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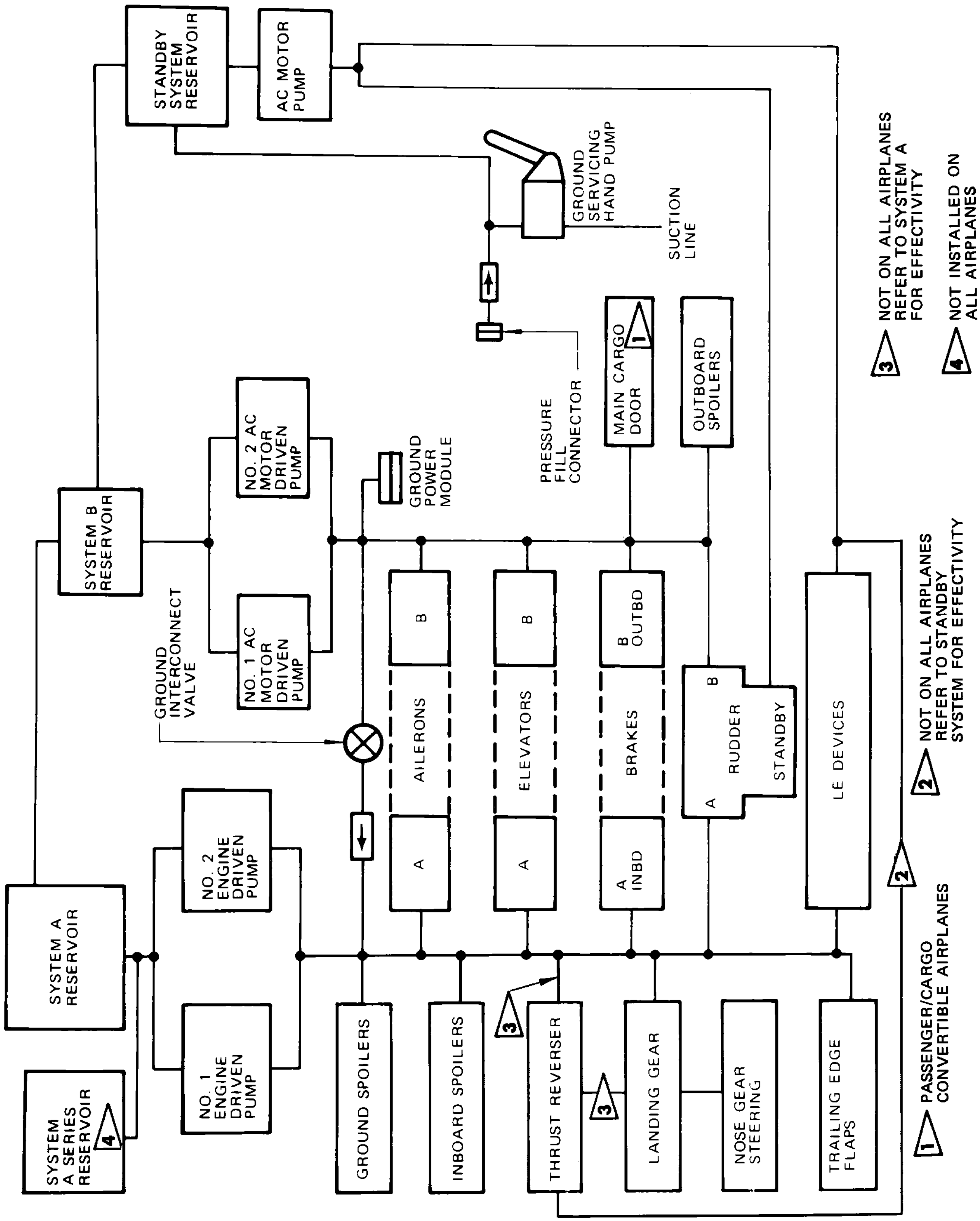
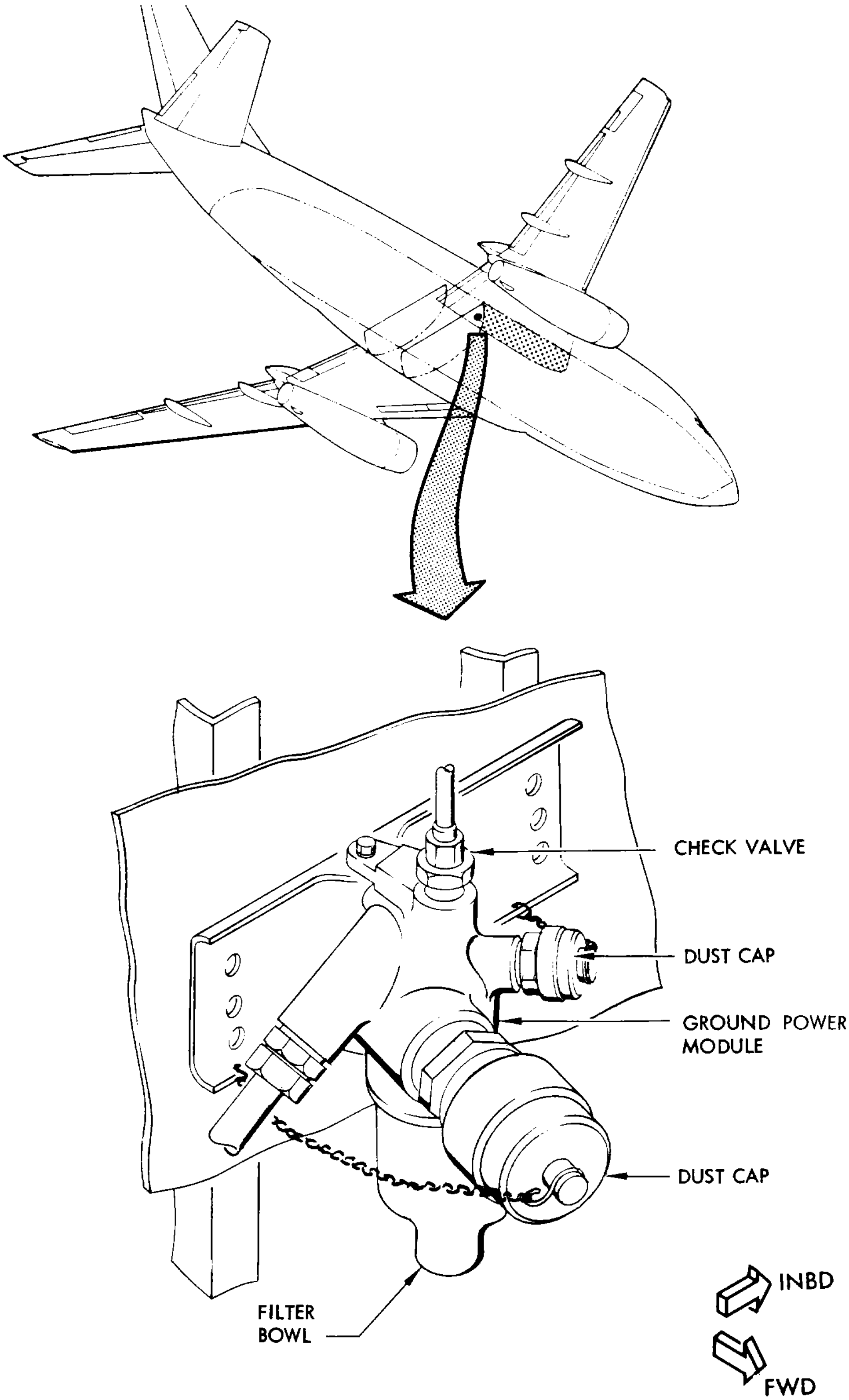
HYDRAULIC POWER - DESCRIPTION AND OPERATION

1. General
    A. Hydraulic fluid at 3000 psi pressure, is supplied to the hydraulically operated airplane systems by three separate and independent power systems (Fig. 1). The power systems are designated as Hydraulic System A, Hydraulic System B and Standby Hydraulic System. Hydraulic fluid is supplied from three pressurized reservoirs, one for each power system. System A receives pressure from two engine-driven pumps installed on engines No. 1 and 2. System B receives pressure from two electric motor-driven pumps installed in the wheel well area. The standby system receives pressure from one electric motor-driven pump installed on the keel beam between the wheel wells. The hydraulic power system reservoirs are serviced at the hydraulic fluid filling station in the right wheel well (AMM Chapter 12, Hydraulic Fluid Servicing).
    B. Hydraulic system A supplies hydraulic power to the ground spoilers, inboard flight spoilers, ailerons, leading edge flaps and slats, trailing edge flaps, landing gear, nose wheel steering, elevators, rudder, main wheel inboard brakes and thrust reverser. On some airplanes hydraulic power for the thrust reverser is supplied through the landing gear control valve (AMM 29-11-0, Hydraulic System A).
    C. Hydraulic system B supplies hydraulic power to the ailerons, elevators, outboard flight spoilers, rudder, and main wheel outboard brakes and on Passenger/Cargo Convertible Airplanes to the main cargo door hydraulic system (AMM 29-12-0, Hydraulic System B).
    D. The standby hydraulic system supplies power to the rudder, the leading edge flaps and slats and thrust reverser on some airplanes (AMM 29-21-0, Standby Hydraulic System).
    E. The hydraulic ground servicing system is provided to fill a hydraulic reservoir from one location (AMM 29-09-200, Hydraulic Ground Servicing System).
    F. The hydraulic reservoir pressurization system is provided to ensure a positive supply of hydraulic fluid to the pumps and to prevent foaming in the reservoirs (AMM 29-09-300, Hydraulic Reservoir Pressurization System).
    G. System A, system B and standby hydraulic system components located in the forward wheel well area are protected by three wire mesh shield panels. These shields are installed to protect hydraulic components, considered to be critical for minimum safe operating limits, against the effects of a tire bursting after takeoff and retraction of the landing gear. The shield panels are hinged and locked in place by mechanical latches and allow access to hydraulic components for maintenance.



Hydraulic Power Distribution
Figure 1

2. Modular Units
   A. Modular units are used in the hydraulic power systems to manifold hydraulic fluid to various easily replaceable cartridge type components. This allows component removal without disrupting tube connections. For a description of individual modular units, refer to the applicable hydraulic system.
3. Hydraulic Fluid
   A. BMS 3-11 is the general specification for the fluid that is circulated through all hydraulically operated systems. It is a fire-resistant base fluid to which suitable additives have been incorporated. All types of fluid under this specification are completely miscible with each other in any degree of mixture with no separation, precipitation or cloudiness. All airplane equipment using BMS 3-11 are identified by nameplates. Areas where hydraulic fluid may leak are designated as possible BMS 3-11 contamination areas. Special paint and protective finishes are used to prevent damage in these areas (AMM Chapter 51, Structures - Protective Finishes).
   B. BMS 3-11 has little or no effect on the metals used in aircraft construction up to 240°F. Only materials compatible with BMS 3-11 fluids, such as ethylene propylene, butyl rubber and teflon, are used for system seals, gaskets, O-rings, and hose linings.
   C. Skin irritation in the form of dry or cracked skin may result from prolonged or repeated contact with BMS 3-11. It also causes painful but temporary irritation to the eyes and may produce a burning sensation to other sensitive parts of the body. Inhalation of the fluid in the form of spray of fine mist may cause irritation of the upper respiratory tract. To minimize contact with BMS 3-11, wear gloves, goggles, face shields or safety glasses whenever there is danger of exposure. If exposure occurs, flush the eyes immediately with water and report to medical for observation.
4. Hydraulic Tubing and Flexible Hoses
   A. Hydraulic Tubing
      (1) The hydraulic pressure lines in the airplane hydraulic systems subject to pressures of 1500 psi and above are made of corrosion resistant seamless steel tubing. It also is used in class I fire zones and on the landing gear structure regardless of pressure. All other lines are made of aluminum alloy seamless tubing. Tubing of 3/4-inch outside diameter and under uses flareless type fittings. For pressures of 1500 psi and above steel fittings are used. Tubing above 3/4-inch outside diameter uses flared type fittings. On this tubing size, aluminum fittings are used, except in class I fire zones and on the landing gear structure where steel fittings are used. For further information, refer to AMM 20-10-51, Flareless Tubing, AMM 20-10-52, Flexible Hose and AMM 20-50-11, Standard Torque Values.



Hydraulic Ground Power Modular Unit
Figure 2

B. Flexible Hoses
  (1) Flexible hose used in the hydraulic systems are teflon high and medium pressure type. High pressure hoses are used in the pressure lines. Medium pressure hoses are used in supply lines and return lines.

5. Hydraulic System Check Valves
  A. Make sure that valves are installed in the hydraulic power systems to prevent -ERROR- flow of fluid, direct fluid flow, prevent fluid loss, and to isolate hydraulically operated subsystems. Flow direction through a valve is shown by an arrow on the valve body. Normally no maintenance other than removal and installation is required of a check valve.

6. Hydraulic Ground Power Modular Unit
  A. The hydraulic ground power modular unit (Fig. 2) is located on the forward side of the forward bulkhead of the right wheel well and is accessible through an access panel on the right side of the airplane. The modular unit is used to connect an external hydraulic power source to pressurize systems A and B. The module consists of a pressure connection, return connection, and a filter containing a noncleanable element.

HYDRAULIC POWER - MAINTENANCE PRACTICES

1. General
   A. The following procedure is used to change the fluid in the hydraulic system. If severe contamination is present in the system and flushing is required before refilling, refer to the Maintenance Practices section of the applicable subsystem.
   B. Whenever hydraulic system components are disassembled, cleaned, overhauled or installed, flushing with BMS 3-11 hydraulic fluid only is recommended to avoid fluid contamination within the operational system by incompatible materials.

      WARNING: FIRE-RESISTANT HYDRAULIC FLUIDS CONFORMING TO BMS 3-11 MAY CAUSE SKIN IRRITATION. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. IN CASE OF EYE CONTACT, FLUSH EYES WITH WATER AND OBTAIN MEDICAL AID. IN CASE OF INGESTION, OBTAIN MEDICAL AID.

   C. To change the hydraulic fluid in the system, a ground test bench or the system B pumps can be used to introduce the new fluid and purge the system. To ensure satisfactory performance, the new fluid should be checked after thorough mixing has taken place by operating all systems, preferably after flight (Ref 29-09-111, Inspection/Check).
   D. Should fluid spill on airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Airworthiness Limitation Precautions
   A. General
      (1) Critical Design Configuration Control Limitations (CDCCLs)
         (a) All occurrences of CDCCLs found in this chapter of the AMM are identified by this note after each applicable CDCCL design feature:
            1) NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

(b) Design features that are CDCCLs are defined and controlled by Special Federal Aviation Regulation (SFAR) 88, and can be found in Airworthiness Limitations (AWL) and Certification Maintenance Requirements (CMR) document, D6-38278-CMR. CDCCLs are a means of identifying certain design configuration features intended to preclude a fuel tank ignition source for the operational life of the airplane. CDCCLs are mandatory and cannot be changed or deleted without the approval of the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency. A critical fuel tank ignition source prevention feature may exist in the fuel system and its related installation or in systems that, if a failure condition were to develop, could interact with the fuel system in such a way that an unsafe condition would develop without this limitation. Strict adherence to configuration, methods, techniques, and practices as prescribed is required to ensure the CDCCL is complied with. Any use of parts, methods, techniques or practices not contained in the applicable CDCCL must be approved by the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency.

(2) Airworthiness Limitation Instructions (ALIs)

(a) All occurrences of fuel tank system ALIs found in this chapter of the AMM are identified by this step after the General section in the applicable ALI inspection task:

1) ALI - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on airworthiness limitation instructions (ALIs).

(b) Inspection tasks that are ALIs are defined and controlled by Special Federal Aviation Regulation (SFAR) 88, and can be found in Airworthiness Limitations (AWL) and Certification Maintenance Requirements (CMR) document, D6-38278-CMR. These ALIs identify inspection tasks related to fuel tank ignition source prevention which must be done to maintain the design level of safety for the operational life of the airplane. These ALIs are mandatory and cannot be changed or deleted without the approval of the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency. Strict adherence to methods, techniques and practices as prescribed is required to ensure the ALI is complied with. Any use of methods, techniques or practices not contained in these ALIs must be approved by the FAA office that is responsible for the airplane model Type Certificate, or applicable regulatory agency.

B. Access

(1) Location Zones

500 Left Wing
600 Right Wing

C. Critical Design Configuration Control Limitations (CDCCLs)
(1) Make sure you follow the procedures for items identified as CDCCLs.

WARNING: OBEY THE MANUFACTURER'S PROCEDURES WHEN YOU DO ANY MAINTENANCE THAT MAY AFFECT A CDCCL. IF YOU DO NOT FOLLOW THE PROCEDURES, IT CAN INCREASE THE THE RISK OF A FUEL TANK IGNITION SOURCE.

D. Airworthiness Limitation Instructions (ALIs)
(1) Make sure you follow the procedures for tasks identified as ALIs.

WARNING: OBEY THE MANUFACTURER'S PROCEDURES WHEN YOU DO ANY MAINTENANCE THAT MAY AFFECT AN ALI. IF YOU DO NOT FOLLOW THE PROCEDURES, IT CAN INCREASE THE RISK OF A FUEL TANK IGNITION SOURCE.

3. Equipment and Materials
A. Approximately 100 gallons of new BMS 3-11 Hydraulic Fluid
B. Hydraulic ground test bench equipped with a minimum of 5-15 (3-15 preferred) micron-rated filter between ground bench and airplane connection (use of airplane hydraulic system B pumps optional)
C. Waste containers of approximately 100-gallon capacity
4. Replace Hydraulic System Fluid
A. Drain and purge A and B systems.
(1) Depressurize system A (Ref 29-11-0).
(2) Depressurize system B (Ref 29-12-0).
(3) Depressurize all hydraulic system reservoirs (Ref 29-09-300).
(4) Drain A, B, and standby reservoirs
(5) Disconnect and drain suction, pressure, and case return lines at both engine-driven hydraulic pumps by disconnecting the hoses at pumps. Plug or cap open ports and lines.
(6) Jack airplane for retraction (Ref Chapter 7, Jacking Airplane).
(7) Using one of the following steps, provide fluid flow path to the waste container.
(a) Disconnect return hoses from system A and B reservoirs. Lengthen as necessary and route hoses to empty containers.

(b) Disconnect a pump supply hose from a system B pump and lengthen this hose as necessary to reach the waste container.

(c) Disconnect a system B pump supply hose at the disconnect on the reservoir and connect a suitable length hose from disconnect on reservoir to waste container.

(8) Connect hydraulic ground test bench to No. 1 engine driven hydraulic pump pressure line. Operate any flight control until approximately 2 gallons of fluid have been flushed into container.

(9) Connect test bench to No. 1 engine pump case drain line. Operate test bench until approximately 2 gallons of fluid have been flushed into container.

(10) Repeat steps (8) and (9) for No. 2 engine pump lines.

(11) Using one of the following steps, provide hydraulic fluid source.

(a) To connect ground test bench pressure source, disconnect pressure hose from No. 1 or 2 system B pump. Lengthen as necessary and route to outlet of ground test bench. Route inlet of ground test bench into barrel of new oil.

(b) To use system B pumps as pressure source, disconnect both system B pump supply hoses at the reservoir disconnects and then lengthen hoses as required to reach into the barrel of new oil.

CAUTION: DO NOT OPERATE SYSTEM B PUMPS MORE THAN 2 MINUTES UNLESS THE NO. 2 FUEL TANK CONTAINS AT LEAST 250 GALLONS OF FUEL. IF PUMPS ARE OPERATED 2 MINUTES WITHOUT FUEL IN TANK, ALLOW RESERVOIR TO RETURN TO AMBIENT TEMPERATURE BEFORE RESUMING TEST.

(12) If test bench is used as fluid source, flush system B pump pressure and case drain lines by connecting test bench to each line and operating until approximately 2 gallons of fluid has been flushed from each line into container.

(13) Provide electrical power and check that the following circuit breakers are closed:

(a) All flight control circuit breakers

(b) Hydraulic System B circuit breakers (if system B pumps are being used as pressure source)
(c) Standby System circuit breakers

(14) On the forward overhead panel, check that FLT CONTROL A and B switches are in the OFF position.
(15) Open ground interconnect valve circuit breaker, then manually open valve. Energize fluid source. Perform the following operations in sequence to assure complete changing of fluid.

WARNING: ENSURE THAT ALL PERSONNEL AND MAINTENANCE EQUIPMENT ARE CLEAR OF ALL FLIGHT CONTROLS BEFORE OPERATION TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO THE AIRPLANE.

(16) Retract and extend main and nose gear through two full cycles (Ref Chapter 32, Landing Gear).
(17) Shut off fluid source.
(18) Remove airplane from jacks (Ref Chapter 7, Jacking Airplane).
(19) Turn on fluid source.
(20) Cycle nose wheel steering through two full cycles. Refer to Chapter 32, Landing Gear.
(21) Position FLT CONTROL A and B and SPOILER A and B switches to ON.
(22) Operate elevators through seven full stroke cycles from DOWN to UP to DOWN. Return control column to normal position.
(23) Operate rudders through two full stroke cycles from LEFT to RIGHT to LEFT. Return rudder pedal to normal.
(24) Operate trailing edge flaps twice from 0 to 10 to 0 degrees. This will also operate leading edge devices. Return flap control lever to normal.
(25) Operate flight spoilers and ailerons by turning the control wheel through five full stroke cycles from LEFT to RIGHT to LEFT. Return control wheel to normal and turn OFF A and B SPOILER and FLT CONTROL switches.
(26) Operate thrust reverser through three full cycles. Refer to Chapter 78, Thrust Reverser System.
(27) Shut off fluid source. Discharge brake accumulator by pumping brake pedals full stroke. Turn ON fluid source to recharge the brake accumulator. Shut off fluid source. Discharge brake accumulator by pumping brake pedals full stroke.

(28) Turn on fluid source. Operate the ground spoilers through two full stroke cycles from DOWN to UP to DOWN.
(29) With fluid source operating, open bleed valves on each brake and allow at least 2 quarts of fluid to bleed from each brake.
(30) Shut off fluid source.
(31) Disconnect fluid source and reconnect lines.

B. Drain and purge standby hydraulic system.
(1) Disconnect standby return hose from standby reservoir. Plug port in reservoir. Lengthen return hose as required and route to an empty container.
(2) Fill standby reservoir through normal fill system with new fluid. Refer to 12-12-0, Hydraulic Fluid Servicing.
(3) Pressurize standby hydraulic system. Operate standby rudder through two full stroke cycles from LEFT to RIGHT to LEFT. Return rudder pedal to normal position. Turn OFF standby pump.
(4) Reconnect standby return hose to reservoir.

C. After all hydraulic fluid has been replaced, remove and install new filters at the following location:
(1) System A hydraulic pump case drain filters. Refer to 29-11-41.
(2) System A hydraulic pressure filter. Refer to 29-11-71.
(3) System A hydraulic return filter. Refer to 29-11-111.
(4) System B hydraulic pressure filter. Refer to 29-12-41.
(5) System B hydraulic pump case drain filter. Refer to 29-12-71.
(6) System B hydraulic return filter. Refer to 29-12-81.
(7) Standby hydraulic system case drain filter. Refer to 29-21-31.
(8) Standby hydraulic system pressure filter. Refer to 29-21-51.

5. <u>Return System to Normal</u>

A. Service hydraulic reservoirs. Refer to 12-12-0, Hydraulic Fluid Servicing.
B. Pressurize hydraulic reservoirs. Refer to 29-11-0.
C. Pressurize system B with ground interconnect valve open. This will also pressurize system A. Refer to 29-11-0, Hydraulic System A - Maintenance Practices.
D. Check for leaks on all connections.
E. Depressurize A and B systems.
F. Position GROUND INTERCONNECT valve switch to CLOSE.
G. Pressurize standby system and check for leaks.
H. Return standby system to normal.
I. Determine if there is any further need for electrical power on airplane. If not, remove electrical power.

HYDRAULIC POWER - INSPECTION/CHECK

1. Check Hydraulic System
   A. General
      (1) The following external and internal hydraulic leakage checks are provided to aid the operator in determining more readily the general condition of the hydraulic system and its components. For external leakage, see par. 1.B., for systems A and B internal leakage see par. 1.C. and for standby system internal leakage.
   B. Hydraulic System External Leakage Check
      (1) General
         (a) The following leakage check chart provides recommended allowable external leakage rates for the various possible leakage sources. These rates have been determined to be what is tolerable without adversely affecting component or system operation. The operator should evaluate each of the leakage rates with respect to his operation and establish a maximum accumulative leakage based on his average flight duration.

            NOTE: Fluid level may be 2 gallons below full level without impairing hydraulic systems operation.

         (b) To assure a proper evaluation, the following should be considered when checking various components for leakage.
            1) The seal obtained at B-nut tube connections is obtained on metal-to-metal surfaces. Should an initially sealed joint subsequently develop a leak which cannot be stopped by tightening the B-nut to the specified torque, the joint is probably defective and should be repaired. No visible evidence of leakage is allowable for either normal or dispatch operations.
            2) When possible, actuate components through several full cycles prior to performing a leakage check.
            3) Dynamic seals should also be checked for leakage while in a static condition since pistons, slide valves and swivel joints move only during a short time interval. Also many components cannot be closely monitored while operating.
            4) Experience indicates that some static seal leakage has been due to housing cracks. Such leakage increases with increasing pressure. Therefore, each such leakage problem should be considered individually by the operator for the amount of leakage allowable.
      (2) Check hydraulic system external leakage.
         (a) Where fluid is present, wipe the surfaces clean.
         (b) Apply hydraulic system pressure and operate the unit if possible.

<table>
<tr><td>Seal</td><td>Allowable Leakage For Normal Operations (See Note)</td><td>Allowable Leakage For Dispatch Operation To Avoid Delay (See Note)</td></tr>
<tr><td>1. Tube Connections</td><td>No visible evidence of leakage</td><td>No visible evidence of leakage</td></tr>
<tr><td>2. Static Seals</td><td>1 drop per 10 minutes</td><td>Determined by operator</td></tr>
<tr><td>3. Dynamic Seals Engine-Driven Pump</td><td></td><td></td></tr>
<tr><td>(1) Inline Pumps (ABEX/VICKERS)</td><td>30 drops per minute</td><td>60 drops per minute</td></tr>
<tr><td>(2) Yoke Type or Bent Axis (VICKERS)</td><td>7 drops per minute</td><td>10 drops per minute Correct at first opportunity</td></tr>
<tr><td>b. Electric Motor-Driven Pumps</td><td></td><td></td></tr>
<tr><td>Task/ABEX</td><td>10 drops per minute</td><td>20 drops per minute</td></tr>
<tr><td>Vickers</td><td>20 drops per minute</td><td>30 drops per minute Correct at first opportunity</td></tr>
<tr><td rowspan="2">c. Other dynamic seals under static conditions of full or partial pressure</td><td>1 drop per 10 minutes - no repair required</td><td rowspan="2">1 drop per minute up to 30 drops per minute Correct at first opportunity</td></tr>
<tr><td>1 drop per 10 minutes to 1 drop per minute - correct at first opportunity</td></tr>
<tr><td>d. Other dynamic seals under dynamic conditions of full or partial pressure</td><td>1 drop per cycle</td><td>1 drop per cycle</td></tr>
<tr><td>4. Landing gear brake assemblies</td><td>No visible leakage</td><td>See Main Gear Brake (AMM 32-41-41/601)</td></tr>
<tr><td colspan="3"><u>NOTE</u>: Leakage rates are based on there being approximately 20 drops per cubic centimeter and/or 75,600 drops per gallon.</td></tr>
</table>

C. Hydraulic Systems A and B Internal Leakage Checks

(1) General

(a) This check is to be used as an aid in determining the general internal condition of the hydraulic system, or as an aid in troubleshooting the system.

(b) The general condition of the system is determined by comparing measured internal leakage rates to the recommended inservice leakage limits provided for the various subsystems. If an inservice leakage limit is exceeded the component or components within the subsystem should be replaced to bring the leakage within limits (AMM Chapter 27 or 32).

(c) The leakage rates for the subsystems are determined by measuring changes in flow rates during different operating conditions while hydraulic power is applied. Three methods for measuring the flow rates are available: the ammeter method, flowmeter method and the amp-clamp and multimeter method.

1) The ammeter method uses an ammeter connected in series with one of the hydraulic system B motor-driven pumps. The leakage rates are determined by measuring the current and current changes of the system B pump. These current changes are then related to a pump characteristics graph relating pump current to pump fluid flow (Fig. 603). Using this method of measuring flow, two men can perform the check in approximately 1/2 hour.

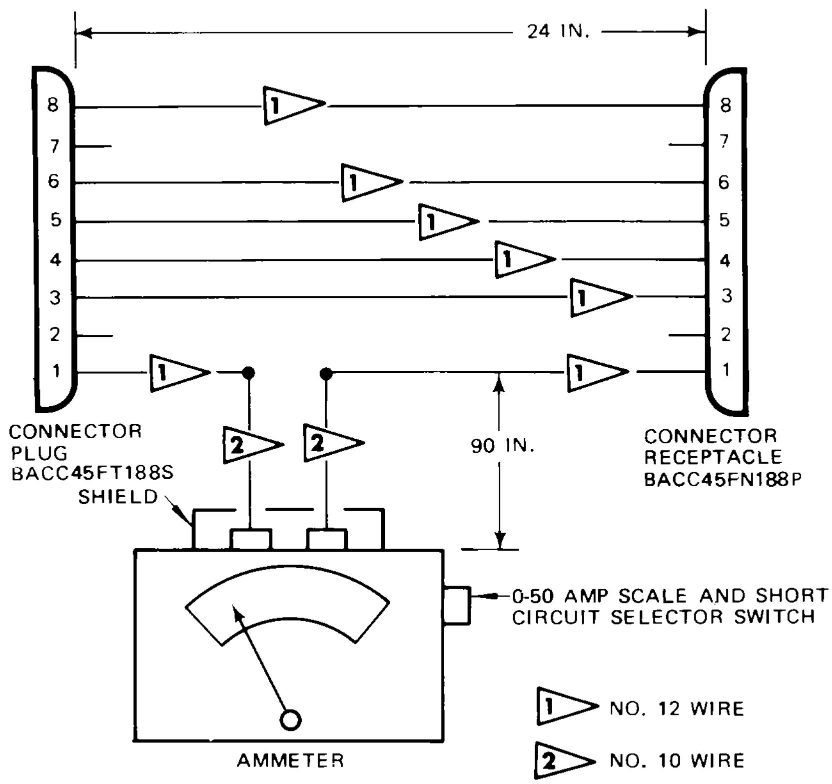
2) The flowmeter method uses a flowmeter connected to the pressure side of a hydraulic service cart providing the source of hydraulic power. As the system configuration is changed the flow rates can be read directly and recorded. Using this method of measuring flow, two men can perform the check in approximately 2 hours.

3) The amp-clamp and multimeter method is used by placing the amp-clamp adapter around a selected wire at one of the system B pump relays in the P6-4 panel and connecting to a digital multimeter. The current changes are recorded and are then related to the pump characteristics graph (Fig. 603). One man can perform this procedure from the control cabin.

(d) When troubleshooting, it is not necessary to perform a check of both systems. Only the system (A or B) where the trouble is present needs to be checked. By feeling for hot tubing or actuators or listening for fluid leakage, faulty components can be isolated within a subsystem which has excessive internal leakage. Whenever possible, standard tools for detecting heat, vibration or sound should be used. Before checking for internal leakage by these methods, cycle the components to be checked to make sure that personnel will not be injured or equipment damaged when the component moves.

(e) The internal leakage check is divided into four separate procedures.
   1) Procedure 1 determines total systems A and B internal leakage and the need for further testing.
   2) Procedure 2 provides an initial brief check to determine basic and null leakage of major flight control systems.
   3) Procedure 3 provides an entire leakage check procedure. Portions of the check may be accomplished as required.
   4) Procedure 4 provides a method of locating and checking the condition of a single component without disturbing other components or subsystems.
   5) Standby Hydraulic System Internal Leakage Check. This procedure does a leak check in the Standby Hydraulic System.
   6) Airplanes with the Enhanced Rudder Control System (RSEP) (POST-SB 27-1252); Procedure 5 provides an internal leak check for the Rudder Power Control Unit (PCU). You use this procedure to find the internal leakage of the Rudder Power Control Unit.

(2) Equipment and Materials
   (a) AC Ammeter - Amp ranges 0-25 and 0-50 with a short circuit selector switch. The switch contacts should be the make-before-break type to prevent arcing during mode selection. The meter scales shall permit accurate reading to the nearest 0.10 amp on the 0-25 scale and 0.20 amp on the 0-50 scale
   (b) Cable Assembly - Hydraulic Leak Check F80135-1, or equivalent (Fig. 601)
   (c) Hydraulic Service Cart - variable flow pump capable of 0 to 3000 psi



Ammeter Wiring Harness
Figure 601

(d) Flowmeter - should have capability to measure flows of 50 to 20,000 cc/min with a remote readout of sufficient length to be located in the control cabin
(e) Digital Multimeter - Model 8024B, John Fluke Mfg Co. Inc., Redmond, WA
(f) Amp-Clamp Adapter - AC Current, Model 80i-600, John Fluke Mfg Co. Inc., Redmond, WA (used with digital multimeter)
(g) Landing Gear Downlocks (AMM 32-00-01)
(h) Mechanic's Stethoscope - GA 111D, Snap-on-Tools Corp., Kenosha, Wisconsin

(3) Prepare for Check
(a) Install landing gear downlocks in main and nose gear (AMM 32-00-01). Check that main gear is blocked and that block and tow bar are removed from nose gear. Establish communications between ground and control cabin if ammeter or flowmeter method is used.
(b) Ammeter Method
1) Disconnect airplane wiring from No. 1 or 2 system B pump at the pump connector.
2) Connect one end of the test harness to the B pump connector.
3) Connect the other end of the harness to the airplane wiring disconnected from the pump.
4) Place the ammeter in short circuit position.

<u>CAUTION</u>: MAKE SURE THAT THE AMMETER IS IN THE SHORT POSITION UNTIL THE SYSTEM HAS STABILIZED. SWITCH AMMETER INTO CIRCUIT ONLY AT TIME OF TAKING A READING. THE STARTING CURRENT FOR THE MOTOR PUMP IS APPROXIMATELY 180 AMPS. THIS WILL DESTROY THE AMMETER IF THE AMMETER IS IN CIRCUIT.

(c) Flowmeter Method
1) Connect hydraulic service cart to ground service module.
2) Connect flowmeter remote readout to service cart and place remote indicator in control cabin.
3) Start hydraulic service cart.
(d) Amp-clamp and Multimeter method
1) Gain access to system B pump relays located in P6-4 panel. R23 relay is for No. 1 pump. R24 relay is for No. 2 pump.
2) Select relay and place amp-clamp adapter around any one of three wires protruding forward from relay.
3) Connect leads between multimeter and amp-clamp adapter.

(e) Provide electrical power (AMM 24-22-0/201).
    1) Place battery switch to ON.

    NOTE: If a ground cart is used for electrical power, it is essential that the voltage be maintained within 114 to 116 volts ac at 400 ±5 Hz. No other electrical operation is permitted during this test.

(f) Check No. 2 fuel tank for 1675 pounds (760 kg) minimum fuel before operating B pumps.
(g) Check that the temperature of the hydraulic fluid is warm (70°F or above) by feeling reservoir. If fluid is not warm, proceed as follows:
    1) Open the ground interconnect valve (set parking brakes if not set).
    2) Position flight controls and spoiler switches to ON.
    3) Pressurize hydraulic system using either a system B pump or the hydraulic service cart.
    4) Exercise flaps to warm fluid to 70°F or above.
    5) Operate all control surfaces through at least two complete cycles after fluid is warm.
    6) Position thrust reverser control lever to STOWED.
    7) Position speed brake lever to DOWN.
    8) Position flap lever to 25 units and allow flap position to stabilize.
    9) Switch OFF B system pump(s).
(h) Pull standby pump NORMAL (No. 1 Gen Bus) and ALTERNATE (No. 2 Gen Bus) circuit breakers. Switches are located on the P6 panel, back of copilot's seat, just above floor level.
(i) Position thrust reverser override switches to NORMAL.
(j) Position antiskid switches to OFF.
(k) Position yaw damper switch to OFF.
(l) Check that the autopilot switches are in DISENGAGED position.
(m) Position alternate flap switch to OFF.
(n) Position alternate flap arm switch to ARM.

    NOTE: This step does not apply when performing Procedure 1.

(o) Position flight control switches A and B to OFF.
(p) Position spoiler switches A and B to OFF.
(q) Place stabilizer trim in the green band.
(r) Position aileron trim control to zero.
(s) Place landing gear handle in OFF position.
(t) Check ground interconnect valve switch is CLOSED.
(u) Position flap lever to 40 units (flap position should remain at 25 units).

(v) Place manual hydraulic isolation shutoff valves No. 1 thru 6 to the CLOSED or OFF position. Gain access to the valves through the tail compartment access door (Fig. 602).

NOTE: This step does not apply when performing Procedure 1.

(w) Place manual landing gear isolation valves to CLOSED position. Valves are located in left wheel well.

NOTE: This step does not apply when performing Procedure 1.

(x) Pressurize hydraulic system.

NOTE: Use system B pump which has ammeter connected to it when not using hydraulic service cart for hydraulic power.

(y) Make sure that the system B pressure gage reads above 2800 psi.
(z) Turn off hydraulic pump and note pressure decay within a 60-second period.
 1) If system B pressure decays to 0 within the 60-second period, the system B pressure module relief valve is probably faulty and should be replaced before proceeding with the test.
(aa) Pressurize hydraulic system and allow pressure to stabilize.

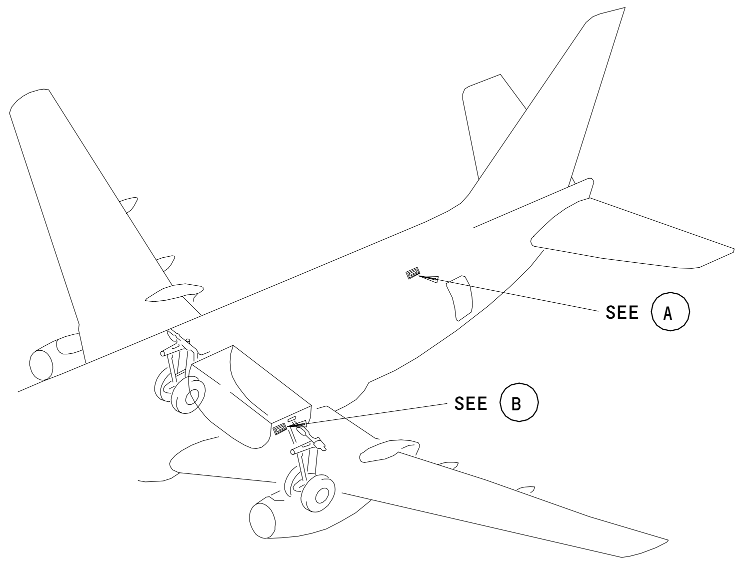
NOTE: Hydraulic pressure should exceed 2800 psi throughout the test. Before recording each ammeter or flowmeter reading, operate flight control being checked two complete cycles and wait 20 to 30 seconds or until ammeter or flowmeter has stabilized.

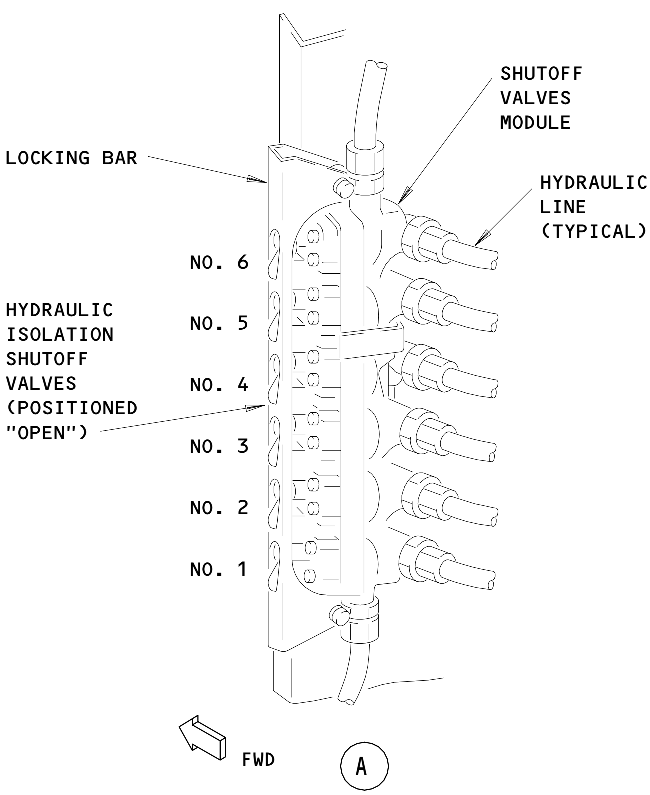
(4) Check Internal Leakage (Procedure 1)

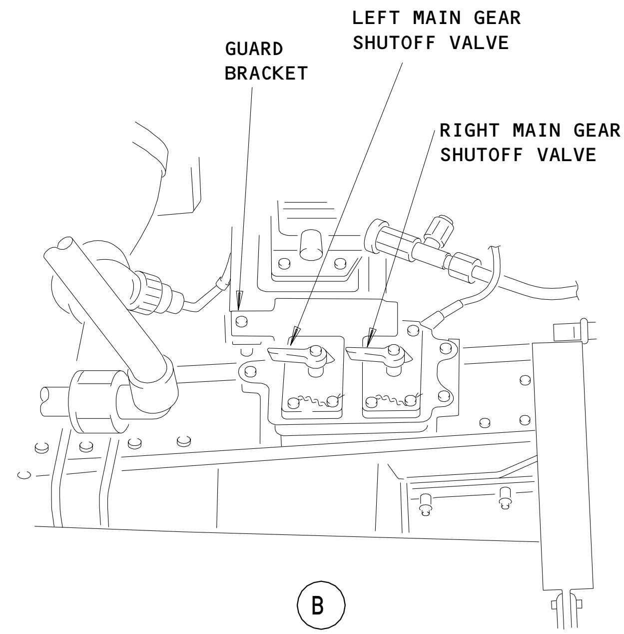
NOTE: The following procedure determines total systems A and B internal leakage and the need for further testing.

(a) Prepare for check per par. C.(3).
(b) If ammeter is used, set for highest range.
(c) With system B pump on, record reading for system B basic reference.

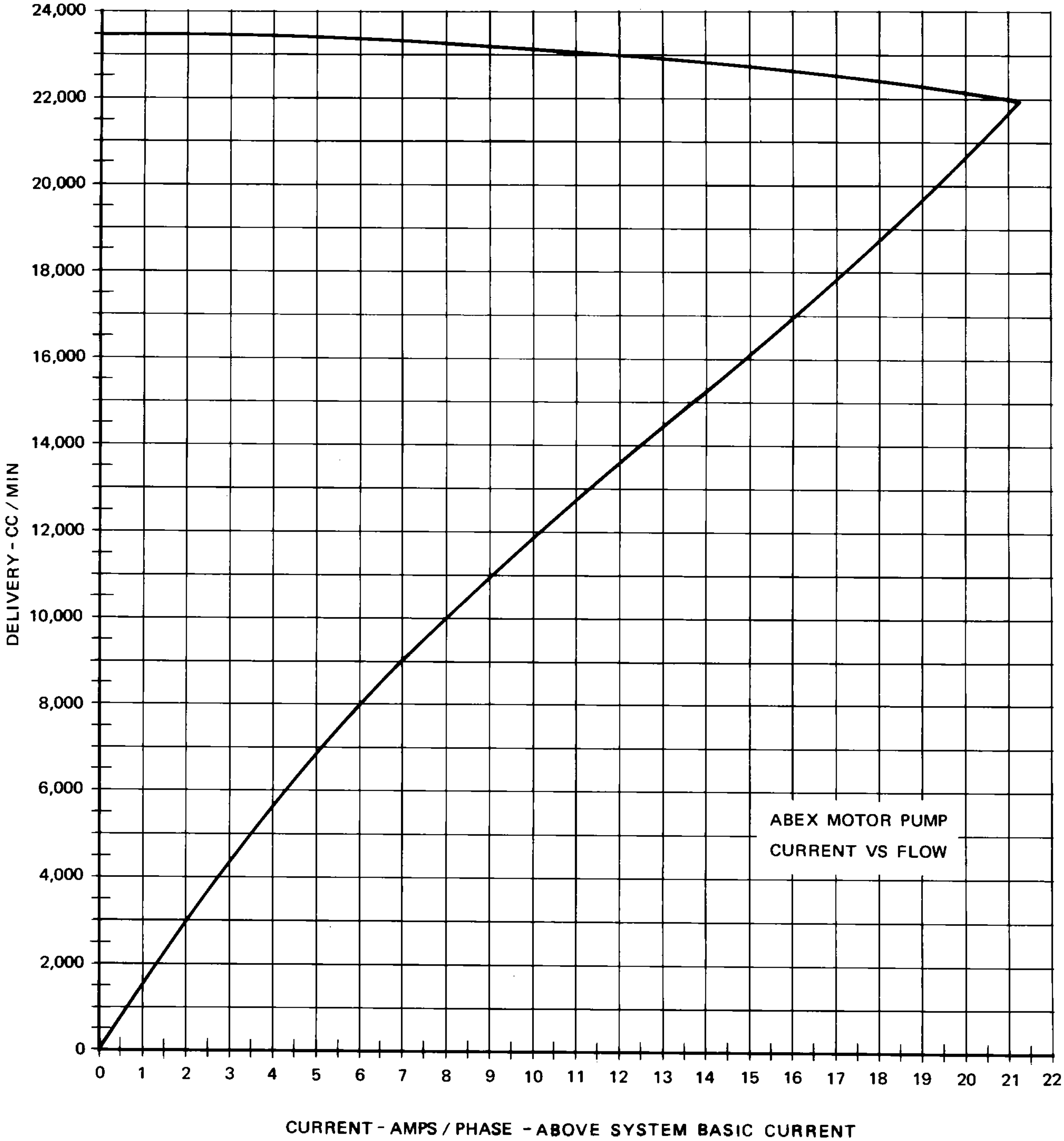
NOTE: When ammeter is being used, record amp reading for each step to the nearest 0.1 amp. When flowmeter is being used, record reading for each step to the nearest 100 cc/min.







Manual Shutoff Valve Modules
Figure 602



Pump Characteristic Graph
Figure 603

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(d) Switch system B spoilers to ON. With control wheel centered, position speed brake handle mid way between ARMED and FLIGHT detent.
(e) Switch system B flight controls to ON. Record difference between steps (c) and (e) as total system B leakage. Check that total flow does not exceed 14,500 cc/min.
(f) Position system B spoilers and flight controls to OFF. Record flow for system B basic reference.
(g) Open ground interconnect valve and position alternate flap switch to OFF.
(h) Position flap lever to 25 units and allow flaps to stabilize.
(i) Switch system A spoilers to ON. With control wheel centered, position speed brake handle mid way between armed and flight detent.
(j) Position system A flight controls switch to ON.
(k) Place landing gear handle in down position.
(l) Record difference between readings in steps (h) and (n) as total system A flow. Make sure that flow does not exceed 22,000 cc/min.
(m) Determine from flow readings if procedure 2, 3 or 4 should be performed. If not, restore airplane to normal.

Internal Leakage Test Data Sheet - Procedure 1

A/P No.: ____ Pump Mfr: ____ Ser No.: ____ Date: ____ Pump Used: No. 1 or 2	Recorded Amps	Amp Change	Flow (cc/min) (Fig. 603)	Max Flow Limit (cc/min)
1. System B basic reference			0	
a. Total system B leakage		a-1		14,500
b. Establish new system B reference			0	
c. Total system A leakage		c-b		22,000

(5) Check Internal Leakage (Procedure 2)

NOTE: The following procedure provides an initial brief check to determine basic and null leakage of major flight control systems.

(a) Prepare for check.
(b) If ammeter is used, set for highest range.
(c) With system B pump on, record reading for system B basic reference.

NOTE: When ammeter is being used, record amp reading for each step to the nearest 0.1 amp. When flowmeter is being used, record reading for each step to the nearest 100 cc/min.

(d) Switch system B spoilers to ON. With control wheel centered, position speed brake handle mid way between ARMED and FLIGHT detents. Record difference between steps (c) and (d) as null leakage for flight spoilers No. 2 and 7. Make sure that flow does not exceed 4000 cc/min.
(e) Switch system B flight controls to ON. Record difference between steps (d) and (e) as null leakage for the aileron power control unit. Make sure that flow does not exceed 3000 cc/min.
(f) Open No. 6 isolation valve. Record difference between steps (e) and (f) as null leakage for elevator power control unit and tab lock cylinder. Make sure that flow does not exceed 3000 cc/min.
(g) Open No. 5 isolation valve. Record difference between steps (f) and (g) as null leakage for rudder power control unit. Make sure that flow does not exceed 3000 cc/min.
(h) Open No. 4 isolation valve. Record difference between steps (g) and (h) as leakage for feel computer null and for feel cylinders. Make sure that flow does not exceed 1500 cc/min.
(i) Switch off system B spoilers and system B flight controls. Record reading for system B basic reference.

(j) Close No. 4, 5 and 6 isolation valves and open ground interconnect valve. Record difference between steps (i) and (j) as reference flow which includes system A relief valve and ground spoilers. Make sure that flow does not exceed 500 cc/min.

(k) Position flap handle to 25 units, position alternate flap switch off and let flaps stabilize. Record difference between steps (j) and (k) as leakage for T.E. flap control valve at null position. Make sure that flow does not exceed 8000 cc/min.

(l) Switch system A spoilers on with control wheel centered and speed brake handle midway between armed and flight detent. Record difference between steps (k) and (l) as null leakage for flight spoilers No. 3 and 6. Make sure that flow does not exceed 4000 cc/min.

(m) Position system A flight controls switch on. Record difference between steps (l) and (m) as null leakage for aileron PCU. Make sure that flow does not exceed 3000 cc/min.

(n) Open No. 3 isolation valve. Record difference between steps (m) and (n) as leakage for elevator PCU null and tab lock cylinder. Flow shall not exceed 3000 cc/min.

(o) Open No. 2 isolation valve. Record difference between steps (n) and (o) as null leakage for the rudder PCU. Flow shall not exceed 3000 cc/min.

(p) Open No. 1 isolation valve. Record difference between steps (o) and (p) as leakage for the feel computer null and feel cylinder. Flow shall not exceed 1500 cc/min.

(q) Place landing gear handle in down position. Record difference between steps (p) and (q) as leakage for nose gear and steering valve. Flow shall not exceed 1500 cc/min.

(r) Determine from flow reading if procedure 3 or 4 are required. If not, restore airplane to normal.

(6) Check Internal Leakage (Procedure 3)

<u>NOTE</u>: The following procedure provides an entire leakage check. Portions of this check may be accomplished as required.

(a) Prepare for check.

NOTE: If ammeter is being used, set for highest range.

(b) With system B pump ON, record reading for system B basic reference.

NOTE: When ammeter is being used, record amp reading for each step to the nearest 0.1 amp. When flowmeter is being used record reading for each step to the nearest 100 cc/min.

Internal Leakage Test Data Sheet - Procedure 2					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recorded Amps	Amp Change	Flow (cc/min) (Fig. 603)		Max Flow Limit
			Cumu-lative	Increment	
1. System B basic reference (Step 1.C.(5)(c))					
a. Null leakage spoilers 2 and 7 (Step 1.C.(5)(d))				a-1	4000
b. Null leakage aileron PCU (Step 1.C.(5)(e))				b-a	3000
c. Null leakage elevator PCU and tab lock cylinder (Step 1.C.(5)(f))				c-b	3000
d. Null leakage rudder PCU (Step 1.C.(5)(g))				d-c	3000
e. Null leakage feel cylinder and computer (Step 1.C.(5)(h))				e-d	1500
f. Establish new system B reference (Step 1.C.(5)(i))					
g. System A reference flow including relief valve and ground spoilers (Step 1.C.(5)(j))				g-f	500
h. Null leakage trailing edge flap control (Step 1.C.(5)(k))				h-g	8000

Internal Leakage Test Data Sheet - Procedure 2					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recorded Amps	Amp Change	Flow (cc/min) (Fig. 603) Cumu- lative	Increment	Max Flow Limit
i. Null leakage flight spoilers 3 and 6 (Step 1.C.(5)(l))				i-h	4000
j. Null leakage aileron PCU (Step 1.C.(5)(m))				j-i	3000
k. Null leakage elevator PCU and tab lock cylinder (Step 1.C.(5)(n))				k-j	3000
l. Null leakage rudder PCU (Step 1.C.(5)(o))				l-k	3000
m. Null leakage feel cylinder and computer (Step 1.C.(5)(p))				m-l	1500
n. Null leakage nose gear and steering valve (Step 1.C.(5)(q))				n-m	1500

(c) Switch system B spoilers to ON. Record difference between steps (b) and (c) as leakage with flight spoilers No. 2 and 7 retracted. Make sure that flow does not exceed 500 cc/min.

(d) Position control wheel approximately 40 degrees clockwise. Record difference between steps (c) and (d) as null leakage for flight spoiler No. 7. Make sure that flow does not exceed 2000 cc/min.

(e) Position control wheel approximately 40 degrees counterclockwise. Record difference between steps (c) and (e) as null leakage for flight spoiler No. 2. Make sure that flow does not exceed 2000 cc/min.

(f) With control wheel centered, position speed brake handle half way between ARMED and FLIGHT detent. Record difference between steps (b) and (f) as null leakage for flight spoilers No. 2 and 7. Make sure that flow does not exceed 4000 cc/min.

(g) Position speed brake handle to DOWN, switch system B spoilers to OFF and record reading as new basic reference flow.

(h) Switch system B flight controls to ON. Record difference between steps (g) and (h) as null leakage for aileron power control unit. Make sure that flow does not exceed 3000 cc/min.

(i) Position control wheel fully clockwise against wheel stops. Record difference between steps (g) and (i) as aileron cylinder and bleed leakage. Make sure that flow does not exceed 1500 cc/min. If flow exceeds 1500 cc/min, center control wheel and repeat check.

(j) With control wheel centered, position autopilot system select switch to B, disengage aileron autopilot and record reading as new basic reference flow.

(k) Position aileron autopilot ENGAGED. Record difference between steps (j) and (k) as aileron electrohydraulic servo valve leakage. Make sue that flow does not exceed 2000 cc/min.

(l) Position aileron autopilot to DISENGAGED.

(m) Open No. 6 isolation valve. Record difference between steps (j) and (m) as null leakage for elevator power control unit and tab lock cylinder. Make sure that flow does not exceed 3000 cc/min.

(n) Position control column fully aft against column stops. Record difference between steps (j) and (n) as elevator cylinder and bleed leakage. Make sure that flow does not exceed 1500 cc/min. If flow exceeds 1500 cc/min, return column to neutral and repeat test.

(o) With control column in neutral and autopilot system select switch on B, position elevator autopilot to DISENGAGED and record reading as new basic reference flow.

(p) Position elevator autopilot to ENGAGED. Record difference between steps (o) and (p) as elevator electrohydraulic servo valve leakage. Make sure that flow does not exceed 2000 cc/min.

(q) Position elevator autopilot switch to DISENGAGED.

(r) Open No. 5 isolation valve. Record difference between steps (o) and (r) as null leakage for rudder power control unit. Make sure that flow does not exceed 3000 cc/min.

(s) Push rudder pedal for full right rudder against pedal stops. Record difference between steps (o) and (s) as rudder cylinder and bleed leakage. Make sure that flow does not exceed 1200 cc/min. If flow exceeds 1200 cc/min. center the pedals and repeat test.
(t) With rudder pedals in neutral and autopilot system select switch on B, position yaw damper OFF and record reading as new basic reference flow.
(u) With rudder pedals in neutral, switch yaw damper to ON. Record difference between steps (t) and (u) as rudder electrohydraulic servo valve leakage. Make sure that flow does not exceed 2000 cc/min.
(v) Position yaw damper to OFF.
(w) Open No. 4 isolation valve. Record difference between steps (t) and (w) as leakage for feel computer null and for feel cylinders. Make sure that flow does not exceed 1500 cc/min.
(x) Switch system B flight controls to OFF.
(y) Make sure that flaps are positioned to approximately 25 units.
(z) Make sure that alternate flap switch is positioned to ARM.
(aa) Make sure that flap handle is positioned to 40 units and record reading as new basic reference flow.
(ab) Open ground interconnect valve. Record difference between steps (aa) and (ab) as reference flow which includes system A relief valve and ground spoilers. Make sure that flow does not exceed 500 cc/min.
(ac) Position flap handle to zero units. Record difference between steps (ab) and (ac) as TE flap motor case drain leakage. Make sure that flow does not exceed 3000 cc/min.
(ad) Position flap handle to 25 units, position alternate flap switch to OFF and let flaps stabilize. Record difference between steps (ac) and (ad) as leakage for TE flap control valve at null position. Make sure that flow does not exceed 8000 cc/min.
(ae) Position flap handle to zero units and let flaps stabilize. Record difference between steps (ad) and (ae) as leakage for leading edge flaps and slats. Make sure that flow does not exceed 500 cc/min.
(af) Position flap lever to 25 units and let flaps stabilize.
(ag) Position alternate flap switch to ARM.
(ah) Position flap lever to 40 units and record as new basic reference flow.
(ai) Switch system A spoilers to ON. Record difference between steps (ah) and (ai) as leakage with flight spoilers No. 3 and 6 retracted. Make sure that flow does not exceed 500 cc/min.

(aj) Position control wheel approximately 40 degrees clockwise. Record difference between steps (ai) and (aj) as null leakage for flight spoiler No. 6. Make sure that flow does not exceed 2000 cc/min.
(ak) Position control wheel approximately 40 degrees counterclockwise. Record difference between steps (ak) and (ai) as null leakage for flight spoiler No. 3. Make sure that flow does not exceed 2000 cc/min.
(al) With control wheel centered, position speed brake handle half way between ARMED and FLIGHT detent. Record difference between steps (al) and (ah) as null leakage for flight spoilers No. 3 and 6. Make sure that flow does not exceed 4000 cc/min.
(am) Return speed brake handle to DOWN and position system A spoilers switch to OFF. Record reading as new basic reference flow.
(an) Position system A flight controls switch to ON. Record difference between steps (am) and (an) as null leakage for aileron power control unit. Make sure that flow does not exceed 3000 cc/min.
(ao) Position control wheel fully CW against wheel stops and record reading. Record difference between steps (am) and (ao) as leakage for aileron cylinder and bleed. Make sure that flow does not exceed 1500 cc/min. If flow exceeds 1500 cc/min, center control wheel and repeat test.
(ap) With control wheel centered, position aileron autopilot switch to DISENGAGED and, record reading as new basic reference flow.
(aq) On airplanes with system A autopilot, center control wheel and position autopilot system select switch to A. Position aileron autopilot switch to ENGAGED and record difference between steps (ap) and (aq) as leakage for aileron electrohydraulic servo valve. Make sure that flow does not exceed 2000 cc/min.
(ar) Position aileron autopilot to DISENGAGE.
(as) Open No. 3 isolation valve. Record difference between steps (ap) and (as) as leakage for elevator power control unit null and for tab lock cylinder. Make sure that flow does not exceed 3000 cc/min.

(at) Position control column fully aft against column stops and record reading. Record difference between steps (ap) and (at) as leakage for elevator cylinder and bleed. Make sure that flow does not exceed 1500 cc/min. If flow exceeds 1500 cc/min, return column to neutral and repeat test.
(au) With control column in neutral, position elevator autopilot to DISENGAGE, record reading as new basic reference flow.
(av) On airplanes with system A autopilot, place control column in neutral and position autopilot system select switch to A. Position elevator autopilot switch to ENGAGED and record difference between steps (au) and (av) as leakage for elevator electrohydraulic servo valve. Make sure that flow does not exceed 2000 cc/min.
(aw) Position elevator autopilot to DISENGAGED.
(ax) Open No. 2 isolation valve. Record difference between steps (au) and (ax) as null leakage for rudder power control unit. Make sure that flow does not exceed 3000 cc/min.
(ay) Push rudder pedal for full right rudder against pedal stop. Record difference between steps (au) and (ay) as leakage for rudder cylinder and bleed. Make sure that leakage does not exceed 1200 cc/min. If flow exceeds 1200 cc/min, center the pedals and repeat test.
(az) With rudder pedals in neutral and yaw damper OFF, record reading as new basic reference flow.
(ba) On airplanes with system A autopilot, place rudder pedals in neutral, position autopilot system select switch to A and position yaw damper switch to ON. Record difference between steps (az) and (ba) as leakage for rudder electrohydraulic servo unit. Make sure that flow does not exceed 2000 cc/min.

NOTE: Step (ba) is not applicable to airplanes on which rudder autopilots can only be selected to hydraulic system B rudder power unit.

(bb) Position yaw damper switch to OFF.
(bc) Open No. 1 isolation valve. Record difference between steps (az) and (bc) as leakage for feel computer null and feel cylinder. Make sure that flow does not exceed 1500 cc/min.
(bd) Position system A flight control switch to OFF, and record reading as new basic reference flow.
(be) Place landing gear handle in down position. Record difference between steps (bd) and (be) as leakage for nose gear and steering valve null. Make sure that flow does not exceed 1500 cc/min.

(bf) Position nose gear steering fully left. Record difference between steps (bd) and (bf) as leakage for steering valve bleed and left cylinder. Make sure that flow does not exceed 900 cc/min.
(bg) Position nose gear steering fully right. Record difference between steps (bg) and (bd) as leakage for steering valve bleed and right cylinder. Make sure that flow does not exceed 900 cc/min.
(bh) Return nose gear to neutral, and record reading as new basic reference flow.
(bi) Open No. 1 landing gear isolation valve. Record difference between steps (bh) and (bi) as leakage for left main gear and lock. Make sure that flow does not exceed 300 cc/min.
(bj) Open No. 2 landing gear isolation valve. Record difference between steps (bi) and (bj) as leakage for right main gear and lock. Make sure that flow does not exceed 300 cc/min.
(bk) Switch No. 1 thrust reverser to OVERRIDE. Record difference between steps (bj) and (bk) as leakage at No. 1 thrust reverser in stowed position. Make sure that flow does not exceed 300 cc/min.
(bl) Switch No. 2 thrust reverser to OVERRIDE. Record difference between steps (bk) and (bl) as leakage at No. 2 thrust reverser in stowed position. Make sure that flow does not exceed 300 cc/min.

(7) Check Internal Leakage (Procedure 4)

NOTE: The following procedure provides a method of locating and checking the condition of a single component without disturbing other components or subsystem.

(a) Prepare for check.
(b) If ammeter is used, set for highest range and record amp readings to nearest 0.1 amp.
(c) If flowmeter is used, record reading to nearest 100 cc/min.
(d) Determine suspected system and component (Fig. 604) to locate steps within procedure 3 to perform unique test of component and determine its condition.
(e) Determine if additional testing is required. If not, restore airplane to normal.

(8) Restore airplane to normal.
(a) Open manual shutoff valves No. 1 thru 6 if closed. Secure safety bar over the shutoff valve module with bolt and nut (Fig. 602).

(b) Verify that shutoff valves No. 1 thru 6 are open (handles vertical) by performing the following test.
    1) Check that hydraulic system A and B are pressurized.
    2) Position A and B flight control switches to OFF.
    3) Verify valve No. 4 is open.
        a) Retract the flaps to zero.

            NOTE: The flaps must be fully retracted for the FEEL DIFF PRESS light to illuminate.

        b) Position B flight control switch to ON and make sure that FEEL DIFF PRESS light is illuminated.

SYSTEMS AND REFERENCES TO STEPS IN PROCEDURE 3	SYSTEM COMPONENTS	COMPONENT REFERENCES TO STEPS IN PROCEDURE 3	FLOW LIMIT (CC/MIN)
System B basic reference [Ref step C.(4)]	Total system		14,500
System B spoilers [Ref steps C.(6)(b) thru C.(6)(f)]	Spoiler down leakage	C.(6)(c)	500
	Right wing down leakage, No. 7 spoiler PCU null	C.(6)(d)	2,000
	Left wing down leakage, No. 2 spoiler PCU null	C.(6)(e)	2,000
	No. 2 and 7 PCU valve null	C.(6)(f)	4,000
System B ailerons [Ref steps C.(6)(g) thru C.(6)(l)]	Aileron PCU null	C.(6)(h)	3,000
	Aileron PCU hardover, cylinder and bleed leakage	C.(6)(I)	1,500
	System B aileron autopilot leakage	C.(6)(k)	2,000
System B elevators [Ref steps C.(6)(j) and C.(6)(m) thru C.(6)(q)]	Elevator PCU null	C.(6)(m)	3,000
	Elevator PCU hardover, cylinder and bleed leakage	C.(6)(n)	1,500

SYSTEMS AND REFERENCES TO STEPS IN PROCEDURE 3	SYSTEM COMPONENTS	COMPONENT REFERENCES TO STEPS IN PROCEDURE 3	FLOW LIMIT (CC/MIN)
System B rudder [Ref steps C.(6)(o) and C.(6)(r) thru C.(6)(v)]	System B elevator autopilot leakage	C.(6)(p)	2,000
	Rudder PCU null	C.(6)(r)	3,000
	Rudder PCU hardover, cylinder and bleed leakage	C.(6)(s)	1,200
	Yaw damper system leakage	C.(6)(u)	2,000

SYSTEMS AND REFERENCES TO STEPS IN PROCEDURE 3	SYSTEM COMPONENTS	COMPONENT REFERENCES TO STEPS IN PROCEDURE 3	FLOW LIMIT (CC/MIN)
System B feel computer [Ref steps C.(6)(t) and C.(6)(w)	Feel computer null and cylinders	C.(6)(w)	1,500
System A basic reference [Ref steps C.(6)(aa) and C.(6)(bb)]	Total system		22,000
Trailing edge flap system [Ref steps C.(6)(ab) thru C.(6)(ah)]	Motor case drain leakage	C.(6)(ac)	3,000
	TE flap control valve null	C.(6)(ad)	8,000
	LE flap and slat actuators	C.(6)(ae)	500
System A spoilers [Ref steps C.(6)(ab) and C.(6)(ai) thru C.(6)(am)]	Spoiler down leakage	C.(6)(ai)	500
	Right wing down, No. 6 spoiler PCU null	C.(6)(aj)	2,000
	Left wing down, No. 3 spoiler PCU null	C.(6)(ak)	2,000
	No. 3 and 6 PCU valve null	C.(6)(al)	4,000
System A aileron [Ref steps C.(6)(am) thru C.(6)(ar)]	Aileron PCU null	C.(6)(an)	3,000
	Aileron PCU hardover, cylinder and bleed	C.(6)(ac)	3,000
	System A autopilot (if installed)	C.(6)(aq)	2,000

SYSTEMS AND REFERENCES TO STEPS IN PROCEDURE 3	SYSTEM COMPONENTS	COMPONENT REFERENCES TO STEPS IN PROCEDURE 3	FLOW LIMIT (CC/MIN)
System A elevator [Ref steps C.(6)(ap) and C.(6)(as) thru C.(6)(aw)]	Elevator PCU null	C.(6)(as)	3,000
	Elevator PCU hardover, cylinder and bleed	C.(6)(at)	1,500
	System A autopilot (if installed)	C.(6)(av)	2,000

Component Testing Chart			
SYSTEMS AND REFERENCES TO STEPS IN PROCEDURE 3	SYSTEM COMPONENTS	COMPONENT REFERENCES TO STEPS IN PROCEDURE 3	FLOW LIMIT (CC/MIN)
System A rudder [Ref steps C.(6)(au) and C.(6)(ax) thru C.(6)(bb)]	Rudder PCU null	C.(6)(ax)	3,000
	Rudder PCU hardover, cylinder and bleed	C.(6)(ay)	1,200
	System A yaw damper (if installed)	C.(6)(ba)	2,000
System A feel computer [Ref steps C.(6)(az) and C.(6)(bc)]	Feel computer null and actuator	C.(6)(bc)	1,500
Nose gear system [Ref steps C.(6)(bd) thru C.(6)(bh)]	Nose gear plus steering null	C.(6)(be)	1,500
	Steering valve bleed plus left cylinder	C.(6)(bf)	900
	Steering valve bleed plus right cylinder	C.(6)(bg)	900
Main gear system [Ref steps C.(6)(bh) thru C.(6)(bj)]	Left main gear and lock	C.(6)(bi)	300
	Right main gear and lock	C.(6)(bj)	300
Thrust reverser system [Ref steps C.(6)(bk) and C.(6)(bl)]	No. 1 thrust reverser, stowed position	C.(6)(bk)	300
	No. 2 thrust reverser, stowed position	C.(6)(bl)	300

4) Verify valve No. 6 is open.
   a) With B flight control switch ON, move control column full travel and check that column force is approximately 25 pounds.

      NOTE: If valve is closed, column force will be approximately 60 pounds. This can be verified by positioning B flight control switch to OFF and comparing forces.

5) Verify valve No. 5 is open.
   a) With B flight control switch ON, move rudder pedals full travel and check that pedal force is approximately 60 pounds.

      NOTE: If valve is closed, pedal force will be approximately 160 pounds. This can be verified by positioning B flight control switch to OFF and comparing forces.

6) Verify valve No. 1 is open.
   a) Position A flight control switch to ON and check that FEEL DIFF PRESS light goes out.
7) Verify valve No. 3 is open.
   a) With B flight control switch OFF and A flight control switch ON, repeat step 4)a).
8) Make sure that valve No. 2 is open.
   a) With B flight control switch OFF and A flight control switch ON, repeat step 5)a).

(c) Remove hydraulic power (AMM 29-12-0/201, Hydraulic System B).
(d) Open any hydraulic isolation shutoff valve found closed during test. Install locking bar over open valves and secure with bolt and nut.
(e) Open landing gear shutoff valves. Install guard bracket to secure valves in open position.
(f) Close standby pump NORMAL (No. 1 GEN BUS) and ALTERNATE (No. 2 GEN BUS) circuit breakers on the P6 panel.
(g) Position alternate arm switch to off.
(h) Position flight control switches A and B and spoiler switches on.
(i) Remove electrical power from airplane.

Internal Leakage Test Data Sheet					
A/P No.: ____________ Pump Mfr: ____________ Ser No.: ____________ Date: ____________ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
1. System B basic reference [Step 1.C.(6)(b)]					
a. Spoilers 2 and 7 down leakage [Step 1.C.(6)(c)]				a-1	500
b. Null leakage spoiler 7 [Step 1.C.(6)(d)]				b-a	2000
c. Null leakage spoiler 2 [Step 1.C.(6)(e)]				c-a	2000
d. Null leakage spoilers 2 & 7 [Step 1.C.(6)(f)]				d-1	4000
e. Establish new reference flow [Step 1.C.(6)(g)]					
f. Null leakage aileron PCU [Step 1.C.(6)(h)]				f-e	3000
g. Aileron cylinder and bleed leakage [Step 1.C.(6)(i)]				g-e	1500
h. Establish new reference flow [Step 1.C.(6)(j)]					
i. Aileron electrohydraulic servo valve leakage [Step 1.C.(6)(k)]				i-h	2000

Internal Leakage Test Data Sheet					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
j. Null leakage for elevator PC and tab lock cylinder [Step 1.C.(6)(m)]				j-h	3000
k. Elevator cylinder and bleed leakage [Step 1.C.(6)(n)]				k-h	1500
l. Establish new basic reference [Step 1.C.(6)(o)]					
m. Elevator electrohydraulic servo valve leakage [Step 1.C.(6)(p)]				m-l	2000
n. Rudder PCU null leakage [Step 1.C.(6)(r)]				n-l	3000
o. Rudder cylinder and bleed leakage [Step 1.C.(6)(s)]				o-l	1200
p. Establish new basic reference [Step 1.C.(6)(t)]					
q. Rudder electrohydraulic servo valve leakage [Step 1.C.(6)(u)]				q-p	2000

Internal Leakage Test Data Sheet					
A/P No.: ________ Pump Mfr: ________ Ser No.: ________ Date: ________ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
r. Establish new basic reference [Step 1.C.(6)(x) thru (aa)]					
s. System A reference flow including relief valve and ground spoilers [Step 1.C.(6)(ab)]				s-r	500
t. Trailing edge flap motor case drain leakage [Step 1.C.(6)(ac)]				t-s	3000
u. Trailing edge flap control null leakage [Step 1.C.(6)(ad)]				u-t	8000
u. Leading edge flaps and slats leakage [Step 1.C.(6)(ae)]				u-u	500
v. Establish new basic reference [Steps 1.C.(af) thru (ah)]					
w. Flight spoilers 3 and 6 retracted leakage [Step 1.C.(6)(ai)]				w-v	500
x. Null leakage flight spoiler 6 [Step 1.C.(6)(aj)]				x-w	2000

Internal Leakage Test Data Sheet					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
y. Null leakage flight spoiler 3 [Step 1.C.(6)(ak)]				y-w	2000
z. Null leakage flight spoilers 3 and 6 [Step 1.C.(6)(al)]				z-v	4000
aa. Establish new basic reference [Step 1.C.(6)(am)]					
ab. Null leakage aileron PCU [Step 1.C.(6)(an)]				ab-aa	3000
ac. Aileron cylinder and bleed leakage [Step 1.C.(6)(ao)]				ac-aa	1500
ad. Establish new basic reference [Step 1.C.(6)(ap)]					
ae. System A aileron electrohydraulic servo valve [Step 1.C.(6)(aq)], if operative				ae-ad	2000
af. Elevator PCU and tab lock cylinder null leakage [Step 1.C.(6)(as)]				af-ad	3000

Internal Leakage Test Data Sheet					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
ag. Elevator cylinder and cylinder and bleed leakage [Step 1.C.(6)(at)]				ag-ad	1500
ah. Establish new basic reference [Step 1.C.(6)(au)]					
ai. Elevator electrohydraulic servo valve leakage [Step 1.C.(6)(av)], if operative				ai-ah	2000
aj. Rudder PCU leakage [Step 1.C.(6)(ax)]				aj-ah	3000
ak. Rudder cylinder and bleed leakage [Step 1.C.(6)(ay)]				ak-ah	1200
al. Establish new basic reference [Step 1.C.(6)(az)]					
am. Rudder electrohydraulic servo valve leakage, if operative [Step 1.C.(6)(ba)]				am-al	2000
an. Feel cylinder and computer null leakage [Step 1.C.(6)(bc)]				an-al	1500

Internal Leakage Test Data Sheet					
A/P No.: ______ Pump Mfr: ______ Ser No.: ______ Date: ______ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
ao. Establish new basic reference [Step 1.C.(6)(bd)]					
ap. Nose gear and steering valve null leakage [Step 1.C.(6)(be)]				ap-ao	1500
aq. Steering valve bleed and left cylinder leakage [Step 1.C.(6)(bf)]				aq-ao	900
ar. Steering valve bleed and right cylinder leakage [Step 1.C.(6)(bg)]				ar-ao	900
as. Establish new basic reference [Step 1.C.(6)(bh)]					
at. Left main gear and lock leakage [Step 1.C.(6)(bi)]				at-as	300
au. Right main gear and lock leakage [Step 1.C.(6)(bj)]				au-at	300
av. No. 1 thrust reverser stowed leakage [Step 1.C.(6)(bk)]				av-au	300

Internal Leakage Test Data Sheet					
A/P No.: ______________ Pump Mfr: ______________ Ser No.: ______________ Date: ______________ Pump Used: No. 1 or 2	Recd Amps	Amp Chng	Flow cc/mi (Fig. 603) Cumulative	Max Flow Limit (cc/Increment	
aw. No. 2 thrust reverser stowed leakage [Step 1.C.(6)(bl)]				aw-av	300

D. Standby Hydraulic System Internal Leakage Check

(1) General

(a) The following procedure provides instructions for performing an internal leakage check of the standby hydraulic system to determine the condition of the system based on the degree of internal leakage. By comparing measured leakage to recommended in-service leakage limits, a determination of the system condition can be made.

(b) Leakage flows are determined by measuring changes in the flow rates during different operating conditions while hydraulic power is applied. Three methods for measuring the flow rates are available: the ammeter method, the flowmeter method and the amp-clamp and multimeter method.

1) The ammeter method uses an ammeter connected in series with one phase of the standby pump. The leakage rates are determined by measuring the current and current changes of the pump. These current changes are then related to an amperage versus flow rate chart (Fig. 605).

2) The flowmeter method uses a flowmeter connected to the pressure side of the standby pump or ground service cart pump. As the system configuration is changed the flow rates can be read directly and recorded.

3) The amp-clamp and multimeter method is used by placing the amp-clamp adapter around any one of the three phase wires connected to the loadside of C847 standby hydraulic pump (normal) circuit breaker in P6-11 panel or C848 standby hydraulic pump (alternate) circuit breaker in P6-12 panel (whenever supplying power to the pump). The current changes are recorded and are then related to the pump characteristic graph (Fig. 605). One person can perform this procedure from the control cabin.

NOTE: An alternate location to place the amp-clamp adapter is around one of the three load wires connected to standby hydraulic pump relay R68.

(2) Equipment and Materials
   (a) AC Ammeter - Amp ranges 0-25 with a short circuit selector switch. The switch contacts should be the make-before-break type to prevent arcing during mode selection. The meter scales shall permit accurate reading to the nearest 0.10 amp on the 0-25 scale
   (b) Cable Assembly - Hydraulic Leak Check F80135-10 (Fig. 604)
   (c) Hydraulic Service Cart - variable flow pump capable of 0 to 3000 psi
   (d) Flowmeter - should have capability to measure flows of 50 to 20,000 cc/min with a remote readout of sufficient length to be located in the control cabin
   (e) Digital Multimeter - Simpson Model 461
   (f) Amp-Clamp Adapter - Model 153 (used with digital multimeter)
   (g) Landing Gear Downlocks (AMM 32-00-01)
(3) Prepare for Check
   (a) Connect external power and adjust voltage to 114-116 volts as 400 ±5 Hz.

      NOTE: Do not conduct any other electrical operation on aircraft during this test.

   (b) Install landing gear downlocks (AMM 32-00-01), and establish communication between ground and crew compartment.
   (c) If ammeter method is used, install ammeter in series with one phase of standby pump.
      1) Disconnect pump electrical connector.
      2) Connect one end of test harness to pump connector.
      3) Connect other end of harness to wiring disconnected from the pump.

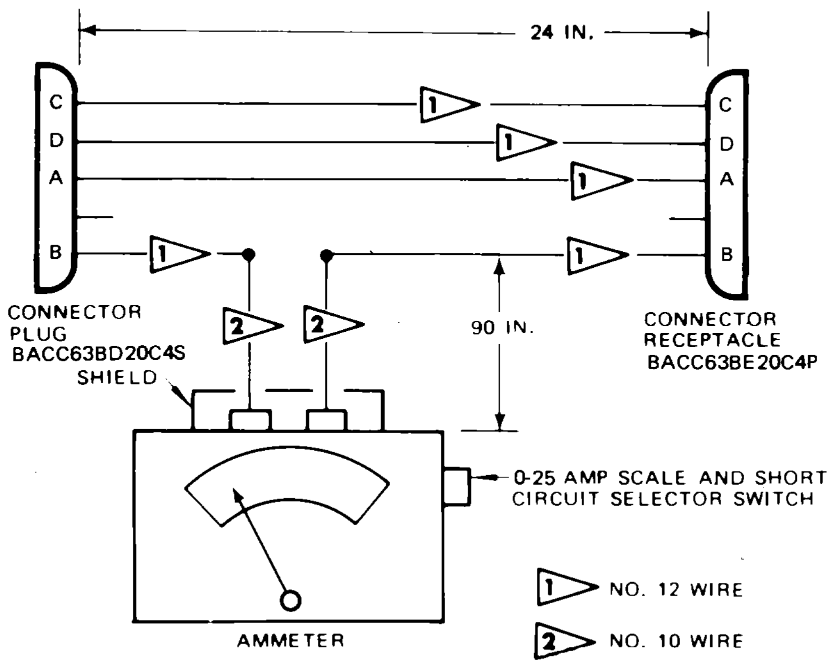
         CAUTION: CHECK THAT THE AMMETER IS IN THE SHORT CIRCUIT POSITION UNTIL THE SYSTEM HAS STABILIZED. SWITCH AMMETER INTO CIRCUIT ONLY AT TIME OF TAKING A READING. THE STARTING CURRENT FOR THE MOTOR PUMP IS APPROXIMATELY 100 AMPS. THIS WILL DESTROY THE AMMETER IF THE AMMETER IS IN CIRCUIT.

(d) If flowmeter is used, install flowmeter in standby pump pressure line.
(e) Position alternate flap switch to ARM.
(f) Check that systems A and B hydraulic systems are off.
(g) Operate standby system through several cycles to bring fluid to operating temperature.
(h) Check standby module for sound and hot spots. If a hissing noise is present and module return line is hot, replace pressure relief valve before performing test.
(i) If amp-clamp and multimeter are used, perform the following:
1) Gain access to standby system pump circuit breaker C847 in P6-11 or C848 in P6-12 as applicable.
2) Select relay and place amp-clamp adapter around any one of the three wires connected to the load side of the circuit breaker.
3) Connect leads between multimeter and amp-clamp adapter.
4) Provide electrical power to airplane.

CAUTION: CARE SHOULD BE TAKEN TO MAKE SURE THAT AMP-CLAMP DOES NOT COME IN CONTACT WITH CIRCUIT BREAKER TERMINALS WHICH CAN CAUSE DAMAGE TO EQUIPMENT.

NOTE: If a ground cart is used for electrical power, it is essential that the voltage be maintained within 114 to 116 volts ac at 400 ±5 Hz. No other electrical operation is permitted during this test.

(4) Perform Internal Leakage Check
(a) After preparation for check has been completed, accomplish the following steps and follow instruction given in Fig. 607 to determine component internal leakage.
1) Pressurize the B hydraulic system via the electric motor pump.
2) Position B system flight control switch to ON.



Ammeter Wiring Harness
Figure 604

3) Position ALTERNATE FLAP switch to ARM. Allow system to stabilize and take basic reference reading, enter as step 1 in Fig. 607.
4) Position A system flight control switch to STDBY RUD. Allow flow to stabilize and take reading, enter as step 2 in Fig. 607.
5) Switch the B system electric motor pump off.
6) Position ALTERNATE FLAP switch to OFF.
7) Allow system pressure to decay to below 100 psi.
8) Position A and B system flight control switches to off.
9) Gain access to the standby rudder PCU input crank via the access door located on the right side of the vertical fin (Fig. 606).

   WARNING: COCKPIT PERSONNEL MUST STAY CLEAR OF RUDDER PEDALS AND MUST NOT MAKE ANY FLIGHT CONTROL INPUTS FOR STEPS 9) THRU 15).

   NOTE: It is suggested that the standby PCU be accessed from the forward side of the horizontal stabilizer on the right side of the airplane. Make sure that all empennage flight control surfaces are clear.

10) Remove the bolts connecting the input rod to the standby PCU input crank and the aft quadrant torque tube (Fig. 606). Remove input rod.

    NOTE: Bolts and input rod must be retained and reinstalled after completion of test.

11) Pressurize the B hydraulic system via the electric motor pump.

    WARNING: DO NOT PROCEED UNTIL SECTION 48 PERSONNEL HAVE COMPLETED STEPS 9) AND 10), AND ALL EMPENNAGE FLIGHT CONTROL SURFACES ARE CLEAR.

12) Position B system flight control switch to on.
13) Position ALTERNATE FLAP switch to ARM. Allow system to stabilize and take basic reference reading, enter as step 4 in Fig. 607.
14) Position A system flight control switch to STBY RUD.
15) Manually displace the standby PCU input crank as far as possible in the aft direction. Wait 1 minute and take reading, enter as step 5 in Fig. 607.

<u>WARNING</u>: PRIOR TO AND WHILE MANUALLY DISPLACING THE STANDBY PCU INPUT CRANK MAKE SURE THAT ALL EMPENNAGE FLIGHT CONTROL SURFACES AND THE RUDDER HINGE ARE CLEAR.

16) Manually displace the standby PCU input crank as far as possible in the forward direction. Wait 1 minute and take reading, enter as step 6 in Fig. 607.
17) Complete the worksheet given in Fig. 607.
18) Place ALTERNATE FLAP switch to OFF.
19) Depressurize the B hydraulic system.
20) Set A and B flight control switches to OFF.
21) Reconnect the input rod to the standby PCU input crank and aft quadrant torque tube.

(b) Post leakage check operational test.

1) Pressurize standby hydraulic system by setting the A system flight control switch to STBY RUD.

<u>WARNING</u>: MAKE SURE THAT ALL EMPENNAGE FLIGHT CONTROL SURFACES ARE CLEAR.

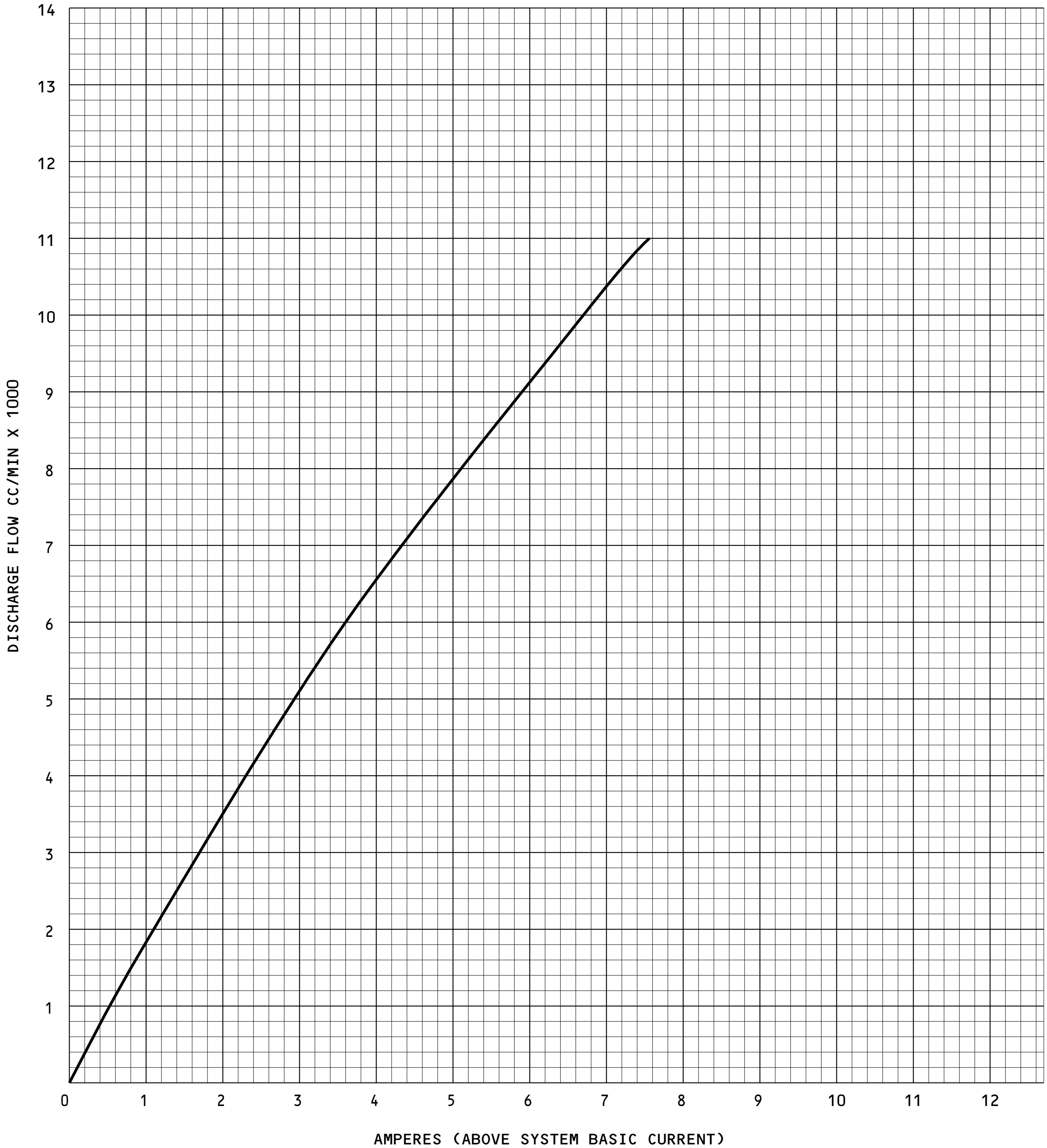
2) Observe rudder reaction, rudder should not move to a hard-over position.
3) Cycle rudder pedals hard-over right and make sure that the rudder moves hard-over right. Slowly allow rudder to recenter.

4) Measure alignment of rudder with index mark. Rudder alignment should be within 1.5 inches.
5) Cycle rudder pedals hard-over left and make sure that the rudder moves hard-over left. Slowly allow rudder to recenter.
6) Measure alignment of rudder with index mark. Rudder alignment should be within 1.5 inches.
7) If any of the following conditions exist, the input rod has not been correctly reinstalled.
   a) Rudder alignment with the index mark is not within 1.5 inches.
   b) Cycling of rudder pedals is limited.
   c) Rudder moves hard-over without being commanded.
   d) Unusually high pedal forces experienced.
8) If any condition given in step 7) exists, check input rod for proper installation and repeat par. 1.D.(4)(b).

(5) Restore Airplane to Normal
   (a) Remove electrical power.
   (b) Remove harness (if used) and connect electrical connector to pump.
   (c) Remove flowmeter (if used).
   (d) Service hydraulic reservoir (AMM Chapter 12, Hydraulic Fluid Servicing).

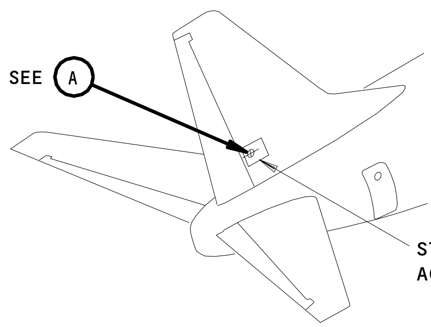
Standby Hydraulic Internal Leak Check					
STEP	DESCRIPTION	REF STEP	AMPS	FLOW *[1] (cc/min)	LIMIT (cc/min)
1	BASIC REFERENCE	1.D.(4)(a)3)	____		
2	BASIC REFERENCE + NULL	1.D.(4)(a)4)	____		
3=2-1	NULL (PER RIGGING)	-	____	____	1000
4	BASIC REFERENCE	1.D.(4)(a)13)	____		
5	BASIC REFERENCE + H/O LEFT SEAL LEAKAGE	1.D.(4)(a)15)	____		
6	BASIC REF + H/O RIGHT SEAL LEAKAGE	1.D.(4)(a)16)	____		
7=5-4	H/O LEFT SEAL LEAKAGE	-	____	____	400
8=6-4	H/O RIGHT SEAL LEAKAGE	-	____	____	400

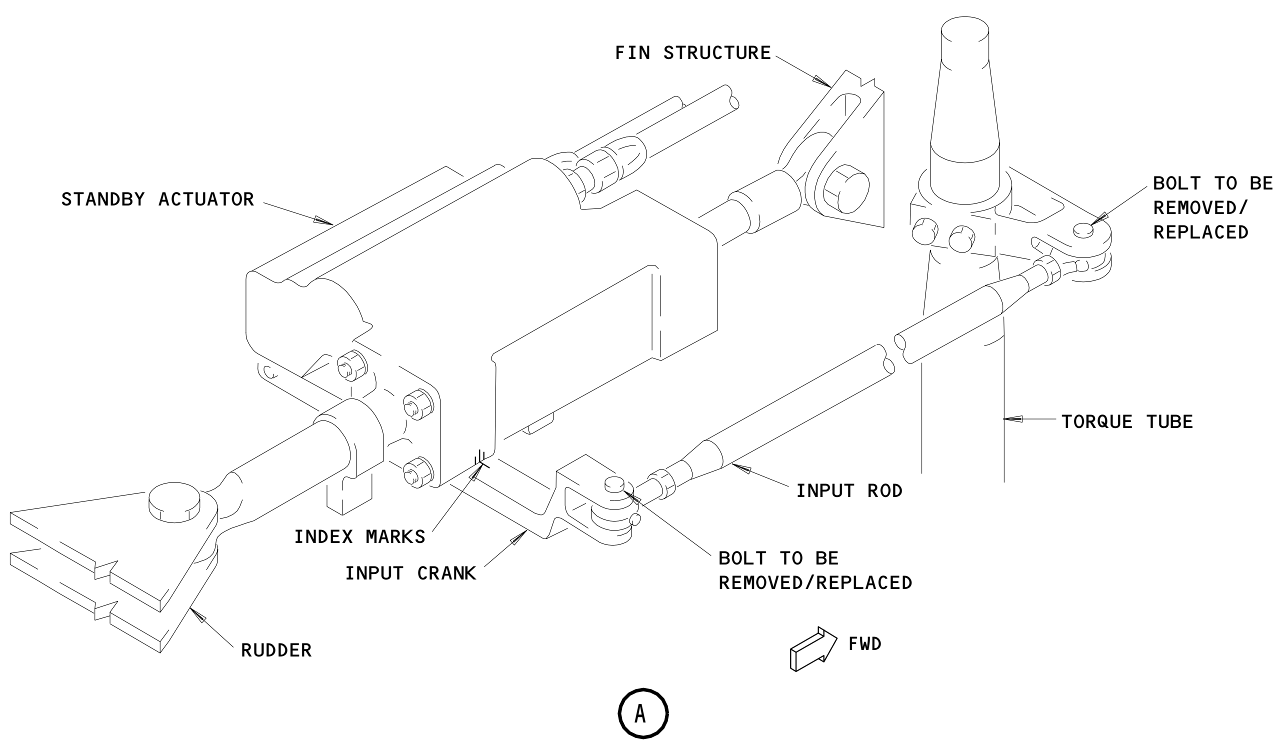
*[1] See Fig. 607



NYAB/TASK FLOW vs CURRENT

Standby Hydraulic System Leak Check
Figure 605





Standby Rudder Actuator
Figure 606

2. Internal Leak Check for the Rudder Power Control Unit (Procedure 5)

A. General

(1) Use this procedure to find the internal leakage of the rudder power control unit for hydraulic system A or B.

B. References

(1) AMM 24-22-0/201, Manual Control
(2) AMM 27-21-0/201, Rudder and Rudder Trim Control System
(3) AMM 29-11-0/201, Hydraulic System A
(4) AMM 29-12-0/201, Hydraulic System B

C. Access

(1) Location Zones

12	Electronic Compartment
95	Vertical Fin

(2) Access Panels

1201	Electronic Equipment Access Door
9510	TE Access Door
9512	TE Access Panel - Rudder
9514	TE Access Panel - Rudder
9559	Cover - Rudder Nose

D. Prepare for the Main Rudder PCU Internal Leakage Check

(1) Make sure that this circuit breaker is closed:
   (a) P6-2, Circuit Breaker Panel:
      1) RUDDER LOAD LIMITER
(2) Open the access door 9510.
(3) Remove the access panels 9512 and 9514 from the vertical fin.
(4) Do this task: Supply electrical power (AMM 24-22-0/201).

WARNING: MAKE SURE THAT THE PERSON AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SLATS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE EQUIPMENT.

(5) Do this task: "Rudder Hydraulic System A and B Pressurization" (AMM 27-21-0/201).

(6) Put the FLT CONTROL A and B switches, on the P5-3 panel, to the ON position.

(7) Move the rudder pedals through five cycles of full travel.

(a) Move the rudder pedals until the rudder is in approximate center position.

(8) Open the Electronic Equipment Access Door, 1201 to gain access to the main electronics equipment compartment.

(9) Use a digital voltmeter to verify 4.38 to 5.62 Vdc between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) in the EE bay.

(10) Make sure that the STBY RUD ON Light on the overhead panel P5-3 is not illuminated.

(11) Put the FLT CONTROL A switch, on the P5-3 panel, to the OFF position.

E. Rudder Main PCU System B Internal Leakage Check in the Extend Direction

NOTE: You will need three persons to complete this task. There is a time limit to complete some of the steps in this task.

(1) Use the Yaw Damper Coupler (YDC) to command the Rudder Pressure Reducer to the "Low" pressure state:

(a) Push the ON/OFF key on the BITE keypad on the face of the yaw damper coupler located on the E1-3 shelf.

1) Make sure that the display shows ENTER BITE?

(b) Push the YES key on the keypad within 10 seconds.

1) Make sure that the display shows EXISTING FAULTS?

(c) Push and release the down arrow key until the display shows OTHER FUNCTNS?

(d) Push YES key on the keypad.

1) Make sure that the display shows SYSTEM CONFIG?

(e) Push and release the down arrow key until the display shows OUTPUT CONTROL?

(f) Push the YES key on the keypad.

1) Make sure that the display shows YD SERVO CONTROL.

(g) Push and release the down arrow key until the display shows REDUCER CONTROL?

(h) Push the YES key on the keypad.

1) Make sure that the display shows these indication:

a) WARNING! WARNING!

b) RUDDER MOVEMENT

c) RUDDER CLEARED?

(i) Make sure that all personnel are clear of the rudder.

(j) Push the YES key on the keypad.

1) Make sure that the display shows the following:

a) UP: ON ND: OFF

2) Push the UP KEY on the keypad.

<u>NOTE</u>: This sets the pressure limiter ON, or to reduced pressure.

3) Make sure that the display shows the following:

a) ON (XXXX is a number)

b) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(2) Push the left rudder pedal until it touches the forward quadrant stop and hold.

(3) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is between 1.87 to 2.62 VDC.

(4) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:

(a) Manually hold the main rudder PCU lower control rod at location B (Fig. 607) and pull forward with a force of approximately 30 to 40 lbs until it touches the stop and hold.

(b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is between 1.87 to 2.62 VDC.

(c) Release the main rudder PCU control rod.

(5) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.

(6) Push the DOWN key on the YDC keypad.

(a) Make sure that the display shows the following:

1) OFF (Where XXXX is a number) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(7) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 (stanchion station 351) shelf is less than 1.87 VDC

(8) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:
   (a) Manually hold the main rudder PCU lower control rod at location B (Fig. 607) and pull forward with a force of approximately 30 to 40 lbs until it touches the stop and hold.
   (b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is less than 1.87 VDC.
   (c) Release the main rudder PCU control rod.
(9) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.
(10) Release the rudder pedal.

NOTE: You have completed the test of system B in the extend direction.

F. Rudder Main PCU System B Internal Leakage Check in the Retract Direction

NOTE: You will need three persons to complete this task. There is a timie limit to complete some of the steps in this task.

(1) Use the Yaw Damper Coupler (YDC) to command the Rudder Pressure Reducer to the "Low" pressure state:

NOTE: If the test is being done in sequence, and the BITE screen has not timed out and reset, you can proceed to the next step at this step level.

   (a) Push the ON/OFF key on the BITE keypad on the face of the yaw damper coupler located on the E1-3 shelf.
      1) Make sure that the display shows ENTER BITE?
   (b) Push the YES key on the keypad within 10 seconds.
      1) Make sure that the display shows EXISTING FAULTS?
   (c) Push and release the down arrow key until the display shows OTHER FUNCTNS?
   (d) Push YES key on the keypad.
      1) Make sure that the display shows SYSTEM CONFIG?
   (e) Push and release the down arrow key until the display shows OUTPUT CONTROL?
   (f) Push the YES key on the keypad.
      1) Make sure that the display shows YD SERVO CONTROL.
   (g) Push and release the down arrow key until the display shows REDUCER CONTROL?
   (h) Push the YES key on the keypad.
      1) Make sure that the display shows these indications:
         a) WARNING! WARNING!
         b) RUDDER MOVEMENT

c) RUDDER CLEARED?

(i) Make sure that all personnel are clear of the rudder.

(j) Push the YES key on the keypad.

1) Make sure that the display shows the following:

a) UP: ON DN: OFF

2) Push the UP key on the keypad.

NOTE: This sets the pressure limiter ON, or to reduced pressure.

3) Make sure that the display shows the following:

a) ON (XXXX is a number)

b) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(2) Push the right rudder pedal until it touches the forward quadrant stop and hold.

(3) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is between 7.37 to 8.13 VDC.

(4) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:

(a) Manually hold the main rudder PCU lower control rod at location B (Fig. 607) and pull aft with a force of approximately 30 to 40 lbs until it touches the stop and hold.

(b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is between 7.37 to 8.13 VDC.

(c) Release the main rudder PCU control rod.

(5) If the voltage between pins 1 and 2 of connector D10070 is within the range, then continue with the next step.

(6) Push the DOWN key on the YDC keypad.

(a) Make sure that the display shows the following:

1) OFF (Where XXXX is a number)

2) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(7) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is greater than 8.13 VDC.

(8) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:

(a) Manually hold the main rudder PCU lower control rod at location B (Fig. 607) and pull aft with a force of approximately 30 to 40 lbs until it touches the stop and hold.

(b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is greater than 8.13 VDC.

(c) Release the main rudder PCU control rod.

(9) If the voltage between pins 1 and 2 of connector D10070 is within the range, then continue with the next step.

(10) Release the rudder pedal.

NOTE: You have completed the test of system B in the retract direction.

G. Rudder Main PCU System A Internal Leakage Check in the Extend Direction

NOTE: You will need three persons to complete this task. There is a time limit to complete some of the steps in this task.

(1) Put the FLT CONTROL A switch, on the P5-3 panel, to the ON position.
(2) Put the FLT CONTROL B switch, on the P5-3 panel, to the OFF position.
(3) Use the Yaw Damper Coupler (YDC) to command the Rudder Pressure Reducer to the "Low" pressure state:

NOTE: If the test is accomplished in sequence, and the BITE screen has not timed out, and reset, you can proceed to the next step at this step level.

(a) Push the ON/OFF key on the BITE keypad on the face of the yaw damper coupler located on the E1-3 shelf.
1) Make sure that the display shows ENTER BITE?
(b) Push the YES key on the keypad within 10 seconds.
1) Make sure that the display shows EXISTING FAULTS?
(c) Push and release the down arrow key until the display shows OTHER FUNCTNS?
(d) Push YES key on the keypad.
1) Make sure that the display shows SYSTEM CONFIG?
(e) Push and release the down arrow key until the display shows OUTPUT CONTROL?
(f) Push the YES key on the keypad.
1) Make sure that the display shows YD SERVO CONTROL.
(g) Push and release the down arrow key until the display shows REDUCER CONTROL?
(h) Push the YES key on the keypad.
1) Make sure that the display shows these indications:
a) WARNING! WARNING!
b) RUDDER MOVEMENT
c) RUDDER CLEARED?
(i) Make sure that all personnel are clear of the rudder.
(j) Push the YES key on the keypad.
1) Make sure that the display shows the following:
a) UP: ON DN: OFF

2) Push the UP KEY on the keypad.

NOTE: This sets the pressure limiter ON, or to reduced pressure.

3) Make sure that the display shows the following:
   a) ON (XXXX is a number)
   b) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(4) Push the left rudder pedal until it touches the forward quadrant stop and hold.
(5) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is between 6.87 to 7.63 VDC.
(6) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:
   (a) Manually hold the main rudder PCU upper control rod at location A (Fig. 607) and pull forward with a force of approximately 30 to 40 lbs until it touches the stop and hold.
   (b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is between 6.87 to 7.63 VDC.
   (c) Release the main rudder PCU control rod.
(7) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.
(8) Push the DOWN key on the YDC keypad.
   (a) Make sure that the display shows the following:
      1) OFF (Where XXXX is a number)
      2) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)
(9) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is greater than 8.13 VDC.
(10) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:
   (a) Manually hold the main rudder PCU upper control rod at location A (Fig. 607) and pull aft with a force of approximately 30 to 40 lbs until it touches the stop and hold.
   (b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is greater than 8.13 VDC.
   (c) Release the main rudder PCU control rod.
(11) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.
(12) Release the rudder pedal.

NOTE: You have completed the test of system A in the extend direction.

H. Rudder Main PCU System A Internal Leakage Check in the Retract Direction

NOTE: You will need three persons to complete this task. There is at time limit to complete some of the steps in this task.

(1) Use the Yaw Damper Coupler (YDC) to command the Rudder Pressure Reducer to the "Low" pressure state:

NOTE: If the test is accomplished in sequence, and the BITE screen has not timed out, and reset, you can proceed to the next step at this step level.

(a) Push the ON/OFF key on the BITE keypad on the face of the yaw damper coupler located on the E1-3 shelf.
    1) Make sure that the display shows ENTER BITE?
(b) Push the YES key on the keypad within 10 seconds.
    1) Make sure that the display shows EXISTING FAULTS?
(c) Push and release the down arrow key until the display shows OTHER FUNCTNS?
(d) Push YES key on the keypad.
    1) Make sure that the display shows SYSTEM CONFIG?
(e) Push and release the down arrow key until the display shows OUTPUT CONTROL?
(f) Push the YES key on the keypad.
    1) Make sure that the display shows YD SERVO CONTROL.
(g) Push and release the down arrow key until the display shows REDUCER CONTROL?
(h) Push the YES key on the keypad.
    1) Make sure that the display shows these indications:
        a) WARNING! WARNING!
        b) RUDDER MOVEMENT
        c) RUDDER CLEARED?
(i) Make sure that all personnel are clear of the rudder.
(j) Push the YES key on the keypad.
    1) Make sure that the display shows the following:
        a) UP: ON DN: OFF
    2) Push the UP key on the keypad.

    NOTE: This sets the pressure limiter ON, or to reduced pressure.

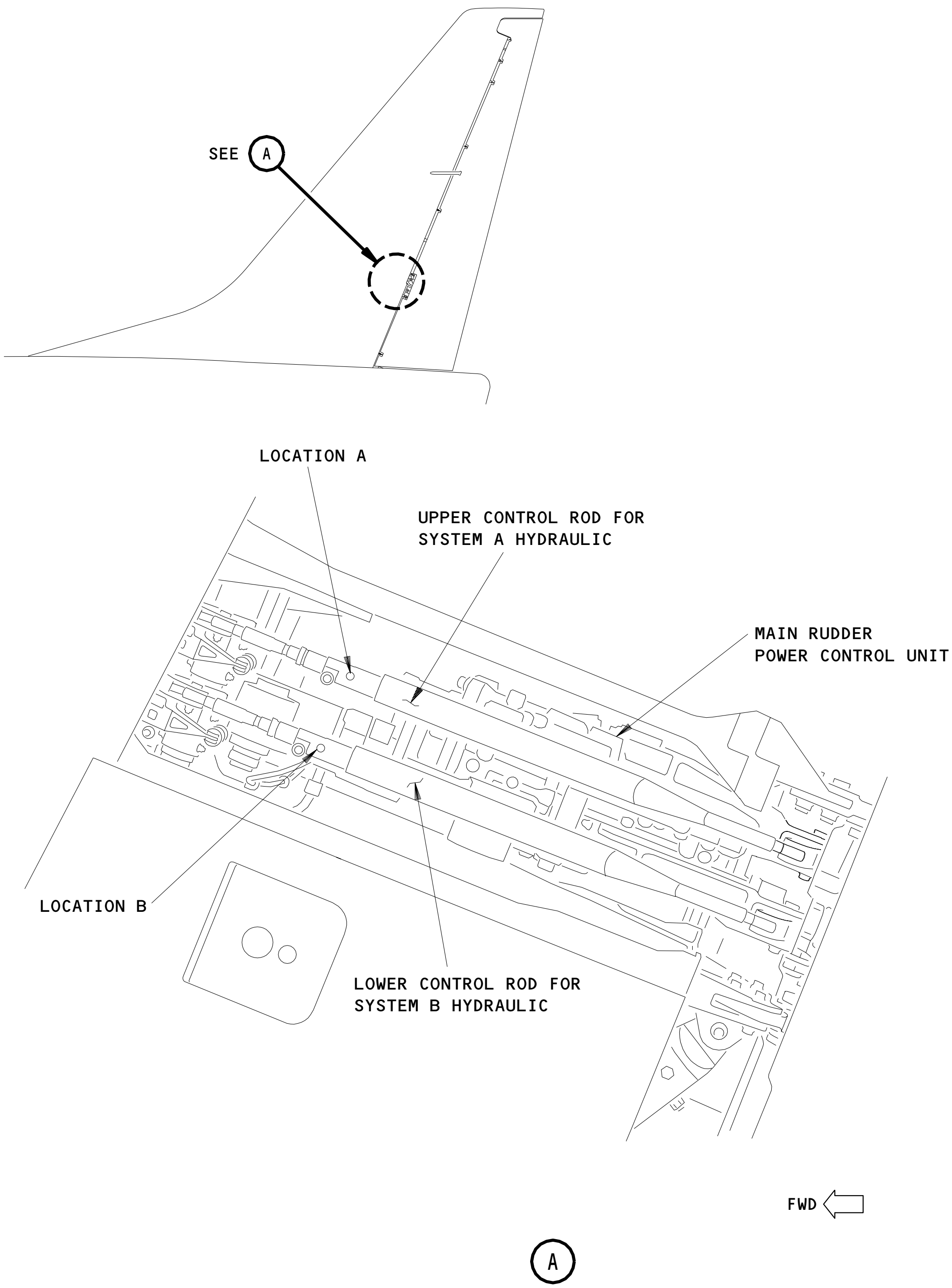
    3) Make sure that the display shows the following:
        a) ON (XXXX is a number)
        b) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)

(2) Push the right rudder pedal until it touches the forward quadrant stop and hold.

(3) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is between 2.37 to 3.13 VDC.
(4) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:
    (a) Manually hold the main rudder PCU upper control rod at location A (Fig. 607) and pull aft with a force of approximately 30 to 40 lbs until it touches the stop and hold.
    (b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is between 2.37 to 3.13 VDC.
    (c) Release the main rudder PCU control rod.
(5) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.
(6) Push the DOWN key on the YDC keypad.
    (a) Make sure that the display shows the following:
        1) OFF (Where XXXX is a number)
        2) XXXX psi (IGNORE THE NUMBER FOR THIS TEST)
(7) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf (stanchion station 351) is less than 1.87 VDC.
(8) If the voltage between pins 1 and 2 of connector D10070 is out of this range, do the steps that follow:
    (a) Manually hold the main rudder PCU upper control rod at location A (Fig. 607) and pull aft with a force of approximately 30 to 40 lbs until it touches the stop and hold.
    (b) Make sure that the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is less than 1.87 VDC.
    (c) Release the main rudder PCU control rod.
(9) If the voltage between pins 1 and 2 of connector D10070 on the E2 shelf is within the range, then continue with the next step.
(10) Release the right rudder pedal.

NOTE: You have completed the test of system A in the retract direction.

I. Put the Airplane Back to Its Usual Condition
(1) Release the pressure from the rudder hydraulic system (AMM 27-21-0/201).
(2) If electrical power is not needed, remove electrical power (AMM 24-22-0/201).
(3) Close the trailing edge access door, 9510.
(4) Close the access panels 9512 and 9514.
(5) Close the electrical equipment compartment access door 1201.
(6) Put the FLT CONTROL A and B switches, on the P5-3 panel, to the ON position.



Main Rudder PCU Internal Leakage Test
Figure 607

HYDRAULIC FLUID - INSPECTION/CHECK

1. General
   A. The operational environment of the hydraulic fluid will affect the service life of the fluid. A sample of the fluid should be removed from the airplane at intervals in accordance with the operator's experience and analyzed for the fluid properties shown in Fig. 601. If the fluid properties exceed any one of the fluid in service limits, an amount of fluid should be replaced in order to bring the fluid properties within service limits. The amount of fluid replaced is left to the discretion of the operator.
2. Hydraulic Fluid Sampling Procedure
   A. General
      (1) The following is the recommended procedure for obtaining hydraulic fluid samples. Fluid samples must be taken in bottles cleaned per the following procedure or fluid samples may be invalid.
      (2) Duplicate fluid samples should be obtained from each test source selected. One sample from each source should be obtained in a 1-pint polyethylene bottle and the other should be in a 1- or 2-oz glass bottle.
   B. Equipment and Materials
      (1) Polyethylene bottle with polyethylene sealed screw cap - 1-pint capacity
      (2) Glass bottle with polyethylene sealed screw cap - 1- or 2-ounce capacity
      (3) Isopropyl alcohol - approximately 1 pint
      (4) Petroleum ether - approximately 1 pint
      (5) Distilled deionized water - approximately 1 pint
      (6) Millipore NR filter and Trichloroethylene or the solvent
      (7) Filter - Gelman Type GA-6 Membrane, or equivalent
      (8) Clean polyethylene bags for storing bottles
      (9) Nitric acid 20% by volume - approximately 1 pint

FLUID PROPERTIES	IN-SERVICE FLUID LIMITS	TEST METHOD
Appearance	No cloudiness, phase separation or precipitation. Any color acceptable	Visual
Specific Gravity at 77°F/77°F 25°C/25°C	0.970 to 1.066	ASTM D941
Water Content Percent by wt.	0.8 maximum	ASTM D1744 or Infrared
Neutralization No. mg KOH/gm	1.5 maximum	ASTM D974
Viscosity, cs at 100°F at 210°F	 6.00 to 12.50 2.00 to 4.00	ASTM D445
Organic Contamination	None detectable by Infrared	Infrared *[1]
Elemental Contamination *[2]		Any Method with Following Accuracy
Calcium	50 ppm maximum	± 4 ppm
Potassium	50 ppm maximum	± 2 ppm
Sodium	50 ppm maximum	± 3 ppm
Chlorine	200 ppm maximum	± 20 ppm
Sulfur	500 ppm maximum	± 10 ppm *[3]
Particulate Contamination	NAS1638, Class 9 *[4]	SAE ARP 598
Particle Size Range (Microns)	Max Number of Particles Permitted	
5 to 15	128,000	

FLUID PROPERTIES	IN-SERVICE FLUID LIMITS	TEST METHOD
15 to 25	22,800	
25 to 50	4,050	
50 to 100	720	
Over 100	128	

*[1] If contamination is suspected, do procedure in accordance with Boeing Document D6-24429, An Analytical Method for Contaminants in BMS 3-11 Fluids and Their Mixtures Using Differential IR Spectroscopy.
*[2] Cntamination is a quantity that is more than that in the base stock or the group of items which you add. Compare the data from the fluid analysis with the limits put on the new fluid.
*[3] The precision of ± 10 ppm is applicable to total values in the range from 0 to 1000 ppm. In the range from 1000 to 3000 ppm, the precision will decrease to ± 50 ppm with some equipment.
*[4] These are the maximum contamination limits based on a 100 milliliter sample size.

C. Prepare Bottles for Sampling
(1) Clean polyethylene bottle.
(a) Prepare solution of detergent and hot water and wash bottle thoroughly.
(b) Rinse twice in hot soft tap water.
(c) Rinse twice in double distilled, deionized water.
(d) Drain and air dry in clean room laminar flow bench.

NOTE: If laminar flow bench is not available, bottle may be placed upside down in a clean dry room. All personnel should be kept from the room until bottle has been dried and capped.

(e) When bottle is dry, install screw cap and place in new polyethylene bag. Seal bag with knot or tape and identify.
(2) Clean glass bottle.
(a) Rinse thoroughly in 20% by volume nitric acid.
(b) Rinse twice in hot, soft tap water.
(c) Rinse twice in distilled water.
(d) Rinse isopropyl alcohol filtered through Gelman Type GA-6 membrane.
(e) Rinse with petroleum ether filtered through Millipore NR filter.

(f) Drain and air dry in clean room laminar flow bench.

NOTE: If laminar flow bench is not available, bottle may be placed upside down in a clean dry room. All personnel should be kept from room until bottle has been dried and capped.

(g) When bottle is dry, install screw cap and place in new polyethylene bag. Seal bag with knot or tape and identify.

D. Obtain Fluid Sample

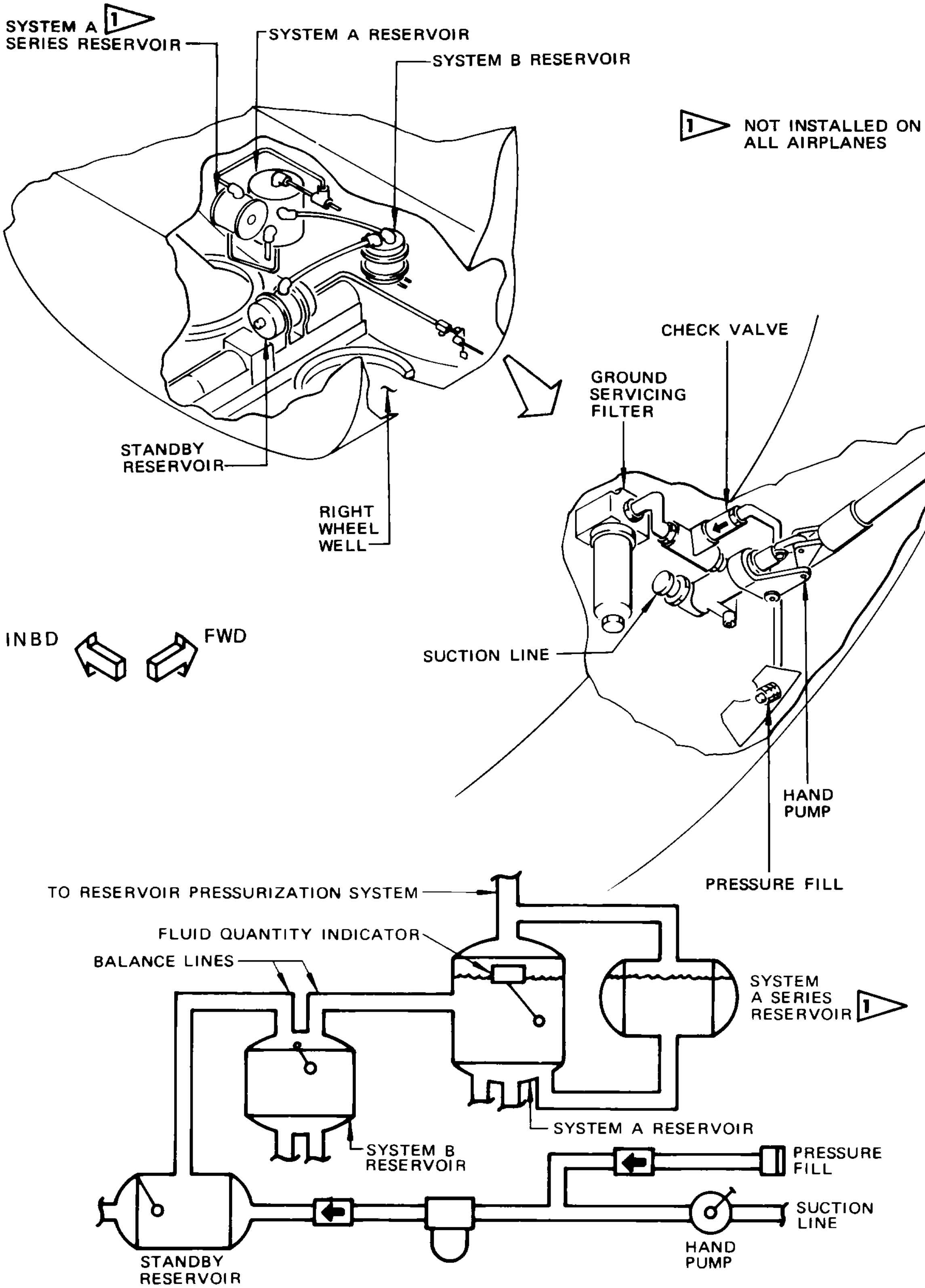
(1) Depressurize hydraulic reservoirs.
(2) Open system interconnect valve.
(3) Provide electrical power.
(4) Operate both system B hydraulic pumps (AMM 29-12-0/201).
(5) Place all A and B flight control and spoiler switches to ON position. Cycle all systems several times to circulate fluid through system.
(6) Engage yaw damper, aileron and elevator autopilot switches.
(7) Cycle flaps through a minimum of two complete cycles.
(8) With pumps operating, open system A reservoir drain valve and drain 1/2 to 1 gallon of fluid into waste container. Then from same valve and without closing, obtain sample in cleaned bottle.

CAUTION: SAMPLING BOTTLE SHOULD BE REMOVED FROM STREAM SO THATVALVE CLOSING WILL NOT DISLODGE CONTAMINANTS AND INFLUENCE SAMPLE.

(9) Place cap on bottle.
(10) Close drain valve and lockwire.
(11) Service hydraulic reservoirs (Ref 12-12-0, Hydraulic - Servicing).

HYDRAULIC GROUND SERVICING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The hydraulic ground servicing system is provided to fill all hydraulic reservoirs from one location (Fig. 1). A fluid filling station located in the right wheel well consists of a manually operated hand pump with a suction line, a connection for pressure filling, and a ground servicing filter. The system also includes the necessary tubing and connections required to connect the fill station components to the hydraulic reservoirs. A fluid quantity indicator mounted on the system. A reservoir is visible from the filling station. When servicing the hydraulic systems, the reservoirs are vented through the reservoir pressure regulator. Refer to 29-09-300, Hydraulic Reservoir Pressurization System. For hydraulic power system fluid servicing procedures, refer to Chapter 12, Hydraulic Fluid Servicing.
2. Ground Servicing Hand Pump
   A. The ground servicing hand pump is used to service the hydraulic reservoirs when pressure fill equipment is not available (Fig. 1). The hand pump is located in the right wheel well. The pump consists of a piston, handle, two mounting holes through the lower side of the pump body, and two ports for supply and discharge of fluid. A suction line is attached to the supply port of the pump.
3. Ground Servicing Filter
   A. The ground servicing filter is installed downstream of the hand pump and pressure fill connection. The filter prevents contamination of the hydraulic power system reservoirs and filters during ground filling of a filter head, filter bowl, and a 0.4 to 3 micron noncleanable element.



Hydraulic Ground Servicing System
Figure 1

GROUND SERVICING HAND PUMP - REMOVAL/INSTALLATION

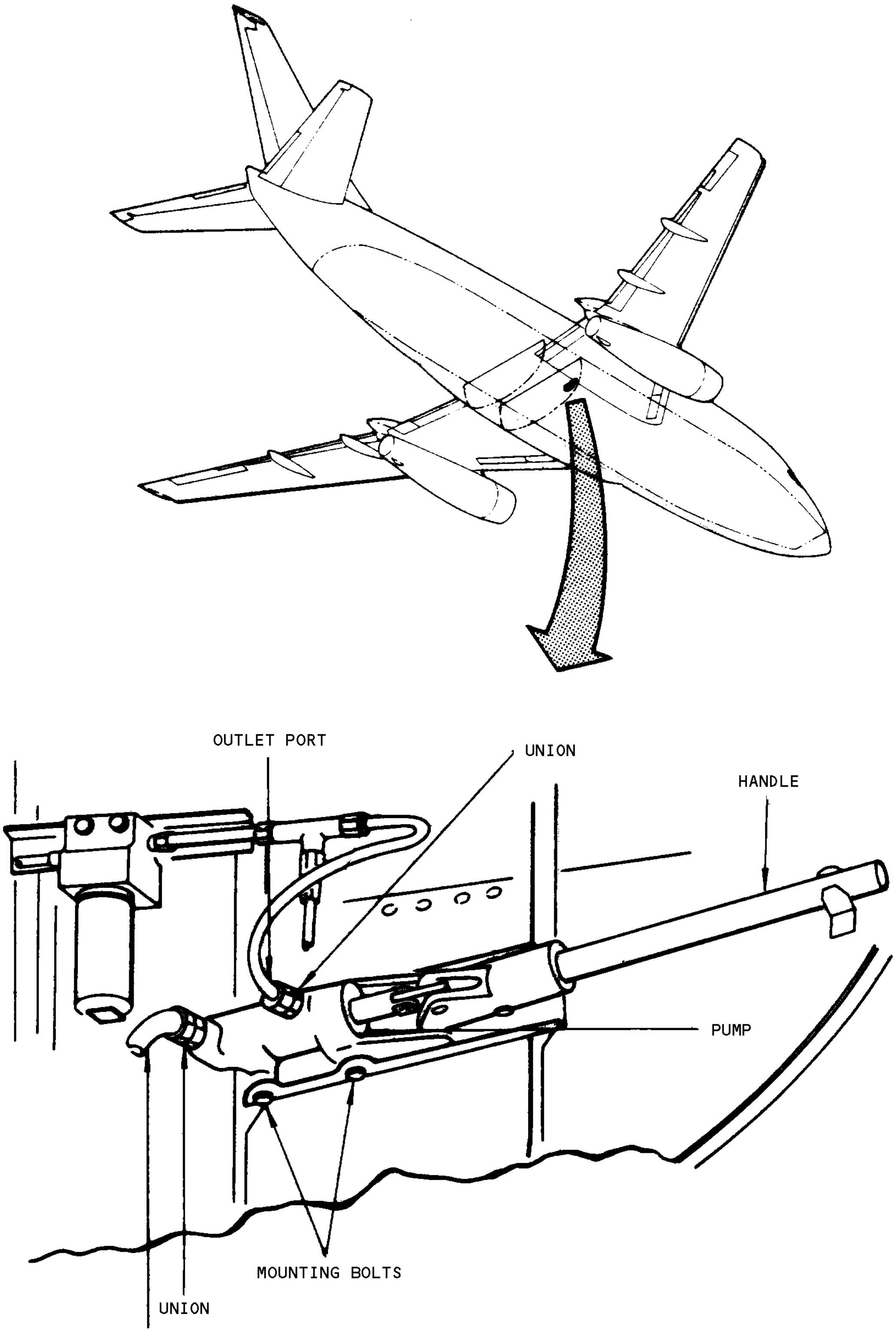
1. General
   A. A container will be necessary to catch fluid from the hand pump and disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid BMS 3-11.
3. Remove Ground Servicing Hand Pump
   A. Disconnect and cap hydraulic pump inlet and outlet lines (Fig. 401).
   B. Install protective covers on pump inlet and outlet ports.
   C. Remove pump mounting bolts and remove hand pump.
4. Install Ground Servicing Hand Pump
   A. Remove protective cover from pump ports.
   B. Apply assembly lube or hydraulic fluid to O-rings and unions and install in inlet and outlet ports.
   C. Position hand pump in mounting position and install pump mounting bolts and washers (Fig. 401).
   D. Remove protective caps on lines and connect line to inlet and outlet ports.

      CAUTION: DURING INSTALLATION, IT IS IMPERATIVE THAT EXTREME CARE BE TAKEN TO PREVENT IMPURITIES FROM ENTERING THE SYSTEM. ALL CONNECTIONS MUST BE TIGHT TO PREVENT FLUID AND AIR LEAKAGE.

   E. Check operation of pump by pumping a small quantity of fluid through pump.

      CAUTION: USE CONTAINER TO CATCH ANY FLUID PUMPED OVERBOARD WHILE CHECKING PUMP.

   F. Check pump connections for any sign of leakage.



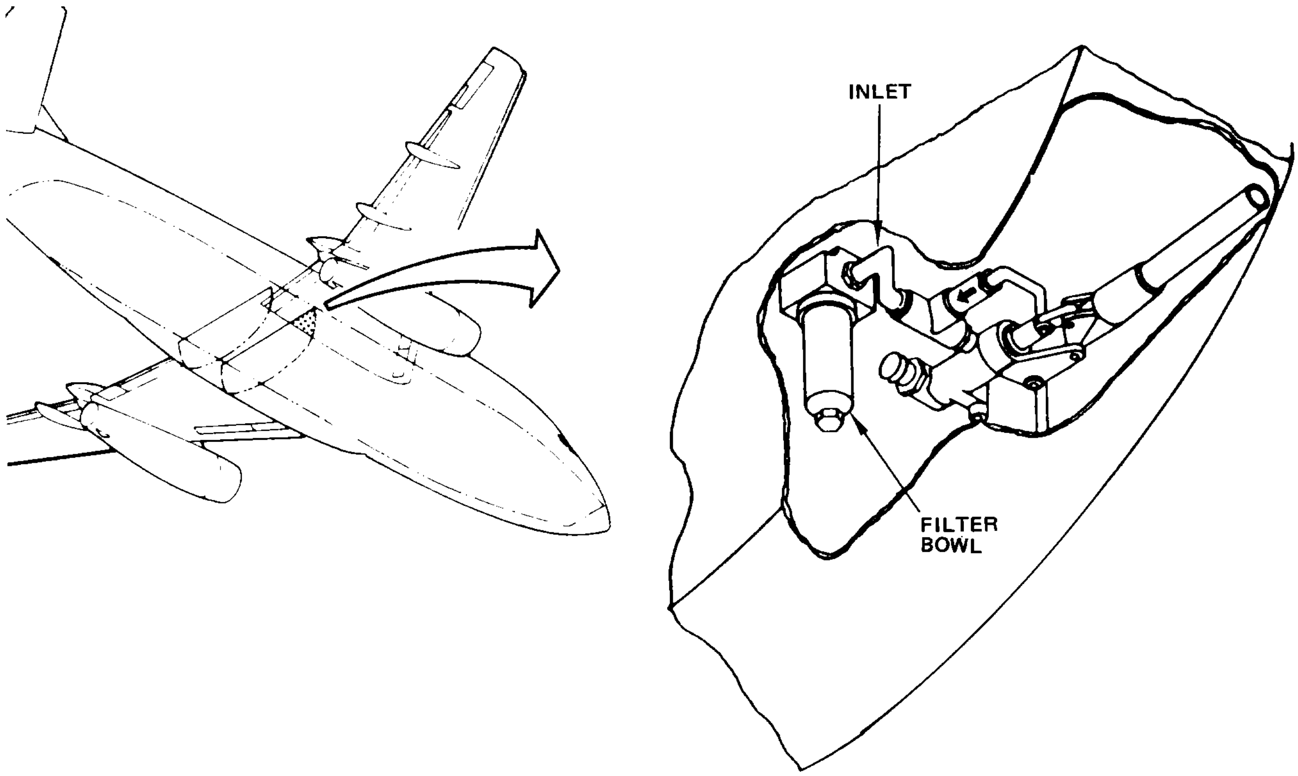
Ground Servicing Hand Pump Installation
Figure 401

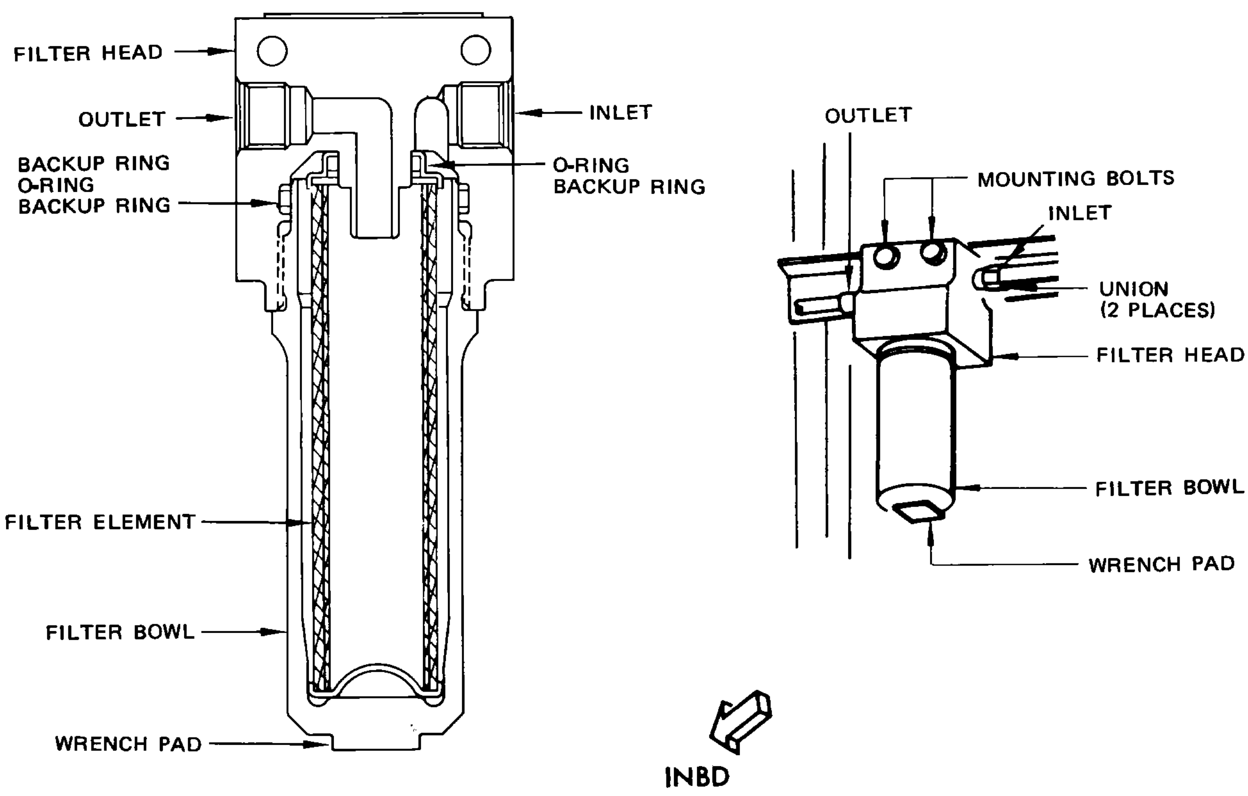
HYDRAULIC GROUND SERVICING FILTER - UNIT SERVICING

1. General
   A. The ground servicing filter bowl should be removed at regular intervals and the filter element checked for contamination. If excessive contamination exists, the element should be replaced.
   B. A container will be necessary to catch fluid from the disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire -Resistant Hydraulic Fluid, BMS 3-11
   B. Torque Wrench 50-75 pound inches.
3. Remove Ground Servicing Filter Element
   A. Gain access to filter located in the right wheel well.
   B. Remove filter bowl with filter element (Ref 29-09-221 R/I).
   C. Remove and dispose of element and clean filter bowl.
4. Install Ground Servicing Filter Element
   A. Lubricate O-rings, backup rings and filter bowl threads with assembly lube or hydraulic fluid.
   B. Insert backup ring and O-ring in groove inside upper end of filter element (Ref 29-09-221 R/I).
   C. Install backup ring, O-ring, and backup ring in groove in filter head.
   D. Partially prefill filter bowl with hydraulic fluid. Place element in filter bowl and screw into filter head.
   E. Torque filter bowl 50 to 75 pound-inches and install safety wire.
   F. Connect ground servicing source and check filter for leaks (AMM 29-11-0/201).

HYDRAULIC GROUND SERVICING FILTER - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid from the disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11.
3. Remove Hydraulic Ground Servicing Filter
   A. Gain access to filter located in the right wheel well.
   B. Disconnect lines from inlet and outlet ports of filter (Fig. 401).
   C. Cap open lines and plug filter ports to prevent contamination.
   D. Remove mounting bolts and remove filter.
4. Install Hydraulic Ground Servicing Filter
   A. Install O-ring and union in each port (Fig. 401). Lubricate with assembly lube or hydraulic fluid.
   B. Place filter in mounting position and install mounting bolts.
   C. Connect hydraulic lines to inlet and outlet ports.
   D. Check the filter bowl is tight and lockwired.
   E. Connect ground servicing source and check filter and connections for leaks.

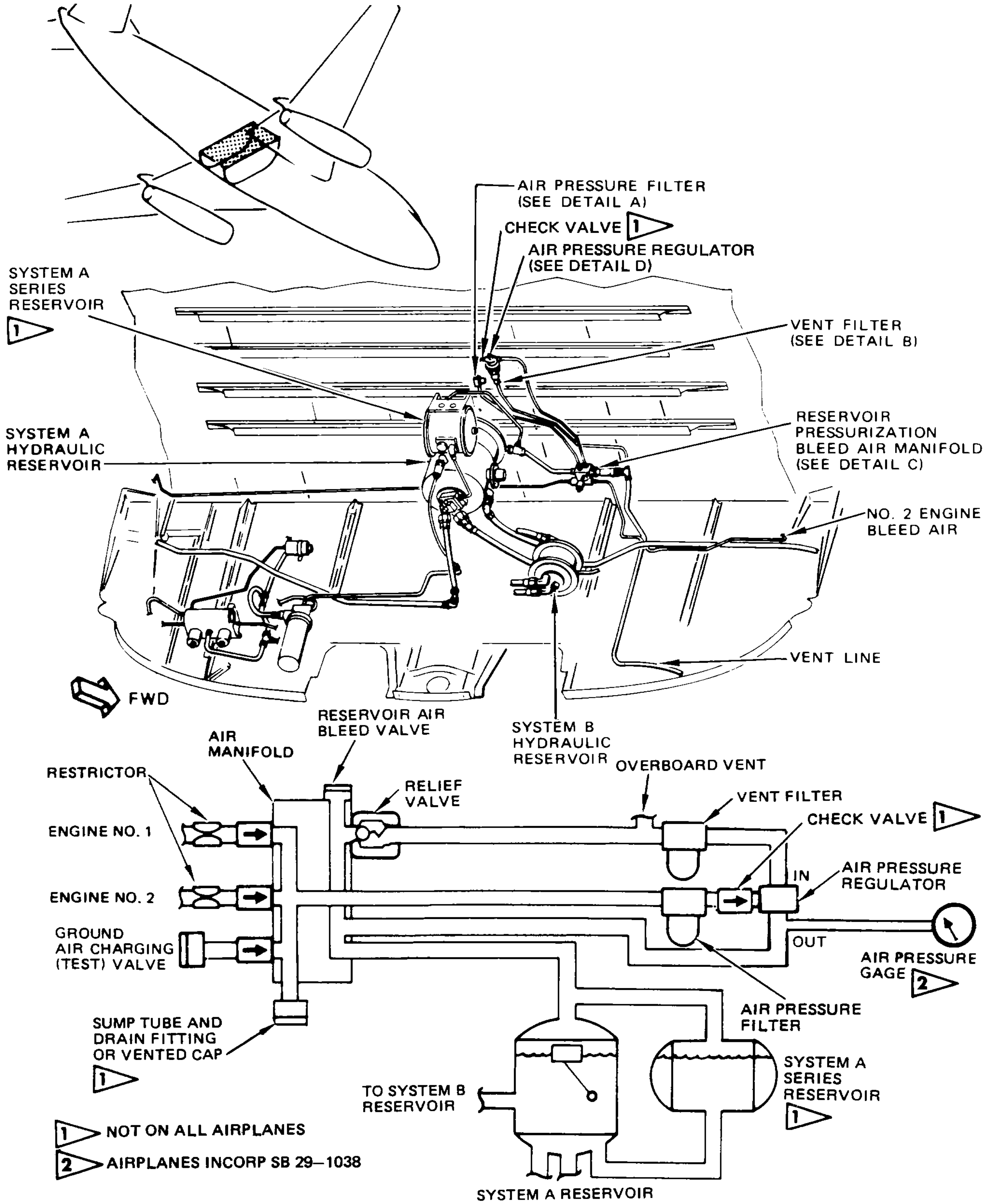




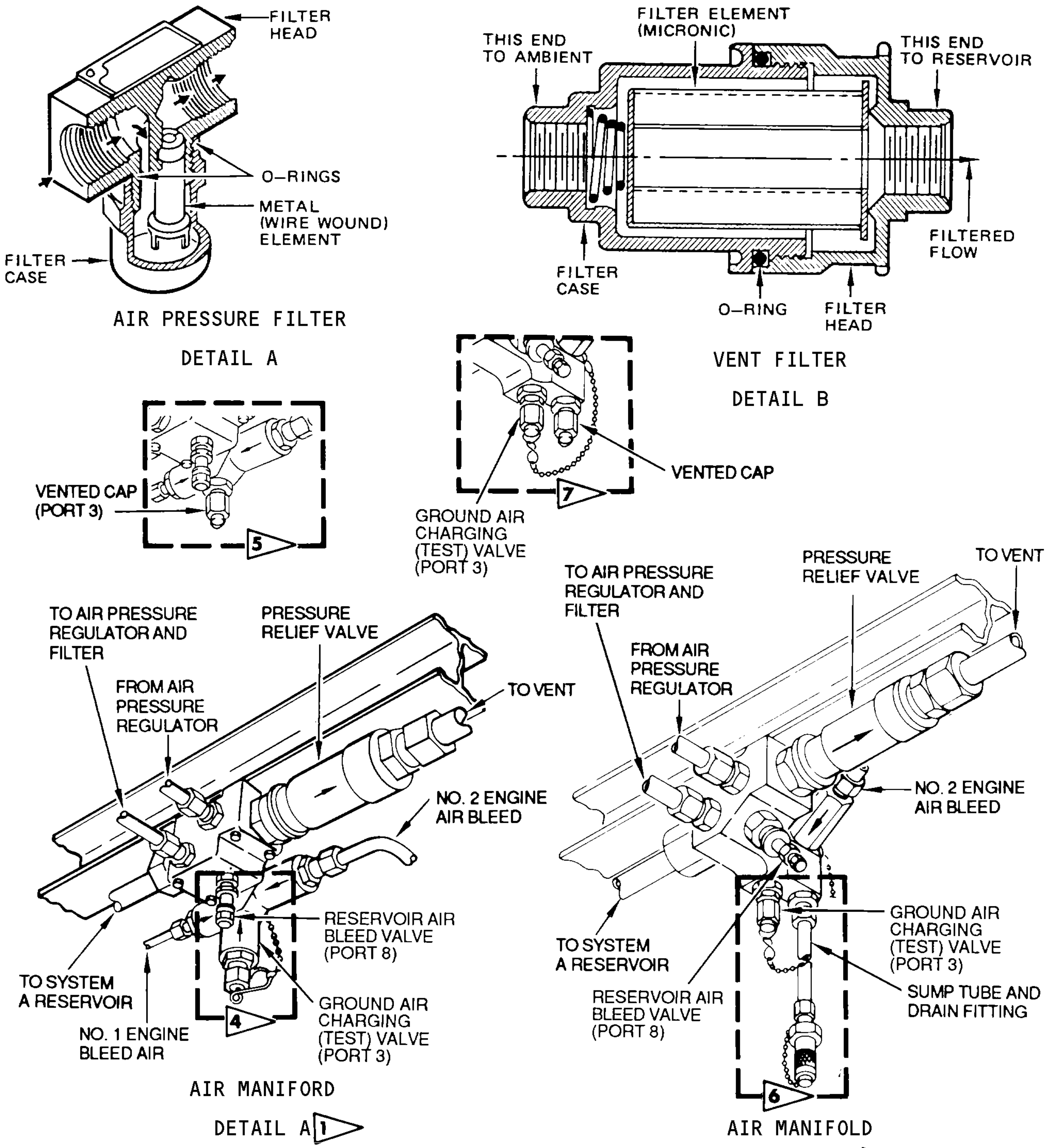
Hydraulic Ground Servicing Filter Installation
Figure 401

HYDRAULIC RESERVOIR PRESSURIZATION SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The reservoir pressurization system supplies bleed air from No. 1 and 2 engines to pressurize system A, system B, and standby hydraulic reservoirs. The system provides a positive supply of hydraulic fluid to the pumps and prevents foaming in the reservoirs. A constant pressure of 40 to 47 psi is maintained in the reservoirs by a pressure regulator which also operates as a vacuum relief valve to relieve negative pressures in the reservoirs. Overpressurization of the system is prevented by a system relief valve set to relieve between 60 and 65 psi. The pressurization system also contains an air pressure filter, vent filter, check valves, restrictors, ground air charging (test) valve, relief valve, air manifold, reservoir air bleed valve and (on some airplanes) a sump tube and drain fitting or vented cap.
2. Ground Air Charging (Test) Valve (Fig. 1)
   A. The ground air charging (test) valve is provided to attach an external air source to the reservoir pressurization system. An external air source should be used during ground test procedures to provide a positive fluid flow and to increase the hydraulic return systems to normal operating pressures. The valve is installed on the air manifold located on the upper surface of the right wheel well area.
3. Air Pressure Regulator (Fig. 1)
   A. The air pressure regulator maintains a constant pressure of 40 to 47 psi in the hydraulic reservoirs. The regulator operates as a vacuum relief valve and a pressure relief valve. The regulator consists of the pressure valve, poppet valve, spring and diaphragm. On some airplanes, a check valve is installed in the IN (inlet) port of the regulator to maintain system pressure. The regulator is installed on the upper surface of the wheel well area. Ambient pressure and spring forces acting on the diaphragm control the regulator. Air from engines No. 1 and 2 flows to the regulator. When the reservoir is below regulated pressure, air will flow through the poppet valve to the reservoir until the regulated pressure is obtained. As pressure in the reservoir overcomes spring and ambient pressure the poppet closes, preventing air from entering. As air pressure in the reservoir rises over regulated pressure, air pressure inside the reservoir overcomes spring and ambient pressure opening the pressure valve allowing air to escape until regulated pressure is obtained. As pressure in the reservoirs drops 0.50 psi under ambient pressure, the ambient valve opens allowing ambient air to enter the reservoir, preventing vacuum in the reservoir. An air pressure gauge is installed at the outlet of the air pressure regulator (on some airplanes).



Reservoir Pressurization System Components Location
Figure 1 (Sheet 1)



1 ALL EXCEPT 2

2 AIRPLANES WITH PORT 9

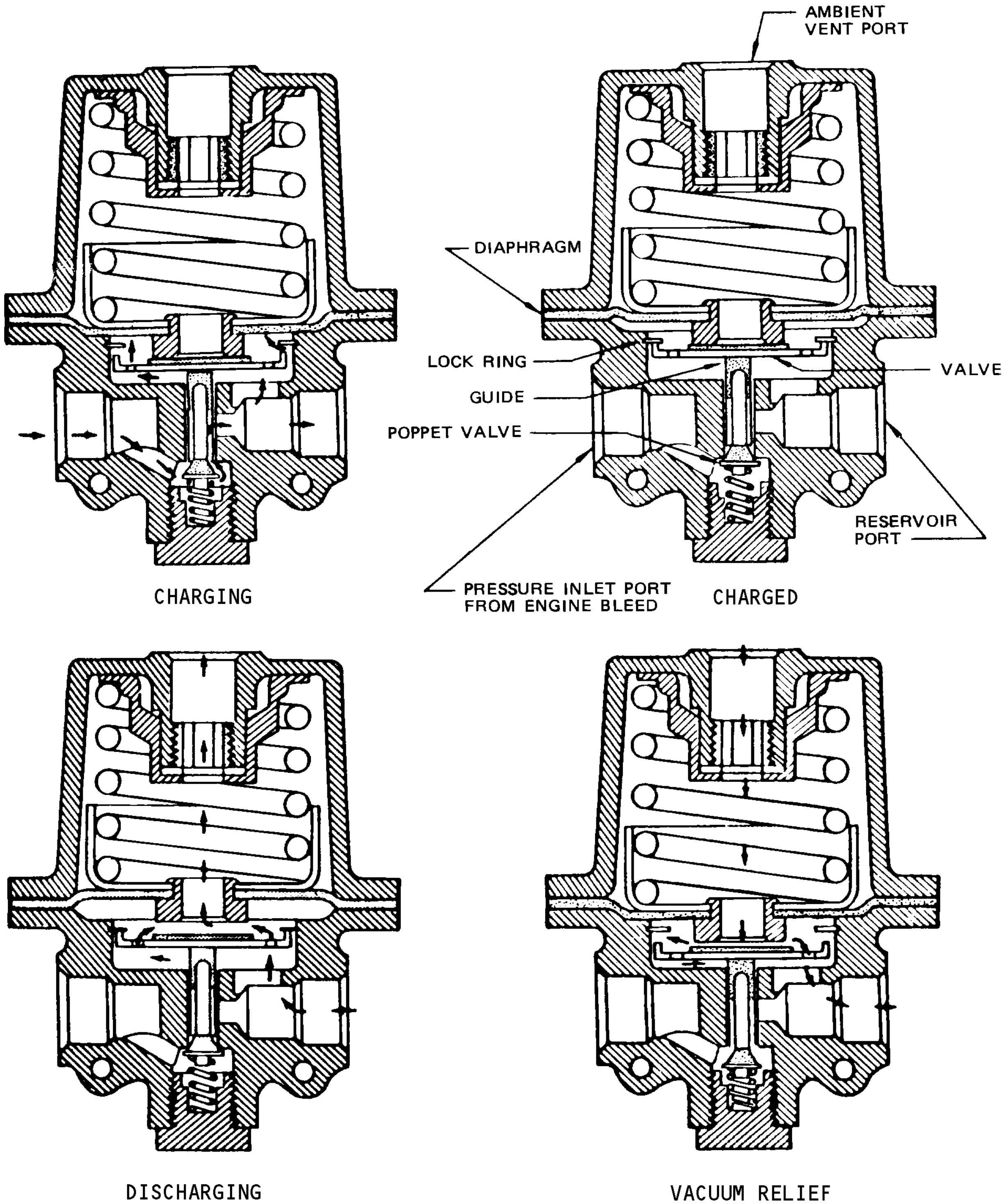
4 AIRPLANES WITH BLEED VALVE

5 AIRPLANES WITH VENTED CAP

6 AIRPLANES WITH SUMP TUBE AND DRAIN FITTING

7 AIRPLANES WITH VENTED CAP

Reservoir Pressurization System Components Location
Figure 1 (Sheet 2)



AIR PRESSURE REGULATOR

DETAIL D

Reservoir Pressurization System Components Location
Figure 1 (Sheet 3)

4. Vent Filter
   A. The vent filter removes foreign material from ambient air entering the air pressure regulator through the vent line for system A reservoir vacuum relief. The filter consists of a filter head, noncleanable element and a filter bowl. The filter is installed at the vent inlet of the air pressure regulator on the upper surface of the main wheel well (Fig. 1).
5. Air Pressure Filter
   A. The air pressure filter removes foreign material from engine bleed air entering the air pressure regulator. The filter consists of a filter head, nonclogging metal cleanable element and a filter bowl. The filter is installed next to the regulator on the upper surface of the wheel well area (Fig. 1).
6. Check Valves and Restrictors
   A. Check valves.
      (1) A check valve is installed in the ground air charging (test) valve line and in each engine bleed line to prevent reverse flow. The direction of flow is shown by an arrow on the valve body.
   B. Restrictors
      (1) A fixed restrictor is installed in each engine bleed line upstream of each check valve to limit maximum airflow in case of air pressure regulator malfunction.
7. Relief Valve
   A. A relief valve connected to the air manifold (Fig. 1) prevents the reservoir from being damaged by overpressurization. The relief valve is set to relieve between 60 and 65 psi, and has a maximum flow of about 20 gpm. The valve is designed to reset at 90% of the relieving pressure.
8. Reservoir Air Bleed Valve (Fig. 1)
   A. A reservoir air bleed valve is installed on the air manifold. The connection is used for attaching external air pressure and a gage to check the operation of the air pressure regulator. The valve can be used for pressurizing the reservoir.
9. Air Manifold (Fig. 1)
   A. An air manifold is installed in the reservoir air pressurization system to manifold the engine bleed air from the engines into one line to the reservoir. The manifold also provides connections for the relief valve, air pressure regulator and filter, ground air charging (test) valve, reservoir air bleed valve, and (on some airplanes) a sump tube and drain fitting or vented cap.
      10 Sump Tube and Drain Fitting (Fig. 1) (Not on all airplanes)
   B. A sump tube is installed on the bottom of the air manifold to collect any water condensate from the restrictors and check valves. A drain fitting in installed on the bottom of the sump tube.

10. Vented Cap (Fig. 1)(Not on all airplanes)
    A. A vented cap is installed on the bottom of the manifold to constantly drain any water condensate from the restrictors, check valves, and vent lines.

HYDRAULIC RESERVOIR PRESSURIZATION SYSTEM - MAINTENANCE PRACTICES

1. General
   A. When testing hydraulic equipment during ground test procedures, the hydraulic reservoir should be pressurized to provide positive fluid flow to the pumps and to maintain a normal operating pressure on the return side of the hydraulic system. Air entering the reservoir via the reservoir air bleed valve is not filtered. Air entering the reservoir via the ground air charging (test) valve is filtered (Fig. 1).
   B. Depressurize reservoirs when maintenance is being performed on the return side of the hydraulic system.
   C. On some airplanes, a vented cap in the pressurization system continuously bleeds air and water accumulation to prevent air pressure lines from freezing.
   D. On some airplanes, a check valve in the air pressurization system prevents air pressure from bleeding from the reservoir when the pressurization system is inactive. The air bleed valve will allow the reservoir to be depressurized.
   E. Should fluid spill on the airplane, decontaminate (Ref 12-40-0).
2. Pressurize Hydraulic Reservoir
   A. Equipment and Materials.
      (1) Regulated source of clean, dry air, 0 to 65 psig maximum pressure
   B. Pressurize Reservoirs with reservoir air bleed valve.
      (1) Gain access to air bleed valve in wheel well area.
      (2) Connect air source to air bleed valve and open valve one to two turns.
      (3) Pressurize reservoirs 40 to 47 psi. Maintain constant pressure until test requirements are complete.
      (4) Remove air source, tighten air bleed valve body and install dust cap.
      (5) Lockwire air bleed valve.
   C. Pressurize reservoirs with ground air charging (test) valve.
      (1) Gain access to charging valve on pressurization manifold in wheel well.
      (2) Remove dust cap and connect air source to connector.

         NOTE: Check valve in charging valve will prevent loss of air while connection in being made.

      (3) Open air source. Pressure regulators will maintain system pressure until tests are complete.
      (4) Remove air source and install dust cap.
3. Depressurize Hydraulic Reservoirs
   A. Gain access to reservoir air bleed valve on air manifold in wheel well.
   B. Hold container below bleed valve to catch trapped fluid.

C. Bleed air from system by removing cap from valve and loosening release nut one or two turns.
D. Tighten release nut on valve and reinstall cap.
E. Lockwire bleed valve.

4. <u>Drain Air Manifold Sump Tube and Drain Fitting (Not on all airplanes)</u>
A. Gain access to sump tube and drain fitting on air manifold in wheel well.
B. Ensure that engines are not operating and external air source is not connected to air manifold. Depressurize reservoir per Par. 3.

<u>WARNING</u>: DO NOT OPEN DRAIN FITTING IF AIR MANIFOLD IS PRESSURIZED. PERSONNEL INJURY COULD RESULT.

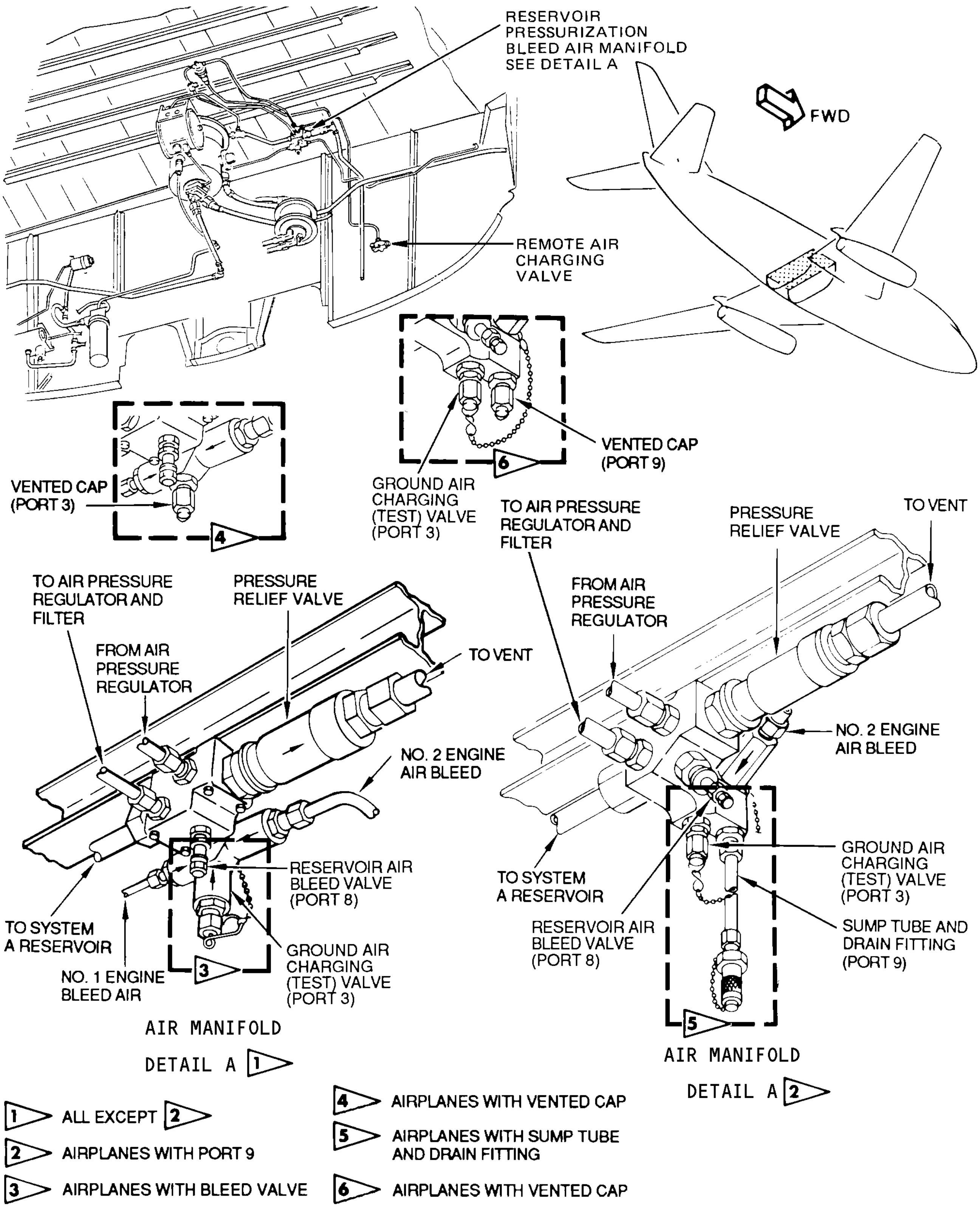
C. Hold container below drain fitting to catch drained water.
D. Remove cap from drain fitting and drain sump tube.
E. Invert drain cap and insert the raised portion of cap into opening now exposed in bottom of drain body. Press cap into drain body with hand pressure to open a spring-loaded seal and allow any collected liquid in the sump to exit.
F. Install cap.

HYDRAULIC RESERVOIR PRESSURIZATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure is used to test the pressure regulator for proper operation and correct setting and to test for leakage along the lines and fittings from the engine bleed to the reservoir pressurization system. No adjustment is allowed on the regulator. A defective regulator should be replaced by a new regulator.
2. Equipment and Materials
   A. Regulated source of high pressure nitrogen or clean, dry air, 0 to 200 psi
   B. Pressure gage - 0- to 200-psi range (3 required)
   C. Pneumatic shutoff valve (2 required)
3. Test Air Pressure Regulator
   A. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   B. Connect 200-psi gage to reservoir air bleed valve on Test Port No. 8 of the reservoir pressurization air manifold. Open bleed valve. Reservoir air pressure gage, if installed, can be used for this purpose and bleed valve need not be opened.
   C. On airplanes with sump tube and drain fitting, remove sump drain cap and install blanking cap to seal opening.
   D. On No. 1 engine-to-wing fairing area, open access panel No. 5226 on outboard side of fairing.
   E. Disconnect reservoir pressurization engine bleed line hose from fitting and connect a nitrogen or dry air source to reservoir side of fitting together with a 200-psi gage and shutoff valve.
   F. On No. 2 engine-to-wing fairing area, open access panel No. 5126 on outboard side of fairing.
   G. Disconnect reservoir pressurization engine bleed line hose and connect a 200-psi test gage to reservoir side of fitting.
   H. Slowly pressurize engine No. 1 line to 200 psi. Close shutoff valve at source and check that reservoir pressure stabilizes between 40-47 psi.
   I. Decrease pressure to zero psi.
   J. Disconnect and cap inlet tube to air pressure regulator.
   K. Slowly increase pressure to 200 psi and close shutoff valve. Check that pressure in No. 1 engine bleed air line does not drop more than 5 psi over a 5-minute period. Check that check valve in No. 2 engine bleed line does not leak.

      NOTE: Leakage through check valve will cause a reading on pressure gage in No. 2 engine area.

   L. Decrease pressure to zero by opening shutoff valve. Reverse connections between No. 1 and 2 engine bleed lines and repeat step G thru J at No. 2 engine.



Hydraulic Reservoir Pressurization System Test
Figure 501

M. Remove pressure source, pressure gages and shutoff valves. Close reservoir air bleed valve at air manifold by tightening release nut and reinstalling cap, if used. Reconnect bleed air lines in No. 1 and 2 engine area.
N. Check that inlet tube is connected to air pressure regulator.
O. Close access panels.
P. Check pressure relief valve.
   (1) Remove dust cap or pressure gage and connect regulated source of nitrogen or clean dry air to reservoir air bleed valve on manifold port 8.
   (2) Disconnect and cap inlet tube from air pressure regulator and outlet tube to system A reservoir.
   (3) Open release nut of bleed valve and slowly apply pressure. Check that relief valve opens at 60 to 65 psi. Do not exceed 70 psig.
   (4) Close release nut of bleed valve and remove pressure source.
   (5) Install bleed valve dust cap.
Q. On airplanes with sump tube and drain fitting, remove blanking cap from drain port and reinstall the sump drain cap.

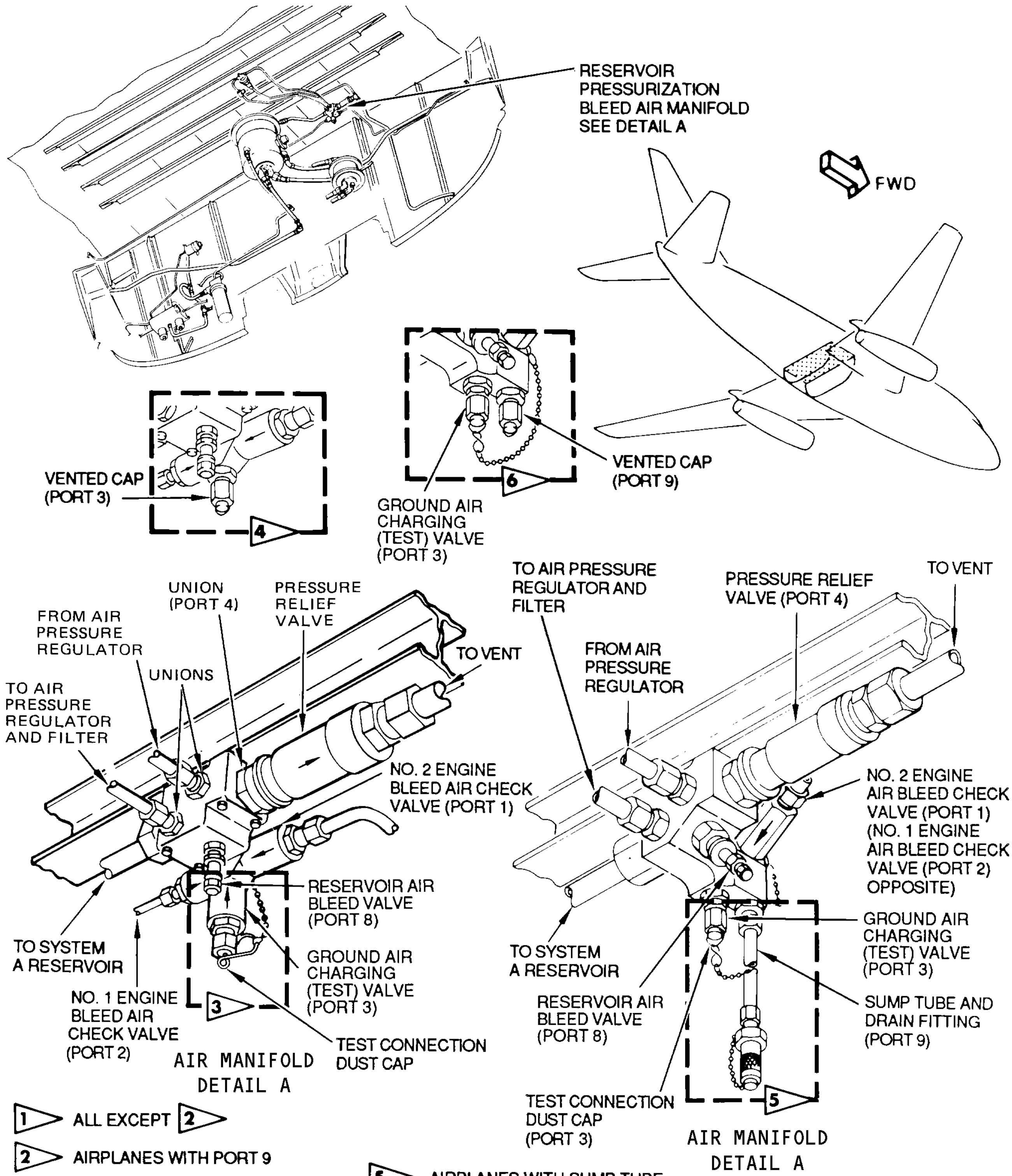
   NOTE: The sump drain cap has a small hole drilled through it to act as a constant bleed valve. The purpose of this is to constantly eject water buildup during flight and so prevent freezing.

R. On airplanes with vented cap, check that hole in vented cap on lower side of air manifold is not blocked.

   NOTE: The vented cap has a small hole drilled through it to act as a constant bleed valve. The purpose of this is to constantly eject water buildup during flight and so prevent freezing.

HYDRAULIC RESERVOIR PRESSURIZATION AIR MANIFOLD - REMOVAL/INSTALLATION

1. General
   A. A container may be necessary to catch fluid from disconnected lines. Should any fluid spill on the airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
3. Remove Hydraulic Reservoir Pressurization Air Manifold (Fig. 401)
   A. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   B. Disconnect lines from manifold.
   C. Remove pressure relief valve and union from manifold.
   D. Remove engine bleed air check valves.
   E. Remove ground air charging (test) valve and cap retaining chain or vented cap.
   F. Remove reservoir air bleed valve from manifold.
   G. Remove sump tube and drain fitting or vented cap from manifold, if installed.
   H. Remove remaining unions from manifold.
   I. Remove mounting bolts securing manifold to airplane structure.
4. Install Hydraulic Reservoir Pressurization Air Manifold (Fig. 401)
   A. Place manifold in mounting position and install mounting bolts.
   B. Install unions in manifold, using new O-rings. Lubricate with assembly lube or hydraulic fluid.
   C. Install ground air charging (test) valve in port 3 and attach cap and retaining chain or install vented cup.
   D. Install reservoir air bleed valve in port 8.
   E. Install sump tube and drain fitting or vented cap in port 9, if installed.
   F. Install engine bleed air check valves in ports 1 and 2.
   G. Install pressure relief valve and union in port 4 with flow arrow pointing away from manifold.
   H. Connect all lines to manifold.
   I. Pressurize hydraulic reservoir pressurization system and check manifold and connections for leaks (Ref 29-09-300 MP).



1 ALL EXCEPT 2

2 AIRPLANES WITH PORT 9

3 AIRPLANES WITH BLEED VALVE

4 AIRPLANES WITH VENTED CAP

5 AIRPLANES WITH SUMP TUBE AND DRAIN FITTING

6 AIRPLANES WITH VENTED CAP

Hydraulic Reservoir Pressurization Air Manifold Installation
Figure 401

HYDRAULIC RESERVOIR PRESSURIZATION AIR PRESSURE FILTER - UNIT SERVICING

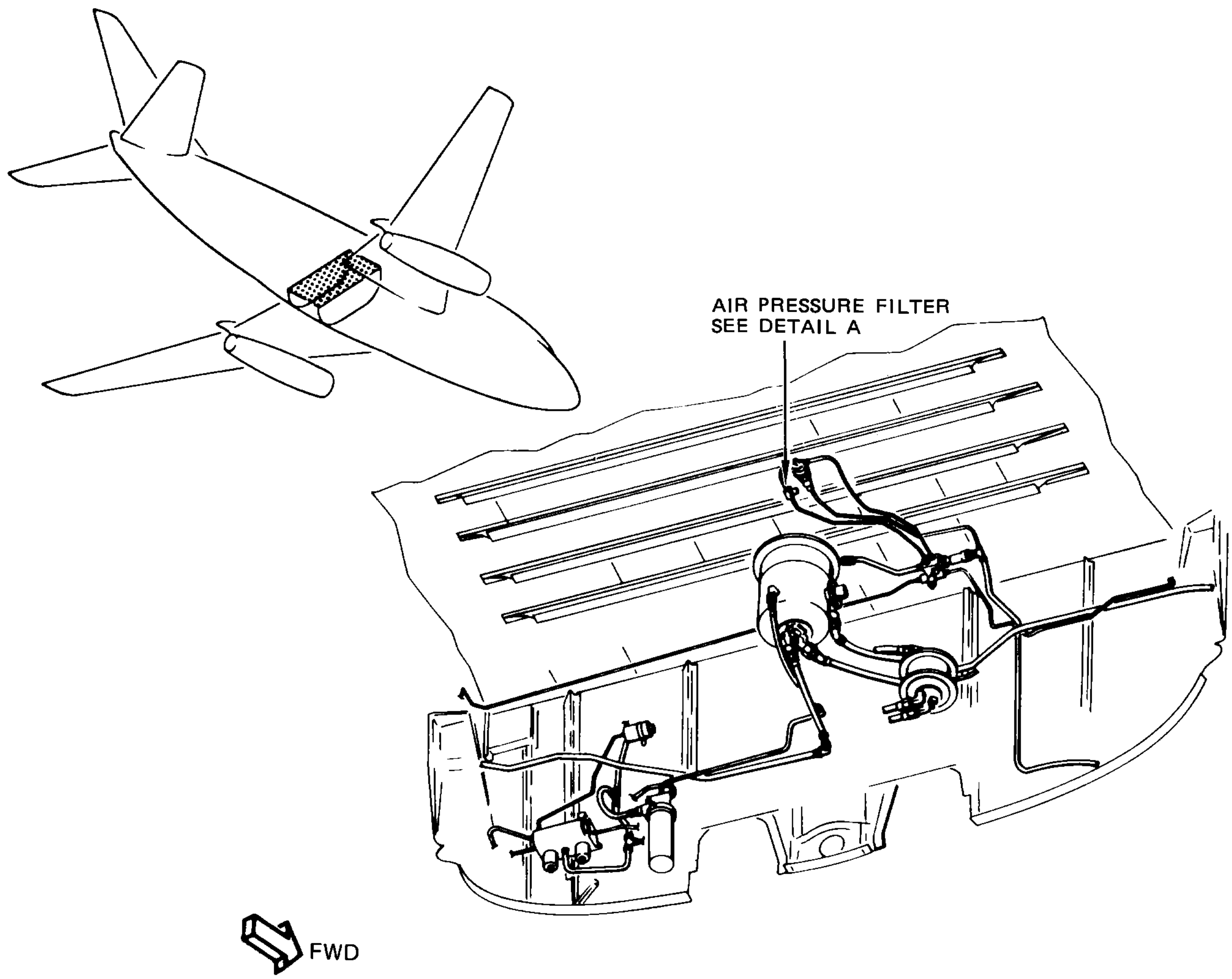
1. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
2. Clean Air Pressure Filter
   A. Depressurize hydraulic reservoir system (Ref 29-09-300 MP).
   B. Unscrew filter case and remove case with filter element (Fig. 301).
   C. Clean filter case and element.

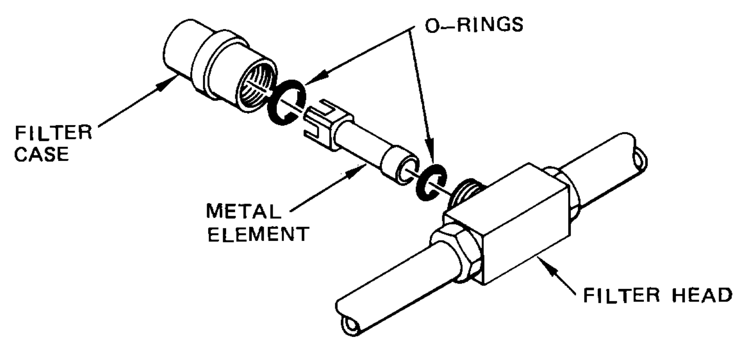
      NOTE: The most effective means of cleaning metallic filter elements is the ultrasonic method.

   D. Lubricate O-rings and threads of filter bowl with assembly lube or hydraulic fluid.
   E. Install O-rings in filter head as shown on (Fig. 301).
   F. Place element in filter case and screw case into filter head. Apply a torque of 50 to 75 pound-inches to filter case.

      NOTE: Ensure that the filter assembly is mounted such that the filter bowl is horizontal.

   G. Lockwire filter case.
   H. Pressurize hydraulic reservoir system and check for leaks (Ref 29-09-300).



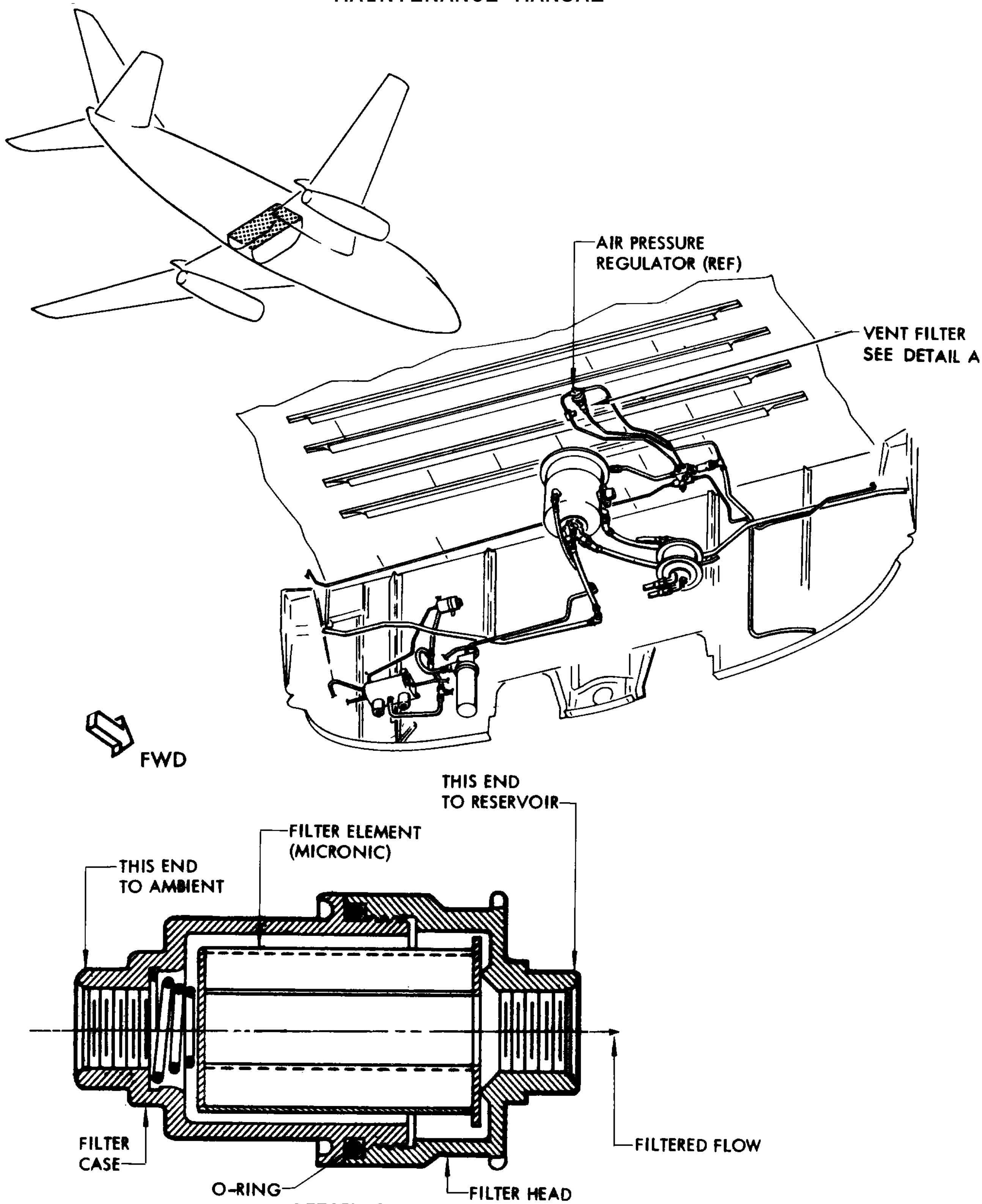


AIR PRESSURE FILTER
DETAIL A

Hydraulic Reservoir Pressurization Air Pressure Filter Servicing
Figure 301

HYDRAULIC RESERVOIR PRESSURIZATION VENT FILTER - UNIT SERVICING

1. Replace Vent Filter Element
   A. Disconnect tubing from filter (See Fig. 301).
   B. Unscrew filter case from filter head.
   C. Remove and discard filter element.
   D. Clean filter case, filter head and spring.
   E. Install new O-ring in filter head.
   F. Reinstall spring and new filter element in filter case and screw case into filter head.
   G. Connect tubing to filter.



DETAIL A

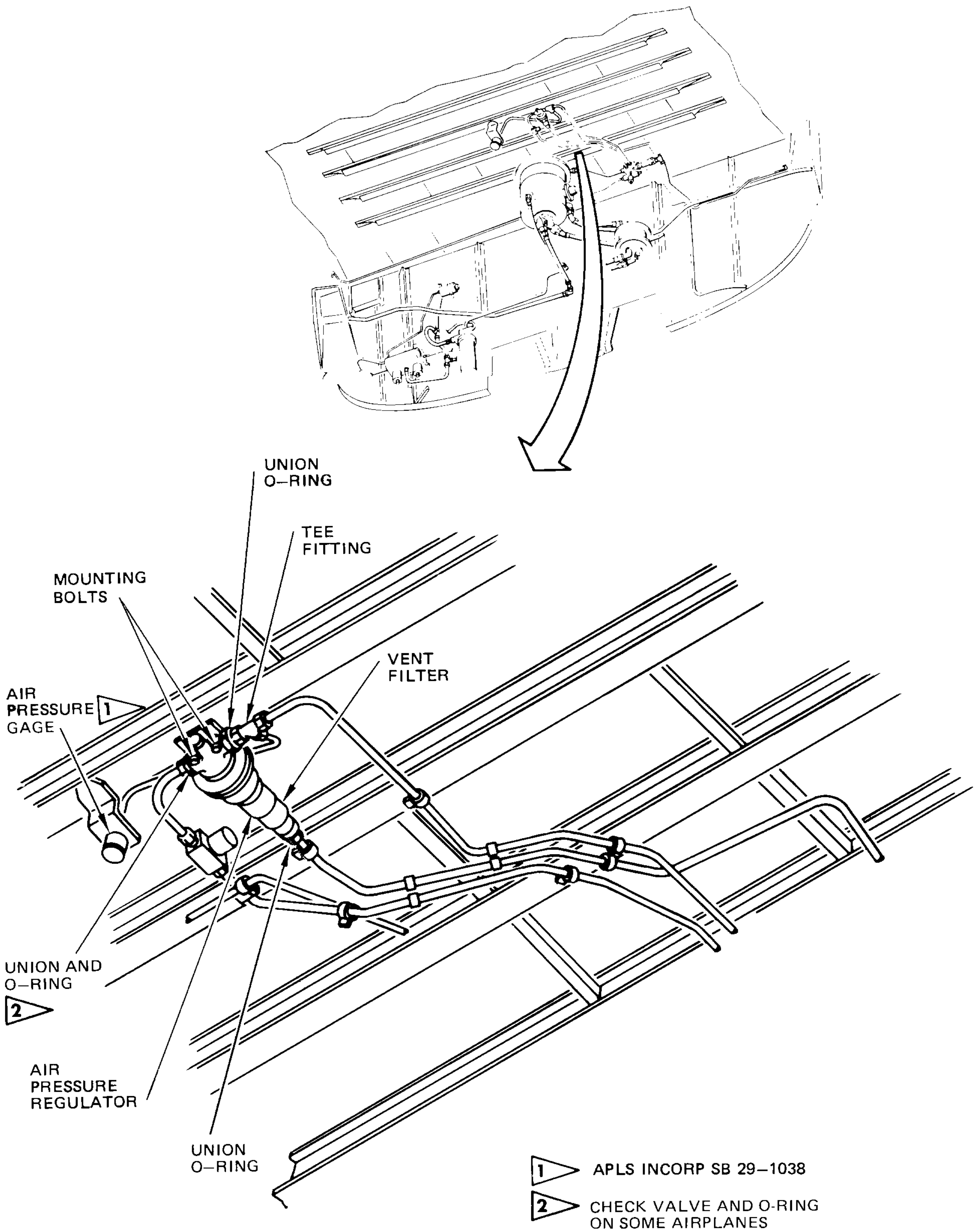
Hydraulic Reservoir Pressurization Vent Filter Servicing
Figure 301

HYDRAULIC RESERVOIR PRESSURIZATION AIR PRESSURE REGULATOR - REMOVAL/INSTALLATION

1. General
   A. A container may be necessary to catch fluid from disconnected lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
3. Remove Air Pressure Regulator
   A. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. Disconnect lines from regulator and cap lines (Fig. 401).
   C. Remove vent filter from regulator.
   D. Remove regulator mounting bolts and remove regulator.
4. Install Air Pressure Regulator
   A. Install O-rings and unions in IN and RES ports. Lubricate with assembly lube or hydraulic fluid.
   B. Position regulator in mounting position and install mounting bolts.

      CAUTION: CHECK THAT REGULATOR IS NOT INSTALLED BACKWARD. "IN" PORT SHOULD BE FACING LEFT SIDE OF AIRPLANE AND "RES" PORT SHOULD BE FACING RIGHT SIDE OF AIRPLANE. IF INSTALLED BACKWARD, UNREGULATED AIR PRESSURE WILL DAMAGE RESERVOIR.

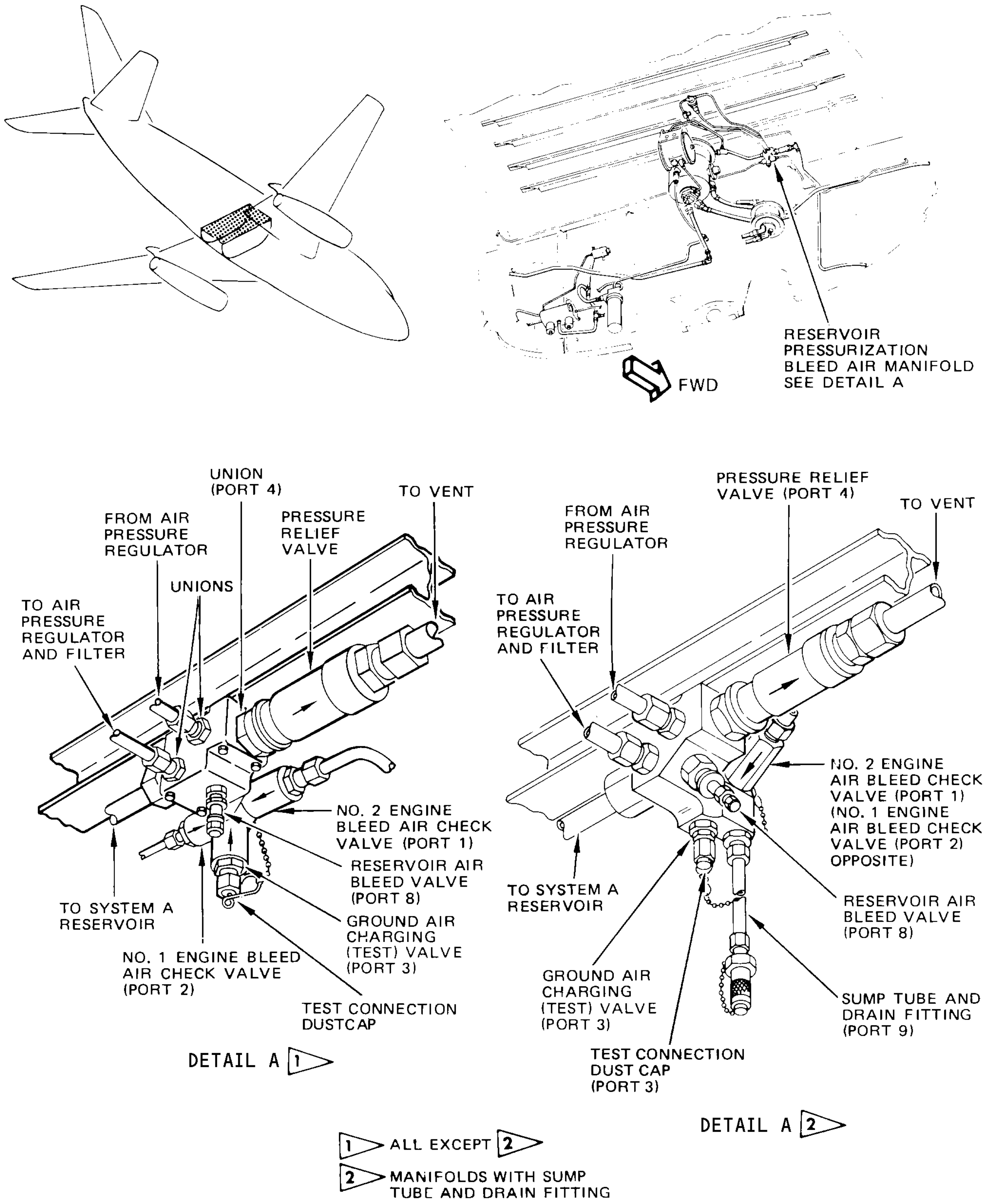
   C. Install vent filter in VENT port.
   D. Connect lines to pressure regulator.
   E. Pressurize hydraulic reservoirs and check connections for leaks. Refer to 29-09-300.



Hydraulic Reservoir Pressurization Air
Figure 401

HYDRAULIC RESERVOIR PRESSURIZATION RELIEF VALVE - REMOVAL/INSTALLATION

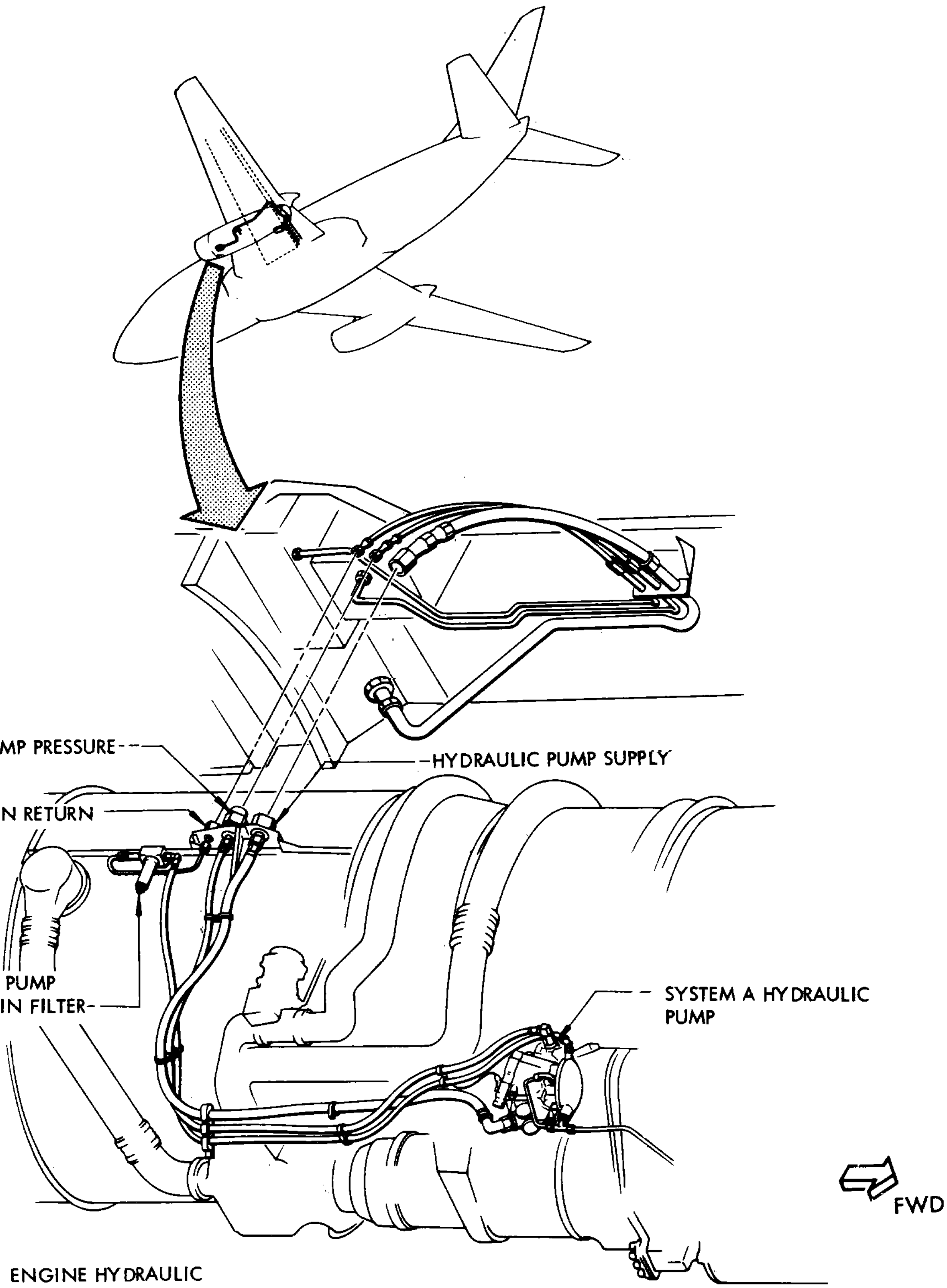
1. General
   A. A container may be necessary to catch fluid when removing the relief valve from the manifold. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
3. Remove Relief Valve
   A. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
   B. Disconnect vent line from relief valve (Fig. 401).
   C. Remove relief valve from manifold.
4. Install Relief Valve (Fig. 401)
   A. Install O-rings and unions in relief valve. Lubricate with assembly lube or hydraulic fluid.
   B. Install end of relief valve marked IN in port 4 of manifold.
   C. Connect vent line to VENT end of relief valve.
   D. Pressurize hydraulic reservoirs and check for leaks. Refer to 29-09-300.



Hydraulic Reservoir Pressurization Relief Valve Installation
Figure 401

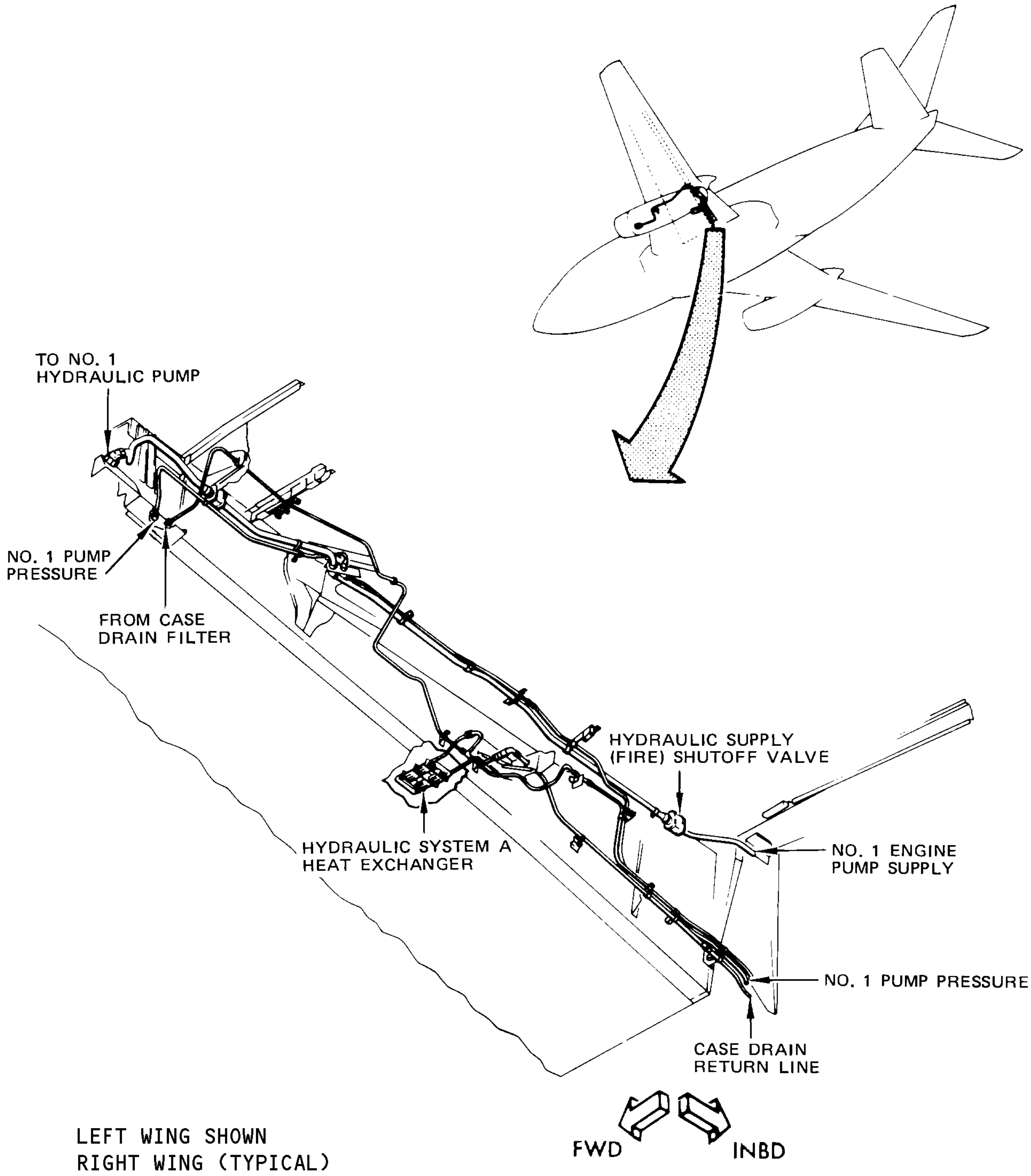
HYDRAULIC SYSTEM A - DESCRIPTION AND OPERATION

1. General
   A. Hydraulic system A (figure 1) supplies fluid under pressure of 3000 psi to the ground spoilers, inboard flight spoilers, ailerons, leading edge flaps and slats, landing gear, nose wheel steering, elevators, trailing edge flaps, rudder, main wheel inboard brakes and thrust reverser. On some airplanes, system A pressure is supplied to the thrust reverser through the landing gear control valve. (See figure 2 for effectivity).
   B. Hydraulic system A includes the equipment necessary to store, pressurize, deliver, control, monitor, and filter the hydraulic fluid to operate the systems supplied by system A (figure 2). Hydraulic fluid for system A is stored in a pressurized reservoir. The reservoir is pressurized by engine bleed air routed through a filter and a pressure regulator to ensure a positive supply of hydraulic fluid to the pumps. Two supply shutoff valves controlled by separate engine fire switches are installed downstream of the reservoir to stop the flow of hydraulic fluid to the engine area in case of an engine failure or fire. Two variable displacement engine-
   driven pumps supply fluid to the various systems upon demand. Each pump is equipped with an electrically controlled depressurizing valve to depressurize the pump if pump output is not required. A filter in the pressure line from each pump filters the fluid before it enters the various subsystems. A pressure switch in the pressure line from each pump is connected to a pump low pressure warning light on the pilots' overhead panel to provide an indication of low hydraulic pressure. A pressure relief valve protects the system against damage by abnormally high pressures. A pump case drain filter in each pump return line is provided to detect incipient pump failures and to filter return fluid before it enters the reservoir. A hydraulic fluid heat exchanger in the pump return line is provided to cool the hydraulic fluid. A two-stage system return filter with visual indicators located ahead of the reservoir, filters return fluid from the subsystems supplied by system A.
   C. For ground operation system A can be pressurized to provide normal pressure without engine operation by attaching an external hydraulic source to the hydraulic round power modular unit located just forward of the right wheel well. System A can also be pressurized without engine operation by attaching electrical power, opening the ground interconnect valve and operating system B pumps.



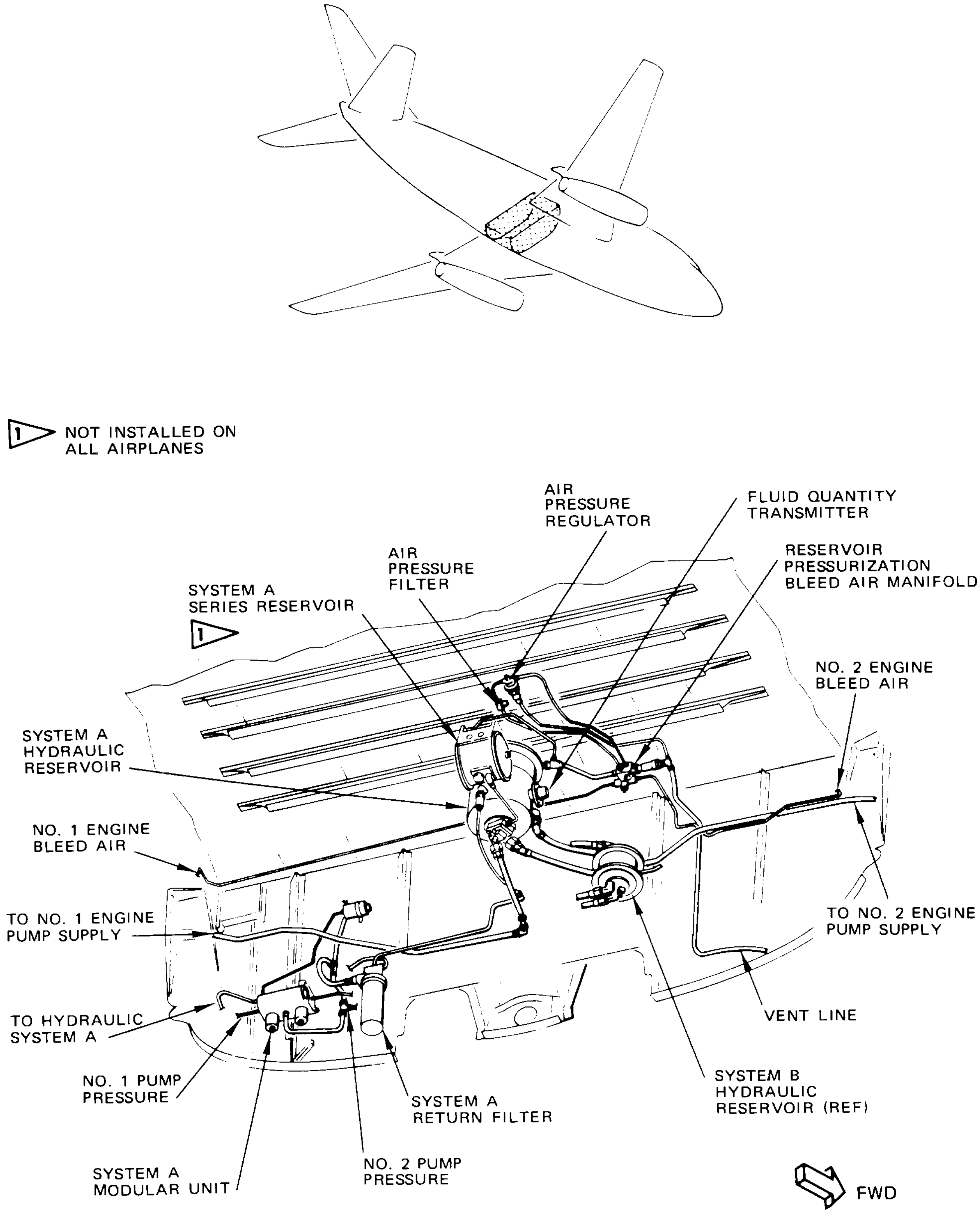
NOTE: NO. 1 ENGINE HYDRAULIC COMPONENT LOCATIONS SHOWN. NO. 2 ENGINE HYDRAULIC COMPONENT LOCATION TYPICAL.

Hydraulic System A Component Location
Figure 1 (Sheet 1)

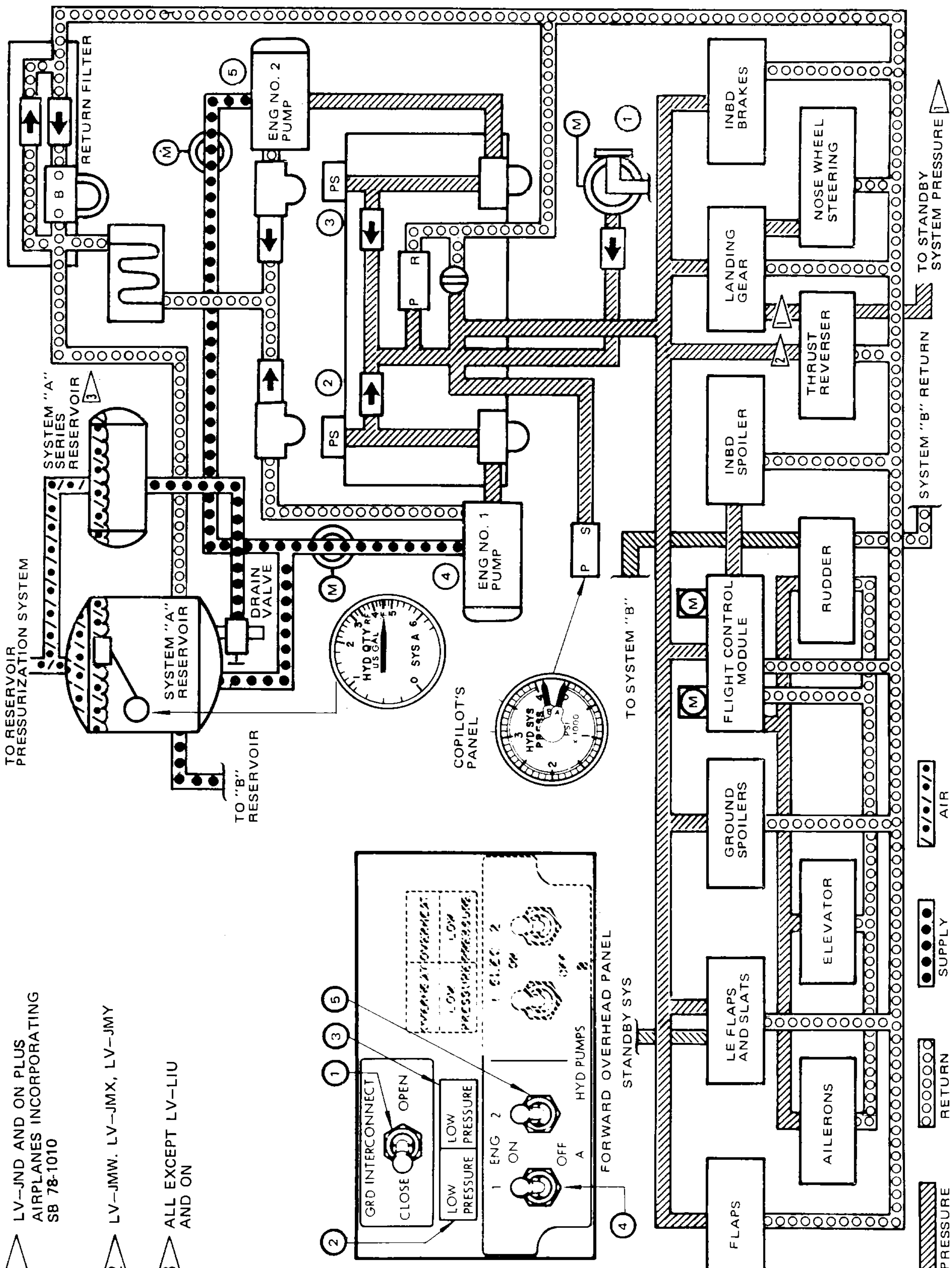


LEFT WING SHOWN
RIGHT WING (TYPICAL)

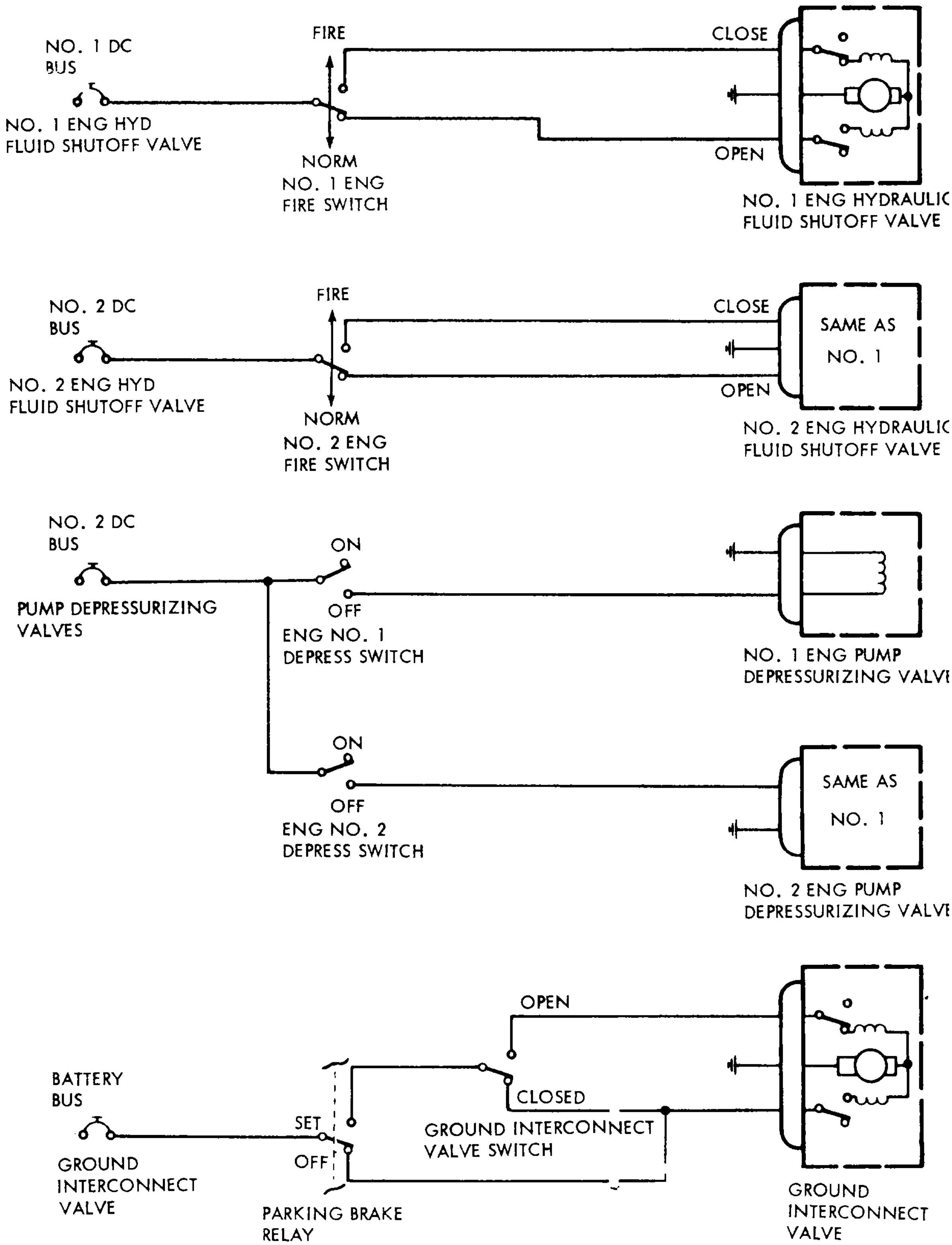
Hydraulic System A Component Location
Figure 1 (Sheet 2)



Hydraulic System A Component Location
Figure 1 (Sheet 3)



Hydraulic System A Schematic
Figure 2 (Sheet 1)



Hydraulic System A Schematic
Figure 2 (Sheet 2)

2. System A Hydraulic Reservoirs

A. Hydraulic fluid for system A is supplied by a main reservoir. The reservoir provides a total capacity of 4.1 U.S. gallons. The reservoir is installed in the upper central area of the wheel well (Fig. 1). Attached to the main reservoir is a gage and a fluid quantity transmitter which is connected electrically to a gage on the first officer's panel. The gages indicate total available fluid quantity in the reservoir (Ref 29-33-0). The gages show empty when 0.55 gallons remain in the reservoir. The reservoir is pressurized by engines No. 1 and 2 bleed air. Engine bleed air is routed through check valves, a filter, and a pressure regulator to pressurize the reservoirs to approximately 45 psi, thus ensuring a positive supply of hydraulic fluid to the engine-driven pumps.

B. The main reservoir is an airtight vessel consisting of a metal shell, return baffle, outlet baffle and supply, return drain, overflow, pressurization, and balance line ports fitted with attaching hoses. The baffle wall just inside the return port prevents aeration of fluid. A radial baffle at the outlet port prevents vortexing. The system A, system B, and standby reservoirs are connected together by balance lines to provide pressurization, makeup fluid, and thermal expansion space. The balance lines are also used as fill lines during fluid servicing (Ref 12-12-0).

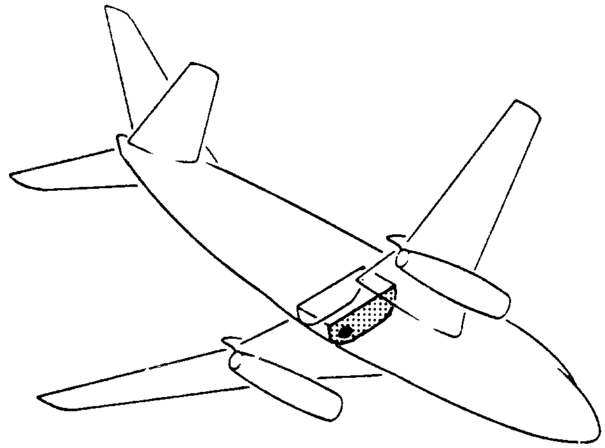
3. System A Engine-Driven Pumps

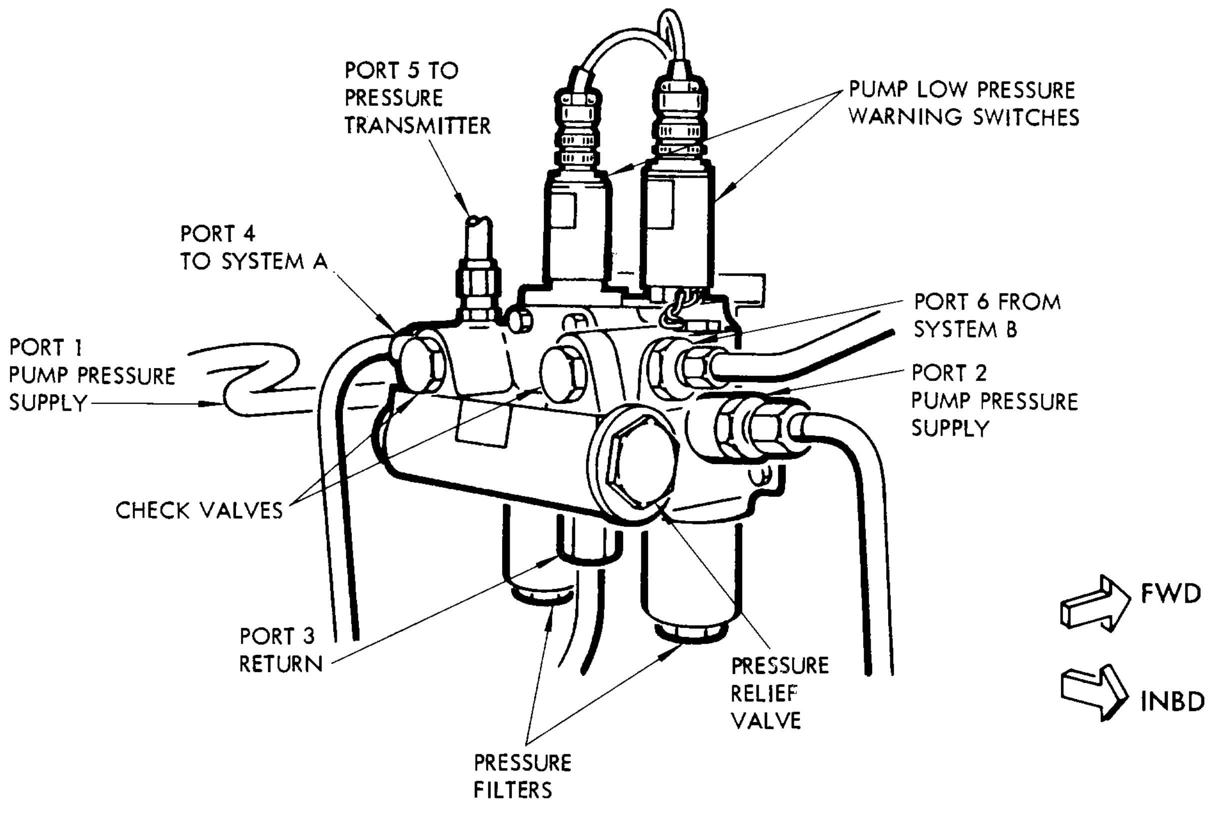
A. Hydraulic system A pressure is supplied by two engine-driven hydraulic pumps. The pumps are mounted on the lower right side of engines No. 1 and 2 (Fig. 1). Each pump is a pressure compensated, variable displacement pump which can be depressurized by an electrically controlled depressurizing valve. Each pump delivers a maximum flow of about 22 gpm at approximately 3000 psi, upon demand by the hydraulic system. For a more detailed description of the engine-driven pump, refer to 29-11-31.

4. System A Modular Unit

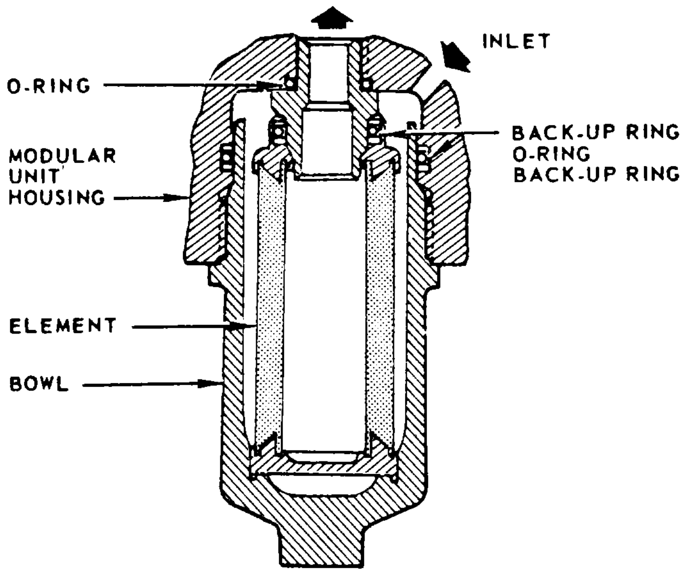
A. The modular unit is provided to manifold hydraulic fluid to various easily replaceable cartridge type components (Fig. 3). The modular unit consists of a housing with provisions for installing the cartridge type hydraulic pump pressure filters, pump low pressure warning switches, pressure relief valve, check valves, and male fittings for attaching system tubing connectors. The modular unit housing has drilled passages to provide fluid flow through the unit. The modular unit is installed on the forward bulkhead of the left wheel well.

5. System A Hydraulic Filters
   A. Pressure Filters
      (1) A nonbypass cartridge type pressure filter in the pressure line from each engine-driven hydraulic pump filters the hydraulic fluid before it enters the various systems (Fig. 2). The pressure filters are installed in the system A modular unit, and consist of a filter bowl and a noncleanable filter element (Fig. 4).
   B. Return Filter
      (1) The return filter (Fig. 4) is a two-stage type filter. The first stage is a 0.4 to 3 micron noncleanable paper element. The second stage is 1.5 to 15 micron noncleanable paper element. The filter is designed to handle a flow rate of 43 gpm.
      (2) If the flow rate exceeds 5 to 7 gpm, a flow control bypass valve wil1 open and allow fluid to bypass the first stage element. The flow control valve also acts as a pressure relief valve and will bypass the first stage element at 50 psi differential pressure. Fluid which bypasses the first stage element will go through the second stage element until the pressure drop across the second stage element exceeds 100 psi. When this occurs a second bypass valve will open and bypass both filter stages. The two stage filter also has a differential pressure indicator for each filter element. When the when the pressure drop across the second stage element exceeds 65 (+ 8) psi an indicator will become visible indicating that the associated element is contaminated and needs replacing. These indicators will remain visible until manually depressed back into the filter head.
   C. Case Drain Filters
      (1) A case drain filter, installed in each engine-driven hydraulic pump case return line, is provided to detect incipient failures of a hydraulic pump and therefore prevent contamination of the hydraulic reservoir and possible damage to the remaining hydraulic pump. The filters are installed on the right side of the engines (Fig. 1). The filter consists of a filter head, a filter element and a filter bowl. The filter element and a magnetic plug provide the check points for detection of incipient pump failures (Fig. 4).
6. System A Hydraulic Fluid Heat Exchanger
   A. A hydraulic fluid heat exchanger is provided to cool the hydraulic fluid by transferring heat from the fluid to the fuel. The heat exchanger is in the return line common to both engine-driven pumps, and consists of two coils of tubing mounted in the bottom of the No. 1 fuel tank. Fluid circulates through the heat exchanger whenever system A engine-driven pumps are in operation. The heat exchanger fluid inlet and outlet ports are in the fuel tank wing rear spar (Fig. 5).

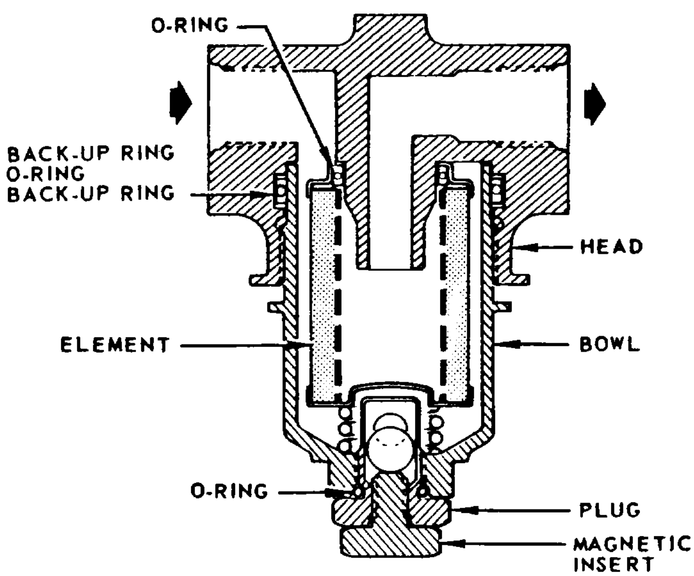




System A Modular Unit
Figure 3

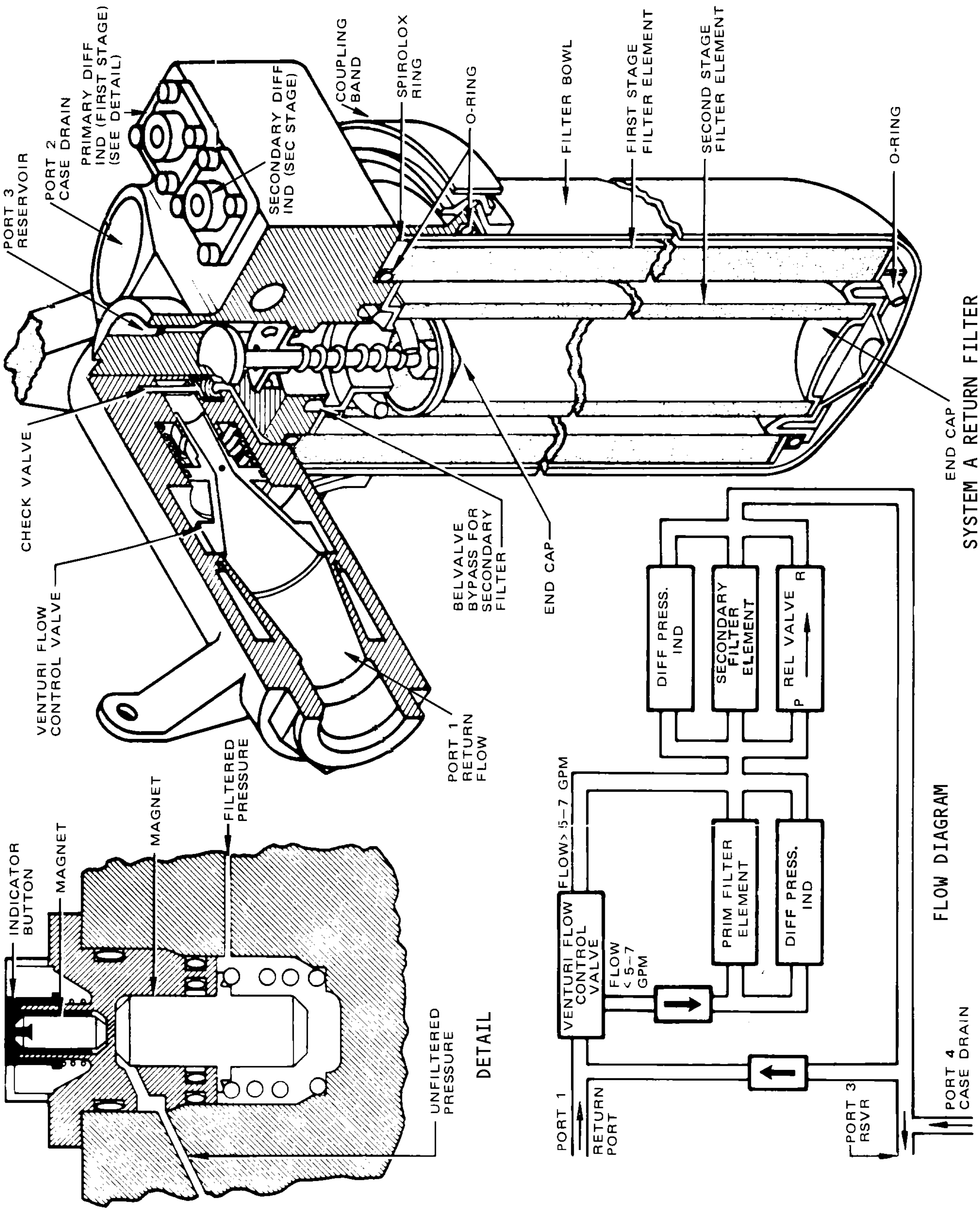


PRESSURE FILTER DETAILS



CASE DRAIN FILTER DETAILS

System A Hydraulic Filters
Figure 4 (Sheet 1)



System A Hydraulic Filters
Figure 4 (Sheet 2)

7. System A Hydraulic Valves

A. System A Relief Valve

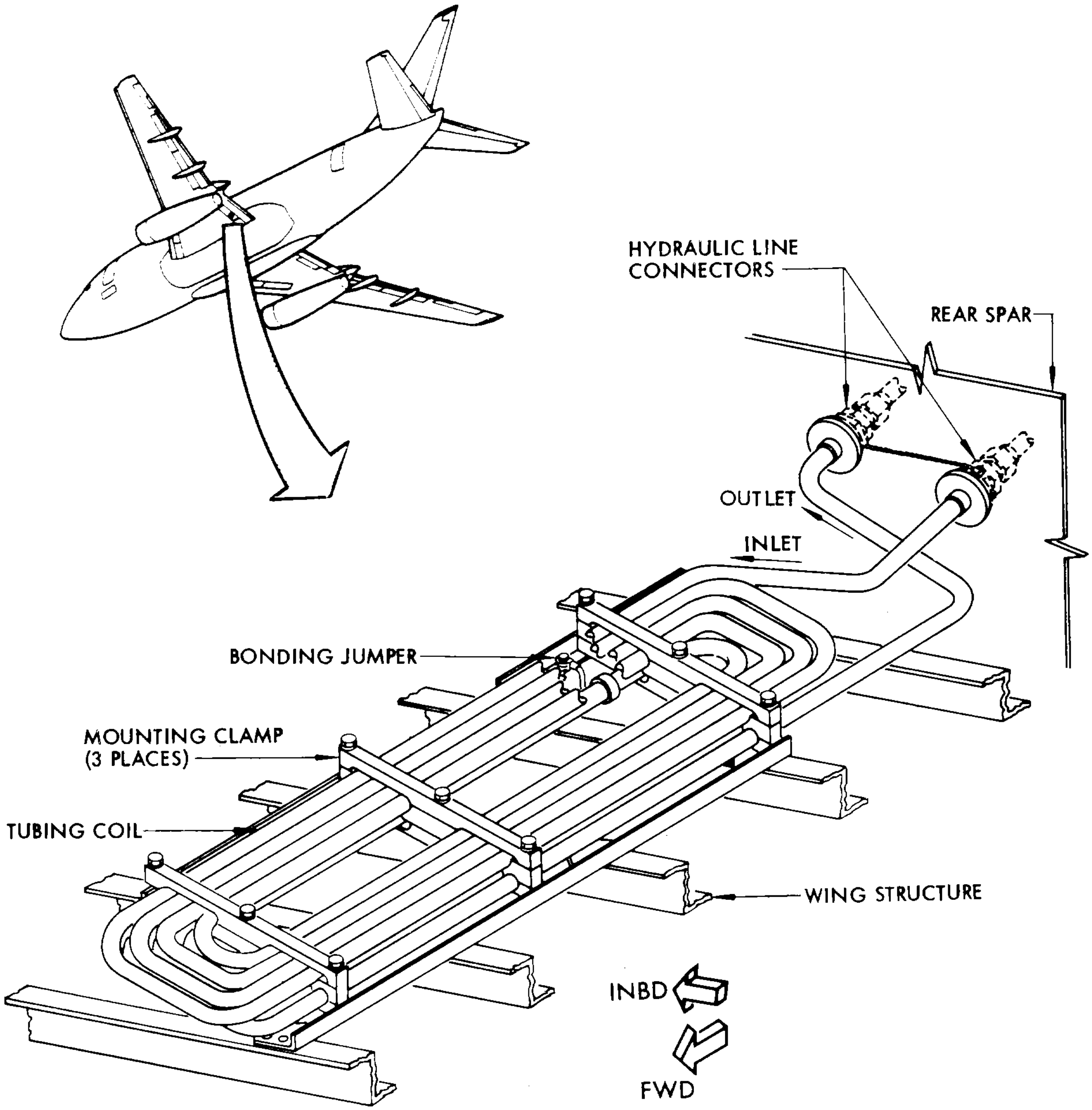
(1) The cartridge type system A relief valve installed in the modular unit protects the system against damage by abnormally high pressures. (See Figs. 2 and 3). The valve is set to relieve at 3500 (+ 50) psi and reset at 3100 psi minimum. The valve is set by the manufacturer and no maintenance other than removal and installation is recommended. A reverse flow poppet allows fluid to reverse flow through the valve when return pressure exceeds pressure in the pressure network to compensate for contraction after shutdown.

B. Hydraulic Supply (Fire) Shutoff Valve

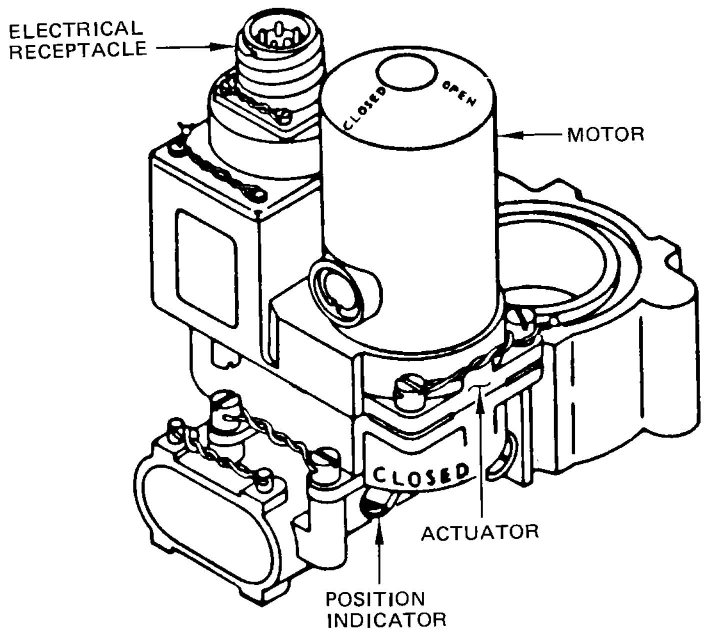
(1) The hydraulic supply (fire) shutoff valves are provided to stop the flow of hydraulic fluid to the engine area. The supply shutoff valve is a sliding gate type valve which is motor-driven by 28. The valves, one in each of the engine-driven pump supply lines, are mounted on the rear spar just aft of the engines (Fig. 1). The valves are controlled by engines No. 1 or No. 2 fire switches (Fig. 7). A position indicator on the valve provides a valve CLOSED or OPEN position indication.

C. Ground Interconnect Valve

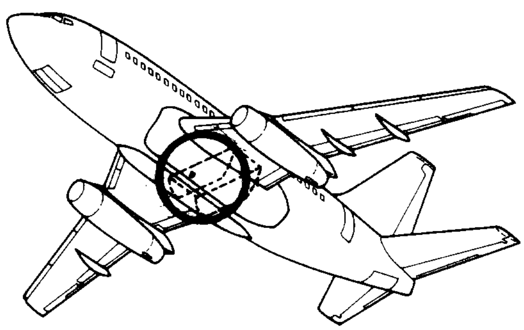
(1) The ground interconnect valve is provided to pressurize system A using system B hydraulic power source or when using an external source connected to the ground power module. A check valve installed on the system A side of the interconnect valve prevents the valve from being used to pressurize system B using system A power source, and also prevents loss of system A fluid through a failure of system B. The valve is motor-operated, consisting of a motor, cam-operated slide valve and three port housing (one port plugged) (Fig. 7). The valve can be operated on the ground only. For normal ground operation the valve is wired through the parking brake relay normally set contact. The valve is also wired to close automatically in case the interconnect valve control switch is not moved to the CLOSED position prior to releasing the parking brake. For this condition the valve receives power through the parking brake relay normally-off contact to the OPEN side of the valve. The valve is controlled by the ground interconnect valve switch on the forward overhead panel, and installed on the forward bulkhead of the wheel well. A manual override lever is provided on the valve for operating the valve on the ground without electrical power.

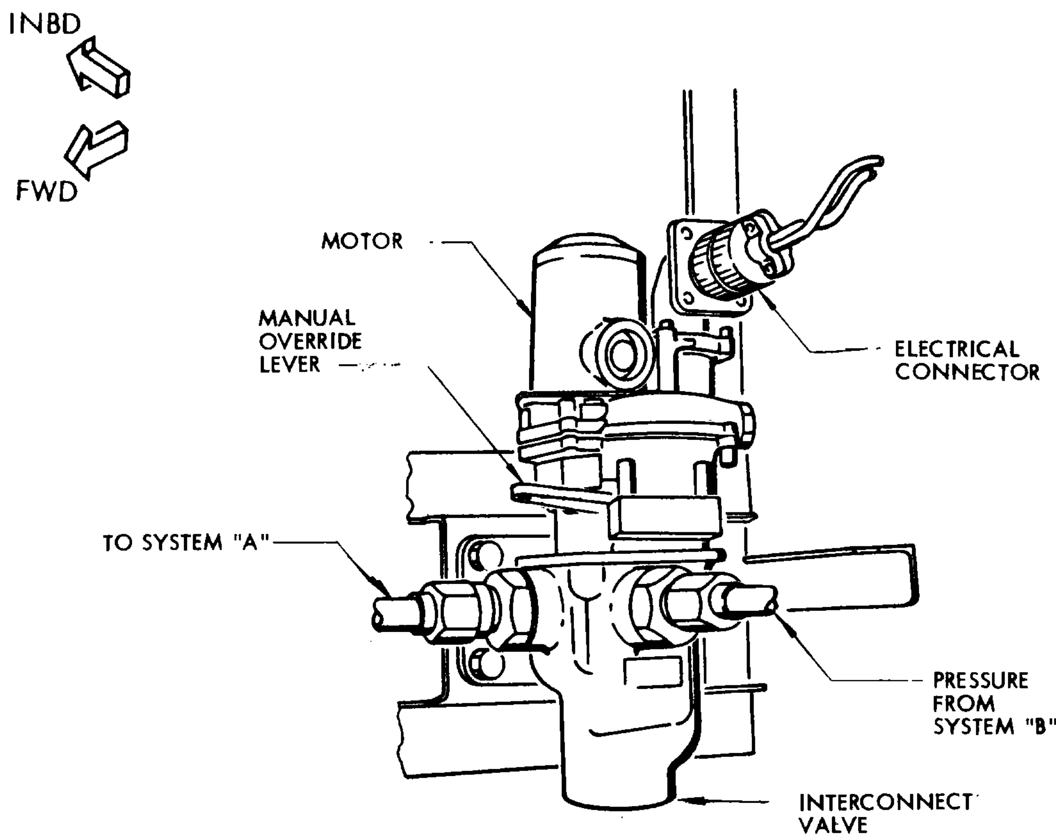


System A Hydraulic Fluid Heat Exchanger
Figure 5



Hydraulic Supply (Fire) Shutoff Valve
Figure 6





Ground Interconnect Valve
Figure 7

8. System A Operation

A. System A reservoir supplies a positive flow of fluid to the engine-driven pumps (Fig. 2). Fluid flows from the reservoir through supply shutoff valves to the pumps. Each pump supplies fluid from zero to approximately 22-1/2 gpm at 3000 psi through a pressure filter and check valve as demanded by the system. As pressure increases to 1200 (+ 250) psi, the pump low pressure warning switch is actuated, opening the circuit to the pump low pressure warning light. The pressure transmitter pressure line senses the increase and electrically positions the pressure indicator on the first officer's panel. As system pressure approaches 3000 psi the pumps automatically adjust output to the need of the system. If system pressure increases to 3500 (+ 50) psi the system relief valve will open to reduce pressure then reset at 3100 psi. For pump cooling and lubrication, fluid circulates through the pump and back to the reservoir through a case drain filter, check valve, and heat exchanger via a return filter module.

B. If the system should malfunction, the pumps are depressurized by positioning the engine-driven hydraulic pump valve switch to OFF, thus activating the depressurization valve in the pump and completely stopping pump output (Ref 29-11-31, Fig. 1). However, hydraulic fluid from the reservoir will still flow through the pump casing for cooling and lubrication.

C. For ground operation system A can be pressurized to provide normal pressure without engine operation by attaching an external hydraulic source to the airplane at the ground power module and opening the ground interconnect valve. If electrical power is available, system A can be pressurized using system B electric pump.

D. Interconnection of systems A and B.

(1) No provision is made for interconnecting system A and B in flight.

(2) When the parking brake is set and the parking brake relay is energized, power is available to operate the ground interconnect valve. Positioning the ground interconnect valve switch to OPEN allows system A to be pressurized by system B. Also, the switch must be placed in the OPEN position when pressurizing system A with an external source connected to the ground power module. A check valve is installed to prevent system B from being pressurized by system A. The interconnect valve is always closed when the parking brake is off and electrical power is applied to the airplane.

HYDRAULIC SYSTEM A - TROUBLESHOOTING

1. General
   A. Hydraulic systems A and B will be checked separately except when checking for external leakage. When checking for leakage, pressurize both systems A and B and examine all components, hydraulic fittings and connecting lines. Pin hole leaks may be detected by noting damp spots on the airplane and tracing run back fluid to locate source of leak. When disconnecting hydraulic lines during removal of components, take care to prevent spillage of hydraulic fluid. Should fluid leak on the airplane or spill while performing maintenance, the affected area must be decontaminated in accordance with instructions in AMM Chapter 12, Cleaning and Washing.
   B. Illumination of either the No. 1 or 2 engine-driven pump low pressure warning lights during operation of system A and a confirmation of loss of pressure on the affected pump should be followed by a check of the corresponding pump pressure filter and case drain return filter. Contaminated filter elements indicate a defective pump. A pump need not be operated again following warning light illumination unless filter check shows no sign of contamination and trouble is suspected outside the pump. If additional information is required on the pump low pressure warning lights, refer to AMM 29-34-0, Hydraulic Pump Low Pressure Warning Systems.
   C. When troubleshooting the hydraulic system, system A should stabilize between 2800 and 3100 psi with flight control switches ON and ground interconnect valve CLOSED and 2900 to 3100 with flight control switches OFF and ground interconnect valve CLOSED.
   D. If either engine No. 1 or 2 fire switches are positioned to FIRE with the corresponding engine-driven pump operating, proceed with the following steps:
      (1) If a supply shutoff valve was closed for less than 5 minutes, no maintenance is required and shutoff periods are not accumulative.
      (2) If supply shutoff valve was closed for longer than 5 minutes:

         NOTE: Make sure that pump has operated at least 1 minute with supply fluid available before checking filter elements/bowl so that metal contamination, possibly generated during fluid shutoff, has reached the filter.

         (a) Check case drain filter element for metal contamination (AMM 29-11-41/301).
         (b) Check pressure filter for metal contamination (AMM 29-11-71/301).
         (c) If no metal is found in either filter, install new filters and continue to run pump (AMM 29-11-41/401 and AMM 29-11-71/401). Recheck filters in 200 hrs.

(d) If metal is found, remove applicable pump for overhaul & flush lines between the pump and filters (Ref MP).

2. Prepare System A Hydraulic System for Troubleshooting
   A. Service hydraulic reservoir system (AMM Chapter 12, Hydraulic Servicing).
   B. Pressurize hydraulic reservoir system (AMM 29-09-300/201).
   C. Connect electric power to airplane.
   D. Check that parking brake is set.
   E. When troubleshooting engine-driven pumps, pressurize system by motoring engines (AMM 71-09-100, Operating Procedures).
   F. If pressurizing system A using system B pump, refer AMM 29-11-0/201, Hydraulic System A.

3. Hydraulic System A Troubleshooting Chart

   NOTE: Hydraulic pump high and low pressure adjustments are made on a test bench before pump installation. Pump pressure adjustments should not be attempted while pump is installed on the airplane because of the internal bleed characteristics of the hydraulic system. Pump pressure adjustments are made under zero flow conditions.

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure above normal (3100 psi)	Clogged case drain return filter	Check applicable case drain filter for contamination	Clean or replace filter, refer to AMM 29-11-41
	No. 1 and/or 2 engine-driven pump	High pressure indication occurs during operation of engine-driven pumps. Switch No. 1 and 2 hydraulic pump switches to OFF until pressure bleeds off to about 2000 psi. Switch No. 1 pump switch to ON and check indicator. If pressure indication does not rise above normal, pump No. 2 is defective.	Replace No. 2 pump
		If pressure indication rises above normal with pump No. 2 switch OFF, switch pump No. 1 switch to OFF until pressure bleeds off to about 2000 psi. Switch No. 2 pump switch to ON and check indicator. If pressure indication does not rise above normal, pump No. 1 is defecive.	Replace No. 1 pump

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
		If pressure rises to above normal (3100 psi) on both of the above checks for No. 1 and 2 pumps, both pumps could be defective or the pressure transmitter or indicator could be defective. To isolate trouble, continue with the following tests for transmitter and indicator.	
Pressure above normal (3100 psi)	Restriction in the line or bent line	Check applicable pump lines for flow check.	Remove, replace as necessary
	System A pressure transmitter and/or indicator	Open ground interconnect valve and pressurize systems A and B by turning on system B electric motor-driven pumps or by connecting a ground hydraulic service cart to the airplane ground power module. Compare systems A and B pressure indicator readings.	
		If system B indicator reads normal pressure and system A still reads above normal, system A transmitter and/or indicator are defective	Test system A transmitter and indicator. Refer to AMM 29-31-0, Pressure Indicating Systems. Repair or replace as required.
	No. 1 and 2 engine-driven pumps	If system A and B indicators both read normal, then both system A engine-driven pumps No. 1 and 2 are defective.	Replace No. 1 and 2 engine-driven pumps

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure below tolerance specified in par. 1.C.	System A pressure transmitter and/or indicator	Low pressure indication occurs during operation of engine-driven pumps No. 1 and 2. Shut down engines, open ground interconnect valve and pressurize systems A and B by turning on system B electric motor-driven pumps or by connecting a ground hydraulic service cart to the airplane ground power module. Compare systems A and B pressure indicator readings.	

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure below tolerance specified in par. 1.C. (Cont)	System A pressure transmitter and/or indicator (Cont)	If system B indicator reads normal and system A indicator still reads below normal, then system A transmitter and/or indicator are defective.	Test system A transmitter and indicator. Refer to AMM 29-31-0, Pressure Indicating Systems. Repair or replace as required.
	System A engine-driven pumps No. 1 and 2.	If system A and B indicators both read normal, then both system A engine-driven pumps No. 1 and 2 are defective.	Replace engine-driven pumps No. 1 and 2.
	System A pressure relief valve	If system A and B indicators both read below normal, close ground interconnect valve. If system B pressure indicator rises to normal, system A pressure relief valve is opening at too low pressure.	Replace pressure relief valve and recheck system A
	Hydraulic leaks	With both systems A and B pressurized monitor system A fluid quantity indicator. If quantity indicator shows loss of fluid, open panels and trace hydraulic leakage to its source.	Repair or replace defective components
Hydraulic fluid quantity low	Hydraulic leaks	Pressure systems A and B. Trace hydraulic fluid leakage to its source.	Repair or replace defective components
	Fluid quantity indicator and/or transmitter	Ref AMM 29-33-0/101, Hydraulic Fluid Quantity Indicating Systems.	

HYDRAULIC SYSTEM A - MAINTENANCE PRACTICES

1. General
   A. The maintenance practices included in this section (201-299 page block) are general maintenance instructions that do not definitely fall within a specific category. Other maintenance instructions, such as Servicing, Removal/Installation, Adjustment/Test, etc. are provided in the applicable page blocks.
   B. To pressurize hydraulic system A, three methods can be used: hydraulic test stand, system B using electric motor-driven pumps, or system A engine-driven hydraulic pump.
   C. Pressurizing the hydraulic system will supply hydraulic power to the flight control module, flaps, slats, ground spoilers, landing gear module, and inboard brakes.
   D. When maintenance being performed on system A affects the return side of the hydraulic system, the system A hydraulic reservoir will have to be depressurized.
   E. Should fluid spill on airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Pressurize Hydraulic System A

   WARNING: CHECK THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL FLIGHT CONTROL SURFACES AND NOSE GEAR BEFORE TURNING HYDRAULIC POWER ON. ISOLATE OR TAG SYSTEMS NOT BEING TESTED TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO AIRPLANE.

   A. Equipment and Materials
      (1) Hydraulic test stand - 0 to 3000 psi, with Hydraulic Fluid BMS 3-11
      (2) Ground Lock Assembly - F72735
   B. Pressurize Hydraulic System A (Hydraulic Test Stand)
      (1) Install ground lock assembly in nose gear.
      (2) Open air conditioning duct access panel on right side of airplane.
      (3) Connect hydraulic test stand to hydraulic ground power modular unit.
      (4) Open ground interconnect valve.
         (a) If airplane is on ground and electrical power is available check that parking brake is set and position ground interconnect switch on forward overhead panel to OPEN.

(b) If electrical power is not available or airplane is on jacks, disconnect the ground interconnect valve electrical connector and open valve using manual override lever.

CAUTION: VALVE MOTOR BURNOUT MAY OCCUR IF THE GROUND INTERCONNECT VALVE IS MANUALLY POSITIONED WHILE ELECTRICAL POWER IS APPLIED TO THE VALVE. TO PREVENT THIS, ENSURE THAT THE VALVE ELECTRIC CONNECTOR IS DISCONNECTED, AND SUITABLY TAGGED.

(5) Operate hydraulic test stand to pressurize system until requirements are complete.
(6) Close ground interconnect valve.
(7) Disconnect test stand from module and install dust caps.
(8) Close access panel.
(9) Remove ground lock from nose gear if maintenance is complete.

C. Pressurize Hydraulic System A (System B Electric Motor-Driven Pump)

CAUTION: DO NOT OPERATE SYSTEM B PUMPS MORE THAN 2 MINUTES UNLESS THE NO. 2 FUEL TANK CONTAINS AT LEAST 1675 LBS/760 KG OF FUEL. IF PUMPS ARE OPERATED 2 MINUTES WITHOUT FUEL IN TANK, ALLOW RESERVOIR TO RETURN TO AMBIENT TEMPERATURE BEFORE RESUMING TEST.

NOTE: With the A system reservoir not pressurized and the system B pump operating at near maximum, the system A reservoir fluid level may rise faster than the system B reservoir fluid level. This condition is possible because with the system A reservoir not pressurized, the balance line is not large enough to handle maximum system B pump output. This condition can be corrected by pressurizing the hydraulic reservoirs (Ref 29-09-300, Maintenance Practices).

(1) Install ground lock assembly in nose gear.
(2) Connect electrical power to airplane and close system B pump circuit breakers.
(3) Check that parking brake is set.
(4) Open ground interconnect valve.
    (a) If airplane is on ground check that parking brake is set and position ground interconnect switch on forward overhead panel to OPEN.

(b) If airplane is on jacks, disconnect the ground interconnect valve electrical connector and open valve using manual override lever.

CAUTION: VALVE MOTOR BURNOUT MAY OCCUR IF THE GROUND INTERCONNECT VALVE IS MANUALLY POSITIONED WHILE ELECTRICAL POWER IS APPLIED TO THE VALVE. TO PREVENT THIS, ENSURE THAT THE VALVE ELECTRIC CONNECTOR IS DISCONNECTED, AND SUITABLY TAGGED.

(5) Operate system B pump (Ref 29-12-0 MP).
(6) Check that system A hydraulic pressure stabilizes between 2800 and 3200 psi.
(7) When completing operation, check that pump switch is in ON position.

NOTE: The engine-driven pump should be left in the ON position after maintenance has been performed. This will help to prolong the life of the depressurization solenoid which becomes energized when the pump switch is placed in the OFF position.

(8) Close ground interconnect valve and disconnect electrical power.
(9) Remove ground lock from nose gear if maintenance is complete.

D. Pressurize Hydraulic System A (System A Engine-Driven Pump)

CAUTION: DO NOT OPERATE SYSTEM A PUMPS MORE THAN 2 MINUTES UNLESS THE NO. 1 FUEL TANK CONTAINS AT LEAST 1675 LBS/760 KG OF FUEL. IF PUMPS ARE OPERATED 2 MINUTES WITHOUT FUEL IN TANK, ALLOW RESERVOIR TO RETURN TO AMBIENT TEMPERATURE BEFORE RESUMING TEST.

(1) Install ground lock assembly in nose gear.
(2) If engine run is required to pressurize hydraulic system, using engine No. 1 or 2 (Ref Chapter 71-00, Power Plant - General).
(3) If pressurization can be accomplished by motoring engine, refer to 71-09-100, Power Plant (JT8D) - Operating Procedures.
(4) Remove ground lock from nose gear if maintenance is complete.

3. Depressurize Hydraulic System A

A. Shut off source of hydraulic power and wait 5 to 10 minutes to allow system pressure to dissipate through internal leakage to the return system.
B. Depressurize reservoir if any lines are being opened (Ref 29-09-30 MP).

4. Flush Hydraulic System A

A. General

(1) The following procedure is provided to flush the hydraulic system after replacement of a failed engine-driven hydraulic pump.

(2) If, following this procedure, severe contamination is suspected due to a collapsed filter element, the case drain filter element should again be replaced after 1 week of normal operation. After 2 months of operation, all system filter elements should be replaced.
(3) If fluid contamination exists from a chemical source, the fluid and filter elements should be replaced in accordance with 29-00 MP.
(4) Whenever hydraulic system components are disassembled, cleaned, overhauled or installed, flushing with BMS 3-11 hydraulic fluid only is recommended to avoid fluid contamination within the operational system by incompatible materials.

WARNING: FIRE-RESISTANT HYDRAULIC FLUIDS CONFORMING TO BMS 3-11 MAY CAUSE SKIN IRRITATION. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. IN CASE OF EYE CONTACT, FLUSH EYES WITH WATER AND OBTAIN MEDICAL AID. IN CASE OF INGESTION, OBTAIN MEDICAL AID.

B. Flush Hydraulic System
(1) Depressurize hydraulic system A.
(2) Replace applicable case drain filter element (Ref 29-11-41, Unit Servicing).
(3) Replace applicable system A pressure filter element (Ref 29-11-71, Unit Servicing).
(4) Replace system A return filter elements (Ref 29-11-111, Unit Servicing).
(5) Pressurize hydraulic system A using engine-driven pump (Ref par. 2.C.).
(6) Cycle all hydraulic subsystems (except landing gear) at least six times at maximum rate.
(7) Replace applicable case drain filter element and system A pressure filter element with clean elements.
(8) Restore system to normal configuration.

HYDRAULIC SYSTEM A - INSPECTION/CHECK

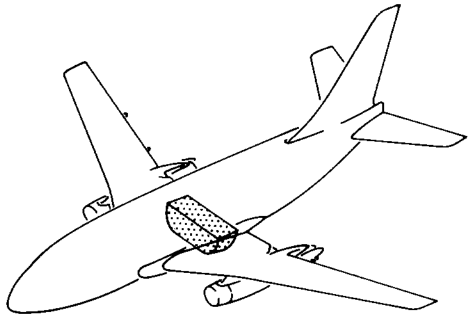
1. Hydraulic System A Check
   A. Check Hydraulic System A Tubing
      (1) Check hydraulic tubing in the nacelle area for discoloration which indicates overheating of hydraulic fluid. The tubing is accessible by raising the applicable engine cowl panels.
   B. Check Hydraulic System A Filters
      (1) At regular intervals replace or clean system A case drain filter element. During removal, inspect magnetic plug and filter element for contamination.

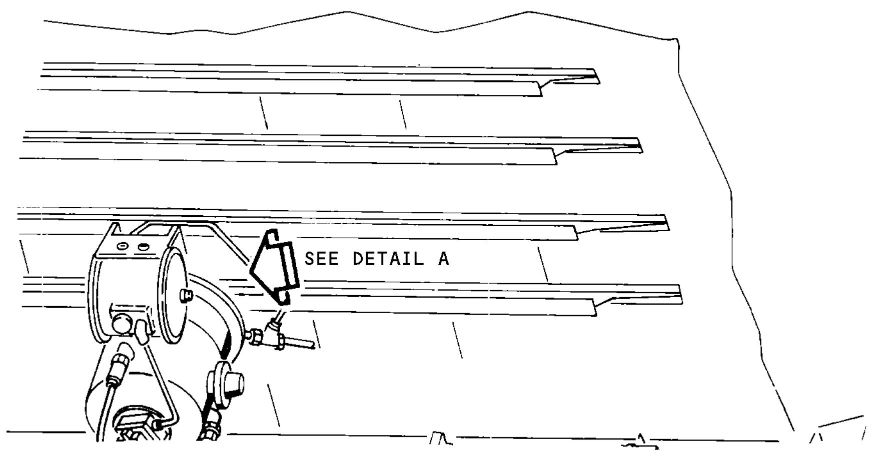
         NOTE: If paper filter element is used, examine for contamination by cutting the element and laying the paper out flat.

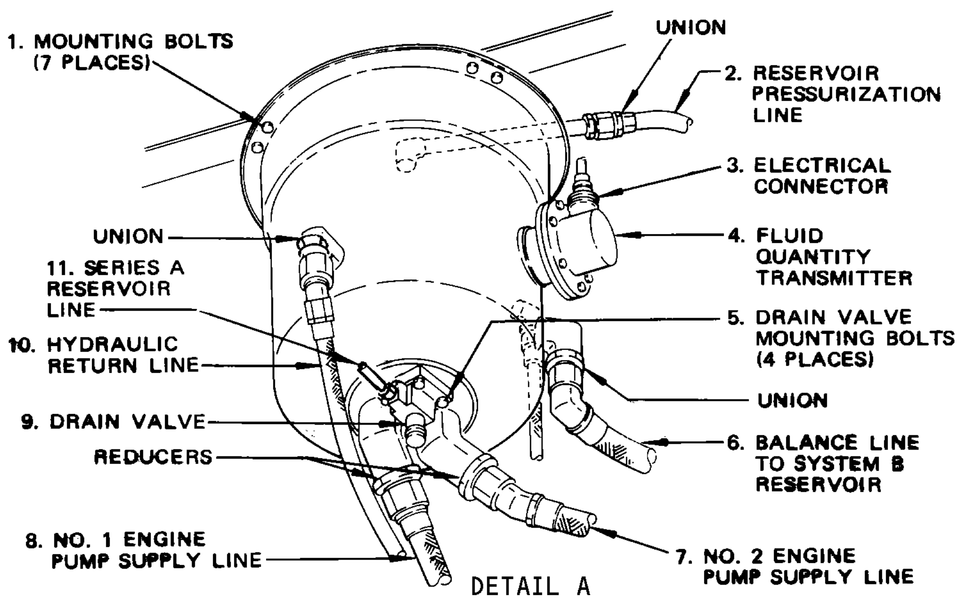
      (2) If excessive amount of metal particles are found in the case drain filter proceed with the following steps:
         (a) Remove and overhaul the associated pump.
         (b) Clean case drain filter bowl and replace element. See 29-11-41, System A Hydraulic Pump Case Drain Filter.
         (c) Check system pressure and return filters.
      (3) If sufficient contamination is found in system A pressure and return filter, to warrant a pump change proceed with the following:
         (a) Flush hydraulic pressure line. Refer to 29-11-0, Hydraulic System A - MP.
         (b) Remove and thoroughly clean filter bowls. Replace with clean elements. Refer to 29-11-71, System A Hydraulic Pressure Filter and 29-11-111, System A Hydraulic Return Filter.

SYSTEM A HYDRAULIC RESERVOIR - REMOVAL/INSTALLATION

1. General
   A. Take precaution to prevent spilling hydraulic fluid on the airplane. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Suitable container for draining hydraulic fluid
   B. Regulated source of nitrogen - 0- to 200-psi maximum pressure
   C. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
3. Prepare Hydraulic Reservoir for Removal
   A. Depressurize hydraulic systems A and B (AMM 29-11-0/201 and AMM 29-12-0/201).
   B. Tag hydraulic systems A, B and standby pump switches to prevent operation.
   C. Depressurize hydraulic reservoirs (AMM 29-09-300/201).
   D. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Open tire burst protector screen doors.
   E. Open drain valve and drain fluid from reservoir.
   F. Open drain valve on system B reservoir and drain fluid until balance line between A and B reservoir is empty.
   G. Close system B drain valve and lockwire handle in the CLOSED position.
4. Remove Hydraulic Reservoir
   A. Disconnect reservoir pressurization line (2, Fig. 401).
   B. Disconnect hydraulic lines (6), (7), (8), (10), and (11) from reservoir.
   C. Install protective covers over fittings and hoses.
   D. Disconnect electrical connector (3) from fluid quantity transmitter (4).
   E. Remove mounting bolts (l) and remove reservoir.
   F. Remove fluid quantity transmitter (4) (AMM 29-33-11/401).
5. Prepare Hydraulic Reservoir for Installation
   A. Check that reservoir is clean and mounting surfaces are free from foreign material. Make sure that foreign material does not enter reservoir during maintenance procedures.
   B. Install drain valve (9, Fig. 401) if not included on reservoir.
      (1) Apply assembly lube or hydraulic fluid to O-ring and install in groove of drain valve flange.
      (2) Position drain valve on flange. Install mounting bolts and lockwire.
      (3) Place drain valve handle in CLOSED position and install lockwire.
   C. Install O-rings, unions and reducers in reservoir ports. Apply assembly lube or hydraulic fluid O-rings and fittings before installation.
   D. Install fluid quantity transmitter (4) (AMM 29-33-11/401).
6. Install Hydraulic Reservoir
   A. Place reservoir in mounting position and install mounting bolts (1, Fig. 401).







DETAIL A

System A Hydraulic Reservoir Installation
Figure 401

B. Connect electrical connector (3) to fluid quantity transmitter.
C. Connect all hydraulic lines to reservoir.

CAUTION: PRIOR TO INSTALLING HOSE HALF OF QUICK DISCONNECT, VISUALLY CHECK FOR DISCONNECT POPPET STRAIGHTNESS. AFTER QUICK DISCONNECT CONNECTION, CHECK THAT INDICATOR PINS ARE EXTENDED A MINIMUM OF 0.06 INCH. IF INDICATOR PINS ARE NOT PROPERLY EXTENDED, FLUID FLOW WILL BE RESTRICTED OR COMPLETELY STOPPED AND RESERVOIR AND/OR PUMP DAMAGE MAY RESULT. IF EXCESSIVE TORQUE IS REQUIRED WHEN RECONNECTING THE TWO HALVES OF THE QUICK DISCONNECT, DISASSEMBLE THE FITTING AND CHECK FOR POPPET STRAIGHTNESS AGAIN.

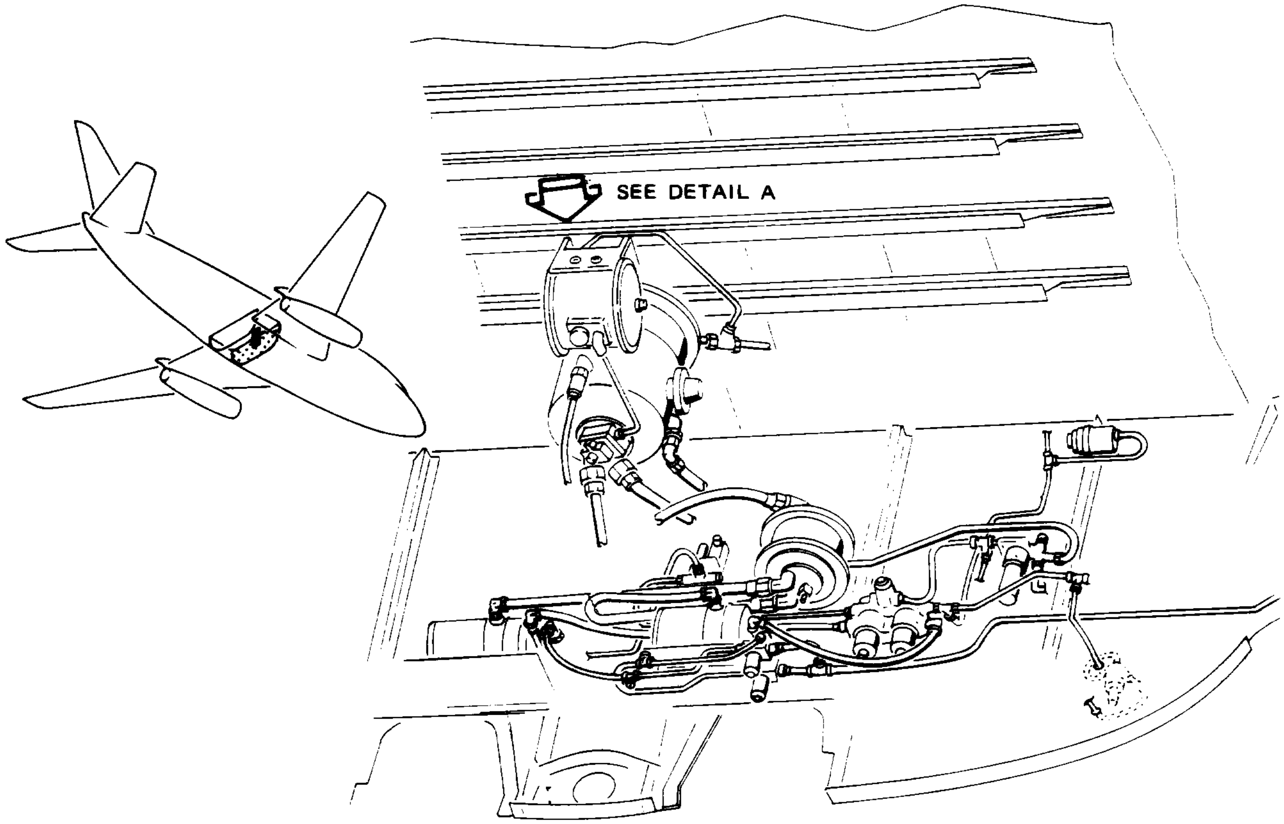
D. Connect reservoir pressurization line (2).
E. Service hydraulic reservoir (Ref Chapter 12, Servicing).
F. Pressurize hydraulic reservoir and check for leaks (Ref 29-09-300 MP).
G. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
   Close and latch tire burst protector screen doors.
H. Remove tags from hydraulic pump switches.

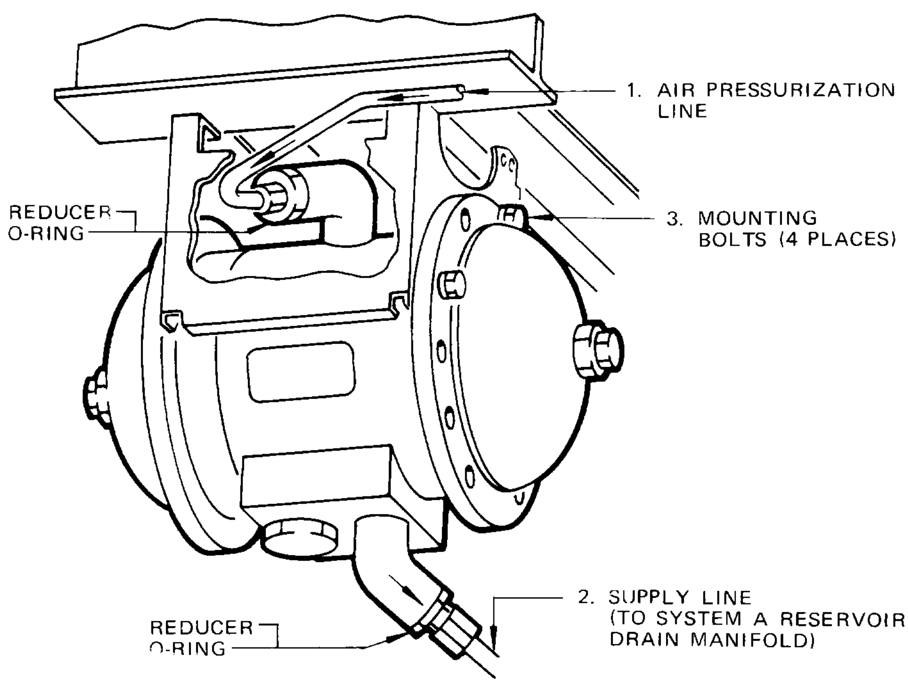
SYSTEM A SERIES RESERVOIR - REMOVAL/INSTALLATION

1. General
   A. Take precaution to prevent spilling hydraulic fluid on the airplane. Should any fluid spill on the airplane, decontaminate (Refer AMM Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Suitable container for draining hydraulic fluid - approximately 6-gallon capacity
   B. Skydrol Assembly Lube - MCS 352B or Fire-Resistant Hydraulic Fluid, BMS 3-11
3. Remove Series Reservoir
   A. Ensure that the systems A, B, and standby pump switches are off. Tag pump switches to prevent operation.
   B. Depressurize hydraulic reservoirs (AMM 29-09-300 Maintenance Practices).
   C. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Open tire burst protector screen door.
   D. Drain fluid from the system A reservoir by opening the drain valve.

      NOTE: Draining the fluid from the system A reservoir will also drain the fluid from the series reservoir.

   E. Close drain valve and lockwire.
   F. Disconnect lines (Item 1 and 2, Fig. 401) from reservoir and install protective covers on disconnected fittings.
   G. Remove mounting bolts (3) and remove reservoir.
   H. If reservoir is being replaced, remove reducers from reservoir ports and retain for installation on new reservoir.
4. Install Series Reservoir
   A. Check that reservoir is clean and mounting surfaces are free from foreign materials.
   B. If reservoir is a new replacement, install O-rings and reducers in reservoir ports. Apply assembly lube or hydraulic fluid to O-rings and threaded fittings.
   C. Place reservoir in mounting position and install mounting bolts (Fig. 401).
   D. Remove protective covers from lines (1) and (2) and connect to series reservoir.
   E. Service system A reservoir. Refer to AMM Chapter 12, Hydraulic Fluid Servicing.
   F. Pressurize reservoir and check for leaks. Refer to AMM 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
   G. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Close and latch tire burst protector screen doors.
   H. Remove tags on pump switches.



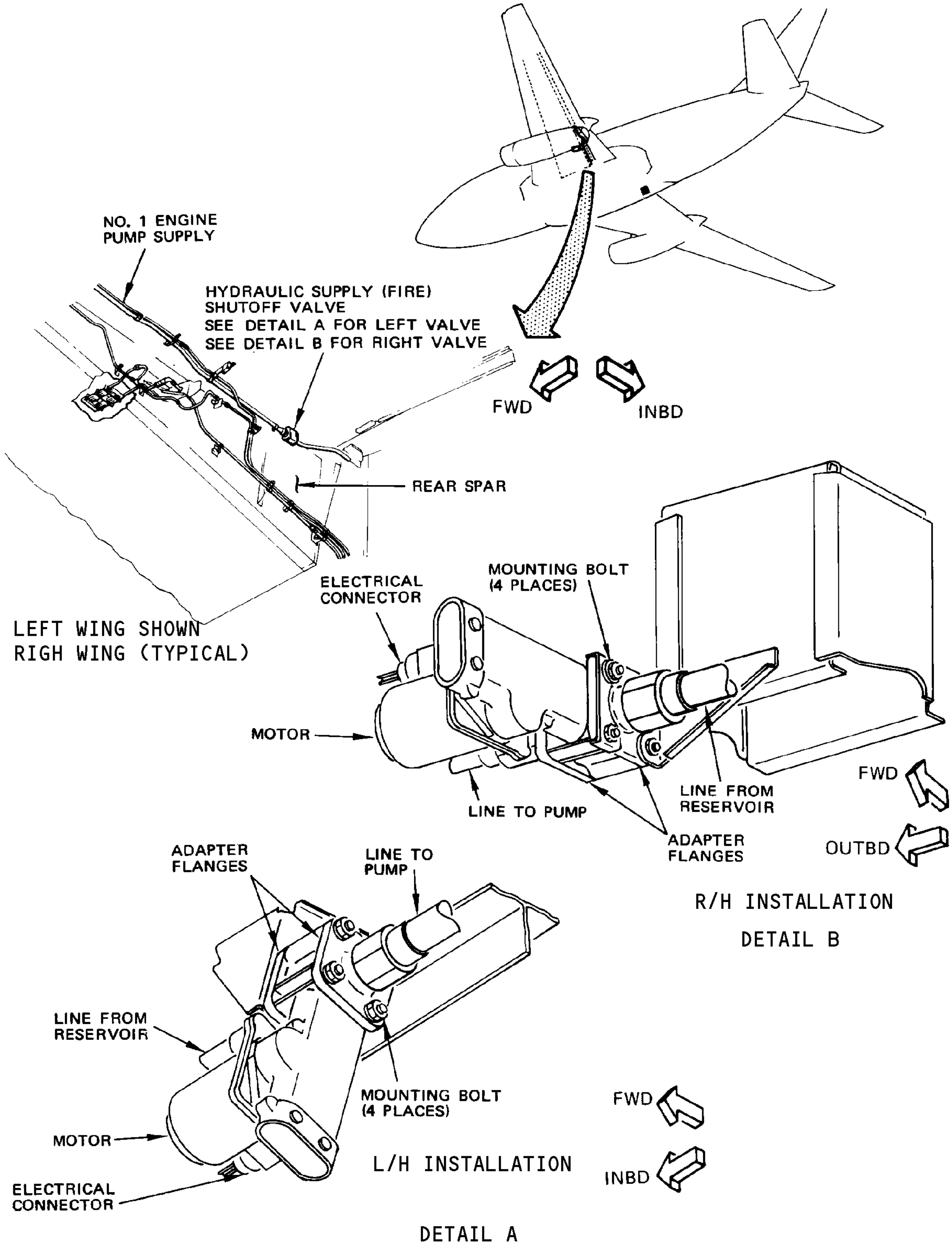


DETAIL A

System A Series Reservoir Installation
Figure 401

HYDRAULIC SUPPLY (FIRE) SHUTOFF VALVE - REMOVAL/INSTALLATION

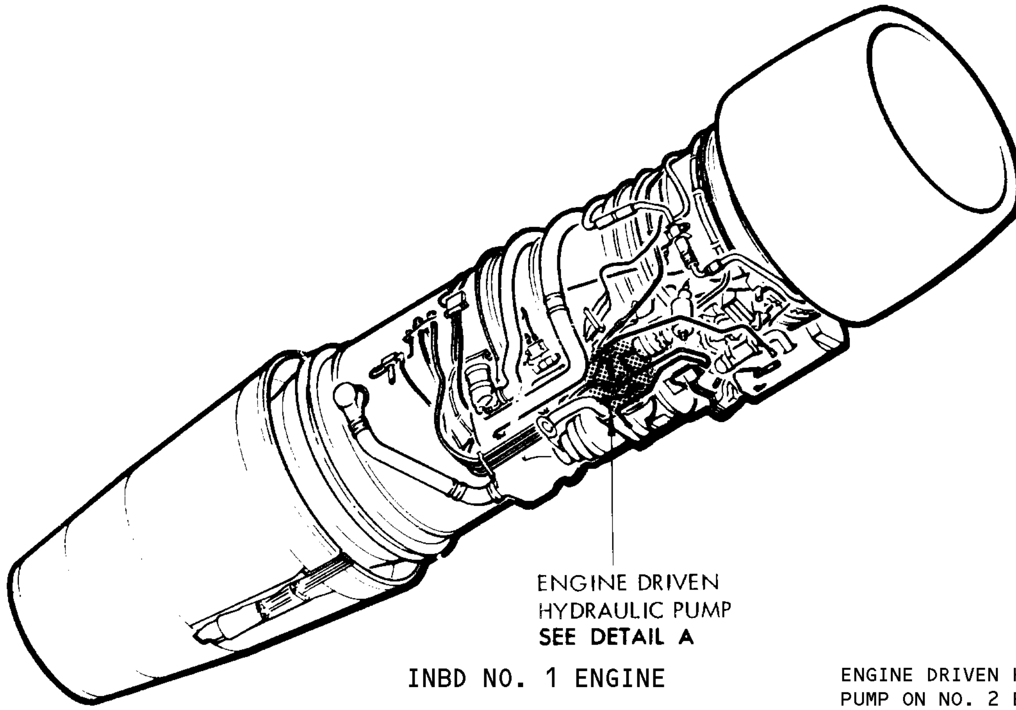
1. General
   A. The fire shutoff valves are installed in the supply lines to the engine-driven pumps and are mounted in the rear spar area just outboard of the wheel wells. A container of about 4.5-gallon capacity will be necessary to catch fluid when disconnecting the supply lines from the valve. Should any fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Remove Hydraulic Supply (Fire) Shutoff Valve
   A. Depressurize reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
   Open tire burst protector screen door.
   C. Drain system A reservoir. After draining, close reservoir drain valve and lockwire.
   D. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
   Close and latch tire burst protector screen door.
   E. Open HYDRAULIC FLUID SHUTOFF VALVE ENGINE NO. 1 and NO. 2 circuit breakers on P6 load control panel.
   F. Disconnect electrical connector from electrical receptacle of shutoff valve (Fig. 401).
   G. Remove mounting bolts from reservoir inlet and pump outlet adapter flanges.
   H. Remove valve assembly by sliding outwards from between adapter flanges.
3. Install Hydraulic Supply (Fire) Shutoff Valve
   A. Position packings in grooves of valve inlet and outlet flange mounting surfaces.
   B. Position shutoff valve between adapter flanges and install mounting bolt (Fig. 401).
   C. Connect electrical connector to shutoff valve.
   D. Service hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.
   E. Pressurize reservoir system. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   F. Provide electrical power to airplane and close HYDRAULIC FLUID SHUTOFF VALVE ENGINE NO. 1 and NO. 2 circuit breakers on P6 load control panel.
   G. On P8 aft electronic panel, pull corresponding fire switch. Check that position indicator on valve moves to the CLOSED position and that valve motor stops operating. Check valve for leaks.
   H. Push the corresponding fire switch in. Check that position indicator on valve moves to the OPEN position and that valve motor stops operating.
   I. Remove electrical power from airplane.



Hydraulic Supply (Fire) Shutoff Valve
Figure 401

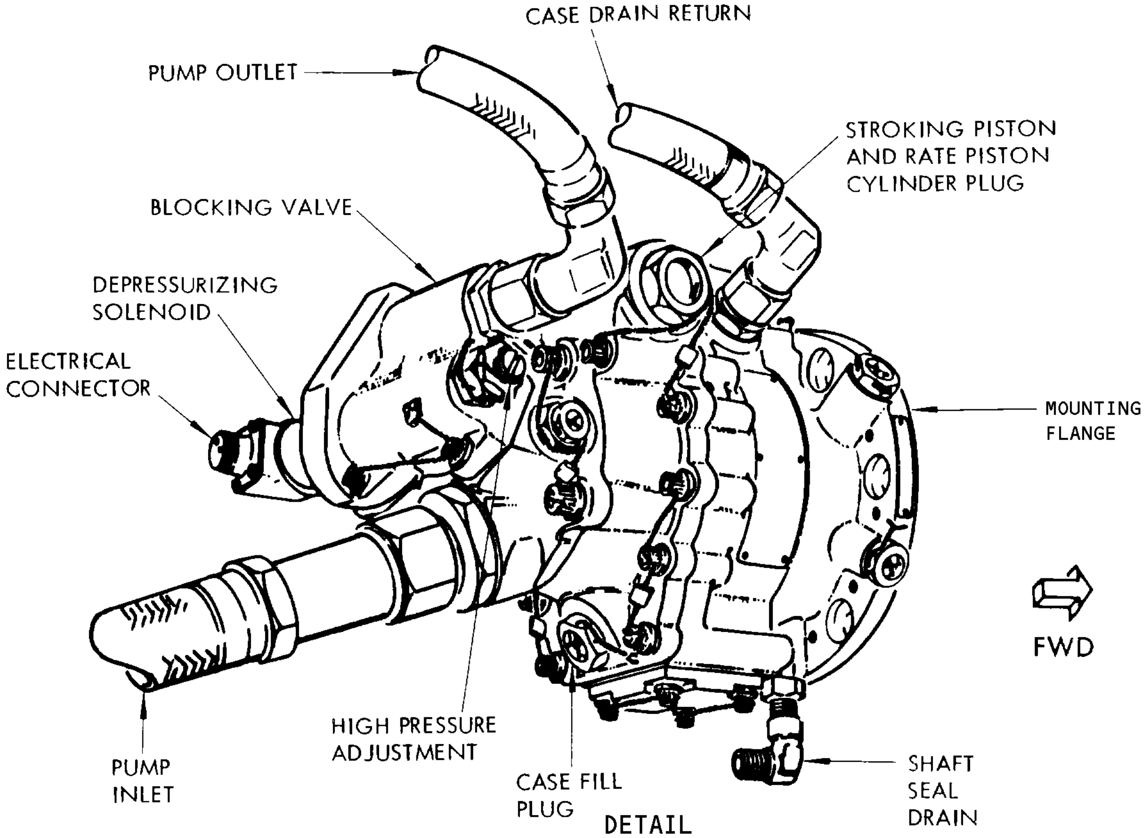
SYSTEM A ENGINE-DRIVEN HYDRAULIC PUMPS - DESCRIPTION AND OPERATION

1. General
   A. Hydraulic system A pressure is supplied by two variable displacement engine-driven hydraulic pumps (Fig. 1). Each pump has a maximum displacement of 1.77 cubic inches per revolution and at 3000 rpm delivers approximately 22-1/2 gpm at 2850 psi. The pumps are single-stage, variable displacement units. Pump discharge pressure is limited by a pressure compensator. Each pump may be depressurized by an electrically controlled depressurizing valve. The pumps are mounted on the lower right side of the engines and consist of the units shown in Fig. 1.
   B. The pumping mechanism consists of a revolving cylinder barrel containing nine pistons. The cylinder barrel is supported by a roller bearing and is driven by the internal drive shaft. The pistons are supported on an inclined cam plate by means of a hold-down plate and hydraulically balanced shoes. The axial thrust of the pistons against the cam plate during the power stroke is balanced hydraulically. Oil, at system pressure, is admitted through holes in the piston and balance shoe to an undercut area in the face of the shoe. This pressure applied to the undercut area, which is slightly less than the piston area balances the forces so that the shoe is supported on an oil film at all times. The axial thrust of the cylinder barrel is also balanced hydraulically against the port cap. The inclined cam plate causes the pistons to reciprocate as the barrel revolves. The hold-down plate provides positive stroking of the pistons during the intake stroke. The angle of the cam plate is varied by moving the hanger on which it is mounted, thereby changing the displacement of the pump. The hanger, in turn, is controlled by the pressure compensators.
   C. As the pumping mechanism revolves, reservoir pressurized fluid flows through the inlet port and then through porting in the port cap to the cylinders in the barrel. As the cylinder barrel revolves the pistons are forced into their bores discharging high pressure fluid through porting in the port cap to the pump discharge port. The blocking valve is opened by this pressure, and flow to the system is provided.
   D. The pressure compensator regulates the fluid volume delivered in accordance with the demand of the system, thereby maintaining a predetermined pressure. System pressure is directed to the compensator valve, which is held in the closed position by an adjustable spring load. When system pressure reaches 3000 psi, the valve opens to admit system fluid into the stroking cylinder. The stroking piston then moves the hanger to a lesser angle, which reduces the volume pumped maintaining the desired pressure. When system demand lowers the pressure, the spring closes the valve porting the fluid in the stroking cylinder to the pump case. The stroking piston then retracts and the spring load on the rate piston moves the hanger to a greater angle and increases the pumped volume.



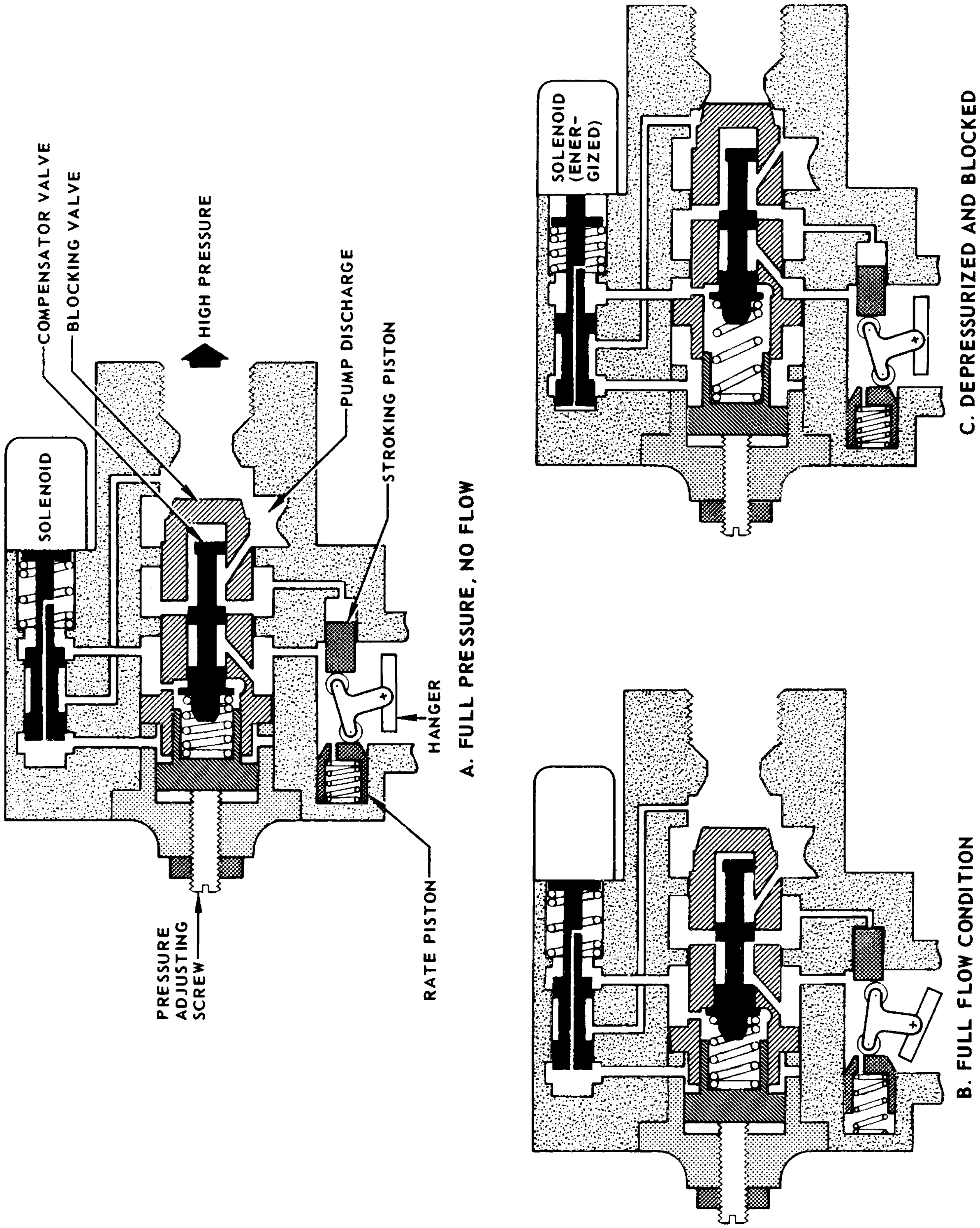
INBD NO. 1 ENGINE

ENGINE DRIVEN HYDRAULIC PUMP ON NO. 2 ENGINE IS MOUNTED ON OUTBOARD (RIGHT) SIDE OF ENGINE



DETAIL

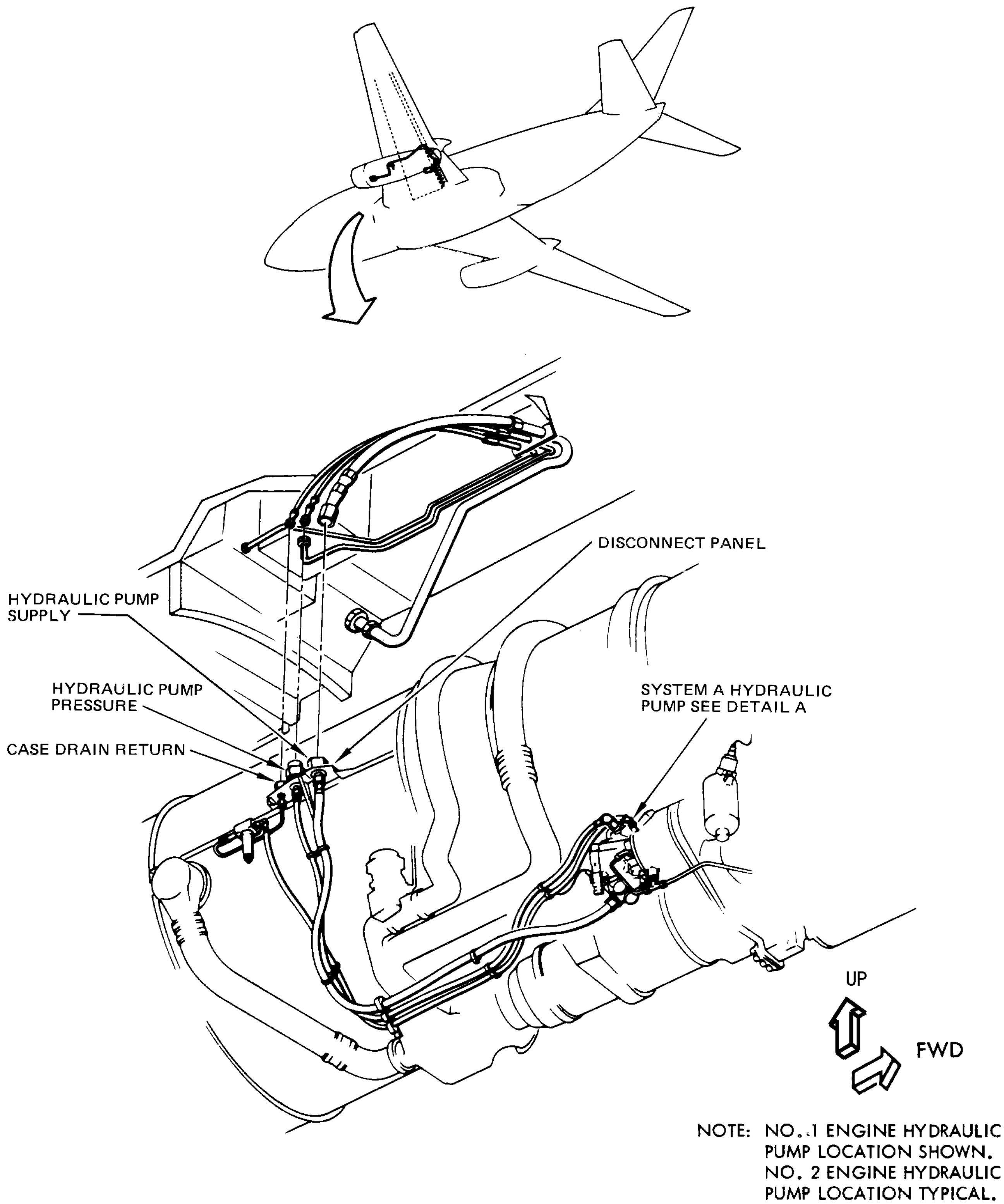
Engine Driven Hydraulic Pumps
Figure 1 (Sheet 1)



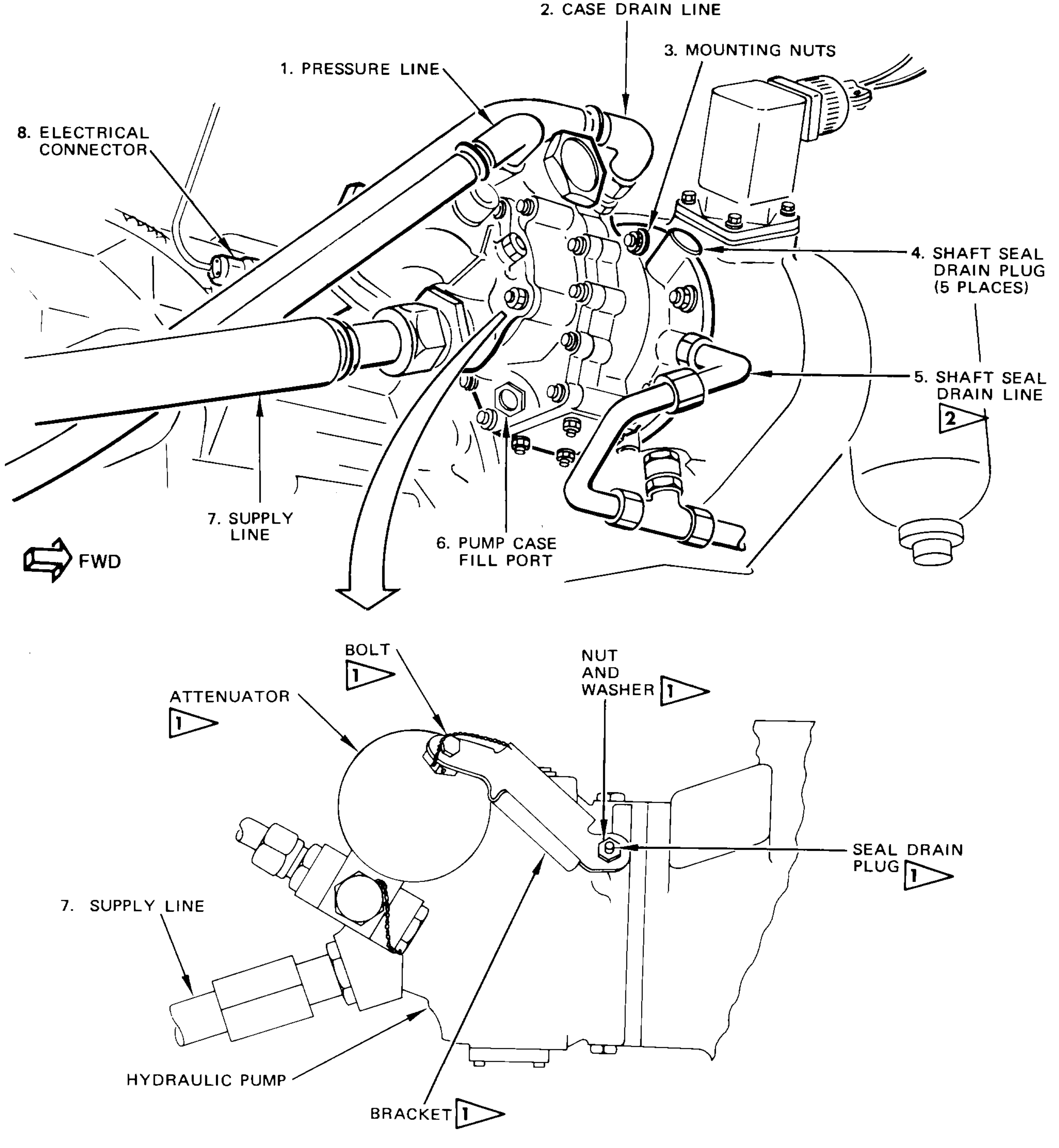
Engine Driven Hydraulic Pumps
Figure 1 (Sheet 2)

SYSTEM A ENGINE-DRIVEN HYDRAULIC PUMP - REMOVAL/INSTALLATION

1. General
   A. Should the hydraulic pump be replaced due to mechanical malfunction, replace the pressure and case drain filter elements and flush the lines between the pump and filters prior to replacing the pump (Ref 29-11-0 MP and I/C). The No. 1 and 2 engine-driven hydraulic pumps are identical except for their location. Both pumps will be covered by the same maintenance procedure.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B (Ref 20-30-21)
   B. Hydraulic Fluid - BMS 3-11 (Ref 20-30-21)
   C. Container of about one gallon capacity to catch hydraulic fluid
3. Prepare Hydraulic Pump for Removal
   A. Depressurize hydraulic system A (Ref 29-11-0 MP).
   B. Depressurize reservoir (Ref 29-09-300 MP).
   C. Open applicable cowl panel.
   D. Disconnect hydraulic pressure and supply lines at disconnect panel to prevent excessive loss of hydraulic fluid.
4. Remove Hydraulic Pump
   A. Check that engine hydraulic pump switches on the FORWARD OVERHEAD PANEL are in ON position. (Pump depressurization valve solenoids are energized when switches are in OFF position.)
   B. Disconnect electrical connector (8, Fig. 401).
   C. Disconnect hydraulic lines (1), (2), and (7) at disconnect panel.
   D. On airplanes with shaft seal drain line,remove hydraulic lines (1), (2), (5) and (7) from pump and allow fluid in lines to drain into container. Cap disconnected lines.
   E. On airplanes without shaft seal drain line,remove hydraulic lines (1), (2) and (7) from pump and allow fluid in lines to drain into container. Cap disconnected lines.
   F. Remove pump mounting nuts (3) and remove pump.
   G. Remove hydraulic attenuator if not installed on new pump. (See Fig. 401 for effectivity.)
5. Prepare Hydraulic Pump for Installation
   A. If filters show signs of contamination, flush hydraulic system A (Ref 29-11-0 MP).
   B. Install O-rings, unions and reducers in pump. Apply hydraulic fluid or assembly lube to all O-
   rings and hydraulic fittings to facilitate installation.
   C. Install attenuator on new pump. (See Fig. 401 for airplane effectivity.)
      (1) Ensure that all contaminates are removed by rinsing attenuator with BMS 3-11 hydraulic fluid.
      (2) Replace seal drain plug with plug from old pump which contains external threaded end. Install O-ring and tighten to 100-125 pound-inches and lockwire.



System A Engine-Driven Hydraulic Pump Installation
Figure 401 (Sheet 1)



1 ON AIRPLANES INCORPORATING SB 29-1024

2 AIRPLANES WITH SHAFT SEAL DRAIN LINE

System A Engine-Driven Hydraulic Pump Installation
Figure 401 (Sheet 2)

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(3) Install attenuator and O-ring in pump pressure port.
(4) Install bracket to attenuator and to seal drain plug. Lockwire bolt attaching bracket to attenuator.

D. On airplanes with shaft seal drain line,
(1) Remove shaft seal drain plug from pump mounting flange and in tall drain fitting as shown on Fig. 401. Lockwire fitting.
(2) Check that shaft seal drain line (5, Fig. 401) is clean.

E. Fill pump with hydraulic fluid to remove air from pump.
(1) Remove pump case fill port plug (6) and fill pump case with hydraulic fluid.
(2) Turn pump shaft by hand (in direction of the arrow) until bubbles stop appearing in the pressure port. Refill pump if necessary. Secure and lockwire pump case fill plug (6) when case is full.

6. <u>Install Hydraulic Pump</u>

A. Install gasket on pump mounting flange. Make sure mounting flange surfaces are clean.

B. Engage pump shaft with engine driving shaft, and position pump correctly on mounting studs. Secure hydraulic pump with one washer and mounting nut (3, Fig. 401).

<u>NOTE</u>: Do not lubricate the pump spline shaft and driving shaft cavity.

C. Install remaining washers and mounting nuts (3). Apply a torque of 160 to 190 pound-inches to mounting nuts.

D. Connect hydraulic lines (1), (2), and (7) to hydraulic pump.

E. Carefully fill supply line (7) and pressure line (1) with hydraulic fluid so that all air can escape from line.

F. Connect hydraulic lines at engine disconnect panel.
(1) Tighten case drain line (2) 270 pound-inches.
(2) Tighten pressure line (1) 500 +25 pound-inches.
(3) Tighten supply line (7) 1200 +60 pound-inches.

G. On airplanes with shaft seal drain line, connect shaft seal drain line (5) to shaft seal drain fitting.

H. Connect electrical connector (8).

I. Connect air source to system A reservoir charging valve (Ref 29-09-300 MP [Pressurize System A Hydraulic Reservoir]).

J. Loosen hydraulic supply line at pump inlet and apply air pressure to reservoir charging valve. Bleed supply line until air is removed, then tighten supply line.

<u>NOTE</u>: Use suitable container to catch hydraulic fluid.

K. Remove air source from reservoir.

L. Pressurize hydraulic system A by motoring engine (Ref 71-09-100, Operating Procedure).
   (1) Check that hydraulic pressure stabilizes between 2900 and 3100 psi with flight control switches OFF and ground interconnect valve CLOSED.
   (2) Position engine-driven pump switch to DEPRESSURIZE and allow system to bleed down.
   (3) Position pump switch to NORMAL and check that hydraulic pressure stabilizes between 2900 and 3100 psi.
   (4) Shut down engine.

M. Check pump, pump lines and connection for leaks.

N. Service hydraulic reservoir after completion of test.

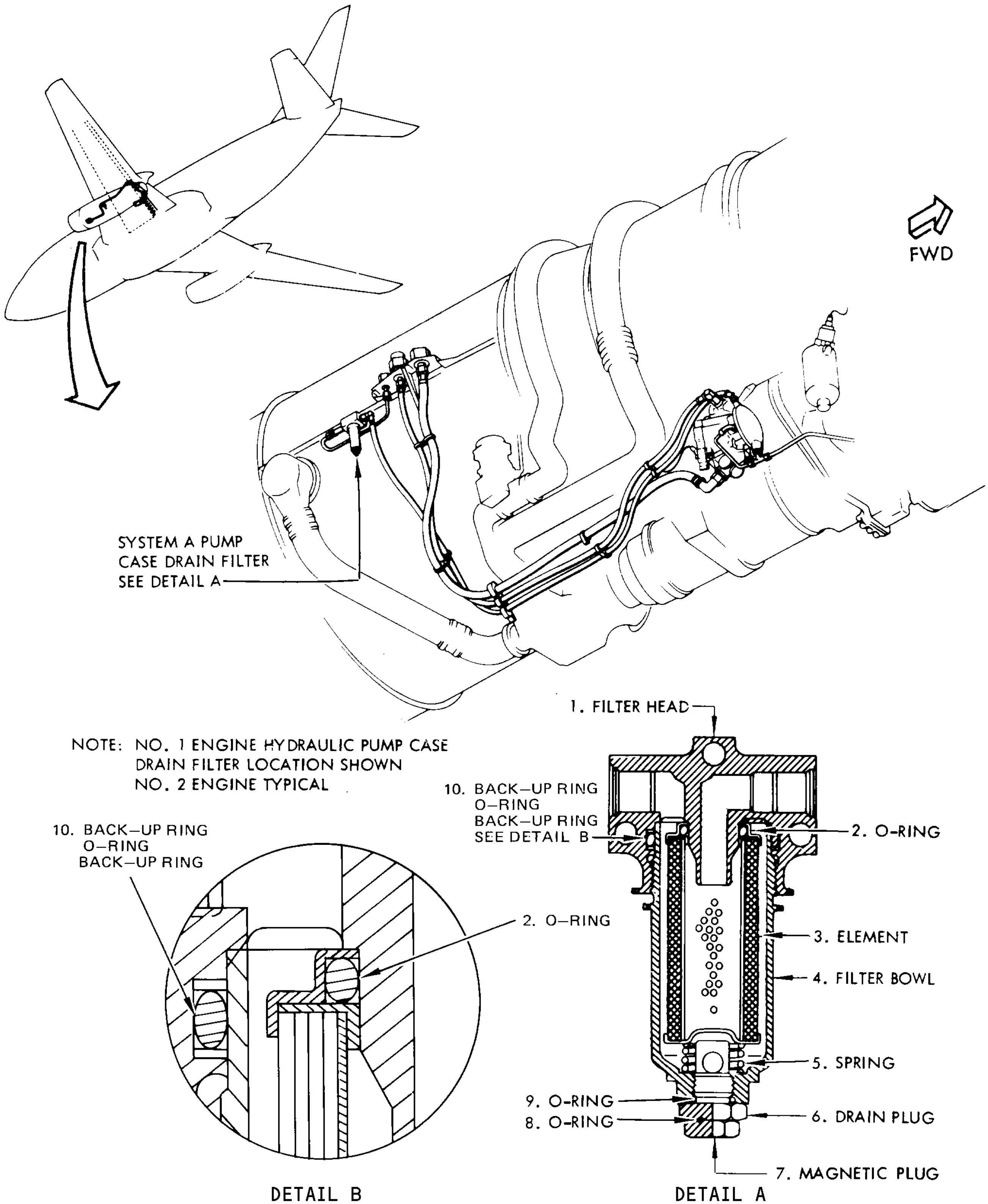
O. Close engine cowl.

SYSTEM A ENGINE-DRIVEN HYDRAULIC PUMP - ADJUSTMENT/TEST

1. System A Engine-Driven Hydraulic Pump Test
   A. General
      (1) The following test procedure should be performed when the engine-driven hydraulic pump has been replaced or when the pump is suspected of malfunctioning. This test is typical for either engine pump.
   B. Test Engine-Driven Hydraulic Pump
      (1) Check that PUMP DEPRESSURIZING VALVES circuit breaker is closed.
      (2) Pressurize hydraulic system A, using system A engine-driven pump (AMM 29-11-0/201).
      (3) With engine operating at idle or above, indicated no flow system A pressure should be between 2900 and 3100 psi with flight control switches OFF and ground interconnect valve CLOSED.
      (4) Place system A depressurization switch on overhead panel in OFF position. Allow system pressure to bleed off.
      (5) Place depressurization switch in ON position. System pressure should return to normal.
      (6) After completion of test, return system to normal configuration.

SYSTEM A HYDRAULIC PUMP CASE DRAIN FILTER - UNIT SERVICING

1. General
   A. The hydraulic pump case drain filter element should be removed and checked at regular intervals. Between these intervals the magnetic plug in the filter case should be removed and checked for metal contamination. If excessive metal is found, the associated pump should be removed and the system checked and flushed (Ref 29-11-0, Hydraulic System A - MP and I/C).
   B. A container will be necessary to catch fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid BMS 3-11 (Ref 20-30-21)
3. Service Hydraulic Pump Case Drain Filter
   A. Check Case Drain Filter Magnetic Plug
      (1) Open engine right cowl panel.
      (2) Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
      (3) Unscrew magnetic plug (7, Fig. 301) and check for metal contamination on plug, and in hydraulic fluid lost during removal of plug.
      (4) Place new O-ring (8) on magnetic plug (7). Apply assembly lube or hydraulic fluid to O-ring and threads of magnetic plug, then screw magnetic plug into drain plug (6). Hold drain plug and tighten magnetic plug to 15-20 pound-inches.
      (5) Lockwire magnetic plug and drain plug.
   B. Remove Case Drain Filter Element
      (1) Open engine right cowl panel.
      (2) Depressurize hydraulic reservoirs (Ref 29-09-300).
      (3) Unscrew filter bowl (4, Fig. 301) from filter head (1). Remove bowl with filter element (3).
      (4) Remove filter element and spring (5). Check element and bowl for metal contamination.
      (5) Replace paper filter element (3) and clean filter bowl (4), magnetic plug and spring.
   C. Install Case Drain Filter Element
      (1) Insert backup ring, O-ring and backup ring (10, Fig. 301) into internal filter head groove. Lubricate with assembly lube or hydraulic fluid.
      (2) Insert O-ring (2) in filter element groove.
      (3) Install spring (5) and filter element (3) in filter bowl (4).
      (4) Lubricate threads lightly with assembly lube or hydraulic fluid and screw filter bowl (4) into filter head (1). Apply a torque of 50 to 75 pound-inches to filter bowl and lockwire.



System A Hydraulic Pump Case Drain Filter Servicing
Figure 301

(5) Operate applicable engine-driven hydraulic pump and check filter for leaks. Refer to 71-09-100, Power Plant (JT8D) - Operating Procedures.

(6) Close engine cowl.

SYSTEM A HYDRAULIC PUMP CASE DRAIN FILTER - REMOVAL/INSTALLATION

1. General
   A. The maintenance practices for the system A hydraulic pump case drain filters installed on engines No. 1 and 2 are identical, except for unit location.
   B. A container will be necessary to catch any fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid - BMS 3-11
3. Remove Case Drain Filter
   A. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   B. Open engine right cowl panel.
   C. Disconnect hydraulic lines from case drain filter and cap lines (Fig. 401).
   D. Remove mounting bolts and remove filter from engine.

S 214-001

(1) Examine the filter element, the filter bowl, and the fluid in the filter bowl for metal contamination.

(a) AIRPLANES WITH ABEX PUMPS;
If you find a small quantity of metal particles that have equal dimensions, then replace the filter and do an operational test of the pump (AMM 29-11-31/501). Examine the filter again at the scheduled filter change interval.

NOTE: It is not necessary to replace a pump if the quantity of metal particles is small and they have equal dimensions. The filter can have more particles during initial operation of a new pump while mating parts wear away small surface defects. It is not necessary to replace the pump if more small particles are found at the next filter change after installation of a new pump.

(b) AIRPLANES WITH ABEX PUMPS;
If you find a large quantity of small metal particles, large metal particles that are not of equal dimensions, or a large quantity of steel particles, then replace the pump at the next maintenance opportunity (AMM 29-11-31/401).

NOTE: A large quantity of small metal particles, or large metal particles that are not of equal dimensions, can be an indication of an unsatisfactory pump. The particles are usually bronze mixed with a small quantity of steel. A large quantity of steel particles is an indication of unsatisfactorily worn bearings.

(c) Write down the results of the filter inspection and give them to the pump overhaul facility.

NOTE: The filter inspection results can be used as an aid to find the condition of the pump. A pump with an unsatisfactory bearing can pass the functional test and be returned to service with no fault found. Giving the filter inspection data to the overhaul facility can prevent the return of an unsatisfactory pump to service.

CAUTION: FLUSH THE HYDRAULIC LINES TO REMOVE UNWANTED METAL CONTAMINATION. IF THE LINES ARE NOT FLUSHED, THEN THE REMAINING METAL CONTAMINATION CAN BE FOUND AT THE NEXT FILTER CHANGE. IF A LARGE QUANTITY OF METAL CONTAMINATION STAYS IN THE LINES, THEN THE FILTER CAN BECOME BLOCKED. A CONTAMINATED FILTER CAN CAUSE AN UNWANTED REMOVAL OF A SATISFACTORY PUMP. A BLOCKED FILTER CAN CAUSE A PUMP TO FAIL.

(d) If a pump is removed because metal contamination is found in the filter, then flush the hydraulic lines and replace the related filter elements (AMM 29-00-00/201).

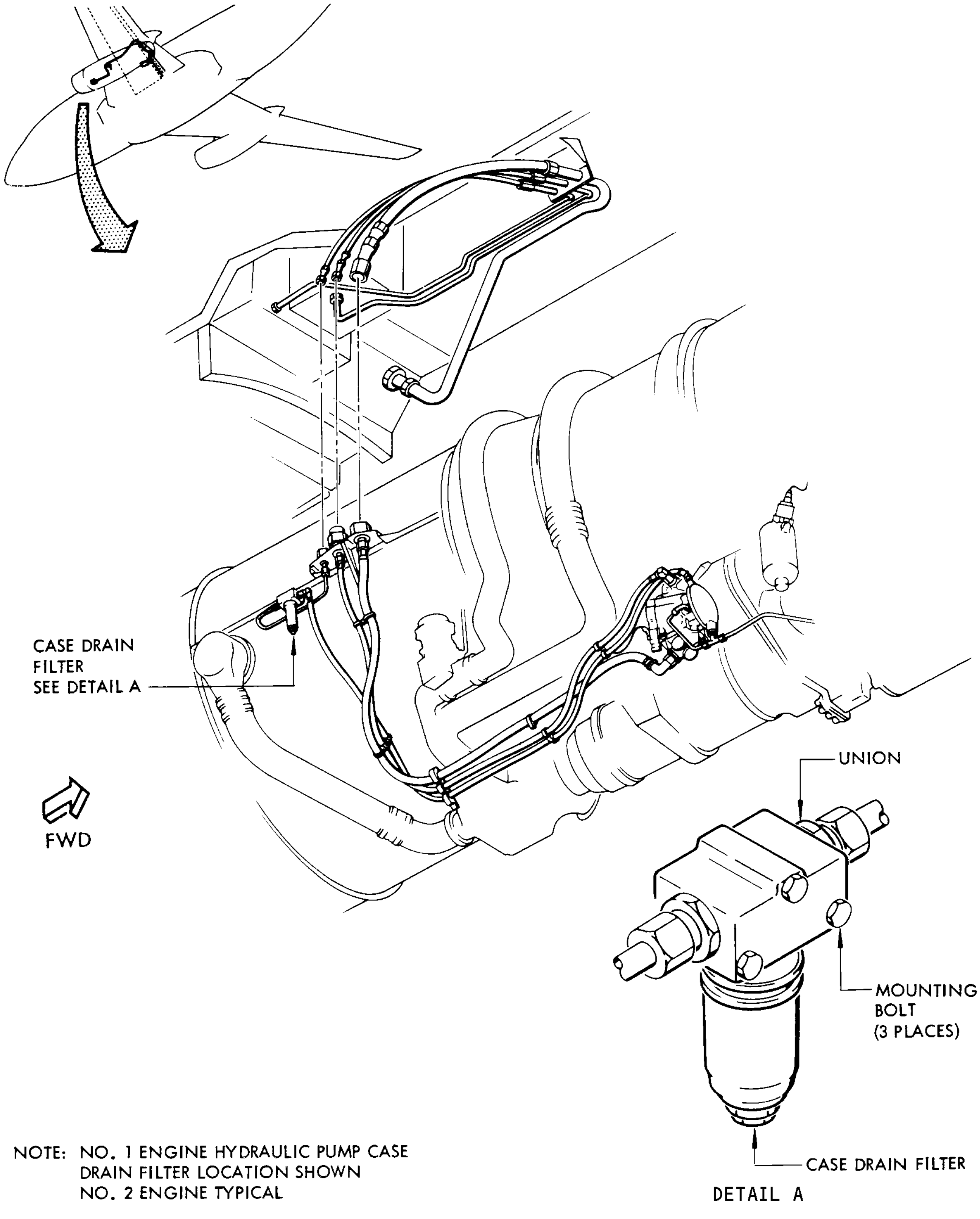
4. Install Case Drain Filter

A. Install unions and O-rings in the case drain filter ports. Lubricate with assembly lube or hydraulic fluid.

B. Position filter assembly on mounting bracket and install filter mounting bolts.

CAUTION: CHECK THAT ARROW ON CASE DRAIN FILTER IS POINTED "AFT."

C. Remove caps from hydraulic lines and connect hydraulic lines to case drain filter.
D. Pressurize hydraulic reservoir (Ref 29-09-300 MP).
E. Motor applicable engine-driven hydraulic pump and check filter and connections for leaks (Ref 71-09-100, Power Plant (JT8D) - Operating Procedures).
F. Close engine cowl.



NOTE: NO. 1 ENGINE HYDRAULIC PUMP CASE DRAIN FILTER LOCATION SHOWN NO. 2 ENGINE TYPICAL

System A Hydraulic Pump Case Drain Filter Servicing
Figure 401

SYSTEM A HYDRAULIC FLUID HEAT EXCHANGER - REMOVAL/INSTALLATION

1. General
   A. The heat exchanger for system A is installed in the bottom of No.1 fuel tank. A container will be necessary to catch any fluid when removing the heat exchanger. Should any fluid spill on the airplane, the affected area must be decontaminated (AMM Chapter 12, Cleaning and Washing).
   B. Removal and installation of the heat exchanger requires entry into the No.1 fuel tank. Refer to Chapter 28, Fuel Storage System, for precautionary measures and procedures before attempting removal or installation of the heat exchanger.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid - BMS 3-11
3. Prepare System A Hydraulic Fluid Heat Exchanger for Removal
   A. Depressurize hydraulic system A (AMM 29-11-0 MP).
   B. Depressurize hydraulic reservoirs (AMM 29-09-300 MP).
   C. Defuel fuel tank No.1 and remove fuel tank access panel just forward of heat exchanger (AMM 28, Fuel Storage System).
   D. Prepare fuel tank for entering to remove heat exchanger.

      WARNING: FUEL TANK IS HAZARDOUS AREA (AMM CHAPTER 28, FUEL STORAGE SYSTEM). KNOW PRECAUTIONS BEFORE ENTERING FUEL TANK.

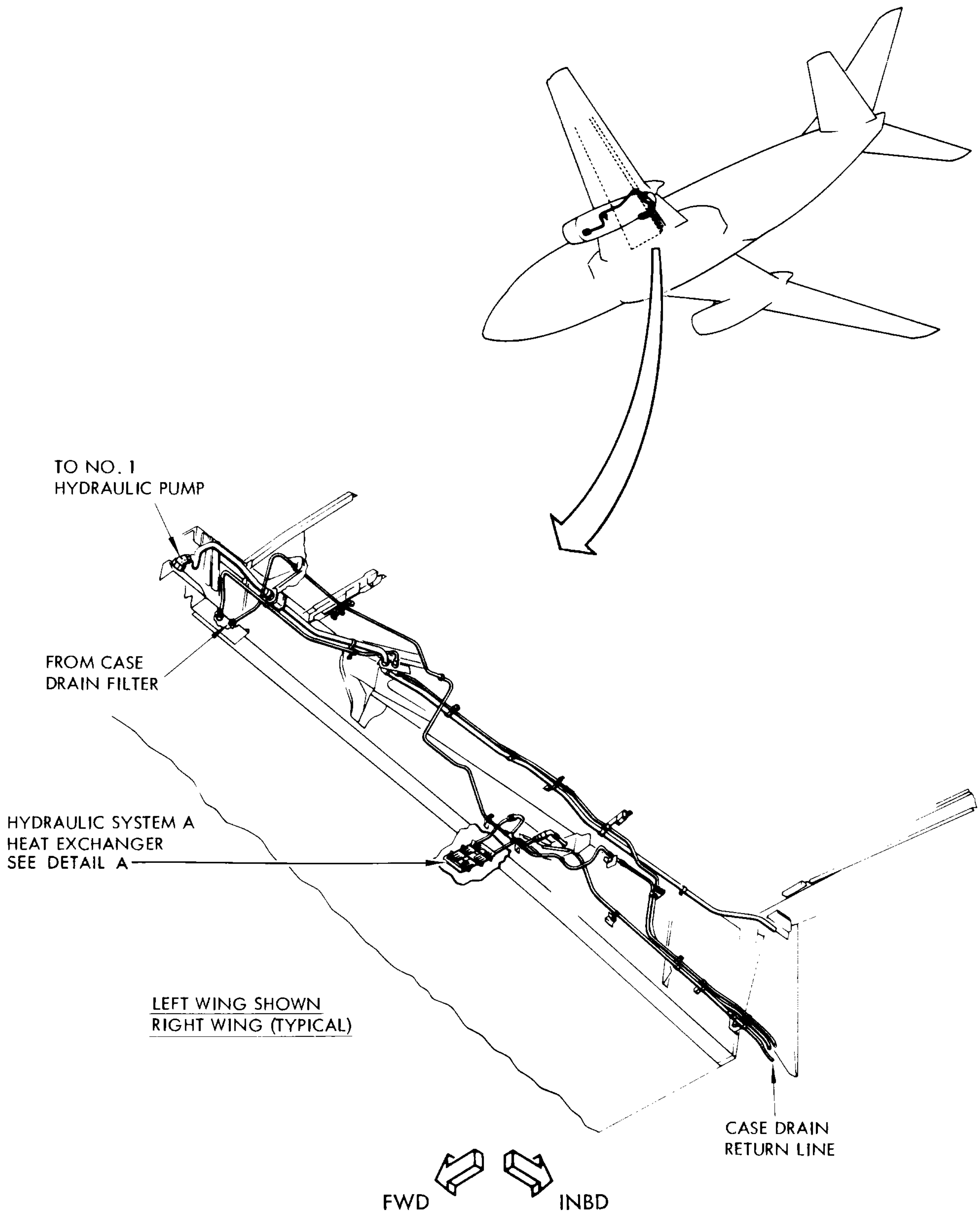
4. Remove System A Hydraulic Fluid Heat Exchanger
   A. At the aft side of the rear spar (Fig. 401) where heat exchanger inlet and outlet lines pass through, disconnect hydraulic fittings (1). Remove and cap hydraulic lines.
   B. Remove unions (7), bulkhead nuts (8) and washers (9).
   C. Remove electrical bonding jumper (5) from tubing coil.
   D. Remove the heat exchanger mounting bolts (2) and (4).
   E. Loosen heat exchanger fittings from rear spar.

      NOTE: O-rings may cause fittings to stick to spar surface.

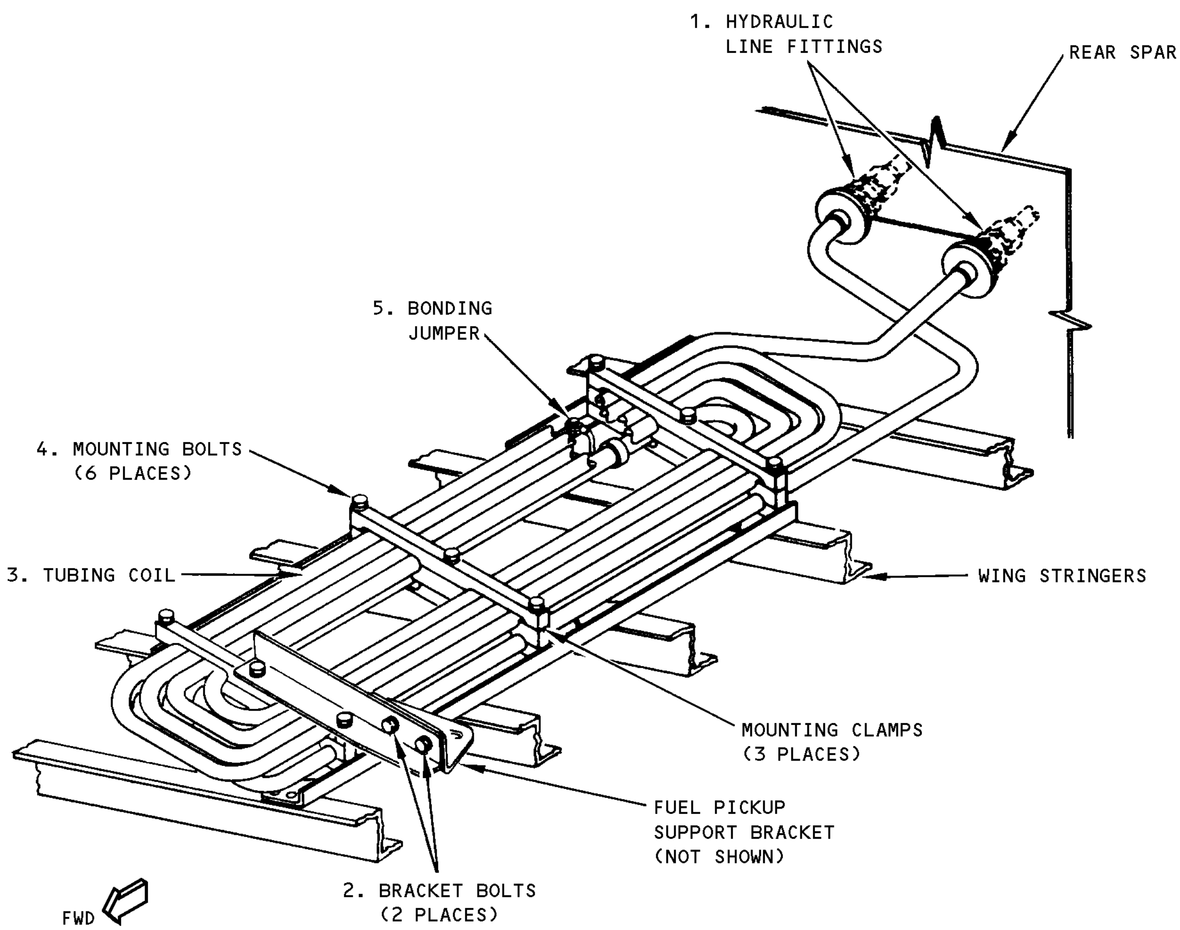
   F. Remove exchanger through tank access opening.

      CAUTION: ENSURE ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING FUEL TANK.

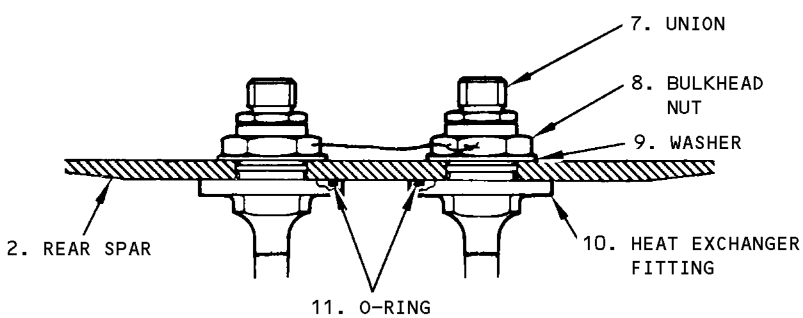
5. Install System A Hydraulic Fluid Heat Exchanger
   A. Insert O-rings (11) in grooves of heat exchanger fittings (Fig. 401).



System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 1)



DETAIL A



DETAIL B

System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 2)

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B. Pass heat exchanger through wing tank access opening with the inlet and outlet ports going through opening first.

WARNING: FUEL TANK IS HAZARDOUS AREA. REFER TO CHAPTER 28, FUEL STORAGE SYSTEM. KNOW PRECAUTIONS BEFORE ENTERING TANK.

C. Enter fuel tank and position inlet and outlet fittings so they enter the holes in rear spar.

NOTE: Ensure that O-rings are properly seated and that sealing surfaces on the rear spar are clean and free from flaws. Apply assembly lube or hydraulic fluid to all O-rings and fittings to facilitate installation.

D. Align holes and install mounting bolts (2) and (4) through heat exchanger mounting clamps.
E. Connect bonding jumper (5).

CAUTION: ENSURE ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING TANK.

F. At the aft face of the rear spar web, where heat exchanger fittings (10) pass through, install fittings as follows:
   (1) Install washers (9) and bulkhead nuts (8). Lockwire nuts.
   (2) Install unions (7) on heat exchanger inlet and outlet fittings. Lubricate with assembly lube or hydraulic fluid.

   CAUTION: EXERCISE CARE TO PREVENT IMPURITIES FROM ENTERING HYDRAULIC SYSTEM.

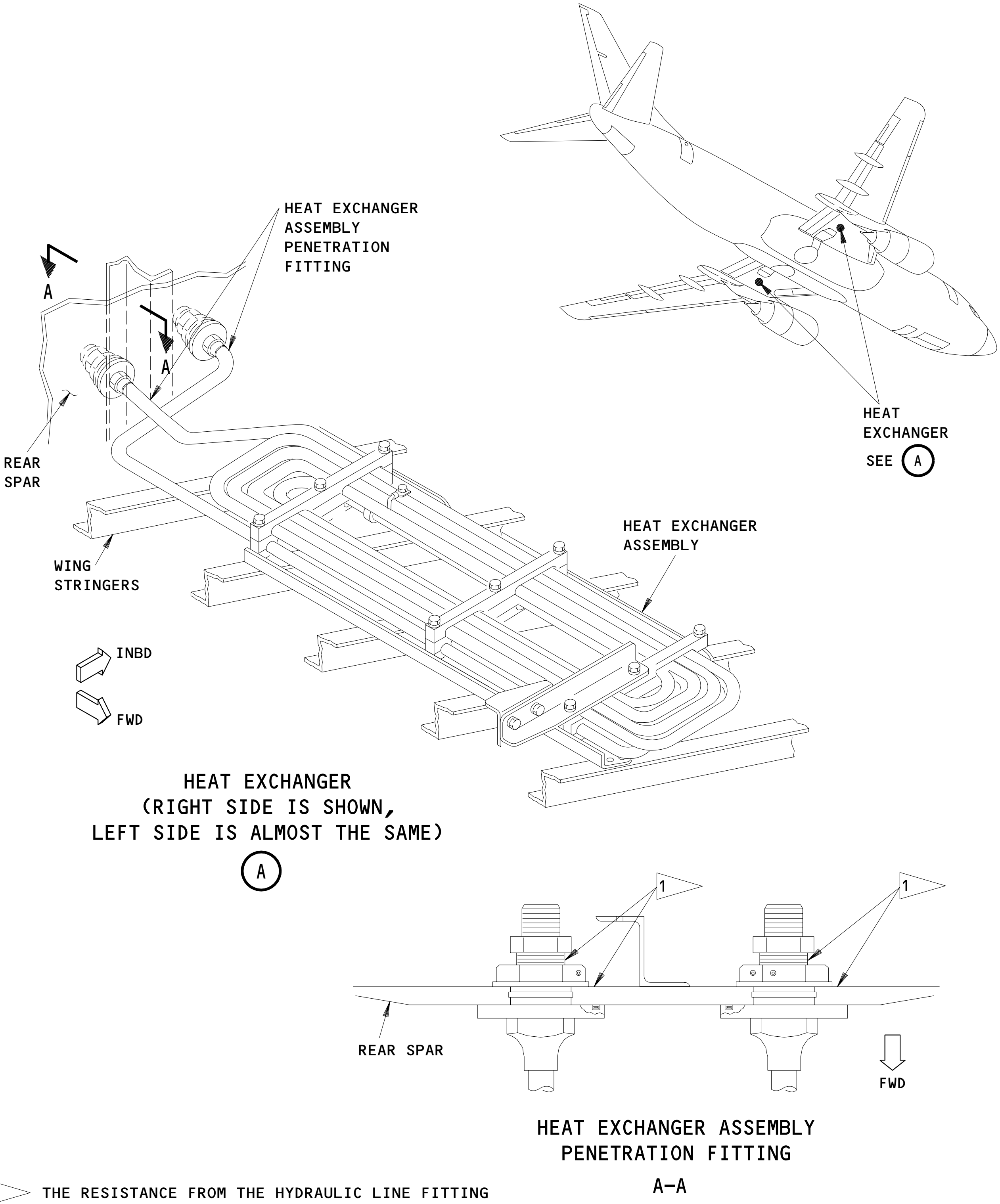
   (3) Remove protective caps from hydraulic lines and connect to unions.
G. Install fuel tank access panels. Refer to AMM Chapter 28, Fuel Tank Access Panels - R/I.
H. Service hydraulic reservoirs. Refer to AMM Chapter 12, Hydraulic Fluid Servicing.
I. Refuel fuel tank No.1 to a minimum of 250 gallons of fuel. Refer to AMM Chapter 12, Servicing.

NOTE: Normally 250 gallons of fuel is required in the No.1 fuel tank to provide adequate hydraulic fluid cooling.

J. Pressurize hydraulic system A by motoring either engine. Refer to AMM 71-09-100, Power Plant (JT8D) - Operating Procedures.
K. Check heat exchanger fittings for signs of leakage.
L. Check fuel tank for leakage in areas reworked by heat exchanger removal and installation. Refer to AMM Chapter 28, Fuel System.

SYSTEM A HYDRAULIC FLUID HEAT EXCHANGER - INSPECTION/CHECK

1. General
   A. The hydraulic lines connected to the heat exchanger in the bottom of the No. 1 fuel tank penetrate the rear spar. A lightning strike to the airplane can transmit current to the fuel tank through these hydraulic lines. This procedure gives instructions to make sure that the hydraulic lines are correctly bonded to rear spar at the bulkhead fittings at the penetration points.
2. Hydraulic Lines to the Heat Exchanger - Bonding Resistance Check (Fig. 601)
   A. References
      (1) AMM 27-51-0/201, Trailing Edge Flaps
      (2) SWPM 20-20-00, Electrical Bonds and Grounds
   B. Equipment
      (1) Bonding Meter - Use one of these:
         (a) Bonding Meter - Model T477W
             Avtron Manufacturing Inc.
             Cleveland OH
         (b) Bonding Meter - Model M1
             (Serial Number A0000112 and subsequent)
             BCD Electronics Ltd.
             Vancouver Canada
   C. Procedure
      (1) Depressurize the trailing edge flaps hydraulic system A (AMM 27-51-0/201).
      (2) Get access to the inlet and outlet hydraulic lines for the heat exchanger on the rear spar, outside of the No. 1 fuel tank.
      (3) Do a check of the bonding resistance between the penetration fittings for each of the hydraulic lines (inlet and outlet) and the rear spar (SWPM 20-20-00).
         (a) Make sure the bonding resistance is 0.002 ohm (2 milliohms) or less.
      (4) If no additional work is to be done in the area, pressurize the trailing edge flaps hydraulic system A (AMM 27-51-0/201).



1 THE RESISTANCE FROM THE HYDRAULIC LINE FITTING TO THE REAR SPAR IS 0.002 OHMS OR LESS

Hydraulic Lines to the Heat Exchanger Resistance Check
Figure 601

SYSTEM A HYDRAULIC FLUID HEAT EXCHANGER - REMOVAL/INSTALLATION

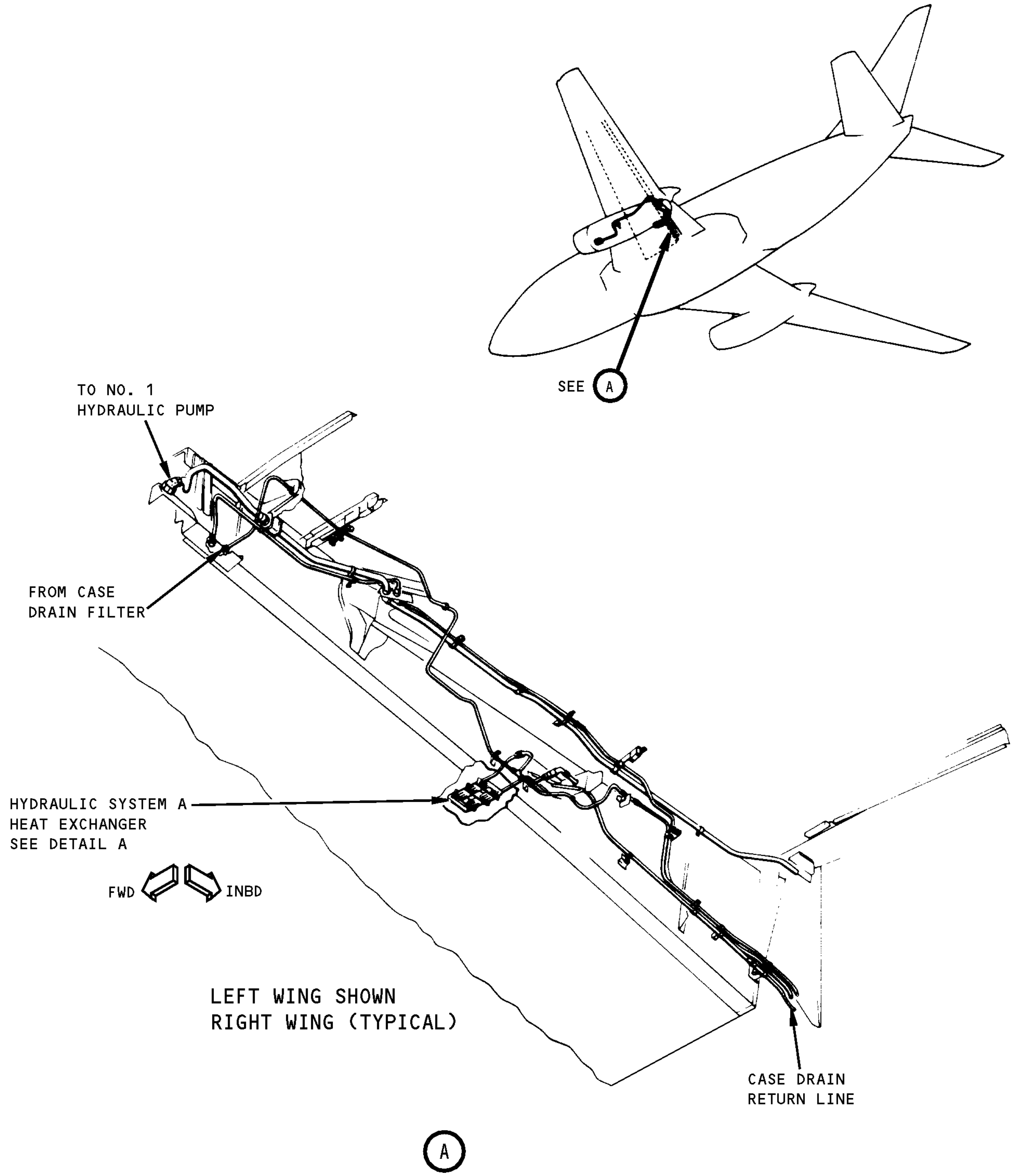
1. General
   A. The heat exchanger for system A is installed in the bottom of No.1 fuel tank. A container will be necessary to catch any fluid when removing the heat exchanger. Should any fluid spill on the airplane, the affected area must be decontaminated (AMM Chapter 12, Cleaning and Washing).
   B. Removal and installation of the heat exchanger requires entry into the No.1 fuel tank. Refer to AMM Chapter 28, Fuel Storage System, for precautionary measures and procedures before attempting removal or installation of the heat exchanger.
2. Consumable Materials
   A. Skydrol Assembly Lube - MCS 352B
   B. Hydraulic Fluid - BMS 3-11
   C. Sealant - BMS 5-26, Type 2
   D. Alodine 600, Type 2, Class D - Protective Coating
   E. Abrasive Paper - 100, 320 or finer grit
   F. Primer - BMS 10-20, Type 2
   G. Enamel Finish - BMS 10-60, Type 1 or Type 2
3. Prepare System A Hydraulic Fluid Heat Exchanger for Removal

   WARNING: DO NOT USE AIRPLANE ELECTRICAL POWER WHEN FUEL TANK ACCESS PANELS ARE OPEN. WHEN WORKING IN THE VICINITY OF THE OPEN FUEL TANKS, DO NOT USE ANY TOOLS OR EQUIPMENT THAT HAVE ANY POTENTIAL IGNITION SOURCE. A FIRE OR EXPLOSION CAN OCCUR IF FUEL VAPOR IS IGNITED BY SPARK(S) FROM ELECTRICAL EQUIPMENT. A FIRE OR EXPLOSION CAN CAUSE INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT.

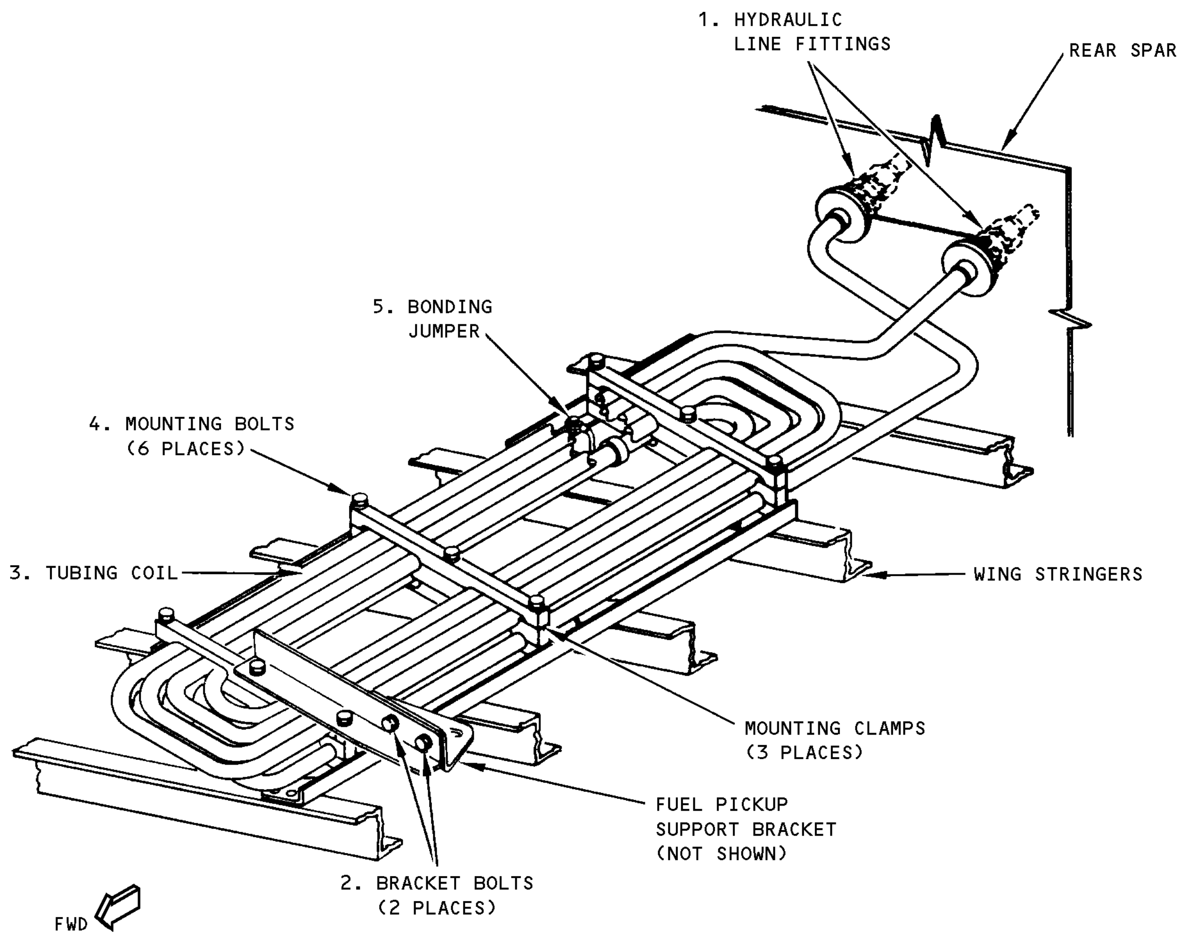
   A. Depressurize hydraulic system A (AMM 29-11-0/201 Maintenance Practices).
   B. Depressurize hydraulic reservoirs (AMM 29-09-300/201 Maintenance Practices).
   C. Defuel fuel tank No.1 and remove fuel tank access panel just forward of heat exchanger (AMM 28-23-00/201, Defueling - Maintenance Practices).

      WARNING: MAKE SURE THAT ALL STEPS TO PREPARE THE FUEL TANK ARE DONE CORRECTLY BEFORE ENTERING THE EMPTY FUEL TANK. IF YOU DO NOT FOLLOW ALL INSTRUCTIONS, SERIOUS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

   D. Prepare fuel tank for entering to remove heat exchanger.
4. Remove System A Hydraulic Fluid Heat Exchanger
   A. At the aft side of the rear spar (Fig. 401) where heat exchanger inlet and outlet lines pass through, disconnect hydraulic fittings (1). Remove and cap hydraulic lines.
   B. If the aileron control cables are loosen for other maintenance purposes, remove pully bracket assembly for easier access to work areas.

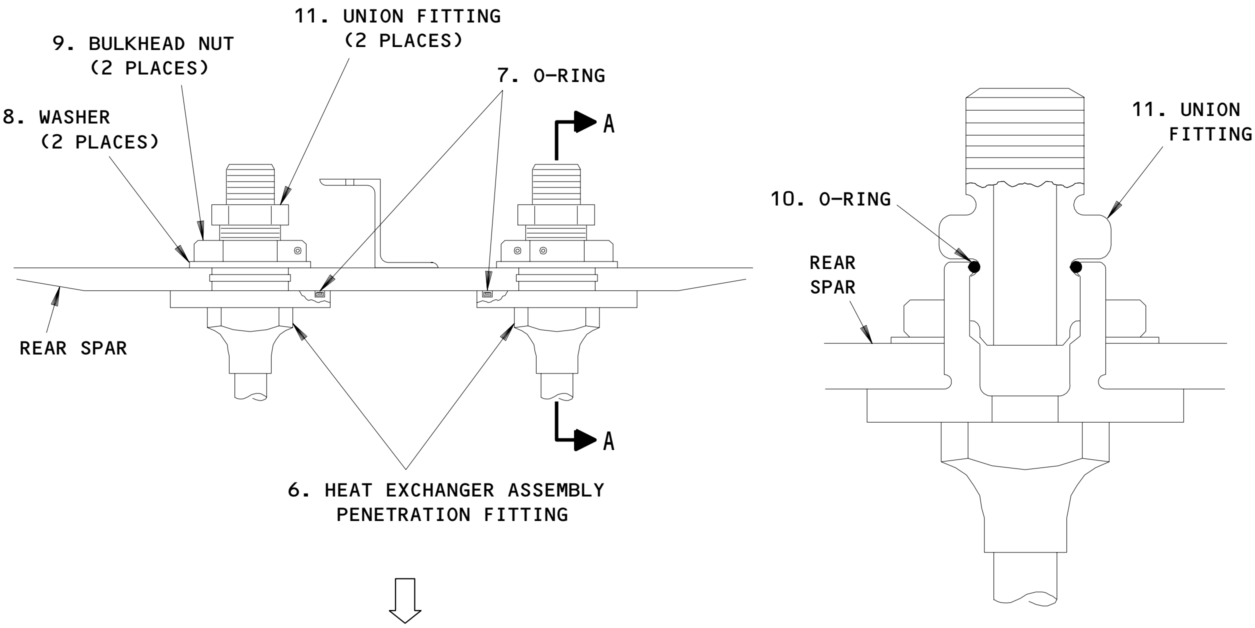


System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 1)



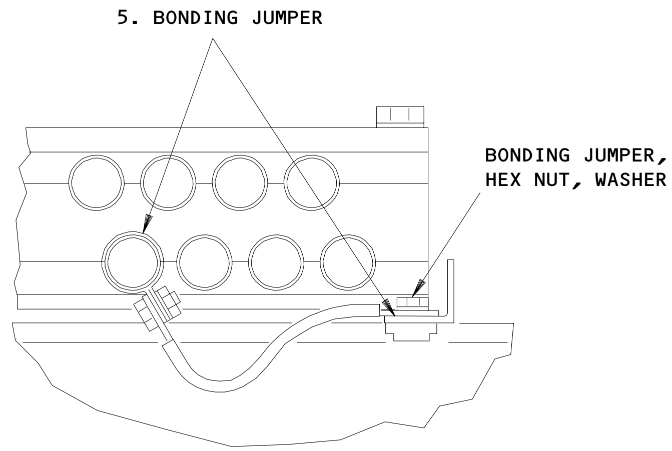
DETAIL A

System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 2)



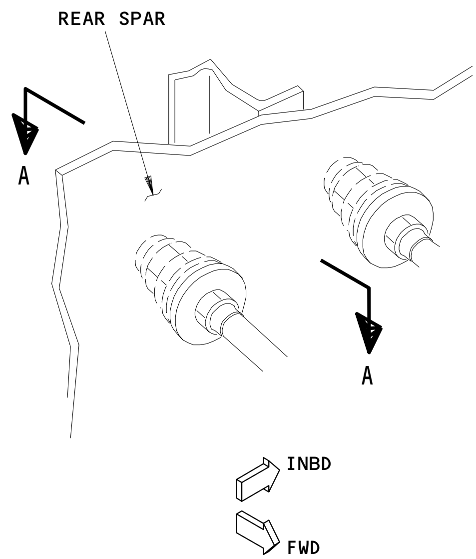
DETAIL B

A-A

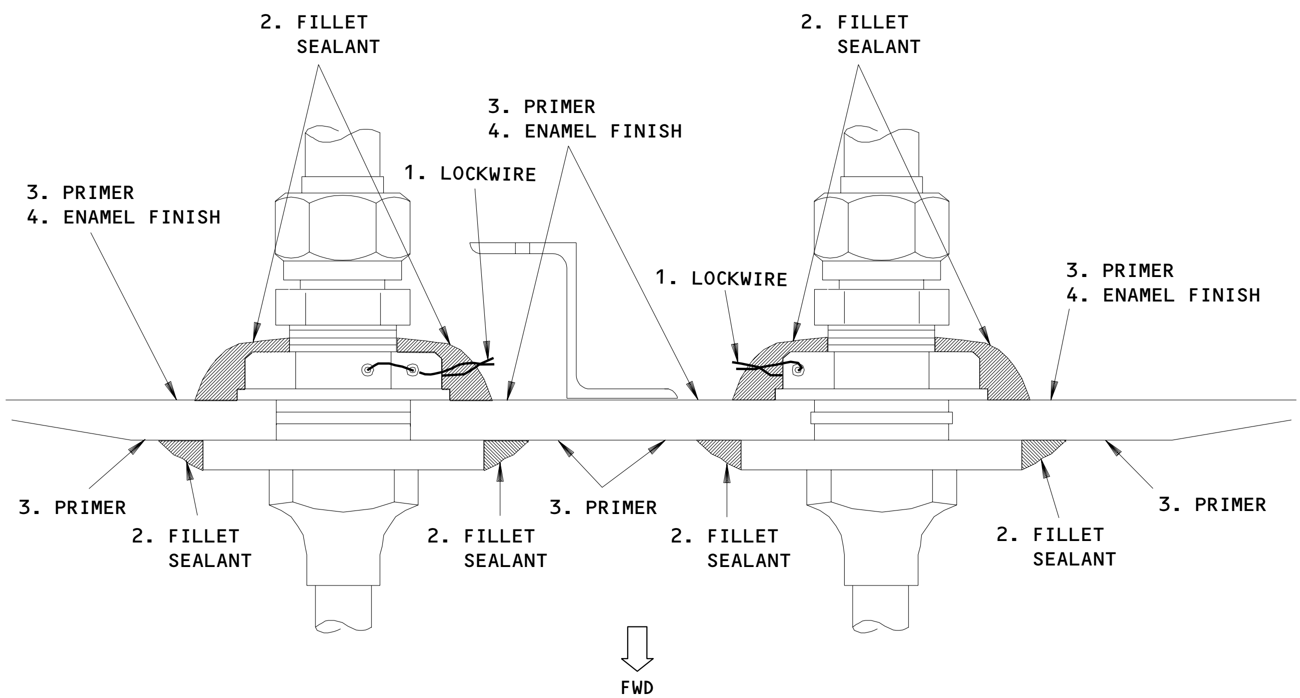


DETAIL C

System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 3)



RIGHT SIDE SHOWN,
LEFT SIDE ALMOST THE SAME



A-A

System A Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 4)

C. Remove unions (11), bulkhead nuts (9) and washers (8).
D. Remove electrical bonding jumper (5) from tubing coil.
E. Remove the heat exchanger mounting bolts and washers (4).
F. Remove mounting bolts, washers, nuts and bracket (2).

CAUTION: WHEN REMOVING THE BULKHEAD NUTS AT THE AFT SIDE OF THE REAR SPAR, HOLD THE FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, YOU CAN TWIST AND CAUSE DAMAGE TO THE HEAT EXCHANGER TUBES.

G. Remove the fillet sealant (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE FILLET SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

H. Loosen heat exchanger fittings from rear spar.

NOTE: O-rings may cause fittings to stick to spar surface.

I. Carefully remove exchanger through tank access opening.

CAUTION: ENSURE ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING FUEL TANK.

5. Install System A Hydraulic Fluid Heat Exchanger

WARNING: DO NOT USE AIRPLANE ELECTRICAL POWER WHEN FUEL TANK ACCESS PANELS ARE OPEN. WHEN WORKING IN THE VICINITY OF THE OPEN FUEL TANKS, DO NOT USE ANY TOOLS OR EQUIPMENT THAT HAVE ANY POTENTIAL IGNITION SOURCE. A FIRE OR EXPLOSION CAN OCCUR IF FUEL VAPOR IS IGNITED BY SPARK(S) FROM ELECTRICAL EQUIPMENT. A FIRE OR EXPLOSION CAN CAUSE INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: KEEP THE WORK AREA, WIRES AND ELECTRICAL BUNDLES CLEAN OF METAL PARTICLES AND CONTAMINATION WHEN YOU USE TOOLS. UNWANTED MATERIAL, METAL PARTICLES OR CONTAMINATION CAUGHT IN WIRE BUNDLES CAN CAUSE DAMAGE TO THE BUNDLES. DAMAGED WIRE BUNDLES CAN CAUSE SPARKS OR OTHER ELECTRICAL DAMAGE.

A. Preparation of Electrical Bonding Fay Surfaces
   (1) Remove any debris from the rear spar contact surfaces (AMM 20-10-181/701).

(2) Remove all surface finishes until only bare metal shows. Use paint stripper if necessary and 100 grit or finer abrasives (AMM 20-10-181/701).

<u>NOTE</u>: Use the washer (8) as a guide to measure the finish removal surface areas. The finish removal areas at the forward and aft sides of the rear spar, only need to be a minimum of approximately 0.0625 inch wider than the surfaces where the fitting flanges and the fitting washers touch.

(3) With 320 grit or finer abrasive, remove any remaining anodic surface finish. Make a clean and flat bare metal surface all the way around the penetration holes (AMM 20-10-81/701).

<u>NOTE</u>: The protective anodic surface finish thickness is approximately less than 0.0001 inch.

(4) Examine the rear spar to make sure that the bare metal contact surfaces are bright, flat and clean.

<u>CAUTION</u>: KEEP THE BARE METAL SURFACES EXPOSURE TIME TO A MINIMUM. IF THE BARE METAL SURFACES EXPOSURE TIME IS MORE THAN APPROXIMATELY 4 HOURS, RUB THE BARE SURFACES LIGHTLY AGAIN BEFORE APPLYING THE CONVERSION COATING.

<u>CAUTION</u>: DO NOT APPLY THE CONVERSION COATING ON THE FLANGES OF THE HYDRAULIC HEAT EXCHANGER FITTINGS. IF YOU DO, THE ELECTRICAL RESISTANCE WILL POSSIBLY BE HIGHER THAN THE BONDING REQUIRMENT.

(5) Apply the conversion coating on the bare metal surfaces with a small clean brush (AMM 20-30-31/201).

<u>NOTE</u>: Alodine 600 gives a better electrical conductive coating. Not all types of Alodine are electrically conductive and some types of Alodine can cause a powdery coating if put on the fuel tank paint finishes.

(6) Clean Heat Exchanger fitting flange all the way around with 320 grit or finer abrasive to remove any anodic surface finish.

(7) If necessary, clean Heat Exchanger penetration fitting threads by the dry wipe or solvent cleaning method.

<u>CAUTION</u>: REMOVE ANY CONTAMINATION OF REMAINING ABRASIVE, FINISH AND METAL SURFACE MATERIAL FROM THE FUEL TANKS. IF NOT, CONTAMINATION CAN CAUSE DAMAGE TO EQUIPMENT.

B. Insert O-rings (7) in grooves of heat exchanger penetration fittings (Fig. 401).
C. Pass heat exchanger through wing tank access opening with the inlet and outlet ports going through opening first.

<u>WARNING</u>: MAKE SURE THAT ALL STEPS TO PREPARE THE FUEL TANK ARE DONE CORRECTLY BEFORE ENTERING THE EMPTY FUEL TANK. IF YOU DO NOT FOLLOW ALL INSTRUCTIONS, SERIOUS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

D. Enter fuel tank and position inlet and outlet fittings so they enter the holes in rear spar.

<u>CAUTION</u>: CLEAN WASHER AND BULKHEAD NUT BY DRY WIPING OR SOLVENT CLEANING METHOD PRIOR TO INSTALLATION. CHECK FOR SIGNS OF DAMAGE, USE NEW NUTS AND WASHERS AS NECESSARY.

<u>NOTE</u>: Ensure that O-rings are properly seated. Apply assembly lube or hydraulic fluid to all O-rings and fittings to facilitate installation.

E. At the aft face of the rear spar web, where heat exchanger penetration fittings (6) pass through, install washers (8) and bulkhead nuts (9) on fittings. DO NOT TIGHTEN.
F. At heat exchanger mounting points, align holes and install mounting bolts and washers through heat exchanger mounting clamps (4).
G. Install bolts, washers and nuts through mounting clamp and bracket (2).

<u>CAUTION</u>: WHEN TIGHTENING THE BULKHEAD NUTS, HOLD THE FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, THE TUBE MAY TWIST AND CAUSE DAMAGE TO THE HEAT EXCHANGER TUBES.

H. Tighten bulkhead nuts on penetration fittings. Torque nuts to 750-785 pound-inches (AMM 20-50-11/201).

WARNING: AN OPEN FUEL TANK IS AN EXPLOSIVE VAPOR AREA. MAKE SURE THAT AN EXPLOSIVE-SAFE BONDING METER IS USED WHEN CHECKING THE ELECTRICAL BONDING RESISTANCE.

CAUTION: MAKE SURE THE BONDING JUMPER OF THE HEAT EXCHANGER IS NOT CONNECTED TO THE WING STRUCTURE. IF SO, YOU CAN GET AN INCORRECT ELECTRICAL RESISTANCE MEASUREMENT AT THE REAR SPAR BONDING SURFACE.

I. Measure the electrical resistance of the penetration fittings and the rear spar. Make sure that the resistance measurement is less than 0.001 ohm, or 1 milliohms, between the fittings and the alodined spar

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

J. Install the bonding jumper (5).

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

K. Measure the electrical resistance of the bonding jumper. Make sure that the resistance measurement is less than 0.005 ohm, or 5 milliohms, between the bonding surfaces.

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

CAUTION: WHEN YOU TIGHTEN A UNION FITTING, HOLD THE PENETRATION FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, THE FITTING MAY TWIST AND CAUSE DAMAGE TO PARTS.

L. Install O-rings (10) and unions (11) on heat exchanger inlet and outlet fittings. Lubricate with assembly lube or hydraulic fluid. Torque unions to 345-375 pound-inches.

CAUTION: EXERCISE CARE TO PREVENT IMPURITIES FROM ENTERING HYDRAULIC SYSTEM.

CAUTION: WHEN YOU TIGHTEN THE HYDRAULIC TUBES, HOLD THE UNION FITTING WITH A WRENCH. IF NOT, THE TUBES MAY TWIST AND CAUSE DAMAGE TO THE PARTS

M. Remove protective caps from hydraulic lines and connect to unions. Tighten tube fitting nuts.
N. Lockwire (1) bulkhead nuts (Fig. 401).
O. Apply sealant (2) (BMS 5-26) at forward and aft sides of the rear spar, all the way around the penetration fittings and bulkhead nuts.

NOTE: CDCCL - Refer to the task: Airworthiness Limitation Precautions (AMM 29-00-00/201), for important information on Critical Design Configuration Control Limitations (CDCCLs).

NOTE: The following areas should be covered with sealant:
On the rear spar surfaces, at a minimum of 0.1875 inch wider than the penetration fitting flange and the washer.

All of the bulkhead (penetration fitting) nut and washer surfaces.

A minimum of 2 threads on the penetration fitting.

P. Allow sealant to cure.
Q. Apply primer (3) (BMS 10-20), as necessary, on the visible alodined bare metal surfaces at the forward and aft faces of the rear spar.
R. Apply enamel finish (4) (BMS 10-60), as necessary, on the primered surfaces at the forward and aft faces of the rear spar.
S. If removed, install pully bracket assembly on rear spar.

CAUTION: ENSURE THAT ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE CLOSING FUEL TANK.

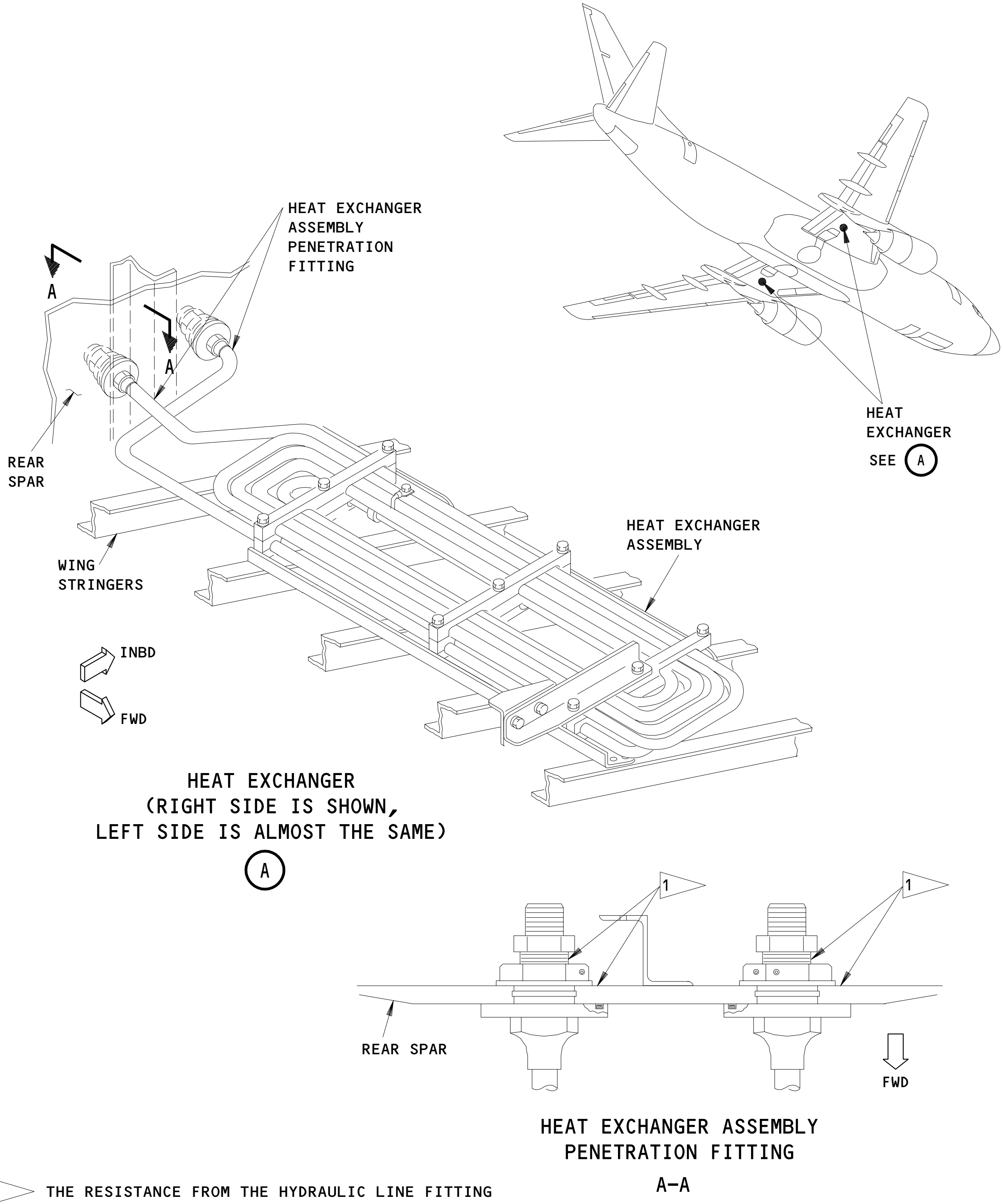
T. Install fuel tank access panels. Refer to AMM Chapter 28, Fuel Tank Access Panels - R/I.
U. Service hydraulic reservoirs. Refer to AMM Chapter 12, Hydraulic Fluid Servicing.
V. Refuel fuel tank No.1 to a minimum of 250 gallons of fuel. Refer to AMM Chapter 12, Servicing.

NOTE: Normally 250 gallons of fuel is required in the No.1 fuel tank to provide adequate hydraulic fluid cooling.

W. Pressurize hydraulic system A by motoring either engine. Refer to AMM 71-09-100, Power Plant (JT8D) - Operating Procedures.
X. Check heat exchanger fittings for signs of leakage.
Y. Check fuel tank for leakage in areas reworked by heat exchanger removal and installation. Refer to AMM Chapter 28, Fuel System.

SYSTEM A HYDRAULIC FLUID HEAT EXCHANGER - INSPECTION/CHECK

1. General
   A. The hydraulic lines connected to the heat exchanger in the bottom of the No. 1 fuel tank penetrate the rear spar. A lightning strike to the airplane can transmit current to the fuel tank through these hydraulic lines. This procedure gives instructions to make sure that the hydraulic lines are correctly bonded to rear spar at the bulkhead fittings at the penetration points.
2. Hydraulic Lines to the Heat Exchanger - Bonding Resistance Check (Fig. 601)
   A. References
      (1) AMM 27-51-0/201, Trailing Edge Flaps
      (2) SWPM 20-20-00, Electrical Bonds and Grounds
   B. Equipment
      (1) Bonding Meter - Use one of these:
         (a) Bonding Meter - Model T477W
             Avtron Manufacturing Inc.
             Cleveland OH
         (b) Bonding Meter - Model M1
             (Serial Number A0000112 and subsequent)
             BCD Electronics Ltd.
             Vancouver Canada
   C. Procedure
      (1) Depressurize the trailing edge flaps hydraulic system A (AMM 27-51-0/201).
      (2) Get access to the inlet and outlet hydraulic lines for the heat exchanger on the rear spar, outside of the No. 1 fuel tank.
      (3) Do a check of the bonding resistance between the penetration fittings for each of the hydraulic lines (inlet and outlet) and the rear spar (SWPM 20-20-00).
         (a) Make sure the bonding resistance is 0.002 ohm (2 milliohms) or less.
      (4) If no additional work is to be done in the area, pressurize the trailing edge flaps hydraulic system A (AMM 27-51-0/201).



1 THE RESISTANCE FROM THE HYDRAULIC LINE FITTING TO THE REAR SPAR IS 0.002 OHMS OR LESS

Hydraulic Lines to the Heat Exchanger Resistance Check
Figure 601

HYDRAULIC SYSTEM A MODULE UNIT - REMOVAL/INSTALLATION

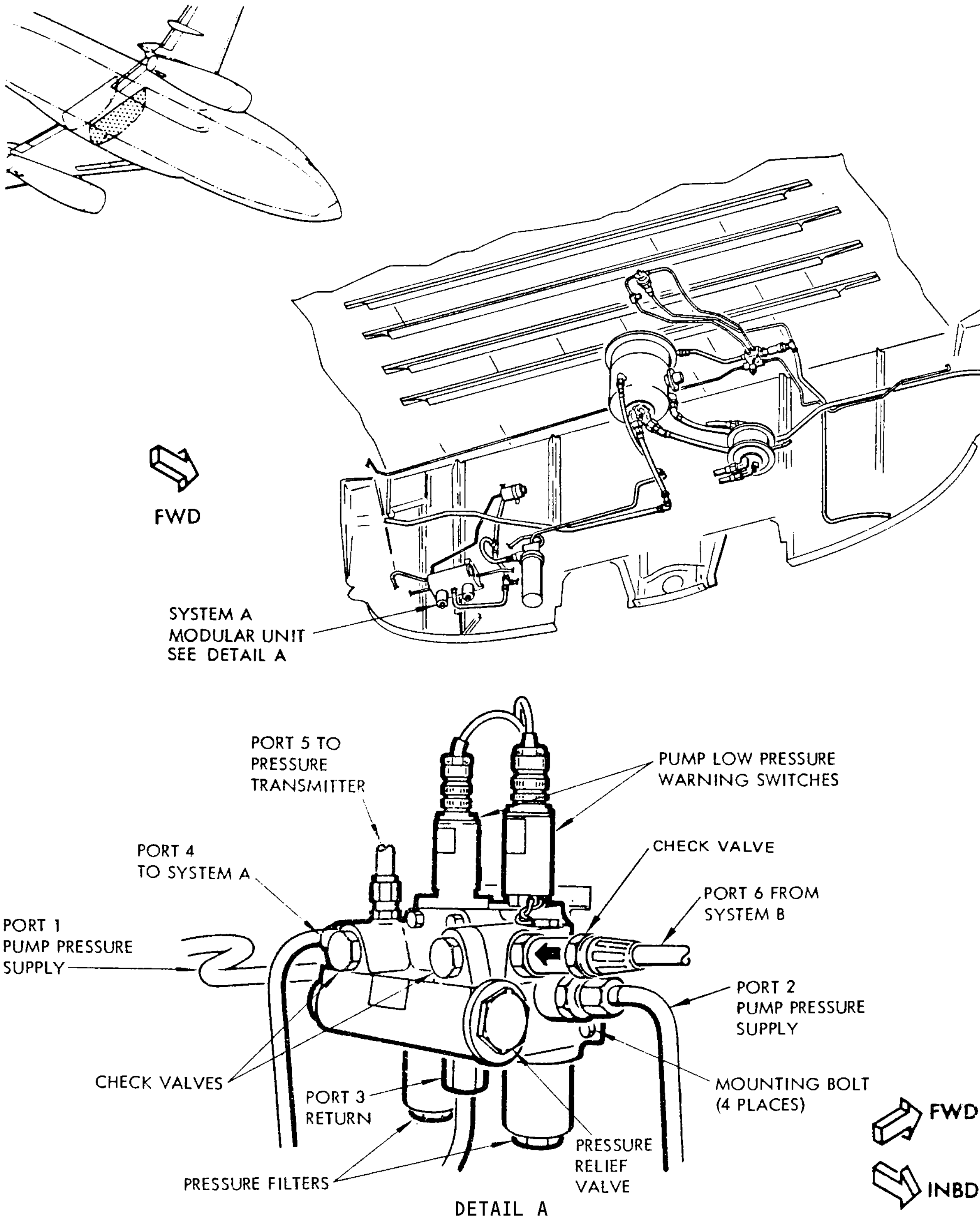
1. General
   A. System A module unit is mounted on the forward bulkhead of the left wheel well (Fig. 401). A container will be necessary to catch fluid from the module unit and disconnected hydraulic lines when removing the unit. Should any fluid spill on the airplane, the affected area must be decontaminated (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid - BMS 3-11
3. Remove System A Module Unit (Fig. 401)
   A. Depressurize hydraulic system A (Ref 29-11-0 MP).
   B. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   C. Open SYSTEM A-B PRESSURE circuit breaker on P6 panel.
   D. Disconnect pump low pressure warning switch electrical connectors.
   E. Disconnect and plug hydraulic lines. Plug open ports on module.
   F. Remove mounting bolts and remove module unit.
4. Install System A Module Unit (Fig. 401)
   A. Install O-rings and unions in module hydraulic ports. Ensure that check valve is installed in port 6. Lubricate with assembly lube or hydraulic fluid.

      CAUTION: ENSURE FOREIGN MATTER DOES NOT ENTER MODULE PORTS OR CONNECTING LINES DURING INSTALLATION.

   B. Place module unit in mounting position and install mounting bolts.
   C. Connect hydraulic lines to module.
   D. Connect electrical connectors to low pressure warning switches.
   E. Close SYSTEM A-B PRESSURE circuit breaker on P6 panel.
   F. Check low pressure switch operation and check for leaks.
      (1) Position HYD PUMPS ELEC 1 switch to ON.
      (2) Position HYD PUMPS ENG 1 switch to ON.
      (3) Pressurize hydraulic system A by motoring engine No. 1 (Ref 29-11-00 MP).
      (4) Check that ENG 1 LOW PRESSURE light extinguishes.
      (5) Check that ENG 2 LOW PRESSURE light remains illuminated.
      (6) Check pressure module for leaks.

      WARNING: ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF FLAPS.

      (7) Stop motoring engine No. 1. Operate flaps until ENG 1 low pressure light illuminates.
      (8) Position HYD PUMPS ENG 2 switch to ON.
      (9) Pressurize hydraulic system A by motoring engine No. 2 (Ref 29-11-00 MP).
      (10) Check that ENG 2 LOW PRESSURE light extinguishes.



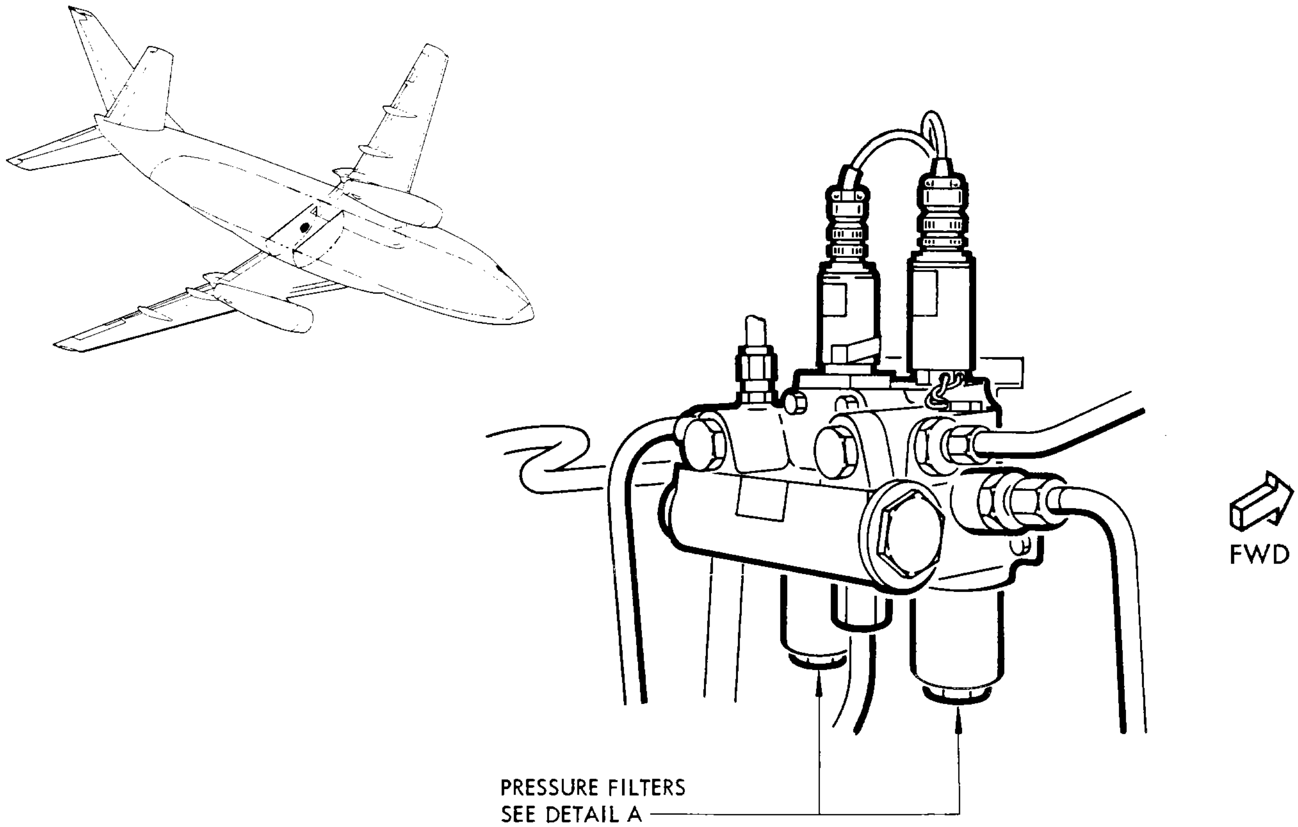
System A Module Installation
Figure 401

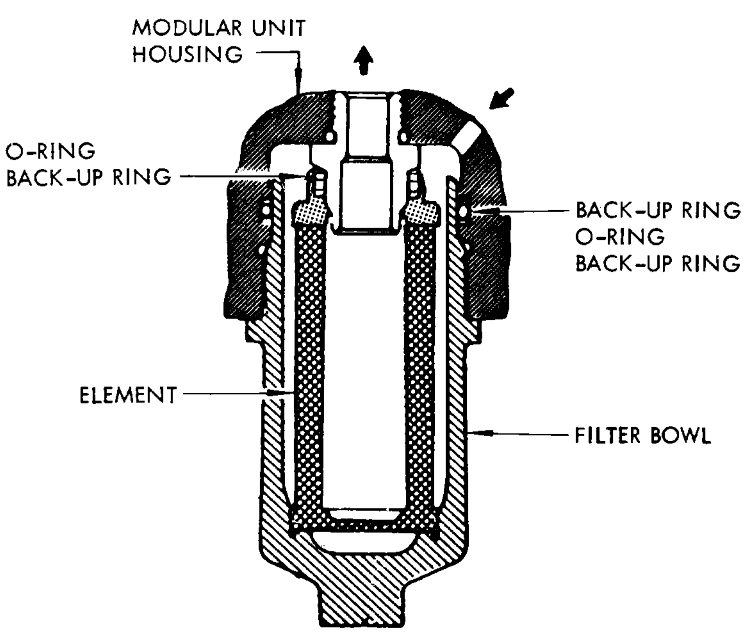
(11) Check that ENG 1 LOW PRESSURE light remains illuminated.
(12) Check pressure module for leaks.
(13) Stop motoring engine No. 2. Depressurize hydraulic system A (Ref 29-11-00 MP). Depressurize hydraulic System B (Ref 29-12-00 MP).

G. Service hydraulic reservoir (Ref Chapter 12, Hydraulic Fluid Servicing).

SYSTEM A HYDRAULIC PRESSURE FILTER - UNIT SERVICING

1. General
   A. A container will be necessary to catch hydraulic fluid when removing pressure filter element. Should any fluid spill on the airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Replace Pressure Filter Element
   A. Remove Pressure Filter Element
      (1) Depressurize hydraulic system A (Ref 29-11-0 MP).
      (2) Unscrew filter bowl with element (Fig. 301).
      (3) Clean filter bowl, and discard filter element.
   B. Install Pressure Filter Element
      (1) Install backup ring, O-ring and backup ring in groove in modular housing (Fig. 301).
      (2) Lubricate O-ring and backup ring with assembly lube or hydraulic fluid and install in groove at top of filter element.
      (3) Lightly lubricate filter bowl threads with assembly lube or hydraulic fluid.
      (4) Partially prefill filter bowl with hydraulic fluid. Place element in filter bowl and screw into modular housing.
      (5) Apply a torque of 50 to 200 pound-inches to filter bowl and secure with lockwire.
      (6) Pressurize hydraulic system A by motoring engines (Ref 71-09-100, Power Plant (JT8D) - Operating Procedures).
      (7) Check pressure filter for leaks.



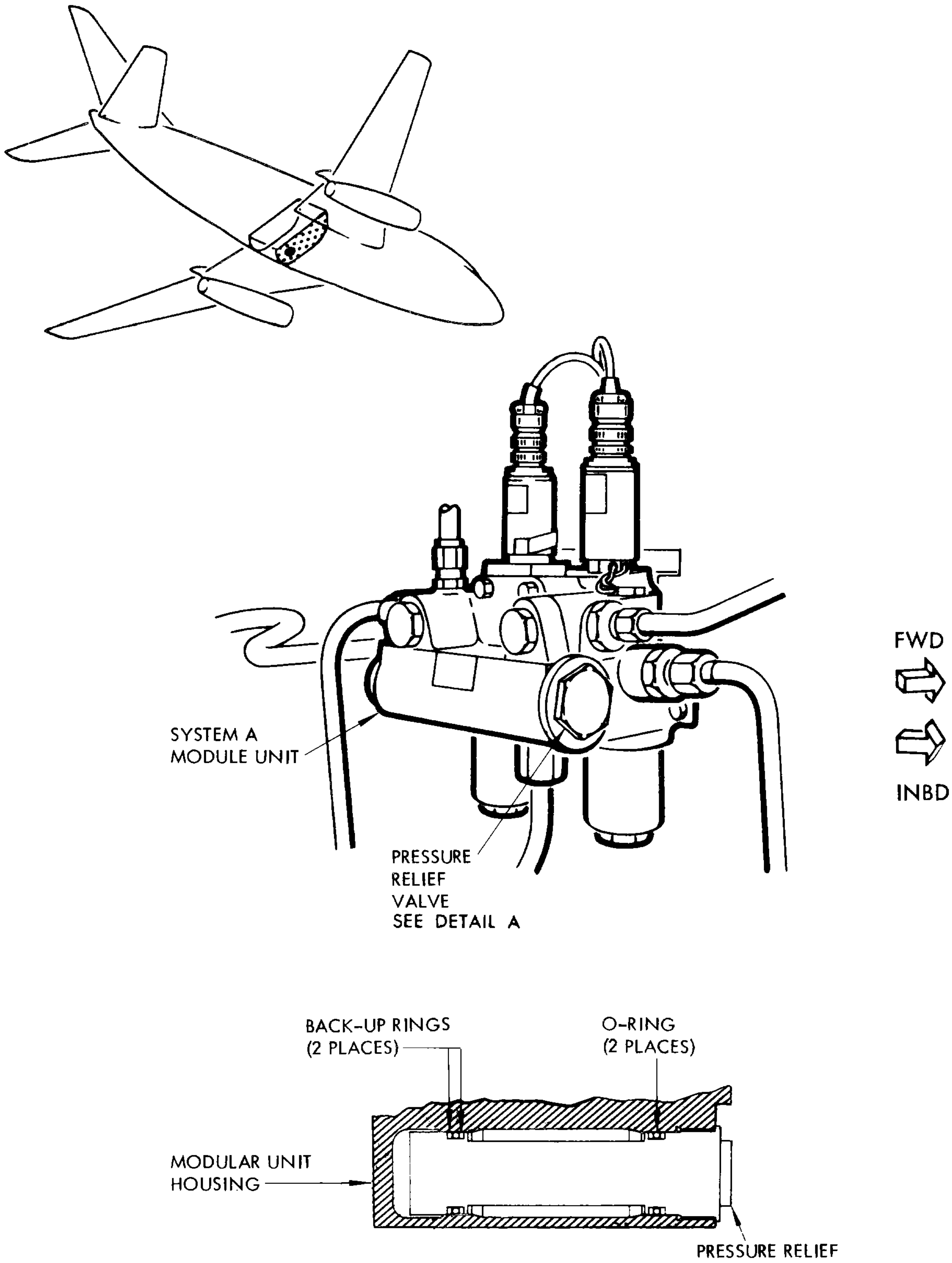


DETAIL A

System A Hydraulic Pressure Filter Servicing
Figure 301

HYDRAULIC SYSTEM A PRESSURE RELIEF VALVE - REMOVAL/INSTALLATION

1. General
   A. The system A pressure relief valve is installed in the system A module unit, which is mounted on the forward bulkhead of the left wheel well.
   B. A container will be necessary to catch fluid when removing the relief valve. Should fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Hydraulic System A Pressure Relief Valve
   A. Depressurize hydraulic system A. Refer to 29-11-0, Hydraulic System A - MP.
   B. Depressurize hydraulic reservoir. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Unscrew pressure relief valve and remove from module unit (Fig. 401).
   D. Install protective plug in open port of module unit.
4. Install Hydraulic System A Pressure Relief Valve
   A. Install O-rings between backup rings in each relief valve groove (Fig. 401).
   B. Apply assembly lube or hydraulic fluid to O-rings and to the threads of relief valve to facilitate installation.
   C. Remove protective plug and screw relief valve into module housing. Apply 50 to 200 pound-inches of torque to relief valve.
   D. Pressurize hydraulic system A by motoring engines. Refer to 71-09-100, Power Plant (JT8D) - Operating Procedures.
   E. Check relief valve for leaks.
   F. Secure relief valve with lockwire.

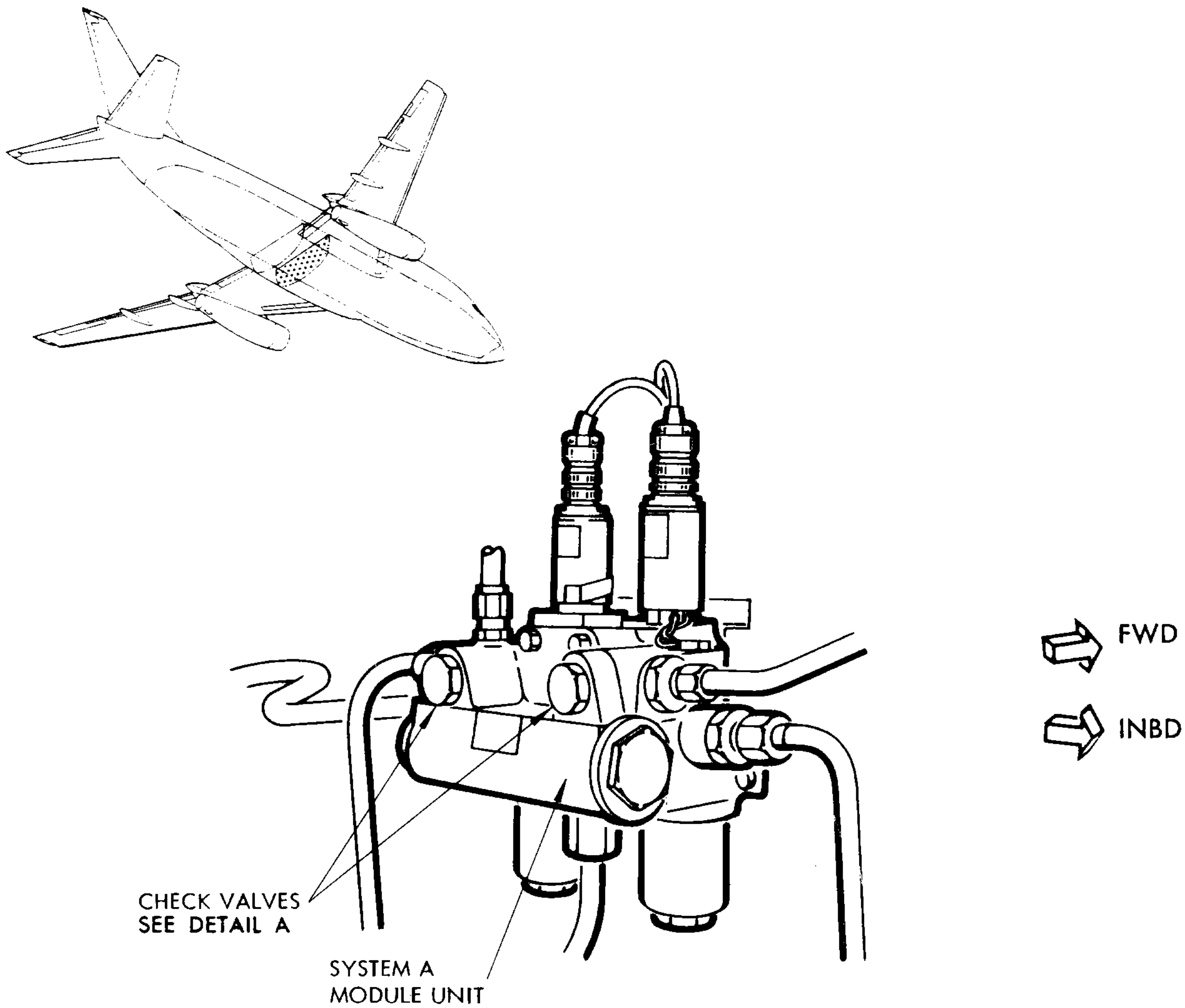


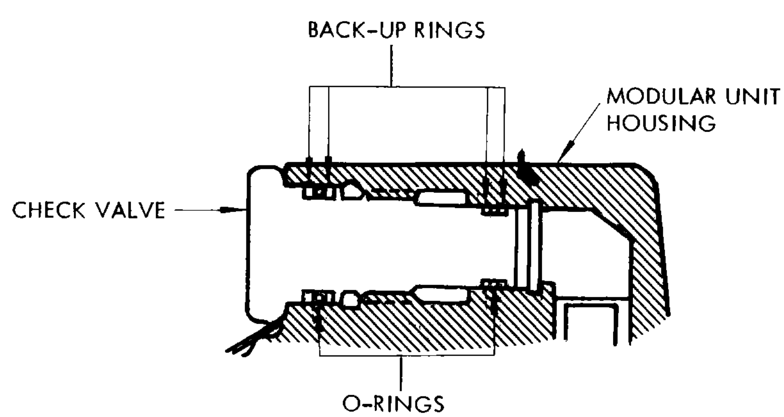
DETAIL A

System A Pressure Relief Valve Installation
Figure 401

HYDRAULIC SYSTEM A CHECK VALVES - REMOVAL/INSTALLATION

1. General
   A. The system A check valves are installed in the system A module unit which is mounted on the forward bulkhead of the left wheel well.
   B. A container will be necessary to catch hydraulic fluid when removing either of the check valves from the module unit. Should fluid spill on the airplane, the affected area must be decontaminated by following the procedures outlined in Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Hydraulic System A Check Valve
   A. Depressurize hydraulic System A (Ref 29-11-0 MP).
   B. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   C. Unscrew and remove check valve from module unit (Fig. 401).
   D. Install protective plug in open port of module unit.
4. Install Hydraulic System A Check Valve
   A. Install O-rings with back up rings in each groove on check valve (Fig. 401).
   B. Apply assembly lube or hydraulic fluid to O-rings and to threads of check valve to facilitate installation.
   C. Remove protective plug and screw check valve into module housing. Tighten check valve 200 to 250 pound-inches.
   D. Pressurize hydraulic System A by motoring engines (Ref 71-09-100, Operating Procedures).
   E. Examine check valve for leakage.
   F. Secure check valve with lockwire.





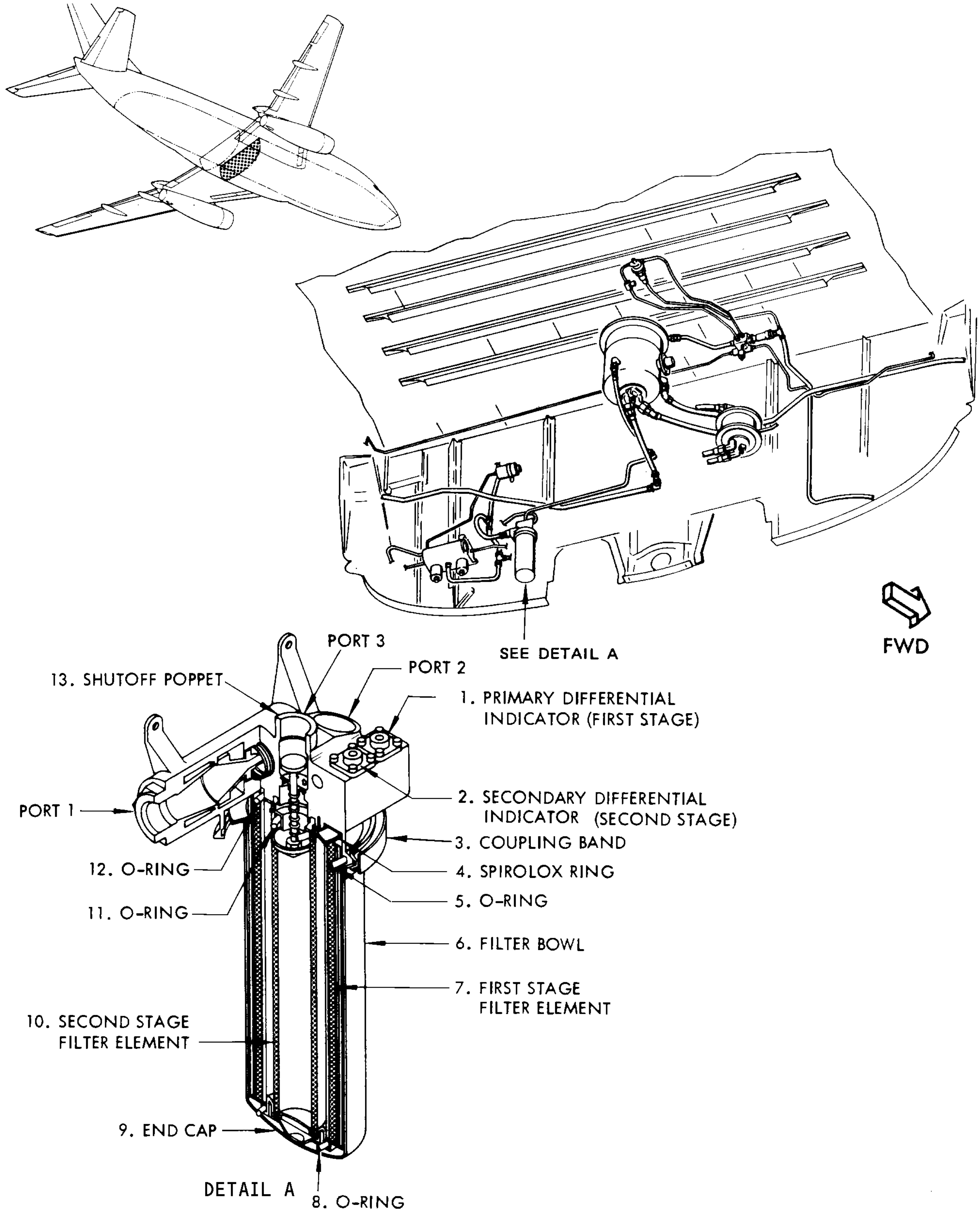
DETAIL A

Check Valve Installation
Figure 401

SYSTEM A HYDRAULIC RETURN FILTER - UNIT SERVICING

1. General
   A. The two stage return filter has a differential pressure indicator for each filter stage. When the limiting pressure drop across the first or second stage element is exceeded the indicator will become visible indicating that the associated element is contaminated and needs replacing. The indicator will remain visible until manually depressed back into the filter head. The first and second stage elements are noncleanable paper elements. The differential pressure indicators are on top of the filter head.
   B. A container will be necessary to catch fluid drained from filter and disconnected lines. Should any fluid spill on the airplane, decontaminate the area. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Replace Hydraulic Return Filter Elements
   A. Remove First and Second Stage Return Filter Elements
      (1) Depressurize hydraulic system A. Refer to 29-11-0, Hydraulic System A - MP.
      (2) Depressurize system A hydraulic reservoir. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
      (3) Remove locknut from coupling band (3, Fig. 301).
      (4) Remove filter bowl (6) from filter head.
      (5) Remove second stage filter element (10) from filter bowl. Discard element if contaminated.
      (6) Remove spirolox retaining ring (4) from top of filter bowl.
      (7) Remove first stage filter element (7). Discard element if contaminated.
      (8) Clean filter bowl thoroughly.
   B. Install First and Second Stage Return Filter Elements
      (1) Install O-rings (5, 8, 11, and 12 Fig. 301) in filter head and filter elements. Lubricate with assembly lube or hydraulic fluid.
      (2) Install first stage element in filter bowl. Secure filter by inserting spirolox retaining ring (4) between top of filter bowl and filter element.
      (3) Place second stage filter element (10) in filter bowl.
      (4) Insert filter bowl (6) into filter head.
      (5) Secure coupling band (3) around filter bowl and filter head. Check filter assembly manufacturer and tighten coupling band as follows:
         (a) Aircraft Porus Media, 120-144 lb. in.
         (b) Purolator, 60-70 lb. in.
      (6) Depress differential pressure indicator(s) (1) (2) if required.
      (7) Pressurize hydraulic reservoirs (Ref 29-09-300 MP).
      (8) Pressurize hydraulic system A (Ref 29-11-0 MP).

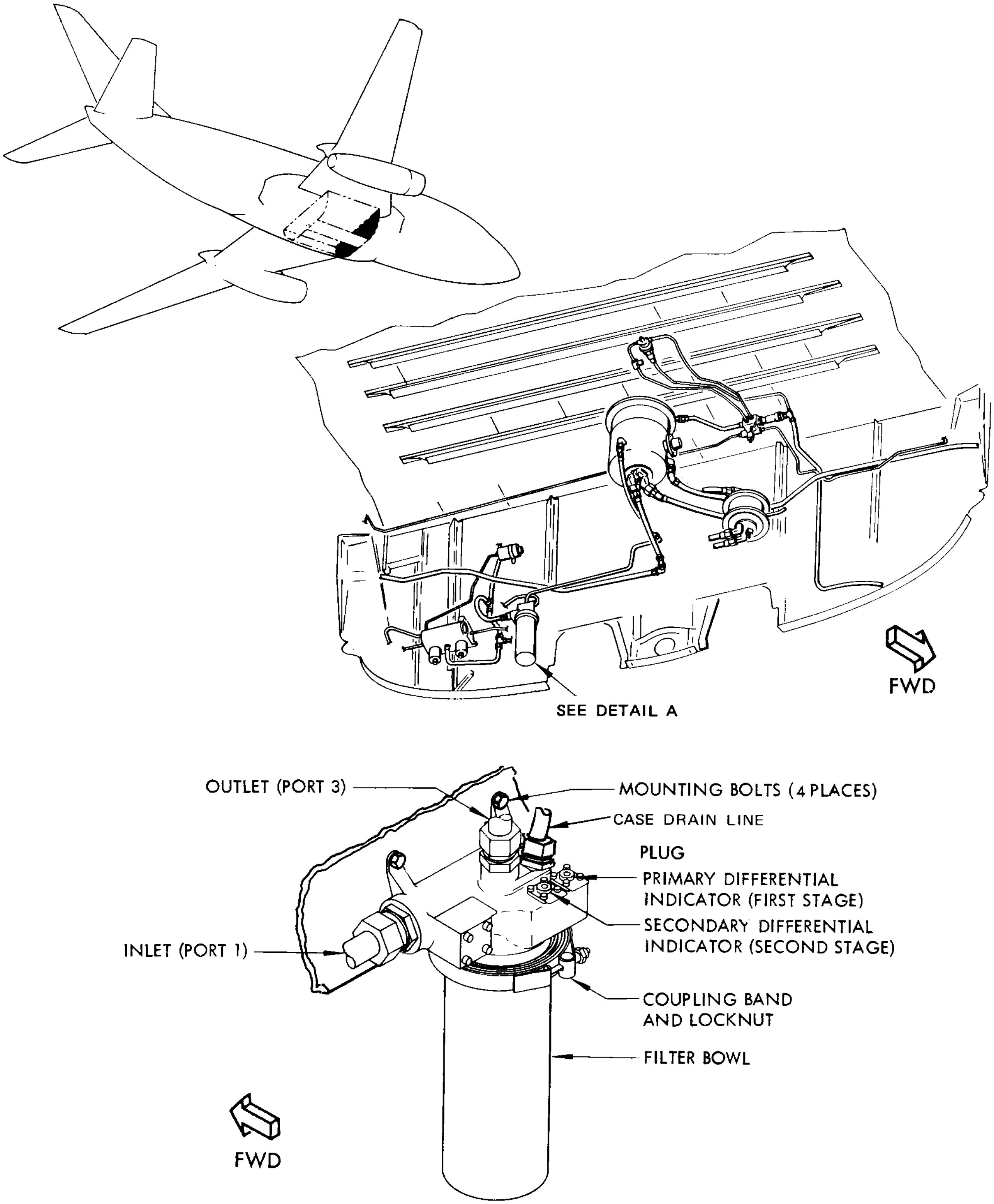
(9) Check return filter for leaks.
(10) Service hydraulic reservoir (Ref Chapter 12, Hydraulic Fluid Servicing).



System A Hydraulic Return Filter Servicing
Figure 301

SYSTEM A HYDRAULIC RETURN FILTER - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid drained from filter and disconnected lines. Should any fluid spill on the airplane, decontaminate the area. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Return Filter
   A. Depressurize hydraulic system A (Ref 29-11-0 MP).
   B. Depressurize system A hydraulic reservoir (Ref 29-09-300 MP).
   C. Disconnect hydraulic lines from filter and plug lines (Fig. 401).
   D. Unscrew mounting bolts from support bracket and remove return filter.
4. Install Return Filter
   A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid.
   B. Install union and O-ring in ports 1 and 3, and in case drain line port (Fig. 401).
   C. Deleted
   D. Place return filter in mounting position and install mounting bolts in support bracket.
   E. Remove plug from lines and connect hydraulic lines.
   F. Pressurize hydraulic reservoirs (Ref 29-09-300 MP).
   G. Pressurize hydraulic system A (Ref 29-11-0 MP).
   H. Check return filter for leaks.
   I. Service hydraulic reservoir (Ref Chapter 12, Hydraulic Fluid Servicing).

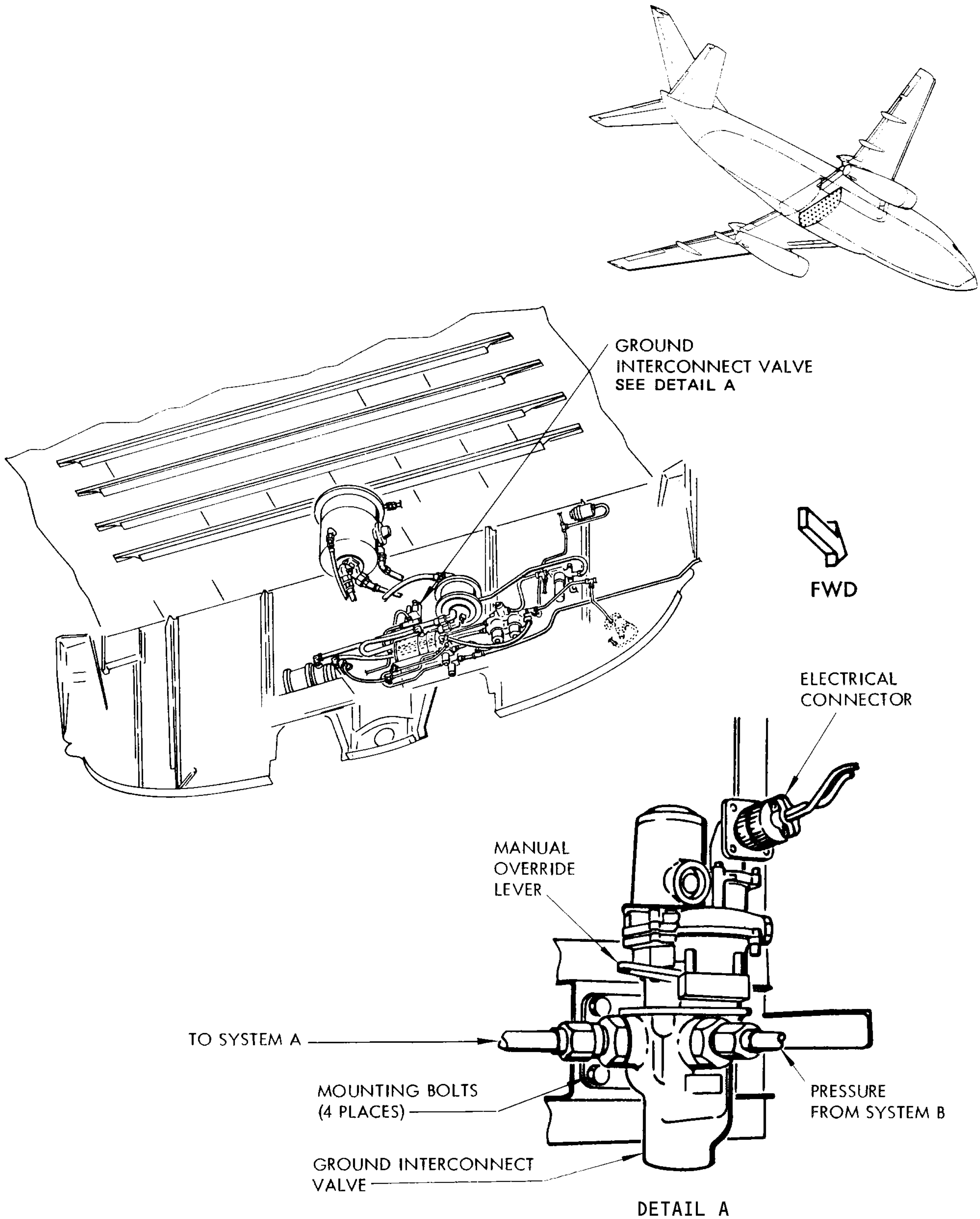


DETAIL A

System A Hydraulic Return Filter Installation
Figure 401

GROUND INTERCONNECT VALVE - REMOVAL/INSTALLATION

1. General
   A. The ground interconnect valve is mounted on the forward bulkhead in the wheel well cavity (Fig. 401). A check valve installed on the system A side of the interconnect valve prevents pressurizing system B using system A power source.
   B. A container will be necessary to catch fluid when disconnecting hydraulic lines from the valve during removal. Should any fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Ground Interconnect Valve
   A. Depressurize hydraulic systems A and B. Refer to 29-11-0, Hydraulic System A, and 29-12-0, Hydraulic System B - MP.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Open GROUND INTERCONNECT VALVE circuit breaker on load control P6 panel.
   D. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Open tire burst protection screen doors.
   E. Disconnect electrical connector from interconnect valve (Fig. 401).
   F. Disconnect hydraulic lines from interconnect valve.
   G. Install protective plugs in valve ports and connecting hydraulic lines.
   H. Remove interconnect valve mounting bolts and remove valve.
4. Install Ground Interconnect Valve
   A. Install O-rings and unions in system A and system B ports of interconnect valve. Apply assembly lube or hydraulic fluid to all O-rings and to the threads of unions couplings.
   B. Install O-ring and plug in third port and secure with lockwire.
   C. Place interconnect valve in mounting position and install mounting bolts.
   D. Connect hydraulic lines to interconnect valve.
   E. Connect electrical connector to interconnect valve.
   F. Provide electrical power to airplane and close GROUND INTERCONNECT VALVE circuit breaker on P6 panel.
   G. Pressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B - MP.
   H. Check that parking brake is set.
   I. Switch GROUND INTERCONNECT on P5 forward overhead panel to OPEN.
   J. Check interconnect valve for leakage.
   K. Check that interconnect valve override lever is in OPEN position.
   L. Check that system A pressure gage indicates approximately 3000 psi.
   M. Switch GROUND INTERCONNECT switch to CLOSE position.
   N. Check that interconnect override lever is in CLOSE position.

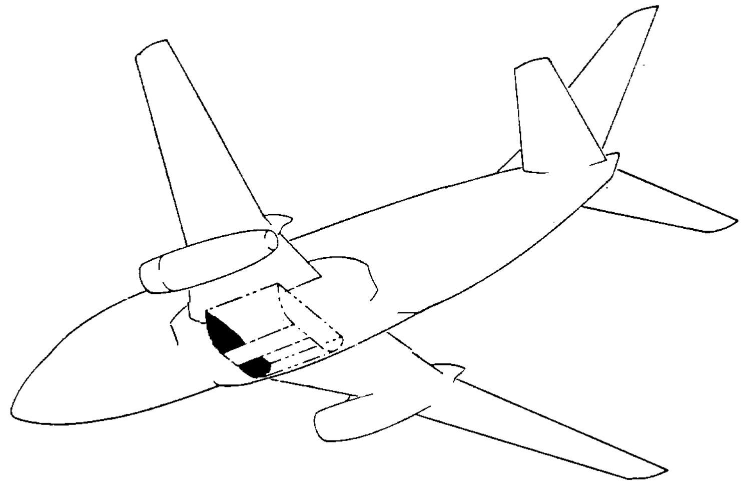


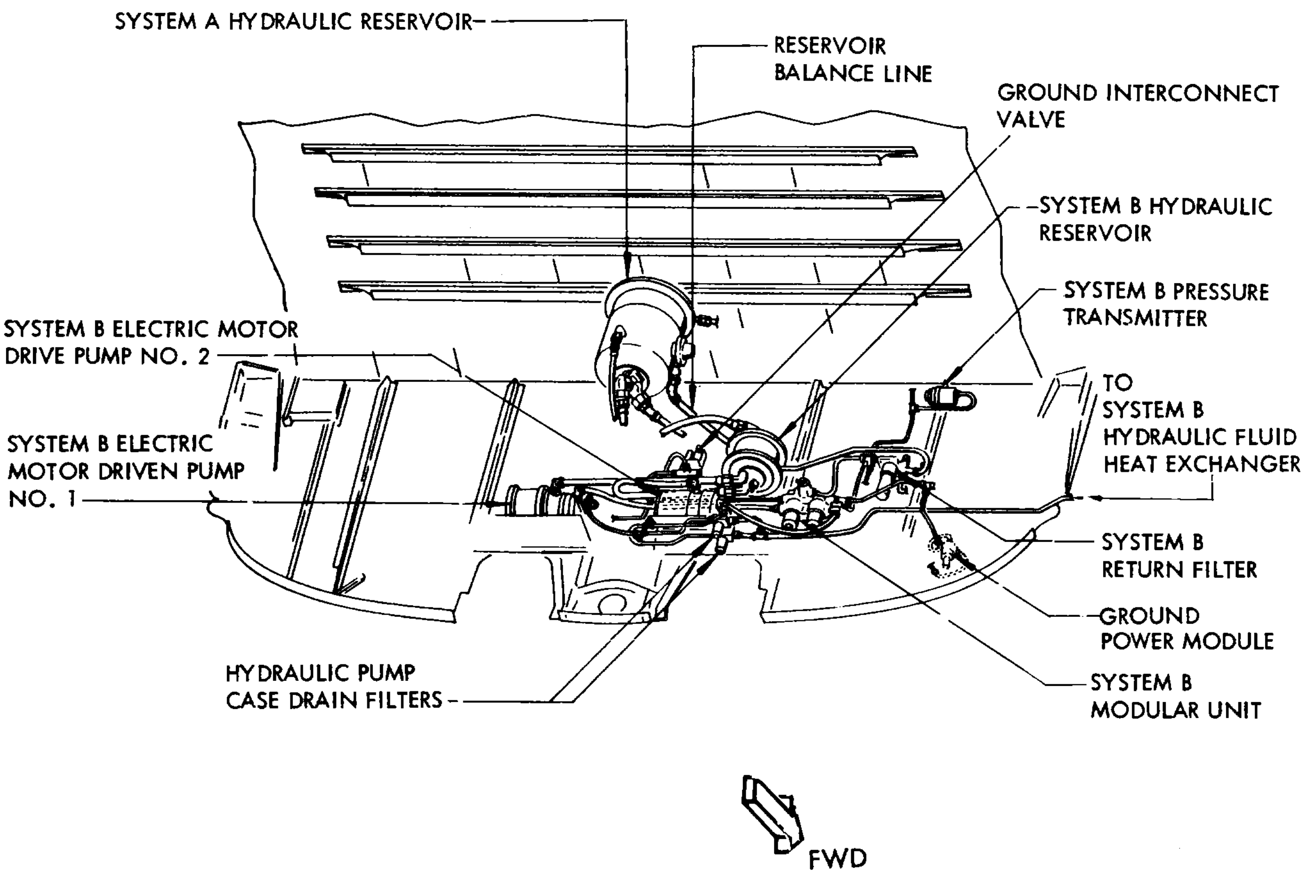
Ground Interconnect Valve Installation
Figure 401

O. Check that system A pressure gage drops to 0 psi to ensure there is no internal leakage in the ground interconnect valve.
P. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
Close tire burst protection screen doors.
Q. Switch hydraulic system B electric pump switch OFF.
R. Remove electrical power source from airplane.

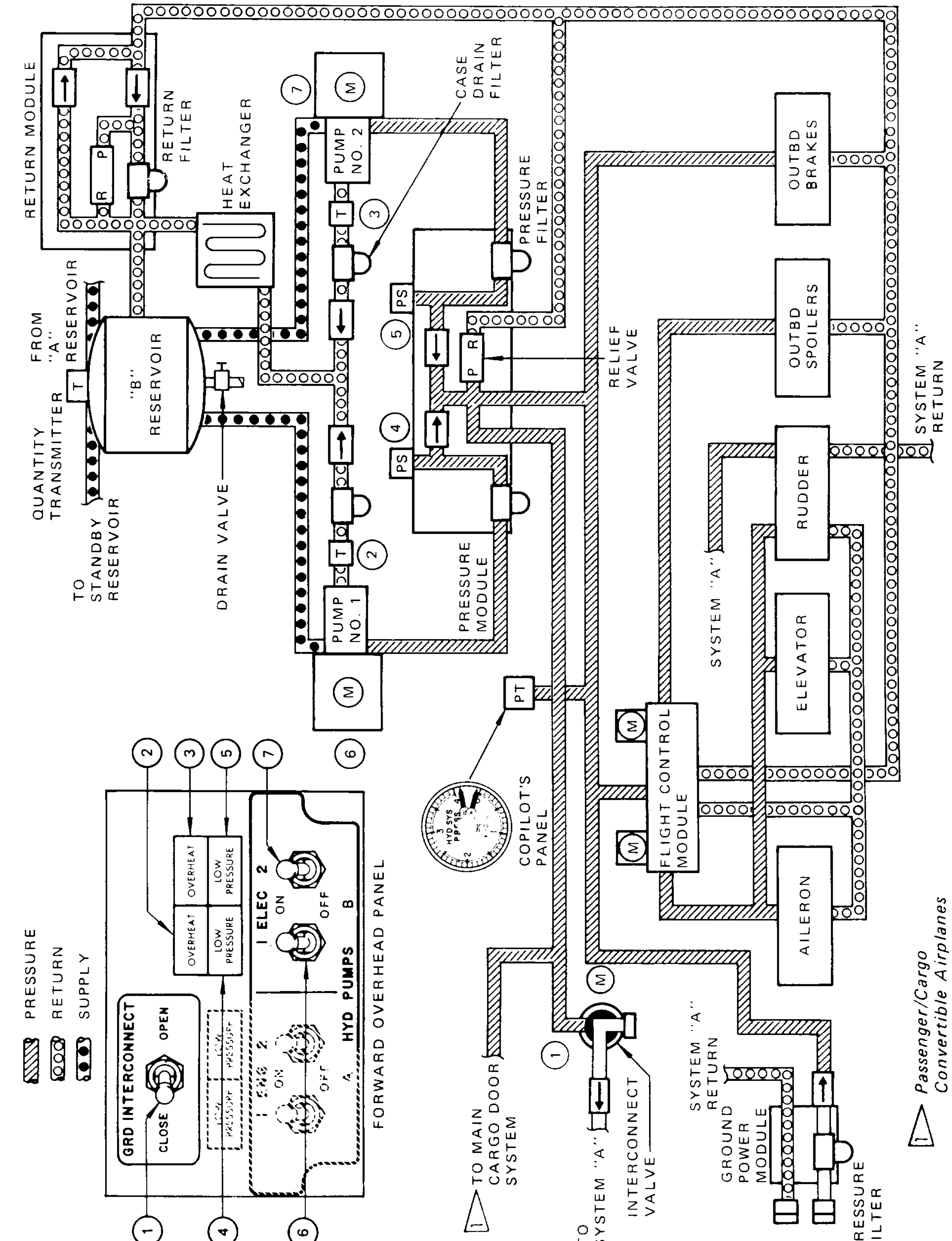
HYDRAULIC SYSTEM B - DESCRIPTION AND OPERATION

1. General
    A. Hydraulic power system B (Fig. 1) supplies fluid under pressure of 3000 psi to the ailerons, elevators, outboard spoilers, rudder, main wheel outboard brakes, and to the main cargo door hydraulic system on cargo airplanes.
    B. Hydraulic system B includes the equipment necessary to store, pressurize, deliver, control, monitor, and filter the hydraulic fluid to operate the systems supplied by system B (Fig. 2). Hydraulic fluid for system B is stored in a pressurized reservoir. The reservoir is pressurized from a balance line from system A reservoir to ensure a positive supply of hydraulic fluid to the pumps. Two variable displacement electric motor-driven pumps supply fluid to the various systems upon demand. Each pump is controlled by a switch on the forward overhead panel. A filter in the pressure line from each pump filters the fluid before it enters the various systems. A pressure switch in the pressure line from each pump is connected to a pump low pressure warning light in the control cabin to provide an indication of low hydraulic pressure. A pressure relief valve protects the system against damage by abnormally high pressures. A pump case drain filter in each pump return line is provided to detect incipient pump failures and to filter return fluid before it enters the reservoir. A hydraulic fluid heat exchanger in the return line common to both system B pumps is installed in the No. 2 fuel tank. The heat exchanger is provided to cool the hydraulic fluid by transferring heat from it to the fuel. A system return filter, just ahead of the reservoir, filters return fluid from the systems supplied by system B. Hydraulic fluid overheat is sensed by a switch installed in the system return line and indicated by a warning light on the forward overhead panel. For detailed description and operation of the system B indicating and warning systems, refer to the applicable section.
2. System B Hydraulic Reservoir
    A. The system B reservoir has a 1.3 gallon capacity and is installed on the forward bulkhead of the right wheel well (Fig. 1). The reservoir is an air-tight vessel consisting of a metal shell with supply, return, drain and balance line parts and fitted with attaching lines. System A and B reservoirs are connected by a balance line to provide system B with pressurization, make up fluid and thermal expansion. Attached to the top of the reservoir is a low level warning switch which is connected electrically to a low quantity warning light on the first officer's panel. Refer to 29-33-0, Hydraulic Fluid Quantity Indicating System.

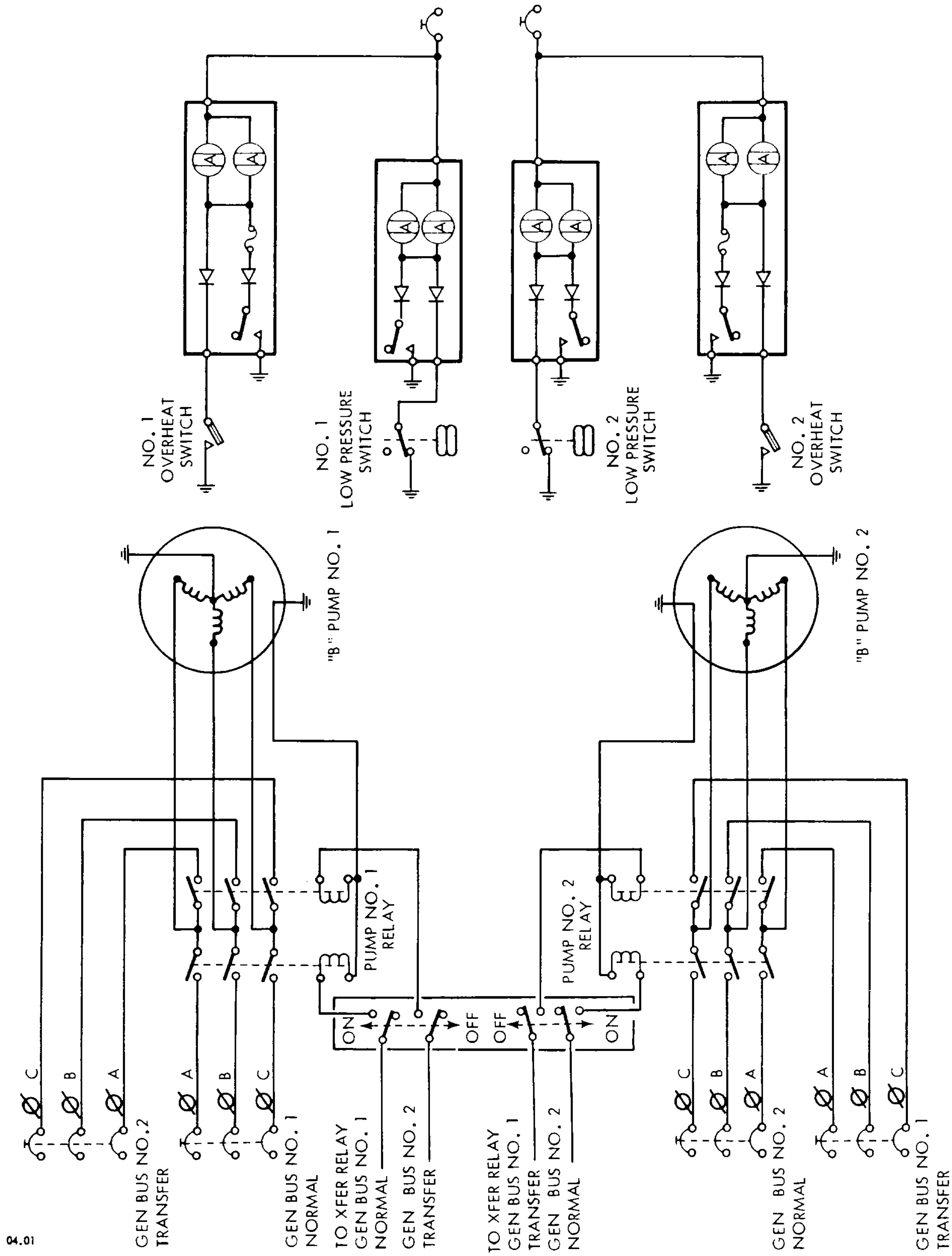




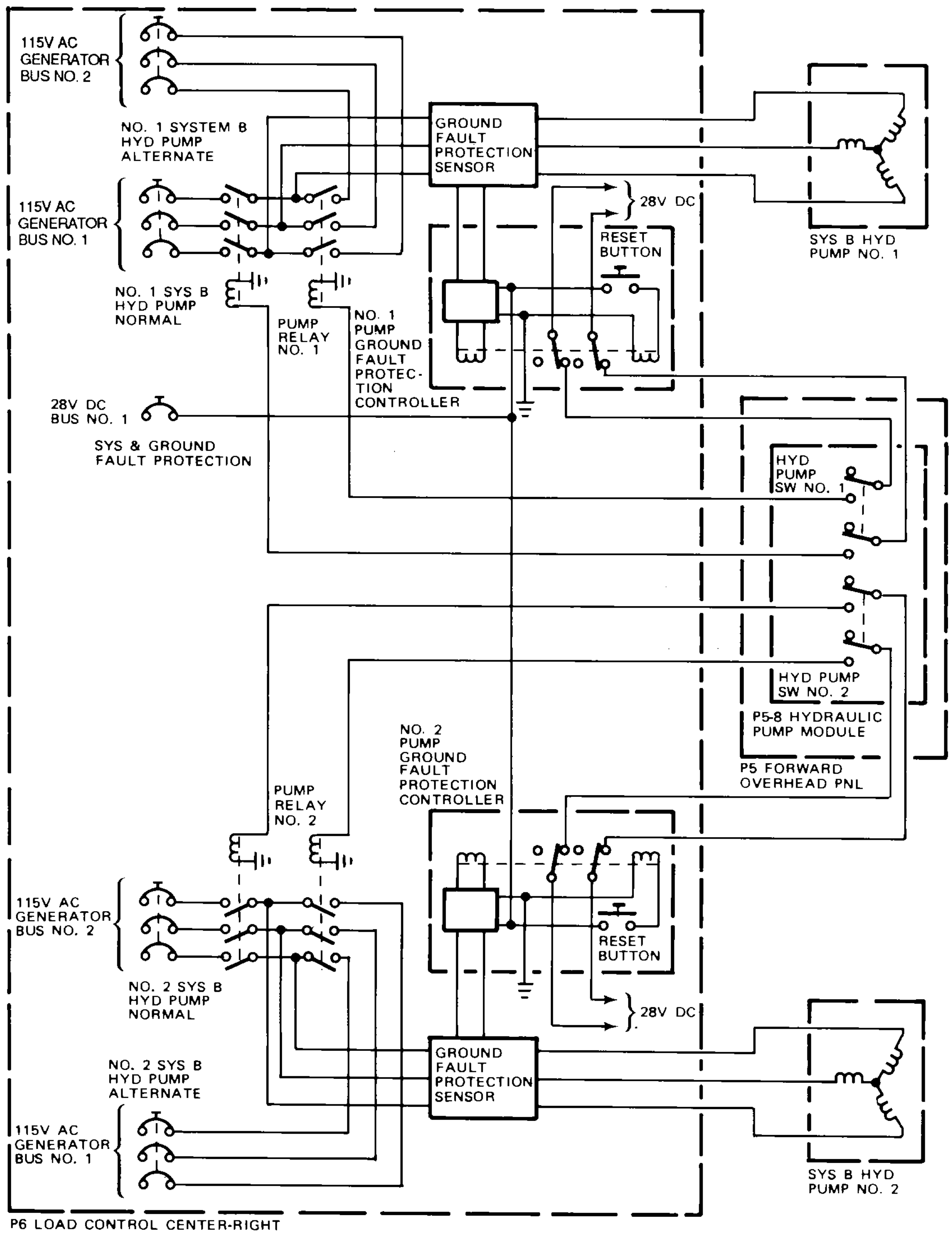
Hydraulic System B Component Location
Figure 1



Hydraulic System B Schematic
Figure 2 (Sheet 1)

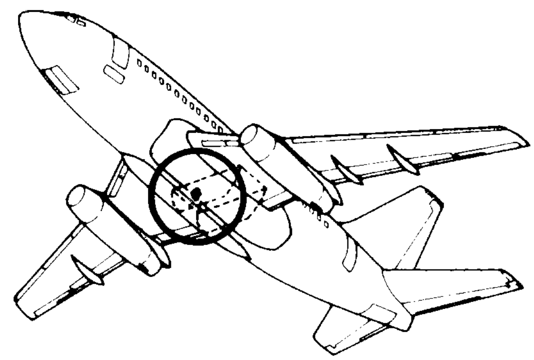


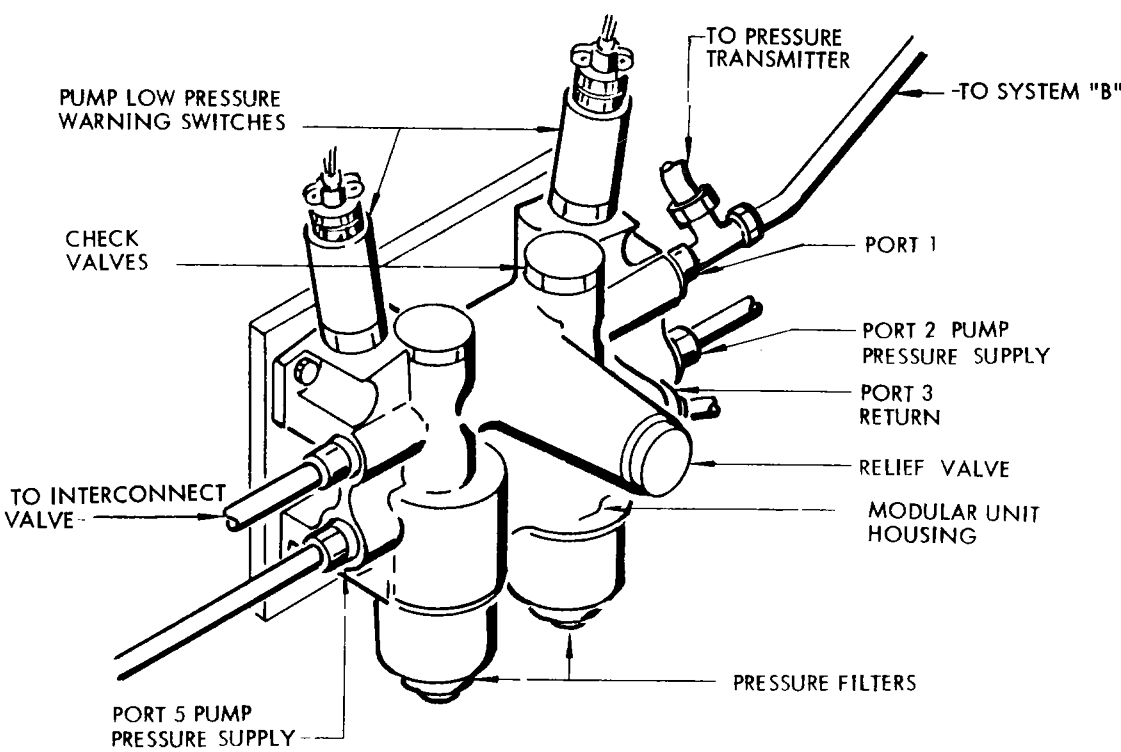
Hydraulic System B Schematic
Figure 2 (Sheet 2)



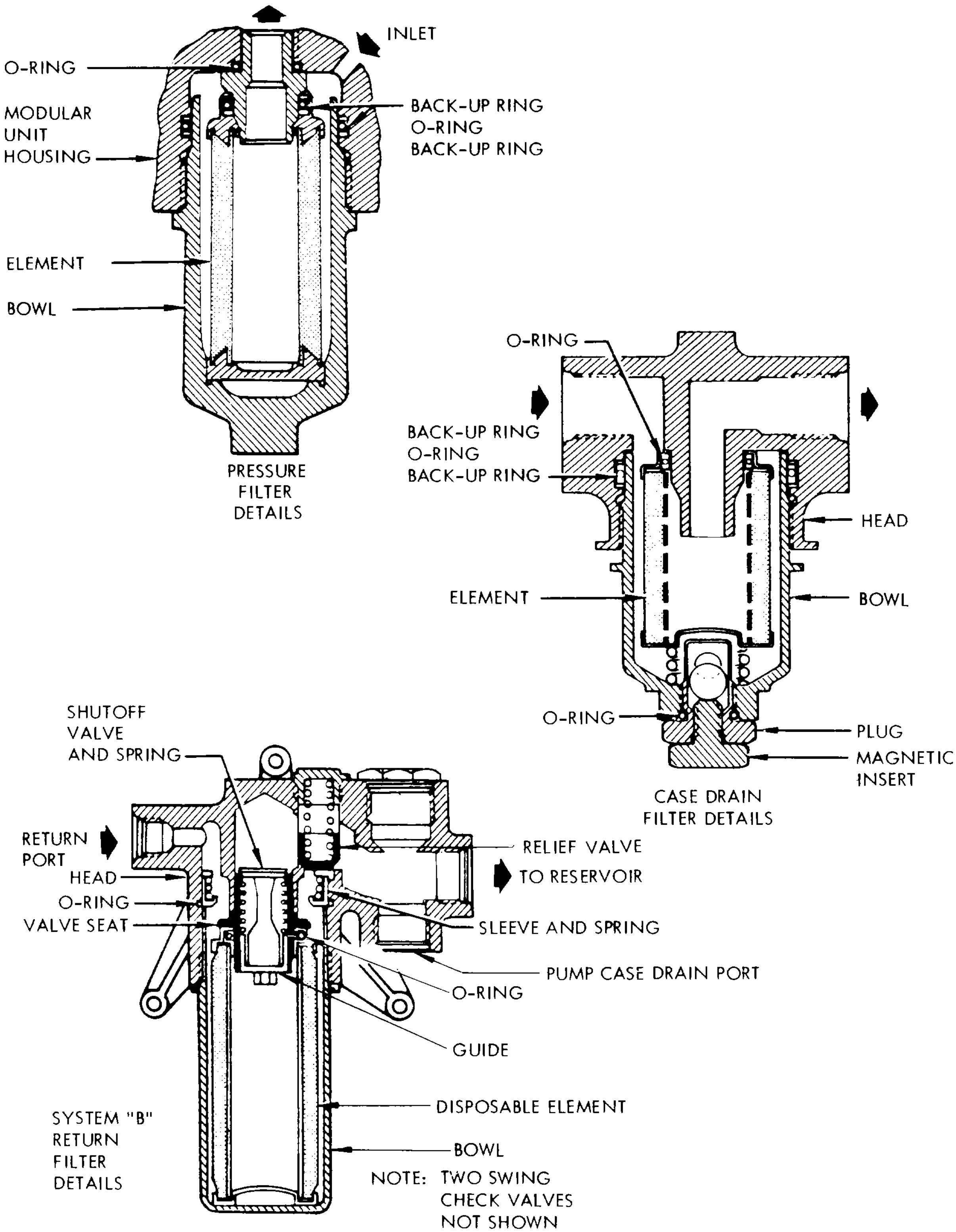
Hydraulic System B Schematic
Figure 2 (Sheet 3)

3. System B Electric Motor-Driven Pumps
   A. Hydraulic system B pressure is supplied by two electric motor-driven hydraulic pump assemblies. The pumps are located on the forward bulkhead of the wheel well area (Fig. 1) and are controlled by switches on the forward overhead panel. Each pump is a pressure compensated, variable displacement pump that will deliver a maximum flow of about 6 gpm at approximately 3000 psi upon demand by the hydraulic system. For a more detailed description of the system B pumps, refer to the unit level coverage.
4. System B Modular Unit
   A. The modular unit (Fig. 3) is provided to manifold hydraulic fluid to various easily replaceable cartridge type components. The modular unit consists of a 5 port housing providing attachment provisions for the cartridge type hydraulic pump pressure filters, pump low pressure warning switches, check valves, pressure relief valve, and male fittings for attaching system tubing connectors. The modular unit housing has drilled passages to provide system flow through the unit. The modular unit is installed on the forward bulkhead of the right wheel well.
5. System B Hydraulic Filters
   A. Pressure Filters
      (1) A nonbypass cartridge type pressure filter in the pressure line from each electric motor-
      driven pump filters the hydraulic fluid before it enters the various systems (Fig. 2). The pressure filters are installed in system B modular unit, and consist of a filter bowl and noncleanable element (Fig. 4).
   B. Return Filters
      (1) A return filter installed in the return line near the reservoir filters the hydraulic fluid before it enters the reservoir (Fig. 2). The filter consists of a filter bowl, disposable filter element and a filter head. The filter head incorporates a relief valve, a shutoff valve and two cartridge type check valves (Fig. 4). The relief valve is provided to bypass the hydraulic fluid in the event of excessive restriction to flow through the filter element. The shutoff valve is provided to prevent hydraulic fluid from draining through the filter from the reservoir or the system return line when the filter bowl is removed. Two additional ports are provided in the filter head for installation of a temperature switch and for pressure filling of the system. However, these two ports are not used and are therefore plugged.
      (2) The cartridge type check valves are installed in the filter head to direct fluid flow through the filter element from the outside in, and to prevent contaminated fluid from being drawn out into the return system from the IN port of the filter when the system is depressurized and a hydraulic component is manually actuated.





System B Modular Unit
Figure 3



System B Hydraulic Filters
Figure 4

C. Case Drain Filters

(1) A case drain filter installed in each electric motor-driven pump case return line (Fig. 2) is provided to detect incipient failures of a hydraulic pump, and therefore prevent contamination of the reservoir and possible damage to the remaining hydraulic pump. The filters are installed near the pumps in the wheel well, and consist of a filter head, filter element and a filter bowl (Fig. 4).

6. System B Hydraulic Fluid Heat Exchanger

A. A hydraulic fluid to fuel heat exchanger is provided to cool the hydraulic fluid by transferring heat from it to the fuel. The heat exchanger is in the pump case return line common to both system B hydraulic pumps, and consists of two coils of tubing mounted in the bottom of the No. 2 fuel tank. Fluid circulates through the heat exchanger whenever system B hydraulic pumps are in operation. The heat exchanger fluid inlet and outlet ports are in the fuel tank wing rear spar (Fig. 5).

7. System B Relief Valve

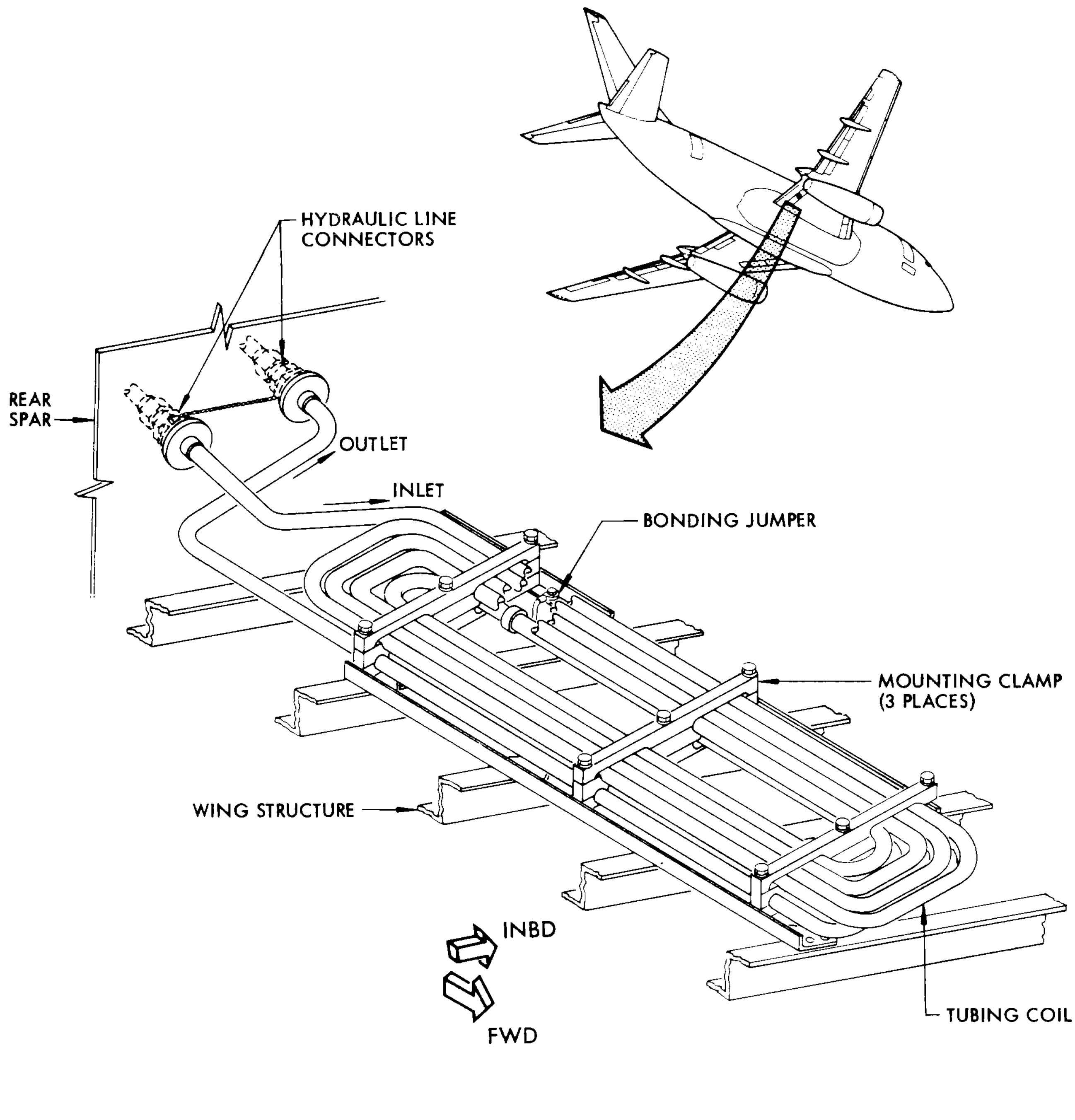
A. The cartridge type system B relief valve installed in the modular unit (Fig. 2) protects the system against damage by abnormally high pressures. The valve is set to relieve at 3500 +50 psi and reset at 3400 psi. The valve is set by the manufacturer and no maintenance other than removal and installation is recommended.

8. Pump Ground Fault Protection Controller (See Fig. 2 for airplane affectivity)

A. The pump ground fault protection controllers for No. 1 and 2 systems are located aft of the P6-1 circuit breaker panel. When 3-phase power to the pump is interrupted or power is grounded in the pump, a sensor located in the 3-phase circuit trips a relay in the controller causing the pump relay to open (Fig. 2). A reset button on the controller is provided to reset the relay after the controller has been tripped. The reset button should not be reset until the failure has been repaired.

9. System B Operation

A. System B reservoir supplies a positive flow of fluid to the electric motor-driven pumps (Fig. 2). Two switches on the pilots' overhead panel control the two electric motor-driven pumps. Positioning the switches to ON energizes the 28-volt dc relay connecting 115-volt, 3-phase ac power to the pump motors. The pumps supply fluid through a pressure filter to the hydraulic-
operated systems upon demand. The pumps start at full volume flow. As pressure increases to 1200 +250 psi, the pump low pressure warning switch is actuated opening the circuit to the pump low pressure warning light. As pressure increases, the pressure transmitter senses the increase and electrically positions the pressure indicator on the first officer's panel. As system pressure approaches 3000 psi the pumps automatically adjust output to the need of the system. If system pressure increases to 3500 +50 psi the system relief valve will open to reduce pressure, then reset at 3400 psi. At low pump output, fluid circulates through the pump and back to the reservoir through a case drain filter, heat exchanger and return filter. To shut down the electric motor-driven pumps the pump switches are positioned to OFF.



System B Hydraulic Fluid Heat Exchanger
Figure 5

HYDRAULIC SYSTEM B - TROUBLESHOOTING

1. General
   A. Systems A and B will be checked separately except when checking for external leakage. When checking for leakage, pressurize both systems A and B and examine each component, hydraulic fitting and connecting line. Pin hole leaks may be detected by noting damp spots on hydraulic components, tubing or on the airplane, and tracing run back fluid to locate source of leak. When disconnecting lines and units take care to prevent spillage of hydraulic fluid. Should fluid leak on the airplane or spill while performing maintenance, the affected area must be decontaminated in accordance with AMM Chapter 12, Cleaning and Washing.
   B. Illumination of No. 1 or 2 pump low pressure warning light during operation of system B and a confirmation of loss of pressure on the affected pump should be followed by a check of the corresponding pump pressure and case drain return filters. Contaminated filter elements indicate a defective pump. The pump need not be operated again following warning light illumination, unless filter check shows no sign of contamination and trouble is suspected outside the pump. If additional information is required on the pump low pressure warning lights, refer to AMM 29-34-0, Hydraulic Pump Low Pressure Warning Systems.
   C. When troubleshooting the hydraulic system, system B should stabilize between 2800 and 3100 psi with flight control switches ON and ground interconnect valve CLOSED and 2900 to 3100 with flight control switches OFF and ground interconnect valve CLOSED.
   D. Trouble symptoms in the troubleshooting chart are shown as they are expected to appear when the hydraulic system is operating with its normal hydraulic power source. Therefore, the system should be pressurized by operating the system B electric motor-driven pumps.
2. Prepare System B Hydraulic System for Troubleshooting
   A. Service hydraulic reservoir system (AMM Chapter 12, Hydraulic Fluid Servicing).
   B. Pressurize hydraulic reservoir system (AMM 29-09-300/201).
   C. Provide electrical power (AMM 24-22-0/201).
      (1) Place battery switch to ON.
   D. Make sure that parking brake is set.
   E. Make sure that ground interconnect valve is in CLOSED position.

3. Hydraulic System B Troubleshooting Chart

NOTE: Pump high and low pressure adjustments are made on a test bench before pump installation. Pump pressure adjustments should not be attempted while the pump is installed on the airplane because of the internal bleed characteristics of the hydraulic system. Pump pressure adjustments are made under zero flow conditions. On some airplanes a ground fault protection system is installed. If electrical power to a hydraulic pump is interrupted during normal operation by this system, the pump should be replaced (AMM 29-12-21/401). A ground fault protection controller is located aft of P6-1 circuit breaker panel. If pump will not operate after replacement or after repair of electrical circuit, check that reset button on ground fault protection controller is RESET. If pump still will not operate, perform ground fault protection test (AMM 29-12-21/401).

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure above normal (3100 psi)	Hydraulic pressure indicator and/or transmitter	Open ground interconnect valve and pressurize system A. Compare systems A and B indicator readings. If system A indicator reads normal and system B indicator still reads high, then system B transmitter and/or indicator are defective	Test pressure indicator and transmitter. Calibrate or replace as required (AMM 29-31-0, Pressure Indicating Systems)
	Electric pump or pumps	If both systems A and B indicators read the same, then one or both system B pumps are defective. Close interconnect valve	
		Operate both system B pumps. Switch No. 1 pump OFF and record reading on indicator. Switch No. 1 pump ON and switch No. 2 pump OFF and record reading on indicator. Compare readings of two pumps	
		If difference is noted then high reading pump is above tolerance	Remove applicable pump for bench test and repair
		If no difference is noted then both pumps are above tolerance	Remove both pumps for bench test and repair

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Overheat warning light illuminates (temperature above 220°F accompanied with pressure above 3100 psi)	Case drain or pressure filter contaminated	Check applicable pump case drain and pressure filter for contamination	If contamination is found, ref AMM 29-12-0/601, to check hydraulic system B filters
			Replace filter elements and recheck system

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure below tolerance specified in par. 1.C.	Hydraulic pressure indicator and/or transmitter	Open ground interconnect valve and pressurize both systems A and B with system pumps. Compare systems A and B pressure indicator readings	
		If system A indicator reads normal and system B indicator still reads below normal then system B transmitter and/or indicator are defective	Test system B pressure indicator and transmitter. Repair or replace as required (AMM 29-31-0, Pressure Indicating Systems)
	System B electric motor-driven pumps No. 1 and 2	Pressurize system with hydraulic ground service cart. With ground interconnect valve open and both systems A and B indicators reading normal, then both system B pumps are defective	Replace system B electric motor-driven pumps No. 1 and No. 2
	Hydraulic leak	Pressurize systems A and B. Monitor fluid quantity indicators and reservoir low level warning lights	
		If quantity indicator indicates losing fluid, shut down hydraulic system, open panels and trace hydraulic fluid leakage to its source	Repair or replace defective components
	NOTE: Approximately 2.0 gallons of fluid will drain from system A reservoir to system B through balance line. Therefore, system A reservoir quantity indicator will drop.		

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Pressure below normal (2800 psi)	Hydraulic leak	To 1.6 ±0.2 gallon indication (3.6 gallons indicates full) before system B low level warning light will come on due to leak in system B	
	System B pressure relief valve	If system B pressure indication is still below normal after following above procedures, relief valve is opening at too low pressure	Remove and replace system B pressure relief valve
Hydraulic fluid low NOTE: When system B reservoir low level warning light is on, approx 2.0 gallons have been drained from system A reservoir	System A fluid quantity indicator and/or transmitter	Service hydraulic reservoir system (AMM Chapter 12, Hydraulic Servicing). If system A quantity indicator still reads low, indicator and/or transmitter is defective. If indicator is replaced and still reads low, transmitter is defective. If indicator is replaced and reads full, removed indicator is defective	Test quantity transmitter and indicator. Replace as required (AMM 29-33-0, Fluid Quantity Indicating Systems)
	System B low level warning system switch	If system B low level warning light is on and system A reservoir is full, system B reservoir must be full and low level warning switch is defective	Replace low level warning switch
	NOTE: Warning light comes on when system B reservoir is 50% of normal capacity (1.3 gals)	If system A reservoir is full, low level warning switch has been replaced and warning light is still on check for short circuit	Check system B low level warning system electrical circuit

HYDRAULIC SYSTEM B - MAINTENANCE PRACTICES

1. General
   A. The following procedure provides instruction for pressurizing (par. 2) and depressurizing (par. 3) hydraulic system B.
2. Pressurize Hydraulic System B
   A. General
      (1) To pressurize hydraulic system B, two methods may be used. System B electric motor-
      driven pumps or a hydraulic test stand. Pressurizing hydraulic system B will supply hydraulic system B will supply hydraulic power to the elevator, rudder, ailerons, outboard spoilers, and outboard brakes and on Passenger/Cargo Convertible Airplanes, the main cargo door.

      WARNING: CHECK THAT PERSONNEL AND OBSTRUCTIONS ARE CLEAR OF ALL FLIGHT CONTROL SURFACES BEFORE TURNING HYDRAULIC POWER ON. ISOLATE OR TAG SYSTEMS NOT BEING TESTED TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO AIRPLANE.

      (2) On hot days or when fuel temperature is known to be above 90°F, monitor the system B overheat indicator on the forward overhead panel while running the system B pumps for ground maintenance and checkout procedures and switch pumps off when overheat is indicated.
      (3) Deleted.
   B. Pressurize Hydraulic System B (Electric Motor-Driven Pump)

      CAUTION: DO NOT OPERATE SYSTEM B PUMPS MORE THAN 2 MINUTES UNLESS THE NO. 2 FUEL TANK CONTAINS AT LEAST 1675 POUNDS (760 KILOGRAMS) GALLONS OF FUEL. IF PUMPS ARE OPERATED 2 MINUTES WITHOUT FUEL IN TANK, ALLOW RESERVOIR TO RETURN TO AMBIENT TEMPERATURE BEFORE RESUMING TEST.

      (1) Provide electrical power (Ref 24-22-0 MP).
         (a) Place battery switch to ON.
      (2) On the forward overhead panel, switch HYDRAULIC SYSTEM B - ELEC PUMP 1 and/or ELEC PUMP 2 to ON.

(3) Pressurize hydraulic system for a sufficient time to complete al1 necessary checks.

NOTE: When using system B pumps as a power source for pressurizing the hydraulic system with interconnect valve closed and flight control switches ON, turn on both No. 1 and 2 electric pumps to maintain a pressure indication between 2800 and 3100 psi. With flight control switches OFF, pressure indication should be between 2900 and 3100 psi.

(4) When operation is complete, check that switch is in ON position.

NOTE: The engine-driven pump should be left in the ON position after maintenance has been performed. This will help to prolong the life of the depressurization solenoid which becomes energized when the pump switch is placed in the OFF position.

C. Pressurize Hydraulic System B (Hydraulic Test Stand)
  (1) Equipment and Materials
    (a) Hydraulic test stand - 0 to 3000 psi, with BMS 3-11 hydraulic fluid
  (2) Pressurize System
    (a) Open air conditioning duct access panel on right side of airplane.
    (b) Connect hydraulic test stand to hydraulic ground power modular unit.
    (c) Operate test stand until requirements are complete.
    (d) Disconnect test stand from module and install dust caps.
    (e) Close access panel.

3. Depressurize Hydraulic System B
  A. Shut off source of hydraulic power and open the ground interconnect valve. Wait 5 to 10 minutes to allow system pressure to dissipate through internal leakage to the return system.
  B. Depressurize reservoir if return lines are being opened. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.

HYDRAULIC SYSTEM B - INSPECTION/CHECK

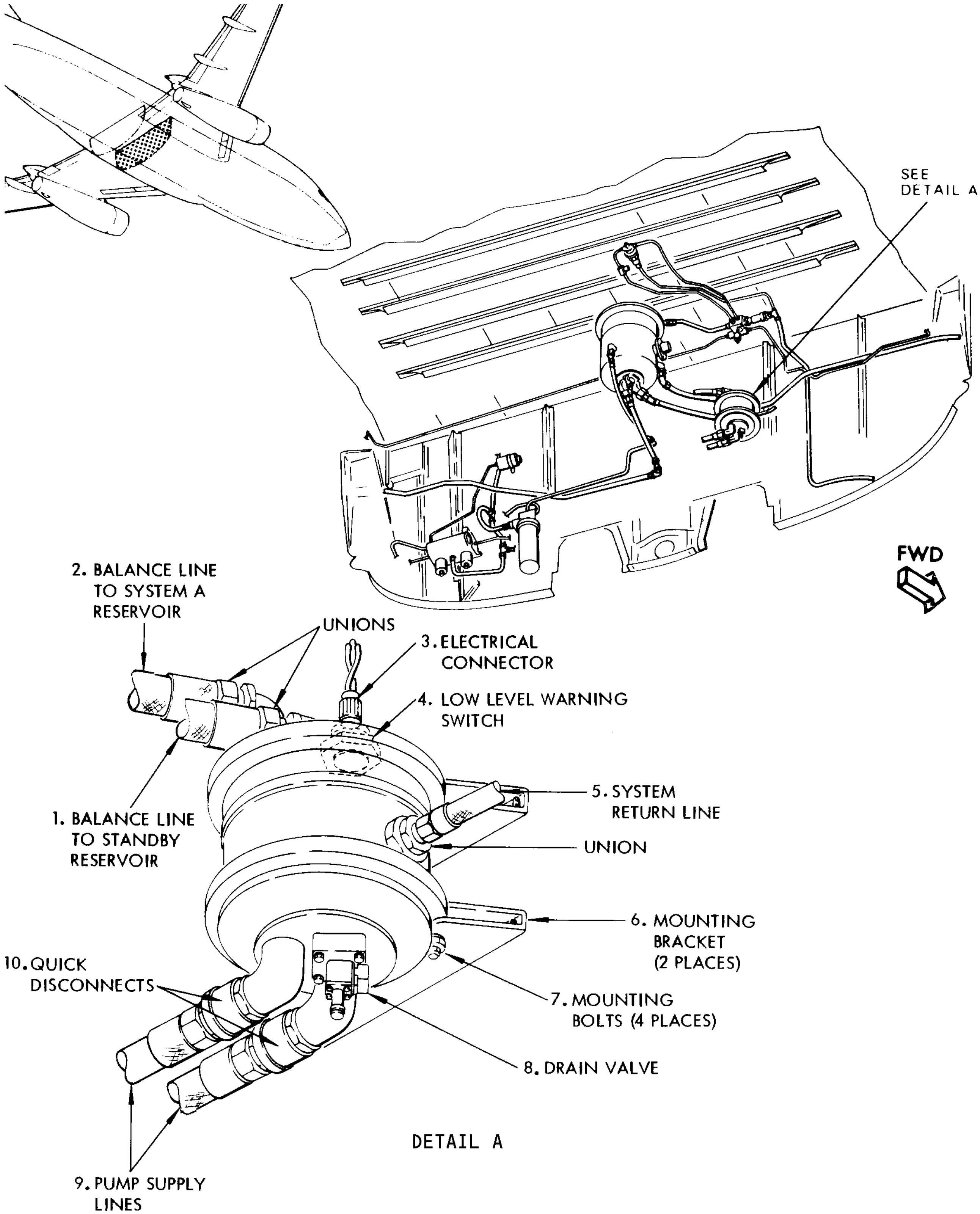
1. Hydraulic System B Check
   A. Check Hydraulic System B Tubing
      (1) Check hydraulic tubing in the wheel well area for discoloration which indicates overheating of hydraulic fluid.
   B. Check Hydraulic System B Filters
      (1) At regular intervals replace or clean system B case drain filter element. During removal, inspect magnetic plug and filter element for contamination.

         NOTE: If paper filter element is used, examine for contamination by cutting the element and laying the paper out flat.

      (2) If excessive amount of metal particles are found in the case drain filter proceed with the following steps:
         (a) Remove and overhaul the associated pump.
         (b) Clean case drain filter bowl and replace element. Refer to 29-12-71, System B Hydraulic Pump Case Drain Filter.
         (c) Check system pressure and return filters.
      (3) If sufficient contamination is found in system B pressure and return filter to warrant a pump change, proceed with the following:
         (a) Remove and thoroughly clean filters bowls. Replace with clean elements. Refer to 29-12-41, System B Hydraulic Pressure Filter and 29-12-81, System B Hydraulic Return Filter.
         (b) Disconnect line between hydraulic pump and filter and flush with clean BMS 3-11 hydraulic fluid.

SYSTEM B HYDRAULIC RESERVOIR - REMOVAL/INSTALLATION

1. General
   A. System B reservoir is installed on the forward bulkhead of the right wheel well. Removal of the reservoir requires draining. A small amount of fluid will be drained from system A reservoir through the balance line, therefore a container larger than the quantity of fluid in the system B reservoir will be necessary to catch fluid from the reservoir and disconnected hydraulic lines. Should any fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Suitable container for draining hydraulic fluid (approx 4 gal. capacity)
   B. Regulated source of nitrogen, 0- to 200-psi maximum pressure
   C. Skydrol Assembly Lube - MCS352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Prepare Hydraulic Reservoir for Removal
   A. Depressurize hydraulic systems A and B. Refer to 29-11-0, Hydraulic System A and 29-12-0, hydraulic System B - Maintenance Practices.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System. - Maintenance Practices.
   C. Tag hydraulic systems A, B and standby pump switches to prevent operation.
   D. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Open tire protection screen doors.
   E. Open system B reservoir drain valve (8, figure 401) and drain fluid from reservoir.
4. Remove System B Hydraulic Reservoir
   A. Disconnect reservoir balance lines (1 and 2, figure 401).
   B. Disconnect system return line (5).
   C. Disconnect pump supply lines (9) from reservoir at quick-disconnect fittings (10).
   D. Install protective covers over fittings and plug disconnected hydraulic lines.
   E. Disconnect electrical connector (3) from low level warning switch at top of reservoir.
   F. Remove mounting bolts (7) and remove reservoir.
5. Prepare Hydraulic Reservoir for Installation
   A. Ensure that reservoir is clean and mounting surfaces are free from foreign material. Exercise caution that foreign material does not enter reservoir during maintenance procedures.
   B. Apply assembly lube or hydraulic fluid to all O-rings and fittings to facilitate installation.
   C. Install drain valve (8, Fig. 401), if not included with reservoir.
      (1) Install O-ring in groove of drain valve flange.
      (2) Position drain valve on flange. Install mounting bolts and lockwire.



System B Hydraulic Reservoir Installation
Figure 401

(3) Lockwire drain valve handle in CLOSED position.

D. Install low level warning switch (4) if not included with reservoir.

E. Install O-rings, unions, and reducers in reservoir ports.

6. Install System B Hydraulic Reservoir

A. Place reservoir in mounting position and install mounting bolts (7, Fig. 401).

B. Connect electrical connector (3) to low level warning switch (4).

C. Connect all hydraulic lines to reservoir.

CAUTION: PRIOR TO INSTALLING HOSE HALF OF QUICK DISCONNECT, VISUALLY CHECK FOR DISCONNECT POPPET STRAIGHTNESS. AFTER QUICK DISCONNECT CONNECTION, CHECK THAT INDICATOR PINS ARE EXTENDED A MINIMUM OF 0.06 INCH. IF INDICATOR PINS ARE NOT PROPERLY EXTENDED, FLUID FLOW WILL BE RESTRICTED OR COMPLETELY STOPPED AND RESERVOIR AND/OR PUMP DAMAGE MAY RESULT. IF EXCESSIVE TORQUE IS REQUIRED WHEN RECONNECTING THE TWO HALVES OF THE QUICK DISCONNECT, DISASSEMBLE THE FITTING AND CHECK FOR POPPET STRAIGHTNESS AGAIN.

D. Service hydraulic reservoir (Ref Chapter 12, Servicing).

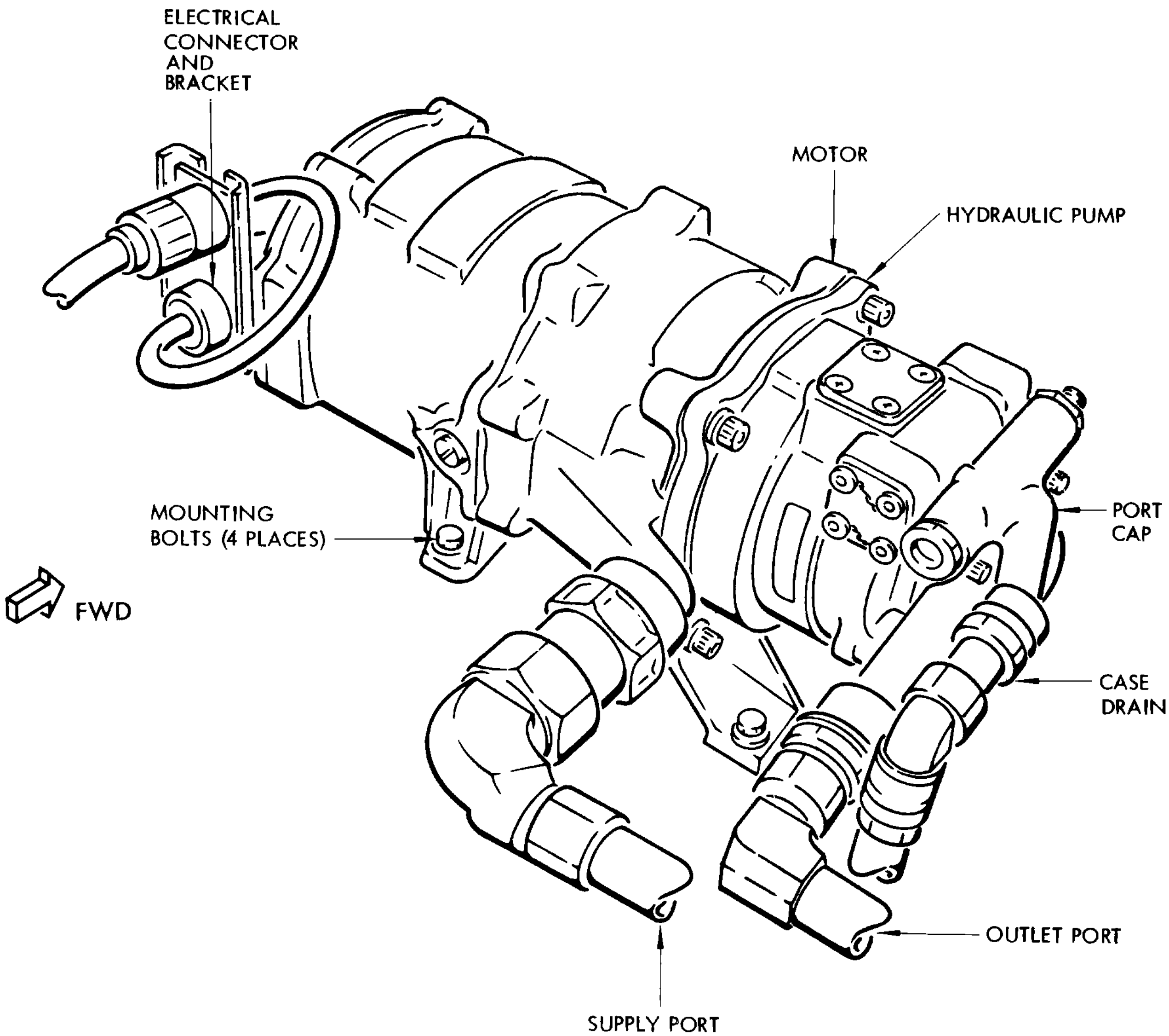
E. Pressurize reservoir system and check for leaks (Ref 29-09-300).

F. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
Close tire burst screen protection doors.

G. Remove tags from hydraulic pump switches.

SYSTEM B ELECTRIC MOTOR-DRIVEN HYDRAULIC PUMP - DESCRIPTION AND OPERATION

1. General
   A. Two electric motor-driven hydraulic pump assemblies (figure 1) supply fluid under pressure to the hydraulically-operated subsystems supplied by system B. Each pump assembly consists of an oil-cooled three phase ac motor, a centrifugal pump and a single stage, variable displacement, pressure-compensated hydraulic pump. With an inlet pressure of approximately 45 psig, each pump output is approximately 6.3 gpm at 2700 psig operating at 5800 rpm. The pump assemblies are installed in the wheel well area and controlled by switches on the forward overhead panel.
   B. Hydraulic fluid from the system B reservoir enters the-motor pump through the inlet port in the motor housing and passes around the motor rotor and stator assemblies to an antiswirl ring located at the rear of the pump and motor assembly. The antiswirl ring removes fluid turbulence induced by the rotating motor and directs fluid into the specially designed hollow rotor shaft. A helical impeller acts as an inducer in the rotor shaft and pumps fluid through the rotor shaft to the impeller inlet of the centrifugal boost pump and is pressurized to approximately 15 psig above the inlet pressure. The outlet port of the boost pump is located in the volute closure ring and feeds directly into the attached hydraulic pump.
   C. The variable displacement pump-consists essentially of a piston and cylinder barrel rotating group, a splined driveshaft, a pivoting hanger with an inclined cam face, a compensating mechanism, a pump housing and port cap. The pump and motor consists of three circuits: the main circuit, the control circuit, and the cooling and lubricating circuit.
      (1) The main circuit is the main path of flow through the inlet passageway, through the rotating group, and out the outlet port under pressure to the system.
         (a) The pumping mechanism consists of a revolving cylinder barrel containing nine pistons. The cylinder barrel is supported by a roller bearing and driven by the internal drive shaft. As the drive shaft is rotated by the electric motor, the pistons and cylinder barrel are rotated by the drive shaft, which is spline-mated to the motor rotor shaft. The lapped face of the rotating cylinder barrel is held flush against the lapped face of the stationary valve plate in the cap port by the action of a spring on the drive shaft and cylinder barrel. Rotation of the cylinder barrel ports across the ports in the valve plate provide the valving action of the pump.



System B Electric Motor Driven Pump
Figure 1

(b) The hanger supports the pistons which ride axially in their mating bores in the cylinder barrel. The pistons are held against the inclined cam face of the hanger by a hold-down plate and hydraulically balanced shoes. The hanger is linked to the compensating mechanism, which is normally held at a maximum angle of displacement, with relation to the drive shaft axis, by the action of the rate piston and spring in the compensating mechanism. In this position, the pistons reciprocate in relation to the valving face of the cylinder barrel. On one half of each revolution of the drive shaft, the pistons are drawn away from the valve plate, creating a partial vacuum in the cylinder bores. Oil is forced into the bores to satisfy this vacuum. During the intake phase of each revolution, oil flows from the centrifugal pump through a passage in the pump housing to the inlet side of the valve plate in the port cap and into the cylinder barrel. On the other half of each revolution of the drive shaft, oil is forced out of the cylinder bores by movement of the pistons toward the valve plate. During the output phase of each revolution, oil flows at high pressure from the cylinder barrel, through the outlet side of the valve plate into the passages in the port cap and out through the outlet port into the hydraulic system. The axial thrust of the pistons against the hanger cam plate during the power stroke is balanced hydraulically. Oil at system pressure, is admitted through holes in the pistons and balance shoes to an undercut area in the face of the shoes. This pressure is applied to the undercut area, which is slightly less than the piston area balances the forces so that the shoe is supported on an oil film at all times. The axial thrust of the cylinder barrel is also balanced hydraulically against the valve plate in the port cap.

(2) The control circuit comprises the flow path of fluid through the drilled sensing passages in the pump housing to the pressure compensating mechanism.

(a) Resistance to the flow of fluid in the system causes pressure to build up on the outlet side of the hydraulic pump. The greater the resistance to the fluid flow, the greater the pressure buildup. The pressure rise is reflected through the pressure sensing passage in the cap port, which acts on the compensating mechanism. At pressures from 0 to 2700 psig, the adjustable compensator spring holds the compensator valve closed. The pressure sensing port is blocked. Under these conditions the rate piston and spring positions the hanger at the maximum angle of displacement. This permits the pump to deliver a maximum volume of fluid (6.3 gpm).

(b) As the pressure exceeds 2700 psig, hydraulic fluid under pressure acts on the head end of the compensator valve, overcomes the force of the compensator spring and positions the compensator valve to permit flow between the pressure sensing port and the stroking piston. The hydraulic fluid under pressure, continues to act on the stroking piston, overcomes the force of the rate piston spring and forces the hanger toward a minimum angle of displacement. At approximately 3025 psig the hanger is at zero angle of displacement. In this position the rotating group continues to rotate, but does not pump fluid because the pistons do not reciprocate. The zero displacement angle is a momentary condition which changes as the hanger moves to a displacement angle sufficient to overcome the volumetric loss due to internal leakage. When the system demand lowers the pressure, the compensator spring closes the compensator valve and fluid behind the stroking piston is ported into the pump housing. The stroking piston then retracts and the spring load on the rate spring moves the hanger to a greater angle and increases the pump volume.

(3) The cooling and lubrication circuit comprises the flow path of hydraulic fluid in the pump and motor housing.

(a) When the unit is installed in the system, the case is completely filled with hydraulic fluid and the case drain port is connected to the system B reservoir. Hydraulic fluid is circulated around the motor rotor and stator and through the hollow rotor shaft, this circulated fluid cools the rotor and stator of the electric motor. Leakage past the pistons, and flow from the compensating mechanism increases the volume of fluid in the pump housing and causes flow out the case drain port. Circulation of fluid in the pump and motor housing provide lubrication and cooling for the moving parts and a head of fluid at the case drain line provides a positive case pressure to keep air out of the system. This flow path constitutes the lubrication and cooling circuit.

SYSTEM B ELECTRIC MOTOR-DRIVEN HYDRAULIC PUMP - REMOVAL/INSTALLATION

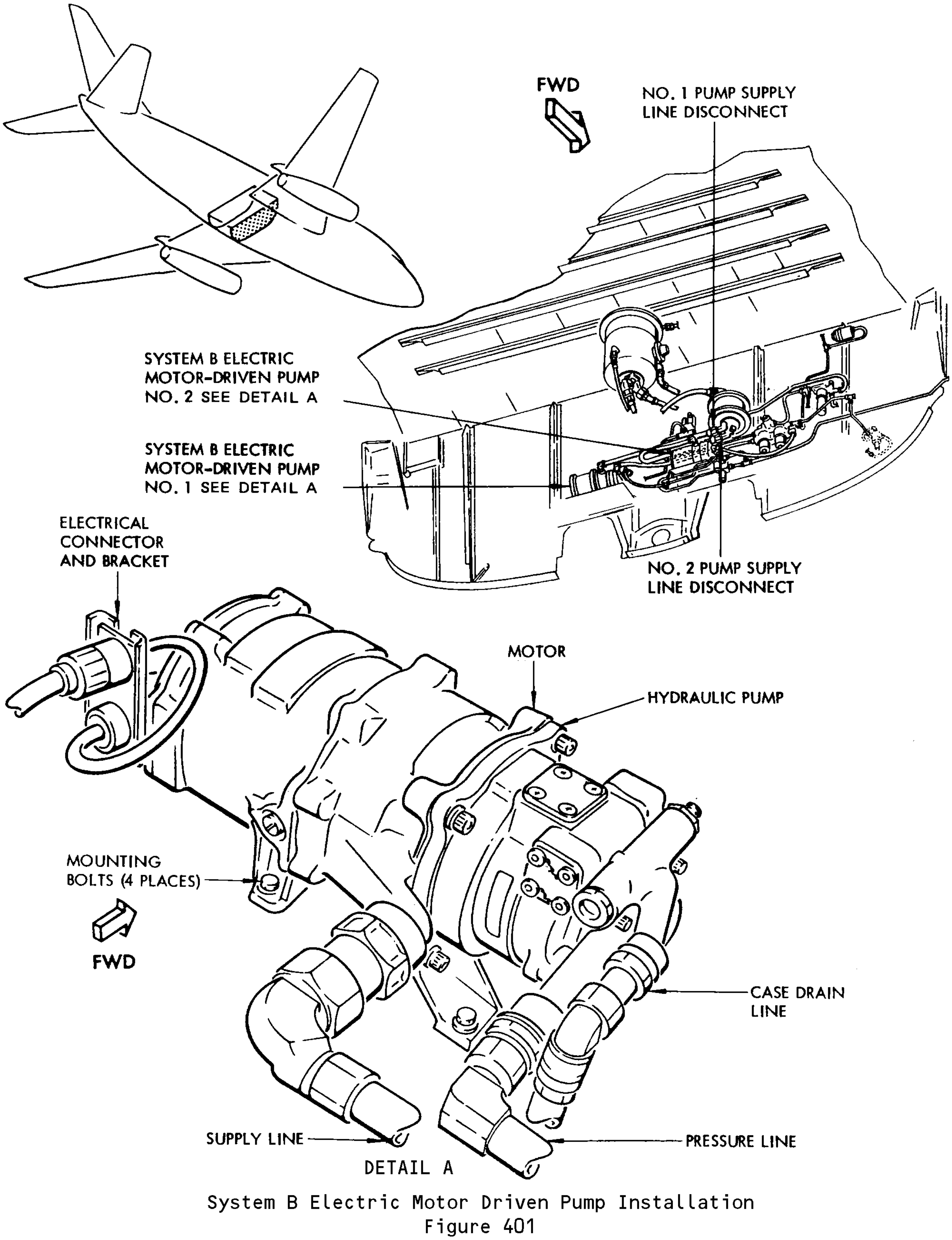
1. General
   A. If ground fault protection system is installed and electrical power to the pump motor is interrupted during normal operation by this system, the pump should be replaced. If the hydraulic pump is replaced due to mechanical malfunction, replace the pressure and case drain filter elements and flush the lines between the pump and filters prior to replacing the pump (AMM 29-12-0/601).
   B. A container will be necessary to catch fluid from the disconnected hydraulic lines. Take precaution to prevent spillage of fluid. Should any fluid spill on the airplane, decontaminate (AMM Chapter 12, Cleaning and Washing).
   C. The system B hydraulic pumps are identical units, therefore only one maintenance procedure is given.
2. Equipment and Materials
   A. Fire-Resistant Hydraulic Fluid - BMS 3-11 (AMM 20-30-21)
   B. A container to catch hydraulic fluid
3. Prepare Hydraulic Pump for Removal
   A. Open applicable system B pump circuit breakers on P6-11 and P6-12 panels.
   B. Depressurize hydraulic reservoirs (AMM 29-09-300/201).
   C. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
      Open tire burst protection screen doors.
   D. Disconnect pump supply line at quick disconnect at bottom of reservoir and drain fluid from line.
4. Remove Hydraulic Pump (Fig. 401)
   A. Disconnect electrical connector.
   B. Disconnect hydraulic lines at pump and install protective covers.
   C. Remove pump mounting bolts.

      NOTE: The two forward mounting bolts are not lockwired. Do not remove the two forward lockwired bolts that secure the mounting bracket. Bonding jumper is attached to mounting bolt. Disengage bonding jumper from mounting bolt.

   D. Remove pump from airplane.
5. Prepare Hydraulic Pump for Installation
   A. Check that pump assembly is complete.

      NOTE: All fittings and O-rings should be installed or supplied with the assembly and all ports capped.

   B. Make sure that pump is full of clean BMS 3-11 hydraulic fluid.
   C. Make sure that all lockwire is intact and that pressure control adjusting screw is lockwired and sealed with a lead seal.
6. Install Hydraulic Pump
   A. Put the pump in its mounting position.



System B Electric Motor Driven Pump Installation
Figure 401

B. Engage the bonding jumper, which is attached to the airplane structure, with the aft inboard mounting bolt on the pump.

NOTE: The mounting pad, bolt, washers, and bonding jumper must be clean to give a good electrical ground.

C. If two bonding jumpers are part of the pump assembly, engage them with a pump mounting bolt as follows:
   (1) Aft outboard bolt on the No. 1 pump.
   (2) Aft inboard bolt on the No. 2 pump.
D. Install the pump mounting bolts.
E. Safety the two aft mounting bolts with a lockwire.
F. Connect pressure line to pump outlet.
G. Connect supply line to pump inlet and then to reservoir supply coupling.

CAUTION: WHEN INSTALLING HOSE HALF OF THE QUICK-DISCONNECT, MAKE SURE THAT INDICATOR PINS ARE EXTENDED A MINIMUM OF 0.06 INCH. IF THE INDICATOR PINS ARE NOT PROPERLY EXTENDED FLUID FLOW WILL BE RESTRICTED OR COMPLETELY STOPPED AND RESERVOIR AND/OR PUMP DAMAGE MAY RESULT.

H. Connect case drain line. Make sure that hydraulic fluid is up to the case drain port.
I. Install hydraulic pump electrical connector.
J. Pressurize system B reservoir (AMM 29-09-300/201).
K. If installed, make sure that reset button is RESET on ground fault protection controller located aft of P6-1 circuit breaker panel.
L. Close system B pump circuit breaker on P6-11 and P6-12 panels.

WARNING: MAKE SURE THAT RUDDER IS CLEAR TO DEFLECT FULLY BEFORE TURNING POWER ON TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.

M. Pressurize hydraulic system B using applicable pump (AMM 29-12-0/201).

CAUTION: IF SYSTEM B PUMP DOES NOT OPERATE WHEN SWITCH IS PLACED IN ON POSITION, SWITCH SHOULD BE IMMEDIATELY POSITIONED TO OFF AND THE PUMP AND GROUND FAULT PROTECTION SYSTEM (IF INSTALLED) TESTED (AMM 29-12-21/501).

N. Cycle rudder several times to prime and bleed hydraulic pump.
O. With flight control switches ON and ground interconnect valve closed, make sure that system B hydraulic pressure gage on first officer's panel stabilizes between 2800 and 3100 psi.
P. Check pump and connections for leaks.
Q. Place pump switch in OFF position.
R. Service hydraulic reservoirs (AMM Chapter 12, Hydraulic Servicing).

S. AIRPLANES WITH TIRE BURST PROTECTOR SCREEN DOORS;
Close tire burst protection screen doors.

SYSTEM B ELECTRIC MOTOR-DRIVEN HYDRAULIC PUMP - ADJUSTMENT/TEST

1. System B Electric Motor-Driven Hydraulic Pump Test
   A. General
      (1) Paragraph C. tests system B hydraulic pumps and electrical power supply to the pumps. If installed, the ground fault protection system is tested by performing par. D.

         CAUTION: DO NOT OPERATE EITHER SYSTEM B PUMP MORE THAN 2 MINUTES IF THE NO. 2 (RIGHT-HAND) FUEL TANK CONTAINS LESS THAN 250 GALLONS (1675 POUNDS) OF FUEL. IN SUCH CASES WHEN THE PUMP IS OPERATED WITH LESS THAN THE MINIMUM FUEL FOR HYDRAULIC FLUID COOLING, THE PUMPS SHOULD NOT BE RETESTED UNTIL THE SYSTEM B RESERVOIR HAS RETURNED TO AMBIENT TEMPERATURE.

   B. Equipment and Materials
      (1) Test Equipment, Ground Fault Protection System, Hydraulic System B-F72917-( )
   C. Test Hydraulic Pump
      (1) Apply power to the No. 1 generator bus by placing either the No. 1 generator or the APU generator left switch to ON.

         NOTE: Ground power cannot be used for this test.

      (2) Place Bus Transfer switch on P5 panel to AUTO position.
      (3) Place the battery switch to ON position.
      (4) Check that the No. 1 and 2 System B pump (NORMAL and ALT) circuit breakers on P6 load control center are closed.
      (5) With flight control switches OFF and ground interconnect valve closed, pressurize system B hydraulic system by switching No. 1 pump to ON. Check that No. 1 pump is operating and the no flow pressure stabilizes between 2925 and 3100 psi.
      (6) Apply power to the No. 2 generator bus by placing either the No. 2 generator or APU generator right switch to ON.
      (7) Remove power from the No. 1 generator bus by switching to OFF the switch placed to ON in (1). System B pump No. 1 should continue to operate.
      (8) Place pump No. 1 switch to OFF position. Check that pump stops operating.
      (9) Reapply power to the No. 1 generator bus.
      (10) Open No. 1 system B pump (ALT) and No. 2 system B pump (NORMAL and ALT) circuit breakers.
      (11) Place pump No. 1 switch to ON. Check that pump operates and no flow pressure stabilizer between 2925 and 3100 psi.
      (12) Place pump No. 1 switch to OFF. Check that pump stops operating.

(13) Remove power from the No. 1 generator bus.
(14) Close No. 1 system B pump (ALT) circuit breaker. Open No. 1 (NORMAL) circuit breaker.
(15) Place pump No. 1 switch to ON. Check that pump operates and no flow pressure stabilizes between 2925 and 3100 psi.
(16) Place pump No. 1 switch to OFF. Check that pump stops operating.
(17) Close No. 1 system B pump (NORMAL) and No. 2 system B pump (NORMAL and ALT) circuit breakers.
(18) Pressurize hydraulic system B by switching No. 2 pump to ON. Check that pump operates and no flow pressure stabilizes between 2925 and 3100 psi.
(19) Apply power to the No. 1 generator bus. Remove power from the No. 2 generator bus. Check that pump continues operating.
(20) Place pump No. 2 switch to OFF. Check that pump stops operating.
(21) Reapply power to the No. 2 generator bus.
(22) Open No. 2 system B pump (ALT) and No. 1 system B pump (NORMAL and ALT) circuit breakers.
(23) Place pump No. 2 switch to ON. Check that pump operates and no flow pressure stabilizes between 2925 and 3100 psi.
(24) Place pump No. 2 switch to OFF. Check that pump stops operating.
(25) Remove power from No. 2 generator bus.
(26) Close No. 2 system B pump (ALT) circuit breaker. Open No. 2 (NORMAL) circuit breaker.
(27) Place pump No. 2 switch to ON. Check that pump operates and no flow pressure stabilizes between 2925 and 3100 psi.
(28) Place pump No. 2 switch to OFF. Check that pump stops operating.
(29) Depressurize hydraulic system B (Ref 29-12-0, Maintenance Practices).
(30) If there is no further need for electrical power on the airplane, switch generator to OFF.

D. Test Ground Fault Protection System Using Test Equipment B-F72917-( )
(1) Open applicable system B pump circuit breakers on P6-11 and P6-12 panels.
(2) Disconnect electrical connectors from system B pump No. 1 and 2.
(3) Connect test equipment ground to airplane frame at an approved ground.
(4) Connect test equipment connector to No. 1 pump electrical plug.

WARNING: TO PREVENT SHOCK HAZARD, ASSURE THAT TEST EQUIPMENT GROUND LEAD IS SECURED TO AIRPLANE GROUND BEFORE CONNECTING TESTER TO PUMP CONNECTOR.

(5) Check that system B pump and pump control circuit breakers are closed on P6-11 and P6-12 panels.
(6) Position No. 1 pump switch to ON.
(7) Turn test switch S2 to NO TRIP position.

(8) Depress test switch S1 and check that light L1 illuminates.
(9) Release test switch S1.
(10) Turn test switch S2 to TRIP position and check that light L1 goes out.
(11) Return test switch S2 to NO TRIP position and check that light L1 does not illuminate.
(12) Gain access to ground fault detector controller located behind decorative panel outboard of P6-1 or P6-2 panels.
(13) Momentarily depress reset button on No. 1 pump controller.
(14) Depress test switch S1 and check that light L1 illuminates.
(15) Position No. 1 pump switch to OFF and check that test light L1 goes out.
(16) Open applicable system B pump circuit breakers on P6-11 and P6-12 panels.
(17) Disconnect test equipment connector from No. 1 pump electrical plug.
(18) Connect test equipment to No. 2 pump electrical plug.
(19) Repeat steps (6) thru (16) for No. 2 pump.
(20) Disconnect test equipment and remove from airplane.
(21) Install electrical connectors on No. 1 and 2 pumps.
(22) Close pump control circuit breakers on P6-11 and P6-12 panels.

2. Inspection/Check System B Electric Motor-Driven Pump

A. Check System B Electric Motor-Driven Pump

(1) With the applicable pump running, visually check for external leakage.
    (a) Remove unit if excessive leakage is observed.
(2) Visually check the security of mounting and for any possible external damage.

HYDRAULIC SYSTEM B MODULE UNIT - REMOVAL/INSTALLATION

1. General
   A. System B module unit is mounted on the forward bulkhead of the right wheel well (Fig. 401). A container will be necessary to catch fluid from the module and disconnected hydraulic lines during removal. Should any fluid spill on the airplane, the affected area must be decontaminated (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Material
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove System B Module Unit
   A. Depressurize hydraulic system B (Ref 29-12-0 MP).
   B. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   C. Open SYSTEM A-B PRESSURE circuit breaker on P6 panel.
   D. Disconnect pump low pressure warning switch electrical connectors (Fig. 401).
   E. Disconnect and plug hydraulic lines. Plug open ports on module unit.
   F. Remove mounting bolts and remove module unit.
4. Install System B Module Unit

   CAUTION: ENSURE FOREIGN MATTER DOES NOT ENTER MODULE PORTS OR CONNECTING LINES DURING INSTALLATION.

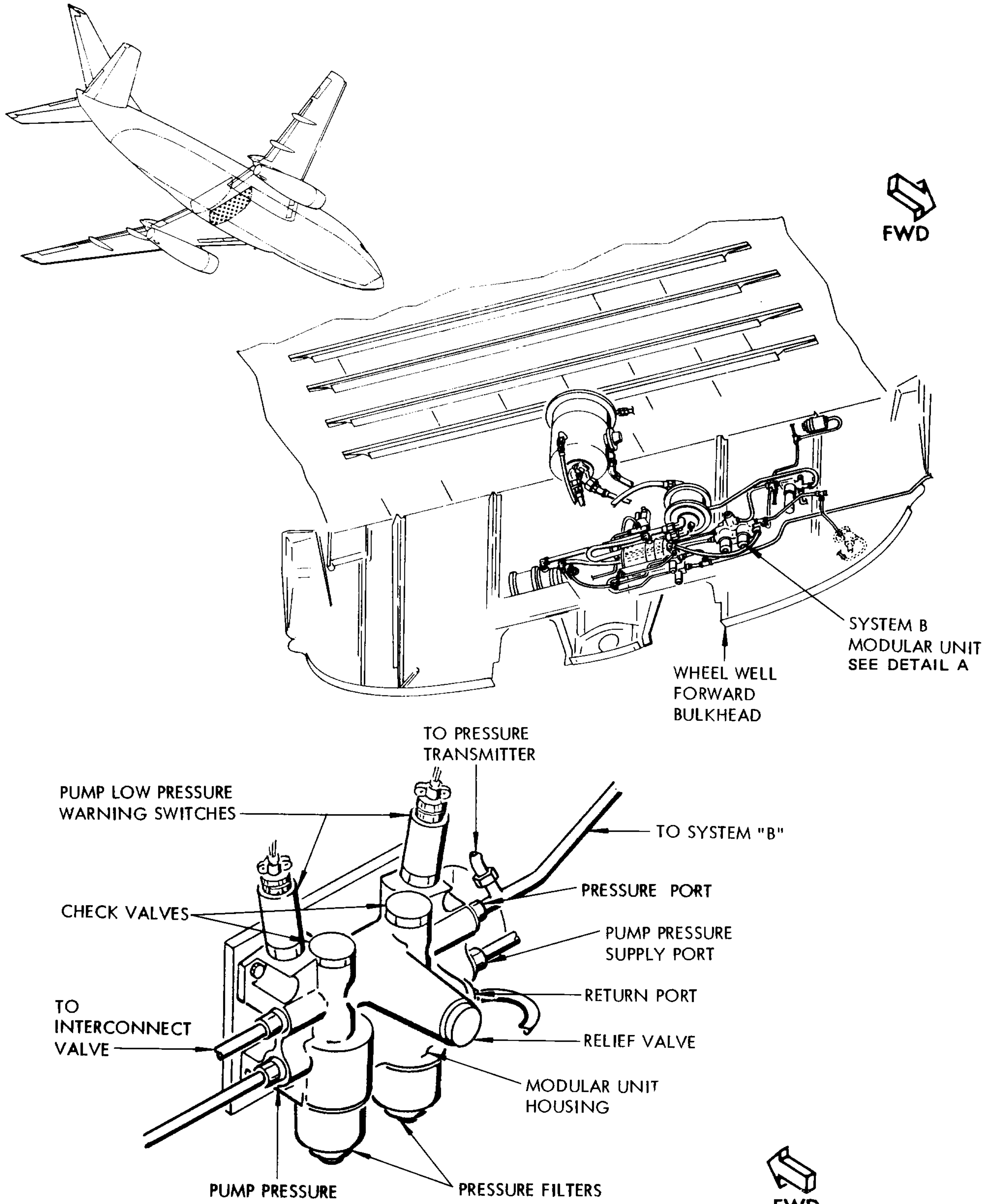
   A. Apply assembly lube or hydraulic fluid to O-rings and to the threads of couplings and unions to facilitate installation. Install O-rings and unions in module ports.
   B. Place module unit in mounting position and install mounting bolts.
   C. Connect all hydraulic lines to correct module ports.
   D. Connect electrical connectors to low pressure warning switches.
   E. Close SYSTEM A-B PRESSURE circuit breaker on P6 panel.
   F. Check low pressure switch operation and check for leaks.
      (1) Pressurize hydraulic system B with electric motor-driven pump No. 1 (Ref 29-12-0 MP).
      (2) Check that HYD PUMPS ELEC 1 LOW PRESSURE light extinguishes.
      (3) Check that HYD PUMPS ELEC 2 LOW PRESSURE light remains illuminated.
      (4) Check module for leaks.
      (5) Position HYD PUMPS ELEC 1 switch to OFF.

      WARNING: ENSURE THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF SPOILERS.

      (6) Operate outboard spoilers until No. 1 ELEC LOW PRESSURE light illuminates.
      (7) Pressure hydraulic system B with electric motor-driven pump No. 2 (Ref 29-12-0 MP).
      (8) Check that HYD PUMPS ELEC 2 LOW PRESSURE light extinguishes.

(9) Check that HYD PUMPS ELEC 1 LOW PRESSURE light remains illuminated.
(10) Check module for leaks.
(11) Position HYD PUMPS ELEC 2 switch to OFF.
(12) Depressurize hydraulic system B (Ref 29-12-0 MP).

G. Service hydraulic reservoirs (Ref Chapter 12, Hydraulic Fluid Servicing).



DETAIL A

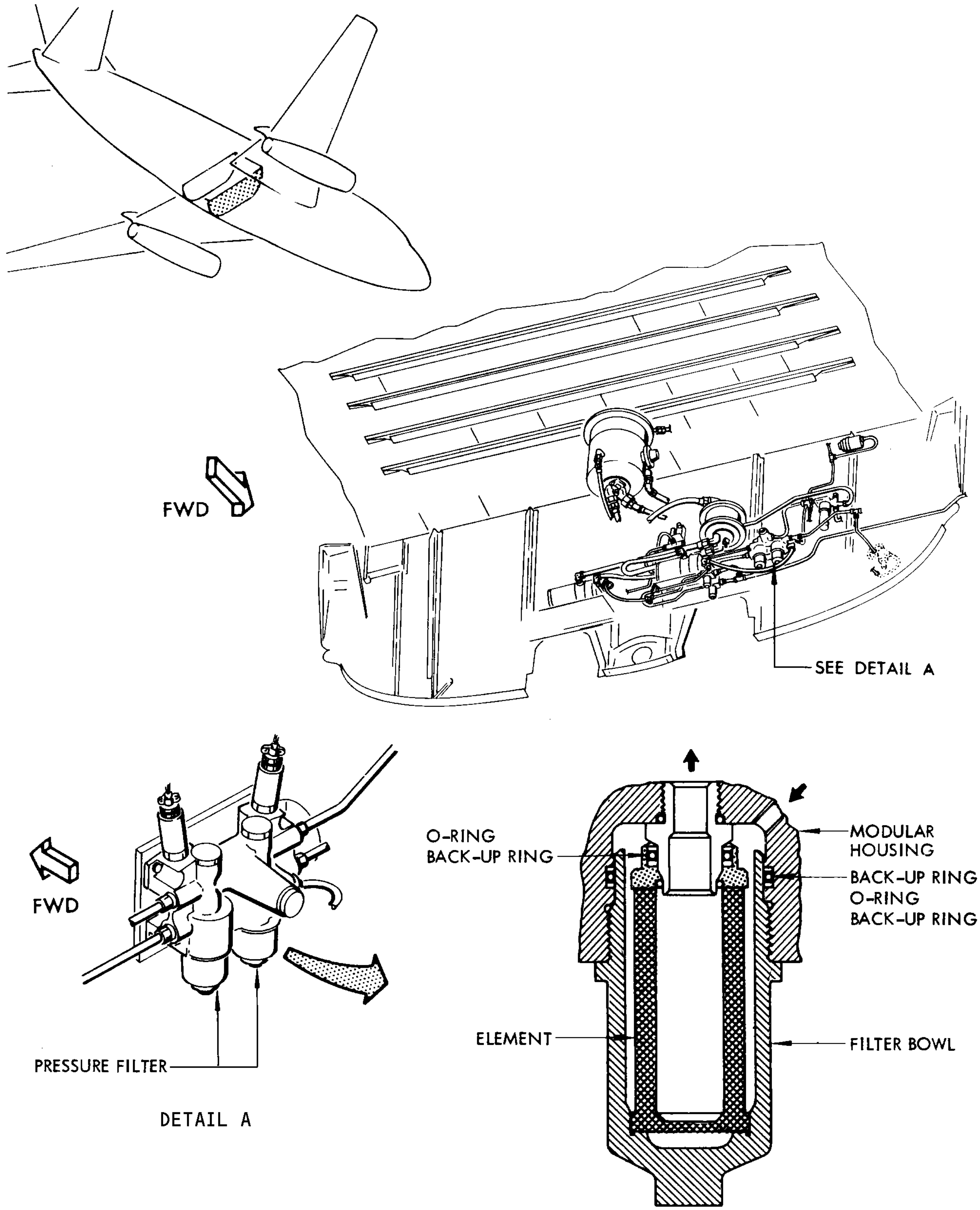
Hydraulic System B Module Unit
Figure 401

SYSTEM B HYDRAULIC PRESSURE FILTER - UNIT SERVICING

1. General
   A. The hydraulic pressure filters for system B are identical and are installed side by side in the modular unit (Fig. 301). Both pressure filters will be covered by the same maintenance procedures.
   B. A container will be necessary to catch fluid from the removed filter. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Replace Pressure Filter Element
   A. Equipment and Material
      (1) Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
   B. Remove Pressure Filter Element
      (1) Depressurize system B hydraulic system (Ref 29-12-0 MP).
      (2) Unscrew filter case and remove case and filter element (Fig. 301).
      (3) Thoroughly clean filter bowl. Replace paper element.
   C. Install Pressure Filter Element
      (1) Insert O-ring between backup rings in groove in modular housing (Fig. 301).
      (2) Insert O-ring and backup ring in groove at top of element.
      (3) Partially prefill filter bowl with hydraulic fluid. Place element in filter bowl and lightly lubricate filter bowl threads and O-rings with assembly lube or hydraulic fluid.

      CAUTION: DURING INSTALLATION, IT IS IMPERATIVE THAT EXTREME CARE BE TAKEN TO PREVENT IMPURITIES FROM ENTERING THE SYSTEM. ALL CONNECTIONS MUST BE MADE TIGHT TO PREVENT FLUID AND AIR LEAKAGE.

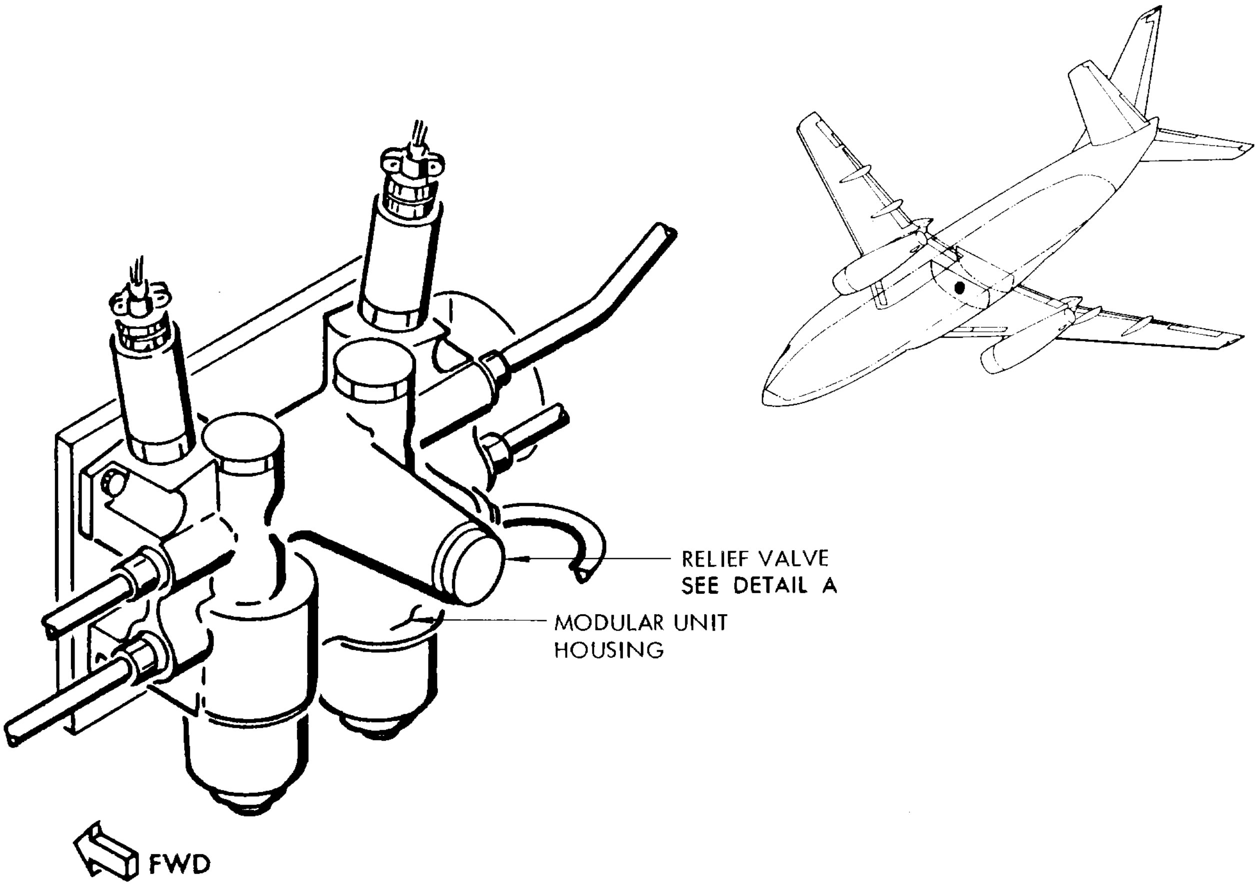
      (4) Screw filter bowl into modular housing and apply a torque to the filter bowl of 200 to 275 pound-inches and secure with lockwire.
      (5) Pressurize hydraulic system B (Ref 29-12-0 MP).
      (6) Check filter for leakage.

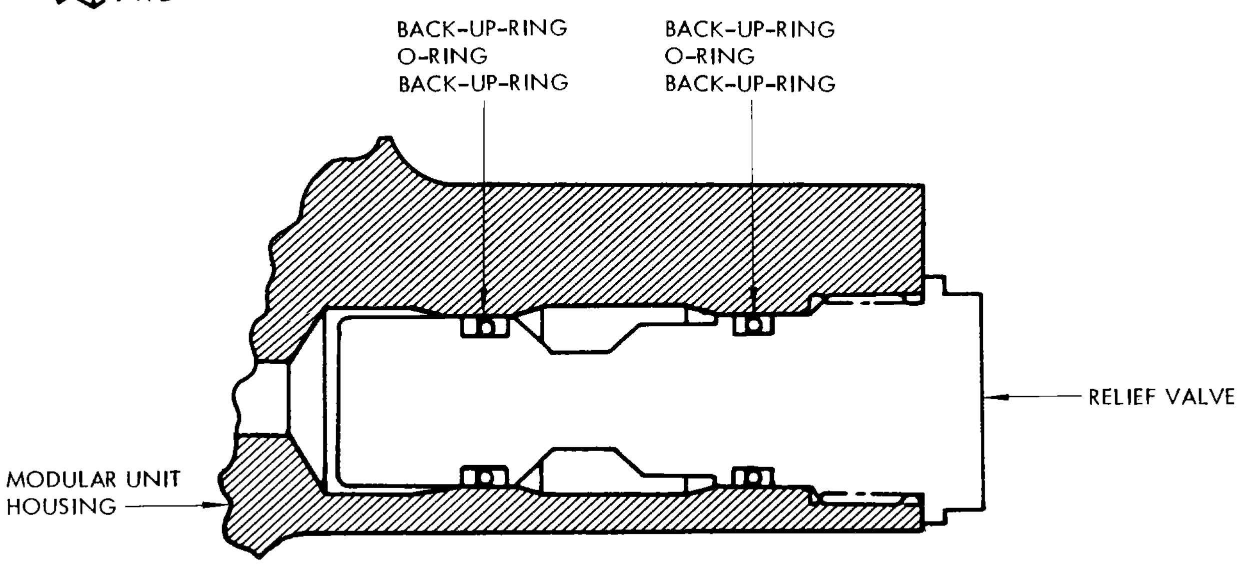


System B Hydraulic Pressure Filter Servicing
Figure 301

SYSTEM B PRESSURE RELIEF VALVE - REMOVAL/INSTALLATION

1. General
   A. The system B pressure relief valve is installed in the system B module unit which is mounted on the forward bulkhead of the right wheel well.
   B. A container will be necessary to catch fluid when removing the relief valve. Should any fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Material
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove System B Pressure Relief Valve
   A. Depressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B - MP.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Unscrew pressure relief valve (Fig. 401) and remove from module unit.
   D. Install protective plug in open port of module unit.
4. Install System B Pressure Relief Valve
   A. Apply assembly lube or hydraulic fluid to all O-rings and to threads of relief valve to facilitate installation.
   B. Install O-ring between backup rings in each relief valve groove (Fig. 401).
   C. Remove protective plug and screw relief valve into module housing. Apply 200 to 275 inch-pounds of torque to relief valve and secure with lockwire.
   D. Pressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B - MP.
   E. Check relief valve for leaks.



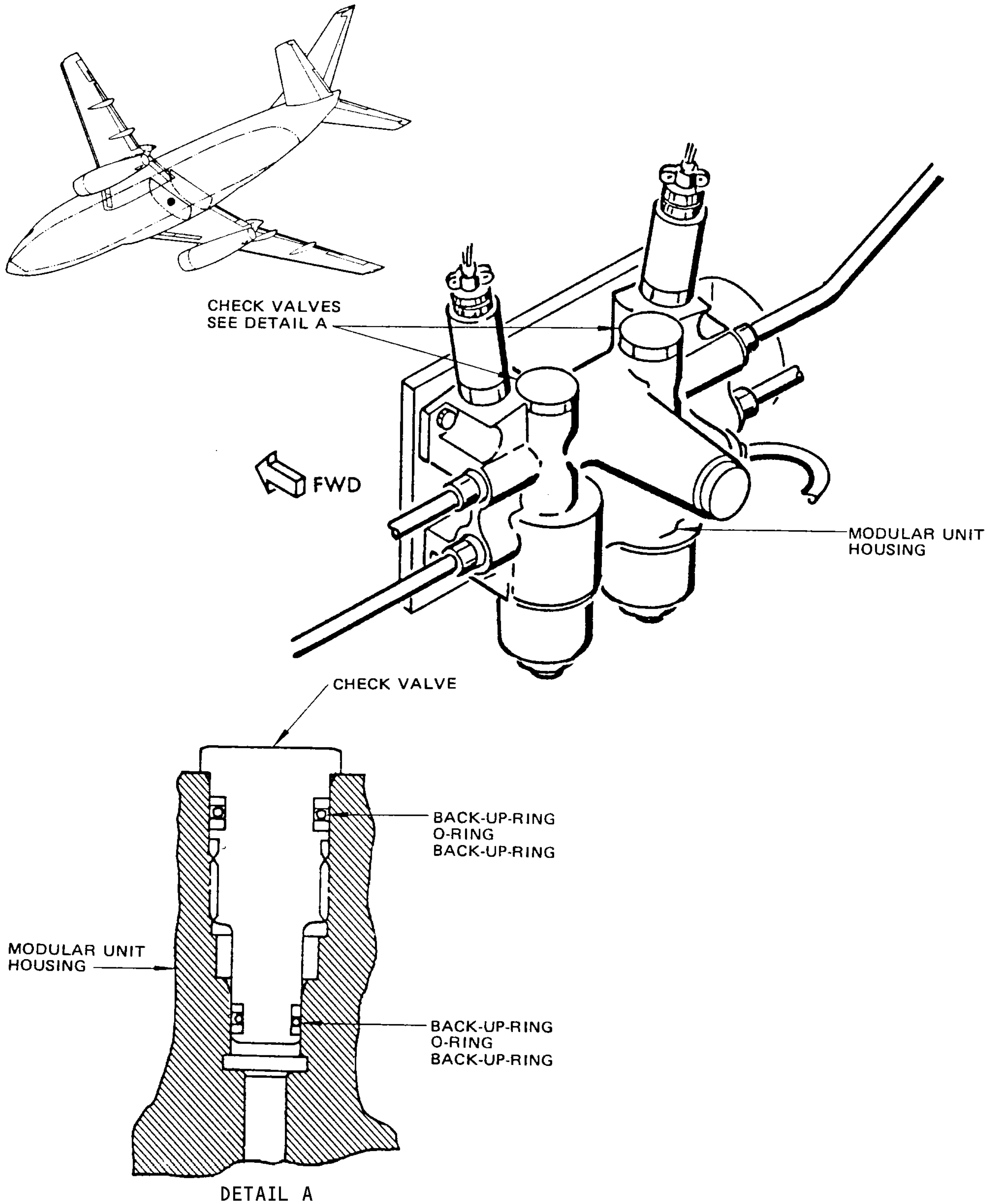


DETAIL A

System B Pressure Relief Valve Installation
Figure 401

SYSTEM B CHECK VALVES - REMOVAL/INSTALLATION

1. General
   A. The system B check valves are installed in the system B module unit which is mounted on the forward bulkhead in the right wheel well.
   B. A container will be necessary to catch hydraulic fluid when removing either of the check valves from the module unit. Should any fluid spil1 on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Material
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove System B Check Valve
   A. Depressurize hydraulic system B. Refer to Hydraulic System B - MP.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Unscrew and remove check valve from module unit.
   D. Install protective plug in open port of module unit.
4. Install System B Check Valve
   A. Apply assembly lube or hydraulic fluid to all O-rings and to the threads of check valve to facilitate installation.
   B. Install O-ring with backup rings in each groove of check valve (Fig. 401).
   C. Remove protective plug and screw check valve into module housing. Apply 200 to 250 inch-pounds of torque to check valve.
   D. Pressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B - MP.
   E. Examine check valve for leakage.
   F. Secure check valve with lockwire.

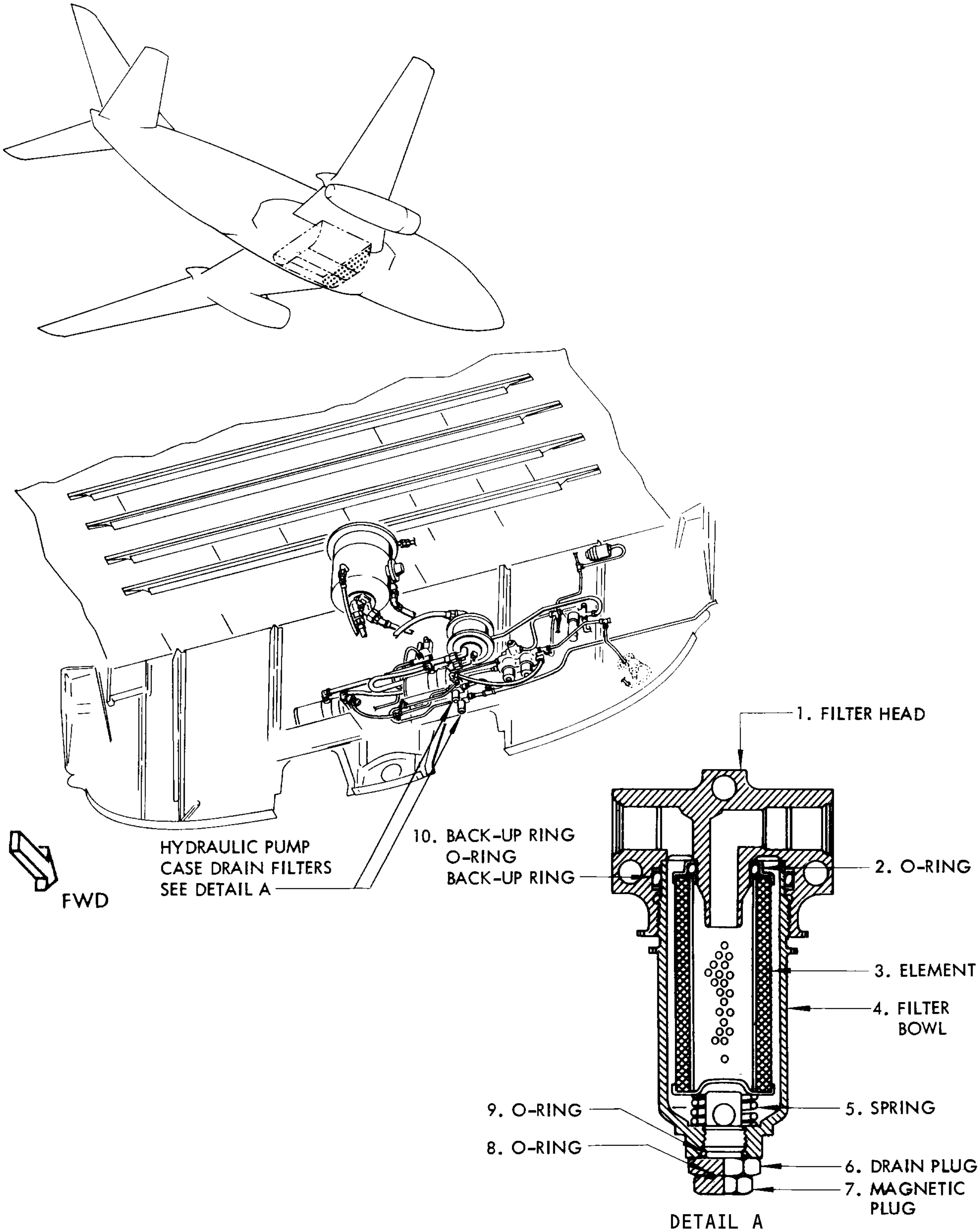


System B Check Valve Installation
Figure 401

SYSTEM B HYDRAULIC PUMP CASE DRAIN FILTER - UNIT SERVICING

1. General
   A. The hydraulic pump case drain filter element should be removed and checked at regular intervals. Between these intervals the magnetic plug in the filter case should be removed and checked for metal contamination. If excessive metal is found, the associated pump should be removed and the system checked and flushed (Ref 29-12-0, Hydraulic System B - MP and I/C).
   B. A container will be necessary to catch fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate (Ref Chapter 12, Cleaning and Washing).
   C. The servicing procedures for both system B case drain filters are identical, therefore only one procedure is given.
2. Equipment and Material
   A. Skydrol Assembly Lube - MCS 852 or Hydraulic Fluid - BMS 3-11 (Ref. 20-30-21)
3. Check Case Drain Filter Magnetic Plug
   A. Depressurize hydraulic reservoir (Ref 29-09-300 MP).
   B. Unscrew magnetic plug (7, Fig. 301) and check for metal contamination on plug. Check for contamination in hydraulic fluid lost during removal of plug.
   C. Place new O-ring (8) on magnetic plug. Apply assembly lube or hydraulic fluid to O-ring and threads of magnetic plug, then screw plug into drain plug (6). Hold drain plug and tighten magnetic plug to 15-20 pound-inches.
   D. Lockwire magnetic plug and drain plug.
4. Removal/Installation System B Pump Case Drain Filter Element
   A. Remove Case Drain Filter Element
      (1) Open SYSTEM B PUMP NORMAL and ALTERNATE circuit breakers on P6 load control center panel.
      (2) Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
      (3) Disconnect system B pump supply hose at the reservoir quick disconnect fitting to prevent fluid from draining through pump.
      (4) Unscrew filter bowl (4, figure 301) from filter head (1). Remove bowl with filter element (3).
      (5) Remove filter element and spring (5). Check element and bowl for metal contamination.
      (6) Replace paper filter element (3) and clean filter bowl, magnetic plug and spring.
   B. Install Case Drain Filter Element
      (1) Insert backup ring, O-ring and backup ring (10, figure 301) in filter head groove.
      (2) Insert O-ring (2) in filter element groove.
      (3) Install spring (5) and filter element (3) in filter bowl (4).

(4) Lubricate threads lightly with assembly lube or hydraulic fluid and screw filter bowl (4) into filter head (1). Apply a torque of 50 to 75 pound-inches to filter bowl and lockwire.
(5) Connect pump supply hose to reservoir quick disconnect fitting.
(6) Close SYSTEM B PUMP NORMAL and ALTERNATE circuit breakers on P6 load control center panel.
(7) Pressurize system B hydraulic system using the applicable pump.Refer to 29-12-0, Hydraulic System B - MP.
(8) Check filter for leaks.



System B Hydraulic Pump Case Drain Filter Servicing
Figure 301

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SYSTEM B HYDRAULIC PUMP CASE DRAIN FILTER - REMOVAL/INSTALLATION

1. General
   A. The maintenance practices for the system B hydraulic pump case drain filters are identical, therefore only one procedure is given.
   B. A container will be necessary to catch any fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate. See Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Case Drain Filter
   A. Open SYSTEM B NORMAL and ALTERNATE circuit breakers on P6 load control center.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Disconnect system B pump supply hose at the reservoir quick disconnect fitting to prevent fluid from draining through pump.
   D. Disconnect hydraulic lines from case drain filter and cap lines (Fig. 401).
   E. Remove mounting bolts and remove filter from mounting bracket.

      S 214-001
      (1) Examine the filter element, the filter bowl, and the fluid in the filter bowl for metal contamination.
         (a) AIRPLANES WITH ABEX PUMPS;
         If you find a small quantity of metal particles that have equal dimensions, then replace the filter and do an operational test of the pump (AMM 29-12-21/501). Examine the filter again at the scheduled filter change interval.

         NOTE: It is not necessary to replace a pump if the quantity of metal particles is small and they have equal dimensions. The filter can have more particles during initial operation of a new pump while mating parts wear away small surface defects. It is not necessary to replace the pump if more small particles are found at the next filter change after installation of a new pump.

(b) AIRPLANES WITH ABEX PUMPS;
If you find a large quantity of small metal particles, large metal particles that are not of equal dimensions, or a large quantity of steel particles, then replace the pump at the next maintenance opportunity (AMM 29-12-21/401).

NOTE: A large quantity of small metal particles, or large metal particles that are not of equal dimensions, can be an indication of an unsatisfactory pump. The particles are usually bronze mixed with a small quantity of steel. A large quantity of steel particles is an indication of unsatisfactorily worn bearings.

(c) Write down the results of the filter inspection and give them to the pump overhaul facility.

NOTE: The filter inspection results can be used as an aid to find the condition of the pump. A pump with an unsatisfactory bearing can pass the functional test and be returned to service with no fault found. Giving the filter inspection data to the overhaul facility can prevent the return of an unsatisfactory pump to service.

CAUTION: FLUSH THE HYDRAULIC LINES TO REMOVE UNWANTED METAL CONTAMINATION. IF THE LINES ARE NOT FLUSHED, THEN THE REMAINING METAL CONTAMINATION CAN BE FOUND AT THE NEXT FILTER CHANGE. IF A LARGE QUANTITY OF METAL CONTAMINATION STAYS IN THE LINES, THEN THE FILTER CAN BECOME BLOCKED. A CONTAMINATED FILTER CAN CAUSE AN UNWANTED REMOVAL OF A SATISFACTORY PUMP. A BLOCKED FILTER CAN CAUSE A PUMP TO FAIL.

(d) If a pump is removed because metal contamination is found in the filter, then flush the hydraulic lines and replace the related filter elements (AMM 29-00-00/201).

4. Install Case Drain Filter

A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid.

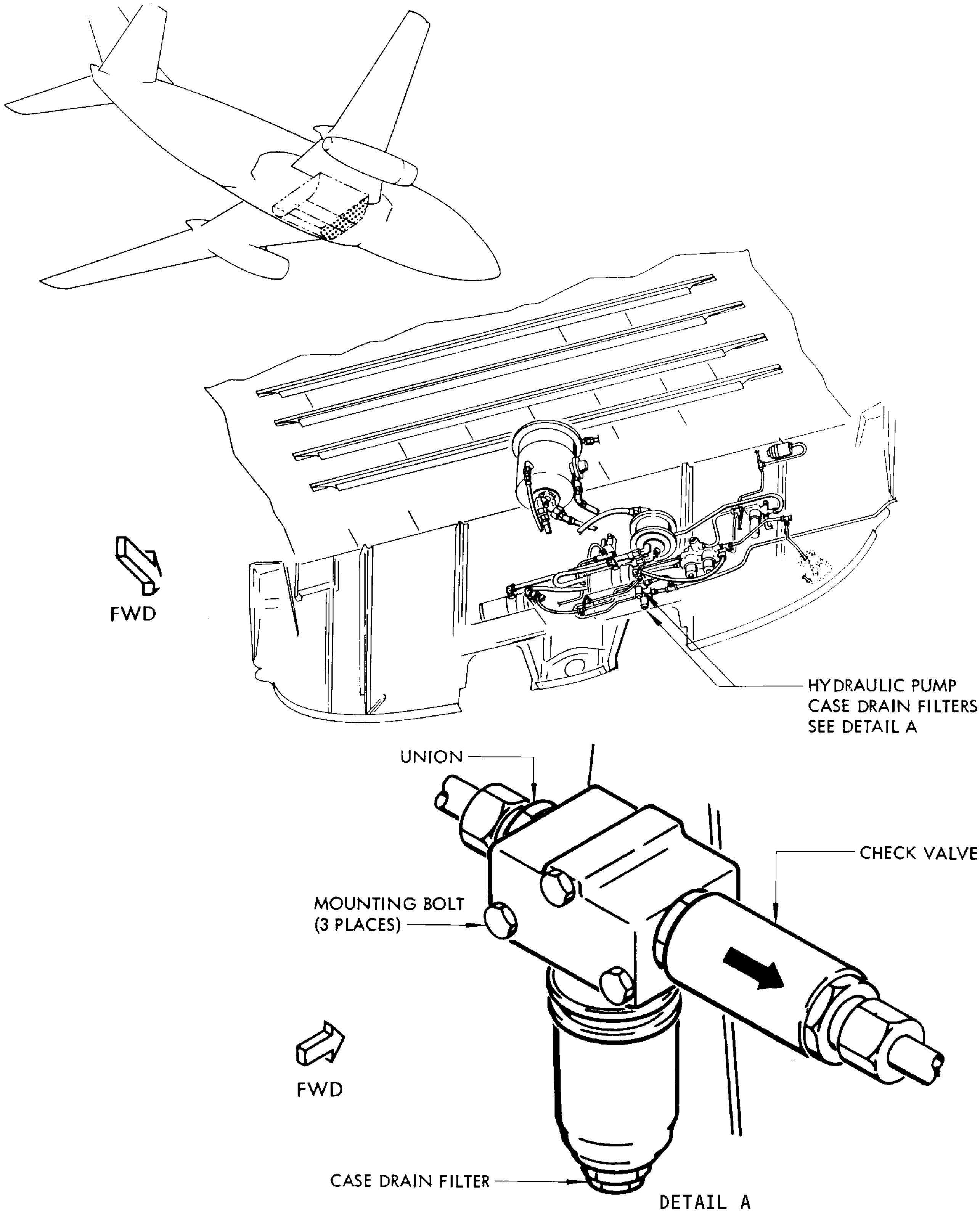
B. Install O-ring and check valve (Fig. 401) on case drain filter.

CAUTION: INSTALL CHECK VALVE SUCH THAT DIRECTION ARROW ON CHECK VALVE AGREES WITH CASE DRAIN FILTER METAL-CAL.

C. Install union and O-ring in the remaining case drain filter port.
D. Position filter assembly on mounting bracket and install filter mounting bolts.
E. Remove caps from hydraulic lines and connect hydraulic lines to case drain filter and check valve.
F. Reconnect pump supply hose to system B reservoir quick disconnect fitting.

<u>CAUTION</u>: WHEN INSTALLING PUMP SUPPLY LINE QUICK DISCONNECT FITTING, ENSURE THAT INDICATOR PINS ARE EXTENDED. IF PINS ARE NOT EXTENDED, FLUID SUPPLY TO PUMP WILL BE RESTRICTED OR COMPLETELY STOPPED, AND PUMP DAMAGE OR OVERHEATING MAY RESULT.

G. Pressurize hydraulic reservoirs (Ref 29-09-300 MP).
H. Close SYSTEM B NORMAL and ALTERNATE circuit breakers and pressurize hydraulic system B using applicable pump (Ref 29-12-0 MP).
I. Check filter for leaks.



System B Hydraulic Pump Case Drain Filter Installation
Figure 401

SYSTEM B HYDRAULIC RETURN FILTER - UNIT SERVICING

1. General
   A. A container will be necessary to catch fluid when removing the filter bowl. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Prepare Return Filter for Servicing
   A. Depressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B-MP.
   B. Depressurize system B reservoir. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Open system B pump circuit breakers on P6-11 and P6-12 panels.
4. Replace Return Filter Element
   A. Remove Return Filter Element
      (1) Remove filter bowl (4, Fig. 301).

      NOTE: When filter bowl is removed, shutoff valve (2) closes and prevents fluid from draining from the system.

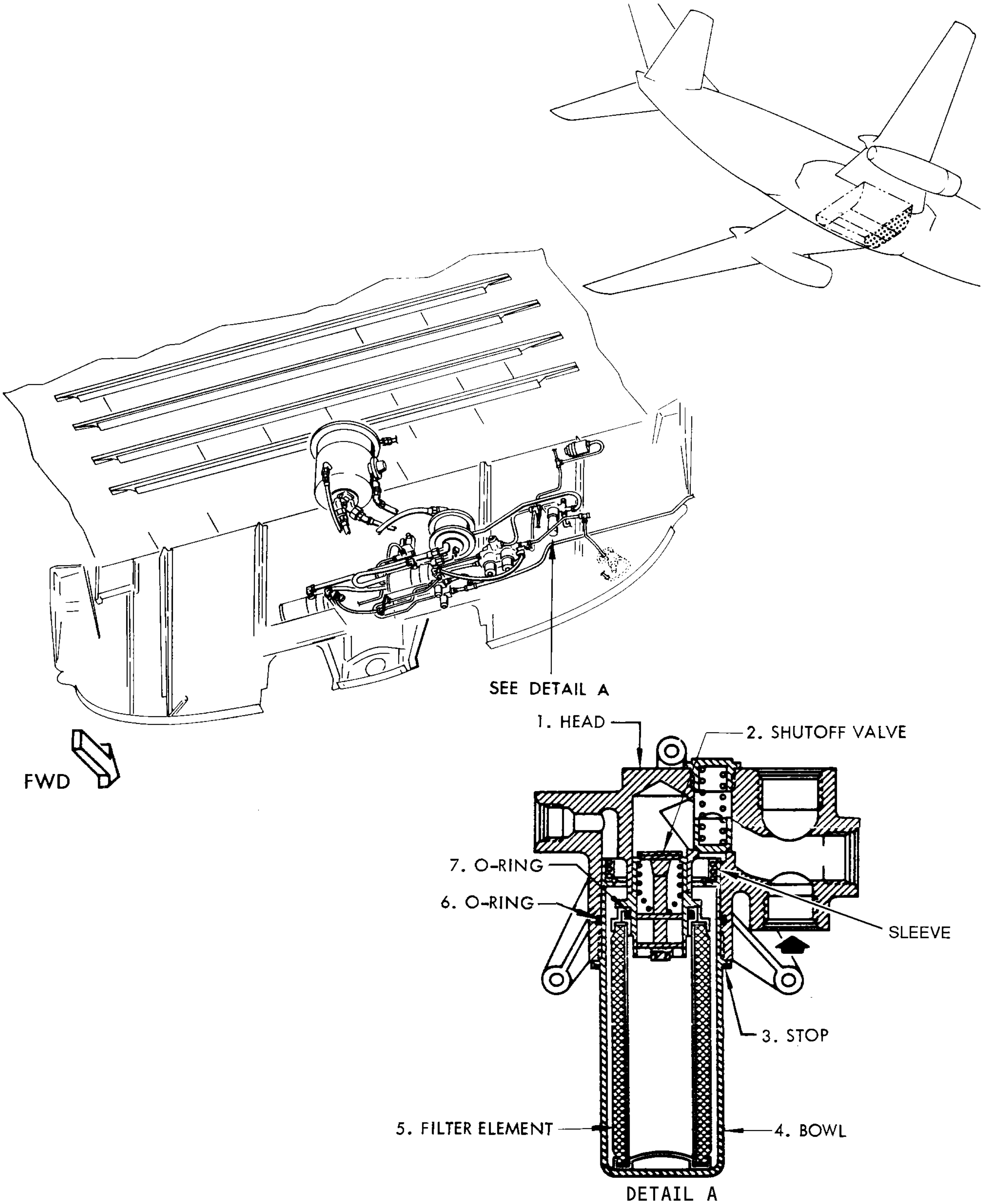
      (2) Remove filter element (5) from filter bowl.
      (3) Clean filter bowl (4) and filter head (1) thoroughly and dispose of element.
   B. Install Return Filter Element
      (1) Lubricate O-rings and filter bowl threads with assembly lube or hydraulic fluid.
      (2) Install O-ring (7, Fig. 301) on filter element (5) and place element in filter bowl.
      (3) Deleted.
      (4) Screw filter bowl (4) into filter head (l), hand tighten filter bowl until it reaches stop (3). Do not use wrench.

      CAUTION: DURING INSTALLATION, IT IS IMPERATIVE THAT EXTREME CARE BE TAKEN TO PREVENT IMPURITIES FROM ENTERING THE SYSTEM.

      (5) Pressurize system B reservoir (Ref 29-09-300).
      (6) Pressurize system B hydraulic system and check filter bowl for leaks (Ref 29-12-0).

(7) Lockwire filter bowl.

<u>NOTE</u>: If leakage occurs at the filter bowl, replace the hydraulic return filter assembly (Ref 29-12-81/401). The leaking O-ring (6) is covered by a sleeve when the filter bowl is removed. Special tools are required to disassemble the filter to permit replacement of the O-ring.



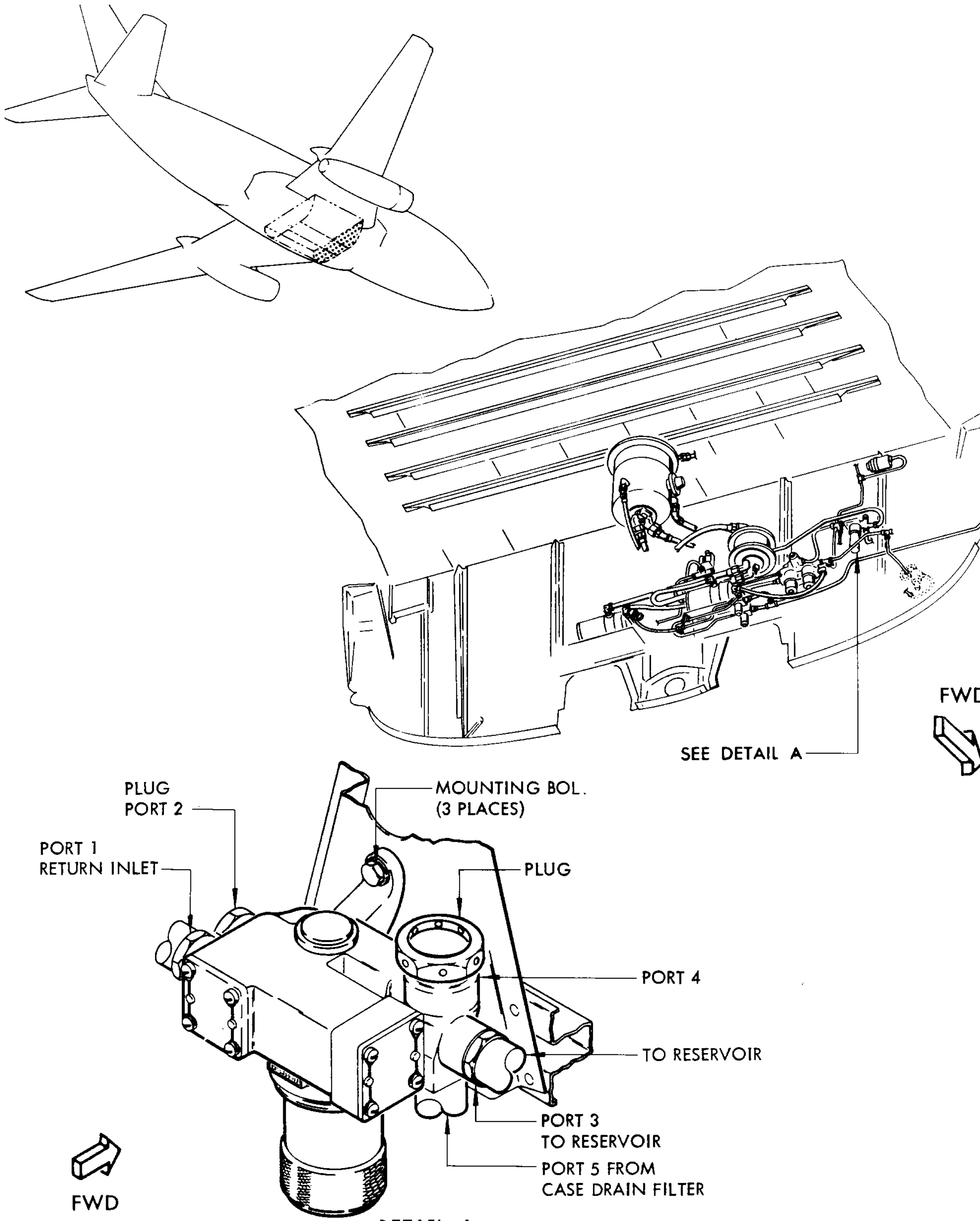
System B Hydraulic Return Filter Servicing
Figure 301

SYSTEM B HYDRAULIC RETURN FILTER - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Return Filter
   A. Depressurize hydraulic system B. Refer to 29-12-0, Hydraulic System B - MP.
   B. Depressurize system B reservoir. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Open system B pump circuit breakers on P6-11 and P6-12 panels.
   D. Remove hydraulic lines from filter head (Fig. 401) and install protective covers.
   E. Remove filter mounting bolts and remove filter.
4. Install Return Filter
   A. Install union and O-ring in ports 1, 3 and 5 (Fig. 401). Lubricate with assembly lube or hydraulic fluid.
   B. Check that plugs in ports 2 and 4 are tight and lockwired.
   C. Check that filter bowl is tight and lockwired.
   D. Position filter on mounting bracket and install mounting bolts (Fig. 401).
   E. Connect hydraulic lines to filter.

   CAUTION: DURING INSTALLATION, IT IS IMPERATIVE THAT EXTREME CARE BE TAKEN TO PREVENT IMPURITIES FROM ENTERING THE SYSTEM.

   F. Pressurize hydraulic reservoirs (Ref 29-09-300).
   G. Pressurize hydraulic system B and check filter and connections for leaks (Ref 29-12-0 .



DETAIL A

System B Hydraulic Return Filter Installation
Figure 401

SYSTEM B HYDRAULIC FLUID HEAT EXCHANGER - REMOVAL/INSTALLATION

1. General
   A. The heat exchanger for hydraulic system B is installed in the bottom of No. 2 fuel tank. A container will be necessary to catch any fluid when removing the heat exchanger. Should any fluid spill on the airplane, the affected area must be decontaminated (AMM Chapter 12, Cleaning and Washing).
   B. Removal and installation of the heat exchanger requires entry into the No. 2 fuel tank. Refer to AMM Chapter 28, Fuel Storage System, for precautionary measures and procedures before attempting removal or installation of the heat exchanger.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove System B Hydraulic Fluid Heat Exchanger
   A. Depressurize hydraulic system B (AMM 29-12-0/201 Maintenance Practices).
   B. Depressurize hydraulic reservoirs (AMM 29-09-300/201 Maintenance Practices).
   C. Defuel fuel tank No. 2 and remove fuel tank access panel just forward of heat exchanger (AMM 28-23-00/201, Defueling - Maintenance Practices).
   D. At the aft side of the rear spar (Fig. 401) where heat exchanger inlet and outlet lines pass through, disconnect hydraulic fittings (1). Remove and cap hydraulic lines.
   E. Remove unions (6), bulkhead nuts (7) and washers (8).
   F. Prepare fuel tank for entering to remove heat exchanger.

      WARNING: THE FUEL TANK IS A HAZARDOUS AREA (REFER AMM CHAPTER 28, FUEL STORAGE SYSTEM). KNOW PRECAUTIONS BEFORE ENTERING FUEL TANK.

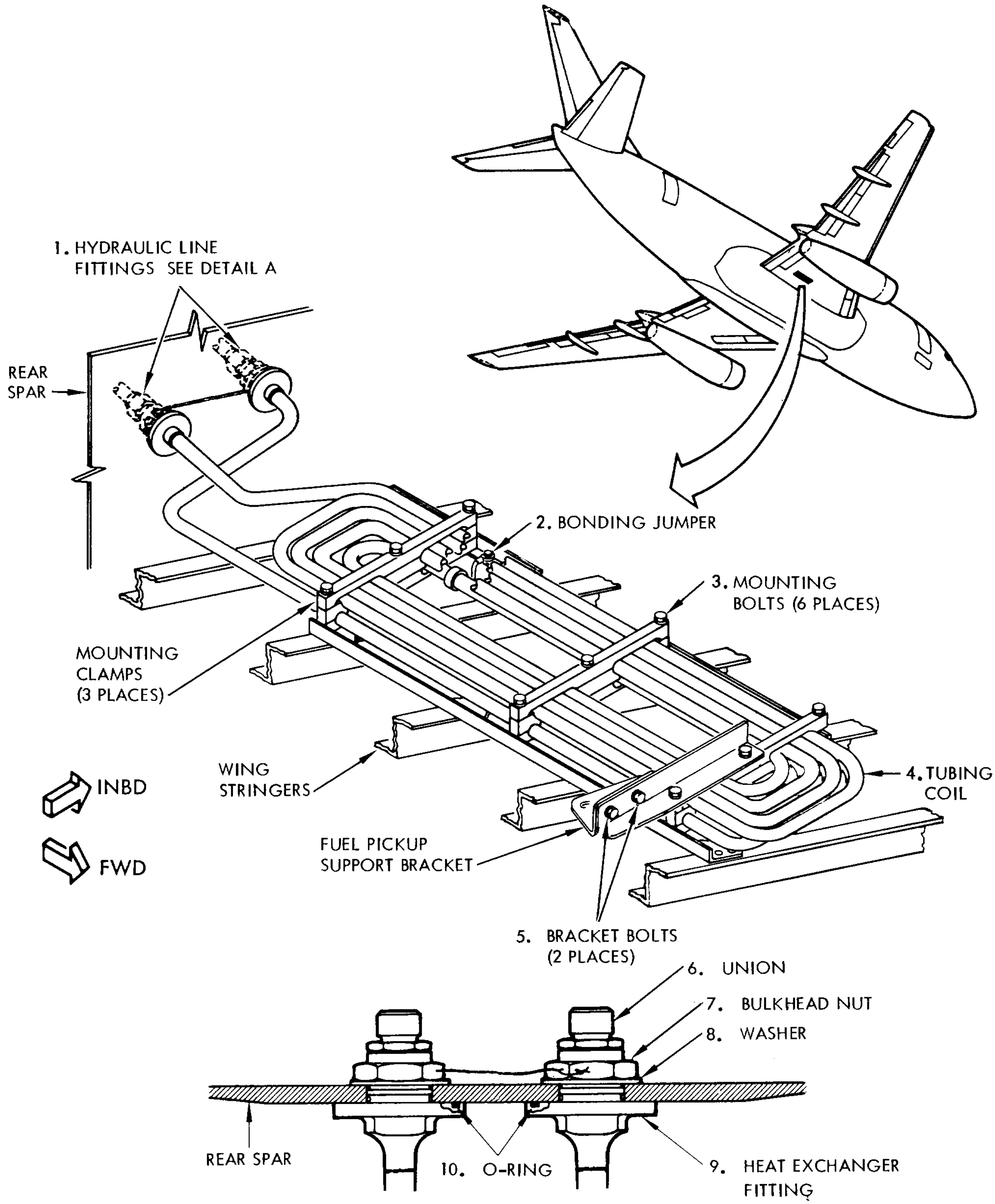
   G. Remove electrical bonding jumper (2) from tubing coil (4).
   H. Remove heat exchanger mounting bolts (3) and (5).
   I. Loosen heat exchanger fittings from rear spar.

      NOTE: O-rings may cause fittings to stick to spar.

   J. Remove heat exchanger through tank access opening.

      CAUTION: ENSURE ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING THE FUEL TANK.

4. Install System B Hydraulic Fluid Heat Exchanger
   A. Insert O-rings (10) in grooves of heat exchanger fittings (Fig. 401).



System B Hydraulic Fluid Heat Exchanger Installation
Figure 401

B. Pass heat exchanger through the wing tank access opening with the inlet and outlet ports going through the opening first.

<u>WARNING</u>: FUEL TANK IS A HAZARDOUS AREA (AMM CHAPTER 28, FUEL STORAGE SYSTEM). KNOW THE PRECAUTIONS BEFORE ENTERING THE TANK.

C. Enter the fuek tank and position inlet and outlet fittings so that they enter the holes in the rear spar.

<u>WARNING</u>: HYDRAULIC FLUID MAY CONTAIN TRICRESYLPHOSPHATE. THIS ADDITIVE IS POISONOUS AND CAN BE READILY ANSORBED THROUGH THE SKIN. USE NEOPRENE GLOVES AND MAKE CERTAIN THAT THIS OIL DOES NOT REMAIN ON SKIN. USE IN A WELL VENTILATED AREA. AVOID PROLONGED BREATHING OF VAPORS. AVOID EYE AND REPEATED SKIN CONTACT. KEEP AWAY FROM SPARKS AND FLAMES.

<u>NOTE</u>: Ensure the O-rings are properly seated, and tha the sealing surfaces on the rear spar are clean and free from flaws. Apply assemply lube or hydraulic fluid to all O-rings and fittings to facilitate installation.

D. Align the holes and install the mounting bolts (3) and (5).

<u>CAUTION</u>: ENSURE THAT ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING THE TANK.

E. At the aft face of the rear spar web, where the heat exchanger fittings (1) pass through, install the fittings as follows:
   (1) Install washers (8) and bulkhead nuts (7). Lockwire nuts.
   (2) Install unions (6) on the heat exchanger inlet and outlet fittings. Lubricate with assembly lube or hydraulic fluid.

   <u>CAUTION</u>: EXERCISE CARE TO PREVENT IMPURITIES FROM ENTERING THE HYDRAULIC SYSTEM.

   (3) Remove the protective caps from the hydraulic lines and connect them to the unions.
F. Install the fuel tank access panel (AMM Chapter 28, Fuel Tank Access Panels - R/I).
G. Service the hydraulic reservoirs (AMM Chapter 12, Hydraulic Fluid Servicing).
H. Refuel fuel tank No. 2 to a minimum of 250 gallons of fuel (AMM Chapter 12, Servicing).
I. Pressurize hydraulic system B using electric motor-driven pumps (AMM 29-12-0).

J. Check the heat exchanger fittings for any leakage.

K. Check the fuel tank for leakage in the areas that were reworked by the heat exchanger removal and installation (AMM Chapter 28, Fuel Storage System).

SYSTEM B HYDRAULIC FLUID HEAT EXCHANGER - REMOVAL/INSTALLATION

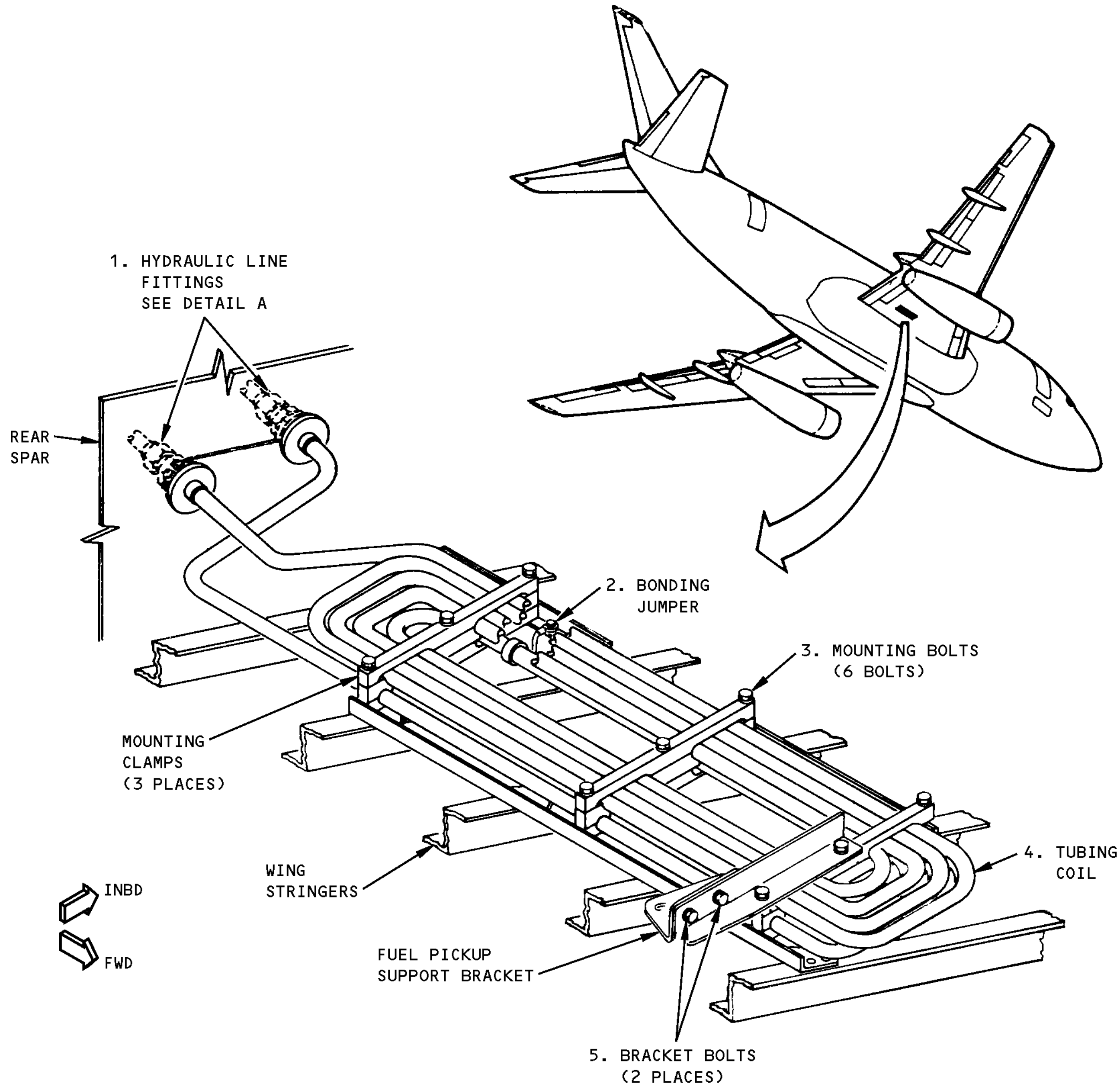
1. General
   A. The heat exchanger for system B is installed in the bottom of No. 2 fuel tank. A container will be necessary to catch any fluid when removing the heat exchanger. Should any fluid spill on the airplane, the affected area must be decontaminated (AMM Chapter 12, Cleaning and Washing).
   B. Removal and installation of the heat exchanger requires entry into the No. 2 fuel tank. Refer to AMM Chapter 28, Fuel Storage System, for precautionary measures and procedures before attempting removal or installation of the heat exchanger.
2. Consumable Materials
   A. Skydrol Assembly Lube - MCS 352B
   B. Hydraulic Fluid - BMS 3-11
   C. Sealant - BMS 5-26, Type 2
   D. Alodine 600, Type 2, Class D - Protective Coating
   E. Abrasive Paper - 100, 320 or finer grit
   F. Primer - BMS 10-20, Type 2
   G. Enamel Finish - BMS 10-60, Type 1 or Type 2
3. Prepare System B Hydraulic Fluid Heat Exchanger for Removal

   WARNING: DO NOT USE AIRPLANE ELECTRICAL POWER WHEN FUEL TANK ACCESS PANELS ARE OPEN. WHEN WORKING IN THE VICINITY OF THE OPEN FUEL TANKS, DO NOT USE ANY TOOLS OR EQUIPMENT THAT HAVE ANY POTENTIAL IGNITION SOURCE. A FIRE OR EXPLOSION CAN OCCUR IF FUEL VAPOR IS IGNITED BY SPARK(S) FROM ELECTRICAL EQUIPMENT. A FIRE OR EXPLOSION CAN CAUSE INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT.

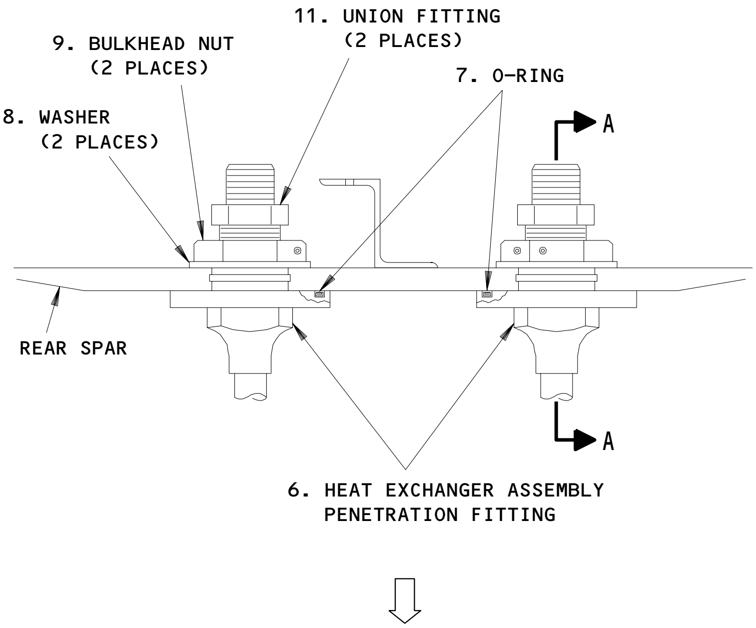
   A. Depressurize hydraulic system B (AMM 29-12-0/201 Maintenance Practices).
   B. Depressurize hydraulic reservoirs (AMM 29-09-300/201 Maintenance Practices).
   C. Defuel fuel tank No. 2 and remove fuel tank access panel just forward of heat exchanger (AMM 28-23-00/201, Defueling - Maintenance Practices).

      WARNING: MAKE SURE THAT ALL STEPS TO PREPARE THE FUEL TANK ARE DONE CORRECTLY BEFORE ENTERING THE EMPTY FUEL TANK. IF YOU DO NOT FOLLOW ALL INSTRUCTIONS, SERIOUS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

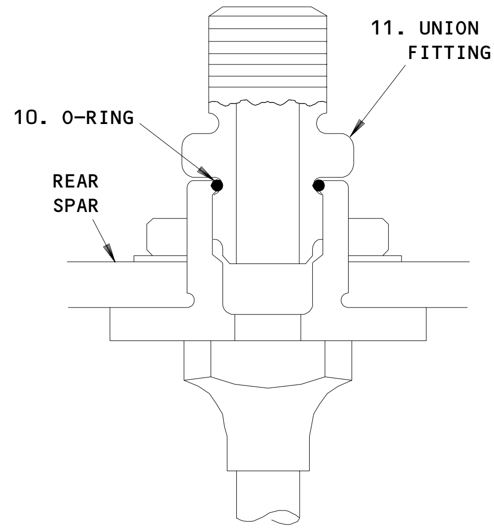
   D. Prepare fuel tank for entering to remove heat exchanger.
4. Remove System B Hydraulic Fluid Heat Exchanger
   A. At the aft side of the rear spar (Fig. 401) where heat exchanger inlet and outlet lines pass through, disconnect hydraulic fittings (1). Remove and cap hydraulic lines.
   B. If the aileron control cables are loosen for other maintenance purposes, remove pully bracket assembly for easier access to work areas.



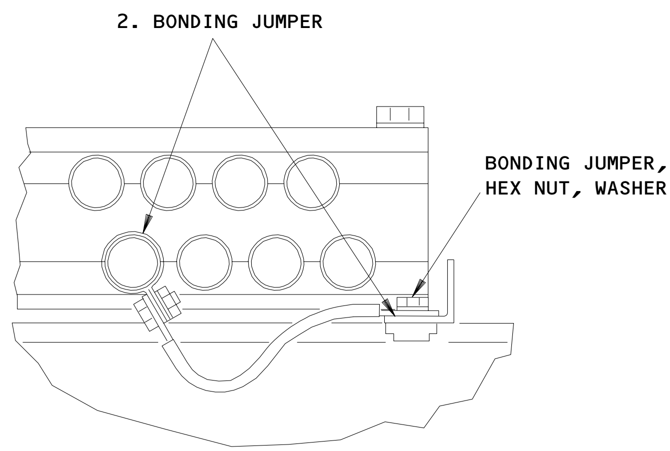
System B Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 1)



DETAIL B

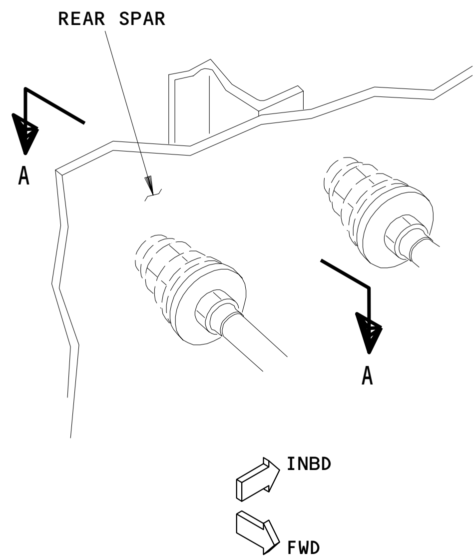


A-A

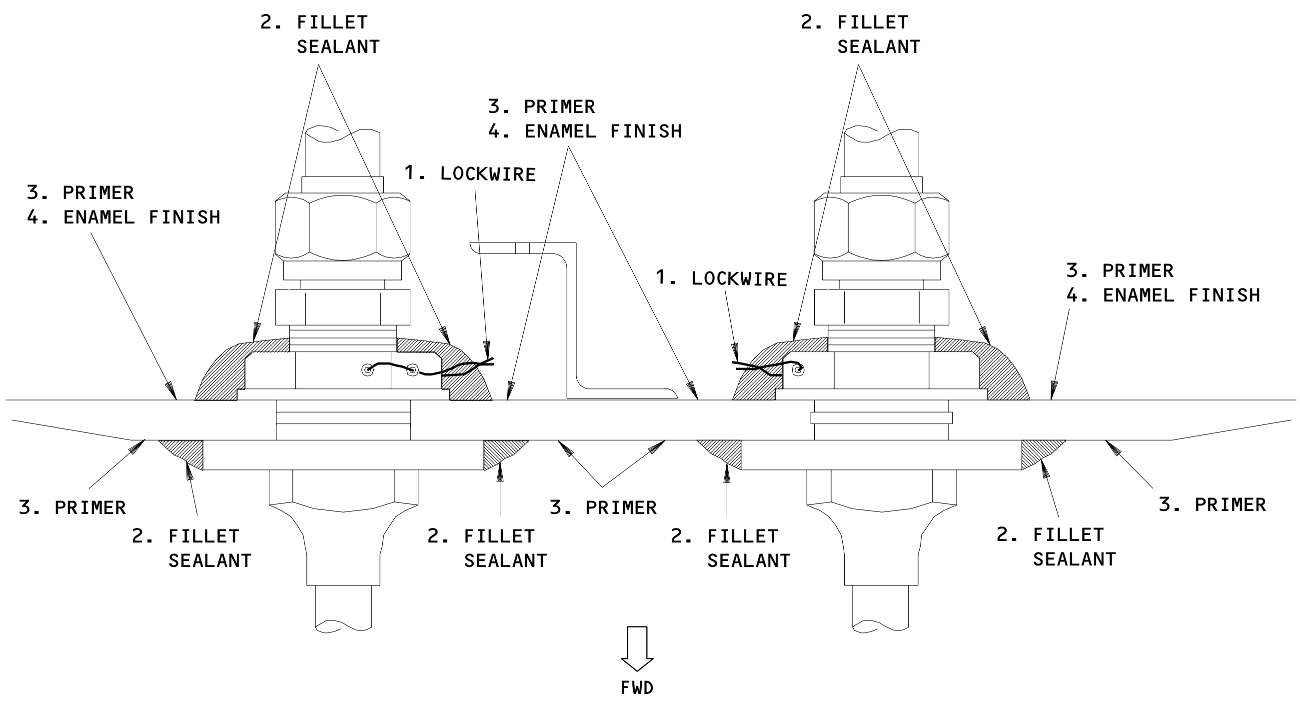


DETAIL C

System B Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 2)



RIGHT SIDE SHOWN,
LEFT SIDE ALMOST THE SAME



A-A

System B Hydraulic Fluid Heat Exchanger Installation
Figure 401 (Sheet 3)

C. Remove unions (11), bulkhead nuts (9) and washers (8).
D. Remove electrical bonding jumper (2) from tubing coil.
E. Remove the heat exchanger mounting bolts and washers (3).
F. Remove mounting bolts, washers, nuts and bracket (5).

<u>CAUTION</u>: WHEN REMOVING THE BULKHEAD NUTS AT THE AFT SIDE OF THE REAR SPAR, HOLD THE FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, YOU CAN TWIST AND CAUSE DAMAGE TO THE HEAT EXCHANGER TUBES.

G. Remove fillet sealant (AMM 51-31-0/201).

<u>CAUTION</u>: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE FILLET SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

H. Loosen heat exchanger fittings from rear spar.

<u>NOTE</u>: O-rings may cause fittings to stick to spar surface.

I. Carefully remove exchanger through tank access opening.

<u>CAUTION</u>: ENSURE ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE LEAVING FUEL TANK.

5. <u>Install System B Hydraulic Fluid Heat Exchanger</u>

<u>WARNING</u>: DO NOT USE AIRPLANE ELECTRICAL POWER WHEN FUEL TANK ACCESS PANELS ARE OPEN. WHEN WORKING IN THE VICINITY OF THE OPEN FUEL TANKS, DO NOT USE ANY TOOLS OR EQUIPMENT THAT HAVE ANY POTENTIAL IGNITION SOURCE. A FIRE OR EXPLOSION CAN OCCUR IF FUEL VAPOR IS IGNITED BY SPARK(S) FROM ELECTRICAL EQUIPMENT. A FIRE OR EXPLOSION CAN CAUSE INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT.

<u>CAUTION</u>: KEEP THE WORK AREA, WIRES AND ELECTRICAL BUNDLES CLEAN OF METAL PARTICLES AND CONTAMINATION WHEN YOU USE TOOLS. UNWANTED MATERIAL, METAL PARTICLES OR CONTAMINATION CAUGHT IN WIRE BUNDLES CAN CAUSE DAMAGE TO THE BUNDLES. DAMAGED WIRE BUNDLES CAN CAUSE SPARKS OR OTHER ELECTRICAL DAMAGE.

A. Preparation of Electrical Bonding Fay Surfaces
   (1) Remove any debris from the rear spar contact surfaces (AMM 20-10-181/701).

(2) Remove all surface finishes until only bare metal shows. Use paint stripper if necessary and 100 grit or finer abrasives (AMM 20-10-181/701).

NOTE: Use the washer (8) as a guide to measure the finish removal surface areas. The finish removal areas at the forward and aft sides of the rear spar, only need to be a minimum of approximately 0.0625 inch wider than the surfaces where the fitting flanges and the fitting washers touch.

(3) With 320 grit or finer abrasive, remove any remaining anodic surface finish. Make a clean and flat bare metal surface all the way around the penetration holes (AMM 20-10-81/701).

NOTE: The protective anodic surface finish thickness is approximately less than 0.0001 inch.

(4) Examine the rear spar to make sure that the bare metal contact surfaces are bright, flat and clean.

CAUTION: KEEP THE BARE METAL SURFACES EXPOSURE TIME TO A MINIMUM. IF THE BARE METAL SURFACES EXPOSURE TIME IS MORE THAN APPROXIMATELY 4 HOURS, RUB THE BARE SURFACES LIGHTLY AGAIN BEFORE APPLYING THE CONVERSION COATING.

CAUTION: DO NOT APPLY THE CONVERSION COATING ON THE FLANGES OF THE HYDRAULIC HEAT EXCHANGER FITTINGS. IF YOU DO, THE ELECTRICAL RESISTANCE WILL POSSIBLY BE HIGHER THAN THE BONDING REQUIRMENT.

(5) Apply the conversion coating on the bare metal surfaces with a small clean brush (AMM 20-30-31/201).

NOTE: Alodine 600 gives a better electrical conductive coating. Not all types of Alodine are electrically conductive and some types of Alodine can cause a powdery coating if put on the fuel tank paint finishes.

(6) Clean Heat Exchanger fitting flange all the way around with 320 grit or finer abrasive to remove any anodic surface finish.

(7) If necessary, clean Heat Exchanger penetration fitting threads by the dry wipe or solvent cleaning method.

CAUTION: REMOVE ANY CONTAMINATION OF REMAINING ABRASIVE, FINISH AND METAL SURFACE MATERIAL FROM THE FUEL TANKS. IF NOT, CONTAMINATION CAN CAUSE DAMAGE TO EQUIPMENT.

B. Insert O-rings (7) in grooves of heat exchanger penetration fittings (Fig. 401).

C. Pass heat exchanger through wing tank access opening with the inlet and outlet ports going through opening first.

WARNING: MAKE SURE THAT ALL STEPS TO PREPARE THE FUEL TANK ARE DONE CORRECTLY BEFORE ENTERING THE EMPTY FUEL TANK. IF YOU DO NOT FOLLOW ALL INSTRUCTIONS, SERIOUS INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

D. Enter fuel tank and position inlet and outlet fittings so they enter the holes in rear spar.

WARNING: HYDRAULIC FLUID MAY CONTAIN TRICRESYL PHOSPHATE. THIS ADDITIVE IS POISONOUS AND CAN BE READILY ABSORBED THROUGH THE SKIN. USE NEOPRENE GLOVES AND MAKE CERTAIN THAT THIS OIL DOES NOT REMAIN ON SKIN. USE IN A WELL VENTILATED AREA. AVOID PROLONGED BREATHING OF VAPORS. AVOID EYE AND REPEATED SKIN CONTACT. KEEP AWAY FROM SPARKS AND FLAMES.

CAUTION: CLEAN WASHER AND BULKHEAD NUT BY DRY WIPING OR SOLVENT CLEANING METHOD PRIOR TO INSTALLATION. CHECK FOR SIGNS OF DAMAGE, USE NEW NUTS AND WASHERS AS NECESSARY.

NOTE: Ensure that O-rings are properly seated. Apply assembly lube or hydraulic fluid to all O-rings and fittings to facilitate installation.

E. At the aft face of the rear spar web, where heat exchanger penetration fittings (6) pass through, install washers (8) and bulkhead nuts (9) on fittings. DO NOT TIGHTEN.

F. At heat exchanger mounting points, align holes and install mounting bolts and washers through heat exchanger mounting clamps (3).

G. Install bolts, washers and nuts through mounting clamp and bracket (5).

CAUTION: WHEN TIGHTENING THE BULKHEAD NUTS, HOLD THE FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, THE TUBE MAY TWIST AND CAUSE DAMAGE TO THE HEAT EXCHANGER TUBES.

H. Tighten bulkhead nuts on penetration fittings. Torque nuts to 750-785 pound-inches (AMM 20-50-11/201).

<u>WARNING</u>: AN OPEN FUEL TANK IS AN EXPLOSIVE VAPOR AREA. MAKE SURE THAT AN EXPLOSIVE-SAFE BONDING METER IS USED WHEN CHECKING THE ELECTRICAL BONDING RESISTANCE.

<u>CAUTION</u>: MAKE SURE THE BONDING JUMPER OF THE HEAT EXCHANGER IS NOT CONNECTED TO THE WING STRUCTURE. IF SO, YOU CAN GET AN INCORRECT ELECTRICAL RESISTANCE MEASUREMENT AT THE REAR SPAR BONDING SURFACE.

I. Measure the electrical resistance of the penetration fittings and the rear spar. Make sure that the resistance measurement is less than 0.001 ohm, or 1 milliohms, between the fittings and the alodined spar surfaces.
J. Install the bonding jumper (2).
K. Measure the electrical resistance of the bonding jumper. Make sure that the resistance measurement is less than 0.005 ohm, or 5 milliohms, between the bonding surfaces.

<u>CAUTION</u>: WHEN YOU TIGHTEN A UNION FITTING, HOLD THE PENETRATION FITTING WITH A WRENCH AT THE FORWARD SIDE OF THE REAR SPAR. IF NOT, THE FITTING MAY TWIST AND CAUSE DAMAGE TO PARTS.

L. Install O-rings (10) and unions (11) on heat exchanger inlet and outlet fittings. Lubricate with assembly lube or hydraulic fluid. Torque unions to 345-375 pound-inches.

<u>CAUTION</u>: EXERCISE CARE TO PREVENT IMPURITIES FROM ENTERING HYDRAULIC SYSTEM.

<u>CAUTION</u>: WHEN YOU TIGHTEN THE HYDRAULIC TUBES, HOLD THE UNION FITTING WITH A WRENCH. IF NOT, THE TUBES MAY TWIST AND CAUSE DAMAGE TO THE PARTS

M. Remove protective caps from hydraulic lines and connect to unions. Tighten tube fitting nuts.
N. Lockwire (1) bulkhead nuts (Fig. 401).

O. Apply sealant (2) (BMS 5-26) at forward and aft sides of the rear spar, all the way around the penetration fittings and bulkhead nuts.
   (1) The following areas should be covered with sealant:
      (a) On the rear spar surfaces, at a minimum of 0.1875 inch wider than the penetration fitting flange and the washer.
      (b) All of the bulkhead (penetration fitting) nut and washer surfaces.
      (c) A minimum of 2 threads on the penetration fitting.
P. Allow sealant to cure.
Q. Apply primer (3) (BMS 10-20), as necessary, on the visible alodined bare metal surfaces at the forward and aft faces of the rear spar.
R. Apply enamel finish (4) (BMS 10-60), as necessary, on the primered surfaces at the forward and aft faces of the rear spar.
S. If removed, install pully bracket assembly on rear spar.

<u>CAUTION</u>: ENSURE THAT ALL PARTS, TOOLS AND FOREIGN MATERIALS ARE REMOVED BEFORE CLOSING FUEL TANK.

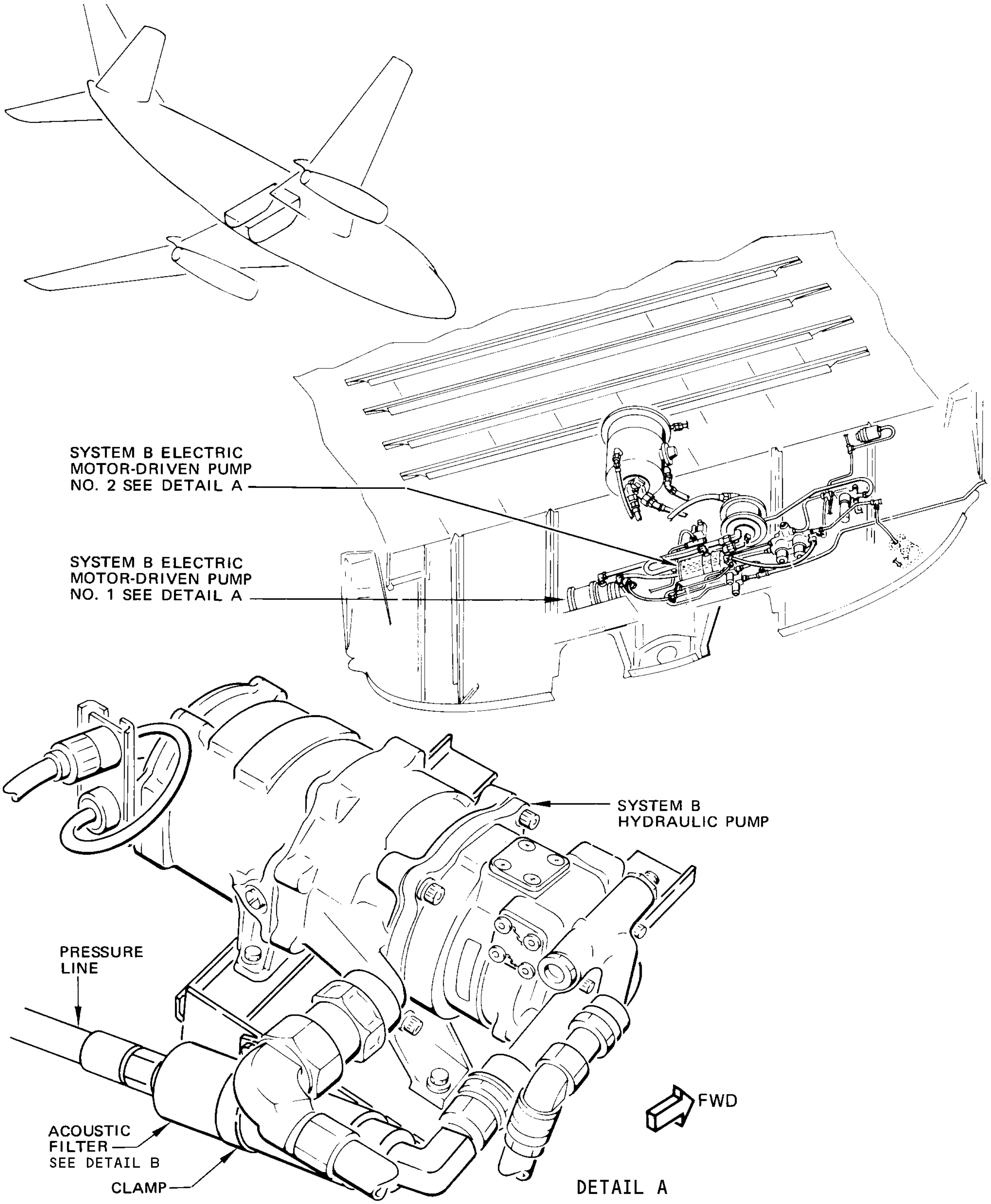
T. Install fuel tank access panels. Refer to AMM Chapter 28, Fuel Tank Access Panels - R/I.
U. Service hydraulic reservoirs. Refer to AMM Chapter 12, Hydraulic Fluid Servicing.
V. Refuel fuel tank No.1 to a minimum of 250 gallons of fuel. Refer to AMM Chapter 12, Servicing.

<u>NOTE</u>: Normally 250 gallons of fuel is required in the No.1 fuel tank to provide adequate hydraulic fluid cooling.

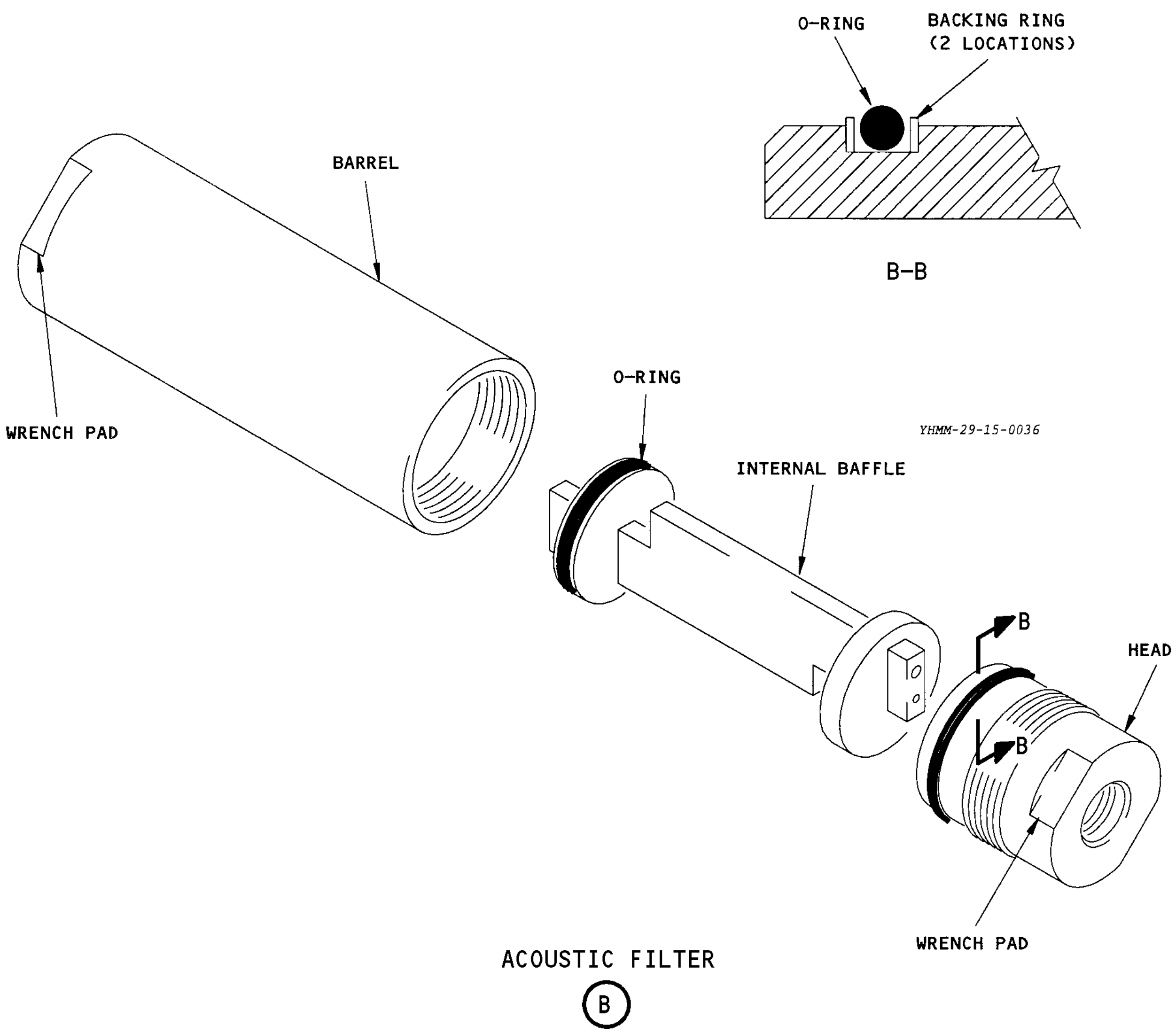
W. Pressurize hydraulic system B by using electric motor-driven pumps (AMM 29-12-0/001)
X. Check heat exchanger fittings for signs of leakage.
Y. Check fuel tank for leakage in areas reworked by heat exchanger removal and installation. Refer to AMM Chapter 28, Fuel System.

SYSTEM B HYDRAULIC PUMP ACOUSTIC FILTER - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid from the disconnected hydraulic lines. Take precaution to prevent spillage of fluid. Should any fluid spill on the airplane, decontaminate. Refer to AMM Chapter 12 - Cleaning and Washing.
   B. The following procedure may be used for either the left or right acoustic filter.
2. Remove Acoustic Filter (Fig. 401)
   A. Open system B pump circuit breakers on P6-11 and P6-12 panels.
   B. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   C. Remove mounting clamp.
   D. Disconnect line from filter.
   E. Remove filter from pump.
3. Check Filter for Metal Particle Contamination (Optional) (Fig 401.)
   A. Use the wrenching flats on the barrel and head then disassemble the filter.
   B. Remove and discard O-ring packings and teflon backing rings.
   C. Flush all surfaces using degreaser BMS 11-7, or equivalent.
   D. Examine all surfaces, the O-ring grooves and threads for defects or contamination.
   E. Install new O-ring packings and backing rings.
   F. Apply lubricant to the threads on head then assemble the unit.
   G. Tighten the head to 40 pound-feet.
   H. Apply sealant, Dow Corning 30-121, or equivalent to the barrel and head joint.
   I. Install lockwire to secure the head to the barrel.
   J. If the filter contained metal particles, accomplish the following:
      (1) Replace the pump (Ref 29-12-21 R/I).
      (2) Flush the hydraulic line between the pressure filter and the pump.
      (3) Check the pressure filter for metal particles (Ref 29-12-0 I/C).
4. Install Acoustic Filter (Fig. 401)
   A. Install acoustic filter on hydraulic pump.
   B. Install mounting clamp.
   C. Connect line to filter.
   D. Close system B pump circuit breaker on P6-11 and P6-12 panels.
   E. Pressurize hydraulic system B using applicable pump (Ref 29-12-0 MP).
   F. Check connections for leaks.



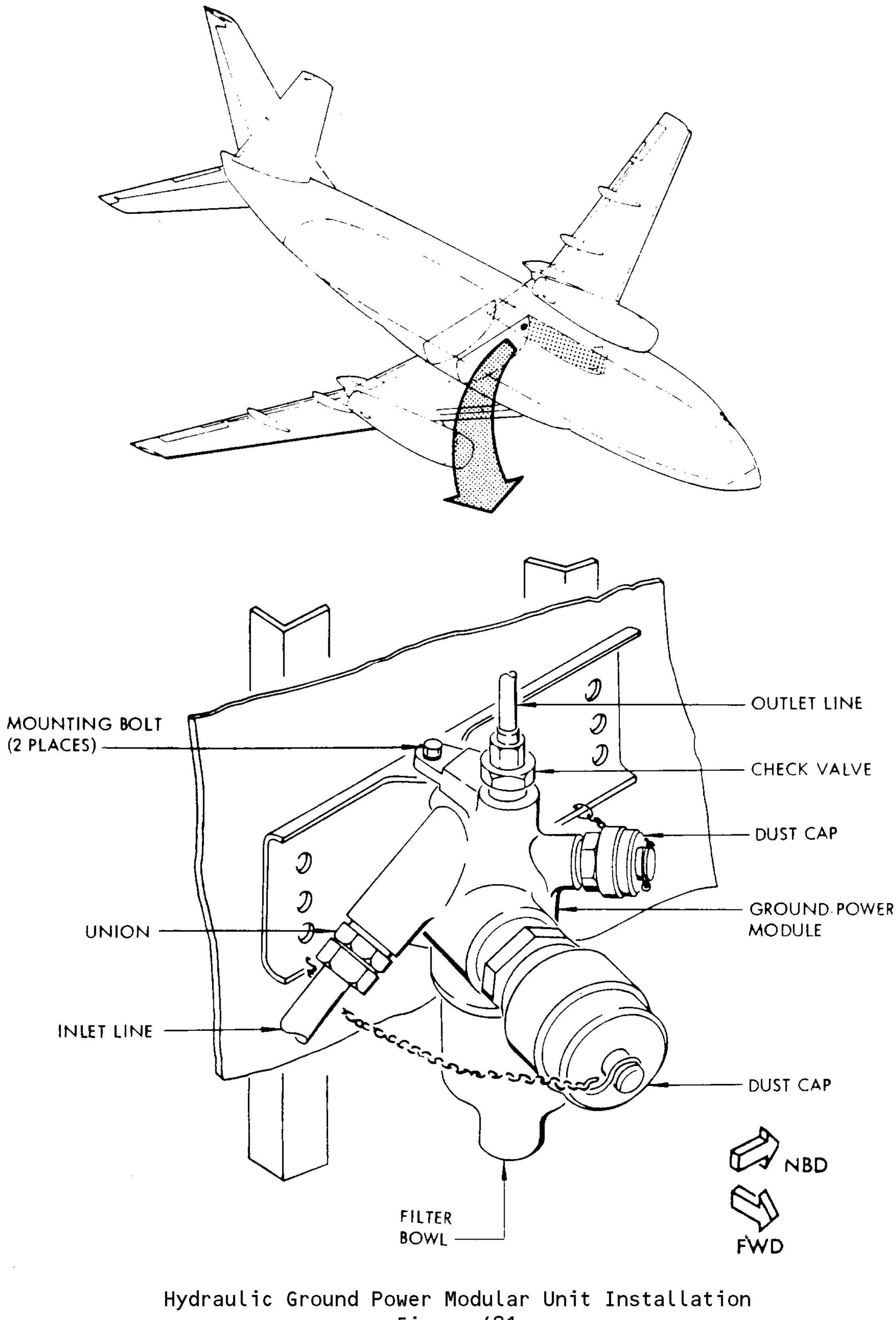
System B Hydraulic Pump Acoustic Filter Installation
Figure 401 (Sheet 1)



System B Hydraulic Pump Acoustic Filter Installation
Figure 401 (Sheet 2)

HYDRAULIC GROUND POWER MODULAR UNIT - REMOVAL/INSTALLATION

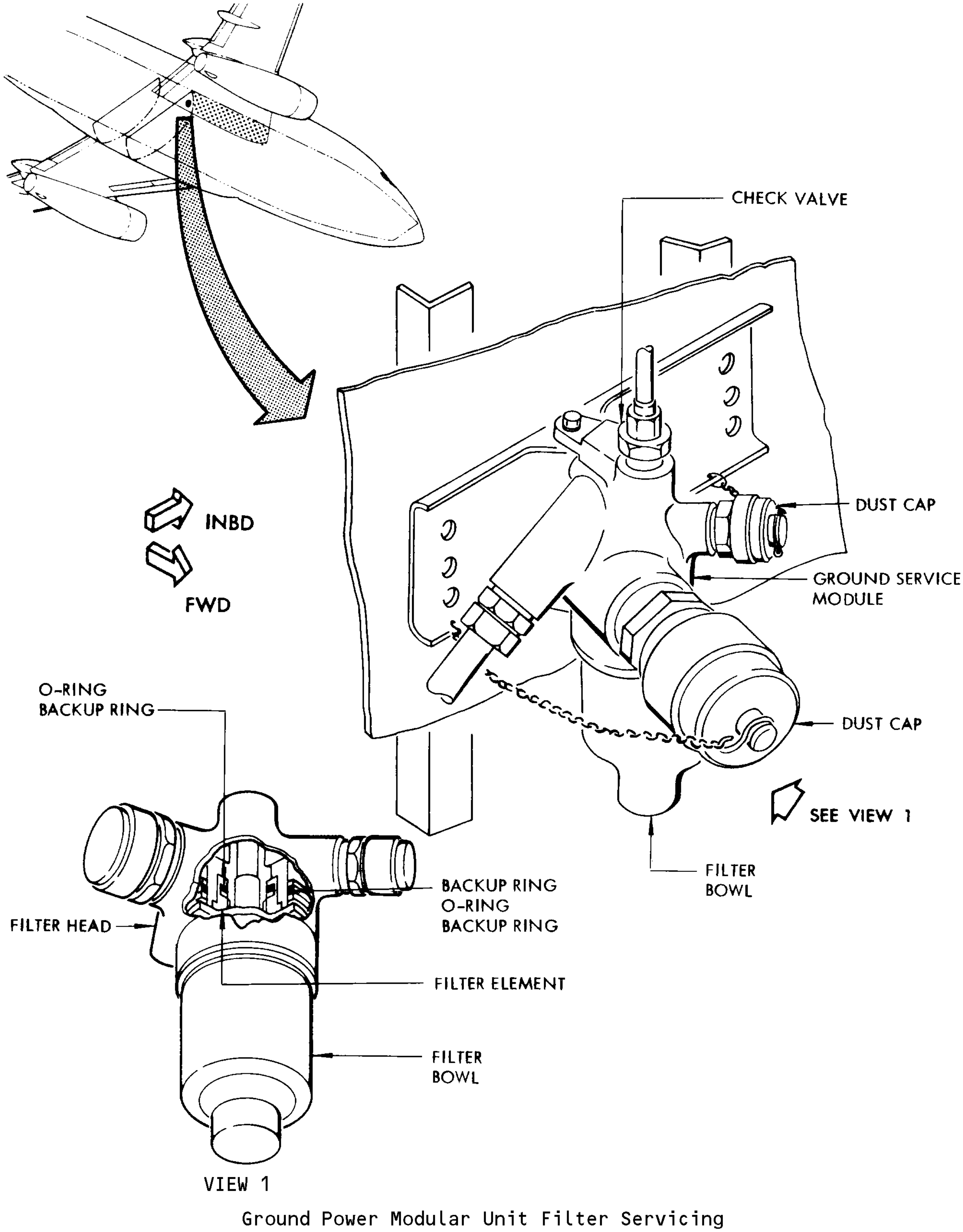
1. General
   A. A container will be necessary to catch fluid from the modular unit and disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate (AMM 12-40-0/201).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Ground Power Modular Unit
   A. Gain access to modular unit by opening the air conditioning duct access door on right side of airplane.
   B. Depressurize hydraulic system B. Refer to AMM 29-12-0/201, Hydraulic System B - Maintenance Practices.
   C. Depressurize hydraulic reservoirs. Refer to AMM 29-09-300/201, Hydraulic Reservoir Pressurization - Maintenance Practices.
   D. Disconnect lines from modular unit (Fig. 401).
   E. Cap open lines and plug ports to prevent contamination.
   F. Remove mounting bolts and remove modular unit.
4. Install Ground Power Modular Unit
   A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid.
   B. Install check valve and O-ring in outlet port of modular unit (Fig. 401).
   C. Install union and O-ring in inlet port.
   D. Place modular unit in mounting position and install mounting bolts.
   E. Connect hydraulic lines to inlet and outlet ports.
   F. Check that filter bowl is tight and lockwired.
   G. Pressurize hydraulic system B and check for leaks at check valve (AMM 29-12-0).
   H. Close access door.



Hydraulic Ground Power Modular Unit Installation
Figure 401

HYDRAULIC GROUND POWER MODULAR UNIT FILTER - UNIT SERVICING

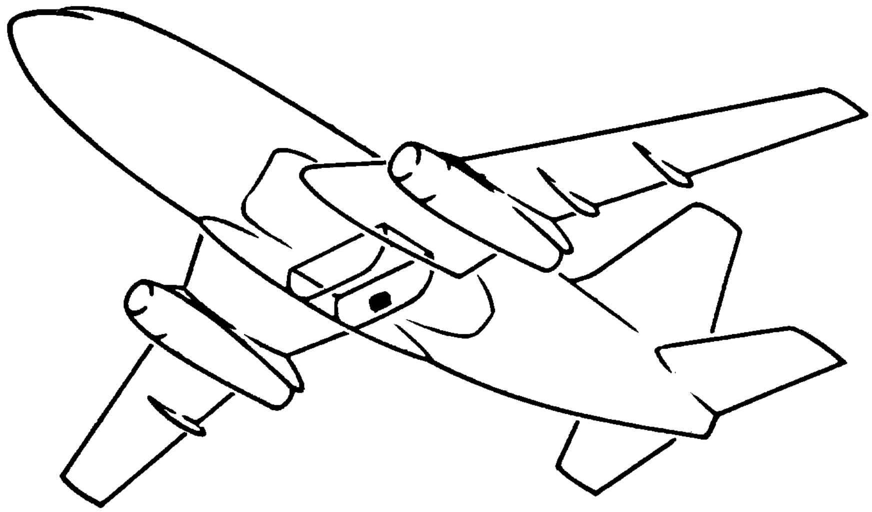
1. General
   A. The ground power modular unit filter bowl should be removed at regular intervals and the element checked for contamination. If excessive contamination exists, the element should be replaced.
   B. A container will be necessary to catch fluid when removing the modular unit filter bowl. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Ground Power Modular Unit Filter Element
   A. Gain access to modular unit by opening air conditioning duct access door on right side of airplane.
   B. Remove filter bowl with filter element (Fig. 301).
   C. Dispose of element and clean filter bowl.
4. Install Ground Power Modular Unit Filter Element
   A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid.
   B. Insert backup ring and O-ring in groove inside upper end of filter element (Fig. 301).
   C. Install backup ring, O-ring and backup ring in groove in filter head.
   D. Place element in filter bowl and screw into filter head.
   E. Torque filter bowl 50 to 75 pound-inches and install safety wire.
   F. Close access door.

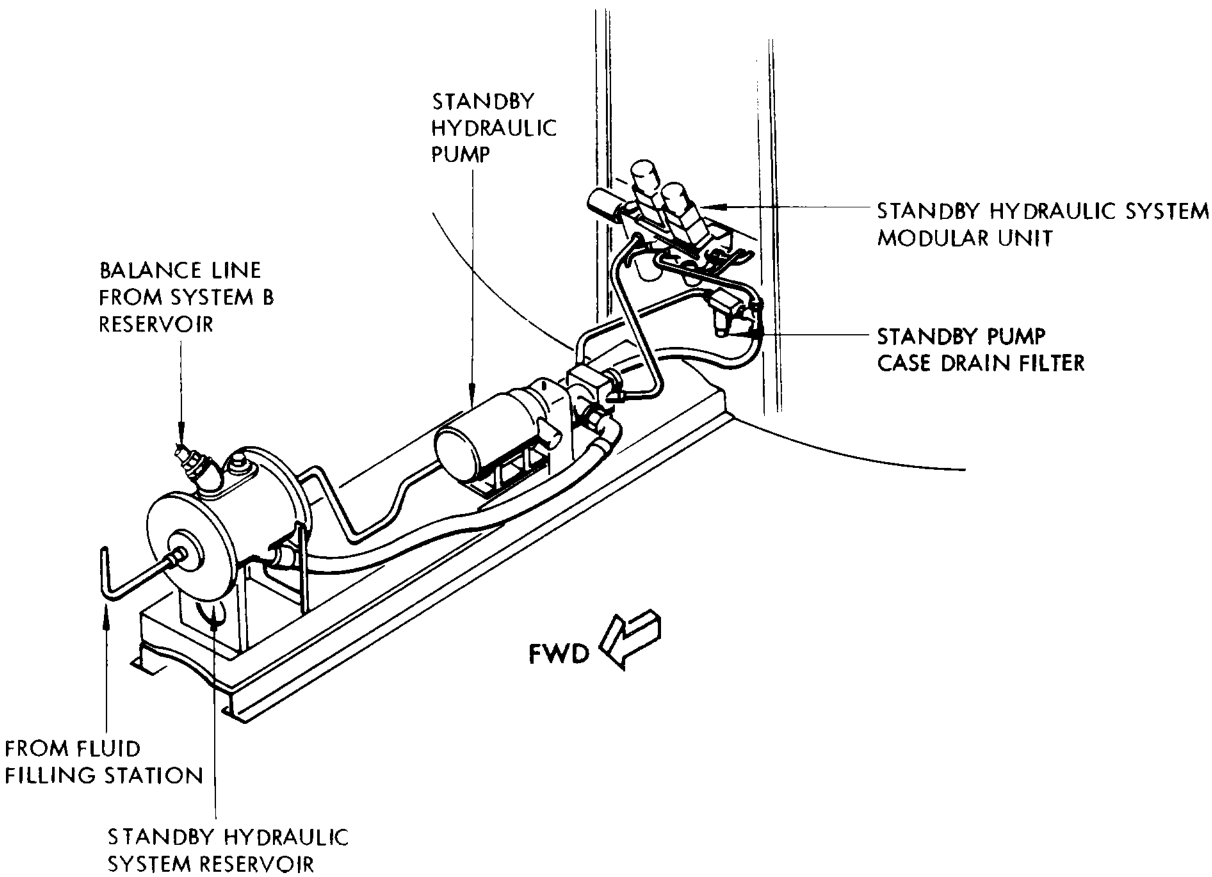


Ground Power Modular Unit Filter Servicing
Figure 301

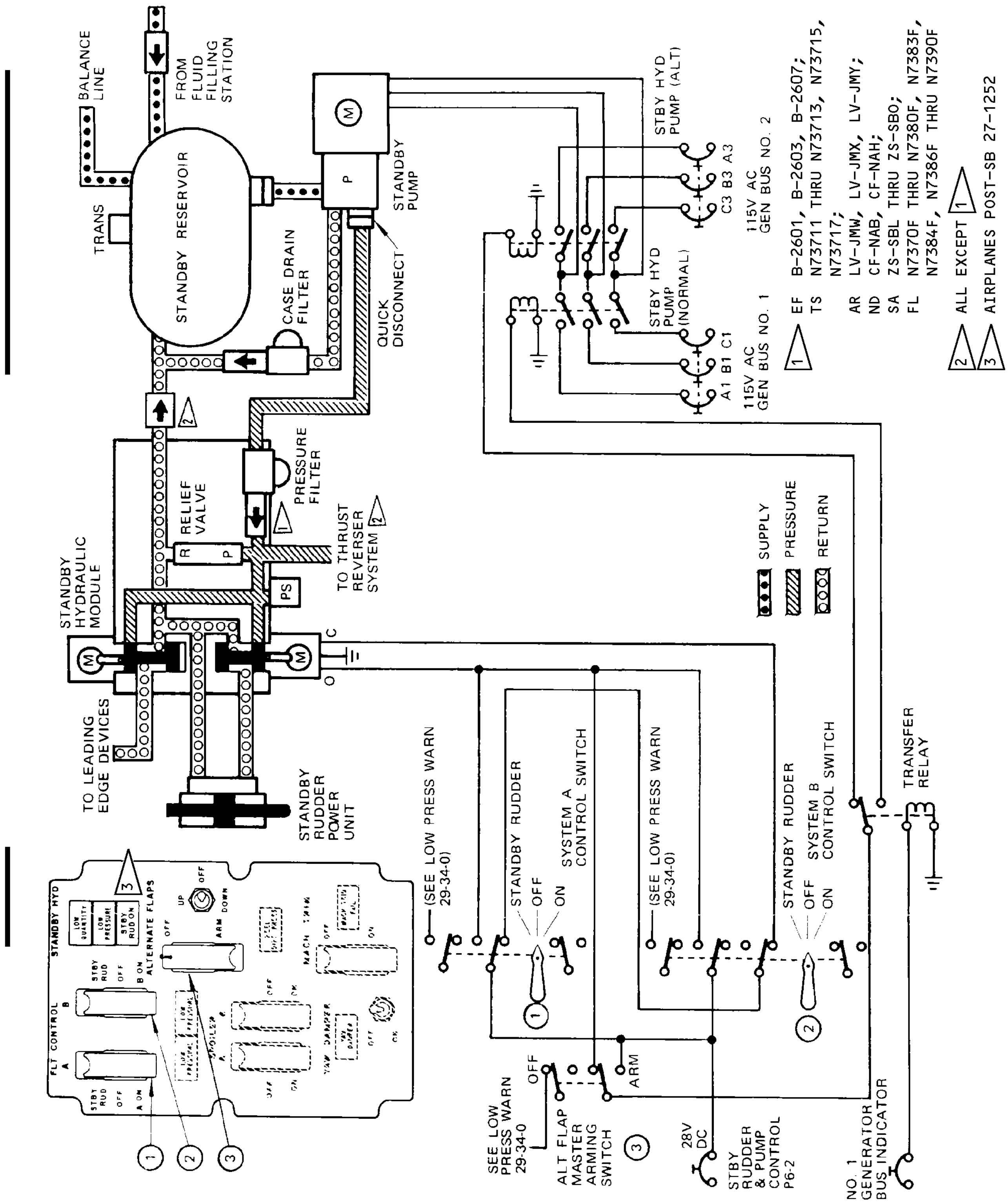
STANDBY HYDRAULIC SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The standby hydraulic power system (Fig. 1) operates only on demand, and supplies fluid under pressure of 3000 psi for alternate operation to the standby rudder, the leading edge flaps and slats and on some airplanes thrust reverser (Fig. 2 for effectivity).
   B. The standby hydraulic system includes the equipment necessary to store, pressurize, deliver, control, monitor and filter the hydraulic fluid to operate the systems supplied by the standby system (Fig. 2). Hydraulic fluid for the standby system is stored in a pressurized reservoir. One variable displacement electric motor-driven pump supplies fluid to systems upon demand. Pump operation is controlled by either the RUDDER standby control switch, or the ALTERNATE FLAP control switch. Refer to Chapter 27, Rudder Hydraulic Control System and Leading Edge Flaps and Slats System. A filter in the pressure line from the pump filters the fluid before it enters the various systems. A pressure switch in the pressure line from the pump is connected to a low pressure indicator light on the pilots' overhead panel. A pressure relief valve protects the system against damage by abnormally high pressures. A pump case drain filter in the pump return line is provided to detect incipient pump failures and to filter all standby return fluid before it enters the systems.
   C. ON AIRPLANES WITH SB 737-27-1252 (RUDDER SYSTEM ENHANCEMENT PROGRAM); The standby pump is turned on automatically if (1) the rudder pressure reducer fails to the low pressure condition or (2) the rudder PCU force fight monitor detects a force fight for more than 5 seconds.
2. Standby System Hydraulic Reservoir
   A. A 1.9 gallon capacity hydraulic reservoir supplies hydraulic fluid to the standby hydraulic system. The reservoir is an air-tight vessel consisting of a metal shell with supply, return, balance line and fill ports. Baffles just inside the return port are provided to prevent fluid vortexing. Attached to the top of the reservoir is a low level warning switch which is connected to a low quantity warning light on the pilots' overhead panel. The reservoir is filled from the hydraulic fluid filling station. The reservoir is located on the keel beam between the left and right wheel wells.
   B. The standby system reservoir is pressurized to approximately 45 psi through a balance line connected to system A and system B reservoirs.
3. Standby System Electric Motor-Driven Hydraulic Pump
   A. One electric motor-driven hydraulic pump supplies fluid under pressure to the hydraulically-operated systems supplied by the standby system. Pump operation is controlled by either the RUDDER standby control switch, or the ALTERNATE FLAPS control switch (Ref to Chapter 27, Rudder Hydraulic Control System, and Leading Edge Flaps and Slats System).





Standby Hydraulic System Component Location
Figure 1



Standby Hydraulic System Schematic
Figure 2

B. The pump assembly consists of a 3-phase 115 volt ac motor and a variable delivery, positive displacement hydraulic pump. The hydraulic pump consists of the units shown in Fig. 3. Pump pressure is regulated at 2975 to 3100 psi and maximum output is 3 gpm. Pump pressure, return and supply ports are connected to flexible hoses. The pump assembly is installed on the keel beam between the wheel wells. 28 volt dc relays control motor power. Pressure compensation inside the pump varies the ratio between the volume of fluid that is delivered to the system and the volume that is recirculated within the pump. Some fluid is discharged out the return port.

C. The pump control (compensator) consists of a compensator cylinder, a compensator stem with a plate carrying piston sleeves, and a compensator spring unit. A small difference in the stem diameter provides an annular area on which the pressure of discharged fluid produces a force. This force is opposed by the control spring. When the discharge pressure exceeds 3000 psi, the hydraulic force on the stem overcomes the control spring and pushes the compensator stem with piston sleeves away from the driving shaft. The sleeves keep the discharge holes uncovered during nearly the whole discharge stroke, and no fluid is delivered to the pressure line. A small quantity of fluid discharged through the piston bypass holes to the return line, provides fluid circulation for cooling and lubrication of the pump during idling periods.

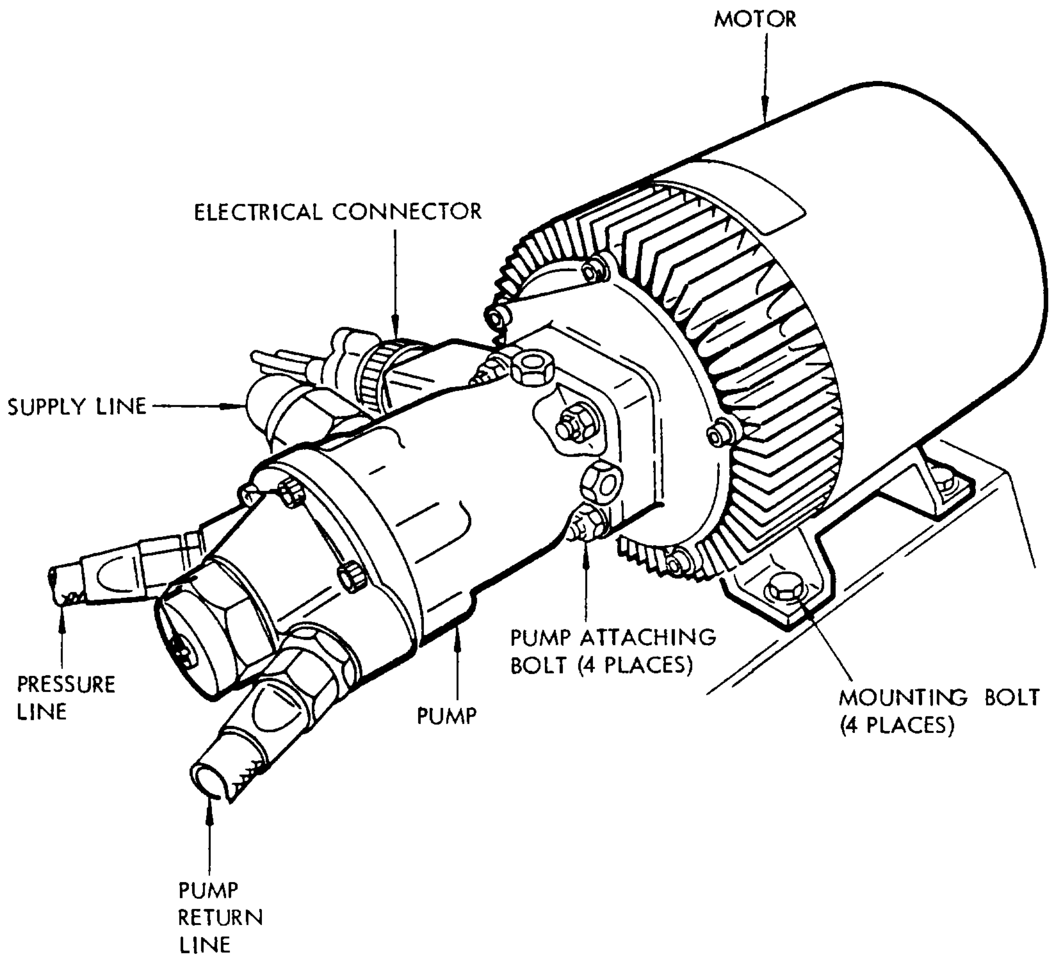
4. <u>Standby System Modular Unit</u>

A. The modular unit (Fig. 4) is provided to manifold hydraulic fluid to various easily replaceable cartridge type component. The modular unit consists of a 6-port housing providing attachment provisions for the cartridge type hydraulic pump pressure filter, rudder shutoff valve, leading edge flap standby shutoff valve, pressure switch, check valve, standby system pressure relief valve, and male fittings for attaching system tubing connectors. The modular unit housing has drilled passages to provide fluid flow through the unit. The modular unit is installed on the aft bulkhead of the wheel well area.

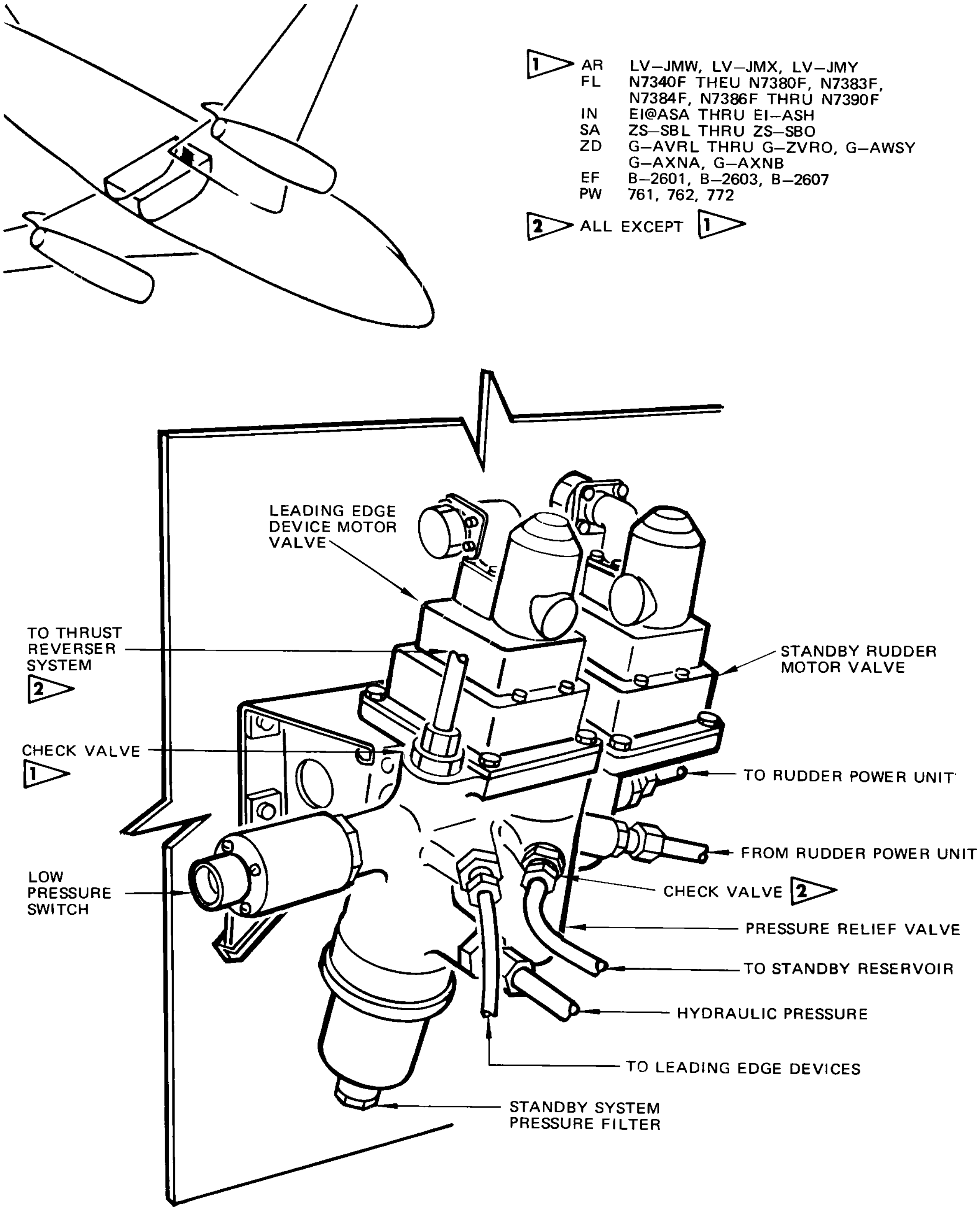
5. <u>Standby System Hydraulic Filters</u>

A. Pressure Filter

(1) A cartridge type pressure filter in the pressure line from the electric motor-driven hydraulic pump filters the hydraulic fluid before it enters the hydraulic systems (Fig. 2). The pressure filter is installed in the standby system modular unit and consists of a filter bowl and a noncleanable element (Fig. 5).



Standby System Electric Motor-Driven Pump
Figure 3



Standby System Modular Unit
Figure 4

B. Case Drain Filter

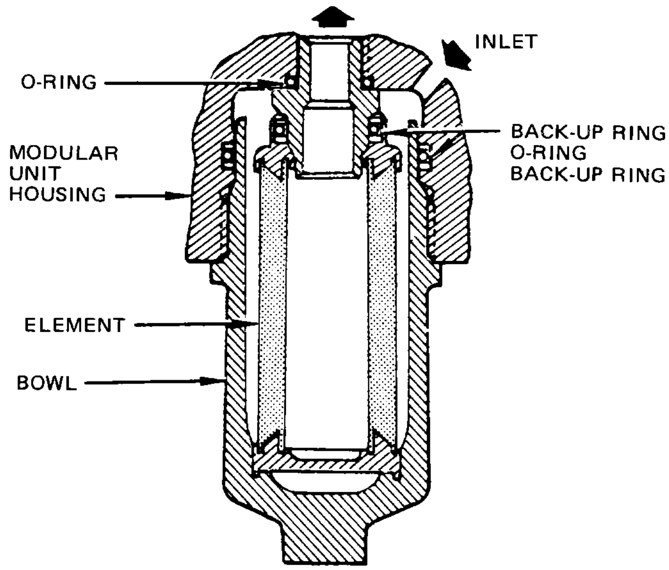
(1) A case drain filter installed in the return line, filters the fluid before it enters the standby reservoir (Fig. (2) The filter is installed to detect incipient pump or motor failures and to prevent contamination of the standby reservoir. The filter is installed in the wheel well and consists of a filter head, noncleanable filter element, a filter bowl, and a magnetic plug for checking ferrous contamination without filter disassembly (Fig. 5).

6. <u>Standby System Relief Valve</u>

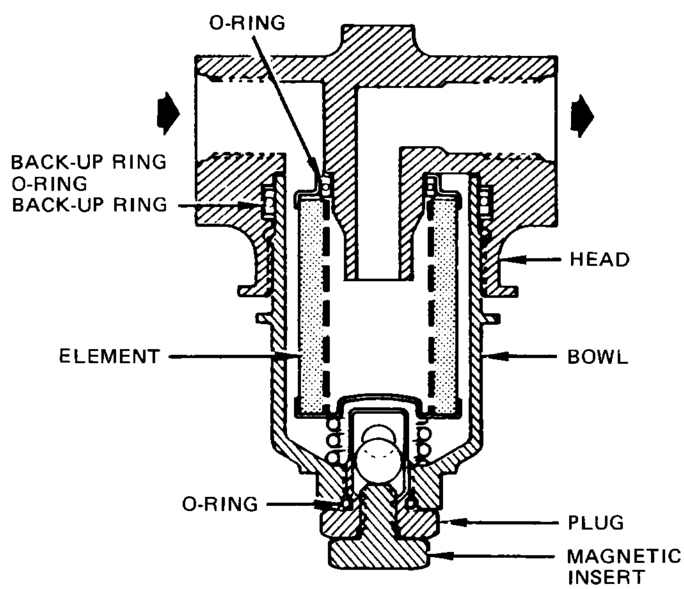
A. The cartridge type standby system relief valve installed in tthe modular unit (Fig. 2) protects the system against damage by abnormally high pressures. The valve is set to relieve at 3500 (+ 50) psi and reset at 3400 psi. The valve is set by the manufacturer and no maintenance other than removal and installation is recommended.

7. <u>Standby System Operation</u>

A. The standby reservoir supplies a positive flow of fluid to the electric motor-driven pump (Fig. 2). Pump operation is controlled by either the standby rudder A, standby rudder B, or the alternate flaps switch. Refer to Chapter 27, Rudder Hydraulic Control System, and Leading Edge Flaps and Slats System. With the pump motor energized, the pumps start at full volume flow to supply fluid through a pressure filter to the hydraulic systems. As pressure increases to 1200 (+ 250) psi, the pump low pressure switch is actuated causing the low pressure light on the pilots' overhead panel to go out. As system pressure approaches 3000 psi, the pump automatically adjusts output to the need of the system. If system pressure increases to 3500 (+ 50) psi, the system pressure relief valve will open to reduce pressure to 3400 psi. At low pump demand, the pump automatically adjusts displacement and case drain flow is directed through a return filter and check valve to the reservoir.



PRESSURE FILTER
DETAILS



CASE DRAIN FILTERS
DETAILS

03.01

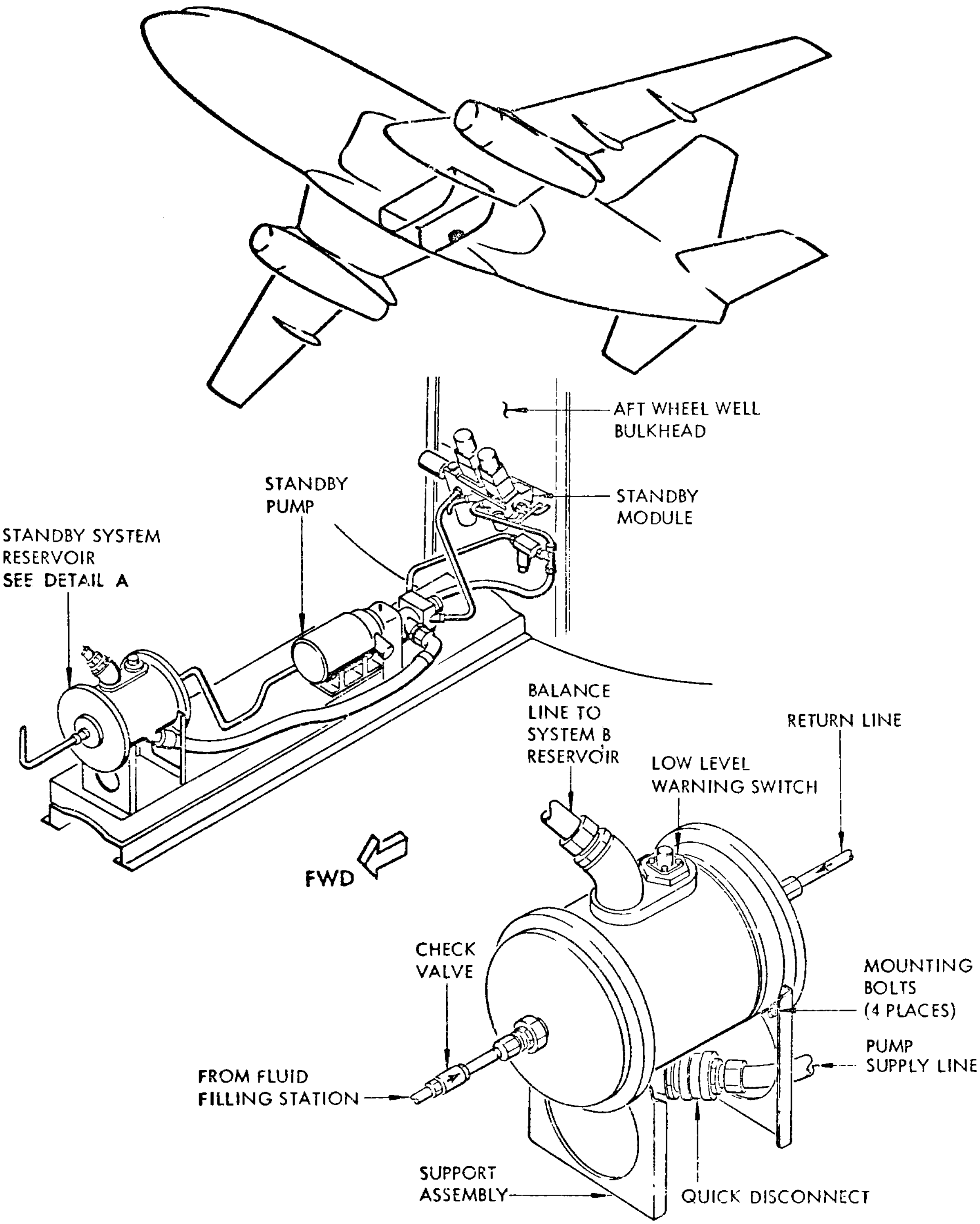
Standby System Hydraulic Filters
Figure 5

STANDBY SYSTEM HYDRAULIC RESERVOIR - REMOVAL/INSTALLATION

1. General
   A. The standby system reservoir is mounted on the keel beam between the left and right wheel wells (Fig. 401).
   B. A container will be necessary to catch fluid when disconnecting hydraulic lines during removal of the reservoir. Should any fluid be spilled on the airplane , the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Suitable container to catch hydraulic fluid (approx 4 gal. capacity)
   B. Regulated source of nitrogen - 0 to 200 psi maximum pressure
   C. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Prepare Standby Reservoir for Removal
   A. Depressurize hydraulic reservoir system. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. Tag system B and Standby pump switches to prevent operation.
   C. Open system B reservoir drain valve and drain approximately 2 gallons of hydraulic fluid into container.

      NOTE: If reservoirs are completely serviced at removal of standby reservoir, approximately 1.8 gallons will drain thru the balance lines from system A reservoir.

   D. Close and secure system B reservoir drain valve with lockwire.
4. Remove Standby Reservoir
   A. Disconnect balance line from top of standby reservoir and catch fluid drainage from balance line in container.
   B. Remove pump supply line at quick-disconnect coupling at bottom of reservoir (Fig. 401).
   C. Remove opposite end of pump supply line at standby pump.
   D. With flexible pump supply line placed in container, reconnect disconnect coupling end of supply line to supply outlet fitting at bottom of reservoir and allow all fluid to drain into container.
   E. Disconnect remaining hydraulic lines from reservoir.
   F. Install protective covers over fittings and hoses.
   G. Disconnect electrical connector from low level warning switch at top of reservoir.
   H. Remove bolts attaching reservoir to mounting assembly and remove reservoir.



Standby Hydraulic Reservoir Installation
Figure 401

5. Install Standby Reservoir
   A. Install O-rings, check valve, unions and reducers in reservoir ports. Apply hydraulic fluid or assembly lube to O-rings and to threads of check valve and all unions, reducers and couplings to facilitate installation.

      CAUTION: ENSURE THAT RESERVOIR IS CLEAN, MOUNTING SURFACES ARE FREE FROM FOREIGN MATERIAL, AND THAT FOREIGN MATERIAL DOES NOT ENTER RESERVOIR OR CONNECTING HYDRAULIC LINES DURING MAINTENANCE PROCEDURES.

   B. Place reservoir in position and fasten to mounting assembly with mounting bolts.
   C. Connect electrical connector to low level warning switch (Fig. 401).
   D. Connect pump supply line between reservoir and standby pump.
   E. Connect all other hydraulic lines to reservoir.

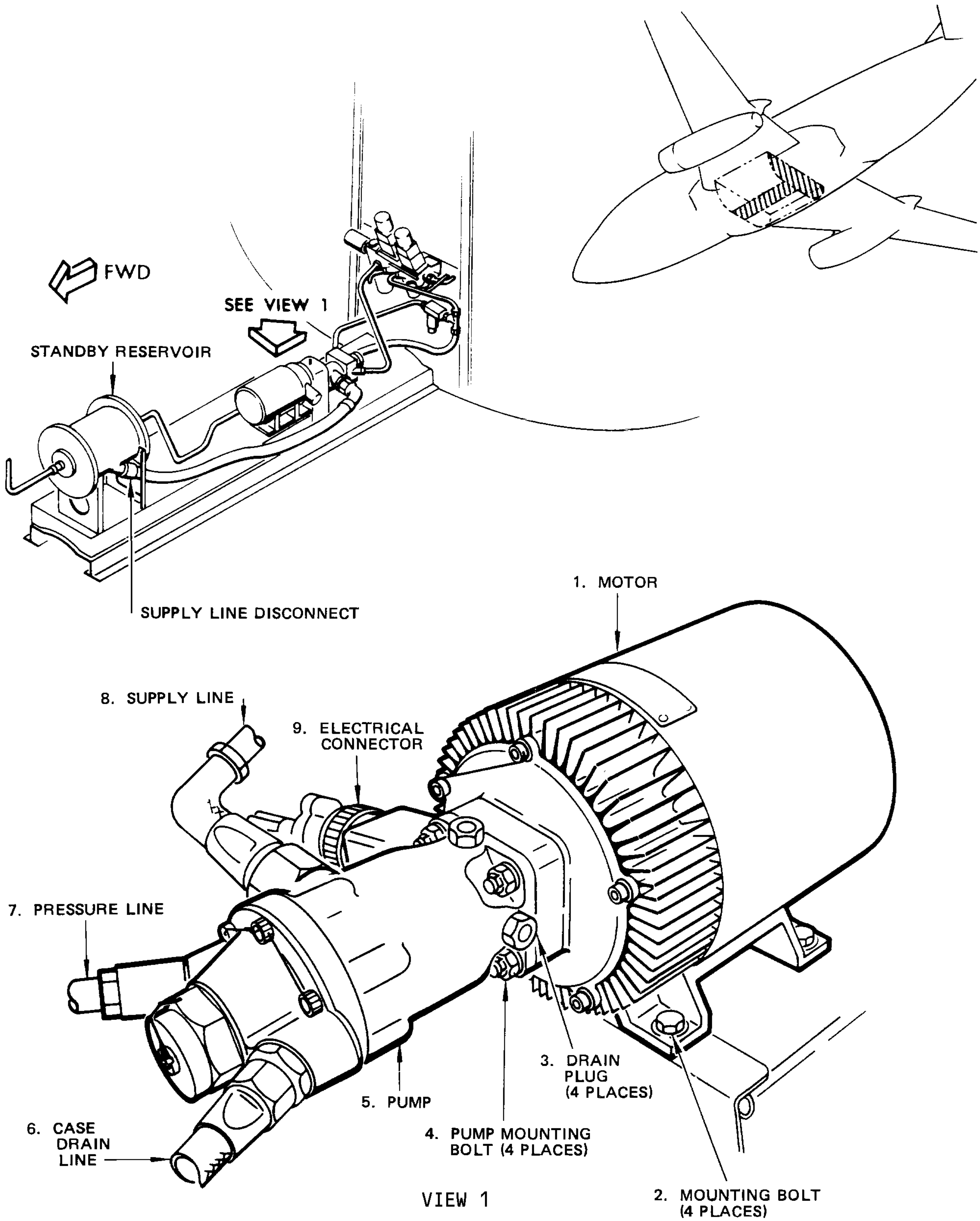
      CAUTION: PRIOR TO INSTALLING HOSE HALF OF QUICK DISCONNECT, VISUALLY CHECK FOR DISCONNECT POPPET STRAIGHTNESS. AFTER QUICK DISCONNECT CONNECTION, CHECK THAT INDICATOR PINS ARE EXTENDED A MINIMUM OF 0.06 INCH. IF INDICATOR PINS ARE NOT PROPERLY EXTENDED, FLUID FLOW WILL BE RESTRICTED OR COMPLETELY STOPPED AND RESERVOIR AND/OR PUMP DAMAGE MAY RESULT.
      IF EXCESSIVE TORQUE IS REQUIRED WHEN RECONNECTING THE TWO HALVES OF THE QUICK DISCONNECT, DISASSEMBLE THE FITTING AND CHECK FOR POPPET STRAIGHTNESS AGAIN.

   F. Service hydraulic reservoirs (Ref Chapter 12, Hydraulic Fluid Servicing).
   G. Pressurize hydraulic reservoirs and check for leaks (Ref 29-09-300).
   H. Remove tags from pump switches.

STANDBY HYDRAULIC SYSTEM ELECTRIC MOTOR-DRIVEN PUMP - REMOVAL/INSTALLATION

1. General
   A. Should replacement of the standby hydraulic pump be required due to mechanical malfunction, check the pressure filter, and the case drain filter for particles of foreign material. If an excessive amount is present, remove and clean filter bowl thoroughly and install new filter element.
   B. A container will be necessary to catch fluid from disconnected lines. Take necessary precaution to prevent spillage of fluid. Should any fluid spill on the airplane, decontaminate. See Chapter 12, Cleaning and Washing.
2. Removal/Installation Standby Hydraulic System Motor-Driven Pump Assembly
   A. Equipment and Materials
      (1) Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
      (2) Hydraulic Fluid - BMS 3-11
      (3) Suitable container to catch drained fluid
   B. Prepare Hydraulic Pump Assembly for Removal
      (1) Depressurize standby reservoir. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
      (2) Open standby hydraulic pump circuit breakers on P6-11 and P6-12 panels.
      (3) Disconnect pump supply line at quick-disconnect at standby reservoir and drain fluid from line into container.
   C. Remove Hydraulic Pump Assembly
      (1) Disconnect hydraulic pump electrical connector (9, Fig. 401).
      (2) Disconnect lines from pump and install protective covers.
      (3) Remove mounting bolts (2) and remove pump assembly from airplane.
   D. Prepare Hydraulic Pump Assembly for Installation
      (1) Remove plug (3, Fig. 401) from lowest drain port in the pump mounting flange and install O-ring and drain fitting in open port.
      (2) Check that pump and motor are properly assembled and that pump mounting bolts (4) are lockwired.
      (3) Install O-rings and reducers in pump ports. Lubricate with assembly lube or hydraulic fluid.
      (4) Fill pump approximately half full with BMS 3-11 hydraulic fluid through supply port.
   E. Install Hydraulic Pump Assembly
      (1) Place hydraulic pump assembly in mounting position and instal1 mounting bolts (2, Fig. 401).

      NOTE: Pump mounting bolts, washers, nuts and faying surfaces must be clean to provide an adequate electrical ground.



Standby System Hydraulic Pump Installation
Figure 401

(2) Connect supply line (8), pressure line (7) and case drain line (6) to hydraulic pump.
(3) Connect supply line at reservoir.
(4) Install electrical connector (9).
(5) Pressurize standby system reservoir (Ref 29-09-300).
(6) Pressurize standby system to bleed pump and check for leaks.
  (a) Connect electrical power to airplane.
  (b) Close standby pump circuit breakers on P6-11 and P6-12 panels.

  WARNING: PERSONNEL STAND CLEAR OF RUDDER AND LEADING EDGE DEVICES.

  (c) On the overhead panel, position system A flight control switch to STBY RUD and cycle rudder several times.
  (d) Place switch in OFF position and remove electrical power.
(7) Service hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.

3. Removal/Installation Standby Hydraulic Pump Motor
A. Remove Hydraulic Pump Motor
(1) Open standby pump circuit breakers on P6-11 and P6-12 panel.
(2) Remove electrical connector (9, Fig. 401).
(3) Remove pump mounting nuts (4).
(4) Remove mounting bolts (2) and separate motor from pump.
B. Install Hydraulic Pump Motor
(1) Remove protective plug from port on accessory mounting flange of pump motor.
(2) Place motor in mounting position and install mounting bolts (2, Fig. 401).
(3) Engage splines between motor (l) and pump (5). Install pump mounting nuts (4) and install lockwire.
(4) Install electrical connector (9).
(5) Check operation of motor in accordance with paragraph 2.E. step (6).

4. Removal/Installation Standby System Pump
A. To remove and install the standby system pump without removing the motor, follow the procedure given in par. 2. except as follows: Instead of removing mounting bolts (2, Fig. 401),
separate pump (5) from motor (1) by removing pump mounting nuts (4).

STANDBY HYDRAULIC SYSTEM ELECTRIC MOTOR-DRIVEN PUMP - ADJUSTMENT/TEST

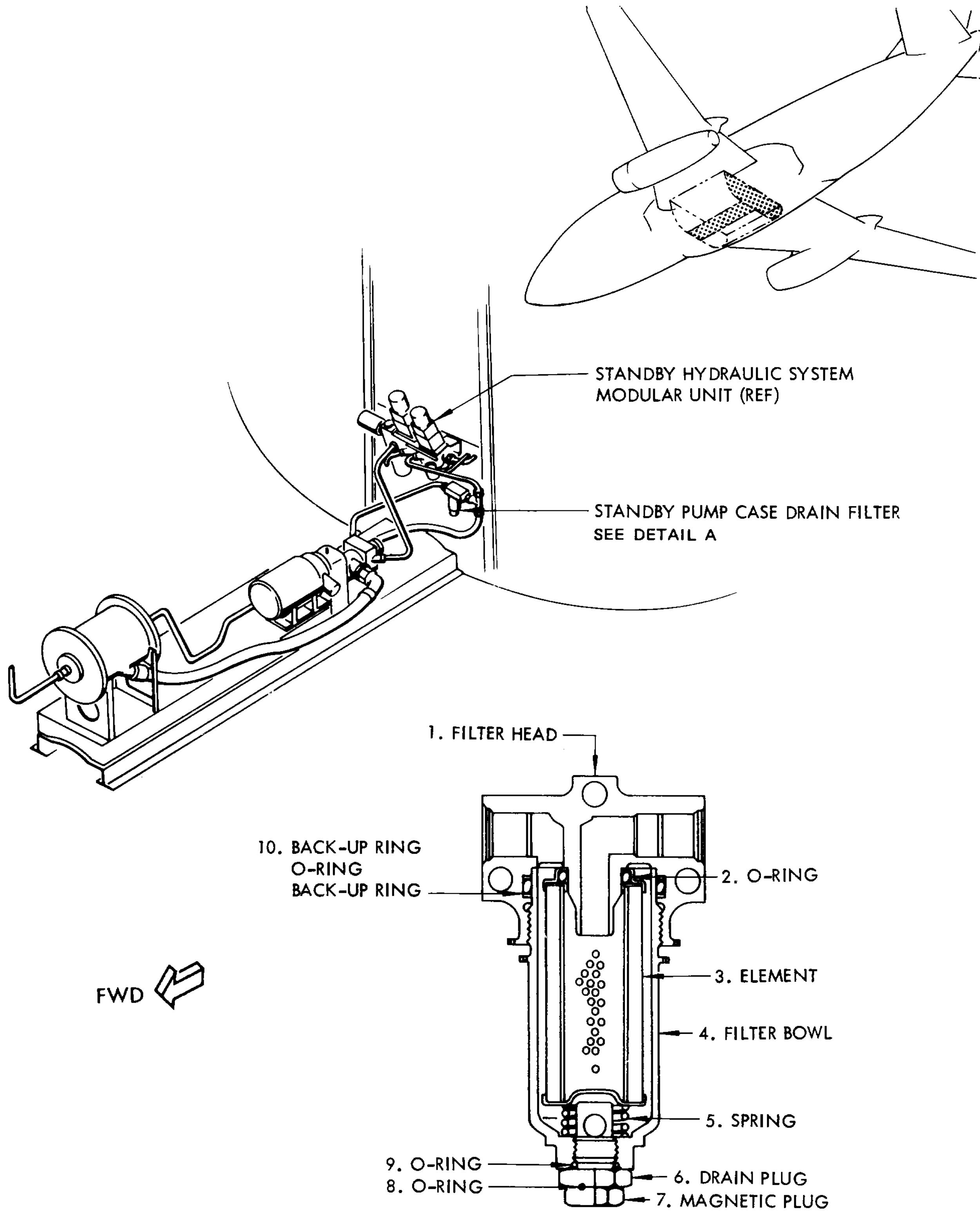
1. Standby Hydraulic Pump Test
   A. General
      (1) The following test procedure is performed to operationally check the hydraulic pump and the electrical circuits that provide power to the pump.
      (2) A container will be necessary to catch fluid when disconnecting hydraulic lines.
         (a) If there is a fluid spill, clean it (AMM 12-40-0/201).
   B. Equipment and Materials
      (1) Pressure gage - 0 to 3500 psi
      (2) Suitable container for catching hydraulic fluid
   C. Prepare Standby Hydraulic Pump for Test
      (1) Install pressure gage in pressure line between pump and standby modular package.
      (2) Pressurize standby reservoir (AMM 29-09-300/201).
      (3) Close STBY HYD PUMP NORMAL circuit breaker on P6 panel.
      (4) Close STBY HYD PUMP (ALT) circuit breaker on P6 panel.
      (5) Close STBY RUDDER and STBY PUMP CONT circuit breaker on P6 panel.
      (6) Close AC INDICATION BUS NO. 1 PHASE C circuit breaker on P6 panel.
      (7) Make sure that the following switches are in OFF position:
         (a) Alt Flap Master Arming Switch
         (b) System A Control Switch
         (c) System B Control Switch
   D. Test Standby Hydraulic Pump
      (1) Connect electrical power to airplane and make sure that power is available on No. 1 and 2 generator buses.
      (2) Place system A flight control switch in STBY RUD position. The standby pump should operate and pressure on gage should indicate 3050 ±75 psi.
      (3) Open AC INDICATION BUS NO. 1 PHASE C then STBY HYD PUMP (NORMAL) circuit breakers on P6 panel. Make sure that pump continues to operate.
      (4) Close STBY HYD PUMP (NORMAL) and AC INDICATION NO. BUS 1 PHASE C circuit breakers on P6 panel and open STBY HYD PUMP (ALT) circuit breaker on P6 panel.
         (a) Make sure that the pump continues to operate.

(5) Close STBY HYD PUMP (ALT) circuit breaker on P6 panel.
   (a) Make sure that the pump continues to operate.
(6) Place system A flight control switch in OFF position. Make sure that pump stops.
(7) Place system B flight control switch in STBY RUD position. Make sure that pump operates.
(8) Place system B flight control switch in OFF position and make sure that pump stops.
(9) Position ALT FLAP arming switch to ARM. Make sure that pump operates.
(10) Position ALT FLAP arming switch to OFF. Make sure that pump stops.

E. Restore Airplane to Normal Configuration
(1) Remove electrical power from airplane.
(2) Remove pressure gage from pressure line.
(3) Service hydraulic reservoirs (AMM Chapter 12, Hydraulic Fluid Servicing).

STANDBY HYDRAULIC SYSTEM PUMP CASE DRAIN FILTER - UNIT SERVICING

1. General
   A. The hydraulic pump case drain filter element should be removed and checked at regular intervals. Between these intervals the magnetic plug in the filter case should be removed and checked for metal contamination. If excessive metal is found, the pump should be removed and the pressure line flushed.
   B. A container will be necessary to catch fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Servicing Hydraulic Pump Case Drain Filter
   A. Depressurize hydraulic reservoirs (Ref 29-09-300 MP).
   B. Check Case Drain Filter Magnetic Plug
      (1) Unscrew magnetic plug (7, Fig. 301) and check for metal contamination on plug, and in hydraulic fluid lost during removal of plug.
      (2) Place new O-ring (8) on magnetic plug . Apply assembly lube or hydraulic fluid to O-ring and threads of plug, then screw plug into drain plug (6). Apply a torque of 15 to 20 pound-inches to magnetic plug, while holding drain plug.
      (3) Lockwire magnetic plug and drain plug.
   C. Remove Case Drain Filter Element
      (1) Open standby pump circuit breakers on P6-11 and P6-12 panels.
      (2) Unscrew filter bowl (4, Fig. 301) from filter head (l). Remove bowl with filte r element (3).
      (3) Remove filter element and spring (5). Check element and bowl for metal contamination.
      (4) Replace paper filter element (3) and clean filter bowl (4), magnetic plug (7) and spring (5).
   D. Install Case Drain Filter Element
      (1) Insert backup ring, O-ring and backup ring (10, Fig. 301) in filter head groove.
      (2) Insert O-ring (2) in filter element groove.
      (3) Install spring (5) and filter element (3) in filter bowl (4).
      (4) Lubricate threads lightly with assembly lube or hydraulic fluid and screw filter bowl (4) into filter head (1). Apply a torque of 96 to 120 pound-inches to filter bowl and lockwire.
      (5) Pressurize standby system and check filter for leaks.
         (a) Connect electrical power to airplane.



DETAIL A

Standby Hydraulic System Case Drain Filter Servicing
Figure 301

(b) Close standby pump circuit breaker on P6-11 and P6-12 panels.

WARNING: PERSONNEL STAND CLEAR OF RUDDER AND LEADING EDGE DEVICES.

(c) On overhead panel, position system A flight control switch to STBY RUD and cycle rudder.

(d) Place switch in off position and remove electrical power.

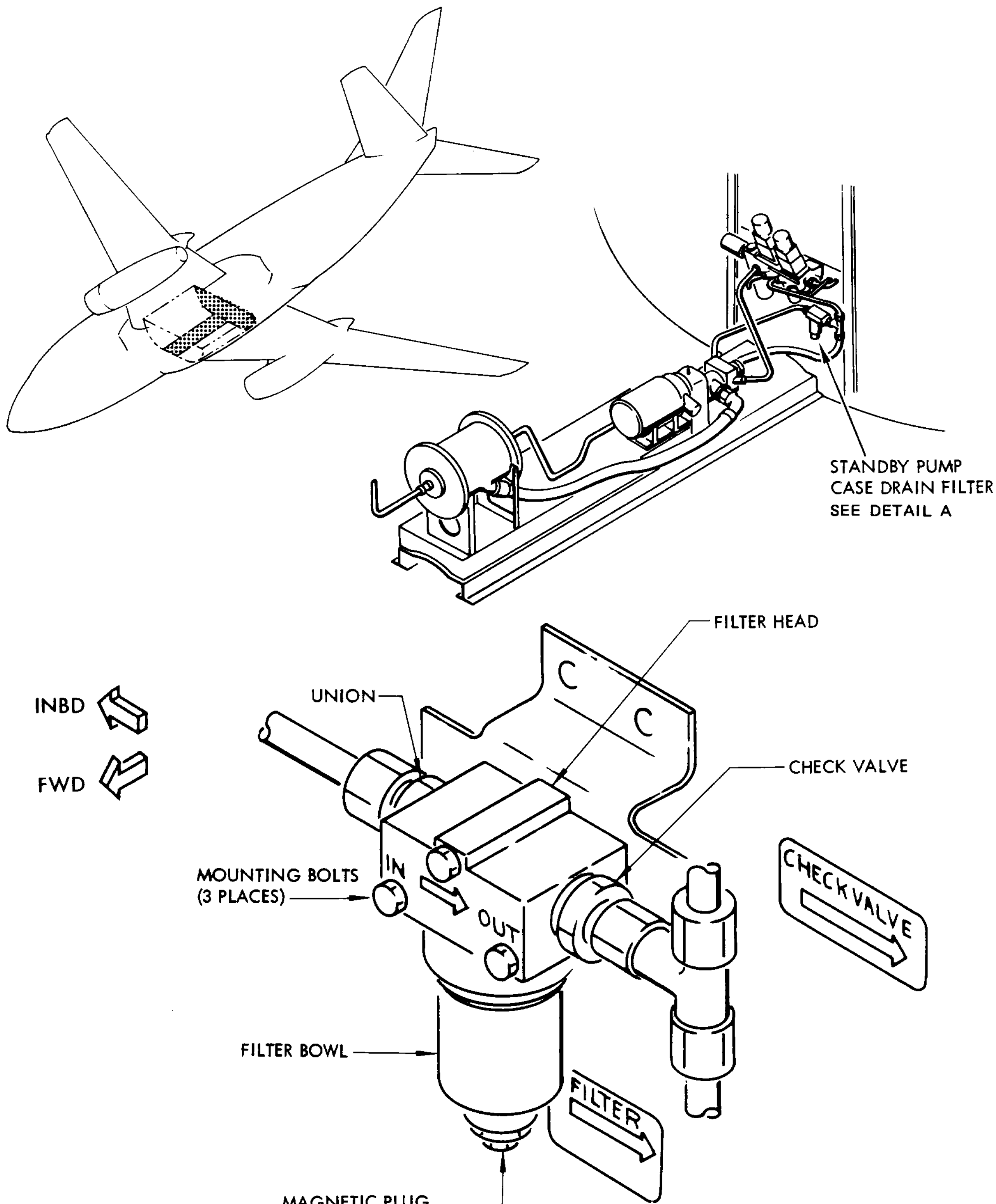
(6) Service Hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.

STANDBY HYDRAULIC SYSTEM CASE DRAIN FILTER - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Prepare Case Drain Filter for Removal
   A. Open standby pump circuit breakers on P6-11 and P6-12 panels.
   B. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   C. Drain standby hydraulic reservoir.
4. Remove Case Drain Filter
   A. Disconnect hydraulic lines from filter and install protective covers (Fig. 401).
   B. Remove filter mounting bolts and remove filter.
5. Install Case Drain Filter
   A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid at installation.
   B. Install O-ring and union in inlet port of filter (Fig. 401).
   C. Install O-ring and check valve in outlet port of filter.
   D. Position filter on mounting bracket and install mounting bolts.
   E. Check that filter bowl and magnetic plug are tight and lockwired.
   F. Service hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.
   G. Pressurize standby hydraulic system and check filter for leaks.
      (1) Connect electrical power to airplane.
      (2) Close standby pump circuit breakers on P6-11 and P6-12 panels.

         WARNING: PERSONNEL STAND CLEAR OF RUDDER AND LEADING EDGE DEVICES.

      (3) On overhead panel, position system A flight control switch to STBY RUD and cycle rudder.
      (4) Place switch in OFF position and remove electrical power.



DETAIL A

Standby Hydraulic System Case Drain Filter Installation
Figure 401

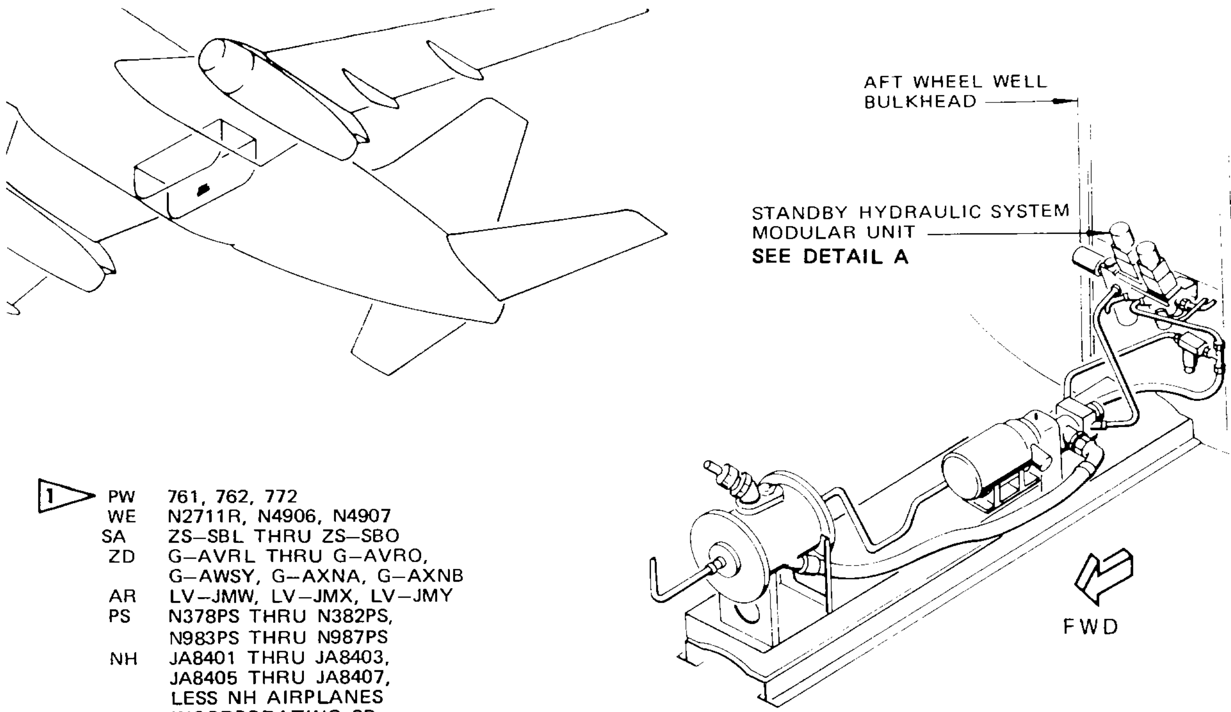
STANDBY HYDRAULIC SYSTEM MODULAR UNIT - REMOVAL/INSTALLATION

1. General

1. The standby module is mounted on the center of the aft wheel well bulkhead just above the keel beam (See figure. 401).
   A. A container will be necessary to catch hydraulic fluid from hydraulic lines when removing the module unit. Should fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
      2. Equipment and Materials
   B. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
      (1) Remove Standby System Modular Unit
   C. Depressurize hydraulic reservoir system. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - Maintenance Practices.
   D. Disconnect standby system motor-driven pump electrical connector.
   E. Disconnect leading edge device motor valve, low pressure switch and standby rudder motor valve electrical connectors (See figure 401).
   F. Disconnect all hydraulic lines on modular unit.
   G. Install protective plugs in all hydraulic lines and cap open fittings on module.
   H. Remove mounting bolts and remove modular unit.
      4. Install Standby System Modular Unit
   I. Install O-rings and unions in module unit ports. Apply assembly lube or hydraulic fluid to O-rings and to the threads of unions and reducers to facilitate installation. See figure 401 for variable check valve installation.

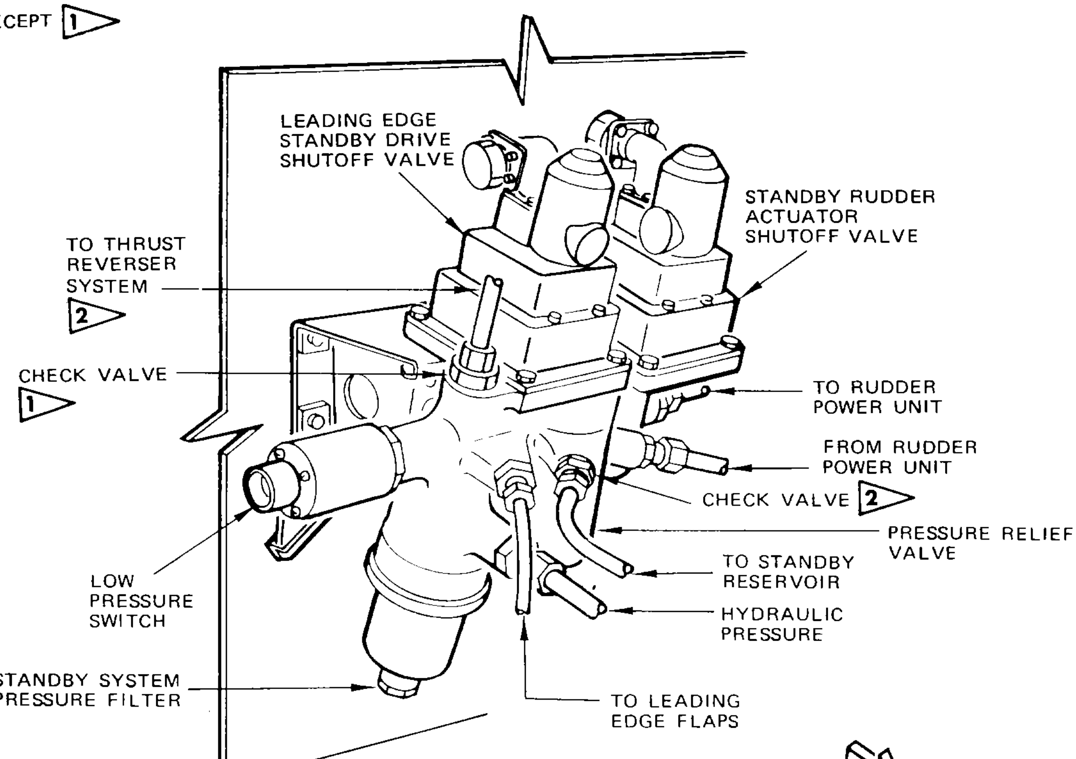
      CAUTION: ENSURE NO FOREIGN MATTER ENTERS MODULE HOUSING OR CONNECTING HYDRAULIC LINES DURING INSTALLATION.

   J. Position module in mounting position and install mounting bolts.
   K. Remove plugs from hydraulic lines and connect lines to port fittings (See figure 401).
   L. Connect leading edge flap standby drive shutoff valve, low pressure switch and standby rudder actuator shutoff valve electrical connectors.
   M. Connect electrical connector to standby system electric motor-driven pump.
   N. Pressurize hydraulic reservoir system (Ref 29-09-300 MP).
   O. Connect electrical power to airplane.



1 PW 761, 762, 772
WE N2711R, N4906, N4907
SA ZS-SBL THRU ZS-SBO
ZD G-AVRL THRU G-AVRO, G-AWSY, G-AXNA, G-AXNB
AR LV-JMW, LV-JMX, LV-JMY
PS N378PS THRU N382PS, N983PS THRU N987PS
NH JA8401 THRU JA8403, JA8405 THRU JA8407, LESS NH AIRPLANES INCORPORATING SB 78-1010

2 ALL EXCEPT 1



DETAIL A

Standby System Modular Unit Installation
Figure 401

P. Pressurize standby hydraulic system.

WARNING: ENSURE ALL PERSONNEL AND MAINTENANCE EQUIPMENT ARE CLEAR OF RUDDER AND LEADING EDGE FLAPS AND SLATS BEFORE OPERATION.

NOTE: Standby system is pressurized with the standby pump by switching either of the FLIGHT CONTROL switches to STBY RUD (standby rudder) position or by switching the ALTERNATE FLAP switch to ARM position. Switches are located on the P5 forward overhead panel.

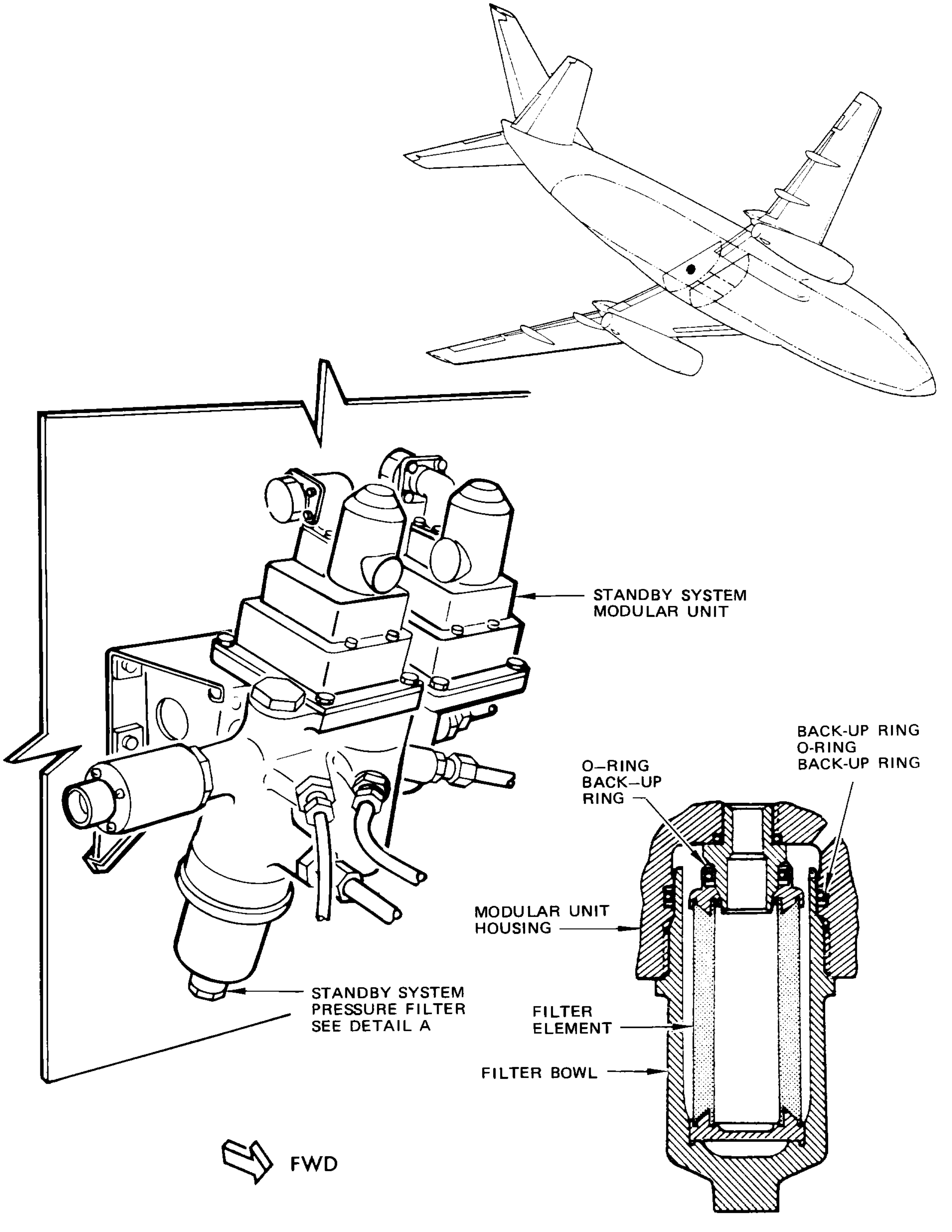
Q. Operate leading edge flaps and slats and cycle rudder several times.
R. Examine module unit and line connections for leaks.
S. Return FLIGHT CONTROL and ALTERNATE FLAP switches back to normal position.
T. Remove electrical power from airplane.
U. Service hydraulic reservoirs (Ref Chapter 12, Hydraulic Fluid Servicing).

STANDBY HYDRAULIC SYSTEM PRESSURE FILTER - UNIT SERVICING

1. General
   A. A container will be necessary to catch fluid from modular unit and filter bowl during maintenance of the pressure filter. Should any fluid spil1 on the airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Replace Pressure Filter Element
   A. Remove Pressure Filter Element
      (1) Open standby pump circuit breakers on P6-11 and P6-12 panels.
      (2) Unscrew filter bowl and remove filter element (Fig. 301).
      (3) Discard filter element and clean filter bowl.
   B. Install Pressure Filter Element
      (1) Install O-ring and backup ring in groove of top of filter element (Fig. 301).
      (2) Install backup ring, O-ring and backup ring in groove in modular housing.
      (3) Lightly lubricate filter bowl threads and O-rings with assembly lube or hydraulic fluid.
      (4) Partially prefill filter bowl with hydraulic fluid. Place element in filter bowl and screw bowl onto modular housing.
      (5) Apply a torque of 50 to 200 pound-inches to filter bowl and secure with lockwire.
      (6) Pressurize standby system and check filter for leaks.
         (a) Connect electrical power to airplane.
         (b) Close standby pump circuit breakers on P6-11 and P6-12 panels.

            WARNING: PERSONNEL STAND CLEAR OF RUDDER AND LEADING EDGE DEVICES.

         (c) On overhead panel, position system A flight control switch to STBY RUD and cycle rudder.
         (d) Place switch in OFF position and remove electrical power.
      (7) Service hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.



Standby Hydraulic Pressure Filter Servicing
Figure 301

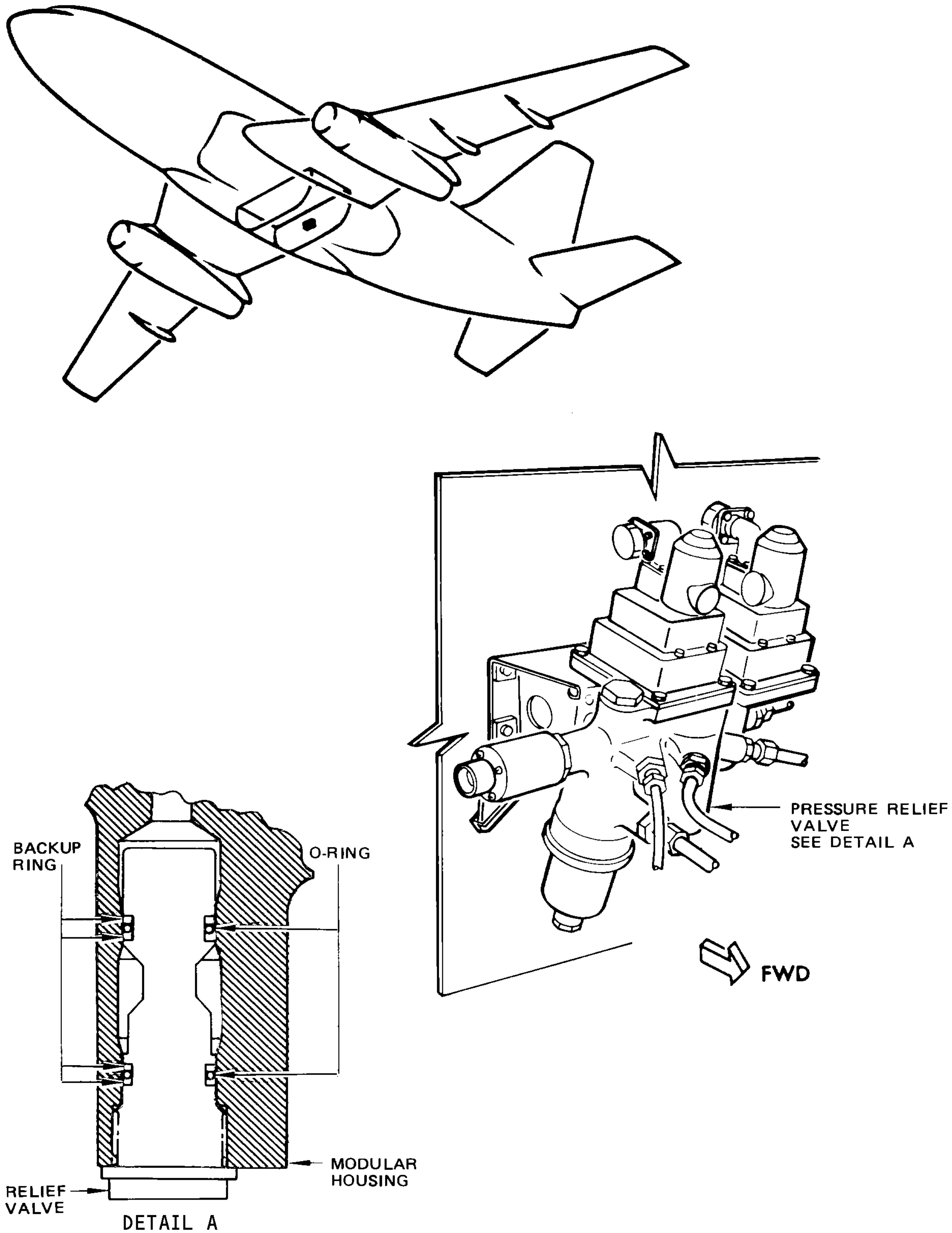
STANDBY HYDRAULIC SYSTEM PRESSURE RELIEF VALVE - REMOVAL/INSTALLATION

1. General
   A. The standby system relief valve is installed in the standby module housing which is mounted on the center of the aft bulkhead in the wheel well area (Fig. 401).
   B. A container will be necessary to catch hydraulic fluid when removing the relief valve from the module unit. Should fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Standby System Pressure Relief Valve
   A. Depressurize hydraulic reservoir system. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. Disconnect standby system motor-driven pump electrical connector.
   C. Unscrew and remove relief valve from module unit (Fig. 401).
   D. Install protective plug in open port of module unit.
4. Install Standby System Pressure Relief Valve
   A. Install O-rings with backup rings in each groove of relief valve. Apply assembly lube or hydraulic fluid to O-rings and to threads of relief valve (Fig. 401).
   B. Remove protective plug and screw relief valve into module housing. Apply 50 to 200 pound-inches of torque to relief valve and install lockwire.
   C. Pressurize hydraulic reservoir system (Ref 29-09-300).
   D. Connect electrical connector to standby pump electric motor.
   E. Position BAT switch, on the forward overhead panel P5, to ON.
   F. Apply electrical power (AMM 24-22-00/201).
   G. Pressurize standby hydraulic system and check for leaks.

      NOTE: Standby system is pressurized with the standby pump by switching either of the FLIGHT CONTROL switches to STBY RUD (standby rudder) position or by switching the ALTERNATE FLAP switch to ARM position. Switches are located on the P5 forward overhead panel.

5. RESTORE TO NORMAL
   A. Remove electric power if no longer required (AMM 24-22-00/201).

B. Position BAT switch, on the forward overhead panel P5, to OFF.

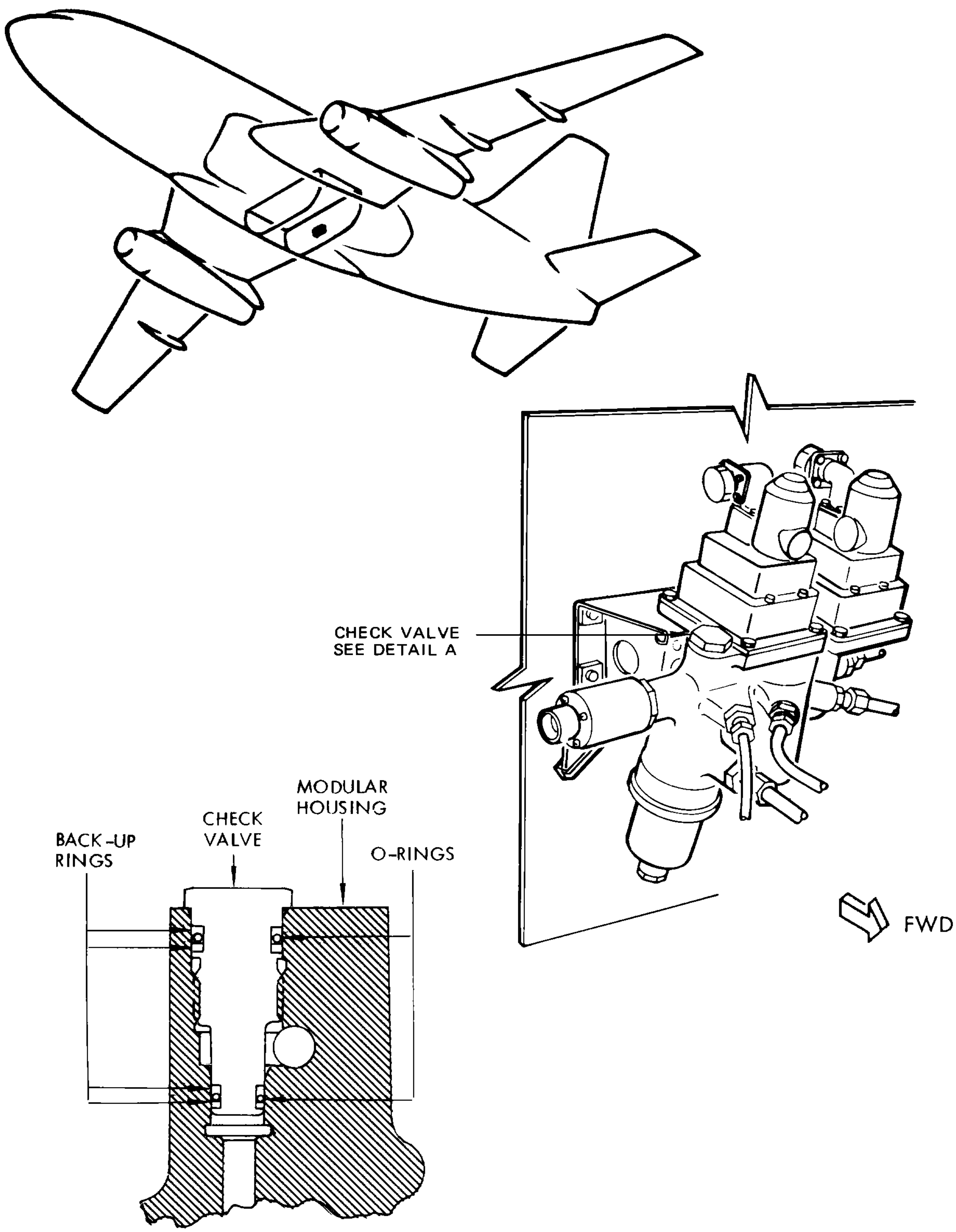


Standby System Relief Valve Installation
Figure 401

STANDBY HYDRAULIC SYSTEM CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. The standby system check valve is installed in the standby module housing which is mounted on the center of the aft bulkhead in the wheel well area (Fig. 401).
   B. A container will be necessary to catch hydraulic fluid when removing the check valve from the module unit. Should fluid spill on the airplane, the affected area must be decontaminated (Ref Chapter 12, Cleaning and Washing).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Standby Hydraulic System Check Valve
   A. Depressurize hydraulic reservoir system (Ref 29-09-300, Maintenance Practices).
   B. Disconnect standby system motor-driven pump electrical connector.
   C. Unscrew and remove check valve from module unit (Fig. 401).
   D. Install protective plug in open port of modular unit.
4. Install Standby Hydraulic System Check Valve
   A. Install O-rings with backup rings in each groove of check valve. Apply assembly lube or hydraulic fluid to O-rings and to threads of check valve (Fig. 401).
   B. Remove protective plug and screw check valve into module housing. Apply 50 to 200 pound-inches of torque to check valve and lockwire.
   C. Pressurize hydraulic reservoir system (Ref 29-09-300).
   D. Connect electrical connector to standby pump electric motor.
   E. Pressurize standby hydraulic system and check for leaks.

      NOTE: Standby system is pressurized with the standby pump by operating either of the FLIGHT CONTROL switches to STBY RUD (standby rudder) position or by switching the ALTERNATE FLAPS switch to ARM position. Switches are located on the P5 forward overhead panel.



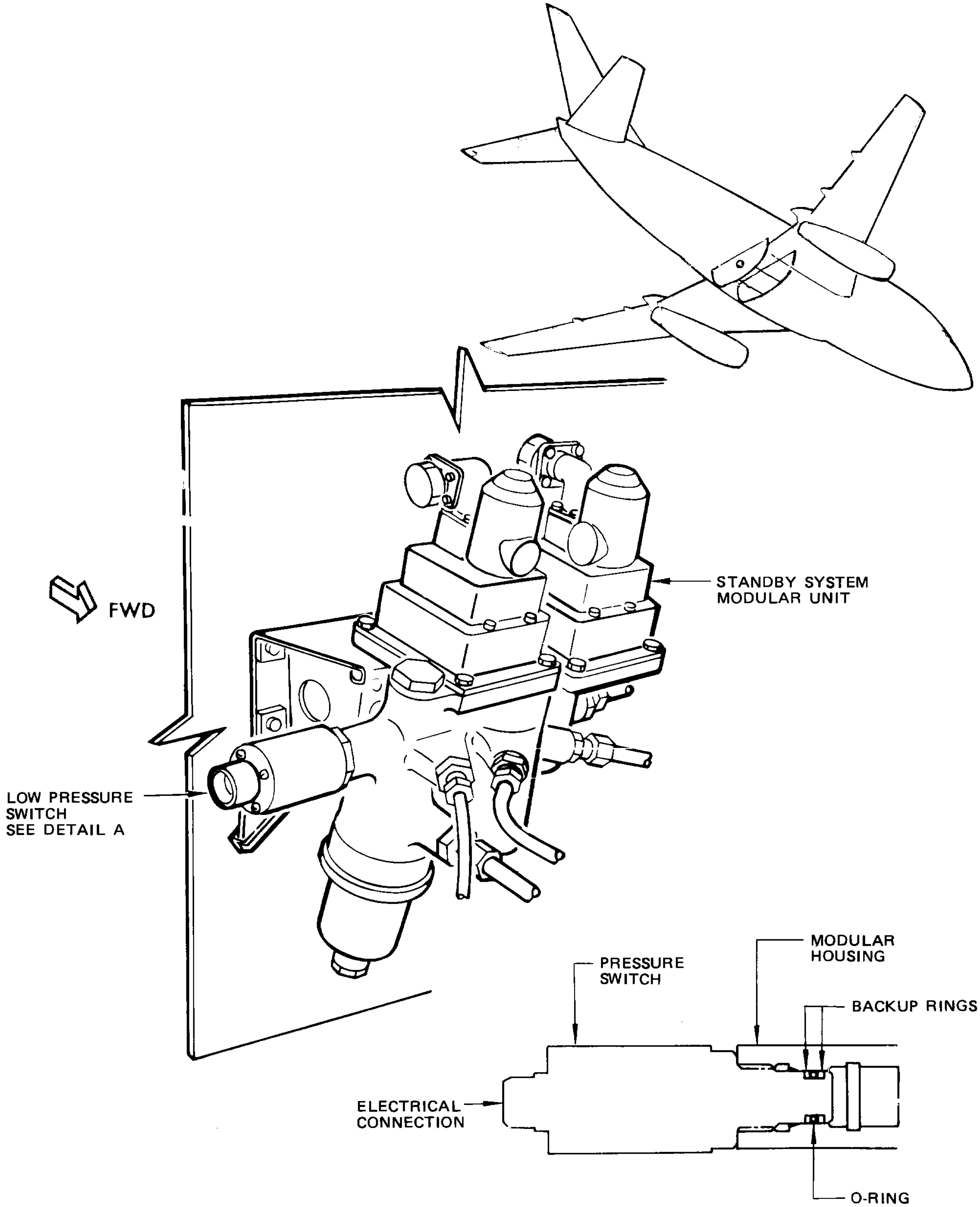
Standby System Check Valve Installation
Figure 401

STANDBY HYDRAULIC SYSTEM LOW PRESSURE SWITCH - REMOVAL/INSTALLATION

1. General
   A. A container will be necessary to catch fluid from the modular unit. Take necessary precautions to prevent spillage of fluid. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Pressure Switch
   A. Depressurize hydraulic reservoir system. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. Disconnect electrical connector from pressure switch (Fig. 401).
   C. Unscrew pressure switch and install protective cover.
4. Install Pressure Switch
   A. Install backup ring, O-ring and backup ring in groove on pressure switch (Fig. 401). Lubricate O-ring and threads with assembly lube or hydraulic fluid.
   B. Install switch in modular unit and apply a torque of 50 to 200 pound-inches.
   C. Install lockwire on pressure switch.
   D. Install electrical connector.
   E. Pressurize standby hydraulic system and check pressure switch for leaks.
      (1) Connect electrical power to airplane.
      (2) Close standby pump circuit breakers on P6-11 and P6-12 panels.

      WARNING: PERSONNEL STAND CLEAR OF RUDDER AND LEADING EDGE DEVICES.

      (3) On overhead panel, position system A flight control switch to STBD RUD and cycle rudder.
      (4) Place switch in OFF position and remove electrical power.
   F. Service hydraulic reservoirs. Refer to Chapter 12, Hydraulic Fluid Servicing.

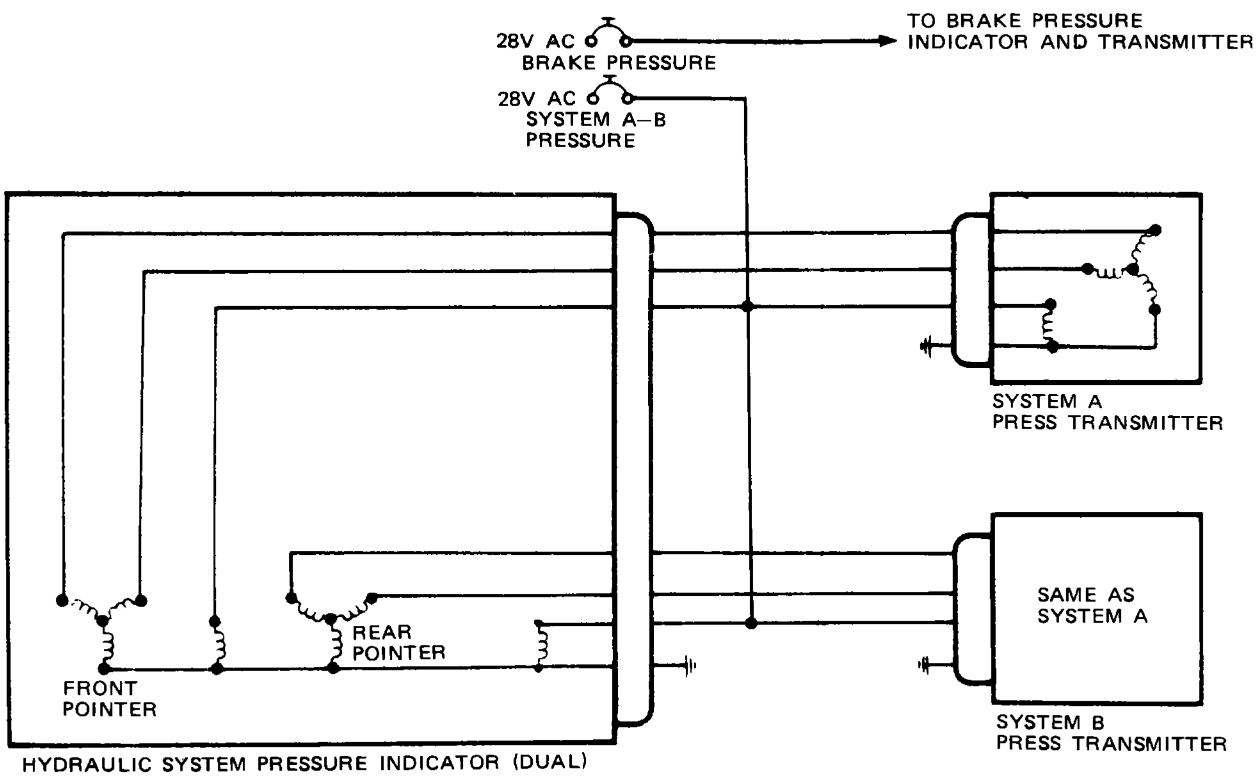


Standby System Low Pressure Switch Installation
Figure 401

HYDRAULIC PRESSURE INDICATING SYSTEMS - DESCRIPTION AND OPERATION

1. General

A. Two hydraulic pressure indicating system s provide remote indication of fluid pressure in hydraulic power systems A and B. Each hydraulic pressure indicating system consists of a transmitter and an indicator for remote indication of pressure. The transmitters are mounted on the forward bulkhead in the left and right wheel wells, and are connected to the pressure side of systems A and B modules by hydraulic connecting lines. The transmitters sense pressure changes and send corresponding electrical signals to a dual pressure indicator on the first officer's panel. The pressure indicating systems are powered by 28 volt ac from the load control panel (P6) (Fig. 1).



Hydraulic Pressure Indicating System Schematic
Figure 1

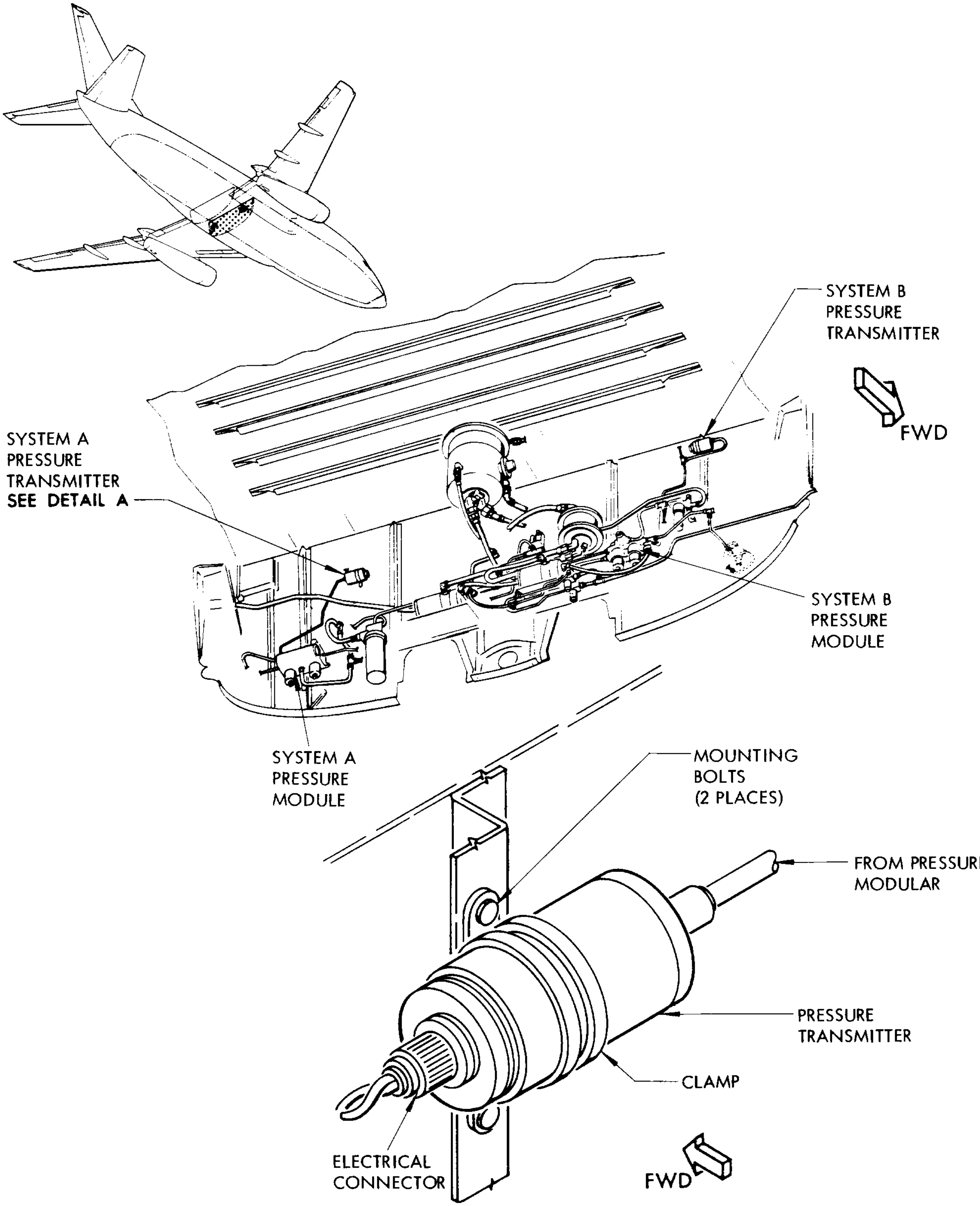
HYDRAULIC PRESSURE INDICATING SYSTEMS - TROUBLESHOOTING

1. General
   A. The pressure transmitters for systems A and B are installed on the respective system pressure modular units and transmit signals to a dual indicator located on the first officer's panel. The standby hydraulic system is not provided with a pressure indication system, but is equipped with a low pressure warning system.
   B. Before troubleshooting system A or B pressure indicating systems, ensure that the hydraulic system is within design pressure tolerances. Tolerance of the hydraulic reading shown on the dual pressure indicator is ± 100 psi.
2. Troubleshooting Hydraulic Pressure Indicating Systems

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
High or low pressure reading	Pressure indicator	Replace installed indicator with a tested indicator. Pressurize applicable system and compare readings. Tolerance of indicators is ± 20 psi. If comparative reading between indicators is not in tolerance, removed indicator is defective	Calibrate indicator or replace
	Transmitter	If comparative reading between indicators is not in tolerance, transmitter is defective	Replace transmitter
Zero pressure indication	Open circuit or no electrical power	Check SYSTEM A-B PRESSURE circuit breaker on P6 load control panel	Close circuit breaker
		Still no pressure indication after making sure electrical power is applied	Make continuity check
	Transmitter	If electrical circuitry is all right, transmitter is defective	Replace transmitter

HYDRAULIC PRESSURE TRANSMITTERS - REMOVAL/INSTALLATION

1. General
    A. The pressure transmitters for systems A and B are similar units having the same removal and installation procedures, therefore, only one procedure will be given. Both transmitters are mounted on the forward wheel well bulkhead. The system A transmitter is accessible through the left wheel well and the system B transmitter is in the right wheel well (Fig. 401).
2. Equipment and Materials
    A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Hydraulic Pressure Transmitter
    A. Depressurize hydraulic reservoir system (AMM 29-09-300/201).
    B. Depressurize applicable hydraulic system (AMM 29-11-0/201 or 29-12-0/201).
    C. Open SYSTEM A-B PRESSURE circuit breaker on P6 load control panel.
    D. Remove connector plug from transmitter.
    E. Disconnect hydraulic line to transmitter from modular unit (Fig. 401).
    F. Remove transmitter mounting bolts and U-clamp and remove transmitter.
4. Install Hydraulic Pressure Transmitter
    A. Install O-ring and union in transmitter pressure port. Apply assembly lube or hydraulic fluid to O-ring and to threads of union.
    B. Place U-clamp on transmitter, position over mounting holes in bulkhead stringer, and install mounting bolts (Fig. 401).
    C. Connect hydraulic line from modular unit to transmitter.
    D. Connect electrical connector to transmitter.
    E. Close SYSTEM A-B PRESSURE circuit breaker on P6 load control panel.
    F. Pressurize applicable hydraulic system and check for leaks (AMM 29-11-0/201 or 29-12-0/201).
    G. Verify that the HYD SYS PRESS gage on the copilot's flight instrument panel reads approximately 3000 psi for the applicable system.
    H. Remove hydraulic power (AMM 29-11-0/201 or 29-12-0/201).
    I. Remove electrical power, if no longer needed.



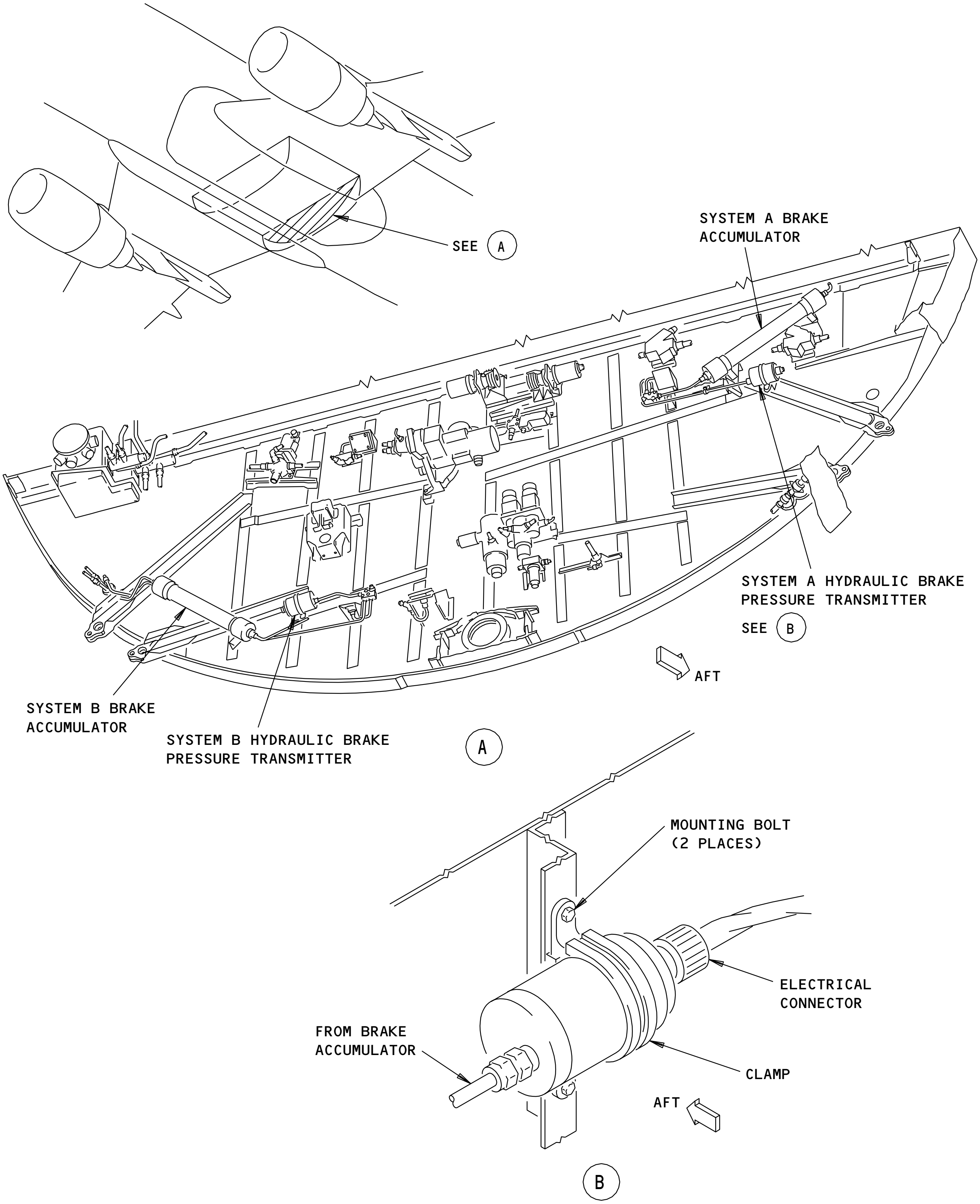
Hydraulic Pressure Transmitter Installation
Figure 401

HYDRAULIC BRAKE PRESSURE TRANSMITTERS - REMOVAL/INSTALLATION

1. General
   A. The pressure transmitters for the hydraulic brake system are similar units having the same removal and installation procedures, therefore, only one procedure will be given. Both transmitters are mounted on the aft wheel well bulkhead. The transmitters are accessible through the left and right wheel wells (Fig. 401).
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove Hydraulic Brake Pressure Transmitter
   A. Depressurize applicable hydraulic system (Ref 29-11-0, Hydraulic System A or 29-12-0, Hydraulic System B - MP).
   B. Depressurize brake accumulator by applying brakes fully six times.
   C. Open BRAKE-PRESS IND circuit breaker on P6 load control panel.
   D. Check that the landing gear are down and locked and ground lock assemblies installed (Ref 32-00-01).
   E. Remove dust cap from brake accumulator charging valve (Fig. 401).
   F. Discharge nitrogen pressure from accumulator by loosening swivel hexagonal nut on charging valve a maximum of one turn.

      WARNING: DO NOT LOOSEN VALVE BODY OR VALVE MAY BLOW OFF RESULTING IN INJURY TO PERSONNEL.

   G. Remove connector plug from transmitter.
   H. Disconnect pressure gage line to transmitter.
   I. Remove transmitter mounting bolts and U-clamp and remove transmitter.
4. Install Hydraulic Brake Pressure Transmitter
   A. Install O-ring and union in transmitter pressure port. Apply assembly lube or hydraulic fluid to O-ring and to threads of union.
   B. Place U-clamp on transmitter, position over mounting holes in bracket and install mounting bolts (Fig. 401).
   C. Connect electrical connector to transmitter.
   D. Connect pressure gage line to transmitter.
   E. Precharge hydraulic accumulator according to instructions on aluminum foil marker near pressure gage in right wheel well.
   F. Tighten swivel hexagonal nut.
   G. Install dust cap on charging valve.
   H. Check connections for nitrogen leaks.
   I. Close BRAKE-PRESS IND circuit breaker on P6 load control panel.
   J. Pressurize applicable hydraulic system (Ref 29-11-0 or 29-12-0). Brake pressure gage on the copilot's flight instrument panel should read approximately 3,000 psi for the applicable system.
   K. Check connections for nitrogen leaks.



Hydraulic Brake Pressure Transmitter Installation
Figure 401

HYDRAULIC FLUID OVERHEAT WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Two amber overheat lights on the pilots' overhead panel are provided to show when an overheat condition exists in the system B hydraulic pump return line (Fig. 1). When the return fluid temperature exceeds 220 ±5°F, the amber light comes on. When the fluid temperature drops to 165°F, the light goes out. The overheat switches are located in the case drain lines near No. 1 and No. 2 system B hydraulic pumps. Twenty-eight volt dc power is supplied to the overheat warning switches through the indicator light circuit breakers on the P6 panel. When an overheat condition occurs, the overheat switch will close, forming a ground and thereby completing the circuit to the amber light on the overhead panel. The amber light will go out when the overheat condition disappears and the overheat switch opens.
   B. On some airplanes (Fig. 1 for airplane effectivity) a temperature sensor is connected to the motor housing of system B hydraulic pumps. The sensor operates in parallel with the system B overheat switches in activation of the overheat lights. If temperature of the pump exceeds 235 ±8° F, system B overheat light will illuminate.

HYDRAULIC FLUID OVERHEAT WARNING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This test is for electrical continuity between the overheat warning lights and the overheat switches and for proper operation and temperature settings of the switches. The overheat switches are installed in the case drain lines of system B No. 1 and 2 hydraulic pumps (29-32-11401). Temperature settings are checked by applying controlled heat to each overheat switch.

      NOTE: The temperature sensor (235 ±8°F) connected to the motor housing of system B hydraulic pumps is not considered to be a line maintenance test item and should be tested per the manufacturer's overhaul manual.

   B. A container will be necessary to catch any fluid leakage from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate (Ref Chapter 12, Cleaning and Washing).
2. Overheat Warning System Test
   A. Equipment and Materials
      (1) H394R Tester - K-Type Thermocouple Switches (recommended)
          H394 TEMPCAL Tester (alternate)
          H294 Tester - Thermo Switch (alternate)
          Howell Instruments, Inc. (Vendor Code 98869)
          3479 West Vickery Blvd., Fort Worth, TX 76107-5722
      (2) Heater Probe - BH16440-40
      (3) Suitable container for BMS 3-11
   B. Procedure
      (1) Provide electrical power to airplane.
      (2) Check that all three indicator light circuit breakers, including section 1 and 5 circuit breakers in the P6 panel are closed.
      (3) Press-to-test both system B overheat warning lights on forward overhead panel.
          (a) Both lights should illuminate.
      (4) Depressurize hydraulic reservoir system (AMM 29-09-300/201).
      (5) Open section 1 and section 5 circuit breakers on P6 panel.
      (6) On airplanes with temperature sensor (235 ±8°F) on pump motor housing, remove electrical connector from each System B hydraulic pump.

(7) Connect pin 7 of each electrical connector plug to ground at thermal sensor hex fitting.
(8) Close Section 1 and 5 circuit breakers on P6 Panel.
    (a) Check that warning light illuminates.
(9) Open section 1 and 5 circuit breakers on P6 Panel.
(10) Remove jumper from pin 7 of electrical connector and reconnect electrical connector to hydraulic pump.
(11) Disconnect electrical connectors from overheat switches.

CAUTION: DO NOT REMOVE OR INSTALL THE OVERHEAT SWITCHES WHILE THE ELECTRICAL CONNECTORS ARE ATTACHED. DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Remove overheat switches from case drain line and cap lines (AMM 29-32-11/401).
(13) Reconnect electrical connectors to overheat switches.
(14) Close Section 1 and 5 circuit breakers on P6 Panel.
(15) Gradually heat each overheat switch 215 to 235°F at a rate of 5 degrees per min (±1 degree per minute).

NOTE: Use Temp Cal probe heater or equivalent to apply heat.

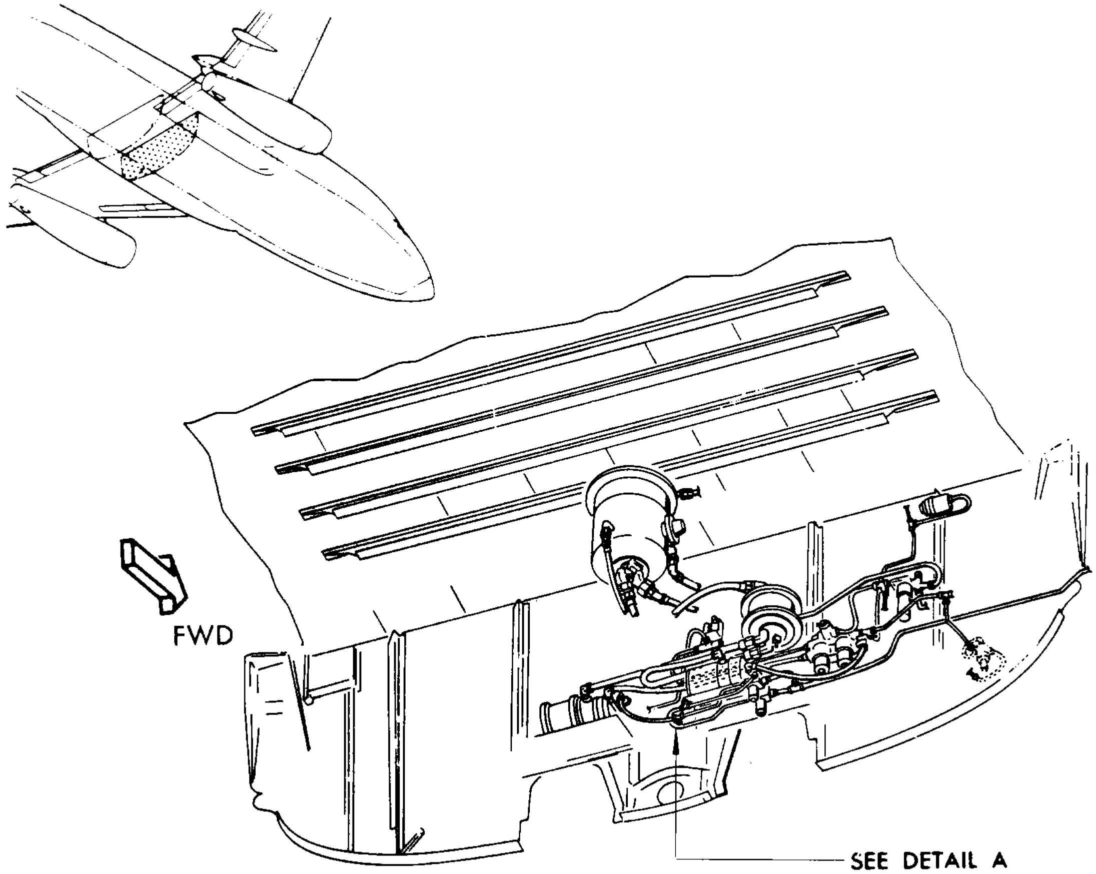
    (a) Make sure that the applicable warning light comes on.
(16) Slowly decrease temperature to 165°F at a rate of 5 degrees per min (±1 degree per minute).
    (a) Make sure that the applicable warning light goes off.
(17) Open section 1 and 5 circuit breakers on P6 panel.
(18) Disconnect electrical connectors from overheat switches and re-install overheat switches (AMM 29-32-11/401).
(19) Reconnect electrical connectors to overheat switches.
(20) Close section 1 and 5 circuit breakers on P6 panel.
(21) Check overheat switches for leaks (AMM 29-32-11 401).
(22) Remove electrical power if no longer required.

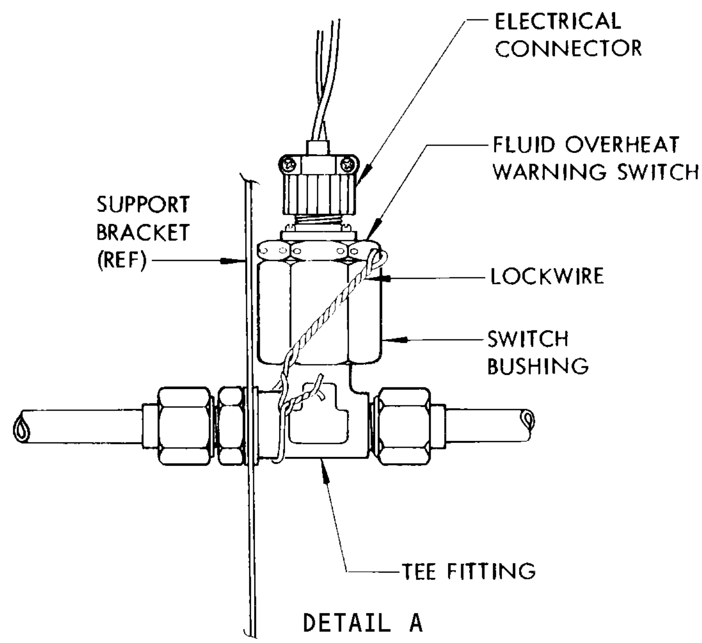
HYDRAULIC FLUID OVERHEAT WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. The system B overheat warning switches are installed in No. 1 and No. 2 pump case drain return lines. They are located just above the keel beam on the forward wheel well bulkhead (Fig. 401).
   B. A container will be necessary to catch any fluid spilled from disconnected hydraulic lines. Should fluid spill on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.
   C. The system B overheat switches are identical, therefore, only one removal and installation procedure is given.
2. Equipment and Materials
   A. Skydrol Assembly Lube - MCS 352B or Fire Resistant Hydraulic Fluid - BMS 3-11
3. Remove System B Fluid Overheat Warning Switch
   A. Depressurize hydraulic reservoirs. Refer to 29-09-300, Hydraulic Reservoir Pressurization System - MP.
   B. Open fluid overheat circuit breakers on P6 load control panel.
   C. Disconnect applicable pump supply line at reservoir to prevent fluid drainage from reservoir when switch is removed (Fig. 401).
   D. Remove electrical connector from switch.
   E. Remove overheat warning switch from switch bushing.
   F. Remove switch bushing and O-rings from tee fitting and install protective cover on open port of tee fitting.
4. Install System B Fluid Overheat Warning Switch
   A. Lubricate O-rings and threaded fittings with assembly lube or hydraulic fluid.
   B. Install O-ring and overheat warning switch bushing on open port of tee fitting.
   C. Install O-ring and overheat switch in the switch bushing.
   D. Lockwire switch to tee fitting (Fig. 401).
   E. Connect electrical connector to overheat switch.
   F. Close overheat warning switch circuit breakers on P6 load control panel.
   G. Connect hydraulic supply line to reservoir.

      CAUTION: WHEN INSTALLING THE PUMP SUPPLY LINE QUICK-DISCONNECT FITTING ENSURE THAT INDICATOR PINS ARE EXTENDED. IF PINS ARE NOT EXTENDED FLUID SUPPLY TO THE PUMP WILL BE RESTRICTED OR COMPLETELY STOPPED AND PUMP DAMAGE MAY RESULT.

   H. Pressurize hydraulic reservoirs (Ref 29-09-300).
   I. Operate applicable system B pump. Refer to 29-12-0, Hydraulic System B - MP.
   J. Check overheat switch and switch bushing for leakage.
   K. Switch system B pump switch OFF.





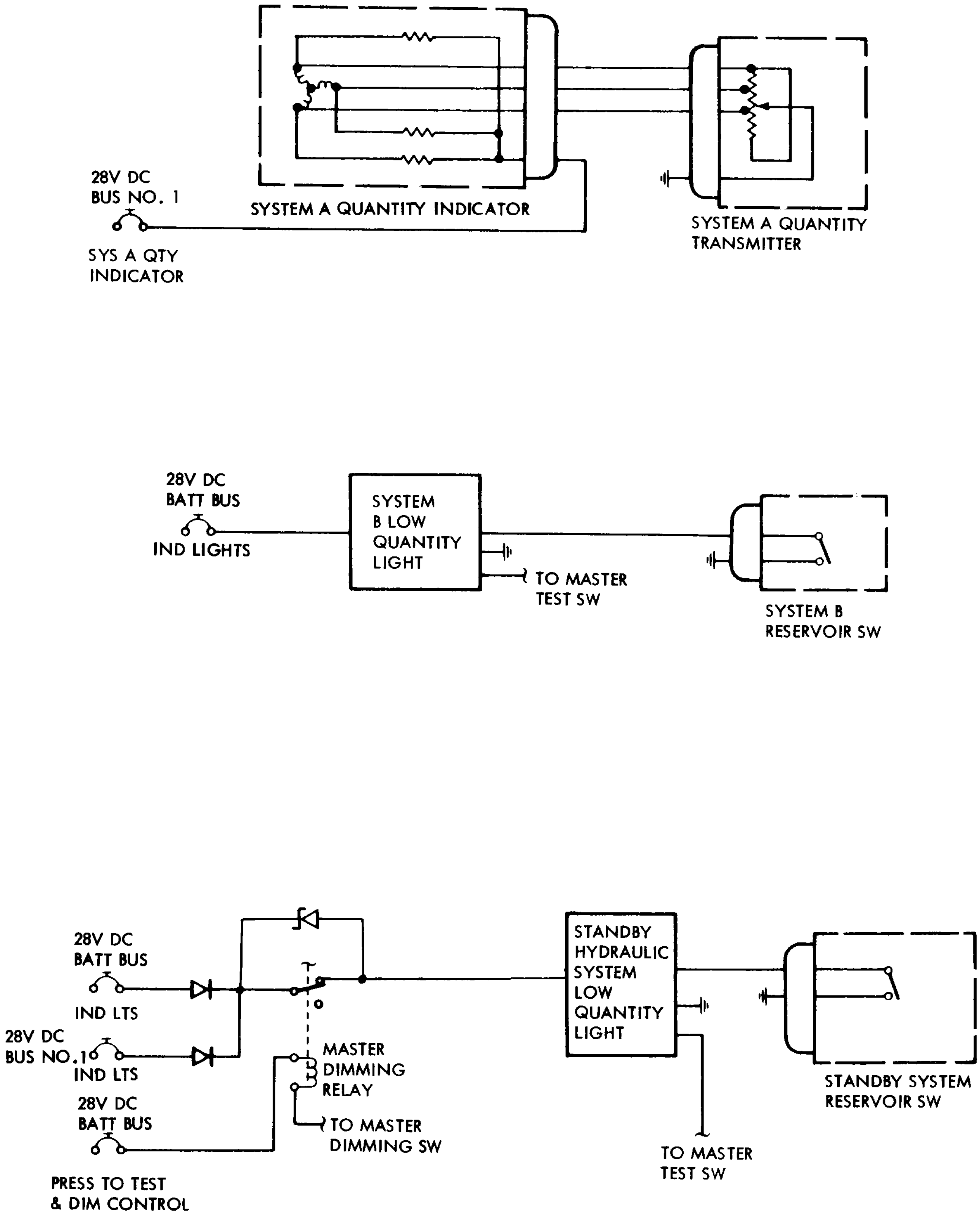
DETAIL A

Hydraulic Fluid Overheat Warning Switch Installation
Figure 401

L. Remove electrical power from airplane.

HYDRAULIC FLUID QUANTITY INDICATING SYSTEMS - DESCRIPTION AND OPERATION

1. General
   A. The hydraulic fluid quantity indicating systems indicate fluid quantity in each hydraulic power system reservoir. The system A fluid quantity indicating system consists of a float type level transmitter at the reservoir, and two indicators calibrated in U.S. gallons. One indicator on the first officer's panel, and the other indicator is a direct reading gage in the level transmitter providing fluid quantity indication at the reservoir (Fig. 1). The system is powered by 28 volts dc. A change in reservoir fluid level causes the transmitter float and arm to move up or down. The float arm moves a sliding contact of a variable resistor. The position of the sliding contact of the variable resistor determines the voltage pattern applied to coils in the indicator. The voltages on the coils produce a magnetic field which drives the indicator pointer to show reservoir fluid level. A magnet in the indicator moves the indicator needle "off scale" when there is no electrical power to the system.
   B. Hydraulic fluid quantity indication for system B and standby system is indicated by amber low level warning lights. The system B and standby system reservoirs are normally full and the warning lights are off when the fluid level in the system A reservoir is above the system B balance line connection. If fluid level in either the system B or standby reservoir falls approximately 50% below the full level, the low level transmitter in the affected reservoir will illuminate the low level warning lights. The low level warning light for system B is located on the first officer's panel and the low level warning light for the standby system is located on the pilots' overhead panel.



Hydraulic Fluid Quantity Indicating System Schematic
Figure 1

HYDRAULIC FLUID QUANTITY INDICATING SYSTEM - TROUBLESHOOTING

1. General
   A. Two basic troubles may be encountered in the hydraulic fluid quantity indicating system. They are an incorrect reading or zero reading of the direct reading gage on the system A reservoir or the remote quantity indicator located on the first officer's panel. The troubles could be caused by an open circuit (no power), defective indicator, or transmitter out of calibration.
   B. When troubleshooting the system, first check for electrical power and then substitute a known serviceable indicator. If defect is still apparent, replace transmitter, but leave the known serviceable indicator in system.

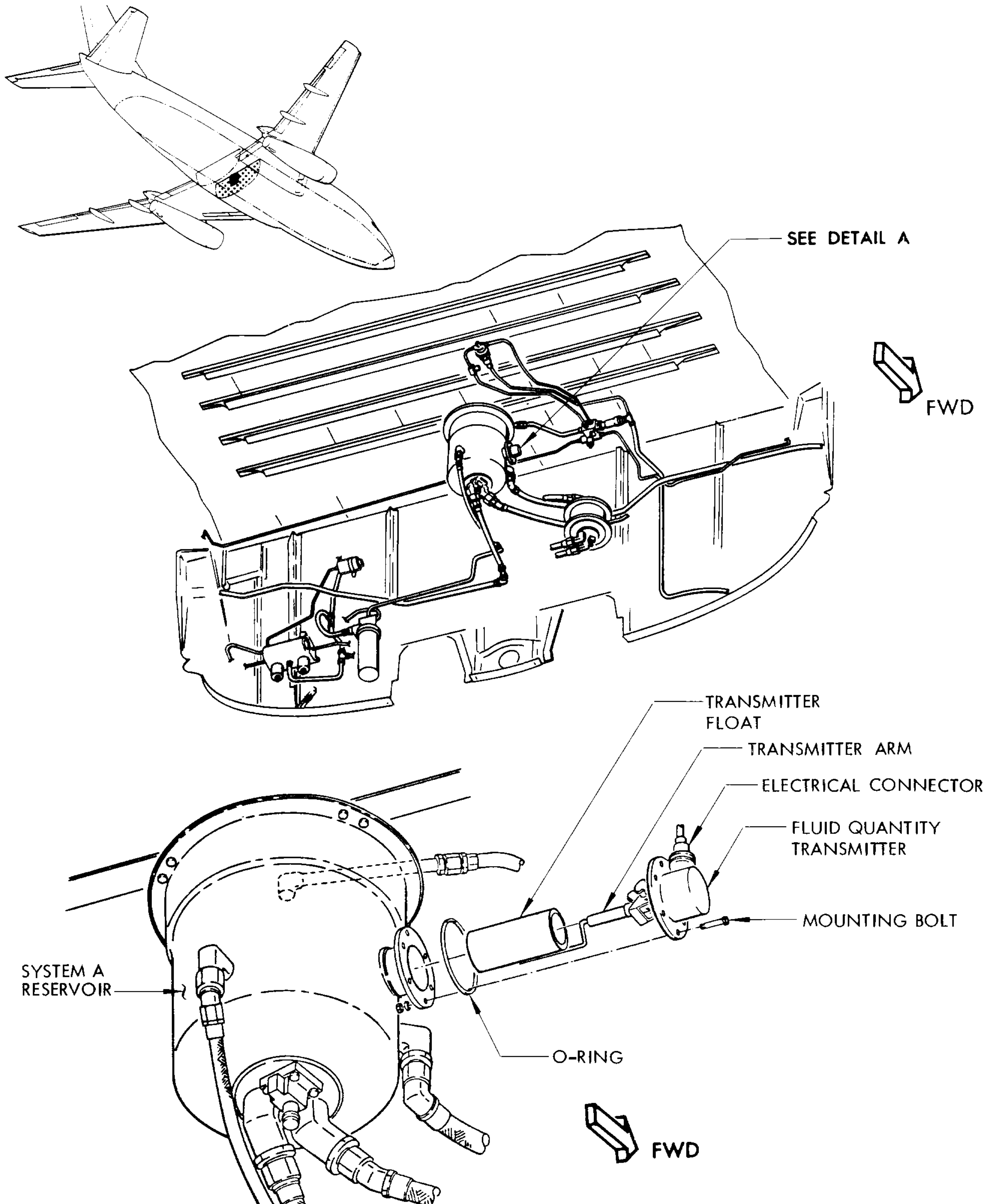
      CAUTION: DO NOT INSTALL NEW TRANSMITTER WITH A SUSPECT INDICATOR AS THIS MAY CAUSE DAMAGE TO NEW TRANSMITTER.

FLUID QUANTITY TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. The fluid quantity transmitter is installed in the side of the system A hydraulic reservoir (Fig. 401). When removing the transmitter, take precaution to prevent spilling hydraulic fluid. Should fluid spill on the airplane, the affected area must be decontaminated (Ref Chapter 12, Cleaning and Washing).
2. Remove Fluid Quantity Transmitter
   A. Depressurize hydraulic reservoir system (Ref 29-09-300 MP).
   B. Open drain valve and drain system A reservoir. Leave drain valve open.

      WARNING: DO NOT CLOSE DRAIN VALVE UNTIL TRANSMITTER HAS BEEN REINSTALLED. IF DRAIN VALVE IS CLOSED, FLUID MAY ACCUMULATE IN RESERVOIR AND SPILL ONTO PERSONNEL WHEN TRANSMITTER IS REMOVED.

   C. Open SYSTEM A QUANTITY INDICATION circuit breaker on P6 load control panel.
   D. Remove transmitter electrical connector (Fig. 401).
   E. Remove transmitter mounting bolts.
   F. Slowly remove transmitter from reservoir and carefully pull arm and float through reservoir opening.
3. Install Fluid Quantity Transmitter
   A. Ensure that mounting surfaces on reservoir flange and transmitter are clean and free of nicks (Fig. 401).
   B. Install O-ring on transmitter flange.
   C. Carefully insert transmitter arm into reservoir opening.
   D. Position transmitter in mounting position and secure with mounting bolts.
   E. Install transmitter electrical connector.
   F. Close drain valve and lockwire.
   G. Connect external electric power to airplane.
   H. Close SYSTEM A QUANTITY INDICATION circuit breaker on P6 load control panel.
   I. Check indicator for zero reading.
   J. Service hydraulic reservoirs (Ref Chapter 12, Servicing).
   K. Pressurize hydraulic reservoir system (Ref 29-09-300 MP).
   L. Check for leaks.
   M. Check quantity indicators for full indication as follows:
      (1) Hydraulic system A indicator should read F (full) +0.25 gallon.
      (2) Hydraulic system B indicator should read F (full) +0.10 gallon.
      (3) Standby hydraulic system indicator should read F (full) +0.05 gallon.
   N. Remove electrical power from airplane.



DETAIL A

Fluid Quantity Transmitter Installation
Figure 401

FLUID QUANTITY TRANSMITTER - INSPECTION CHECK

1. General
   A. The fluid quantity transmitter is installed in the side of the system A reservoir and transmits signals to an indicator on the first officer's panel. A direct reading gage in the level transmitter provides an indication at the reservoir.
2. Check Fluid Quantity Transmitter
   A. Remove fluid quantity transmitter (Ref 29-33-11 R/I).
   B. Check mechanical linkage of float assembly for signs of wear at pivot points, and for smooth operation through full travel.
   C. Install transmitter (Ref 29-33-11 R/I).

      NOTE: Do not fill reservoir with hydraulic fluid.

   D. Connect electrical power to airplane and close SYSTEM A QUANTITY INDICATION circuit breaker on P6 load control panel.
   E. Check indicators for zero readings.
   F. Fill reservoir system with hydraulic fluid (Ref (12-12-0).
   G. Check indicators for F (full) indication as follows:
      (1) Hydraulic system A indicator should read F (full) + 0.25 gallon.
      (2) Hydraulic system B indicator should read F (full) + 0.10 gallon.
      (3) Standby hydraulic system indicator should read F (full) + 0.05 gallon.
   H. If indicator does not read full, remove transmitter and replace.
   I. If indicator reads zero, refer to 29-33-0 TS.
   J. Pressurize hydraulic reservoir system and check for leaks (Ref 29-09-300 MP).

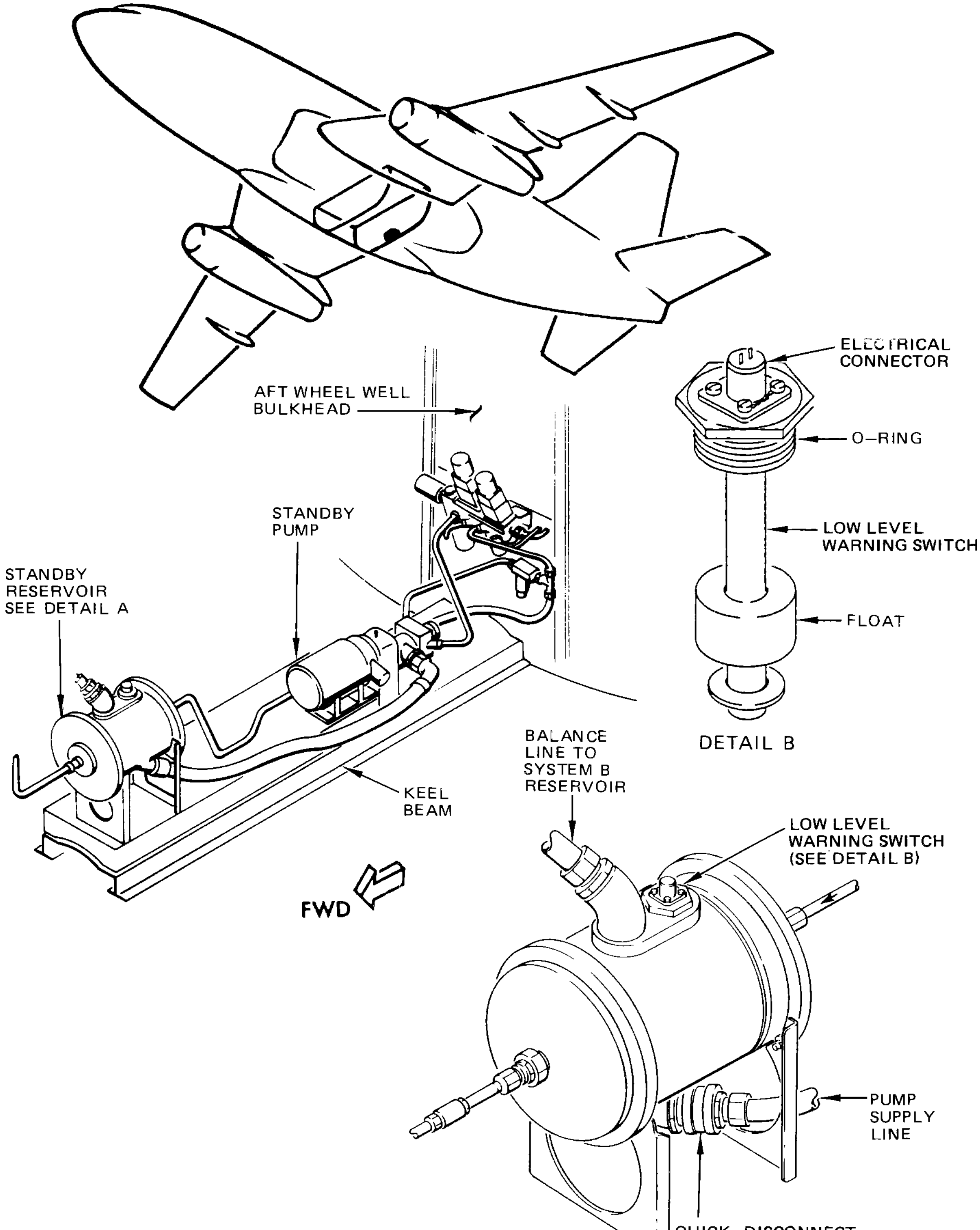
STANDBY HYDRAULIC SYSTEM RESERVOIR LOW LEVEL WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. The standby hydraulic system low level warning switch is mounted on top of the standby hydraulic reservoir located over the keel beam in the wheel well area.
   B. Should any fluid be spilled on the airplane, the affected area must be decontaminated (Ref 12-40-04).
2. Equipment and Materials
   A. Suitable container to catch hydraulic fluid (approx 4-gallon capacity)
   B. Quick-disconnect coupling half P/N 375530-12 with approx 18-inch hose
   C. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid - BMS 3-11 (20-30-21)
   D. Sealant - BMS 5-95 (Ref 20-30-11)
3. Remove Standby Reservoir Low Level Warning Switch (Fig. 401)
   A. Open nine circuit breakers CONTROL CABIN LIGHTING MASTER DIM BUS IND (P6).
   B. Open CONTROL CABIN LIGHTING MASTER CAUTION ANNUNCIATION No. 1 and BATTERY circuit breakers (P6).
   C. Position FLT CONTROL B switch OFF.
   D. Depressurize system B hydraulic reservoir (Ref 29-09-300 MP).,
   E. Disconnect standby hydraulic pump supply line at bottom of standby reservoir.
   F. Place open end of hose with quick-disconnect coupling half assembly in container and connect coupling to quick-disconnect at bottom of standby reservoir. Permit fluid to drain until all flow ceases.
   G. Remove electrical connector from low level warning reservoir.
   H. Remove switch from reservoir.
   I. Remove drain quick-disconnect coupling and hose.
4. Install Standby Reservoir Low Level Warning Switch (Fig. 401).
   A. Lubricate O-ring with assembly lube or hydraulic fluid and install on low level warning switch.
   B. Install switch in port on top of standby hydraulic reservoir and tighten.
   C. Apply a fillet of sealant around hexagonal nut of switch.
   D. Install electrical connector on switch.

E. Provide electrical power (Ref 24-22-00 MP).
F. Close all circuit breakers CONTROL CABIN LIGHTING MASTER DIM BUS IND. (P6 panel).
G. Close CONTROL CABIN LIGHTING MASTER CAUTION ANNUNCIATION BUS NO. 1 and BATTERY circuit breakers (P6 panel).
H. Check that STBY HYD LOW QUANTITY (P5 panel) light is on.
I. Position FLT Control B switch to ON.
J. Fill standby and system B reservoirs (Ref 12-12-00).
K. Check that light observed above is off.
L. Connect standby pump supply line quick-disconnect to disconnect on bottom of standby reservoir.

<u>CAUTION</u>: ENSURE THAT INDICATOR PINS ON QUICK DISCONNECT ARE FULLY EXTENDED OR RESTRICTED FLOW COULD DAMAGE PUMP.

M. Close system B depressurization valve and pressurize system B reservoir (Ref 29-09-300).
N. Check all connections for leaks.
O. Check system B hydraulic quantity. Service if necessary (Ref 12-12-00).
P. Remove electrical power if no longer required (Ref 24-22-00 MP).

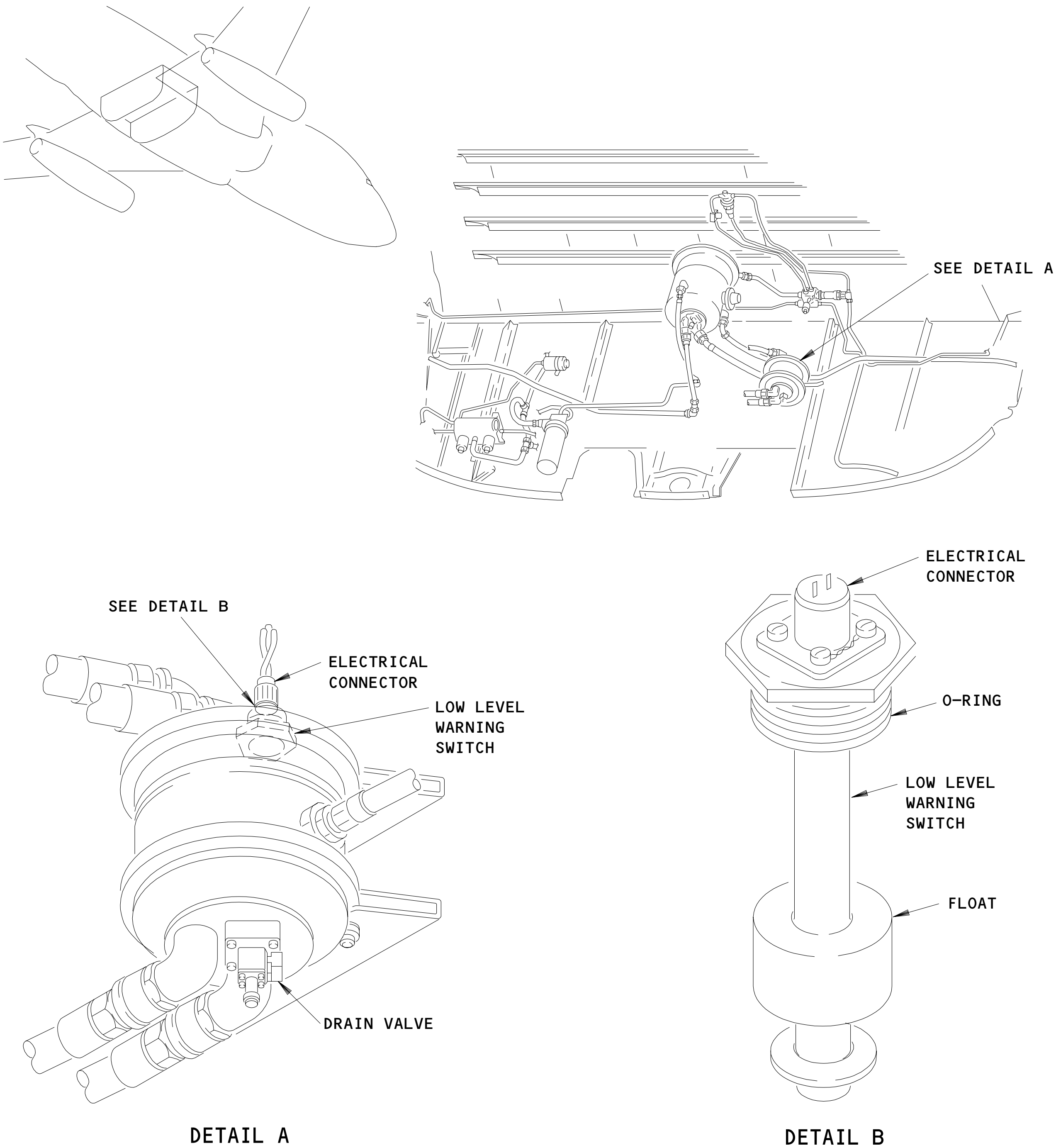


Standby Hydraulic System Low Level Warning Switch Installation
Figure 401

SYSTEM B HYDRAULIC SYSTEM RESERVOIR LOW LEVEL WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. The System B Hydraulic System Reservoir low level warning switch is mounted on top of the System B Hydraulic System Reservoir located on the forward bulkhead of the wheel well area.
   B. Should any fluid be spilled on the airplane, the affected area must be decontaminated (AMM 12-40-0/201).
2. Equipment and Materials
   A. Suitable container to catch hydraulic fluid (approx 4-gallon capacity)
   B. Skydrol Assembly Lube - MCS 352B or Hydraulic Fluid - BMS 3-11 (AMM 20-30-21/201)
   C. Sealant - BMS 5-95 (AMM 20-30-11/201)
3. System B Hydraulic System Reservoir Low Level Warning Switch (Fig. 401)
   A. Open nine circuit breakers CONTROL CABIN LIGHTING MASTER DIM BUS IND (P6).
   B. Open CONTROL CABIN LIGHTING MASTER CAUTION ANNUNCIATION No. 1 and BATTERY circuit breakers (P6).
   C. Position FLT CONTROL B switch OFF.
   D. Depressurize system B hydraulic reservoir (AMM 29-09-300/201).
   E. Open System B reservoir drain valve and drain fluid from reservoir.
   F. Close system B drain valve and lockwire handle in the CLOSE position.
   G. Remove electrical connector from low level warning reservoir.
   H. Remove switch from reservoir.
4. System B Hydraulic System Reservoir Low Level Warning Switch (Fig. 401)
   A. Provide electrical power (AMM 24-22-00/201).
   B. Lubricate O-ring with assembly lube or hydraulic fluid and install on low level warning switch.
   C. Install switch in port on top of the System B hydraulic reservoir.
   D. Apply a fillet of sealant around hexagonal nut of switch.
   E. Install electrical connector on switch.
   F. Close all circuit breakers CONTROL CABIN LIGHTING MASTER DIM BUS IND (P6 panel).
   G. Close CONTROL CABIN LIGHTING MASTER CAUTION ANNUNCIATION BUS NO. 1 and BATTERY circuit breakers (P6 panel).
   H. Check that STBY HYD LOW QUANTITY (P5 panel) light is on.
   I. Fill standby and system B reservoirs (AMM 12-12-0/201).
   J. Check that light observed above is off.

K. Pressurize resevoirs and check switch for leaks (AMM 29-09-300/201).

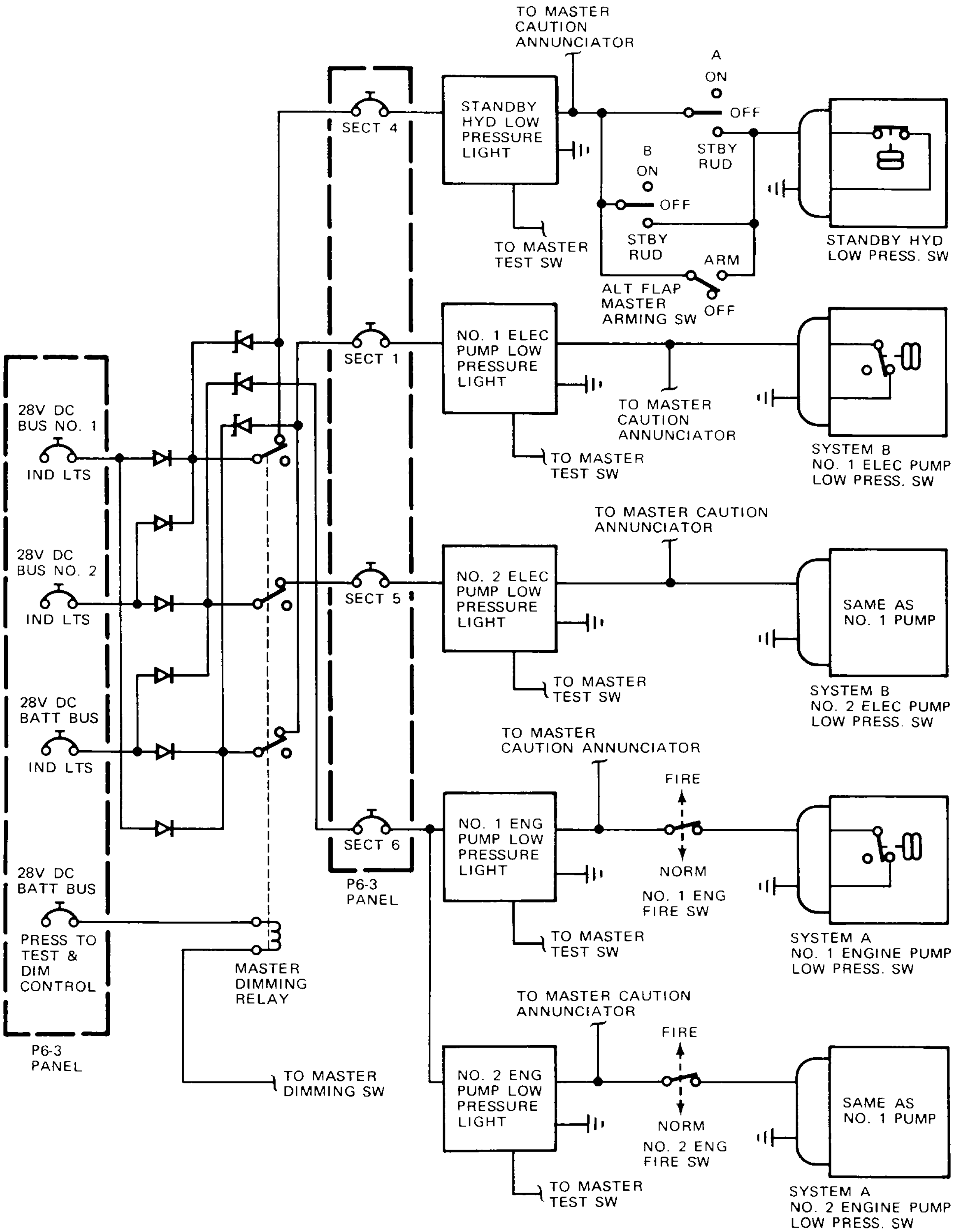


System B Hydraulic Reservoir Low Level Warning Switch Installation
Figure 401

HYDRAULIC PUMP LOW PRESSURE WARNING SYSTEMS - DESCRIPTION AND OPERATION

1. General
   A. The hydraulic pump low pressure warning systems give an amber light warning signal when pump delivery pressure is low (Fig. 1). Five independent hydraulic pump low pressure warning systems are installed, one for each engine-driven hydraulic pump, one for each system B electric motor-driven pump and one for the standby pump. Each warning system consists of an amber low pressure light on the pilots' overhead panel, and a cartridge type low pressure warning switch installed in the associated modular unit pump discharge line. The system A engine-driven hydraulic pump warning systems are wired through their appropriate engine fire switch. Positioning an engine fire switch to FIRE will de-energize the warning system. Each system warning light illuminates when electric power is on and the pump delivery pressure drops below the preset pressure of the low pressure warning switch. Each warning system is powered by 28 volts.

      NOTE: Pump low pressure warning lights indicate pump pressurization and do not reflect system hydraulic pressure. If an engine driven pump is depressurized when the opposite pump is pressurized, pressure between the downstream check valve and the blocking valve of the depressurized pump must bleed back through the blocking valve. This will increase the delay in illumination of the low pressure light.



Hydraulic Pump Low Pressure Warning System Schematic
Figure 1

HYDRAULIC PUMP LOW PRESSURE WARNING SYSTEM - ADJUSTMENT/TEST

1. General
    A. The low pressure warning system is tested for electrical continuity between the low pressure warning lights and pressure switches and for proper operation and pressure settings of the switches. Pressure settings are checked by applying controlled pressure to each individual low pressure switch. The settings of the switches are manufacturer adjusted and there is no adjustment to be done.
    B. A container will be necessary to catch any fluid leakage from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.
2. Hydraulic Pump Low Pressure Warning System Test
    A. Equipment and Materials
        (1) Hydraulic ground test bench, 0 to 3000 psi
    B. Prepare to Test Low Pressure Warning System
        (1) Provide electrical power to airplane.
        (2) Check that the following circuit breakers on the P6 panel are closed:
            (a) Indicator Light circuit breakers
            (b) Dim and Test Control circuit breakers
            (c) Sect. 1, Sect. 4, Sect. 5, and Sect. 6 circuit breakers
    C. Test Low Pressure Warning System
        (1) Test system A low pressure warning system.
            (a) Reset master caution light.
            (b) Disconnect pressure hose from Engine No. 1 hydraulic pump and connect hose to ground test bench. Cap pressure port of pump.
            (c) Check that system A low pressure warning lights are illuminated.
            (d) Operate the ground test bench and slowly increase hydraulic pressure:
                1) ON AIRPLANES WITH P/N 10-60552-1 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that master caution and engine No. 1 pump low pressure warning lights go out between 950 and 1450 psi.
                2) ON AIRPLANES WITH P/N 10-60552-11 OR -22 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that master caution and engine No. 1 pump low pressure warning lights go out between 1200 and 1500 psi.
                3) ON AIRPLANES WITH P/N 10-60552-35 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that master caution and engine No. 1 pump low pressure warning lights go out between 1400 and 1600 psi.
            (e) Operate corresponding press-to-test circuit. Check that warning light illuminates.

(f) Slowly decrease pressure:
 1) ON AIRPLANES WITH P/N 10-60552-1 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that the master caution warning light and the corresponding low pressure light illuminates between 1350 and 700 psi.
 2) ON AIRPLANES WITH P/N 10-60552-11 OR -22 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that the master caution warning light and the corresponding low pressure light illuminates between 1400 and 1100 psi.
 3) ON AIRPLANES WITH P/N 10-60552-35 PRESSURE SWITCHES INSTALLED ON THE SYSTEM PRESSURE MODULE, check that the master caution warning light and the corresponding low pressure light illuminates between 1500 and 1300 psi.

(g) Turn off ground test bench and disconnect pressure hose connected to ground test bench in step (b).

(h) Reconnect pressure hose to pressure port of pump.

(i) Repeat steps (a) thru (h) for engine No. 2 pump low pressure warning system.

(2) Test system B low pressure warning system.

(a) Repeat steps (1)(a) thru (1)(h) for No. 1 Elec. Pump Low Pressure Warning System.

(b) Repeat steps (1)(a) thru (1)(h) for No. 2 Elec. Pump Low Pressure Warning System.

(3) Test standby system low pressure warning system.

(a) Operate master DIM AND TEST switch and check that the STANDBY LOW PRESSURE light illuminates.

(b) Open STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).

(c) Reset Master CAUTION light (pilot's light shield).

(d) Position FLT CONTROL A switch (P5) to STBY RUD momentarily. Check that STANDBY HYD LOW PRESSURE light illuminates. Return switch to OFF.

(e) Close STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).

(f) Position FLT CONTROL A switch to STBY RUD. Check that STANDBY HYD LOW PRESSURE light illuminates momentarily and then extinguishes. Master CAUTION light may illuminate and should be reset if it illuminates. Return switch to OFF.

(g) Open STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).

(h) Position FLT CONTROL B switch (P5) to STBY RUD momentarily. Check that STANDBY HYD LOW PRESSURE light illuminates. Return switch to OFF.

(i) Close STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).

(j) Position FLT CONTROL B switch to STBY RUD. Check that STANDBY HYD LOW PRESSURE light illuminates momentarily and then extinguishes. Master CAUTION light may illuminate and should be reset if it illuminates. Return switch to OFF.
(k) Open STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(l) Position either FLT CONTROL A or FLT CONTROL B switch to STBY RUD momentarily. Check that STANDBY HYD LOW PRESSURE light illuminates. Return switch to OFF.
(m) Close STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(n) Position ALTERNATE FLAPS position switch (P5) to OFF.
(o) Position ALTERNATE FLAPS arming switch (P5) to ARM. Check that STANDBY HYD LOW PRESSURE light illuminates momentarily and then extinguishes. Master CAUTION light may illuminate and should be reset if it illuminates.
(p) Position ALTERNATE FLAPS arming switch to OFF.
(q) Open STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(r) Position either FLT CONTROL A or FLT CONTROL B switch (P-5) to STBY RUD momentarily. Check that STANDBY HYD LOW PRESSURE light illuminates. Return switch to OFF.
(s) Open AC INDICATION BUS #1 PHASE C circuit breaker (P6-4).
(t) Close STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(u) Position either FLT CONTROL A or FLT CONTROL B switch to STBY RUD. Check that STANDBY HYD LOW PRESSURE light illuminates and then extinguishes. Master CAUTION light may illuminate and should be reset if it illuminates. Return FLT CONTROL switch to off.
(v) Close AC INDICATION BUS #1 PHASE C circuit breaker (P6-4).
(w) Open STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(x) Position either FLT CONTROL A or FLT CONTROL B switch to STBY RUD. Check that STANDBY HYD LOW PRESSURE light illuminates.

<u>NOTE</u>: FLT CONTROL SWITCH must remain in STBY RUD position to energize the low pressure light circuit for the following procedure.

(y) Disconnect standby pump pressure hose at quick disconnect and connect hose to ground test bench. Cap pressure port of pump.
(z) Remove the lockwire from the ALT FLAP arming switch and set the ALT FLAP arming switch to the ARM position.
(aa) Operate ground test bench and slowly increase hydraulic pressure.
(ab) On airplanes with 10-60552-1 pressure switch installed, check that STANDBY HYD low pressure light extinguishes between 950 and 1450 psi.

(ac) On airplanes with 10-60552-11 or -22 pressure switch installed, check that STANDBY HYD low pressure light extinguishes between 1100 and 1500 psi.
(ad) On airplanes with 10-60552-35 pressure switch installed, check that STANDBY HYD low-pressure light extinguishes between 1300 and 1600-psi.
(ae) Slowly decrease pressure.
(af) On airplanes with 10-60552-1 pressure switch installed, check that master caution light and STANDBY HYD low pressure light illuminates between 1350 and 700 psi.
(ag) On airplanes 10-60552-11 or -22 pressure switch installed, check that master caution and STANDBY HYD low pressure lights illuminate between 1400 and 1000 psi.
(ah) On airplanes with 10-60552-35 pressure switch installed, check that STANDBY HYD low pressure and master caution lights illuminate between 1500 and 1200 psi.
(ai) Turn off ground test bench and disconnect pressure hose connected to ground test bench in step (y).
(aj) Reconnect pressure hose to pressure port of pump.
(ak) Return FLT CONTROL switch to OFF.
(al) Close STANDBY HYD PUMP NORMAL and ALTERNATE circuit breakers (P6).
(am) Secure ALT FLAP arming switch in OFF position with lockwire.
(an) Remove electrical power/hydraulic power if no longer required.