Aerolineas Argentinas

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CHAPTER 75 - AIR

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AIR - DESCRIPTION AND OPERATION

1. General

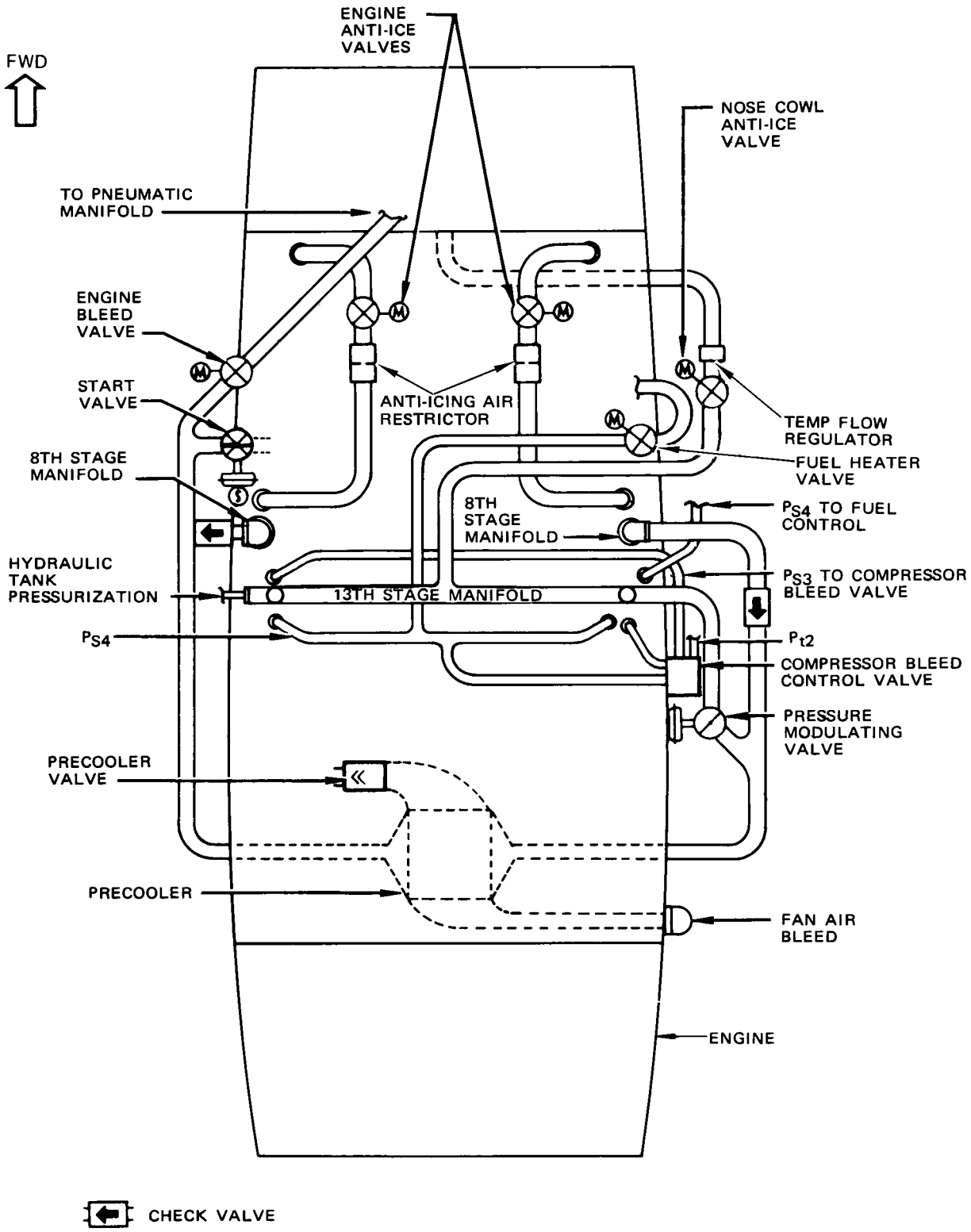
A. Engine compressor air is tapped for operating various engine accessories and airplane systems. Some bleed systems are basic with the engine as received from the engine manufacturer. Other engine bleed systems are installed by the airframe manufacturer. In addition to engine bleeds for accessory and system use, a compressor bleed system is incorporated to permit engine operational flexibility by allowing high compressor discharge air to bleed into the fan discharge duct.

B. Those systems using engine bleed air and containing coverage within this chapter are as follows:

SYSTEM	SECTION
Compressor Bleed	75-31-0
Engine Anti-Icing	75-11-0
Engine Nose Cowl Anti-Icing	75-11-0
Generator Cooling	75-21-0

C. Those systems using engine bleed air and containing coverage in other chapters are as follows:

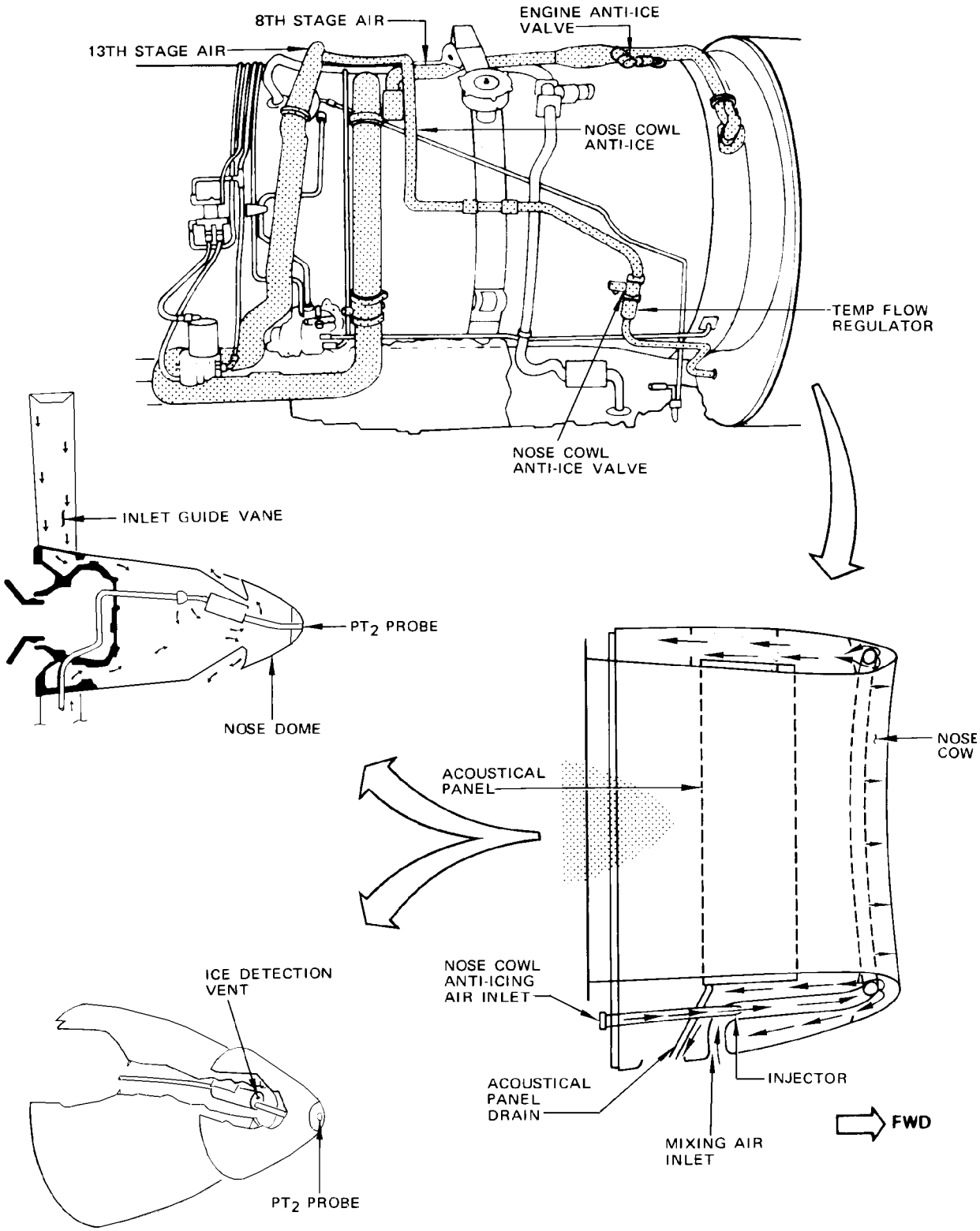
SYSTEM	CHAPTER
Pneumatic Starting System	80
Engine Fuel Deicing	73
Pneumatic System	36



Engine Air Bleeds
Figure 1

ENGINE AND NOSE COWL ANTI-ICING - DESCRIPTION AND OPERATION

1. General
   A. A thermal anti-icing system using engine bleed air is provided to prevent the formation of ice on the engine inlet nose cowl, nose dome, compressor inlet case and inlet guide vanes. There is a separate and independently controlled system for each engine.
   B. The engine nose cowl leading edge is anti-iced by 13th-stage engine bleed air controlled by a thermostatic valve, a shutoff valve and tempered with ambient air by the use of an injector. The engine inlet nose dome, compressor inlet case and inlet guide vanes are anti-iced by 8th-stage engine bleed air controlled by fixed orifice plates and shutoff valves (Fig. 1). The three shutoff valves for each engine are controlled by a single switch so that the engine and the nose cowl anti-icing systems operate simultaneously. The switches and VALVE OPEN lights are located on the forward overhead panel.
2. Engine Anti-Icing Air Valve
   A. An engine anti-icing air shutoff valve is provided in each of the two plumbing lines which supply 8th-stage engine bleed air to the inlet guide vanes and nose dome. The valves are located at the 11 o'clock, and 1 o'clock positions aft of the inlet guide vane case.
   B. Each anti-icing air valve is motor -operated and when energized, drives to the fully open or closed position as determined by the control switch selection. The valve has an indicator which can be used during maintenance to determine valve position.
3. Nose Cowl Anti-Icing Air Valve
   A. A nose cowl anti-icing air valve is provided in the plumbing line which supplies 13th-stage engine bleed air for anti-icing the nose cowl. The valve is located at approximately, the 4 o'clock position aft of the nose cowl.
   B. The valve is motor-operated and when energized drives to the fully open or fully closed position as determined by the control switch selection. The valve has an override handle for manually positioning the valve and can be used also during maintenance to determine valve position.
4. Engine Anti-Icing Air Orifice
   A. An orifice plate is located on the upstream side of each engine anti-icing air valve as a fixed part of the rear anti-icing tube assemblies. The orifice plates limit the volume of anti-icing air supplied to the inlet guide vane assembly. This keeps the guide vane assembly from becoming too hot preventing excessive temperature of the engine inlet air.

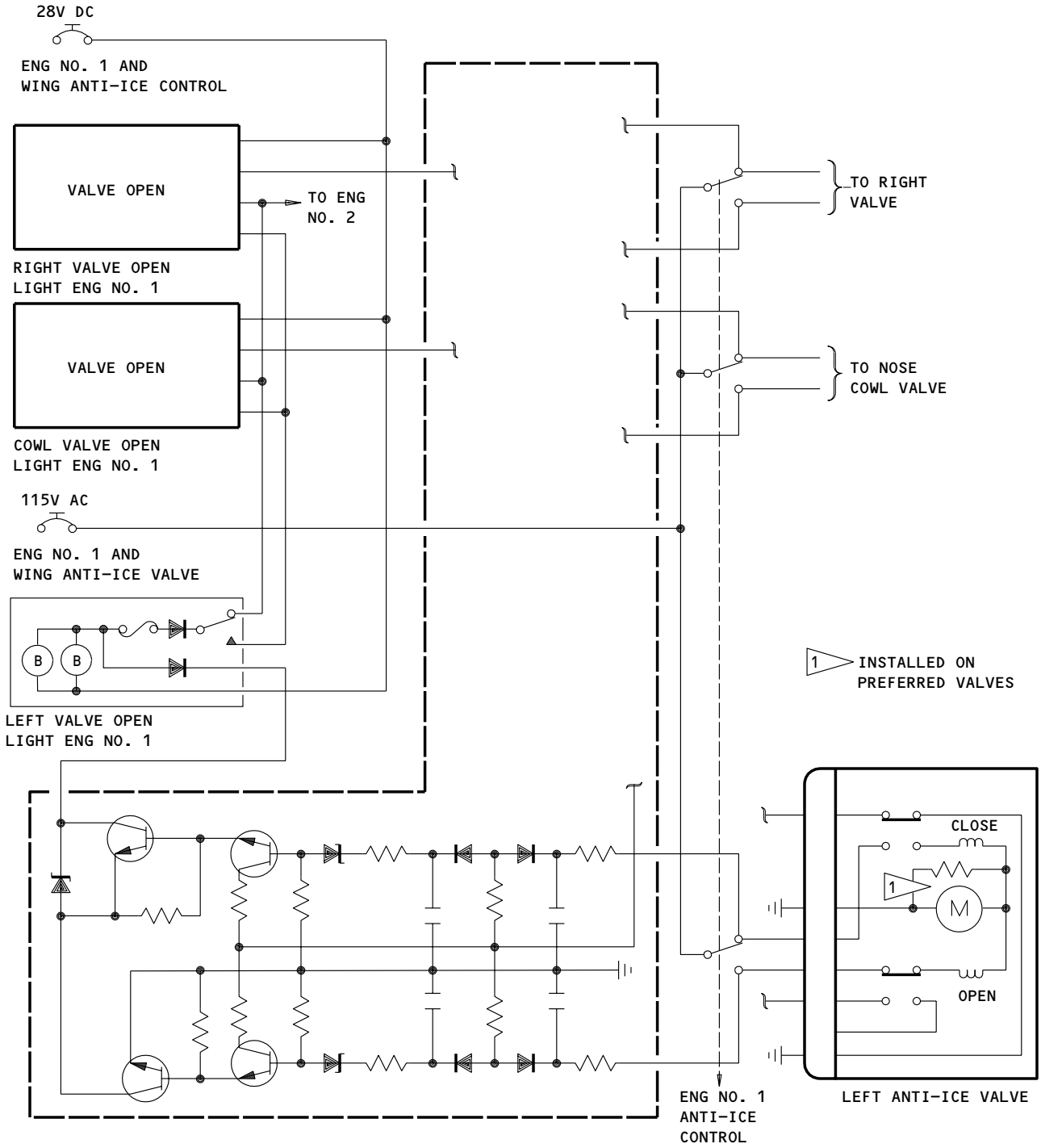


Engine and Nose Cowl Anti-Icing Component Location
Figure 1

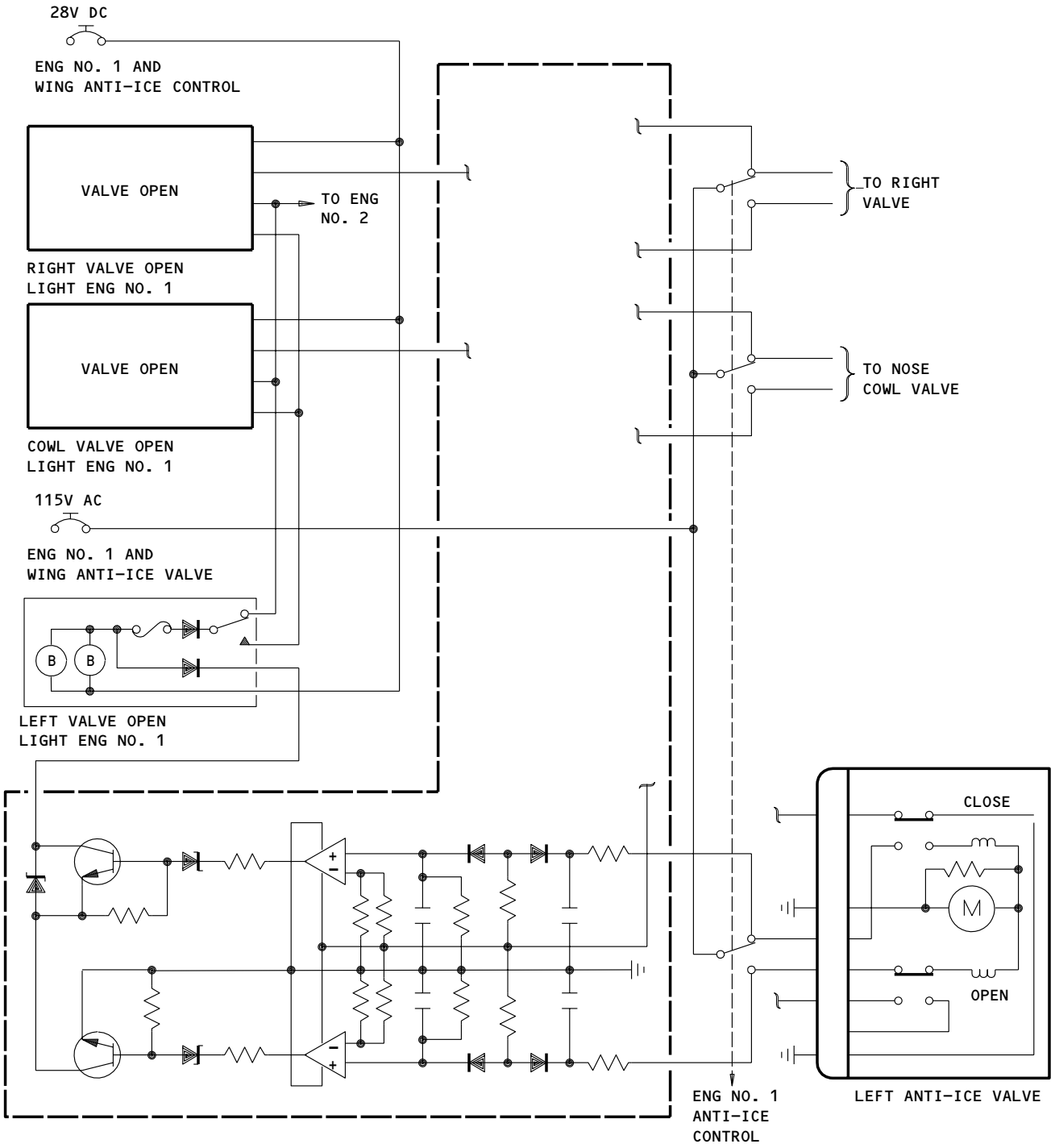
5. Nose Cowl Anti-Icing Thermostatic Valve
   A. The nose cowl anti-icing thermostatic valve is located on the downstream side of the nose cowl anti-icing valve. The thermostatic valve limits the volume of anti-icing air supplied to the nose cowl. The valve opening is controlled by bi-metallic coils connected to a moving sleeve. The extent and direction of movement is in accord with the expansion or contraction of the coils caused by variation in temperature. The rotation of the sleeve covers or uncovers holes in the valve housing, thus forming a variable orifice controlling the flow of air.
6. Operation
   A. The nose cowl and engine anti-icing systems use hot air bleed from the engine compressor section. The shutoff valves, for each engine, are operated by a single switch located on the forward overhead panel. (See figure 2.)
   B. When the engine anti-icing air valves are opened hot air circulates around the engine inlet guide vane assembly. The air passes through each inlet guide vane and into the inner shroud which forms part of the engine front bearing hub. The air passes from the front hub into the engine nose dome and exhausts, through a slot, into the engine inlet air stream. The hot air passing through the valves is controlled by a fixed opening or orifice plate upstream of the valves.
   C. When the nose cowl anti-icing air valve is opened hot air passes through the thermostatic valve and through the injector where it draws ambient air and then enters the nose cowl. At the injector, the hot air mixes with the lower temperature ambient air producing an air mixture warm enough to prevent icing of the nose cowl structure. The air mixture is directed against the interior surfaces of the nose cowl by means of a perforated distribution tube. The air is then exhausted through an opening at the bottom of the cowl.

      CAUTION: DO NOT OPERATE THE COWL ANTI-ICING SYSTEMS AT HIGH ENGINE POWERS WITH THE INDICATED OUTSIDE AMBIENT TEMPERATURES OVER 50F (10°C). PROLONGED OPERATION UNDER THESE CONDITIONS WILL REDUCE THE HAIL RESISTANCE OF THE COWL LEADING EDGE SKIN.

   D. The VALVE OPEN lights will not illuminate when the valves are in the closed position. When the valves start opening, the VALVE OPEN lights will illuminate bright. The VALVE OPEN lights change to a dim condition when the valves reach the open position. The lights remain dim as long as the valves are in the open position.



Engine and Nose Cowl Anti-Icing Circuit
Figure 2 (Sheet 1)



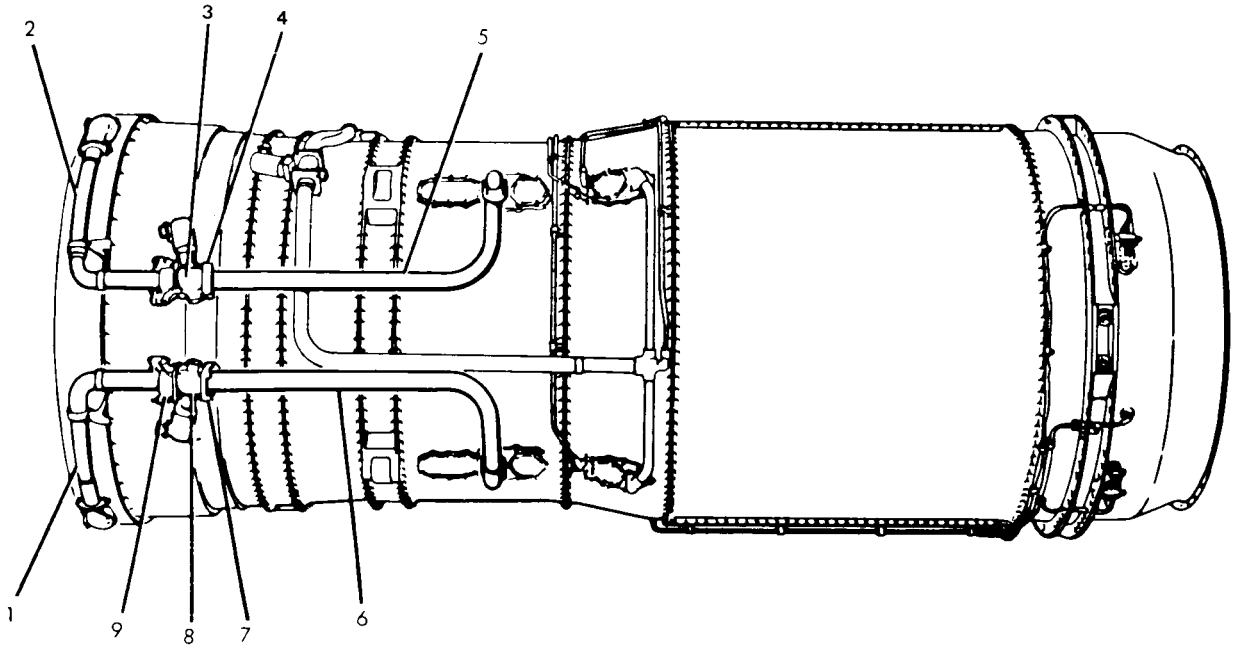
Engine and Nose Cowl Anti-Icing Circuit
Figure 2 (Sheet 2)

ANTI-ICING AIR SYSTEM - REMOVAL/INSTALLATION

1. Removal/Installation of the Anti-Icing Air System (Fig. 401)
   A. General
      (1) The anti-icing air system is composed of two assemblies located on the left and right sides of the engine. The tubes extend from elbows located on the sides of the rear compressor outer duce to elbows located at the upper quadrants of the inlet case. Replacement procedure is the same for either side.

      NOTE: These procedures are also applicable to anti-icing tubes used with the respaced inlet configuration (RIGV) P&W post-SB 5948.

   B. Removal
      (1) Establish clamp locations to facilitate installation.
      (2) Disconnect electrical lead to anti-icing air shutoff valve.
      (3) Remove clips, then unfasten bolts at inlet case elbow.
      (4) Remove three nuts and remove elbow from inlet case.
      (5) Remove front anti-icing tube.
      (6) On airplanes with anti-icing valve support, remove nuts and bolts holding valve support to front compressor case.
      (7) On airplanes with anti-icing valve support, unfasten bolts from front flange of anti-icing air shutoff valve and remove support.
      (8) On airplanes with tube sealing sleeve, remove the nuts and bolts that attach the half clamp to the sealing sleeve.
      (9) On airplanes with tube sealing sleeve, remove the bolts, nuts, and the washers that attach the sealing sleeve to the anti-icing valve.
      (10) Unfasten bolts at valve assembly rear flange and remove valve and actuator.
      (11) Unfasten bolts securing rear anti-icing air tube to rear compressor outer duct and remove tube.
   C. Installation
      (1) Assemble air valve to rear tube with four bolts. Tighten bolts to recommended torque and lockwire.
      (2) Install assembled rear tube and valve on engine, using new gasket on rear compressor outer duct boss. Fasten rear tube to boss with four washers and bolts. Tighten bolts to recommended torque and lockwire.
      (3) On airplane with anti-icing valve support, fasten valve support to front flange of valve with four bolts, washers, and locknuts. Tighten locknuts to recommended torque.
      (4) On airplanes with anti-icing valve support, secure support to front compressor case with two spacers, four washer, two bolts, and two locknuts.



1 ANTI-ICING LEFT FRONT TUBE ASSEMBLY
2 ANTI-ICING RIGHT FRONT TUBE ASSEMBLY
3 AIR SHUTOFF VALVE ASSEMBLY
4 ANTI-ICING REAR TUBE FIXED ORIFICE
5 ANTI-ICING AIR RIGHT REAR TUBE ASSEMBLY
6 ANTI-ICING AIR LEFT REAR TUBE ASSEMBLY
7 ANTI-ICING REAR TUBE FIXED ORIFICE
8 AIR SHUTOFF VALVE ASSEMBLY
9 AIR SHUTOFF VALVE SUPPORT

Anti-Icing Air Tubing
Figure 401

(5) On airplanes with tube sealing sleeve, attach the sealing sleeve to the front flange of the anti-icing valve with the bolts, washers, and the locknuts. Tighten the locknuts.
(6) On airplanes with tube sealing sleeve, attach the half clamp on the sealing sleeve to the brackets on the engine flange with the bolts and locknuts. Tighten the locknuts.
(7) Insert front anti-icing tube into flange.
(8) Secure inlet case elbow to front tube with two bolts, four washers, and two locknuts. Tighten nuts to recommended torque.
(9) Secure elbow to inlet case using new gasket, three washers and locknuts. Tighten locknuts to recommended torque.
(10) Secure front tube with clip.
(11) Connect electrical lead to air valve.
(12) Perform operational check of air valve during next engine operation.

ENGINE AND NOSE COWL ANTI-ICING SYSTEM - ADJUSTMENT/TEST

1. Engine and Nose Cowl Anti-Icing System Test
   A. Prepare for Engine and Nose Cowl Anti-Icing System Test
      (1) Connect electrical power to airplane.
      (2) On circuit breaker panel (P18-3) close the following circuit breakers.
         (a) Engine 1 - ENG 1 AND WING ANTI-ICE VALVE and ENG 1 AND WING ANTI-ICE CONTROL.
         (b) Engine 2 - ENG 2 AND WING ANTI-ICE VALVE and ENG 2 AND WING ANTI-ICE CONTROL.
      (3) Gain access to valves by opening left and right engine cowl panels (Ref Chapter 71). Left and right anti-ice valves are respectively located at 11 o'clock and 1 o'clock. Nose cowl anti-ice valve is located at 4 o'clock.
   B. Test Engine and Nose Cowl Anti-Icing System
      (1) Place ENG ANTI-ICE switch on pilot's overhead panel (P5-11) to ON position. All valves should open as indicated by the position indication on each valve. Engine 1 COWL VALVE OPEN, R VALVE OPEN and L VALVE OPEN indicator lights should illuminate bright during valve transit. Indicator lights should change to a dim condition when the valves reach the full open position.
      (2) Visually check nose cowl anti-icing regulator (Thermostatic valve) failure indicating pin to verify that the valve is fully open. Scribed marks on the failure indicating pin are visible beyond the open position stop to give indication of regulator failure.
      (3) With the regulator valve between 60 and 100°F the inboard scribe mark shall be within 0.040" to flush with end of open position stop screw, when a force of 1 to 2 lbs. is applied to the end of the pin. Regulator failure is indicated if the pin will not move, or if the inboard scribe mark moves inwards beyond the end of the open position stop screw.
      (4) Place ENG ANTI-ICE switch to the OFF position. All valves should close as indicated by the position indication on each valve. Engine valve position indicator lights should illuminate bright during valve transit then go out and remain out as long as the valves are closed.
      (5) If required, repeat steps (1) thru (4) for other engine.
   C. Restore Airplane to Normal Configuration
      (1) Close engine cowl panels.
      (2) Determine if electrical power is needed, if not, disconnect electrical power.

ANTI-ICING AIR SYSTEM - INSPECTION/CHECK

1. Periodic Inspection
   A. General
      (1) These check procedures are a normal function of operating organizations. They consist of required checks and minor adjustments necessary on the JT8D engine air systems. The nature and conditions of engine operation determine the time interval between required checks.
      (2) Engine compartment cleanliness is important because the extensive mass air flow tends to draw foreign objects into the engine. Thoroughly clean the entire engine compartment with a vacuum cleaner after completion of any work. Keep the compartment free of dirt, oil, and grease, and remove any small unused parts, such as nuts, washers, and pieces of lockwire. Immediately cover all apertures resulting from the disconnection of tubing or parts.
      (3) Carefully check the air systems without dismantling to ensure that all connections are tight and free from leaks and that lines, tubing, and controls are secure.

ENGINE ANTI-ICING SHUTOFF VALVE - REMOVAL/INSTALLATION

1. General
   A. There are two engine anti-icing shutoff valves on each engine. The valves are located at the 11 o'clock and 1 o'clock positions on the front fan case. Replacement procedure is the same for both valves.
2. Remove Engine Anti-Icing Shutoff Valve (Engines before PWA SB 5872)
   A. Open applicable ENGINE AND WING ANTI-ICE VALVE and ENGINE AND WING ANTI-ICE CONTROL circuit breakers on P-18 circuit breaker panel.
   B. Disconnect electrical connector from valve (Fig. 401).
   C. Establish clip and bracket locations to facilitate installation.
   D. Remove three nuts and washers that secure anti-icing tube to engine.
   E. Remove nuts and bolts securing anti-icing valve support to front compressor case bracket per one of the following methods:
      (1) Remove bolts from front flange of anti-icing valve, remove support.
         (a) Prior to P&WA SB 5666. Remove bolts, locknuts and washers.

            NOTE: Assembly prior to P&WA SB 3218 have key washers under boltheads. Straighten tabs of key washers and discard after bolts are removed.

         (b) Incorporating P&WA SB 5666. Remove bolts, locknuts and washers. Remove bushing, using drift at each side of valve support.
   F. Remove bolts securing anti-ice valve rear flange to anti-icing air regulator.
   G. Remove anti-icing valve.

      NOTE: Assembly prior to P&WA SB 1536 will incorporate anti-icing air regulator or metering plug in forward end of rear anti-icing tube.

      Assembly incorporating P&WA SB 5706 will incorporate gaskets between anti-icing valve and mating tube or support surface. Remove gaskets and note location to facilitate installation.

3. Remove Engine Anti-Icing Valve (Airplanes with Sealing Sleeve) (Incorporating PWA SB 5872) (Fig. 401)
   A. Establish the clamp locations to facilitate installation.
   B. Disconnect electrical connector from valve.
   C. Remove the three bolts and washers from the front anti-icing tube elbow.
   D. Remove the two bolts that attach the clamp to the front anti-icing tube.
   E. Remove the two bolts and nuts that attach the half clamp to the sealing sleeve.
   F. Remove the bolts, nuts, and washers that attach the anti-icing valve to the sealing sleeve.
   G. Remove the bolts, nuts, and washers that attach the anti-icing valve to the rear anti-icing tube assembly.

H. Remove the anti-icing valve.

4. Install Engine Anti-Icing Shutoff Valve (Fig. 401) (Engines before PWA SB 5872)
   A. Position anti-icing valve on rear anti-icing tube and attach with 4 bolts. Tighten bolts and lockwire.

      NOTE: If assembly is prior to P&WA SB 1536, install anti-icing air regulator or metering plug in forward end of rear anti-icing tube as applicable. If assembly incorporates P&WA SB 5706, install gasket between anti-icing valve and rear tube.

   B. Install anti-icing valve support to front flange of anti-icing valve with 4 bolts, washers and locknuts. Tighten locknuts.

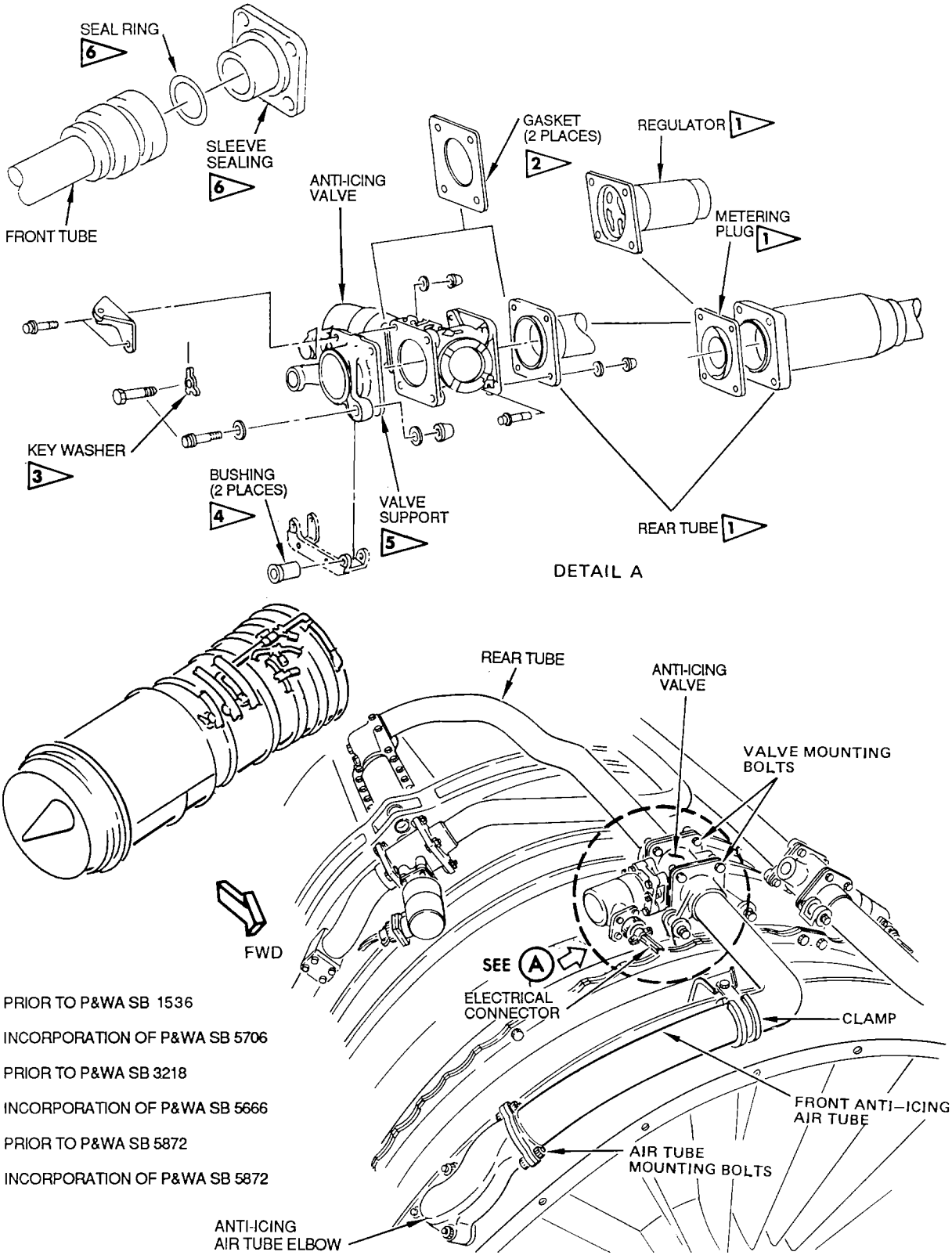
      NOTE: If assembly incorporates P&WA SB 5706, install gasket between anti-icing valve and support.

   C. On airplanes with anti-icing valve support, attach anti-icing support to front compressor case bracket with nuts and bolts per one of the following methods:
      (1) Prior to P&WA SB 5666. Install bolts and locknuts through support and engine bracket, 1 washer under each bolthead and nut. Tighten nuts.

         NOTE: Assembly prior to P&WA SB 3218 incorporate hex-head bolts with key washers under boltheads in lieu of flat washers. Install key washers under boltheads so that tab of key washer enters hole in engine bracket. Bend tabs of key washers against flat of bolthead after nuts are tightened.

      (2) Incorporating P&WA SB 5666. Position anti-icing valve support between lugs of engine bracket. Install bushing through lugs of bracket and support at each side from front. Install bolts with washers under boltheads through bushings from front, and washer and locknuts. Tighten nuts.
   D. Install anti-icing air elbow attached to front anti-icing air tube to inlet case with new gasket, 3 washers and locknuts. Tighten locknuts.
   E. Secure front tube with clip.
   F. Connect electrical connector.

5. Install Engine Anti-Icing Shutoff Valve (Airplanes with Sealing Sleeve) (Incorporating PWA SB 5872) (Fig. 401)
   A. Attach the anti-icing valve to the rear anti-icing tube with four bolts, nuts, and washers. Tighten the bolts.
   B. Attach the anti-icing valve to the sealing sleeve flange on the front anti-icing tube with the four bolts, washers, and locknuts. Tighten the locknuts.



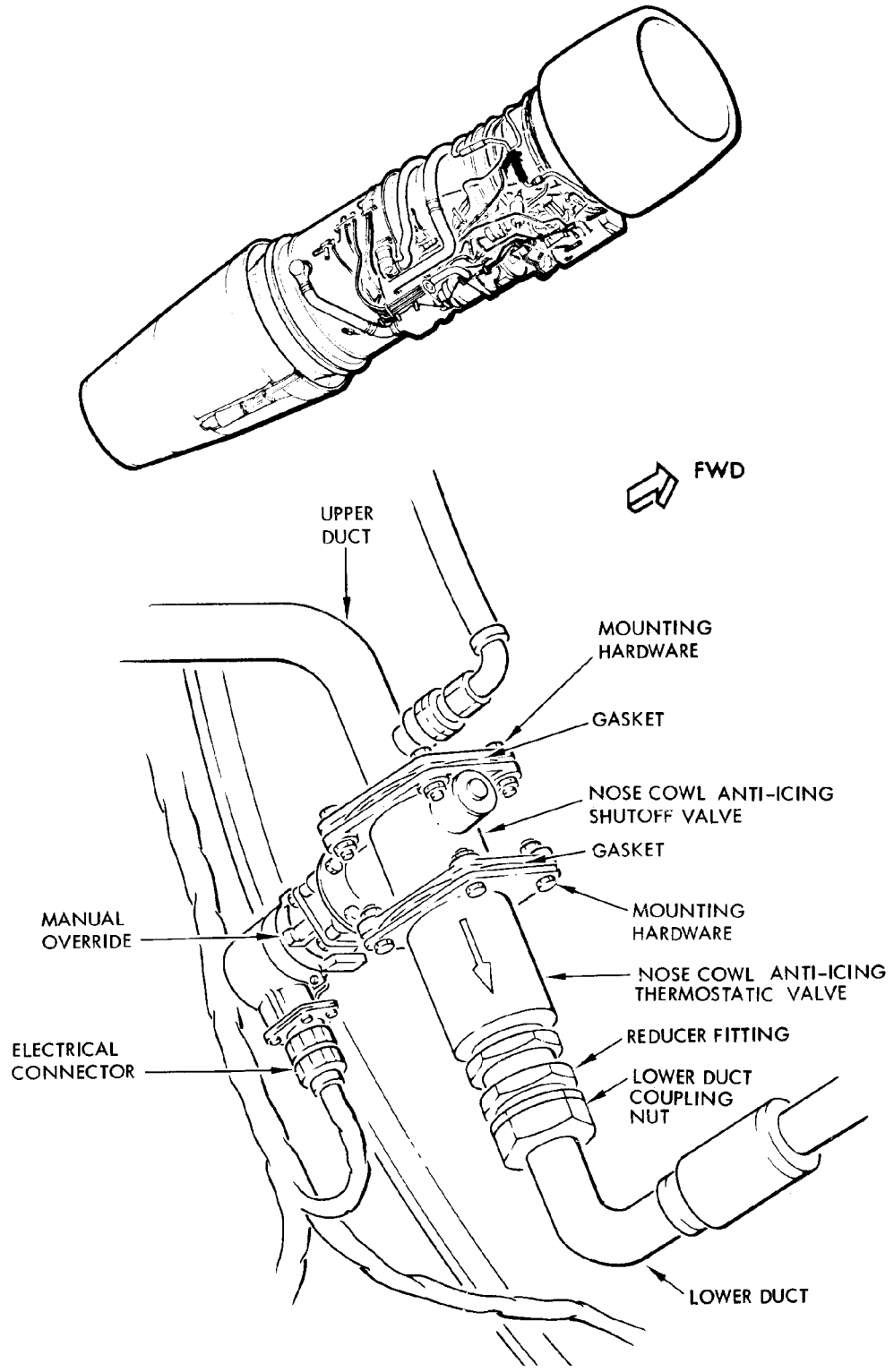
Engine Anti-Icing Valve Installation
Figure 401

C. Attach the half clamp on the sealing sleeve with bolts and locknuts to the bracket on the engine flange.
D. Attach the clamp, bolts, and nuts to the front anti-icing tube.
E. Attach the front anti-icing tube elbow with a new gasket with the washers and bolts to the inlet case. Tighten the bolts and lockwire.
F. Tighten the bolts (or locknuts) on the clamps and half clamp.
G. Connect the electrical connector.
H. Perform a functional test of the valve (Ref 75-10-0 A/T).
I. Close the engine cowl panels.

NOSE COWL ANTI-ICING SHUTOFF VALVE AND THERMOSTATIC VALVE -

REMOVAL/INSTALLATION

1. General
   A. The nose cowl anti-icing shutoff valve and thermostatic valve are located on the right side of each engine. Access is gained by opening main right cowl panel. The valves are located at approximately the four o'clock position. Installation on both engines are the same.
2. Removal/Installation Nose Cowl Anti-Icing Shutoff Valve
   A. Remove Nose Cowl Anti-Icing Shutoff Valve (See figure 401.)
      (1) Pull (open) ENGINE AND WING ANTI-ICE VALVE and ENGINE AND WING ANTI-ICE CONTROL circuit breakers on P18 circuit breaker panel for applicable engine.
      (2) Disconnect electrical connector.
      (3) Remove mounting hardware that attaches shutoff valve to thermostatic valve.
      (4) Remove mounting hardware that attaches shutoff valve to upper duct.
      (5) Remove shutoff valve and gaskets.
   B. Install Nose Cowl Anti-Icing Shutoff Valve (See figure 401.)
      (1) Position shutoff valve and gaskets in place between thermostatic valve and upper duct.
      (2) Install mounting hardware that attaches shutoff valve to upper duct.
      (3) Install mounting hardware that attaches shutoff valve to thermostatic valve.
3. Removal/Installation Nose Cowl Anti-Icing Thermostatic Valve
   A. Remove Nose Cowl Anti-Icing Thermostatic Valve
      (1) Disconnect lower duct coupling nut.
      (2) Remove mounting hardware that attaches thermostatic valve to nose cowl anti-icing shutoff valve.
      (3) Remove thermostatic valve and gasket.
      (4) Remove reducer fitting and gasket from valve.
   B. Install Nose Cowl Anti-Icing Thermostatic Valve
      (1) Install new gasket on reducer fitting and install fitting in thermostatic valve.
      (2) Position thermostatic valve and valve gasket between lower duct and nose cowl anti-icing shutoff valve.
      (3) Install mounting hardware that attaches thermostatic valve to shutoff valve.
      (4) Connect lower duct coupling nut.



Nose Cowl Anti-Icing Shutoff Valve and
Figure 401

ANTI-ICING AIR REAR TUBE - REMOVAL/INSTALLATION

1. General
   A. The anti-icing air system is composed of two identical, but opposite assemblies located on the left and right sides of the engine. Replacement procedure is the same for either assembly.
2. Remove Anti-Icing Air Rear Tube (Fig. 401)
   A. Lower the engine enough to gain access to the rear anti-icing tube (Ref 71-00 R/I).
   B. Remove bolts securing rear anti-icing air tube to rear compressor outer duct.
   C. Remove four bolts securing anti-icing valve to anti-icing air rear tube assembly. Remove assembly from engine.

      NOTE: Assembly prior to P&WA SB 1536 will incorporate anti-icing air regulator or metering plug in forward end of rear anti-icing tube.

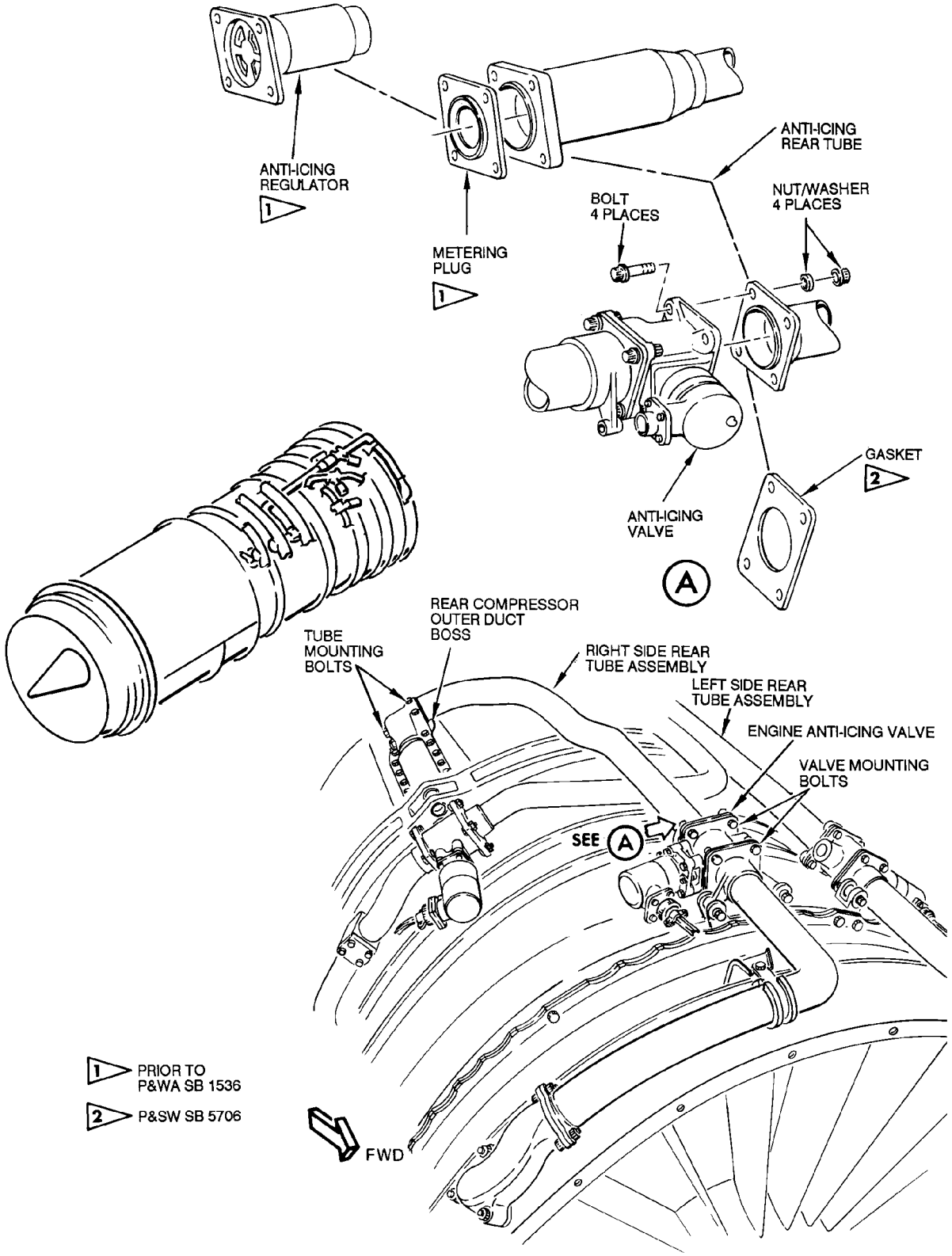
      Assembly incorporating P&WA SB 5706 will incorporate gaskets between anti-icing valve and muting tube or support surface. Remove gaskets and note location to facilitate installation.

3. Install Anti-Icing Air Rear Tube (Fig. 401)
   A. Install rear tube assembly on rear compressor outer duct boss using new gasket, four washers and bolts. Tighten bolts 65 to 75 pound-inches and lockwire.
   B. Secure tube assembly to anti-icing valve with four bolts. Tighten bolts 65 to 75 pound-inches and lockwire.

      NOTE: If assembly is prior to P&WA SB 1536, install anti-icing air regulator or metering plug in forward end of-rear anti-icing tube as applicable.

      If assembly incorporates P&WA SB 5706, install gasket between anti-icing valve and rear tube.

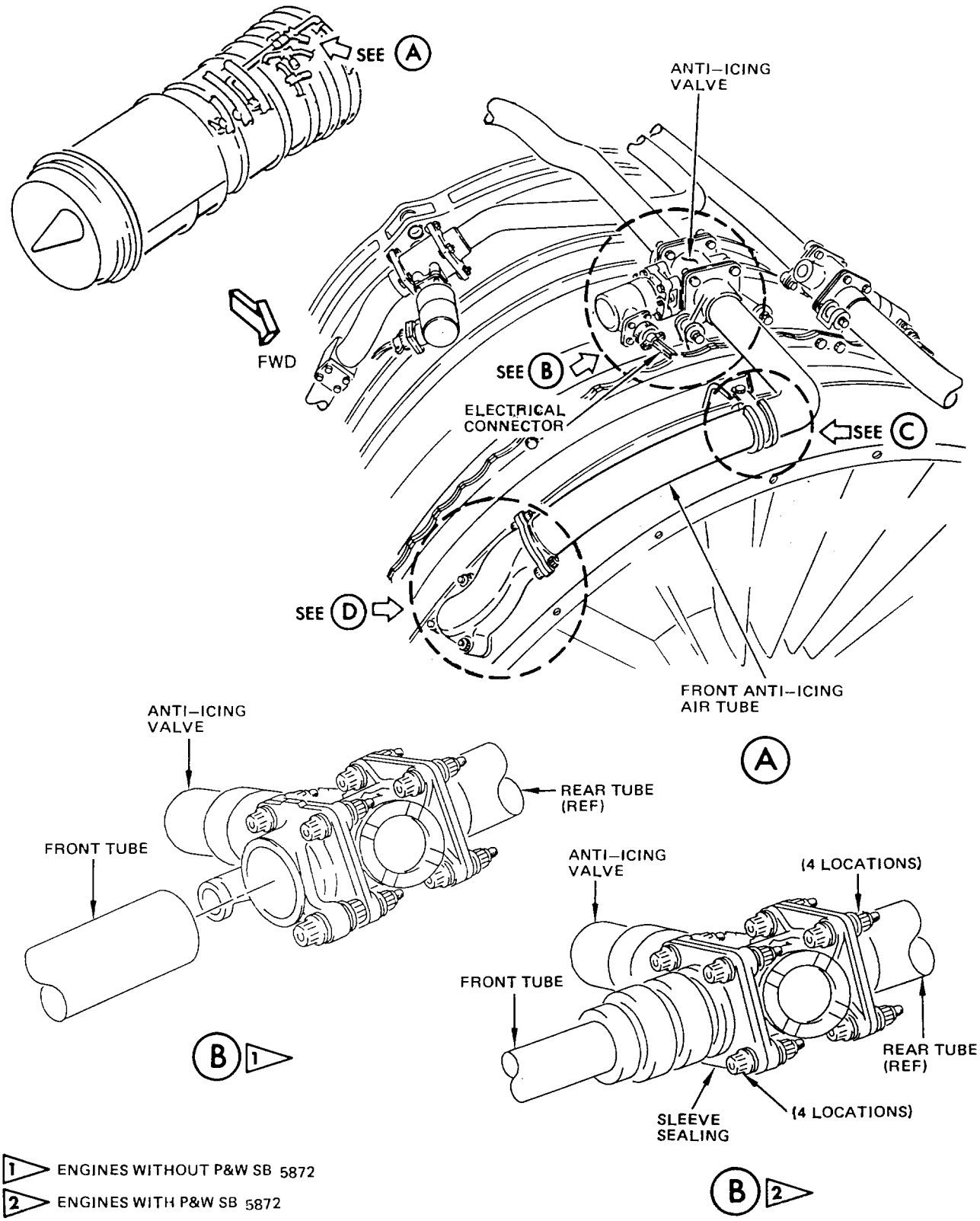
   C. Raise and secure engine back in its normal position (Ref 71-00 R/I).



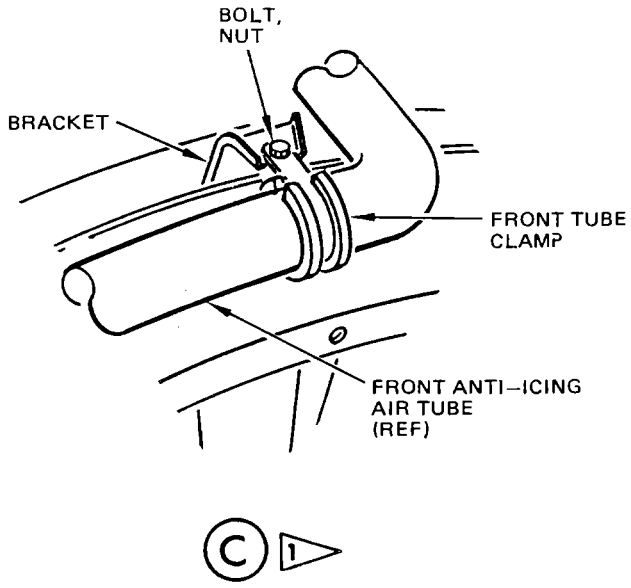
Engine Anti-Icing Air Rear Tube Installation
Figure 401

ANTI-ICING AIR FRONT TUBE - REMOVAL/INSTALLATION

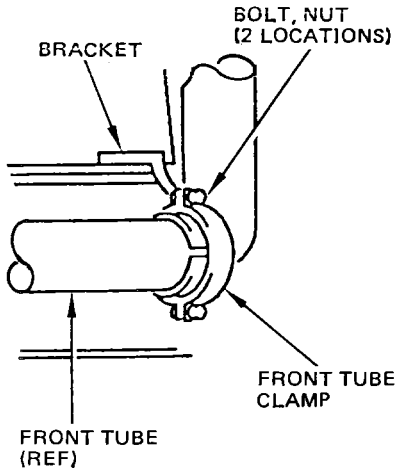
1. General
   A. The anti-icing system contains two identical but opposite assemblies. One assembly is on the left side of the engine and the other assembly is on the right side. The replacement procedure is the same for the two front tubes.
2. Anti-Icing Air Front Tube Removal (Fig. 401)
   A. Make a note of the clamp locations to make the installation easier.
   B. Disconnect the electrical connector from the anti-icing valve and move the electrical cable away from the front tube.
   C. On the engines without P&W SB 5872, do these steps:
      (1) Remove the bolt and the nut that attach the front tube clamp to the inlet case bracket.
      (2) Remove the two bolts, the four washers, and the two locknuts that attach the front tube to the inlet case elbow.
      (3) Remove the three locknuts and the washers that attach the inlet case elbow to the inlet case.
      (4) Remove the elbow from the inlet case and discard the gasket.
      (5) Pull the front tube towards the front of the engine to remove it from the anti-icing valve support and the engine.
   D. On the engines with P&W SB 5872, do these steps:
      (1) Remove the three bolts and the washers that attach the front tube elbow to the inlet case.
      (2) Remove the two bolts and the nuts that attach the front tube clamp to the inlet case bracket.
      (3) Remove the two bolts and the nuts that attach the two half clamps on the sealing sleeve to the compressor case bracket.
      (4) Remove the bolts, the nuts, and the washers that attach the sealing sleeve for the front tube to the anti-icing valve.
      (5) Remove the front tube from the engine.
3. Anti-Icing Air Front Tube Installation (Fig. 401)
   A. On the engines without P&W SB 5872, do these steps:
      (1) Put the front tube in the flange on the anti-icing valve support.
      (2) Attach the inlet case elbow to the front tube with the two bolts, the four washers, and the two locknuts. Tighten the locknuts.
      (3) Attach the elbow with a new gasket to the inlet case with the three washers and the locknuts. Tighten the locknuts.
      (4) Attach the front tube clamp to the inlet case bracket with the bolt and the nut.
   B. On the engines with P&W SB 5872, do these steps:
      (1) Put the front tube assembly in its position on the engine.
      (2) Attach the sealing sleeve on the front tube to the anti-icing valve with the four bolts, the washers, and the locknuts. Tighten the locknuts.



Engine Anti–Icing Air Front Tube Installation
Figure 401 (Sheet 1)



C 1



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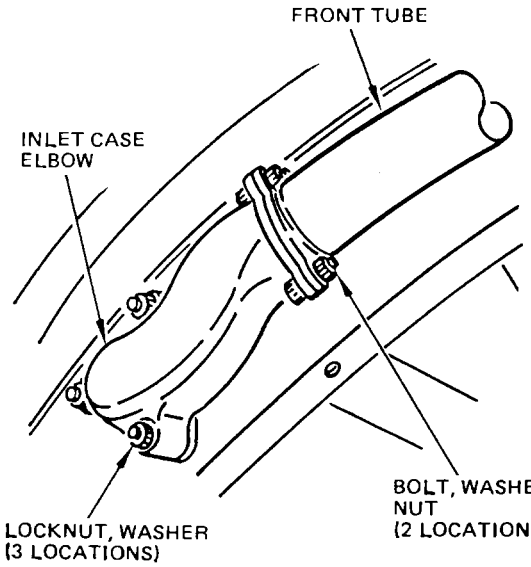

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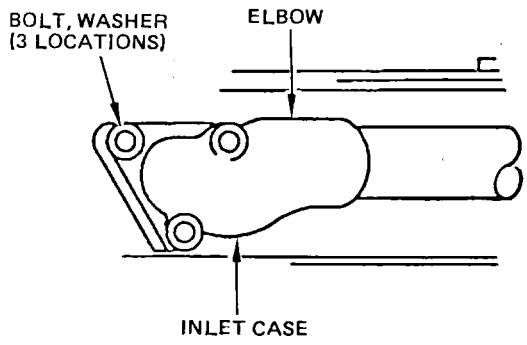


D 2

Engine Anti–Icing Air Front Tube Installation
Figure 401 (Sheet 2)

(3) Attach the half clamps for the sealing sleeve to the compressor case bracket with the bolts and the locknuts. Do not tighten the locknuts at this time.
(4) Attach the front tube clamp to the inlet case bracket with the bolts and the locknuts. Do not tighten the locknuts at this time.
(5) Attach the front tube elbow with a new gasket to the inlet case with the washers and the bolts. Tighten the bolts. Install lockwires on the bolts.
(6) Tighten the locknuts on the half clamps for the sealing sleeve and the front tube clamp.

C. Connect the electrical connector to the anti-icing valve.

NOSE COWL ANTI-ICING DUCT - REMOVAL/INSTALLATION

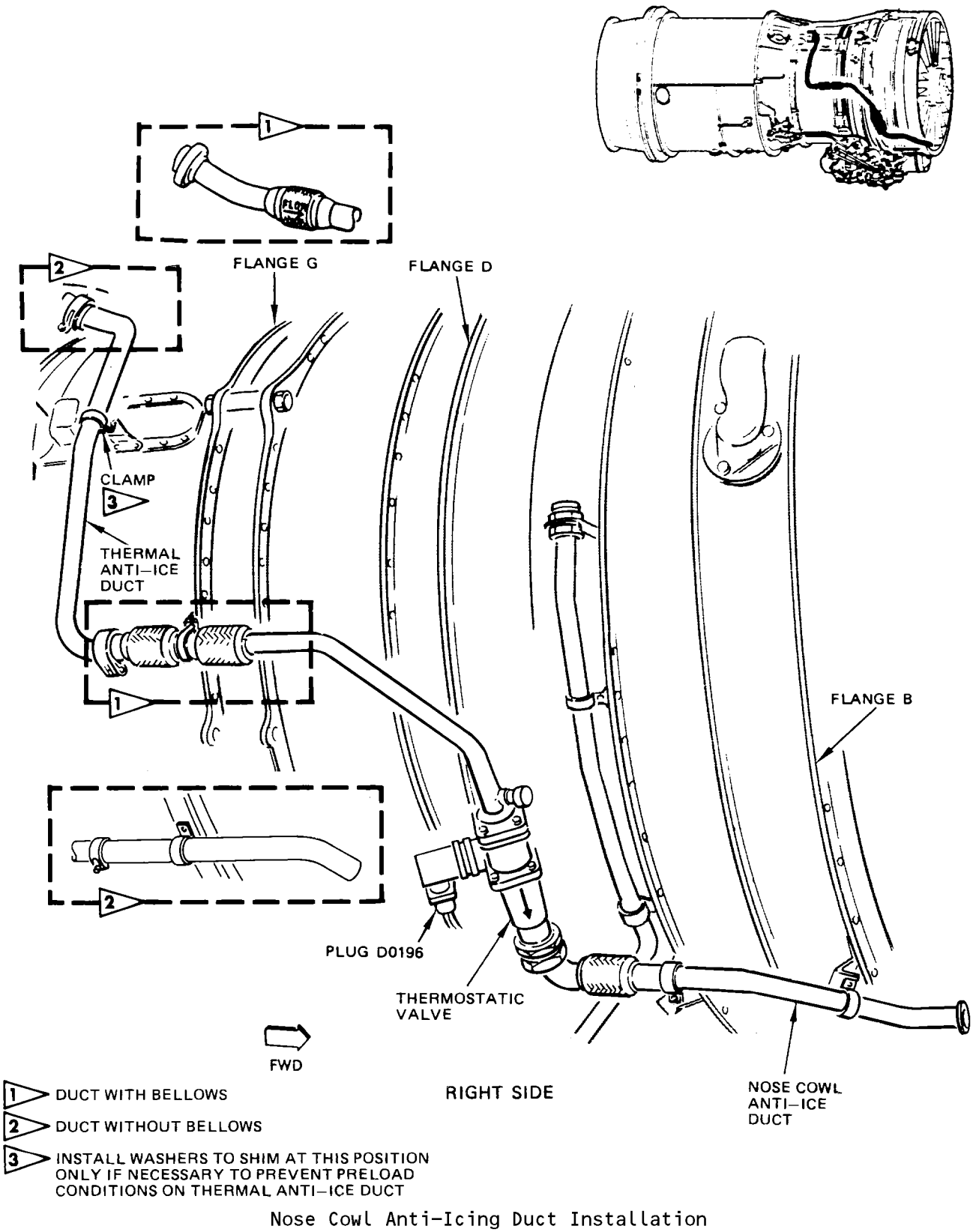
1. General
   A. The nose cowl anti-icing duct is located on the right side of each engine. The forward end of the duct is attached to the engine nose cowl and the aft end is attached to the thermostatic valve.
2. Remove the Nose Cowl Anti-icing Duct (Fig. 401)
   A. Open the right side removable cowl panel.
   B. Loosen the duct forward coupling nut at the location the duct goes into the nose cowl.
   C. Remove the connecting ring from the forward location and keep for the installation.
   D. Loosen the duct aft coupling nut from the thermostatic valve.
   E. Manually support the duct and remove the screws, nuts and two clamps.
   F. Remove the duct from the engine.
3. Install the Nose Cowl Anti-icing Duct (Fig. 401)
   A. Loosen the clamps and bolts. To prevent a preload on the nose cowl anti-icing duct:
      (1) Loosen all the thermal anti-icing duct clamps.
      (2) Loosen the thermostatic valve assembly mounting bolts.
   B. Manually support the duct and loosely install the two clamps with the screws and nuts.
   C. Install the duct forward connecting ring at the nose cowl.
   D. Loosely install the duct forward coupling nut at the nose cowl.
   E. Loosely install the duct aft coupling nut on the thermostatic valve.
   F. Tighten the thermostatic valve assembly mounting bolts.
   G. Tighten the duct forward coupling nut at the nose cowl.
   H. Tighten the two duct clamps.
   I. Tighten the duct aft coupling nut at the thermostatic valve.
   J. Use washers to shim between the clamp and the support bracket at the location shown in Fig. 401 to prevent a preload on the thermal anti-ice duct.

      NOTE: The maximum height of the washers is 0.30 inch.

   K. Tighten all the thermal anti-icing duct clamps.
   L. Make sure the clearance between the cowl frames and the air ducts is a minimum of 0.125 inch.
      (1) Place modeling clay on the cowl frames that are between the cowl frames and the air ducts.
      (2) Close the right side cowl panel.
      (3) Open the right side cowl panel.
      (4) Make sure that the compressed part of the modeling clay has a thickness of a minimum of 0.125 inch.
      (5) Adjust the air ducts if the clearance is not correct.

(6) If the air ducts are moved, make sure there are no air leaks the next time you operate the engine.

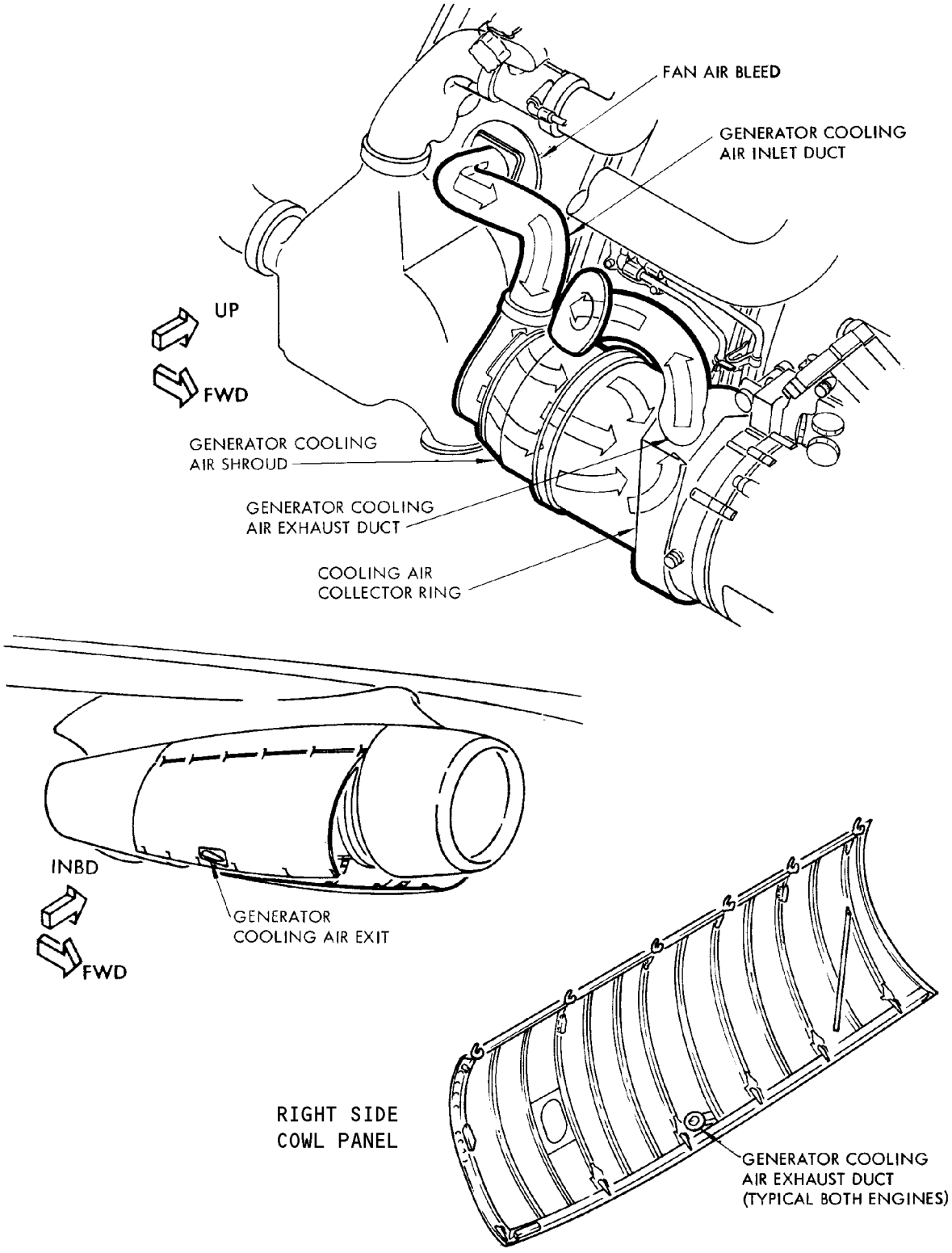
M. Close the right side removable cowl panel.



Nose Cowl Anti-Icing Duct Installation
Figure 401

GENERATOR COOLING - DESCRIPTION AND OPERATION

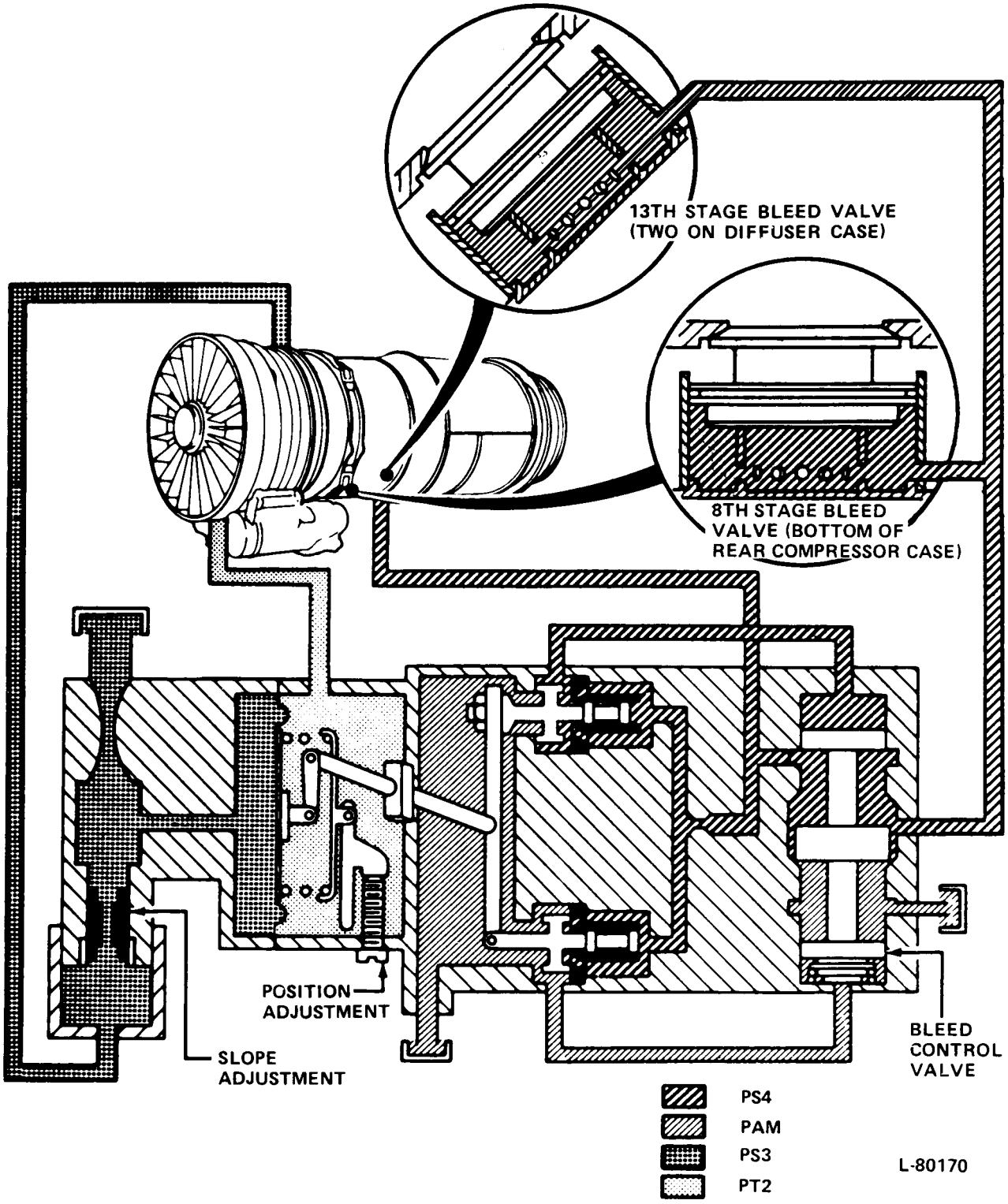
1. General
   A. The generator is a high speed unit that requires cooling whenever it is operating. To provide this cooling the generator is supplied with engine bleed air. A port on the outer fan case of the engine is connected by a large duct, to a fitting on the end of the generator. An exhaust duct, attached to the generator shroud, mates with the cooling air exhaust port in the engine cowl panel. (See figure 1.)
   B. When an engine is operating, low pressure fan air is forced through the large duct into the generator. The air circulates around the inside of the generator then leaves through the screened openings around the forward end of the generator casing. After leaving the generator, the air enters the generator shroud, passes through the exhaust duct and is then exhausted overboard through the exhaust port in the engine cowl panel.



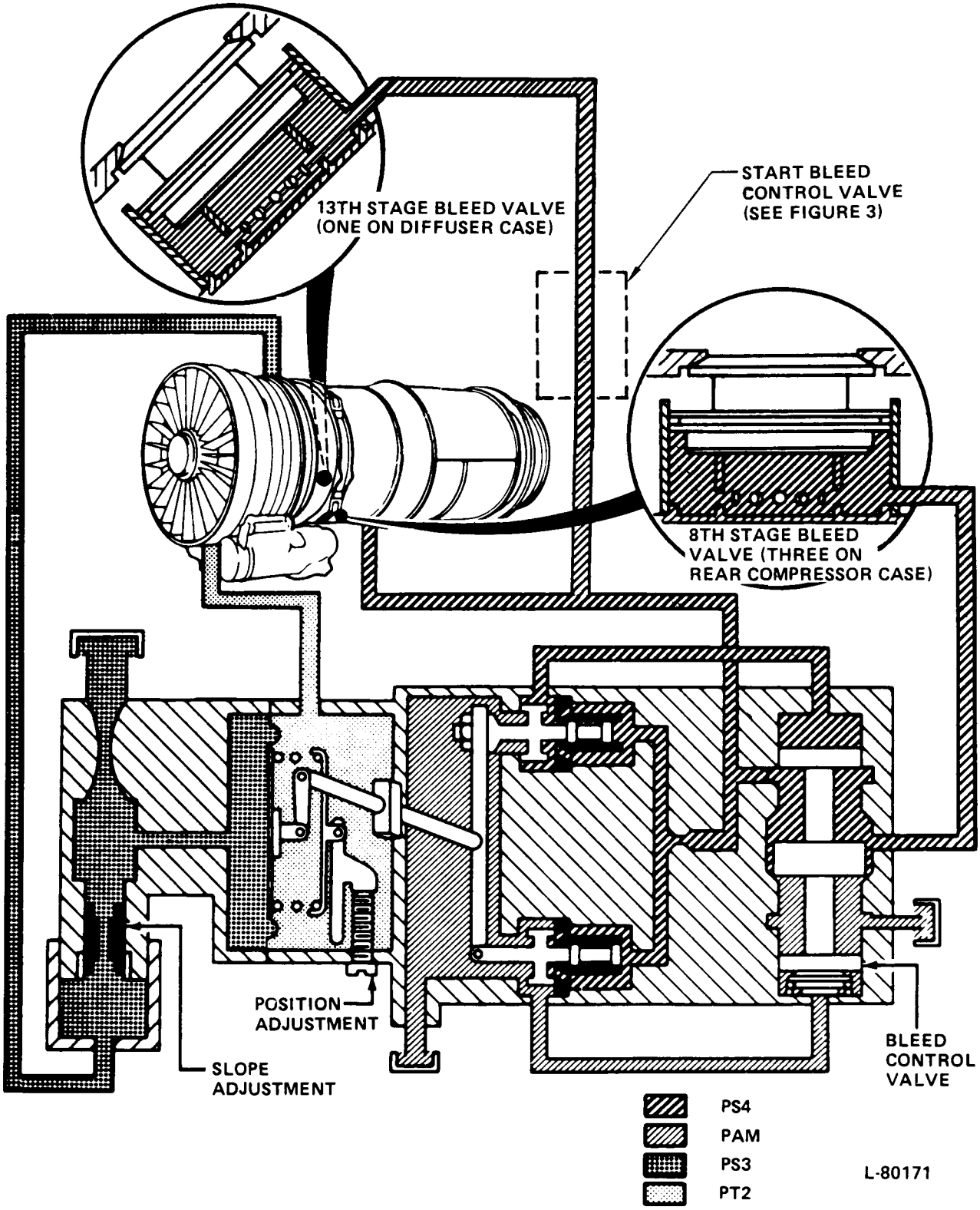
Generator Cooling
Figure 1

COMPRESSOR BLEED SYSTEM - DESCRIPTION AND OPERATION

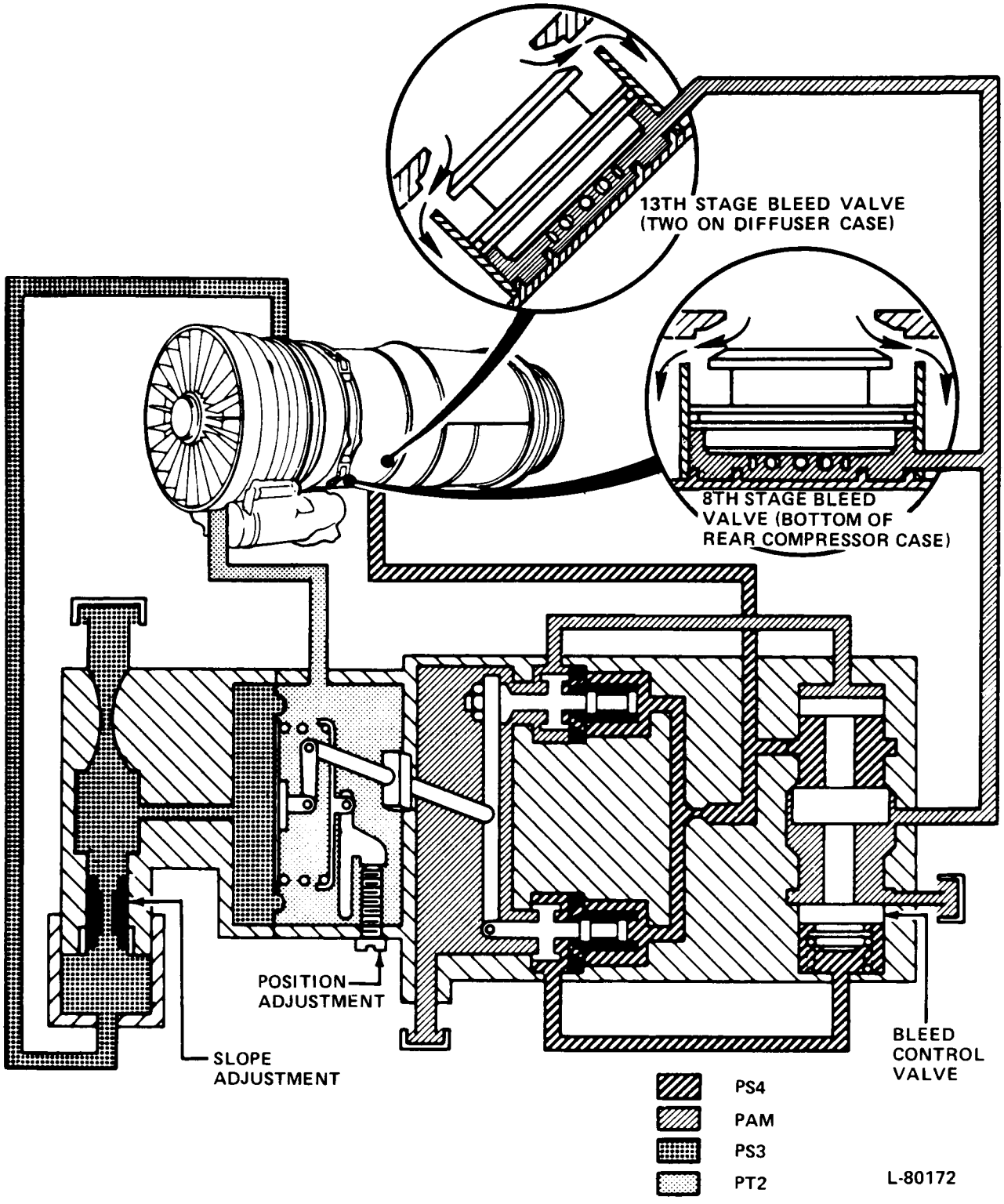
1. General (Fig. 1 through 2)
   A. The compressor bleed air system is primarily designed to permit operational flexibility by allowing high compressor discharge air to bleed into the fan discharge duct.
   B. In current JT8D engines this is accomplished by two basic arrangements of 8th and 13th stage bleed valves:
      (1) Prior to P&WA SB 5425: Two 13th stage bleed valves (at four and seven o'clock positions on annulus of diffuser case) bleed compressor discharge air (Ps4) into the fan stream. On current engines an additional, single 8th stage bleed valve on the rear compressor case (acting in unison with the 13th stage valves) bleeds 8th stage compressor air into the fan stream. Actuating air (Ps4) to the 8th and 13th stage bleed valves is interrupted by the pressure ratio bleed control.
      (2) Incorporating P&WA SB 5425: One 13th stage bleed valve (at four o'clock position on annulus of diffuser case) bleeds compressor discharge air (Ps4) into the fan stream. Three 8th stage bleed valves on the rear compressor case bleed 8th stage compressor air into the fan stream. Both the 13th stage bleed valve and the 8th stage bleed valves are actuated by Ps4 air; actuating air to the 13th stage bleed valve is interrupted by the start bleed control valve (Fig. 2), and actuating air to the 8th stage bleed valves is interrupted by the pressure ratio bleed control.
   C. In the static position (engine not running) bleed valves may be either open or closed, depending upon gravity and/or drag caused by contact of the valves with the cylinder walls. During periods of engine operation, compressor discharge air pressure exerted on the valve faces acts to force valves into the open position.
   D. Pressure Ratio Bleed Control: When Ps3 pressure on one side of the diaphragm in the pressure ratio bleed control increases to the point where it overcomes combined Pt2 and spring pressure forces, the poppet valves in the control reverse position, the muscle valve transfers, and Ps4 actuating air is directed to the back side of bleed valves. This Ps4 air acting on the larger area of the back side of the valves is sufficient to overcome compressor discharge air acting on the valve faces and the valves close. When the Ps3/Pt2 differential pressure decreases, the procedure is reversed. Ps4 actuating pressure on the back side of the valves is reduced to ambient, and internal engine pressure forces bleed valves open.
   E. Start Bleed Control Valve: With engine shut down or starting up, spring pressure forces a poppet valve closed. As Ps4 pressure increases during starting cycle, valve closing pressure is overcome and Ps4 air proceeds into the engine, closing the 13th stage bleed valve.



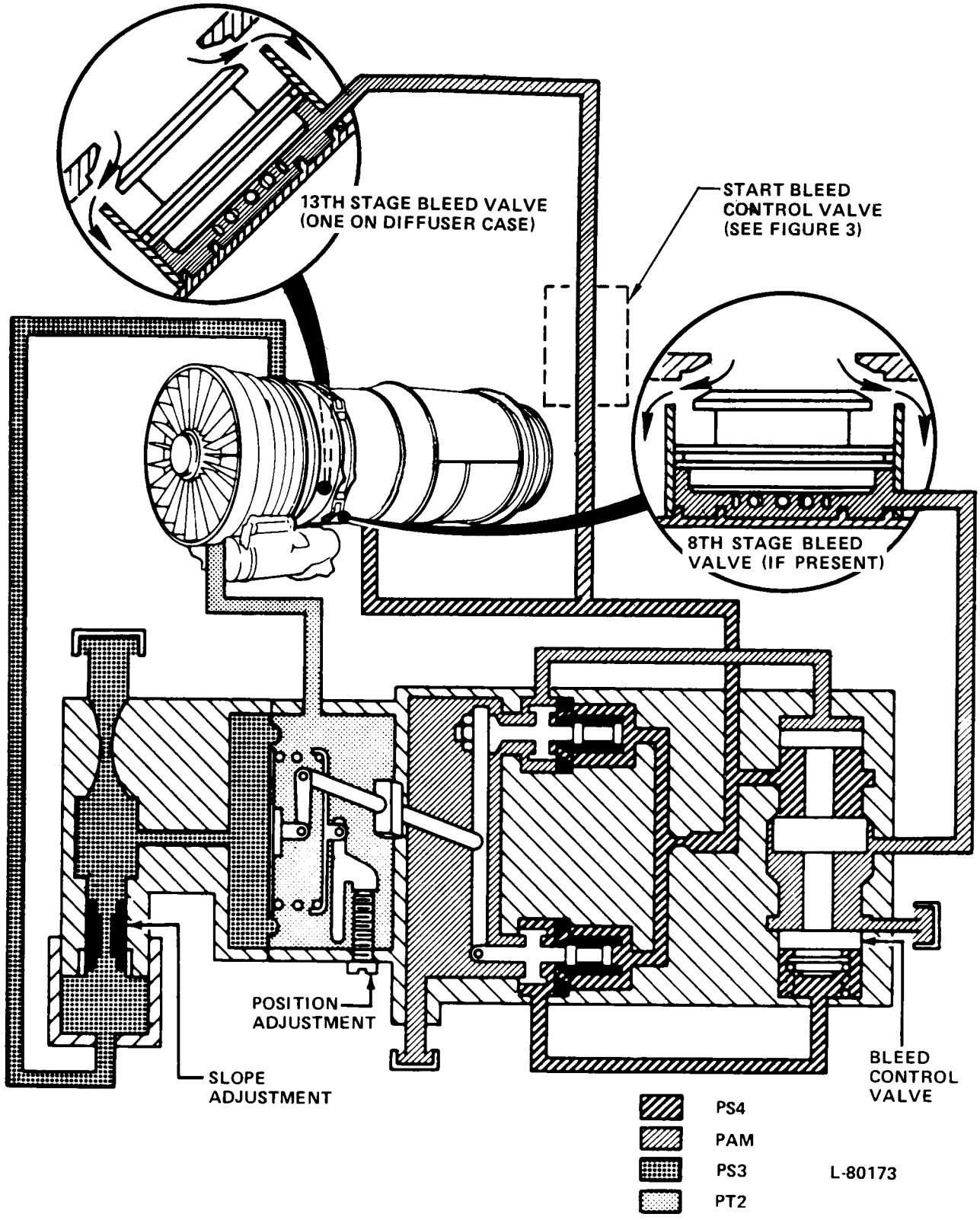
Bleed System Schematic – Closed
Figure 1 (Sheet 1)



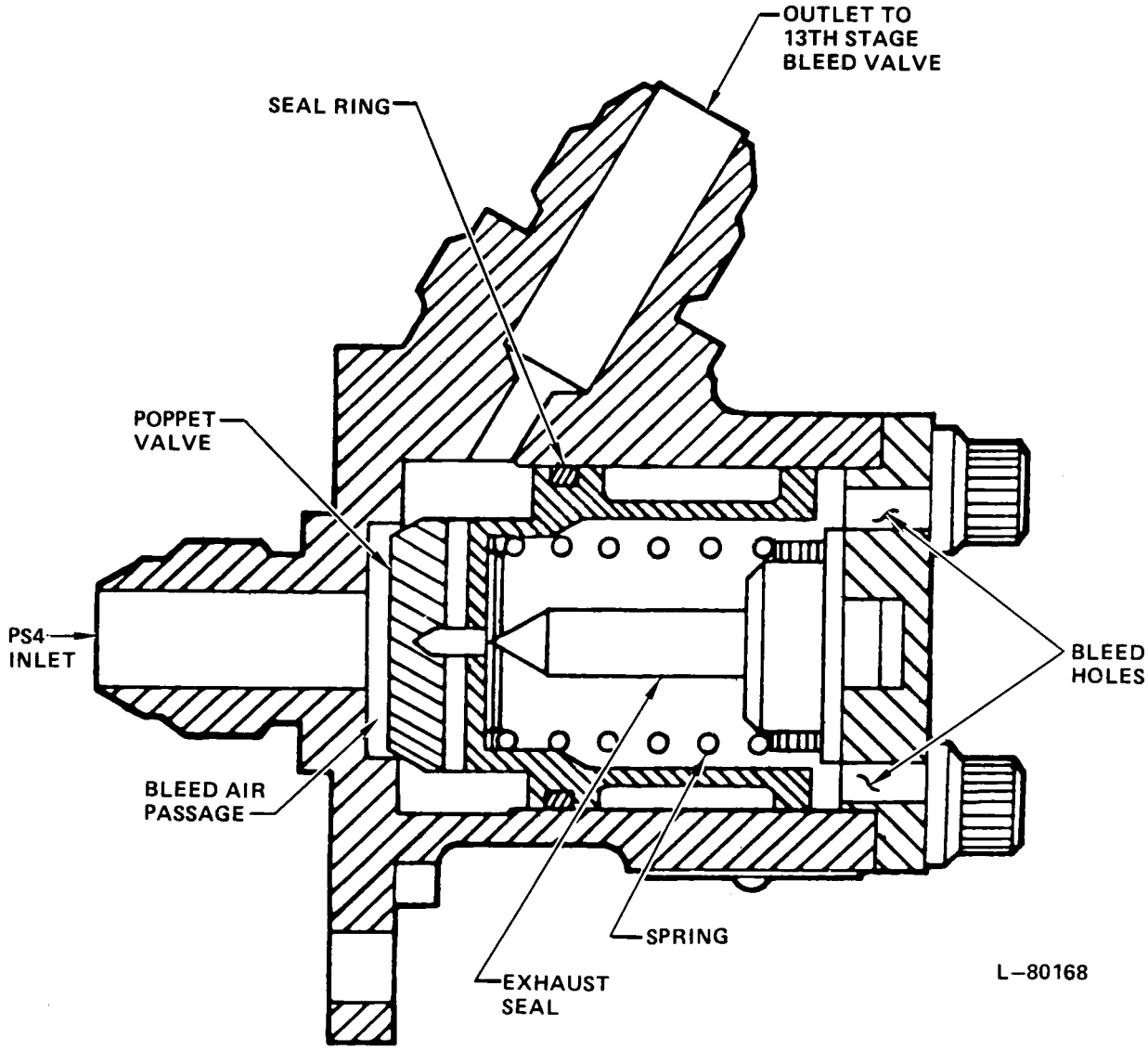
Bleed System Schematic – Closed
Figure 1 (Sheet 2)



Bleed System Schematic – Open
Figure 2 (Sheet 1)



Bleed System Schematic – Open
Figure 2 (Sheet 2)



Bleed System Schematic – Open
Figure 2 (Sheet 3)

COMPRESSOR BLEED SYSTEM - INSPECTION/CHECK

1. Periodic Inspection
   A. General
      (1) These inspection procedures are a normal function of operating organizations. They consist of required inspections and minor adjustments necessary on the JT8D engine. The nature and conditions of engine operation determine the time interval between required inspections. For this reason, the intervals described in the Periodic Inspection Chart in this section are labeled Routine, Minor, and Major.
      (2) Engine compartment cleanliness is important because the extensive mass airflow tends to draw foreign objects into the engine. Thoroughly clean the entire engine compartment with a vacuum cleaner after completion of any work. Keep the compartment free of dirt, oil, and grease, and remove all unused parts, such as nuts, washers, and pieces of lockwire. Immediately cover all apertures resulting from disconnection of tubing or parts. Use external caps on all tube openings, not internal plugs.
      (3) Carefully inspect the compressor bleed system without dismantling to make sure that all connections are tight and free from leaks and that lines, tubing, and controls are secure.

B. Periodic Inspection Chart

COMPRESSOR BLEED SYSTEM					
Component	Nature of the Inspection	Inspection Time			Remarks
		Routine	Minor	Major	
Pressure Ratio Bleed Control	a. Security of mounting		X	X	
	b. Security of accessible lines and fittings		X	X	
Pressure Ratio Bleed Control Ps3 Pressure Air Supply Strainer, P/N 44056 (located in fitting on front of high pressure bleed pad at 11 o'clock position)	a. Foreign matter, strainer damaged			X	Replace strainer, or if serviceable, clean with a standard solvent, then dry with compressed air.
Pressure Ratio Bleed Control Ps3 Air Supply Screen (In Control Inlet)	a. Foreign matter		X		Disconnect Ps3 line from pressure ratio bleed control and remove fitting, metering plug, venturi, and and screen (AMM 75-31-12). Brush clean parts and reassemble.

COMPRESSOR BLEED SYSTEM					
Component	Nature of the Inspection	Inspection Time			Remarks
		Routine	Minor	Major	
Compressor Bleed Valve, 8th or 13th-Stage	a. Make sure the bleed valves move freely			X	Bleed valves that do not operate freely can be lubricated by the following procedure.

NOTE: Bleed valves that cannot be freed by lubrication and bleed valves that need frequent lubrication should be removed and overhauled.

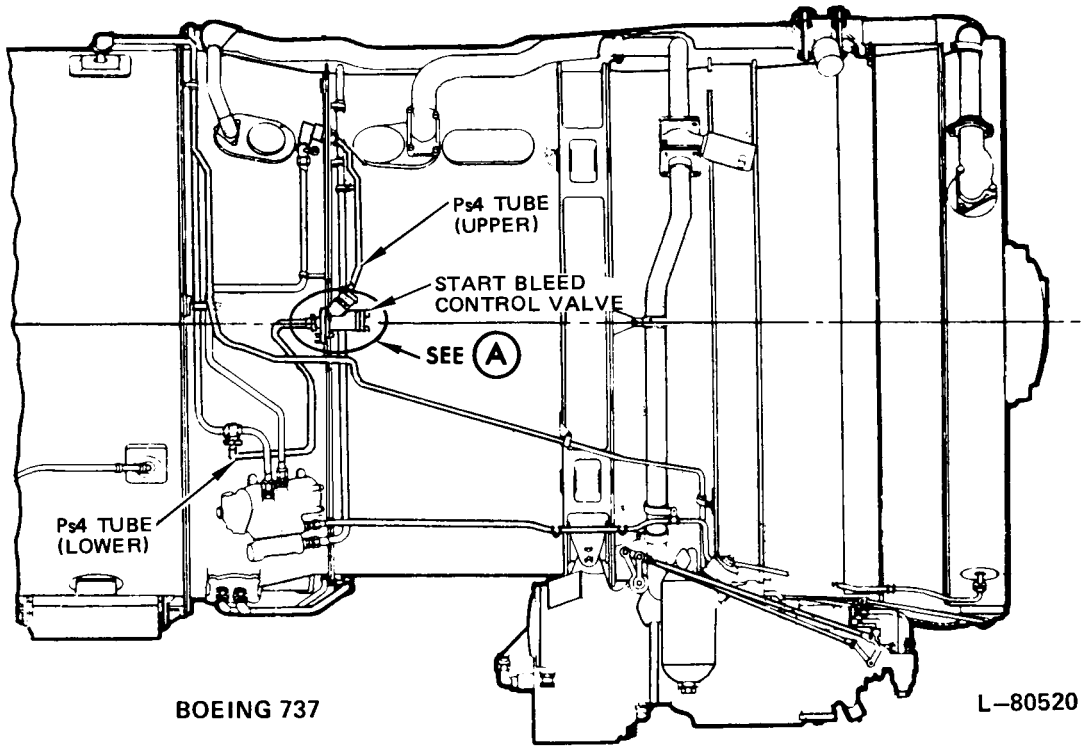
(1) Inject 4 - 6 ounces of approved lubricant into the muscle line to the valve at the nearest connection.
(2) Apply 100 psig of air or nitrogen to make sure there is flow into the valve. This will also exercise the valve.
(3) Permit the product to soak for 30 minutes.
(4) Connect the muscle line again.
(5) Start the engine and exercise it several times up to the bleed close point to permit the valve to open and close.

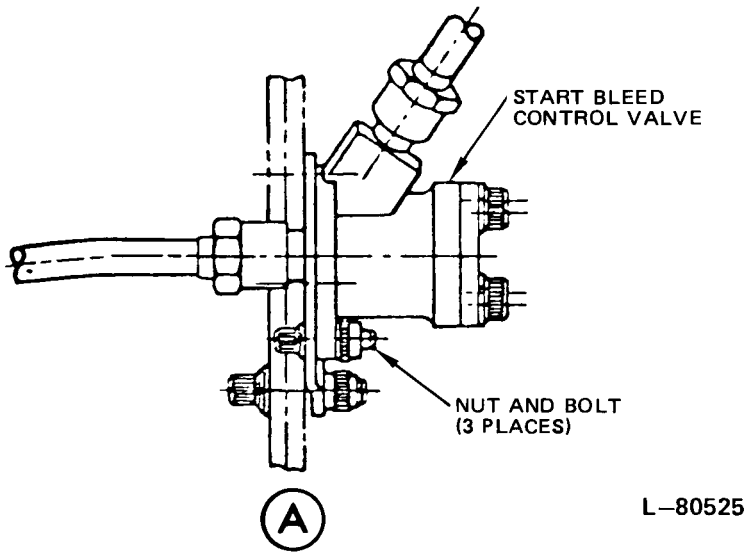
NOTE: The only lubricant approved for this application is WC-393. This is the only product known to P&W which keeps its lubricating properties at engine operating temperatures without gumming or coking (which can result in increased seizing of the valve). WC-393 lubricant can be obtained from the source that follows:
Aviation Fluids Services, Inc.
950 Kingsland Ave.
St. Louis, MO 63130
Phone: (800) 325-4720 or (314) 721-2910

START BLEED CONTROL VALVE - REMOVAL/INSTALLATION

1. Removal/Installation Of Start Bleed Control Valve (Engine Incorporating SB 5425)
   A. Removal (Fig-401)
      (1) Remove bleed control Ps4 tube between start bleed control valve and bleed control Ps4 manifold.
      (2) Remove bleed control Ps4 tube between start bleed control valve and diffuser outer duct boss.
      (3) Unbolt and remove start bleed control valve from flange bracket.
   B. Installation
      (1) Install start bleed control valve on bracket at Flange H and bolt in place, angled fitting facing forward.
      (2) Install bleed control Ps4 tube between start bleed control valve and diffuser outer duct boss.
      (3) Install bleed control Ps4 tube between start bleed control valve and bleed control Ps4 manifold.

START BLEED CONTROL VALVE - REMOVAL/INSTALLATION





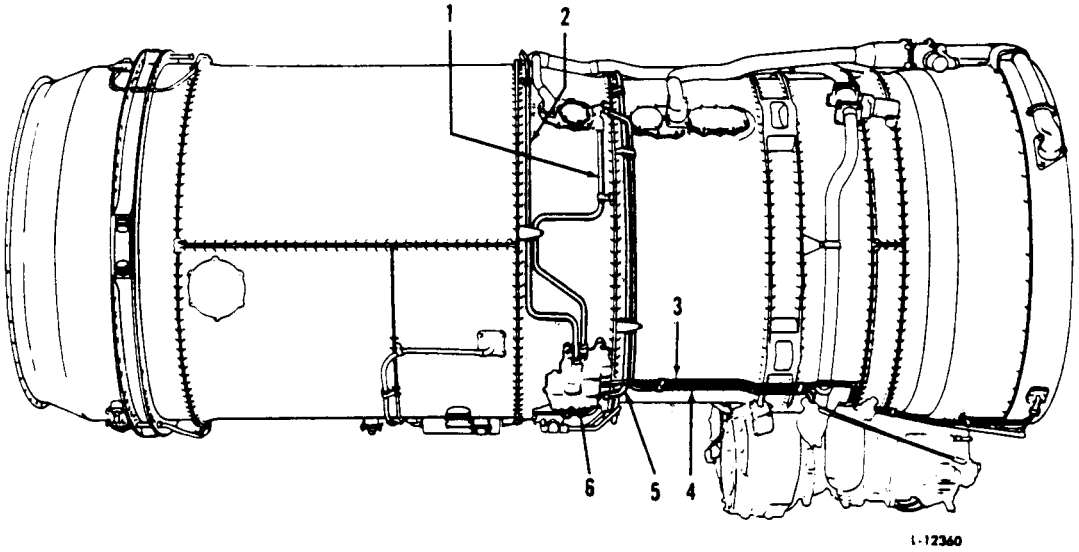
Start Bleed Control Valve Installation
Figure 401

PRESSURE RATIO BLEED CONTROL - DESCRIPTION AND OPERATION

1. Description and Operation of Pressure Ratio Bleed Control
   A. The pressure ratio bleed control is located on the lower right side of the engine at the diffuser section.
   B. Compressor discharge air (Ps4) is routed to the pressure ratio bleed control mounted on the outside of the engine. This unit operates so as to schedule the bleed valve operation as a function of the pressure rise across the front compressor. Senses utilized are inlet total pressure (Pt2) and compressor discharge static pressure (Ps3).
   C. Ps3 is ported through a two-stage nozzle system and the resultant sense, upstream of the second nozzle moves a diaphragm against Pt2 and spring pressure. Any change from the schedule position of the diaphragm produces a corrective action by varying the low pressure bleed valves. This is accomplished by a yoke which transmits the signal from the diaphragm to a transfer valve assembly consisting of poppet valves linked together. Movement of these valves directs high compressor discharge air (Ps4) to a "servo valve" which in turn moves to port actuating air to the manifold which supplied the individual bleed valves.

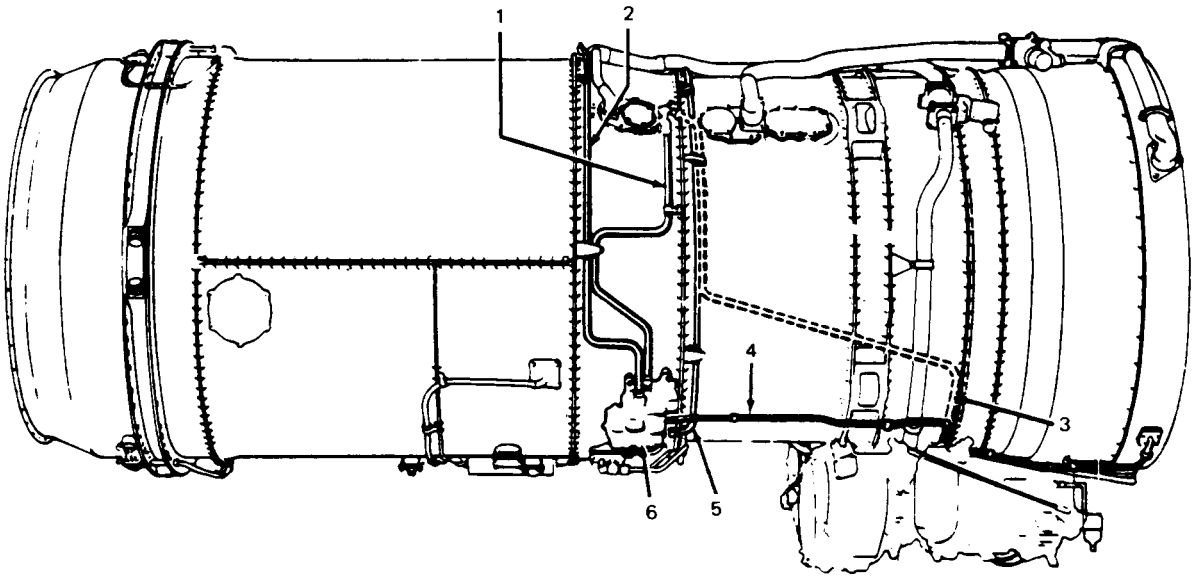
PRESSURE RATIO BLEED CONTROL - REMOVAL/INSTALLATION

1. General
   A. Refer to 72-00, Removal/Installation, P&WA Maintenance Manual for information concerning general maintenance.
2. Removal/Installation of the Pressure Ratio Bleed Control Tubes
   A. Removal
      (1) Remove following pressure ratio bleed control tubes from engine:
         (a) Prior to P&WA SB 5425:
            1) Bleed control high pressure air supply tube (Ps4).
            2) Bleed control high pressure air sensing tube (Ps4).
            3) Bleed control low pressure air supply tube (Ps3).
            4) Bleed control low pressure air sensing tube (Pt2).
         (b) Incorporating P&WA SB 5425:
            1) Bleed control Ps4 manifold.
            2) Bleed control high pressure air sensing tube (Ps4).
            3) Bleed control low pressure air supply tube (Ps3).
            4) Bleed control low pressure air sensing tube (Pt2).
            5) Bleed control Ps4 tube (to start bleed control valve).
   B. Installation
      (1) Using new packings and/or retainers as indicated, install following pressure ratio bleed control tubes:
         (a) Prior to P&WA SB 5425:
            1) Bleed control high pressure air supply tube connecting at top of engine to de-icing manifold and to bleed control.
            2) Bleed control high pressure air sensing tube connecting at pad (2 o'clock position) on diffuser outer duct and to bleed control.
            3) Bleed control low pressure air supply tube connecting to bleed control, using two new packings and two retainers. Connect other end of tube to strainer housing (at 10 o'clock position) on diffuser outer duct.
            4) Bleed control low pressure air sensing tube, using two new packings and two retainers. Connect other end of tube to compressor inlet case (5 o'clock position).
            5) Tighten nuts to recommended torque and lockwire.
            6) Install clips and brackets on tubes.
         (b) Incorporating P&WA SB 5425:
            1) Bleed control Ps4 manifold, between de-icing air manifold and bleed control. Connect Ps4 tube leading to start bleed control valve to manifold.
            2) Bleed control high pressure air sensing tube between diffuser outer duct pad (2 o'clock position) and bleed control.



1. Bleed Control High Pressure Air Sensing Tube
2. Bleed Control High Pressure Air Supply Tube
3. Bleed Control Low Pressure Air Sensing Tube
4. Fuel Control Rear Ps4 Tube
5. Bleed Control Low Pressure Air Supply Tube
6. Pressure Ratio Bleed Control

Pressure Ratio Bleed Control and Tubing (Early Engines)
Figure 401



1. Bleed Control High Pressure Air Sensing Tube
2. Bleed Control High Pressure Air Supply Tube
3. Fuel Control Rear Ps4 Tube
4. Bleed Control Low Pressure Air Sensing Tube (Pt2)
5. Bleed Control Low Pressure Air Supply Tube (Ps3)
6. Pressure Ratio Bleed Control

Pressure Ratio Bleed Control
Figure 402

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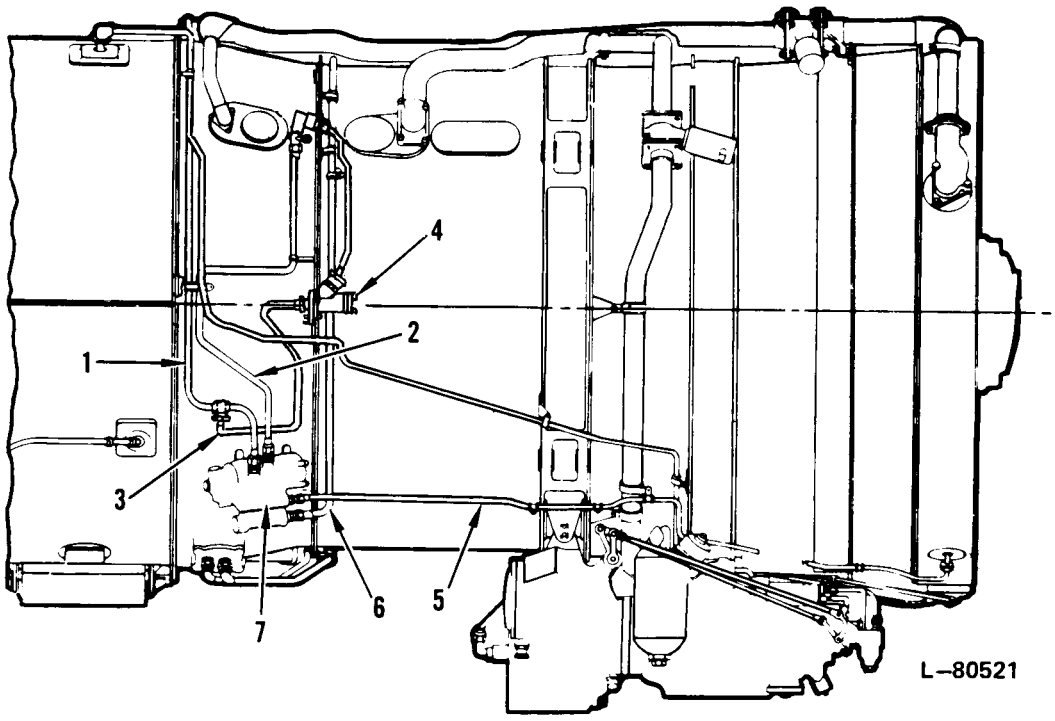


1. Bleed Control Ps4 Manifold
2. Bleed Control High Pressure Air Sensing Tube
3. Bleed Control Ps4 Tube
4. Start Bleed Control Valve
5. Bleed Control Pt2 Tube
6. Bleed Control Ps3 Tube
7. Pressure Ratio Bleed Control

Pressure Ratio Bleed Control
Figure 403

3) Bleed control low pressure air supply tube, using two new packings and retainers. Connect other end of tube to strainer housing (at 10 o'clock position) on diffuser outer duct.
4) Bleed control low pressure air sensing tube, using two new packings and retainers. Connect other end of tube to compressor inlet case (5 o'clock position).

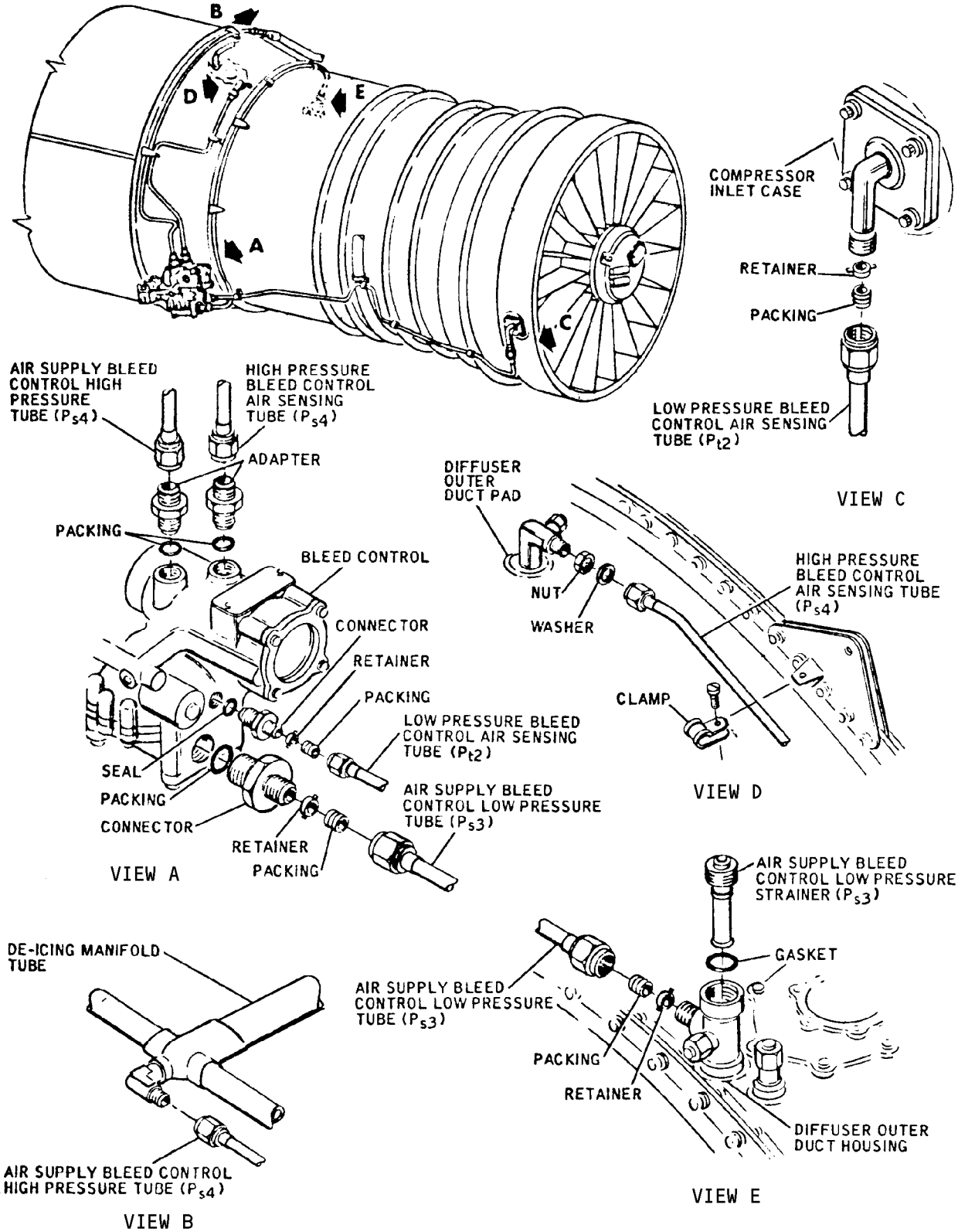
3. Removal/Installation of the Pressure Ratio Bleed Control

A. Removal
(1) Disconnect pressure ratio bleed control tubes at control (see step 2.a.).
(2) Unfasten bolts (formerly locknuts) and remove pressure ratio bleed control from lower right side of engine.

B. Installation
(1) Place pressure ratio bleed control on diffuser outer duct (5 o'clock position).
(2) Secure assembly with four washers and bolts. Torque bolts.

NOTE: Use washers and locknuts for stud type installations.

(3) Reconnect bleed control tubing and secure (see step 2.B.).
(4) Do the test for the Pressure Ratio Bleed Control (AMM 71-00-00/501).



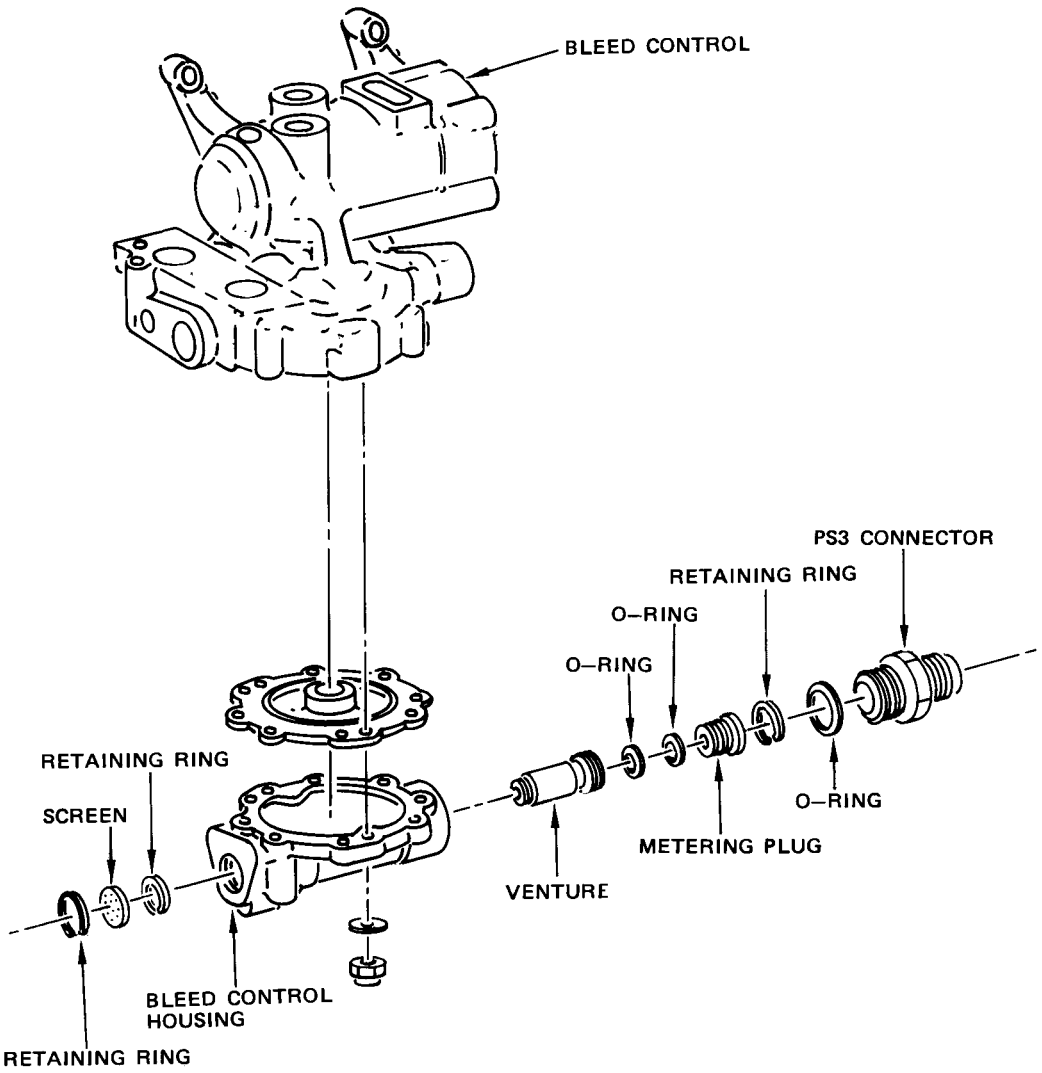
Pressure Ratio Bleed Control Tube Installation
Figure 404

PRESSURE RATIO BLEED CONTROL METERING PLUG - REMOVAL/INSTALLATION

1. General
   A. The procedure in this section pertains to the removal and installation of the pressure ratio bleed control metering plug located approximately 4 O'clock on the right side of engine.
2. Equipment and Material
   A. Brass Drift Pin (locally procured)
3. Removal (Fig. 401)
   A. Remove PS3 line from pressure ratio bleed control.
   B. Remove connector and retaining ring from bleed control housing. Remove O-Ring from connector and discard.
   C. From opposite end of bore remove retaining ring, screen and retaining ring which secures venturi.
   D. Place suitable drift against venturi and drift venturi with metering plug from bleed control housing. Remove O-ring from metering plug and O-ring from venturi. Discard O-rings.
4. Installation
   A. Check that bleed control housing, venturi, screen, retaining rings, metering plug and O-rings are clean and free of dirt, grit and moisture.

      CAUTION: DIRT, GRIT AND MOISTURE MAY DAMAGE PREFORMED PACKING.

   B. Lubricate O-ring with petrolatum and place in groove of venturi. Seat venturi in bleed control housing. Secure venturi with retaining ring. Install screen and secure with retaining ring.
   C. Lubricate O-ring with petrolatum and place in groove of metering plug. Seat plug in bleed control housing and secure with retaining ring.
   D. Lubricate O-ring with petrolatum and install on connector. Install connector in bleed control housing and tighten.
   E. Connect PS 3 line to pressure ratio bleed control.



Pressure Ratio Bleed Control Metering
Figure 401