

# CHAPTER

# 73

# ENGINE FUEL AND CONTROL

# MD-80 AIRCRAFT MAINTENANCE MANUAL

## CHAPTER 73 ENGINE FUEL AND CONTROL

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**GENERAL - DESCRIPTION AND OPERATION**

**1. General**

A. The engine fuel distribution and control system consists of subsystems and components necessary to supply filtered, pressurized, and metered fuel for steady state, acceleration and deceleration fuel flow to the engine combustion section. Indicating systems are provided to monitor fuel pump inlet pressure, fuel temperature, and fuel filter differential pressure, and fuel flow with indicators mounted in the flight compartment.

**2. Distribution**

A. The purpose of the fuel distribution system is to provide a clean vapor-free supply of fuel to the engine under all operating conditions and power requirements. The system consists of the fuel supply bridle, fuel tubes, two-stage engine-driven fuel pump, fuel/oil cooler ENGINE FUEL/OIL COOLER - MAINTENANCE PRACTICES, PAGEBLOCK 79-20-01/201, pressurizing and dump valve, nine individual fuel nozzles, and an eductor. For a complete description and operation of the engine fuel system, refer to DISTRIBUTION - DESCRIPTION AND OPERATION, PAGEBLOCK 73-10-00/001.

**3. Controlling**

A. The engine-driven fuel control is basically a fuel metering system and a computer, responding to various engine operating parameters. The fuel control is provided with two control levers; one to control the engine speed during all forward and reverse thrust operations, and the other to control engine starting and shutdown. The fuel control accurately governs the steady state selected speed, acceleration and deceleration, and indirectly governs the maximum turbine temperature of the engine during both forward and reverse thrust operation. For a complete description and operation of the fuel control, refer to CONTROLLING, SUBJECT 73-20-00, Page 1.

**4. Indicating**

A. Indicating systems are provided to monitor fuel pump inlet pressure, fuel temperature, fuel filter differential pressure, and fuel flow. The information is displayed on either a gage or light indicator mounted on a panel in the flight compartment. For a complete description and operation of the indicating system, refer to INDICATING, SUBJECT 73-30-00, Page 1.

**5. Operation**

A. Fuel flows through the duct at the high point of the engine, to the fuel supply bridle and centrifugal first stage of the engine-driven fuel pump then to the air/fuel heater. Any restriction to fuel flow caused by accumulation of foreign matter creates a pressure drop across the fuel filter. This causes a light on the annunciator panel in the flight compartment to come on, and the air shutoff valve is opened to allow warm 13th stage bleed air to flow through the air/fuel heater. Fuel passes through the main fuel filter to the high-pressure gear stage of the engine-driven fuel pump and out to the fuel control where it is filtered, metered, and either passed to the pressurizing and dump valve, or bypassed back to the inlet of the fuel pump high-pressure gear stage. Before entering the main fuel filter, a portion of the fuel is diverted to provide the motive fluid stream for the eductor. Fuel discharging from the eductor nozzle evacuates the eductor chamber by entraining vapor molecules, compressing and mixing them in a constant area mixing section, then forcing the mixture into the inlet of the fuel pump centrifugal first stage. Fuel leaving the fuel control passes through the fuel flowmeter and fuel/oil cooler to the pressurizing and dump valve. Upon leaving the pressurizing and dump valve the fuel flow is divided and passes into primary and secondary manifolds. Fuel enters the dual inlet manifolds where it is distributed through the nine individual fuel nozzles into the combustion chambers.

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## GENERAL - TROUBLE SHOOTING

### 1. General

- A. To find and correct fuel system troubles, first study the symptoms carefully. Check each possible cause beginning with the most likely, until the exact nature of the trouble is determined. Before attempting to diagnose the trouble or work on the system which has been reported malfunctioning during flight, consult the pilot's flight report and all other pertinent data for information which might help in diagnosing the trouble.

### 2. Trouble Shooting

Possible Causes		Isolation Procedure	Correction
<b>A. ENGINE FAILS TO START</b>			
(1)	Fuel pressurizing and dump valve defective	(a) Remove plug from P&D valve drain port and attach fitting and hose. Provide container to catch any fuel during test. Motor engine with starter (SUBJECT 71-00-00) and check for fuel draining from hose.  (b) Check P&D valve fuel strainer.	If fuel drains, replace P&D valve.  Clean or replace strainer. (SUBJECT 73-13-05)
(2)	Fuel control defective		Replace fuel control. (SUBJECT 73-20-01)
(3)	Engine-driven fuel pump defective	Check fuel pump filter for evidence of first stage centrifugal pump failure.	Replace fuel pump. (SUBJECT 73-12-01)
<b>B. ENGINE ACCELERATION ERRATIC</b>			
(1)	Fuel pressurizing and dump valve defective	Faulty distribution of fuel to fuel nozzles.	Replace pressurizing and dump valve. (SUBJECT 73-13-05)
(2)	Fuel control defective		Replace fuel control. (SUBJECT 73-20-01)
(3)	Fuel nozzles defective	Check for clogged fuel nozzles.	Replace defective fuel nozzles.
(4)	Engine-driven fuel pump cavitation	Clogged eductor nozzle orifice.	Remove eductor SUBJECT 73-13-01 and clean.
<b>C. N<sub>2</sub> SPEED OVER MAXIMUM RPM</b>			
(1)	Fuel control defective		Replace fuel control. (SUBJECT 73-20-01)
<b>D. ENGINE FAILS TO ACCELERATE TO IDLE</b>			
(1)	Fuel control defective		Replace fuel control. (SUBJECT 73-20-01)
<b>E. ENGINE IDLE SPEED INCORRECT</b>			
(1)	Incorrect engine trim adjustment	Check engine trim, if correct trim cannot be obtained. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>F. ENGINE OVERTEMPERATURE INDICATION</b>			
(1)	Fuel pressurizing and dump valve defective	Faulty distribution of fuel to fuel nozzles.	Replace pressurizing and dump valve. (SUBJECT 73-13-05)

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Possible Causes		Isolation Procedure	Correction
(2)	Fuel control defective		Replace fuel control. (SUBJECT 73-20-01)
<b>G. LOW ENGINE PRESSURE RATIO READING</b>			
(1)	Loose P <sub>t7</sub> line connection at exhaust case		Tighten P <sub>t7</sub> line connection. (CHAPTER 71)
<b>H. ENGINE ACCELERATION OR DECELERATION SLOW</b>			
(1)	Incorrect engine trim adjustment	Check engine trim, if correct trim cannot be obtained. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>I. ENGINE ACCELERATION FAST</b>			
(1)	Incorrect engine trim adjustment	Check engine trim, if correct trim cannot be obtained. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>J. ENGINE HOT START</b>			
(1)	Incorrect engine trim adjustment	Check engine trim, if correct trim cannot be obtained. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>K. ENGINE MAXIMUM SPEED INCORRECT</b>			
(1)	Incorrect engine trim adjustment	Check engine trim, if correct trim cannot be obtained. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>L. ENGINE HANGS UP AT HIGH POWER</b>			
(1)	Fuel control defective	Check engine trim. (GENERAL, SUBJECT 71-00-00, Page 501)	Replace fuel control. (SUBJECT 73-20-01)
<b>M. ENGINE FIRE AT SHUTDOWN</b>			
(1)	Fuel pressurizing and dump valve defective	Faulty distribution of fuel to fuel nozzles.	Replace pressurizing and dump valve. (SUBJECT 73-13-05)
<b>N. FUEL PUMP FILTER DIFFERENTIAL PRESSURE CAUTION LIGHT ON (Fuel heater on, but engine fuel temperature low)</b>			
(1)	Air/fuel heater defective	Air/fuel heater core clogged.	Replace air/ fuel heater. (SUBJECT 73-14-01)
(2)	Fuel de-icing air shutoff valve failed closed	Check position of air shutoff valve indicator.	Replace air shutoff valve. (SUBJECT 73-14-00)
(3)	Fuel pump filter clogged	Check fuel filter.	Replace fuel filter element. (SUBJECT 73-12-01)
(4)	Fuel pump filter clogged	Check fuel filter.	Check for microbial contamination. (FUEL PUMP, SUBJECT 73-12-01)

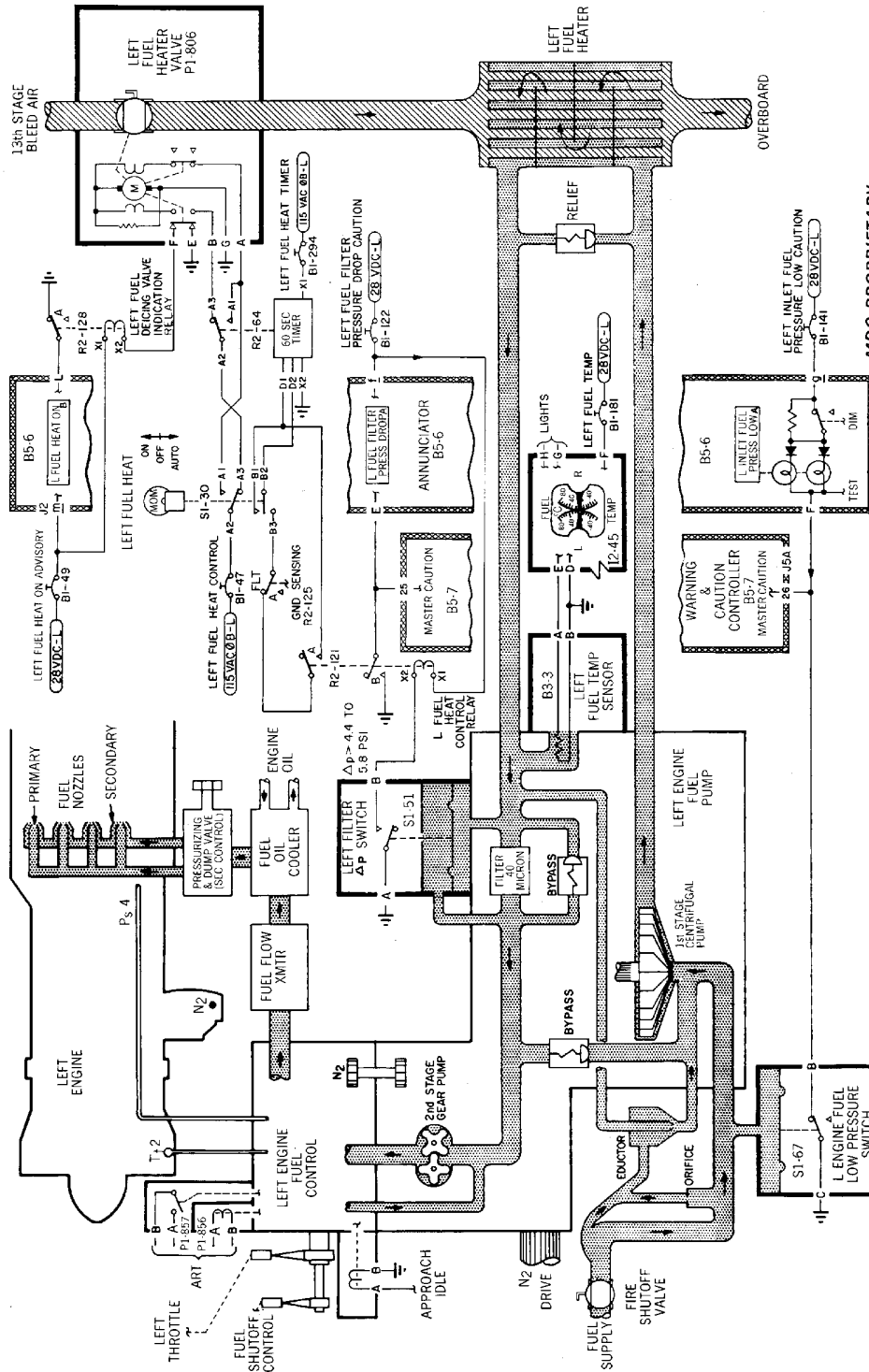
EFFECTIVITY  
WJE ALL

TP-80MM-WJE

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BBB2-73-25B

MDC PROPRIETARY

**Left Engine Fuel and Control - Schematic**  
Figure 101/73-00-00-990-803

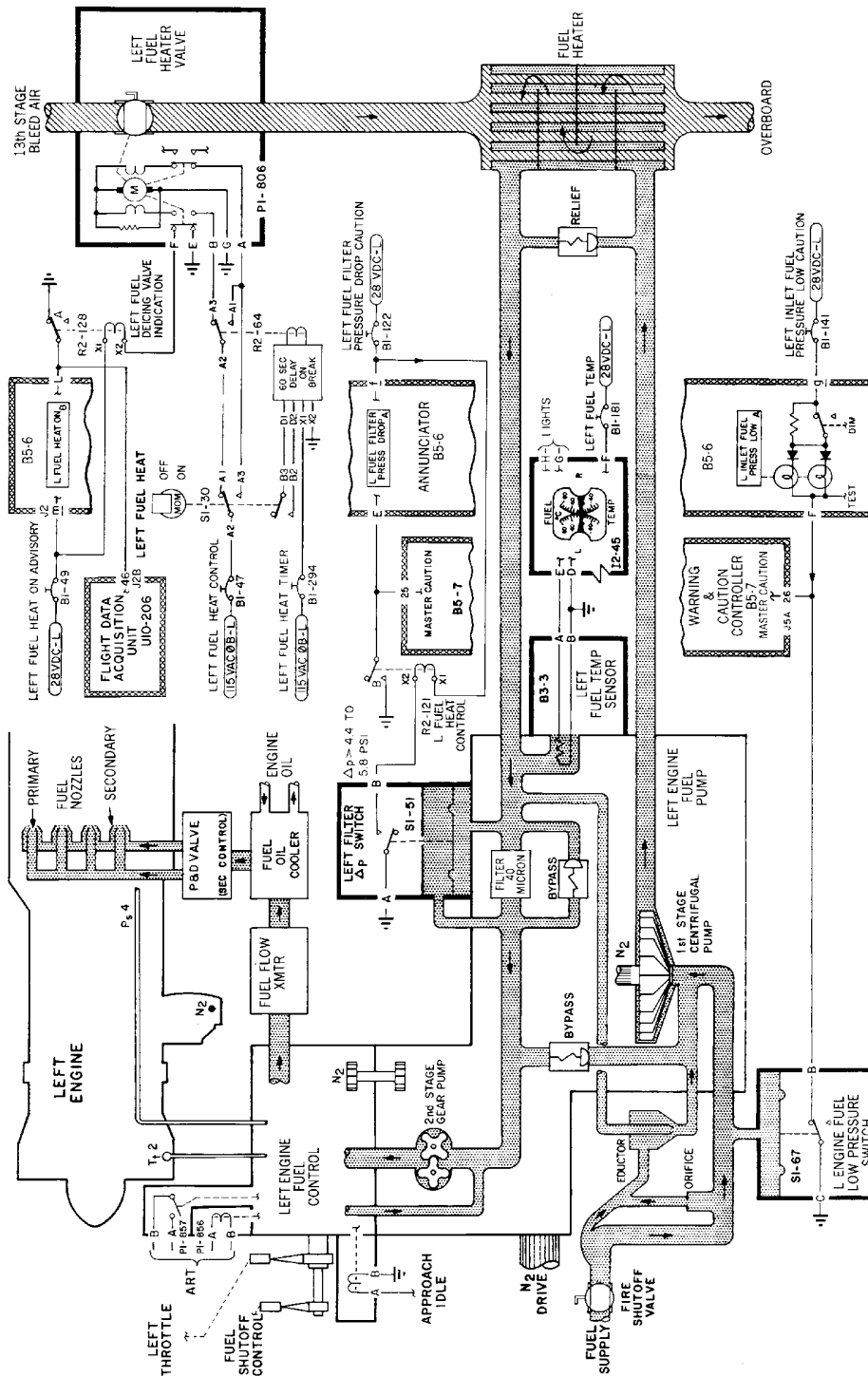
EFFECTIVITY  
WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 891

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Left Engine Fuel and Control - Schematic  
Figure 102/73-00-00-990-805

BBB2-73-56A

REFERENCED ATA NUMBERS ARE VALID TO THE THIRD DIGIT.

MDC PROPRIETARY

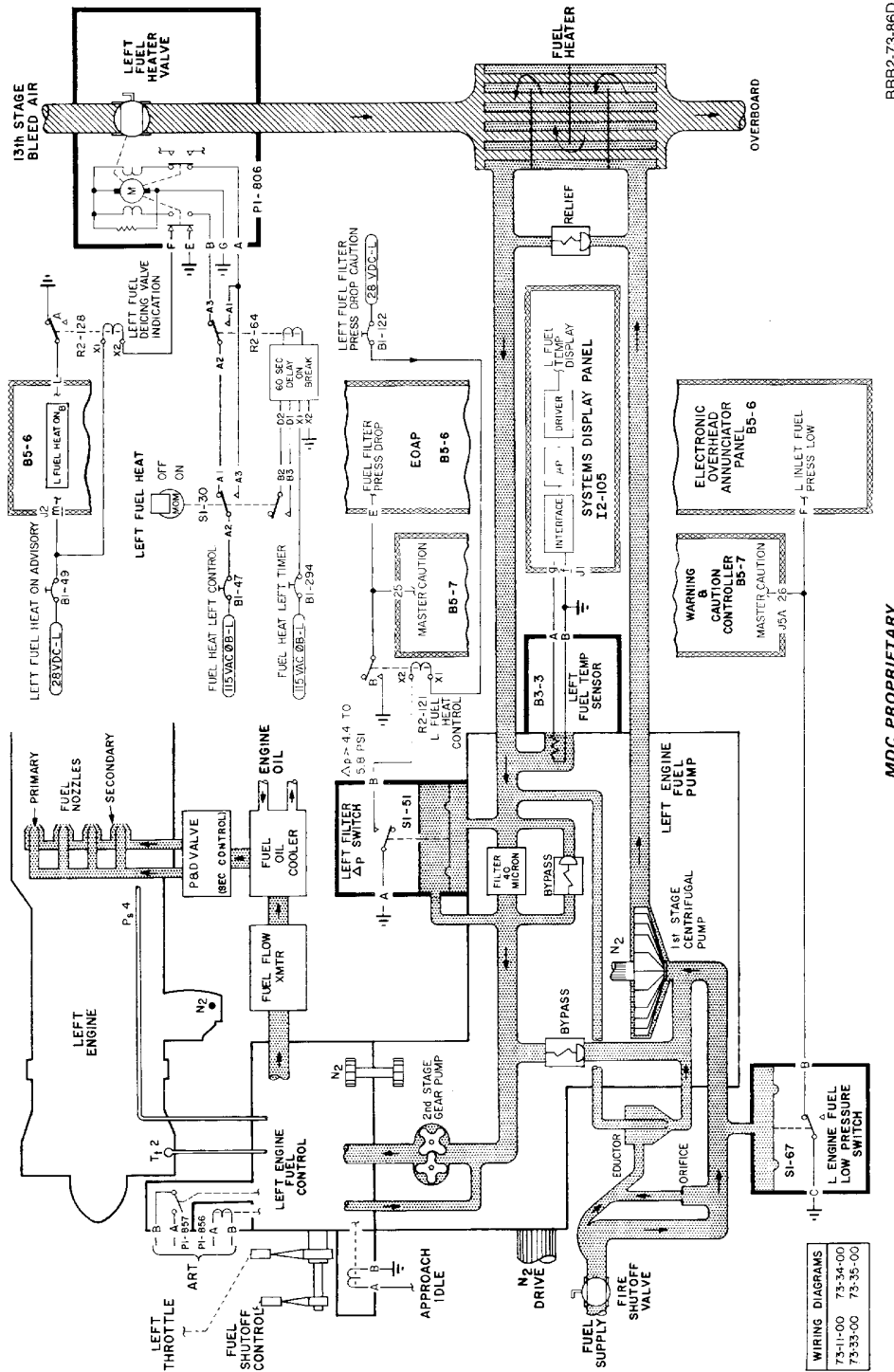
EFFECTIVITY  
WJE 873, 874, 892, 893

TP-80MM-WJE

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BBB2-73-86D

MDC PROPRIETARY

Left Engine Fuel and Control - Schematic  
Figure 103/73-00-00-990-808

EFFECTIVITY  
WJE 405, 406, 410, 886, 887

TP-80MM-WJE

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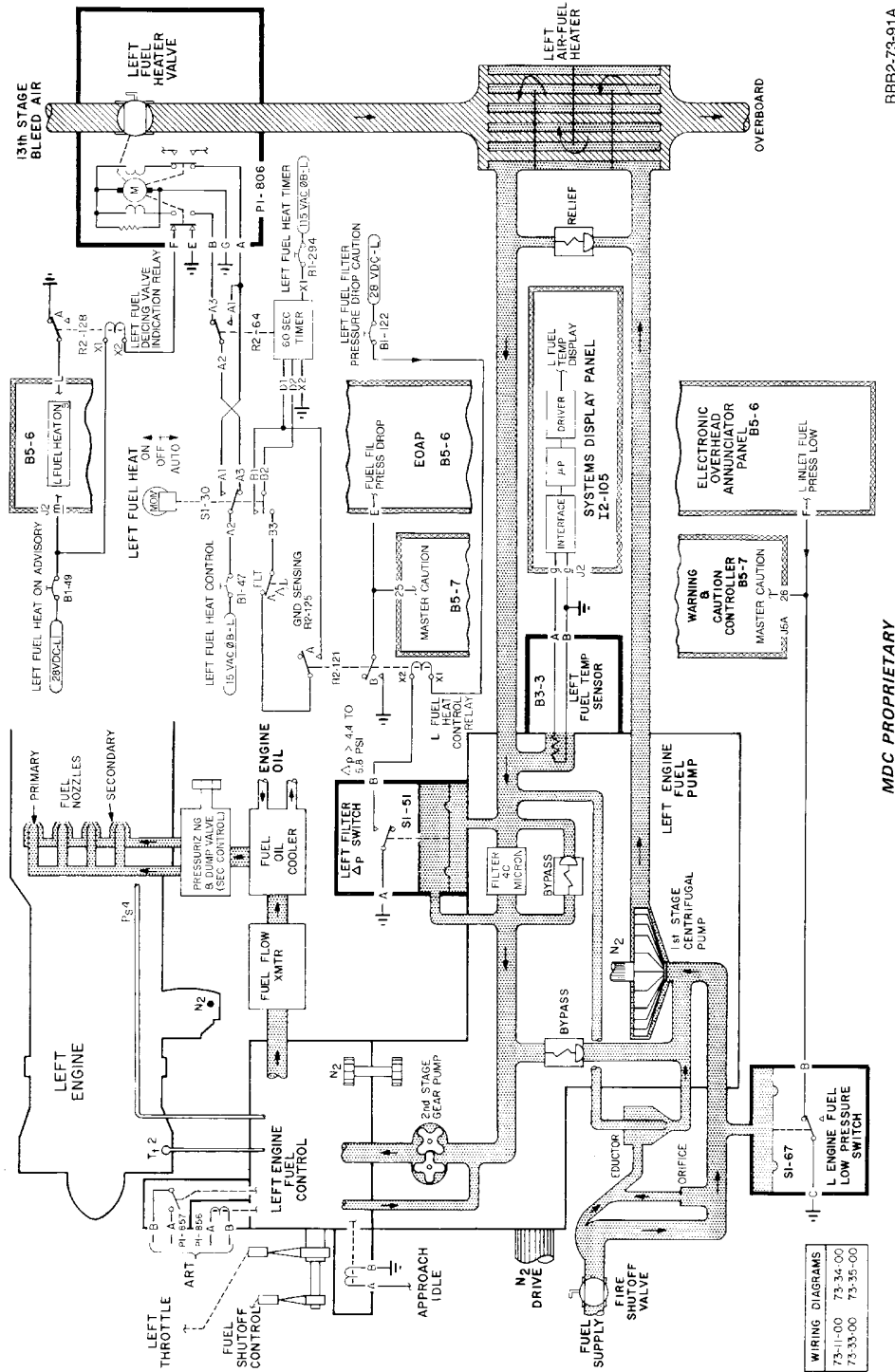
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BBB2-73-91A

MDC PROPRIETARY

**Left Engine Fuel and Control - Schematic  
Figure 104/73-00-00-990-810**

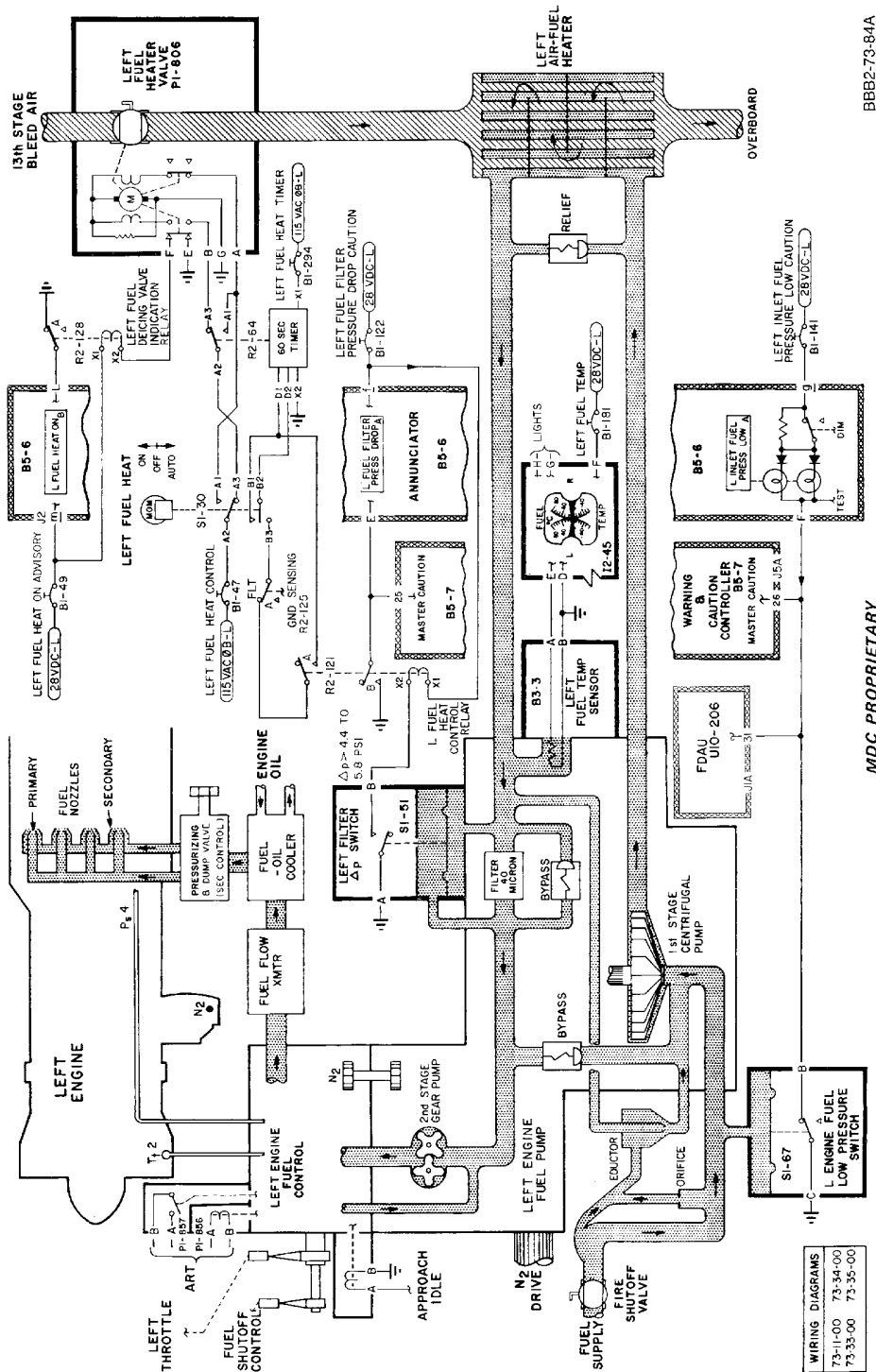
WIRING DIAGRAMS	
73-11-00	73-34-00
73-33-00	73-35-00

EFFECTIVITY  
WJE 415, 418, 421, 423, 863-866, 869, 871, 872,  
875-879

TP-80MM-WJE

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BBB2-73-84A

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WIRING DIAGRAMS	
73-11-00	73-34-00
73-33-00	73-35-00

Left Engine Fuel and Control - Schematic Figure  
Figure 105/73-00-00-990-811

EFFECTIVITY  
WJE 406-408, 411, 880

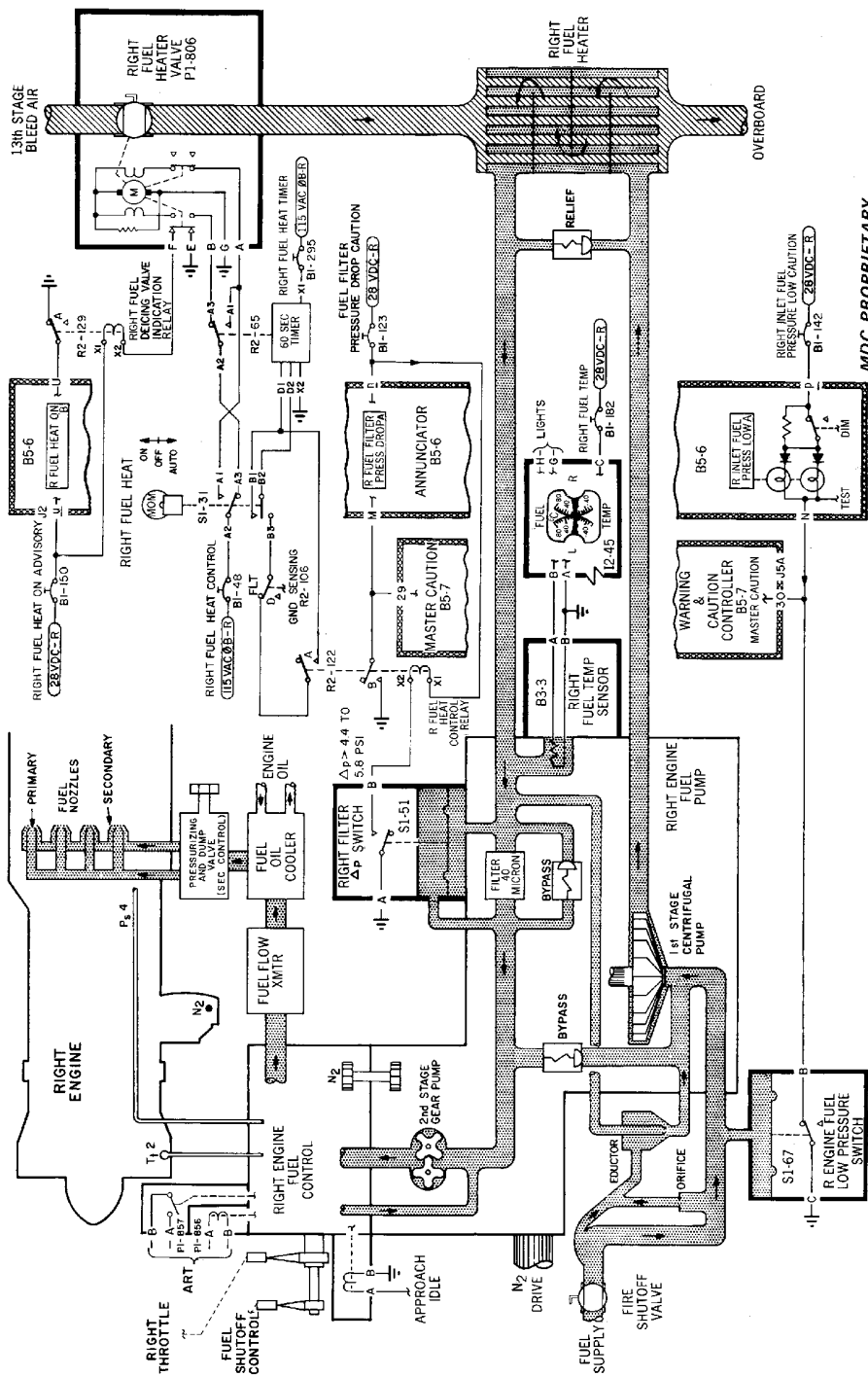
TP-80MM-WJE

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BB62-73-59A

MDC PROPRIETARY

Right Engine Fuel and Control - Schematic  
Figure 106/73-00-00-990-816

EFFECTIVITY  
WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 891

TP-80MM-WJE

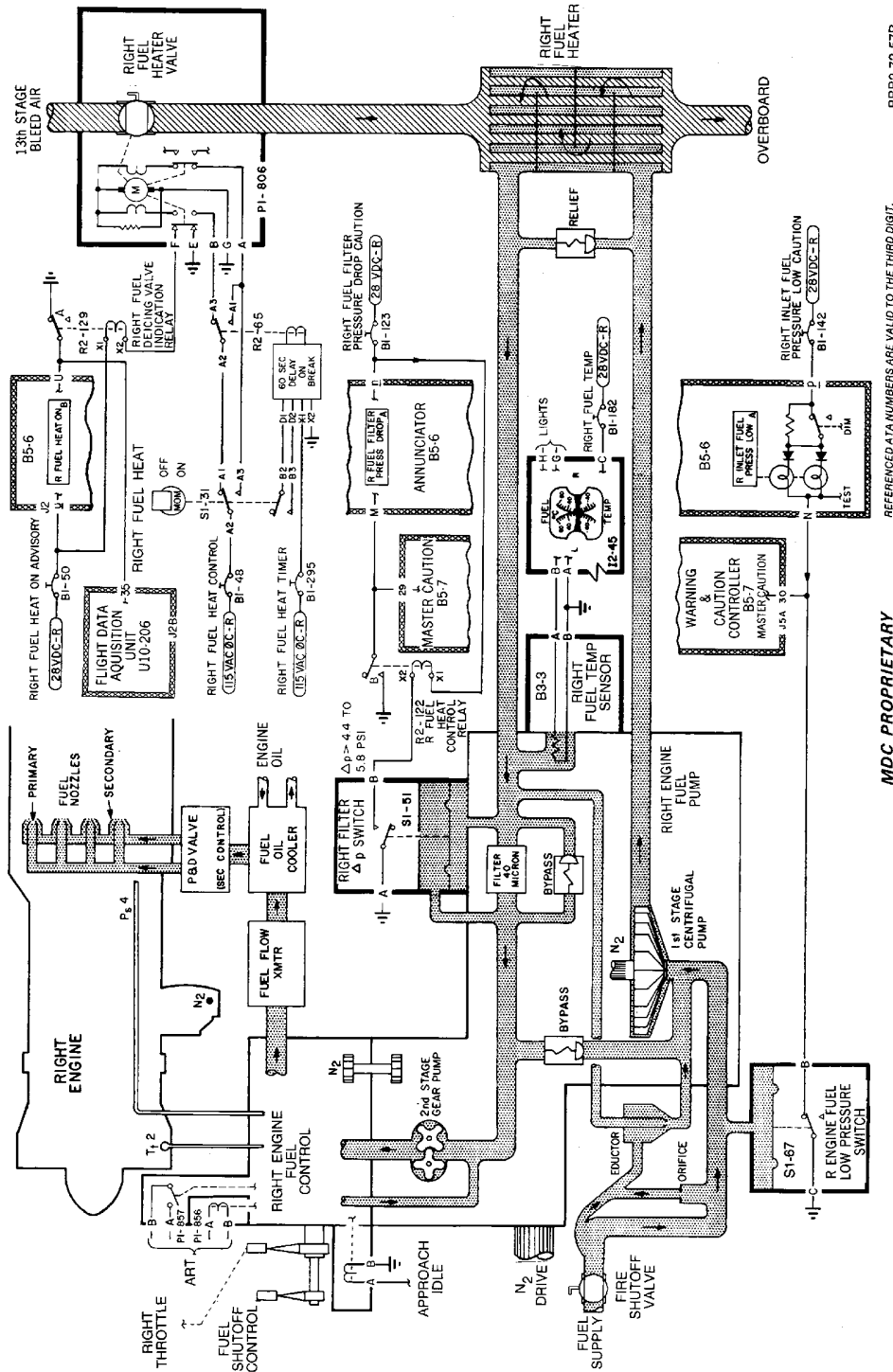
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



Right Engine Fuel and Control - Schematic  
Figure 107/73-00-00-990-817

BBB2-73-57B

REFERENCED ATA NUMBERS ARE VALID TO THE THIRD DIGIT.

MDC PROPRIETARY

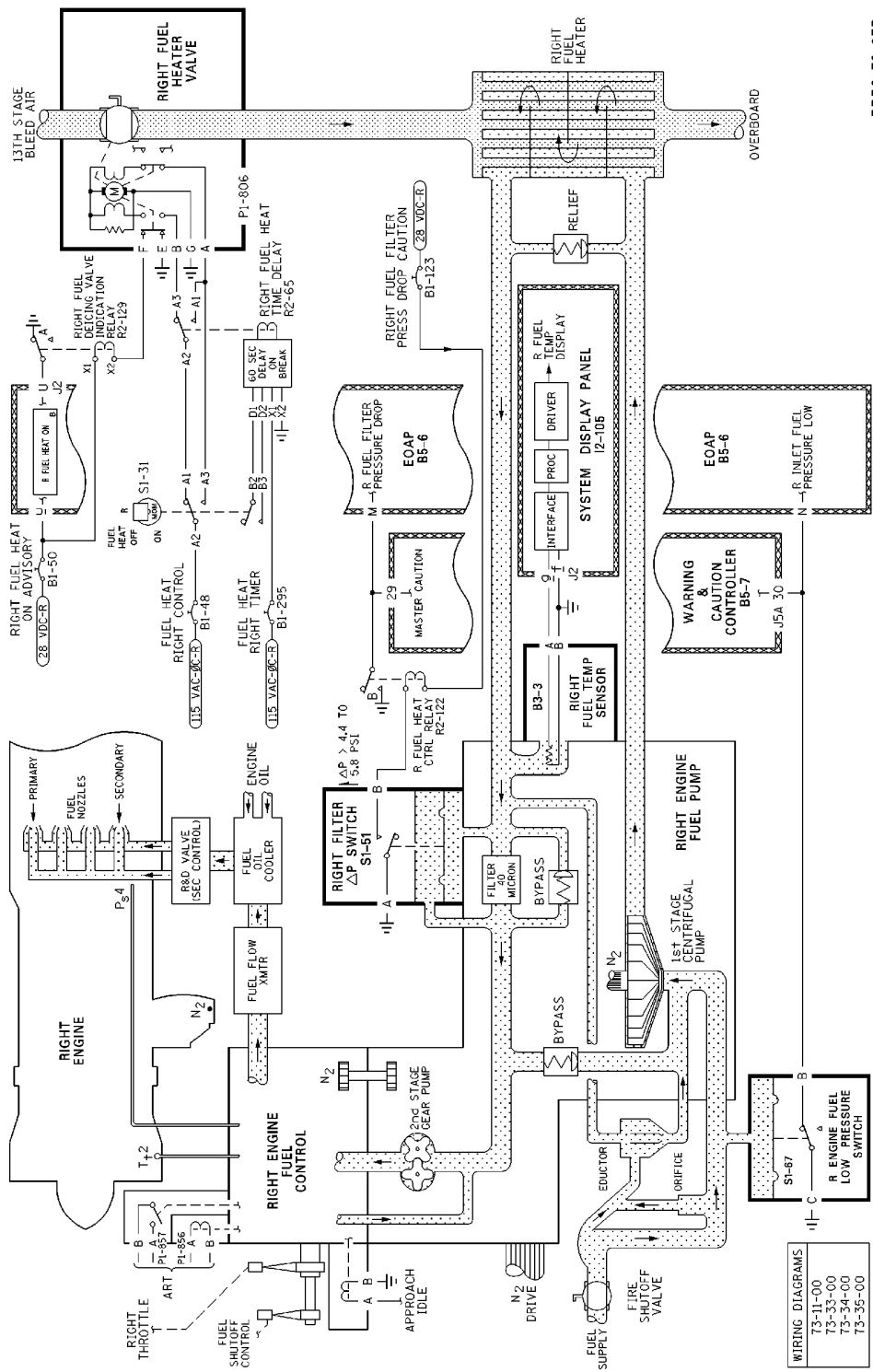
EFFECTIVITY  
WJE 874, 892, 893

TP-80MM-WJE

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-87D

MDC PROPRIETARY

**Right Engine Fuel and Control - Schematic**  
Figure 108/73-00-00-990-821

WIRING DIAGRAMS	
T3-11-00	
T3-33-00	
T3-34-00	
T3-35-00	

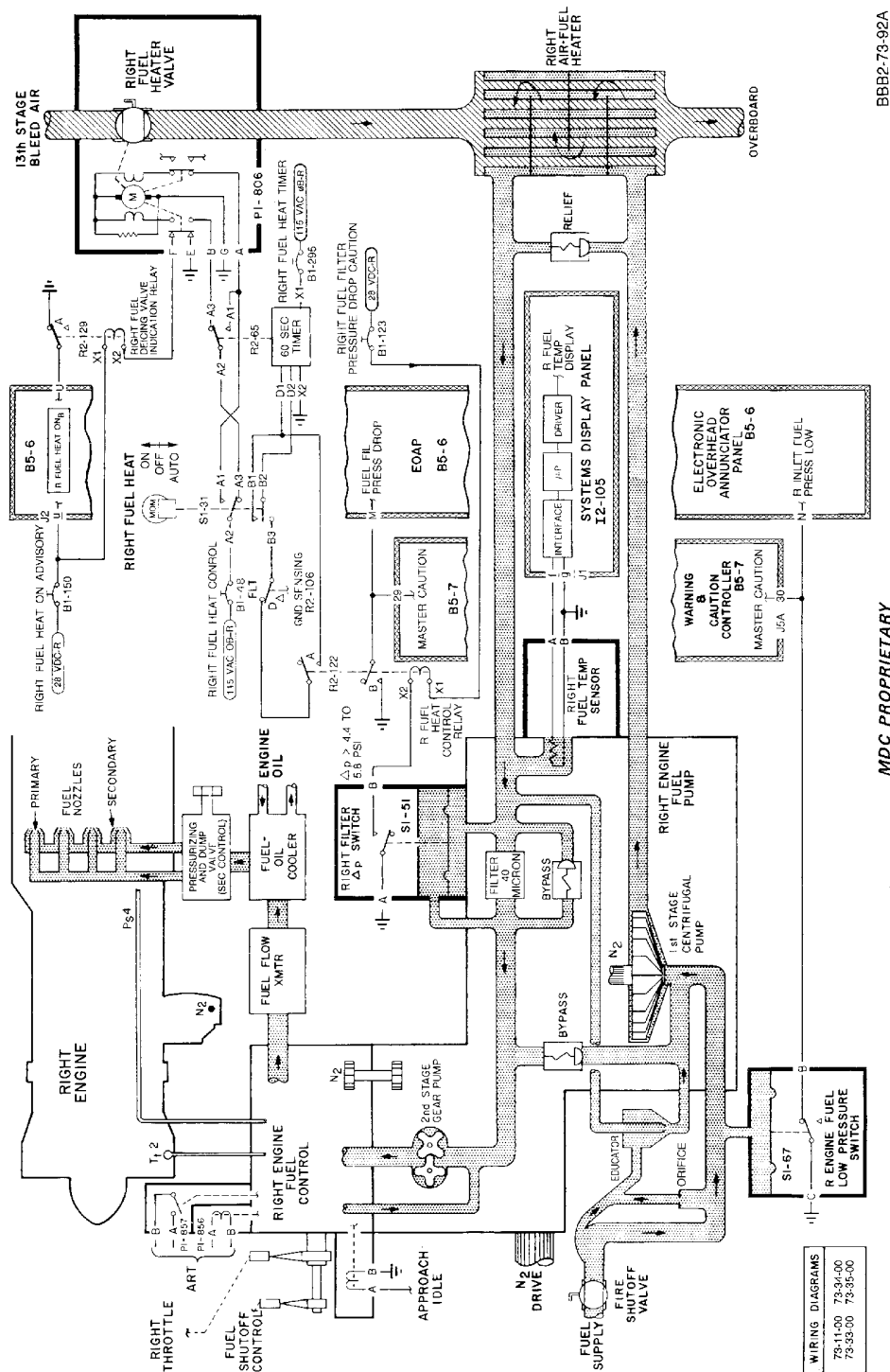
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EFFECTIVITY  
WJE 405, 406, 410, 886, 887

**73-00-00**  
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TP-80MM-WJE

# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-92A

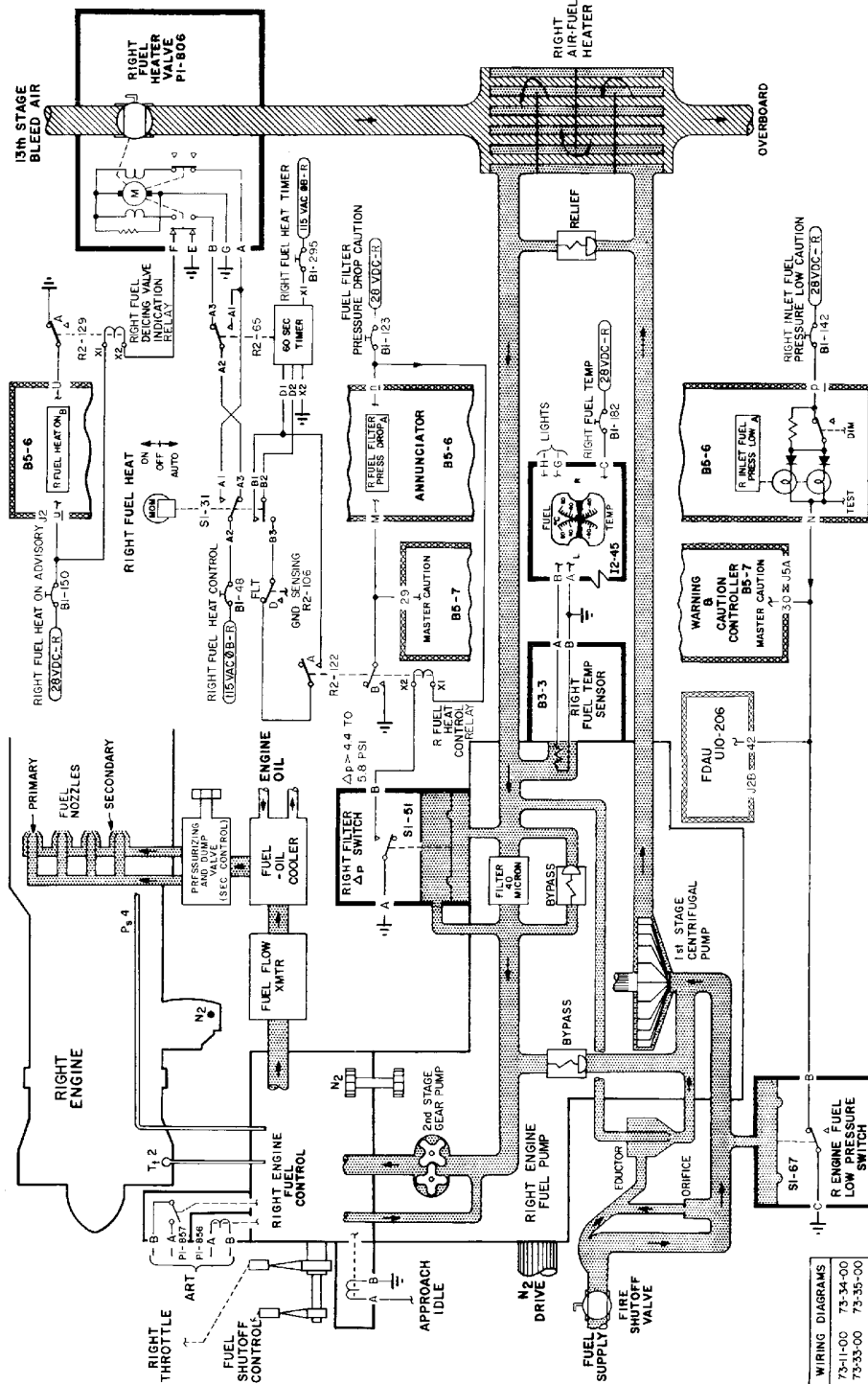
MDC PROPRIETARY

Right Engine Fuel and Control - Schematic  
Figure 109/73-00-00-990-823

EFFECTIVITY  
WJE 401-404, 412, 414, 415, 418, 421, 423, 863-866,  
869, 871, 872, 875-879

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BB82-73-85A

MDC PROPRIETARY

Right Engine Fuel and Control - Schematic  
 Figure 110/73-00-00-990-824

WIRING DIAGRAMS	
73-11-00	73-34-00
73-33-00	73-35-00

EFFECTIVITY  
 WJE 406-408, 411, 880

**73-00-00**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### GENERAL - MAINTENANCE PRACTICES

#### 1. General Maintenance Features

##### A. Maintenance Interphone System

- (1) The maintenance interphone system provides a means of communication between the flight compartment and maintenance personnel working in the other areas of the aircraft. A maintenance interphone switch, located on the overhead switch panel, is utilized to actuate the system.
- (2) Two interphone jacks are accessible to personnel working in the engine areas. One each on the left and right side of fuselage adjacent to the engine pylons.

##### B. Engine Accessibility

- (1) Accessibility is provided to all system and components within the engine installation. The forward lower cowl door provides access to the accessory gearbox area and the aft lower cowl door provides access to the aft lower portion of the engine. The upper cowl door provides access to the upper portion of the engine. Small access doors are provided in the cowl doors for access to areas requiring frequent servicing.

##### C. Component Interchangeability

- (1) Identical accessories are installed on both engines.

##### D. Hydraulic System Pressurization

**WARNING:** WHEN PERSONNEL ARE WORKING IN AREA OF THRUST REVERSER DOORS, THRUST REVERSER HYDRAULIC SYSTEM MUST BE DEPRESSURIZED.

- (1) The system is depressurized by manually placing the thrust reverser control valve arm in dump position and installing the safety pin (PAGEBLOCK 78-00-00/201). After all maintenance has been completed, the reverser accumulator must be pressurized. This requires the aircraft hydraulic system to be pressurized as outlined in PAGEBLOCK 29-00-00/201. Remove safety pin from control valve arm and place arm in open position until 3000 psi (20,700 kPa) is observed on accumulator gage then release arm.

#### 2. Safety and Operating Precautions

##### A. Circuit Breakers

**CAUTION:** EXTRA CAUTION MUST BE OBSERVED TO MAKE CERTAIN ELECTRICAL CIRCUITS TO ALL FIRE EXTINGUISHER CONTAINER CARTRIDGES ARE ISOLATED WHEN TEST PROCEDURES REQUIRE OPERATION OF FIRE EXTINGUISHER OR EMERGENCY SHUTDOWN SYSTEMS.

- (1) All circuit breakers opened during maintenance should be tagged to prevent inadvertent operation of affected system.

##### B. High-Voltage System and Components

**WARNING:** BEFORE ACTIVATING ANY FUEL, ELECTRICAL, HYDRAULIC, OR PNEUMATIC SYSTEM FOR MAINTENANCE PURPOSES, MAKE CERTAIN THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF OPERATING PORTIONS OF THE AIRCRAFT. INADVERTENT OPERATION OF AN AIRCRAFT SYSTEM COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Prior to performing maintenance on high-voltage system or components, make certain that power to system or components has been shut off and that all affected circuit breakers are open and tagged.

##### C. Application of External Power and Pressurization of Fluid Systems

EFFECTIVITY  
WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** INADVERTENT OPERATION OF AN AIRCRAFT SYSTEM COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** BEFORE ACTIVATING ANY FUEL, ELECTRICAL, HYDRAULIC, OR PNEUMATIC SYSTEM FOR MAINTENANCE PURPOSES, MAKE CERTAIN THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF OPERATING PORTIONS OF AIRCRAFT.

D. Engine Motoring

**CAUTION:** FUEL PUMP AND MAIN ENGINE CONTROL ARE FUEL-LUBRICATED. DO NOT MOTOR ENGINE UNLESS POSITIVE FUEL INLET PRESSURE IS INDICATED.

E. Clear Thrust Reverser Doors

**WARNING:** ENSURE ALL PERSONNEL ARE CLEAR OF REVERSER DOORS BEFORE DEPLOYING OR STOWING DOORS. WHEN THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THRUST REVERSER LEVER MOVEMENT REGARDLESS OF ANY ELECTRICAL OR HYDRAULIC POWER SUPPLIED TO AIRCRAFT.

F. Cowl Doors

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

**CAUTION:** DO NOT OPEN COWL DOORS IF GROUND WIND VELOCITY EXCEED 30 KNOTS.

**CAUTION:** ENSURE RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

**CAUTION:** BEFORE WORKING IN NOSE COWL A PROTECTIVE BLANKET SHOULD BE SPREAD INSIDE NOSE COWL. VACUUM INSIDE NOSE COWL TO REMOVE PARTICLES WHICH MAY CAUSE DAMAGE TO PERFORATED SKIN. ANY DAMAGE TO PERFORATED SKIN MAY CAUSE DISSIMILAR METAL REACTION WHICH COULD SPREAD TO SURROUNDING AREA.

(1) Exercise care when working in engine area.

### 3. **General Maintenance Practices**

A. Engine Access

(1) To open engine cowl doors, refer to PAGEBLOCK 71-00-00/201.

B. Protective Covers - When lines and electrical connectors are disconnected or components are removed, caps, covers, or other suitable means should be provided to prevent damage or foreign material from contaminating any component.

C. External Electrical Power

(1) For procedures to connect external electrical power to aircraft, refer to PAGEBLOCK 24-40-00/001.

D. Remove/Replace Electrical Connections

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**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (1) When electrical connectors are disconnected, caps or other protective materials should be used to prevent entry of oil, fuel, hydraulic fluid, moisture, and other foreign material.

### E. Engine Motoring

- (1) For procedures to dry motor or wet motor engine, refer to GENERAL, SUBJECT 71-00-00, Page 501.

### F. Cable Lubrication

**CAUTION:** USE EXTREME CARE WHEN WORKING WITH ENGINE-MOUNTED CONTROL CABLES. EACH CABLE FRICTION LIMIT IS DEPENDENT ON MANUFACTURED CONTOUR OF CABLE CONDUIT. DO NOT CLEAN CONTROL CABLE CONDUITS WITH PAINT STRIPPING SOLVENTS.

- (1) Throttle and fuel shutoff fuselage control cable conduits are lubricated with Dow Corning Silicone Grease (DC-33). All other control cable conduits are internally dry lubricated and require no additional lubrication.

### G. Cleanup

**WARNING:** CLEANING OPERATIONS USING SOLVENTS SHOULD BE PERFORMED IN WELL-VENTILATED ATMOSPHERE. EXERCISE NORMAL SAFETY PRECAUTIONS DURING USE.

- (1) Spilled oil, fuel, or hydraulic fluid should be cleaned up immediately to prevent damage to wiring or other components and to prevent raise leak reports.

### H. Functional Test

- (1) A functional test should be performed after removal/installation, adjustment/test or approved repairs.

### I. Seals, O-rings, and Gaskets

- (1) Seals, O-rings, and gaskets are identified in Figure 201.

### J. Used O-rings

- (1) Discard all used O-rings.

### K. Preservation of Accessories

- (1) Accessories removed from engine for storage or return to overhaul must be preserved as follows:
  - (a) Component which has been subjected to commercial fuels, as in engine operation, can be stored for periods up to 30 days by draining excess fluid, installing protective covers over drive shaft and control shafts, and capping all openings.
  - (b) To store components for periods in excess of 30 days, flush component with lubricating oil, (SAE Grade 1010). Drain excess fluid, install protective covers over drive shaft and control shafts, and cap all openings.

## 4. Approach Idle Inop Light

### A. Check Left Engine Light

- (1) Perform functional check of left engine Approach Idle Inop light as follows:

**NOTE:** Check must be accomplished with nose gear compressed (aircraft landing gear resting on ground).

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WJE ALL

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- (a) Make sure that these circuit breakers are closed:

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	40	B1-835	APPROACH IDLE CONTROL

### UPPER EPC, L AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 417, 419, 421, 423, 865, 869, 871, 872</b>			
K	30	B1-23	LEFT GROUND CONTROL RELAY
<b>WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893</b>			
K	33	B1-23	LEFT GROUND CONTROL RELAY

### UPPER EPC, R AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 417, 419, 421, 423, 865, 869, 871, 872</b>			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
<b>WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893</b>			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

**WJE ALL**

- (b) Check that Approach Idle Inop light, located in electronic equipment bay on upper forward side of generator control rack, is off.

**CAUTION:** NORMAL ELECTRICAL POWER SUPPLY TO VARIOUS SYSTEMS WILL BE INTERRUPTED WHEN GROUND CONTROL RELAY CIRCUIT BREAKERS ARE OPENED. MAKE CERTAIN THAT SWITCHES AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITIONS TO PREVENT INADVERTENT OPERATION OR SHUTDOWN OF EQUIPMENT.

- (c) Open these circuit breakers and install safety tags:

### UPPER EPC, L AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 417, 419, 421, 423, 865, 869, 871, 872</b>			
K	30	B1-23	LEFT GROUND CONTROL RELAY
<b>WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893</b>			
K	33	B1-23	LEFT GROUND CONTROL RELAY

**WJE ALL**

- (d) Check that Approach Idle Inop light comes on.  
 (e) Remove the safety tags and close these circuit breakers:

### UPPER EPC, L AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 417, 419, 421, 423, 865, 869, 871, 872</b>			
K	30	B1-23	LEFT GROUND CONTROL RELAY

EFFECTIVITY	
WJE ALL	

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

**UPPER EPC, L AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

**WJE ALL**

- (f) Check that Approach Idle Inop light remains on.
  - (g) Depress reset button and check that Approach Idle Inop light goes out.
- NOTE: A 5 second delay may be required after closing circuit breaker before reset button operates.

**B. Check Right Engine Light**

- (1) Perform functional check of right engine Approach Idle Inop light as follows:

NOTE: Check must be accomplished with nose gear compressed (aircraft landing gear resting on ground).

- (a) Make sure that these circuit breakers are closed:

**LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	40	B1-835	APPROACH IDLE CONTROL

**UPPER EPC, L AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 417, 419, 421, 423, 865, 869, 871, 872			
K	30	B1-23	LEFT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
K	33	B1-23	LEFT GROUND CONTROL RELAY

**UPPER EPC, R AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

**WJE ALL**

- (b) Check that Approach Idle Inop light, located in electronic equipment bay on upper forward side of generator control rack, is off.
- (c) Open these circuit breakers and install safety tags:

**UPPER EPC, R AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY

EFFECTIVITY  
WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 417, 419, 421, 423, 865, 869, 871, 872 (Continued)

(Continued)

**UPPER EPC, R AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

**WJE ALL**

- (d) Check that Approach Idle Inop light comes on.
- (e) Remove the safety tags and close these circuit breakers:

**UPPER EPC, R AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

**WJE ALL**

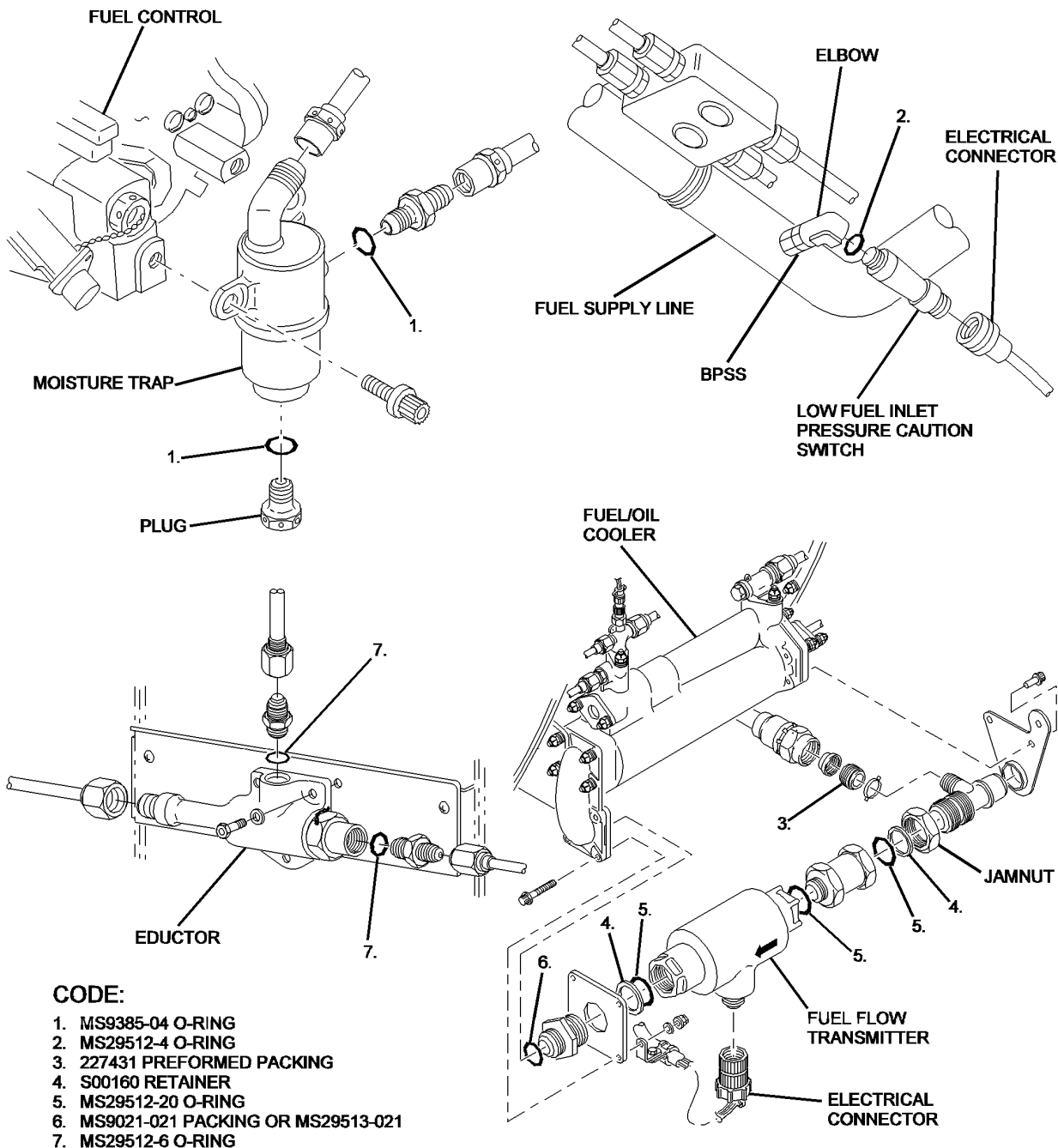
- (f) Check that Approach Idle Inop light remains on.
  - (g) Depress reset button and check that Approach Idle Inop light goes out.
- NOTE: A 5 second delay may be required after closing circuit breaker before reset button operates.

EFFECTIVITY WJE ALL
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AIRCRAFT MAINTENANCE MANUAL**



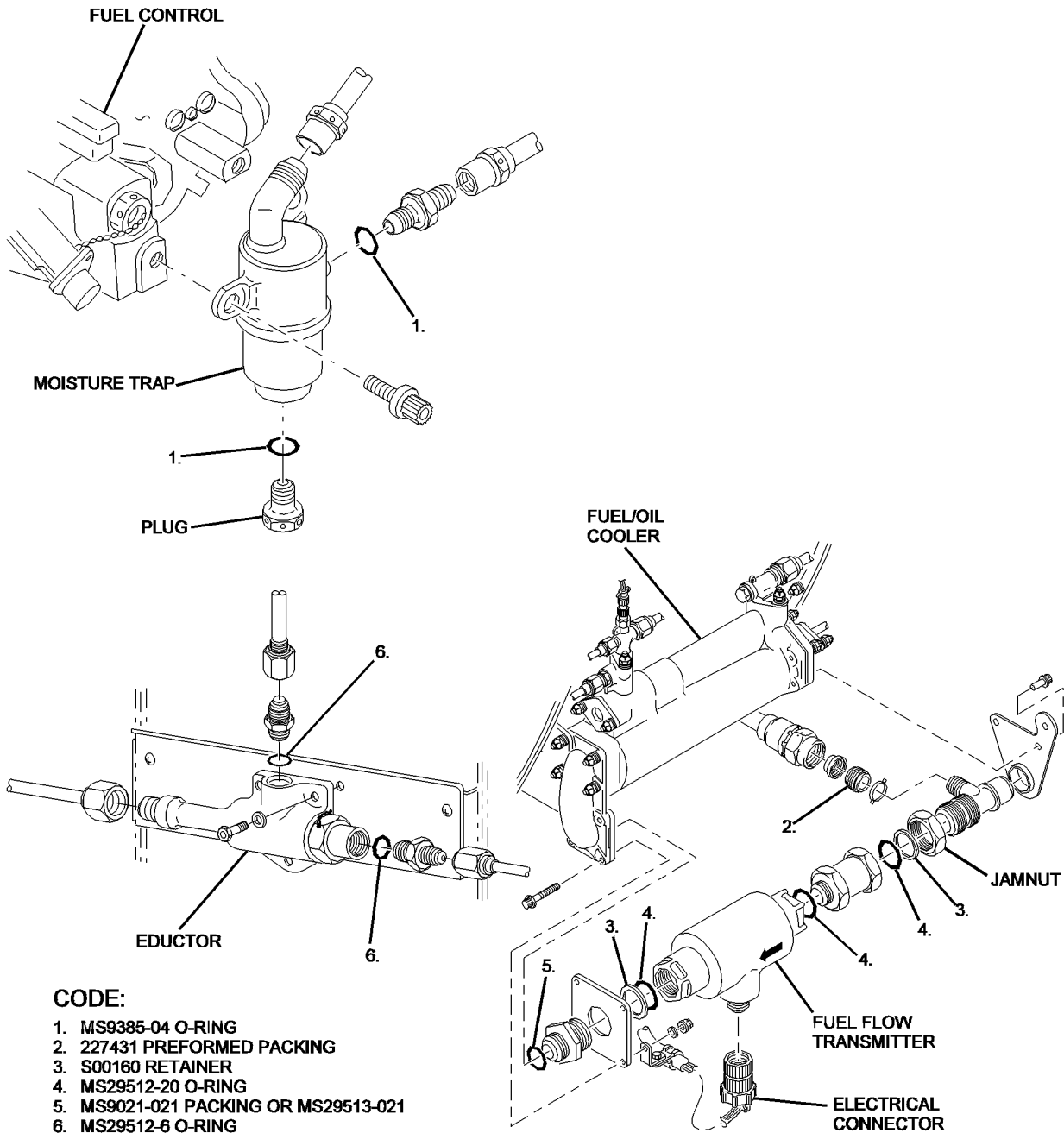
BBB2-73-39E  
S000655445V3

**Seals, O-rings, and Gaskets**  
Figure 201/73-00-00-990-841 (Sheet 1 of 7)

**EFFECTIVITY**  
WJE 401, 405, 406, 409, 410, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

**73-00-00**

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**CODE:**

- 1. MS9385-04 O-RING
- 2. 227431 PREFORMED PACKING
- 3. S00160 RETAINER
- 4. MS29512-20 O-RING
- 5. MS9021-021 PACKING OR MS29513-021
- 6. MS29512-6 O-RING

BBB2-73-102B  
S000655447V3

**Seals, O-rings, and Gaskets**  
Figure 201/73-00-00-990-841 (Sheet 2 of 7)

**EFFECTIVITY**

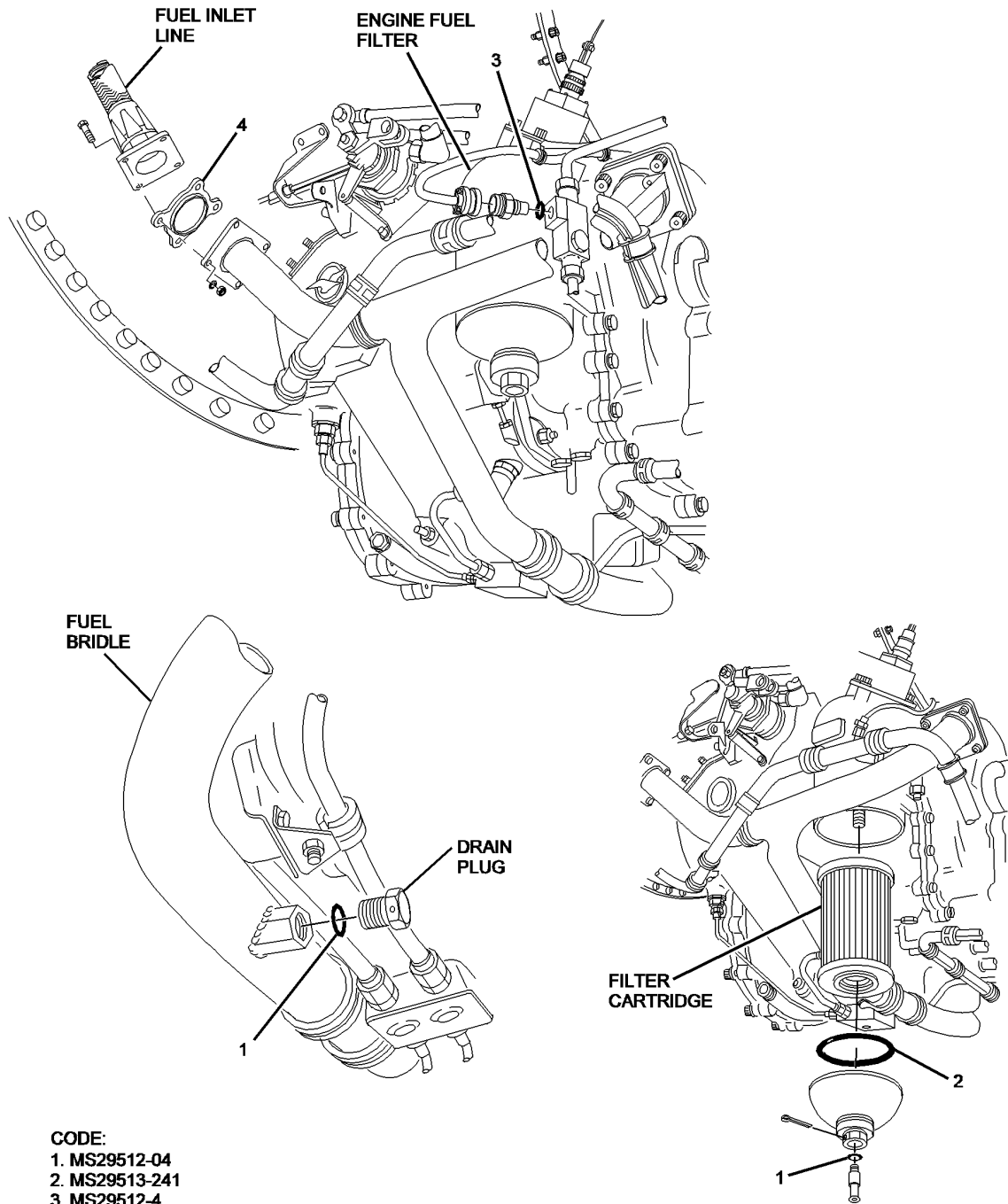
WJE 402-404, 406-408, 411, 414, 417, 419, 421, 423,  
863-866, 869, 871, 872, 886, 887, 893

TP-80MM-WJE

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**CODE:**  
 1. MS29512-04  
 2. MS29513-241  
 3. MS29512-4  
 4. 011157-015-24 PARKER CO.

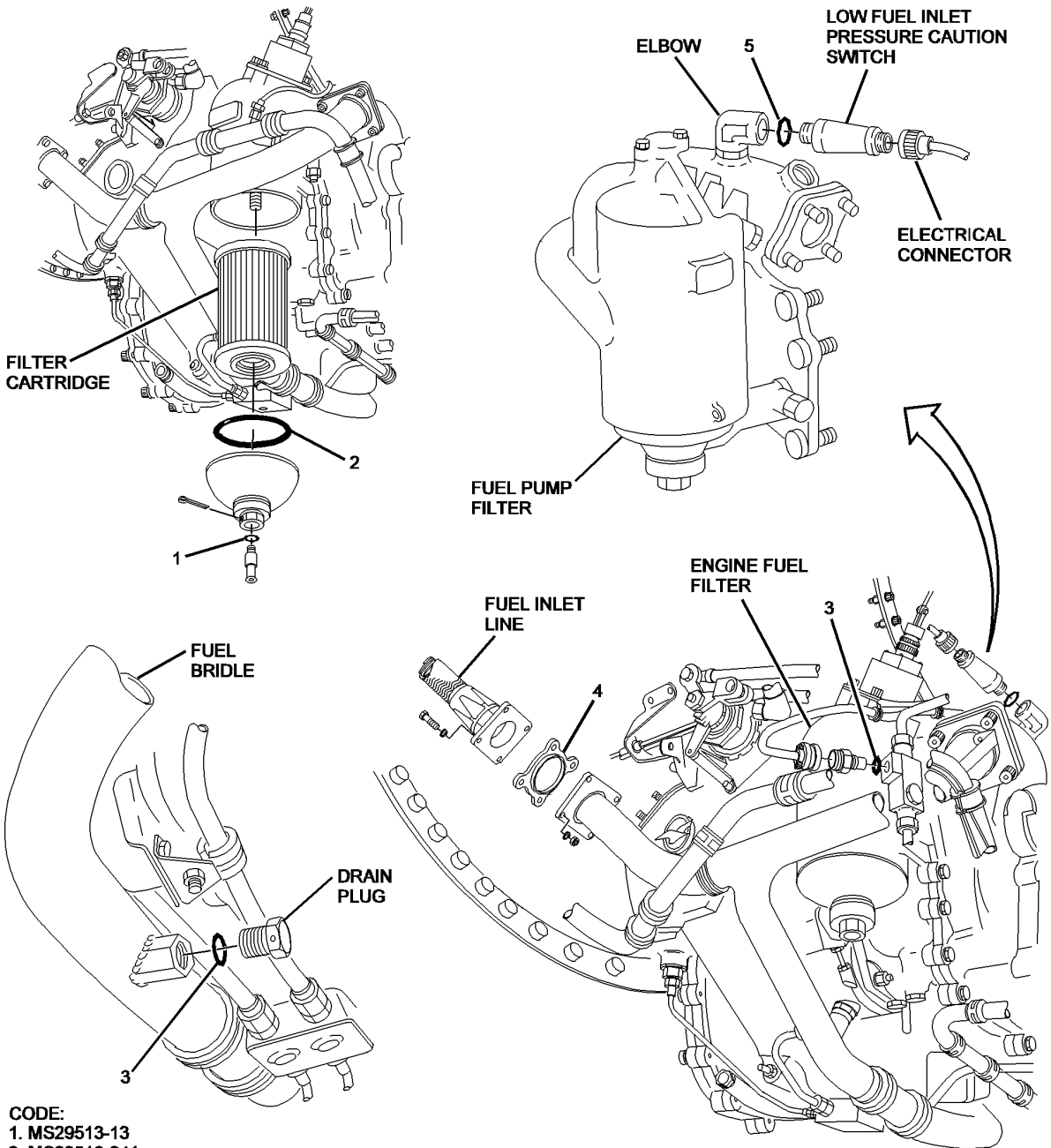
BBB2-73-151  
S0000225238V1

**Seals, O-rings, and Gaskets**  
 Figure 201/73-00-00-990-841 (Sheet 3 of 7)

**EFFECTIVITY**  
 WJE 401, 405, 406, 409, 410, 412, 414-416, 418, 420,  
 422, 424-427, 429, 861, 862, 868, 874-881, 883, 884,  
 891, 892

**73-00-00**

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- CODE:**
1. MS29513-13
  2. MS29513-241
  3. MS29512-4
  4. 011157-015-24 PARKER CO.
  5. MS29512-04

BBB2-73-103B  
S000655449V3

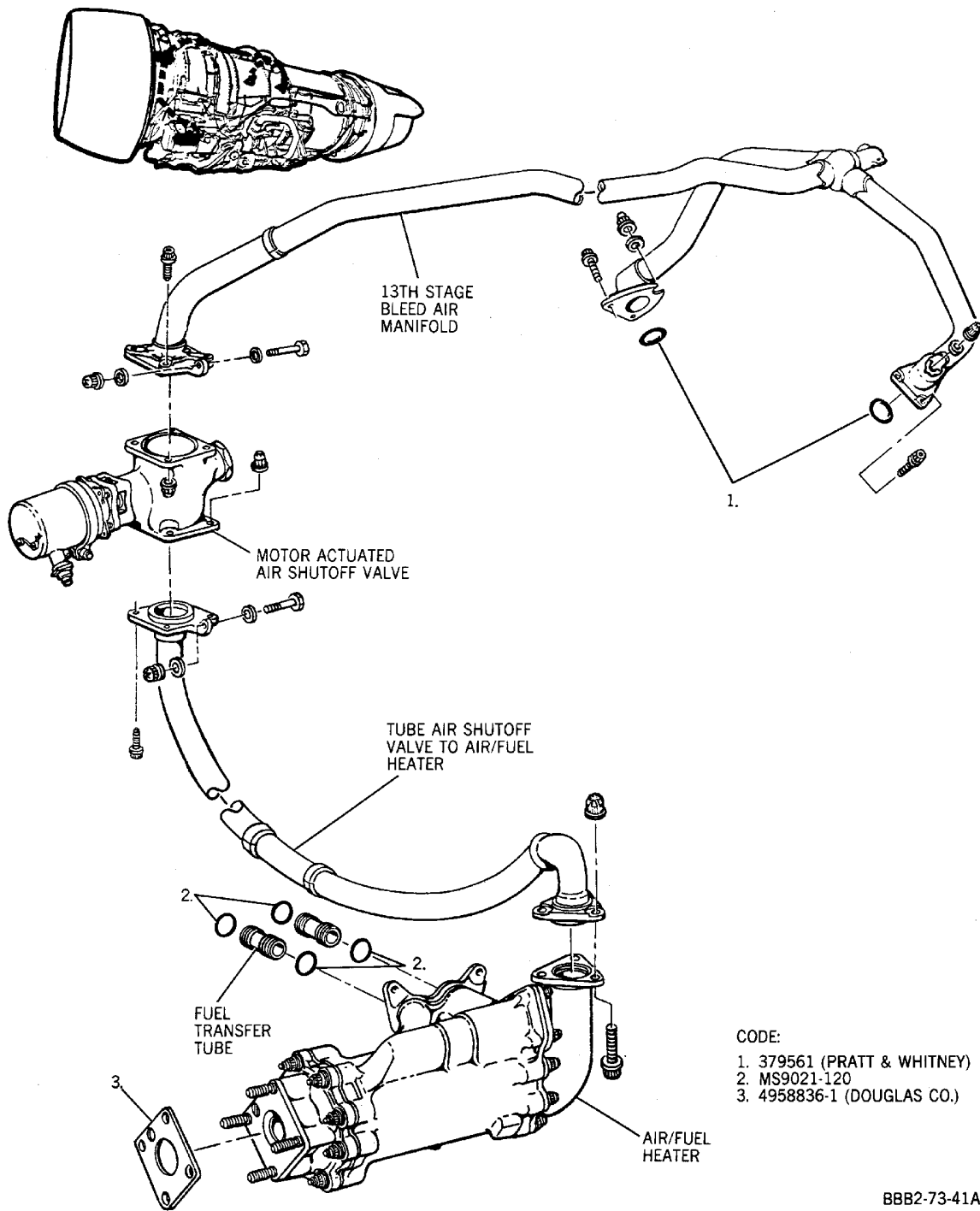
**Seals, O-rings, and Gaskets**  
**Figure 201/73-00-00-990-841 (Sheet 4 of 7)**

**EFFECTIVITY**

**WJE 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893**

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- CODE:
- 1. 379561 (PRATT & WHITNEY)
  - 2. MS9021-120
  - 3. 4958836-1 (DOUGLAS CO.)

BBB2-73-41A

**Seals, O-rings, and Gaskets**  
**Figure 201/73-00-00-990-841 (Sheet 5 of 7)**

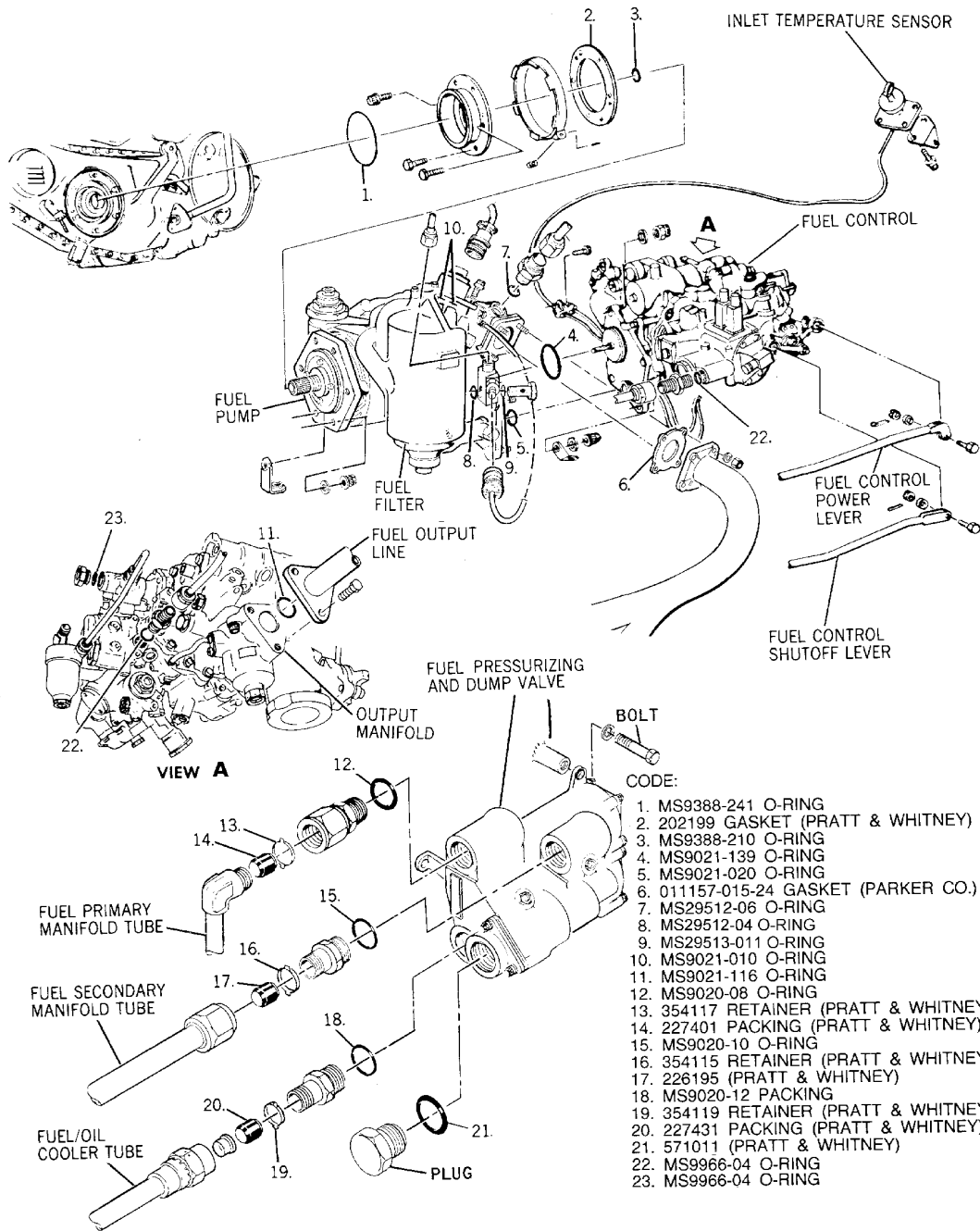
EFFECTIVITY

WJE 401-411, 415-427, 429, 861-866, 868, 869,  
871-881, 883, 884, 891-893

**73-00-00**



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BBB2-73-42D  
S000655452V2

**Seals, O-rings, and Gaskets**  
**Figure 201/73-00-00-990-841 (Sheet 6 of 7)**

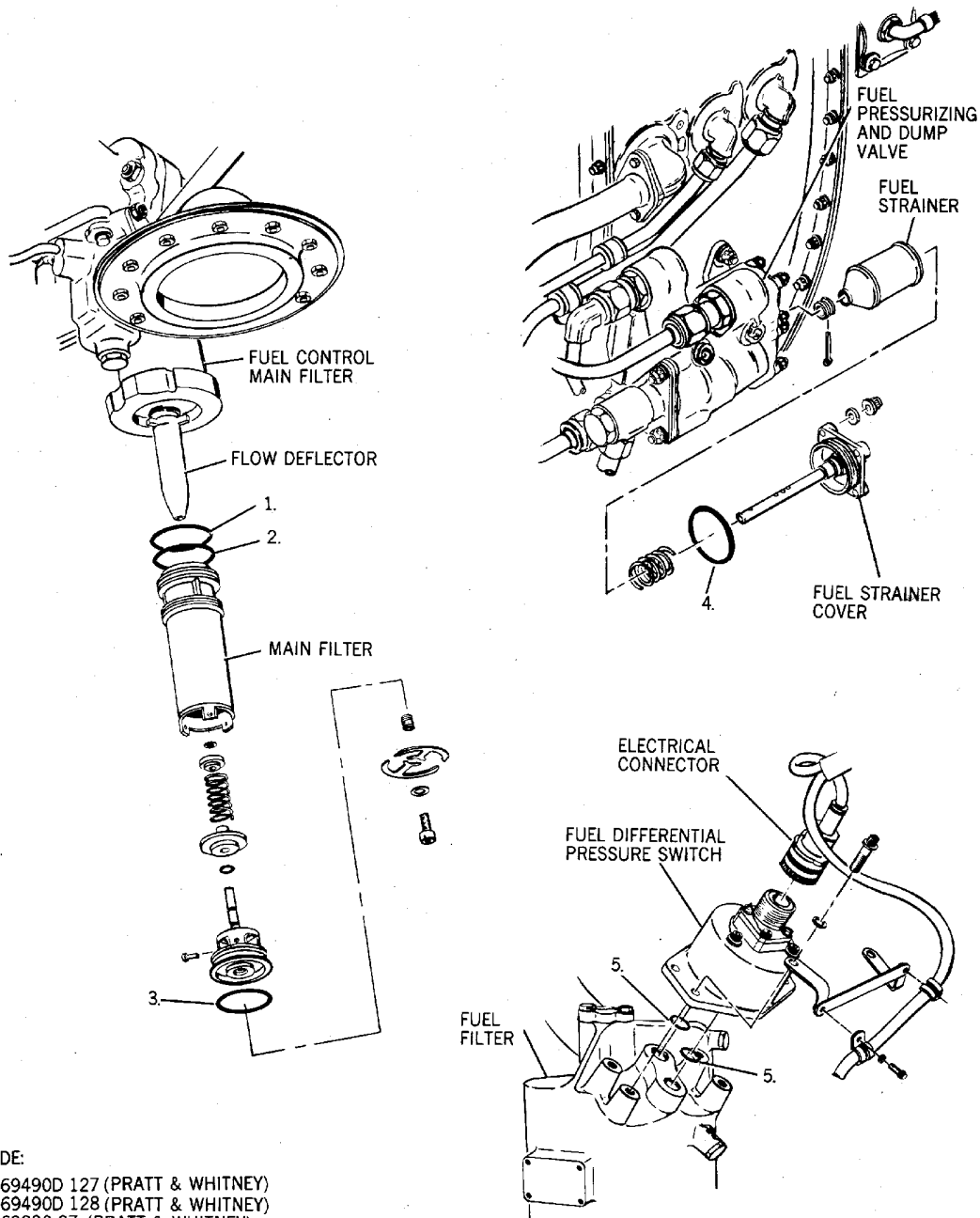
EFFECTIVITY  
WJE ALL

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CODE:

- 1. 69490D 127 (PRATT & WHITNEY)
- 2. 69490D 128 (PRATT & WHITNEY)
- 3. 69890-27 (PRATT & WHITNEY)
- 4. 665700 (PRATT & WHITNEY)
- 5. MS9021-010

BBB2-73-43A

**Seals, O-rings, and Gaskets**  
Figure 201/73-00-00-990-841 (Sheet 7 of 7)

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## ENGINE FUEL AND CONTROL - CHECK

### 1. Check

- A. The following information is intended to serve as an aid to identify areas to look at and conditions to look for whenever extent of disassembly permits. Disassembly to check should not be accomplished solely on basis of information contained in Table 601. Referenced data should be used when disassembly is required as a result of other maintenance actions.
- B. Engine compartment cleanliness is important because the extensive mass airflow tends to draw foreign objects into the engine. After completion of any work, entire engine compartment should be thoroughly cleaned using a vacuum cleaner. Engine compartment and annular duct should be kept free of dirt, oil and grease, and cleared of all loose hardware. All apertures resulting from disconnected tubing or parts should be immediately covered. External caps should be used on tube openings, not internal plugs.
- C. It is not implied that items of conditions listed are all inclusive. Experience and judgement will continue to be a very real part of any check program.

### 2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

**Table 601**

Name and Number	Manufacturer
Torque Wrench (0 to 100 inch pounds range)	
Lockwire, 0.032 corrosion resistant steel, P05-289	

**Table 602 Table 601**

ITEM	CHECK FOR	CHAPTER/ SECTION REFERENCE
Fuel Pump	External leakage.	FUEL CONTROL, SUBJECT 73-20-01, Maintenance Practices, Paragraph 2.
	Security of quick disconnect clamp.	
	Paper (cartridge) filter for foreign matter. Check filter element if fuel pump filter element is contaminated.	
<u>NOTE:</u> Filter element must be checked frequently in new aircraft and after rework of fuel tanks.		
Fuel Control	Security of control on pump and pump quick-disconnect.	FUEL CONTROL, SUBJECT 73-20-01, Maintenance Practices, Paragraph 2.
	External fuel leakage.	
	Security of mechanical linkage.	
	Inlet filter (coarse filter) for foreign matter or damaged screen.	
<u>NOTE:</u> The filter screen must be checked frequently in new aircraft and after rework of fuel tanks.		

EFFECTIVITY <b>WJE ALL</b>
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Table 602 Table 601 (Continued)

ITEM	CHECK FOR	CHAPTER/ SECTION REFERENCE
Fuel Control	Servo fuel filter for foreign matter or damaged screen.	Ref. procedure above note. Frequency of check contingent on degree of contamination of main (coarse) filter.
		If screen check per above note reveals contamination check fuel pressurizing and dump valve screen for possible contamination also.

### 3. Check Fuel Pump Quick-Disconnect Nut Security

#### A. Check Nut Security

- (1) Disconnect all tubes at fuel pump and fuel control. (PAGEBLOCK 73-12-02/201)
- (2) Disconnect cantilever support from front bracket of fuel control.
- (3) Using hand force, attempt to move fuel pump and fuel control up, down, side-to-side, and radially, to check for looseness of fuel pump at quick-disconnect nut.

**NOTE:** If any looseness or motion is found at fuel pump mount, pump should be removed and sent to overhaul facility for check of driveshaft spline. Defective driveshaft spline could be the result of loose quick-disconnect nut.

- (4) Remove lockwire at quick-disconnect locking bolt and apply 65 inch-pounds (7.34 N·m) torque to bolt. If bolt does not turn, safety bolt with P5-289 lockwire.
- (5) If quick-disconnect locking bolt does turn when torque is applied, torque to specified torque and nut-to-bracket clearance as follows:

**NOTE:** As quick-disconnect locking bolt is tightened, an eight-ounce plastic mallet should be used to tap quick-disconnect nut radially around circumference of nut, and circumferentially in tightening direction at locking bolt location.

- (a) Check that nut-to-bracket distance is 0.300 to 1.160 inch (7.62 to 29.46 mm). (Figure 601)

**CAUTION:** MAKE CERTAIN THAT REAR FACE OF QUICK-DISCONNECT NUT IS NOT TOUCHING FACE OF GEARBOX MOUNTING PAD. GAP BETWEEN NUT AND FACE OF PAD SHALL BE 0.010 INCH (0.254MM) MINIMUM. (FIGURE 602)

- (b) Torque locking bolt 65 to 85 inch-pounds (7.3 to 9.6 N·m). Safety locking bolt with P05-289 lockwire.
- (c) Connect tubes at fuel pump and fuel control, and connect and adjust cantilever support. (FUEL PUMP AND FUEL CONTROL - MAINTENANCE PRACTICES, PAGEBLOCK 73-12-02/201)

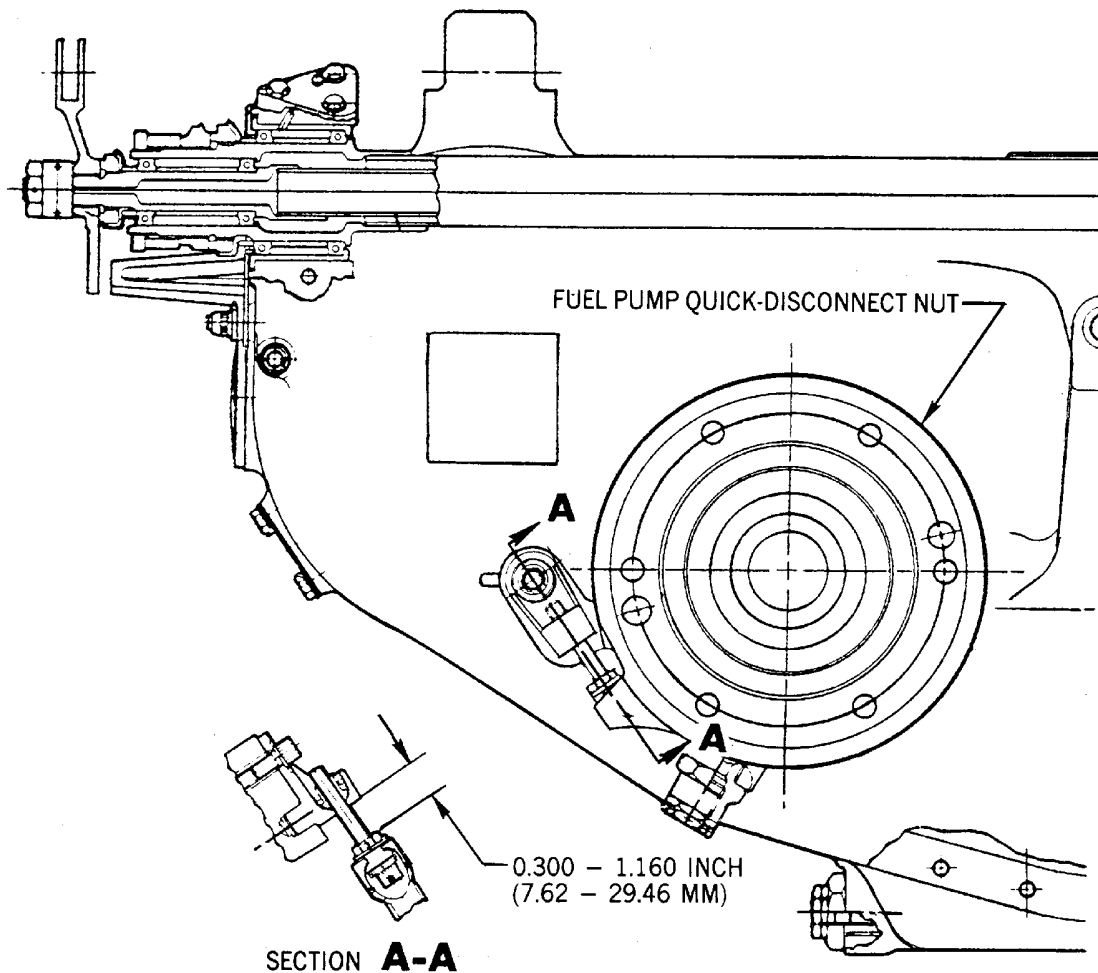
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**FRONT VIEW OF GEARBOX FUEL PUMP PAD**

L-61052

BBB2-73-1A

**Fuel Pump Quick-Disconnect Nut-to-Bracket Clearance  
Figure 601/73-00-00-990-801**

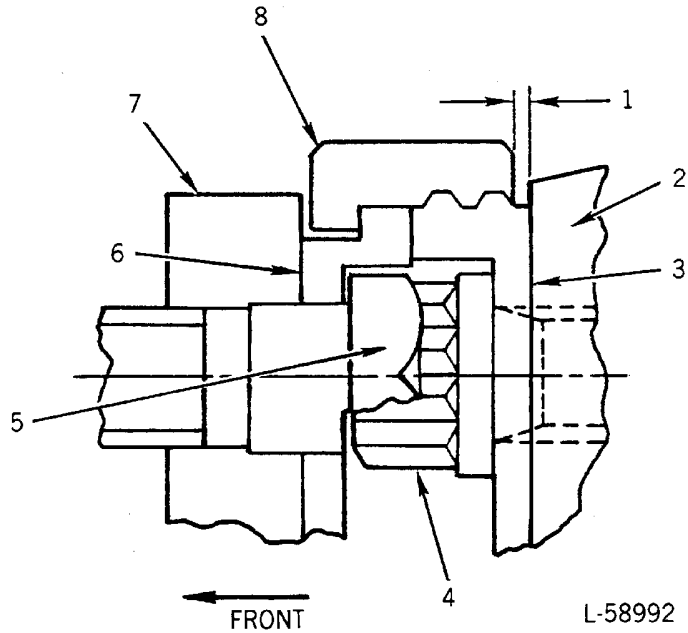
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CROSS-SECTION THRU FUEL PUMP QUICK-DISCONNECT NUT

1. 0.010 INCH (0.254 MM) MINIMUM CLEARANCE
2. GEARBOX SURFACE (FUEL PUMP PAD)
3. QUICK-DISCONNECT REAR COUPLING
4. REAR COUPLING RETAINING BOLTS
5. FRONT COUPLING RETAINING BOLTS
6. QUICK-DISCONNECT FRONT COUPLING
7. FUEL PUMP MOUNTING FLANGE
8. QUICK-DISCONNECT NUT

BBB2-73-2A

**Fuel Pump Quick-Disconnect Coupling and Nut  
Figure 602/73-00-00-990-802**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### DISTRIBUTION - DESCRIPTION AND OPERATION

#### 1. General

- A. The engine fuel distribution system supplies filtered, pressurized, and metered fuel for steady state, acceleration, and deceleration fuel flow that is sprayed into the combustion section of the engine. When the fuel/air mixture is ignited, sufficient energy is produced to drive both the high-pressure turbine and the low-pressure turbine and expel the burned gases through the exhaust nozzle.
- B. Fuel distribution consists of plumbing, pumping, and valving, and includes the following major components.
  - (1) Plumbing - Fuel tubes and the fuel supply bridle.
  - (2) Pumping - Two-stage engine-driven fuel pump and quick-disconnect nut.
  - (3) Valving - Fuel nozzles and supports, pressurizing and dump valve, and eductor valve.

#### 2. Plumbing

- A. Description
  - (1) Fuel Tubes - The fuel tubes which serve as the fuel manifold, consist of two tubes, primary and secondary, bolted to the exterior of the diffuser outer fan duct and two dual inlet tubes inside the fan discharge duct. Each external tube is Y-branched to divide the fuel flow between the fuel manifold inlets on the lower left and right sides of the engine. Fuel is carried from the fuel inlets through an annular duct to the fuel nozzles.
  - (2) Fuel Supply Bridle - The fuel supply bridle connects between the fuel supply hose and the engine-driven fuel pump. The bridle is shaped to pass under the engine to provide for common engine interchangeability. The blank end of the bridle has an interchangeable flange plate with a small orifice fitting attached. The fitting connects to the eductor suction tube.

#### 3. Pumping

- A. Description
  - (1) Engine fuel system pumping supplies filtered and pressurized fuel to the combustor during engine operation. Pumping consists of a two-stage engine-driven fuel pump and a quick-disconnect nut.
  - (2) Fuel Pump - The fuel pump consists of a single element gear stage, with a high speed centrifugal boost stage. A cartridge type relief valve is incorporated to limit the pressure rise across the gear stage. The unit provides a rigid mounting pad and a rotational splined drive for the fuel control. An internal fuel filter containing a replaceable micronic barrier filter element is located between the discharge of the centrifugal stage and the inlet of the gear stage.
  - (3) Quick-Disconnect Nut - The quick-disconnect nut secures the fuel pump to the accessory gearbox mounting pad. The quick-disconnect nut incorporates a locking bolt for locking the nut after the nut has engaged the coupling ring on the accessory gearbox.

#### 4. Valving

- A. Description
  - (1) Engine fuel system valving regulates metered fuel to the engine combustor during all operating conditions. Valving consists of nine fuel nozzle and support assemblies, a pressurizing and dump valve, and an eductor.
  - (2) Fuel Nozzle and Support - The flange of each fuel nozzle support is bolted to the diffuser case to position the fuel nozzle in the combustion chamber.

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- (3) Pressurizing and Dump Valve - The pressurizing and dump valve consists of a 200-mesh fuel inlet screen, pressurizing valve, and dump valve. The pressurizing portion of the valve discharges fuel to the primary and secondary fuel manifolds. The dump portion of the valve is plugged.
- (4) Eductor - The eductor is a jet pump which uses first-stage engine-driven fuel pump pressure as a primary source to remove fuel vapors or air from the physical high point of the engine fuel supply tube, and fuel supply bridle. This ensures a steady bubble-free fuel supply to the fuel pump during hot climbs and suction feed operation. Vapor air is pumped from the high point of the fuel supply tube and fuel supply bridle by the large pressure differential existing between the eductor chamber and fuel supply lines. The eductor is T-shaped and consists of two stationary parts, the body and a screw-in nozzle.

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### FUEL TUBES - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation instructions for the engine primary and secondary fuel manifolds and inlet tubes located on the underside of the engine on the diffuser case.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel supply manifolds and inlet tubes is through the forward lower and aft lower cowling.
- C. Removal and installation procedures for the fuel supply manifolds, fuel flow transmitter tube, and fuel control forward and aft burner pressure tubes on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Container, fuel drain, 5 US gallons (4.16 Imperial gallons or 18.93 liters) capacity	
Lockwire, 0.032 corrosion resistant steel, P05-289	
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Tag "Do Not Operate"	

#### 3. Removal/Installation Primary and Secondary Fuel Supply Manifolds and Tubes

- A. Remove Fuel Manifolds (Figure 201)
- (1) Tag throttle/thrust reverser levers.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Open these circuit breakers and install safety tags:

##### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP

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### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.
  - (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.
    - (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
  - (5) Remove clamps on primary and secondary fuel supply manifolds.
  - (6) Disconnect primary and secondary fuel manifolds at 5 and 7 o'clock positions on diffuser outer fan duct and at pressurizing and dump valve.
  - (7) Remove manifolds from engine.
  - (8) Remove and discard all packing from manifolds.
- B. Install Primary and Secondary Fuel Supply Manifolds
- (1) Make certain that throttle/thrust reverse levers are tagged.

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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain that thrust reverser control valve is in dump position and safety pin is installed.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (5) Install primary fuel manifold. (Figure 201)

**CAUTION:** IF RETAINER IS NOT USED, O-RING MAY PROTRUDE BETWEEN TUBE AND CONNECTOR AND PIECES OF RUBBER MAY ENTER FUEL SYSTEM.

- (6) Lightly lubricate new packings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install packings and retainers on each primary fuel manifold connection.

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- (7) Position primary manifold on engine, torque nuts on inlet tubes 30 to 35 inch-pounds and nut on pressurizing and dump valve 55 to 60 inch-pounds. Safety nuts with P05-289 lockwire.
- (8) Lightly lubricate new packings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install packings and retainers on each secondary fuel manifold connection.
- (9) Position and install secondary fuel manifold on engine. Torque nuts on fuel inlet tubes 45 to 50 inch-pounds and nut on pressurizing and dump valve 65 to 70 inch-pounds. Safety nuts with P05-289 lockwire.
- (10) Install clamps on primary and secondary fuel supply manifolds.

**NOTE:** Minimum clearance between any two adjacent tubes or between one single tube and any adjacent engine part should be 0.125 inch unless otherwise specified. Exceptions to clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact of clearances less than 0.125 inch minimum.

Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.

- (11) Remove tag from throttle/thrust reverser levers.
- (12) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (13) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (14) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.

#### 4. Removal/Installation Fuel Flow Transmitter Inlet Tube

A. Remove Fuel Flow Transmitter Inlet Tube (Figure 203)

- (1) Tag throttle/thrust reverser levers.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Open these circuit breakers and install safety tags:

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

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**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.
  - (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
- (5) Remove oil tank. (PAGEBLOCK 79-10-01/201)
- (6) Disconnect clamp holding fuel flow transmitter inlet tube.
- (7) Remove bolts securing inlet tube to fuel control and loosen connection at fuel flow transmitter inlet adapter connector. (Figure 203)

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUGS.

- (8) Disconnect fuel flow transmitter electrical connector.
  - (9) Disconnect and remove fuel flow transmitter and shift transmitter adapter connector to allow removal of inlet tube.
  - (10) Remove fuel flow transmitter inlet tube and transmitter inlet adapter connector.
  - (11) Remove and discard O-ring and packing from tube, and O-ring and backup ring from fuel flow transmitter adapter connector nut.
- B. Install Fuel Flow Transmitter Inlet Tube (Figure 203)
- (1) Make certain that throttle/thrust reverse levers are tagged.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT

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(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain that thrust reverser control valve is in dump position and safety pin is installed.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.

**CAUTION:** IF RETAINER IS NOT USED, O-RING OR SEAL MAY PROTRUDE BETWEEN TUBE AND CONNECTOR AND PIECES OF RUBBER MAY ENTER SYSTEM.

- (5) Install new key washer in fuel flow transmitter inlet tube stop nut and assemble coupling nut in stop nut. (Figure 202)
- (6) Lubricate new packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install ferrule, packing, and retainer over end of tube and inside coupling nut. (Figure 203)
- (7) Lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on fuel control end of tube.
- (8) Install fuel flow transmitter adapter connector nut, new backup ring, and O-ring lubricated with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine on fuel flow transmitter inlet adapter connector.
- (9) Install fuel flow transmitter inlet tube and adapter connector on engine and bolt lower end of tube to fuel control. Torque and safety bolts with P05-289 lockwire.
- (10) Connect upper end of tube to adapter connector and lock with key washer.

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- (11) Install clamp on inlet tube.

**NOTE:** Minimum clearance between any two adjacent tubes or between one single tube and any adjacent engine part should be 0.125 inch unless otherwise specified. Exceptions to clearance requirement are permitted at specific locations where adjacent tubes are clipped together or where other local constraints will prevent tube contact of clearances less than 0.125 inch minimum.

Minimum clearance refers only to clearance relative to tube and not to fittings or other attached hardware.

- (12) Install fuel flow transmitter.  
 (13) Install oil tank. (PAGEBLOCK 79-10-01/201)

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (14) Connect fuel flow transmitter electrical connector.  
 (15) Remove tag from throttle/thrust reverser levers.  
 (16) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (17) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (18) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.

### 5. Removal/Installation Fuel Control Burner Pressure Tubes

A. Remove Fuel Control Aft Burner Pressure Tube (Figure 204)

- (1) Tag throttle/thrust reverser levers.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Open these circuit breakers and install safety tags:

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

#### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.
  - (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.
    - (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
  - (5) Disconnect clamps holding aft burner pressure tube.
  - (6) Disconnect tube at upper left quadrant of combustion chamber and fan duct.
  - (7) Disconnect tube at forward end from moisture trap and remove tube.
- B. Install Fuel Control Aft Burner Pressure Tube (Figure 204)
- (1) Make certain thrust reverser control valve is in dump position and safety pin installed.
  - (2) Make certain throttle/thrust reverser levers are tagged,

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (3) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (5) Position tube on engine and connect forward end of tube to moisture trap.
- (6) Connect aft nut at upper left quadrant to combustion chamber and fan duct.
- (7) Torque nuts and safety with P05-289 lockwire.
- (8) Install clamps on tube.
- (9) Remove tag from throttle/thrust reverser levers.
- (10) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (11) Remove safety pin from thrust reverser control valve. Stow safety pin.
  - (12) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.
- C. Remove Fuel Control Front Burner Pressure Tube (Figure 204)

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- (1) Make certain thrust reverser control valve is in dump position and safety pin installed.
- (2) Make certain throttle/thrust reverser levers are tagged.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (3) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (4) Place thrust reverser control valve in dump position and install safety pin.
- (5) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.
  - (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
- (6) Disconnect fuel control front burner pressure tube at moisture trap cover and fuel control, and remove tube.

D. Install Fuel Control Front Burner Pressure Tube Figure 204

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- (1) Make certain thrust reverser control valve is in dump position
- (2) Make certain throttle/thrust reverser levers are tagged.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (3) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (4) Make certain that thrust reverser control valve is in dump position and safety pin is installed.
- (5) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (6) Install tube and connect forward end to moisture trap cover.
- (7) Connect aft end of tube to connector on fuel control.
- (8) Torque nuts and safety with P05-289 lockwire.
- (9) Remove tag from throttle/thrust reverser levers.

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- (10) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (11) Remove safety pin from thrust reverser control valve. Stow safety pin.  
 (12) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.  
 E. Removal/Installation Engine Fuel Flex Line (Figure 205)

**NOTE:** The engine fuel flex line is installed with the 45 degree swivel fitting attached to the airframe fuel supply and the 90 degree fitting installed at the engine fuel bridle.

- (1) Make certain that throttle/thrust reverser levers are tagged.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain that thrust reverser control valve is in dump position and safety pin is installed.  
 (4) Make certain that fire control handle is pulled.

**NOTE:** The engine fuel flex hose is installed with the 45 degree swivel fitting attached to the airframe fuel supply and the 90 degree fitting installed at the engine fuel bridle.

**NOTE:** An alternate fuel flex hose (Stratoflex) can be used. The Stratoflex hose can be identified by part number and it is most important that a firesleeve is installed on the flex hose (Figure 205).

- (5) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.  
 (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

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- (6) Remove fuel flex hose by removing eight attach bolts and nuts at swivel fitting and fuel bridle.

**CAUTION:** STRATOFLEX TYPE FUEL FLEX HOSE MUST HAVE FIRESLEEVE INSTALLED BEFORE FUEL FLEX HOSE CAN BE INSTALLED ON AIRCRAFT.

- (7) Install new flex hose with packing, lightly lubricate packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, attach 45 degree swivel fitting to upper airframe fuel supply.
- (8) Rotate 45 degree swivel fitting so it is pointing aft and is parallel to engine pylon. Secure attach bolts.
- (9) Using new packing, lightly lubricate with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on 90 degree flex line fitting to engine fuel bridle. Secure attach bolts to fuel bridle.
- (10) Installed fuel flex hose clearances-Left hand engine.
- (a) Minimum clearance between fuel flex hose and engine components/airframe structure is 1/2 inch.
- (b) Obtain minimum clearance by loosening upper 45 degree attach fitting and rotating swivel fitting toward airframe until minimum clearance is obtained.
- (11) Installed fuel flex hose clearances-Right hand engine.
- NOTE:** When the fuel flex hose on the right hand engine is properly installed it will have 3/4 inch clearance between the flex line and start valve sense line. This clearance is CRITICAL to prevent chafing against the start valve sense line.
- (a) For proper clearance loosen 45 degree end of fuel flex hose and rotate 45 degree swivel fitting toward airframe until proper clearance is obtained. Secure swivel fitting.
- (12) Remove tag from throttle/thrust reverser levers.
- (13) Leak check fuel flex hose.
- (a) Place applicable fuel tank boost pump to on position.
- (b) Check that no fuel leakage exists at fuel bridle or flex hose. Loosen vapor removal line connection at fuel bridle, bleed until clear fuel is observed and tighten connection.
- (c) Place applicable fuel tank boost pump to off position.
- (14) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

**UPPER EPC, ENGINE - LEFT AC BUS**

**Row   Col   Number   Name**

WJE ALL

K	26	B1-424	LEFT ENGINE IGNITION
---	----	--------	----------------------

**UPPER EPC, ENGINE - RIGHT AC BUS**

**Row   Col   Number   Name**

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

- (15) Place fire control handle in normal position.
- (16) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.
- (17) Place generator control switch momentarily to reset position.

NOTE: When fire control handle is actuated, generator field circuit is opened. Generator control switch must be reset to close generator field circuit.

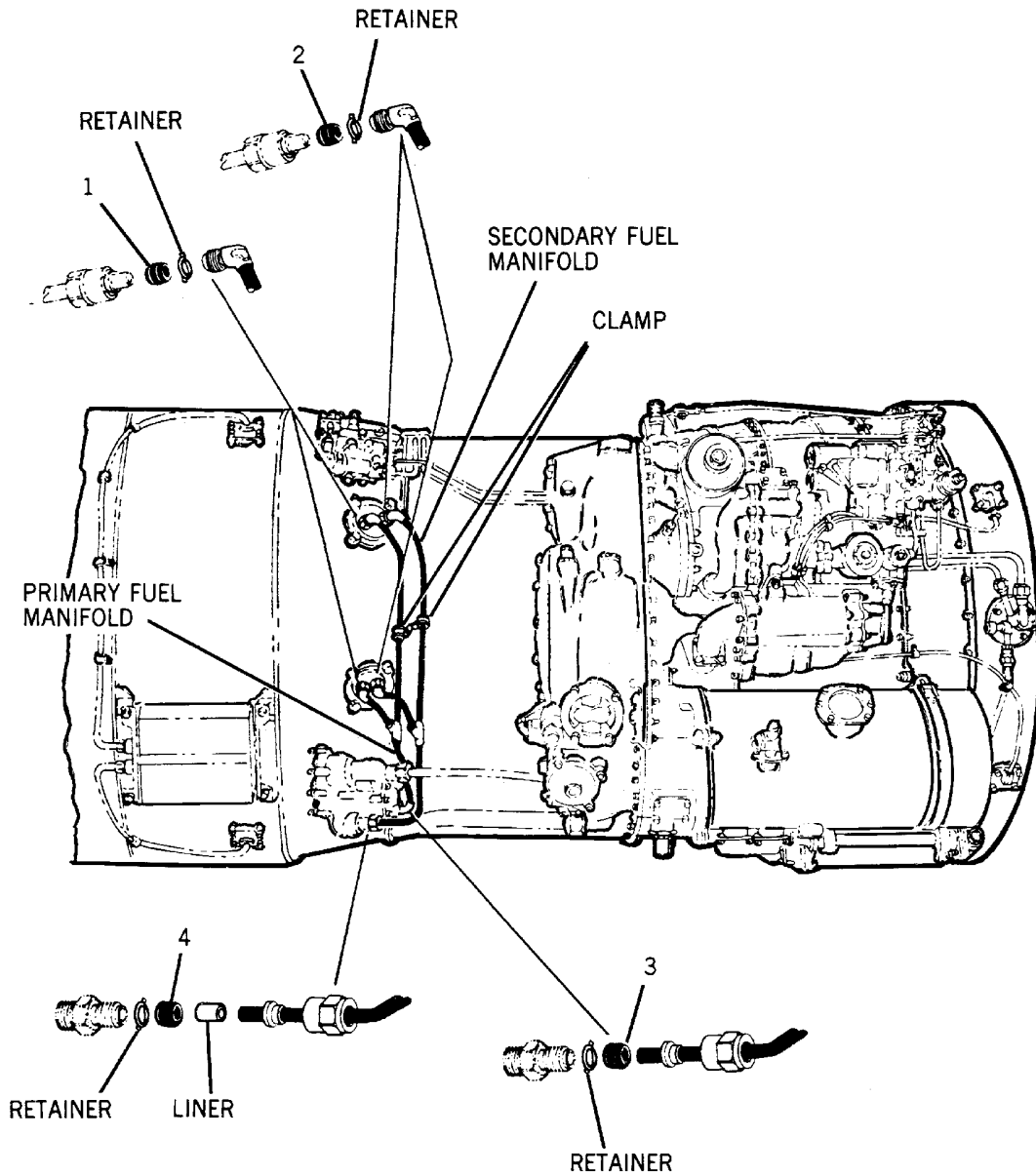
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- CODE:  
 1. 226366 PACKING (PRATT & WHITNEY)  
 2. 227419 PACKING (PRATT & WHITNEY)  
 3. 227401 PACKING (PRATT & WHITNEY)  
 4. 226195 PACKING (PRATT & WHITNEY)

L-66876

BBB2-73-33A

**Primary and Secondary Fuel Manifold -- Removal/Installation**  
**Figure 201/73-11-02-990-801**

EFFECTIVITY  
 WJE ALL

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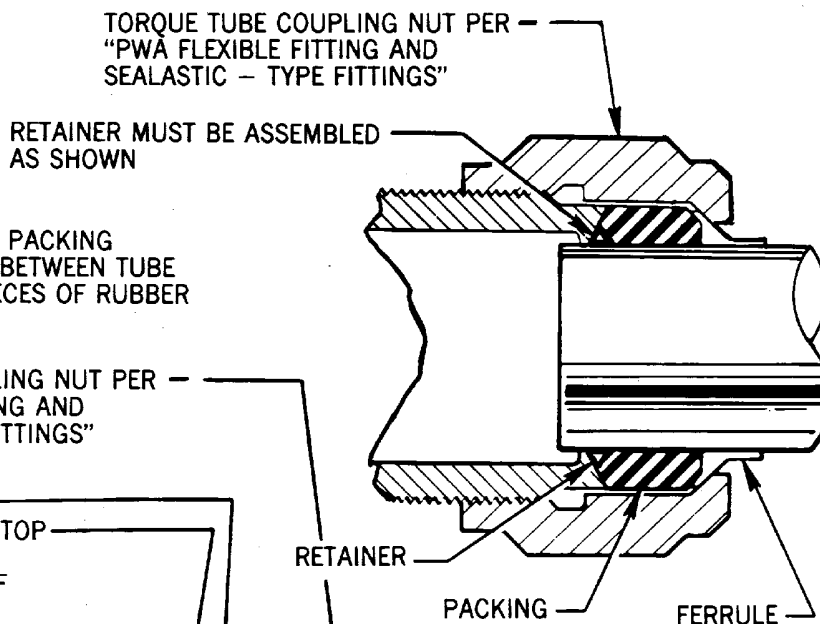
**MD-80  
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**CAUTION:**

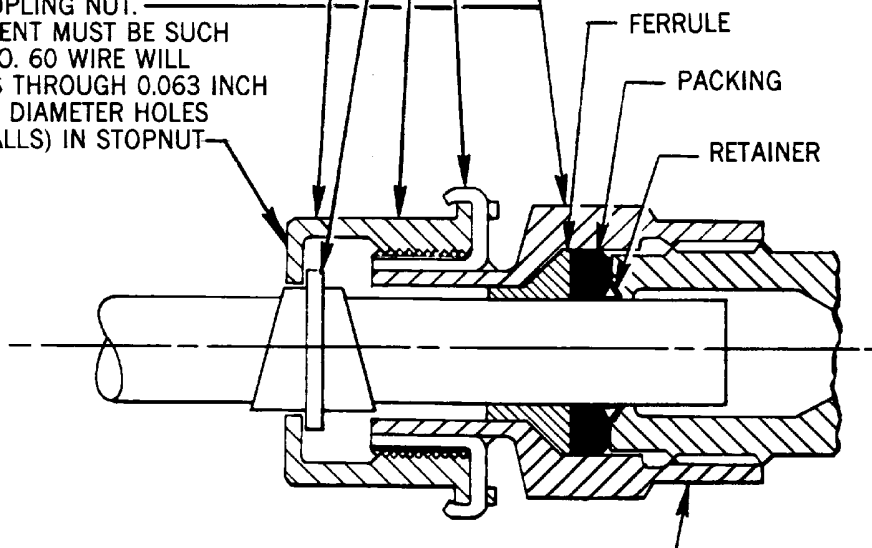
IF RETAINER IS NOT USED PACKING OR SEAL MAY PROTRUDE BETWEEN TUBE AND CONNECTOR AND PIECES OF RUBBER MAY ENTER SYSTEM.

TORQUE TUBE COUPLING NUT PER --  
"PWA FLEXIBLE FITTING AND  
SEALASTIC -- TYPE FITTINGS"

POSITION STOPNUT  
AGAINST TUBE FERRULE STOP  
TIGHTEN FINGER TIGHT  
THEN BACK OFF ONE HALF  
TURN TO NEXT SLOT  
AND BEND TABS OF  
KEYWASHER TO CLINCH  
STOPNUT. CHECK THREAD  
ENGAGEMENT BETWEEN  
STOPNUT AND  
TUBE COUPLING NUT.  
ENGAGEMENT MUST BE SUCH  
THAT A NO. 60 WIRE WILL  
NOT PASS THROUGH 0.063 INCH  
(1.60 MM) DIAMETER HOLES  
(BOTH WALLS) IN STOPNUT



ASSEMBLY OF FLEXIBLE FITTING  
PACKING AND RETAINER



L-43839  
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ASSEMBLY OF FLEXIBLE  
FITTING LOCK AND STOPNUT

BBB2-73-34A

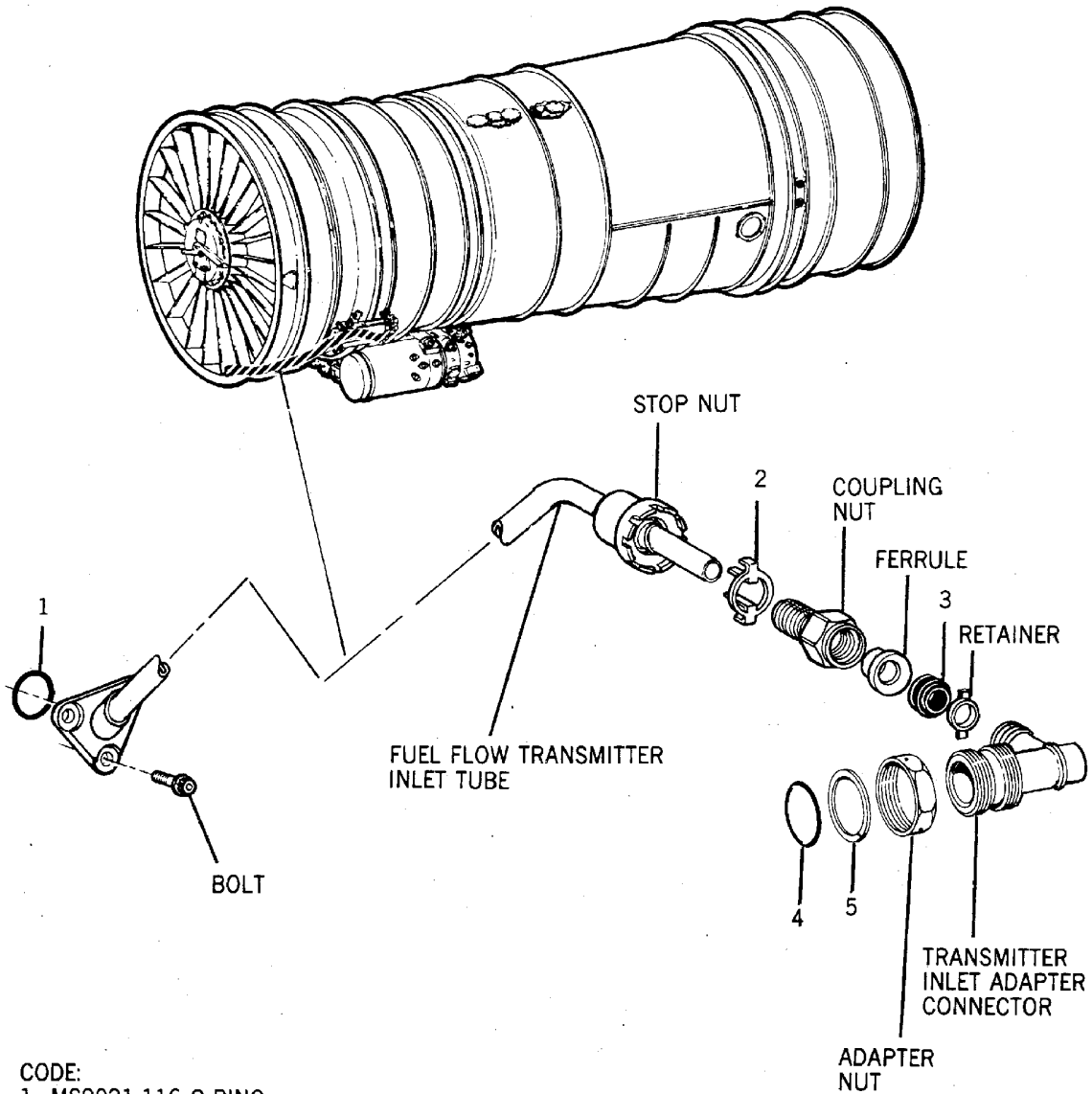
Fuel Manifold Stop-Nut Connector  
Figure 202/73-11-02-990-802

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**CODE:**

- 1. MS9021-116 O-RING
- 2. 766338 KEY WASHER (PRATT & WHITNEY)
- 3. 227431 PACKING (PRATT & WHITNEY)
- 4. MS29512-20 O-RING
- 5. MS9058-20 BACKUP

L-61503

BBB2-73-35A

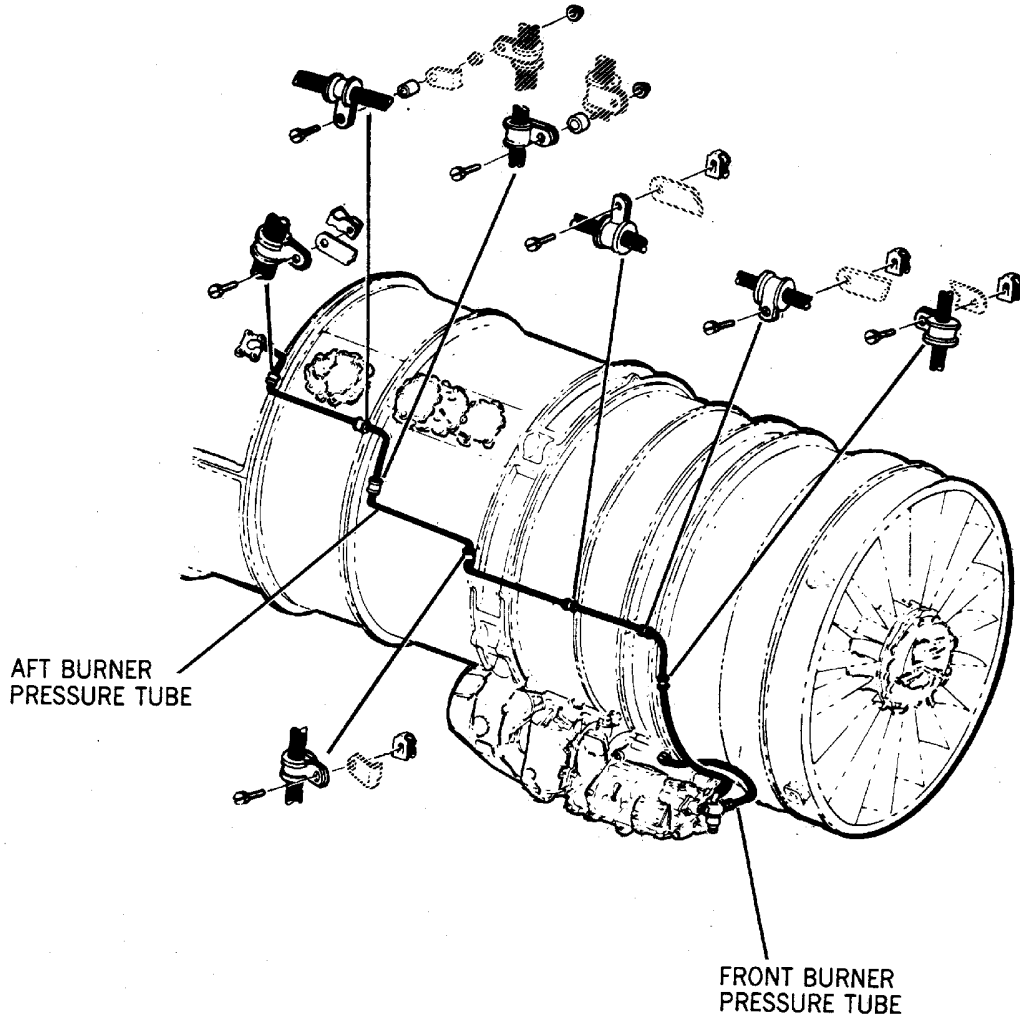
**Fuel Flow Transmitter Inlet Tube -- Removal/Installation  
Figure 203/73-11-02-990-803**

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Fuel Control Burner Pressure Tubes -- Removal/Installation  
Figure 204/73-11-02-990-804

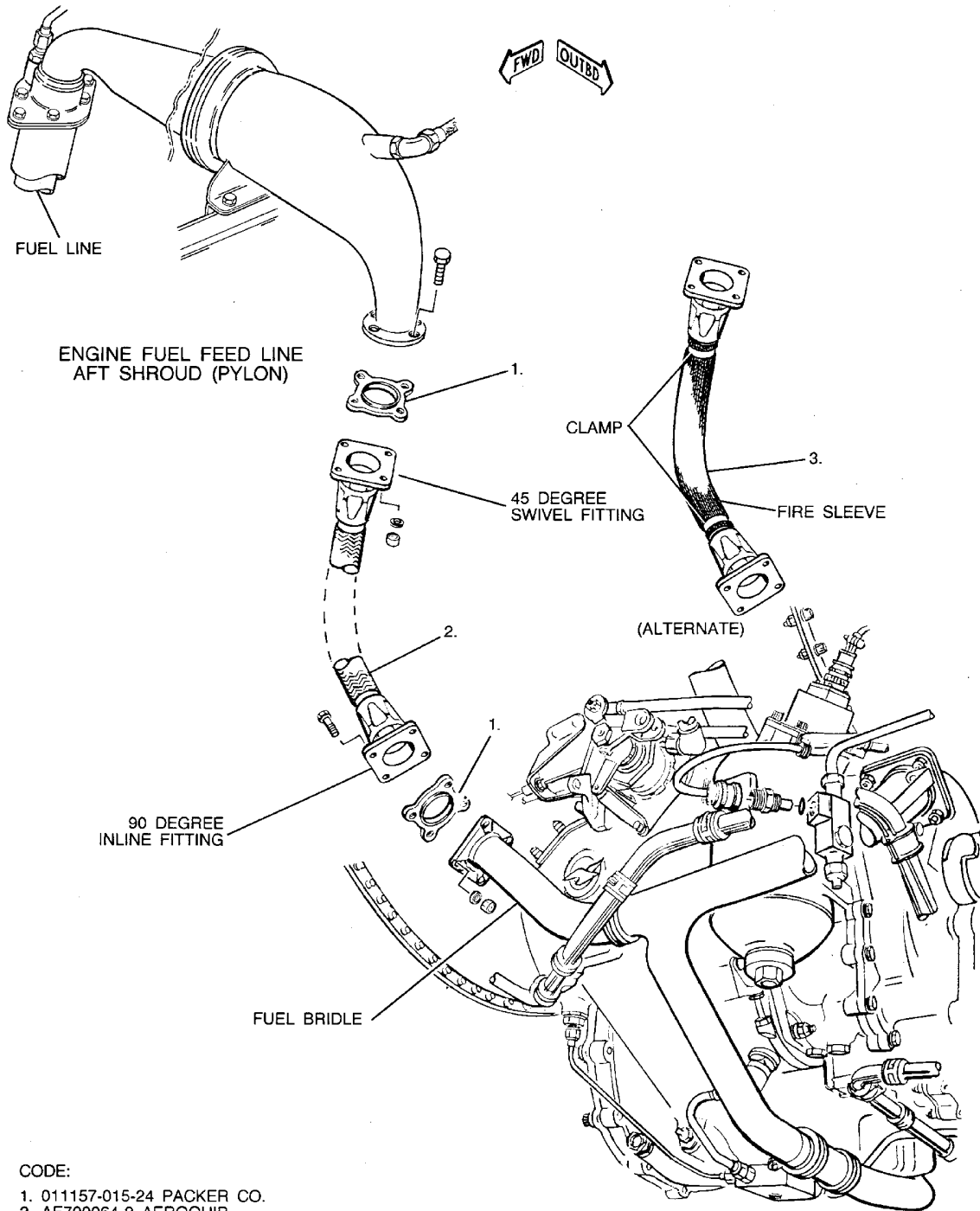
EFFECTIVITY  
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CODE:

- 1. 011157-015-24 PACKER CO.
- 2. AE700064-2 AEROQUIP
- 3. 156525-24-D0243 STRATOFLEX (ALTERNATE)

BBB2-73-97

**Fuel Flex Hose To Fuel Bridle -- Removal/Installation**  
**Figure 205/73-11-02-990-805 (Sheet 1 of 2)**

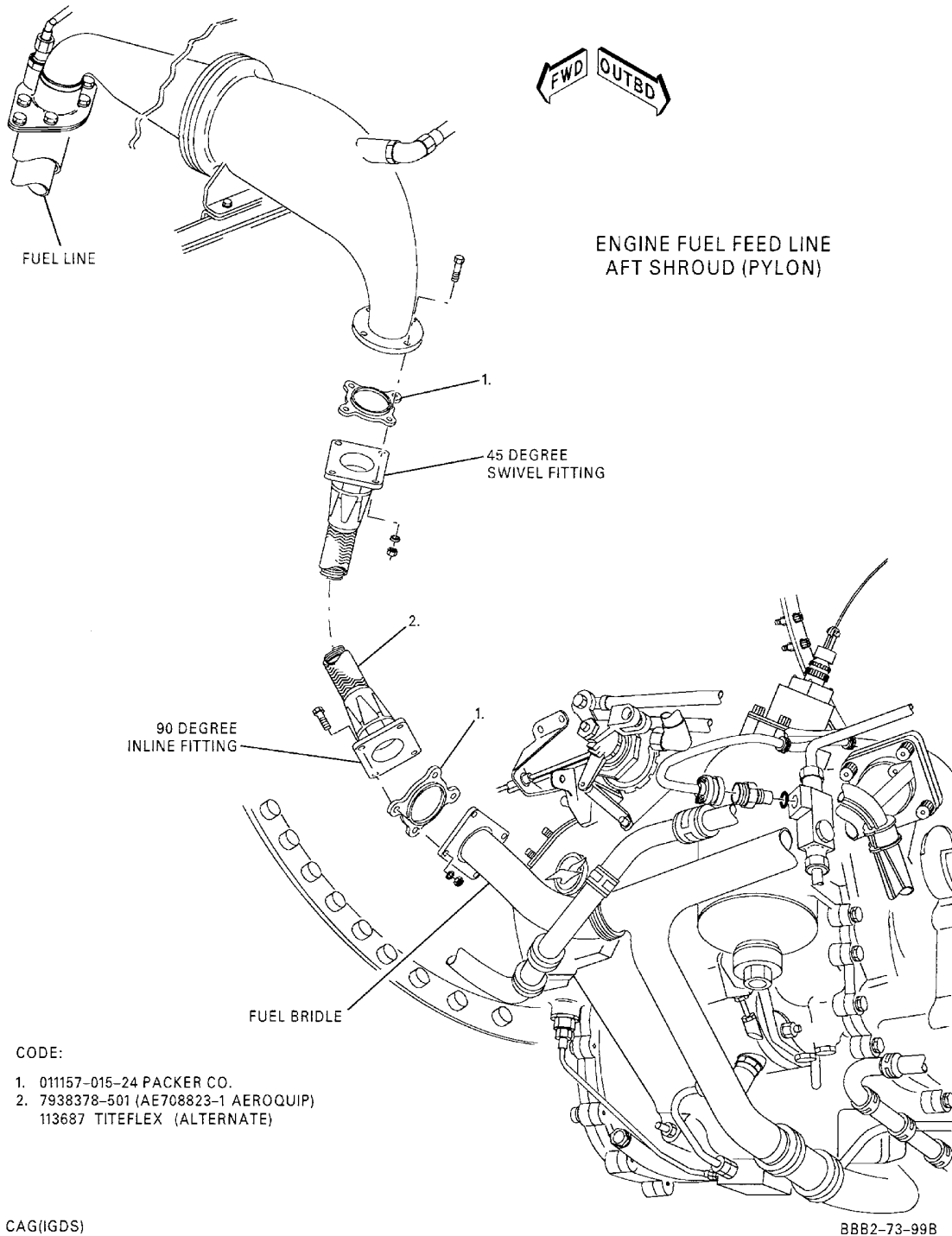
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**Fuel Flex Hose To Fuel Bridle -- Removal/Installation  
Figure 205/73-11-02-990-805 (Sheet 2 of 2)**

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**FUEL PUMP - MAINTENANCE PRACTICES**

**1. General**

A. This maintenance practice provides removal/installation instructions for the fuel pump located on the right front side of the accessory gear box.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the fuel pump is through the forward lower cowling.

C. Removal and installation procedures for the fuel pump on left and right engines are identical.

**2. Equipment and Materials**

**NOTE:** Equivalent substitutes may be used instead of following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) P03-001	
Lubricant, Sealing Ring P06-053	
Suitable container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Torque wrench (0-150 in-lb (0-16.95 N·m) range)	
Lockwire, 0.020 corrosion-resistant steel, P05-288	
Lockwire, 0.032 corrosion-resistant steel, P05-289	
Tag - DO NOT OPERATE	

**3. Removal/Installation Fuel Pump**

A. Remove Fuel Pump

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

**EFFECTIVITY**

**WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.**

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Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

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<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL & HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable pneumatic crossfeed lever.

1) Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove plug from center rear of fuel bridle and drain fuel into container.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Remove fuel control. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)

(7) Remove air/fuel heater. (PAGEBLOCK 73-14-01/201)

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (8) Disconnect electrical connector from fuel temperature sensor.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (9) Disconnect electrical connector from fuel filter differential pressure switch.
- (10) Remove fuel filter differential pressure switch.
- (11) Disconnect fuel pressure line from T-fitting on pump filter housing.
- (12) Remove T-fitting from pump filter housing. Discard O-ring.
- (13) Disconnect fuel discharge line from reducer on pump inlet housing.
- (14) Remove reducer from pump inlet housing. Discard O-ring.
- (15) Remove fire detection unit. (FIRE PROTECTION, CHAPTER 26)
- (16) Disconnect fuel supply bridle.
- (17) Loosen bolt securing fuel pump quick disconnect nut. (Figure 201)

**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** DO NOT ALLOW WEIGHT OF FUEL CONTROL AND FUEL PUMP TO BE TRANSMITTED TO PUMP SHAFT DRIVE SPLINES DURING REMOVAL.

- (18) Support fuel pump, then turn accessory drive pad quick disconnect nut counterclockwise (front view) to disengage from mating rear coupling. Carefully pull pump forward until drive shaft is clear of drive splines.
- (19) Remove coupling from fuel pump. Discard O-ring.

### B. Install Fuel Pump

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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WJE 401, 412, 414, 875, 876, 878, 879, 881, 883 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

- (2) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position and a "DO NOT OPERATE" tag is attached.
- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (4) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (5) Position new gasket, quick-disconnect nut, front coupling, and fire detector support bracket on pump mounting flange. (Position coupling so that bolt hole adjacent to larger dowel pin hole aligns with second hole center clockwise from fuel drain boss in flange outside diameter.) Secure coupling to pump. (Figure 201)

NOTE: The bolt used to install the fire detector support bracket must be a longer bolt.

**CAUTION:** ENSURE O-RING IS INSTALLED IN OUTSIDE DIAMETER GROOVE OF FRONT COUPLING.

- (6) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump front coupling. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (7) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump drive shaft.

**CAUTION:** FUEL PUMP DRIVE SPLINES ARE LUBRICATED BY ENGINE OIL WHICH CIRCULATES THROUGH OIL FEED HOLES DRILLED IN ACCESSORY DRIVE GEARSHAFT. USE ONLY ENGINE OIL TO LUBRICATE PUMP AND GEARSHAFT MATING SPLINES. DO NOT USE PLASTILUBE NO. 3 OR SIMILAR LUBRICANTS WHICH MIGHT PLUG OIL FEED HOLES.

- (8) Lightly coat pump shaft splines with engine oil (P03-001). (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (9) Lightly lubricate threads of gearbox quick-disconnect nut and rear coupling.

**EFFECTIVITY**

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** SUPPORT FUEL PUMP AND COUPLING SO THAT NO OVERHUNG WEIGHT IS INTRODUCED AT QUICK-DISCONNECT NUT.

- (10) Position fuel pump on accessory drive pad and engage quick-disconnect nut on pump with coupling on accessory drive pad.

**CAUTION:** DO NOT LET WEIGHT OF FUEL CONTROL AND PUMP BE TRANSMITTED TO PUMP SPLINES DURING INSTALLATION.

- (11) Lightly lubricate threads of locking bolt and engage bolt in lug on quick-disconnect nut with nut bracket on accessory drive pad.
- (12) Tighten locking bolt until pump coupling bottoms on accessory drive coupling and dimension of 0.300 to 1.160 inch (8 to 29 mm) is obtained between nut and locking bolt and nut bracket on accessory drive pad. (Figure 201)

**NOTE:** As quick-disconnect nut locking bolt is tightened, an eight-ounce plastic mallet should be used to tap quick-disconnect nut radially around circumference of nut, and circumferentially in tightening direction at locking bolt location.

**CAUTION:** MAKE CERTAIN THAT REAR FACE OF QUICK-DISCONNECT NUT IS NOT TOUCHING FACE OF GEARBOX MOUNTING PAD. GAP BETWEEN NUT AND FACE OF PAD SHALL BE 0.010 INCH (0.254 MM) MINIMUM. (FIGURE 202)

- (13) Torque locking bolt 65 to 85 inch-pounds (7.35 to 9.61 N·m).
- (14) Safety locking bolt with P05-289 lockwire. STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201
- (15) Install air/fuel heater. (PAGEBLOCK 73-14-01/201)
- (16) Install fuel control (FUEL CONTROL, SUBJECT 73-20-01, Page 201).
- (17) Position new gasket on fuel pump inlet and connect fuel bridle.
- (18) Install the fire detection unit. (ENGINE FIRE DETECTOR UNITS - MAINTENANCE PRACTICES, PAGEBLOCK 26-10-01/201)
- (19) Lightly lubricate two new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install first O-ring on bolt, then bolt through T-fitting and second O-ring on bolt.
- (20) Install T-fitting on pump filter housing. Torque the bolt 65 in-lb (7.34 N·m) to 75 in-lb (8.47 N·m). Safety bolt with P05-289 lockwire.
- (21) Connect fuel pressure line to T-fitting on pump filter housing.
- (22) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on reducer. Install reducer on pump inlet housing.
- (23) Connect fuel discharge line to reducer on pump inlet housing.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUG. DO NOT OVERTIGHTEN.

- (24) Connect electrical connector to fuel temperature sensor. Safety connector with P05-288 lockwire. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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- (25) Lightly lubricate two new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-rings in counterbored ports on fuel filter.
- (26) Position fuel filter differential pressure switch on fuel filter, locate electrical cable bracket on switch and install switch. Safety bolts with P05-289 lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUG. DO NOT OVERTIGHTEN.

- (27) Connect electrical connector to fuel filter differential pressure switch. Safety connector with P05-288 lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (28) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on drain plug. Install drain plug in fuel bridle and safety with P05-289 lockwire.
- (29) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

- (30) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (31) Close fire control handle, located on upper instrument panel.
- (32) Remove the "DO NOT OPERATE" tag from the applicable pneumatic crossfeed lever.

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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- (33) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

- (34) Purge Fuel Pump, Fuel Control (PAGEBLOCK 73-12-02/201).

#### 4. Removal/Installation Fuel Pump Filter Cartridge

- A. Remove Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

##### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

##### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

##### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL & HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

- (3) Pull fire control handle located on upper instrument panel.
- (4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position.
  - (a) Attach a "DO NOT OPERATE" tag to the applicable pneumatic crossfeed lever.
    - 1) Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
- (5) Remove filter cover valve from valve body and allow residual fuel to drain from filter. (Figure 203)

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

- (6) Remove filter cover, pull out filter cartridge.
  - (7) Make sure that filter cartridge gaskets are on filter cartridge, and do not remain in housing cavity or in cover.
  - (8) Discard filter cartridge.
- B. Install Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WJE 401, 405, 409, 412, 414, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-879, 884, 891, 892**

**WARNING:** MAKE CERTAIN THRUST REVERSER SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

**WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; WITHOUT SB 73-11 INCORP.**

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position and a "DO NOT OPERATE" tag is attached.

**CAUTION:** IT IS POSSIBLE THAT THE OLD GASKETS FROM THE REMOVED FILTER CARTRIDGE WILL REMAIN IN THE FUEL FILTER HOUSING CAVITY OR COVER. BE SURE YOU EXAMINE THE FILTER CAVITY AND COVER. REMOVE THE OLD FILTER GASKETS FROM THE CAVITY AND COVER IF NECESSARY, OR DAMAGE TO THE ENGINE CAN RESULT.

- (5) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on filter cover.
- (6) Position new filter cartridge on cover assembly and insert into filter housing. Tighten cover 75 to 100 inch-pounds (8.5 to 11.3 N·m).

**NOTE:** Cover installation is critical in the prevention of fuel leaks. Approximately nineteen complete turns of the cover assembly jam nut are required to ensure proper seating of the cover into the filter housing assembly.

- (7) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on cover valve. Install cover valve into valve body and tighten 60 to 80 inch-pounds. Install cotter pin.
- (8) Safety cover with P05-289 lockwire.
- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT

**EFFECTIVITY**

**WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.**

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WJE 405, 877, 880, 884, 892 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAIL-ABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (10) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (11) Close fire control handle, located on upper instrument panel.
- (12) Remove the "DO NOT OPERATE" tag from the applicable pneumatic crossfeed lever.
- (13) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

## 5. Check Fuel Pump and Filter

### A. Check Fuel Pump and Filter

**NOTE:** At initial engine start, the fuel flow indicator may fluctuate due to air in the system. The fuel control will function properly, and the system will clear of air after approximately 3 minutes operation. Exercising the throttle may aid in clearing the system of air.

- (1) Check fuel pump, filter, fuel control, and adjacent area for leaks after first engine run.

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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- (2) After engine run, remove fuel control main filter (FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-02/201) and check for evidence of contamination. If contamination is present, remove and check fuel pump filter cartridge. (Paragraph 4.)
  - (a) The above step is not required if inspection of the fuel pump filter did not have any contamination. If the condition of the fuel pump filter is not known, the FCU filter must be inspected for contamination after engine run.

**EFFECTIVITY**

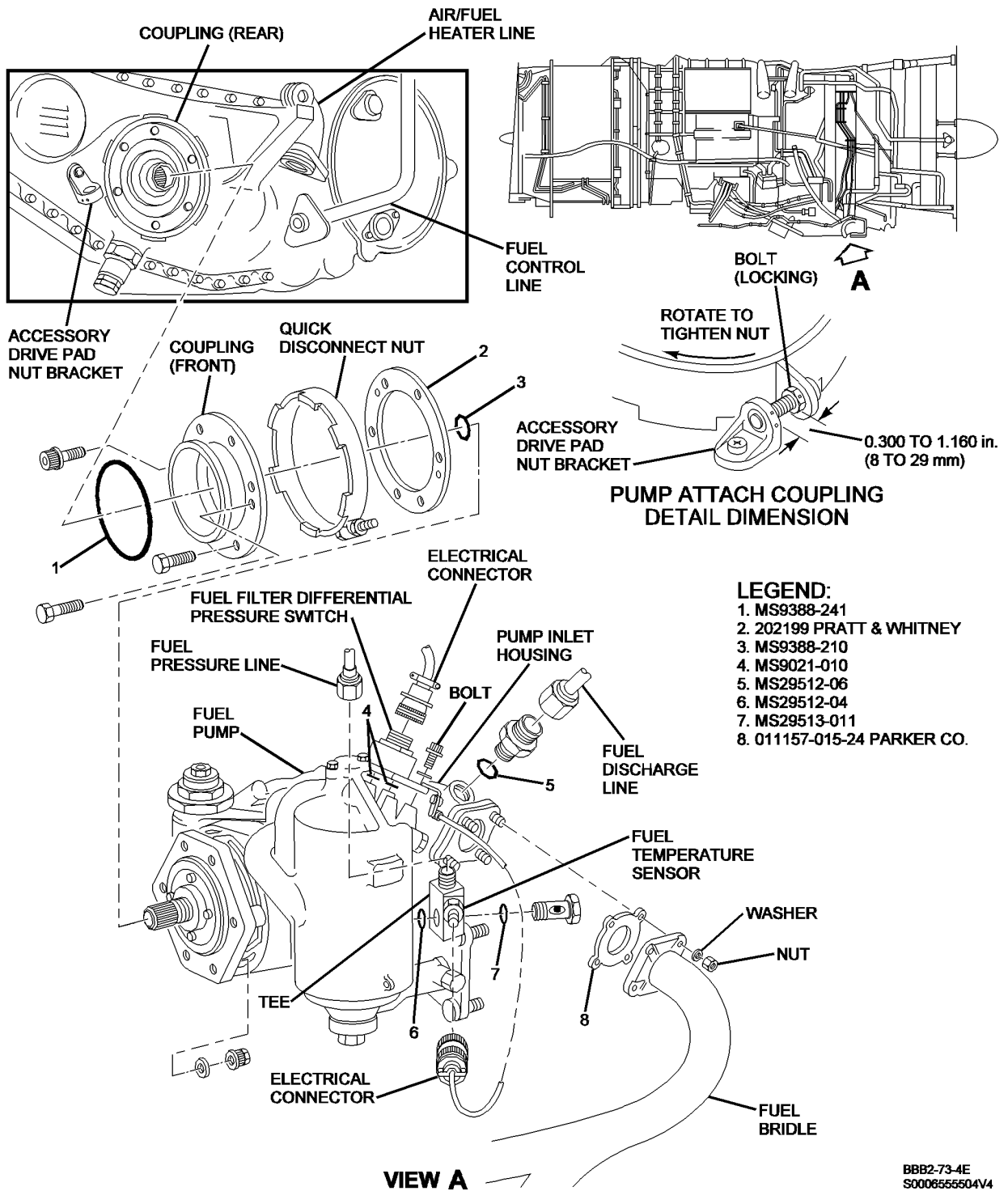
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**Fuel Pump -- Removal/Installation**  
Figure 201/73-12-01-990-805

BBB2-73-4E  
S000855504V4

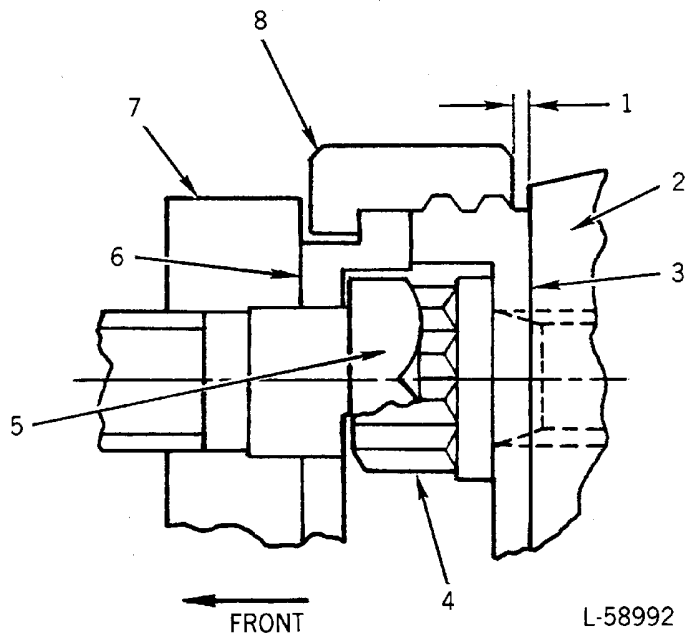
**EFFECTIVITY**  
WJE 401, 405, 409, 412, 414-416, 418, 420, 422,  
424-427, 429, 861, 862, 868, 873-881, 883, 884, 891,  
892; Without SB 73-11 incorp.

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CROSS-SECTION THRU FUEL PUMP QUICK-DISCONNECT NUT

1. 0.010 INCH (0.254 MM) MINIMUM CLEARANCE
2. GEARBOX SURFACE (FUEL PUMP PAD)
3. QUICK-DISCONNECT REAR COUPLING
4. REAR COUPLING RETAINING BOLTS
5. FRONT COUPLING RETAINING BOLTS
6. QUICK-DISCONNECT FRONT COUPLING
7. FUEL PUMP MOUNTING FLANGE
8. QUICK-DISCONNECT NUT

BBB2-73-2A

**Fuel Pump Quick-Disconnect Coupling and Nut**  
Figure 202/73-12-01-990-806

**EFFECTIVITY**

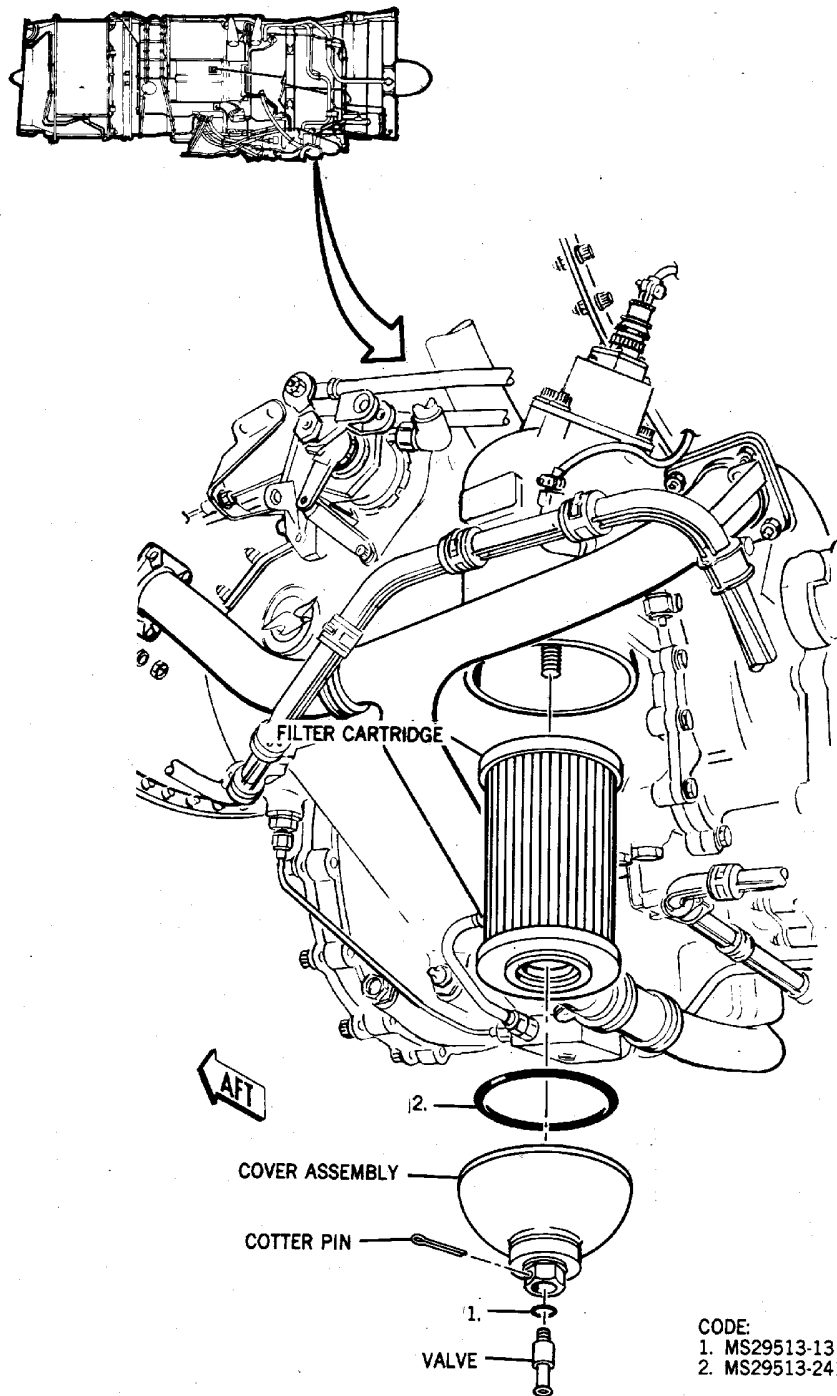
WJE 401, 405, 409, 412, 414-416, 418, 420, 422,  
424-427, 429, 861, 862, 868, 873-881, 883, 884, 891,  
892; Without SB 73-11 incorp.

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**Fuel Pump Filter -- Removal/Installation**  
Figure 203/73-12-01-990-807

**EFFECTIVITY**

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; Without SB 73-11 incorp.

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**FUEL PUMP - MAINTENANCE PRACTICES**

**1. General**

A. This maintenance practice provides removal/installation instructions for the fuel pump located on the right front side of the accessory gear box.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the fuel pump is through the forward lower cowling.

C. Removal and installation procedures for the fuel pump on left and right engines are identical.

**2. Equipment and Materials**

**NOTE:** Equivalent substitutes may be used instead of following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) P03-001	
Lubricant, Sealing Ring P06-053	
Suitable container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Torque wrench (0-150 in-lb (0-16.95 N·m) range)	
Lockwire, 0.020 corrosion-resistant steel, P05-288	
Lockwire, 0.032 corrosion-resistant steel, P05-289	
Tag - DO NOT OPERATE	

**3. Removal/Installation Fuel Pump**

A. Remove Fuel Pump

**EFFECTIVITY**

**WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.**

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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

#### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable pneumatic crossfeed lever.

1) Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove plug from center rear of fuel bridle and drain fuel into container.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Remove fuel control. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)

(7) Remove air/fuel heater (PAGEBLOCK 73-14-01/201).

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(8) Disconnect electrical connector from low fuel pressure caution switch.

(9) Remove low fuel pressure caution switch. (Figure 201).

(10) Disconnect connector wiring clamp from right fwd attach bracket on the fuel pressure differential switch.

(11) Disconnect electrical connector from fuel temperature sensor.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(12) Disconnect electrical connector from fuel filter differential pressure switch.

(13) Remove fuel filter differential pressure switch.

(14) Disconnect fuel pressure line from T-fitting on pump filter housing.

(15) Remove T-fitting from pump filter housing. Discard O-ring.

(16) Disconnect fuel discharge line from reducer on pump inlet housing.

(17) Remove reducer from pump inlet housing. Discard O-ring.

(18) Remove fire detection unit. (FIRE PROTECTION, CHAPTER 26)

(19) Disconnect fuel supply bridle.

(20) Loosen bolt securing fuel pump quick disconnect nut. (Figure 201)

### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** DO NOT ALLOW WEIGHT OF FUEL CONTROL AND FUEL PUMP TO BE TRANSMITTED TO PUMP SHAFT DRIVE SPLINES DURING REMOVAL.

- (21) Support fuel pump, then turn accessory drive pad quick disconnect nut counterclockwise (front view) to disengage from mating rear coupling. Carefully pull pump forward until drive shaft is clear of drive splines.
- (22) Remove coupling from fuel pump. Discard O-ring.

### B. Install Fuel Pump

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

#### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

**WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.**

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WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892  
(Continued)

### UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
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WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
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L	26	B1-425	RIGHT ENGINE IGNITION
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- (2) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position and a "DO NOT OPERATE" tag is attached.

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.  
 (4) Make certain that fire control handle, located on upper instrument panel, is pulled.  
 (5) Position new gasket, quick-disconnect nut, front coupling, and fire detector support bracket on pump mounting flange. (Position coupling so that bolt hole adjacent to larger dowel pin hole aligns with second hole center clockwise from fuel drain boss in flange outside diameter.) Secure coupling to pump. (Figure 201)

**NOTE:** The bolt used to install the fire detector support bracket must be a longer bolt.

**CAUTION:** ENSURE O-RING IS INSTALLED IN OUTSIDE DIAMETER GROOVE OF FRONT COUPLING.

- (6) Lightly lubricate new O-ring with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump front coupling.  
 (7) Lightly lubricate new O-ring with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump drive shaft. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

**CAUTION:** FUEL PUMP DRIVE SPLINES ARE LUBRICATED BY ENGINE OIL WHICH CIRCULATES THROUGH OIL FEED HOLES DRILLED IN ACCESSORY DRIVE GEARSHAFT. USE ONLY ENGINE OIL TO LUBRICATE PUMP AND GEARSHAFT MATING SPLINES. DO NOT USE PLASTILUBE NO. 3 OR SIMILAR LUBRICANTS WHICH MIGHT PLUG OIL FEED HOLES.

- (8) Lightly coat pump shaft splines with engine lubricating oil (P03-001). (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)  
 (9) Lightly lubricate threads of gearbox quick-disconnect nut and rear coupling.

**EFFECTIVITY**

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** SUPPORT FUEL PUMP AND COUPLING SO THAT NO OVERHUNG WEIGHT IS INTRODUCED AT QUICK-DISCONNECT NUT.

- (10) Position fuel pump on accessory drive pad and engage quick-disconnect nut on pump with coupling on accessory drive pad.

**CAUTION:** DO NOT LET WEIGHT OF FUEL CONTROL AND PUMP BE TRANSMITTED TO PUMP SPLINES DURING INSTALLATION.

- (11) Lightly lubricate threads of locking bolt and engage bolt in lug on quick-disconnect nut with nut bracket on accessory drive pad.
- (12) Tighten locking bolt until pump coupling bottoms on accessory drive coupling and dimension of 0.300 to 1.160 inch (8 to 29 mm) is obtained between nut and locking bolt and nut bracket on accessory drive pad. (Figure 201)

**NOTE:** As quick-disconnect nut locking bolt is tightened, an eight-ounce plastic mallet should be used to tap quick-disconnect nut radially around circumference of nut, and circumferentially in tightening direction at locking bolt location.

**CAUTION:** MAKE CERTAIN THAT REAR FACE OF QUICK-DISCONNECT NUT IS NOT TOUCHING FACE OF GEARBOX MOUNTING PAD. GAP BETWEEN NUT AND FACE OF PAD SHALL BE 0.010 INCH (0.254 MM) MINIMUM.

- (13) Torque locking bolt 65 to 85 inch-pounds (7.35 to 9.61 N·m).
- (14) Safety locking bolt with P05-289 lockwire. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (15) Install air/fuel heater. (PAGEBLOCK 73-14-01/201)
- (16) Install fuel control. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)
- (17) Position new gasket on fuel pump inlet and connect fuel bridle.
- (18) Install the fire detection unit. (ENGINE FIRE DETECTOR UNITS - MAINTENANCE PRACTICES, PAGEBLOCK 26-10-01/201)
- (19) Lightly lubricate two new O-rings with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install first O-ring on bolt, then bolt through T-fitting and second O-ring on bolt.
- (20) Install T-fitting on pump filter housing. Torque the bolt 65 in-lb (7.34 N·m) to 75 in-lb (8.47 N·m). Safety bolt with P05-289 lockwire.
- (21) Connect fuel pressure line to T-fitting on pump filter housing.
- (22) Lightly lubricate new O-ring with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on reducer. Install reducer on pump inlet housing.
- (23) Connect fuel discharge line to reducer on pump inlet housing.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (24) Connect electrical connector to fuel temperature sensor. Safety connector with P05-288 lockwire. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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- (25) Lightly lubricate two new O-rings with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-rings in counterbored ports on fuel filter.
- (26) Position fuel filter differential pressure switch on fuel filter, locate electrical cable bracket on switch and install switch. Safety bolts with P05-289 lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (27) Connect electrical connector to fuel filter differential pressure switch. Safety connector with P05-288 lockwire.  
NOTE: Connector is properly installed when no relative motion exists between backshell and coupling ring.
- (28) Lightly lubricate new packing with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, install packing on low fuel pressure switch and install switch on elbow mounted on inlet temperature boss. Torque switch 60 to 70 inch-pounds.
- (29) Safety switch to elbow nut with P05-289 lockwire.
- (30) Connect electrical connector to fuel pressure switch and safety with P05-289 lockwire.
- (31) Install wire clamp at fwd right attach bracket on the fuel pressure differential switch.
- (32) Lightly lubricate new O-ring with sealing ring lubricant (P06-053) and install O-ring on drain plug. Install drain plug in fuel bridle and safety with P05-289 lockwire.
- (33) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

**WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.**

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(Continued)

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (34) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (35) Close fire control handle, located on upper instrument panel.
- (36) Remove the "DO NOT OPERATE" tag from the applicable pneumatic crossfeed lever.
- (37) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

- (38) Purge Fuel Pump, Fuel Control (PAGEBLOCK 73-12-02/201).

#### 4. Removal/Installation Fuel Pump Filter Cartridge

- A. Remove Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP

#### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable pneumatic crossfeed lever.

1) Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove filter cover valve from valve body and allow residual fuel to drain from filter. (Figure 203)

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Remove filter cover, pull out filter cartridge.

#### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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- (7) Make sure that filter cartridge gaskets are on filter cartridge, and do not remain in housing cavity or in cover.
- (8) Discard filter cartridge.

### B. Install Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

#### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel, is pulled.

#### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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- (4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position and a "DO NOT OPERATE" tag is attached.

**CAUTION:** IT IS POSSIBLE THAT THE OLD GASKETS FROM THE REMOVED FILTER CARTRIDGE WILL REMAIN IN THE FUEL FILTER HOUSING CAVITY OR COVER. BE SURE YOU EXAMINE THE FILTER CAVITY AND COVER. REMOVE THE OLD FILTER GASKETS FROM THE CAVITY AND COVER IF NECESSARY, OR DAMAGE TO THE ENGINE CAN RESULT.

- (5) Lightly lubricate new O-ring with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on filter cover.
- (6) Position new filter cartridge on cover assembly and insert into filter housing. Tighten cover 75 to 100 inch-pounds (8.5 to 11.3 N·m).

**NOTE:** Cover installation is critical in the prevention of fuel leaks. Approximately nineteen complete turns of the cover assembly jam nut are required to ensure proper seating of the cover into the filter housing assembly.

- (7) Lightly lubricate new O-ring with with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on cover valve. Install cover valve into valve body and tighten 60 to 80 inch-pounds. Install cotter pin.
- (8) Safety cover with P05-289 lockwire.
- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

#### EFFECTIVITY

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (10) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (11) Close fire control handle, located on upper instrument panel.
- (12) Remove the "DO NOT OPERATE" tag from the applicable pneumatic crossfeed lever.
- (13) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

### 5. Check Fuel Pump and Filter

#### A. Check Fuel Pump and Filter

**NOTE:** At initial engine start, the fuel flow indicator may fluctuate due to air in the system. The fuel control will function properly, and the system will clear of air after approximately 3 minutes operation. Exercising the throttle may aid in clearing the system of air.

- (1) Check fuel pump, filter, fuel control, and adjacent area for leaks after first engine run.
- (2) After engine run, remove fuel control main filter and check for evidence of contamination. If contamination is present, remove and check fuel pump filter cartridge. (FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-02/201) (Paragraph 4.)
  - (a) The above step is not required if inspection of the fuel pump filter did not have any contamination. If the condition of the fuel pump filter is not known, the FCU filter must be inspected for contamination after engine run.

#### EFFECTIVITY

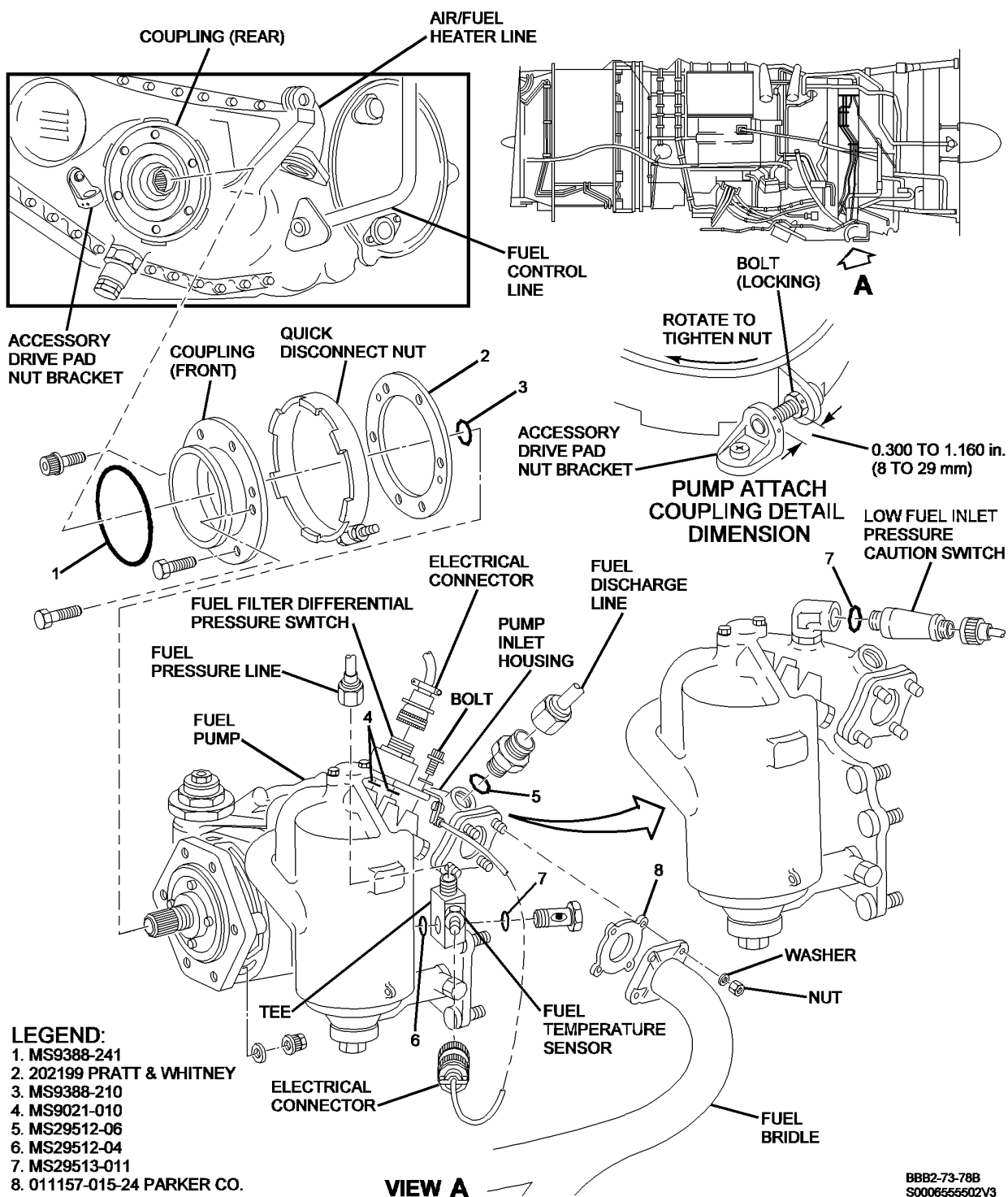
WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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**Fuel Pump -- Removal/Installation  
Figure 201/73-12-01-990-804**

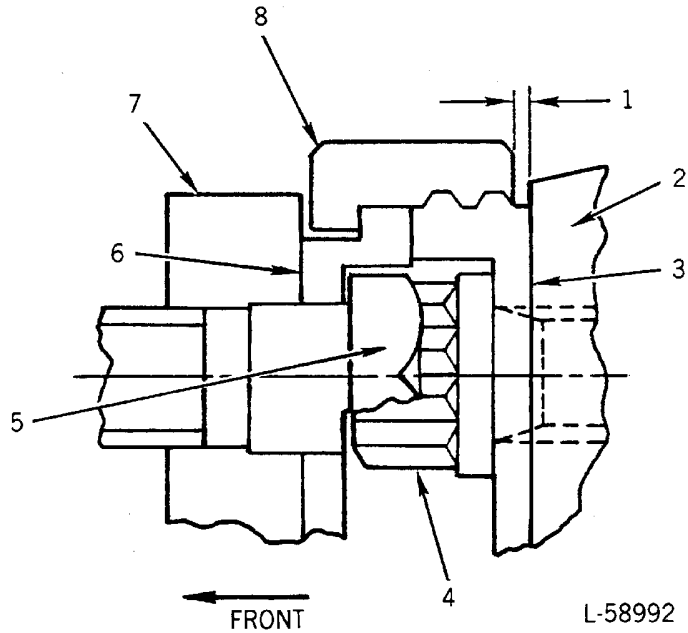
**EFFECTIVITY**  
WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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CROSS-SECTION THRU FUEL PUMP QUICK-DISCONNECT NUT

1. 0.010 INCH (0.254 MM) MINIMUM CLEARANCE
2. GEARBOX SURFACE (FUEL PUMP PAD)
3. QUICK-DISCONNECT REAR COUPLING
4. REAR COUPLING RETAINING BOLTS
5. FRONT COUPLING RETAINING BOLTS
6. QUICK-DISCONNECT FRONT COUPLING
7. FUEL PUMP MOUNTING FLANGE
8. QUICK-DISCONNECT NUT

BBB2-73-2A

**Fuel Pump Quick-Disconnect Coupling and Nut  
Figure 202/73-12-01-990-802**

**EFFECTIVITY**

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427,  
429, 861, 862, 868, 873-881, 883, 884, 891, 892; With  
SB 73-11 incorp.

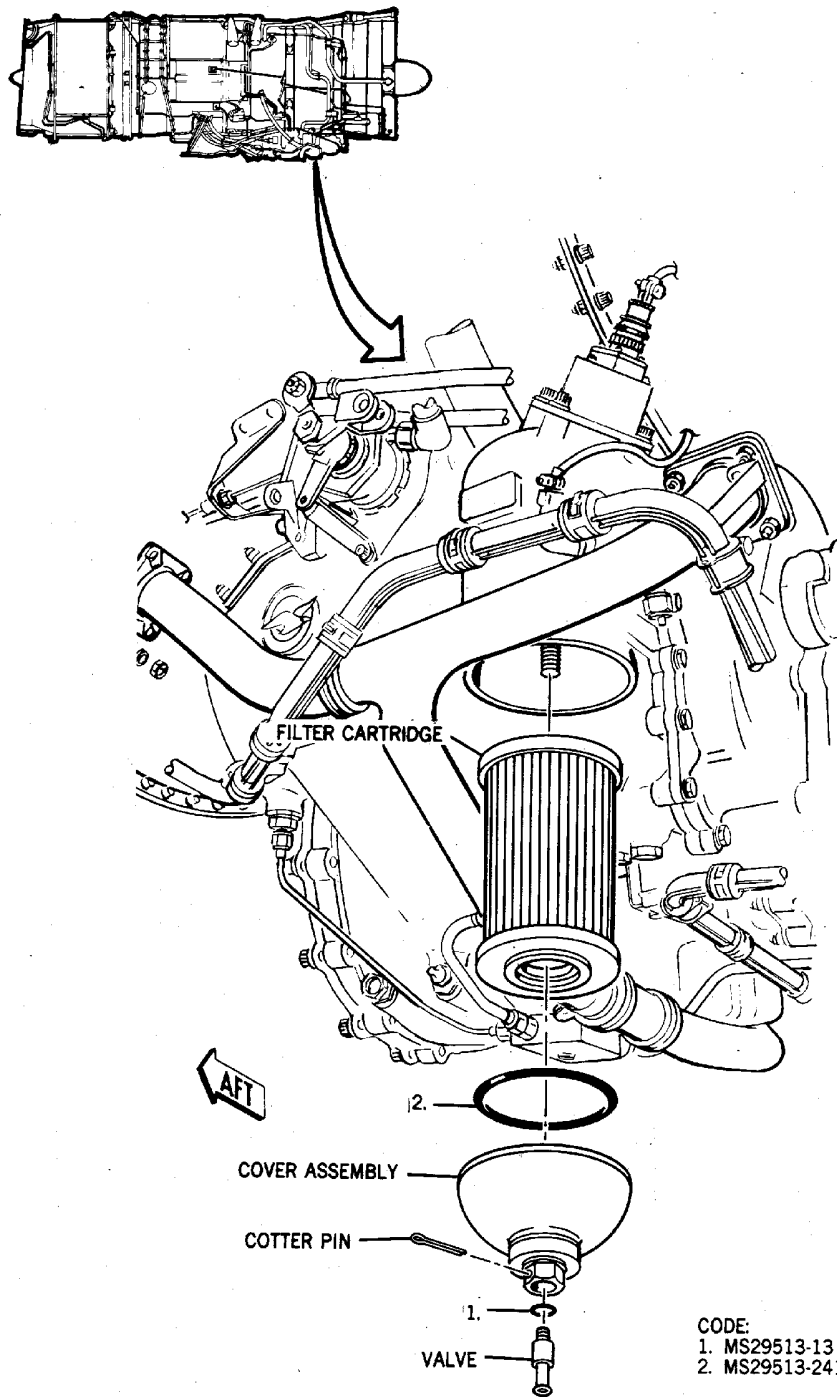
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**Fuel Pump Filter -- Removal/Installation**  
Figure 203/73-12-01-990-803

**EFFECTIVITY**

WJE 401, 405-412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892; With SB 73-11 incorp.

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**AIRCRAFT MAINTENANCE MANUAL**  
**FUEL PUMP - MAINTENANCE PRACTICES**

**1. General**

A. This maintenance practice provides removal/installation instructions for the fuel pump located on the right front side of the accessory gear box.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the fuel pump is through the forward lower cowling.

C. Removal and installation procedures for the fuel pump on left and right engines are identical.

**2. Equipment and Materials**

**NOTE:** Equivalent substitutes may be used instead of following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) P03-001	
Lubricant, Sealing Ring P06-053	
Suitable container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Torque wrench (0-150 in-lb (0-16.95 N·m) range)	
Lockwire, 0.020 corrosion-resistant steel, P05-288	
Lockwire, 0.032 corrosion-resistant steel, P05-289	
Tag - DO NOT OPERATE	

**3. Removal/Installation Fuel Pump**

A. Remove Fuel Pump

<p>EFFECTIVITY  WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  423, 863-866, 869, 871, 872, 886, 887, 893</p>
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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable Pneumatic Crossfeed Lever.

1) Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove plug from center rear of fuel bridle and drain fuel into container.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Remove fuel control. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)

(7) Remove air/fuel heater (PAGEBLOCK 73-14-01/201).

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(8) Disconnect electrical connector from low fuel pressure caution switch.

(9) Remove low fuel pressure caution switch. (Figure 201).

(10) Disconnect connector wiring clamp from right fwd attach bracket on the fuel pressure differential switch.

(11) Disconnect electrical connector from fuel temperature sensor.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(12) Disconnect electrical connector from fuel filter differential pressure switch.

(13) Remove fuel filter differential pressure switch.

(14) Disconnect fuel pressure line from T-fitting on pump filter housing.

(15) Remove T-fitting from pump filter housing. Discard O-ring.

(16) Disconnect fuel discharge line from reducer on pump inlet housing.

(17) Remove reducer from pump inlet housing. Discard O-ring.

(18) Remove fire detection unit. (FIRE PROTECTION, CHAPTER 26)

(19) Disconnect fuel supply bridle.

(20) Loosen bolt securing fuel pump quick disconnect nut. (Figure 201)

### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** DO NOT ALLOW WEIGHT OF FUEL CONTROL AND FUEL PUMP TO BE TRANSMITTED TO PUMP SHAFT DRIVE SPLINES DURING REMOVAL.

- (21) Support fuel pump, then turn accessory drive pad quick disconnect nut counterclockwise (front view) to disengage from mating rear coupling. Carefully pull pump forward until drive shaft is clear of drive splines.
- (22) Remove coupling from fuel pump. Discard O-ring.

### B. Install Fuel Pump

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

#### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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WJE 407, 408, 411, 893 (Continued)

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

- (2) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (4) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (5) Position new gasket, quick-disconnect nut, front coupling, and fire detector support bracket on pump mounting flange. (Position coupling so that bolt hole adjacent to larger dowel pin hole aligns with second hole center clockwise from fuel drain boss in flange outside diameter.) Secure coupling to pump. (Figure 201)

**NOTE:** The bolt used to install the fire detector support bracket must be a longer bolt.

**CAUTION:** ENSURE O-RING IS INSTALLED IN OUTSIDE DIAMETER GROOVE OF FRONT COUPLING.

- (6) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump front coupling. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (7) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump drive shaft.

**CAUTION:** FUEL PUMP DRIVE SPLINES ARE LUBRICATED BY ENGINE OIL WHICH CIRCULATES THROUGH OIL FEED HOLES DRILLED IN ACCESSORY DRIVE GEARSHAFT. USE ONLY ENGINE OIL TO LUBRICATE PUMP AND GEARSHAFT MATING SPLINES. DO NOT USE PLASTILUBE NO. 3 OR SIMILAR LUBRICANTS WHICH MIGHT PLUG OIL FEED HOLES.

- (8) Lightly coat pump shaft splines with engine lubricating oil (P03-001). (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (9) Lightly lubricate threads of gearbox quick-disconnect nut and rear coupling.

**EFFECTIVITY**

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** FUEL PUMP WEIGHS APPROXIMATELY 33.0 POUNDS (14.97 KG). USE CARE WHEN HANDLING PUMP TO AVOID INJURY.

**CAUTION:** SUPPORT FUEL PUMP AND COUPLING SO THAT NO OVERHUNG WEIGHT IS INTRODUCED AT QUICK-DISCONNECT NUT.

- (10) Position fuel pump on accessory drive pad and engage quick-disconnect nut on pump with coupling on accessory drive pad.

**CAUTION:** DO NOT LET WEIGHT OF FUEL CONTROL AND PUMP BE TRANSMITTED TO PUMP SPLINES DURING INSTALLATION.

- (11) Lightly lubricate threads of locking bolt and engage bolt in lug on quick-disconnect nut with nut bracket on accessory drive pad.
- (12) Tighten locking bolt until pump coupling bottoms on accessory drive coupling and dimension of 0.300 to 1.160 inch (8 to 29 mm) is obtained between nut and locking bolt and nut bracket on accessory drive pad. (Figure 201)

**NOTE:** As quick-disconnect nut locking bolt is tightened, an eight-ounce plastic mallet should be used to tap quick-disconnect nut radially around circumference of nut, and circumferentially in tightening direction at locking bolt location.

**CAUTION:** MAKE CERTAIN THAT REAR FACE OF QUICK-DISCONNECT NUT IS NOT TOUCHING FACE OF GEARBOX MOUNTING PAD. GAP BETWEEN NUT AND FACE OF PAD SHALL BE 0.010 INCH (0.254 MM) MINIMUM.

- (13) Torque locking bolt 65 to 85 inch-pounds (7.35 to 9.61 N·m).
- (14) Safety locking bolt with P05-289 lockwire. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
- (15) Install air/fuel heater. (PAGEBLOCK 73-14-01/201)
- (16) Install fuel control. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)
- (17) Position new gasket on fuel pump inlet and connect fuel bridle.
- (18) Install the fire detection unit. (ENGINE FIRE DETECTOR UNITS - MAINTENANCE PRACTICES, PAGEBLOCK 26-10-01/201)
- (19) Lightly lubricate two new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install first O-ring on bolt, then bolt through T-fitting and second O-ring on bolt.
- (20) Install T-fitting on pump filter housing. Torque the bolt 65 in-lb (7.34 N·m) to 75 in-lb (8.47 N·m). Safety bolt with P05-289 lockwire.
- (21) Connect fuel pressure line to T-fitting on pump filter housing.
- (22) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on reducer. Install reducer on pump inlet housing.
- (23) Connect fuel discharge line to reducer on pump inlet housing.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (24) Connect electrical connector to fuel temperature sensor. Safety connector with P05-288 lockwire. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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- (25) Lightly lubricate two new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-rings in counter bored ports on fuel filter.
- (26) Position fuel filter differential pressure switch on fuel filter, locate electrical cable bracket on switch and install switch. Safety bolts with P05-289 lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (27) Connect electrical connector to fuel filter differential pressure switch. Safety connector with P05-288 lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (28) Lightly lubricate new packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, install packing on low fuel pressure switch and install switch on elbow mounted on inlet temperature boss. Torque switch 60 to 70 inch-pounds.
- (29) Safety switch to elbow nut with P05-289 lockwire.
- (30) Connect electrical connector to fuel pressure switch and safety with P05-289 lockwire.
- (31) Install wire clamp at fwd right attach bracket on the fuel pressure differential switch.
- (32) Lightly lubricate new O-ring with sealing ring lubricant (P06-053) and install O-ring on drain plug. Install drain plug in fuel bridle and safety with P05-289 lockwire.
- (33) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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WJE 407, 408, 411, 893 (Continued)

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (34) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (35) Close fire control handle, located on upper instrument panel.
- (36) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.
- (37) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

- (38) Purge Fuel Pump, Fuel Control (PAGEBLOCK 73-12-02/201).

#### 4. Removal/Installation Fuel Pump Filter Cartridge

- A. Remove Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable Pneumatic Crossfeed Lever.

1) Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove filter cover valve from valve body and allow residual fuel to drain from filter. (Figure 203)

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Remove filter cover, pull out filter cartridge.

**EFFECTIVITY**

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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- (7) Make sure that filter cartridge gaskets are on filter cartridge, and do not remain in housing cavity or in cover.
- (8) Discard filter cartridge.

### B. Install Filter Cartridge

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

#### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel, is pulled.

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a “Do Not Operate” tag is attached.

**CAUTION:** IT IS POSSIBLE THAT THE OLD GASKETS FROM THE REMOVED FILTER CARTRIDGE WILL REMAIN IN THE FUEL FILTER HOUSING CAVITY OR COVER. BE SURE YOU EXAMINE THE FILTER CAVITY AND COVER. REMOVE THE OLD FILTER GASKETS FROM THE CAVITY AND COVER IF NECESSARY, OR DAMAGE TO THE ENGINE CAN RESULT.

- (5) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on filter cover.
- (6) Position new filter cartridge on cover assembly and insert into filter housing. Tighten cover 75 to 100 inch-pounds (8.5 to 11.3 N·m).

**NOTE:** Cover installation is critical in the prevention of fuel leaks. Approximately nineteen complete turns of the cover assembly jam nut are required to ensure proper seating of the cover into the filter housing assembly.

- (7) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on cover valve. Install cover valve into valve body and tighten 60 to 80 inch-pounds. Install cotter pin.
- (8) Safety cover with P05-289 lockwire.
- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 402-404, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (10) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (11) Close fire control handle, located on upper instrument panel.
- (12) Remove the “ Do Not Operate” tag from the applicable Pneumatic Crossfeed Lever.
- (13) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

### 5. Check Fuel Pump and Filter

#### A. Check Fuel Pump and Filter

**NOTE:** At initial engine start, the fuel flow indicator may fluctuate due to air in the system. The fuel control will function properly, and the system will clear of air after approximately 3 minutes operation. Exercising the throttle may aid in clearing the system of air.

- (1) Check fuel pump, filter, fuel control, and adjacent area for leaks after first engine run.
- (2) After engine run, remove fuel control main filter (FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-02/201) and check for evidence of contamination. If contamination is present, remove and check fuel pump filter cartridge. (Paragraph 4.)
  - (a) The above step is not required if inspection of the fuel pump filter did not have any contamination. If the condition of the fuel pump filter is not known, the FCU filter must be inspected for contamination after engine run.

EFFECTIVITY

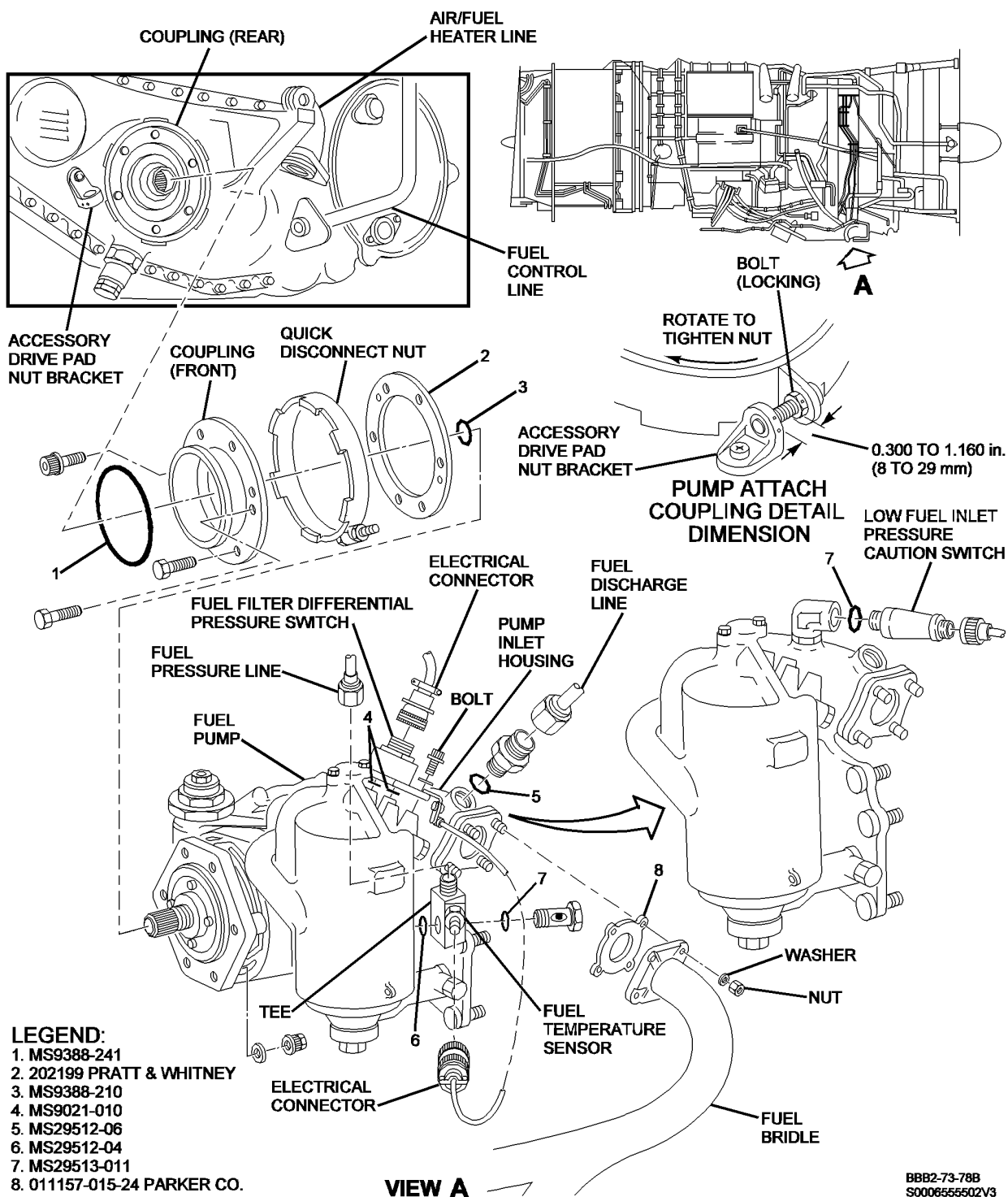
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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BBB2-73-788  
S000655502V3

**Fuel Pump -- Removal/Installation  
Figure 201/73-12-01-990-808**

**EFFECTIVITY**  
 WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
 423, 863-866, 869, 871, 872, 886, 887, 893

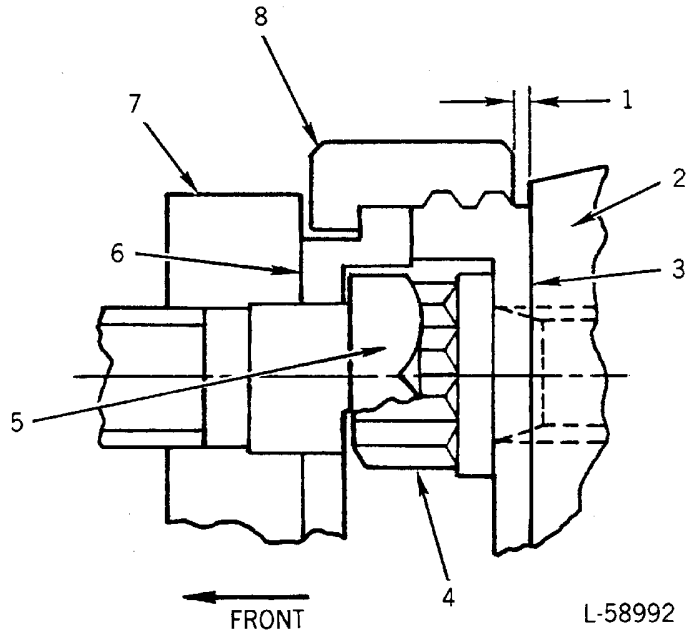
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CROSS-SECTION THRU FUEL PUMP QUICK-DISCONNECT NUT

1. 0.010 INCH (0.254 MM) MINIMUM CLEARANCE
2. GEARBOX SURFACE (FUEL PUMP PAD)
3. QUICK-DISCONNECT REAR COUPLING
4. REAR COUPLING RETAINING BOLTS
5. FRONT COUPLING RETAINING BOLTS
6. QUICK-DISCONNECT FRONT COUPLING
7. FUEL PUMP MOUNTING FLANGE
8. QUICK-DISCONNECT NUT

BBB2-73-2A

**Fuel Pump Quick-Disconnect Coupling and Nut  
Figure 202/73-12-01-990-809**

EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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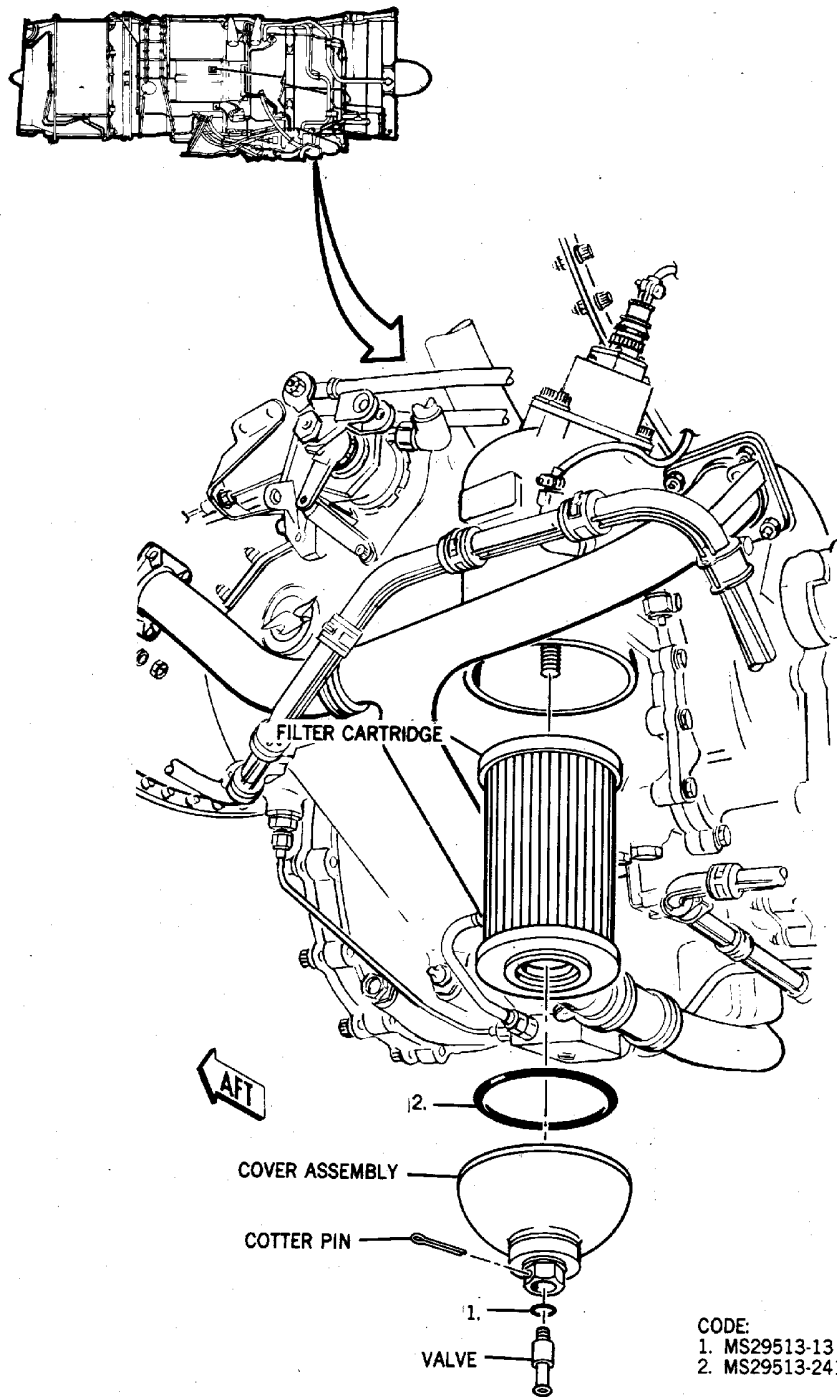
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**Fuel Pump Filter -- Removal/Installation**  
Figure 203/73-12-01-990-810

BBB2-73-6A

EFFECTIVITY  
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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**FUEL PUMP - REMOVAL/INSTALLATION**

**1. General**

A. This procedure contains MSG-3 task card data.

**TASK 73-12-01-901-801**

**2. Inspect for Contamination and Discard the Main Fuel Filter**

NOTE: This procedure is a scheduled maintenance task.

**A. Equipment and Materials**

NOTE: Equivalent substitutes may be used instead of the following listed items.

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Name and Number	Manufacturer
Lockwire, Inconel .032 DPM 684 (NASM20995N)	
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	

**B. Prepare for the Inspection for Contamination and Discard of the Main Fuel Filter**

SUBTASK 73-12-01-941-001

**WARNING**: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING**: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Tag throttle/thrust reverser lever and open these circuit breakers and install safety tags:

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

EFFECTIVITY  
WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain the applicable pneumatic crossfeed lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable pneumatic crossfeed lever.

1) Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

### C. Inspect for Contamination and Discard the Main Fuel Filter

SUBTASK 73-12-01-901-001

(1) Remove filter cover valve from valve body and allow residual fuel to drain from filter. (Figure 401)

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(2) Remove filter cover, pull out filter cartridge.

(3) Make sure that filter cartridge gaskets are on filter cartridge, and do not remain in housing cavity or in cover.

(4) Inspect filter for contamination.

(5) Discard filter cartridge.

EFFECTIVITY  
WJE ALL

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### D. Install Filter Cartridge

SUBTASK 73-12-01-420-001

- (1) Make certain that circuit breakers identified in step B (1) are opened and tagged.

**CAUTION:** IT IS POSSIBLE THAT THE OLD GASKETS FROM THE REMOVED FILTER CARTRIDGE WILL REMAIN IN THE FUEL FILTER HOUSING CAVITY OR COVER. BE SURE YOU EXAMINE THE FILTER CAVITY AND COVER. REMOVE THE OLD FILTER GASKETS FROM THE CAVITY AND COVER IF NECESSARY, OR DAMAGE TO THE ENGINE CAN RESULT.

- (2) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on filter cover.
- (3) Position new filter cartridge on cover assembly and insert into filter housing. Tighten cover 75 to 100 inch-pounds (8.5 to 11.3 N·m).

**NOTE:** Cover installation is critical in the prevention of fuel leaks. Approximately nineteen complete turns of the cover assembly jam nut are required to ensure proper seating of the cover into the filter housing assembly.

- (4) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) engine turbine lubricant and install on cover valve. Install cover valve into valve body and tighten 60 to 80 inch-pounds. Install cotter pin.
- (5) Safety cover with (P05-262) lockwire.

### E. Job Close-up

SUBTASK 73-12-01-942-001

- (1) Remove the tag from throttle/thrust reverser lever and remove the safety tags and close these circuit breakers:

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (2) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (3) Close fire control handle, located on upper instrument panel.
- (4) Remove the "DO NOT OPERATE" tag from the applicable pneumatic crossfeed lever.
- (5) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

### F. Check Differential Fluid Pressure Switch

SUBTASK 73-12-01-710-001

- (1) Do a maintenance operational check of the differential pressure switch.
  - (a) With electrical buses energized, check that applicable fuel filter pressure drop CAUTION light stays off.
  - (b) At next engine run, check that applicable fuel filter pressure drop light stays off.
  - (c) Visually check for leaks on first engine run.

————— **END OF TASK** —————

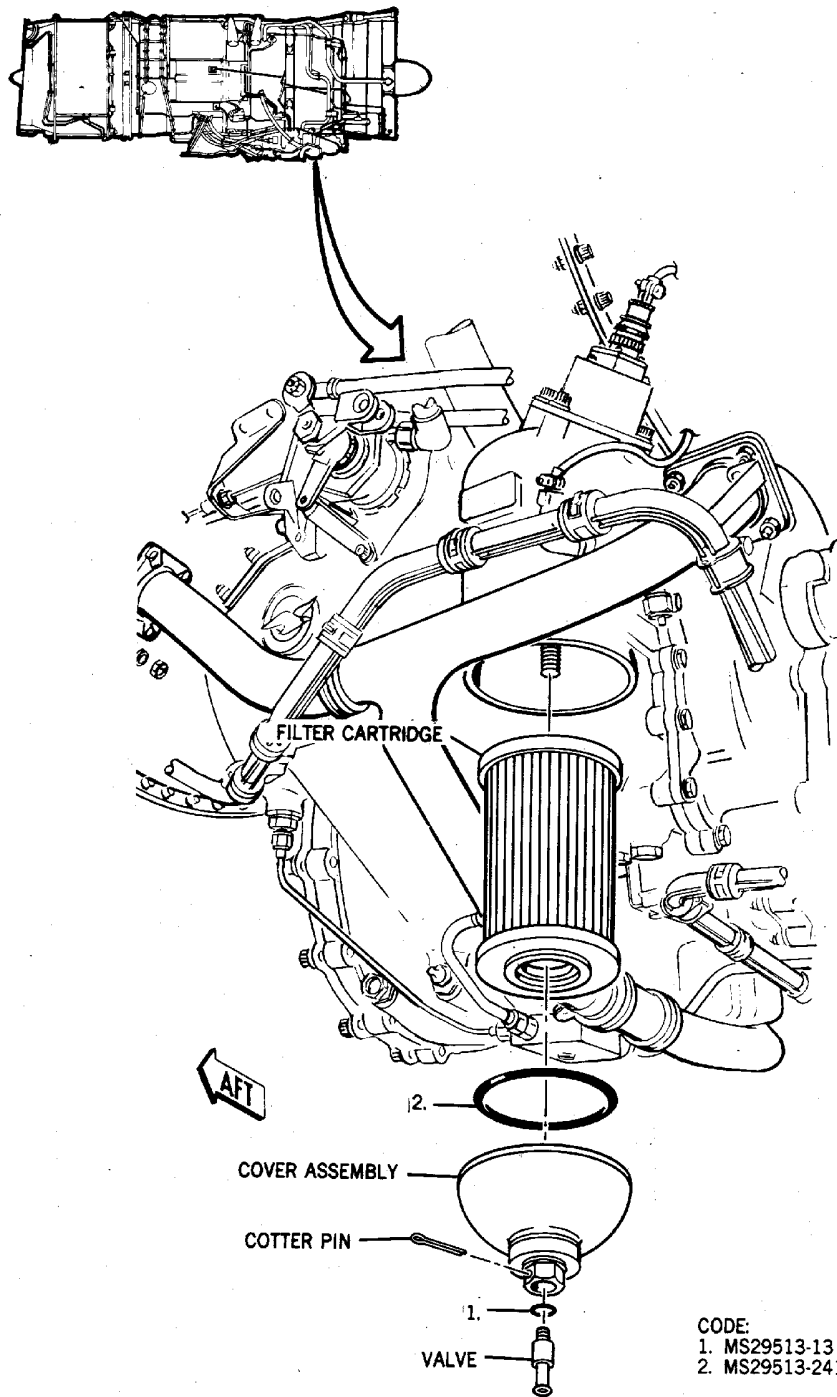
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BBB2-73-6A

Fuel Pump Filter -- Removal/Installation  
Figure 401/73-12-01-990-811

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## FUEL PUMP AND FUEL CONTROL - MAINTENANCE PRACTICES

### 1. General

A. This maintenance practice provides removal/installation instructions for the fuel pump, fuel control and air/fuel heater as a unit, located on the forward right underside of the engine.

NOTE: To remove these units individually, the following sections should be referred to: (FUEL PUMP, SUBJECT 73-12-01) (AIR/FUEL HEATER, SUBJECT 73-14-01) (FUEL CONTROL, SUBJECT 73-20-01)

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the fuel pump, fuel control and air/fuel heater is through the forward lower cowl.

C. Removal/installation procedures for the fuel pump, fuel control and air/fuel heater on left and right engines are identical.

### 2. Equipment and Materials

**CAUTION:** TO PREVENT DAMAGE TO FUEL TUBES AND TO PREVENT CONTAMINANTS FROM ENTERING FUEL SYSTEM, MAKE CERTAIN ALL OPEN TUBES ARE CAPPED.

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

**Table 201**

Name and Number	Manufacturer
Lockwire 0.032 corrosion resistant steel, P05-289	
Lockwire 0 .020 corrosion resistant steel, P05-288	
Lubricant, Sealing Ring (P06-053)	
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Torque wrench (0-50 inch-pounds)	
Torque wrench (0-150 inch-pounds)	
Suitable container approximately 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Silicone oil PCR 52M20 or PCR 52M25 DPM 2327-2	PCR, Inc. Gainesville, FL
Sealant, RTV-159	General Electric Co.
Tag, "Do Not Operate"	

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### 3. Removal/Installation Fuel Pump, Fuel Control, and Air/Fuel Heater Unit

A. Remove Unit (Figure 201 or Figure 202)

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE ALL</b>			
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

#### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

#### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL & HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED.

(3) Pull fire control handle, located on upper instrument panel.

(4) Make certain applicable pneumatic crossfeed lever is in CLOSED position.

(a) Attach "Do Not Operate" tag to applicable pneumatic crossfeed lever. Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove plug from center rear of fuel bridle. Discard O-ring.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

(6) Disconnect fuel shutoff lever and power lever from fuel control.

**NOTE:** Install rig pins (THROTTLE SYSTEMS, SUBJECT 76-11-00, Page 501) and (FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 76-12-00/501) before disconnecting fuel control lever and power lever from control.

(7) Disconnect high-pressure air sense tube from fuel control moisture trap.

(8) Disconnect bleed valve, fuel signal pressure (pdbo) tube, and fuel pressure (pd) tube from fuel control.

(9) Remove fuel outlet tube from fuel control. Discard O-ring.

(10) Remove inlet temperature sensor from engine inlet case.

**NOTE:** The inlet temperature sensor and lead are an integral part of the control. Carefully coil the lead to avoid kinking and wrap the temperature sensor in protective paper.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(11) Disconnect electrical connector from ART indicating switch, ART solenoid and idle solenoid.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(12) Disconnect electrical connector from fuel temperature sensor.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

(13) Disconnect electrical connector from fuel filter differential pressure switch.

(14) On aircraft with SB 73-11 incorporated, disconnect electrical connector from low fuel pressure caution switch. (Figure 201 or Figure 202)

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- (15) On aircraft with SB 73-11 incorporated, remove low fuel pressure caution switch. (Figure 201 or Figure 202)
- (16) On aircraft with SB 73-11 incorporated, disconnect connector wiring clamp from right fwd attach bracket on the fuel pressure differential switch.
- (17) Remove bracket supporting electrical cable from left side of air/fuel heater exhaust duct.
- (18) Remove bolts securing 13th-stage bleed air tube to air/fuel heater.
- (19) Disconnect fuel pressure line from T-fitting on fuel pump filter housing.
- (20) Disconnect fuel discharge line from reducer on fuel pump inlet housing.
- (21) Remove engine fire detection unit. (ENGINE FIRE DETECTOR UNITS - MAINTENANCE PRACTICES, PAGEBLOCK 26-10-01/201)
- (22) Disconnect fuel supply bridle and remove bridle.
- (23) Remove bolts attaching cantilever support to fuel control bracket (leave support rods and adjusters attached to engine). (Figure 203)
- (24) Loosen bolt securing fuel pump quick disconnect nut. (Figure 201 or Figure 202)

**WARNING:** FUEL PUMP AND FUEL CONTROL WEIGHS 71.0 POUNDS (32.20 KG). USE CARE WHEN HANDLING FUEL PUMP AND FUEL CONTROL TO AVOID INJURY.

**CAUTION:** DO NOT ALLOW WEIGHT OF FUEL CONTROL AND FUEL PUMP TO BE TRANSMITTED TO PUMP SHAFT DRIVE SPLINES DURING REMOVAL.

- (25) Support fuel pump and fuel control, then turn accessory drive pad quick-disconnect nut counterclockwise (front view) to disengage from mating rear coupling. Carefully pull pump and control forward until drive shaft is clear of drive splines.

**NOTE:** For further disassembly or removal of unions and fittings, reference should be made to individual component Maintenance Practices.

### B. Install Unit

**NOTE:** Fuel pump, fuel control and fuel/air heater must be completely assembled. Refer to individual component Maintenance Practices for assembly procedures or installation procedures for unions and fittings.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE ALL</b>			
U	40	B1-40	ENGINE START PUMP

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(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (4) Make certain applicable pneumatic crossfeed lever is in CLOSED position and a "Do Not Operate" tag is attached.

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**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1016, OIL/LUBRICATING (DPM 3564)

HAZMAT 1000, REFER TO MSDS

- (5) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump front coupling.

**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1016, OIL/LUBRICATING (DPM 3564)

HAZMAT 1000, REFER TO MSDS

- (6) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring in groove on pump drive shaft.

**CAUTION:** FUEL PUMP DRIVE SPLINES ARE LUBRICATED BY ENGINE OIL WHICH CIRCULATES THROUGH OIL FEED HOLES DRILLED IN ACCESSORY DRIVE GEARSHAFT. USE ONLY ENGINE OIL TO LUBRICATE PUMP AND GEARSHAFT MATING SPLINES. DO NOT USE PLASTILUBE NO. 3 OR SIMILAR LUBRICANTS WHICH MIGHT PLUG OIL FEED HOLES.

- (7) Lightly coat pump shaft splines with engine oil.

- (8) Lightly lubricate threads of gearbox quick-disconnect nut and rear coupling.

**WARNING:** FUEL PUMP AND FUEL CONTROL WEIGHS 71.0 POUNDS (32.20 KG). USE CARE WHEN HANDLING FUEL PUMP AND FUEL CONTROL TO AVOID INJURY.

**CAUTION:** SUPPORT FUEL PUMP AND FUEL CONTROL SO THAT NO OVERHUNG WEIGHT IS INTRODUCED AT QUICK-DISCONNECT NUT.

- (9) Position unit on accessory drive pad and engage quick-disconnect nut on pump with coupling on accessory drive pad.

**CAUTION:** DO NOT LET WEIGHT OF UNIT BE TRANSMITTED TO PUMP SPLINES DURING INSTALLATION.

- (10) Lightly lubricate threads of locking bolt and engage bolt in lug on quick-disconnect nut with nut bracket on accessory drive pad.

- (11) Tighten locking bolt until pump coupling bottoms on accessory drive coupling and dimension of 0.300 to 1.160 inch (7.62 to 29.5 mm) is obtained between nut and locking bolt and nut bracket on accessory drive pad. Figure 201 or Figure 202

**NOTE:** As quick-disconnect nut locking bolt is tightened, an eight-ounce plastic mallet should be used to tap quick-disconnect nut radially around circumference of nut, and circumferentially in tightening direction at locking bolt location.

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**CAUTION:** MAKE CERTAIN THAT REAR FACE OF QUICK-DISCONNECT NUT IS NOT TOUCHING FACE OF GEARBOX MOUNTING PAD. GAP BETWEEN NUT AND FACE OF PAD SHALL BE 0.010 INCH (0.254 MM) MINIMUM (REF. FIGURE 201).

- (12) Torque locking bolt 65 to 85 inch-pounds (7.35 to 9.61 N·m).
- (13) Safety locking bolt with P05-289 0.032 inch lockwire.
- (14) Install and adjust cantilever support as follows (Figure 203):
  - (a) Remove cotter pins from each nut holding support rods to engine brackets and loosen nuts.
  - (b) Remove each adjuster and install with new key washers between jamnuts and adjuster. Center each adjuster on support rod threads within 0.080 inch (2.032 mm). Back off each jamnut from each end of adjusters to allow adjusters to be turned.
  - (c) Connect support rods and adjusters to fuel control bracket (do not torque bolts at this time).
  - (d) Torque each adjuster to 5 to 10 inch-pounds (0.565 to 1.130 N·m).
  - (e) Tighten each jamnut against adjusters and bend tabs of key washers to secure jamnuts (bend one set of tabs onto adjuster and other set onto jamnut).
  - (f) Tighten nuts at engine brackets and at fuel control bracket and secure with cotter pins.
- (15) Install inlet temperature sensor as follows:
  - (a) Clean surfaces of inlet temperature sensor and engine inlet case by SPOP208. (STANDARD PRACTICES - ENGINE - DESCRIPTION AND OPERATION, PAGEBLOCK 70-00-00/001)
  - (b) Install inlet temperature sensor in engine inlet case.

**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1022, SILICONE RTV (DMS QPL 1799)

HAZMAT 1000, REFER TO MSDS

- (c) Apply sealant (RTV-159) to inner surface of inlet case around sensor, sufficiently thick to fill gap all around sensor. (Figure 205)
- (16) Position new gasket on fuel pump inlet and connect fuel bridle.
- (17) Install engine fire detection unit. (ENGINE FIRE DETECTOR UNITS - MAINTENANCE PRACTICES, PAGEBLOCK 26-10-01/201)
- (18) Connect fuel discharge line to reducer on pump inlet housing.
- (19) Connect fuel pressure line to T-fitting on pump filter housing.
- (20) Position and bolt 13th-stage bleed air tube on air/fuel heater and tighten bolts.
- (21) Install bracket supporting electrical cable on left side of air/fuel heater exhaust duct.

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**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUG. DO NOT OVERTIGHTEN.

- (22) Connect electrical connector to fuel filter differential pressure switch. Safety connector with P05-288 0.020 inch lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1016, OIL/LUBRICATING (DPM 3564)

HAZMAT 1000, REFER TO MSDS

- (23) On aircraft with SB 73-11 incorporated, lightly lubricate new packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, install packing on low fuel pressure switch and install switch on elbow mounted on inlet temperature boss. Torque switch 60 to 70 inch-pounds.
- (24) On aircraft with SB 73-11 incorporated, safety switch to elbow nut with P05-289 0.032 inch lockwire.
- (25) On aircraft with SB 73-11 incorporated, connect electrical connector to fuel pressure switch and safety with P05-289 0.032 inch lockwire.
- (26) On aircraft with SB 73-11 incorporated, install wire clamp at fwd right attach bracket on the fuel pressure differential switch.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUG. DO NOT OVERTIGHTEN.

- (27) Connect electrical connector to fuel temperature sensor. Safety connector with P05-288 0.020 inch lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (28) Connect electrical connector on ART indicating switch, ART solenoid, and idle solenoid. Safety connectors with P05-288 0.020 inch lockwire.

**NOTE:** Connector plug is properly installed when no relative motion exists between plug backshell and coupling ring.

**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1016, OIL/LUBRICATING (DPM 3564)

HAZMAT 1000, REFER TO MSDS

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### (WARNING PRECEDES)

- (29) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on fuel control outlet tube. Install fuel outlet tube. Safety bolts with P05-289 0.032 inch lockwire.
- (30) Connect bleed valve, fuel signal pressure (pdbo) tube and fuel pressure (pd) tube to fuel control. Safety tube nuts with P05-289 0.032 inch lockwire.
- (31) Connect high-pressure air sense tube to fuel control moisture trap. Safety tube nut with P05-289 0.032 inch lockwire.
- (32) Fill burner pressure bellows and limiter cavity as follows:
  - (a) Remove plug from end of compressor discharge pressure (CDP) limiter.
  - (b) Remove O-ring from plug and discard O-ring.

**WARNING:** SILICONE OIL IS AN AGENT THAT IS A LOW HAZARD. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN SILICONE OIL IS USED.

- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

**CAUTION:** EXERCISE CARE TO INJECT OIL DOWNWARD INTO CYLINDRICAL PORTION OF BELLOWS CHAMBER CONNECTING UPPER AND LOWER HOUSINGS.

- (c) Fill burner pressure bellows and limiter cavity completely to level of CDP plug port opening with silicone oil (PRC 52M20 or PRC 52M25).
  - (d) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on plug.
  - (e) Install plug in CDP limiter port. Safety plug with P05-289 0.032 inch lockwire.
- (33) Connect fuel shutoff lever and power lever to fuel control. (THROTTLE SYSTEMS, SUBJECT 76-11-00, Page 501) and (FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 76-12-00/501)

**NOTE:** For power lever and fuel shutoff lever rigging procedures, refer to THROTTLE SYSTEMS, SUBJECT 76-11-00, Page 501 and FUEL SHUTOFF SYSTEM - ADJUSTMENT/TEST, PAGEBLOCK 76-12-00/501.

**WARNING:** USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1016, OIL/LUBRICATING (DPM 3564)

HAZMAT 1000, REFER TO MSDS

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**(WARNING PRECEDES)**

- (34) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-ring on drain plug. Install drain plug in fuel bridle. Safety plug with P05-289 0.032 inch lockwire.
- (35) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE ALL</b>			
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

**LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

**LOWER EPC, ENGINE - RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (36) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (37) Place fire control handle in retracted position.
- (38) Remove "Do Not Operate" tag from applicable pneumatic crossfeed lever.
- (39) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

### C. Fuel Control Purging

**NOTE:** This procedure is to be accomplished before engine start whenever the engine fuel system has been serviced, replacement of engine fuel system parts, or when removing or servicing engine fuel screens.

- (1) Place fuel control shutoff levers and ignition selector switches in off position.
- (2) Loosen fuel control bleeder plug sufficiently to bleed air from fuel control.  
**NOTE:** Bleeder plug is located adjacent to engine fuel control trimmer housing on forward end of fuel control. (Figure 201 or Figure 202)
- (3) With suitable container under fuel control, place appropriate aircraft fuel pump switch in on position.
- (4) Allow sufficient fuel and air to flow out of fuel control bleeder plug until only fuel is flowing from bleeder plug.
- (5) Place fuel pump switch in off position, tighten bleeder plug. Safety plug with P05-289 0.032 inch lockwire.
- (6) Run engine, then repeat torquing procedure on quick-disconnect nut. (Paragraph 3.B.(11))
- (7) Visually check for leaks on first engine runup.
- (8) Check engine trim or perform engine trim if fuel control was replaced. (GENERAL, SUBJECT 71-00-00)
- (9) After engine run, remove fuel control main filter if fuel pump was replaced (FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-02/201) and check for evidence of contamination.

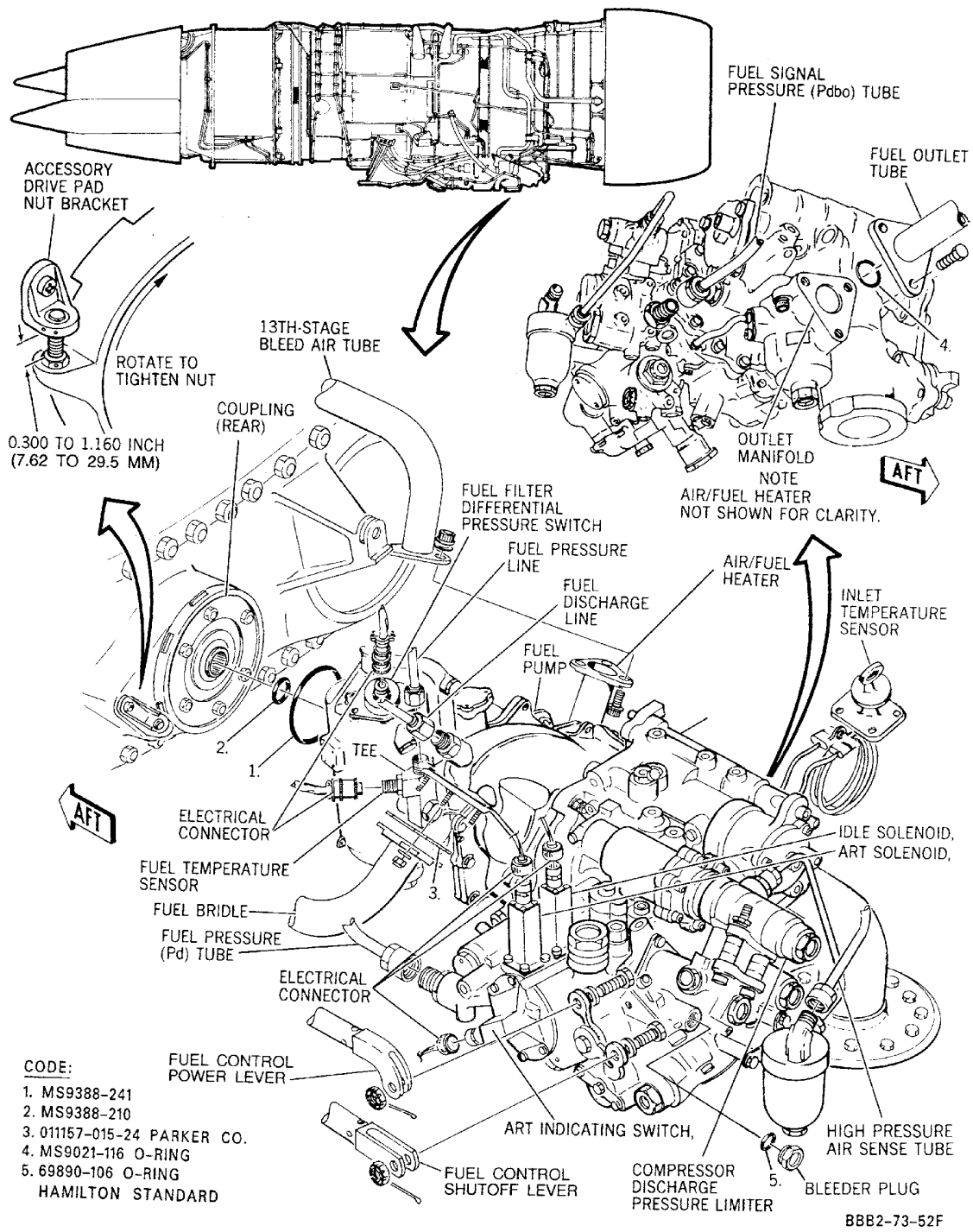
EFFECTIVITY  
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Fuel Pump, Fuel Control and Air/Fuel Heater Unit -- Removal/Installation (Aircraft Without SB 73-11 Incorporated)  
Figure 201/73-12-02-990-801

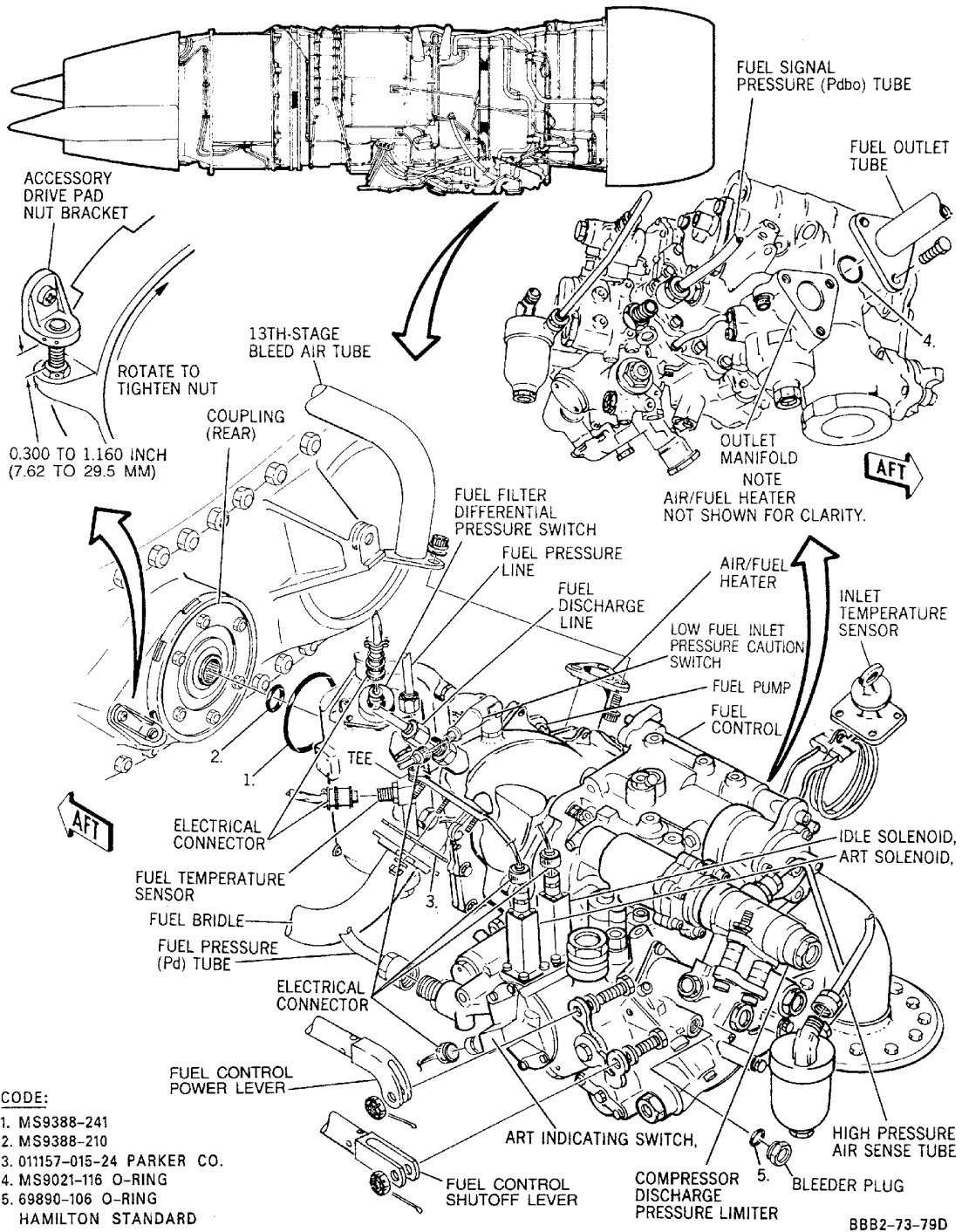
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**Fuel Pump, Fuel Control and Air/Fuel Heater Unit -- Removal/Installation (Aircraft With SB 73-11 Incorporated)**

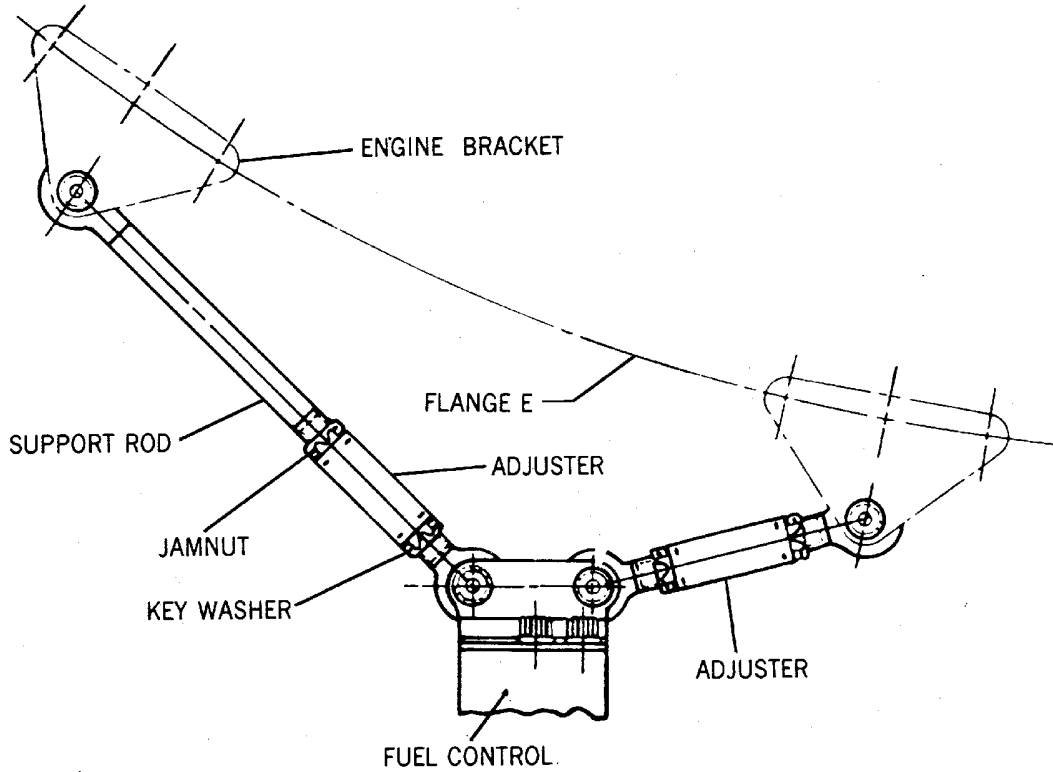
**Figure 202/73-12-02-990-802**

EFFECTIVITY  
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FRONT VIEW OF FUEL CONTROL

L-61686

BBB2-73-37

Fuel Control Cantilever Support -- Removal/Installation  
Figure 203/73-12-02-990-804

EFFECTIVITY  
WJE ALL

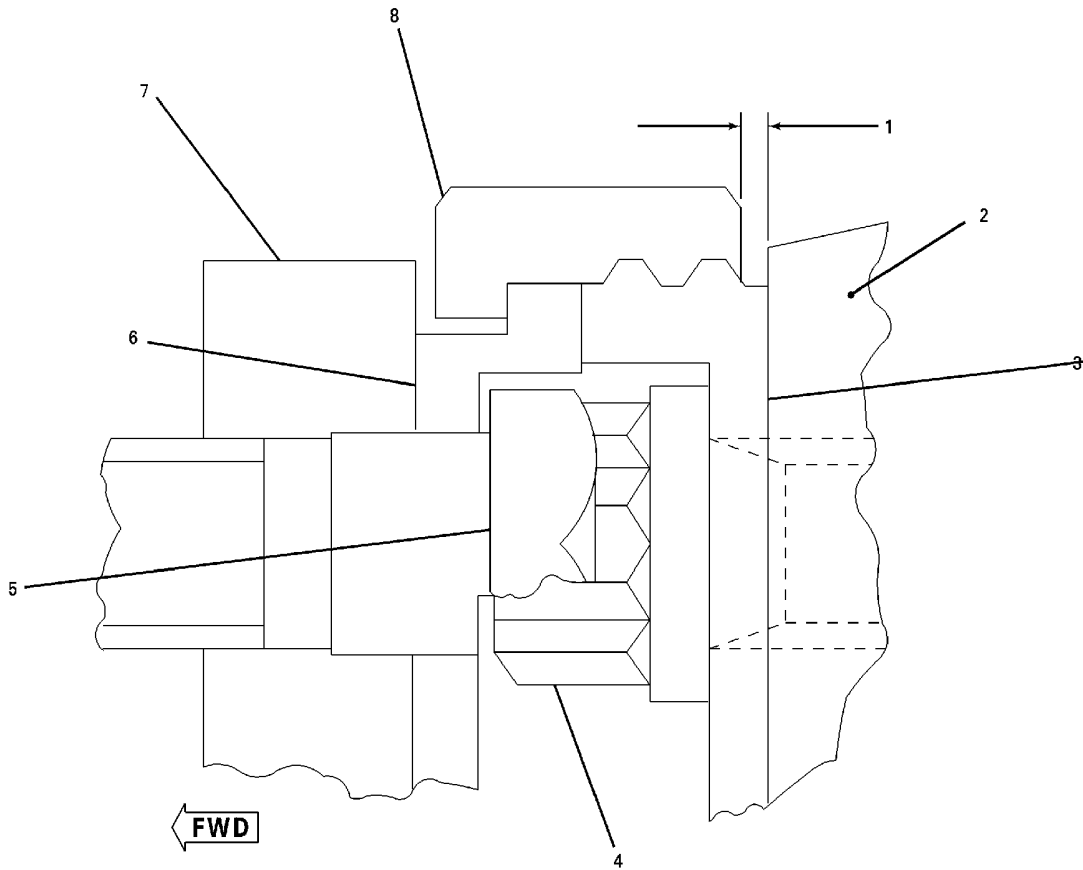
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**CROSS-SECTION THRU FUEL PUMP QUICK-DISCONNECT NUT**

1. 0.010 INCH (0.254 MM) MINIMUM CLEARANCE
2. GEARBOX SURFACE (FUEL PUMP PAD)
3. QUICK-DISCONNECT REAR COUPLING
4. REAR COUPLING RETAINING BOLTS
5. FRONT COUPLING RETAINING BOLTS
6. QUICK-DISCONNECT FRONT COUPLING
7. FUEL PUMP MOUNTING FLANGE
8. QUICK-DISCONNECT NUT

L-58992

CAG(IGDS)

BBB2-73-126

**Fuel Pump Quick-Disconnect Coupling and Nut Assembly  
Figure 204/73-12-02-990-805**

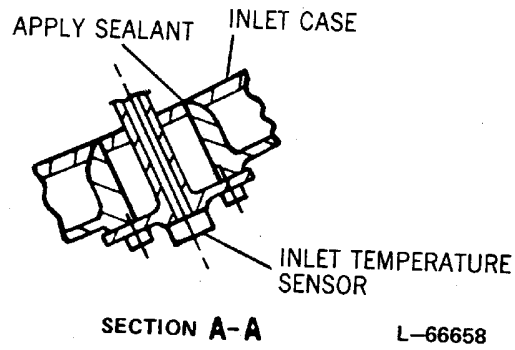
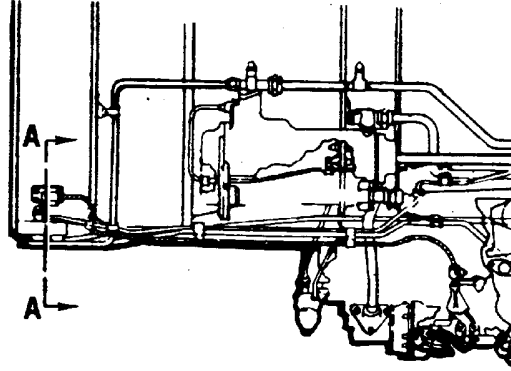
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WJE ALL

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BBB2-73-38

**Inlet Temperature Sensor Sealing**  
Figure 205/73-12-02-990-806

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL PUMP - INSPECTION/CHECK-01

#### 1. Fuel Pump Shaft Removal And Inspection

##### A. Prerequisites

- (1) Remove the fuel pump and fuel control package. (FUEL PUMP AND FUEL CONTROL - MAINTENANCE PRACTICES, PAGEBLOCK 73-12-02/201)

##### B. Equipment And Materials - None

##### C. Procedure (Figure 601)

##### (1) General

- (a) The procedure that follows removes the drive shaft from the fuel pump, gives the drive shaft a spline inspection, and replaces the shaft in the pump after the spline is lubricated.
- (b) If the fuel pump is removed and will go back on an engine to be used again, do this procedure when the fuel pump is removed from the engine and is on a bench.
- (c) Do this inspection and spline lubrication procedure when the fuel pump is removed from the gearbox.

**NOTE:** This procedure is applicable only to fuel pumps that were maintained only with parts and processes approved in the Argo-Tech Overhaul Manual. (FUEL TUBES - MAINTENANCE PRACTICES, PAGEBLOCK 73-11-02/201)

**CAUTION:** MAKE SURE THAT FUEL PUMP PARTS ARE NOT DAMAGED AND THAT CONTAMINATION DOES NOT GET IN THE PUMP DURING THIS PROCEDURE. BE CAREFUL WHEN PUMP PARTS ARE REMOVED OR TOUCHED.

##### (2) Drive shaft removal (Figure 601)

##### (a) Pre-SB 6439 (PN 384300 Pump) (Figure 601 (Sheet 1))

- 1) Remove the four bolts (1) and washers (2), and remove the drive shaft seal assembly (3).
- 2) Remove the packing (4) from the groove in the pump housing.

**CAUTION:** BEFORE YOU REMOVE THE PUMP SHAFT OR ITS MATING PARTS, USE BLUE DYE TO PUT MARKS ON THE SHAFT AND MATING PARTS TO RECORD THEIR RADIAL POSITION. BE SURE TO PUT THESE MARKS ON THE ROTATING SEAL RING (5), INTERNAL DRIVER GEAR (12), AND DRIVE SHAFT (10). KEEP ALL SEAL SHIMS (6) FOUND, AND MAKE SURE THAT THEY GO BACK ON THE DRIVER GEAR AT ASSEMBLY.

- 3) Pull the drive shaft out of the pump.
- 4) Remove the spring washer (9), then remove the rotating seal ring (5), shims (6), outer urethane washer (7), spring (8), and inner urethane washer (7).
- 5) Remove the packing (11) from the internal pump gear (12).
- 6) Put a cover on the pump opening to keep out contamination.

##### (b) Post-SB 6439 (PN 835900 Pump) (Figure 601 (Sheet 2))

- 1) Remove the four bolts (1), and remove the drive shaft seal assembly (2).
- 2) Remove and discard the packing (3) from the groove in the pump housing.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**CAUTION:** BEFORE YOU REMOVE THE PUMP SHAFT OR ITS MATING PARTS, USE BLUE DYE TO PUT MARKS ON THE SHAFT AND MATING PARTS TO RECORD THEIR RADIAL POSITION. BE SURE TO PUT THESE MARKS ON THE ROTATING SEAL RING (4), INTERNAL DRIVER GEAR (12), AND PUMP SHAFT (9). KEEP ALL SEAL SHIMS (5) FOUND, AND MAKE SURE THAT THEY GO BACK ON THE DRIVER GEAR AT ASSEMBLY.

- 3) Pull the drive shaft (9) out of the pump.
  - 4) Remove the retaining ring (10) from the drive shaft (9).
  - 5) Remove the spring washer (8), then remove the rotating seal ring (4), shims (5), outer urethane washer (6), spring (7), and inner urethane washer (6).
  - 6) Remove the packing (11) from the internal pump driver gear (12).
  - 7) Put a cover on the pump opening to keep out contamination.
- (3) Drive shaft inspection. (Figure 602)
- (a) Clean all removed metal parts fully by SPOP 208. Use a brush on unwanted material which is difficult to remove. Dry the parts with filtered compressed air. (STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201)
  - (b) Clean the internal spline of the internal drive gear (12) with a dry cotton swab to remove as much grease as possible.
  - (c) Examine the inner spline of the pump drive shaft (the end that goes in the pump). Use a dial indicator to measure the depth of wear on the spline. Compare worn areas to adjacent spline areas which are not worn. If the spline wear is in the permitted area of the figure, continued fuel pump operation is permitted. If the spline wear is not in the permitted area of the figure, action is necessary to correct why the unsatisfactory driveshaft wear occurred before the engine can continue in service. If there is more than 0.004 inch (0.102 mm) wear on the shaft spline, send the pump assembly to overhaul.

### 2. Fuel Pump Shaft Installation

A. Equipment And Materials Support Equipment:

#### Support Equipment

Name and Number	Manufacturer
Crank, Argo-Tech 207954	

#### Consumable Materials

Reference	Designation
<b>Equivalent substitutes may be used instead of the following listed items:</b>	
<b>It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.</b>	
P06-059 WA 36230	Lubricant, Fluorinated Grease Krytox 283 AD High temperature Anti-corrosion Grease
P06-053 PWA 36500	Lubricant, Sealing Ring
P05-289	Lockwire, 0.032-inch, corrosion resistant steel

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### Expendable Parts

Name and Number	Manufacturer
Packing, PN MS29513-140	
Packing, Argo-Tech PN 94512-23	

B. Procedure (Figure 601).

(1) Pre-SB 6439 (Figure 601 (Sheet 1))

- (a) Install the retaining washer (9) on the internal driver gear (12). Install the packing (11) (Argo-Tech PN 94512-23), lubricated with PWA 36500 lubricant, in the groove of the gear.
- (b) Assemble all shims (6) found at disassembly, the outer urethane washer (7), spring (8), and the inner urethane washer (7) on the rotating seal ring (5). Put the rotating seal ring and its shims, washers, and spring on the outer end (small spline) of the pump drive shaft.

**WARNING:** REFER TO THE MANUFACTURER/SUPPLIER'S MATERIAL SAFETY DATA SHEET FOR INSTRUCTIONS ON HOW TO USE KRYTOX 283AD SAFELY.

- (c) Apply four grams of Krytox 283AD lubricant to the inner (rear) end of the drive shaft. Install the drive shaft (with the rotating seal ring assembly) carefully into the driver gear (12). Engage the seal ring with the internal driver gear (in the same radial position as it was at disassembly). Make sure that the shims (6) and the inner and outer washers (7) stay in the correct position as shown in (Figure 601 (Sheet 3)), and make sure that the packing (11) in the driver gear groove is not pushed out of position.

NOTE: Krytox 283AD is available from Dupont Corporation, Wilmington, DE 19898.

- (d) Install a new packing, ( MS29513-140), lubricated with PWA 36500 lubricant, on the outer seal assembly (3). Install the seal assembly around the outer end of the drive shaft and attach it with four bolts (1) and washers (2). Torque the bolts to 25-30 in-lb. (111.2 - 133.4 N·m). Safety the bolts with lockwire.
- (e) When the assembly is completed, use Argo-Tech tool 207954 Crank, to turn the pump through the shaft. Make sure that the shaft turns freely and does not rub. If there is too much friction, or if the shaft rubs against adjacent parts, send the pump to overhaul.

(2) Post-SB 6439 (Figure 601 (Sheet 2))

- (a) Install the retaining washer (8) on the internal driver gear (12). Install the packing (11) (Argo-Tech PN 94512-23), lubricated with PWA 36500 lubricant, in the groove of the gear.
- (b) Assemble all shims (5) found at disassembly, the outer urethane washer (6), spring (7), and the inner urethane washer (6) on the rotating seal ring (4). Put the rotating seal ring and its shims, washers, and spring on the outer end (small spline) of the pump drive shaft.

**WARNING:** REFER TO THE MANUFACTURER/SUPPLIER'S MATERIAL SAFETY DATA SHEET FOR INSTRUCTIONS ON HOW TO USE KRYTOX 283AD SAFELY.

- (c) Apply four grams of Krytox 283AD lubricant to the inner (rear) end of the drive shaft. Install the drive shaft (with the rotating seal ring assembly) carefully into the driver gear (12). Engage the seal ring with the internal driver gear (in the same radial position as it was at disassembly). Make sure that the shims (5) and the inner and outer washers (6) stay in the correct position as shown in (Figure 601 (Sheet 3)), and make sure that the packing (11) in the driver gear groove is not pushed out of position.

NOTE: Krytox 283AD is available from Dupont Corporation, Wilmington, DE 19898.

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- (d) Install a new packing, (PN MS29513-140), lubricated with PWA 36500 lubricant, on the outer seal assembly (2). Install the seal assembly around the outer end of the drive shaft and attach it with four bolts (1). Torque the bolts to 25-30 in-lb. (111.2 - 133.4 N·m). Safety the bolts with lockwire.
- (e) When the assembly is completed, use Argo-Tech tool 207954 Crank, to turn the pump through the shaft. Make sure that the shaft turns freely and does not rub. If there is too much friction, or if the shaft rubs against adjacent parts, send the pump to overhaul.
- (3) When the assembly is completed, use Argo-Tech tool 207954 Crank, to turn the pump through the shaft. Make sure that the shaft turns freely and does not rub. If there is too much friction, or if the shaft rubs against adjacent parts, send the pump to overhaul.

**C. Postrequisites**

- (1) Install the fuel pump and fuel control package. (FUEL PUMP AND FUEL CONTROL - MAINTENANCE PRACTICES, PAGEBLOCK 73-12-02/201)

**Key To Sheet 1 of Figure**

1.	Bolt (4)
2.	Washer (4)
3.	Seal Assembly
4.	Packing
5.	Rotating Seal Ring
6.	Shim (As Necessary)
7.	Urethane Washer (Inner and Outer)
8.	Spring
9.	Retaining Washer
10.	Drive Shaft
11.	Packing
12.	Internal Driver Gear Key

**Key To Sheet 2 of Figure**

1.	Bolt (4)
2.	Seal Assembly
3.	Packing
4.	Rotating Seal Ring
5.	Shim (As Necessary)
6.	Urethane Washer (Inner and Outer)
7.	Spring
8.	Retaining Washer
9.	Drive Shaft
10.	Retaining Ring
11.	Packing

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WJE ALL

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**Key To Sheet 2 of Figure (Continued)**

12.	Internal Driver Gear Key
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EFFECTIVITY  
WJE ALL

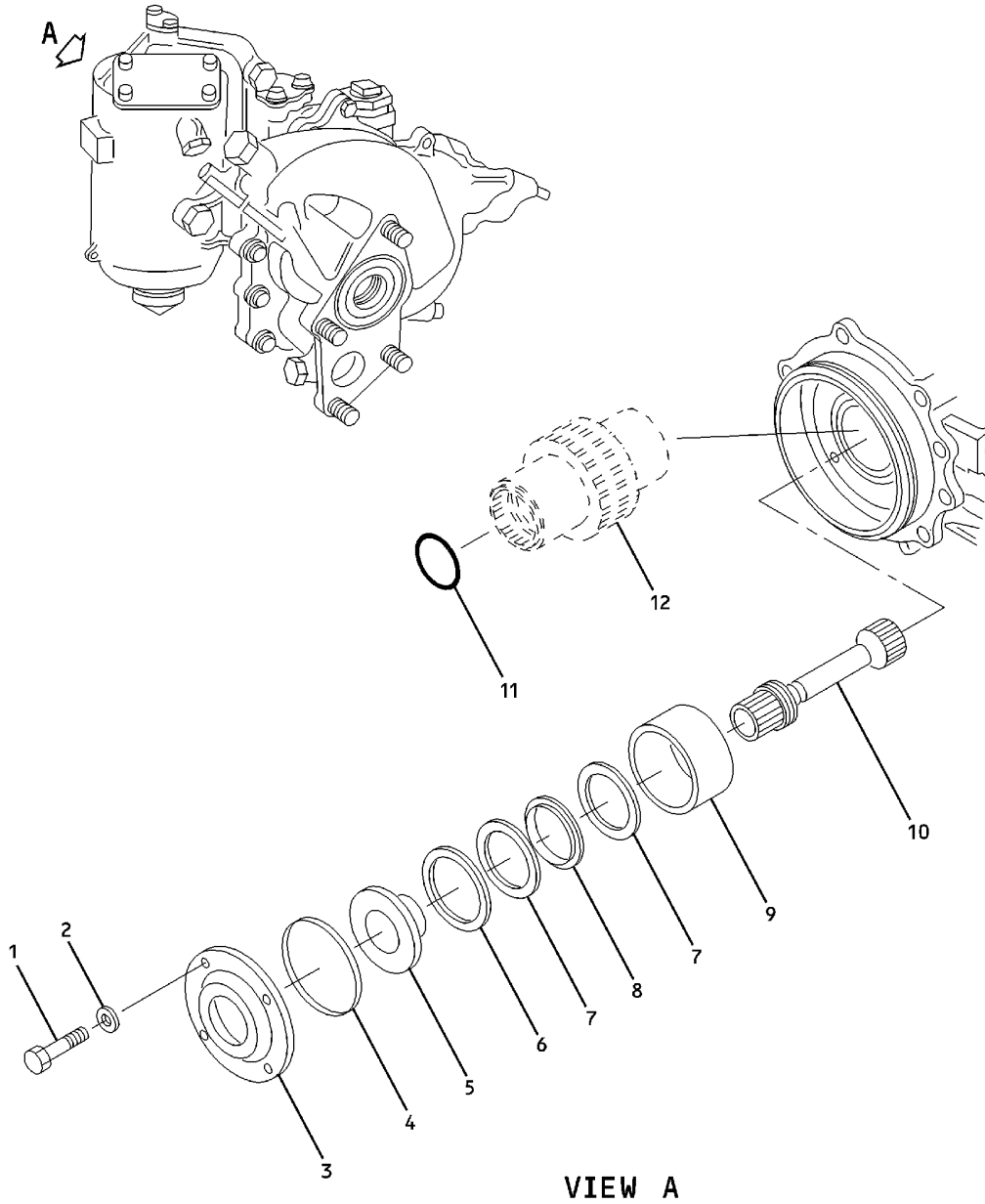
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



L-H3944 (0799)  
PW V

CAG(IGDS)

BBB2-73-144

## Fuel Pump Drive Shaft Removal/Installation Figure 601/73-12-03-990-801 (Sheet 1 of 3)

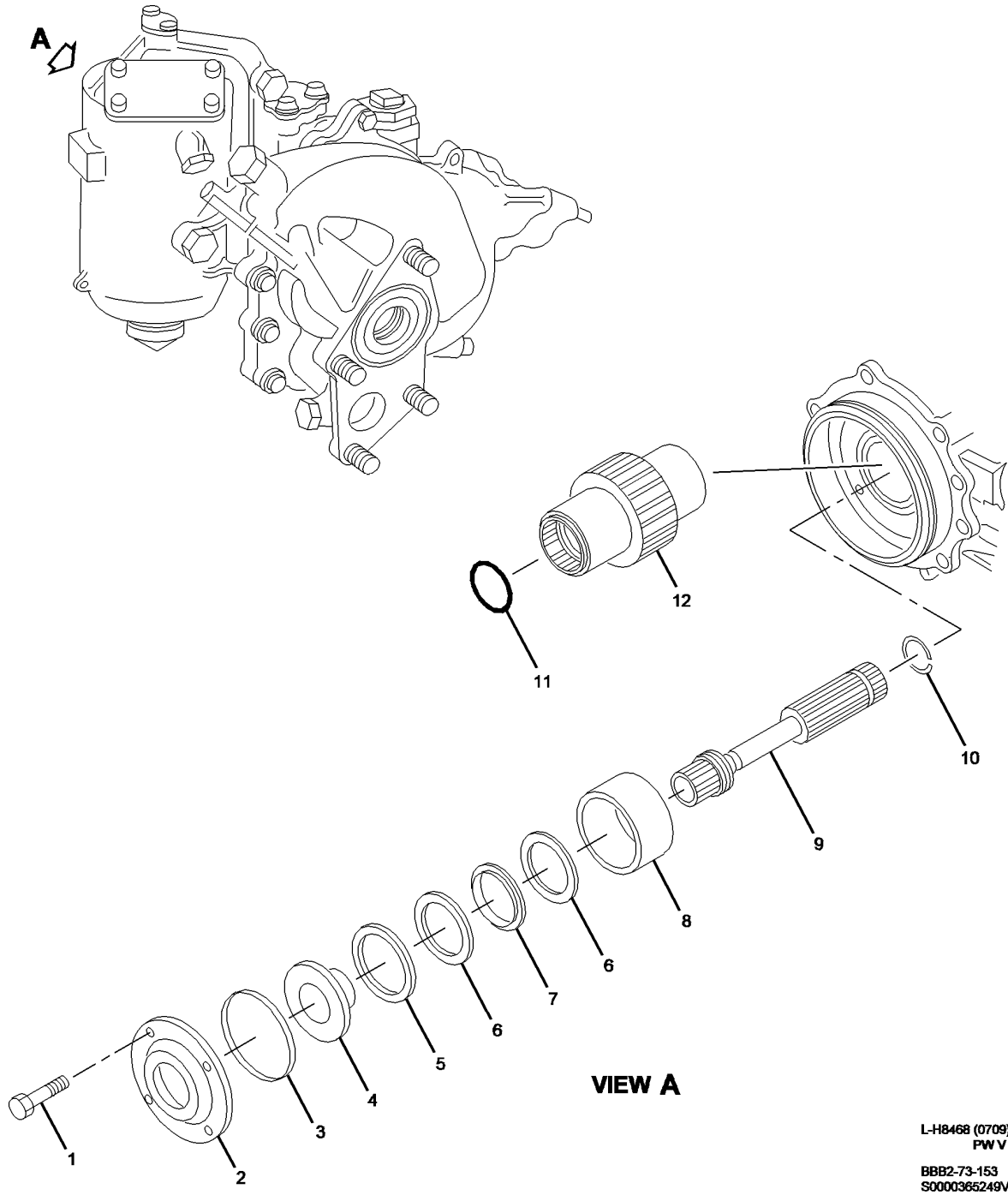
EFFECTIVITY  
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Fuel Pump Drive Shaft Removal/Installation  
Figure 601/73-12-03-990-801 (Sheet 2 of 3)

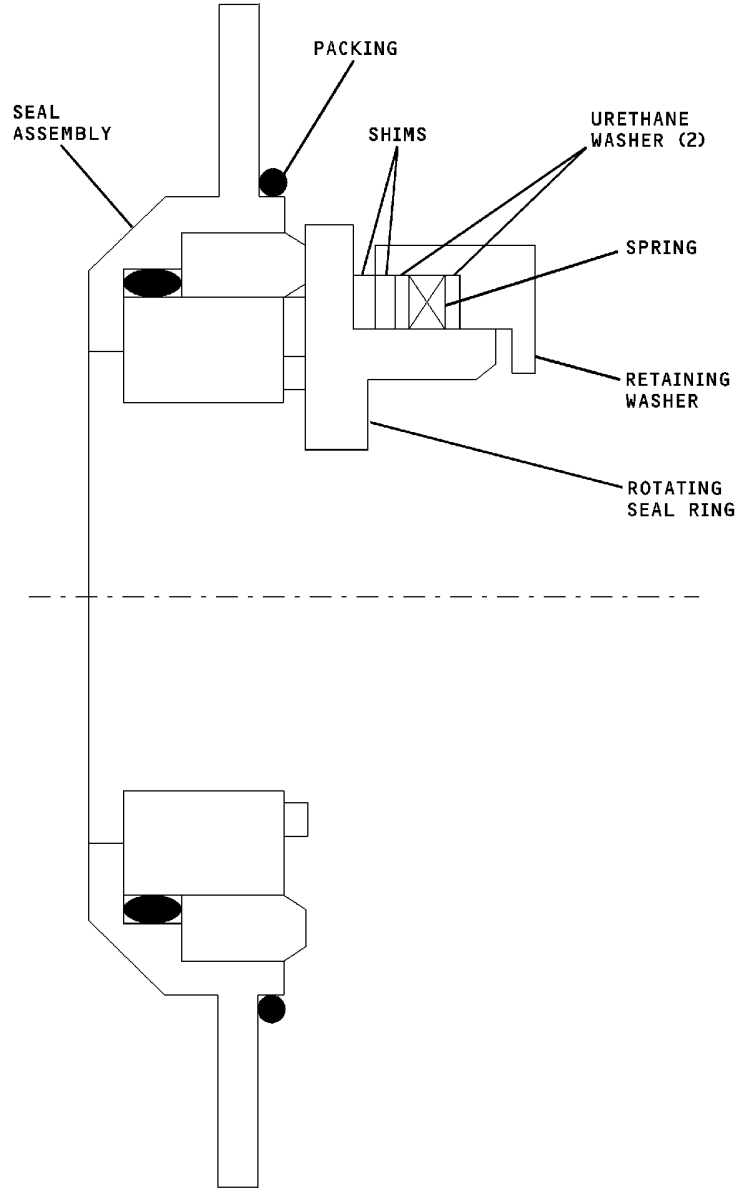
EFFECTIVITY  
WJE ALL

TP-80MM-WJE

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



L-H3946 (0799)  
PW V

CAG(IGDS)

BBB2-73-145

**Fuel Pump Drive Shaft Removal/Installation**  
**Figure 601/73-12-03-990-801 (Sheet 3 of 3)**

EFFECTIVITY  
WJE ALL

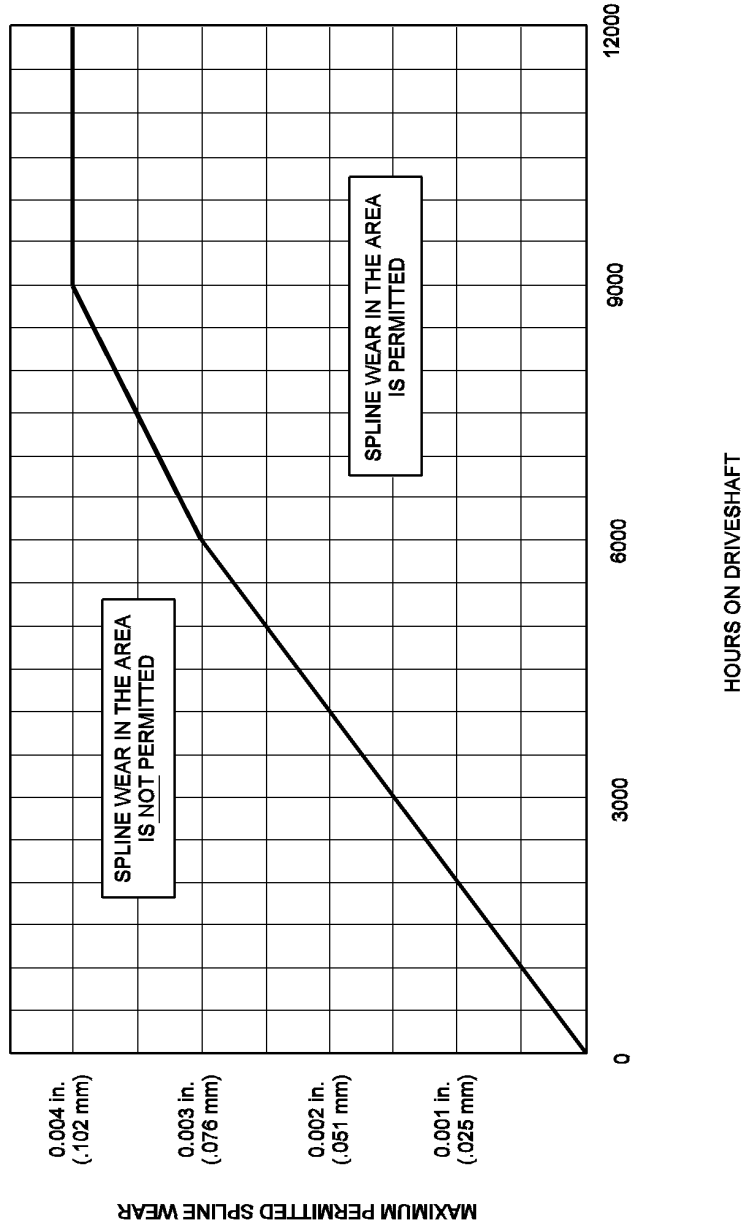
TP-80MM-WJE

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**MAIN FUEL GEAR PUMP DRIVESHAFT EXTERNAL SPLINE WEAR INSPECTION  
HOURS ON DRIVESHAFT VS. MAXIMUM PERMITTED WEAR LIMIT**



L-H8372 (0108)  
PW V

BBB2-73-53  
S0000328023V1

**Fuel Pump Drive Shaft Wear Limits  
Figure 602/73-12-03-990-802**

EFFECTIVITY  
WJE ALL

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**73-12-03**

## MD-80 AIRCRAFT MAINTENANCE MANUAL

### EDUCTOR VALVE - MAINTENANCE PRACTICES

**1. General**

A. This maintenance practice provides removal/installation instructions for the eductor valve located on the right side of the engine. (Figure 201)

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the eductor valve is through the forward lower cowling.

C. Removal and installation procedures for the eductor valve on left and right engines are identical.

**2. Equipment and Materials**

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

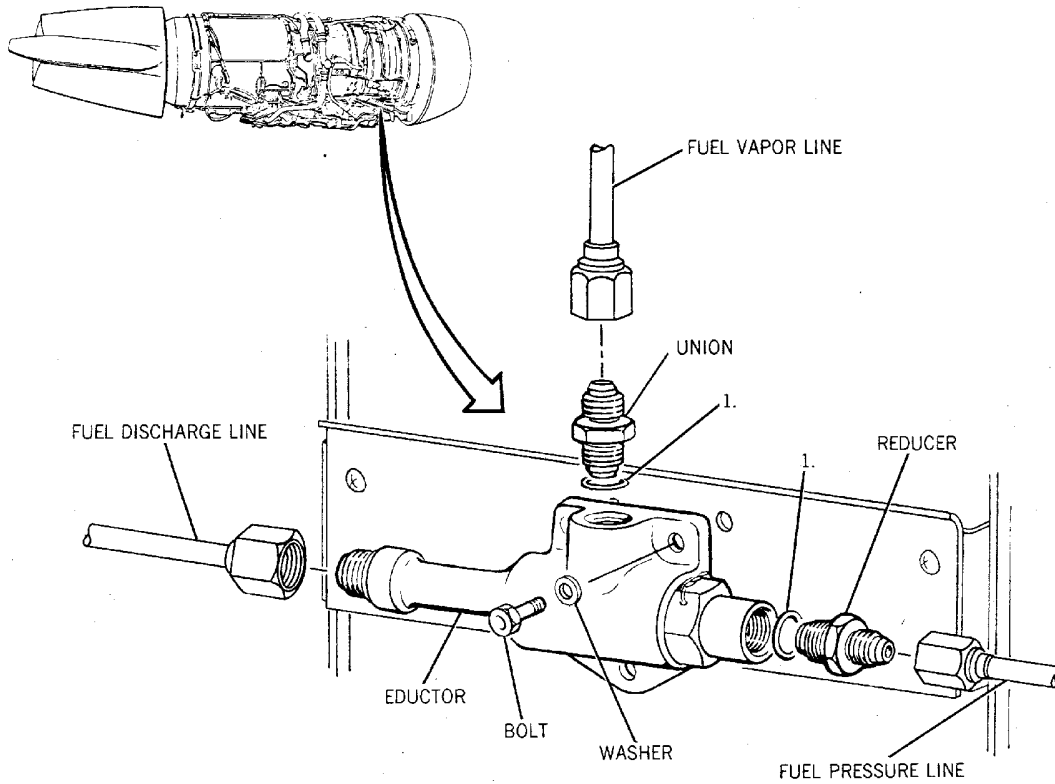
Name and Number	Manufacturer
Petrolatum VV-P-236	

EFFECTIVITY  
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**73-13-01**

# MD-80 AIRCRAFT MAINTENANCE MANUAL



CODE:  
1. MS29512-06 O-RING

BBB2-73-19A

**Eductor Valve -- Removal/Installation**  
**Figure 201/73-13-01-990-801**

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### 3. Removal/Installation Eductor Valve

#### A. Remove Valve

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**CAUTION:** TAKE CARE NOT TO DAMAGE FUEL LINES WHEN REMOVING EDUCTOR. IF NECESSARY, LOOSEN FUEL LINE SUPPORT CLAMPS TO EASE EDUCTOR REMOVAL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.
- (3) Disconnect fuel vapor line from top of valve.
- (4) Disconnect fuel pressure line from forward end of valve.
- (5) Disconnect fuel discharge line from aft end of valve.
- (6) Remove valve from mounting bracket.
- (7) Remove union and reducer from valve. Discard O-rings.

#### B. Install Valve

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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**CAUTION:** TAKE CARE NOT TO DAMAGE FUEL LINES WHEN INSTALLING EDUCATOR. IF NECESSARY, LOOSEN FUEL SUPPORT CLAMPS TO CORRECTLY POSITION LINES BEFORE TIGHTENING.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Lightly lubricate O-ring with petrolatum (VV-P-236), install O-ring on union and install union in valve fuel vapor inlet port.
- (4) Lightly lubricate O-ring with petrolatum (VV-P-236), install O-ring on reducer and install reducer in valve fuel pressure (primary nozzle) inlet port.
- (5) Install valve on mounting bracket; do not tighten bolts.
- (6) Connect fuel pressure line to valve fuel pressure (primary nozzle) inlet.
- (7) Connect fuel discharge line to valve.
- (8) Connect fuel vapor line to valve.
- (9) Tighten valve mounting bolts.
- (10) Remove tools, equipment, loose hardware, spilled fluids, and debris from maintenance area.

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- (11) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (12) Remove safety pin from thrust reverser control valve. Stow safety pin.

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### FUEL PRESSURIZING AND DUMP VALVE - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation, check and cleaning/painting instructions for fuel pressurizing and dump valve located on the left side of the engine.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the valve is through the forward lower cowl door.  
 C. Removal, installation, check, and cleaning procedures for the valve on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lockwire, 0.032- inch, corrosion resistant steel, P05-289	
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Stoddard solvent P-D-680, Type 1	
Sulphuric acid	
Sodium dichromate	
Source of clean dry compressed air	

#### 3. Removal/Installation Fuel Pressurizing and Dump Valve

- A. Remove Valve  
 (1) Tag throttle/thrust reverser lever.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Open these circuit breakers:

##### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT

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WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.
- (4) Disconnect fuel/oil cooler tube. Discard packing.
- (5) Disconnect primary manifold tube. Discard packing.
- (6) Disconnect secondary manifold tube. Discard packing.
- (7) Remove plug from valve. Discard O-ring.
- (8) Remove valve from engine.
- (9) Remove reducer and adapters from valve. Discard O-rings.

#### B. Install Valve

- (1) Make sure that the throttle/thrust reverser lever is tagged.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make sure that these circuit breakers are open:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (4) Lightly lubricate O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, install O-rings on reducer and install reducer in valve.
- (5) Lightly lubricate O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, install O-ring on adapters and install adapters in valve.
- (6) Install valve on engine.
- (7) Lightly lubricate O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install O-ring on plug and install plug in valve. Safety plug with P05-289 lockwire.
- (8) Lightly lubricate packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine, or (P03-001) lubricant engine turbine. Install ferrule, packing and retainer and connect fuel/oil cooler tube to valve. Torque nut 75 to 85 inch-pounds. Safety nut and reducer with P05-289 lockwire.
- (9) Lightly lubricate packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install packing and retainer and connect primary manifold tube to valve. Torque nut 55 to 60 inch-pounds. Safety adapter with P05-289 lockwire.
- (10) Lightly lubricate packing with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine. Install packing and retainer and connect secondary manifold tube to valve. Torque nut 65 to 70 inch-pounds. Safety nut and adapter with P05-289 lockwire.
- (11) Remove tag from throttle/thrust reverser lever.

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- (12) Close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (13) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (14) Perform test C (ENGINE GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 72-00-00/501 Config 5 or ENGINE GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 72-00-00/501 Config 2 or ENGINE GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 72-00-00/501 Config 3 or ENGINE GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 72-00-00/501 Config 4 or ENGINE GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 72-00-00/501 Config 1).

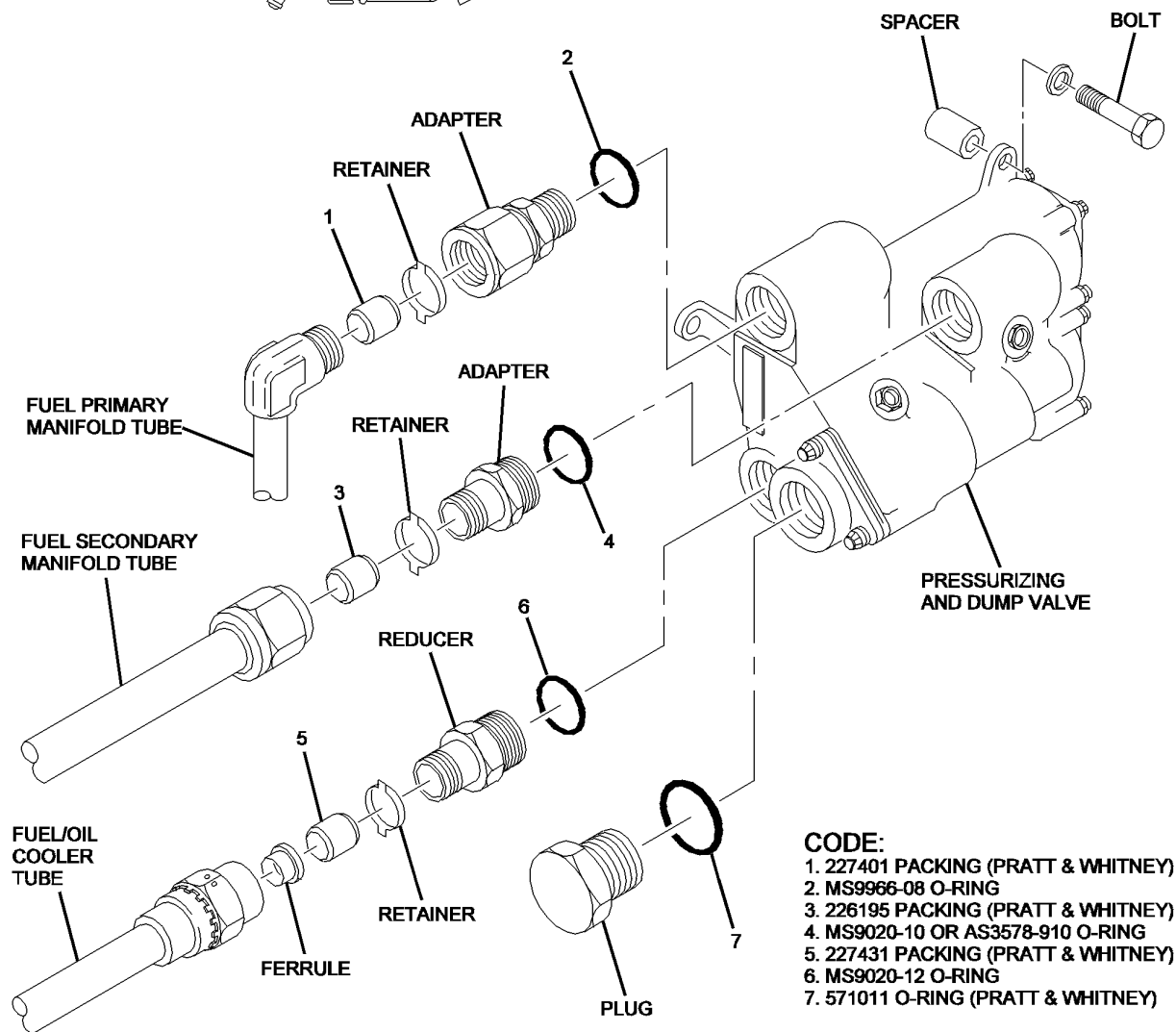
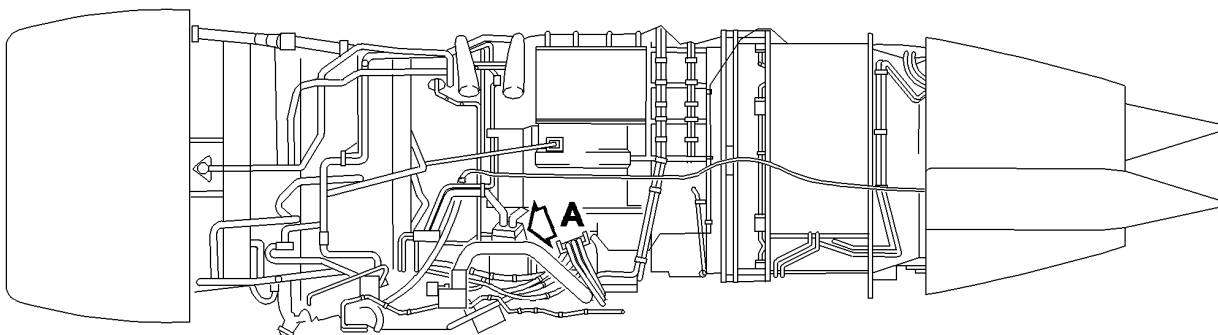
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- CODE:**
- 1. 227401 PACKING (PRATT & WHITNEY)
  - 2. MS9966-08 O-RING
  - 3. 226195 PACKING (PRATT & WHITNEY)
  - 4. MS9020-10 OR AS3578-910 O-RING
  - 5. 227431 PACKING (PRATT & WHITNEY)
  - 6. MS9020-12 O-RING
  - 7. 571011 O-RING (PRATT & WHITNEY)

**VIEW A**

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**Fuel Pressurizing and Dump Valve -- Removal/Installation  
Figure 201/73-13-05-990-801**

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### 4. Removal/Installation Pressurizing and Dump Valve Strainer

#### A. Remove Strainer

- (1) Tag throttle/thrust reverser lever.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Open these circuit breakers:

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.
- (4) Remove cover with strainer from valve.
- (5) Remove strainer from cover.

#### B. Install Strainer

- (1) Make sure that the throttle/thrust reverser lever is tagged.

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**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make sure that these circuit breakers are open:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (4) Position spring, strainer, and retaining collar on cover and secure with cotter pin.
- (5) Lightly lubricate O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install in cover groove.
- (6) Position cover and strainer in valve housing. Ensure end of rod is engaged in guide and install cover.
- (7) Remove tag throttle/thrust reverser lever.
- (8) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT

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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (9) Remove safety pin from thrust reverser control valve. Stow safety pin.

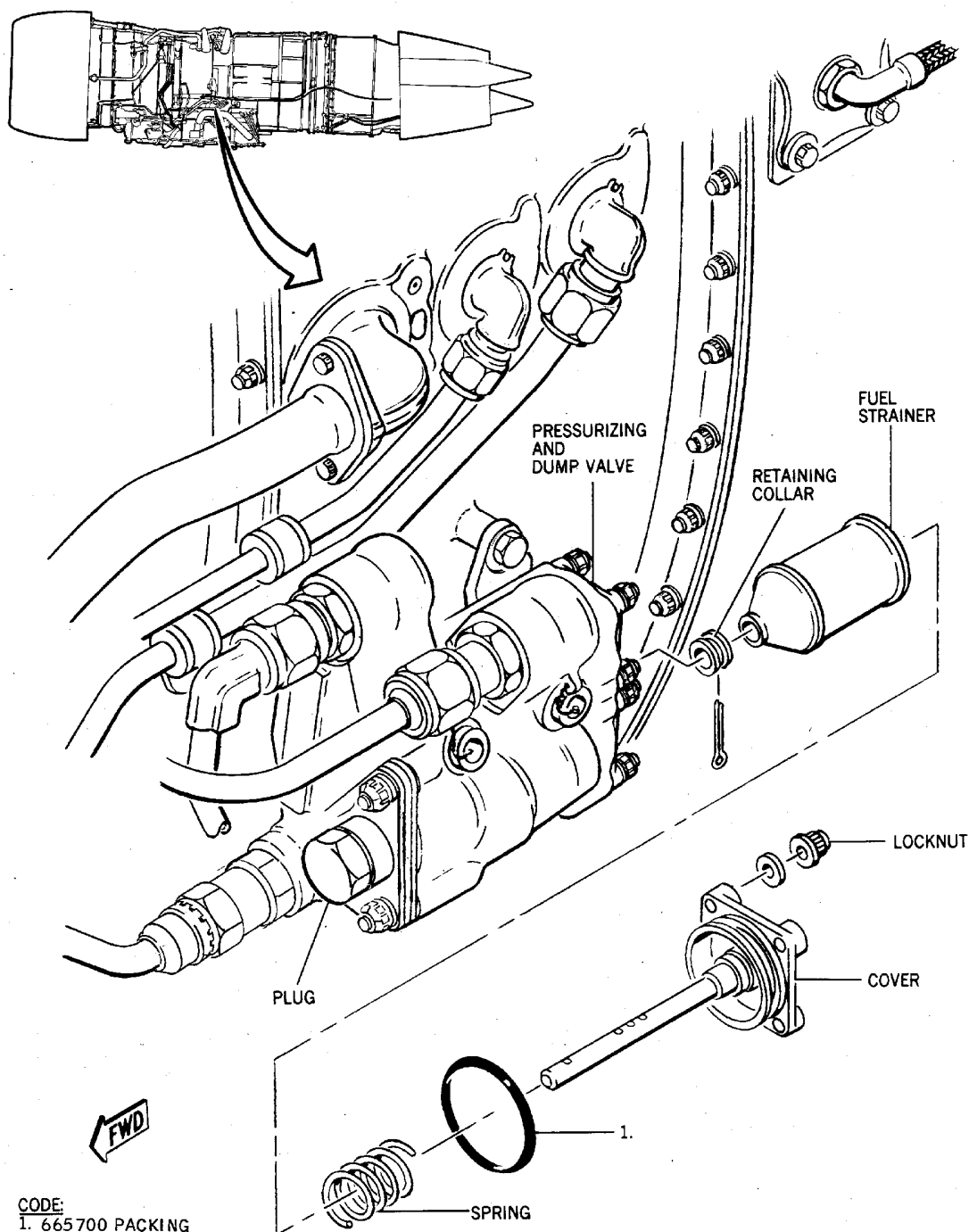
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WJE ALL

TP-80MM-WJE

**73-13-05**

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-10B

Fuel Pressurizing and Dump Valve Strainer -- Removal/Installation  
Figure 202/73-13-05-990-802

EFFECTIVITY  
WJE ALL

## 73-13-05

## MD-80 AIRCRAFT MAINTENANCE MANUAL

### 5. Check Pressurizing and Dump Valve and Strainer

#### A. Check Valve and Strainer

- (1) Check valve and strainer for leaks upon first engine runup.

### 6. Cleaning/Painting Pressurizing and Dump Valve Strainer

#### A. Clean Strainer

- (1) Immerse and agitate clogged strainer screen in Stoddard solvent (P-D-680, Type 1) to remove bulk of contamination.

**WARNING:** SOLUTION IS AN EXTREMELY STRONG AGENT THAT WILL CAUSE SEVERE BURNS. EYE PROTECTION AND PROTECTIVE CLOTHING MUST BE WORN.

- (2) Immerse strainer screen in a saturated solution of one liter of sulphuric acid and 20 grams of sodium dichromate, for 1 minute.

**NOTE:** It may be necessary to heat the solution to 150°F (66°C) to dissolve the crystals.

- (3) Rinse strainer thoroughly in clean warm water.
- (4) Thoroughly dry strainer with clean dry compressed air with pressure not exceeding 30 psi.

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WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL DEICING SYSTEM - DESCRIPTION AND OPERATION

#### 1. General

- A. The fuel deicing system consists of an air/fuel heater, air shutoff valve, fuel heat switch, and timer.
- B. The air/fuel heater is connected to the left side of the engine-driven fuel pump between the centrifugal boost stage and high-pressure gear stage. The heater functions as a heat exchanger using high-pressure compressor bleed air to heat the fuel. The heater has a bypass valve which opens in event of restriction of fuel flow through heater.
- C. The air shutoff valve is located on the forward lower right side of the engine. The valve controls the supply of high-pressure compressor bleed air to the air/fuel heater.
- D. A momentary on switch controls the position of air shutoff valve through a 60-second timer. The switch is located on the forward overhead panel in the flight compartment. The timer is located on the relay panel at station 110.

#### 2. Operation

- A. When a pressure drop across the filter, caused by ice or other foreign matter, is sensed by the differential fluid pressure switch, a caution light on the annunciator panel in the flight compartment comes on.
- B. The fuel deicing system is activated when the fuel heat switch is placed in the on position and then released. The timer is energized, 115-volt ac is supplied to the open winding of the air shutoff valve motor, and the motor opens the valve. As the valve starts to open, a switch closes to complete a circuit to the fuel heat indicator light on the annunciator panel, causing the light to come on. When the valve reaches the open position, a switch opens the circuit to the motor. At the same time, warm engine bleed air passes through the valve and circulates through the heater tubes to heat the fuel which is baffled around the tubes. The warm air circulates through the heater for a 60-second period, allowing the heated fuel to melt any ice within the filter. When the ice melts, the pressure drop across the fuel filter decreases and the caution light on the annunciator panel goes off. After a 60-second period, the timer closes the circuit from the fuel heat switch to the close winding of the air shutoff motor, and the valve moves to the closed position. The fuel heat light goes off when the valve reaches the closed position.

EFFECTIVITY  
WJE 401-404, 410, 412, 414, 880, 886, 887, 892, 893

TP-80MM-WJE

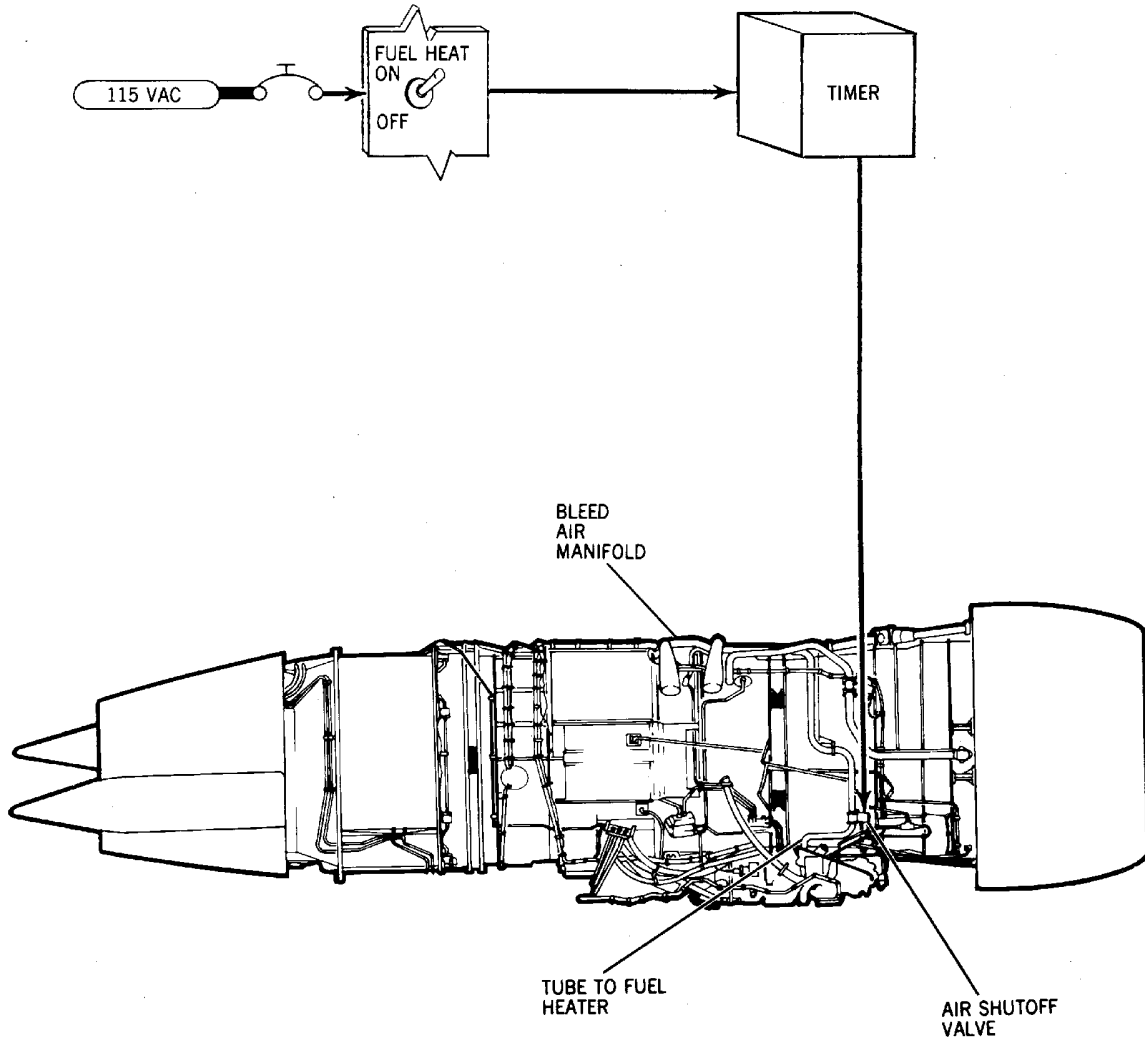
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-12A

**Fuel Deicing System**  
Figure 1/73-14-00-990-801

EFFECTIVITY  
WJE 401-404, 410, 412, 414, 880, 886, 887, 892, 893

TP-80MM-WJE

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## 73-14-00

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL DEICING SYSTEM - DESCRIPTION AND OPERATION

#### 1. General

- A. The fuel deicing system consists of an air/fuel heater, air shutoff valve, fuel heat switch, and timer.
- B. The air/fuel heater is connected to the left side of the engine-driven fuel pump between the centrifugal boost stage and high-pressure gear stage. The heater functions as a heat exchanger using high-pressure compressor bleed air to heat the fuel. The heater has a bypass valve which opens in event of restriction of fuel flow through heater.
- C. The air shutoff valve is located on the forward lower right side of the engine. The valve controls the supply of high-pressure compressor bleed air to the air/fuel heater.
- D. An on-off-auto fuel heat switch controls the position of air shutoff valve through a 60-second timer. The switch is located on the forward overhead panel in the flight compartment. The timer is located on the relay panel at station 110.

#### 2. Operation

- A. When a pressure drop across the filter, caused by ice or other foreign matter, is sensed by the differential fluid pressure switch, a caution light on the annunciator panel in the flight compartment comes on.
- B. With the airplane in flight and with the fuel heat switch in the auto position, 115-volt ac is supplied to the timer and to the open winding of the air shutoff valve motor, opening the valve. When the valve starts to open, the fuel heat indicator light on the annunciator panel comes on. At the same time, warm engine bleed air passes through the valve and circulates through the heater tubes to heat the fuel which is baffled around the tubes. The warm air circulates through the heater for a 60-second period, allowing heated fuel to melt any ice within the filter. When the ice melts, the pressure drop across the fuel filter decreases, causing the caution light on the annunciator panel to go off. After a 60-second period, the timer closes the circuit from the fuel heat switch to the close winding of the air shutoff valve motor to drive the valve to the closed position. The fuel heat light goes off when the valve reaches the closed position. The timer will complete the first 60-second cycle, even though interrupted during the course of the cycle. An additional 60-second cycle is automatically programmed if the circuit is interrupted after the completion of the first cycle.
- C. Manual operation of the fuel deicing system is accomplished by placing the fuel heat switch momentarily in the on position. Placing the switch in the on position initiates one 60-second cycle of the timer.

#### EFFECTIVITY

WJE 405-409, 411, 415-427, 429, 861-866, 868, 869,  
871-879, 881, 883, 884, 891

TP-80MM-WJE

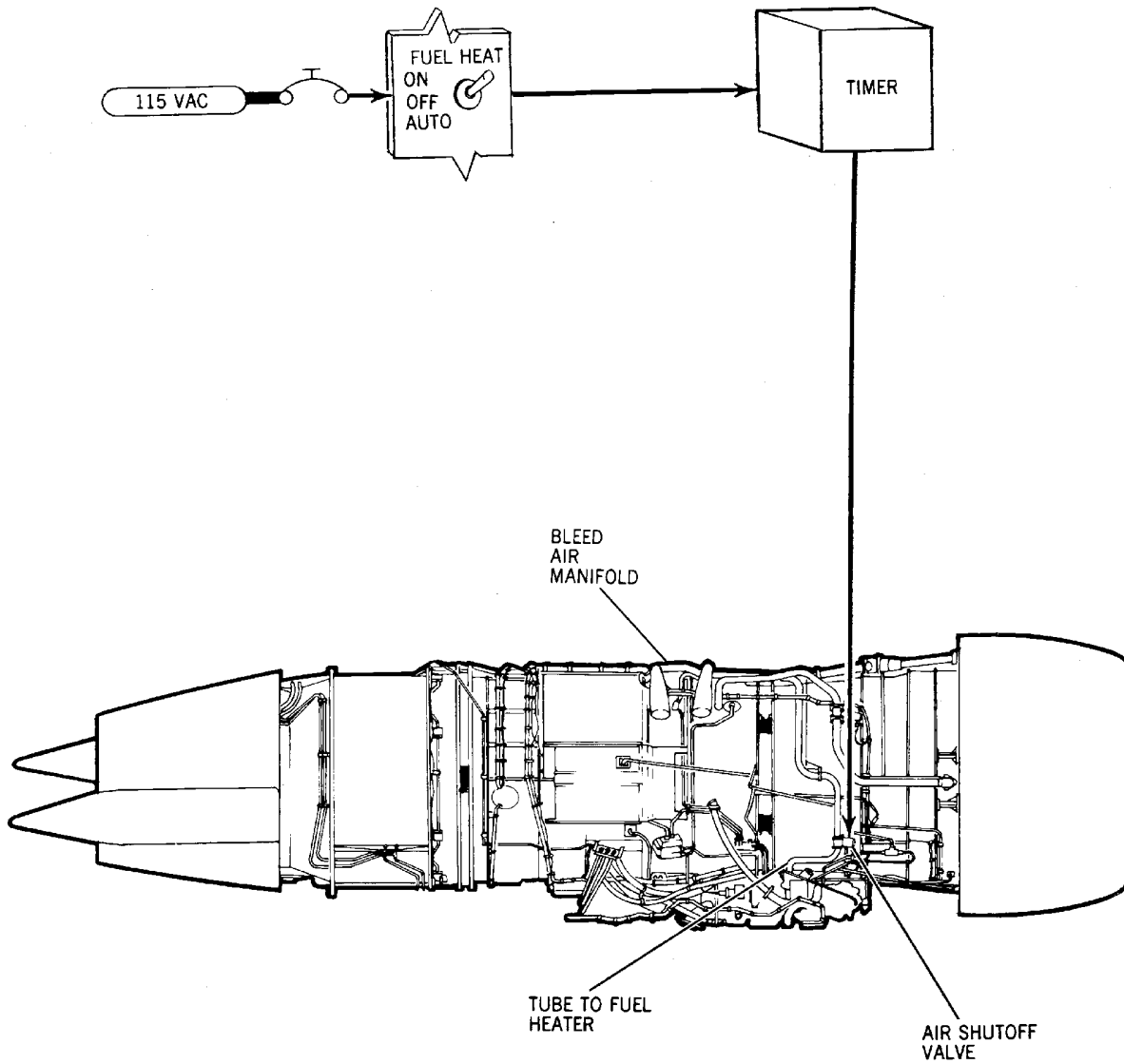
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-53

**Fuel Deicing System**  
Figure 1/73-14-00-990-802

**EFFECTIVITY**

WJE 405-409, 411, 415-427, 429, 861-866, 868, 869,  
871-879, 881, 883, 884, 891

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL DEICING SYSTEM - TROUBLE SHOOTING

#### 1. General

- A. To find and correct fuel deicing system troubles, first study the symptoms carefully. Check each possible cause beginning with the most likely until the exact nature of the trouble is determined. Before attempting to diagnose the trouble or work on the system which has been reported malfunctioning during flight, consult the pilot's flight report and all other pertinent data for information which might help in diagnosing the trouble.

#### 2. Trouble Shooting

- A. Trouble Shooting Tables:

**Table 101 ENGINE FUEL TEMPERATURE HIGH**

Possible Causes	Isolation Procedures	Correction
ENGINE FUEL TEMPERATURE HIGH		
(1) Fuel deicing air shutoff valve failed in open position	Visually check air shut-off valve position indicator.	Replace air shutoff valve. (Ref. 73-14-02, Page 201)

**Table 102 ENGINE FUEL TEMPERATURE LOW (Air/fuel heater on)**

Possible Causes	Isolation Procedures	Correction
ENGINE FUEL TEMPERATURE LOW (Air/fuel heater on)		
(1) Check fuel temperature indicating system operation	Remove electrical connector, and remove fuel temperature sensor. Connect electrical connector to sensor, and immerse sensor in cup of hot water.	Replace defective indicating system component.
(1a) Air/fuel heater defective	Check for clogged air/ fuel heater core.	Replace air/ fuel heater. (AIR/FUEL HEATER - MAINTENANCE PRACTICES, PAGEBLOCK 73-14-01/201)
(2) Fuel deicing air shutoff valve failed in closed position	Visually check air shut off valve position indicator.	Replace air shutoff valve. (Ref. 73-14-02, Page 201)
(3) Fuel pump filter clogged	Check fuel pump filter.	Replace fuel filter element. (Ref. 73-12-01, Page 201)
(4) Failure of first stage of engine driven fuel pump	Operate engine at 1.20 EPR. If fuel temperature does not show a rapid rise plus an increase in oil temperature, the first stage of the engine driven fuel pump is defective.	Replace engine driven fuel pump. (Ref. 73-12-01, Page 201)

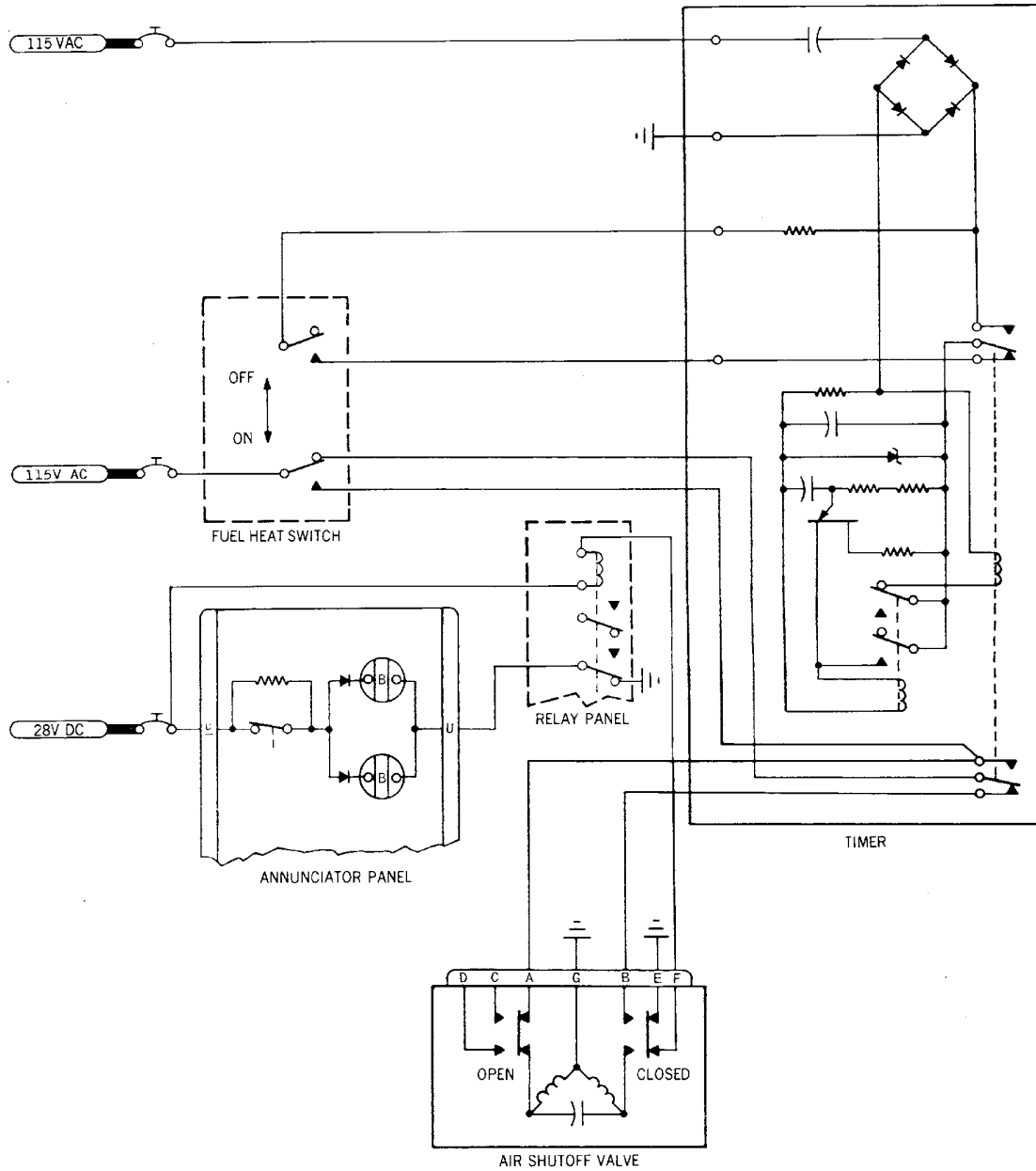
EFFECTIVITY  
WJE 401-404, 410, 412, 414, 880, 886, 887, 892, 893

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AIRCRAFT MAINTENANCE MANUAL



BBB2-73-13A

Fuel Deicing System -- Schematic Figure 101  
Figure 101/73-14-00-990-804

EFFECTIVITY  
WJE 401-404, 410, 412, 414, 880, 886, 887, 892, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL DEICING SYSTEM - TROUBLE SHOOTING

#### 1. General

- A. To find and correct fuel deicing system troubles, first study the symptoms carefully. Check each possible cause beginning with the most likely until the exact nature of the trouble is determined. Before attempting to diagnose the trouble or work on the system which has been reported malfunctioning during flight, consult the pilot's flight report and all other pertinent data for information which might help in diagnosing the trouble.

#### 2. Trouble Shooting

- A. Trouble Shooting Tables:

**Table 101 ENGINE FUEL TEMPERATURE HIGH**

Possible Causes	Isolation Procedures	Correction
ENGINE FUEL TEMPERATURE HIGH		
(1) Fuel deicing air shutoff valve failed in open position	Visually check air shut-off valve position indicator.	Replace air shutoff valve. (Ref. 73-14-02, Page 201)

**Table 102 ENGINE FUEL TEMPERATURE LOW (Air/fuel heater on)**

Possible Causes	Isolation Procedures	Correction
ENGINE FUEL TEMPERATURE LOW (Air/fuel heater on)		
(1) Check fuel temperature indicating system operation	Remove electrical connector, and remove fuel temperature sensor. Connect electrical connector to sensor, and immerse sensor in cup of hot water.	Replace defective indicating system component.
(1a) Air/fuel heater defective	Check for clogged air/ fuel heater core.	Replace air/ fuel heater. (AIR/FUEL HEATER - MAINTENANCE PRACTICES, PAGEBLOCK 73-14-01/201)
(2) Fuel deicing air shutoff valve failed in closed position	Visually check air shut off valve position indicator.	Replace air shutoff valve. (Ref. 73-14-02, Page 201)
(3) Fuel pump filter clogged	Check fuel pump filter.	Replace fuel filter element. (Ref. 73-12-01, Page 201)
(4) Failure of first stage of engine driven fuel pump	Operate engine at 1.20 EPR. If fuel temperature does not show a rapid rise plus an increase in oil temperature, the first stage of the engine driven fuel pump is defective.	Replace engine driven fuel pump. (Ref. 73-12-01, Page 201)

**EFFECTIVITY**

**WJE 405-409, 411, 415-427, 429, 861-866, 868, 869, 871-879, 881, 883, 884, 891**

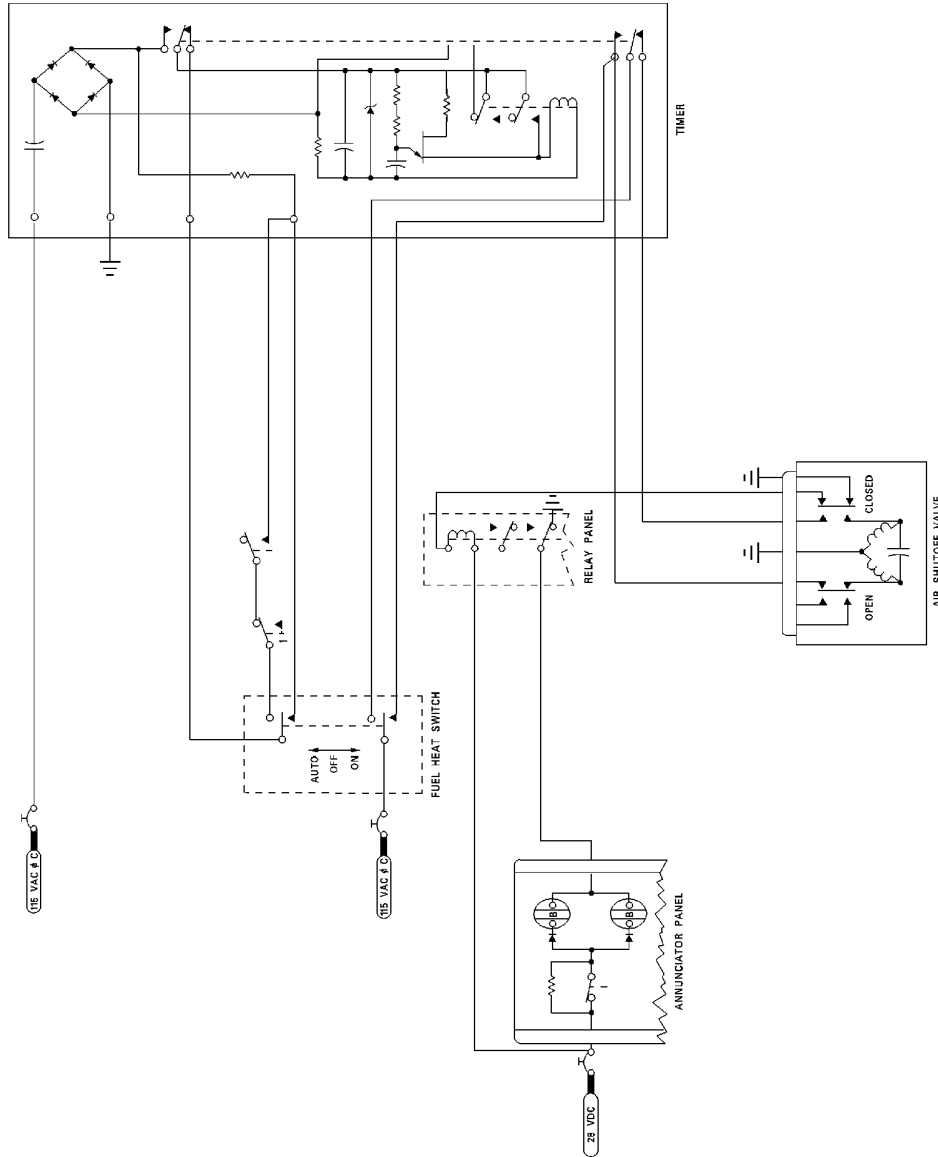
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AIRCRAFT MAINTENANCE MANUAL

BBB2-73-128



CAG(IGDS)

Fuel Deicing System -- Schematic  
Figure 101/73-14-00-990-805

EFFECTIVITY

WJE 405-409, 411, 415-427, 429, 861-866, 868, 869,  
871-879, 881, 883, 884, 891

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### AIR/FUEL HEATER - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the air/fuel heater located on the forward underside of the engine.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the air/fuel heater is through the lower cowling.  
 C. Removal, installation, and check procedures for the air/fuel heater on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Suitable container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Lockwire, .032 corrosion resistant steel P05-289	
Tag - DO NOT OPERATE	

#### 3. Removal/Installation Air/Fuel Heater

- A. Remove Heater

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT

EFFECTIVITY  
WJE ALL

# 73-14-01

## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle, located on upper instrument panel.

(4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.

(a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever.

1) Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

(5) Remove plug from center rear of fuel bridle and drain fuel into container.

(6) Remove bracket supporting electrical cable from left side of exhaust duct.

(7) Remove bolts securing 13th-stage bleed air tube to heater.

(8) Remove brackets at heater attachment lugs and move temperature sensing capillary lines clear.

(9) Support heater, remove locknut from top rear lug of heater and remove heater. Cover ports in fuel pump to prevent foreign matter contamination.

(10) Remove exhaust duct from heater.

B. Install Heater

EFFECTIVITY  
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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (5) Install two new packing items lightly lubricated with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine on each of two transfer tubes and install trans-fer tubes in heater.
- (6) Remove covers from ports on fuel pump, position heater on fuel pump and secure with locknut at top rear lug.
- (7) Position brackets and clamps with temperature sensing capillary lines at top forward and lower lug of heater and secure with locknut.
- (8) Tighten locknuts at all three heater lugs.
- (9) Position and bolt 13th-stage bleed air tube on heater and tighten bolts.
- (10) Place new gasket over heater exhaust port and secure with screw.
- (11) Install exhaust duct, position bracket on left side and tighten nuts.

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WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

- (12) Lightly lubricate new O-ring with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on drain plug. Install drain plug in fuel bridle and safety with P05-289 lockwire.
- (13) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (14) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (15) Close fire control handle located on upper instrument panel.
- (16) Remove the " Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.
- (17) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

EFFECTIVITY  
WJE ALL

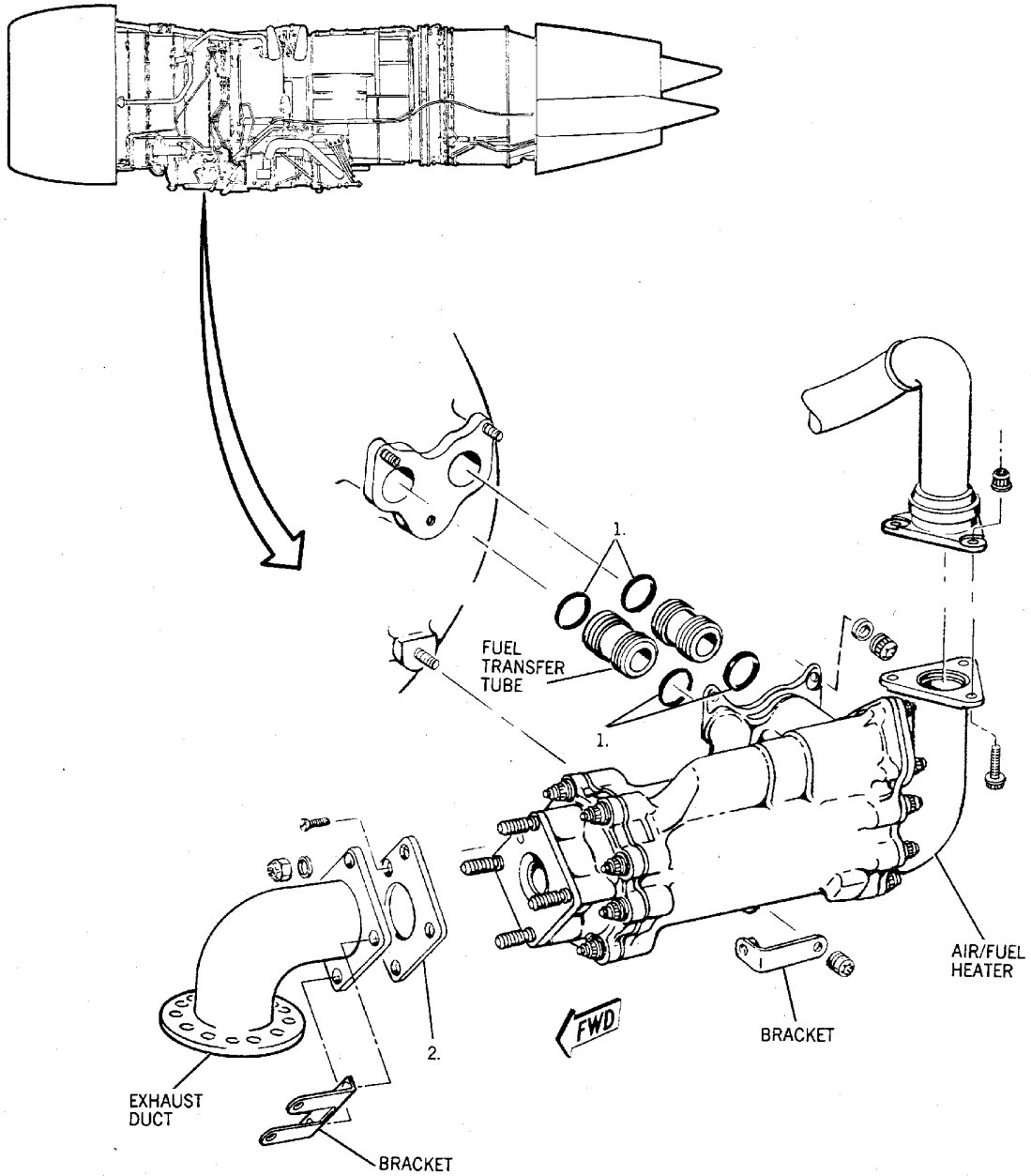
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AIRCRAFT MAINTENANCE MANUAL**



- CODE:  
 1. MS9021-120 O-RING  
 2. 4958836-1 GASKET (DOUGLAS AIRCRAFT)

BBB2-73-7A

**Air/Fuel Heater -- Removal/Installation**  
**Figure 201/73-14-01-990-801**

EFFECTIVITY  
 WJE ALL

**73-14-01**

TP-80MM-WJE

## MD-80 AIRCRAFT MAINTENANCE MANUAL

### 4. Check Air/Fuel Heater

#### A. Check Heater

- (1) Check heater operation on first engine run up. Note a fuel temperature increase when fuel heat switch is placed to on position and released. Visually observe that FUEL HEAT ON light on annunciator panel goes on and remains on for 60(±10) seconds. The FUEL HEAT ON light goes off and fuel temperature will decrease.

EFFECTIVITY  
WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### AIR/FUEL HEATER AIR SHUTOFF VALVE AND TUBING - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the air/fuel heater air shutoff valve and tubing located on the top center and forward right side of the engine.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

**CAUTION:** ENSURE RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

- B. Access to the air/fuel heater air shutoff valve and tubing is through the forward lower and upper cowling.

**NOTE:** Forward lower cowl door overlaps the aft lower cowl door and must be opened first.

- C. Removal, installation, and check procedures for the air/fuel heater air shutoff valve and tubing on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**Table 201**

Name and Number	Manufacturer
Lockwire, NASM20995N20, DPM 684	Not Specified
Lockwire, NASM20995N32, DPM 684	Not Specified
Tag, "DO NOT OPERATE"	Not Specified
Cloth, cotton, lint free, P05 005	Not Specified
Foil, aluminum, P05 169	Not Specified
Developer, non-aqueous, fluorescent penetrant, P05 237	Not Specified

#### 3. Removal/Installation Air/Fuel Heater Air Shutoff Valve and Tubing

- A. Remove Valve and Tubing  
 (1) Tag throttle/thrust reverser lever.

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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

WJE ALL

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	36	B1-49	LEFT FUEL HEAT ON ADVISORY

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	36	B1-50	RIGHT FUEL HEAT ON ADVISORY

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION
K	28	B1-47	FUEL HEAT LEFT CONTROL
K	28	B1-294	FUEL HEAT LEFT TIMER

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	28	B1-48	FUEL HEAT RIGHT CONTROL
L	29	B1-295	FUEL HEAT RIGHT TIMER

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Place thrust reverser control valve in dump position and install safety pin. (PAGEBLOCK 78-00-00/201)

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- (4) Open the upper and the lower cowl doors. (COWL DOORS - MAINTENANCE PRACTICES, PAGEBLOCK 71-10-03/201 Config 1)
  - (5) Establish clamp and bracket locations on tubing to facilitate installation.
  - (6) Disconnect electrical connector from air shutoff valve.
  - (7) Disconnect pressure ratio bleed control line at top of engine.
  - (8) Remove upper fuel heater tube.
  - (9) Remove air shutoff valve.
  - (10) Remove lower heater tube.
- B. Install Air Shutoff Valve and Tubing
- (1) Make sure that the throttle/thrust reverser lever is tagged.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (2) Make sure that these circuit breakers are open and have safety tags:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

**WJE ALL**

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	36	B1-49	LEFT FUEL HEAT ON ADVISORY

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	36	B1-50	RIGHT FUEL HEAT ON ADVISORY

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION
K	28	B1-47	FUEL HEAT LEFT CONTROL
K	28	B1-294	FUEL HEAT LEFT TIMER

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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(Continued)

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	28	B1-48	FUEL HEAT RIGHT CONTROL
L	29	B1-295	FUEL HEAT RIGHT TIMER

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed. (PAGEBLOCK 78-00-00/201)
  - (4) If necessary, open the upper and the lower cowl doors. (COWL DOORS - MAINTENANCE PRACTICES, PAGEBLOCK 71-10-03/201 Config 1)
  - (5) Install lower fuel heater tube, bolt lower end of tube to heater. Bolt upper end of tube to eye bracket.
  - (6) Install new gasket on lower fuel heater tube. (Figure 201)
  - (7) Position air shutoff valve on lower fuel heater tube with arrow pointing down and actuator forward. Bolt lower flange of air shutoff valve to tube.
  - (8) Install new gasket on upper fuel heater tube. (Figure 201)
  - (9) Install new gaskets in rear left and right sections of upper fuel heater tube and install tube. Safety bolts with .032 inch lockwire. (Figure 201)
- NOTE:** Maintain minimum clearance between upper fuel heater tube and bleed control PS4 tube. (Figure 201 View A)
- (10) Connect pressure ratio bleed control line to rear of upper fuel heater tube. Safety with .032 inch lockwire.
  - (11) Position upper fuel heater tube on upper flange of air shutoff valve and bolt to valve. Bolt upper fuel heater tube to eye bracket.
  - (12) Install new gasket on upper fuel heater tube. (Figure 201)
  - (13) Connect electrical connector to air shutoff valve. Safety connector with .020 inch lockwire.
  - (14) Remove tag from throttle/thrust reverser lever.
  - (15) Remove the safety tags and close these circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE ALL

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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S	36	B1-49	LEFT FUEL HEAT ON ADVISORY
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### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

T	36	B1-50	RIGHT FUEL HEAT ON ADVISORY
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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

K	26	B1-424	LEFT ENGINE IGNITION
K	28	B1-47	FUEL HEAT LEFT CONTROL
K	28	B1-294	FUEL HEAT LEFT TIMER

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
L	28	B1-48	FUEL HEAT RIGHT CONTROL
L	29	B1-295	FUEL HEAT RIGHT TIMER

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (16) Remove safety pin from thrust reverser control valve. Stow safety pin.  
(PAGEBLOCK 78-00-00/201)

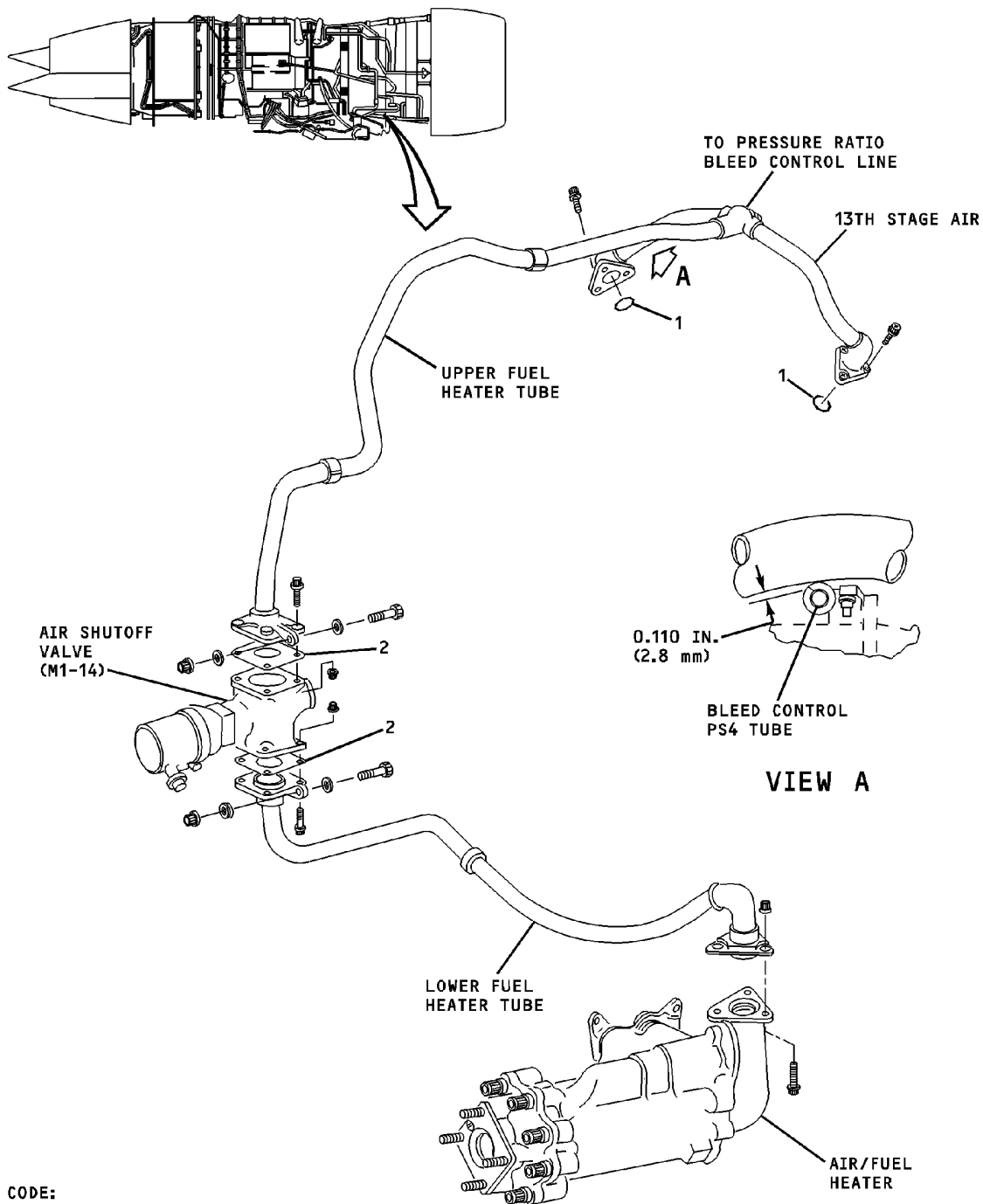
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CODE:  
1. 379561 GASKET (PRATT & WHITNEY)  
2. GASKET

CAG(IGDS)

BBB2-73-11C

**Air/Fuel Heater Air Shutoff Valve and Tubing -- Removal/Installation**  
**Figure 201/73-14-02-990-801**

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### 4. Check Air/Fuel Heater Air Shutoff Valve and Tubing

#### A. Check Air Shutoff Valve

- (1) If necessary, open the upper and the lower cowl doors. (COWL DOORS - MAINTENANCE PRACTICES, PAGEBLOCK 71-10-03/201 Config 1)
- (2) Make sure that these circuit breakers are closed:

#### **LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	36	B1-49	LEFT FUEL HEAT ON ADVISORY

#### **LOWER EPC, ENGINE - RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	36	B1-50	RIGHT FUEL HEAT ON ADVISORY

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	28	B1-47	FUEL HEAT LEFT CONTROL
K	28	B1-294	FUEL HEAT LEFT TIMER

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	28	B1-48	FUEL HEAT RIGHT CONTROL
L	29	B1-295	FUEL HEAT RIGHT TIMER

- (3) With electrical buses energized and applicable fuel heat switch (overhead panel) positioned to OFF visually check that air shutoff valve actuator position indicator is in closed position. Check applicable annunciator light is not illuminated.
  - (4) Place applicable fuel heat switch to ON and release. Visually check that FUEL HEAT ON light on annunciator panel goes on.
  - (5) Visually check that fuel heat shutoff valve opens and stays open for 60(±10) seconds at which time the valve will close and the FUEL HEAT ON light will go off.
- B. Check Fuel Heat System for Pneumatic Leaks and Operation
- (1) Wrap aluminum foil, as applicable, over the air shutoff valve tube and all ducting attach points.
    - (a) Operate engine at idle and check for external leaks. The aluminum foil will blow off or become deformed if leaks are present.
    - (b) If leaks are found, check air shutoff valve and tubing for proper installation and correct any faults.
  - (2) If necessary, do alternate method as follows:
    - (a) Apply non-aqueous developer to the air shutoff valve tube and all ducting attach points.
    - (b) Operate engine at idle and check for external leaks. Check developer for signs of leakage.
    - (c) If leaks are found, check air shutoff valve and tubing for proper installation and correct any faults.
  - (3) Repeat applicable step Paragraph 4.B.(1) or Paragraph 4.B.(2).
  - (4) Note a fuel temperature increase when fuel heat switch is placed to ON position and released. Visually observe that FUEL HEAT ON light on annunciator panel goes on and remains on for 60 (±10) seconds. The FUEL HEAT ON light goes off and fuel temperature will decrease.

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- (5) De-energize airplane electrical system. (GENERAL - DESCRIPTION AND OPERATION, PAGEBLOCK 24-00-00/001)
- (6) If used, remove the aluminum foil from the air shutoff valve and tubing.
- (7) If used, remove developer from the air shutoff valve and tubing with a lint free cloth.
- (8) Close the upper and lower cowl doors. (COWL DOORS - MAINTENANCE PRACTICES, PAGEBLOCK 71-10-03/201 Config 1)

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### CONTROLLING - DESCRIPTION AND OPERATION

#### 1. General

- A. The fuel control is basically a fuel metering system and a computer, responding to various engine operating parameters. The fuel control is provided with two control levers; one to control the engine speed during all forward and reverse thrust operations, and the other to control engine starting and shut-down. The fuel control accurately governs the steady state selected speed, acceleration and deceleration, and indirectly governs the maximum turbine temperature of the engine during both forward and reverse thrust operation.

#### 2. Fuel Control

##### A. Description

- (1) The fuel control schedules the fuel flow required by the engine to deliver thrust as dictated by the power lever position and operating conditions of the engine. Two control levers are provided. The power lever controls the engine during forward or reverse thrust operation. The shutoff lever effects engine shutdown and starting by closing and opening a fuel shutoff valve.
- (2) A proportional or droop-type governing system accurately governs the engine steady state selected speed, and regulates acceleration and deceleration fuel flow.
- (3) The fuel control consists of metering and computing sections. The metering section selects the rate of fuel flow to be supplied to the engine combustion chambers in accordance with the amount of thrust demanded by the pilot, but subject to engine operating limitations as scheduled by the computing section which monitors various engine operational parameters. The computing system senses and combines various parameters to bias the output of the metering section of the fuel control during all regimes of engine operation.
- (4) Metering System
  - (a) High-pressure fuel, at approximately 500 psig, is supplied to the control inlet from the engine-driven fuel pump. This fuel encounters the coarse filter which protects the metering system against large particles of fuel contaminants. The fuel then encounters the fine servo supply filter which further protects the computing system against solid contaminants. This filter is self-cleaning because fuel velocity through the axis of the cylinder toward the metering section is significantly greater than the flow through the mesh supplying the servo control valves. Both filters are protected by valves that open to allow fuel to bypass if screens become clogged and the fuel flow is restricted.
  - (b) Fuel flows to the metering valve (throttle valve) across a constant pressure differential maintained by the pressure regulating system. The throttle valve is a window-type valve and is positioned by a half-area servo. The movable sleeve (piston) position is controlled by a rotating pilot valve which is displaced from its hydraulic null (steady-state) position by compress discharge pressure, engine speed, compressor inlet temperature, power lever, or any combination of these parameters. These actuating signals work in conjunction with each other to produce a net torque on the multiplying lever. A balancing torque is created by the throttle valve extension spring-load varied with the valve position. As long as the resultant torque is zero, the throttle valve maintains a constant position. However, any change in the signal torque will displace the pilot valve and cause motion of the throttle valve piston until the unbalanced signal torque is balanced by the new throttle valve position and corresponding spring force. Fuel flow is proportional to the position of the throttle valve piston, by virtue of the constant pressure drop maintained across the throttle valve.

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- (c) Fuel flows to the metering valve (throttle valve) across a constant pressure differential maintained by the pressure regulating system. The throttle valve is a window-type valve and is positioned by a half-area servo. The movable sleeve (piston) position is controlled by a rotating pilot valve which is displaced from its hydraulic null (steady-state) position by compressor discharge pressure, engine speed, compressor inlet temperature, power lever, or any combination of these parameters. These actuating signals work in conjunction with each other to produce a net torque on the multiplying lever. A balancing torque is created by the throttle valve extension spring-load varied with the valve position. As long as the resultant torque is zero, the throttle valve maintains a constant position. However, any change in the signal torque will displace the pilot valve and cause motion of the throttle valve piston until the unbalanced signal torque is balanced by the new throttle valve position and corresponding spring force. Fuel flow is proportional to the position of the throttle valve piston, by virtue of the constant pressure drop maintained across the throttle valve.
  - (d) The pressure drop across the throttle valve is maintained nominally at 40 psi by a (bypass type) pressure regulating valve. All high-pressure fuel in excess of that required to maintain pressure differential is bypassed to pump interstage. The pressure regulating valve consists of a sensor and a pressure regulating valve. The pressure regulating valve will bypass more or less of the fuel flow necessary to maintain pressure differential. The lower end of the pressure regulating valve is subjected to upstream throttle valve pressure and the upper end is balanced by downstream throttle valve pressure and a spring force equivalent to 40 psig. If failure occurs in the direction of low control discharge pressure, the control will meter at the spring force equivalent pressure and prevent bypassing the total flow back to pump interstage.
  - (e) Fuel leaving the throttle valve passes through the minimum pressure and shutoff valve on its way to the engine. This valve is designed to shut off the flow of metered fuel to the engine when the pilot moves the shutoff lever to the off position. When actuated for the shutoff function, high-pressure is directed to the spring side of the valve by the action of the windmill bypass and shutoff valve. This pressure closes the valve and allows the spring to keep it in the shutoff position. When the shutoff lever is moved to the on position, the high-pressure on the spring side of the valve is replaced by pump interstage pressure. When metered fuel pressure has increased sufficiently to overcome the spring and low-pressure fuel force, the valve opens and fuel flow to the engine is initiated. Thereafter, the valve will provide a minimum operating pressure within the fuel control, ensuring that adequate pressure is always available for operation of the servos at low-flow conditions.
- (5) Computing System
- (a) The computing system positions the throttle valve to control fuel flow during steady state operation, acceleration and deceleration by using the ratio of metered fuel flow to engine compressor discharge pressure ( $W_f/P_{s4}$ ) as a control parameter. The positioning of the throttle valve by means of the  $W_f/P_{s4}$  parameter is accomplished through a multiplying system whereby the  $W_f/P_{s4}$  signal for acceleration, deceleration or steady state speed control is multiplied by a signal proportional to compressor discharge pressure to provide the required fuel flow.

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- (b) Compressor discharge pressure is sensed by a motor bellows which is externally exposed to the pressure. The resultant force, caused by the expansion or contraction of this bellows, is opposed by an evacuated bellows of equal size. The net force, which is proportional to absolute compressor discharge pressure, is transmitted through a sensor lever to a set of rollers whose position is proportional to the required  $W_f/P_{s,4}$  ratio. These rollers ride between the sensor lever and a multiplying lever. The force, proportional to compressor discharge pressure, is transmitted through the rollers to the multiplying lever. Any change in the roller position or the compressor discharge pressure signal results in an unbalanced torque which will displace the rotating pilot valve from its hydraulic null position, thereby repositioning the throttle valve. The movement of the throttle valve extends or relaxes a spring which will return the multiplying lever to its equilibrium position when the throttle valve reaches the required fuel flow position. Both the motor and evacuated bellows are located in a chamber vented to ambient pressure so that in event of an evacuated bellows failure, the fuel flow error is only the difference between the flow required for the absolute pressure reading and that required for a gage pressure reading. The vent line to the bellows chamber contains an orifice which will allow compressor discharge pressure sensing should a minor motor bellows failure occur.
- (c) The compressor discharge pressure limiting valve is held seated by the action of a spring at  $P_{s,4}$  values below the limiting pressure. Signal pressure to the  $P_{s,4}$  bellows is tapped off between the two valve seats and, below the limiting point, the bellows signal pressure and compressor discharge pressure are equal. When compressor discharge pressure exceeds the limiting value, the spring force is overcome and the limiter valve opens to bleed off compressor discharge pressure and thereby reduce the bellows signal pressure.
- (d) Deceleration control is provided by the constant radius portion of the droop cam and by adjustment of the roller positioning linkage to limit the travel of the rollers toward decreasing fuel flow, thereby effecting a minimum  $W_f/P_{s,4}$  ratio. This provides a linear relationship between fuel flow and compressor discharge pressure which results in blow-out free deceleration.
- (e) Acceleration control is provided by adjustment of the roller positioning linkage to effect a maximum  $W_f/P_{s,4}$  ratio stop for a particular value of speed and compressor inlet temperature. The maximum  $W_f/P_{s,4}$  ratio value at the stop is controlled by a three dimensional (3-D) cam which is translated by a signal proportional to engine speed and rotated by a signal proportional to compressor inlet temperature. The 3-D cam is so contoured as to define a schedule of  $W_f/P_{s,4}$  versus compressor inlet temperature which is used as a limiting value for each speed through-out the transient acceleration range. This combination will permit engine accelerations within the over-temperature and surge limits of the engine. When the acceleration limiting lever is in operation to control the maximum value of  $W_f/P_{s,4}$  ratio, it overrides the speed setting linkage.
- (f) The engine speed signal is transmitted from the engine-driven drive shaft through a gear train to the centrifugal type flyweight governor. This governor controls movement of the speed servo (3-D cam) by displacing a rotating pilot valve from its hydraulic null position. When the speed changes, the flyweight force varies and the pilot valve is displaced causing motion of the speed servo. This motion of the speed servo repositions the pilot valve, through the action of a feedback lever working on a spring, until the speed sensing governor returns to hydraulic null at the new speed servo position. The position of the speed servo is, therefore, indicative of actual engine speed.

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- (g) Compressor inlet temperature is sensed by a liquid filled bulb mounted in the compressor inlet and connected to a liquid filled bellows in the control. Changes in inlet air temperature cause corresponding changes in the bellows length. The position output of the motor bellows is biased by a position output of a second, or compensating bellows. The compensating bellows is also liquid filled and is connected to a capillary tube placed adjacent to the line leading from the air inlet bulb to the motor bellows. Pressure changes due to the temperature gradient between the air inlet and the control act on this compensating line as well as the motor bellows supply line. This permits the second bellows to modify the motor bellows output to ensure a correct indication of inlet air temperature. This corrected position output displaces a pilot valve from its hydraulic null (steady-state) position and results in movement of the temperature servo piston. The servo piston is connected through a linkage to a rack which meshes with the spline on the 3-D cam and motion of the piston rotates the cam. As the rack moves to rotate the cam, it also repositions the pilot valve in order to return the valve to the steady-state position. The rotation of the 3-D cam, acting through a linkage, resets the governor droop line.
- (h) Engine speed control is accomplished by comparing the actual speed, as indicated by the position of the speed servo, to the desired speed value required for the power selected by the pilot through a power lever positioning speed set cam. The power lever actuates the speed set cam to select a governor droop line. The position of the droop line is biased by compressor inlet temperature. The deviation of desired speed from the actual speed (speed error) causes movement of the speed servo. This movement of the speed servo is transmitted through a lever and results in the repositioning of the droop cam. The rollers in the multiplication system are positioned through the action of the droop cam to be a function of the speed error. The repositioning of the rollers then provides the required steady-state  $W/P_{s4}$  ratio setting.
- (6) Auxiliary Functions
- (a) The windmill bypass and shutoff valve, in addition to supplying the high-pressure signal for the shutoff function, also provides a windmill bypass feature. This valve is plumbed to a line leading to the spring side of the pressure regulating valve and is positioned by a shutoff leveroperated cam so that signals are generated at the desired shutoff lever positions. Movement of the shutoff lever toward the shutoff position displaces the valve, thereby porting the pressure on the spring side of the pressure regulating valve to pump interstage. The pressure regulating valve now operates as a relief valve to handle the full windmilling fuel flow.
- (7) Automatic Reserve Thrust (ART) System
- (a) The fuel control incorporates a Reserve Takeoff Thrust (RTT) Engine package which provides fuel flow for the Automatic Reserve Thrust (ART) requirements. Reset is accomplished by translation of the 3-D speed set by a fuel control internal linkage connected to a fuel pressure activated servo. The servo is controlled by a solenoid valve remotely operated by a DFGC supplied signal. If the ART system is inoperative maximum takeoff thrust can be obtained by manual operation of the power lever.
- (b) When placed in the AUTO position, the ART switch commands the Digital Flight Guidance Computer (DFGC) to reduce the displayed EPR shown on the Thrust Rating Indicator and on each EPR indicator. (Figure 1)



## MD-80 AIRCRAFT MAINTENANCE MANUAL

- (c) The ART system is armed when the low speed rotors of both engines ( $N_1$ ) reach 64.0%, and activates when the difference in low speed rotors reaches 30.2%. On activation, the ART solenoid on the fuel control energizes and shifts the 3-D speed cam set increasing the high rotor speed ( $N_2$ ), increasing the thrust from Normal Takeoff to Maximum Takeoff. This action initiates the ART follow-up switch on the fuel control, turning the amber ART light ON indicating successful ART operation and notifying an engine failure.
  - (d) Three annunciator lights (READY, ART, and ART INOP) are incorporated in the ART system. When in the takeoff mode, with the ART switch in AUTO, the green READY light will come on to indicate that the ART system has been tested and will successfully actuate when the need arises. The amber ART light is actuated by the ART solenoids installed on the fuel controls and when on indicates an engine or computer failure has occurred and that the ART system has been initiated. The amber ART INOP light is coupled to the Master Warning and Caution Controller and when ON indicates that a failure in the ART system has occurred. (Figure 1)
  - (e) A functional test will be made to demonstrate that the speed set cam on both fuel controls moves to the thrust reset position when appropriately commanded by the digital computer. Success is measured by the closing of a follow-up switch when the cam moves to reset position and then by opening of the switch when the command is removed.
  - (f) The functional test is performed once when both engines are operating, the aircraft is on the ground, and ART switch is put into 'AUTO' position with slats extended or by extending slats when the ART switch is in 'AUTO' position. Consequently, the functional test is repeated if either the ART switch or the slats are cycled. The fuel control solenoids will be energized only long enough to detect a successful test. The short time required for the test will preclude any noticeable increase in thrust.
- (8) Approach Idle.
- (a) The fuel control incorporates a two position idle selection solenoid whose functions are described as follows:
  - (b) The approach idle control system consists of a nose gear down switch, ground sensing relay, a 5 second delay relay, and an engine fuel control idle solenoid.
  - (c) The idle control solenoid selects the ground/descent (low) idle position when electrical power is applied to the solenoid, and the approach (high) idle position when no power is applied.
  - (d) In the approach mode, with the nose gear extended, the nose gear down switch is actuated to the open circuit position, de-energizing the solenoid and positioning the idle solenoid in the approach (high) idle mode. At touch down, with weight on the nose gear, the ground sensing switches close, energizing a 5 second delay relay, after 5 seconds, the relay closes the circuit and energizes the idle solenoid to the ground/descent (low) idle position. The approach idle is maintained after nose gear touch down for 5 seconds to provide rapid engine acceleration capability in case of a miscalculated landing or other reasons.
  - (e) The approach idle inoperative light is located in the electronics equipment bay and is used for maintenance only. The light operation is based on differences of electrical inputs to the two engine idle solenoids. If one system is grounded and the other is energized, as in a failed condition, the 3 second delay relay is energized, after 3 seconds the relay closes energizing the approach idle inop. relay, closing the relay contact to ground and energizing the inop. light ON. The light will remain on until the fault is repaired and the reset switch is closed, latching the relay in the fault-free position.

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**AIRCRAFT MAINTENANCE MANUAL**

- (9) Deceleration Bleed Override The fuel control incorporates a bleed override circuit which is designed to open the bleed valves when the engine is on a rapid deceleration schedule. A reduced fuel flow associated with a rapid decelerating power lever movement results in a lower bleed override fuel signal. This fuel signal is carried through external plumbing to a bleed valve control which interrupts the flow of actuating air to the bleed valves from the pressure ratio bleed control. When the override fuel signal is low because of rapid deceleration scheduling, the bleed valve control cuts the bleed valves off from their actuating air pressure and allows them to open. When the rapid deceleration phase is terminated, an increased fuel signal pressure to the bleed valve control opens the air valve in the control and allows pressure from the pressure ratio bleed control to close the bleed valves.

EFFECTIVITY  
WJE 873, 874, 892, 893

TP-80MM-WJE

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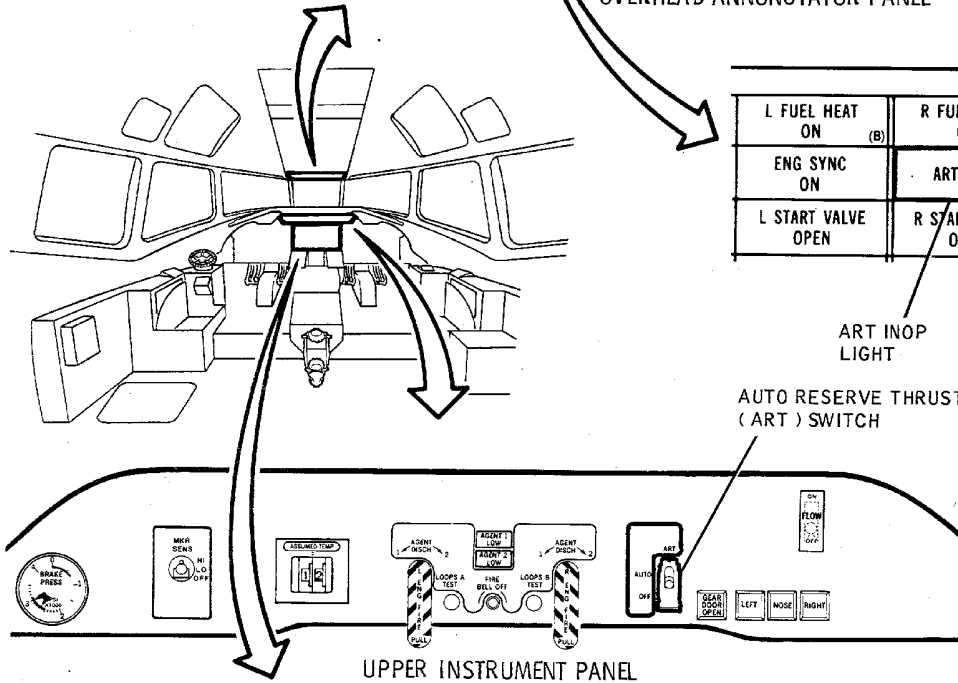
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AC DISCONNECT LOCKED	L ENG ANTI-ICE ON (B)	R ENG ANTI-ICE ON (B)	L FUEL HEAT ON (B)	R FUEL HEAT ON (B)	WAMP SHAMP OFF	CAMS FAIL	WHEEL TOWERS UNRESTRICTED (B)	AUTO SPILLER DO NOT USE	ELEVATION PWR ON (B)	SPOILER DEPLOYED	ART CARGO DOOR
APU GEN OFF	DC TRANSFER BUS OFF	PROT STALL HEATER OFF	L START VALVE OPEN	R START VALVE OPEN	CPWS FAIL	STALL INDICATION FAILURE	RAIN REPELLANT RESERVE IN USE	SPEED BRAKE EXTENDED	L HYD TEMP HI	R HYD TEMP HI	WING CARGO DOOR
L AC BUS OFF	R AC BUS OFF	L ICE PROTECT TEMP HI	L ICE PROTECT SUPPLY PRESS HI	R ICE PROTECT SUPPLY PRESS HI	L OIL STANDBY CLOGGING	R OIL STANDBY CLOGGING	WING FLAP TEMP HIGH	FIRE DETECTOR LOOP	APU OIL TEMP HI	L WFO PRESS LOW	R WFO PRESS LOW
L GEN OFF	R GEN OFF	APU ICE PROT PRESS ABNORMAL	L ICE PROTECT TEMP LOW	R ICE PROTECT TEMP LOW	L WFO FUEL PRESS LOW	R WFO FUEL PRESS LOW	CABIN ALT. EMER OFF (B)	L WFO SUPPLY TEMP HI	R WFO SUPPLY TEMP HI	L INDO ANTI-SMOG	R INDO ANTI-SMOG
L ESD ON	R ESD ON	L ENG VALVE	R ENG VALVE	L FUEL FILTER PRESS DROP	R FUEL FILTER PRESS DROP	DC EMER BUS OFF	RADIO FAULT OFF	PIF RECORDER OFF	L INDO ANTI-SMOG	R INDO ANTI-SMOG	WING CARGO DOOR

OVERHEAD ANNUNCIATOR PANEL

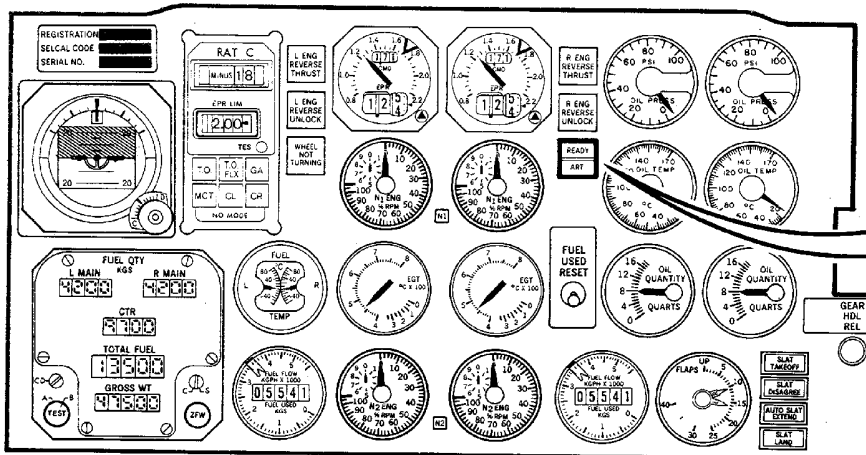


L FUEL HEAT ON (B)	R FUEL HEAT ON (B)
ENG SYNC ON	ART INOP
L START VALVE OPEN	R START VALVE OPEN

ART INOP LIGHT

AUTO RESERVE THRUST (ART) SWITCH

UPPER INSTRUMENT PANEL



CENTER INSTRUMENT PANEL

ART READY LIGHT



ART ACTUATION LIGHT

BBB2-73-23

Automatic Reserve Thrust (ART) -- Annunciator Lights  
Figure 1/73-20-00-990-801

EFFECTIVITY  
WJE 873, 874, 892, 893

TP-80MM-WJE

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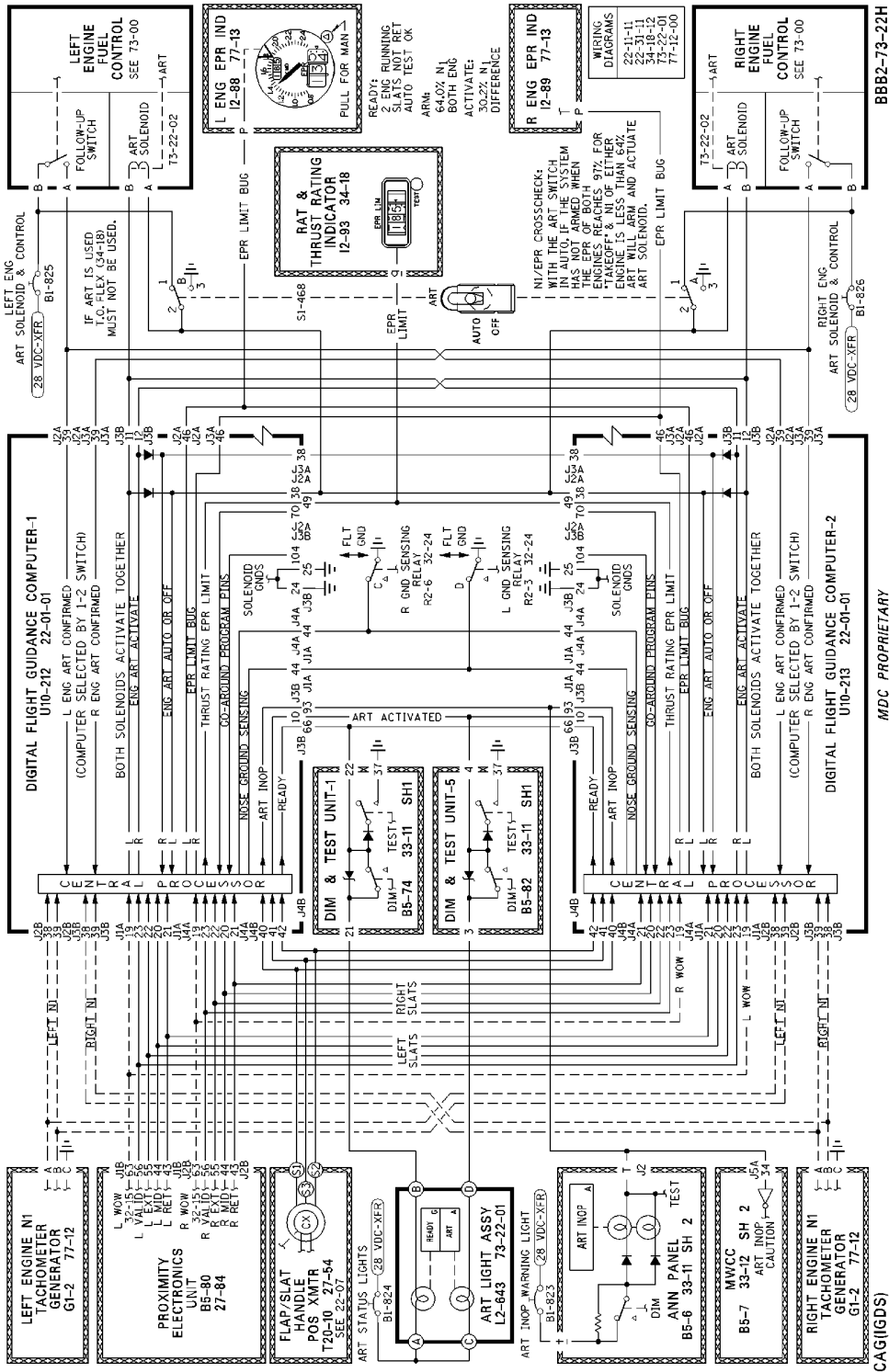
For Instructional Use Only

**73-20-00**

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Automatic Reserve Thrust (ART) -- Schematic  
Figure 2/73-20-00-990-802

EFFECTIVITY  
WJE 873, 874, 892, 893

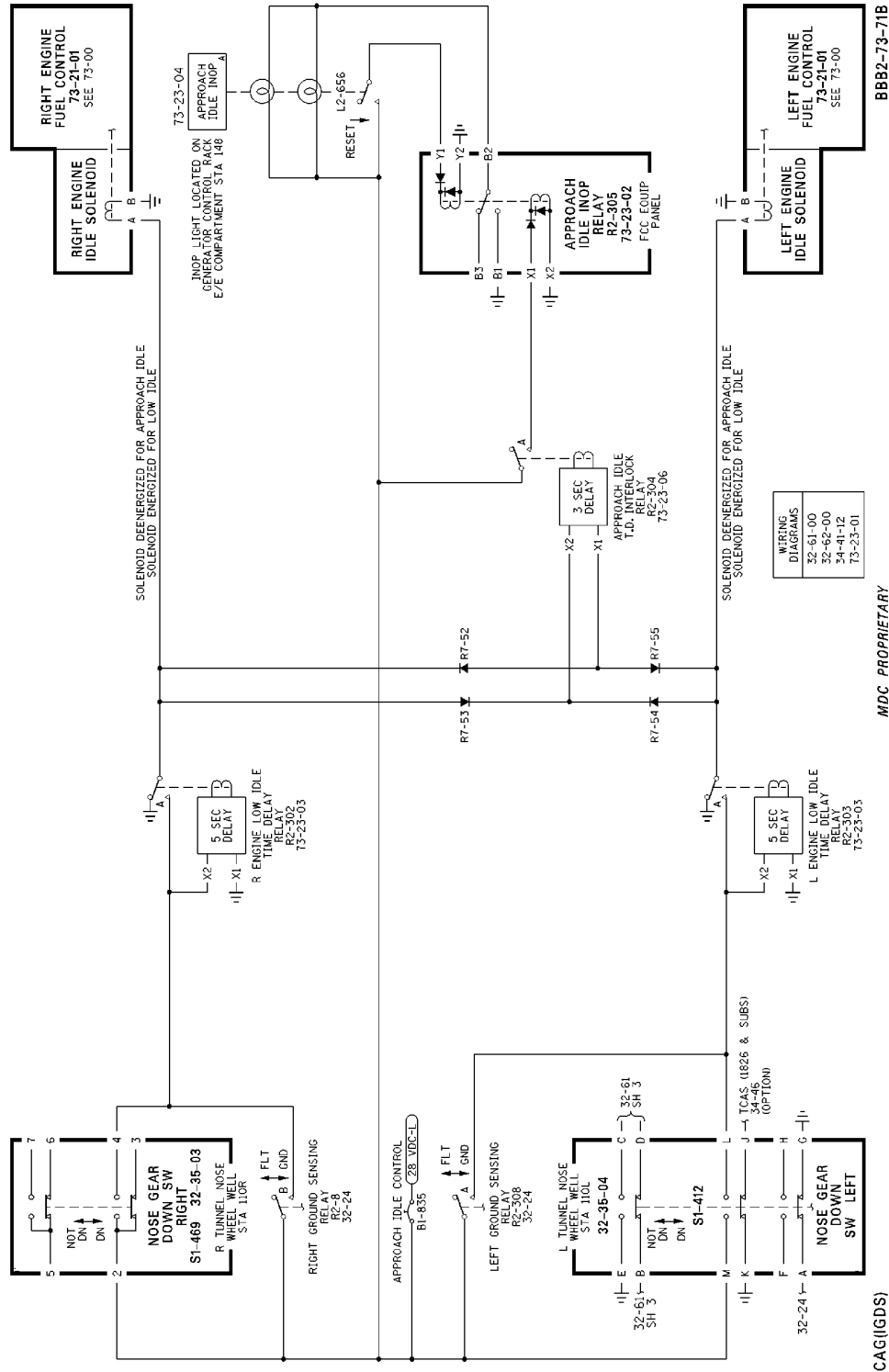
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-71B

MDC PROPRIETARY

CAG(IIGDS)

Approach Idle Control -- Schematic  
Figure 3/73-20-00-990-803-001

EFFECTIVITY  
WJE 873, 874, 892, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### CONTROLLING - DESCRIPTION AND OPERATION

#### 1. General

- A. The fuel control is basically a fuel metering system and a computer, responding to various engine operating parameters. The fuel control is provided with two control levers; one to control the engine speed during all forward and reverse thrust operations, and the other to control engine starting and shut down. The fuel control accurately governs the steady state selected speed, acceleration and deceleration, and indirectly governs the maximum turbine temperature of the engine during both forward and reverse thrust operation.

#### 2. Fuel Control

##### A. Description

- (1) The fuel control schedules the fuel flow required by the engine to deliver thrust as dictated by the power lever position and operating conditions of the engine. Two control levers are provided. The power lever controls the engine during forward or reverse thrust operation. The shutoff lever effects engine shutdown and starting by closing and opening a fuel shutoff valve.
- (2) A proportional or droop-type governing system accurately governs the engine steady state selected speed, and regulates acceleration and deceleration fuel flow.
- (3) The fuel control consists of metering and computing sections. The metering section selects the rate of fuel flow to be supplied to the engine combustion chambers in accordance with the amount of thrust demanded by the pilot, but subject to engine operating limitations as scheduled by the computing section which monitors various engine operational parameters. The computing system senses and combines various parameters to bias the output of the metering section of the fuel control during all regimes of engine operation.
- (4) Metering System
  - (a) High-pressure fuel, at approximately 500 psig, is supplied to the control inlet from the engine-driven fuel pump. This fuel encounters the coarse filter which protects the metering system against large particles of fuel contaminants. The fuel then encounters the fine servo supply filter which further protects the computing system against solid contaminants. This filter is self-cleaning because fuel velocity through the axis of the cylinder toward the metering section is significantly greater than the flow through the mesh supplying the servo control valves. Both filters are protected by valves that open to allow fuel to bypass if screens become clogged and the fuel flow is restricted.
  - (b) Fuel flows to the metering valve (throttle valve) across a constant pressure differential maintained by the pressure regulating system. The throttle valve is a window-type valve and is positioned by a half-area servo. The movable sleeve (piston) position is controlled by a rotating pilot valve which is displaced from its hydraulic null (steady-state) position by compress discharge pressure, engine speed, compressor inlet temperature, power lever, or any combination of these parameters. These actuating signals work in conjunction with each other to produce a net torque on the multiplying lever. A balancing torque is created by the throttle valve extension spring-load varied with the valve position. As long as the resultant torque is zero, the throttle valve maintains a constant position. However, any change in the signal torque will displace the pilot valve and cause motion of the throttle valve piston until the unbalanced signal torque is balanced by the new throttle valve position and corresponding spring force. Fuel flow is proportional to the position of the throttle valve piston, by virtue of the constant pressure drop maintained across the throttle valve.

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- (c) The pressure drop across the throttle valve is maintained nominally at 40 psi by a (bypass type) pressure regulating valve. All high-pressure fuel in excess of that required to maintain pressure differential is bypassed to pump interstage. The pressure regulating valve consists of a sensor and a pressure regulating valve. The pressure regulating valve will bypass more or less of the fuel flow necessary to maintain pressure differential. The lower end of the pressure regulating valve is subjected to upstream throttle valve pressure and the upper end is balanced by downstream throttle valve pressure and a spring force equivalent to 40 psig. If failure occurs in the direction of low control discharge pressure, the control will meter at the spring force equivalent pressure and prevent bypassing the total flow back to pump interstage.
  - (d) Fuel leaving the throttle valve passes through the minimum pressure and shutoff valve on its way to the engine. This valve is designed to shut off the flow of metered fuel to the engine when the pilot moves the shutoff lever to the off position. When actuated for the shutoff function, high-pressure is directed to the spring side of the valve by the action of the windmill bypass and shutoff valve. This pressure closes the valve and allows the spring to keep it in the shutoff position. When the shutoff lever is moved to the on position, the high-pressure on the spring side of the valve is replaced by pump interstage pressure. When metered fuel pressure has increased sufficiently to overcome the spring and low-pressure fuel force, the valve opens and fuel flow to the engine is initiated. Thereafter, the valve will provide a minimum operating pressure within the fuel control, ensuring that adequate pressure is always available for operation of the servos at low-flow conditions.
- (5) Computing System
- (a) The computing system positions the throttle valve to control fuel flow during steady state operation, acceleration and deceleration by using the ratio of metered fuel flow to engine compressor discharge pressure ( $W_F / P_S^4$ ) as a control parameter. The positioning of the throttle valve by means of the  $W_F / P_S^4$  parameter is accomplished through a multiplying system whereby the  $W_F / P_S^4$  signal for acceleration, deceleration or steady state speed control is multiplied by a signal proportional to compressor discharge pressure to provide the required fuel flow.
  - (b) Compressor discharge pressure is sensed by a motor bellows which is externally exposed to the pressure. The resultant force, caused by the expansion or contraction of this bellows, is opposed by an evacuated bellows of equal size. The net force, which is proportional to absolute compressor discharge pressure, is transmitted through a sensor lever to a set of rollers whose position is proportional to the required  $W_F / P_S^4$  ratio. These rollers ride between the sensor lever and a multiplying lever. The force, proportional to compressor discharge pressure, is transmitted through the rollers to the multiplying lever. Any change in the roller position or the compressor discharge pressure signal results in an unbalanced torque which will displace the rotating pilot valve from its hydraulic null position, thereby repositioning the throttle valve. The movement of the throttle valve extends or relaxes a spring which will return the multiplying lever to its equilibrium position when the throttle valve reaches the required fuel flow position. Both the motor and evacuated bellows are located in a chamber vented to ambient pressure so that in event of an evacuated bellows failure, the fuel flow error is only the difference between the flow required for the absolute pressure reading and that required for a gage pressure reading. The vent line to the bellows chamber contains an orifice which will allow compressor discharge pressure sensing should a minor motor bellows failure occur.

## MD-80 AIRCRAFT MAINTENANCE MANUAL

- (c) The compressor discharge pressure limiting valve is held seated by the action of a spring at  $P_{S4}$  values below the limiting pressure. Signal pressure to the  $P_{S4}$  bellows is tapped off between the two valve seats and, below the limiting point, the bellows signal pressure and compressor discharge pressure are equal. When compressor discharge pressure exceeds the limiting value, the spring force is overcome and the limiter valve opens to bleed off compressor discharge pressure and thereby reduce the bellows signal pressure.
- (d) Deceleration control is provided by the constant radius portion of the droop cam and by adjustment of the roller positioning linkage to limit the travel of the rollers toward decreasing fuel flow, thereby effecting a minimum  $W_F/P_{S4}$  ratio. This provides a linear relationship between fuel flow and compressor discharge pressure which results in blowout free deceleration.
- (e) Acceleration control is provided by adjustment of the roller positioning linkage to effect a maximum  $W_F/P_{S4}$  ratio stop for a particular value of speed and compressor inlet temperature. The maximum  $W_F/P_{S4}$  ratio value at the stop is controlled by a three dimensional (3-D) cam which is translated by a signal proportional to engine speed and rotated by a signal proportional to compressor inlet temperature. The 3-D cam is so contoured as to define a schedule of  $W_F/P_{S4}$  versus compressor inlet temperature which is used as a limiting value for each speed throughout the transient acceleration range. This combination will permit engine accelerations within the over-temperature and surge limits of the engine. When the acceleration limiting lever is in operation to control the maximum value of  $W_F/P_{S4}$  ratio, it overrides the speed setting linkage.
- (f) The engine speed signal is transmitted from the engine-driven drive shaft through a gear train to the centrifugal type flyweight governor. This governor controls movement of the speed servo (3-D cam) by displacing a rotating pilot valve from its hydraulic null position. When the speed changes, the flyweight force varies and the pilot valve is displaced causing motion of the speed servo. This motion of the speed servo repositions the pilot valve, through the action of a feedback lever working on a spring, until the speed sensing governor returns to hydraulic null at the new speed servo position. The position of the speed servo is, therefore, indicative of actual engine speed.
- (g) Compressor inlet temperature is sensed by a liquid filled bulb mounted in the compressor inlet and connected to a liquid filled bellows in the control. Changes in inlet air temperature cause corresponding changes in the bellows length. The position output of the motor bellows is biased by a position output of a second, or compensating bellows. The compensating bellows is also liquid filled and is connected to a capillary tube placed adjacent to the line leading from the air inlet bulb to the motor bellows. Pressure changes due to the temperature gradient between the air inlet and the control act on this compensating line as well as the motor bellows supply line. This permits the second bellows to modify the motor bellows output to ensure a correct indication of inlet air temperature. This corrected position output displaces a pilot valve from its hydraulic null (steady-state) position and results in movement of the temperature servo piston. The servo piston is connected through a linkage to a rack which meshes with the spline on the 3-D cam and motion of the piston rotates the cam. As the rack moves to rotate the cam, it also repositions the pilot valve in order to return the valve to the steady-state position. The rotation of the 3-D cam, acting through a linkage, resets the governor droop line.



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- (h) Engine speed control is accomplished by comparing the actual speed, as indicated by the position of the speed servo, to the desired speed value required for the power selected by the pilot through a power lever positioning speed set cam. The power lever actuates the speed set cam to select a governor droop line. The position of the droop line is biased by compressor inlet temperature. The deviation of desired speed from the actual speed (speed error) causes movement of the speed servo. This movement of the speed servo is transmitted through a lever and results in the repositioning of the droop cam. The rollers in the multiplication system are positioned through the action of the droop cam to be a function of the speed error. The repositioning of the rollers then provides the required steady-state  $W_F / P_S$  4 ratio setting.
- (6) Auxiliary Functions
- (a) The windmill bypass and shutoff valve, in addition to supplying the high-pressure signal for the shutoff function, also provides a windmill bypass feature. This valve is plumbed to a line leading to the spring side of the pressure regulating valve and is positioned by a shutoff lever operated cam so that signals are generated at the desired shutoff lever positions. Movement of the shutoff lever toward the shutoff position displaces the valve, thereby porting the pressure on the spring side of the pressure regulating valve to pump interstage. The pressure regulating valve now operates as a relief valve to handle the full windmilling fuel flow.
- (7) Automatic Reserve Thrust (ART) System
- (a) The fuel control incorporates a Reserve Takeoff Thrust (RTT) Engine package which provides fuel flow for the Automatic Reserve Thrust (ART) requirements. Reset is accomplished by translation of the 3-D speed set by a fuel control internal linkage connected to a fuel pressure activated servo. The servo is controlled by a solenoid valve remotely operated by a DFGC supplied signal. If the ART system is inoperative maximum takeoff thrust can be obtained by manual operation of the power lever.
- (b) When placed in the AUTO position, the ART switch commands the Digital Flight Guidance Computer (DFGC) to reduce the displayed EPR shown on the Thrust Rating Indicator and on each EPR indicator. (Figure 1)
- (c) The ART system is armed when the low speed rotors of both engines ( $N_1$ ) reach 64.0%, and activates when the difference in low speed rotors reaches 30.2%. On activation, the ART solenoid on the fuel control energizes and shifts the 3-D speed cam set increasing the high rotor speed ( $N_2$ ), increasing the thrust from Normal Takeoff to Maximum Takeoff. This action initiates the ART follow-up switch on the fuel control, turning the amber ART light ON indicating successful ART operation and notifying an engine failure.

### WJE 405-411, 880, 881, 883, 884

- (d) Three annunciator lights (READY, ART, and ART INOP) are incorporated in the ART system. When in the takeoff mode, with the ART switch in AUTO, the green READY light will come on to indicate that the ART system has been tested and will successfully actuate when the need arises. The amber ART light is actuated by the ART solenoids installed on the fuel controls and when on indicates an engine or computer failure has occurred and that the ART system has been initiated. The amber ART INOP light is coupled to the Master Warning and Caution Controller and when ON indicates that a failure in the ART system has occurred. (Figure 1)

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WJE 405-411, 880, 881, 883, 884; with SB 32-178 incorp.

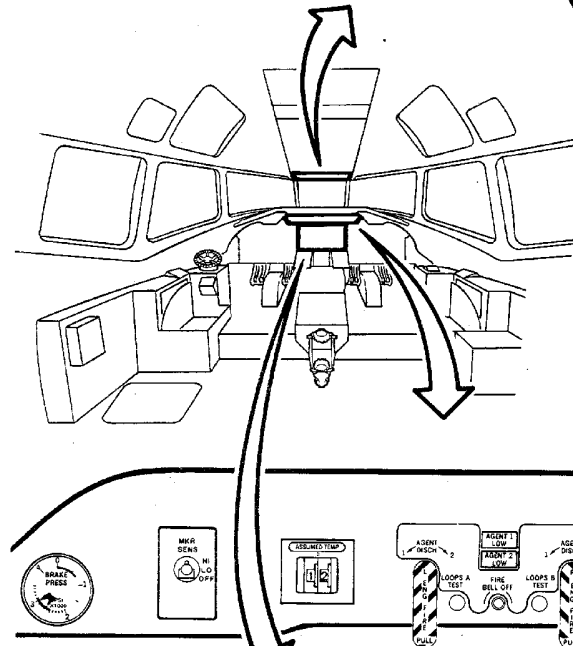
- (e) A functional test will be made to demonstrate that the speed set cam on both fuel controls moves to the thrust reset position when appropriately commanded by the digital computer. Success is measured by the closing of a follow-up switch when the cam moves to reset position and then by opening of the switch when the command is removed.
  - (f) The functional test is performed once when both engines are operating, the aircraft is on the ground, and ART switch is put into 'AUTO' position with slats extended or by extending slats when the ART switch is in 'AUTO' position. Consequently, the functional test is repeated if either the ART switch or the slats are cycled. The fuel control solenoids will be energized only long enough to detect a successful test. The short time required for the test will preclude any noticeable increase in thrust.
- (8) Approach Idle (Figure 3)
- (a) The fuel control incorporates a two position idle selection solenoid whose functions are described as follows:
  - (b) The approach idle control system consists of a nose gear down switch, ground sensing relay, a 5 second delay relay, and an engine fuel control idle solenoid.
  - (c) The idle control solenoid selects the ground/descent (low) idle position when electrical power is applied to the solenoid, and the approach (high) idle position when no power is applied.
  - (d) In the approach mode, with the nose gear extended, the nose gear down switch is actuated to the open circuit position, de-energizing the solenoid and positioning the idle solenoid in the approach (high) idle mode. At touch down, with weight on the nose gear, the ground sensing switches close, energizing a 5 second delay relay, after 5 seconds, the relay closes the circuit and energizes the idle solenoid to the ground/descent (low) idle position. The approach idle is maintained after nose gear touch down for 5 seconds to provide rapid engine acceleration capability in case of a miscalculated landing or other reasons.
  - (e) The approach idle inoperative light is located in the electronics equipment bay and is used for maintenance only. The light operation is based on differences of electrical inputs to the two engine idle solenoids. If one system is grounded and the other is energized, as in a failed condition, the 3 second delay relay is energized, after 3 seconds the relay closes energizing the approach idle inop. relay, closing the relay contact to ground and energizing the inop. light ON. The light will remain on until the fault is repaired and the reset switch is closed, latching the relay in the fault-free position.
- (9) Deceleration Bleed Override
- (a) The fuel control incorporates a bleed override circuit which is designed to open the bleed valves when the engine is on a rapid deceleration schedule. A reduced fuel flow associated with a rapid decelerating power lever movement results in a lower bleed override fuel signal. This fuel signal is carried through external plumbing to a bleed valve control which interrupts the flow of actuating air to the bleed valves from the pressure ratio bleed control. When the override fuel signal is low because of rapid deceleration scheduling, the bleed valve control cuts the bleed valves off from their actuating air pressure and allows them to open. When the rapid deceleration phase is terminated, an increased fuel signal pressure to the bleed valve control opens the air valve in the control and allows pressure from the pressure ratio bleed control to close the bleed valves.



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AC BUS OFF	AC BUS OFF	L ENG ANTIFICE ON	R ENG ANTIFICE ON	L FUEL HEAT ON	R FUEL HEAT ON	WING DAMP OFF	CARGO FAIL	WINGER TAREL UNRESTRICTED	AUTO SPOILER DO NOT USE	ELEVATOR PWR ON	SPOILER DEFLECTED	MT CARGO DOOR
APU GEN OFF	DC TRANSFER BUS OFF	WING ANTIFICE ON	TAIL DE-ICE ON	ENG SYNC ON	ART INOP	STALL INDICATION FAILURE	STALL INDICATION FAILURE	RAIN REPELLANT RESERVE IN USE	PARKING BRAKES ON	SLIDER COMPACT	SLIDER COMPACT	MT CARGO DOOR
L AC BUS OFF	R AC BUS OFF	ICE PROTECT TEMP HIGH	ICE PROTECT TEMP HIGH	L START VALVE OPEN	R START VALVE OPEN	CPWS FAIL	CPWS FAIL	WING TEMP HIGH	SPEED BRAKE EXTENDED	L HYD TEMP HI	R HYD TEMP HI	MT STAIRWAY DOOR
L GEN OFF	R GEN OFF	APU GEN PROTECT PRESS UNNORMAL	ICE PROTECT SUPPLY PRESS HI	L OIL STANDBY LOW	R OIL STANDBY LOW	TRAIL COMP/TEMP HIGH	FIRE DETECTOR LOOP	APU OIL TEMP HIGH	L HYD PRESS LOW	R HYD PRESS LOW	APU CABIN DOOR	ACCESS COMP DOOR
L CSD OIL	R CSD OIL	ICE PROTECT TEMP LOW	ICE PROTECT TEMP LOW	L FUEL FILTER PRESS LOW	R FUEL FILTER PRESS LOW	CABIN ACT	APU FIRE	L AIR COND SUPPLY TEMP HI	R AIR COND SUPPLY TEMP HI	L OUTFLOW AIR-GAUGE	R OUTFLOW AIR-GAUGE	MT STAIRWAY DOOR
EMER LIGHT NOT LAMED	DC BUS OFF	L ENG VALVE	R ENG VALVE	FUEL FILTER PRESS SHUT	FUEL FILTER PRESS SHUT	EMER OFF	DC EMER BUS OFF	RADIO XAN OFF	PLT RECORDER OFF	L INNO ANTI-SMOG	R INNO ANTI-SMOG	MT CARGO DOOR

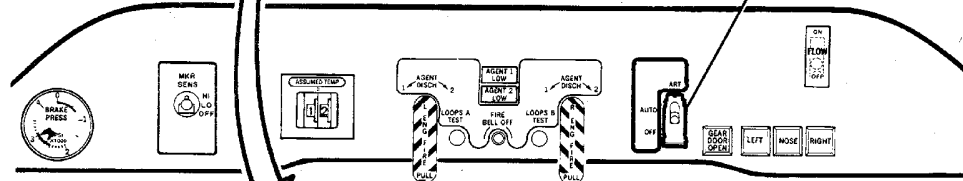
OVERHEAD ANNUNCIATOR PANEL



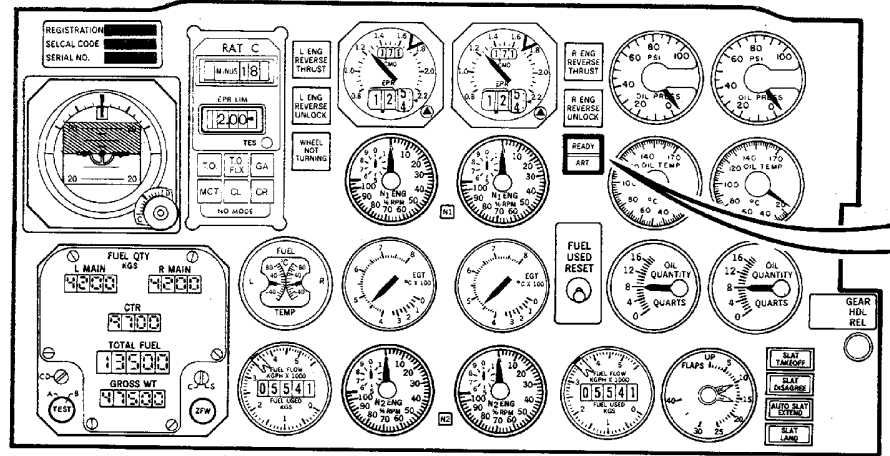
L FUEL HEAT ON (B)	R FUEL HEAT ON (B)
ENG SYNC ON	ART INOP
L START VALVE OPEN	R START VALVE OPEN

ART INOP LIGHT

AUTO RESERVE THRUST (ART) SWITCH



UPPER INSTRUMENT PANEL



ART READY LIGHT



ART ACTUATION LIGHT

CENTER INSTRUMENT PANEL

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Automatic Reserve Thrust (ART) -- Annunciator Lights  
Figure 1/73-20-00-990-804

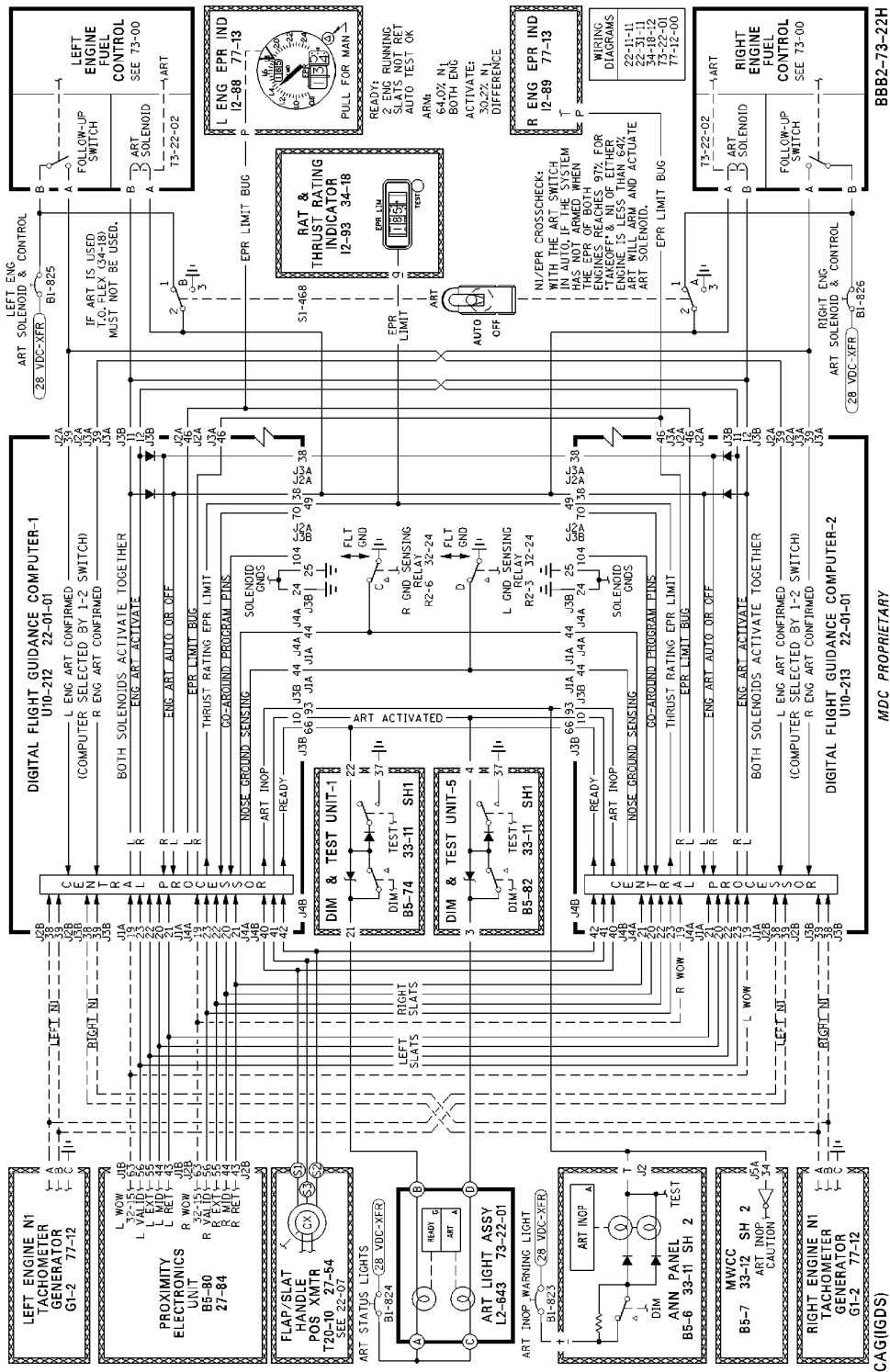
EFFECTIVITY  
WJE 405-411, 880, 881, 883, 884

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



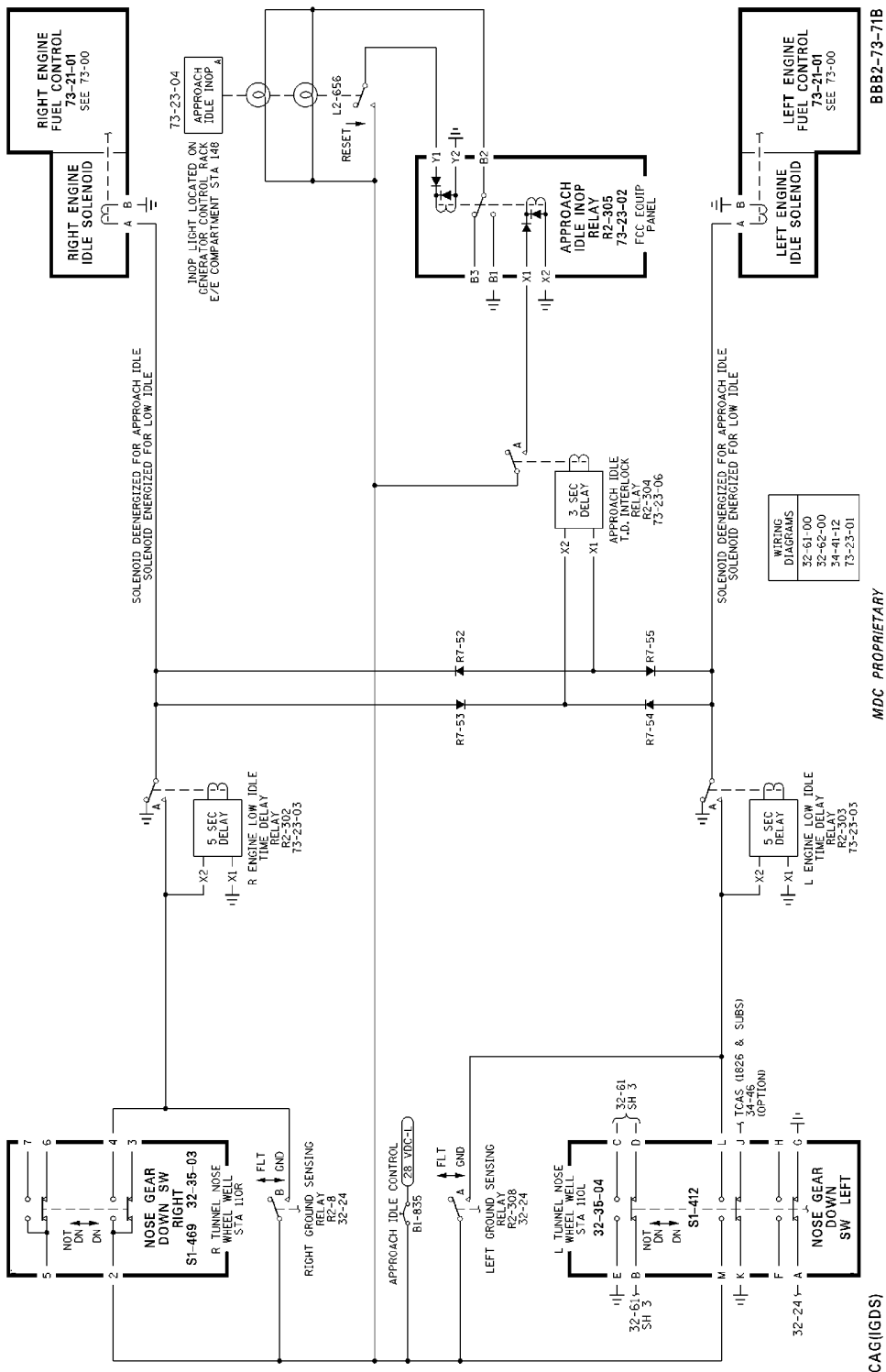
**Automatic Reserve Thrust (ART) -- Schematic**  
Figure 2/73-20-00-990-805

EFFECTIVITY  
WJE 405-411, 880, 881, 883, 884

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TP-80MM-WJE

# MD-80 AIRCRAFT MAINTENANCE MANUAL



Approach Idle Control -- Schematic  
Figure 3/73-20-00-990-806

EFFECTIVITY  
WJE 405-411, 880, 881, 883, 884; with SB 32-178  
incorp.

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## CONTROLLING - DESCRIPTION AND OPERATION

### 1. General

- A. The fuel control is basically a fuel metering system and a computer, responding to various engine operating parameters. The fuel control is provided with two control levers; one to control the engine speed during all forward and reverse thrust operations, and the other to control engine starting and shut-down. The fuel control accurately governs the steady state selected speed, acceleration and deceleration, and indirectly governs the maximum turbine temperature of the engine during both forward and reverse thrust operation.

### 2. Fuel Control

#### A. Description

- (1) The fuel control schedules the fuel flow required by the engine to deliver thrust as dictated by the power lever position and operating conditions of the engine. Two control levers are provided. The power lever controls the engine during forward or reverse thrust operation. The shutoff lever effects engine shutdown and starting by closing and opening a fuel shutoff valve.
- (2) A proportional or droop-type governing system accurately governs the engine steady state selected speed, and regulates acceleration and deceleration fuel flow.
- (3) The fuel control consists of metering and computing sections. The metering section selects the rate of fuel flow to be supplied to the engine combustion chambers in accordance with the amount of thrust demanded by the pilot, but subject to engine operating limitations as scheduled by the computing section which monitors various engine operational parameters. The computing system senses and combines various parameters to bias the output of the metering section of the fuel control during all regimes of engine operation.
- (4) Metering System
  - (a) High-pressure fuel, at approximately 500 psig, is supplied to the control inlet from the engine-driven fuel pump. This fuel encounters the coarse filter which protects the metering system against large particles of fuel contaminants. The fuel then encounters the fine servo supply filter which further protects the computing system against solid contaminants. This filter is self-cleaning because fuel velocity through the axis of the cylinder toward the metering section is significantly greater than the flow through the mesh supplying the servo control valves. Both filters are protected by valves that open to allow fuel to bypass if screens become clogged and the fuel flow is restricted.
  - (b) Fuel flows to the metering valve (throttle valve) across a constant pressure differential maintained by the pressure regulating system. The throttle valve is a window-type valve and is positioned by a half-area servo. The movable sleeve (piston) position is controlled by a rotating pilot valve which is displaced from its hydraulic null (steady-state) position by compress discharge pressure, engine speed, compressor inlet temperature, power lever, or any combination of these parameters. These actuating signals work in conjunction with each other to produce a net torque on the multiplying lever. A balancing torque is created by the throttle valve extension spring-load varied with the valve position. As long as the resultant torque is zero, the throttle valve maintains a constant position. However, any change in the signal torque will displace the pilot valve and cause motion of the throttle valve piston until the unbalanced signal torque is balanced by the new throttle valve position and corresponding spring force. Fuel flow is proportional to the position of the throttle valve piston, by virtue of the constant pressure drop maintained across the throttle valve.

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- (c) The pressure drop across the throttle valve is maintained nominally at 40 psi by a (bypass type) pressure regulating valve. All high-pressure fuel in excess of that required to maintain pressure differential is bypassed to pump interstage. The pressure regulating valve consists of a sensor and a pressure regulating valve. The pressure regulating valve will bypass more or less of the fuel flow necessary to maintain pressure differential. The lower end of the pressure regulating valve is subjected to upstream throttle valve pressure and the upper end is balanced by downstream throttle valve pressure and a spring force equivalent to 40 psig. If failure occurs in the direction of low control discharge pressure, the control will meter at the spring force equivalent pressure and prevent bypassing the total flow back to pump interstage.
  - (d) Fuel leaving the throttle valve passes through the minimum pressure and shutoff valve on its way to the engine. This valve is designed to shut off the flow of metered fuel to the engine when the pilot moves the shutoff lever to the off position. When actuated for the shutoff function, high-pressure is directed to the spring side of the valve by the action of the windmill bypass and shutoff valve. This pressure closes the valve and allows the spring to keep it in the shutoff position. When the shutoff lever is moved to the on position, the high-pressure on the spring side of the valve is replaced by pump interstage pressure. When metered fuel pressure has increased sufficiently to overcome the spring and low-pressure fuel force, the valve opens and fuel flow to the engine is initiated. Thereafter, the valve will provide a minimum operating pressure within the fuel control, ensuring that adequate pressure is always available for operation of the servos at low-flow conditions.
- (5) Computing System
- (a) The computing system positions the throttle valve to control fuel flow during steady state operation, acceleration and deceleration by using the ratio of metered fuel flow to engine compressor discharge pressure ( $W_f/P_{s,4}$ ) as a control parameter. The positioning of the throttle valve by means of the  $W_f/P_{s,4}$  parameter is accomplished through a multiplying system whereby the  $W_f/P_{s,4}$  signal for acceleration, deceleration or steady state speed control is multiplied by a signal proportional to compressor discharge pressure to provide the required fuel flow.
  - (b) Compressor discharge pressure is sensed by a motor bellows which is externally exposed to the pressure. The resultant force, caused by the expansion or contraction of this bellows, is opposed by an evacuated bellows of equal size. The net force, which is proportional to absolute compressor discharge pressure, is transmitted through a sensor lever to a set of rollers whose position is proportional to the required  $W_f/P_{s,4}$  ratio. These rollers ride between the sensor lever and a multiplying lever. The force, proportional to compressor discharge pressure, is transmitted through the rollers to the multiplying lever. Any change in the roller position or the compressor discharge pressure signal results in an unbalanced torque which will displace the rotating pilot valve from its hydraulic null position, thereby repositioning the throttle valve. The movement of the throttle valve extends or relaxes a spring which will return the multiplying lever to its equilibrium position when the throttle valve reaches the required fuel flow position. Both the motor and evacuated bellows are located in a chamber vented to ambient pressure so that in event of an evacuated bellows failure, the fuel flow error is only the difference between the flow required for the absolute pressure reading and that required for a gage pressure reading. The vent line to the bellows chamber contains an orifice which will allow compressor discharge pressure sensing should a minor motor bellows failure occur.

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- (c) The compressor discharge pressure limiting valve is held seated by the action of a spring at  $P_{s4}$  values below the limiting pressure. Signal pressure to the  $P_{s4}$  bellows is tapped off between the two valve seats and, below the limiting point, the bellows signal pressure and compressor discharge pressure are equal. When compressor discharge pressure exceeds the limiting value, the spring force is overcome and the limiter valve opens to bleed off compressor discharge pressure and thereby reduce the bellows signal pressure.
- (d) Deceleration control is provided by the constant radius portion of the droop cam and by adjustment of the roller positioning linkage to limit the travel of the rollers toward decreasing fuel flow, thereby effecting a minimum  $W_f/P_{s4}$  ratio. This provides a linear relationship between fuel flow and compressor discharge pressure which results in blow-out free deceleration.
- (e) Acceleration control is provided by adjustment of the roller positioning linkage to effect a maximum  $W_f/P_{s4}$  ratio stop for a particular value of speed and compressor inlet temperature. The maximum  $W_f/P_{s4}$  ratio value at the stop is controlled by a three dimensional (3-D) cam which is translated by a signal proportional to engine speed and rotated by a signal proportional to compressor inlet temperature. The 3-D cam is so contoured as to define a schedule of  $W_f/P_{s4}$  versus compressor inlet temperature which is used as a limiting value for each speed through-out the transient acceleration range. This combination will permit engine accelerations within the over-temperature and surge limits of the engine. When the acceleration limiting lever is in operation to control the maximum value of  $W_f/P_{s4}$  ratio, it overrides the speed setting linkage.
- (f) The engine speed signal is transmitted from the engine-driven drive shaft through a gear train to the centrifugal type flyweight governor. This governor controls movement of the speed servo (3-D cam) by displacing a rotating pilot valve from its hydraulic null position. When the speed changes, the flyweight force varies and the pilot valve is displaced causing motion of the speed servo. This motion of the speed servo repositions the pilot valve, through the action of a feedback lever working on a spring, until the speed sensing governor returns to hydraulic null at the new speed servo position. The position of the speed servo is, therefore, indicative of actual engine speed.
- (g) Compressor inlet temperature is sensed by a liquid filled bulb mounted in the compressor inlet and connected to a liquid filled bellows in the control. Changes in inlet air temperature cause corresponding changes in the bellows length. The position output of the motor bellows is biased by a position output of a second, or compensating bellows. The compensating bellows is also liquid filled and is connected to a capillary tube placed adjacent to the line leading from the air inlet bulb to the motor bellows. Pressure changes due to the temperature gradient between the air inlet and the control act on this compensating line as well as the motor bellows supply line. This permits the second bellows to modify the motor bellows output to ensure a correct indication of inlet air temperature. This corrected position output displaces a pilot valve from its hydraulic null (steady-state) position and results in movement of the temperature servo piston. The servo piston is connected through a linkage to a rack which meshes with the spline on the 3-D cam and motion of the piston rotates the cam. As the rack moves to rotate the cam, it also repositions the pilot valve in order to return the valve to the steady-state position. The rotation of the 3-D cam, acting through a linkage, resets the governor droop line.

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- (h) Engine speed control is accomplished by comparing the actual speed, as indicated by the position of the speed servo, to the desired speed value required for the power selected by the pilot through a power lever positioning speed set cam. The power lever actuates the speed set cam to select a governor droop line. The position of the droop line is biased by compressor inlet temperature. The deviation of desired speed from the actual speed (speed error) causes movement of the speed servo. This movement of the speed servo is transmitted through a lever and results in the repositioning of the droop cam. The rollers in the multiplication system are positioned through the action of the droop cam to be a function of the speed error. The repositioning of the rollers then provides the required steady-state  $W_f/P_{s4}$  ratio setting.
- (6) Auxiliary Functions
- (a) The windmill bypass and shutoff valve, in addition to supplying the high-pressure signal for the shutoff function, also provides a windmill bypass feature. This valve is plumbed to a line leading to the spring side of the pressure regulating valve and is positioned by a shutoff lever-operated cam so that signals are generated at the desired shutoff lever positions. Movement of the shutoff lever toward the shutoff position displaces the valve, thereby porting the pressure on the spring side of the pressure regulating valve to pump interstage. The pressure regulating valve now operates as a relief valve to handle the full windmilling fuel flow.
- (7) Automatic Reserve Thrust (ART) System
- (a) The fuel control incorporates a Reserve Takeoff Thrust (RTT) Engine package which provides fuel flow for the Automatic Reserve Thrust (ART) requirements. Reset is accomplished by translation of the 3-D speed set by a fuel control internal linkage connected to a fuel pressure activated servo. The servo is controlled by a solenoid valve remotely operated by a DFGC supplied signal. If the ART system is inoperative maximum takeoff thrust can be obtained by manual operation of the power lever.
- (b) When placed in the AUTO position, the ART switch commands the Digital Flight Guidance Computer (DFGC) to reduce the displayed EPR shown on the Thrust Rating Indicator and on each EPR indicator. (Figure 1)
- (c) The ART system is armed when the low speed rotors of both engines ( $N_1$ ) reach 64.0%, and activates when the difference in low speed rotors reaches 30.2%. On activation, the ART solenoid on the fuel control energizes and shifts the 3-D speed cam set increasing the high rotor speed ( $N_2$ ), increasing the thrust from Normal Takeoff to Maximum Takeoff. This action initiates the ART follow-up switch on the fuel control, turning the amber ART light ON indicating successful ART operation and notifying an engine failure.

### WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 891

- (d) Three annunciator lights (READY, ART, and ART INOP) are incorporated in the ART system. When in the takeoff mode, with the ART switch in AUTO, the green READY light will come on to indicate that the ART system has been tested and will successfully actuate when the need arises. The amber ART light is actuated by the ART solenoids installed on the fuel controls and when on indicates an engine or computer failure has occurred and that the ART system has been initiated. The amber ART INOP light is coupled to the Master Warning and Caution Controller and when ON indicates that a failure in the ART system has occurred. (Figure 1)

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### WJE 415, 418, 421, 423, 861-866, 869, 871, 872

- (e) Two annunciator lights (READY, ART,) and ART INOP Message Display are incorporated in the ART system. When in the takeoff mode, with the ART switch in AUTO, the green READY light will come on to indicate that the ART system has been tested and will successfully actuate when the need arises. The amber ART light is actuated by the ART solenoids installed on the fuel controls and when on indicates an engine or computer failure has occurred and that the ART system has been initiated. The ART INOP Message Display is coupled to the Master Warning and Caution Controller and when ON indicates that a failure in the ART system has occurred. (Figure 1)

### WJE 412, 414-427, 429, 861-866, 868, 869, 871, 872, 891

- (f) A functional test will be made to demonstrate that the speed set cam on both fuel controls moves to the thrust reset position when appropriately commanded by the digital computer. Success is measured by the closing of a follow-up switch when the cam moves to reset position and then by opening of the switch when the command is removed.
  - (g) The functional test is performed once when both engines are operating, the aircraft is on the ground, and ART switch is put into 'AUTO' position with slats extended or by extending slats when the ART switch is in 'AUTO' position. Consequently, the functional test is repeated if either the ART switch or the slats are cycled. The fuel control solenoids will be energized only long enough to detect a successful test. The short time required for the test will preclude any noticeable increase in thrust.
- (8) Approach Idle (Figure 3)
- (a) The fuel control incorporates a two position idle selection solenoid whose functions are described as follows:
  - (b) The approach idle control system consists of a nose gear down switch, ground sensing relay, a 5 second delay relay, and an engine fuel control idle solenoid.
  - (c) The idle control solenoid selects the ground/descent (low) idle position when electrical power is applied to the solenoid, and the approach (high) idle position when no power is applied.
  - (d) In the approach mode, with the nose gear extended, the nose gear down switch is actuated to the open circuit position, de-energizing the solenoid and positioning the idle solenoid in the approach (high) idle mode. At touch down, with weight on the nose gear, the ground sensing switches close, energizing a 5 second delay relay, after 5 seconds, the relay closes the circuit and energizes the idle solenoid to the ground/descent (low) idle position. The approach idle is maintained after nose gear touch down for 5 seconds to provide rapid engine acceleration capability in case of a miscalculated landing or other reasons.
  - (e) The approach idle inoperative light is located in the electronics equipment bay and is used for maintenance only. The light operation is based on differences of electrical inputs to the two engine idle solenoids. If one system is grounded and the other is energized, as in a failed condition, the 3 second delay relay is energized, after 3 seconds the relay closes energizing the approach idle inop. relay, closing the relay contact to ground and energizing the inop. light ON. The light will remain on until the fault is repaired and the reset switch is closed, latching the relay in the fault-free position.
- (9) Deceleration Bleed Override

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The fuel control incorporates a bleed override circuit which is designed to open the bleed valves when the engine is on a rapid deceleration schedule. A reduced fuel flow associated with a rapid decelerating power lever movement results in a lower bleed override fuel signal. This fuel signal is carried through external plumbing to a bleed valve control which interrupts the flow of actuating air to the bleed valves from the pressure ratio bleed control. When the override fuel signal is low because of rapid deceleration scheduling, the bleed valve control cuts the bleed valves off from their actuating air pressure and allows them to open. When the rapid deceleration phase is terminated, an increased fuel signal pressure to the bleed valve control opens the air valve in the control and allows pressure from the pressure ratio bleed control to close the bleed valves.

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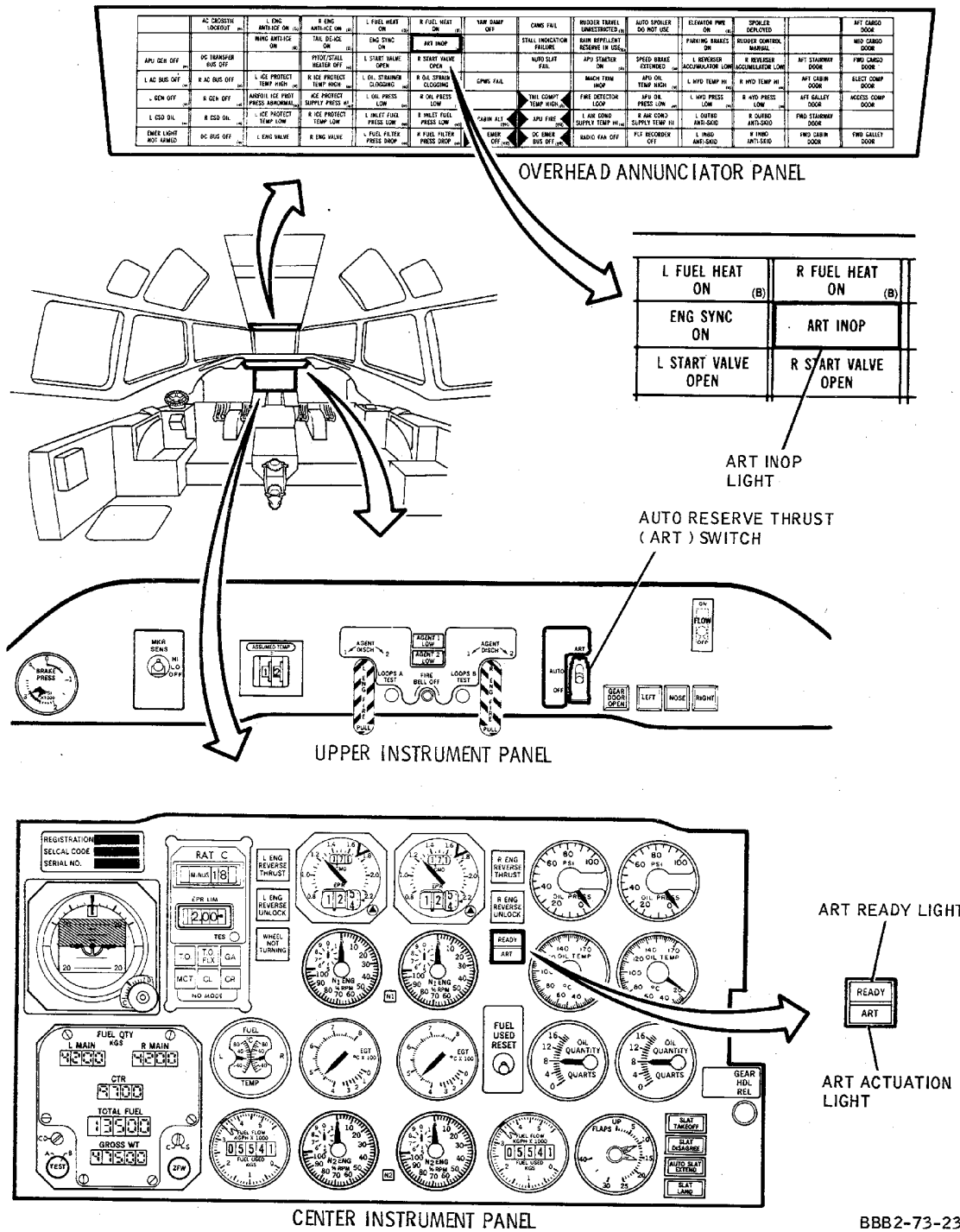
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BBB2-73-23

**Automatic Reserve Thrust (ART) -- Annunciator Lights and Message Display**  
Figure 1/73-20-00-990-813 (Sheet 1 of 2)

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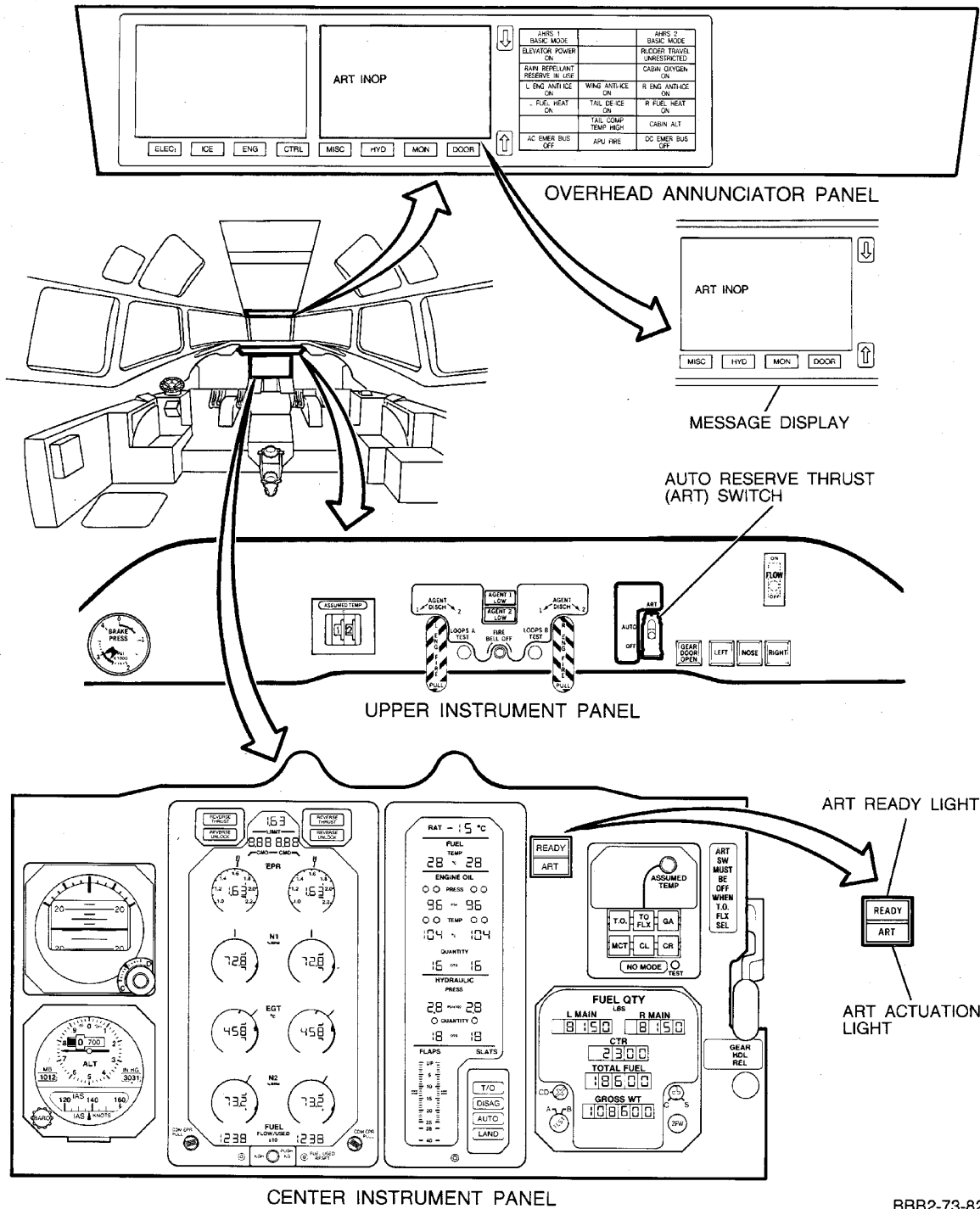
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BBB2-73-82

**Automatic Reserve Thrust (ART) -- Annunciator Lights and Message Display**  
Figure 1/73-20-00-990-813 (Sheet 2 of 2)

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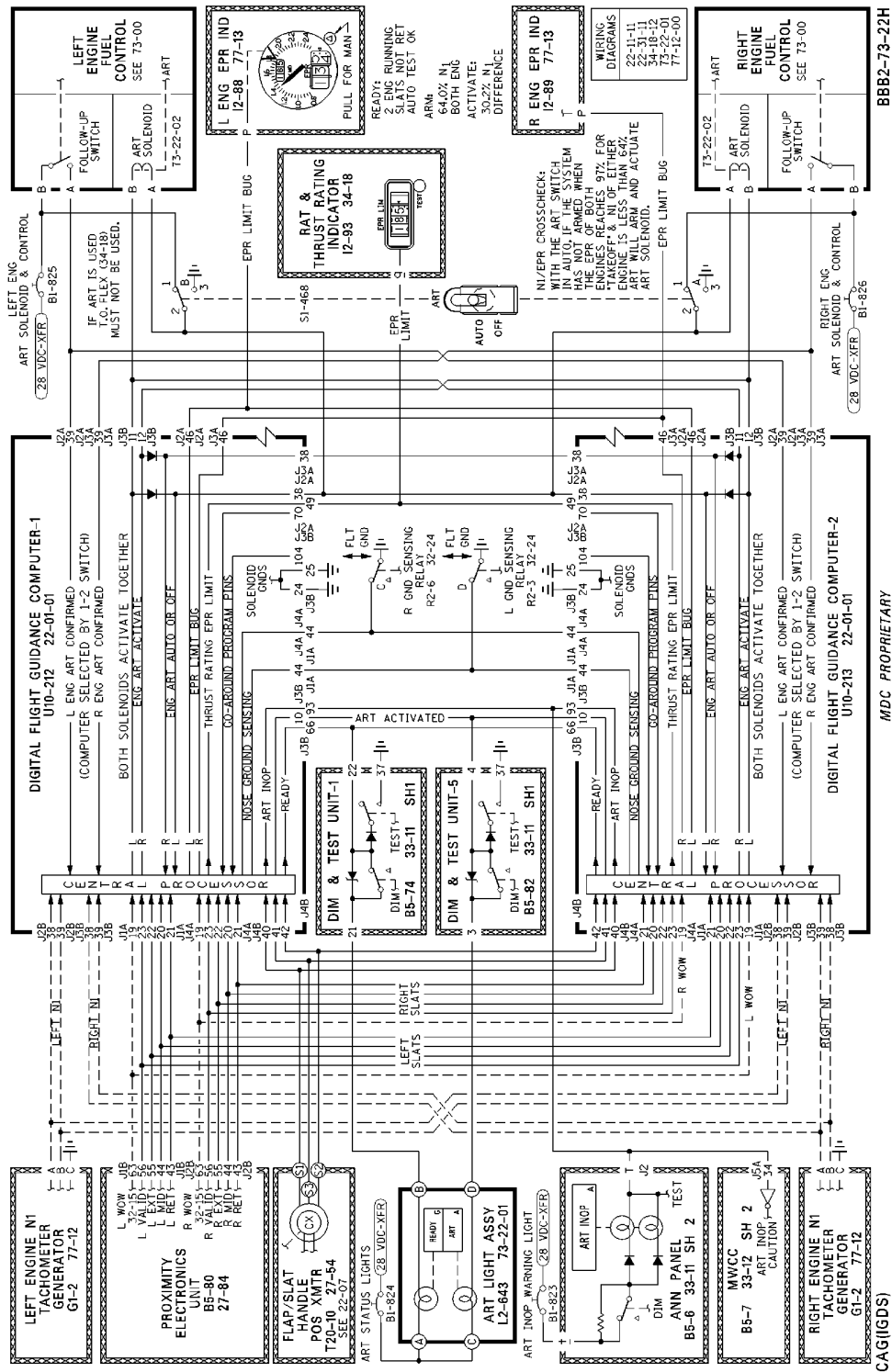
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Automatic Reserve Thrust (ART) -- Schematic  
Figure 2/73-20-00-990-814 (Sheet 1 of 2)

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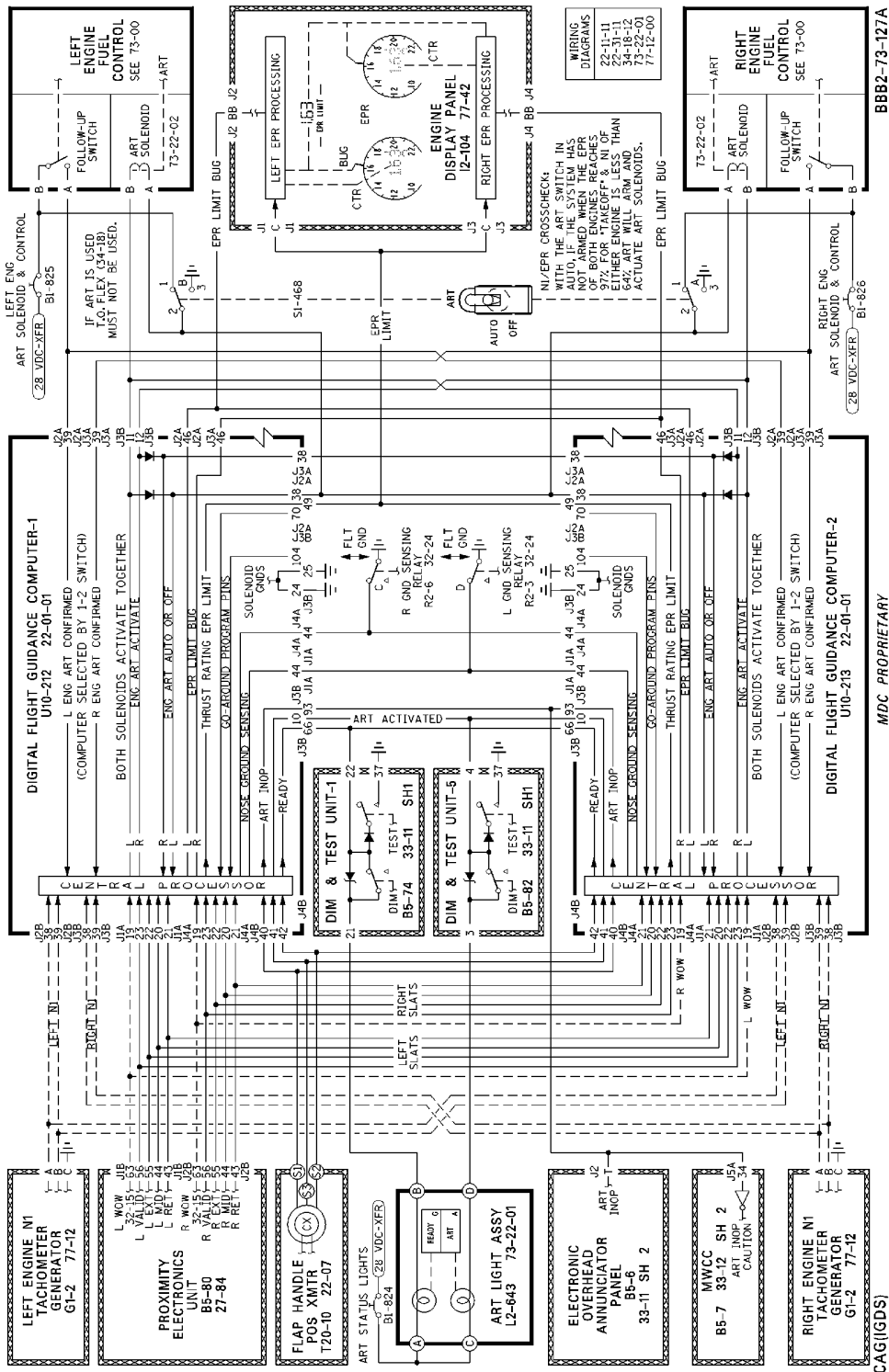
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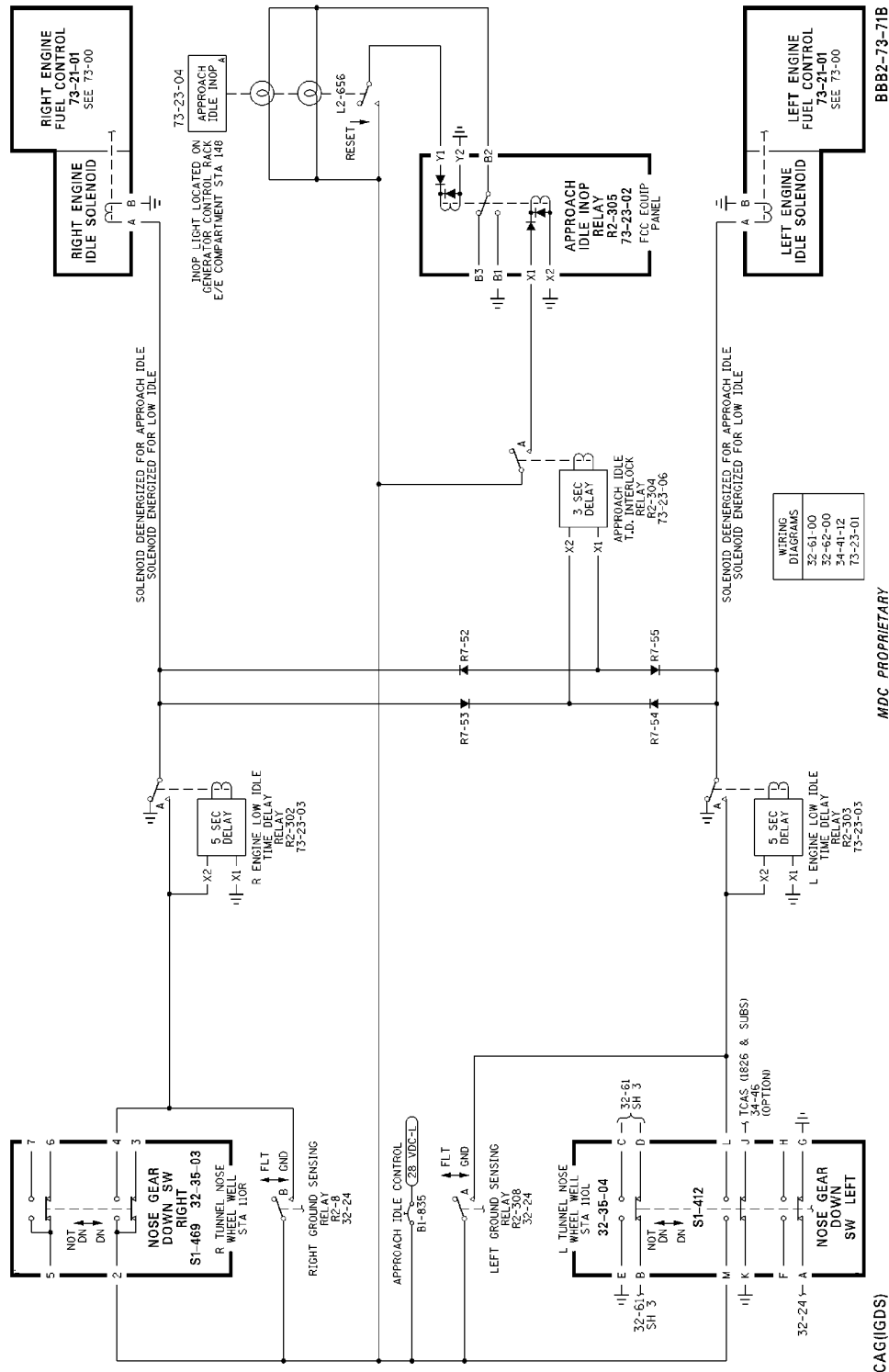
Automatic Reserve Thrust (ART) -- Schematic  
Figure 2/73-20-00-990-814 (Sheet 2 of 2)

EFFECTIVITY  
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BBB2-73-71B

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CAG(IIGDS)

Approach Idle Control -- Schematic  
Figure 3/73-20-00-990-815

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### CONTROLLING - DESCRIPTION AND OPERATION

#### 1. General

- A. The fuel control is basically a fuel metering system and a computer, responding to various engine operating parameters. The fuel control is provided with two control levers; one to control the engine speed during all forward and reverse thrust operations, and the other to control engine starting and shut-down. The fuel control accurately governs the steady state selected speed, acceleration and deceleration, and indirectly governs the maximum turbine temperature of the engine during both forward and reverse thrust operation.

#### 2. Fuel Control

##### A. Description

- (1) The fuel control schedules the fuel flow required by the engine to deliver thrust as dictated by the power lever position and operating conditions of the engine. Two control levers are provided. The power lever controls the engine during forward or reverse thrust operation. The shutoff lever effects engine shutdown and starting by closing and opening a fuel shutoff valve.
- (2) A proportional or droop-type governing system accurately governs the engine steady state selected speed, and regulates acceleration and deceleration fuel flow.
- (3) The fuel control consists of metering and computing sections. The metering section selects the rate of fuel flow to be supplied to the engine combustion chambers in accordance with the amount of thrust demanded by the pilot, but subject to engine operating limitations as scheduled by the computing section which monitors various engine operational parameters. The computing system senses and combines various parameters to bias the output of the metering section of the fuel control during all regimes of engine operation.
- (4) Metering System
  - (a) High-pressure fuel, at approximately 500 psig, is supplied to the control inlet from the engine-driven fuel pump. This fuel encounters the coarse filter which protects the metering system against large particles of fuel contaminants. The fuel then encounters the fine servo supply filter which further protects the computing system against solid contaminants. This filter is self-cleaning because fuel velocity through the axis of the cylinder toward the metering section is significantly greater than the flow through the mesh supplying the servo control valves. Both filters are protected by valves that open to allow fuel to bypass if screens become clogged and the fuel flow is restricted.
  - (b) Fuel flows to the metering valve (throttle valve) across a constant pressure differential maintained by the pressure regulating system. The throttle valve is a window-type valve and is positioned by a half-area servo. The movable sleeve (piston) position is controlled by a rotating pilot valve which is displaced from its hydraulic null (steady-state) position by compress discharge pressure, engine speed, compressor inlet temperature, power lever, or any combination of these parameters. These actuating signals work in conjunction with each other to produce a net torque on the multiplying lever. A balancing torque is created by the throttle valve extension spring-load varied with the valve position. As long as the resultant torque is zero, the throttle valve maintains a constant position. However, any change in the signal torque will displace the pilot valve and cause motion of the throttle valve piston until the unbalanced signal torque is balanced by the new throttle valve position and corresponding spring force. Fuel flow is proportional to the position of the throttle valve piston, by virtue of the constant pressure drop maintained across the throttle valve.



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- (c) The pressure drop across the throttle valve is maintained nominally at 40 psi by a (bypass type) pressure regulating valve. All high-pressure fuel in excess of that required to maintain pressure differential is bypassed to pump interstage. The pressure regulating valve consists of a sensor and a pressure regulating valve. The pressure regulating valve will bypass more or less of the fuel flow necessary to maintain pressure differential. The lower end of the pressure regulating valve is subjected to upstream throttle valve pressure and the upper end is balanced by downstream throttle valve pressure and a spring force equivalent to 40 psig. If failure occurs in the direction of low control discharge pressure, the control will meter at the spring force equivalent pressure and prevent bypassing the total flow back to pump interstage.
  - (d) Fuel leaving the throttle valve passes through the minimum pressure and shutoff valve on its way to the engine. This valve is designed to shut off the flow of metered fuel to the engine when the pilot moves the shutoff lever to the off position. When actuated for the shutoff function, high-pressure is directed to the spring side of the valve by the action of the windmill bypass and shutoff valve. This pressure closes the valve and allows the spring to keep it in the shutoff position. When the shutoff lever is moved to the on position, the high-pressure on the spring side of the valve is replaced by pump interstage pressure. When metered fuel pressure has increased sufficiently to overcome the spring and low-pressure fuel force, the valve opens and fuel flow to the engine is initiated. Thereafter, the valve will provide a minimum operating pressure within the fuel control, ensuring that adequate pressure is always available for operation of the servos at low-flow conditions.
- (5) Computing System
- (a) The computing system positions the throttle valve to control fuel flow during steady state operation, acceleration and deceleration by using the ratio of metered fuel flow to engine compressor discharge pressure ( $W_f/P_{s,4}$ ) as a control parameter. The positioning of the throttle valve by means of the  $W_f/P_{s,4}$  parameter is accomplished through a multiplying system whereby the  $W_f/P_{s,4}$  signal for acceleration, deceleration or steady state speed control is multiplied by a signal proportional to compressor discharge pressure to provide the required fuel flow.
  - (b) Compressor discharge pressure is sensed by a motor bellows which is externally exposed to the pressure. The resultant force, caused by the expansion or contraction of this bellows, is opposed by an evacuated bellows of equal size. The net force, which is proportional to absolute compressor discharge pressure, is transmitted through a sensor lever to a set of rollers whose position is proportional to the required  $W_f/P_{s,4}$  ratio. These rollers ride between the sensor lever and a multiplying lever. The force, proportional to compressor discharge pressure, is transmitted through the rollers to the multiplying lever. Any change in the roller position or the compressor discharge pressure signal results in an unbalanced torque which will displace the rotating pilot valve from its hydraulic null position, thereby repositioning the throttle valve. The movement of the throttle valve extends or relaxes a spring which will return the multiplying lever to its equilibrium position when the throttle valve reaches the required fuel flow position. Both the motor and evacuated bellows are located in a chamber vented to ambient pressure so that in event of an evacuated bellows failure, the fuel flow error is only the difference between the flow required for the absolute pressure reading and that required for a gage pressure reading. The vent line to the bellows chamber contains an orifice which will allow compressor discharge pressure sensing should a minor motor bellows failure occur.



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- (c) The compressor discharge pressure limiting valve is held seated by the action of a spring at  $P_{s4}$  values below the limiting pressure. Signal pressure to the  $P_{s4}$  bellows is tapped off between the two valve seats and, below the limiting point, the bellows signal pressure and compressor discharge pressure are equal. When compressor discharge pressure exceeds the limiting value, the spring force is overcome and the limiter valve opens to bleed off compressor discharge pressure and thereby reduce the bellows signal pressure.
- (d) Deceleration control is provided by the constant radius portion of the droop cam and by adjustment of the roller positioning linkage to limit the travel of the rollers toward decreasing fuel flow, thereby effecting a minimum  $W_f/P_{s4}$  ratio. This provides a linear relationship between fuel flow and compressor discharge pressure which results in blow-out free deceleration.
- (e) Acceleration control is provided by adjustment of the roller positioning linkage to effect a maximum  $W_f/P_{s4}$  ratio stop for a particular value of speed and compressor inlet temperature. The maximum  $W_f/P_{s4}$  ratio value at the stop is controlled by a three dimensional (3-D) cam which is translated by a signal proportional to engine speed and rotated by a signal proportional to compressor inlet temperature. The 3-D cam is so contoured as to define a schedule of  $W_f/P_{s4}$  versus compressor inlet temperature which is used as a limiting value for each speed through-out the transient acceleration range. This combination will permit engine accelerations within the over-temperature and surge limits of the engine. When the acceleration limiting lever is in operation to control the maximum value of  $W_f/P_{s4}$  ratio, it overrides the speed setting linkage.
- (f) The engine speed signal is transmitted from the engine-driven drive shaft through a gear train to the centrifugal type flyweight governor. This governor controls movement of the speed servo (3-D cam) by displacing a rotating pilot valve from its hydraulic null position. When the speed changes, the flyweight force varies and the pilot valve is displaced causing motion of the speed servo. This motion of the speed servo repositions the pilot valve, through the action of a feedback lever working on a spring, until the speed sensing governor returns to hydraulic null at the new speed servo position. The position of the speed servo is, therefore, indicative of actual engine speed.
- (g) Compressor inlet temperature is sensed by a liquid filled bulb mounted in the compressor inlet and connected to a liquid filled bellows in the control. Changes in inlet air temperature cause corresponding changes in the bellows length. The position output of the motor bellows is biased by a position output of a second, or compensating bellows. The compensating bellows is also liquid filled and is connected to a capillary tube placed adjacent to the line leading from the air inlet bulb to the motor bellows. Pressure changes due to the temperature gradient between the air inlet and the control act on this compensating line as well as the motor bellows supply line. This permits the second bellows to modify the motor bellows output to ensure a correct indication of inlet air temperature. This corrected position output displaces a pilot valve from its hydraulic null (steady-state) position and results in movement of the temperature servo piston. The servo piston is connected through a linkage to a rack which meshes with the spline on the 3-D cam and motion of the piston rotates the cam. As the rack moves to rotate the cam, it also repositions the pilot valve in order to return the valve to the steady-state position. The rotation of the 3-D cam, acting through a linkage, resets the governor droop line.

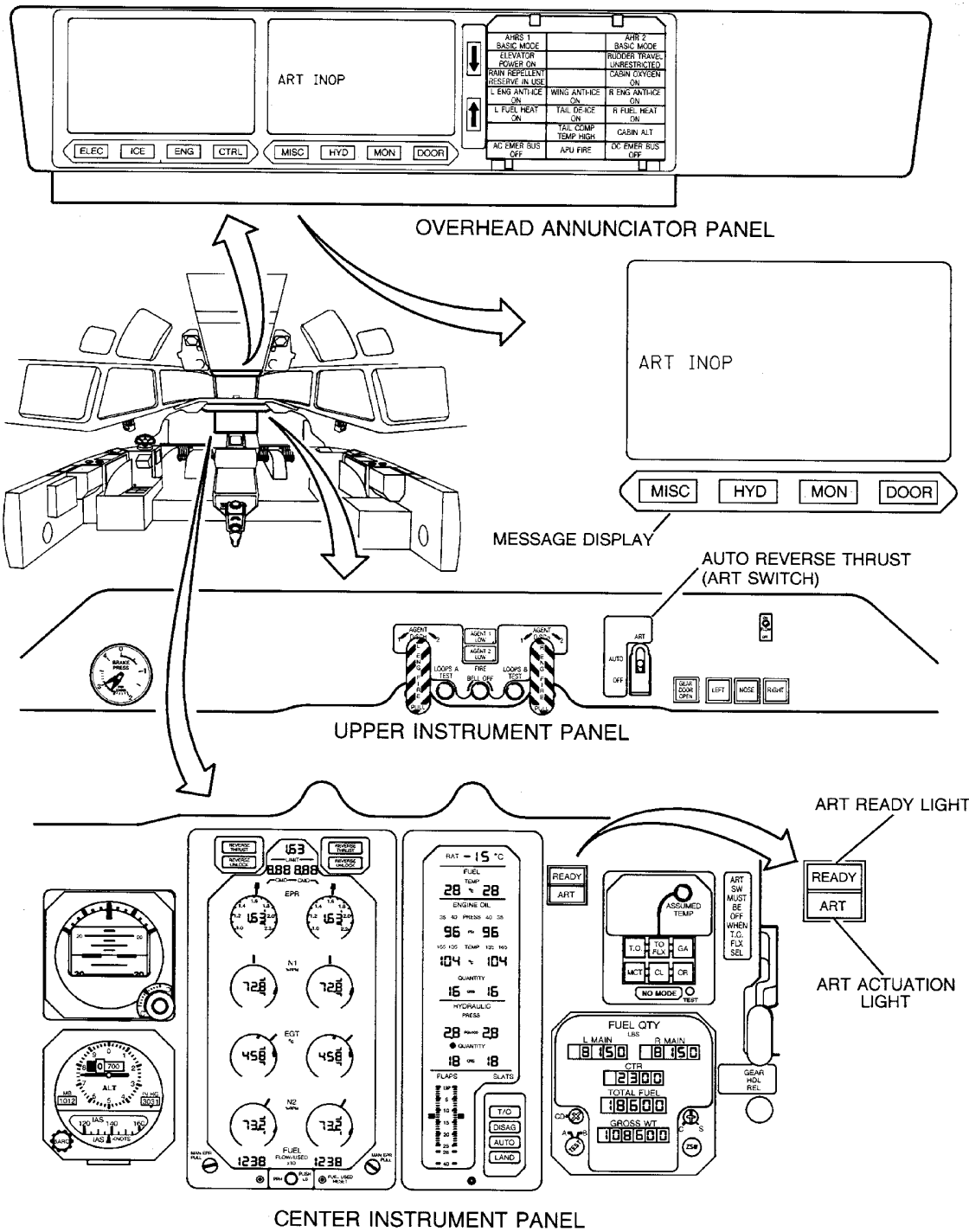
## MD-80 AIRCRAFT MAINTENANCE MANUAL

- (h) Engine speed control is accomplished by comparing the actual speed, as indicated by the position of the speed servo, to the desired speed value required for the power selected by the pilot through a power lever positioning speed set cam. The power lever actuates the speed set cam to select a governor droop line. The position of the droop line is biased by compressor inlet temperature. The deviation of desired speed from the actual speed (speed error) causes movement of the speed servo. This movement of the speed servo is transmitted through a lever and results in the repositioning of the droop cam. The rollers in the multiplication system are positioned through the action of the droop cam to be a function of the speed error. The repositioning of the rollers then provides the required steady-state  $W_f/P_{s4}$  ratio setting.
- (6) Auxiliary Functions
- (a) The windmill bypass and shutoff valve, in addition to supplying the high-pressure signal for the shutoff function, also provides a windmill bypass feature. This valve is plumbed to a line leading to the spring side of the pressure regulating valve and is positioned by a shutoff lever-operated cam so that signals are generated at the desired shutoff lever positions. Movement of the shutoff lever toward the shutoff position displaces the valve, thereby porting the pressure on the spring side of the pressure regulating valve to pump interstage. The pressure regulating valve now operates as a relief valve to handle the full windmilling fuel flow.
- (7) Automatic Reserve Thrust (ART) System
- (a) The fuel control incorporates a Reserve Takeoff Thrust (RTT) Engine package which provides fuel flow for the Automatic Reserve Thrust (ART) requirements. Reset is accomplished by translation of the 3-D speed set by a fuel control internal linkage connected to a fuel pressure activated servo. The servo is controlled by a solenoid valve remotely operated by a DFGC supplied signal. If the ART system is inoperative maximum takeoff thrust can be obtained by manual operation of the power lever.
- (b) When placed in the AUTO position, the ART switch commands the Digital Flight Guidance Computer (DFGC) to reduce the displayed EPR shown on the Thrust Rating Indicator and on each EPR indicator. (Figure 1)
- (c) The ART system is armed when the low speed rotors of both engines ( $N_1$ ) reach 64.0%, and activates when the difference in low speed rotors reaches 30.2%. On activation, the ART solenoid on the fuel control energizes and shifts the 3-D speed cam set increasing the high rotor speed ( $N_2$ ), increasing the thrust from Normal Takeoff to Maximum Takeoff. This action initiates the ART follow-up switch on the fuel control, turning the amber ART light ON indicating successful ART operation and notifying an engine failure.
- (d) Two annunciator lights (READY, ART,) and ART INOP Message Display are incorporated in the ART system. When in the takeoff mode, with the ART switch in AUTO, the green READY light will come on to indicate that the ART system has been tested and will successfully actuate when the need arises. The amber ART light is actuated by the ART solenoids installed on the fuel controls and when on indicates an engine or computer failure has occurred and that the ART system has been initiated. The ART INOP Message Display is coupled to the Master Warning and Caution Controller and when ON indicates that a failure in the ART system has occurred. (Figure 1)
- (e) A functional test will be made to demonstrate that the speed set cam on both fuel controls moves to the thrust reset position when appropriately commanded by the digital computer. Success is measured by the closing of a follow-up switch when the cam moves to reset position and then by opening of the switch when the command is removed.

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- (f) The functional test is performed once when both engines are operating, the aircraft is on the ground, and ART switch is put into 'AUTO' position with slats extended or by extending slats when the ART switch is in 'AUTO' position. Consequently, the functional test is repeated if either the ART switch or the slats are cycled. The fuel control solenoids will be energized only long enough to detect a successful test. The short time required for the test will preclude any noticeable increase in thrust.
- (8) Approach Idle (Figure 3)
- (a) The fuel control incorporates a two position idle selection solenoid whose functions are described as follows:
  - (b) The approach idle control system consists of a nose gear down switch, ground sensing relay, a 5 second delay relay, and an engine fuel control idle solenoid.
  - (c) The idle control solenoid selects the ground/descent (low) idle position when electrical power is applied to the solenoid, and the approach (high) idle position when no power is applied.
  - (d) In the approach mode, with the nose gear extended, the nose gear down switch is actuated to the open circuit position, de-energizing the solenoid and positioning the idle solenoid in the approach (high) idle mode. At touch down, with weight on the nose gear, the ground sensing switches close, energizing a 5 second delay relay, after 5 seconds, the relay closes the circuit and energizes the idle solenoid to the ground/descent (low) idle position. The approach idle is maintained after nose gear touch down for 5 seconds to provide rapid engine acceleration capability in case of a miscalculated landing or other reasons.
  - (e) The approach idle inoperative light is located in the electronics equipment bay and is used for maintenance only. The light operation is based on differences of electrical inputs to the two engine idle solenoids. If one system is grounded and the other is energized, as in a failed condition, the 3 second delay relay is energized, after 3 seconds the relay closes energizing the approach idle inop. relay, closing the relay contact to ground and energizing the inop. light ON. The light will remain on until the fault is repaired and the reset switch is closed, latching the relay in the fault-free position.
- (9) Deceleration Bleed Override
- The fuel control incorporates a bleed override circuit which is designed to open the bleed valves when the engine is on a rapid deceleration schedule. A reduced fuel flow associated with a rapid decelerating power lever movement results in a lower bleed override fuel signal. This fuel signal is carried through external plumbing to a bleed valve control which interrupts the flow of actuating air to the bleed valves from the pressure ratio bleed control. When the override fuel signal is low because of rapid deceleration scheduling, the bleed valve control cuts the bleed valves off from their actuating air pressure and allows them to open. When the rapid deceleration phase is terminated, an increased fuel signal pressure to the bleed valve control opens the air valve in the control and allows pressure from the pressure ratio bleed control to close the bleed valves.

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CAG(GDS)

BBB2-73-96

**Automatic Reserve Thrust (ART) -- Annunciator Lights and Message Display Figure 1  
Figure 1/73-20-00-990-810**

EFFECTIVITY  
WJE 401-404, 412, 414, 886, 887

TP-80MM-WJE

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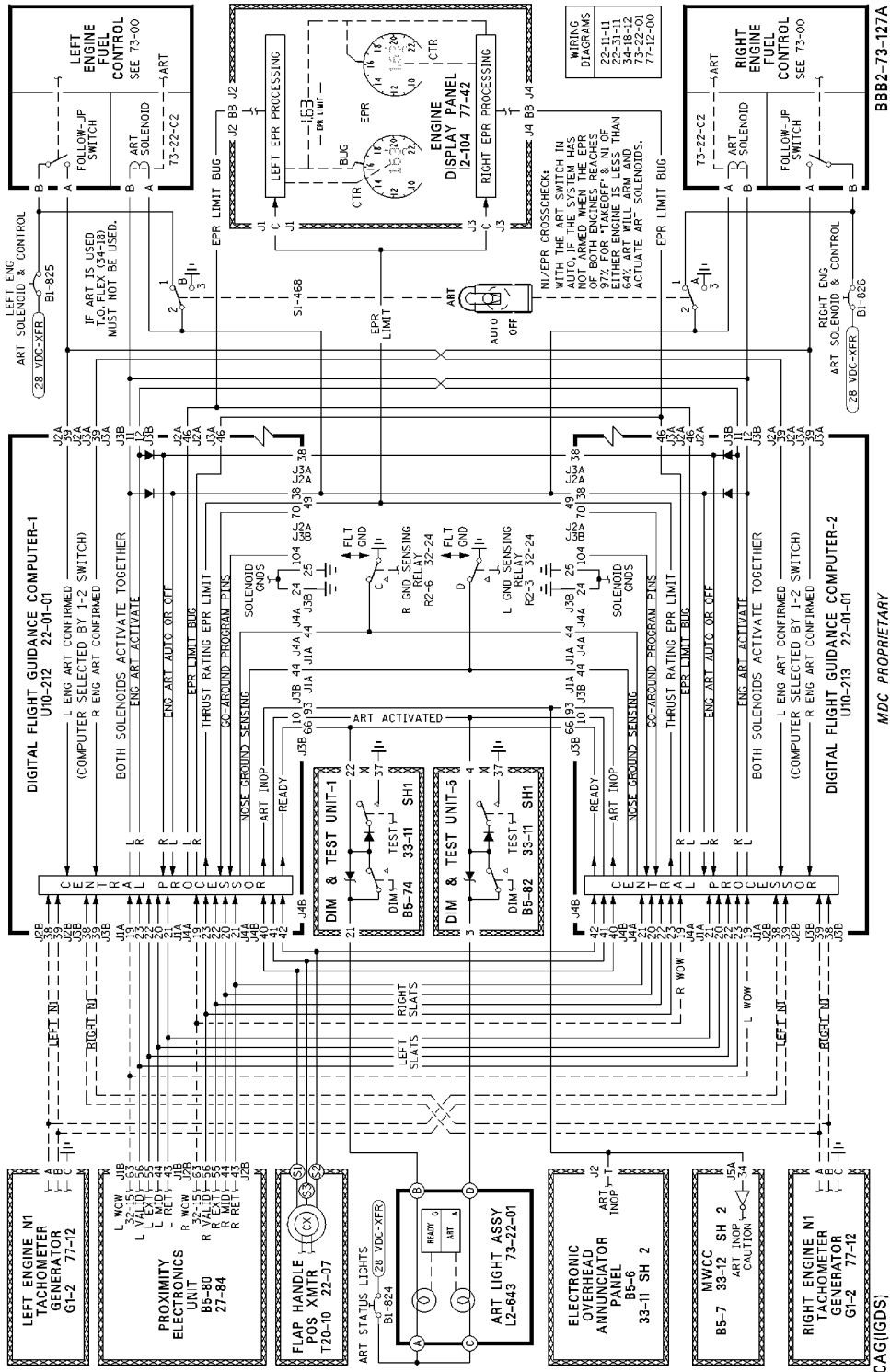
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Automatic Reserve Thrust (ART) -- Schematic  
Figure 2/73-20-00-990-811

EFFECTIVITY  
WJE 401-404, 412, 414, 886, 887

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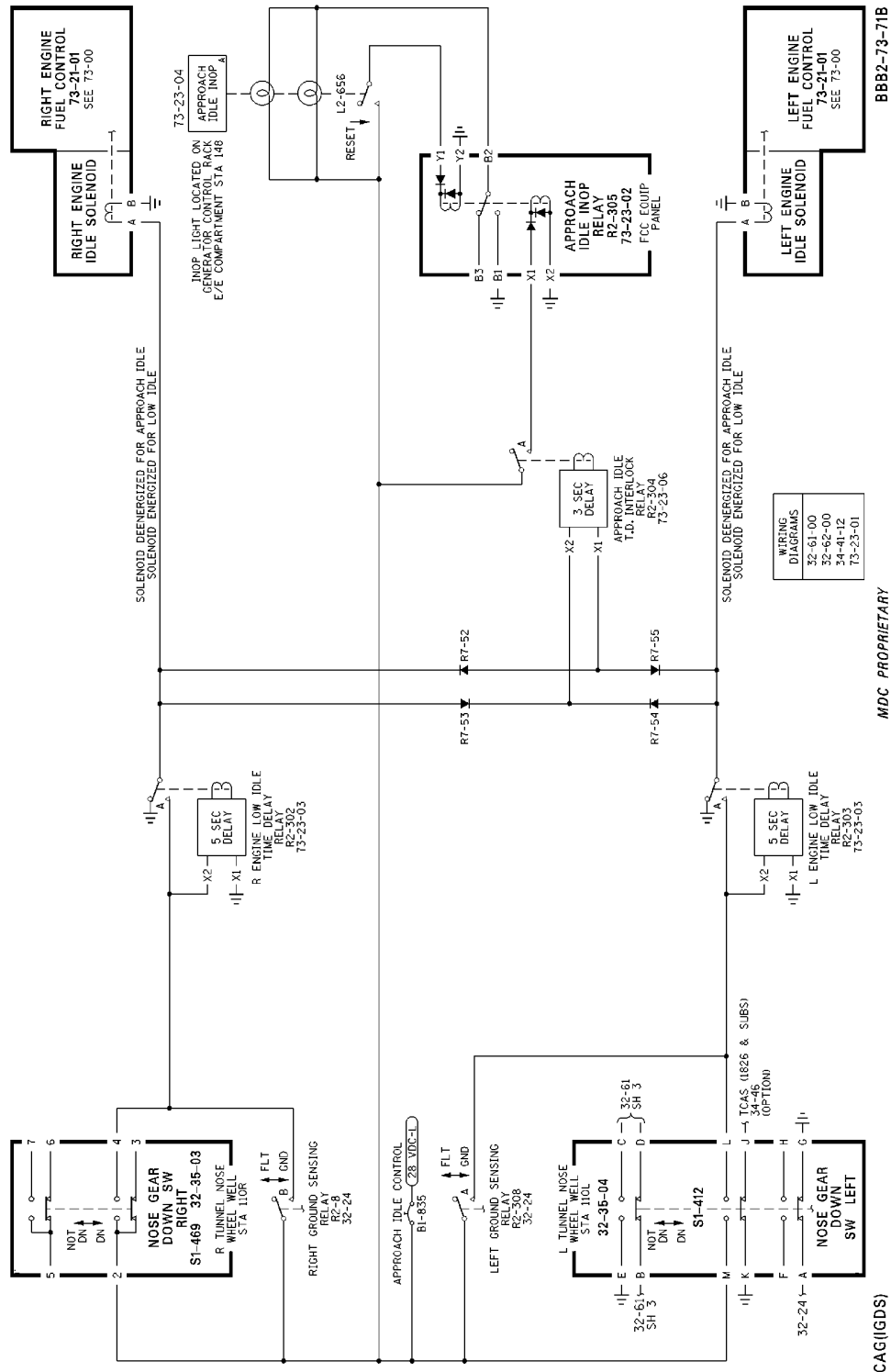
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BBB2-73-71B

MDC PROPRIETARY

CAG(IIGDS)

**Approach Idle Control -- Schematic  
Figure 3/73-20-00-990-812**

EFFECTIVITY  
WJE 401-404, 412, 414, 886, 887

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### AUTOMATIC RESERVE THRUST (ART) - TROUBLE SHOOTING

#### 1. General

- A. To find and correct automatic reserve thrust (ART) system troubles, first study the symptoms carefully. Check each possible cause beginning with the most likely until the exact nature of the trouble is determined. Before attempting to diagnose the trouble or work on the system which has been reported malfunctioning during flight, consult the pilot's flight report and all other pertinent data for information which might help in diagnosing the trouble.
- B. Position of circuit breakers should be checked before beginning trouble shooting procedures.

#### 2. Trouble Shooting Automatic Reserve Thrust (ART) System

- A. Check Circuit Breakers and Self-Test of ART System

(1) Check the following circuit breakers for being in the closed position:

##### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

**WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

U	32	B1-823	ART INOP WARNING LIGHT
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##### **WJE ALL**

W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

##### **LOWER EPC, MISCELLANEOUS LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

P	39	B1-827	LEFT PROXIMITY SWITCH CONTROL
---	----	--------	-------------------------------

##### **LOWER EPC, MISCELLANEOUS RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

R	39	B1-828	RIGHT PROXIMITY SWITCH CONTROL
---	----	--------	--------------------------------

##### **UPPER EPC, 28 VAC**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

C	17	B10-367	DIGITAL FLIGHT GUIDANCE SYSTEM SWITCH A
C	18	B10-368	DIGITAL FLIGHT GUIDANCE SYSTEM SWITCH B
C	19	B10-369	DIGITAL FLIGHT GUIDANCE SYSTEM SWITCH C

##### **UPPER EPC, L AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

**WJE 417, 419, 421, 423, 865, 869, 871, 872**

K	30	B1-23	LEFT GROUND CONTROL RELAY
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**WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893**

K	33	B1-23	LEFT GROUND CONTROL RELAY
---	----	-------	---------------------------

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WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893  
(Continued)

### UPPER EPC, LEFT RADIO AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE ALL			
D	20	B10-351	DIGITAL FLIGHT GUIDANCE SYSTEM-1
F	20	B10-302	GROUND PROXIMITY WARNING COMPUTER

### UPPER EPC, LEFT RADIO BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
C	10	B10-361	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	11	B10-363	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	12	B10-339	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-1
C	13	B10-337	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-1

### UPPER EPC, LEFT RADIO DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
E	20	B10-349	DIGITAL FLIGHT GUIDANCE SYSTEM-1
E	21	B10-348	DIGITAL FLIGHT GUIDANCE SYSTEM-2
G	20	B10-303	GROUND PROXIMITY WARNING LIGHTS

### UPPER EPC, R AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 417, 419, 421, 423, 865, 869, 871, 872			
L	30	B1-24	RIGHT GROUND CONTROL RELAY
WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893			
L	33	B1-24	RIGHT GROUND CONTROL RELAY

### UPPER EPC, RIGHT RADIO AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE ALL			
D	8	B10-352	DIGITAL FLIGHT GUIDANCE SYSTEM-2

### UPPER EPC, RIGHT RADIO BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
C	1	B10-360	DIGITAL FLIGHT GUIDANCE SYSTEM-1
C	2	B10-362	DIGITAL FLIGHT GUIDANCE SYSTEM-2
C	3	B10-340	DIGITAL FLIGHT GUIDANCE SYSTEM ALPHA-2
C	4	B10-338	DIGITAL FLIGHT GUIDANCE SYSTEM FLAP POSITION-2

### UPPER EPC, RIGHT RADIO DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
E	8	B10-350	DIGITAL FLIGHT GUIDANCE SYSTEM-2
E	9	B10-347	DIGITAL FLIGHT GUIDANCE SYSTEM-1

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- (2) Perform self-test on Digital Flight Guidance System. If system failed, repair system as indicated by self-test. If no failure indicated proceed with trouble shooting procedures. (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201)

NOTE: During takeoff ARTS will activate; if one engine is slow to spool up compared to the other, or a throttle split (stagger) was present resulting in a 30.2% split of N<sub>1</sub>.

### B. AUTOMATIC RESERVE THRUST SYSTEM INOPERATIVE

#### AUTOMATIC RESERVE THRUST SYSTEM INOPERATIVE

POSSIBLE CAUSE	ISOLATION PROCEDURE	CORRECTION
(1) Faulty Digital Flight Guidance Computer (DFGC)	Using DFGC side select switch, select opposite DFGC. If ARTS INOP light goes out after selecting opposite DFGC, the DFGC which cause the light is faulty.	Replace DFGC. (DIGITAL FLIGHT GUIDANCE COMPUTER (DFGC) - MAINTENANCE PRACTICES, PAGEBLOCK 22-01-01/201)
(2) Faulty ARTS solenoid (DFGC Flight Fault Review Recorded the Fault)		Replace ARTS solenoid. (AUTOMATIC RESERVE THRUST (ART) SOLENOID - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-04/201)
(3) Faulty ARTS follow up switch or solenoid (DFGC flight fault review did not record fault)	Connect analog meter selected to 28 VDC scale at mod blocks S30-117 pin 68, station 110 and S30-114 pin 8X, to ground. (Verify that meter is set to DC volts scale before connecting to aircraft.) Perform Optional Automatic Reserve Thrust (ARTS) System Check. (GENERAL, SUBJECT 71-00-00, Page 501). While performing the above check, both meters should show a momentary jump in voltage as both ARTS follow up switches close for a short period of time during test. If one of the volt meters did not show a deflection, the follow up switch or ARTS solenoid may be faulty. To isolate, replace ARTS solenoid and repeat step (3).	Replace ARTS Solenoid. (AUTOMATIC RESERVE THRUST (ART) SOLENOID - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-04/201)
(4) Faulty ARTS follow up switch	If both meters show a voltage jump during the test, the system is operating correctly. If the same engine does not show a voltage jump during the test, the ARTS follow up switches are suspect.	Replace fuel control. (determine configuration) (FUEL CONTROL, SUBJECT 73-20-01, Page 201).
<u>NOTE:</u> Aircraft wiring should be checked before replacing any component.		
<u>NOTE:</u> If fuel control is replaced, ARTS test should be performed. (GENERAL, SUBJECT 71-00-00, Page 501).		
(5) Faulty N1 tachometer generator	Using DFGC review the flight fault review for presence of any N1 generator failures having been recorded.	Replace N1 tachometer generator. (N1 TACHOMETER GENERATOR - MAINTENANCE PRACTICES, PAGEBLOCK 77-12-02/201)

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### AUTOMATIC RESERVE THRUST SYSTEM INOPERATIVE (Continued)

POSSIBLE CAUSE	ISOLATION PROCEDURE	CORRECTION
(6) Missing flap handle position information	Using DFGC maintenance test for the flap handle position transmitter (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201), observe flap handle position readings as flap handle is moved through all the detents. If loss of position data is observed, flap handle position switch may be faulty.	Replace flap handle position switch. (FLAP WARNING SWITCHES - MAINTENANCE PRACTICES, PAGEBLOCK 27-53-01/201)
(7) Missing Slat Position Information	Using DFGC maintenance test, second setup interactives test and passive discretes section (DFGS STATUS/TEST, SUBJECT 22-01-05, Page 201), observe for slat positions faults as slats are cycled. If faults are observed the proximity switch electronics unit or proximity sensors for slats may be faulty.	Troubleshoot slat proximity sensors. (LIFT AUGMENTING, SUBJECT 27-80-00, Page 1)
(8) Bad/Shorted ARTS switch (S1-468)	Place ARTS switch to AUTO position and check for ground at the DFGC connector J2A pin 38. If ground at DFGC, the ARTS switch may be faulty. Remove wires from switch, if ground no longer observed at the connector, the switch is faulty. If ground is present at DFGC connector with wires disconnected, check aircraft wiring.	Replace switch.
(9) Faulty ground sense relay(s)	Check DFGC flight fault review for presence of of ground sense fail fault. If faults are recorded, or a ground sense failure is is suspected, verify that a ground does not appear at DFGC connector J1A and J4A pin 44. If ground is present at connector, the left or right sense relay is faulty.	Replace left/ right relay as required.
(10) Missing solenoid grounds- DFGC	Check DFGC rear con nector for ground at J3B pins 24 and 25. If no ground is present, check aircraft wiring.	

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## FUEL CONTROL - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the fuel control located on the forward right underside of the engine.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel control is through the forward lower cowling.

**CAUTION:** TO PREVENT DAMAGE TO FUEL TUBE AND TRANSMITTER AND TO PREVENT CONTAMINANTS FROM ENTERING FUEL SYSTEM, MAKE CERTAIN OPEN ENDS OF TUBE AND TRANSMITTER PORT ARE COVERED.

- C. Removal, installation, and check procedures for the fuel control on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

**Table 201**

Name and Number	Manufacturer
Lockwire 0.032 corrosion resistant steel, P05-289	
Lockwire 0.020 corrosion resistant steel, P05-288	
Petrolatum VV-P-236 DPM 675	
Torque Wrench (0-50 inch-pounds)	
Suitable container approximately 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Silicone oil Nyosil-M20 (PRC 52M20) or Nyosil-M25 (PRC 52M25)	Nye Lubricants P.O. Box 8927 New Bedford, MA USA 02742-8927 TEL: (508) 996-6721 FAX: (508) 997-528
Wrench adapter PWA 45246	Pratt and Whitney
Sealant, RTV-159	General Electric Co.
Tag, "Do Not Operate"	

### 3. Removal/Installation Fuel Control

- A. Remove Control

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WJE 405-411, 873-881, 883, 884, 892, 893

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 873, 874, 880, 881, 883, 884, 892, 893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
U	40	B1-40	ENGINE START PUMP
<b>WJE 873, 874</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 873, 874</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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**WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891**

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 886, 887</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 886, 887</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WJE ALL**

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

- (4) Pull fire control handle, located on upper instrument panel.

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- (5) Make certain applicable pneumatic crossfeed lever is in CLOSED position.
  - (a) Attach a "Do Not Operate" tag to applicable pneumatic crossfeed lever. Write on tag:  
PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.
- (6) Remove plug from center rear of fuel bridge. Discard O-ring.

NOTE: Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).
- (7) Inspect removed fuel control filter for contamination. If contamination is found, determine source of contamination and correct as necessary. (FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES, PAGEBLOCK 73-20-02/201)
- (8) Disconnect fuel shutoff lever and power lever from control.

NOTE: Install rig pins (Ref. 76-11-00 and 76-12-00, Page 501) before disconnecting fuel control lever and power lever from control.
- (9) Disconnect fuel control rear Pb tube from control moisture trap.
- (10) Remove fuel control front Pb tube between control and moisture trap.
- (11) Disconnect bleed valve control fuel signal pressure (Pdbo) tube, and fuel pressure (Pd) tube from fuel control.
- (12) Remove fuel outlet tube from fuel control. Discard O-ring.
- (13) Remove inlet temperature sensor from engine inlet case.

NOTE: The inlet temperature sensor and lead are an integral part of the fuel control. Carefully coil the lead to avoid kinking and wrap the temperature sensor in protective paper.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (14) Disconnect electrical connector from ART indicating switch, ART solenoid and idle solenoid.
- (15) Remove bolts attaching cantilever support to fuel control bracket (leave support rods and adjusters attached to engine). (Figure 202)

**WARNING:** FUEL CONTROL WEIGHS APPROXIMATELY 38.0 POUNDS (17.23 KG). USE CARE WHEN HANDLING CONTROL TO AVOID INJURY.

- (16) Remove fuel control from fuel pump. Discard O-rings.

NOTE: Remove upper left nut using Wrench Adapter PWA 45246. (Figure 201)
- (17) Remove adapter unions from (Pdbo) and (Pd) ports. Discard O-rings.
- (18) Remove moisture trap and fittings for transfer to replacement fuel control.
- (19) Cover all openings on fuel control. Protect control and inlet temperature sensor by placing in plastic bag.

B. Install Control

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WJE 405-411, 873-881, 883, 884, 892, 893

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 873, 874, 880, 881, 883, 884, 892, 893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
U	40	B1-40	ENGINE START PUMP
<b>WJE 873, 874</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 873, 874</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (2) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 886, 887</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 886, 887</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

WJE ALL

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (3) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (4) Make certain that fire control handle, located on upper instrument panel, is pulled.
- (5) Make certain applicable pneumatic crossfeed lever is in CLOSED position and a "Do Not Operate" tag is attached.

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**WARNING:** WHITE PETROLATUM IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN WHITE PETROLATUM IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT BREATHE THE MIST.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

- (6) Lightly lubricate new O-ring with Petrolatum (VV-P-236) and install O-ring into groove on fuel control splined shaft boss.
- (7) Lightly lubricate new O-ring with Petrolatum (VV-P-236) and install O-ring into groove on fuel control fuel inlet boss.
- (8) Lightly lubricate new O-rings with petrolatum (VV-P-236), install O-ring on adapter unions and install adapter unions in (Pdbo) and (Pd) ports.

**WARNING:** LUBRICATING OIL IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN LUBRICATING OIL IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET LUBRICATING OIL IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE MIST.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### (WARNING PRECEDES)

**WARNING:** FUEL CONTROL WEIGHS APPROXIMATELY 38.0 POUNDS (17.23 KG). USE CARE WHEN HANDLING CONTROL TO AVOID INJURY.

**CAUTION:** EXTREME CARE MUST BE EXERCISED DURING INSTALLATION OF CONTROL TO ENSURE THAT FUEL PUMP AND FUEL CONTROL SPLINES ARE POSITIVELY ENGAGED TO AVOID DAMAGE TO FUEL CONTROL DRIVESHAFT BEARING. IF ENGINE IS STARTED WITH CONTROL INCORRECTLY INSTALLED ENGINE WILL CONTINUE TO ACCELERATE WITH NO POWER LEVER RESPONSE. THIS MALFUNCTION RESULTS FROM LACK OF ROTATION OF CONTROL DRIVE CAUSING FLOW REGULATION ON ZERO SPEED SCHEDULE ONLY. IN EVENT THIS PROBLEM SHOULD OCCUR, CONTROL MUST BE REMOVED FOR DRIVEGEAR BEARING CHECK.

- (9) Lightly lubricate control shaft splines with engine oil, position control, and install on fuel pump.
- (10) Tighten the upper left nut to 275 in-lb (31.07 N·m) to 300 in-lb (33.90 N·m).

**NOTE:** Wrench adapter PWA 45246 should be used to tighten the upper left nut (wrench adapter has three inch (76.2 mm) effective length). (Figure 201)

- (11) Tighten the remaining three nuts to 135 in-lb (15.25 N·m) to 150 in-lb (16.95 N·m).
- (12) Install and adjust cantilever support as follows (Figure 202):
  - (a) Remove cotter pins from each nut holding support rods to engine brackets and loosen nuts.
  - (b) Remove each adjuster and install with new key washers between jamnuts and adjuster. Center each adjuster on support rod threads within 0.080 inch (2.032 mm). Back off each jamnut from each end of adjusters to allow adjusters to be turned.
  - (c) Connect support rods and adjusters to fuel control bracket (do not torque bolts at this time).
  - (d) Torque each adjuster to 5 to 10 inch-pounds (0.565 to 1.130 N·m).
  - (e) Tighten each jamnut against adjusters and bend tabs of key washers to secure jamnuts (bend one set of tabs onto adjuster and other set onto jamnut).
  - (f) Tighten nuts at engine brackets and at fuel control bracket and secure with cotter pins.

**WARNING:** CONTAINS CHLORINATED HYDROCARBON, VAPOR TOXIC. AVOID PROLONGED OR REPEATED BREATHING OF VAPOR. USE ONLY WITH ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. KEEP CONTAINER CLOSED WHEN NOT IN USE. DO NOT TAKE INTERNALLY.

- (13) Clean surfaces of inlet temperature sensor and engine inlet case by SPOP 208. Refer to Chapter/Section STANDARD PRACTICES - ENGINE - MAINTENANCE PRACTICES, PAGEBLOCK 70-00-00/201.
- (14) Install inlet temperature sensor in engine inlet case.
- (15) Apply sealant (RTV-159) to inner surface of inlet case around sensor, sufficiently thick to fill gap all around sensor. (Figure 203)

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**WARNING:** WHITE PETROLATUM IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN WHITE PETROLATUM IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT BREATHE THE MIST.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

- (16) Lightly lubricate new O-ring with Petrolatum (VV-P-236) and install O-ring on fuel control outlet tube. Install fuel outlet tube. Safety bolts with P05-289 0.032 inch lockwire.
- (17) Connect bleed valve control fuel signal pressure (Pdbo) tube and fuel pressure (Pd) tube to fuel control. Safety tube nuts with P05-289 0.032 inch lockwire.
- (18) Install moisture trap and fittings with new O-rings on fuel control.
- (19) Connect fuel control rear Pb tube to moisture trap. Safety tube nut with P05-289 0.032 inch lockwire.
- (20) Fill burner pressure bellows and limiter cavity as follows (Figure 204):

**WARNING:** SILICONE OIL IS AN AGENT THAT IS A LOW HAZARD. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN SILICONE OIL IS USED.

- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

**CAUTION:** EXERCISE CARE TO INJECT OIL DOWNWARD INTO CYLINDRICAL PORTION OF BELLOWS CHAMBER CONNECTING UPPER AND LOWER HOUSINGS.

**CAUTION:** THE OIL USED TO FILL THE FUEL CONTROL BELLOWS IN THIS PROCEDURE MUST BE ONE OF THE OILS SPECIFIED BELOW. NO OTHER OILS ARE APPROVED. THESE OILS HAVE A SPECIFIC GRAVITY OF MORE THAN 1.0 AND HAVE COLD FLOW CHARACTERISTICS TO -65 DEGREES F (-53 DEGREES C).

- (a) Fill burner pressure bellows and limiter cavity through front Pb tube port opening with silicone oil Nyosil-M20 (PRC 52M20) or Nyosil-M25 (PRC 52M25) to level of port opening.

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- (b) Install front Pb tube between moisture trap and fuel control limiter housing. Safety tube nuts with P05-289 0.032 inch lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTORS, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUGS. WHEN CONNECTING PLUGS, DO NOT OVERTIGHTEN.

- (21) Connect electrical connector on ART indicating switch, ART solenoid, and idle solenoid. Safety connectors with P05-288 0.020 inch lockwire.

**NOTE:** Connector plug is properly installed when no relative motion exists between plug backshell and coupling ring.

- (22) Connect fuel shutoff lever and power lever to fuel control (Ref. 76-11-00 and 76-12-00, Page 501).

**NOTE:** For power lever and fuel shutoff lever rigging procedures, refer to 76-11-00 and 76-12-00, Page 501.

- (23) Lightly lubricate new O-ring with Petrolatum (VV-P-236) and install O-ring on drain plug. Install drain plug in fuel bridle. Safety plug with P05-289 0.032 inch lockwire.

- (24) Check fuel control per Paragraph 4..

### WJE 405-411, 873-881, 883, 884, 892, 893

- (25) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 873, 874, 880, 881, 883, 884, 892, 893</b>			
U	32	B1-823	ART INOP WARNING LIGHT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
U	40	B1-40	ENGINE START PUMP
<b>WJE 873, 874</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 873, 874</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 405-411, 873-881, 883, 884, 892, 893</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891

- (26) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 886, 887</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 886, 887</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871, 872, 886, 887, 891</b>			
W	32	B1-824	ART STATUS LIGHTS
X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

WJE ALL

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (27) Remove safety pin from thrust reverser control valve. Stow safety pin.  
 (28) Place fire control handle in retracted position.  
 (29) Remove "Do Not Operate" tag from applicable pneumatic crossfeed lever.

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- (30) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

NOTE: When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

### 4. Check Fuel Control

#### A. Purge Control

NOTE: This procedure is to be accomplished before engine start whenever the engine fuel system has been serviced, replacement of engine fuel system parts, or when removing or servicing engine fuel screens.

- (1) Place fuel control shutoff levers and ignition selector switches in OFF position.
- (2) Loosen fuel control bleeder plug sufficiently to bleed air from fuel control.

NOTE: Bleeder plug is located adjacent to engine fuel control trimmer housing on forward end of fuel control. (Figure 201)

- (3) With suitable container under fuel control, place appropriate aircraft fuel pump switch in on position.
- (4) Allow sufficient fuel and air to flow out of fuel control bleeder plug until only fuel is flowing from bleeder plug.
- (5) Place fuel pump switch in off position, tighten bleeder plug. Safety plug with P05-289 0.032 inch lockwire.

#### B. Check Control

- (1) Check control operation and visually check for leaks on first engine runup.
- (2) Check Pt<sub>2</sub> line for leaks if removed during fuel control removal/installation.
- (3) Perform engine trim procedures. (GENERAL, SUBJECT 71-00-00, Page 501)
- (4) If fuel control filter was NOT inspected for contamination in Paragraph 3.A.(7), remove control main filter and check for evidence of contamination after engine run.

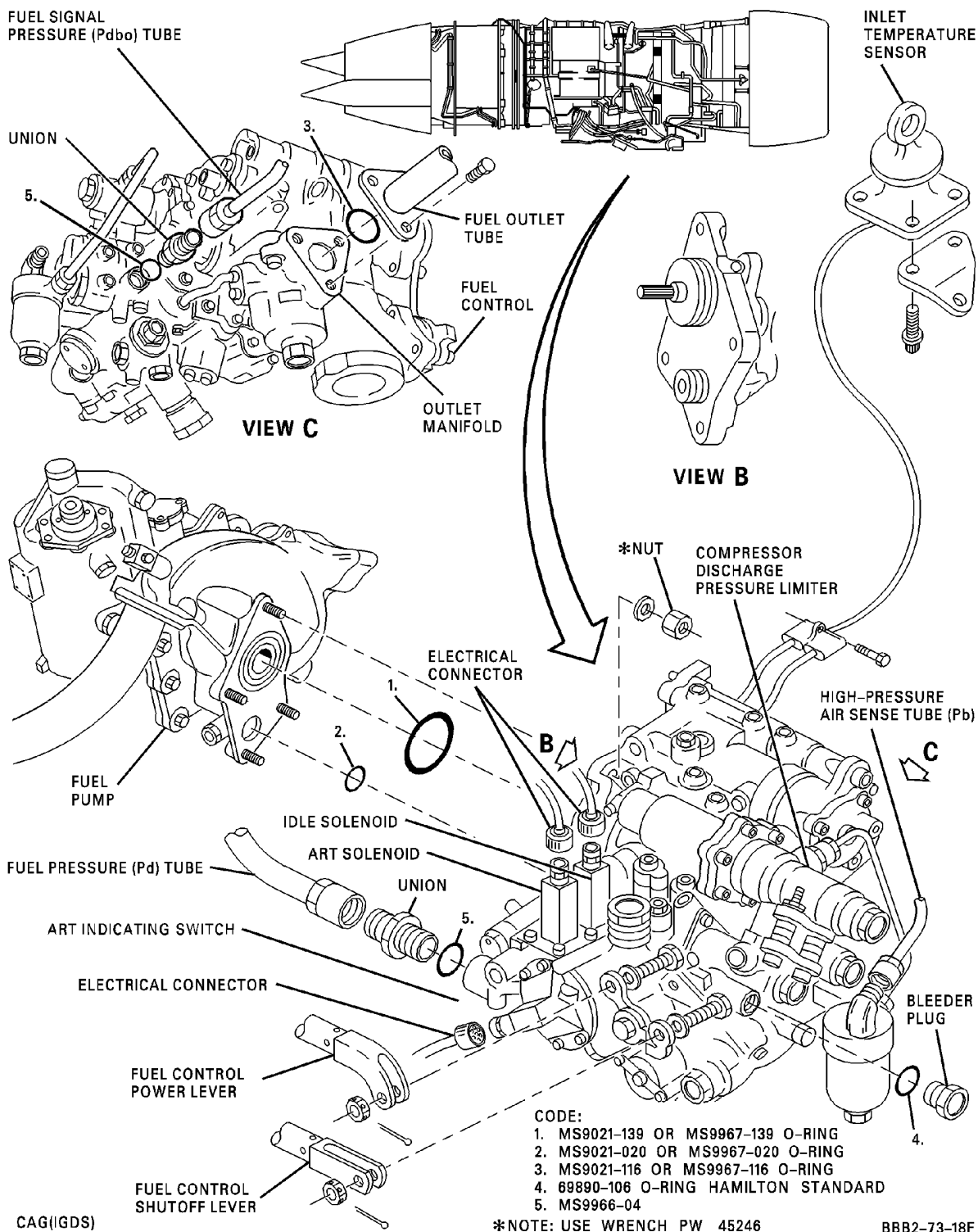
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**Fuel Control -- Removal/Installation  
Figure 201/73-20-01-990-801**

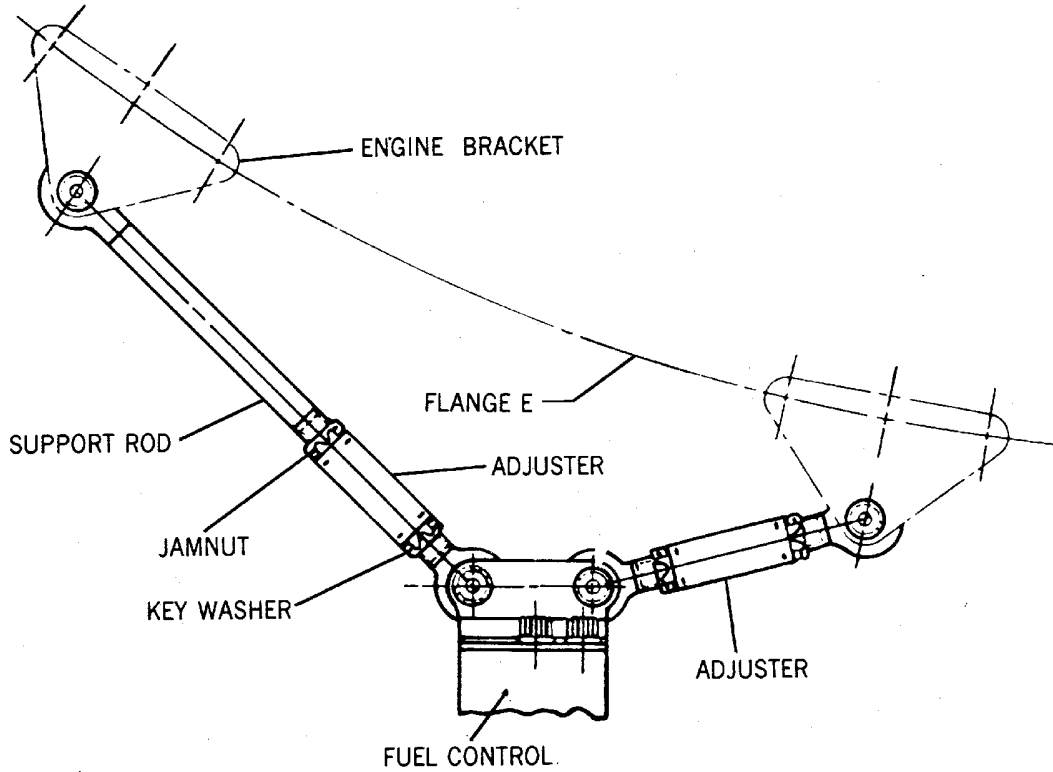
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FRONT VIEW OF FUEL CONTROL

L-61686

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Fuel Control Cantilever Support -- Removal/Installation  
Figure 202/73-20-01-990-802

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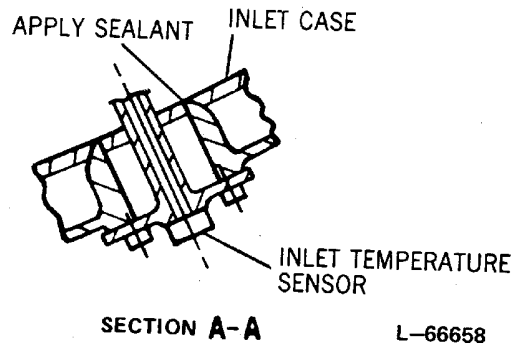
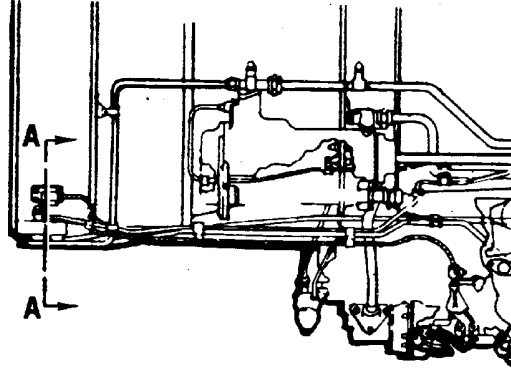
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**Inlet Temperature Sensor Sealing**  
Figure 203/73-20-01-990-803

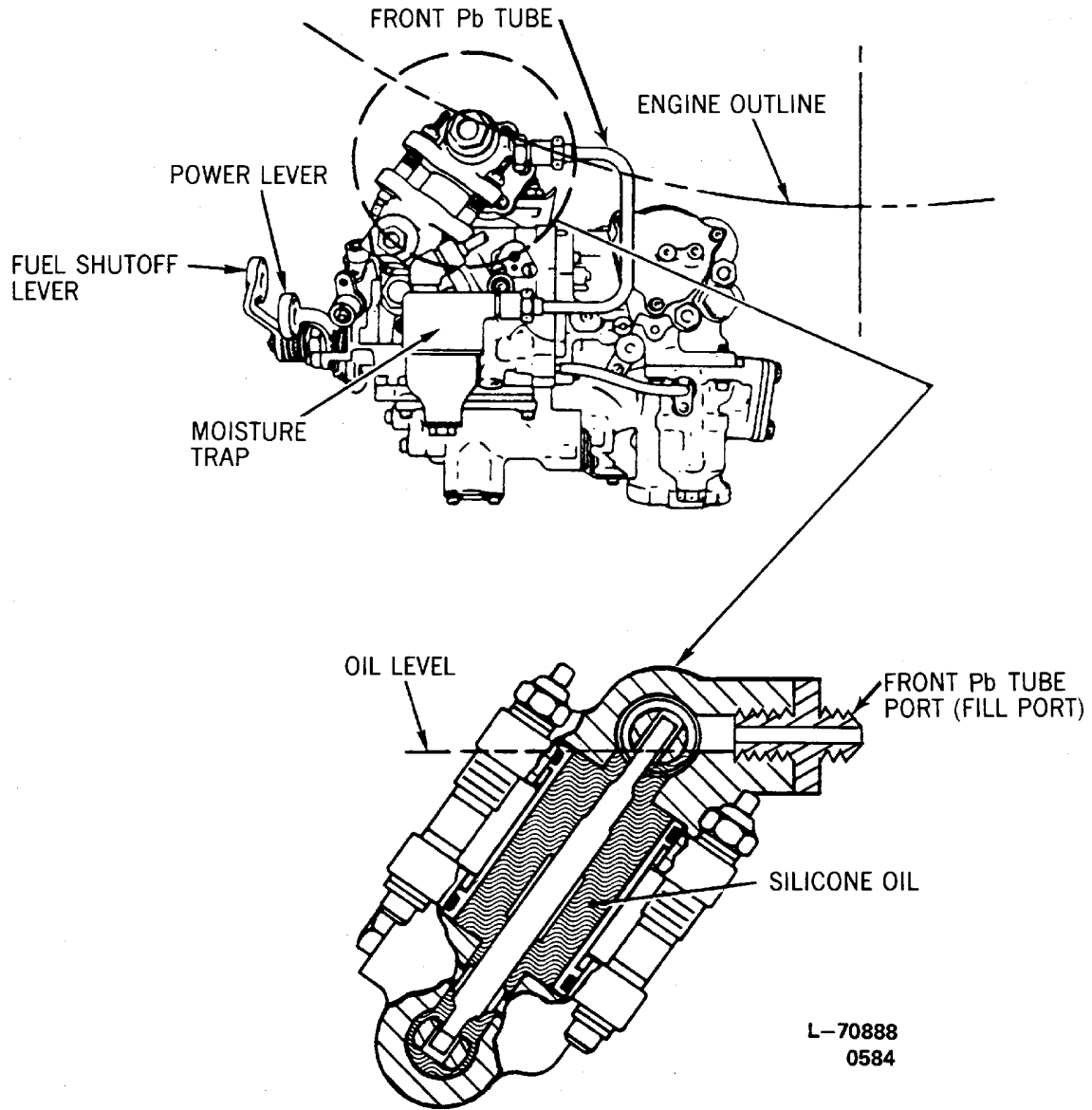
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-60

Burner Pressure Bellows Cavity Oil Filling  
Figure 204/73-20-01-990-804

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## FUEL CONTROL MAIN FILTER - MAINTENANCE PRACTICES

### 1. General

A. This maintenance practice provides removal/installation, check and cleaning/painting instructions for the fuel control main filter located in the bottom left side of the fuel control.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

B. Access to the fuel control main filter is through the forward lower cowling.

C. Removal, installation, check, and cleaning procedures for the fuel control main filter on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Stoddard solvent P-D-680 Type 1	
Fingerprint solution MIL-C-15074	
Torque wrench (0-100 inch-pounds)	
Lockwire .020 corrosion resistant steel, P05-288	
Sodium hydroxide	
Source of clean dry compressed air	
Suitable container approximately 2 US gallons (1.67 Imperial gallons or 7.6 liters)	

### 3. Removal/Installation Fuel Control Main Filter

**NOTE:** Main filter group includes fuel control main filter and servo fuel filter.

A. Remove Filter

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.

**CAUTION:** WHEN REMOVING FILTER, CHECK TO SEE IF O-RINGS ARE MISSING OR CUT. O-RING FRAGMENTS CARRIED INTO FUEL CONTROL COULD CLOG PASSAGES RESULTING IN FUEL CONTROL FAILURE.

- (3) Remove capscrew and washer securing filter retaining rings; remove retaining ring. Be prepared to catch fuel in container with approximate capacity of 2 US gallons (1.67 Imperial gallons or 7.6 liters).
- (4) Thread long shank bolt into bolt hole in center of valve cap and using bolt as puller, remove filter.
- (5) Remove O-rings from valve cap and filter. Discard O-rings.
- (6) Remove pins securing valve to main filter and separate valve from filter.
- (7) Remove capscrew, flat washer, and spring tension clip from flow deflector. Remove internal retaining ring and withdraw flow deflector from main filter.
- (8) Clean filter (Ref. paragraph 5.A. for Cleaning/Painting Fuel Control Main Filter).

#### B. Install Filter

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Position flow deflector in filter and install retaining ring.
- (4) Position spring tension clip on deflector and install washer and capscrew. Torque capscrew 5 to 15 inch-pounds (0.6 to 1.7 N·m). Safety capscrew with P05-288 lockwire. Dress lockwire out of fuel flow stream.
- (5) Align valve shaft with hole in deflector and insert valve into filter.
- (6) Position valve cap on filter and install retaining pins. Secure pins with P05-288 .020 lockwire.
- (7) Lightly lubricate new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install on valve cap and filter.
- (8) Insert filter into fuel control housing, install retaining rings and secure with flat washer and capscrew. Torque capscrew 60 to 80 inch-pounds (6.8 to 9.0N·m). Safety cap-screw with P05-288 lockwire.

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- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (10) Remove safety pin from thrust reverser control valve. Stow safety pin.

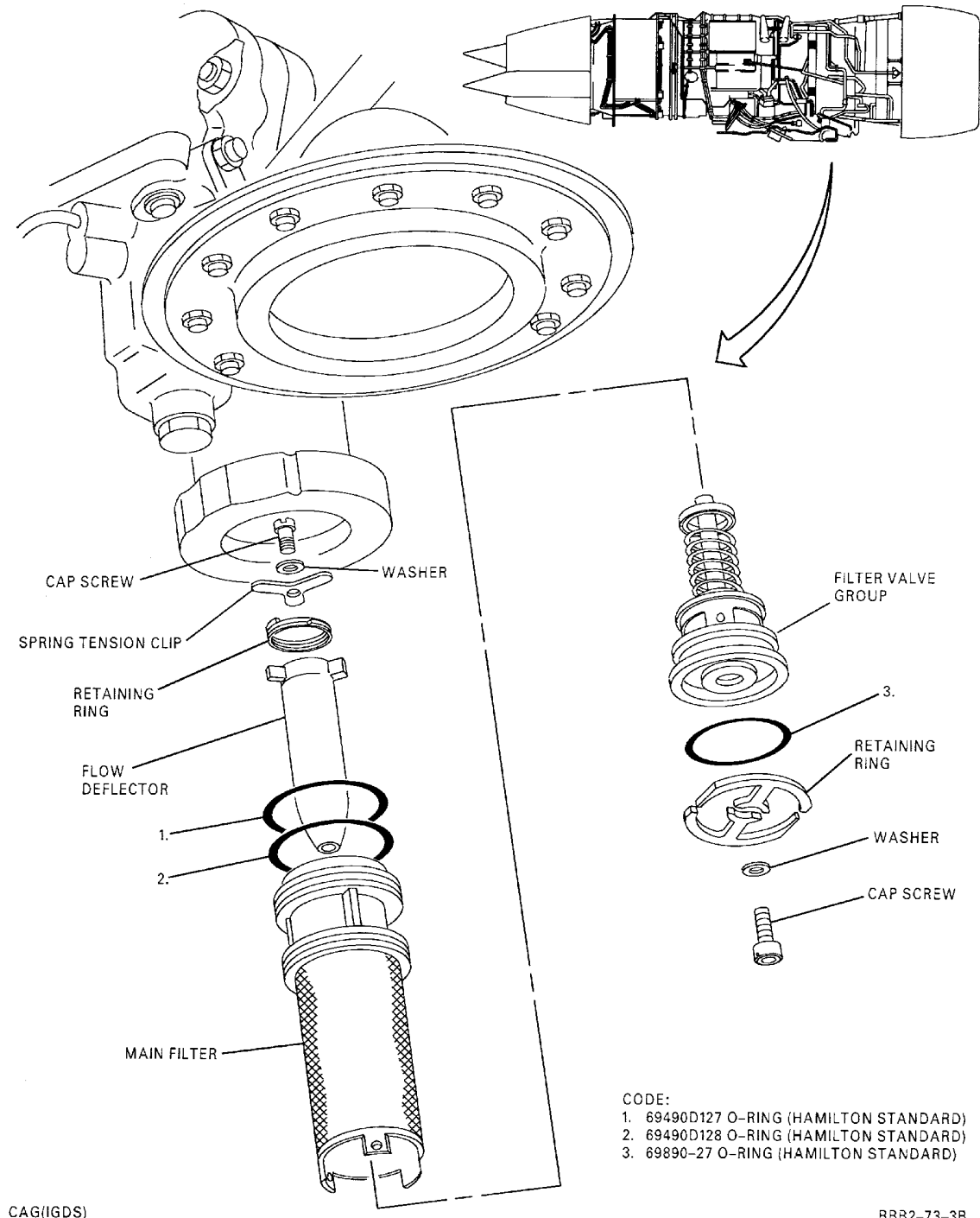
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**Fuel Control Main Filter -- Removal/Installation**  
**Figure 201/73-20-02-990-801**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### 4. Check Fuel Control Main Filter

#### A. Check Filter

- (1) Visually check for leaks on first engine runup.

### 5. Cleaning/Painting Fuel Control Main Filter

#### A. Clean Filter

**WARNING:** CLEANING OPERATIONS USING SOLVENTS SHOULD BE PERFORMED IN A WELL-VENTILATED ATMOSPHERE. EXERCISE NORMAL SAFETY PRECAUTIONS DURING USE.

- (1) Immerse and agitate filter in Stoddard solvent (P-D-680, Type 1) to remove bulk of contamination.

**WARNING:** SODIUM HYDROXIDE CAUSES SEVERE BURNS TO SKIN AND WILL ATTACK CLOTHING. WHILE MAKING SOLUTION, ADD SODIUM HYDROXIDE SLOWLY TO AVOID POSSIBLE SPLATTERING OR SPLASHING.

- (2) Immerse filter in caustic solution consisting of 30 percent by weight of sodium hydroxide in water.
- (3) Soak filter for 1 hour.
- (4) Rinse filter in running water.

**NOTE:** In case of contact with sodium hydroxide, wash skin immediately with plenty of water. For eyes, flush heavily with water and obtain immediate medical attention.

- (5) Immerse filter in warm water bath and wash thoroughly to ensure removal of caustic cleaner.
- (6) Apply clean dry compressed air with pressure not exceeding 50 psi, to filter screens to remove any remaining deposits.
- (7) Insert a light inside filter screen to check results of the cleaning procedure. Repeat steps (1) through (6) if any contaminants remain in screen.
- (8) Immerse and agitate filter in fingerprint neutralizing solution (MIL-C-15074).
- (9) Thoroughly dry filter with clean dry compressed air with pressure not exceeding 50 psi.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL CONTROL PRESSURE SENSE LINE MOISTURE TRAP - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the fuel control pressure sense line moisture trap located on the front of the fuel control.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel control pressure sense line moisture trap is through the forward lower cowling.  
 C. Removal, installation, and check procedures for the fuel control pressure sense line moisture trap on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Petrolatum VV-P-236	
Lockwire, 0.032 corrosion-resistant steel, P05-289	

#### 3. Removal/Installation Fuel Control Pressure Sense Line Moisture Trap

- A. Remove Moisture Trap.

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.
- (3) Disconnect diffuser to moisture trap rear air pressure tube from elbow on moisture trap.
- (4) Disconnect front air pressure tube from moisture trap.
- (5) Remove moisture trap from fuel control.
- (6) Remove adapter union from elbow. Discard O-ring.
- (7) Remove drain plug from moisture trap. Discard O-ring.

#### B. Install Moisture Trap

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Lightly lubricate new O-ring with petrolatum (VV-P-236). Install O-ring on adapter and install adapter in elbow on moisture trap.

**CAUTION:** MAKE CERTAIN THAT PLUG DRAIN HOLE IS NOT CLOGGED.

- (4) Lightly lubricate new O-ring with petrolatum (VV-P-236), install O-ring on drain plug and install drain plug in moisture trap. Tighten plug and safety with P05-289 lockwire.

**NOTE:** Do not obstruct drainhole with lockwire.

- (5) Install moisture trap on fuel control. Safety bolts with P05-289 lockwire.
- (6) Connect front air pressure tube to moisture trap. Safety with P05-289 lockwire.
- (7) Connect rear air pressure tube to elbow on moisture trap. Safety tube with P05-289 lockwire.
- (8) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (9) Remove safety pin from thrust reverser control valve. Stow safety pin.

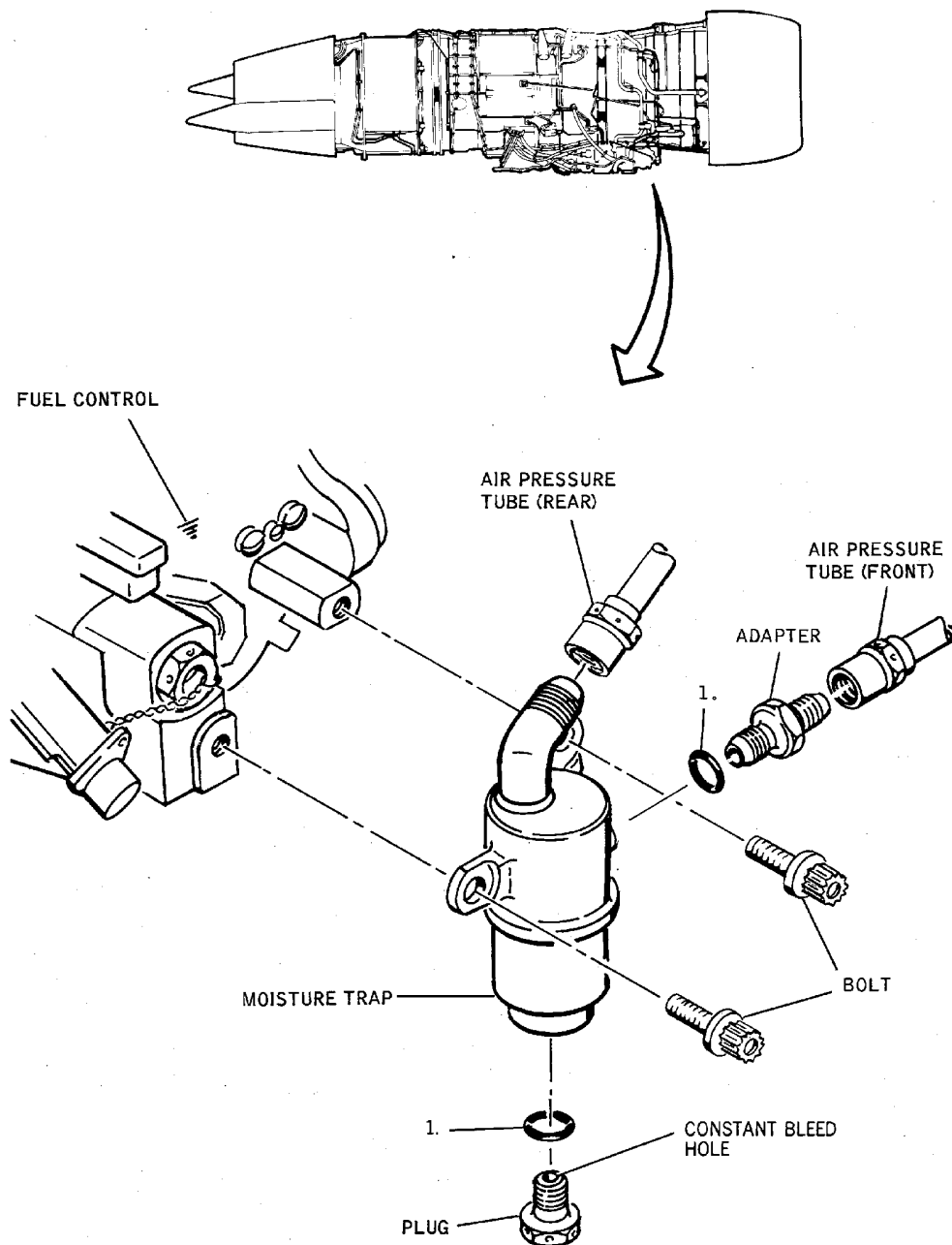
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



**CODE:**

1. MS9385-04 PACKING

BBB2-73-8A

**Fuel Control Pressure Sense Line Moisture Trap -- Removal/Installation**  
**Figure 201/73-20-03-990-801**

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### 4. Check Fuel Control Pressure Sense Line Moisture Trap

#### A. Check Moisture Trap.

- (1) Make certain bleed hole is clear by passing a 0.018 inch lockwire through bleed hole. If accumulated moisture drains from bleed hole indicating bleed hole was blocked, perform following:
  - (a) Remove drain plug and allow accumulated moisture to drain.
  - (b) Remove and discard O-ring.
  - (c) Lightly lubricate new O-ring with petrolatum (VV-P-236) and install O-ring on drain plug.
  - (d) Install drain plug in moisture trap and safety with P05-289 lockwire.

NOTE: Do not obstruct drainhole with lockwire. (Figure 202)

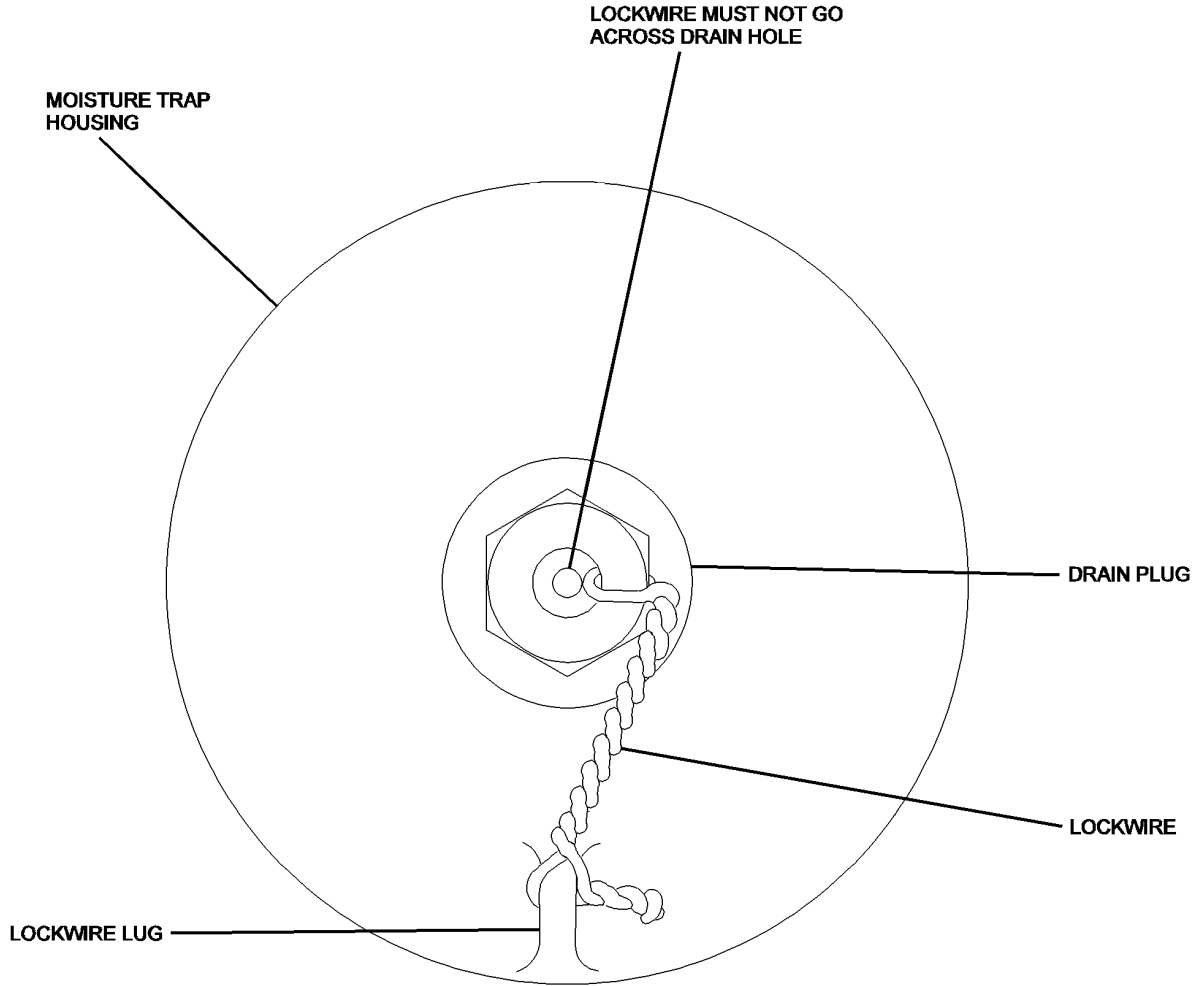
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**BOTTOM VIEW OF MOISTURE TRAP ASSEMBLY**

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**Moisture Trap Lockwire  
Figure 202/73-20-03-990-804**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### AUTOMATIC RESERVE THRUST (ART) SOLENOID - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation instructions for the automatic reserve thrust (ART) solenoid located on the right of the engine and is mounted on the fuel control.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the ART solenoid is through the forward lower cowling.  
C. Removal and installation procedures for the ART solenoid on left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Torque wrench, (0 to 50 inch- pounds range)	
Grease, Mo-Lith No. 2	Fiske Brothers Refining Co.

#### 3. Removal/Installation Automatic Reserve Thrust (ART) Solenoid

- A. Remove Solenoid

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

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WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

S	34	B1-181	LEFT FUEL TEMP
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### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

T	34	B1-182	RIGHT FUEL TEMP
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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE ALL

K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(3) Disconnect electrical connector.

(4) Remove solenoid from engine. Discard O-ring.

B. Install Solenoid

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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U	40	B1-40	ENGINE START PUMP
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WJE 415-427, 429, 861-866, 868, 869, 871-874, 891

U	41	B1-2	ENGINE IGNITION RIGHT
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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893

U	41	B1-423	ENGINE START VALVE RIGHT
---	----	--------	--------------------------

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Lightly lubricate new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-rings on solenoid.
- (4) Make certain solenoid is free from foreign matter.
- (5) Install solenoid; lubricate bolts with Mo-Lith No. 2 grease. Determine running torque of bolts; running torque must be 2 to 18 inch-pounds (0.23 to 2.03 N·m). Tighten bolts to torque of 30 to 35 inch-pounds (3.39 to 3.95 N·m) above running torque.

**NOTE:** The ART solenoid has a 3 pin connector. Correct installation of the ART solenoid is when the electrical connector keyway is set at the opposite point from the IDLE solenoid.

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**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (6) Connect electrical connector.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling rings.

- (7) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (8) Remove safety pin from thrust reverser control valve. Stow safety pin.

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WJE ALL

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- (a) Perform ART system functional test. (GENERAL, SUBJECT 71-00-00, Page 501)

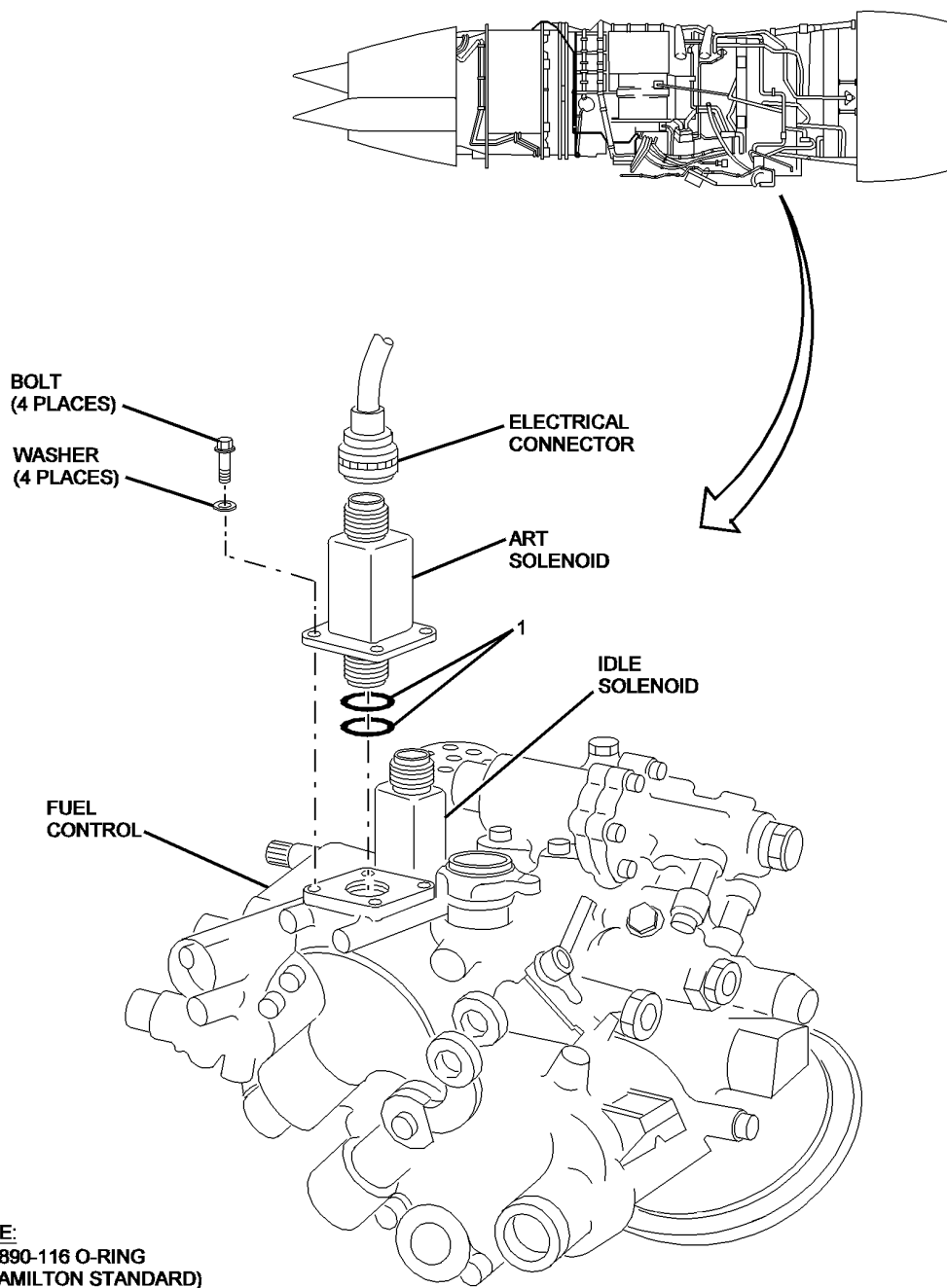
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



BBB2-73-46A  
S0006556657V2

Automatic Reserve Thrust (ART) solenoid  
Figure 201/73-20-04-990-801

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## IDLE SELECT SOLENOID - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practice provides removal/installation instructions for the idle select solenoid located on the right of the engine and is mounted on the fuel control.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the idle solenoid is through the forward lower cowling.  
 C. Removal and installation procedures for the idle solenoid on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lubricant, Aircraft Turbine Engine (Synthetic Base) (P03-001)	
Lubricant, Sealing Ring (P06-053)	
Torque wrench, (0 to 50 inch- pounds range)	
Grease, Mo-Lith No. 2	Fiske Brothers Refining Co.

### 3. Removal/Installation Idle Select Solenoid

- A. Remove Solenoid

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

EFFECTIVITY  
WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

S	34	B1-181	LEFT FUEL TEMP
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### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

T	34	B1-182	RIGHT FUEL TEMP
---	----	--------	-----------------

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

WJE ALL

K	26	B1-424	LEFT ENGINE IGNITION
---	----	--------	----------------------

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(3) Disconnect electrical connector.

(4) Remove solenoid from engine. Discard O-ring.

B. Install Solenoid

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

(1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

U	40	B1-40	ENGINE START PUMP
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WJE 415-427, 429, 861-866, 868, 869, 871-874, 891

U	41	B1-2	ENGINE IGNITION RIGHT
---	----	------	-----------------------

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893

U	41	B1-423	ENGINE START VALVE RIGHT
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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Lightly lubricate new O-rings with (P06-053) sealing ring lubricant, or (P03-001) lubricant engine turbine and install O-rings on solenoid.
- (4) Make certain solenoid is free from foreign matter.
- (5) Install solenoid. Determine running torque of bolts; running torque must be 2 to 18 inch-pounds (0.23 to 2.03 N·m). Tighten bolts to torque of 30 to 35 inch-pounds (3.39 to 3.95 N·m) above running torque.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (6) Connect electrical connector.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling rings.

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WJE ALL

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

- (7) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (8) Remove safety pin from thrust reverser control valve. Stow safety pin.

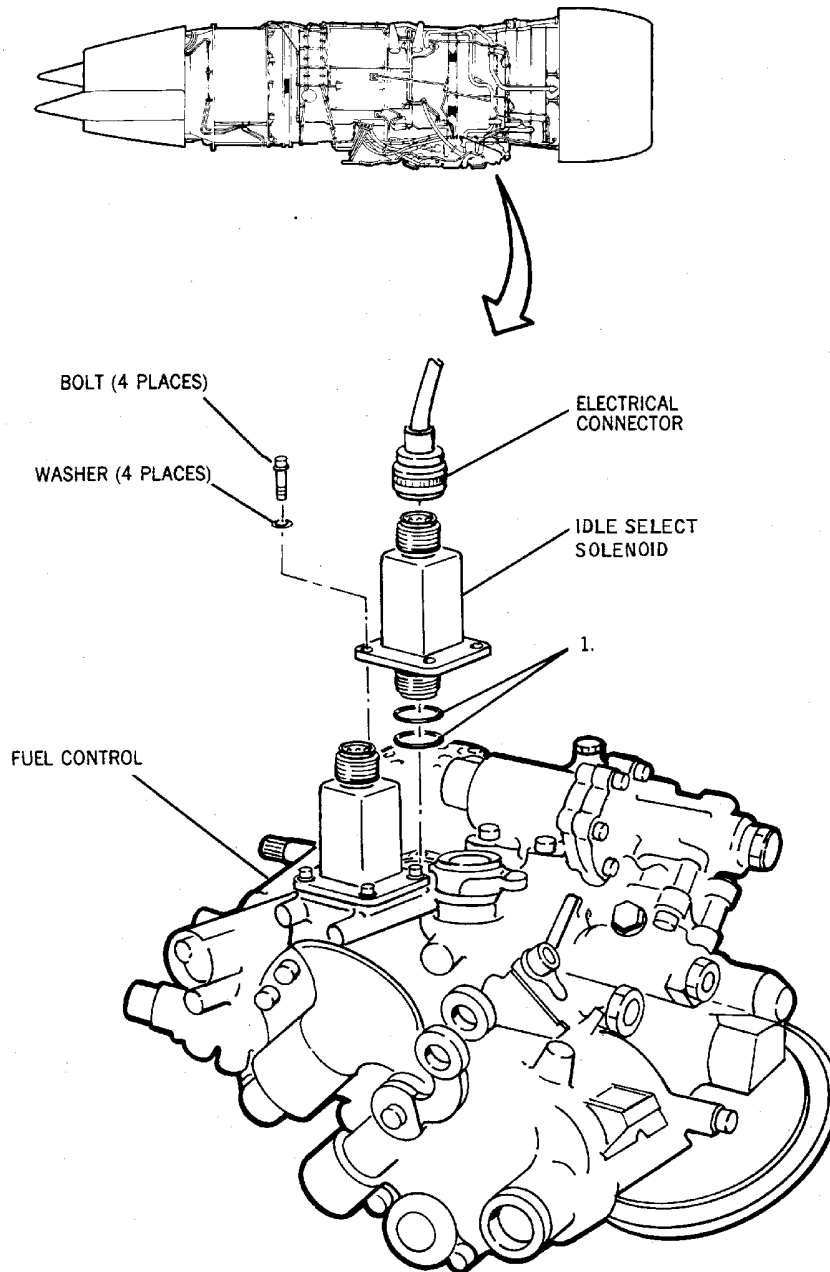
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# MD-80 AIRCRAFT MAINTENANCE MANUAL



CODE:

- 1. 69890-116 O-RING  
(HAMILTON STANDARD)

BBB2-73-47

**Idle Select Solenoid -- Removal/Installation**  
**Figure 201/73-20-05-990-801**

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## FUEL CONTROL DAMPER - MAINTENANCE PRACTICES

### 1. General

A. This maintenance practice provides removal/installation instructions for the fuel control damper pressure regulating valve located on the front left side of the fuel control. The fuel control damper consists of a transfer tube and a restrictor.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

**CAUTION:** MAKE CERTAIN RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU, OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

B. Access to the fuel control is through the forward lower cowl door.

C. Removal and installation procedures for the fuel control damper on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Antiseize compound MIL-T-5544	
Petrolatum V V -P-236	
Lockwire 0.020 corrosion resistant steel, P05-288	
Transfer tube and restrictor (MPN 588498 change letter F and above)	
Seal (MPN 69890-6)	
Seal (MPN 69890-3)	

### 3. Removal/Installation Fuel Control Damper

A. Remove Transfer Tube and Restrictor

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

**WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

U	32	B1-823	ART INOP WARNING LIGHT
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### WJE ALL

U	40	B1-40	ENGINE START PUMP
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**WJE 415-427, 429, 861-866, 868, 869, 871-874, 891**

U	41	B1-2	ENGINE IGNITION RIGHT
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U	42	B1-1	ENGINE IGNITION LEFT
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### WJE ALL

W	32	B1-824	ART STATUS LIGHTS
---	----	--------	-------------------

X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
---	----	--------	---------------------------------

Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL
---	----	--------	----------------------------------

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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S	40	B1-835	APPROACH IDLE CONTROL
---	----	--------	-----------------------

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

**WARNING:** MAKE CERTAIN THRUST REVERSER SYSTEM HAS BEEN DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 PSI (6550 KPA) TO 1050 PSI (7239 KPA)(PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin. (PAGEBLOCK 78-00-00/201)

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

- (3) Open engine forward lower cowl door.
- (4) Remove transfer tube and restrictor from fuel control. Discard O-rings. (Figure 201).
- (5) Check damper as follows:
- (a) For damper P/N 588498 change letter F and above:
- 1) Insert 0.065 diameter drill rod into end of damper opposite hex head. Damper is acceptable if drill rod or equivalent does not enter body more than 0.150 in. (3.810 mm).

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- 2) Dampers that do not meet or exceed this inspection criteria are to be replaced with damper P/N 588498 letter change F and above that have passed this check.
  - (b) For damper P/N 588498 thru P/N 5884999 change letter E:
    - 1) Replace all pre change letter F damper with damper P/N 588498 change letter F and above that have passed Paragraph 3.A.(5)(a) check.
- B. Install Transfer Tube and Restrictor

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

**WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

U	32	B1-823	ART INOP WARNING LIGHT
---	----	--------	------------------------

### WJE ALL

U	40	B1-40	ENGINE START PUMP
---	----	-------	-------------------

**WJE 415-427, 429, 861-866, 868, 869, 871-874, 891**

U	41	B1-2	ENGINE IGNITION RIGHT
---	----	------	-----------------------

U	42	B1-1	ENGINE IGNITION LEFT
---	----	------	----------------------

### WJE ALL

W	32	B1-824	ART STATUS LIGHTS
---	----	--------	-------------------

X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
---	----	--------	---------------------------------

Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL
---	----	--------	----------------------------------

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

S	40	B1-835	APPROACH IDLE CONTROL
---	----	--------	-----------------------

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

K	26	B1-424	LEFT ENGINE IGNITION
---	----	--------	----------------------

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed. (PAGEBLOCK 78-00-00/201)
- (3) Make certain transfer tube and restrictor are free from foreign matter.

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- (4) Lightly lubricate new O-rings with petrolatum (V V-P-236) and install O-rings on transfer tube and restrictor (Figure 201).
- (5) Lightly lubricate threads of transfer tube and restrictor with antiseize compound (MIL-T-5544).
- (6) Install transfer tube and restrictor into fuel control. Torque 30 in-lb (3 N·m) to 35 in-lb (4 N·m) and safety with P05-288 0.020 inch lockwire.

**NOTE:** Preferred transfer tube and restrictor is the "F" or higher change part number MPN 588498F. This transfer tube and restrictor has a pin plug installed between the wrenching flats in the center of the exposed head, while previous configurations have a plain head. Installation of previous configurations is allowed but should be avoided if "F" change transfer tube and restrictor is available.

- (7) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

**WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

U	32	B1-823	ART INOP WARNING LIGHT
---	----	--------	------------------------

#### WJE ALL

U	40	B1-40	ENGINE START PUMP
---	----	-------	-------------------

**WJE 415-427, 429, 861-866, 868, 869, 871-874, 891**

U	41	B1-2	ENGINE IGNITION RIGHT
---	----	------	-----------------------

U	42	B1-1	ENGINE IGNITION LEFT
---	----	------	----------------------

#### WJE ALL

W	32	B1-824	ART STATUS LIGHTS
---	----	--------	-------------------

X	32	B1-825	LEFT ENG ART SOLENOID & CONTROL
---	----	--------	---------------------------------

Z	32	B1-826	RIGHT ENG ART SOLENOID & CONTROL
---	----	--------	----------------------------------

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

S	40	B1-835	APPROACH IDLE CONTROL
---	----	--------	-----------------------

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

K	26	B1-424	LEFT ENGINE IGNITION
---	----	--------	----------------------

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,684 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (8) Remove safety pin from thrust reverser control valve. Stow safety pin.  
(PAGEBLOCK 78-00-00/201)
- (9) Check fuel control for leaks. (FUEL CONTROL, SUBJECT 73-20-01, Page 201)
- (10) Close engine forward lower cowl door.

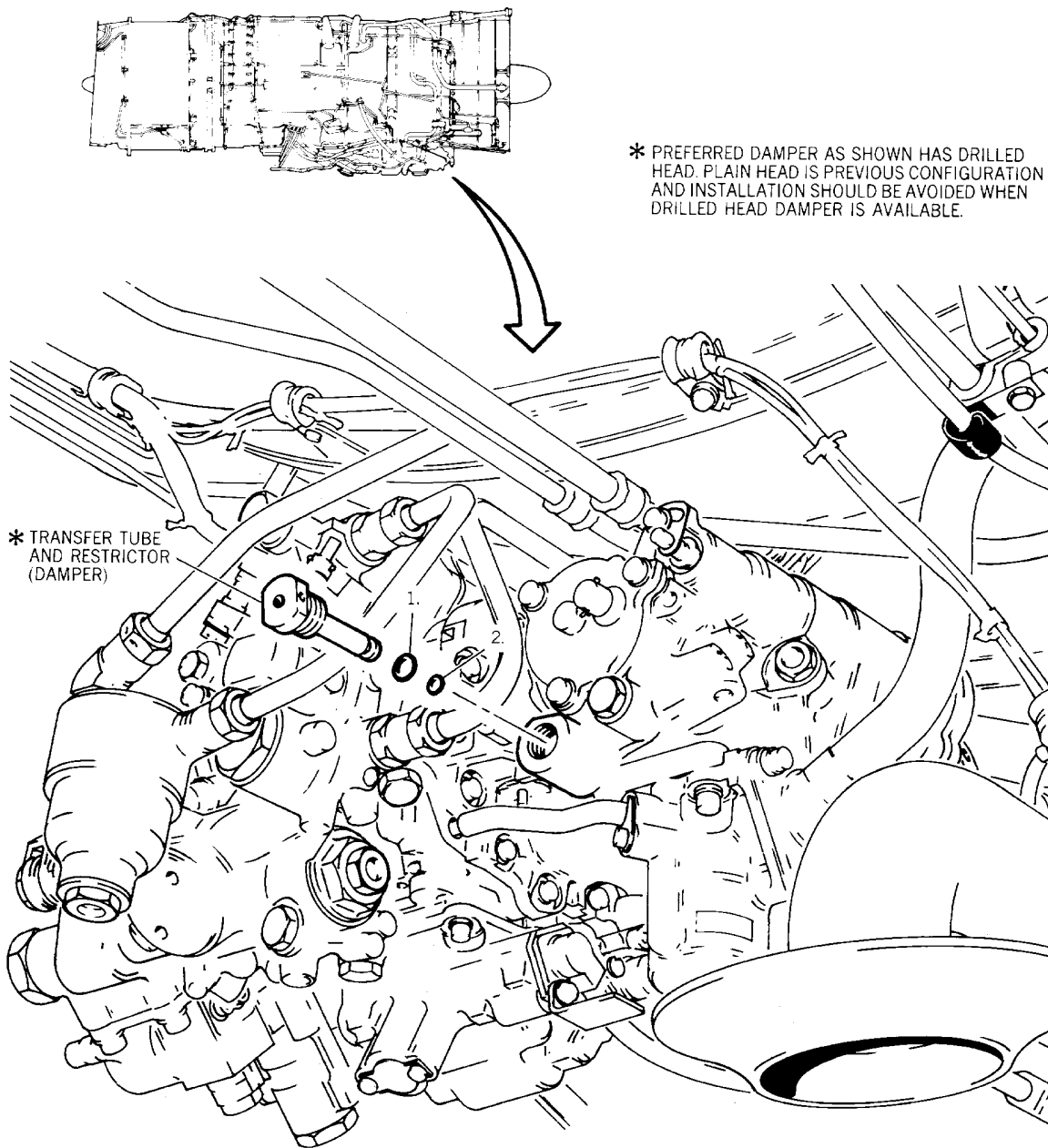
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- CODE:  
1. SEAL  
(MPN 69890-3)  
2. SEAL  
(MPN 69890-6)

BBB2-73-117

**Fuel Control Damper - Removal/Installation**  
Figure 201/73-20-06-990-801

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**INDICATING - DESCRIPTION AND OPERATION**

**1. General**

- A. Engine indicating systems are provided to monitor the fuel flow rate, fuel temperature, and fuel pump inlet pressure. The systems include fuel flow indicating, fuel temperature indicating, low fuel inlet pressure caution, and fuel filter differential pressure.

**2. Fuel Flow**

- A. Description

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- (1) The engine fuel flow indicating system provides a visual indication to the flight crew of engine fuel consumption. The system consists of a transmitter secured to the fuel/ oil cooler on the forward left side of the engine, an indicator and reset switch on the center instrument panel in the flight compartment, and a power supply located on aft right radio rack equipment panel. The system is powered by 115-volt AC through circuit breaker, located on upper main circuit breaker panel.

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- (2) The engine fuel flow indicating system provides a visual indication to the flight crew of engine fuel consumption. The system consists of a transmitter secured to the fuel/ oil cooler on the forward left side of the engine, and Engine Display Panel mounted on the center instrument panel. The fuel used reset button is located on the bezel of the panel. The power supply is located on the aft right radio rack equipment panel. The system is powered by 115-volt AC through a circuit breaker, located on the upper main circuit breaker panel.

**WJE ALL**

- (3) Fuel Flow Transmitter - The transmitter measures the flow rate of fuel consumed by the engine and provides an electrical output that is proportional to measured mass fuel flow. The transmitter consists of a synchronous drive motor unit that rotates an impeller at a constant speed, a spring restrained turbine, and a transducer that converts the mechanical turbine movement into an electrical position signal.

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- (4) Fuel Flow Indicator - The indicator provides visual indication, by digital counter, of fuel used and pointer indication of flow rate. The indicator consists of a generator, self-contained solid state amplifier, servomotor, counter, tachometer assembly, pointer, and a single-pole, double-throw reset relay controlled by a switch on the instrument panel. Operation of momentary reset switch returns the fuel used indication to zero. When the switch is actuated, the indicator counter drums go past zero and stop rotating. For indicator removal and installation instructions PAGEBLOCK 31-00-01/201.

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- (5) Fuel Flow Indication - The Engine Display Panel provides visual display as digital counter readout. The FUEL USED portion is displayed when the FUEL FLOW/FUEL USED button is pressed. This display is derived from the fuel flow information and an internal real time clock. For Engine Display Panel removal/installation instructions PAGEBLOCK 31-00-01/201.

**WJE ALL**

- (6) Solid State Power Supply - The power supply consists of a DC power supply, unijunction oscillator and temperature controlled oven, silicon controlled switch with logic circuit, and four silicon controlled rectifiers. The power supply converts single-phase, 115-vac, 400-cps power to two phase 50-to 75-vac 8-cps power to drive the synchronous drive motor.

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### 3. Fuel Temperature

#### A. Description

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- (1) The engine fuel temperature system consists of a sensor mounted on the engine fuel filter downstream of the air/fuel heater, and an indicator on the center instrument panel in the flight compartment. The system is powered by 28-volt DC from the main dc bus through a circuit breaker located on the lower main circuit breaker panel.

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- (2) The engine fuel temperature system consists of a sensor mounted on the engine fuel filter downstream of the air/fuel heater, and a Systems Display Panel on the center instrument panel in the flight compartment. The system is powered by 28-volt DC from the main DC bus through a circuit breaker located on the lower main circuit breaker panel.

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- (3) Fuel Temperature Dual Indicator - The indicator is integrally lighted and hermetically sealed. The indicator consists of two permanent magnet moving coil mechanisms, several springs, resistors, and calibration potentiometers. The indicator is not adjustable at field maintenance level. For indicator removal and installation instructions (PAGEBLOCK 31-00-01/201).

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- (4) Fuel Temperature Dual Indication - The Systems Display Panel accepts signals from the fuel temperature sensors, then processes and displays the parameters on a solid state Light Emitting Diode (LED) display by means of seven-segment counter display. The Systems Display Panel is not adjustable at field maintenance level. For Systems Display Panel removal and installation (PAGEBLOCK 31-00-01/201).

**WJE ALL**

- (5) Fuel Temperature Sensor - The sensor is a resistance type which consists of an element sealed in an insulation material within a housing. The housing is provided with an electrical connector. The sensor is mounted on the engine fuel filter. Access to the sensor is gained through the lower forward cowl door.

### 4. Fuel Pressure

#### A. Description

- (1) The low fuel inlet pressure caution system consists of a pressure switch mounted on the forward lower right side of the engine and an indicating light on the annunciator panel in the flight compartment. The system is powered by a 28-volt DC from the main DC bus through a circuit breaker located on the lower main circuit breaker panel.
- (2) Pressure Switch - The switch consists of a diaphragm, mechanical linkage, and a microswitch. The components are enclosed in a housing provided with a single pressure sensing port connection and an electrical connector. Switch contacts open on fuel pressure increase at 5.5 psig (37.9 kPa) and close upon pressure decrease at 5 psig (34 kPa) (+0.5 psig (3.4 kPa), -1.0 psig (6.9 kPa)). Access to the pressure switch is gained through the lower forward cowl door.

### 5. Fuel Filter Differential Pressure Switch

- A. The differential pressure switch is mounted on the fuel filter which is integral with the engine-driven fuel pump. The fuel pump is located on the front right side of the accessory gearbox. The pressure switch measures pressure differential between the fuel filter inlet and outlet. Access to pressure switch is gained through the lower forward cowl door.

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WJE ALL

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### 6. Operation

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- A. A variable AC voltage signal from fuel flow transmitted is fed to fuel flow indicator. This signal is compared with the generator feedback voltage in a summing network, the difference voltage appearing at the amplifier input. The amplifier output then drives the motor at a speed proportional to the input voltage. The motor is geared directly to the digital counter which provides an indication of fuel used. The motor-driven set of magnets, in a tachometer assembly within the indicator causes a spring-restrained drag disc to assume an angle proportional to motor speed. A pointer connected to shaft of drag disc presents fuel flow rate on the indicator.

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- B. A variable AC voltage signal from the fuel flow transmitter is fed to the Engine Display Panel. This signal input is processed by demodulating and digitizing the AC input signal. This digitized input is then used by the processor to calculate the fuel flow. Using a real time clock, an integration of fuel flow is made to give fuel used, and either fuel flow or fuel used can be displayed on the counter by the selection button on the indicator bezel. The fuel used/fuel flow counter display is a seven-segment display. When the fuel used mode is selected, a lamp gives a visual indication of the condition.

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

- C. The fuel temperature indicator operates on the Wheatstone bridge principle with the temperature sensor forming one arm of the bridge. A change in engine fuel temperature sensed by the sensor causes a change in resistance. This change in resistance unbalances the bridge creating a greater current flow in one side of the bridge. The increase in current flow results in movement of the indicator pointer and registration of fuel temperature in degrees centigrade.

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

- D. The fuel temperature indicator portion of the System Display Panel accept signals from the fuel temperature sensor, than processes and displays the parameters on a solid state Light Emitting Diode (LED) display by means of seven-segment counter display. Fuel temperature is displayed in degrees centigrade.

**WJE ALL**

- E. The normally on fuel low pressure caution light remains on at fuel pressure of 5 psig (34 kPa) (+0.5 psig (3.4 kPa)0.5 psig (3.4 kPa), -1.0 psig (6.9 kPa)) psig. When fuel pressure switch senses increasing fuel pressure of 5.5 psig (37.9 kPa), the light goes off.
- F. Buildup of foreign matter in the fuel filter element causes a pressure drop which is sensed by the pressure switch. When a pressure differential of 4.5 psi (31.0 kPa) to 5.8 psi (40.0 kPa) is reached across the filter, fuel filter pressure drop and master caution light in the flight compartment comes on. At the same time, the fuel heat control is activated for one minute.

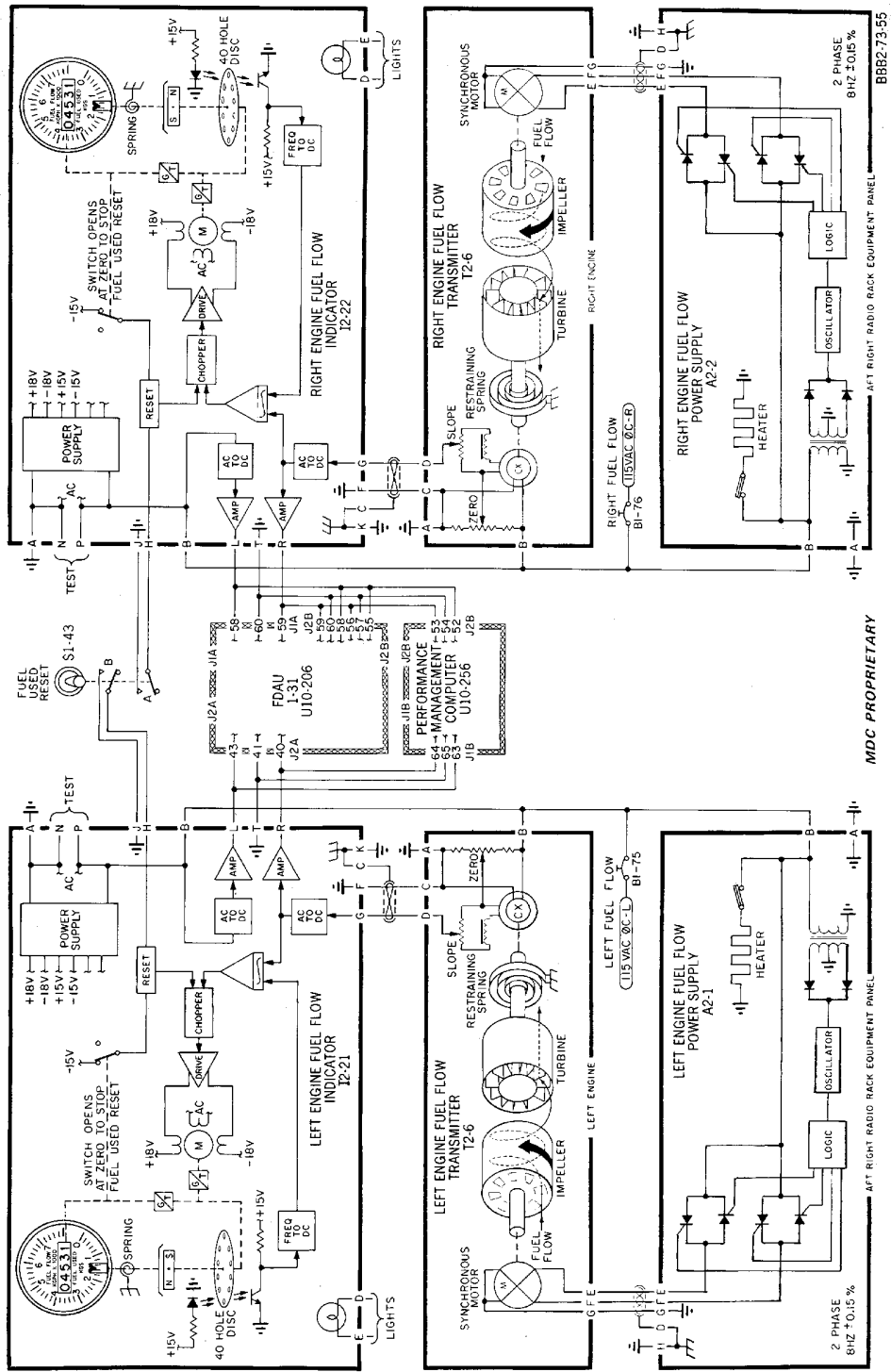
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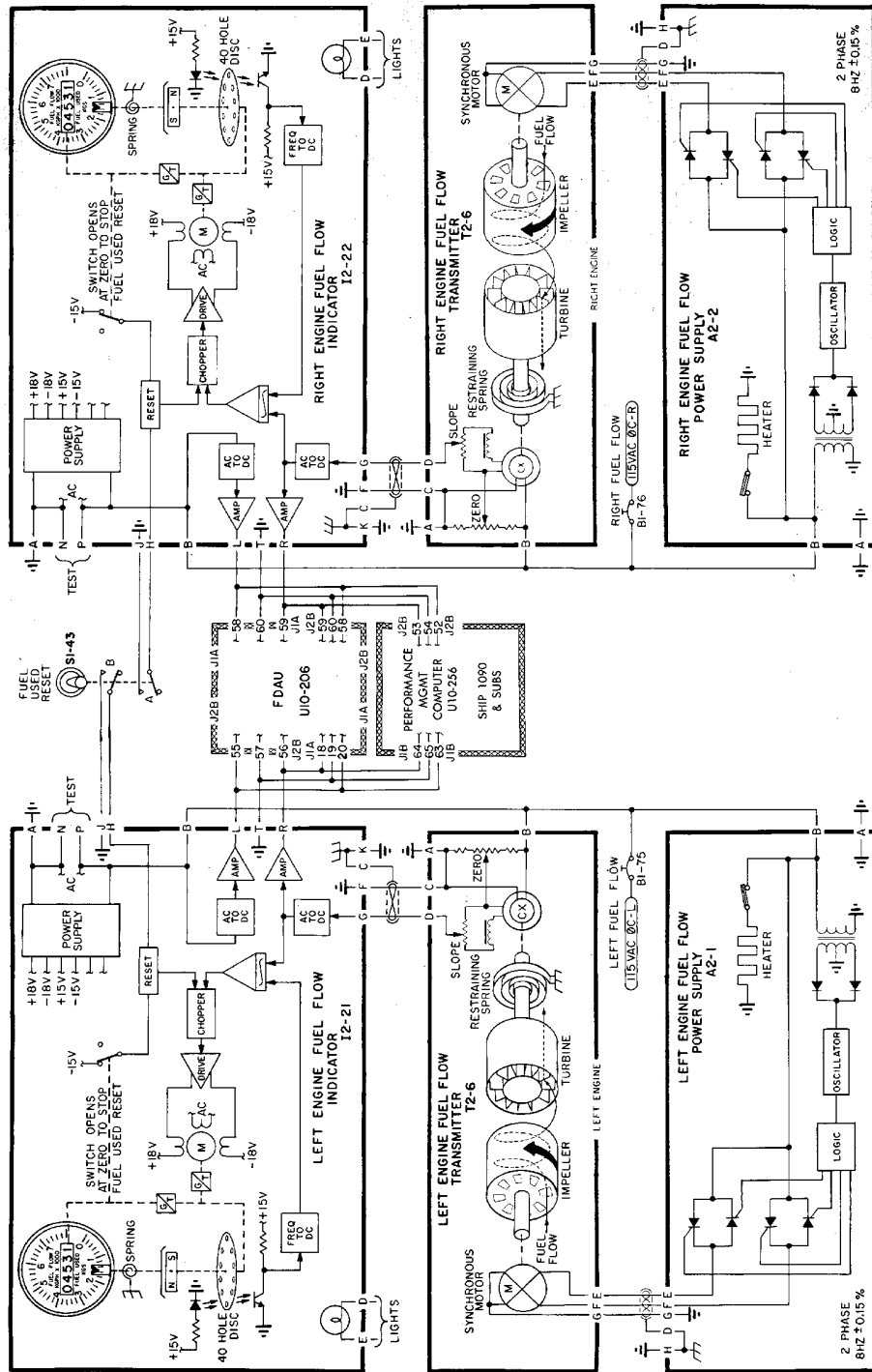


Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 1 of 7)

EFFECTIVITY  
WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 891

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Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 2 of 7)

EFFECTIVITY  
WJE 407-409, 411, 880, 881, 883, 884

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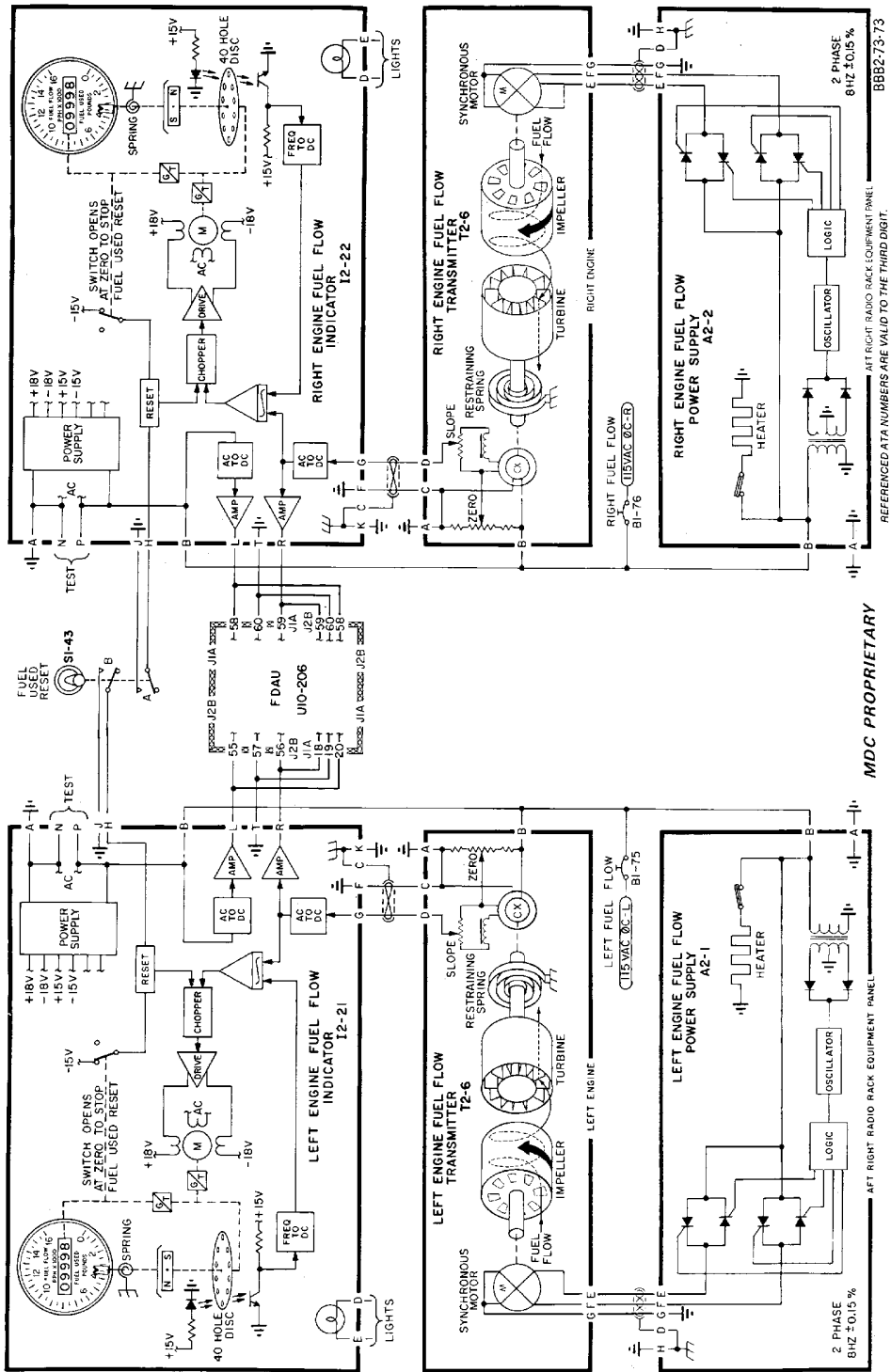
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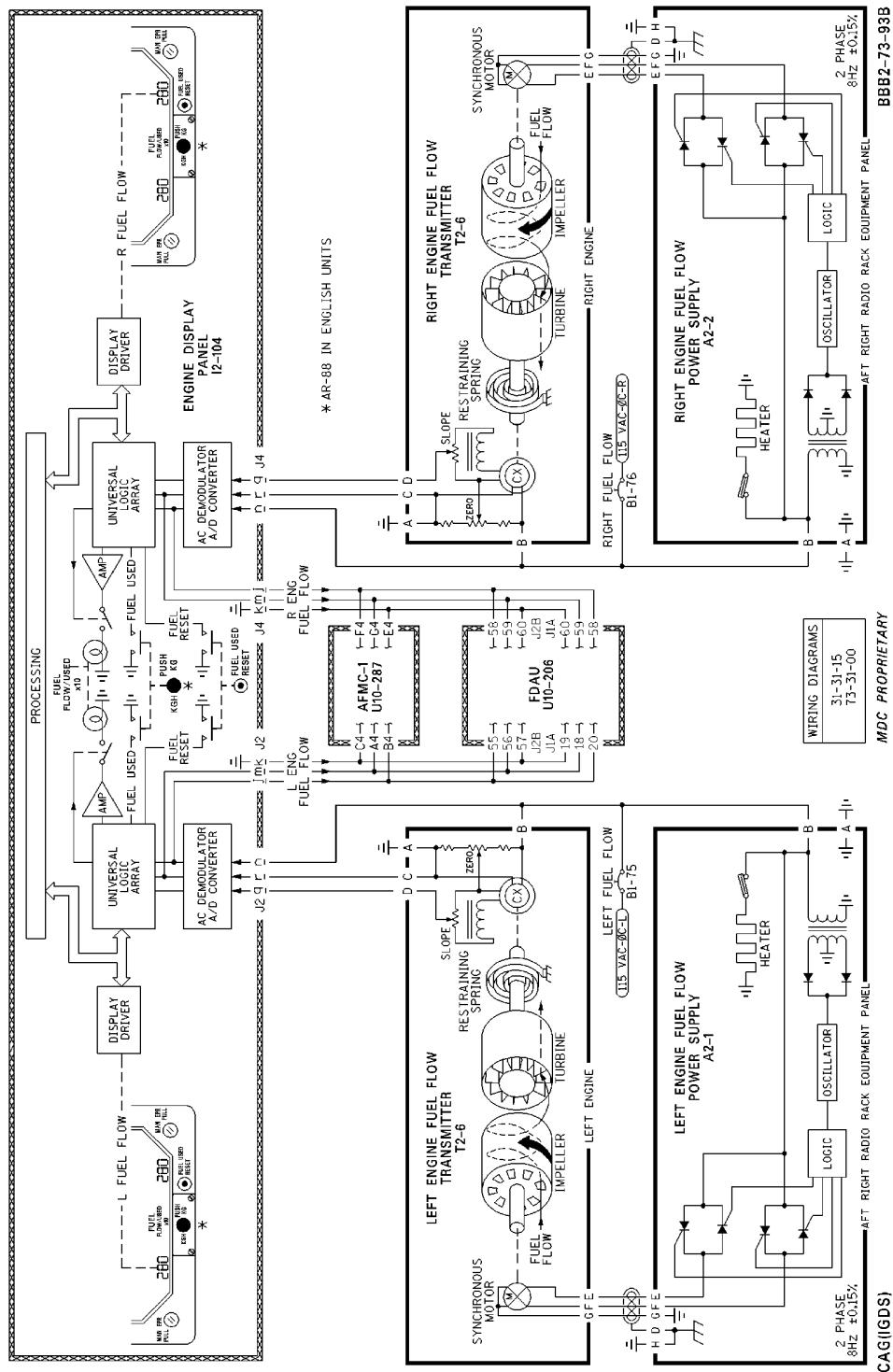
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Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 3 of 7)

EFFECTIVITY  
WJE 873, 874, 892, 893

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Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 4 of 7)

EFFECTIVITY  
WJE 415, 417-419, 421, 423, 863-866, 869, 871, 872

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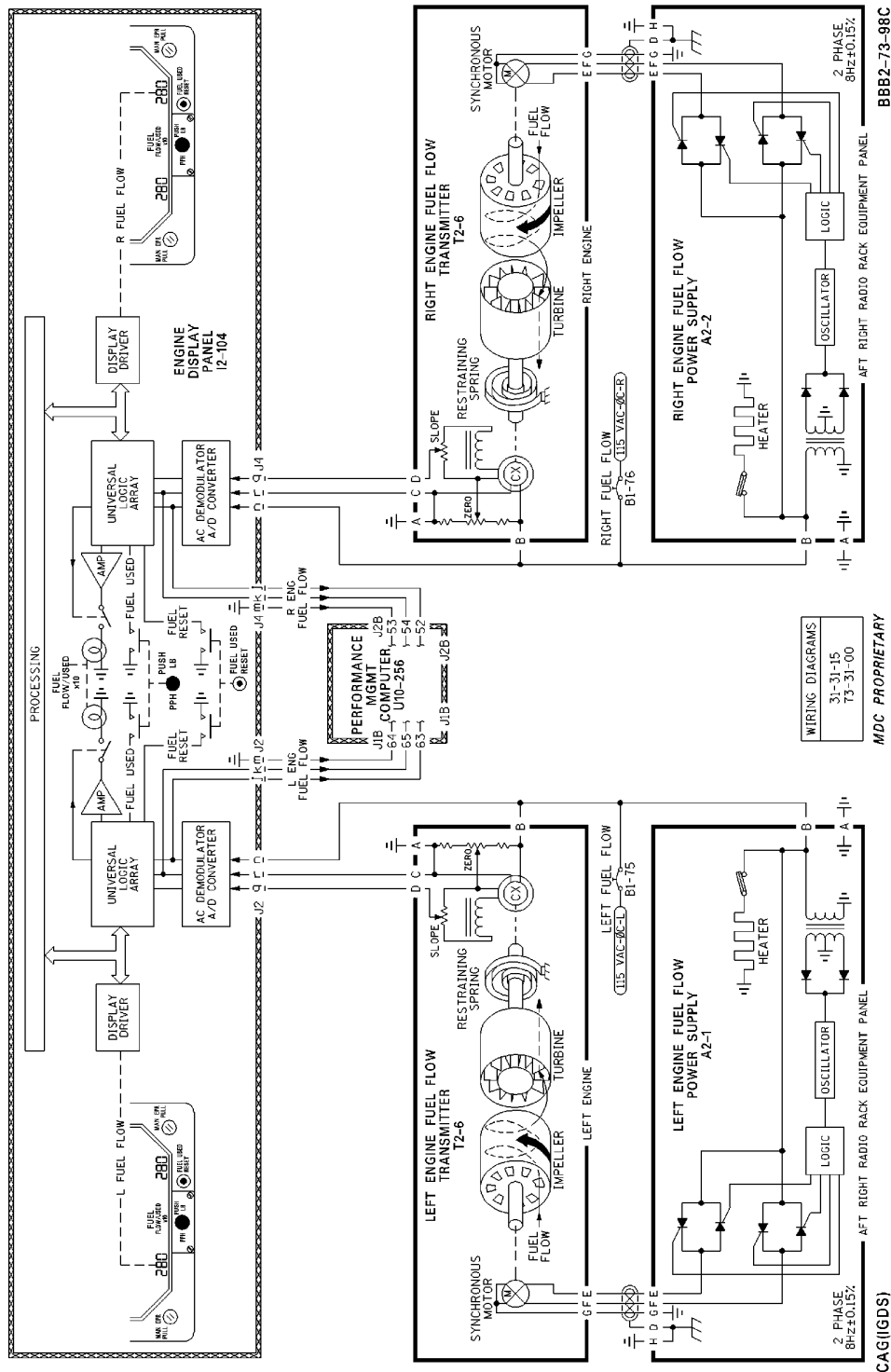
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Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 5 of 7)

EFFECTIVITY  
WJE 886, 887

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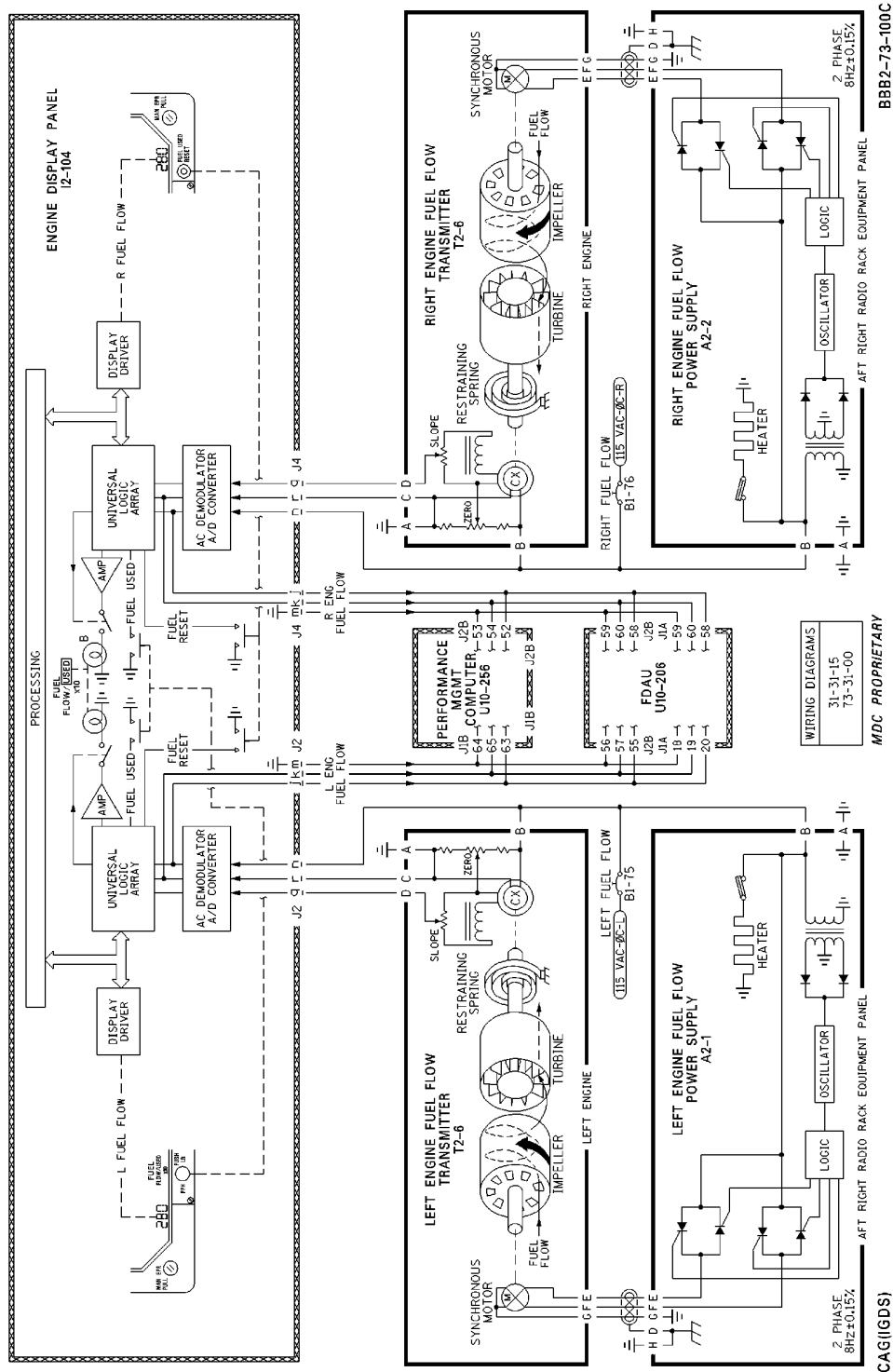
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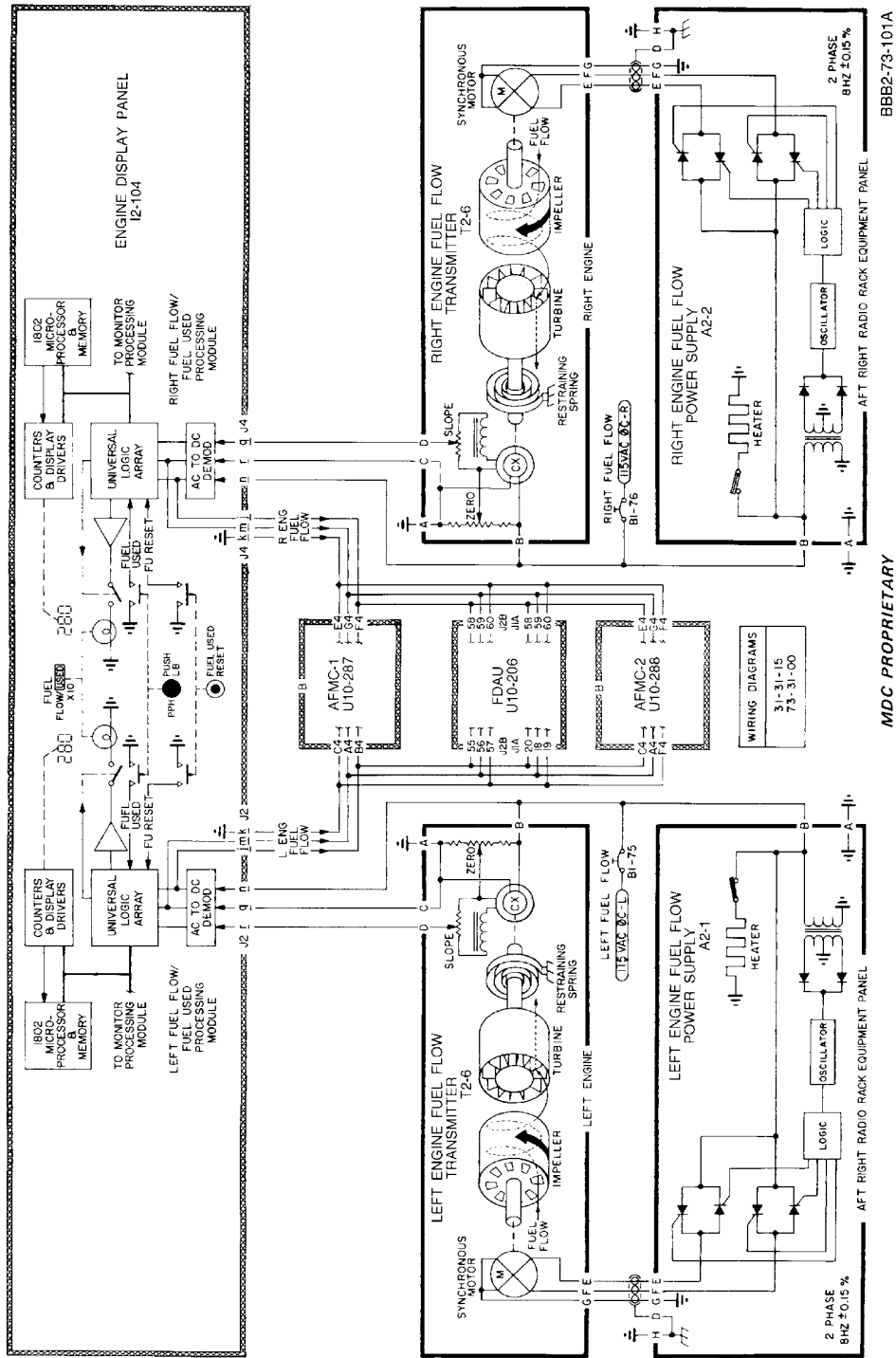
Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 6 of 7)

EFFECTIVITY  
WJE 405, 406, 410, 875-879

73-30-00

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Engine Fuel Flow Indicating System -- Schematic  
Figure 1/73-30-00-990-801 (Sheet 7 of 7)

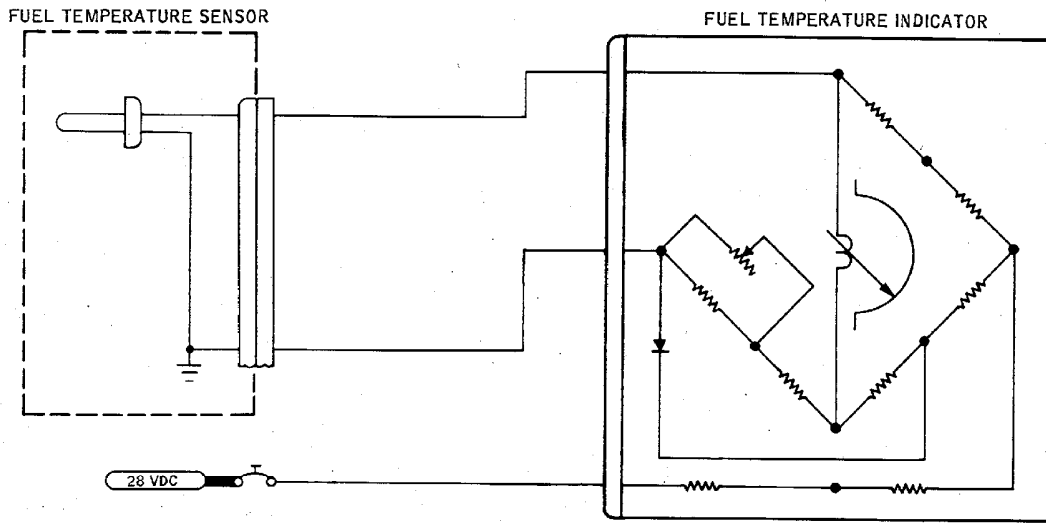
EFFECTIVITY  
WJE 401-404, 412, 414

73-30-00

TP-80MM-WJE

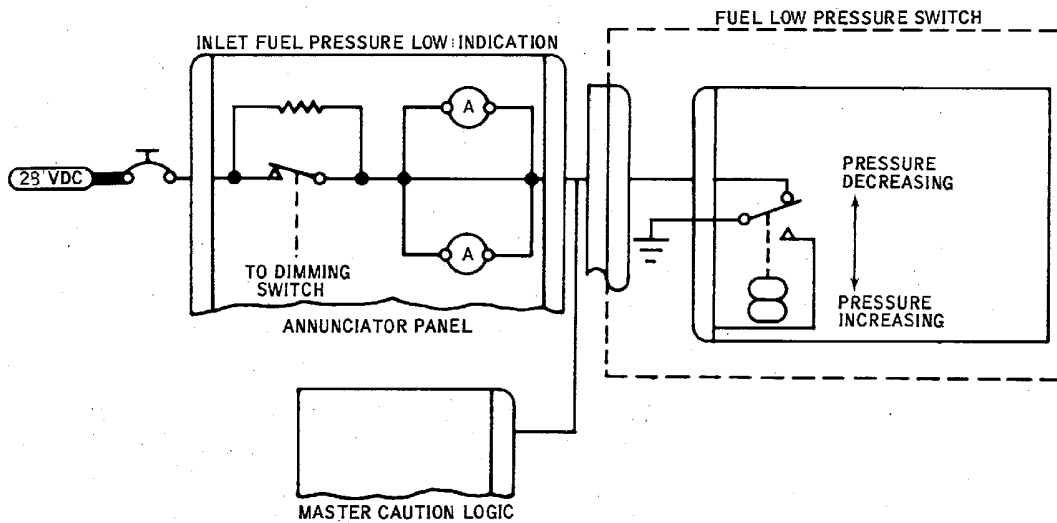
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**Engine Fuel Temperature Indicating System -- Schematic**  
Figure 2/73-30-00-990-802



BBB2-73-31

**Low Fuel Inlet Pressure Caution -- Schematic**  
Figure 3/73-30-00-990-803

EFFECTIVITY  
WJE ALL

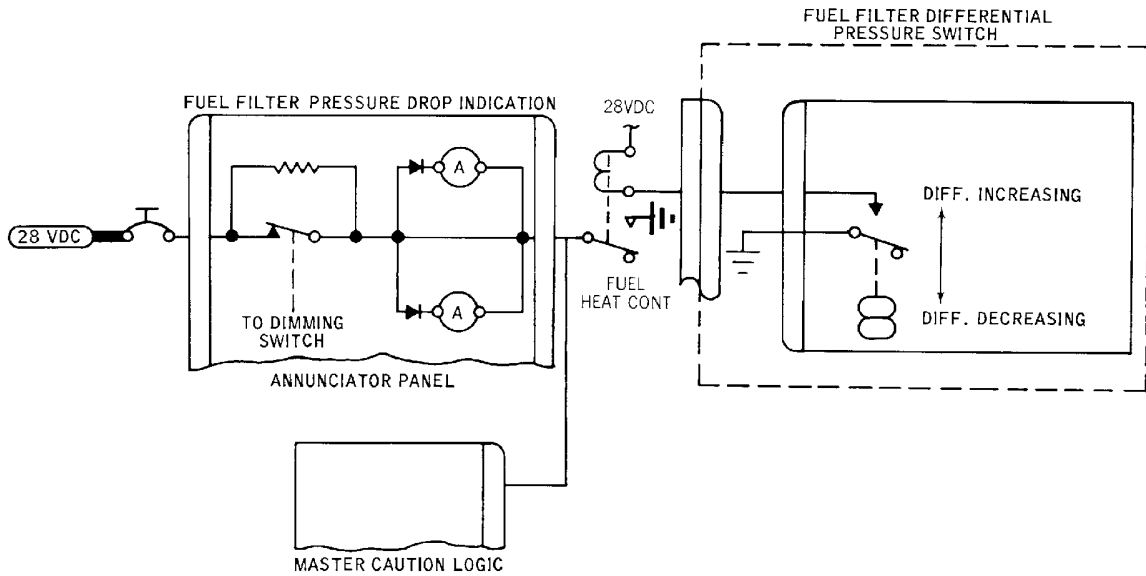
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WJE 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891-893



BBB2-73-32A

**Engine Fuel Filter Differential Pressure Caution -- Schematic**  
**Figure 4/73-30-00-990-804 (Sheet 1 of 2)**

WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

EFFECTIVITY  
WJE ALL

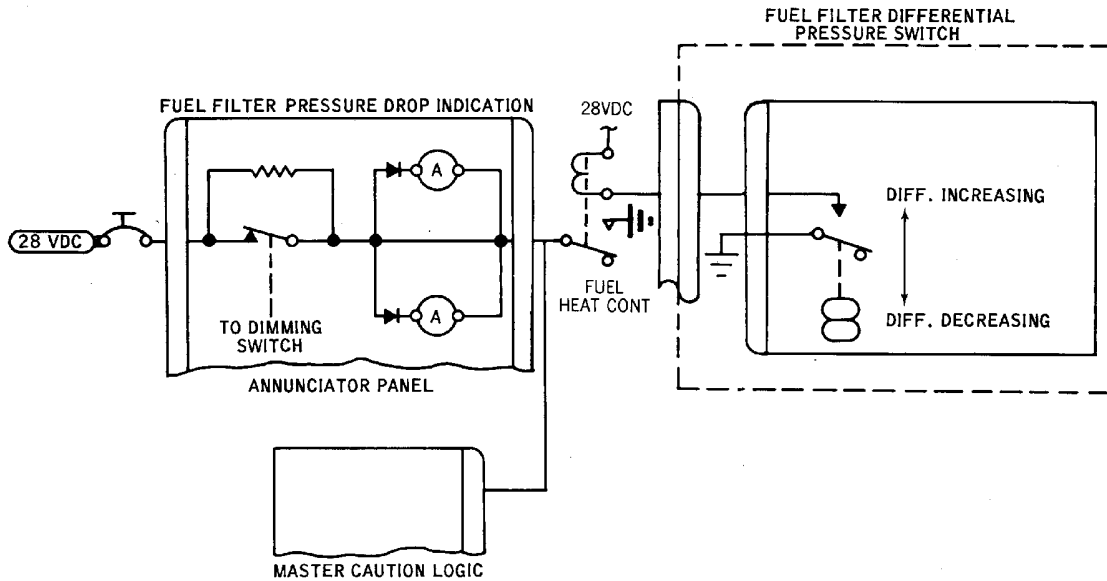
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WJE 407-409, 411, 880, 881, 883, 884



BBB2-73-75

**Engine Fuel Filter Differential Pressure Caution -- Schematic**  
**Figure 4/73-30-00-990-804 (Sheet 2 of 2)**

WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

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## FUEL FLOW INDICATING SYSTEM - ADJUSTMENT/TEST

### 1. General

- A. The fuel flow indicating system includes a transmitter secured to the fuel/oil cooler on the forward left side of the engine, a power supply in the electrical/electronics compartment and an indicator and reset switch on the center instrument panel in the flight compartment. Adjustment/Test procedures for the fuel flow indicating system on both right and left engines are identical.

### 2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

**Table 501**

Name and Number	Manufacturer
Fuel flow system line checker, 4753880-503	Douglas Aircraft Co.
Stop watch	Commercially available

### 3. Adjustment/Test Fuel Flow Indicating System

#### A. Test

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

- (2) Place fuel flow line checker controls in following positions.

**Table 502**

CONTROL	POSITION
ØA - ØB Switch	OFF
FUEL FLOW SIMULATE rotary switch	ZERO (PPH), or ZERO (KgPH) as applicable
VAR FLOW Control	ZERO
COUNTER Switch	OFF

- (3) Connect adapter cables to line checker cables; refer to line checker operation instructions.  
 (4) Disconnect aircraft electrical cable connector from fuel flow indicator.  
 (5) Determine fuel flow indicator model number, from part number on nameplate.

NOTE: Last digit of part number signifies the model number.

- (6) On the line checker, place indicator model switch in position corresponding to fuel flow indicator.  
 (7) Connect line checker cables to fuel flow indicator and indicator electrical cable.  
 (8) Connect line checker grounding cable clip to airframe structure (ground).  
 (9) Close LEFT or RIGHT FUEL FLOW circuit breaker. Line checker PWR AVAIL light should come on.

**EFFECTIVITY**

**WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893**

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- (10) Observe FUEL USED counter for ten minutes (minimum). After ten minutes, counter should still indicate same number.
- (11) Place FUEL FLOW SIMULATE switch in B (PPH) or E (KgPH), as applicable.
- (12) With FUEL USED counter running, start stopwatch at convenient number.
- (13) Stop stopwatch after FUEL USED counter accumulates an additional 300 PPH or 150 KgPH (for 12000 PPH or 5500 KgPH indicators) or 400 PPH or 200 KgPH (for 16000 PPH or 7200 KgPH indicators).
- (14) Time for FUEL USED counter to increase should be 360(±8) seconds.  
NOTE: When performing test, counter should not be reset to zero.
- (15) Place FUEL FLOW SIMULATE switch in VAR (PPH) or VAR (KgPH) position, as applicable.
- (16) Slowly rotate VAR FLOW knob.  
NOTE: Indicator pointer must follow smoothly without sticking.
- (17) Place FUEL FLOW SIMULATE switch in ZERO (PPH) or ZERO (KgPH) position, as applicable.
- (18) Open LEFT or RIGHT FUEL FLOW circuit breaker.
- (19) Disconnect line checker cable from indicator and electrical cable.
- (20) Connect aircraft electrical cable connector to left or right fuel flow indicator.
- (21) Disconnect aircraft electrical cable connector from left or right fuel flow transmitter.
- (22) Connect line checker cable to transmitter electrical cable connector.
- (23) Connect line checker grounding cable clip to airframe structure (ground).
- (24) Close LEFT or RIGHT FUEL FLOW circuit breaker. Line checker PWR AVAIL light should come on.
- (25) Place  $\Phi A - \Phi B$  switch in  $\Phi A$  position, then in  $\Phi B$  position. Meter on line checker should indicate 55 to 70, in both positions.
- (26) Place  $\Phi A - \Phi B$  switch in  $\Phi A$  position.
- (27) Set line checker counter to zero.
- (28) Place counter switch in ON position and simultaneously start stopwatch.
- (29) At end of exactly six minutes, place COUNTER switch in OFF position. Counter should indicate 2871 to 2889.
- (30) Place  $\Phi A - \Phi B$  switch in  $\Phi B$  position and repeat Paragraph 3.A.(27) through Paragraph 3.A.(29).
- (31) Place  $\Phi A - \Phi B$  switch in OFF position.
- (32) With line checker FUEL FLOW SIMULATE switch in ZERO (PPH) or ZERO (KgPH) position as applicable, hold FUEL USED RESET switch (in flight compartment) for applicable indicator in RESET position, until FUEL USED counter stops moving; then release.
- (33) Observe FUEL USED counter for 10 minutes, minimum. Counter should still indicate zero (±2).  
NOTE: If counter does not indicate zero, indicator signal wiring, shield continuity and grounding should be checked per applicable wiring diagrams.
- (34) Place FUEL FLOW SIMULATE switch in B (PPH) or E (KgPH) as applicable, position.
- (35) With FUEL USED counter running, start stopwatch at convenient number.
- (36) Stop stopwatch after FUEL USED counter accumulates an additional 300 PPH or 150 KgPH (for 12000 PPH or 5500 KgPH indicators) or 400 PPH or 200 KgPH (for 16000 PPH or 7200 KgPH indicators).

### EFFECTIVITY

WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

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- (37) Time for FUEL USED counter to increase should be 360(±8) seconds.
- (38) Repeat steps (1) through (37) for opposite engine, if applicable.
- (39) Open LEFT or RIGHT FUEL FLOW circuit breaker.
- (40) Disconnect line checker cable and connect electrical cable to fuel flow transmitter.
- (41) Remove tools, equipment, loose hardware, spilled fluids, and debris from maintenance area.
- (42) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

**EFFECTIVITY**

WJE 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

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## FUEL FLOW INDICATING SYSTEM - ADJUSTMENT/TEST

### 1. General

- A. The fuel flow indicating system includes a transmitter secured to the fuel/oil cooler on the forward left side of the engine, a power supply in the electrical/electronics compartment and a Engine Display Panel (EDP) with reset button on bezel of panel, on the center instrument panel in the flight compartment. Adjustment/Test procedures for the fuel flow indicating system on both right and left engines are identical.

### 2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

**Table 501**

Name and Number	Manufacturer
Fuel flow system line checker, 4753880-507	Douglas Aircraft Co.
Stop watch	Commercially available

### 3. Adjustment/Test Fuel Flow Indicating System

#### A. Engine Display Panel (EDP) Self Test

- (1) Perform an EDP self test (BIT) by pushing unmarked recessed switch located adjacent left to PPG/LB or KGH/KG switch.
- (2) Fuel flow should indicate 2500 PPH or 1130 KgPH.

#### B. System Test

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

#### **UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

- (2) Place fuel flow line checker controls in following positions.

**Table 502**

CONTROL	POSITION
ØA - ØB Switch	OFF
FUEL FLOW SIMULATE rotary switch	ZERO (PPH), or ZERO (KgPH) as applicable
VAR FLOW Control	ZERO
COUNTER Switch	OFF
INDICATOR MODEL Switch	EDP

- (3) Disconnect aircraft electrical cable connector from left or right fuel flow transmitter.
- (4) Connect line checker cable CA-1 to transmitter electrical cable connector.

**EFFECTIVITY**

**WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887**

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- (5) Connect line checker grounding cable clip to airframe structure (ground).
- (6) Remove the safety tags and close these circuit breakers:

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

- (7) After the circuit breakers have been closed, make sure that the line checker PWR AVAIL light comes on.
- (8) Place  $\Phi A$  -  $\Phi B$  switch in  $\Phi A$  position, then in  $\Phi B$  position. Meter on line checker should indicate 55 to 70, in both positions.
- (9) Place  $\Phi A$  -  $\Phi B$  switch in  $\Phi A$  position.
- (10) Set line checker counter to zero.
- (11) Place counter switch in ON position and simultaneously start stopwatch.
- (12) At end of exactly six minutes, place COUNTER switch in OFF position. Counter should indicate 2871 to 2889.
- (13) Place  $\Phi A$  -  $\Phi B$  switch in  $\Phi B$  position and repeat Paragraph 3.B.(10) through Paragraph 3.B.(12).
- (14) Place  $\Phi A$  -  $\Phi B$  switch in OFF position.
- (15) Place the line checker INDICATOR WIRING switch in REVERSE position.
- (16) Place line checker FUEL FLOW SIMULATE switch in C (PPH) or F (KgPH) as applicable.
- (17) EDP fuel flow indicator should read 12000( $\pm$ 100) PPH or 3995( $\pm$ 50) KgPH.
- (18) Place line checker FUEL FLOW SIMULATE switch in B (PPH) or E (KgPH) as applicable.
- (19) EDP fuel flow indicator should read 4000( $\pm$ 50) PPH or 2000( $\pm$ 25) KgPH.
- (20) Push FUEL FLOW/USED button to obtain fuel used display.
- (21) With fuel used counter running, start stopwatch.
- (22) Observe fuel used display. The fuel used display must increase by 400( $\pm$ 10) lbs. or 200( $\pm$ 10) kgs. at the end of exactly six minutes.
- (23) Repeat Paragraph 3.A.(1) through Paragraph 3.B.(22) for opposite engine, if applicable.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (24) Open these circuit breakers and install safety tags:

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

#### EFFECTIVITY

WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423,  
863-866, 869, 871, 872, 875-879, 886, 887

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- (25) Disconnect line checker cable and connect electrical cable to fuel flow transmitter.
- (26) Remove tools, equipment, loose hardware, spilled fluids, and debris from maintenance area.
- (27) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

#### EFFECTIVITY

WJE 401-406, 410, 412, 414, 415, 417-419, 421, 423,  
863-866, 869, 871, 872, 875-879, 886, 887

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## FUEL FLOW TRANSMITTER - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the fuel flow transmitter located on the left side of the engine secured to the fuel/oil cooler.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel flow transmitter is through the forward lower cowling.  
 C. Removal, installation, and check procedures for the fuel flow transmitter on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

**Table 201**

Name and Number	Manufacturer
Lockwire 0.020 corrosion resistant steel, P05-288	
Lockwire 0.032 corrosion resistant steel, P05-289	
Petrolatum VV-P-236 DPM 675	
Fluid, MIL-C-7024 type II	
Suitable container approximately 2 US gallons (1.7 Imperial gallons or 7.57 liters)	
Oil, MIL-L-6081 grade 1010 DPM 339	
Molykote type G	
Torque wrench (0-1000 inch-pounds (113 N·m) range)	
Torque wrench (0-1800 inch-pounds (203.4 N·m) range)	

### 3. Removal/Installation Fuel Flow Transmitter

- A. Remove Transmitter

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**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THRUST REVERSER SYSTEM HAS BEEN DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6555 TO 7245 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (3) Disconnect electrical connector.  
 (4) Deleted.  
 (5) Disconnect fuel inlet line from aft inboard side of fuel flow transmitter and discard packing.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 2 US gallons (1.7 Imperial gallons or 7.57 liters).

- (6) Remove transmitter mounting bracket from aft end of fuel/ oil cooler.

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(7) Disconnect transmitter from forward end of fuel/oil cooler by removing lock plate bolts.

**CAUTION:** HANDLE TRANSMITTER CAREFULLY TO PREVENT DAMAGE TO INTERNAL MOVING COMPONENTS.

(8) Remove transmitter from fuel/oil cooler. Remove and discard O-ring from outlet adapter.

**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE LOOSENING CONNECTIONS.

(9) Remove inlet connector from inlet adapter and discard O-ring and retainer.

(10) Remove inlet adapter from transmitter and discard O-ring.

**WARNING:** CALIBRATING FLUID MIL-C-7024 IS AN AGENT THAT IS FLAMMABLE, EXPLOSIVE, POISONOUS, CARCINOGENIC, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN CALIBRATING FLUID MIL-C-7024 IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET CALIBRATING FLUID MIL-C-7024 IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

**WARNING:** JET ENGINE OIL LUBRICANT (GRADE 1010) IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN JET ENGINE OIL LUBRICANT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET JET ENGINE OIL LUBRICANT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

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**(WARNING PRECEDES)**

**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE LOOSENING CONNECTIONS.

**CAUTION:** STORING OR SHIPPING TRANSMITTER WITHOUT FLUID CAN CAUSE SEVERE DAMAGE TO TRANSMITTER COMPONENTS.

- (11) Remove outlet adapter from transmitter, retain lock plate and discard O-ring and retainer.

**NOTE:** If the fuel flow transmitter is to be stored or will be subjected to extensive handling, the unit should be flushed thoroughly with MIL-C-7024, type II fluid and then filled with 4.5 to 6.0 ounces (127.6 to 170.1 grams) of clean MIL-L-6081, grade 1010, jet engine oil or equivalent.

**CAUTION:** BEFORE INSTALLING TRANSMITTER, MAKE CERTAIN THAT SMALL AMOUNT OF FUEL IS PRESENT IN TRANSMITTER TO PREVENT IT RUNNING DRY ON FIRST ENGINE RUNUP.

B. Install Transmitter

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION
K	27	B1-75	LEFT FUEL FLOW

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Assemble transmitter assembly.
  - (a) Prepare and install outlet adapter.
    - 1) Install lock plate over threaded end of adapter so index devices point toward transmitter outlet port.
    - 2) Install retainer on threaded end of adapter by pushing retainer over first thread for 360-degree circumference, then turn retainer by hand until retainer falls into undercut area beyond thread run out.
    - 3) Use flat tool to push retainer flat into recess in adapter face for 360-degree circumference.

**WARNING:** WHITE PETROLATUM IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN WHITE PETROLATUM IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT BREATHE THE MIST.

**WARNING:** REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

- 4) Lightly lubricate new O-ring with petrolatum and install O-ring over threaded end of adapter.
- 5) Lightly lubricate threads of adapter with Molykote.
- 6) Install outlet adapter in outlet port of transmitter.

**NOTE:** Ensure lock plate index devices are over corresponding flats on transmitter outlet boss.

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**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE TIGHTENING CONNECTIONS.

- 7) Tighten outlet adapter to torque of 950 to 1050 inch-pounds.
  - 8) Lockwire outlet adapter to lock plate.
- (b) Prepare and install inlet adapter.
- 1) Lightly lubricate new O-ring with petrolatum and install O-ring over threaded end of inlet adapter.
  - 2) Install inlet adapter in inlet port of transmitter.

**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE TIGHTENING CONNECTIONS.

- 3) Tighten inlet adapter to torque of 950 to 1050 inch-pounds.
- (c) Prepare and install inlet connector.
- 1) Install jamnut on connector so recess in jamnut face points toward transmitter and jamnut is on innermost threads.  
**NOTE:** There should be three threads showing between back surface of jamnut and thread run out on connector. (Figure 201)
  - 2) Install retainer on threaded end of connector by pushing retainer over first thread for 360-degree circumference, then turn retainer by hand until retainer falls into undercut area between two sets of threads.
  - 3) Use flat tool to push retainer flat into recess in jamnut face for 360-degree circumference.
  - 4) Lightly lubricate new O-ring with petrolatum and install O-ring over threaded end of connector.
  - 5) Install connector into adapter until O-ring contacts inlet adapter.  
**NOTE:** There should be three threads showing between back surface of jamnut and thread run out on connector. (Figure 201)  
**NOTE:** Looking from inlet end of transmitter assembly toward outlet end, transmitter electrical connector is at 6 o'clock position (down) and inlet connector nipple is at approximately 3 o'clock position (right).  
**NOTE:** Do not tighten jamnut.
- (4) If fuel inlet line stopnut and key washer were disassembled, proceed as follows: (Figure 202)
- (a) Install new key washer on inlet line.
  - (b) Position stopnut against stop on tube ferrule and tighten finger tight. Back off stopnut one-half turn to next slot and bend tabs of key washer to clinch stopnut.
  - (c) Check thread engagement between stopnut and coupling nut. Thread engagement must be such that a No. 60 wire will not pass through 0.063-inch diameter holes (both walls) of stopnut.
- (5) Install transmitter assembly.
- (a) Lightly lubricate new O-ring with petrolatum and install on outlet adapter.
  - (b) Lightly lubricate new packing with petrolatum, then install ferrule, packing and retainer on fuel inlet line.

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- (c) Position transmitter assembly so that electrical connector is at 6 o'clock (down) and flow arrow points forward.
- (d) Insert outlet adapter nipple into fuel/oil cooler port.
- (e) Connect fuel inlet line to inlet connector nipple. Tighten connector hand tight.  
NOTE: Move inlet connector slightly up or down to help align fuel inlet line coupling.
- (f) Install aft mounting bracket on inlet connector and attach bracket to engine with three bolts. Tighten bolts and safety with P05-289 0.032-inch lockwire.
- (g) Attach lock plate to fuel/oil cooler with four bolts, washers and nuts. Tighten bolts and safety with P05-289 0.032-inch lockwire.

**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE TIGHTENING CONNECTIONS.

- (h) Tighten inlet fuel line to a torque of 75 to 85 inch-pounds.

**CAUTION:** USE A WRENCH TO HOLD ADJACENT WRENCHING FLATS TO PRECLUDE THE TORQUE MOTION FROM DAMAGING THE TRANSMITTER BODY WHILE TIGHTENING CONNECTIONS.

- (i) Tighten inlet connector jamnut to a torque of 570 to 630 inch-pounds.
- (j) Safety inlet fuel line coupler to inlet connector jamnut with P05-289 0.032-inch lockwire.
- (k) Connect electrical connector to transmitter. Safety the connector with P05-288 0.020-inch lockwire.

NOTE: Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (6) Close up transmitter assembly installation.
  - (a) Remove tag from throttle/thrust reverser lever
  - (b) Remove tags and close following circuit breakers:

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION
L	27	B1-76	RIGHT FUEL FLOW

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(c) Remove safety pin from thrust reverser control valve. Stow safety pin.

#### 4. Check Engine Fuel Flow Transmitter

A. Check Transmitter

(1) Visually check for fuel leaks on first engine runup.

**NOTE:** At initial engine start, the fuel flow indicator may fluctuate due to air in the system. The fuel control will function properly, and the system will clear of air after approximately 3 minutes operation. Exercising the throttle may aid in clearing the system of air.

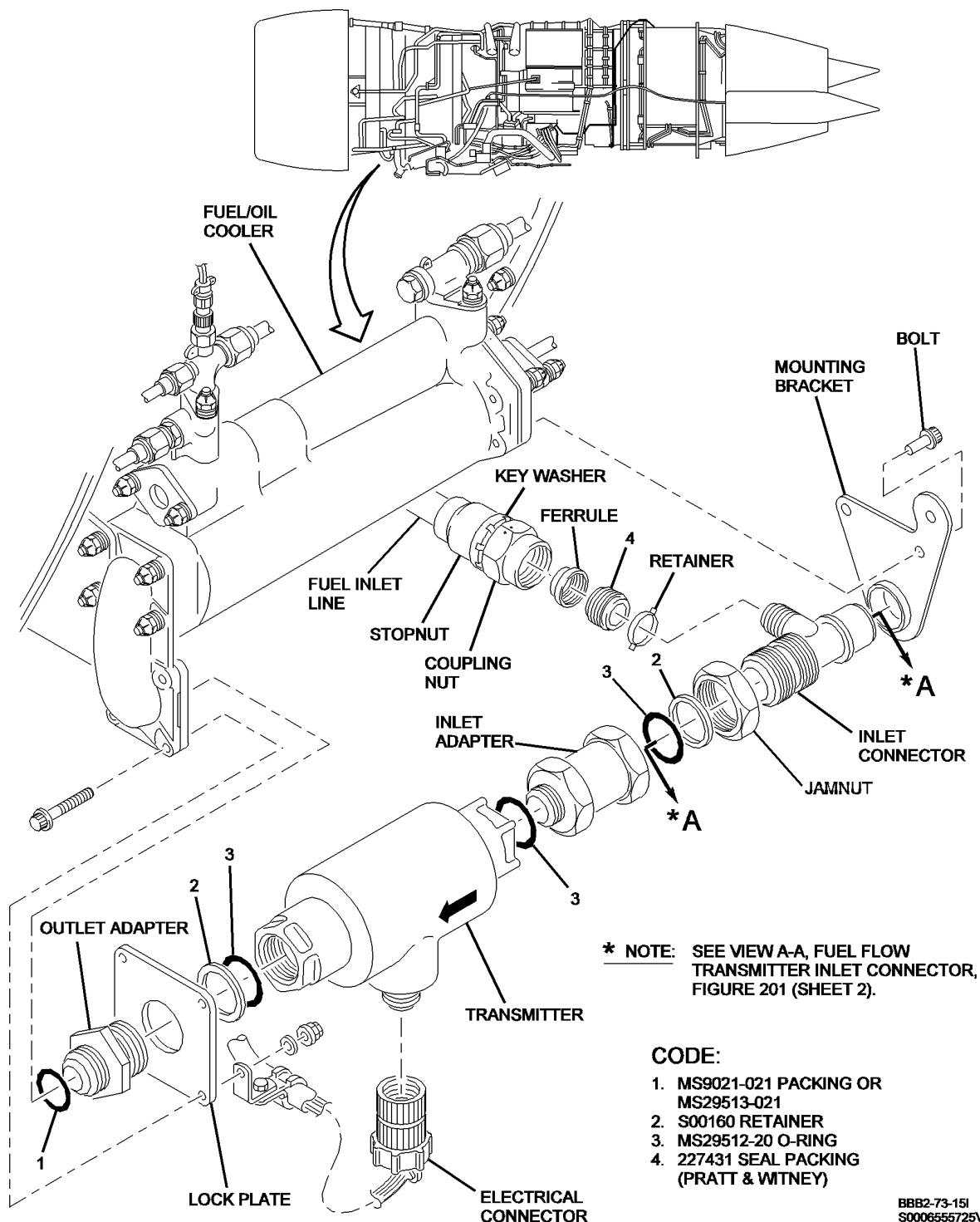
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**Fuel Flow Transmitter -- Removal/Installation  
Figure 201/73-31-01-990-801 (Sheet 1 of 2)**

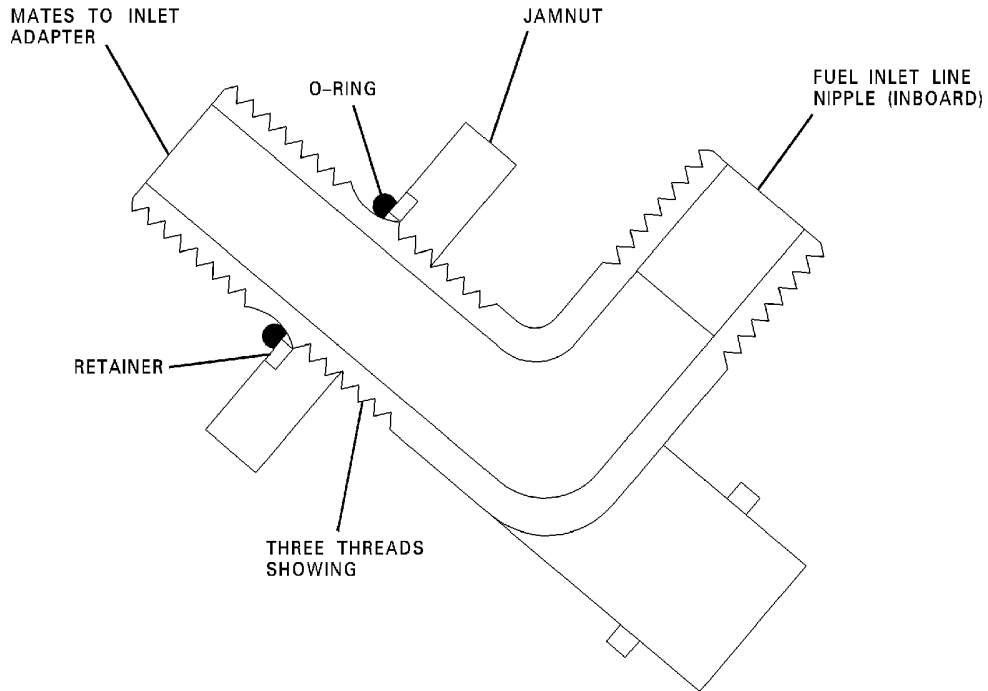
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FUEL FLOW TRANSMITTER  
INLET CONNECTOR

ROTATE CONNECTOR INTO  
INLET ADAPTER UNTIL  
O-RING CONTACTS ADAPTER  
MATING SURFACE. DO NOT  
TURN JAMNUT.

CAG(IGDS)

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## Fuel Flow Transmitter -- Removal/Installation Figure 201/73-31-01-990-801 (Sheet 2 of 2)

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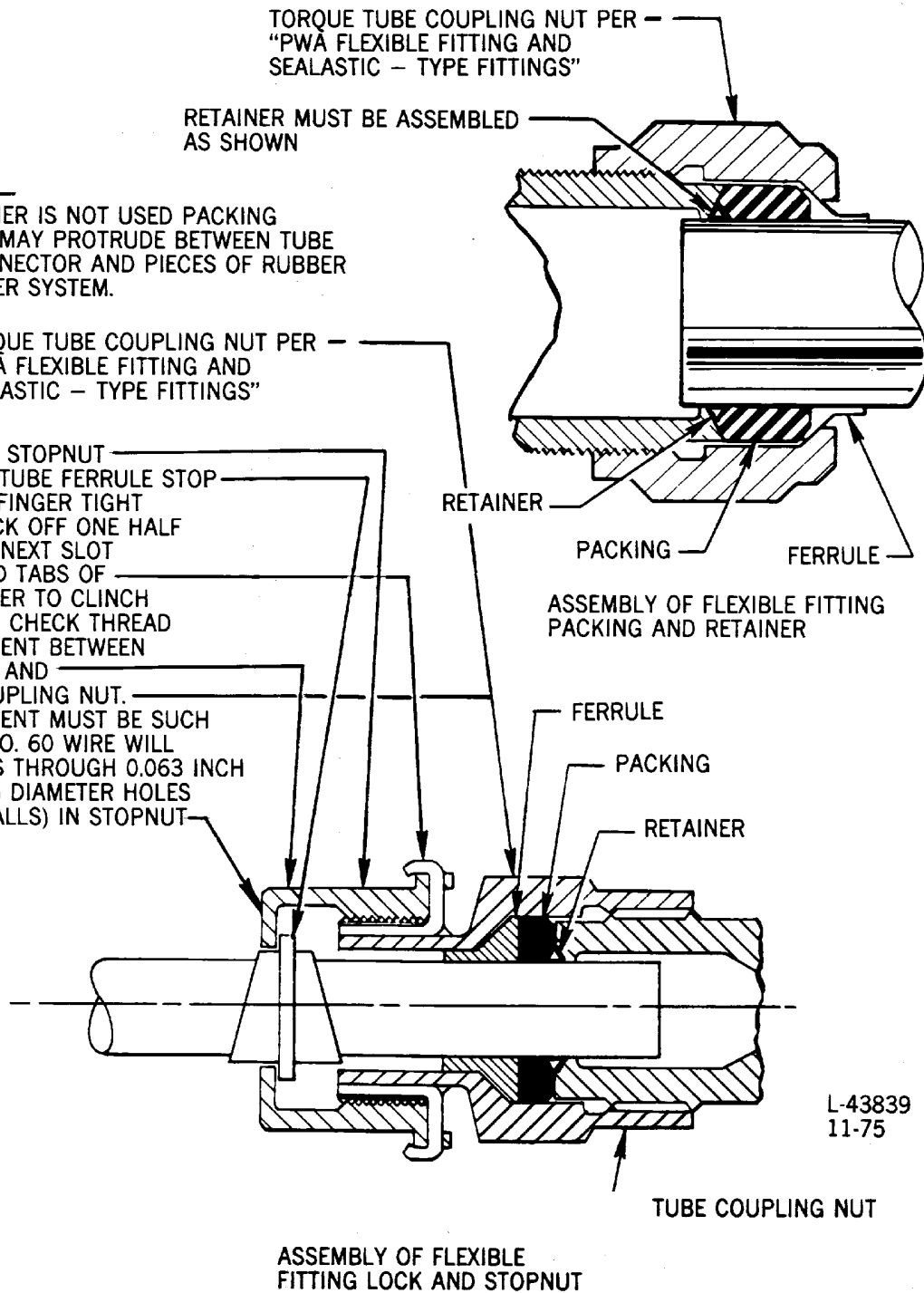
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**CAUTION:**

IF RETAINER IS NOT USED PACKING OR SEAL MAY PROTRUDE BETWEEN TUBE AND CONNECTOR AND PIECES OF RUBBER MAY ENTER SYSTEM.

TORQUE TUBE COUPLING NUT PER --  
"PWA FLEXIBLE FITTING AND SEALASTIC -- TYPE FITTINGS"

POSITION STOPNUT AGAINST TUBE FERRULE STOP TIGHTEN FINGER TIGHT THEN BACK OFF ONE HALF TURN TO NEXT SLOT AND BEND TABS OF KEYWASHER TO CLINCH STOPNUT. CHECK THREAD ENGAGEMENT BETWEEN STOPNUT AND TUBE COUPLING NUT. ENGAGEMENT MUST BE SUCH THAT A NO. 60 WIRE WILL NOT PASS THROUGH 0.063 INCH (1.60 MM) DIAMETER HOLES (BOTH WALLS) IN STOPNUT



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**Fuel Manifold Stop-Nut Connector  
Figure 202/73-31-01-990-802**

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## FUEL FLOW INDICATOR POWER SUPPLY - MAINTENANCE PRACTICES

### 1. General

- A. The fuel flow indicator power supply is a solid state unit located on the aft right radio rack equipment panel. Access to power supply is gained through electrical/electronics compartment access door 4501. Removal and installation procedures for power supply on the left and right engines are identical.

### 2. Removal/Installation Fuel Flow Indicator Power Supply

- A. Remove Power Supply

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Open these circuit breakers and install safety tags:

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (2) Disconnect electrical connector.  
 (3) Remove power supply from mounting.

- B. Install Power Supply

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make sure that these circuit breakers are open and have safety tags:

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

- (2) Position power supply on mounting panel.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (3) Connect electrical connector.

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- (4) Remove the safety tags and close these circuit breakers:

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	27	B1-75	LEFT FUEL FLOW

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	27	B1-76	RIGHT FUEL FLOW

### 3. Check Fuel Flow Indicator Power Supply

#### A. Check Power Supply

- (1) Check fuel flow indicating system during first engine run.

NOTE: At initial engine start, the fuel flow indicator may fluctuate due to air in the system. The fuel control will function properly, and the system will clear of air after approximately 3 minutes operation. Exercising the throttle may aid in clearing the system of air.

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## FUEL TEMPERATURE SENSOR - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the fuel temperature sensor located on the right of the engine and is mounted on the fuel filter.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel temperature sensor is through the forward lower cowling.  
 C. Removal, installation, and check procedures for the fuel temperature sensor on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Lockwire, 0.020 corrosion- resistant steel, P05-288	
Lockwire, 0.032 corrosion- resistant steel, P05-289	
Petrolatum V V-P-236	
Torque wrench, (0 to 200 inch- pounds range)	
Tag, "Do Not Operate"	

### 3. Removal/Installation Fuel Temperature Sensor

- A. Remove Sensor

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT

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WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893

U	42	B1-422	ENGINE START VALVE LEFT
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### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

S	34	B1-181	LEFT FUEL TEMP
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### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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T	34	B1-182	RIGHT FUEL TEMP
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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE ALL

K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
------------	------------	---------------	-------------

L	26	B1-425	RIGHT ENGINE IGNITION
---	----	--------	-----------------------

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

(4) Make certain applicable pneumatic crossfeed lever is in CLOSED position.

(a) Attach "Do Not Operate" tag to the applicable pneumatic crossfeed lever. Write on tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(5) Disconnect electrical connector.

(6) Remove sensor from engine. Discard O-ring.

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### B. Install Sensor

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

#### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

#### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

#### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

#### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

#### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle on upper instrument panel is pulled.
- (4) Make certain applicable pneumatic crossfeed lever is in CLOSED position and a "Do Not Operate" tag is attached.
- (5) Lightly lubricate new O-ring with petrolatum (V V-P-236) and install O-ring on sensor.

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- (6) Make certain sensor is free from foreign matter.
- (7) Install sensor. Torque sensor 80 to 100 inch-pounds (9.04 to 11.3 N·m). Safety sensor with P05-289 .032 inch lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (8) Connect electrical connector and safety with P05-288 .020 inch lockwire.  
NOTE: Connector is properly installed when no relative motion exists between backshell and coupling rings.
- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893</b>			
S	34	B1-181	LEFT FUEL TEMP

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	34	B1-182	RIGHT FUEL TEMP

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (10) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (11) Close fire control handle located on upper instrument panel.
- (12) Remove "Do Not Operate" tag from applicable pneumatic crossfeed lever.
- (13) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

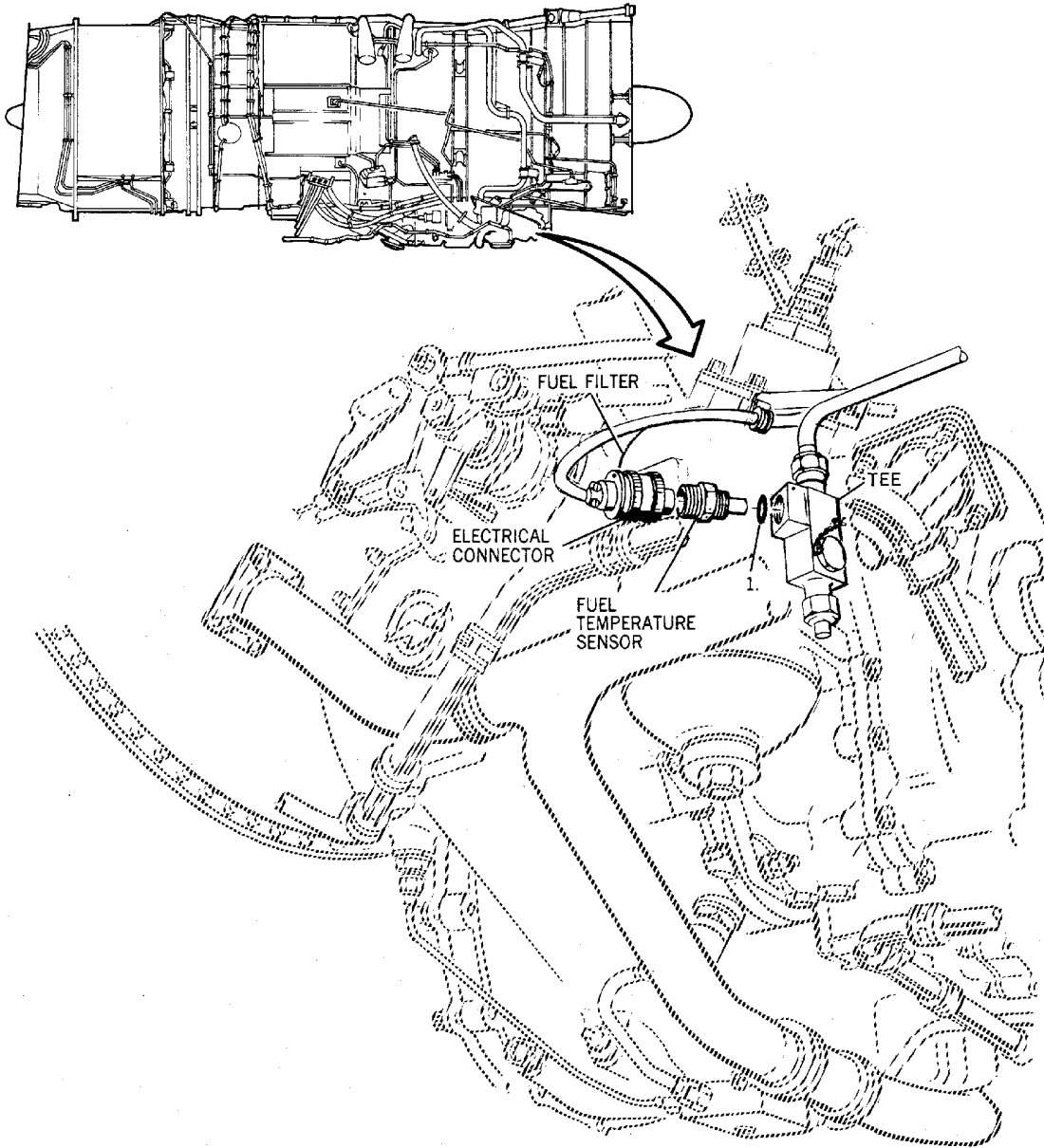
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CODE:  
I. MS29512-04

BBB2-73-14

Fuel Temperature Sensor -- Removal/Installation  
Figure 201/73-32-01-990-801

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**4. Check Fuel Temperature Sensor**

**A. Check Sensor**

- (1) Check fuel temperature indicator for proper indication on first engine runup and engine temperature sensor connection for leaks.

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# MD-80 AIRCRAFT MAINTENANCE MANUAL

## LOW FUEL INLET PRESSURE CAUTION SWITCH - MAINTENANCE PRACTICES

### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the low fuel inlet pressure caution switch located on the underside of the engine in the fuel supply line.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the low fuel inlet pressure caution switch is through the forward lower cowling.  
 C. Removal, installation, and check procedures for the low fuel inlet pressure caution switch on left and right engines are identical.

### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

**Table 201**

Name and Number	Manufacturer
Lockwire .020 corrosion resistant steel, P05-288	
Lockwire .032 corrosion resistant steel, P05-289	
Petrolatum VV-P-236	
Suitable container approximately 5 US gallons (4.16 Imperial gallons or 18.93 liters)	
Torque wrench (0 to 100 inch pounds range)	

### 3. Removal/Installation Pressure Caution Switch

- A. Remove Switch

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT

**EFFECTIVITY**

**WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 405, 877, 880, 884, 892 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891	U	42 B1-1	ENGINE IGNITION LEFT
WJE 405, 877, 880, 884, 892	U	42 B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892	S	33 B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
	T	33 B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892	K	26 B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
	L	26 B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

(3) Pull fire control handle located on upper instrument panel.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(4) Disconnect electrical connector.

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**CAUTION:** EXTREME CARE MUST BE EXERCISED WHEN REMOVING OR INSTALLING SWITCH TO PREVENT DAMAGE TO WELDED FITTING AND FUEL LINE.

- (5) Remove switch from elbow. Discard O-ring.

**NOTE:** Be prepared to catch fuel in container with approximate capacity of 5 US gallons (4.16 Imperial gallons or 18.93 liters).

B. Install Switch

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT

**LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

**LOWER EPC, ENGINE - RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892</b>			
K	26	B1-424	LEFT ENGINE IGNITION

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**EFFECTIVITY**

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

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**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle located on upper instrument panel is pulled.
- (4) Lightly lubricate new O-ring with petrolatum (VV-P-236) and install O-ring on switch.

**CAUTION:** EXTREME CARE MUST BE EXERCISED WHEN REMOVING OR INSTALLING SWITCH TO PREVENT DAMAGE TO WELDED FITTING AND FUEL LINE.

- (5) Install switch in elbow. Torque switch 60 to 70 inch-pounds (6.78 to 7.91 N·m). Safety switch with P05-289 .032 inch lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (6) Connect electrical connector. Safety connector with P05-288 .020 inch lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (7) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405, 877, 880, 884, 892</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 415, 416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405, 877, 880, 884, 892</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

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WJE 405, 409, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891, 892 (Continued)

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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L	26	B1-425	RIGHT ENGINE IGNITION
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**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (8) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (9) Close fire control handle located on upper instrument panel.
- (10) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

**EFFECTIVITY**

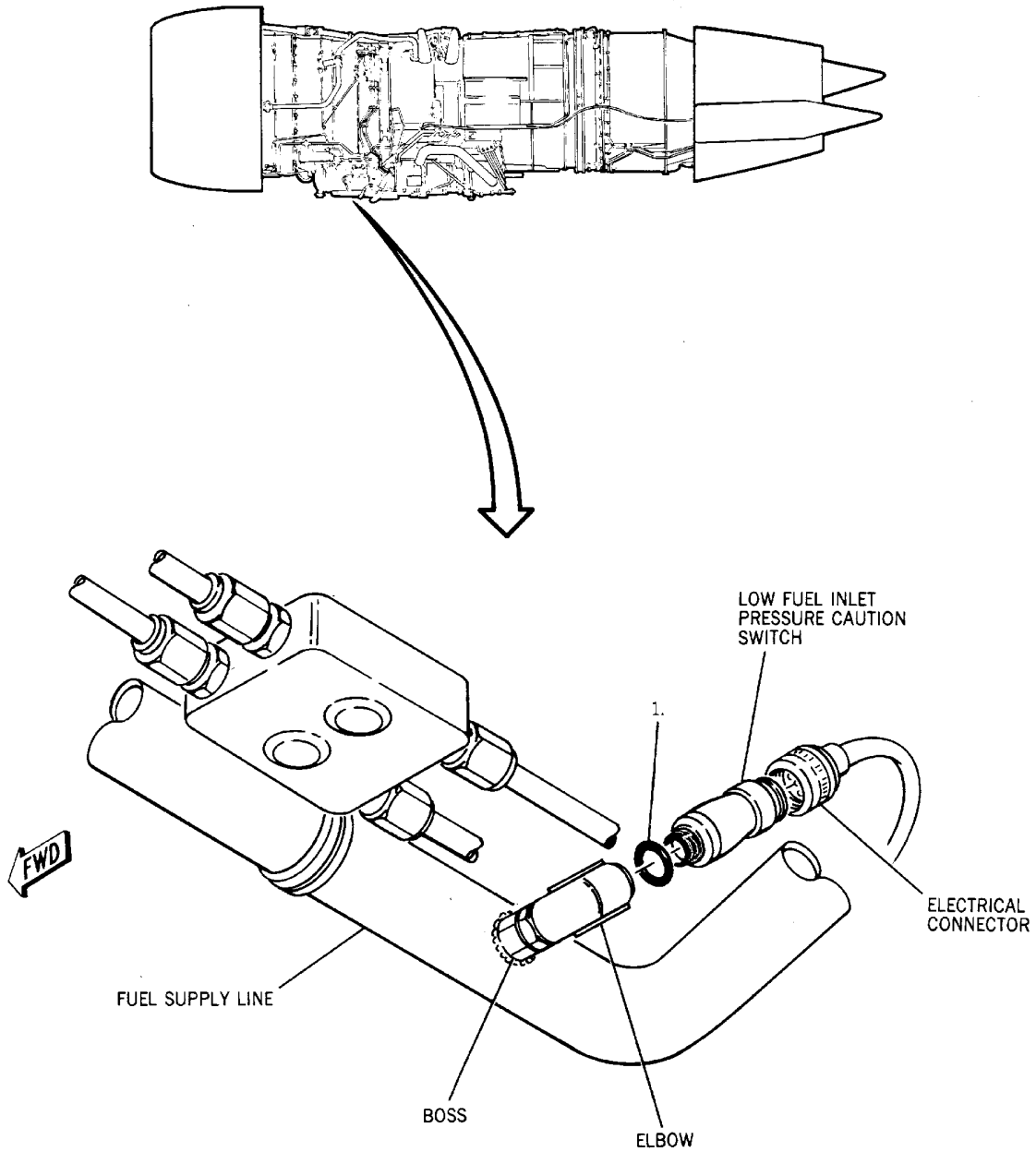
WJE 401, 405, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861, 862, 868, 873-881, 883, 884, 891, 892

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



CODE:  
I. MS29512-04

BBB2-73-16B

**Low Fuel Inlet Pressure Caution Switch -- Removal/Installation**  
Figure 201/73-33-01-990-801

**EFFECTIVITY**

WJE 401, 405, 409, 412, 414-416, 418, 420, 422,  
424-427, 429, 861, 862, 868, 873-881, 883, 884, 891,  
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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### 4. Check Low Fuel Inlet Pressure Caution Switch

#### A. Check Switch Operation/Leak Check

- (1) With electrical buses energized, check that applicable LH or RH "Inlet Fuel Press Low" caution light comes on (pilot's master caution panel).
- (2) Make certain that crossfeed valve is closed.
- (3) Place LH or RH fuel tank boost pump in ON position. ("Inlet Fuel Press Low Light" should go out.)
- (4) Leak check installed fuel low pressure switch.
- (5) Restore aircraft to normal configuration.

NOTE: While performing this test, once fuel feed manifold has been pressurized and fuel boost pumps are selected off, left and right engine inlet fuel pressure low lights may take approximately two minutes to come on when engines are not running.

#### B. Check Switch

- (1) With electrical buses energized, check that applicable fuel low-pressure caution light comes on.
- (2) At next engine run, check that applicable fuel low-pressure caution light goes off.
- (3) Visually check engine connections for leaks.

#### EFFECTIVITY

WJE 401, 405, 409, 412, 414-416, 418, 420, 422,  
424-427, 429, 861, 862, 868, 873-881, 883, 884, 891,  
892

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### LOW FUEL INLET PRESSURE CAUTION SWITCH - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation and check instructions for the low fuel inlet pressure caution switch located on the inlet temperature boss on engine fuel pump.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the low fuel inlet pressure caution switch is through the forward lower cowling.

**CAUTION:** TO PRECLUDE ALTERING SWITCH PRESET PRESSURE RANGES, USE CORRECT TOOLS AND CORRECT SWITCH FEATURES WHEN MAINTENANCE IS PERFORMED. USE WRENCH FLATS ON PRESSURE CAPSULE FOR REMOVAL/INSTALLATION OF SWITCH. OVERTIGHTENING ELECTRICAL CONNECTOR MAY TURN SWITCH ELECTRICAL ASSEMBLY CAUSING AN INACCURATE INDICATION.

- C. Removal, installation, and check procedures for the low fuel inlet pressure caution switch on left and right engines are identical.
- D. Bleed air from engine fuel feed manifold and fuel pump prior to accomplishing functional test of switch. Air in engine fuel feed system may result in abnormal or erratic switch operations/indications prior to engine being operated.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

**Table 201**

Name and Number	Manufacturer
Lockwire .020 corrosion resistant steel, P05-288	
Lockwire .032 corrosion resistant steel, P05-289	
Petrolatum VV-P-236	
Suitable container approximately 5 gal (19 l)US (4.16 Imperial gallons)	
Torque wrench (0 in-lb (0 N·m) to 100 in-lb (11 N·m) range)	
Packing MS29512-04	
Tag "Do Not Operate"	

#### 3. Removal/Installation Pressure Caution Switch

- A. Remove Switch

**EFFECTIVITY**

**WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893**

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL AND HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1 OR AGENT 2 POSITION.

- (3) Pull fire control handle located on upper instrument panel.  
 (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.

#### EFFECTIVITY

**WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893**

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- (a) Attach a "Do Not Operate" tag to the applicable Pneumatic Crossfeed Lever. Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (5) Disconnect electrical connector.

B. Install Switch

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are opened and tagged.

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

**LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

**LOWER EPC, ENGINE - RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893</b>			
K	26	B1-424	LEFT ENGINE IGNITION

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**EFFECTIVITY**

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle located on upper instrument panel is pulled.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (5) Lightly lubricate new O-ring with petrolatum (VV-P-236) and install O-ring on switch.
- (6) Install switch in elbow. Torque switch 60 in-lb (7 N·m) to 70 in-lb (8 N·m). Safety switch with P05-289 0.032 inch lockwire.

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

- (7) Connect electrical connector. Safety connector with P05-288 0.020 inch lockwire.

**NOTE:** Connector is properly installed when no relative motion exists between backshell and coupling ring.

- (8) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 417, 419, 421, 423, 863-866, 869, 871, 872</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 406-408, 410, 411, 886, 887, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 407, 408, 411, 893</b>			
S	33	B1-141	LEFT INLET FUEL PRESS LOW CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	33	B1-142	RIGHT INLET FUEL PRESS LOW CAUTION

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

WJE 407, 408, 411, 893 (Continued)

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (9) Remove safety pin from thrust reverser control valve. Stow safety pin.
- (10) Close fire control handle located on upper instrument panel.
- (11) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.
- (12) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

**NOTE:** When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

EFFECTIVITY

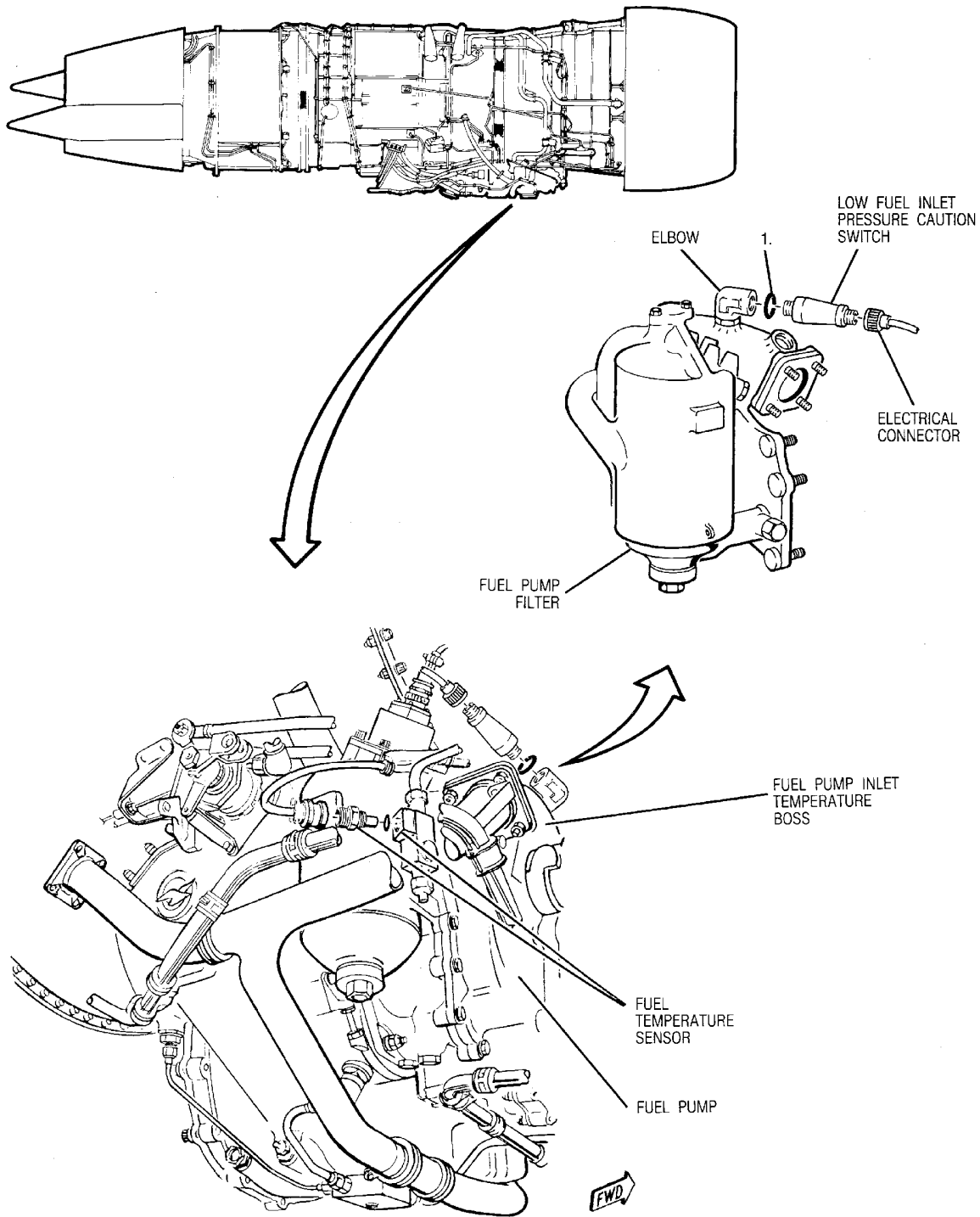
WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421, 423, 863-866, 869, 871, 872, 886, 887, 893

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# MD-80 AIRCRAFT MAINTENANCE MANUAL



1.MS29512-04

BBB2-73-80

**Low Fuel Inlet Pressure Caution Switch -- Removal/Installation**  
**Figure 201/73-33-01-990-803**

**EFFECTIVITY**

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### 4. Check Low Fuel Inlet Pressure Caution Switch

#### A. Check Switch Operation/Leak Check

- (1) With electrical buses energized, check that applicable LH or RH "Inlet Fuel Press Low" caution light comes on (pilot's master caution panel).
- (2) Make certain that crossfeed valve is closed.
- (3) Place LH or RH fuel tank boost pump in ON position. ("Inlet Fuel Press Low Light" should go out.)
- (4) Leak check installed fuel low pressure switch.
- (5) Restore aircraft to normal configuration.

NOTE: While performing this test, once fuel feed manifold has been pressurized and fuel boost pumps are selected off, left and right engine inlet fuel pressure low lights may take approximately two minutes to come on when engines are not running.

#### EFFECTIVITY

WJE 402-404, 406-408, 410, 411, 414, 417, 419, 421,  
423, 863-866, 869, 871, 872, 886, 887, 893

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

### FUEL FILTER DIFFERENTIAL PRESSURE SWITCH - MAINTENANCE PRACTICES

#### 1. General

- A. This maintenance practice provides removal/installation, check, and adjustment/test instructions for the fuel filter differential pressure switch located on the fuel filter mounted on the right side of the engine.

**WARNING:** EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

**CAUTION:** TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

- B. Access to the fuel filter differential pressure switch is through the forward lower cowling.  
 C. Removal, installation, check, and test procedures for the fuel filter differential pressure switch on the left and right engines are identical.

#### 2. Equipment and Materials

**NOTE:** Equivalent substitutes may be used instead of the following listed items:

**NOTE:** Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

**Table 201**

Name and Number	Manufacturer
Petrolatum VV-P-236	
Lockwire 0.020 corrosion resistant steel, P05-288	
Lockwire 0.032 corrosion resistant steel, P05-289	
Nozzle PWA 33682	
Source of clean dry compressed air	
Tag - DO NOT OPERATE	

#### 3. Removal/Installation Fuel Filter Differential Pressure Switch

- A. Remove Switch

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

#### **LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	35	B1-122	LEFT FUEL FILTER PRESS DROP CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	35	B1-123	RIGHT FUEL FILTER PRESS DROP CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(2) Place thrust reverser control valve in dump position and install safety pin.

**WARNING:** DO NOT MOVE FIRE CONTROL HANDLE BEYOND FUEL & HYD OFF POSITION. INADVERTENT DISCHARGE OF FIREX AGENT CONTAINERS WILL OCCUR IF HANDLE IS ACCIDENTALLY ROTATED TO AGENT 1, OR AGENT 2 POSITION.

(3) Pull fire control handle, located on upper instrument panel.

(4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position.

(a) Attach a "DO NOT OPERATE" tag to the applicable Pneumatic Crossfeed Lever.

1) Write on the tag: PNEUMATIC CROSSFEED LEVER TO REMAIN IN THE CLOSED POSITION - ENGINE MAINTENANCE IN PROGRESS.

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT PLUG.

- (5) Disconnect electrical connector from switch.
- (6) Remove switch from fuel filter housing. Discard O-rings.

B. Install Switch

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Make certain throttle/thrust reverser lever is tagged and following circuit breakers are open and tagged.

**LOWER EPC, DC TRANSFER BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			

**LOWER EPC, ENGINE - LEFT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	35	B1-122	LEFT FUEL FILTER PRESS DROP CAUTION

**LOWER EPC, ENGINE - RIGHT DC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	35	B1-123	RIGHT FUEL FILTER PRESS DROP CAUTION

**UPPER EPC, ENGINE - LEFT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

**UPPER EPC, ENGINE - RIGHT AC BUS**

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

EFFECTIVITY  
WJE ALL

**73-34-01**



## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Make certain thrust reverser control valve is in dump position and safety pin is installed.
- (3) Make certain that fire control handle, located on upper instrument panel is pulled.
- (4) Make certain the applicable Pneumatic Crossfeed Lever is in the CLOSED position and a "Do Not Operate" tag is attached.
- (5) Lightly lubricate two O-rings with petrolatum (VV-P-236) and install O-rings in counterbored ports on fuel filter.
- (6) Position switch on fuel filter, locate electrical cable bracket on switch and install switch. Safety bolts with P05-289 0.032 inch lockwire. (Figure 201)

**CAUTION:** TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO CONNECT PLUG. DO NOT OVERTIGHTEN.

- (7) Connect electrical connector. Safety with P05-288 0.020 inch lockwire.

**NOTE:** Connector plug is properly installed when no relative motion exists between plug backshell and coupling ring.

- (8) Remove tools, equipment, loose hardware, spilled fluids, and debris from maintenance area.

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (9) Remove tag from throttle/thrust reverser lever, and remove tags and close following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

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WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

(Continued)

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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WJE ALL

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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S	35	B1-122	LEFT FUEL FILTER PRESS DROP CAUTION
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### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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T	35	B1-123	RIGHT FUEL FILTER PRESS DROP CAUTION
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### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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K	26	B1-424	LEFT ENGINE IGNITION
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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
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L	26	B1-425	RIGHT ENGINE IGNITION
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(10) Remove safety pin from thrust reverser control valve. Stow safety pin. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 78-00-00/201)

(11) Close fire control handle, located on upper instrument panel.

(12) Remove the "Do Not Operate" tag from the applicable Pneumatic Crossfeed Lever.

(13) Place applicable L GEN or R GEN control switch on overhead switch panel momentarily to RESET position.

NOTE: When an engine fire control handle is actuated, generator field is opened. Generator control switch must be reset to close generator field circuit.

#### 4. Check Differential Fluid Pressure Switch

##### A. Operational Check

- (1) With electrical buses energized, check that applicable fuel filter pressure drop CAUTION light stays off.
- (2) At next engine run, check that applicable fuel filter pressure drop light stays off.
- (3) Visually check for leaks on first engine runup.

#### 5. Adjustment/Test Differential Pressure Switch

##### A. Test Switch

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## MD-80 AIRCRAFT MAINTENANCE MANUAL

**WARNING:** MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

**WARNING:** TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- (1) Tag throttle/thrust reverser lever, and open and tag following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT
<b>WJE ALL</b>			

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	35	B1-122	LEFT FUEL FILTER PRESS DROP CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	35	B1-123	RIGHT FUEL FILTER PRESS DROP CAUTION

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
K	26	B1-424	LEFT ENGINE IGNITION

### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

- (2) Place thrust reverser control valve in dump position and install safety pin.
- (3) Prepare test equipment; source of clean dry compressed air or nitrogen, pressure regulator, and 0 to 25 psig (172.5 kPa) pressure gage. Gage should have ±1 percent accuracy with dial marked in 1/4 psi (1.7 kPa) increments.

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- (4) Remove fuel pump filter cartridge. (FUEL PUMP, SUBJECT 73-12-01)
- (5) Remove tag and close FUEL FILTER PRESSURE DROP CAUTION circuit breakers.

### LOWER EPC, ENGINE - LEFT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
S	35	B1-122	LEFT FUEL FILTER PRESS DROP CAUTION

### LOWER EPC, ENGINE - RIGHT DC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
T	35	B1-123	RIGHT FUEL FILTER PRESS DROP CAUTION

- (6) Connect nozzle PWA 33682 to pressure source test line and lightly lubricate rubber seal at tip of nozzle with Petrolatum (VV-P-236).
- (7) Insert nozzle inside filter housing, and position tip of nozzle in high pressure port for differential pressure switch. Hold nozzle firmly in place. (Figure 202)

**CAUTION:** DO NOT EXCEED 20 PSIG (137.9 KPA) GAGE PRESSURE.

- (8) Slowly apply pressure through nozzle. Check that FUEL FILTER PRESSURE DROP CAUTION LIGHT on engine caution annunciator panel comes on between 3.0 and 8.0 psig (20.7 and 55.2 kPa).
- (9) Slowly decrease line pressure and check that FUEL FILTER PRESSURE DROP CAUTION LIGHT goes out between 6.0 and 2.0 psig (41.4 and 13.8 kPa).
- (10) Shut off air pressure and remove nozzle from fuel filter housing.
- (11) Install fuel pump filter cartridge. (FUEL PUMP, SUBJECT 73-12-01)
- (12) Remove tag from throttle/thrust reverser lever, and remove tags and close the following circuit breakers.

### LOWER EPC, DC TRANSFER BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
U	40	B1-40	ENGINE START PUMP
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	41	B1-2	ENGINE IGNITION RIGHT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	41	B1-423	ENGINE START VALVE RIGHT
<b>WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883</b>			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
<b>WJE 415-427, 429, 861-866, 868, 869, 871-874, 891</b>			
U	42	B1-1	ENGINE IGNITION LEFT
<b>WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893</b>			
U	42	B1-422	ENGINE START VALVE LEFT

### UPPER EPC, ENGINE - LEFT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
<b>WJE ALL</b>			
K	26	B1-424	LEFT ENGINE IGNITION

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### UPPER EPC, ENGINE - RIGHT AC BUS

<u>Row</u>	<u>Col</u>	<u>Number</u>	<u>Name</u>
L	26	B1-425	RIGHT ENGINE IGNITION

**WARNING:** MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

- (13) Remove safety pin from thrust reverser control valve. Stow safety pin.

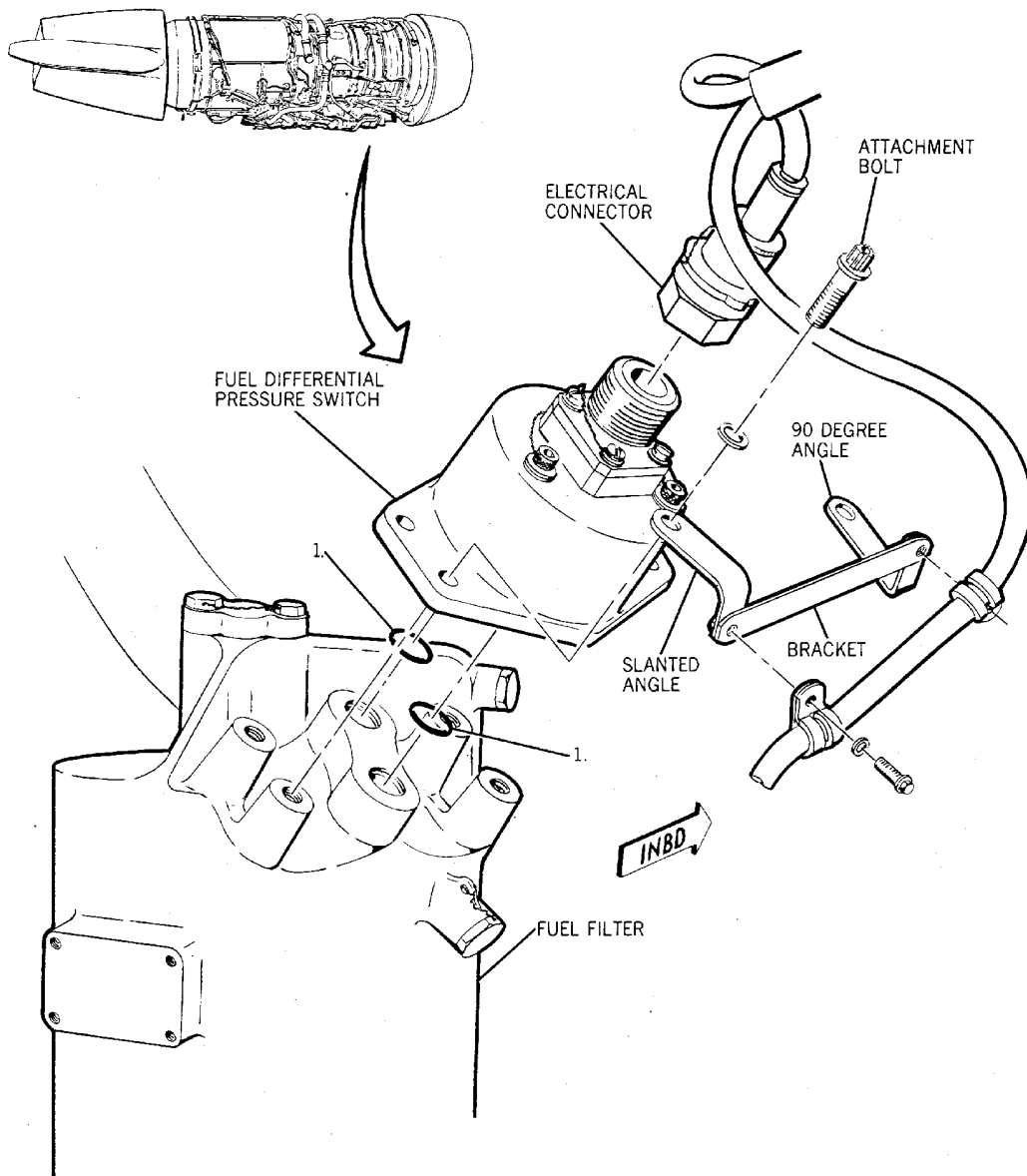
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CODE:  
1. MS9021-010 O-RING.

BB82-73-21

Fuel Filter Differential Pressure Switch -- Removal/Installation  
Figure 201/73-34-01-990-803

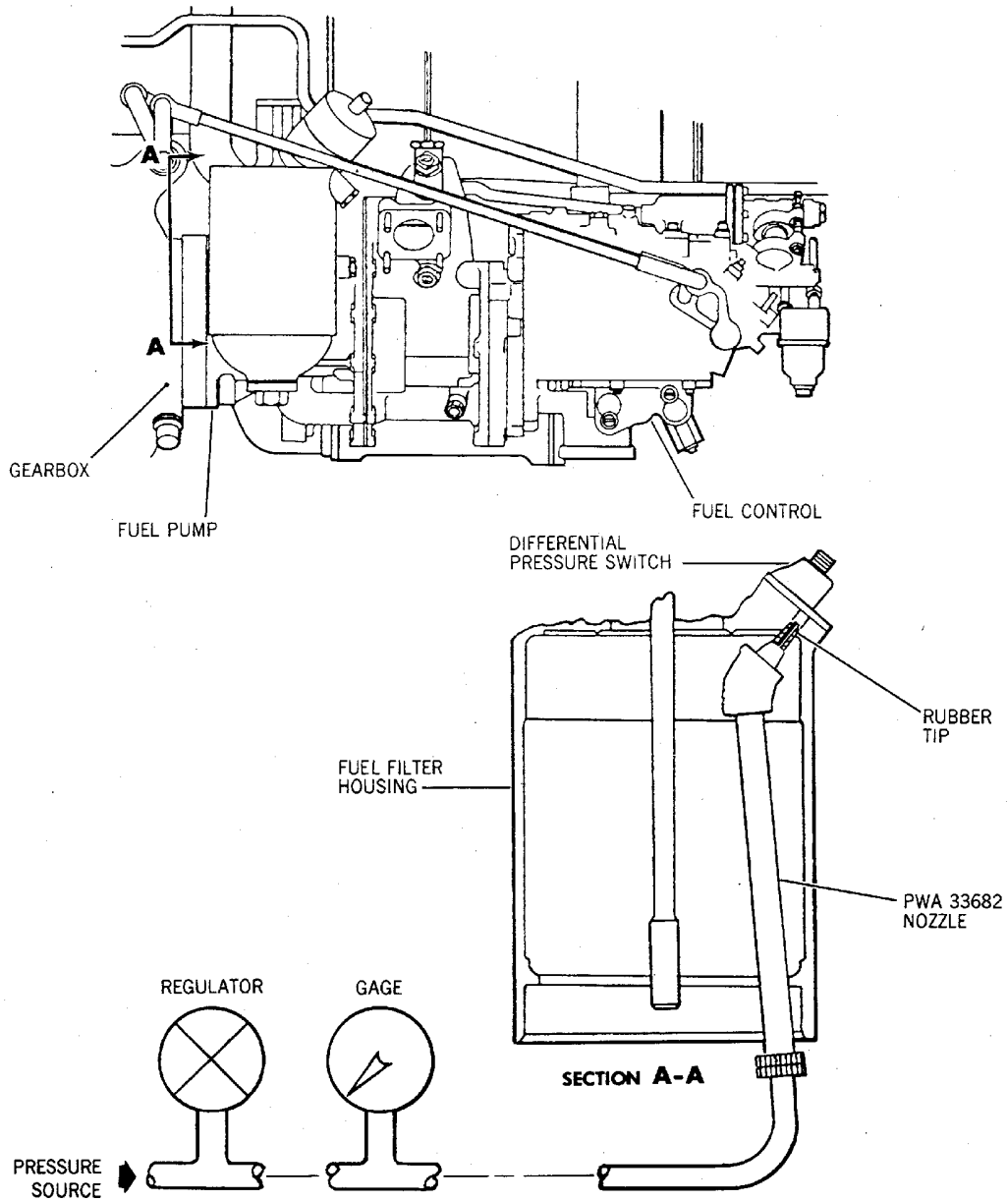
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**Fuel Filter Differential Pressure Switch -- Adjustment/Test  
Figure 202/73-34-01-990-804**

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