CHAPTER

36

PNEUMATIC

Chapter Section Subject	Page	Date
36-TITLE		
36-Rec. of Temp. Rev.	1	Feb 11/00
* 36-LOEP	1	Jan 12/01
* 36-Contents	1	Jan 12/01
* 36-Contents	2	Jan 12/01
36-00-00	1	Jun 12/87
36-10-00	1	Jun 12/87
36-10-00	2	Jun 12/87
36-10-00	3	Jun 12/87
36-10-00	4	Jun 12/87
36-10-00	5	Nov 17/89
36-10-00	6	Nov 17/89
36-10-00	7	Jun 12/87
36-10-00	8	Jun 12/87
36-10-00	9	Jun 12/87
36-10-00	10	Jun 12/87
36-10-00	11	Jun 12/87
36-10-00	12	Jun 12/87
36-10-00	13	Jun 22/90
36-10-00	14	Jun 22/90
36-10-00	15	Jun 12/87
36-10-00	16	Jun 12/87
36-10-00	17	Jun 12/87
36-10-00	18	Jun 12/87
36-10-00	19	Nov 17/89
36-10-00	20	Nov 17/89
36-10-00	21	Jun 12/87
36-10-00	22	Jun 12/87
36-10-00	101	Nov 17/89
36-10-00	201	Sep 25/92
36-10-00	202	Sep 25/92
36-10-00	203	Sep 25/92
36-10-00	204	Sep 25/92
36-10-00	205	Sep 25/92
36-10-00	206	Sep 25/92
36-10-00	207	Sep 25/92
36-10-00	208	Sep 25/92
36-10-00	209	Sep 25/92
36-10-00	210	Sep 25/92
36-10-01	101	Jun 12/87
36-10-01	102	Jun 12/87
36-10-01	103	Jun 12/87
* 36-10-01	201	Jan 12/01
* 36-10-01	202	Jan 12/01
* 36-10-01	203	Jan 12/01
* 36-10-01	204	Jan 12/01
* 36-10-01	205	Jan 12/01
* 36-10-01	206	Jan 12/01
* 36-10-01	207	Jan 12/01
* 36-10-01	208	Jan 12/01
* 36-10-01	209	Jan 12/01
* 36-10-01	210	Jan 12/01
* 36-10-01	211	Jan 12/01
* 36-10-01	212	Jan 12/01
* 36-10-01	213	Jan 12/01
36-10-02	201	Feb 11/00
36-10-02	202	Feb 11/00
36-10-02	203	Feb 11/00
36-10-02	204	Feb 11/00
36-10-03	201	Jun 12/87
36-10-03	202	Jun 12/87
36-10-03	203	Jun 12/87
36-10-03	204	Jun 12/87
* 36-10-04	201	Jan 12/01
* 36-10-04	202	Jan 12/01
36-15-01	201	Sep 25/92
36-15-01	202	Sep 25/92
36-15-01	203	Sep 25/92
36-20-00	1	Jun 12/87
36-20-00	2	Jun 12/87
36-20-01	201	Feb 11/00
36-20-01	202	Feb 11/00
36-20-01	203	Feb 11/00
36-20-02	201	Jun 12/87
36-20-02	202	Jun 12/87
36-20-03	201	Jun 12/87
36-20-03	202	Jun 12/87
36-20-04	201	Feb 11/00
36-20-04	202	Feb 11/00
36-20-04	203	Feb 11/00

Insert latest revised pages; destroy superseded or deleted pages.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.

Record of Temporary Revisions

Rev. No.	Date Inserted	Date Removed	Page Number	Rev. No.	Date Inserted	Date Removed	Page Number
36-1	Mar 15/76	Apr 30/76 Rev 6	36-10-01 Page 201				
36-2	Aug 30/76	Apr 6/79 Rev 12	36-00-00 Page 4				
36-3	Aug 30/76	Apr 6/79 Rev 12	36-20-02 Page 203				
36-4	Aug 30/76	Mar 24/77 TR #36-8	36-10-00 Page 1				
36-5	Aug 30/76	Apr 6/79 Rev 12	36-20-00 Page 1				
36-6	Mar 24/77	Apr 6/79 Rev 12	36-00-00 Page 4				
36-7	Mar 24/77	Apr 6/79 Rev 12	36-00-00 Page 5				
36-8	Mar 24/77	Nov 1/77 TR #36-10	36-10-00 Page 1				
36-9	Mar 24/77	Apr 6/79 Rev 12	36-10-01 Page 5				
36-10	Nov 1/77	Apr 6/79 Rev 12	36-10-00 Page 1				
36-11	Oct 22/80	Sep 4/81 Rev 24	36-10-01 Page 201				
36-12	Oct 15/99	Feb 11/00 Rev 68	36-20-01 Page 201				

PNEUMATIC - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The pneumatic system provides engine bleed air for nacelle inlet anti-ice, cabin air conditioning and pressurization, windshield anti-ice, wing leading edge anti-ice and horizontal stbilizer leading edge anti-ice.

B. On Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent, the pneumatic system also provides bleed air for operation of the Alcohol Anti-Ice System, and the Temperature Control System and the emergency pressurization valves.

C. Engine bleed air is regulated at the engine by a bleed air shutoff and pressure regulator valve and then is routed through ducting to a central distribution point within the tailcone section of the aircraft.

D. The system consists basically of two independent distribution systems connected to a common distribution point. Each system is controlled by an on-off switch and operation is monitored by an annunciator on the glare-shield.

DISTRIBUTION SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031 have two basically independent bleed air distribution systems connected at a common distribution point. Each system consists of a bleed air shutoff and pressure regulator valve installed on the engine, a bleed air check valve installed in the ducting adjacent to the bleed air manifold, a bleed air manifold (the common distribution point) installed in the tailcone, and a two-position control switch. A modulating valve control and warning box installed on the RH side of the tailcone is shared by both systems' bleed air shutoff and pressure regulator valves.

NOTE: On Aircraft modified per AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve," a pressure regulator is installed in addition to the above components.

B. Aircraft 35-107, 35-113 thru 35-504, 35-506 thru 35-513, and 36-032 thru 36-053 have two basically independent bleed air distribution systems connected at a common distribution point. Each system consists of a bleed air shutoff and pressure regulator valve installed on the engine, a bleed air check valve installed in the ducting adjacent to the bleed air manifold, a bleed air manifold (the common distribution point) installed in the tailcone, a three-position control switch, a modulating valve control box, and an emergency pressurization valve installed adjacent to the check valve. Each system's bleed air shutoff and pressure regulator valve and emergency pressurization valve is controlled by a separate modulating valve control box.

NOTE: On Aircraft modified per AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve," a pressure regulator is installed in addition to the above components.

C. Aircraft 35-505, 35-514 and Subsequent, and 36-054 and Subsequent have two basically independent bleed air distribution systems connected at a common distribution point. Each system consists of a bleed air shutoff and pressure regulator valve installed on the engine, a bleed air check valve installed in the ducting adjacent to the bleed air manifold, a bleed air manifold (the common distribution point) installed in the tailcone, a three-position control switch, a modulating valve control box, and an emergency pressurization valve installed adjacent to the check valve. Each system's bleed air shutoff and pressure regulator valve and emergency pressurization valve is controlled by a separate modulating valve control box. Each bleed air shutoff and pressure regulator valve is provided a regulated pressure source from the temperature control system pressure regulator (Chapter 21) installed in the tailcone.

D. Bleed air heat is utilized as anti-icing for nacelle inlets, wing, and horizontal stabilizer and as anti-icing and rain removal for windshields. (Refer to Chapter 30.)

E. Bleed air is utilized for normal and emergency cabin pressurization, and air conditioning. (Refer to Chapter 21.)

F. On aircraft equipped with Aeronca thrust reversers, bleed air is utilized to drive the thrust reverser actuator motors. (Refer to Chapter 78.)

G. **Component Description**

(1) On Aircraft 35-002 thru 35-063 and 36-002 thru 36-017 not modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," the bleed air shutoff and pressure regulator valve is basically a primary pressure regulator integral with a combination secondary pressure regulator and shutoff valve. The primary pressure regulator is pneumatically actuated, normally closed, balanced-poppet-type with an ejector mixing chamber flow control. The secondary pressure regulator, a butterfly-type shutoff valve, is also pneumatically operated and controlled by an electrically actuated solenoid.

(2) On Aircraft 35-064 thru 35-504, 35-506 thru 35-513 and 36-018 thru 36-053 not modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," the bleed air shutoff and pressure regulator valve is basically a combination primary pressure regulator and secondary pressure regulator, and shutoff valve. Each section is controlled by an integral shutoff solenoid. The primary pressure regulator is a pneumatically actuated, normally-closed valve with a solenoid shutoff and bleed off regulator. The regulator provides (14.5 to 17.0 psi) bleed air flow to pneumatically open the primary portion of the valve allowing high pressure (N_2) through the valve to the bleed air system. The use of an ejector nozzle creates a differential pressure on the low pressure stage check valve, allowing low pressure air to augment the flow of high pressure air at high power settings.

(3) On Aircraft 35-505, 35-514 and Subsequent, 36-054 and Subsequent and prior aircraft modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," the bleed air shutoff and pressure regulator valve is basically a combination primary pressure regulator and secondary pressure regulator and shutoff valve. Each section is controlled by an integral shutoff solenoid. The primary pressure regulator is a pneumatically actuated, normally closed valve with a solenoid shutoff. The temperature control system pressure regulator in the tailcone (refer to Chapter 21) provides (14 to 17 psi) air flow to pneumatically open the primary portion of the valve, allowing high pressure (N_2) through the valve to the bleed air system. The use of an ejector nozzle creates a differential pressure on the low pressure stage check valve, allowing low pressure air to augment the flow of high pressure air at high power settings.

(4) Bleed air pressure is regulated to a primary (high stage) (N_2) pressure of 27.0 to 34.0 psig by the flow mixing poppet valve, and to a secondary (low stage) (N_1) pressure of 35.0 (±1.0) psig (at approximately 70% N_1) by the secondary pressure shutoff butterfly valve.

(5) On Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031, the bleed air check valve is riveted into the bleed air inlet ports of the bleed air manifold assembly. The check valve is a flapper-type valve allowing air flow in one direction and closes with air flow applied in the opposite direction.

(6) On Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent, the bleed air check valve is installed between the emergency pressurization valve and the bleed air manifold assembly. The check valve is a spring-loaded, flapper-type valve allowing air flow in one direction and closes with air flow applied in the opposite direction.

2. OPERATION

A. On Aircraft 35-002 thru 35-106, 35-108 thru 35-112 and 36-002 thru 36-031, with the BLEED AIR Switches set to ON, the bleed air shutoff and pressure regulator valves (one on each engine) are opened and engine bleed air (regulated to 35.0 [±2.5] psig) is applied through ducting to the bleed air manifold within the tailcone. From the bleed air manifold, bleed air is distributed to the using systems. Thermal switches and pressure switches provide bleed air indication by illuminating either BLEED AIR (red) annunciator installed in the glareshield assembly. (Refer to 36-20-00.)

B. On Aircraft 35-107, 35-113 thru 35-513, except 35-505, and 36-032 thru 36-053, with the BLEED AIR Switches set to ON, the bleed air shutoff and pressure regulator valves (one for each engine) are opened and engine bleed air (regulated at 35.0 [±2.5] psig) is applied through ducting to the bleed air manifold within the tailcone. From the bleed air manifold, bleed air is distributed to the using systems. Two emergency pressurization valves (one for each engine) are installed in the bleed air ducting between the pylon firewall and the bleed air manifold. In their normal operating position, bleed air is directed to the bleed air manifold. Under emergency pressurization conditions (Refer to Chapter 21), bleed air is routed directly into the cabin area, and bleed air for wing, stabilizer and windshield anti-icing systems are not available. Thermal switches provide bleed air indication by illuminating either BLEED AIR (red) annunciator installed in the glareshield assembly. (Refer to 36-20-00.)

C. On Aircraft 35-505, 35-514 and Subsequent, 36-054 and Subsequent, with the Bleed Air Switches set to ON, the bleed air shutoff and pressure regulator valves (one for each engine) are opened and engine bleed air (regulated at 35.0 [±2.5] psig) is applied through ducting to the bleed air manifold within the tailcone. From the bleed air manifold, bleed air is distributed to the using systems. Two emergency pressurization valves (one for each engine) are installed in the bleed air ducting between the pylon firewall and the bleed air manifold. In their normal operation position, bleed air is directed to the bleed air manifold. Under emergency pressurization conditions (Refer to Chapter 21), bleed air is routed directly into the cabin area, and bleed air for wing, stabilizer and windshield anti-icing systems are not available. Thermal switches provide bleed air indication

by illuminating either BLEED AIR (red) annunciator installed in the glare-shield assembly. (Refer to 36-20-00.)

D. Check valves are installed in the ducting to prevent loss of bleed air during single-engine operation.

E. **Component Operation**

(1) **Bleed Air Shutoff and Pressure Regulator Valve** (Aircraft 35-002 thru 35-063 and 36-002 thru 36-017 not modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement") (See figure 3.)

(a) At engine start, initial pressurization of the engine's high pressure stage causes the flow mixing poppet reference chamber "E" pressure to increase. This increased pressure overcomes reference chamber "E" spring pressure and allows the poppet to open. As the high pressure stage bleed air flows into the flow mixing chamber is passes through an ejector nozzle. This creates a differential pressure on the low pressure stage check valve. The check valve will open and admit engine low stage pressure to the flow mixing chamber.

(b) The reference regulator, set to maintain a predetermined pressure in the flow mixing poppet reference chamber "E," senses the pressure increase from the high stage port to the mixing chamber. When downstream pressure reaches approximately 27.5 (±2.0) psig, this pressure overcomes the flow mixing poppet reference chamber "E" pressure and moves the flow mixing poppet to close. This allows the low stage port to supply the bleed air requirements at higher power settings (approximately 70% N_1) and below approximately 28,000 feet altitude.

(c) After engine start, with Bleed Air Switches set to BLEED AIR, the secondary pressure regulator is deenergized (opened). As downstream pressure continues to increase, pressure is admitted through a ball type check valve to the closing chamber and through the shutoff solenoid and an orifice to the opening side of the secondary pressure regulator. Pressure in both chambers will increase to the predetermined value of the bleed off regulators. These regulators act to stabilize pressure at 35.0 (±2.5) psig. During closing of the shutoff and pressure regulator valve, the shutoff solenoid is energized. This opens a path, allowing regulated pressure to flow to the closing chamber of the pressure regulator. At the same time the path to the opening chamber of the pressure regulator is closed, the butterfly valve in the shutoff and pressure regulator valve also closes.

(d) As the temperature rises downstream, increased thermal expansion takes place within the reference regulator. At approximately 375°F, thermal expansion is sufficient to open the high stage sense line to ambient, thus regulating the temperature of the bleed air.

(2) **Bleed Air Shutoff and Pressure Regulator Valve** (Aircraft 35-064 and Subsequent and 36-018 and Subsequent) (See figure 3.)

(a) At engine start with the bleed Air Switches set to BLEED AIR (solenoid A energized), pressurization of the high and low stages will cause the flow mixing poppet to move to the full open position, thereby allowing flow initially from the high stage port and then also from the low stage port when pressure increases sufficiently. On Aircraft 35-064 thru 35-504, 35-506 thru 35-513, and 36-018 thru 36-053 not modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," bleed off regulator No. 3 controls the reference pressure to chamber "E." On Aircraft 35-505, 35-514 and Subsequent, and 36-054 and Subsequent and prior aircraft modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," the temperature control system pressure regulator in the tailcone (Refer to Chapter 21) controls the reference pressure to chamber "E." The downstream pressure is sensed on the poppet, forcing it toward the closed position. The reference pressure in chamber "E" modulates the poppet position to maintain regulated downstream pressure sensed at the secondary inlet test port.

(b) If the low stage pressure exceeds the pressure regulated by the flow mixing poppet, the poppet will go closed. Downstream pressure can increase to the maximum of 35.0 (±1.0) psi available from the low stage. If the low stage pressure decreases below the value regulated by the flow mixing poppet, the mixing poppet opens to supplement the flow with high stage bleed air. If the low stage pressure decreases further, the check valve will close to prevent reverse flow and the entire bleed air will be supplied by the high stage port.

(c) When the Bleed Air Switches are set to OFF (solenoid "A" de-energized closed), the reference pressure to chamber "E" is shut off. The pressure in chamber "E" then bleeds off to ambient thru the deenergized solenoid "A." The flow mixing poppet closes and all bleed air flow comes from the low stage port.

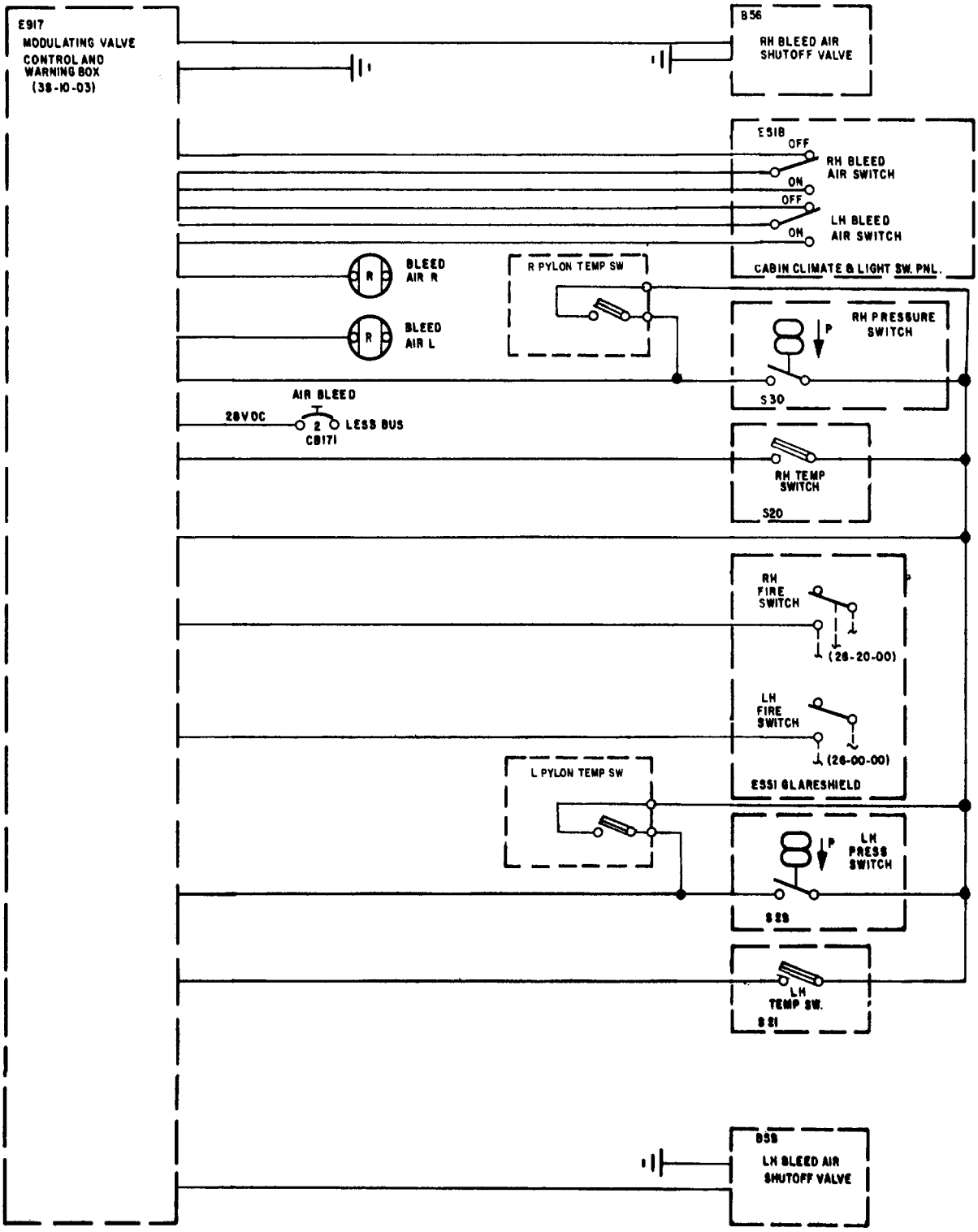
(d) When the Bleed Air Switches are set to BLEED AIR, solenoid B is deenergized, the secondary outlet admits air pressure thru a filter and a ball check valve, and into chamber D and bleed off regulator No. 2. The air then passes through solenoid "B," bleed off regulator No. 1, and into chamber "C." As downstream pressure reaches the high tolerance of the regulation band, the increased force it exerts in chamber "D" will move the secondary pressure shutoff butterfly valve toward the closed position, thus reducing the downstream regulated pressure. If the downstream pressure is low, the valve is moved toward the open position by the combination of the opening spring and regulated pressure in chamber "C."

(e) When the Bleed Air Switches are set to OFF, solenoid "B" is energized (open), secondary inlet air pressure passes through solenoid "B," bleed air regulator No. 2, and into chamber "D." Chamber "C" pressure is allowed to bleed to ambient through an orifice. This causes the secondary pressure shutoff valve to close. The secondary pressure shutoff valve functions this way irrespective of whether solenoid "A" is energized or deenergized.

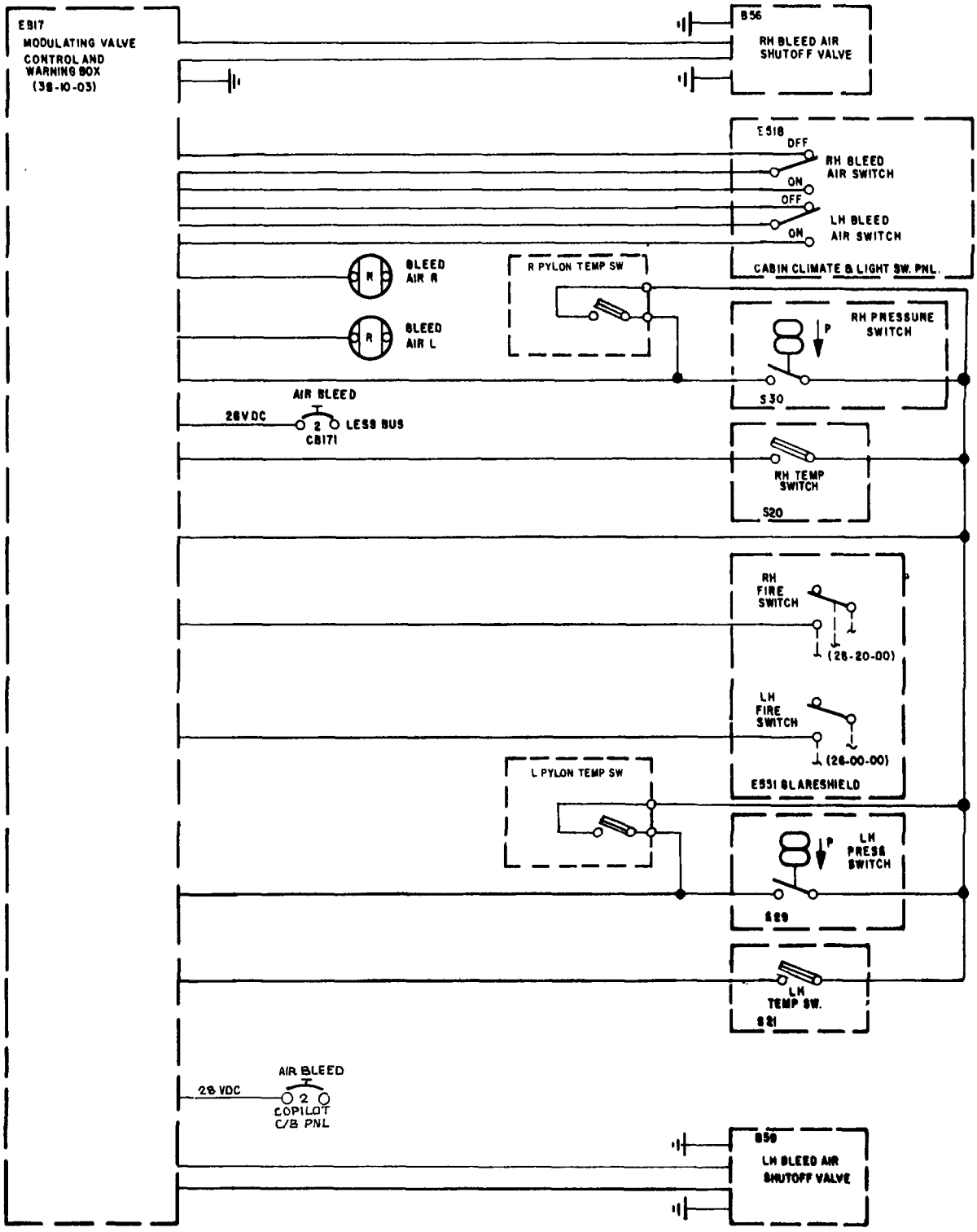
(f) All bleed off regulators are provided to limit chamber pressures to required values.

(g) On Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent, when the Bleed Air Switches are set to EMER or if the pressurization aneroid switch has opened, solenoid "A" and solenoid "B" will be deenergized. Bleed air pressure from the high stage port (high temperature) is blocked when solenoid "A" is deenergized. This allows the low stage (low temperature) bleed air to be utilized for emergency pressurization. When solenoid "B" is deenergized, the secondary pressure regulator is opened. The pressurization aneroid switches also control the emergency pressurization 3-way valves. (Refer to Chapter 21.)

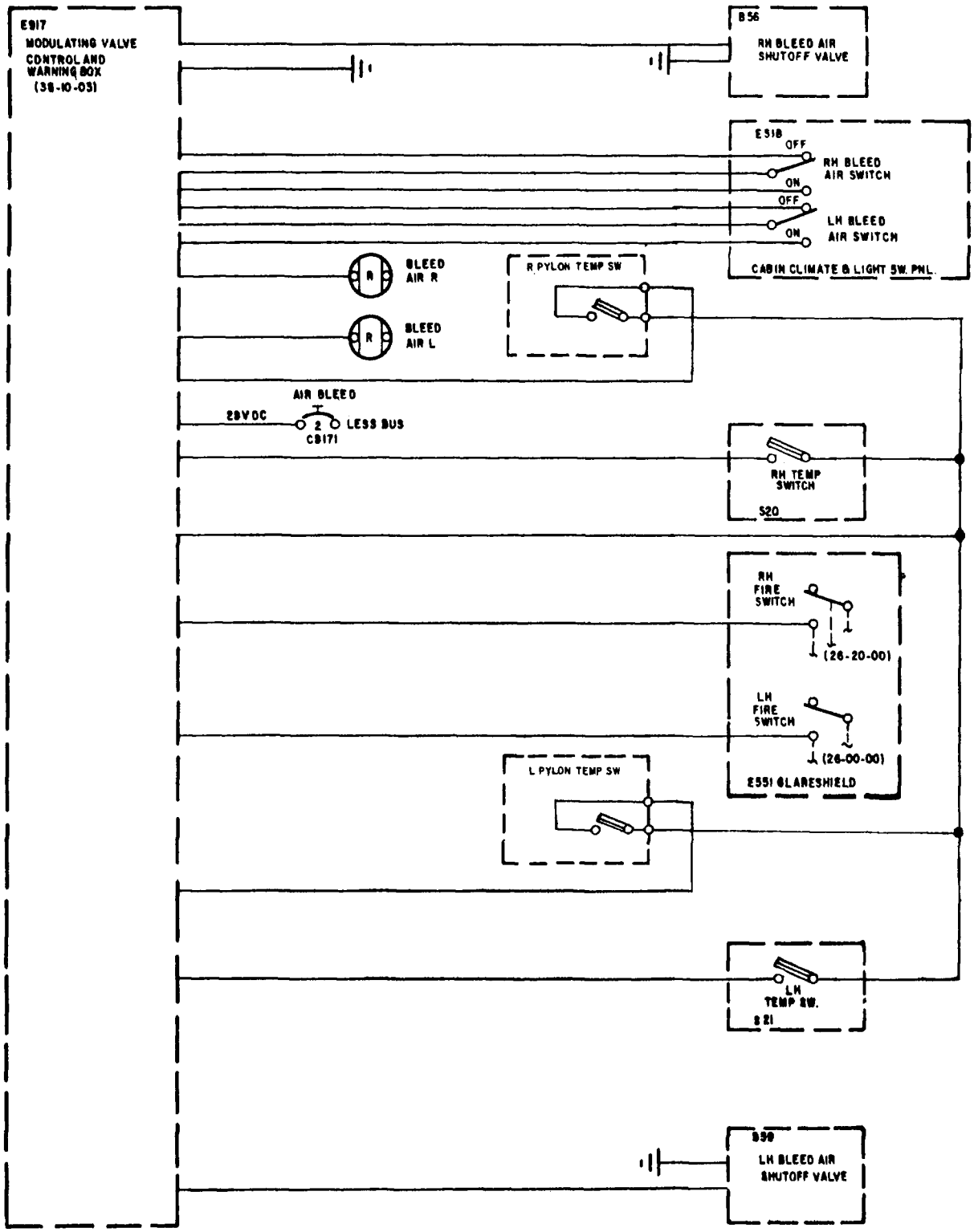
(h) When the FIRE tee-handle is pulled, a 28 vdc circuit is completed through the modulating valve control box to the shutoff solenoid on the bleed air shutoff and pressure regulator valve. When the shutoff solenoid is energized, the valve closes and bleed air from the applicable engine stops.



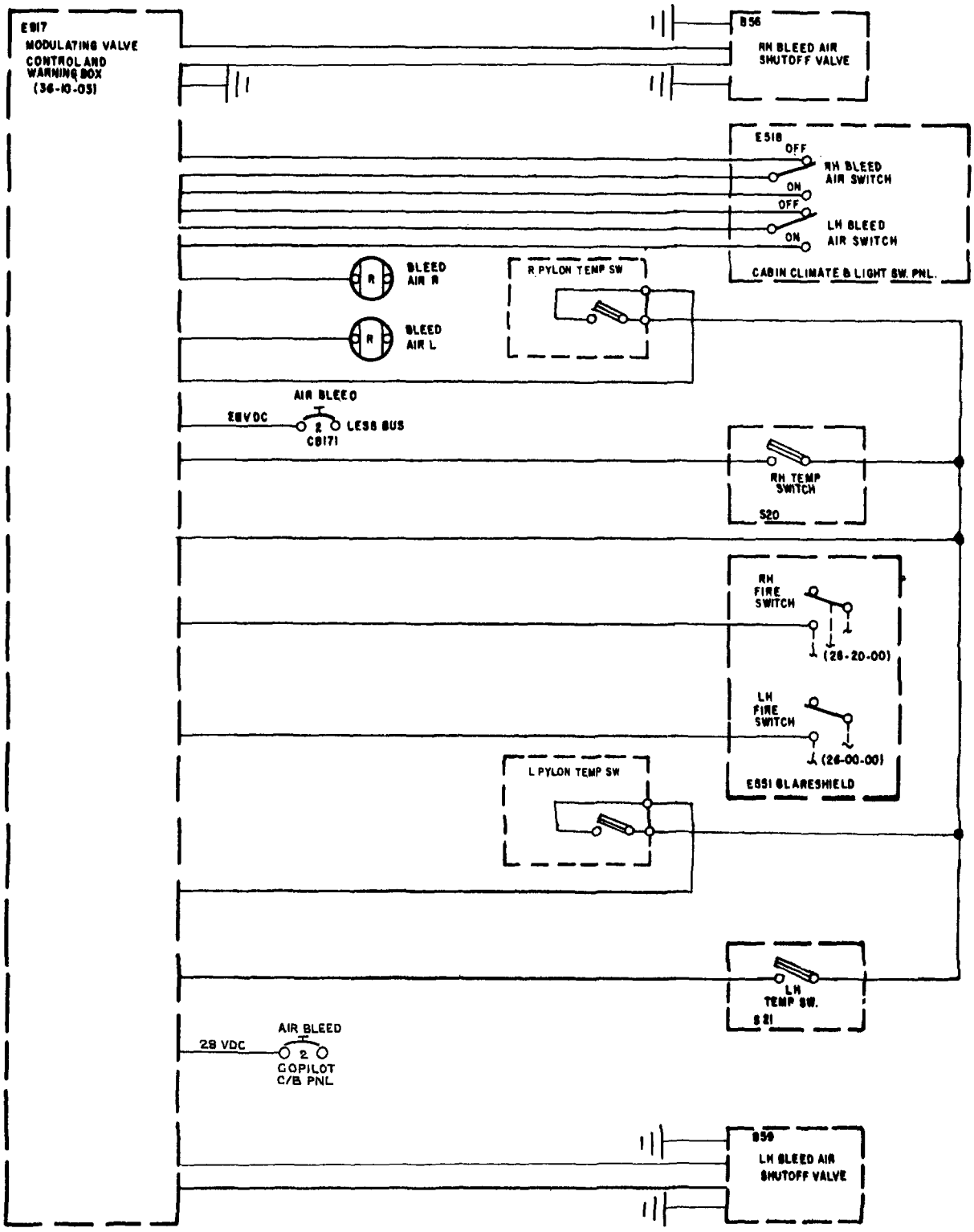
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 1 of 8)



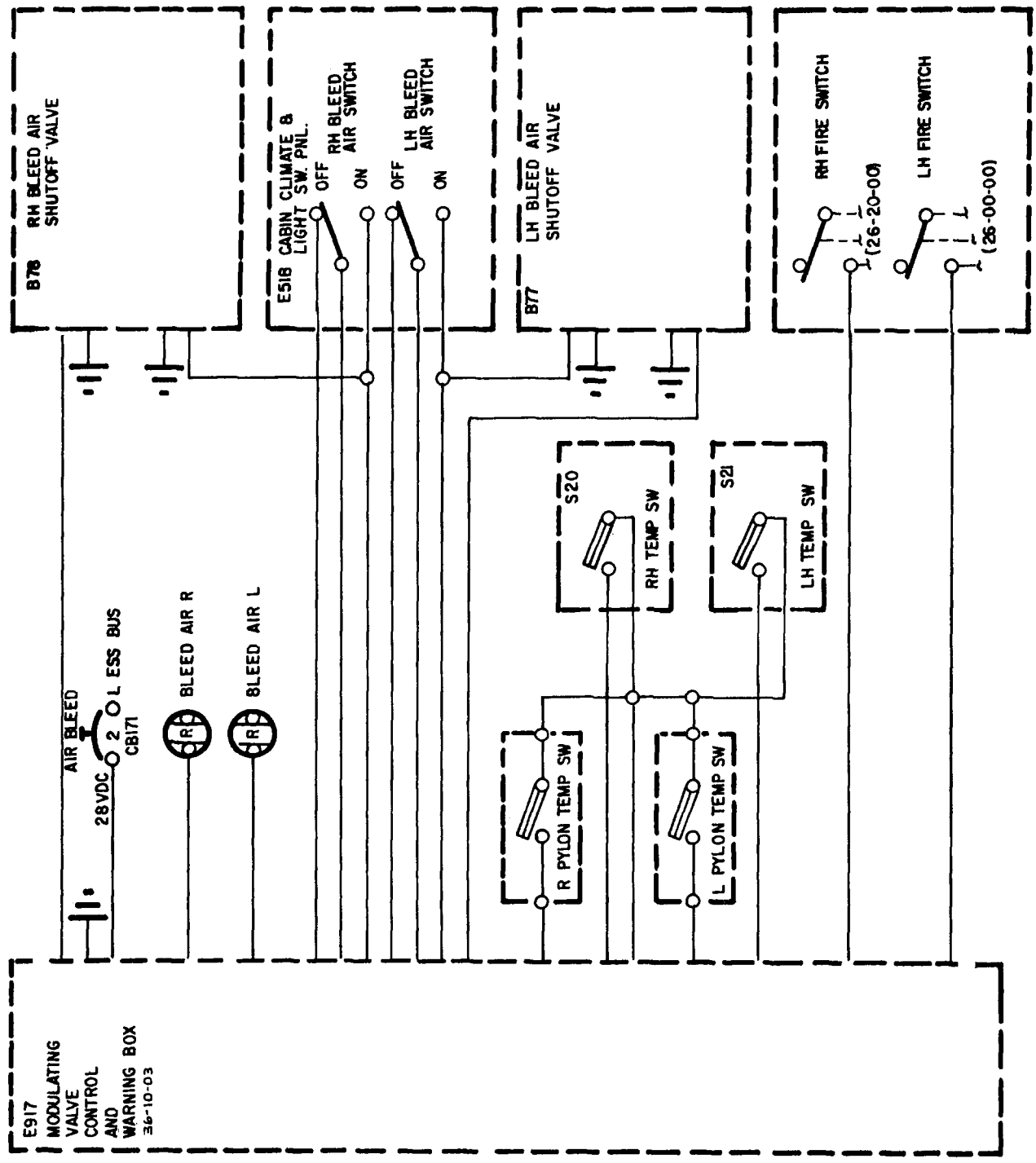
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 2 of 8)



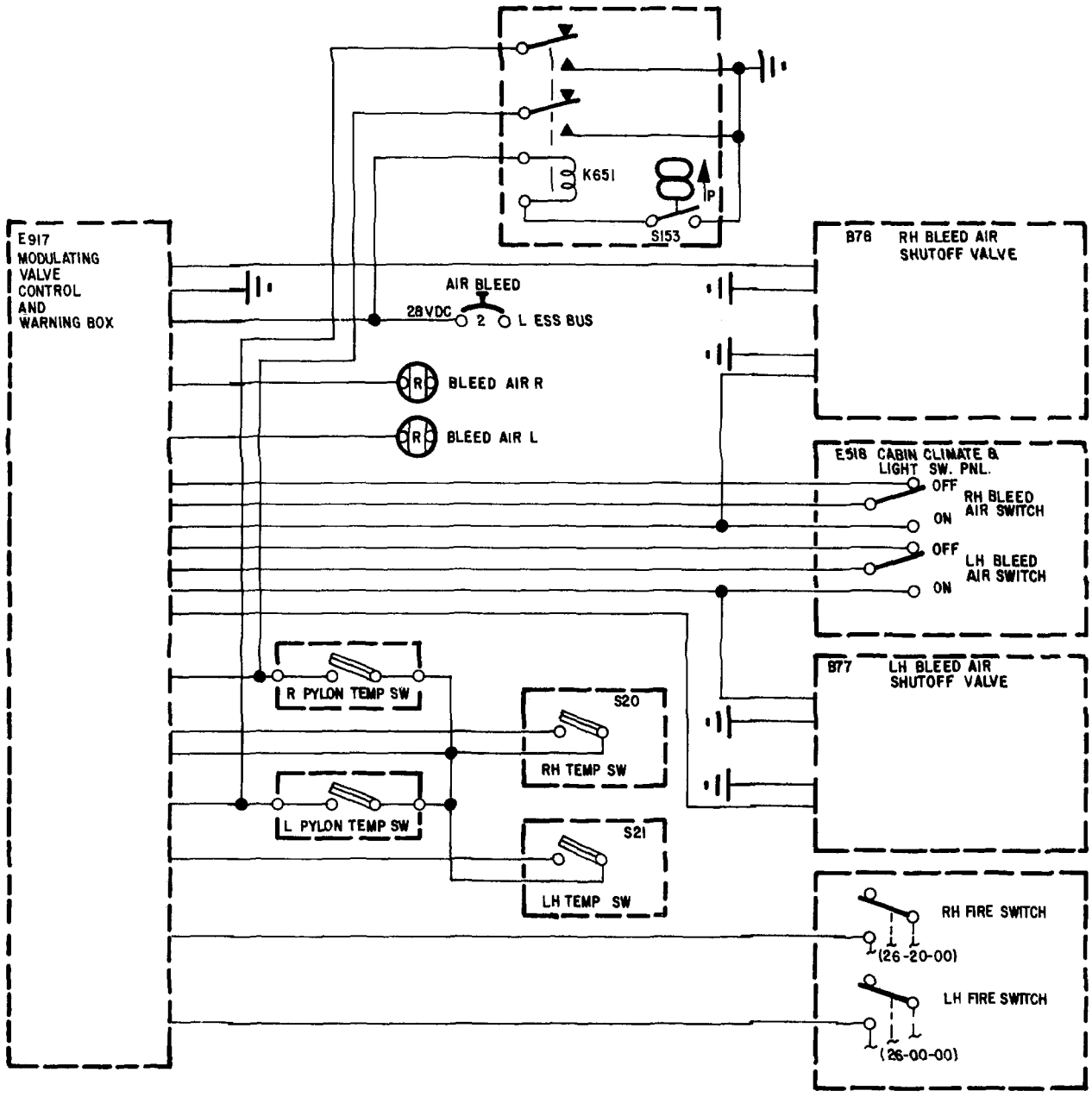
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 3 of 8)



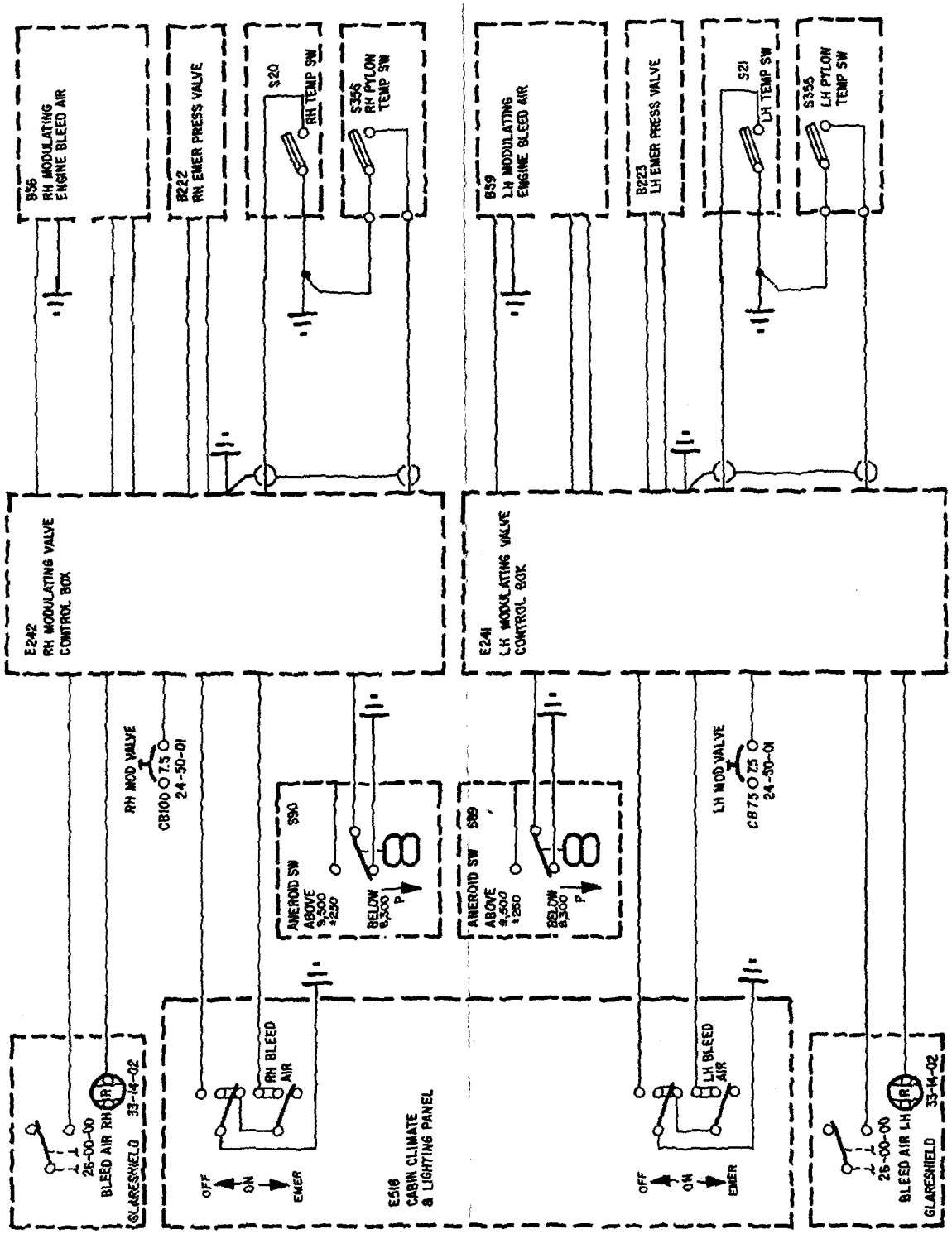
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 4 of 8)



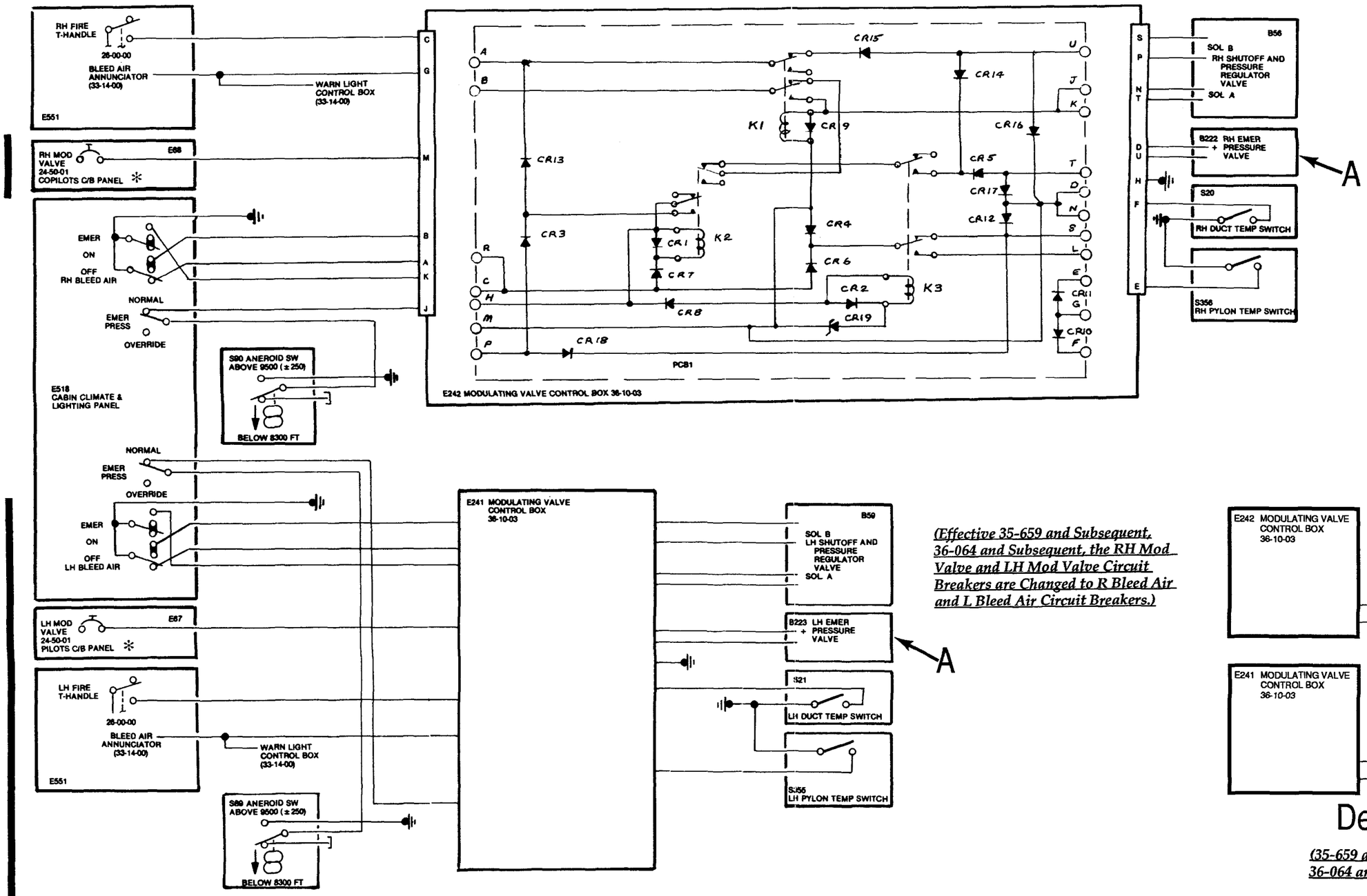
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 5 of 8)



Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 6 of 8)

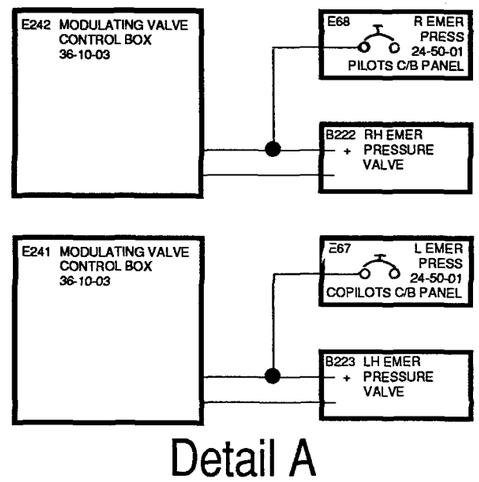


Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 7 of 8)



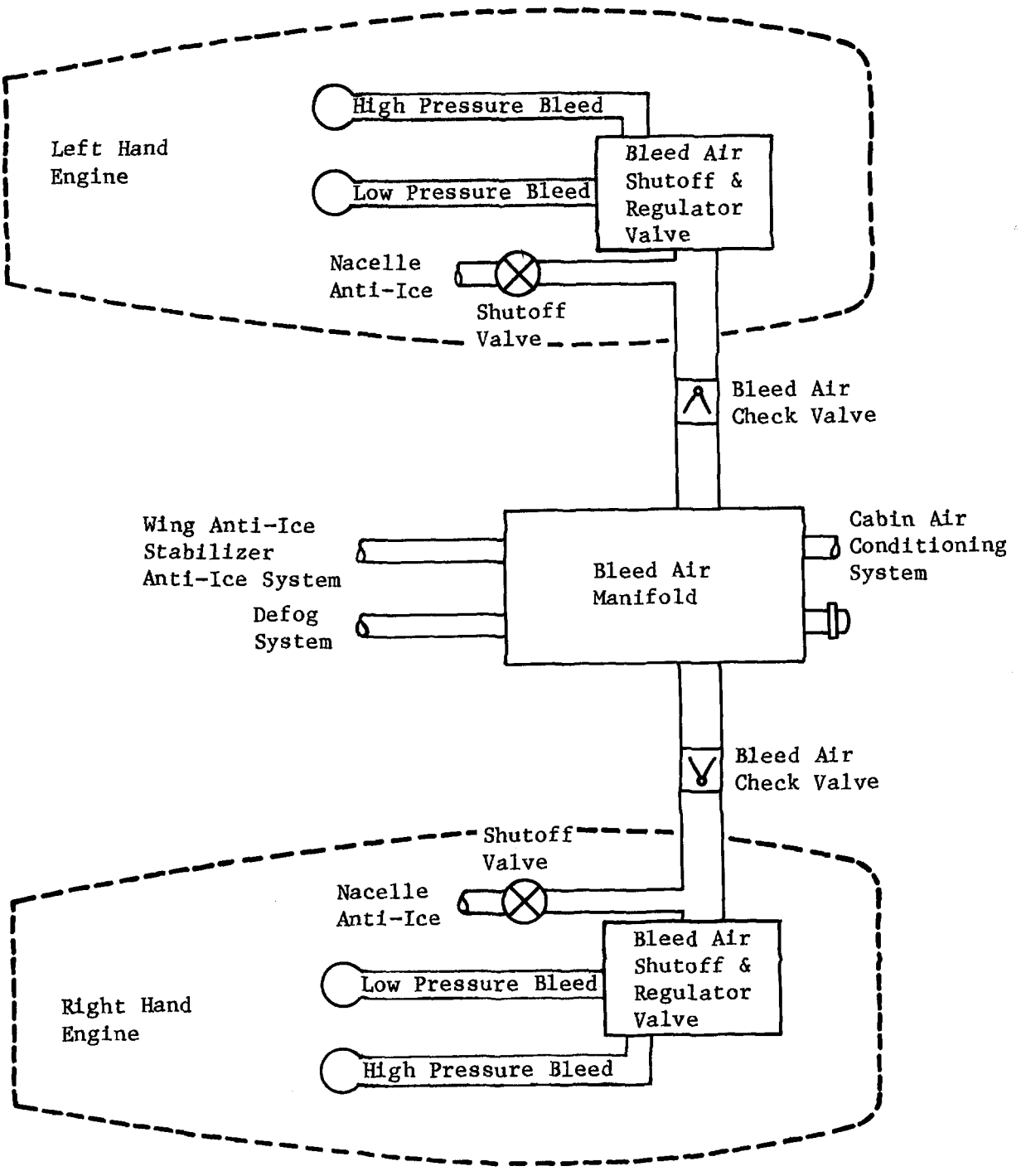
Pneumatic System Electrical Control Schematic
Figure 1 (Sheet 8 of 8)

(Effective 35-659 and Subsequent, 36-064 and Subsequent, the RH Mod Valve and LH Mod Valve Circuit Breakers are Changed to R Bleed Air and L Bleed Air Circuit Breakers.)

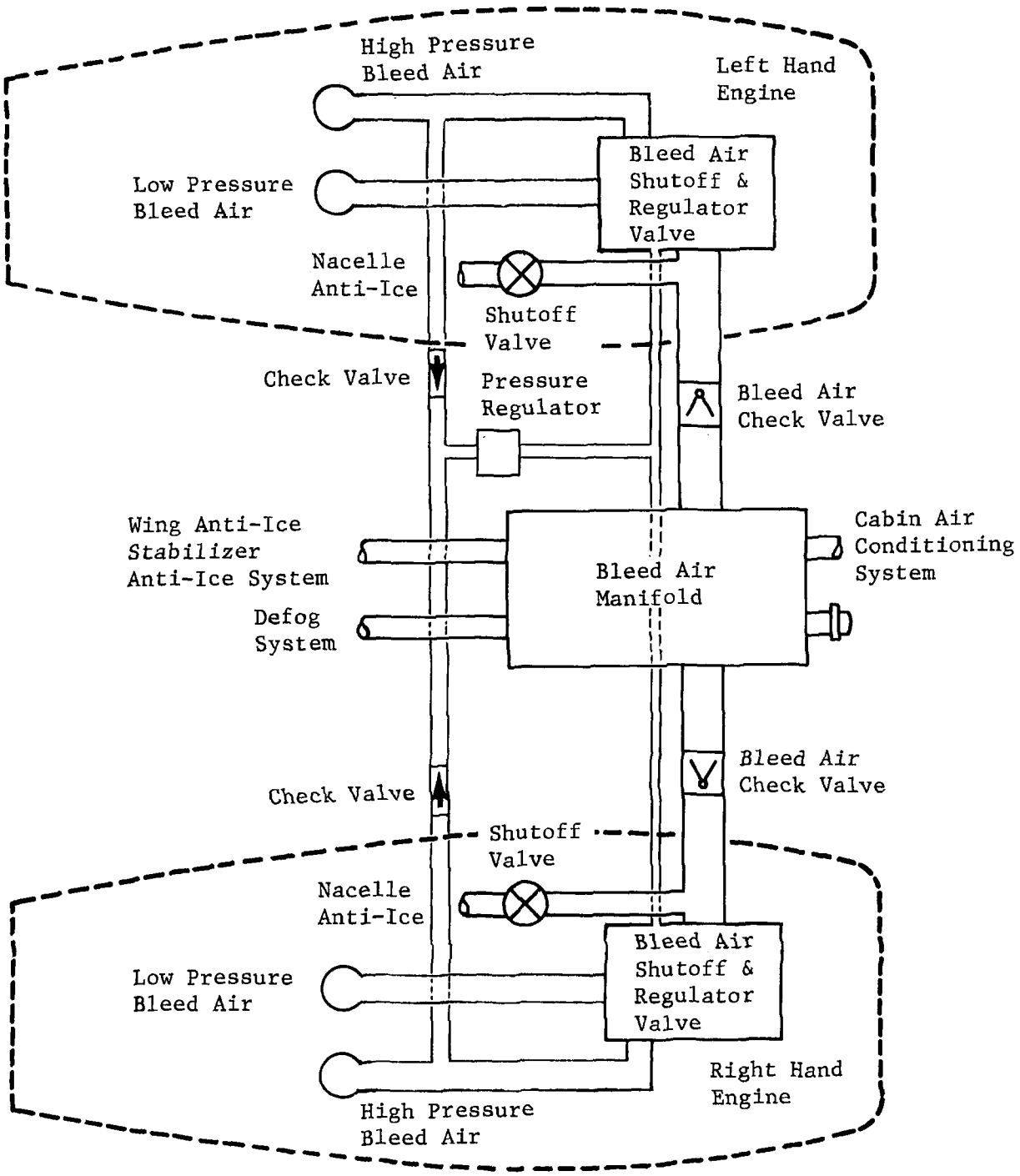


Detail A

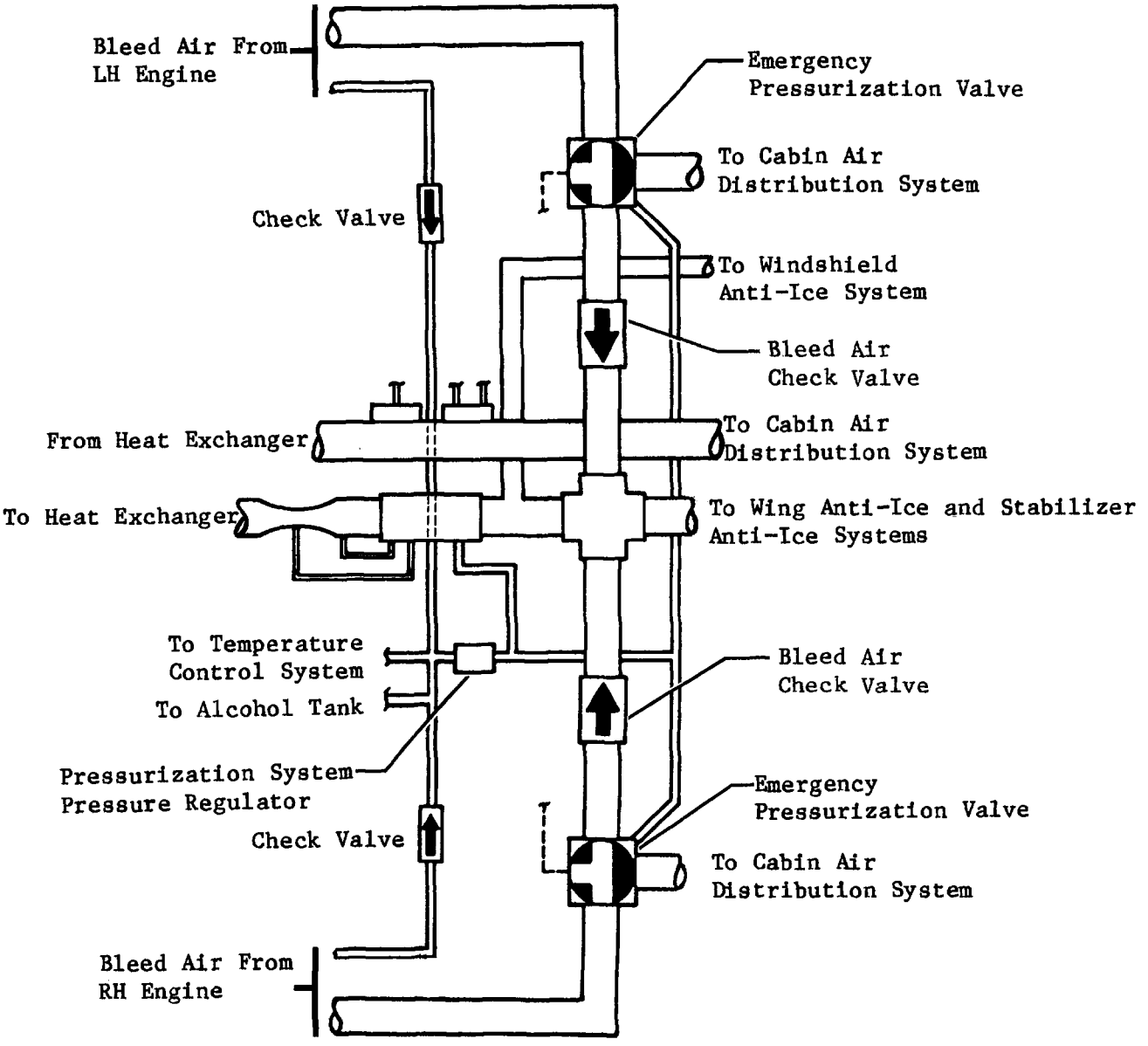
(35-659 and Subsequent 36-064 and Subsequent)



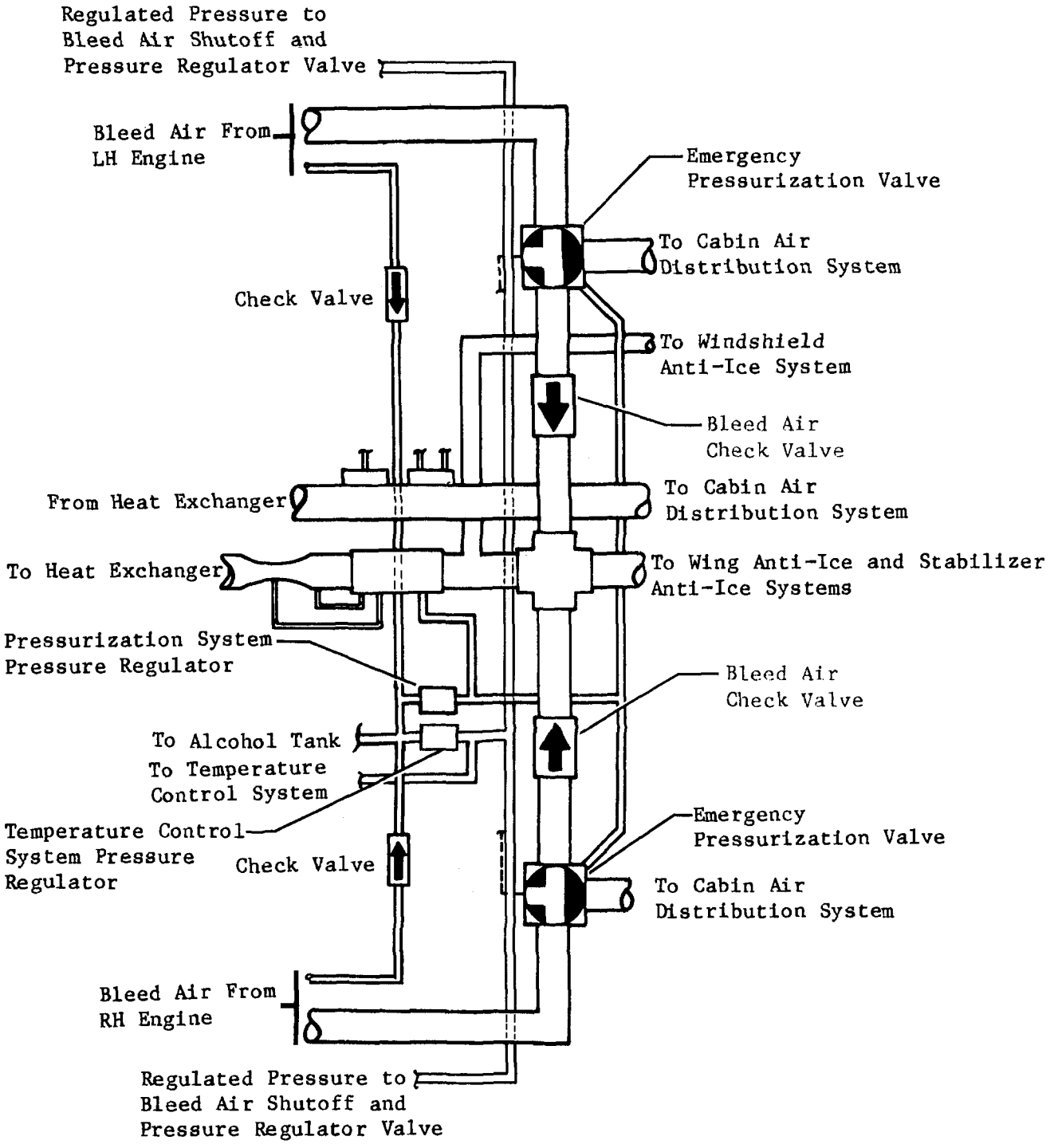
Pneumatic System Schematic
Figure 2 (Sheet 1 of 5)



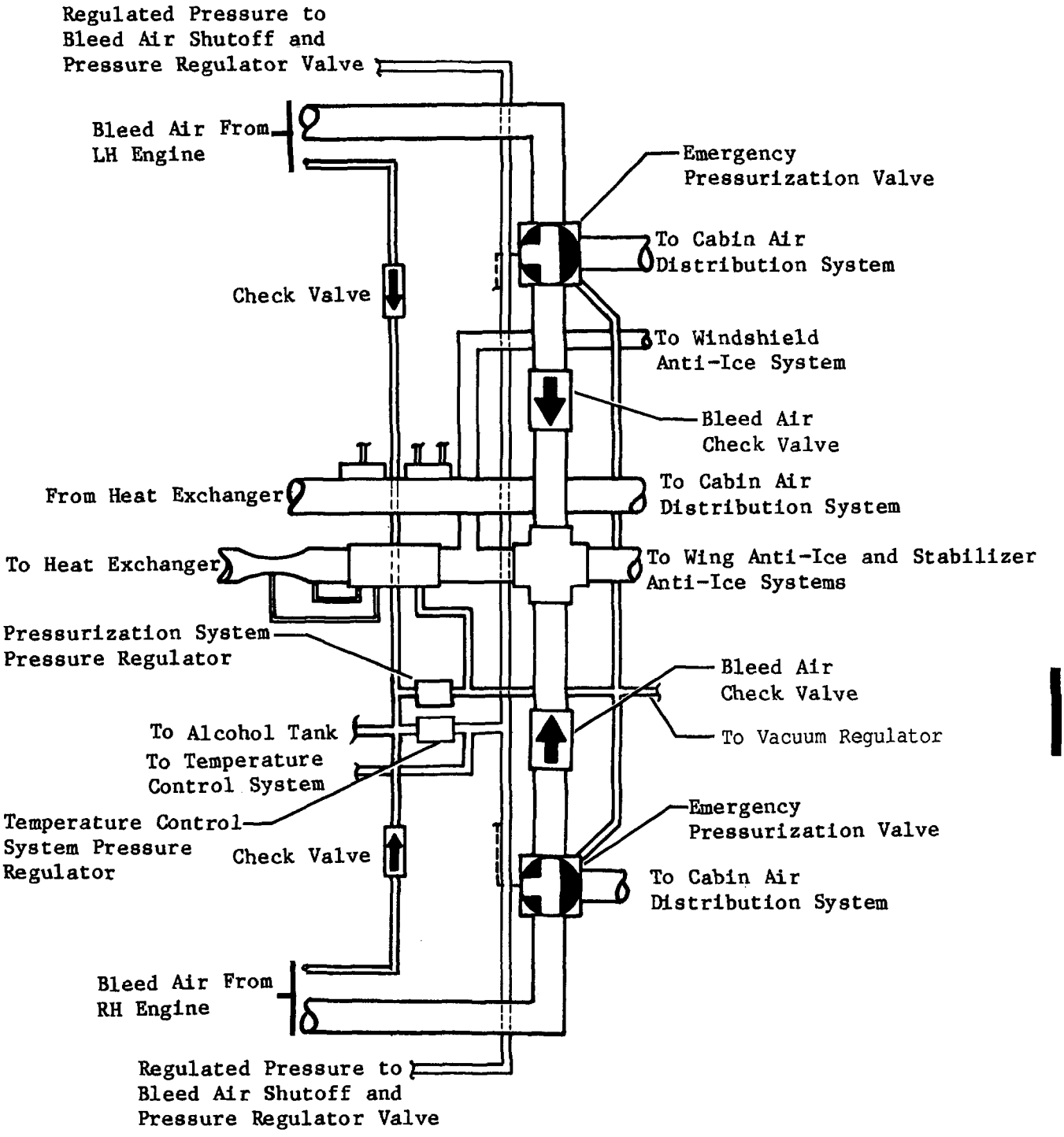
Pneumatic System Schematic
Figure 2 (Sheet 2 of 5)



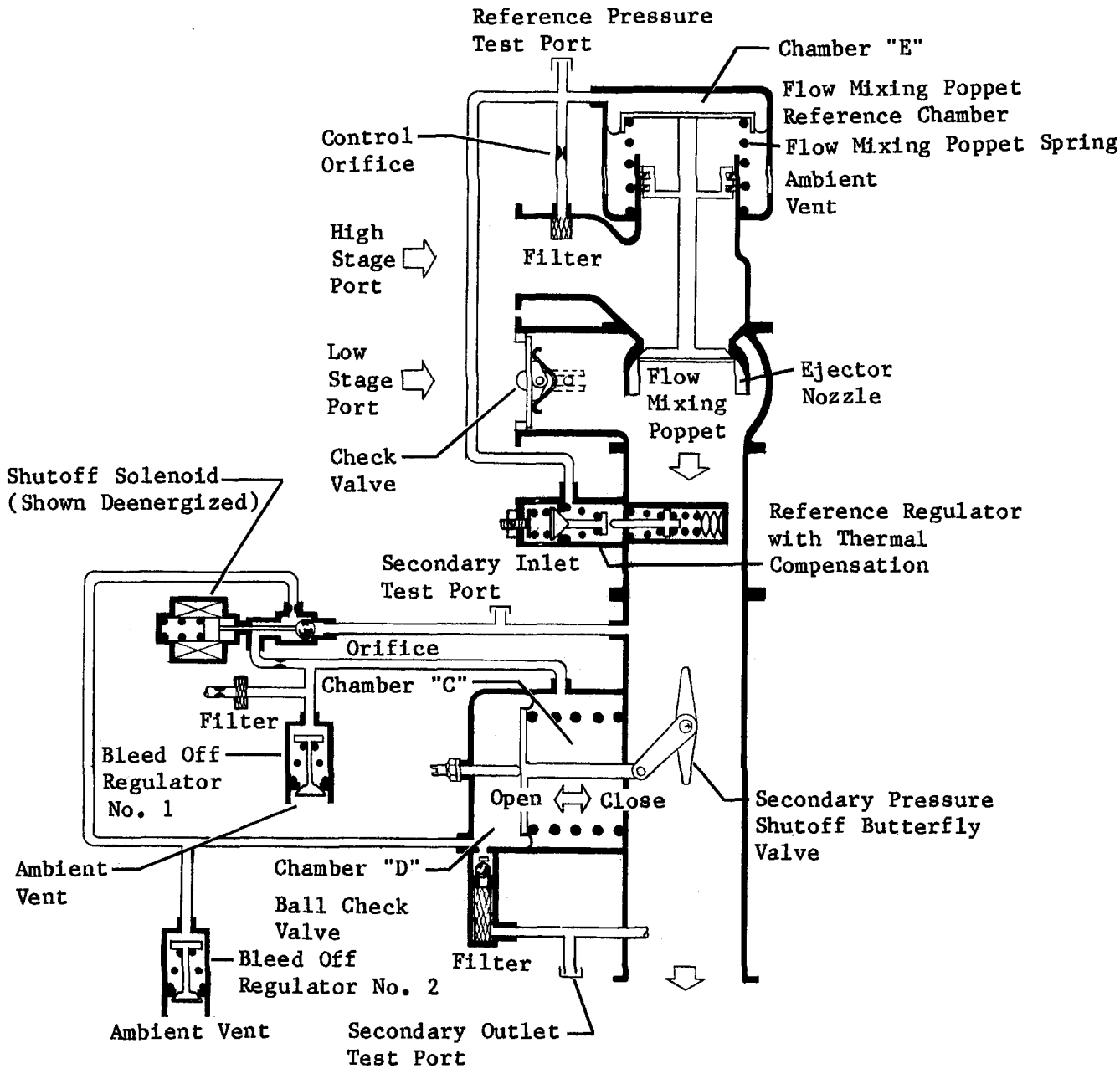
Pneumatic System Schematic
Figure 2 (Sheet 3 of 5)



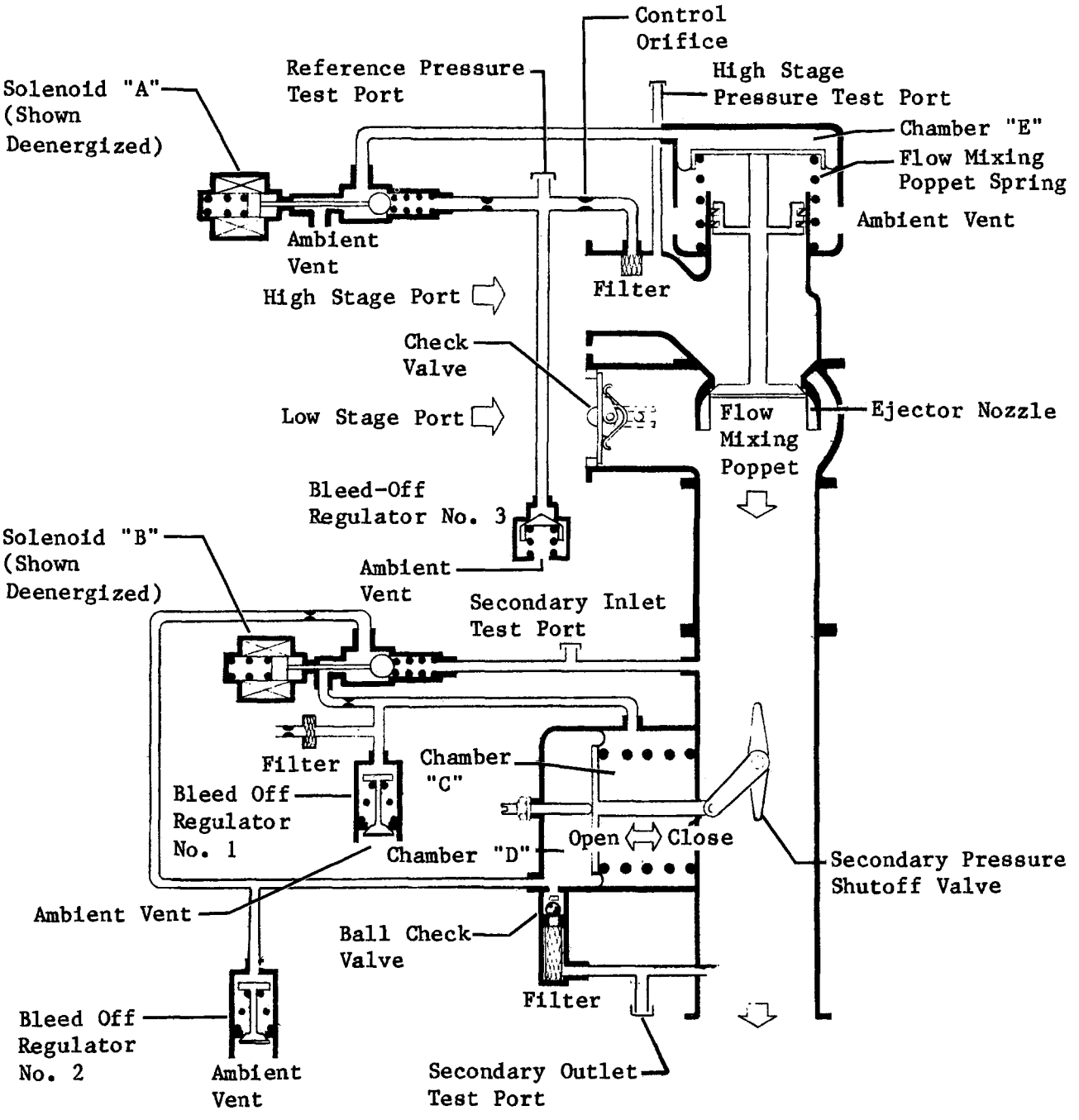
Pneumatic System Schematic
Figure 2 (Sheet 4 of 5)



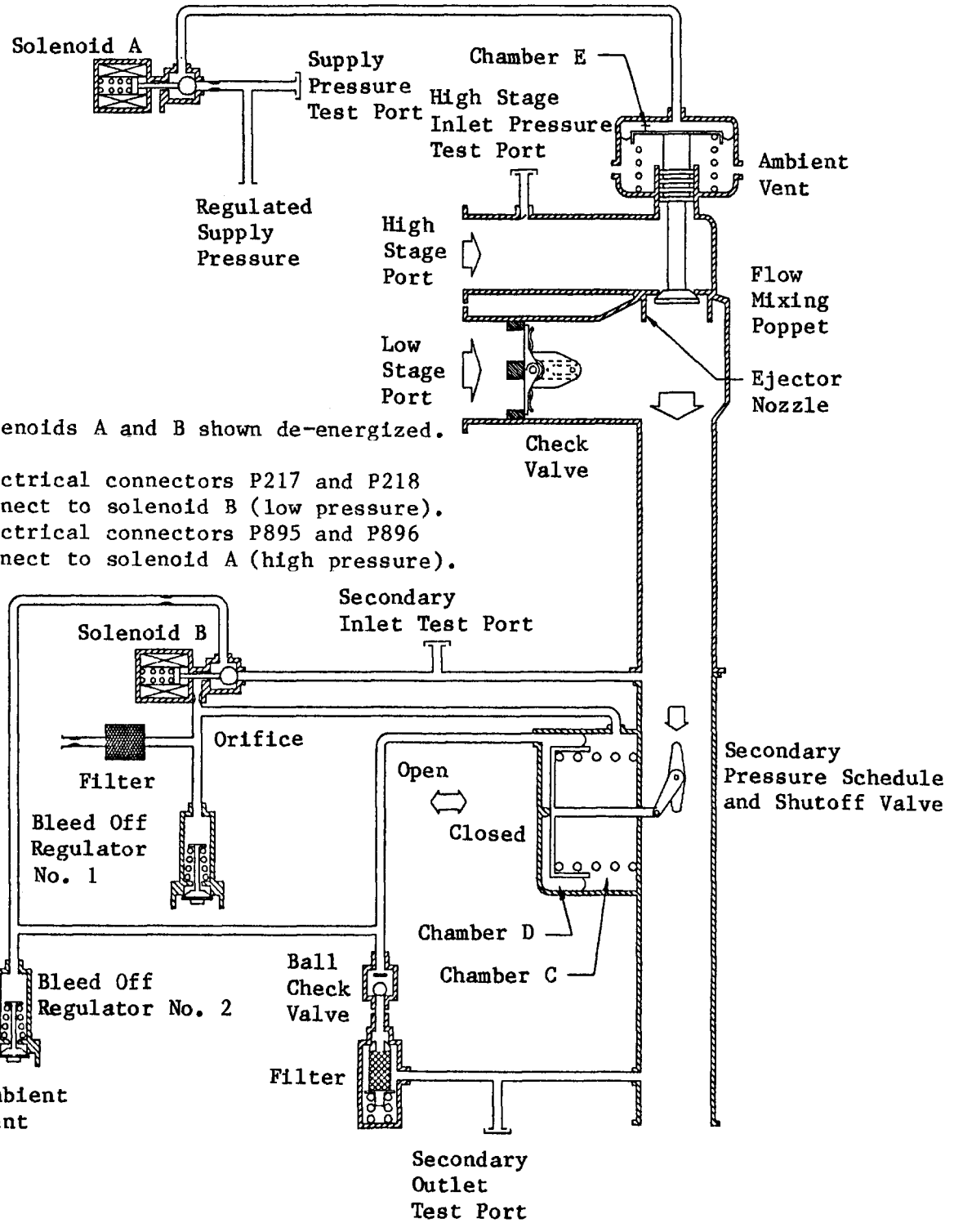
Pneumatic System Schematic
Figure 2 (Sheet 5 of 5)



Bleed Air Shutoff and Pressure Regulator Valve Schematic
Figure 3 (Sheet 1 of 3)



Bleed Air Shutoff and Pressure Regulator Valve Schematic
Figure 3 (Sheet 2 of 3)



NOTE: ° Solenoids A and B shown de-energized.

° Electrical connectors P217 and P218 connect to solenoid B (low pressure). Electrical connectors P895 and P896 connect to solenoid A (high pressure).

Bleed Air Shutoff and Pressure Regulator Valve Schematic
Figure 3 (Sheet 3 of 3)

1. TROUBLE SHOOTING
   A. System malfunction symptoms and probable causes may be similar to those experienced in the pressurization and temperature control systems described in Chapter 21.
   B. References will be made from these trouble shooting procedures to those in Chapter 21 where necessary.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. Loss of Engine Bleed Air.		
NOTE: • Set RH Bleed Air Switch off. If LH ITT indicator rises 6 to 8 ° C and RH ITT indicator falls 6 to 8 ° C, the engines are sharing the bleed air requirements equally. • Set RH Bleed Air Switch off. If LH ITT indicator rises 12 to 14 ° C and RH ITT indicator falls 12 to 14 ° C, the RH engine is providing all the bleed air requirements. • Set RH Bleed Air Switch off. If LH ITT indicator shows no change in ITT, the RH engine is not providing any bleed air requirements.		
a. Shutoff and pressure regulator valve (B56 or B59) inoperative.	Check regulated supply pressure line from temperature control system pressure regulator to shutoff and pressure regulator valve. Perform Bleed Air System Electrical Check. (Refer to Pressurization System Trouble Shooting, Chapter 21.)	Tighten all connections and/or replace damaged components.
b. Bleed air ducting or ducting connectors have failed.	Check ducts, duct fittings, and connections from engines to the bleed air manifold assembly in the tailcone.	Tighten connections or replace damaged ducts as required.

Distribution System Trouble Shooting
Figure 101

1. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Anti-Seize Compound	C5-A	Fel-Pro Inc. Skokie, IL.	Prevent seizing of engine parts.

2. Removal/Installation

A. Remove Bleed Air Ducts (Typical of Both Engines) (See figure 201.)
   (1) Remove engine nacelle.
   (2) Remove attaching parts and clamps securing ducts to engine.
   (3) Remove attaching parts securing duct to bleed air shutoff and pressure regulator valve.

   NOTE: On *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4*, four plates at each bleed air port will be released. Tag plates for reinstallation.

   (4) Remove duct from engine.
   (5) Remove and inspect all gaskets. Any gaskets that show signs of deterioration or damage in any way must be replaced. A "C" seal is installed in the low pressure duct connection on the bleed air shutoff and pressure regulator valve. This "C" seal must be replaced each time the duct is removed.
   (6) Check insulation and insulation wrapping.

B. Install Bleed Air Ducts (Typical Both Engines) (See figure 201.)

   NOTE: Coat threads of bleed air duct attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

   (1) Install gaskets, "C" ring, and ducts on engine. Secure with attaching parts.

   NOTE: On *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4*, ensure that the proper plates (four each port) are installed.

   (2) Install clamps on ducts and secure with attaching parts.
   (3) Install engine nacelle.

C. Install Flex Tube Assembly (See figure 201.)

   NOTE:
   - When aircraft engines are changed, there may be some variations in the gap between the flange of the flex tube assembly and the mount pad on the engine. These variations may require special configurations of gaskets and spacers. Refer to Detail A for gasket and spacer configuration.
   - Coat threads of flex tube assembly attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

   (1) Temporarily attach the forward end of flex tube assembly to elbow with plate assembly, gaskets, and bolts.
   (2) On *Aircraft 35-002 thru 35-193 and 36-002 thru 36-040 not modified per AMK 78-6*, secure other end of flex tube assembly with gaskets and bolts.

(3) On *Aircraft 35-194 and Subsequent; 36-041 and Subsequent and prior aircraft modified per AMK 78-6*, refer to Detail A and inspect gap between flex tube assembly flange and engine pad. Determine whether flanges are parallel as viewed from the rear of the engine.

(a) If flanges are parallel, proceed as follows:

1) Position gaskets on each side of the -5 spacer and place between flex tube and engine pad flanges as shown.

2) Place gasket under either a -6 or -7 spacer and insert in place as required to attain a gap between the lower gasket and engine pad flange of 0.03 to 0.09 inch. If gap is within this dimension, the -6 or -7 spacer and third gasket are not required.

CAUTION: CHECK BOLT HOLE DEPTH. SELECT CORRECT BOLT LENGTH AND ADD WASHERS UNDER BOLT HEAD AS REQUIRED. BOLTS THAT ARE TOO LONG WILL BOTTOM OUT BEFORE COMPRESSING GASKETS. BOLT THREADS MAY BECOME STRIPPED IF BOLTS ARE TOO SHORT.

3) Remove bolts from forward end of flex tube assembly.

4) Install top half of inner fan duct.

5) Position selected spacer and gaskets on engine pad and secure aft end of flex tube assembly using bolts and washers.

6) Place new gaskets at front end of flex tube assembly. Insert front end of tube assembly in elbow. Secure elbow to tube assembly using bolts.

(b) If flanges are not parallel as viewed from the rear of the engine, proceed as follows:

1) Select a spacer (-1 thru -4) that suitably fits the flange angle. Insert spacer with arrow marked on the thickest side pointing up.

NOTE: The angle spacers are to be installed with the angle crossing the centerline of the engine.

2) Position gaskets on each side of spacer selected and place between flex tube and engine pad flanges as shown.

3) Place gasket under either a -6 or -7 spacer and insert in place as required to attain a gap between the lower gasket and engine pad flange of 0.03 to 0.09 inch. If gap is within this dimension, the -6 or -7 spacer and a third gasket are not required.

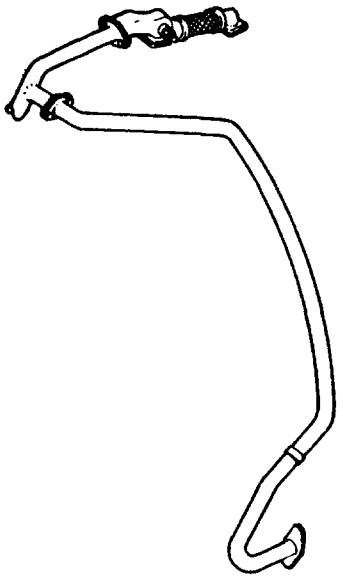
CAUTION: CHECK BOLT HOLE DEPTH. SELECT CORRECT BOLT LENGTH AND ADD WASHERS UNDER BOLT HEAD AS REQUIRED. BOLTS THAT ARE TOO LONG WILL BOTTOM OUT BEFORE COMPRESSING GASKETS. BOLT THREADS MAY BECOME STRIPPED IF BOLTS ARE TOO SHORT.

4) Perform steps 3) through 6) in paragraph (3)(a).

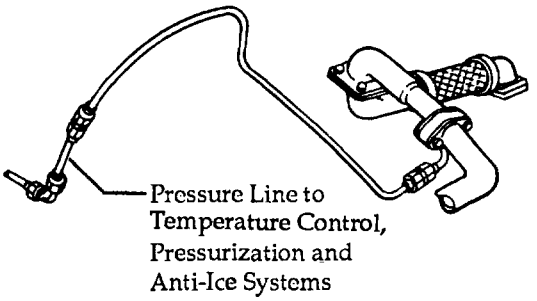
(c) Torque bolts at both ends of flex tube assembly 25 inch-pounds.

(d) Safety wire bolts. Install flex tube assembly fairing.

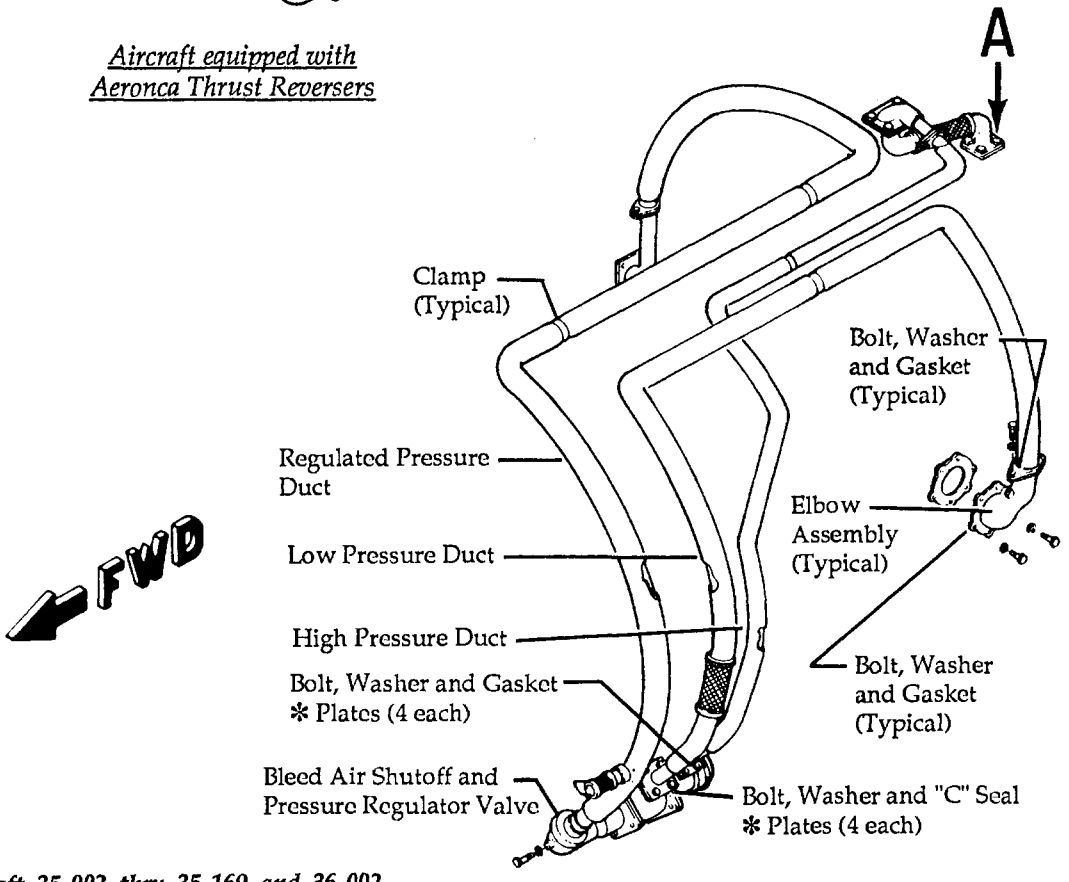
(e) Install engine afterbody.



Aircraft equipped with Aeronca Thrust Reversers



Aircraft Modified per AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement," except aircraft equipped with Aeronca Thrust Reversers



* *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4, "Installation of Engine Bleed Air Duct Flange Reinforcing Plates"*

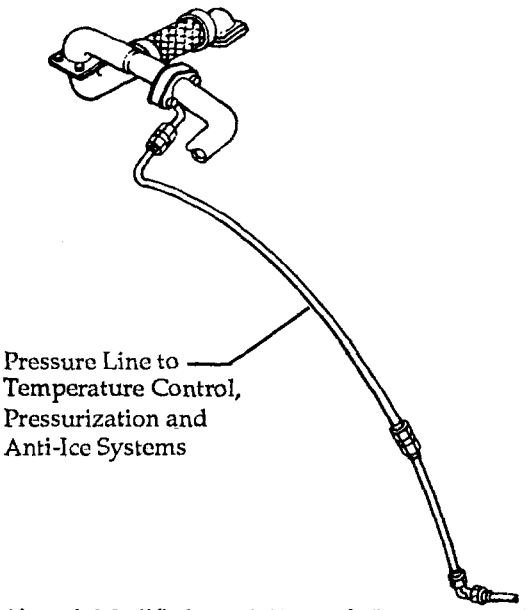
NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

LH ENGINE

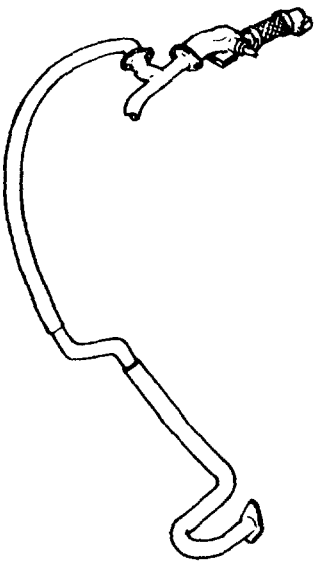
13-80A3

Engine Bleed Air Duct Installation
Figure 201 (Sheet 1 of 8)

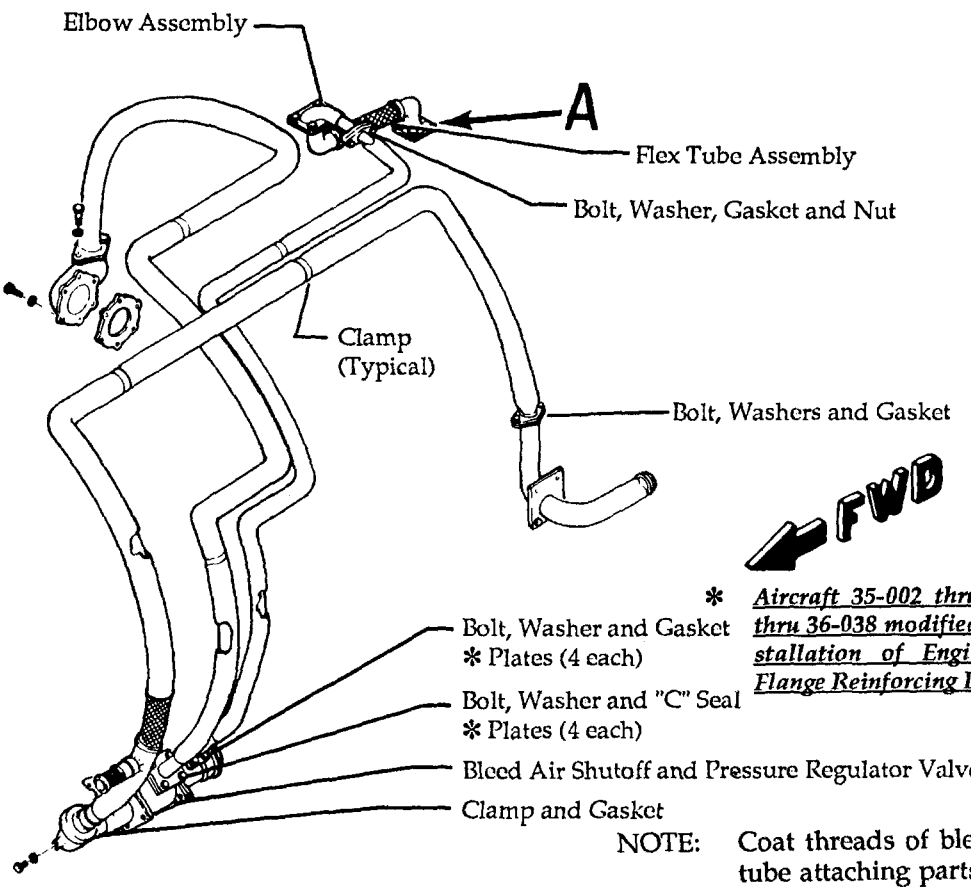
EFFECTIVITY: 35-002 THRU 35-106, 35-108 THRU 35-112, 36-002 THRU 36-031



Aircraft Modified per AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement," except aircraft equipped with Aeronca Thrust Reversers



Aircraft equipped with Aeronca Thrust Reversers



* *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4, "Installation of Engine Bleed Air Duct Flange Reinforcing Plates"*

NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

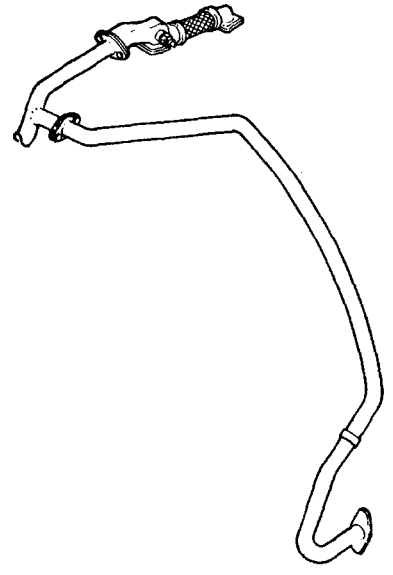
RH ENGINE

13-80A3

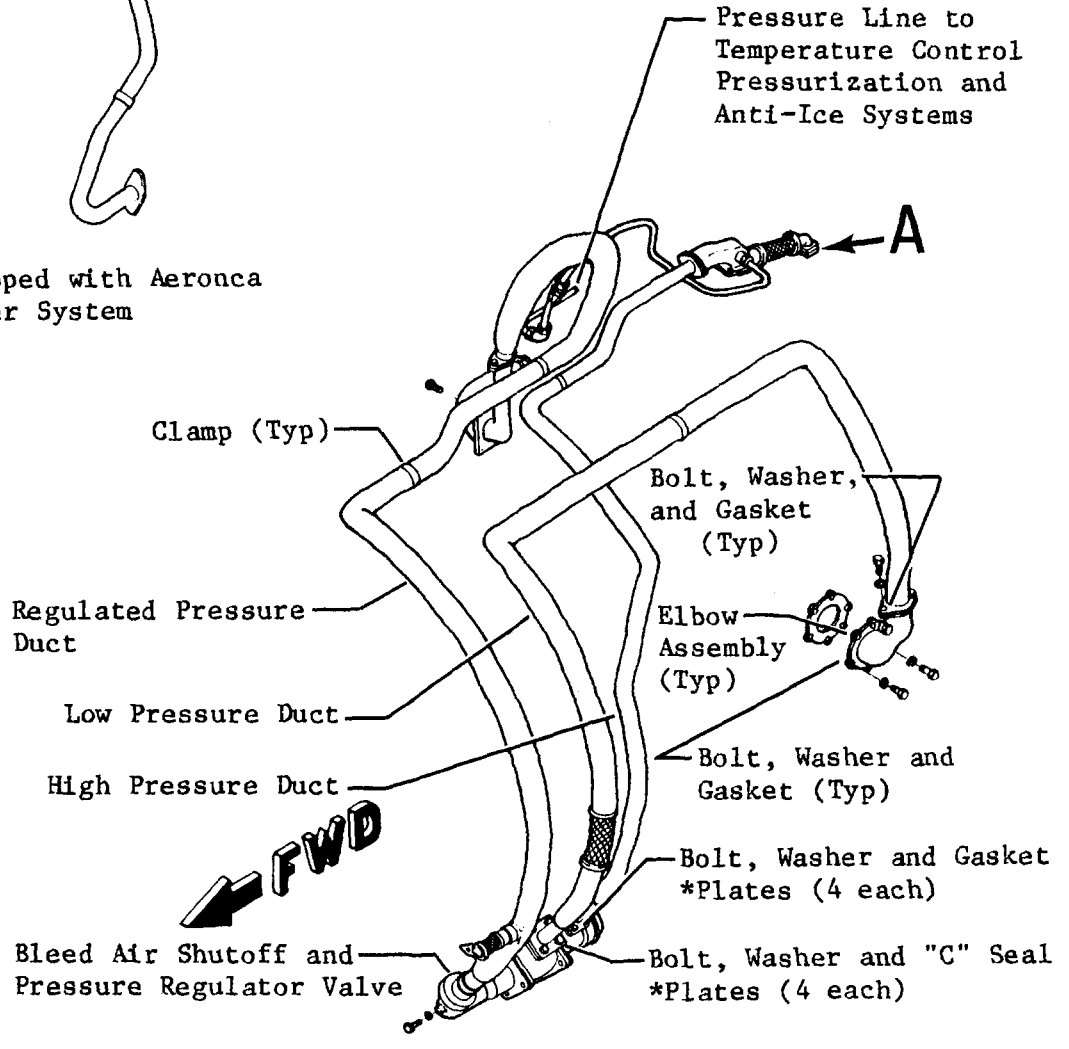
Engine Bleed Air Duct Installation
Figure 201 (Sheet 2 of 8)

NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

* *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4, "Installation of Engine Bleed Air Duct Flange Reinforcing Plates"*



Aircraft Equipped with Aeronca Thrust Reverser System



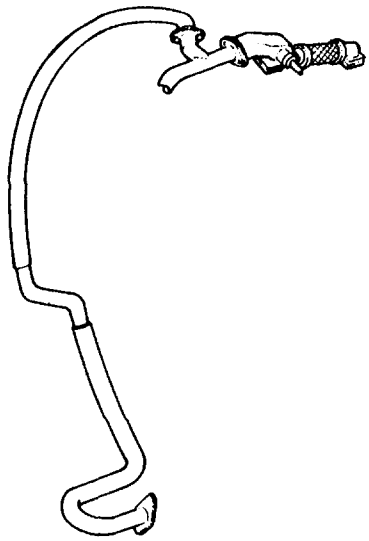
LH ENGINE

Engine Bleed Air Duct Installation
Figure 201 (Sheet 3 of 8)

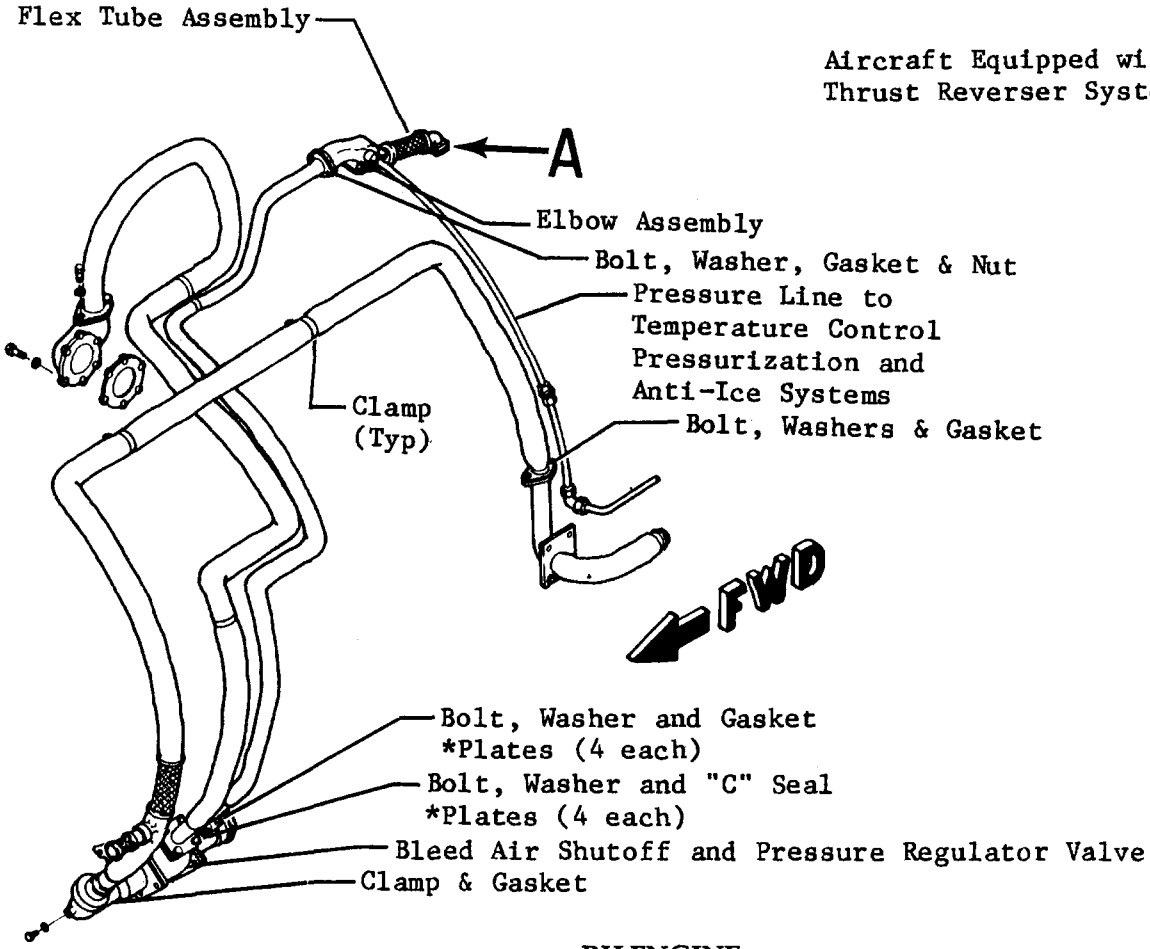
EFFECTIVITY: 35-107,35-113 THRU 35-504, 35-506 THRU 35-513, 36-032 THRU 36-053

NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

* *Aircraft 35-002 thru 35-169 and 36-002 thru 36-038 modified per AMK 78-4, "Installation of Engine Bleed Air Duct Flange Reinforcing Plates"*



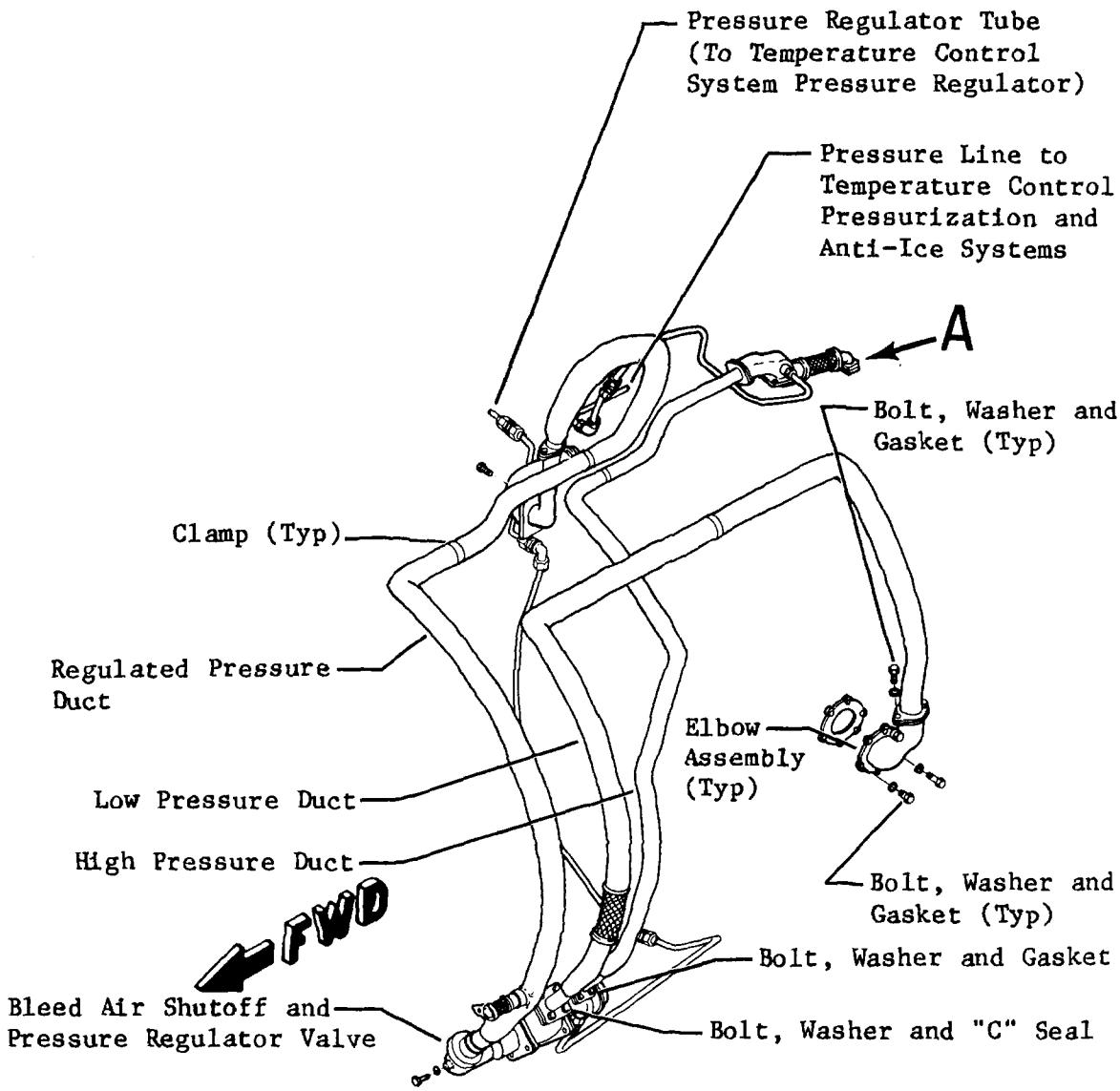
Aircraft Equipped with Aeronca Thrust Reverser System



RH ENGINE

Engine Bleed Air Duct Installation
Figure 201 (Sheet 4 of 8)

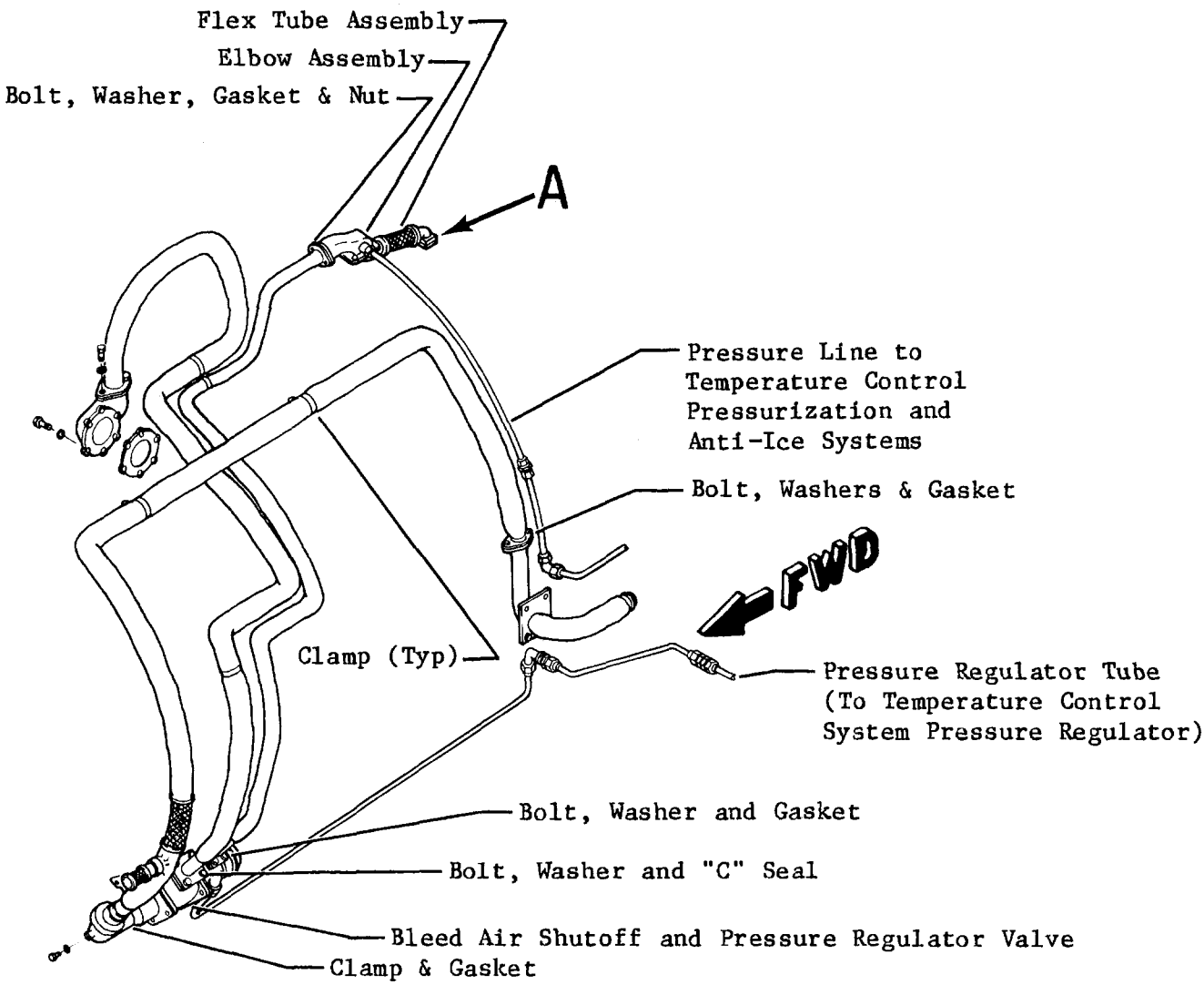
NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.



LH ENGINE

Engine Bleed Air Duct Installation
Figure 201 (Sheet 5 of 8)

NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

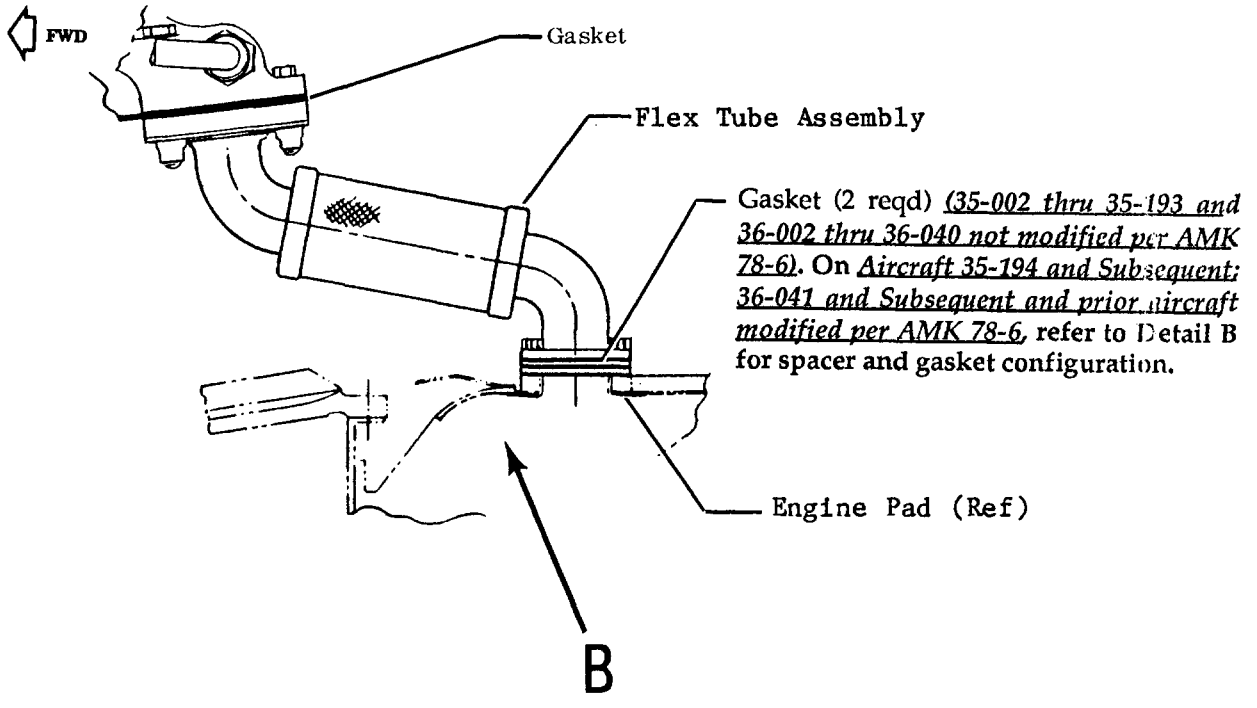


RH ENGINE

Engine Bleed Air Duct Installation
Figure 201 (Sheet 6 of 8)

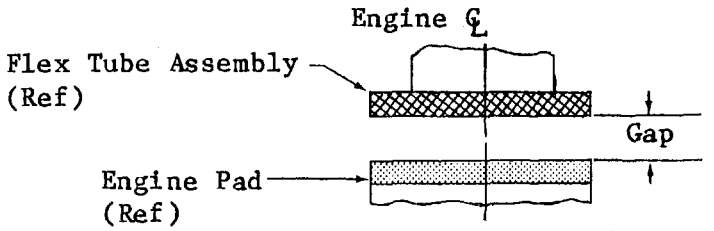
EFFECTIVITY: 35-505, 35-514 AND SUBSEQUENT,
36-054 AND SUBSEQUENT

NOTE: Coat threads of bleed air duct and flex tube attaching parts with high temperature anti-seize compound (Fel-Pro, C5-A or equivalent) prior to installation.

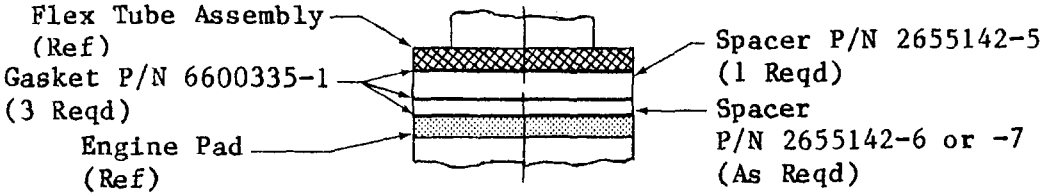


Detail A

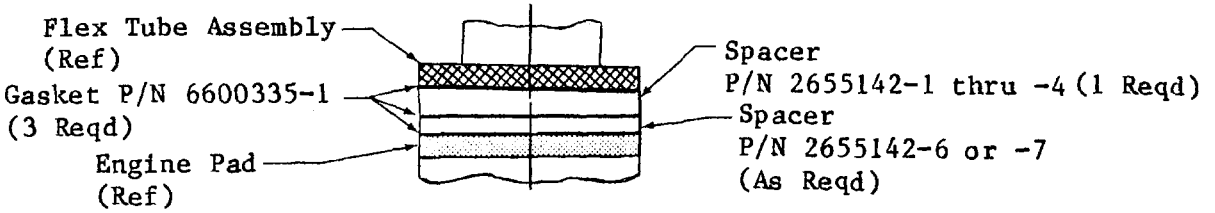
Engine Bleed Air Duct Installation
Figure 201 (Sheet 7 of 8)



Inspect Gap Between Flanges



Install Flat Spacers When Flanges are Parallel



Install a Flat Spacer and an Angled Spacer
When Flanges are Not Parallel

View of Spacer and Gasket Installation Looking Forward

Part Number	Angle
2655142-1 2655142-2 2655142-3 2655142-4	1° 2° 3° 4°
2655142-5	0° (Flat)
2655142-6 2655142-7	0° (Flat) 0° (Flat)

SPACER TABLE

Select spacer that suitably fits the angle across the centerline of the engine. Position spacer with the arrow pointing up.

If flanges are parallel, use this spacer in place of the spacers above.

After one spacer (-1 thru -5) is in place and gaskets are installed, insert either a -6 or -7 spacer with an additional gasket to attain a 0.03- to 0.09-inch gap.

Detail B

Engine Bleed Air Duct Installation
Figure 201 (Sheet 8 of 8)

BLEED AIR SHUTOFF AND PRESSURE REGULATOR VALVE - TROUBLESHOOTING

1. TROUBLESHOOTING

NOTE: The following procedures are applicable to 35-064 thru 35-504, 35-506 thru 35-513, 36-017 thru 36-053 and prior Aircraft Incorporating SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve."

A. If, during descent at approximately 15,000 to 18,000 feet, when throttles are retarded to flight idle, the cabin altitude starts to rise and then, when the throttles are advanced, the cabin altitude starts back down, the bleed air shutoff and pressure regulator valve may be malfunctioning. This may be suspected especially if at altitude there is an ITT split.

B. The following troubleshooting procedures may be followed to locate the malfunction.

(1) Remove engine lower nacelle.

(2) Set Cabin Air Switch to OFF, Bleed Air Switches to ON.

(3) Start aircraft engine equipped with valve to be checked.

NOTE: If at altitude an ITT split exists, the cool engine probably has the discrepant valve. (Refer to Approved Airplane Flight Manual for starting procedures.)

(4) Set engine at idle RPM and observe (through ambient vent port of aft white cylindrical spring container) that flow mixing poppet spring is fully compressed.

NOTE: ° If the spring is compressed, the valve is not the cause of the malfunction. The problem may be the result of cabin leaks or high pressure air leaks.

° Spring should be compressed fully (spring coils almost touching) at engine idle (with Cabin Air Switch OFF to eliminate excessive pressure drops in bleed air plumbing). Engine rpm may have to be increased slightly at higher field elevations or high ambient temperatures, in order for flow-mixing poppet spring to fully compress, due to density of ambient air. Spring should smoothly expand by the time the engine is accelerated to 70% N_1.

(5) Check secondary butterfly valve to ensure that it is open.

(6) If spring is not compressed, check for blow-by at O-rings and seals.

(7) Shut down engine. (Refer to Approved Airplane Flight Manual for shutdown procedures.)

(8) If valve is malfunctioning, the spring is not compressed. Check for 28 volts DC at solenoid A. If 28 volts DC is not available, check electrical wiring for possible shorts or opens.

(9) If 28 volts DC is available, on Aircraft not modified per SSK 966, reset Bleed Air Switch from normal to emergency and back and forth to see if solenoid clicks. On Aircraft modified per SSK 966, pull and reset several times AIR BLEED circuit breaker (CB 134) to see if solenoid clicks. If solenoid does not click, replace valve.

(10) If there is blow by, replace valve.

(11) If flow mixing poppet spring is not fully compressed, clean the No. 3 bleed off regulator poppet. (Refer to Cleaning/Painting, this section.)

(12) Repeat steps 1.B.(2) and (3). If flow mixing poppet spring does not fully compress, replace bleed air shutoff and pressure regulator valve. If spring is compressed, the valve is not the cause of the malfunction.

NOTE: Gates Learjet Accessory Overhaul, Wichita, Kansas, has repair and overhaul capabilities for the P/N 6600202-1 Bleed Air Shutoff and Pressure Regulator Valve.

C. To further diagnose a suspected malfunction of the bleed air shutoff and pressure regulator valve, an adapter may be made to read pressure when visually inspecting the operation and shifting of the flow mixing poppet valve spring.

(1) To fabricate the test adapters, procure two AN815-4C unions, two AN screws size 10R5's, two number 4 AN fitting instrument hoses approximately 12" long, two pressure gages - one reading 0 to 30 psig and one reading 0 to 50 psig - and weld or silver solder screw to one end of union and drill a No. 50 hole through screw into open passage of union. (See figure 101.)

(2) Attach hoses to unions, and gages to hoses.

(3) Once access is gained to bleed air valve, remove No. 10 apex head screws from E chamber test port on side of No. 3 bleed-off regulator assembly and H/P test port on aft side of high pressure port of valve assembly.

(4) Install adapter with 0 - 30 psig gage on chamber E test port and 0 - 50 psig gage on H/P test port.

(5) With engines running, Bleed Air Switch ON, and Cabin Air Switch OFF, adjust engine power setting until 20 psig is indicated at H/P gage.

(6) Chamber E gage shall read a minimum of 14 psig.

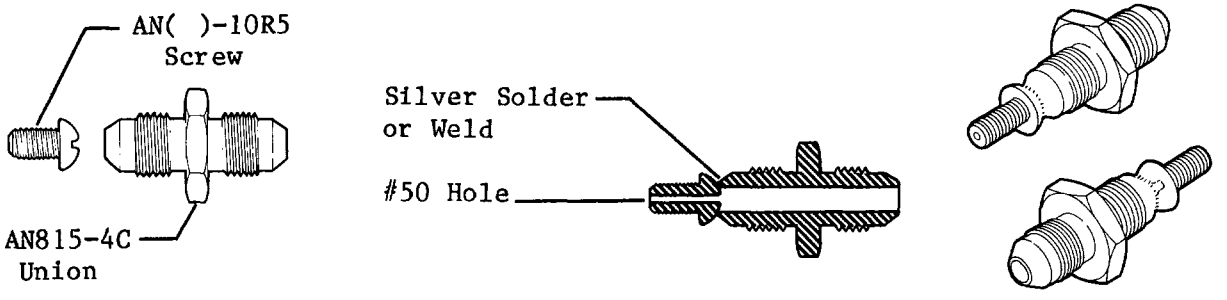
NOTE: The flow mixing poppet valve spring at this point shall be fully compressed.

(7) Increase engine RPM until 50 psig is indicated at H/P gage; chamber E reference pressure should not increase above 17 psig.

NOTE: The flow mixing poppet valve spring shall be in the fully expanded, low-pressure position.

(8) If the valve does not meet these operational specifications and the poppet valve spring does not shift in proper perspective, verify that 28 VDC power exists at solenoid A. If so, clean the No. 3 bleed-off regulator poppet and seat assembly. (Refer to Cleaning/Painting, this section.)

(9) If, after cleaning the No. 3 bleed-off regulator poppet, the valve pressures and poppet valve spring shift pattern are still not correct, the valve must be replaced.



Test Adapter Fabrication
Figure 101

BLEED AIR SHUTOFF AND PRESSURE REGULATOR VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Removal of Bleed Air Shutoff and Pressure Regulator Valve (B59, LH; B56, RH) *(Aircraft 35-002 thru 35-504, 35-506 thru 35-513, and 36-002 thru 36-053 not modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement.")* (See Figure 201.)

(1) Disconnect electrical power from aircraft.

(2) Remove lower engine cowl. (Refer to Chapter 71.)

(3) *On Aircraft 35-002 thru 35-063 and 36-002 thru 36-017*, remove safety wire and disconnect electrical connector (P217, LH; P218, RH) from valve.

(4) *On Aircraft 35-064 thru 35-504, 35-506 thru 35-513, and 36-018 thru 36-053*, remove safety wire and disconnect electrical connector (P895, LH; P896, RH) from valve Solenoid A and (P217, LH; P218, RH) from valve Solenoid B located lower RH side of valve.

(5) Remove attaching parts securing high pressure and low pressure ducts to valve.

NOTE: *On Aircraft modified per AMK 78-4, "Installation of Engine Bleed Air Duct Flange Reinforcing Plates,"* there shall be four (4) plates at each duct location.

(6) Loosen and remove coupling securing regulated pressure duct to valve.

(7) Remove attaching parts and valve from engine.

B. Installation of Bleed Air Shutoff and Pressure Regulator Valve (B59, LH; B60, RH) *(Aircraft 35-002 thru 35-504, 35-506 thru 35-513, and 36-002 thru 36-053, not modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement")* (See Figure 201.)

(1) Acquire necessary tools and equipment.

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

NAME	PART NUMBER	MANUFACTURER	USE
Thread Compound - Anti-Seize	C-5A	Fel-Pro Chemical Products Skokie, IL	Coat threads of attaching parts used in high temperature areas.
Torque Wrench		Commercially Available	Torque bolts.
Safety Wire		Commercially Available	Safety wire attaching parts.

(2) Apply thread compound to threads of attaching parts.

(3) Install valve and secure with attaching parts.

(4) Install and secure coupling securing regulated pressure duct to valve.

(5) Check low pressure duct gasket for serviceability; replace if necessary.

(6) Replace high pressure duct metal C-seal.

(7) Assemble plates (if installed) on duct flanges and secure high pressure and low pressure ducts to valve with attaching parts. Torque bolts 25 inch-pounds [2.8 Nm].
(8) *On Aircraft 35-002 thru 35-063 and 36-002 thru 36-017,* connect electrical connector (P217, LH; P218, RH) to valve and safety wire.
(9) *On Aircraft 35-064 thru 35-504, 35-506 thru 35-513, and 36-018 thru 36-053,* connect electrical connector (P895, LH; P896, RH) to valve Solenoid A and (P217, LH; P218, RH) to valve Solenoid B and safety wire.
(10) Perform Operational Check of Pressurization System. (Refer to Chapter 21.)
(11) Perform Functional Test of Bleed Air Shutoff and Pressure Regulator Valve. (Refer to Adjustment/ Test, this section.)
(12) Install lower engine cowl. (Refer to Chapter 71.)

C. Removal of Bleed Air Shutoff and Pressure Regulator Valve (B59, LH; B56, RH) *(Aircraft 35-505, 35-514 and Subsequent, 36-054 and Subsequent and prior aircraft modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement")* (See Figure 201.)
(1) Disconnect electrical power from aircraft.
(2) Remove lower engine cowl. (Refer to Chapter 71.)
(3) Remove safety wire and disconnect electrical connector (P895, LH; P896, RH) from valve Solenoid A and (P217, LH; P218, RH) from valve Solenoid B located lower RH side of valve.
(4) Remove safety wire and attaching parts securing high pressure and low pressure ducts to valve.
(5) Disconnect pressure regulator tube from valve.
(6) Loosen and remove coupling securing regulated pressure duct to valve.
(7) Remove attaching parts and bleed air pressure regulator and shutoff valve from engine.

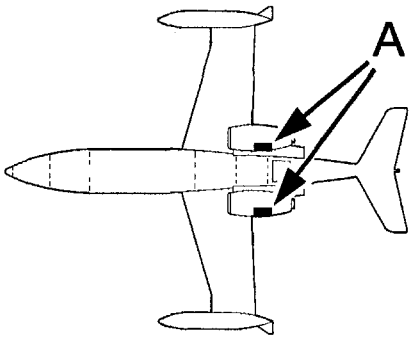
D. Installation of Bleed Air Shutoff and Pressure Regulator Valve (B59, LH; B56, RH) *(Aircraft 35-505, 35-514 and Subsequent, 36-054 and Subsequent and prior aircraft modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement")* (See Figure 201.)
(1) Acquire necessary tools and equipment.

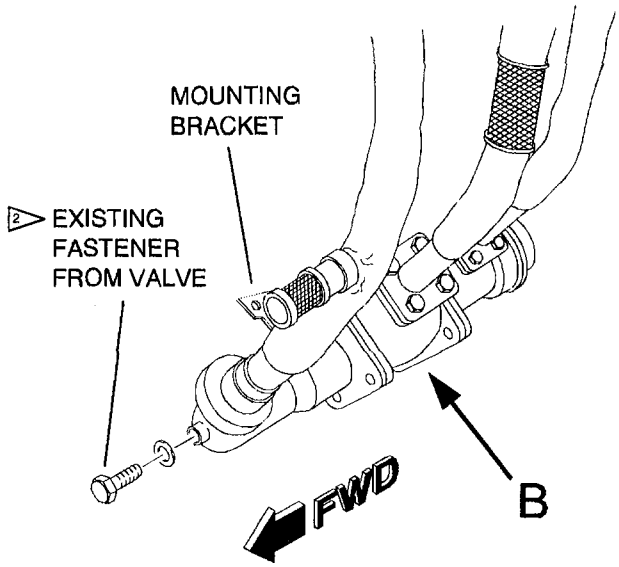
NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Thread Compound - Anti-Seize	C-5A	Fel-Pro Chemical Products Skokie, IL	Coat threads of attaching parts used in high temperature areas.
Torque Wrench		Commercially Available	Torque bolts.
Safety Wire		Commercially Available	Safety wire attaching parts.

(2) Apply thread compound to threads of attaching parts.
(3) Install valve and secure with attaching parts.

(4) Install and secure coupling securing regulated pressure duct to valve.
(5) Check low pressure duct gasket for serviceability; replace if necessary.
(6) Replace high pressure duct metal C-seal.
(7) Secure high pressure and low pressure ducts to valve with attaching parts. Torque bolts 25 inch-pounds [2.8 Nm]. Install safety-wire.
(8) Connect pressure regulator tube to valve.
(9) Connect electrical connector (P895, LH; P896, RH) to valve Solenoid A and (P217, LH; P218, RH) to valve Solenoid B and safety wire.
(10) Perform Operational Check of Pressurization System. (Refer to Chapter 21.)
(11) Perform Functional Test of Bleed Air Shutoff and Pressure Regulator Valve. (Refer to Adjustment/Test, this section.)
(12) Install lower engine cowl. (Refer to Chapter 71.)



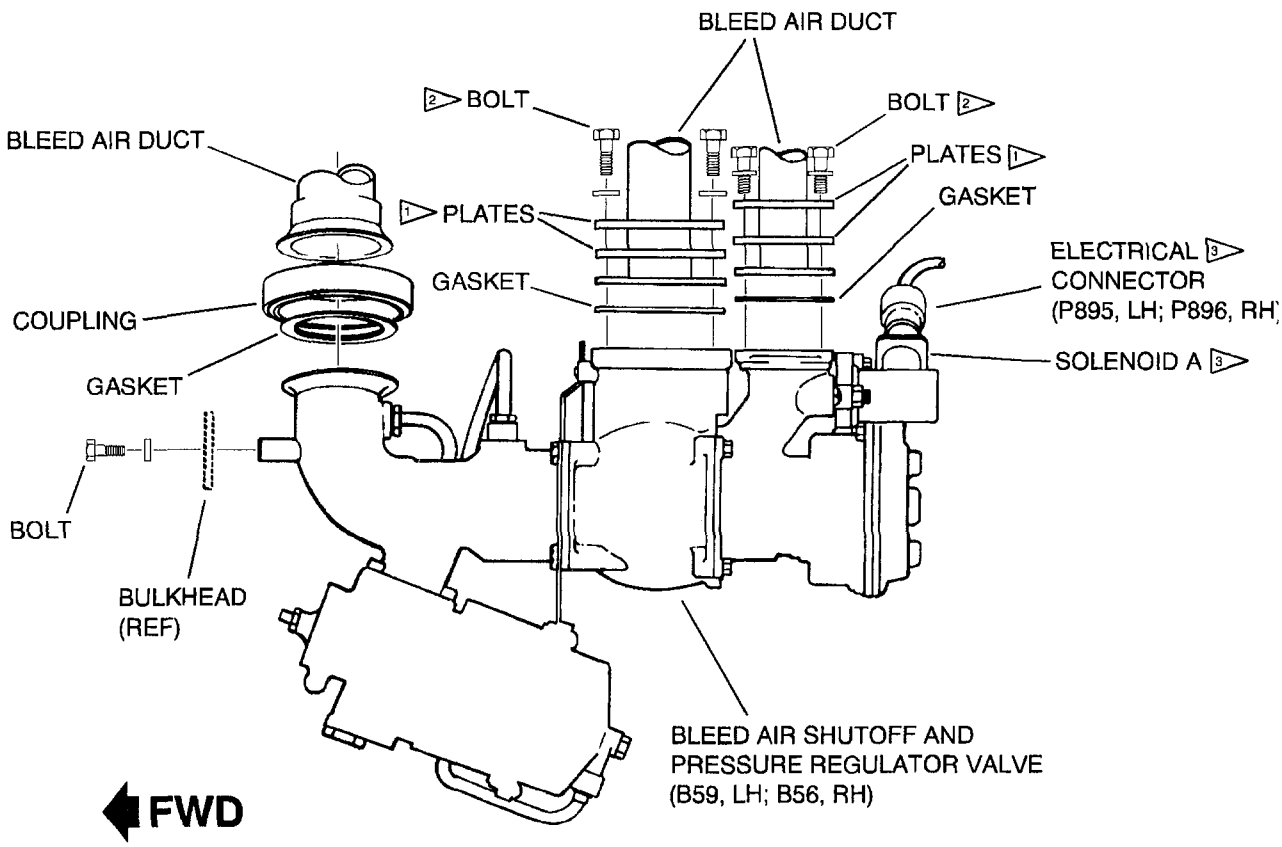


Detail A

1 AIRCRAFT MODIFIED PER AMK 78-4, FOUR (4) PLATES ARE INSTALLED AT EACH PORT

2 COAT THREADS OF ATTACHING BOLTS WITH HIGH TEMPERATURE ANTI-SEIZE COMPOUND PRIOR TO INSTALLATION

3 AIRCRAFT 35-505, 35-514 AND SUBSEQUENT, 35-054 AND SUBSEQUENT AND PRIOR AIRCRAFT MODIFIED PER SSK 966 OR AAK 85-6



Detail B

M35-361001-201-01

Bleed Air Shutoff and Pressure Regulator Valve Installation
Figure 201

2. Adjustment/Test

A. Functional Test of Engine Bleed Air Shutoff and Pressure Regulator Valve

NOTE: Perform Functional Test of Engine Bleed Air Shutoff and Pressure Regulator Valve in accordance with the current intervals specified in Chapter 5.

(1) Acquire necessary tools and equipment.

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

NAME	PART NUMBER	MANUFACTURER	USE
Digital Multimeter	8050A-1	Fluke Mfg. Inc. Everett, WA	Check for power at connector.
Pressure Gage (Capable of 30 psig [207 kPa] pressure)		Commercially Available	Check valve supply pressure.
Bleed air adapter	2471018	Learjet, Inc. Wichita, KS	Allow pressure measurements.

(2) Remove lower engine cowl. (Refer to Chapter 71.)
(3) Start aircraft engine equipped with valve to be checked. (Refer to FAA Approved Airplane Flight Manual.)
(4) Set engine at idle RPM and observe (through ambient vent) that flow mixing poppet spring is fully compressed.
(5) Check for leaks around newly installed components and surrounding areas.
(6) If flow mixing poppet spring is not fully compressed, perform the following:
(a) *On Aircraft 35-002 thru 35-063, and 36-002 thru 36-017 not modified per AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement" or SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve",* shut down engine (refer to FAA Approved Airplane Flight Manual) and replace bleed air shutoff and pressure regulator valve.
(b) *On Aircraft 35-064 thru 35-504, 35-506 thru 35-513, and 36-018 thru 36-053 and prior aircraft modified per AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement" or SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve",* perform the following:

NOTE: *On Aircraft 35-064 thru 35-504, 35-506 thru 35-513, and 36-018 thru 36-053 and prior aircraft modified per SSK 966 only, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve",* clean bleed off regulator No. 3. (Refer to Cleaning/Painting, this section.) If malfunction is not resolved, replace bleed air shutoff and pressure regulator valve.

1) Disconnect electrical connector (P895, LH; P896, RH) from Solenoid A.

2) Verify 28 vdc is present at pin C and perform continuity check between pin A and aircraft ground.
3) If 28 vdc is not present at pin C or continuity check fails, check Modulating Valve Control Box.
4) If Modulating Valve Control Box is okay, perform Functional Test of Emergency Pressurization Aneroid Switch (S89, LH; S90, RH). (Refer to Chapter 21.)
5) If aneroid switch is okay, verify Bleed Air Switch (S343, LH; S342, RH), located on co-pilot's instrument panel, and switch wiring is functional.
6) If flow mixing poppet spring is still expanded at idle power settings, perform the following:
   a) Disconnect pressure regulator tube from bleed air shutoff and pressure regulator valve (B59, LH; B56, RH).
   b) Install pressure gage.
   c) Verify gage indicates 13 to 17 psig [89.6 to 117.2 kPa] with engine at 60% N2.
   d) If pressure is out of tolerance, check plumbing between bleed air shutoff and pressure regulator valve and temperature pressure regulator located in tailcone.
   e) If plumbing is okay, replace temperature pressure regulator. (Refer to Chapter 21.)
   f) If pressure is within tolerance, shut down engine (refer to FAA Approved Airplane Flight Manual) and replace bleed air shutoff and pressure regulator valve. (Refer to Removal/Installation, this section.)

(c) *On Aircraft 35-505, 35-514 and Subsequent, and 36-054 and Subsequent,* perform the following:
1) Disconnect electrical connector (P895, LH; P896, RH) from Solenoid A.
2) Verify 28 vdc is present at pin C and perform continuity check between pin A and aircraft ground.
3) If 28 vdc is not present at pin C or continuity check fails, check Modulating Valve Control Box.
4) If Modulating Valve Control Box is okay, perform Functional Test of Emergency Pressurization Aneroid Switch (S89, LH; S90, RH). (Refer to Chapter 21.)
5) If aneroid switch is okay, verify Bleed Air Switch (S343, LH; S342, RH), located on co-pilot's instrument panel, and switch wiring is functional.
6) If flow mixing poppet spring is still expanded at idle power settings, perform the following:
   a) Disconnect pressure regulator tube from bleed air shutoff and pressure regulator valve (B59, LH; B56, RH).
   b) Install pressure gage.
   c) Verify gage indicates 13 to 17 psig [89.6 to 117.2 kPa] with engine at 60% N2.
   d) If pressure is out of tolerance, check plumbing between Bleed Air Shutoff and Pressure Regulator Valve and temperature pressure regulator located in tailcone.
   e) If plumbing is okay, replace temperature pressure regulator. (Refer to Chapter 21.)
   f) If pressure is within tolerance, shut down engine (refer to FAA Approved Airplane Flight Manual) and replace bleed air shutoff and pressure regulator valve. (Refer to Removal/Installation, this section.)

(7) If flow mixing poppet spring is fully compressed and valve is otherwise malfunctioning, shut down engine (refer to FAA Approved Airplane Flight Manual) and replace bleed air shutoff and pressure regulator valve. (Refer to Removal/Installation, this section.)

NOTE: At high ambient temperature and/or high field elevations, the poppet spring may not fully compress. This is normal at idle N1 RPM.

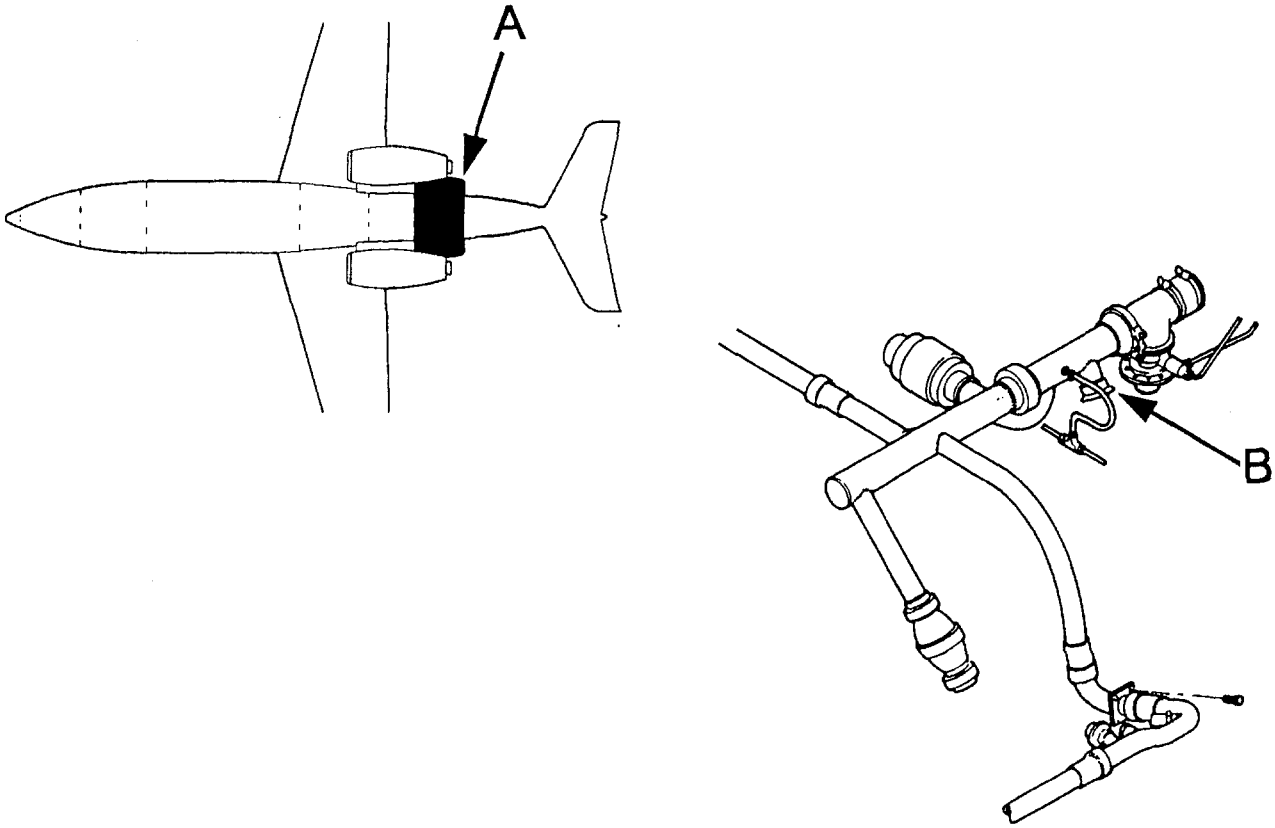
(8) Shut down engine, if required. (Refer to FAA Approved Airplane Flight Manual.)
(9) Remove bleed air cap (P/N MFB68866-150) covering service port in aircraft tailcone, and install bleed air adapter (P/N 2471018). (See Figure 202.)
(10) Connect pressure gage to bleed air adapter.
(11) Start engines. (Refer to FAA Approved Airplane Flight Manual.)
(12) Set the LH and RH bleed switches to OFF.
(13) Set the cabin air switch to OFF.

CAUTION: DO NOT OPERATE ENGINE AT 85% N1 POWER SETTING FOR MORE THAN TWO (2) MINUTES.

(14) Advance LH engine thrust lever to approximately 85% N1.
(15) Set LH engine bleed air switch and the cabin air switch to ON.
(16) Verify pressure gage indicates 35 (±2.5) psi [241.3 (±17.2) kPa].
(17) Set LH bleed air switch to OFF.
(18) Verify pressure gage indicates less than 1 psi [6.8 kPa].
  (a) If gage indicates more than 1 psi [6.8 kPa], set the LH bleed air switch to OFF and then back to ON. While cycling LH bleed air switch, check secondary shaft (butterfly) on modulating valve for binding and full range of movement to the shutoff position. Replace modulating valve if positive bleed air shutoff is not obtained.
(19) Set LH engine thrust lever to idle.

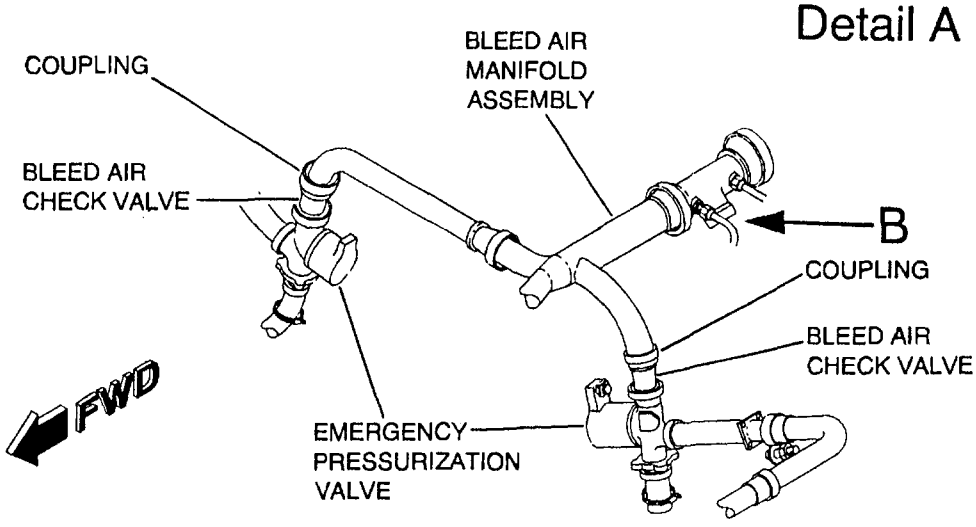
CAUTION: DO NOT OPERATE ENGINE AT 85% N1 POWER SETTING FOR MORE THAN TWO (2) MINUTES.

(20) Set RH thrust lever to approximately 85% N1.
(21) Set RH engine bleed air switch and the cabin air switch to ON.
(22) Verify pressure gage indicates 35 (±2.5) psi [241.3 (±17.2) kPa].
(23) Set RH bleed air switch to OFF.
(24) Verify pressure gage indicates less than 1 psi [6.8 kPa].
  (a) If gage indicates more than 1 psi [6.8 kPa], set the LH bleed air switch to OFF and then back to ON. While cycling LH bleed air switch, check secondary shaft (butterfly) on modulating valve for binding and full range of movement to the shutoff position. Replace modulating valve if positive bleed air shutoff is not obtained.
(25) Set RH engine thrust lever to idle.
(26) Shut down engines. (Refer to FAA Approved Airplane Flight Manual.)
(27) Remove bleed air adapter and install bleed air cap (P/N MFB68866-150).
(28) Install lower engine cowl. (Refer to Chapter 71.)



35-002 THRU 35-106,
35-108 THRU 35-112,
AND 36-002 THRU 36-031

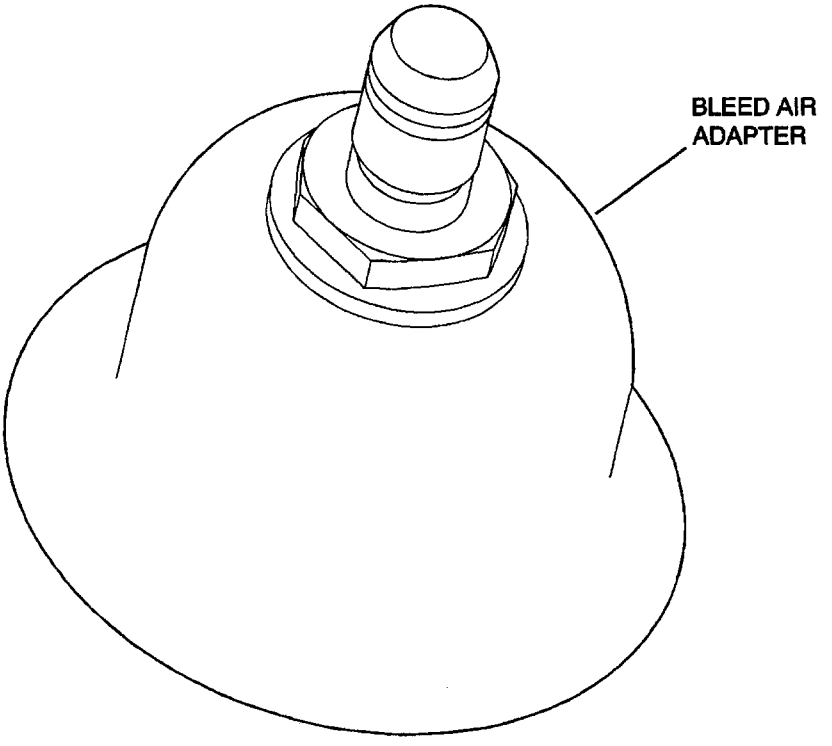
Detail A



35-107, 35-113 AND SUBSEQUENT AND 36-032 AND SUBSEQUENT

Detail A

Bleed Air Adapter Installation
Figure 202 (Sheet 1 of 2)



Detail B

Bleed Air Adapter Installation
Figure 202 (Sheet 2 of 2)

B. Bleed Air Shutoff and Pressure Regulator Valve Banjo and B-Nut Fittings Torque Check *(Aircraft 35-002 thru 35-063 and 36-002 thru 36-017, not modified per AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve" or SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve")* (See Figure 203.)

NOTE: Perform check of fittings torque in accordance with the current inspection interval specified in Chapter 5.

(1) Acquire necessary tools and equipment.

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

NAME	PART NUMBER	MANUFACTURER	USE
Torque Wrench		Commercially Available	Torque bolts.

(2) Remove lower engine cowl. (Refer to Chapter 71.)
(3) Check torque of banjo and B-nut fittings on RH side of valve as indicated. Torque fittings 100 to 120 inch-pounds [11.3 to 13.5 Nm].
(4) Install lower engine cowl. (Refer to Chapter 71.)

3. Cleaning/Painting

A. Clean Bleed Off Regulator No. 3 *(Aircraft 35-002 thru 35-063, and 36-002 thru 36-017 not modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK 85-6 "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement")* (See Figure 204.)

NOTE: Perform Adjustment/Test prior to accomplishing this cleaning procedure.

Cleaning bleed off regulator No. 3 is the only cleaning or adjustment procedure allowed by Garrett Corporation. Any further attempt at field maintenance on bleed air shutoff and pressure regulator valve will void existing warranties.

(1) Remove lower engine cowl. (Refer to Chapter 71.)
(2) Locate Bleed Air Shutoff and Pressure Regulator Valve (B59, LH; B56, RH) on lower forward LH side of engine.
(3) Locate bleed off regulator No. 3 on LH side of valve.
(4) Insert a long thin object up into regulator No. 3 to hold snap ring, retainer, spring, washers, and poppet when snap ring is removed.
(5) Remove snap ring. If necessary, depress retainer into housing slightly to remove spring load from snap ring.
(6) Remove attaching parts from housing bore. If poppet sticks in housing bore, wiggle it free using a small hooked metal instrument.

(7) Inspect poppet guide and expander ring as installed on poppet. If poppet guide exhibits freedom of movement, do not remove it from poppet. Proceed (with poppet, poppet guide, and expander ring assembled) to step (9).

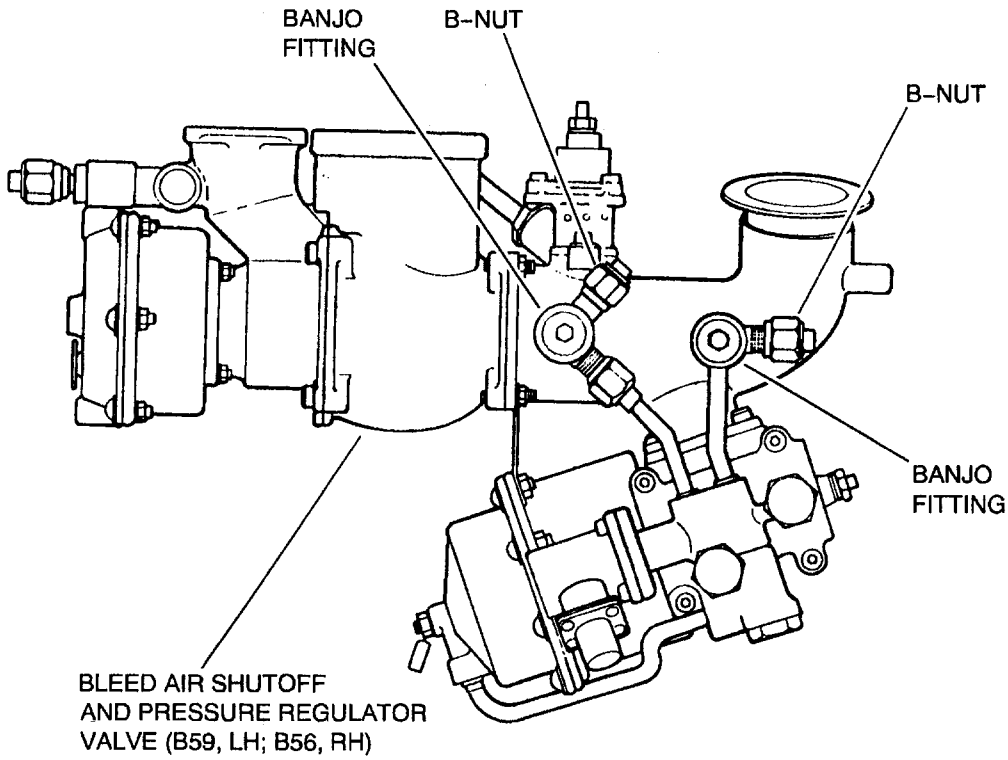
CAUTION: DUE TO EXTREME DELICACY OF POPPET GUIDE, EVERY EFFORT SHALL BE MADE TO LOOSEN AND CLEAN IT WHILE INSTALLED ON POPPET.

(8) If poppet guide is "frozen" onto poppet, remove it with great care, and remove expander ring. Be careful not to distort expander ring.
(9) Clean attaching parts with approved solvent. (Refer to Chapter 20.)
(10) When all parts are clean, install expander ring and poppet guide on poppet (if necessary).

NOTE: Gap of poppet guide must be opposite gap in expander ring.

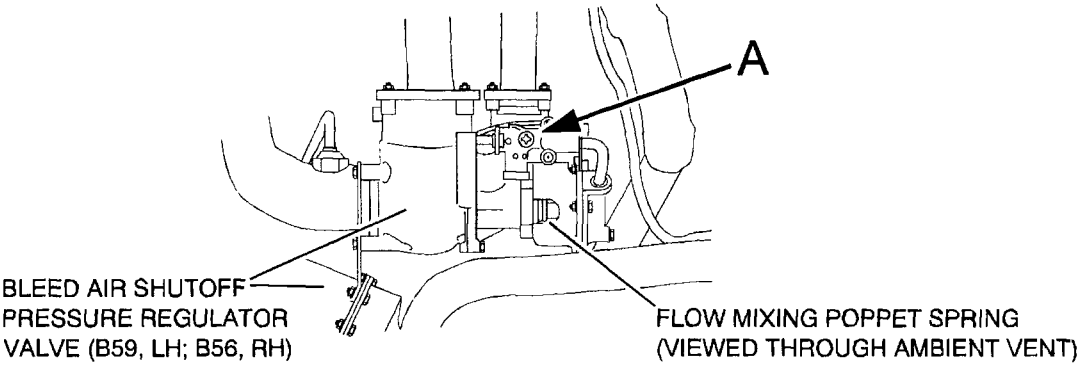
CAUTION: ENSURE THAT ALL WASHERS ARE INSTALLED. INSTALLATION OF CORRECT THICKNESS AND QUANTITY OF WASHERS IS CRITICAL AND IS DETERMINED INDIVIDUALLY AT INITIAL INSTALLATION BY GARRETT CORPORATION.

(11) Install clean poppet assembly, washers, spring, and retainer in housing bore, and secure with snap ring.
(12) Perform Functional Test of Engine Bleed Air Shutoff and Pressure Regulator Valve. (Refer to Adjustment/Test, this section.)
(13) Install lower engine cowl. (Refer to Chapter 71.)

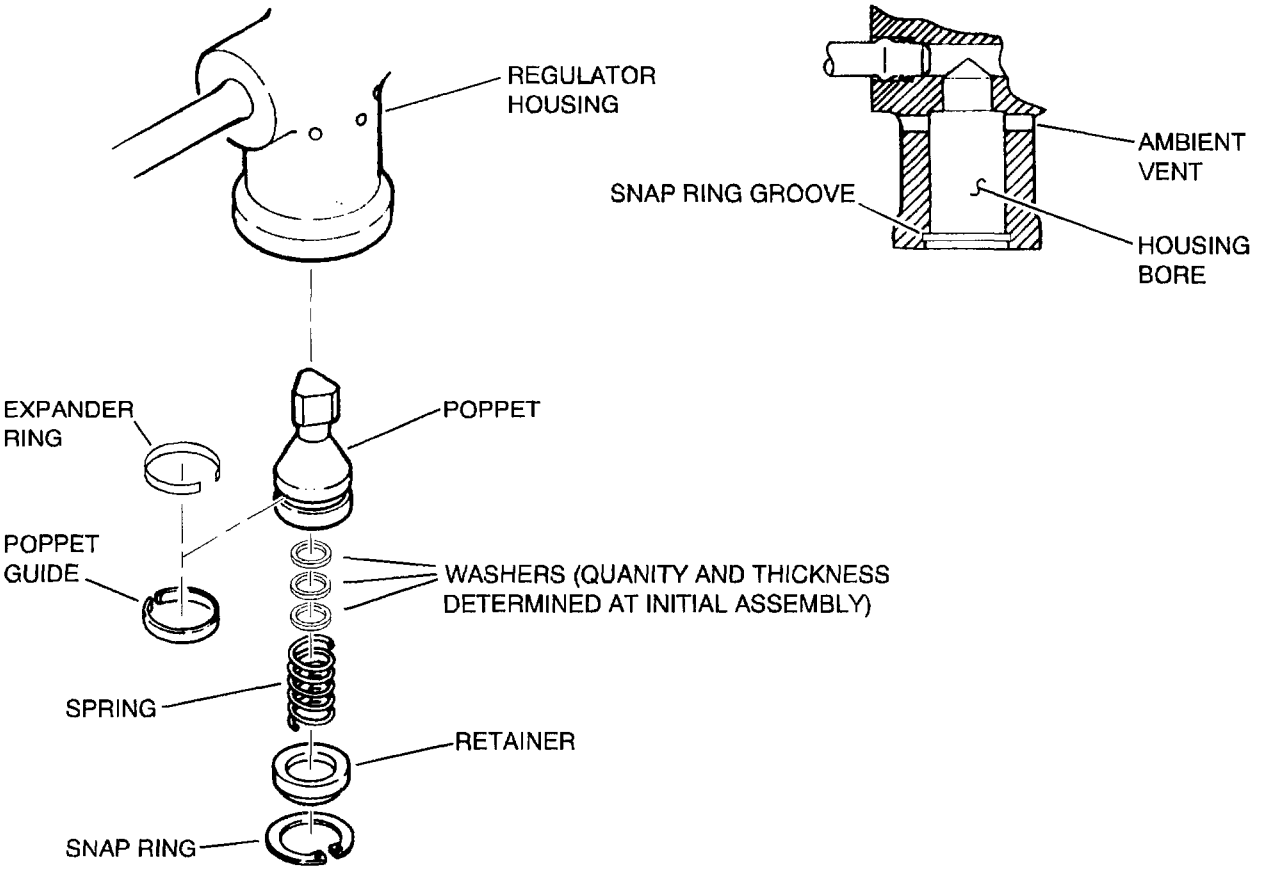


M35-361001-203-01

Banjo and B-Nut Fitting Torque Check
Figure 203



(LOOKING AT LH SIDE OF ENGINE)



BLEED OFF REGULATOR NO. 3

(AIRCRAFT 35-064 THRU 35-504, 35-506 THRU 35-513; 36-018 THRU 36-053 AND PRIOR AIRCRAFT MODIFIED PER SSK 996)

Detail A

M35-361001-202-01

Bleed Off Regulator No.3 Cleaning
Figure 204

BLEED AIR CHECK VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Tools and Equipment

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

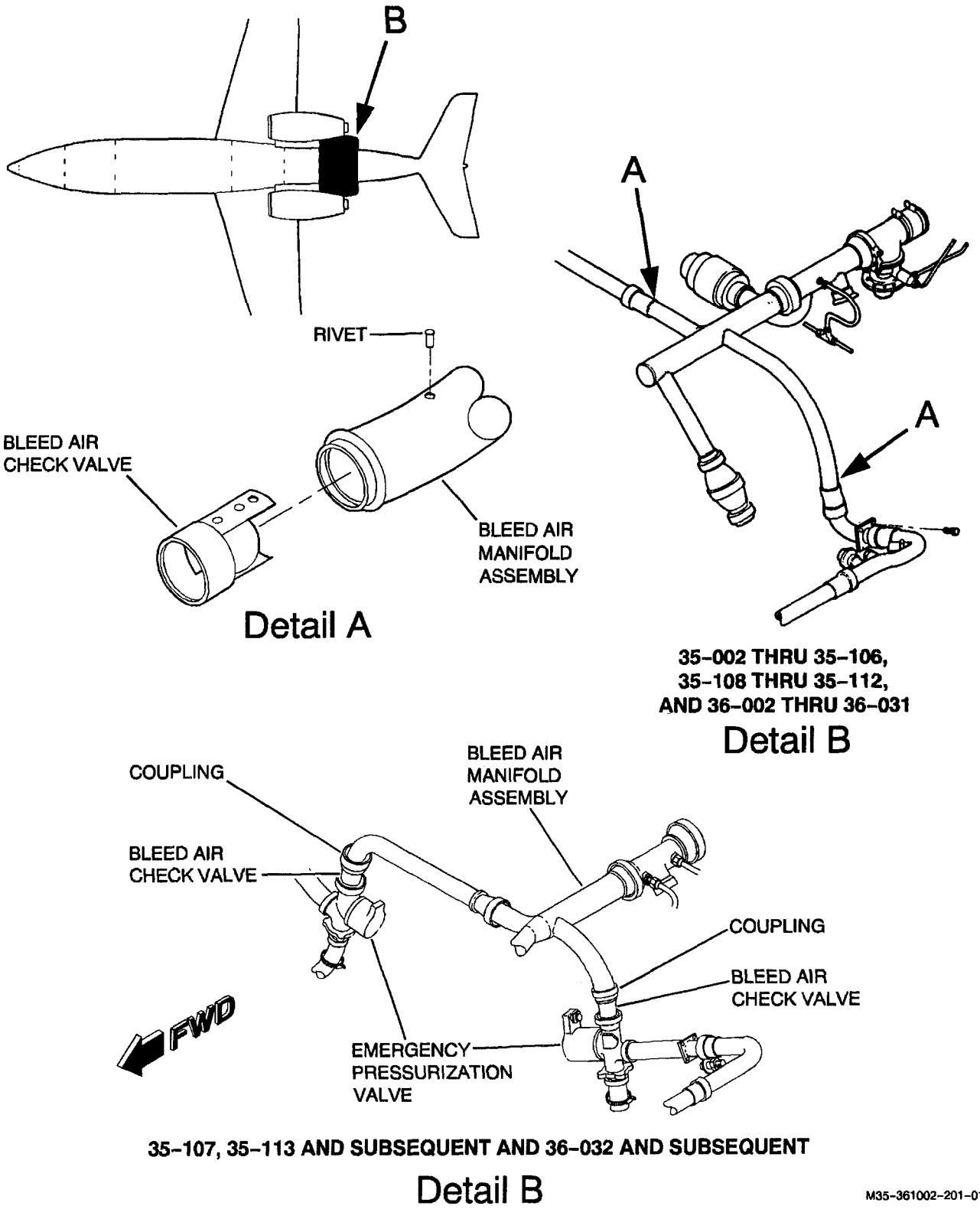
NAME	PART NUMBER	MANUFACTURER	USE
Drill		Commercially Available	Remove check valve rivets.
Silicone Adhesive	(Refer to Chapter 20.)		Coat head and shank of rivets.
Rivets	NAS 1398C or CR 2663	Cherry Division of Textron, Inc. Santa Ana, CA	Secure check valve in manifold duct.

B. Removal of Bleed Air Check Valve (See Figure 201.) (*Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031*)
   (1) Lower tailcone access door.
   (2) Remove bleed air manifold assembly from aircraft.
   (3) Drill out rivet (2 places) securing check valve in bleed air manifold duct and remove check valve.
   (4) Clean area where check valve was installed.

C. Installation of Bleed Air Check Valve (See Figure 201.) (*Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031*)
   (1) Install check valve in bleed air manifold duct.
   (2) Coat head and shank of rivet with silicone adhesive and install rivet securing check valve in manifold duct.
   (3) Pressure test manifold to determine that check valve operates freely.
   (4) Check leakage of each valve individually. Leakage rate shall not exceed 2.5 lb/min [1.13 kg/min] at 20.0 psig [138 kPa].
   (5) Install manifold in aircraft.
   (6) Close tailcone access door.

D. Removal of Bleed Air Check Valve (See Figure 201.) (*Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*)
   (1) Lower tailcone access door.
   (2) Loosen coupling on bleed air manifold assembly sufficiently to allow clearance for removal of check valve.
   (3) Loosen couplings at check valve and remove check valve from aircraft.

E. Installation of Bleed Air Check Valve (See Figure 201.) (*Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*)
   (1) Install check valve and secure with couplings.
   (2) Tighten remaining couplings securing bleed air manifold assembly.
   (3) Secure tailcone access door.



Bleed Air Check Valve Installation
Figure 201

2. Inspection/Check

A. Operational Check of Bleed Air Check Valve (Preferred) (*Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*.)

NOTE: On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, perform Operational Check of Bleed Air Check Valve in accordance with the current inspection interval as specified in Chapter 5.

(1) Connect external electrical power source to aircraft. (Refer to Chapter 24.)
(2) Set Battery Switches on.
(3) Set Cabin Air Switch to OFF.
(4) Set STAB WING HEAT Switch to OFF.
(5) Set Windshield Heat Switch to OFF.
(6) Set Nacelle Heat Switch (both L and R) to OFF.
(7) Set Bleed Air Switch (both L and R) to OFF.
(8) Start right aircraft engine. (Refer to FAA Approved Airplane Flight Manual.)

CAUTION: TO PREVENT DAMAGE TO ENGINE INLET SENSOR HEATING ELEMENT, NACELLE HEAT OPERATION SHALL BE LIMITED TO 30 SECONDS IF ENGINE IS NOT RUNNING.

(9) Set LH Nacelle Heat Switch to ON and RH Bleed Air Switch to ON.
(10) Check for air flow at left hand nacelle heat outlet. There shall be no air flow from nacelle heat outlet.
(11) Check for leaks around installed components and surrounding areas.
(12) Set LH Nacelle Heat Switch to OFF and RH Bleed Air Switch to OFF.
(13) Start left engine and shut down right engine. (Refer to FAA Approved Airplane Flight Manual.)

CAUTION: TO PREVENT DAMAGE TO ENGINE INLET SENSOR HEATING ELEMENT, NACELLE HEAT OPERATION SHALL BE LIMITED TO 30 SECONDS IF ENGINE IS NOT RUNNING.

(14) Set RH Nacelle Heat Switch to ON and LH Bleed Air Switch to ON.
(15) Check for airflow at right hand nacelle heat outlet. There shall be no airflow from nacelle outlet.
(16) Check for leaks around installed components and surrounding areas.
(17) Set RH Nacelle Heat Switch to OFF and LH Bleed Air Switch to OFF.
(18) Shut down left engine. (Refer to FAA Approved Airplane Flight Manual.)
(19) If no airflow is noted from either nacelle heat outlet, this indicates check valves are seating properly and no air is leaking to the opposite engine during single engine operation.
(20) If airflow is noted from either nacelle heat outlet, remove suspect check valve and perform visual inspection for the following:
  (a) Clapper and arm wear; foreign material buildup; cracks and general condition.
  (b) Condition of spring.
  (c) Freedom of movement of clapper and arm.
  (d) Clapper warpage and positive seating.
(21) If check valve is contaminated, but not damaged, clean with approved solvent. (Refer to Chapter 20.)
(22) If check valve is damaged, replace check valve and repeat operational check for proper operation.
(23) Set Battery Switches off.
(24) Disconnect external electrical power source from aircraft. (Refer to Chapter 24.)

B. Operational Check of Bleed Air Check Valve (Alternative) (*Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent.*)

NOTE: On *Aircraft 35-107, 35-113 and Subsequent and 36-032 and Subsequent*, perform Operational Check of Bleed Air Check Valve in accordance with the current inspection interval as specified in Chapter 5.

(1) Connect external electrical power source to aircraft. (Refer to Chapter 24.)
(2) Set Battery Switches on.
(3) Set Cabin Air Switch to OFF.
(4) Set STAB WING HEAT Switch to OFF.
(5) Set Windshield Heat Switch to OFF.
(6) Set Nacelle Heat Switch (both L and R) to OFF.
(7) Set Bleed Air Switch (both L and R) to OFF.
(8) Connect a 20 psig [138 kPa] clean air source to bleed air manifold service port and to pressurization system pressure regulator inlet port.

CAUTION: TO PREVENT DAMAGE TO ENGINE INLET SENSOR HEATING ELEMENT, NACELLE HEAT OPERATION SHALL BE LIMITED TO 30 SECONDS IF ENGINE IS NOT RUNNING.

(9) Set LH Nacelle Heat Switch to ON and RH Bleed Air Switch to ON.
(10) Check for airflow at left hand nacelle heat outlet. There shall be no airflow from nacelle heat outlet.
(11) Check for leaks around installed components and surrounding areas.
(12) Set LH Nacelle Heat Switch to OFF and RH Bleed Air Switch OFF.

CAUTION: TO PREVENT DAMAGE TO ENGINE INLET SENSOR HEATING ELEMENT, NACELLE HEAT OPERATION SHALL BE LIMITED TO 30 SECONDS IF ENGINE IS NOT RUNNING.

(13) Set RH Nacelle Heat Switch to ON and LH Bleed Air Switch to ON.
(14) Check for airflow at right hand nacelle heat outlet. There shall be no airflow from nacelle heat outlet.
(15) Check for leaks around installed components and surrounding areas.
(16) Set RH Nacelle Heat Switch to OFF and LH Bleed Air Switch to OFF.
(17) Set Battery Switch off.
(18) Disconnect external electrical power source from aircraft. (Refer to Chapter 24.)
(19) Repeat steps 2.A.(12) thru (24).

MODULATING VALVE CONTROL BOX- MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

   A. **Remove Modulating Valve Control Box (E917)** (Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031) (See figure 201.)

   (1) Open tailcone access door.
   (2) Locate valve control box (E917) at FS 511 along inboard edge of RH electrical equipment tray.
   (3) Disconnect electrical connector from control box.
   (4) Remove attaching parts and remove control box from aircraft.

   B. **Install Modulating Valve Control Box (E917)** (Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031) (See figure 201.)

   (1) Position valve control box (E917) on RH electrical equipment tray and secure with attaching parts.
   (2) Connect electrical connector to control box.
   (3) Close tailcone access door.

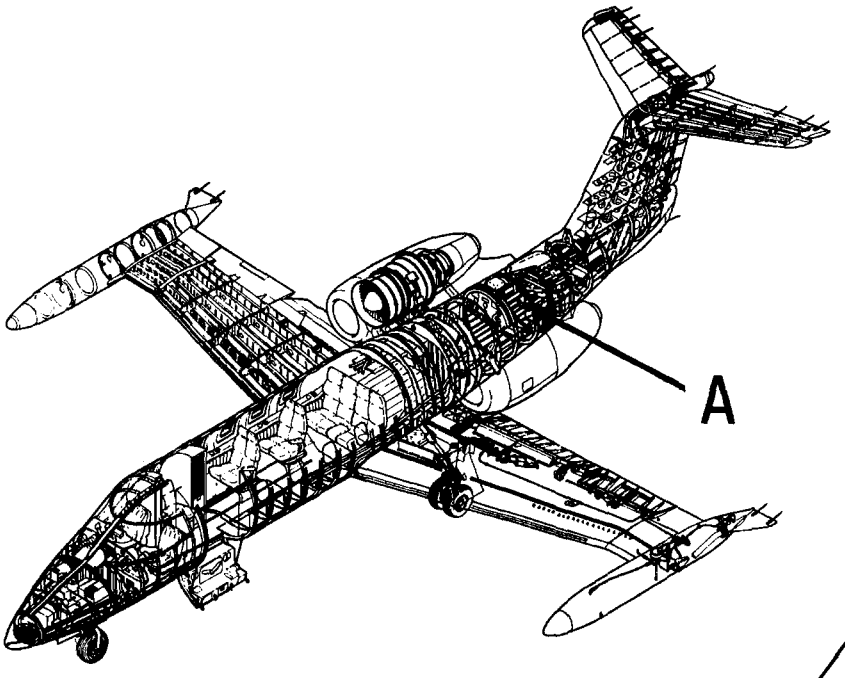
   C. **Remove Modulating Valve Control Box (E241 and E242)** (Aircraft 35-107, 35-113 and Subsequent, and 36-032 and Subsequent) (See figure 201.)

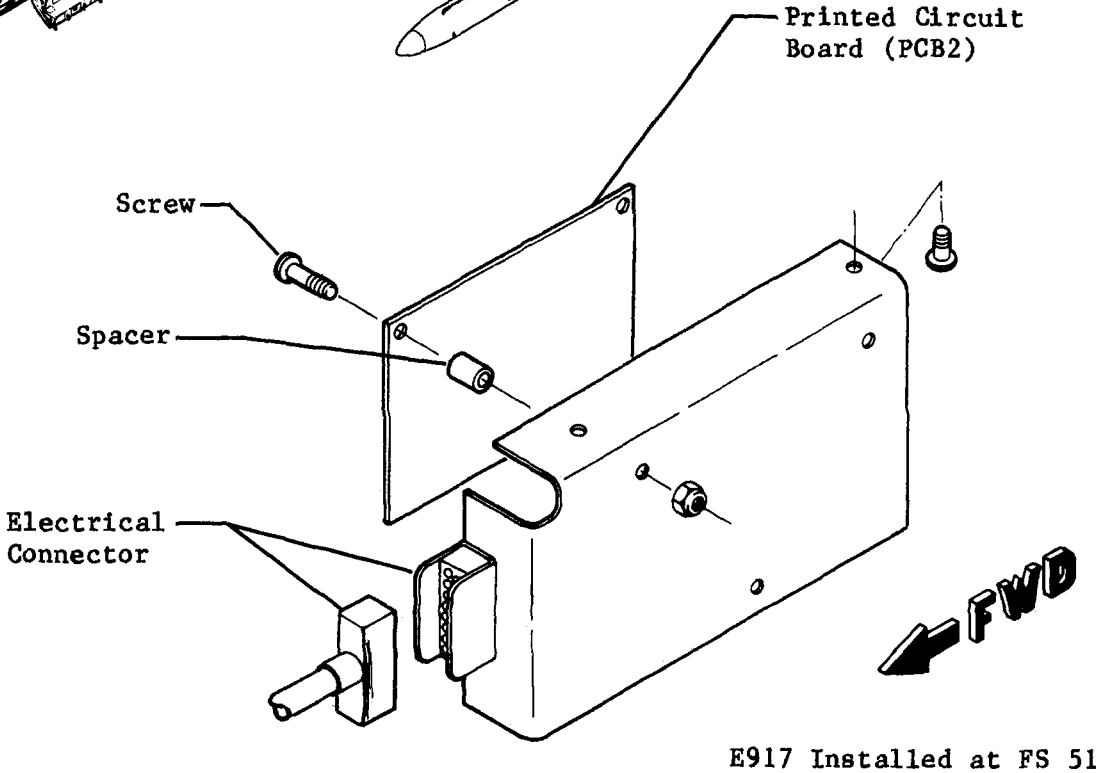
   NOTE: E241 is located at LH side of tailcone at FS 530 on engine fuel computer's lower pan installation. E242 is located at RH side of tailcone at FS 511 along inboard edge of RH electrical equipment tray.

   (1) Open tailcone access door.
   (2) Locate valve control box. E241 is on LH side of tailcone at FS 530 and just forward of engine fuel computer installations. E242 is at FS 511 along inboard edge of RH electrical equipment tray.
   (3) Disconnect electrical connector from control box.
   (4) Remove attaching parts and remove control box from aircraft.

   D. **Install Modulating Valve Control Box (E241 and E242)** (Aircraft 35-107, 35-113 and Subsequent, and 36-032 and Subsequent) (See figure 201.)

   (1) Position valve control box and secure with attaching parts.
   (2) Connect electrical connector to control box.
   (3) Close tailcone access door.



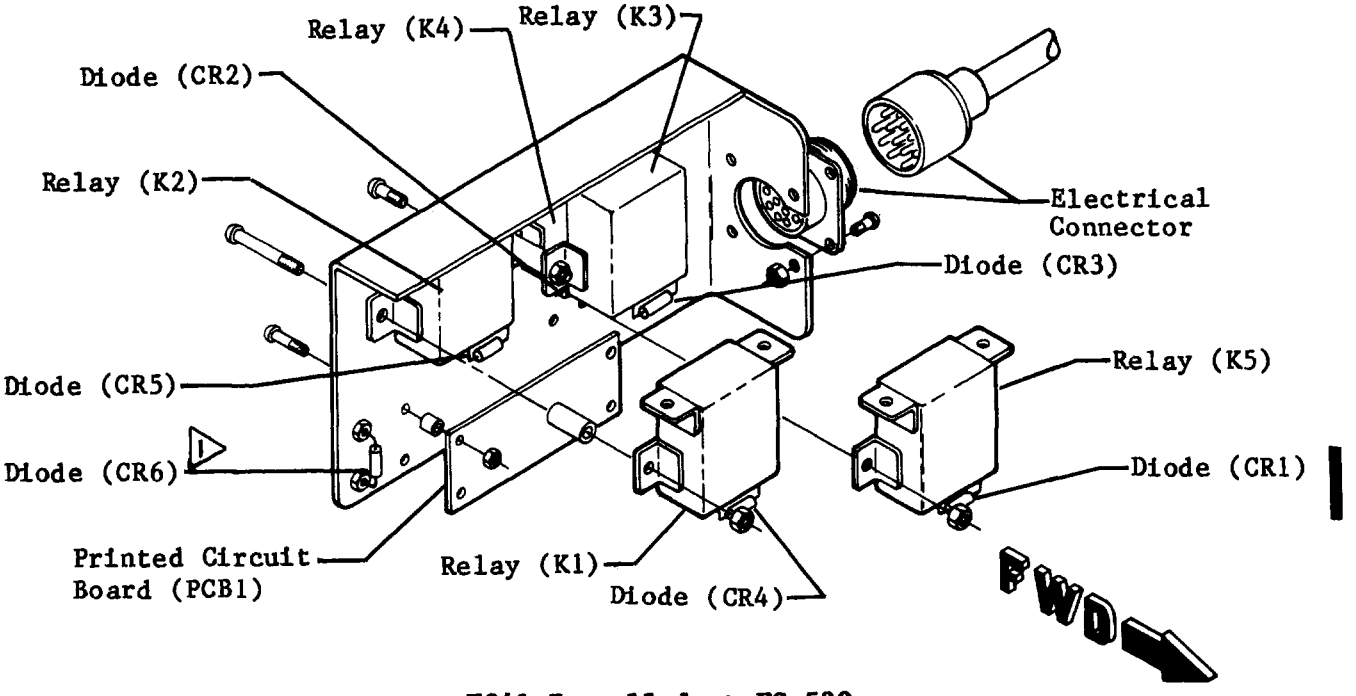


E917 Installed at FS 511

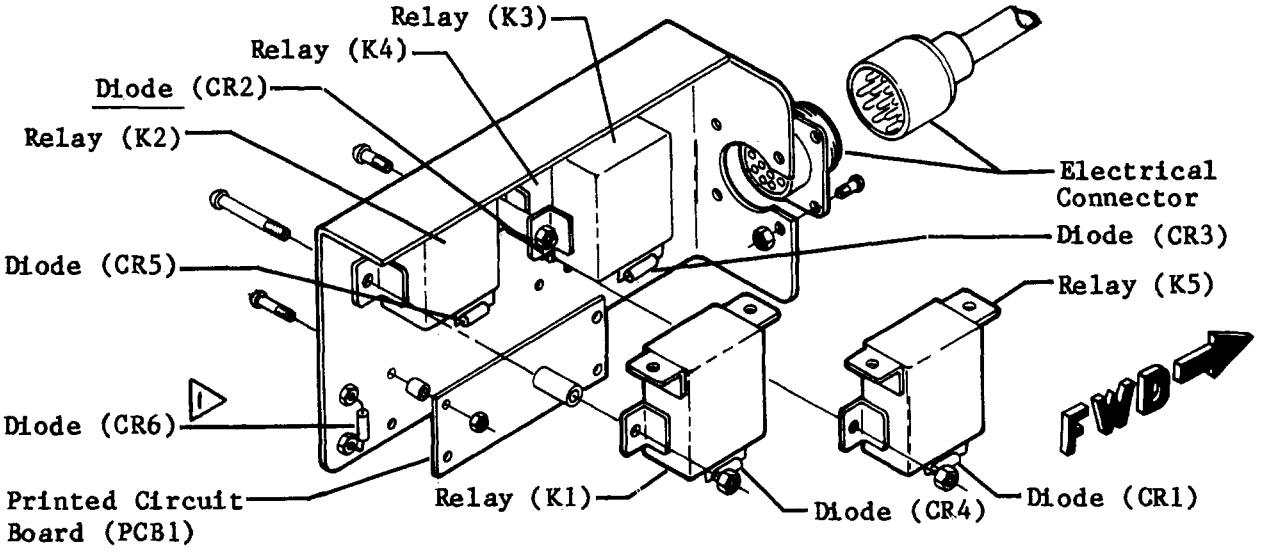
E917 Effectivity: Aircraft 35-002 thru 35-106, 35-108 thru 35-112, and 36-002 thru 36-031.

Detail A

Modulating Valve Control Box Installation
Figure 201 (Sheet 1 of 3)



E241 Installed at FS 530



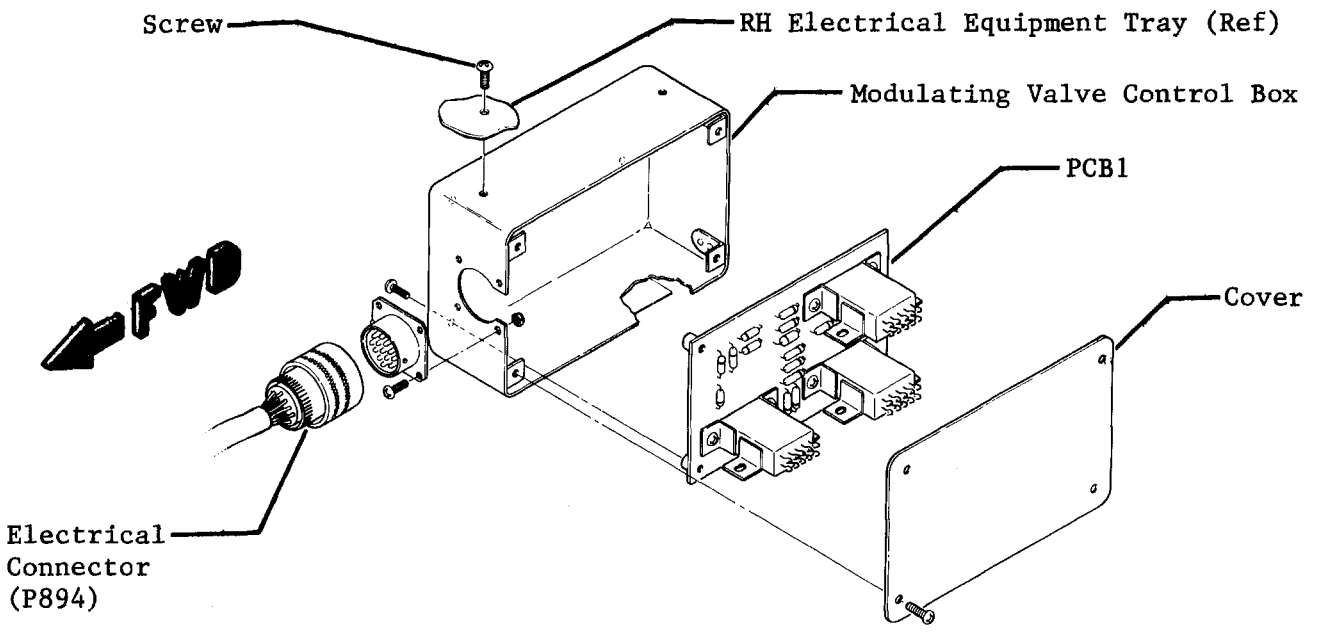
E242 Installed at FS 511

1 35-107, 35-113 thru 35-493
36-032 thru 36-050

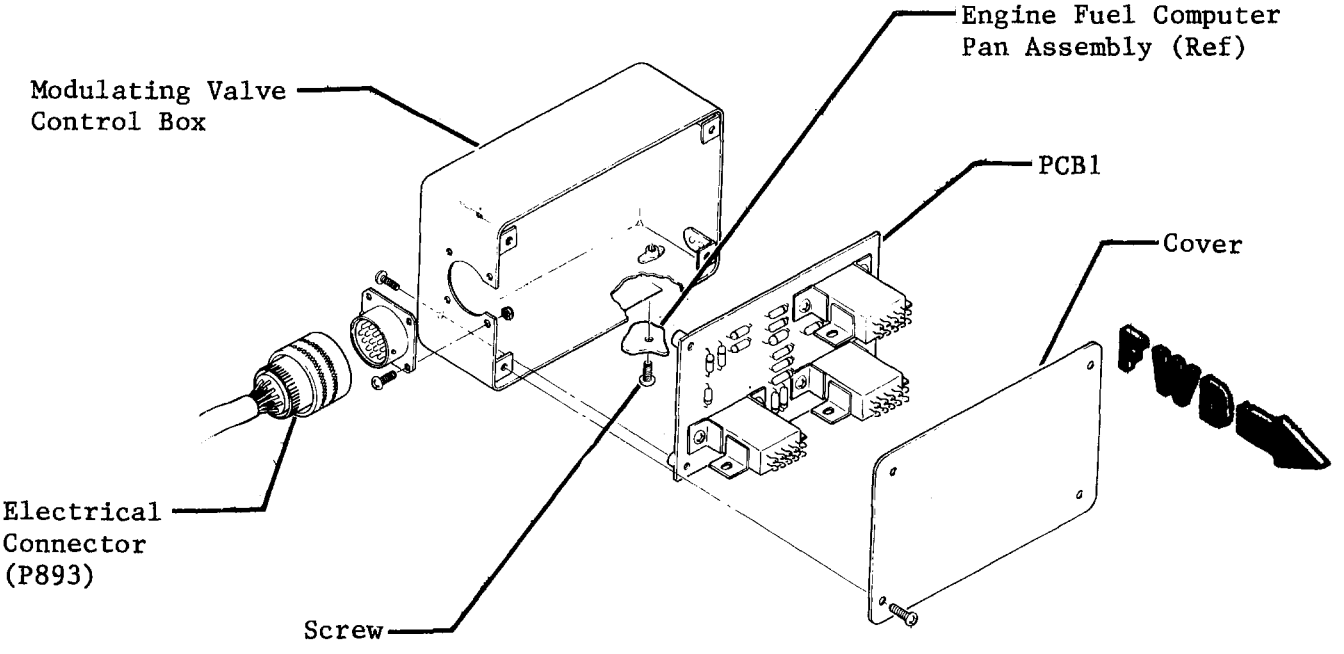
Detail A

Modulating Valve Control Box Installation
Figure 201 (Sheet 2 of 3)

9-120B



Modulating Valve Control Box (E242)



Modulating Valve Control Box (E241)

Modulating Valve Control Box Installation
Figure 201 (Sheet 3 of 3)

9-383B

HIGH PRESSURE BLEED AIR CHECK VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Removal of High Pressure Bleed Air Check Valve (See Figure 201.)
(1) Open tailcone access door and disconnect both battery quick-disconnects.

CAUTION: WHEN ANY LINE IS DISCONNECTED OR COMPONENT REMOVED FROM THE PRESSURIZATION SYSTEM, ENSURE THAT ALL EXPOSED OPENINGS ARE TIGHTLY CAPPED. THE SMALLEST SPECK OF DUST OR OTHER CONTAMINANT COULD CAUSE SYSTEM MALFUNCTION.

(2) Loosen couplings at check valve and remove valve from aircraft. Cap or plug all exposed openings.

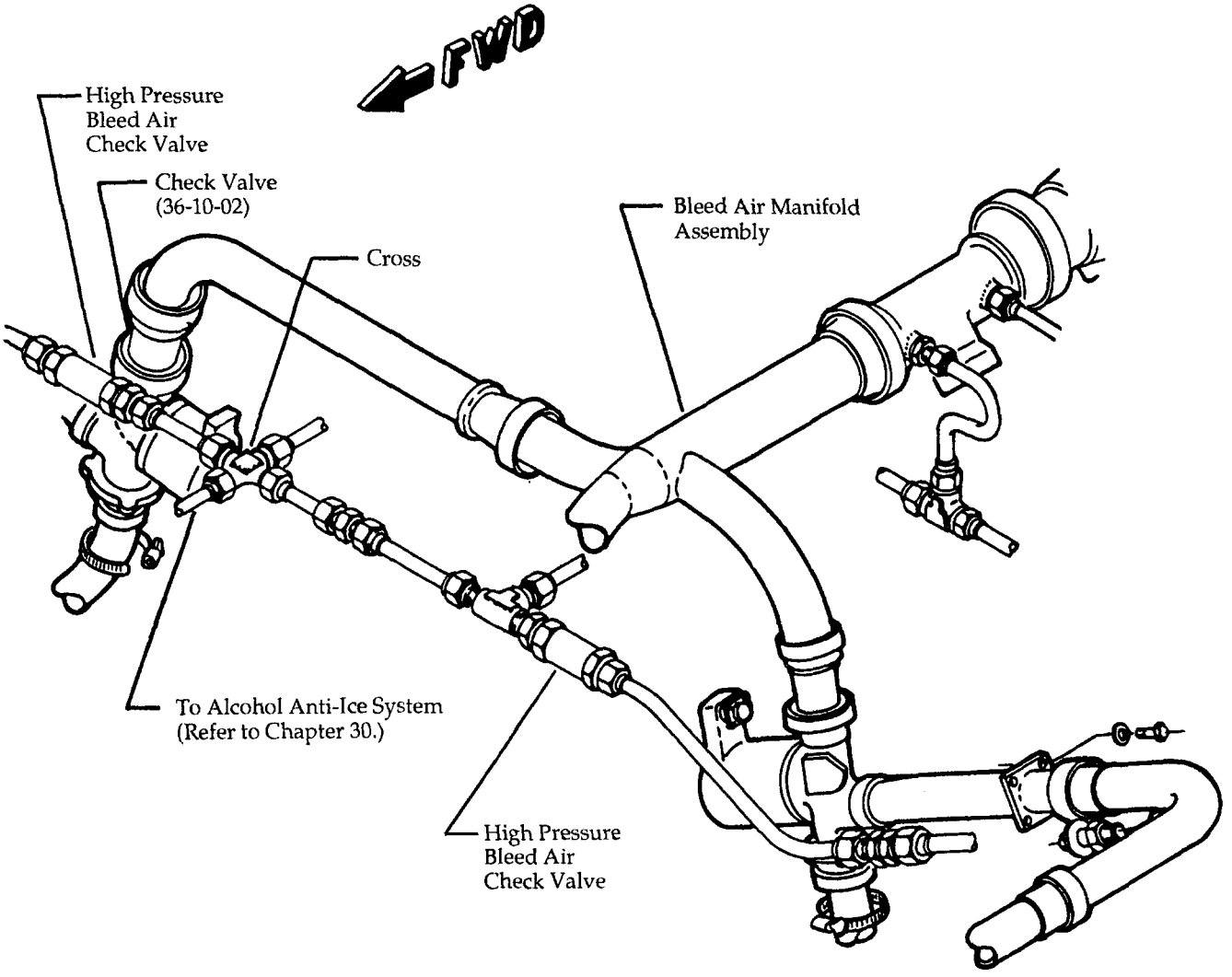
B. Installation of High Pressure Bleed Air Check Valve (See Figure 201.)
(1) Remove any installed caps or plugs and connect tubing to check valve.
(2) Connect both battery quick-disconnects and close tailcone access door.
(3) Perform Operational Check of Pressurization System. (Refer to 21-30-00.)

2. Inspection/Check

A. Visual Inspection of High Pressure Bleed Air Check Valve

NOTE: Perform Visual Inspection of High Pressure Bleed Air Check Valve in accordance with the current inspection interval specified in Chapter 5.

(1) Remove high pressure bleed air check valve. (Refer to Removal/Installation, this section.)
(2) Visually inspect valve flapper for freedom of movement.
(3) Install high pressure bleed air check valve. (Refer to Removal/Installation, this section.)



13-106C-1

High Pressure Bleed Air Check Valve Installation
Figure 201

EMERGENCY AIR BOTTLE - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Remove Emergency Air Bottle (See figure 201.)
      (1) Remove nose compartment access doors.
      (2) Remove oxygen bottle. (Refer to Chapter 35.)
      (3) Remove oxygen bottle support structure.
      (4) Discharge emergency air bottle. (Refer to Chapter 12.)

      WARNING: ENSURE THAT EMERGENCY AIR BOTTLE PRESSURE IS DEPLETED PRIOR TO DISCONNECTING PRESSURE LINES AS BODILY HARM MAY OCCUR SHOULD THE LINES BE UNDER PRESSURE.

      (5) Disconnect plumbing from emergency air bottle.
      (6) Remove bolts, spacers, and washers securing strap assembly to emergency air bottle support.
      (7) Remove emergency air bottle from aircraft.
   B. Install Emergency Air Bottle (See figure 201.)
      (1) Position emergency air bottle on support.
      (2) Install strap assembly and secure with bolts, spacers, and washers.
      (3) Connect emergency pressure line to emergency air bottle.

      WARNING: ENSURE THAT EMERGENCY AIR PRESSURE LINES ARE SECURELY ATTACHED TO EMERGENCY AIR BOTTLES PRIOR TO CHARGING.

      (4) Service emergency air bottle. (Refer to Chapter 12.)
      (5) Install oxygen bottle support structure.
      (6) Install oxygen bottle. (Refer to Chapter 35.)
      (7) Install nose compartment access doors.

2. **Inspection/Check**

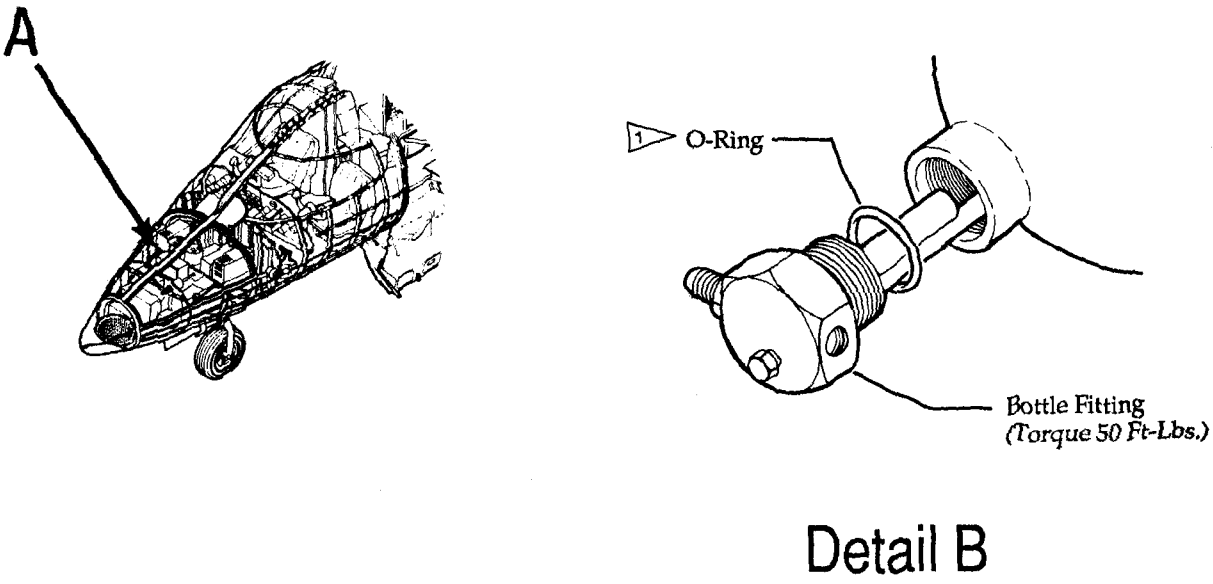
   WARNING: DO NOT METAL STAMP TAVCO BOTTLES.

   NOTE: The emergency air bottle must be removed and a visual inspection (internal and external) in accordance with the inspection interval specified in Chapter 5.

   A. Emergency Air Bottle Inspection
      (1) Remove air bottle from aircraft.
      (2) Remove bottle fitting from bottle.

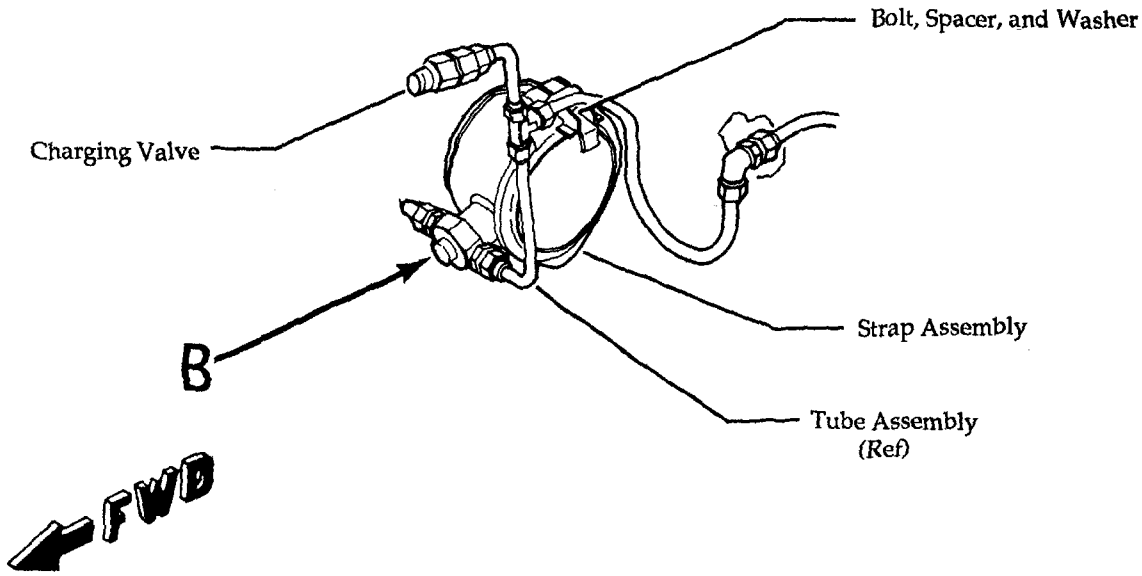
      WARNING: IF ANY CORROSION, RUST, OR ANY OTHER PHYSICAL DAMAGE EXISTS, THE BOTTLE MUST BE REMOVED FROM SERVICE AND RETURNED TO MANUFACTURER FOR REPAIR.

      (3) Visually inspect interior of bottle for any signs of corrosion, rust, or other damage.
      (4) Visually inspect exterior of bottle for any signs of corrosion, rust, dents, scrapes, or other damage. Refer to "Approved Repairs" for external limits of damage.
      (5) Install new O-ring on bottle fitting and install fitting in bottle. Torque to 50 ft-lbs.
      (6) Install bottle in aircraft.



Detail B

1 Kidde Bottle O-Ring P/N MS28778-16
Tavco Bottle O-Ring P/N MS28778-12



Detail A

11-52C

Emergency Air Bottle Installation
Figure 201

3. **Approved Repairs**
   A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Abrasive Cloth (#200 to #400 grit)		Commercially Available	Smooth bottle surface.
Phosphate Coating	TT-C-490, Type I	Commercially Available	Protect Tavco bottle from corrosion.
Red Oxide Primer	TT-P-664	Commercially Available	Prime surface for painting (Tavco or Kidde bottles).
Lacquer (Dull Black)	TT-L-32	Commercially Available	Paint Tavco bottle.
Enamel (Black)	MIL-E-5557, Type II	Commercially Available	Paint Kidde bottle.

B. Emergency Air Bottle Repair

NOTE:
- Approved repairs on emergency air bottle shall be limited to repair of minor exterior dings and scratches and repainting following a magnetic particle inspection.
- *For Tavco bottles*, the following procedure provides a protective barrier between emergency air bottle base material and corrosive influences.

(1) Remove protective coating from affected area of emergency air bottle.

WARNING: DO NOT DECREASE WALL THICKNESS OF EMERGENCY AIR BOTTLE BY MORE THAN 0.005 INCH (0.127 MM) FROM BOTTLE'S ORIGINAL WALL THICKNESS. OTHERWISE, EMERGENCY AIR BOTTLE INTEGRITY AND SAFETY OF AIRCRAFT IS JEOPARDIZED.

(2) Use wet or dry #200 to #400 grit abrasive cloth to smooth dings and scratches.
(3) Paint air bottle as follows:
   (a) *For Tavco air bottle,* use one coat of phosphate coating per TT-C-490, Type I, one coat red oxide primer per TT-P-664, and two coats dull black lacquer per TT-L-32.
   (b) *For Kidde air bottle*, use one coat primer per TT-P-664 and one coat black enamel per MIL-E-5557, Type II.
(4) Allow sufficient time for applied lacquer to dry.
(5) Return emergency air bottle to service.

INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. On Aircraft 35-002 thru 35-037, and 36-002 thru 36-013, 36-015, and 36-016, each engine's bleed air indication system consists of two thermal switches and a pressure switch. One thermal switch is installed in each pylon on the bleed air ducting, one thermal switch is installed on a bracket just aft of the forward engine mount, and the pressure switch is installed in each pylon on the bleed air ducting. On Aircraft 35-038 thru 35-081, 35-083 thru 35-086, 36-014, 36-017 thru 36-022, and prior aircraft modified per SB 35/36-36-1, "Removal of Bleed Air Pressure Switches," each engine's bleed air indication system consists of two thermal switches. One thermal switch is installed in each pylon on the bleed air ducting, and one thermal switch is installed on a bracket just aft of the forward engine mount. 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 AMK 76-7, "Relocation of Cabin Air Distribution Flow Control Valve," each engine's bleed air indication system consists of two thermal switches. One pressure switch and relay assembly is shared by both systems. One thermal switch is installed in each pylon on the bleed air ducting, one thermal switch is installed on a bracket just aft of the forward engine mount, and the pressure switch and relay assembly is located in the tailcone bleed air ducting. Monitoring for the LH and RH systems is provided by one bleed air shutoff and pressure regulator valve control box installed on the RH electrical equipment tray in the tailcone. On Aircraft 35-107, 35-113 and Subsequent, 36-032 and Subsequent, each engine's bleed air indication system consists of two thermal switches. One thermal switch is installed in each pylon on the bleed air ducting and one thermal switch is installed on a bracket just aft of the forward engine mount. Monitoring for the LH and RH systems is provided by LH and RH bleed air shutoff and pressure regulator valve control boxes installed in the tailcone.

2. OPERATION

A. The thermal switches complete a ground to illuminate the BLEED AIR (red) annunciator and the Master Warning light if the temperature exceeds a predetermined limit. On Aircraft 35-002 thru 35-063 and 36-002 thru 36-017 not modified per SSK966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK85-6, "Engine Bleed Air Shutoff and Pressure Regulator Replacement," the switches open at 590 ±5°F and on Aircraft 35-064 and Subsequent and 36-018 and Subsequent, the switches close at 645 ±10°F.

B. On Aircraft 35-002 thru 35-037, and 36-002 thru 36-013, 36-015, and 36-016 not modified per SB 35/36-36-1, "Removal of Bleed Air Pressure Switches" and not modified per AMK 76-7, "Relocation of Cabin Air Distribution Flow Control Valve," the pressure switch (N.O.) completes a ground circuit when duct pressure exceeds 45 (±2) psi, to the bleed air shutoff and pressure regulator control box. The ground circuit illuminates its applicable red BLEED AIR annunciator on the glareshield and the Master Warning annunciator.

C. The pylon thermal switch (N.O.) completes a ground circuit, when the temperature in the pylon exceeds 250 (±5)°F, to the bleed air shutoff and pressure regulator control box. The switch opens at 240 (±5)°F. The ground circuit illuminating its applicable red BLEED AIR annunciator on the glareshield and the Master Warning annunciator.

D. On Aircraft 35-082 thru 35-106, 35-108 thru 35-112, and 36-023 thru 36-031 and prior aircraft modified per AMK 76-7, "Relocation of Cabin Air Distribution Flow Control Valve," a pressure switch and relay are installed on the tailcone bleed ducting between the bleed air manifold and the heat exchanger. If the bleed air pressure increases to approximately 47 psig, the pressure switch is actuated and completes a ground circuit to the relay. The relay completes two ground circuits to the bleed air shutoff and pressure regulator control box. These ground circuits illuminate both BLEED AIR annunciators and the Master Warning annunciator. The switch opens when bleed air pressure decreases to approximately 38 psig and the BLEED AIR annunciators and Master Warning annunciator extinguish.

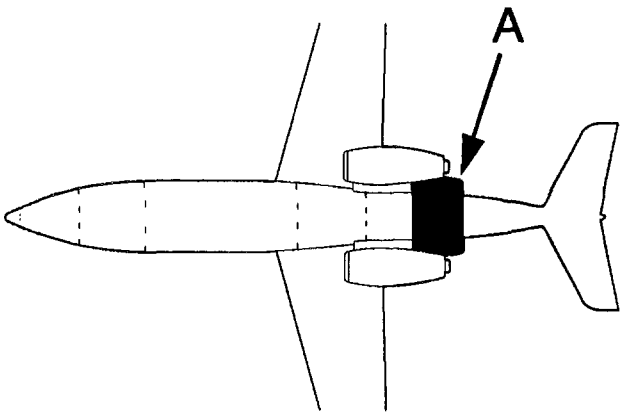
OVER-TEMP BLEED AIR SWITCH - MAINTENANCE PRACTICES

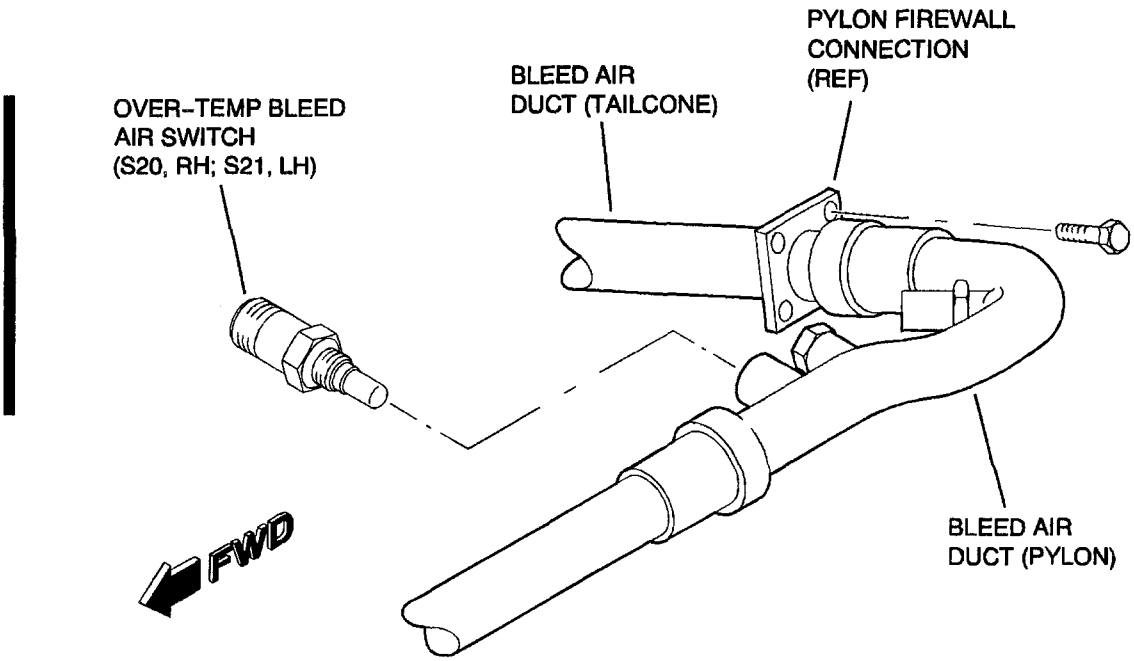
1. **Removal/Installation**
   A. Removal of Over-Temp Bleed Air Switch (S20, RH; S21, LH) (See Figure 201.)
      (1) Disconnect electrical power from aircraft.
      (2) Remove access panels from pylon to gain access to over-temp switches.
      (3) Disconnect switch electrical wiring at splice.
      (4) Remove switch and gasket from bleed air ducting.
   B. Installation of Over-Temp Bleed Air Switch (S20, RH; S21, LH) (See Figure 201.)
      (1) Inspect switch gasket and replace if required.
      (2) Install gasket and switch in bleed air duct.
      (3) Connect electrical wiring to switch.
      (4) Start aircraft engine equipped with newly installed switch. (Refer to FAA Approved Airplane Flight Manual.)
      (5) Set appropriate Bleed Air Switch ON.
      (6) Check for leaks around installed switch.
      (7) Shutdown engine. (Refer to FAA Approved Airplane Flight Manual.)
      (8) Install access panels on pylon.

2. **Adjustment/Test**
   A. Tools and Equipment
      (1) Acquire necessary tools and equipment.

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

NAME	PART NUMBER	MANUFACTURER	USE
Digital Multimeter	8050A-1	Fluke Mfg. Inc. Everett, WA	Check for closed circuit.
Torque Wrench		Commercially Available	Torque bolts.
Hot Plate (Controllable: 80 to 675°F [27 to 357°C])		Commercially Available	Heat test fixture.
Temperature Millivolt Potentiometer (Range: 0 to 675°F [-18 to 357°C])	8693-2	Leeds and Northrup	Determine temperature of switch.
or			
Digital Thermometer	Fluke 52	Fluke Mfg. Inc. Everett, WA	
Test Fixture (Aluminum block tapped for switch)		Locally Manufactured	Hold switch.





(LH SHOWN; RH TYPICAL)

Detail A

M35-362001-201-01

Over-Temp Bleed Air Switch Installation
Figure 201

B. Functional Test of Over-Temp Bleed Air Switch (S20, RH; S21, LH) *(LES-FT-242E)*

NOTE: Perform Functional Test of Over-Temp Bleed Air Switch in accordance with the current inspection intervals specified in Chapter 5.

(2) Remove over-temp bleed air switch from aircraft. (Refer to Removal/Installation, this section.)
(3) Install over-temp bleed air switch in test fixture using 160 (±10) inch-pounds [18 (±1) Nm] torque applied to switch hex. This is to effect a tight metal-to-metal contact between switch face and mating surface of test fixture mounting base.
(4) On *Aircraft 35-002 thru 35-063 and 36-002 thru 36-017 not modified per SSK 966, "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement,"* adjust hot plate to bring test fixture temperature to 595°F [313°C].
(5) Allow switch to stabilize for two (2) minutes.
(6) Using multimeter, check for open circuit. Switch shall open at 590 (±5)°F [310 (±2.75)°C].
(7) On *Aircraft 35-064 and Subsequent, 36-018 and Subsequent and prior aircraft modified per SSK 966 "Replacement of Bleed Air Shutoff and Pressure Regulator Valve" or AAK 85-6, "Engine Bleed Air Shutoff and Pressure Regulator Valve Replacement,"* adjust hot plate to bring test fixture temperature to 655°F [346°C].
(8) Allow switch to stabilize for two (2) minutes.
(9) Using multimeter, check for closed circuit.
(10) Reduce temperature approximately 1°F [.55°C] per minute. Check for temperature at which over-temp bleed air switch opens. Switch shall open at 615°F [324°C] minimum.
(11) Increase temperature approximately 1°F [.55°C] per minute. Check for temperature at which over-temp bleed air switch closes. Switch shall close at 655°F [346°C] maximum.

CAUTION: USE EXTREME CAUTION TO PREVENT INJURY OF PERSONNEL DUE TO ELEVATED TEMPERATURE OF SWITCH AND TEST FIXTURE.

(12) Remove over-temp bleed air switch from test fixture.
(13) If over-temp bleed air switch does not operate within specified limits, replace switch.

C. Functional Test of Over-Temp Bleed Air Switch (S20, RH; S21, LH) Electrical System *(LES-FT 1181AF)*

NOTE: Perform Functional Test of Over-Temp Bleed Air Switch Electrical System in accordance with the current inspection intervals specified in Chapter 5.

CAUTION: ENSURE ELECTRICAL JUMPER USED WILL NOT ARC TO AIRCRAFT.

(1) Disconnect electrical connector (P747, LH; P748, RH) from switch (S21, LH; S20, RH).
(2) Connect an electrical jumper between pin A and pin B of electrical connector (P747, LH).
(3) Connect an electrical jumper between pin A and pin B of electrical connector (P748, RH).
(4) Connect external electrical power to aircraft. (Refer to Chapter 24.)
(5) Set Battery Switches on.
(6) If applicable Bleed Air annunciator does not illuminate:
  (a) Conduct lamp test by depressing pilot's or copilot's Warning Light Test Switch.
  (b) Check circuit in modulating valve control and warning box. (Refer to Wiring Manual.)
  (c) Check electrical circuit for an open or loose connection.
(7) If applicable Left Bleed Air or Right Bleed Air annunciator illuminates, disconnect electrical power from aircraft.
(8) Remove electrical jumper from electrical connector terminals.
(9) Connect electrical connector (P747, LH; P748, RH) to switch (S21, LH; S20, RH).

PRESSURE SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Pressure Switch (Typical LH and RH) (See figure 201.)

(1) Remove access panels from pylon to gain access to pressure switch.
(2) Disconnect electrical wiring from pressure switch at splice.
(3) Remove pressure switch from bleed air ducting.

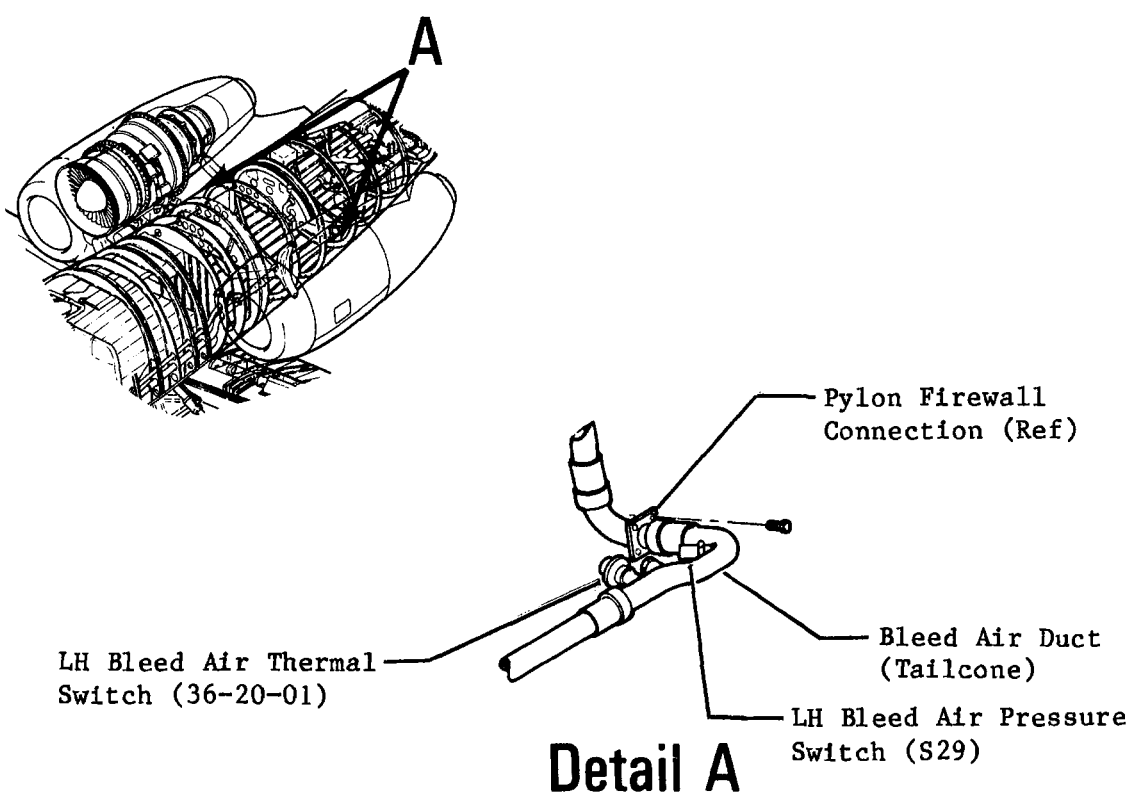
B. Install Pressure Switch (Typical LH and RH) (See figure 201.)

(1) Install pressure switch in bleed air duct.
(2) Connect electrical wiring to pressure switch.
(30 Install access panels on pylon.

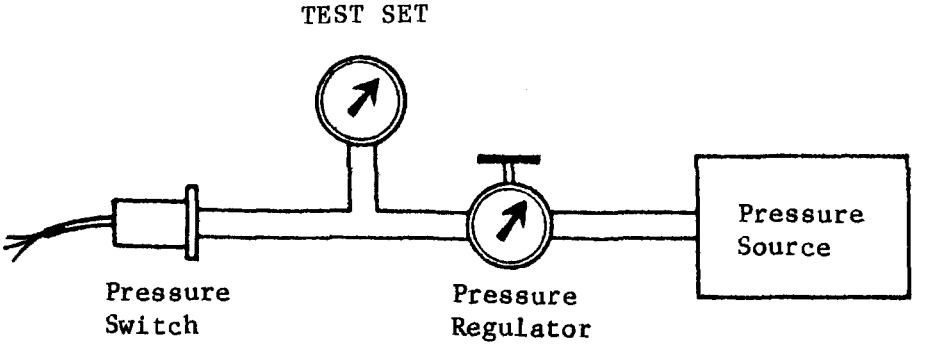
2. ADJUSTMENT/TEST

A. Functional Test of Pressure Switch (See figure 202.)

(1) Connect pressure switch to test set as shown in figure 202.
(2) Connect air source and pressurize test set 45 (±2) psi.
(3) Check that switch actuation occurs at 45 (±2) psi.
(4) Depressurize test set and remove pressure switch.
(5) Install pressure switch in pylon.



Pressure Switch Installation
Figure 201



Pressure Switch Functional Test Schematic
Figure 202

PRESSURE SWITCH AND RELAY - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Pressure Switch (See figure 201.)

NOTE: The pressure switch is installed on the bleed air duct between the windshield anti-ice manifold and the heat exchanger. The switch is plumbed to the duct by a bleed air tube.

(1) Lower tailcone access door.
(2) Disconnect aircraft batteries.
(3) Disconnect pressure switch wiring.
(4) Loosen and remove bleed air tube between pressure switch and duct.
(5) Loosen and remove nut that secures pressure switch to duct bracket. Remove pressure switch from bracket.

B. Install Pressure Switch (See figure 201.)

(1) Install pressure switch in bracket and secure with nut.
(2) Install and secure bleed air tube between pressure switch and duct.
(3) Connect pressure switch wiring.
(4) Connect aircraft batteries.
(5) Raise and secure tailcone access door.

C. Remove Relay (See figure 201.)

NOTE: The relay is installed on the mounting bracket adjacent to the pressure switch.

(1) Lower tailcone access door.
(2) Disconnect aircraft batteries.
(3) Disconnect wiring from relay.
(4) Remove attaching parts and relay from bracket.

D. Install Relay (See figure 201.)

(1) Install relay and secure with attaching parts.
(2) Connect electrical wiring to relay.
(3) Connect aircraft batteries.
(4) Raise and secure tailcone access doors.

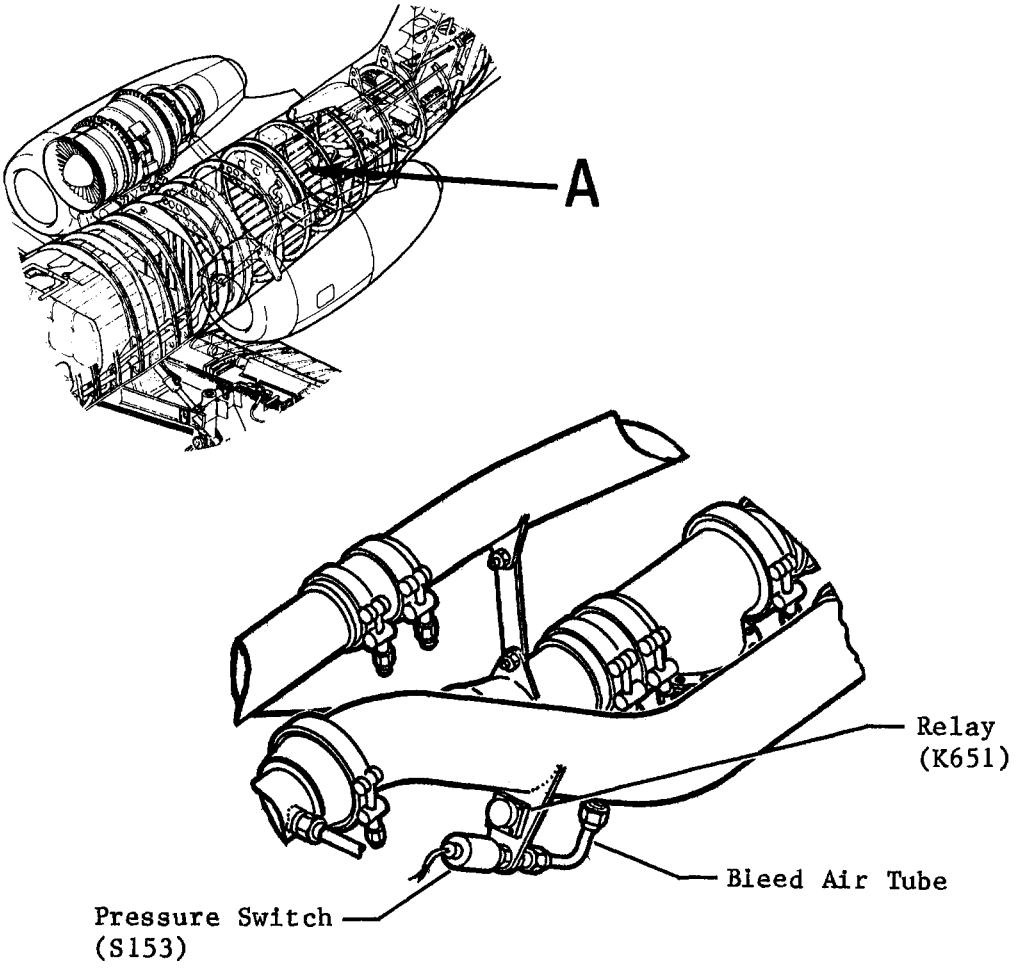
2. INSPECTION/CHECK

A. Pressure Switch Operational Check

NOTE: The pressure switch is operationally checked installed in the aircraft.

(1) Lower tailcone access door.
(2) Disconnect bleed air tube at pressure switch.
(3) Attach a pressure source with pressure gage and pressure regulator to union on pressure switch.
(4) Set Battery Switches ON.

(5) Slowly increase pressure on pressure switch until BLEED AIR annunciators and the Master Warning annunciator are illuminated. The annunciators shall illuminate at approximately 47 psig.
(6) Slowly decrease the pressure on pressure switch until BLEED AIR annunciators and Master Warning annunciator are extinguished. The lights shall extinguish at approximately 38 psig.
(7) Set Battery Switches to OFF.
(8) Disconnect pressure source and connect bleed air tube to pressure switch.
(9) Raise and secure tailcone access door.



Detail A

Pressure Switch and Relay Installation
Figure 201

PYLON HI-LIMIT THERMOSTAT - MAINTENANCE PRACTICES

1. Removal/Installation

A. Removal of Pylon Hi-Limit Thermostat (S355, LH; S356, RH) (See Figure 201.)

(1) Disconnect electrical power from aircraft.

(2) Remove lower access panel (just aft of engine forward mount) from pylon.

NOTE: On *Aircraft 35-002 thru 35-153 and 36-002 thru 36-038*, a single piece lower access panel is installed.

(3) Disconnect electrical wiring from pylon thermostat.

(4) Remove attaching parts and thermostat from bracket.

B. Installation of Pylon Hi-Limit Thermostat (S355, LH; S356, RH) (See Figure 201.)

(1) Position pylon thermostat on bracket and secure with attaching parts.

(2) Connect electrical wiring to thermostat.

(3) Install and secure lower access panel.

2. Adjustment/Test

A. Functional Test of Pylon Hi-Limit Thermostat (S355, LH; S356, RH) *(LES-FT 119J)*

NOTE: Perform Functional Test of pylon Hi-Limit Thermostat in accordance with the current inspection intervals specified in Chapter 5.

(1) Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Digital Multimeter	8050A-1	Fluke Mfg. Inc. Everett, WA	Check for continuity of pylon thermostat.
Digital Thermometer	Fluke 52	Fluke Mfg. Inc. Everett, WA	Check temperature of oven or oil bath.

(2) Remove pylon thermostat from aircraft. (Refer to Removal/Installation, this section.)

(3) Using an oven or oil bath capable of 300°F [149°C], check thermostat as follows:

(a) Connect multimeter to thermostat and place in oven or oil bath.

(b) Increase temperature approximately 1°F [.55°C] per minute. Check for temperature at which pylon thermostat closes. Thermostat shall close at 250 (±5)°F [121 (±2.7)°C].

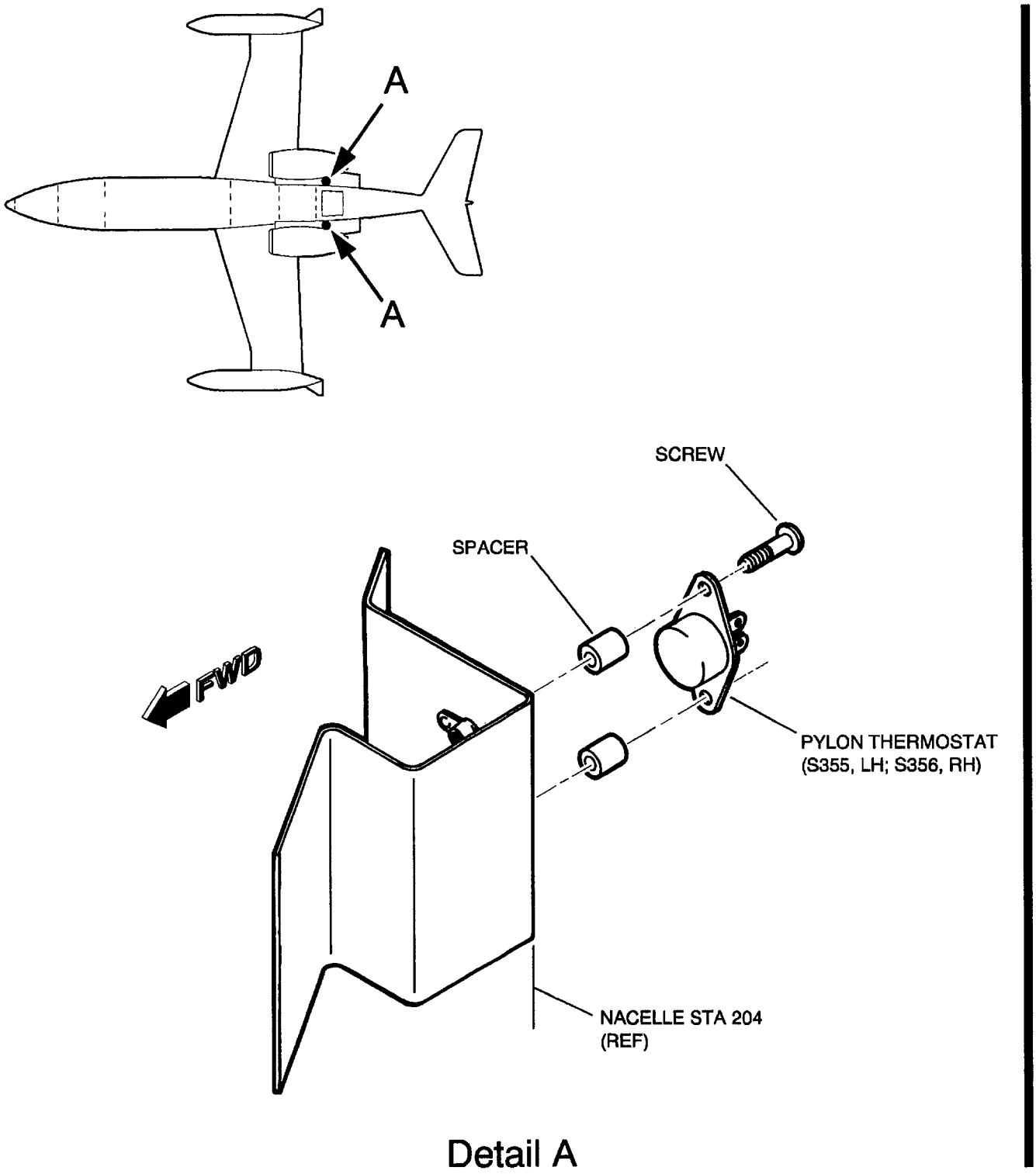
(c) Reduce temperature approximately 1°F [.55°C] per minute. Check for temperature at which pylon thermostat opens. Switch shall open at 240 (±5)°F [116 (±2.7)°C].

B. Functional Test of Pylon Hi-Limit Thermostat (S355, LH; S356, RH) Electrical System *(LES-FT 1181AF)*

NOTE: Perform Functional Test of pylon Hi-Limit Thermostat Electrical System in accordance with the current inspection intervals specified in Chapter 5.

CAUTION: ENSURE ELECTRICAL JUMPER USED WILL NOT ARC TO AIRCRAFT.

(1) Connect an electrical jumper between pylon hi-limit thermostat leads.
(2) Connect electrical power to aircraft and ensure Battery Switches are on.
(3) If applicable Bleed Air annunciator does not illuminate:
  (a) Conduct lamp test by depressing pilot's or copilot's Warning Light Test Switch.
  (b) Check circuit in modulating valve control and warning box. (Refer to Wiring Manual.)
  (c) Check electrical circuit for an open or loose connection.
(4) If applicable Left Bleed Air or Right Bleed Air annunciator illuminates, remove electrical power from aircraft.
(5) Remove electrical jumper from pylon thermostat leads.
(6) Continue with pylon thermostat installation.



Pylon Hi-Limit Thermostat Installation
Figure 201