Aerolineas Argentinas

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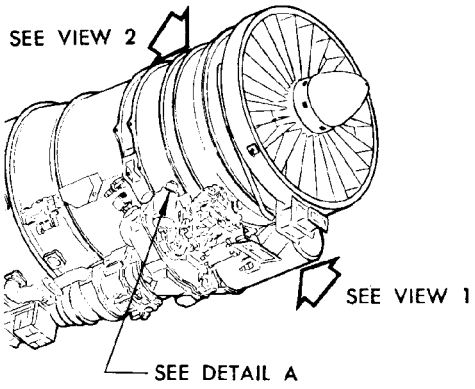
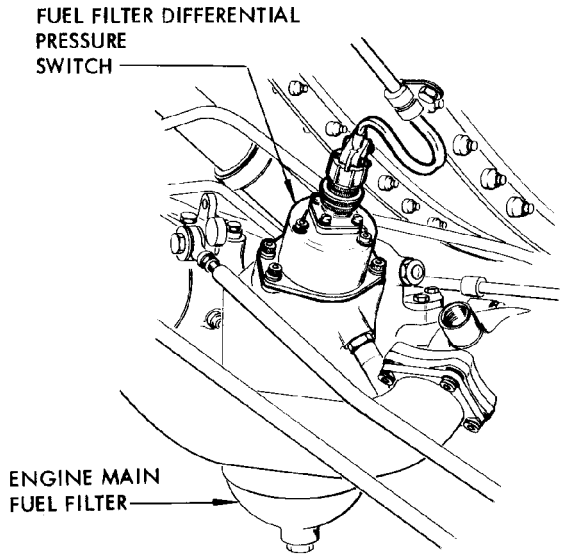
CHAPTER 73 - ENGINE FUEL AND CONTROL

TABLE OF CONTENTS

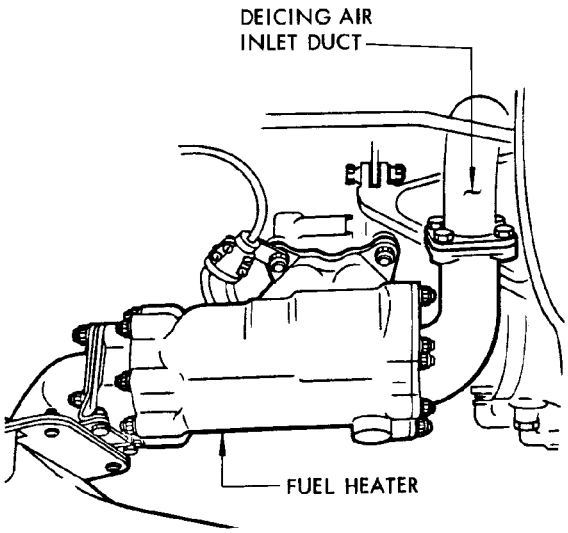
ENGINE FUEL HEATING (DE-ICING) SYSTEM - DESCRIPTION/OPERATION

1. General
   A. The engine fuel heating (deicing) system detects the presence of ice in the fuel and provides controlled heating of fuel to melt the ice. Fuel generally contains suspended water droplets and when the temperature of the fuel falls below the freezing point of water the droplets freeze. Ice eventually clogs the engine main fuel filter and restricts normal fuel flow to the engine.
   B. The engine fuel heating system for each engine consists of a fuel heater, fuel heat valve (P&W fuel deicing air shutoff valve), semiautomatic fuel heat switch, fuel heat valve open light, fuel filter differential pressure switch (P&W differential fluid pressure switch), fuel filter icing light, and the necessary plumbing. The fuel heater, fuel filter differential pressure switch, and fuel heat valve are mounted on the engine. The fuel heat switch, fuel heat valve open light, and fuel filter icing light area on the forward overhead panel. (See figure 1.)
   C. When ice clogs the engine main fuel filter, pressure differential across the filter builds up, the fuel filter differential pressure switch closes, and the fuel filter icing light and master caution light illuminate. Placing the fuel heat switch in the ON position, starts a timing device and opens the fuel heat valve, which permits high pressure compressor air to pass through the heater air tubes and heat the fuel. The fuel heat valve, after remaining open for one minute, will automatically close and the fuel heat switch will return to OFF. (See figure 2.) Should a fuel heat switch malfunction occur, the switch may be overridden to the OFF position. The warm fuel passes through the fuel filter and melts the ice. When the ice is melted, the fuel filter differential pressure switch opens and de-energizes the fuel filter icing light. The fuel heating system is designed to be used intermittently. One minute of operation every 30 minutes is recommended, when No. 1 tank fuel temperature is at 0 C or below, to restore the filter to its maximum filtration capacity.
2. Fuel Heater
   A. The fuel heater (P&W fuel deicing heater) is an air-fuel heat exchanger. (See figure 1.) The heater consists of a housing containing a core composed of air tubes, a series of baffles, and a fuel bypass valve. The heater is mounted on the fuel control unit between the boost and main stages of the engine-driven fuel pump.
   B. The fuel flowing to the main engine fuel filter passes through the heater at all times. It is heated only when the fuel heat valve is open and permits high pressure compressor (13th stage) bleed air to pass through the hearer air tubes. To obtain uniform heating of the fuel, it is baffled around the air tubes. In the event the heater becomes clogged, a bypass valve permits the fuel to bypass the heater and flow directly through the fuel filter to the engine.





DETAIL A



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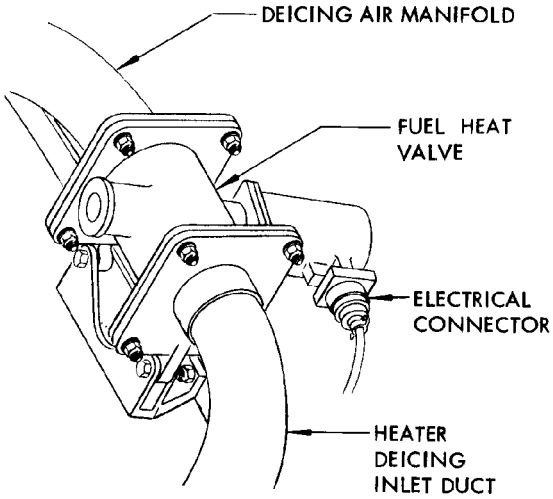

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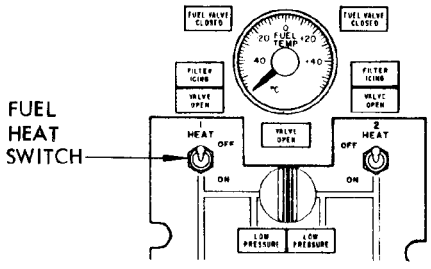
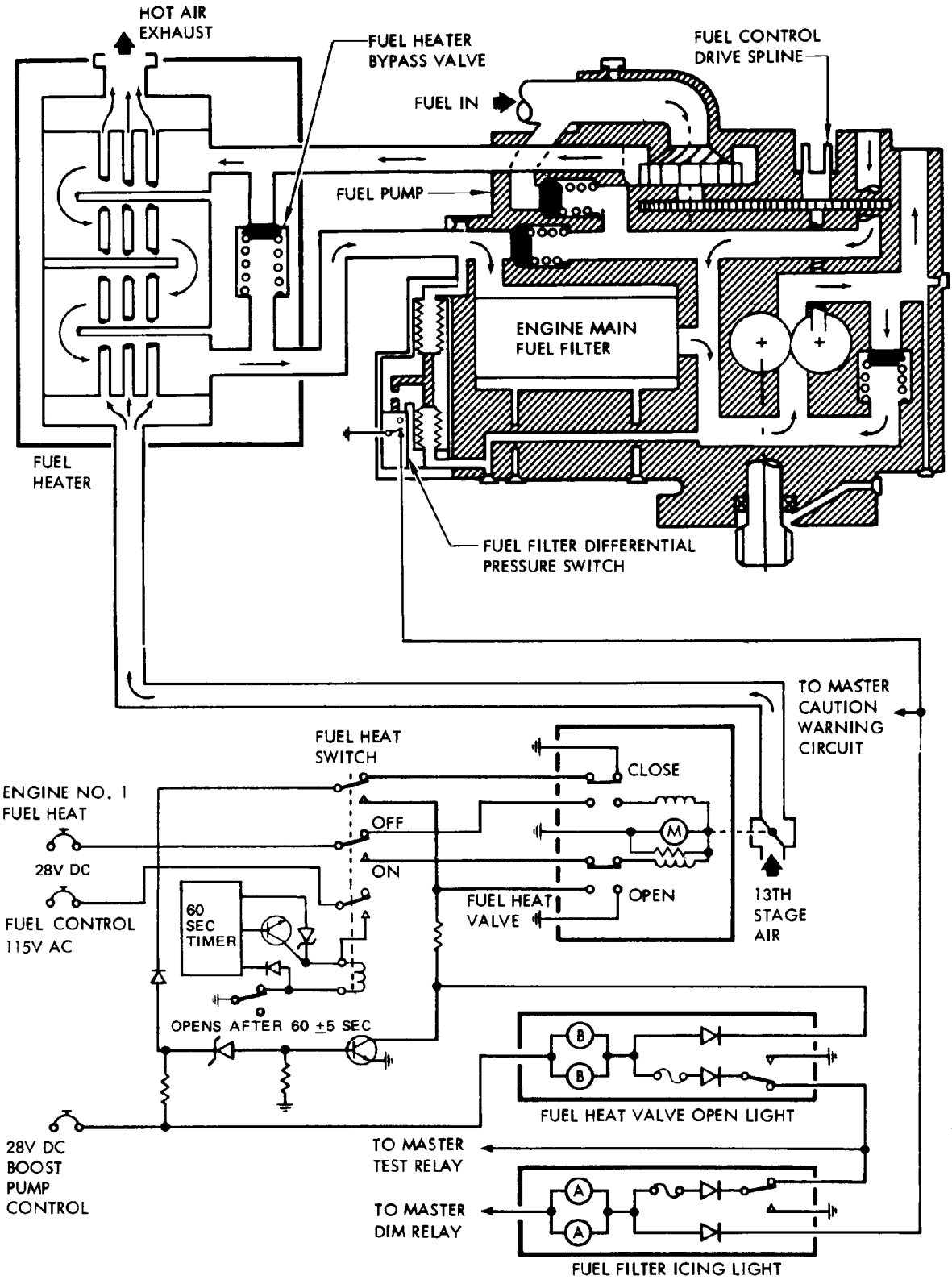


FORWARD OVERHEAD PANEL

Engine Fuel Deicing System Component Location
Figure 1



Engine Fuel Deicing System Schematic
Figure 2

3. Fuel Heat Valve
   A. The fuel heat valve (P&W fuel deicing air shutoff valve) is used to control the high pressure compressor (13th-stage) bleed airflow through the fuel heater (Fig. 1). It consists of a butterfly valve and an electrical actuator (motor). The valve is operated by a fuel heat switch, located on the forward overhead panel. There is one valve for each engine located at the 2 o'clock position slightly forward of the engine mount ring.
4. Fuel Filter Differential Pressure Switch
   A. The fuel filter differential pressure switch (P&W differential fluid pressure switch) senses the pressure differential across the engine main fuel filter. It is mounted directly on the filter on the engine fuel control unit (Fig. 1). If the engine fuel filter becomes clogged, pressure differential across the filter builds up. When the pressure differential reaches 4.4 to 5.8 psi, the switch closes and illuminates the fuel filter icing light on the forward overhead panel. When the pressure differential again decreases, the pressure switch opens and the fuel filter icing light goes off.
5. Operation
   A. When ice is present in the fuel it will eventually clog the engine main fuel filter and cause the pressure differential across the filter to increase (Fig. 2). When the pressure differential reaches 4.4 to 5.8 psi, the fuel filter differential pressure switch will close and illuminate the fuel filter icing light on the forward overhead panel and the master caution light. Placing the fuel heat switch to ON position opens the fuel heat valve and starts a timer. High pressure compressor bleed air (13th-stage) passes through the valve into the heater air tubes and heats the fuel. To obtain a uniform heating of the fuel, baffles in the heater core direct the fuel around the air tubes in a controlled flow pattern. The heated fuel flows to the fuel filter and gradually melts the ice clogging the filter. When all the ice is melted, the switch opens, de-energizing the filter icing light. One minute after being turned on, the hot airflow through the heater is stopped by the automatic return of the fuel heat switch to the OFF position. Whenever the fuel heat valve is open, the valve open light on the forward overhead panel will illuminate dimly. When the valve is in transit, the light illuminates brightly, and when the valve closes, the light extinguishes.
   B. If the fuel filter becomes clogged, the filter icing light will remain on, and the filter pressure differential will continue to increase until the filter bypass valve opens. The entire filter system must be cleaned and checked after operating under these conditions. If the fuel heater itself becomes clogged, a bypass valve permits the fuel to bypass the heater and flow directly through the fuel filter to the engine.

With external electrical power connnected to airplane, close FUEL HEAT, FUEL CONTROL and BOOST PUMP CONTROL circuit breakers on main load control circuit breaker panel P6-3. Remove connector plug from fuel filter pressure switch and short connector plug terminals A and B. Place heater switch to ON. IF -

HEAT VALVE OPEN LIGHT DOES NOT ILLUMINATE - Push press-to-test switch. IF -

FUEL HEAT VALVE DOES NOT OPEN - Remove connector plug from fuel heater and check for 28 volts dc between plug terminal A and ground. IF -

OK - Restore continuity between terminal and ground.

NOT OK - Restore continuity between valve actuator heater and circuit breaker panel. Repeat test. IF -

Continued on next page.

OK - Check for 28 volts dc between terminal A and ground. IF -

NOT OK - Replace light bulb or restore continuity between transit light, fuel heater switch and circuit breaker panel.

OK - Check for continuity between terminal B and ground. Push press to test fuel icing light. IF -

NOT OK - Restore continuity between terminal A and ground.

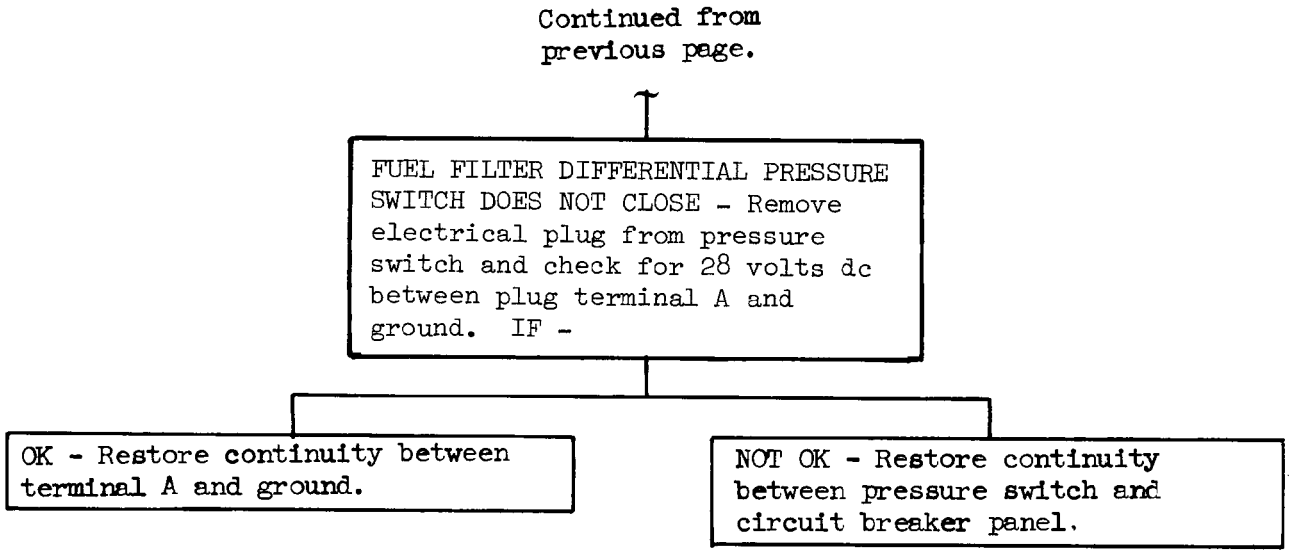
OK - Check for 28 volts dc between terminal A and ground. IF -

NOT OK - Replace light bulb or restore continuity between icing light, pressure switch and circuit breaker panel.

OK - Check for continuity between terminal B and ground.

NOT OK - Restore continuity between terminal A and ground.

Engine Fuel Deicing - Troubleshooting
Figure 101 (Sheet 1)



Engine Fuel Deicing - Troubleshooting
Figure 101 (Sheet 2)

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ENGINE FUEL HEATING (DE-ICING) SYSTEM - ADJUSTMENT/TEST

1. Engine Fuel Deicing System Test
   A. Fuel Heat Valve Test
      (1) Prepare for test.
         (a) Connect electrical power sources.
         (b) Open left and right removable cowl panels for each engine. Refer to Chapter 71.
         (c) Check that fuel heat switches, on forward overhead panel, are in OFF position.
         (d) Close FUEL HEAT, FUEL CONTROL, and BOOST PUMP CONTROL circuit breakers on circuit breaker panel P6-3.
         (e) Press-to-test fuel heat valve open light and fuel filter icing light to assure light will illuminate.
      (2) Test fuel heat valve.
         (a) Place fuel heat switch to ON position and observe valve open light (blue). Verify that valve open light illuminates brightly during valve transition and remains illuminated dimly at completion of the opening cycle.
         (b) Visually check position indicator on valve and verify that valve has fully opened.
         (c) The valve shall begin to close within 60 ± 5 seconds from the time the valve switch was placed in ON position. Verify that valve open light illuminates brightly during valve transition and is extinguished at completion of closing cycle.
         (d) Visually check position indicator on valve and verify that valve has fully closed.
   B. Fuel Filter Icing Indicator Light and Master Warning Lights Test
      (1) Prepare for test.
         (a) Check that 28 volt dc bus No. 1 is energized.
         (b) Close MASTER CAUTION BUS, INDICATOR LIGHTS - MASTER DIMMING BUS, and DIM and TEST circuit breakers on panel P6-3.
         (c) Disconnect electrical connector from the fuel filter differential pressure switch.
      (2) Test fuel filter icing indicator light and master warning lights.
         (a) Jumper terminals A and B of disconnected connector and verify that amber warning light on P5-2 fuel module, fuel system annunciator light, and two master warning lights illuminate.
         (b) Place LIGHTS switch on panel P2-1 to DIM, verify that indicator lights dim.
         (c) Place LIGHTS switch to BRIGHT, verify that indicator lights return to original intensity.
         (d) Press either master caution light, verify that master caution lights and the fuel annunciator light are extinguished and the fuel filter icing indicator light remains illuminated.

(e) Press either master caution annunciator, verify that both master caution lights and all annunciator lights remain illuminated as long as annunciator is depressed.
(f) Release master caution annunciator, verify that only the master caution and fuel annunciator lights remain illuminated.

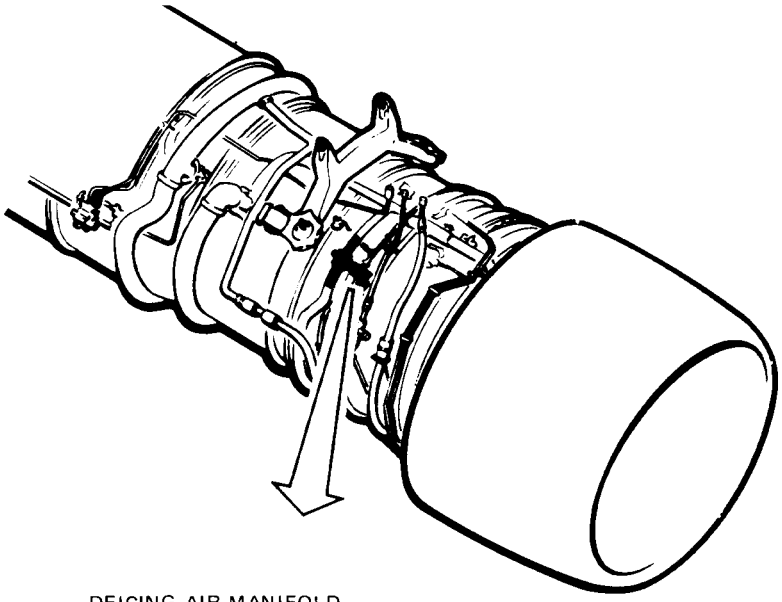
(3) Restore airplane to normal configuration.
(a) Remove jumper from terminals A and B of disconnected connector, verify that all lights are extinguished.
(b) Connect electrical connector to fuel filter differential pressure switch.
(c) Close left and right removable cowl panels for each engine. Refer to Chapter 71.
(d) Determine if there is any further need for electrical power, if not, disconnect electrical power from airplane.

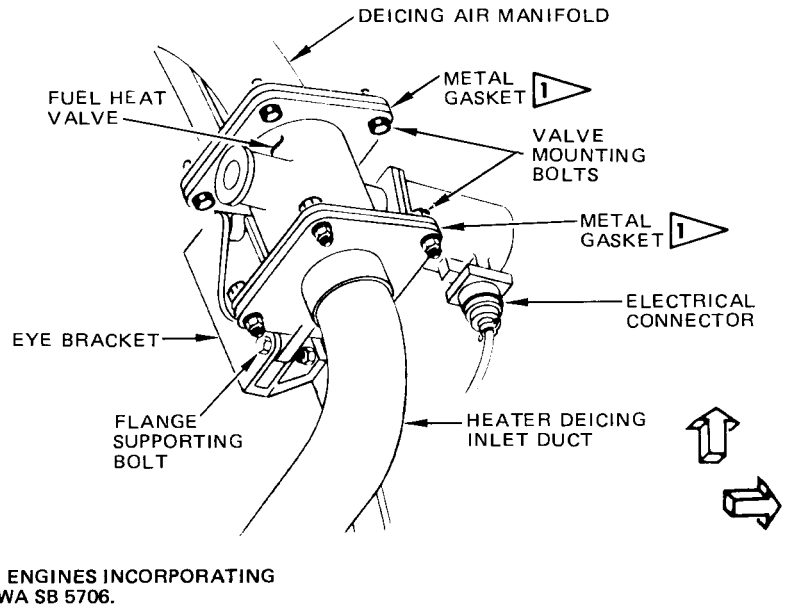
FUEL HEAT (DEICING AIR) VALVE - REMOVAL/INSTALLATION

1. Prepare to Remove Fuel Heat (Deicing Air) Valve
   A. Pull FUEL HEAT circuit breaker, for applicable engine, on circuit breaker panel P6.
   B. Open left and right removable cowl panels for applicable engine (Ref Chapter 71, Engine Cowling).
2. Remove Fuel Heat (Deicing Air) Valve
   A. Disconnect electrical connector from valve (Fig. 401).
   B. Remove valve mounting bolts.
   C. Loosen bolts attaching deicing inlet duct to fuel deicing heater.
   D. Remove bolts attaching deicing inlet duct clamps to engine, located at 3 and 5 o'clock positions.
   E. Remove flange supporting bolt.
   F. Support valve and move heater deicing inlet duct downward until valve can be removed.
   G. On engines incorporating P&WA SB 5706, remove metal gaskets between valve and upper tube flange and lower tube flange.

      NOTE: Make note of gasket locations when removing and keep gaskets separate. Retain gaskets for later reinstallation.

   H. Lift valve clear of engine.
3. Install Fuel Heat (Deicing Air) Valve
   A. Move heater deicing inlet duct downward until valve can be inserted between flanges of ducts.
   B. On engines incorporating P&WA SB 5706, install metal gaskets between valve and upper tube flange and lower tube flange.
   C. Insert valve between duct flanges then move heater deicing inlet duct upward until it contacts valve.
   D. Install flange supporting bolt.
   E. Install valve mounting bolts.
   F. Install bolts attaching deicing inlet duct clamps to engine, tighten finger-tight only.
   G. Tighten bolts attaching deicing inlet duct to heater and lockwire.
   H. Tighten bolts attaching clamps to engine.
   I. Connect electrical connector to valve.
   J. Perform operation check of valve (Ref Engine Fuel Heating (Deicing) System - A/T).
   K. Close engine cowl panels.





1 ON ENGINES INCORPORATING P&WA SB 5706.

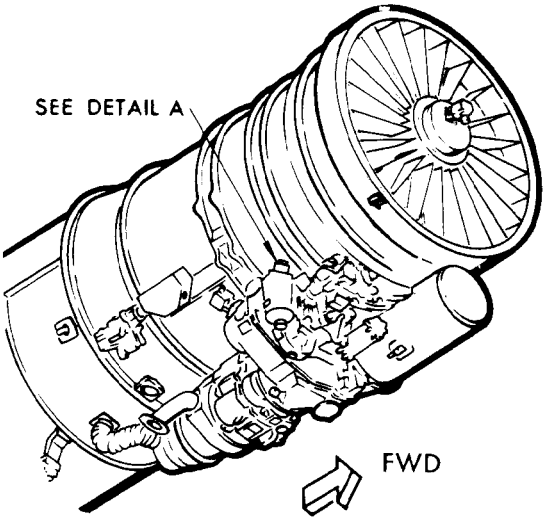
Fuel Deicing Air Valve Installation
Figure 401

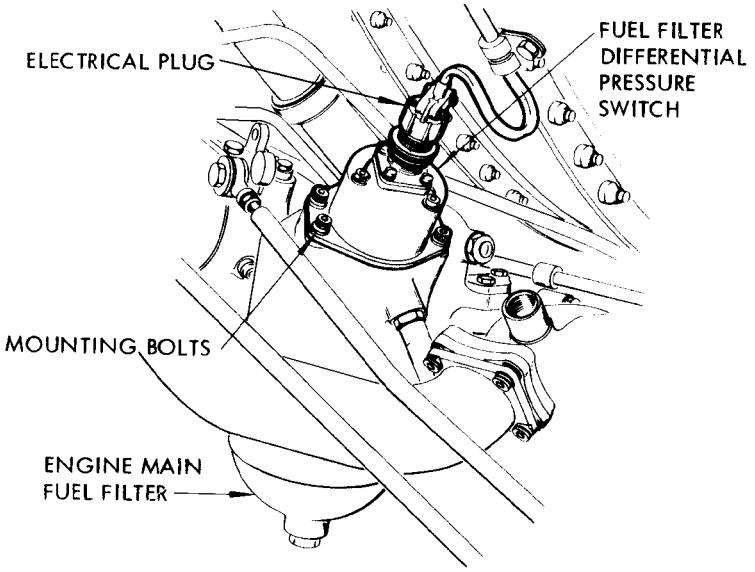
FUEL FILTER DIFFERENTIAL PRESSURE SWITCH - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Naphtha oil
   B. Lint-free cloth
2. Prepare to Remove Fuel Filter Differential Pressure Switch
   A. Pull applicable INDICATOR LTS circuit breaker, for applicable engine, on circuit breaker panel P6.
   B. Open right removable cowl panel for applicable engine (Ref Chapter 71, Engine Cowling).
3. Remove Fuel Filter Differential Pressure Switch
   A. Disconnect electrical plug from switch.
   B. Remove switch mounting bolts, and liftoff switch.
4. Install Fuel Filter Differential Pressure Switch

   WARNING: DO NOT GET NAPHTHA IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM NAPHTHA. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE NAPHTHA. KEEP NATHPHA AWAY FROM SPARKS, FLAME, AND HEAT. NAPHTHA IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY OR DAMAGE.

   A. Thoroughly clean mating surfaces of switch and fuel filter with naphtha oil, wipe dry with lint-free cloth.
   B. Install new seal in ports on switch.
   C. Place switch on fuel filter and install four mounting bolts.
   D. Connect electrical connector to switch.
   E. Test engine in accordance with Power Plant Repair Reference Table, Test A (Ref 71-00 A/T).
   F. Close engine cowl panels.





DETAIL A

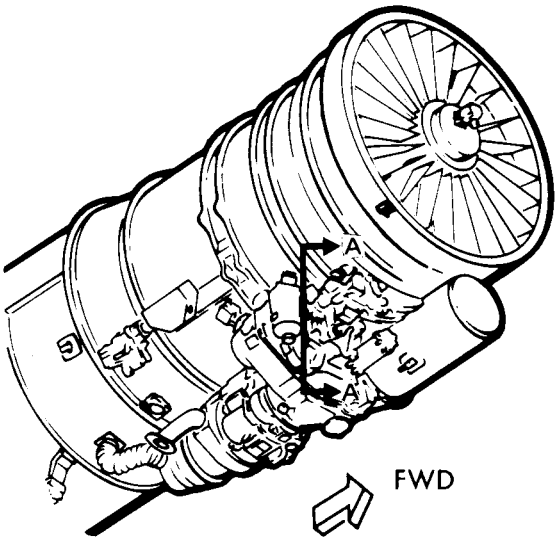
Fuel Filter Differential Pressure Switch Installation
Figure 401

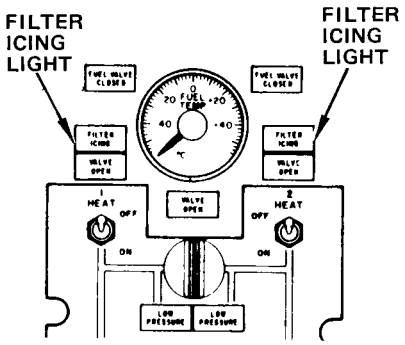
FUEL FILTER DIFFERENTIAL PRESSURE SWITCH - ADJUSTMENT/TEST

1. Fuel Filter Differential Pressure Switch Test
   A. Equipment and Materials
      (1) Clean dry air or nitrogen source, 0-20 psig
      (2) Nozzle - Pratt & Whitney Part No. 33682
      (3) Petrolatum
   B. Prepare for Switch Test
      (1) Open right removable cowl panel for applicable engine . Refer to Chapter 71, Engine Cowling.
      (2) Remove fuel filter. Refer to Chapter 73-11-1, P & WA Maintenance Manual.
   C. Test Fuel Filter Differential Pressure Switch
      (1) Activate power supply to flight deck ice warning instrumentation by closing applicable FUEL CONTROL circuit breaker on main load control circuit breaker panel P6-3.
      (2) Connect PWA 33682 nozzle to clean dry air source and coat rubber seal at tip of nozzle lightly with petrolatum.
      (3) Insert nozzle into pressure discharge port near pressure switch (Fig. 501). Hold firmly in place.
      (4) Gradually introduce pressure into base of switch through nozzle.

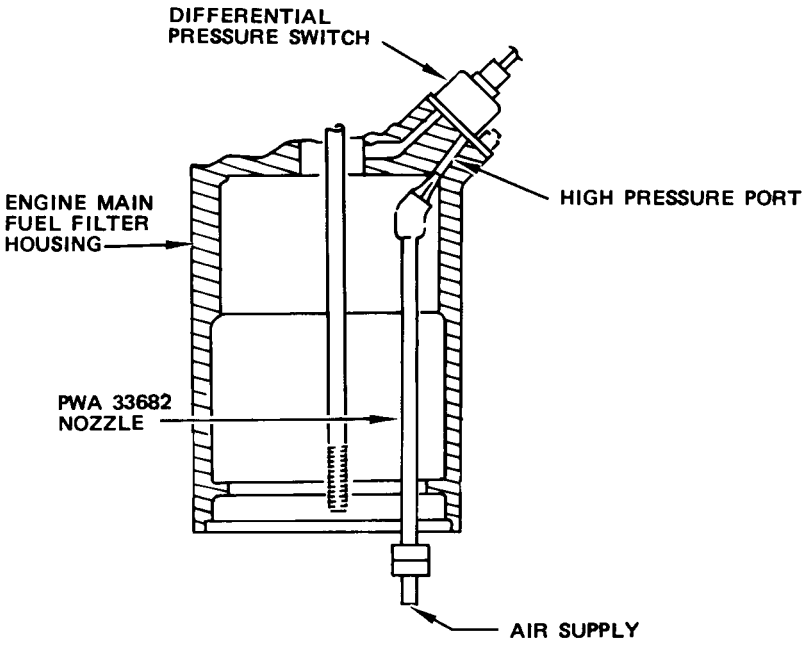
          CAUTION: DO NOT EXCEED 20 PSIG PRESSURE OR SWITCH MAY BE DAMAGED.

      (5) Check that applicable FILTER ICING light, on forward overhead panel in flight deck, illuminates between 3 and 8 psig.
      (6) Gradually decrease pressure and check that FILTER ICING light extinguishes between 6 and 2 psig.
      (7) Relieve pressure and remove nozzle from filter housing.
      (8) Deactivate power supply to flight deck ice warning instrumentation.
   D. Return Airplane to Normal
      (1) Re-install fuel filter. Refer to Chapter 73-11-1, P & WA Maintenance Manual.
      (2) Close cowl panel. Refer to Chapter 71, Engine Cowling.





FORWARD OVERHEAD PANEL

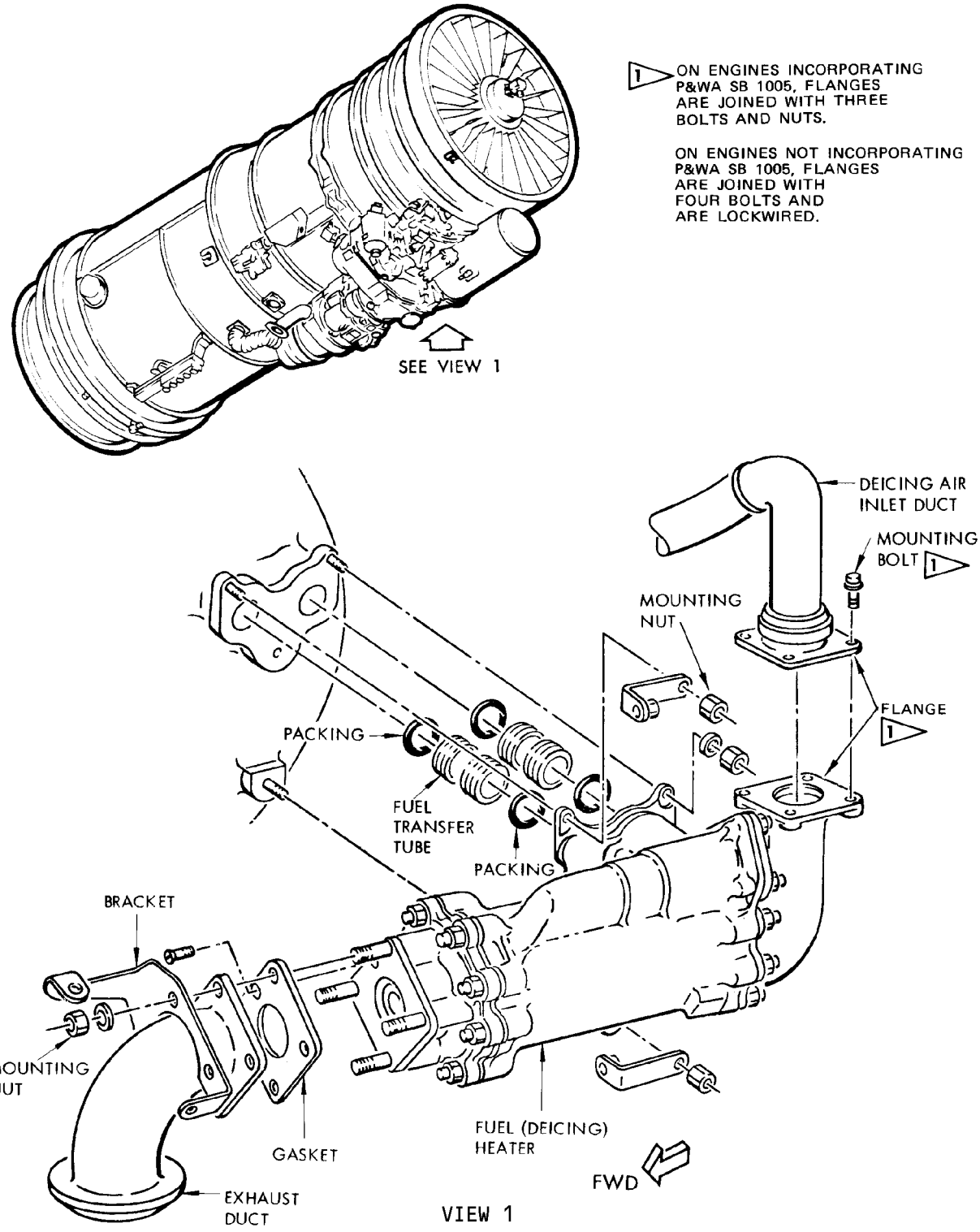


SECTION A-A

Fuel Filter Differential Pressure Switch Test
Figure 501

FUEL (DEICING) HEATER - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Petrolatum
2. Remove Fuel (Deicing) Heater (Fig. 401)
   A. Pull applicable fire switch to close engine fuel shutoff valve. Open applicable ENG SHUTOFF VALVE circuit breaker on circuit breaker panel P6.
   B. Open right removable cowl panel for applicable engine (Ref Chapter 71, Engine Cowling).
   C. Remove bolts (or bolts and nuts) attaching fuel deicing air inlet duct to heater.
   D. Remove bonding jumper installation nut and remove bonding jumper.
   E. Remove heater mounting nuts and washers from upper studs.
   F. Lift capillary temperature sensing tube support bracket from forward stud.
   G. Remove heater mounting nut and washer from lower stud.
   H. Lift capillary temperature sensing tube support bracket from lower stud and move tube aside.
   I. Lift heater clear of engine.
   J. Remove fuel transfer tubes. (These are located directly between heater and fuel control unit.)
   K. Remove nuts attaching fuel deicing air exhaust duct to heater and remove duct and bracket from heater.
3. Install Fuel (Deicing) Heater (Fig. 401)
   A. Using new gaskets, position bracket and deicing air exhaust duct on studs in end of heater; install mounting nuts except the one supporting bonding jumper.
   B. Install two new seals, coated with petrolatum, on each fuel transfer tube.
   C. Install fuel transfer tubes in heater.
   D. Position heater on its mounting studs, carefully guiding fuel transfer tubes into fuel control unit.
   E. Secure heater with washer and nut on aft upper stud.
   F. Place capillary temperature sensing tube brackets on remaining studs, install washers and nuts.
   G. Replace bonding jumper and install nut.
   H. On engines incorporating P&WA SB 1005, install three bolts and nuts attaching fuel deicing air inlet duct to heater. On engines not incorporating P&WA SB 1005, install four bolts attaching fuel deicing air inlet duct to heater and lockwire.



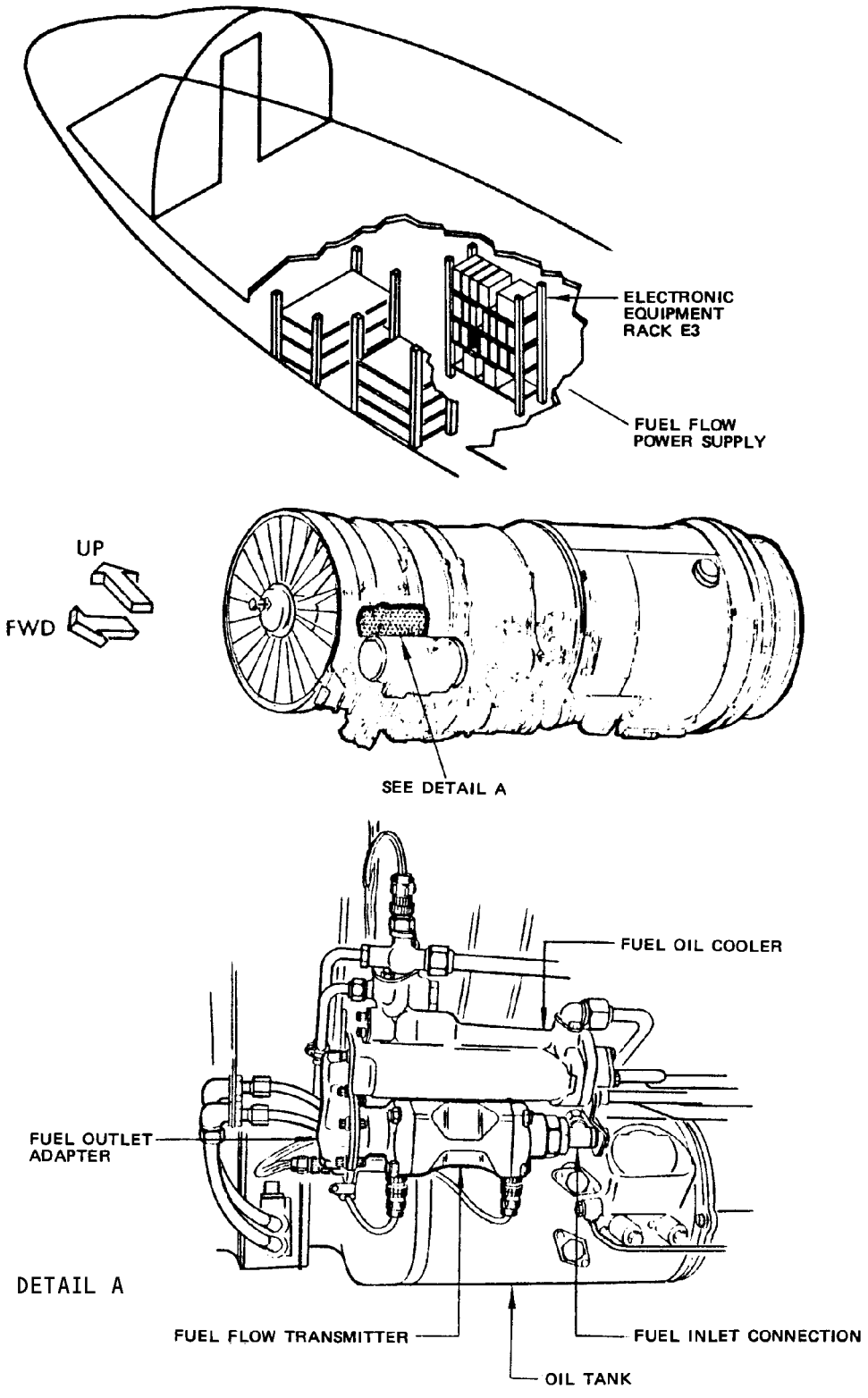
Fuel Deicing Heater Installation
Figure 401

I. Push in fire switch to open engine fuel shutoff valve. Close ENG SHUTOFF VALVE circuit breaker on circuit breaker panel P6.

J. Operate engine (Ref Chapter 71, Power Plant). Check for air leaks around heater mounting flanges.

FUEL FLOW INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The purpose of the fuel flow indicating system is to provide a visual indication of the fuel consumption of each engine. The fuel flow is measured in kilograms per hour by fuel flow indicators which are located on the center instrument panel.
   B. The fuel flow indicating system consists of two fuel flow transmitters, two fuel flow indicators, and one fuel flow power supply. The fuel flow transmitters are located on the forward left side of the engines. (See figure 1.) The fuel flow power supply is located on the E3-3 electronic equipment rack.
   C. The fuel flow power supply provides constant frequency three-phase power for driving the two fuel flow transmitters. Fuel flows through each fuel flow transmitter while en route to each engine. The fuel flow transmitters interpret the rate of flow into electrical signals. The electrical signals are transmitted to the fuel flow indicators which translates the electrical signals into mechanical movement of pointers on calibrated dials.
2. Fuel Flow Power Supply
   A. The fuel flow power supply is a synchronous motor connected to a three-bar commutator through reduction gears. A radio noise filter is also in the fuel flow power supply.
   B. Energizing the motor of the fuel flow power supply causes the three-bar commutator to be driven at a constant speed. Rotation of the three-bar commutator chops the incoming dc current to the fuel flow power supply and produces a three-phase, four-cycle ac current output.
3. Fuel Flow Transmitter
   A. The purpose of the fuel flow transmitter is to provide an angular deflection of a turbine element that is directly proportional to the mass-rate of fuel flow. This deflection degree is then transmitted electrically to the fuel flow indicator.
   B. The transmitter is located in the fuel line downstream of the fuel control unit and does not appreciably effect the fuel pressure to the engines. The fuel pressure to the engines is the same whether the transmitter is functioning or is inoperative.
   C. The transmitter consists of a housing containing a motor driven impeller and a fuel flow driven turbine. An impeller motor is located upstream of the impeller. A signal transmitting unit is located downstream of the turbine and is attached to the turbine with two restraining springs of different load characteristics. This permits the use of an indicator with fine index marks at the low side and coarser index marks at the high side resulting in greater sensitivity at low flow rates.



Fuel Flow Indicating System Component Location
Figure 1

D. The impeller motor drives the impeller and produces a swirling motion of the fuel. The fuel then passes through the turbine and the fuel flow is straightened. The action of the fuel on the blades of the turbine produces a torque against the restraining springs which is directly proportional to the mass rate of fuel flow. Rotation of the restraining springs positions a permanent magnet rotor in the transmitter to a position corresponding to the fuel flow. An electrical signal is generated and transmitted to the indicator.

CAUTION: IT IS RECOMMENDED THAT THE "FUEL FLOW" CIRCUIT BREAKERS BE PULLED (OPEN) WHENEVER THE ENGINE FUEL FEED LINE IS DRAINED OR THE AIRPLANE IS OUT OF SERVICE FOR MAINTENANCE. THIS WILL PREVENT DAMAGE TO THE FUEL FLOW TRANSMITTER CAUSED FROM DRY OPERATION AND WILL PROLONG THE LIFE OF THE FUEL FLOW TRANSMITTER.

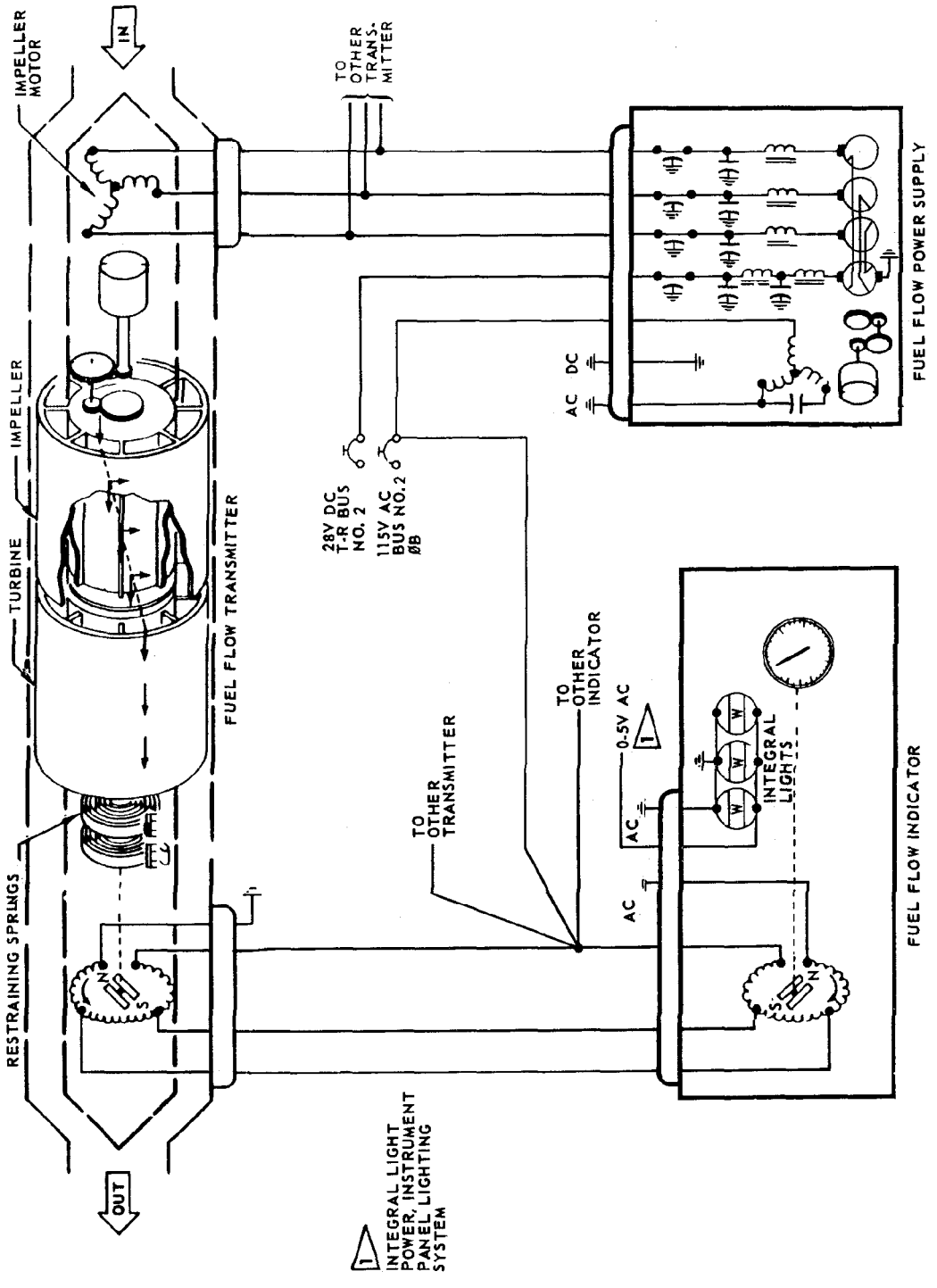
4. Fuel Flow Indicator
   A. There are two fuel flow indicators in the fuel flow indicating system. One indicator is provided for each engine. Each indicator is hermetically sealed and is located on the center instrument panel.
   B. The fuel flow indicator provides high accuracy fuel flow indications up to 3000 kgph. Less accurate fuel flow indications are shown in the 3000 kgph to 5500 kgph range. The dial face of the fuel flow indicator is graduated with 100 kgph index marks up to 3000 kgph. From 3000 kgph to 5550 kgph the graduations are 500 kgph apart.
   C. The fuel flow indicator consists essentially of a coil, a frame assembly, bearings, a dial face, a permanent magnet rotor, and a pointer contained in a can assembly.
   D. The fuel flow indicator receives an electrical signal from the fuel flow transmitter. The fundamental frequency exciting current of the fuel flow indicator and the electrical signal received from the fuel flow transmitter creates flux across the core. The flux across the core aligns the permanent magnet rotor in the same angular position as the magnet in the fuel flow transmitter.
5. Operation
   A. The main load control center furnishes 28 volt dc and 115 volt ac power for operation of the fuel flow indicating system. The fuel flow indicating system provides an electrical signal relative to fuel flow rate and transforms this signal into mechanical movement of the indicator pointer. The fuel flow indicating system does not contribute to radio noise.

B. Closing the FUEL FLOW circuit breakers on the FUEL SYSTEMS circuit breaker panel P6-3, energizes the fuel flow power supply. The fuel flow power supply motor drives the three-bar commutator at a constant speed. A frequency with 0.3 percent is maintained constant and the power output is approximately 40 watts. The incoming dc current is transformed into three-phase, four-cycle electrical output that drives the fuel flow transmitter impeller motor which drives the impeller through reduction gears and is a constant speed regardless of fuel flow rate. Fuel passes into the fuel flow transmitter and is given a swirling motion by the rotating impeller. (See figure 2.)

C. The turbine of the fuel flow transmitter is mechanically independent from the impeller. The turbine incorporates straight through vanes that straighten the fuel flow. As the fuel flow is straightened, the swirling motion of the fuel rotates the turbine against restraining springs. The extent of turbine rotation depends on rate of fuel flow.

D. The turbine is directly connected to a permanent magnet which is positioned with respect to the angle of rotation of the turbine. A coil surrounds the permanent magnet in the fuel flow transmitter and 115 volts ac current is introduced to this coil. The fuel flow transmitter produces an output signal which is proportional to fuel flow.

E. A coil in the fuel flow indicator picks up the output signal from the fuel flow transmitter. The fuel flow indicator coil is energized by the 115 volts ac current to stabilize the pointer. The permanent magnet in the fuel flow indicator takes a position corresponding to the position of the permanent magnet in the fuel flow transmitter. The fuel flow indicator permanent magnet is directly connected to the pointer. The pointer gives a visual indication of fuel flow on the dial face of the fuel flow indicator.

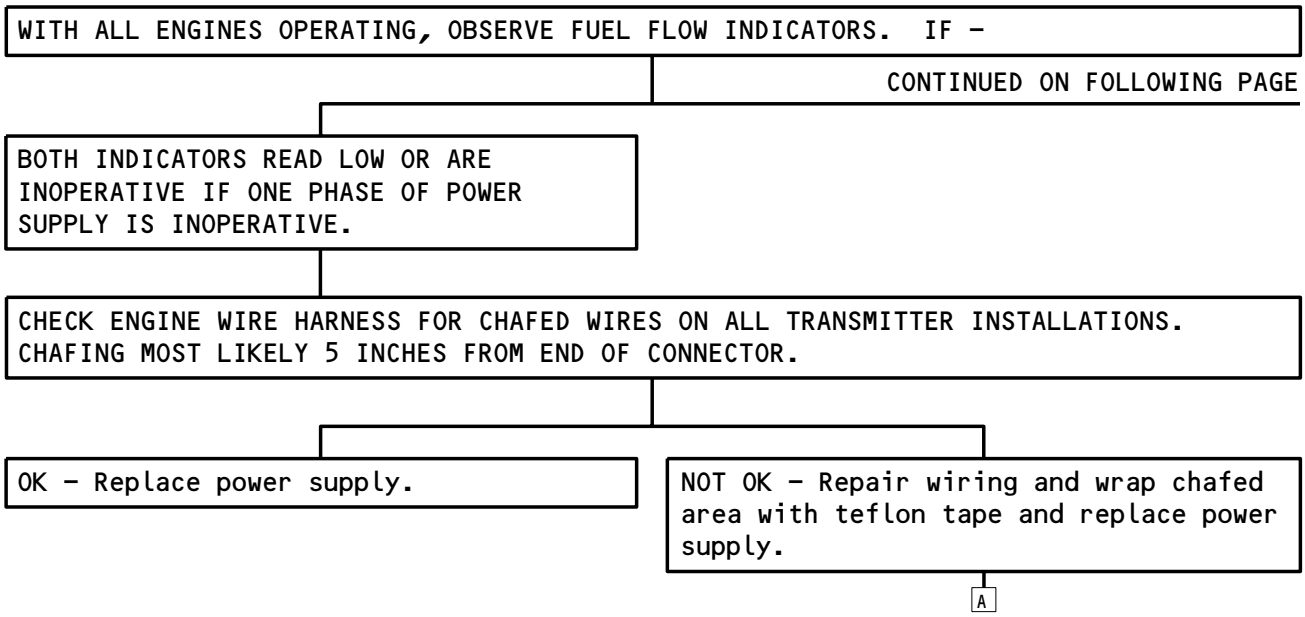


Fuel Flow Indicating System Schematic
Figure 2

FUEL FLOW INDICATING SYSTEM - TROUBLESHOOTING

1. General
   A. Troubleshooting is comparatively simple because the trouble points are few. If all indicators are not performing properly, the power supply should be replaced. If the power supply checks out, the trouble points either the transmitters, the indicators or the wiring.

2. Fuel Flow Indicating System Trouble Shooting Chart



Fuel Flow Indicating System – Troubleshooting
Figure 101 (Sheet 1)

CONTINUED FROM PRECEDING PAGE

ONE INDICATOR READS LOW OR IS INOPERATIVE.

CHECK ENGINE WIRE HARNESS FOR CHAFED WIRES ON APPLICABLE TRANSMITTER INSTALLATION. CHAFING MOST LIKELY 5 INCHES FROM END OF CONNECTOR.

OK - With interchanged indicator, replace old indicator.

NOT OK - Repair wiring and wrap chafed area with Teflon tape.

B

Fuel Flow Indicating System - Troubleshooting
Figure 101 (Sheet 2)

A B

OK – With interchanged indicator, replace old indicator.

NOT OK – Check resistance on applicable transmitter between:

TRANSMITTER SERIES	PIN TO PIN	RESISTANCE (OHMS)
TJ50	1 or A 4 or D	60 to 100
	4 or D 3 or C	60 to 100
	3 or C 2 or B	60 to 100
	2 or B 1 or A	180 to 300
TJ85	5 or G 4 or F	250 ±25
	5 or G 3 or E	250 ±25
	1 or A 2 or B	Verify the circuits are not open or shorted
	6 or C 7 or D	Verify the circuits are not open or shorted

NOT OK – Replace transmitter.

OK – Check aircraft wiring for breaks, shorts, or loose connections. Check wiring with multimeter.

OK – Replace transmitter (internal mechanical binding).

NOT OK – Replace or repair wiring.

Fuel Flow Indicating System – Troubleshooting
Figure 101 (Sheet 3)

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FUEL FLOW TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. Removal/Installation procedures for any one of the fuel flow transmitters are basically the same, the only difference being one of location. There is one transmitter mounted on the forward left side of each engine.
2. Prepare to Remove Fuel Flow Transmitter
   A. Pull applicable fire switch to close engine fuel shutoff valve. Open applicable ENG SHUTOFF VALVE circuit breaker on circuit breaker panel P6.

      NOTE: Engine fuel shutoff valves may be closed manually if desired.

   B. Open both FUEL FLOW circuit breakers on circuit breaker panel P6.

      CAUTION: FUEL FLOW CIRCUIT BREAKER MUST BE OPENED PRIOR TO DISCONNECTING TRANSMITTER CONNECTOR. FAILURE TO DO SO CAN RESULT IN DAMAGE TO INDICATOR RESET MECHANISM. DAMAGE WILL RESULT IF RESET BUTTON IS PUSHED OR BY PICKUP OF STRAY SIGNALS IF INDICATOR IS ENERGIZED AND THE TRANSMITTER IS DISCONNECTED.

   C. Open left side cowl panel on applicable engine.
3. Remove Fuel Flow Transmitter
   A. Place suitable container under transmitter to catch fuel spillage.
   B. Disconnect electrical connectors from transmitter (Fig. 401).
   C. Disconnect bonding jumper from transmitter.
   D. Disconnect fuel line from fuel inlet connection.
   E. Remove four mounting bolts from clamp plate.
   F. Remove three bolts attaching transmitter support bracket to oil cooler.
   G. Slide support bracket free of fuel inlet connection.
   H. Pull transmitter straight aft until clear of fuel outlet adapter.
   I. Pull transmitter straight out from engine until clear of fuel inlet line, lift transmitter clear of engine.
   J. Fill transmitter with fluid upon removal from engine. Use fluid from new transmitter or, as a substitute, clean fuel.
4. Prepare to Install Fuel Flow Transmitter

   NOTE: When removing old O-rings, ferrule and retainers, clean off dried lubricant which may be on the O-ring bearing surfaces.

A. Loosen locknut on fuel inlet connection, remove fuel inlet connection from transmitter and save for installation.
B. Remove clamp plate and adapter from transmitter and save for installation.
C. Remove bonding jumper between electrical connectors and save for installation.
D. Prior to installing forward adapter, make sure that forward adapter and clamp plate are compatible per Table 1.

TABLE 1

ADAPTER PWA P/N	CLAMP PLATE PWA P/N	TORQUE VALUE POUND-INCHES	PWA SB4936 STATUS
773086	773085	570 - 630	ACCOMPLISHED
447884	719851	570 - 630	NOT ACCOMPLISHED

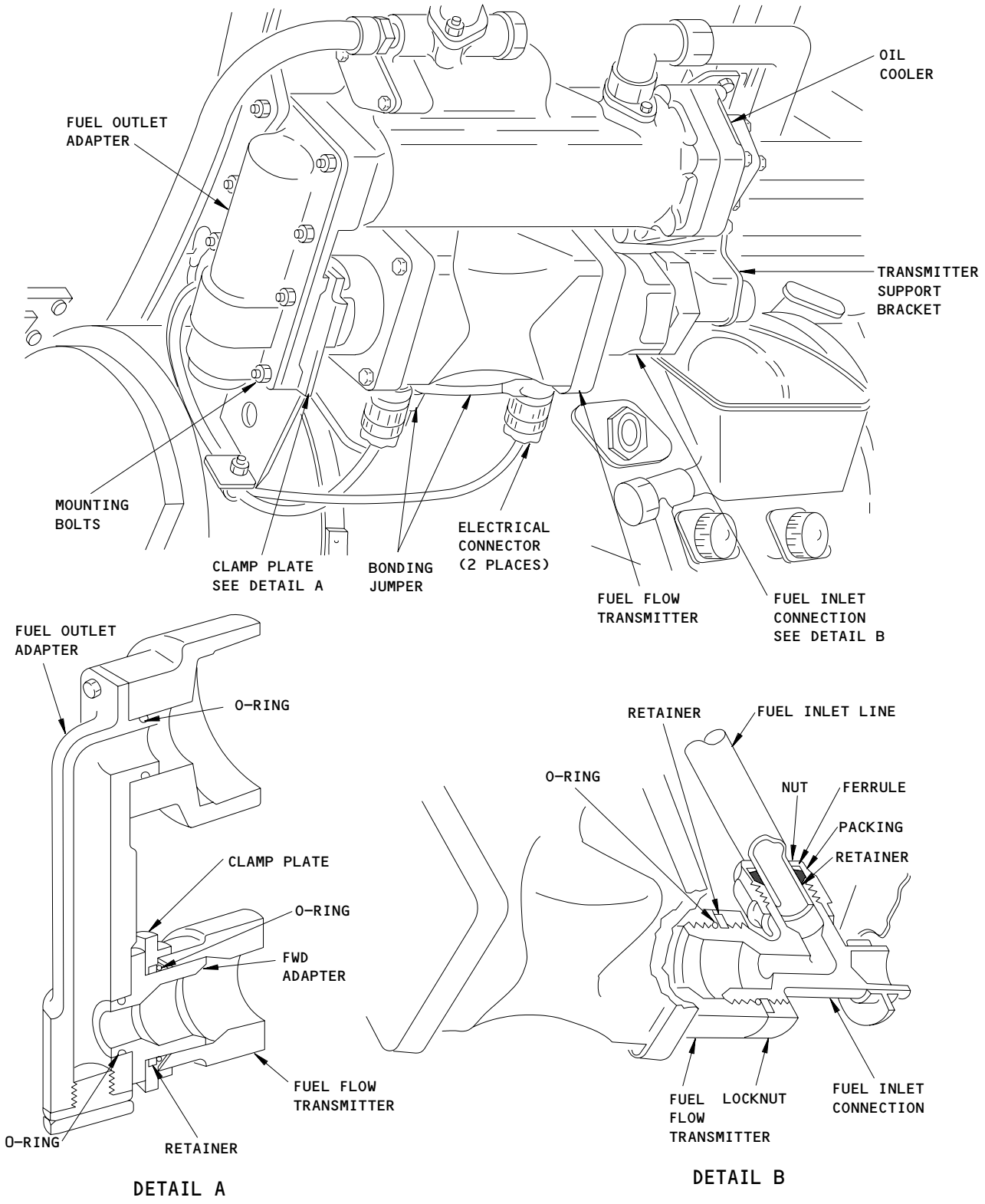
E. Using new O-ring lightly lubricated with fuel, install forward adapter, clamp plate and retainer onto outlet end of transmitter.

NOTE: Arrow scribed on transmitter indicates direction of fuel flow.

(1) Prior to attaching forward adapter, lubricate male threads with Molykote Type G-N. Attach forward adapter to transmitter and while gripping the transmitter wrenching flats, tighten adapter torque values in Table 1.

CAUTION: DO NOT ALLOW TORQUE TO BE TRANSMITTED THROUGH TRANSMITTER BODY WHILE ATTACHING FORWARD ADAPTER

F. Using new O-ring lightly lubricated with fuel, install fuel inlet adapter, retainer and locknut onto inlet end of transmitter.



Fuel Flow Transmitter Installation
Figure 401

G. Place new ferrule, packing and retainer on fuel inlet line.
H. Place new O-ring, lightly lubricated with fuel, into groove of adapter in outlet end of transmitter.

5. Install Fuel Flow Transmitter
   A. Position transmitter against engine and insert fuel inlet line into fuel inlet connection.
   B. Insert adapter, on outlet end of transmitter, into fuel outlet adapter.

      NOTE: It may be necessary to spring the fuel inlet line slightly, towards the rear of the engine, to perform steps A. and B.

   C. Slide transmitter support bracket into position on fuel inlet connection and install three mounting bolts.
   D. Install clamp plate mounting bolts.
   E. Connect fuel inlet line to fuel inlet connection.
   F. Install bonding jumpers to transmitter.
   G. Connect electrical connector to transmitter.

6. Restore Airplane to Normal Configuration
   A. Push in applicable fire switch to open engine fuel shutoff valve.
   B. Close both FUEL FLOW circuit breakers and applicable ENG SHUTOFF VALVE circuit breaker on circuit breaker panel P6-3.
   C. Perform engine leak check run (AMM Chapter 71).

      NOTE: When starting engine for engine leak check run after replacing fuel flow transmitter, the fuel flow indicator may not indicate any flow until all air has been purged from transmitter.

FUEL FLOW POWER SUPPLY - REMOVAL/INSTALLATION

1. General
   A. There is only one fuel flow power supply unit on each airplane. Access to the power supply may be obtained through the lower access door of the electrical and electronic compartment. The power supply is located on the E3-3 electrical equipment rack.
2. Remove Fuel Flow Power Supply
   A. Open the FUEL FLOW circuit breaker on the FUEL SYSTEMS circuit breaker panel P6-3 and placard the circuit breaker with DO NOT CLOSE.
   B. Remove electrical connector.
   C. Release catches holding power supply in rack.
   D. Slide power supply straight out until it clears rack.
3. Install Fuel Flow Power Supply
   A. Slide power supply straight into rack.
   B. Secure catches.
   C. Connect electrical connector.
   D. Remove the placard and close the FUEL FLOW circuit breaker.