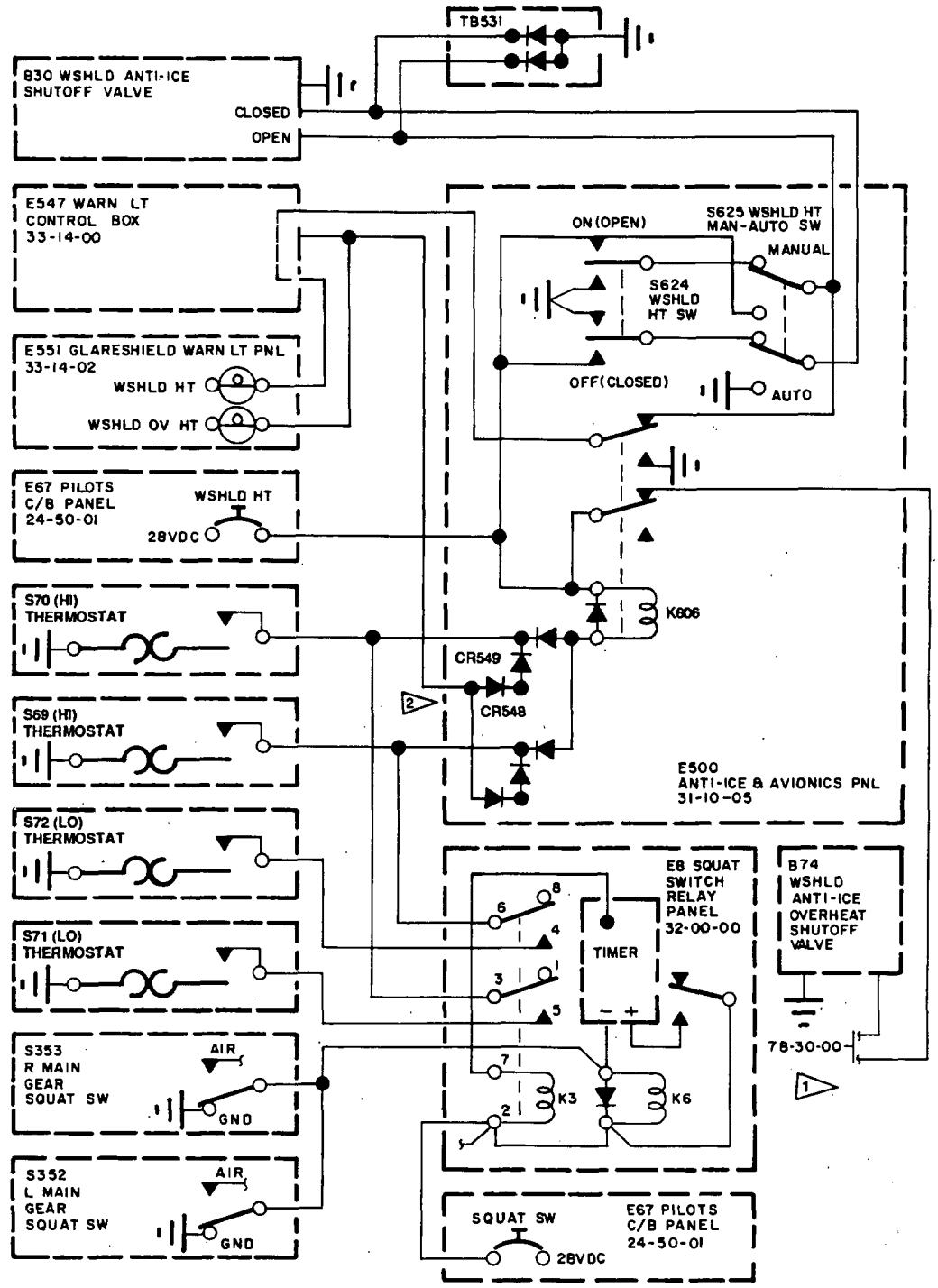
Windshield Anti-Ice System Component Locator
Figure 1 (Sheet 4 of 4)



1 On Aircraft not equipped with Aeronca Thrust Reversers, regulator valve (B65) is wired directly to K606 relay.

2 Add diodes effective Aircraft 35-023 and Sub., except 35-024, 35-027, and 35-029, and 36-014 and Sub.

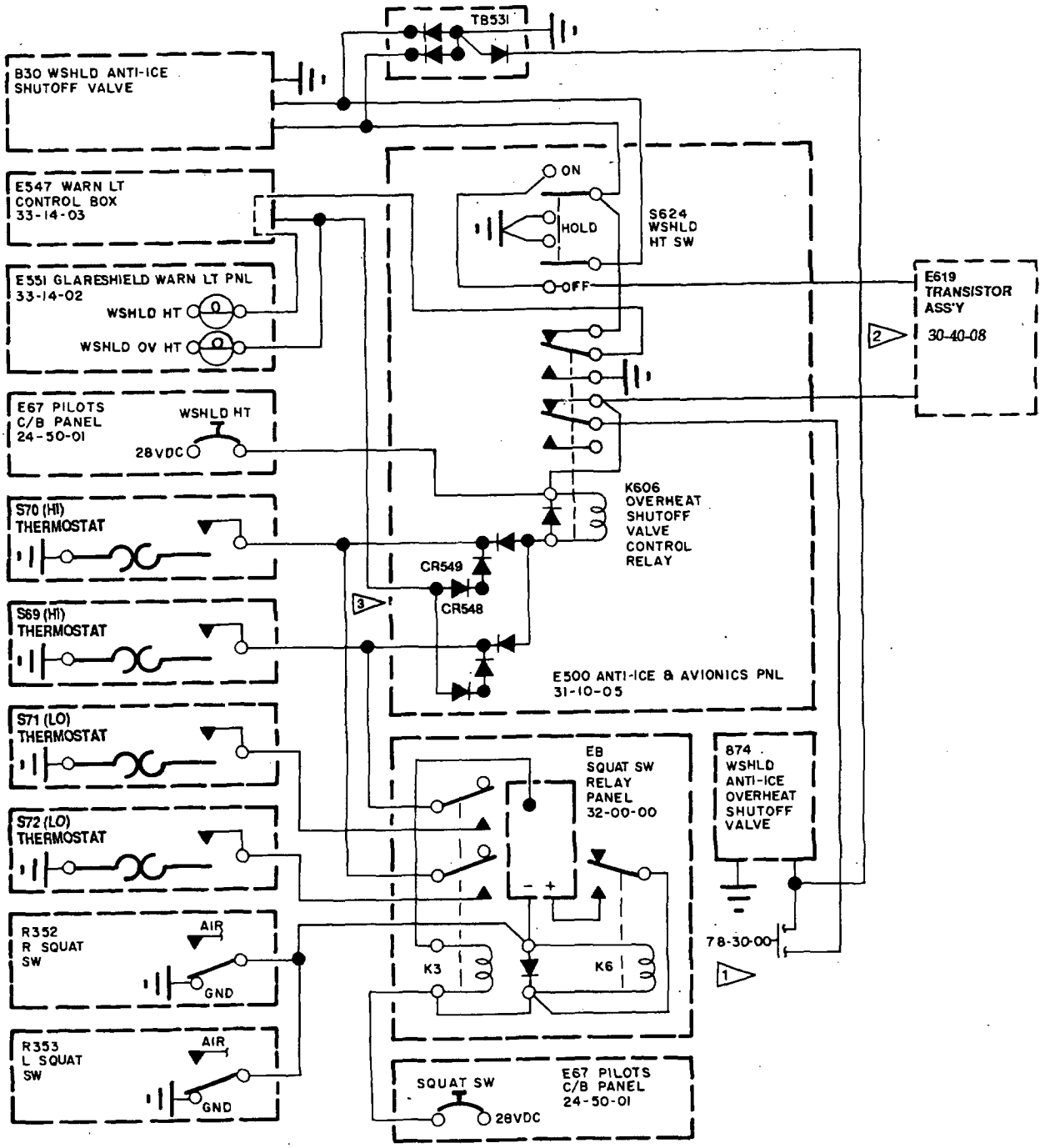
Windshield Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 1 of 4)



1 On Aircraft not equipped with Aeronca Thrust Reversers, valve (B74) wiring connects to relay K605.

2 On Aircraft 35-663 and Subsequent, 36-064 and Subsequent and prior aircraft modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostat", CR548 is deleted and CR549 is not used.

Windshield Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 2 of 4)

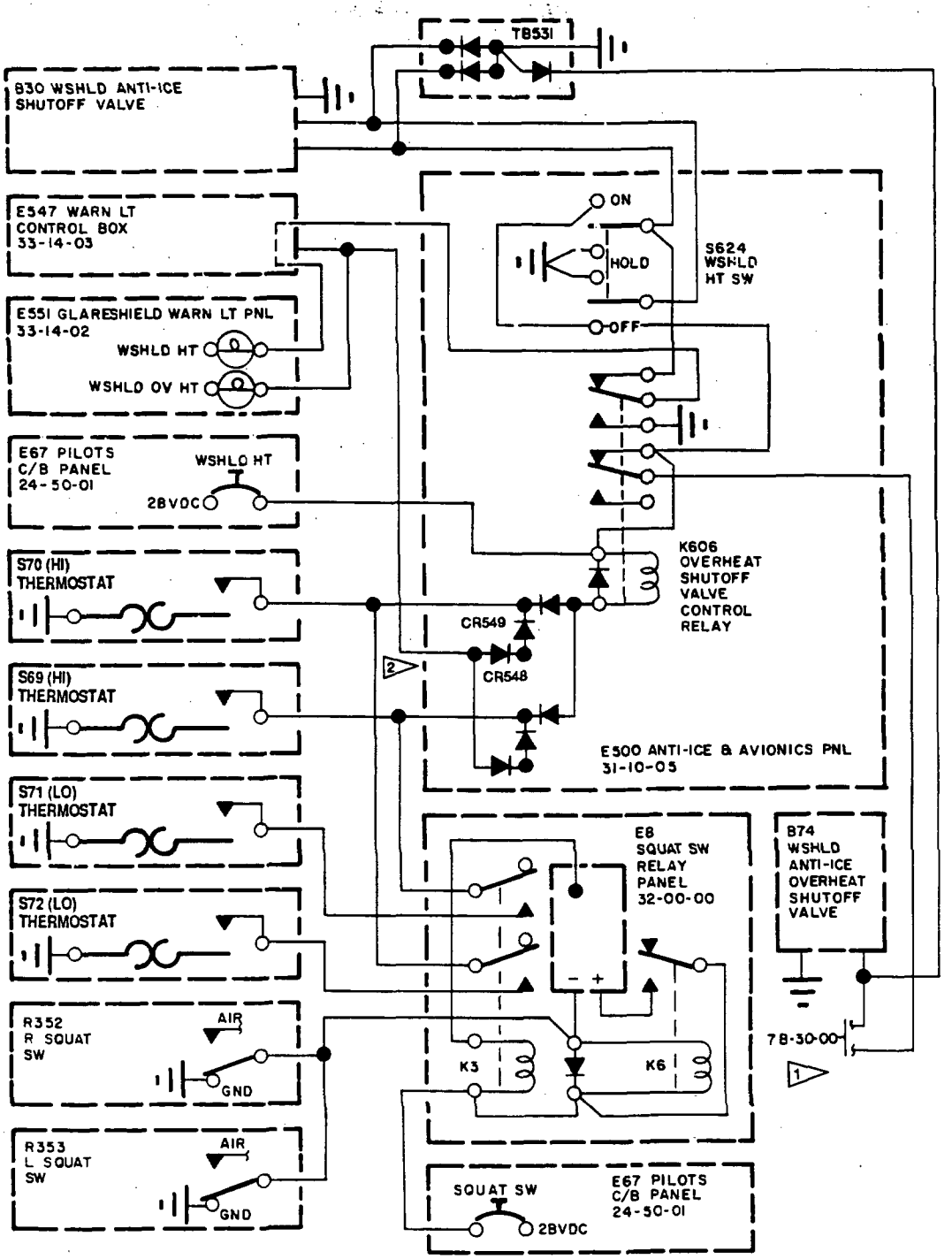


1 **On Aircraft not equipped with Aeronca Thrust Reversers, valve (B74) wiring connects directly to relay K606.**

2 **Effective on Aircraft 35-643 thru 35-673 and 36-058 thru 36-063.**

3 **On Aircraft 35-663 and Subsequent , 36-064 and Subsequent and prior aircraft modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostat", CR548 is deleted and CR549 is not used.**

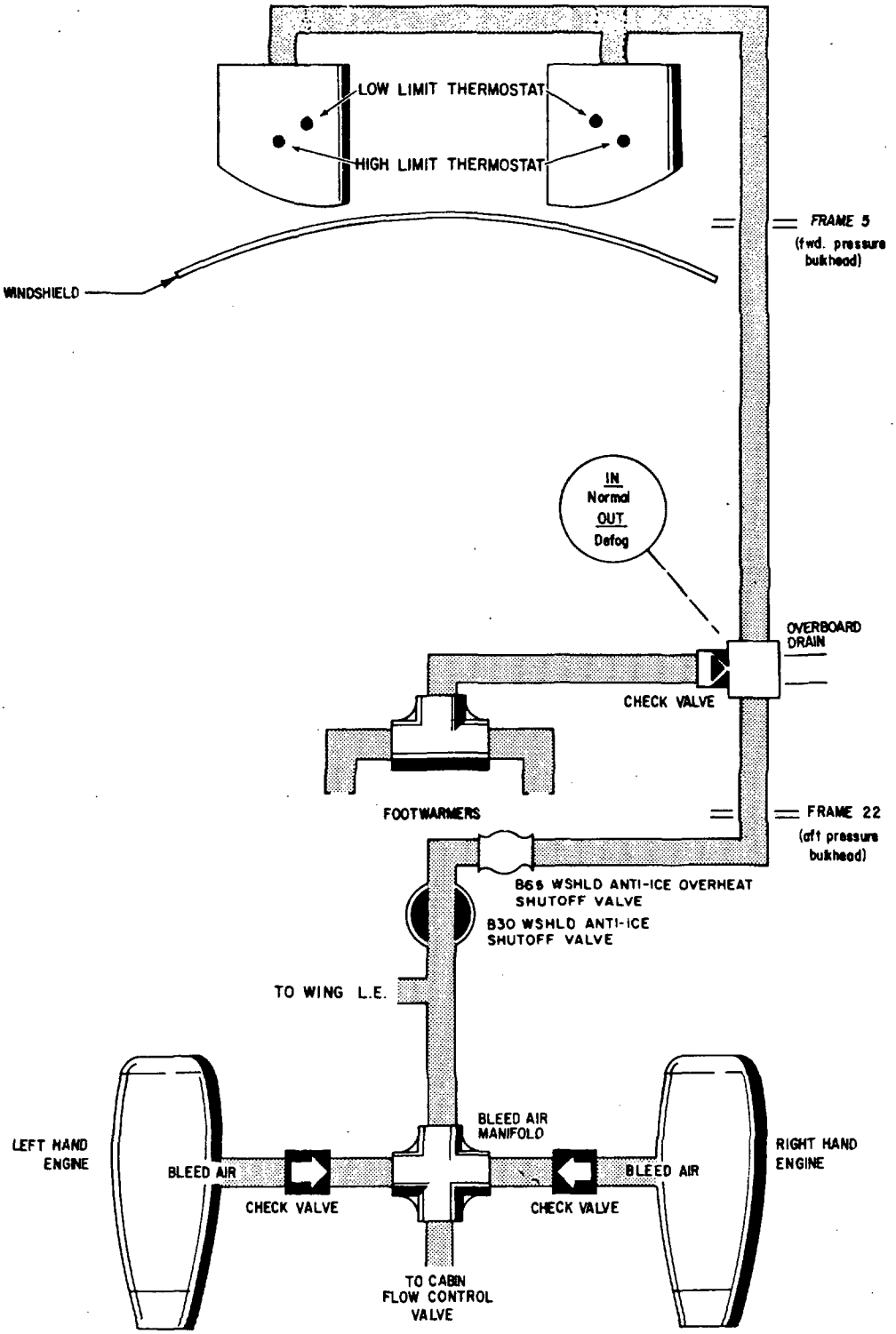
Windshield Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 3 of 4)



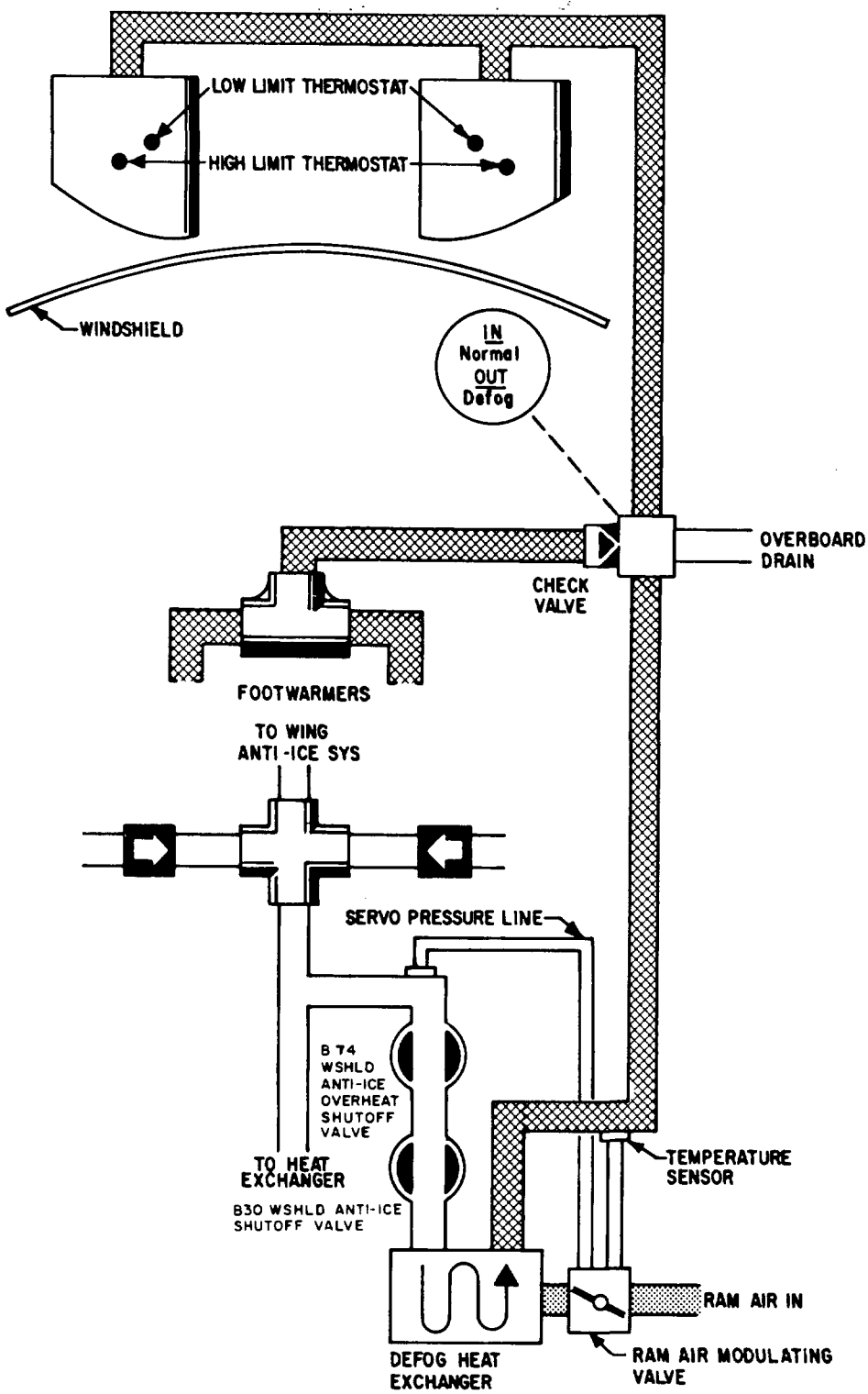
1 On Aircraft not equipped with Aeronca Thrust Reversers, valve (B74) wiring connects directly to relay K606.

2 On Aircraft 35-663 and Subsequent , 36-064 and Subsequent and prior aircraft modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostat", CR548 is deleted and CR549 is not used.

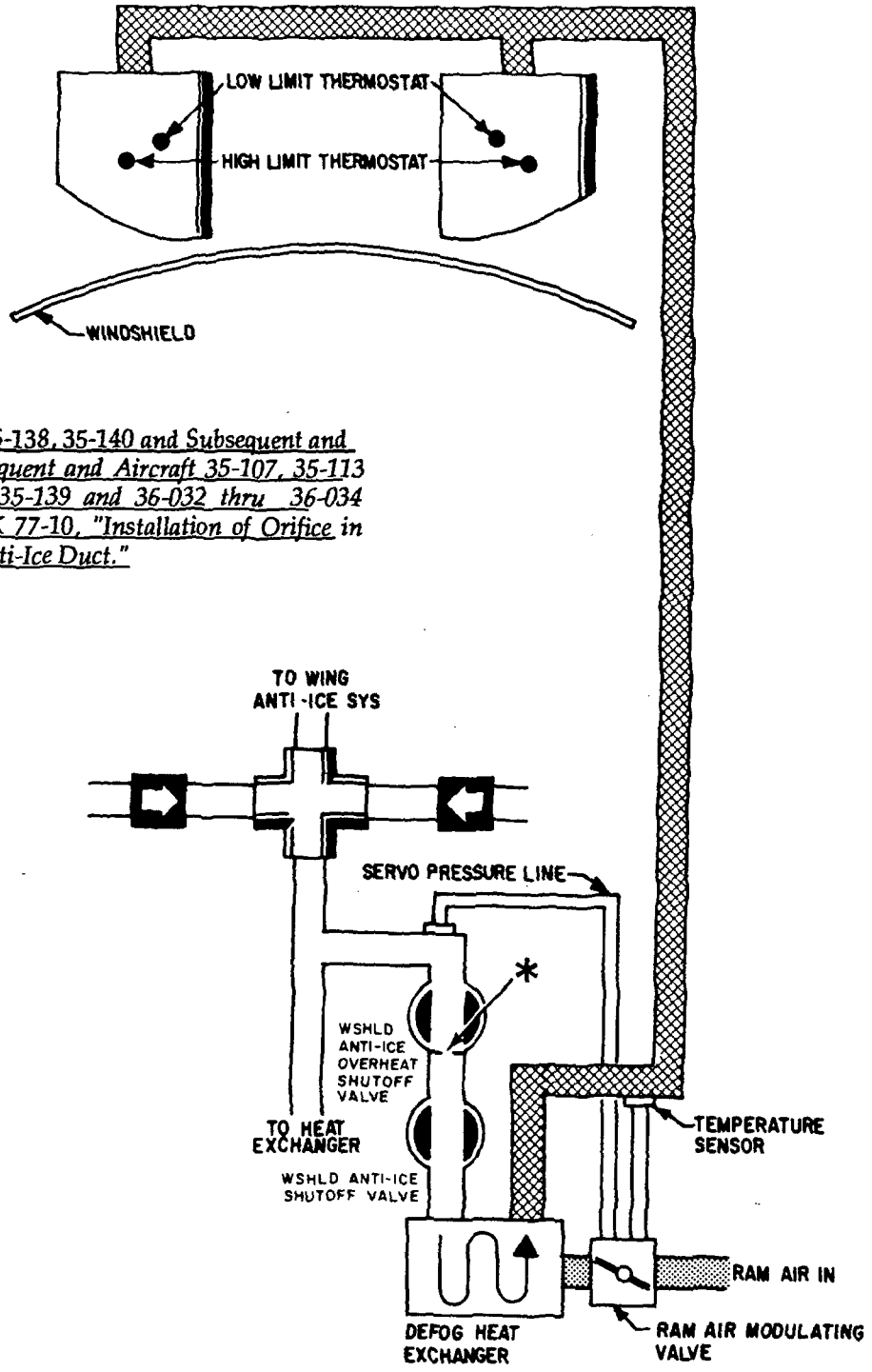
Windshield Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 4 of 4)



Windshield Anti-Ice System Schematic
Figure 3 (Sheet 1 of 3)

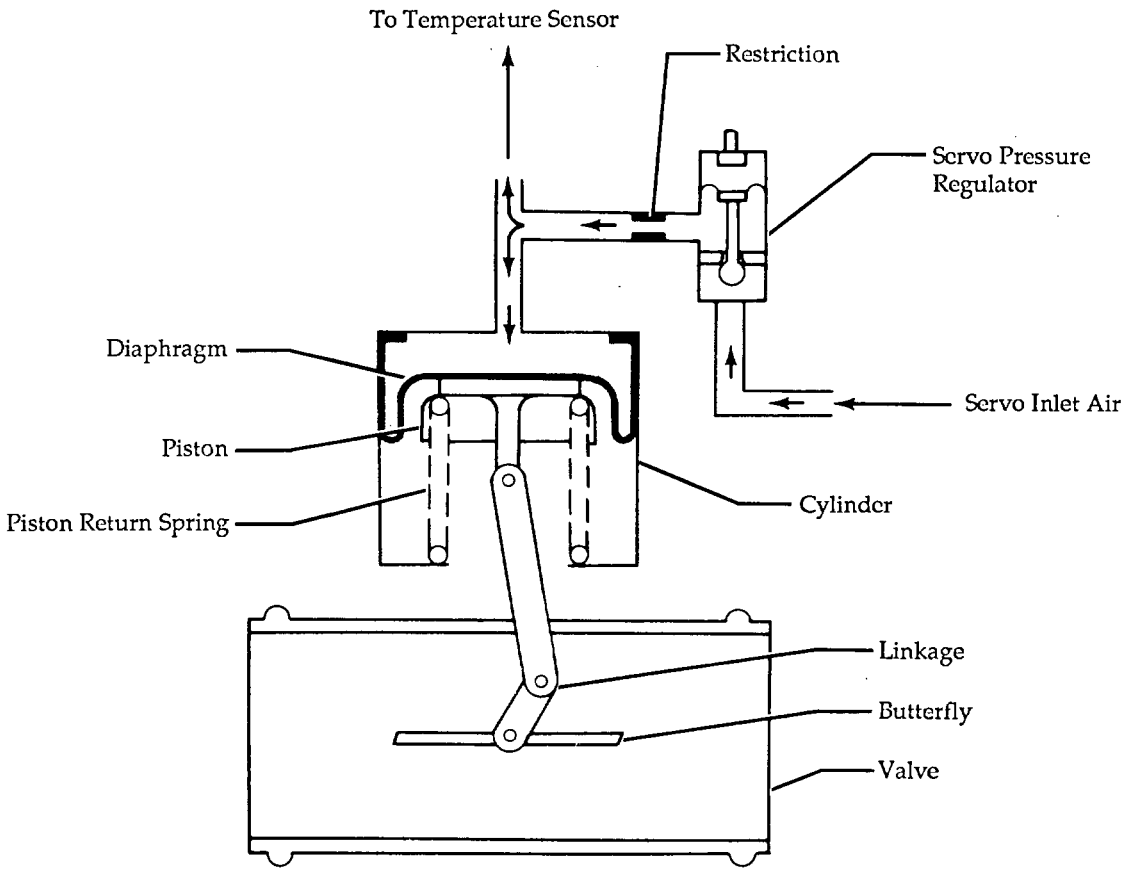


Windshield Anti-Ice System Schematic
Figure 3 (Sheet 2 of 3)



* *Orifice Effective 35-138, 35-140 and Subsequent and 36-035 and Subsequent and Aircraft 35-107, 35-113 thru 35-137 and 35-139 and 36-032 thru 36-034 modified per AMK 77-10, "Installation of Orifice in the Windshield Anti-Ice Duct."*

Windshield Anti-Ice System Schematic
Figure 3 (Sheet 3 of 3)



Windshield Anti-Ice Ram Air Modulating Valve Schematic
Figure 4

WINDSHIELD ANTI-ICE SYSTEM - TROUBLE SHOOTING

1. **Trouble Shooting**
   A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items.

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson	Check circuits.

B. Windshield Trouble Shooting
   (1) See Figure 101 for trouble shooting procedure. (Refer to Chapter 30 of the Wiring Manual for windshield anti-ice system wiring diagram.)
   (2) If the procedures in Figure 101 do not locate windshield anti-ice problems, refer to the Engine Maintenance Manual for further trouble shooting procedures.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. *Green Windshield Heat Light Does Not Illuminate When Windshield Heat Switch is Set to ON.*		
a. Defective windshield heat switch.	Check mechanical function of switch on anti-ice and avionics panel.	Replace defective switch.
b. Open power circuit or defective overheat shutoff valve control relay.	Check continuity from pin 28 of P616 on anti-ice and avionics panel to ground.	If continuity exists, replace relay. Otherwise, repair or replace wiring or components as applicable.
2. Green Windshield Heat Light Stays Illuminated When Windshield Heat Switch is Set to OFF.		
a. Defective windshield heat switch.	Check mechanical function of switch on anti-ice and avionics panel.	Replace defective switch.
b. Short in power circuit or defective overheat shutoff valve control relay.	Check continuity from pin 28 of P616 on anti-ice and avionics panel to ground.	If continuity exists, repair or replace wiring or components as applicable. Otherwise, replace relay.

Windshield Anti-Ice Trouble Shooting
Figure 101 (Sheet 1 of 3)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
3. Red Windshield Overheat Light Stays Illuminated When Windshield Cools to Normal from Overheated Condition.		
a. Defective high or low limit thermostat(s) or overheat shutoff valve (failed open).	Perform Windshield Anti-Ice System Functional Test. (Refer to Maintenance Practices, this section.)	Replace defective thermostat(s). (Refer to 30-40-04.) Replace defective overheat shutoff valve. (Refer to 30-40-01.)
b. Short in thermostat circuits.	Check wiring continuity.	Repair or replace wiring or components as applicable.
4. Windshield Does Not De-Ice (No Air Flow to Windshield).		
a. Loss of power to windshield heat switch.	Ensure that CB81 on pilot's circuit breaker panel is depressed. Check for 28 vdc at pin 20 of P616 on anti-ice and avionics panel.	Repair or replace wiring or components as necessary.
b. Defective windshield heat switch.	Check mechanical function of switch on anti-ice and avionics panel.	Replace defective switch.
c. Loss of power to anti-ice shutoff valve.	With windshield heat switch in ON position, check for 28 vdc at pin A of P155 on valve B30. *	Repair or replace wiring or components as necessary.
d. Defective defog shutoff valve (failed closed).	Perform Windshield Anti-Ice System Functional Test. (Refer to Maintenance Practices, this section.)	Replace defective valve. (Refer to 30-40-02.)
e. Defective defog overheat shutoff valve (failed closed).	Perform Windshield Anti-Ice System Functional Test. (Refer to Maintenance Practices, this section.)	Replace defective valve. (Refer to 30-40-01.)

* **On *Aircraft 35-139, 35-387, 35-613 thru 35-673 and 36-058 thru 36-063 equipped with electrically heated windshields, except aircraft modified per SB 35/36-30-5, "Replacement of Anti-Ice Shutoff Valve,"* check for 7.0 (± 0.2) vdc at pin A of P155 on valve B30.**

Windshield Anti-Ice Trouble Shooting
Figure 101 (Sheet 2 of 3)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
5. Low Limit Thermostats Inoperative (Aircraft on Ground).		
a. Defective time delay relay.	Check for 28 vdc at pin A of P121 on squat switch relay panel (E8).	Replace defective relay.
b. Open power circuit to thermostat(s).	Check wiring continuity.	Repair or replace wiring or components as applicable.
6. Clear Area on Windshield Reduced in Size.		
a. Defective ram air modulative valve (failed partially open).	Verify that valve connections are tightened and secure.	Replace defective valve. (Refer to 30-40-07.)
b. Defective external nozzle installation.	Check nozzle installation. (Refer to 30-40-03.)	Repair or replace nozzle as applicable. (Refer to 30-40-03.)
7. Anti-Ice System Not Effective and Cabin Pressure Climbs.		
a. Defective bleed air ducts.	Check for loose connections and ruptured or damaged ducts from tailcone bleed air system to nosecone piping.	Repair connections or ductwork as applicable.
b. Defective heat exchanger.	Check for heat exchanger damage in tailcone.	Repair or replace heat exchanger as applicable. (Refer to 30-40-05.)
8. Windshield Overheat Condition.		
a. Defective ram air modulating valve (failed closed).	Check for damage to valve. Verify that valve connections are tightened and secure. Verify that servo and temperature sense plumbing is intact.	Replace defective valve. (Refer to 30-40-07.)

Windshield Anti-Ice Trouble Shooting
Figure 101 (Sheet 3 of 3)

1. INSPECTION/CHECK

A. Windshield Anti-Ice System Functional Test *(Aircraft 35-002 thru 35-081, 35-083 thru 35-086, and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement")*

(1) Lower tailcone access door.
(2) Connect an air pressure source to fitting on bleed air manifold.
(3) Set all bleed air system switches to OFF and Battery Switches on.
(4) Slowly apply air pressure until 25 psig is present at bleed air manifold with airflow through windshield anti-ice system.
(5) Remove nose compartment access doors.
(6) Set Automatic-Manual Switch to MAN.
(7) Hold Windshield Heat Switch to OFF until anti-ice shutoff valve (B30) closes (airflow from outlets shall stop). WSHLD HT (green) indicator light shall extinguish.
(8) Hold Windshield Heat Switch to ON until anti-ice shutoff valve (B30) opens (air shall flow from outlets). WSHLD HT (green) light shall illuminate.
(9) Place jumper across terminals of RH low limit thermostat located on inboard side of RH anti-ice outlet. WSHLD OV HT (red) warning light shall illuminate.
(10) Set squat switches to air mode. WSHLD OV HT (red) warning light shall extinguish.
(11) Remove jumper from low limit thermostat and place jumper across terminals of high limit thermostat located on outboard side of anti-ice outlet. WSHLD OV HT (red) warning light shall illuminate and windshield overheat shutoff valve (B65) shall close (airflow at outlets will stop).
(12) Remove jumper from high limit thermostat.
(13) Perform steps A.(9) through A.(12) using LH low and high limit thermostats.
(14) Set Automatic-Manual Switch to AUTO. Place jumper across terminals of RH low limit thermostat. WSHLD OV HT (red) warning light shall illuminate and anti-ice shutoff valve (B30) shall close (airflow shall stop and WSHLD HT [green] indicator light shall extinguish).
(15) Position squat switches to air mode. WSHLD OV HT (red) warning light shall extinguish and anti-ice shutoff valve (B30) shall remain closed. Remove jumper from low limit thermostat and anti-ice shut- off valve (B30) shall open (air shall flow at outlets and WSHLD HT [green] indicator light shall illuminate).
(16) Place jumper across terminals of high limit thermostat. WSHLD OV HT (red) warning light shall illuminate and anti-ice pressure regulator valve (B65) shall close.
(17) Remove jumper from high limit thermostat.
(18) Perform steps A.(14) through A.(17) using LH low and high limit thermostats.
(19) Set squat switches to ground mode, disconnect air pressure source and close tailcone access door.

B. Perform Windshield Anti-Ice System Functional Test *(Aircraft 35-082, 35-087 and Subsequent and 36-023 and Subsequent and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement")*

(1) Set up test per steps A.(1) through A.(5).
(2) Set squat switches to air mode.
(3) On *Aircraft 35-082, 35-087 thru 35-106, 35-108 thru 35-112, and 36-023 thru 36-031*, set Automatic-Manual Switch to AUTO. On *Aircraft 35-107 and 35-113 and Subsequent*, set Windshield Heat Switch to ON.
(4) Place jumper across terminals of RH low limit thermostat and position squat switches to ground mode.
(5) Ten seconds after squat switches are placed in ground mode, WSHLD OV HT (red) warning light shall illuminate, windshield overheat shutoff valve (B74) shall close (airflow stops) and WSHLD HT (green) indicator light shall extinguish.
(6) Set squat switches to air mode. WSHLD OV HT (red) warning light shall extinguish, windshield anti-ice overheat shutoff valve (B74) shall open (air shall flow out of outlets) and WSHLD HT (green) indicator light shall illuminate.

(7) Remove jumper from RH low limit thermostat and connect jumper across terminals of RH high limit thermostat. WSHLD OV HT (red) warning light shall illuminate, WSHLD HT (green) indicator light shall extinguish and windshield anti-ice overheat shutoff valve (B74) shall close (airflow will stop).

(8) Remove jumper from high limit thermostat.

(9) Repeat steps B.(4) through B.(8) using LH low and high limit thermostats.

(10) On *Aircraft 35-082, 35-087 thru 35-106, 35-108 thru 35-112 and 36-023 thru 36-031*, set Automatic-Manual Switch to MAN and hold Windshield Heat Switch to OFF until shutoff valve (B30) closes. On *Aircraft 35-107, 35-113 and Subsequent, and 36-032 and Subsequent*, hold Windshield Heat Switch to OFF until shutoff valve (B30) closes. Airflow will stop and WSHLD HT (green) indicator shall extinguish.

(11) Hold Windshield Heat Switch to ON. Shutoff valve (B30) shall open (air shall flow from outlets and WSHLD HT [green] indicator shall illuminate).

(12) Hold Windshield Heat Switch to OFF until shutoff valve (B30) closes.

(13) On *Aircraft 35-082, 35-087 thru 35-106, 35-108 thru 35-112 and 36-023 thru 36-031*, set Automatic-Manual Switch to AUTO. Shutoff valve (B30) shall open and WSHLD HT (green) indicator shall illuminate.

(14) Set squat switches to ground mode, disconnect air pressure source and close tailcone access door.

C. Windshield Anti-Ice System Timer Circuit Functional Test *(Aircraft 35-082, 35-087 and Subsequent, 36-032 and Subsequent and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement")*

NOTE: This functional test is to be performed in accordance with the current inspection interval specified in Chapter 5.

(1) Set Battery Switches to ON.

(2) Pull Squat Switch circuit breaker to simulate an air mode.

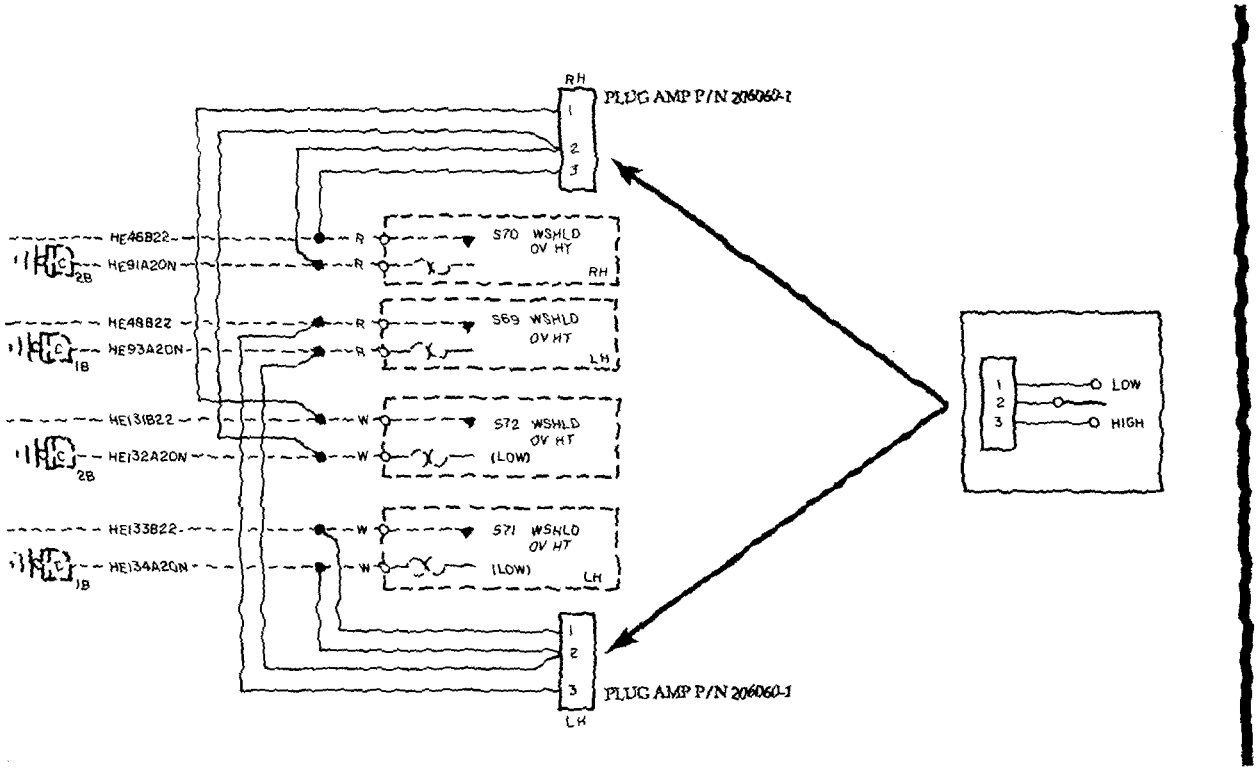
(3) Install jumper wire across terminals of LH low limit thermostat.

NOTE: To save time during subsequent inspections, install two permanent test plugs to take the place of the jumper wires. Mount the plugs near frame 4 on the LH and RH sides of the aircraft. Connect electrical wiring as shown in figure 201. Use switch during test to perform jumpering function.

(4) Set Windshield Heat Switch (S624) to ON. Reset Squat Switch circuit breaker to simulate a ground mode.

(5) Within 10 (±2) seconds after Squat Switch circuit breaker is reset, the WSHLD OV HT (red) warning annunciator on the glareshield shall illuminate and the WSHLD HT (green) annunciator shall extinguish.

(6) Set Battery Switches to OFF. Disconnect jumper wire from LH low limit thermostat.



Timer Circuit Test Plugs Electrical Schematic
Figure 201

WINDSHIELD ANTI-ICE OVERHEAT SHUTOFF VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Overheat Shutoff Valve (See figure 201.)

(1) Remove electrical power from aircraft.
(2) Lower tailcone access door.
(3) Remove duct insulation as required to gain access to overheat shutoff valve.
(4) Loosen and remove clamps securing shutoff value to bleed air ducts.
(5) Remove attaching parts and remove shutoff valve from aircraft.

B. Install Overheat Shutoff Valve (See figure 201.)

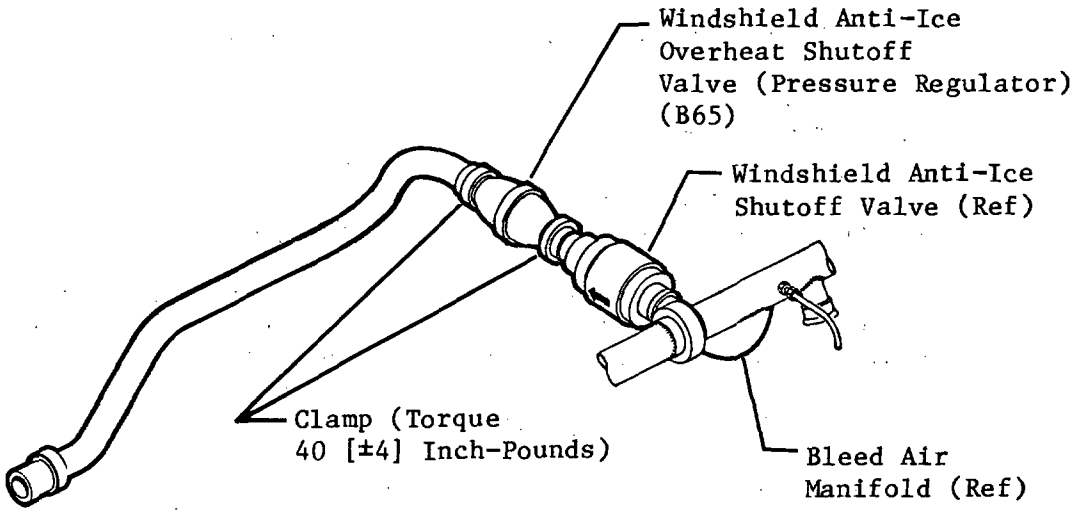
(1) Position valve and orifice if installed in place and secure with attaching parts and clamps.

NOTE: On Aircraft 35-619 and Subsequent and 36-056 and Subsequent and prior aircraft equipped with clamp (P/N NM102921-0150); torque clamp 45 (±4.5) inch-pounds.

(2) Torque clamps to 40 (±4) or 45 (±4.5) inch-pounds plus drag torque.

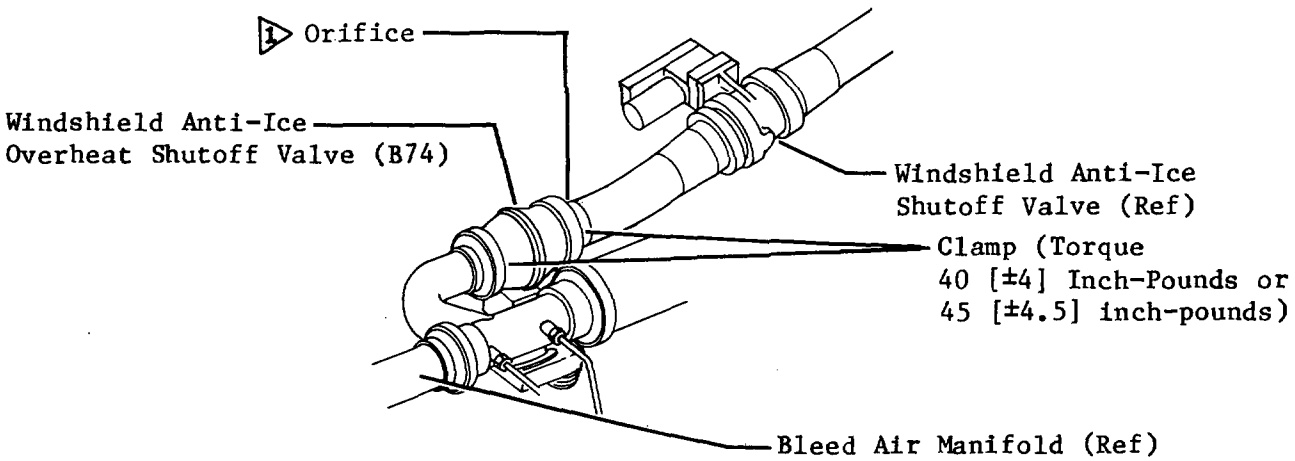
NOTE: Drag torque is the amount of torque required to overcome the friction of the self-locking nut. This value must be added to the torque callout to ensure proper torquing.

(3) Install duct insulation.
(4) Restore aircraft to normal.
(5) Restore electrical power to aircraft.



35-002 thru 35-081, 35-083 thru 35-086, and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement"

1 35-138, 35-140 and Subsequent, 36-035 and Subsequent and Prior Aircraft Modified per AMK77-10, "Installation of Orifice in Windshield Anti-Ice Duct."



35-082, 35-087 and Subsequent, 36-023 and Subsequent and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement"

Windshield Anti-Ice Overheat Shutoff Valve Installation
Figure 201

WINDSHIELD ANTI-ICE SHUTOFF VALVE - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

   A. **Remove Shutoff Valve** (See figure 201.)

      (1) Remove electrical power from aircraft.
      (2) Lower tailcone access door.
      (3) Remove duct insulation as required to gain access to shutoff valve.
      (4) Disconnect electrical connector from shutoff valve.
      (5) Loosen clamps sufficiently to remove duct from shutoff valve.
      (6) Loosen remaining clamp and remove shutoff valve from aircraft.

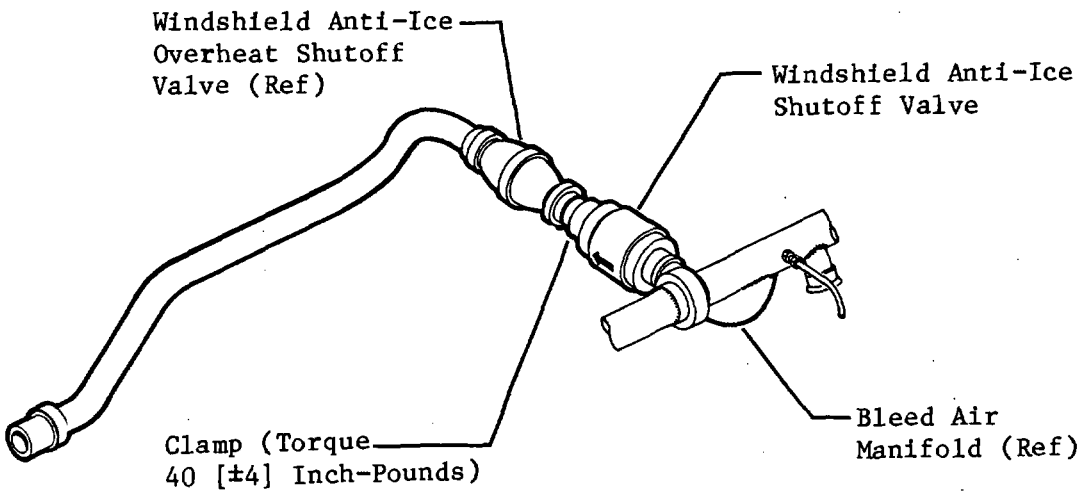
   B. **Install Shutoff Valve** (See figure 201.)

      CAUTION: WHEN INSTALLING SHUTOFF VALVE, EXTREME CARE SHOULD BE TAKEN TO ENSURE THAT THE VALVE MATES PROPERLY WITH DISTRIBUTION DUCTS. FAILURE TO OBSERVE THIS COULD CAUSE DAMAGE TO THE SHUTOFF VALVE WHEN COUPLINGS ARE TIGHTENED.

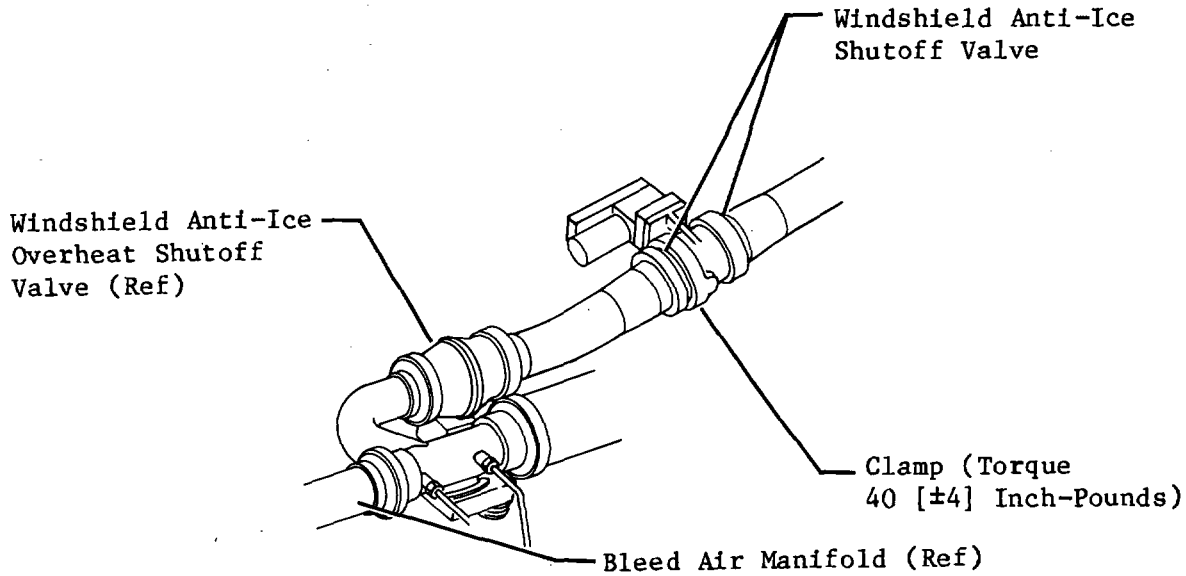
      (1) Position shutoff valve in bleed air ducts and secure with clamps. Torque clamps 40 inch-pounds plus drag torque.

      NOTE: Drag torque is the amount of torque required to overcome the friction of any self-locking nut. This nut friction (drag torque) must be added to the torque callout to assure proper torquing. The tailcone bleed air ducting incorporates stainless steel clamps, nuts, and bolts, which require higher nut-friction than the standard self-locking nuts. In some instances, nut friction may exceed the required torque values.

      (2) Connect electrical connector to shutoff valve.
      (3) Install duct insulation.
      (4) Restore aircraft to normal.
      (5) Restore electrical power to aircraft.



35-002 thru 35-081, 35-083 thru 35-086, and 36-002 thru 36-022 not modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement"



35-082, 35-087 and Subsequent, 36-023 and Subsequent and prior aircraft modified per AAK 76-7, "Bleed Air Precooler and Windshield Defog and Anti-Ice Improvement"

Windshield Anti-Ice Shutoff Valve Installation
Figure 201

1. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Methyl Ethyl Ketone	TT-M-261	Commercially Available	Cleaning solvent.
Aliphatic Naphtha	TT-N-95, Type II	Commercially Available	Cleaning solvent.
Coast Pro-Seal	890, Class B	Essex Chemical Co. Compton, CA	Sealant.
Sealing Gun	No. 250	Semco	Applicator device.
Sealing Gun Nozzle		Semco	Applicator device.
Sealant Fairing Tool		Commercially Available	Applicator device.
Stiff Bristle Brush (not nylon)		Commercially Available	Cleaning device.
Black Air-Dry Conductive Coating Catalyst Reducer	#463-6-14 #CA-97 #TL-52	Bostik Div., USM Corp. Torrance, CA	Anti-static coating for conductivity.
* Epoxy Primer CAT-A-LAC Primer Catalyst Reducer	 #463-12-8 #CA-116 #TL-52	Bostik Div., USM Corp. Torrance, CA	Corrosion preventive primer.
* Abrasive	220 Grit, or finer	Commercially Available	Surface sanding
* Aluminum Wool		Commercially Available	Surface prep
* Paint Brush		Commercially Available	Applicator.
* Turcoat Accelagold		Turco Products Carson, CA	Protective sealing film.
**Silastic Adhesive	732 RTV	Dow Corning Corp. Midland, MI	Adhesive.

LES-1039
LES-1063
LES-1091
LES-1231A

NAME	PART NUMBER	MANUFACTURER	USE
Primer	1200	Dow Corning Corp. Midland, MI	Primer base.
Epoxy Adhesive	EC 2216	3M Co. St. Paul, MN	Adhesive.
Masking Tape	#250	3M Co. St. Paul, MN	Masking windshield.
Cheesecloth		Commercially Available	Cleaning and wiping.
Waterproof Cover		Commercially Available	Leak check.
Hapex Core Fill Resin	1231-1	Hasting Plastics Co.	Fill cavities, recesses.

* Required if repairs or application of epoxy primer is required.
** Required if gasket on external nozzle is to be replaced.

2. **Removal/Installation**

NOTE:
- Maintenance practices on the external nozzles include removal and installation of the nozzle assemblies and repair of the erosion coating. During the removal of a nozzle, the epoxy primer coating on the windshield and aircraft skin may be damaged and require repair.
- Both left and right nozzles are removed and installed using the same procedure.

A. Remove Windshield Anti-Ice External Nozzle (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove nose compartment access doors and gain access to thermostats.
   (3) Remove high- and low-limit thermostats. (Refer to 30-40-04.)
   (4) Disconnect alcohol system plumbing from external nozzle (pilot side only).
   (5) Disconnect bleed air duct from nozzle.
   (6) Nozzle attaching screws are recessed into the nozzle and the recesses are filled with putty. Remove putty covering attaching screws.
   (7) Remove attaching parts and nozzle from aircraft. Note position and quantity of washers (shims) between gasket and structure.

B. Install Windshield Anti-Ice External Nozzle (See figure 201.)

WARNING: WHEN PERFORMING REPAIRS TO OR APPLYING NEW EPOXY PRIMER TO THE WINDSHIELD AREA, ENSURE THAT PROPER MEASURES ARE TAKEN TO PROTECT THE WINDSHIELD FROM DAMAGE.

   (1) Prepare external nozzle and aircraft for nozzle installation.
      (a) Remove and clean old fillet seal from around nozzle and aircraft skin and windshield.
      (b) Brush aircraft and windshield structure clean of old sealant, lint, and dust using stiff bristle brush.

(c) Wipe area clean with a clean, white, cotton cloth and MEK. Dry area with another cloth before solvent evaporates.
(d) Inspect area where nozzle was removed, paying particular attention to epoxy-primed surface on both metal structure and windshield. If there is evidence of primed surface damage, reprime or touch up primed area as described in step 2.B.(3).
(e) Inspect old gasket on nozzle. If gasket shows signs of damage, replace gasket as described in step 2.B.(4).
(f) Inspect nozzle to determine if anti-static coating is continuous and free from breaks, scratches, and other damage, especially in counterbore areas. If there is evidence of damage, recoat nozzle as described in step 2.B.(2).

(2) If inspection requires repair or replacement of external nozzle, application of anti-static coating is as follows:
(a) Mix Black Air-Dry Conductive Coating per manufacturer's instructions.
(b) Wipe entire surface and counterbore areas clean with white, cotton cloth and MEK. Dry surface area with another cloth before solvent evaporates.

CAUTION: USE EXTREME CAUTION NOT TO SAND THROUGH OUTER RESIN COAT OF NOZZLE INTO THE FIBERGLASS CLOTH SUBSTRUCTURE.

(c) Uniformly abrade solvent cleaned surface using 180 grit abrasive.
(d) Use filtered, clean, and dry compressed shop air or dry nitrogen to facilitate removal of abraded residue. Then reclean per step 2.B.(2)(b).

CAUTION: THERE SHALL BE CONTINUITY (INTIMATE CONTACT) OF ANTI-STATIC COATING BETWEEN THE EXTERIOR SURFACE AND THE COUNTERBORE (ATTACH HOLES) AREAS TO ENSURE SAFE STATIC DISCHARGE CONDUCTIVITY INTO STRUCTURE.

(e) Spray (two coats applied at 90° to each other) anti-static conductive coating evenly over surface to achieve a 1.2 to 1.8 mil dry film thickness.

(3) If inspection requires repair or application of epoxy primer to windshield or aircraft skin, accomplish the following:

NOTE: Clean and proper equipment should be used. Coating material should be uniform, free of skins, lumps, and gelled or coarse particles. Finish area should be free of dust and severe temperature change which will adversely affect application and cure of coating. Suitable ventilation and safety precautions should be provided in work area. Thickness requirements listed for coating should be strictly maintained.

(a) Inspect aluminum skin to determine if protective film is continuous and free from breaks, scratches, and other damages.
(b) If repair to protective film is required, mix Turcoat Accelagold per manufacturer's instructions.
(c) Using aluminum wool, strip scratched or damaged area.
(d) Using paint brush, apply small quantities of protective film solution over stripped area until a satisfactory chemical film has been produced. Apply solution over chemical film along edge of stripped area only as far as is necessary to produce a continuous film.
(e) Cover nose compartment area with waterproof cover and rinse area thoroughly with water, using a sponge or brush. Rinse with 40°F to 100°F temperature water and then with 100°F to 160°F water.
(f) The area should be dried in a temperature range of 60°F to 160°F (15°C to 71°C) in still air or in a room of circulating air. Do not wipe area for any reason until area has dried for 24 hours.

(g) Mix epoxy primer, catalyst, and reducer per manufacturer's instructions. Allow mixture to set one (1) hour after mixing.
(h) Apply a spray coat of mixed primer to give a dry film thickness on windshield of 0.007 inch with no pin holes when visually inspected.
(i) Epoxy primer shall extend 0.30 inch beyond edge of nozzle.
(j) Allow primer to dry a minimum of 2 hours before applying top coat. Allow to cure for 24 hours before installing nozzle.

(4) If inspection requires replacement or installation of nozzle gaskets, accomplish the following:
(a) Using MEK, clean surface of nozzle where new gasket is to be bonded. Ensure that all old adhesive is removed.
(b) Brush a uniform thin coat of primer No. 1200 on surface of nozzle and allow to air dry for at least 30 minutes.
(c) Clean surface of gasket to be bonded to nozzle. Spread a uniform coat of adhesive (Silastic 732 RTV) to surface of gasket.
(d) Press surface of gasket and nozzle together using only enough pressure to displace trapped air. Avoid using excessive pressure which may cause adhesive to be forced out.

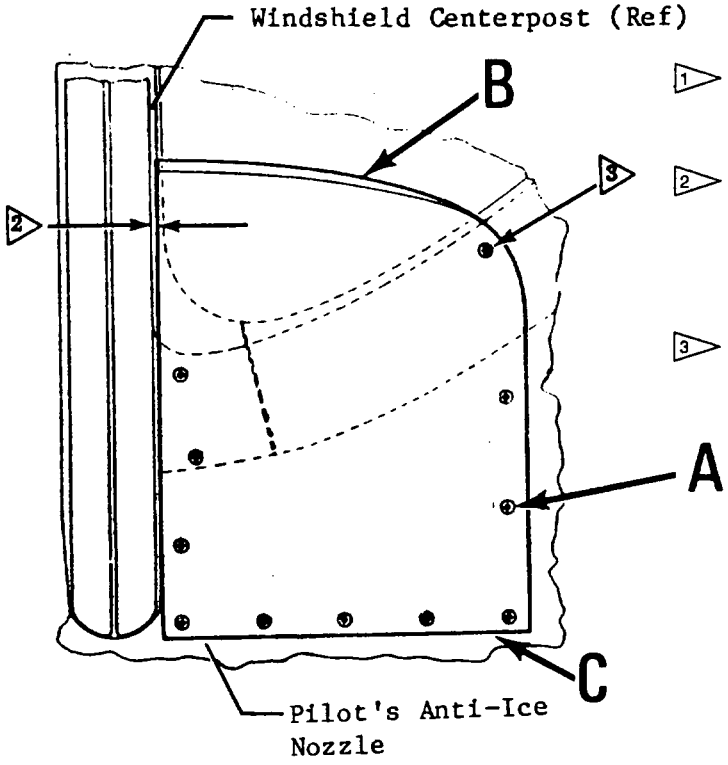
CAUTION: DO NOT USE HEAT TO ACCELERATE CURE.

(e) Allow bond to cure at room temperature for 24 hours.
(f) After bond has cured, trim gaskets approximately 0.10 inch back from edge of nozzle.
(g) Remove all excess adhesive from trimmed area.

(5) Ensure that washers previously removed are in their proper location, install nozzle, and secure with attaching parts.
(6) Torque screws securing nozzle 5 inch-pounds plus drag torque.

NOTE: Drag torque is the amount of torque required to overcome the friction of any self-locking nut. This nut friction (drag torque) must be added to the torque callout to ensure proper torquing. In some instances, nut friction may exceed the required torque values.

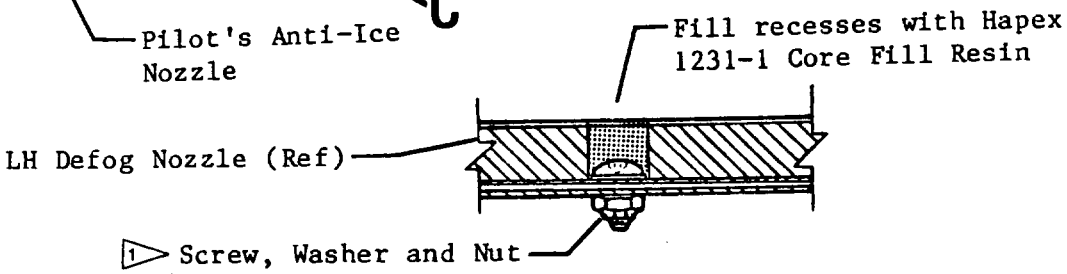
(7) Apply fillet seal around perimeter of external nozzle. (Refer to Chapter 20.)
(8) Epoxy primer on windshield shall extend 0.03 inch beyond fillet seal.
(9) Remove waterproof cover over nose compartment area.
(10) Install low- and high-limit thermostats. (Refer to 30-40-04.)
(11) Connect alcohol system plumbing to nozzle (pilot's side only).
(12) Connect bleed air duct to nozzle with attaching parts.
(13) Install nose compartment access doors.
(14) Fill recesses in defog nozzle with Hapex 1231-1 core fill resin (manufactured by Hastings Plastics Co., 1704 Colorado Ave., Santa Monica, California).
(15) Restore aircraft to normal.
(16) Repaint affected area as required. (Refer to Chapter 20.)
(17) Restore electrical power to aircraft.
(18) Perform Windshield Anti-Ice System Functional Test. (Refer to 30-40-00.)



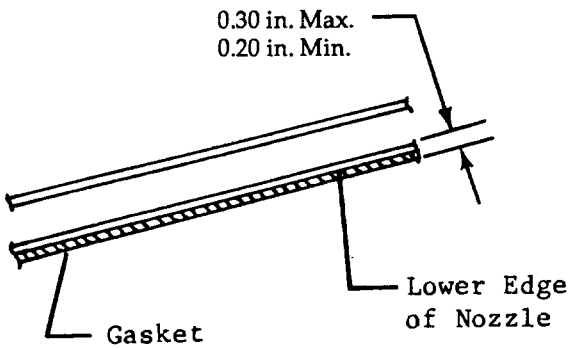
1 Torque all screws securing nozzle 5 inch-pounds plus drag torque.

2 *Effective 35-023 and Subsequent and 36-014 and Subsequent,* it is permissible to have 0.04 inch maximum gap between nozzle and windshield counterpost.

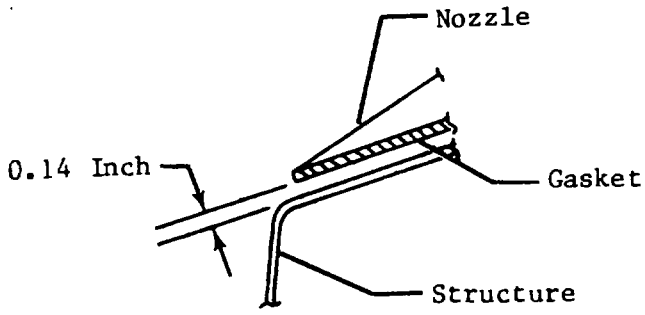
3 *On Aircraft 35-124, 35-125, 35-130 and Subsequent and 36-034 and Subsequent,* with nozzle in position to maintain dimensions (see Details B and C), add washers (P/N AN960PD10 or AN960PD10L) between gasket and structure to fill gap. Maximum washer thickness at any location must not exceed 0.080 inch.



Detail A



Detail B



Detail C

Windshield Anti-Ice External Nozzle Installation
Figure 201

THERMOSTAT - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items:

NAME	PART NUMBER	MANUFACTURER	USE
* Sealant	RTV-159	Dow Corning Corp. Midland, MI	Fillet seal.

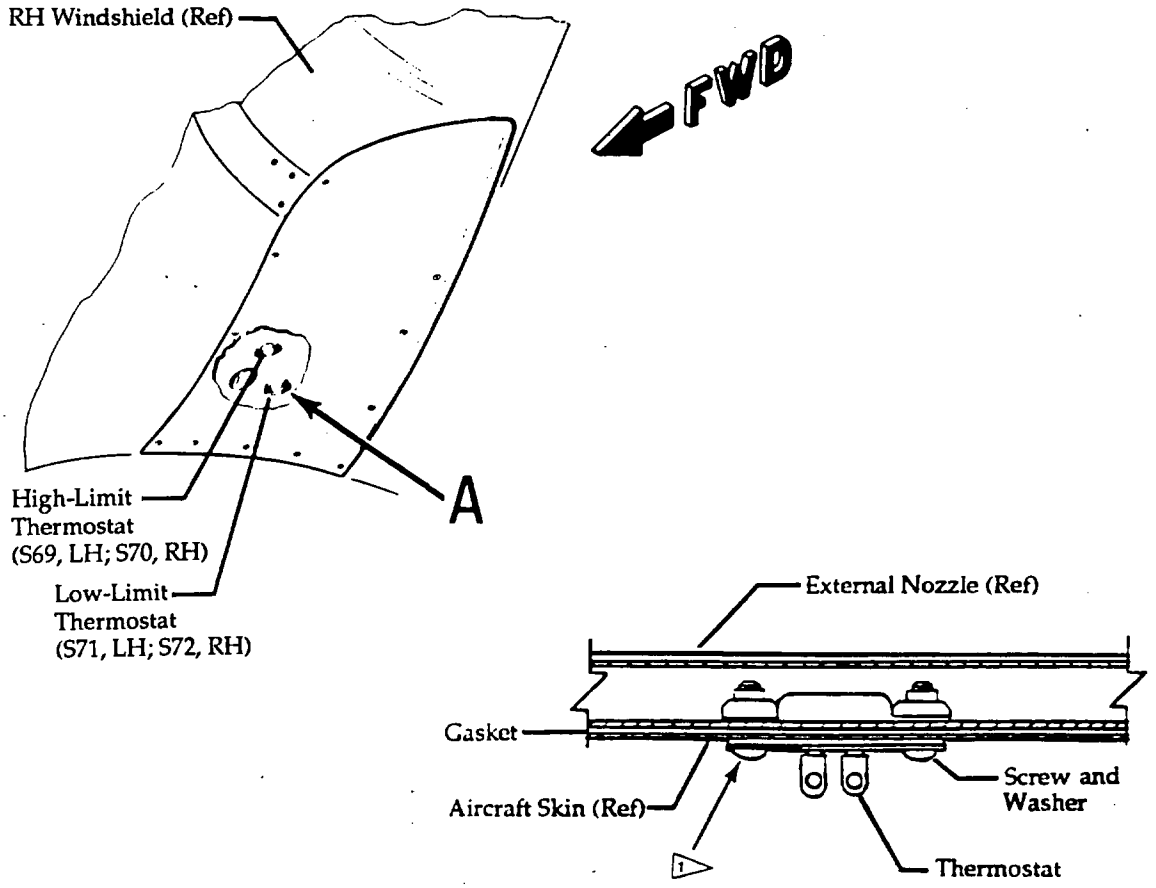
* *Used on Aircraft 35-211 and Subsequent , 36-043 and Subsequent*

NOTE:
- Access to the thermostats is through the nose compartment doors.
- The following chart indicates applicable low- and high-limit thermostats and their respective wire lead colors:

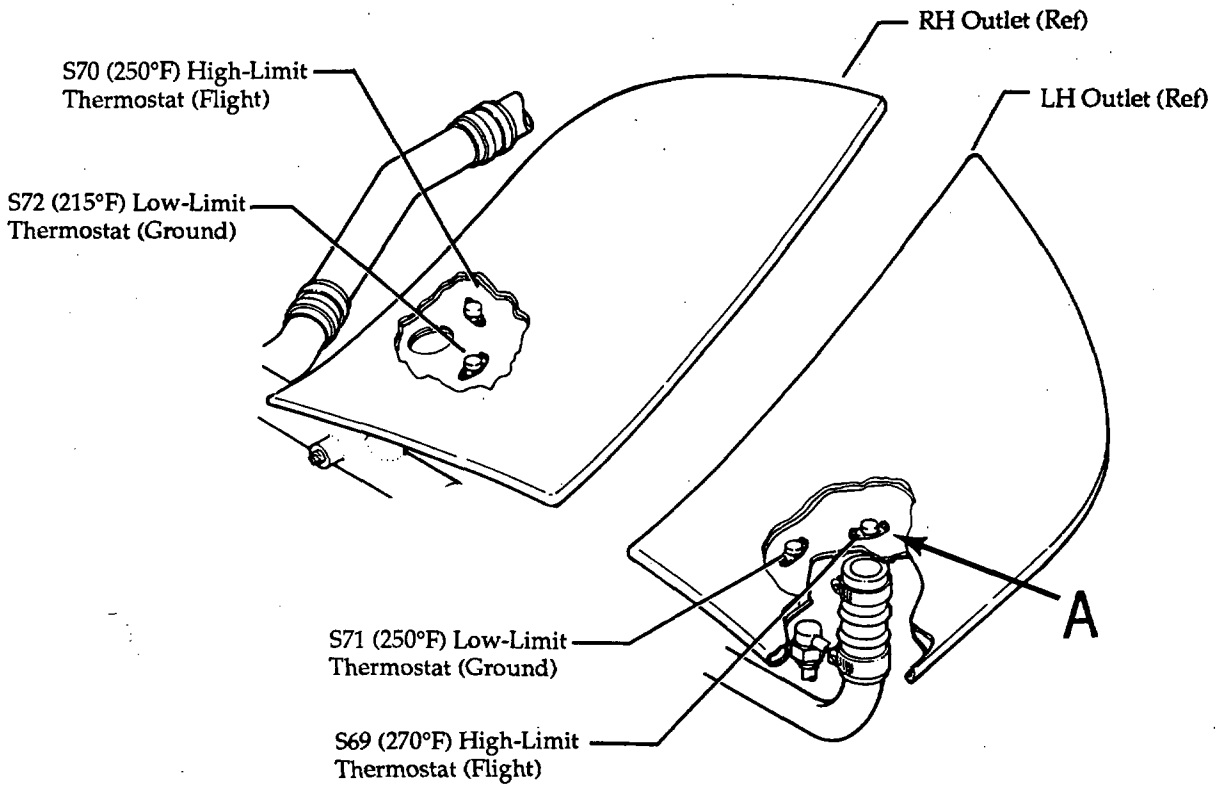
THERMOSTAT (Wire Lead Color)	TYPE	EFFECTIVITY
6600141-3 (Black)	High-Limit	35-001 thru 35-057 not modified per AAK 77-6 36-001 thru 36-017 not modified per AAK 77-6
6600141-7 (Black)	High-Limit	35-058 thru 35-112 except 35-107 and prior aircraft modified per AAK 77-6
6600141-8 (Red)	High-Limit	Same as 6600141-7
6600141-8 (Red)	High-Limit	35-107, 35-113 and Subsequent 36-032 and Subsequent
6600141-3 (Black)	Low-Limit	35-107, 35-113 and Subsequent 36-032 and Subsequent
6600141-1 (White)	Low-Limit	35-001 thru 35-086, except 35-082 36-001 thru 36-022
6600141-3 (Black)	Low-Limit	35-082, 35-087 thru 35-112, except 35-107 36-023 thru 36-031
6600141-14 (Yellow)	High-Limit	35-663 and Subsequent, 36-064 and Subsequent, and previous aircraft modified per AMK 91-2A, "Replacement of Windshield Anti-Ice Thermostats."

B. Remove Thermostat (Typical) (See Figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove nose compartment access doors.
   (3) Disconnect and identify thermostat wiring at splices.
   (4) Remove screws, washers, and thermostat from aircraft.
   (5) On *Aircraft 35-211 and Subsequent and 36-043 and Subsequent*, remove old fillet seal from structure where thermostat was installed.

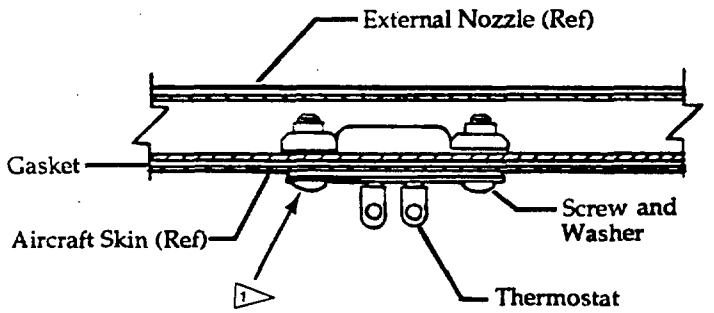
C. Install Thermostat (Typical) (See Figure 201.)
   (1) Position thermostat in place and secure with screws and washers.
   (2) Identify and connect aircraft wiring and connect to thermostats.
   (3) On *Aircraft 35-211 and Subsequent and 36-043 and Subsequent*, apply a fillet seal around perimeter of thermostats, using RTV-159 (red).
   (4) Install nose compartment access doors.
   (5) Restore electrical power to aircraft.



Thermostat Installation
Figure 201 (Sheet 1 of 2)



1 On *Aircraft 35-211 and Subsequent; 36-043 and Subsequent,* **apply a fillet seal around perimeter of thermostat with RTV-159 (red).**



Detail A

Thermostat Installation
Figure 201 (Sheet 2 of 2)

WINDSHIELD ANTI-ICE HEAT EXCHANGER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Heat Exchanger (See figure 201.)

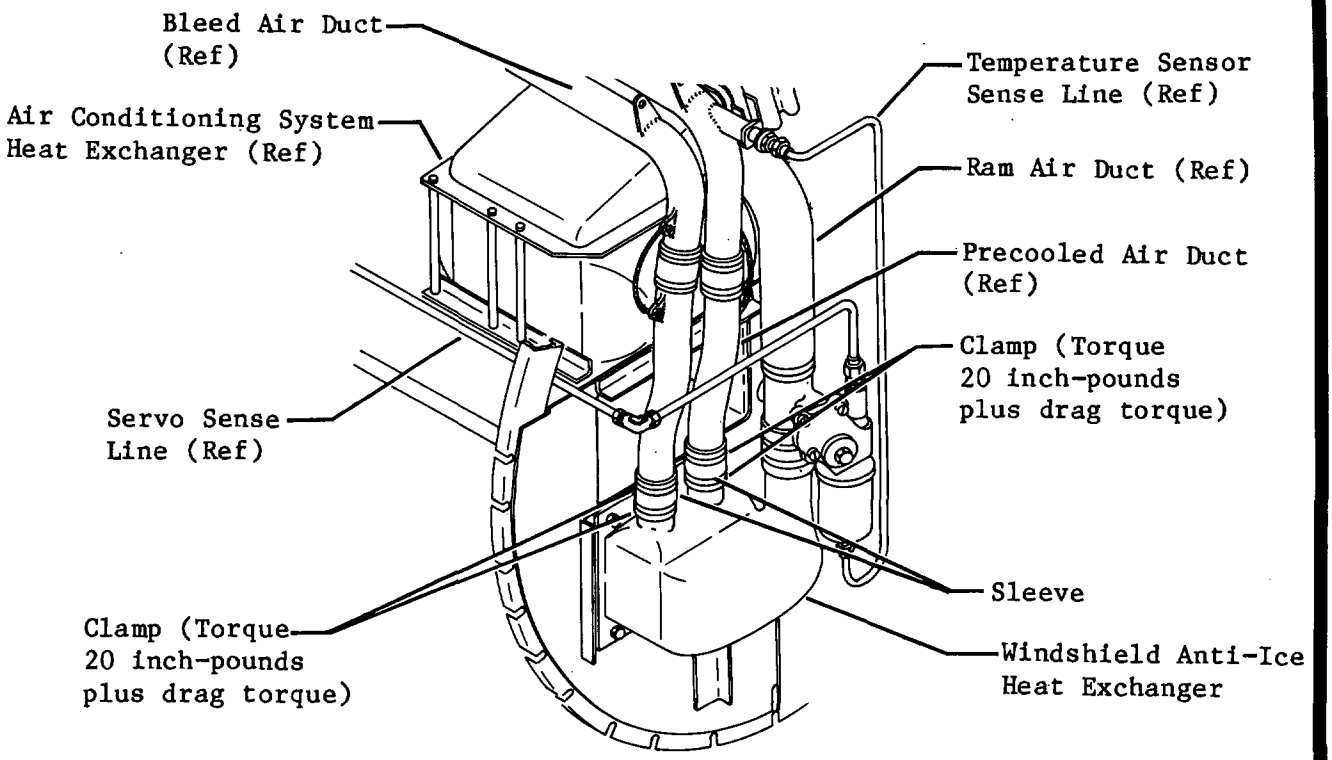
(1) Remove electrical power from aircraft.
(2) Lower tailcone access door and gain access to anti-ice heat exchanger.
(3) Loosen clamps securing sleeves to heat exchanger and ducts.
(4) Remove attaching parts and heat exchanger from aircraft.

B. Install Heat Exchanger (See figure 201.)

(1) Position heat exchanger in place and secure with attaching parts.
(2) Position sleeves on ducts and heat exchanger and secure with clamps.
(3) Torque clamps 20 inch-pounds plus drag torque.

NOTE: Drag torque is the amount of torque required to overcome the friction of the self-locking nut. This value must be added to the torque callout to assure proper torquing.

(4) Install previously removed equipment.
(5) Restore aircraft to normal.
(6) Restore electrical power to aircraft.



Windshield Anti-Ice Heat Exchanger Installation
Figure 201

WINDSHIELD ANTI-ICE TEMPERATURE SENSOR - MAINTENANCE PRACTICES

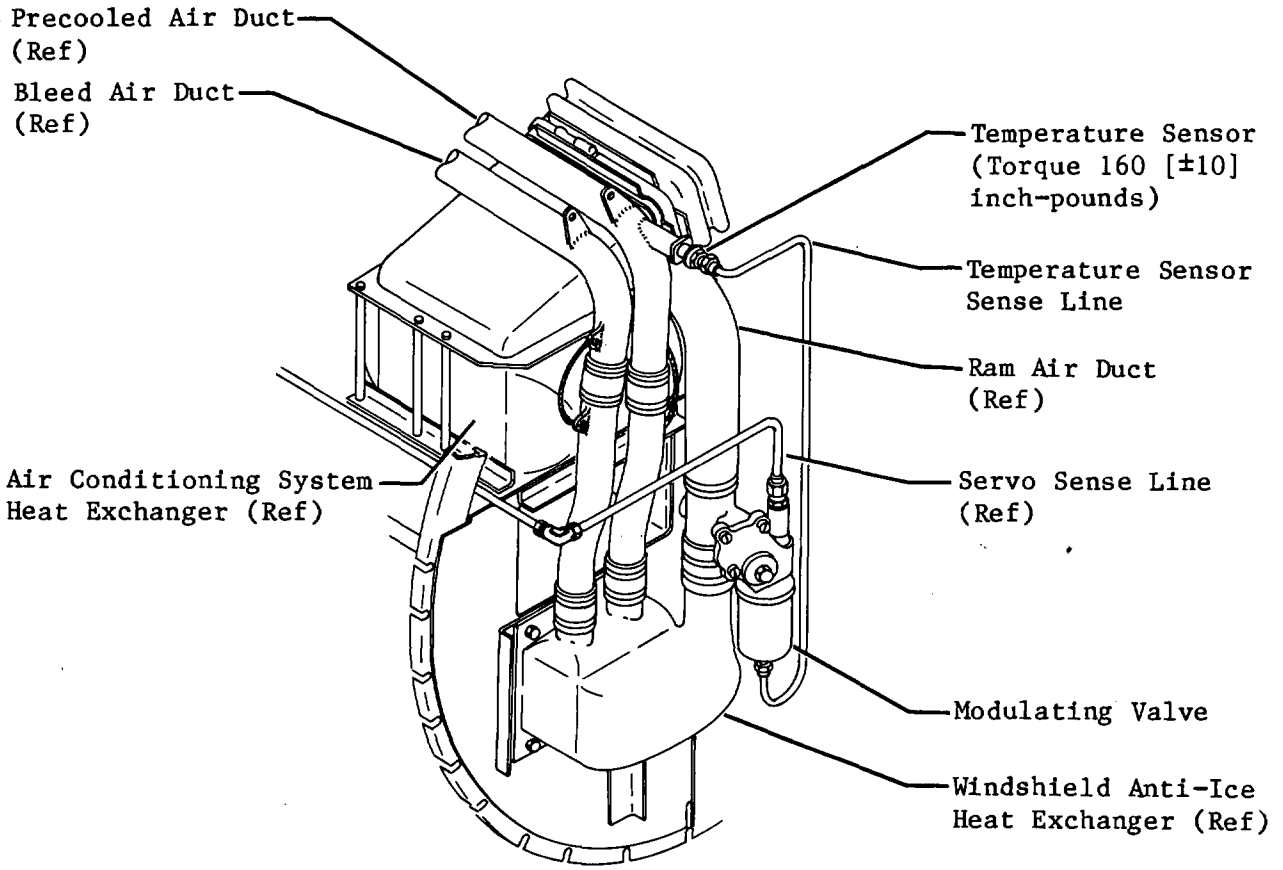
1. REMOVAL/INSTALLATION

NOTE: ° The temperature sensor is located in the precooled air duct downstream of the heat exchanger. A tube assembly is installed between the sensor and the ram air modulating valve.

° The temperature sensor provides a regulated bleed path, to ambient, for the ram air modulating valve servo air inlet pressure.

A. Remove Temperature Sensor (See figure 201.)

(1) Remove electrical power from aircraft.
(2) Lower tailcone access door and gain access to anti-ice temperature sensor.
(3) Disconnect temperature sense line from temperature sensor and cap exposed lines.
(4) Remove temperature sensor from duct.



Windshield Anti-Ice Temperature Sensor Installation
Figure 201

B. Install Temperature Sensor (See figure 201.)

(1) Position temperature sensor in duct.
(2) Torque temperature sensor 160 (±10) inch-pounds.
(3) Remove caps and connect temperature sense line to temperature sensor.
(4) Install previously removed equipment.
(5) Restore aircraft to normal.
(6) Restore electrical power to aircraft.

WINDSHIELD ANTI-ICE RAM AIR MODULATING VALVE - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

   A. Remove Ram Air Modulating Valve (See figure 201.)

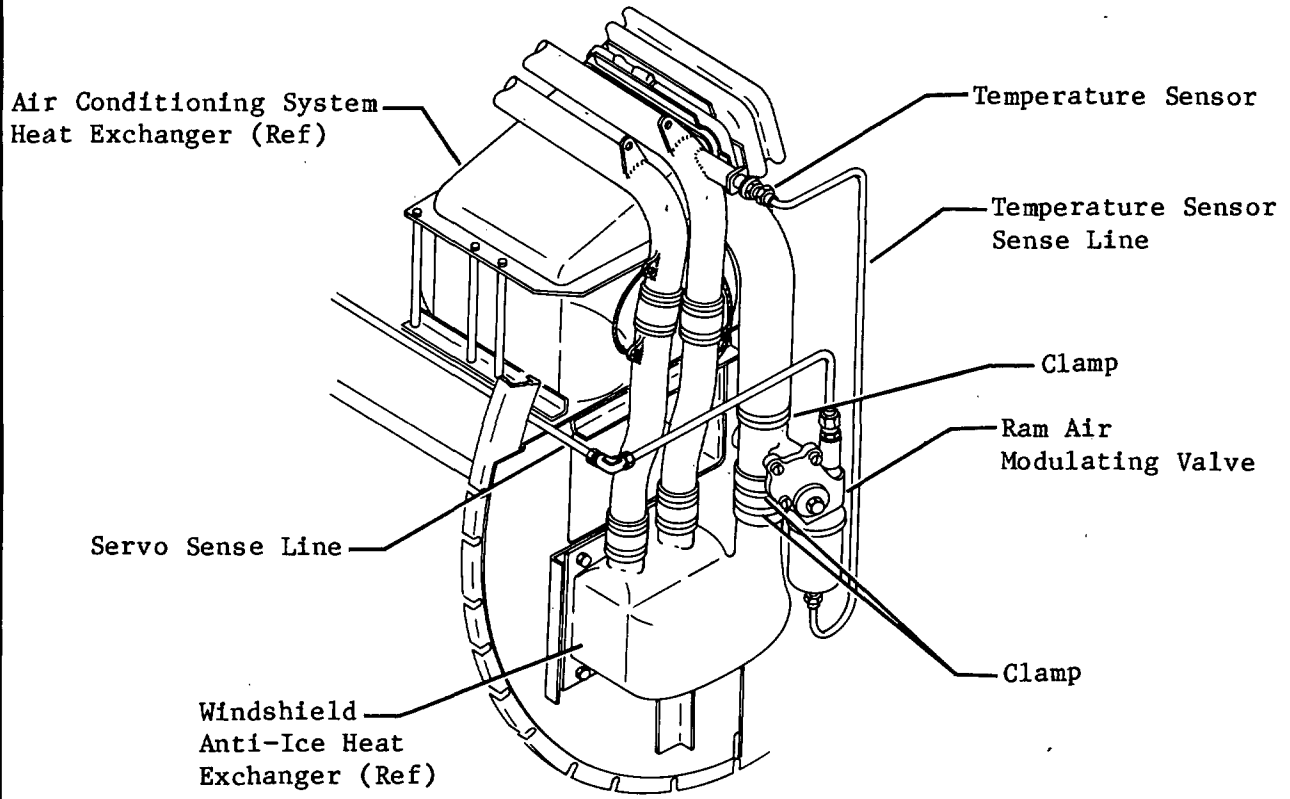
   (1) Remove electrical power from aircraft.
   (2) Lower tailcone access door and gain access to ram air modulating valve.
   (3) Disconnect servo sense line and temperature sensor sense line from valve. Cap exposed openings.
   (4) Loosen clamps securing valve to heat exchanger and to ram air duct.
   (5) Remove attaching parts and modulating valve from aircraft.

   B. Install Ram Air Modulating Valve (See figure 201.)

   (1) Position ram air modulating valve on heat exchanger, connect ram air duct, and secure assembly with clamps.
   (2) Torque clamps 20 inch-pounds plus drag torque.

   NOTE: Drag torque is the amount of torque required to overcome the friction of the self-locking nut. This value must be added to the torque callout to assure proper torquing.

   (3) Remove caps and connect servo sense line and temperature sensor sense line to modulating valve.
   (4) Install previously removed equipment.
   (5) Restore aircraft to normal.
   (6) Restore electrical power to aircraft.



Windshield Anti-Ice Ram Air Modulating Valve Installation
Figure 201

WINDSHIELD ANTI-ICE TRANSISTOR ASSEMBLY (VOLTAGE REGULATOR) - MAINTENANCE PRACTICES

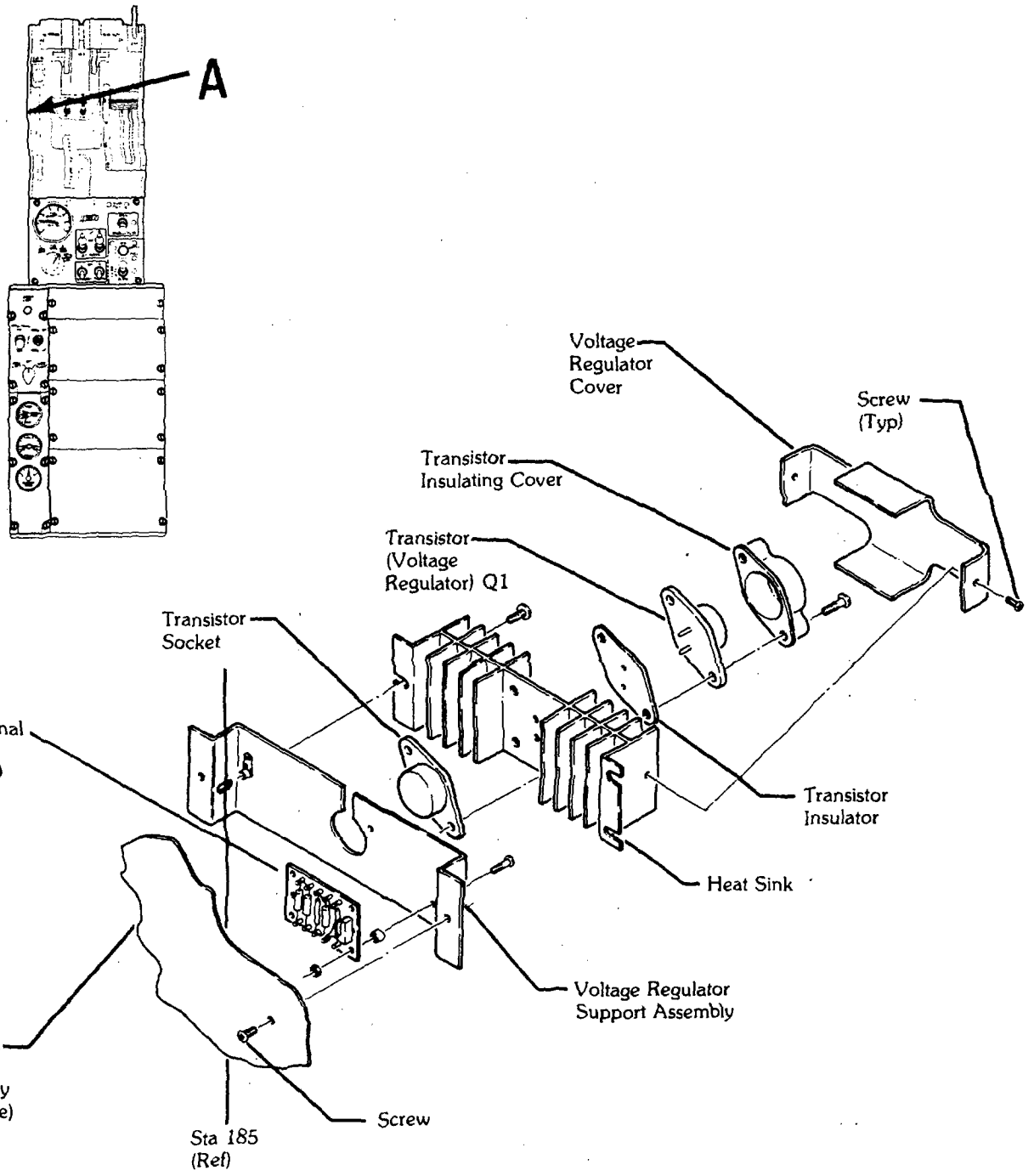
1. REMOVAL/INSTALLATION

A. Remove Windshield Anti-Ice Transistor Assembly (Voltage Regulator) (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove upholstery and furnishings as required to gain access to LH side panel of forward pedestal assembly.
   (3) Remove attaching parts securing LH side panel to forward pedestal assembly.
   (4) While supporting LH side panel, remove attaching parts securing transistor assembly to LH side panel. Remove side panel from aircraft.
   (5) Disconnect electrical connector and remove transistor assembly.

B. Install Windshield Anti-Ice Transistor Assembly (Voltage Regulator) (See figure 201.)
   (1) Position transistor assembly on LH side panel and secure with attaching parts.
   (2) Position LH side panel at forward pedestal assembly.
   (3) Connect electrical connector.
   (4) Restore electrical power to aircraft.
   (5) Perform Windshield Anti-Ice System Functional Test, noting cycle time of anti-ice shutoff valve from full-closed to full-open to full-closed. (Refer to 30-40-00.)
   (6) If cycle time is not 24 (±2) seconds in each direction, adjust transistor assembly. (Refer to Adjustment/Test.)
   (7) Position LH side panel on forward pedestal assembly and secure with attaching parts.
   (8) Install previously removed upholstery and furnishings.
   (9) Restore aircraft to normal.

2. ADJUSTMENT/TEST

A. Adjust Windshield Anti-Ice Shutoff Valve Motor Speed
   (1) Ensure that Battery Switches are OFF.
   (2) Pull WSHLD HT circuit breaker.
   (3) Set Windshield Heat Switch (S624) to HOLD.
   (4) Gain access to TB-1 of windshield anti-ice transistor assembly. (See figure 201.)
   (5) Adjust R2 on TB-1 full CCW. Verify that resistance to airframe ground at terminal 5 is 0.2 ohms or less.
   (6) Connect ground power to aircraft.
   (7) Depress WSHLD HT circuit breaker and set Battery Switches ON.
   (8) Adjust R2 to obtain 7.0 (±0.2) vdc at terminal 5.
   (9) Using Windshield Heat Switch, time windshield anti-ice shutoff valve (B30) from full-closed to full-open and full-open to full-closed.
   (10) Adjust R2 to obtain 24 (±2) seconds full-closed to full-open and 24 (±2) seconds full-open to full-closed.
   (11) Set Windshield Heat Switch to OFF.
   (12) Set Battery Switches OFF.
   (13) Remove electrical power from aircraft.
   (14) Install transistor assembly. (Refer to Removal/Installation.)
   (15) Restore aircraft to normal.



Detail A

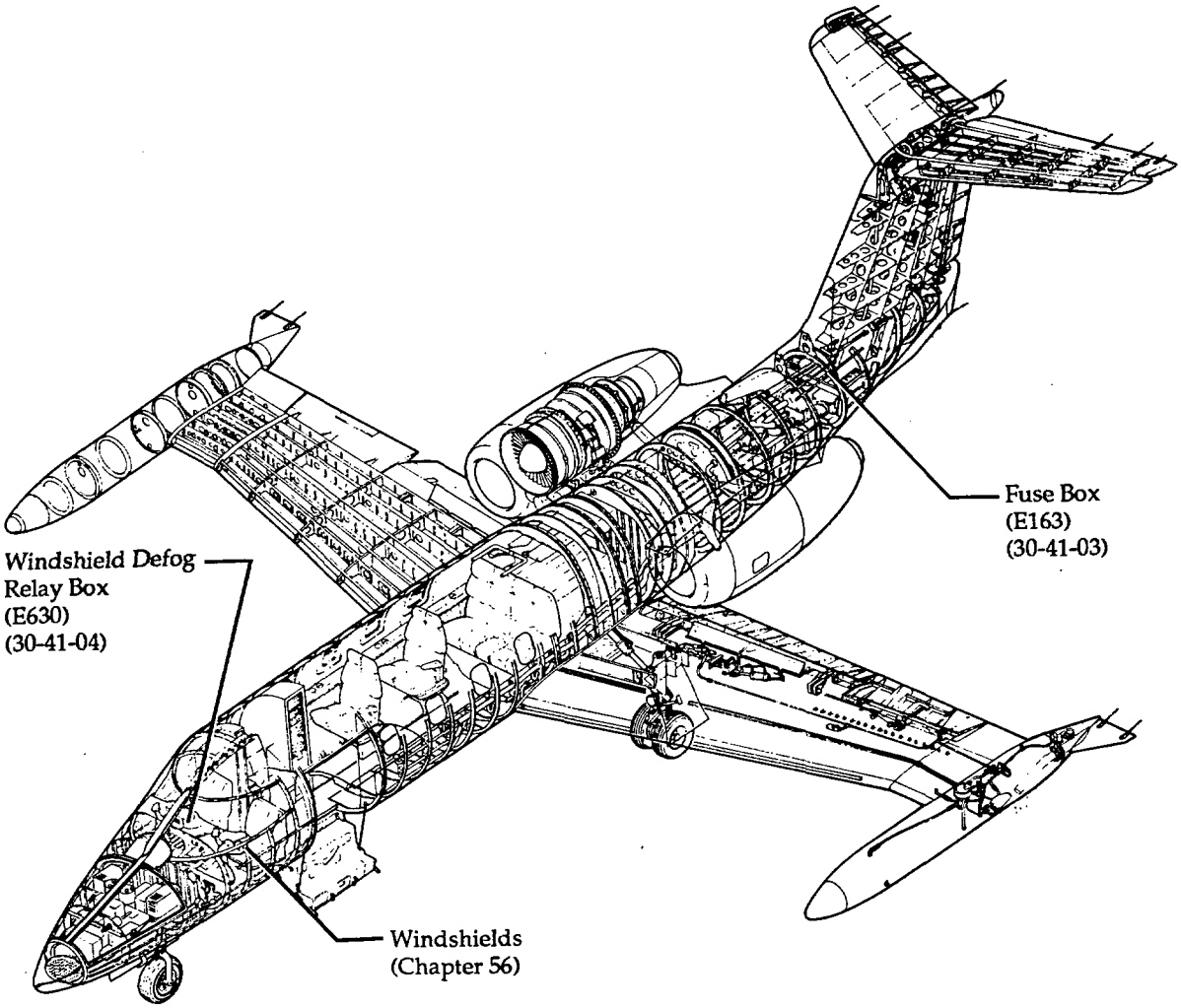
Windshield Anti-Ice Transistor Assembly (Voltage Regulator) Installation
Figure 201

10-165B

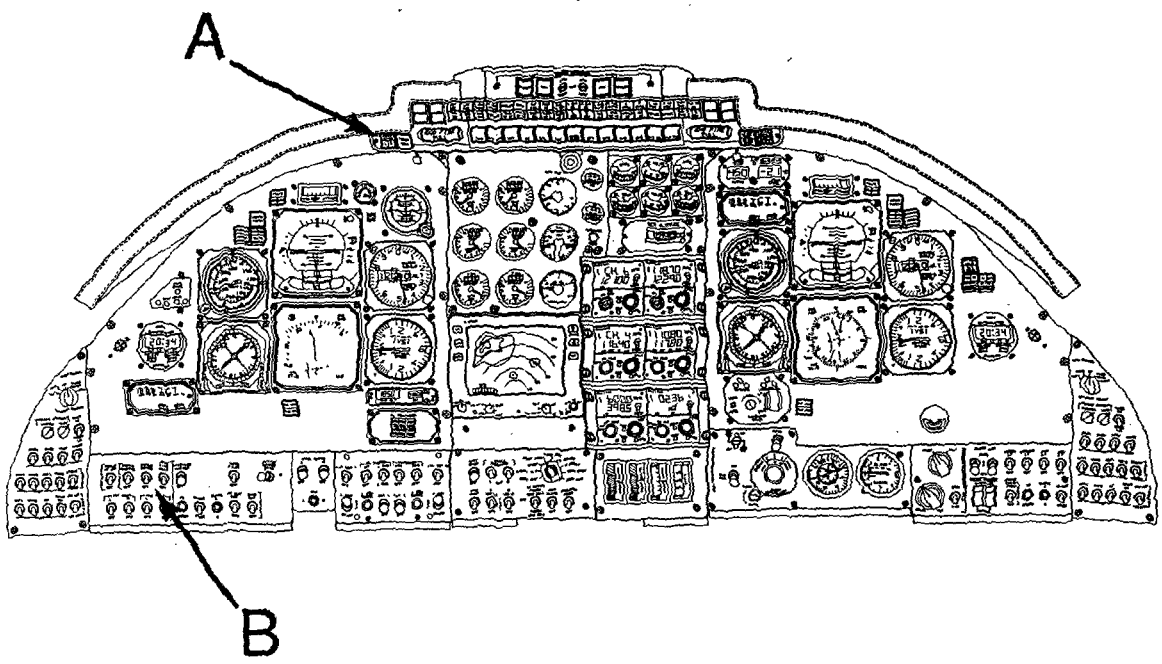
WINDSHIELD ELECTRIC DEFOG SYSTEM - DESCRIPTION AND OPERATION

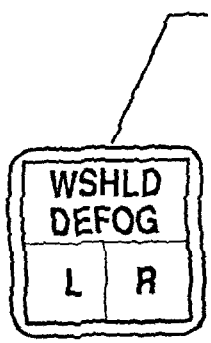
1. **Description** (See figure 1.)
   A. Windshield defogging is assisted by a windshield electric defog system.
   B. The windshield has an integral electric heater and external heat sensors. The electric heating element consists of a thin layer of gold laminated into the windshield. Because of the gold layer, the windshield has a yellow or gold color cast. The function of the heater is to provide windshield defogging. Terminal blocks are embedded in the windshield and provide the means for wiring the electric heater to the aircraft wiring.
   C. Components of the windshield electric defog system are two windshield heaters (integral with windshield), four heat sensors, a windshield defog relay box mounted on the floorboards under the copilot's seat, a system switch located in the pilot's switch panel, two overheat annunciators in the glareshield, two circuit breakers, and two fuses located on the inverter mounting panel at frame 29. Power for the windshield electric defog heaters is supplied by the secondary and auxiliary inverters.
   D. Component Description
      (1) The windshield heater is an integral part of the windshield and cannot be replaced without replacing the windshield. Each end of the gold layer is connected to a terminal block embedded in the windshield. The windshield heater operates on 163 vac, 400 Hertz.
      (2) The two fuses, used for ac current limiting, are mounted in a fuse holder and enclosed in a box mounted in the tailcone on the inverter mounting panel.
      (3) The windshield heat sensors are thermistors mounted on the interior surface of the windshield. There are two heat sensors in each windshield half. All four heat sensors are identical.
      (4) The windshield defog relay box consists of two printed circuit boards, two relays, and two solid state relays enclosed in a metal box with three electrical connectors.
      (5) The L and R WS DEFOG annunciators monitor each side of the windshield defog system. The annunciator(s) will illuminate in the following conditions:
         (a) When the Windshield Defog Switch is set on, the annunciator will illuminate momentarily.
         (b) When an overheat/underheat condition exists.
         (c) When the Windshield Defog Switch is set on and no AC power is available from the inverters.
         (d) When the Windshield Defog Switch is set on and no DC power is available from the defog circuit breakers.

2. **Operation** (See figures 2 and 3.)
   A. The secondary and auxiliary inverters must be operating before the windshield electric defog system will operate. When the Windshield Defog Switch is set to WSHLD DEFOG, 28 vdc through the L WSHLD and R WSHLD circuit breakers is applied to the windshield defog relay box and the L and R WSHLD DEFOG annunciators illuminate. This causes the solid state relays within the windshield defog relay box to energize allowing 163 vac output from the inverters to be applied to the left and right windshield heaters. Once the windshield temperature reaches approximately 90°F (32°C), the L and R WS DEFOG annunciators will extinguish. The solid state relays will remain on until the windshield reaches a preset operating temperature (110°F [43°C]) at which time one of the heat sensors will signal the windshield defog relay box to cycle off. As the windshield cools, the heat sensor will signal the windshield defog relay box to cycle back on thus modulating the windshield temperature. Operation of the left and right windshield heaters is independent of each other.
   B. Component Operation
      (1) When the Windshield Defog Switch is set to WSHLD DEFOG, 163 vac is applied to the heating element. The heating element heats the windshield and assists in defogging the windshield. The output of the heater is approximately 400 watts and serves a windshield defog function only.

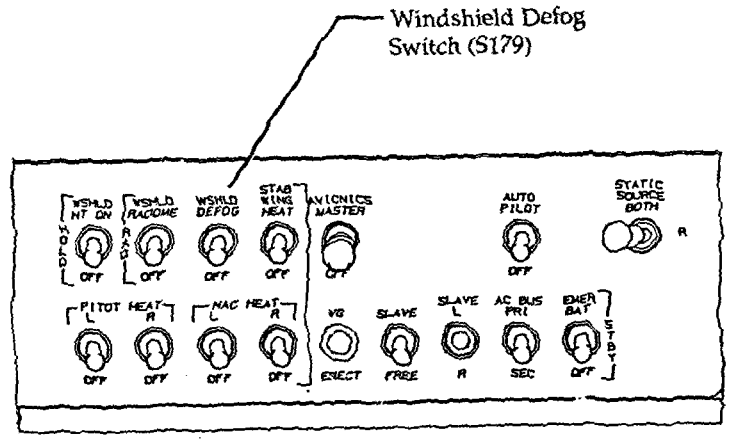


Windshield Electric Defog System Components Locator
Figure 1



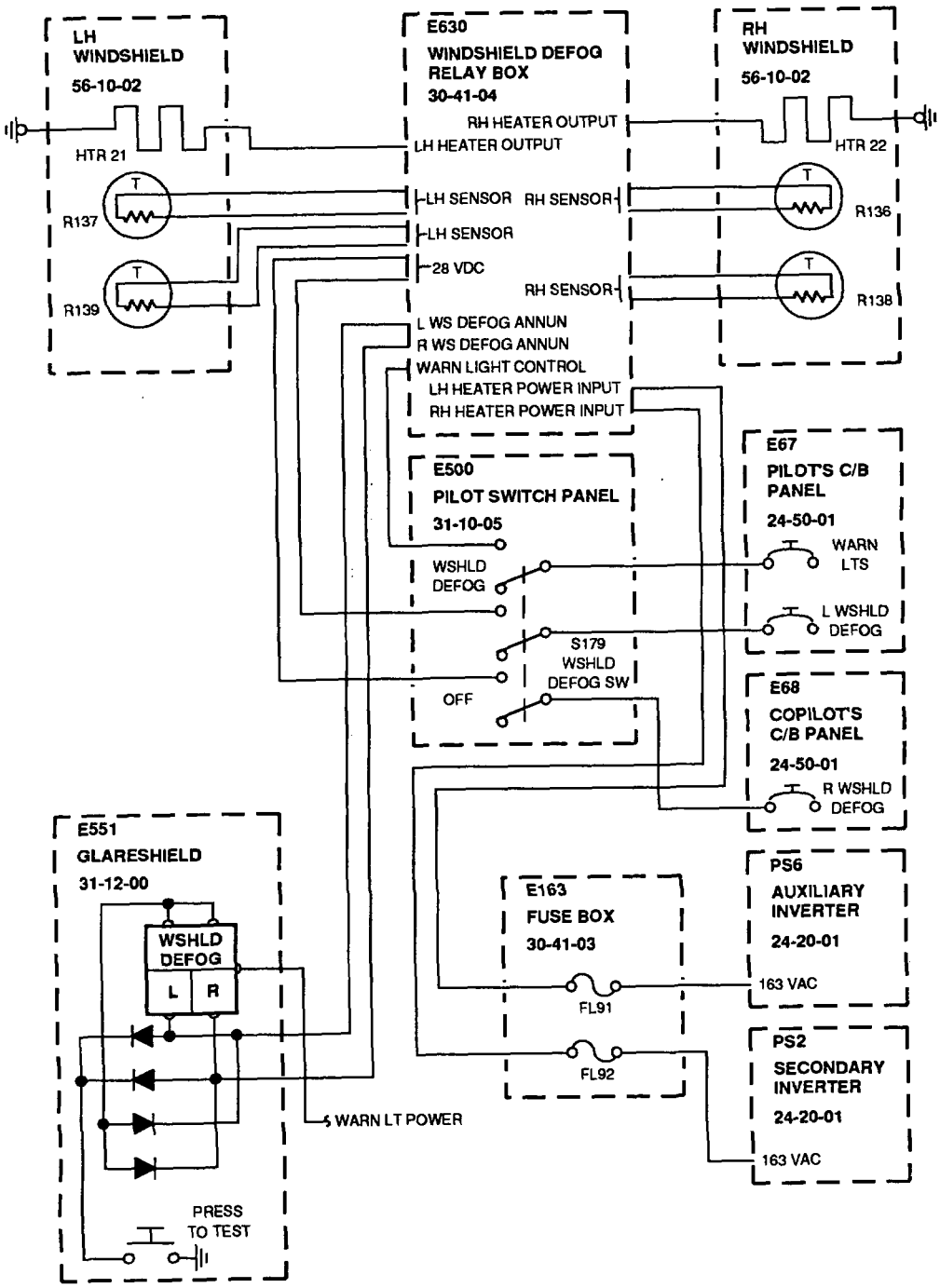


Detail A



Detail B

Windshield Electric Defog System Components Locator
Figure 2



Windshield Electric Defog System Electrical Control Schematic
Figure 3

(2) The heat sensors respond to changes of the windshield temperature by increasing their resistance as windshield temperature increases and decreasing their resistance as windshield temperature decreases. One heat sensor, on each windshield half, is used to cycle off and on its respective solid state relay within the heat control unit. A second heat sensor, on each windshield half, is used to sense a windshield overheat/underheat which disables the heating circuit causing the applicable annunciator to illuminate.

(3) When the Windshield Defog Switch is set to WSHLD DEFOG, 28 vdc is applied to the windshield heat control circuit. Depending upon the resistance of the heat sensors, the windshield defog relay box will cycle on (low resistance) or cycle off (high resistance) the applicable solid state relay.

(4) The windshield defog relay box also contains monitoring functions as described:

CAUTION: DO NOT ALLOW WINDSHIELD ELECTRIC DEFOG MALFUNCTION TO CONTINUE UNCHECKED, OTHERWISE SERIOUS DAMAGE COULD RESULT TO THE AIRCRAFT.

(a) If the windshield temperature exceeds a preset overheat/underheat level (150°F [66°C]/90°F [32°C]), a second set of heat sensors in the windshield will signal the windshield defog relay box monitoring circuit. In the event of an overheat condition, the windshield defog relay box will shutdown the power output (by de-energizing the appropriate solid state relay) to the effected windshield(s) and cause the appropriate L or R WS DEFOG annunciator to illuminate. The annunciators will extinguish and power to the windshield will be restored when temperature is below approximately 110°F (43°C). If the windshield temperature decreases below approximately 90°F (32°C) (underheat condition), the second heat sensor will signal the windshield defog relay box which will illuminate the appropriate L or R WS DEFOG annunciator. During an underheat condition, 163 vac to the windshield will remain.

(b) If the temperature control circuit within the windshield defog relay box has removed power from the solid state relays and the windshield defog heaters remain powered, the appropriate L or R WS DEFOG annunciator will illuminate. If the temperature control circuit within the windshield defog relay box has supplied power to the solid state relays and the windshield defog heaters are not supplied power, the appropriate L or R WS DEFOG annunciator will illuminate.

(c) Any time the L or R WS DEFOG annunciators illuminate after initial heating, the Windshield Defog Switch shall be set to OFF unless absolutely necessary.

WINDSHIELD ELECTRIC DEFOG SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Digital Multimeter	Model 8000	Fluke Mfg. Inc. Everett, WA	Measure voltage.
Digital Temperature Meter	Model HH81	Omega Engineering, Inc. Stamford, CT	Measure temperature.
Surface Temperature Probe	Model 88225K	Omega Engineering, Inc. Stamford, CT	Measure temperature.

B. Functional Test of Windshield Electric Defog System

NOTE: Perform Functional Test in accordance with current inspection intervals in Chapter 5.

CAUTION: ALL COVERS MUST BE REMOVED FROM THE WINDSHIELD WHEN OPERATING WINDSHIELD ELECTRIC DEFOG SYSTEM.

(1) Remove windshield terminal block covers to gain access to windshield heating element terminals.
(2) Connect external electrical power source to aircraft.
(3) Set Battery Switches on.

CAUTION: COOL THE WINDSHIELD INTERIOR BY OPERATING AIRCRAFT COOLING SYSTEM AND RUNNING FANS ON EXTERIOR OF AIRCRAFT. DO NOT PLACE COOL PACKS ON WINDSHIELD.

(4) Cool the pilot's windshield to below 80°F (27°C).
(5) Pull R WSHLD DEFOG circuit breaker located on copilot's circuit breaker panel.
(6) Set Auxiliary Inverter Switch to ON.

NOTE: Steps (8) and (9) must be performed immediately after step (7), during initial heat cycle.

(7) Set Windshield Defog Switch to WSHLD DEFOG. L WS DEFOG annunciator shall illuminate.

CAUTION: WHEN OPERATING TEMPERATURE METER, USE CARE NOT TO DAMAGE AIRCRAFT WINDSHIELD.

(8) Position temperature meter and probe on pilot's windshield immediately below forward LH sensor. Verify L WS DEFOG annunciator extinguishes prior to 100°F (38°C).

WARNING: WINDSHIELD HEATERS OPERATE ON 163 VAC. TAKE ADEQUATE PRECAUTIONS TO AVOID INJURY TO PERSONNEL.

(9) Using voltmeter, verify 163 (±5) vac at the windshield heating element terminals.

(10) With temperature meter and probe located directly below sensors, verify pilot's windshield heats to 110 (+10;-5)°F (43.3 [+5.5;-2.8]°C) after three complete heating cycles.

NOTE: If temperature is not within tolerance, perform steps (11) thru (15). If temperature is within tolerance, proceed with step (16).

(11) Gain access to windshield defog relay box located underneath copilot's seat.
(12) Remove cover from relay box.
(13) Locate trimpot potentiometer on printed circuit board controlling pilot's windshield temperature. (See Figure 201.)

NOTE: Electrical connector J1279 is attached to printed circuit board controlling pilot's windshield temperature.

(14) Turn trimpot potentiometer (CW to decrease temperature, CCW to increase temperature) until temperature is within tolerance.
(15) Replace cover on relay box.
(16) Pull L WSHLD DEFOG circuit breaker located on pilot's circuit breaker panel. L WS DEFOG annunciator shall illuminate.
(17) Depress L WSHLD DEFOG circuit breaker. L WS DEFOG annunciator shall extinguish.
(18) Set Auxiliary Inverter Switch to OFF. L WS DEFOG annunciator shall illuminate.

NOTE: There may be a short delay before the annunciator illuminates. The annunciator will illuminate when the windshield requires heating.

(19) Set Auxiliary Inverter Switch to ON. L WS DEFOG annunciator shall extinguish.
(20) Pull L WSHLD DEFOG circuit breaker.
(21) Depress R WSHLD DEFOG circuit breaker.
(22) Set Auxiliary Inverter Switch to OFF.
(23) Set Secondary Inverter Switch to ON.

NOTE: Steps (25) and (26) must be performed immediately after step (24), during initial heat cycle.

(24) Set Windshield Defog Switch to WSHLD DEFOG. R WS DEFOG annunciator shall illuminate.

CAUTION: WHEN OPERATING TEMPERATURE METER, USE CARE NOT TO DAMAGE AIRCRAFT WINDSHIELD.

(25) With temperature meter and probe located on copilot's windshield immediately below forward RH sensor, verify R WS DEFOG annunciator extinguishes prior to 100°F (38°C).

WARNING: WINDSHIELD HEATERS OPERATE ON 163 VAC. TAKE ADEQUATE PRECAUTIONS TO AVOID INJURY TO PERSONNEL.

(26) With the voltmeter, verify 163 (±5) vac at the windshield heating element terminals.
(27) With temperature meter and probe located directly below sensors, verify copilot's windshield remains at 110 (+10;-5)°F (43.3 [+5.5;-2.8]°C) after three complete heating cycles.

NOTE: If temperature is not within tolerance, perform steps (27) thru (31). If temperature is within tolerance, proceed with step (32).

(28) Gain access to windshield defog relay box located under copilot's seat.

(29) Remove cover from relay box.
(30) Locate trimpot potentiometer on printed circuit board controlling copilot's windshield temperature. (See Figure 201.)

NOTE: Electrical connector J1280 is attached to printed circuit board controlling copilot's windshield temperature.

(31) Turn trimpot potentiometer (CW to decrease temperature, CCW to increase temperature) until temperature is within tolerance.
(32) Replace cover on relay box.
(33) Pull R WSHLD DEFOG circuit breaker located on copilot's circuit breaker panel. R WS DEFOG annunciator shall illuminate.
(34) Depress R WSHLD DEFOG circuit breaker. R WS DEFOG annunciator shall extinguish.
(35) Set Secondary Inverter Switch to OFF. R WS DEFOG annunciator shall illuminate.

NOTE: There may be a short delay before the annunciator illuminates. The annunciator will illuminate when the windshield requires heating.

(36) Set Secondary Inverter Switch on. R WS DEFOG annunciator shall extinguish.
(37) Depress L WSHLD DEFOG circuit breaker.
(38) Set Windshield Defog Switch to OFF.
(39) Set Secondary and Auxiliary Inverter Switches to OFF.
(40) Set Battery Switches off.
(41) Install windshield terminal block covers.

2. Inspection/Check

A. Operational Check of Windshield Electric Defog System

CAUTION: ALL COVERS MUST BE REMOVED FROM THE WINDSHIELD WHEN OPERATING WINDSHIELD ELECTRIC DEFOG SYSTEM.

(1) Connect external electrical power source to aircraft.
(2) Set Battery Switches on.
(3) Pull R WSHLD DEFOG circuit breaker located on copilot's circuit breaker panel.

CAUTION: COOL THE WINDSHIELD INTERIOR BY OPERATING AIRCRAFT COOLING SYSTEM AND RUNNING FANS ON EXTERIOR OF AIRCRAFT. DO NOT PLACE COOL PACKS ON WINDSHIELD.

(4) Cool the pilot's windshield to below 80°F (27°C).
(5) Set Auxiliary Inverter Switch to ON.
(6) Set Windshield Defog Switch to WSHLD DEFOG. L WS DEFOG annunciator shall illuminate then extinguish.
(7) Pull L WSHLD DEFOG circuit breaker located on pilot's circuit breaker panel. L WS DEFOG annunciator shall illuminate.
(8) Depress L WSHLD DEFOG circuit breaker. L WS DEFOG annunciator shall extinguish.
(9) Set Auxiliary Inverter Switch to OFF. L WS DEFOG annunciator shall illuminate.

NOTE: There may be a short delay before the annunciator illuminates. The annunciator will illuminate when the windshield requires heating.

(10) Set Auxiliary Inverter Switch to ON. L WS DEFOG annunciator shall extinguish.
(11) Set Windshield Defog Switch to OFF.

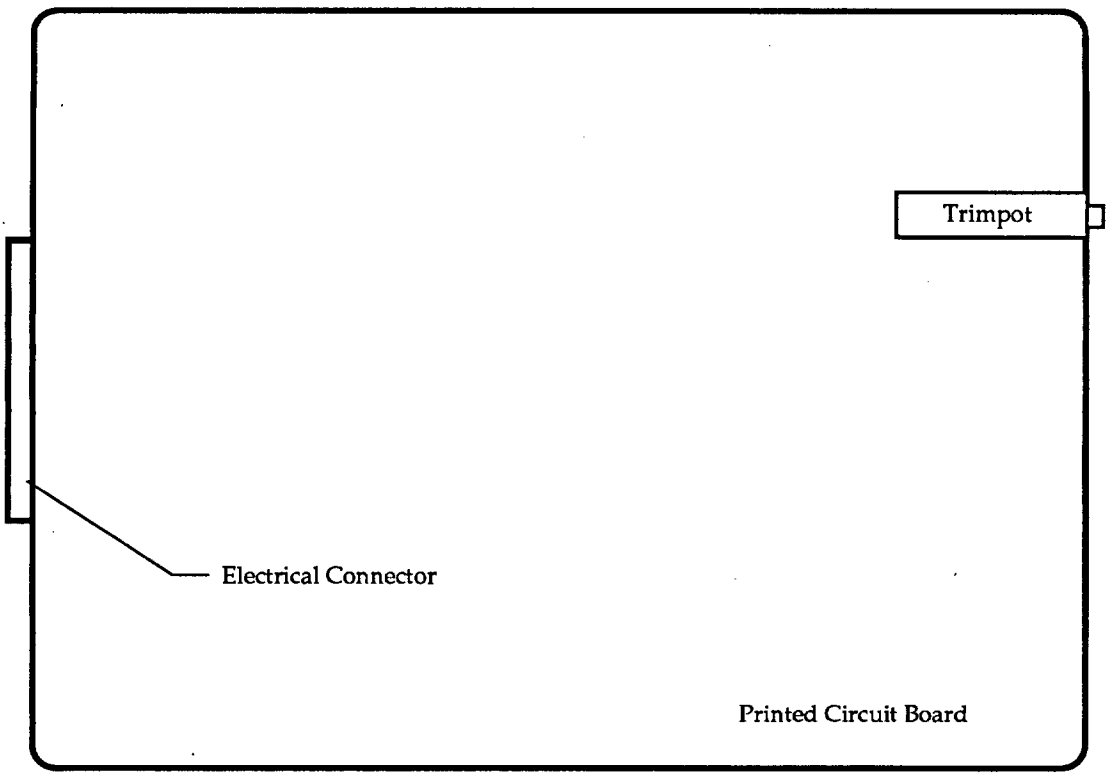
(12) Set Auxiliary Inverter Switch to OFF.
(13) Depress R WSHLD DEFOG circuit breaker.
(14) Pull L WSHLD DEFOG circuit breaker.

CAUTION: COOL THE WINDSHIELD INTERIOR BY OPERATING AIRCRAFT COOLING SYSTEM AND RUNNING FANS ON EXTERIOR OF AIRCRAFT. DO NOT PLACE COOL PACKS ON WINDSHIELD.

(15) Cool the copilot's windshield to below 80°F (27°C).
(16) Set Secondary Inverter Switch on.
(17) Set Windshield Defog Switch to WSHLD DEFOG. R WS DEFOG annunciator shall illuminate then extinguish.
(18) Pull R WSHLD DEFOG circuit breaker. R WS DEFOG annunciator shall illuminate.
(19) Depress R WSHLD DEFOG circuit breaker. R WS DEFOG annunciator shall extinguish.
(20) Set Secondary Inverter Switch to OFF. R WS DEFOG annunciator shall illuminate.

NOTE: There may be a short delay before the annunciator illuminates. The annunciator will illuminate when the windshield requires heating.

(21) Set Secondary Inverter Switch on. R WS DEFOG annunciator shall extinguish.
(22) Set Windshield Defog Switch to OFF.
(23) Depress L WSHLD DEFOG circuit breaker.
(24) Set Secondary Inverter Switch to OFF.



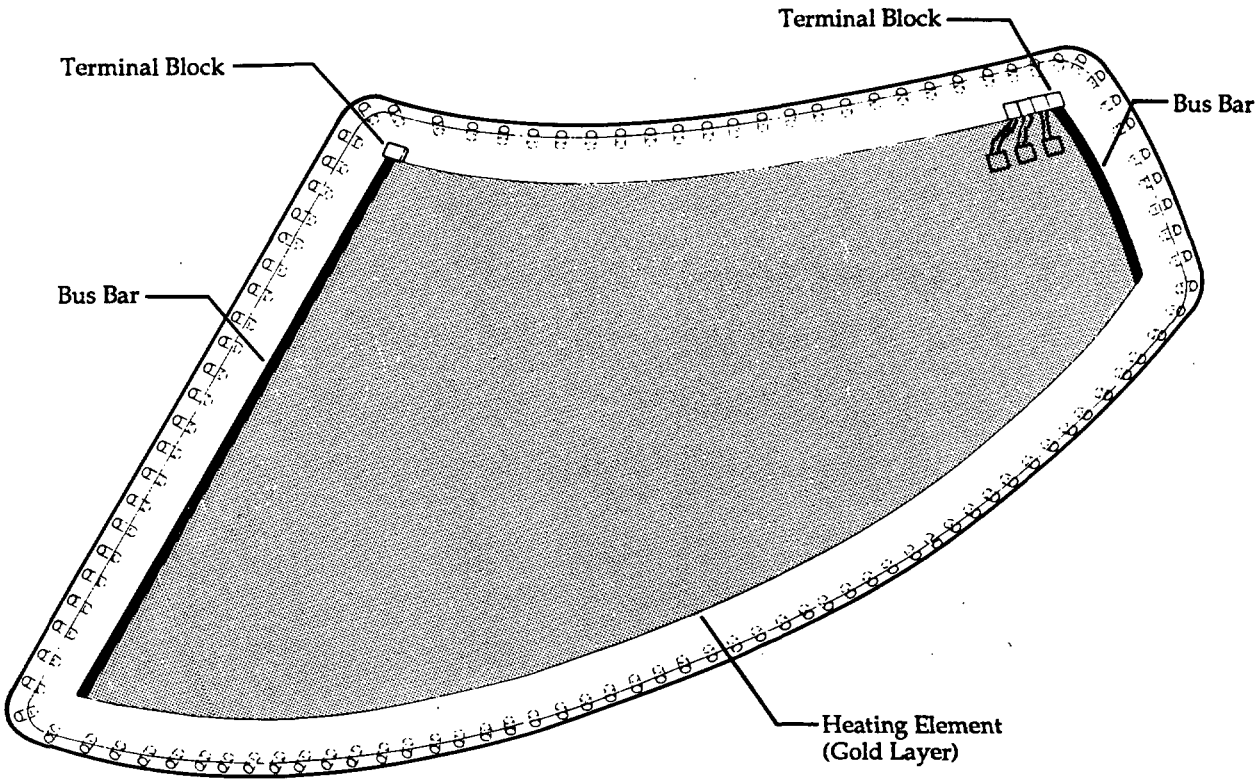
NOTE: Circuit board not shown fully populated.

Windshield Defog Control Printed Circuit Board
Figure 201

1. Removal/Installation

WARNING: REMOVE ELECTRICAL POWER FROM AIRCRAFT TO AVOID INJURY TO PERSONNEL.

A. If windshield heating element fails, replacement of the affected windshield half shall be accomplished. (Refer to Chapter 56.)



Windshield Heater
Figure 201

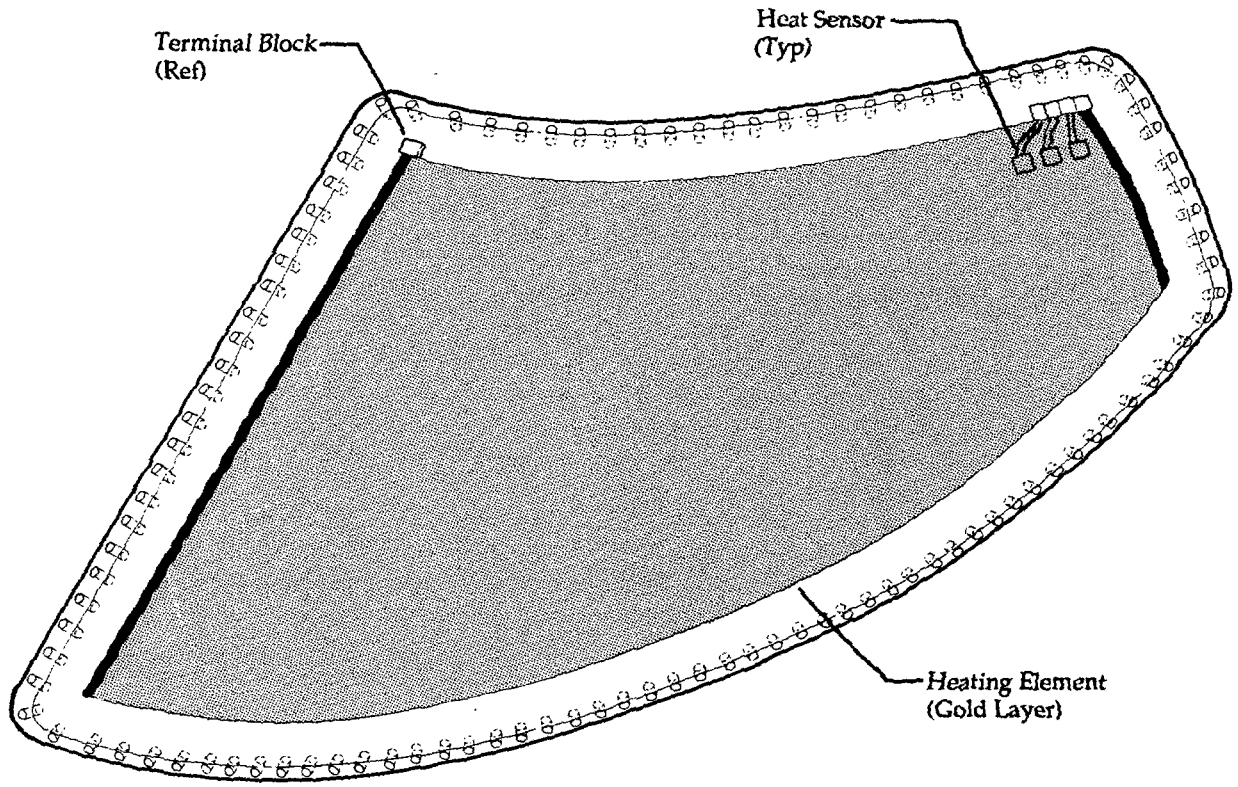
2-154B

WINDSHIELD HEAT SENSOR - MAINTENANCE PRACTICES

1. Removal/Installation

WARNING: REMOVE ELECTRICAL POWER FROM AIRCRAFT TO AVOID INJURY TO PERSONNEL.

A. If heat sensor fails, disconnect wires from failed sensor and connect wires to spare sensor.
B. If two of the three sensors in either windshield half fail, replacement of the affected windshield half shall be accomplished. (Refer to Chapter 56.)



Windshield Heat Sensors
Figure 201

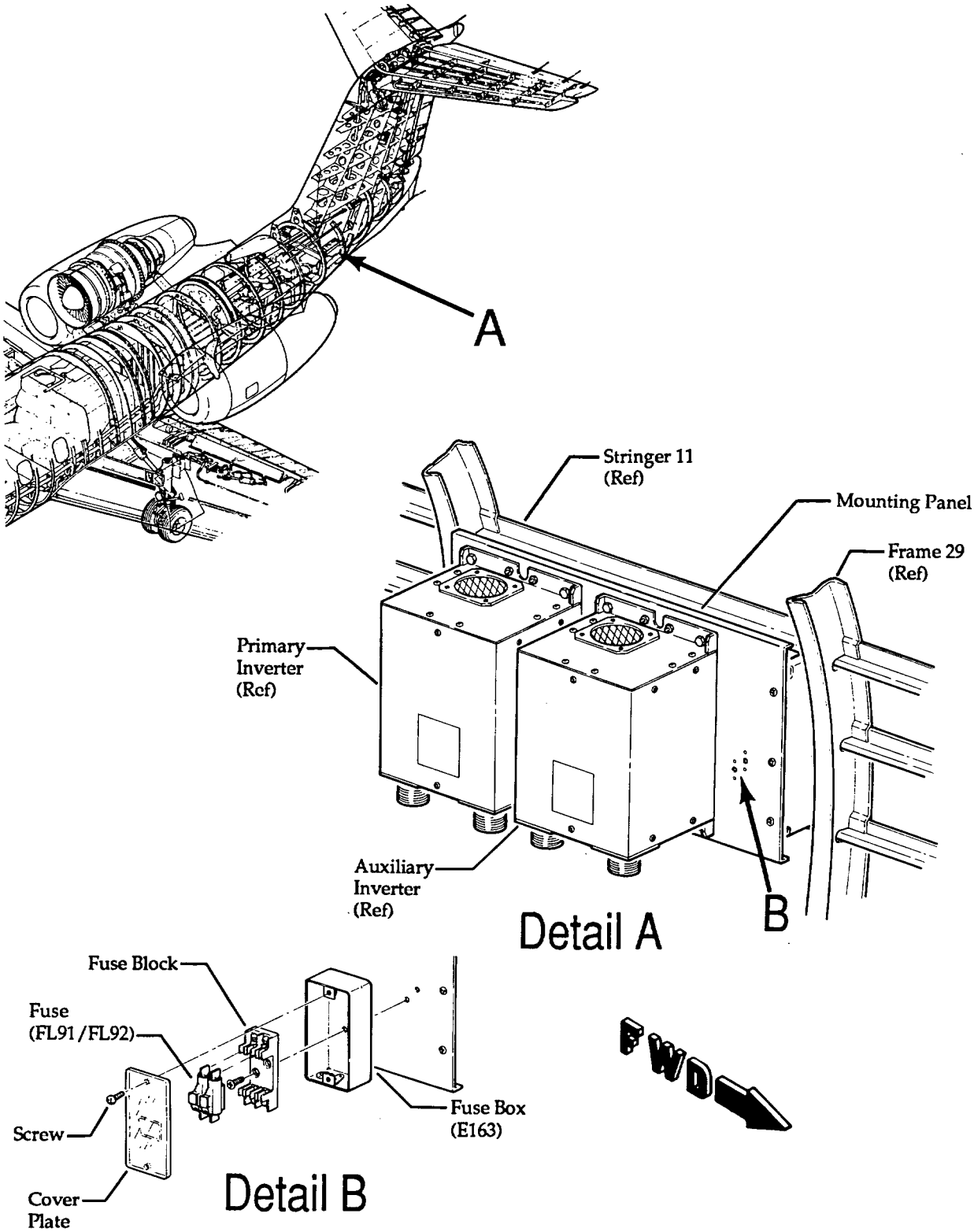
2-154B

1. Removal/Installation

WARNING: REMOVE ELECTRICAL POWER FROM AIRCRAFT TO AVOID INJURY TO PERSONNEL.

A. Remove Fuse Box (E163) (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Remove attaching screws and fuse box cover.
   (3) Disconnect and identify wires from fuse block.
   (4) Remove wires from fuse box.
   (5) Remove fuses from fuse block.
   (6) Remove attaching parts, fuse block, and fuse box from aircraft.

B. Install Fuse Box (E163) (See figure 201.)
   (1) Position fuse box and fuse block on mounting plate and secure with attaching parts.
   (2) Install fuses in fuse block.
   (3) Route wires into the fuse box, identify and connect wires to fuse block.
   (4) Install fuse box cover and secure with attaching parts.
   (5) Restore electrical power to aircraft.
   (6) Perform Operational Check of Windshield Electric Defog System. (Refer to 30-41-00, Inspection/Check.)
   (7) Raise and secure tailcone access door.
   (8) Restore aircraft to normal.



9-380C

Fuse Box Installation
Figure 201

WINDSHIELD DEFOG RELAY BOX - MAINTENANCE PRACTICES

1. Removal/Installation

WARNING: REMOVE ELECTRICAL POWER FROM AIRCRAFT TO AVOID INJURY TO PERSONNEL.

A. Remove Windshield Defog Relay Box (E630) (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Gain access to windshield defog relay box under copilot's seat.
   (3) Disconnect electrical connectors (P1279, P1280, P1281) from relay box.
   (4) Remove attaching parts and relay box from aircraft.

B. Install Windshield Defog Relay Box (E630) (See figure 201.)
   (1) Position windshield defog relay box on support structure and secure with attaching parts.
   (2) Check electrical bond of windshield defog relay box to aircraft. (Refer to Chapter 20 of the Wiring Manual.)
   (2) Connect electrical connectors (P1279, P1280, P1281) to relay box.
   (3) Perform functional test of windshield electric defog system. (Refer to 30-41-00, Adjustment/Test.)
   (4) Restore aircraft to normal.

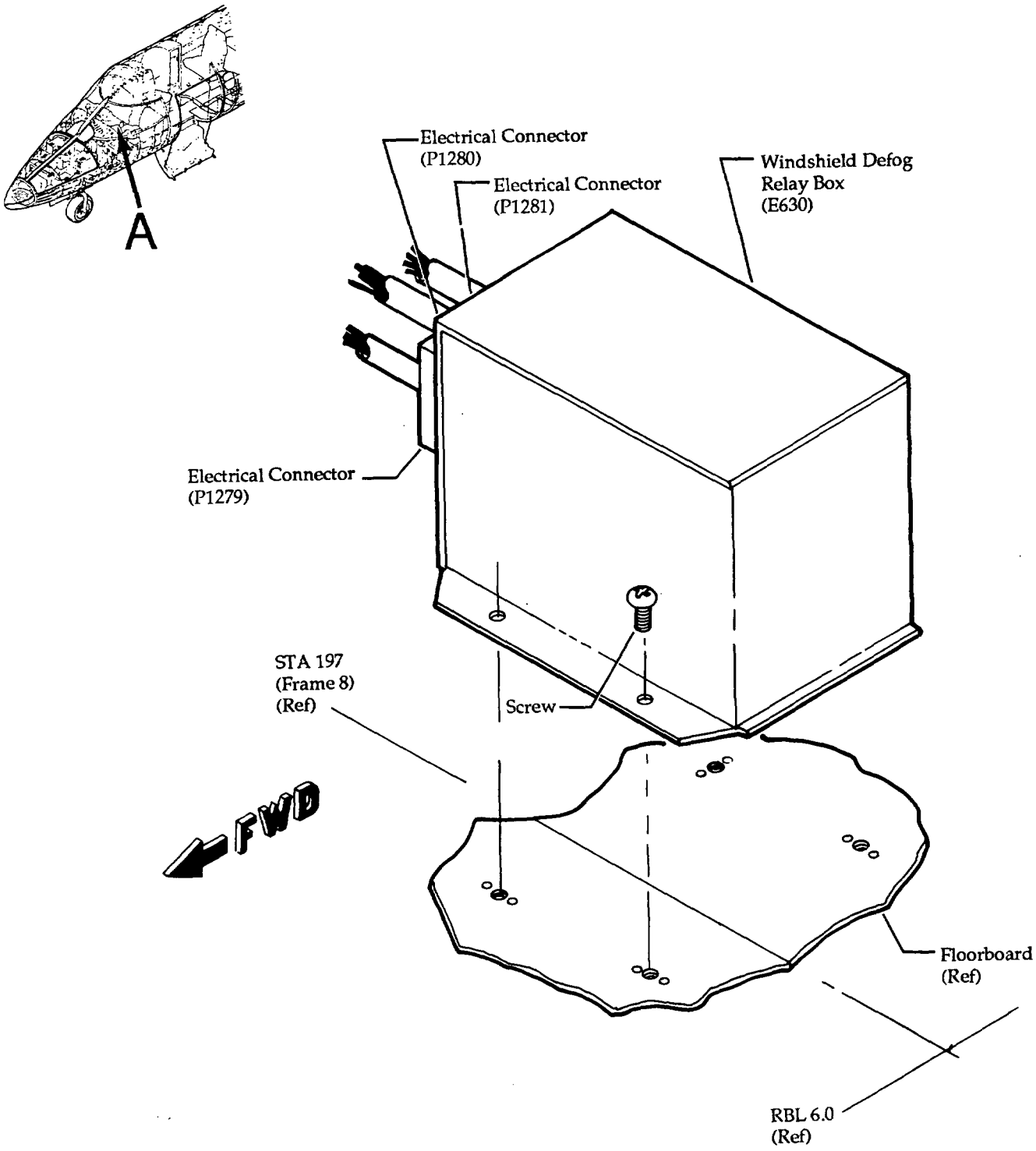
2. Adjustment/Test

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Test Harness		Local Manufacture	Test relay box.

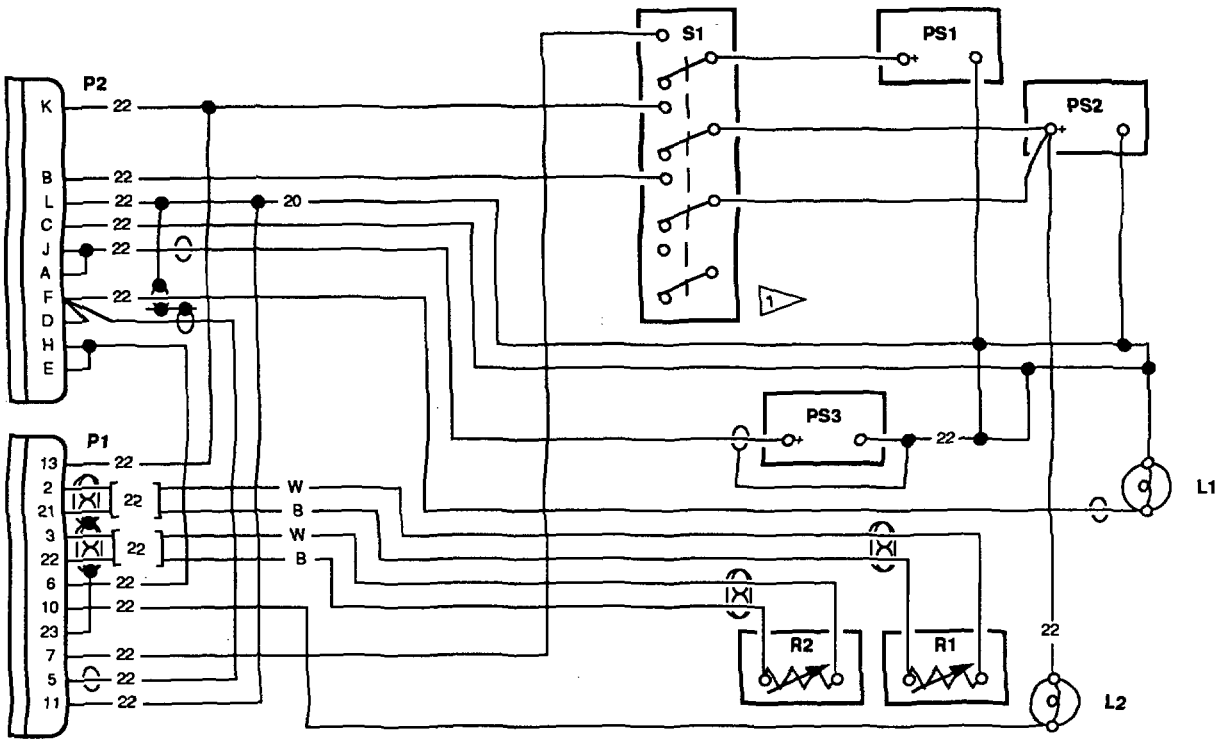
B. Functional Test of Windshield Defog Relay Box
   (1) Locally manufacture test harness. (See figure 202.)
   (2) Remove windshield defog relay box (E630) from aircraft. (Refer to Removal/Installation, this section.)
   (3) Connect test harness electrical connector P2 to J1281 of relay box, connect electrical connector P1 to J1280 of relay box, and remove wire from pin E of P2.
   (4) Set S1 off (open circuit).
   (5) Set PS1 on.
   (6) Set PS2 on.
   (7) Set PS3 on.
   (8) Set R1 and R2 to 100 ohms.
   (9) Set S1 on. L2 shall illuminate.
   (10) Set R1 and R2 to 300 ohms.
   (11) Remove attaching parts and cover from relay box. Adjust trimpot potentiometer located on printed circuit board to which P1 is attached until L1 extinguishes. (See figure 203.)
   (12) Set R1 and R2 to 0 ohms. L2 shall illuminate.
   (13) Gradually increase R1 until L1 illuminates (approximately 170 ohms).
   (14) Gradually increase R2 until L2 extinguishes. L2 shall be between 270 and 280 ohms.
   (15) Increase R2 until L2 illuminates and L1 extinguishes. L2 shall be between 330 and 350 ohms.
   (16) Set R2 to 300 ohms.
   (17) Decrease R1 until L2 illuminates and L1 extinguishes. R1 shall be approximately 160 ohms. Note value of R1.



9-479A

Windshield Defog Relay Box Installation
Figure 201

EFFECTIVITY: 35-671 AND SUBSEQUENT; 36-064 AND SUBSEQUENT



SYM CODE	DESCRIPTION	PART NUMBER	MANUFACTURER
S1	4 POLE SWITCH 1		MICROSWITCH
L1	LIGHT BULB, 115 VAC, 100 W		COMMERCIALLY AVAILABLE
L2	LIGHT BULB, 28 VDC		COMMERCIALLY AVAILABLE
PS1, PS2	POWER SUPPLY, 28 VDC		COMMERCIALLY AVAILABLE
PS3	POWER SUPPLY, 115 VAC, 400 HZ		COMMERCIALLY AVAILABLE
P1	PLUG	RD37F110Y0X 2	POSITRONICS
P2	PLUG	S-801-2FSN	LEARJET
R1, R2	DECADE BOX, 0 TO 1K OHM, ±1%		COMMERCIALLY AVAILABLE

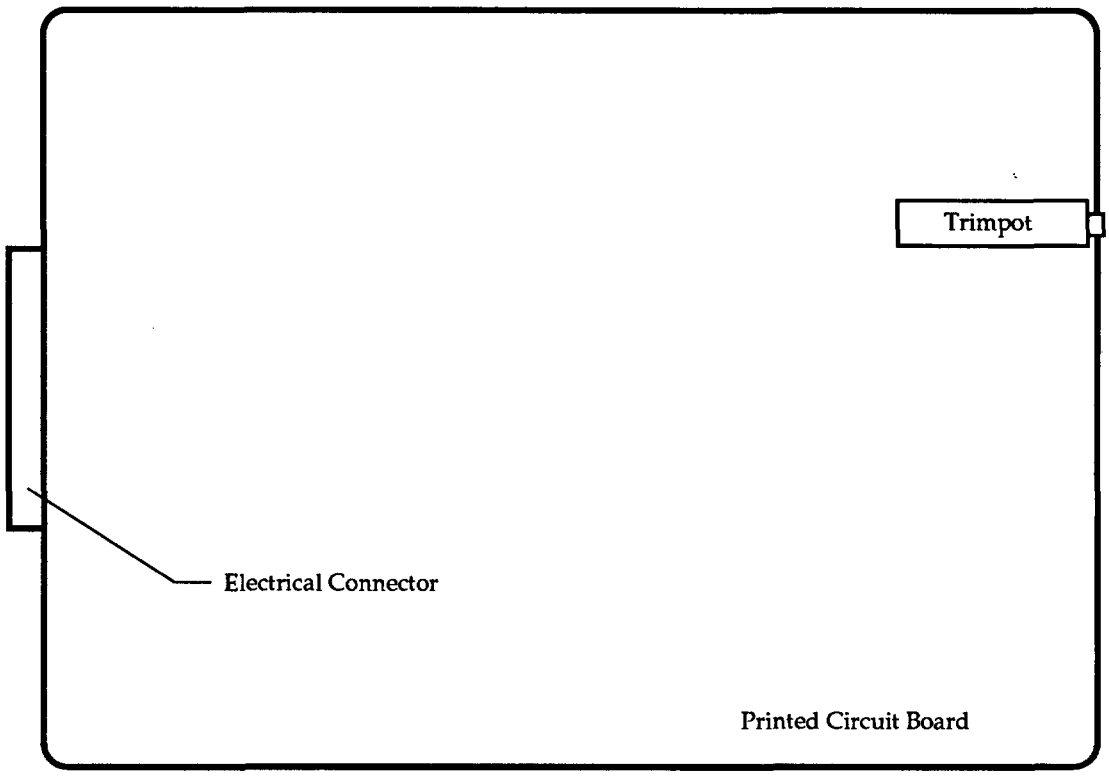
1 **Mount in any appropriate size box.**

2 **Alternate Part Number: DCMA37S, D20419-21, DC24660 (Cannon)**

12831-095

Test Harness
Figure 202

(18) Increase R1 until L2 extinguishes and L1 illuminates. R1 setting shall be greater than value determined in step (17).
(19) Increase R1 until L1 extinguishes. R1 shall be approximately 300 ohms. Note value of R1.
(20) Decrease R1 until L1 illuminates. R1 setting shall be within 10 ohms of value determined in step (19).
(21) Set PS3 off. L1 shall extinguish and L2 shall illuminate.
(22) Set PS3 on. L1 shall illuminate and L2 shall extinguish.
(23) Set PS2 off. L1 shall extinguish and L2 shall illuminate.
(24) Set S1 off. L2 shall extinguish.
(25) Set PS1 and PS3 off.
(26) Disconnect P1 from J1280 and connect to J1279.
(27) Connect wire to pin E, and disconnect wire from pin H of P2.
(28) Set PS1 on.
(29) Set PS2 on.
(30) Set PS3 on.
(31) Set R1 and R2 to 100 ohms.
(32) Set S1 on. L2 shall illuminate.
(33) Set R1 and R2 to 300 ohms.
(34) Adjust trimpot potentiometer located on printed circuit board to which P1 is attached until L1 extinguishes. (See figure 203.)
(35) Set R1 and R2 to 0 ohms. L2 shall illuminate.
(36) Gradually increase R1 until L1 illuminates (approximately 170 ohms).
(37) Gradually increase R2 until L2 extinguishes. L2 shall be between 270 and 280 ohms.
(38) Increase R2 until L2 illuminates and L1 extinguishes. L2 shall be between 330 and 350 ohms.
(39) Set R2 to 300 ohms.
(40) Decrease R1 until L2 illuminates and L1 extinguishes. R1 shall be approximately 160 ohms. Note value of R1.
(41) Increase R1 until L2 extinguishes and L1 illuminates. R1 setting shall be greater than value determined in step (40).
(42) Increase R1 until L1 extinguishes. R1 shall be approximately 300 ohms. Note value of R1.
(43) Decrease R1 until L1 illuminates. R1 setting shall be within 10 ohms of value determined in step (42).
(44) Set PS3 off. L1 shall extinguish and L2 shall illuminate.
(45) Set PS3 on. L1 shall illuminate and L2 shall extinguish.
(46) Set PS2 off. L1 shall extinguish and L2 shall illuminate.
(47) Set S1 off. L2 shall extinguish.
(48) Disconnect electrical connectors from relay box.
(49) Position cover on relay box and install with attaching parts.
(50) Install relay box in aircraft. (Refer to Removal/Installation, this section.)



NOTE: Circuit board not shown fully populated.

Windshield Defog Circuit Board Adjustment
Figure 203

RADOME AND WINDSHIELD ANTI-ICE - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)
   A. On *Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031*, the system consists of a filter, a motor-driven pump, a shutoff valve, a low pressure switch, a pressure relief valve, a 2.2 gallon tank containing methyl alcohol (methanol) O-M-232, Grade A, a system switch, and a caution light.
   B. On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, the system consists of a filter, a pressure relief valve, a 1.75 gallon pressurized tank containing methyl alcohol (methanol) O-M-232, Grade A, a shutoff and pressure regulator valve, a three-way shutoff valve, a float switch, a system switch, and a caution light. On *Aircraft 35-674 and Subsequent and 36-064 and Subsequent*, an orifice fitting is installed in place of the union fitting aft of frame 25 to reduce heat and pressure from the bleed air system to the alcohol storage tank.
   C. Component Description
      (1) On *Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031*, the alcohol filter is installed in the alcohol pump supply line. On *Aircraft 35-107, 35-113 and Subsequent, and 36-032 and Subsequent*, the filter is installed in the supply line between the supply tank and the 3-way shutoff valve.
      (2) The alcohol pump is a cam-rotor-type, controlled by a three-position switch on the anti-ice and avionics panel. The pump delivers a constant flow rate.
      (3) The alcohol shutoff valve (solenoid type) is installed in the alcohol anti-ice line leading to the pilot's defog nozzle. The valve is normally closed with no electrical power applied.
      (4) The low pressure switch is located in the radome alcohol line. The switch is actuated if the alcohol supply is depleted or the pump malfunctions. Actuation of the switch completes a ground circuit to illuminate the ALC AI caution light.
      (5) On *Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031*, an alcohol pressure relief valve is installed in the system pressure line. The relief valve opens and vents alcohol pressure in excess of 1.1 psi into the supply tank return line. On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, the pressure relief valve is installed in the supply tank overboard vent line. The valve is set to relieve supply tank pressure in excess of 2.6 (±0.1) psi. The relief valve also incorporates a bleed-off feature which allows the alcohol supply tank to depressurize when the alcohol system is not being utilized.
      (6) The alcohol supply tank is installed on the LH side of the nose compartment. The tank is of single-piece, molded construction. On *Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031*, the alcohol tank has a capacity of 2.2 gallons and incorporates fittings for a filler cap and supply, return, and vent tubes. On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, the alcohol tank has a capacity of 1.75 gallons and incorporates fittings for a filler cap, for supply, pressurization, and vent tubes, and for a float switch. The alcohol tank is pressurized to approximately 2.3 psi only when the system is utilized.
      (7) The shutoff and pressure regulator valve is installed on the LH side of frame 5 in the nose compartment. The regulator is connected to engine bleed air pressure in the tailcone by tube assemblies. (Refer to Chapter 21). The (normally closed) shutoff and pressure regulator valve, when energized open, regulates alcohol tank pressure to 2.3 (±0.1) psi normal. The regulator also incorporates a backup feature which vents any pressure in excess of 4.0 psi overboard. The valve also incorporates a vacuum relief feature. Should the ambient pressure exceed 1.0 psi above the alcohol tank pressure, the ambient pressure will flow through the overboard drain line and the pressure regulator into the tank. Coil resistance of the shutoff valve is 78 ohms (minimum). The pressure regulator incorporates a filter in the inlet pressure port. If trouble is experienced in the alcohol anti-ice system, the filter should be removed and cleaned.

(8) The three-way valve is located in the nose compartment on the LH side of the nose wheel well box. The shutoff valve incorporates two solenoids which direct alcohol to the radome or to the radome and windshield. When solenoid No. 1 is energized, alcohol is routed to the radome. When both solenoids No. 1 and No. 2 are energized, alcohol is routed to the radome and windshield. The coil resistance for each solenoid is 130 to 150 ohms. Actuating time is one second (maximum).

(9) The float switch is installed in the lower aft end of the alcohol supply tank. The float switch is used to alert the crew that the alcohol in the supply tank has been depleted.

2. Operation

A. On *Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031*, when the alcohol system switch is set to RADOME, the motor-driven pump is energized and supplies methyl alcohol to the radome. The shutoff valve (normally closed) prevents any methyl alcohol from reaching the pilot's defog nozzle. If the supply of methyl alcohol is depleted, the low pressure switch will actuate and light the ALC AI caution light. Should the normal defog system malfunction, the alcohol system switch is set to WSHLD/RADOME. This will allow alcohol flow to the radome and energizes (open) the shutoff valve, allowing methyl alcohol flow through the orifice assembly to the pilot's defog nozzle. The methyl alcohol is sprayed on the windshield through holes drilled in a small tube which forms an integral part of the defog nozzle. A pressure relief valve opens and vents any pressure in excess of 1.1 psi into the pressure return line.

B. On *Aircraft 35-107, 35-113 and Subsequent, and 36-032 and Subsequent*, when the alcohol system switch is set to RAD, two circuits are completed through a control relay: (1) a power circuit is completed to open the pressure regulator and (2) a power circuit is completed to position the 3-way control valve for alcohol flow to the radome. The alcohol tank is pressurized to 2.3 (±.1) psi through the pressure regulator and supplies alcohol to the radome through the filter and 3-way control valve. Operation of the system is the same when the system switch is set to WSHLD & RADOME except the 3-way control valve is positioned to supply alcohol to both the windshield and the radome. When the system switch is set to OFF, the pressure regulator valve is closed. The alcohol tank pressure is bled to ambient through the relief valve. The relief valve is set at 2.6 psi to prevent over-pressurization should the pressure regulator fail. A float switch installed in the lower portion of the tank illuminates the ALC AI caution light when the alcohol tank is empty.

C. Component Operation

(1) Alcohol Anti-Ice Shutoff and Pressure Regulator Valve *(Aircraft 35-107, 35-113 and Subsequent, 36-032 and Subsequent)*

(a) Setting the WSHLD/RADOME-RAD-OFF Switch to either WSHLD/RADOME or RAD completes a ground circuit to energize the pressure regulator valve control relay. With the relay energized, a 28 vdc circuit is completed to one side of the pressure regulator valve solenoid. When the solenoid is opened, engine bleed air is admitted to the pressure regulator. The regulator regulates the pressure applied to the supply tank to 2.3 (±0.1) psi.

(2) Alcohol Three-Way Shutoff Valve *(Aircraft 35-107, 35-113 and Subsequent, 36-032 and Subsequent)* (See Figure 4.)

(a) When the WSHLD & RADOME-RAD-OFF Switch on the Anti-Ice and Avionics switch panel is set to RAD, a ground circuit is completed to energize a control relay. With the relay energized, a power circuit (28 vdc) is completed to energize the pressure regulator and a power circuit (28 vdc) is completed to energize solenoid No. 1 of the three-way shutoff valve.

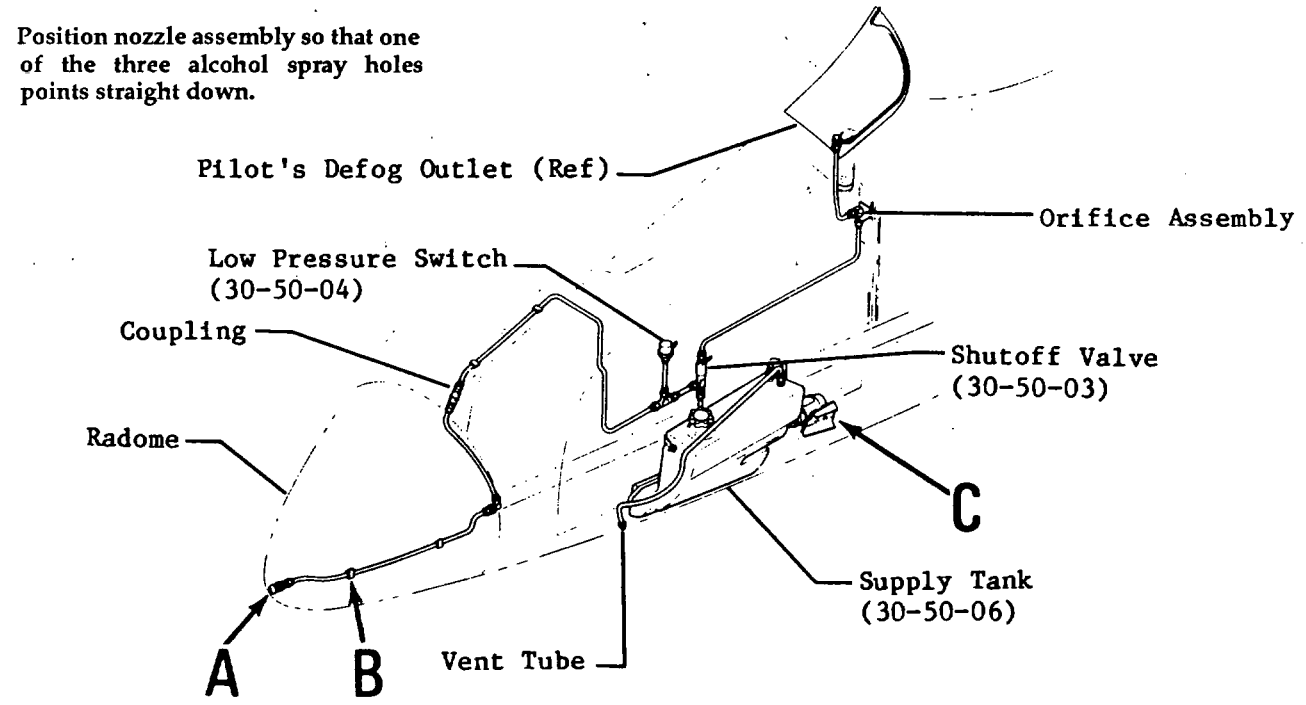
(b) When the WSHLD & RADOME-RAD-OFF Switch is set to WSHLD & RADOME, a ground circuit is completed to both control relays. With the relays energized, power circuits (28 vdc) are completed to both solenoids No. 1 and No. 2 of the three-way shutoff valve and to the pressure regulator.

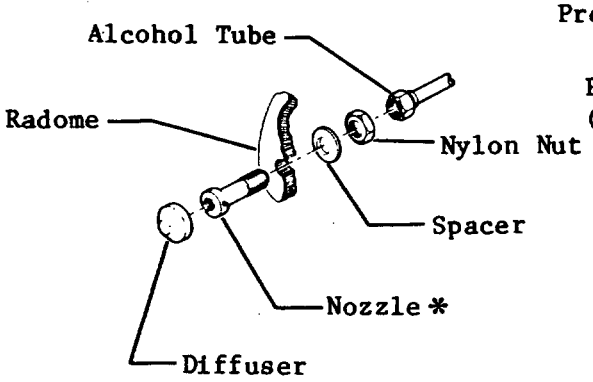
(3) Anti-Ice Float Switch *(Aircraft 35-107, 35-113 and Subsequent, 36-032 and Subsequent)*

(a) When the alcohol supply tank is empty, the float switch completes a ground circuit to energize the ALC AI caution light control relay. When the relay is energized, a ground circuit is completed to illuminate the ALC AI caution (amber) light. The relay also incorporates a holding circuit which keeps the relay energized once ground is applied. This prevents the caution light from flickering due to the bobbing motion of the float switch. The holding circuit is opened when the Battery Switches are set to OFF and the alcohol supply tank is serviced.

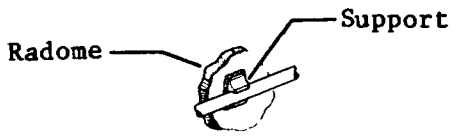
(b) On *Aircraft 35-524 and Subsequent and 36-054 and Subsequent*, a timer delays activation of the ALC AI caution light control relay. This prevents caution light illumination when the ground circuit is momentarily completed and then opened due to bobbing motion of the float switch.

* Position nozzle assembly so that one of the three alcohol spray holes points straight down.



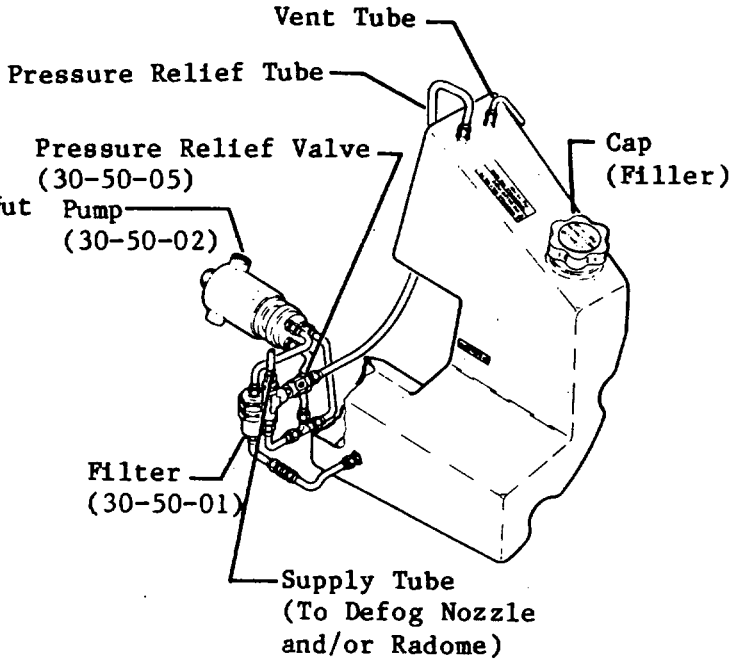


Detail A



TYPICAL TUBE SUPPORT

Detail B

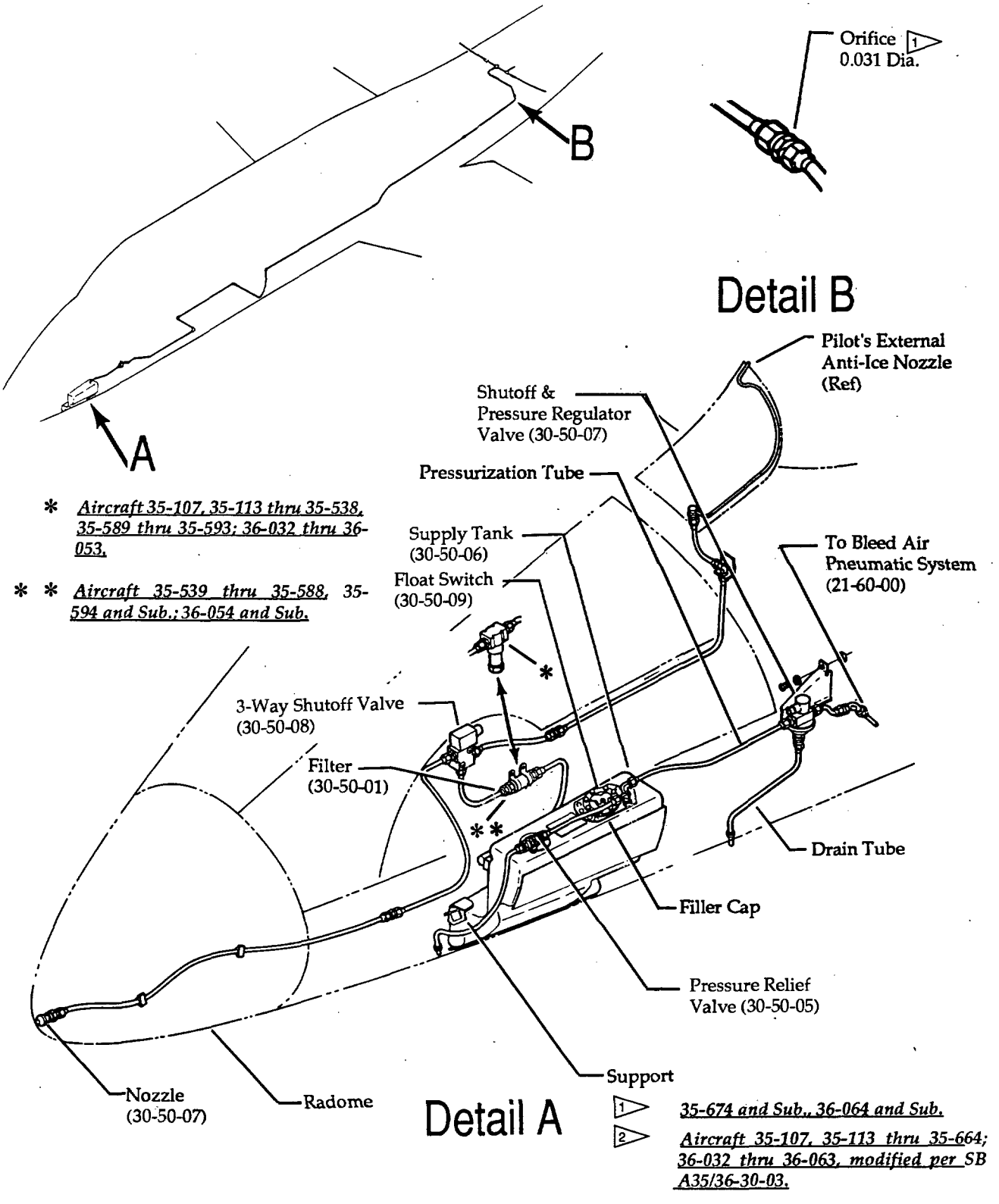


ROTATED 90° COUNTERCLOCKWISE

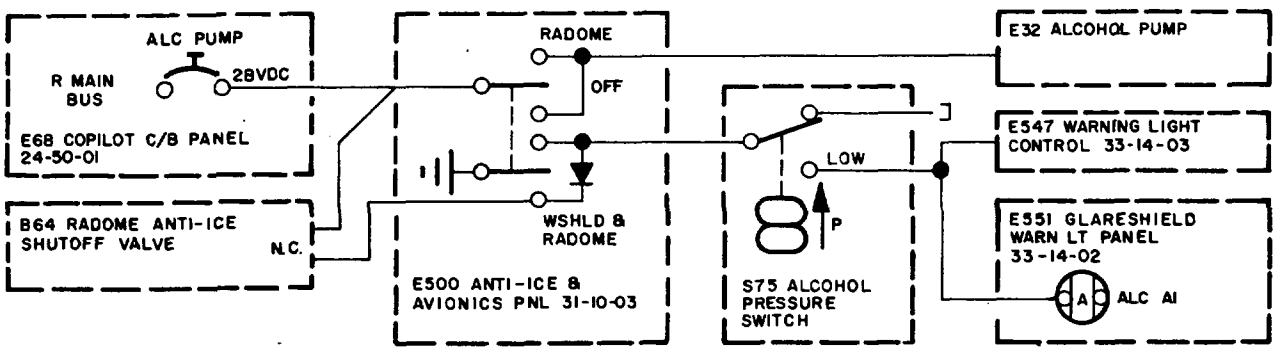
Detail C

Alcohol Anti-Ice System Component Locator
Figure 1 (Sheet 1 of 2)

13-25D-2

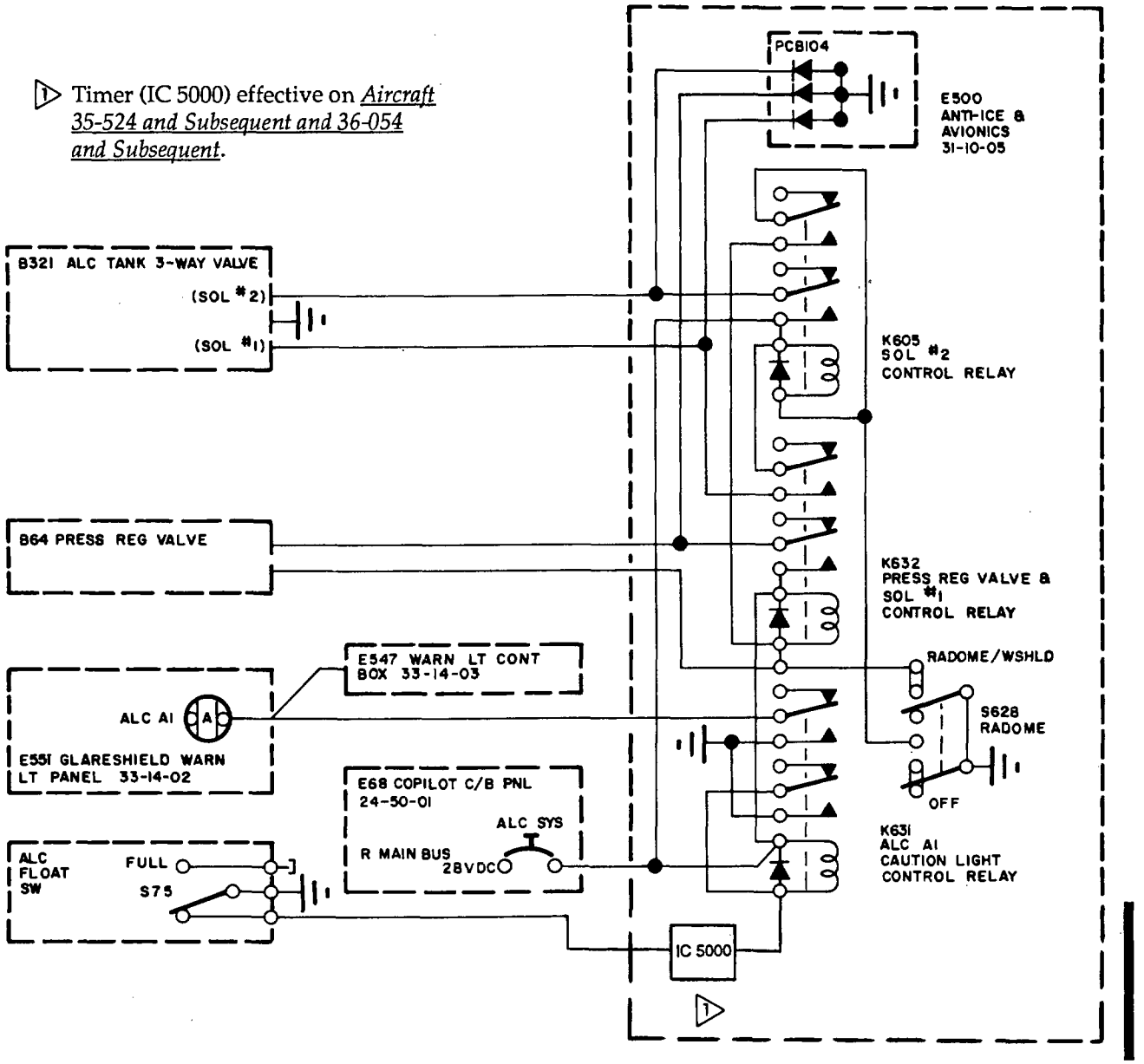


Alcohol Anti-Ice System Component Locator
Figure 1 (Sheet 2 of 2)

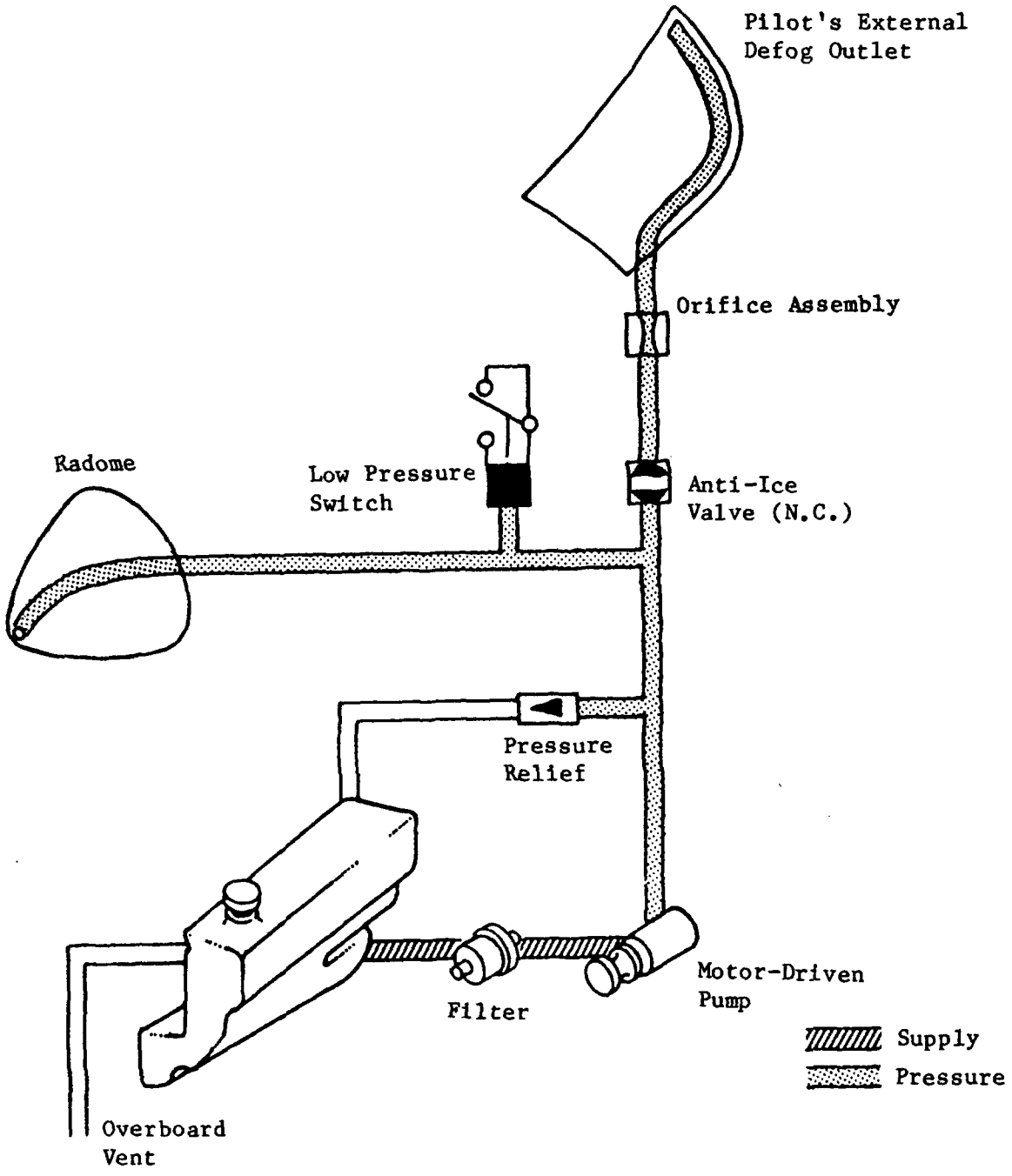


Alcohol Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 1 of 2)

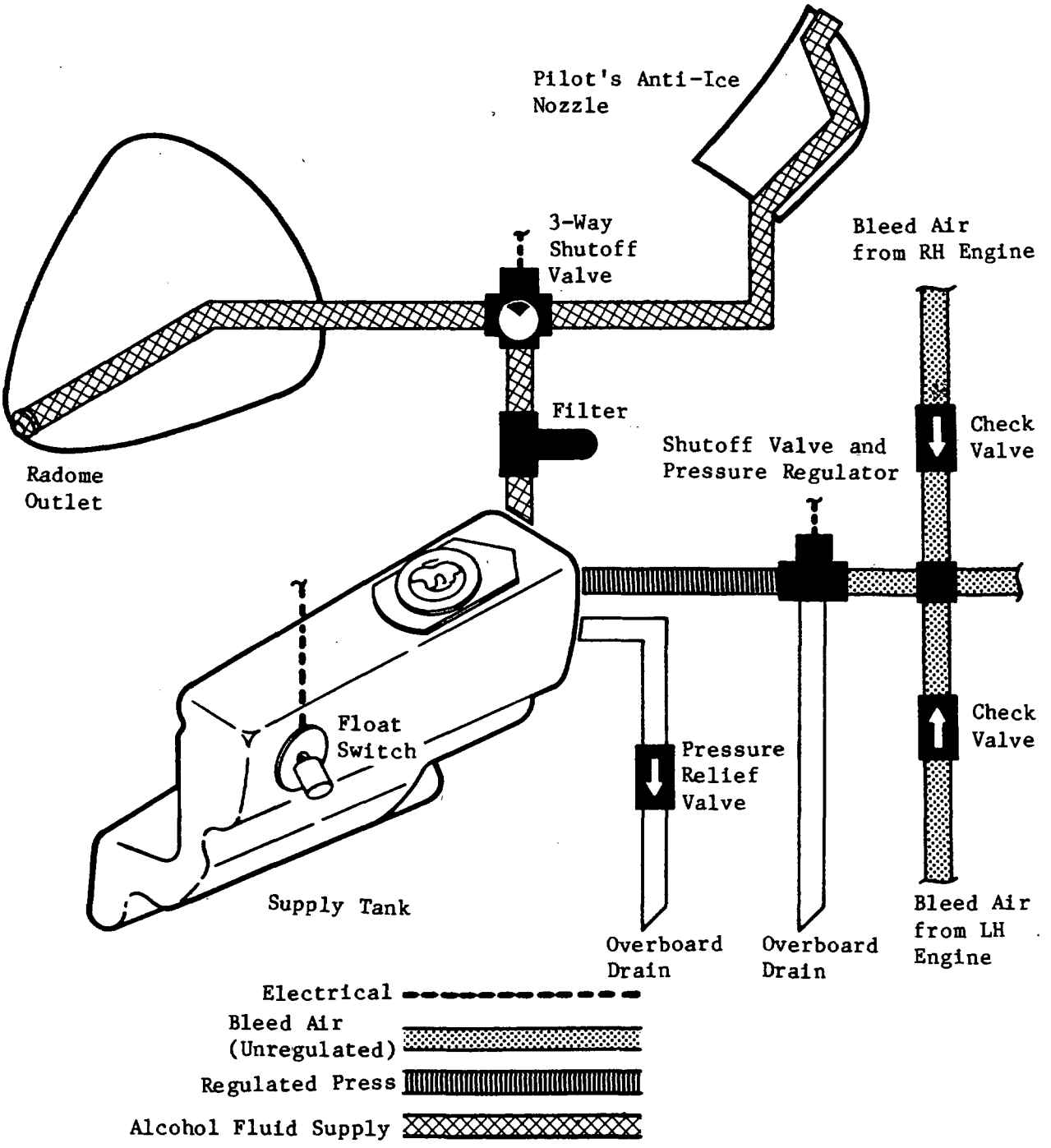
▷1 Timer (IC 5000) effective on *Aircraft 35-524 and Subsequent and 36-054 and Subsequent*.



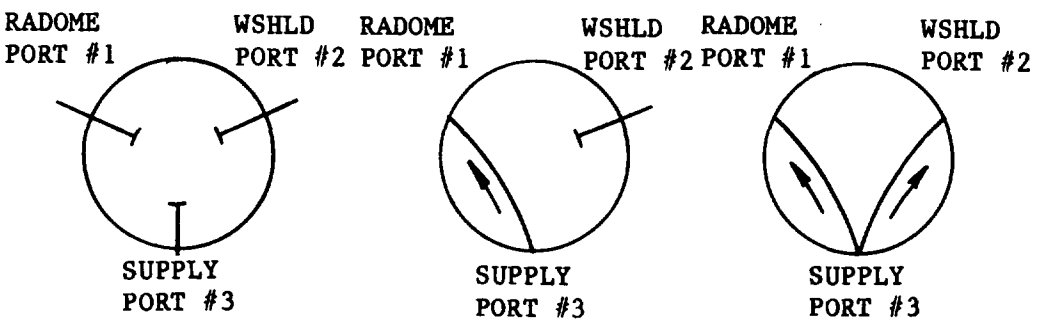
Alcohol Anti-Ice System Electrical Control Schematic
Figure 2 (Sheet 2 of 2)



Alcohol Anti-Ice System Schematic
Figure 3 (Sheet 1 of 2)



Alcohol Anti-Ice System Schematic
Figure 3 (Sheet 2 of 2)



Three-Way Shutoff Valve Schematic
Figure 4

1. TROUBLE SHOOTING

A. Tools and Test Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson	Check circuits.

B. Radome and Windshield Trouble Shooting

(1) See figure 101 for trouble shooting procedure. Refer to Chapter 30 of the Wiring Manual for alcohol anti-ice system wiring diagrams.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. No Alcohol Flow, or Low Alcohol Flow, to Radome or Windshield.		
a. Defective float switch or low alcohol level in tank.	Check float switch (S75) for free movement, and check alcohol level.	Repair or replace float switch as applicable. (Refer to 30-50-09.) Fill tank to capacity. (Refer to Chapter 12.)
b. Loss of power to three-way shutoff valve.	Visually inspect CB78 on copilot's circuit breaker panel.	Ensure that circuit breaker is depressed.
	Check for 28 vdc at pin 43 of P616 on anti-ice and avionics panel.	Repair or replace wiring or components as applicable.
c. Defective system switch.	Check switch on anti-ice and avionics panel for mechanical function and loose or broken connections.	Repair or replace switch, wiring, or components as applicable.

Radome and Windshield Anti-Ice Trouble Shooting
Figure 101 (Sheet 1 of 2)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. No Alcohol Flow, or Low Alcohol Flow, to Radome or Windshield (Continued).		
d. Defective switch panel relay.	With system switch in on position, check for 28 vdc at pins 27 and 42 of P616 on anti-ice and avionics panel.	If power does not exist, replace relay.
e. Defective three-way shutoff valve.	Check for 28 vdc at pins A and C of P901 on shutoff valve (B321).	If power exists, replace shutoff valve. (Refer to 30-50-08.)
	Check shutoff valve for leaks, damage, or faulty installation.	Repair or replace shutoff valve as applicable. (Refer to 30-50-08.)
g. Defective plumbing or obstructed alcohol filter.	Check outlet ports, tubing, filter, fittings, and connections for leaks, damage, or obstructions.	Clear lines, tighten connections, and replace damaged components as applicable.
		Clean or replace alcohol filter. (Refer to 30-50-01.)
h. Defective shutoff and pressure regulator valve.	Check for 28 vdc at pin A of P902 on valve (B64).	If power exists, replace valve. (Refer to 30-50-07.)
	Check valve for leaks, damage, or faulty installation.	Repair or replace valve as applicable. (Refer to 30-50-07.)
i. Defective pressure relief valve.	Check valve in tank overboard vent line for damage and faulty installation.	Repair or replace valve as applicable. (Refer to 30-50-05.)

Radome and Windshield Anti-Ice Trouble Shooting
Figure 101 (Sheet 2 of 2)

RADOME AND WINDSHIELD ANTI-ICE - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: Refer to Chapter 5 for the current inspection interval for the Operational Check of the Alcohol Anti-Ice System.

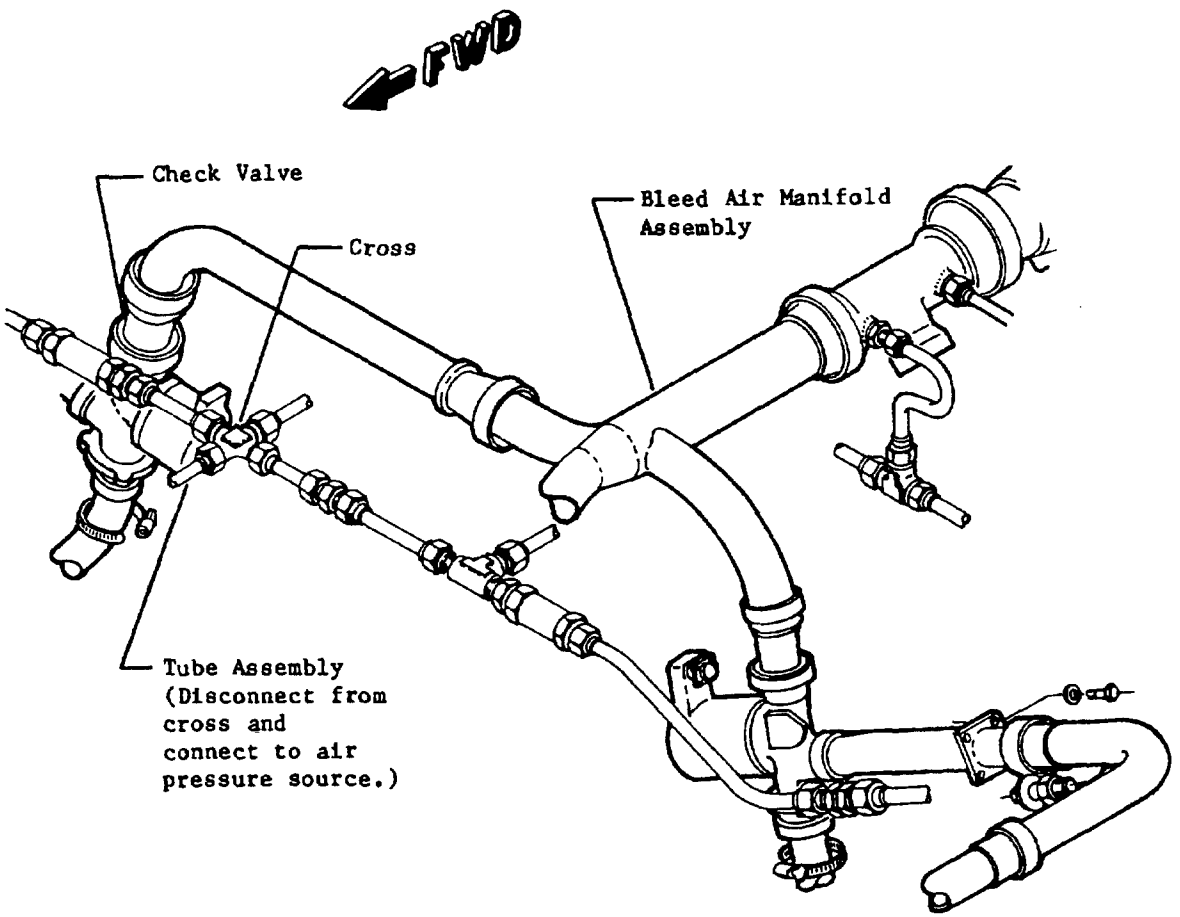
A. Operational Check of the Alcohol Anti-Ice System *(Aircraft 35-107, 35-113 and subsequent and 36-032 and subsequent)* (See Figure 201.)

WARNING: EXTREME CARE MUST BE TAKEN WHEN WORKING IN THE NOSE COMPARTMENT AND IN THE TAILCONE EQUIPMENT SECTION WITH THE BATTERIES CONNECTED AND ELECTRICAL POWER ON THE AIRCRAFT. ELECTRICAL SHORTING COULD CAUSE BODILY HARM AND EQUIPMENT DAMAGE.

(1) Lower the tailcone access door to gain access to the alcohol anti-ice bleed air tubing.
(2) Disconnect the tubing from the cross and connect an air pressure source to the tube assembly. (Refer to 36-10-00.)
(3) Set the pressure source to 50 (±5) psi [344.7 (±34.4) kPa] and pressurize the tubing leading to the shutoff and pressure regulator valve.
(4) Set the Battery Switches to BAT 1 and BAT 2 and Windshield and Radome Switch to WSHLD/RADOME.
  (a) Check the system fittings for leaks.
  (b) Remove the diffuser from the radome nozzle. Alcohol must flow from all three holes in the nozzle. To unplug the holes, use 0.0115 inch [0.2921 mm] diameter (maximum) wire.
  (c) The alcohol must flow from all five holes in the windshield nozzle. To unplug the holes use a No. 80 drill bit.
  (d) Repeat steps (4)(a) thru (4)(c) four times.
(5) Set the Windshield and Radome Switch to RADOME. The alcohol must flow from the radome nozzle but not from the pilot's external defog nozzle.
(6) Set the Windshield and Radome Switch to OFF. The alcohol flow must stop.

CAUTION: IF ANY ALCOHOL BECOMES TRAPPED OR IS ALLOWED TO ACCUMULATE ON THE WINDSHIELD OR AIRCRAFT PAINT, DAMAGE MAY RESULT TO THE WINDSHIELD OR PAINT.

(7) Drain the alcohol tank. The ALC AI annunciator on the glareshield must illuminate.
  (a) *On Aircraft 35-524 and subsequent and 36-054 and subsequent,* a timer in the annunciation circuit delays the warning light illumination for approximately 10 seconds after the tank float switch actuates.
  (b) If the warning light does not illuminate, push the Glareshield Test Switch. If the lamp is good, check the tank float switch for continuity.
(8) Depressurize the alcohol anti-ice tubing and disconnect the pressure source.
(9) Connect the tubing to the cross and close the tailcone access door.
(10) Wash off any alcohol remaining on the aircraft.
(11) Set the Battery Switches to OFF.



Alcohol Anti-Ice System Pressure Source
Figure 201

ALCOHOL FILTER - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: Refer to Chapter 5 for the current inspection interval to disassemble and clean the filter. Filters bearing the P/N 213-851 cannot be disassembled.

A. Remove the Filter *(Aircraft 35-002 thru 35-106, 35-108 thru 35-112, 36-002 thru 36-031 not modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft)* (See Figure 201.)
   (1) Remove the left nose equipment access door.
   (2) Drain the alcohol tank. (Refer to12-10-08.)
   (3) Disconnect the tube assemblies at the filter and remove the filter from the aircraft. Cap all the exposed fittings.

B. Install the Filter *(Aircraft 35-002 thru 35-106, 35-108 thru 35-112, 36-002 thru 36-031 not modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft)* (See Figure 201.)
   (1) Remove the caps from the tube assemblies.
   (2) Connect the tube assemblies to the filter, noting the direction arrow on the filter. The arrow points in the direction of the flow. The flow is toward the pump.
   (3) Operate the system and check for leaks.
   (4) Service the alcohol tank. (Refer to 12-10-08.)
   (5) Install the nose equipment access door.

C. Remove the Filter *(Aircraft 35-002 thru 35-106, 35-108 thru 35-112, 36-002 thru 36-031 modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft)* (See Figure 201.)
   (1) Remove the left nose equipment access door.
   (2) Drain the alcohol tank. (Refer to12-10-08.)
   (3) Remove the parts that attach the access cover from the LH side of the nose wheel box to get access to the alcohol filter.
   (4) *On aircraft equipped with 6608255-1 filter*, remove the safety wire from the filter.
   (5) Disconnect the tube assemblies at the filter.
   (6) Remove the parts that attach the filter and remove the filter from the aircraft. Cap all the exposed fittings.

D. Install the Filter *(Aircraft 35-002 thru 35-106, 35-108 thru 35-112, 36-002 thru 36-031 modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft)* (See Figure 201.)
   (1) Install the filter.
   (2) Connect the tube assemblies at the filter.
   (3) *On aircraft equipped with 6608255-1 filter*, safety wire the filter.
   (4) Install the access cover.
   (5) Operate the system and check for leaks.
   (6) Service the alcohol tank. (Refer to 12-10-08.)
   (7) Install the nose equipment access door.

E. Remove the Filter *(35-107, 35-113 and subsequent, 36-032 and subsequent)*
   (1) Remove the left nose equipment access door.
   (2) Drain the alcohol tank. (Refer to 12-10-08.)

(3) Disconnect the tube assemblies at the filter.
(4) Remove the parts that attach the filter and remove the filter from the aircraft.
(5) Cap all the exposed fittings.

F. Install the Filter *(35-107, 35-113 and subsequent, 36-032 and subsequent)*
(1) Remove the caps from the fittings.
(2) *On aircraft equipped with 6608255-1 filter*, make sure that the port stamped OUT is toward the 3-way shutoff valve.
(3) Install the filter.
(4) Connect the tube assemblies to the filter.
(5) Operate the system and check for leaks.
(6) Service the alcohol tank. (Refer to 12-10-08.)
(7) Install the nose equipment access door.

2. Cleaning/Painting

NOTE: Refer to Chapter 5 for the current inspection interval for the Cleaning of the Alcohol Filter.

A. Clean the Alcohol Filter Assembly *(Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031 not modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft)* (See Figure 202.)
(1) Get the necessary tools and equipment.

NOTE: You can use equivalent alternatives for these items:

NAME	PART NUMBER	MANUFACTURER	USE
Methyl Alcohol		Commercially Available	To clean components.
Compressed Air		Commercially Available	To dry components.

(2) Remove the alcohol filter assembly.
(3) Unscrew the filter cap from the filter body and remove the filter element and O-ring.
(4) Wash the filter element, O-ring, cap, and body in methyl alcohol (methanol) O-M-232, Grade A, and dry with dry, compressed air.
(5) Inspect the O-ring and, if necessary, replace.
(6) Insert the filter element into the body, place the O-ring on the cap, and install the cap.
(7) Tighten the cap hand tight and safety wire.
(8) Install the filter assembly.
(9) Operate the system and check for leaks.

B. Clean the Alcohol Filter Assembly *(Aircraft equipped with P/N 6608255-1 filter)* (See Figure 202.)
(1) Get the necessary tools and equipment.

NOTE: You can use equivalent alternatives for these items:

NAME	PART NUMBER	MANUFACTURER	USE
Methyl Alcohol		Commercially Available	To clean components.
Compressed Air		Commercially Available	To dry components.

(2) Remove the alcohol filter assembly.
(3) Unscrew the bowl from the head and remove the filter element, O-rings, and backup ring.
(4) Wash the head, filter element, backup ring, O-rings, and bowl in methyl alcohol (methanol) O-M-232, Grade A, and dry with dry, compressed air.
(5) Inspect the backup ring and O-rings and, if necessary, replace.
(6) Assemble the O-rings and backup ring.
(7) Position the filter element into the head and tighten the bowl hand tight. Safety wire the bowl.
(8) Install the filter assembly.
(9) Operate the system and check for leaks.

C. Clean the Alcohol Filter *(Aircraft 35-539 thru 35-588, 35-594 and subsequent, 36-054 and subsequent and prior aircraft equipped with P/N 213-851 filter)*
(1) Get the necessary tools and equipment.

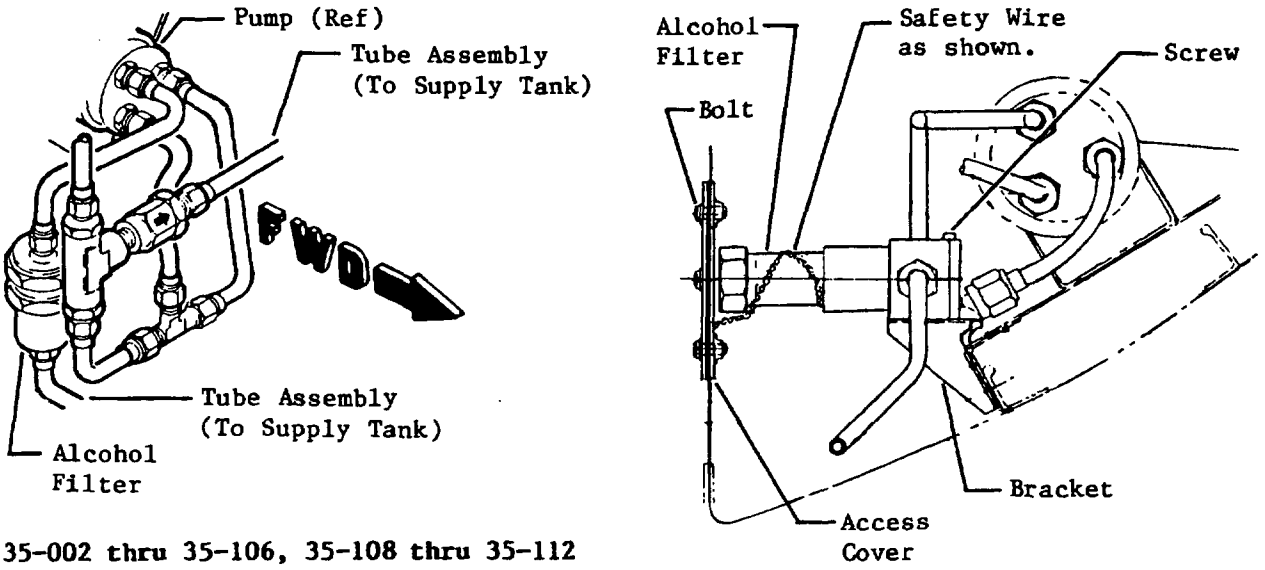
NOTE: You can use equivalent alternatives for these items:

NAME	PART NUMBER	MANUFACTURER	USE
Methyl Alcohol		Commercially Available	To clean components.

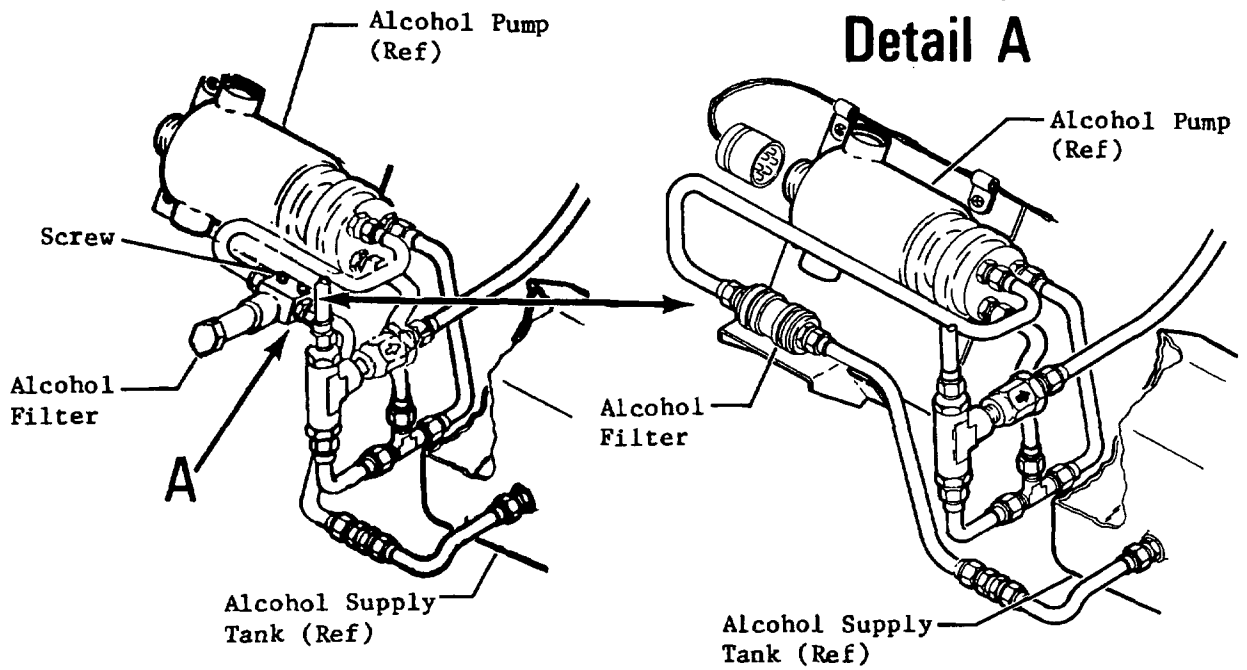
(2) Remove the alcohol filter. (Refer to 30-50-01.)
(3) Using methyl alcohol, back flush the filter to remove the contaminates.

CAUTION: DO NOT USE COMPRESSED AIR TO DRY THE FILTER. COMPRESSED AIR CAN DAMAGE THE FILTER.

(4) Allow the filter to air dry. Do not force air through the filter.
(5) Install the alcohol filter. (Refer to 30-50-01.)
(6) Operate the system and check for leaks.

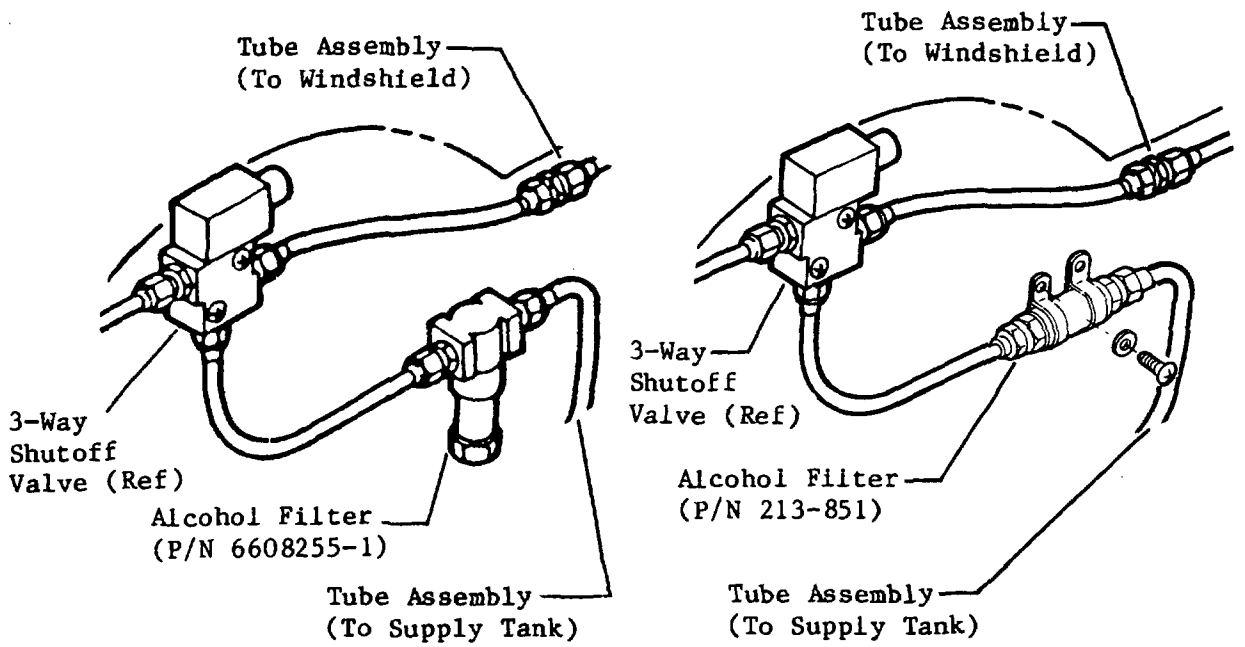


35-002 thru 35-106, 35-108 thru 35-112
36-002 thru 36-031 not modified per AMK 78-3



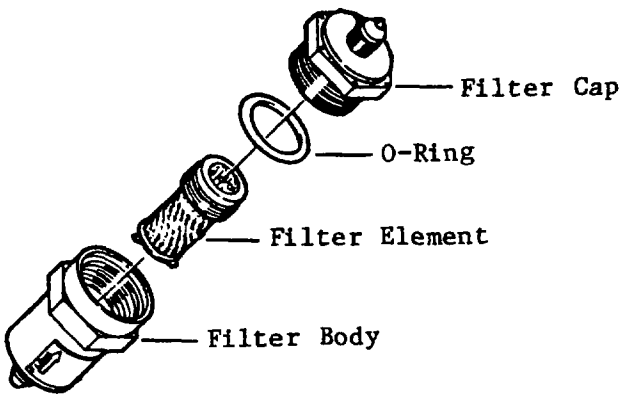
Aircraft Modified per AMK 78-3, Modification of Alcohol Anti-Ice System for All-Weather Aircraft

Alcohol Filter Installation
Figure 201 (Sheet 1 of 2)



35-107, 35-113 and Subsequent
36-032 and Subsequent

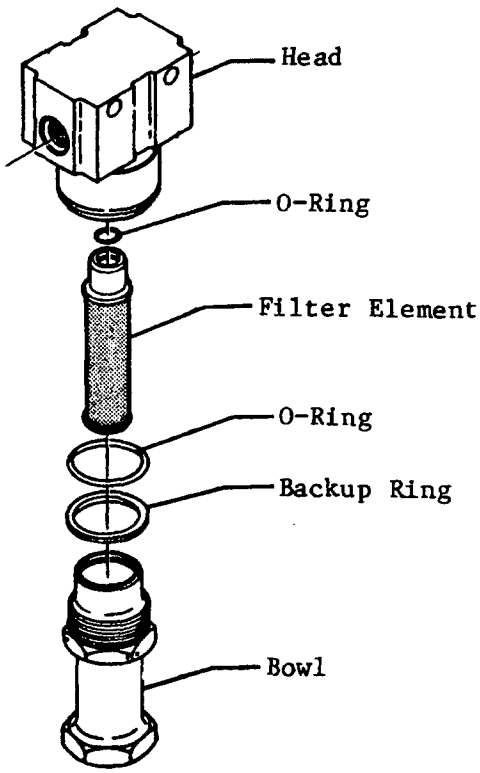
Alcohol Filter Installation
Figure 201 (Sheet 2 of 2)



35-002 thru 35-106, 35-108 thru 35-112;
36-002 thru 36-031 not modified per AMK 78-3,
Modification of Alcohol Anti-Ice System for
All Weather Aircraft

Filter Assembly

Alcohol Filter Cleaning
Figure 202 (Sheet 1 of 2)



Filter Assembly

Alcohol Filter Cleaning
Figure 202 (Sheet 2 of 2)

ALCOHOL PUMP - MAINTENANCE PRACTICES

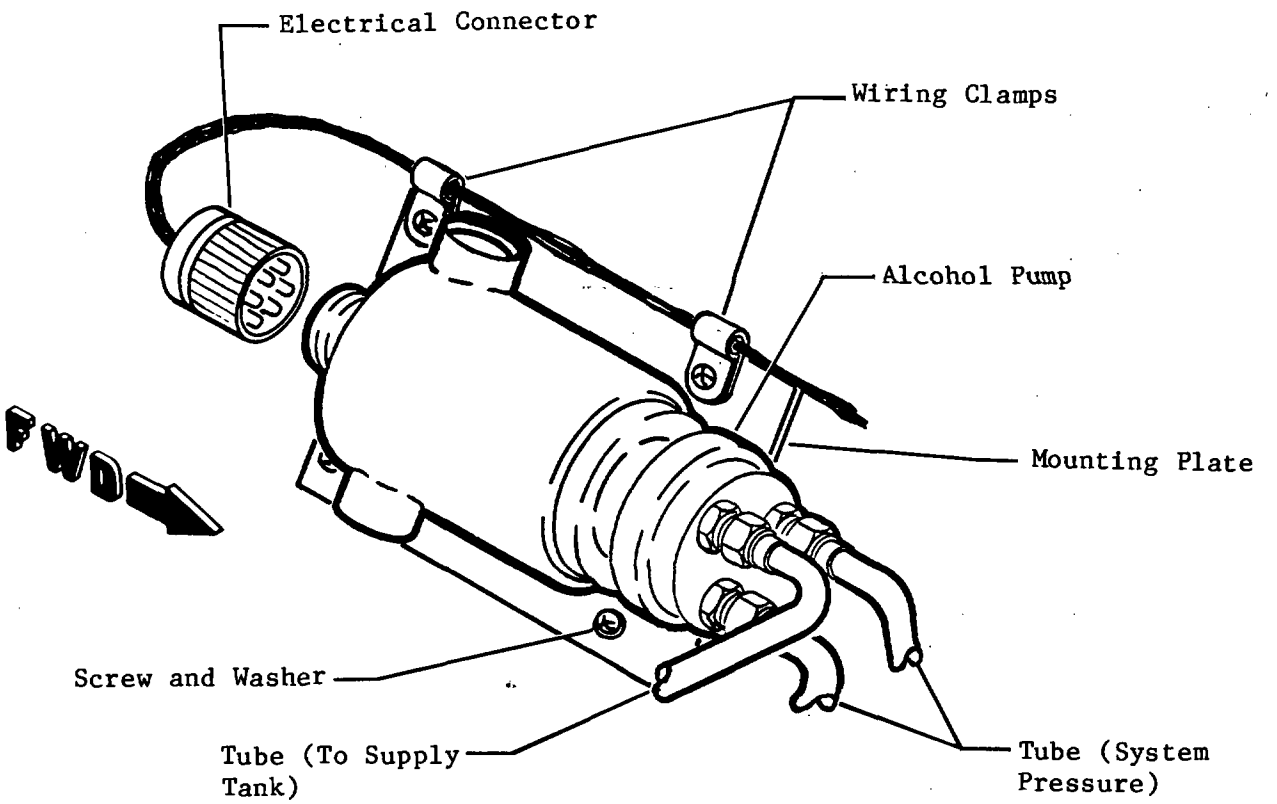
1. REMOVAL/INSTALLATION

A. Remove Pump (See figure 201.)

(1) Remove left nose compartment access door.
(2) Remove avionics equipment as required to gain access to pump.
(3) Drain alcohol tank. (Refer to Chapter 12.)
(4) Disconnect electrical connector from pump.
(5) Disconnect tube assemblies from pump. Cap tube assemblies.
(6) Remove attaching parts and mounting plate with pump attached from aircraft.

B. Install Pump (See figure 201.)

(1) Install plate with pump attached and secure with attaching parts.
(2) Connect electrical connector to pump.
(3) Remove caps from tube assemblies and connect tube assemblies to pump.
(4) Service alcohol tank. (Refer to Chapter 12.)
(5) Install avionics equipment previously removed.
(6) Install left nose compartment access door.



Alcohol Pump Installation
Figure 201

2. INSPECTION/CHECK

NOTE: The following operational check must be performed in accordance with the current inspection interval specified in Chapter 5.

A. Perform Operational Check of Alcohol Anti-Ice Pump

(1) Set Battery Switches to BAT 1 and BAT 2 and assure that ALC PUMP circuit breaker is depressed.
(2) Set alcohol system switch to RADOME.
(3) Assure that alcohol flows from radome nozzle.
(4) Set alcohol system switch and Battery Switches to OFF.
(5) Wash off any alcohol remaining on aircraft.

ALCOHOL SHUTOFF VALVE - MAINTENANCE PRACTICES

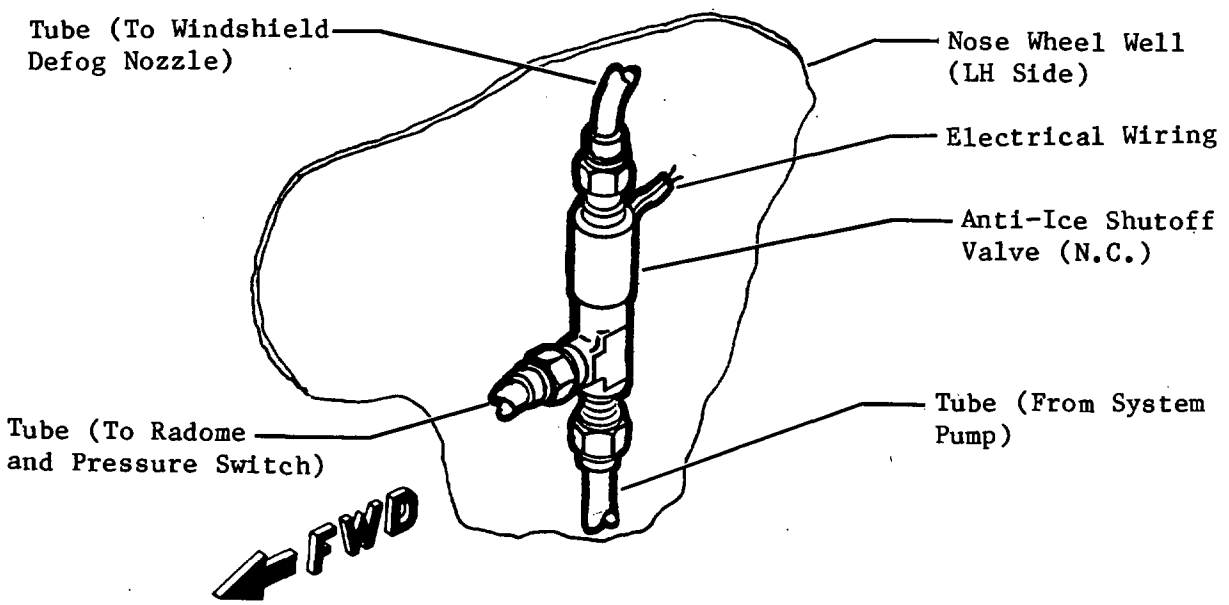
1. REMOVAL/INSTALLATION

A. Remove Shutoff Valve (See figure 201.)

(1) Remove left nose compartment access door.
(2) Disconnect wiring from shutoff valve.
(3) Disconnect tube assemblies from shutoff valve and remove valve from aircraft. Cap all exposed fittings.

B. Install Shutoff Valve (See figure 201.)

(1) Remove caps from tube assemblies. Connect tube assemblies to shutoff valve.
(2) Connect wiring to shutoff valve.
(3) Install nose compartment access door.



Alcohol Shutoff Valve Installation
Figure 201

ALCOHOL LOW PRESSURE SWITCH - MAINTENANCE PRACTICES

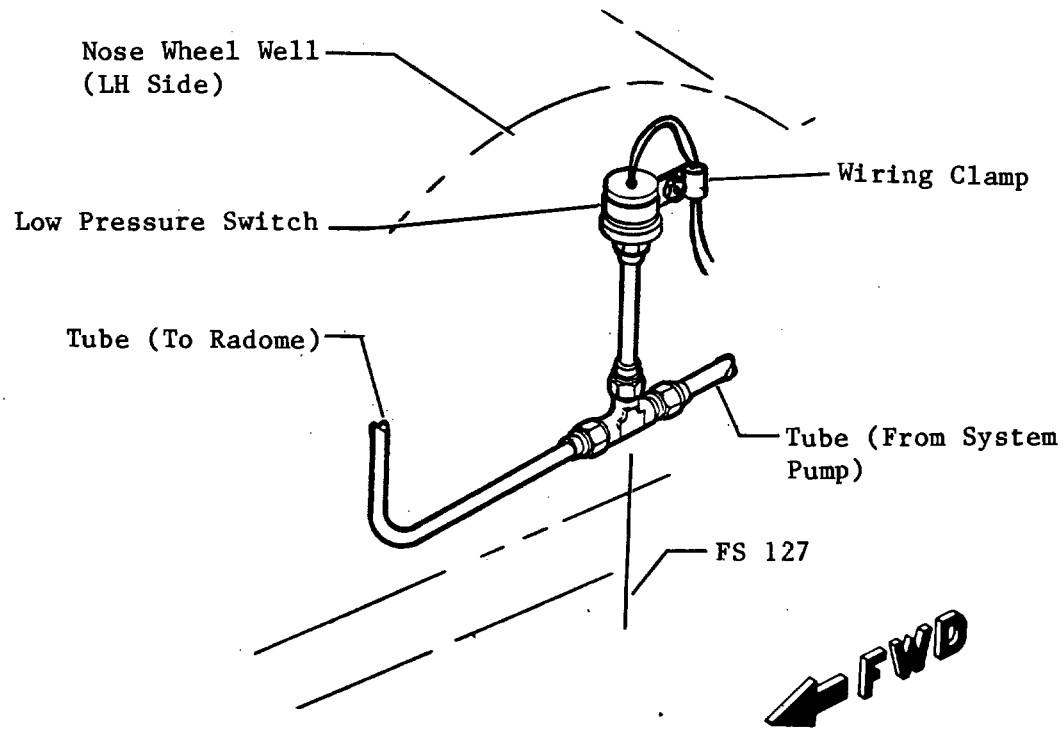
1. REMOVAL/INSTALLATION

A. Remove Low Pressure Switch (See figure 201.)

(1) Remove left nose compartment access door.
(2) Disconnect electrical wiring at splices.
(3) Disconnect tube assemblies from pressure switch. Cap all exposed fittings.
(4) Remove attaching parts and pressure switch from aircraft.

B. Install Low Pressure Switch (See figure 201.)

(1) Install pressure switch and secure with attaching parts.
(2) Remove caps from fittings and connect tube assembly to pressure switch.
(3) Connect electrical wiring.
(4) Install nose compartment access door.



Alcohol Low Pressure Switch Installation
Figure 201

ALCOHOL PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Pressure Relief Valve (See figure 201.)

(1) Remove LH nose compartment access door.

(2) Drain alcohol tank. (Refer to Chapter 12.)

(3) Remove avionics equipment, if required, to gain access to relief valve.

(4) On Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031, disconnect tube assembly (return to supply tank) from relief valve. Cap tube assembly. Remove relief valve from tee. Cap tee. On Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent, disconnect overboard drain tubes from relief valve. Remove attaching parts, clamp and relief valve from aircraft.

B. Install Pressure Relief Valve (See figure 201.)

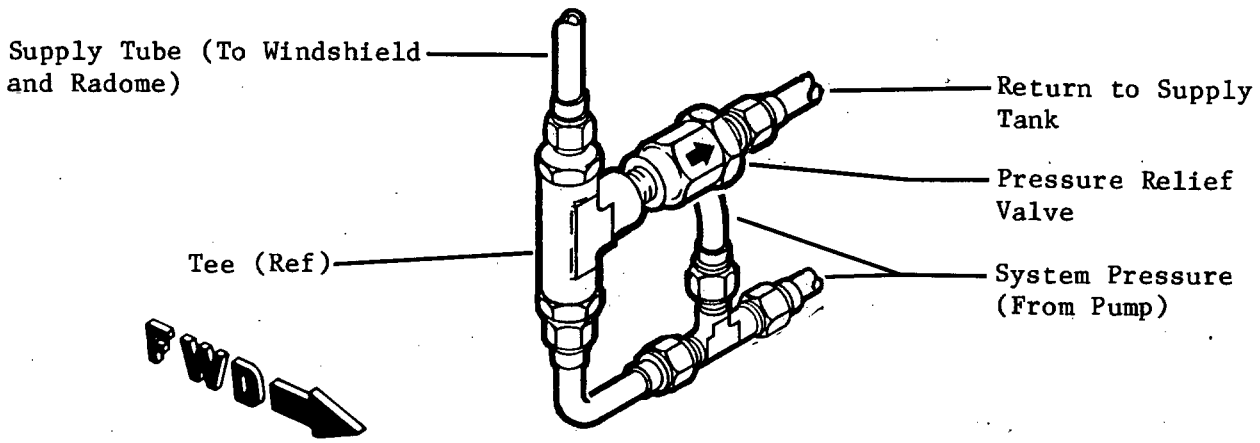
(1) On Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031, install relief valve in tee noting direction arrow. Arrow points toward supply tank. On Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent, install relief valve with clamp and attaching parts, noting direction arrow. Arrow points toward overboard drain.

(2) Remove cap from tube assembly(s) and connect tube assembly to relief valve.

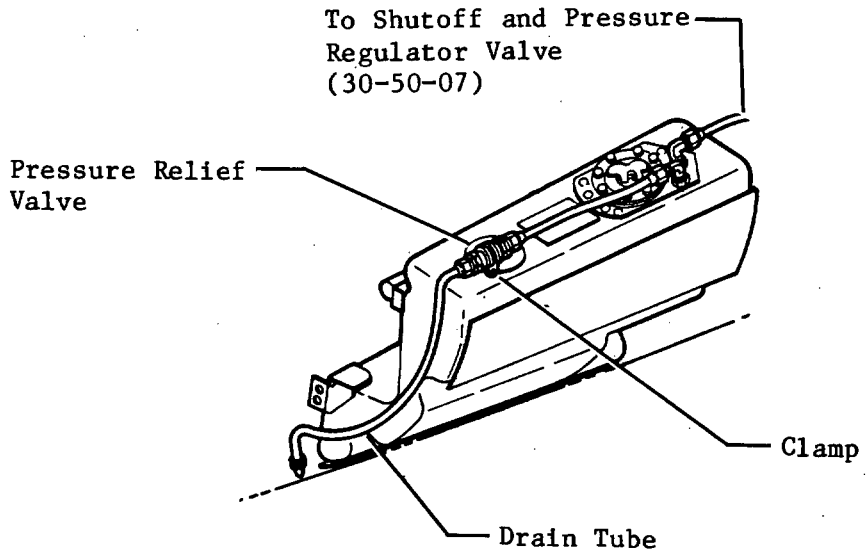
(3) Install previously removed avionics equipment, if required.

(4) Service alcohol tank. (Refer to Chapter 12.)

(5) Install LH nose compartment access door.



Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 36-031



Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent

Alcohol Pressure Relief Valve Installation
Figure 201

1. REMOVAL/INSTALLATION

A. Remove Tank *(35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031)* (See figure 201.)
   (1) Remove LH nose compartment access door.
   (2) Drain alcohol supply tank. (Refer to Chapter 12.)
   (3) Remove avionics equipment as required to allow removal of alcohol supply tank.
   (4) Disconnect supply, return, and vent tubes from tank. Cap all exposed tubes and fittings.
   (5) Loosen and remove nut from strap assembly bolt (two places). Remove alcohol supply tank from aircraft.

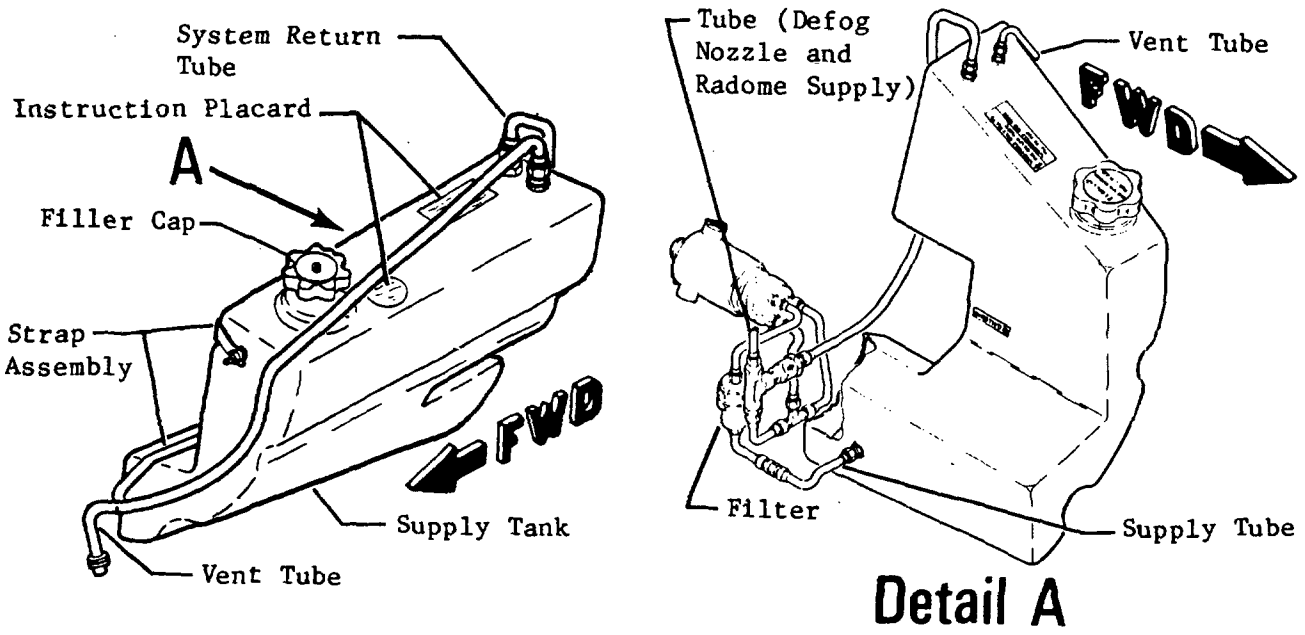
B. Install Tank *(35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031)* (See figure 201.)
   (1) Position alcohol supply tank in place in nose compartment.
   (2) Apply Loctite Nut Lock to strap assembly bolt threads.
   (3) Position strap assemblies with pads between straps and tank and tighten nuts on strap assembly bolts.
   (4) Remove caps from vent, supply, and pressure return tubes and fittings and connect tubes to tank.
   (5) Install previously removed avionics equipment.
   (6) Service alcohol supply tank. (Refer to Chapter 12.)
   (7) Install LH nose compartment access door.

C. Remove Tank *(35-107, 35-113 and Subsequent, 36-032 and Subsequent)* (See figure 201.)
   (1) Remove LH nose compartment access door.
   (2) Drain alcohol supply tank. (Refer to Chapter 12.)
   (3) Remove avionics equipment as required to allow removal of alcohol supply tank.
   (4) Disconnect electrical wiring from float switch. Disconnect supply, vent, and pressurization tubes from tank. Cap all exposed tubes and fittings.
   (5) Remove attaching parts and upper and lower supports. Remove alcohol supply tank from aircraft.

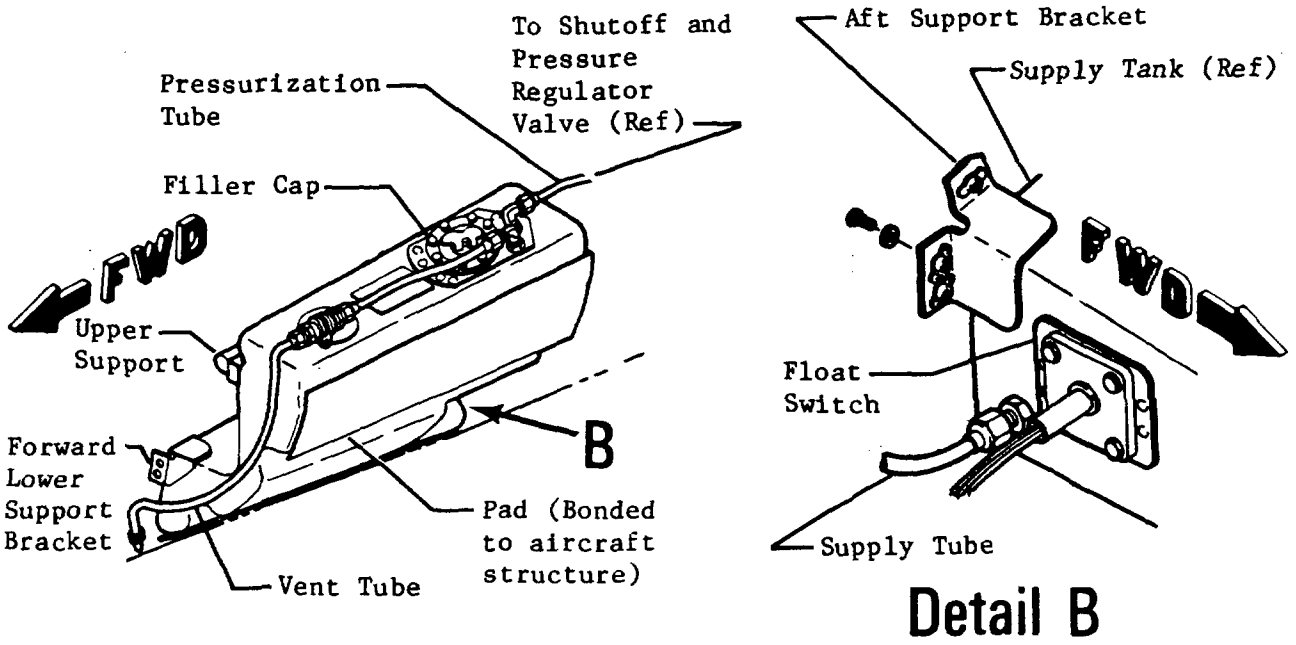
D. Install Tank *(35-107, 35-113 and Subsequent, 36-032 and Subsequent)* (See figure 201.)

   NOTE: Protective foam pads bonded to structure and supports shall be inspected for damage or deterioration and replaced if necessary prior to installation of the alcohol supply tank.

   (1) Position alcohol supply tank in place in nose compartment.
   (2) Install upper and lower supports and secure with attaching parts.
   (3) Remove caps from supply, vent, and pressurization tubes and fittings and connect tubes to tank.
   (4) Connect electrical wiring to float switch.
   (5) Install previously removed avionics equipment.
   (6) Service alcohol supply tank. (Refer to Chapter 12.)
   (7) Install LH nose compartment access door.

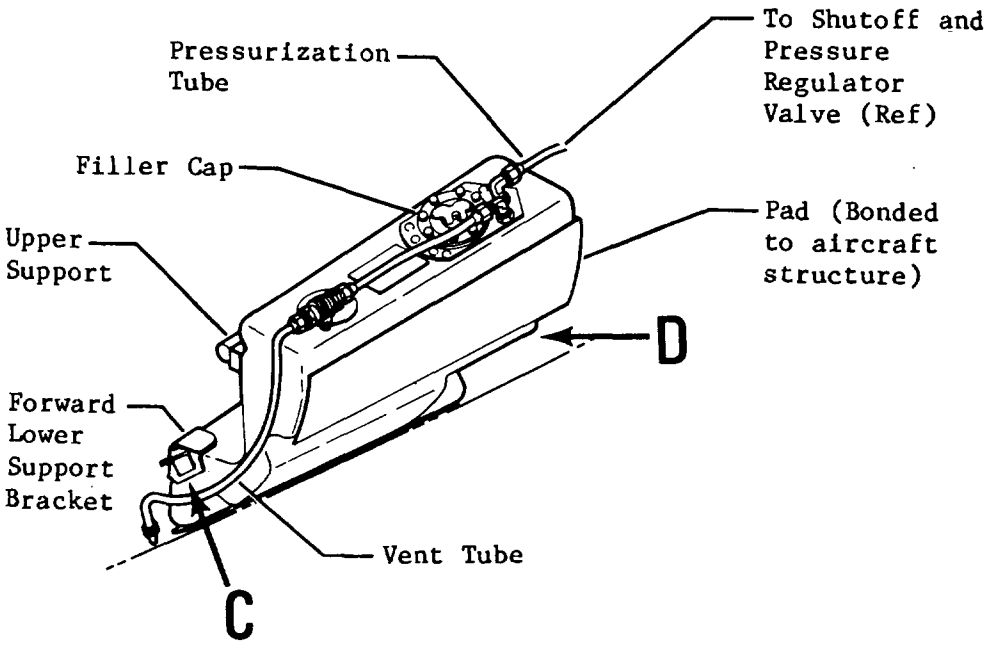


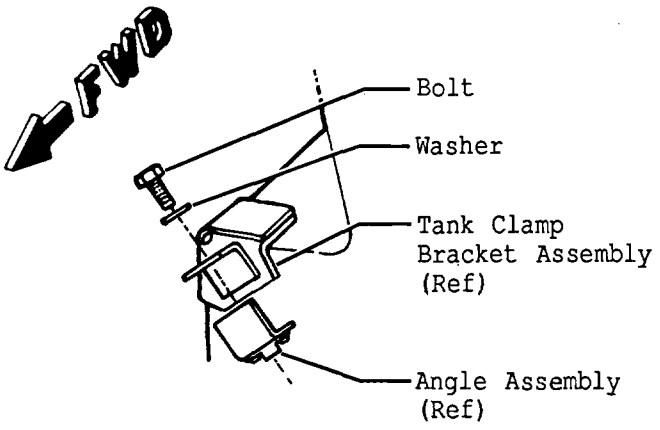
Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031



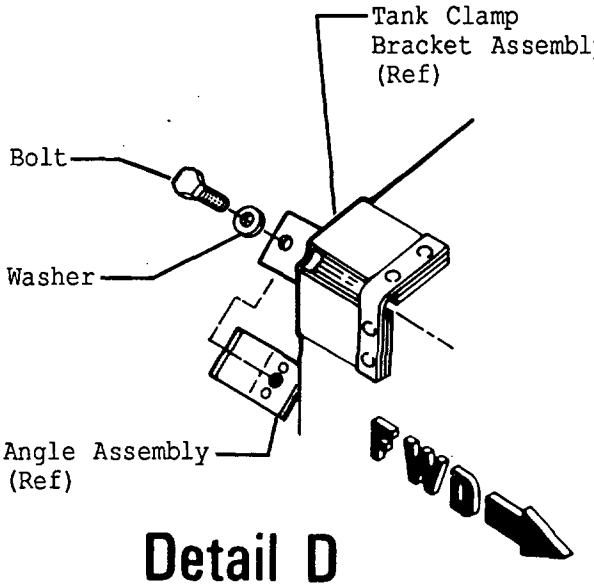
Aircraft 35-107, 35-113 thru 35-580, 35-589 thru 35-615 thru 36-053, 36-055

Alcohol Supply Tank Installation
Figure 201 (Sheet 1 of 2)





Detail C



Detail D

Aircraft 35-581 thru 35-588, 35-616 and Subsequent, 36-054, 36-056 and Subsequent

Alcohol Supply Tank Installation
Figure 201 (Sheet 2 of 2)

13-94C

EFFECTIVITY: NOTED

MM-99

ALCOHOL ANTI-ICE SHUTOFF AND PRESSURE REGULATOR VALVE - MAINTENANCE PRACTICES

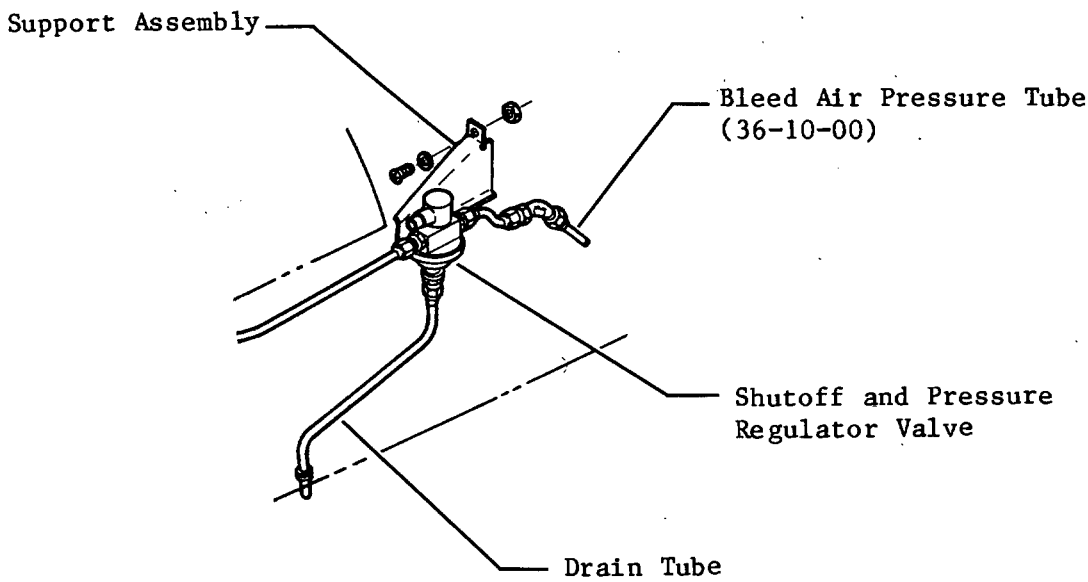
1. **REMOVAL/INSTALLATION**

   A. Remove Shutoff and Pressure Regulator Valve (See figure 201.)

   (1) Remove LH nose compartment access door.
   (2) Remove avionics equipment as required to gain access to pressure regulator installation.
   (3) Disconnect electrical connector from pressure regulator.
   (4) Disconnect tubing from pressure regulator.
   (5) Remove safety wire, attaching parts, and pressure regulator from aircraft.

   B. Install Shutoff and Pressure Regulator Valve (See figure 201.)

   (1) Install pressure regulator valve and secure with attaching parts. Safety wire attaching parts.
   (2) Remove caps from tubing and connect tubing to pressure regulator.
   (3) Connect electrical connector to pressure regulator.
   (4) Install previously removed avionics equipment.
   (5) Perform operational check of pressure regulator. (Refer to Inspection/Check, 30-50-00.)
   (6) Install LH nose compartment access door.



Shutoff and Pressure Regulator Valve Installation
Figure 201

ALCOHOL THREE-WAY SHUTOFF VALVE - MAINTENANCE PRACTICES

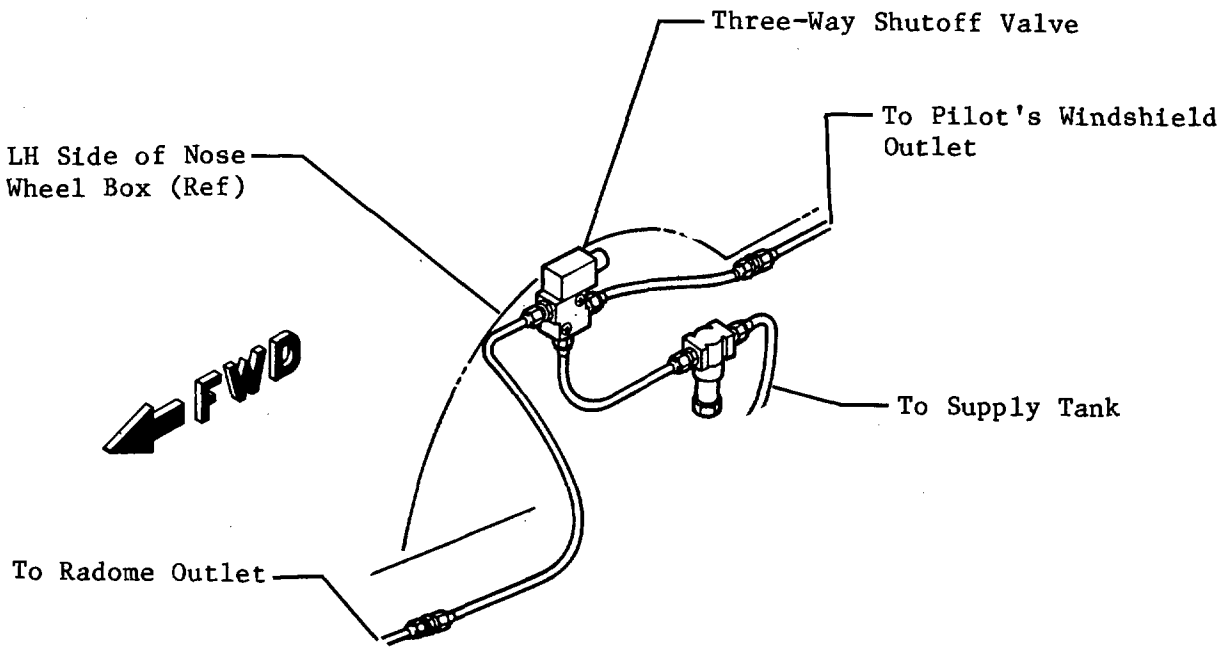
1. REMOVAL/INSTALLATION

A. Remove Three-Way Shutoff Valve (See figure 201.)

(1) Remove LH nose compartment access door.
(2) Disconnect electrical connector from shutoff valve.
(3) Disconnect tubes from shutoff valve. Cap all exposed tubes and fittings.
(4) Remove attaching parts and valve from aircraft.

B. Install Three-Way Shutoff Valve (See figure 201.)

(1) Install valve on nose wheel box and secure with attaching parts. Assure that washers are installed between valve and side of nose wheel box.
(2) Remove caps from tubes and fittings and connect tubes to shutoff valve.
(3) Connect electrical connector to valve.
(4) Perform operational check of Alcohol Anti-Ice System. (Refer to 30-50-00.)
(5) Install LH nose compartment access door.



Three-Way Shutoff Valve Installation
Figure 201

ALCOHOL ANTI-ICE FLOAT SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Float Switch (See figure 201.)
   (1) Remove alcohol supply tank from aircraft. (Refer to 30-50-06.)
   (2) Loosen and remove attaching parts and float switch from tank.

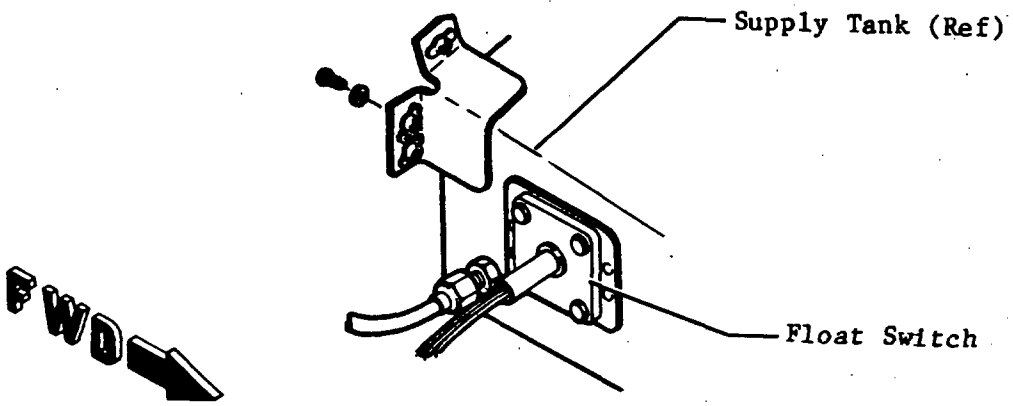
B. Install Float Switch (See figure 201.)
   (1) Check condition of float switch O-ring. Replace if O-ring shows signs of distortion or deterioration.
   (2) Connect electrical wiring to float switch.
   (3) Perform Alcohol Anti-Ice Float Switch Functional Test. (Refer to Adjustment/Test.)
   (4) Install float switch in tank with the word TOP in the up position.
   (5) Secure float switch to tank with attaching parts.

2. ADJUSTMENT/TEST

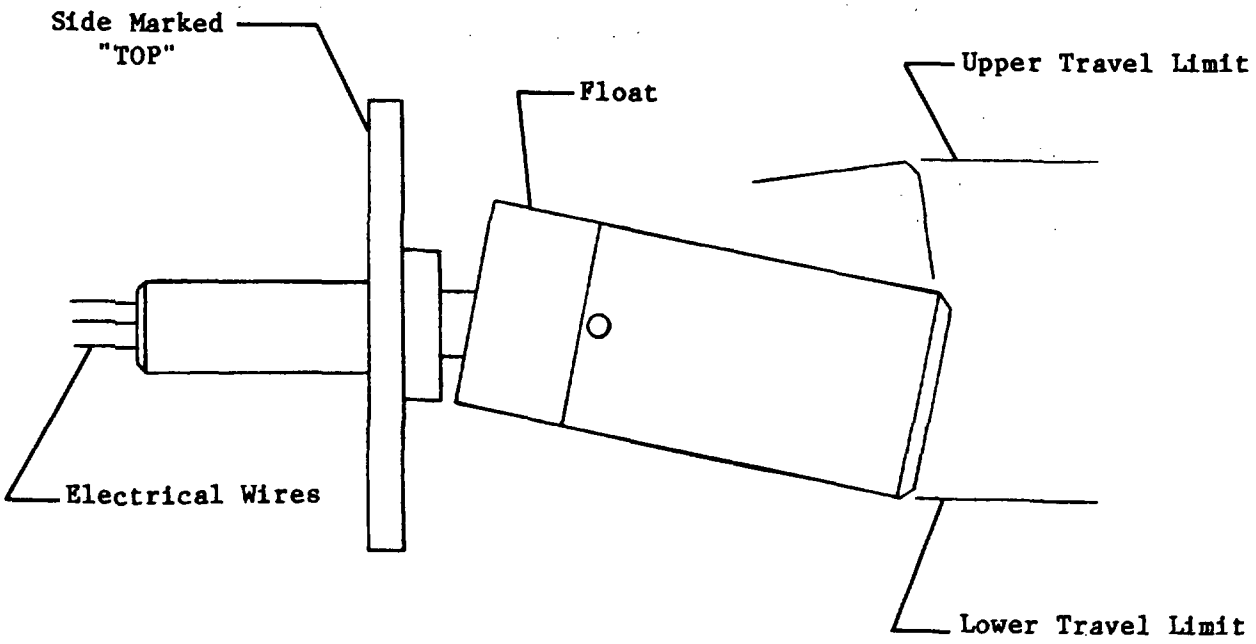
A. Perform Alcohol Anti-Ice Float Switch Functional Test (See figure 202.)
   (1) Remove float switch, with electrical wiring intact, from alcohol tank.
   (2) Move float from lower travel limit to upper travel limit to ensure that float travels freely.
   (3) Set Battery Switches ON.
   (4) With float switch at lower travel limit, the ALC AI annunciator shall illuminate. Raise float to upper limit, ensuring that ALC AI annunciator illuminates and then remains illuminated when float is lowered.

   NOTE:
   - Once energized, a holding circuit keeps the ALC AI annunciator illuminated. This prevents annunciator flickering at low fluid levels. To deenergize the holding circuit, the Battery Switches must be set to OFF or the ALC SYS circuit breaker must be pulled.
   - On *Aircraft 35-524 and Subsequent and 36-054 and Subsequent*, a timer delays illumination of the annunciator for approximately 10 seconds after the tank float switch actuates.

   (5) Holding float at upper limit, set Battery Switches OFF and then ON. The ALC AI annunciator shall not illuminate at upper travel limit.
   (6) Set Battery Switches OFF.
   (7) Install float switch. (Refer to Removal/Installation.)



Alcohol Anti-Ice Float Switch Installation
Figure 201



Alcohol Anti-Ice Float Switch Functional Test Setup
Figure 202

ICE DETECTION SYSTEM - DESCRIPTION AND OPERATION

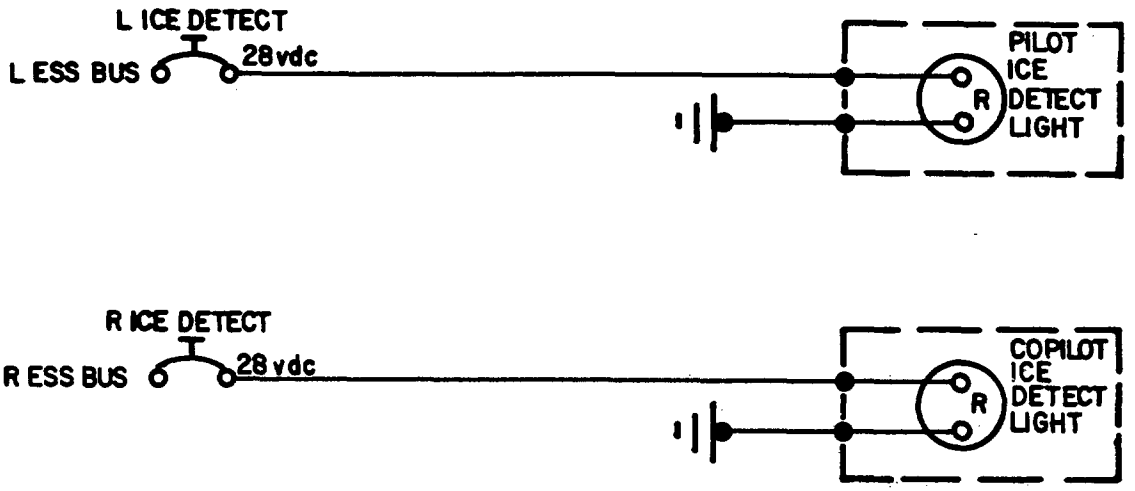
1. DESCRIPTION

A. Ice detection is accomplished by monitoring the wing heat indicator, the stabilizer heat indicator, and the windshield ice detect lights. (Refer to 30-10-01 and 30-10-02 for further information on the temperature indicators.)

B. The windshield ice detection system consists of two red light assemblies mounted on the glareshield and two circuit breakers. The light on the pilot's side is located in an area which is cleared by the windshield defog system. The light on the copilot's side is located in an area outside the windshield defog airflow system. These locations are such that if the windshield defog system is in operation, there will still be an indication available on the copilot's side.

2. OPERATION (See figure 1.)

A. Setting the Battery Switches on applies 28 vdc through individual circuit breakers to its respective light. When particles of ice or moisture form, light refraction takes place, resulting in the appearance of two red areas, approximately 1-1/2 inches in diameter, on the windshield.

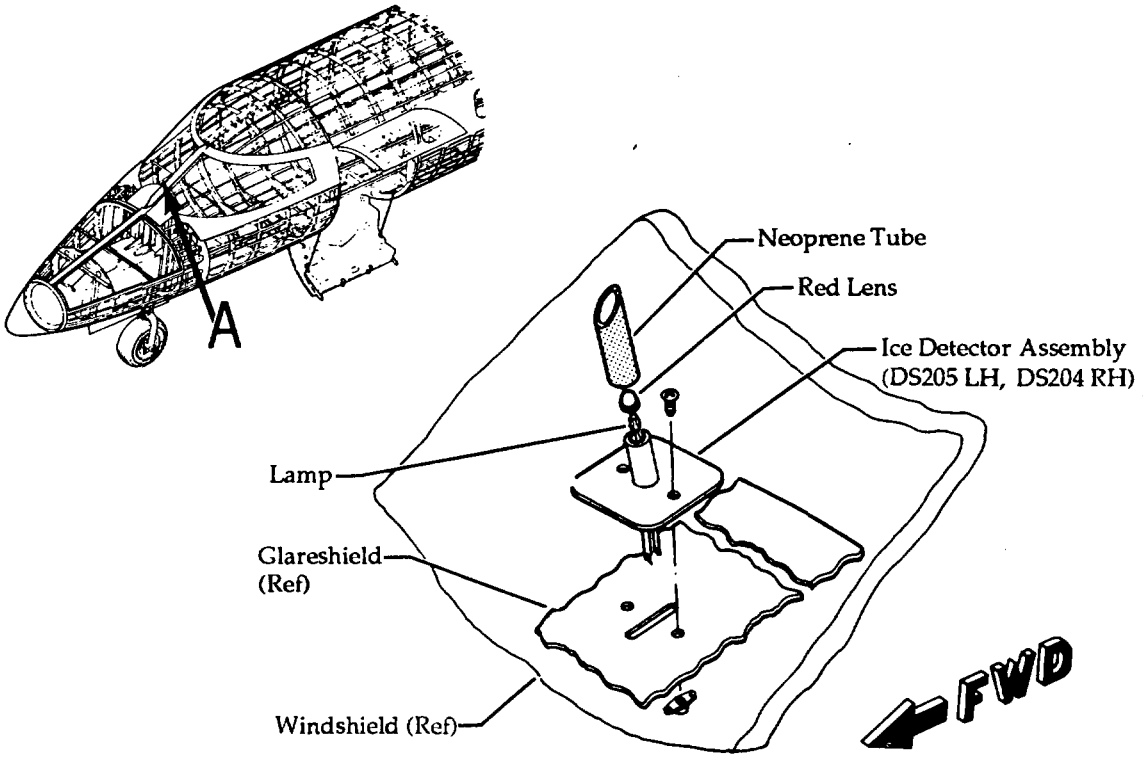


Ice Detection System Electrical Control Schematic
Figure 1

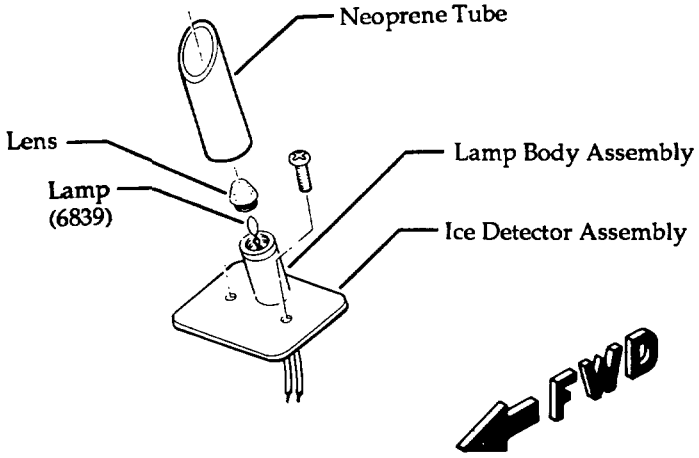
ICE DETECT LIGHT - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Remove Ice Detect Lamp (*Aircraft 35-002 thru 35-662 and 36-002 thru 36-063*) (See figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Slip neoprene tube off ice detector assembly.
      (3) Snap off red lens to expose lamp.
      (4) Extract lamp using a piece of tacky putty.
   B. Install Ice Detect Lamp (*35-002 thru 35-662 and 36-002 thru 36-063*) (See figure 201.)
      (1) Install new lamp (62 Shelly) ensuring that wire leads enter holes in socket.
      (2) Install red lens.
      (3) Replace neoprene tube with bevel facing forward.
      (4) Restore electrical power to aircraft.
      (5) Perform operational test. (Refer Adjustment/Test, this Section.)
      (6) Restore aircraft to normal.
   C. Remove Ice Detect Lamp (*Aircraft 35-663 and Subsequent and 36-064 and Subsequent*) (See figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Slip neoprene tube off ice detector assembly.
      (3) Unscrew lens from lamp body assembly and remove lamp.
   D. Install Ice Detect Lamp (*Aircraft 35-663 and Subsequent and 36-064 and Subsequent*) (See figure 201.)
      (1) Install new lamp (6839) in lamp body assembly.
      (2) Install lens.
      (3) Replace neoprene tube with bevel facing forward.
      (4) Restore electrical power to aircraft.
      (5) Perform operational test. (Refer Adjustment/Test, this Section.)
      (6) Restore aircraft to normal.

2. **Adjustment/Test**
   A. Operational Test of Ice Detect Light
      (1) Ensure aircraft batteries are connected.
      (2) Set Battery Switches on.
      (3) Position a piece of paper between ice detect light and windshield. Two red areas, approximately 1-1/2 inches in diameter shall appear on the paper.
      (4) Remove paper. Two red areas shall disappear.
      (5) Set Battery Switches off.



(Aircraft 35-002 thru 35-662 and 36-002 thru 36-063)



(Aircraft 35-663 and Subsequent and 36-064 and Subsequent)

Detail A

A9-457A

Ice Detection Light Installation
Figure 201