CHAPTER 29

HYDRAULIC POWER

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 29
HYDRAULIC POWER

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A = Added, R = Revised, D = Deleted, O = Overflow, C = Customer Originated Change

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HYDRAULIC POWER

GENERAL - DESCRIPTION AND OPERATION

1. Description

A. The hydraulic power system consists of two main systems, an auxiliary system, and an indicating system. The hydraulic main and auxiliary systems provide primary and backup power for operating hydraulically actuated systems and subsystems on the airplane. The hydraulic indicating system provides a means for monitoring the hydraulic systems.

B. Main. (Figure 1)(Figure 2)

(1) Main hydraulic power is provided by two, separate, closed-circuit hydraulic systems identified as the left and right systems. One engine-driven hydraulic pump, on each engine, supplies power to the corresponding system. The hydraulic systems are filled with a fire-resistant hydraulic fluid and are normally pressurized by the engine-driven pumps to approximately 3000 psi. Hydraulic power is required for the operation of the elevator boost, rudder, flaps, slats, flight spoilers, ground spoilers, ventral stairway, engine thrust reversers, landing gear, brake, and nosewheel steering systems. Each main hydraulic system is provided with similar components and the necessary controls and indicators for system operation.

(2) The engine-driven hydraulic pumps are mounted on the accessory gear cases of their respective engines and controlled by switches in the flight compartment. Each engine-driven pump is equipped with a solenoid-operated depressurization valve which, when energized, allows a spring-loaded blocking valve to close and shuts off hydraulic pressure to the system, feathers the pump, and ports pump leakage and lubrication fluid through the case drain line and filter and through the system return line filters to the reservoir. The engine-driven pumps are also equipped with solenoid-operated unloading valves to reduce pump output pressure to approximately 1500 psi when full system pressure (3000 psi) is not required during cruise flight. Pressurized fluid from the engine-driven pumps is directed through pressure line filters, located in the aft accessory compartment, before entering pressure lines of the general system.

(3) Overpressure protection is provided by hydraulic system pressure relief valves, one for each system which start to relieve at 3600(±50) psi and return pressure to the system return lines and reservoirs.

(4) Each reservoir contains a supply of hydraulic fluid for the system it serves. System return fluid, except for brake fluid, flows through the system return line filters into the reservoir. The reservoir has a relief and bleed valve, direct fluid level indicator, fluid quantity transmitter, low level switch, and temperature sensor.

(5) A manually operated spoiler shutoff and system depressurization valve is provided for each hydraulic system. It is located in each main gear wheel well and can only be operated when the airplane is on the ground. It is a three-position, rotary-action valve and is installed in the hydraulic pressure line upstream of the flight spoilers. The spoiler shutoff and system depressurization valve functions to isolate and depressurize the flight spoiler subsystem or to depressurize the hydraulic power system, depending upon the position in which it is placed.

(6) Each system is provided with separate ground power service connection panels with quick-disconnect fittings and dust caps for applying external hydraulic power and for filling reservoirs. A ground service handpump in each main gear wheel well is provided for each system. The handpumps can be used to fill the reservoirs or to pressurize the systems for actuation of the various subsystems for ground maintenance.

(7) Hydraulic fluid filtration is provided by five identical, non-bypassing, disposable element filters in each system. Each engine-driven pump is equipped with a pressure line filter and a case drain line filter; the electrically driven (auxiliary) pump in the right system is equipped with a pressure line filter; and two return line filters in parallel are provided to filter all fluid returning to the reservoir. The fifth filter in the left system filters all fluid entering the system from an external source, either the handpump or the ground power connection.

(8) The hydraulic fire shutoff valve, one for each system supply line, is mechanically operated and is normally in the open position. The valve in each system is controlled by a lever in the flight compartment and is closed when the need exists to stop the flow of hydraulic fluid to the engine-driven pumps.

C. Auxiliary

(1) A backup means of pressurizing all systems is provided by one, electric, motor-driven, auxiliary pump and one hydraulically operated, power transfer unit. The electric motor-driven pump pressurizes the right system only. The power transfer unit transfers power from a pressurized system to a depressurized or sufficiently lower pressurized system.

(2) The electric motor-driven pump is capable of supplying a continuous flow of hydraulic fluid at 8 gpm and approximately 2200 psi (15,180 kPa) or 6 gpm and approximately 2750 psi (18,975 kPa). The pump motor operates on 115-volt, 3-phase, 400-cycle power and is controlled by a switch in the flight compartment on the First Officer's Instrument Panel.

(3) The power transfer unit mechanically connects the two systems and enables hydraulic power to be transferred from the higher to the lower system (higher pressure side operates as a motor and lower pressure side as a pump) and supplies a flow of hydraulic fluid at approximately 8 gpm and pressure that may fluctuate within 2000 to 3000 psi (13,800 to 20,700 kPa). The unit is controlled by a single motor operating two shutoff valves, one in each system. Operation is controlled by a separate switch located on the hydraulic control panel on the First Officer's Instrument Panel. The motor operated shutoff valves are also connected electrically to the low level switch on each reservoir, the shutoff valve will automatically close if either system reservoir is below 1-1/3 quarts (1.26 l). The unit and control valves are located in the left main landing gear well.

D. Indication and Control

(1) Indications and controls for the hydraulic power system consist of electrically operated instruments, indicating lights, and control switches located in the flight compartment.

(2) Each system is provided with hydraulic pressure and quantity indicators. Electrical signals for indicator displays are provided by a pressure transmitter in each system pressure line, located in each main gear wheel well, fluid quantity transmitter on each reservoir.

(3) Each system is also provided with high-temperature and low-pressure indicating lights. Electrical signals for illuminating the lights are provided by a temperature switch, located on the bottom of each reservoir and a pressure switch located in each main gear wheelwell.

(4) Switches for controlling the engine-driven pumps, power transfer unit, and electric motor-driven auxiliary pump are provided at the first officer's instrument panel. Master caution lights at the flight crew stations come on whenever any high-temperature or low-pressure light is on.

E. Auxiliary

(1) A backup means of pressurizing all systems is provided by one, electric, motor-driven, auxiliary pump and one hydraulically operated, power transfer unit. The electric motor-driven pump pressurizes the right system only. The power transfer unit transfers power from a pressurized system to a depressurized or sufficiently lower pressurized system.

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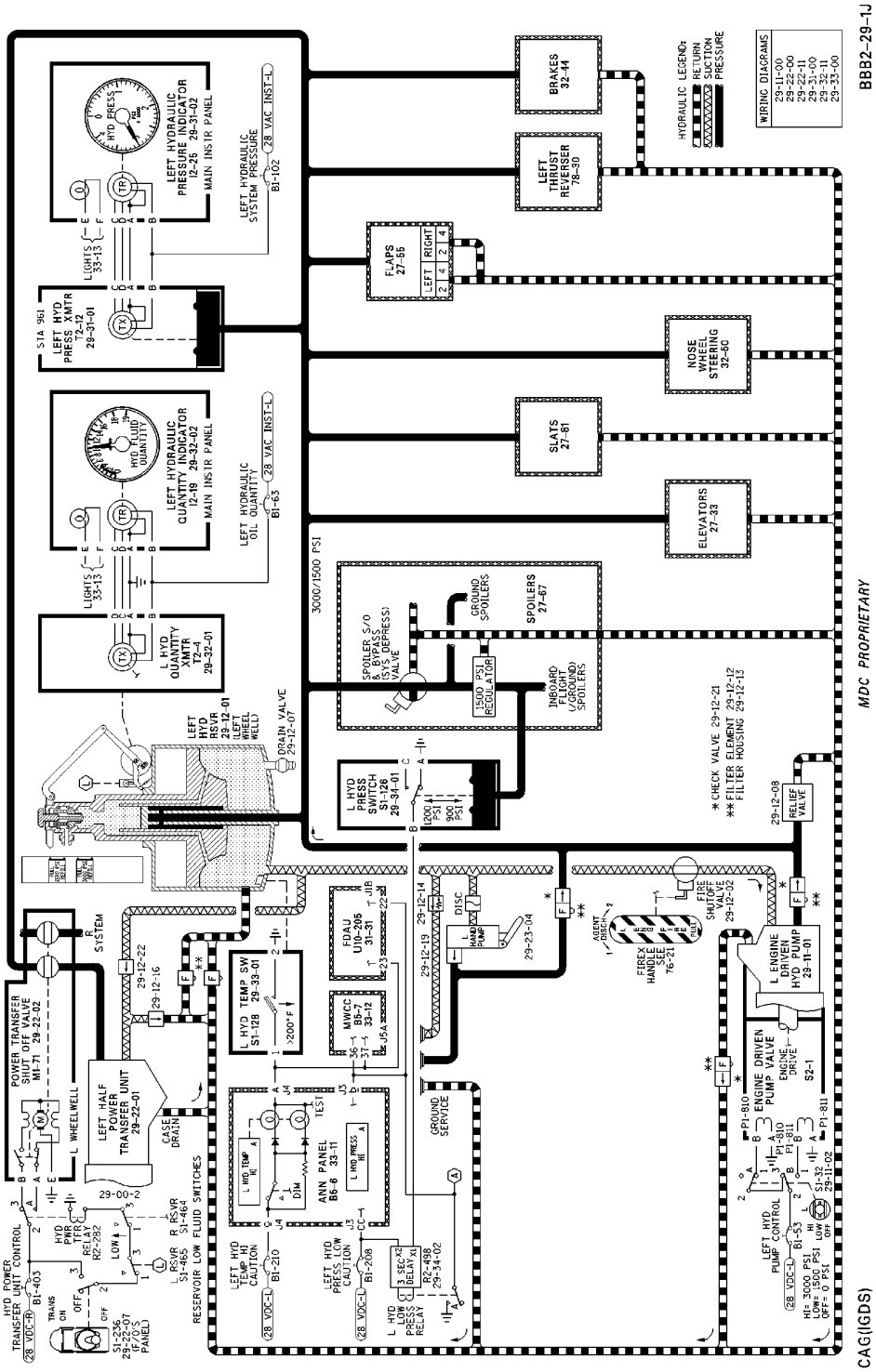

Left Hydraulic System -- Schematic
Figure 1/29-00-00-990-801 (Sheet 1 of 3)

EFFECTIVITY
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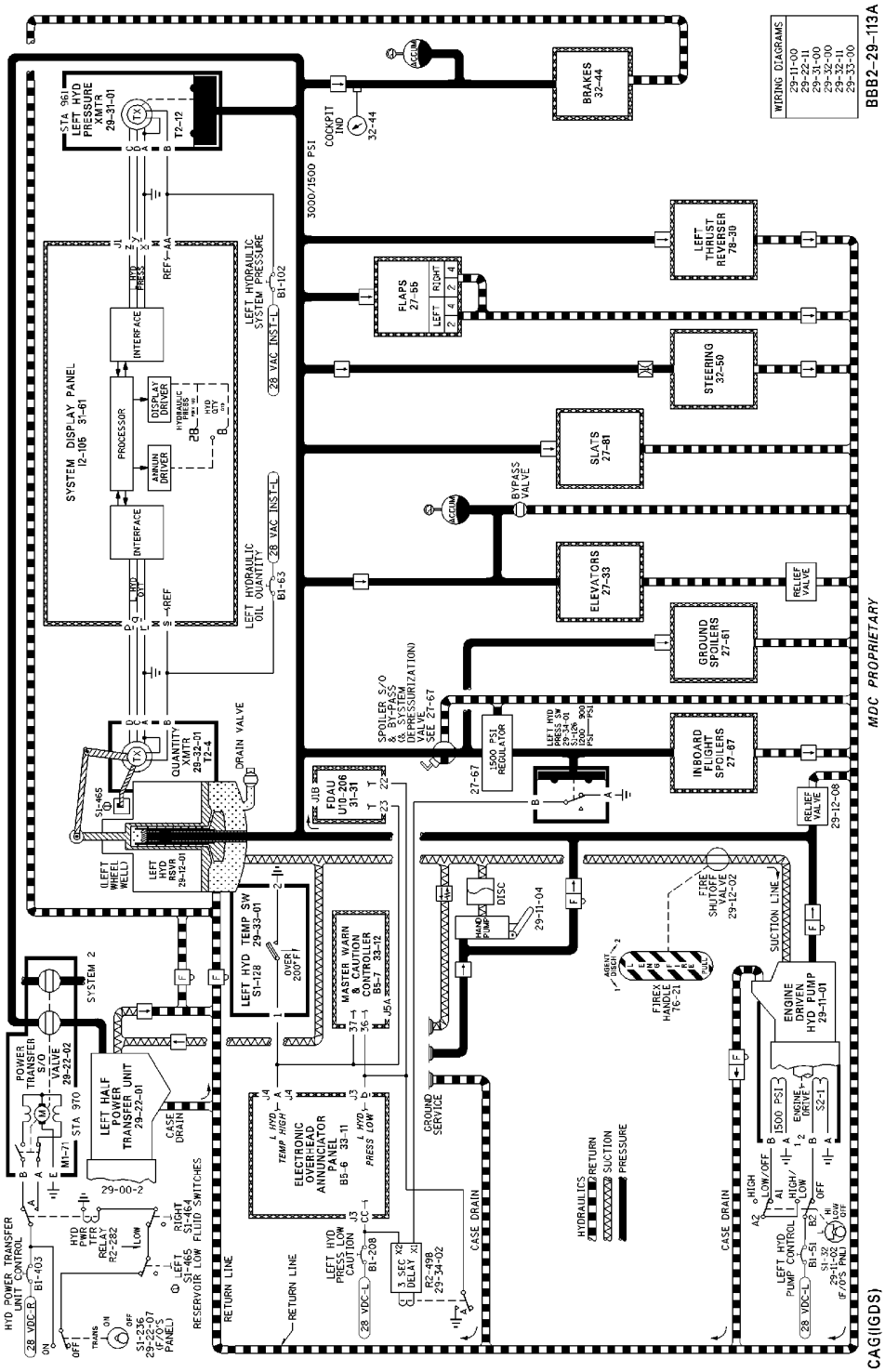
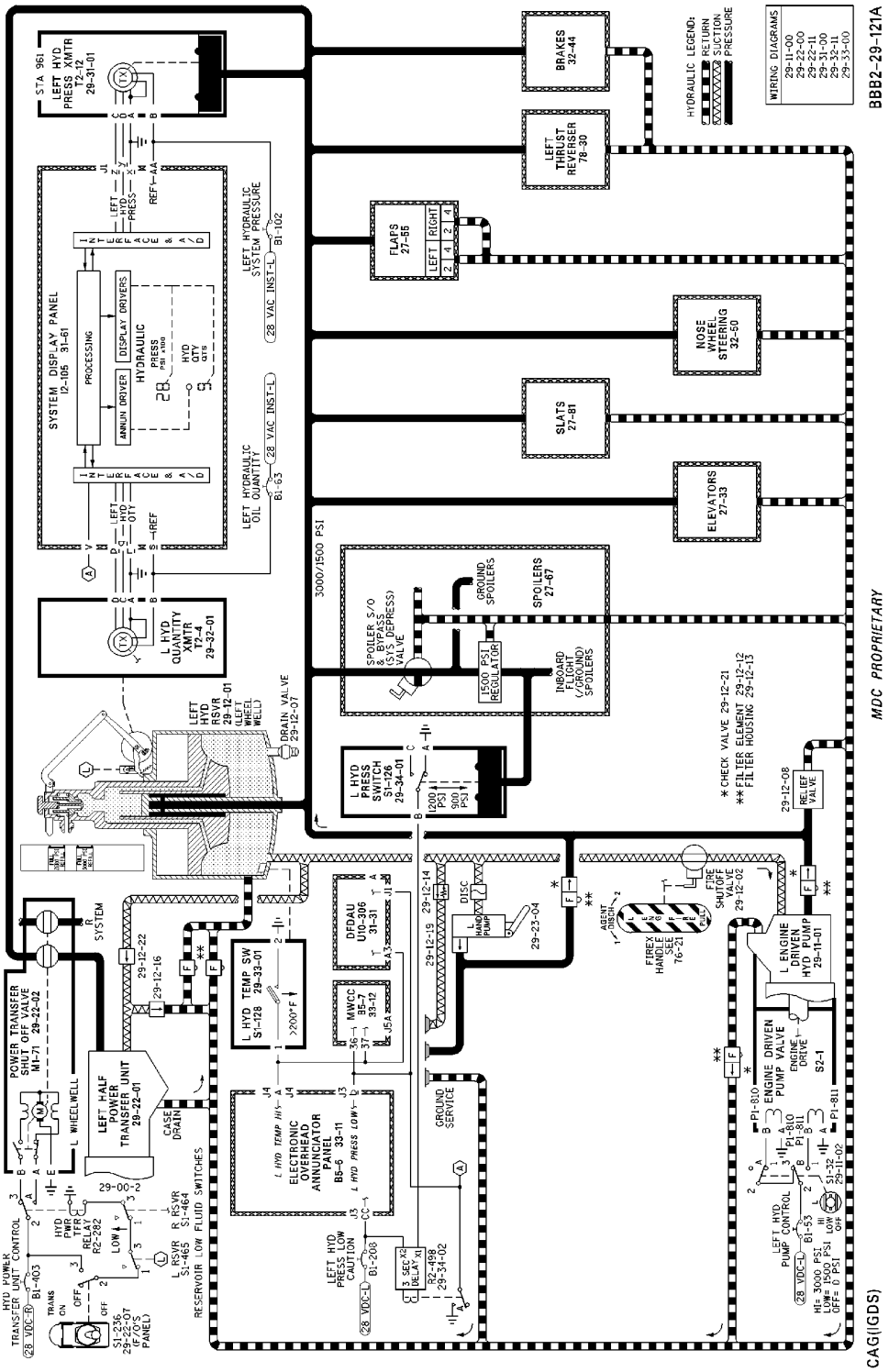
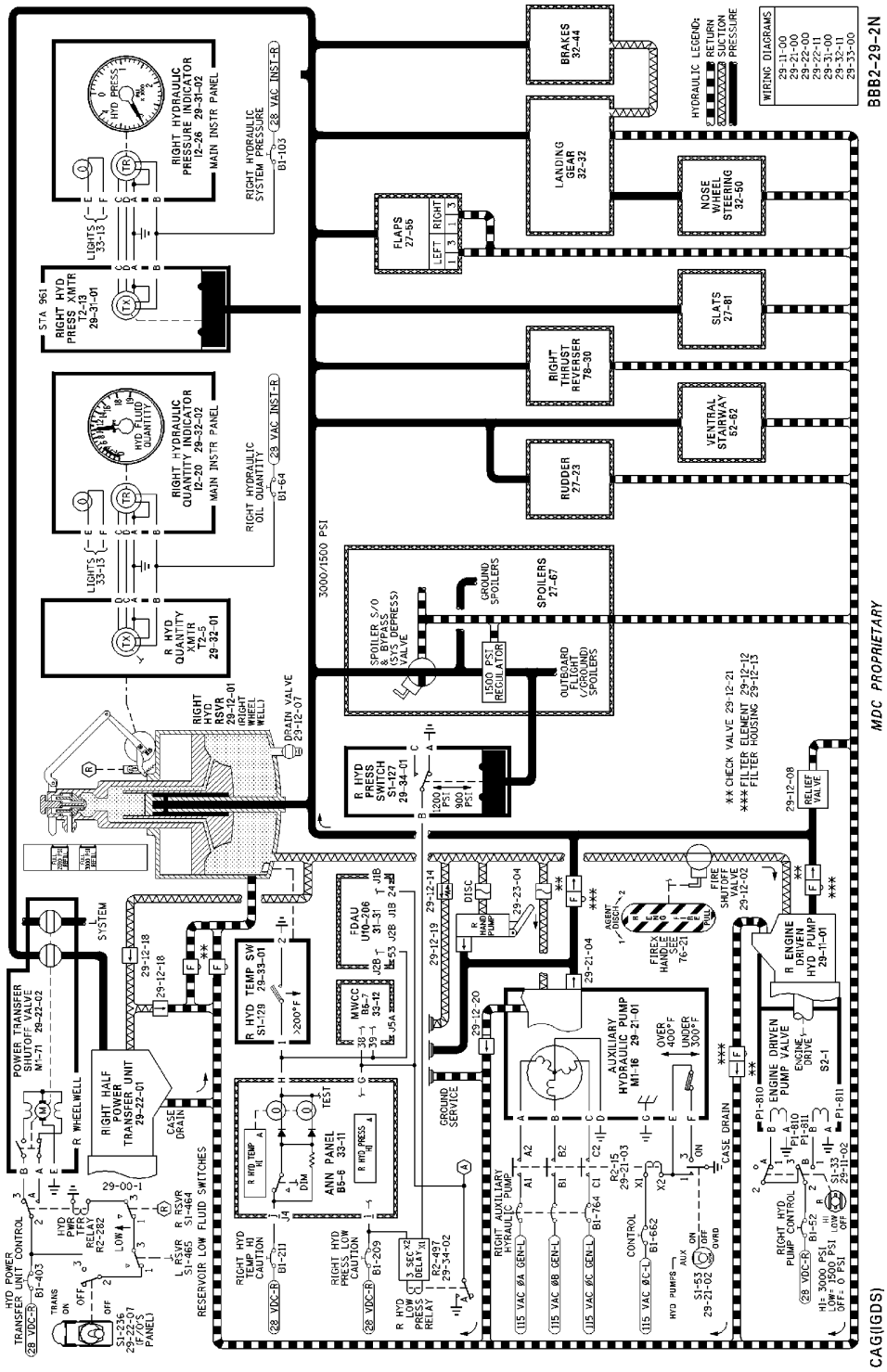


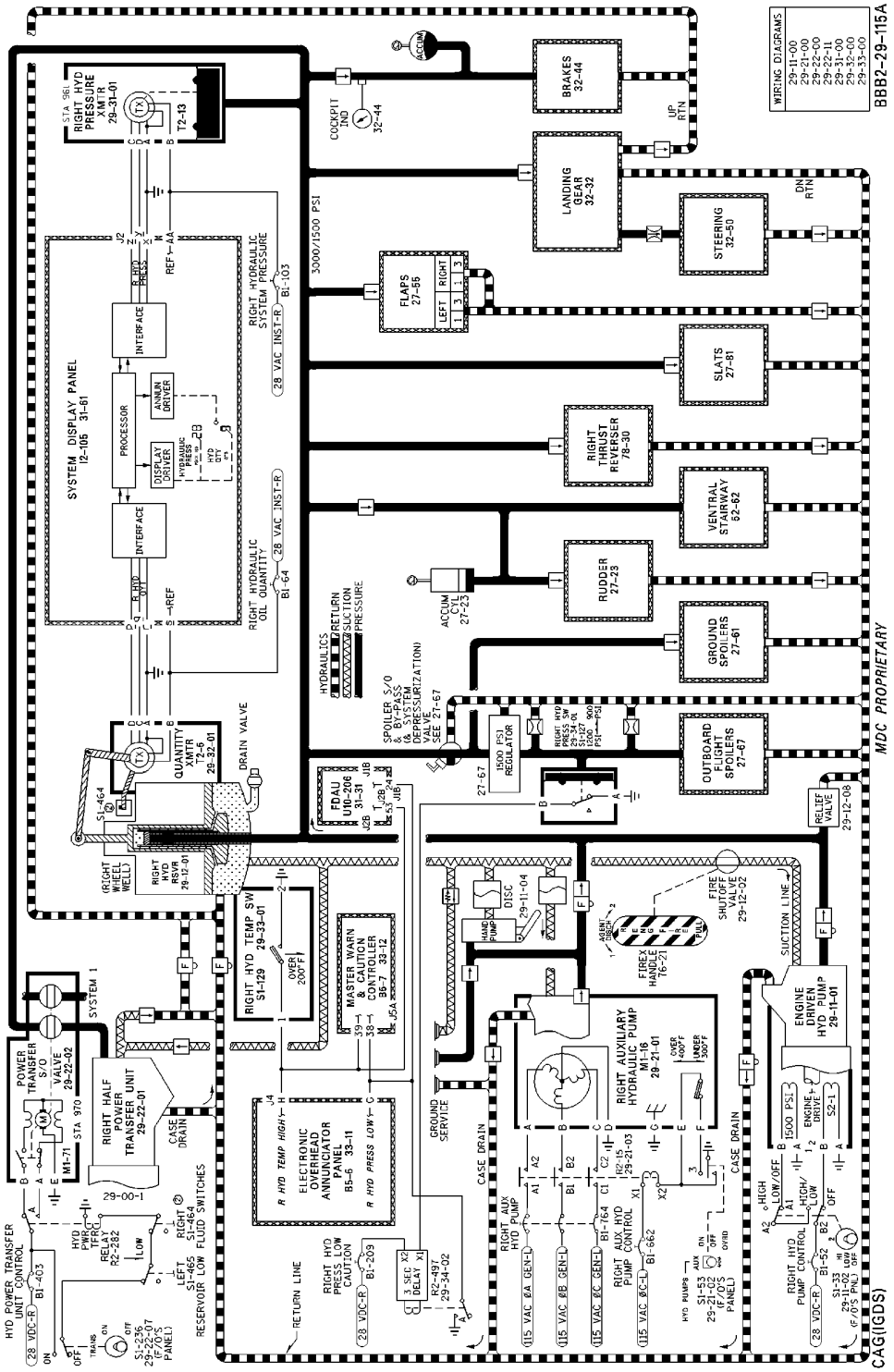
Left Hydraulic System -- Schematic
Figure 1/29-00-00-990-801 (Sheet 2 of 3)



Left Hydraulic System -- Schematic
Figure 1/29-00-00-990-801 (Sheet 3 of 3)



Right Hydraulic System -- Schematic
Figure 2/29-00-00-990-808 (Sheet 1 of 3)



Right Hydraulic System -- Schematic
Figure 2/29-00-00-990-808 (Sheet 2 of 3)

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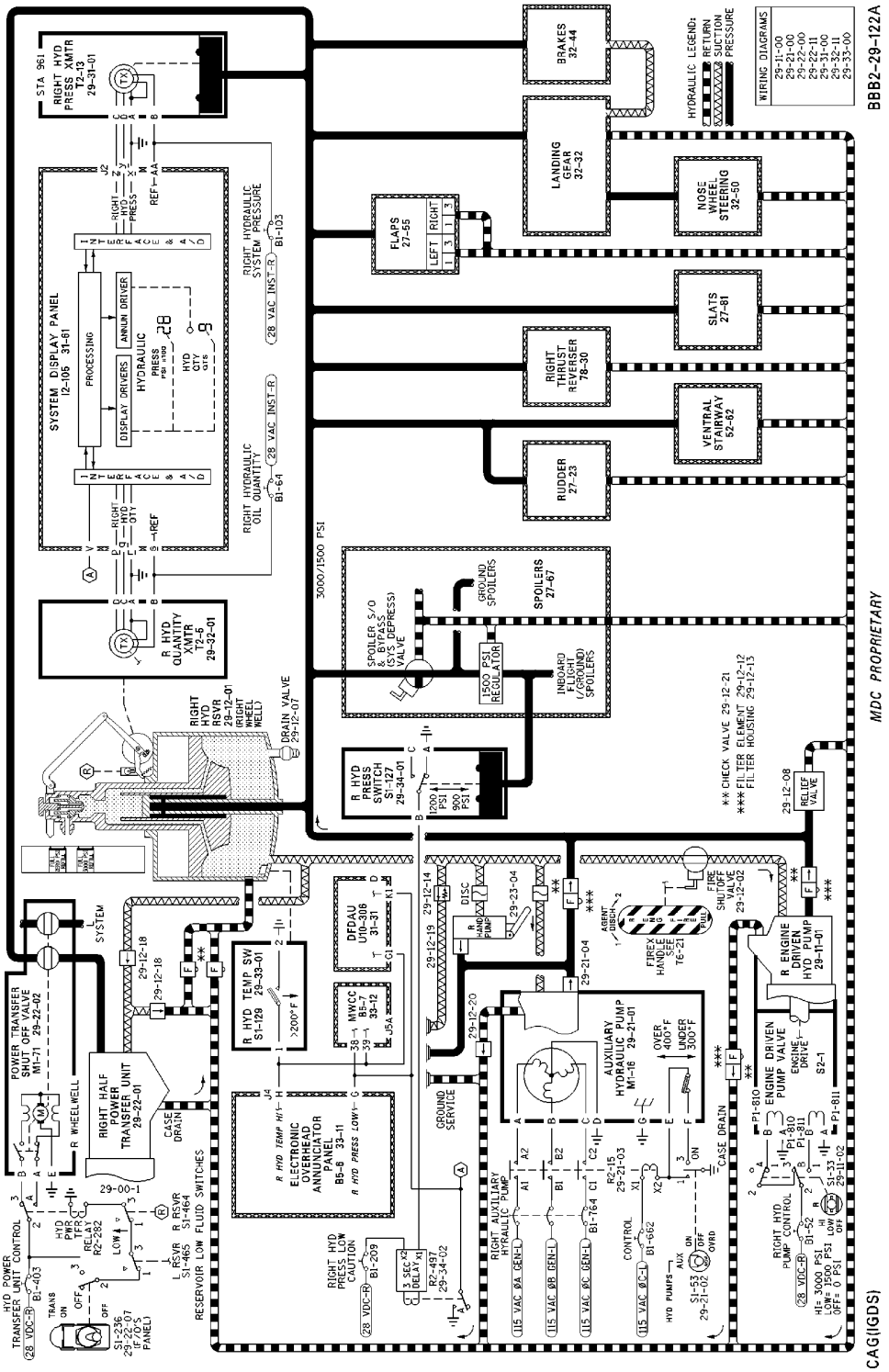

Right Hydraulic System -- Schematic
Figure 2/29-00-00-990-808 (Sheet 3 of 3)

GENERAL - TROUBLE SHOOTING

1. General

A. To successfully trouble shoot the hydraulic system, it is necessary to have a clear understanding of the operation of the system and of what takes place when the system is operating properly. After the system and its operation is clearly under-stood, an orderly analysis of what can cause improper operation can be made. There are only a few things that can be wrong with the system itself. These are: insufficient fluid in the system, air in the system, leaks, and clogged lines or fittings in the system and malfunctioning or failed components.

B. The location and elimination of trouble in a particular unit can usually be traced to one or more of the following: leaks, either internal or external; foreign particles clogging or holding open some part of a unit; improper adjustment; mechanical damage; structural failure; or excessive clearance resulting from wear. When the trouble is isolated to a particular unit, remove it from the aircraft and install a new unit.

NOTE: When a hydraulic unit has been changed or hydraulic lines have been disconnected, check the affected system under pressure for leaks and proper operation before placing the aircraft back in service.

C. Tube Leaks and Failures

(1) Trouble in a tubing system may be broadly classified into two groups: leaks and failures.

D. Causes of Leaks at Flared Joints

(1) Poor flare, rough surface, cracks, and splits
(2) Improper wrench torque
(3) Insufficient or improper support of lines
(4) Damage to flares
(5) Foreign material under flares
(6) Badly fitted or mismated parts
(7) Careless assembly
(8) Threads seized or galled.

E. Causes of Leaks at Straight Threaded Joints Using O-rings

(1) Improper positioning of O-ring on fitting
(2) Fitting not properly positioned in boss
(3) Insufficient wrench torque to squeeze O-ring and make seal
(4) Careless assembly.

F. Tubing Failures

(1) Hydraulic tubing is designed to withstand several times the operating pressure to which it is subjected. Vibration resulting from chattering or insufficient support, preloaded fittings, and rubbing contact are the causes of most failures.

GENERAL - MAINTENANCE PRACTICES

1. General

A. The general maintenance practices for the hydraulic system consist of hydraulic fluid safety and technical precautions, hydraulic system line identification codes, O-rings and backup rings used with hydraulic components, torque values for line and component connections, depressurization procedures for the hydraulic system, and pressurization procedures for the system using various power sources.

2. Hydraulic Fluid Safety Precautions

A. Equipment and Materials

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

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

Name and Number	Manufacturer
Cream, protective, water resistant barrier cream DPM 1002-3	
Goggles	
MLG Door safety locks 3936851-1 or -501 (Paragraph 2.C.(2))	Douglas Aircraft Co.
1,1,1-Trichloroethane (MIL-T-81533A) DPM 5792	
Lubricant (MCS 352) DPM 376	Monsanto Chemical Co.

WARNING: OBSERVE FOLLOWING SAFETY PRECAUTIONS WHEN WORKING ON HYDRAULIC SYSTEM. LONG EXPOSURE TO HYDRAULIC FLUID CAN CAUSE SKIN DEHYDRATION AND CHAPPING.

WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(WARNING PRECEDES)

B. Prior to performing any maintenance on hydraulic system, personnel should observe and thoroughly understand following precautions when working with hydraulic fluid.

(1) Wash hands thoroughly with soap and water before starting work.

WARNING: WATER RESISTANT PROTECTIVE CREAM IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN WATER RESISTANT PROTECTIVE CREAM IS USED. DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES. USE IN AN AREA OPEN TO THE AIR. CLOSE THE CONTAINER WHEN NOT USED. DO NOT GET WATER RESISTANT PROTECTIVE CREAM IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

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(2) Apply barrier cream to hands, wrists, and forearms. Rub cream under fingernails and into creases of skin.

(3) Wear goggles when pressure testing components or systems, and whenever there is a possibility of hydraulic fluid splashing into eyes.

(4) If hydraulic fluid splashes into eyes, treat eyes immediately by irrigating thoroughly with clear cold water, and report incident.

(5) Wash hands and wrists, and forearms with soap and hot water whenever they have been in contact with hydraulic fluid.

(6) If clothing becomes soaked with hydraulic fluid, remove clothing as soon as possible, thoroughly wash skin, and put on clean clothing.

C. When working in main gear wheelwell areas, observe following precautions:

(1) Make certain that ground maintenance bypass lever, located on fuselage lower surface near edge of inboard door, is in bypass position.

(2) Make certain that door safety locks (Part Number 3936851-1, -501 or equivalent) are installed on piston rods of main gear inboard door actuating cylinders.

NOTE: Door safety lock 3936581-1 is used if aircraft is sitting on the gear. The -501 is used if aircraft is on jacks.

3. Technical Precautions

CAUTION: OBSERVE THE FOLLOWING TECHNICAL PRECAUTIONS WHEN WORKING ON THE HYDRAULIC SYSTEM. HYDRAULIC FLUID WILL ATTACK A WIDE RANGE OF MATERIALS INCLUDING RUBBER, COPPER, VARIOUS PLASTICS AND PAINTS.

A. Prior to performing any maintenance on hydraulic system, personnel should observe and thoroughly understand following precautions. Careful adherence to instructions will aid in maintaining functional and trouble-free system.

WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(1) Ensure that hydraulic fluid does not come into contact with aircraft outside of hydraulic system. Keep spillage to an absolute minimum. Clean up spilled hydraulic fluid immediately to prevent entry into adjacent areas and to prevent future false hydraulic leak reports. If spillage occurs, wipe up the fluid with dry cloth, and wash contaminated area with handwipe solvent (P-D-680).

(2) When lines are disconnected and/or components are removed, provide suitable protection to prevent foreign material from entering lines or components by use of caps or covers.

(3) When electrical connectors are disconnected, install caps or other suitable covers to prevent entry of hydraulic fluid, moisture, and foreign objects.

(4) Always check position and angle of fittings removed from components to ensure placement and alignment on installation of replacement components.

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

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(5) When washing metal parts before assembly, use handwipe solvent (P-D-680), and ensure that all traces of the solvent are removed before assembly.

WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

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- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

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- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

CAUTION: USE ONLY BOEING APPROVED HYDRAULIC FLUIDS. UNAPPROVED HYDRAULIC FLUIDS CAN CAUSE DAMAGE TO AIRCRAFT SYSTEMS.

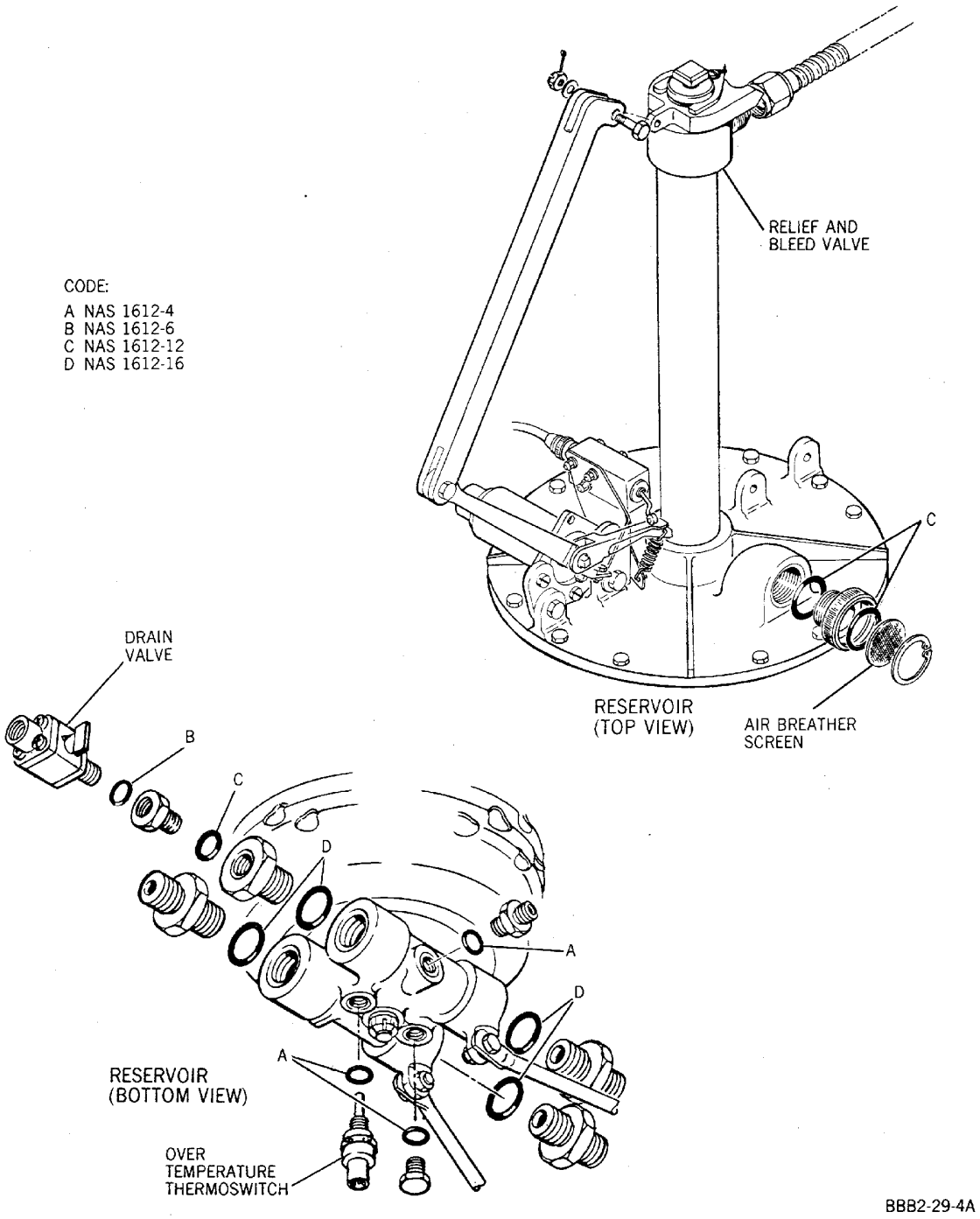
(6) Do not unpack hydraulic system O-rings and seals until required, and ensure that only approved O-rings and seals are used.

CAUTION: TAKE SPECIAL CARE TO AVOID CONTAMINATION OF O-RINGS AFTER LUBRICATION.

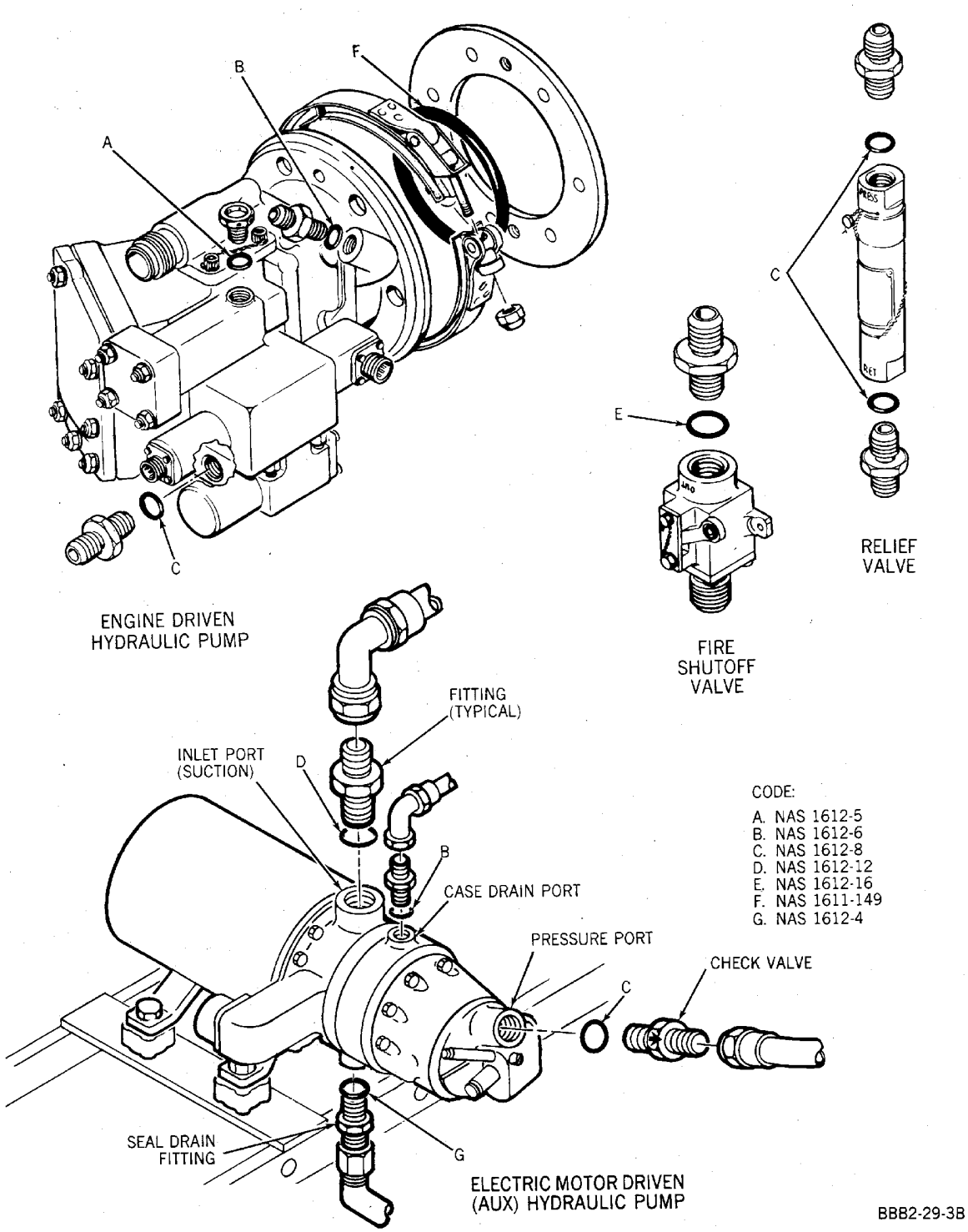
(7) When assembling hydraulic system O-rings and seals, use lubricant (MCS 352) or Douglas approved hydraulic system fluids. Always lubricate O-rings and seals immediately before installation.

(8) Take care to prevent contamination of hydraulic fluid with other unapproved fluids, oils, water, or dirt.

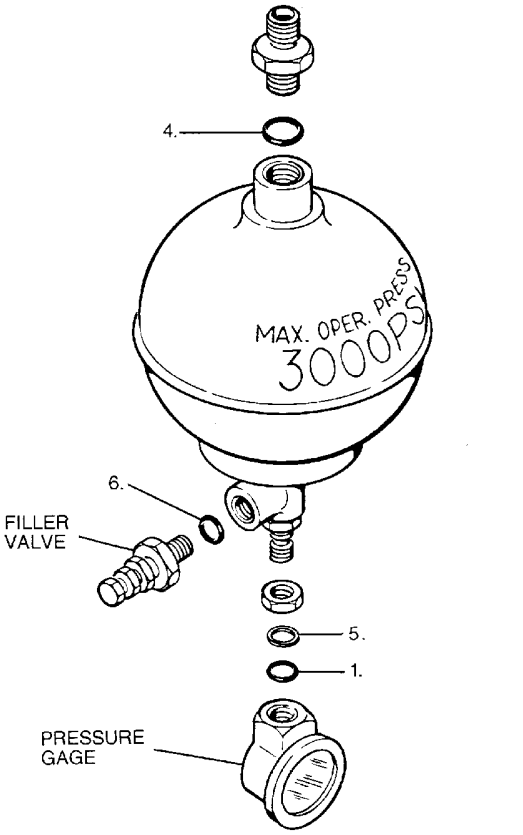
(9) If a system becomes contaminated with any petroleum-based oil or solvent, drain the system and flush with clean hydraulic fluid. (PAGEBLOCK 29-01-00/201)



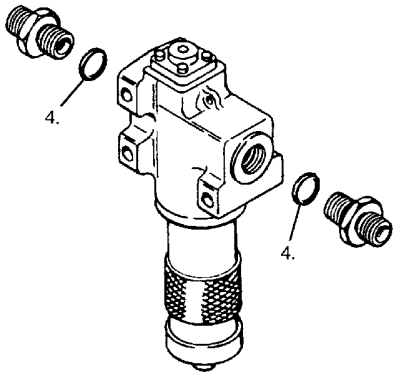
Hydraulic System Component O-rings
Figure 201/29-00-00-990-828 (Sheet 1 of 5)



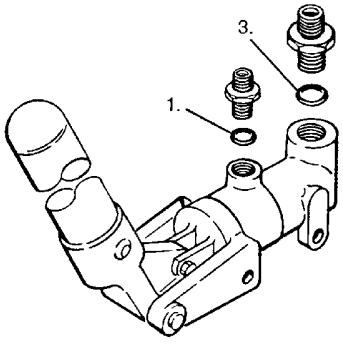
Hydraulic System Component O-rings
Figure 201/29-00-00-990-828 (Sheet 2 of 5)



ACCUMULATOR
(ELEVATOR PRESSURE, LEFT AND RIGHT
BRAKES, LEFT AND RIGHT THRUST REVERSERS)



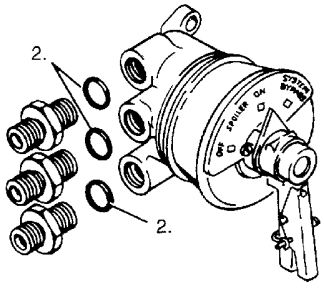
SINGLE-STAGE
HYDRAULIC FLUID FILTER



GROUND SERVICE
HAND PUMP

CODE: 1. NAS 1612-4 O-RING
2. NAS 1612-6 O-RING
3. NAS 1612-8 O-RING
✻4. NAS 1612-8 O-RING
5. MS28777-4 BACKUP RING
6. MS24690 PACKING

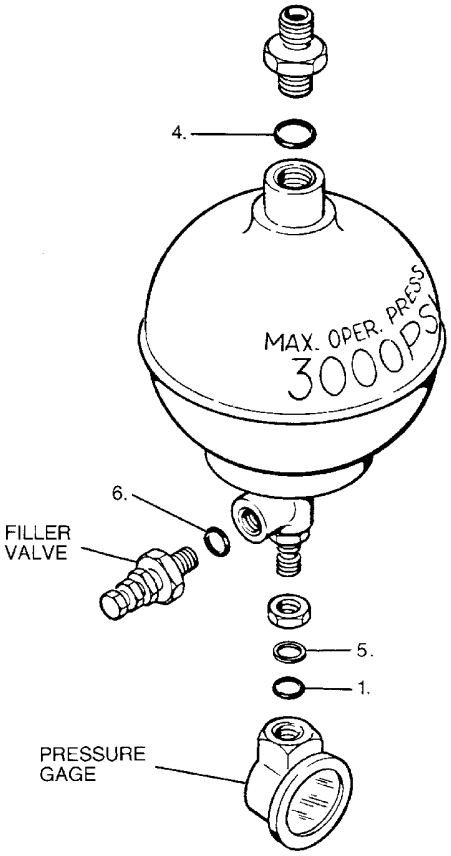
✻LATER MODEL AIRCRAFT WITH LARGER CAPACITY RETURN FILTERS OR AIRCRAFT WITH SB29-41 INCORP USE NAS 1612-12 O-RING.



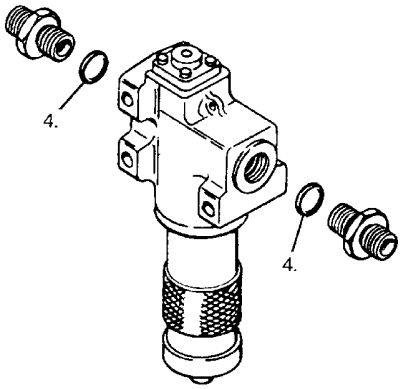
SPOILER SHUTOFF AND
SYSTEM DEPRESSURIZATION VALVE

BBB2-29-5C

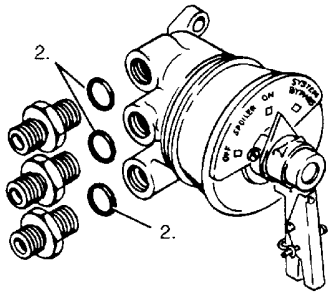
Hydraulic System Component O-rings
Figure 201/29-00-00-990-828 (Sheet 3 of 5)



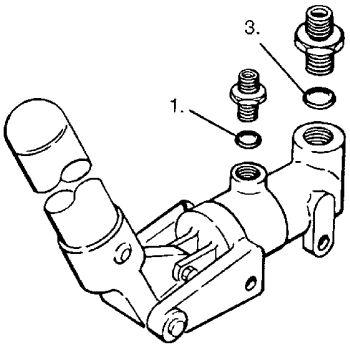
ACCUMULATOR
(ELEVATOR PRESSURE, LEFT AND RIGHT
BRAKES, LEFT AND RIGHT THRUST REVERSERS)



SINGLE-STAGE
HYDRAULIC FLUID FILTER



SPOILER SHUTOFF AND
SYSTEM DEPRESSURIZATION VALVE

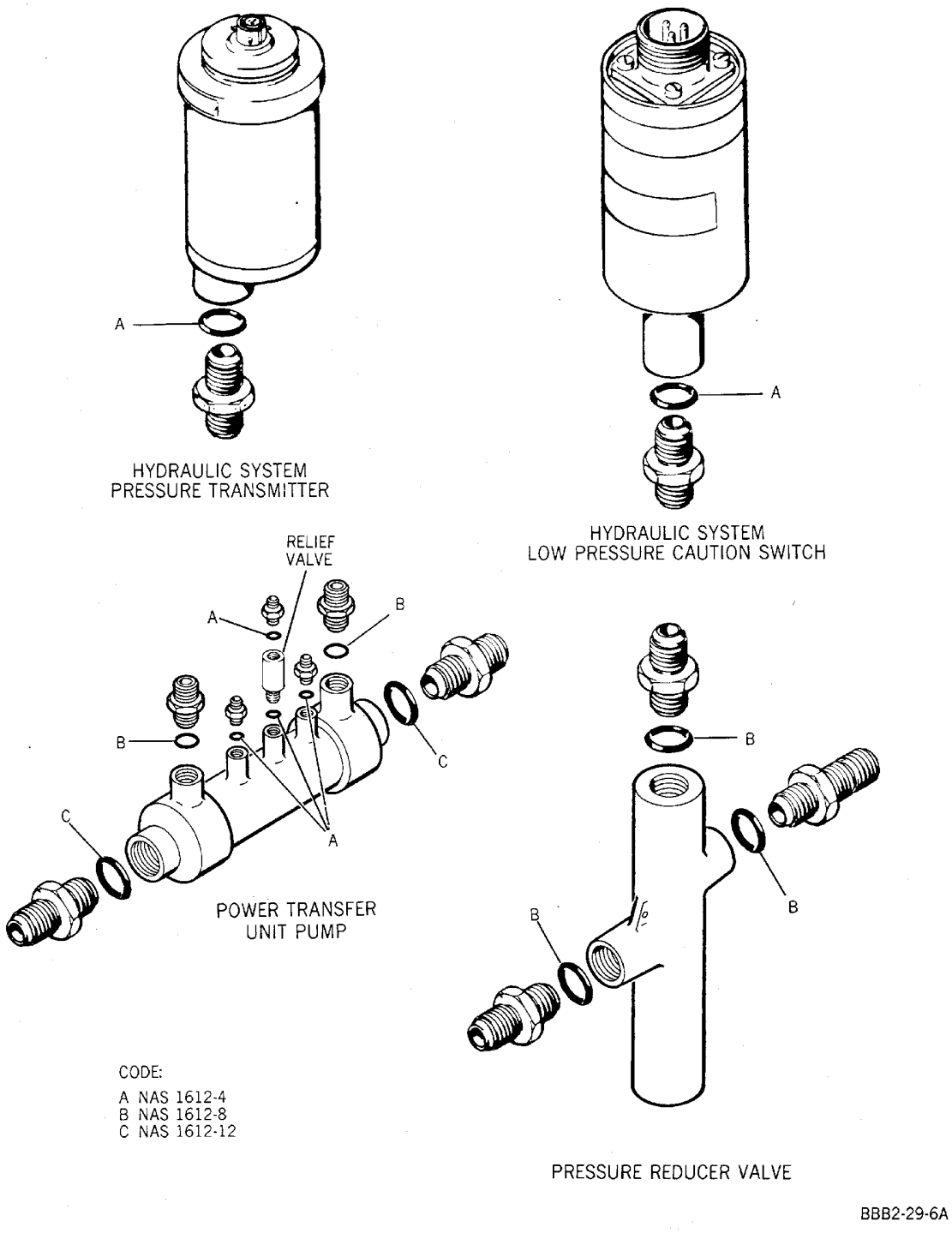


GROUND SERVICE
HAND PUMP

CODE: 1. NAS 1612-4 O-RING
2. NAS 1612-6 O-RING
3. NAS 1612-8 O-RING
4. NAS 1612-12 O-RING
5. MS28777-4 BACKUP RING
6. MS24690 PACKING

BBB2-29-93

Hydraulic System Component O-rings
Figure 201/29-00-00-990-828 (Sheet 4 of 5)



Hydraulic System Component O-rings
Figure 201/29-00-00-990-828 (Sheet 5 of 5)

4. **Electrical Power**

   A. Maintenance Practices in this chapter assumes that all circuit breakers are closed and electrical buses are energized, unless otherwise noted.

5. **Hydraulic System Component O-rings**

   A. O-rings used in the installation of hydraulic power system components are shown in Figure 201. O-rings required for the landing gear, power control system, etc., will be found in the applicable chapters. Removal and/or installation procedures for O-rings, back-up rings and hydraulic fittings are covered in STANDARD PRACTICES - AIRFRAME, CHAPTER 20.

6. **Torque Values**

   A. Standard torque values for hydraulic fittings, nuts, jamnuts, etc., are not provided in the system maintenance procedures; only nonstandard torque values are given.

7. **Hydraulic System Reservoir Fluid Level**

   A. Check Fluid Level

      WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

      (1) Open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

      (2) Bleed air from reservoir. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

         NOTE: Air must be bled from reservoir with reservoir in a pressurized condition before an accurate fluid level check can be made. After bleeding air from the reservoir, the reservoir fluid level can be checked with the system either fully pressurized or completely depressurized.

      (3) Observe fluid level pointer with relation to fill levels indicator scales on reservoir fill levels instruction plate. (Figure 202)

         NOTE: If the hydraulic system is fully pressurized, read the respective reservoir fill levels instruction plate lower scale, placarded: HYDRAULIC PRESSURE 3000 psi (20,684 kPa); if the system is completely depressurized, read the upper scale, placarded: HYDRAULIC PRESSURE ZERO PSI. Complete depressurization requires subsystem depressurization with accumulators at the correct initial nitrogen precharge, otherwise fluid over-service will result.

         The figures on the edge of the fill levels instruction plate indicate in US quarts measurement, the approximate quantity of fluid contained in the reservoir when in either a pressurized or depressurized condition with respect to the position of the reservoir fluid level pointer.

      WARNING: FIRE RESISTANT HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN FIRE RESISTANT HYDRAULIC FLUID IS USED.

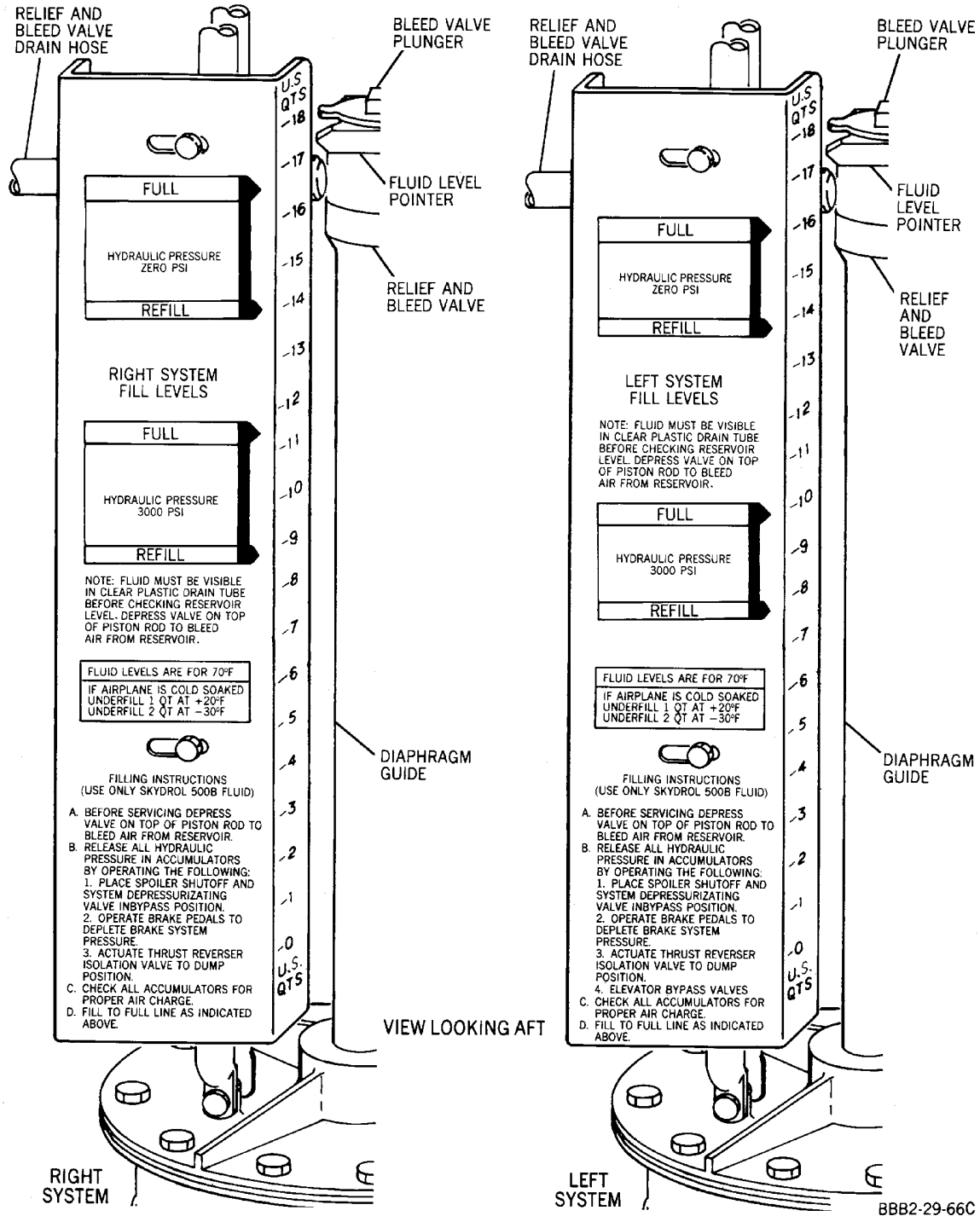
      - DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
      - USE IN AN AREA OPEN TO THE AIR.
      - CLOSE THE CONTAINER WHEN NOT USED.
      - DO NOT GET FIRE RESISTANT HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
      - DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIERS MSDS FOR:

- MORE PRECAUTIONARY DATA.
- APPROVED SAFETY EQUIPMENT.
- EMERGENCY MEDICAL AID.
- TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(4) If fluid level pointer does not point to fill levels instruction plate full mark on appropriate scale, add fluid to fill reservoir. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)



Hydraulic System Reservoir -- Fluid Level Indication
Figure 202/29-00-00-990-829

8. Depressurize/Pressurize Hydraulic System

NOTE: The left and right hydraulic systems may be pressurized by several methods, such as engine driven pump, external hydraulic stand, or the right system may utilize the electric driven auxiliary pump. If means are not available to pressurize both systems independently, the power transfer unit can be utilized to pressurize the other system. (Paragraph 8.)

CAUTION: THE LEFT AND RIGHT HYDRAULIC SYSTEMS ARE PRESSURIZED INDEPENDENTLY. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

A. Depressurize Hydraulic System

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Deenergize hydraulic pressure source.

WARNING: KEEP WING FLAP AREA AND SLAT AREA CLEAR OF PERSONNEL AND EQUIPMENT WHENEVER THE HYDRAULIC SYSTEM IS DEPRESSURIZED WITH FLAPS IN UP POSITION. ACTUATION OF THE WING FLAP/SLAT CONTROL TO THE FLAPS DOWN POSITION, WHEN THE SYSTEM IS DEPRESSURIZED, WILL ALLOW THE FLAPS TO DROP RAPIDLY TO THE FULL DOWN POSITION. SLATS MAY ALSO EXTEND. MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(3) Turn spoiler shutoff and system depressurization valve to bypass position until hydraulic system pressure indicator in flight compartment reads zero. Place valve to ON position. Make certain valve handle latch is engaged and install safety pin.

(4) Depress brake pedals at least six times to depressurize brake system accumulator.

NOTE: Due to the design of the brake system accumulator, a small amount of fluid can be trapped during depressurization of the system. If this occurs, the pressure reading on the brake pressure gauge can return to approximately 675 psi. This is not a fault, and no maintenance action is required.

(5) The rudder and ventral stairway hydraulic system (right hydraulic system) share the same accumulator to depressurize it, operate the ventral stairway control valve. If stairway is in up position, lower it. If in the down position, it will raise and then settle to the ground as pressure is depleted.

(6) Pull applicable (left or right) thrust reverser control valve handle out to bypass position; hold until all audible fluid flow ceases, return handle to normal position.

NOTE: The thrust reverser control valves are located in the aft accessory compartment, aft of the fuselage pressure dome, one on each side of the fuselage. Access is through doors located one on each side of the aft fuselage.

(7) If left system is being depressurized, depressurize the elevator power control system by opening elevator bypass valve. Hold knob in bypass until system pressure is depleted from accumulator. Close bypass valve.

NOTE: The bypass valve (small valve) is located in the lower right side of the fuselage aft accessory compartment, adjacent to the elevator accumulator, and is accessible through door 6102A located on the lowers right side of the aft fuselage.

B. Pressurize Hydraulic System With External Pressure Source

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Remove dust caps from ground power suction and pressure connectors on ground service panel. (Figure 203)

(3) Connect test stand pressure and suction hoses to airplane ground power connections.

(4) Energize test stand hydraulic pump; pressurize system to 3000 psi (20,684 kPa).

(5) Shut off hydraulic pressure source.

(6) Disconnect test stand suction and pressure hoses from airplane ground power connections.

(7) Install dust caps on suction and pressure connectors on ground service panel.

(8) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

C. Pressurize Hydraulic System With Electrically Driven (Auxiliary) Hydraulic Pump (Right System Only)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Place AUX pump switch, located on first officer's instrument panel, in ON position.

(2) Monitor right hydraulic system pressure indicator in flight compartment; pressure should be 3000 psi (20,684 kPa) ±200 psi (1379 kPa)).

(3) Place AUX pump switch in OFF position.

D. Pressurize Hydraulic System With Engine-driven Hydraulic Pump Pressure

(1) Place applicable (left or right) engine-driven pump control switch in HI position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(2) Start applicable (left or right) engine. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 7 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 5)

(3) Monitor hydraulic pressure indicator in flight compartment; pressure should be 3000 psi (20,684 kPa) (± 200 psi (1379 kPa)).

(4) Shut down engine. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 7 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 5)

(5) Place applicable (left or right) engine driven pump control switch in OFF position.

E. Pressurize Hydraulic System With Power Transfer Unit Pressure

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) Check left hydraulic system transfer power source as follows:

(a) Place left hydraulic system bypass valve in BYPASS position to depressurize left hydraulic system.

(b) Place left hydraulic system bypass valve in ON position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(c) Pressurize right hydraulic system. (Paragraph 8.B.) (Paragraph 8.C.) (Paragraph 8.D.)

(d) Place TRANS pump switch, located on first officer's instrument panel in ON position. Power transfer unit functions as hydraulic power source for left hydraulic system.

(e) Monitor left hydraulic system pressure indicator in flight compartment. Pressure should indicate 2800 psi (19,305 kPa) (±300 psi (2068 kPa)) during a steady demand period.

NOTE: Pressure fluctuation between 2000 psi (13,790 kPa) and 3100 psi (21,374 kPa) are normal during an ON-OFF mode of operation (no demand).

(f) Place TRANS pump switch in OFF position.

(g) Shut off right hydraulic system pressure source.

(h) Actuate brake pedals until all hydraulic system pressure is bled off.

(3) Check right hydraulic system transfer power source as follows:

(a) Make certain door safety locks are installed and that ground maintenance bypass lever is in bypass position.

(b) Place right hydraulic systems bypass valve in BYPASS position to depressurize right hydraulic system.

(c) Place right hydraulic system bypass valve in ON position.

(d) Remove door safety locks from main gear inboard doors.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(e) Pressurize left hydraulic system. (Paragraph 8.B.) (Paragraph 8.D.)

WARNING: BEFORE MOVING BYPASS VALVE, MAKE CERTAIN THAT AREAS AROUND MAIN GEAR DOORS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(f) Place ground maintenance bypass levers in normal (stowed) position.

(g) Place TRANS switch in ON position. Power transfer unit functions as hydraulic power source for right hydraulic system. Main gear doors should close.

(h) Monitor right hydraulic system pressure indicator in flight compartment. Pressure should indicate 2800 psi (19,305 kPa) (±300 psi (2068 kPa)).

(i) Place TRANS switch in OFF position.

(j) Shut off left hydraulic system pressure source.

Table 201

ALLOWABLE HYDRAULIC FLUID LEAKAGE RATES (Hydraulic System Pressurized)		
Leak Source	**Allowable Leakage For Normal Operation**	**Allowable Leakage For Dispatch Operation To Avoid Delay**
Tube Connections	No visible leaks	No visible leaks
Actuator Cylinder Seals	1 drop per three cycles	1 drop per cycle*
Static Seals	1 drop per 10 minutes	Determined by operator
Engine Driven Pumps	10 drops per minute	20 drops per minute *[1]
Electric Motor Driven Pump	10 drops per minute	20 drops per minute *[1]
Power transfer unit	10 drops per minute	20 drops per minute *[1]
Other Dynamic Seals Under Static Conditions	1 drop per 10 minutes	1 drop per minute *[1]
WJE 412, 414		
Brakes	1 drop per 10 minutes	5 drop per minute *[1]
WJE ALL		
Aircraft Brakes, Applied (Pressurized)	No visible leakage	Does not exceed 5 drops per minute*[1]
Aircraft Brakes, Not Applied (Not-Pressurized)	No visible leakage	Does not exceed 1 drop per minute*[1]

*[1] Correct at first opportunity.

F. Alternate Method of Checking Reservoir Low Fluid Level Limit Switches

NOTE: This alternate method will check the adjustment of low fluid level limit switches without pressurizing hydraulic system or draining hydraulic reservoir.

(1) Make certain that both hydraulic system reservoirs are at normal operating quantity levels.

(2) Disconnect upper link from lower link.

(3) Place TRANS pump switch, located on first officer's instrument panel in ON position.

(4) Make certain that power transfer unit shutoff valve, located in left hand wheelwell, has moved to open position.

(5) Slowly rotate lower link downward until low fluid level switch actuates, and check for following:

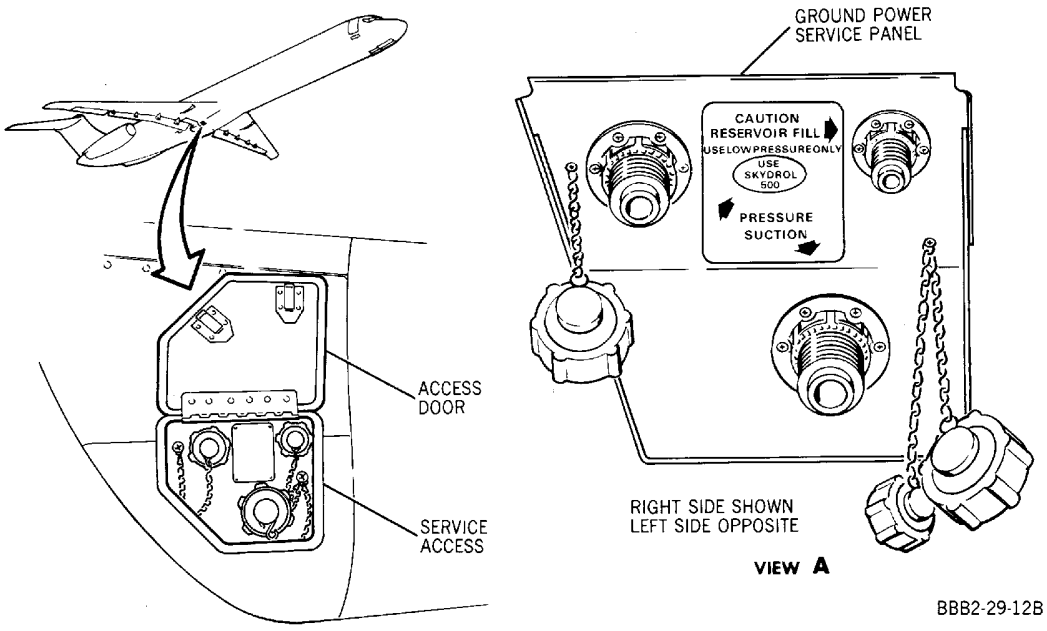
(a) Power transfer unit shutoff valve is in closed position.

(b) Lower link is 1½ in. (38 mm) to 1¾ in. (44 mm) from upper surface of reservoir.

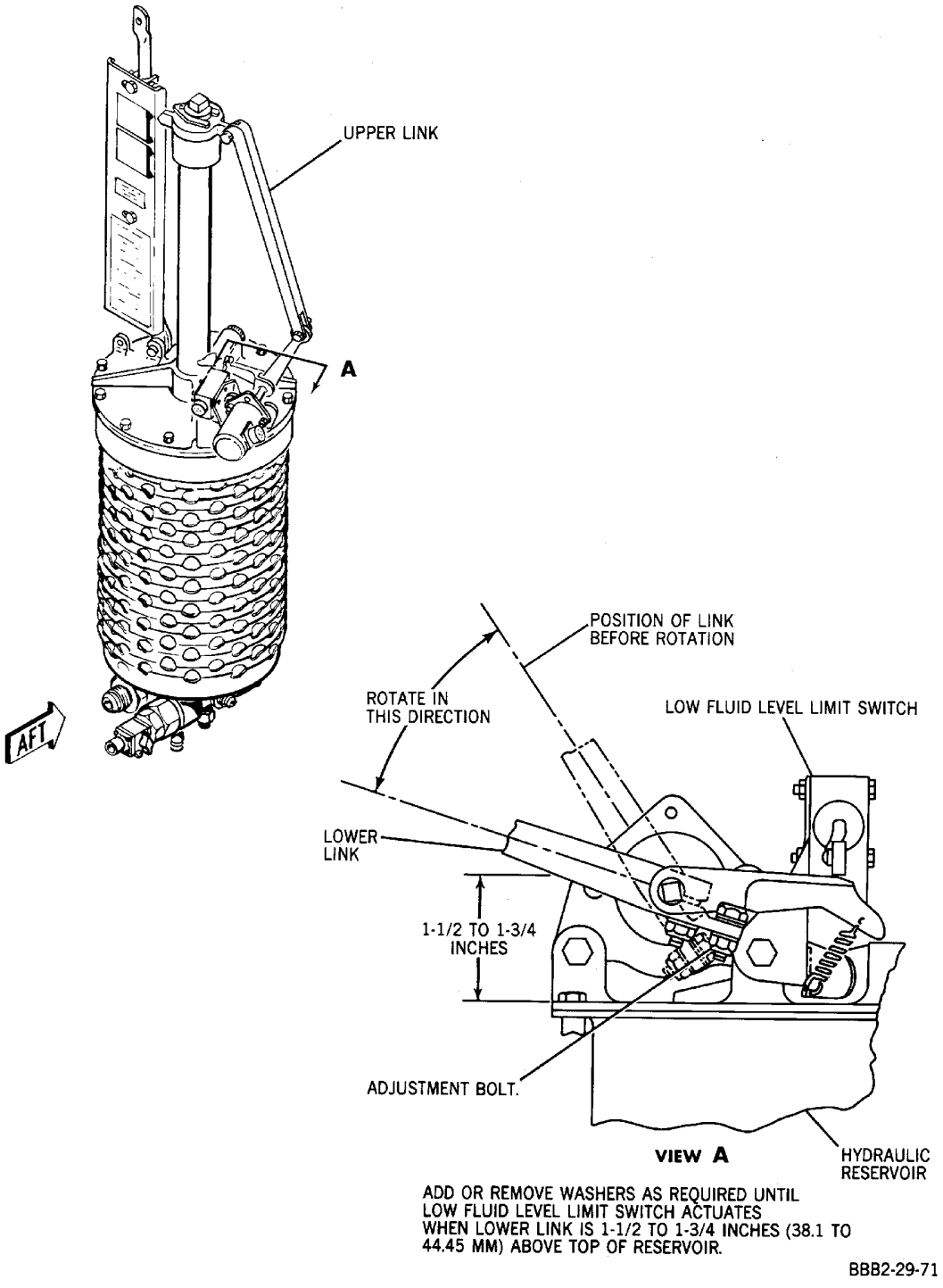
NOTE: If actuation of low fluid level limit switch is not within required dimensions, add or remove washers as necessary to obtain required dimension. (Figure 204)

(6) Slowly rotate lower link upward until bolt connecting upper and lower links can be inserted. Connect upper link to lower link.

(7) Perform Paragraph 8.F.(2) through Paragraph 8.F.(6) to check opposite reservoir's low fluid level limit switch for proper adjustment.



Ground Power Connections
Figure 203/29-00-00-990-830



Low Fluid Level Limit Switch - Adjustment/Test (Alternate Method)
Figure 204/29-00-00-990-831

HYDRAULIC SYSTEM CHECK AND RESERVICING FOLLOWING IN-FLIGHT FLUID LOSS

1. General

A. This procedure provides outline references to existing maintenance procedures in MD-80 Aircraft Maintenance Manual which provide work instructions to successfully service, bleed, flush, remove and install and check any affected components as a result of an in-flight hydraulic fluid loss in either or both left and right hydraulic systems.

B. In the event of engine driven hydraulic pumps, electric driven auxiliary pump/power transfer unit running without hydraulic fluid in the system; each pump should be visually checked for evidence of over temperature damage, all filters checked for contamination. Any pump which has operated without fluid for any length of time and all the corresponding filters must be replaced with serviceable units prior to further flight.

C. This procedure must also include a check of hydraulic fluid for evidence of contamination and condition affected by possible overheat due to fluid quantity loss. If contamination is found, the corresponding hydraulic system must be flushed to remove contaminated fluid prior to further flight, as required. (PAGEBLOCK 29-01-00/201)

D. Any bleeding procedure must also include wing flaps and slats extension and retraction, landing gear hydraulic extension and retraction, main landing gear brakes bleeding and nose landing gear steering with use of left and right hydraulic systems. Particular attention should be given to landing gear actuating cylinders if alternate landing gear extension was used as a result of total hydraulic fluid loss. As required, a landing gear retraction, with aircraft on jacks, plus the nose landing gear steering system may be performed to remove entrapped air from actuating cylinders and lines.

E. A portable external hydraulic power unit (preferred power source), the aircraft electric motor driven pump/power transfer unit may be used, as required and conditions permit, as pressure source for these. The ground service hand pump may also be used to pressurize hydraulic reservoirs.

F. For the safety and protection of personnel, aircraft and equipment; ground safety observers should be stationed, as required, during all systems operational function checks. The observers should maintain effective communications with personnel operating controls from the cockpit or other areas of the aircraft. These observers should also validate proper system response to controls movement. A visual leak check of affected hydraulic components must be completed prior to further flight to make certain that system integrity is maintained. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

G. All pertinent safety procedures must be observed when working in and around landing gear wheel wells and landing gear assemblies, around operating flight controls, thrust reversers, ventral stairs and any other areas of the aircraft where personnel may be injured and/or aircraft and support equipment may be damaged.

2. Equipment and Materials

NOTE: Equivalent replacements are permitted for the items that follow.

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

Table 201

Name and Number	Manufacturer
Cleaner, hand wipe, DPM 6380-1	
Cloth (low lint) MIL-C 85043 (Type II)	

3. **Hydraulic Systems Condition Check And Servicing Following Inflight Fluid Loss**

A. Check left and right hydraulic systems for general condition and function in reference to reported failure condition. Repair, restore and perform functional check, as required, as follows: (PAGEBLOCK 29-00-00/201)

(1) Determine cause of failure. Replace/repair, as required. (GENERAL - TROUBLE SHOOTING, PAGEBLOCK 29-00-00/101) (MAIN - TROUBLE SHOOTING, PAGEBLOCK 29-10-00/101) (INDICATING - TROUBLE SHOOTING, PAGEBLOCK 29-30-00/101)

(2) Check all hydraulic pumps. Replace, as required:

(a) Engine driven pump. (ENGINE-DRIVEN HYDRAULIC PUMP, SUBJECT 29-10-05)

(b) Electric motor driven pump.

(PAGEBLOCK 29-10-06/201)

(c) Hydraulic power transfer unit. (PAGEBLOCK 29-10-07/201)

(3) Check all affected hydraulic system filters and replace, as required: (PAGEBLOCK 29-10-14/201)

(4) Flush respective hydraulic system(s) affected by individual failure(s), as required: (PAGEBLOCK 29-01-00/201)

(a) Engine driven pump to reservoir. (PAGEBLOCK 29-01-02/201)

(b) Electric motor driven auxiliary pump. (PAGEBLOCK 29-01-01/201)

(c) Hydraulic power transfer unit. (PAGEBLOCK 29-01-05/201)

(d) Thrust reverser systems, left and right. (PAGEBLOCK 29-01-03/201)

(e) Flight controls. (PAGEBLOCK 29-01-04/201)

(f) Landing gear, steering and brakes. (PAGEBLOCK 29-01-06/201)

(g) Ventral stairs actuation system. (PAGEBLOCK 29-01-07/201)

(5) Bleed air from any affected hydraulic system(s) not requiring flushing by operating each system with hydraulic power, as required, as follows: (PAGEBLOCK 29-00-00/201)

(a) Flight controls, flaps/slats. (FLAPS - ADJUSTMENT/TEST, PAGEBLOCK 27-50-00/501)

(b) Flight controls, rudder. (RUDDER AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-20-00/501)

(c) Flight controls, elevators. (ELEVATOR AND TAB - ADJUSTMENT/TEST, PAGEBLOCK 27-30-00/501)

(d) Thrust reverser(s), left/right, as required. (PAGEBLOCK 78-30-01/201)

(e) Landing gear extension/retraction system. (EXTENSION AND RETRACTION - MAINTENANCE PRACTICES, PAGEBLOCK 32-30-00/201)

(f) Nose landing gear steering. (PAGEBLOCK 32-50-00/201)

(g) Bleed main landing gear brakes. (MAIN GEAR WHEEL BRAKES - MAINTENANCE PRACTICES, PAGEBLOCK 32-42-01/201)

(6) Bleed air from left and right systems through bleed valve at top of each hydraulic reservoir. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(7) Recheck each hydraulic reservoir fluid level and service as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(8) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

WARNING: HANDWIPE CLEANER IS AN AGENT THAT IS FLAMMABLE, A SENSITIZER, AN ASPHYXIANT, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN HANDWIPE CLEANER IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET HANDWIPE CLEANER IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

B. Use (DPM 6380-1) handwipe solvent and clean cloth to remove unwanted hydraulic fluid and accumulated foreign material from all affected work areas.

C. Remove all tools and equipment from work areas. Make certain that work areas are clean.

HYDRAULIC SYSTEM FLUSHING - GENERAL

1. General

A. The aircraft is equipped with two hydraulic systems, one left and one right. Each system is equipped with an engine-driven hydraulic pump. The right system is equipped with an electrically driven (auxiliary) hydraulic pump. The two systems are mechanically interconnected by a hydraulic power transfer unit. Any one of these pumps may be the source of contamination of the hydraulic system fluid. In addition, contamination may enter the system through inadvertent use of externally contaminated fluid or improper type of fluid, either when reservoirs are filled or when a test stand is connected to the systems. Fluid contamination regardless of its source, must be constantly guarded against and when discovered, must be removed immediately to prevent damage to the various system components and possible failure of the hydraulic systems.

B. Contamination may consist of foreign particles (metal, rubber, plastic, dirt, etc.), fluids other than hydraulic fluid, and damaged hydraulic fluid which because of excessive heat and friction, no longer meets the minimum requirements for use in aircraft hydraulic systems.

C. The hydraulic system filters ordinarily remove the minor contamination associated with normal wear. These filters are equipped with disposable elements, which are replaced at regular intervals.

D. Cooked hydraulic fluid, which can result from an engine driven pump burning up, can produce a gray jelly-like substance or in some cases a black tar-like matter. All evidence of this type of contamination must be removed from the system. If this type of contamination is found in the suction hoses or in case drain or pump pressure hoses, hoses should be removed and bench cleaned.

WARNING: JET FUELS A AND A-1 (JP-5 FUEL) ARE AGENTS THAT ARE FLAMMABLE, EXPLOSIVE, POISONOUS, AND IRRITANTS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN JET FUELS A AND A-1 (JP-5 FUEL) ARE USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET JET FUELS A AND A-1 (JP-5 FUEL) IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: JET FUEL B (JP-4 FUEL) IS AN AGENT THAT IS EXPLOSIVE, FLAMMABLE, POISONOUS, AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN JET FUEL B (JP-4 FUEL) IS USED.

- GAS/AIR MIXTURES MORE THAN THE LOWER EXPLOSIVE LIMIT (LEL) CAN CAUSE AN EXPLOSION IF HIGH HEAT, SPARKS, OR FLAMES SUPPLY IGNITION.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET JET FUEL B (JP-4 FUEL) IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: 1,1,1-TRICHLOROETHANE IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN 1,1,1-TRICHLOROETHANE IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET 1,1,1-TRICHLOROETHANE IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THESE HAZARDOUS AGENTS.

E. When cleaning piping on or off aircraft that shows evidence of decomposed hydraulic fluid contamination, Trichloroethane 1,1,1, or jet fuel under pressure may be used, providing any of these cleaning agents are thoroughly flushed out of system with clean hydraulic fluid.

F. When bench cleaning pipes or hoses, Trichloroethane 1,1,1 or jet fuel may be used providing any of these cleaning agents are thoroughly flushed out of system with clean hydraulic fluid.

G. Flushing procedures provide a guide for removing contaminants from the hydraulic system fluid, components, and lines. Deviation from the outlined flushing procedures may be dictated by individual circumstances.

H. Before flushing hoses can be connected to lines for flushing, it may be necessary in some cases to remove a component.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501 (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
External hydraulic source (9 gpm minimum flow at 500 psi)	
Hose adapter assortment	
Hose connection assortment	
Drain hose with fitting (8-foot)	

Table 201 (Continued)

Name and Number	Manufacturer
Assorted caps and plugs	
Container (1 pint)	
Pressure gages (25-3000 psi)	
Sample bottles (1 pint)	
Container (7-gallon)	
Goggles	
Trichloroethane 1,1,1, stabilized MIL-T-81533 DPM 5972	
Jet Fuel A & A-1 (JP-5) MIL-T-5624 DPM 387-5	
Jet Fuel B (JP-4) MIL-T-5624 DPM 387	

3. Contamination Detection

A. The presence of contamination in the hydraulic system can be detected as follows:

(1) Check filter differential pressure indicators, elements, and cartridges for visible contamination.

(2) Take samples of hydraulic fluid from system reservoir, components, or lines and check for visible contamination.

(3) Take samples of overheated or diluted hydraulic fluid from associated pump pressure lines and send samples to laboratory for analysis.

NOTE: If hydraulic fluid samples show that the system is not contaminated, filter elements located in the engine hydraulic manifold, system manifold, and auxiliary pump manifold should be checked and replaced as required. If hydraulic fluid samples show that the system is contaminated, proceed with flushing procedures.

B. Draining of Fluid Samples

NOTE: To assure correct results from testing fluid samples, care must be used with sample bottles to make sure they are carefully precleaned, including final rinse with nonchlorinated solvent, which has been filtered through Millipore membrane (1 micron rating or less) followed by complete drying of bottle.

(1) Obtain fluid samples as follows:

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(a) Depressurize system and reservoir. (PAGEBLOCK 29-00-00/201)

(b) Place waste pan under sampling port, for example, reservoir drain valve.

(c) Open valve so that steady but not forceful stream is running.

(d) Allow approximately 1 pint (500 cc) to drain. This should purge immediate area of settled particles.

(e) Insert sample bottle under stream and fill, leaving small air space at top. Withdraw bottle and cap immediately.

NOTE: Bottle cap should contain a conical polyethylene closure or piece of mylar or polyethylene film under cap. Deterioration of bottle caps will cause false indication of fluid contamination.

(f) Close drain valve.

(g) Label bottle with full information including which system in aircraft and where in system sample was taken.

4. General Flushing Procedures

A. Preparation for Flushing

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

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

(3) Open the following applicable circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) Drain system reservoir as follows:

(a) Connect hose to reservoir drain valve and place hose end in suitable container. Open drain valve.

(b) Close drain valve and remove hose when reservoir is empty. Plug drain valve.

(5) Disconnect hydraulic lines from reservoir and remove reservoir, if necessary. Cap lines and reservoir fittings. (PAGEBLOCK 29-10-01/201)

(6) Identify and tag all hydraulic lines disconnected from reservoir.

(7) Remove and clean restrictor and check valves, as applicable, when hydraulic lines are disconnected from subsystem components.

CAUTION: TO PREVENT CONTAMINATION OF SYSTEM, DO NOT CONNECT HYDRAULIC LINES TO RESERVOIR UNTIL ALL INTER-CONNECTED LINES IN SYSTEM HAVE BEEN FLUSHED.

(8) Continue with detailed flushing procedures, as required. Recommended sequence for flushing subsystems is as follows: Engine-Driven Pump to Reservoir (PAGEBLOCK 29-01-02/201), Hydraulic Power Transfer Unit (PAGEBLOCK 29-01-05/201), Electric Motor Driven Auxiliary Pump (PAGEBLOCK 29-01-01/201), Flight Controls (PAGEBLOCK 29-01-04/201), Landing Gear and Brakes (PAGEBLOCK 29-01-06/201), Engine Thrust Reverser (PAGEBLOCK 29-01-03/201), and Ventral Stairs (PAGEBLOCK 29-01-07/201).

B. Post Flushing

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

(1) Make sure the following applicable circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(2) Install clean restrictors and check valves in hydraulic lines, as applicable, and connect line ends at system components.

(3) Install clean system reservoir. (HYDRAULIC SYSTEM RESERVOIR INTERNAL LEAKAGE - ADJUSTMENT/TEST, PAGEBLOCK 29-10-01/501)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Connect all hydraulic lines at system manifold and relief and bypass valve.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

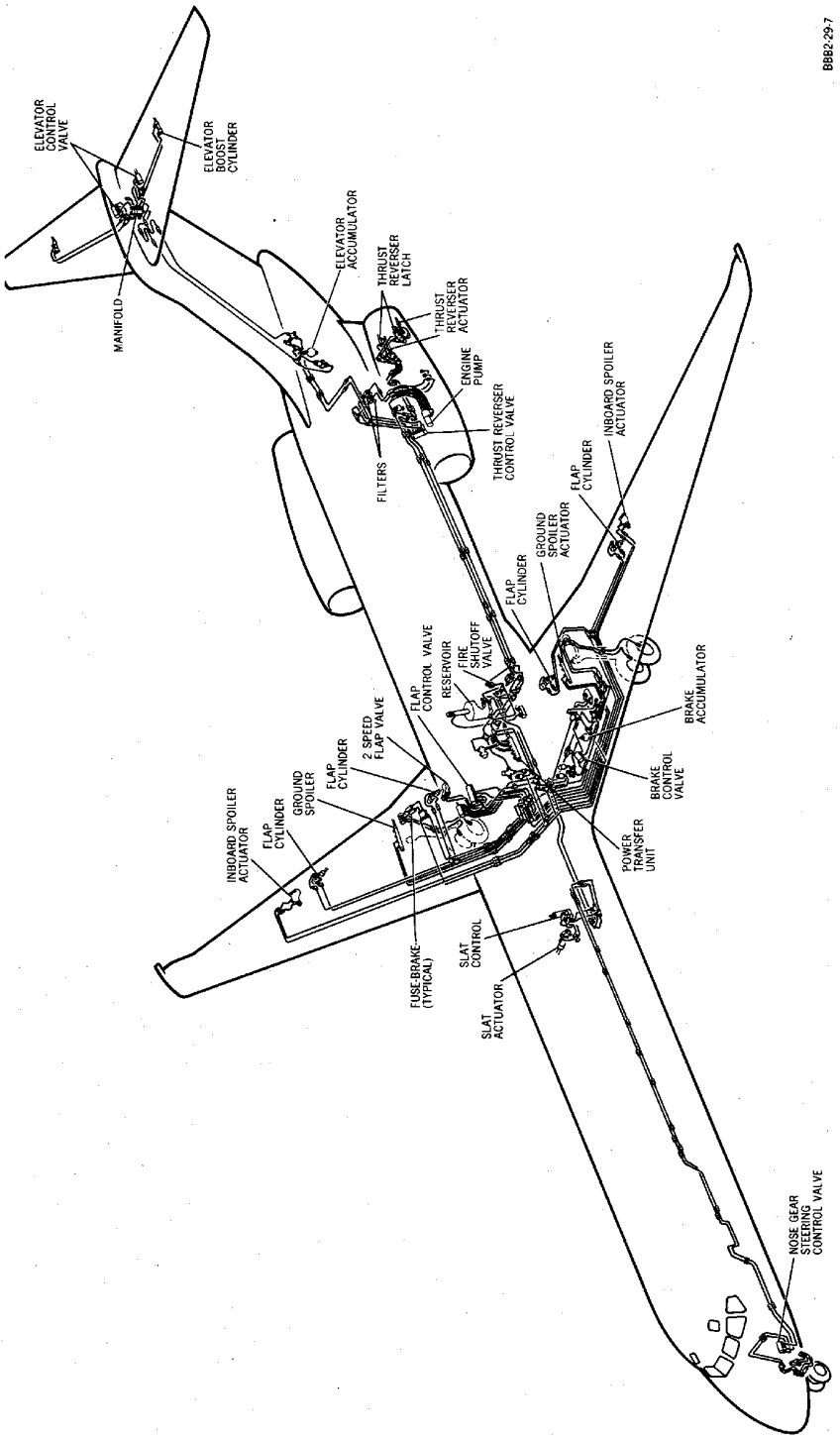
(6) Pressurize the hydraulic system. (PAGEBLOCK 29-00-00/201).

(7) Fill and bleed the hydraulic system reservoir. (SUBJECT 12-13-01 Page 301)

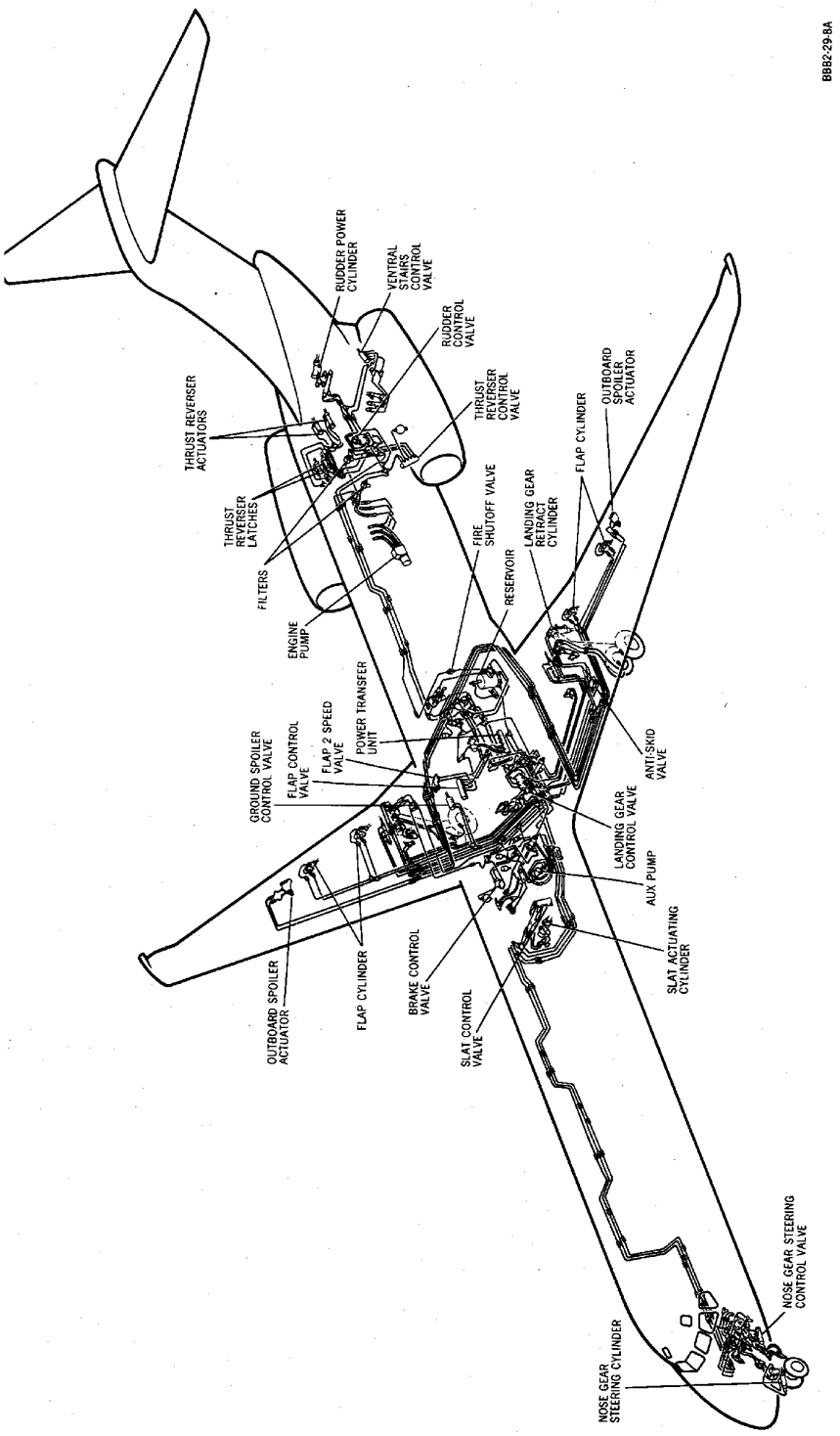
(8) Check all hydraulic line connections for leaks.

(9) Shut off hydraulic pressure source.

(10) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Left Hydraulic System -- Composite
Figure 201/29-01-00-990-801



Right Hydraulic System -- Composite
Figure 202/29-01-00-990-802

5. **Alternate Flushing Procedure**

A. Prepare for flushing

(1) Make sure that the test stand is directly connected to the aircraft system service panel. (Figure 203)

(2) The test stand must supply a minimum of 10 gpm flow, but not more than 40 gpm. This is to make sure that the pressure relief valve does not open.

(3) Pressurize the effected hydraulic system to 3000 psi. Slowly fill the reservoir. The reservoir fluid level pointer should point to the lower scale full mark on the fill level instruction plate, HYDRAULIC PRESSURE 3000 PSI. (Figure 204)

(4) Push the button on the manual bleed valve on top of the reservoir to bleed air from the affected hydraulic reservoir. (Figure 205)

(a) Release the bleed button if a flow of fluid flows from the bleed valve.

(5) Move the Flap/Slat handle from UP/RET to the full aft position.

(6) After the full extension of the flaps and slats, move the Flap/Slat handle back to the UP/RET position.

(7) Repeat Paragraph 5.A.(5) and Paragraph 5.A.(6) a total of ten cycles.

(8) Move to arm the spoiler handle from RET to the full aft speedbrake position.

(9) After the spoilers are deployed, move the spoiler handle back to the RET position.

(10) Repeat Paragraph 5.A.(8) and Paragraph 5.A.(9) a total of ten cycles.

(11) Move the control column from neutral to the full forward position.

(12) Move the control column to the full aft position after the elevators have moved to the full trailing edge down position.

(13) Move the control column to neutral.

(14) Repeat Paragraph 5.A.(11) through Paragraph 5.A.(13) a total of ten cycles.

(15) Operate the thrust reversers on the effected engine extend and stow. Repeat a total of ten cycles.

(16) Brakes

- Make sure that the wheels are chocked
- Release the parking brake
- Turn antiskid ON
- Pump brake pedals (full On/Off 1 to 2 seconds each) ten times
- Turn antiskid OFF
- Set the parking brake.

(17) If the RH system is effected:

(a) Set the rudder to power mode.

(b) Depress left and right rudder pedals fully. Repeat ten times.

(18) If the RH system is effected:

(a) Lift the airplane on jacks.

(b) Disconnect and safety retract cylinders on the nose and main landing gear doors

NOTE: To prevent damage between cylinders and adjacent components.

(c) Extend and retract the landing gear. Repeat ten times.

(19) Manually bleed air out of the reservoir.

(20) Disconnect the hydraulic stand from the airplane.

(21) Remove/replace the dirty filter elements in the effected system.

(a) With filter patches, use alcohol or an equivalent cleaner to back-flush contamination from filters.

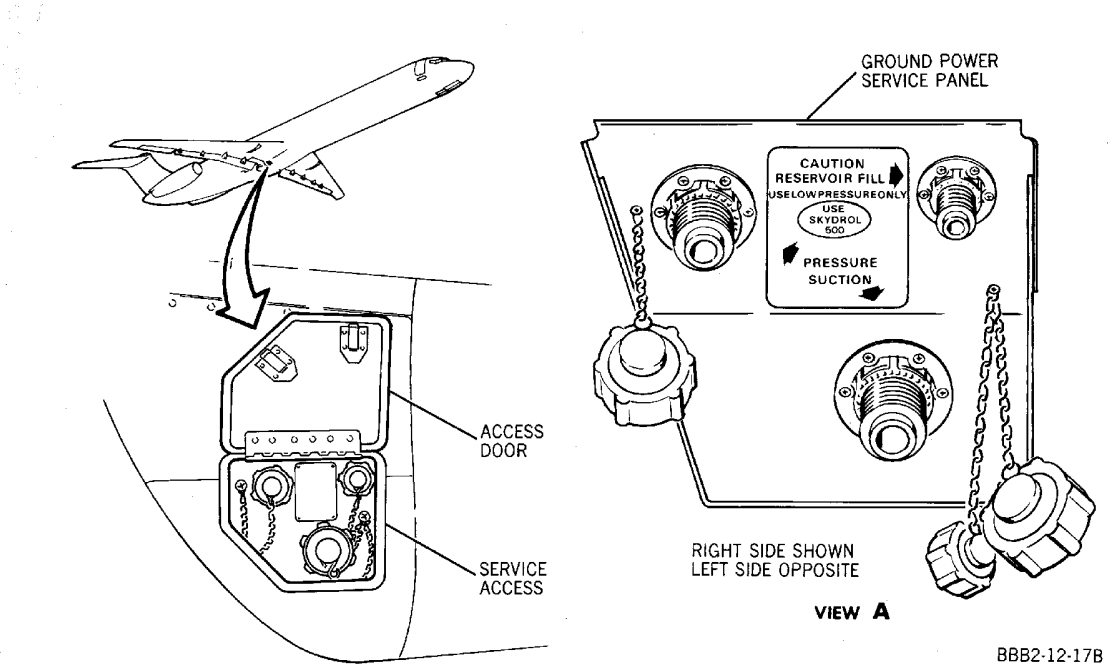
(b) Find the source of contamination through the material analysis of the collected particles. Make sure to apply necessary corrective procedure.

(22) Drain the affected hydraulic reservoir and fill with new fluid.

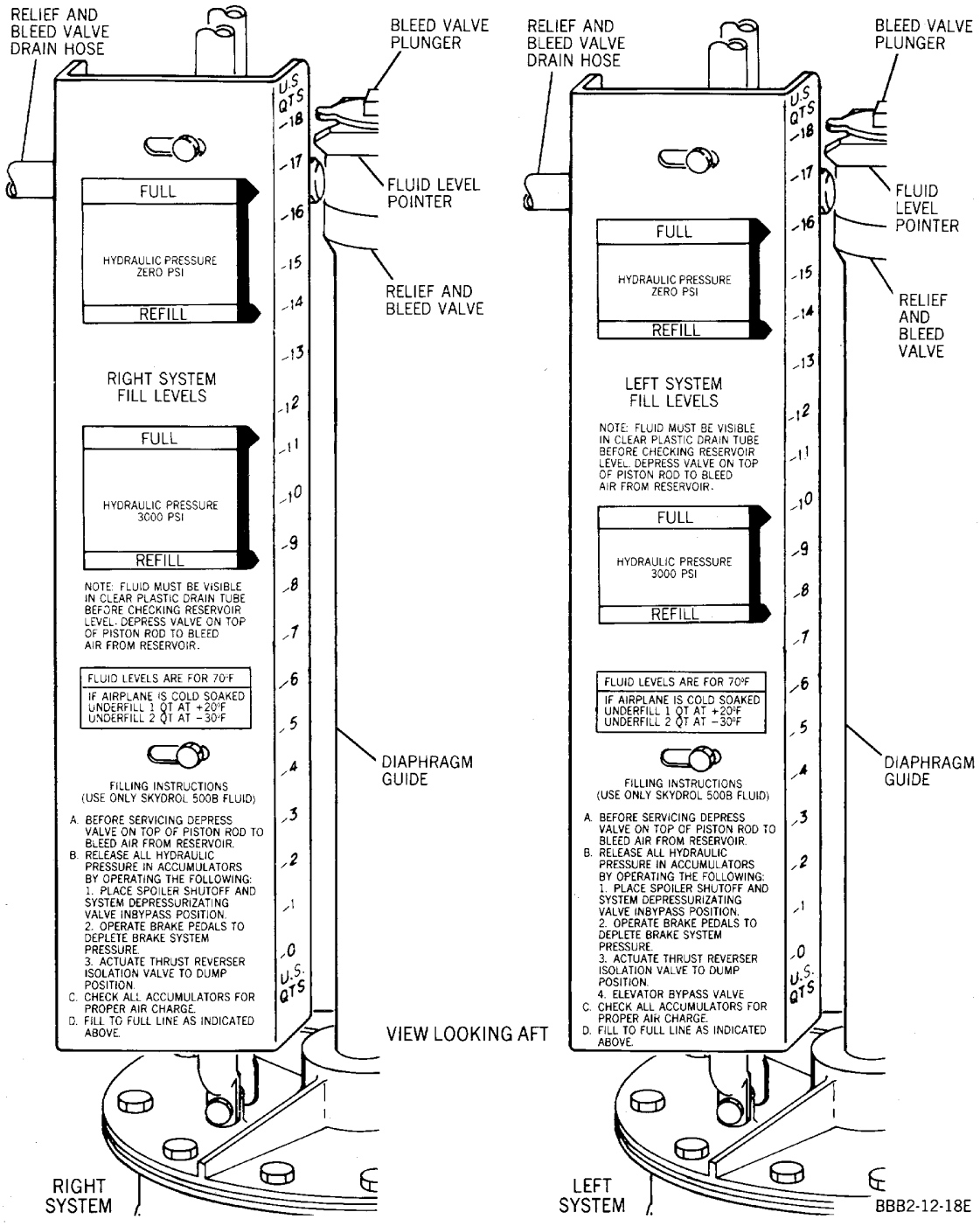
(23) Return the airplane to revenue service.

(24) At the next maintenance check, do the fluid sample analysis.

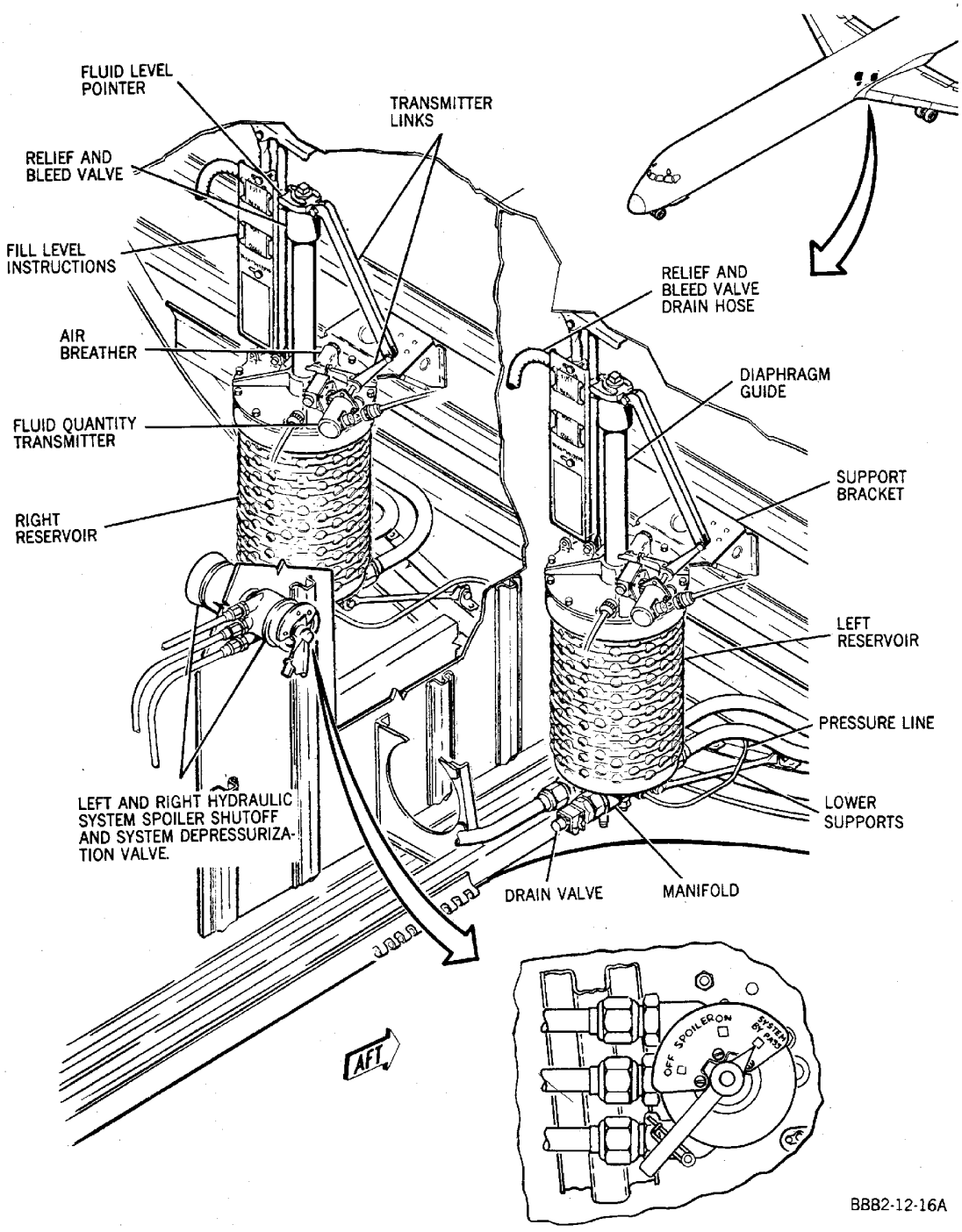
(a) If necessary, repeat the flushing procedure. (Paragraph 5.)



Ground Power and Reservoir Fill Connections
Figure 203/29-01-00-990-805



Hydraulic Reservoir -- Fluid Level Indication
Figure 204/29-01-00-990-806



Hydraulic Reservoir -- Servicing
Figure 205/29-01-00-990-807

HYDRAULIC SYSTEM FLUSHING - ELECTRIC MOTOR DRIVEN AUXILIARY PUMP

1. General

A. This section provides a guide for flushing hydraulic lines connected to the electric motor driven auxiliary pump in right hydraulic system.

B. Access to the electric motor driven pumps, located in the lower forward section of the right main gear wheelwell, is through the right main gear door.

C. Before any flushing procedure is performed on the hydraulic system, personnel should thoroughly understand the general flushing procedures in HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201.

2. Flushing Electric Motor Driven Auxiliary Pump

A. Supply Line (Reservoir to Pump)

(1) Remove cap from system supply line at reservoir and connect line to hydraulic source pressure hose. (Figure 201)

(2) Disconnect supply line at pump and connect line to hydraulic source return hose. Cap pump fitting.

(3) Pressurize external hydraulic source to 500 psi and 9 gpm flow.

(4) Flush line for 5 minutes.

(5) Depressurize external hydraulic source.

(6) Disconnect hydraulic source hoses from supply line. Cap line ends.

B. Case Drain/Return Line (Pump to Reservoir)

(1) Disconnect case drain line at pump and connect line to hydraulic source pressure hose. Cap pump fitting. (Figure 201)

(2) Remove cap from system return line at reservoir and connect line to hydraulic source return hose.

(3) Pressurize external hydraulic source to 500 psi and 9 gpm flow.

(4) Flush line for 5 minutes.

(5) Depressurize external hydraulic source.

(6) Disconnect hydraulic source hoses from case drain/return line. Cap line end at pump and connect return line at reservoir.

NOTE: Do not connect return line to reservoir if additional flushing of system is required.

(7) Install new filter elements in return line filters. (PAGEBLOCK 29-10-14/201)

C. Pressure Line (Pump to Reservoir)

(1) Disconnect pressure line at pump and connect line to hydraulic source pressure hose. Cap pump fitting. (Figure 201)

(2) Remove cap from pressure line at reservoir and connect line to hydraulic source return hose.

(3) Pressurize external hydraulic source.

(4) Flush line for 5 minutes.

(5) Depressurize external hydraulic source.

(6) Disconnect hydraulic source hoses from pressure line. Cap line ends.

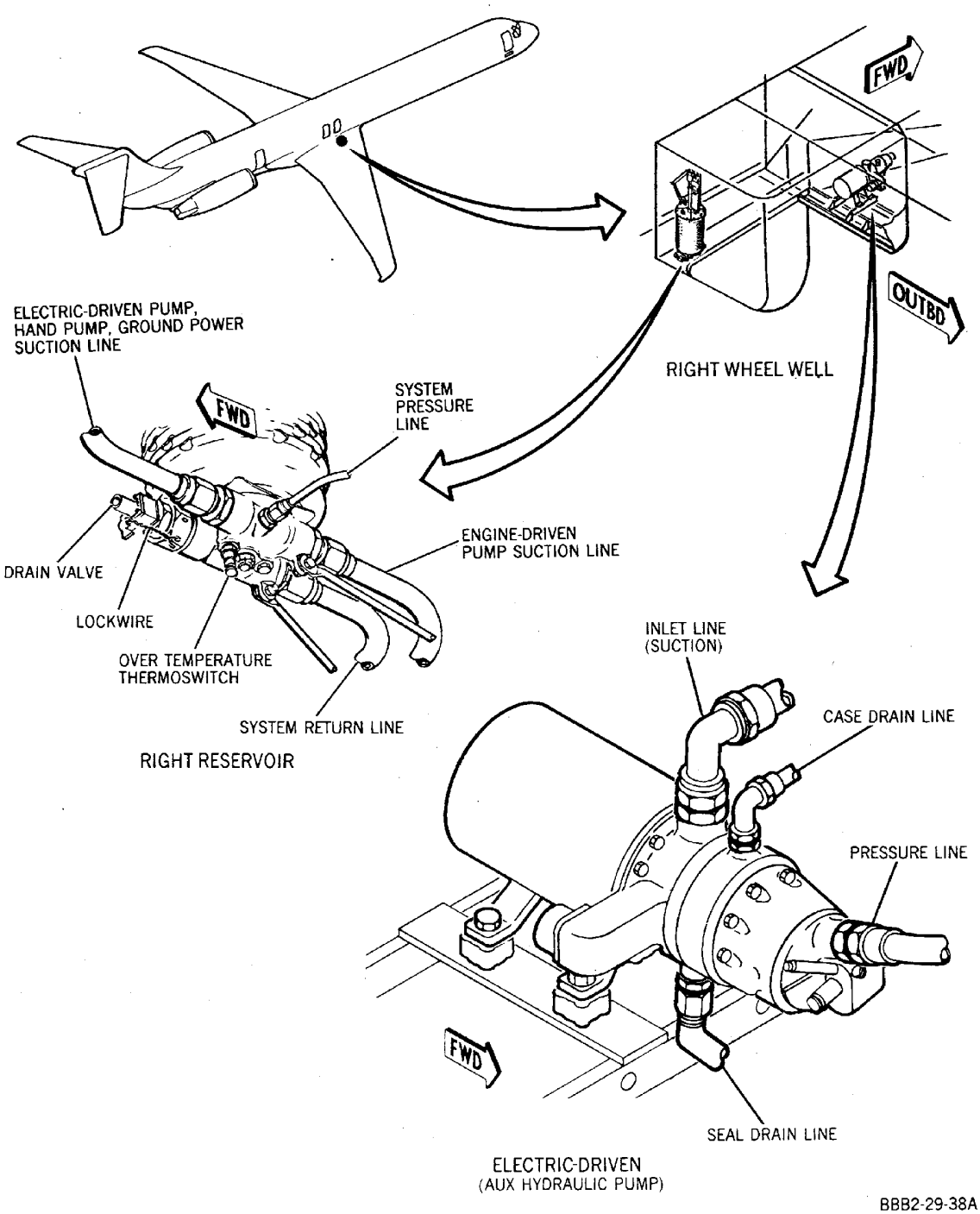
(7) Install new filter element in auxiliary pressure line filter. (PAGEBLOCK 29-10-14/201)

(8) Connect pressure line to reservoir.

NOTE: Do not connect return line to reservoir if additional flushing of system is required.

(9) Install clean electric motor driven auxiliary pump. (PAGEBLOCK 29-10-06/201)

(10) If hydraulic system does not require additional flushing, perform post flushing procedures. (PAGEBLOCK 29-01-00/201)



Electric Motor Driven Auxiliary Pump -- Hydraulic Connections
Figure 201/29-01-01-990-801

AUXILIARY HYDRAULIC PUMP POWER FEEDER WIRING - INSPECTION/CHECK

1. General

A. This procedure contains task card data.

B. Refer to SCR MDC-92K9145, ALI 20-2.

TASK 29-01-01-211-801

2. Detailed Inspection of the Auxiliary Hydraulic Pump Power Feeder Wiring

NOTE: The following task is an ALI procedure. For important information on ALI's, refer toGENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 28-00-00/201.

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
28-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Job Set-Up - Detailed Inspection of the Auxiliary Hydraulic Pump Power Feeder Wiring

SUBTASK 29-01-01-860-001

(1) Place ground maintenance bypass lever in bypass position, open main gear inboard doors, install MLG door safety locks and place bypass lever in normal (stowed) position.

C. Detailed Inspection of the Auxiliary Hydraulic Pump Power Feeder Wiring

SUBTASK 29-01-01-211-001

(1) Do a detailed inspection of the auxiliary hydraulic pump power feeder wiring over the entire harness length adjacent to the fuel tank per Standard Wiring Practices Manual section 20-10-01, per the paragraph titled “Protection of Installed Wire Bundles.”

(a) Verify that auxiliary hydraulic pump power feeders do not contact the fuel tank.

(b) Verify that the sleeving does not show signs of rubbing against fuel tank wall structure.

D. Job Close-up

SUBTASK 29-01-01-942-001

(1) Remove all tools and equipment from the work area. Make sure the area is clean.

(2) Place ground maintenance bypass lever in bypass position, remove MLG door safety locks and place bypass lever in normal (stowed) position.

(3) Return the aircraft to operable configuration.

END OF TASK

HYDRAULIC SYSTEM FLUSHING - ENGINE-DRIVEN PUMP TO RESERVOIR

1. General

A. This section provides a logical guide for removing the contaminates (foreign particles) from the fluid, units, and lines of the left and right engine-driven pump systems by flushing the systems with clean hydraulic fluid. The procedures in this section are identical for either the left or right system for component locations as shown in the illustrations.

B. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

C. Before any flushing procedures are performed, personnel should read and thoroughly understand the general flushing procedures in HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	

3. Flush Engine-Driven Hydraulic Pump Systems

A. Pressure Lines (Engine-Driven Pump to Pressure Line Filter)

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) Disconnect hydraulic pump pressure hose at pump. (Figure 201)

(4) Disconnect pressure line from outlet port of pressure line filter, located in aft accessory compartment. Cap open line. (Figure 201)

(5) Remove check valve from filter outlet port.

(6) Connect test stand return hose to outlet port.

(7) Connect test stand pressure hose to engine pump pressure hose disconnected in Paragraph 3.A.(3).

(8) Pressurize test stand to 500 psi (3450 kPa) and 9 gpm flow.

(9) Flush lines for 5 minutes.

(10) Depressurize test stand.

(11) Remove pressure line filter bowl and element, clean bowl.

(12) Install clean element and install filter bowl. (HYDRAULIC SYSTEM FILTERS - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-14/201)

(13) Disconnect test stand return hose from filter.

(14) Install clean check valve in filter outlet port using new O-ring.

(15) Connect pressure line to check valve in filter outlet port.

(16) Disconnect test stand pressure hose from engine-driven pump pressure hose.

(17) Install new or clean engine-driven hydraulic pump. Do not connect suction and case drain hoses to pump at this time. (ENGINE-DRIVEN HYDRAULIC PUMP - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-05/201)

B. Case Drain Lines (Engine-Driven Hydraulic Pump to Case Drain Line Filter)

(1) Connect test stand pressure hose to case drain hose at engine-driven pump. (Figure 201)

(2) Disconnect return line from tee downstream of case drain line filter, located in aft accessory compartment. Cap tee. (Figure 201)

(3) Connect test stand return hose to line disconnected in Paragraph 3.B.(2).

(4) Pressurize test stand to 500 psi and 9 gpm flow.

(5) Flush lines for 5 minutes.

(6) Depressurize test stand.

(7) Remove case drain line filter bowl and element, clean bowl.

(8) Install clean element and install filter bowl. (PAGEBLOCK 29-10-14/201)

(9) Disconnect test stand return hose from line downstream of filter.

(10) Connect return line to tee downstream of case drain filter.

(11) Disconnect test stand pressure hose from engine-driven pump case drain hose.

(12) Connect case drain hose to engine-driven pump.

C. Return Lines (Case Drain Line Filter to Reservoir)

(1) Disconnect return line from tee, located in aft accessory compartment, above filters. (Figure 201)

(2) Remove tee and check valve for cleaning. Plug lines.

(3) Connect test stand pressure hose to return line disconnected in Paragraph 3.C.(1).

(4) Drain hydraulic system reservoir, located in main gear wheel well. (PAGEBLOCK 29-10-01/201)

(5) Disconnect return line from reservoir. Cap reservoir port. (Figure 202)

(6) Connect test stand return hose to return line at reservoir.

(7) Pressurize test stand to 500 psi at 9 gpm flow.

(8) Flush lines for 5 minutes.

(9) Depressurize test stand.

(10) Disconnect test stand return hose from reservoir return line in wheel well. Plug line and tighten plug.

(11) Remove return line filter bowls and elements located in main gear wheel well and clean bowls.

(12) Install clean elements and install filter bowls. (PAGEBLOCK 29-10-14/201)

(13) Disconnect test stand pressure hose from return line in aft accessory compartment.

(14) Install a clean tee and check valves disconnected in Paragraph 3.C.(2).

(15) Connect lines to tee and check valves.

(16) Remove all plugs and caps and return all lines and units to original configuration.

D. Suction Lines (Reservoir to Engine-Driven Pumps)

(1) Connect test stand pressure hose to engine-driven pump suction hose. (Figure 202)

(2) Disconnect supply line at reservoir supply port. Cap reservoir port. (Figure 202)

(3) Connect test stand return hose to supply line.

(4) Disconnect lines from both sides of fire shutoff valve.

(5) Install jumper hose between lines.

(6) Disconnect return line from check valve in tee fitting, located between reservoir and fire shutoff valve. Remove check valve from tee and plug tee port.

(7) Pressurize test stand to 500 psi at 9 gpm flow.

(8) Flush lines for 5 minutes.

(9) Depressurize test stand.

(10) Disconnect test stand return hose and remove reservoir for cleaning. (HYDRAULIC SYSTEM RESERVOIR - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-01/201)

(11) Remove fire shutoff valve for cleaning. (PAGEBLOCK 29-10-04/201)

(12) Disconnect test stand pressure hose from engine-driven pump suction hose. Connect suction hose to pump.

(13) Install clean reservoir and fire shutoff valve. Connect all lines.

(14) Install clean check vavle in tee fitting between reservoir and fire shutoff valve and connect return line to check valve.

E. Pressure Lines (Pressure Line Filter to Tee Fitting)

(1) Disconnect pressure line from outlet port of pressure line filter located in aft accessory compartment. Cap filter port. (Figure 201)

(2) Connect test stand pressure hose to pressure line.

(3) Disconnect pressure inlet line from pressure tee fitting located in center web of main gear wheel well. Cap tee fitting. (Figure 201)

(4) Connect test stand return hose to pressure line.

(5) Pressurize test stand to 500 psi at 9 gpm flow.

(6) Flush lines for 5 minutes.

(7) Depressurize test stand.

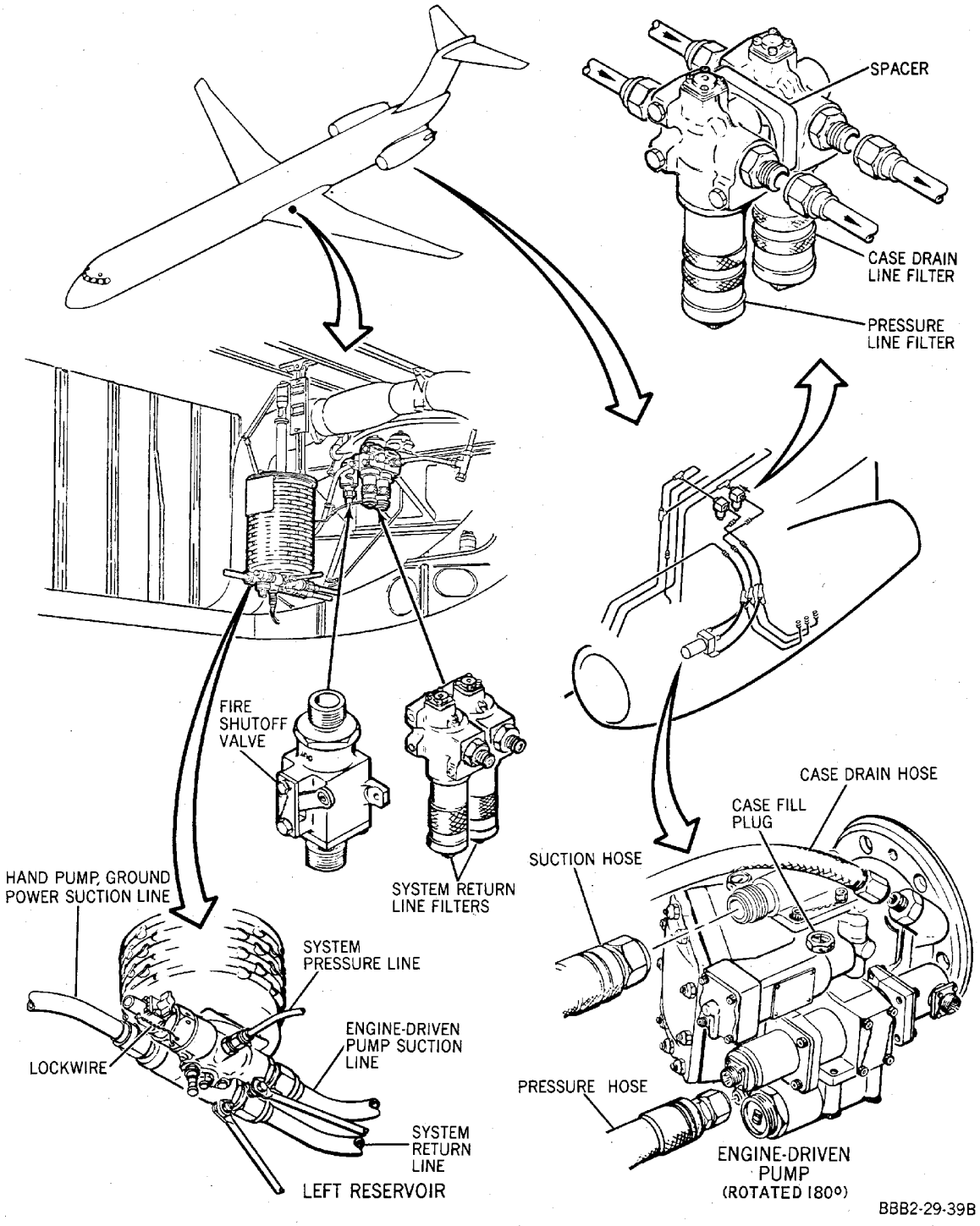
(8) Disconnect test stand pressure and return hoses.

(9) Remove tee and short pressure line to reservoir for cleaning.

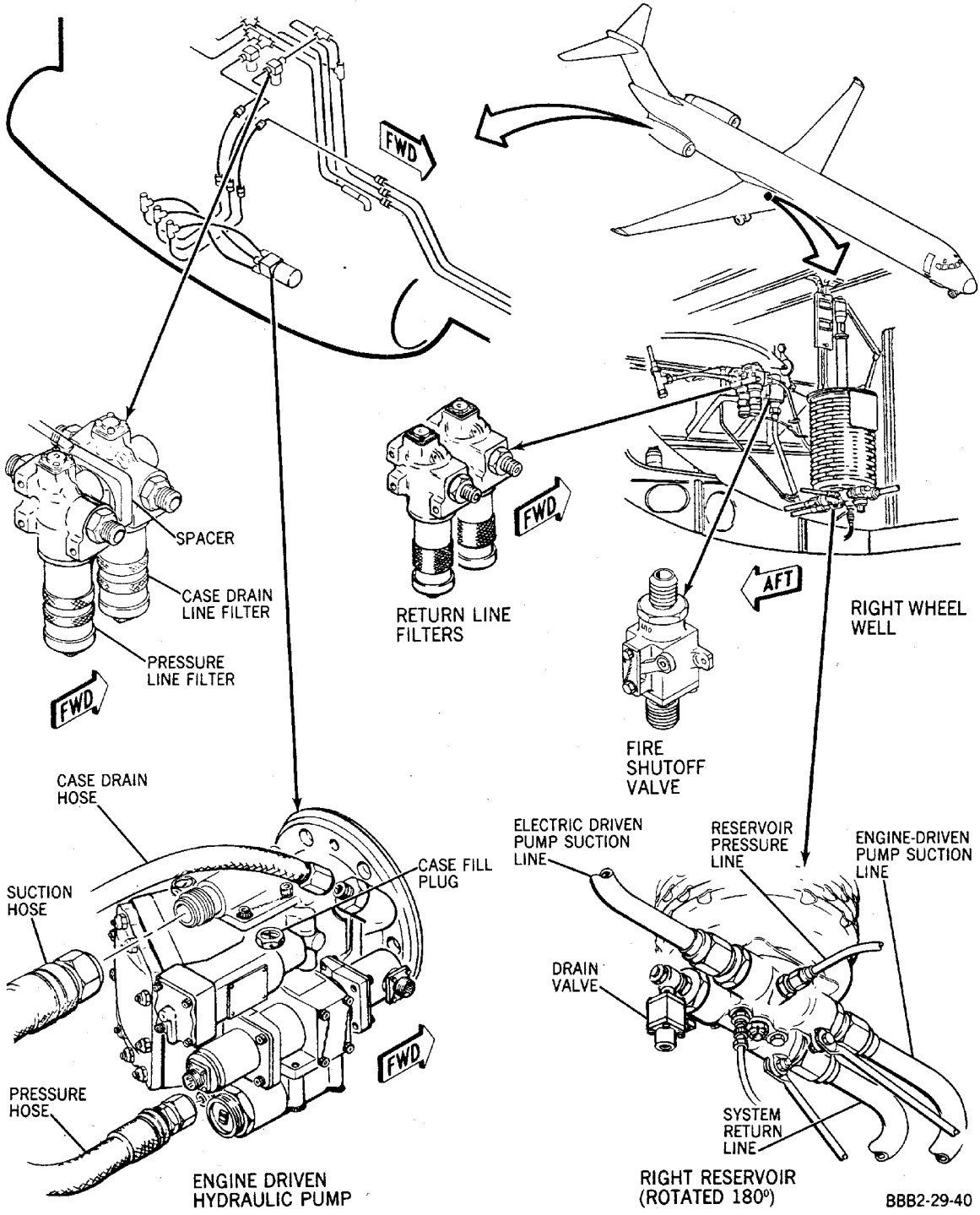
(10) Install clean or new tee and short pressure line.

(11) Return system to original configuration.

(12) Close auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.



Flushing Procedures -- Left System Line Connections
Figure 201/29-01-02-990-801



Flushing Procedures -- Right System Line Connections
Figure 202/29-01-02-990-802

HYDRAULIC SYSTEM FLUSHING - THRUST REVERSER SYSTEMS (LEFT AND RIGHT)

1. General

A. The purpose of this section is to provide a logical guide for removing the contaminates (foreign particles) from the fluid, units, and lines of the left and right thrust reverser system by flushing the systems with clean hydraulic fluid. The procedures in this section are identical for either the left or right system except for component locations as shown in illustrations.

B. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

C. Before any flushing procedures are performed, personnel should read and thoroughly understand the general flushing procedures in HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	

3. Flush Thrust Reverser Systems

A. Pressure Lines (Pressure Line Filters to Thrust Reverser Actuators)

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located onupper EPC circuit breaker panel.

(3) Depressurize thrust reverser system by placing thrust reverser bypass lever in bypass position and insert safety pin. Thrust reverser valve is located in aft accessory compartment.

(4) Disconnect deploy and stow lines from reverser actuators. (Figure 201) (Figure 202)

(5) Install jumper hoses between deploy and stow lines at each actuator.

(6) Disconnect thrust reverser latch and unlatch lines from deploy and stow lines at tee. Install pressure caps on tee.

(7) Disconnect stow line and accumulator line from reverser control valve and install jumper hose between lines. Cap valve fittings.

(8) Disconnect pressure line and deploy line from reverser control valve and install jumper hose between lines. Cap valve fittings.

(9) Disconnect return line from reverser control valve and connect return line to test stand return line. Cap valve fitting.

(10) If flushing LH system, disconnect line at top of accumulator and return line on outlet side case drain filter and install jumper hose between lines. Cap open fittings. (Figure 201)

(11) If flushing RH system, diconnect line at top of accumulator and line on outlet side case drain filter and install jumper hose between lines. Also disconnect line on outlet side case drain filter at upper end tee fitting and disconnect line on aft side tee fitting. Install jumper hose between lines. Cap open fittings. (Figure 202)

(12) If flushing LH system, disconnect pressure line from outlet side pressure line filter and connect test stand pressure hose to pressure line. Cap open fitting.

(13) If flushing RH system, disconnect pressure line from lower end of cross fitting just forward of pressure line filter. Connect test stand pressure hose to pressure line. Cap open fitting.

(14) Pressurize test stand to 500 psi at 9 gpm flow.

(15) Flush lines for 5 minutes.

(16) Depressurize test stand.

(17) Disconnect test stand pressure hose from pressure line at filter. Connect line to filter.

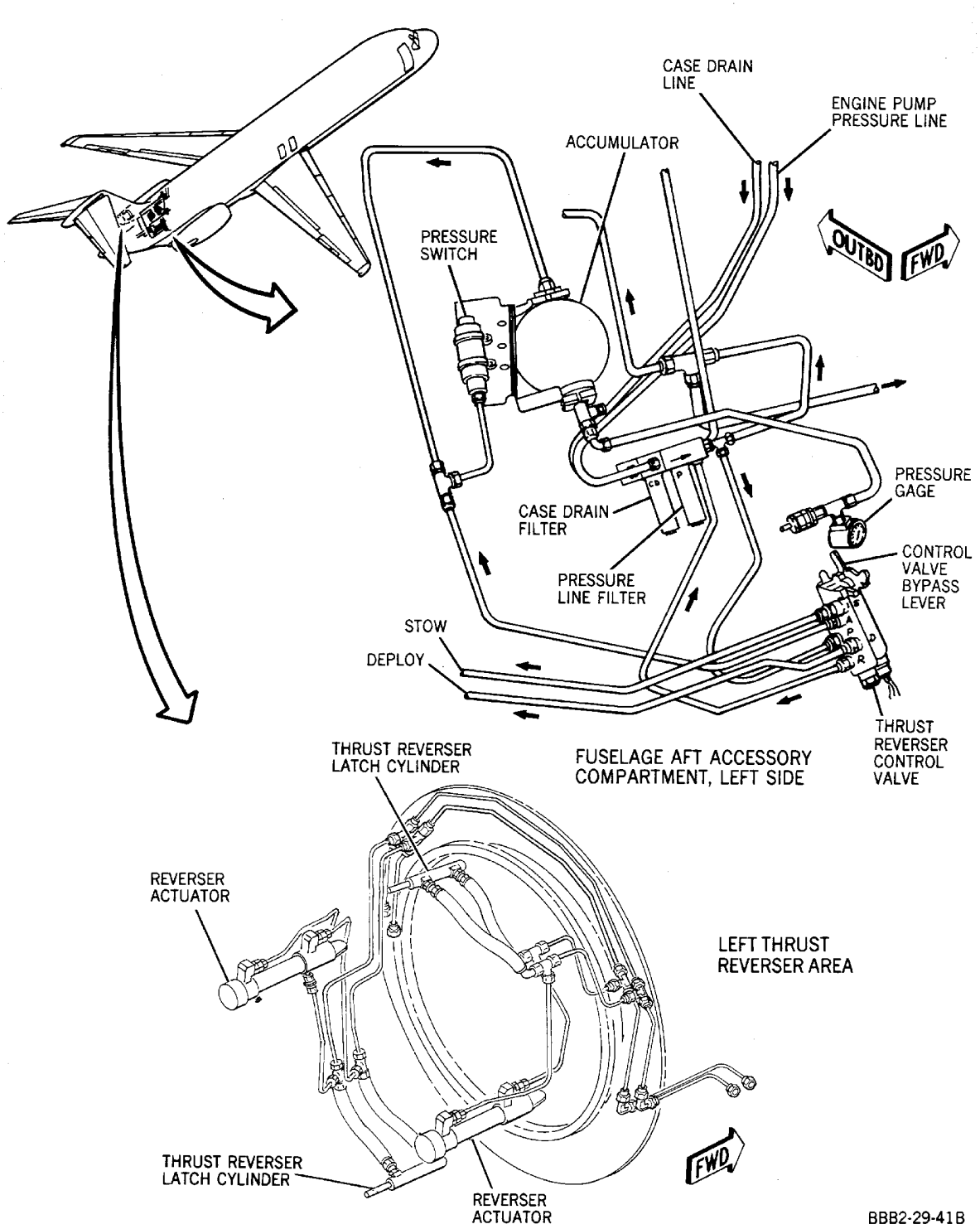
(18) Disconnect test stand return hose from stow line at control valve. Cap line.

(19) Disconnect and remove all jumper hoses.

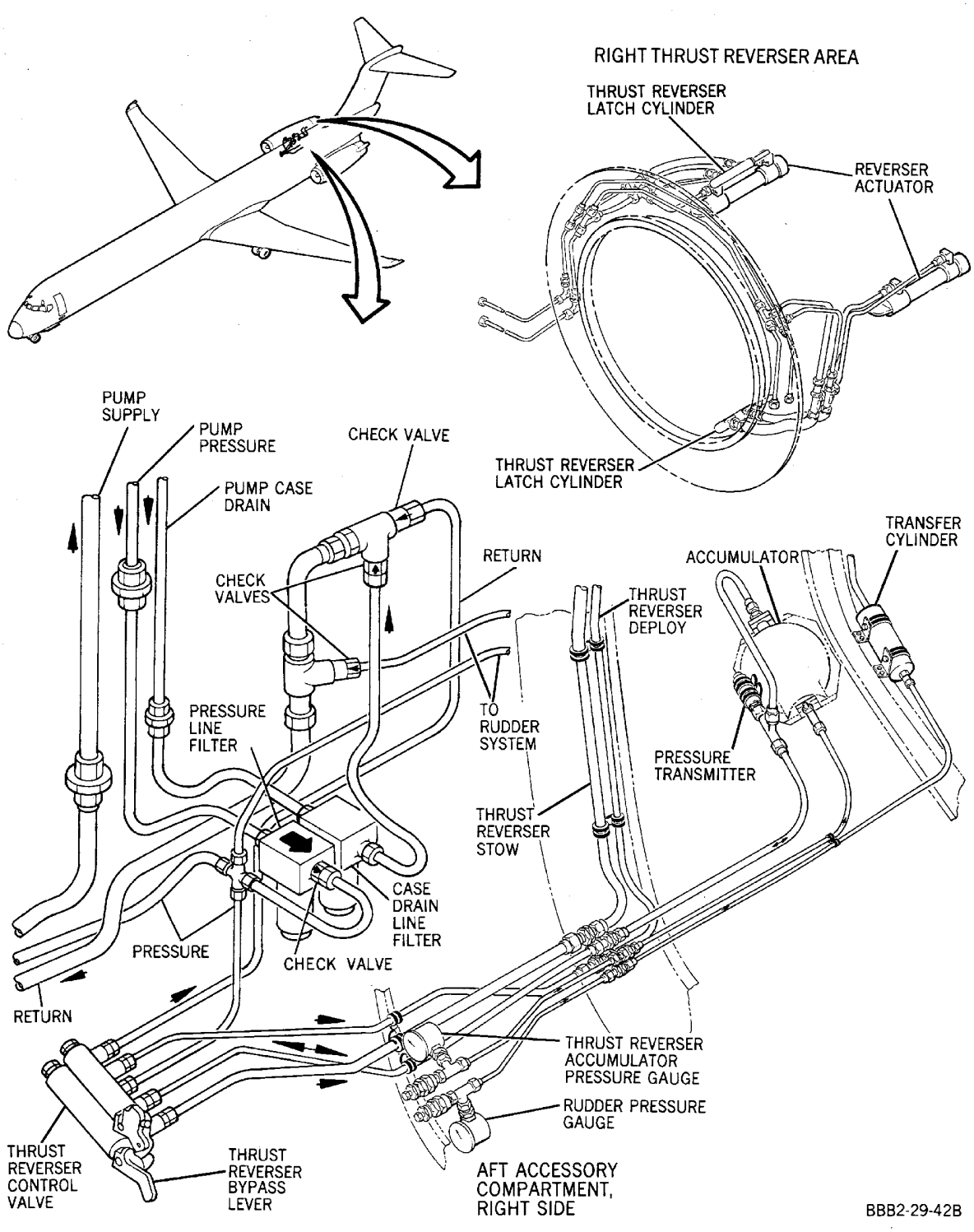
(20) Remove control valve, actuators, accumulator, pressure switch and short lines for cleaning. (THRUST REVERSER, SUBJECT 78-30-00) (THRUST REVERSER DOOR ACTUATOR, SUBJECT 78-30-02) (THRUST REVERSER HYDRAULIC ACCUMULATOR, SUBJECT 78-31-01) (THRUST REVERSER ACCUMULATOR LOW PRESSURE WARNING SWITCH, SUBJECT 78-32-01)

(21) Install clean or new control valve, actuators, accumulator, pressure switch, and short lines.

(22) Return all lines and units to original configuration.



Flushing Procedure -- Left Thrust Reverser Line Connections
Figure 201/29-01-03-990-801



Flushing Procedure -- Right Thrust Reverser Line Connections
Figure 202/29-01-03-990-802

HYDRAULIC SYSTEM FLUSHING - FLIGHT CONTROLS

1. General

A. This section provides a guide for removing the contaminants (foreign particles) from the fluid, units and lines of the following systems:

(1) Elevator boost system

(2) Rudder boost system

(3) Wing Flap system (left and right) - The left system operates the outboard flap cylinders; the right system operates the inboard flap cylinders.

(4) Spoiler system (left, right, and ground) - The left system operates the inboard flight spoiler actuators; the right system operates the outboard flight spoiler actuators. Both left and right systems operate both ground spoiler actuators.

(5) Slat system (left and right) - The left system operates the left slat actuator cylinders; the right system operates the right slat actuator cylinders.

B. The procedures in this section when applicable, are locations as shown in illustrations.

C. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

D. Before any flushing procedures are performed, personnel should read and thoroughly understand the general flushing procedures in HYDRAULIC SYSTEM FLUSHING, SUBJECT 29-01-00.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	

3. Flush Elevator Boost System

A. Pressure and Return Lines (Left Pressure Line Filter to Elevator Boost System Pressure Reducer)

NOTE: This procedure requires work stands capable of reaching the elevators and top of vertical fin.

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect pressure line from outlet port of left pressure line filter located in left side of aft accessory compartment. Cap filter port. (Figure 201)

(3) Connect test stand pressure hose to pressure line at filter.

(4) In aft accessory compartment, remove hydraulic accumulator and short sections of line for cleaning. Plug ports in union.

(5) In same area, disconnect both return lines from return relief valve. Jumper the lines. Remove relief valve for cleaning.

(6) Disconnect pressure and return lines from elevator actuators, left and right. Install jumpers between lines. Remove actuators for cleaning. (Figure 201)

(7) Disconnect lines from left and right elevator control valves located in aft inboard end of horizontal stabilizers.

(8) Install jumper hose between pressure inlet and pressure outlet lines of LH control valve. Remove short return line for cleaning. Cap tee in return lines.

(9) Disconnect pressure and return lines at elevator manifold. Cap manifold ports.

(10) Install jumper hose between inlet pressure from left elevator control valve and outlet pressure to right elevator actuator cylinder.

(11) At elevator manifold, install jumper hose between return line from right actuator cylinder to left actuator cylinder.

(12) Install jumper hose between two open pressure lines at elevator manifold. Cap manifold ports.

(13) Install jumper hose between pressure line at right elevator control valve to system return line at elevator manifold. Remove shore lines from control valve for cleaning. Cap tee fittings on pressure and return lines and open ports on control valve.

(14) Disconnect elevator boost system return line from tee located near left engine-driven pump case drain filter in aft accessory compartment. Cap tee.

(15) Connect test stand return hose to return line at tee.

(16) Pressurize test stand to 500 psi at 9 gpm flow.

(17) Flush lines for 5 minutes.

(18) Depressurize test stand.

(19) Disconnect jumper from right elevator actuator return line. Plug line.

(20) Remove plug from left elevator actuator return line and connect jumper to return line.

(21) Pressurize test stand to 500 psi at 9 gpm flow.

(22) Flush lines for 5 minutes.

(23) Depressurize test stand.

(24) Remove elevator control valves.

(25) Install clean or new elevator control valves.

(26) Remove jumper hoses and plugs from control valve lines and connect lines to control valves. Install clean or new short lines removed in Paragraph 3.A.(8).

(27) Install clean or new elevator actuators on left and right elevators.

(28) Remove jumper hoses from actuator lines and connect lines to actuators.

(29) Install clean or new accumulator and short lines removed in Paragraph 3.A.(4). Connect all lines to their respective fittings.

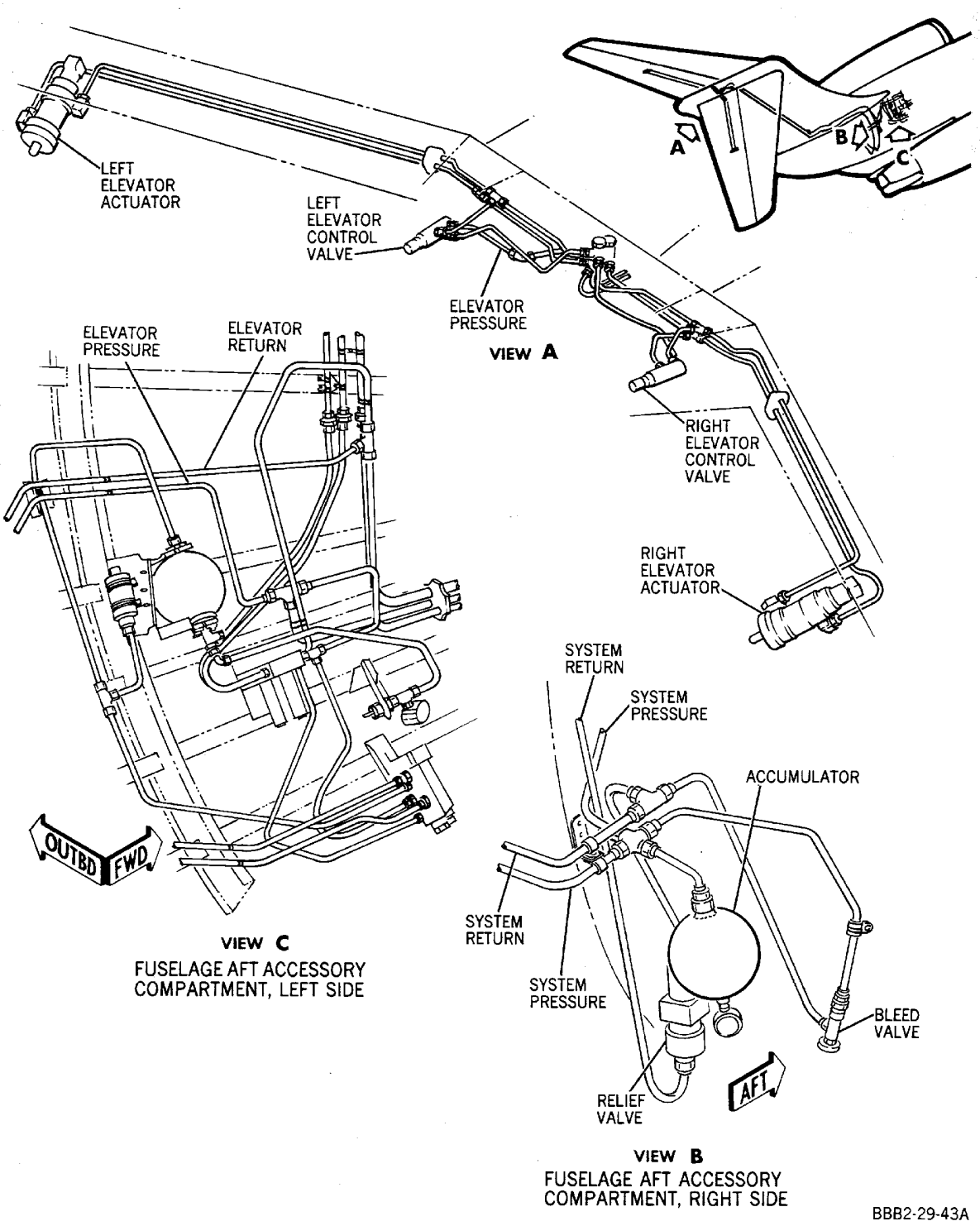
(30) Install clean or new return relief valve removed in Paragraph 3.A.(5).

(31) Remove jumper hose from lines and connect lines to relief valve.

(32) Disconnect, remove, inspect, clean, or replace bypass valve.

(33) Disconnect test stand return hose from return line in left aft accessory compartment. Connect return line to tee fitting.

(34) Disconnect test stand pressure hose from system pressure line at left pressure line filter. Uncap filter and connect pressure line to filter.



Flushing Procedure -- Elevator Line Connection
Figure 201/29-01-04-990-801

4. Flush Rudder Boost System

A. Pressure and Return Lines (Right Pressure Line Filter to Rudder Shutoff Valve)

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) Disconnect pressure inlet and outlet lines from rudder shutoff valve. Cap valve. (Figure 202)

(4) Install jumper hose between lines at valve.

(5) Disconnect pressure and return lines from rudder power package located overhead in tail section.

(6) Install jumper hose between lines at power package.

(7) Disconnect rudder pressure line at cross fitting, first connection down stream of right pressure line filter. Cap cross fitting.

(8) Connect test stand pressure hose to pressure line at cross fitting.

(9) Disconnect rudder return line at cross fitting forward of rudder shutoff valve. Cap cross fitting.

(10) Connect test stand return hose to rudder return line at cross fitting.

(11) Pressurize test stand to 500 psi at 9 gpm flow.

(12) Flush lines for 5 minutes.

(13) Depressurize test stand.

(14) Remove jumper hose from rudder shutoff valve pressure inlet and outlet lines. Cap lines.

(15) Disconnect remaining lines from rudder shutoff valve. Cap lines.

(16) Remove rudder shutoff valve.

(17) Remove jumper hose from rudder package pressure and return lines. Cap lines.

(18) Remove rudder power package.

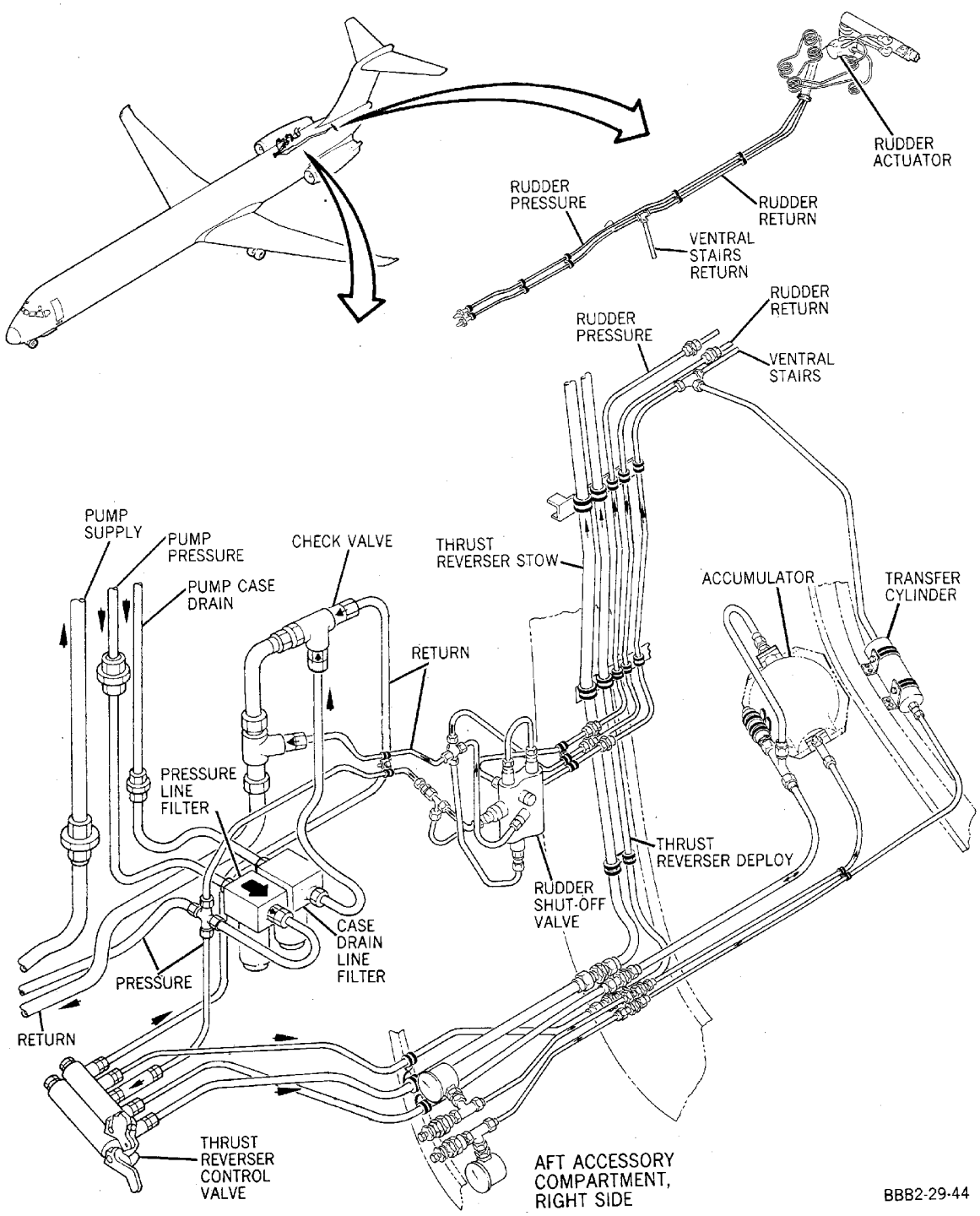
(19) Install clean or new rudder shutoff valve and rudder power package.

(20) Connect all lines to rudder shutoff valve and rudder power package.

(21) Disconnect test stand pressure and return hoses from rudder pressure and return lines.

(22) Connect rudder pressure and return lines to their respective cross fittings.

(23) Close auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.



Flushing Procedure -- Rudder Line Connections
Figure 202/29-01-04-990-802

5. Flush Wing Flap Systems

A. Pressure and Return Lines (Tee Fitting to Return Line Tee)

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) Disconnect wing flap pressure line from tee fitting located in left main gear wheelwell; below ground control spoiler valve if left system being flushed, below spoiler shutoff valve if right system being flushed. Cap tee fitting. (Figure 203)

(4) Connect test stand pressure hose to pressure line at tee fitting.

(5) Disconnect wing flap return line from tee fitting located in left main gear wheelwell; at bottom of spoiler control valve if left system being flushed, above power transfer unit. Cap tee fitting. (Figure 203)

(6) Connect test stand return hose to return line at tee fitting.

(7) Disconnect pressure inlet line from flap control valve in wheelwell. Cap valve port.

(8) Disconnect flap down line from flap control valve. Cap valve port.

(9) Install jumper hose between lines.

(10) Disconnect both lines from flap two-speed control valve. Cap valve ports.

(11) Install jumper hose between lines.

(12) Disconnect both lines from left and right flap actuator cylinders; outboard cylinders if left system is being flushed, inboard cylinders if right system is being flushed. Cap cylinder ports.

(13) Install jumper hoses between up and down lines at each actuator cylinder.

(14) Disconnect flap up line at flap control valve. Cap valve port.

(15) Disconnect return line at flap control valve. Cap valve port.

(16) Install jumper hose between up line and return line at control valve.

(17) Pressurize test stand to 500 psi and 9 gpm flow.

(18) Flush lines for 5 minutes.

(19) Depressurize test stand.

(20) Disconnect test stand return hose from flap return line at tee in left wheelwell. Connect flap return line to tee.

(21) Disconnect test stand pressure hose from pressure line at tee.

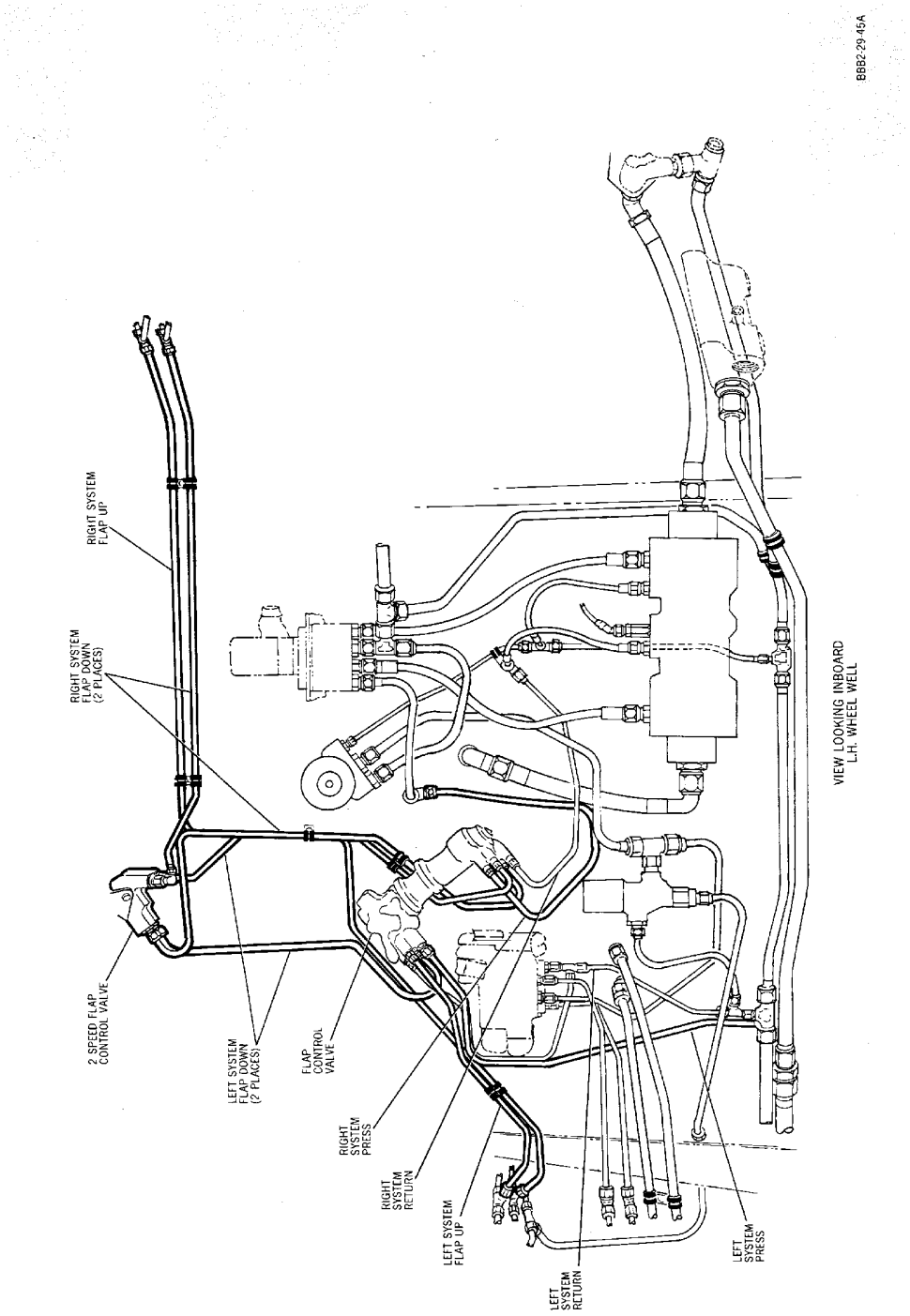
(22) Remove flap control valve with check valves and restrictor, flap two-speed control valve, and flap actuator cylinders. (PAGEBLOCK 27-52-01/201)

(23) Install clean or new flap control valve with check valves and restrictor, flap two-speed control valve, and flap actuator cylinders. (FLIGHT CONTROLS, CHAPTER 27)

(24) Remove jumper hoses and connect hydraulic lines to valves and cylinders.

(25) Check flap control valve rigging. (PAGEBLOCK 27-52-01/201)

(26) Close auxiliary hydraulic pump circuit breaker.



Flushing Procedure -- Flap Line Connections
Figure 203/29-01-04-990-803

6. Flush Flight Spoiler Systems

A. Pressure and Return Lines (Spoiler Reducer to System Return Tee)

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) Disconnect spoiler pressure line on outlet side of reducer located in main gear wheelwell. Cap reducer port. (Figure 204 (Sheet 1) for left)

WJE 405-411, 880, 881, 883, 884

(4) Disconnect spoiler pressure line on outlet side of reducer located in main gear wheelwell. Cap reducer port. (Figure 204 (Sheet 2) for right)

WJE ALL

(5) Connect test stand pressure hose to spoiler pressure line at spoiler reducer.

(6) Disconnect spoiler return line; where spoiler return line tees into system return at forward inboard corner of left main wheelwell if left system being flushed, at spoiler reducer tee if right system being flushed. Cap tee.

(7) Connect test stand return hose to spoiler return line disconnected in Paragraph 6.A.(5).

(8) Disconnect spoiler pressure and return lines from spoiler actuators; inboard actuators if left system is being flushed, outboard actuators if right system is being flushed. Cap actuator ports.

(9) Install jumper hoses between pressure and return lines at each actuator.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(10) Disconnect line between pressure and return lines at cooling orifice tee fittings. Cap tee fittings (right system only). (Figure 204 (Sheet 3))

WJE 405-411, 880, 881, 883, 884

(11) On airplanes 104-999, disconnect line between pressure and return lines at cooling orifice tee fittings. Cap tee fittings (right system only). (Figure 204 (Sheet 3))

WJE ALL

(12) Pressurize test stand to 500 psi (3450 kPa) at 9 gpm flow.

(13) Flush lines for 5 minutes.

(14) Depressurize test stand.

(15) Remove spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports. (Figure 204 (Sheet 1))

WJE 405-411, 884

(a) On airplanes 104-999, remove in-line check valve. (Figure 204 (Sheet 1))

WJE 405-411, 880, 881, 883, 884

(16) Remove spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports. (Figure 204 (Sheet 2))

WJE 405-411, 884

(a) On airplanes 104-999, remove in-line check valve. (Figure 204 (Sheet 2))

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(17) Remove spoiler reducer, spoiler shutoff valve, in-line check valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports.

WJE 405-412, 414, 880, 881, 883, 884

(18) Remove spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports.

WJE ALL

(19) Install clean or new spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines.

WJE 405-411, 880, 881, 883, 884

(a) On airplanes 104-999, install clean or new in-line check valve.

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(20) Remove spoiler reducer, spoiler shutoff valve, in line check valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports.

WJE 405-412, 414, 880, 881, 883, 884

(21) Remove spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines for cleaning. Cap open ports.

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(22) Install clean or new spoiler reducer, spoiler shutoff valve, in-line check valve, pressure switch, and short pressure and return lines.

WJE 405-412, 414, 880, 881, 883, 884

(23) Install clean or new spoiler reducer, spoiler shutoff valve, pressure switch, and short pressure and return lines.

WJE ALL

(24) Disconnect test stand pressure hose from spoiler pressure line. Connect spoiler pressure line to applicable fitting.

(25) Disconnect test stand return hose from spoiler return line. Connect spoiler return line to applicable fitting.

(26) Remove spoiler actuators from left and right wings.

(27) Install clean or new actuators in left or right wings, as applicable.

(28) Remove jumper lines from actuator pressure and return lines. Connect lines to actuators.

(29) Remove spoiler actuators and tee fittings from left and right wings. (Figure 204 (Sheet 3))

WJE 401-404, 415-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(30) Install clean or new actuators and tee fittings in left or right wings, as applicable.

(31) Remove jumper lines and connect pressure and return lines to actuators.

(32) Remove caps from cooling orifice tee fittings. Install clean or new short line between pressure and return lines at tee fittings.

WJE 405-411, 880, 881, 883, 884

(33) On airplanes 104-999, remove caps from cooling orifice tee fittings. Install clean or new short line to pressure and return lines at tee fittings. (Figure 204 (Sheet 3)).

WJE ALL

(34) Close auxiliary hydraulic pump circuit breakers.

7. Flush Ground Spoiler System

A. Pressure and Return Lines (From Spoiler Up Line to Spoiler Down Lines)

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) Disconnect spoiler up line at ground spoiler control valve; located in left main wheelwell if left system being flushed, located in right main wheelwell if right system being flushed. Cap valve port.

(4) Connect test stand pressure hose to ground spoiler up line.

(5) Disconnect spoiler down line at ground spoiler control valve; located in left main wheelwell if left system being flushed, located in right main wheelwell if right system being flushed. Cap valve port.

(6) Connect test stand return hose to spoiler down line.

(7) Disconnect ground spoiler pressure and return lines from ground spoiler actuators. Cap actuator ports.

WJE 401-412, 414, 873-881, 883, 884, 886, 887, 892, 893

(8) Install jumper hose between pressure and return lines; right system lines if right system being flushed, left system lines if left system being flushed.

(9) Pressurize test stand to 500 psi at 9 gpm flow.

(10) Flush lines for 5 minutes.

(11) Depressurize test stand.

(12) Remove ground spoiler actuators and applicable ground spoiler control valve for cleaning.

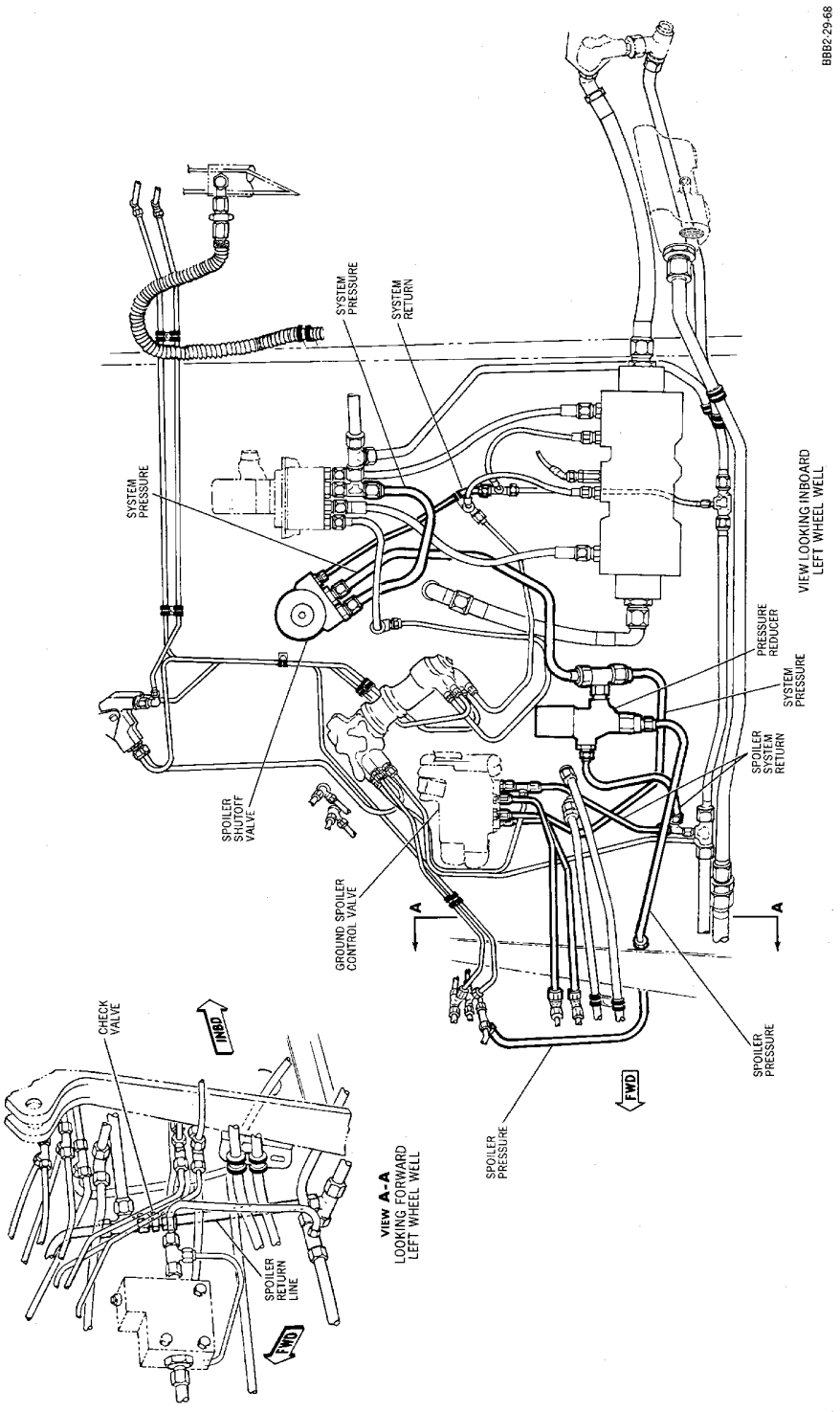
(13) Install clean or new actuators and applicable ground spoiler control valve.

(14) Remove jumper lines from actuator pressure and return lines. Connect lines to actuators.

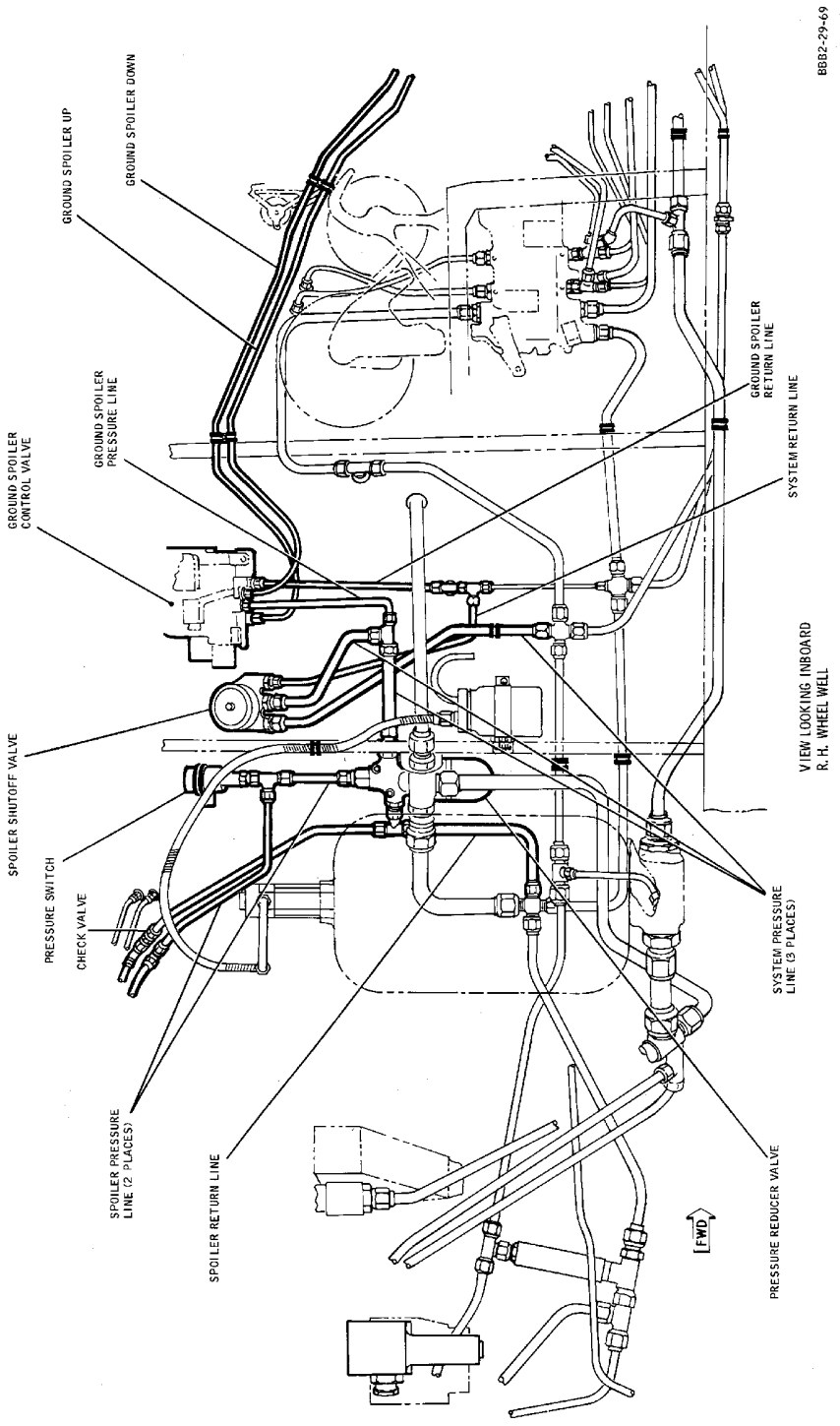
(15) Disconnect test stand pressure and return hoses from ground spoiler up and down lines. Connect up and down lines to control valve.

(16) Close auxiliary hydraulic pump circuit breakers.

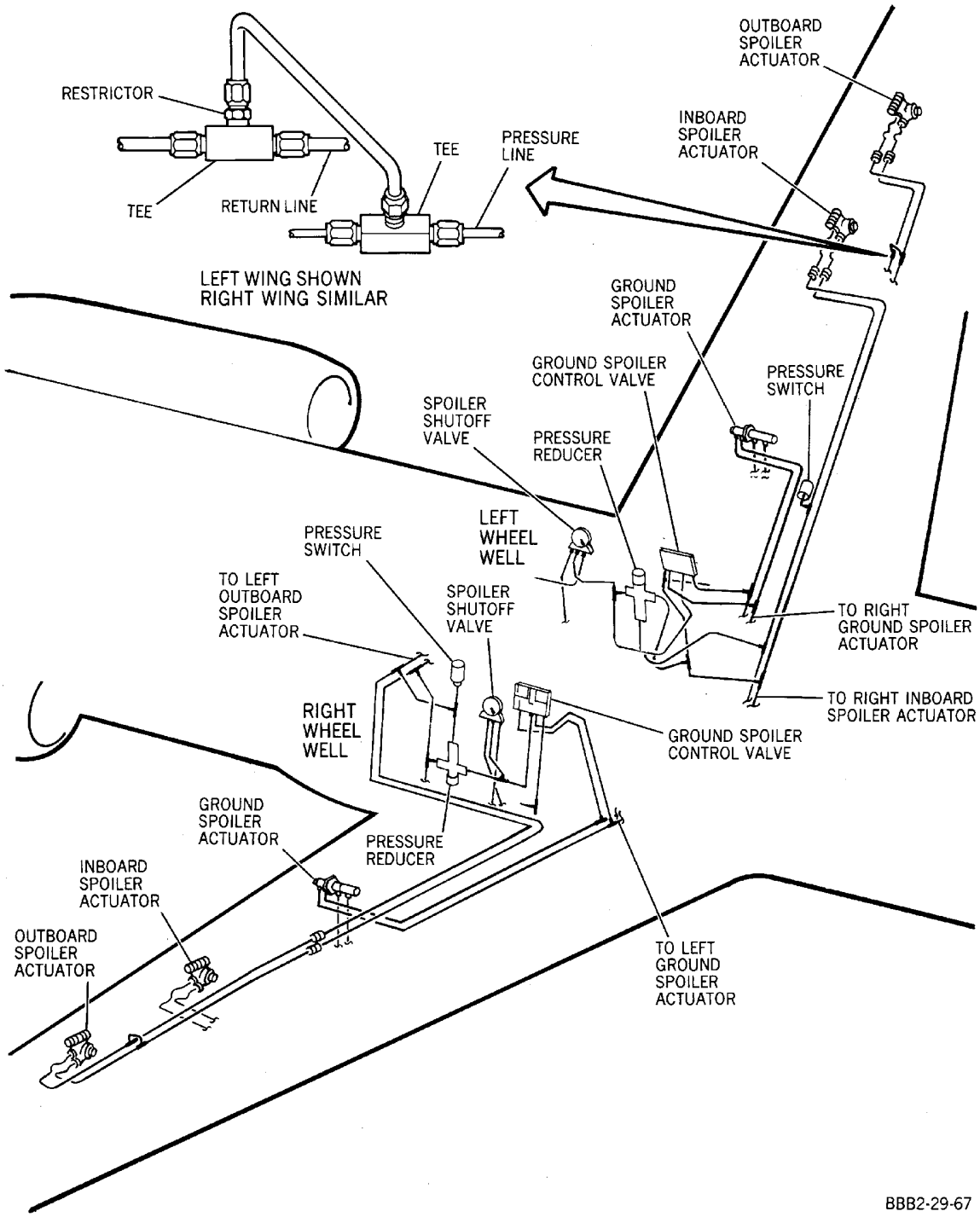
WJE ALL



Flushing Procedure -- Spoiler Line Connections
Figure 204/29-01-04-990-804 (Sheet 1 of 3)



Flushing Procedure -- Spoiler Line Connections
Figure 204/29-01-04-990-804 (Sheet 2 of 3)



Flushing Procedure -- Spoiler Line Connections
Figure 204/29-01-04-990-804 (Sheet 3 of 3)

8. Flush Leading Edge Slat Systems

A. Pressure and Return Lines (Pressure Line Tee to Return Line Tee) as applicable)

(Figure 205

(1) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on EPC aft circuit breaker panel.

(3) For left system, disconnect slat pressure line from tee above and left of slat drive mechanism, access through mid cargo compartment aft panel; for right system, disconnect slat pressure line from tee below pressure transmitter. Cap tee.

(4) Connect test stand pressure hose to slat pressure line.

(5) For left system, disconnect slat return line from tee above and left of slat drive mechanism, access through mid-cargo compartment aft panel; for right system, disconnect slat return line from tee fitting to right of slat control valve.

(6) Connect test stand pressure hose to slat return line.

(7) Disconnect system pressure line and slats extend line from applicable (left or right) slat control valve. Cap valve ports.

NOTE: Access to the slat control valves is through access aft panel in the mid-cargo compartment.

(8) Install jumper hose between system pressure line and slats extend line.

(9) Disconnect system return line and slats retract line from applicable (left or right) slat control valve. Cap valve ports.

(10) Install jumper hose between return line and slats retract line.

(11) Disconnect extend and retract lines from applicable (left or right) slat actuator cylinder in mid-cargo compartment. Cap cylinder ports.

(12) Install jumper hoses between the extend and retract lines at cylinder disconnected in step (11).

(13) Pressurize test stand to 500 psi at 9 gpm flow.

(14) Flush line for 5 minutes.

(15) Depressurize test stand.

(16) Remove control valve with check valve and restrictor, actuator cylinders, and extend line restrictors located behind aft panel in mid-cargo compartment.

(17) Install clean or new control valve with check valve and restrictor, actuator cylinders, and extend line restrictors.

(18) Disconnect jumper hoses from extend and retract lines at actuator cylinders in mid-cargo compartment behind aft panel. Connect lines to cylinders.

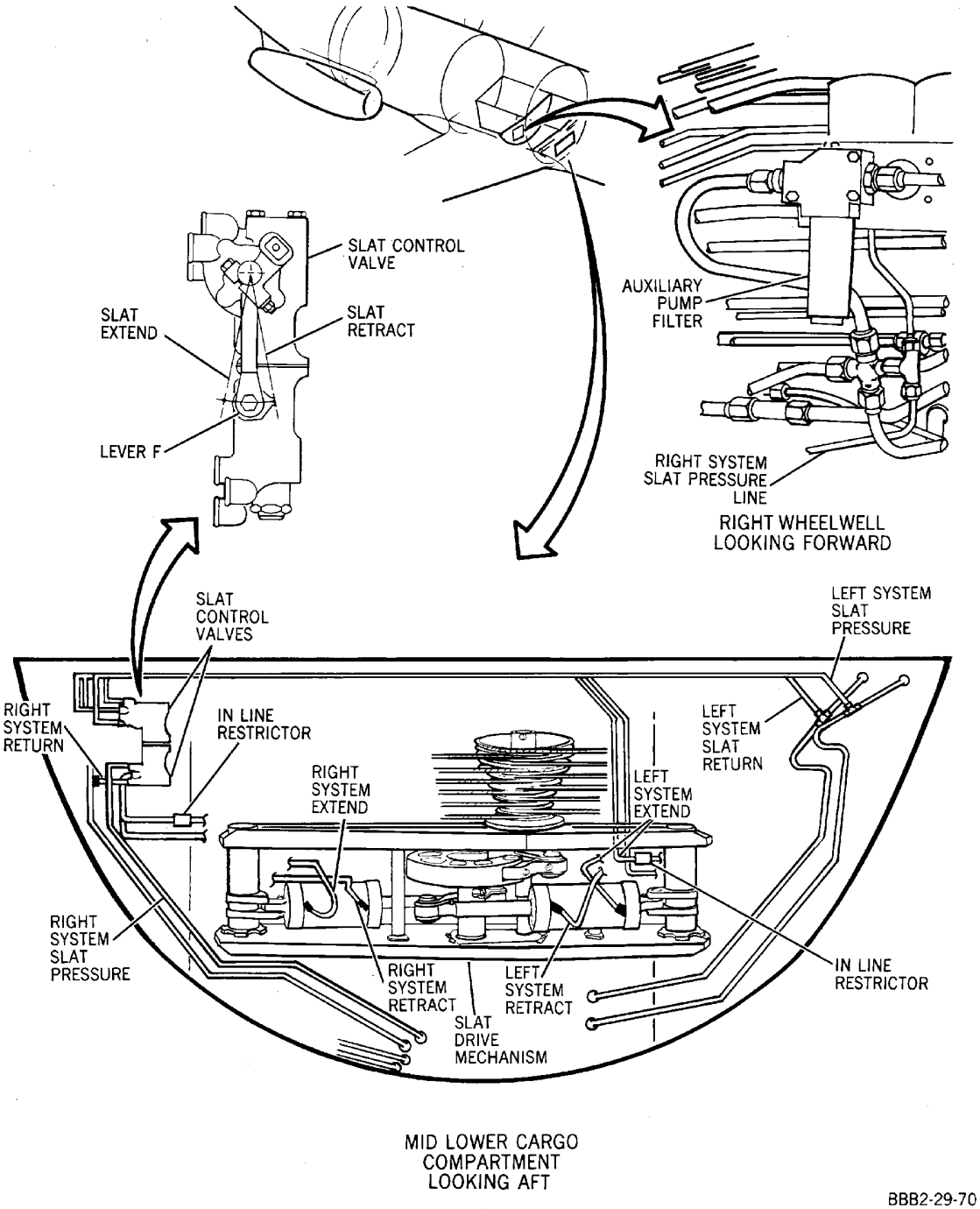
(19) Disconnect jumper hoses from pressure and extend lines, and from return and retract lines at slat control valve. Connect lines to control valves.

(20) Disconnect test stand pressure and return hoses. Connect pressure and return lines to their respective fittings.

(21) Check control valve rigging (PAGEBLOCK 27-80-03/201).

(22) Check actuator cylinder rigging (PAGEBLOCK 27-80-05/201).

(23) Close auxiliary hydraulic pump circuit breakers.



Flushing Procedures -- Slat Lines Connection
Figure 205/29-01-04-990-808

HYDRAULIC SYSTEM FLUSHING - HYDRAULIC POWER TRANSFER UNIT

1. General

A. The purpose of this section is to provide a logical guide for removing the contaminates (foreign particles) from the fluid, units, and lines of the hydraulic power transfer unit by flushing the systems with clean hydraulic fluid.

B. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

C. Before any flushing procedures are performed, personnel should read and thoroughly understand. (HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	

3. Flush Hydraulic Power Transfer Unit

A. Transfer Unit Pressure, Supply, and Case Drain Lines

(1) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on upper EPC circuit breaker panel.

(3) Open hydraulic power transfer unit control circuit breaker located on lower EPC circuit breaker panel.

(4) Disconnect pressure, suction, and case drain hoses from left system power tranfer unit and respective dual shutoff valve and tee fittings. Remove hoses for cleaning. Plug unit and valve ports.

(5) Disconnect and remove short pressure line and tee between dual shutoff valve and spoiler shutoff valve. Plug valve ports.

(6) Disconnect pressure, suction, and case drain hoses from right system power transfer unit and respective dual shutoff valve and tee fitting. Plug valve ports.

(7) If right system is being flushed, remove hoses for cleaning.

(8) Disconnect vent line from power transfer unit.

(9) Remove hydraulic power transfer unit and dual shutoff valve. (PAGEBLOCK 29-10-07/201) (PAGEBLOCK 29-10-08/201)

(10) If right system is being flushed, disconnect and remove two short suction lines, tee and check valve located in right main gear wheelwell. Cap line.

(11) Install new or clean hydraulic power transfer unit and dual shutoff valve. (PAGEBLOCK 29-10-07/201) (PAGEBLOCK 29-10-08/201)

(12) Install and connect pressure, suction, and case drain hoses to hydraulic power transfer unit and dual shutoff valve and respective tees.

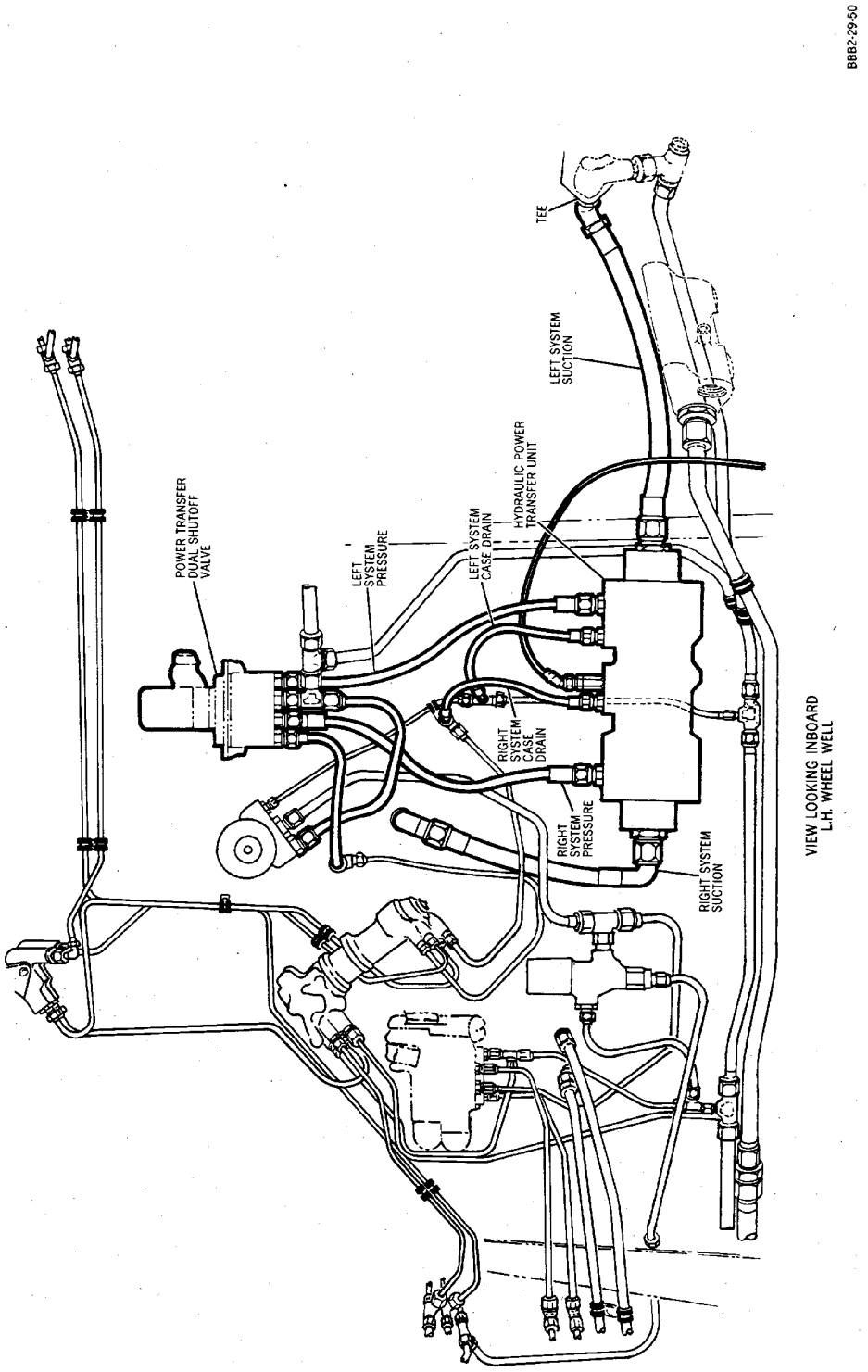
(13) Install and connect short pressure lines to dual shutoff valve and left spoiler shutoff valve.

(14) Connect right system short pressure lines to shutoff valve and respective tees.

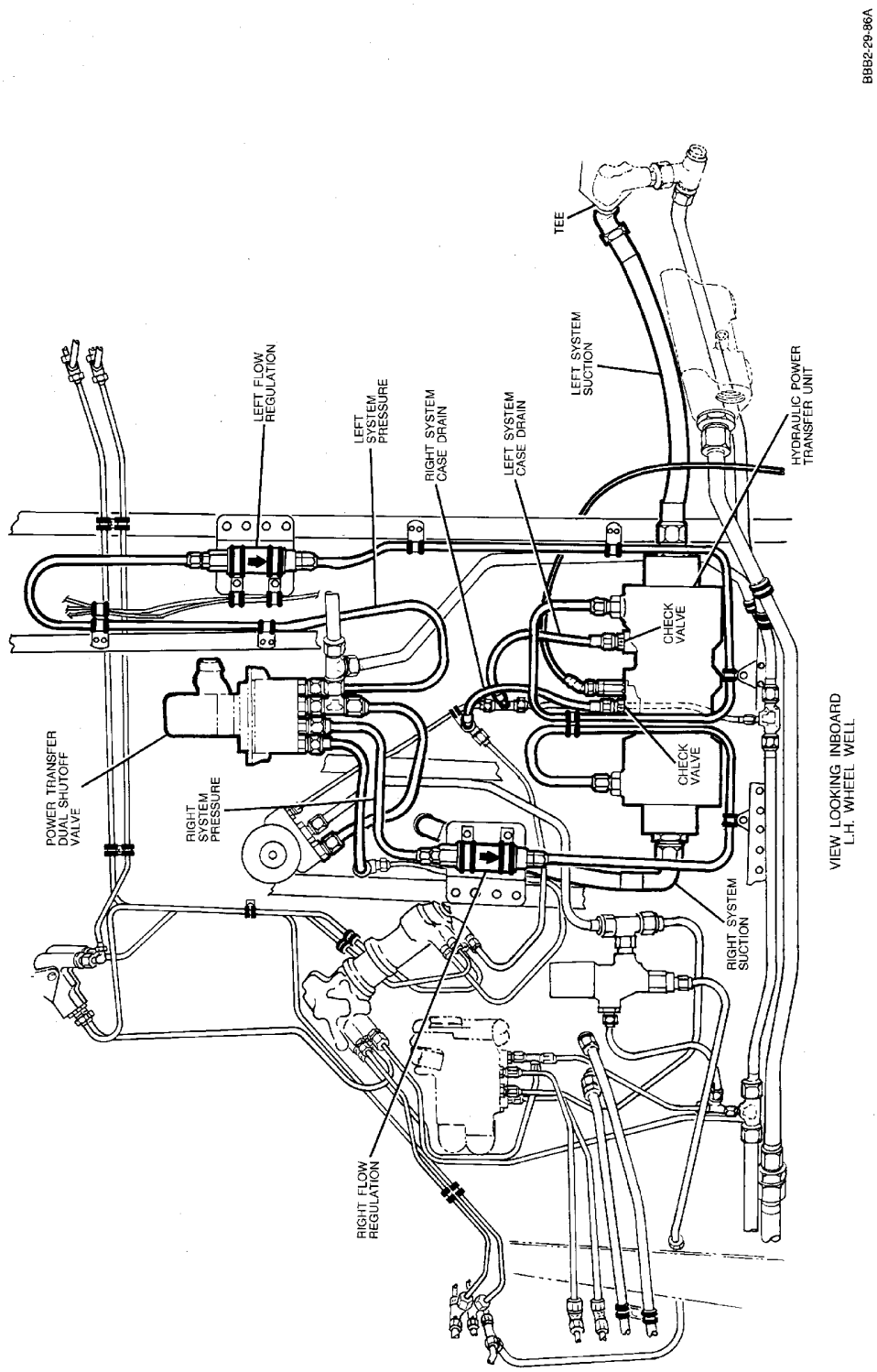
(15) Connect vent line to power transfer unit.

(16) Close hydraulic power transfer unit control circuit breakers.

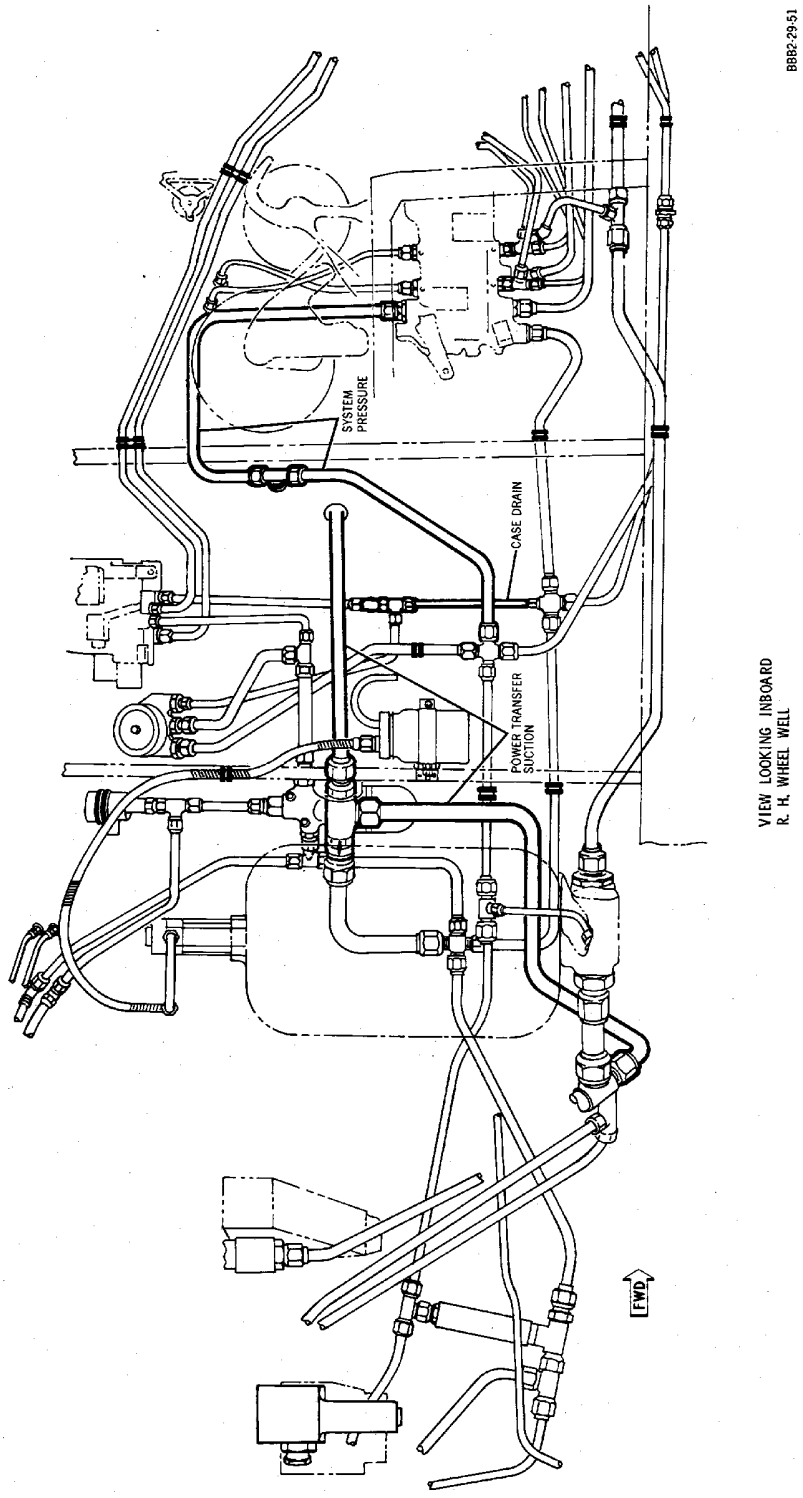
(17) Close auxiliary hydraulic pump circuit breakers.



Flushing Procedure -- Hyd Power Transfer Unit Line Connections
Figure 201/29-01-05-990-801 (Sheet 1 of 3)



Flushing Procedure -- Hyd Power Transfer Unit Line Connections
Figure 201/29-01-05-990-801 (Sheet 2 of 3)



Flushing Procedure -- Hyd Power Transfer Unit Line Connections
Figure 201/29-01-05-990-801 (Sheet 3 of 3)

HYDRAULIC SYSTEM FLUSHING - LANDING GEAR, STEERING, AND BRAKES

1. General

A. The purpose of this section is to provide a logical guide for removing the contaminates (foreign particles) from the fluid, units, and lines of the landing gear retraction, left and right nose gear steering, and left and right wheel brake systems by flushing the system with clean hydraulic fluid.

B. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

C. Before any flushing procedures are performed, personnel should read and thoroughly understand. (HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	

3. Flush Landing Gear Retraction System

A. Pressure Line to Landing Gear Control Valve

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

WARNING: MAKE CERTAIN THAT LANDING GEAR LOCK PINS AND LANDING GEAR DOOR LOCKS ARE INSTALLED.

(2) Open auxiliary hydraulic pump circuit breakers located on upper EPC circuit breaker panel.

(3) Place landing gear bypass lever in bypass position. Lever is located on lower RH side of fuselage, just forward of main gear wheel wells.

(4) Disconnect short pressure inlet line from landing gear control valve located in right wheel well. Cap valve port.

(5) Disconnect short pressure line from tee and remove pressure line for cleaning. Cap tee.

B. Gear Up and Gear Down Lines (Landing Gear Control Valve to Actuating Cylinders)

(1) Disconnect lines from landing gear control valve and remove control valve. (PAGEBLOCK 32-32-01/201)

(2) Install jumper hoses between gear down lines with tee fitting between hoses.

(3) Connect test stand pressure hose to tee in gear down line jumper hoses.

(4) Install jumper hoses between gear up lines with tee fitting between hoses.

(5) Connect test stand return hose to tee in gear up line jumper hoses.

(6) Disconnect up and down lines from left and right gear actuating cylinders. (Figure 201)

(7) Install jumper hoses between up line and down line at each cylinder.

(8) Disconnect lines from nose gear actuating cylinder. (Figure 202)

(9) Install jumper hose between lines.

(10) Remove left and right main gear and nose gear actuating cylinders. (MAIN GEAR ACTUATING CYLINDER - MAINTENANCE PRACTICES, PAGEBLOCK 32-32-02/201) (NOSEGEAR ACTUATING CYLINDER, SUBJECT 32-32-06)

(11) Disconnect lines from left and right main gear and nose gear bungee cylinders.

(12) Install jumper hoses between lines at each cylinder.

(13) Remove left and right main gear and nose gear bungee cylinders. (MAIN GEAR BUNGEE CYLINDER - MAINTENANCE PRACTICES, PAGEBLOCK 32-32-03/201) (NOSEGEAR BUNGEE CYLINDER - MAINTENANCE PRACTICES, PAGEBLOCK 32-32-07/201)

(14) Disconnect lines from main gear door actuating cylinders.

(15) Install jumper hoses between lines at each door actuating cylinder.

(16) Remove door cylinders. (PAGEBLOCK 32-32-04/201)

(17) Disconnect lines from gear door latch cylinders.

(18) Install jumper hose between lines at each latch cylinder.

(19) Remove latch cylinders. (PAGEBLOCK 32-32-05/201)

(20) Pressurize test stand to 500 psi at 9 gpm flow.

(21) Flush lines for 5 minutes.

(22) Depressurize test stand.

(23) Remove jumper hoses from gear actuating cylinder lines, bungee cylinder lines, door cylinder lines, and door latch cylinder lines.

(24) Install clean or new gear actuating cylinders, bungee cylinders, door actuating cylinders, and door latch cylinders per reference in Paragraph 3.B.(10), Paragraph 3.B.(13), Paragraph 3.B.(16), and Paragraph 3.B.(19).

(25) Connect lines to their respective ports.

(26) Disconnect test stand pressure hose from gear down lines in wheel well. Plug lines.

(27) Disconnect test stand return hose from gear up lines in wheel well. Plug lines.

(28) Install clean or new landing gear control valve, and connect up and down lines to valve. (PAGEBLOCK 32-32-01/201)

(29) Install short pressure in line and connect to landing gear control valve and tee fitting.

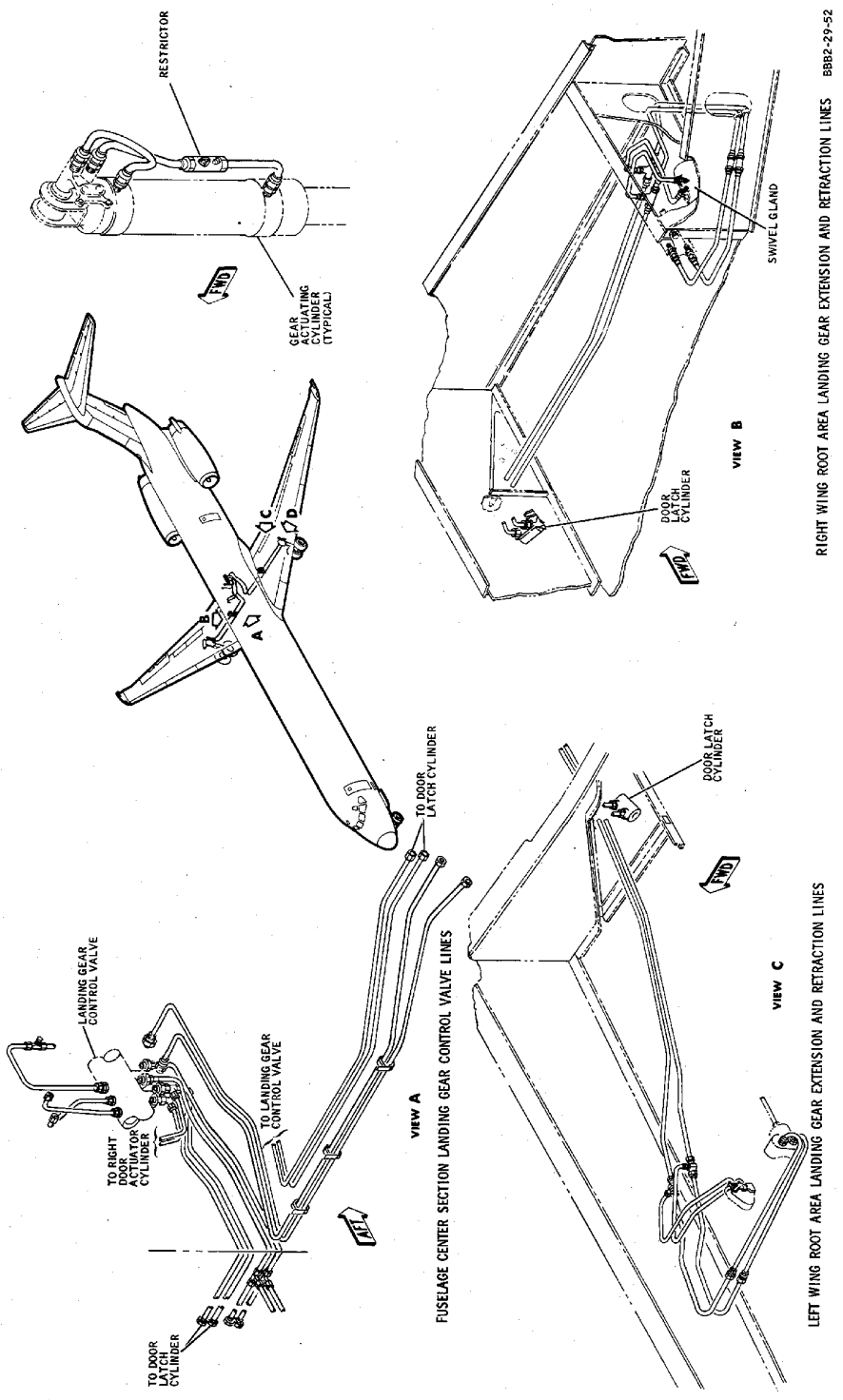
(30) Disconnect lines from restrictors located in landing gear down lines in wing root areas, and remove restrictors.

(31) Install clean or new restrictors and connect lines.

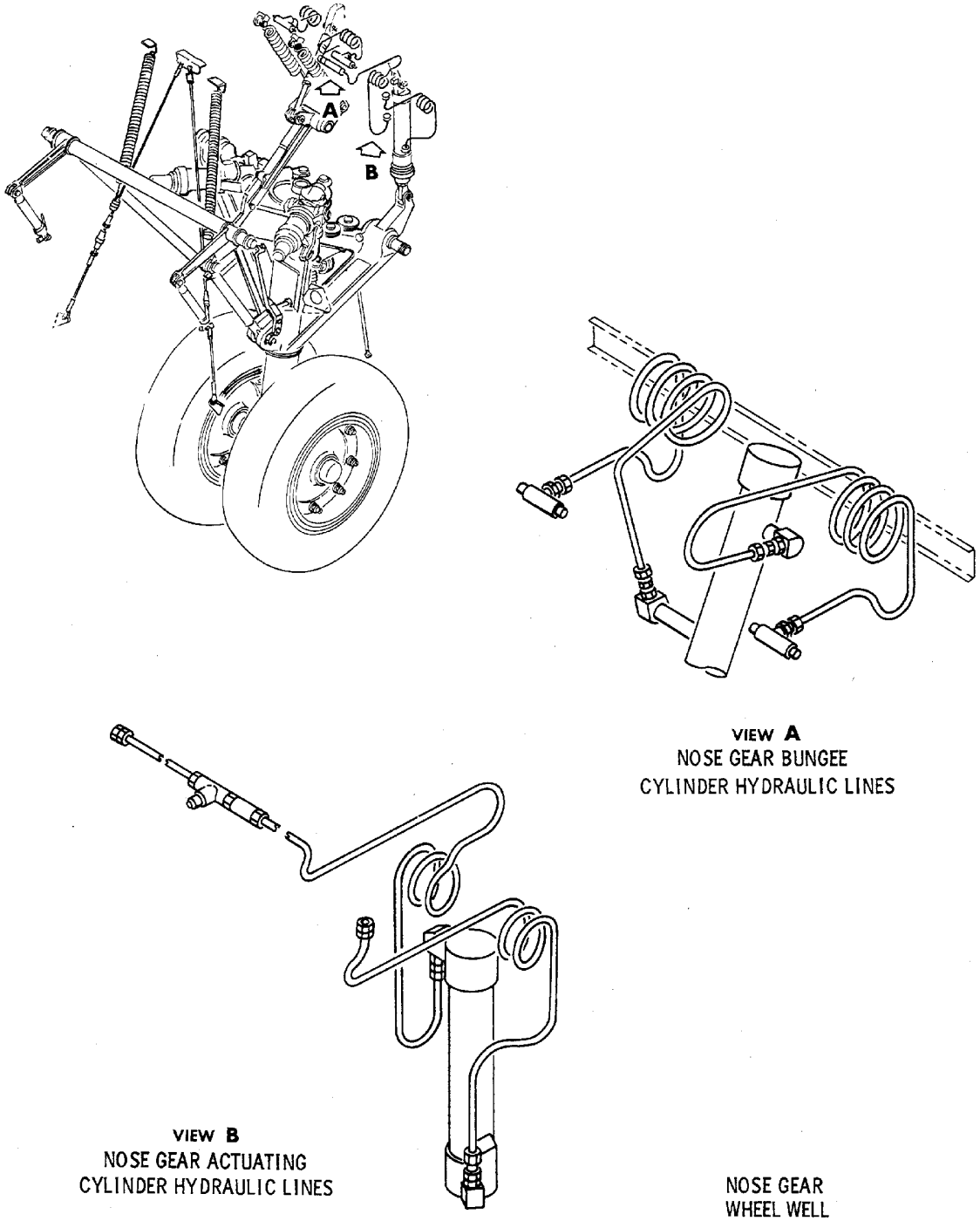
(32) Disconnect lines from check valves located in landing gear down lines in left and right wing root areas, and remove check valves.

(33) Install clean or new check valves and connect lines.

(34) Close auxiliary hydraulic pump circuit breakers.



Flushing Procedure -- Landing Gear Line Connections
Figure 201/29-01-06-990-801



Flushing Procedure -- Nose Gear Line Connections
Figure 202/29-01-06-990-802

4. Flush Nose Gear Steering System

A. Left System Pressure and Return Lines (Left Main Gear Wheel Well to Left Nose Gear Steering Control Valves)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect nose gear steering and slat pressure line from cross fitting in left wheel well forward of main gear inboard door cylinder. Cap cross.

(3) Connect test stand pressure hose to pressure line at cross fitting.

(4) Disconnect pressure inlet line from left nose gear steering control valve, located in left nosewheel well tunnel. Cap valve port.

(5) Disconnect return line from control valve. Cap valve port.

(6) Install jumper hose between pressure and return lines.

(7) Disconnect nose gear steering return line from tee in forward end of left main gear wheel well. Cap tee.

(8) Connect test stand return hose to nose gear steering return line at tee fitting.

(9) Disconnect left system slat pressure and return lines from nose gear steering lines at tee fitting in mid cargo compartment behind aft access panel. Plug lines and install pressure cap on tee fittings.

(10) Pressurize test stand to 500 psi at 9 gpm flow.

(11) Flush lines for 5 minutes.

(12) Depressurize test stand.

(13) Remove jumper hose from pressure and return lines at steering control valve.

(14) Disconnect remaining lines from control valve. Plug all lines.

(15) Remove steering control valve. (PAGEBLOCK 32-52-01/201)

(16) Install clean or new control valve and connect pressure and return lines only. (PAGEBLOCK 32-52-01/201)

(17) Connect slat pressure line to nose gear steering pressure line at tee in mid cargo compartment.

(18) Connect slat return line to nose gear steering return line at tee in mid cargo compartment.

(19) Disconnect test stand return hose from return line at tee and connect line to tee.

(20) Disconnect test stand pressure hose from pressure line at cross and connect line to cross.

B. Right System Pressure and Return Lines (Right Main Gear Wheel Well to Nose Gear Steering Control Valve)

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect nose gear down line at tee in landing gear down line at rear wing spar in right main gear wheel well. Cap tee.

(3) Connect test stand pressure hose to nose gear down line.

(4) Disconnect pressure inlet line from right nose gear steering control valve, located in left nosewheel well tunnel. Cap valve port. (Figure 203)

(5) Disconnect return line from control valve. Cap valve port.

(6) Install jumper hose between pressure and return lines at control valve.

(7) Disconnect return line from reducer tee to the left, and forward of auxiliary pump in right wheel well system return line. Cap reducer tee.

(8) Connect test stand return hose to nose gear steering return line.

(9) Disconnect right slat control valve return line from nose gear steering return line, at tee in mid cargo compartment on aft bulkhead. Plug line and install pressure cap on tee.

(10) Pressurize test stand to 500 psi at 9 gpm flow.

(11) Flush lines for 5 minutes.

(12) Depressurize test stand.

(13) Remove jumper hose from pressure and return lines at steering control valve.

(14) Connect lines to control valve.

(15) Disconnect test stand pressure hose from nose gear down line at tee in right wheel well and connect line to tee.

(16) Disconnect test stand return hose from steering return line at reducer tee in right wheel well and connect line to tee.

(17) Connect right slat control valve return to nose gear steering return line at tee in mid cargo compartment.

C. Steering Lines (Nose Gear Steering Control Valves to Steering Actuator Cylinders, Left and Right Systems. (Figure 203)

NOTE: The flushing procedures for the left hydraulic system nose gear steering system and for the right hydraulic system nose gear steering system are the same from the respective steering control valves to the respective steering actuator cylinders.

(1) Disconnect steer left and steer right lines from applicable (left or right) nose gear steering control valve. Cap valve ports.

(2) Connect test stand pressure and return hoses to steering lines.

(3) Disconnect lines from applicable (left or right) steering actuator cylinder at top of nose gear oleo strut.

(4) Install jumper hose between actuator lines.

(5) Place nosegear torque links in ground mode position.

(6) Pressurize test stand to 500 psi at 9 gpm flow.

(7) Flush lines for 5 minutes.

(8) Depressurize test stand.

(9) Disconnect lines from applicable (left or right) system steering swivel gland and bypass relief valve, located on nose gear strut. Plug lines.

(10) Disconnect and remove swivel glands and bypass relief valve.

(11) Disconnect and remove steering actuator cylinder and restrictors.

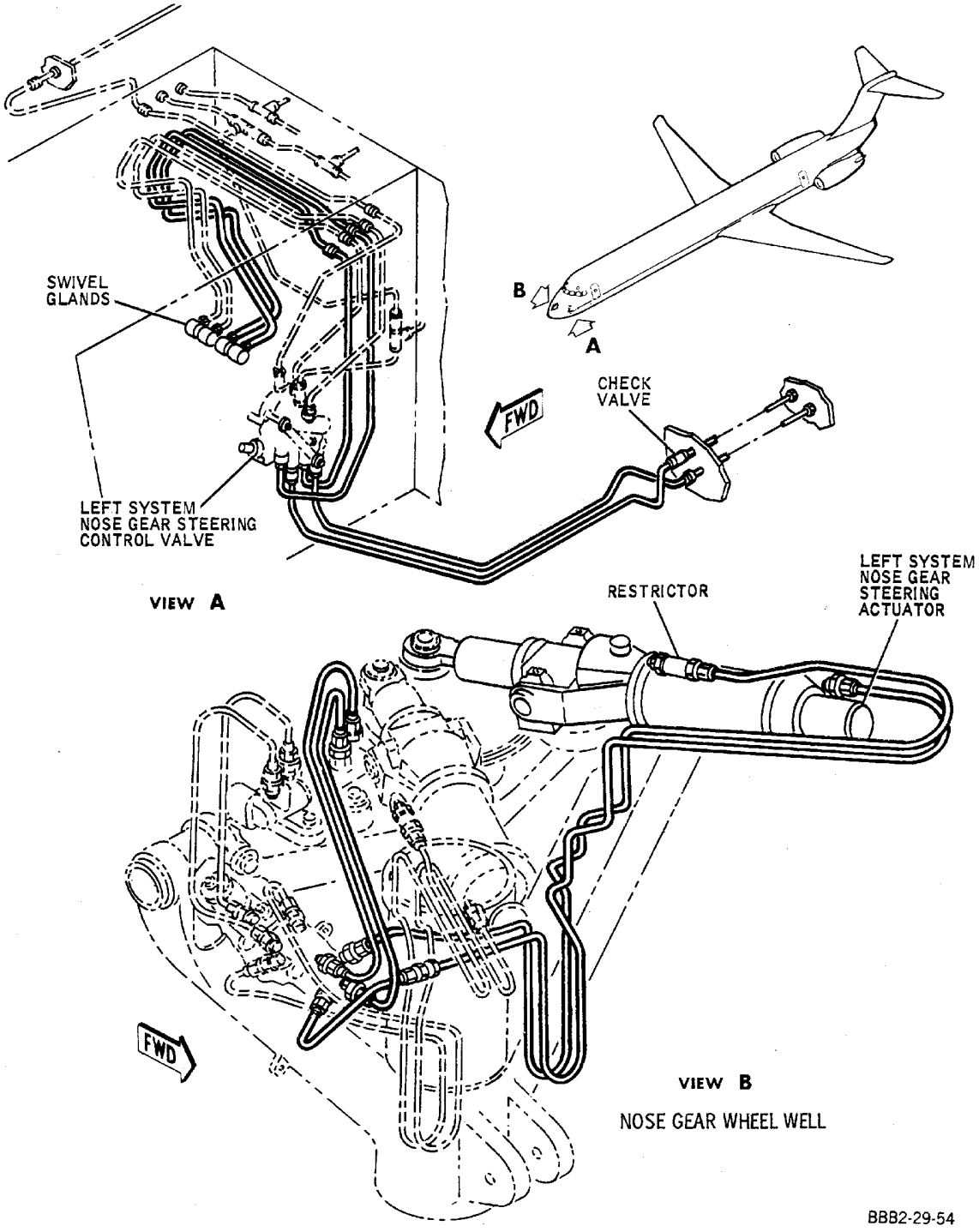
(12) Install clean or new steering actuator cylinder, restrictors, swivel glands and bypass relief valve.

(13) Remove jumper hose from actuator lines and connect lines to actuator cylinder ports.

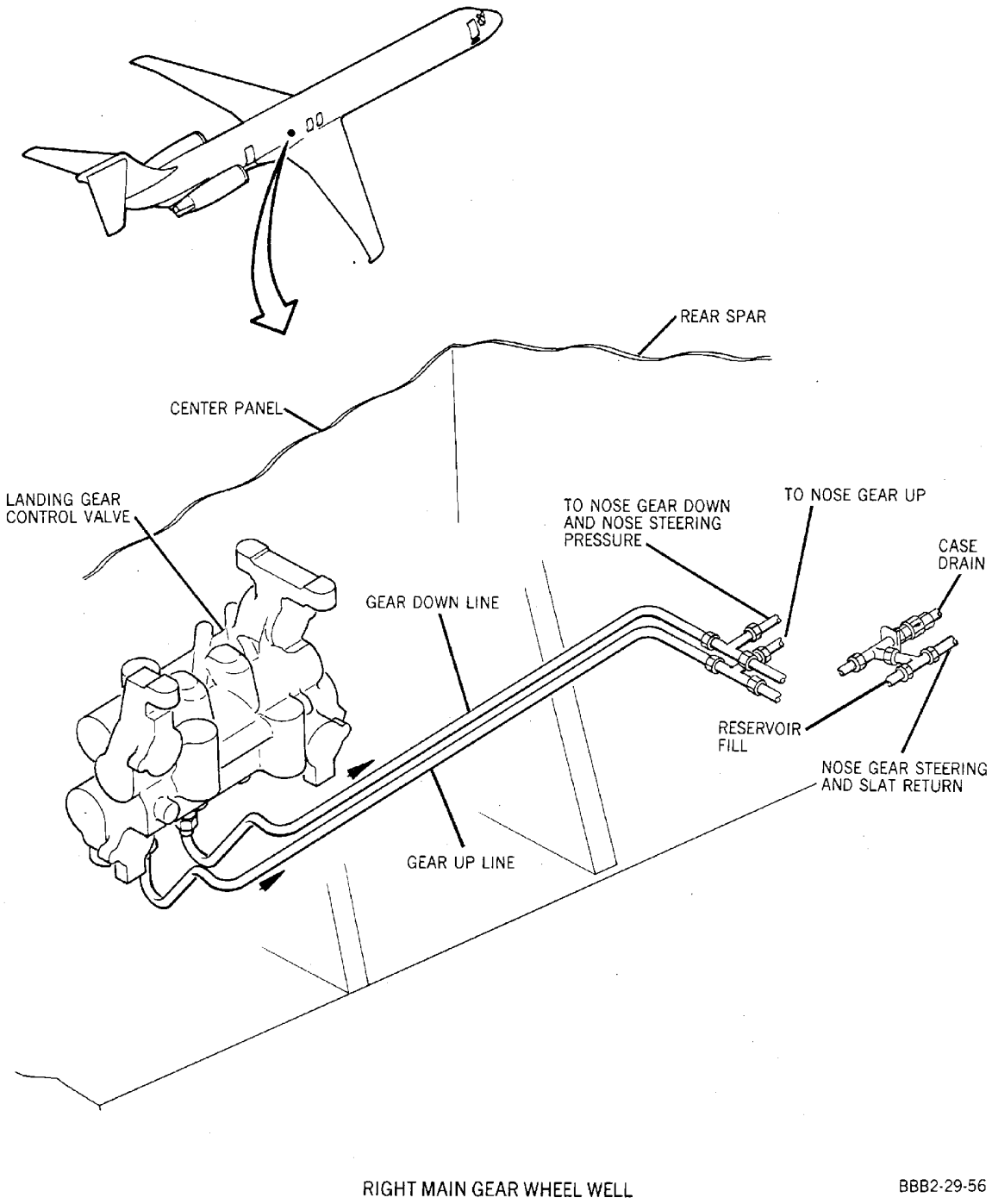
(14) Connect lines to swivel glands and bypass relief valve.

(15) Disconnect test stand pressure and return hoses from steering lines at steering control valve.

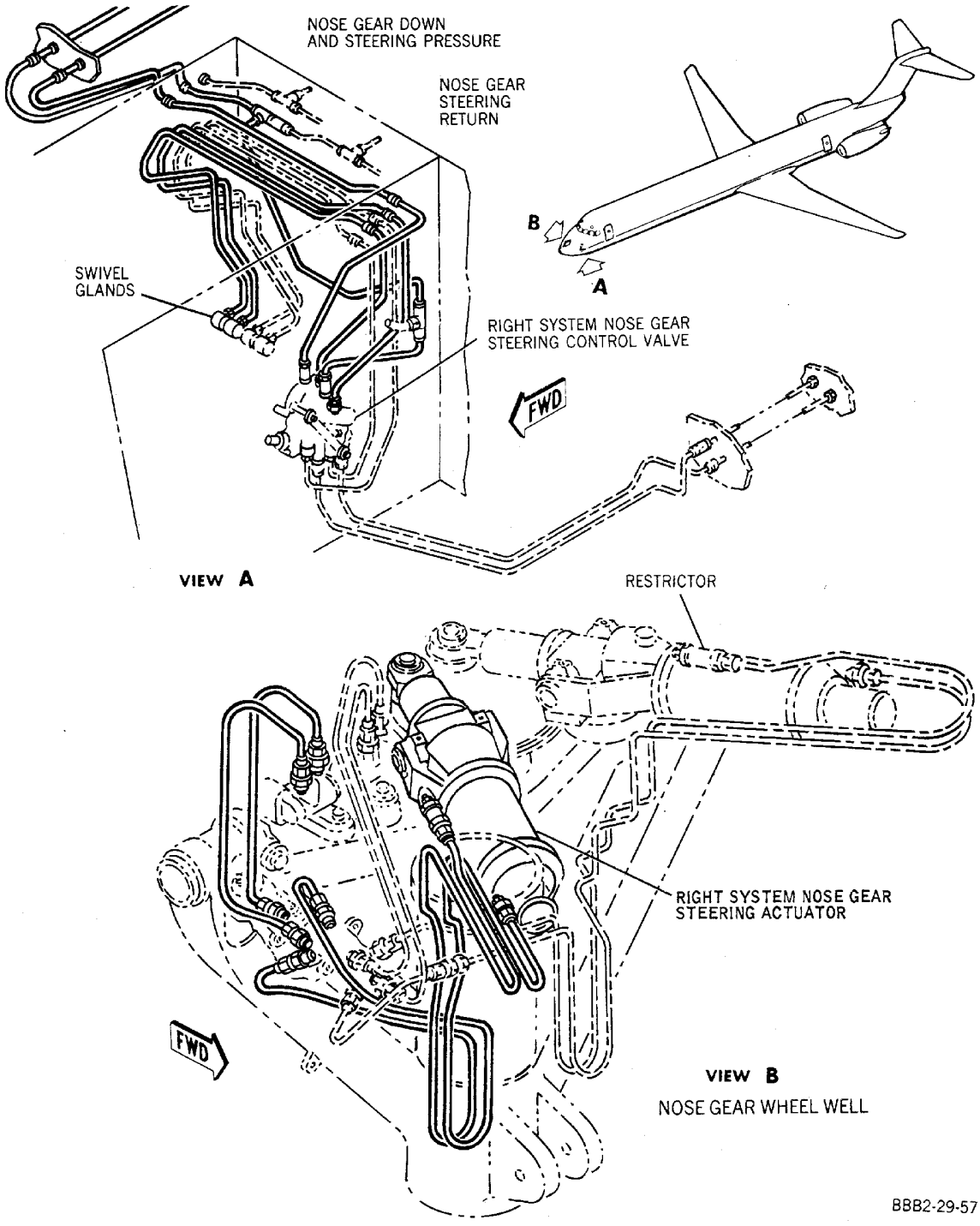
(16) Connect steering lines to steering control valve.



Flushing Procedure -- Nose Gear Steering Line Connections
Figure 203/29-01-06-990-803 (Sheet 1 of 3)



Flushing Procedure -- Nose Gear Steering Line Connections
Figure 203/29-01-06-990-803 (Sheet 2 of 3)



Flushing Procedure -- Nose Gear Steering Line Connections
Figure 203/29-01-06-990-803 (Sheet 3 of 3)

5. **Flush Left Wheel Brake System**

A. System Pressure in Line to Brake Pressure Manifold. (Figure 204)

(1) Depressurize left hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect pressure line from tee fittings in left wheel well below fill line filter. Cap valve.

(3) Connect test stand pressure hose to pressure line at tee fitting, in left wheel well below fill line filter.

(4) Disconnect pressure in line from brake pressure manifold. Cap manifold port.

(5) Connect test stand return line to pressure in line at manifold.

(6) Pressurize test stand to 500 psi at 9 gpm flow.

(7) Flush lines for 5 minutes.

(8) Depressurize test stand.

(9) Disconnect test stand return hose from pressure in line at manifold. Plug line.

(10) Disconnect test stand pressure hose from pressure line at tee fitting.

(11) Connect pressure line to tee fitting.

B. Brake Pressure Manifold to Brake Pressure Transmitter Lines

(1) Disconnect lines from brake pressure transmitter in left wheelwell.

(2) Remove pressure transmitter for cleaning.

(3) Connect test stand pressure hose to pressure transmitter pressure line at manifold.

(4) Connect test stand return line to pressure line at pressure transmitter.

(5) Pressurize test stand to 500 psi at 9 gpm flow.

(6) Flush line for 5 minutes.

(7) Depressurize test stand.

(8) Disconnect remaining short pressure line to control valve from brake manifold. Cap valve port.

(9) Remove brake manifold and short pressure line to control valve for cleaning.

(10) Install clean or new brake manifold and brake pressure transmitter.

(11) Install and connect brake pressure transmitter line.

(12) Connect remaining lines to brake manifold.

C. Brake Control Valve to Wheel Brake Assemblies (Left Gear Wheels and Right Gear Wheels)

(1) Disconnect wheel brake pressure lines from brake control valve. Plug lines. (Figure 204)

(2) Disconnect system pressure and return lines from brake control valve. Plug line.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(3) Disconnect wheel brake pressure lines from auto brake manifold. Plug lines. (Figure 204)

(4) Disconnect system pressure and return lines from auto brake manifold. Plug lines.

(5) Disconnect remaining short pressure lines from auto brake manifold. Plug lines.

(6) Remove all short lines between control valve and auto brake manifold for cleaning.

(7) Remove brake control valve and auto brake manifold. (WHEEL BRAKE CONTROL VALVES - MAINTENANCE PRACTICES, PAGEBLOCK 32-42-02/201) (ABS CONTROL PANEL - MAINTENANCE PRACTICES, PAGEBLOCK 32-44-01/201)

(8) Connect test stand pressure hose to right wheel brake line at auto brake manifold.

WJE 873, 874, 886, 887, 892, 893

(9) Remove brake control valve. (PAGEBLOCK 32-42-02/201)

(10) Connect test stand pressure hose to right wheel brake line at control valve. (Figure 204)

WJE ALL

(11) Remove uppermost brake bleed valves from both brake assemblies of right gear, left brake system and install suitable fittings in place of bleed valves.

(12) Connect jumper hoses to brake fittings (both brakes of right gear).

(13) Connect hoses together with tee fitting.

(14) Connect test stand return hose to tee fitting at right brakes.

(15) Open bypass lever of flow limiter valve located in right wing root.

(16) Pressurize test stand to 500 psi at 9 gpm flow.

(17) Flush lines for 5 minutes.

(18) Depressurize test stand.

(19) Disconnect lines from left system antiskid valve located in right wing root. Plug lines.

(20) Remove antiskid valve. (PAGEBLOCK 32-43-03/201)

(21) Disconnect test stand return hose from tee fitting at right brake assembly.

(22) Disconnect and remove jumper hoses and tee fitting from brake assemblies.

(23) Remove fittings from bleed valve ports and install bleed valves.

(24) Install clean or new antiskid valve in right wing root and connect lines to valve. (PAGEBLOCK 32-43-03/201).

(25) Disconnect test stand pressure hose from brake pressure line in left wheelwell.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(26) Install clean or new brake control valve and auto brake manifold. (WHEEL BRAKE CONTROL VALVES - MAINTENANCE PRACTICES, PAGEBLOCK 32-42-02/201) (ABS TAKEOFF MANIFOLD - MAINTENANCE PRACTICES, PAGEBLOCK 32-44-04/201)

(27) Connect right wheel brake line to auto brake manifold.

(28) Connect system pressure and return lines to auto brake manifold.

(29) Install short brake pressure and return lines between brake control and auto brake manifold.

(30) Repeat steps Paragraph 5.C.(8) through Paragraph 5.C.(25) for left gear wheel brake assemblies.

(31) Disconnect accumulator pressure line at accumulator. Remove accumulator for cleaning. (PAGEBLOCK 32-42-04/201)

WJE 873, 874, 886, 887, 892, 893

(32) Install clean or new brake control valve. (PAGEBLOCK 32-42-02/201)

(33) Connect right wheel brake line to brake control valve.

(34) Connect system pressure and return lines to brake control valve.

(35) Repeat steps Paragraph 6.C.(11) through Paragraph 6.C.(26) for left gear wheel brake assemblies.

(36) Disconnect accumulator pressure line at accumulator. Remove accumulator for cleaning. (PAGEBLOCK 32-42-04/201)

WJE ALL

(37) Connect test stand return line to pressure line at accumulator.

(38) Connect test stand pressure hose to accumulator pressure line at control valve.

(39) Pressurize test stand to 500 psi at 9 gpm flow.

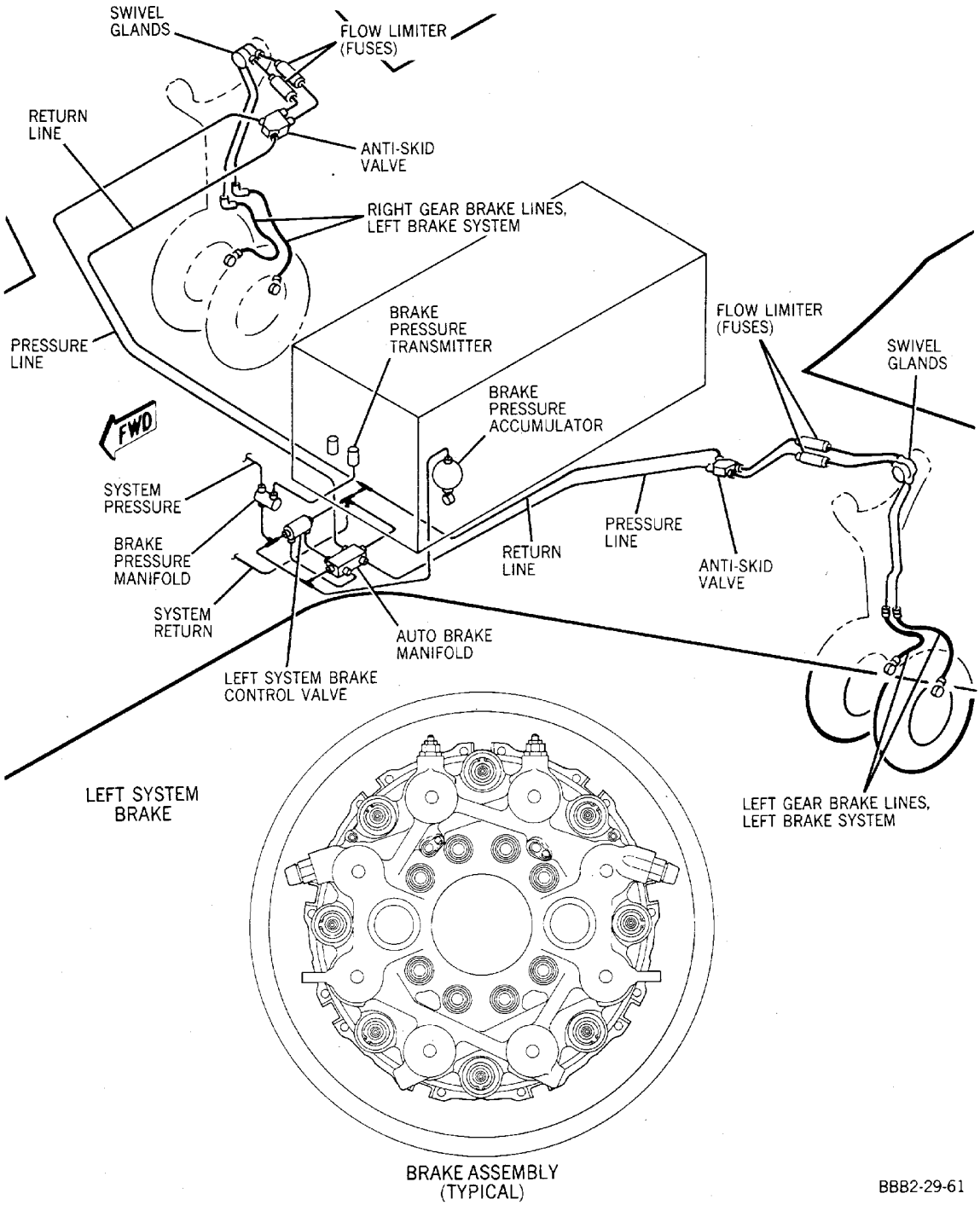
(40) Flush lines for 5 minutes.

(41) Depressurize test stand.

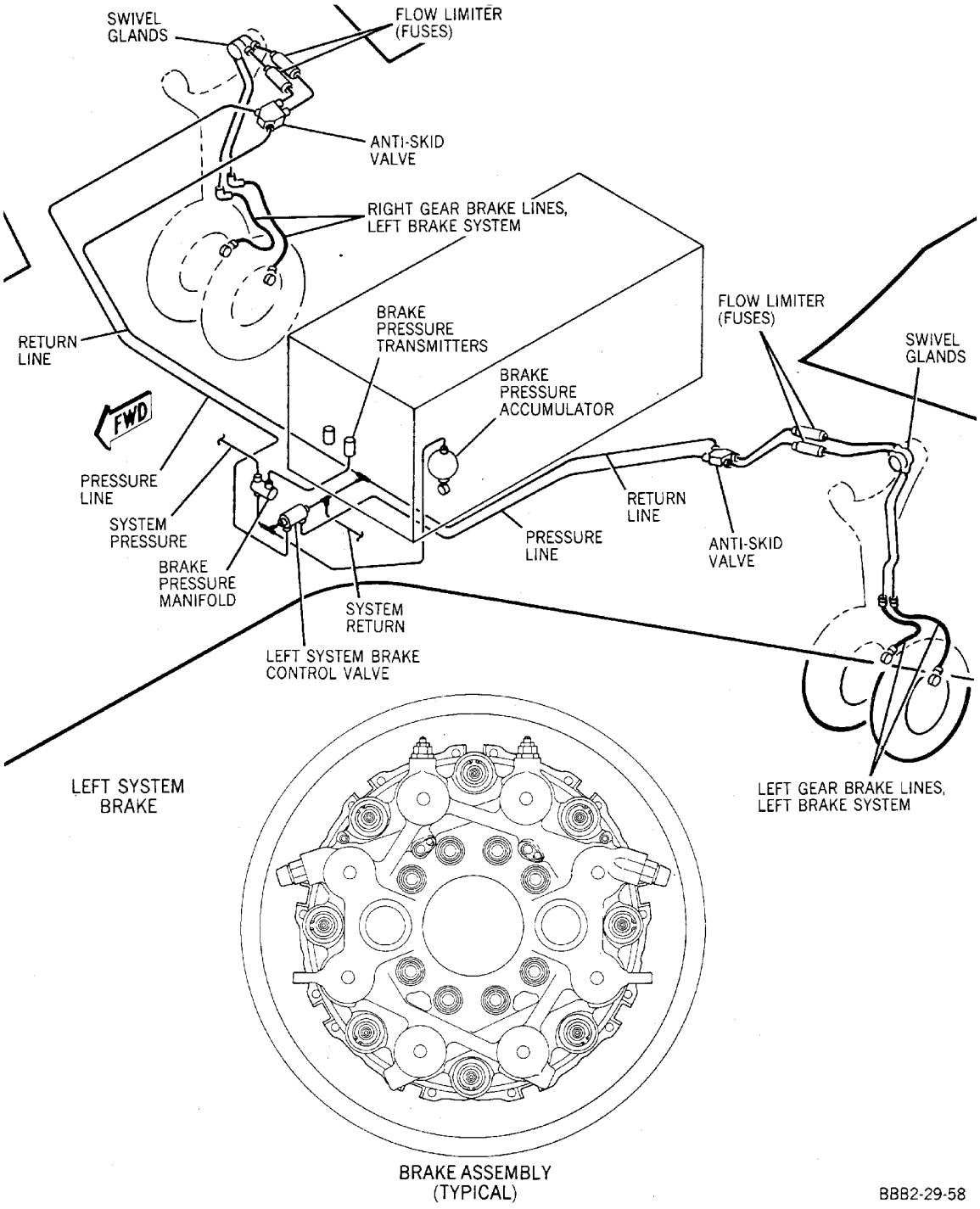
(42) Disconnect test stand hoses from accumulator pressure line. Plug line.

(43) Install clean or new accumulator and connect pressure line. (PAGEBLOCK 32-42-04/201)

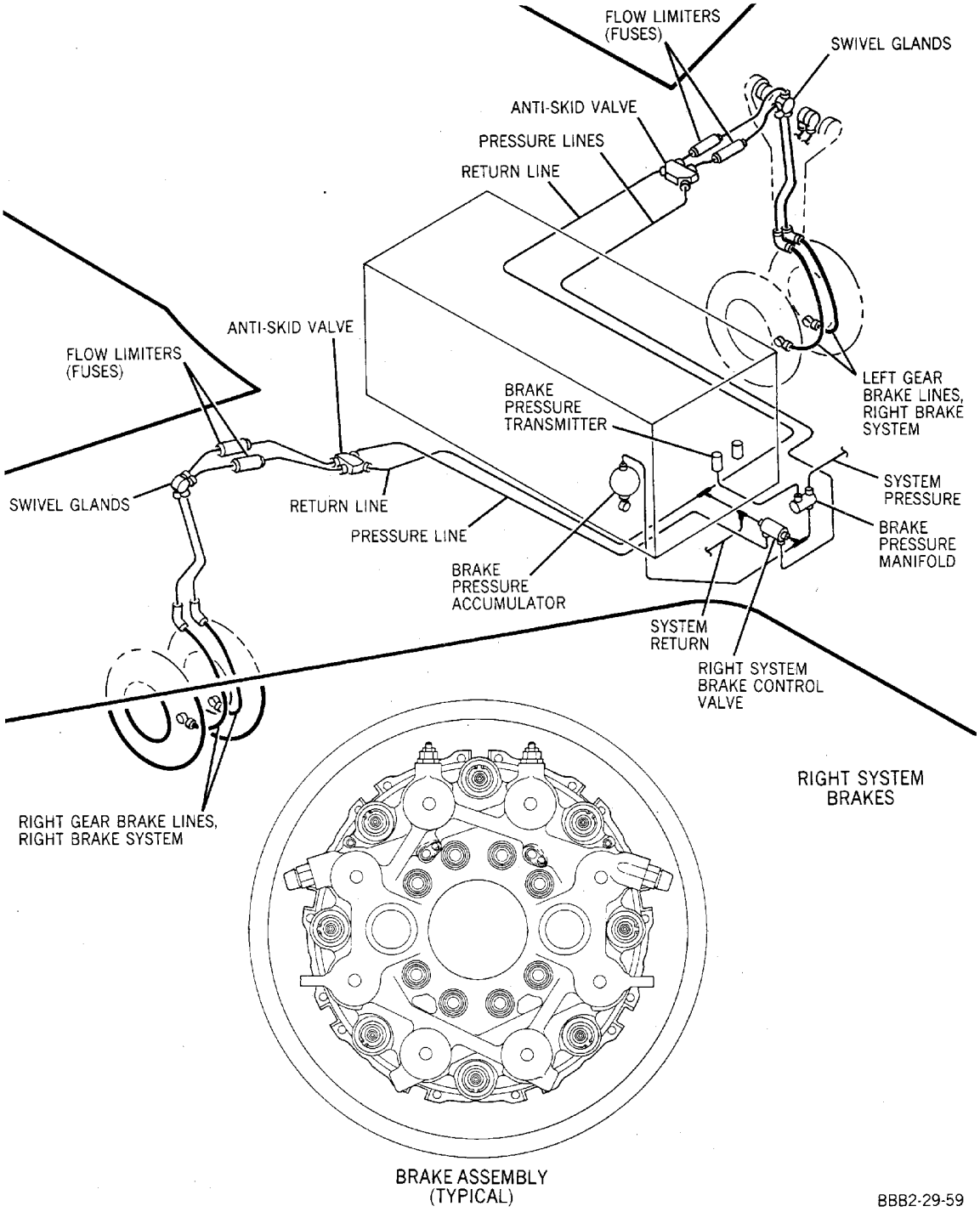
(44) Bleed brakes. (PAGEBLOCK 32-42-01/201)



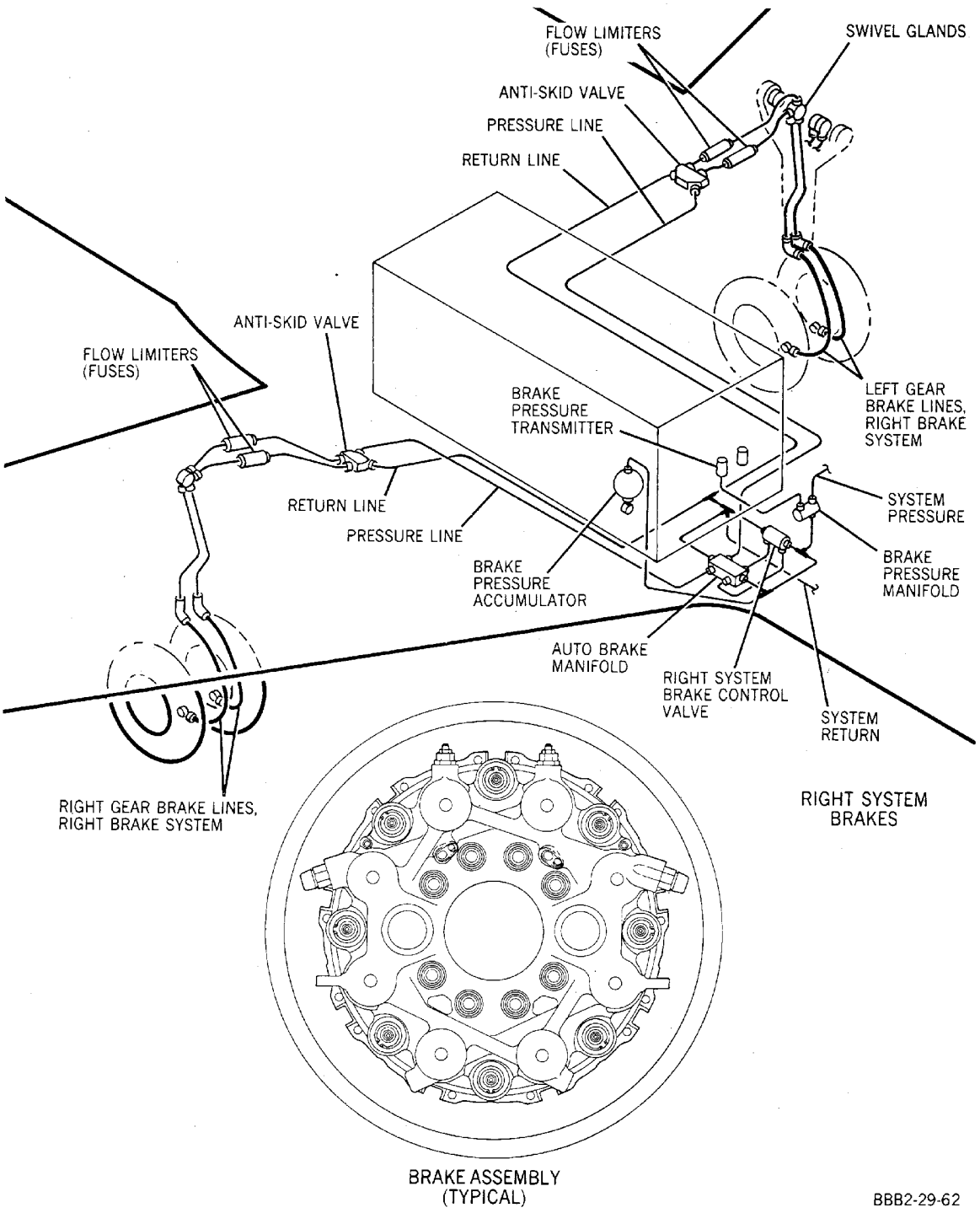
Flushing Procedure -- Left System Line Connections
Figure 204/29-01-06-990-805 (Sheet 1 of 2)



Flushing Procedure -- Left System Line Connections
Figure 204/29-01-06-990-805 (Sheet 2 of 2)



Flushing Procedure -- Right System Line Connections
Figure 205/29-01-06-990-806 (Sheet 1 of 2)



Flushing Procedure -- Right System Line Connections
Figure 205/29-01-06-990-806 (Sheet 2 of 2)

6. Flush Right Wheel Brake System

A. System Pressure in Line to Brake Control Valve (Figure 205)

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Disconnect pressure in line at brake pressure manifold. Cap manifold.

(3) Disconnect short pressure line from cross fitting in right wheel well above auxiliary pump.

(4) Connect test stand pressure hose to pressure line at cross fitting.

(5) Connect test stand return hose to pressure in line at manifold.

(6) Pressurize test stand to 500 psi at 9 gpm flow.

(7) Flush lines for 5 minutes.

(8) Depressurize test stand.

(9) Disconnect test stand pressure hose from pressure line at cross fitting.

(10) Connect pressure line to cross fitting.

(11) Disconnect test stand return hose from pressure line at manifold. Plug line.

B. Brake Pressure Manifold to Brake Pressure Transmitter Lines

(1) Disconnect brake pressure transmitter line from brake manifold.

(2) Remove transmitter and line for cleaning.

(3) Disconnect remaining lines from brake manifold. Plug lines.

(4) Remove brake manifold for cleaning.

(5) Install clean or new brake manifold and brake pressure transmitter.

(6) Install and connect brake pressure transmitter line.

(7) Connect remaining lines to brake manifold.

C. Brake Control Valve to Wheel Brake Assemblies (Left Gear Wheels and Right Gear Wheels

(1) Disconnect wheel brake pressure lines from brake control valve in right wheel well. Plug lines.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(2) Disconnect system pressure and return lines from brake control valve. Plug lines.

(3) Disconnect wheel brake pressure lines from auto brake manifold in right wheel well. Plug lines.

(4) Disconnect system pressure and return lines from auto brake manifold. Plug lines.

(5) Disconnect remaining short pressure lines from auto brake manifold. Plug lines.

(6) Remove all short lines between control valve and auto brake manifold for cleaning.

(7) Remove brake control valve and auto brake manifold. (WHEEL BRAKE CONTROL VALVES - MAINTENANCE PRACTICES, PAGEBLOCK 32-42-02/201) (ABS LAND MANIFOLD - MAINTENANCE PRACTICES, PAGEBLOCK 32-44-03/201)

(8) Connect test stand pressure hose to right wheel brake line at auto brake manifold.

WJE 873, 874, 886, 887, 892, 893

(9) Disconnect system pressure and return lines from brake control valve. Plug line.

(10) Remove brake control valve. (PAGEBLOCK 32-42-02/201)

(11) Connect test stand pressure hose to right wheel brake line at control valve.

WJE ALL

(12) Remove uppermost brake bleed valves from both brake assemblies of right gear, right brake system and install fittings in place or bleed valves.

(13) Connect jumper hoses to brake fittings (both brakes of right gear).

(14) Connect hoses together with tee fitting.

(15) Connect test stand return hose to tee fitting at right brakes.

(16) Open bypass lever of flow limiter valve located in right wing root.

(17) Pressurize test stand to 500 psi at 9 gpm flow.

(18) Flush lines for 5 minutes.

(19) Depressurize test stand.

(20) Disconnect lines from right system antiskid valve located in right wing root. Plug lines.

(21) Remove antiskid valve. (PAGEBLOCK 32-43-03/201).

(22) Disconnect test stand return hose from tee fitting at right brake assembly.

(23) Disconnect and remove jumper hoses and tee fitting from brake assemblies.

(24) Remove fittings from bleed valve ports and install bleed valves.

(25) Install clean or new antiskid valve in right wing root and connect lines to valve. (PAGEBLOCK 32-43-03/201)

(26) Disconnect test stand pressure hose from brake pressure line in right wheel well.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(27) Install clean or new brake control valve and auto brake manifold. (WHEEL BRAKE CONTROL VALVES - MAINTENANCE PRACTICES, PAGEBLOCK 32-42-02/201) (ABS LAND MANIFOLD - MAINTENANCE PRACTICES, PAGEBLOCK 32-44-03/201)

(28) Connect right wheel brake line to auto brake manifold.

(29) Connect system pressure and return lines to auto brake manifold.

(30) Install short brake pressure and return lines between brake control and auto brake manifold.

(31) Repeat steps Paragraph 6.C.(8) through Paragraph 6.C.(26) for left gear wheel brake assemblies. (Figure 204 (Sheet 1))

(32) Disconnect accumulator pressure line at accumulator. Remove accumulator for cleaning. (PAGEBLOCK 32-42-04/201)

WJE 873, 874, 886, 887, 892, 893

(33) Install clean or new brake control valve. (PAGEBLOCK 32-42-02/201)

(34) Connect right wheel brake line to brake control valve.

(35) Connect system pressure and return lines to brake control valve.

(36) Repeat steps Paragraph 6.C.(11) through Paragraph 6.C.(26) for left gear wheel brake assemblies.

(37) Disconnect accumulator pressure line at accumulator. Remove accumulator for cleaning. (PAGEBLOCK 32-42-04/201)

WJE ALL

(38) Connect test stand return line to pressure line at accumulator.

(39) Connect test stand pressure hose to accumulator pressure line at control valve.

(40) Pressurize test stand to 500 psi at 9 gpm flow.

(41) Flush lines for 5 minutes.

(42) Depressurize test stand.

(43) Disconnect test stand hoses from accumulator pressure line. Plug line.

(44) Install clean or new accumulator and connect pressure line. (PAGEBLOCK 32-42-04/201)

(45) Bleed brakes. (PAGEBLOCK 32-42-01/201)

HYDRAULIC SYSTEM FLUSHING - VENTRAL STAIRS ACTUATION SYSTEM

1. General

A. The purpose of this section is to provide a logical guide for removing the contaminates (foreign particles) from the fluid, units, and lines of the ventral stairs actuation system by flushing the system with clean hydraulic fluid.

B. The removal of contaminated, overheated or diluted fluid would follow generally the same procedure with the exception that the removed contaminated fluid would be caught in containers rather than recirculated through the test stand.

C. Before any flushing procedures are performed, personnel should read and thoroughly understand. (HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201)

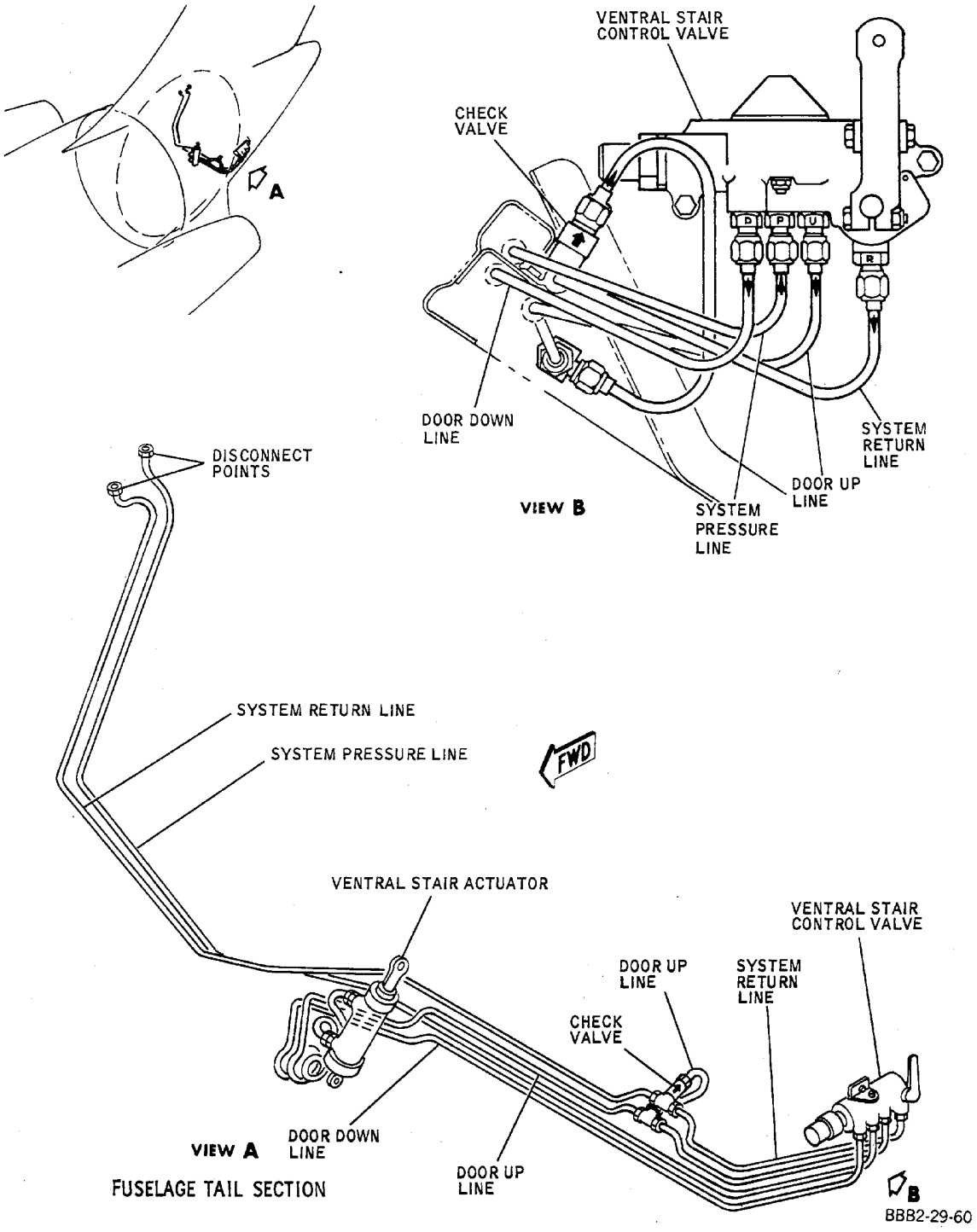
2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
Hydraulic test stand (skydrol capable and filter with minimum 10 micron required)	
Pressure and return hoses	
Hose connection assortment	
Containers	
Eye protection	



Flushing Procedure -- Line Connections
Figure 201/29-01-07-990-801

3. Flush Ventral Stair Actuation System

A. Ventral Stairs Lines Valve and Actuator (Figure 201)

(1) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

(2) Open auxiliary hydraulic pump circuit breakers located on upper EPC circuit breaker panel.

(3) Disconnect lines from ventral stairs control valve, located in left side of fuselage aft accessory compartment.

(4) Remove control valve. (PAGEBLOCK 52-63-01/201)

(5) Install jumper hose between system pressure line and door down line.

(6) Install jumper hose between return line and door up line.

(7) Disconnect up and down lines from door actuator.

(8) Install jumper hose between up and down lines at actuator.

(9) Remove actuator. (PAGEBLOCK 52-63-02/201)

(10) Disconnect pressure and return lines from tees at right side of fuselage. Cap tees.

(11) Connect test stand pressure and return hoses to lines at tees.

(12) Pressurize test stand to 500 psi at 9 gpm flow.

(13) Flush lines for 5 minutes.

(14) Depressurize test stand.

(15) Disconnect test stand pressure and return hoses from lines in aft fuselage.

(16) Connect pressure and return lines to their respective tees.

(17) Remove jumper hoses from actuator lines.

(18) Install clean or new actuator and connect lines to actuator ports. (PAGEBLOCK 52-63-02/201)

(19) Disconnect runaround line from check valve at tee in door up line upstream of control valve, and remove check valve.

(20) Install clean or new check valve and connect runaround line to check valve.

(21) Install clean or new control valve in left aft accessory compartment. (PAGEBLOCK 52-63-01/201)

(22) Remove jumper hoses from lines at control valve.

(23) Connect lines to their respective ports on control valve.

(24) Close auxiliary hydraulic pump circuit breakers.

MAIN - DESCRIPTION AND OPERATION

1. General

A. The hydraulically separate closed-circuit hydraulic systems identified as the left system and right system provide hydraulic power to operate the various hydraulic systems in the air-plane. Fire-resistant Skydrol hydraulic fluid is used in both systems. The two systems are interconnected mechanically by an electrically controlled, reversible, hydraulic motor-pump identified as the hydraulic power transfer unit. The two systems are basically similar except for component location and subsystem served. (Figure 1) (Figure 2).

B. The left hydraulic system serves the following subsystems:

(1) Flight spoilers (inboard actuating cylinders, left and right).

(2) Wing flaps (2 and 4 actuating cylinders, left and right).

(3) Wheelbrakes (left and right).

(4) Nosewheel steering (left actuating cylinder, one half of dual system).

(5) Elevator power control.

(6) Left engine thrust reverser.

(7) Leading edge slats (left actuating cylinder).

(8) Ground spoilers (left and right actuating cylinders).

C. The right hydraulic system serves the following subsystems:

(1) Flight spoilers (outboard actuating cylinders, left and right).

(2) Wing flaps (1 and 3 actuating cylinders, left and right).

(3) Ground spoilers (left and right actuating cylinders).

(4) Wheelbrakes (left and right).

(5) Nosewheel steering (right actuating cylinder, one half of dual system).

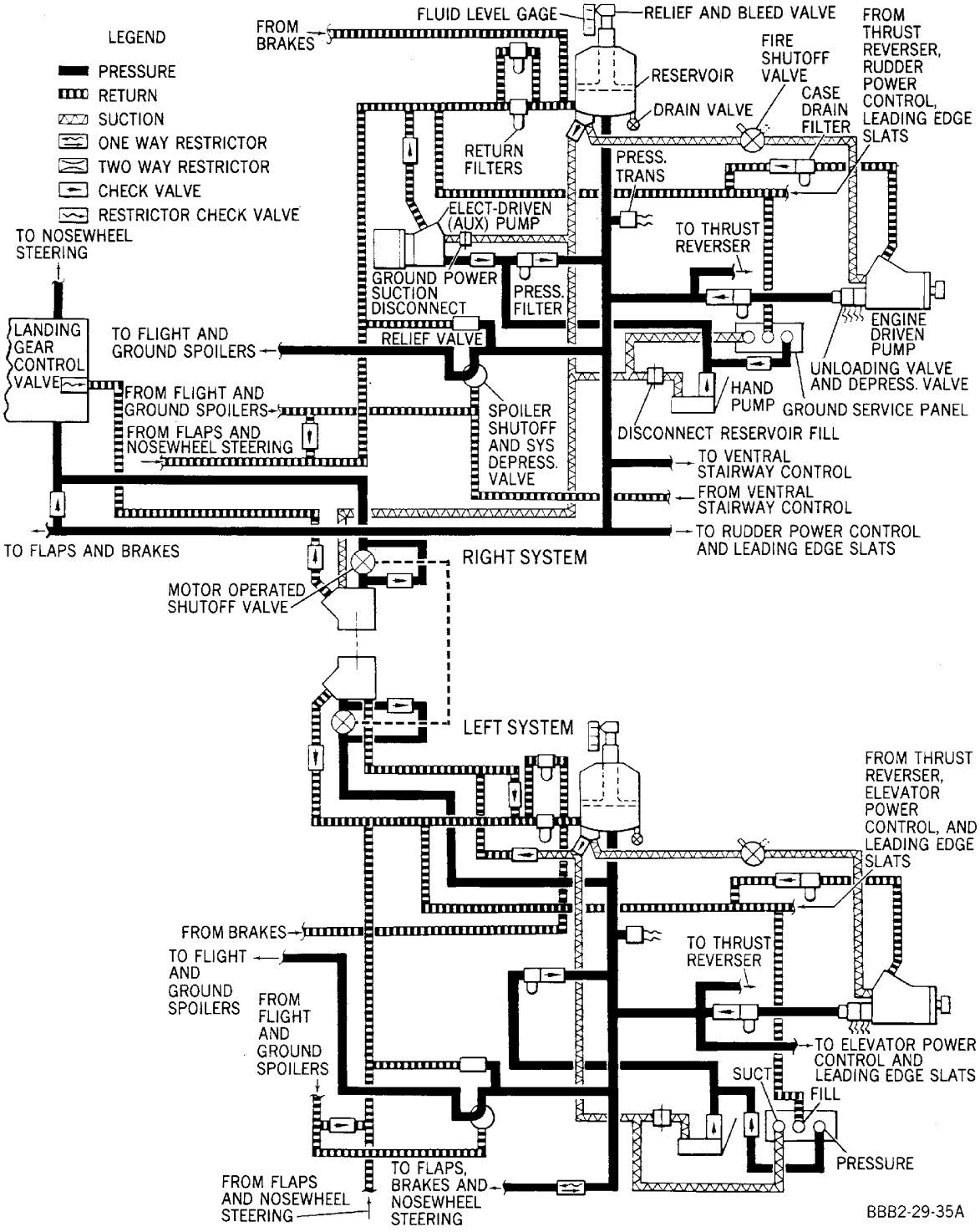
(6) Landing gear actuation and main gear inboard doors.

(7) Rudder power control.

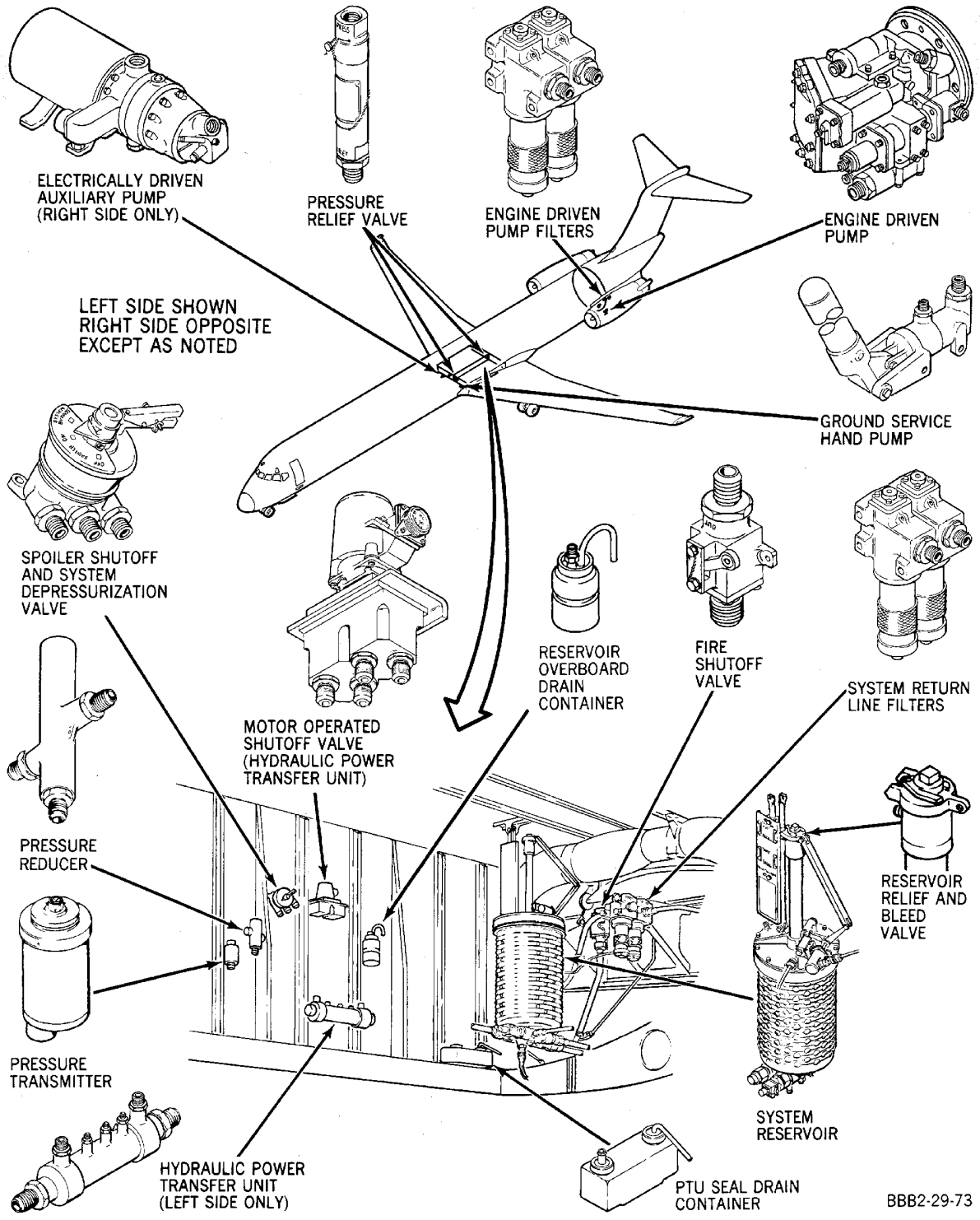
(8) Right engine thrust reverser.

(9) Leading edge slats (right actuating cylinder).

(10) Ventral stairway.



Hydraulic Power Systems -- Schematic
Figure 1/29-10-00-990-801



Hydraulic Power Systems -- Component Locations
Figure 2/29-10-00-990-802

2. System Components

A. Hydraulic System Reservoir

(1) The left and right hydraulic reservoirs are located in the inboard aft corners of the left and right main gear wheel wells. The reservoirs are identical and interchangeable from left to right locations, except for the location of external components. Left and right mounting locations for the external components are provided on each reservoir. Each reservoir supplies hydraulic fluid to respective system exclusively.

(2) Each reservoir is cylindrical in shape and is protected by a corrugated, perforated shield around the reservoir shell. Each reservoir has a net fluid capacity of 19.01 US quarts (17.99 liters) with reservoir in a depressurized condition. A manifold, equipped with four main ports, a small pressure line port, and a thermoswitch port, is welded to the bottom of the reservoir shell. The four main ports are internally connected and open into the supply fluid section of the reservoir. This configuration of ports makes possible either left or right installation of the reservoir by reversing the location of port connector unions and reducers. When connected in the systems, the right reservoir manifold inboard ports deliver fluid to the suction ports of the engine-driven pump, forward end of hydraulic power transfer unit, the electrically driven (auxiliary) pump, and the ground service handpump; the left reservoir manifold inboard ports deliver fluid to the suction ports of the engine-driven pump, aft end of hydraulic power transfer unit, and the ground service handpump. One of the outboard ports of each reservoir receives system return fluid from its system while the other outboard port is equipped with a valve to drain the reservoir.

(3) A relief and bleed valve, located at the top of the diaphragm guide is provided to relieve excessive reservoir pressure at 47(±5) psi and to bleed off accumulated system air. A clear drain tube, located on the relief and bleed valve, provides a means of determining presence of excessive air in the reservoir.

(4) A reservoir overboard drain container is provided for each hydraulic system reservoir to receive bleed fluid and to vent excess reservoir pressure to atmosphere. The container is mounted adjacent to the reservoir, in the left and right main gear wheel wells. A clear line is routed from the hydraulic reservoir relief and bleed valve to the inlet port of the container. A second line is routed from the container vent port to atmosphere.

(5) A calibrated instruction plate, mounted adjacent to the reservoir diaphragm guide and a pointer attached to the top of the relief and bleed valve, provide fluid level instructions and direct fluid level indications for system pressurized and system depressurized conditions.

(6) A fluid quantity transmitter, bracket, and actuating linkage is mounted on the reservoir cover. The lower end of the linkage is attached to the transmitter rotor while the upper end is attached to the fluid level pointer at the top of the relief and bleed valve. Fluid level changes in the reservoir raise or lower the relief and bleed valve and pointer, extending or retracting the linkage, and thereby changing the rotor position. The transmitter delivers a fluid quantity signal to the fluid quantity indicator in the flight compartment.

(7) A hydraulic fluid low level switch, bracket, and actuating link is mounted on the reservoir cover, adjacent to the fluid quantity transmitter. The clevis end of the actuating link is installed on the fluid quantity transmitter shaft, along with the lower link of the fluid quantity linkage, the free end of the actuating link is held by a spring attached to the link and bracket. The switch actuating arm roller rests on the upper surface of the link. When the usable hydraulic fluid is depleted, an adjustable belt on the lower link of the quantity linkage engages the lower surface of the switch actuating link, rotating the link to actuate the switch. The low level switch is electrically connected to the hydraulic power transfer unit motor operated shutoff valves and will prevent the valves from opening if usable fluid is low or shut the valve, if open, when usable fluid is depleted.

(8) An air breather, equipped with a filter screen, is provided in the reservoir cover forward of the diaphragm guide. It allows the upper (ambient air) section of the reservoir to breathe air in and out as the diaphragm lowers and raises with pressurization of the hydraulic system and operation of the various subsystem actuators. The filter screen removes atmospheric impurities from the air which enters the upper portion of the reservoir.

(9) Internally, the reservoir is equipped with a piston and diaphragm assembly which utilizes system pressure (3000 psi), from the small pressure line port, to maintain a pressure head on the supply fluid of 28 to 30 psi, the large pressure reduction being the result of the large (approximately 100 to 1) difference in area between the piston and the diaphragm.

B. Fire Shutoff Valve

(1) The fire shutoff valves, one for each of the two hydraulic systems, are manually operated, two-position, two-way, ball-type, hydraulic shutoff valves. The valves are located, one on each side of the airplane, in the main gear wheel wells. Each valve is mounted on a bracket attached to the aft bulk-head of the wheel well, outboard of the hydraulic system reservoir. Mechanical control from the flight compartment is provided by a cable system operated by two fire control push-pull handles. The two handles, left and right, are located directly above the center instrument panel, easily accessible to either the pilot or first officer and operate both the hydraulic and fuel fire shutoff valves. A cable drum, located on the wheel well bulkhead above each hydraulic fire shutoff valve, has a pushrod attached near its outer circumference. The lower end of the rod is attached to the fire shutoff valve crank.

(2) The fire shutoff valve is operated during engine operation only in case of fire in the engine compartment. Closing the valve stops all flow of hydraulic fluid to the engine-driven hydraulic pump, thereby preventing loss of hydraulic fluid in case of fire-damaged hydraulic lines or hoses in the engine area. Simultaneous fuel shutoff will stop the engine, and switches actuated by the fire control handle will disconnect the generator from the bus, and activate the fire extinguisher system. Operation is accomplished by pulling the handles in the flight compartment, left handle or right handle as applicable, to its aft position. The handle shaft actuates the cable system which in turn rotates the ball of the fire shutoff valve to the closed position. Pushing the handle to its forward (normal) position reverses the action and the valve is opened.

C. Engine-Driven Hydraulic Pump

(1) The engine-driven hydraulic pumps, one for each hydraulic system, are variable-displacement, pressure-compensated, axial-piston type pumps. They are capable of providing the systems with continuous, nonpulsating, hydraulic fluid. Pressures are dependent on flow. During operation of the engine-driven pumps, a portion of pump suction inlet fluid, used for lubrication and pump cooling, is returned to the reservoirs through the pump case drain and system return lines. Each pump is equipped with a solenoid-actuated depressurization valve, a spring-loaded blocking valve, and a solenoid-actuated unloading valve. When the depressurization valve is actuated, the blocking valve closes shutting off pressure to the system, the pump is feathered, and pump leakage and lubrication fluid is ported to the case drain line. The unloading valve reduces pump output pressure to approximately 1500 psi for cruise flight operation when full system pressure (3000 psi) is not required. The depressurization and unloading valves are operated by the engine pump control switches in the flight compartment. The pressure line and case drain line filters, located in the aft accessory compartment, are equipped with check valves at the outlet ports to prevent pressurized fluid from returning through the filters to the pumps when the pumps are not operating.

D. Electrically Driven (Auxiliary) Hydraulic Pump

(1) The electrically driven (auxiliary) hydraulic pump is located in the forward area of the right main gear wheel well. The pump is controlled by an auxiliary hydraulic pump switch in the flight compartment and is capable of supplying the right system with a continuous flow of hydraulic fluid. Pressures are dependent on flow.

(2) An auxiliary pump seal drain container is provided to receive seal drain fluid. The container is located in the right wheelwell. A line is routed from the auxiliary pump seal drain fitting to the inlet port of the container. A fitting on the container is vented to atmosphere.

E. Hydraulic Power Transfer Unit

(1) The hydraulic power transfer unit mechanically connects the left and right hydraulic systems and enables hydraulic pressure to be transferred from the highest pressure to the lowest pressure (high pressure side operates as a motor and lowest pressure side as a pump). The power transfer unit is controlled by a single motor operating two shutoff valves, one in each hydraulic system. Operation is controlled by a separate switch located on the first officers hydraulic control panel. The motor operated shutoff valves are connected electrically to the low level switch on the reservoir and the valves will automatically close if either system reservoir is below usable fluid levels.

(2) A hydraulic power transfer unit seal drain container is provided to receive seal drain fluid. The container is located in the left wheelwell. A line is routed from transfer unit seal drain fitting to the inlet port of the container. A fitting on the container is vented to atmosphere.

F. Ground Service Handpump

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(1) The ground service handpumps, one for each of the two hydraulic systems, are single-cylinder, double-action, piston-type, hand-operated hydraulic pumps capable of delivering 0.750 cubic inch of hydraulic fluid per cycle. The handpumps are located in the forward outboard corner of each main gear wheel well, with access through the main gear inboard doors. The pumps are connected between the reservoir supply lines and the system pressure lines so that operation of the handpumps will pressurize the hydraulic system for ground maintenance operations. RH spoiler shutoff and system depressurization valve must be placed in off position for pressurization of RH hydraulic system. A quick-disconnect fitting in the handpump suction line is provided for filling the hydraulic reservoir with the handpump. This operation is accomplished by separating the quick-disconnect fitting, connecting the female half of the fitting (on the handpump suction hose) to a container of clean hydraulic fluid, and placing the spoiler shutoff and system depressurization valve in bypass position. Operation of the handpump will then pump fluid from the container through the electrically driven (auxiliary) hydraulic pump pressure line filter and the depressurization valve, into the system return lines, through the return line filters and into the reservoir. A check valve is incorporated in the outlet port of the handpump to prevent system pressure from backing up through the handpump and into the suction side of the system.

WJE 405-411, 880, 881, 883, 884

(2) The ground service handpumps, one for each of the two hydraulic systems, are single-cylinder, double-action, piston-type, hand-operated hydraulic pumps capable of delivering 0.750 cubic inch of hydraulic fluid per cycle. The handpumps are located in the forward outboard corner of each main gear wheel well, with access through the main gear inboard doors. The pumps are connected between the reservoir supply lines and the system pressure lines so that operation of the handpumps will pressurize the hydraulic system for ground maintenance operations. (On airplanes 104-999 RH spoiler shutoff and system depressurization valve must be placed in off position for pressurization of RH hydraulic system). A quick-disconnect fitting in the handpump suction line is provided for filling the hydraulic reervoir with the handpump. This operation is accomplished by separating the quick-disconnect fitting, connecting the female half of the fitting (on the handpump suction hose) to a container of clean hydraulic fluid, and placing the spoiler shutoff and system depressurization valve in bypass position. Operation of the handpump will then pump fluid from the container through the electrically driven (auxiliary) hydraulic pump pressure line filter and the depressurization valve, into the system return lines, through the return line filters and into the reservoir. A check valve is incorporated in the outlet port of the handpump to prevent system pressure from backing up through the handpump and into the suction side of the system.

WJE ALL

G. Pressure Relief Valves

(1) One hydraulic power system pressure relief valve is provided in each hydraulic system. It serves the engine-driven hydraulic pump, the electrically driven (auxiliary) hydraulic pump, and the ground power and handpump pressure lines. The valves are spring-loaded, poppet-type valves which relieve excess pressure which may build up in the pressure side of the pumps or from a ground power source.

(2) The pressure relief valves are located in the aft area of the main gear wheel wells.

(3) When an overpressure condition occurs, the valve starts to relieve. The high-pressure fluid entering through the pressure port acts on the poppet which forces the spring guide against the spring. At the cracking pressure, the hydraulic force on the poppet overcomes the spring pressure,the poppet starts to open, and fluid starts to flow through the valve. If presssure continues to build up, the poppet continues to open and will allow full flow of 9 gpm at a specific maximum pressure increase above cracking pressure. When pressure is relieved, the poppet reseats and relief flow ceases. The pressure relief valve cracks at 3600(±50) psi (24840(±345) kPa), full flow occurs at 200 psi (1380 kPA) maximum above cracking pressure and the valve reseats at 3350 psi (23115 kPa) minimum.

H. Filters

(1) The two hydraulic systems are each equipped with five hydraulic fluid filters: an engine-driven hydraulic pump pressure line filter, an engine-driven hydraulic pump case drain line filter, a pressure line filter in each system provides fluid filtration for fluid entering the system from an external source, either the ground power connection or the handpump. Two return line filters in parallel are provided in each system to filter all fluid returning to the reservoir. The inlet and outlet ports are internally threaded and are marked in and out. The filter bowl is cylindrical in shape with wrench flats at the lower end, and is threaded into the filter head immediately below the ports. An O-ring seal is provided in the filter head to prevent leakage between the bowl and head.

(2) Internally, the filters are of the nonbypassing type; however, a differential pressure indicator is provided to indicate an overloaded condition of the filter element. The indicator consists of a red button which protrudes 3/16 inch from the top of the filter head when the filter element becomes overloaded causing a differential pressure of 120(±10) psi or more across the filter. Case drain filters are equipped with 80(±10) psi differential pressure indicators which may be identified by the black anodized indicator button housing. The indicator can be reset by manually depressing the button only after the overloaded condition has been corrected. A low-temperature cutoff device consisting of a bimetallic spring is provided to prevent false indication of an overloaded element as caused by high viscosity of the hydraulic fluid at low temperature. Below 32°F(0°C), the spring contracts inward above a shoulder on the indicator button preventing movement of the button. Above 85(±15)°F (29.9(±9.4)°C), the spring is extended and the indicator button operates normally.

(3) The filter elements are the disposable type, and the filter head incorporates a spring-loaded shutoff diaphragm to prevent loss of hydraulic fluid and minimize air entry when the filter bowl is removed for element replacement.

(4) The engine-driven hydraulic pump pressure line and case drain line filters are located in the fuselage aft accessory compartment. They are installed with one pressure line and one case drain line filter mounted together on a bracket. The brackets and filters are located one on each side of the fuselage, just aft of the pressure dome.

(5) The pressure line filter is mounted on a bracket attached to the forward bulkhead in the left and right main gear wheel wells.

(6) The hydraulic system return line filters are located, two in parallel for each system, on brackets attached to the aft bulkhead of each main gear wheel well.

I. Spoiler Shutoff and System Depressurization Valve

(1) The spoiler shutoff and system depressurization valves, one for each hydraulic system, are separately operated, manual, three-way hydraulic valves. They are located on opposite sides of the airplane centerline panel in each main gear wheel well. The spoiler shutoff and system depressurization valves can be operated only when the airplane is on the ground.

(2) The three-way characteristic permits the inlet port to be connected to either of the two outlet ports or to both out-let ports simultaneously. The three ports are designated port 1, port 2, and port 3. Port 1 is connected to the pressure side of the spoiler subsystem, port 2 is connected to the hydraulic system pressure, and port 3 is connected to the return system.

(3) A nameplate is attached to the face of the valve to indicate the operating position of the valve and is marked to indicate the spoiler on, spoiler off, and system bypass (depressurization) positions. A handle with a pointer at one end to register with the nomenclature on the nameplate is provided. The handle is also equipped with a latch mechanism and a safety pin to secure the valve in the spoiler on or spoiler off position.

(4) With the handle in the spoiler on position, hydraulic pres-sure is supplied to the spoiler subsystem and return port 3 is blocked. With the handle in the spoiler off position, hydraulic pressure to the spoiler subsystem is shut off and spoiler subsystem pressure is directed through the valve and port 3 to the return system. With the handle in the system bypass position, both system hydraulic pressure (port 2) and spoiler subsystem pressure (port 1) are directed through the valve and port 3 to the hydraulic fluid return system.

(5) With both valves in the system bypass position, both hydraulic power systems are depressurized (the left valve controls the left hydraulic power system and the right valve controls the right system). A hydraulic pressure low caution light for each system is provided on the annunciator panel in the flight compartment to indicate a low pressure or bypass condition in the hydraulic power system or the flight spoiler subsystem.

J. Ground Power Connections

(1) Ground power pressure and suctions for applying external hydraulic power and filling the reservoirs are provided for each system on a ground service panel located in each main gear wheel well. Access doors are provided just forward of the main gear inboard doors for access to the ground service panels. Each of the three ground service connections consists of the male half of a quick-disconnect fitting and a dust cap to prevent contamination of the fitting when not in use. The dust caps are removed for connection of external source ground power hoses.

K. Indicating

WJE 401-412, 414, 415, 417-419, 421, 423, 863-866, 869, 871-881, 883, 884, 886, 887, 892, 893

(1) Hydraulic fluid quantity is indicated both directly and remotely for each system. The direct reading fluid level indicator is located on the top of each system reservoir. Fluid level indications are read on a fixed fluid level scale with the level being provided by a pointer attached to the top of the reservoir relief and bleed valve which moves up and down with fluid level fluctuations. An electric fluid quantity transmitter, also mounted on each reservoir, and attached to the fluid level pointer by a linkage, provides fluid quantity signals to the Systems Display Panel (SDP) on center instrument panel in the flight compartment. A hydraulic fluid pressure transmitter, located in each main gear wheel well, provides hydraulic pressure signals to the Systems Display Panel (SDP) on center instrument panel in the flight compartment. A thermo switch located in the bottom of each system reservoir, provides fluid overtemperature signals to master caution lights and the annunciator panel lights in the flight compartment. A pressure switch in each main gear wheel well provides indication of low hydraulic pressure by illumination of the master caution lights and left or right hydraulic pressure low caution lights on the annunciator panel in the flight compartment whenever hydraulic system pressure falls below 900(±100) psi.

WJE 422, 425, 427, 868

(2) Hydraulic fluid quantity is indicated both directly and remotely for each system. The direct reading fluid level indicator is located on the top of each system reservoir. Fluid level indications are read on a fixed fluid level scale with the level being provided by a pointer attached to the top of the reservoir relief and bleed valve which moves up and down with fluid level fluctuations. An electric fluid quantity transmitter, also mounted on each reservoir, and attached to the fluid level pointer by a linkage, provides fluid quantity signals to the hydraulic fluid quantity indicator in the flight compartment. A hydraulic fluid pressure transmitter, located in each main gear wheel well, provides hydraulic pressure signals to the hydraulic system pressure indicator in the flight compartment. A thermo-switch located in the bottom of each system reservoir, provides fluid overtemperature signals to master caution lights and the annunciator panel lights in the flight compartment. A pressure switch in each main gear wheel well provides indication of low hydraulic pressure by illumination of the master caution lights and left or right hydraulic pressure low caution lights on the annunciator panel in the flight compartment whenever hydraulic system pressure falls below 900(±100) psi.

1. Trouble Shooting

WARNING: INADVERTENT OPERATION OF THRUST REVERSERS COULD CAUSE SERIOUS INJURY TO PERSONNEL WORKING IN THE ENGINE AREA.

A. NO ENGINE-DRIVEN HYDRAULIC PUMP PRESSURE

Table 101

Step	Possible Causes	Isolation Procedure	Correction
(1)	Pressure line filter clogged	Check condition of pressure line filter element (indicator on top of filter).	Replace clogged filter element.
(2)	Pressure relief valve bypassing	Check function of pressure relief valve.	Replace defective valve.
(3)	Failure of spoiler shutoff and system depressurization valve	Check function of valve.	Replace defective valve.
(4)	Fire shutoff valve control system defective or improperly rigged	Check control system and rigging. Check for broken cable.	Rig system and adjust pushrod. Replace broken cable.
		Check linkage from cable drum to valve crank.	Rig system and adjust pushrod.
(6)	Defective depressurization valve solenoid	Check solenoid for proper function.	Replace hydraulic pump.
(7)	Defective engine-driven hydraulic pump control switch causing actuation of depres surization valve solenoid	Check for proper function of switch.	Replace defective switch.
(8)	Shorted pump control wiring between control switch and depressurization valve solenoid	Check wiring for continuity and short circuits.	Repair wiring as necessary.

B. LOW ENGINE-DRIVEN HYDRAULIC PUMP PRESSURE

Table 102

Step	Possible Causes	Isolation Procedure	Correction
(1)	Pressure line filter clogged	Check condition of pressure line filter.	Replace clogged element filter element.
(2)	Pressure relief valve improperly adjusted	Check relief setting of pressure relief valve.	Replace valve with properly adjusted unit.
(3)	Hydraulic fluid leaks in system	Check for broken lines or loose fittings.	Replace broken lines; tighten loose fittings.
(4)	Defective engine-driven hydraulic pump	Check pump for proper function.	Replace engine driven hydraulic pump.
(5)	Defective engine-driven hydraulic pump control switch	Check for proper function of switch.	Replace defective switch.
(6)	Shorted engine-driven hydraulic pump control wiring between control switch and unloading valve	Check wiring for continuity and short circuits.	Repair wiring as necessary.

C. FAILURE OF ENGINE-DRIVEN HYDRAULIC PUMP TO CONTROL -- CONTROL SWITCH OFF

Table 103

Step	Possible Causes	Isolation Procedure	Correction
(1)	Defective depressurization valve solenoid	Check function of solenoid.	Replace engine driven hydraulic pump.
(2)	Defective engine-driven hydraulic pump control switch preventing operation of depressurization valve solenoid	Check for proper function of switch.	Replace defective switch.
(3)	Defective engine-driven hydraulic pump control circuit breaker prevent ing operation of depressurization valve solenoid	Check for proper function of circuit breaker.	Replace defective circuit breaker.
(4)	Loose connection or defective wiring between circuit breaker and depressurization valve solenoid	Check wiring for continuity, loose connections and open circuits.	Repair wiring as necessary.

D. FAILURE OF ENGINE-DRIVEN HYDRAULIC PUMP TO CONTROL -- CONTROL SWITCH LOW

Table 104

Step	Possible Causes	Isolation Procedure	Correction
(1)	Defective unloading valve solenoid	Check function of unloading valve solenoid.	Replace engine driven hydraulic pump.
(2)	Defective engine-driven hydraulic pump control switch preventing operation of unloading valve solenoid	Check for proper function of switch.	Replace defective switch.
(3)	Defective engine-driven hydraulic pump control circuit breaker prevent ing operation of unloading valve solenoid	Check for proper function of circuit breaker.	Replace defective circuit breaker.
(4)	Loose connection or defective wiring between circuit breaker and depressurization valve solenoid	Check wiring for continuity, loose connections and open circuits.	Repair wiring as necessary.

E. NO ELECTRICALLY DRIVEN (AUXILIARY) HYDRAULIC PUMP PRESSURE

Table 105

Step	Possible Causes	Isolation Procedure	Correction
(1)	Defective electrically driven (auxiliary) hydraulic pump power relay	Check function of relay.	Replace defective relay.
(2)	Defective wiring or electrical connections	Check electrical system.	Repair as necessary.
(3)	Electrically driven (auxiliary) hydraulic pump pressure line filter clogged	Check condition of pressure line filter element (indicator on top of filter).	Replace clogged filter element.

Table 105 (Continued)

Step	Possible Causes	Isolation Procedure	Correction
(4)	Hydraulic system pressure relief valve bypassing	Check function of pressure relief valve.	Replace defective pressure relief valve.
(5)	Internal failure of spoiler shutoff and system depres surization valve	Check function of valve.	Replace defective valve.
(6)	Defective electrically driven (auxiliary) hydraulic pump	Check pump for proper function.	Replace electrically driven (auxiliary) hydraulic pump.
(7)	Defective electrically driven (auxiliary) hydraulic pump motor	Check operation of pump motor.	Replace electrically driven (auxiliary) hydraulic pump.

F. LOW ELECTRICALLY DRIVEN (AUXILIARY) HYDRAULIC PUMP PRESSURE

Table 106

Step	Possible Causes	Isolation Procedure	Correction
(1)	Defective electrically driven (auxiliary) hydraulic pump power relay	Check function of relay.	Replace defective relay.
(2)	Defective wiring or electrical connections	Check electrical system.	Repair as necessary.
(3)	Electrically driven (auxiliary) hydraulic pump pressure line filter clogged	Check condition of pressure line filter element (indicator on top of filter).	Replace clogged filter element.
(4)	Hydraulic system pressure relief valve bypassing	Check function of pressure relief valve.	Replace defective valve.
(5)	Internal failure of spoiler shut-off and system depressurization valve	Check function of valve.	Replace defective valve.
(6)	Defective electrically driven (auxiliary) hydraulic pump	Check pump for proper function.	Replace defective electrically driven (auxiliary) hydraulic pump.
(7)	Defective electrically driven (auxiliary) hydraulic pump motor	Check operation of motor.	Replace electrically driven (auxiliary) hydraulic pump.
(8)	Hydraulic fluid leaks in system	Check for broken lines or loose fittings.	Replace broken lines; tighten loose fittings.

G. FAILURE OF HYDRAULIC POWER TRANSFER UNIT TO OPERATE

Table 107

Step	Possible Causes	Isolation Procedure	Correction
(1)	Defective transfer pump switch	Check function of switch.	Replace defective switch.
(2)	Defective hydraulic power transfer unit control circuit breaker	Check function of circuit breaker.	Replace defective circuit breaker.
(3)	Defective shut-off valve motor	Check function of shut-off valve.	Replace defective valve.
(4)	Defective hydraulic power transfer unit	Check function of hydraulic power transfer unit.	Replace defective unit.

Table 107 (Continued)

Step	Possible Causes	Isolation Procedure	Correction
(5)	Defective wiring or electrical connections between circuit breaker and shutoff valves	Check electrical system to shutoff valves.	Repair wiring as necessary.
(6)	Reservoir fluid level low	Check reservoir fluid level.	Fill reservoir with hydraulic fluid.
7)	(Defective fluid low level switch	Check function of fluid low level switch.	Replace defective switch.

H. L OR R HYD TEMP HIGH EOAP MESSAGE IS SHOWN

NOTE: Hydraulic System temperature normally stabilizes in cruise. Higher temperatures may be reached after extended ground idle operation or at top of climb. Cruise temperatures above 200° F are usually caused by failing pumps or by excessive internal leakage and must be corrected at the first opportunity for maintenance.

(1) Possible Causes:

(a) By-pass valves in the bypass position.

(b) Electric driven auxiliary hydraulic pump.

(c) Engine Driven Pump (EDP).

(d) Hydraulic Power Transfer Unit (PTU).

(e) Internal leakage in the Main Hydraulic Reservoir.

(f) Excessive Air in the Hydraulic System.

(g) Internal leakage of Flight Control Actuators.

(h) Internal leakage of Landing Gear Control Valve.

(i) Internal leakage of the hydraulic accumulator.

(j) Internal leakage of the rudder shut off valve.

(k) Leakage at Accumulator Bleed Valves.

(l) Left Hydraulic fluid over-temperature thermo-switch, S1-128.

(m) Right Hydraulic fluid over-temperature thermo-switch, S1-129.

(n) Hydraulic Fluid Contamination.

(o) Left (Right) Hydraulic Pressure Relief Valve.

(p) Wiring.

(2) Do the System Configuration Check of the systems that follow:

- All bypass valves are in the correct position.
- No excessive air in the hydraulic system.
- No visable hydraulic fluid contamination, If contamination is found, do the alternate flush procedure. (HYDRAULIC SYSTEM FLUSHING - GENERAL, PAGEBLOCK 29-01-00/201)
- Reservoirs and accumulators are serviced to their operating levels. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(3) Check the hydraulic system for excessive heat and internal leakage as follows:

(a) Run the AUX pumps for a minimum of 15 min. (ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-06/201)

1) To pressurize both hydraulic systems, put the TRANS switch to the ON position.

(b) Make sure that the hydraulic PTU is cycling On and Off.

1) If the hydraulic PTU is running continuously, remove and replace the PTU. (HYDRAULIC POWER TRANSFER UNIT - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-07/201)

(c) Cycle the flight controls (rudder, ailerons and flaps). (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 27-00-00/201)

(d) By hand feel, check the system components for heat and listen for abnormal hissing and/or chatter.

1) If excessive heat or internal leakage is found remove and replace the affected Line Replaceable Unit (LRU).

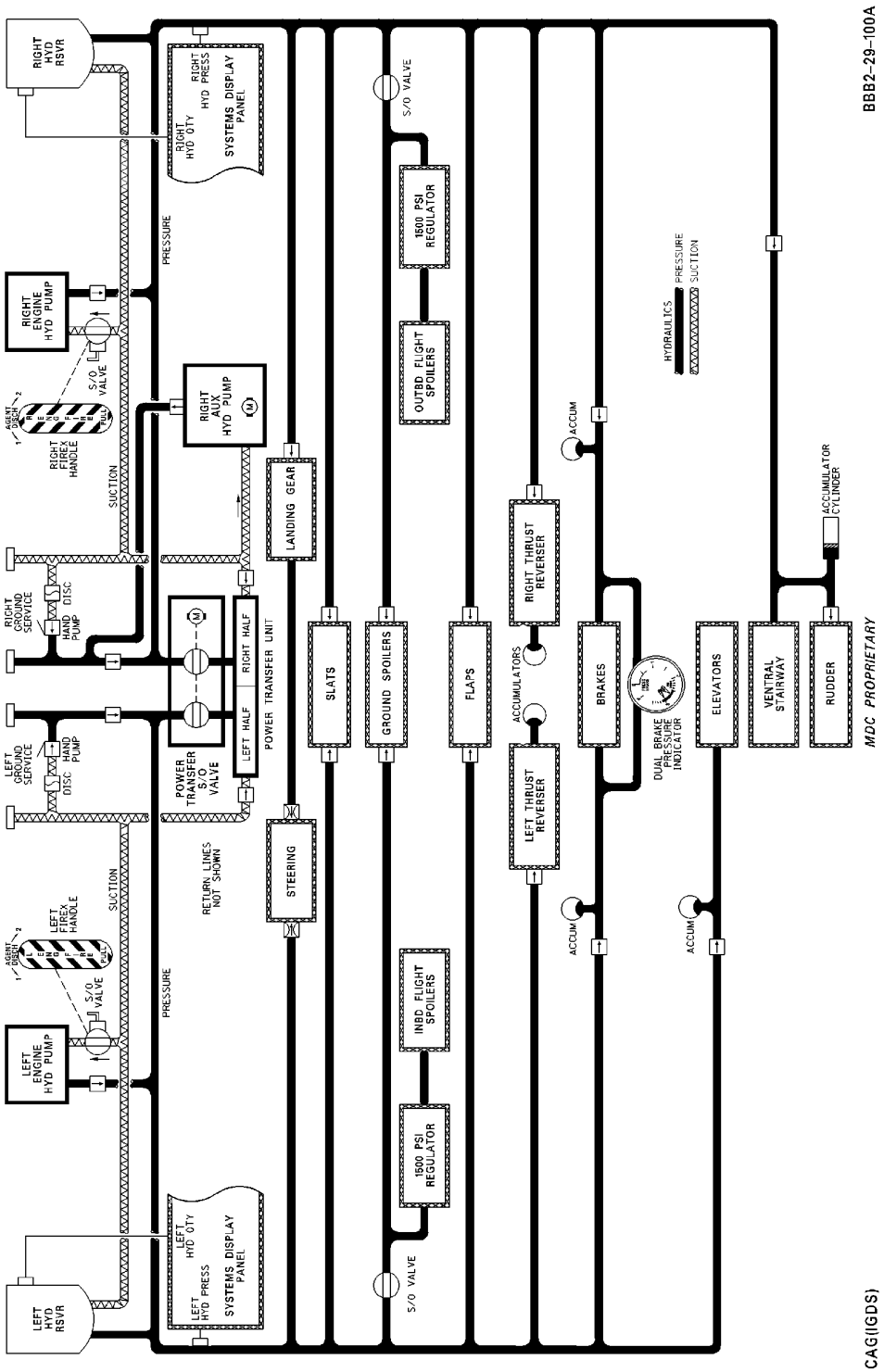
(4) If the TEMP HIGH is not present when the electric motor driven AUX pump, or AUX and TRANS pumps are operated, do trouble shooting as follows:

Table 108

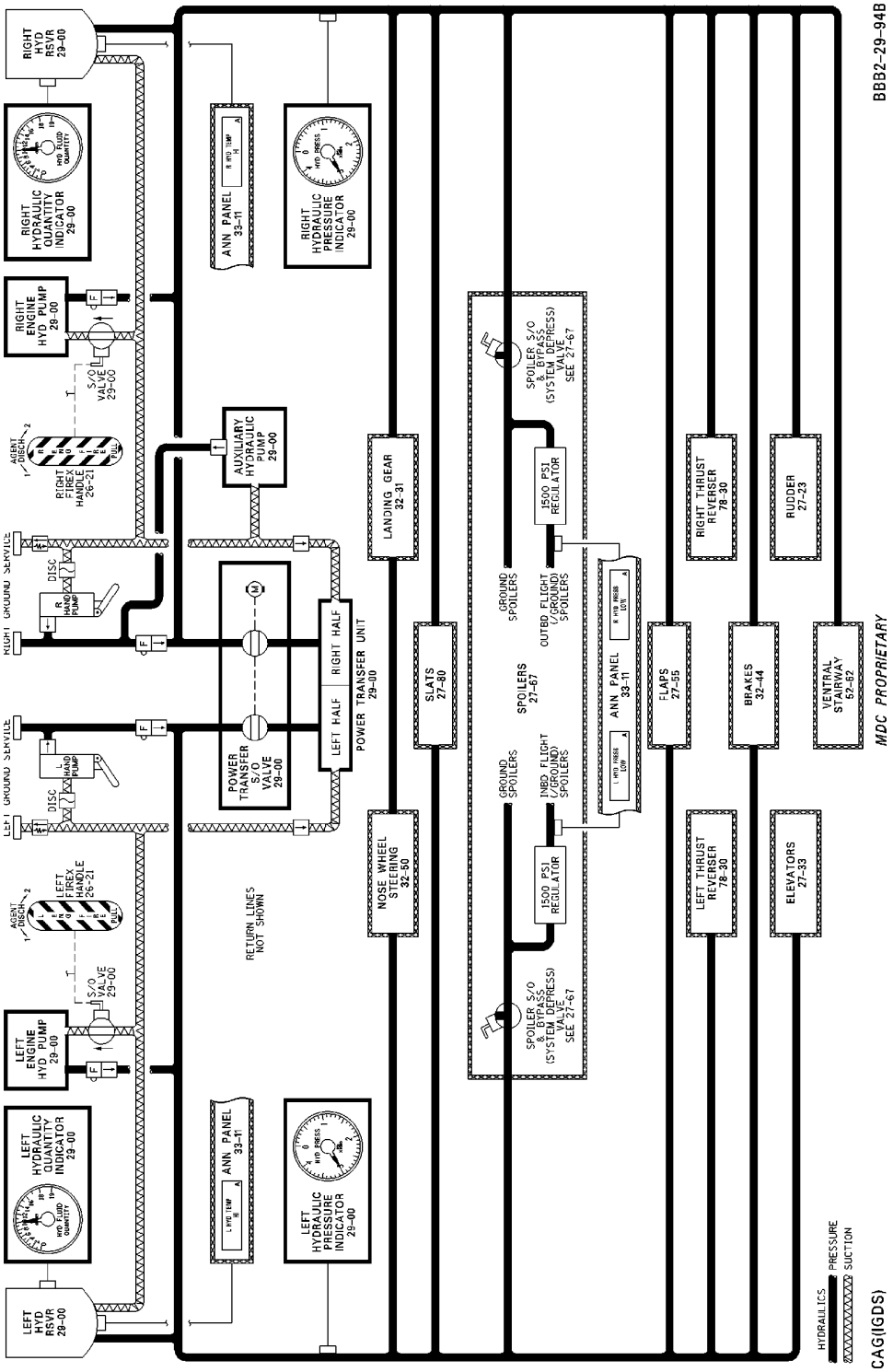
Step	Possible Causes	Isolation Procedure	Correction
(1)	Engine driven hydraulic pump.	Put the HYD PUMPS AUX and TRANS switches in the ON position to pressurize both hydraulic systems (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201).	If the high temperature indication does not continue, replace the engine driven hydraulic pump. (ENGINE-DRIVEN HYDRAULIC PUMP - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-05/201) Also inspect the engine pump pressure line, pump case drain line, and return filters on the system that had the high temperature indication. (HYDRAULIC SYSTEM FILTERS - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-14/201)
(2)	Hydraulic fluid over-temperature thermo-switch S1-128 (left) or S1-129 (right).	Check the Hydraulic fluid over-temperature thermo-switch S1-128 (left) or S1-129 (right).	If the fault continues, replace the hydraulic over-temperature thermo-switch. (HYDRAULIC FLUID OVERTEMPERATURE THERMOSWITCH - MAINTENANCE PRACTICES, PAGEBLOCK 29-30-03/201)
(3)	Wiring.		If fault continues, examine/repair the wiring.
(4)	Excessive internal leakage of main hydraulic reservoir.		If the fault continues, do the functional test of the affected hydraulic system reservoir for internal leakage. (HYDRAULIC SYSTEM RESERVOIR - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-01/201)

Table 108 (Continued)

Step	Possible Causes	Isolation Procedure	Correction
(5)	Excessive internal bypass of the main (L) or (R) hydraulic system pressure relief valve.	Check for internal bypass by listening for hissing, cyclic, or chattering noise at the hydraulic pressure relief valve. There will be noticeable temperature increase at the relief valve.	If the fault continues, replace the suspected system pressure relief valve. (HYDRAULIC POWER SYSTEM PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-12/201)
(6)	If the fault continues do an ITCAN hydraulic check. (MAIN - ADJUSTMENT/TEST, PAGEBLOCK 29-10-00/501)		



Hydraulic Power System
Figure 101/29-10-00-990-806 (Sheet 1 of 2)



Hydraulic Power System
Figure 101/29-10-00-990-806 (Sheet 2 of 2)

EFFECTIVITY
WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

1. Hydraulic ITCAN Test

A. General

(1) This procedure is a process to determine the serviceability status of the MD-80 hydraulic systems to support on condition aircraft maintenance. By configuring aircraft controls as prescribed, system functions are isolated sequentially. Internal leakage is measured by the hydraulic ITCAN tester. Test readings are recorded and the results are evaluated against tolerances.

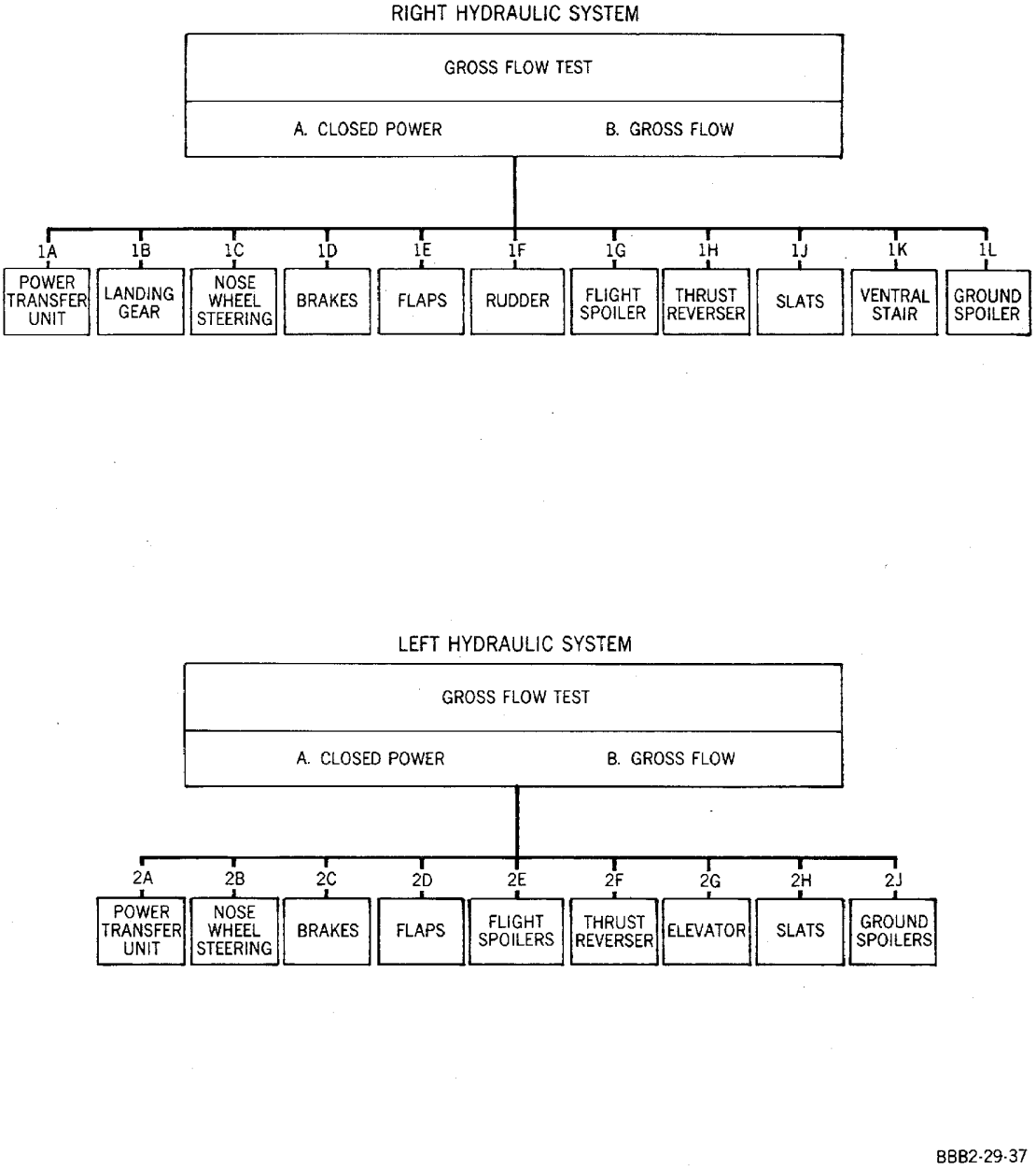
(2) The test procedure presented herein is a two-level test.

The provisions of each are as follows:

Gross Level: A short test to determine overall system and subsystem condition. The procedural steps and resultant readouts included in the gross level test will enable the test operator to determine whether or not it will be necessary to perform secondary level fault isolation procedures. If all flows recorded during a gross level test are satisfactory, no further testing is necessary.

Secondary Level: A detailed test to fault isolate to the degraded component/s. This test is generated by either the gross test, or flight/maintenance squawk.

(3) The MD-80 ITCAN test procedure utilizes a GSE flowmeter to determine flow rates of a system, specific subsystem, or component. The individual system, subsystem or component under test is interrogated by pressurizing either hydraulic system, and measuring the internal leakage of that system. Internal leakage limits are assigned to each test segment as a measurement of system, subsystem, or component degradation. This information provides the MD-80 operators with maintenance planning data.



Hydraulic ITCAN Test -- Block Diagram
Figure 501/29-10-00-990-803

2. Equipment and Materials

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

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

Table 501

Name and Number	Manufacturer
Ground lockpins (2916700-1 and -501)	
Steering bypass lockpin assembly (2916721-1)	
Ground power unit	
Flow measuring unit (positive displacement)	ACL-FILCO Co.
Hydraulic test stand	
Filler cart, Hydraulic	
Interphone (ground service)	
Extension cord	
Tester power extension cord	
Chocks	
Fuselage jacks (1228-31 or 8017)	
Fuselage jack pad adapter	

3. Preparation for ITCAN Hydraulic Check

- Specific references to ITCAN hydraulic system tester and/or its controls refer to the Industrial Measurements & Controls PDQ Meter (with flow suppression feature). Other testers may require modification to these instructions.
- All indications of hydraulic fluid flow are read from the ground test readout meter. All readouts are in cc/min. The readout meter presents both an analog and digital display. All specific flow readouts are taken from the digital display.
- Qualification of the readout meter should be verified prior to any aircraft testing. Periodic calibration of the readout meter should be accomplished at a convenient time, in order to eliminate any test interference.The analog meter represents a backup or trend indication display. Specific test instructions require periodic zeroing (suppression) of the readout meter. This applies only to the digital indicator.
- After connecting tester, do not place hyd unit selector valve handle in FLOWMETER CIRCUIT position until tester and airplane hydraulic systems have been bled through BYPASS FLOWMETERS (PRESSURE) position of tester selector valve to eliminate air from hydraulic fluid. (APPLIES ONLY TO HYD UNITS SO EQUIPPED.)
- When operating on aircraft reservoir, tester may vibrate without a fluid pressure head. To eliminate this condition, stop tester and insure tester supply hose connection is correct. Start tester and bleed aircraft reservoir.
- All test flow readouts should be taken at 3000 psig except test No. 2G which should be 1000 psi. Adjust ground hyd unit pressure as required during testing.
- Both system reservoirs must be at proper levels.

- When checking R.H. hydraulic system on later aircraft (or earlier aircraft with SB 29-39 incorp.), induced heat and bypass noise may be noticed in outer wing area where cooling orifice is installed.

A. Preparation for ITCAN hydraulic check for either right or left system is identical except as noted.

(1) Check that correct ground lockpins are installed in landing gear.

(2) Make certain airplane is electrically grounded.

(3) Place chocks in position at main gear wheels only.

(4) Move all obstructions and clear personnel to permit free operation of thrust reversers, wing flaps, spoilers, rudder, nosewheel steering, elevators, main landing gear doors, wing slats, also upper cargo door and ventral stair, if installed.

CAUTION: NEVER ROTATE NOSEWHEEL MANUALLY WHEN JACKED AND GROUND SENSING ROD CONNECTED.

(5) Nose gear will be required to move full travel in each direction.

NOTE: Nose gear may be raised by a jack placed at the forward fuselage jack point. An alternate method is to use greased plates under the nosewheel.

- If nose gear was raised, it is necessary to remove bolt from ground sensing rod at sector. Rotate sector to ground position (do not over rotate). Do not leave bolt in rod or sector.

(6) Position landing gear shutoff and bypass lever to BYPASS (Extended) (located on right side fuselage forward of MLG door).

(7) Open main gear doors.

(8) Remove bolt at door end of right and left main gear door actuators and position actuators to permit unobstructed operation.

(9) Depressurize hydraulic systems and insure accumulators have proper pre-charge pressure.

(10) Position ITCAN tester aft of either right or left wing as may be convenient to power source. Figure 502

(a) Position unit flowmeter selector valve to BYPASS, if applicable.

(11) Flow measuring unit requires electrical power and approximately 60 psi shop air, for ultimate readout accuracy 30 minute warm up time is required.

(12) Right System Check

Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, DC

Row	Col	Number	Name
M	36	B1-216	PARKING BRAKE CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	29	B1-219	RIGHT REVERSER ACCUM LOW CAUTION
T	30	B1-74	RIGHT REVERSER UNLOCK ADVISORY

(Continued)

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	31	B1-453	RIGHT REVERSE THRUST ADVISORY

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	33	B1-244	SPOILER CONTROL
P	40	B1-213	ANTI SKID INBOARD POWER

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
R	28	B1-209	RIGHT HYD PRESSURE LOW CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

R	33	B1-229	RUDDER CONTROL MANUAL ADVISORY

WJE ALL

R	40	B1-212	ANTI SKID OUTBOARD POWER

UPPER EPC, POWER - RIGHT AC BUS

Row	Col	Number	Name
L	9	B1-115	RIGHT INST XFMR

UPPER EPC, R AC BUS

Row	Col	Number	Name

WJE 417, 419, 421, 423, 865, 869, 871, 872

L	30	B1-24	RIGHT GROUND CONTROL RELAY

WJE 401-412, 414-416, 418, 420, 422, 424-427, 429, 861-864, 866, 868, 873-881, 883, 884, 886, 887, 891-893

L	33	B1-24	RIGHT GROUND CONTROL RELAY

WJE ALL

(13) Left System Check

Make sure that these circuit breakers are closed:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	30	B1-243	SPOILER CONTROL

LOWER EPC, DC

Row	Col	Number	Name
M	36	B1-216	PARKING BRAKE CONTROL

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	29	B1-218	LEFT REVERSER ACCUM LOW CAUTION
S	30	B1-73	LEFT REVERSER UNLOCK ADVISORY

(Continued)

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	31	B1-452	LEFT REVERSE THRUST ADVISORY

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	27	B1-377	ELEVATOR POWER ON ADVISORY
P	28	B1-208	LEFT HYD PRESSURE LOW CAUTION
P	33	B1-244	SPOILER CONTROL
P	40	B1-213	ANTI SKID INBOARD POWER

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
R	40	B1-212	ANTI SKID OUTBOARD POWER

UPPER EPC, L AC BUS

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

UPPER EPC, POWER - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	9	B1-114	LEFT INST XFMR

(14) Open applicable auxiliary hydraulic pump circuit breakers (3 breakers each).

(15) Connect electrical ground power unit.

(16) Position power unit to aircraft switch - ON.

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

EXTERNAL POWER PANEL

Row	Col	Number	Name
		B1-283	EXTERNAL POWER CART
		B1-249	EXTERNAL POWER IND
		B1-287	EXTERNAL POWER PHASE A
		B1-286	EXTERNAL POWER PHASE B
		B1-285	EXTERNAL POWER PHASE C
		B1-284	EXTERNAL POWER RELAYS

(18) Position applicable (right or left) bus external power switch in flight compartment - ON.

(19) Bleed air from hydraulic tester and hoses before connecting to airplane: Refer to tester mfg instructions.

(20) Position tester pump bypass valve - BYPASS (if applicable).

(21) Connect tester to airplane applicable (right or left) hydraulic ground power connections. Fill reservoir if fluid level low.

(22) Open tester pressure hose hand valve (if applicable).

(23) Place applicable (right or left) spoiler shutoff and system depressurizing valve - ON.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT REVERSERS, FLAPS, SPOILERS, NOSE-WHEEL, ELEVATORS, RUDDER, SLATS, VENTRAL STAIR, RUDDER PEDALS AND CONTROL COLUMNS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(24) Reservoir Selector - AIRPLANE RESERVOIR (if applicable)

WARNING: WITH AIRPLANE RESERVOIR FLUID AT NORMAL LEVEL, A FULL TESTER RESERVOIR WILL OVERFILL WITH SELECTOR POSITIONED TO TESTER RESERVOIR. AIRPLANE RESERVOIR MAY OVERFILL IF SELECTOR POSITIONED TO FILL AIRCRAFT RESERVOIR.

(25) Start tester (assure tester flowmeter selector valve in BYPASS FLOWMETERS) (PRESSURE) (if applicable).

(26) Position tester pump bypass valve (if installed) (PRESSURE).

(27) Adjust tester pump pressure to 3000 psi.

(28) Circulate hydraulic fluid for 1 minute to assure elimination of air from tester and airplane systems.

(29) Move tester flowmeter selector valve to FLOWMETER CIRCUIT (if applicable).

(30) Bleed air from aircraft hydraulic reservoir.

(31) Remove applicable engine exhaust covers.

(32) Landing gear alternate extension lever UP.

Table 502

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
A.			
1	Prepare aircraft for ITCAN HYDRAULIC CHECK (See Paragraph 3.).		
2	Anti-Skid - OFF		
3	Parking Brake - OFF		
4	Speed Brake Lever - RETRACT		
5	Wing Flap - UP		
6	Rudder Power - MANUAL		
7	L.G. Alternate Extension Lever - UP (gear extend position)		

Table 502 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
8	Landing Gear Control - DOWN		
9	Power Transfer Unit - OFF		
10	Auxiliary Hydraulic Pump Switch - OFF		
11	Reverser Lever - FORWARD THRUST (buckets stowed)		
CAUTION: REVERSER DOORS AND CONTROL POSITIONS MUST CORRESPOND.			
12	Wing Slats - RETRACT		
13	R.H. Reverser Control Valve - DUMP (Pin installed) (Located aft of pressure bulkhead inside RH side of fuselage)		
14	Spoiler Shutoff and System Depressurization Valve - OFF (Located at inboard side of right wheel well)		
15	MLG Shutoff and Bypass Lever - NORMAL (Closed) (Located on fuselage forward of right MLG door)		
16	Nose wheel Steering - BYPASS (Pin installed) (Arm at left side of NLG strut depressed inboard)		
17	Aft Stair UP and Control NEUTRAL		
18	Before pressurizing system insure the following lo pressure warning lights are illuminated.		
	a. R. Hyd Pressure Low Light - ON		
	b. R.H. Reverser Accum. Low Light - ON		
	c. Rudder Power Manual Light - ON		
19	Pressurize R.H. Hydraulic System to 3000 psi		
20	After flow has stabilized, record flow readout. (Wait for flow to settle)		485 cc/m

Table 502 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	REASON: Checks total internal leakage of: R.H. Reverser Shutoff Valve; Engine, Auxiliary and Hand Pump Check Valves; Landing Gear Control Valve Bypass Slide; Flap Control Valve and No. 1 & 3 Actuating Cylinders; Motor Operated Shutoff Valve; Brake Control Valve; System Pressure Relief Valve and Reservoir Pressurizing Cylinder, Slat Control Valve, Rudder Shutoff Valve, Spoiler Shutoff and System Depressurization Valve, Ventral Stairway Control Valve.		

NOTE: Leakage in excess of 485 cc/m would be the result of one or more of the above components leaking. Faulty component(s) should be isolated, i.e., by sound (excessive noise), or feel (excessive temperature), and corrected before continuing test. Failure to do so could result in erroneous gross test and fault isolation readouts.

Table 503

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
B.			
1	Insure that closed power leakage is within limits and/or faulty components/s have been isolated.		
2	Position Flow Suppression Control Switch on PDQ Readout Panel to - ON		
3	Zero Meter		
4	Parking Brake - ON		
	a. Record Flow		50 cc/m
	b. Checks internal leakage with the R.H. brake subsystem pressurized with anti- skid subsystem "OFF".		
	c. Zero Meter		

Table 503 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
5	Spoiler Shutoff and System Depressurization Valve - ON		
	a. Record Flow		1300cc/m
	b. Checks internal leakage of outboard flight spoiler actuators, (retract) including spoiler pressure reducer and ground spoiler control valve and ground spoiler actuating cylinders.		
6	Speed Brakes - FULL EXTEND		
	a. Record Flow		1520 cc/m
	b. Checks internal leakage through the outboard flight spoiler actuator control valves, the ground spoiler control valve and actuating cylinders.		

NOTE: Ground spoilers will not move up, but pressure differential will be across the actuator pistons.

Table 504

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1 Con't.	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	c. Speed Brakes - RETRACT		
	d. Zero Meter		
	e. Rudder Pedals - NEUTRAL.		
	f. Place rudder hydraulic control lever in POWER position.		
	g. Record Flow		650 cc/m
	h. Checks internal leakage of rudder control valve (neutral mode) and rudder shutoff valve (power on).		
7	Rudder - Full right and hold. (Do not depress brake pedal.)		
	a. Record Flow		400 cc/m
	b. Checks internal leakage of rudder power actuator and control valve with slide ported to right travel and rudder shutoff valve (rudder power on).		

Table 504 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1 Con't.	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
8	Rudder - Full left and hold. (Do not depress brake pedal.)		
	a. Record Flow		400 cc/m
	b. Checks internal leakage of rudder power actuator and control valve with slide ported to left travel and rudder shutoff valve (rudder power on).		
	c. Deleted		
9	Rudder - NEUTRAL		
	a. Record Flow		650 cc/m
	b. Checks internal leakage of rudder power actuator control valve and rudder shutoff valve (rudder power on).		
	c. Zero Meter		
WARNING:	IN THE NEXT STEP, PRESSURE WILL BE RESTORED TO MAIN LANDING GEAR SYSTEM. MAKE SURE MAIN GEAR DOOR ACTUATING CYLINDERS ARE DISCONNECTED AND WILL NOT BIND ON STRUCTURE WHEN PISTON RETRACTS. BINDING CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.		
10	L.G. Alternate Extension Lever - DOWN (handle stowed position)		
	a. Record Flow		450 cc/m
	b. Checks internal leakage of MLG control valve, bungee cylinders, actuating cylinders, door actuating and door latch cylinders, NW steering control valve, NW bypass and relief valve, NW steering swivel glands, and MG swivel glands free fall check valve, and nose gear retract check valve.		
	c. Zero Meter.		
11	N.W. Steering - NORMAL (Pin Out)		
	a. NW Steering - Full right and hold.		
	b. Record Flow		165 cc/m
	c. Checks internal leakage of R.H. NW steering cylinder, and NW steering bypass and relief valve.		
	d. NW Steering - NEUTRAL		
	e. Record FLOW.		165 cc/m
12	Slats - Extend Flap handle 0° (Slats-mid)		
	a. Record Flow		500 cc/m

Table 504 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST.	GROSS	1 Con't.	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	b. Checks internal leakage of the right hydraulic system portion of the leading edge slat control valve.		
	c. Zero meter.		
13	Wing Flap - 11°		
	Flap and slat extend (flap 11° detent).		
	a. Record Flow		500 cc/m
	b. Checks internal leakage of flap and slat control valve in neutral.		
	c. Zero Meter.		
14	Reverser Control Valve - NORMAL (PULL PIN)		
	a. Record Flow		50 cc/m
	b. Checks internal leakage of R.H. reverser control valve and actuating cylinders.		
	c. Zero Meter.		
15	Ventral Stair - RETRACT		
	a. Record Flow		100 cc/m
	b. Release control lever to off.		
	c. Checks internal leakage of ventral stair actuator control valve.		
16	Insure Tester Pressure - 3000 psi		
17	Position Flow Suppression Control Switch on PDQ Readout Panel - OFF		
WJE 405-411, 880, 881, 883, 884			
	a. Record Flow		3000 cc/m
WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893			
	a. Record Flow		3000 cc/m
WJE ALL			
	b. Checks total internal leakage of R.H. hydraulic system power ON.		
18	If no further testing is required (right hydraulic system), perform disconnect and close up functions (See Paragraph 4.).		

Table 505

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. POWER TRANSFER UNIT	FAULT ISOLATION	1A	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check (See Paragraph 3.).		
NOTE: Position left system spoiler shutoff and system depressurization valve - OFF. (Located in left main landing gear wheel well.)			
2	Pressurize right hydraulic system to 3000 psi.		
3	Record flow (wait for flow to settle) (Closed power internal leakage)		Ref. only
4	Power transfer unit switch - ON		
5	Record pressures (left system gage)		Info.
NOTE: System gage should read over 2000 psi (ignore gage fluctuations)			
6	Power transfer unit switch - OFF		
7	Record flow. (Closed power leakage, should compare with test step No. 4). Any flow change indicates faulty transfer pump shutoff valve, (R.H.) which could cause an erroneous closed power readout.		Info.
8	If no fault is evident in test No. 1A, proceed with additional subsystem fault isola- tion. If no further testing is required (right hydraulic system), perform disconnect and close up functions (See Paragraph 4.).		

Table 506

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. LANDING GEAR	FAULT ISOLATION	1B	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check (See Paragraph 3.).		
2	CAUTION: Insure that: a. Landing gear lock pins are properly installed. b. Aircraft jacks are properly installed. c. Landing gear door struts are free to move.		
3	Pressurize right hydraulic system to 3000 psi.		

Table 506 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. LANDING GEAR	FAULT ISOLATION	1B	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
4	Position flow suppression control switch on PDQ Readout Panel to - ON.		
5	Zero Meter.		
6	Position gear alternate extension lever - DOWN (handle stowed position).		
7	Record flow.		450 cc/m
	Checks total leakage of: a. Main landing gear control valve b. Main landing gear retract cylinders c. Main landing gear swivel glands d. Main landing gear bungee cylinders e. De spin wheel brake cylinder f. Main landing gear door latch cylinders g. Main landing gear door cylinders h. Nose gear retract cylinder i. Nose gear bungee cylinder j. Nose gear steering control valve k. Nose gear retract check valve l. Landing gear free fall check valves		
CAUTION: INSURE THAT LANDING GEAR LOCK PINS ARE PROPERLY INSTALLED.			
8	Position landing gear control handle UP		
9	Record flow.		450 cc/m
	Checks same items as test step No. 7, except: a. Checks nose gear extend check valve. b. Does not check landing gear free fall check valves and nose gear retract check valve.		
10	Landing gear-control - intermediate. position (neutral)		
11	Record flow.		100 cc/m
	Checks internal leakage of landing gear control valve slide and landing gear control valve bypass slide.		

Table 506 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. LANDING GEAR	FAULT ISOLATION	1B	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
12	Landing gear control - DOWN		
13	Landing gear alternate extension lever - UP (gear extend position).		
14	Record flow.		Info.
	Readout should compare with test step 11. Any change in flow could indicate improperly positioned controls or a faulty motor operated shutoff valve.		
15	MLG shutoff and bypass lever - EXTENDED. (Located on fuselage forward of right MLG forward of MLG doors).		
16	Landing gear alternate extension lever - DOWN (handle stowed position).		
17	Record flow.		Info.
	Readout should compare with test step No. 14. Any disagreement indicates MLG door bypass lever rigging discrepancy.		
18	MLG door bypass - NORMAL (retracted).		
19	If no fault is evident in test No. 1B, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system) perform disconnect and close up functions. (See Paragraph 4.).		

Table 507

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. NOSE WHEEL STEERING	FAULT ISOLATION	1C	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check (See Paragraph 3.).		
2	Landing gear alternate extension lever - DOWN.		
3	Nose wheel steering - NORMAL (Pin out).		
4	Pressurize right hydraulic system to 3000 psi.		
5	Position flow suppression control switch on PDQ readout panel to - ON.		
6	Nose wheel steering - Full left and hold.		

Table 507 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. NOSE WHEEL STEERING	FAULT ISOLATION	1C	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
7	Record nose gear travel.		80 degrees minimum
8	Nose wheel steering - full right and hold.		
9	Record nose gear travel.		60 degrees minimum
10	Nose wheel steering bypass and relief valve- Bypass		
11	Zero meter (holding full right)		
12	Nose wheel steering bypass and relief valve- Normal		
13	Record flow (hold nose steering full right)		165 cc/m
	Checks leakage of nose wheel steering bypass and relief valve and steering cylinders		
14	Zero readout meter (N.W. steering full right and hold).		
15	Nose wheel steering - NEUTRAL.		
16	Record flow.		165 cc/m
	Checks internal leakage of NW steering control valve (neutral).		
17	Check steering wheel marker alignment on captain's console.		
18	If no fault is evident in test No. 1C, proceed with additional subsystem fault isolation. If no further testing is required (right hand system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 508

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. BRAKES	FAULT ISOLATION	1D	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		

Table 508 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. BRAKES	FAULT ISOLATION	1D	PDQ: FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
4	Zero meter.		
5	Parking brake - ON.		
6	Record flow (wait for flow to settle).		50 cc/m
7	Anti-skid - ARM.		
8	Record flow.		100 cc/m
	Verifies parking brake shutoff valve function.		
9	Parking brake - OFF.		
10	Verify readout meter zero.		
11	Depress right brake fully and hold. (Do not depress left brake.)		
12	Record flow.		300-1300 cc/m
	Checks R.H. anti-skid slave valve spool function and internal leakage.		
13	Anti-skid - OFF. (R.H. brake depressed)		
14	Record flow.		Info.
	Checks R.H. anti-skid valve shutoff function. (Readout should be zero.)		
15	Release right brake.		
16	Anti-skid - ARM.		
17	Verify readout meter zero.		
18	Depress left brake full and hold. (Do not depress right brake.)		
19	Record flow.		300-1300 cc/m
	Checks L.H. anti-skid slave valve spool function and internal leakage.		
20	Anti-skid - OFF (L.H. brake depressed)		
21	Record flow.		Info.
	Checks L.H. anti-skid valve shutoff function. (Readout should be zero.)		
22	Release left brake.		
23	If no fault is evident in test No. 1D, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 509

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. BRAKES	FAULT ISOLATION	1E	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
4	Zero meter.		
WARNING:	MAKE SURE FLAPS AND SLATS ARE CLEAR TO OPERATE.		
5	Flap handle to 0 degree position (slats mid)		
6	Record flow.		500 cc/m
	Checks internal leakage of a portion of slat control valve.		
7	Zero meter.		
8	Flap handle to 11° position.		
9	Record flow.		500 cc/m
	Checks internal leakage of a portion of the flap control valve.		
NOTE:	In the following step record in- transit flow during extension between 28 degrees and 40 degrees position.		
10	Flap handle to 40° position. Record in-transit flow.		Ref. only
NOTE:	In following step record in-transit flow during retraction between 40 degrees and 28 degrees positions.		
11	Flap handle to 28° position. Record in-transit flow.		Ref. only
NOTE:	Compare test steps number 9 and 10. Readout should indicate a min. of 100 cc/m difference.		
12	Wing flaps - 40°.		
NOTE:	In following step observe flap position at which the two speed flap valve changes flow rate.		
13	Flap handle in up position. Record transfer point.		20 ±5 degrees
NOTE:	With only the right hydraulic system pressurized, the flaps may not fully retract to the zero-degree positions; this is considered normal.		
14	If no fault is evident in test No. 1E, proceed with subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 510

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. RUDDER	FAULT ISOLATION	1F	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ meter to - ON.		
WARNING:	MAKE SURE RUDDER IS CLEAR TO OPERATE.		
4	Zero meter.		
5	Rudder pedals - NEUTRAL.		
6	Rudder hydraulic control lever - POWER.		
7	Record flow (Slow to settle).		650 cc/m
	Checks internal leakage of rudder control valve (neutral mode) and rudder shutoff valve (power on).		
8	Rudder - full right and hold (brakes off).		
9	Record flow.		400 cc/m
	Checks internal leakage of rudder shutoff valve, rudder control valve (hard over) & rudder actuating cylinder.		
10	Rudder - Full left and hold.		
11	Record flow.		400 cc/m
	Checks internal leakage of rudder shutoff valve, rudder control valve (hard over) & rudder actuating cylinder.		
12	Rudder - NEUTRAL.		
13	Rudder hydraulic control - MANUAL.		
14	If no fault is evident in test No. 1F, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (Ref. Paragraph 4.).		

Table 511

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. FLIGHT SPOILERS	FAULT ISOLATION	1G	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
WARNING:	MAKE CERTAIN SPOILERS ARE CLEAR TO OPERATE.		
4	Zero meter.		
5	Spoiler shutoff and system depressurization valve - ON.		
WJE 405-411, 880, 881, 883, 884			
6	Record flow.		1300 cc/m
WJE ALL			
	Checks spoiler system internal leakage. (L.H. and R.H. outboard spoiler actuators and part of each ground spoiler actuator, ground spoiler control valve and spoiler pressure reducer.) (Spoilers retract.) (Spoiler pressure reducer and both spoiler actuating cylinders.)		
7	Speed brakes - full extend and hold.		
WJE 405-411, 880, 881, 883, 884			
8	Record flow.		1520 cc/m
WJE ALL			
	Checks internal leakage of both L.H. and R.H. outboard spoiler actuators (spoilers neutral) (spoiler pressure reducer valve and both control valves) ground spoiler control valve and ground spoiler actuating cylinders.		
9	Speed brakes - Retract.		
10	Ailerons - 45° counterclockwise and hold (from neutral).		
11	Record flow.		Info.
	Checks internal leakage of L.H. outboard spoiler actuator control valve (neutral) and R.H. inboard spoiler actuator cylinder (retract).		

NOTE: Compare flow with test step No. 6. An increase in flow indicates L.H. outboard spoiler actuator control valve internal leakage. A decrease indicates L.H. spoiler actuator cylinder internal leakage.

Table 511 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. FLIGHT SPOILERS	FAULT ISOLATION	1G	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
12	Ailerons - 45° clockwise and hold (from Neutral).		
13	Record flow.		Info.
	Checks internal leakage of R.H. outboard spoiler actuator control valve (neutral) and L.H. outboard spoiler actuator cylinder (retract).		
NOTE:	Compare flow readout with test step No. 6. An increase in flow indicates R.H. outboard spoiler actuator control valve internal leakage. A decrease indicates R.H. outboard spoiler actuator cylinder internal leakage.		
14	Ailerons - NEUTRAL.		
15	Spoiler shutoff and system bypass valve - OFF.		
16	If no fault is evident in test No. 1G, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 512

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. THRUST REVERSER	FAULT ISOLATION	1H	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
WARNING:	MAKE CERTAIN REVERSER IS CLEAR TO OPERATE.		
4	Zero meter.		
5	Reverser control valve - NORMAL. (Pin out, access door closed.)		
6	Record flow (slow to settle, wait 3 minutes).		50 cc/m

Table 512 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. THRUST REVERSER	FAULT ISOLATION	1H	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	Checks internal leakage of both reverser actuating cylinders, latch actuators and reverser control valve. (Hard over stowed)		
7	R.H. Throttle - Aft (Idle).		
8	R.H. reverser lever - Reverse thrust (Flight Compartment).		
9	Record flow (slow to settle, wait 3 minutes).		50 cc/m
	Checks internal leakage of both reverser actuating cylinders, latch actuators and control valve (deployed).		
10	R.H. reverser lever - Forward thrust (stow) (Flight Compartment).		
11	If no fault is evident in test No. 1H, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 513

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. L.E. SLATS	FAULT ISOLATION	1J	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
4	Wing slats - retract (wing flaps up, first detent).		
5	Zero meter.		
6	Wing slats - extend (wing flaps handle 0° detent) (0 position = slats mid position)		
7	Record flow.		500 cc/m

Table 513 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. L.E. SLATS	FAULT ISOLATION	1J	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	Checks internal leakage of wing slats actuating cylinders and slat control valve.		
8	Wing slats - retract.		
9	If no fault is evident in test No. 1J, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 514

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. AFT STAIRWAY	FAULT ISOLATION	1K	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ meter to - ON.		
4	Aft stairway up - control neutral - NEUTRAL.		
WARNING:	MAKE CERTAIN THAT AFT STAIRWAY IS CLEAR TO OPERATE.		
5	External stairway control handle - OPEN position and hold (located left side mid position of aft stair).		
6	After stairway has fully extended and while holding control lever to open position. Record flow Checks internal leakage of aft stairway actuating cylinder and control valve (hard over).		100 cc/m
7	Zero meter.		
8	External stairway control handle - NEUTRAL.		
9	Record flow Checks internal leakage of ventral stairway control valve.		100 cc/m

Table 514 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT SYST. AFT STAIRWAY	FAULT ISOLATION	1K	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
10	If no fault is evident in test No. 1K, proceed with additional subsystem fault isolation. If no further testing is required (Right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

Table 515

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT GROUND SPOILER	FAULT ISOLATION	1L	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout unit to ON.		
4	Zero meter.		
5	Advance left throttle approx. 1 inch.		
6	Spoiler shutoff and system bypass valve to on position.		
7	Record flow:		1300 cc/m
	Checks internal leakage of a section of two ground spoiler actuating cylinders and the control valve in the retract position and L.H. and R. H. outboard spoiler actuator.		
8	Zero meter.		
9	Place left throttle to idle position.		
NOTE: Landing gear lever must be in down position, and weight of aircraft on the struts (or target not against the sensor) also 28 vdc power on the left bus.			
10	Record flow		1050cc
	Flow indicates internal leakage of right hyd syst. control valve.		

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893 (Continued)

Table 515 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT GROUND SPOILER	FAULT ISOLATION	1L	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	Any decrease indicates the amount of flow thru the actuators.		
11	If no fault is evident in test 1L, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system) perform disconnect and closeup function.		

WJE 405-411, 880, 881, 883, 884

Table 516

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT GROUND SPOILER	FAULT ISOLATION	1L	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize right hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout unit to ON.		
4	Zero meter.		
5	Advance left throttle approx. 1 inch.		
6	Spoiler shutoff and system bypass valve to on position.		
7	Record flow:		
	a. On airplanes 101-103.		435 cc/m
	b. On airplanes 104-999.		1200 cc/m
	Checks internal leakage of a section of two ground spoiler actuating cylinders and the control valve in the retract position and L.H. and R. H. outboard spoiler actuator.		
8	Zero meter.		
9	Place left throttle to idle position.		

WJE 405-411, 880, 881, 883, 884 (Continued)

Table 516 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
RIGHT GROUND SPOILER	FAULT ISOLATION	1L	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
NOTE:	Landing gear lever must be in down position, and weight of aircraft on the struts (or target not against the sensor) also 28 vdc power on the left bus.		
10	Record flow		250cc
	Flow indicates internal leakage of right hyd syst. control valve.		
	Any decrease indicates the amount of flow thru the actuators.		
11	If no fault is evident in test 1L, proceed with additional subsystem fault isolation. If no further testing is required (right hydraulic system) perform disconnect and closeup function.		

WJE ALL

Table 517

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST.	GROSS	2	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
A.			
1	Prepare aircraft for ITCAN HYDRAULIC CHECK. (See Paragraph 3.).		
2	Anti-Skid - OFF		
3	Parking Brake - OFF		
4	Speed Brake - RETRACT		
5	Wing Flap - UP		
6	L.G. Alternate Extension Lever - DOWN		
7	Landing Gear Control - DOWN		
8	Power Transfer Unit - OFF		
9	Auxiliary Pump Switch - OFF		

Table 517 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST.	GROSS	2	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
10	L.H. Reverser Lever - FORWARD THRUST		
CAUTION: REVERSER DOORS AND CONTROL POSITIONS MUST CORRESPOND.			
11	Control Column - NEUTRAL (Elevator Boost - OFF)		
12	Wing Slats - RETRACT		
13	Check that elevator power bypass valve is CLOSED (Knurled knob inside access door at R.H. side of tail cone).		
14	L.H. Reverser Control Valve - DUMP (Pin installed) (Located aft of press. bulkhead, inside left side of fuselage).		
15	MLG Door Bypass - NORMAL (Retracted) (Located on fuselage forward of right MLG door).		
16	Spoiler Shutoff and System Depressurization VALVE - OFF (Located at inboard side of left wheel well).		
17	Nose wheel steering - BYPASS (Pin in) (Arm at left side of nose gear strut depressed inboard).		
18	Before pressurizing system insure the following low pressure warning lights are illuminated.		
	a. L. Hyd. pressure low light - ON		
	b. L.H. reverser accum. low light - ON		
19	Pressurize L.H. hydraulic system to 3000 psi.		
20	After flow has stabilized, record flow readout.		485 cc/m
	REASON: Checks total internal leakage of: L.H. reverser shutoff valve, engine and hand pump check valve, nose wheel steering control valve, system pressure relief valve and the reservoir pressurizing cylinder, also the elevator control valve, slat control valve, slat actuating cylinder, flap control valve and number 2 and 4 flap actuating cylinders.		
NOTE: Leakage in excess of 485 cc/m would be the result of one or more of the above components leaking. Faulty component(s) should be isolated, i.e., by sound (excessive noise), or feel (excessive temperature), and corrected before continuing test. Failure to do so could result in erroneous gross test and fault isolation readouts.			
B.			
1	Insure that closed power leakage is within limits and/or faulty component/s have been isolated.		

Table 517 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST.	GROSS	2	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
2	Position flow suppression control switch on PDQ readout panel to - ON.		
3	Zero Meter (Zeros out closed power).		
4	Parking Brake - ON.		
	a. Record flow		50 cc/m
	b. Checks internal leakage with the L.H. brake subsystem pressurized with anti- skid subsystem "OFF".		
	c. Zero Meter.		
5	Spoiler shutoff and depressurizing valve - ON.		
	a. Record flow		500 cc/m
	b. Checks internal leakage of the inboard spoiler control valves and actuators (retract) ground spoiler control valve including spoiler pressure reducer and ground spoiler actuators.		
6	Speed brakes - EXTEND.		
	a. Record flow		700 cc/m
	b. Checks internal leakage through the inboard spoiler actuator control valve, spoiler pressure reducer, ground spoiler control valve and ground spoiler actuating cylinders.		
	c. Speed brakes - RETRACT.		
	d. Zero Meter.		
7	Slats - EXTEND. Flap handle 0° (Slats Mid)		
	a. Record flow		500 cc/m
	b. Checks internal leakage of the left hydraulic system portion of the leading edge slat control valve.		
	c. Zero Meter.		
8	Flaps - Extend. Flap handle 11° detent		
	a. Record flow		500 cc/m
	b. Checks internal leakage of the left hydraulic system portion of the wing flap control valve		
	c. Zero Meter.		
9	Thrust Reverser Control Valve - NORMAL. (pin pulled)		

Table 517 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST.	GROSS	2	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	a. Record flow (Wait 3 minutes for flow to settle).		50 cc/m
	b. Checks internal leakage of the L.H. Reverser control valve and actuating cylinders.		
	c. Zero Meter.		
10	Nose wheel steering - NORMAL (Pin out)		
	a. N.W. Steering - Full left and hold.		
	b. Record flow		165 cc/m
	c. Checks internal leakage of L.H. nose wheel steering cylinder, and the nose wheel steering bypass and relief valve.		
	d. N.W. steering - NEUTRAL.		
	e. Record flow		165 cc/m
10a	Reduce hydraulic testing pressure to 1000 psi.		
	a. Cycle control column forward and aft a few times to deplete elevator accumulator.		
	b. Zero meter.		
11	Control column - Full forward and hold.		
	a. Record flow.		220 cc/m
	b. Checks internal leakage of the elevator bleed valve, both elevator control valves and actuating cylinders and a check valve in the manifold.		
	c. Control Column - NEUTRAL.		
	d. Increase test pressure to 3000 psi.		
12	Position flow suppression control switch on PDQ readout panel - OFF.		
	a. Record flow.		1500 cc/m
	b. Checks total internal leakage of L.H. hydraulic system power - ON.		
13	If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 3.).		

Table 518

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. POWER TRANSFER UNIT	FAULT ISOLATION	2A	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Auxiliary HYD PUMP circuit breakers - IN.		
3	Extend maintenance bypass lever to shut off flow to main landing gear.		
4	Pressurize left hydraulic system to 3000 psi with a ground hydraulic cart.		
5	Position flow suppression control switch on PDQ readout and control unit to - ON		
6	Zero Meter.		
7	Power transfer unit switch - ON.		
8	Record pressure (from right system gage).		Info.
NOTE: Pressure will fluctuate but should not drop below 2000 psi.			
9	Record flow.		Info.
	Checks total internal leakage of transfer unit, pressurizing right hydraulic system and operating flow.		
NOTE: Adjust hydraulic power cart output as near to 3000 psi as possible.			
10	Auxiliary pump switch - ON.		
	This should stop pumping action of POWER TRANSFER UNIT		
11	Record flow.		1000 cc/m
	Flow represents case drain leakage of left half of power transfer unit.		
12	Power Transfer Unit switch - OFF.		
13	Auxiliary pump switch - OFF.		
14	If condition of unit is determined and no further testing is required, depressurize left hydraulic system and perform disconnect and close up functions (see Paragraph 4.).		

Table 519

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. NOSE WHEEL STEERING	FAULT ISOLATION	2B	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Nose wheel steering - normal (Pin out).		
3	Pressurize left hydraulic system to 3000 psi.		
4	Position flow suppression control switch on PDQ meter to - ON.		
5	N.W. steering - FULL RIGHT AND HOLD.		
6	Record nose gear travel.		80 degrees minimum
7	N.W. steering - FULL LEFT AND HOLD.		
8	Record nose gear travel		60 degrees minimum
9	Zero meter (N.W. steering full left and hold).		
10	N.W. steering - NEUTRAL.		
11	Record flow. Checks internal leakage of N.W. steering control valve (neutral).		165 cc/m
12	Check steering wheel marker alignment on captain's console.		
13	If no fault is evident in test No. 2B, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 520

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. BRAKES	FAULT ISOLATION	2C	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		

Table 520 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. BRAKES	FAULT ISOLATION	2C	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
3	Position flow suppression control switch on PDQ readout panel to - ON.		
4	Zero Meter.		
5	Parking brake - ON.		
6	Record flow. (Wait for flow to settle.) Checks brakes parked internal leakage.		50 cc/m
7	Anti-skid - ARM.		
8	Record flow. Verifies parking brake shutoff valve function.		100 cc/m
9	Parking brake - OFF.		
10	Verify readout meter zero.		
11	Depress right brake fully and hold. (Do not depress left brake.)		
12	Record flow.		300-1300 cc/m
	Checks R.H. anti-skid slave valve spool function and internal leakage.		
13	Anti-skid - OFF (R.H. brake depressed).		
14	Record flow.		Info.
	Checks R.H. anti-skid valve shutoff function. (Readout should be zero.)		
15	Release right brake.		
16	Anti-skid - ARM.		
17	Zero meter.		
18	Depress left brake fully and hold. (Do not depress right brake.)		
19	Record flow.		300-1300 cc/m
	Checks L.H. anti-skid slave valve spool function and internal leakage.		
20	Anti-skid - OFF. (L.H. brake depressed.)		
21	Record flow.		Info.
	Checks L.H. anti-skid valve shutoff valve function. (Readout should be zero.)		
22	Release left brake.		

Table 520 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. BRAKES	FAULT ISOLATION	2C	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
23	Verify readout meter zero.		
24	Record flow.		50 cc/m
	Checks internal leakage of brake control valve and brake selector valve (selected both). (Should compare with step No. 6.)		
25	If no fault is evident in test No. 2C, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 521

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. FLAPS	FAULT ISOLATION	2D	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
4	Zero meter.		
WARNING: MAKE SURE FLAPS AND SLATS ARE CLEAR TO OPERATE.			
5	Flap handle to 0 degree position (slats mid)		
6	Record flow.		500 cc/m
	Checks internal leakage of a portion of slat control valve.		
7	Zero meter.		
8	Flap handle to 11° position.		
9	Record flow.		500 cc/m

Table 521 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. FLAPS	FAULT ISOLATION	2D	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	Checks internal leakage of a portion of the flap control valve.		
NOTE: In the following step record in- transit flow during extension between 28 degrees and 40 degrees position.			
10	Flap handle to 40° position. Record in-transit flow		Ref. only
NOTE: In following step record in-transit flow during retraction between 40 degrees and 28 degrees positions.			
11	Flap handle to 28° position. Record in-transit flow.		Ref. only
NOTE: Compare test steps number 9 and 10. Readout should indicate a min. of 100 cc/m difference.			
12	Wing flaps - 40°.		
NOTE: In following step observe flap position at which the two speed flap valve changes flow rate.			
13	Flap handle in up position. Record transfer point.		20 ±5 degrees
NOTE: With only the right hydraulic system pressurized, the flaps may not fully retract to the zero-degree positions; this is considered normal.			
14	If no fault is evident in test No. 1E, proceed with subsystem fault isolation. If no further testing is required (right hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 522

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. SPOILERS	FAULT ISOLATION	2E	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
WARNING: MAKE CERTAIN SPOILERS ARE CLEAR TO OPERATE.			
4	Zero meter.		

Table 522 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. SPOILERS	FAULT ISOLATION	2E	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
5	Aileron control - NEUTRAL.		
6	Spoiler shutoff and system by-pass valve - ON.		
7	Record flow.		500 cc/m
	Checks spoiler system ON internal leakage. (Spoilers retract) (L.H. and R.H. spoiler actuators and spoiler pressure reducer and ground spoiler control valve).		
8	Speed brakes - full extend and hold.		
9	Record flow.		700 cc/m
	Checks internal leakage of both L.H. and R.H. inbd spoiler actuator control valves. (Speed brakes fully extended and spoiler pressure reducer and ground spoiler actuators.)		
10	Speed brakes - retract.		
11	Ailerons - 45° counterclockwise and hold (from neutral).		
12	Record flow.		Info.
	Checks internal leakage of L.H. inbd spoiler actuator control valve, neutral and R.H. inbd spoiler actuator cylinder (retract).		
NOTE: Compare flow with test step No. 7. An increase in flow indicates L.H. outboard spoiler actuator control valve internal leakage. A decrease indicates L.H. spoiler actuator cylinder internal leakage.			
13	Ailerons - 45° clockwise and hold. (From neutral)		
14	Record flow.		Info.
	Checks internal leakage of R.H. inboard spoiler actuator control valve (neutral) and L.H. inboard spoiler actuator cylinder (retract).		
NOTE: Compare flow readout with test step No. 7. An increase in flow indi- cates R.H. inboard spoiler actuator control valve internal leakage. A decrease indicates R.H. inboard spoiler actuator cylinder internal leakage.			
15	Ailerons - NEUTRAL.		
16	Spoiler shutoff and system bypass valve - OFF.		
17	If no fault is evident in test No. 2E, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 523

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. THRUST REVERSER	FAULT ISOLATION	2F	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to - ON.		
WARNING:	MAKE CERTAIN REVERSER IS CLEAR TO OPERATE.		
4	Zero meter.		
5	Reverser control valve - NORMAL. (Pin out, access door closed)		
6	Record flow.		50 cc/m
7	(Slow to settle, wait 3 minutes.) Checks internal leakage of both reverser actuating cylinders and reverser control valve (hard over stowed).		
	L.H. throttle - AFT (idle).		
8	L.H. reverser lever - reverse thrust (flight compartment).		
9	Record flow (slow to settle, wait 3 minutes).		50 cc/m
	Checks internal leakage of both reverser actuating cylinders and reverser control valve (deployed).		
10	L.H. reverser lever - forward thrust (stow) (flight compartment).		
11	If no fault is evident in test No. 2F, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 524

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. ELEVATOR	FAULT ISOLATION	2G	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
WARNING:	MAKE CERTAIN ELEVATORS ARE CLEAR TO OPERATE.		
2	Check elevator power bypass valve - CLOSED (Knurled knob) (Use hand tool to tighten)		
3	Pressurize left hydraulic system to 1000 psi.		
4	Position flow suppression control switch on PDQ readout panel to - ON.		
5	Zero meter.		
6	Control column - full forward and hold.		
7	Record flow.		220 cc/m
	Checks internal leakage of L.H. elevator bypass valve, both elevator control valves and actuating cylinders and a check valve.		
8	Control column - NEUTRAL		
9	If no fault is evident in test No. 2G, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		
10	Increase pressure to 3000 psi if other test is to be conducted.		

Table 525

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. L.E. SLATS	FAULT ISOLATION	2H	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		

Table 525 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. L.E. SLATS	FAULT ISOLATION	2H	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
3	Position flow suppression control switch on PDQ readout panel to - ON.		
4	Wing slats - retract (wing flaps up detent).		
5	Zero meter.		
6	Wing slats - extend (wing flaps 0° detent).		
7	Record flow.		500 cc/m
	Checks internal leakage of wing slats actuating cylinders and slat control valve.		
8	Wing slats - RETRACT.		
9	If no fault is evident in test No. 2H, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system), perform disconnect and close up functions. (See Paragraph 4.).		

Table 526

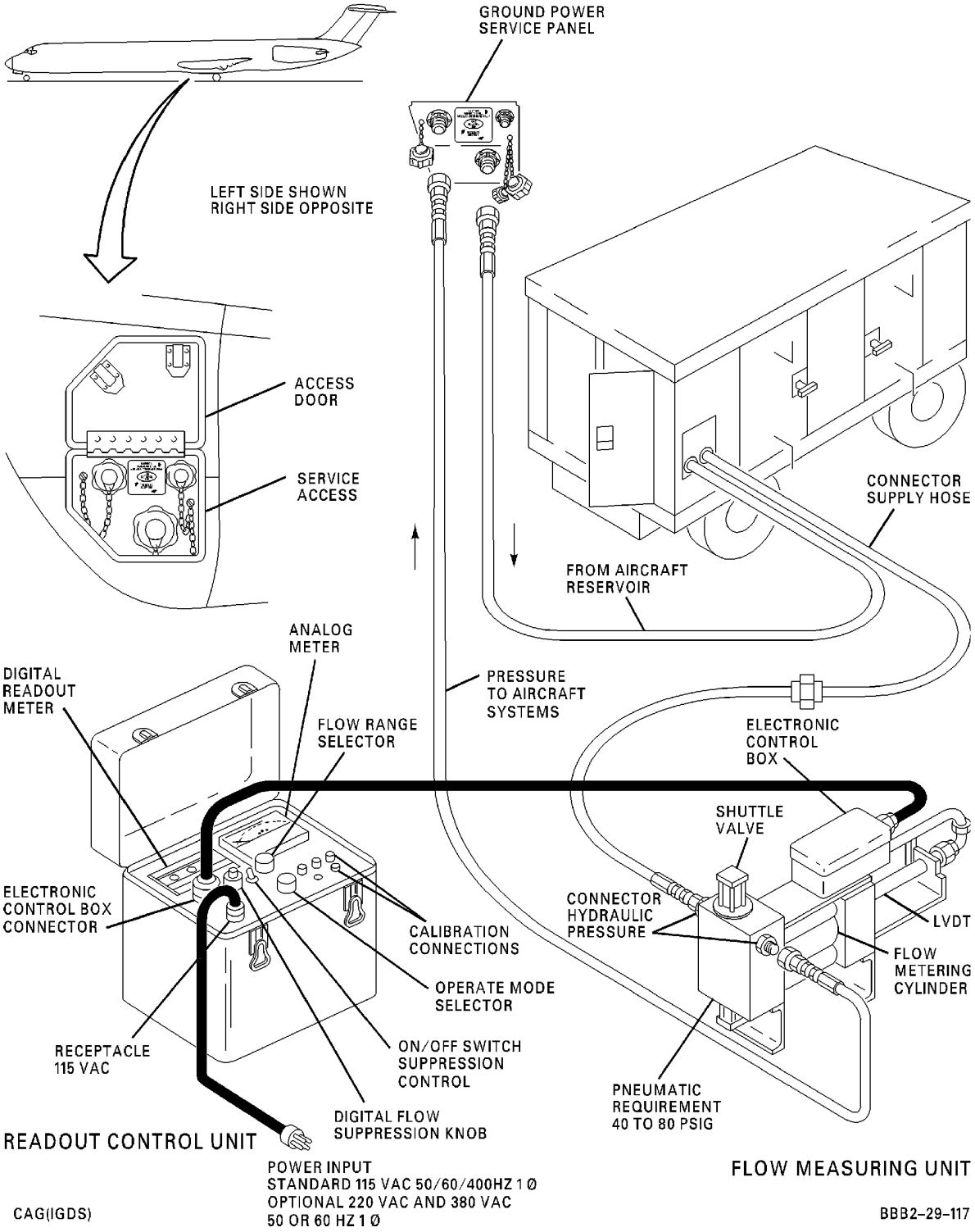
SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. GROUND SPOILER	FAULT ISOLATION	2J	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
1	Prepare aircraft for ITCAN internal leakage check. (See Paragraph 3.).		
2	Pressurize left hydraulic system to 3000 psi.		
3	Position flow suppression control switch on PDQ readout panel to ON.		
4	Zero meter.		
5	Advance left throttle approx. 1 inch.		
6	Spoiler shutoff and system bypass valve to ON position.		
7	Record flow		425 cc/m

Table 526 (Continued)

SYSTEM/ SUBSYSTEM	TEST LEVEL	TEST NO.	GSE AND POWER REQUIREMENTS
LEFT SYST. GROUND SPOILER	FAULT ISOLATION	2J	PDQ FLOW MEASURING UNIT GROUND ELECTRICAL POWER GROUND HYDRAULIC POWER SHOP AIR OR EQUIVALENT

TEST STEP	FUNCTION	READOUT	TOLERANCE
	Checks internal leakage of a section of two ground spoiler actuating cylinders and the control valve in the retract position.		
8	Place left throttle to idle position.		
NOTE: Landing gear lever must be in down position, and weight of aircraft on the struts (or target not against the sensor) also 28 vdc power on the left bus.			
9	Record Flow		500 cc/m
	Flow indicates internal leakage of left hydraulic system control valve.		
	Any decrease indicates the amount of flow thru the actuators.		
10	If no fault is evident in test 2J, proceed with additional subsystem fault isolation. If no further testing is required (left hydraulic system) perform disconnect and closeup function.		



ITCAN Hydraulic Test Equipment Hook-Up
Figure 502/29-10-00-990-805

4. Disconnect and Close Up

A. The disconnect and close up procedures are applicable to either the right or left hydraulic systems for the DC-9.

NOTE: Asterisk items are not applicable where one system test is to be followed by opposite system, i.e., left system followed by right system test, etc.

(1) Tester Power - Off.

(2) Right/Left System(s) Spoiler Shutoff and System Bypass Valve - Bypass.

(3) Tester Pressure Hose Hand Valve - Closed (if applicable).

(4) Disconnect Tester Hoses from Right/Left System Ground Power Connections and Cap Connector(s).

(5) * Disconnect Tester Electrical & Pneumatic Power Connections.

(6) * Connect Left and Right Main Gear Door Actuators to Main Gear Doors and Install Cotter Pins.

(7) * Safety Right/Left System(s) Spoiler Shutoff and System Bypass Valve to - On Position.

(8) Right/Left Reverser Control Valve(s) - Normal (Access Door Closed).

(9) Elevator Power Bypass Valve (Knurled Knob) - Closed and Safetied (Left System test only) (Use hand tool to tighten).

(10) Install applicable engine exhaust covers.

(11) * Remove aircraft jacks and adapters at main fuselage or wing jack points (as applicable).

(12) * Reinstall bolt in Ground Control Sensing Rod at Sector and Install nut and Cotter Pin.

(13) * Right/Left Bus External Power switch in Flight Compartment - Off.

(14) * External Electrical Power Unit to airplane switch - Off.

(15) * Disconnect Electrical Ground Power Unit.

(16) Auxiliary Hydraulic Pump and Power Transfer Unit Switches - Off.

(17) * Auxiliary Hydraulic Pump circuit breakers - Closed.

(18) Service aircraft reservoir(s).

HYDRAULIC SYSTEM RESERVOIR - MAINTENANCE PRACTICES

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

A. Each of the two hydraulic systems is equipped with a hydraulic fluid reservoir located in its respective main landing gear wheel well. Access is through the main gear inboard doors. The reservoirs, supports, and all components of the fluid quantity transmitter assemblies and fluid low level switch are interchangeable. The fluid level instruction plates differ from left to right as the right system contains a greater volume of fluid and the plate is graduated differently. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG door safety locks 3936851-1 or -501(GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Inconel Lockwire 0.032 in NASM20995N32, DPM 684	Not specified
Corrosion Resistant Steel Lockwire 0.032 in NASM20995C32, DPM 5865	Not specified
Container 6-gallon (22.7 Liter)	
Drain hose 6-foot (1.83 meters)	
Torque wrench (0 to 50 inch pounds range)	

3. Removal/Installation Hydraulic System Reservoir

A. Remove Reservoir

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

(1) Open the following applicable circuit breakers and intall safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

(Continued)

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name

WJE ALL

H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(3) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Connect hose to reservoir drain valve and place other end in suitable container of at least 6-gallon capacity.

(5) Open drain valve.

(6) Apply manual pressure at top of reservoir relief and bleed valve to pressurize reservoir diaphragm to aid drain flow.

NOTE: Do not depress bleed valve plunger while manually pressurizing reservoir diaphragm as fluid will be dumped at relief valve drain.

(7) Disconnect relief and bleed valve overboard drain line at valve.

(8) Remove and retain spring from low level switch link. (Figure 201 or Figure 202) (Figure 203 or Figure 204) (Figure 205 or Figure 206)

(9) Loosen fluid quantity transmitter lower link clamp bolt and remove link and low level switch link from transmitter shaft.

(10) Disconnect transmitter upper link from fluid level pointer collar; remove transmitter upper and lower links from reservoir.

(11) Disconnect transmitter electrical connector.

(12) Disconnect low level switch electrical connector.

(13) Disconnect thermoswitch electrical connector.

(14) Disconnect suction, pressure, and system return lines from reservoir manifold; allow residual fluid in lines to drain into a suitable container. Plug open lines.

(15) Remove thermoswitch. (PAGEBLOCK 29-30-03/201)

(16) Disconnect reservoir lower support rods.

(17) Remove bolt securing fill level instruction plate support to reservoir support bracket; loosen attach bolt at top of instruction plate support.

(18) Support reservoir. Remove attach bolts from reservoir upper support bracket and remove reservoir.

(19) Remove transmitter and low level switch, including brackets, from reservoir cover.

NOTE: Do not remove transmitter or low level switch from brackets.

(20) Remove drain valve, fittings, reducers, and check valve from reservoir manifold. Plug manifold ports.

(21) Remove reservoir lower support rods from reservoir.

B. Install Reservoir

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

(1) Make sure that the following applicable circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

(2) Make certain main gear inboard doors door safety locks are installed.

(3) Install drain valve, fittings, reducers, and check valve in reservoir manifold; use new O-rings. Safety the drain valve, from drain tube to reducer, with lockwire. (Figure 201 or Figure 202) (Figure 203 or Figure 204) (Figure 205 or Figure 206) (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(4) Position transmitter and bracket, low level switch and bracket on reservoir cover and install attach bolts.

WJE 407, 408, 410, 411, 417, 419, 421, 423, 869, 871, 872, 875-879, 887; WJE 401-406, 409, 412, 414-416, 418, 420, 422, 424-427, 429, 861-866, 868, 873, 874, 880, 881, 883, 884, 886, 891-893 POST MD80-32-218

NOTE: The left hand hydraulic quantity transmitter (XMTR) electrical connector faces to the center of the reservoir.

(a) Make sure that the wire from the transmitter is positioned so that no portion of the wire extends beyond the outboard edge of only the left hand reservoir.

WJE ALL

(5) Place reservoir in position in wheel well and insert upper attach bolts in support bracket and reservoir. Install, but do not tighten nuts at this time.

NOTE: The left and right reservoirs are positioned identically. The reservoir filling instruction plates must be positioned forward. The lower support attach points on the reservoir manifolds must be positioned aft.

(6) Carefully align and mate each hydraulic line connector with its union on reservoir manifold; do not tighten connector nuts.

(7) Secure fill level instruction plate support to reservoir support bracket; tighten support upper attach bolt.

(8) Tighten nuts on reservoir upper attach bolts.

(9) Install lower supports.

(10) Tighten hydraulic line connector nuts.

(11) Install overtemperature thermoswitch and torque to 20 inch-pounds (2.24 N·m). (PAGEBLOCK 29-30-03/201)

(12) Connect thermoswitch electrical connector.

(13) Align scribed line on quantity transmitter shaft with stamped zero mark on transmitter housing to establish electrical zero of transmitter.

(14) Align clevis end of low level switch link with transmitter lower link and place both links on transmitter shaft; make certain low level switch roller is on upper surface of link, do not tighten clamp bolt at this time.

(15) Align clevis end of upper link with pointer collar bolt hole and install bolt. Tighten nut to leave 0.010 to 0.020 inch (0.254-0.508 mm) clearance between nut and link. Safety nut with cotter pin.

(16) Install spring on low level switch link and switch bracket.

(17) Connect transmitter and low level switch electrical connectors.

(a) Make sure that left hand XMTR faces the center of the reservoir.

(18) Connect drain line to relief and bleed valve then manually depress reservoir diaphragm guide to maximum retracted position.

(19) Remove these safety tags and close the applicable circuit breakers:

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

(20) Hydraulic fluid quantity indicator in flight compartment should indicate zero. If necessary, adjust as follows:

(a) Rotate transmitter shaft either clockwise or counterclockwise, as applicable, until indicator reads zero.

(21) Hold transmitter shaft stationary and tighten lower link clamp bolt to secure lower link to transmitter shaft.

(22) Manually extend reservoir diaphragm guide approximately 2 inches above fully retracted position then slowly push guide towards retract position, fluid low level switch should actuate when guide reaches 1 (+1/2, -1/4) inch above fully retracted position.

(23) If low level switch actuation is not within tolerances of step (Paragraph 3.B.(22)) rearrange washers, as required, on bolt at lower end of quantity transmitter lower link until actuation is within tolerance.

(24) Remove these safety tags and close these circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

(Continued)

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(25) Fill reservoir. (PAGEBLOCK 12-13-01/301).

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(26) Pressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

(27) Bleed and refill reservoir as required. (PAGEBLOCK 12-13-01/301)

NOTE: Immediately check reservoir and line connections for leaks.

(28) Observe reservoir fluid level with aircraft in ground condition; flaps up, spoilers down, landing gear down, brakes off, thrust reversers stowed (retracted), and sub-systems accumulators fully charged. Reservoir fluid level pointer should point to lower full mark on fill level instruction plate, with hydraulic pressure at 3000 psi.

(29) Fluid quantity indicator in flight compartment should agree with fluid quantity indicator on hydraulic reservoir within ±1 quart.

(30) Place TRANS pump switch, located on first officer's instrument panel in ON position. Hydraulic power transfer unit shutoff valves should open and transfer unit should operate.

(31) Manually lift low level switch actuating link until low level switch actuates (audible click). Hydraulic power transfer unit shutoff valves should close and transfer unit should stop. Release actuating link.

(32) Place TRANS pump switch in OFF position.

(33) Shut off hydraulic pressure source.

(34) Observe reservoir fluid level. The fluid level pointer should point to upper full mark on fill level instruction plate, with hydraulic pressure at zero psi.

(35) The fluid quantity indicator in flight compartment should agree with fluid quantity indicator on reservoir within ±1 quart.

(36) Remove all tools and equipment from work areas. Make certain that work areas are clean.

(37) Pressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

(38) Place TRANS pump switch in ON position.

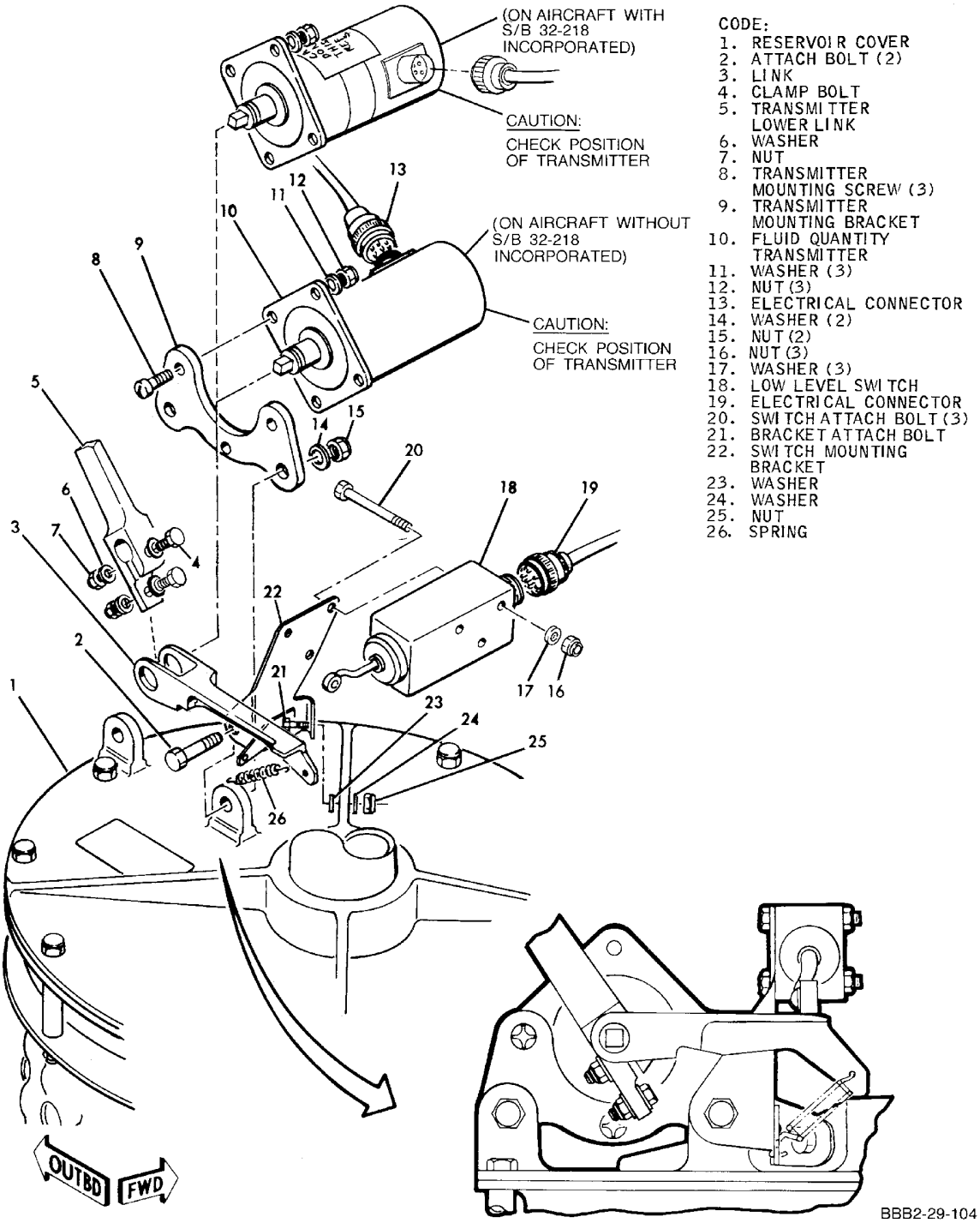
(39) Remove inboard door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(40) Shut off hydraulic pressure source.

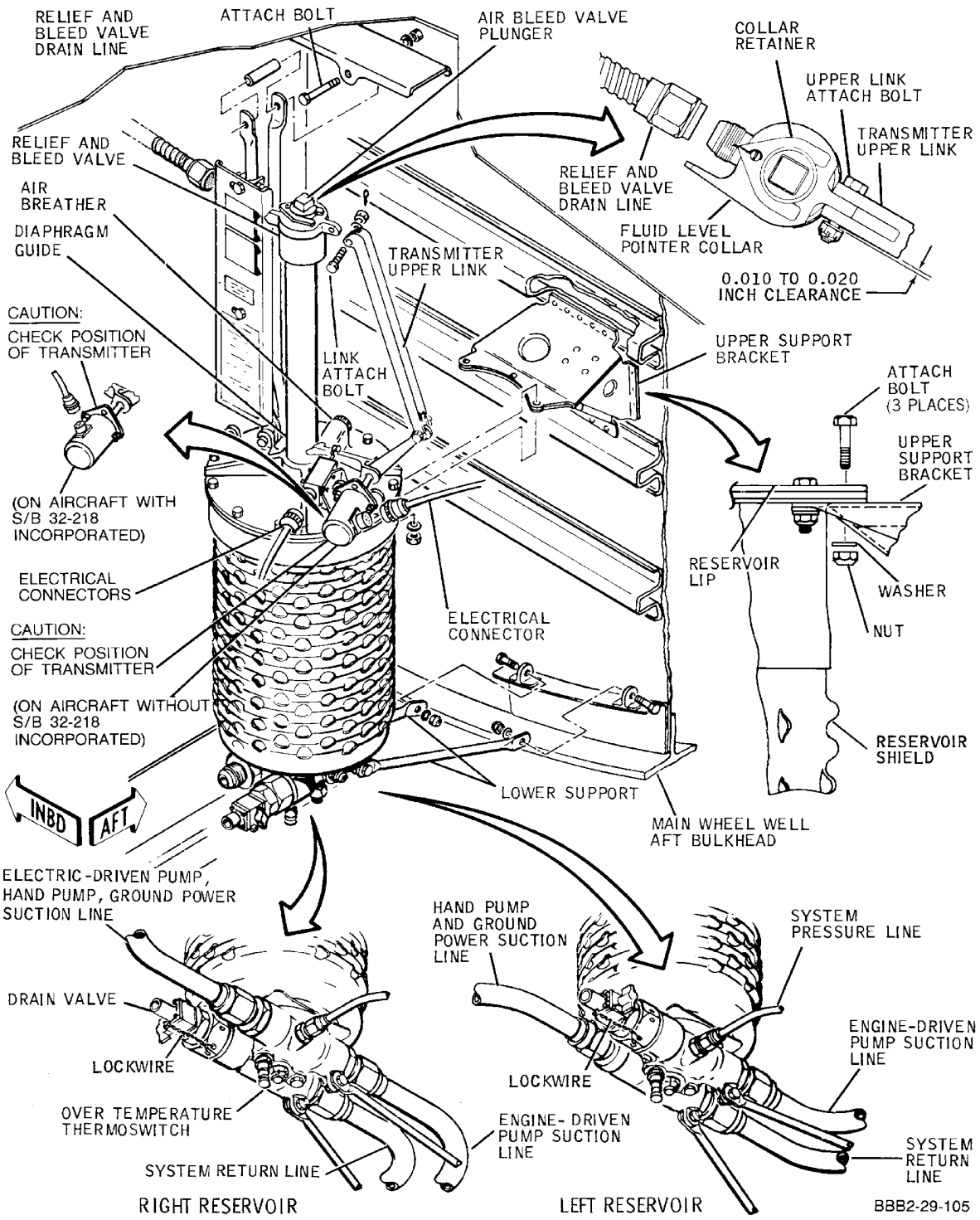
(41) Place TRANS pump switch in OFF position.

(42) Depressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

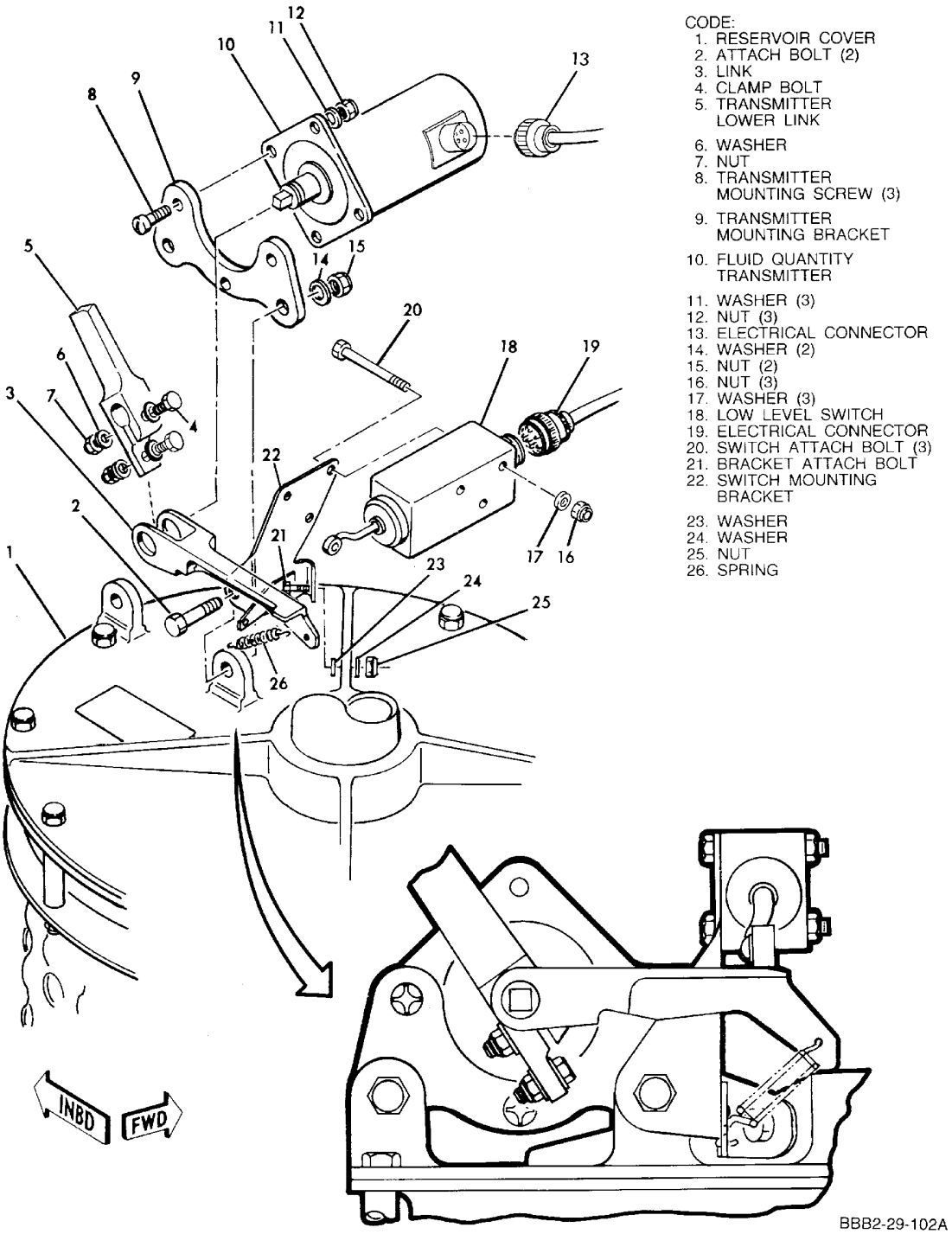
(43) Service hydraulic reservoirs, as/if required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)



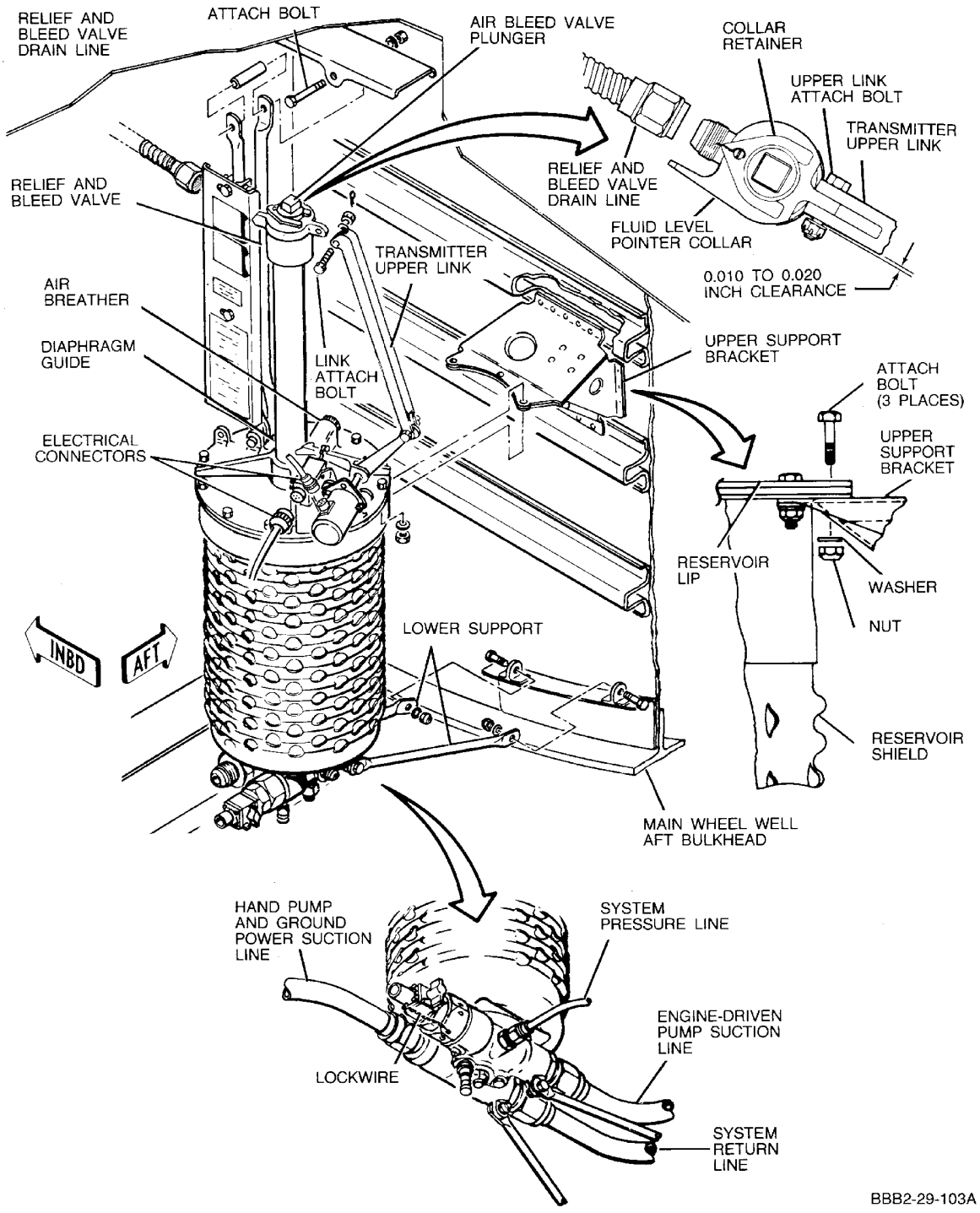
Hydraulic System Reservoir -- Removal/Installation
Figure 201/29-10-01-990-801



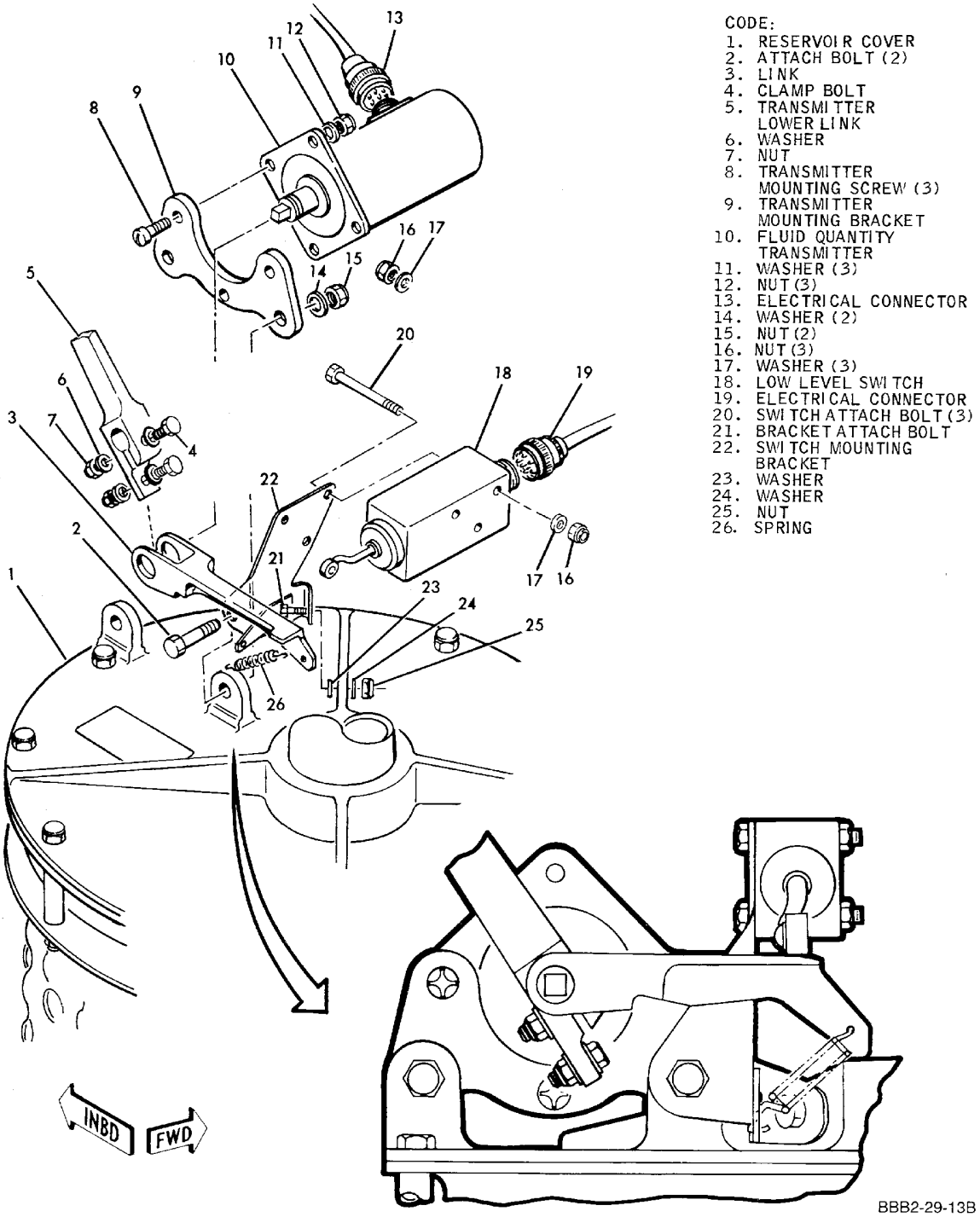
Hydraulic System Reservoir -- Removal/Installation
Figure 202/29-10-01-990-804



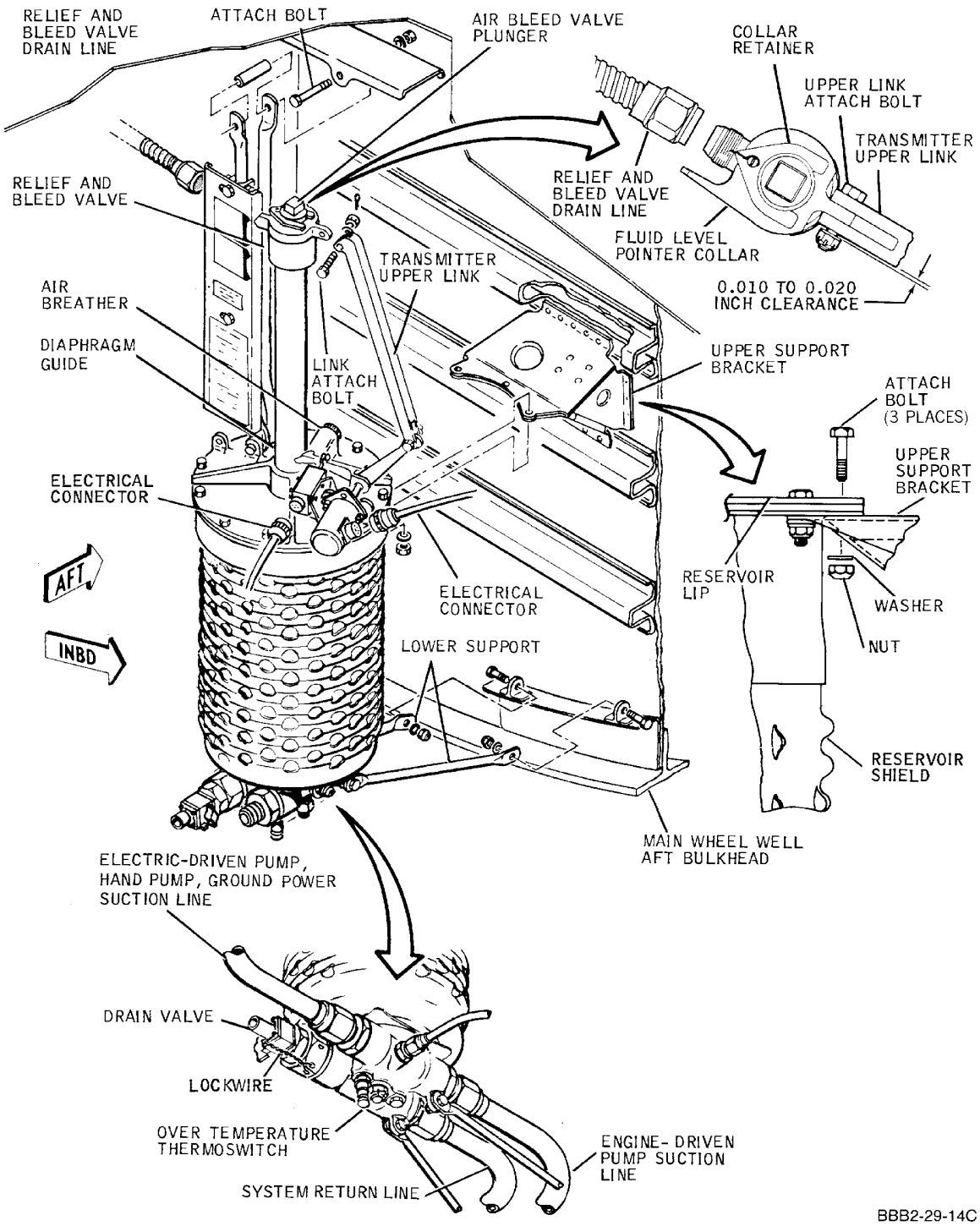
Left Hydraulic System Reservoir -- Removal/Installation
Figure 203/29-10-01-990-802



Left Hydraulic System Reservoir -- Removal/Installation
Figure 204/29-10-01-990-805



Right Hydraulic System Reservoir -- Removal/Installation
Figure 205/29-10-01-990-803



Right Hydraulic System Reservoir -- Removal/Installation
Figure 206/29-10-01-990-806

HYDRAULIC SYSTEM RESERVOIR INTERNAL LEAKAGE - ADJUSTMENT/TEST

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

A. This procedure has the functional test instructions for the hydraulic system reservoirs for internal leakage.

B. The hydraulic reservoirs are located in the main landing gear wheel wells. There is one hydraulic reservoir for each hydraulic system. Access is through the left or right main landing gear wheel well inboard door.

C. No internal leakage is allowed in the hydraulic system fluid reservoir.

2. Equipment and Materials

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

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

Table 501

Name and Number	Manufacturer
Ground lockpins (2916700-1 and -501)	
Main landing gear door safety locks	
Hydraulic test stand	
Chocks	
MIL-C-5501 (Types 1 thru 15)	Protective plugs and caps

3. Hydraulic Reservoirs Internal Leak Check

A. Preparation for Check

(1) Make certain airplane is electrically grounded.

(2) Place chocks in position at main gear wheels.

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

(3) Open the following applicable circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

(Continued)

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name

WJE ALL

H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

(4) Make certain that landing gear ground safety lock pins are installed for maintenance.

(5) If necessary, make certain that aircraft electrical power is energized. (PAGEBLOCK 24-00-00/401)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(6) Place main gear door ground maintenance bypass lever in BYPASS position (lever extended) (located on right side fuselage forward of MLG door), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(7) Depressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

B. Perform Internal Leak Check of Hydraulic Reservoir.

CAUTION: BOTH SYSTEM RESERVOIRS MUST BE AT PROPER FLUID LEVELS PRIOR TO BEGINNING INTERNAL LEAK CHECK (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301).

(1) Disconnect hydraulic reservoir pressure line located at bottom of reservoir, as required, for left or right system. Install plug in disconnected pressure line fitting. (Figure 501)

(2) Connect external ground hydraulic pressure source to reservoir pressure port. External pressure source must be equipped with in-line pressure gauge with 0 to 4500 psi (0 to 31026 kPa).

NOTE: Line pressure gauge on external pressure source can be used as alternative to in-line pressure gauge.

(3) Apply maximum 3000 psi (20,685 kPa) to applicable reservoir pressure port.

(4) Shut off external hydraulic pressure source and monitor pressure in applicable hydraulic reservoir. Make certain pressure indication is stable.

(5) If pressure drops to 0 psi (0 kPa) then excessive internal leakage is present. Remove and replace applicable hydraulic system reservoir. (PAGEBLOCK 29-10-01/201)

(6) If no significant pressure drop is evident, reservoir is in acceptable internal condition.

(7) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

(8) Disconnect external ground hydraulic pressure source from bottom of reservoir, as required, for left or right system. (Figure 501)

(9) Remove plug from respective disconnected pressure line and reconnect system pressure line to reservoir pressure port.

(10) Pressurize applicable hydraulic system, as required. Leak check reinstalled reservoir system pressure line. (PAGEBLOCK 29-00-00/201)

(11) Depressurize applicable hydraulic system. (PAGEBLOCK 29-00-00/201)

(12) Service hydraulic reservoirs, as/if required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(13) Remove these safety tags and close the applicable circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

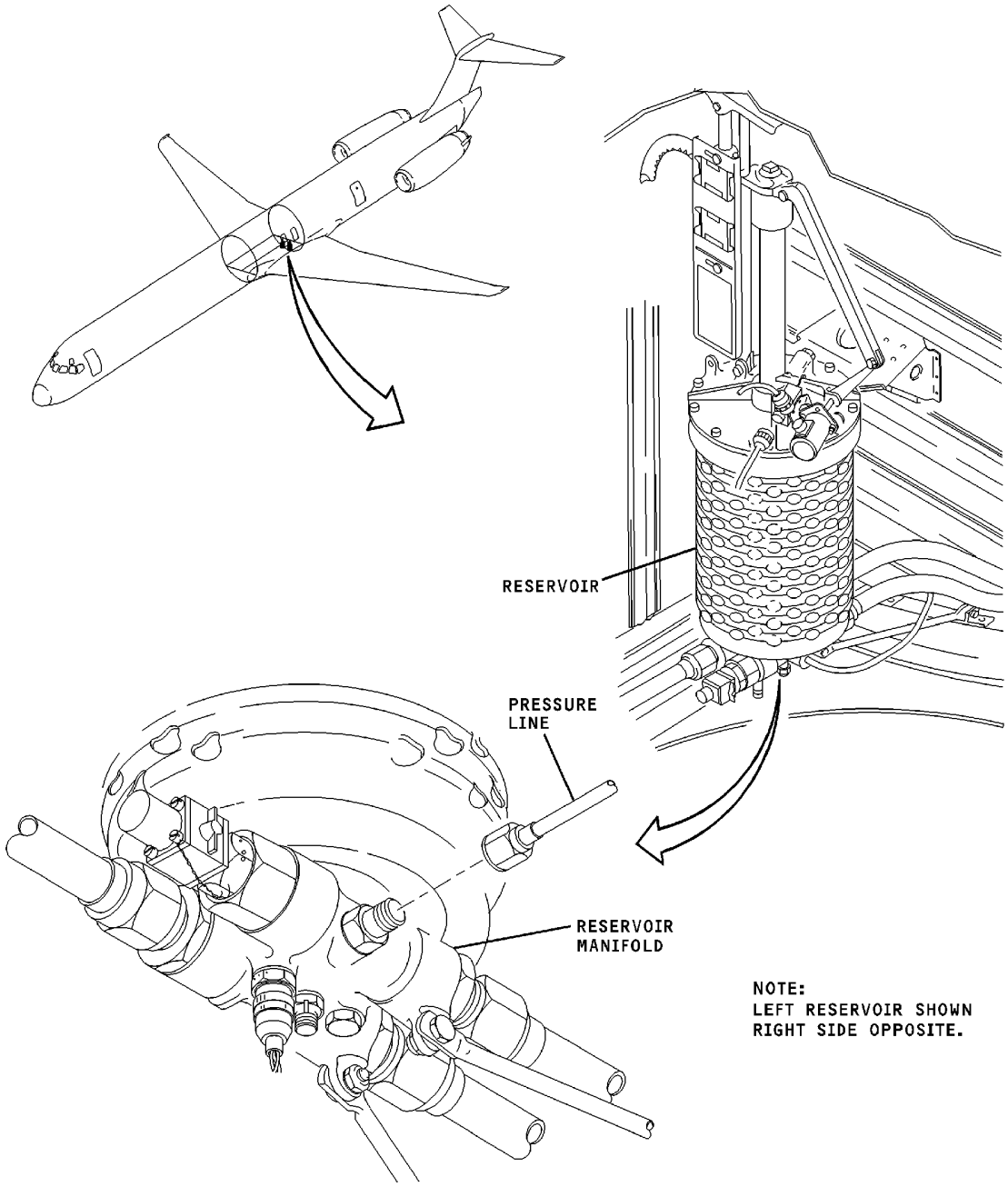
Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

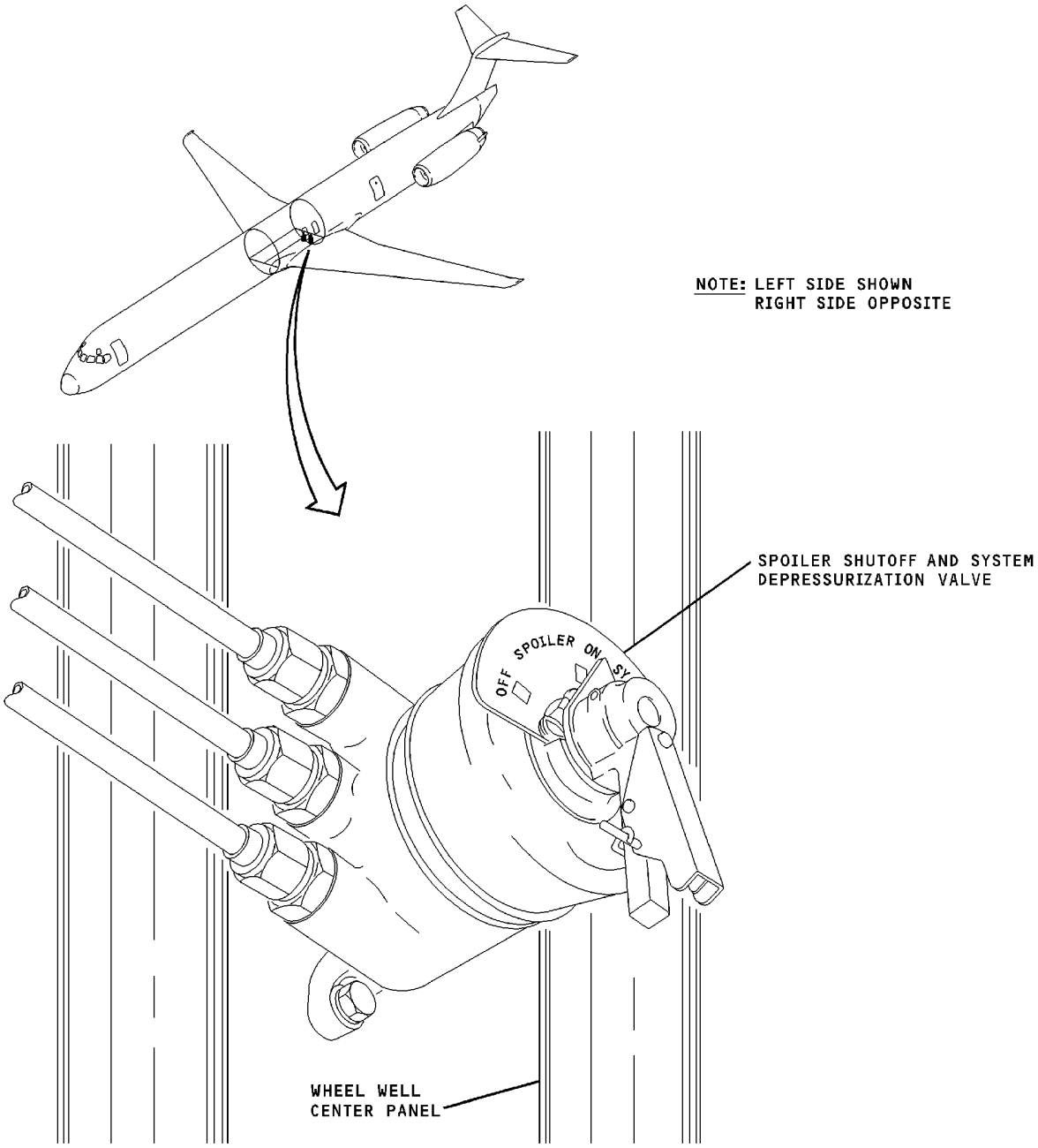
Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

(14) Remove all tools and equipment from work areas. Make certain that work areas are clean.

(15) Remove landing gear door ground safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted). (PAGEBLOCK 32-00-00/201)



Hydraulic Reservoir Internal Leakage - Adjustment/Test
Figure 501/29-10-01-990-811



Hydraulic Reservoir Internal Leakage - Adjustment/Test
Figure 502/29-10-01-990-812

HYDRAULIC SYSTEM RESERVOIR - ADJUSTMENT/TEST

1. General

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

TASK 29-10-01-720-801

2. Functional Check of the Main Hydraulic Reservoirs Internal Leakage

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
12-13-01 P/B 301	HYDRAULIC RESERVOIRS - SERVICING
24-00-00 P/B 401	GENERAL - REMOVAL/INSTALLATION
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
COM-163	Portable Hydraulic Cart, Systems Test, Capable of 3000 PSI and a minimum flow of 30 GPM. **MD80-81, -82, -83, -88** Part #: HT2000-1-E/1-S Supplier: H6394

C. Prepare for the Main Hydraulic Reservoirs Internal Leakage Functional Check

SUBTASK 29-10-01-840-001

(1) Make certain airplane is electrically grounded.

SUBTASK 29-10-01-586-001

(2) Place chocks in position at main gear wheels.

SUBTASK 29-10-01-865-001

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

(3) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

(Continued)

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name

WJE ALL

H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

SUBTASK 29-10-01-490-002

(4) Make certain that landing gear ground safety lock pins are installed for maintenance.

SUBTASK 29-10-01-861-001

(5) If necessary, make certain that aircraft electrical power is energized. (GENERAL - REMOVAL/INSTALLATION, PAGEBLOCK 24-00-00/401)

SUBTASK 29-10-01-010-001

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(6) Place main gear door ground maintenance bypass lever in BYPASS position (lever extended) (located on right side fuselage forward of MLG door), open main gear inboard doors and install door safety locks. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-10-01-864-001

(7) Depressurize applicable hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

D. Main Hydraulic Reservoirs Internal Leakage Functional Check

SUBTASK 29-10-01-030-001

CAUTION: BOTH SYSTEM RESERVOIRS MUST BE AT PROPER FLUID LEVEL PRIOR TO BEGINNING INTERNAL LEAK CHECK.

(1) Disconnect hydraulic reservoir pressure line located at bottom of reservoir, as required, for left or right system. Install plug in disconnected pressure line fitting. (Figure 501)

SUBTASK 29-10-01-490-001

(2) Connect external portable hydraulic cart, COM-163 to reservoir pressure port. Portable hydraulic cart must be equipped with in-line pressure gauge with 0 psi (0 kPa) to 4500 psi (31,026 kPa).

NOTE: Line pressure gauge on portable hydraulic cart can be used as alternative to in-line pressure gauge.

SUBTASK 29-10-01-720-001

(3) Apply maximum 3000 psi (20,684 kPa) to applicable reservoir pressure port with portable hydraulic cart.

(4) Shut off portable hydraulic cart and monitor pressure in applicable hydraulic reservoir. Make certain pressure indication is stable.

(5) No significant pressure drop is acceptable.

SUBTASK 29-10-01-864-002

(6) Depressurize hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-10-01-090-001

(7) Disconnect portable hydraulic cart from bottom of reservoir, as required, for left or right system. (Figure 501)

SUBTASK 29-10-01-430-001

(8) Remove plug from respective disconnected pressure line and reconnect system pressure line to reservoir pressure port.

SUBTASK 29-10-01-863-001

(9) Pressurize applicable hydraulic system, as required. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-10-01-790-001

(10) Leak check reinstalled reservoir system pressure line. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-10-01-864-003

(11) Depressurize applicable hydraulic system. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-10-01-611-001

(12) Service hydraulic reservoirs, as/if required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

E. Job Close-up

SUBTASK 29-10-01-865-002

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

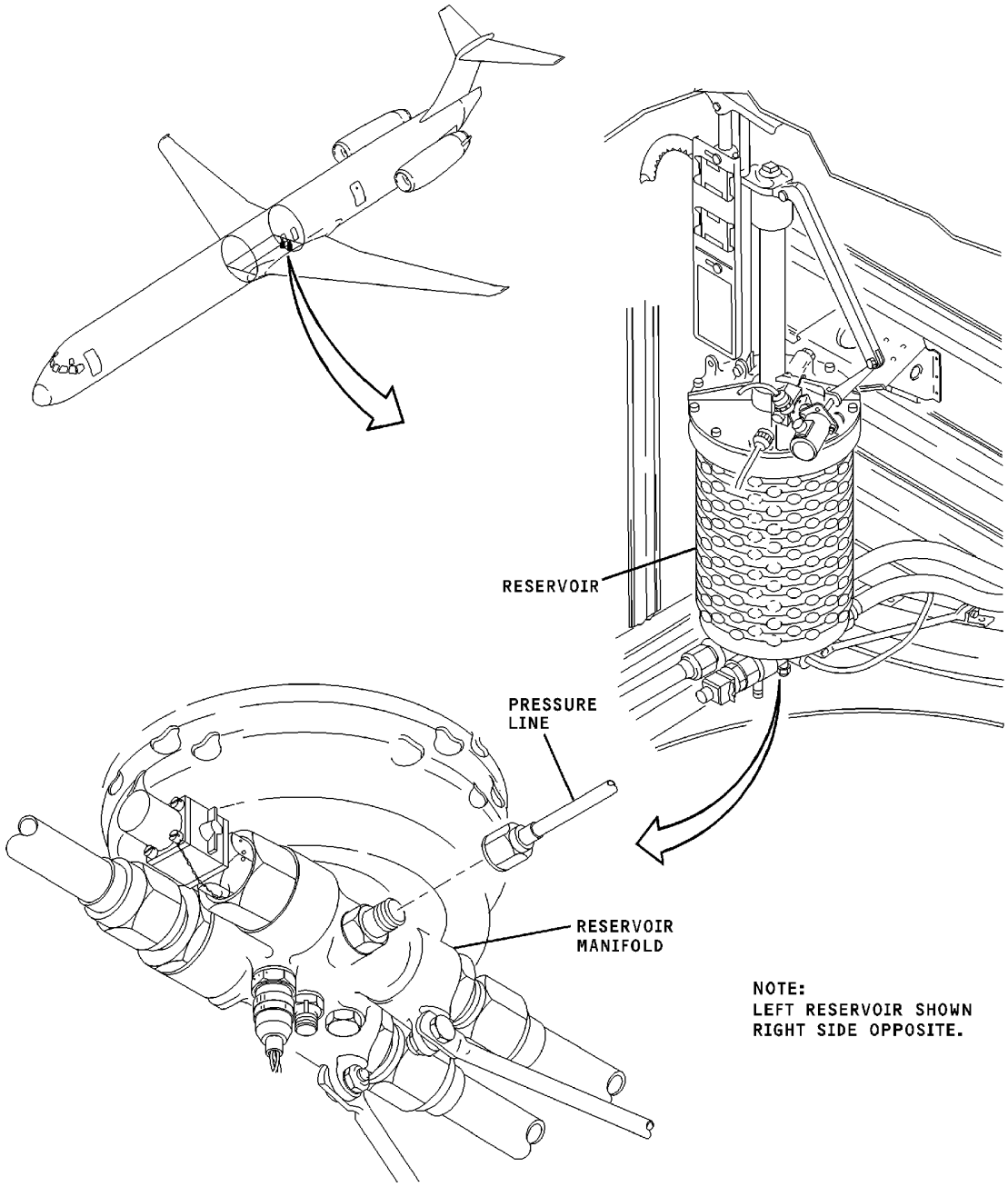
SUBTASK 29-10-01-942-001

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

SUBTASK 29-10-01-090-002

(3) Remove landing gear door ground safety locks, close inboard main landing gear doors, and return main gear door ground maintenance bypass lever to normal position (lever retracted). (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

END OF TASK



Main Hydraulic Reservoirs Internal Leakage - Functional Check
Figure 501/29-10-01-990-813

RESERVOIR AIR BREATHER - MAINTENACE PRACTICES

1. General

WARNING: DOORKEEPERS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS

A. Each of the hydraulic reservoirs is equipped with an air breather located on the reservoir cover. Access is through the main gear inboard doors. Removal and installation procedures for the left and right reservoir air breathers are identical. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety lock 3936851-1 or -501 (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Lubricant, anti seize, MIL-T-5544 DPM 376	
Solvent, Douglas P-D-680, Type 1 DPM 518	

3. Removal/Installation Reservoir Air Breather

A. Remove Breather

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks (PAGEBLOCK 32-00-00/201).

(2) Unscrew and remove air breather from reservoir cover and cap opening; discard O-ring.

(3) Remove lockring, filter screen, and O-ring from breather; discard O-ring.

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(4) Thoroughly clean all parts with cleaning solvent (Stoddard P-D-680, Type 1) and air dry.

B. Install Breather

(1) Make certain door safety locks are installed.

(2) Assemble air breather using new O-ring.

WARNING: THREAD COMPOUND LUBRICATING GREASE IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN THREAD COMPOUND LUBRICATING GREASE IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

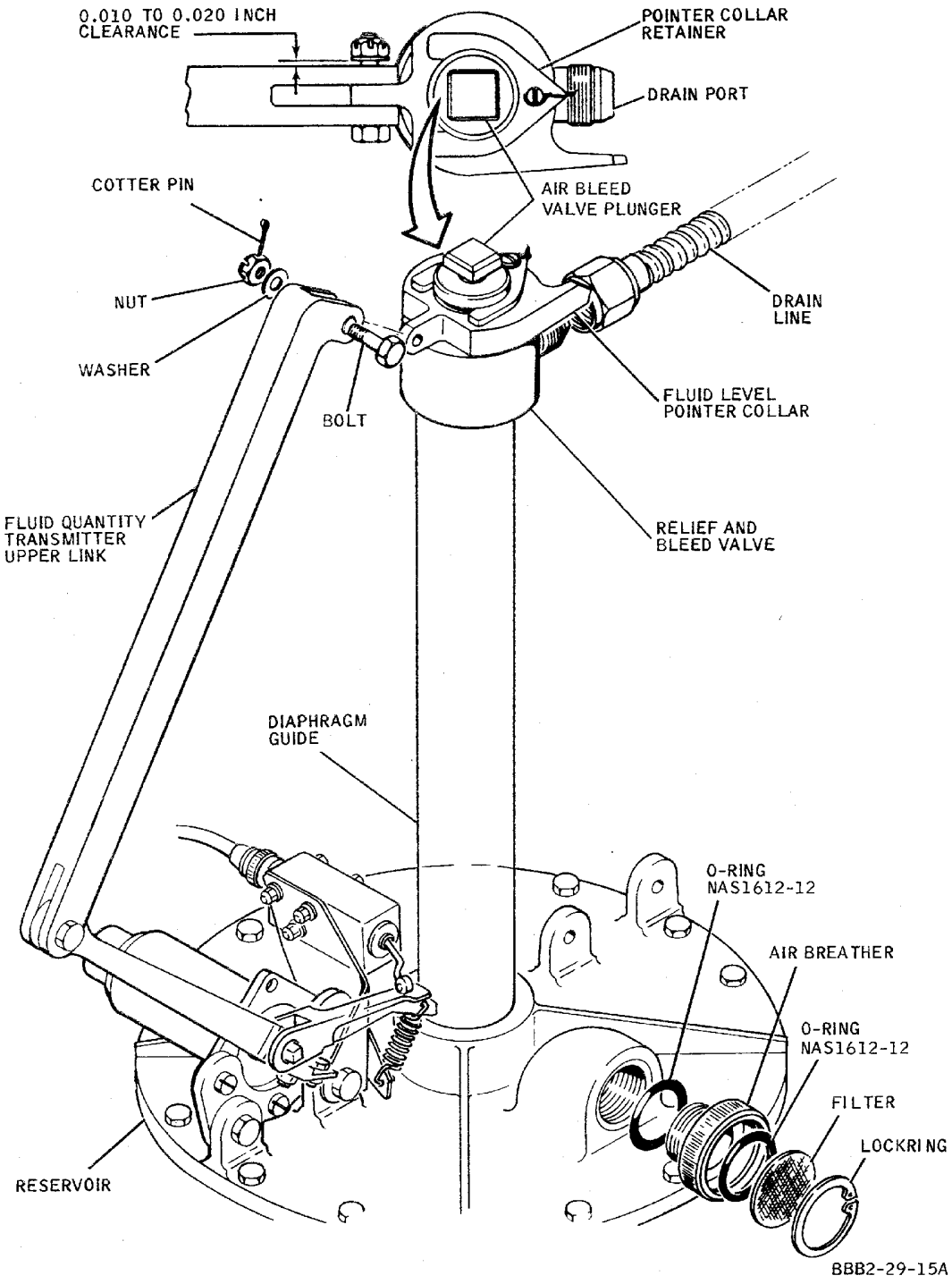
- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(3) Install new O-ring in groove above external threads; apply antiseize compound (MIL-T-5544) to threads.

(4) Install breather in reservoir cover and secure fingertight.

(5) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Reservoir Air Breather -- Removal/Installation
Figure 201/29-10-03-990-801

FIRE SHUTOFF VALVE - MAINTENANCE PRACTICES

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

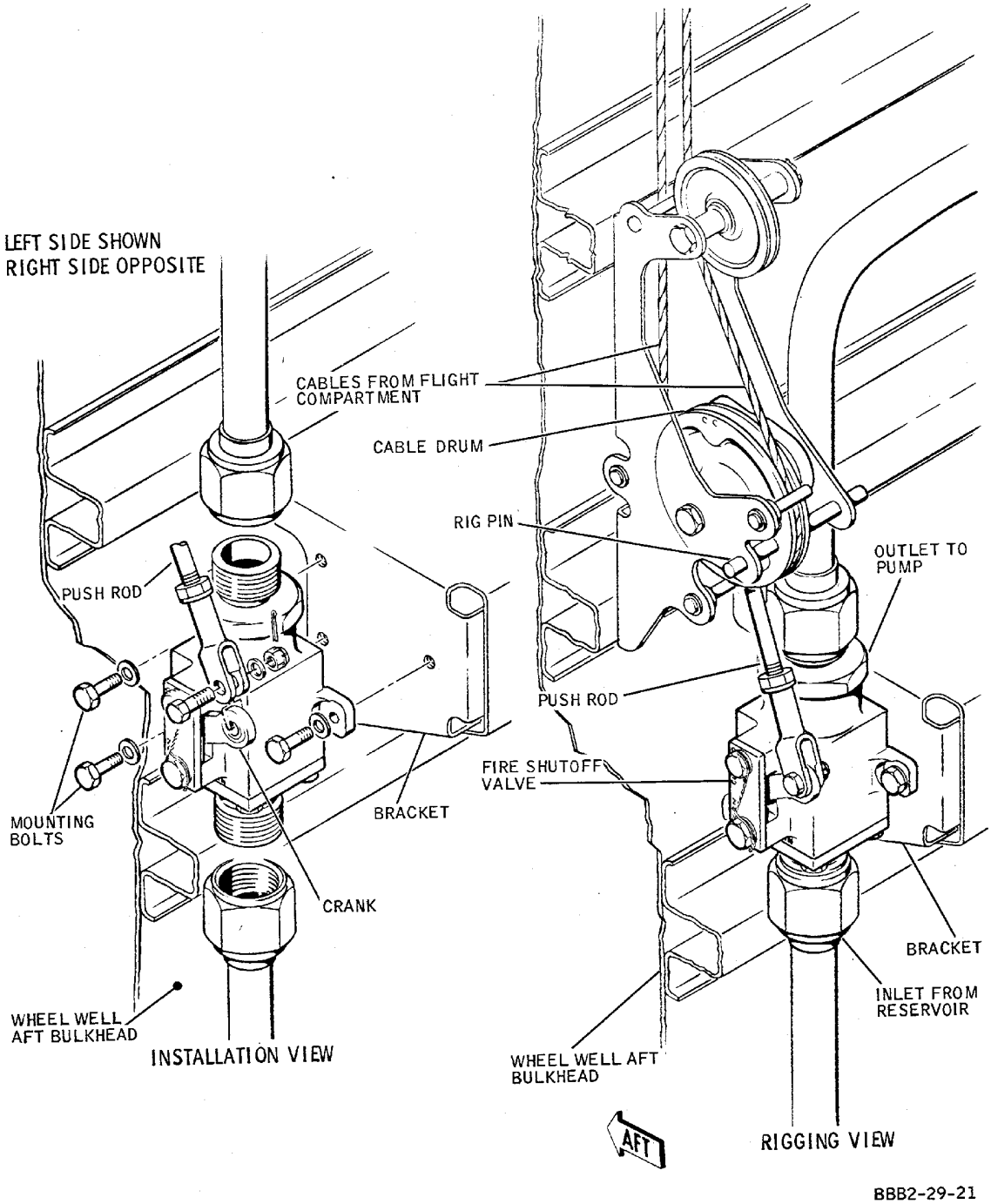
A. Each hydraulic system is equipped with a fire shutoff valve. The valves are located on brackets mounted on the aft bulkhead of each main gear wheel well. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right hydraulic system fire shutoff valves are identical. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501(GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM684	Not specified
Rig pin (R-32) 1/4 by 5 5/8	
NOTE: Rig pin sizes are in inches (diameter x length; length = grip plus 5/8 inch).	



Fire Shutoff Valve -- Removal/Installation
Figure 201/29-10-04-990-801

3. **Removal/Installation Fire Shutoff Valve**

A. Remove Valve

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic systems, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Disconnect pushrod from valve crank.

(5) Disconnect hydraulic lines from valve.

(6) Remove valve.

(7) If required, remove union from outlet end of valve; retain for installation in new valve. Discard O-ring.

B. Install Valve

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install new O-ring and install union in outlet port of valve.

(5) Install valve.

(6) Pull fire shutoff handle in flight compartment to closed (full aft) position.

(7) Install rig pin (R-32) through cable drum and bracket, above fire shutoff valve, in wheel well.

(8) Adjust pushrod length as necessary so that with valve crank against stop in closed position, rod attach bolt can be easily installed.

(9) Install bolt, safety nut with cotter pin.

(10) Remove rig pin (R-32).

(11) Visually check interior of valve for fully closed position.

(12) Push fire shutoff handle in flight compartment to normal (full forward) position; visually check interior of valve for fully open position.

(13) Connect hydraulic lines to inlet and outlet connections of valve.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(15) Pressurize applicable hydraulic system; bleed and fill reservoir, if applicable. (PAGEBLOCK 29-00-00/201) (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(16) Check valve hydraulic connections for leakage.

(17) Actuate fire shutoff handle in flight compartment and check crank on valve for full travel to both open and closed position; crank in upper position, valve is closed; crank in lower position, valve is open.

(18) Return valve to open position (flight compartment handle pushed full forward to normal position).

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

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

(20) Place left or right generator, as applicable, control switch, located on overhead panel, momentarily to reset position.

(21) Shut off hydraulic pressure source.

(22) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

ENGINE-DRIVEN HYDRAULIC PUMP - MAINTENANCE PRACTICES

1. General

A. Each hydraulic system is equipped with an engine-driven pump. The pumps are located on the accessory pads on the right side of each engine. Access is through the left or right engine lower access door. The removal and installation procedures for the left and right engine-driven hydraulic pumps are identical.

2. Equipment and Materials

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

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

CAUTION: IF APU IS USED, MAKE CERTAIN RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU, OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

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

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

Table 201

Name and Number	Manufacturer
Inconel Lockwire 0.032 in NASM20995N32, DPM 684	Not specified
Corrosion Resistant Steel Lockwire 0.032 in NASM20995C32, DPM 5865	Not specified
Compound, ME-76, anti-fretting DPM 3565	E/M Lubricants
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company

3. Removal/Installation Engine-Driven Hydraulic Pump

CAUTION: ANY TIME THE ENGINE DRIVEN HYDRAULIC PUMP IS REMOVED FOR ANY REASON, THE CASE DRAIN FILTER ELEMENT SHOULD BE REMOVED AND REPLACED WITH A NEW OR CLEAN ELEMENT.

A. Remove pump. (Figure 201)

WARNING: OPEN CIRCUIT BREAKERS MUST BE TAGGED AND SAFETIED TO PREVENT INADVERTENT OPERATION OF SYSTEM PUMPS.

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

(1) Open the following applicable circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
U	42	B1-422	ENGINE START VALVE LEFT
WJE ALL			
W	37	B1-59	FIRE DETECTORS RIGHT ENGINE LOOP A
W	38	B1-191	FIRE DETECTORS RIGHT ENGINE LOOP B
W	39	B1-282	FIRE DETECTORS LEFT ENGINE LOOP A
W	40	B1-281	FIRE DETECTORS LEFT ENGINE LOOP B
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(2) Close left or right (as applicable) fire shutoff valve by pulling fire control handle, located above center instrument panel in flight compartment, straight out to full aft position.

WARNING: DOORKEEPERS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(3) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY. MAKE CERTAIN THRUST REVERSER HYDRAULIC SYSTEM IS COMPLETELY DEPRESSURIZED TO PREVENT INADVERTENT OPERATION OF THRUST REVERSER DOORS.

(4) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(5) Remove fire detector unit from engine. (PAGEBLOCK 26-10-01/201)

(6) Disconnect unloading valve and depressurization valve electrical connectors from pump.

(7) Disconnect suction, pressure, and case drain hoses from pump. Cap or plug open hoses.

CAUTION: SUPPORT PUMP WHILE REMOVING CLAMP TO PREVENT PUMP FROM FALLING. PUMP WEIGHT IS APPROXIMATELY 25 POUNDS.

(8) Remove two safety screws and mounting clamp and remove pump.

(9) Remove mounting flange adapter from old pump and install on replacement pump with two safety screws.

NOTE: Omit step Paragraph 3.A.(9) if old pump is to be reinstalled on engine.

(10) Place suitable cover over mounting flange hole on engine accessory pad and clamp in place with mounting clamp.

(11) Remove case drain fitting and O-ring from pump case drain port; retain fitting for use on new pump. Discard O-ring.

NOTE: Pressure and case drain check valves may be individually flushed, functionally inspected and re-installed to the aircraft.

(a) Do not remove pressure port fitting from pump. Pressure port fitting is supplied installed on each pump.

(b) In the event an engine-driven hydraulic pump is operated without fluid or if malfunction has occurred and internal damage is suspected, pump(s) and its associated components, items 1), 2), and 3), listed below, should be replaced prior to further service.

CAUTION: IF METALLIC CONTAMINATION IS FOUND IN ANY FILTER OR VALVE, THE LINES CONNECTING THE ENGINE-DRIVEN HYDRAULIC PUMP TO THE AFFECTED FILTERS AND VALVES SHOULD BE FLUSHED TO ELIMINATE CONTAMINATION WHICH MAY BE SUSPENDED IN THE FLUID REMAINING IN THE LINES.

1) Engine-driven pump pressure line filter element.

2) Engine-driven pump case drain line filter element.

3) Hydraulic system return line filter elements.

B. Install Pump

(1) Make certain applicable hydraulic system is depressurized and door safety locks are installed.

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

(2) Make sure that the following applicable circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
U	42	B1-422	ENGINE START VALVE LEFT
WJE ALL			
W	37	B1-59	FIRE DETECTORS RIGHT ENGINE LOOP A
W	38	B1-191	FIRE DETECTORS RIGHT ENGINE LOOP B
W	39	B1-282	FIRE DETECTORS LEFT ENGINE LOOP A
W	40	B1-281	FIRE DETECTORS LEFT ENGINE LOOP B
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(3) Install case drain fitting and new O-ring in pump case drain port.

(4) Remove mounting clamp and cover from mounting flange on engine.

WARNING: ANTI-FRETTING COMPOUND IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN ANTI-FRETTING COMPOUND IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET ANTI-FRETTING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

(WARNING PRECEDES)

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(5) Lubricate pump shaft splines lightly with anti-fretting compound, ME-76.

NOTE: Check to make certain of type of pump drive shaft coupling installed before completing installation.

(6) Check that pump flange seal is properly installed in groove on pump mounting flange and is free of foreign matter, nicks, cuts or other damage.

NOTE: Pump is supplied with flange seal installed.

(7) Install gasket and hydraulic pump adapter on to the mounting flange with the six nuts and washers.

(8) Torque the six nuts to 160 in-lb (18.1 N·m) to 190 in-lb (21.5 N·m).

(9) Install pump on the adapter so that safety screw holes align and case drain hose connection is at approximately 45° outboard of top center of pump; install mounting clamp but do not tighten.

(10) Install and tighten two safety screws to 55 to 60 inch-pounds (6.2 to 6.8 N·m) torque.

NOTE: Safety screws are supplied as part of replacement pump.

(11) Tighten mounting clamp and torque to 45 in-lb (5.1 N·m) to 55 in-lb (6.2 N·m).

(12) Connect pressure, suction, and case drain hoses to pump.

CAUTION: BEFORE YOU OPERATE THE ENGINE-DRIVEN HYDRAULIC PUMP, MAKE SURE THE CASE IS FULL OF HYDRAULIC FLUID. DO NOT LET THE PUMP OPERATE WITHOUT LUBRICATION DURING SELF-PRIMING PERIOD. THIS WILL HELP PREVENT DAMAGE TO THE ENGINE.

(13) Remove case fill plug and fill pump case with clean hydraulic fluid through port; install plug and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(14) Connect unloading valve and depressurization valve electrical connectors; safety connectors with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(15) Install fire detector unit on engine. (PAGEBLOCK 26-10-01/201)

(16) Open left or right (as applicable) fire shutoff valve in flight compartment; fire control handle full forward (normal) position.

(17) Remove these safety tags and close the applicable circuit breakers:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
U	42	B1-422	ENGINE START VALVE LEFT

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

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE ALL			
W	37	B1-59	FIRE DETECTORS RIGHT ENGINE LOOP A
W	38	B1-191	FIRE DETECTORS RIGHT ENGINE LOOP B
W	39	B1-282	FIRE DETECTORS LEFT ENGINE LOOP A
W	40	B1-281	FIRE DETECTORS LEFT ENGINE LOOP B
X	41	B1-95	FIRE EXTINGUISHING CONTROL BOTTLE 1
X	42	B1-96	FIRE EXTINGUISHING CONTROL BOTTLE 2

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
S	27	B1-51	LEFT HYD PUMP CONTROL

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	27	B1-52	RIGHT HYD PUMP CONTROL

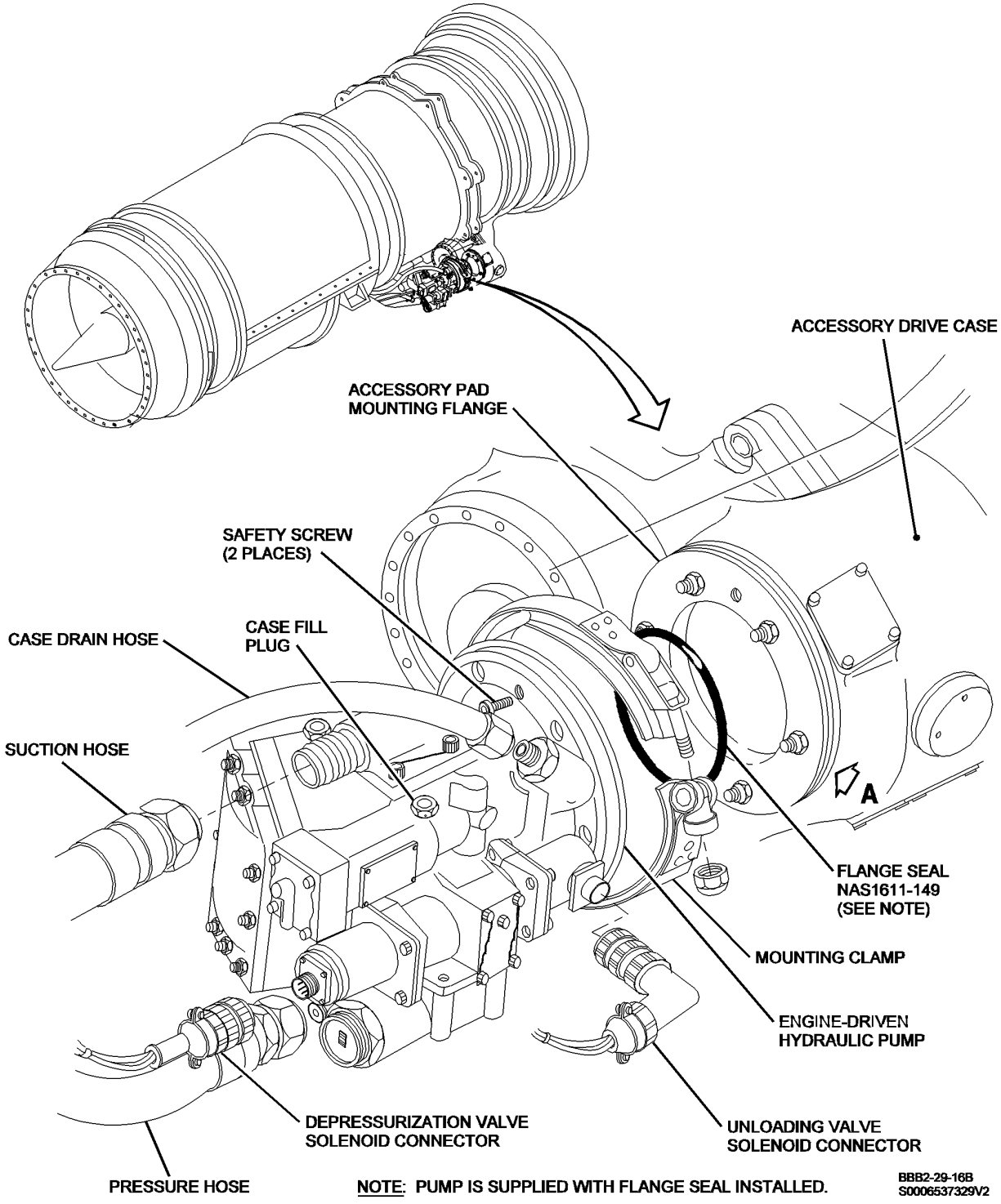
LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

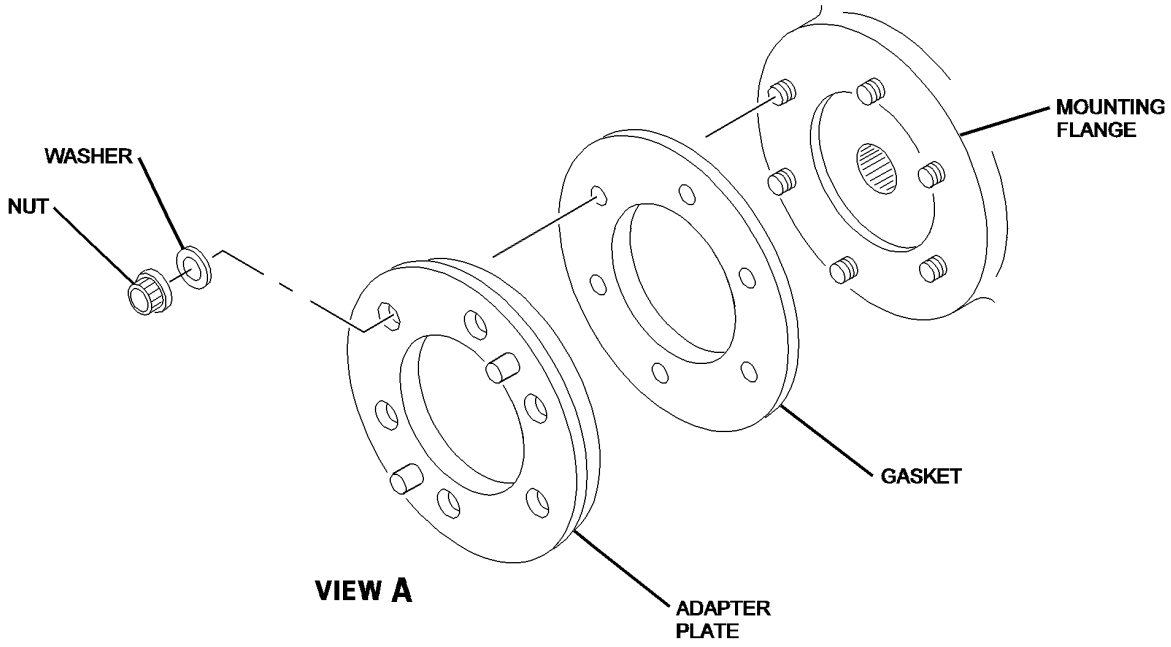
UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(18) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (PAGEBLOCK 12-13-01/301)



Engine-Driven Hydraulic Pump -- Removal/Installation
Figure 201/29-10-05-990-801 (Sheet 1 of 2)



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Engine-Driven Hydraulic Pump -- Removal/Installation
Figure 201/29-10-05-990-801 (Sheet 2 of 2)

4. Check Engine-Driven Hydraulic Pump

A. Check Pump

(1) Make certain door safety locks are installed.

(2) With left or right (as applicable) hydraulic system depressurized, accomplish the following: (PAGEBLOCK 29-00-00/201)

(a) Check engine-driven hydraulic pump for security of mounting.

(b) Check hydraulic lines for general condition and security of attachment to pump.

(c) Check pump electrical connectors for security of attachment and proper safety.

(d) Check fire detector unit for proper installation. (PAGEBLOCK 26-10-01/201)

(3) Place applicable (left or right) engine-driven pump control switch in HI position.

WARNING: BEFORE YOU PRESSURIZE THE HYDRAULIC SYSTEM, MAKE SURE THE LANDING GEAR LOCKPINS ARE INSTALLED AND THE APPLICABLE CONTROLS ARE IN THE CORRECT POSITION. THIS WILL PREVENT ACCIDENTAL OPERATION OF THE LANDING GEAR. INCORRECT PROCEDURES CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: EXERCISE EXTREME CAUTION TO AVOID ENGINE INLET AND EXHAUST AREAS WHILE ENGINE IS OPERATING. AVOID ALL OTHER ENGINE HAZARD AREAS.

(4) Start left or right (as applicable) engine and accomplish the following: (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 7 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 5)

(a) With applicable engine-driven hydraulic pump switch in HI position and all hydraulic subsystems in static (zero flow) condition, check applicable hydraulic system pressure indicator in flight compartment for 2800/3200 psi indication.

(b) Place engine-driven hydraulic pump switch in LOW position; check hydraulic system pressure indicator for 1500(±200) psi indication.

(c) Place engine-driven hydraulic pump switch to HI position.

(d) Check complete engine-driven hydraulic pump installation for hydraulic fluid leaks. (PAGEBLOCK 29-00-00/201)

(e) Place engine-driven hydraulic pump switch in OFF position.

(f) Check applicable hydraulic system pressure indicator to make certain that pressure drops to zero psi.

(g) Shut down left or right (as applicable) engine. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 7 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 5)

(5) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201).

ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - MAINTENANCE PRACTICES

1. General

A. The electric motor driven auxiliary pump, installed in right hydraulic system only, is located at the forward end of the right main landing gear wheelwell.

2. Equipment and Materials

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Container (1-gallon)	
Inconel Lockwire 0.032 in NASM20995N32, DPM 684	Not specified
Corrosion Resistant Steel Lockwire 0.032 in NASM20995C32, DPM 5865	Not specified
Drill rod (1/8-inch)	
Shock mount spanner (3961692)	The Boeing Company
Torque wrench, 0 -750 in-lb (0 - 83.5 N·m)	
2.5 inch adapter	

3. Removal/Installation Electric Motor Driven Auxiliary Pump

A. Remove Pump

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(2) Depressurize right hydraulic system. (PAGEBLOCK 29-00-00/201)

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

(3) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) Disconnect and cap electrical connector.

(5) Disconnect and cap hydraulic lines from pump.

(6) Using 1/8-inch drill rod or shock mount spanner to hold inner member of shock mount, remove pump mount bolts. Retain bolts and washers for installation of new pump.

WARNING: ELECTRIC MOTOR DRIVEN AUXILIARY PUMP WEIGHS APPROXIMATELY 30 POUNDS (13.6 KILOGRAMS). MAKE CERTAIN THAT PUMP IS ADEQUATELY SUPPORTED DURING REMOVAL.

(7) Remove pump from aircraft.

(8) Remove fittings, as required, from pump and retain fittings for installation on new pump. Discard O-rings.

(9) Plug hydraulic ports on pump.

(10) If pump is being replaced due to known or suspected internal failure or overheat condition, replace return filters in associated system.

B. Install Pump

(1) Make certain hydraulic system is depressurized

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) Check shock mounts for damage or wear. If damaged or worn, replace shock mount.

WJE ALL PRE MD80-29-071

(5) Install hydraulic fittings, as required, using new O-rings in pump ports. (Figure 201)

NOTE: Make certain that check valve is reinstalled in pressure port so that flow is out of pump.

WJE ALL POST MD80-29-071

(6) Examine the attenuator for dents and scratch marks.

(a) Dents or scratch marks that exceed 0.25 in. (6.35 mm) in depth must be repaired per CMM 29-11-05 or replaced at the next C-check or 15 months, whichever comes first.

(7) Install hydraulic fittings and attenuator, as required, using new O-rings in pump ports. (Figure 202)

(a) Use a torque wrench and a 2.5 inch adapter to torque the attenuator on the wrench flats from 575 in-lb (65 N·m) to 625 in-lb (71 N·m)

WJE ALL

WARNING: ELECTRIC MOTOR DRIVEN AUXILIARY PUMP WEIGHS APPROXIMATELY 30 POUNDS (13.6 KILOGRAMS). MAKE CERTAIN THAT PUMP IS ADEQUATELY SUPPORTED DURING INSTALLATION.

(8) Install pump on shock mounts.

NOTE: Make certain that washer is installed between each shock mount and pump mount.

(9) Using 1/8-inch drill rod or shock mount spanner to hold inner member of shock mount, install pump mount bolts. Safety boltheads with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Connect hydraulic lines to all fittings except case drain line.

CAUTION: USE ONLY BOEING APPROVED HYDRAULIC FLUIDS. UNAPPROVED HYDRAULIC FLUIDS CAN CAUSE DAMAGE TO AIRCRAFT SYSTEMS.

CAUTION: BEFORE OPERATING ELECTRIC MOTOR DRIVEN PUMP, PUMP CASE MUST BE FULL OF HYDRAULIC FLUID TO PREVENT PUMP FROM OPERATING WITHOUT LUBRICATION.

(11) Fill pump case with clean hydraulic fluid.

(12) Connect case drain line.

WJE ALL POST MD80-29A067

(13) If auxiliary pump is suspected to have failed due to failed electric motor or burnt or shorted feeder cables, do a check of pump motor and associated aircraft wires. (ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - INSPECTION/CHECK, PAGEBLOCK 29-10-06/601)

(a) If the failure of the pump is not related to a failed electric motor or burnt or shorted feeder cables, this check is not required.

WJE ALL

(14) Connect electrical connector to pump and safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(16) Place AUX pump switch, located on first officer's instrument panel, in ON position to pressurize right hydraulic system.

(17) Right hydraulic system pressure indicator should read 3000 (±200) psi.

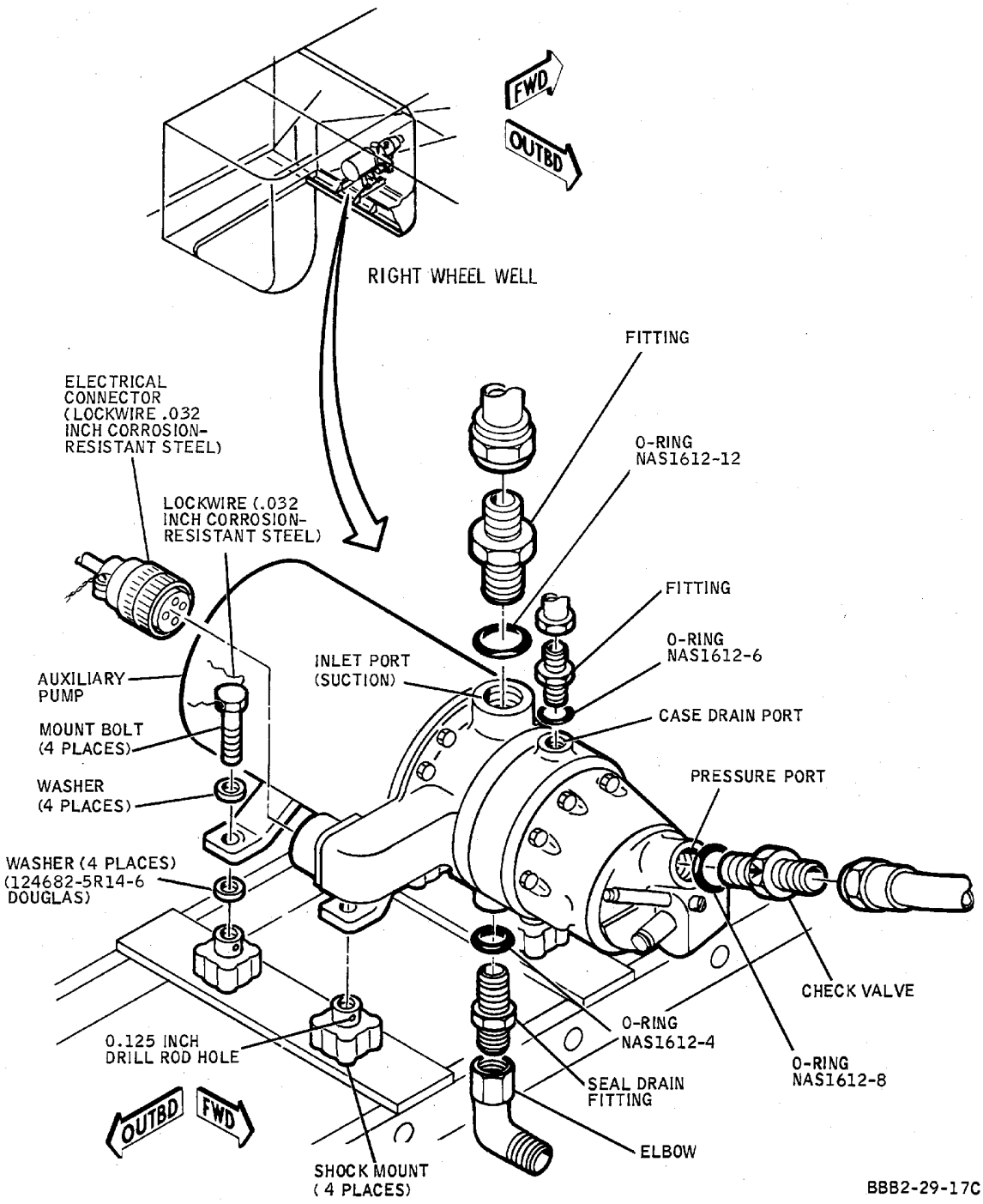
(18) Bleed and fill right hydraulic system reservoir until all traces of air have been eliminated from system. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(19) Check all fittings and connections for leaks.

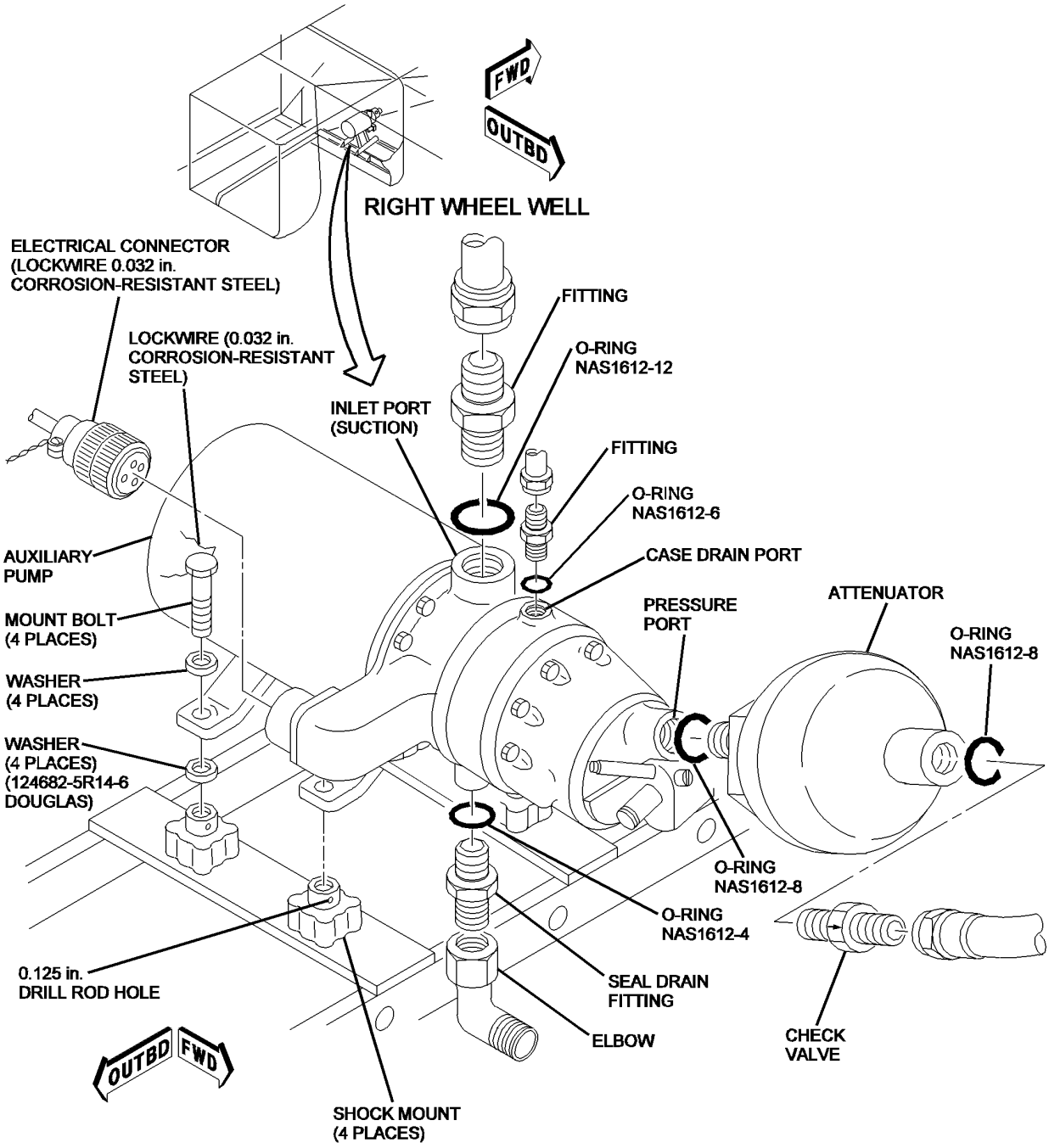
(20) Place AUX pump switch in OFF position.

(21) Hydraulic pressure indicator should decay to less than 100 psi.

(22) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Electric Motor Driven Auxiliary Pump -- Removal/Installation
Figure 201/29-10-06-990-804



Electric Motor Driven Auxiliary Pump -- Removal/Installation
Figure 202/29-10-06-990-806

ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - INSPECTION/CHECK

1. General

A. The electric motor driven auxiliary pump, installed in right hydraulic system only, is located at the forward end of the right main landing gear wheel well. (PAGEBLOCK 32-00-00/201)

B. This procedure is done to comply with Alert Service Bulletin 29-67.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELL.

C. Access to the pump is through the right main gear door.

2. Equipment and Materials

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

Table 601

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501(GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Volt ohmmeter Type 187 CAGE 0HYG7	Fluke Corporation P.O. Box 9090 Mail Stop 216A Everett, Washington 98206
Ammeter 0-50 AMPS clamp-on Type 336 CAGE 0HYG7	Fluke Corporation P.O. Box 9090 Mail Stop 216A Everett, Washington 98206
Meg-ohmmeter Model 1864 CAGE 0PK96	Quadtech Incorporated 100 Nickerson Road Marlborough, Massachusetts 01752
1/4 inch dia. X 6 inch long non-metallic rod	Commercially available
Lockwire, NASM20995N32, DPM684	Not specified

3. Inspection/Check of Electric Motor Driven Auxiliary Pump

A. Gain access to auxiliary hydraulic pump by opening right main landing gear door. (Figure 601).

B. Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201).

NOTE: The auxiliary hydraulic pump motor should be allowed to cool to ambient temperature 1 hour prior to accomplishing the following tests.

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

C. Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

D. Disconnect and cap electrical connector.

E. Inspect auxiliary hydraulic pump electric motor for electrical resistance, continuity, mechanical rotation, and associated aircraft wiring resistance/voltage as follows:

(1) Perform auxiliary hydraulic pump motor stator winding resistance check using volt ohmmeter per table below. Make sure that all three readings are 0.1 Ohm of each other. (Figure 602).

Table 602

Meter Leads at Pump Electrical Receptacle	Resistance Reading
Pin A to Pin D	0.1 to 0.3 Ohm
Pin B to Pin D	0.1 to 0.3 Ohm
Pin C to Pin D	0.1 to 0.3 Ohm

(2) Perform auxiliary hydraulic pump motor thermal disconnect switch continuity check using volt ohmmeter per table below.

Table 603

Meter Leads at Pump Electrical Receptacle	Resistance Reading
Pin E to Pin F	1.0 Ohm or less

(3) Perform auxiliary hydraulic pump motor stator insulation resistance check with meg-ohmmeter set on 500 volts-direct-current (vdc) per table below.

Table 604

Meter Leads at Pump Electrical Receptacle	Resistance Reading
Pin A to Pin G	10 megohms minimum
Pin F to Pin G	10 megohms minimum

(4) Accomplish auxiliary hydraulic pump motor rotational check using 1/4 inch Dia. X 6 inch long non-metallic rod as follows.

NOTE: Let auxiliary hydraulic pump motor to cool to ambient temperature 1 hour prior to accomplishing the following test.

Table 605

Step	Operation	Remarks
A	Insert non-metallic rod in any outer circumference auxiliary hydraulic pump motor cooling exhaust hole.	See (Figure 601)
B	Engage the rod to an adjacent blade of the cooling fan blower.	See (Figure 601)
C	Using the non-metallic rod as a lever and pushing fan blade, insure that the pump will rotate in either direction.	See (Figure 601)

(5) Accomplish auxiliary hydraulic pump motor aircraft wire harness check using volt ohmmeter per table below.

Table 606

Meter Leads at Pump Electrical Connector	Resistance Reading
Aircraft ground to Pin D	1.0 Ohm or less
Aircraft ground to Pin G	1.0 Ohm or less

(6) Visually check auxiliary hydraulic pump motor aircraft wire harness in right wheelwell for minimum bend radius, chafing, discoloration, and mounting clamp alignment. Check connector pins/sockets for arc damage/corrosion.

(7) Perform thermal disconnect circuit lockout switch check.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(b) Place auxiliary hydraulic pump motor switch to ON position.

(c) Accomplish auxiliary hydraulic pump motor aircraft wiring voltage check using volt ohmmeter per table below.

Table 607

Meter Leads at Electrical Connector	Meter Reading
Aircraft Ground to Socket A	*0.0 volts
Aircraft Ground to Socket B	*0.0 volts
Aircraft Ground to Socket C	*0.0 volts
NOTE: *Stray voltage of less than 12 vac is acceptable.	

(d) Place auxiliary hydraulic pump motor switch to OFF position.

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

(e) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(8) Perform aircraft wiring voltage assurance check.

(a) Install wire jumper at sockets E and F on ships wiring.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(c) Place auxiliary hydraulic pump motor switch to ON position.

(d) Accomplish auxiliary hydraulic pump motor aircraft wiring voltage check using volt ohmmeter per table below.

Table 608

Meter Leads at Electrical Connector	Meter Reading
Aircraft Ground to Socket A	115 vac ± 4 vac
Aircraft Ground to Socket B	115 vac ± 4 vac
Aircraft Ground to Socket C	115 vac ± 4 vac

(e) Place auxiliary hydraulic pump motor switch to OFF position.

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

(f) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(g) Remove wire jumper at sockets E and F on ships wiring.

(9) Connect auxiliary hydraulic pump motor electrical connector and safety with lockwire.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(11) Using clamp-on ammeter, perform auxiliary pump motor phase imbalance test as follows:

(a) Gain access to test area by opening circuit breaker panel, 4423A INTERNAL ACCESS DOORS, SUBJECT 06-31-00 (Figure 603).

(b) Determine convenient location and attach clamp-on meter to auxiliary hydraulic pump power feeder cable near circuit breaker B1-764. Use 0-50 AMPS Ammeter or equivalent to accomplish this test.

(c) Operate auxiliary hydraulic pump, measure and record current readings for phases A, B, and C (PAGEBLOCK 29-10-06/201).

NOTE: To obtain consistant readings, do not operate any control surfaces.

(d) Compare readings for phases A, B, and C per percent phase imbalance formula and record results in Table 8. Make sure current readings for all three phases are within 30 percent of each other using following formula:

((High Reading - Low Reading) X 100)/Low Reading = Phase Imbalance Percent.

1) The table below is provided to record phase imbalance check results.

Table 609

Current Reading	AMPS
Phase A	
Phase B	
Phase C	
Phase Imbalance Percent	

(e) Turn off auxiliary hydraulic pump.

(12) After completion of tests, perform as applicable to results:

(a) Condition 1 - No fault with pump motor or aircraft wiring.

1) Auxiliary hydraulic pump is acceptable for continued operation.

(b) Condition 2 - Pump motor fails any check.

1) Replace auxiliary hydraulic pump with serviceable pump. (PAGEBLOCK 29-10-06/201)

(c) Condition 3 - Aircraft wiring fails any check.

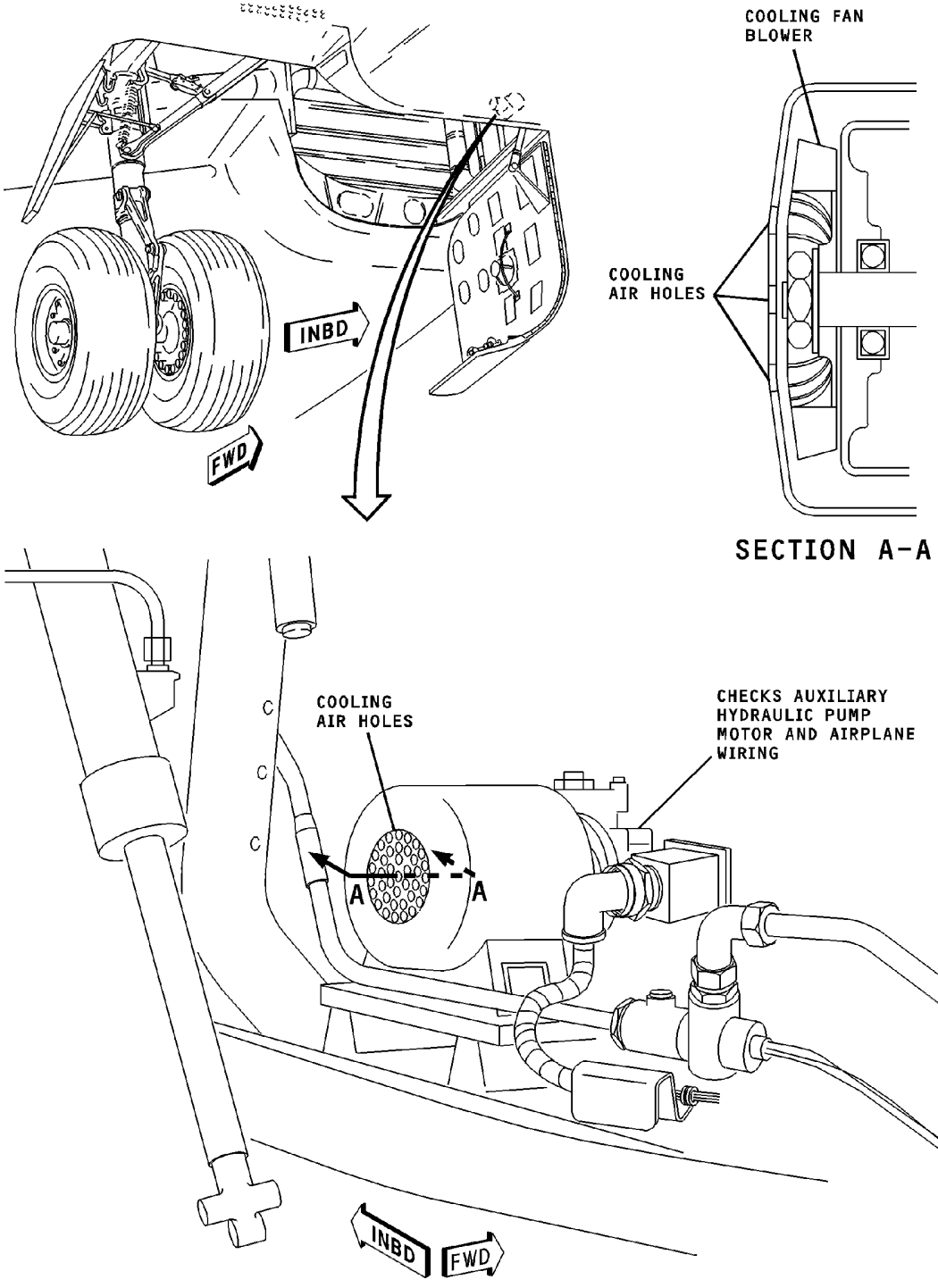
1) Troubleshoot and repair aircraft wire harness. (Figure 602) or (Ref. 29-21-00, WDM).

(13) Pressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

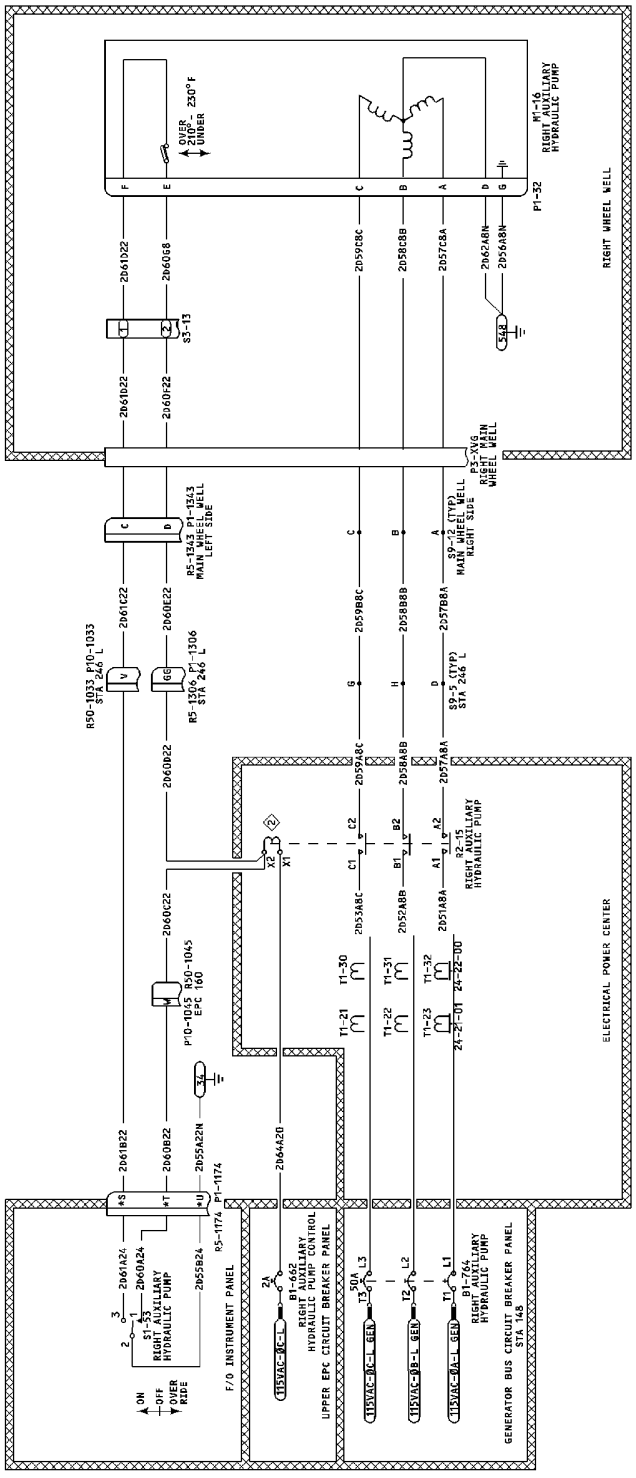
(14) Close right main landing gear door.

(15) Depressurize hydraulic system. (PAGEBLOCK 29-00-00/201)

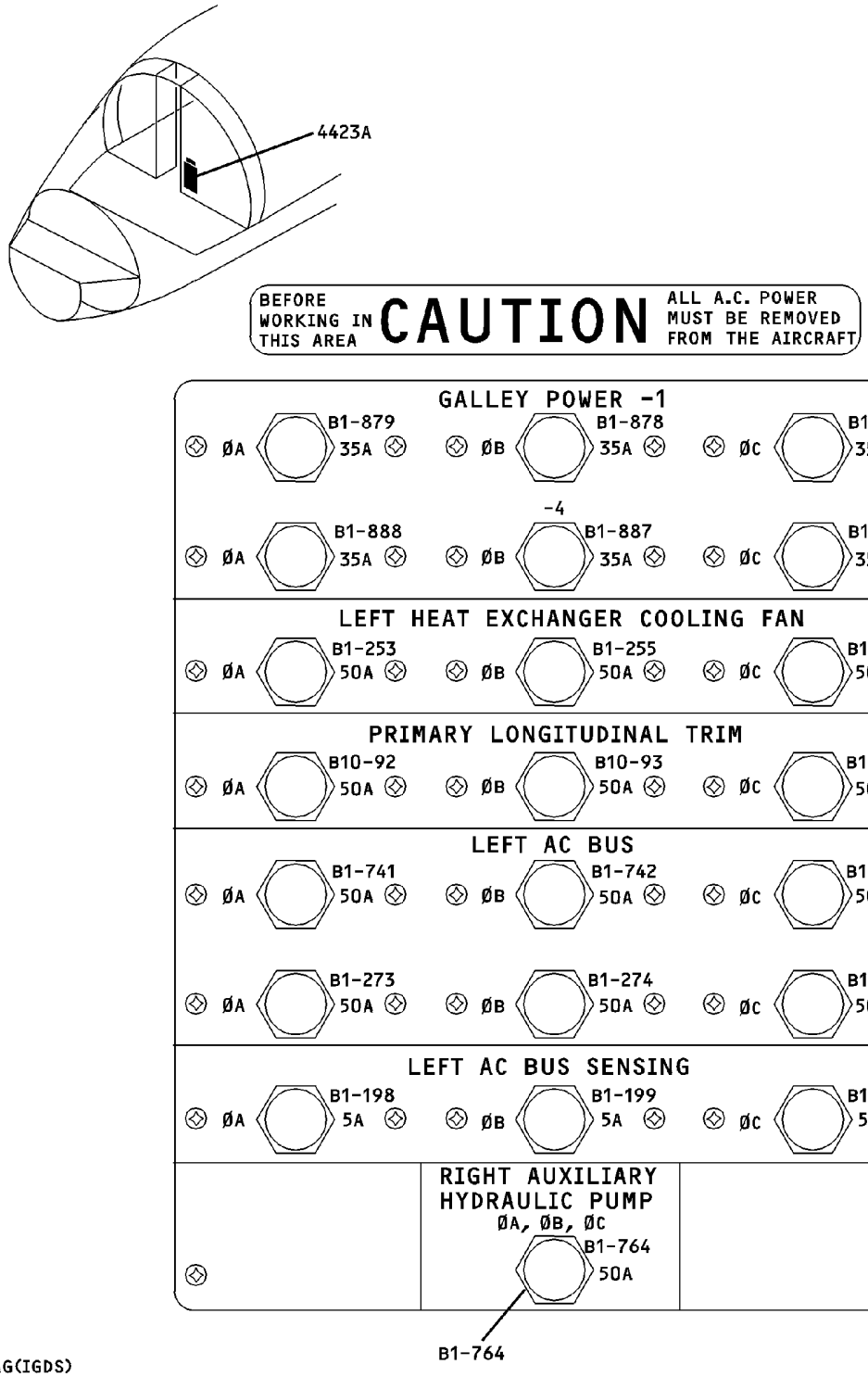
(16) Remove tools and equipment from area. Clean work area.



Scope of Hydraulic Pump Motor Rotational Check
Figure 601/29-10-06-990-801



Auxiliary Hydraulic Pump Control - Wiring Diagram
Figure 602/29-10-06-990-802



Circuit Breaker Panel Location
Figure 603/29-10-06-990-803

ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - INSPECTION/CHECK

1. General

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

TASK 29-10-06-211-801

2. Detailed Inspection of the Auxiliary Hydraulic Pump Seal Drain Container for Fluid due to Loss of Seal

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Auxiliary Hydraulic Pump Seal Drain Container for Fluid due to Loss of Seal Detailed Inspection

SUBTASK 29-10-06-840-001

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

NOTE: The container is located in the right wheelwell next to the hydraulic reservoir.

C. Auxiliary Hydraulic Pump Seal Drain Container for Fluid due to Loss of Seal Detailed Inspection

SUBTASK 29-10-06-211-001

(1) Do a detailed inspection of the auxiliary hydraulic pump seal drain container for fluid. Presence of hydraulic fluid in the container is an indication of pump seal leakage.

D. Job Close-up

SUBTASK 29-10-06-840-002

(1) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-10-06-942-001

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

END OF TASK

HYDRAULIC POWER TRANSFER UNIT - MAINTENANCE PRACTICES

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

A. The two hydraulic systems are connected together mechanically by the hydraulic power transfer unit, located on the center panel in the left main gear wheel well. Access is through the left main gear inboard door. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Lockwire, NASM20995N32, DPM684	Not specified

3. Removal/Installation Hydraulic Power Transfer Unit

A. Remove Hydraulic Power Transfer Unit

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(4) Disconnect hydraulic lines and vent lines from fittings on hydraulic power transfer unit. Plug open lines.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(Figure 201)

WJE ALL

(Figure 202)

(5) If required, remove and retain all fittings and relief valve from transfer unit. Discard O-rings. Plug all open ports on transfer unit.

B. Install Hydraulic Power Transfer Unit

(1) Make certain door safety locks are installed.

(2) Make certain left and right hydraulic systems are depressurized.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install all fittings and relief valve in ports of hydraulic power transfer unit using new O-rings.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 891-893

NOTE: On aircraft with SB 29-43 incorporated, the case drain port fittings (unions) have been replaced with check valves.

WJE 401-404, 412, 414, 886, 887

NOTE: Case drain port fittings (unions) are check valves.

WJE ALL

(5) Position transfer unit on support plate and shock mount and install attach bolts.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 875-881, 883, 884, 891

(Figure 201)

WJE ALL

(Figure 202)

(6) Connect pressure and suction-return lines to fittings on transfer unit.

CAUTION: BEFORE OPERATING HYDRAULIC POWER TRANSFER UNIT, CASES OF BOTH UNITS MUST CONTAIN AS MUCH HYDRAULIC FLUID AS POSSIBLE TO PREVENT PUMPS FROM OPERATING WITHOUT LUBRICATION DURING SELF-PRIMING PERIOD.

(7) Fill cases of transfer unit with clean hydraulic fluid through case drain ports.

(8) Connect case drain lines and vent lines to fittings on transfer unit.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(10) Prime and bleed Power Transfer Unit (PTU) with hydraulic system hand pumps.

(a) Remove the safety tag and close this circuit breaker:

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

(b) Place TRANS pump switch, located on first officer's instrument panel to ON to open motor-operated dual shutoff valves in left wheel well.

(c) Place spoiler shutoff and system depressurization valves, located in left and right wheel wells, to OFF.

(d) Pressurize right hydraulic system reservoir with right hydraulic system hand pump.

(e) Operate left hydraulic system hand pump while listening for power transfer unit to rotate as it fills with fluid from both systems. Continue pumping another 20 strokes (minimum) while listening as unit rotates.

(f) Place TRANS pump switch, located on first officer's instrument panel, to OFF.

(g) Place spoiler shutoff and system depressurization valves, located in left and right wheel wells, to SPOILER ON and safety.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(11) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(12) Fill and bleed system reservoirs, if applicable. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(13) Depressurize left hydraulic system only. (PAGEBLOCK 29-00-00/201)

(14) Place TRANS pump switch, located on first officer's instrument panel, in ON position. Left hydraulic system pressure indicator should indicate 2800(±300) psi (19320(±2070) kPa) during a steady demand operation.

NOTE: Pressure fluctuations between 2000 psi and 3100 psi (13800 kPa and 21390 kPa) are normal during an on-off mode of operation (no demand).

(15) If pressure fluctuates below 2000 psi (13800 kPa) on left hydraulic system pressure indicator, perform the following:

(a) Place transfer pump switch in OFF position.

(b) Depressurize left hydraulic system.

(c) Depressurize left brake system.

(d) Depressurize left thrust reverser system.

(e) With right hydraulic system pressurized, place transfer pump switch to ON position.

(f) Check left hydraulic system pressure at brake pressure indicator to assure 2500 psi (17250 kPa) or more is being maintained at all times.

(16) Check hydraulic power transfer unit hydraulic connections for leaks.

(17) Place TRANS pump switch in OFF position.

(18) Depressurize right hydraulic system.

(19) Pressurize left hydraulic system.

(20) Place TRANS pump switch in ON position. Right hydraulic system pressure indicator should indicate 2800(±300) psi (19320(±2070) kPa) during steady demand operation.

NOTE: Pressure fluctuations between 2000 psi and 3100 psi (13800 kPa and 21390 kPa) are normal during an on-off mode of operation (no demand).

(21) If pressure fluctuates below 2000 psi (13800 kPa) on right hydraulic system pressure indicator, perform the following:

(a) Place transfer pump switch in OFF position.

(b) Depressurize right hydraulic system.

(c) Depressurize right brake system.

(d) Depressurize right thrust reverser system.

(e) With left hydraulic system pressurized, place transfer pump switch to ON position.

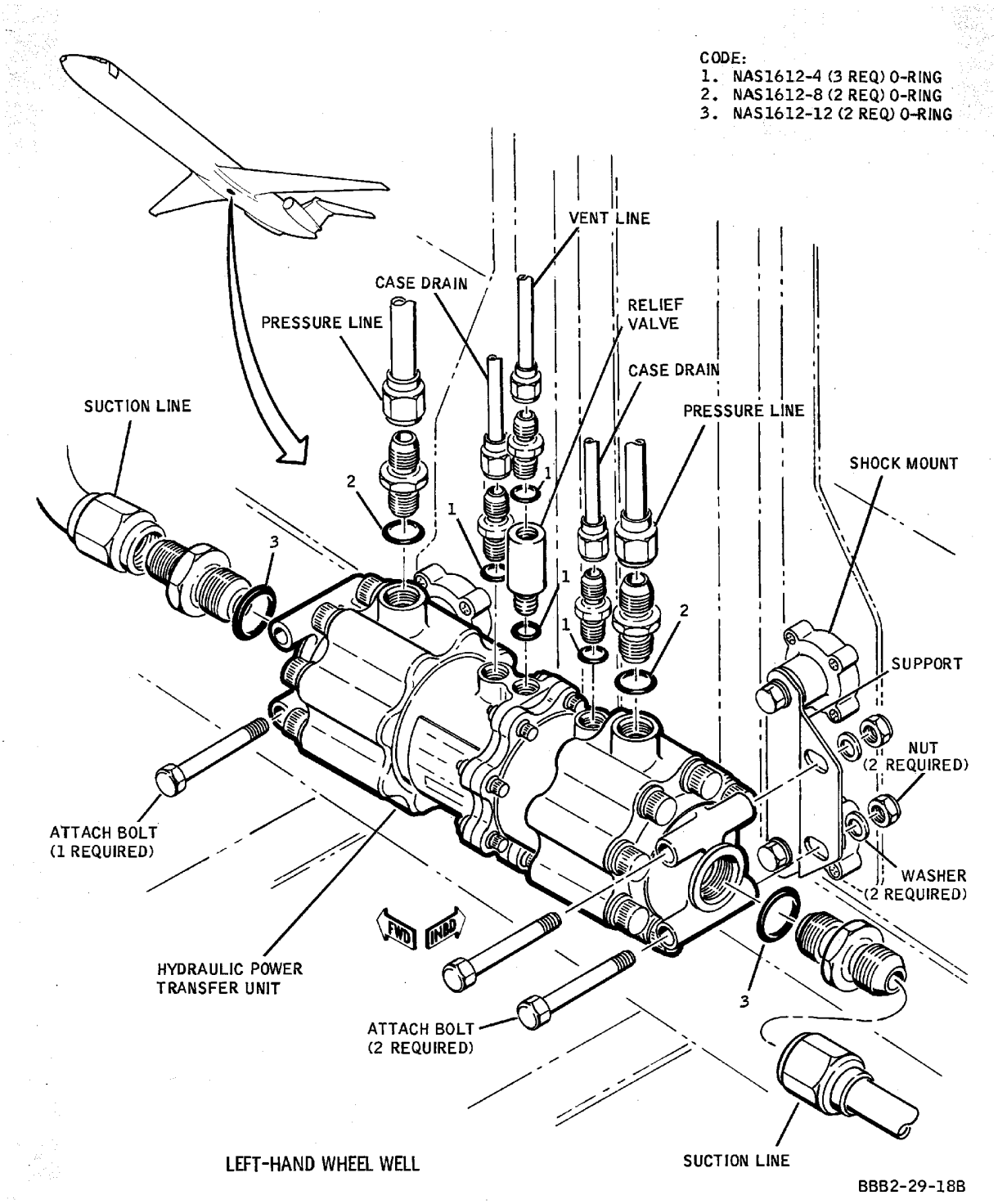
(f) Check right hydraulic system pressure at brake pressure indicator to assure 2500 psi or more is being maintained at all times.

(22) Check hydraulic power transfer unit hydraulic connections for leaks.

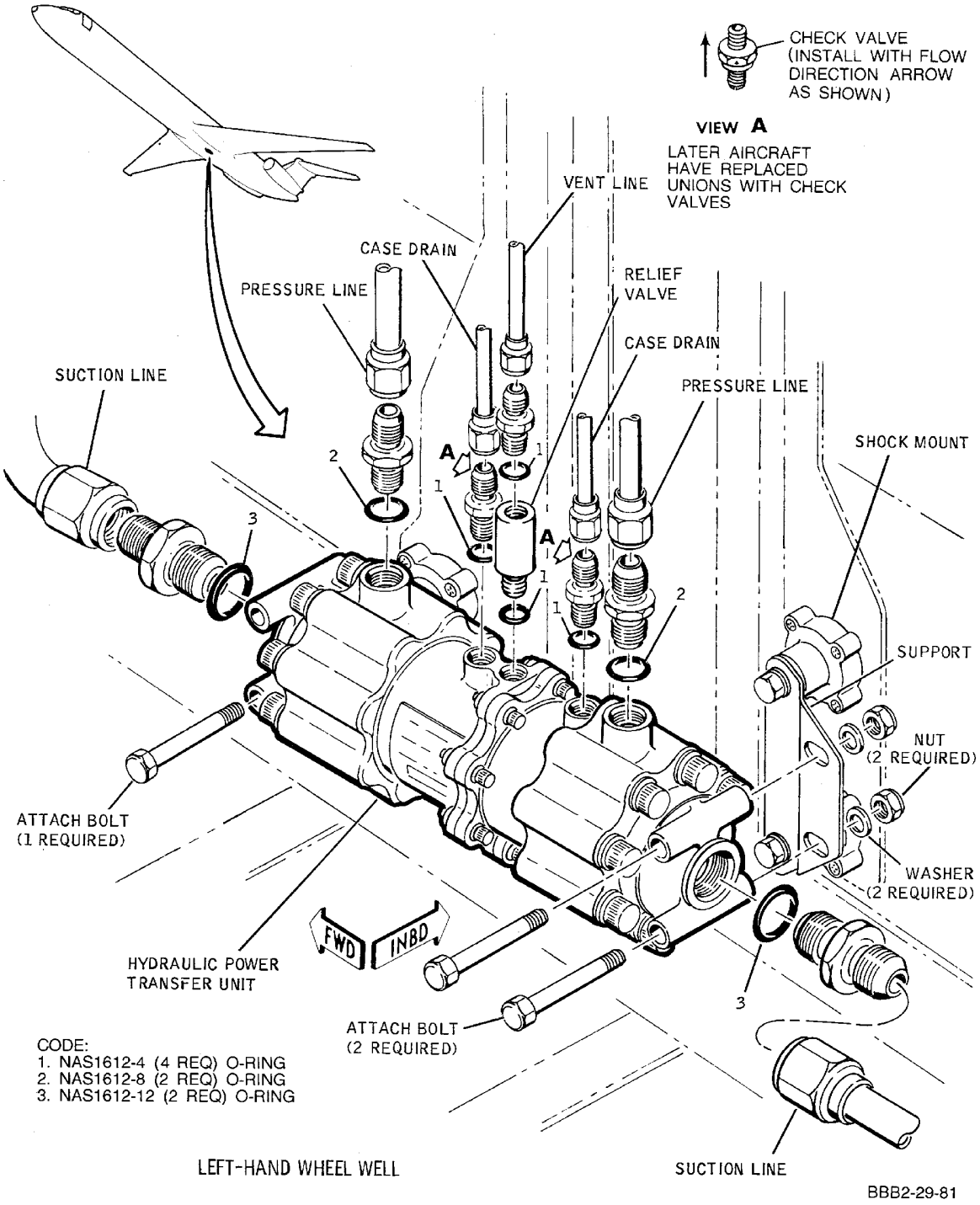
(23) Place TRANS pump switch in OFF position.

(24) Shut off left hydraulic system pressure source.

(25) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Hydraulic Power Transfer Unit -- Removal/Installation Aircraft Without SB 29-43 Incorporated
Figure 201/29-10-07-990-801



Hydraulic Power Transfer Unit -- Removal/Installation Aircraft With SB 29-43 Incorporated
Figure 202/29-10-07-990-802

HYDRAULIC POWER TRANSFER UNIT - INSPECTION/CHECK

1. General

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

TASK 29-10-07-211-801

2. Detailed Inspection of the Transfer Pump Seal Drain Container for Fluid due to Loss of Seal

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Transfer Pump Seal Drain Container for Fluid due to Loss of Seal Detailed Inspection

SUBTASK 29-10-07-840-001

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

NOTE: The container is located in the left wheelwell next to the hydraulic reservoir.

C. Transfer Pump Seal Drain Container for Fluid due to Loss of Seal Detailed Inspection

SUBTASK 29-10-07-211-001

(1) Do a detailed inspection of the transfer pump seal drain container for fluid. Presence of hydraulic fluid in the container is an indication of pump seal leakage.

D. Job Close-up

SUBTASK 29-10-07-840-002

(1) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-10-07-942-001

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

MOTOR OPERATED DUAL SHUT OFF VALVE - MAINTENANCE PRACTICES

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

A. The motor operated dual shutoff valve is mounted on the left main gear wheel well center panel, directly above the hydraulic power transfer unit.

B. Access to the shutoff valve is through the left main gear inboard door. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501 (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Inconel Lockwire 0.032 in NASM20995N32, DPM 684	Not specified
Corrosion Resistant Steel Lockwire 0.032 in NASM20995C32, DPM 5865	Not specified

3. Removal/Installation Motor Operated Dual Shutoff Valve

A. Remove Motor Operated Shutoff Valve

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(4) Disconnect hydraulic lines from fittings on shutoff valve. Plug open lines.

(5) Disconnect electrical connector from motor. Cap motor electrical connector.

(6) Remove attach bolts and remove motor operated dual shutoff valve.

(7) If required, remove and retain fittings from shutoff valve. Discard O-rings. Plug all open ports on shutoff valve.

B. Install Motor Operated Dual Shutoff Valve

(1) Make certain left and right hydraulic systems are depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install fittings in shutoff valve using new O-rings.

(5) Position shutoff valve and install attach bolts.

(6) Connect hydraulic lines to shutoff valve fittings.

(7) Examine the electrical connector(s) and receptacle(s) for damage and unwanted material. (ELECTRICAL CONNECTORS - MAINTENANCE PRACTICES, SWPM 20-31-00)

(8) Connect electrical connector to shutoff valve motor. Safety electrical connector with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

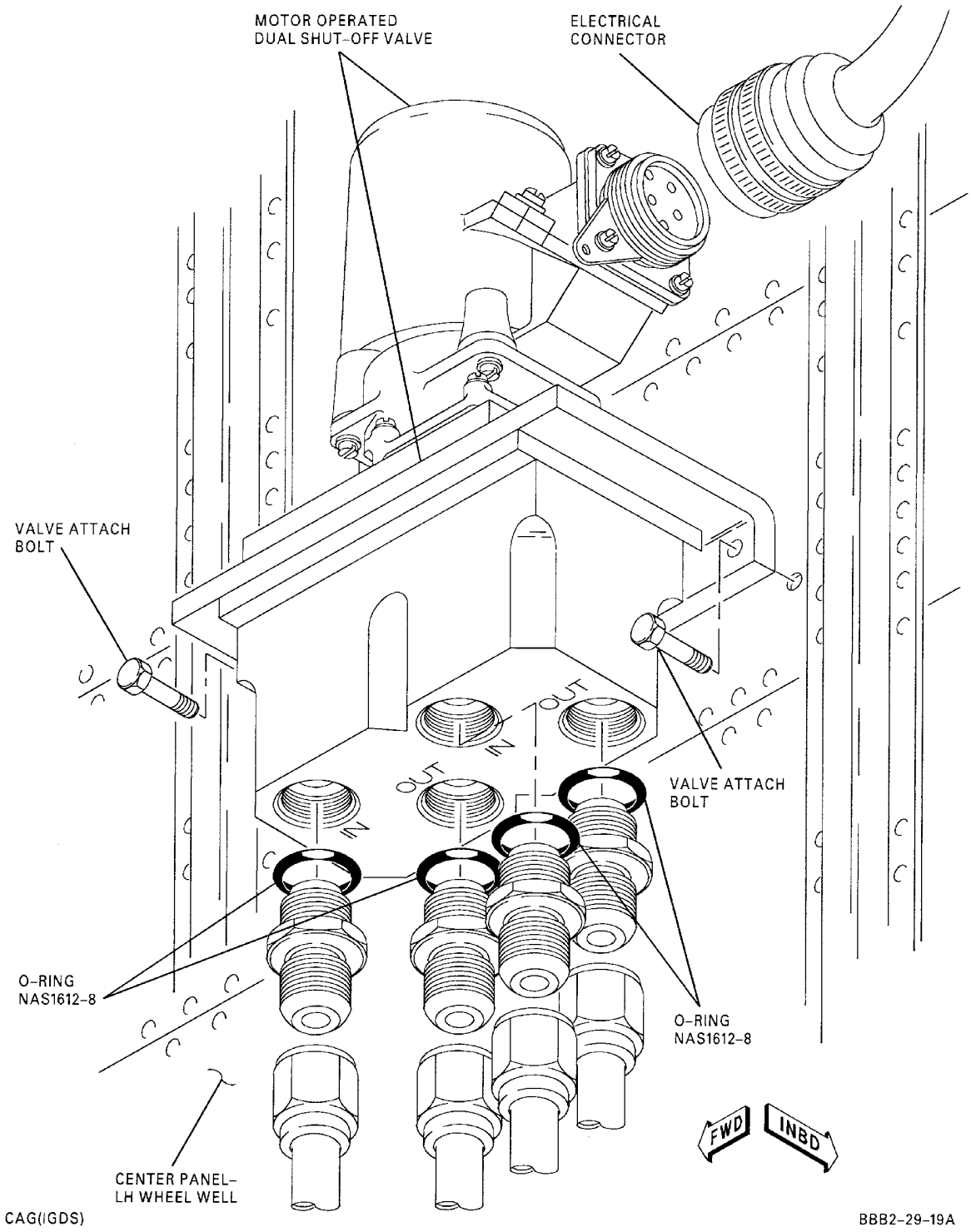
LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(10) Do the operation test of the left and right hand hydraulic system low level switches. (Paragraph 4.)



Motor Operated Dual Shutoff Valve -- Removal/Installation
Figure 201/29-10-08-990-801

4. Test Motor Operated Dual Shutoff Valve Low Level Switch

A. Test Operation of Left Hand and Right Hand Hydraulic System Low Level Switches

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(1) Pressurize left and right hydraulic systems. (PAGEBLOCK 29-00-00/201)

(2) Fill and bleed system reservoirs, if applicable. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left hydraulic system only. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

CAUTION: BEFORE OPERATING HYDRAULIC POWER TRANSFER UNIT, CASES OF BOTH UNITS MUST CONTAIN AS MUCH HYDRAULIC FLUID AS POSSIBLE TO PREVENT PUMPS FROM OPERATING WITHOUT LUBRICATION DURING SELF-PRIMING PERIOD.

(4) Place TRANS pump switch, located on first officer's instrument panel, in ON position. Motor operated dual shutoff valve should open and hydraulic power transfer unit should actuate. Left hydraulic system pressure indicator should indicate 2800(±300) psi.

(5) Check motor operated dual shutoff valve hydraulic connections for leaks.

(6) Manually actuate low level switch (audible click), located on right reservoir cover, to simulate reservoir fluid low, motor operated dual shutoff valve should close and hydraulic power transfer unit should deactuate.

(7) Release low level switch, shutoff valve should open and hydraulic power transfer unit should actuate.

(8) Place TRANS pump switch in OFF position.

(9) Depressurize right hydraulic system.

(10) Pressurize left hydraulic system.

(11) Place TRANS pump switch in ON position. Motor operated dual shutoff valve should open and hydraulic power transfer unit should actuate. Right hydraulic system pressure indicator should indicate 2800(±300) psi.

(12) Check shutoff valve hydraulic connections for leaks.

(13) Perform Paragraph 4.A.(6) and (Paragraph 4.A.(7)) using low level switch on left reservoir cover.

(14) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(15) Place TRANS pump switch in OFF position.

(16) Shut off left hydraulic system pressure source.

HYDRAULIC POWER TRANSFER UNIT (PTU) SHUTOFF SYSTEM - FUNCTIONAL CHECK

1. General

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

TASK 29-10-08-720-802

2. Functional Check of the Hydraulic Power Transfer Unit (PTU) Shutoff System

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
12-13	HYDRAULIC SYSTEMS REPLENISHING
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Hydraulic Power Transfer Unit (PTU) Shutoff System Functional Check

SUBTASK 29-10-08-860-001

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Make landing gear safe for maintenance. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-10-08-861-001

(2) Apply electrical power to the aircraft.

(a) Verify hydraulic quantity and pressure are indicated.

SUBTASK 29-10-08-611-001

(3) Make sure that the left and right hydraulic system reservoirs are properly serviced. (HYDRAULIC SYSTEMS REPLENISHING, SECTION 12-13)

SUBTASK 29-10-08-863-001

(4) Pressurize the right hydraulic system using the Electric Auxiliary Hydraulic Pump (AUX).

SUBTASK 29-10-08-863-002

(5) Pressurize the left hydraulic system by placing the TRANS pump switch in the ON position.

(a) The hydraulic Power Transfer Unit (PTU) shutoff valve should open and the PTU should operate.

(b) Verify in the cockpit that the left and right hydraulic systems are pressurized.

C. Do a Functional Check of the Hydraulic Power Transfer Unit (PTU) Shutoff System

SUBTASK 29-10-08-720-001

(1) On the left hydraulic system reservoir cover, (carefully) manually actuate the left hydraulic system low level switch lever to the down position (audible click).

(a) Verify that the hydraulic PTU shutoff valve closed and the left system pressure decreased toward 0 psi.

(b) Release the left hydraulic system low level switch lever and verify that the hydraulic PTU shutoff valve opened and the left system pressure increased to 2800 +/- 300 psi.

(2) Repeat steps C.(1) through C.(1)(b) for the right hydraulic system reservoir low level switch.

(3) Place the TRANS pump switch in the OFF position.

(a) The Hydraulic PTU shutoff valve should close.

(b) The PTU should stop operating.

(c) The left hydraulic system pressure should decrease to 0 psi.

(4) Place the Electric Auxiliary Hydraulic Pump (AUX) switch to the OFF position.

(a) The right hydraulic system pressure should decrease to 0 psi.

(5) Remove the door safety locks, close the inboard doors, and return the main gear door ground maintenance bypass lever to the normal (lever retracted) position.

(6) Place the Electric Auxiliary Hydraulic Pump (AUX) switch in the ON position.

(a) Verify that the inboard main landing gear doors remain closed with the right hydraulic system pressurized.

(7) Place the Electric Auxiliary Hydraulic Pump (AUX) switch in the OFF position.

D. Job Close-up

SUBTASK 29-10-08-942-002

(1) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

GROUND SERVICE HANDPUMP - MAINTENANCE PRACTICES

1. General

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

A. Each hydraulic system is equipped with a ground service hand-pump. The pumps are located in the forward outboard corner of each main gear wheelwell. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right handpumps are identical. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Ground Service Handpump

A. Remove Handpump

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic systems, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Disconnect suction and pressure lines.

(5) Remove pump.

(6) If required, remove fittings from pump ports; retain for use in new pump. Discard O-rings.

B. Install Handpump

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install fittings in handpump using new O-rings.

(5) Install pump.

(6) Connect hydraulic lines to pump.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893

(8) Place RH spoiler shutoff and system depressurization valve in off position.

WJE 401-404, 412, 414-427, 429, 861-866, 868, 869, 871-879, 886, 887, 891-893 (Continued)

(9) Operate handpump sufficiently to pressurize hydraulic system to 3000 psi. Check fittings and lines for leakage.

WJE 405-411, 880, 881, 883, 884

(10) On aircraft 101-103, operate handpump sufficiently to pressurize hydraulic system to 3000 psi. Check fittings and lines for leakage.

(11) On aircraft 104-999, place RH spoiler shutoff and system depressurization valve in off position.

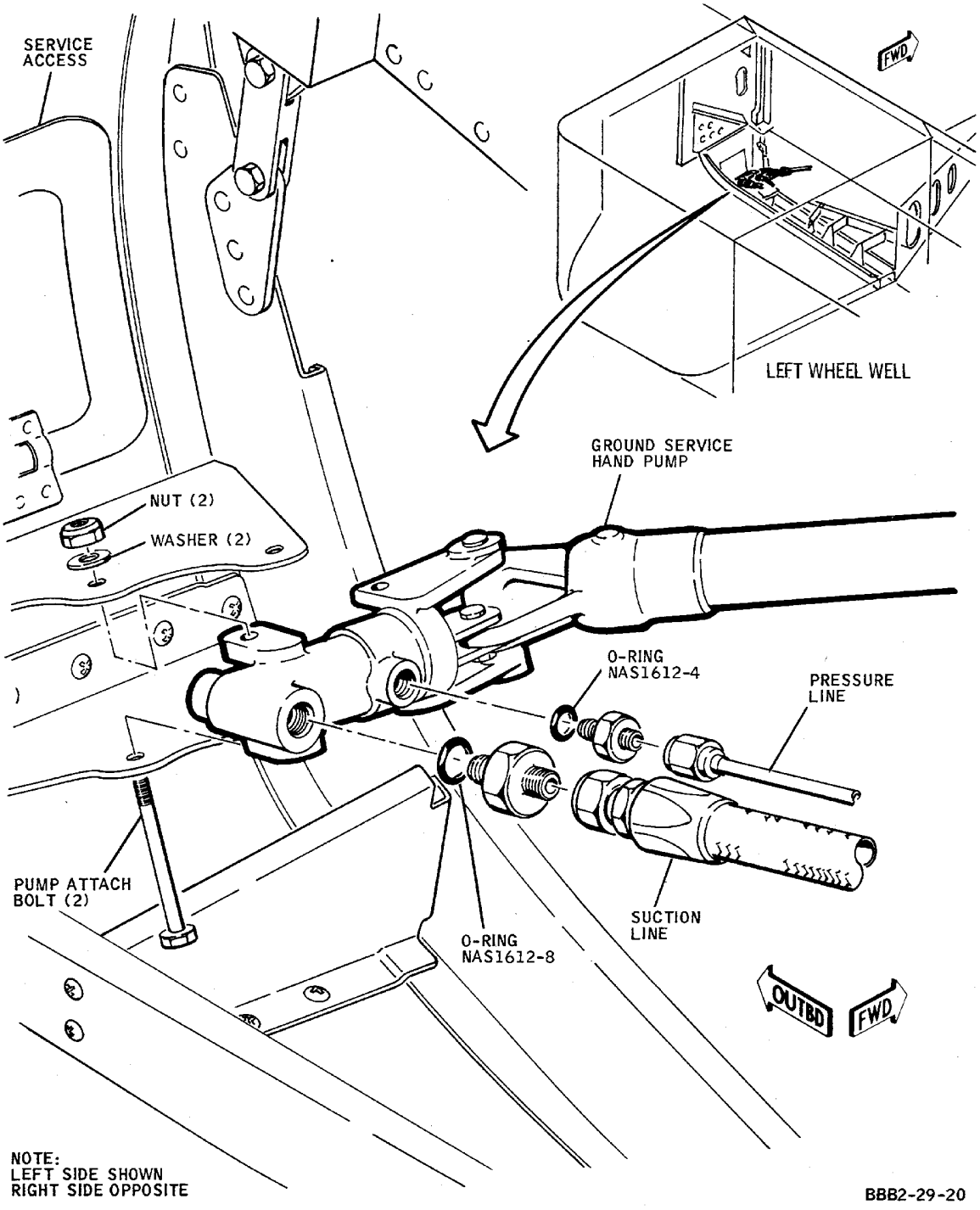
(12) Operate handpump to pressurize hydraulic system to 3000 psi. Check fittings and lines for leakage.

WJE ALL

(13) Return RH spoiler shutoff and system depressurization valve to open position.

(14) Bleed and fill reservoir, if applicable. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(15) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).



Ground Service Handpump -- Removal/Installation
Figure 201/29-10-10-990-801

HYDRAULIC POWER SYSTEM PRESSURE RELIEF VALVE - MAINTENANCE PRACTICES

1. General

A. Each hydraulic system is equipped with a power system pressure relief valve to relieve excessive pressure delivered by the system pumps or external power source. The relief valves are located in the forward inboard corner of each main gear wheelwell.

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

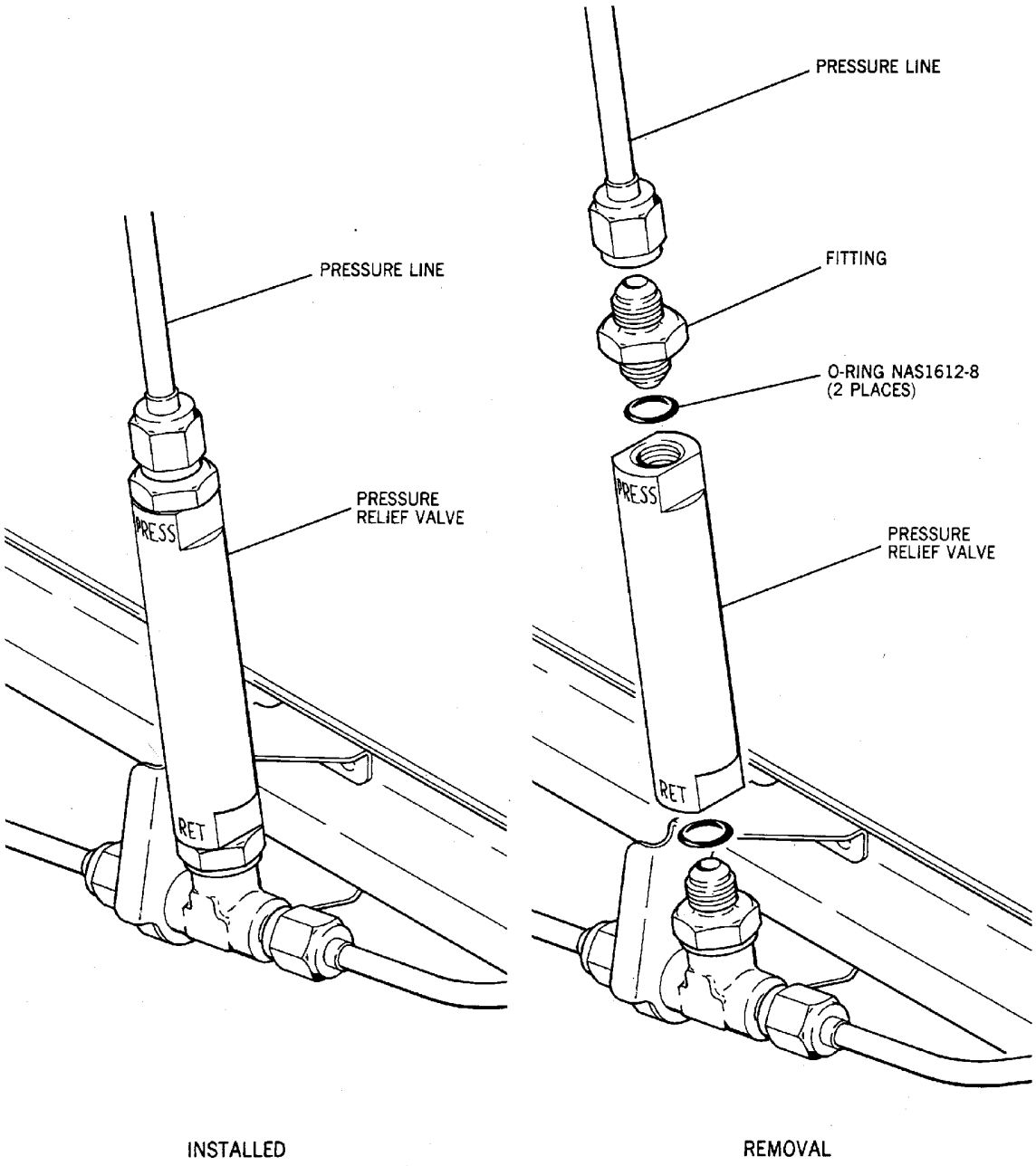
B. Access is through the left or right main gear inboard door. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501 (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.



Hydraulic Power System Pressure Relief Valve -- Removal/Installation
Figure 201/29-10-12-990-801

3. **Removal/Installation Hydraulic Power System Pressure Relief Valve**

A. Remove Pressure Relief Valve

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Disconnect hydraulic line from return end of pressure relief valve.

(5) Remove valve from pressure line fitting. Discard O-ring.

(6) If required, remove fitting from return port of valve, retain fitting. Discard O-ring.

B. Install Pressure Relief Valve

(1) Make certain door safety locks are installed.

(2) Make certain applicable hydraulic system is depressurized.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, using new O-ring install fitting in return port of pressure relief valve.

CAUTION: MAKE CERTAIN THAT PRESSURE PORT OF VALVE IS CONNECTED TO PRESSURE LINE FITTING AND RETURN LINE IS CONNECTED TO RETURN PORT OF VALVE. REVERSED CONNECTIONS WILL PREVENT VALVE FROM RELIEVING IF AN OVERPRESSURE CONDITION OCCURS.

(5) Using new O-ring, install relief valve on pressure line fitting.

(6) Connect hydraulic line to return port fitting of valve.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(8) Pressurize applicable hydraulic system; bleed and fill reservoir as required. (PAGEBLOCK 29-00-00/201) (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(9) Check pressure relief valve connections and fittings for leakage.

(10) Shutoff hydraulic pressure source.

(11) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

HYDRAULIC SYSTEM FILTERS - MAINTENANCE PRACTICES

1. General

A. There are five hydraulic system filters installed in the pressure and return lines of each hydraulic system.

B. Two are installed in the pressure and case drain lines of each engine driven pump and are located in the aft accessory compartment, on each side of the fuselage just aft of the pressure dome. Two are installed in the return lines to each system reservoir and one is installed in the pressure line from each ground service panel and are located in the left and right wheelwell.

C. Removal and installation of the hydraulic system filters is identical except as noted.

D. Access to the engine driven pump filters is through the aft fuselage access door. Access to the return and pressure line filters for the reservoir and service line is through the left and right main gear inboard doors.

E. Each hydraulic system filter contains a disposable filter element which is replaced at regular intervals or in case of excessive contamination. (Paragraph 4.)

F. A spring-loaded diaphragm in the filter head prevents fluid loss when the filter bowl is removed for element replacement.

G. Each filter is equipped with a filter differential pressure indicator to show clogged filters. Removal/installation of the differential pressure indicator is identical for all filters. (Paragraph 6.)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501 (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Inconel Lockwire 0.032 in NASM20995N32, DPM684	Not specified
Corrosion Resistant Steel Lockwire 0.032 in NASM20995C32, DPM 5865	Not specified
Solvent, Douglas P-D-680, Type 1 DPM 518	
Skydrol DMS QPL 2014	Monsanto Chemical Co.

3. Removal/Installation Hydraulic System Filters

A. Remove Filter (Figure 201)

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic systems, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Disconnect hydraulic lines from filter fittings, cap or plug open lines.

NOTE: If filters are mounted in pairs and only one filter is being removed, it is not necessary to disconnect hydraulic lines from the other.

(5) Remove filter attach bolts and remove filter.

NOTE: If removing left engine driven pump filters, attach bolts are retained by nutplates. Right engine driven pump filters attach bolts are retained by nuts (Figure 201, View A and B).

(6) If required, remove fittings from filter and discard O-rings. Cap or plug open ports in filter.

B. Install Filter (Figure 201)

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install new O-rings and install fittings in filter ports.

(5) Position filter(s) and install attach bolts.

NOTE: If installing right engine driven pump filters, make certain spacer is inserted between rear side of mounting bracket and case drain filter (Figure 201, View B).

(6) Connect hydraulic lines to filter fittings.

(7) Remove filter bowl from filter, check element for cleanliness and fill filter bowl and element with clean hydraulic fluid.

(8) Install filter bowl hand tight until flange on bowl touches filter housing.

(9) Safety filter bowl with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Filters mounted in pairs are lockwired together. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(11) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTEND OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(12) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(13) Check filter hydraulic fittings, connections, and filter bowl for leakage.

(14) Check differential pressure indicator button on top of filter head. If extended, press indicator button to reset to flush position.

(15) Shut off hydraulic pressure source.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

(16) If applicable, leak check engine-driven hydraulic pump outlet pressure filter as follows:

(a) Place applicable (left or right) engine-driven pump control switch in HI position.

WARNING: BEFORE STARTING ENGINE TO PRESSURIZE HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

WARNING: EXERCISE EXTREME CAUTION TO AVOID ENGINE INLET AND EXHAUST AREAS WHILE ENGINE IS OPERATING. AVOID ALL OTHER ENGINE HAZARD AREAS (PAGEBLOCK 71-00-00/501 CONFIG 1).

(b) Start left or right (as applicable) engine. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8)

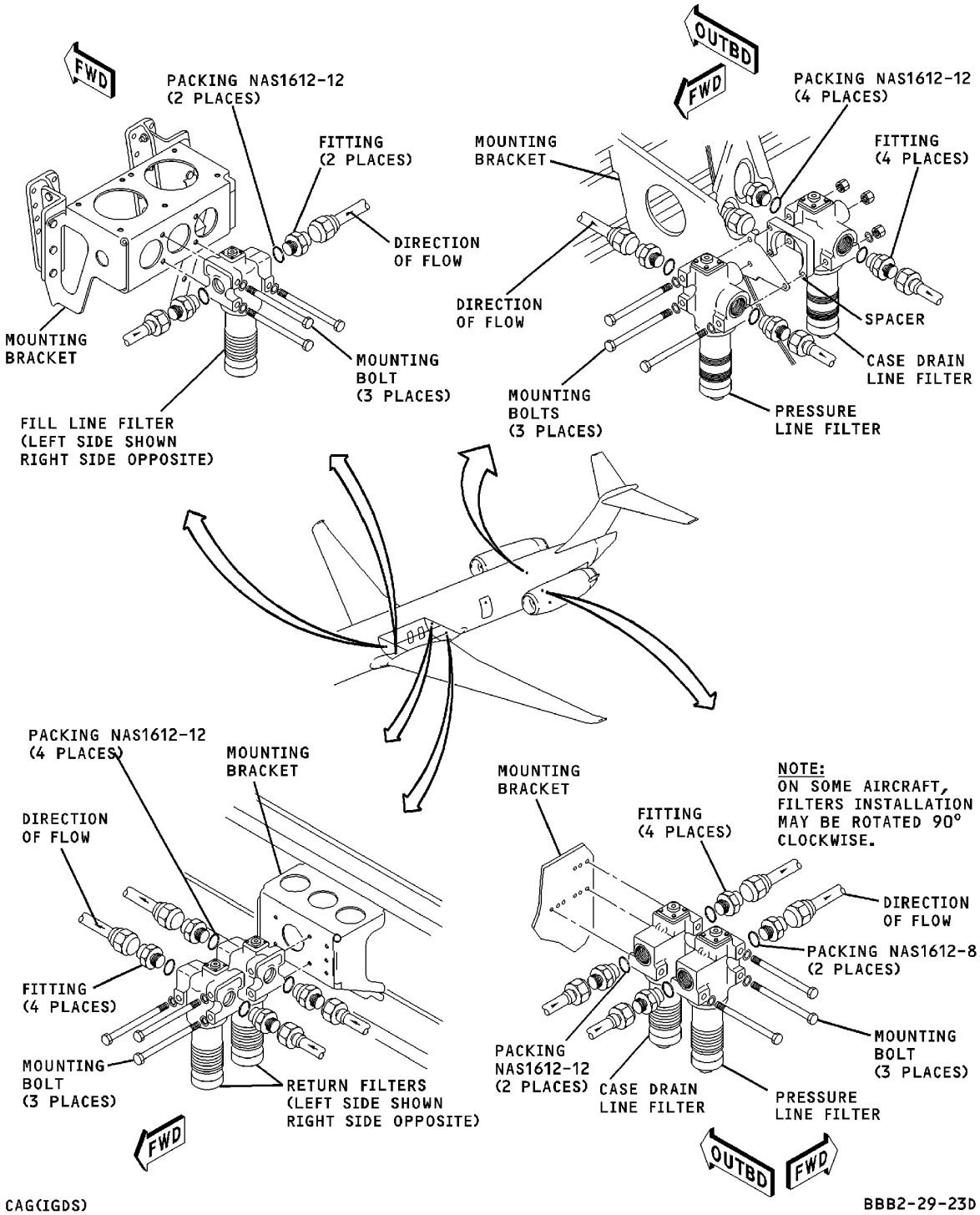
(c) With applicable enigne-driven hydraulic pump switch in HI position, check engine-driven pump pressure filter installation for hydraulic fluid leaks. (PAGEBLOCK 29-00-00/201)

(d) Place engine-driven hydraulic pump switch in OFF position.

(e) Shut down left or right (as applicable) engine. (GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 1 or GENERAL - ADJUSTMENT/TEST, PAGEBLOCK 71-00-00/501 Config 8)

WJE ALL

(17) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Hydraulic System Filters -- Removal/Installation
Figure 201/29-10-14-990-801

4. Removal/Installation Filter Element

A. Remove Element (Figure 202)

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Remove filter bowl.

NOTE: Maintain the bowl in an upright position until the fluid can be drained from it and the element removed. The filter head has an internal valve which automatically prevents fluid loss from the system when the filter bowl is removed.

(5) Remove and discard filter element.

B. Install Element

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(4) Clean filter bowl thoroughly with cleaning solvent, P-D-680, Type 1.

(5) Check that filter element spring is installed in filter head.

(6) Install new filter element in bowl; fill element and bowl with clean hydraulic fluid.

(7) Install filter bowl hand tight until flange on bowl touches filter housing. Safety with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(9) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

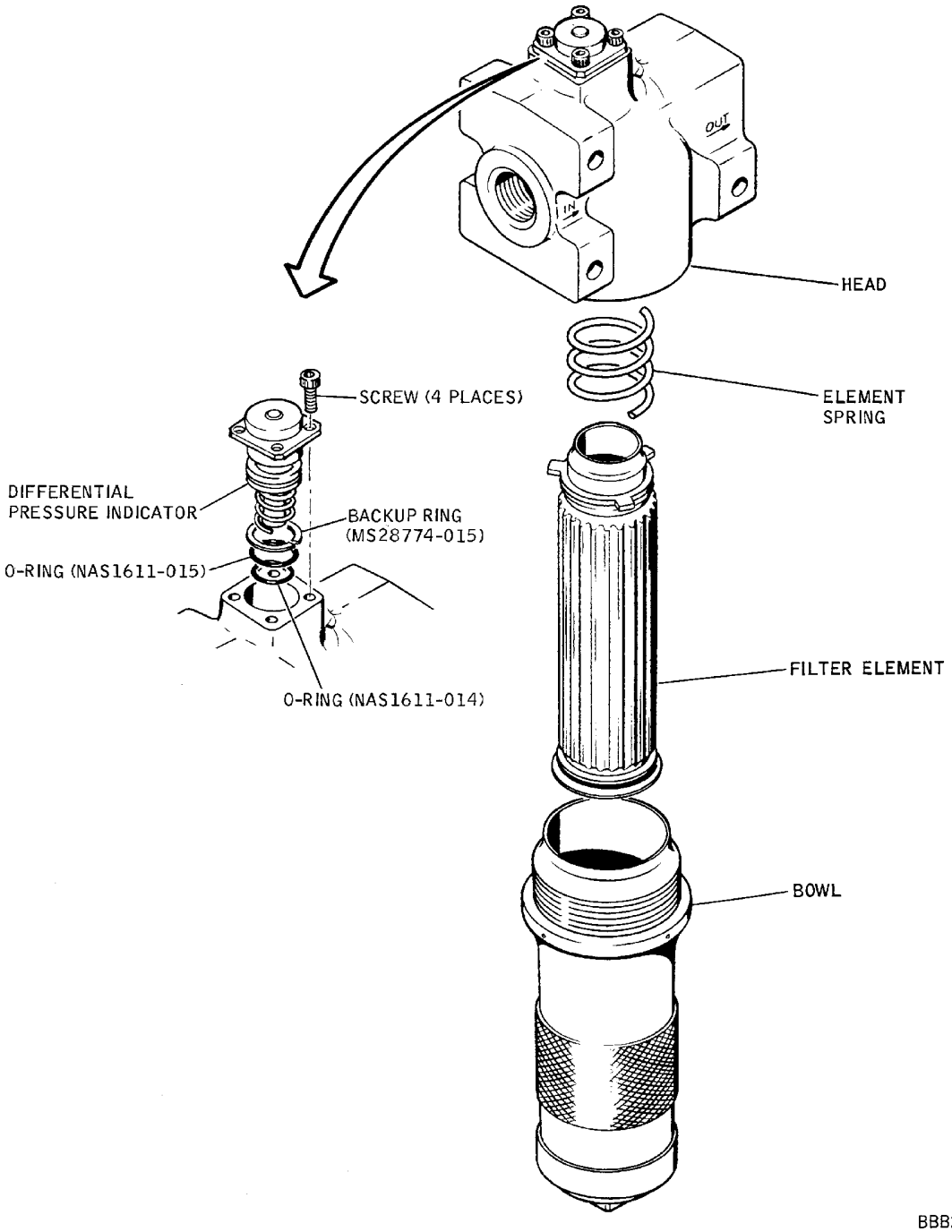
(10) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(11) Check filter bowl for leakage.

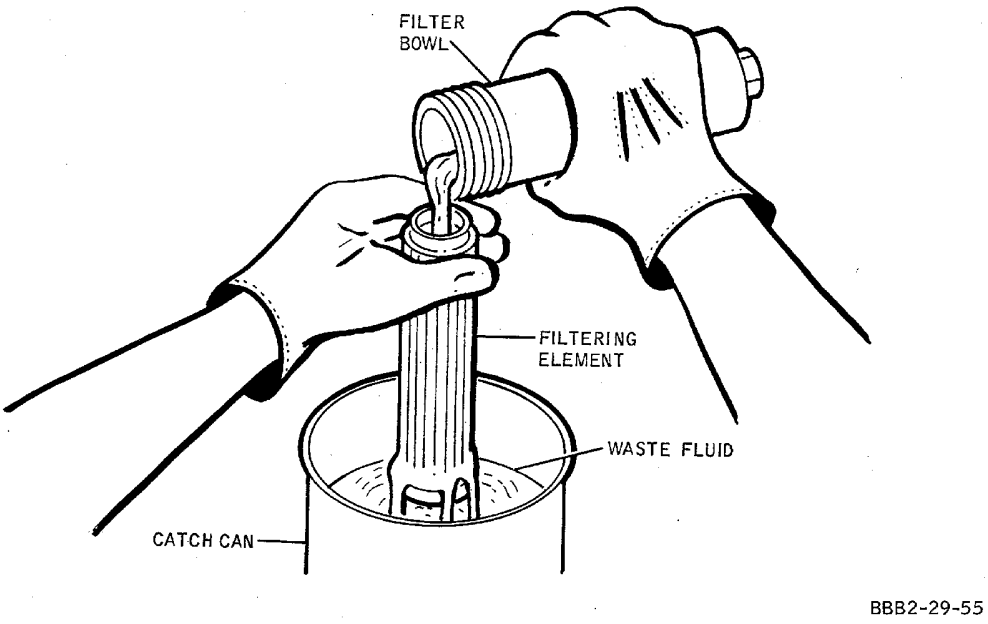
(12) Check differential pressure indicator button on top of filter head. If extended, press indicator button to reset to flush position.

(13) Shut off hydraulic pressure source.

(14) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Hydraulic Filter -- Element Replacement
Figure 202/29-10-14-990-802



Hydraulic Filter Pour Test
Figure 203/29-10-14-990-804

5. Check Filter Element

A. Filter Element Check (Pour Test)

NOTE: A visual inspection of the filter element can only determine the presence of metal or other large visible particles and an apparently clean filter can actually be partially clogged but not visible to detection. When in doubt, the following check can be performed to roughly determine the acceptable use of filter element. Conduct check at room temperature.

(1) Remove filter element and clean filter bowl.

WARNING: SKYDROL HYDRAULIC FLUID IS AN AGENT THAT IS AN IRRITANT. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN SKYDROL HYDRAULIC FLUID IS USED.

- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET SKYDROL HYDRAULIC FLUID IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS OR MIST.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(WARNING PRECEDES)

(2) Fill bowl with clean skydrol fluid.

(3) Time pouring operation within one (1) minute duration.

NOTE: Do not include the time it takes the element to drain - just the time to empty the bowl.

(4) Pour fluid from bowl fast enough to keep element full but not running over.

(5) If it takes more than one (1) minute to empty bowl, discard filter element and install new filter element.

6. Removal/Installation Filter Differential Pressure Indicator

A. Remove Indicator (Figure 202)

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic systems, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Remove indicator from filter head.

(5) Remove and discard O-rings and backup ring from indicator body.

B. Install Indicator

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) Install new backup ring and O-rings on indicator body. (Figure 202)

(5) Install indicator on filter head. Safety screw heads (in pairs) with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(7) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(8) Check indicator for general condition and leaks.

(9) Check that indicator button is reset in flush position.

(10) Shut off hydraulic pressure source.

(11) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

HYDRAULIC SYSTEM FILTERS - INSPECTION/CHECK

1. General

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

TASK 29-10-14-211-801

2. Detailed Inspection of the Delta Pressure Indicator on Hydraulic Filters

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Delta Pressure Indicator on Hydraulic Filters Detailed Inspection

SUBTASK 29-10-14-840-001

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

NOTE: Access to the engine driven pump filters is through the aft passenger entrance door to the aft accessory compartment behind the aft pressure bulkhead. Access to the return and pressure line filters for the reservoir and service line is through the left and right main gear inboard doors.

C. Delta Pressure Indicator on Hydraulic Filters Detailed Inspection

SUBTASK 29-10-14-211-001

(1) Do a detailed inspection of the delta pressure indicator button on top of each filter. Make sure that the indicator is not extended or popped out. (Figure 601)

NOTE: Two filters are installed in the pressure and case drain lines of each engine driven pump and are located in the aft accessory compartment, on each side of the fuselage just aft of the pressure dome. Two filters are installed in the return lines to each system reservoir and one filter is installed in the pressure line from each ground service panel and are located in the left and right wheelwell.

D. Job Close-up

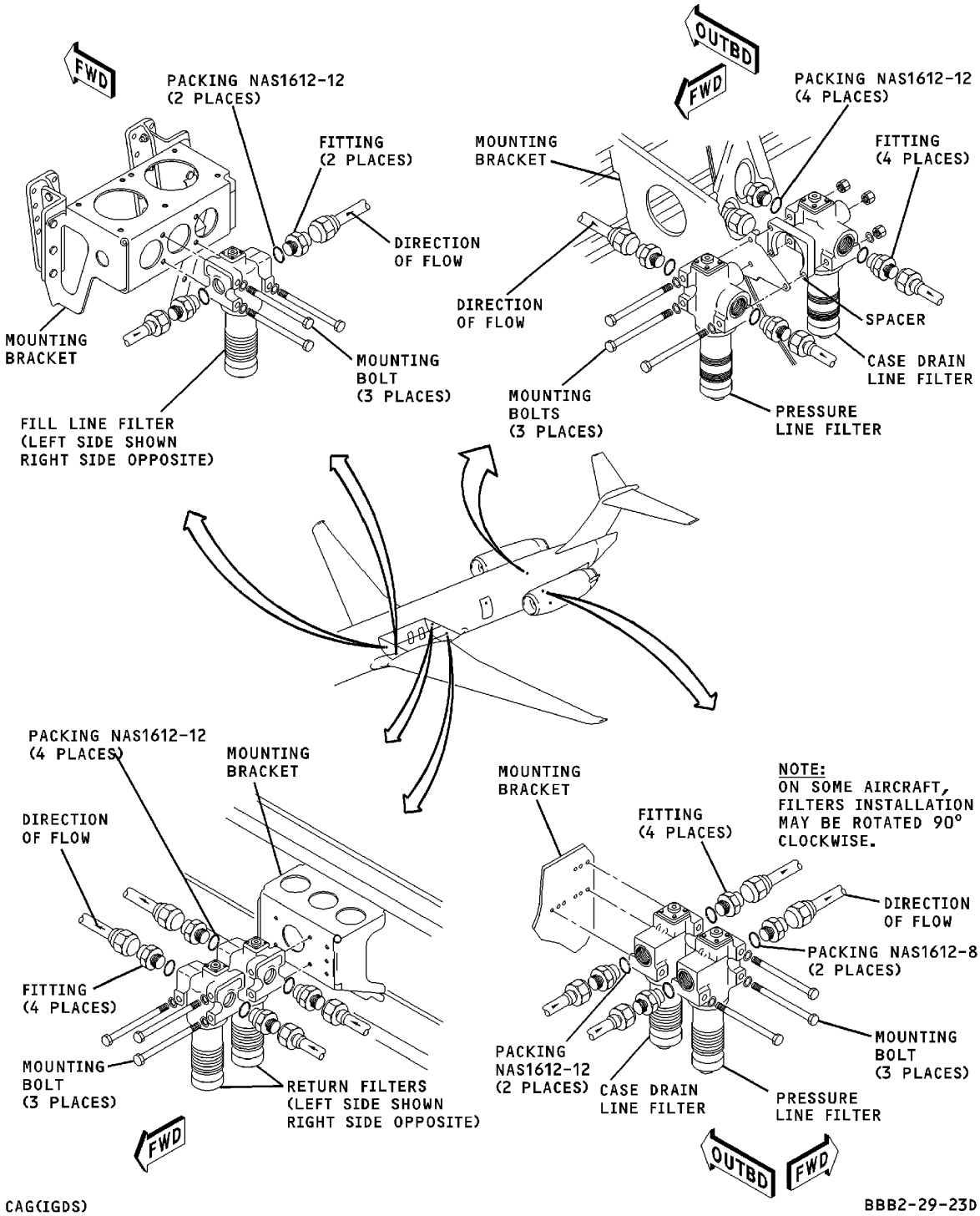
SUBTASK 29-10-14-840-002

(1) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-10-14-942-001

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———



Delta Pressure Indicator on Hydraulic Filters - Detailed Inspection
Figure 601/29-10-14-990-805

SPOILER SHUTOFF AND SYSTEM DEPRESSURIZATION VALVE - MAINTENANCE PRACTICES

1. General

A. The spoiler shutoff and system depressurization valves, one for each hydraulic system, are located on opposite sides of the airplane centerline panel in each main gear wheelwell.

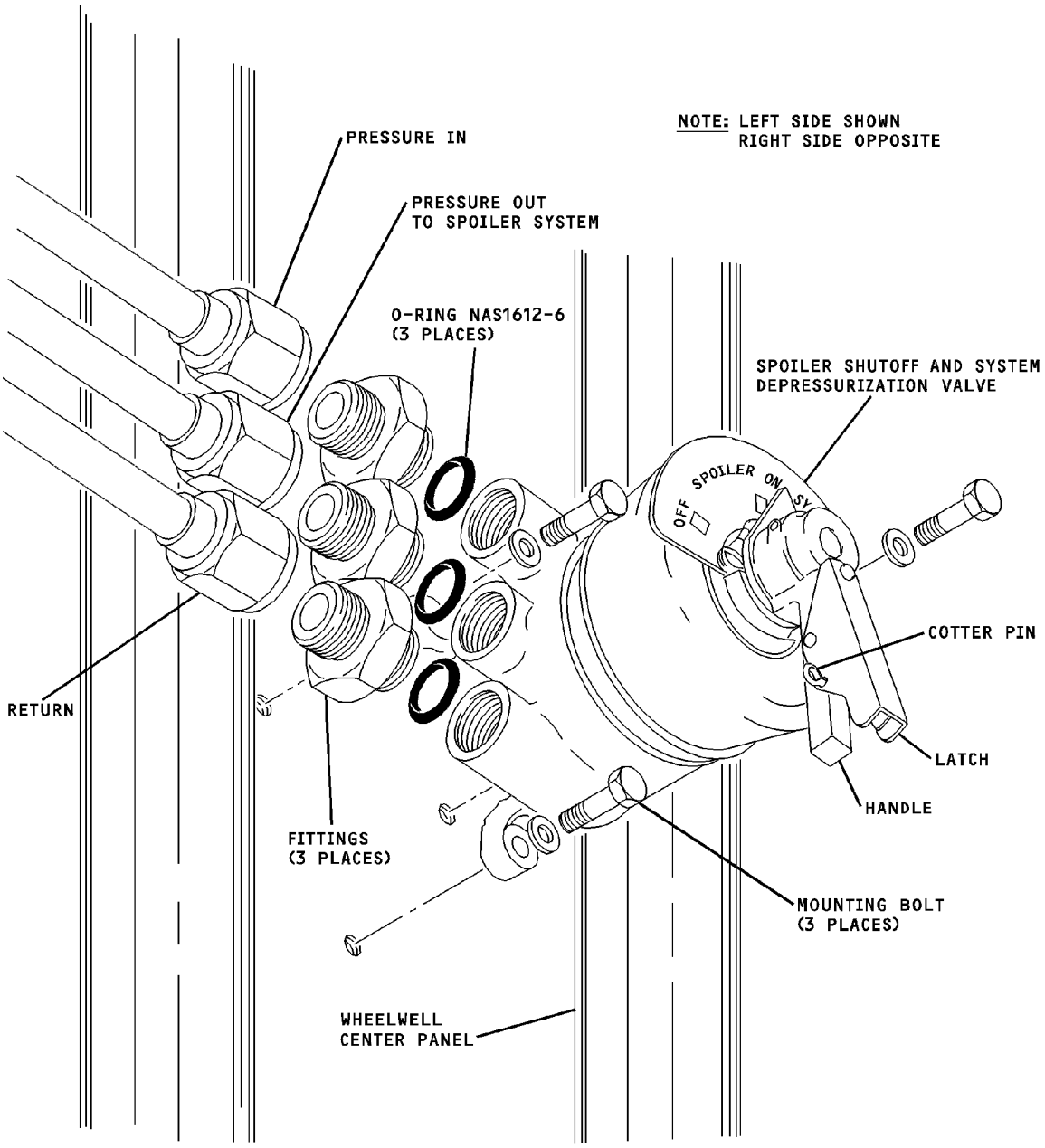
B. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right valves are identical.

2. Equipment and Materials

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	The Boeing Company
Cotter pin (MS24665-88)	



Spoiler Shutoff and System Depressurization Valve -- Removal/Installation
Figure 201/29-10-26-990-801

3. **Removal/Installation Spoiler Shutoff and System Depressurization Valve**

A. Remove Valve

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right hydraulic systems, as applicable. (PAGEBLOCK 29-00-00/201)

(4) Disconnect hydraulic lines.

(5) Remove valve.

(6) If required, remove fittings from valve; retain fittings for use on new valve. Discard O-rings.

B. Install Valve

(1) Make certain applicable hydraulic system is depressurized.

(2) Make certain door safety locks are installed.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, using new O-rings install fittings in valve.

(5) Install valve, rotate valve handle to SPOILER ON position, latch, and install cotter pin (MS24665-88).

(6) Connect hydraulic lines to valve.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(8) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEMS, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(9) Pressurize left or right hydraulic system, as applicable. (PAGEBLOCK 29-00-00/201)

(10) Make certain that applicable HYD PRESS LOW amber caution light on overhead annunciator panel is off.

(11) Check spoiler shutoff and system depressurization valve, lines, and fittings for leaks.

WARNING: BEFORE MOVING SPEEDBRAKE HANDLE OR AILERON CONTROL WHEEL, MAKE CERTAIN THAT AREA AROUND SPOILERS ARE CLEAR OF PERSONNEL AND EQUIPMENT.

(12) Check spoiler operations as follows:

(a) Manually move and lift speedbrake handle to full aft extended position (60° spoiler position), all spoilers should be extended.

(b) Manually move speedbrake handle to retract position, all spoilers should be fully retracted.

(13) Remove cotter pin and rotate handle to SPOILER OFF position; check that handle moves smoothly without sticking.

(14) Shut off hydraulic pressure source.

(15) Rotate handle to SYSTEM BYPASS position; check that handle moves smoothly without sticking.

(16) Rotate handle to SPOILER ON position, latch, and install cotter pin (MS24665-88). Check that latch engages properly and handle is immovable after latching.

(17) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

HYDRAULIC SYSTEM OVERBOARD DRAIN CONTAINERS - MAINTENANCE PRACTICES

1. General

A. The hydraulic system has four overboard drain containers, one for each reservoir, one for the hydraulic power transfer unit and one for the auxiliary pump. All four containers are located in the left and right main landing gear wheelwells. Access is through the main gear inboard doors.

B. Removal and installation procedures for the overboard drain containers are identical except as noted.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Solvent, Douglas P-D-680, Type 1 DPM 518	

3. Removal/Installation Hydraulic System Overboard Drain Container

A. Remove Drain Container. (Figure 201)

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEELWELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

(2) If removing reservoir overboard drain container, disconnect reservoir relief and bleed valve line from container fitting.

(3) If removing hydraulic power transfer unit and/or auxiliary pump seal drain container, remove hose from container fitting.

(4) Remove bolt from container support clamp.

(5) Remove container.

(6) Disassemble container.

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

(WARNING PRECEDES)

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(7) Thoroughly clean container parts with solvent (Stoddard P-D-680, Type 1) and air dry.

B. Install Drain Container

(1) Make certain door safety locks are installed.

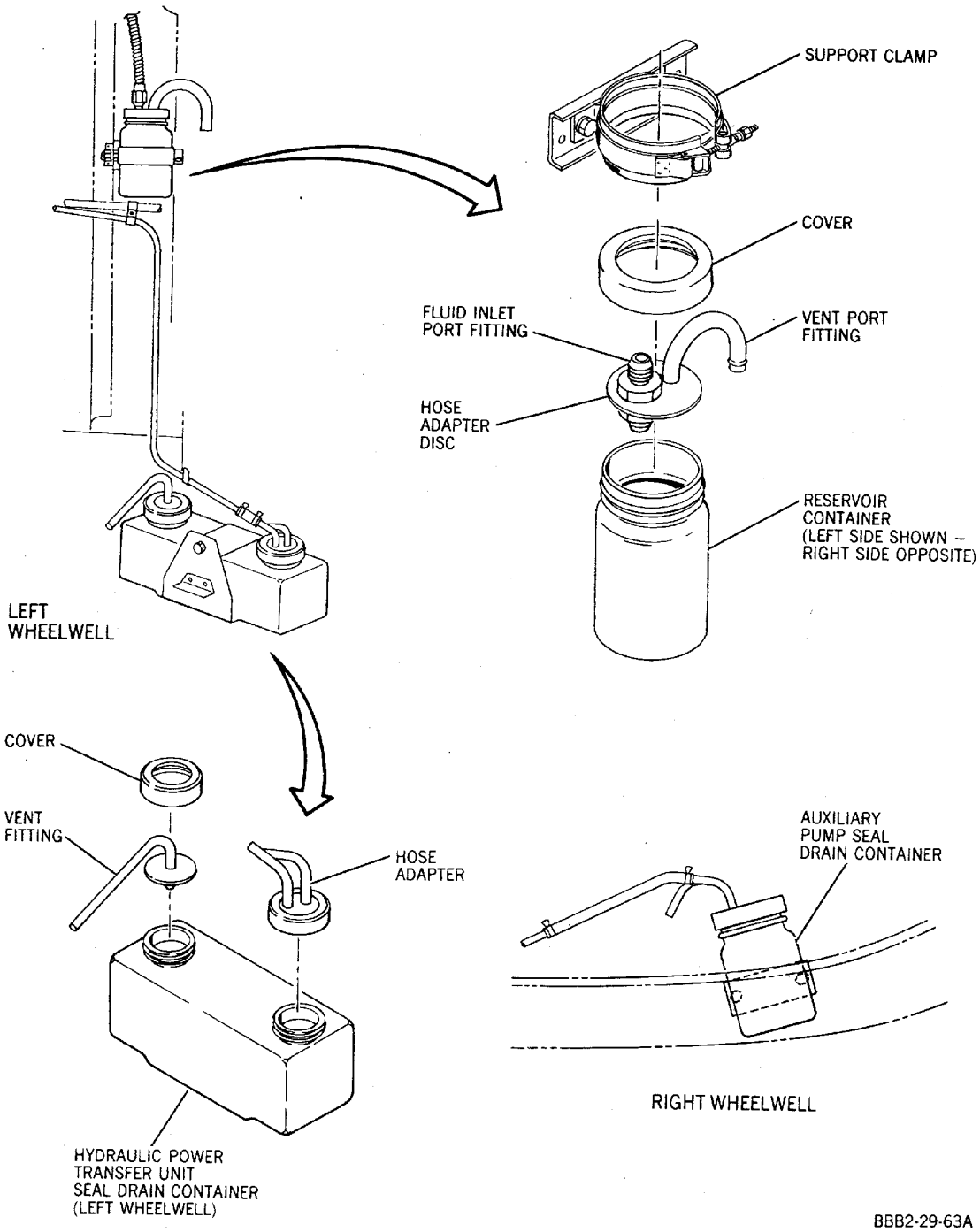
(2) Assemble container.

(3) Install container in support clamp, and install clamp bolt. Tighten nut on clamp bolt to torque of 40 in.-lb (4.48 N·m).

(4) If installing reservoir container, connect relief and bleed valve line to container fitting. Tighten nut.

(5) If installing hydrulic power transfer unit and/or auxiliary pump seal drain container, connect hose to container fitting. Clamp hose.

(6) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Hydraulic System Overboard Drain Container -- Removal/Installation
Figure 201/29-10-27-990-801

TRIPPED AUXILIARY HYDRAULIC PUMP CIRCUIT BREAKER — TROUBLE SHOOTING

1. General

A. The intent of this procedure is to identify the wiring faults adjacent to a fuel tank wall prior to resetting the circuit breaker.

B. The main wheel well is an area where fuel leakage can occur. Since the troubleshooting procedures that follow include the usage of a mega-ohmmeter set to 500 VDC, which could be an ignition source, the precautions must be taken to remove any flammable fluids and vapors from the area.

2. Equipment and Materials

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

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

Table 101

Name and Number	Manufacturer
Mega-ohmmeter (500 VDC)	Not Specified
Non-metallic rod (1/4 inch diameter, 6.0 inch long)	Not Specified

3. Troubleshooting Procedure - Tripped Auxiliary Hydraulic Pump Circuit Breaker

A. Preliminary Procedure

(1) Open the main gear doors and inspect the wheel well area.

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1045, JET FUEL B (JP-4 FUEL)

HAZMAT 1742, JET FUEL JP-4 (DPM 387)

HAZMAT 1044, JET FUELS A AND A-1 (JP-5 FUEL)

HAZMAT 1007, HYDRAULIC FLUID/PETROLEUM-BASE (DPM 366/5414/6176)

HAZMAT 1106, HYDRAULIC FLUID/PRESERVATIVE (DPM 392/6177)

HAZMAT 1104, HYDRAULIC FLUID/SKYDROL (DMS QPL 2014)

HAZMAT 1000, REFER TO MSDS

(2) If any flammable fluids or vapors are found, thoroughly clean the area and correct the source of the leakage.

(3) Verify it is safe to reset the circuit breaker(s) by following this Boeing troubleshooting procedures. Fault(s) that resulted in circuit breaker trip must be isolated and corrected prior to reset if the faults occurred inside the fuel tank or adjacent to any fuel tank wall.

(a) The above step is an Airworthiness Limitation Instruction (ALI) procedure. For important information on Airworthiness Limitation Instructions (ALIs), refer to Airworthiness Limitation Precautions (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 28-00-00/201).

(4) Prior to opening the circuit breakers, identify the tripped circuit breaker(s). If the circuit breaker is tripped, then make sure that the circuit breaker(s) that is not tripped is open in the step that follows (make sure that both circuit breakers are open).

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

(5) Make sure that the following applicable circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

B. Inspection Procedure for Tripped Auxiliary Hydraulic Pump Circuit Breaker

(1) Gain access to the right main wheel well.

(2) Inspect the Auxiliary Hydraulic Pump wiring inside the wheel well (Wiring Diagram 29-21-00). Refer to the Standard Wiring Practice Manual (SWPM) 20-00-06, INSPECTION INSTRUCTIONS FOR STANDARD WIRING INSTALLATIONS.

(3) Disconnect the Auxiliary Hydraulic Pump electrical connector.

(a) Examine the contacts, connector and backshell for evidence of connector contact displacement, arcing or overheating.

(b) If no discrepancies are noted on the connector, wiring or over-wrap, the wiring is considered acceptable.

(4) Disconnect the wires from the terminal A2, B2, and C2 of the Aux Hydraulic Pump power relay R2-15.

(5) Perform the Wire Harness Continuity Test per the SWPM 20-00-09 paragraph 3.B. step (8) between the Aux Hydraulic Pump connector and relay terminals.

(a) If a discontinuity is found, inspect the wiring in the over wing area.

(6) Perform the Wire Harness Insulation Resistance (IR) Test per the SWPM 20-00-09 paragraph 3.B. step (10) between the Aux Hydraulic Pump connector and relay terminals.

(a) If the insulation resistance is below the minimum insulation resistance, inspect the wiring in the over wing area.

(7) Repair any discrepancies per the Standard Wiring Practice Manual (SWPM) prior to resetting a tripped circuit breaker.

C. Inspect the Auxiliary Hydraulic Pump Electrical Motor

(1) Using an ohmmeter measure the pump motor stator winding resistance at the pump electrical receptacle.

(a) The pin A to pin D should be between 0.1 to 0.3 ohms.

(b) The pin B to pin D should be between 0.1 to 0.3 ohms.

(c) The pin C to pin D should be between 0.1 to 0.3 ohms.

(2) Using a mega-ohmmeter set on 500 VDC measure the stator insulation resistance at the pump electrical receptacle.

(a) The pin A to pin G should be 10.0 mega-ohms minimum.

(b) The pin F to pin G should be 10.0 mega-ohms minimum.

D. Auxiliary Hydraulic Pump Rotational Check

(1) The Standard Wiring Practices Manual advises that a tripped circuit breaker should not be reset until the cause is identified. If the cause of the tripped circuit breaker is not identified by the ALI 20-1 inspection procedure, the Auxiliary Hydraulic Pump Rotational Check should be accomplished prior to resetting the circuit breaker.

NOTE: The Auxiliary Hydraulic pump motor should be allowed to cool to ambient temperature for 1.0 hour prior to accomplishing the following test.

(a) Obtain a 0.25 in. (0.64 cm) diameter, 6.0 in. (15.2 cm) long non-metallic rod.

(b) Insert the rod in any outer circumference auxiliary hydraulic pump motor cooling exhaust hole.

(c) Engage the rod to an adjacent blade of the cooling fan blower.

(d) Using the non-metallic rod as a lever and pushing the fan blade, make sure that the pump will rotate in either direction.

1) If the motor does not rotate, replace the auxiliary hydraulic pump assembly.

2) If the motor does rotate, reset the tripped circuit breaker.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(f) Do an operational test of the Auxiliary Hydraulic Pump (ELECTRIC MOTOR DRIVEN AUXILIARY PUMP - MAINTENANCE PRACTICES, PAGEBLOCK 29-10-06/201)

INDICATING - DESCRIPTION AND OPERATION

1. General

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. Each hydraulic power system is equipped with a fluid quantity indicating system, a system pressure indicating system, a fluid overtemperature caution system, and a low hydraulic pressure caution system. The quantity and pressure indicating systems consist of synchro-type transmitters, located in the main gear wheel wells, which provide remote fluid quantity and system pressure indications to an electronic System Display Panel (SDP) in the flight compartment. The panel consists of a visual light emitting diode (LED) display for the flight crew. The fluid overtemperature caution system consists of a thermo switch in the bottom of each hydraulic reservoir which illuminate overtemperature caution lights on the annunciator panel and the master caution lights on the glareshield in the flight compartment. The low hydraulic pressure caution system consists of a pressure switch in each main gear wheel well which provides low hydraulic pressure indication by illumination of the master caution lights and applicable annunciator panel caution lights in the flight compartment. The SDP provides a Built-in-Test (BIT) and a display test for the LED displays. (PAGEBLOCK 31-61-00/201)

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

B. Each hydraulic power system is equipped with a fluid quantity indicating system, a system pressure indicating system, a fluid overtemperature caution system, and a low hydraulic pressure caution system. The quantity and pressure indicating systems consist of synchro-type transmitters, located in the main gear wheel wells, which provide remote fluid quantity and system pressure indications on calibrated synchro-type indicators in the flight compartment. The fluid overtemperature caution system consists of a thermo switch in the bottom of each hydraulic reservoir which illuminate overtemperature caution lights on the annunciator panel and the master caution lights on the glareshield in the flight compartment. The low hydraulic pressure caution system consists of a pressure switch in each main gear wheel well which provides low hydraulic pressure indication by illumination of the master caution lights and applicable annunciator panel caution lights in the flight compartment.

WJE ALL

2. Hydraulic Fluid Quantity Indicating System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. The hydraulic fluid quantity indicating systems, one for each hydraulic system, are electrically operated and provide visual indication, on an LED digital display in the flight compartment, of the fluid quantity present in the hydraulic reservoir of each system. The quantity indicating systems are identical for left and right systems and are completely independent of each other. Each system consists of a transmitter, located on its respective reservoir; an LED digital display, located on the center instrument panel in the flight compartment; a hydraulic fluid quantity circuit breaker, located on the circuit breaker panel; and the wiring required for interconnection of the components. Each system operates from its respective (left or right) 28-volt AC bus, and the LED digital display range indicates from 0 to 25 quarts (23.7 liters) of hydraulic fluid.

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887 (Continued)

B. The hydraulic fluid quantity transmitters are electrically operated, synchro-type, position transmitters. They are mounted on the top of the hydraulic reservoirs, and the transmitter rotors are connected by mechanical linkages to the top of the reservoir relief and bleed valves. Vertical motion of the relief and bleed valve, with changes in fluid level within the reservoir, is changed to rotary motion of the transmitter shaft by the mechanical linkage. An electrical input of 28-volt, 400-cycle AC power is applied to the primary (rotor) winding of the transmitter. The primary voltage induces an output voltage in the secondary (stator) winding of the transmitter which varies in amplitude with the angular position of the rotor. This signal voltage is connected to the hydraulic fluid quantity LED digital display located in the center instrument panel.

C. The hydraulic quantity display in the electronic SDP visually indicates the hydraulic quantity using a light emitting diode (LED) display. The digital display is not adjustable at field maintenance level.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

D. The hydraulic fluid quantity indicating systems, one for each hydraulic system, are electrically operated and provide visual indication, on an indicator in the flight compartment, of the fluid quantity present in the hydraulic reservoir of each system. The quantity indicating systems are identical for left and right systems and are completely independent of each other. Each system consists of a transmitter, located on its respective reservoir; an internally illuminated indicator, located in the flight compartment; a hydraulic fluid quantity circuit breaker, located on the circuit breaker panel; and the wiring required for interconnection of the components. Each system operates from its respective (left or right) 28-volt AC bus, and the indicators are calibrated to indicate from 0 to 19 quarts of hydraulic fluid.

E. The hydraulic fluid quantity transmitters are electrically operated, synchro-type, position transmitters. They are mounted on the top of the hydraulic reservoirs, and the transmitter rotors are connected by mechanical linkages to the top of the reservoir relief and bleed valves. Vertical motion of the relief and bleed valve, with changes in fluid level within the reservoir, is changed to rotary motion of the transmitter shaft by the mechanical linkage. An electrical input of 28-volt, 400-cycle AC power is applied to the primary (rotor) winding of the transmitter. The primary voltage induces an output voltage in the secondary (stator) winding of the transmitter which varies in amplitude with the angular position of the rotor. This signal voltage is connected to the hydraulic fluid quantity indicator located in the flight compartment.

F. The hydraulic fluid quantity indicators are internally illuminated, electrically operated, synchro-type panel indicators with their dials calibrated on an arc of 157 degrees to indicate from 0 to 19 quarts of hydraulic fluid. The stator winding of each indicator receives a signal voltage from its respective transmitter, which varies in amplitude with the fluid quantity present in the reservoir. The indicator rotor, which is energized by 28-volt, 400-cycle AC power, positions itself angularly so the indicator stator voltage, which is induced from the energized rotor, matches exactly the signal voltage from the transmitter stator. The indicator pointer is connected through an internal mechanical linkage to the rotor so that pointer position is relative to rotor position and therefore relative to the transmitter rotor position.

WJE ALL

3. Hydraulic System Pressure Indicating System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. The hydraulic system pressure indicating systems, one for each hydraulic system, are electrically operated and provide visual indication of the hydraulic fluid pressure existing in the hydraulic systems during operation. Hydraulic pressure is displayed on a LED digital display indicator located on the center instrument panel in the flight compartment. The pressure indicating systems are identical for left and right systems and are completely independent of each other. Each system consists of a pressure transmitter, located in its respective landing gear wheel well; an LED digital display, located on the center instrument panel in the flight compartment; a hydraulic system pressure circuit breaker, located on the circuit breaker panel; and the wiring required for interconnection of the components. Each system operates from its respective 28-volt AC bus (left or right), and the LED digital display range indicates from 0 to 4000 psi (0 to 27,600 kPa).

B. The hydraulic system pressure transmitters are electrically operated, synchro-type, pressure transmitters. They are shock mounted on brackets which are located on the forward inboard corners of each main gear wheel well and are connected to the hydraulic system pressure lines. Changes of system pressure, applied to the transmitter, are converted to rotary movement of the transmitter rotor. An electrical input of 28-volt, 400- cycle AC power is applied to the primary (rotor) winding of the transmitter. The primary voltage induces an output voltage in the secondary (stator) winding of the transmitter which varies in amplitude with the angular position of the rotor. This signal voltage is connected to the hydraulic system pressure LED digital display in the center instrument panel. The LED digital display indicates in pounds per square inch of hydraulic pressure. An orifice type snubber with a filter is incorporated in the hydraulic pressure line connection.

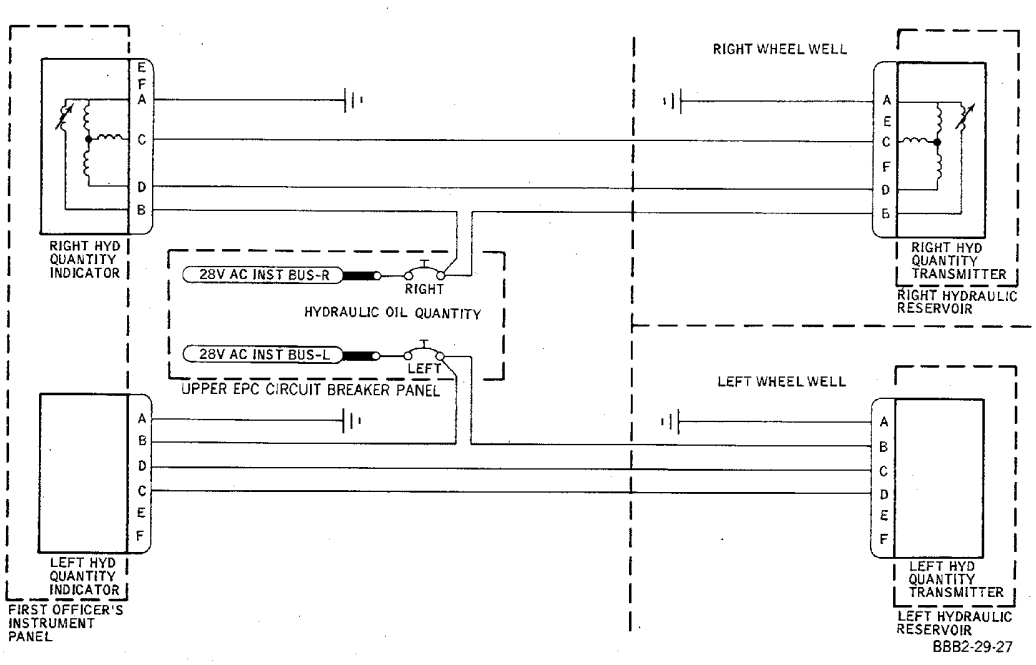
C. The hydraulic pressure display in the electronic SDP visually indicates the hydraulic pressure using a light emitting diode (LED) display. The digital display is not adjustable at field maintenance level.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

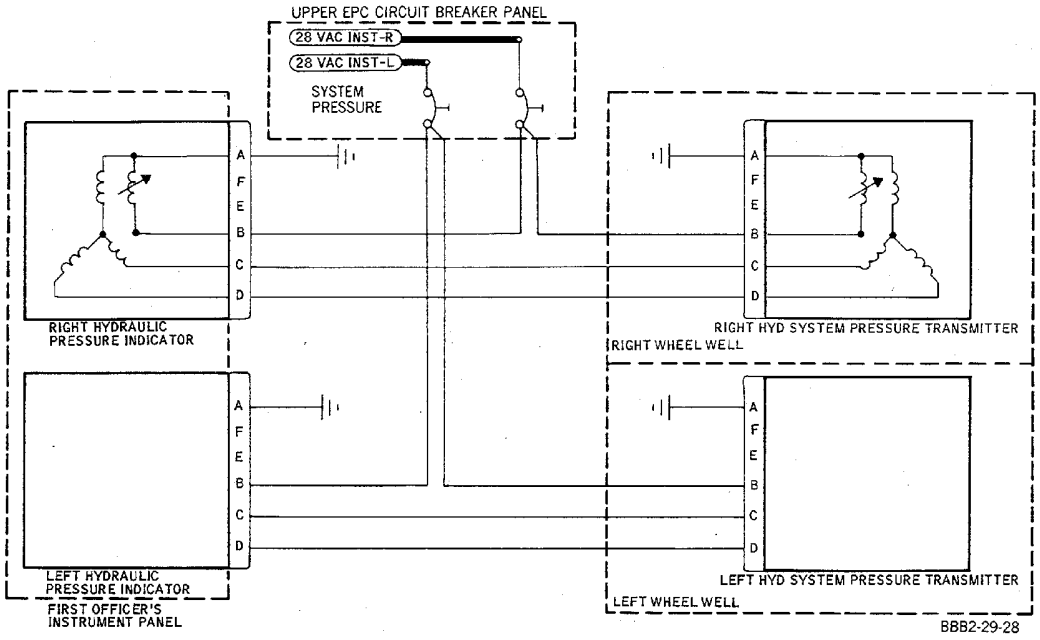
D. The hydraulic system pressure indicating systems, one for each hydraulic system, are electrically operated and provide visual indication, on an indicator in the flight compartment, of the hydraulic fluid pressure existing in the hydraulic systems during operation. The pressure indicating systems are identical for left and right systems and are completely independent of each other. Each system consists of a pressure transmitter, located in its respective landing gear wheel well; an internally illuminated indicator, located in the flight compartment; a hydraulic system pressure circuit breaker, located on the circuit breaker panel; and the wiring required for interconnection of the components. Each system operates from its respective 28-volt AC bus (left or right), and the indicators are calibrated from 0 to 4000 psi.

E. The hydraulic system pressure transmitters are electrically operated, synchro-type, pressure transmitters. They are shock mounted on brackets which are located on the forward inboard corners of each main gear wheel well and are connected to the hydraulic system pressure lines. Changes of system pressure, applied to the transmitter, are converted to rotary movement of the transmitter rotor. An electrical input of 28-volt, 400- cycle AC power is applied to the primary (rotor) winding of the transmitter. The primary voltage induces an output voltage in the secondary (stator) winding of the transmitter which varies in amplitude with the angular position of the rotor. This signal voltage is connected to the hydraulic system pressure indicator in the flight compartment. The indicator converts the electrical signal from the transmitter to a direct gage indication in pounds per square inch of hydraulic pressure. An orifice type snubber with a filter is incorporated in the hydraulic pressure line connection.

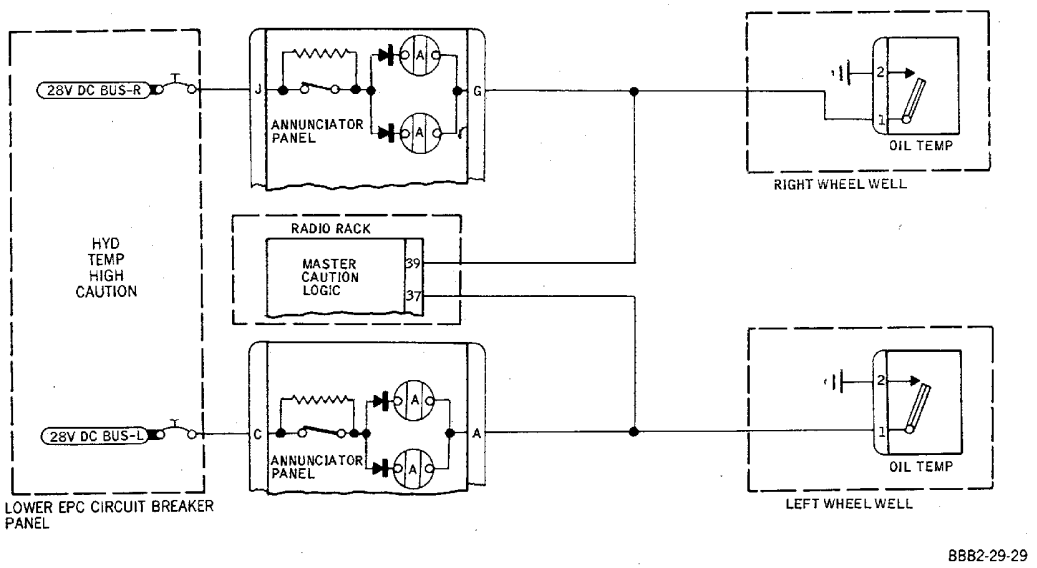
F. The pressure indicators are internally illuminated, electrically operated, synchro-type panel indicators with their dials calibrated on an arc of 320 degrees to indicate from 0 to 4000 pounds per square inch of hydraulic pressure. The stator winding of each indicator receives a signal voltage from its respective transmitter, which varies in amplitude with the hydraulic pressure present in the system. The indicator rotor, which is energized by 28-volt, 400-cycle AC power, positions itself angularly so the indicator stator voltage, which is induced from the energized rotor, matches exactly the signal voltage from the transmitter stator. The indicator pointer is connected through an internal mechanical linkage to the rotor so that pointer position is relative to rotor position and therefore relative to transmitter rotor position.



Hydraulic Fluid Quantity Indicating System -- Schematic
Figure 1/29-30-00-990-801



Hydraulic System Pressure Indicating System -- Schematic
Figure 2/29-30-00-990-802



Hydraulic Fluid Overtemperature Caution System -- Schematic
Figure 3/29-30-00-990-803

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

4. Hydraulic Fluid Overtemperature Caution System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

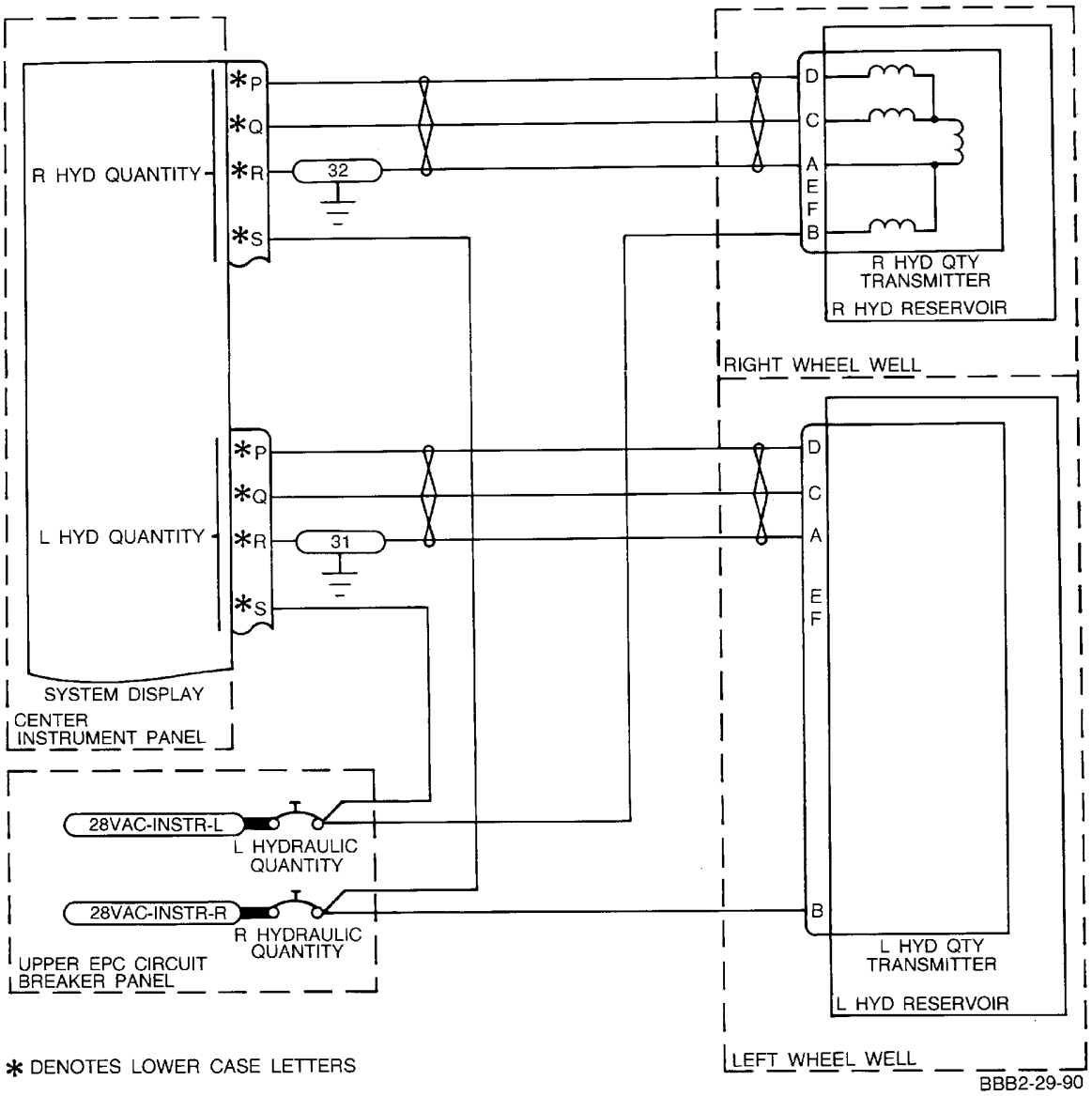
A. The hydraulic fluid overtemperature caution systems, one for each hydraulic system, operate on 28-volt DC power and provide indication in the flight compartment of an overtemperature condition of the hydraulic fluid. A thermo switch, located in each hydraulic reservoir, closes in case of overtemperature condition (over 200°F (93.3°C)) and illuminates both amber master caution lights on the instrument panel glareshield and the respective (left or right) amber hydraulic fluid overtemperature LED display on the electronic overhead annunciator panel. Depressing either master caution light actuates a reset switch, which turns off both master caution lights and resets the master caution lights and resets the master caution circuits. Correction of the overtemperature condition, only, will turn off the annunciator panel LED display. The annunciator panel lights are equipped with a switch to dim the lights by connecting a resistor into the light circuit.

B. The hydraulic fluid overtemperature thermo switches are hermetically sealed probe-type, normally open, temperature sensitive switches. Electrical connection is provided by a 3 pin connector. Each switch is screwed into the manifold at the base of its respective reservoir and is set to close when the hydraulic fluid in the reservoir reaches 200°F (93.3°C).

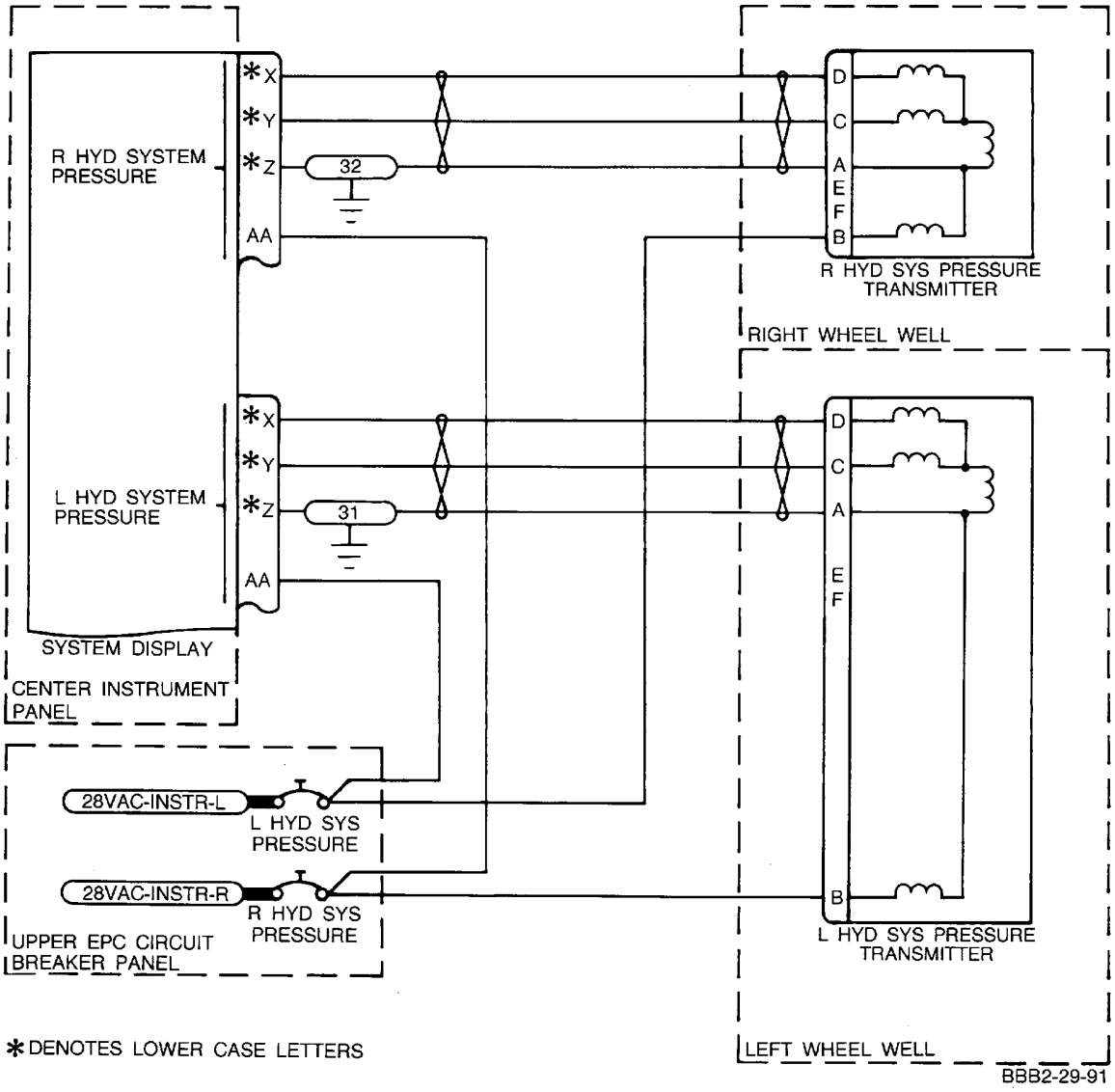
WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

C. The hydraulic fluid overtemperature caution systems, one for each hydraulic system, operate on 28-volt DC power and provide indication in the flight compartment of an overtemperature condition of the hydraulic fluid. A thermo switch, located in each hydraulic reservoir, closes in case of overtemperature condition (over 200°F) and illuminates both amber master caution lights on the instrument panel glareshield and the respective (left or right) amber hydraulic fluid overtemperature light on the annunciator panel. Depressing either master caution light actuates a reset switch, which turns off both master caution lights and resets the master caution lights and resets the master caution circuits. Correction of the overtemperature condition, only, will turn off the annunciator panel lights. The annunciator panel lights are equipped with a switch to dim the lights by connecting a resistor into the light circuit.

D. The hydraulic fluid overtemperature thermo switches are hermetically sealed probe-type, normally open, temperature sensitive switches. Electrical connection is provided by a 3 pin connector. Each switch is screwed into the manifold at the base of its respective reservoir and is set to close when the hydraulic fluid in the reservoir reaches 200°F.

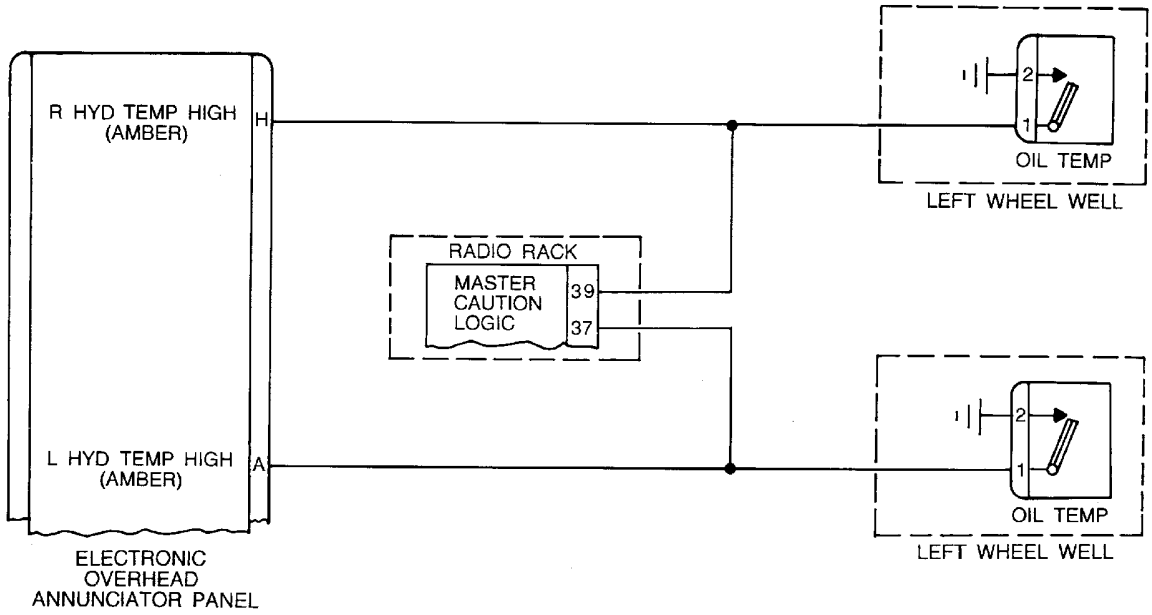


Hydraulic Fluid Quantity Indicating System -- Schematic
Figure 4/29-30-00-990-804



Hydraulic System Pressure Indicating System -- Schematic
Figure 5/29-30-00-990-805

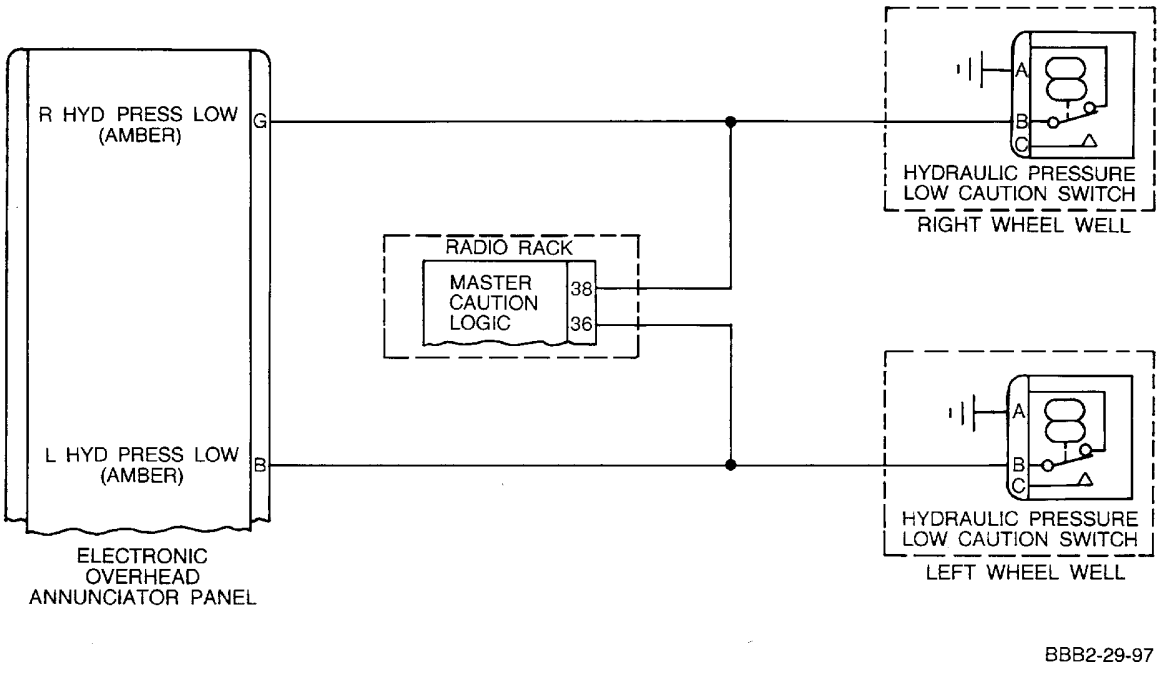
WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887



Hydraulic Fluid Overtemperature Caution System -- Schematic
Figure 6/29-30-00-990-806

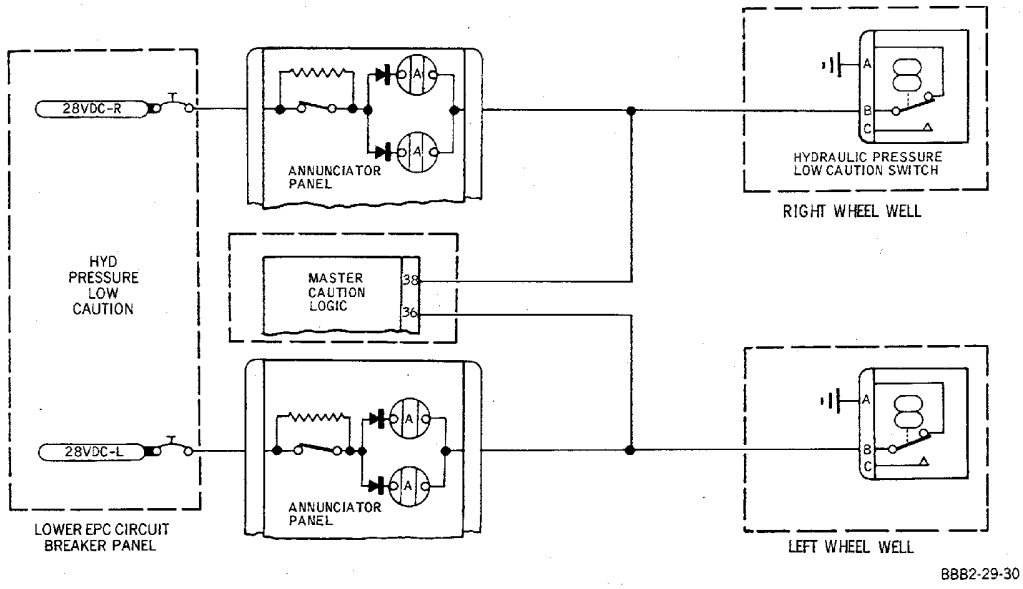
WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887



Hydraulic System Low Pressure Caution System -- Schematic
Figure 7/29-30-00-990-807 (Sheet 1 of 2)

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893



Hydraulic System Low Pressure Caution System -- Schematic
Figure 7/29-30-00-990-807 (Sheet 2 of 2)

WJE ALL

5. Hydraulic System Low Pressure Caution System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. Each hydraulic system is equipped to provide visual indication in the flight compartment of a low pressure condition in the hydraulic power system. The left and right hydraulic system low pressure caution systems are completely independent of each other and each provides low pressure caution indication for its respective system only. Each system consists of a hydraulically actuated, electrically powered, pressure switch in each main gear wheel well; a hydraulic pressure low caution circuit breaker on the lower main - miscellaneous circuit breaker panel; an amber LED display on the electronic overhead annunciator panel in the flight compartment to indicate left or right (as applicable) hydraulic pressure low; the wiring required for interconnection of the electrical components; and the hydraulic tubing and fittings necessary for connection of the pressure switch into the hydraulic system. Each system is electrically powered from its respective (left or right) 28-volt DC bus. The low pressure caution switch is connected into the hydraulic system downstream of the spoiler shutoff and system depressurization valve and provides indication of low pressure in either the hydraulic power system or the flight spoiler subsystem.

B. The hydraulic system low pressure caution switches are hydraulically actuated, electrically powered switches of the single pole, double throw (SPDT) type with normally open contacts. An internal piston and disc spring are used to sense hydraulic pressure at the switch pressure port and close and open the switch contacts when hydraulic pressure is within the switch operating range. As system pressure decreases, the Low Pressure Warning switch contacts close at 900(±100) psi (6210(±690) kPa) and after 2.5 seconds time delay, completes an electrical circuit to illuminate the master caution lights on the glareshield and the left or right hydraulic pressure low LED display on the electronic overhead annunciator panel in the flight compartment. As system pressure increases, the switch contacts open at 1200 psi maximum and the master caution lights and the applicable hydraulic pressure low caution LED display on the overhead electronic annunciator panel go out.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

C. Each hydraulic system is equipped to provide visual indication in the flight compartment of a low pressure condition in the hydraulic power system. The left and right hydraulic system low pressure caution systems are completely independent of each other and each provides low pressure caution indication for its respective system only. Each system consists of a hydraulically actuated, electrically powered, pressure switch in each main gear wheel well; a hydraulic pressure low caution circuit breaker on the lower main - miscellaneous circuit breaker panel; an amber caution light on the annunciator panel in the flight compartment placarded to indicate left or right (as applicable) hydraulic pressure low; the wiring required for interconnection of the electrical components; and the hydraulic tubing and fittings necessary for connection of the pressure switch into the hydraulic system. Each system is electrically powered from its respective (left or right) 28-volt DC bus. The low pressure caution switch is connected into the hydraulic system downstream of the spoiler shutoff and system depressurization valve and provides indication of low pressure in either the hydraulic power system or the flight spoiler subsystem.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

D. The hydraulic system low pressure caution switches are hydraulically actuated, electrically powered switches of the single pole, double throw (SPDT) type with normally open contacts. An internal piston and disc spring are used to sense hydraulic pressure at the switch pressure port and close and open the switch contacts when hydraulic pressure is within the switch operating range. As system pressure decreases, the Low Pressure Warning switch contacts close at 900(±100) psi and after 2.5 seconds time delay, completes an electrical circuit to illuminate the master caution lights on the glareshield and the left or right hydraulic pressure low caution light on the annunciator panel in the flight compartment. As system pressure increases, the switch contacts open at 1200 psi maximum and the master caution lights and the applicable hydraulic pressure low caution light on the annunciator panel go out.

WJE ALL

E. The hydraulic system low pressure caution switches are mounted with loop-type clamps in the left and right main gear wheel wells. The left system switch is mounted on the accumulator bracket in the outboard forward corner of the left wheel well. The right system switch is mounted on the center keel immediately aft of the spoiler shutoff valve in the upper aft corner in the right wheel well.

INDICATING - TROUBLE SHOOTING

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

1. Trouble Shooting Hydraulic Fluid Quantity Indicating System

A. QUANTITY INDICATOR NEEDLE STICKS

Step	Possible Causes	Isolation Procedure	Correction
(1)	Dirty or faulty indicator	Check indicating system with an indicator of indicator known quality.	Replace faulty indicator.

B. QUANTITY INDICATOR DOES NOT OPERATE

Table 101

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty indicator	Check indicating system with an indicator of known quality.	Replace faulty indicator.
(2)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(3)	Faulty interconnecting wiring between indicator and transmitter.	Check wiring for continuity and shorts.	Repair or replace faulty wiring.

C. INDICATOR READS HIGH OR LOW

Table 102

Step	Possible Causes	Isolation Procedure	Correction
(1)	Incorrect adjustment of transmitter linkage.	Check adjustment of transmitter linkage	Adjust linkage to obtain correct indication.

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

2. Trouble Shooting Hydraulic Fluid Quantity Indicating System (Aircraft with Systems Display Panel (SDP)

A. QUANTITY DISPLAY DOES NOT OPERATE

Table 103

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty Systems Display Panel	Perform (BIT) test on SDP, check for failure display.	Replace SDP.
(MULTIFUNCTION DISPLAYS - MAINTENANCE PRACTICES, PAGEBLOCK 31-61-00/201)			
(2)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(3)	Faulty interconnecting wiring between SDP and transmitter.	Check wiring for continuity and shorts.	Repair or replace faulty wiring.

B. DISPLAY READS HIGH OR LOW

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887 (Continued)

Table 104

Step	Possible Causes	Isolation Procedure	Correction
(1)	Incorrect adjustment of transmitter linkage.	Check adjustment of transmitter linkage	Adjust linkage to obtain correct indication.

WJE ALL

3. Trouble Shooting Hydraulic System Pressure System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. SDP DISPLAYS ZERO PRESSURE (HYDRAULIC POWER ON)

Table 105

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty SDP	Perform (BIT) test on SDP, check for failure display.	Replace SDP.
(MULTIFUNCTION DISPLAYS - MAINTENANCE PRACTICES, PAGEBLOCK 31-61-00/201)			
(2)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(3)	Clogged filter or snubber orifice in transmitter pressure line connection	Check filter and orifice.	Clean as necessary.
(4)	Faulty interconnecting wiring between indicator and transmitter	Check wiring for continuity.	Repair or replace faulty wiring.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

B. PRESSURE INDICATOR READS ZERO (HYDRAULIC POWER ON)

Table 106

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty indicator	Check indicating system with an indicator of known quality.	Replace faulty indicator.
(2)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(3)	Clogged filter or snubber orifice in transmitter pressure line connection	Check filter and orifice.	Clean as necessary.
(4)	Faulty interconnecting wiring between indicator and transmitter	Check wiring for continuity.	Repair or replace faulty wiring.

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

C. PRESSURE DISPLAY READS LOW

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887 (Continued)

Table 107

Step	Possible Causes	Isolation Procedure	Correction
(1)	Hydraulic fluid leakage in transmitter pressure line or fittings.	Check for leakage in line and fittings.	Tighten or replace fittings and/or line.
(2)	Incorrect zero adjustment of transmitter	Check zero adjustment of transmitter.	Adjust transmitter to zero with hydraulic system depressurized.
(3)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

D. PRESSURE INDICATOR READS LOW

Table 108

Step	Possible Causes	Isolation Procedure	Correction
(1)	Hydraulic fluid leakage in transmitter pressure line or fittings.	Check for leakage in line and fittings.	Tighten or replace fittings and/or line.
(2)	Incorrect zero adjustment of transmitter	Check zero adjustment of transmitter.	Adjust transmitter to zero with hydraulic system depressurized.
(3)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

E. PRESSURE DISPLAYS READS HIGH

Table 109

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(2)	Incorrect zero adjustment of transmitter	Check zero adjustment of transmitter.	Adjust transmitter to zero with hydraulic system depressurized.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

F. PRESSURE INDICATOR READS HIGH

Table 110

Step	Possible Causes	Isolation Procedure	Correction
(1)	Faulty transmitter	Check indicating system with a transmitter of known quality.	Replace faulty transmitter.
(2)	Incorrect zero adjustment of transmitter	Check zero adjustment of transmitter.	Adjust transmitter to zero with hydraulic system depressurized.

WJE ALL

4. Trouble Shooting Hydraulic Fluid Overtemperature Caution System

WJE 401-404, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

A. OVERTEMPERATURE CAUTION DISPLAY INOPERATIVE ON EOAP

Table 111

Step	Possible Causes	Isolation Procedure	Correction
(1)	No overtemperature display on EOAP.	Perform functional system test on EOAP. (MASTER WARNING AND CAUTION SYSTEM, SUBJECT 33-12-00, Page 201)	Replace EOAP.
(2)	Open circuit in overtemperature circuit wiring	Check continuity of overtemperature circuit.	Repair or replace faulty wiring.
(3)	Faulty overtemperature thermoswitch	Check circuit with a thermoswitch of known quality.	Replace faulty thermoswitch.

WJE 405-411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

B. OVERTEMPERATURE CAUTION SYSTEM INOPERATIVE

Table 112

Step	Possible Causes	Isolation Procedure	Correction
(1)	Indicating light bulb burned out	Actuate pushbutton test switch.	Replace faulty bulb.
(2)	Open circuit in overtemperature circuit wiring	Check continuity of overtemperature circuit.	Repair or replace faulty wiring.
(3)	Faulty overtemperature thermoswitch	Check circuit with a thermoswitch of known quality.	Replace faulty thermoswitch.

INDICATING - INSPECTION/CHECK

1. General

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

TASK 29-30-00-211-801

2. Detailed Inspection of the Cockpit Indication and Reservoir Level for Accuracy

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
29-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES
32-00-00 P/B 201	GENERAL - MAINTENANCE PRACTICES

B. Prepare for the Cockpit Indication and Reservoir Level for Accuracy Detailed Inspection

SUBTASK 29-30-00-840-001

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

C. Cockpit Indication and Reservoir Level for Accuracy Detailed Inspection

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

SUBTASK 29-30-00-840-002

(1) Make sure both reservoir levels are serviced to the upper full mark with hydraulic pressure zero psi. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-30-00-863-001

(2) Pressurize left and right hydraulic systems. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

SUBTASK 29-30-00-840-003

(3) Make sure of the following:

- Flaps up
- Slats retracted
- Spoilers down
- Brakes off
- Thrust reversers stowed.

SUBTASK 29-30-00-211-001

(4) Make sure the cockpit quantity indicator reads within 0 ±1 qt (0.00 ±0.95 l) of each reservoir sight gauge.

SUBTASK 29-30-00-864-001

(5) Depressurize left and right hydraulic systems.(GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

D. Job Close-up

SUBTASK 29-30-00-840-004

(1) Remove door safety locks, close inboard doors, and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

SUBTASK 29-30-00-942-001

(2) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———

HYDRAULIC FLUID QUANTITY TRANSMITTER - MAINTENANCE PRACTICES

1. General

A. The hydraulic fluid quantity transmitters, one for each hydraulic system, are located on the cover of each reservoir in the main gear wheel wells. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right transmitters are identical. (PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Lockwire, NASM20995N20, DPM684	Not specified
Container (6-gallon)	
Drain hose (6-foot)	

3. Removal/Installation Hydraulic Fluid Quantity Transmitter

A. Remove Transmitter

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(1) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

WJE 401-411, 415-427, 429, 861-866, 868, 869, 871-881, 883, 884, 886, 887, 891-893

(4) Connect hose to reservoir drain valve and place other end in suitable container of at least 6-gallon capacity.

(5) Open drain valve and drain reservoir of fluid.

(6) Apply manual pressure at top of reservoir relief and bleed valve to pressurize reservoir diaphragm to aid drain flow.

NOTE: Do not depress bleed valve plunger while manually pressurizing reservoir diaphragm as fluid will be dumped at relief valve drain.

(7) Close drain valve.

WJE ALL

(8) Disconnect transmitter electrical connector.

(9) Disconnect spring at end of low level switch link.

(10) Loosen fluid quantity transmitter lower link clamp bolt, and remove link and low level switch link from transmitter shaft.

(11) Remove transmitter from bracket.

B. Install Transmitter

(1) Make certain door safety locks are installed.

(2) Make certain hydraulic system is depressurized. (PAGEBLOCK 29-00-00/201)

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

WJE 405-408, 410, 411, 416-421, 423, 424, 426, 429, 861, 862, 865, 869, 871-874, 880, 884, 891

CAUTION: LEFT HAND TRANSMITTER IS TO BE INSTALLED WITH ELECTRICAL CONNECTOR INBOARD. FAILURE TO INSTALL TRANSMITTER CORRECTLY WILL RESULT IN DAMAGE TO TRANSMITTER AND WIRING DURING MAIN LANDING GEAR RETRACTION.

(4) Install transmitter on bracket. (Figure 201)

NOTE: The right hand transmitter may be installed in any of the four rotated positions.

WJE 409, 415, 422, 425, 427, 863, 864, 866, 868, 883, 892, 893

(5) Install transmitter on bracket.

NOTE: The transmitter may be installed in any of the four rotated positions.

WJE 401-404, 412, 414, 875-879, 886, 887

CAUTION: LEFT HAND TRANSMITTER IS TO BE INSTALLED WITH ELECTRICAL CONNECTOR INBOARD. FAILURE TO INSTALL TRANSMITTER CORRECTLY WILL RESULT IN DAMAGE TO TRANSMITTER AND WIRING DURING MAIN LANDING GEAR RETRACTION.

(6) Install transmitter on bracket. (Figure 201)

NOTE: The transmitter may be installed in any of the four rotated positions.

WJE ALL

(7) Align scribed line on transmitter shaft with stamped zero mark on transmitter housing to establish electrical zero of transmitter.

(8) Align low level switch link clevis with transmitter link and place both links on transmitter shaft; make certain low level switch roller is on upper surface of link; do not tighten clamp bolt at this time.

(9) Connect spring to end of low level switch link.

(10) Connect transmitter electrical connector.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	12	B1-63	LEFT HYDRAULIC OIL QUANTITY

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	5	B1-64	RIGHT HYDRAULIC OIL QUANTITY

(12) Observe left or right (as applicable) reservoir fluid level on fluid level instruction plate at top of reservoir; bleed and fill reservoir if required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301

NOTE: Reservoir fluid level pointer must point to upper full mark, hydraulic pressure zero psi.

(13) Rotate left transmitter shaft either clockwise to increase, or counterclockwise to decrease, fluid quantity indication in flight compartment; rotate right transmitter shaft counterclockwise to increase, or clockwise to decrease, fluid quantity indication in flight compartment. Check that indicator in flight compartment agrees with indicator on hydraulic reservoir.

(14) Hold transmitter shaft stationary and tighten lower link clamp bolt to secure lower link to shaft.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

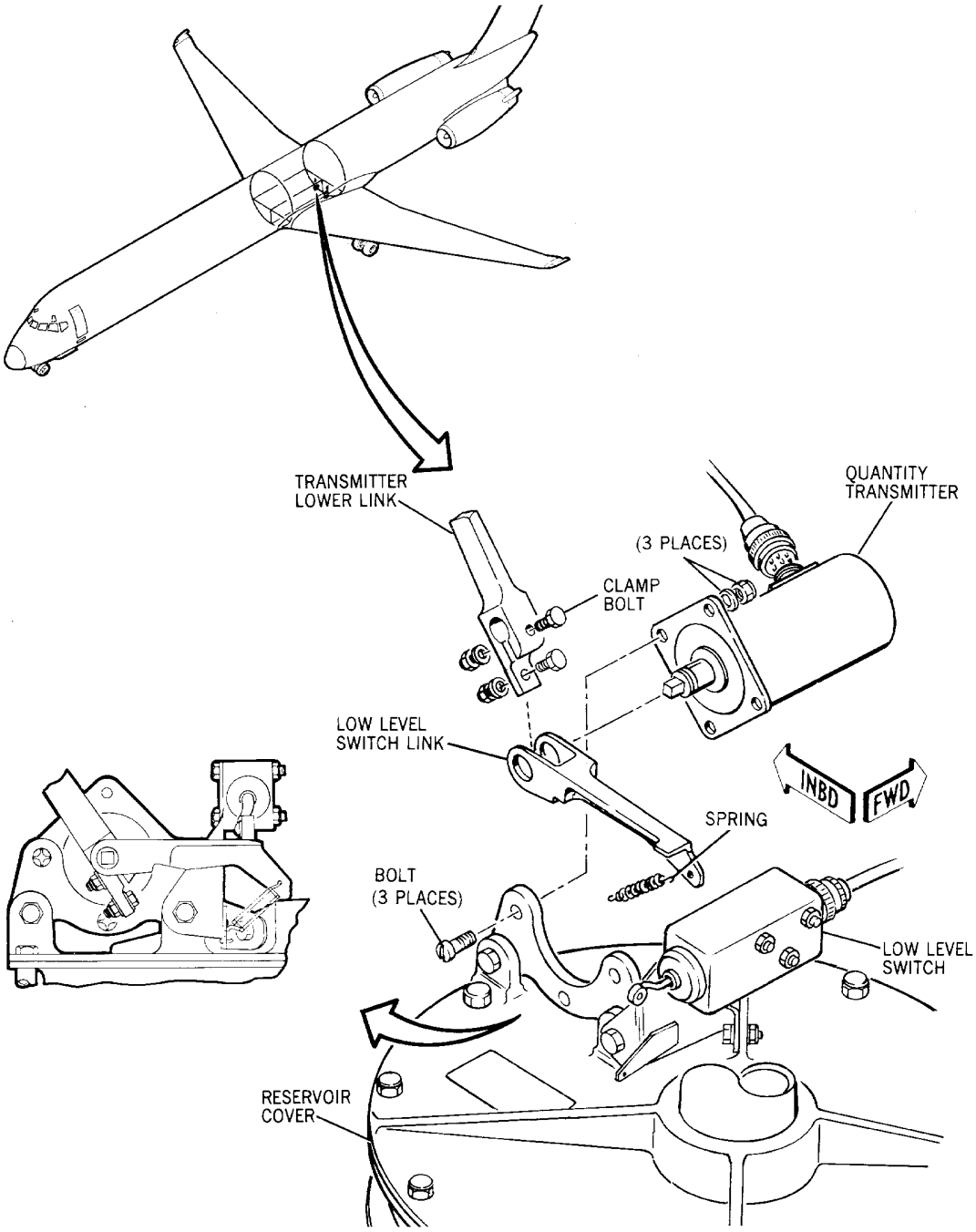
(15) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201).

(16) Observe left or right (as applicable) reservoir fluid level with airplane in ground condition; wing flaps up, slats retracted, spoilers down, brakes off, and thrust reversers stowed (retracted). Fluid level pointer should point to lower full mark (hydraulic pressure 3000 psi), on fill levels instruction plate.

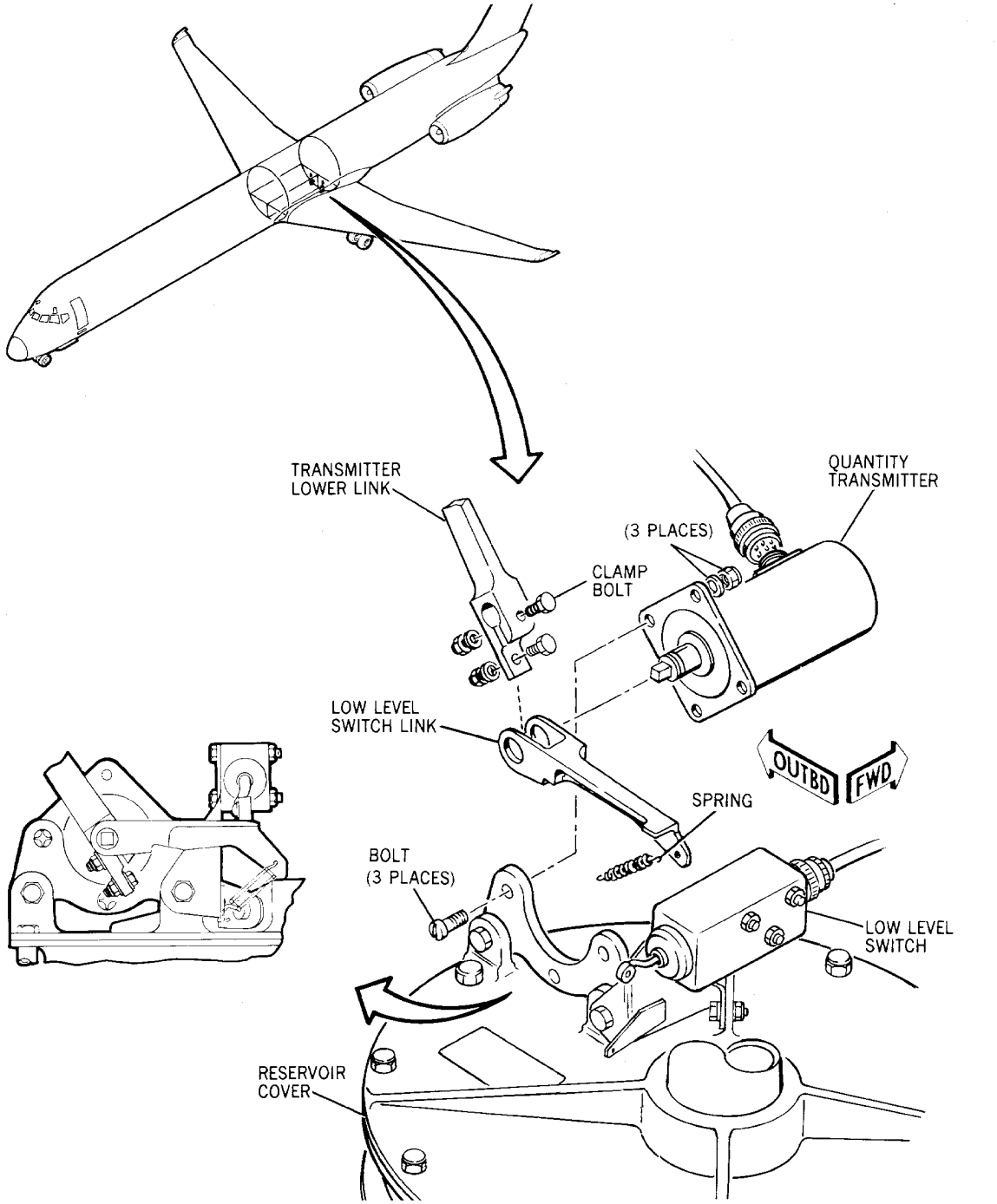
(17) Quantity indicator in flight compartment should agree with reservoir sight gage reading within +1 quart.

(18) Shut off hydraulic pressure source.

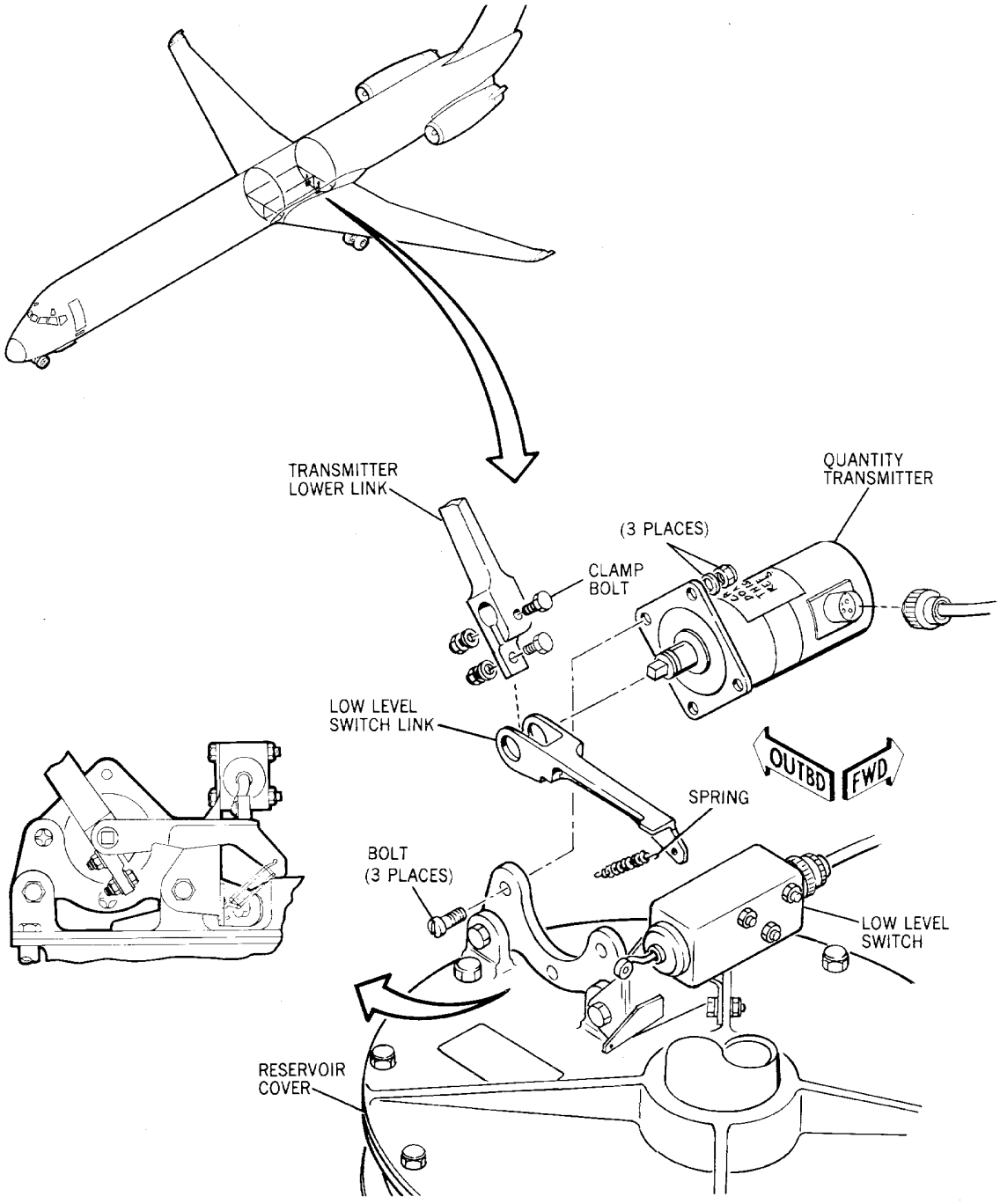
(19) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal position (lever retracted).



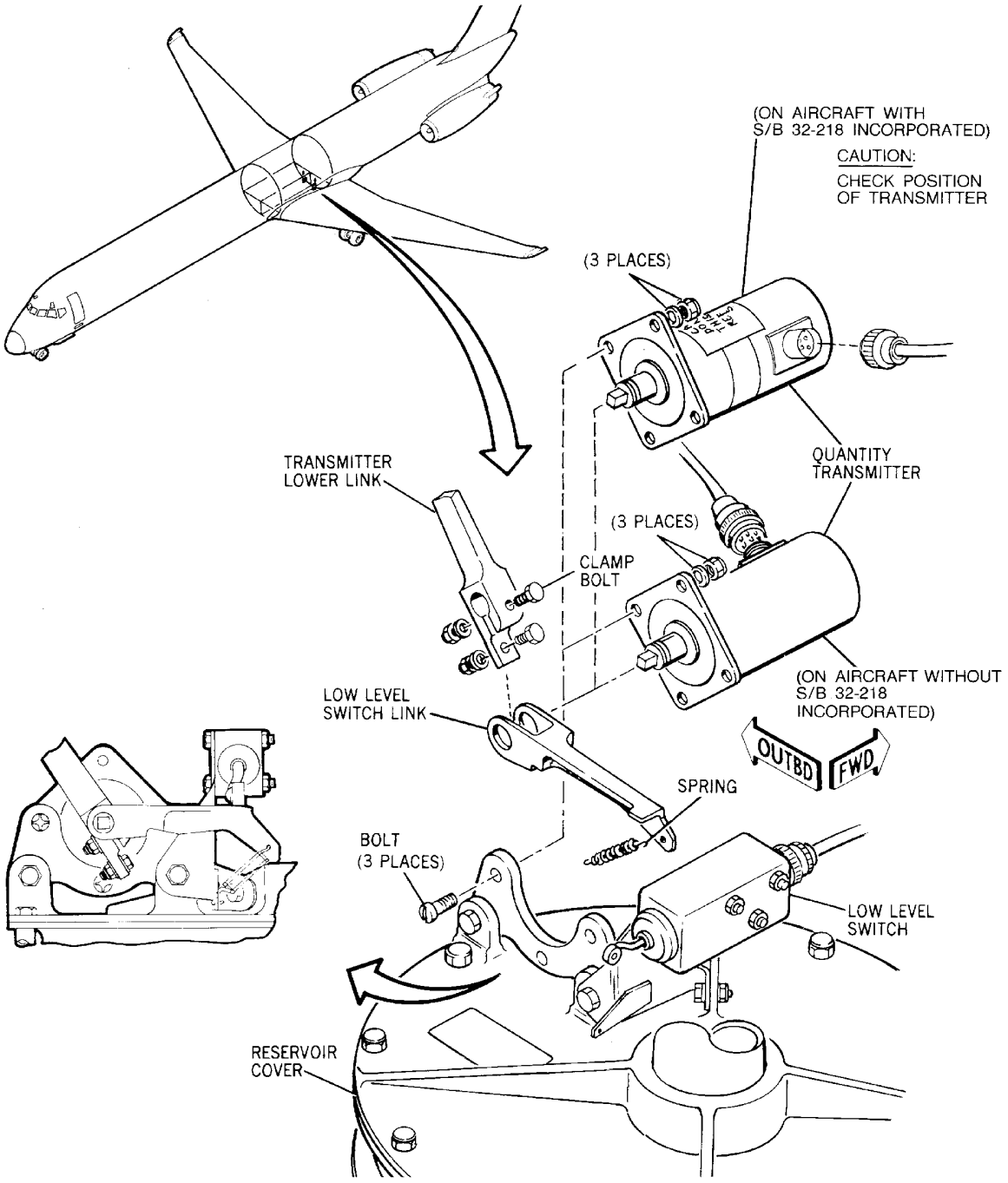
Right Hydraulic Fluid Quantity Transmitter -- Removal/Installation
Figure 201/29-30-01-990-801



Left Hydraulic Fluid Quantity Transmitter -- Removal/Installation
Figure 202/29-30-01-990-802 (Sheet 1 of 3)



Left Hydraulic Fluid Quantity Transmitter -- Removal/Installation
Figure 202/29-30-01-990-802 (Sheet 2 of 3)



Left Hydraulic Fluid Quantity Transmitter -- Removal/Installation
Figure 202/29-30-01-990-802 (Sheet 3 of 3)

HYDRAULIC SYSTEM PRESSURE TRANSMITTER - MAINTENANCE PRACTICES

1. General

A. The hydraulic system pressure transmitters, one for each hydraulic system, are located inboard of the brake system pressure transmitters, on brackets mounted on the forward bulkhead of each main gear wheel well. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right transmitters are identical.

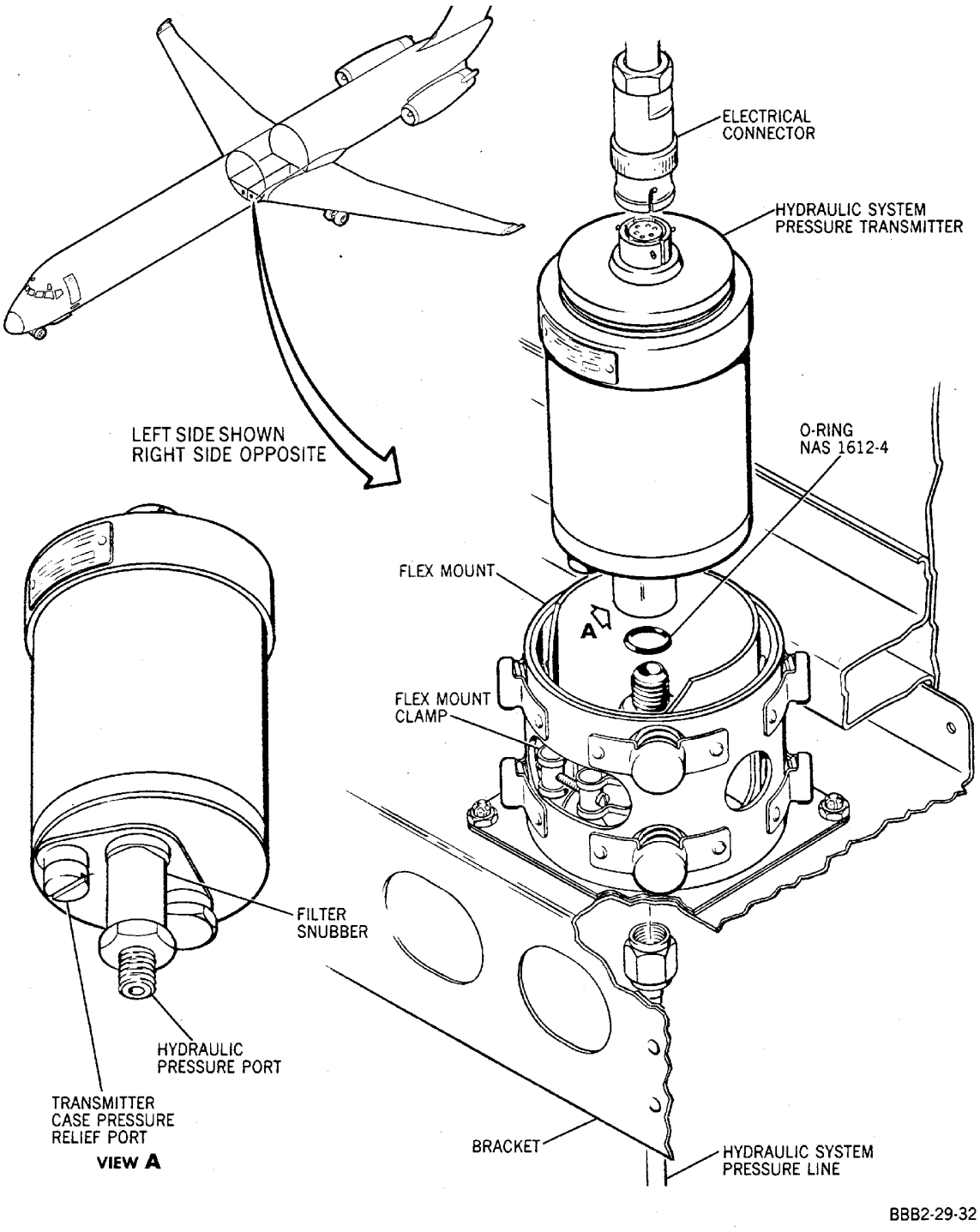
2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.



Hydraulic System Pressure Transmitter -- Removal/Installation
Figure 201/29-30-02-990-801

3. **Removal/Installation Hydraulic System Pressure Transmitter**

A. Remove Transmitter

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	10	B1-102	LEFT HYDRAULIC SYSTEM PRESSURE

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	3	B1-103	RIGHT HYDRAULIC SYSTEM PRESSURE

WARNING: DOOR SAFETY LOCKS MUST BE INSTALLED WHEN PERSONNEL ARE WORKING IN WHEEL WELLS.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Disconnect transmitter electrical connector.

(5) Disconnect hydraulic line.

(6) Loosen flex-mount clamp and remove transmitter.

(7) If required, remove fitting from transmitter pressure port and discard O-ring; retain fitting for use in new transmitter.

B. Install Transmitter

(1) Make certain door safety locks are installed.

(2) Make certain hydraulic system(s) are depressurized.

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

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	10	B1-102	LEFT HYDRAULIC SYSTEM PRESSURE

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	3	B1-103	RIGHT HYDRAULIC SYSTEM PRESSURE

(4) If required, install fitting in transmitter pressure port; use new O-ring.

(5) Connect transmitter electrical connector to receptacle on transmitter.

(6) Remove the safety tags and close the following applicable circuit breakers:

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	10	B1-102	LEFT HYDRAULIC SYSTEM PRESSURE

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	3	B1-103	RIGHT HYDRAULIC SYSTEM PRESSURE

(7) Remove zero adjustment cap from bottom of transmitter.

(8) Adjust transmitter to obtain zero indication on pressure indicator in flight compartment.

(9) Install zero adjustment cap.

NOTE: It is necessary to make zero adjustment before installing transmitter in flex mount due to inaccessibility of zero adjustment after installation.

(10) Open the following applicable circuit breakers and install safety tags:

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	10	B1-102	LEFT HYDRAULIC SYSTEM PRESSURE

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	3	B1-103	RIGHT HYDRAULIC SYSTEM PRESSURE

(11) Disconnect transmitter electrical connector.

(12) Install transmitter in flex mount and secure.

(13) Connect hydraulic line.

(14) Connect transmitter electrical connector to receptacle on transmitter.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

UPPER EPC, LEFT INSTR BUS

Row	Col	Number	Name
B	10	B1-102	LEFT HYDRAULIC SYSTEM PRESSURE

UPPER EPC, RIGHT INSTRUMENT BUS

Row	Col	Number	Name
A	3	B1-103	RIGHT HYDRAULIC SYSTEM PRESSURE

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT NOSE AND MAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(16) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(17) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301

(18) With hydraulic system pressurized, observe hydraulic system pressure indicator in flight compartment. Indicator should read 3000 psi (20,684 kPa) psi.

(19) Shut off hydraulic pressure source.

(20) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

HYDRAULIC FLUID OVERTEMPERATURE THERMOSWITCH - MAINTENANCE PRACTICES

1. General

A. This procedure has the maintenance practices for the hydraulic fluid overtemperature thermoswitch. The procedure includes:

- Removal of the hydraulic fluid overtemperature thermoswitch
- Installation of the hydraulic fluid overtemperature thermoswitch
- Functional test of the hydraulic fluid overtemperature thermoswitch.

B. The hydraulic fluid overtemperature thermoswitches, one for each of the two hydraulic systems, are located in the manifold at the bottom of each reservoir. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right thermoswitches are identical.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.
Torque wrench (0-50 inch pounds)	
Container (5 gal (18.9 liters) capacity)	
Drain hose (6-foot)	
Dust cap, electrical connector MS90376	
Heat Gun	

3. Removal/Installation Hydraulic Fluid Overtemperature Thermoswitch

A. Remove Thermoswitch

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

(1) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear door ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Open reservoir drain valve and drain left or right (as applicable) hydraulic system reservoir. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

(5) Close reservoir drain valve.

(6) Disconnect and install dust cap on thermoswitch and electrical connector.

(7) Remove thermoswitch and discard O-ring.

B. Install Thermoswitch

(1) Make certain door safety locks are installed.

(2) Make certain applicable hydraulic system is depressurized.

(3) Before the installation of the overtemperature thermoswitch, accomplish the following steps to do a funtional test of the hydraulic fluid overtemperature thermoswitch:

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(b) Remove dust caps and connect the electrical connector to the overtemperature thermoswitch.

(c) Set the heat gun to 200 ±10°F (93 ±6°C)) and heat the overtemperature thermoswitch.

WJE 401-404, 406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

(d) Both the MASTER CAUTION lights on the glareshield and the applicable L or R HYD TEMP HIGH message must come on in the Electronic Overhead Annunciator Panel (EOAP).

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

(e) The MASTER CAUTION lights on the glareshield and the applicable HYD L TEMP HI or HYD R TEMP HI alert must come on in the Engine Alert Display (EAD) system display (HYDRAULIC) page.

WJE 401-404, 406, 410, 412, 414, 415, 417-419, 421, 423, 863-866, 869, 871, 872, 875-879, 886, 887

(f) Allow the over-temperature switch to cool and make sure the EOAP message goes off.

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

(g) Allow the overtemperature thermoswitch to cool and make sure the EAD system display (HYDRAULIC) page unit HYD L TEMP HI or HYD R TEMP HI alert goes off.

WJE ALL

(h) Disconnect electrical connector and install dust cap on thermoswitch and connector.

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

(4) Open these circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(5) Install thermoswitch in bottom forward port of reservoir manifold; use new O-ring. Tighten thermoswitch to 20 inch-pounds torque.

(6) Remove dust caps and connect thermoswitch electrical connector.

(7) Fill hydraulic reservoir. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

(Continued)

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name

WJE ALL

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893

R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name

WJE ALL

H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

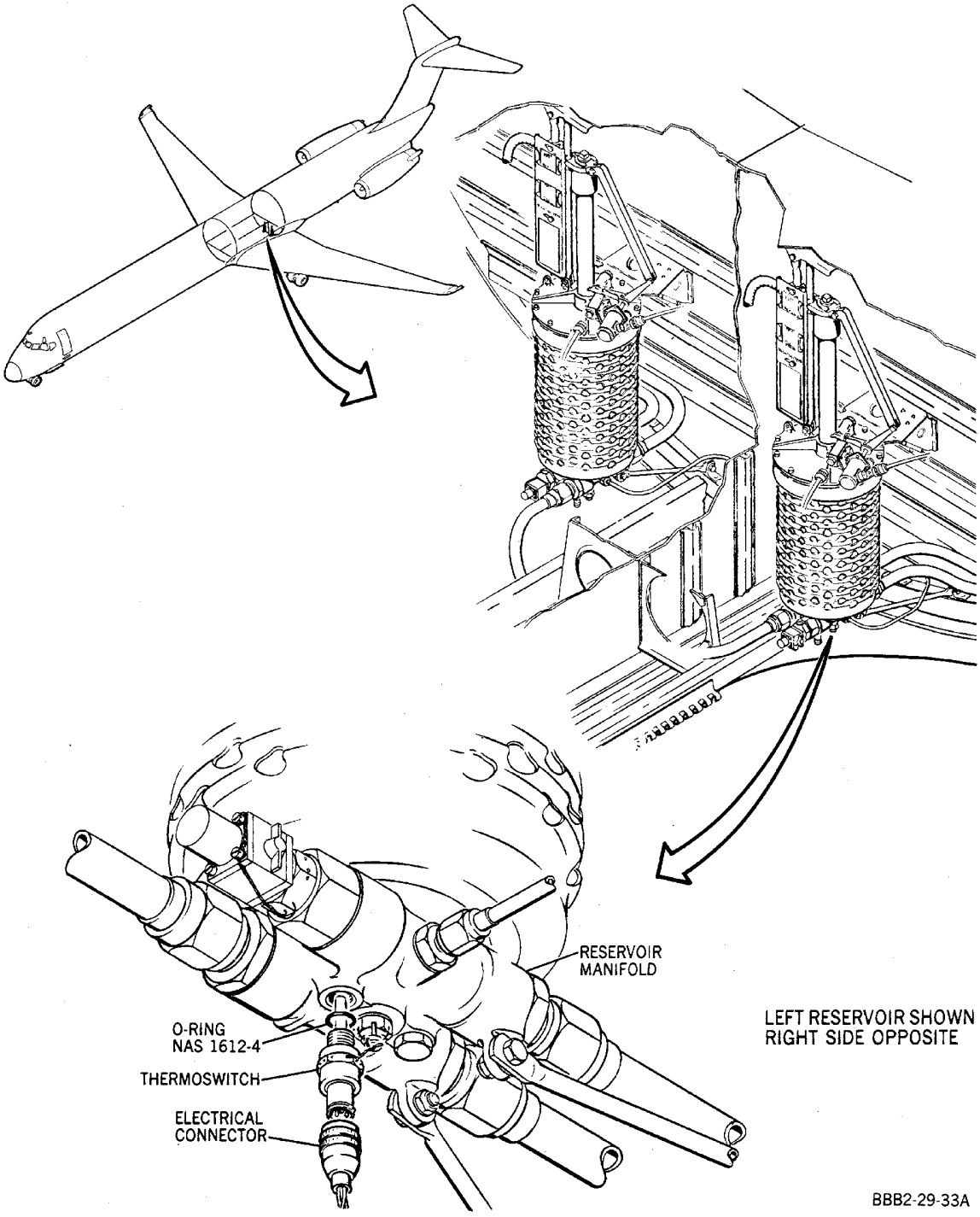
(9) Pressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(10) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

(11) Check thermoswitch port for leaks.

(12) Shut off hydraulic pressure source.

(13) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)



Hydraulic Fluid Overtemperature Thermoswitch -- Removal/Installation
Figure 201/29-30-03-990-801

HYDRAULIC SYSTEM LOW PRESSURE CAUTION SWITCH - MAINTENANCE PRACTICES

1. General

A. The hydraulic system low pressure caution switches, one for each hydraulic system, are located on opposite sides of the centerline panel in the main gear wheel wells. The left system switch is mounted on the outboard bulkhead forward end, adjacent to the brake accumulator in the left wheel well. The right system switch is mounted slightly aft and above the pressure reducer valve in the right wheel well. Access is through the left or right main gear inboard door. The removal and installation procedures for the left and right system switches are identical except as indicated.

2. Equipment and Materials

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

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

Table 201

Name and Number	Manufacturer
MLG Door safety locks 3936851-1 or -501. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201)	Douglas Aircraft Co.

3. Removal/Installation Hydraulic System Low Pressure Caution Switch

A. Remove Switch

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

(1) Open the following applicable circuit breakers and install safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

WARNING: MAKE SURE THE MAIN LANDING GEAR DOOR SAFETY LOCKS OR DOOR OPEN LOCKS ARE INSTALLED WHEN PERSONS WORK IN THE WHEELWELL AREAS. DOOR MOVEMENT CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Place main gear ground maintenance bypass lever in bypass position (lever extended), open main gear inboard doors and install door safety locks. (PAGEBLOCK 32-00-00/201)

CAUTION: LEFT AND RIGHT HYDRAULIC SYSTEMS ARE INDEPENDENTLY PRESSURIZED. EACH SYSTEM MUST BE DEPRESSURIZED SEPARATELY.

(3) Depressurize left or right (as applicable) hydraulic system. (PAGEBLOCK 29-00-00/201)

(4) Disconnect switch electrical connector.

(5) Disconnect hydraulic line.

(6) Loosen switch clamp bolt and remove switch.

(7) If required, remove fitting from switch pressure port and discard O-ring; retain fitting for use in new switch.

B. Install Switch

(1) Make certain door safety locks are installed.

(2) Make certain applicable hydraulic system is depressurized.

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

(3) Make sure that the following applicable circuit breakers are open and have safety tags:

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL

(Continued)

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(4) If required, install fitting in switch pressure port; use new O-ring.

(5) Place switch within clamp and connect hydraulic line.

(6) Connect switch electrical connector.

(7) Tighten switch clamp bolt.

NOTE: Hydraulic system low pressure caution switch settings are adjusted on a test bench. Pressure settings cannot be adjusted with switch installed in airplane.

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

EPC CBP, LEFT GENERATOR BUS

Row	Col	Number	Name
		B1-764	RIGHT AUXILIARY HYDRAULIC PUMP PHASE A, B, & C

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
P	29	B1-210	LEFT HYD TEMP HIGH CAUTION
WJE ALL			

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	27	B1-403	HYD POWER TRANSFER UNIT CONTROL
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
R	29	B1-211	RIGHT HYD TEMP HIGH CAUTION

UPPER EPC, LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
H	17	B1-662	RIGHT AUX HYDRAULIC PUMP CONTROL

(9) Bleed and fill left or right (as applicable) hydraulic system reservoir as required. (HYDRAULIC RESERVOIRS - SERVICING, PAGEBLOCK 12-13-01/301)

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(10) Pressurize left or right (as applicable) hydraulic system with an external hydraulic pressure source. (PAGEBLOCK 29-00-00/201), or the applicable hydraulic hand pump and adjust the pressure output to approximately 700 psi.

(11) Check hydraulic line connection and fitting for leakage.

(12) Monitor left or right (as applicable) hydraulic system pressure indicator and annunciator panel in flight compartment.

(13) Slowly increase hydraulic pressure and observe pressure indication at which left or right (as applicable) hydraulic pressure low light goes out.

NOTE: Light out pressure setting of switch is 1200 psi maximum.

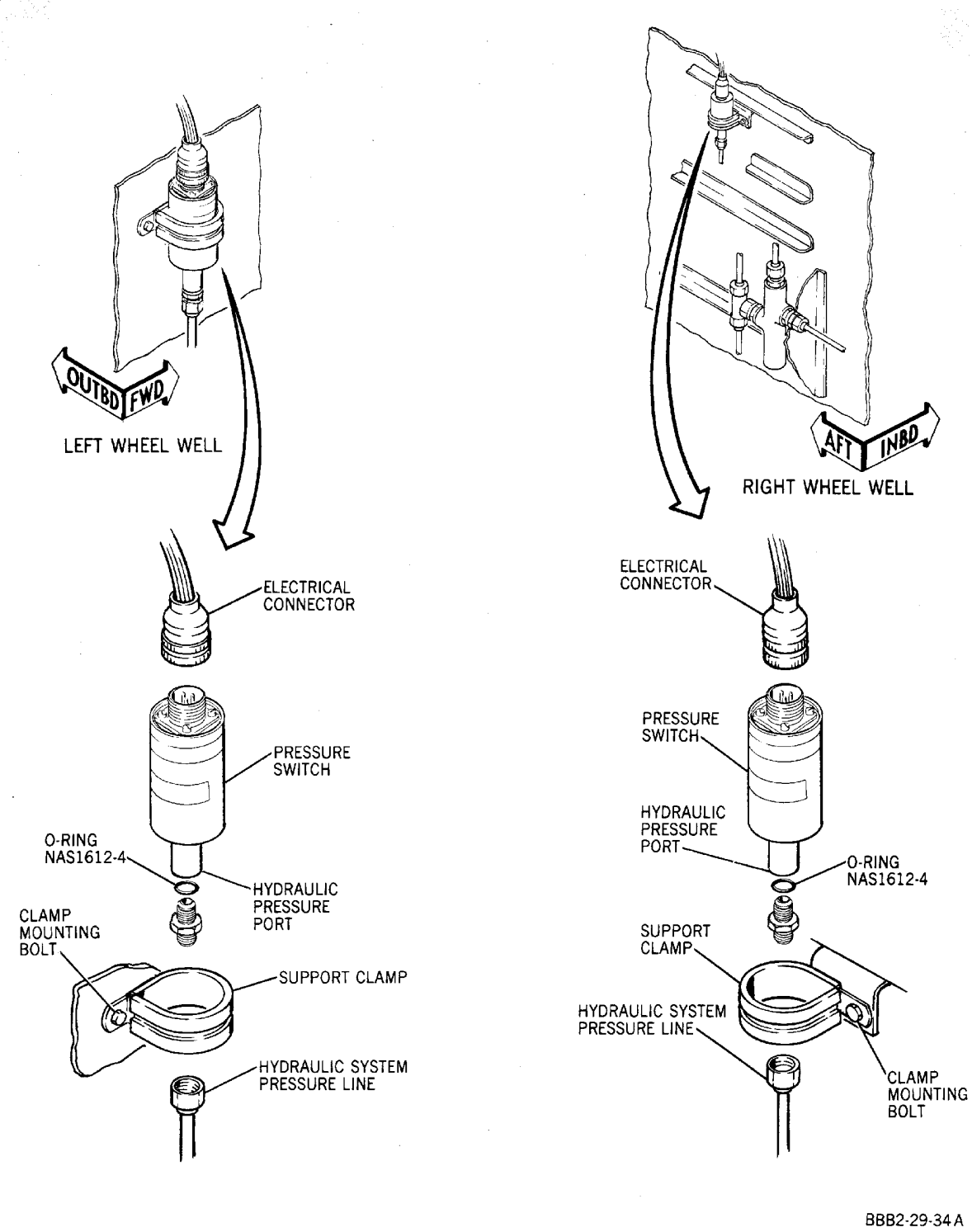
(14) Slowly decrease hydraulic pressure and observe pressure indication at which left or right (as applicable) hydraulic pressure low light comes on.

NOTE: Light on pressure setting of switch is 900(±100) psi.

(15) Shut off hydraulic pressure source.

(16) Remove door safety locks, close inboard doors and return main gear door ground maintenance bypass lever to normal (lever retracted) position. (PAGEBLOCK 32-00-00/201)

(17) Check hydraulic line connection and fitting for leakage.



Hydraulic System Low Pressure Caution Switch -- Removal/Installation
Figure 201/29-30-04-990-801