CHAPTER

28

Fuel

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Fuel

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FUEL SYSTEM - INTRODUCTION

Purpose

The fuel system has these primary purposes:

- Stores fuel for use by engines and APU
- Supplies fuel to engines
- Supplies fuel to APU.

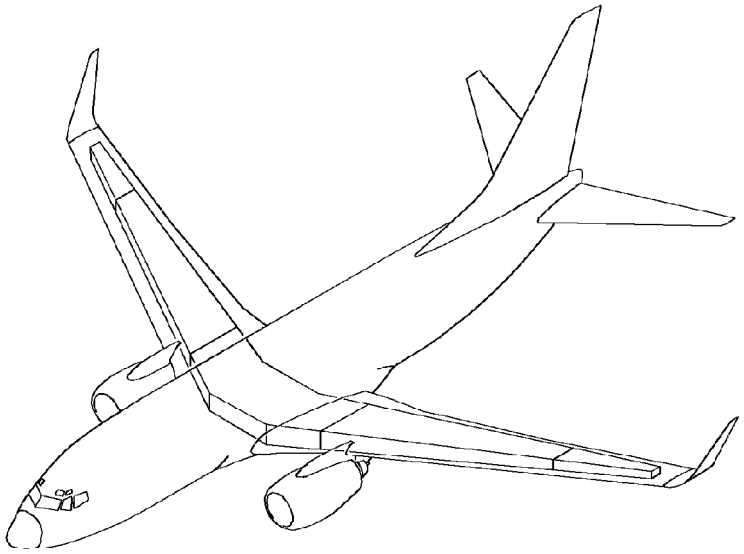
General

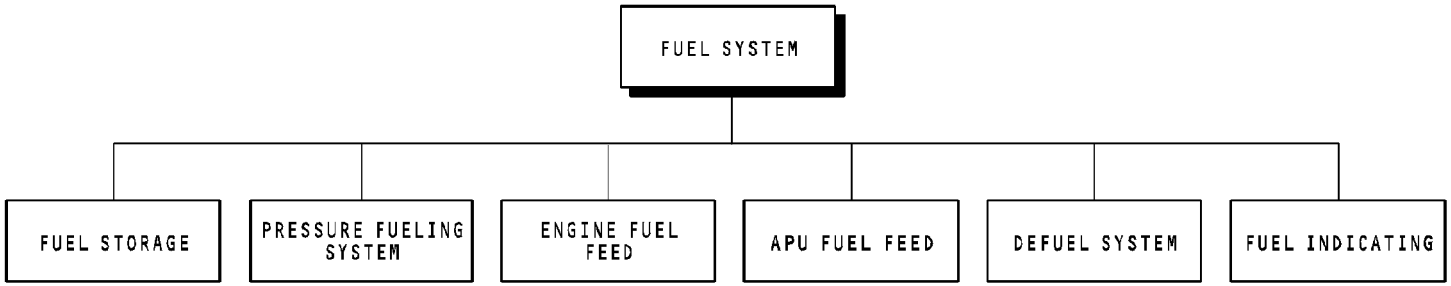
The fuel system has these subsystems:

- Fuel storage
- Pressure fueling
- Engine fuel feed
- APU fuel feed
- Defuel
- Fuel quantity indicating system
- Fuel temperature indication.

Abbreviations and Acronyms

- APU - auxiliary power unit
- CDS - common display system
- FQPU - fuel quantity processor unit
- FQIS - fuel quantity indicating system
- kgs - kilograms
- lbs - pounds





FUEL SYSTEM - INTRODUCTION

EFFECTIVITY
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FUEL SYSTEM - GENERAL DESCRIPTION

General

The fuel tanks store fuel for use by the engines and the APU. The pressure fueling system lets you add fuel to each tank. The fueling station is on the right wing. You also do defueling and fuel transfer at the fueling station.

Each main tank has two boost pumps (fuel pumps). The center tank also has two boost pumps. The center tank boost pumps supply fuel at a higher pressure than the pumps in the main tanks. Because of this, the fuel in the center tank is used before the fuel in the main tanks.

Control of the engine and APU fuel feed system is on the P5 panel. Fuel quantity of each tank shows in the flight compartment and at the fueling station.

BITE is available to maintenance personnel through the control display unit (CDU).

Fuel Storage

These tanks store fuel:

- Main tank 1
- Main tank 2
- Center tank.

The surge tanks collect fuel overflow only.

The main tanks are in the wings. Main tank 1 is in the left wing. Main tank 2 is in the right wing. The center tank is in the fuselage and the inboard section of each wing.

Pressure Fueling System

The pressure refueling system fuels each fuel tank. The P15 fueling panel, on the right wing, controls fueling operations. There is no over wing fueling capability.

Engine Fuel Feed System

The engine fuel feed system supplies fuel from the fuel tanks to the engines. The fuel control panel controls engine fuel feed. The engines use fuel from the center tank before the main tanks.

APU Fuel Feed

The APU fuel feed system supplies fuel to the APU. The APU usually receives fuel from main tank 1. However, with use of the fuel boost pump switches, any fuel tank can supply fuel to the APU.

Defuel System

The defuel system permits the removal of fuel from each tank. It also permits the transfer of fuel between tanks on the ground.

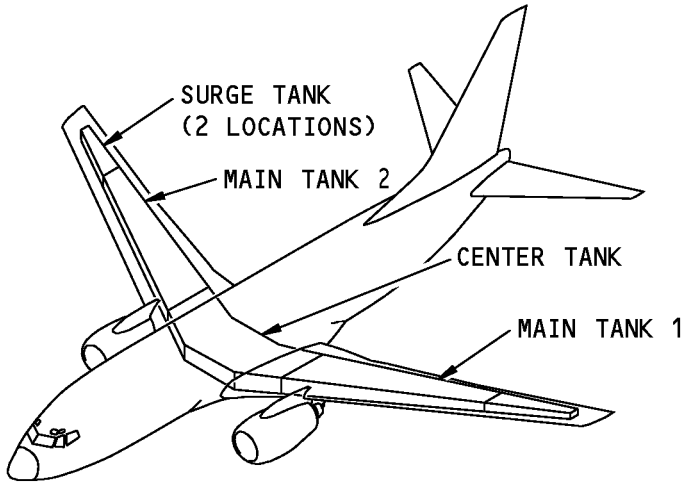
Fuel Quantity Indicating System

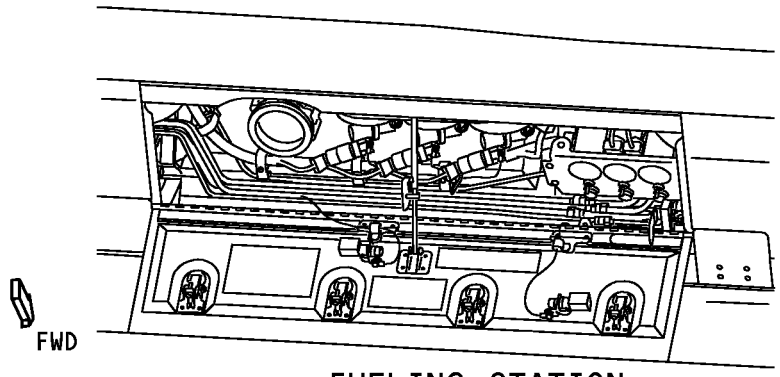
The fuel quantity indicating system (FQIS) shows fuel weight of the main tanks and the center tank on the common display system (CDS) and the P15 refuel panel.

Total fuel weight shows in the flight management computer system (FMCS) data on the CDU.

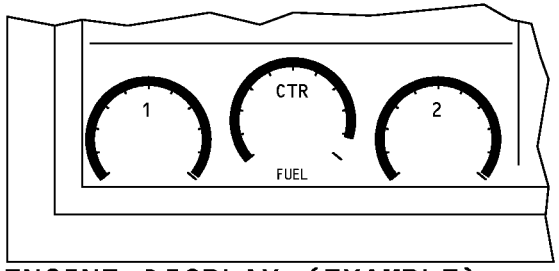
Fuel Temperature Indicating System

Main tank 1 fuel temperature shows on the fuel control panel.





FUELING STATION



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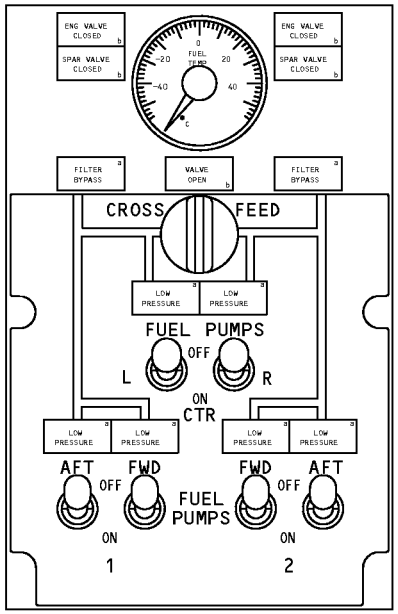
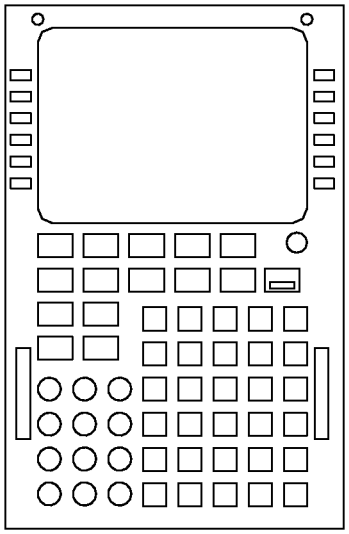


FUEL CONTROL PANEL (P5)



CDU

NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS.

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FUEL SYSTEM - GENERAL DESCRIPTION

EFFECTIVITY

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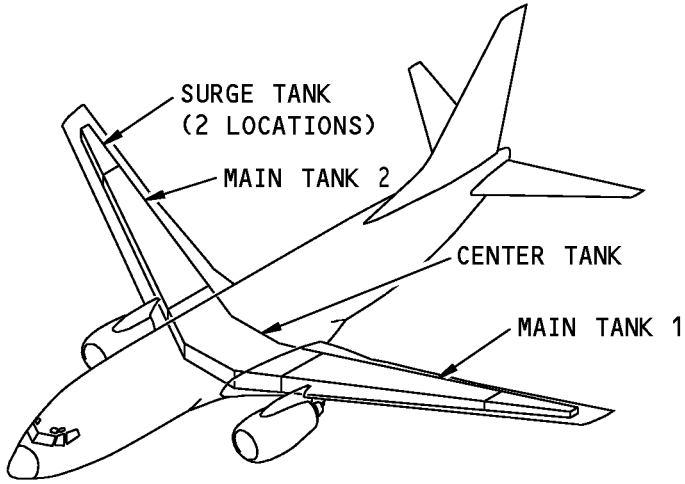

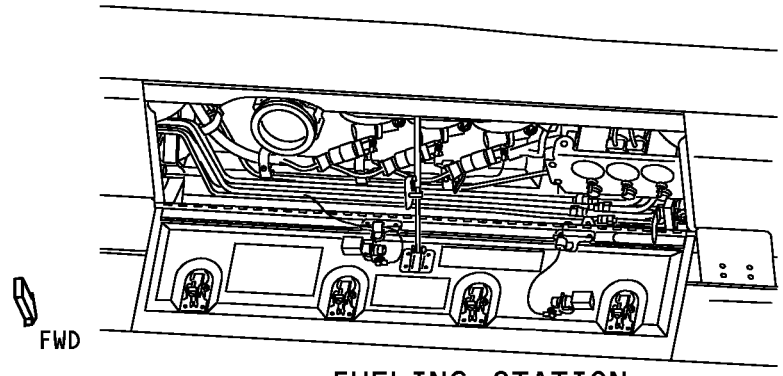

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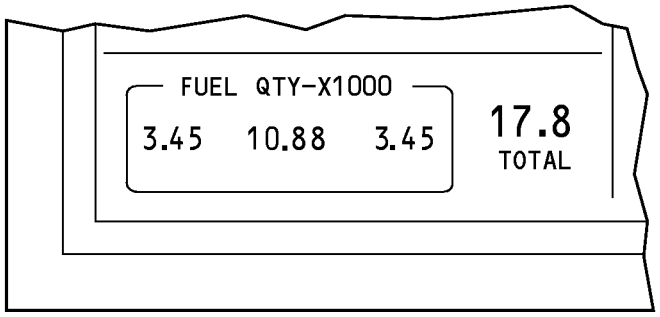

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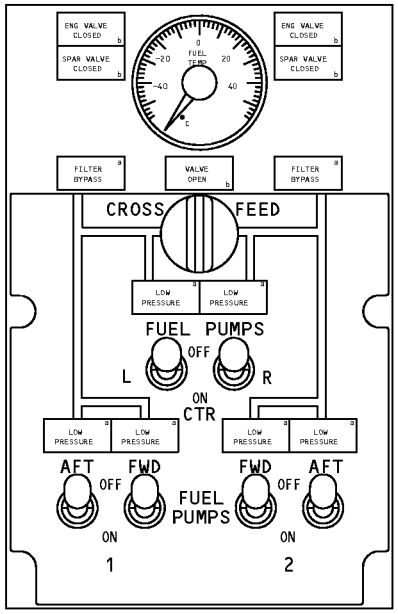
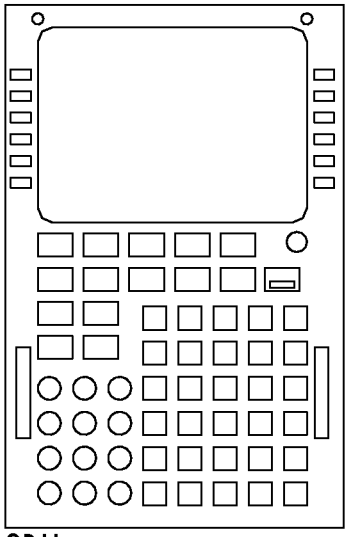


FUEL CONTROL PANEL (P5)



CDU

NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS.

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Fuel Tank Arrangement

These are the fuel tanks:

- Main tank 1
- Main tank 2
- Center tank.

Surge tanks found outboard of each main tank collect fuel overflow and fuel from the vent system. The fuel in the surge tank will drain into the main tank when the airplane is at a constant velocity and cruise pitch angle. If the fuel level is high enough in the surge tank, fuel will drain out of the vent scoop.

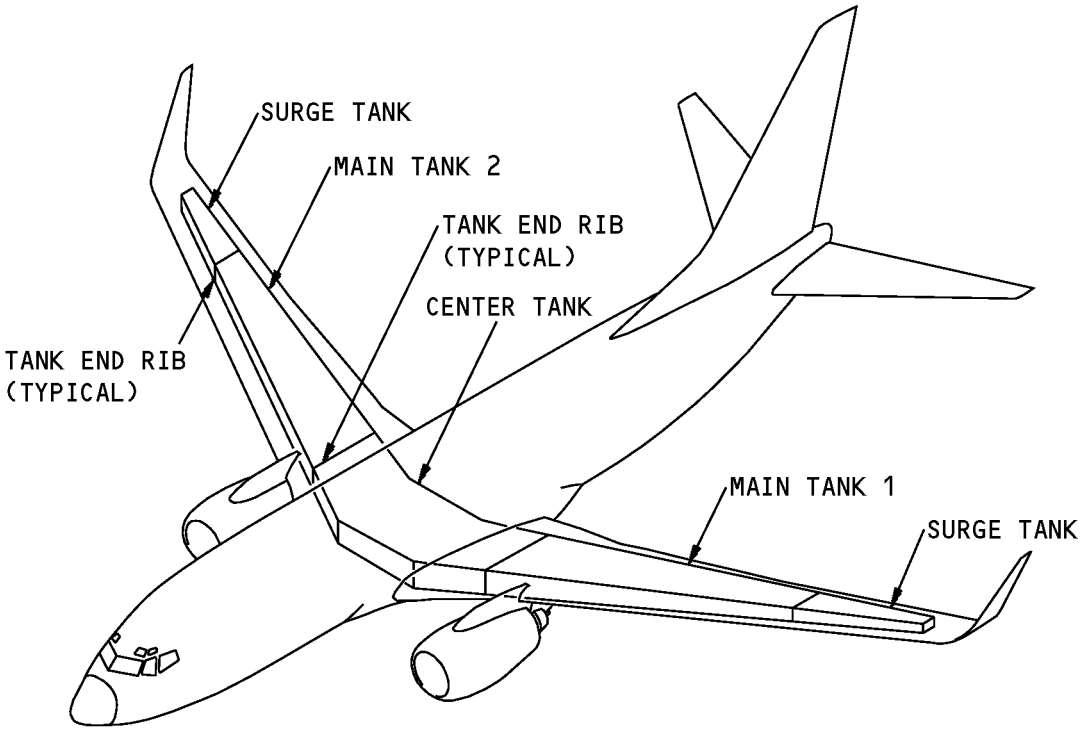
Component Location

Main tank 1 is in the wing box of the left wing. Main tank 2 is in the wing box of the right wing. The center tank is in the fuselage and the left and right wing root.

Capacity

The capacity of main tank 1 is 8630 lb (3915 kg). The capacity of main tank 2 is 8630 lb (3915 kg). The capacity of the center tank is 28,803 lb (13,065 kg). Fuel tank capacity does not include surge tanks.

The capacity of each surge tank is 235 lb (107 kg).



FUEL TANK CAPACITY		
	LB	KGS
MAIN TANK 1	8,630	3,915
MAIN TANK 2	8,630	3,915
CENTER TANK	28,803	13,066
TOTAL	46,063	20,896

NOTE: FUEL DENSITY 6.7 POUNDS PER US GALLON (0.8029 KILOGRAMS PER LITER)

FUEL STORAGE - GENERAL DESCRIPTION

EFFECTIVITY
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General

Wing fuel tank access panels permit entry into each fuel and surge tank. The wing fuel tank access panels are on the bottom wing skin. One center tank access panel permits entry into the center tank through the fuselage. This panel is in the left air conditioning compartment.

Wing ribs divide the fuel tanks into bays. Wing fuel tank access panels are between the wing ribs. Access across wing ribs to adjacent bays is through cutouts.

Wing rib 8, in main tank 1 and main tank 2, has check valves. The check valves let fuel flow inboard but do not let fuel flow outboard.

Tank end ribs close the ends of each fuel tank. There is no fuel flow through the tank end ribs.

Fuel Tank Locations

The side of body rib is rib 1. Main tank 1 is between rib 5 and rib 22. The location of main tank 2 is the same.

The center tank is between rib 5 in the left wing and rib 5 in the right wing.

The surge tank for main tank 1 and main tank 2 is between rib 22 and rib 25.

Fuel Tank Access Panels

The fuel tank access panels attach to the bottom wing skin with a clamp ring. An aluminum gasket supplies a proper fit and an electrostatic bond.

Impact resistant fuel tank access panels are in areas that are subject to impact damage. The three inboard fuel tank access panels, on each wing, are impact resistant panels.

EFFECTIVITY
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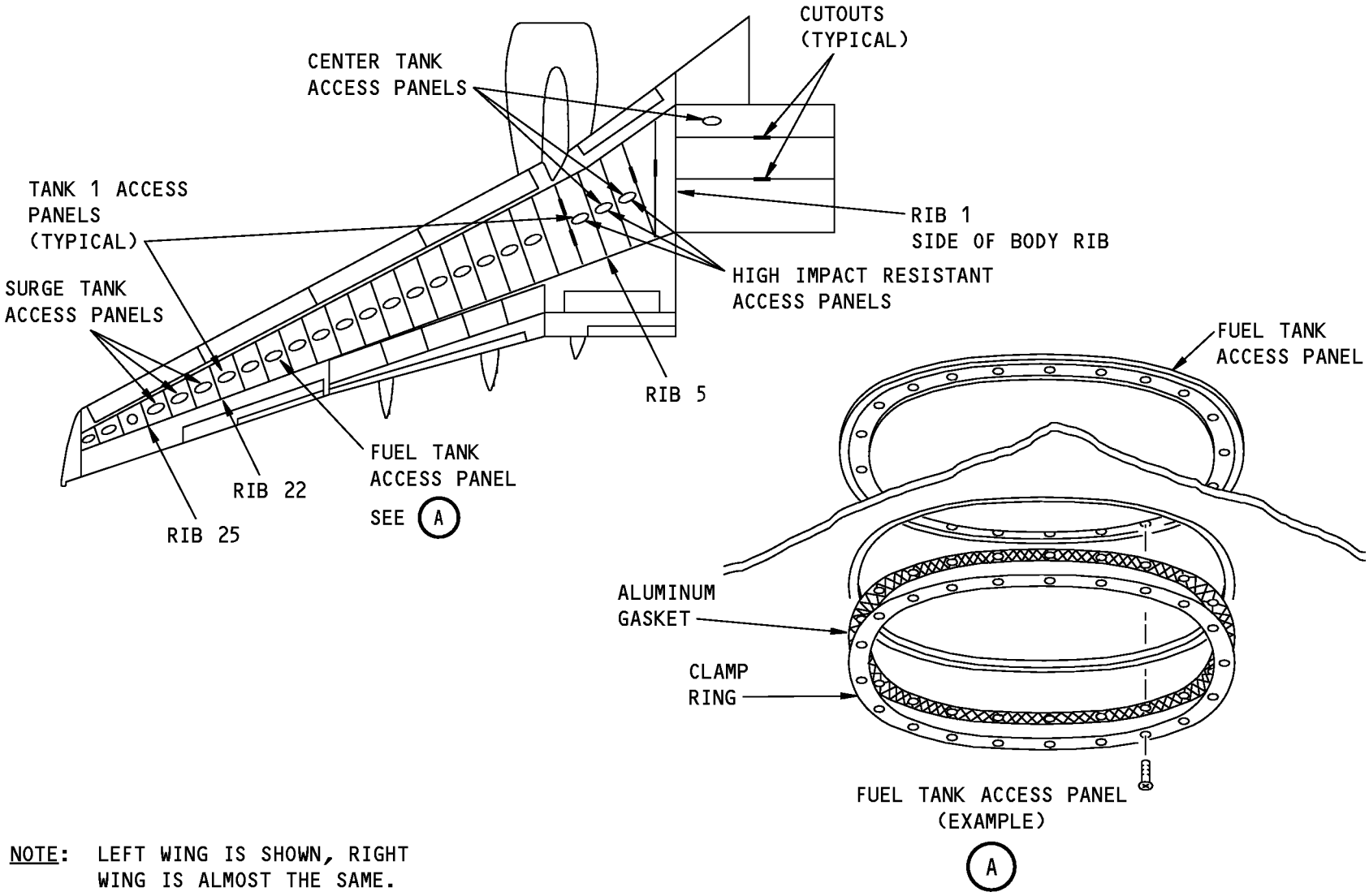

NOTE: LEFT WING IS SHOWN, RIGHT WING IS ALMOST THE SAME.

FUEL STORAGE - FUEL TANK ACCESS

EFFECTIVITY
HAP ALL

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FUEL STORAGE - SUMP DRAIN VALVES

General

The sump drain valves let these drain from each fuel tank:

- Fuel
- Water
- Contamination.

Sump drain valves are at the low point of each tank. The sump drain valves in these tanks attach to the bottom wing skin:

- Main tank 1
- Main tank 2
- Surge tank.

The sump drain valve in the center tank attaches to the lower wing skin panel.

Component Location

The sump drain valve for main tank 1 and main tank 2 is outboard of rib five.

The sump drain valve for the center tank is near the center of the tank. You get to the sump drain valve from an access door on the lower fuselage skin. The access door is between the two air conditioning access doors.

The sump drain valve for the surge tanks is outboard of rib 22. The sump drain valve is on the bottom of the wing.

Operation

The procedure to drain fluid from these tanks is the same:

- Main tank 1
- Main tank 2
- Surge tank.

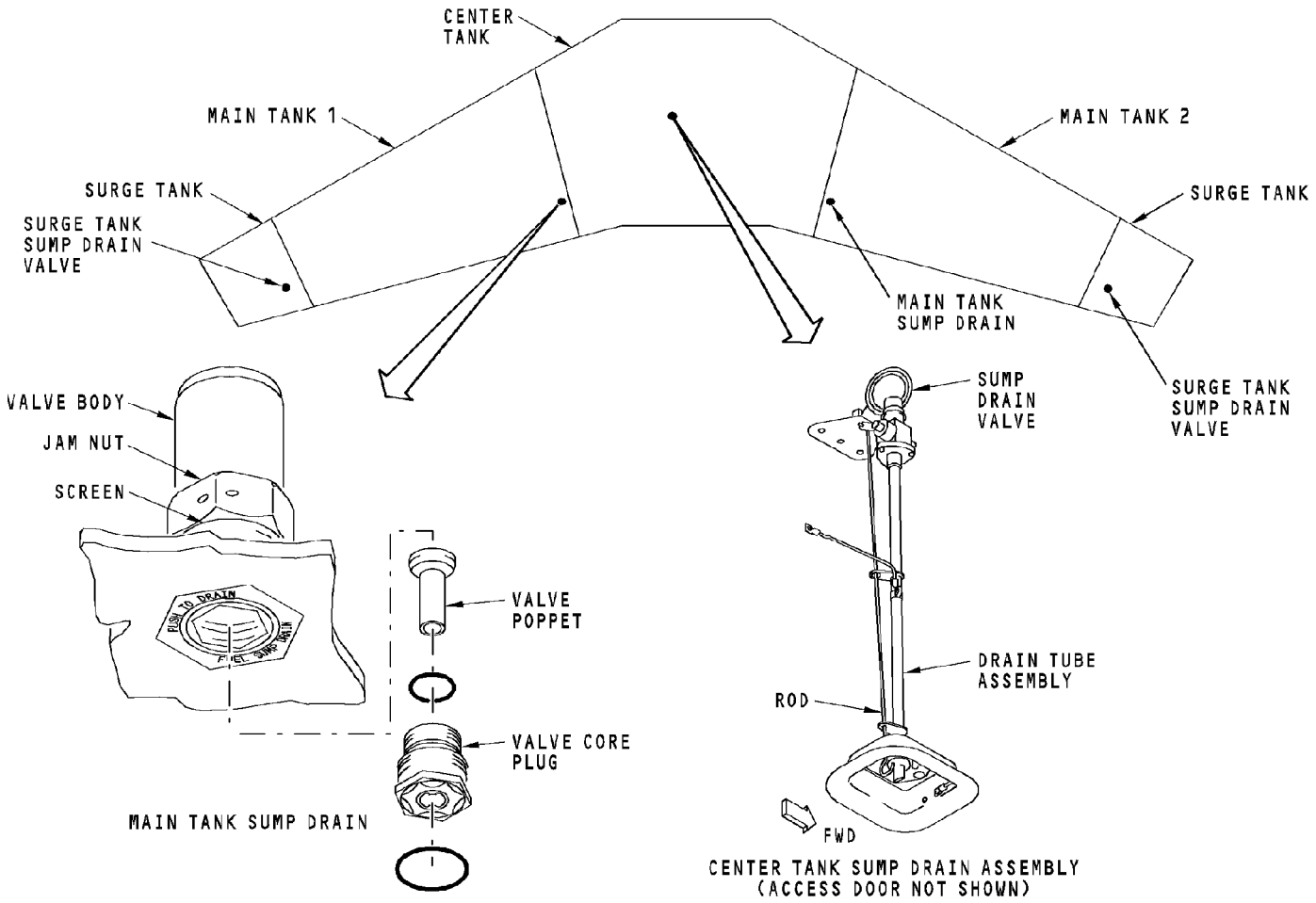
To open the sump drain valve, push up on the center of the valve. An internal spring closes the sump drain valve.

To drain fluid from the center tank, open the access door and pull down on the rod. An internal spring closes the sump drain valve.

Training Information Point

You can replace the primary seal of a main tank sump drain valve by removing the valve core plug and valve poppet. Defueling the main tank is not necessary. However, you must defuel the tank if you need to replace the whole main tank drain valve.

You may replace the center tank sump drain assembly without defueling the center tank.



FUEL STORAGE - SUMP DRAIN VALVES

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General

The fuel vent system keeps the pressure of the fuel tanks near the ambient pressure. Too large a pressure difference can cause damage to the wing structure.

Drains let fuel in the vent system return to the tanks.

Flame arrestors make sure excessive heat does not enter the fuel vent system. A clogged flame arrestor causes the pressure relief valve in the surge tank to open. When open, the pressure relief valve becomes another vent for the fuel vent system.

Component Locations

Stringers and the upper wing skin make the vent channels. The vent channels have drain float valves in the center tank.

Vent tubes attach to vent channels. Each vent tube has a drain float valve.

A fuel vent float valve is on the outboard fuel tank end rib in main tank 1 and main tank 2.

A surge tank drain check valve is on the outboard fuel tank end rib in main tank 1 and main tank 2.

The vent scoop and pressure relief valve are on an access door in each surge tank.

Functional Description

Vent channels and vent tubes equalize the pressure between each tank and the surge tanks when the airplane is in a climb attitude. The surge tanks are open to the atmosphere through the vent scoop.

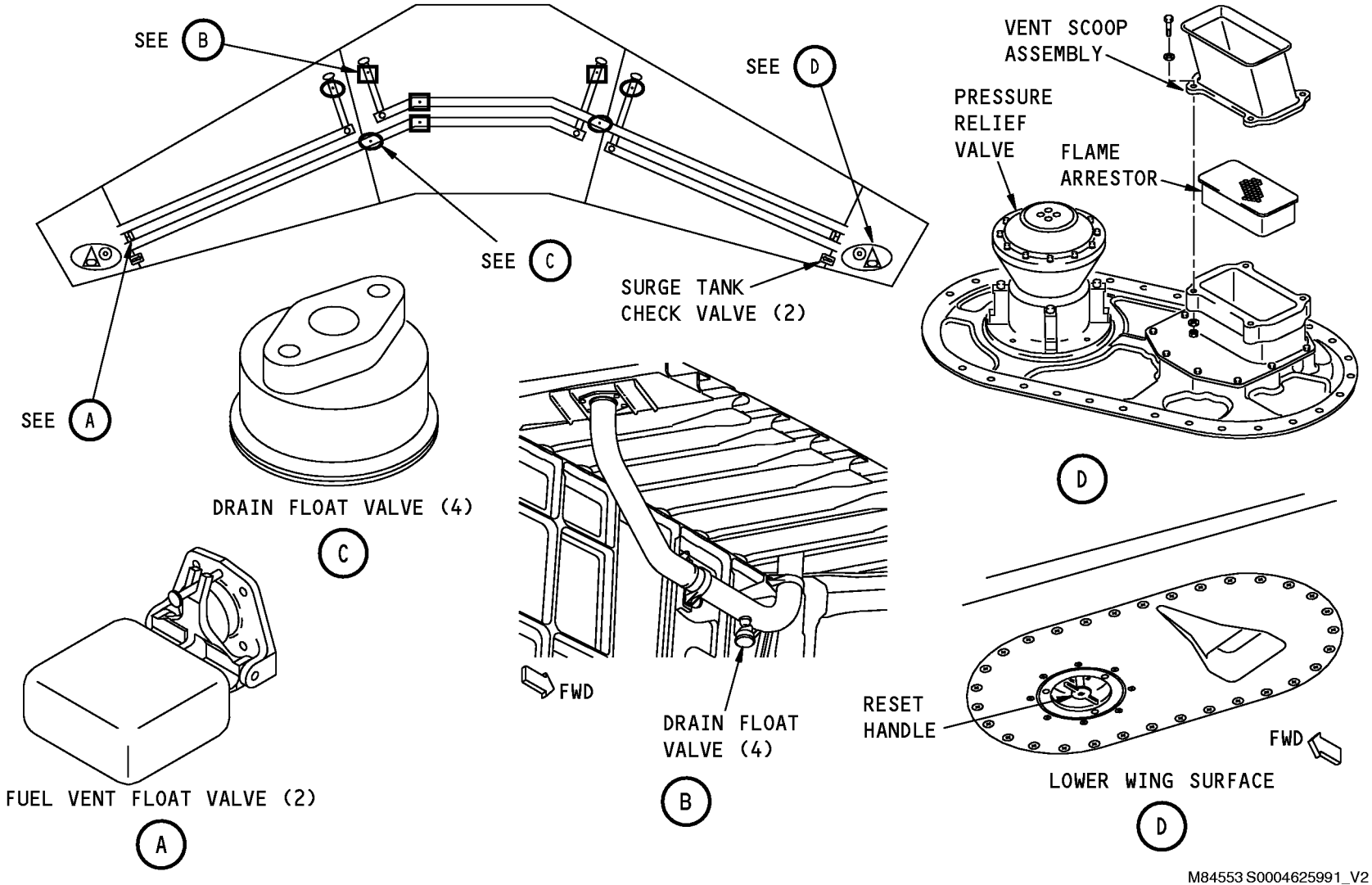
The fuel vent float valves equalize the pressure between main tank 1, main tank 2, and the surge tanks when the airplane is in a cruise or descent attitude.

The drain float valves in the vent tubes and the vent channels permit fuel in the vent system to drain into the tank when the fuel level is lower than the valve.

The surge tank drain check valve permits fuel in the surge tank to flow to either main tank 1 or main tank 2. The surge tank drain check valve also prevents fuel flow from main tank 1 and main tank 2 to the surge tank.

The pressure relief valve prevents damage to the wing structure when there is too much positive or negative pressure in the fuel tanks. The pressure relief valve is usually closed. When closed, it is even with the bottom surface of the wing. When there is too much positive or negative pressure, the pressure relief valve opens. When it is open, part of the pressure relief valve is in the fuel tank. After it opens, the pressure relief valve stays in the open position. In the open position, the pressure relief valve supplies an additional vent in the surge tank. Pull the reset handle to move the pressure relief valve to the closed position.

For normal operations, make sure the pressure relief valve is closed. An open pressure relief valve is a symptom of a problem in the fuel vent system.



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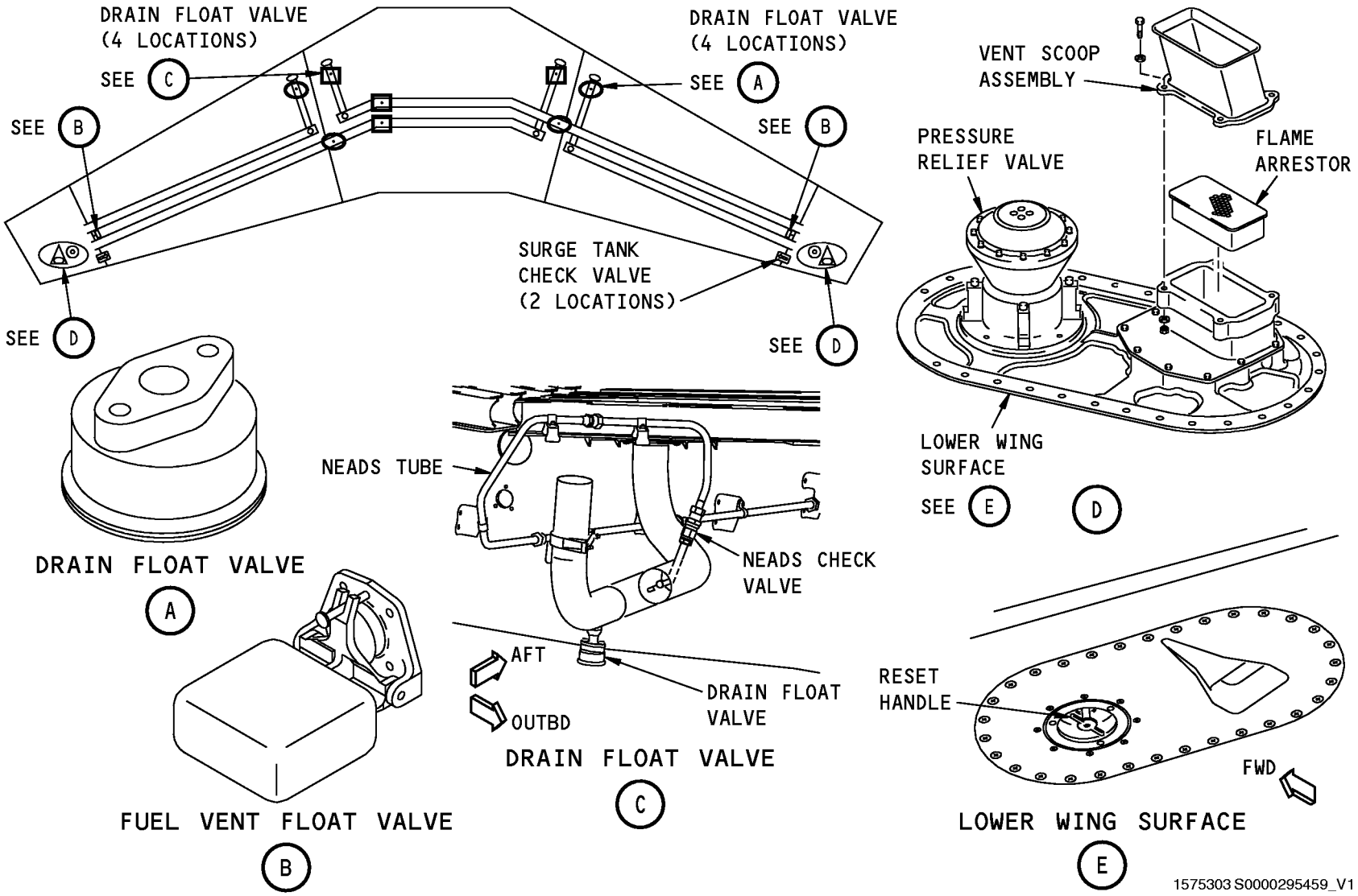
FUEL STORAGE - FUEL VENT SYSTEM



FUEL STORAGE - FUEL VENT SYSTEM

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FUEL STORAGE - CENTER TANK SCAVENGE SYSTEM

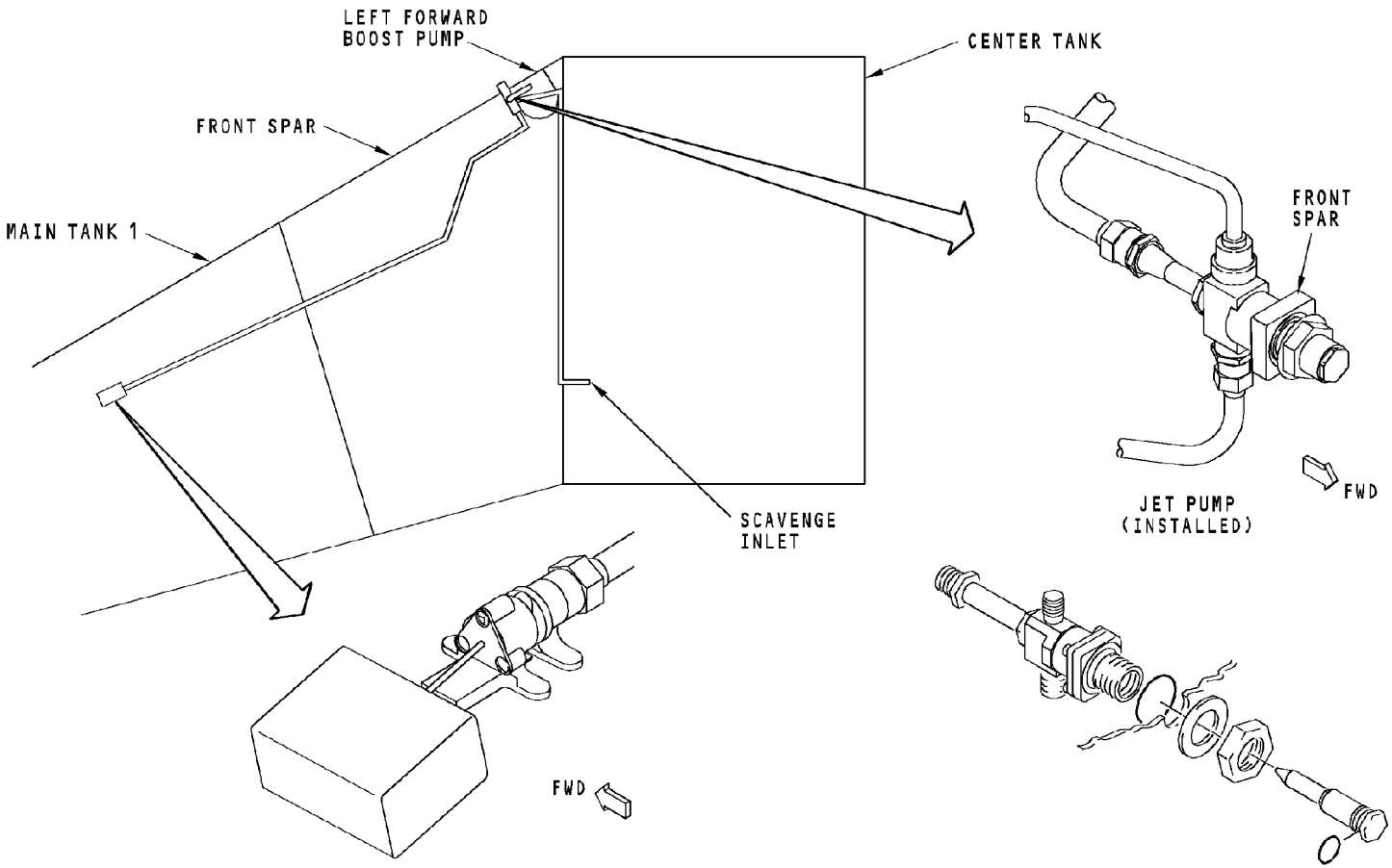
General

The center tank fuel scavenge system increases the quantity of fuel you can use.

Functional Description

The left forward boost pump supplies motive flow to a jet pump. The jet pump removes fuel from the center tank and transfers it to main tank 1. The jet pump has no parts that move. It is on the left front spar. A fuel scavenge shutoff valve controls fuel sent to main tank 1. When the fuel level in main tank 1 decreases to 4,487 lbs (1,990 kgs) the float valve opens.

The minimum fuel transfer rate for the fuel scavenge system is 220 lbs/hour (100 kgs/hour). The fuel transfer rate for the fuel scavenge system is generally between 220 lbs/hour (100 kgs/hour) and 450 lbs/hour (200 kgs/hour).



FUEL STORAGE - CENTER TANK SCAVENGE SYSTEM

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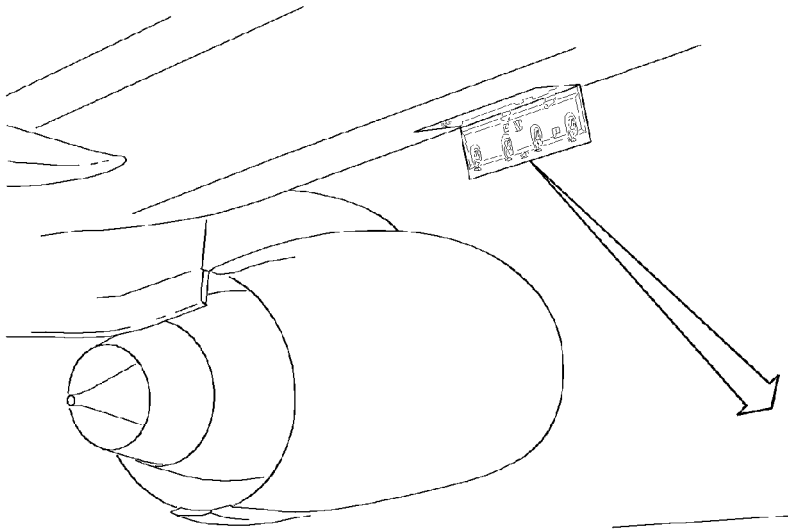
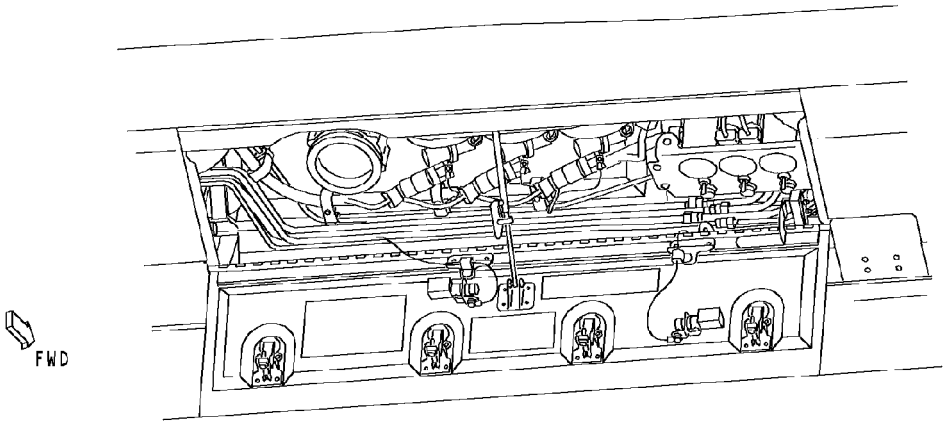
PRESSURE FUELING SYSTEM - INTRODUCTION

General

The pressure fueling system lets you refuel all tanks. You also use the system during fuel transfer from tank to tank.



LOWER RIGHT WING



FUELING STATION (P15)

PRESSURE FUELING SYSTEM - INTRODUCTION

General

All tanks fill from the fueling station at the right wing. The fueling station has these components:

- Fueling panel
- Fueling manifold
- Fueling receptacle
- Fueling shutoff valves (3).

Control

The fueling station permits automatic and manual control of the fueling shutoff valves. The fueling station receives 28v dc hot battery bus power through the refueling power control relay. The relay energizes when you open the door of the fueling station. Power from the relay comes from one of these sources:

- Battery bus
- DC bus 1
- Bus power control unit (BPCU) internal transformer rectifier.

You use the fueling indication test switch to supply an alternative ground for the refueling power control relay.

You can refuel the airplane with any one of these electrical power sources:

- External power on electrical system buses
- External power connected to the airplane, but not on electrical system buses
- APU generator
- Battery power (battery switch must be on).

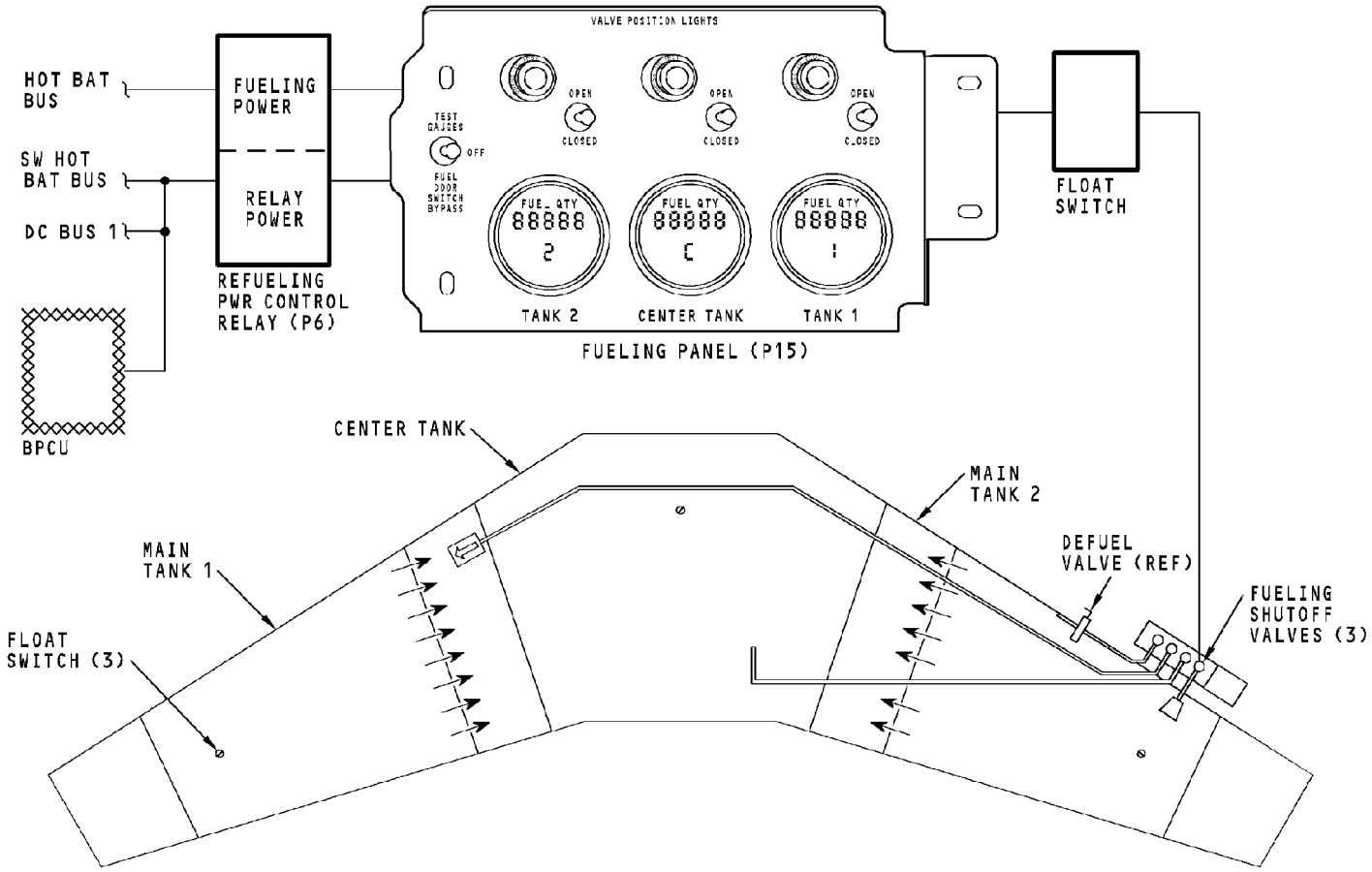
The solenoid for a fueling shutoff valve energizes when you put the control switch to the OPEN position. The valve opens if fuel pressure is available. A float switch removes power to the fueling shutoff valve when the tank is full. You also remove power when you put the control switch to the CLOSE position. Without electrical power, the valve closes.

There is also a manual override plunger on each fueling shutoff valve. The plunger and fuel pressure let you open the valve if the solenoid fails.

Indication

Three valve position lights show that there is power to the fueling shutoff valves. The light does not show that the valve is open. These lights are press-to-test. Three fueling indicators show fuel quantity in each tank.

EFFECTIVITY
HAP ALL



PRESSURE FUELING SYSTEM - GENERAL DESCRIPTION

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EFFECTIVITY
HAP ALL

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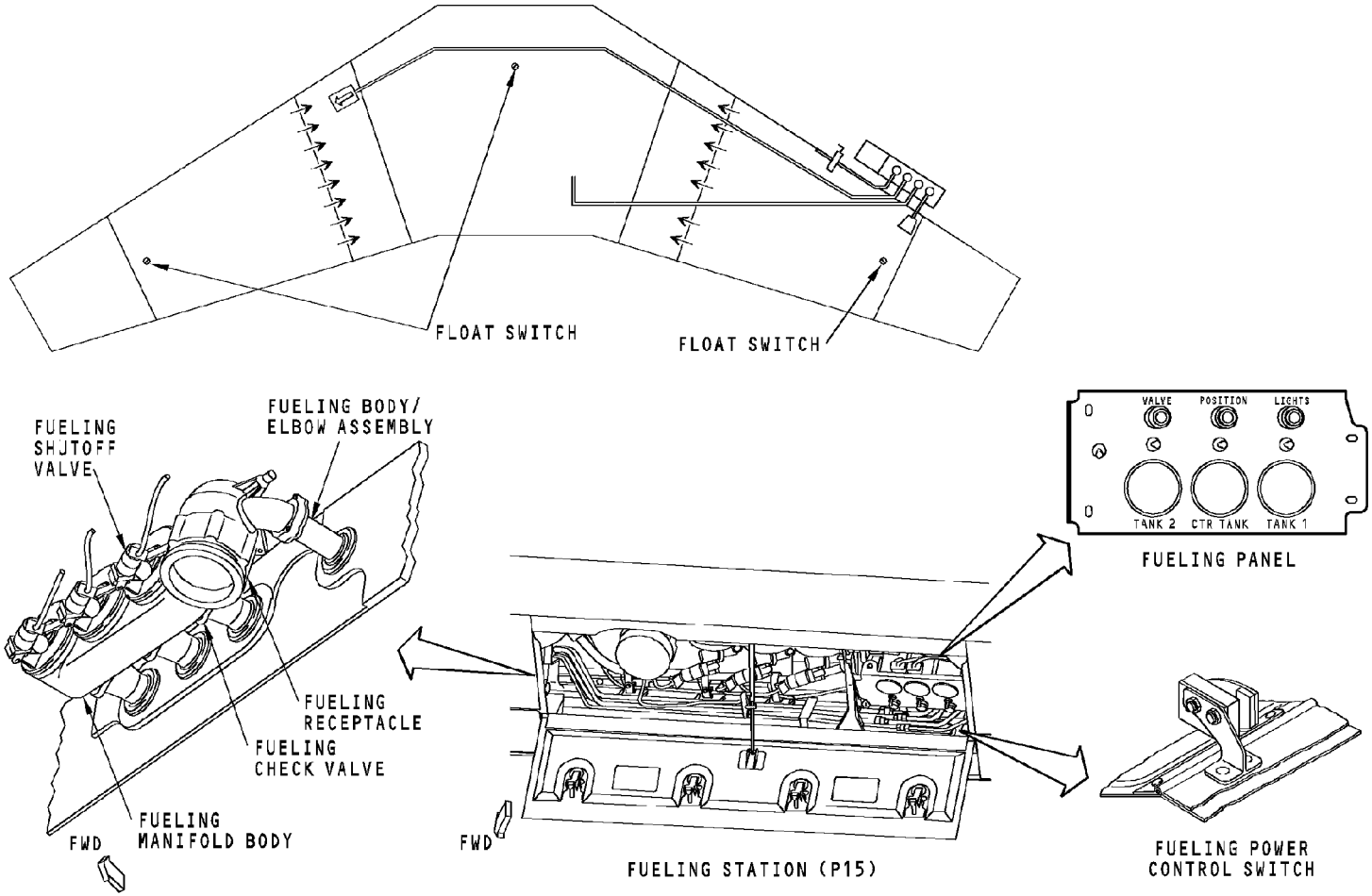
PRESSURE FUELING SYSTEM - COMPONENT LOCATION

General

These pressure fueling system components are at the fueling station:

- Fueling receptacle
- Fueling manifold body
- Fueling check valve
- Fueling body/elbow assembly
- Fueling shutoff valve
- Refueling power control relay
- Fueling panel.

A fueling float switch is in each tank.



PRESSURE FUELING SYSTEM - COMPONENT LOCATION

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General

The P15 fueling panel has these components:

- Fueling valve open lights
- Fueling indication test switch
- Fueling valve control switch
- Fuel indicators
- Fueling power control switch.

Fueling Valve Open Lights

The blue valve position lights come on when the fueling shutoff valve solenoids have power.

Fueling Indication Test Switch

The fueling indication test switch is a three-position switch. The switch is spring loaded to the center (neutral) position. When the switch is in the FUEL DOOR SWITCH BYPASS position, the power control relay receives ground. The normal ground for this relay is through the fueling power control switch. This relay controls power for fueling.

When the switch is in the TEST GAUGES position, the fuel indicators do a display test. Fuel quantity in the flight compartment does not change during this test.

The FUEL DOOR SWITCH BYPASS position and the TEST GAUGES position are momentary positions.

Fueling Valve Control Switches

The fueling valve control switches are two-position switches. The fueling valve solenoid energizes when you put the switch in OPEN and power is available. The valve opens if fuel pressure is available at the fueling manifold. In the CLOSED position, the fueling valve solenoid de-energizes and the valve closes.

Fuel Indicators

The indicators are amber LED displays. They use 28v dc to operate.

The fuel indicators show fuel quantity in a digital format. Fuel quantity shows in kilograms or pounds.

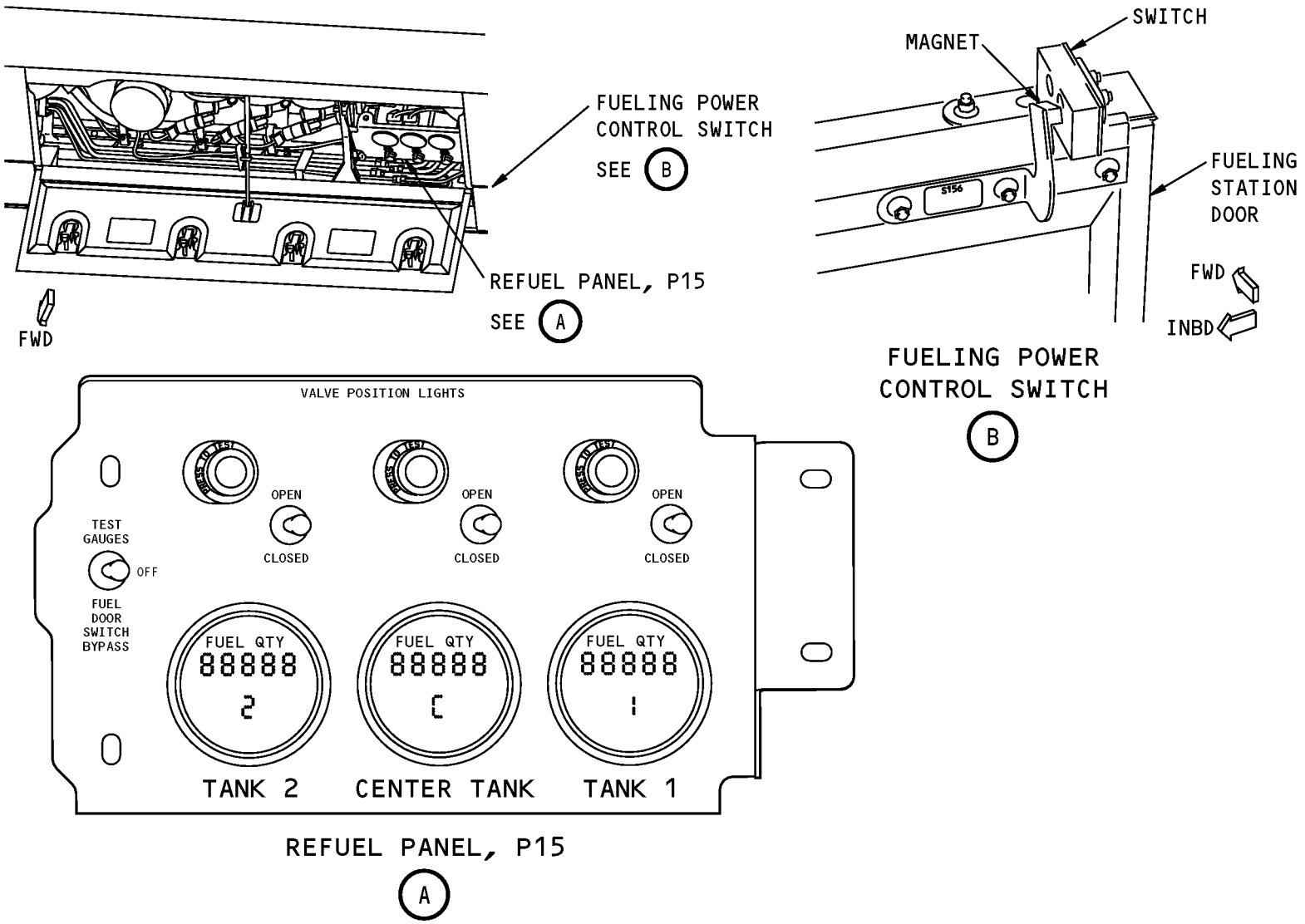
The indicators have a tank overfill indication. The fuel quantity indication will blink on and off at a one second interval if the quantity is more than the rated capacity of that tank. Flight compartment fuel quantity indication does not blink.

Fueling Power Control Switch

The fueling power control switch closes to supply an electrical ground for the R11 fueling power control relay. The control switch closes when the fueling station door opens and the magnet is near the switch. The switch opens when the door closes and the magnet goes away from the switch.

Training Information Point

If the fueling station door is open and the fueling station does not have power, move the fueling indication test switch to the FUEL DOOR SWITCH BYPASS position. This supplies hot battery bus power to the fueling station.



PRESSURE FUELING SYSTEM - P15 FUELING PANEL

28-21-00-003

EFFECTIVITY
HAP ALL

General

These components are in the fueling manifold assembly:

- Fueling receptacle
- Fueling manifold body
- Fueling valves
- Fueling check valves
- Defuel port.

Fueling Receptacle

The fueling receptacle supplies a connection for the fueling hose.

Fueling Manifold Body

The fueling manifold body supplies fuel from the fueling receptacle to the fueling shutoff valves.

Fueling Valves

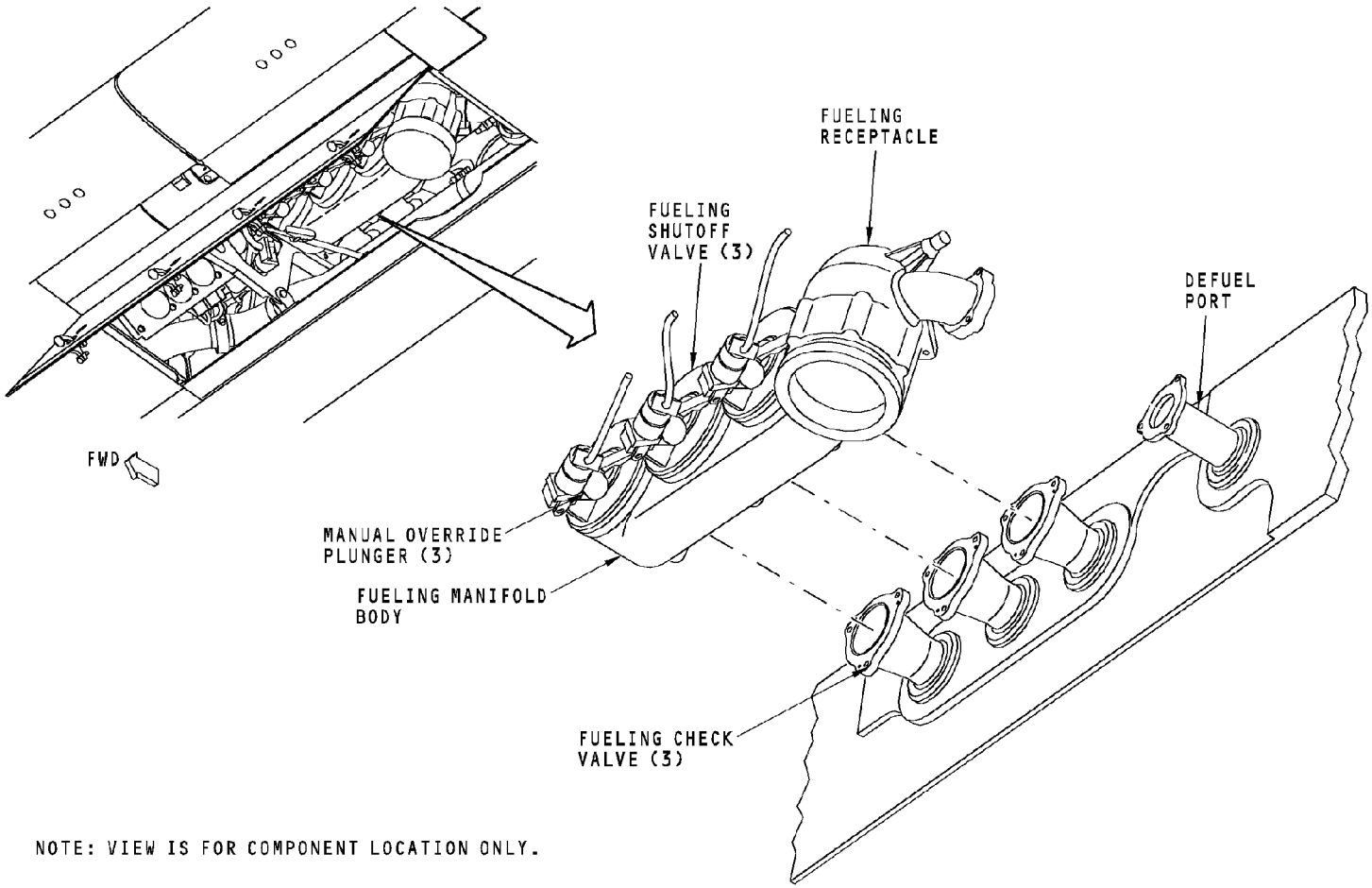
The fueling valves control fuel flow to the fuel tanks. A solenoid controls the valve while fuel pressure operates the valve. A manual override plunger on each valve permits manual operation.

Fueling Check Valve

The fueling check valves permit fueling receptacle manifold replacement without the removal of fuel from each tank.

Defuel Port

The defuel port lets you to bring fuel from each tank to the fueling manifold for fuel transfer or defueling operation.



PRESSURE FUELING SYSTEM - FUELING MANIFOLD

General

The fueling float switches prevent over-fueling the fuel tanks.

The fueling float switches remove power to the fueling valves when the fuel level in the tank is full.

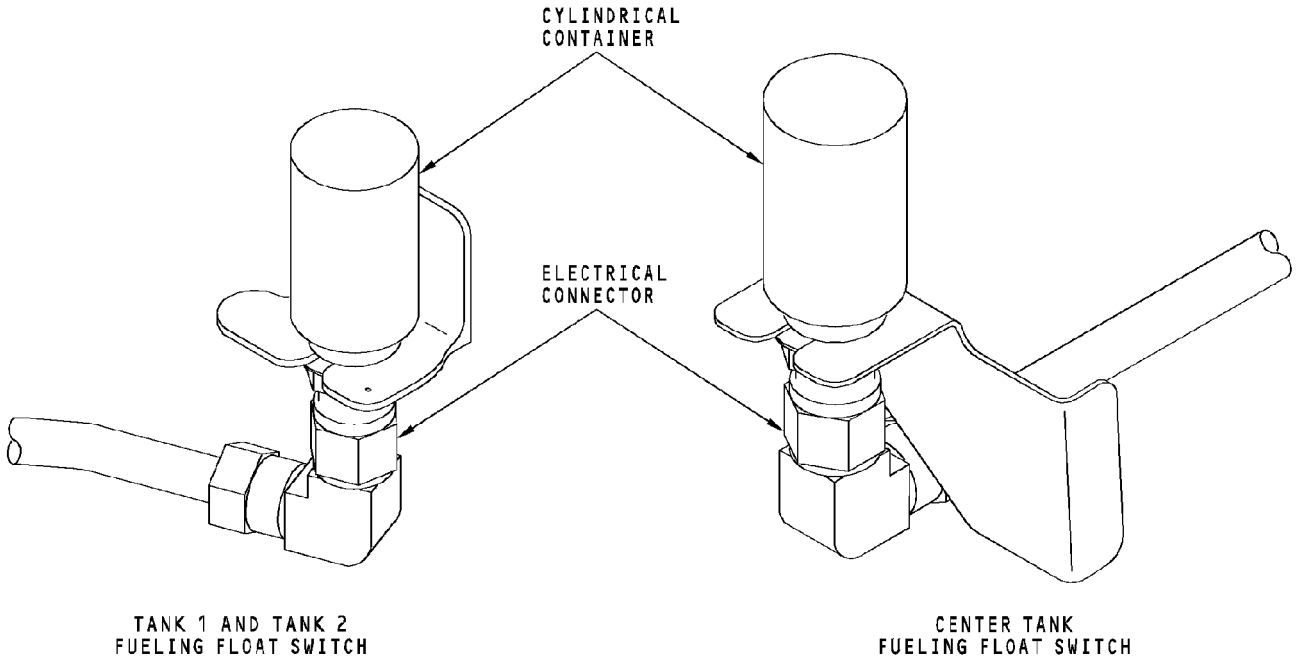
The fueling float switches have a float that is in a cylindrical container. When the tank is less than full, the float switch lets power go to the fueling valve solenoid. When the tank gets full, the fueling float switch removes power to the fueling valve solenoid.

HAP 021-024, 028-054, 101-999; HAP 001-013, 015-020, 025, 026 POST SB 737-28A1142

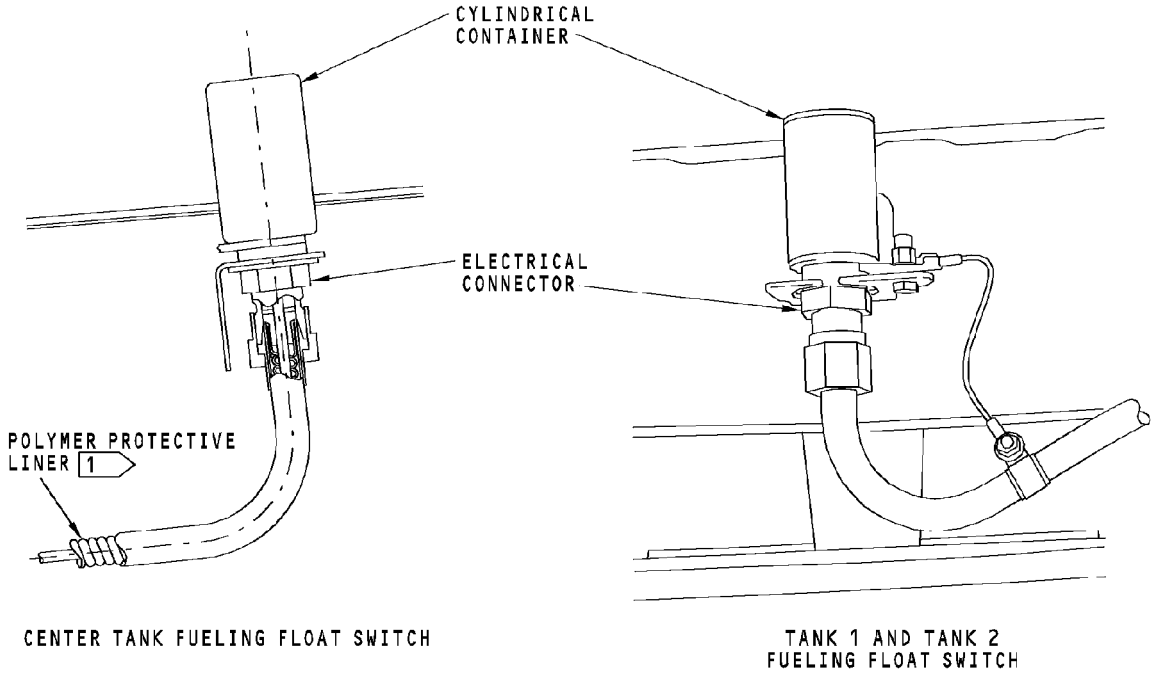
Training Information Point

The conduit contains a polymer protective liner material to eliminate wire damage from chafing.

HAP ALL



PRESSURE FUELING SYSTEM - FUELING FLOAT SWITCHES



1 POLYMER PROTECTIVE LINER IN ALL FLOAT SWITCH CONDUIT

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General

Power for the pressure fueling system comes from the 28v dc hot battery bus. When the fueling station receives power, the outboard fueling panel flood light and the outboard fueling nozzle flood light come on. The fueling indicators also receive power.

Hot Battery Bus

When the fueling panel door opens, the refueling power control relay energizes. This sends hot battery bus power to the fueling panel.

Fueling Valve Open Control

The fueling valves open when all of these conditions are true:

- There is power to the fueling panel
- Fueling valve control switch is in the OPEN position
- Fueling float switch is in the not full position
- The fueling valve solenoid energizes
- Fuel pressure is at the fueling valve.

Fueling Valve Open Light - On

The fueling valve open light comes on when there is power to the fueling valve solenoid. The light does not show that the fueling valve is open. The solenoid must have power and the valve must have fuel pressure to open.

Fueling Valve Closed Control

The fueling valves close when any of these conditions are true:

- Fueling panel does not have power
- Fueling valve control switch is in the CLOSED position
- Fueling float switch is in the full position
- No fuel pressure is at the fueling valve.

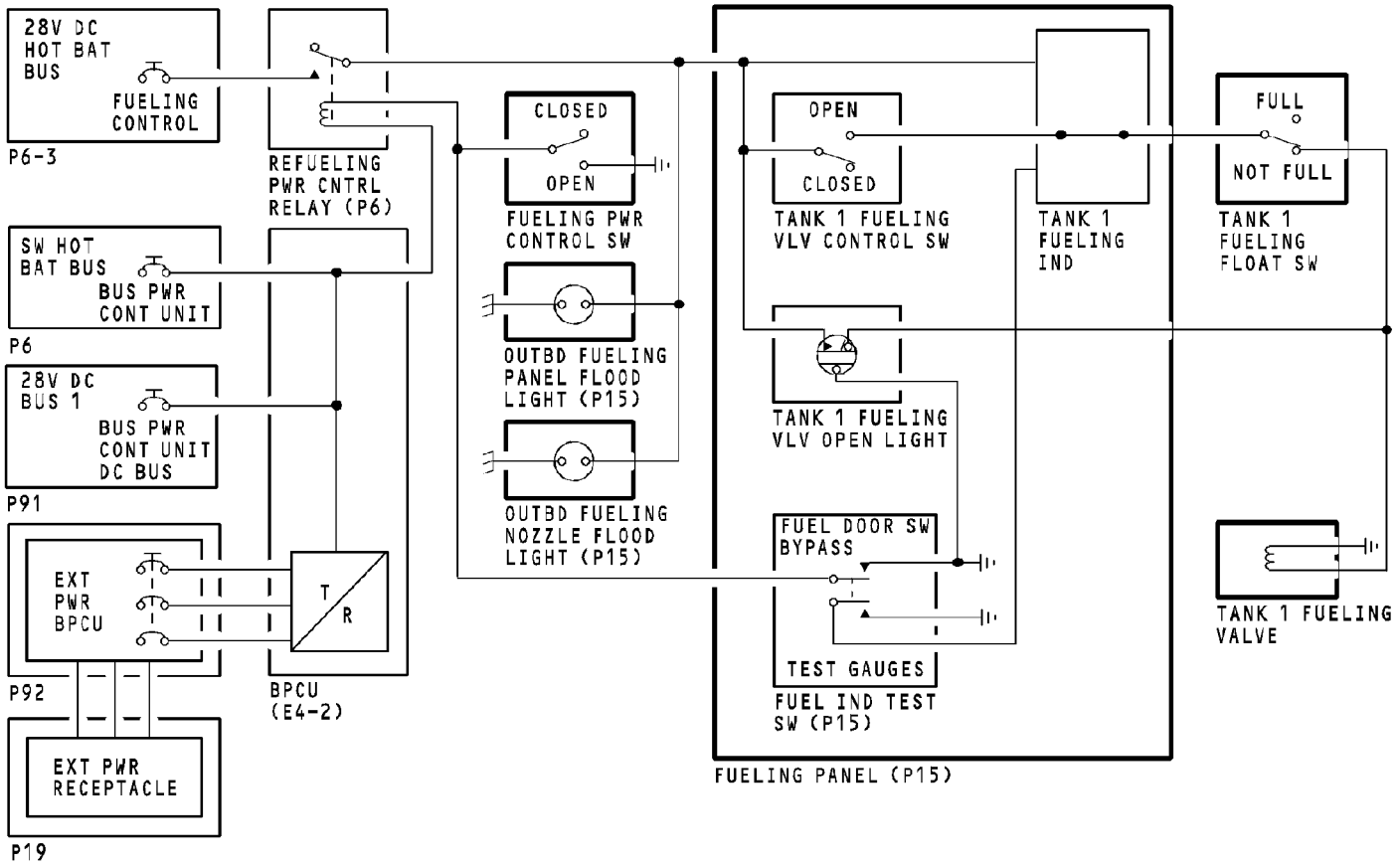
Fueling Valve Open Light - Off

The fueling valve open light goes off when there is no power to the fueling valve solenoid.

Fuel Indication Test Switch

When the switch is in the FUEL DOOR SW BYPASS position, the fueling panel receives 28v dc hot battery bus power.

Put the switch in the TEST GAUGES position to do a test of the fueling indicators.



PRESSURE FUELING SYSTEM - FUNCTIONAL DESCRIPTION - POWER AND CONTROL

General

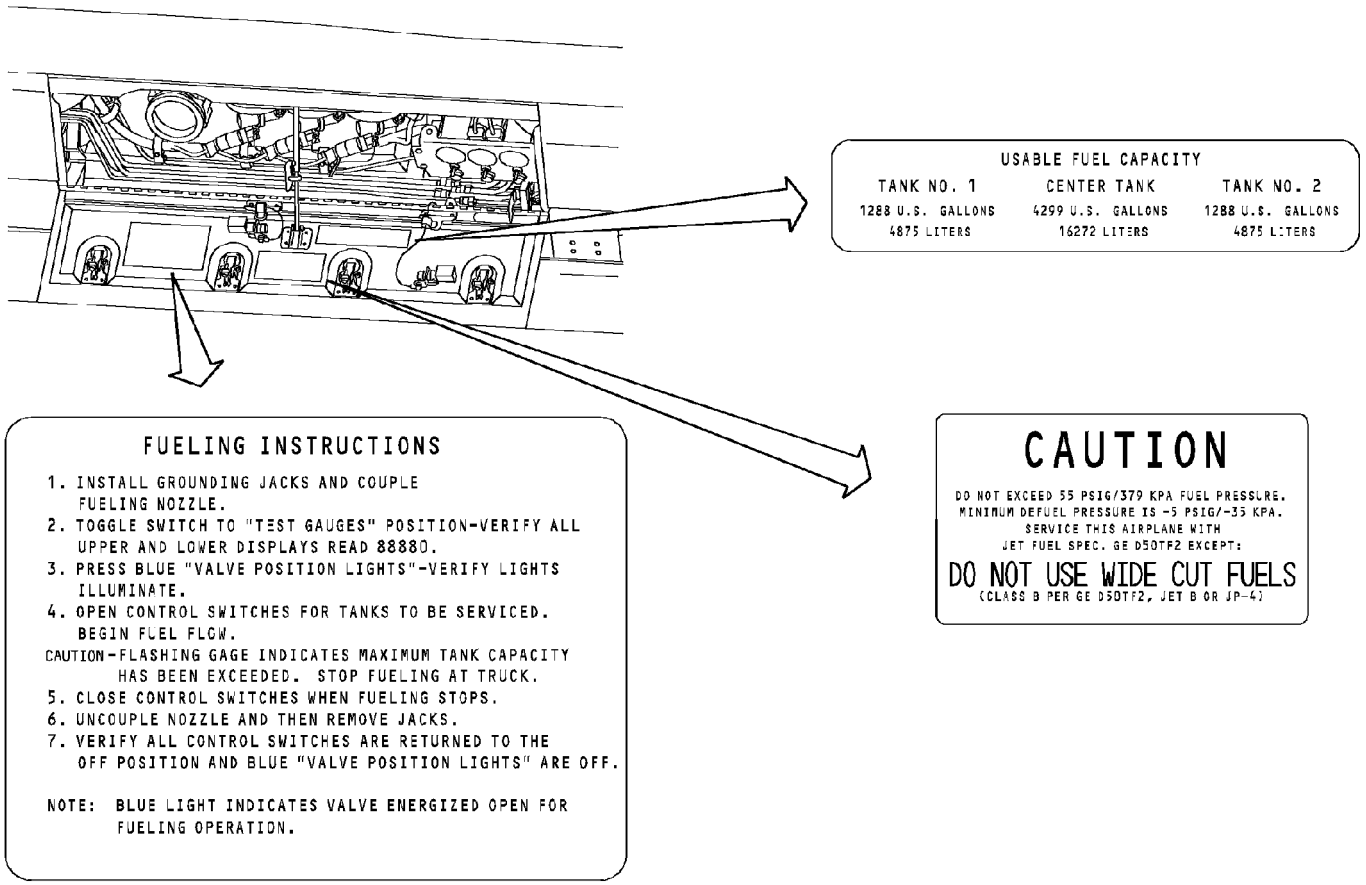
Fueling placards, with instructions for fueling, are on the fueling station door. Use these placards when fueling the aircraft.

The fueling station receives power when the fueling station door opens.

Training Information Point

CAUTION: DO NOT USE WIDE CUT FUEL WHEN IT IS NOT PERMITTED. A FLAMEOUT CAN OCCUR AND ENGINE POWER CAN DECREASE SUDDENLY.

Wide cut fuel is not certified for use on the Boeing 737-600/700/800/900/BBJ model of the airplane. Wide cut fuel is fuel which satisfies ASTM D1655, Jet B or MIL-T-5624, JP-4. Wide cut fuel contains both kerosene and naphtha (gasoline) fractions.



PRESSURE FUELING SYSTEM - OPERATION

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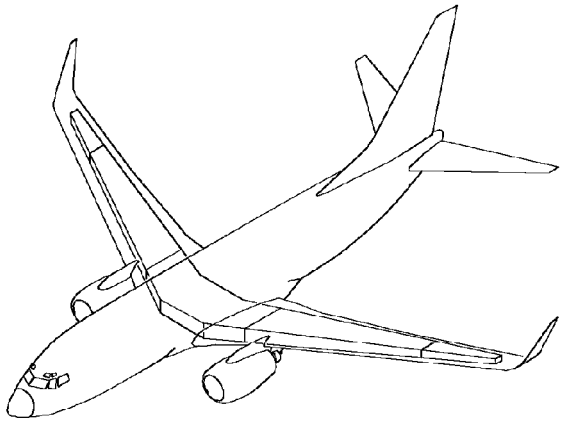
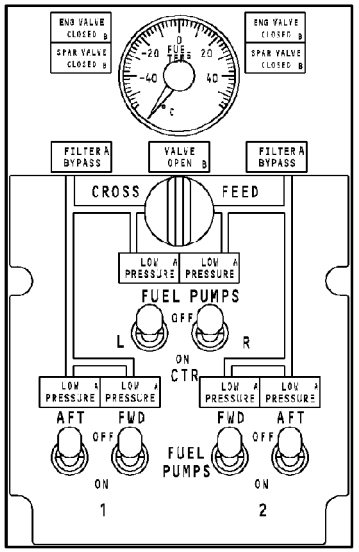
ENGINE FUEL FEED - INTRODUCTION

General

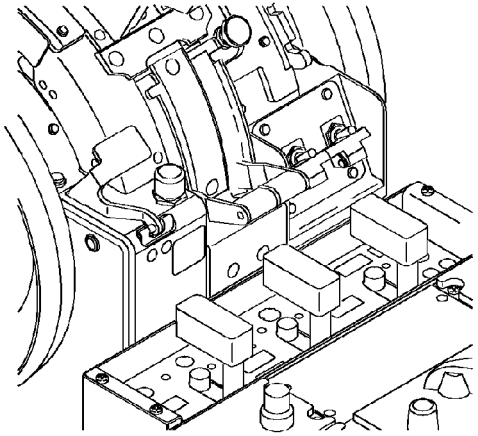
The engine fuel feed system supplies fuel to the engines from main tank 1, main tank 2, and the center tank.

You operate the engine fuel feed system from the fuel control panel (P5-2) and the engine start levers (P8).





FUEL CONTROL PANEL


ENGINE START LEVERS

ENGINE FUEL FEED - INTRODUCTION

EFFECTIVITY
HAP ALL

28-22-00-000

28-22-00

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General

The engine fuel feed system controls and supplies fuel to the engines. It uses these inputs:

- Fuel system panel (P5-2)
- Engine start switches
- Engine fire switches.

The engine fuel feed system uses these components to supply fuel to the engines:

- Center tank boost pumps
- Forward boost pumps
- Aft boost pumps
- Bypass valve
- Crossfeed valve
- Engine fuel spar valve.

Center Tank Boost Pump Control

A switch on the fuel system panel (P5-2) controls each center tank boost pump. The switches control electrical power to the pumps.

Center Tank Boost Pump Indication

A LOW PRESSURE light comes on when the center tank boost pump pressure is low and the center tank boost pump switch is in the ON position.

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-28A1206

There is a 10 second delay after the fuel LOW PRESSURE light comes on, before the master caution light comes on.

HAP ALL

Fuel Boost Pump

A switch on the fuel system panel (P5-2) controls each forward and aft boost pump for main tank No. 1 and main tank No. 2. The switches control power to the pumps.

Fuel Boost Pump Indication

A LOW PRESSURE light comes on when the fuel boost pump pressure is low or when the boost pump switch is in the OFF position.

Bypass Valve

A bypass valve supplies a secondary fuel flow path to the engines. The bypass valves operate automatically.

Engine Fuel Spar Valve

The engine fuel spar valves control fuel flow to the engines. The engine start levers and the engine fire switches control the engine fuel spar valves.

Fuel Spar Valve Battery

The engine fuel spar valve battery makes sure that the engine fuel feed system always has power to close the engine fuel spar valve.

Engine Fuel SPAR Valve Indication

A blue SPAR VALVE CLOSED light shows valve position.

Crossfeed Valve

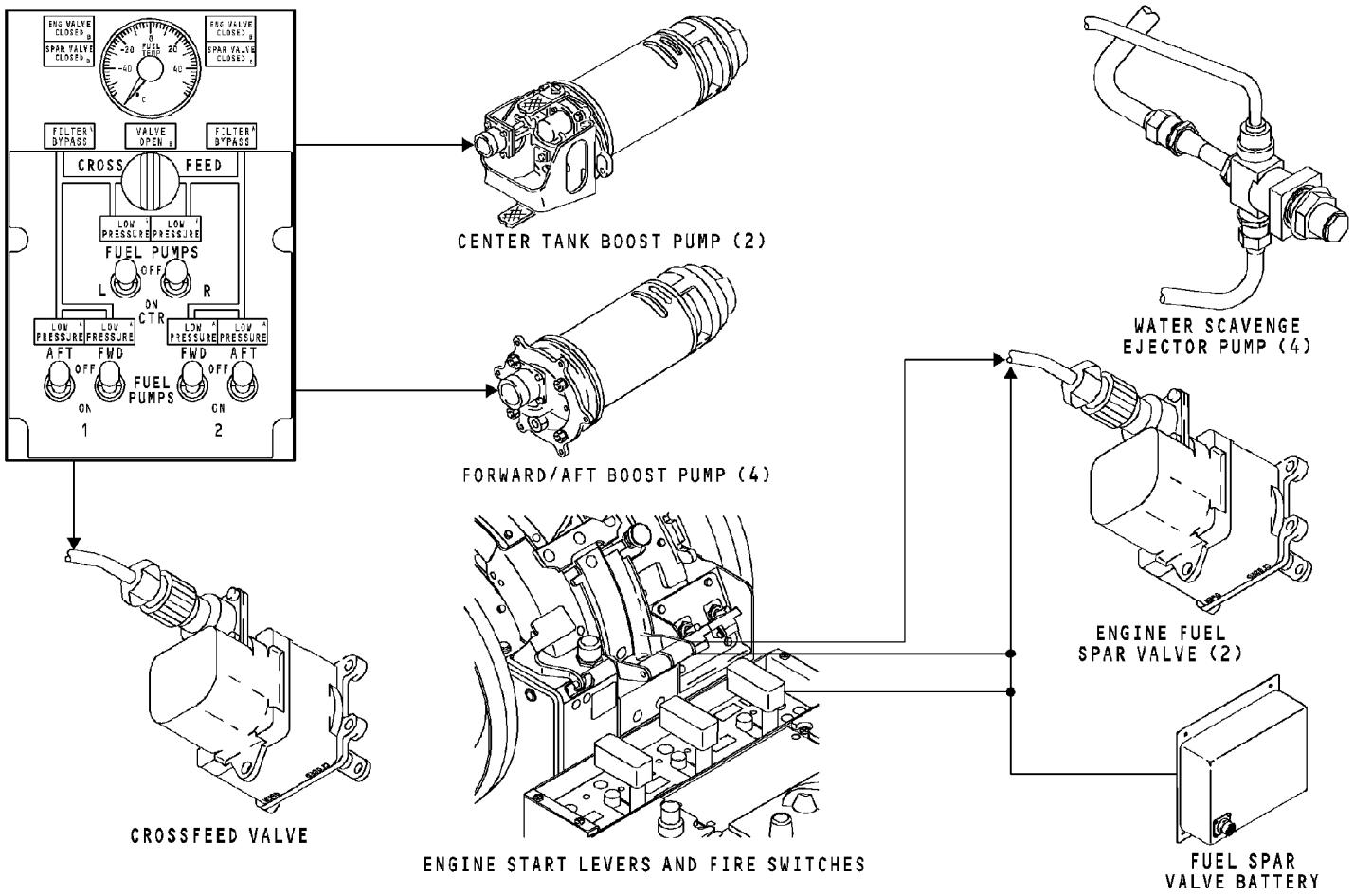
The crossfeed valve permits a single fuel tank to supply fuel to both engines. A switch on the fuel system panel (P5-2) controls the crossfeed valve.

Crossfeed Valve Indication

A blue VALVE OPEN light shows valve position.

Water Scavenge Ejector Pumps

The water scavenge jet pumps remove water from the low points of each tank to prevent corrosion. The center tank, main tank No. 1, and main tank No. 2 boost pumps control the operation of the water scavenge ejector pumps.



ENGINE FUEL FEED - GENERAL DESCRIPTION

EFFECTIVITY

HAP ALL

28-22-00-001

28-22-00

ENGINE FUEL FEED - COMPONENT LOCATION

General

The engine fuel feed system has these components:

- Center tank boost pump (2)
- Forward and aft boost pump (4)
- Crossfeed valve
- Engine fuel spar valve (2)
- Bypass valve (2)
- Water scavenge ejector pump (4).

Center Tank Boost Pumps

There are two center tank boost pumps in the center tank. They are installed on the rear spar. Access to the center tank boost pumps is through the wheel wells.

Forward And Aft Boost Pumps

There are forward and aft boost pumps for the main tanks No. 1 and No. 2 installed in the center tank. The forward boost pumps are on the front spar. The aft boost pumps are on the rear spar. Access to the forward boost pumps is through extended krueger flaps. Access to the aft boost pumps is through the wheel wells.

Crossfeed Valve

The crossfeed valve is on the right side of the center tank on the rear spar. Access to the crossfeed valve is through the right wheel well.

Engine Fuel Spar Valves

There is one engine fuel spar valve for each engine. The engine fuel spar valves are on the front spar outboard of each strut.

Bypass Valves

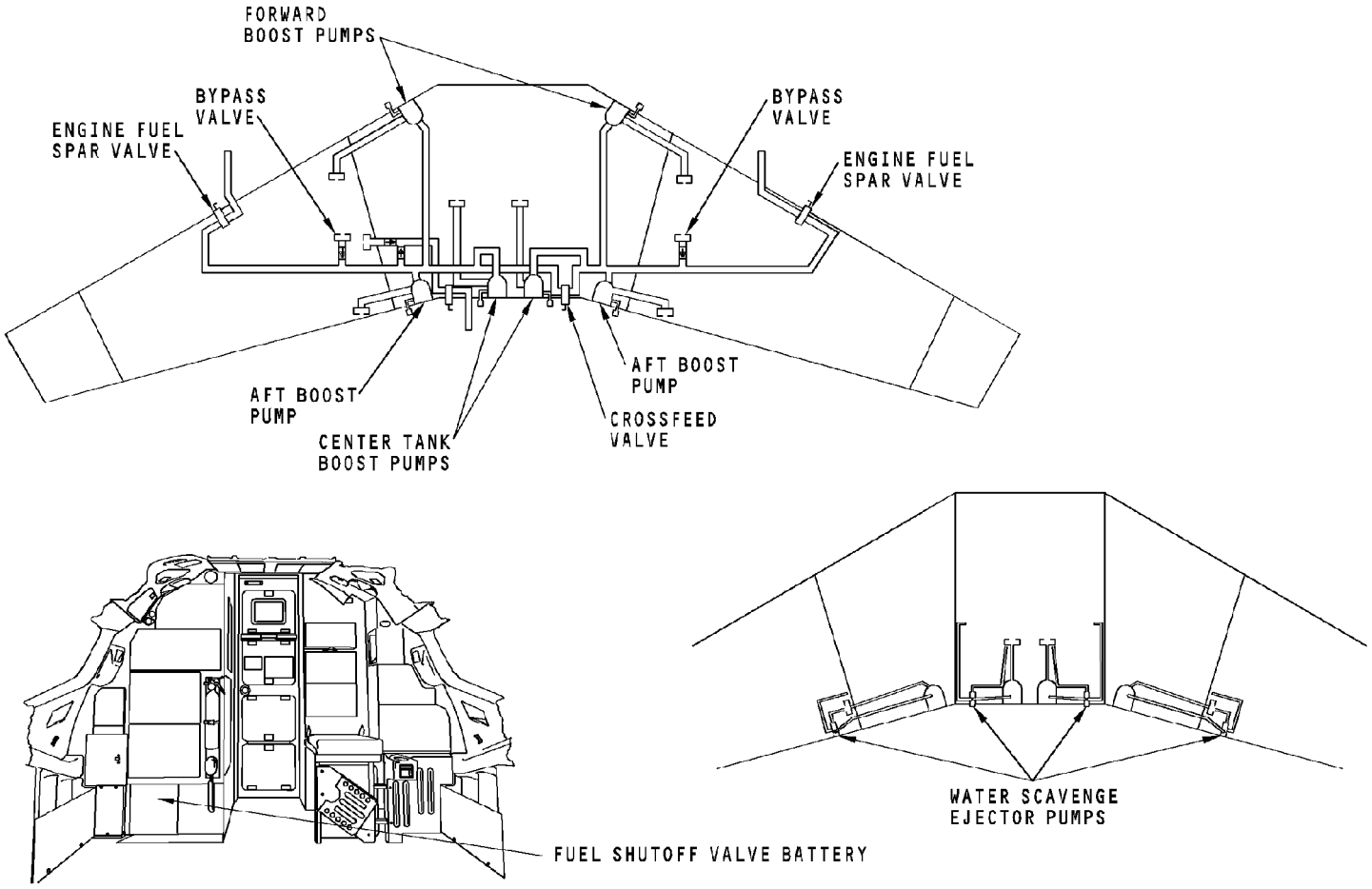
There is one bypass valve in main tank No. 1 and No. 2. The bypass valve connects to the fuel feed manifold.

Water Scavenge Ejector Pumps

There is one water scavenge ejector pump in main tank No. 1 and No. 2. There are two water scavenge ejector pumps in the center tank. All of the water scavenge ejector pumps are on the rear spar.

Fuel Shutoff Valve Battery

The fuel shutoff valve battery is in the P6 panel.



ENGINE FUEL FEED - COMPONENT LOCATION

ENGINE FUEL FEED - CENTER TANK BOOST PUMP

General

The center tank boost pumps supply fuel from the center tank to the engine fuel feed manifold.

The center tank boost pump supplies fuel at a minimum pressure of 23 psi and a minimum flow rate of 20,000 pph (9,071 kgph).

Each pump assembly has a motor and a housing.

Location

The center tank boost pumps are on the rear spar in the wheel well.

The pressure switch for the right and left center tank pump is on the rear spar. Access to the left center tank boost pump pressure switch is through the left wheel well. Access to the right center tank boost pump pressure switch is through the right wheel well.

Center Tank Boost Pump Housing

The housing contains these components:

- Discharge check valve
- Removal check valve
- Vapor discharge check valve.

The discharge check valve is a flapper type valve. The discharge check valve prevents fuel flow from the engine feed manifold through the pump.

The removal check valve is a poppet type valve. The removal check valve closes when you remove the motor. This allows motor removal without defueling the center tank.

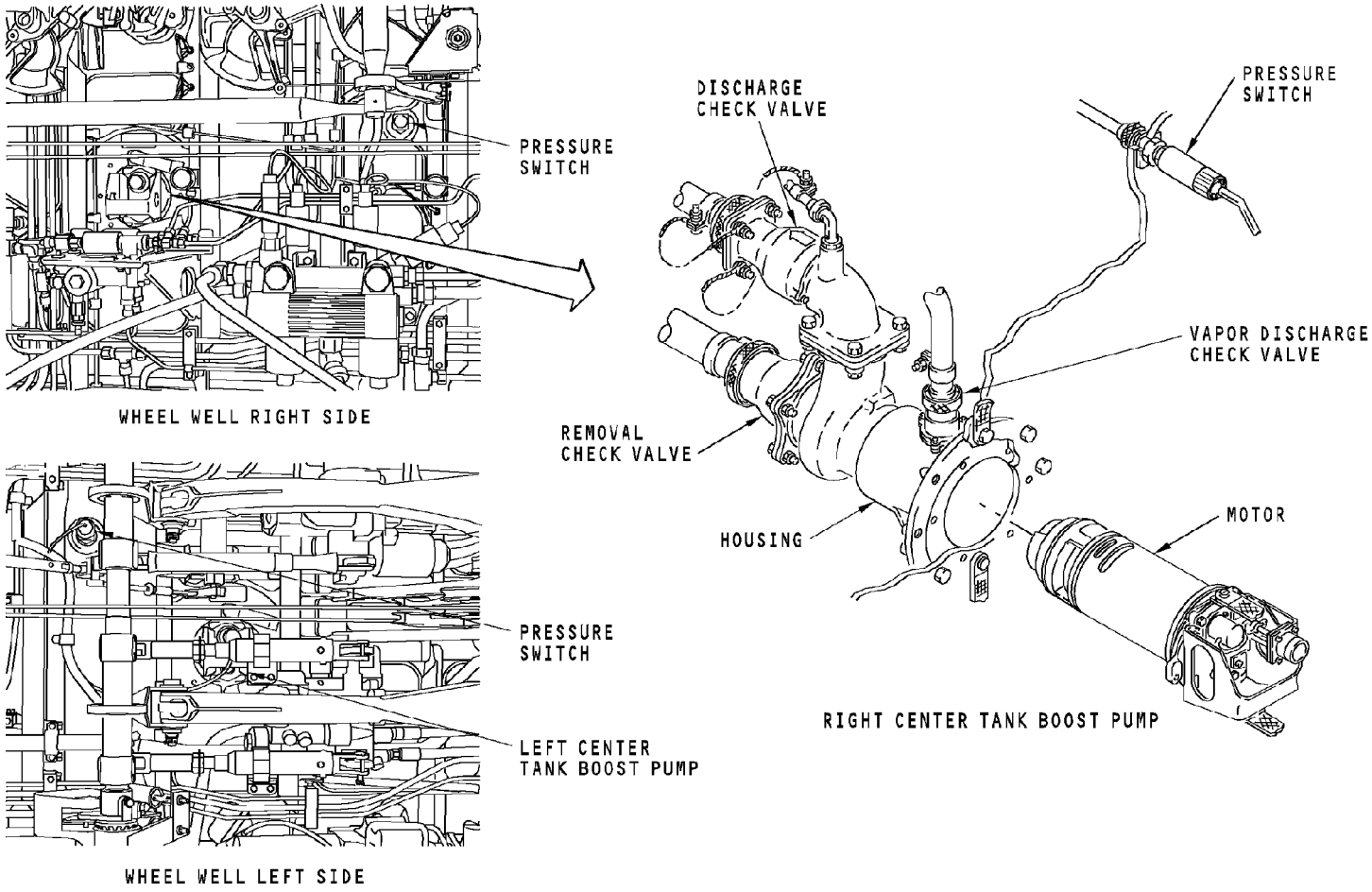
The vapor discharge check valve prevents a reverse flow of fuel, from the tank, through the pump.

Center Tank Boost Pump Motor

The motor has the impeller and uses 3-phase, 115v ac power. It is inside the housing.

Pressure Switch

The low pressure switch sends a low center tank boost pump pressure signal to the LOW PRESSURE light (P5).



ENGINE FUEL FEED - CENTER TANK BOOST PUMP

General

This page shows control of the left center tank boost pump. Control of the right center tank boost pump is almost the same.

Left Center Tank Boost Pump Control

The center tank left boost pump switch controls the the center tank left boost pump relay. The center tank left boost pump relay controls electrical power to the left center tank boost pump.

With the switch in the on position, 115v ac power goes to the relay. With the relay energized, power goes from the 115v ac transfer bus to the left center tank boost pump.

With the switch in the off position, the relay no longer receives 115v ac power. With the relay not energized, the center tank boost pump no longer receives power.

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-28A1206

Left Center Tank Boost Pump Auto Shutoff

The left center tank boost pump has an auto shutoff function.

The auto shutoff function will de-energize the center tank left boost pump relay after a time delay of 15 seconds when low boost pump pressure is detected. With the relay not energized, the center tank boost pump no longer receives power.

Fuel Test Panel, P61–8

The auto shutoff function can be tested with the left auto shutoff test switch, S1, on the fuel test panel, P61–8.

The fuel test panel, P61–8, is found in the rear of the flight compartment on the right side. The fuel test panel, P61–8, is not used by the flight crew.

HAP ALL

Pressure Indication

A LOW PRESSURE light comes on when the center tank left boost pump switch is in the on position and the left center tank boost pump pressure is 22 psig or less.

HAP 039-054, 101-999; HAP 001-013, 015-026, 028-038 POST SB 737-28A1201

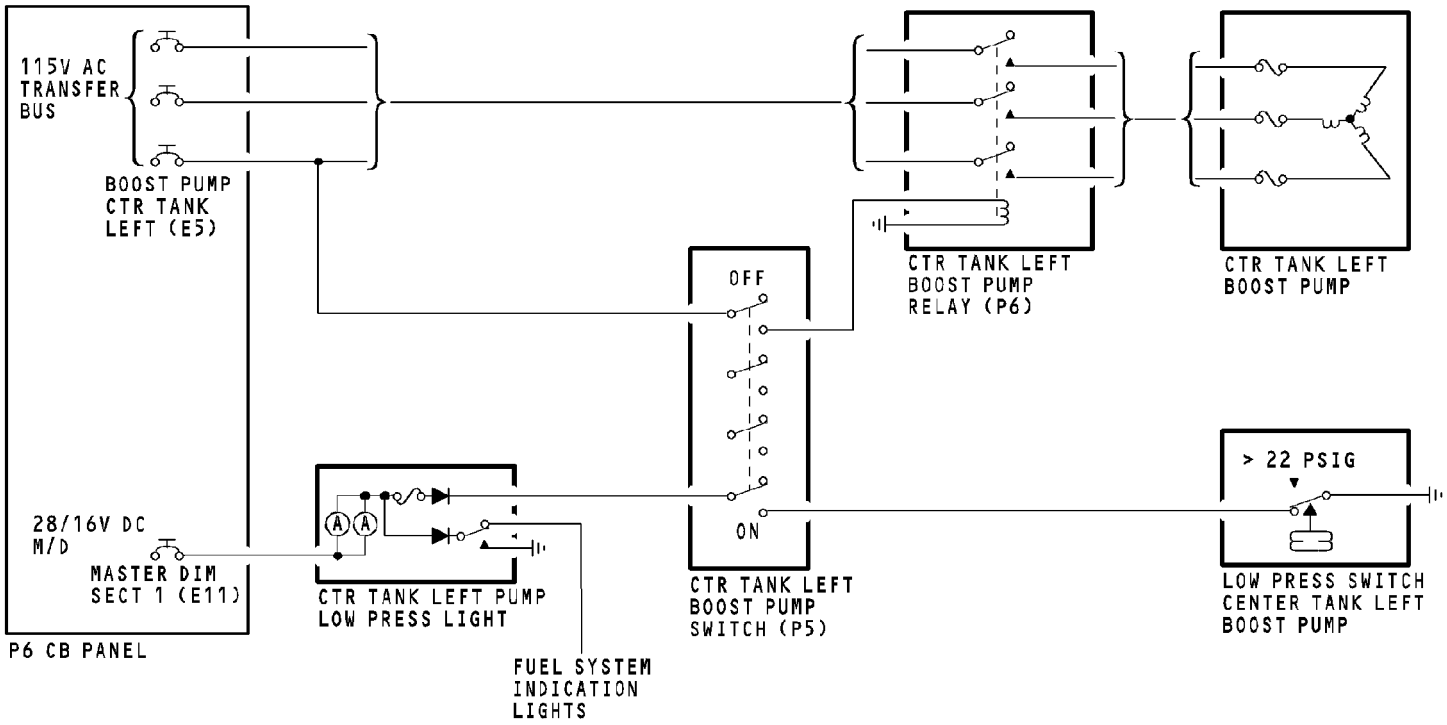
Ground Fault Protection

The center tank left boost pump control relay contains a ground fault protection circuit. It removes power to the left center tank boost pump if there is a short circuit or a phase anomaly in the ac power supply.

HAP ALL

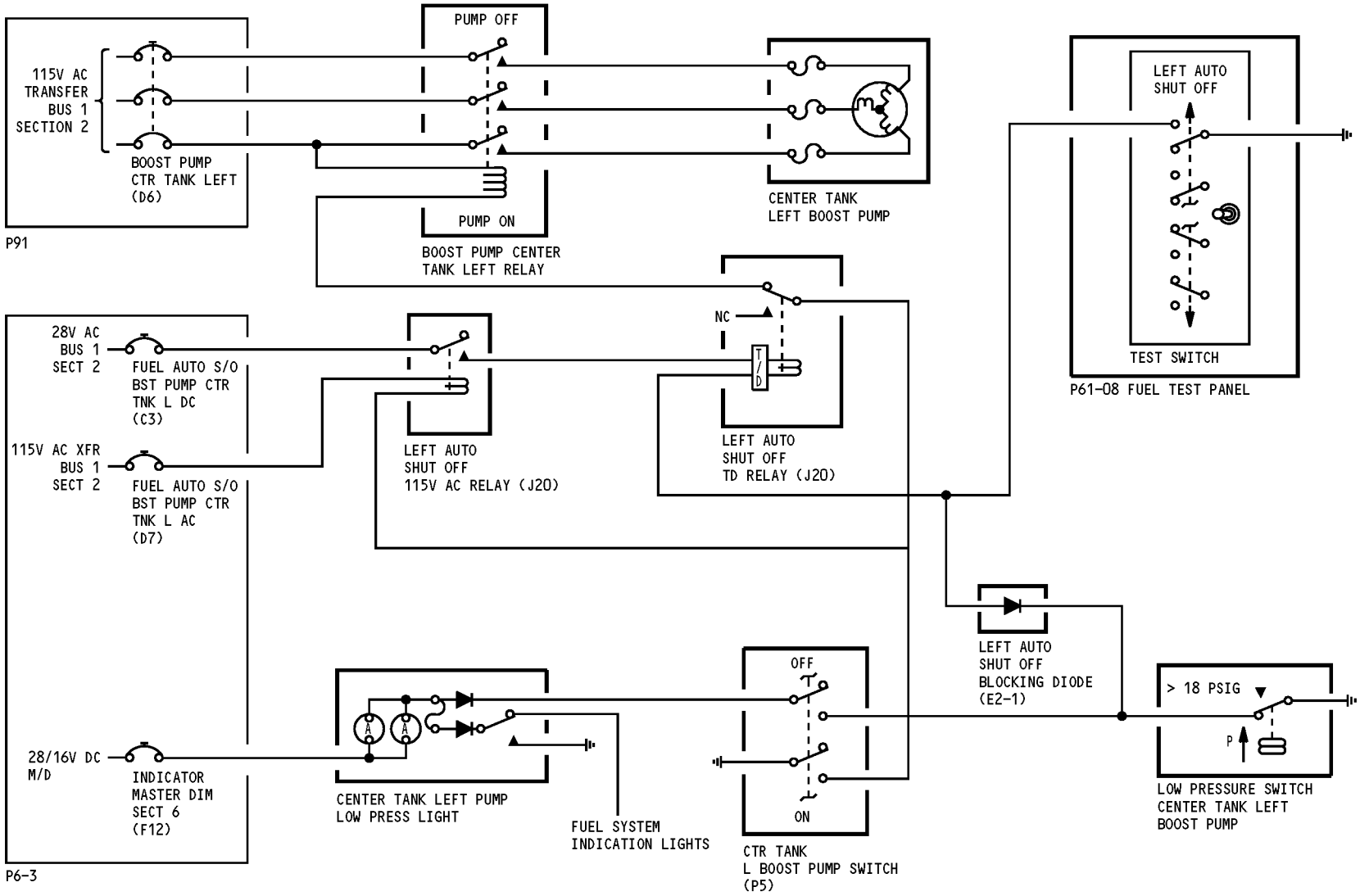
EFFECTIVITY

HAP ALL



NOTE: LEFT CENTER TANK BOOST PUMP SHOWN
RIGHT CENTER TANK BOOST PUMP IS
ALMOST THE SAME

ENGINE FUEL FEED - FUNCTIONAL DESCRIPTION - CENTER TANK BOOST PUMP



ENGINE FUEL FEED - FUNCTIONAL DESCRIPTION - CENTER TANK BOOST PUMP

EFFECTIVITY

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-28A1206

28-22-00

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General

The boost pumps supply fuel from main tank 1 to the engine feed manifold.

The boost pumps supply fuel at a minimum pressure of 10 psi at a flow rate of 20,000 pph (9,071 kgph).

Each of the boost pumps in main tank 1 and main tank 2 are interchangeable.

Location

The forward boost pump is on the left wing front spar. Access to the left forward boost pump is through a deployed leading edge flap. The aft boost pump is on the left wing rear spar. Access to the aft boost pump is through the left wheel well.

The pressure switch for the forward boost pump is on the front spar. Access to this pressure switch is through an access panel on the top of the left wing. The pressure switch for the aft boost pump is on the rear spar. Access to this pressure switch is through the left wheel well.

Boost Pump Housing

The housing contains these components:

- Discharge check valve
- Removal check valve
- Vapor discharge check valve.

The discharge check valve is a flapper type valve. The discharge check valve prevents fuel flow from the engine feed manifold through the pump.

The removal check valve is a poppet type valve. The removal check valve closes when you remove the motor. This permits motor removal without defueling tank 1.

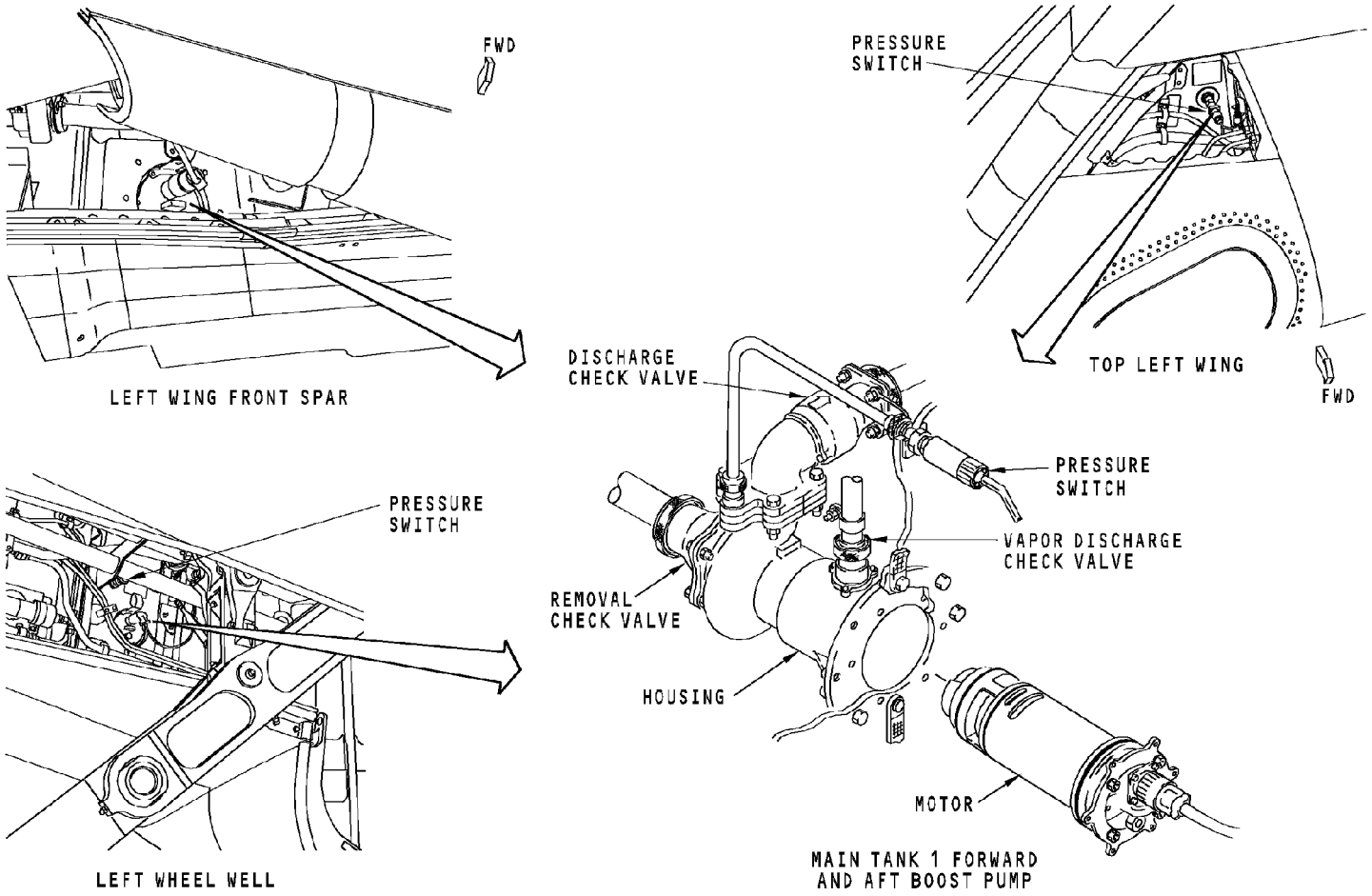
The vapor discharge check valve prevents a reverse flow of fuel, from the tank, through the pump.

Boost Pump Motor

The motor has the impeller and uses three-phase, 115v ac power. It is inside the housing.

Pressure Switch

The low pressure switch sends a low boost pump pressure signal to the LOW PRESSURE light (P5).



ENGINE FUEL FEED - MAIN TANK 1 FORWARD AND AFT BOOST PUMPS

General

The boost pumps supply fuel from main tank 2 to the engine feed manifold.

The boost pumps supply fuel at a minimum pressure of 10 psi and a minium flow rate of 20,000 pph (9,071 kgph).

Each of the boost pumps in main tank 2 and main tank 1 are interchangeable.

Location

The forward boost pump is on the right wing front spar. Access to the right boost pump is through a deployed leading edge flap. The aft boost pump is on the rear spar. Access to the aft boost pump is through the right wheel well.

The pressure switch for the forward boost pump is on the front spar. Access to this pressure switch is through an access panel on the top of the right wing. The pressure switch for the aft boost pump is on the rear spar. Access to this pressure switch is through the right wheel well.

Boost Pump Housing

The housing contains these components:

- Discharge check valve
- Removal check valve
- Vapor discharge check valve.

The discharge check valve is a flapper type valve. The discharge check valve prevents fuel flow from the engine feed manifold through the pump.

The removal check valve is a poppet type valve. The removal check valve closes when you remove the motor. This allows motor removal without defueling main tank 2.

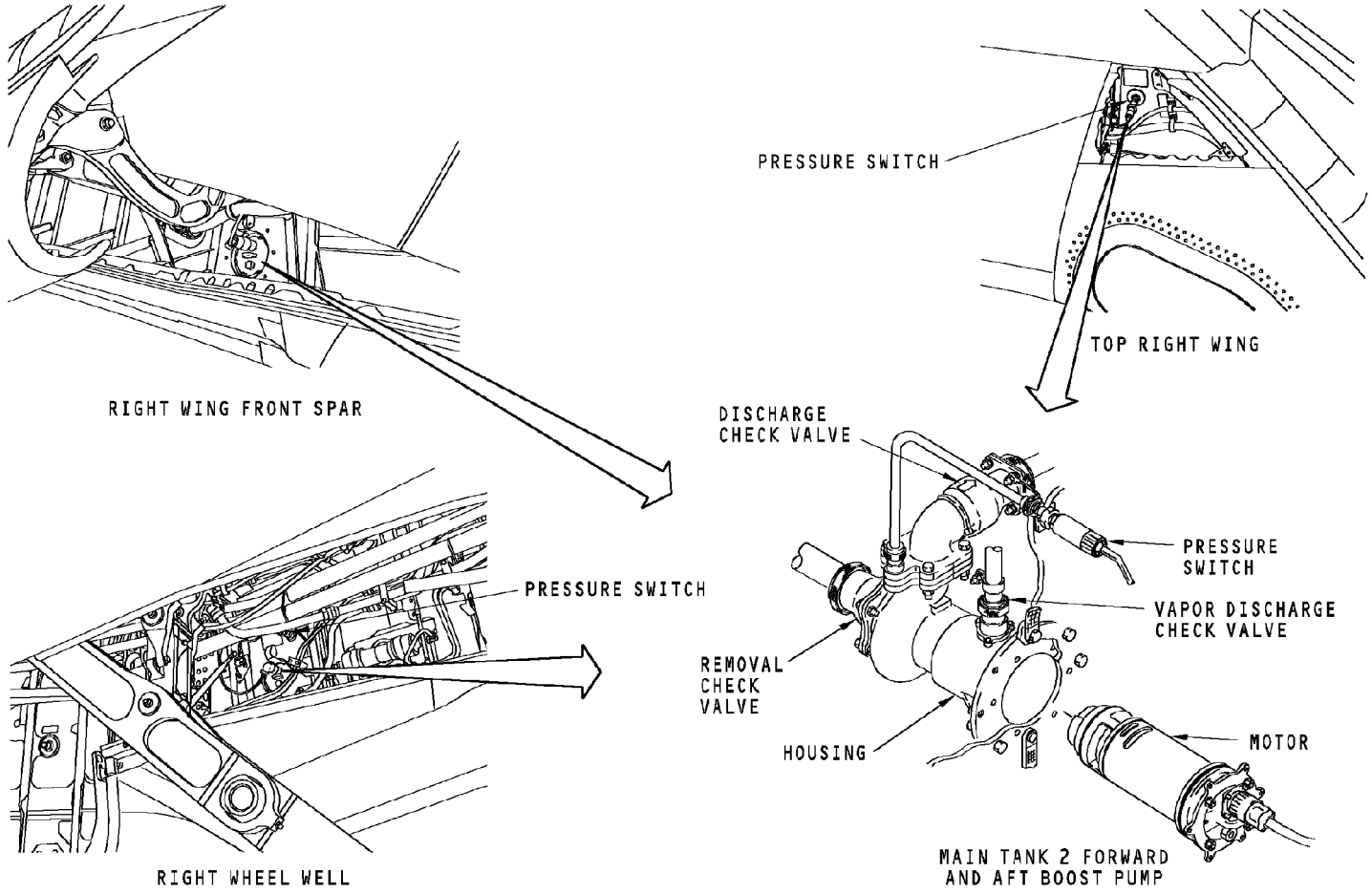
The vapor discharge check valve prevents a reverse flow of fuel, from the tank, through the pump.

Boost Pump Motor

The motor has the impeller and uses 115v ac power. It is inside the housing.

Pressure Switch

The low pressure switch sends a low boost pump pressure signal to the LOW PRESSURE light (P5).



ENGINE FUEL FEED - MAIN TANK NO. 2 FORWARD AND AFT BOOST PUMPS

EFFECTIVITY

HAP ALL

28-22-00

28-22-00-006

General

This page shows control of the left forward boost pump. Control of the left aft, right forward, and right aft boost pump is almost the same.

Left Forward Boost Pump Control

The tank 1 forward boost pump switch controls the tank 1 forward boost pump relay. The tank 1 forward boost pump relay controls power to the left forward boost pump.

With the switch in the ON position, 115v ac power goes to the relay. With the relay energized, power goes from the 115v ac transfer bus to the left forward boost pump.

With the switch in the OFF position, the relay no longer receives 115v ac power. With the relay not energized, the left forward boost pump no longer receives power.

Pressure Indication

A LOW PRESSURE light comes on when the tank No. 1 forward boost pump pressure is 6 psig or less.

HAP 039-054, 101-999; HAP 001-013, 015-026, 028-038 POST SB 737-28A1201

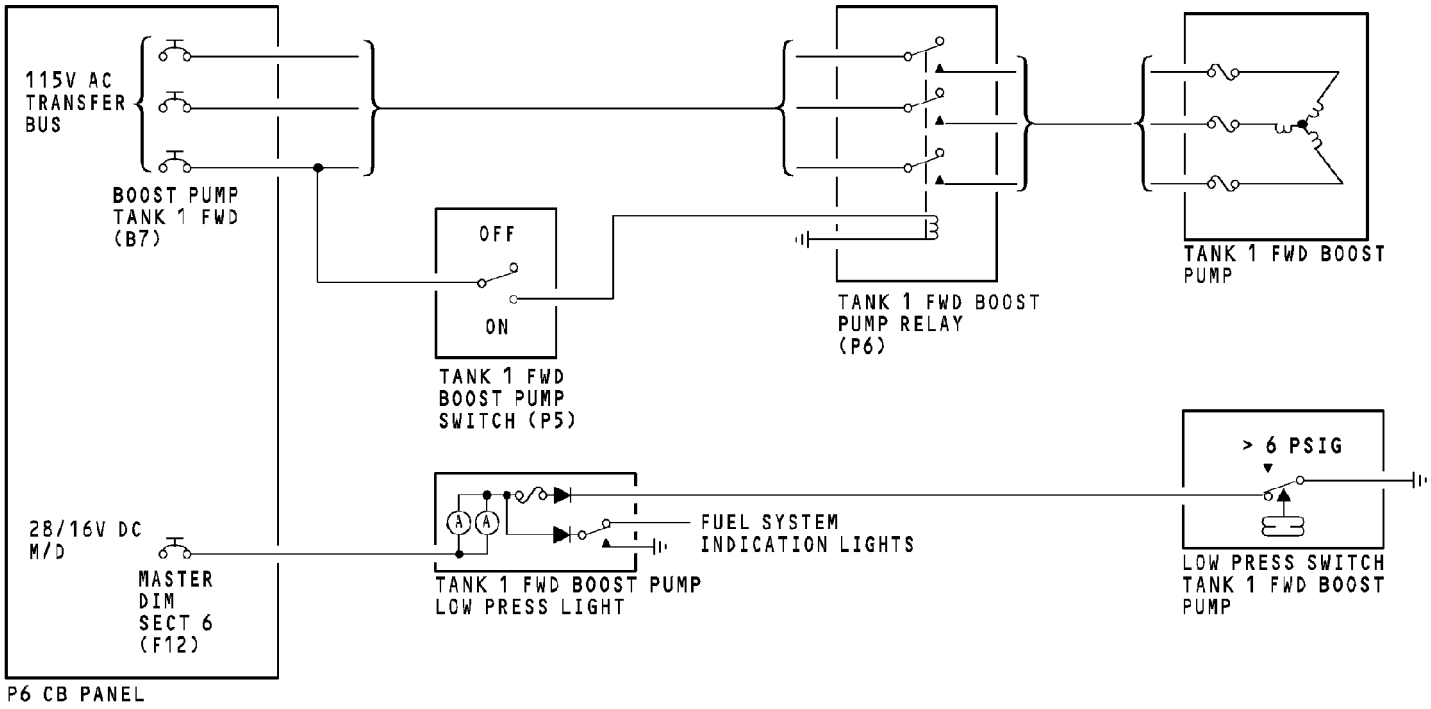
Ground Fault Protection

The tank 1 forward boost pump control relay contains a ground fault protection circuit. It removes power to the tank 1 forward boost pump if there is a short circuit or a phase anomaly in the ac power supply.

HAP ALL

EFFECTIVITY

HAP ALL



NOTE: MAIN TANK NO. 1 FORWARD BOOST PUMP IS SHOWN.
MAIN TANK NO. 1 AFT, MAIN TANK NO. 2 FORWARD, AND
MAIN TANK NO. 2 AFT BOOST PUMP IS SIMILAR.

ENGINE FUEL FEED - FUNCTIONAL DESCRIPTION - FORWARD AND AFT BOOST PUMP

General

The crossfeed valve lets fuel flow between the left and right engine fuel feed manifolds. With the connection of the two engine fuel feed manifolds, one fuel tank supplies fuel to both engines.

Location

The fuel crossfeed valve is on the right wing rear spar. Access is through the right wheel well.

Motor Actuated Valve

The motor actuated valve has these parts:

- Valve body
- Adapter and shaft
- Actuator.

Valve Body

The valve body connects to the left and right engine fuel feed manifold. The valve body has an operating shaft and a butterfly valve (not shown). There are no hard stops for the butterfly valve. The alignment marks show valve position.

Adapter and Shaft

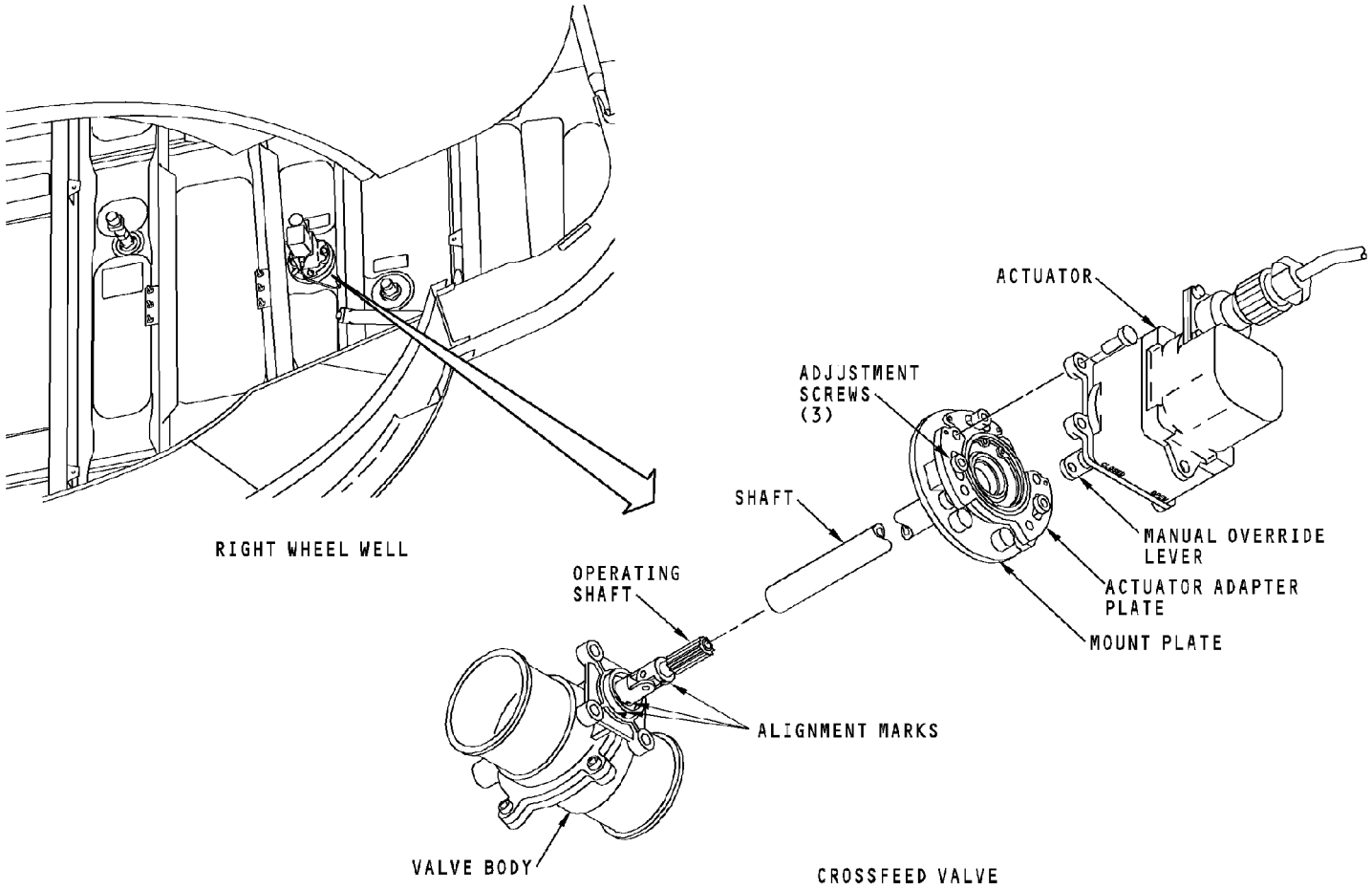
The adapter and shaft attaches between the rear spar and the operating shaft. The adapter has a mount plate and an actuator adapter plate.

The mount plate attaches to the rear spar. The actuator adapter plate attaches to the mount plate with adjustment screws. You loosen the adjustment screws to rotate the actuator adapter plate. You turn the actuator adapter plate to align the butterfly valve with the actuator.

Actuator

The actuator is a 28v dc motor. It has a manual override lever that permits valve operation without electrical power. The lever aligns with valve position indicators on the adapter. This shows valve position.

The fuel crossfeed valve actuator is interchangeable with the engine fuel spar valve actuator.



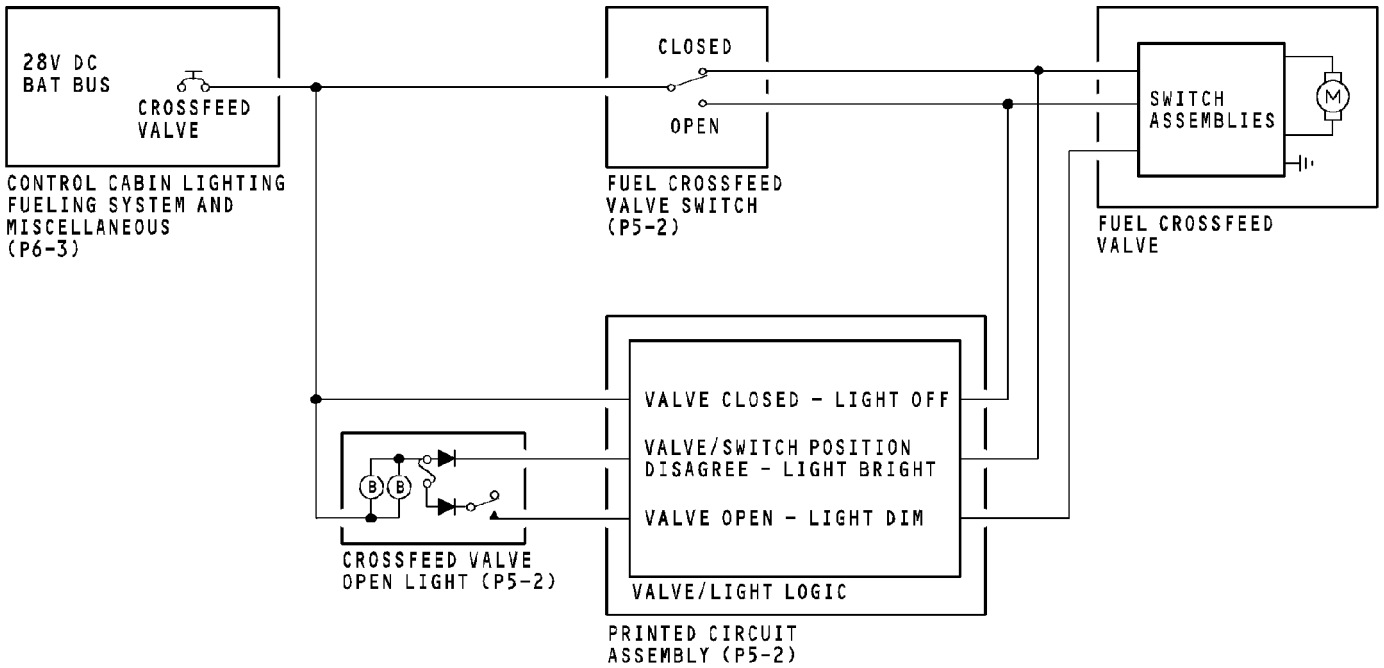
ENGINE FUEL FEED - FUEL CROSSFEED VALVE

General

The fuel crossfeed valve switch controls the crossfeed valve. When you move the switch to the open or closed position, 28v dc power goes through a switch assembly to the actuator. The actuator then moves the crossfeed valve to the applicable position.

The printed circuit card assembly controls the operation of the crossfeed valve open light. The printed circuit assembly receives fuel crossfeed valve position and fuel crossfeed valve switch position information.

When the fuel crossfeed valve is closed, the crossfeed valve open light is off. When the fuel crossfeed valve position and fuel crossfeed valve switch position disagree, the crossfeed valve open light is on bright. When the fuel crossfeed valve is open, the crossfeed valve open light is on dim.



ENGINE FUEL FEED - FUNCTIONAL DESCRIPTION - FUEL CROSSFEED VALVE

General

The fuel spar valve controls fuel flow from the engine fuel feed manifold to the engine fuel supply line.

Location

The left fuel spar valve is on the left wing front spar outboard of the engine strut. Access is through an access panel on the left wing leading edge.

The right fuel spar valve is on the right wing front spar outboard of the engine strut. Access is through an access panel on the right wing leading edge.

Motor Actuated Valve

The motor actuated valve has these parts:

- Valve body
- Adapter and shaft
- Actuator.

Valve Body

The valve body connects between the engine fuel feed manifold and the engine fuel supply line. The valve body has a shaft and a butterfly valve (not shown). The alignment marks show valve position.

Adapter and Shaft

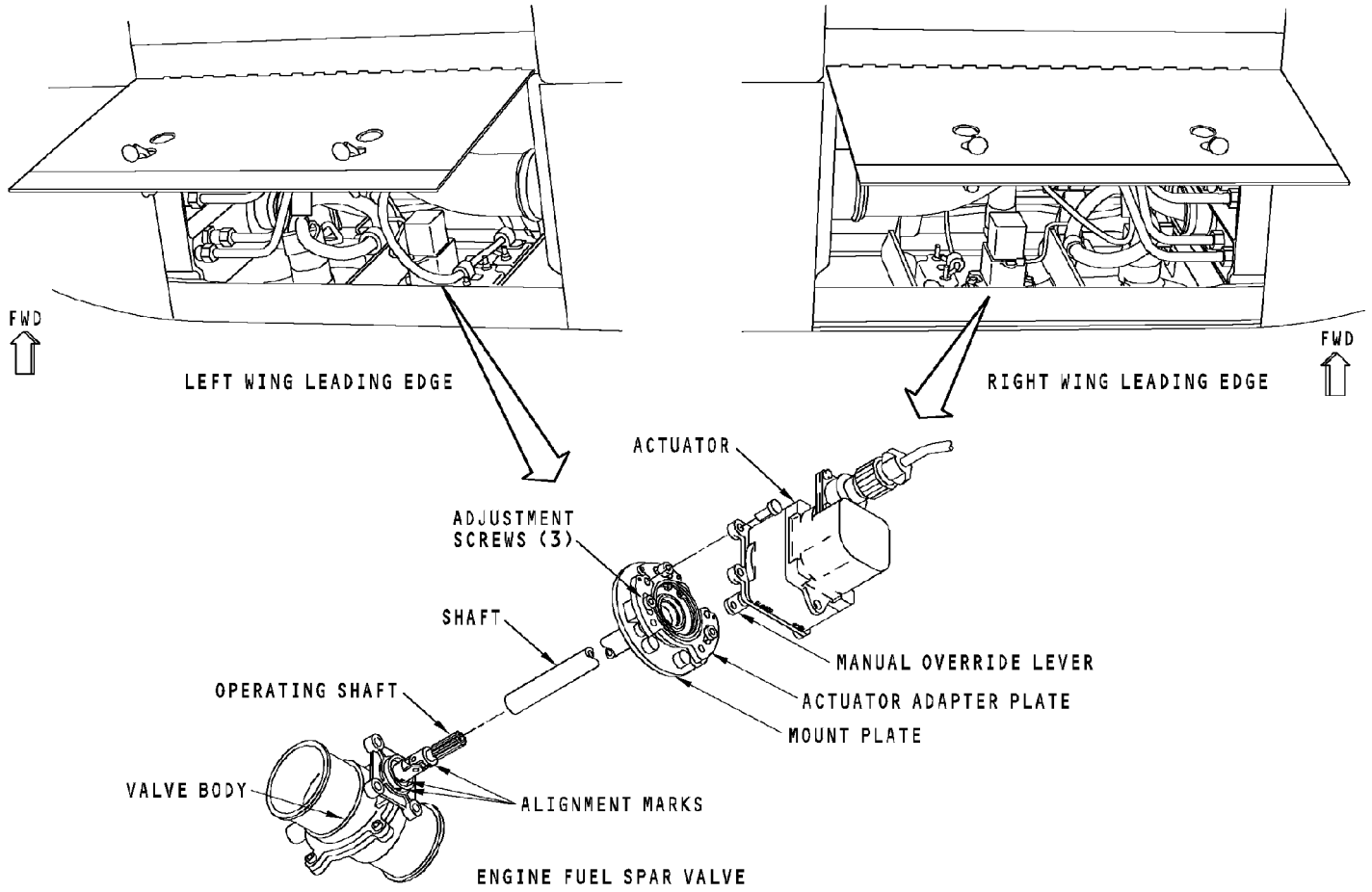
The adapter and shaft attaches between the front spar and the operating shaft. The adapter has a mount plate and an actuator adapter plate.

The mount plate attaches to the front spar.The actuator adapter plate attaches to the mount plate with adjustment screws. You loosen the adjustment screws to rotate the actuator adapter plate. You turn the actuator adapter plate to align the butterfly valve with the actuator.

Actuator

The actuator is a 28v dc motor. It has a manual override lever that permits valve operation without electrical power. The lever aligns with valve position indicators on the adapter. This shows valve position.

The fuel spar valve actuator is interchangeable with the crossfeed valve actuator.



ENGINE FUEL FEED - ENGINE FUEL SPAR VALVE

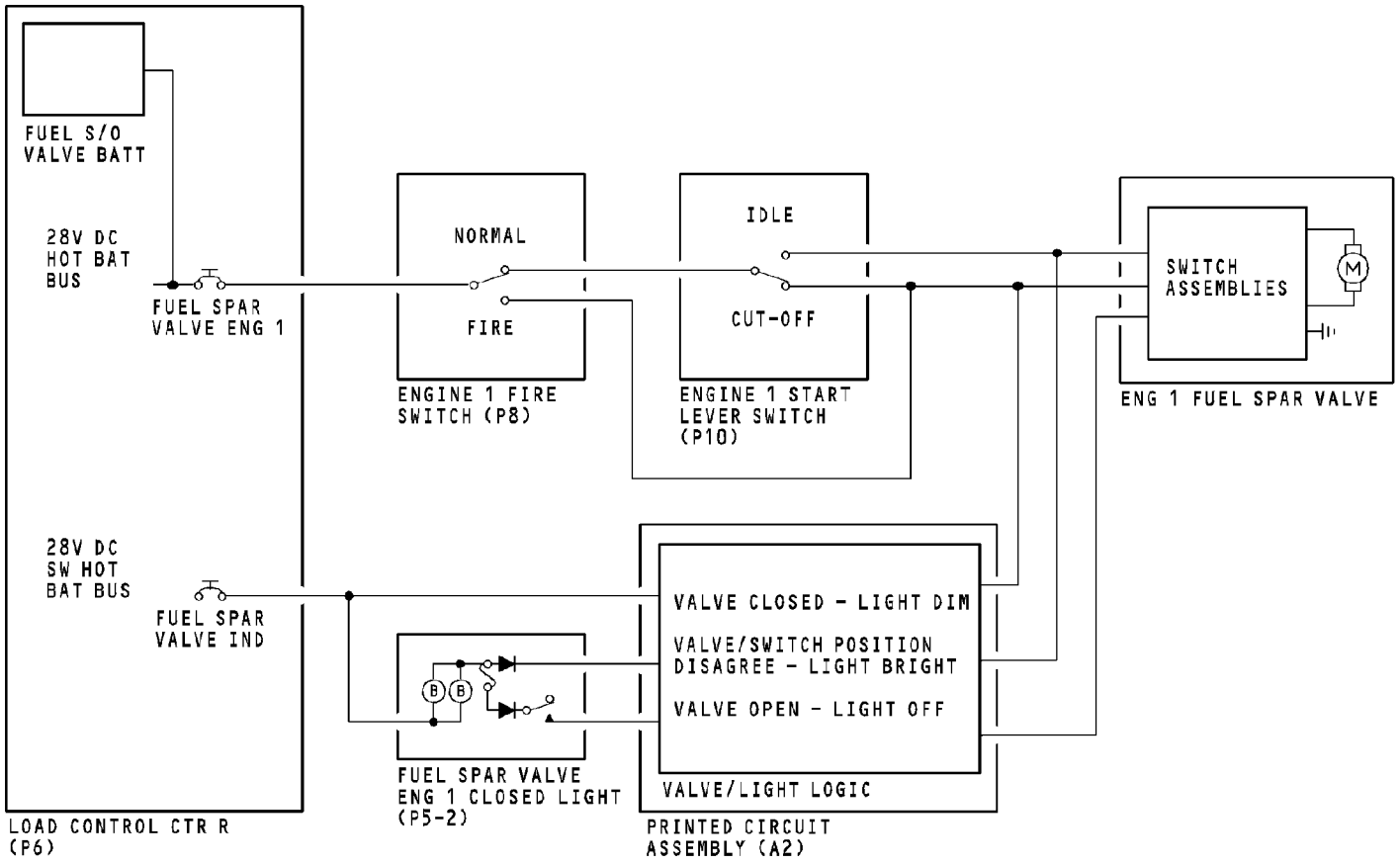
General

The operation of the left engine fuel spar valve is shown. The operation of the right engine fuel spar valve is almost the same.

The engine start lever controls the engine fuel spar valve. When you move the lever to the idle or cut-off position, 28v dc power goes through a switch assembly to the actuator. The actuator then moves the engine fuel spar valve to the correct position.

When the fuel spar valve is closed, the fuel valve closed light is on dim. When the fuel spar valve position and engine start lever switch position disagree, the fuel spar valve closed light is on bright. When the fuel spar valve is open, the fuel spar valve closed light is off.

The fuel shutoff valve battery makes sure that the fuel system always has power to close the engine fuel spar valve.



ENGINE FUEL FEED - ENGINE FUEL SPAR VALVE OPERATION

Purpose

The fuel shutoff valve battery makes sure that the fuel system always has power to close these shutoff valves:

- Engine fuel shutoff valve
- APU fuel shutoff valve.

Components

The fuel shutoff valve battery and charger has these components:

- Aluminum case
- Battery assembly
- Printed circuit board assembly.

Battery Assembly

The battery assembly consists of 22 nickel-cadmium batteries and a temperature sensor. The batteries are connected in series to supply 28v dc to the valve actuators.

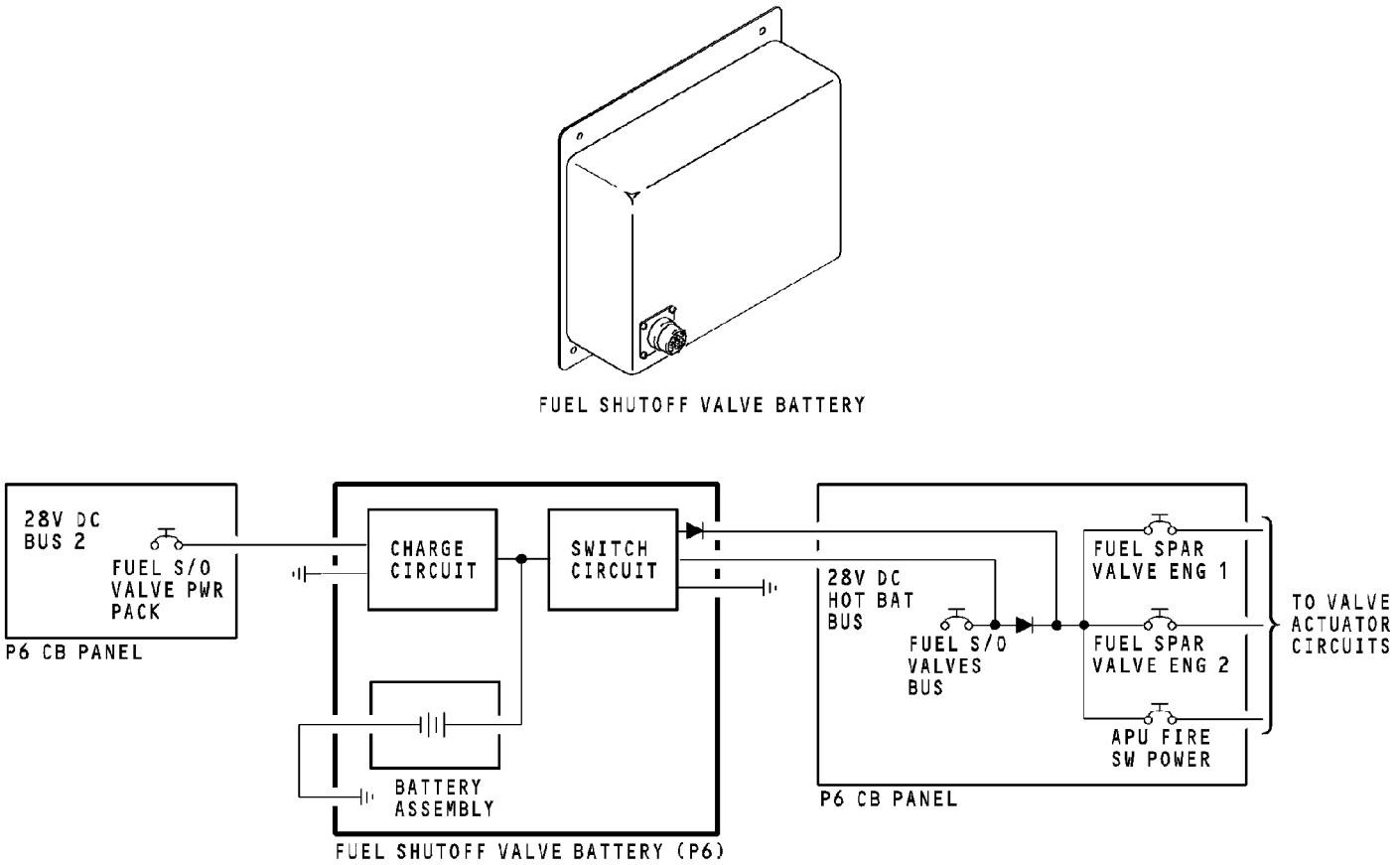
Printed Circuit Board Assembly

The printed circuit board assembly has a switch circuit and a charge circuit.

The switch circuit monitors the voltage of the hot battery bus. If the voltage goes below 22v, the switch circuit supplies power from the fuel shutoff battery to the valve actuator circuits.

The charge circuit uses power from dc bus 2 to charge the batteries.

EFFECTIVITY
HAP ALL



ENGINE FUEL FEED - FUEL SHUTOFF VALVE BATTERY

ENGINE FUEL FEED - WATER SCAVENGE EJECTOR PUMP

General

The water scavenge ejector pumps remove water from the low points in each tank to prevent corrosion.

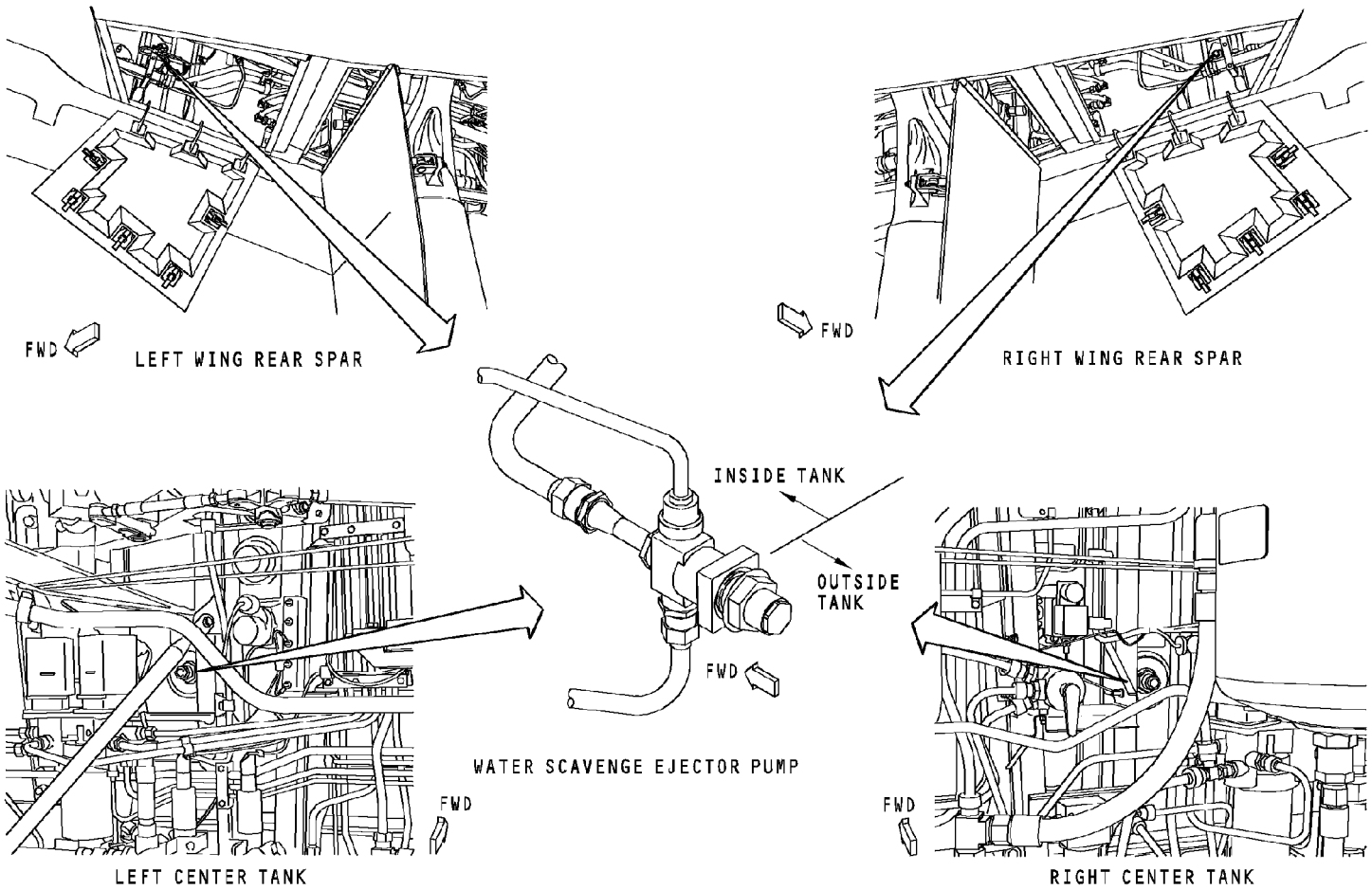
Location

The water scavenge ejector pumps are on the rear spar. There is one water scavenge ejector pump in main tank No. 1 and one water scavenge ejector pump in main tank No. 2. Access to the water scavenge ejector pump for main tank No. 1 is through an access panel on the bottom of the left wing. Access to the water scavenge ejector pump in main tank No. 2 is through an access panel on the bottom of the right wing.

There are two water scavenge ejector pumps in the center tank. Access to the water scavenge ejector pump in the left side of the center tank is through the left wheel well. Access to the water scavenge pump in the right side of the center tank is through the right wheel well.

Functional Description

The water scavenge ejector pumps operate automatically when the center tank boost pumps and the main tank boost pumps are on. The water scavenge ejector pumps use fuel flow from the center tank and main tank boost pumps as motive flow. The motive flow through the water scavenge ejector pump causes a suction. This suction takes water and fuel from the low points in each tank. The water and fuel that comes out of the water scavenge ejector pump goes to the center tank and main tank boost pump inlets.



ENGINE FUEL FEED - WATER SCAVENGE EJECTOR PUMP

Fuel Panel

The fuel panel is on the P5 overhead panel. Switches on the panel control the boost pumps and the crossfeed valve.

Boost pump LOW PRESSURE lights come on when boost pump pressure is low.

Center tank boost pump LOW PRESSURE lights come on when the center tank boost pump switch is in the ON position and center tank boost pump pressure is low.

FUEL VALVE CLOSED lights come on dim when the engine fuel spar valve is closed. The FUEL VALVE CLOSED lights come on bright when there is a disagreement between the switch and valve position. The FUEL VALVE CLOSED lights are off when the engine fuel spar valve is open.

The crossfeed VALVE OPEN light comes on dim when the crossfeed valve is open. The crossfeed VALVE OPEN light comes on brightly when there is a disagreement between the switch and valve position. The crossfeed VALVE OPEN light is off when the crossfeed valve is closed.

Center Tank Engine Fuel Supply

Usually all pump switches are in the ON position at the beginning of a flight. The center tank supplies fuel to the engines. When the center tank is empty, you turn the center tank boost pumps to the OFF position.

Main Tank No. 1 and Main Tank No. 2 Fuel Supply

When the center tank is empty, and the boost pumps are on, fuel goes from the main tanks to the engines.

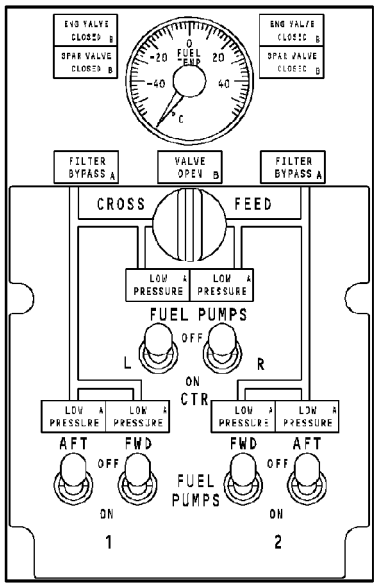
Crossfeed Operation

Fuel goes through the crossfeed valve to correct an imbalance between main tank No. 1 and main tank No. 2.

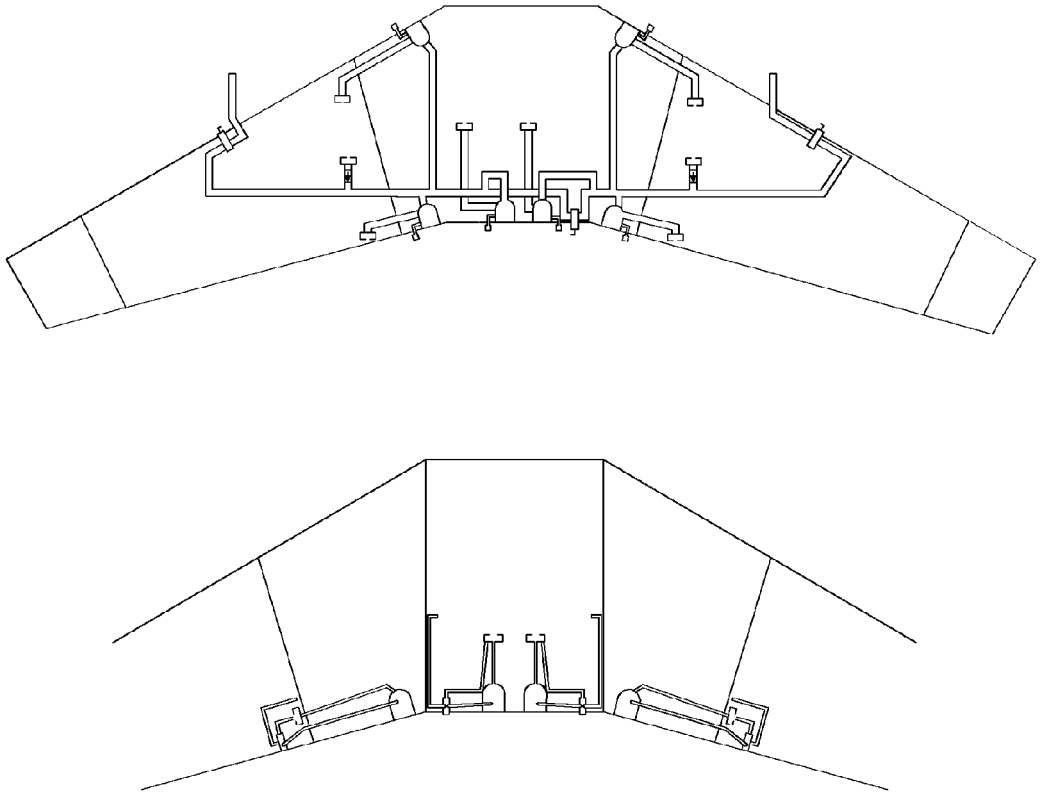
To correct an imbalance, open the crossfeed valve and turn off the boost pumps in the fuel tank that has less fuel.

Suction Operation

Suction supply from main tank No. 1 and main tank No. 2 occurs when all the boost pumps in one tank are off and the crossfeed valve is closed. The bypass valve in main tank No. 1 and/or main tank No. 2 opens. This lets main tank No. 1 and/or main tank No. 2 supply fuel to the engines. The engines can only suction fuel from main tank No. 1 and main tank No. 2.



FUEL SYSTEM PANEL (P5-2)



ENGINE FUEL FEED - OPERATION

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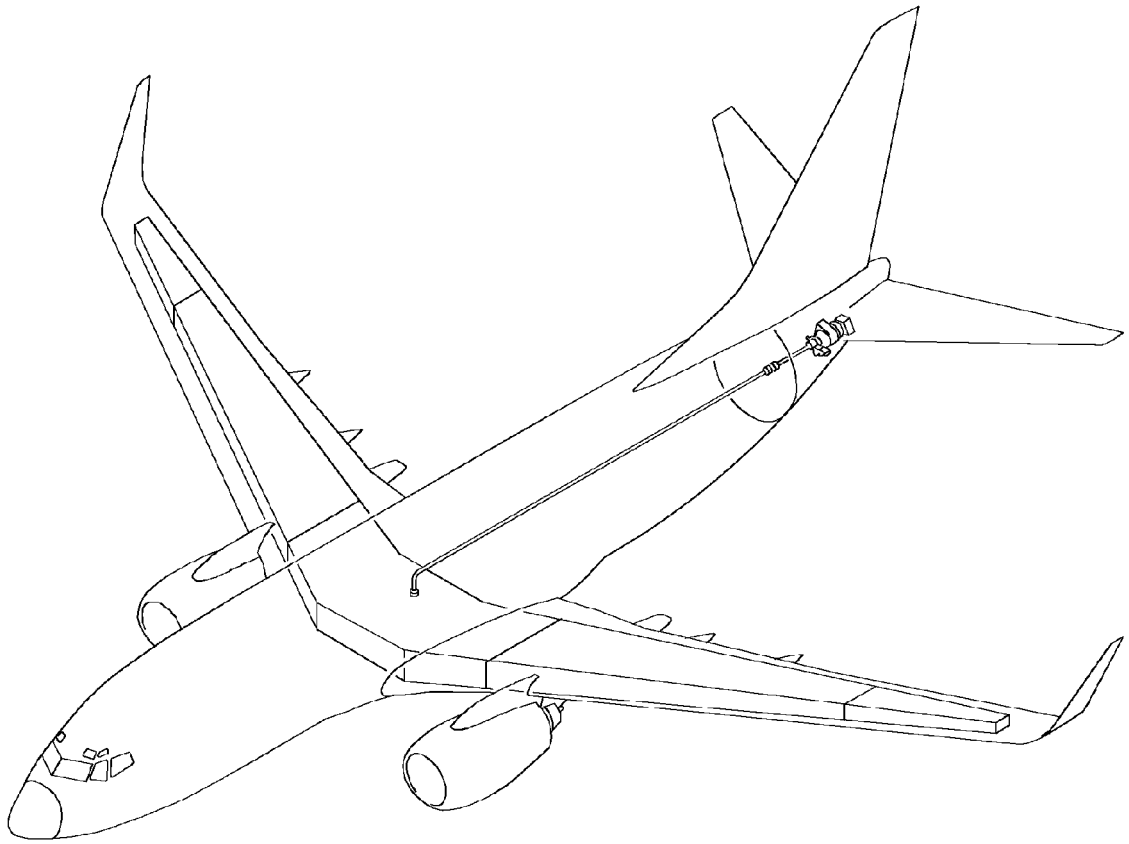
APU FUEL FEED - INTRODUCTION

Purpose

The APU fuel feed system supplies fuel to the APU.



APU FUEL FEED - INTRODUCTION

EFFECTIVITY
HAP ALL

28-25-00

General

The APU fuel feed system supplies fuel from any tank to the APU.

APU Fuel Feed

The center tank boost pumps or the boost pumps in main tank No. 1 and main tank No. 2 supply fuel to the APU. If the boost pumps are off, the APU suctions fuel from main tank No. 1.

Control

The electronic control unit (ECU) controls fuel flow to the APU. The ECU receives inputs from these items:

- APU master switch
- Fire protection system
- APU sensors.

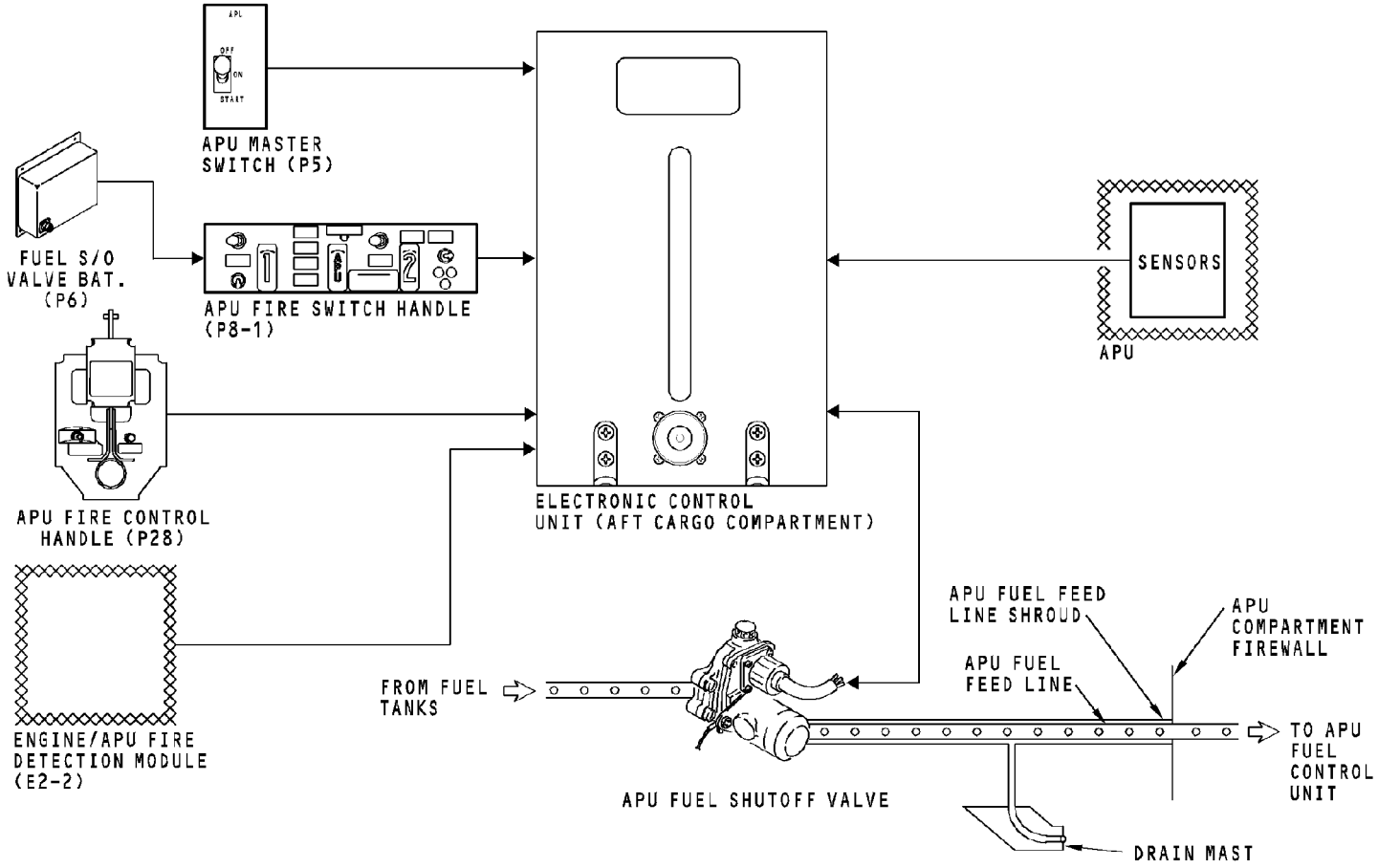
The ECU uses these inputs to control the APU fuel shutoff valve.

The fuel shutoff valve battery makes sure that the fuel system always has power to close the APU fuel shutoff valve.

Fuel Supply Line and Shroud

The APU fuel feed line sends fuel from the APU fuel shutoff valve to the APU fuel control unit.

A shroud collects fuel leaks from the APU fuel feed line. The shroud sends the fuel overboard through a drain mast.



APU FUEL FEED - GENERAL DESCRIPTION

APU FUEL FEED - COMPONENT LOCATION

General

The APU fuel feed system has these components:

- APU fuel feed line
- APU fuel feed line shroud
- APU fuel shutoff valve.

APU Fuel Feed Line

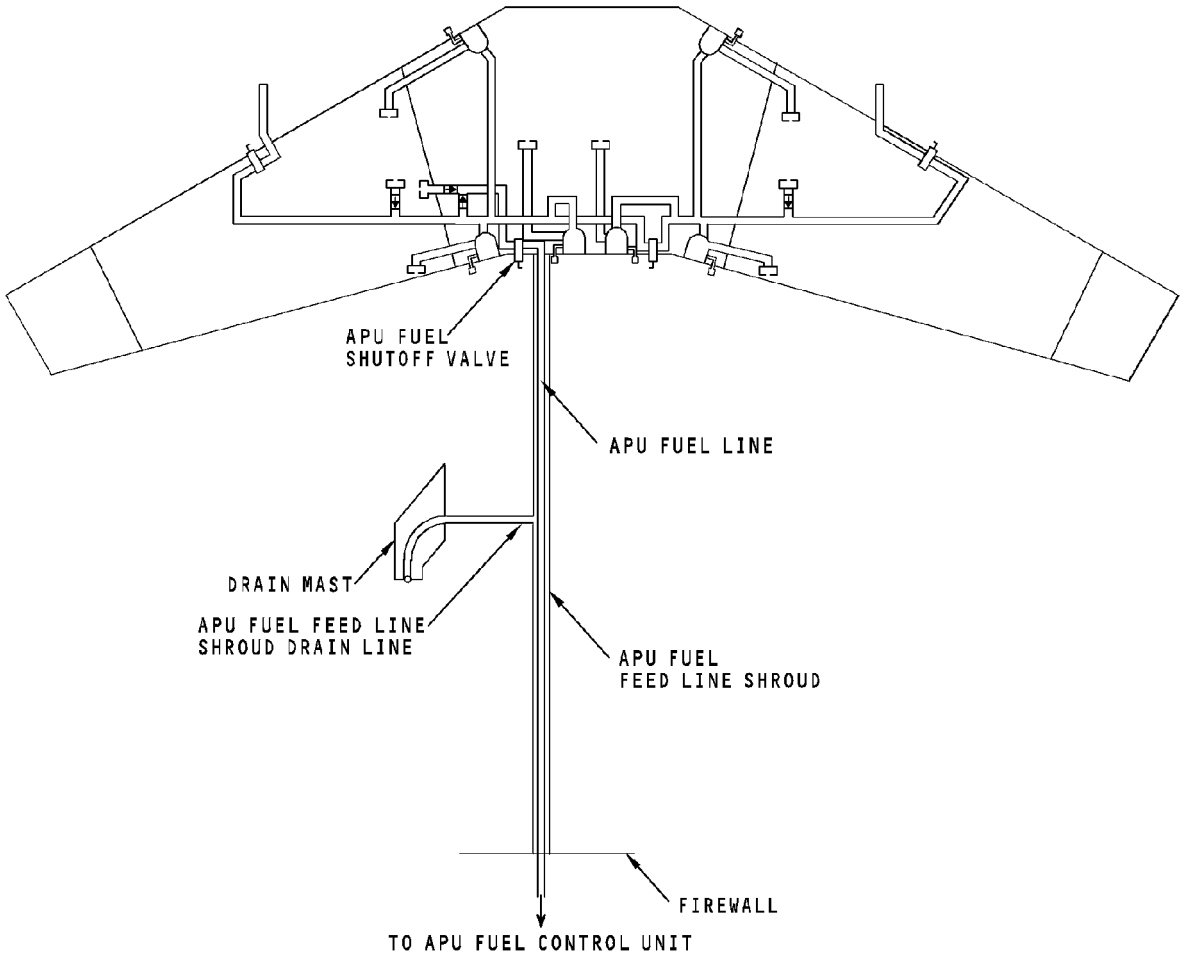
The APU fuel feed line starts in main tank 1, goes through the center tank, then aft to the APU.

APU Fuel Feed Line Shroud

The APU fuel feed line shroud is around the APU fuel feed line. The shroud has a drain line that connects to a drain mast on the bottom of the left wing to body fairing.

APU Fuel Shutoff Valve

The APU shutoff valve is on the center section rear spar.



APU FUEL FEED - COMPONENT LOCATION

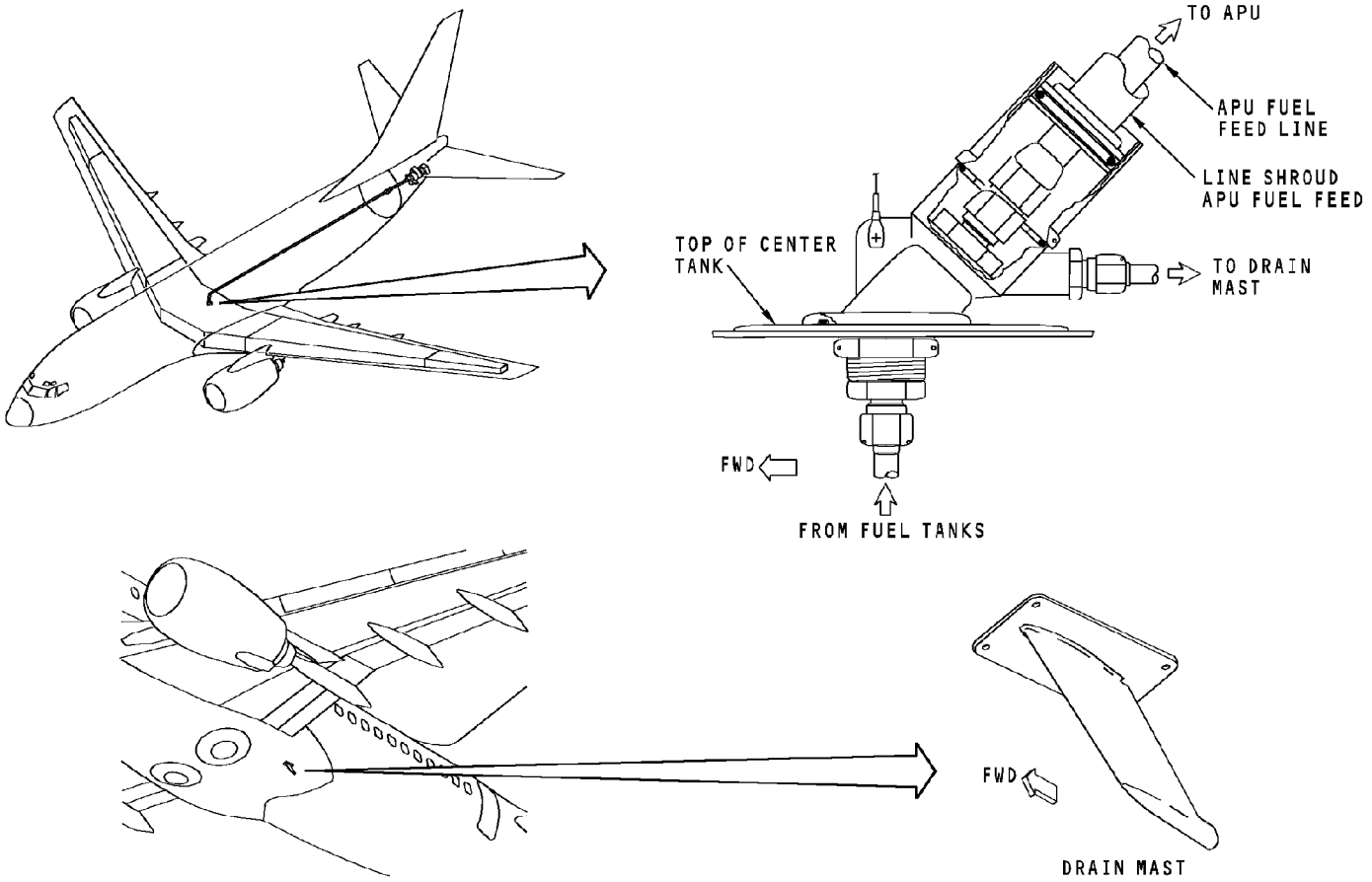
APU Fuel Supply Line and Shroud

In the fuel tanks, the APU supply line is made from aluminum. Outside the tanks, the APU supply line is made from rubber and kevlar and is flexible. An aluminum shroud surrounds the rubber/kevlar APU fuel supply line.

Shroud Drain Line

The shroud drain line connects the fuel line shroud to the drain mast. Leaks in the fuel supply line, are contained by the shroud and flow overboard through the drain mast.

NOTE: This drain mast also drains hydraulic fluid from system A and B reservoirs.



APU FUEL FEED - APU FUEL SUPPLY LINE, SHROUD, AND DRAIN LINE

General

The APU fuel shutoff valve lets fuel flow from the left engine fuel feed manifold to the APU.

Location

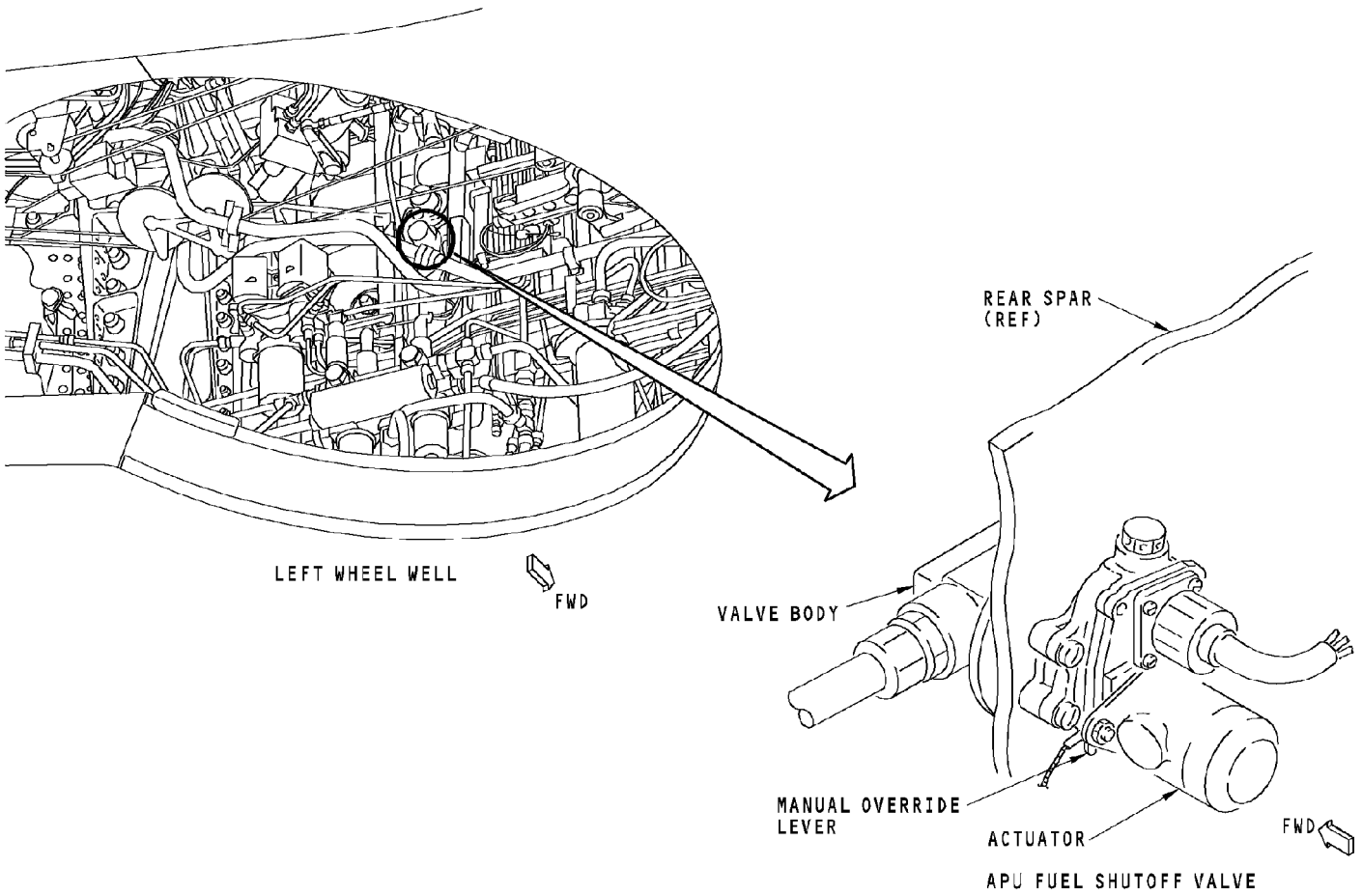
The APU fuel shutoff valve is on the center section rear spar. Access is through the left wheel well.

Motor Actuated Valve

The motor actuated valve has a valve body and an actuator.

The valve body connects to the left engine fuel feed manifold and the APU fuel feed line. The valve is a rotary type valve. The alignment marks show valve position.

The actuator is a 28v dc motor. It has a manual override lever that permits valve operation without electrical power. The lever aligns with valve position indicators on the adapter. This shows valve position.



APU FUEL FEED - APU FUEL SHUTOFF VALVE

Control

The electronic control unit (ECU) controls the APU shutoff valve. The ECU receives input from these components:

- APU switch
- APU fire control handle
- APU fire switch handle
- Engine/APU fire detection module
- APU sensors.

The ECU uses these inputs to open or close the APU shutoff valve.

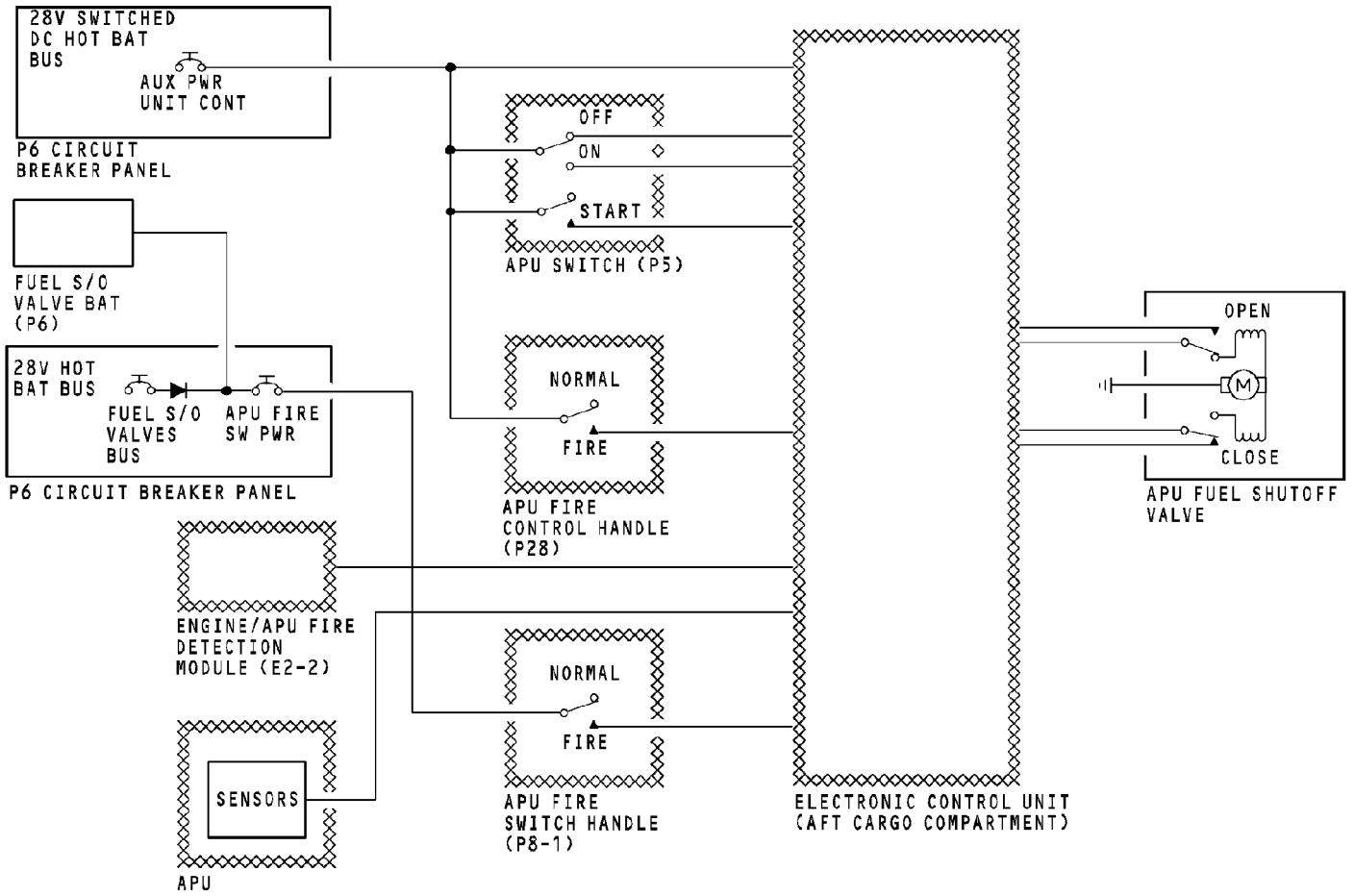
The APU fuel shutoff valve opens when these conditions occur:

- The APU switch is in the START or ON position and
- The APU fire control handle and the APU fire switch handle are in the NORMAL position and
- The engine/APU fire detection module has not sent a fire signal to the ECU and
- The ECU has not received any out of limits signals from the APU sensors.

The APU fuel shutoff valve closes when these conditions occur:

- The APU switch is in the OFF position or
- The APU fire control handle is operated to the FIRE position or
- The APU fire switch handle is in the FIRE position or
- The engine/APU fire detection module sends a fire signal to the ECU or
- The ECU receives an out of limits signal from APU sensors.

NOTE: For more information on ECU function, see CHAPTER 49.



APU FUEL FEED - APU FUEL SHUTOFF VALVE OPERATION

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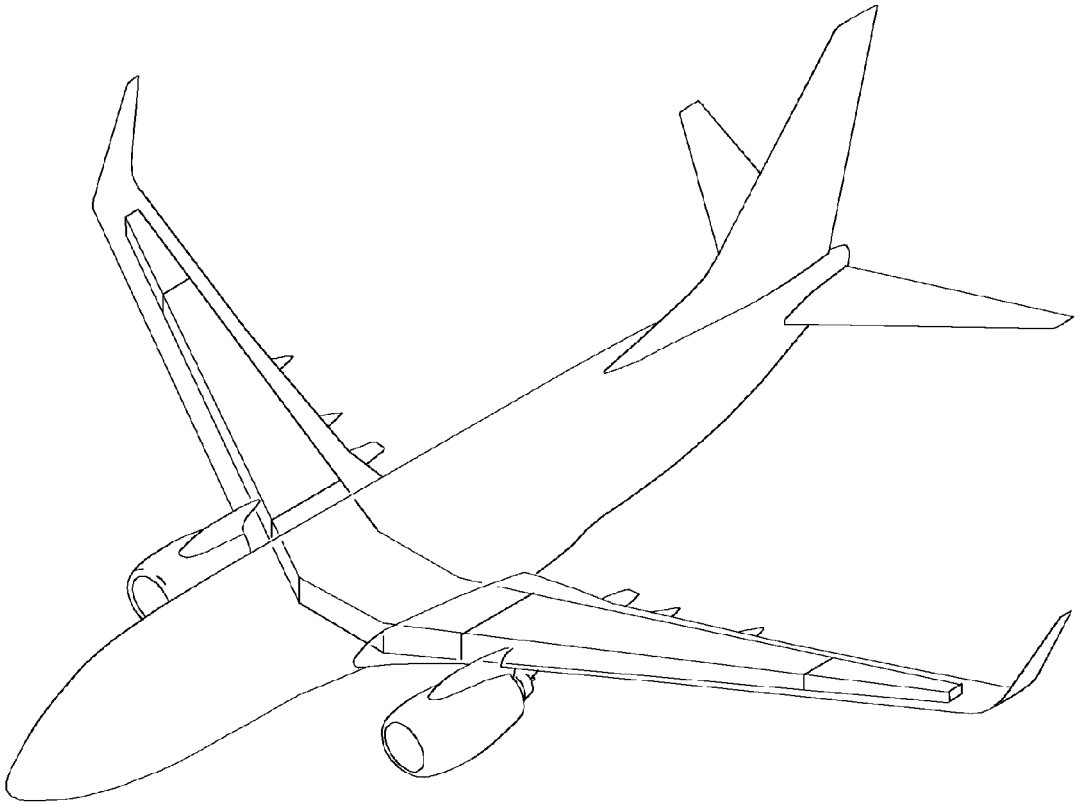
DEFUEL - INTRODUCTION

General

The defuel system removes fuel from the fuel tanks to the refuel station. The defuel system also permits fuel transfer from one fuel tank to another.



DEFUEL - INTRODUCTION

EFFECTIVITY

HAP ALL

28-26-00

DEFUEL - GENERAL DESCRIPTION

General

The defuel system permits pressure defuel of each tank and suction defuel of main tank 1 and main tank 2.

The defuel system also allows fuel transfer on the ground from one fuel tank to another.

Pressure Defuel

You use these to pressure defuel the tanks:

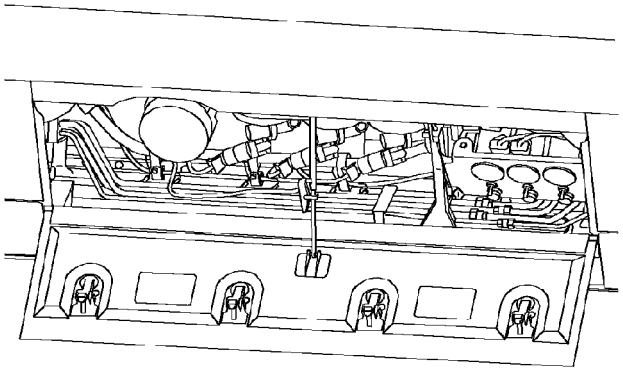
- Refuel station
- Fuel pumps
- Defuel valve
- Crossfeed valve.

Suction Defuel

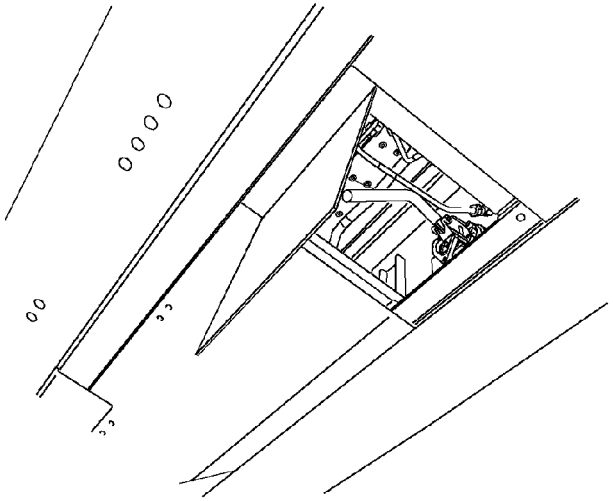
You use the defuel valve and refuel station to suction defuel main tank 1 and main tank 2.

Fuel Transfer

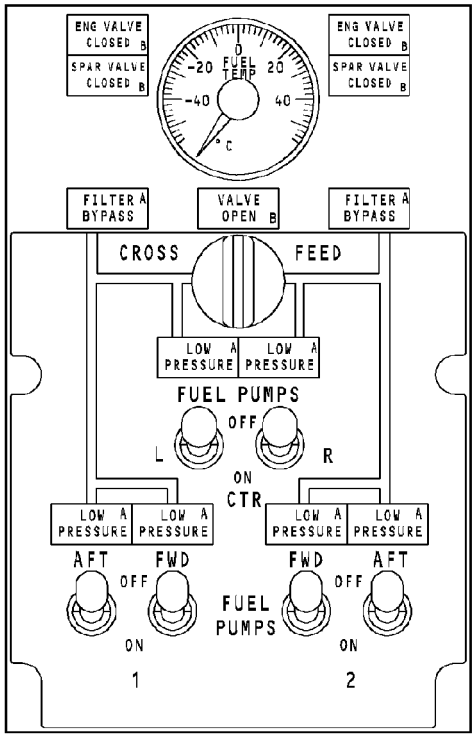
You use the defuel valve, the refuel station, and the fuel control panel to transfer fuel between tanks.



FUELING STATION (P15)



DEFUEL VALVE



FUEL CONTROL PANEL (P5)

DEFUEL - GENERAL DESCRIPTION

EFFECTIVITY

HAP ALL

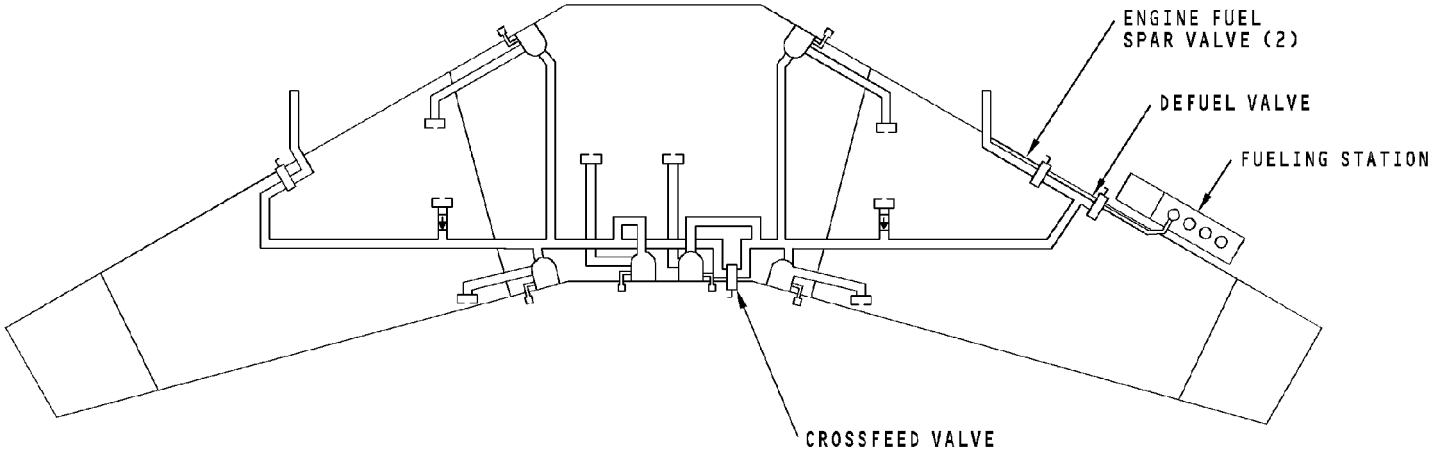
28-26-00-001

28-26-00

DEFUEL - COMPONENT LOCATION

Location

The defuel valve is located on the right wing front spar. The defuel valve connects between the right engine fuel feed manifold and refuel station tubing.



DEFUEL - COMPONENT LOCATION

Purpose

The defuel valve connects the right engine fuel feed manifold with the defuel manifold. This permits removal of fuel from the fuel tanks.

Description

The defuel valve operates manually. It has these components:

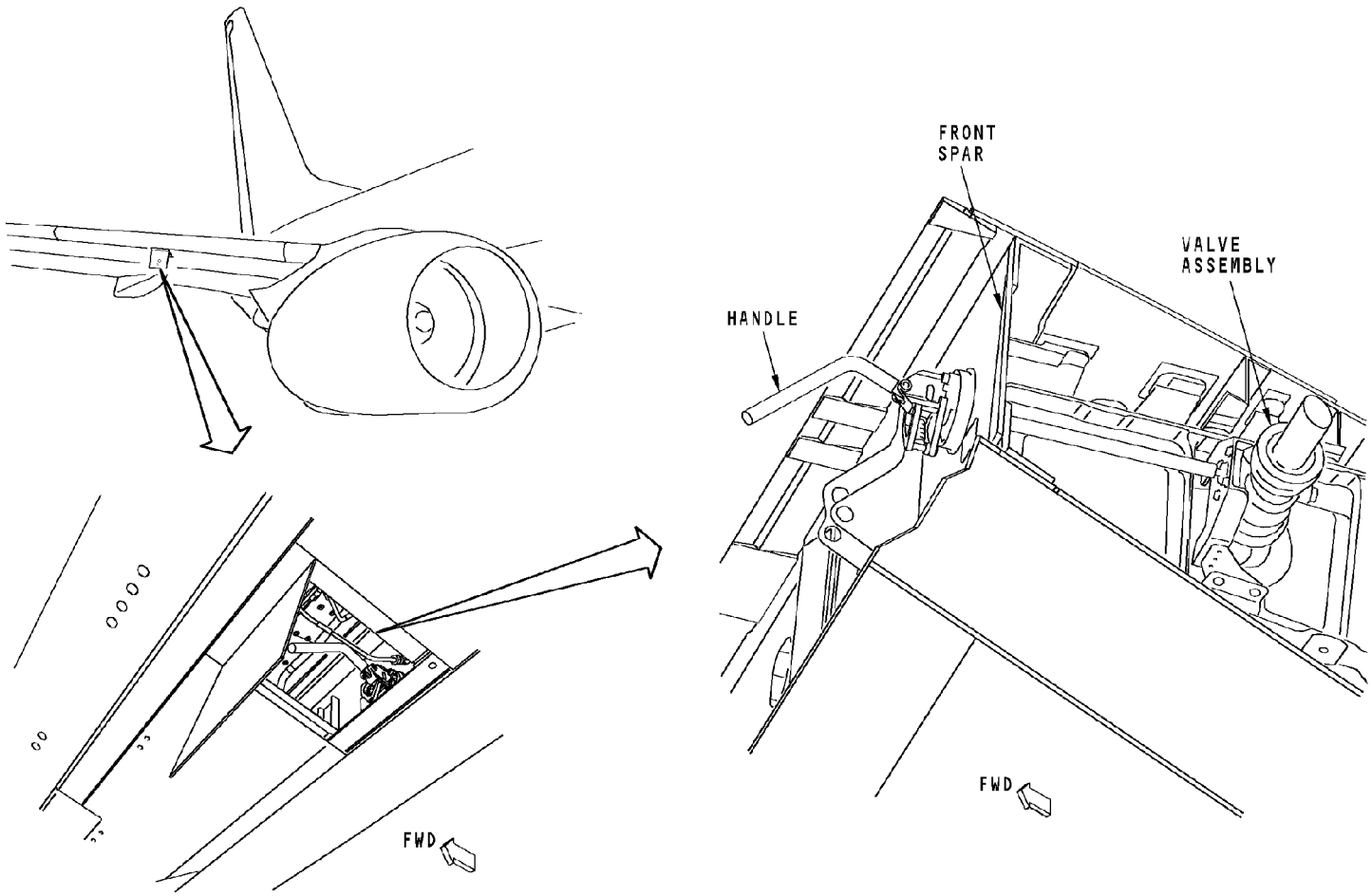
- Handle
- Valve assembly.

Handle

The handle operates the defuel valve. The handle is also a position indicator. You cannot close the defuel valve access door with the handle in the open position.

Valve Assembly

The valve assembly attaches to structure inside the fuel tank. It connects to both the defuel manifold and the right engine fuel feed manifold.



DEFUEL - DEFUEL VALVE

EFFECTIVITY
HAP ALL

28-26-00-003

28-26-00

General

There are two ways to defuel the fuel tanks, pressure defuel and suction defuel. You can pressure defuel any tank. You can only suction defuel main tank 1 and main tank 2. You can transfer fuel between any tank.

Suction defuel of main tank 1 will occur only if main tank 2 is suction defueled at the same time. When main tank 2 empties, air will be drawn into the manifold and fuel flow will stop.

Pressure Defuel

This is a summary of the pressure defuel procedure:

- Connect the refuel nozzles
- Move the handle on the defuel valve to the open position
- Turn on the boost pumps to the tank that you need to defuel
- Open the crossfeed valve if necessary
- Turn the boost pumps off when the tank is empty
- Move the handle on the defuel valve to the closed position
- Disconnect the fueling nozzles.

Suction Defuel

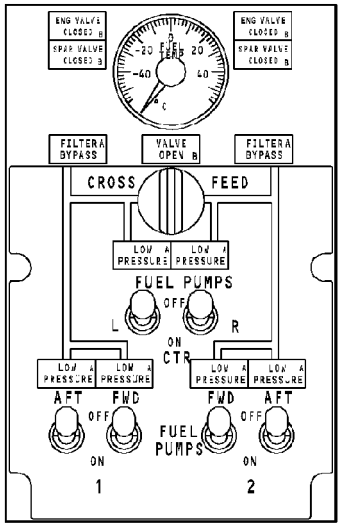
This is a summary of the suction defuel procedure:

- Connect the fueling nozzles
- Move the handle on the defuel valve to the open position
- Open the crossfeed valve if necessary
- Start to suction fuel with the ground source
- When the fuel tank is empty, move the handle on the defuel valve to the closed position
- Disconnect the fueling nozzles.

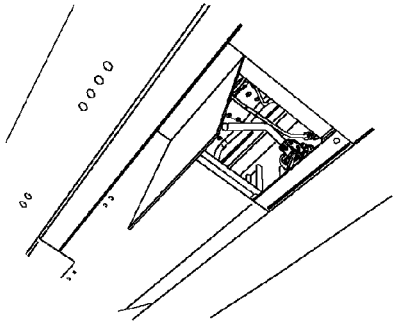
Fuel Transfer

To transfer fuel between tanks you use the defuel system, fueling system, and the engine fuel feed system. This is a summary of the fuel transfer procedure:

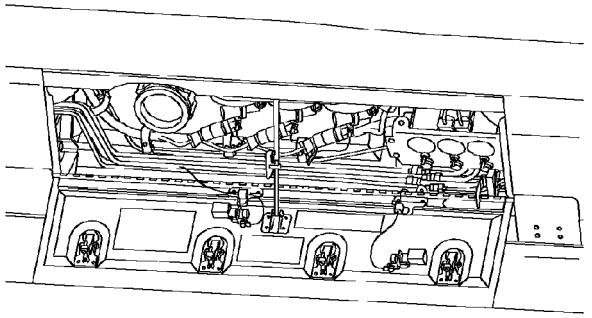
- Move the defuel valve to the open position
- Turn on the boost pumps in the tank you want to defuel
- Open the crossfeed valve
- Move the refuel valve switch to the open position in the tank you want to put fuel into
- After fuel transfer, turn the boost pumps off
- Close the crossfeed valve
- Move the defuel valve to the closed position.



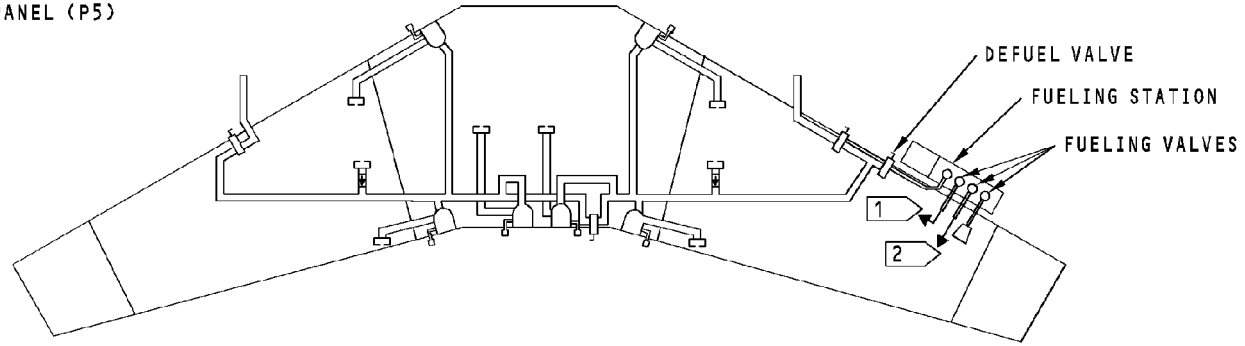
FUEL SYSTEM PANEL (P5)



DEFUEL VALVE



FUELING STATION (P15)



1 TO MAIN TANK 1 2 TO CENTER TANK

DEFUEL - OPERATION

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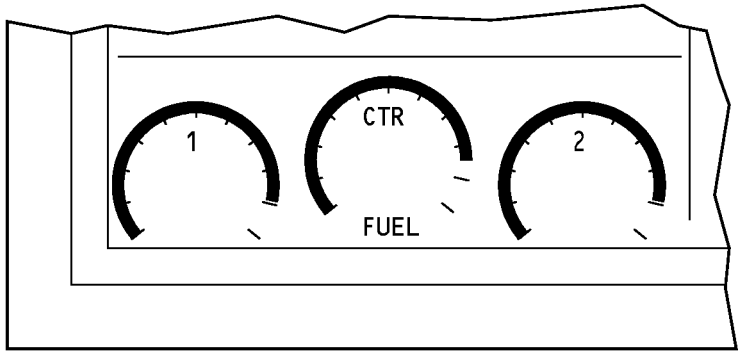
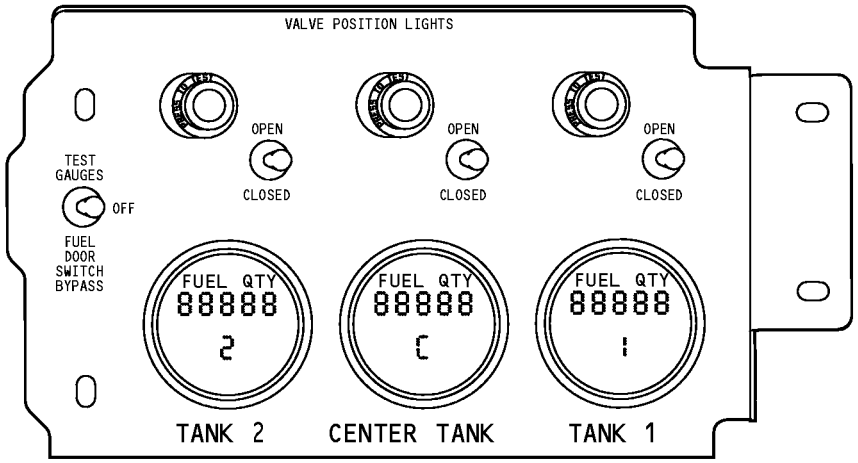
Fuel Quantity Indicating System (FQIS)

The FQIS measures fuel weight in the fuel tanks. The common display system (CDS) and the fueling panel show fuel quantity.



ENGINE DISPLAY
(EXAMPLE)



REFUEL PANEL, P15

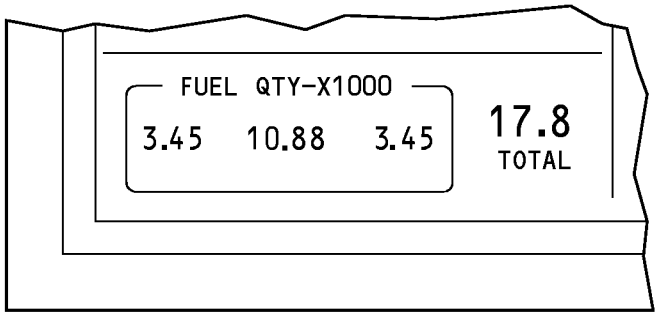
NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS

M84633 S0004626134_V3

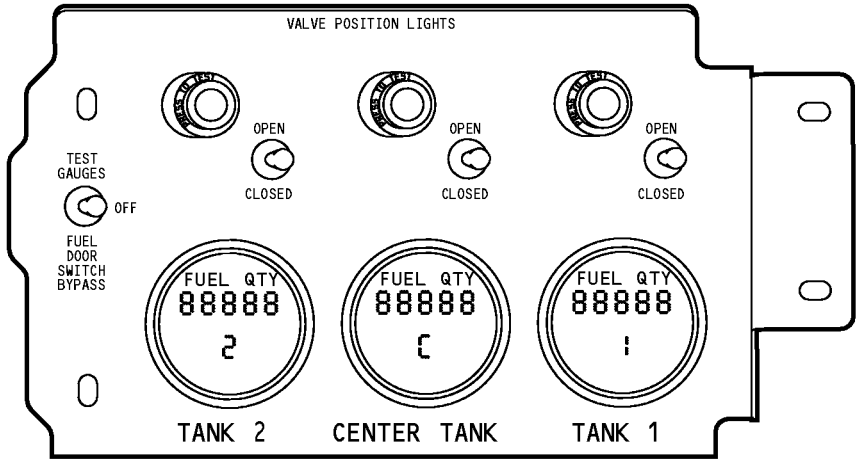
FUEL INDICATING - INTRODUCTION

EFFECTIVITY

HAP 001-013, 015-026, 028-030 PRE SB 737-31-1246 AND PRE SB 737-31-1295



ENGINE DISPLAY
(EXAMPLE)



REFUEL PANEL (P15)

NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS

M84636 S0004626136_V2

FUEL INDICATING - INTRODUCTION

EFFECTIVITY

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-31-1246 OR POST SB 737-31-1295

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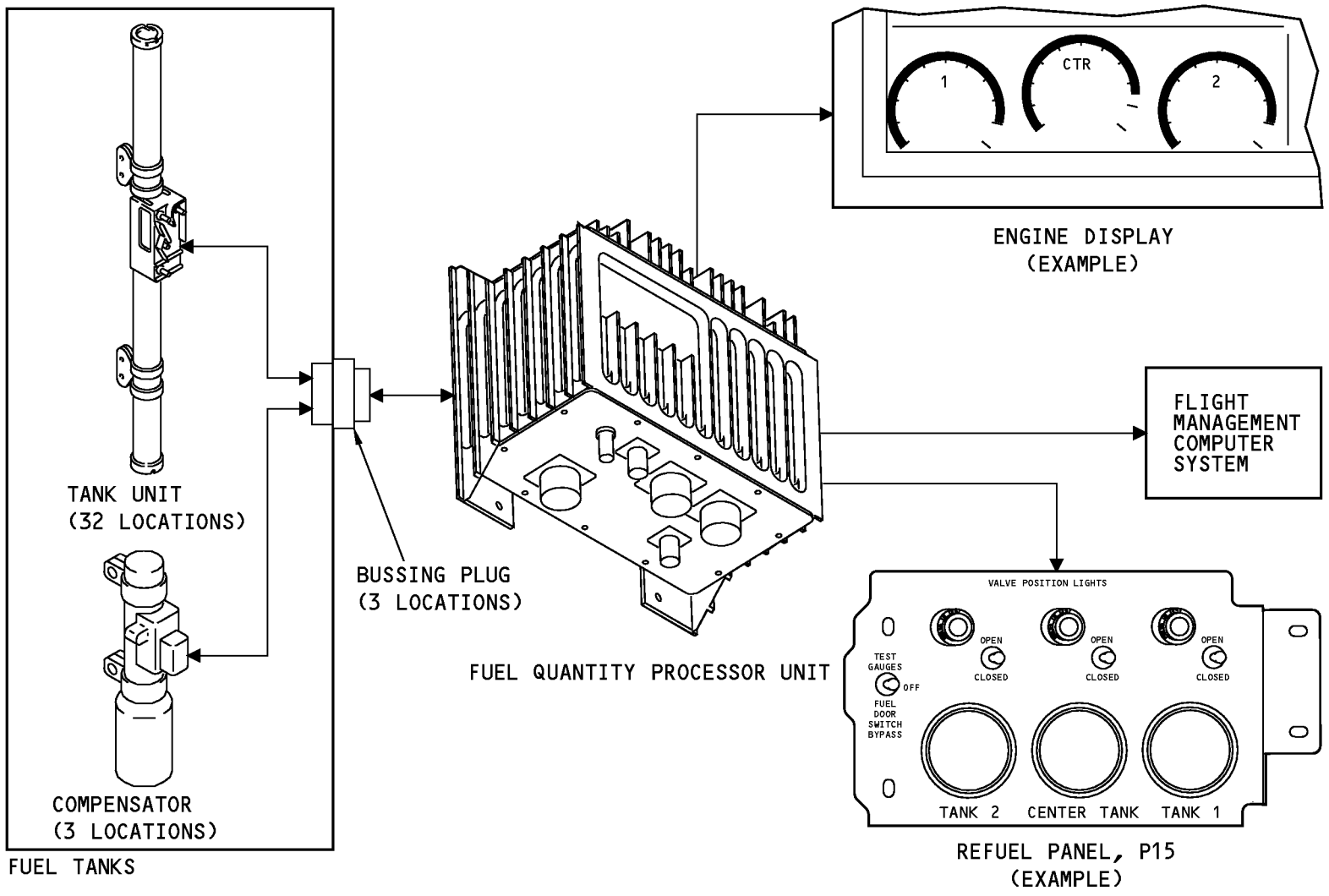
General

The fuel quantity indicating system (FQIS) calculates the fuel weight in each fuel tank. The fuel quantity of each tank shows on the common display system (CDS). The fuel quantity processor unit (FQPU) calculates total fuel weight and supplies this to the FMCS.

Operation

The fuel quantity processor unit sends excitation to and receives signals from the tank units and the compensators. The fuel quantity processor unit uses these signals to calculate fuel quantity in each tank.

Each refueling indicator has an overfill indication. The quantity blinks on, then off, at a one second rate when the fuel in the tank is more than maximum rated capacity.



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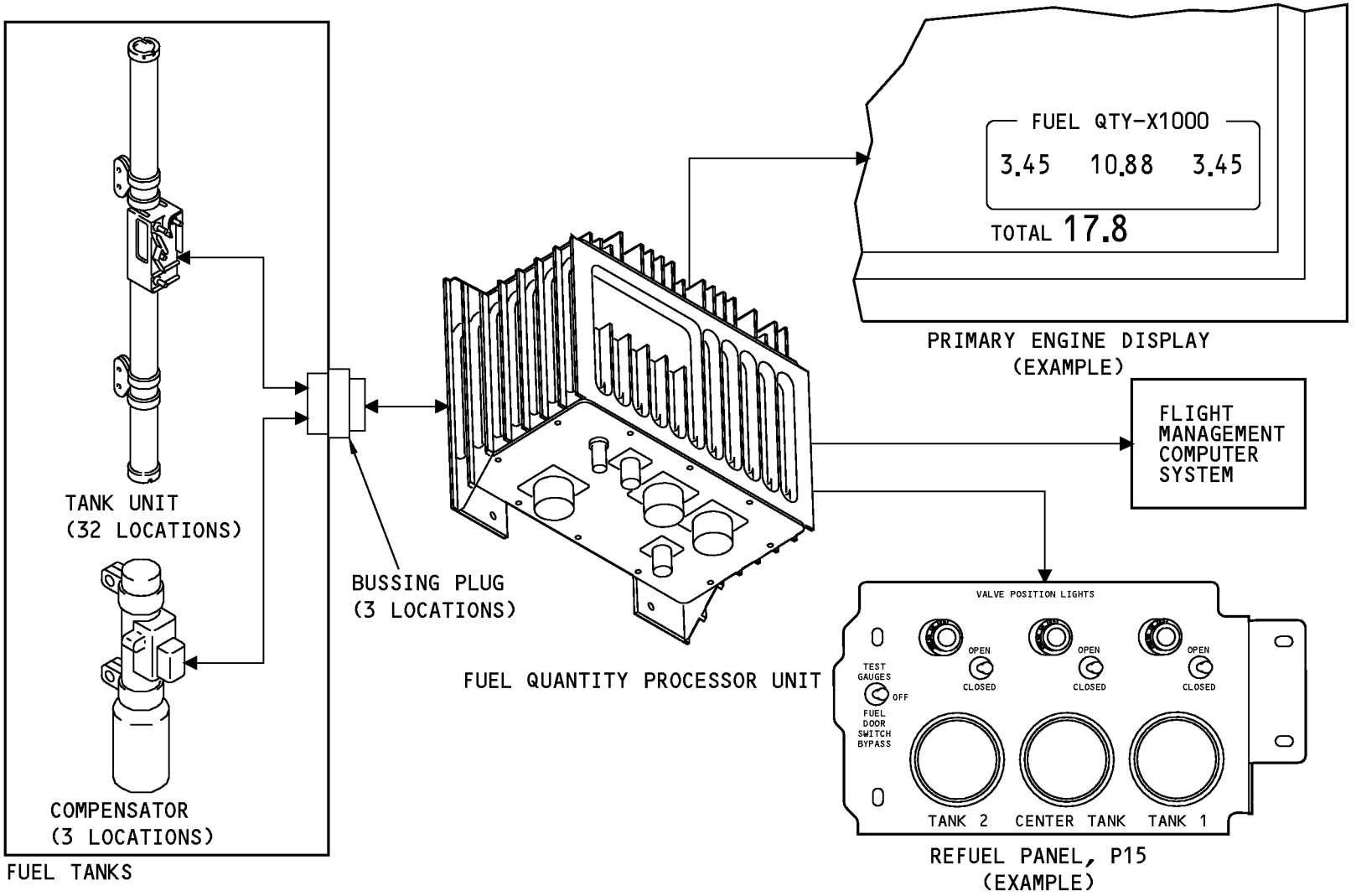
FUEL INDICATING - GENERAL DESCRIPTION

EFFECTIVITY

HAP 001-013, 015-026, 028-030 PRE SB 737-31-1246 AND PRE SB 737-31-1295

28-41-00-001



M84645 S0004626148_V3

FUEL INDICATING - GENERAL DESCRIPTION

EFFECTIVITY

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-31-1246 OR POST SB 737-31-1295

28-41-00

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General

There are 32 tank units in the fuel tanks. There are 12 tank units in main tank 1 and 12 tank units in main tank 2. There are 8 tank units in the center tank.

There is one compensator in each tank.

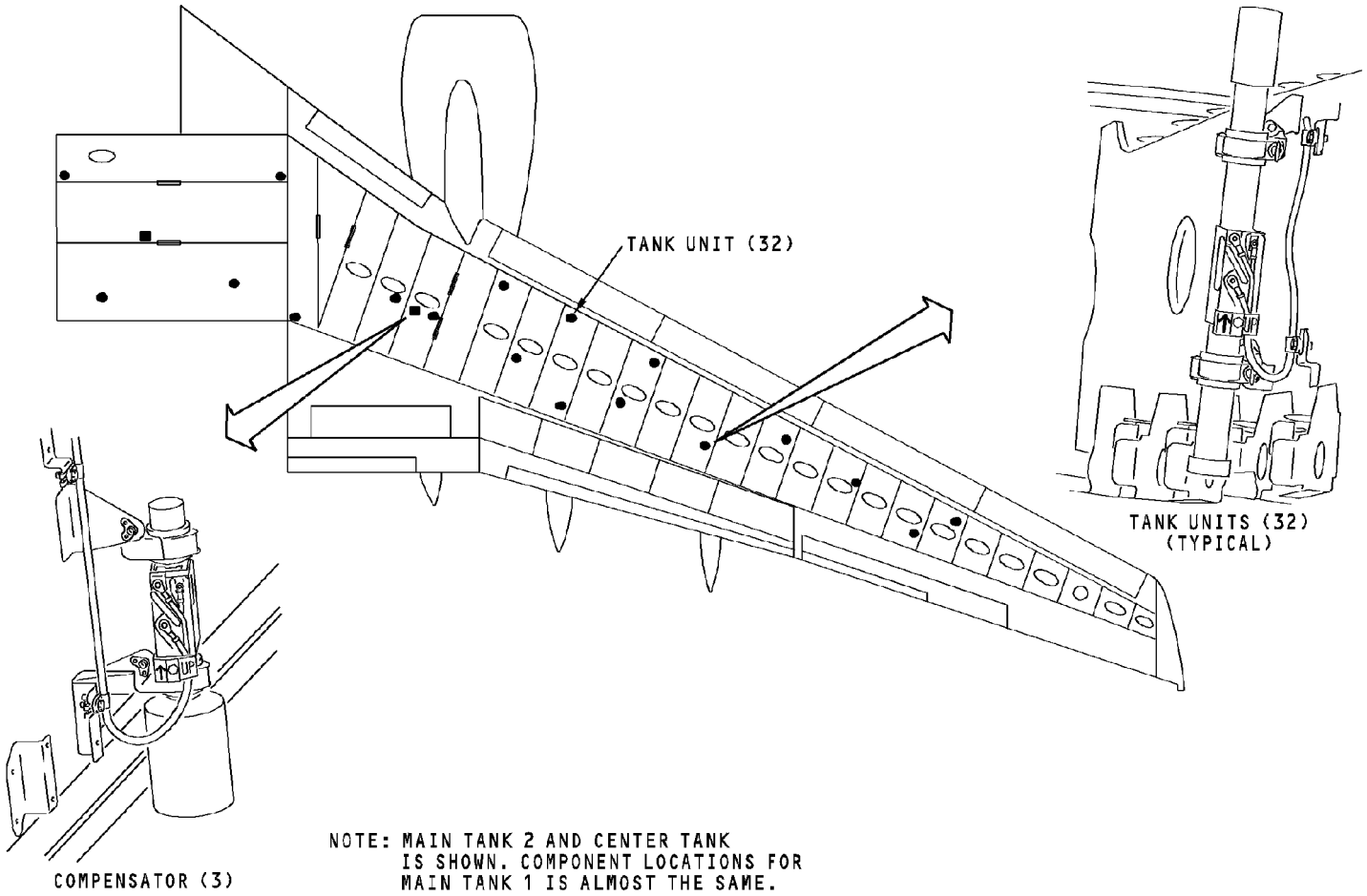
Tank Units

The tank units measure fuel weight. The fuel quantity processor sends a common low impedance excitation signal to the tank units. The tank units return a single high impedance signal to the processor. This high impedance return signal is in proportion to fuel weight for the entire tank.

Compensators

The compensators correct for differences in fuel properties. The fuel quantity processor sends a low impedance signal to each compensator. The compensators return a high impedance signal to the processor. This high impedance return signal is in proportion to the dielectric of the fuel.

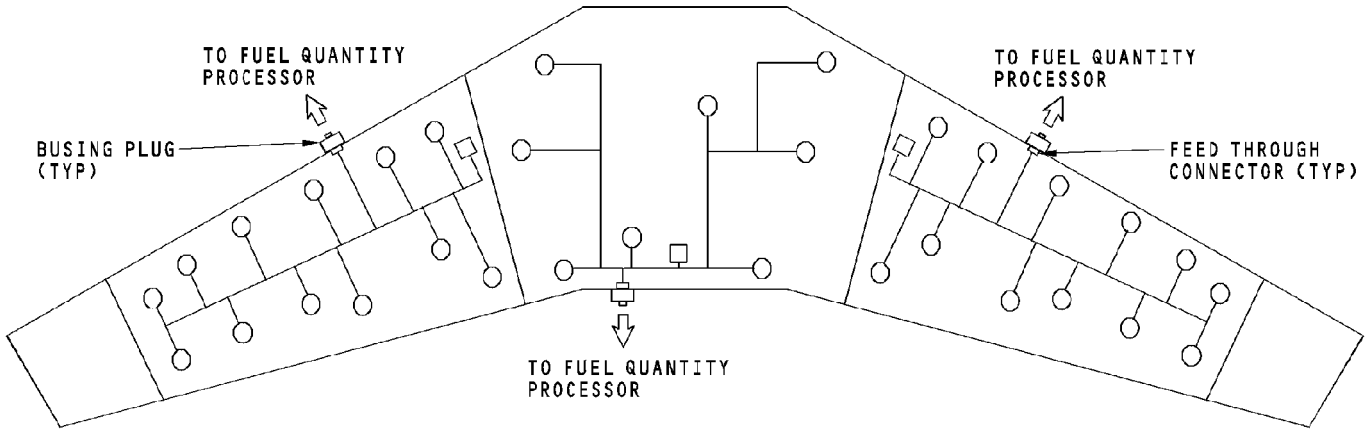
Each compensator is in the low point of its fuel tank. For most operations, fuel completely covers the compensator. The high impedance return signal from each compensator changes only for differences in fuel dielectric.



FUEL INDICATING - TANK UNITS AND COMPENSATORS

General

There is one wire harness in each tank. Each wire harness connects to the fuel tank units and the compensator in each tank. Each wire harness connects to a feed through connector inside the fuel tank. Outside the tank, each spar connector attaches to a busing plug. Each busing plug connects to the fuel quantity processor unit.



FUEL INDICATING - WIRE HARNESSES

FUEL INDICATING - FUEL QUANTITY PROCESSOR UNIT

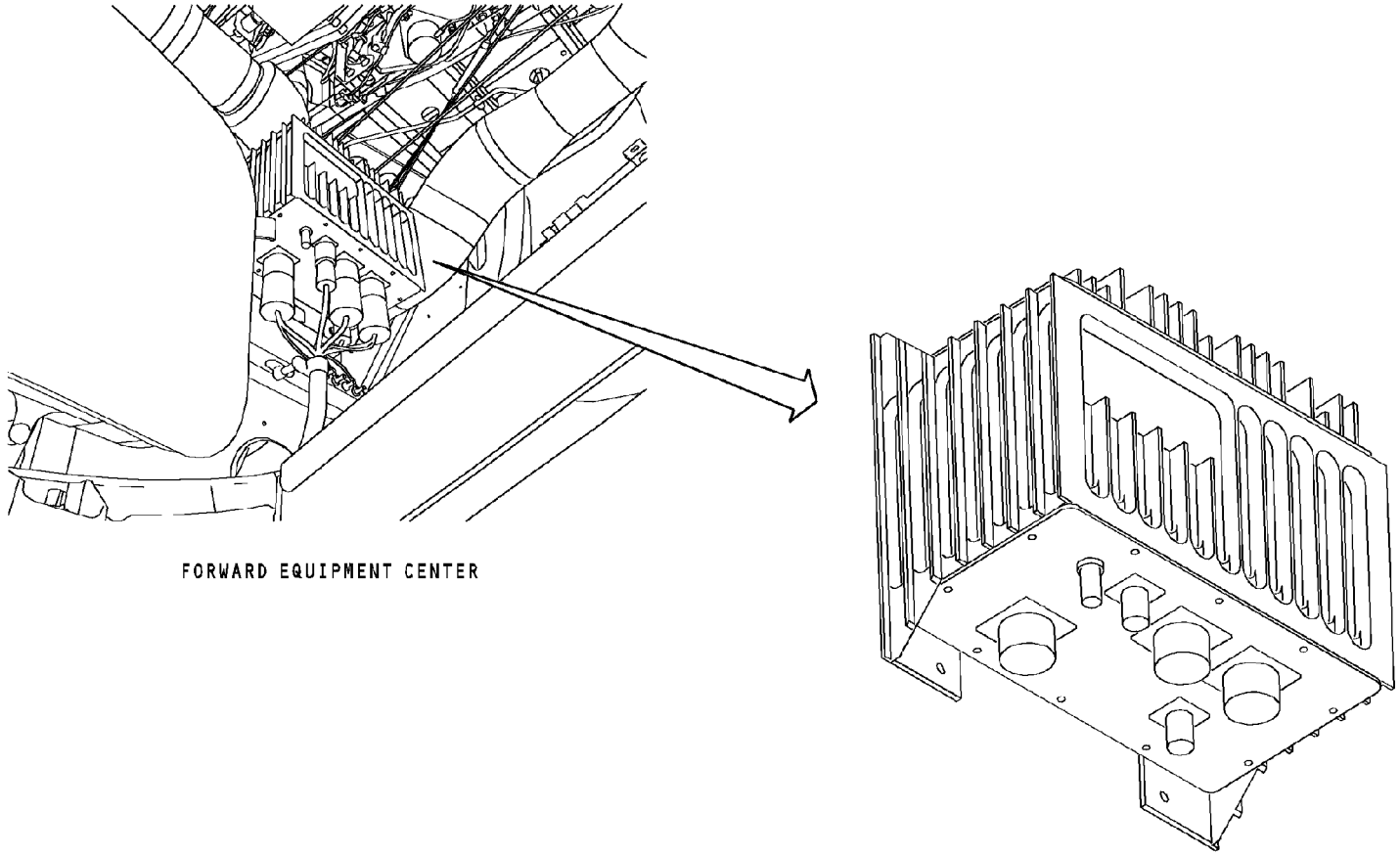
Purpose

The fuel quantity processor unit does these functions:

- Calculates fuel weight in each tank
- Calculates the total fuel weight
- Sends fuel weight to the common display system
- Sends fuel weight to the fueling panel (P15)
- Sends fuel weight to the flight management computer
- Monitors the fuel system for faults
- Stores faults in non-volatile memory
- Sends fault data to the control display units.

Location

The fuel quantity processor unit is on the aft bulkhead of the forward equipment center.



FUEL INDICATING - FUEL QUANTITY PROCESSOR UNIT

General

The fuel quantity processor unit (FQPU) connects to two isolated 28v dc power sources at a time. The fuel quantity processor unit operates when one or both of the sources have power.

Power Sources

The FQPU can receive power from any of these three sources:

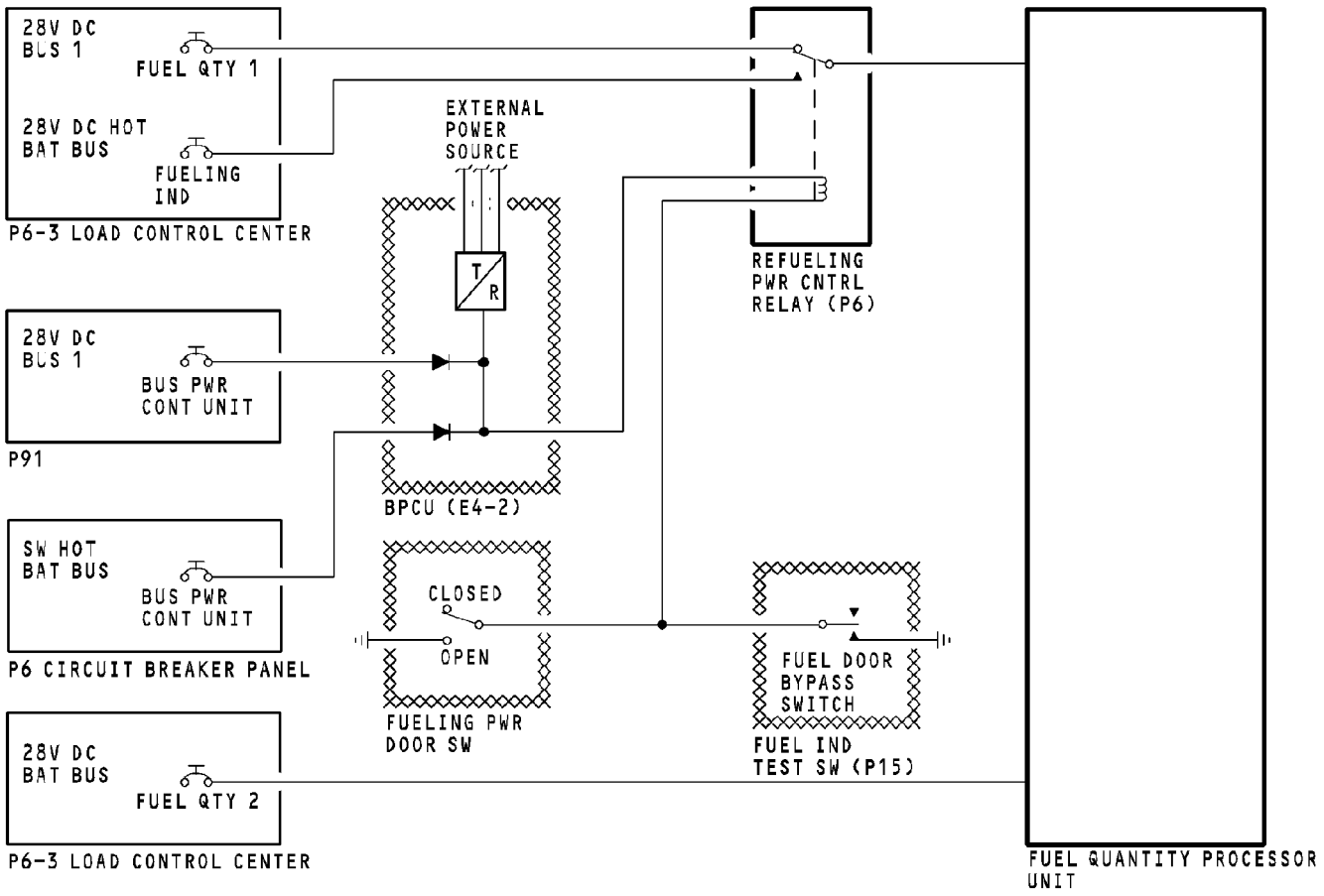
- 28v dc bus 1
- 28v dc hot battery bus
- 28v dc battery bus.

The power source normally available is the 28v dc battery bus. Transformer rectifier 3 (TRU3) is the normal power source for this bus. However, the battery or battery charger may also supply power to this bus if TRU3 power is not available and the battery switch is in the ON position.

When the fueling station door is in the closed position, processor unit power can come from dc bus 1. You must have AC power on the airplane to power this bus.

When the fueling station door is open and ground power is available, processor unit power can come from the 28v dc hot battery bus. The battery supplies power to this bus. It is not necessary to put the battery switch in the ON position for the battery to power this bus.

When the fueling indication test switch is in the FUEL DOOR BYPASS SWITCH position, processor unit power comes from the 28v dc hot battery bus.



FUEL INDICATING - FUEL QUANTITY PROCESSOR UNIT - POWER

General

The fuel quantity processor unit (FQPU) has three signal conditioner circuit cards (SCCC) and a BITE display card (BDC). Fuel quantity shows on the common display system (CDS).

Signal Conditioner Circuit Cards

There is one SCCC for each fuel tank. Each SCCC has these functions:

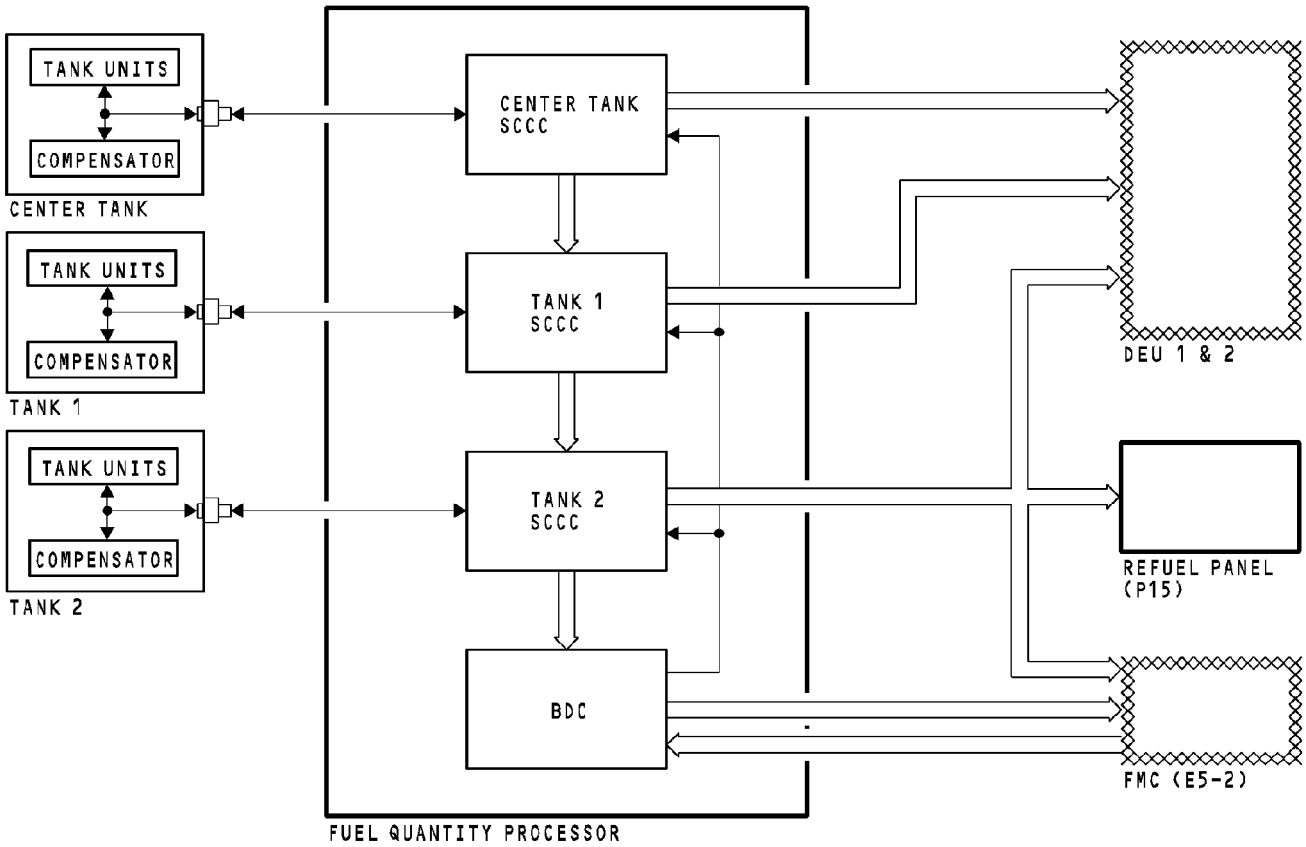
- Sends a low Z signal to the tank units and compensator
- Reads the high Z return signal from the tank units and compensators
- Calculates total fuel weight for its tank
- Changes analog signals to ARINC 429 signals
- Sends tank fuel weight data to the DEUs
- Sends real time fault data to the BDC.

The tank 2 SCCC also sends total fuel tank weight to the FMC.

BITE Display Card

The BDC has these functions:

- Keep fault data in non-volatile memory
- Send a signal to each SCCC to start a real time test for fault isolation
- Send and receives fault data with the flight management computer for fault isolation.



FUEL INDICATING - PROCESSOR - FUNCTIONAL DESCRIPTION

General

Individual fuel tank quantity shows on the CDS and the refuel panel.

Fuel quantity shows in pounds or kilograms.

Fuel Configuration Messages

Fuel configuration messages show on the CDS. These messages show a problem with the configuration of the fuel system.

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 PRE SB 737-31-1246 AND PRE SB 737-31-1295

The LOW message shows that either main tank 1 or main tank 2 has less than 2,000 lb (907 kg) of fuel. This message goes away when there is more than 2,500 lb (1133 kg) of fuel in that tank. The low fuel condition must exist for 30 seconds before the LOW message shows.

HAP 001-013, 015-026, 028-030 POST SB 737-31-1246 OR POST SB 737-31-1295

The LOW message shows that either main tank 1 or main tank 2 has less than 1,000 lb (454 kg) of fuel. This message goes away when there is more than 1,250 lb (567 kg) of fuel in that tank. The low fuel condition must exist for 30 seconds before the LOW message shows.

HAP ALL

The IMBAL message shows when there is a difference of 1,000 lb (453 kg) between main tank 1 and main tank 2. The message goes away when the difference between tanks is 200 lb (90 kg) or less. The IMBAL message only shows when the airplane is in the air. The IMBAL message does not show when the LOW message shows. The imbalance condition must exist for 60 seconds before the IMBAL message shows.

The CONFIG message shows when all of these conditions exist:

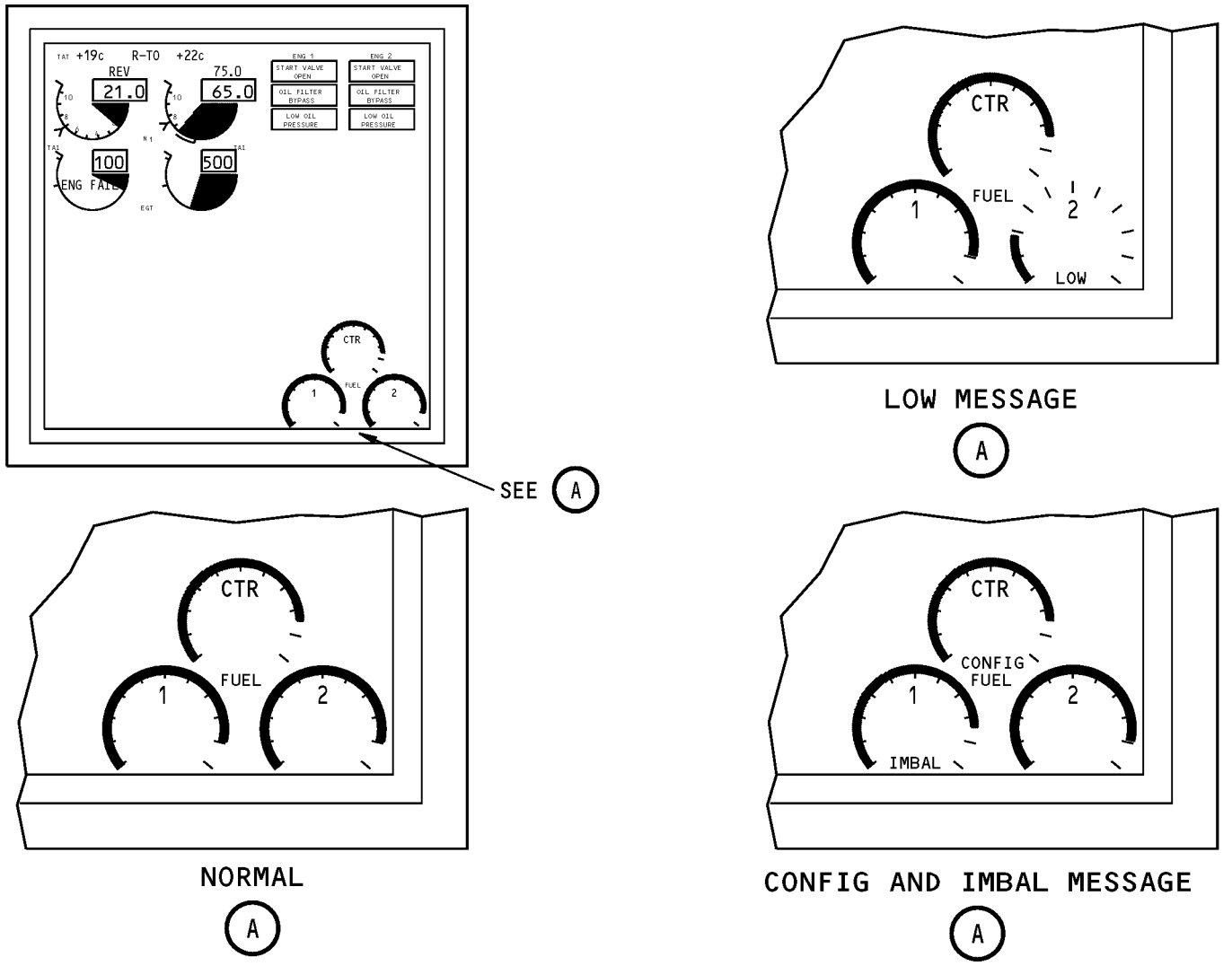
- 1,600 lb (725 kg) or more of fuel in the center tank
- Both center tank boost pumps show low pressure
- Either engine is in operation.

After the CONFIG message shows, it stays on until one or more of these conditions are true:

- 800 lb (360 kg) or less of fuel in the center tank
- A minimum of one center tank pump is producing high pressure
- The two engines are not in operation.

EFFECTIVITY

HAP ALL



NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS.

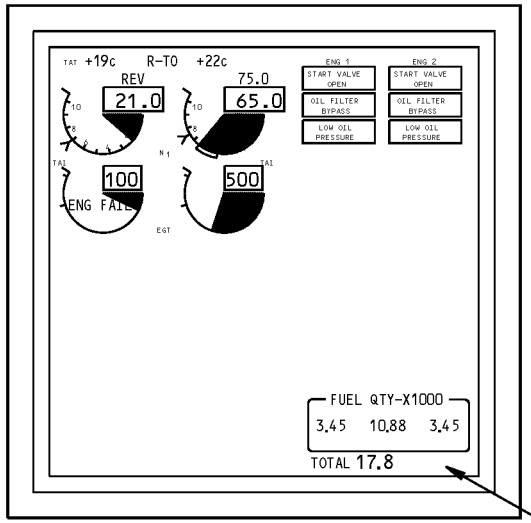
FUEL INDICATING - FUEL QUANTITY INDICATIONS

28-41-00-007

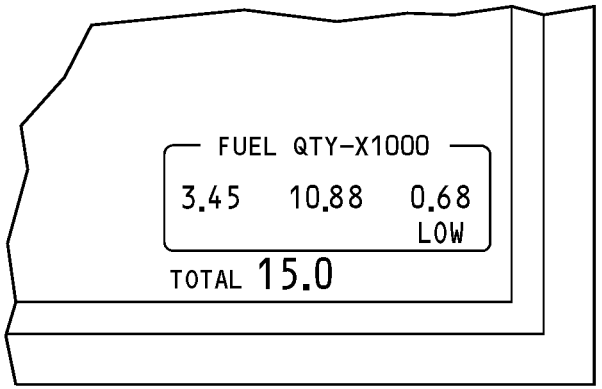
EFFECTIVITY

HAP 001-013, 015-026, 028-030 PRE SB 737-31-1246 AND PRE SB 737-31-1295

28-41-00

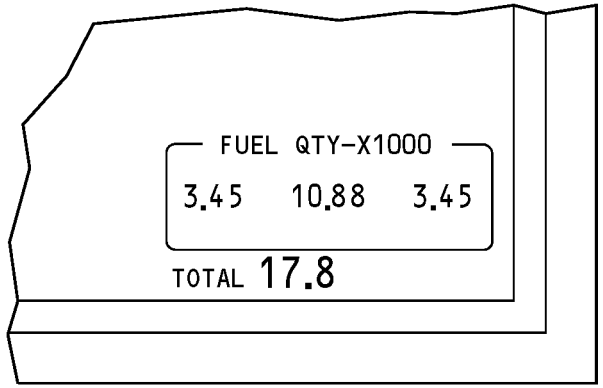


SEE (A)



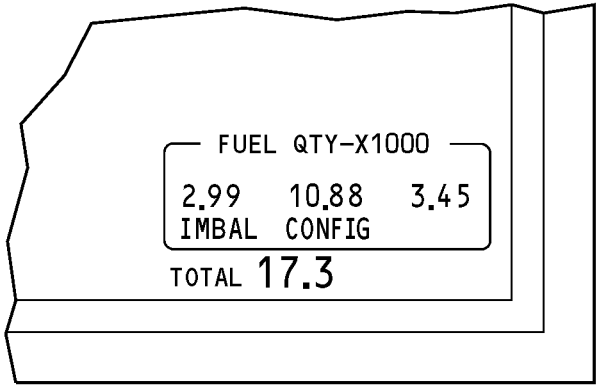
LOW MESSAGE

(A)



NORMAL

(A)



CONFIG AND IMBAL MESSAGE

(A)

NOTE: ALL INDICATIONS ARE DISPLAYED IN KILOGRAMS OR POUNDS.

FUEL INDICATING - FUEL QUANTITY INDICATIONS

EFFECTIVITY

HAP 031-054, 101-999; HAP 001-013, 015-026, 028-030 POST SB 737-31-1246 OR POST SB 737-31-1295

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FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST MAIN MENU PAGES

General

You use the control display units (CDU) to do troubleshooting on the fuel indicating system. The CDU shows real time and recorded system fault data. The fuel quantity processor monitors and stores the data that shows on the CDU. You can only use the CDU to see the FQIS BITE test pages when the airplane is on the ground.

Main Menu Pages

The FQIS BITE test main menu pages allow you to select other FQIS BITE test pages. These are the FQIS BITE test pages:

- Current status
- Inflight faults
- Ground test
- Ident/config
- Input monitoring
- Erase fault history.

Current Status Page

The current status page shows fuel indication system faults that currently exist on the airplane.

Inflight Faults Pages

The inflight faults pages show recorded fuel indication system faults from previous flight legs.

Ground Test Pages

The ground test pages allow you test the FQIS processor.

Ident/Config Pages

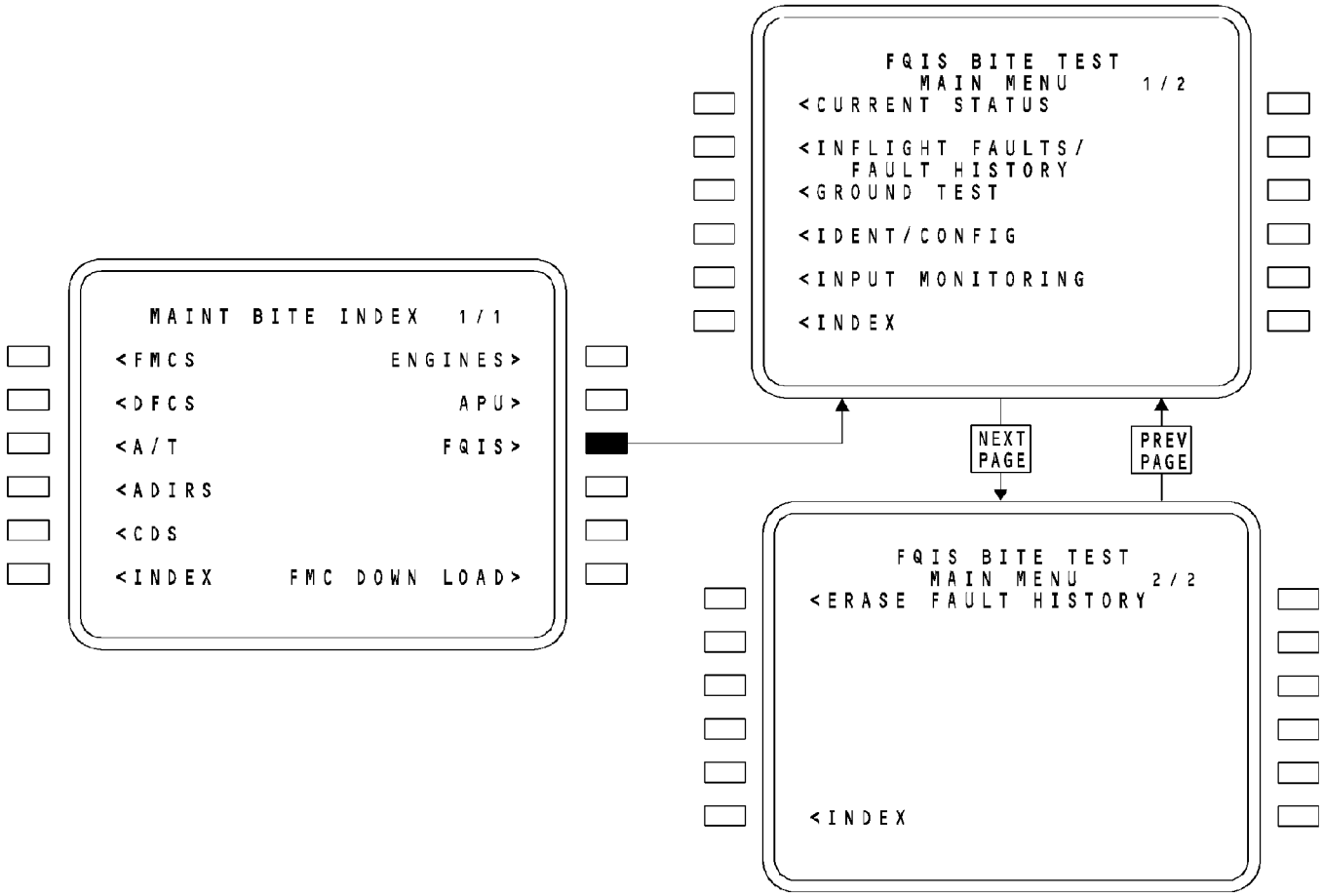
The ident/config pages show data from the configuration of the fuel quantity processor unit.

Input Monitoring Pages

The input monitoring pages show real time fuel quantity data for each fuel tank.

Erase Fault History Pages

The erase fault history pages allow you to erase recorded fault data from the fuel quantity processor memory.

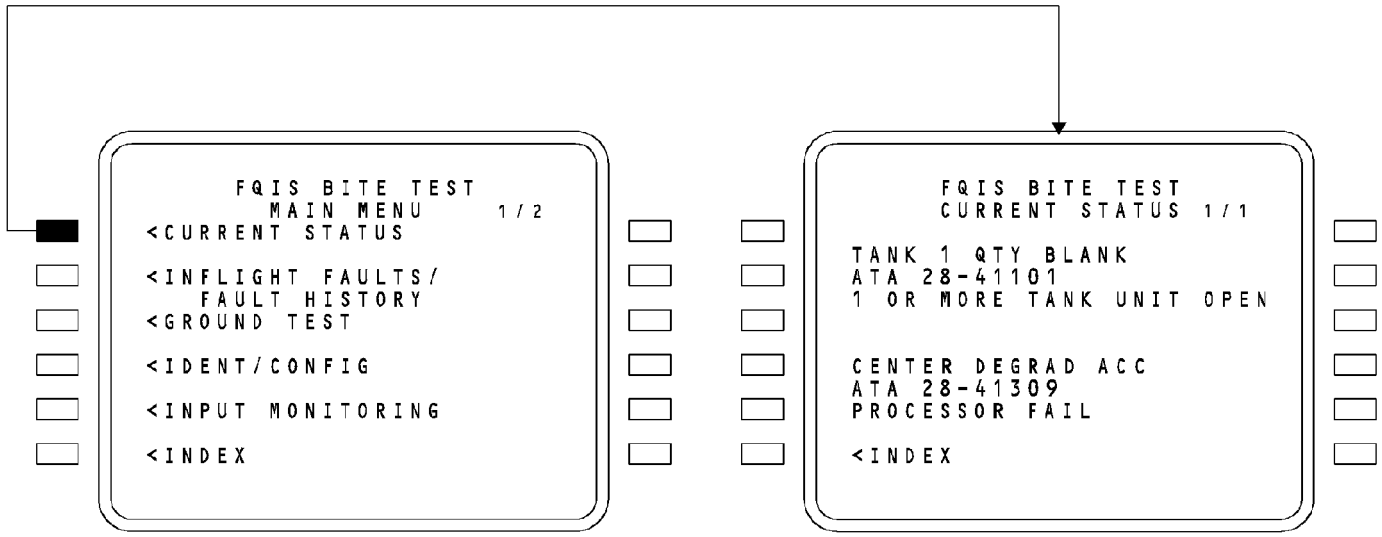


FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST MAIN MENU PAGES

Current Status Page

The current status page shows faults that are currently active. As the number of active faults increases, the number of current status pages increase. You can access all current status pages to see all current faults. A number shows which current status page you are on as well as the total number of current status pages you can access. For each fault, this data shows:

- Maintenance message
- Fault number
- Brief description of the fault.



FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST CURRENT STATUS PAGE

General

The inflight fault pages let you see fault data from the fuel quantity processor's memory. You can access inflight fault pages sorted by flight or sorted by leg.

Inflight Fault Page - Sorted By Fault

The inflight faults (sorted by fault) page shows faults, in order, from the most recent fault to the oldest fault. A number shows which inflight faults page you are on as well as the total number of inflight faults pages you can access. This fault data shows:

- Maintenance message
- Fault number
- Brief description of the fault
- Number of times the fault occurred.

Inflight Faults Menu Page - Sorted By Leg

The inflight faults (sorted by leg) menu page allows you to select specific flight legs in which a fault occurred. Only those flight legs, that had a fault, out of the past 25 flight legs, show.

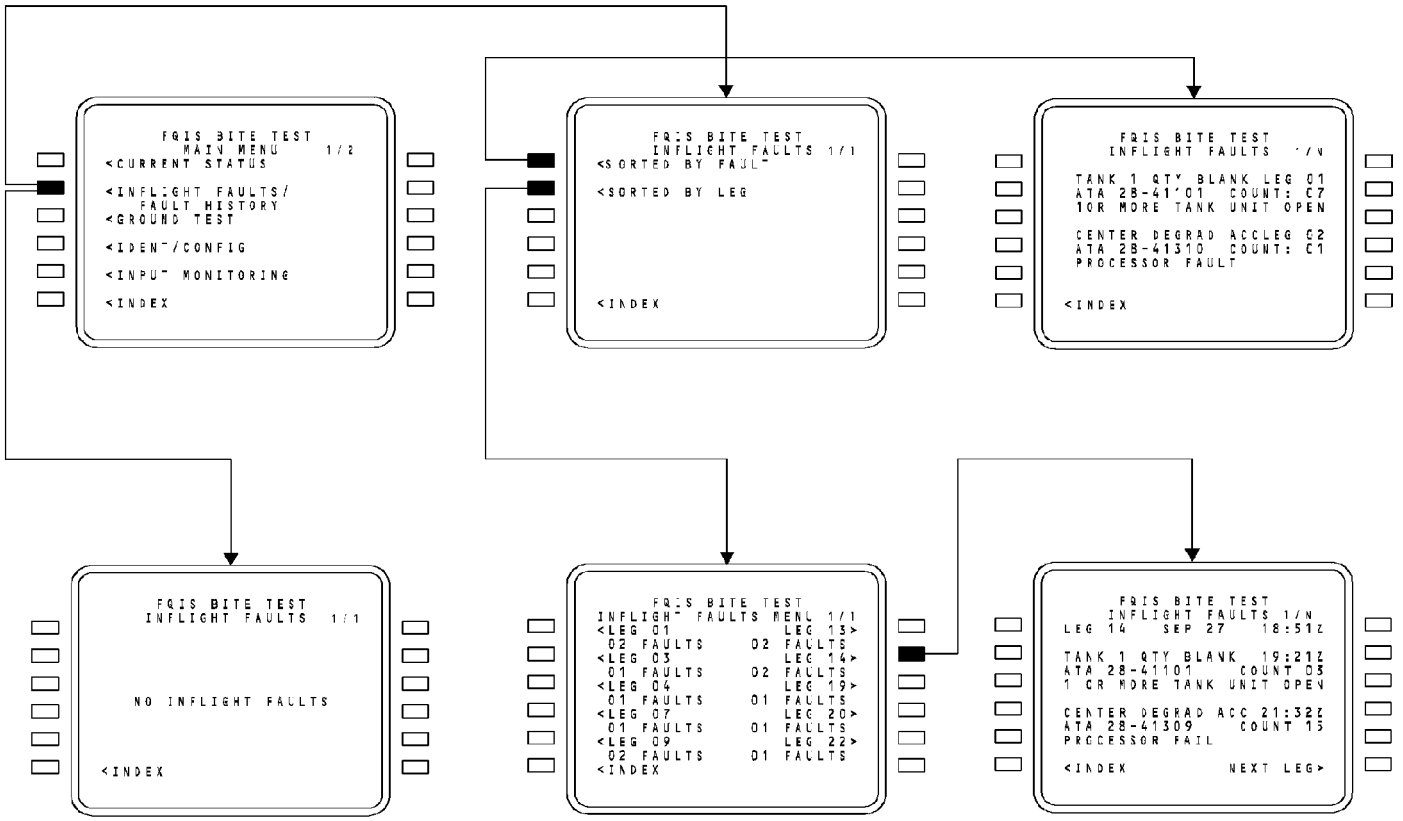
A new flight leg starts when the airplane's airspeed exceeds 100 knots. The flight leg ends the next time the airplane's airspeed decreases below 100 knots and then becomes more than 100 knots.

Inflight is that time from which the airplane's airspeed is more than 100 knots to the next time the airplane's airspeed decreases below 100 knots.

Inflight Faults Page - Sorted By Leg

The inflight faults (sorted by leg) page shows fault data for a specific flight leg. A number shows which inflight faults page you are on as well as the total number of inflight faults pages you can access. This fault data shows:

- Date the flight leg occurred
- Time the flight leg began
- Maintenance message
- Fault number
- Brief description of the fault
- Number of times the fault occurred during this flight leg
- Time of the first occurrence of the fault.

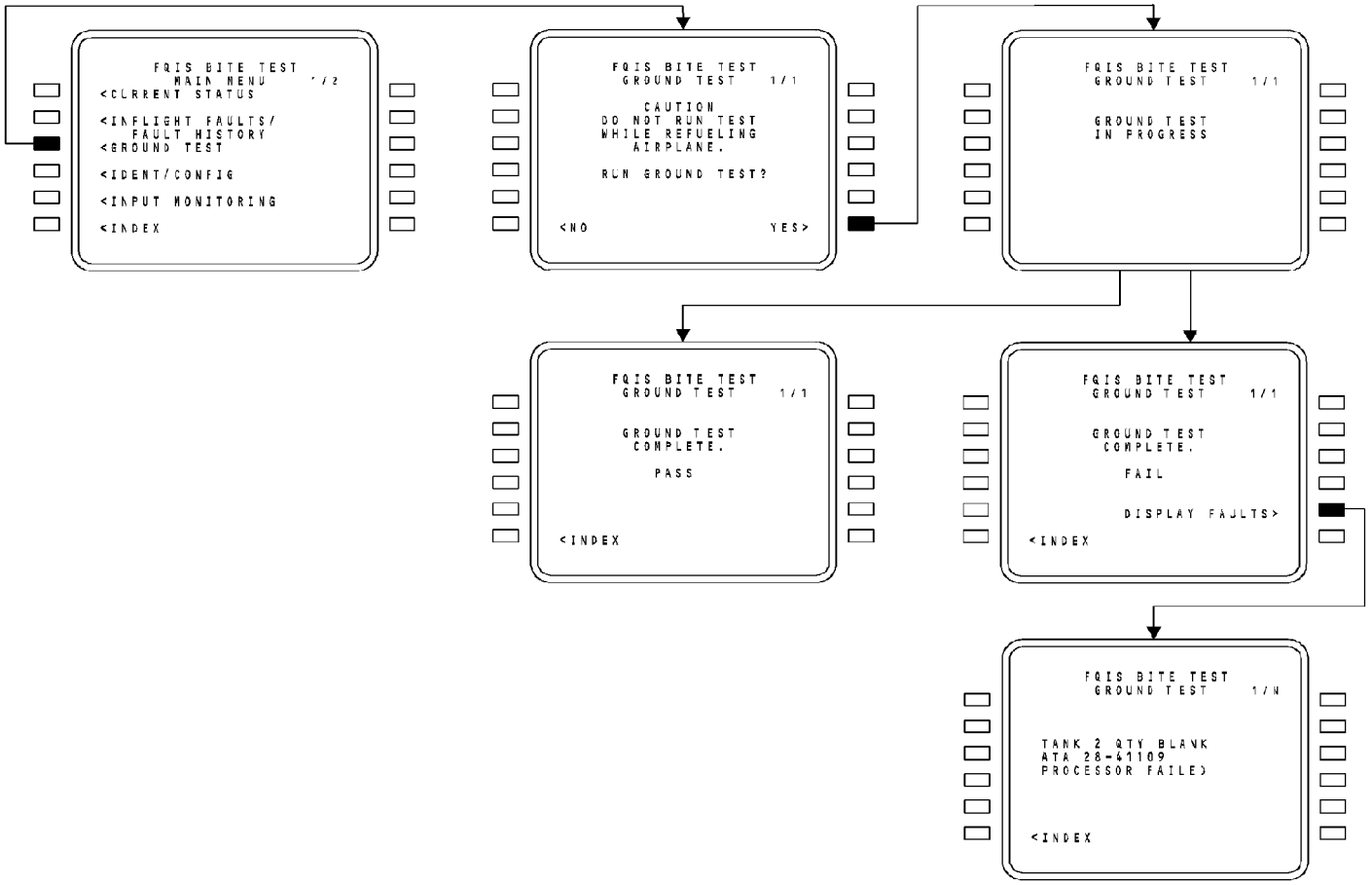


FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST INFLIGHT FAULT PAGES

Ground Test Pages

The ground test pages allow you to do a test of the FQIS processor. This test is similar to the power on self test.

Do not run the ground test while fueling the airplane. You might put the incorrect quantity of fuel on the airplane, as fuel quantity indication is part of the ground test.

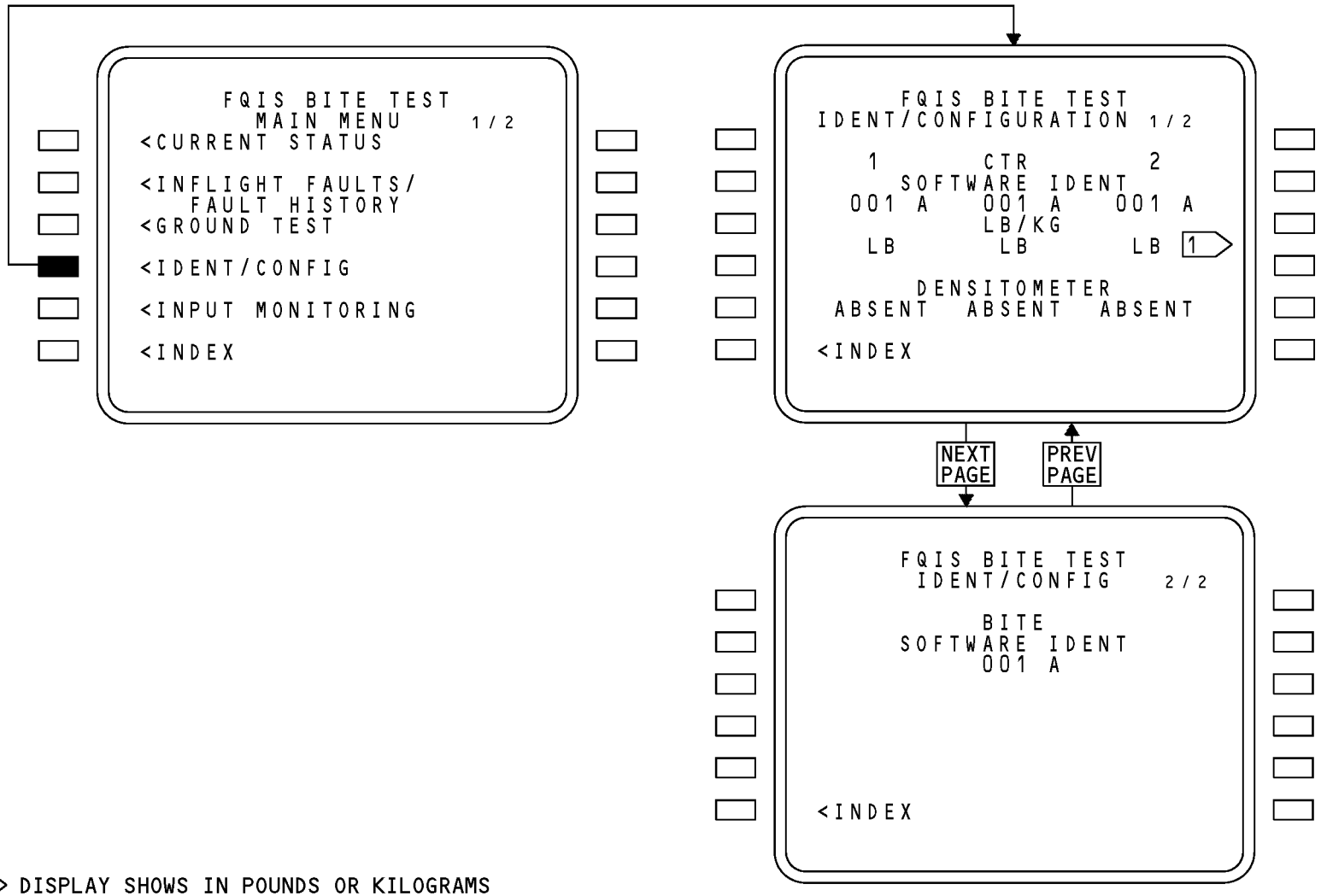


FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST GROUND TEST PAGES

Ident/Config Pages

The ident/config pages show data from the FQIS processor configuration. The ident/config pages show this data for each fuel tank:

- Individual fuel tank software version and revision number
- Fuel quantity display (pounds or kilograms)
- Densitometer installation
- BITE software version and revision number.



1 DISPLAY SHOWS IN POUNDS OR KILOGRAMS

FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST IDENT/CONFIG PAGES

28-41-00-012

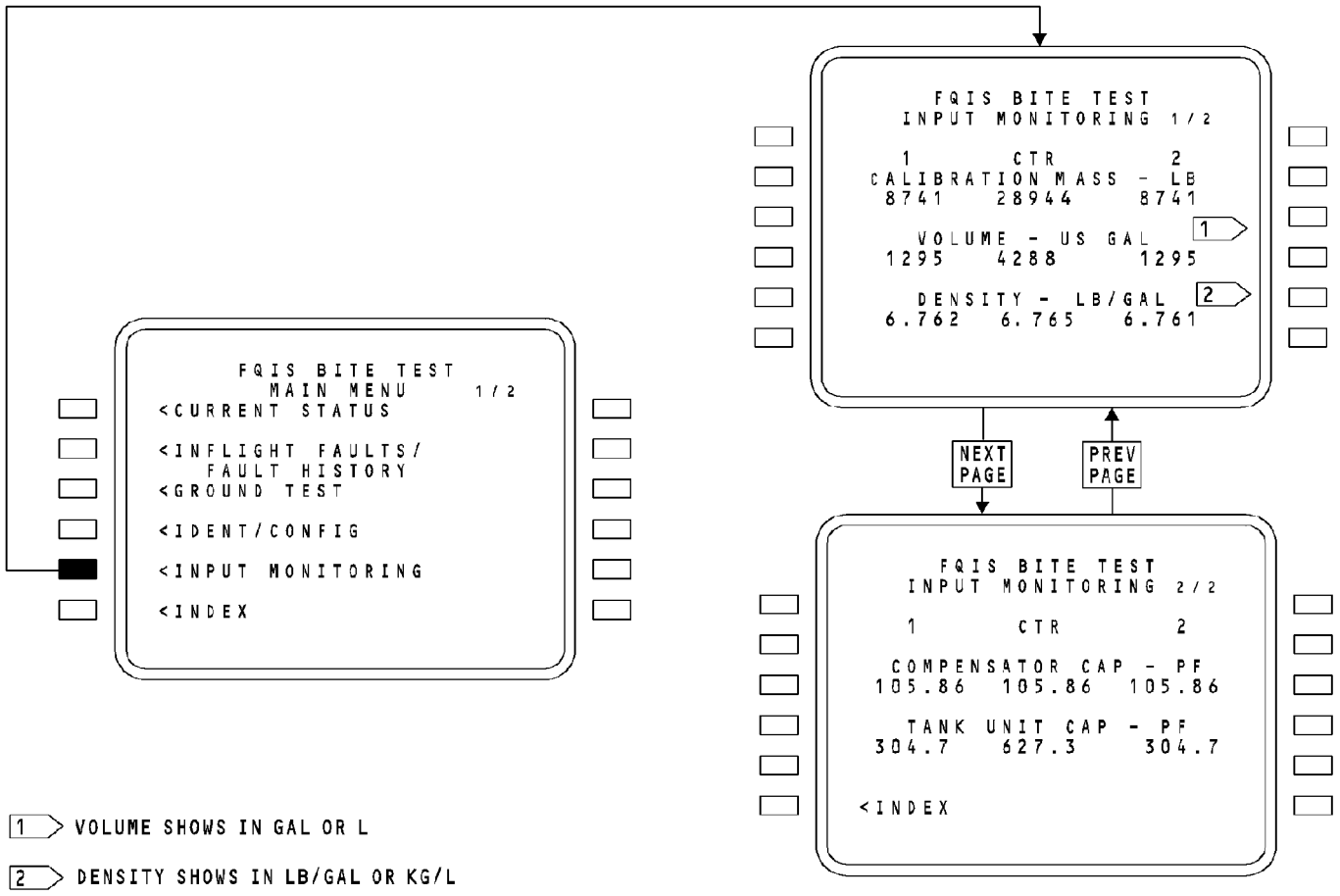
EFFECTIVITY
HAP ALL

28-41-00

Input Monitoring Pages

The input monitoring pages show fuel quantity data for each fuel tank. The input monitoring pages show this data:

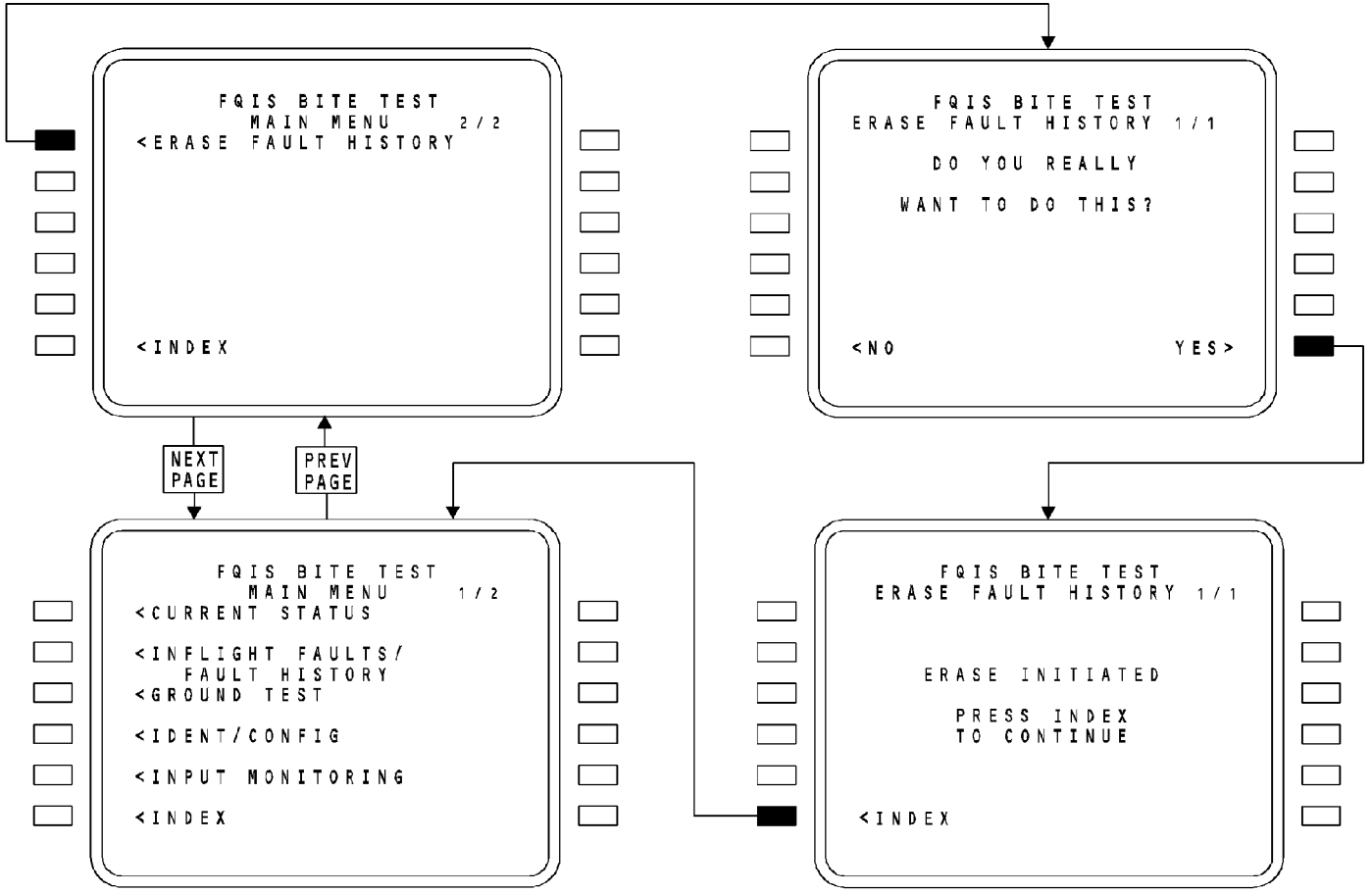
- Fuel mass
- Fuel volume
- Fuel density
- Compensator capacitance
- Total tank unit capacitance.



FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST INPUT MONITORING PAGES

Erase Fault History Pages

The erase fault history page allows you to erase recorded fault history data from the inflight faults pages.



FUEL INDICATING - TRAINING INFORMATION POINTS - FQIS BITE TEST ERASE FAULT HISTORY PAGES

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FUEL TEMPERATURE INDICATING SYSTEM

Purpose

The fuel temperature indicating system shows fuel temperature in main tank No. 1.

Location

The fuel temperature bulb is on the rear spar on main tank No. 1.

The fuel temperature indicator is on the fuel system panel (P5-2).

Components

The fuel temperature indicator is a resistance ratiometer instrument.

The fuel temperature bulb is a resistance unit. The resistance of the fuel temperature bulb changes with fuel temperature.

You do not have to defuel main tank No. 1 to remove the fuel temperature bulb.

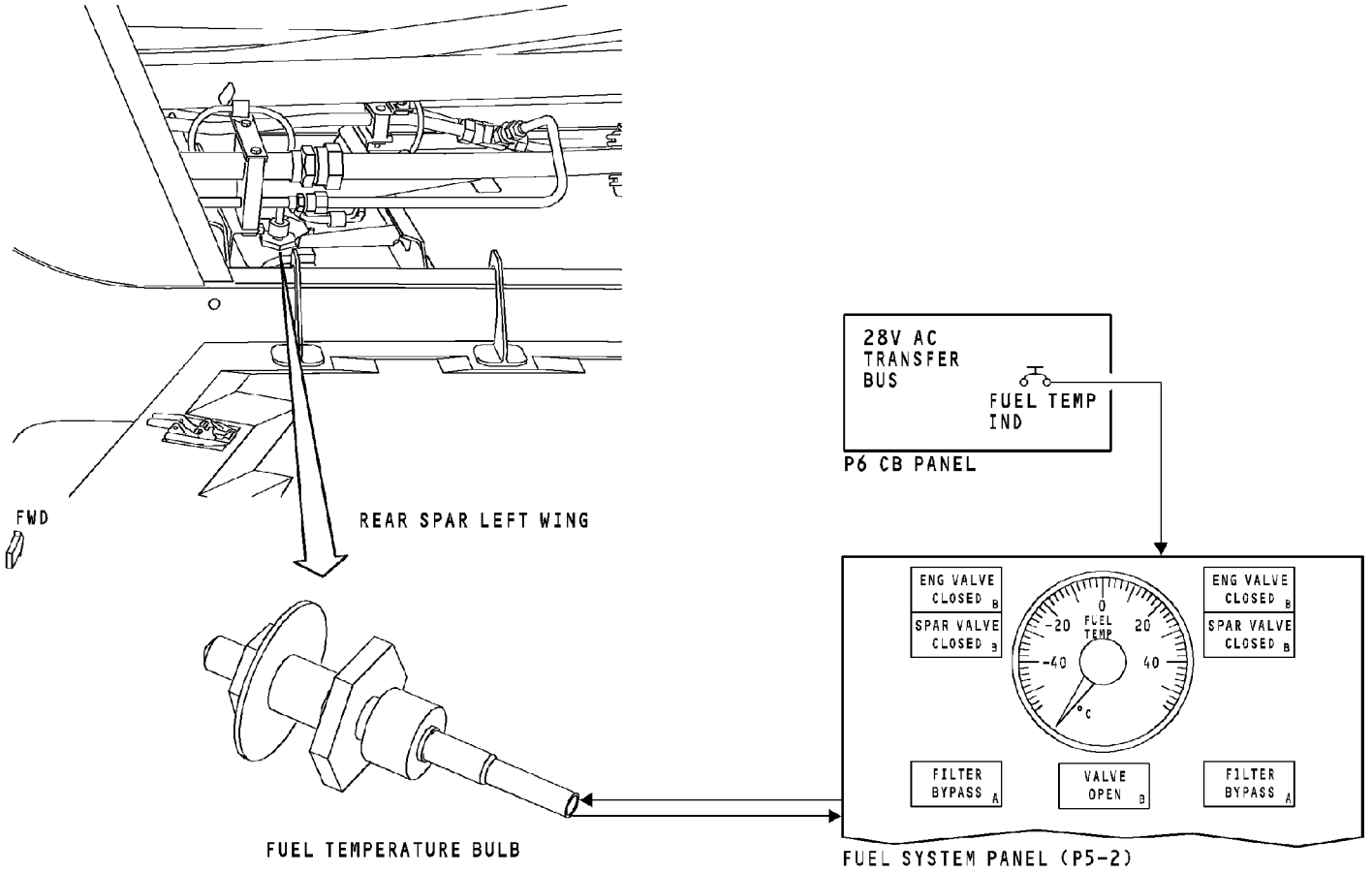
Operation

The fuel temperature indicator receives 28v ac power. The fuel temperature indicator sends a dc signal through the fuel temperature bulb. The fuel temperature bulb resistance changes this signal, before it goes back to the fuel temperature indicator.

Training Information Point

With no electrical power, the pointer goes off scale at the negative side of the indicator.

EFFECTIVITY
HAP ALL



FUEL TEMPERATURE INDICATING SYSTEM

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FUEL MEASURING STICK - INTRODUCTION

General

You manually measure fuel quantity with the fuel measuring sticks.

There are six measuring sticks in main tank 1 and main tank 2. Each fuel measuring stick is on a fuel tank access door. The fuel measuring sticks are numbered 3 through 8, from inboard to outboard.

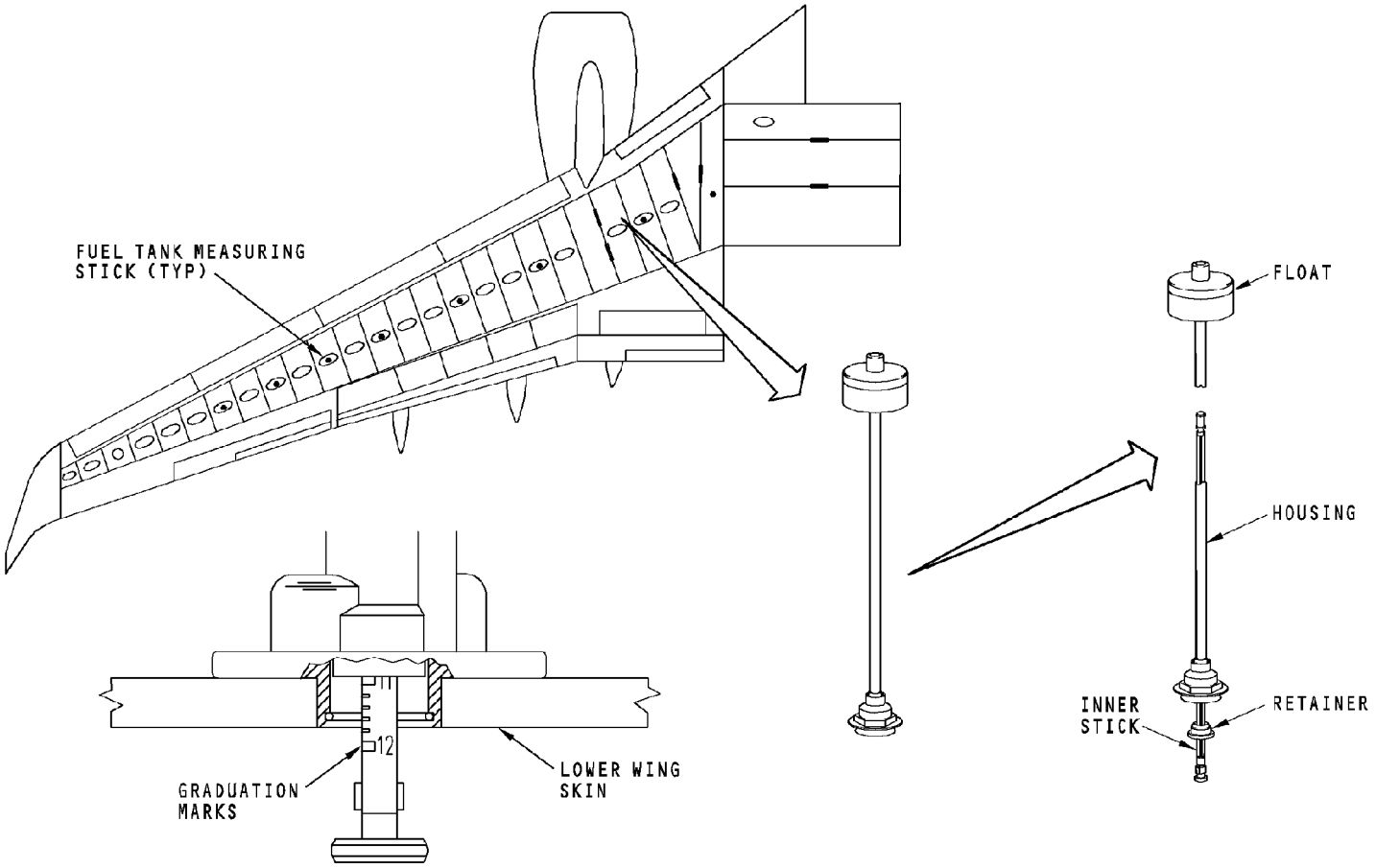
There are four fuel tank measuring sticks in the center tank. Two fuel tank measuring sticks are on fuel tank access panels and two are on the wing skin. The center tank fuel measuring sticks are numbered 1 and 2, from inboard to outboard.

The inner sticks have graduation marks that show fuel height in linear units.

There are two inclinometers, one for airplane pitch, one for airplane roll, in the main landing gear wheel well.

There is also plumb bob attachment and a leveling scale in the right main wheel well. You use the plumb bob and leveling scale to determine airplane pitch and roll.

You use fuel height the linear unit measurement and airplane pitch and roll to measure fuel quantity. Chapter 12 of the AMM Part II, has conversion tables that change linear units, fuel height, and airplane pitch and roll into fuel quantity.



FUEL MEASURING STICK - INTRODUCTION