CHAPTER

29

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CHAPTER 29 EFFECTIVE PAGES

BOEING Intercontinental 707

MAINTENANCE MANUAL

CHAPTER 29

HYDRAULIC POWER

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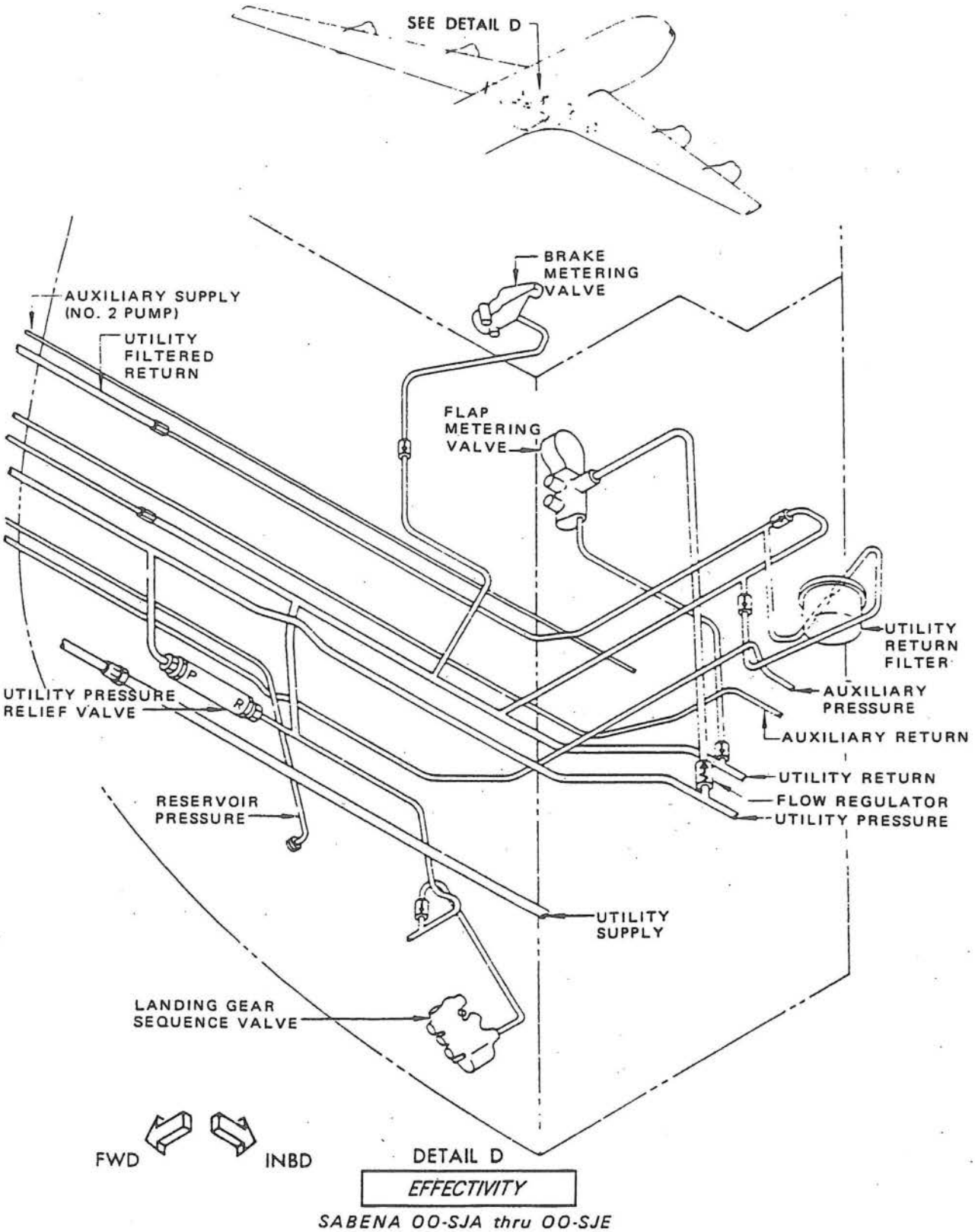
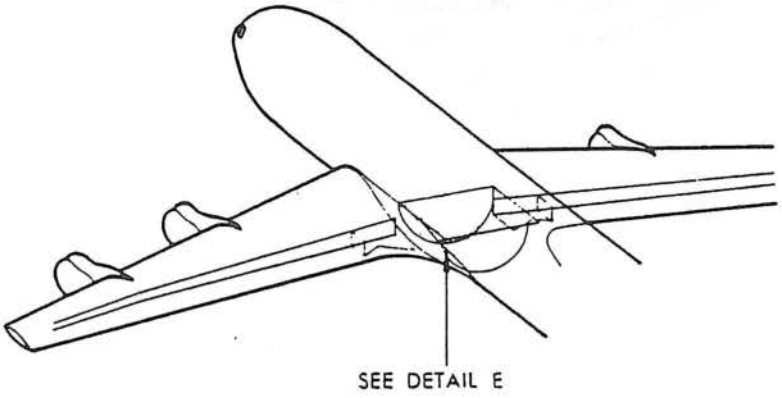
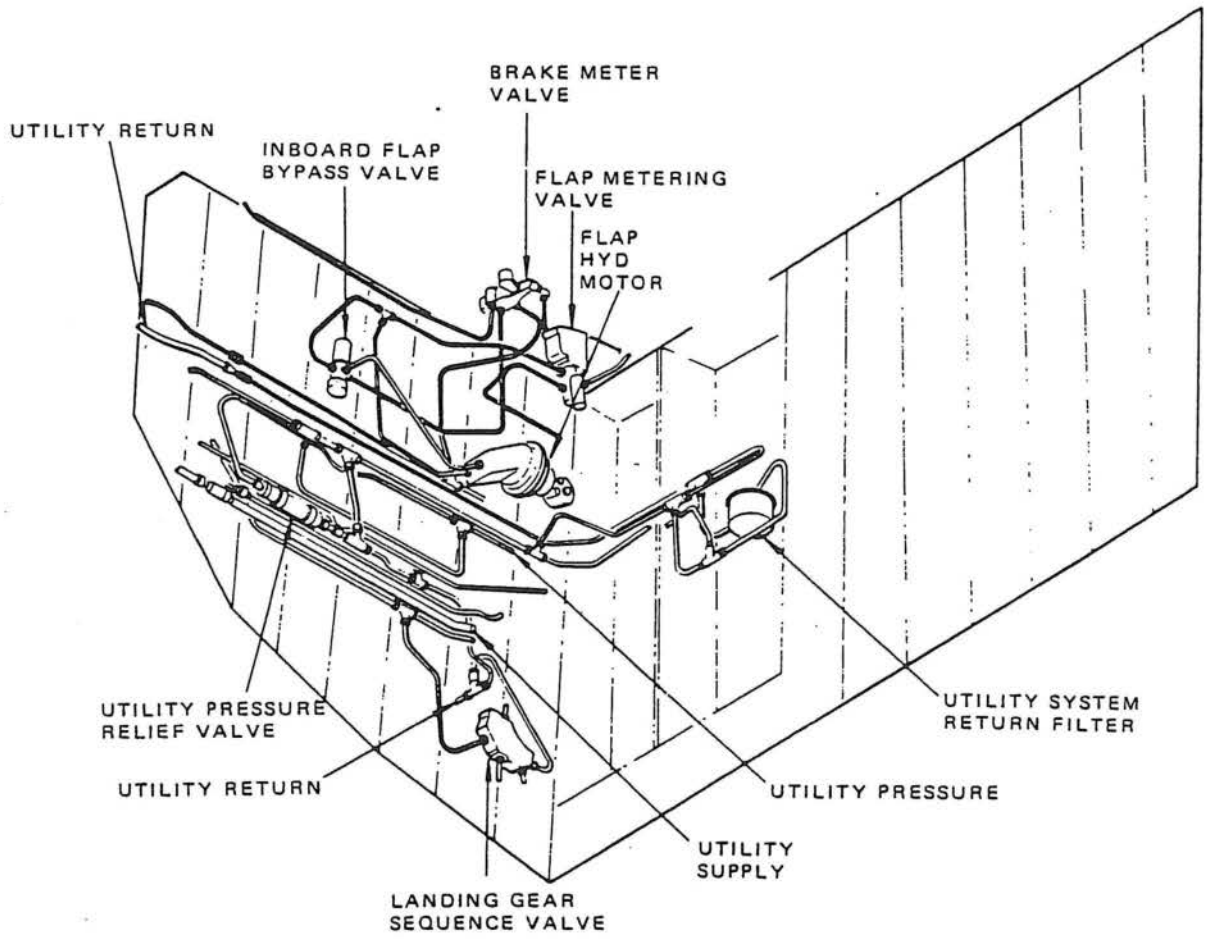


EFFECTIVITY

SABENA OO-SJA thru OO-SJE

Hydraulic System Equipment Location
Figure 1 (Sheet 4)

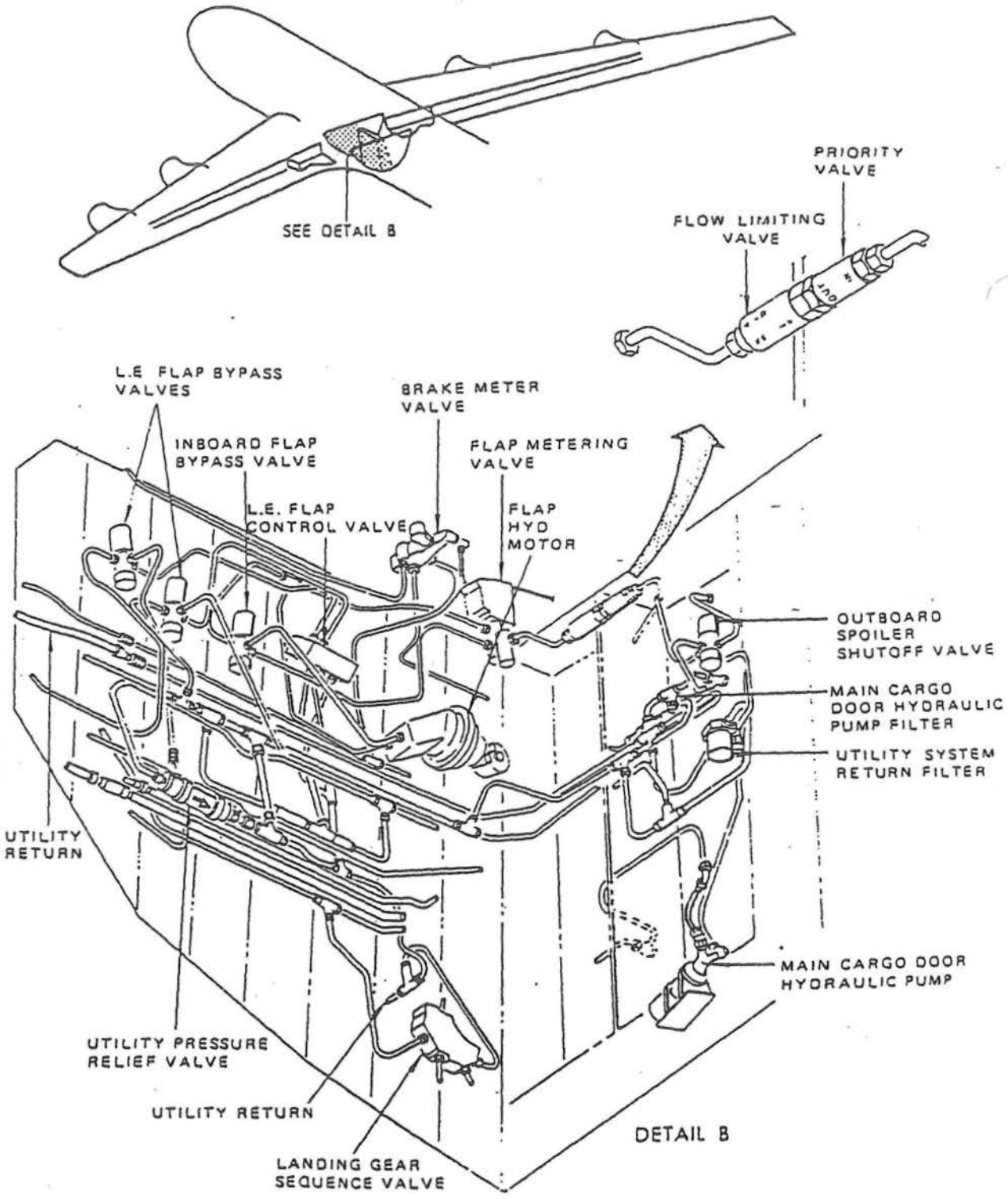




DETAIL E

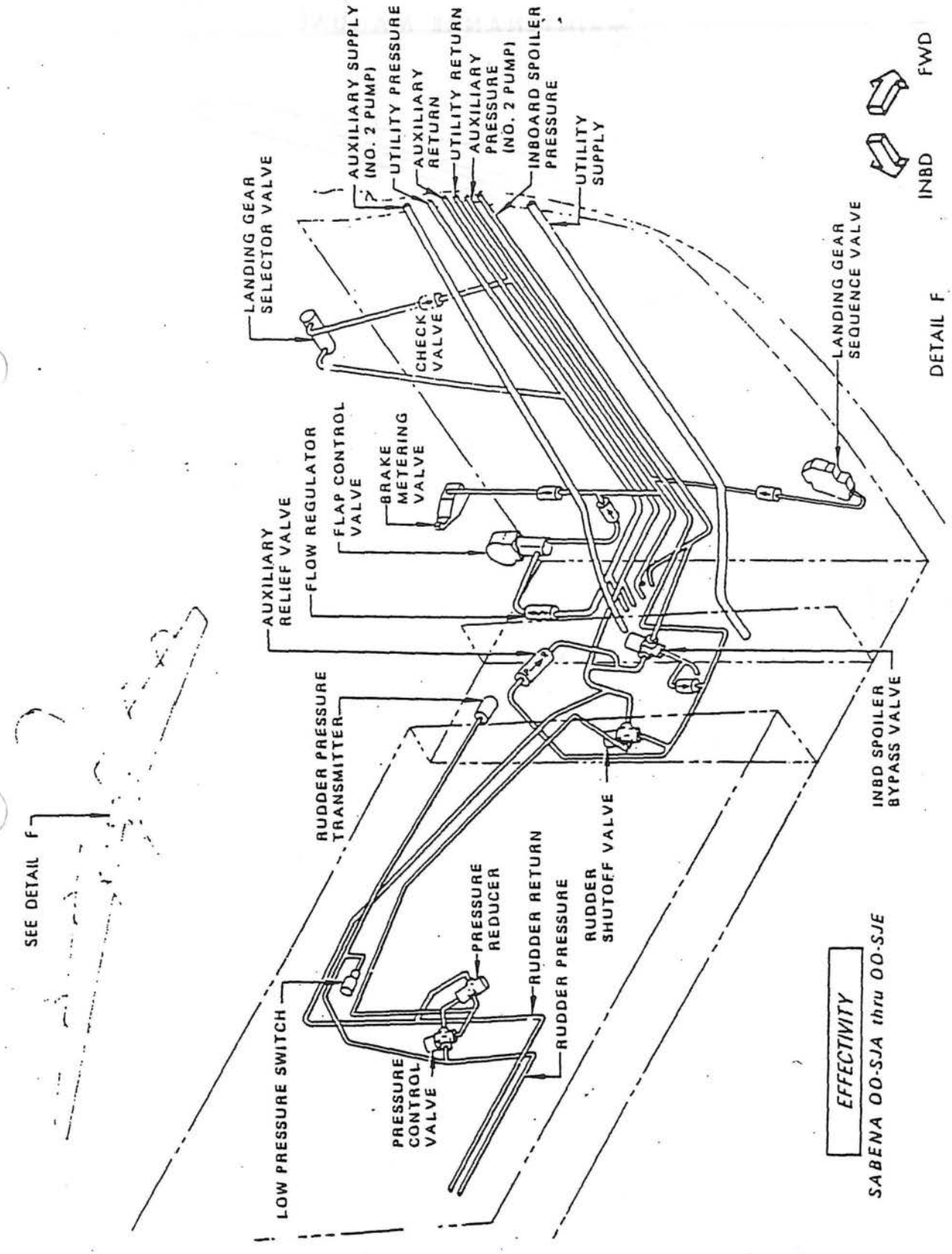
EFFECTIVITY

SABENA OO-SJF thru OO-SJH, OO-SJJ, OO-SJK

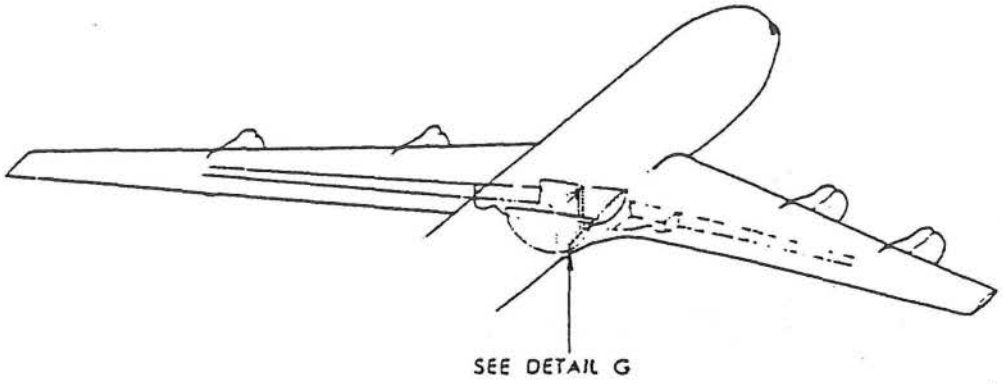


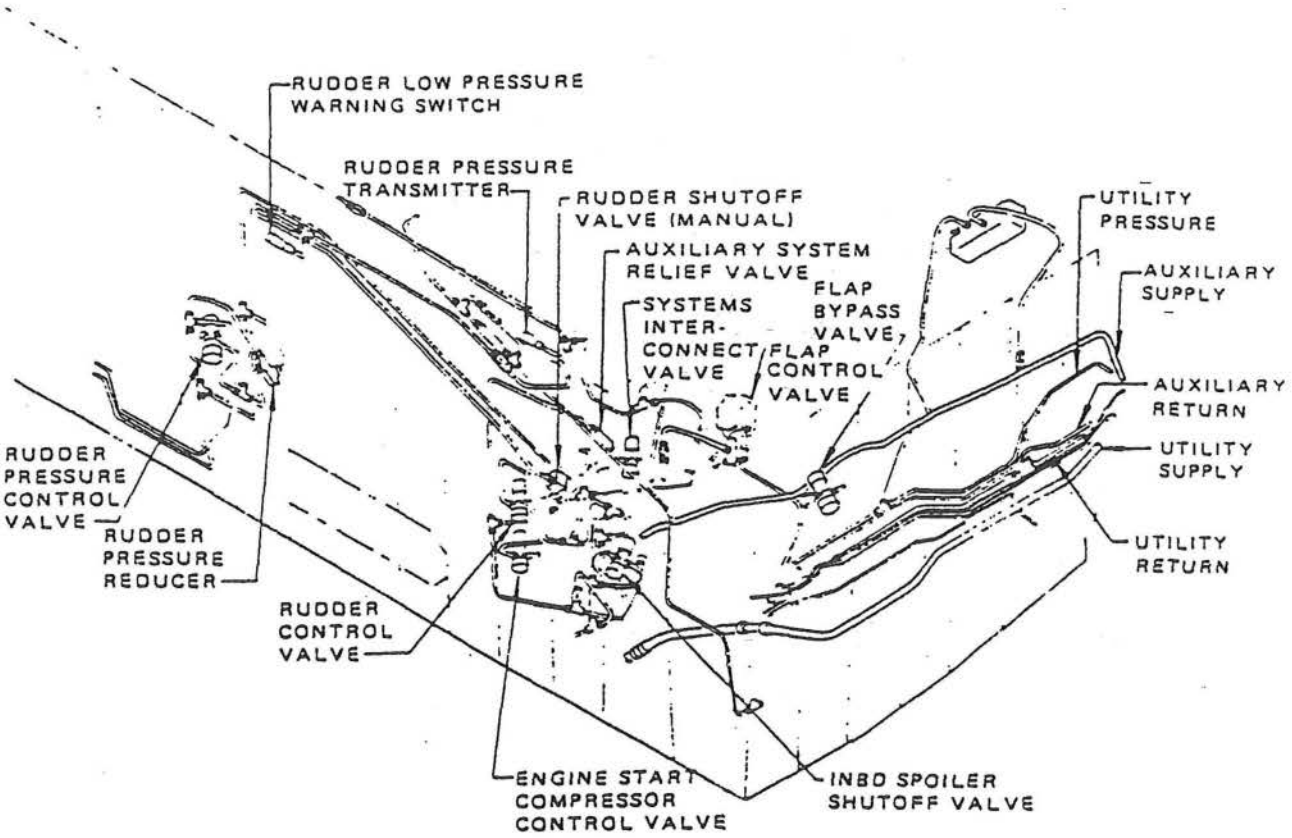
EFFECTIVITY

TCA LX-N20198,LX-N20199. RTCA LX-N19997,LX-N20000.



Hydraulic System Equipment Location
Figure 1 (Sheet 7)

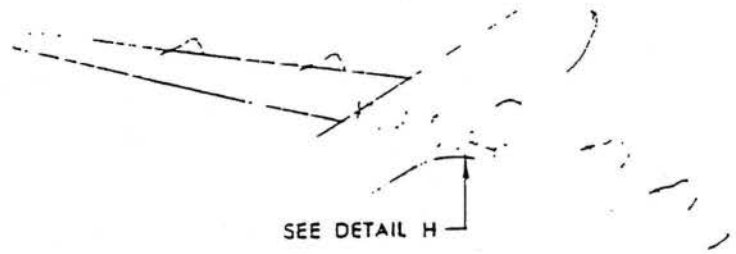


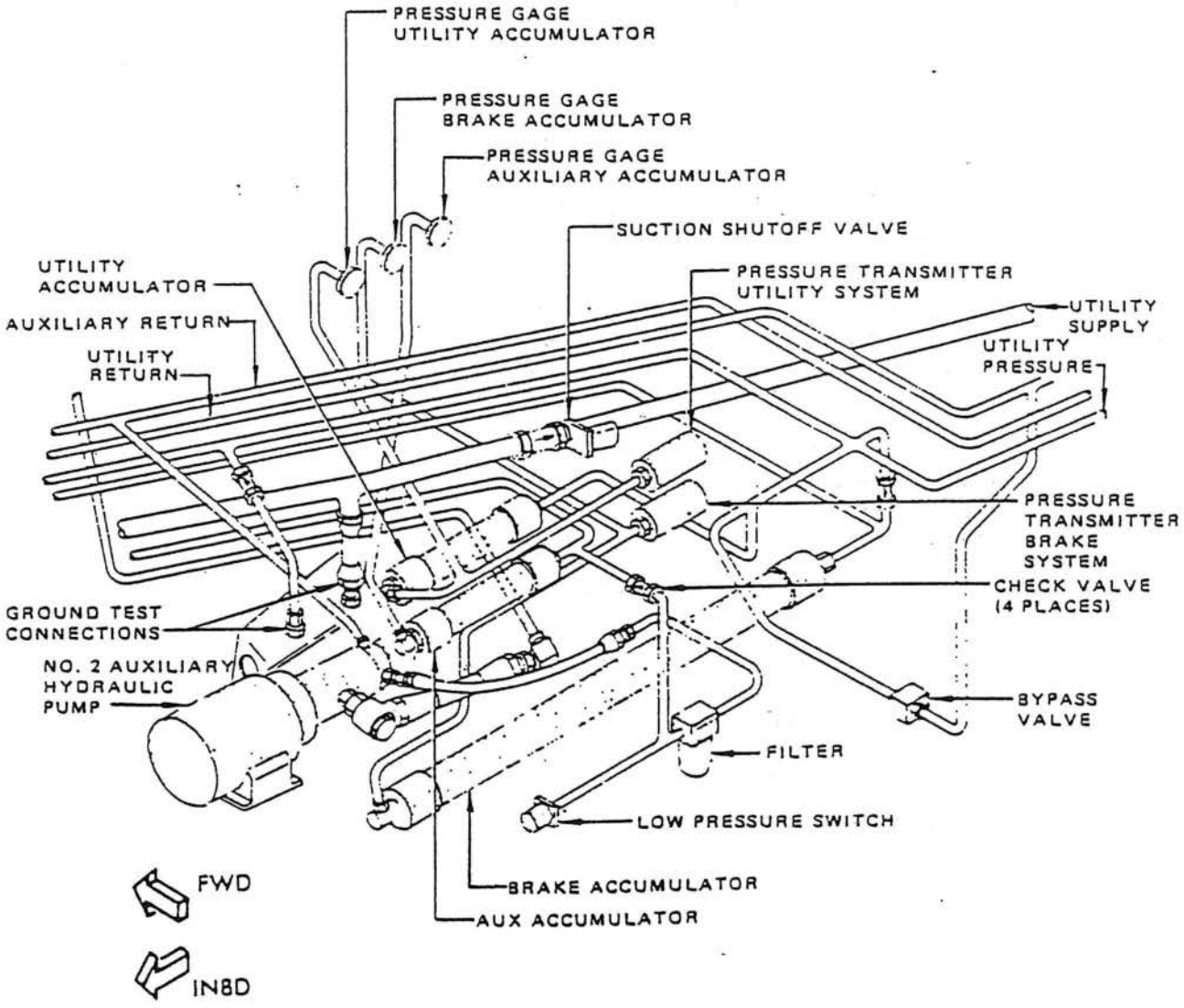


DETAIL G

EFFECTIVITY

TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000





DETAIL H

EFFECTIVITY

SABENA OO-SJA thru OO-SJF

Hydraulic System Equipment Location
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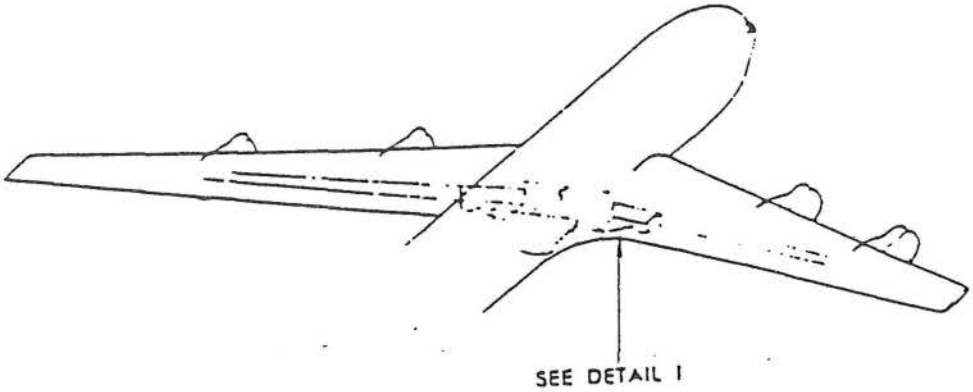

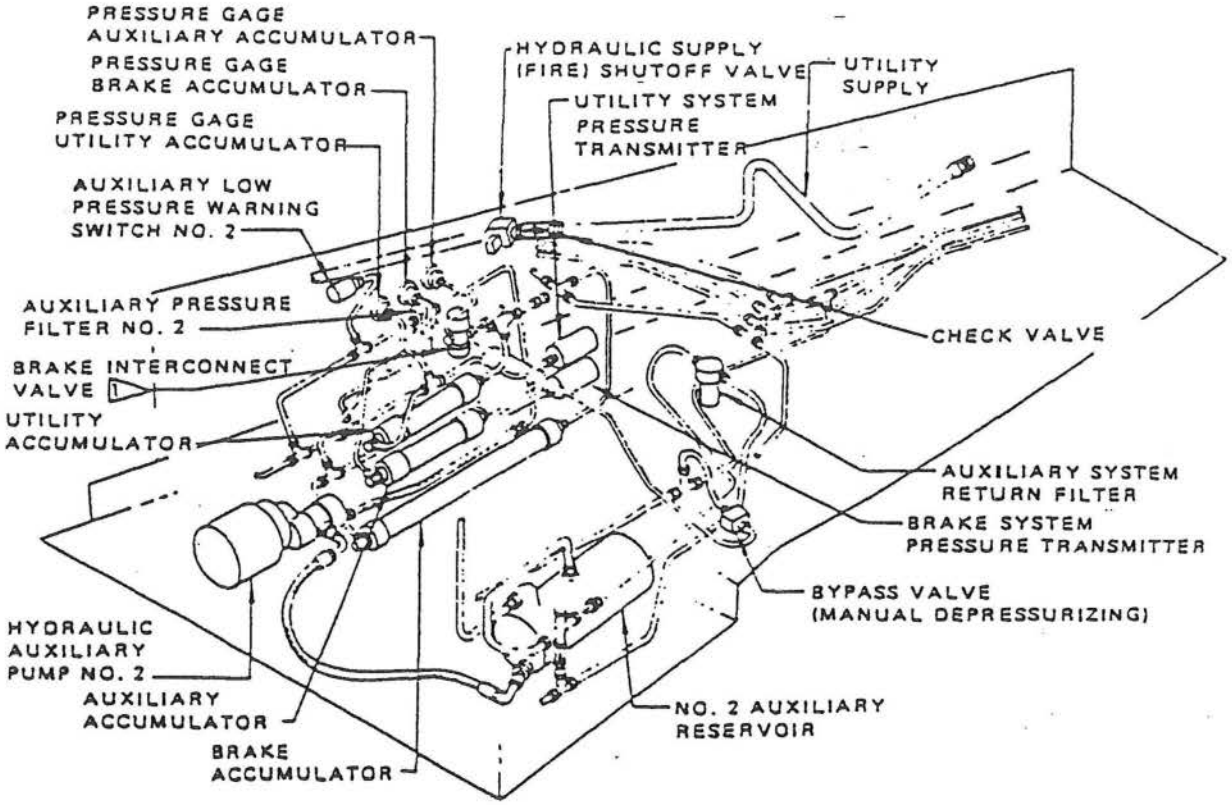

DETAIL 1

EFFECTIVITY

TCA LX-N20198,LX-N20199. RTCA LX-N19997,LX-N20000.

E. The indicating and warning systems include the fluid quantity indicating system for the utility reservoir, the pressure indicating system, and the low pressure warning systems. See sections 29-12-01, 29-14-0, and 29-16-0.

2. Hydraulic Pumps

A. Deleted for SABENA.

B. Engine-Driven Hydraulic Pump (Kellogg Installation, see figure 2, sheet 2 and 3 for effectivity)

(1) Two engine-driven hydraulic pumps supply fluid under pressure to the utility hydraulic system. 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 volume, cam actuated with pressure compensator control. Each pump may be depressurized by an electrical controlled depressurizing valve. The pumps are mounted on the lower right side of engines No. 2 and 3 (figure 1), and consist of the units shown on figure 2, sheet 2.

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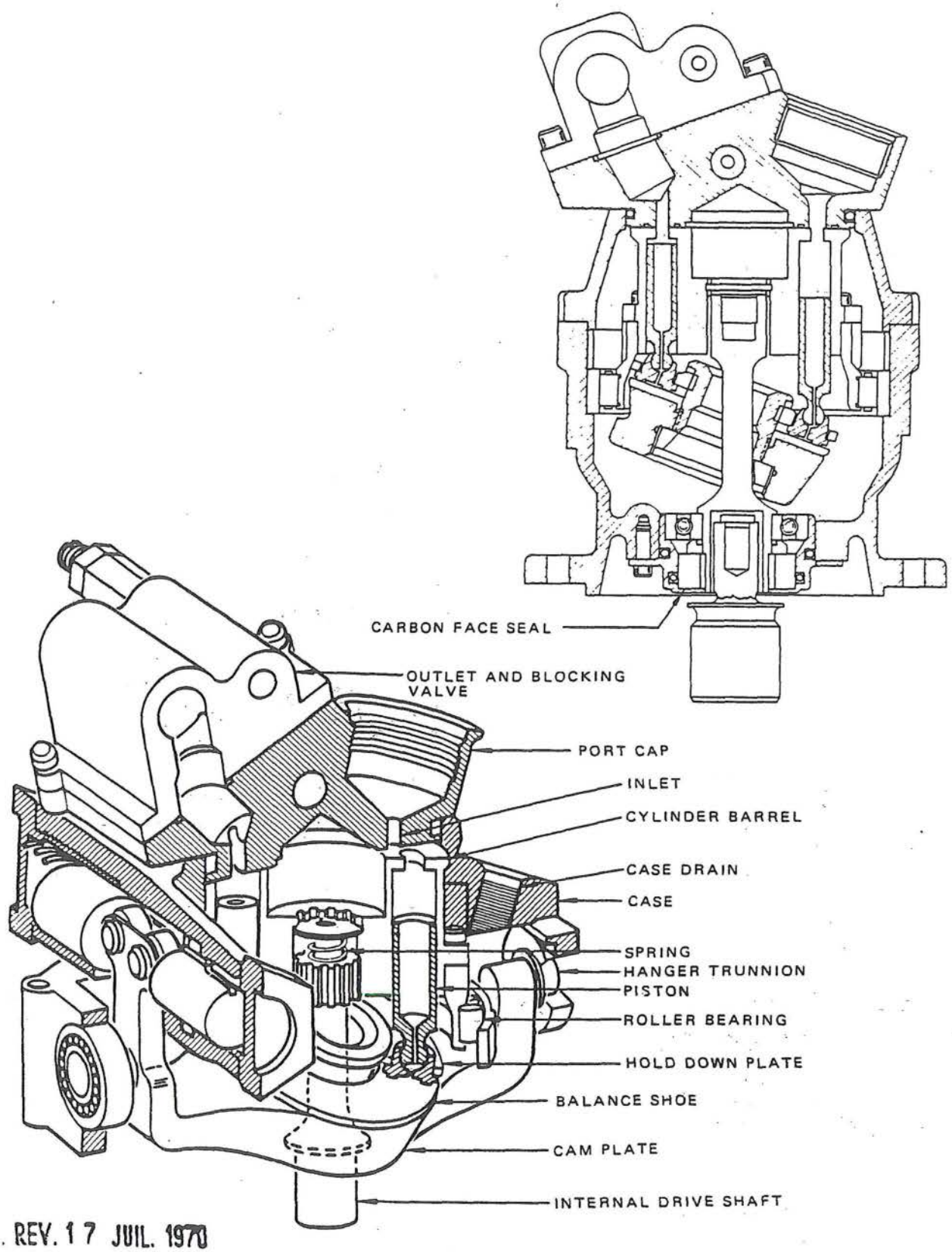
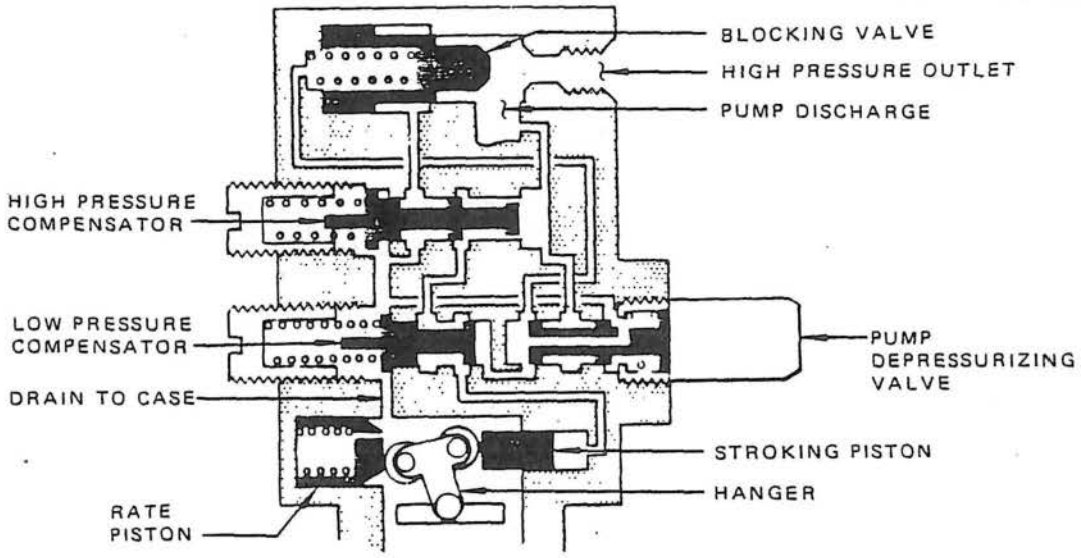
SAB. REV. 17 JUIL. 1970

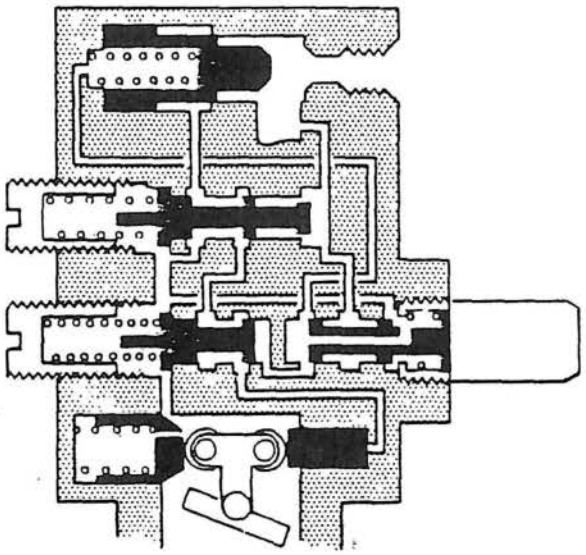


REV. 17 JUIL. 1970

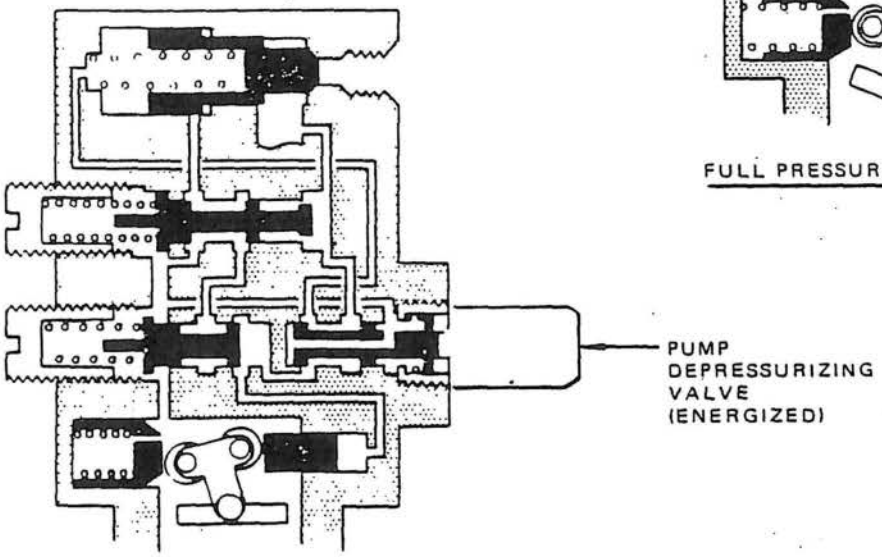
Utility Engine-Driven Hydraulic Pump
Figure 2 (Sheet 2)



FULL PRESSURE, NO FLOW CONDITION



FULL PRESSURE, FULL FLOW CONDITION



DEPRESSURIZED AND BLOCKED CONDITION

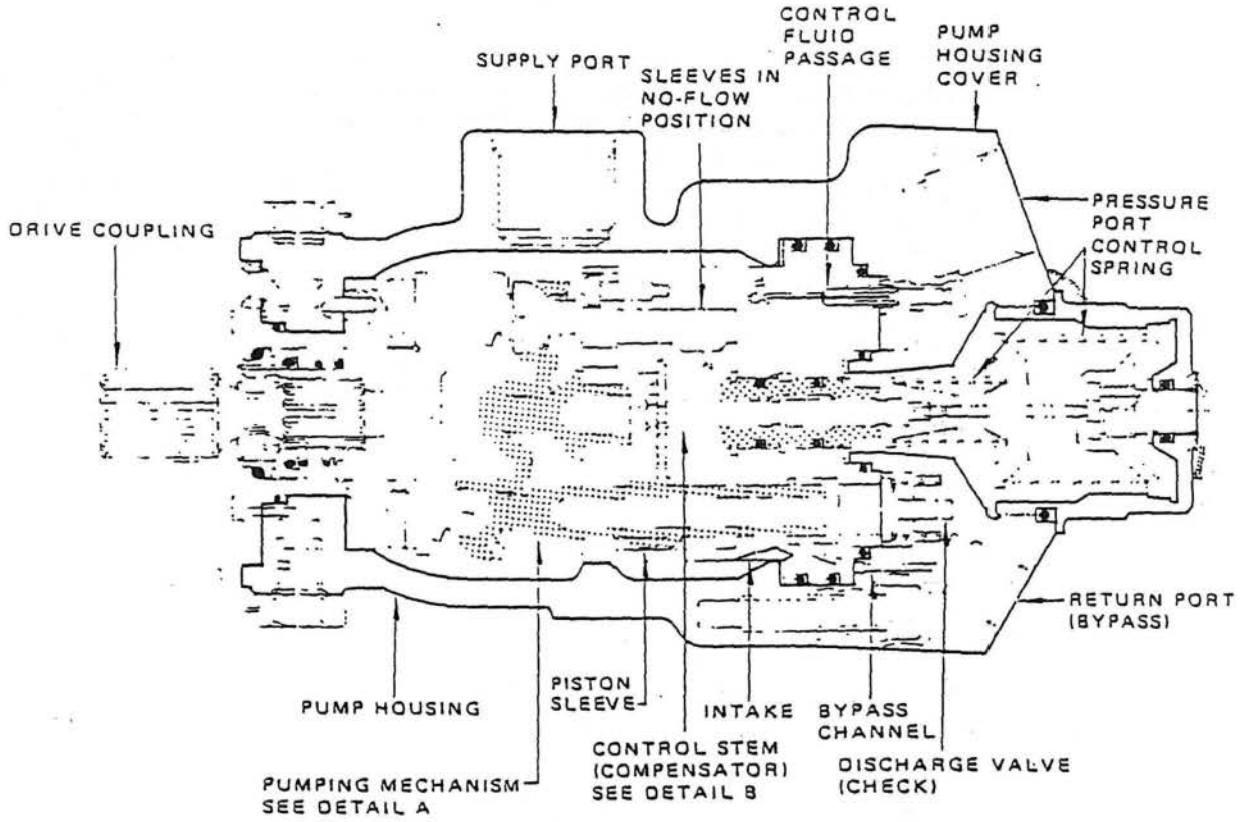
SAB. REV. 17 JUIL. 1970

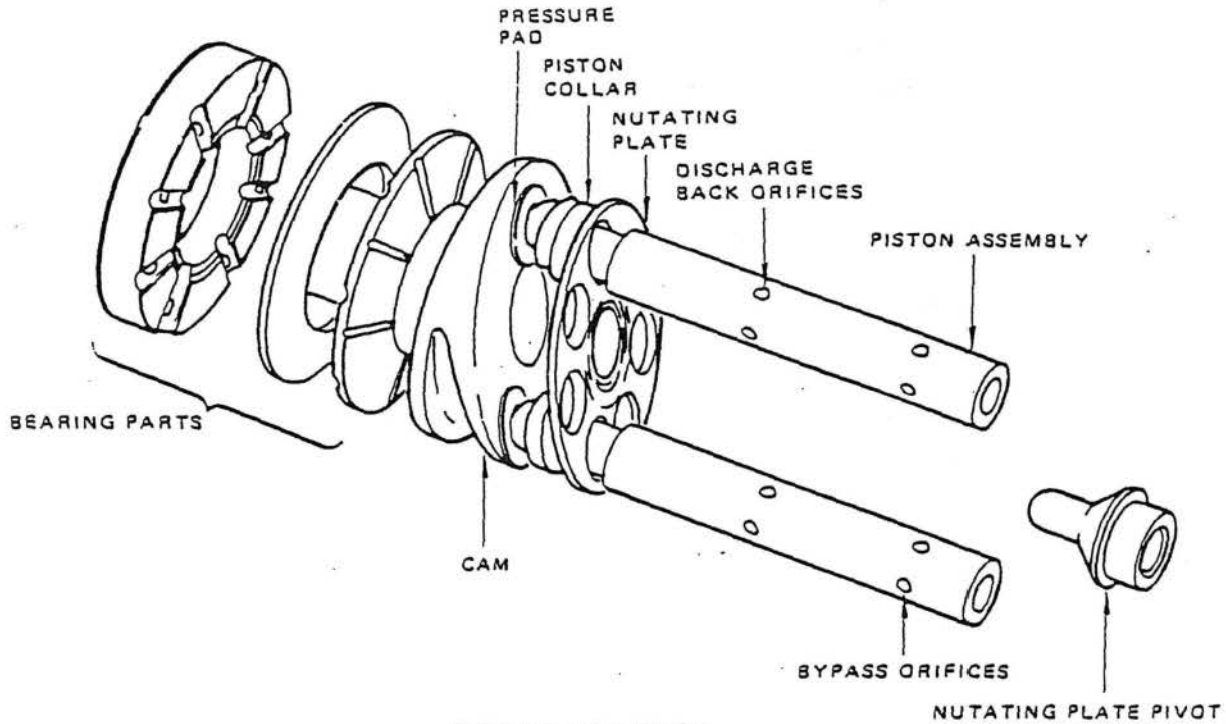
pumping mechanism consists of seven pistons with pressure pads and piston collars, a nutating plate, a stationary cylinder block with a piston guide disc, and seven line discharge valves (checks). The pistons are hollow and have two rings of radial orifices through which part of the hydraulic fluid can escape during the discharge stroke. The pressure pads swivel freely on the piston heads and slide on the camshaft inclined plane. The nutating plate is always parallel with the camshaft inclined plane and by means of piston collars withdraws the pistons from the cylinder block during the intake (suction) stroke. The cylinder block has a central hole for the compensator cylinder (bushing), and fluid passages for the compensator control. The base of the block has seats for the spring-loaded discharge valves.

(4) The pump control (compensator) consists of a compensator cylinder (bushing), 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 just enough fluid circulation for the cooling and lubrication of the pump during idling periods.

D. Main Cargo Door Hydraulic Pump

(1) The main cargo door hydraulic pump is a high pressure, fixed displacement, axial piston pump. Pressure is controlled by a relief valve in the system. The pump is mounted on the keel beam in the left wheel well. The pump consists of a housing with supply and pressure ports, a pumping mechanism of nine pistons attached to a driving shaft, a rotating cylinder block, and a stationary valve plate with intake and delivery passages. The pump is driven by a dc motor attached directly to the pump. The motor is controlled by the main cargo control switch on the cargo attendant panel. When the switch is in either the OPEN or CLOSE position, dc power closes a relay in the J9 panel which connects power from TR Bus No. 4 to the motor.

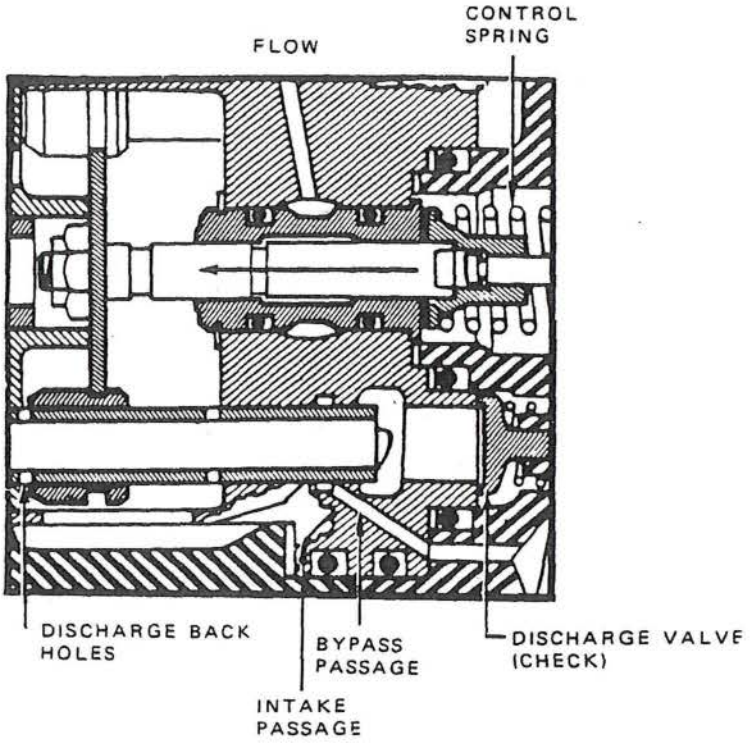


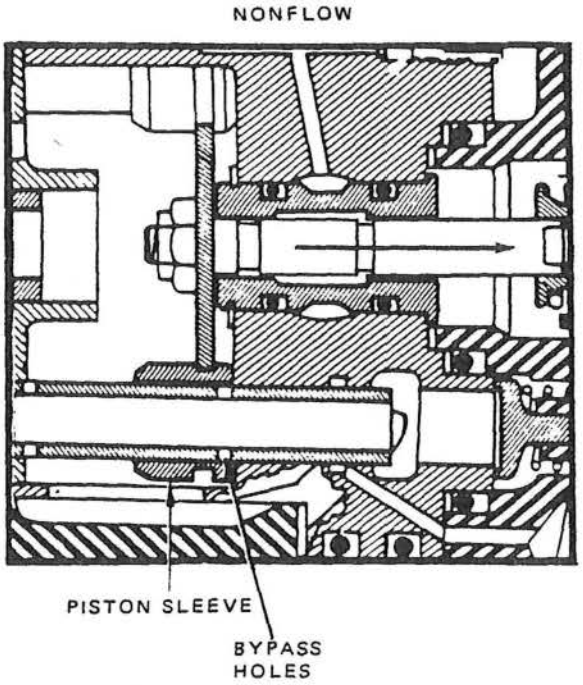


PUMPING MECHANISM

DETAIL A

Auxiliary Hydraulic Pump
Figure 3 (Sheet 1)

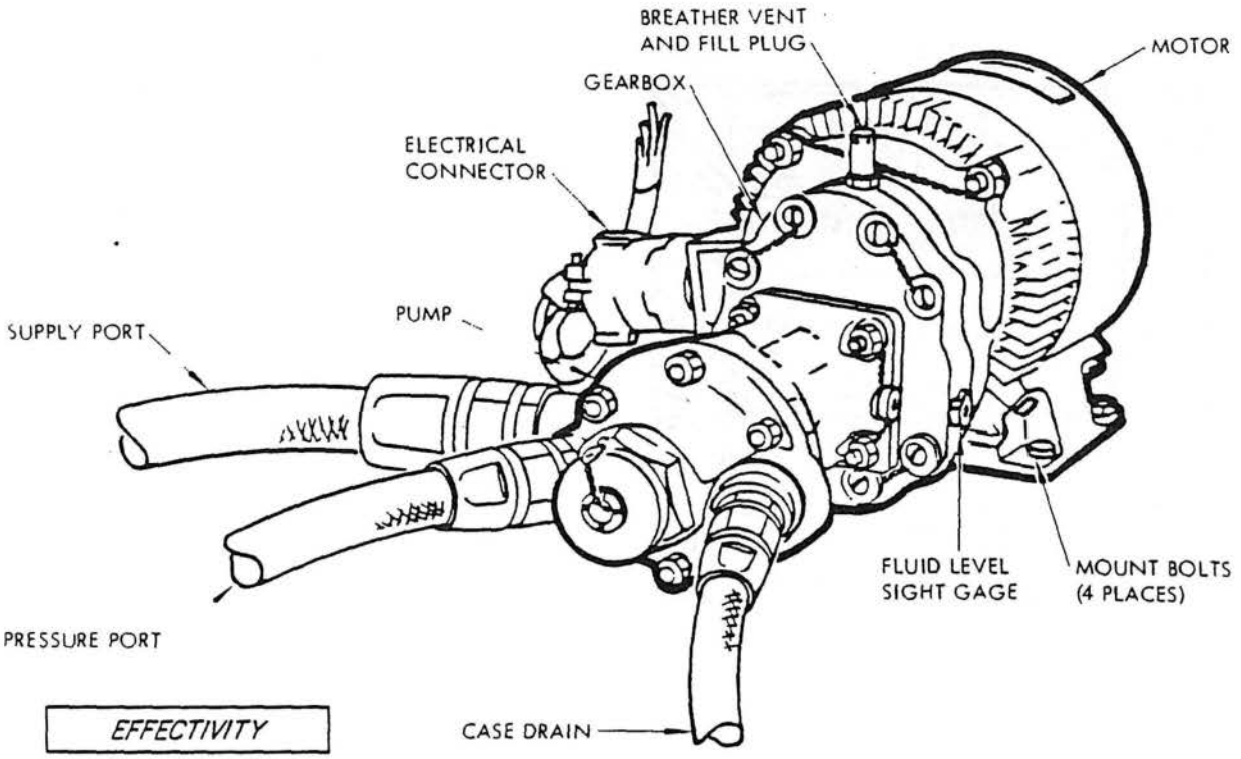




CONTROL STEM POSITIONS

DETAIL B

Auxiliary Hydraulic Pump
Figure 3 (Sheet 2)



EFFECTIVITY

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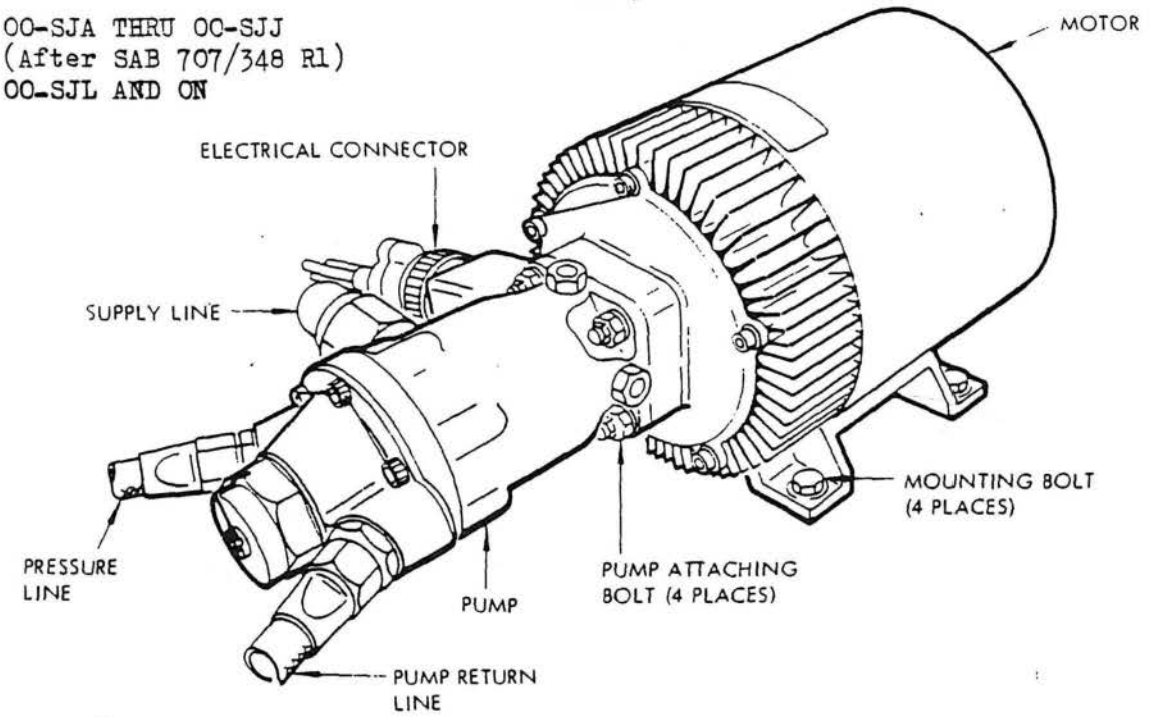
2 > 00-SJA THRU 00-SJJ (After SAB 707/348 R1) 00-SJL AND ON

WESTINGHOUSE MOTOR-DRIVEN PUMP INSTALLATION 1 >



TASK MOTOR-DRIVEN PUMP INSTALLATION 2 >

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. Refer to 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 Lines

A. The hydraulic fluid carrying lines (figure 1) consist of corrosion resistant steel tubing, aluminum alloy tubing, and hoses. Corrosion resistant steel tubing is used for all pressure lines and for all hydraulic lines about the engines. All other lines are made of aluminum alloy tubing. Hoses for high and medium pressure are used where flexible connections are required for connecting movable hydraulic components, and to facilitate installation. Medium pressure hoses are used in the supply and return lines. Tubing of 1-inch outside diameter or larger has flared type rigid connectors. Tubing under 1 inch is connected by flareless tube fittings. Steel tube nuts are used on all steel tubes.

B. Protection Method of Hydraulic Lines Under Clamps.

(1) Solvent clean all surfaces under clamps using chlorothene.
(2) Spray or brush apply primer dow-corning 4094 on all surfaces under clamps. Allow to dry 30 minutes minimum.
(3) Apply one coat silastic 731 RTV on previous places to 0.005 inches thickness minimum.
(4) Install clamps.

9. Hydraulic Accumulators

A. The hydraulic accumulators (figure 1) dampen sudden pressure increases and absorb hydraulic shocks in the systems. The accumulator is a cylindrical pressure vessel with a piston, dividing the accumulator space into two separate compartments. One compartment is pre-loaded with high pressure nitrogen acting as a spring. The other compartment is connected to the hydraulic pressure line. Two identical accumulators are installed : the utility system accumulator, and the auxiliary system accumulator. Both accumulators are located in the right wing fillet, outboard of the main wheel well.

10. Hydraulic Valves

A. General

(1) The hydraulic valves provide means for cutting off and interconnecting the hydraulic lines and systems. They include the supply shutoff valves, the interconnect valve, and the bypass valve.

B. Hydraulic Supply Shutoff Valve

(1) The hydraulic supply shutoff (fire) valve (figure 8) is used to stop the supply of hydraulic fluid to the utility pump in the engine area in the event of an engine fire. The shutoff valve is a motor operated gate valve, installed in each pump supply line, and mounted on the rear spar of each wing, outboard of the left and right wheel wells. The shutoff valve motor is operated by 28 volts dc. supplied through the essential bus circuit breaker panel (P6). On airplanes OO-SJA and on, the valves are controlled either by their respective engine fire switch on the overhead panel or by separate hydraulic shutoff switches on the flight engineer's lower panel and, except on A/C LX-N19997 and LX-N20000, the hydraulic pump valve swithes on the co-pilot's instruments panel.

C. Interconnect Valves

(1) Systems Interconnect Valve

(a) The interconnect valve is used for connecting the pressure lines of the utility and auxiliary hydraulic systems in order to pressurize either system by one source of hydraulic pressure. On airplane OO-SJA through OO-SJE, the valve is a solenoid operated valve, consisting of a single soil solenoid, spool type valve and three port housing (one port plugged). (See figure 10). The valve is spring loaded in its normally closed position. The valve solenoid is powered by 28 volts dc supplied from the external power shield (J9), and controlled

by the interconnect valve switch on the copilot's instrument panel. The valve can be operated on the ground only. The valve is in the left wing fillet aft of the utility reservoir. On airplanes OO-SJF and on, the valve is a motor operated valve, consisting of a motor, rotor type valve and three port housing (one port plugged). (See figures 10 and 11). The valve can be operated on the ground only. Two electrical power sources are available for valve operation. For normal ground operation the valve is wired through the external power contactor normally open auxiliary contact and receives 28 volts dc from the external power shield (J9). The second power source is provided to close the valve in case the interconnect valve contact switch was not moved to the "CLOSED" position prior to the removal of external power. This power source is wired through the external power contactor normally closed auxiliary contact and receives 28 volts dc from the radio and T-R circuit breaker panel (P5). The valve is controlled by the interconnect valve switch on the copilot's instrument panel, and installed in the right wheel well on the inboard wall. A manual overrride handle is provided on the valve for operating the valve on the ground without electrical power.

(2) Brake Interconnect Valve

(a) The brake interconnect valve is used for connecting the pressure lines of the utility and auxiliary hydraulic systems in order to pressurise the brake system by the auxiliary source of hydraulic pressure.
On airplanes OO-SJA through OO-SJG, the valve is a solenoid operate valve and his construction is identical to the system interconnect valve.
On airplanes OO-SJH and on, the valve is a motor operated valve and his construction is identical to the system interconnect valve. Both valves are located in the right wing fillet area on the forwar side of the panel to which the accumulators are attached. The inte connect valve swith on the copilot's instrument panel has three positions and controls both the systems interconnect valve and the brake interconnect valve which cannot both be open at the same tim (See figure 10 and 11).

D. Bypass Valve

(1) The bypass valve is a manually operated valve used for the depressurization of the utility hydraulic power system. The valve handle has two positions, "BYPASS" and "CLOSED." It is normally safety wired in the "CLOSED" position. The valve is connected to the pressure and return line of the utility system. With the valve handle in "BYPASS" position, the pressure and return lines are connected and the utility system is depressurized. The valve is located in the right wing fillet, outboard of the main wheel well.

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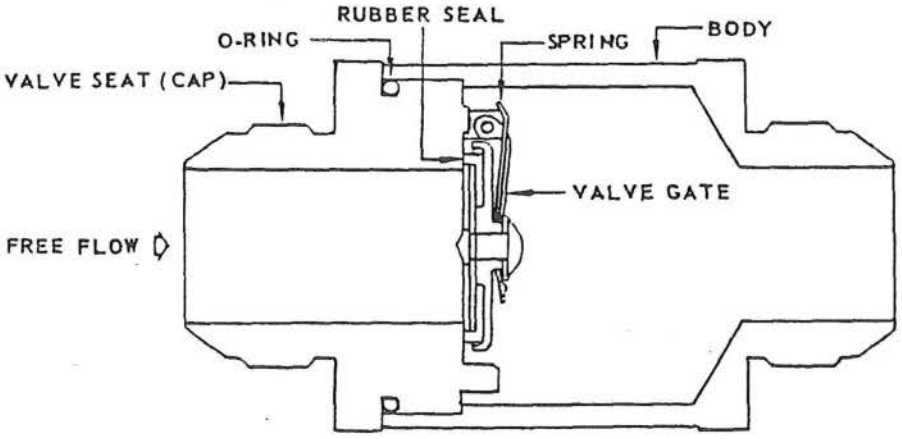
11. Hydraulic System Check Valves and Restrictors

A. General

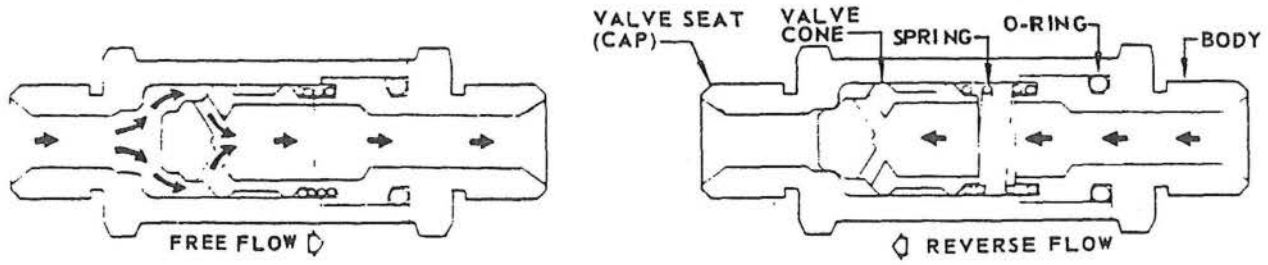
(1) The hydraulic system check valves (figure 7) permit fluid flow in one direction and prevent reverse flow. They also isolate individual hydraulically operated systems. The flow direction is shown by an arrow on the valve. The check valves are installed in the pressure and return lines of both systems, in the supply line of the utility system, in the ground test connection to the pressure line and in the reservoir air charging line. Two types of valves are used: swing check and cone check valves.

B. Swing Check Valve

(1) A swing check valve consists of a valve seat (cap), a body and a spring loaded gate. The gate opens when the flow direction agrees with the direction of gate opening. The reverse flow immediately closes the gate. The swing check valves are installed in the fluid supply line and in the reservoir air charging line. The supply line swing check valves prevent the reverse flow from the pump when the reservoir is not pressurized. They are attached to each shutoff valve on the rear spar of each wing, outboard of the main wheel well.



SWING CHECK VALVE



CONE CHECK VALVE

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C. Cone Check Valve

(1) A cone check valve consists of a valve seat (cap), a spring loaded cone seat valve, and a body. Two cone check valves are installed near each utility pump (one in the pressure line and one in the return line). The pressure line check valves prevent motoring the pumps by a higher hydraulic pressure in the system. The return line check valves prevent damage of the pumps by a back pressure. A cone check valve in the ground test connection of the pressure line prevents loss of fluid due to a malfunction of the charging valve and protects this valve from the reverse pressure. Two check valves are installed in the return line loop of each system.

D. Restrictors

(1) A restrictor is a cylindrical body containing a plug with a small orifice. Restrictors, installed at the port of each pressure switch, dampen the pressure oscillations. Restrictors, installed in the lines supplying compressed air from each inboard engine to the hydraulic reservoir pressurization system dampen the pressure oscillation and provide a steady flow of compressed air to the air pressure regulator.

12. Hydraulic Line Self Sealing Couplings

A. The self-sealing hydraulic line couplings are quick-connect fittings which prevent the loss of hydraulic fluid and do not permit air to enter the hydraulic system during connecting and disconnecting hydraulic lines on the engines and at the test connections for servicing and testing. A coupling consists of a male and a female half, each closed with a spring loaded valve. The valves are automatically depressed during coupling of the two halves, allowing the fluid to flow in either direction. The springs force the valves in both halves to close while the halves are separated (uncoupled).

B. Self-sealing hydraulic line couplings are installed on the inboard engines. Two coupling halves are installed as ground test connections in the right fillet outboard of the main wheel well.

13. Indicating and Warning Systems

A. The indicating and warning systems include the hydraulic fluid quantity indicating system, the hydraulic pressure indicating system and the hydraulic low pressure warning system.

B. The hydraulic fluid quantity indicating system provides an indirect indication of hydraulic fluid quantity in the utility reservoir. This system consists of a float type level transmitter in the utility hydraulic reservoir, and an indicator in the control cabin on the flight engineer's panel. The indicator is calibrated in gallons. The transmitter senses the level position and transmits a corresponding electric signal to the indicator.

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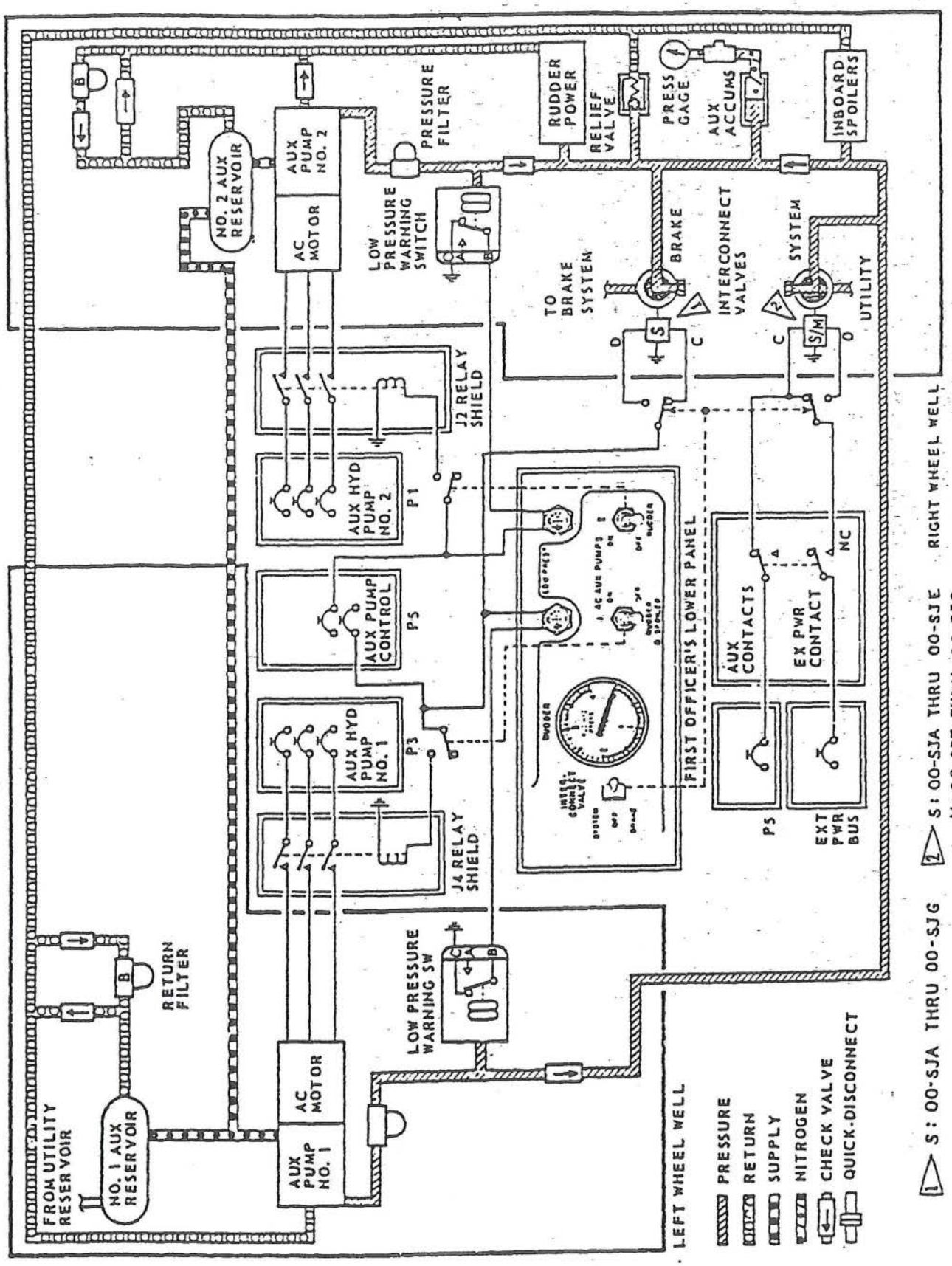
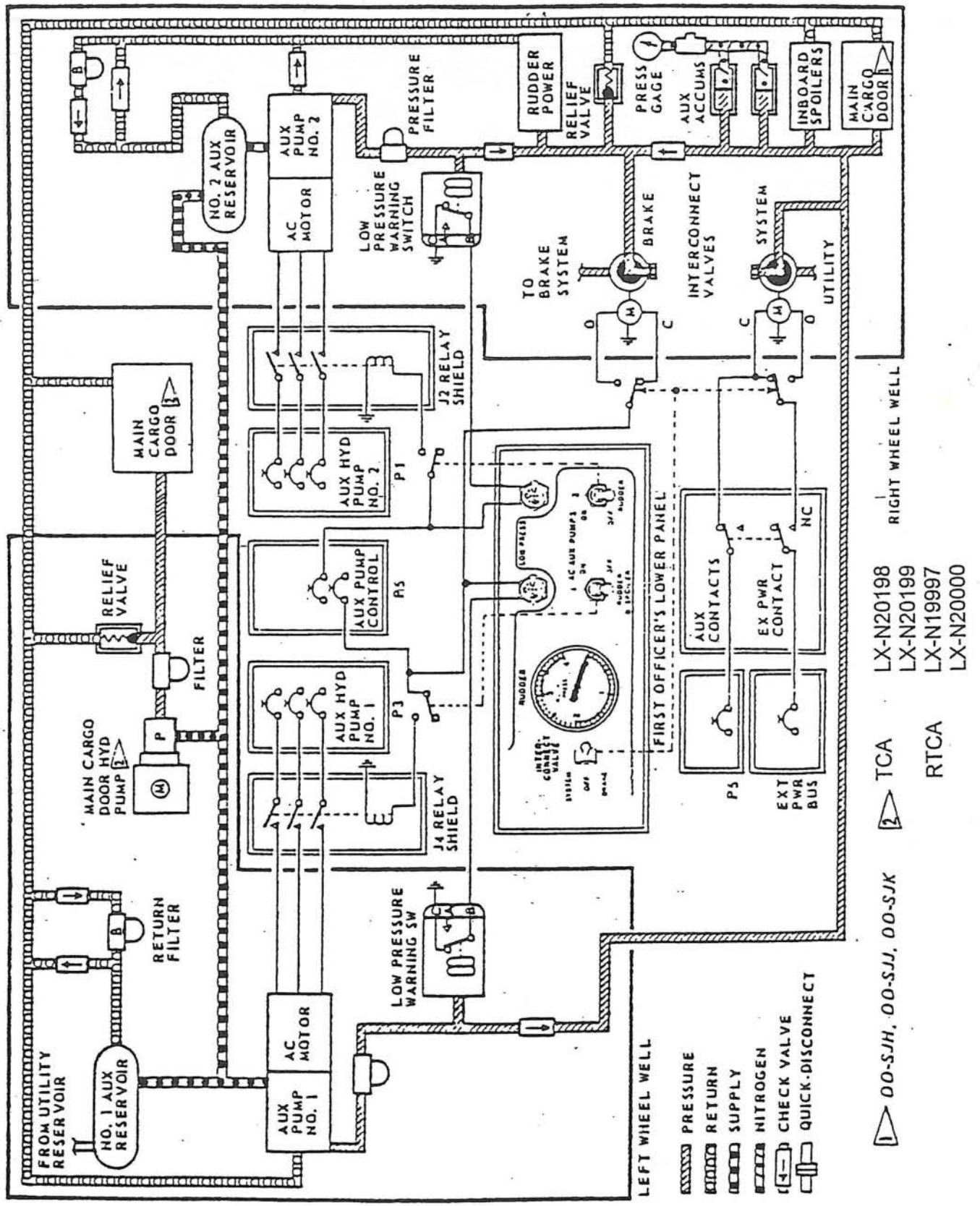


Auxiliary Hydraulic System Schematic
Figure 10



Auxiliary Hydraulic System Schematic
Figure 11

C. Interconnection of Utility and Auxiliary Systems

(1) When appropriate electrical power is available to operate the systems interconnect valve, pressure sides of the utility and auxiliary hydraulic systems are joined when the interconnect valve is open. Any hydraulic component can then be operated by hydraulic service cart or by an airplane pump not in the components normal supply system. No. 2 auxiliary hydraulic pump, however, is still limited to the rudder system and the auxiliary accumulator on turbojet airplanes, to the rudder system only on turbofan airplanes.

(2) On turbofan airplanes with the interconnect valve open and both systems being pressurized with the auxiliary pumps, a pressure reading between 2100 and 2200 psi is within tolerances. This low pressure reading is due to system bleeds, and normal system internal leakages due to component wear.

(3) On airplanes OO-SJA and on, brake interconnect valve permits charging the brake accumulator and operation of the brakes by the auxiliary hydraulic system. Placing the interconnect switch in the "BRAKE" position when the radio and T-R circuit breaker panel (P5) is energized opens the valve.

HYDRAULIC POWER - TROUBLE SHOOTING

1. General

A. Utility and auxiliary hydraulic power systems are checked separately. When checking for external leakage, trace run back fluid to locate source of leak. Pin hole leaks may be detected by noting damp spots on the airplane. When disconnecting lines and units take care to prevent spilling Skydrol. Should fluid spill on the airplane, decontaminate the affected area. See Chapter 12, Cleaning and Washing.

B. Illumination of a pump low pressure warning light should be followed by a check of return and pressure filters associated with the pump. The pump need not be operated following warning light illumination unless the filter check yields no evidence of contamination and the trouble is suspected to be outside the pump.

C. Allowance should be made for cumulative gage and indicator pressure tolerances. Pumps are set at 3025 (± 50) psi; system pressure is checked at 3025 (± 75) psi; gage and indicator error allowance adds a possible 150 psi; therefore, indicated pressure tolerance can be 2800 to 3225 psi.

D. Engine operation to run utility pumps may not be convenient at times, but trouble symptoms are shown as they are expected to appear when an attempt is made to operate the hydraulic system normally.

E. Service both hydraulic systems prior to energizing any units for trouble shooting. See Chapter 12, Servicing.

(1) Service utility reservoir.

(2) Charge utility and auxiliary accumulators.

F. Prepare hydraulic systems for trouble shooting.

(1) Connect electrical power.

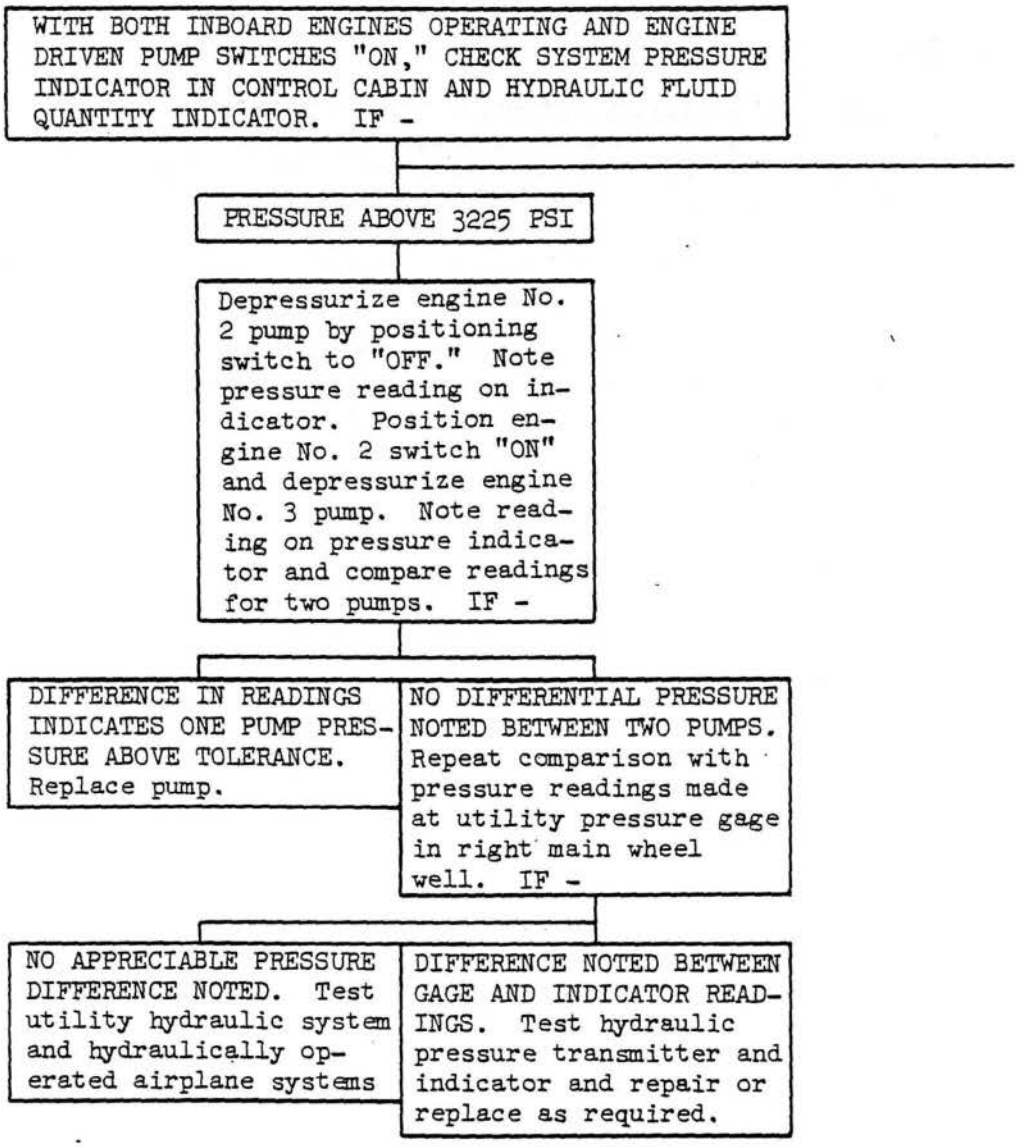
(2) Check that fire switch is in NORMAL position.

(3) Make certain interconnect valve is in CLOSED position.

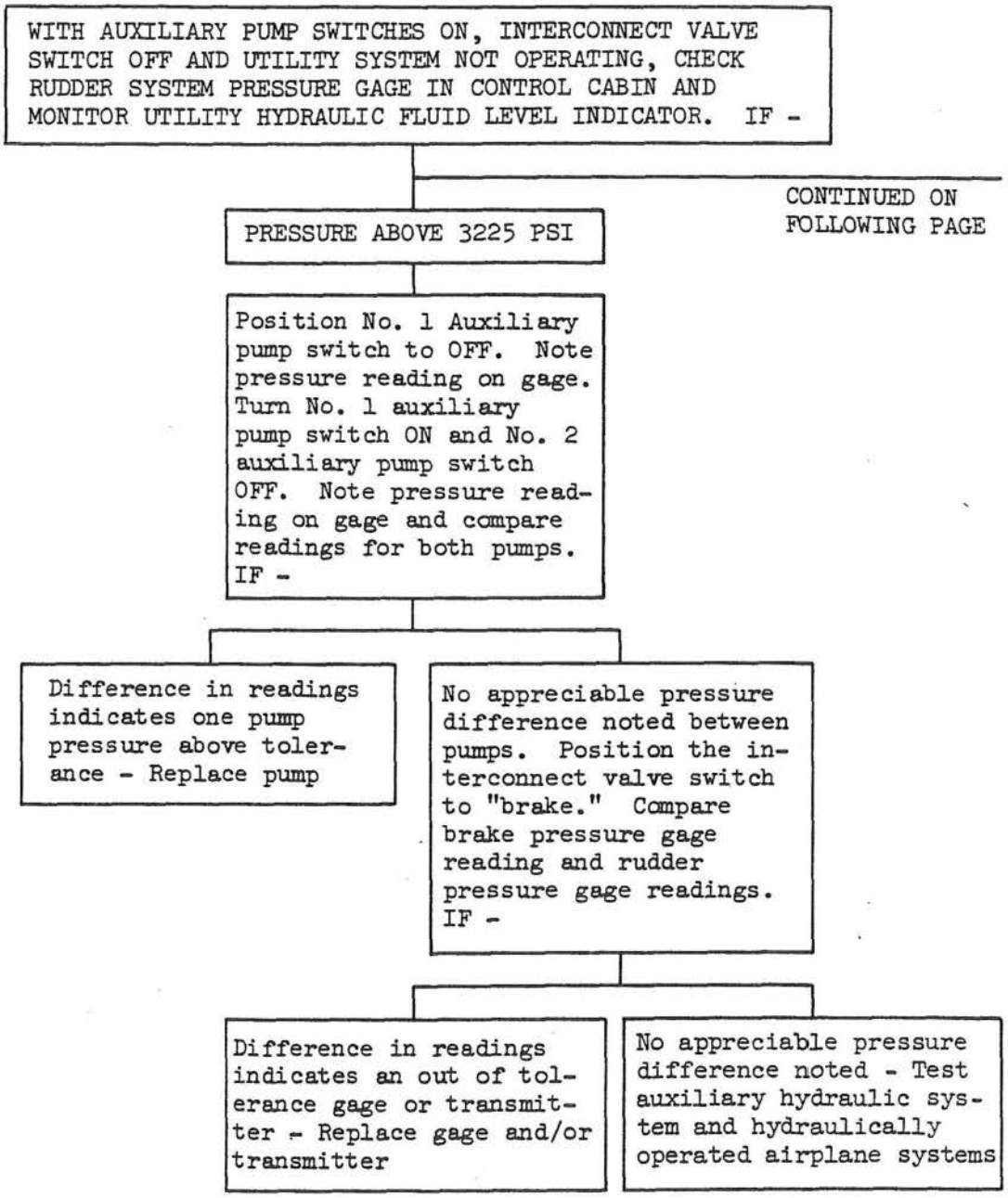
(4) Check that bypass valve is closed.

(5) Check that pump control and pump motor power circuit breakers are closed.

2. Utility Hydraulic System Trouble Shooting Chart



3. Auxiliary Hydraulic System Trouble Shooting Chart



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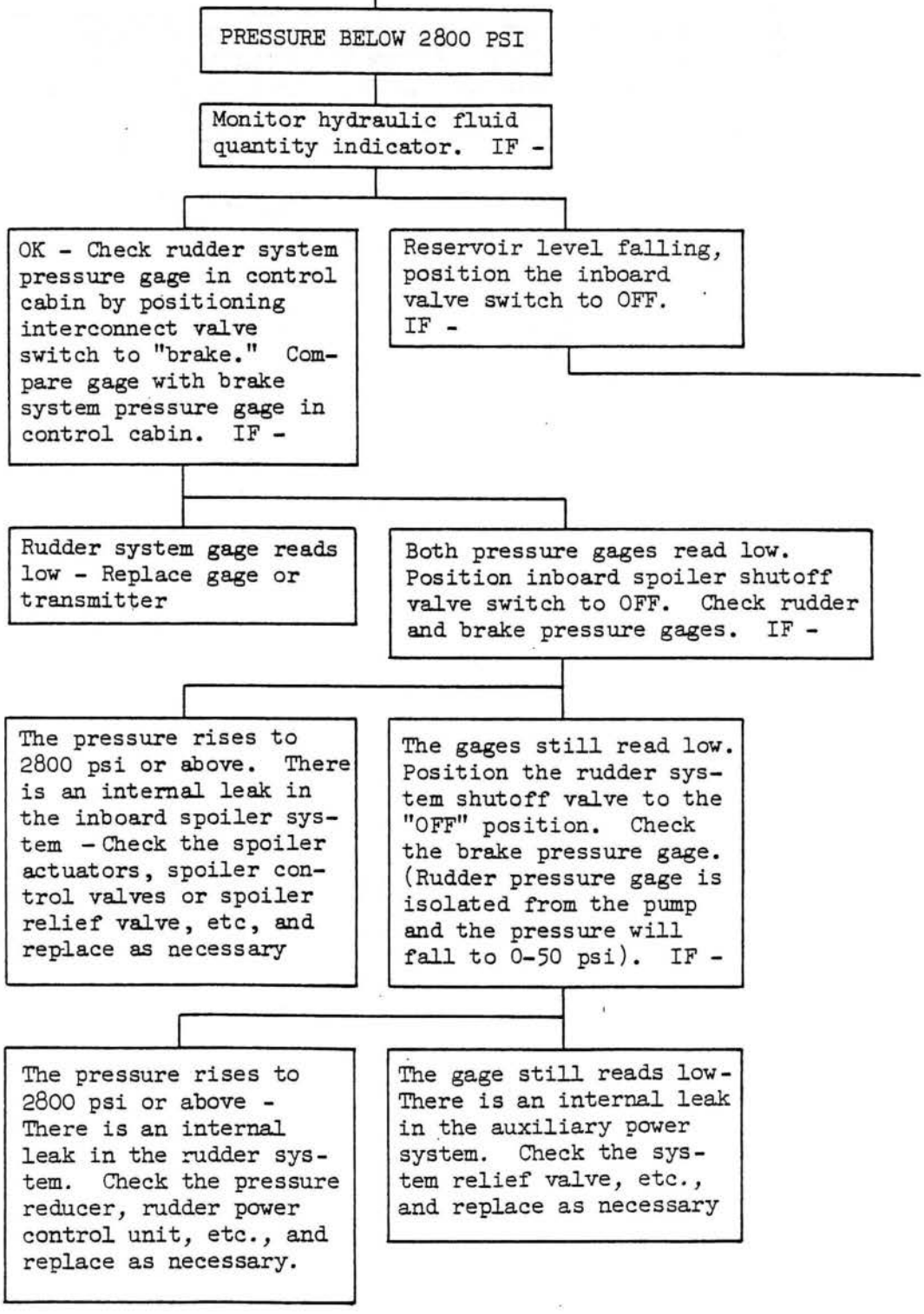

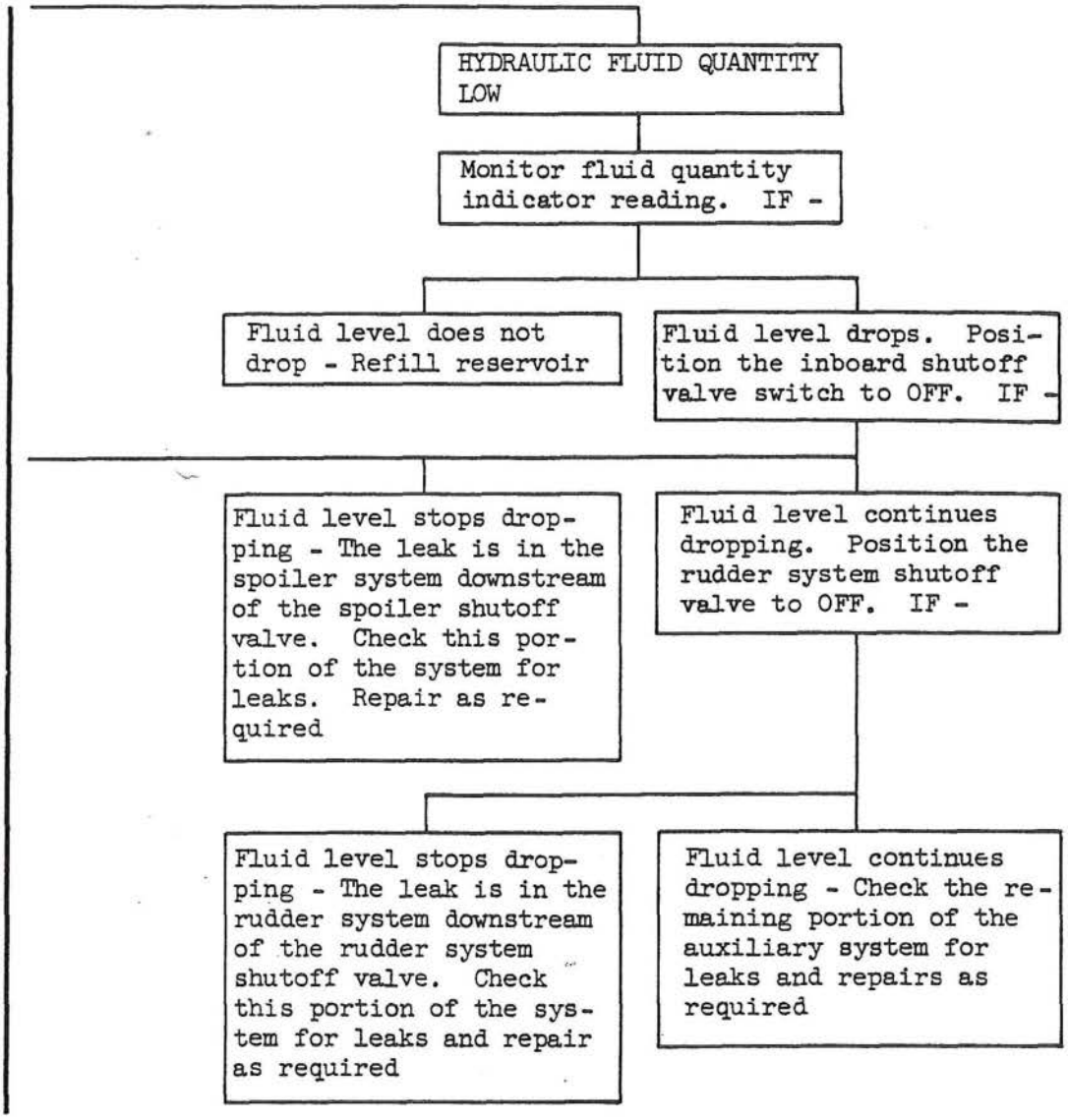
HYDRAULIC FLUID QUANTITY LOW
Monitor fluid quantity indicator reading. IF -
Fluid level does not drop - Refill reservoir
Fluid level drops. Position the inboard shutoff valve switch to OFF. IF -
Fluid level stops dropping - The leak is in the spoiler system downstream of the spoiler shutoff valve. Check this portion of the system for leaks. Repair as required
Fluid level continues dropping. Position the rudder system shutoff valve to OFF. IF -
Fluid level stops dropping - The leak is in the rudder system downstream of the rudder system shutoff valve. Check this portion of the system for leaks and repair as required
Fluid level continues dropping - Check the remaining portion of the auxiliary system for leaks and repairs as required

1. Unit Servicing Hydraulic System

A. General

(1) Flushing the hydraulic systems is necessary when the fluid is contaminated or is suspected of being contaminated because of system failure, system rework, or if lines or components are fouled with dirt, sand, metal particles, etc. The utility and auxiliary hydraulic systems are flushed separately. The utility system may require flushing following replacement of an engine-driven pump after pump failure. Refer to paragraph 3, Inspection/Check Hydrulic System to determine extent of flushing required.

CAUTION: IT IS STRICLY FORBIDDEN TO USE PRODUCTS CONTAINING CHLORINE.

(2) Operation Limits

(a) Shut-off Valve Closure

The shut-off valve may be closed for a period of 15 minutes on turbojet airplanes and 5 minutes on turbofan airplanes (no cumulated time). In the meantime the hydraulic pump is depressurized.

CAUTION: SHUT-OFF VALVE CLOSURE TIME SHOULD BE NOTED IN THE TROUBLE REPORT.

(b) Pump Depressurization

Pump shall be pressurized during all the flight time. On turbojet airplanes, pump may be depressurized if necessary for unlimited time (e.g. important pressure fluctuation). On turbofan airplanes, pump may only be depressurized in case of emergency for a period not exceeding 10 to 15 minutes.

If depressurizing period exceeds 15 minutes, inspect case drain filter for metal particles or clogged filter by burned skydrol.

1) If presence of metal particles or if clogged filter:

a) Replace pump.

b) Replace high pressure filter element and case drain filter element.

c) Flush hydraulic system:

- Pump case drain line flushing.
  Drain tubes between case drain filter and pump. Flush tubes using skydrol.

- Pump pressure line flushing.
  Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

d) Test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

e) Inspect case drain filter after test.

f) Inspect for system leakage.

2) If no presence of metal particles and if no clogged filter, test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

(c) Hydraulic Reservoir Oil-level Limits

Minimum allowable limit: 1/2 gallon (landing gear retracted)
2 gallons (landing gear extended)

(d) Pump Pressure Limits

Indicated pump pressure should be between 2850 psi and 3200 psi.

(e) Low Pressure Limit

Low pressure indicator light should illuminate when pressure drops beyond 1200 psi.

(3) Hydraulic System Restoration After Shut-off Valve(s) Closure

(a) When shut-off valve closure time does not exceed 15 minutes on turbojet airplanes and 5 minutes on turbofan airplanes, inspect case drain filter for metal particles or clogged filter by burned skydrol.

1) If presence of metal particles or if clogged filter:

a) Replace pump.

b) Replace high pressure filter element and case drain filter element.

c) Flush hydraulic system:

- Pump case drain line flushing.
  Drain tubes between case drain filter and pump. Flush tubes using skydrol.
- Pump pressure line flushing.
  Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

d) Test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

e) Inspect case drain filter after test.

f) Inspect for system leakage.

2) If no presence of metal particles and if no clogged filter, test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

(b) When shut-off valve closure time exceeds 15 minutes on turbojet airplanes and 5 minutes on turbofan airplanes, and does not exceed 30 minutes, inspect case drain filter for metal particles or clogged filter by burned skydrol.

1) If presence of metal particles of if clogged filter:

a) Replace pump.

b) Replace high pressure filter element and case drain filter element.

c) Flush hydraulic system.

- Pump case drain line flushing.
  Drain tubes between case drain filter and pump. Flush tubes using skydrol.

- Pump pressure line flushing.
  Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

d) Test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

e) Inspect case drain filter after test.

f) Inspect for system leakage.

2) If no presence of metal particles and if no clogged filter, test pump during a minimum period of 5 minutes for proper operation and pressure establishment (move flaps, ailerons, speed brakes,etc.). Inspect case drain filter.

- If pump operates normally and case drain filter is not clogged, system may be considered as being in good condition.

- If pump does not operate normally or if case drain filter is clogged, proceed as follows:

a) Replace pump.

b) Replace high pressure filter element and case drain filter element.

c) Flush hydraulic system.

- Pump case drain line flushing.
  Drain tubes between case drain filter and pump. Flush tubes using skydrol.

- Pump pressure line flushing.
  Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

d) Test the pump for pressure establishment and for proper operation (move flaps, ailerons, speed brakes, etc.).

e) Inspect case drain filter after test.

f) Inspect for system leakage.

(c) When shut-off valve closure time exceeds 30 minutes, either on turbojet or turbofan airplanes, apply the following procedure:

1) Replace pump.

2) Replace the high pressure filter element and the case drain filter element.

3) Flush the hydraulic system.

a) Pump case drain line flushing.
Drain tubes between case drain filter and pump. Flush tubes using skydrol.

b) Pump pressure line flushing.
Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

4) Test pump for pressure establishment and for proper operation (move flaps, ailerons, speed brakes etc.).

5) Inspect for system leakage.

(4) Hydraulic System Restoration in case of engine windmilling. (shut-off valve closed or not)

(a) In case of engine windmilling, (shut-off valve closed or not) inspect case drain filter for metal particles or clogged filter by burned skydrol.

1) If presence of metal particles or if clogged filter:

a) Replace pump.

b) Replace high pressure filter element and case drain filter element.

c) Flush hydraulic system:

- Pump case drain line flushing.
Drain tubes between case drain filter and pump. Flush tubes using skydrol.

- Pump pressure line flushing.
Drain tubes between Quick-disconnect and pump. Flush tubes using skydrol.

d) Test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

e) Inspect case drain filter after test.

f) Inspect for system leakage.

2) If no presence of metal particles and if no clogged filter, test pump for pressure establishment and proper operation (move flaps, ailerons, speed brakes etc.).

(5) Engine driven hydraulic pumps shaft seal leakage limits

(a) Allowable leakage for normal operation:	30 drops per minute
(b) Allowable leakage for dispatch operation to avoid delay	60 drops per minute

(6) Electric motor driven pumps shaft seal leakage limits (MIAB/MISK motor pump)

(a) Allowable leakage for normal operation:	10 drops per minute
(b) Allowable leakage for dispatch operation to avoid delay	20 drops per minute

(7) Any actuator damaged by fluid contamination should be replaced. Elements are removed from filters and the cases reinstalled without elements to allow unrestricted flow during flushing. Flow is maintained at the maximum rate obtainable at pressures not to exceed 200 psi.

(8) When servicing the airplane, take necessary precautions to prevent spilling hydraulic fluid. Should fluid be spilled on the airplane, the affected area must be decontaminated. Refer to Chapter 12, Cleaning and Washing.

(9) Replenishment of the hydraulic system is necessary when the fluid level in the utility reservoir drops below the sight gage. The combined capacity of both utility and auxiliary systems is about 30 gallons.

WARNING: GOGGLES MUST BE WORN BY PERSONNEL WORKING WITH SKYDROL 500.

(10) Single stage return filter replacement - Actions

(a) General

The filter element should not be replaced at regular intervals. The position of the red button which is installed on each filter is to be checked by the flight crew at each pre-flight check.

(b) Trouble Shooting - Actions

One case may occur:
- the red button of the filter element indicator appears:

Action:

1) The red button should be reset.

2) If, at pre-flight check at the next airline station, the red button appears:

- The filter element is to be replaced within the next 25 flight hours.

NOTE: As the filter element protection relief valve opens at a 400 psi pressure value and the red button appears at a 100 ± 15 psi pressure value, fluid flow through the filter element continues in spite of the red button appearance.

B. Flush and bleed Utility Hydraulic System

(1) Flushing procedure No. 1

(a) General

1) When excessive contamination is found in the utility return filter, portions of the hydraulic power supply system should be flushed per this procedure.

WARNING: GOGGLES MUST BE WORN BY PERSONNEL WORKING WITH SKYDROL 500.

(b) Equipment and Materials

1) Hydraulic Service Cart - Skydrol 500, 0-3000 psig, 20 gpm.

2) Fittings A through E.

a) A, adapter, cart pressure to -6 MS

b) B, adapter, cart return to -12 MS

c) C, adapter, cart pressure to -10 MS

d) D, union, cart return to -20 MS

e) E, adapter, cart pressure to -20 AN

(c) Flush Utility Hydraulic System

1) Depressurize utility hydraulic system by positioning bypass valve to BYPASS

2) Disconnect all hydraulic hoses at engines 2 and 3 disconnect panels.

3) Position bypass valve to CLOSE.

4) Open left main wheel well door by pulling ground door release handle down.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

5) Disconnect door actuator from door.

6) Remove reservoir drain plug and drain utility reservoir. Dispose of fluid and reinstall plug without safety wire.

7) Remove utility pressure and return filter elements. Dispose of paper elements.

8) Remove utility pump case drain filter element (if applicable.)

9) Clean filter bowls and reassemble filters without elements.

10) Flush pump return lines.

a) Remove the disconnect coupling half from the No. 2 engine driven pump return hose at the disconnect panel and connect the hose to the service cart pressure line using fitting A.

CAUTION: KEEP LOOSE COUPLING CLEAN.

b) Disconnect the 3/4 inch return line flexible hose at the connection nearest the utility reservoir and connect this hose to the service cart return hose using fitting B.

c) Flush pump return path for five minutes at maximum flow rate with pressure not to exceed 100 psig.

d) Stop service cart pump and disconnect cart pressure hose from the No. 2 engine pump return hose. Reinstall disconnect coupling half to pump return hose.

e) Connect cart pressure hose to No. 3 engine pump return hose per Step a).

f) Repeat steps c) and d) for engine No. 3 pump return path.

g) Disconnect the service cart return hose from the utility system return hose and reconnect the utility return hose to the fitting from which it was removed in step b).

11) Flush engine driven pump pressure lines.

a) Remove the disconnect coupling half from the No. 3 engine hydraulic pump pressure hose and connect the hose to the cart pressure hose using fitting C.

CAUTION: KEEP LOOSE COUPLING CLEAN.

b) Disconnect tubing from the pressure side of the utility system relief valve and connect the service cart return hose to this tube with adapter fitting B.

c) On airplanes equipped with cooling loop, remove the 2 way restrictors from applicable pressure line cooling loop and attach a waste line to the free end of the loop. Cap or plug the open tee connection in the return line.

NOTE: Place waste line in container suitable for Skydrol.

d) Flush engine No. 3 pressure line five minutes at maximum flow rate with pressure not to exceed 200 psig.

e) Stop service cart pump and disconnect cart pressure hose from the No. 3 engine hydraulic pump pressure hose. Reinstall the disconnect coupling half removed in step a), to the engine hydraulic pump pressure hose.

f) Remove the disconnect coupling half from the No. 2 engine hydraulic pump pressure hose and connect the cart pressure hose to the engine hydraulic pump pressure hose with fitting C.

g) Repeat steps d) and e) for engine No. 2 pressure line.

h) Disconnect cart return hose and reconnect pressure tubing to system relief valve.

12) Flush engine driven pump supply lines.

a) Remove the disconnect coupling half from the No. 2 engine hydraulic pump supply hose and connect that hose to the service cart return hose using fitting D.

b) Disconnect the left wing supply hose from the bottom of the utility reservoir and connect it to the service cart pressure hose using fitting E.

CAUTION: SKYDROL WILL SPILL WHEN HOSE IS DISCONNECTED FROM RESERVOIR.

c) Flush supply line at maximum flow with pressure not to exceed 100 psig.

d) Stop flushing and disconnect cart return hose from the No. 2 pump supply hose at engine and reinstall disconnect coupling half in supply hose.

e) Disconnect cart pressure hose from left wing supply hose and reconnect supply hose to reservoir.

f) Remove the disconnect coupling half from the No. 3 engine pump supply hose and connect hose to cart return hose using fitting D.

g) Disconnect the right wing supply hose from the bottom of the reservoir and connect this hose to the service cart pressure hose using fitting E.

h) Flush engine No. 3 supply line at maximum flow rate at pressure not to exceed 100 psi.

i) Stop flushing and disconnect cart return hose from engine No. 3 pump supply hose. Reinstall disconnect coupling half.

j) Disconnect cart pressure hose from the right wing supply hose and reconnect the right wing supply hose to the reservoir.

13) Flush the utility reservoir.

a) Remove filler cap and filler neck screen.

b) Remove drain plug.

c) Flush the utility reservoir by flowing one or two gallons of clean Skydrol 500 through the filler neck with screen removed. Allow the fluid to drain through the reservoir drain port.

CAUTION: MAKE CERTAIN SERVICING UNIT IS CLEAN.

d) Reinstall drain plug in utility reservoir and lockwire. Reinstall filler neck screen and cap.

14) Remove the No. 2 and No. 3 engine pump case return relief valves (if applicable) and the pump return, supply and pressure lines, between the pump and the disconnect panel. Clean lines in solvent and blow out.

15) Reinstall pump connecting lines and pump case return relief valve (if applicable).

CAUTION: INSTALL RELIEF VALVE PRESSURE SIDE DOWN (ARROW ON VALVE POINTING TOWARD SUPPLY LINE).

16) Remove and clean the No. 2 and No. 3 pump pressure filter bowls, pump case drain bowls (where applicable) and the utility return filter bowl.

17) Install the No. 2 and No. 3 engine pump pressure filter elements. Check that metal elements are clean. Make sure that paper elements are new. Install a new utility return filter element. Check that O-rings and gaskets are in place. Install pump case drain filter elements (where applicable) making sure elements are clean.

18) Reinstall filter bowls. Safety wire filter bowls.

19) Bleed hydraulic system per paragraph B.(3).

20) Restore airplane to normal configuration.

(2) Flushing Procedure Number 2 (Utility System - Minimum)

(a) General

1) This procedure is intended to be used where Skydrol supply is limited and where suitable flushing equipment is unobtainable. It is therefore considered to be minimal. However, once performed, subsequent additional flushing per Procedure Number 1 at a major base may not be necessary. Because replacement engine pumps are to be used to flush the system, it is necessary to perform each step listed in proper sequence and as thoroughly as possible. Otherwise, contamination particles which may remain in the system will cause the pumps to be damaged during the flushing operation.

2) It is recommended that pumps used to flush the system and the system itself be carefully monitored after using this flushing procedure. System filter checks shall therefore be performed at least two times at 50-hour intervals following flushing.

3) Flushing Procedure Number 2 may be used where:

a) Auxiliary system is not contaminated.

b) Metal particles are detected in one or all filters and utility reservoir.

c) Pumps (one or both) damaged.

4) Filter checks should indicate spread of contamination particles. If damage and contamination is confined to one side of airplane, flush lines only on the affected side as there is evidence that disturbing the system where unnecessary may cause future problems. This is particularly true where minimal procedures are employed.

(b) Equipment and Materials

NOTE: Keep all flushing equipment, lines, hoses and components capped during storage and handling.

1) Replacement pump or pumps.

2) Replacement filter elements or means of cleaning contaminated units.

3) Seals and gaskets for filters and fittings.

4) 2-5 Micron industrial non-bypass filter, Purolator P-32-61 filter assembly, and lines and fittings necessary to plumb around the utility return filter. Because this filter is a special item, it is suggested that it be purchased as part of a flushing kit and provisioned as such, either at line stations or in an air-portable flushing package.

5) Modified reservoir filler cap. Cap must have fitting installed so that reservoir may be filled with fluid under pressure. This special cap may be included with above flushing kit.

6) Skydrol service cart equipped with hand pump or high pressure nitrogen bottle and filter.

7) Approximately 15 to 20 gallons of Skydrol 500.

(c) Flush Utility Hydraulic System

WARNING: GOGGLES SHOULD BE WORN BY PERSONNEL WORKING WITH SKYDROL 500.

1) Open left main wheel well door by pulling ground door release handle down. Disconnect door actuator from door.

2) Depressurize utility system by operating the system bypass valve to bypass.

3) Depressurize reservoir by slowly unscrewing reservoir cap and allowing air to escape.

4) Close bypass valve.

5) Open wing panel below utility reservoir. Remove plug and drain reservoir.

6) Remove and check pump case drain filters, pressure filters, and return filters to determine spread of contaminate particles. Check auxiliary system pressure filters and return filters. If auxiliary system is contaminated, see paragraph 1.C. Check fluid drained from reservoir for particles. Determination of contamination spread and quantity by filter and fluid examination is very important. If metal particles of any quantity, whether brass or steel are found, then the line or system upstream of that point is contaminated. Relatively few or small particles could indicate an incipient or future pump failure or transfer of particles from a pump failure on the opposite side of

the airplane. Large or a great many particles undoubtedly indicates pump failure. It is recommended for Flushing Procedure Number 2 that lines in both wings be flushed only if contamination particles are found in both. Otherwise flush lines only in the contaminated side. The system failure report together with the filter and drained fluid examination and replacement parts on hand shall determine what steps need be performed from this point forward.

7) Remove defective pump or pumps.

8) Remove pump return line from disconnect panel and flush with Skydrol, using hand pump.

9) If particles were found in fluid previously drained from reservoir, remove filler inlet screen from reservoir and direct small stream of Skydrol from hand pump on inside walls of reservoir to flush particles out bottom drain hole. When flushing fluid runs clear, reassemble parts, install drain plug and safety wire. Flushing of reservoir is unnecessary unless particles are detected in the drained fluid.

10) Plumb 2-5 micron industrial filter around utility return filter.

11) Fill reservoir from service cart through modified reservoir cap.

12) Flush Supply Lines

a) Assure supply shutoff valve in supply line to be flushed is open, then flush pump supply line from reservoir to engine pump by forcing fluid into reservoir from Skydrol service cart.

NOTE: Flushing will be more thorough if fluid is forced to move quickly through lines. Therefore, flush one supply line at a time, capping off or closing supply shutoff valve to other line. The duration of flushing time should be determined from Skydrol supply available and/or evidence that flushing fluid does not contain particles after flushing for a time.

b) Replace pump or pumps.

c) Clean pressure and case return filter bowls and install new or cleaned filter elements.

d) Fill reservoir to proper level then remove special cap and service cart connections.

e) Operate one engine at a time at idle for a period of about 15 minutes in order to drive pump.

f) To induce fluid flow conditions, operate flaps and speed brakes continuously during engine run.

g) If both pumps were replaced, operate other engine for 15 minutes at idle and repeat above.

h) Shut down engine.

i) Remove 2-5 micron filter and replace or clean utility return filter element.

j) Inspect pressure and case return filters for evidence of particle contamination. If only slightly contaminated replace the filter elements. If heavily contaminated repeat flushing procedure except do not change pumps.

(3) Bleed Utility Hydraulic System

(a) Service hydraulic reservoir. Refer to Chapter 12, Hydraulic Fluid Servicing. Couple the hydraulic service cart pressure hose to the engine No. 2 pump pressure hose and the cart return hose to the engine pump supply hose at the engine No. 2 disconnect panel.

(b) Prepare the utility system for bleeding.

1) Depressurize utility reservoir

a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir.

2) Remove the utility reservoir filler cap.

3) Position utility system bypass valve to bypass.

4) Disconnect door actuator from both main wheel well doors.

5) Place right and left ground door release handles in up position.

NOTE: With door actuators disconnected, wheel well doors will not close. Ground locks prevent beam movement.

6) Check that the system interconnect valve is closed.

7) Check that the hydraulic supply (fire) shutoff valves are open.

(c) Set up the hydraulic service cart for servicing and bleeding airplane.

(d) Service utility reservoir. Refer to Chapter 12, Hydraulic Fluid Servicing.

CAUTION: AN OBSERVER MUST MONITOR THE FLUID LEVEL IN THE UTILITY RESERVOIR DURING BLEEDING. DO NOT LET FLUID LEVEL DROP BELOW SIGHT GAGE WITHOUT STOPPING TO REFILL RESERVOIR.

(e) Start hydraulic cart.

(f) Increase cart pump outlet pressure to 50 psi.

(g) Run cart until fluid level stabilizes, stopping to refill as necessary.

(h) Stop cart and close airplane utility system bypass valve and safety wire closed.

(i) Start hydraulic service cart and set cart compensator control to 3000 psi.

(j) Check pressure filter and utility system relief valve for external leaking.

(k) Actuator outboard spoilers at least six times, stopping to refill utility reservoir as required.

(l) Actuate flaps at least six times, stopping to fill reservoir as required.

(m) Operate air start compressor (if applicable) 1 minute.

(n) Bleed brakes if emergency air brakes were used on landing.

(o) Check and fill reservoir as needed.

(p) Shut off service cart and close cart outlet valve and cart return valve. Disconnect the cart hoses from No. 2 engine.

(q) Fill No. 2 engine pump supply line below disconnect panel.

(r) Fill No. 2 engine pump case through the case return port. Restore supply, return, and pressure hoses at disconnect panel.

(s) Repeat steps (a) through (j) and (p) through (r) as needed.

(t) Check and service utility reservoir as needed.

(u) Pressurize the airplane utility reservoir to 45 psig through ground charging valve.

CAUTION: AIR PRESSURE SOURCE MUST NOT EXCEED 50 PSIG.

BOEING Intercontinental 707

MAINTENANCE MANUAL

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(v) Check for leaks in supply and return lines.

(w) Pull right and left ground door release handles to down position, and reconnect door actuators to door.

(x) Check that No. 2 and No. 3 engine pump line connections have been restored at disconnect panels.

(y) Upon completion of this procedure replace filter element in hydraulic service cart.

C. Flush and Bleed Auxiliary Hydraulic System

(1) General

(a) Since the auxiliary pump is electrically driven, it may be shut off in flight when a failure is encountered.

(b) If the auxiliary pump was shut off due to a fluid loss, correct the system discrepancy and check pump operation.

(c) If the auxiliary pump was shut off as a result of low pressure, replace the pump and clean the pressure and return filters. Proceed with a systematic check to determine the extent of contamination.

(d) When an auxiliary pump is replaced following a failure or when contamination is found in the auxiliary pressure or return filter affected portions of the auxiliary system should be flushed in accordance with the following procedure.

(e) The auxiliary system should not be flushed unless definite evidence of contamination is present in the filters. Precautionary flushing is not required following a pump replacement for an electrical malfunction.

(f) Connections in the auxiliary system should be left intact whenever possible and disconnections made only as necessary.

NOTE: Keep loose couplings clean.

(2) Equipment and Materials

(a) Refer to utility system flushing procedure number one "Equipment and Materials," plus the following fittings.

1) F, adapter, cart pressure to -4 MS.

2) G, adapter, cart return to -6 MS.

3) H, adapter, cart pressure to -8 MS.

4) I, adapter, cart return to -8 MS.

5) J, adapter, cart pressure to -12 MS.

WARNING: GOGGLES MUST BE WORN BY PERSONNEL WORKING WITH BMS 3-11 HYDRAULIC FLUID.

(3) Flush Auxiliary Hydraulic System

(a) Open left and right main wheel well doors by pulling respective ground door release handles down.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATHS.

(b) Disconnect both right and left door actuators from doors.

(c) Depressurize the auxiliary system.

1) Depressurize utility reservoir

a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir.

2) Operate the rudder to discharge accumulator and line pressure.

(d) Flush number one auxiliary pump system.

1) Remove number one auxiliary pump pressure and return filter elements and examine for contamination. Dispose of contaminated return filter paper element.

2) Clean filter bowls and reassemble filter assembly without the elements.

3) Remove drain plug from auxiliary reservoir, or reservoirs if applicable, or disconnect pump supply line at the reservoir, if applicable, and drain the reservoir(s).

NOTE: Four to five gallons of BMS 3-11 hydraulic fluid can be expected from number one auxiliary reservoir and one to two gallons from number two auxiliary reservoir. Dispose of the fluid.

4) Disconnect the return tubing from the auxiliary reservoir(s) and connect service cart pressure. Connect cart return to the drain port, or supply port if applicable, and flush reservoir(s) by flowing one or two gallons of BMS 3-11 hydraulic fluid through the reservoir(s). Keep only enough pressure to establish flow. Do not exceed 45 psi. Disconnect service cart.

5) Reinstall the drain plug(s) and safety wire, if applicable.

6) Replace damaged pump. Connect lines as flushing proceeds.

7) Flush number one pump supply line.

   a) Disconnect the supply hose from number one reservoir, if not previously performed in step (3)(d)3).

   b) Connect service cart pressure to reservoir end of the line and cart return to the pump end. Flush line for 2 minutes with a pressure not to exceed 100 psi.

   c) Disconnect cart and restore supply line connections to the reservoir and the pump.

   d) For those airplanes incorporating a second auxiliary reservoir, connect cart pressure to the number two auxiliary pump supply hose at the tee connection at number one pump, or at the NAS1237 elbow at number one reservoir if applicable, and cart return to the number two auxiliary reservoir end of the line. Flush supply line for 5 minutes with a pressure not to exceed 100 psi.

   e) Disconnect cart and restore the connections to number one pump, or number one reservoir if applicable, and number two reservoir.

   f) Connect cart pressure to the number two reservoir end of the number two pump supply line and cart return to the number two pump end of the line. Flush for 2 minutes with a pressure not to exceed 100 psi.

   g) Disconnect cart and restore number two pump supply line connections to the reservoir and the pump.

8) Flush number one pump return line.

a) Connect cart pressure to the pump end of the line cart return to the reservoir end of the line. The return line at the reservoir was previously disconnected in step (3)(d)4).

b) Flush number one pump return line for 5 minutes with a pressure not to exceed 100 psi.

c) Disconnect cart and restore pump return line connections at the pump and at the reservoir.

9) Flush number one pump pressure line.

a) Disconnect the number one pump pressure line at the inlet port of the inboard spoiler shutoff valve (solenoid or motor operated) at station 840-860 in the right-hand wheel well.

b) Connect cart pressure to the pump pressure line at the pump, and cart return to the pressure line at the shutoff valve. Flush pump pressure line for 5 minutes at a pressure not to exceed 100 psi.

c) Disconnect cart and restore the pressure line connections at the pump and at the shutoff valve.

10) Install clean metallic and new paper elements respectively in the number one pump pressure and return filters.

11) Install filter bowls and lockwire.

(e) Flush number two auxiliary pump system.

1) Repeat steps (3)(d)1) and (3)(d)2) for number two auxiliary pump pressure and return filter elements, if applicable.

2) Repeat step (3)(d)3) for a single auxiliary reservoir system or if a dual reservoir system, remove drain plug from number two auxiliary reservoir, or disconnect number two pump supply line at the reservoir, if applicable, and drain the number two reservoir.

3) Repeat steps (3)(d)4) thru (3)(d)6) for a single auxiliary reservoir system or if a dual reservoir system, steps (3)(d)7)f) and steps (3)(d)5) and (3)(d)6).

4) Reconnect the number one pump supply line to the number one reservoir if disconnected.

5) Flush number two pump supply line.

a) For those airplanes incorporating a single auxiliary reservoir system, disconnect the number two pump supply line at the reservoir or at the NAS1237 elbow at the reservoir, if applicable.

b) Connect cart pressure to the reservoir end of the number two pump supply line, and cart return to the pump end of the line.

c) Flush number two pump supply line for 5 minutes with a pressure not to exceed 100 psi.

d) Disconnect cart and restore pump supply line connections to the reservoir and pump.

e) For those airplanes incorporating a dual auxiliary reservoir system, repeat steps (3)(d)7)f) and (3)(d)7)g) for flushing number two pump supply line.

6) Flush number two pump return line.

a) For those airplanes incorporating a single auxiliary reservoir system, connect cart pressure to the pump end of the line and cart return to the reservoir end of the line. The return line at the reservoir was previously disconnected in step (3)(e)3).

b) Flush number two pump return line for 5 minutes with a pressure not to exceed 100 psi.

c) Disconnect cart and restore pump return line connections at the pump and at the reservoir.

d) For those airplanes incorporating a dual auxiliary reservoir system perform steps (3)(e)6)a) thru (3)(c)6)c) above except connect cart return to the number two auxiliary reservoir end of the line.

7) Flush number two pump pressure line.

a) Disconnect the number two pump pressure line at the inlet port of the rudder system shutoff valve (solenoid or motor operated) at station 840-860 in the right-hand wheel well.

NOTE: Some configurations have the manual shutoff valve for the rudder system in the number two pump pressure line before the rudder system shutoff valve. For these configurations it will be necessary to disconnect the number two pump pressure line at the manual shutoff valve instead of the rudder system shutoff valve.

b) Connect cart pressure to the pump pressure line at the pump and cart return to the pressure line at the shutoff valve. Flush pump pressure line for 5 minutes at a pressure not to exceed 200 psi.

c) Disconnect cart and restore the pressure line connections at the pump and at the shutoff valve.

8) Install a clean metallic element in the number two pump pressure filter. For airplanes incorporating a dual auxiliary reservoir system, install a new paper element in the number two auxiliary return filter.

9) Install filter bowls and lockwire.

(4) Bleed Auxiliary Hydraulic System

(a) Depressurize utility reservoir.

1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir.

(b) Remove the utility reservoir filler cap.

(c) Check that the system interconnect valve is closed.

(d) Check that the brake interconnect valve is closed, if applicable.

(e) Remove bleeder plug on number two auxiliary reservoir, if applicable.

(f) Service utility reservoir. Refer to Chapter 12, Hydraulic Fluid Servicing.

(g) Install bleeder plug on number two auxiliary reservoir, if applicable.

(h) Pressurize the utility reservoir to 45 psig through the ground charging valve. Check for leaks in the auxiliary supply and return tubing in the wheel well and wing fillet areas.

CAUTION: AIR PRESSURE SOURCE MUST NOT EXCEED 50 PSIG.

(i) Bleed off any air in the number two auxiliary reservoir, if applicable, by unscrewing bleeder plug slightly on reservoir. Tighten and lockwire bleeder plug.

(j) Check that the rudder system and inboard spoiler shutoff valves are on, i.e., de-energized, and rudder manual shutoff valve is open and lockwired.

(k) Start number one pump. Rudder pressure should begin to build up.

(l) Operate inboard spoilers and rudder at least six times. Monitor utility reservoir quantity indicator. If quantity drops below 3.2 U.S. gallons, stop and refill utility reservoir taking care to follow depressurizing and filling procedures, step (3)(c) and steps (4)(a) through (4)(h).

(m) Check number one pump pressure lines for leaks in the wheel well and wing fillet areas.

(n) Shut off number one pump.

(o) Start number two pump.

(p) Operate rudder at least six times. Monitor utility reservoir quantity indicator. If quantity drops below 3.2 U.S. gallons proceed as in step (4)(l) above.

(q) Check number two pump pressure lines for leaks in the wheel well and wing fillet areas.

(r) Shutoff number two pump.

(s) Depressurize auxiliary system as in step (3)(c).

(t) Refill utility reservoir, if necessary. Tighten filler cap.

(u) Reconnect door actuators to the wheel well doors.

(v) Upon completion of above procedure replace filter elements in the hydraulic service cart.

D. Lubricate Auxiliary Hydraulic Pump Gearbox (Airplanes equipped with Westinghouse motor-driven pumps)

(1) Open main wheel well door by ground door release handle and install door downlock.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

(2) Lubricate auxiliary hydraulic pump gearbox having gear cover No. 906D661-1.

(a) Remove fill plug (figure 201) and add 50 cc's of oil (MIL-L-7870) through fill hole. Allow oil to settle. Remove level plug and allow excess oil to drain off. Replace level plug making certain that plug O-ring is in place. Add 10 cc's more oil through fill hole.

(b) Replace fill plug. Make certain plug O-ring is in place and lockwire plugs.

(3) Lubricate auxiliary hydraulic pump gearbox having gear cover No. 908D501-1.

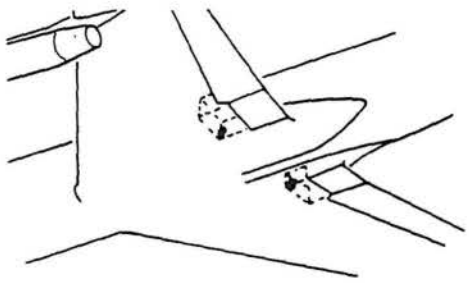
NOTE: On some airplanes the level plug is provided with a sight gage. If oil level is at level mark gear case is full.

(a) Remove fill plug (figure 201) and add 70 cc's of oil (MIL-L-7870) through fill hole. Allow oil to settle. Remove level plug and allow excess oil to drain off.

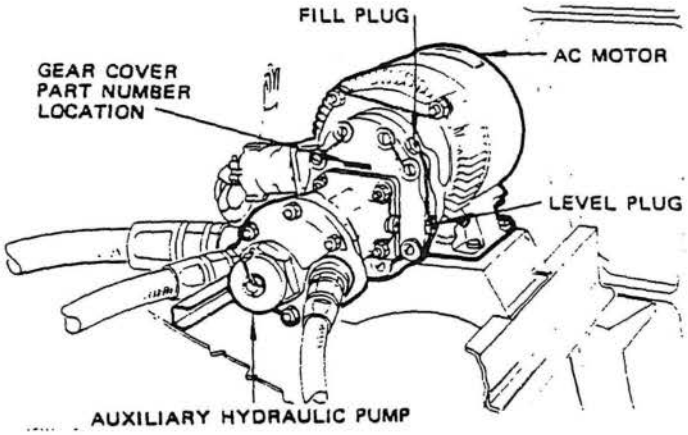
NOTE: On airplanes equipped with sight gage in level plug, check oil level at sight gage before removing level plug to drain off any excess oil.

(b) Replace fill and level plugs. Make certain plug O-rings are in place and lockwire plugs.

(4) Remove wheel well door downlock and close wheel well door by returning ground door release handle to up position.



SINGLE PUMP INSTALLATION SHOWN.
NO. 1 AND NO. 2 PUMPS OF TWO PUMP SYSTEM SIMILAR.



Auxiliary Hydraulic Pumps Lubrication Points
Figure 201

2. Adjustment/Test Hydraulic System

A. General

(1) Hydraulic systems are tested at normal operating pressures. Each component is tested for proper operation. A relief valve must be isolated from the effects of other relief valves for test purposes.

(2) Engines 2 and 3 must be operated to test engine driven pumps.

B. Equipment

(1) Hydraulic Service Cart, 0 to 3500 psi, Skydrol 500.

(2) Air pressure source, 0 to 200 psi operating pressure.

C. Test Utility Hydraulic System

(1) Open following doors and panels: (See "Access Doors and Panels", Chapter 12.)

(a) Main landing gear actuator access panel, 1346.

(b) Main gear walking beam access panel, 1347.

(c) Hydraulic access panel, 1348.

(d) Hydraulic supply shutoff valve access panel, 1349.

(e) Wing lower access panel, 1358.

(f) Inboard cove lip doors, 1256 and 1257.

(g) Inboard aileron control access panel, 1357.

(h) Nacelle strut trailing edge fairing 1715.

(i) Nacelle strut forward fairing, 1703.

(j) Nacelle strut access panel, 1724, 1704, 1705, 1707, 1708 and 1710.

(k) Engine right cowling panel.

(l) Wing leading edge access panel, 1302, 1303, 1304 and 1305.

(m) Wing fuselage fairing access panel 1300.

(n) Main gear wheel well doors.

(2) Connect external electrical power to airplane.

(3) (TWA) Press to test fluid overheat warning light.

(4) Check that four amber low pressure warning lights are illuminated.

(5) Connect external hydraulic cart to hydraulic pressure and supply lines on engine No. 2.

CAUTION: CHECK THAT SUPPLY SHUTOFF (FIRE) VALVE IS OPEN TO PREVENT RUPTURING RESERVOIR.

(6) Plug leading edge flap pressure relief valve pressure port.

(a) Position flap control lever to DOWN.

(b) Open cove lip door 1363. (See Access Doors and Panels, Chapter 12.)

(c) Remove pressure line from flap pressure relief valve and plug line.

(d) Cap pressure port of relief valve.

(7) Increase pressure and check engine No. 2 low pressure warning switch actuates at 950 to 1450 psi, to extinguish low pressure warning light.

(8) Increase pressure to about 3400 psi and examine lines for leakage.

(9) Increase pressure until relief valve opens.

(a) Check that pressure is 3400 to 3600 psi.

(b) Check that pressure does not drop below 3100 psi.

(c) Check for increase in pressure to ascertain that relief valve closed.

(10) Check gage on accumulator and pressure indicator in control cabin against gage on hydraulic pressure source.

(a) Decrease pressure in increments of 200 to 300 psi.

(b) Check that gage and indicator reading is within 150 psi of gage on hydraulic pressure source.

(11) Depressurize utility system.

(a) Position bypass valve to BYPASS.

(b) Check that pressure drops to charge of accumulator.

(12) Position bypass valve to CLOSED.

(a) Check that pressure rises.

(13) Check that pressure stabilizes between 2800 to 3225 psi.

(14) Depressurize system, position bypass valve to BYPASS.

(a) Check pressure at which engine No. 2 low pressure warning light illuminates.

(b) Pressure should be between 700 and 100 psi below pressure warning switch actuating pressure in step (7).

(15) Remove hydraulic source from engine No. 2 and connect system supply and pressure lines.

(16) Attach hydraulic source to engine No. 3.

(17) Repeat steps (2), (5), (7) and (8) for engine No. 3.

(18) Pressurize hydraulic system between 2800 to 3225 psi.

(19) Actuate interconnect valve switch to OPEN.

(a) Check auxiliary pressure to equal utility system pressure.

(20) Reduce hydraulic pressure to zero.

(21) Position interconnect valve to CLOSED.

(22) Actuate fire switch for engines 2 and 3, check supply shutoff valve position indicator to be closed.

(23) Push fire switches for engine 2 and 3. Check supply shutoff valve position indicator to be OPEN.

(24) Position engine-driven hydraulic pump valve switch to OFF. Check for an audible indication of solenoid operation.

(25) Position engine-driven hydraulic pump valve switch to ON. Check for an indication of solenoid operation.

(26) Operate engine No. 2 at IDLE and check pump pressure to be 2800 to 3225 psi.

(27) Check pump and pump lines for leakage.

(28) Check for air leakage in the reservoir pressurization system.

(29) Shut down engine.

(30) Repeat steps (24) through (29) for engine No. 3.

(31) Return system to normal.

(a) Reconnect flap relief valve.

(b) Remove hydraulic and electrical power.

(c) Close access openings.

D. Test Auxiliary Hydraulic System

(1) Connect external electrical power to the airplane.

(2) Connect external hydraulic power to the airplane.

(3) Check that auxiliary hydraulic pump low pressure warning lights are illuminated.

(4) Plug pressure port of leading edge flap relief valve.

(a) Extend flaps.

(b) Open outboard cove lip door.

(c) Remove pressure line from pressure port of relief valve.

(d) Plug line and cap pressure port.

(5) Plug utility system relief valve.

(a) Open right main wheel well door by pulling ground door release handle down and install door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(b) Disconnect pressure line from pressure port of utility pressure relief valve.

(c) Plug line and cap pressure port.

HYDRAULIC SYSTEM - INSPECTION/CHECK

1. General

A. The following procedure provides instructions for performing an internal leakage check of the hydraulic system to determine the condition of the system and its major subsystems.

B. Condition of the hydraulic system is based on the degree of internal leakage. Leakage flows are determined by measuring current and change in current required by one auxiliary hydraulic pump when operating the system components in different configurations. Fluid flow is determined by relating current changes to a pump characteristic chart (Fig. 603). By comparing measured leakage to recommended in-service leakage limits, a determination of subsystem or component condition can be made.

C. The test procedure presented herein is a two level test.

The provisions of each are as follows :

(1) Gross Level : a short test to determine overall system condition. If a gross level test is satisfactory no further testing is necessary.

(2) Subsystem Level : a detailed test to fault isolate the degraded component. This test is generated by either the gross level test or a flight/maintenance squawk.

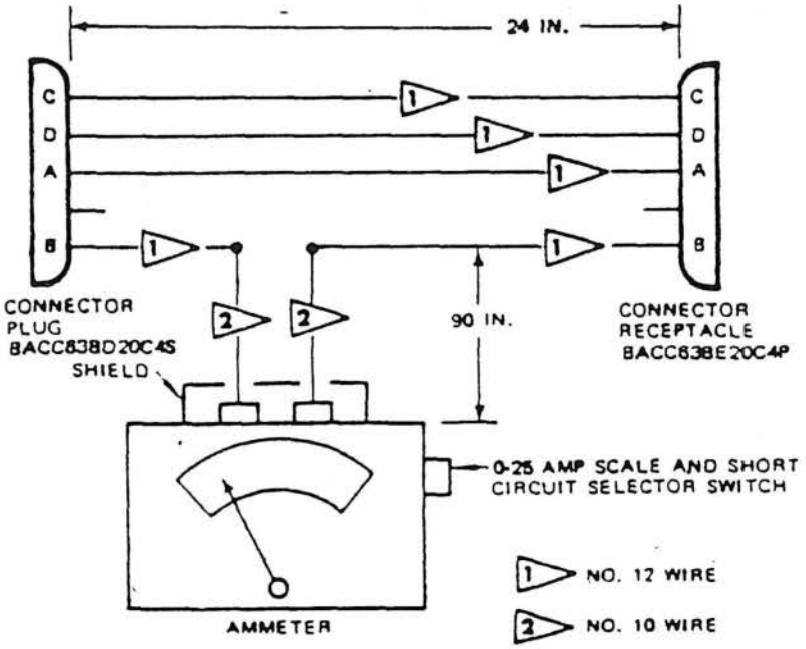
2. Equipment and Materials

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, or equivalent (Fig. 601)

C. The following warning must be adhered to when performing trouble shooting on hydraulic components.

WARNING: TO PREVENT PERSONNEL INJURY OR EQUIPMENT DAMAGE DURING INTERNAL LEAKAGE CHECKS, KEEP PERSONNEL AND EQUIPMENT CLEAR OF HYDRAULIC COMPONENTS THAT CAN MOVE.


24 IN.
C
D
A
B
1
2
CONNECTOR
PLUG
BACC638D20C4S
SHIELD
90 IN.
CONNECTOR
RECEPTACLE
BACC638E20C4P
0-25 AMP SCALE AND SHORT
CIRCUIT SELECTOR SWITCH
AMMETER
NO. 12 WIRE
NO. 10 WIRE

T.R. 29-51

(6) Position interconnect valve switch to OPEN.

(7) Increase pressure to 3400 psi.

(a) Check auxiliary pump No. 1 pressure switch to extinguish low pressure warning light at 950 to 1450 psi.

(b) Check for leakage.

(8) Check relief valve operation.

(a) Increase pressure until relief valve opens.

(b) Check that pressure is within 3400 to 3600 psi when valve opens.

(c) Check that pressure does not drop below 3100 psi before valve reseats.

(d) Deleted.

(9) Check auxiliary hydraulic pump low pressure warning lights.

(a) Decrease pressure until low pressure warning lights illuminate.

(b) Pressure should be above 700 psi and at least 100 psi below low pressure warning switch actuating pressure in step (7).

(10) Check reading on gage on accumulator against gage on hydraulic pressure source.

(a) Increase pressure in increments of 200 psi.

(b) Check gage to be within agreement of 100 psi of gage on hydraulic source.

(11) Remove hydraulic pressure source.

(12) Position interconnect valve to CLOSED.

(13) Position auxiliary hydraulic pump No. 2 switch to ON.

(14) Check for pressure to stabilize between 2800 to 3225 psig.

(15) Attempt to operate inboard spoilers by rotating control wheel. Spoilers shall not operate.

(16) Position auxiliary hydraulic pump No. 2 switch to OFF.

(17) Position auxiliary pump No. 1 switch ON.

(18) With interconnect valve closed, check for pressure to stabilize between 2800 to 3225 psig as indicated by the auxiliary accumulator pressure gage.

(19) Position interconnect valve switch to OPEN.

(20) Check that auxiliary pump No. 2 low pressure light is illuminated.

(21) On Turbojet airplanes (without the cooling loop bleeds) check that pressure indicated by the utility system pressure gage rises and stabilizes between 2800 to 3225 psi. On Turbofan airplanes, check that utility and brake system pressures rise and stabilize above accumulator precharge.

NOTE: On Turbofan airplanes with the interconnect valve open, a low pressure reading is normal due to system bleeds and internal leakage.

(22) Position auxiliary pump No. 1 switch off. Position interconnect valve switch off.

(23) Operate rudder control system to depressurize auxiliary hydraulic system.

(24) Replace pressure lines on relief valves.

(25) Retract flaps.

(26) Close access doors and remove wheel well door downlocks.

(27) Disconnect external electrical power.

3. Inspection/Check Hydraulic System

A. Check Hydraulic System

(1) Check hydraulic tubing in the nacelle area for discoloring which indicates overheating of hydraulic fluid. The tube is accessible by raising the right cowl panel 1717. See Chapter 12, Access Doors and Panels.

E. Check Hydraulic System Filters

(1) At regular intervals visually check the utility pump return filter elements for contamination. If no contaminant is found further filter check is unnecessary, unless system contamination is suspected from water, MIL-oil, dirt and etc. If contaminant is found, the remaining system filters must be checked and pump removal should be considered depending on amount and type of contaminant. If metal contaminant is found proceed with the following steps.

(a) Remove and overhaul the associated pump.

(b) Check utility system pressure filter elements, if no contaminant is found replace the filter element and proceed with step (f).

(c) If utility system pressure filter is contaminated, check utility system return filter element, if no contaminant is found replace the utility system return filter element and proceed with step (f).

(d) If utility system return filter is contaminated, check the auxiliary system return filter and the utility and auxiliary system reservoirs for contamination. If no contaminant is found in the auxiliary system return filter of reservoirs, replace auxiliary system return filter element and proceed with step (f).

(e) If the auxiliary system return filter and the utility and auxiliary reservoirs are contaminated, flush the utility and hydraulic systems.

(f) Flush hydraulic lines which are determined to be contaminated based upon evidence obtained in the above steps.

C. Check Hydraulic Fluid

(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 figure 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.

(b) Reclaimed fluid should be examined to determine its suitability for reuse in the hydraulic systems. If the fluid meets the limits in figure 601, it is considered accptable for reuse. The following companies reclaim BMS 3-11 type fluids and their mixtures:

1) Dalton & Co. Ltd, Silkolene Oil Refinery
Belper, Derbyshire,
England

2) Romic Chemical Corporation
Palo Alto, California

FLUID PROPERTIES	TEST METHOD	IN - SERVICE FLUID LIMITS	RECLAIMED FLUID LIMITS
Appearance	Visual	No Cloudiness, phase separation or precipitation. Any color acceptable.	No Cloudiness, phase separation or precipitation. Any color acceptable.
Specific Gravity 25°C/25°C	ASTM D941	0.995-1.066	0.995-1.066
Water Content % by wt	ASTM D1744 or Infrared [1]	0.40 Min	0.40-0.60
Neutralization No. mg KOH/gm	ASTM D974	1.5 Max	0.25 Max
Viscosity, cs at 100°F	ASTM D445	6.0-12.5	7.0-12.5
Flash Point, °F, open cup	ASTM D92	-------	320 Min
Organic Contamination	Infrared [1]	None detectable by Infrared	None detectable by Infrared
Particle Contamination	ARP 598	-------	[2]

[1] If inadvertant contamination has occured, use procedure from Boeing Document D6-24429, "An Analytical Method for Contaminates in BMS 3-11 Fluids and Their Mixtures Using Differential IR Spectroscopy."

[2]

Size Range (Microns)	Particles/100 ml. (Max)
5-15	27,700
15-25	2,500
25-50	1,000
50-100	350
> 100	120

4. Approved Repairs Hydraulic Systems

A. Repair Hydraulic System Tubing

(1) General

(a) Repair of the hydraulic system tubing consists mainly of repairing scratches, gouges, wear spots, etc. for both high and low pressure tubing installations. Figure 203 gives the maximum allowable wall reduction limits. The tube wall reduction is allowable at any location on the tube. It is suggested that scratches and gouges which are within the allowable limits be repaired as soon after discovery as possible.

(b) Dents are allowable in the tubes if the following requirements are met.

1) The dent does not restrict the flow in the tube.

2) The radius of the dent is not less than wall thickness plus 0.06 inch for AISI-304 tubing, and four times wall thickness for 6061-T6 tubing.

NOTE: Scratches and gouges within dented areas should be repaired as described in step (2).

(2) Repair hydraulic systems tubing.

NOTE: Determine if damage is within the maximum allowable wall reduction limits. (See figure 203.) If damage is not within limits replace tubing.

(a) Blend damaged area so that the damage is removed with a minimum blending radius of one inch.

(b) Taper the damaged area to the original wall thickness over a distance of twenty times the damage depth.

(c) Dye check the reworked area to make sure that no cracks are left in tube.

(d) Refinish reworked area on all aluminum alloy tubing as described in Chapter 51-2-0, "Alodizing."

NOTE: Stainless steel tubing does not require finish applications after rework.

HYDRAULIC TUBE ASSEMBLIES	MAXIMUM ALLOWABLE WALL REDUCTION LIMITS
Power Pressure (Except [1]) Spoilers Up Spoilers Down Flaps Up Flaps Down Landing Gear Up Landing Gear Down Landing Gear Door Open Landing Gear Door Close Landing Gear Uplock	0.006 INCH
Hydraulic Pneumatic Brake Hydraulic Pneumatic Brake Warning [1] Brake Pressure	0.010 INCH
Relief Return (Except [2])	0.014 INCH
[2] Auxiliary Return Tubing Assembly 65-8643-9	0.010 INCH
Vent Input Supply Reservoir Pressure	0.020 INCH

Hydraulic Tubing Allowable Wall Reduction Limits
Figure 203

B. Protection method of hydraulic lines in rubber cushionned clamps.

(1) Remove clamps in which tubes are floating.

(2) Clean clamping areas on tubes using chlorothene and dry with clean cloth.

(3) Apply "Mystik" Mylar tape of .004 inch thick number 7352 under the clamps as much as necessary to avoid tube floatation in the respective rubber cushionned clamps.

(4) Reinstall clamps on mylar taped areas of tubes.

3. Prepare for Internal Leakage Check

A. Connect external electrical power and adjust voltage to 114-116 volts at 400 ±5 Hz.

B. Install landing gear downlocks.

C. Establish communcation between ground and crew compartment.

D. Install ammeter in series with one phase of No. 1 auxiliary pump.

(1) Disconnect pump electrical connector.

(2) Connect one end of test harness to pump connector.

(3) Connect other end of harness to airplane 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.

E. Check that accumulators are fully charged (Ref Chapter 12, Air and Nitrogen Servicing).

F. Position ground power switch to ON.

G. Actuate flaps down and up hydraulically and operate all flight controls through several complete cycles to bring fluid up to near operating temperature.

H. Position switches as follows:

(1) Hydraulic interconnect OFF

(2) Rudder shutoff valve OFF

(3) Emergency flap control OFF

(4) Spoiler bypass OFF

(5) Brake antiskid OFF

(6) Yaw damper OFF (Series yaw damper only)

I. Position speed brakes down and OFF.

J. Check that TE flaps are up and that flap control handle is in up position.

K. Check that landing gear handle is in OFF position.

L. Check that brakes are OFF.

M. Position aileron trim control to zero.

N. Open landing gear warning horn circuit breaker.

O. Check that landing gear doors are closed.

P. Remove nose steering disconnect pin and disconnect nose steering links.

Q. Remove nuts and washers from linkage bolt on leading edge flap control valve. Remove and reinstall the bolt but at 180° from initial position without washer and nut. (Ref 27-6-221 or 27-16-221, Removal/Installation).

R. The following tool and instructions apply when accomplishing hydraulic component leak check.

Tool: MECHANICS STETHOSCOPE, GA 111D, SNAP-ON-TOOLS CORPORATION, KENOSHA, WISCONSIN.

When troubleshooting, it is not necessary to perform a check of both systems. Only the system 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 ensure that personnel will not be injured or equipment damaged when the component moves.

4. Perform Internal Leakage Check

A. Prior to performing the internal leakage check, the part number of auxiliary pump No. 1 should be recorded for reference for future checks.

B. After preparation for check (par. 3) has been completed, turn on pumps as indicated in procedures and allow pressure to stabilize. To interpret the procedure the following instructions should be followed:

(1) Take amperage reading at each step and record in AMPS column.

(2) Make subtractions of steps listed in SUBTRACT STEPS column and record in AMPS DIFFERENCE column.

(3) Convert amperage in AMPS DIFFERENCE column to flow rate by refering to Fig. 603. Record as FLOW in FLOW DETERMINED FROM FIG. 603 column.

(4) To determine unique flow of component or system, make subtraction of FLOWS as indicated in LEAKAGE BEING CHECKED column and record.

(5) The INSERVICE LEAKAGE LIMITS column provides leakage limits that should not be exceeded.

C. Perform internal leakage check (Fig. 602)

NOTE: The pages in Fig. 602 may be reproduced and used as work sheets when performing this check.

STEP	PROCEDURE	SYSTEM BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFER-ENCE	FLOW DETER-MINED FROM FIG. 603	LEAKAGE BEING CHECKED CC/MIN	IN-SERVICE LEAKAGE LIMITS CC/MIN
1	Prepare for internal leakage check. See MM 29-0 Hydr.System Inspect./Check paragraph 3							
2	Position No.1 and 2 auxiliary hydraulic pump switches to ON and check that pressure stabilizes at 2800-3200 psi. Turn off both pumps and check that pressure does not drop below inservice limit in 60 seconds.	Auxiliary system basic components: a. Rudder shut-off valve b. Interconnect valves c. Spoiler bypass d. Pressure relief valve				Time: Press:	Seconds Psi.	*[1] 2500 psi *[2] 2000 psi
3	Position No.1 auxiliary to ON. (Hydraulic interconnect valve OFF)	Basic reference						
4	Position rudder boost switch and yaw damper switch to ON. Position inboard spoiler bypass switch to ON. Using rudder pedals, move rudder to extreme travel and hold.	Inboard spoiler and rudder systems OFF null leakage		4 - 3		FLOW A		3780
5	Center rudder pedals and position speed brake lever to 50 degrees. Center control wheel.	Auxiliary system total leakage with valves at null		5 -3		FLOW B		7500

Figure 602 (Sheet 1)
T.EG.FLH.

STEP	PROCEDURE	SYSTEM BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFER-ENCE	FLOW DETER-MINED FROM FIG. 603	LEAKAGE BEING CHECKED CC/MIN	IN-SERVICE LEAKAGE LIMITS CC/MIN
6	Position rudder boost switch and yaw damper switch to OFF. Position inboard spoiler bypass switch to OFF and speed brake lever to full down.	New basic reference						
7	Open system interconnect valve.	Utility system		7 - 6		Flow C		10.500

*[1] Airplane with two accumulators (Cargo)
*[2] Airplanes with one accumulator (Passenger)

Hydraulic Internal Leak Check - Cross Level including AD74-10-13 requirement
Figure 602 (Sheet 2)
T.EC.FLH.

Hydraulic Internal Leak Check - Subsystem Level
Figure 602 (Sheet 3)
T.R. 29-51

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	LEAKAGE BEING CHECKED CC/MIN	INSERVICE LEAKAGE LIMITS CC/MIN
1	Position No. 1 and 2 auxiliary hydraulic pump switches to ON and check that pressure stabilizes at 2800-3200 psi.. Turn off both pumps and check that pressure does not drop below inservice limit in 60 seconds	Auxiliary system basic components a. Rudder shut-off valve b. Interconnect valves c. Spoiler by-pass d. Pressure relief valve						*[1] 2500 psi *[2] 2000 psi
2	Position No. 1 auxiliary to ON	Basic reference						
3	Position rudder boost switch and yaw damper switch (if installed) to ON. Position inboard spoiler bypass switch to ON, then using rudder pedals move rudder to extreme travel and hold	Inboard spoiler and rudder systems off null leakage		3 -2		Flow A	Flow A	3780
4	Center rudder pedals, position speed brake lever to 50 degrees and center control wheel	Auxiliary system total leakage with valves at null		4 -2		Flow B	Flow B	7500

*[1] Airplane with two accumulators
*[2] Airplanes with one accumulator

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
5	Position inboard spoiler switch to OFF Position yaw damper switch to OFF (if installed)	Rudder system null leakage		5 -2		Flow C	Flow C	3400
6	Depress left rudder to full limit of travel and hold	Rudder system off null leakage		6 -2		Flow D	Flow D	1800
7	Continue to hold rudder to full limit of travel	Rudder system off null leakage less seal leakage		7 -2		Flow D	Flow C minus Flow D =	1600
8	Center rudder pedals and position yaw damper switch to ON (if installed)	Yaw damper system		8 -2		Flow E	Flow E minus Flow C =	2000
9	Position inbd spoiler bypass switch to ON, rudder shutoff valve switch and yaw damper switch (if installed) to OFF. Check that speed brake lever is positioned at 50 degrees and that control wheel is centered.	Inboard spoiler system null leakage		9 -2		Flow F	Flow F	2100
10	Rotate control wheel to full counterclockwise position and hold	Left inboard spoiler system null		10 -2		Flow G	Flow F minus Flow G =	1200
11	Rotate control wheel to full clockwise position and hold	Right inboard spoiler system null		11 -2		Flow H	Flow F minus Flow H	1200

Hyaraulic Internal Leak Check - Subsystem Level
Figure 602 (Sheet 5)
T.R. 29-51

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
12	Position speed brake handle to full down and center control wheel	Off null leakage for piston seal, modular package and inboard spoiler system		12 -2		Flow I	Flow I	400
13	Position inboard spoiler bypass valve switch to OFF	New basic reference						
14	Open system interconnect valve	Utility system		14 -13		Flow J	Flow J	10,500
15	Position aileron trim to full left wing down. If left outboard spoilers raise, replace outboard spoiler bypass valve	Left outboard spoiler bypass valve						None
15A	Position aileron trim to zero							
16	Remove bolt from both leading edge flap control valve selector links. Manually position control valve so that leading edge flaps remain in up position (Ref 27-16-221)							
	Position emergency flap switch to ON (bypass) and position trailing edge flap handle to 20 degrees down (14 degrees for 707/329C).	Null leakage for trailing edge flap control valves and flap bypass valves		16 -13		Flow K	Flow J minus Flow K =	3000

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
17	Check that flap drive torque tubes in right wheel well are not turning							
	a. Upper torque tube turns	Indicates inboard flap bypass valve leakage						None
	b. Lower torque tube turns	Indicates outboard bypass valve leakage						None
18	With flap handle at 20 degrees (14 degrees for 707/329C), extend inboard flaps as follows:	Inboard flap control valve null leakage		18 -13		Flow L	Flow L minus Flow K =	150C
	a. On airplanes with solenoid operated bypass valve, open inboard flap motor control circuit breaker on P5 panel.							
	b. On airplanes with motor-operated bypass valves, open outboard flap motor control circuit breaker on P5 panel, then position emergency flap switch to OFF (Normal)							

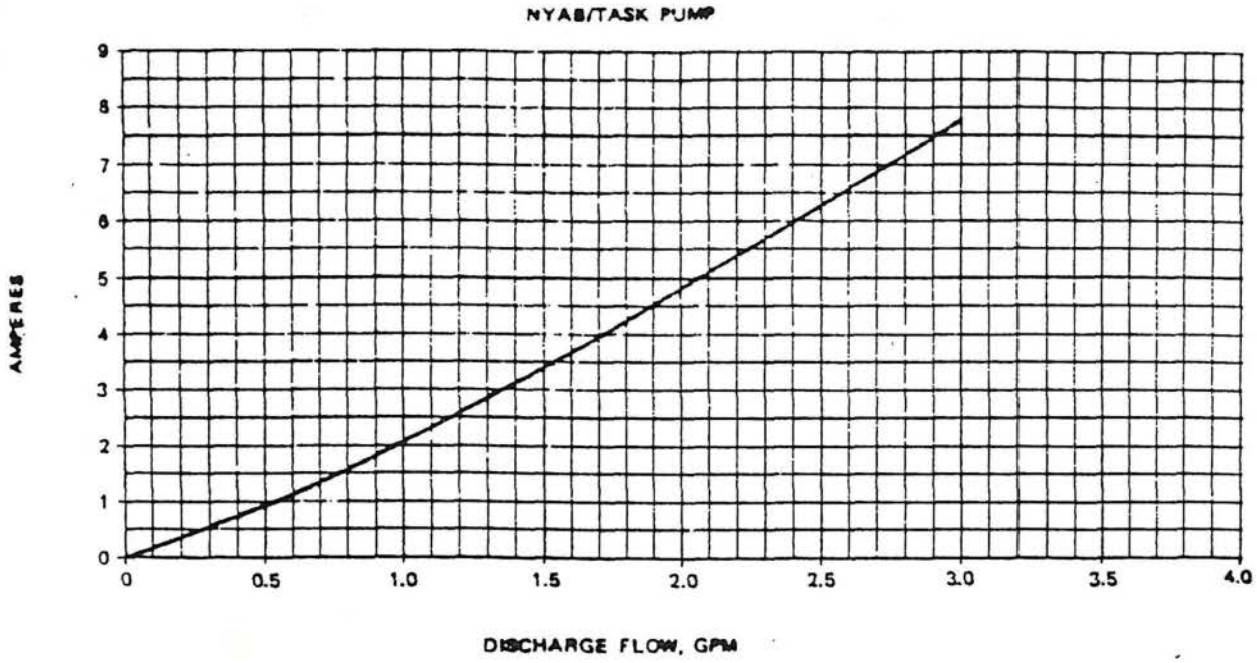
Hydraulic Internal Leak Check - Subsystem Level
Figure 602 (Sheet 7)
T.R. 29-51

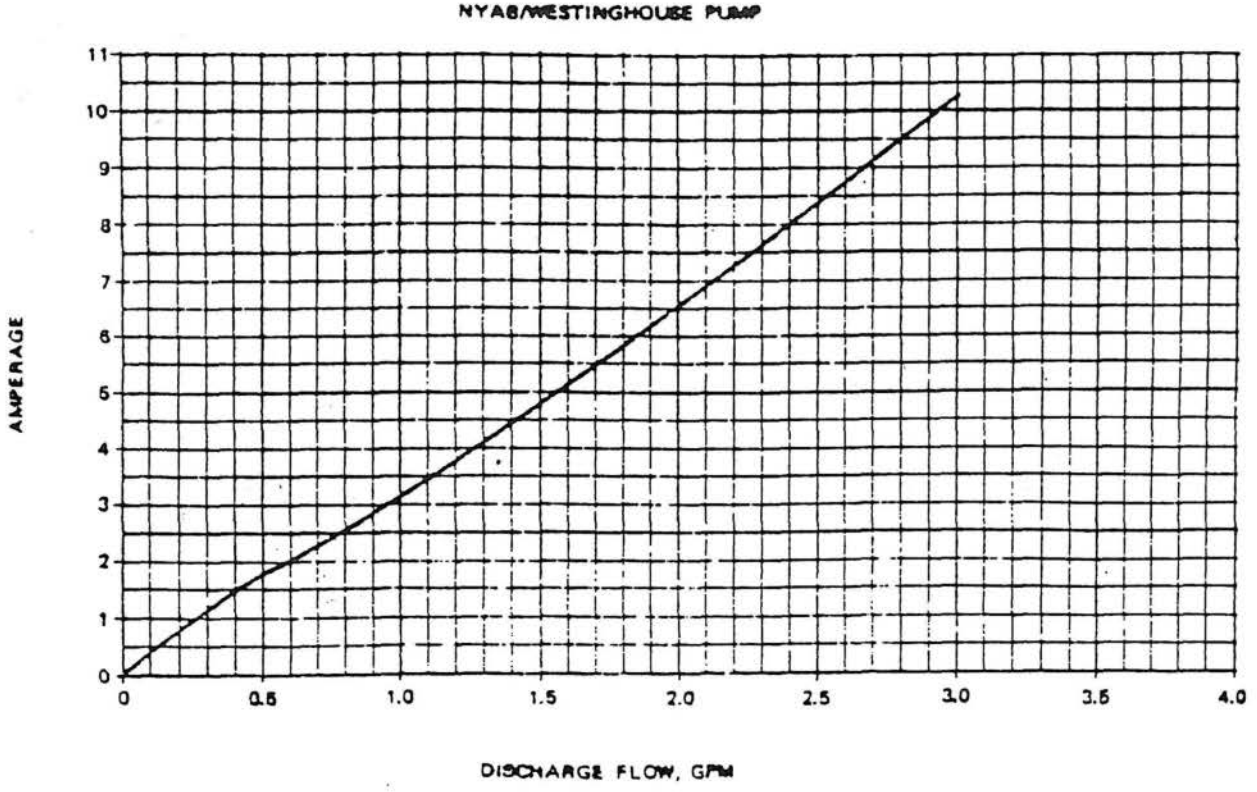
STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
19	Condition same as step 18 Trailing edge flaps at 20 degrees (14 degrees for 707/329C) Circuit breaker Inboard flaps open. Circuit breaker outboard flaps closed. Emergency flap switch OFF (Normal)	Outboard flap control valve null leakage					Final flow in step 16 minus final flow in step 18	1500
20	Close circuit breakers opened in step 18, and position emergency flap switch OFF (Normal). With flaps fully retracted, position emergency flap switch ON. (Bypass)..Place flap handle 20 degrees down (14 degrees for 707/329C)	Basic reference with inboard and outboard flaps off null		20 -13		Flow M	Flow M	7500
21	Position outboard spoiler bypass switch to ON, position speed brake handle at 50 degrees, then center control wheel	Outboard spoiler system null		20 -13		Flow N	Flow N minus Flow M -	2100
22	Rotate control wheel full counterclockwise position and hold	Left outboard spoiler system null		22 -13		Flow 0	Flow N minus Flow 0 -	1200

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	FLOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
23	Rotate control wheel full clockwise position and hold	Right outboard spoiler system null		23 -13		Flow P	Flow N minus Flow P =	1200
24	Return speed brake handle to down position and center control wheel	Outboard spoiler system off null leakage, piston seal and modular package		24 -13		Flow Q	Flow Q minus Flow M =	400
25	Position outboard spoiler bypass valve to OFF	Flap basic reference		25 -13		Flow R	Flow R	7500
26	Place landing gear handle in down position	Landing gear system basic		26 -13		Flow S	Flow S minus Flow R =	3850
27	Pull nose gear door ground release handle and latch in the open position. Hold doors fully closed	Nose gear door actuator		27 -13		Flow T	Flow S minus Flow T =	400
28	Position nose doors fully open and hold	Nose gear lock and gear actuator		28 -13		Flow U	Flow U minus Flow T =	400
29	Release nose gear door handle and allow doors to close	Landing gear system basic		29 -13		Flow V	Flow V minus Flow R =	3000

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFER-ENCE	LOW DETER-MINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
30	Pull left main gear door release handle and latch. Hold door closed	Left main gear door actuator		30 -13		Flow W	Flow V minus Flow W =	400
31	Position left gear door fully open and hold	Left main gear actuator and side strut actu-ator less lock actuator		31 -13		Flow X	Flow X minus Flow W =	400
32	Release left main gear door handle and allow door to close. Pull right main gear door release handle and latch. Hold door closed	Right main gear door actuator		32 -13		Flow Y	Flow V minus Flow Y =	400
33	Position right gear door fully open and hold	Right gear actu-ator and side strut actuator less lock actuator		33 -13		Flow Z	Flow Z minus Flow Y =	400
34	Release right main gear door handle and allow door to close. Position nose gear steering full nose left	Steering meter-ing valve and steering actu-ator NOTE: A posi-tive reading in-dicates metering valve leakage. A negative read-		34 -13		Flow AA	Flow V minus Flow AA =	400

STEP	PROCEDURE	SYSTEM OR COMPONENT BEING CHECKED	AMPS	SUBTRACT STEPS -	AMPS DIFFERENCE	LOW DETERMINED FROM FIG. 603	FINAL FLOW CC/MIN	INSERVICE LIMITS CC/MIN
35	Position nose gear steering full nose right	Same as above		35 -13		Flow AB	Flow V minus Flow AB =	400
36	Position nose steering in neutral and landing gear handle to OFF NOTE: If airplane has two leading edge flap control valves, proceed with steps 37, and 38.	Flap basic reference		36 -13		Flow AC	Flow AC	7500
37	With left leading edge flap control valve selector link disconnected, manually position valve midway (neutral) between extend and retract positions (27-6-221).	Left leading edge flap system		37 -13		Flow AD	Flow AC minus Flow AD =	400
38	Connect left leading edge control valve linkage. With right leading edge flap control valve selector link disconneected, manually position valve midway (neutral) between extend and retract positions (27-6-221).	Right leading edge flap system		38 -13		Flow AE	Flow AC minus Flow AE =	400





Amperage Verses Pump Flow Rate
Figure 603
T.R. 29-51

5. Hydraulic System - Inspection/Check of Hydraulic Lines for Chafing.

A. When Maintenance Schedule requests an E3 inspection, the following procedure will apply :

(1) After opening of panels, every clamp/tube combination shall be inspected as follows :

(a) Use a blade shaped tool as a probe. Check surface of tube where it enters the clamp on both sides of the clamp and at two locations 180° apart to evidence a potential step on the outer surface.

(b) Inspect clamps for radial play. If any play exists, install clamp of correct size and scrap old clamp.

(c) Inspect mylar tape for cuts, even partially. If any damage is present, mylar tape shall be replaced.

B. If results of inspection described in step C.(1) are questionable proceed as follows :

(1) Open the clamp.

(2) Visually inspect the whole hidden surface of the tubes.

(3) Check metal and rubber/plastic parts of the clamp for any damage.

C. Inspect every tube for interference with structure, cables, other tubes or anything else.

D. Any damaged tube or clamp shall be replaced.

6. Restore Airplane to Normal

A. Position auxiliary pump switches to OFF.

B. Close hydraulic interconnect valve.

C. Position landing gear handle to DOWN.

D. Connect linkage at leading edge flap control valves. Reinstall bolt in the correct position. (Ref. 27-16-221).

E. Remove ammeter and install electrical connector on pump.

F. Install nose steering disconnect pin and connect nose steering links.

G. Close landing gear warning horn circuit breaker.

H. Remove electrical power.

UTILITY HYDRAULIC RESERVOIR - MAINTENANCE PRACTICES

1. Removal/Installation Utility Hydraulic Reservoir

A. General

(1) Before removing and installing the reservoir remove level transmitter. Also remove filler cap and scupper to facilitate removal and installation. Take precautions to prevent spilling of hydraulic fluid. Should any fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing," Chapter 12. Lockwire drain plug and level transmitter after testing the reservoir.

B. Equipment and Material

(1) Main Gear Door Down Lock F-71127 or equivalent

(2) Suitable container for BMS 3-11 HYDRAULIC FLUID, about 8 gals. capacity.

C. Remove Utility Hydraulic Reservoir

(1) Open left main gear well door by pulling ground door release handle down, and install main gear door down lock.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

(2) Open hydraulic access door 1348. See Chapter 12, "Access Doors and Panels."

(3) Depressurize hydraulic systems.

(a) Depressurize utility system by moving bypass valve handle to "BYPASS."

NOTE: The bypass valve is accessible through the strut door opening just outboard of the right main wheel well.

(b) Depressurize auxiliary system by rotating aileron control wheel to operate inboard spoilers.

(c) Depressurize utility reservoir

1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurzation valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the air pressure regulator.

(4) Drain fluid from utility and auxiliary hydraulic reservoirs.

(5) Disconnect and plug hydraulic and air pressurization hoses from utility reservoir. Cap hoses.

(6) Remove transmitter connector plug (22, figure 201).

(7) Remove bolts (20) from fluid quantity transmitter flange and carefully remove transmitter (21). See 29-14-0, "Removal/Installation Fluid Quantity Transmitter."

(8) Remove filler cap (5). On airplanes equipped with an expansion tank, remove vent tube (9A).

(9) Remove scupper bolts (3) and remove scupper (7) and filler neck (9) with washer (8).

(10) Disconnect mounting straps (23) and bonding jumper (18).

(11) Remove reservoir.

NOTE: Raise reservoir, tilt its top outboard and lower it slowly through door opening.

(12) Remove snap ring (11) and filler screen (12).

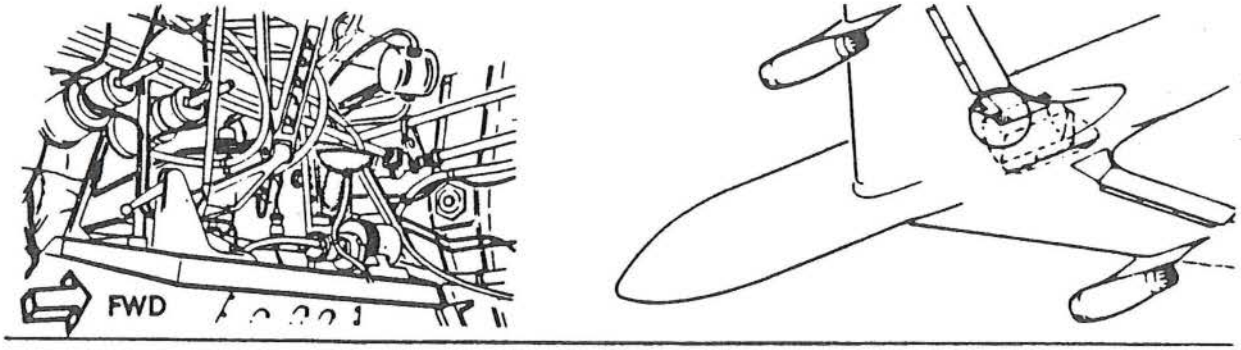
(13) Unscrew sight gage cap and remove sight glass, washers and reflector (13 thru 17).

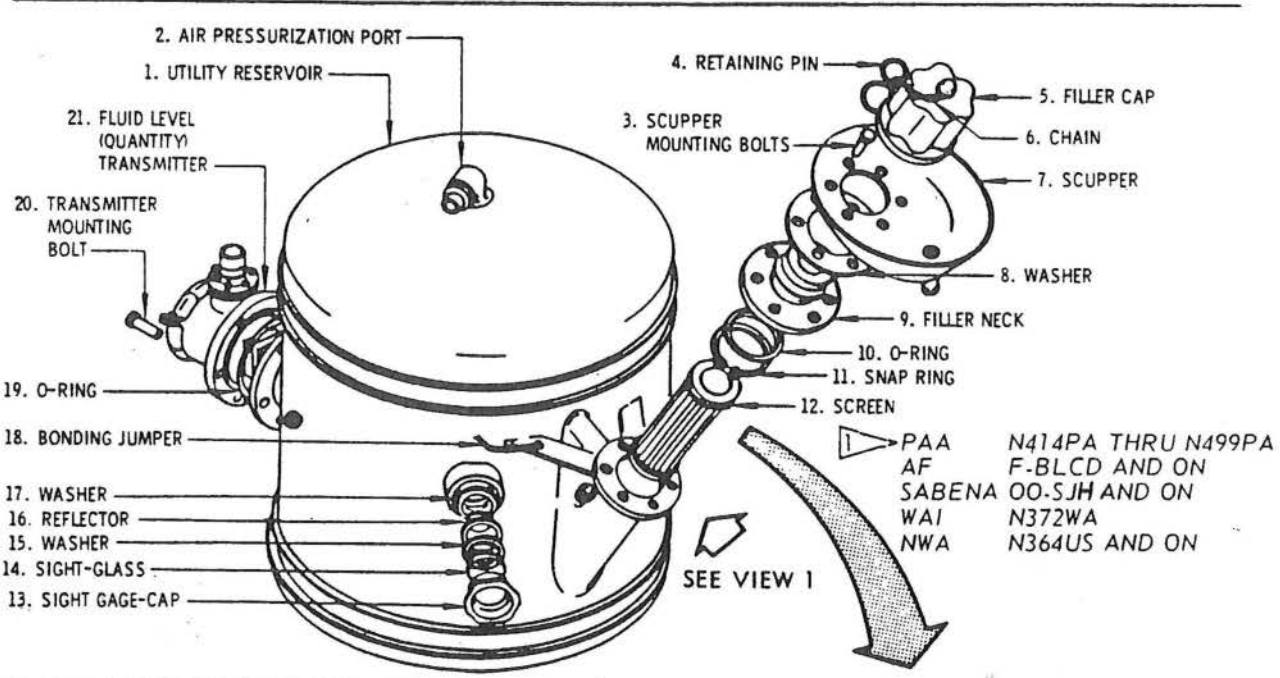
(14) Remove unions from ports.

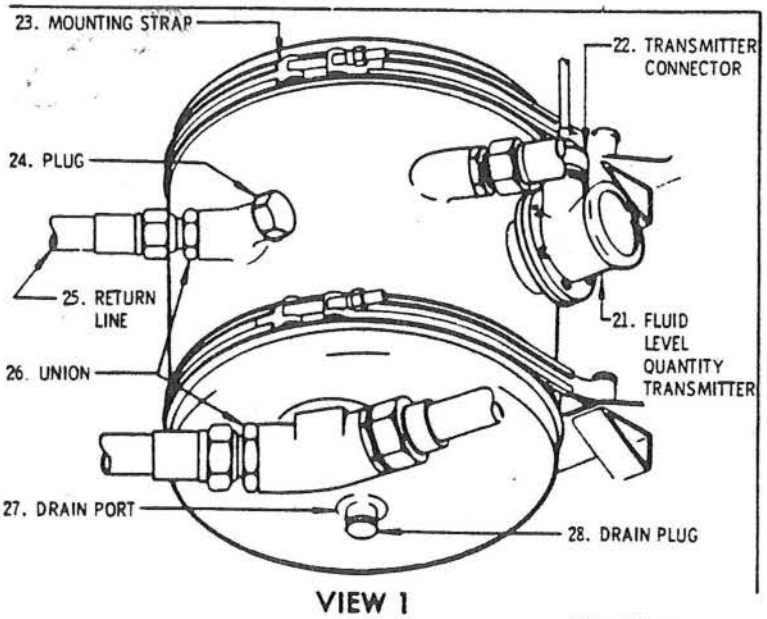
D. Install Utility Reservoir

(1) Check that reservoir is clean, and mounting surfaces free from foreign material. Make sure that no foreign matter enters reservoir openings during installation.

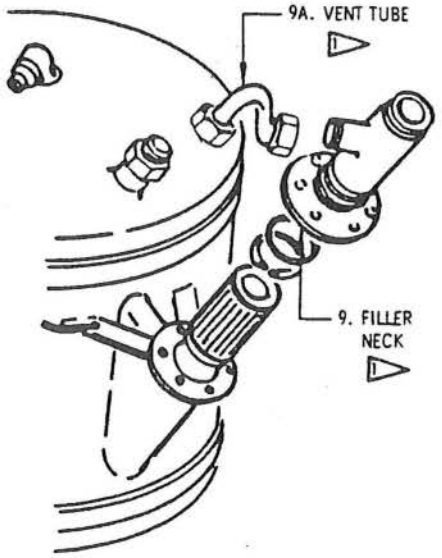
(2) Install drain plug (28, figure 201) with O-ring.







VIEW 1



SB.2195.
Utility Reservoir Installation
Figure 201

(3) Install an O-ring and union in all ports except outboard side of return port and drain port. Install O-ring and plug in drain port on outboard side of return port.

(4) Install sight gage.

(a) Install washer (17) and reflector (16).

(b) Install washer (15) and sight glass (14).

(c) Install sight gage cap (13).

(5) Install filler screen (12) and snap ring (11).

(6) Install reservoir.

(a) Lift reservoir through hydraulic access door opening. Tilt bottom outboard and work reservoir into position.

(b) Secure reservoir with mounting straps.

(7) Install filler neck and scupper.

(a) Insert O-ring (10).

(b) Position filler neck (9) and washer (8).

(c) Position scupper (7) and secure with 2 mounting bolts (3).

(d) Install remaining scupper mounting bolts (3) and tighten all bolts.

(e) On airplanes equipped with expansion tank install vent tube (9A).

(8) Install cap assembly.

(a) Install O-ring in filler cap (5).

(b) Attach chain (6) with retaining pin (4) to filler cap and scupper.

(9) Install fluid quantity transmitter (21).

(a) Check that mounting surfaces on reservoir and transmitter are clean.

(b) Carefully insert transmitter float and arm into the reservoir opening, position transmitter correctly and secure it with mounting bolts.

(10) Connect bonding jumper.

(11) Connect hydraulic, air, and scupper lines.

(12) Install transmitter connector plug (22).

(13) Fill reservoir. See 29-0, "Replenish Hydraulic System."

(14) Check reservoir for fluid leaks and air leaks.

3. Removal/Installation Auxiliary Hydraulic Pump

A. Equipment and Materials

(1) Hydraulic Fluid, BMS 3-11

(2) Main Gear Door Downlock, F71127 or equivalent

B. Remove Auxiliary Hydraulic Pump

(1) Open main gear wheel well door by pulling ground door release handle down, and install main gear door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Check that auxiliary hydraulic pump switches are in OFF position.

(3) Depressurize auxiliary hydraulic system.

(4) Depressurize utility reservoir.

(a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped. Retighten reservoir cap.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the pressure regulator line.

(5) Drain applicable auxiliary hydraulic reservoir.

(6) Disconnect and cap supply line.

(7) Remove and cap return and pressure lines.

(8) Remove nuts securing pump to motor.

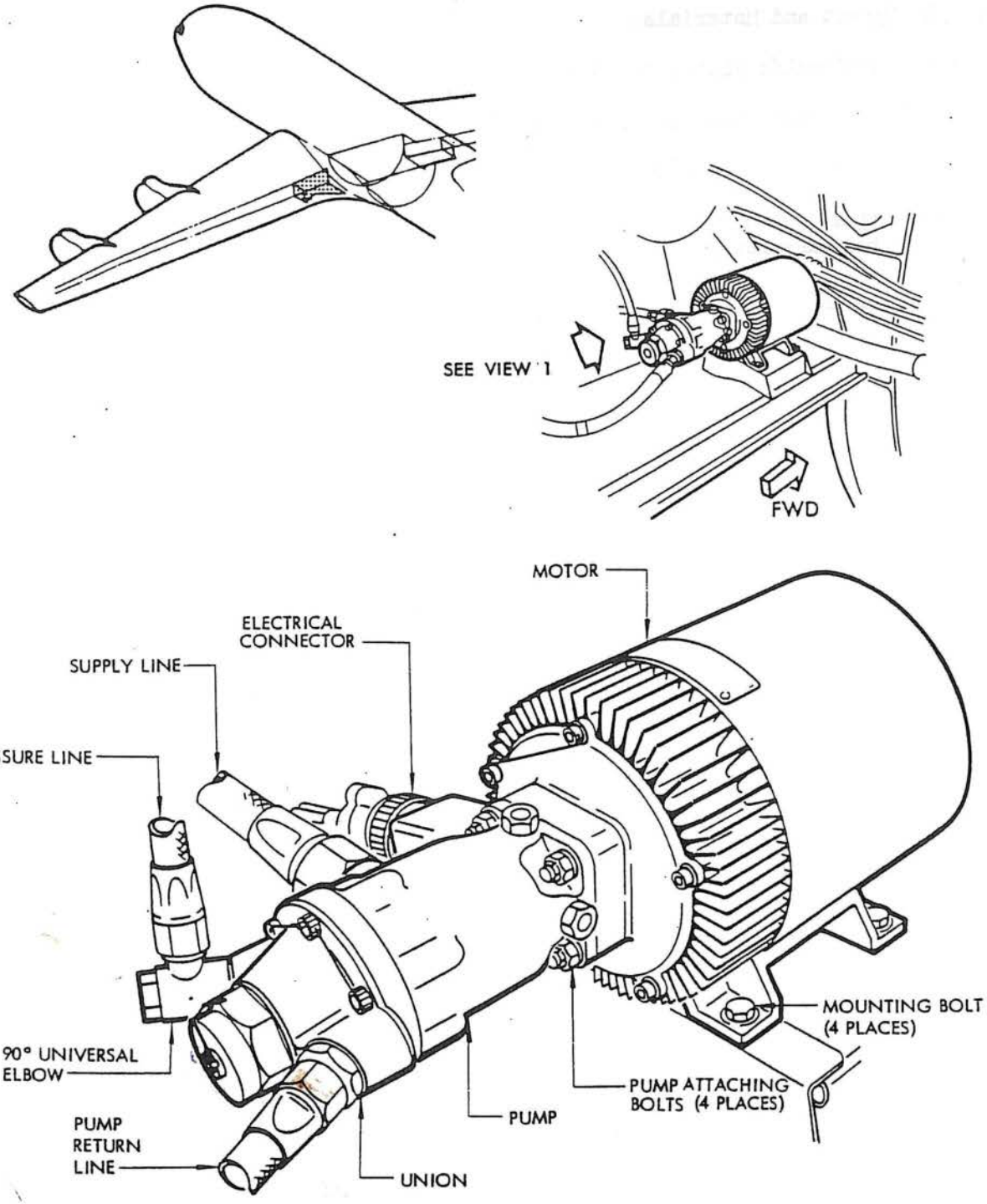
(9) Remove pump.

C. Install Auxiliary Hydraulic Pump

(1) Remove lowest plug from bottom of pump mounting flange and replace with drilled plug from removed pump.

(2) Install O-ring and fitting in return port. (See figure 401.)

(3) Install O-rings and fittings in supply and pressure ports.



VIEW 1

AUXILIARY PUMP NO. 1

AUXILIARY SYSTEM RETURN FILTER - REMOVAL/INSTALLATION

1. General

   A. A container will be necessary to catch fluid drained from disconnected lines and filter. Should any fluid be spilled on the airplane, decontaminate the area. Refer to Chapter 12, Cleaning and Washing.

   B. On airplanes equipped with two auxiliary reservoirs a second auxiliary system return filter is installed in the right wing fillet. The second auxiliary system filter is identical to the auxiliary system filter installed in the left wing fillet, therefore only one procedure is given.

2. Equipment and Materials

   A. Main Landing Gear Door Downlock - F71127 or equivalent

3. Remove Auxiliary System Return Filter

   A. Open main wheel well door and install main landing gear door downlock.

   B. Remove main gear actuator access panel 1346 and main gear walking beam access panel 1347. See Chapter 12, Access Doors and Panels.

   C. Depressurize utility reservoir.

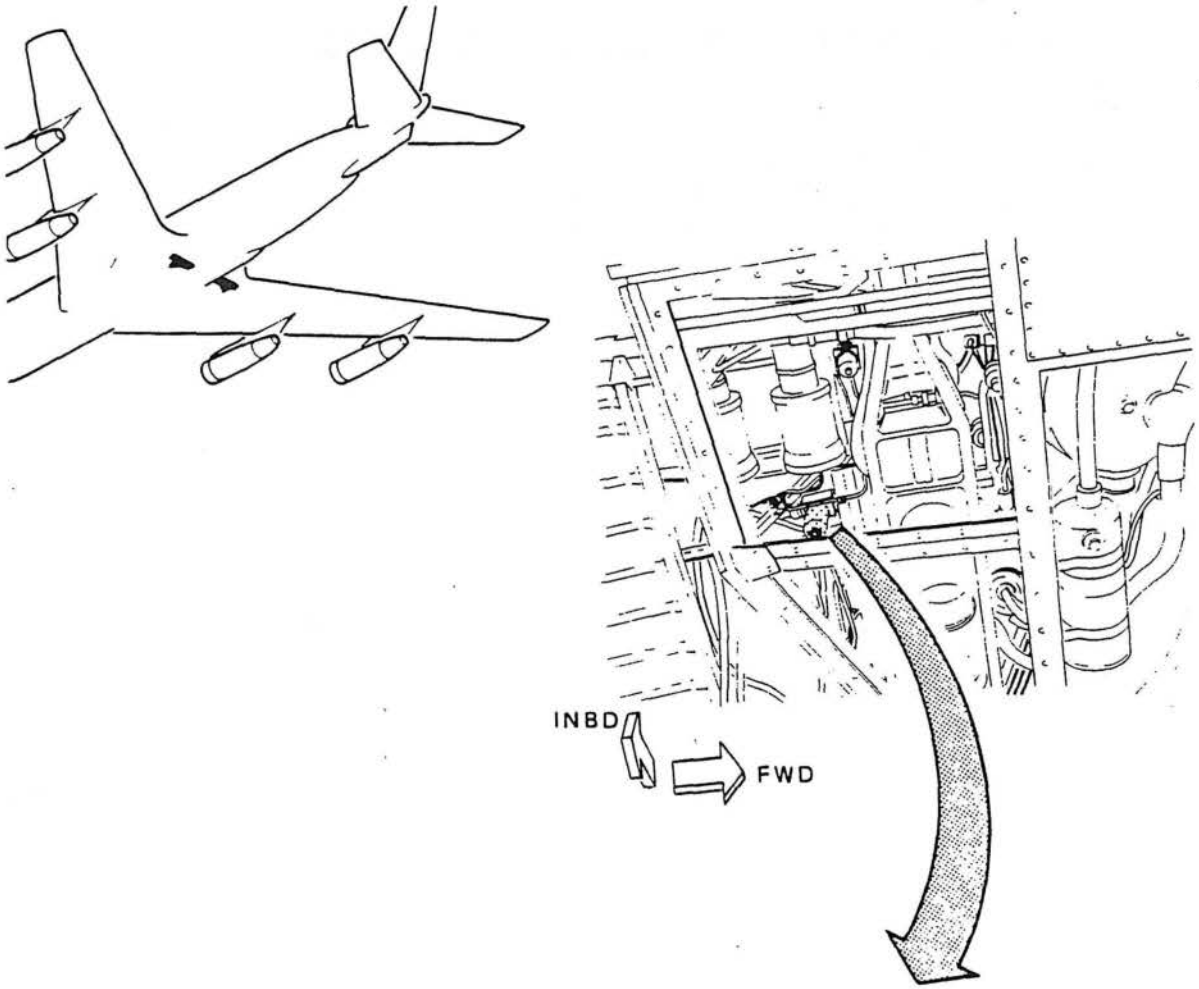
      (1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped.

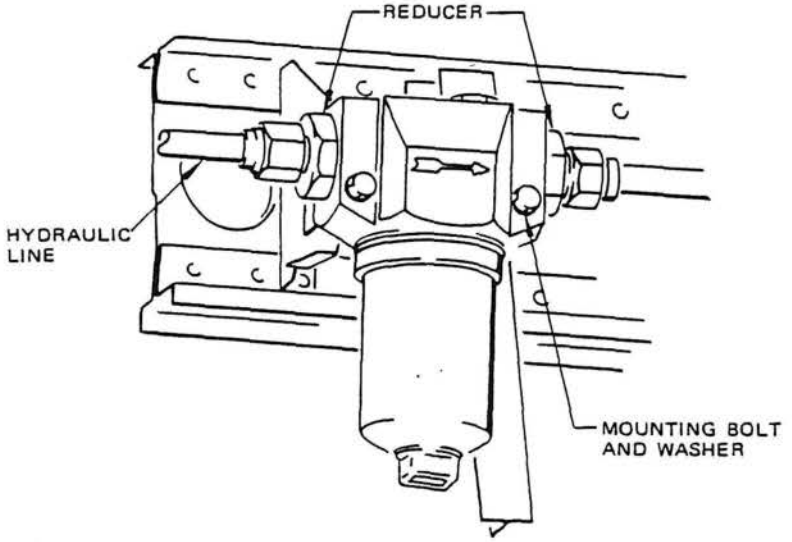
      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

      NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the air pressure regulator line.

   D. Release tubing support clamps on both sides of filter and disconnect lines from filter. Plug ends of lines. (See figure 401.)





Auxiliary System Return Filter Installation
Figure 401

4. Install Utility System Return Filter

A. Deleted.

B. Install O-ring and union in each port. (See figure 401.)

C. Position filter and insert aft mounting bolts and nuts.

D. Position support rod and insert forward mounting bolt and nut.

E. Connect hydraulic lines.

F. Tighten mounting bolt nuts.

G. Pressurize hydraulic reservoir.

H. With any of the inboard engines operating at "IDLE," check filter connections for leaks.

I. Deleted.

J. Remove main landing gear door down lock and close wheel well door.

AUXILIARY SYSTEM RETURN FILTER - UNIT SERVICING

1. General

   A. A container will be necessary to catch fluid drained from disconnected lines and filter. Should any fluid be spilled on the airplane, decontaminate the area. Refer to Chapter 12, Cleaning and Washing.

   B. On airplanes equipped with two auxiliary reservoirs a second auxiliary system return filter is installed in the right wing fillet. The second auxiliary system filter is identical to the auxiliary system filter installed in the left wing fillet, therefore only one procedure is given.

2. Equipment and Materials

   A. Main Landing Gear Door Downlock - F71127 or equivalent

3. Unit Servicing Auxiliary System Return Filters

   A. Remove Auxiliary System Return Filter Element

      (1) Open main wheel well door by pulling ground door release handle down, and install main landing gear door downlock.

      WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

      (2) Remove main gear actuator access panel 1346 and main gear walking beam access panel 1347. See Access Doors and Panels, Chapter 12.

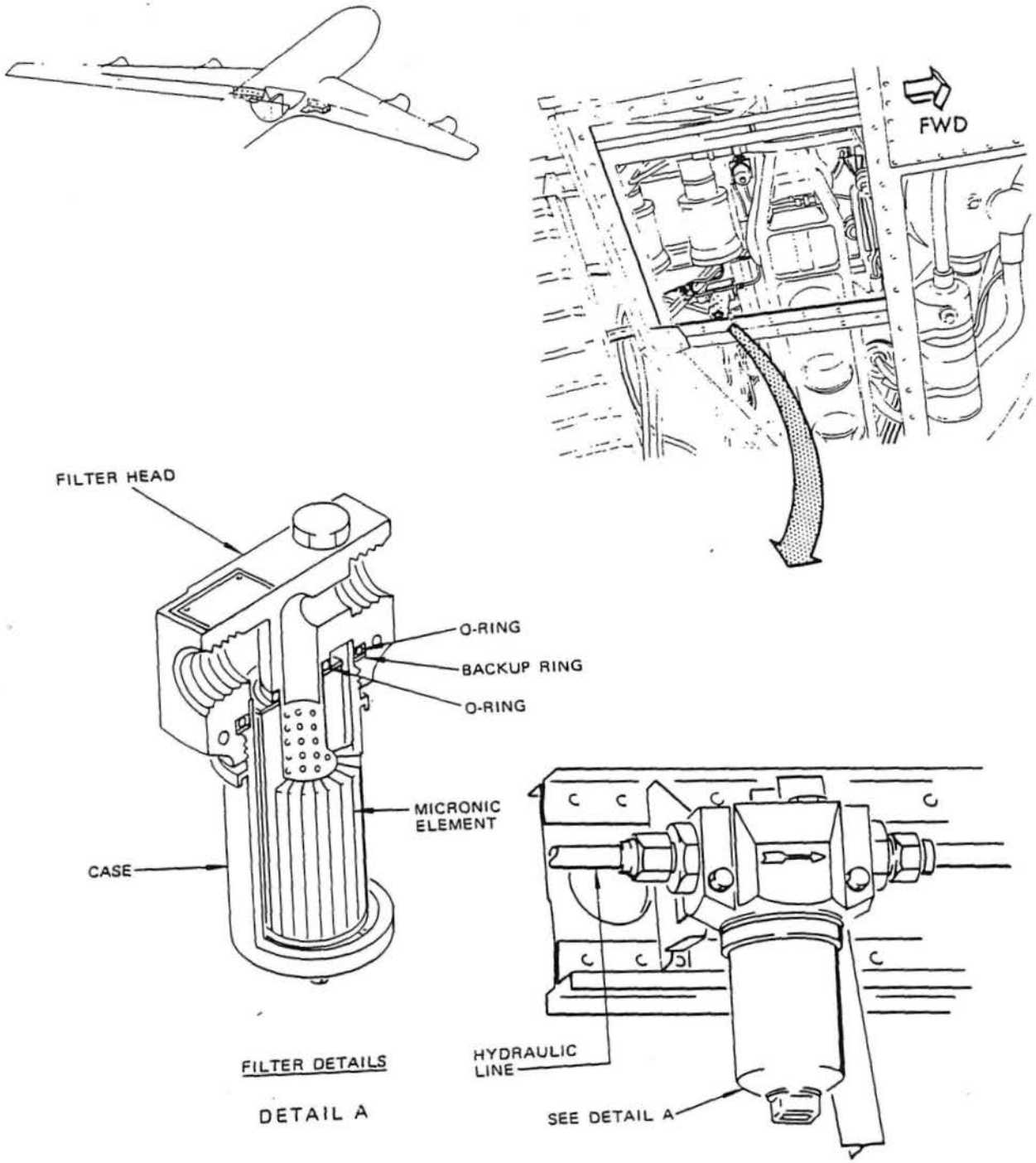
      (3) Depressurize utility reservoir.

         (a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped.

         CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

         (b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

         NOTE: Depressurization valve is located above and just aft of utility reservoir.



Auxiliary System Return Filter Installation
Figure 301

(4) Unscrew filter case with filter element. (See figure 301.)

(5) Dispose of paper element and clean the case.

B. Install Auxiliary System Return Filter Element

(1) Insert new filter element in filter case and install O-ring on nipple in filter head. (See figure 301.)

(2) Position backup ring and O-ring on case and install filter case. Safety wire case.

(3) Tighten filler cap and pressurize hydraulic reservoir through ground charging valve.

(4) Operate auxiliary pump and check filter for leaks.

(5) Remove landing gear door downlock and close landing gear well door by ground door release handle.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(6) Install access panels.

UTILITY SYSTEM 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. Main Landing Gear Door Down Lock F71127 or equivalent

3. Remove Utility System Return Filter

   A. Open left main wheel well door and install main landing gear door down lock.

   B. Depressurize utility hydraulic system by moving bypass valve handle to "BYPASS." Move handle back to "CLOSED."

   C. Depressurize utility reservoir.

      (1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped. Tighten cap.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

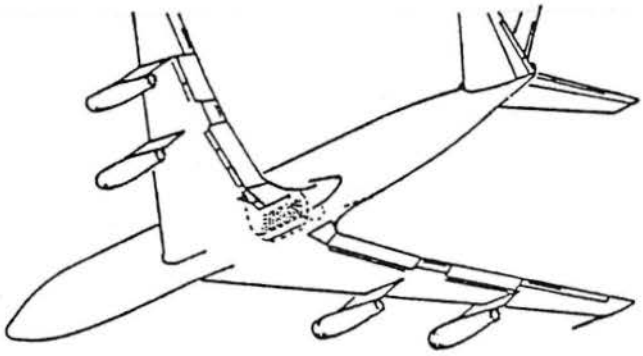
      (2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

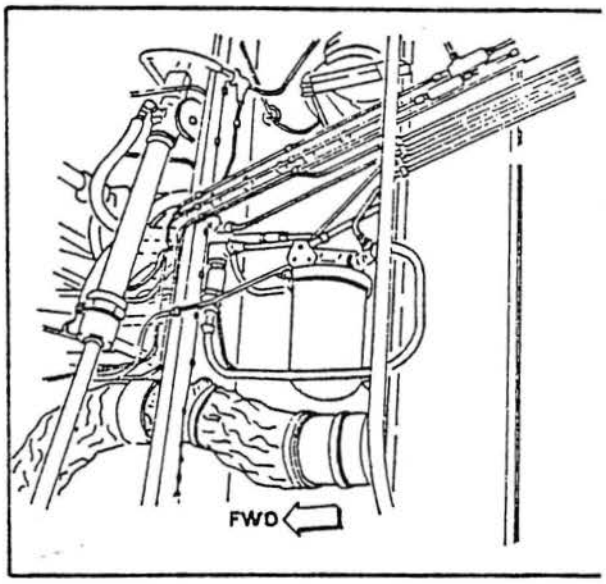
      NOTE: Depressurization valve is located above and just aft of utility reservoir.

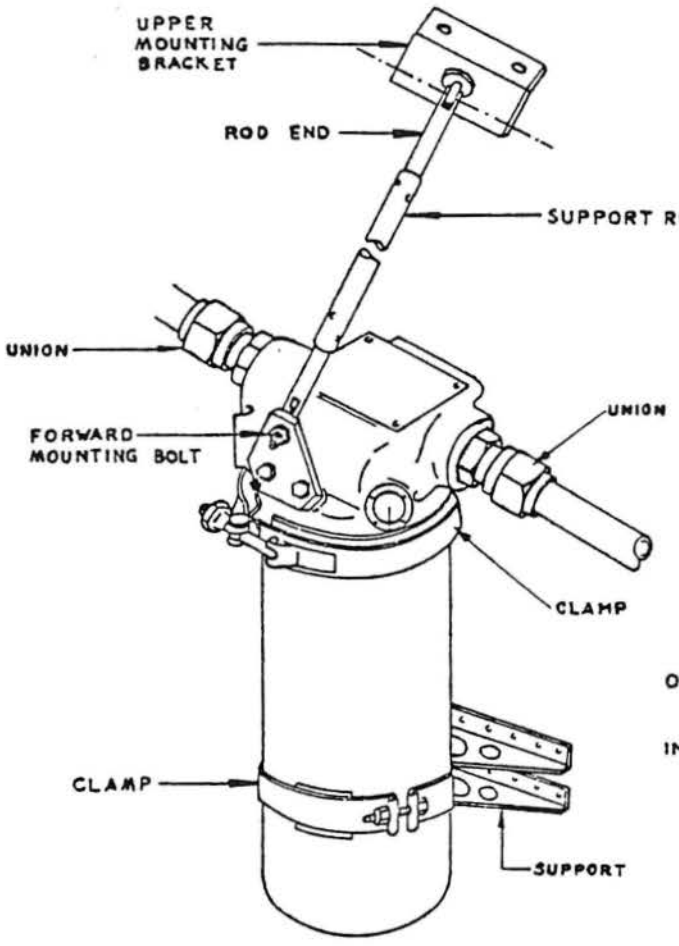
   D. Deleted.

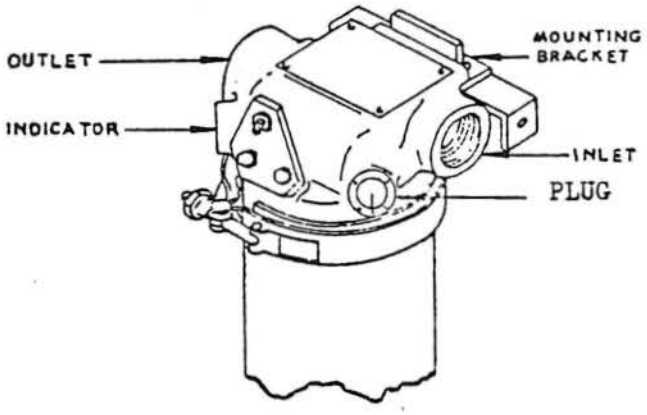
   E. Disconnect hydraulic lines from filter and plug ends of lines.

   F. Remove mounting bolts and filter.









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Utility System Return Filter Installation
Figure 401

(6) Dispose of element and clean the case.

(7) Deleted.

B. Install Utility System Return Filter Element

(1) Insert gasket and new element in the case. (See figure 301.)

(2) Install a gasket and an O-ring in filter body.

(3) Position the case and secure it to body with clamp. Torque clamp to 70 to 80 pound-inches.

(4) Pressurize hydraulic reservoir.

(5) With any of the inboard engines operating at "IDLE," check filter for leaks.

(6) Deleted.

(7) Remove main landing gear door down lock and close wheel well door.

UTILITY SYSTEM RETURN FILTER - UNIT SERVICING

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. Main Landing Gear Door Down Lock F71127 or equivalent

3. Unit Servicing Utility System Return Filter

   A. Remove Utility System Return Filter Element

      (1) Open left main wheel well door by pulling ground door release handle down, and install main landing gear door down lock.

      WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

      (2) Depressurize utility hydraulic system by moving bypass valve handle to "BYPASS." Move handle back to "CLOSED."

      (3) Depressurize utility reservoir.

         (a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped. Tighten cap.

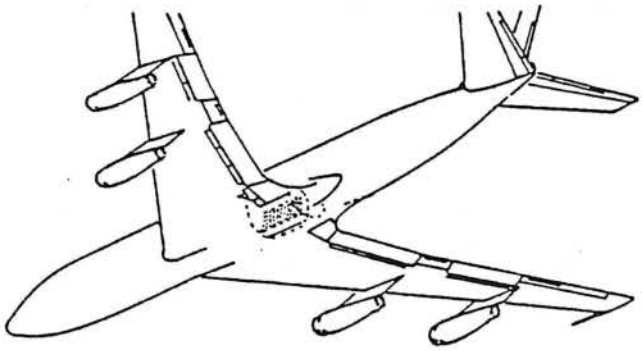
         CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

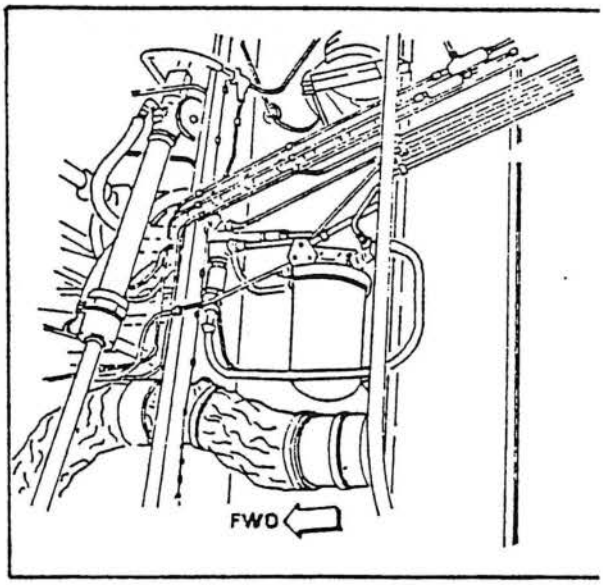
         (b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

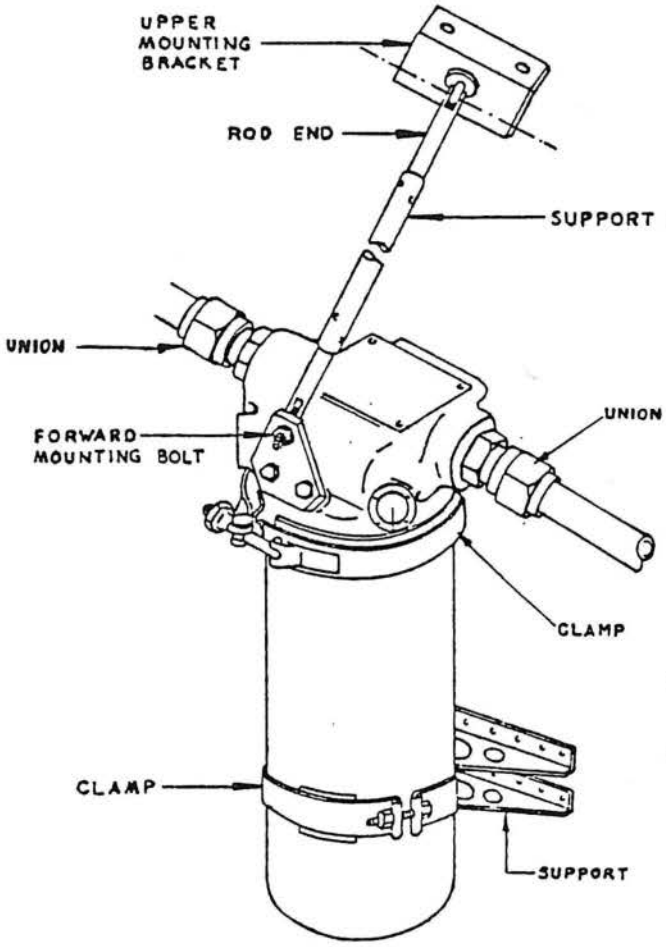
         NOTE: Depressurization valve is located above and just aft of utility reservoir.

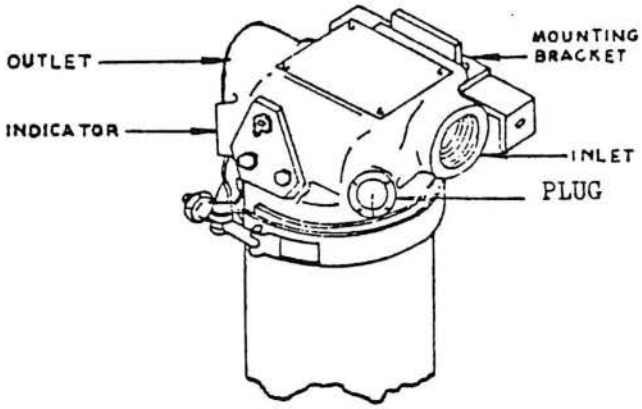
      (4) Deleted.

      (5) Remove filter case clamp and remove case with filter element. (See figure 301.)









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Utility System Return Filter Installation
Figure 301

UTILITY PUMP RETURN FILTER - REMOVAL/INSTALLATION

1. General

   A. A container will be necessary to catch any spilled fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate. Refer to Chapter 12, "Cleaning and Washing."

2. Remove Utility Pump Return Filter

   A. Open strut access door 710. See Chapter 12, "Access Doors and Panels."

   B. Depressurize utility reservoir.

      (1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped. Tighten cap.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (2) On airplanes equpped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

      NOTE: Depressurization valve is located above and just aft of utility reservoir.

   C. Disconnect lines from filter and install line protective caps. (See figure 401.)

   D. Remove filter mounting bolts and remove filter.

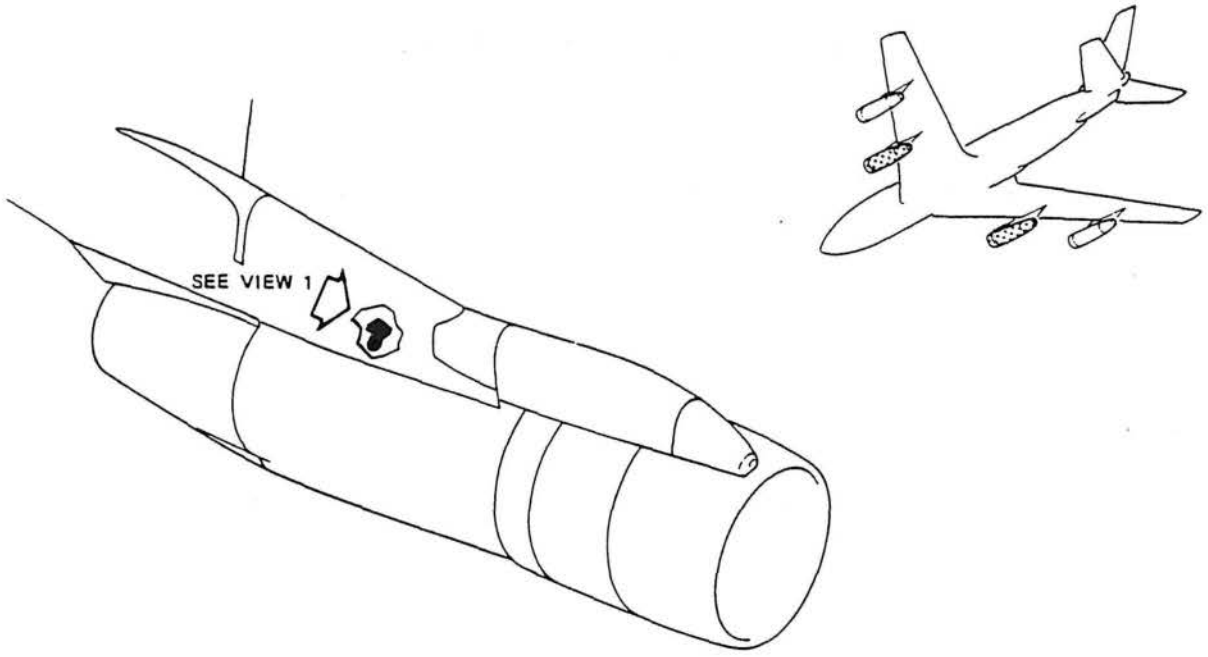
   E. Check filter element for metal contamination and check condition of element. Refer to Utility Pump Return Filters Unit Servicing.

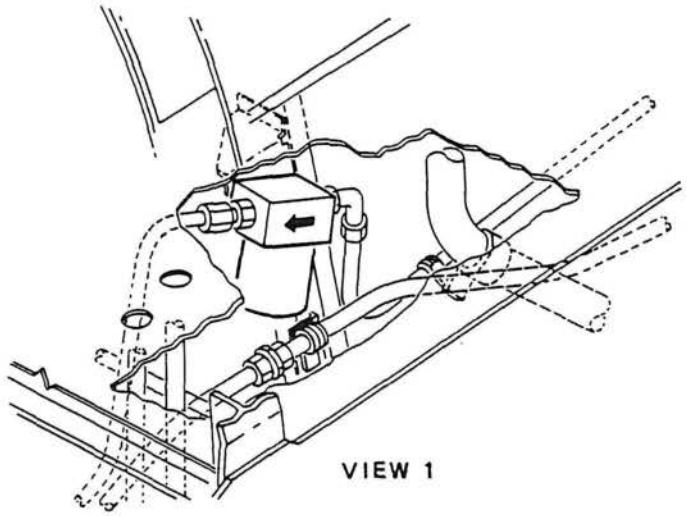
3. Install Utility Pump Return Filter

   A. Position assembled filter on mounting bracket and install filter mounting bolts.

   B. Remove protective caps from hydraulic line ends and connect lines to filter.

   C. Close access doors and panels.





Utility Pump Return Filter Installation
Figure 401

B. Install Utility Pump Return Filter Element

(1) Insert O-ring in filter element and place element in filter case. (See figure 301.)

NOTE: Check condition of filter element and replace if necessary.

(2) Place O-ring on filter case and screw filter case into filter head. Torque filter case to 75 pound-inches.

(3) Lockwire filter case to filter head.

(4) Close access doors and panels.

UTILITY PUMP RETURN FILTER - UNIT SERVICING

1. General

   A. The utility pump return filter elements and filter bowls should be checked at regular intervals. If excessive metal contamination is found the associated pump should be removed and the system flushed.

   B. A container will be necessary to catch any spilled fluid when disconnecting hydraulic lines. Should any fluid spill, decontaminate. Refer to Chapter 12, Cleaning and Washing.

2. Unit Servicing Utility Pump Return Filters

   A. Remove Utility Pump Return Filter Element

      (1) Open strut access panel 1710. See Chapter 12, Access Doors and Panels.

      (2) Depressurize utility reservoir.

         (a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped.

            CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

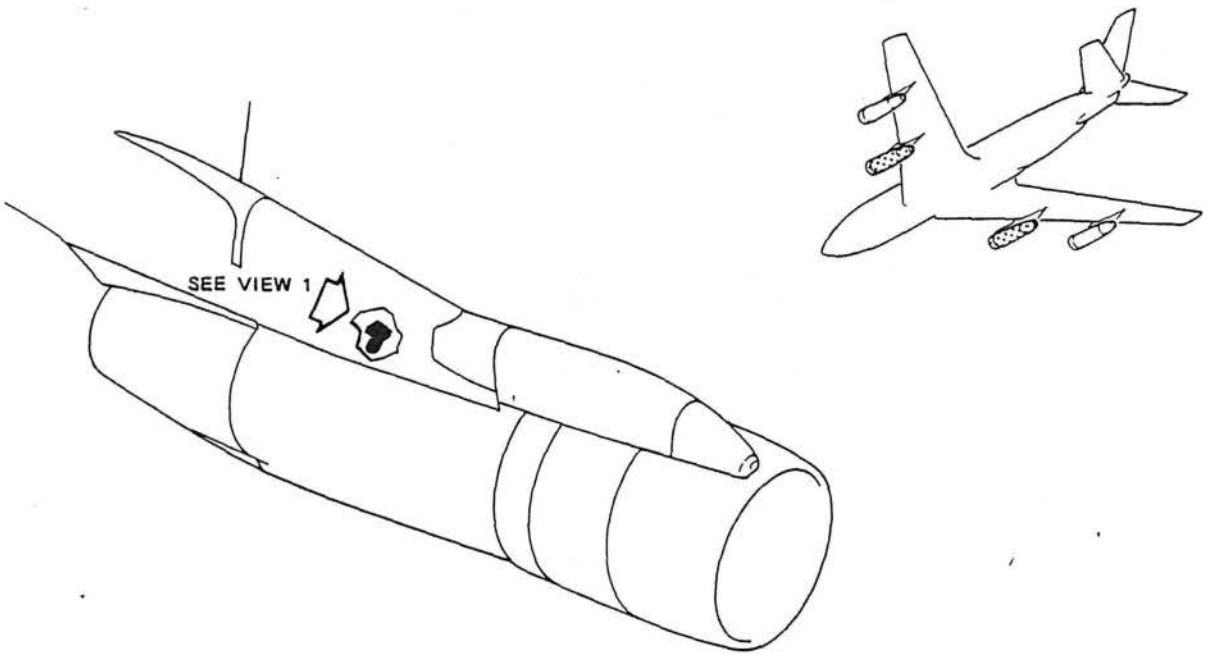
         (b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

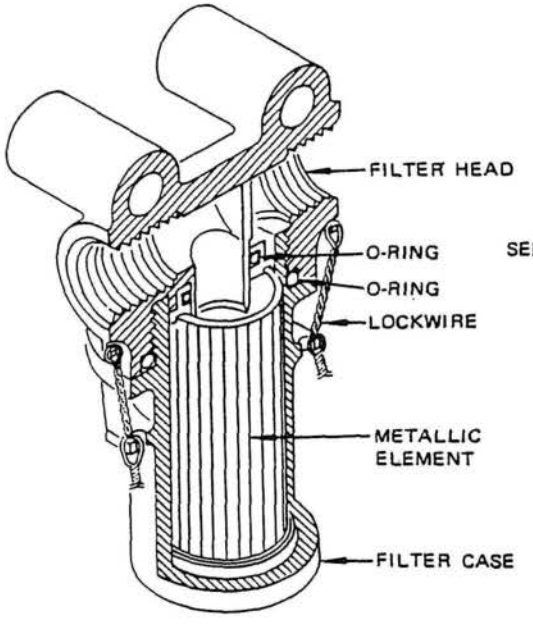
            NOTE: Depressurization valve is located above and just aft of utility reservoir.

      (3) Break lockwire and unscrew filter case and remove case with filter element. (See figure 301.)

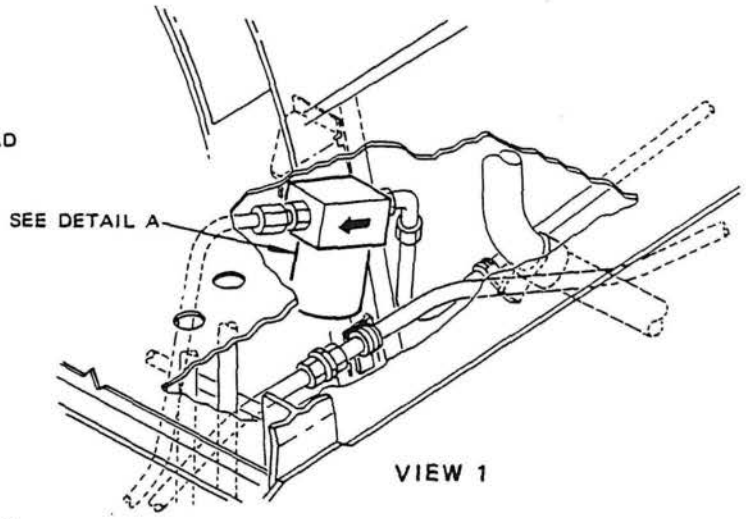
      (4) Remove element and check element and bowl for metal contamination.

      (5) Clean element and filter bowl.





DETAIL A



VIEW 1

Utility Pump Return Filter Installation
Figure 301

AUXILIARY PRESSURE 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. Removal/Installation Auxiliary Pressure Filter

A. Remove Auxiliary Pressure Filter

(1) Remove filter element. Refer to Auxiliary Pressure Filter - Unit Servicing.

(2) Disconnect lines from filter and cap line ends. (See figure 401.)

(3) Remove O-rings and fittings from IN and OUT ports of filter head. (See figure 401.)

(4) Remove filter mounting bolts and filter.

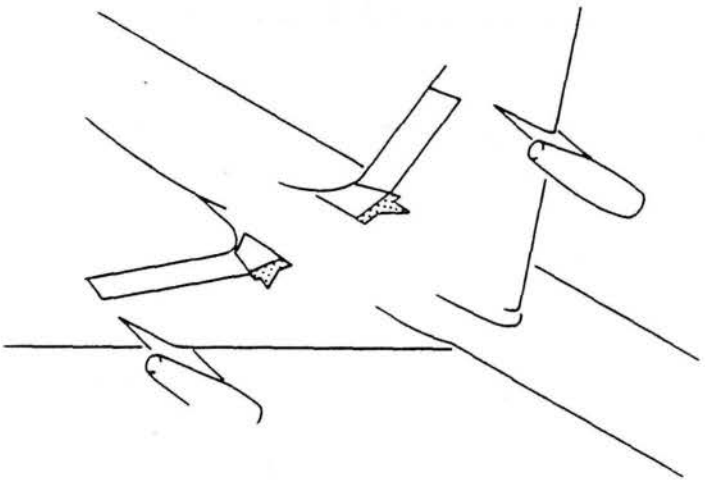
B. Install Auxiliary Pressure Filter

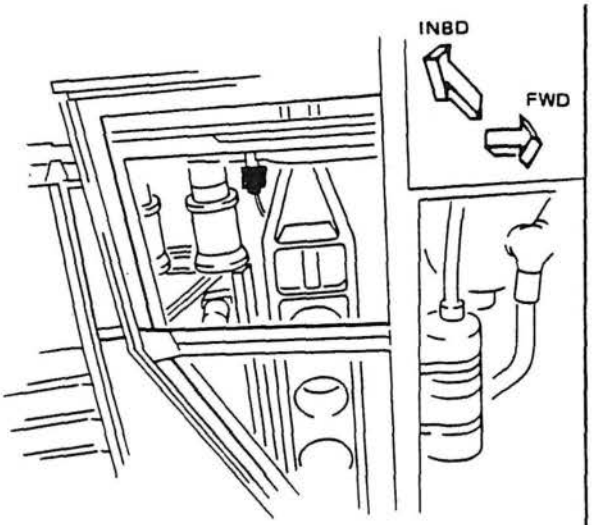
(1) Install O-rings and fittings in IN and OUT ports of filter head. (See figure 401.)

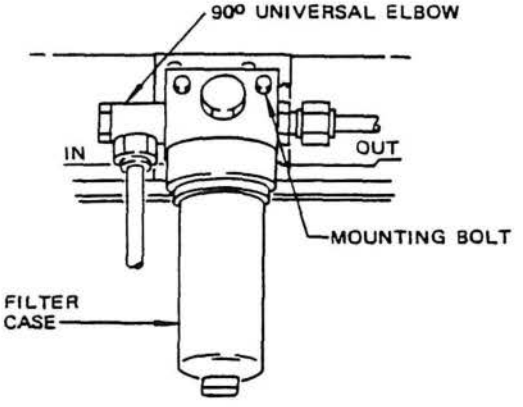
(2) Connect filter head to hydraulic lines with IN and OUT ports aligned per metal cal.

(3) Install mounting bolts and lockwire.

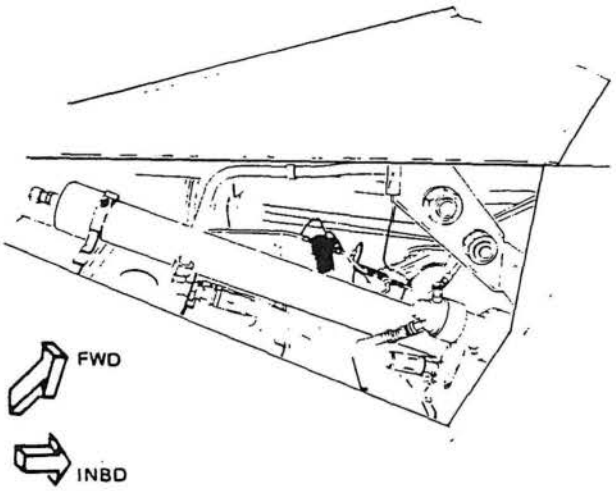
(4) Install filter element. Refer to Auxiliary Pressure Filter - Unit Servicing.

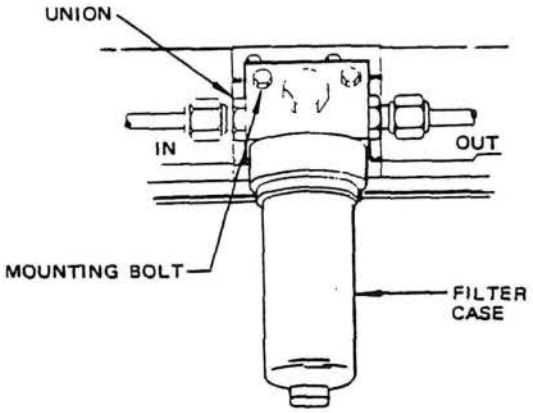






AUXILIARY PUMP NO. 1 PRESSURE FILTER





AUXILIARY PUMP NO. 2 PRESSURE FILTER

Auxiliary Pressure Filters Installation
Figure 401

(6) Remove element and clean the case.

NOTE: For filters with metallic element clean metal element for reuse. For filters with paper element dispose element.

B. Install Auxiliary Pressure Filter Element

(1) Insert clean element in case and install O-rings, backup rings (figure 301), screw filter case with element into filter head, torque filter case to 150 pound-inches and secure with lockwire.

(2) Connect external electrical power and move appropriate auxiliary hydraulic pump switch to ON. Operate pump for 5 minutes.

(3) Check filter for leaks.

(4) Remove main gear wheel door downlock, install access panel and disconnect external electrical power.

AUXILIARY PRESSURE FILTER - UNIT SERVICING

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. Main Gear Wheel Well Door Downlock - F71127 or equivalent

3. Unit Servicing Auxiliary Pressure Filter Element

   A. Remove Auxiliary Pressure Filter Element

      (1) Open main landing gear well doors and install main gear door downlock.

          WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

      (2) Remove main gear actuator access panel 1346 as required. See Chapter 12, Access Doors and Panels.

      (3) Depressurize auxiliary hydraulic system by cycling rudder pedals until rudder no longer responds hydraulically.

      (4) Depressurize utility reservoir.

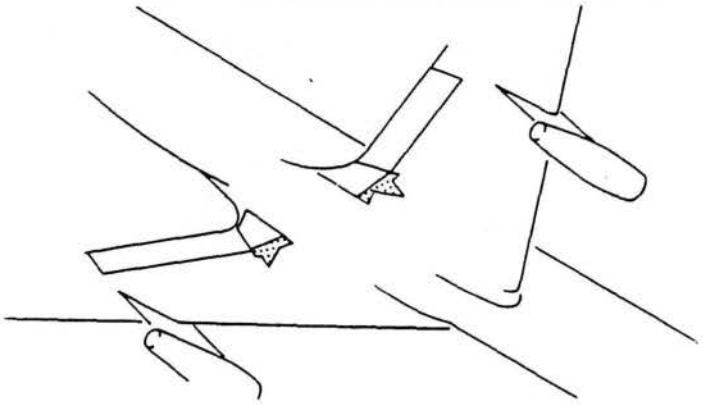
          (a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped. Retighten reservoir cap.

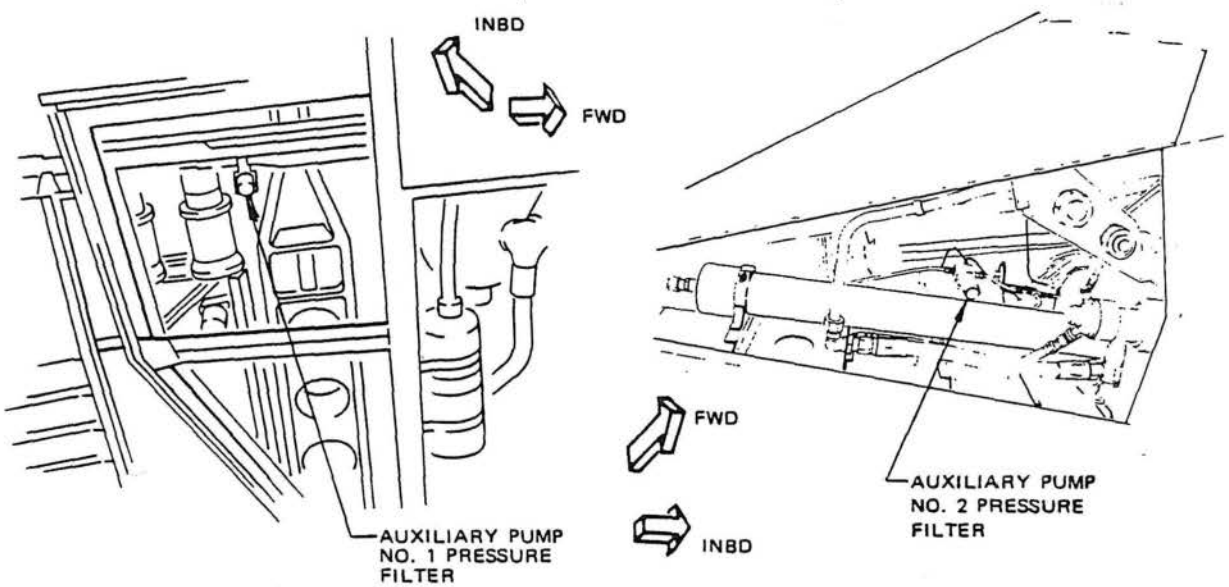
              CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

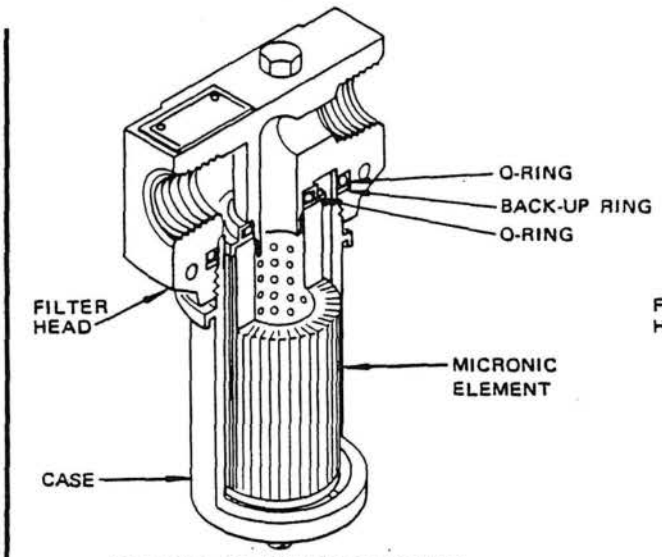
          (b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

              NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the pressure regulator line.

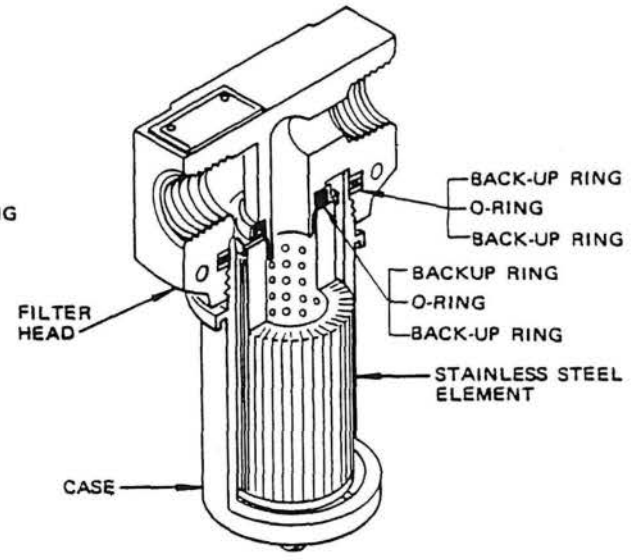
      (5) Unscrew filter case with filter element (figure 301).







DETAILS OF AUXILIARY SYSTEM RETURN FILTER (WITH DISPOSABLE ELEMENT



DETAILS OF AUXILIARY PRESSURE FILTER (WITH CLEANABLE FILTER ELEMENT

Auxiliary Pressure Filter Installation
Figure 301

UTILITY PRESSURE FILTER - REMOVAL/INSTALLATION

1. General

   A. A container will be necessary to catch fluid from disconnected filter and hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.

2. Equipment and Materials

   A. Main Landing Gear Door Downlock - F71127 or equivalent

3. Removal/Installation Utility Pressure Filter

   A. Remove Utility Pressure Filter

      (1) Remove filter element. Refer to Utility Pressure Filter - Unit Servicing.

      (2) Disconnect lines from filter and cap end lines. (See figure 401.)

      (3) Remove O-rings and fittings from each port.

      (4) Remove filter mounting bolts and fillet.

      NOTE: Do not drop fillet when removing mounting bolts.

      (5) Remove filter.

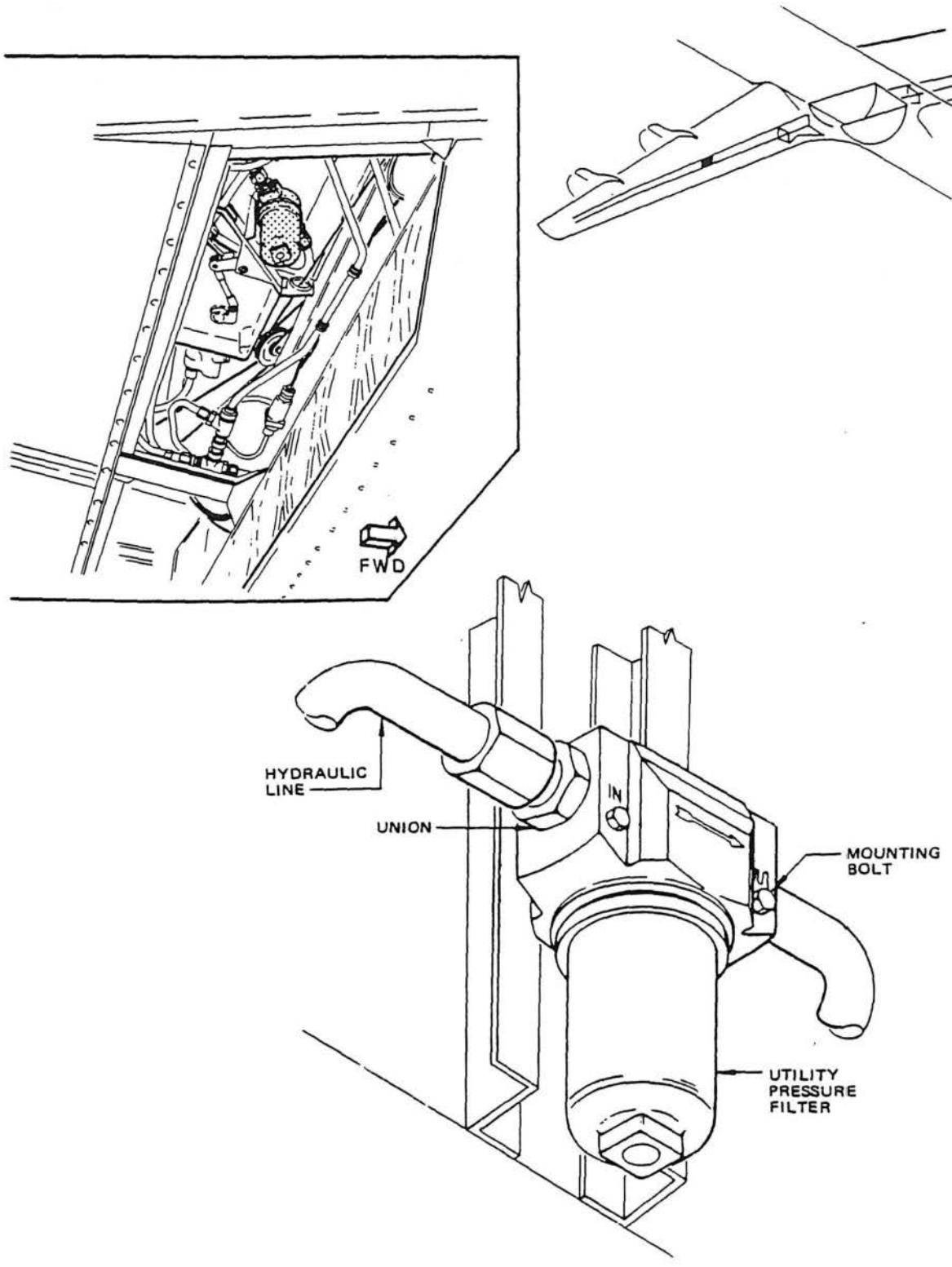
   B. Install Utility Pressure Filter

      (1) Install O-rings and fitting in each port of filter head. (See figure 401.)

      (2) Position filter and install fillet and mounting bolts.

      (3) Connect lines disconnected in step A.(2).

      (4) Install filter element. Refer to Utility Pressure Filter - Unit Servicing.



Utility Pressure Filter Installation
Figure 401

B. Install Utility Pressure Filter Element

(1) Install new or clean element, O-rings and backup rings (figure 301), and screw filter case into filter head, torque filter case to 150 pound-inches, and secure with wire.

(2) Tighten reservoir cap, close and safety wire bypass valve.

(3) Open right cowling panel of applicable engine.

(4) Disconnect hydraulic pressure hose at disconnect panel and connect hose to external hydraulic power.

(5) Pressurize system and check for leakage.

(6) Disconnect external hydraulic power, connect system hose at disconnect panel, and close engine cowling panel.

(7) Close trailing edge panel and remove landing gear door downlock.

UTILITY PRESSURE FILTER UNIT SERVICING

1. General

A. A container will be necessary to catch fluid from disconnected filter and hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

B. Equipment and Materials

(1) Main Landing Gear Door Downlock - F-71127 or equivalent

2. Unit Servicing Utility Pressure Filter Element

A. Remove Utility Pressure Filter Element

(1) Open trailing edge panel, 1358. See Access Doors and Panels, Chapter 12. Open left main wheel well door by pulling ground door release handle down and install door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Depressurize utility hydraulic system.

(a) Position bypass valve handle to BYPASS.

(b) Depressurize utility reservoir.

1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

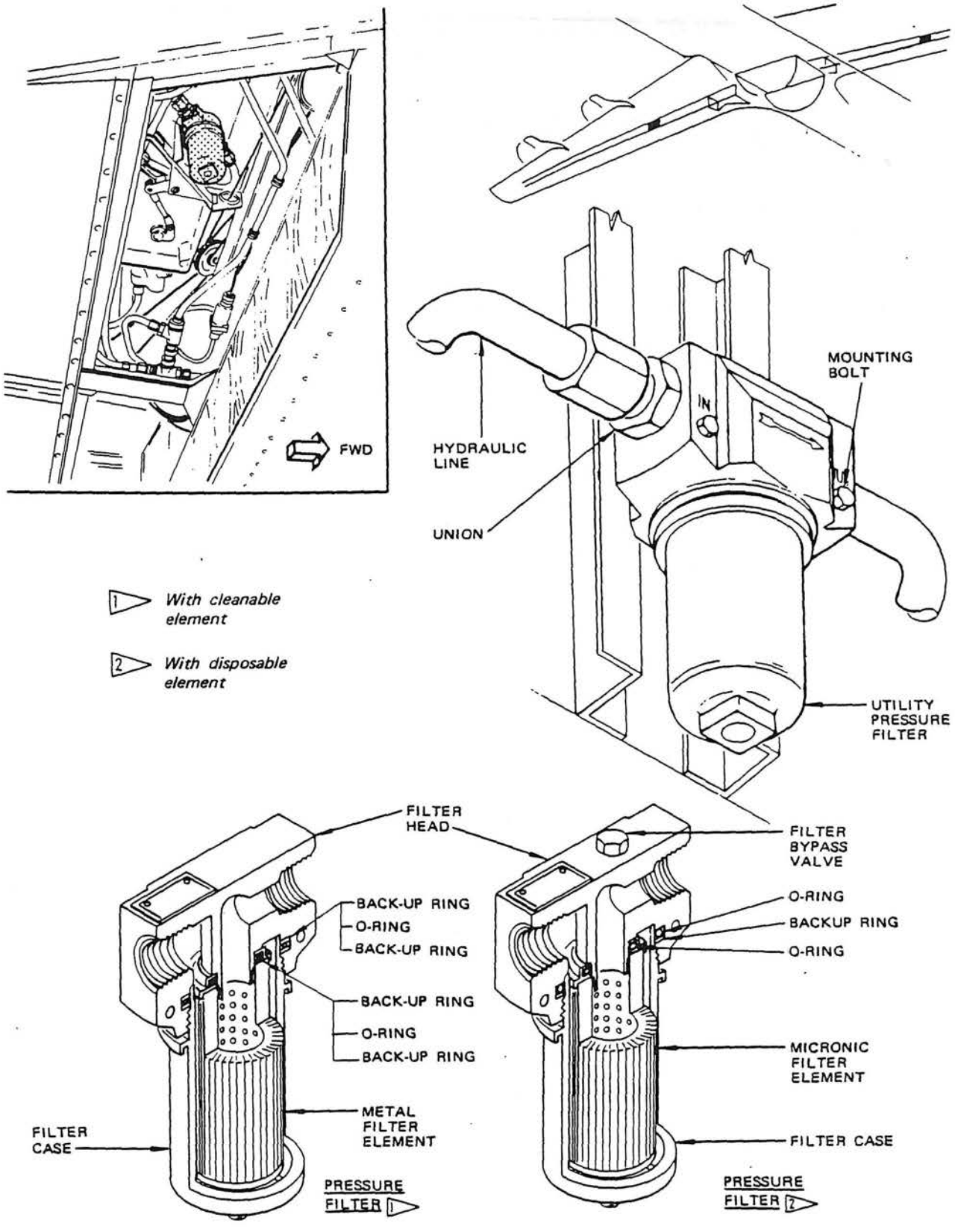
2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the air pressure regulator line.

(3) Unscrew filter case with element (figure 301).

(4) Remove filter element and clean the case.

NOTE: For filters with metallic element, clean metal element for reuse. For filter with disposable (paper) element, dispose of element.



Utility Pressure Filter Installation
Figure 301

(6) Drain utility reservoir and auxiliary reservoir. Install drain plug in utility reservoir.

(7) Disconnect all hoses from auxiliary reservoir (figure 201).

(8) Disconnect bonding jumper.

(9) Release mounting straps and remove auxiliary reservoir.

C. Install Auxiliary Hydraulic Reservoir

(1) Install one O-ring and one union in each port of auxiliary hydraulic reservoir (figure 201).

(2) Install drain plug with O-ring and lockwire the plug.

(3) Position reservoir and secure it with mounting straps.

(4) Connect bonding jumper.

(5) Connect all hoses to auxiliary reservoir.

(6) Service utility reservoir. See Chapter 12, "Hydraulic Fluid Servicing."

(7) Test auxiliary reservoir.

(a) Connect compressed air to utility reservoir air charging valve.

(b) Pressurize reservoir air charging valve.

(c) Check reservoirs and fitting for leaks.

(d) Disconnect compressed air.

(8) Install access panel and close access door and main gear well door.

(8) Remove gage and reconnect line.

(9) Pressurize system and check for leakage.

D. Test Utility Reservoir Pressurization System

(1) Open left main gear wheel well door and install main gear door down lock.

(2) Disconnect air pressurization hose from utility reservoir.

(3) Connect 60 psi pressure gage between air regulator and utility reservoir.

(4) Pressurize system at charging valve. (See 29-0, figure 1.)

(5) Check that reservoir pressure is 40 to 45 psi.

(6) Check lines and fittings for leakage.

(7) Depressurize reservoir, remove gage and connect pressurization hose to reservoir.

(8) With system pressurized, check line and connections between regulator and reservoir for leakage.

(9) Check reservoir pressurization supply line.

(a) Disconnect reservoir pressurization supply line at main wheel well.

(b) With any inboard engine operating at "IDLE" check that air blows from the disconnected line.

(c) Reconnect line and check connection for leakage.

(10) Close main wheel well door.

END

B. Removal/Installation Air Filters

(1) Remove Air Filter

(a) Remove main gear walking beam access panel L1347.

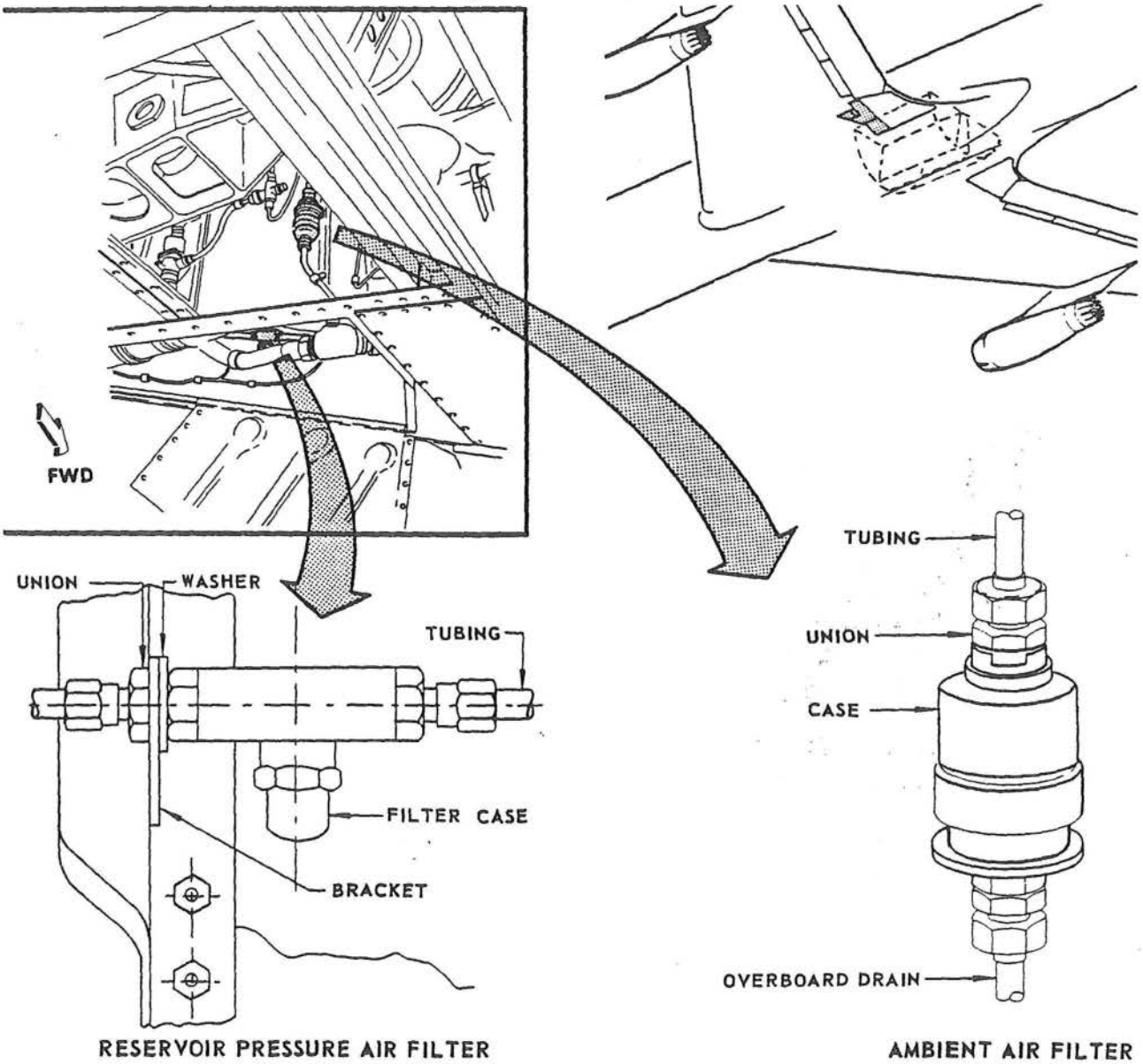
(b) Disconnect and cap tubing (figure 202).

(2) Install Air Filters

(a) Install O-ring and union in each port (figure 202).

(b) Connect lines.

(c) Install access panel.



RESERVOIR PRESSURE AIR FILTER

AMBIENT AIR FILTER

3. Adjustment/Test Hydraulic Reservoir Pressurization System

A. General

(1) The air pressure regulator should be adjusted if the reservoir pressure is not within specified limits. The adjustment is accomplished by turning the adjustment screw in the ambient (vent) port of the air pressure regulator.

B. Equipment and Materials

(1) Clean and dry compressed air, between 50 and 200 psi working pressure.

(2) Connecting hoses with fittings and shutoff valve.

(3) Pressure gage, 0 to 60 psi range.

(4) Main Gear Door Down Lock F-71127 or equivalent.

C. Adjust Hydraulic Reservoir Pressurization System

(1) Open left main gear wheel well door and install main gear door down lock.

(2) Connect pressure gage between air regulator and utility reservoir.

(3) Connect compressed air line to the air charging valve.

NOTE: Air charging valve is accessible through the shock strut door opening, outboard of the left main wheel well.

(4) Slowly admit compressed air and observe pressure gauge. Shut the air off immediately if the pressure rises above 45 psi.

(5) Adjust regulator to 40 to 45 psi.

(a) Remove vent line at ambient port. (See figure 201.)

(b) Slowly turn adjustment screw clockwise to increase and counterclockwise to decrease pressure. Wait a few seconds between adjustments until pressure stabilizes.

(6) Disconnect compressed air.

(7) Depressurize reservoir.

HYDRAULIC RESERVOIR PRESSURIZATION SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Hydraulic Reservoir Pressurization System Components

   A. General

      (1) Filter element of pressure air filter is cleanable. Soak and rinse the element in an organic solvent, then in a soda solution and finally in clean water. Blow element from inside with clean, dry compressed air.

      (2) Ambient air filter element is expendable; a removed element should be replaced by a new one.

   B. Remove Air Filter Element

      (1) Remove main gear walking beam access panel, L1347. See Chapter 12, "Access Doors and Panels."

      (2) Unscrew filter case and remove case with filter element. (See figure 201.)

   C. Install Air Filter Element

      (1) Insert filter element in case and install case. (See figure 201.)

      (2) Install main gear walking beam access panel.

2. Removal/Installation Hydraulic Reservoir Pressurization System Components

   A. Removal/Installation Air Pressure Regulator

      (1) Remove Air Pressure Regulator

         (a) Open left main gear wheel well door and install main gear door down lock.

         (b) Depressurize utility reservoir

            1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

               CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

            2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

               NOTE: Depressurization valve is located above and just aft of utility reservoir.

         (c) Remove main gear walking beam access panel L1347.

(d) Disconnect lines from regulator (figure 201) and plug lines.

(e) Remove regulator mounting bolts.

(f) Remove unions and elbow.

(2) Install Air Pressure Regulator

(a) Install O-ring and union (figure 201) in "IN" and "OUT" ports, and connect lines.

(b) Adjust regulator per paragraph "3.C."

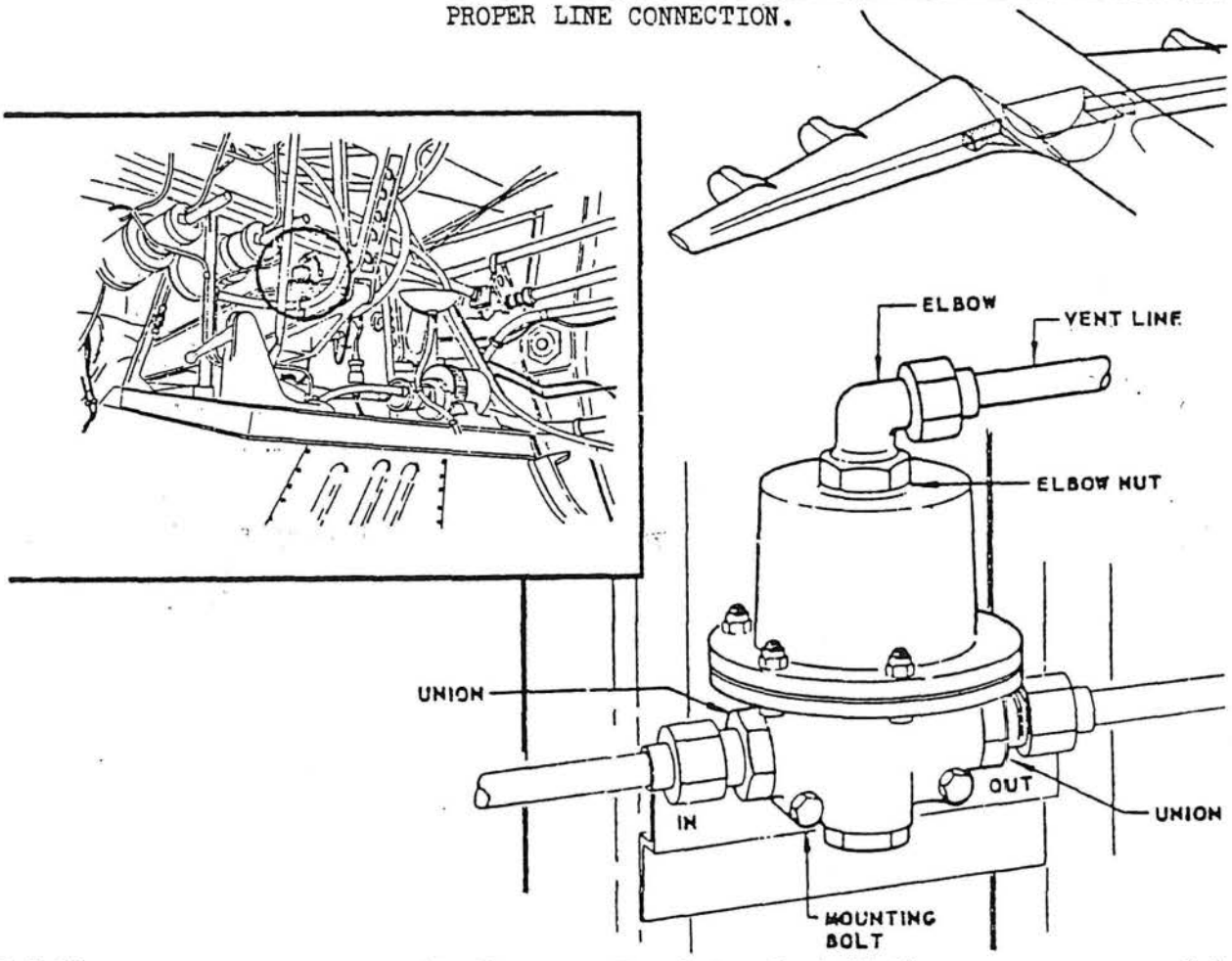
(c) Install mounting bolts.

(d) Install O-ring, nut, and elbow in "VENT" port, with elbow opening on the "OUT" side of port.

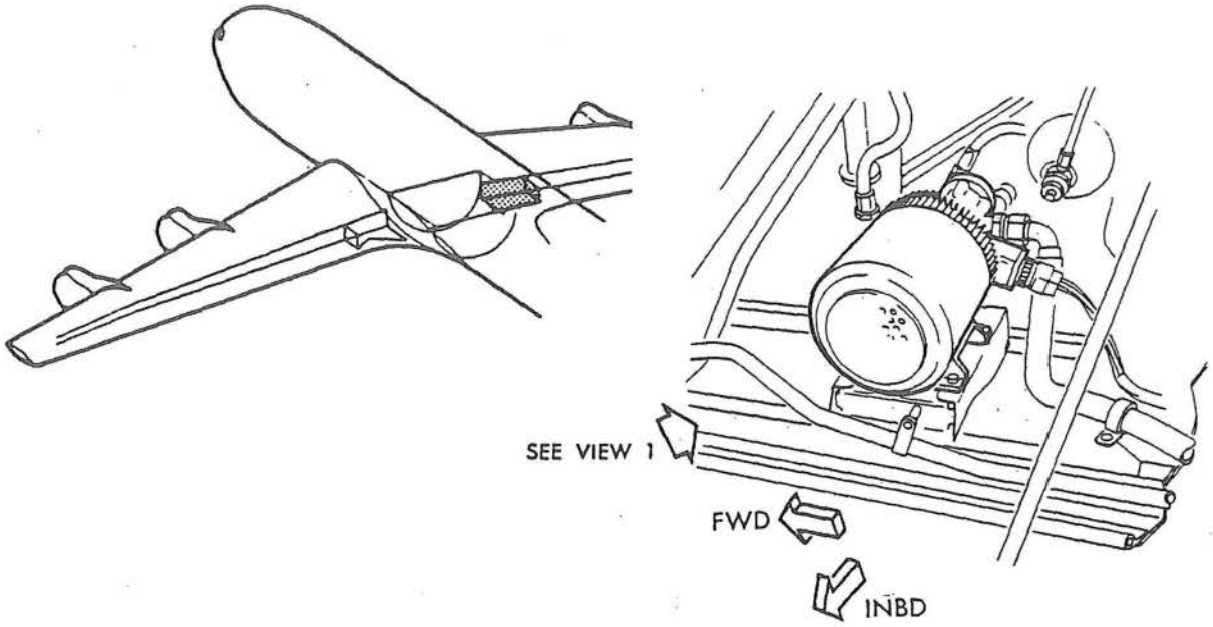
(e) Connect ambient vent line and tighten elbow nut.

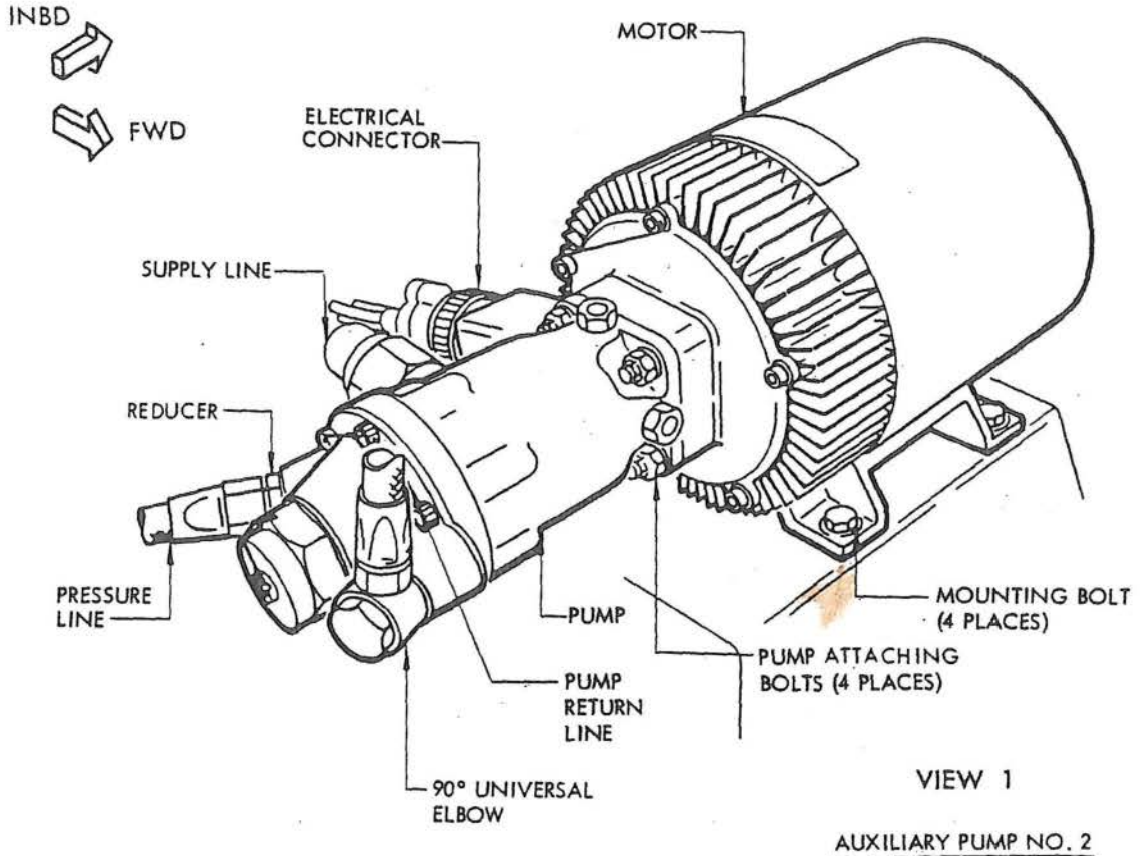
(f) Install access panel and close main gear wheel well door.

CAUTION: IN ORDER TO AVOID RESERVOIR DAMAGE CARE SHOULD BE TAKEN WHEN REPLACING THE AIR PRESSURE REGULATOR FOR PROPER LINE CONNECTION.



Air Pressure Regulator Installation
Figure 201





VIEW 1

AUXILIARY PUMP NO. 2

(4) Fill pump approximately half full with hydraulic fluid through supply port.

(5) Connect supply line.

(6) Check for clean mounting surfaces and install pump. Lockwire pump attaching bolts.

(7) Connect hydraulic pressure line and return line to pump.

(8) Service hydraulic system as required. See 29-0, Hydraulic System - Maintenance Practices.

(9) Test hydraulic pump in accordance with adjustment/test procedure.

(10) Close hydraulic access door.

4. Removal/Installation Auxiliary Motor

A. Equipment and Materials

(1) Hydraulic Fluid, BMS 3-11

(2) Main Gear Door Downlock, F71127 or equivalent

B. Remove Auxiliary Motor

(1) Open main wheel well door by pulling left ground door release handle down, and install main gear door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Check that auxiliary hydraulic pump switches are in OFF position.

(3) Remove electrical connector (figure 201).

(4) Drain applicable auxiliary hydraulic reservoir. Refer to 29-3-21, Auxiliary Hydraulic Reservoir - Maintenance Practices.

(5) Remove bolts securing pump to motor and separate pump from motor.

(6) Remove mounting bolts and remove motor.

C. Install Auxiliary Motor

(1) Position motor and install mounting bolts.

(2) Check for clean mounting surfaces on pump and motor, carefully place pump in position and install attaching bolts and lockwire.

(3) Install electrical connector.

(4) Test auxiliary pump assembly in accordance with adjustment/test procedure.

AUXILIARY HYDRAULIC PUMP ASSEMBLY - REMOVAL/INSTALLATION

1. General

A. When an auxiliary pump is replaced following pump failure which results in system contamination, the auxiliary system must be flushed. See 29-0, Hydraulic System - Maintenance Practices.

B. A container will be necessary to catch fluid from auxiliary reservoir and from disconnected hydraulic lines. Take necessary precaution to prevent spillage of fluid. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.

C. No. 1 and No. 2 auxiliary hydraulic pump installations are similar, therefore only one maintenance procedure is given.

2. Removal/Installation Auxiliary Hydraulic Pump and Motor Assembly

A. Equipment and Materials

(1) Hydraulic Fluid, BMS 3-11

(2) Main Gear Door Downlock, F71127 or equivalent

B. Remove Auxiliary Hydraulic Pump and Motor Assembly

(1) Open main gear wheel well door by pulling ground door release handle down, and install main gear door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Check that auxiliary hydraulic pump switches are in OFF position.

(3) Depressurize utility reservoir.

(a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped. Retighten reservoir cap.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the pressure regulator line.

(4) Depressurize auxiliary hydraulic system.

(5) Drain applicable auxiliary hydraulic reservoir.

(6) Remove electrical connector. (See figure 401.)

(7) Disconnect and cap pump supply line.

(8) Disconnect and cap return and pressure lines.

(9) Remove base mounting bolts.

(10) Remove hydraulic pump and motor assembly

C. Prepare for Installation

(1) Remove lowest plug from bottom of pump mounting flange and replace with drilled plug from removed pump.

(2) Install O-ring and fitting in return port. (See figure 401.)

(3) Install O-rings and fittings in supply and pressure ports.

(4) Fill pump approximately half full with hydraulic fluid through supply port.

D. Install Auxiliary Hydraulic Pump and Motor Assembly

(1) Position pump assembly and install base mounting bolts (figure 401).

(2) Connect hydraulic lines.

(3) Install electrical connector.

(4) Service hydraulic system as required. See 29-0, Hydraulic System - Maintenance Practices.

(5) Test auxiliary hydraulic pump assembly in accordance with adjustment/test procedure.

(6) Close hydraulic access door.

AUXILIARY HYDRAULIC PUMP ASSEMBLY - ADJUSTMENT/TEST

1. Auxiliary Hydraulic Pump Assembly Test

A. Equipment and Materials

(1) Main Gear Door Downlock, F71127 or equivalent

B. Test Auxiliary Hydraulic Pump Assembly

(1) Open main gear wheel well door by pulling ground door release handle down, and install main gear door downlock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Connect external electric power to airplane.

(3) Operate pump by moving auxiliary hydraulic pump control switch to ON.

(4) Cycle components of the affected pump several times to prime and bleed the pump.

(5) Check pump connections for leakage.

(6) Remove door downlock and close main gear wheel well door by ground door release handle, using interconnect valve to pressurize utility system.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(7) Switch the pump off and disconnect external electrical power.

MAIN CARGO DOOR HYDRAULIC PUMP FILTER - MAINTENANCE PRACTICES

1. Unit Servicing Main Cargo Door Hydraulic Pump Filter

A. Replace Filter Element

(1) Open left main wheel well door.

(2) Depressurize main cargo door hydraulic system.

(a) Move manual lever on main cargo door control valve to opposite position.

(3) Remove filter case and remove element from case. (See figure 201.)

(4) Clean case.

(5) Position and install new or cleaned filter element in case.

(6) Install O-ring and install case.

(7) Close left main wheel well door.

2. Removal/Installation Main Cargo Door Hydraulic Pump Filter

A. Remove Filter

(1) Open left main wheel well door.

(2) Depressurize main cargo door hydraulic system.

(a) Move manual lever on main cargo door control valve to opposite position.

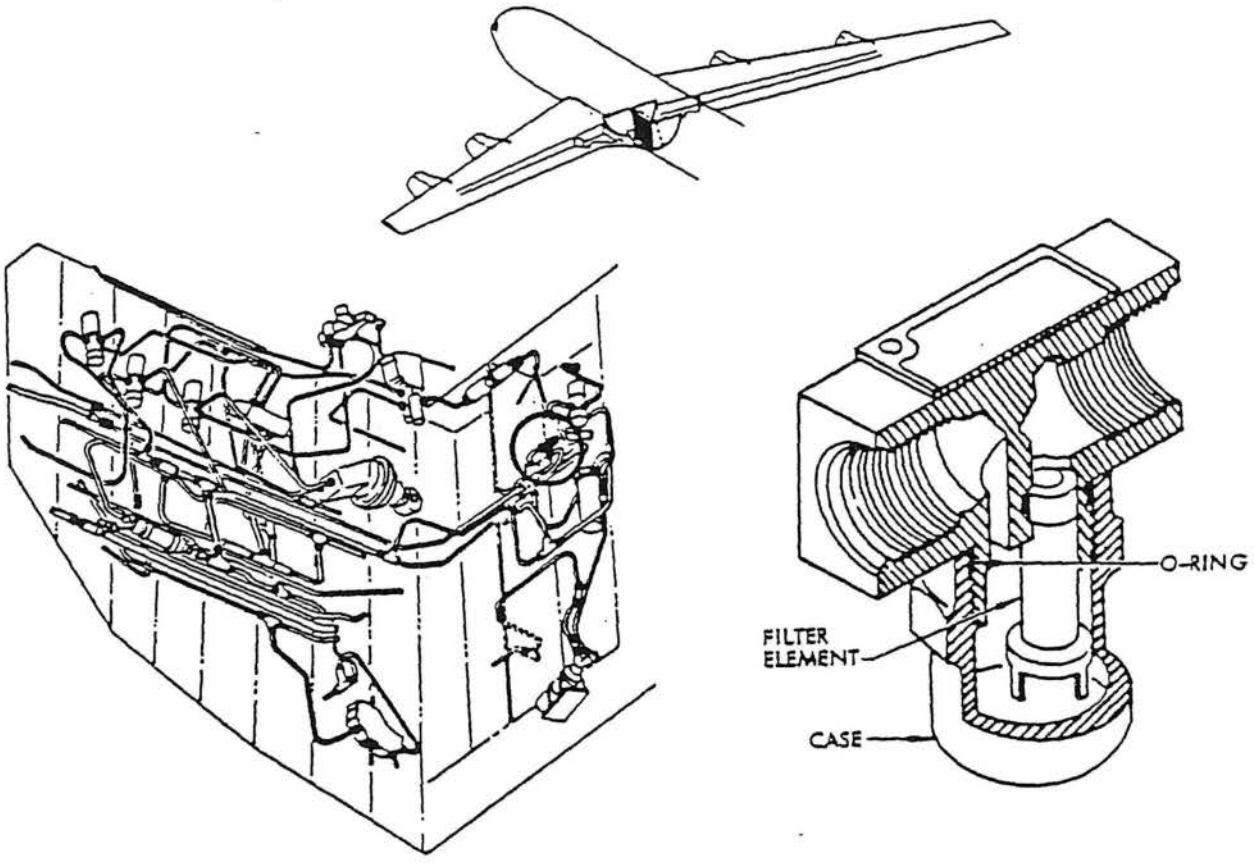
(3) Disconnect tubing and remove filter assembly. (See figure 201.)

B. Install Filter

(1) Install unions and connect hydraulic lines to the filter assembly (figure 201).

(2) Check that direction of arrow on filter assembly corresponds to placard showing correct fluid flow through filter.

(3) Close left main wheel well.



Main Cargo Door Hydraulic Pump Filter Installation
Figure 201

ENGINE-DRIVEN (UTILITY) HYDRAULIC PUMP - REMOVAL/INSTALLATION

1. General

A. When an engine-driven pump is replaced due to mechanical failure, remove the pressure and pump return filters, flush the lines from the applicable pump to the filter and clean or replace the old filter. If excessive contamination is present, perform inspection/check of hydraulic system. Refer to 29-0, Hydraulic System - Maintenance Practices.

B. During removal of the engine-driven hydraulic pump, hydraulic lines are disconnected at the self-sealing line couplings at disconnect panel on the right side of the engine, to prevent excessive loss of hydraulic fluid and also to prevent air from entering the hydraulic system.

C. A container will be necessary to catch fluid from disconnect lines.

D. The pump must be completely filled with hydraulic fluid before installation.

2. Equipment and Materials

A. Hydraulic Fluid, BMS 3-11

B. Grease, MIL-G-21164

3. Remove Engine-Driven Hydraulic Pump

A. Open access doors and depressurize utility hydraulic system.

(1) Open left main wheel well door by ground door release handle.

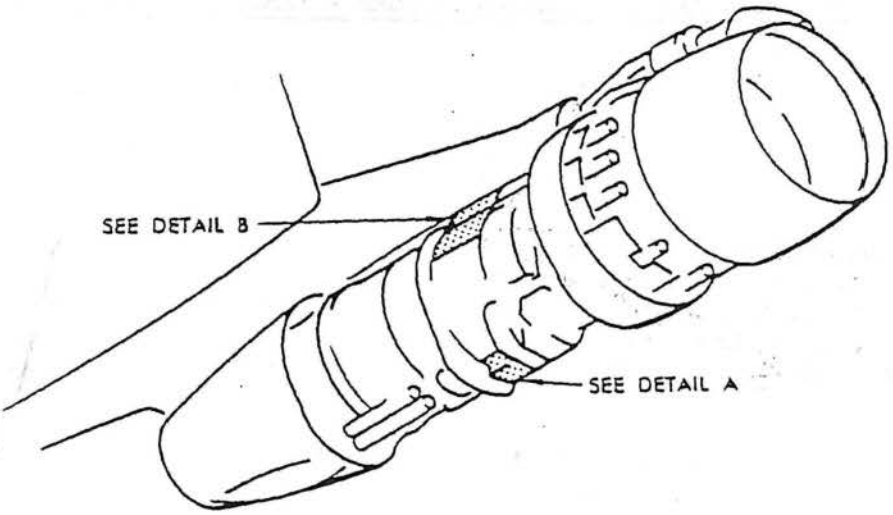
WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

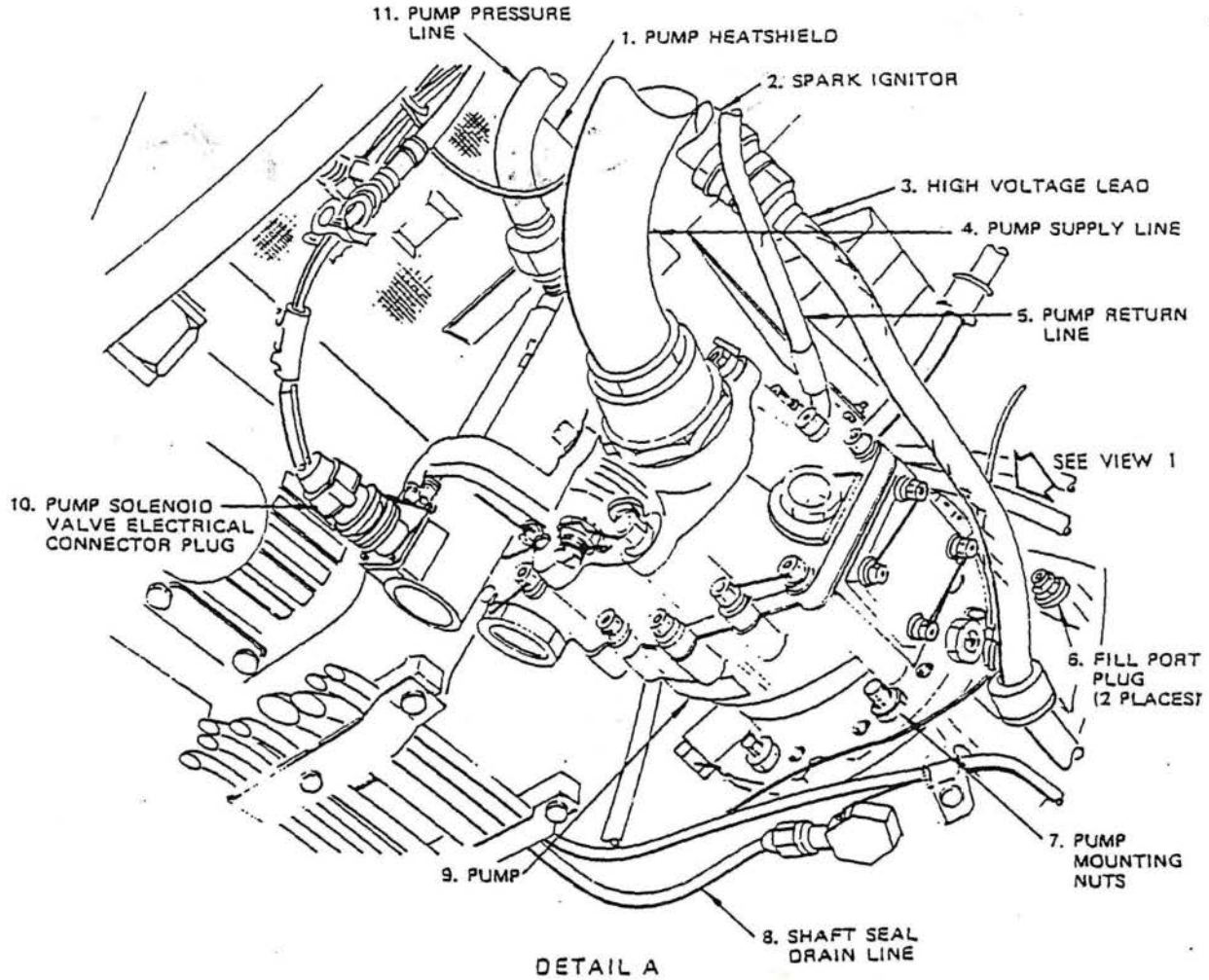
(2) Position bypass valve to BYPASS.

(3) Depressurize utility reservoir.

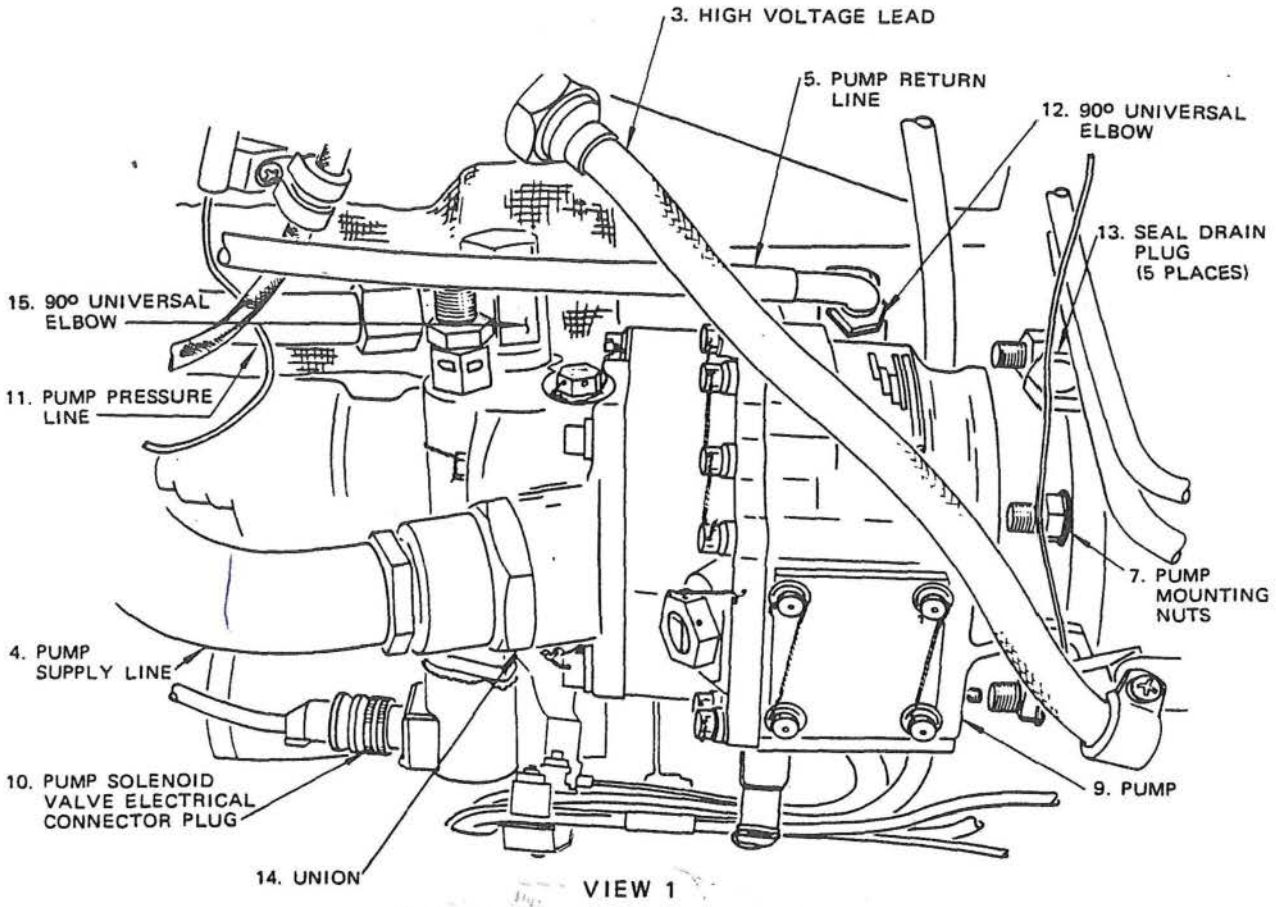
(a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap 3 full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

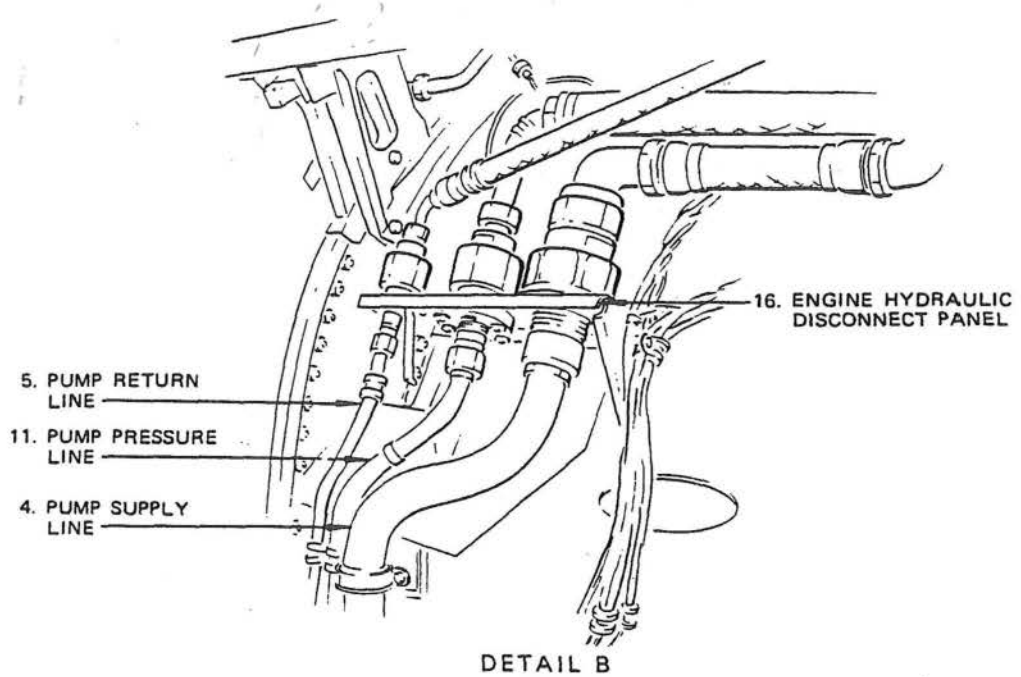




Engine Drive (Utility) Hydraulic Pump Installation
Figure 401 (Sheet 1)



VIEW 1



DETAIL B

Engine Drive (Utility) Hydraulic Pump Installation
Figure 401 (Sheet 2)

(b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the air pressure regulator line.

(4) Open engine right cowl panel.

B. Disconnect high voltage lead (3, figure 401) from spark ignitor (2). See Chapter 74, "High Voltage Leads."

WARNING: THE CURRENTS INVOLVED IN IGNITION SYSTEM CAN BE FATAL. BE SURE POWER IS REMOVED FROM SYSTEM AT LEAST 3 MINUTES BEFORE REMOVING HIGH VOLTAGE LEAD FROM SPARK IGNITOR.

C. Disconnect hydraulic lines (4), (5) and (11) at self-sealing couplings on engine hydraulic disconnect panel (16).

D. Disconnect pump solenoid valve electrical connector plug (10).

E. Disconnect hydraulic lines (4), (5) and (11) from pump.

F. Remove pump heat shield (1).

G. Remove pump mounting nuts (7) and washers.

H. Remove pump (9).

NOTE: Remove or loosen clamps securing hydraulic lines (6), (8) and (10) to engine as necessary to remove pump.

4. Prepare Pump for Installation

A. Flush supply line (4, figure 401), pressure line (11) and return line (5) below engine hydraulic disconnect panel (16).

B. Install O-ring and union (14) in supply port.

C. Remove two lowest seal drain plugs from pump mounting flange and install O-ring and drain port fitting (Boeing P/N 66-13955-1) in openings. Lockwire fittings.

D. Install 90° universal elbows (12) and (15) (banjo fitting) in pressure and return ports. Lockwire elbows.

E. Check that pump shaft seal drain line (8) is clear. Flush if necessary.

ENGINE-DRIVEN (UTILITY) HYDRAULIC PUMP - ADJUSTMENT/TEST

1. Engine-Driven Hydraulic Pump Test

A. Test Engine-Driven Hydraulic Pump

(1) Open engine right cowl panel.

(2) Connect external electrical power.

(3) Start engine and operate at IDLE.

(4) Check that utility system pressure indicator shows 2950 to 3100 psi.

(5) Check pump, pump lines and connections for leaks.

(6) Move the corresponding pump depressurizing valve switch to OFF and check that utility hydraulic pressure drops immediately to accumulator precharge pressure.

NOTE : If pump does not depressurize (switch OFF), clean-up pump and airplane connectors. If pump does not depressurize (switch OFF) after connectors clean-up, replace solenoid valve assy.

(7) Move switch back to ON and check that pressure rises immediately to about 3000 psi.

(8) Stop engine and disconnect external electrical power.

(9) Close engine right cowl panel.

F. Completely fill pump with hydraulic fluid to remove air from pump.

(1) Remove pump case fill port plug (6) and fill pump case.

(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 plug (6) when case is full.

5. Install Engine-Driven Hydraulic Pump

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

B. Engage pump shaft with driving shaft, position pump (9, figure 401) correctly on mounting studs and secure it with one washer and nut (7)

NOTE: Do not lubricate the pump spline shaft and driving shaft cavity.

C. Install remaining washers and nuts (7). Tighten all nuts to 160 to 190 pound-inches torque.

D. Install pump heat shield (1).

E. Connect hydraulic lines (4), (5) and (11) to pump.

F. Carefully fill supply line (4) with hydraulic fluid so that all air can escape from line.

G. Connect hydraulic lines (4), (5) and (11) at self-sealing couplings on engine hydraulic disconnect panel (16).

H. Install clamps that secure hydraulic lines (4), (5) and (11) to engine.

I. Connect pump solenoid valve electrical connector plug (10).

J. Connect high voltage lead (3) to spark ignitor (2). See Chapter 74, High Voltage Leads.

K. Check that all lines are properly installed and all connections are tightened.

L. Test pump in accordance with test procedure.

M. Close access doors and engine right cowl panel. Check that bypass valve is closed and utility reservoir filler cap is tight.

HYDRAULIC SUPPLY (FIRE) SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Hydraulic Supply (Fire) Shutoff Valve

A. General

(1) Two supply shutoff valves are installed, one in the right wing fillet and one in the left wing fillet. The valves have similar maintenance practices. The differences are noted in the combined procedure given below. A container will be necessary to catch any fluid from disconnected hydraulic supply lines. Should any fluid spill on the airplane decontaminate. Refer to Chapter 12, "Cleaning and Washing."

B. Equipment and Materials

(1) Main Landing Gear Door Down Lock, F-71127 or equivalent.

C. Remove Hydraulic Supply (Fire) Shutoff Valve.

(1) Open hydraulic access door 1348, and remove supply shutoff valve access panel 1349. See Chapter 12, "Access Doors and Panels."

(2) Open left main gear wheel well door and install main gear wheel well door down lock.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

(3) Depressurize utility reservoir by unscrewing filter cap three full turns counterclockwise.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(4) Remove drain plug from utility reservoir and drain reservoir. Reinstall drain plug and lockwire.

(5) Remove electrical connector (3, figure 201) from supply shutoff valve.

(6) Remove tubing clamps (1)

(7) Disconnect hydraulic line connectors (2) from supply valve.

NOTE: On AII airplanes VT-DJI through VT-DNZ and VT-DSI and on, and SABENA airplanes OO-SJA through OO-SJF, OO-SJH and on, a check valve (9) is installed on the supply valve. Disconnect hydraulic line connector (2) from check valve. Leave check valve installed on valve.

(8) Remove mounting bolts (6) and remove supply shutoff valve assembly.

(9) Install protective caps on hydraulic line ends.

(10) Remove connector bolts (5) and remove connectors (4) and mounting bracket (7).

NOTE: On supply shutoff valves with a check valve, remove check valve (9) from connector (4).

C. Prepare Hydraulic Supply (Fire) Shutoff Valve for Installation.

(1) Install O-ring on each side of valve.

(2) Position connectors (4) and mounting bracket (7) on valve and secure assembly with connector bolts (5).

(3) On airplanes with a check valve install O-ring and check valve (9) on connector (4).

(a) On supply shutoff valve installed in right wing fillet. Install check valve (9) on inboard connector (4) for SABENA airplanes OO-SJA and on.

(b) On supply shutoff valves installed in left wing fillets on SABENA airplanes OO-SJA and on, install check valve (9) on outboard connector (4).

NOTE: Install check valve such that check valve arrow direction is same as metal-cal arrow direction when valve assembly is installed.

D. Install Hydraulic Supply (Fire) Shutoff Valve Assembly

(1) Place valve assembly in mounting position and install mounting bolts (6, figure 201).

CAUTION: ON AIRPLANES WITH CHECK VALVE, MAKE SURE THAT CHECK VALVE VALVE DIRECTION IS SAME AS METAL-CAL DIRECTION ARROW.

AUXILIARY PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Auxiliary Pressure Relief Valve

A. General

(1) A container will be necessary to catch fluid from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing", Chapter 12.

B. Equipment

(1) External Hydraulic Power, Skydrol 500, 3500 psi maximum pressure

(2) Main Landing Gear Door Down Lock F-71127 or equivalent

(3) Regulated source of clean dry air, 200 psig maximum.

C. Remove Auxiliary Pressure Relief Valve

(1) Open right main gear wheel well door by pulling ground door release handle down, and install landing gear door down lock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH

(2) Depressurize utility reservoir by slowly unscrewing filler cap three full turns until all compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(3) Depressurize auxiliary hydraulic system by operating rudder pedals until rudder does not respond hydraulically.

(4) Release valve from channel by removing clamp screw (4, figure 201).

(5) Disconnect and plug lines.

D. Install Auxiliary Pressure Relief Valve

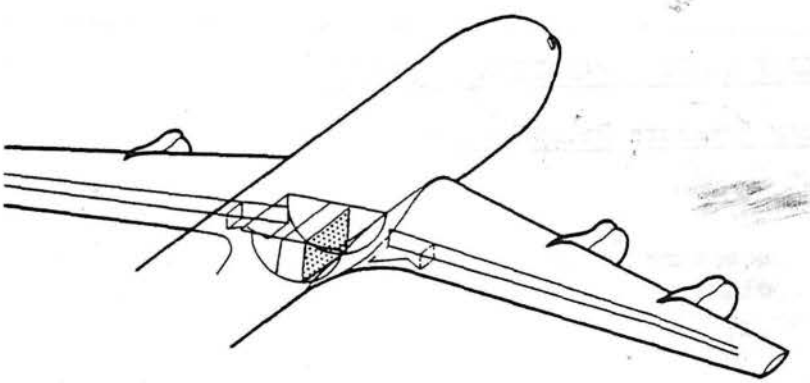
(1) Install O-ring and union in each port. (See figure 201.)

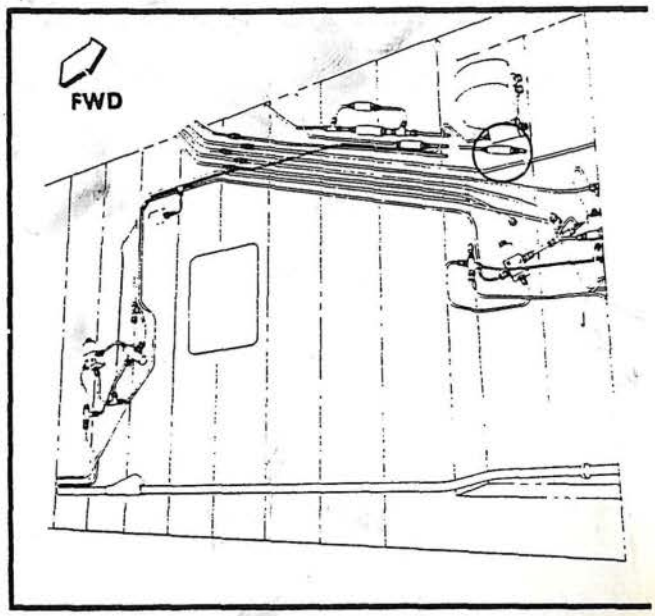
(2) Position relief valve with "PRESSURE" port aft and connect valve to lines.

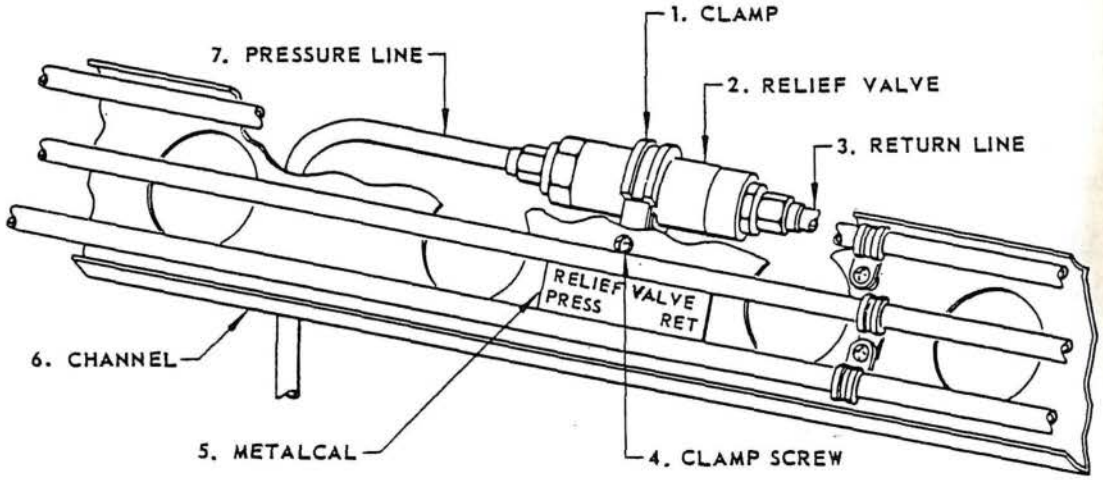
CAUTION: MAKE SURE THAT PRESSURE PORT IS AFT AS INDICATED ON METALCAL.

(3) Install valve clamp.

(4) Test per paragraph 2.A.







Auxiliary Pressure Relief Valve Installation
Figure 201

2. Adjustment/Test Utility Pressure Relief Valve

A. Test Utility Pressure Relief Valve

(1) Bypass both leading edge flap relief valves.

(a) Move flap control lever to "DOWN".

(b) Open cove lip door 1363. See "Access Doors and Panels", Chapter 12.

(c) Disconnect pressure line from relief valve.

(d) Plug pressure line and cap relief valve.

(2) Open left main gear wheel well door and install gear well door down lock.

(3) Open hydraulic access door R1348.

(4) Connect external hydraulic power at pressure ground test connection.

(5) Make sure that bypass valve is in "CLOSED" position.

(6) Slowly open external hydraulic power valve and increase pressure to 3400 psi.

(7) Check valve connections for leakage.

(8) Slowly increase pressure and observe pressure at which relief valve opens. This pressure should be between 3400 and 3600 psi.

(9) Check that relieved pressure does not drop below 3100 psi.

(10) Reduce pressure to zero.

(11) Connect leading edge flap relief valves.

(12) Close cove lip doors.

(13) Position flap lever to "UP".

(14) Close landing gear door.

(15) Disconnect external hydraulic power.

(16) Close hydraulic access door.

END

UTILITY PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Utility Pressure Relief Valve

A. General

(1) A container will be necessary to catch fluid from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing", Chapter 12.

B. Equipment

(1) External Hydraulic Power, with 3500 psi maximum pressure

(2) Main Landing Gear Door Down Lock F-71127 or equivalent

C. Remove Utility Pressure Relief Valve

(1) Open left main gear wheel door and install main gear door down lock.

(2) Depressurize utility hydraulic system by moving bypass valve handle to "BYPASS".

(3) Depressurize utility reservoir by slowly unscrewing filler cap three full turns until compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(4) Remove valve clamps (figure 201).

(5) Disconnect and plug lines.

D. Install Utility Pressure Relief Valve

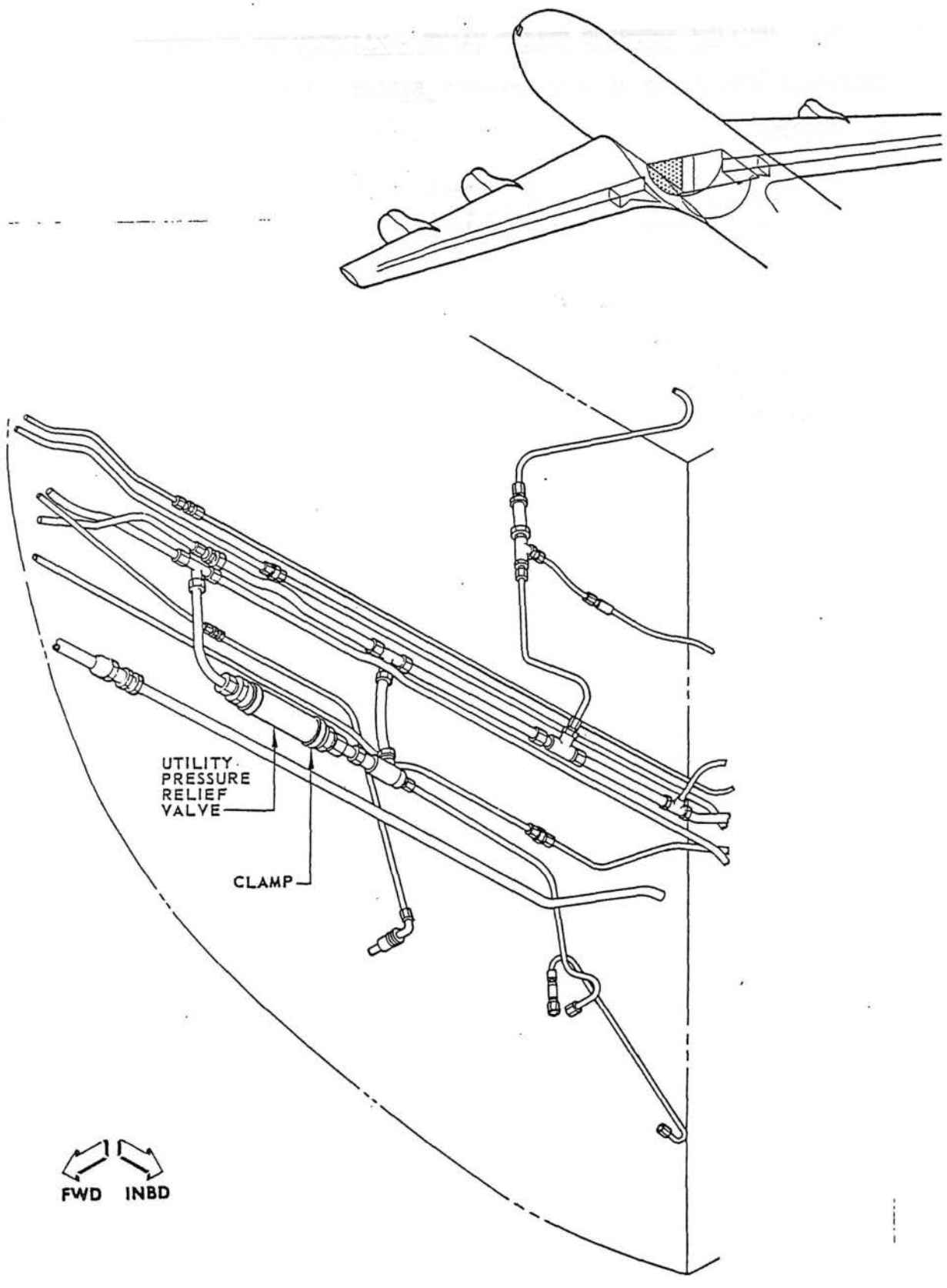
(1) Install O-ring and union in each port (figure 201).

(2) Position relief valve with "PRESSURE" port outboard and connect lines to valve.

CAUTION: MAKE SURE THAT PRESSURE PORT IS ON THE OUTBOARD SIDE.

(3) Install valve clamps.

(4) Test valve per paragraph 2.A.



Utility Pressure Relief Valve Installation
Figure 201

(4) Depressurize utility reservoir.

(a) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped. Retighten reservoir cap.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(b) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

NOTE: Depressurization valve is located above and just aft of utility reservoir, downstream of the pressure regulator line.

(5) Disconnect electrical connector. (See figure 401.)

(6) Disconnect pressure and supply lines from pump, and plug lines.

(7) Remove base mounting bolts and remove pump assembly.

(8) Remove pump bolts and remove pump.

C. Install Hydraulic Pump

(1) Check that mounting surfaces are clean, place pump correctly on motor flange and secure pump with flange bolts.

(2) Install O-rings and 90-degree universal elbows in supply and pressure ports. (See figure 401.)

(3) Completely fill pump with hydraulic fluid through supply port to expel all air from pump case.

(4) Connect flexible lines to ports of pump.

(5) Position pump and install pump mounting bolts.

(6) Connect electrical connector plug. Lockwire universal fitting bolts.

(7) Connect pump pressure line at quick disconnect.

(8) Pressurize utility reservoir.

(9) Connect external electrical power.

(10) Check pump operation by operating main cargo door as necessary to bleed air from lines.

(11) Check pump connections for leaks.

(12) Remove wheel well door downlock.

(13) Disconnect external electrical power.

MAIN CARGO DOOR HYDRAULIC PUMP - REMOVAL/INSTALLATION

1. General

   A. Remove main cargo door hydraulic pump assembled with motor. 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 Main Cargo Door Hydraulic Pump

   A. Equipment and Materials

      (1) Hydraulic Fluid - Skydrol "500"

      (2) Main Landing Gear Door Downlock - F71127 or equivalent

      (3) Regulated Source of Clean Dry Air - 200 psig maximum

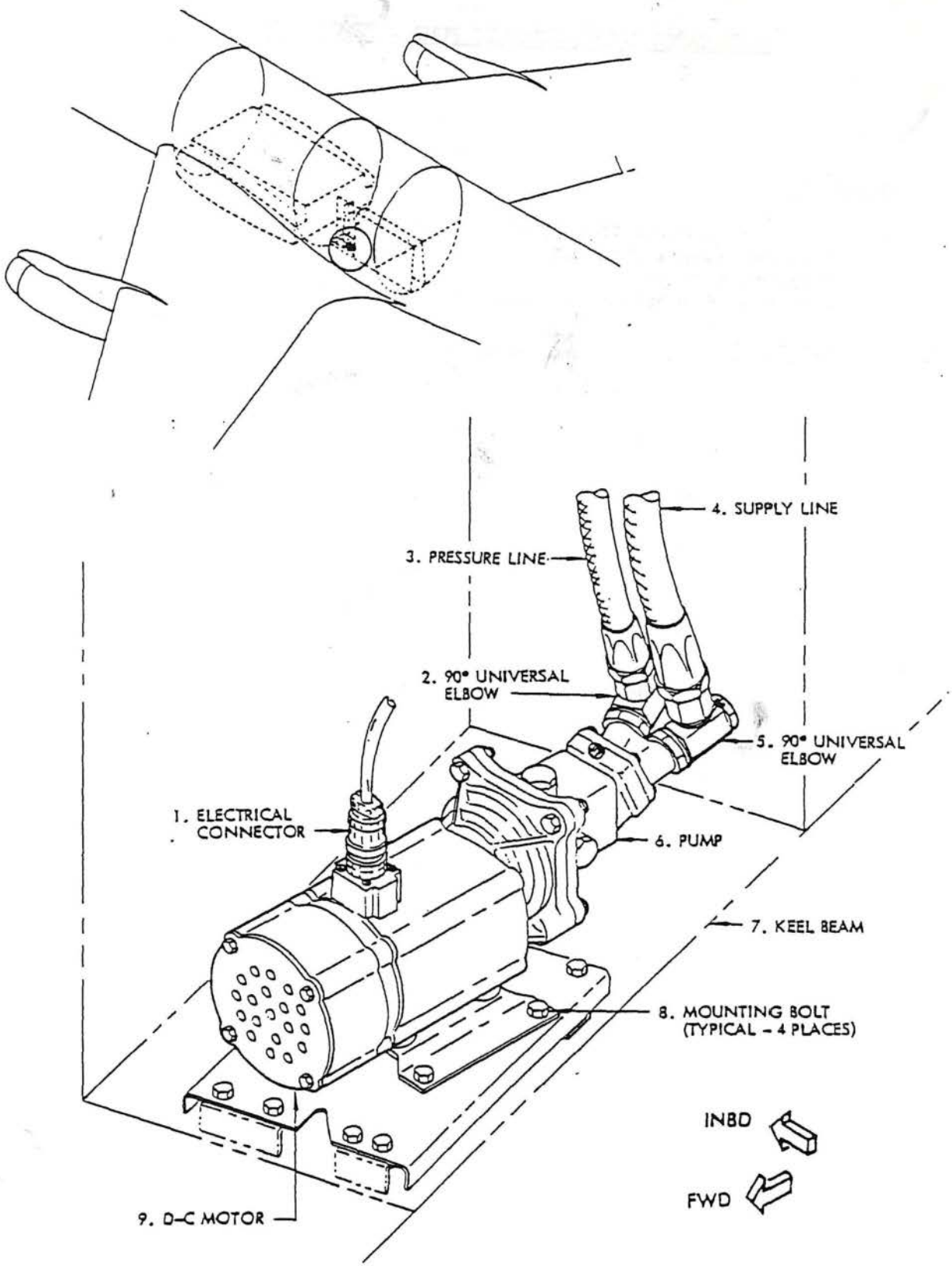
   B. Remove Hydraulic Pump

      (1) Open left main gear wheel well door by ground door release handle, and install main wheel well door downlock.

      WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

      (2) Move manual lever on main cargo door control valve to opposite position.

      (3) Disconnect pump pressure line at quick disconnect and stow in stowage receptacle.



Main Cargo Door Hydraulic Pump Installation
Figure 401

2. Adjustment/Test Auxiliary Pressure Relief Valve

A. Test Auxiliary Pressure Relief Valve

(1) Open left and right main gear wheel well doors by pulling ground door release handles down, and install main gear door down locks.

(2) Depressurize hydraulic reservoirs by slowly unscrewing filler cap three full turns until all compressed air has escaped. Depressurize auxiliary system by operating rudder.

(3) Disconnect pressure and supply line hoses from auxiliary pump No. 2 and plug pump ports.

(4) Connect external hydraulic power pressure hose to auxiliary pump No. 2 pressure line, and external power return line to pump supply line.

(5) Connect external electrical power.

(6) Make sure that bypass valve handle and interconnect valve switch are in "CLOSED" position.

(7) Slowly open external hydraulic power shutoff valve and increase pressure to 3400 psi.

(8) Check valve connections for leakage.

(9) Increase pressure slowly.

(10) Observe pressure at which relief valve opens. This pressure should be between 3400 and 3600 psi.

(11) Check that relieved pressure does not drop below 3100 psi.

(12) Reduce pressure to zero and disconnect external hydraulic power.

(13) Connect auxiliary pump pressure and supply lines to pump.

(14) Pressurize hydraulic reservoirs through ground charging valve.

(15) Move auxiliary pump No. 2 switch to "ON".

(16) Operate rudder pedals to cycle rudder control system to prime bleed the pump, for about 2 minutes.

(17) Remove door down locks and close main landing gear well doors, using interconnect valve and ground door release handles.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATHS

(18) Disconnect external electrical power.

HYDRAULIC ACCUMULATORS - MAINTENANCE PRACTICES

1. Removal/Installation Hydraulic Accumulator

A. General

(1) The accumulators installed in the utility and auxiliary hydraulic systems are similar units having similar maintenance practices. The differences are noted in the combined procedure given below.

(2) A container will be necessary to catch fluid from disconnected hydraulic lines. Take necessary precautions to prevent spillage of hydraulic fluid. Should fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing," Chapter 12.

B. Remove Hydraulic Accumulator

(1) Depressurize hydraulic power systems.

(a) Depressurize utility system by moving bypass valve handle to "BYPASS."

(b) Depressurize auxiliary system by cycling rudder control system until rudder no longer responds hydraulically.

(2) Open right main gear wheel well door and install main landing gear door down lock.

(3) Remove main gear actuator panel R1346.

(4) Depressurize accumulator.

(a) Remove cap.

(b) Very slowly unscrew swivel nut one full turn.

WARNING: DO NOT REMOVE VALVE BODY. THE VALVE ASSEMBLY WOULD BLOW OFF WITH POSSIBLE INJURY TO PERSONNEL.

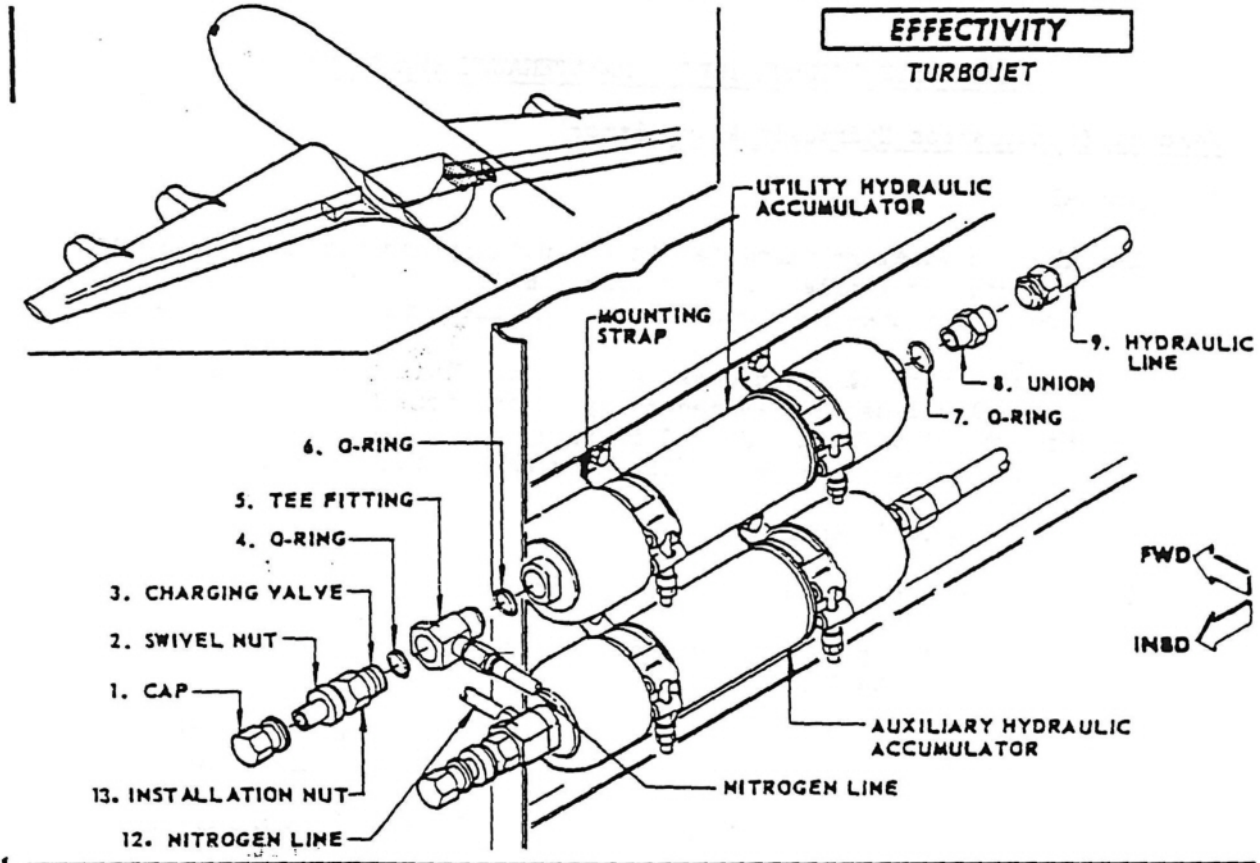
(5) Disconnect and plug nitrogen line (12, figure 201).

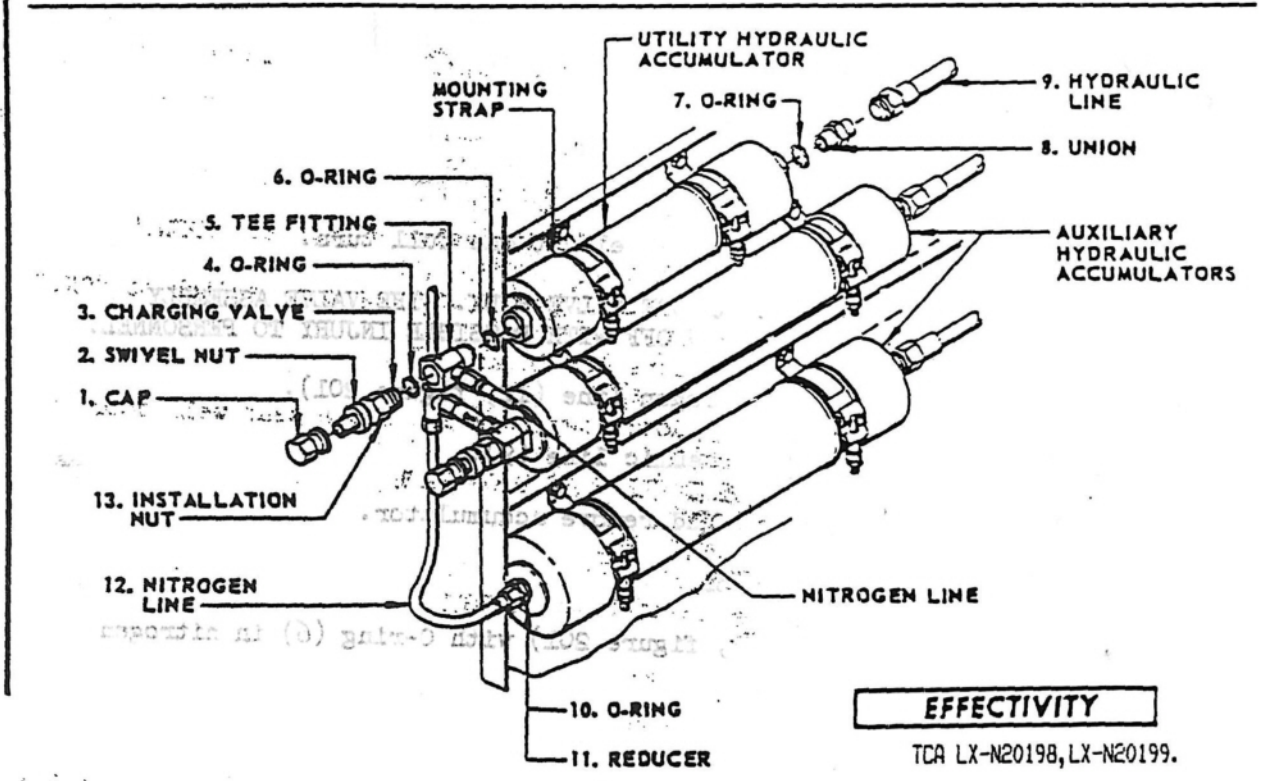
(6) Disconnect and plug hydraulic line (9).

(7) Release mounting strap and remove accumulator.

C. Install Hydraulic Accumulator

(1) Install tee fitting (5, figure 201) with O-ring (6) in nitrogen port of accumulator.





Hydraulic Accumulators Installation
Figure 201

(2) Install charging valve (3) with O-ring (4) in utility and auxiliary accumulator on turbojet airplanes, and in utility and upper auxiliary accumulator on turbofan airplanes.

(a) Tighten charging valve into accumulator by applying 125 (± 5) pound-inches of torque to installation nut (13).

(b) Hold installation nut (13) and back off swivel nut (2).

(3) On turbofan airplanes, install reducer (11) with O-ring (10) in nitrogen port of lowest auxiliary accumulator. Torque reducer to 200 (± 10) pound-inches.

(4) Install O-ring (7) and union (8) in hydraulic port of accumulator. Torque union to 125 (± 5) pound-inches.

(5) Apply enough nitrogen pressure through charging valve to bottom piston in accumulator.

(6) Tighten swivel nut (2) to 50 to 70 pound-inches.

(7) Fill hydraulic side of accumulator with Skydrol 500 and cap union.

(8) Place accumulator inside clamps with charging valve (3) or reducer (13) inboard, align gage line and fitting and secure T-bolts.

(9) Remove caps and connect hydraulic and gage lines.

(10) Service accumulator, refer to Chapter 12, "Air and Nitrogen Servicing."

(11) Install cap (1) on charging valve (3).

(12) Connect external electrical power.

(13) Pressurize hydraulic system.

(a) Open interconnect valve by moving valve switch to "OPEN."

(b) Operate auxiliary hydraulic pump by moving pump switch to "ON."

(14) Check accumulator connections for leaks.

(15) Remove main landing gear door down lock and close gear well door.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(16) Move pump switch to "OFF."

(17) Move interconnect valve switch to "CLOSED."

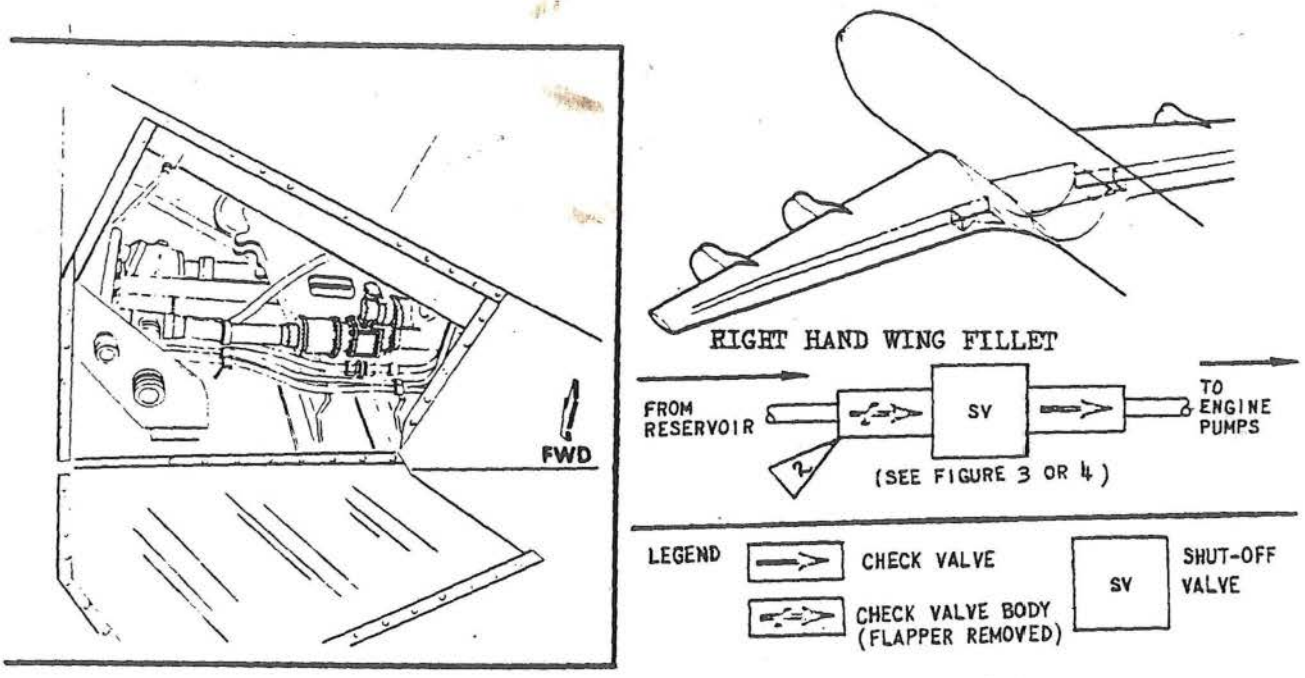
(18) Disconnect external electric power.

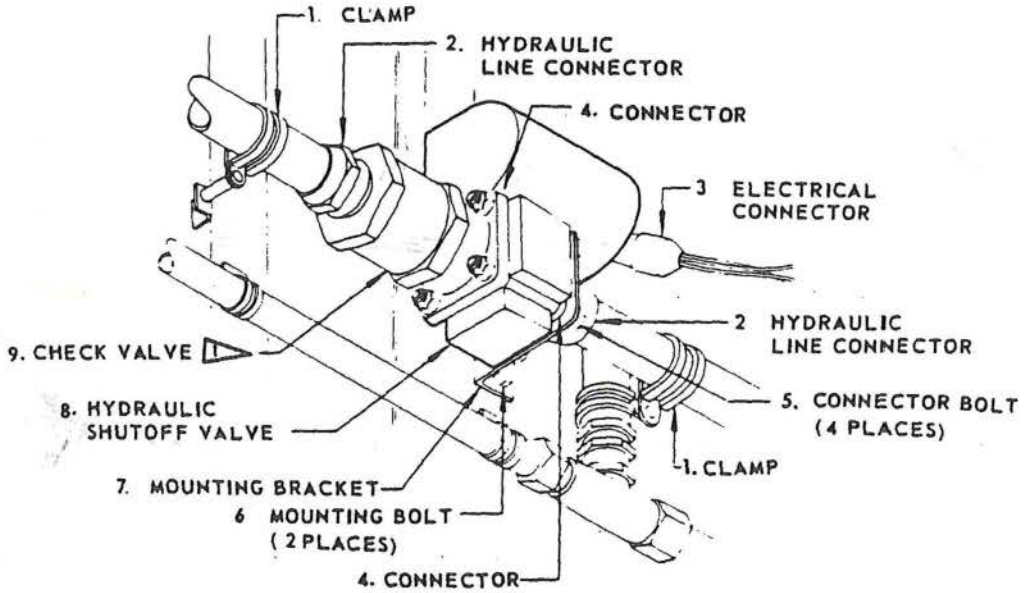
(19) Install main gear actuator panel R1346.

2. Inspection/Check Hydraulic Accumulator

A. Check Hydraulic Accumulator

(1) The utility and auxiliary hydraulic accumulators are in the right wing fillet, just outboard of the right main wheel well. Check accumulators for a pressure loss of not more than 50 psi in a 5 day period.





LEFT WING FILLET SUPPLY SHUTOFF VALVE INSTALLATION SHOWN

1 SABENA 00-SJA THRU 00-SJF
00-SJH AND ON

2 NOT ON 00-SJF AND 00-SJG.

(2) Remove protective caps from hysraulic line ends, and connect hydraulic line connectors (4) to valve assembly.

(3) Install electrical connector (3).

(4) Install hydraulic line clamps (1).

(5) Service utility reservoir. See Chapter 12, "Hydraulic Fluid Servicing."

(6) Bleed supply line.

(7) Test supply shutoff valve.

(8) Close access doors and panels.

2. Adjustment/Test Hydraulic Supply (Fire) Shutoff Valve.

A. Test Hydraulic Supply (Fire) Shutoff Valve.

(1) Open hydraulic access door 1348 and remove hydraulic supply shutoff valve access panel 1349. See Chapter 12, "Access Doors and Panels."

(2) Pressurize utility reservoir and check supply shutoff valve for leaks.

(3) Connect external electrical power and energize essential 28 volt circuit breaker panel (P6). Check that "HYDRAULIC SHUTOFF" circuit breakers are closed.

(4) Pull fire switch of respective engine to operate supply shutoff valve.

(5) Check that supply shutoff valve position indicator shows "CLOSED."

(6) Push engine fire switch back.

(7) Check that supply shutoff valve position indicator shows "OPEN."

(8) Check valve for free and smooth operation.

(9) Install access doors and panels.

(10) Disconnect external electrical power.

HYDRAULIC ACCUMULATORS - MAINTENANCE PRACTICES

1. Removal/Installation Hydraulic Accumulator

A. General

(1) The accumulators installed in the utility and auxiliary hydraulic systems are similar units having similar maintenance practices. The differences are noted in the combined procedure given below.

(2) A container will be necessary to catch fluid from disconnected hydraulic lines. Take necessary precautions to prevent spillage of hydraulic fluid. Should fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing," Chapter 12.

B. Remove Hydraulic Accumulator

(1) Depressurize hydraulic power systems.

(a) Depressurize utility system by moving bypass valve handle to "BYPASS."

(b) Depressurize auxiliary system by cycling rudder control system until rudder no longer responds hydraulically.

(2) Open right main gear wheel well door and install main landing gear door down lock.

(3) Remove main gear actuator panel R1346.

(4) Depressurize accumulator.

(a) Remove cap.

(b) Very slowly unscrew swivel nut one full turn.

WARNING: DO NOT REMOVE VALVE BODY. THE VALVE ASSEMBLY WOULD BLOW OFF WITH POSSIBLE INJURY TO PERSONNEL.

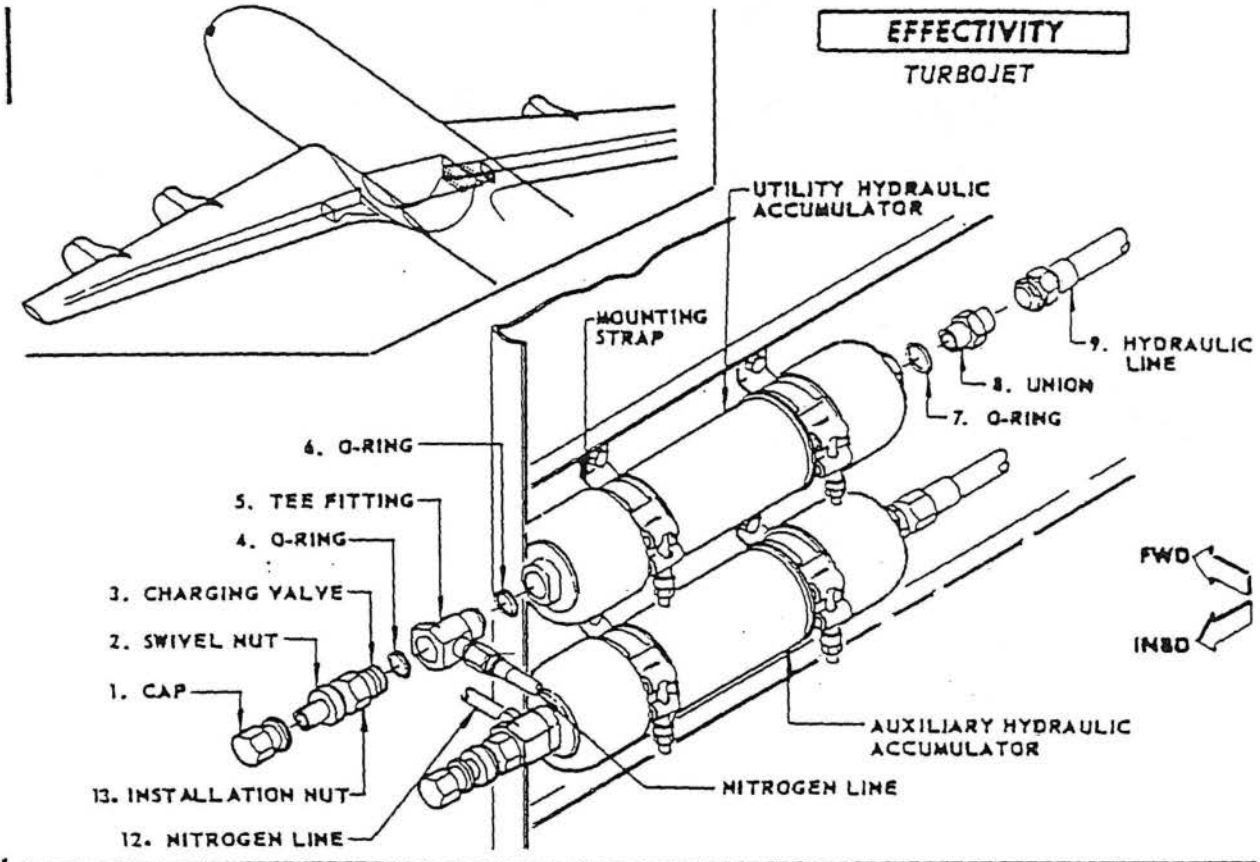
(5) Disconnect and plug nitrogen line (12, figure 201).

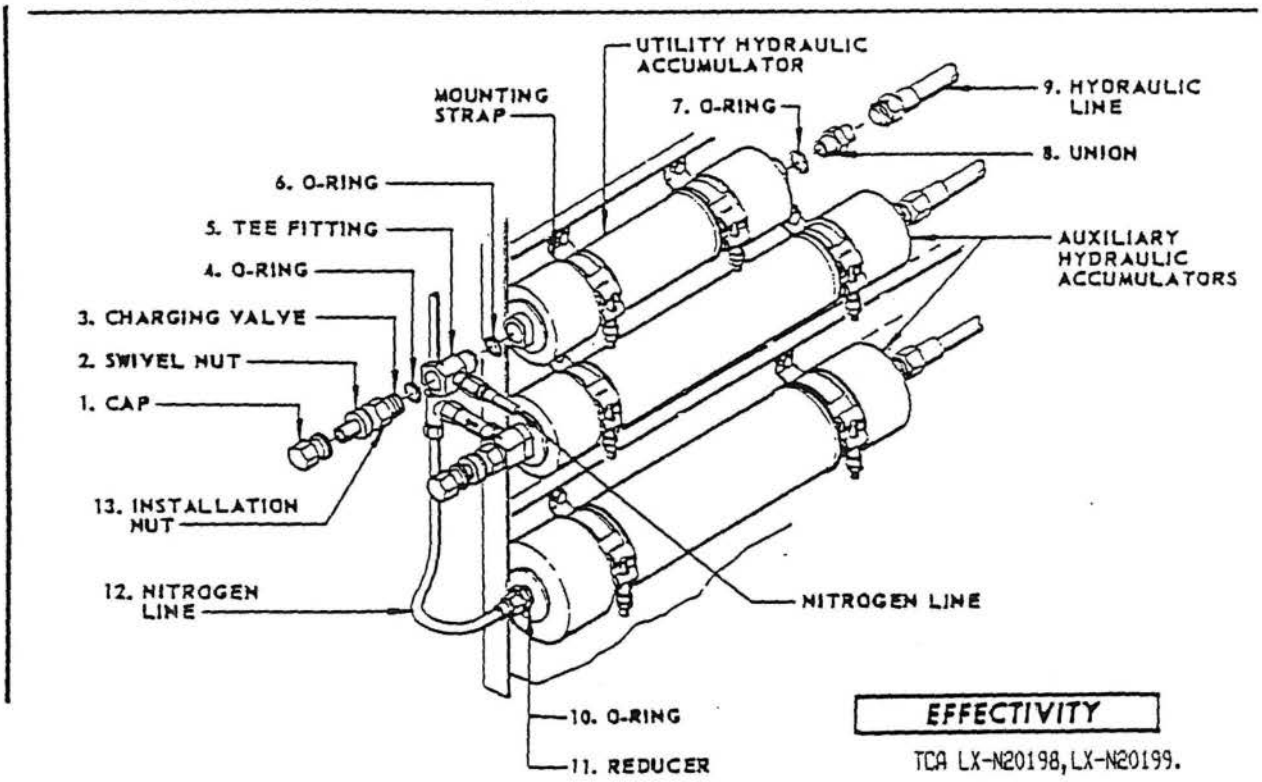
(6) Disconnect and plug hydraulic line (9).

(7) Release mounting strap and remove accumulator.

C. Install Hydraulic Accumulator

(1) Install tee fitting (5, figure 201) with O-ring (6) in nitrogen port of accumulator.





Hydraulic Accumulators Installation
Figure 201

INTERCONNECT VALVES - MAINTENANCE PRACTICES

1. General

   A. The systems interconnect valves are similar units, having identical maintenance practices except for location and access. The systems interconnect valve is connected to the utility and auxiliary pressure lines. The valve is installed in the right main wheel well. (see figure 201.)

   B. The brake interconnect valve is connected to the auxiliary and brake pressure lines, and is installed in the right wing fillet. (see figure 202.)

   C. 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. Hydraulic Service Cart, Skydrol 500, 0-3000 psi, (optional)

   B. Main Wheel Well Door Down Lock - F71127 or equivalent.

   C. Dry Air Source, 50 psi.

3. Removal/Installation Systems Interconnect Valve

   A. Remove Systems Interconnect Valve

      (1) Open main landing gear well door by pulling ground door release handle down, and install wheel well door down lock.

      WARNING: PERSONNEL STAND CLEAR OF DOOR PATH

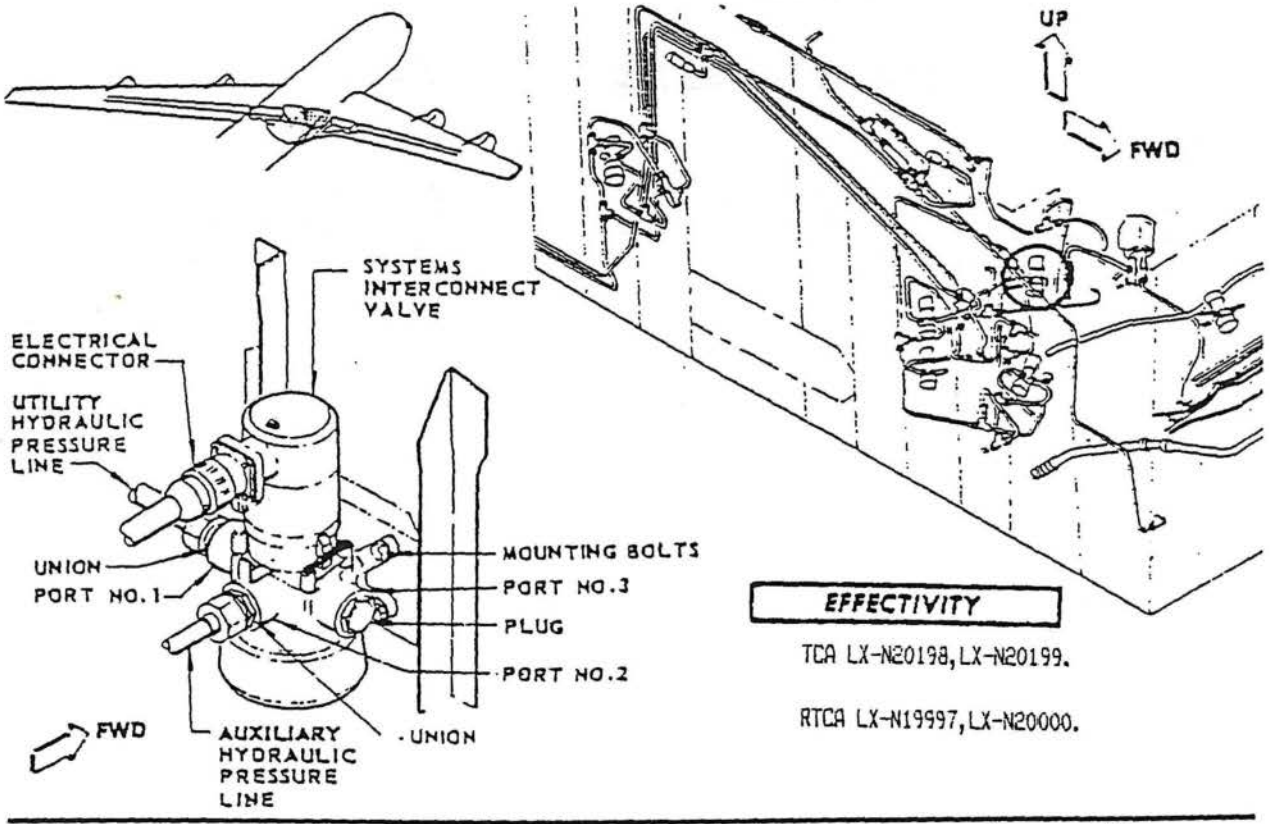
      (2) On airplanes OO-SJA through OO-SJE remove main gear actuator access panel, L1346. See "Access Doors and Panels," Chapter 12.

      (3) Depressurize the utility hydraulic reservoir by slowly unscrewing filler cap three full turns until compressed air has escaped.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (4) Depressurize auxiliary hydraulic system by cycling rudder control system until rudder no longer responds hydraulically.

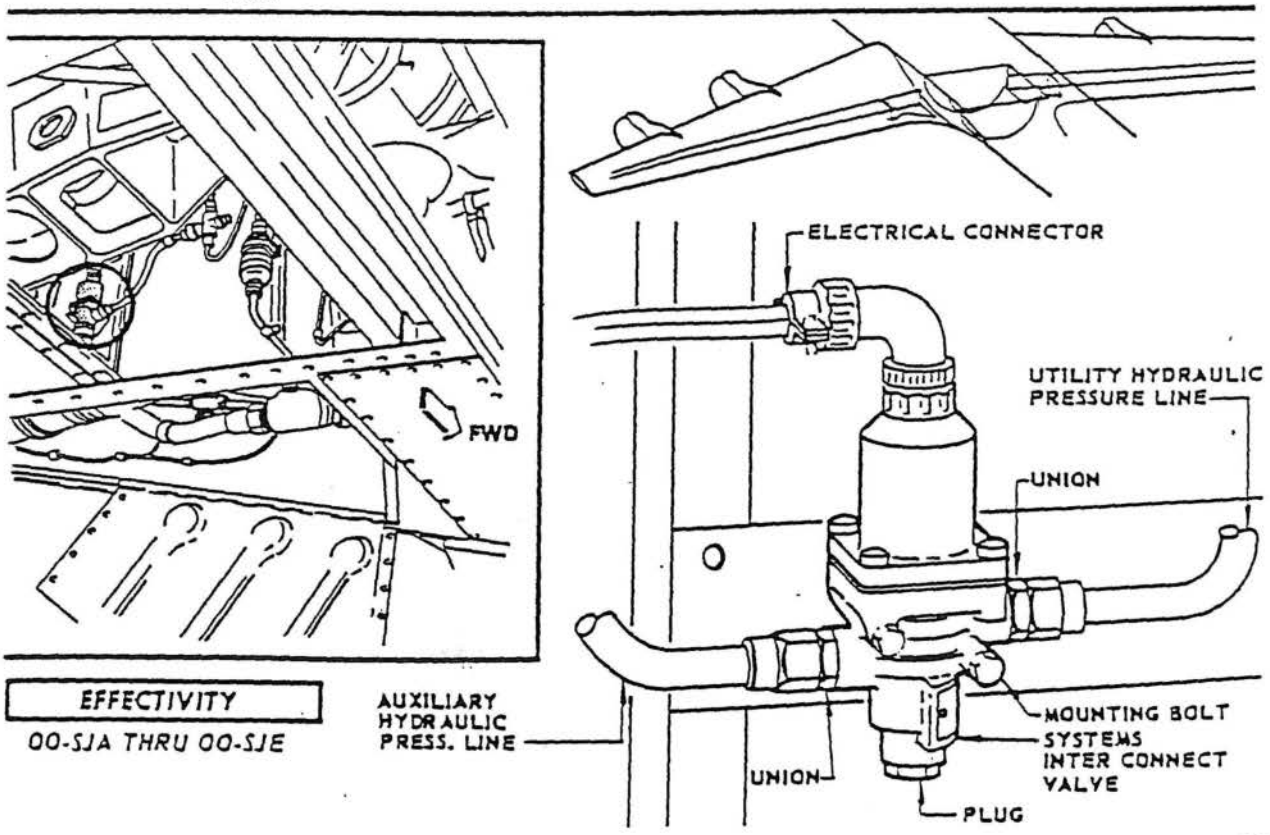
      (5) Depressurize utility hydraulic system by moving bypass valve handle to "BYPASS."



EFFECTIVITY

TCA LX-N20198, LX-N20199.

RTCA LX-N19997, LX-N20000.



EFFECTIVITY

00-SJA THRU 00-SJE

Systems Interconnect Valve Installation
Figure 201

(6) Disconnect electrical connector, (figure 201).

(7) Disconnect and plug hydraulic lines.

(8) Remove mounting bolts and remove systems interconnect valve.

B. Install Systems Interconnect Valve

(1) Install O-ring and union in ports 1 and 2 and O-ring and plug in port 3. Lockwire plug.

(2) Position interconnect valve (figure 201) and install mounting bolts.

(3) Connect hydraulic lines.

(4) Install connector plug.

(5) Return bypass valve handle to closed position and lockwire.

(6) Test systems interconnect valve.

4. Removal/Installation Brake Interconnect Valve (OO-SJA AND ON)

A. Remove Brake Interconnect Valve

(1) Open right main landing wheel well door by pulling ground door release handle down, and install wheel well door down lock.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

(2) Open hydraulic access door R1348. See Chapter 12, "Access Doors and Panels."

(3) Slowly unscrew utility reservoir fillet cap three turns to vent pressurization air. Depressurize utility and auxiliary pressure lines by rotating aileron control wheel to operate spoilers.

(4) Depressurize brake pressure lines by fully depressing and releasing brake pedals about eight times.

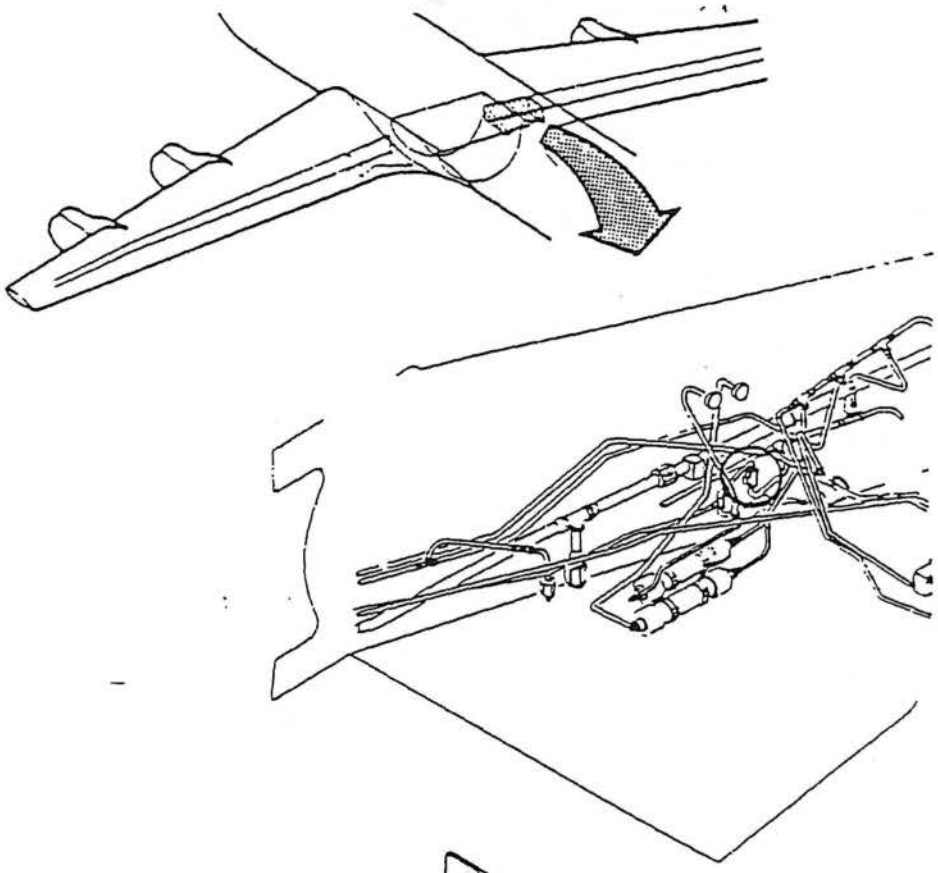
(5) Disconnect electrical connector from brake interconnect valve. (See figure 202.)

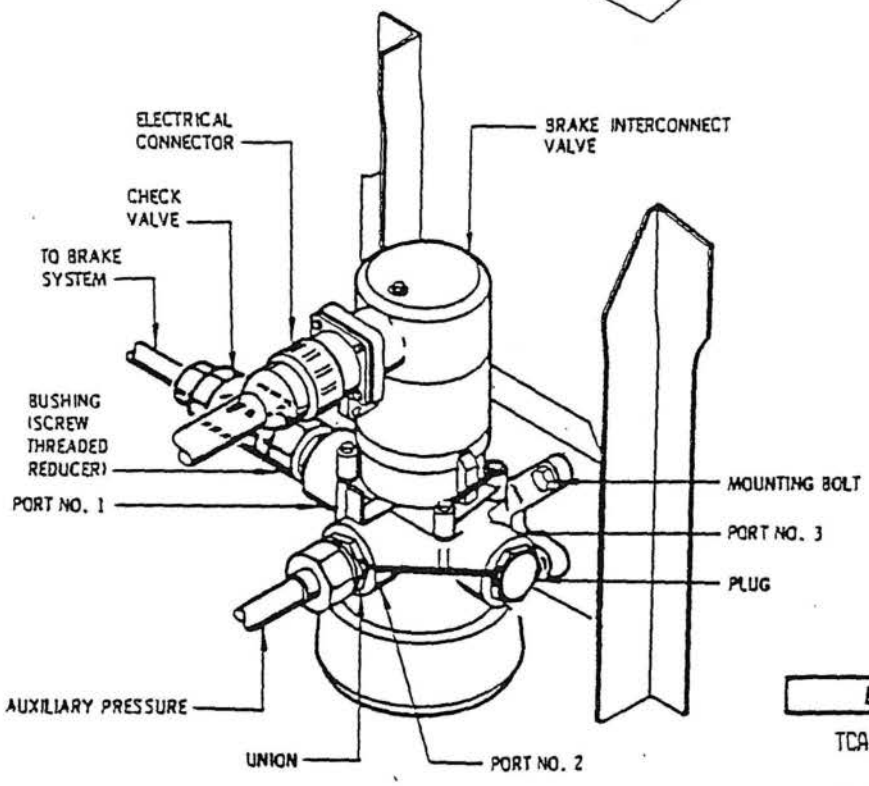
(6) Disconnect hydraulic lines from interconnect valve assembly plug line ends.

NOTE: Leave check valve attached to valve assembly.

(7) Remove mounting bolts and remove valve assembly.

(8) Remove check valve from valve assembly.





EFFECTIVITY

TCA LX-N20198,LX-N20199.

RTCA LX-N19997,LX-N20000.

Brake Interconnect Valve Installation
Figure 202

B. Install Brake Interconnect Valve

(1) Prepare valve for installation.

(a) Install O-ring, bushing-screw threaded reducer, O-ring and check valve in port No. 1. Install check valve with arrow pointing away from valve.

(b) Install O-ring and plug in port No. 3. Lockwire plug.

(c) Install O-ring and union in port No. 2.

(2) Position brake interconnect valve assembly in position and install mounting bolts.

(3) Connect hydraulic line to valve assembly.

(4) Install electrical connector plug.

(5) Test brake interconnect valve.

(6) Remove door down lock and close right main wheel well door by ground door release handle.

WARNING: PERSONNEL STAND CLEAR OF DOOR PATH.

5. Adjustment/Test Systems Interconnect Valve

A. General

(1) The system interconnect valve can be tested by using either auxiliary system pump, or external hydraulic power (whichever method is more conveient).

B. Test Systems Interconnect Valve using Auxiliary Hydraulic System Pump

(1) Remove main gear actuator access panel L1346.

(2) Connect external electrical power.

(3) Pressurize hydraulic reservoirs with compressed air connected to ground pressurization valve.

(4) Pressurize hydraulic systems.

(a) Move interconnect valve switch to "OPEN."

(b) Operate auxiliary hydraulic pump by moving pump switch to "ON."

CAUTION: MAKE CERTAIN BYPASS VALVE IS CLOSED BEFORE PRESSURIZING UTILITY SYSTEM. RETURN LINES WILL NOT STAND HIGH PRESSURE.

(5) Check for equal pressure in both systems.

(6) Check valve connections for leakage.

(7) Move pump switch to "OFF" and interconnect valve switch to "CLOSED."

(8) Depressurize utility system by moving bypass valve handle to "BYPASS." After a few seconds move handle lock to "CLOSED."

(9) Check that auxiliary pressure gage indicates 3000 psi and utility pressure gage indicates pressure of accumulator nitrogen charge.

(10) Disconnect external electrical power.

(11) Install access panel.

C. Test Systems Interconnect Valve Using External Hydraulic Power

(1) Remove main gear actuator access panel L1346.

(2) Open right side hydraulic access door R1348.

(3) Connect external hydraulic power to ground test connections

(4) Connect external electrical power.

(5) Move interconnect valve switch to "OPEN."

CAUTION: MAKE CERTAIN BYPASS VALVE IS CLOSED BEFORE PRESSURIZING UTILITY SYSTEM. RETURN LINES WILL NOT STAND HIGH PRESSURE.

(6) Slowly open external hydraulic power shutoff valve and increase pressure to 3000 psi.

(7) Check for equal pressure in both systems.

(8) Check valve connections for leakage.

(9) Move interconnect valve switch to "CLOSED," and close external shutoff valve.

(10) Depressurize utility system by moving bypass valve handle to "BYPASS." After a few seconds move handle back to "CLOSED."

(11) Check that auxiliary pressure gage indicates 3000 psi and utility pressure gage indicates pressure of accumulator nitrogen charge.

(12) Reduce pressure to zero and disconnect external hydraulic power.

(13) Close access door and install access panel.

(14) Disconnect external electrical power.

6. Adjustment/Test Brake Interconnect Valve (OO-SJA AND ON)

A. General

(1) The brake interconnect valve can be tested by using the auxiliary system pump.

B. Test Brake Interconnect Valve

(1) Open hydraulic access door R1348.

(2) Connect external electrical power.

(3) Pressurize hydraulic reservoirs with compressed air applied at ground pressurization valve.

(4) Pressurize hydraulic systems.

(a) Operate auxiliary hydraulic pump by moving pump switch to "ON."

(b) Move interconnect valve switch to "BRAKE."

(5) Check for equal pressure in auxiliary and brake system.

(6) Check valve connections for leakage.

(7) Move interconnect valve switch to "CLOSED" and pump switch to "OFF."

(8) Depressurize auxiliary system by cycling rudder control system until rudder no longer responds hydraulically.

(9) Check that brake pressure gage indicates 3000 psi and auxiliary pressure gage indicates pressure of nitrogen charge.

(10) Disconnect external electrical power.

(11) Install access panel.

BYPASS VALVE (MANUALLY DEPRESSURIZING) - MAINTENANCE PRACTICES

1. Removal/Installation Bypass Valve

A. General

(1) Bypass valve is accessible through the right main gear strut door opening. A container will be necessary to catch fluid from disconnected hydraulic lines. Should fluid be spilled on the airplane, decontaminate. Refer to "Cleaning and Washing", Chapter 12.

B. Equipment and Material

(1) External Hydraulic Power, 3000 psi operating pressure (optional)

C. Remove Bypass Valve

(1) Depressurize utility reservoir by slowly unscrewing the filler cap three full turns until all compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

(2) Depressurize utility hydraulic system by moving bypass valve handle to "BYPASS". Move bypass valve handle back to "CLOSED".

NOTE: Bypass valve is accessible through the right main gear strut door opening.

(3) Disconnect and plug hydraulic lines (figure 201).

(4) Remove screw which secures valve handle and remove handle.

(5) Remove valve mounting screws and valve.

D. Install Bypass Valve

(1) Install O-ring and union in each port, (figure 201).

(2) Move valve handle to "CLOSED" and remove handle.

(3) Position valve and install mounting screws.

(4) Install valve handle in "CLOSED" position and secure handle with screw.

(5) Connect hydraulic lines.

(6) Test per paragraph 2.B. or 2.C.

(7) Lockwire valve handle in "CLOSED" position.

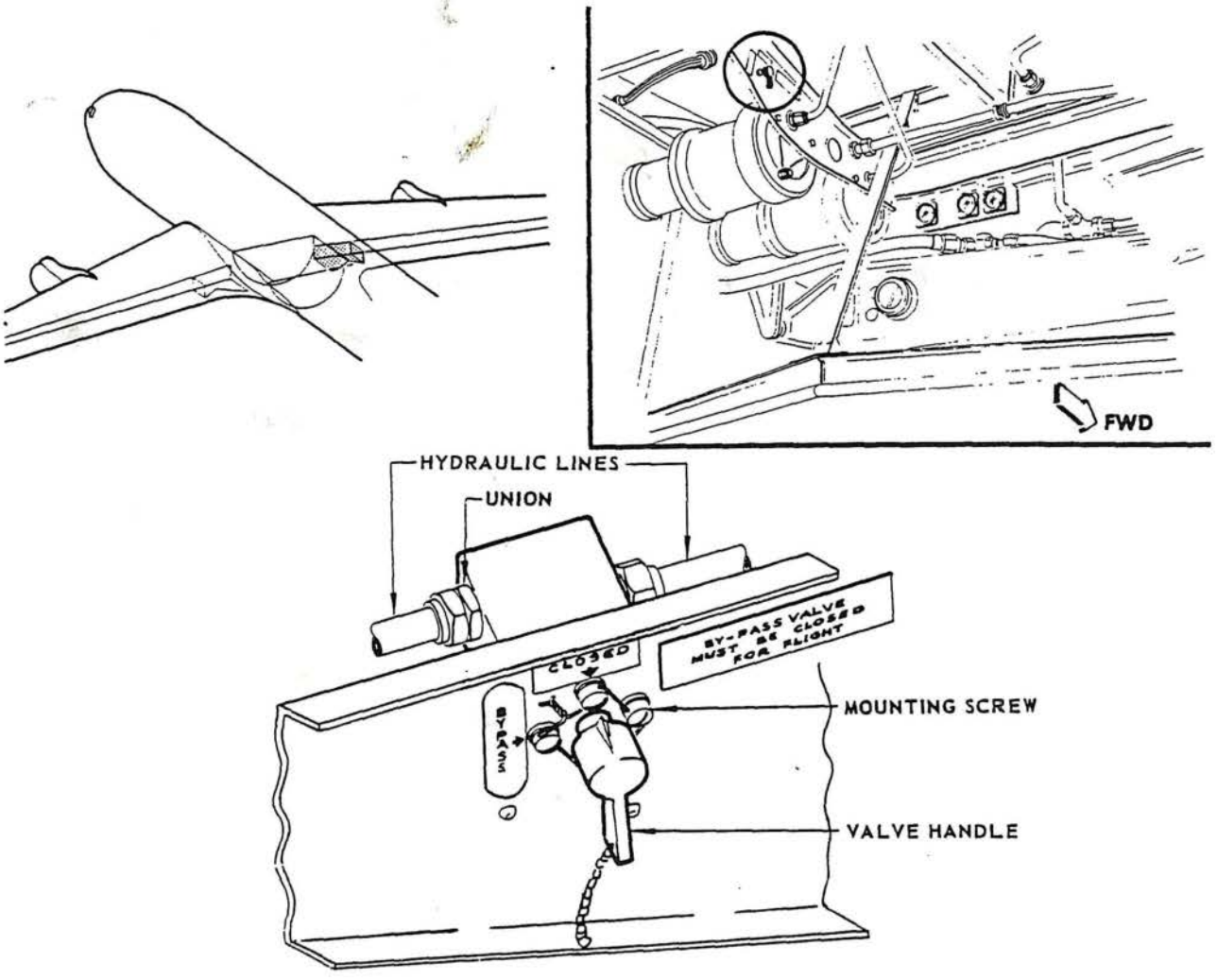
2. Adjustment/Test Bypass Valve

A. General

(1) Bypass valve can be tested by using either auxiliary system pump, or external hydraulic power (whichever method is more convenient).

B. Test Bypass Valve Using Auxiliary System Pump

(1) Connect external electrical power.



Bypass Valve Installation
Figure 201

(2) Open interconnect valves by moving valve switch to "OPEN".

(3) Operate auxiliary hydraulic pump by moving pump switch to "ON".

(4) Check that systems pressure is about 3000 psi.

(5) Move bypass valve handle to "BYPASS".

(6) Check that systems pressure drops to near zero.

(7) Move bypass valve handle to "CLOSED".

(8) Check that pressure rises to 3000 psi.

(9) Check valve connections for leakage.

(10) Move pump switch to "OFF" and interconnect valve switch to "CLOSED".

(11) Disconnect external electrical power.

(12) Lockwire valve handle in "CLOSED" position.

C. Test Bypass Valve Using External Hydraulic Power

(1) Open right side hydraulic access door R1348.

(2) Connect external hydraulic power to ground test connections.

(3) Slowly open external power shutoff valve and increase pressure to 3000 psi.

(4) Move bypass valve handle to "BYPASS".

(5) Check that pressure drops to near zero.

(6) Move bypass valve handle to "CLOSED".

(7) Check that pressure raises to 3000 psi.

(8) Check valve connections for leakage.

(9) Reduce pressure to zero.

(10) Disconnect external hydraulic power.

(11) Lockwire valve handle in "CLOSED" position.

(12) Close hydraulic access door.

END

HYDRAULIC PRESSURE INDICATING SYSTEM - DESCRIPTION AND OPERATION

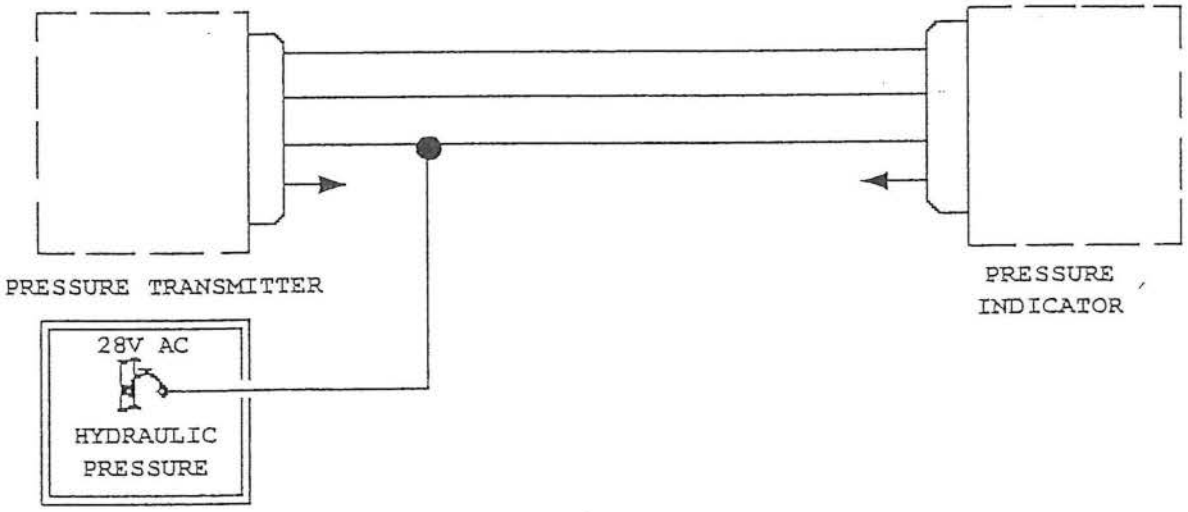
1. General

A. The hydraulic pressure indicating system consists of a variable capacitance transmitter and indicator set, for an indirect indication of pressure in the utility hydraulic power system, and two direct reading pressure gages for the utility and auxiliary system. When the hydraulic systems are de pressurized, the indicating system shows the preload pressure of the accumulator nitrogen charges.

CAUTION : THE VARIABLE CAPACITANCE COMPONENTS ARE NOT INTERCHANGEABLE THE SYNCHRO TRANSMITTER/INDICATOR COMPONENTS DESCRIBED IN 29-12-0.

B. On RTCA A/C LX-N19997 and LX-N20000 the pressure transmitter is connected to the plumbing of the utility system. The transmitter senses pressure changes and sends corresponding electric signals to the pressure indicator on the copilot's instrument panel. The system is powered by 28 volts ac supplied through a circuit breaker on the 28 volt ac circuit breaker panel (P7).

C. The direct reading pressure gages are connected to the nitrogen sides of the utility and auxiliary accumulator. The pressure transmitter and the pressure gages are located in the right wing fillet, near the accumulators (the gages are above the transmitter outboard of the accumulators).



Hydraulic Pressure Indicating System Schematic
Figure 1

HYDRAULIC PRESSURE INDICATING SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Hydraulic Pressure Indicating System

A. Special Tools and Equipment

(1) External Hydraulic Power, 3500 psi maximum pressure

(2) Test Gage 0 - 4000 psi range, with connection fittings

(3) Main Landing Gear Door Down Lock, F-71127 or equivalent

B. Test Hydraulic Pressure Indicating System

(1) Open right main gear wheel well door and install wheel well door down lock.

(2) Open right hydraulic access door R1348.

(3) Connect external hydraulic power at ground test connections, with test gage connected close to the ground test pressure connection.

(4) Connect external electrical power.

(5) Move interconnect valve switch to "OPEN".

(6) Slowly increase hydraulic pressure to 2000 psi on test gage at ambient temperatures below 20°C and to 2200 psi at temperatures above 20°C.

(7) Check that differences in indication of test gage, hydraulic pressure indicator, and systems pressure gages are within 100 psi.

(8) Increase hydraulic pressure by increments of 200 psi, up to 3000 psi.

(9) After each increment, check that difference between indications is within 100 psi.

(10) Slowly increase pressure to 3400 psi.

(11) Check pressure transmitter for leakage.

(12) Decrease hydraulic pressure in 200 psi steps, down to accumulator preload pressure.

(13) After each decrease, check that difference between indications is within 100 psi.

(14) Close main landing gear wheel well door.

(15) Reduce pressure to zero and disconnect external hydraulic power and test gage.

(16) Close hydraulic access door.

(17) Disconnect external electrical power.

END

PRESSURE TRANSMITTER - MAINTENANCE PRACTICES

1. Removal/Installation Pressure Transmitter

A. Remove Utility Pressure Transmitter

(1) Open main gear actuator access panel R1346.

(2) Open right main gear wheel well door and install wheel well door downlock.

(3) Depressurize utility accumulator.

(a) Remove cap from nitrogen charging valve.

(b) Very slowly unscrew swivel nut one full turn.

WARNING: DO NOT REMOVE VALVE BODY. VALVE WOULD BLOW OFF WITH POSSIBLE INJURY TO PERSONNEL.

(4) Disconnect nitrogen line from pressure transmitter. (See figure 201.)

(5) Remove connector plug from transmitter.

(6) Remove transmitter mounting screws and remove transmitter.

B. Install Utility Pressure Transmitter

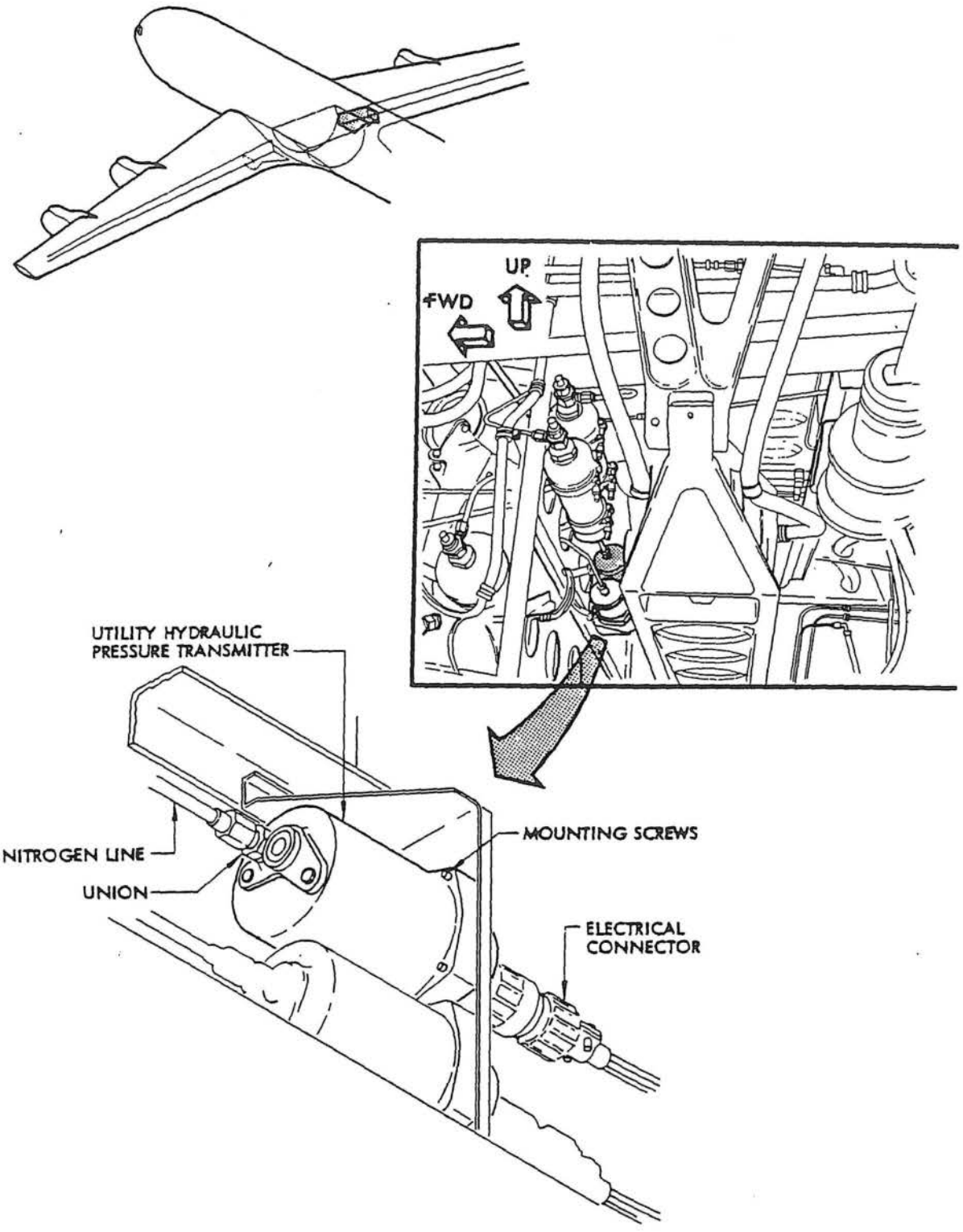
(1) Install O-ring and union in transmitter pressure port. (See figure 201.)

(2) Position transmitter in bracket and install mounting screws.

(3) Connect nitrogen line to transmitter and install connector plug.

(4) Service accumulator. See Chapter 12, Air and Nitrogen Servicing.

(5) Test transmitter per 29-12-01, Test Hydraulic Pressure Indicating System.



Hydraulic Pressure Transmitter Installation
Figure 201

HYDRAULIC PRESSURE GAGE - MAINTENANCE PRACTICES

1. Removal/Installation Hydraulic Pressure Gages

   A. Remove Hydraulic Pressure Gages

      (1) Open right main wheel well door and install wheel well door down lock.

      (2) Depressurize accumulator.

         (a) Remove cap from nitrogen charging valve.

         (b) Very slowly unscrew swivel nut one full turn.

            WARNING: DO NOT REMOVE VALVE BODY. VALVE WOULD BLOW OFF WITH POSSIBLE INJURY TO PERSONNEL.

      (3) Disconnect nitrogen pressure line from gage.

      (4) Remove gage mounting screws (figure 201) and remove gage.

   B. Install Hydraulic Pressure Gage (See figure 201.)

      (1) Install O-ring and union in pressure gage port.

      (2) Position bezel mounting assembly and partly screw in bezel assembly screws.

      (3) Place pressure gage in bracket and partly screw in mounting screws.

      (4) Position pressure gage and tighten bezel screws and mounting screws.

      (5) Connect nitrogen pressure line.

      (6) Service accumulator. Refer to Chapter 12, "Air and Nitrogen Servicing".

      (7) Check gage for leaks. Check that difference in indication of pressure gage and compressed nitrogen source pressure gage is within 100 psi.

      (8) Connect external electrical power.

      (9) Start auxiliary pump by moving auxiliary pump switch to "ON".

(10) Move interconnect valve switch to "OPEN".

(11) Check that both system pressure gages and pressure indicator show about 3000 psi.

(12) Close right main wheel well door.

(13) Stop auxiliary pump by moving pump switch to "OFF".

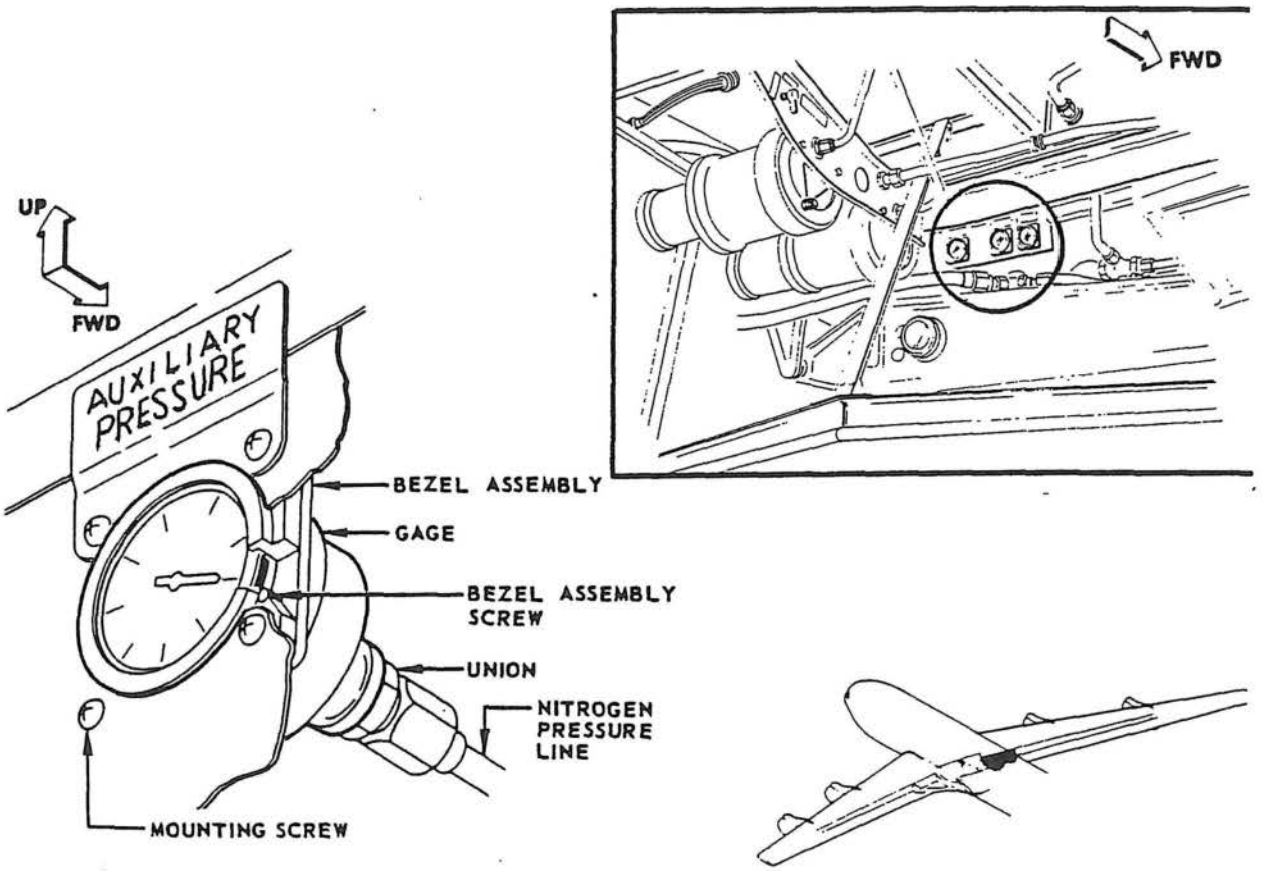
(14) Move interconnect valve switch to "CLOSED".

(15) Disconnect external electrical power.

2. Inspection/Check Hydraulic Pressure Gages

A. Check Hydraulic Pressure Gages

(1) Check pressure gages in the right main gear wheel well for a pressure loss. Pressure drop should not exceed 50 psi in a 5 day period, or 10 psi in 24 hours. Temperatures at the time of readings should not differ more than 10°F.



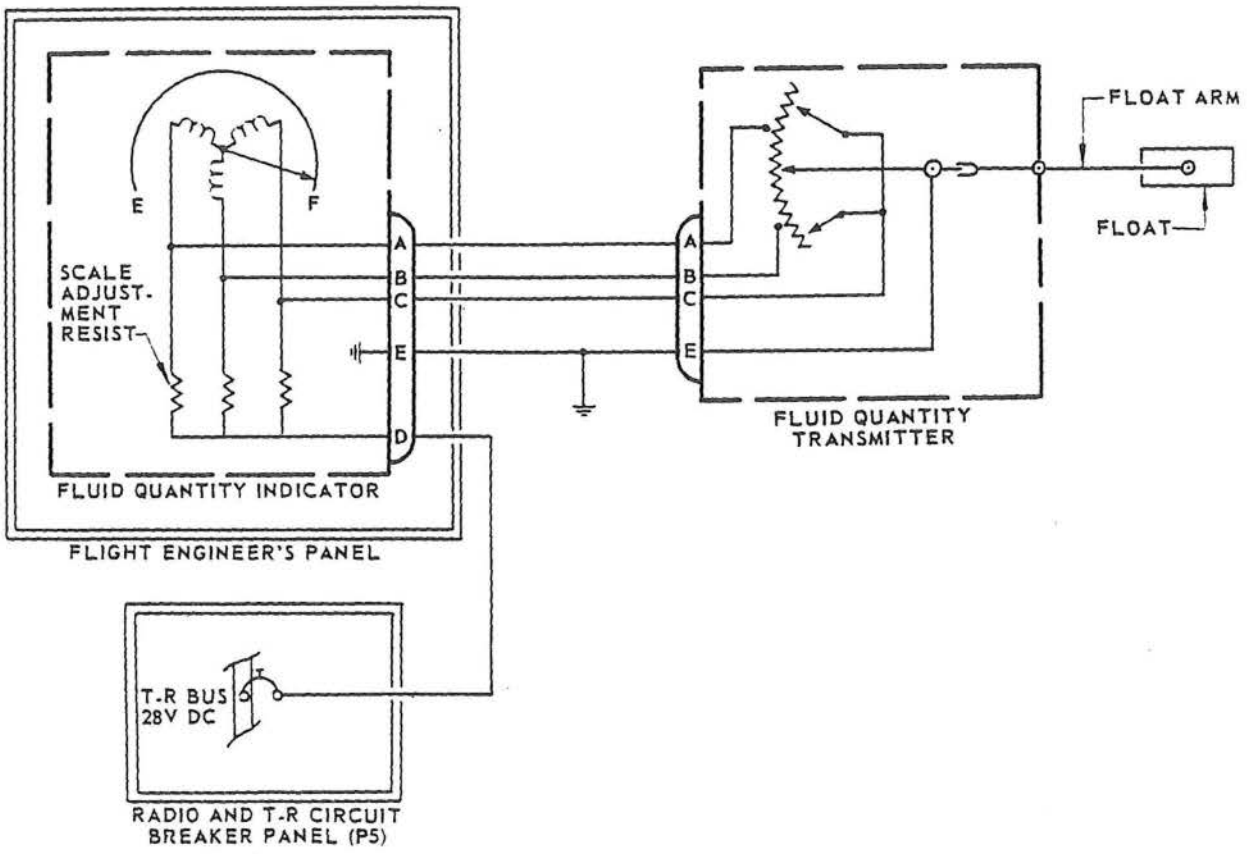
Hydraulic Pressure Gage Installation
Figure 201

HYDRAULIC FLUID QUANTITY INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The hydraulic fluid quantity indicating system provides indication in the control cabin of the fluid quantity in gallons in the utility reservoir. The system consists of a float type level transmitter in the reservoir and an indicator calibrated in gallons and installed on the engineer's instrument panel. (See figure 1.) The system is powered by 28 volts dc supplied through a circuit breaker on the radio and T-R circuit breaker panel (P5). A change in reservoir fluid level causes the float and float arm to move up or down. The float arm actuates sliding contacts of a special variable resistor. Changes in resistor currents are sensed and recorded by the indicator.

B. A magnet in the indicator moves the indicator needle "off scale" when there is no electrical power to the indicator.



Hydraulic Fluid Quantity Indicating System Schematic
Figure 1

HYDRAULIC FLUID QUANTITY INDICATING SYSTEM - ADJUSTMENT/TEST

1. General

   A. A container (approximately 8-gallon capacity) will be necessary to catch any fluid when disconnecting hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.

2. Test Fluid Quantity Indicating System

   A. Open left main gear wheel well door and install main landing gear door downlock.

   B. Open hydraulic access door L1348.

   C. If the hydraulic system has been previously pressurized, depressurize system by turning OFF the hydraulic pumps, cycling the rudder and opening the utility system bypass valve. Close bypass valve after system is depressurized.

   D. Depressurize the utility reservoir.

      (1) On airplanes without a manual depressurization valve, slowly unscrew the reservoir cap three full turns and allow the compressed air to escape.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (2) On airplanes equipped with manual depressurization valve, depress the knurled plunger on the valve body.

      NOTE: Depressurization valve is located above and just aft of the utility reservoir downstream of the air pressure regulator.

   E. Provide electrical power to the airplane and check that the oil quantity indicator circuit breaker is closed.

   F. Check that the reservoir sight glass is fully covered with fluid and that the quantity indicator shows a reading.

   G. Remove the drain plug from the utility reservoir and allow the fluid to drain into an 8-gallon container.

   H. Check that the pointer on the indicator goes down to zero (0).

   I. Replace the drain plug and secure with lockwire.

   J. Test the fluid quantity transmitter. Refer to 29-14-1, Adjustment/Test Fluid Quantity Transmitter.

FLUID QUANTITY TRANSMITTER - 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 Cleaning and Washing, Chapter 12.

2. Remove Fluid Quantity Transmitter

   A. Open left main gear wheel well door and install main gear door downlock.

   B. Open hydraulic access door L1348.

   C. Depressurize utility reservoir.

      (1) On airplanes not equipped with a manual depressurization valve, slowly unscrew reservoir cap three full turns until compressed air has escaped. Tighten cap.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (2) On airplanes equipped with a manual depressurization valve, remove screws and depress knurled button on depressurization valve.

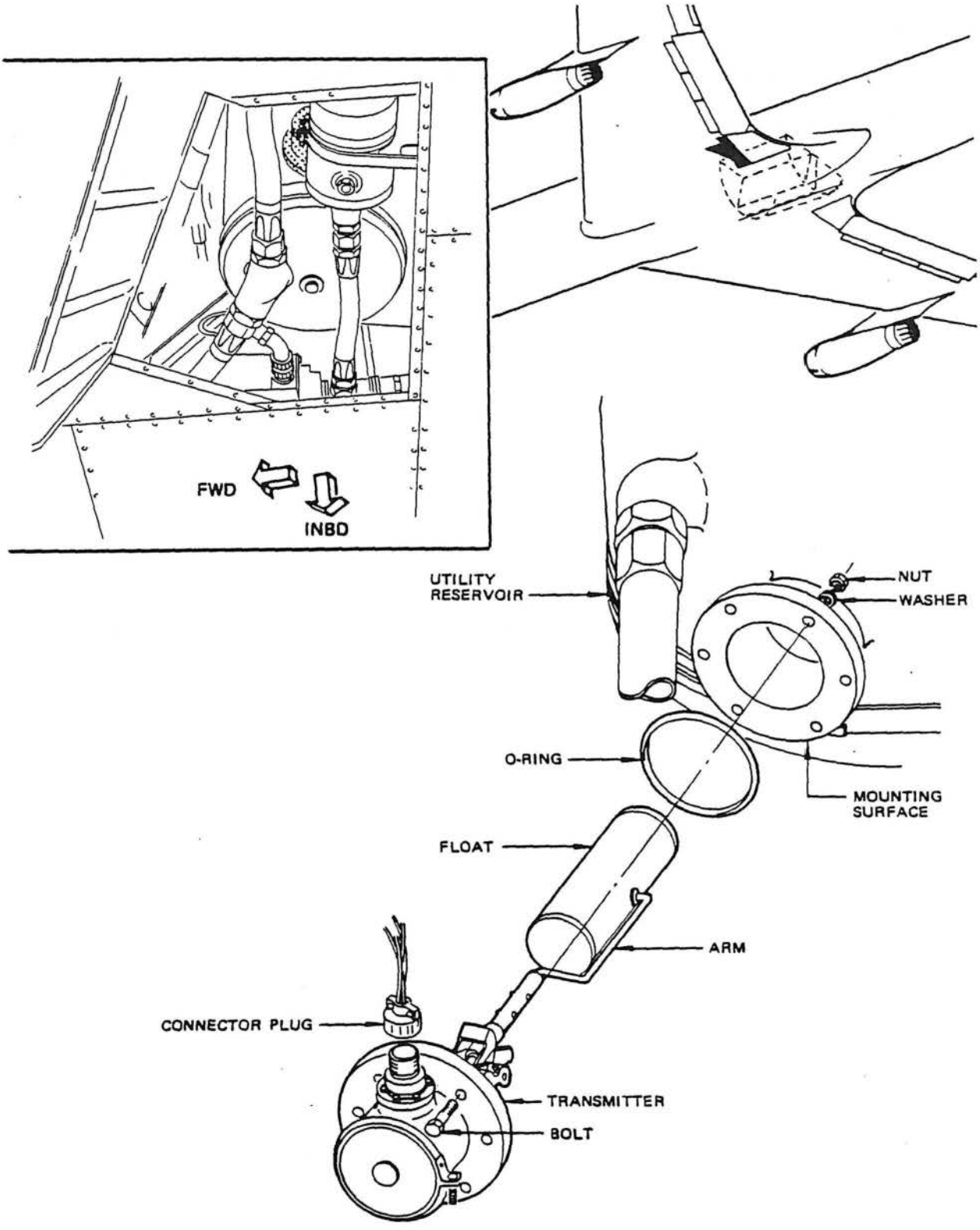
      NOTE: Depressurization valve is located above and just aft of utility reservoir downstream of the air pressure regulator.

   D. Drain utility reservoir by removing the drain plug.

   E. Remove connector plug from transmitter (figure 401).

   F. Remove transmitter mounting bolts.

   G. Slowly move transmitter away from reservoir and carefully pull arm and float through opening.



Fluid Quantity Transmitter Installation
Figure 401

3. Install Fluid Quantity Transmitter

A. Check that mounting surfaces are clean. (See figure 401.)

B. Replace O-ring on flange.

C. Carefully insert float and arm into reservoir opening, position transmitter correctly and secure it with mounting bolts.

D. Install connector plug.

E. Replace the drain plug on the reservoir and secure with lockwire.

F. Test transmitter per Fluid Quantity Transmitter - Adjustment/Test.

HYDRAULIC FLUID QUANTITY TRANSMITTER - ADJUSTMENT/TEST

1. General

   A. A container (approximately 8-gallon capacity) will be necessary to catch any fluid when disconnecting hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.

2. Test Fluid Quantity Indicating System

   A. Open left main gear wheel well door and install main landing gear door downlock.

   B. Open hydraulic access door L1348.

   C. If the hydraulic system has been previously pressurized, depressurize system by turning OFF the hydraulic pumps, cycling the rudder and opening the utility system bypass valve. Close bypass valve after system is depressurized.

   D. Depressurize the utility reservoir.

      (1) On airplanes without a manual depressurization valve, slowly unscrew the reservoir cap three full turns and allow the compressed air to escape.

      CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS DEPRESSURIZED OR FLUID WILL ESCAPE.

      (2) On airplanes equipped with manual depressurization valve, depress the knurled plunger on the valve body.

      NOTE: Depressurization valve is located above and just aft of the utility reservoir downstream of the air pressure regulator.

   E. Provide electrical power to the airplane and check that the oil quantity indicator circuit breaker is closed.

   F. Remove the drain plug from the utility reservoir and allow the fluid to drain into an 8-gallon container.

   G. Check that the pointer on the indicator goes down to zero (0).

   H. Replace the drain plug and secure with lockwire.

   I. Fill the reservoir with hydraulic fluid up to the bottom of the sight glass.

   J. Check that the quantity indicator reads approximately 4.0 U.S. gallons (3.33 Imperial gallons).

   K. Continue filling the reservoir until it contains a measured quantity of fluid equal to its normal capacity as shown on the nameplate.

L. Check that the indicator shows the following reading:

(1) On airplanes with an expansion tank, check that the indicator reads 6 U.S. gallons (5 Imperial gallons).

NOTE: The reservoir will contain 6.9 U.S. gallons (5.7 Imperial gallons) at this maximum reading.

(2) On airplanes without an expansion tank, check that the indicator reads F (full).

M. Close hydraulic access door.

N. Close main wheel well door.

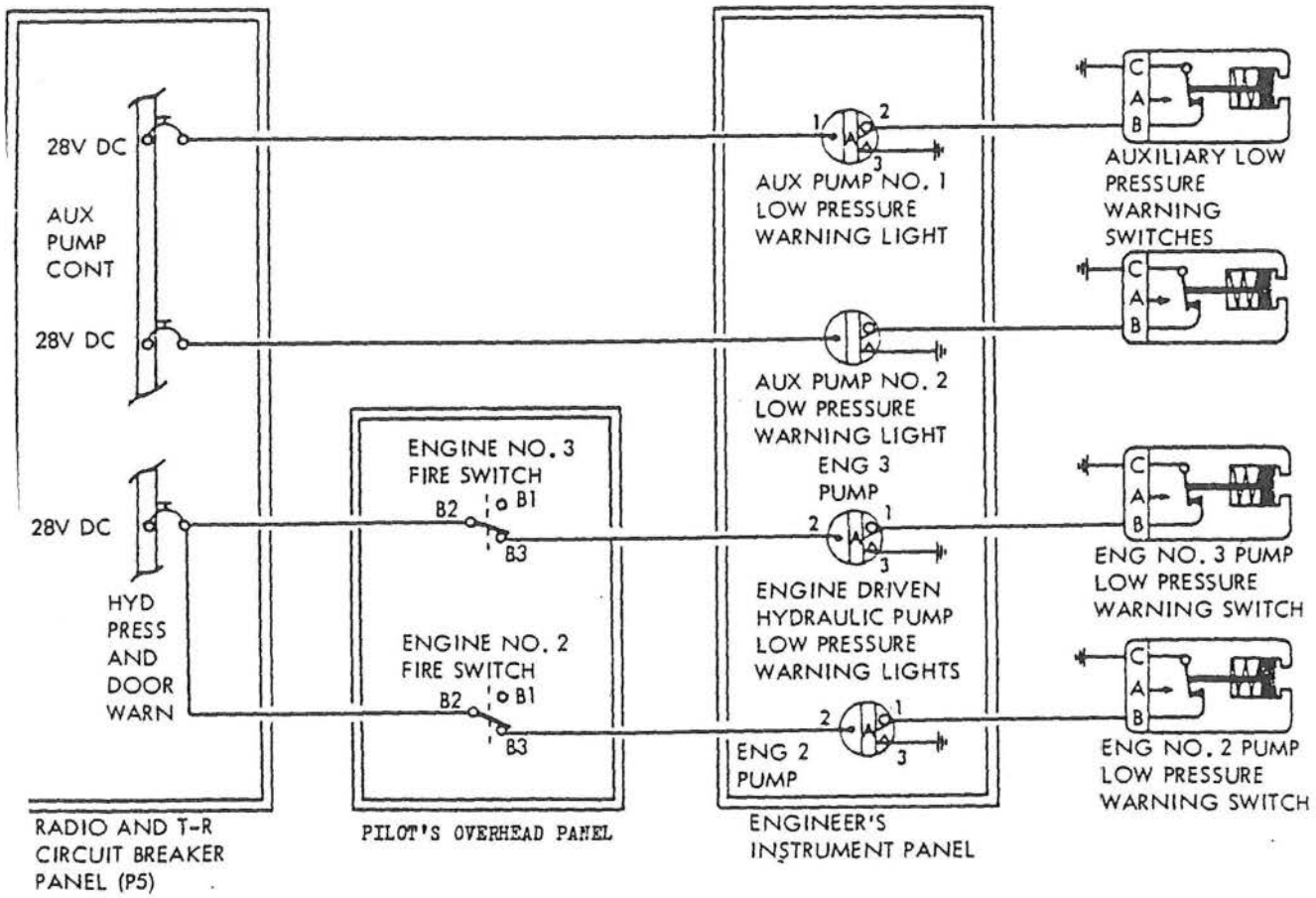
O. Determine whether there is any further need for electrical power on airplane. If not, remove electrical power.

HYDRAULIC LOW PRESSURE WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The hydraulic low pressure warning system (figure 1) gives a visible warning signal when the pump delivery pressure is low. Four independent systems are installed, one for each hydraulic pump. The warning system consists of a low pressure warning switch and an amber low pressure warning light. Each utility pump warning system includes also a switch actuated by the engine fire switch. The warning light illuminates when the electric power is on and the pump does not operate. The light goes off when the pressure in the system increases to 1200 (± 250) psi, and comes on at 100 psi below light-off pressure. The warning system is powered by 28 volts dc supplied through circuit breakers on the radio and T-R circuit breaker panel (P5).

B. The low pressure warning switch for the engine-driven pump is on the rear spar aft of its respective inboard engine. A flow restrictor is installed between the pressure line and switch. The auxiliary system low pressure switches are in the outboard area of the wing fillets. The four low pressure warning lights are on the engineer's instrument panel.



Hydraulic Low Pressure Warning System Circuit
Figure 1

HYDRAULIC LOW PRESSURE WARNING SYSTEM

MAINTENANCE PRACTICES

1. Adjustment/Test Hydraulic Low Pressure Warning System

   A. General

      (1) When testing the low pressure warning systems, each warning system will be pressurized individually.

   B. Equipment and Materials

      (1) External Hydraulic Power, 3000 operating pressure.

   C. Test Utility Hydraulic Pump Low Pressure Warning System

      (1) Connect external electrical power and energize the radio and T-R circuit breaker panel (P5). Check that "HYD PRESS AND DOOR WARN" circuit breaker is closed.

      (2) Check that supply shutoff valves are open.

      CAUTION: MAKE SURE THAT SUPPLY SHUTOFF VALVES ARE OPEN, OTHERWISE THE LEVEL TRANSMITTER AND RESERVOIR WILL BE DAMAGED.

      (3) Open No. 2 engine right cowling panel and connect external hydraulic power at engine hydraulic disconnect panel.

      (4) Slowly increase pressure; low pressure warning light on copilot's instrument panel should extinguish at 1200 ± 250 psi.

      (5) Increase pressure to 3000 psi.

      (6) Check low pressure warning switch for leaks.

      (7) Slowly decrease pressure; check that low pressure warning light on copilot's instrument panel does not illuminate until pressure has dropped 100 psi below actuation pressure. Light must illuminate above 700 psi.

(8) Disconnect hydraulic power from engine No. 2. Reconnect hydraulic lines at disconnect panel and close cowling panel.

(9) Open No. 3 engine right cowling panel and connect external hydraulic power at engine disconnect panel.

(10) Repeat steps (1) through (9) for engine No. 3 utility pump low pressure warning system.

D. Test Auxiliary Hydraulic Pump Low Pressure Warning System.

(1) Connect external electrical power and energize the radio and T-R circuit breaker panel (P5). Check that "AUX HYD PUMP CONT" circuit breaker is closed.

(2) Position No. 1 auxiliary pump switch to "ON."

(3) Check that low pressure warning light on copilot's instrument panel extinguishes at 1200 ± 250 psi.

(4) Check low pressure warning switch for leaks.

(5) Position auxiliary pump switch to "OFF" and decrease pressure by cycling rudder control system.

(6) Check that low pressure warning light on copilot's instrument panel does not illuminate until pressure has dropped 100 psi below actuation pressure. Light must illuminate above 700 psi.

(7) Position No. 2 auxiliary pump switch to "ON" and repeat steps (3) through (6) for No. 2 auxiliary pump low pressure warning system.

(8) Disconnect external electrical power.

HYDRAULIC LOW PRESSURE WARNING SWITCHES - MAINTENANCE PRACTICES

1. General

A. A container will be necessary to catch fluid from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate the area. See Chapter 12, "Cleaning and Washing".

2. Removal/Installation Low Pressure Warning Switches

A. General

(1) Removal and installation procedures of the low pressure switches differ due to switch location and system depressurizing methods.

B. Remove Utility Pump Low Pressure Warning Switch

(1) Depressurize utility system by moving bypass valve handle to "BYPASS".

(2) Open trailing edge panel 1358. See Chapter 12, "Access Doors and Panels".

(3) Remove connector plug from switch. (See figure 201.)

(4) Remove switch mounting screws.

(5) Disconnect hydraulic line from restrictor and remove pressure switch with restrictor.

(6) Cap end of line.

C. Remove Auxiliary Low Pressure Warning Switch

(1) Depressurize auxiliary system by rotating aileron control wheel to operate inboard spoilers.

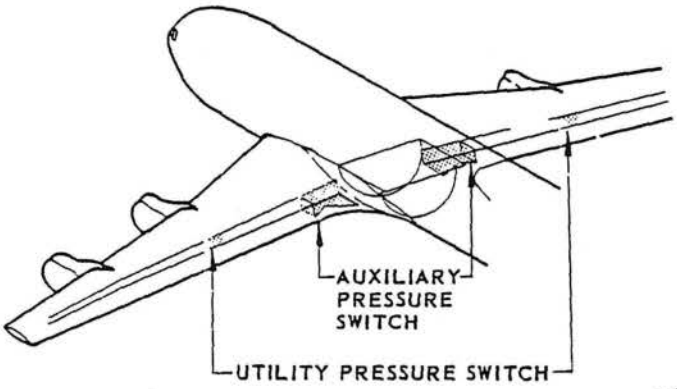
(2) Open main wheel well door and install wheel well door down lock.

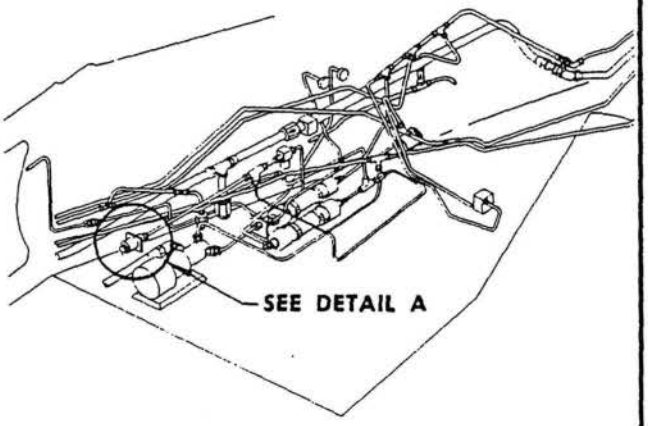
(3) Remove connector plug from switch. (See figure 201.)

(4) Remove switch mounting screws.

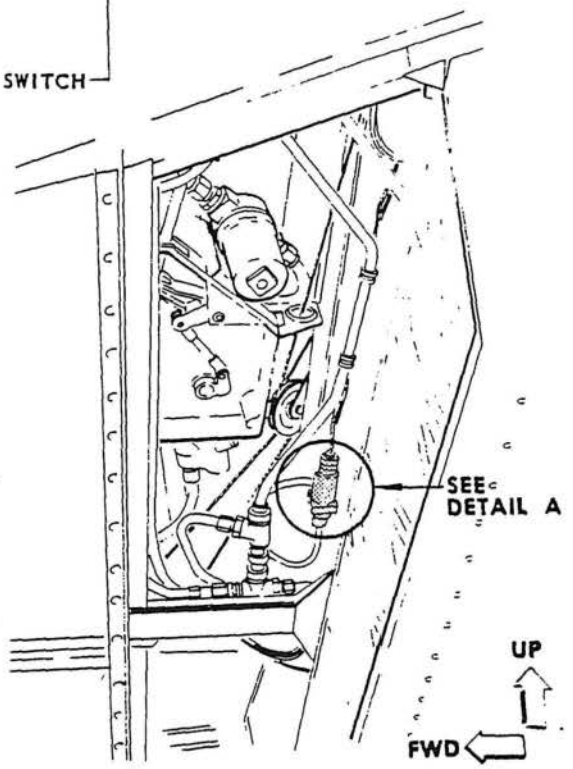
(5) Disconnect hydraulic line from restrictor and remove pressure switch with restrictor.

(6) Cap end of line.

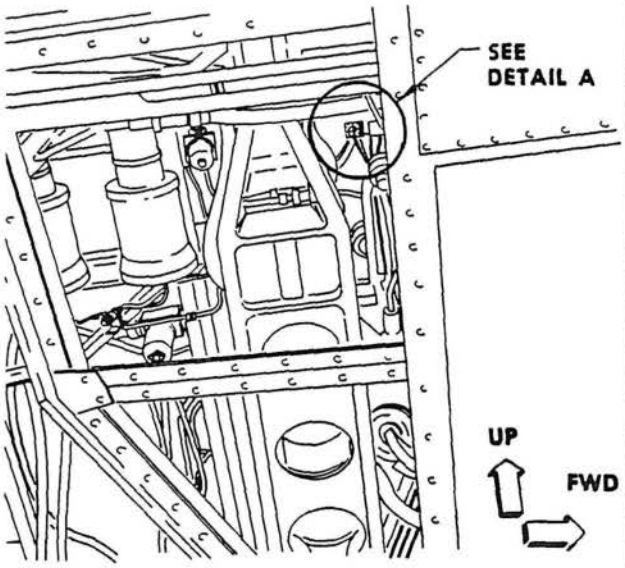




RIGHT WING FILLET AREA

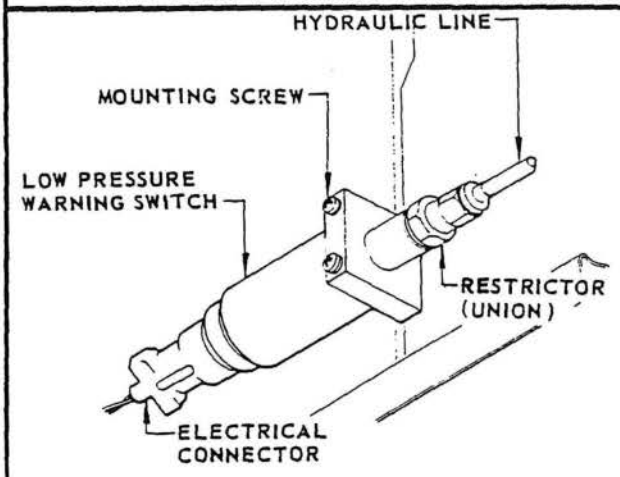


UTILITY LOW PRESSURE SWITCH LOCATION



LEFT WING FILLET AREA

AUXILIARY LOW PRESSURE SWITCH LOCATION



DETAIL A

Hydraulic Low Pressure Warning Switch Installation
Figure 201

D. Install Hydraulic Low Pressure Warning Switch

(1) Install O-ring and restrictor O-ring, and union on pressure switch. (See figure 201.)

(2) Connect switch and restrictor assembly to hydraulic line.

(3) Install switch mounting screws.

(4) Install connector plug.

(5) Pressurize low pressure warning switch.

(a) Close and lockwire bypass valve.

(b) For utility switch: connect external hydraulic power at corresponding engine disconnect panel.

(c) For auxiliary switch: connect external electrical power and move auxiliary pump switch to "ON".

(6) Check switch and restrictor assembly for leakage.

(7) Close main wheel well door by placing ground door release handle up.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

(8) Disconnect external hydraulic or electrical power.

END

BOEING Intercontinental 707

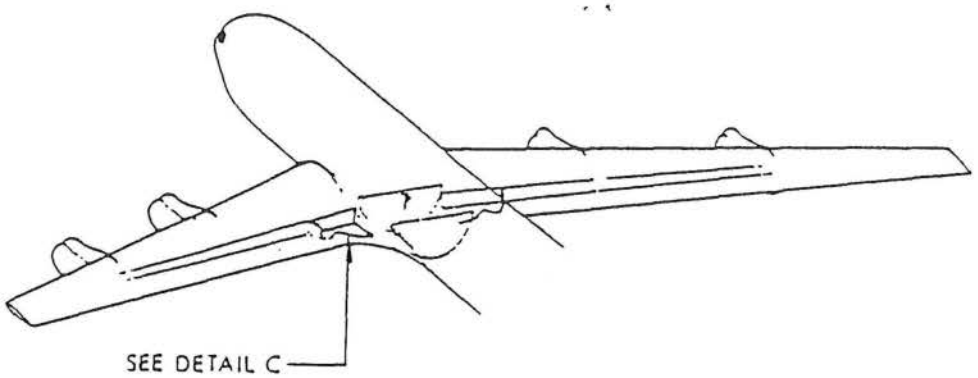
MAINTENANCE MANUAL

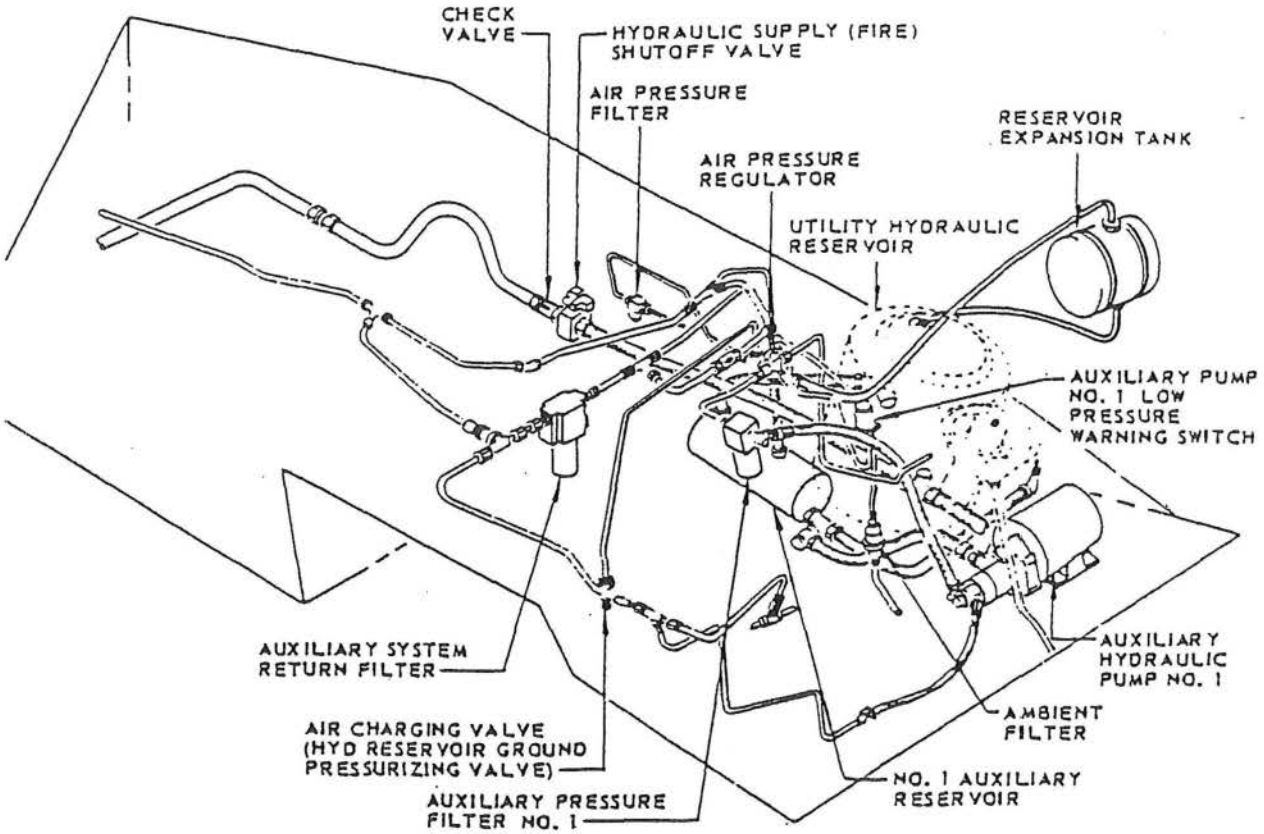
UNIVERSAL AERIAL REFUELING RECEPTACLE SLIPWAY INSTALLATION
HYDRAULIC SYSTEM - DESCRIPTION AND OPERATION

ıiversal Aerial Refueling Receptacle Slipway Installation -
ılic System - Description and Operation, refer to chapter
-01, pages 1 and on.

UNIVERSAL AERIAL REFUELING RECEPTACLE SLIPWAY INSTALLATION
HYDRAULIC SYSTEM - REMOVAL/INSTALLATION

iiversal Aerial Refueling Receptacle Slipway Installation -
ılic System - Removal/Installation, refer to chapter 28-10-01,
401 and on.



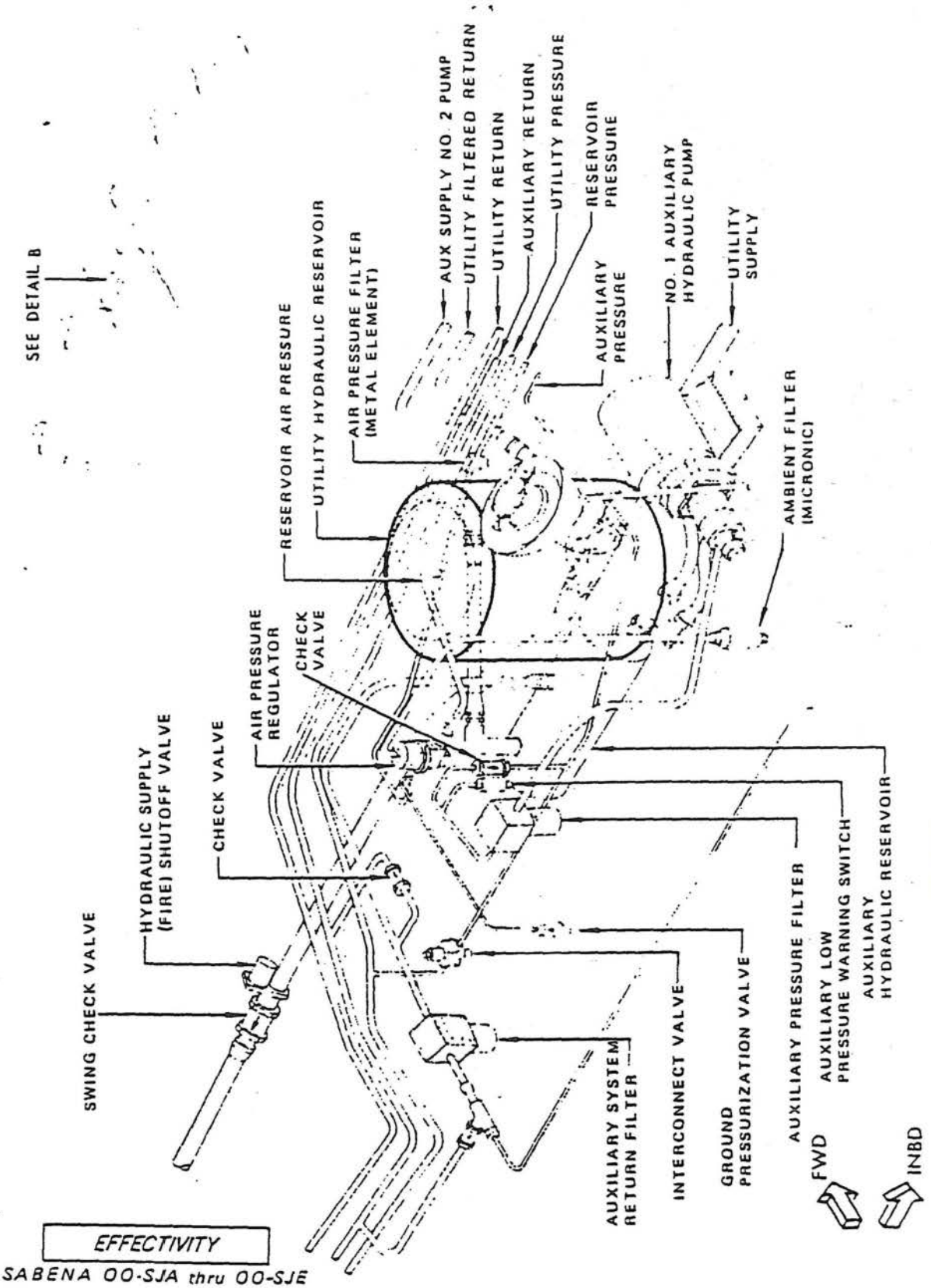


DETAIL C

EFFECTIVITY	
TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000

SB 2195

Hydraulic System Equipment Location
Figure 1 (Sheet 3)



EFFECTIVITY
SABENA OO-SJA thru OO-SJE

Hydraulic System Equipment Location
Figure 1 (Sheet 2)