

TASK 29-13-00-810-807

7. No. 3 Hydraulic System Internal Leakage

A. Description

The observed No. 3 hydraulic-system internal leakage rate is more than the permitted limits.

B. Possible Causes

1. The No. 3 hydraulic-system pressure-relief-valve has leakage.
2. The valve manifold pressure-relief-valve has leakage.
3. The No. 3 hydraulic-system reservoir has leakage.
4. The Ram Air Turbine (RAT) hydraulic pump has leakage.

C. Reference Information

REFERENCE	DESIGNATION
AMM TASK 20-22-00-910-801	Torquing of Plumbing Line Fittings
AMM TASK 24-00-00-863-801	Opening of Non-Thermal Circuit Breakers
AMM TASK 24-00-00-863-802	Closing of Non-Thermal Circuit Breakers
AMM TASK 24-00-00-910-801	Electrical/Electronic Safety Precautions
AMM TASK 24-23-01-000-801	Removal of the Ram Air Turbine (RAT)
AMM TASK 24-23-01-400-801	Installation of the Ram Air Turbine (RAT)
AMM TASK 29-00-00-910-801	Hydraulic Safety Precautions
AMM TASK 29-00-00-910-802	Hydraulic Technical Precautions
AMM TASK 29-10-00-480-802	Connect Ground Hydraulic Power and Pressurize the No. 3 Hydraulic System
AMM TASK 29-10-00-862-804	Release Hydraulic Pressure – No. 3 Hydraulic System
AMM TASK 29-13-00-790-802	Internal Leak Test of the No. 3 Hydraulic System
AMM TASK 29-13-05-000-801	Removal of the No. 3 Hydraulic-System Filter Manifold
AMM TASK 29-13-05-400-801	Installation of the No. 3 Hydraulic-System Filter Manifold

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REFERENCE	DESIGNATION
AMM TASK 29-13-29-000-801	Removal of the No. 3 Hydraulic-System Reservoir
AMM TASK 29-13-29-400-801	Installation of the No. 3 Hydraulic-System Reservoir
AMM TASK 29-13-57-000-801	Removal of the No. 3 Hydraulic-System Valve Manifold
AMM TASK 29-13-57-400-801	Installation of the No. 3 Hydraulic-System Valve Manifold
AMM TASK 53-61-09-000-801	Removal of the Belly Fairing Access-Panels
AMM TASK 53-61-09-400-801	Installation of the Aft Wing-to-Fuselage Fairings

D. Tools and Equipment

REFERENCE	DESIGNATION
GSE GSE 29X-00-01	Unit ,Ground Hydraulic Power
Commercially Available	Drain Line, Hydraulic Fluid
Commercially Available	Container, Hydraulic Fluid

NOTE: Refer to the BD-700 ILLUSTRATED TOOL AND EQUIPMENT MANUAL to make sure that you use the correct equipment configuration.

E. Job Set-Up

- (1) Obey all the electrical/electronic safety precautions (AMM TASK 24-00-00-910-801).
- (2) Obey all the hydraulic safety precautions (AMM TASK 29-00-00-910-801).
- (3) Obey all the hydraulic technical precautions (AMM TASK 29-00-00-910-802).
- (4) In the flight compartment, on the EMS CDU, open the circuit breakers that follow (AMM TASK 24-00-00-863-801):

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HYD	HYD PUMP 3A	AC 4
HYD	HYD PUMP 3B	AC 1

- (5) Open the No. 3 hydraulic system–servicing door (171AL).
- (6) To get access to the No. 3 hydraulic–system valve manifold, remove the aft wing–to–fuselage fairings (185BR/186BL) (AMM TASK 53–61–09–000–801).

F. Fault Isolation

Refer to Figure 202, Figure 203 and Figure 204.

- (1) Do the fault isolation for internal leakage of the No. 3 hydraulic–system as follows:
 - (a) Do the fault isolation of the filter–manifold system pressure–relief–valve as follows:

CAUTION: USE TWO WRENCHES WHEN YOU REMOVE/TORQUE THE HOSES/TUBES. USE ONE WRENCH TO HOLD THE FITTING, AND THE OTHER WRENCH TO LOOSEN/TORQUE THE COUPLING NUT. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE COMPONENTS.

- 1 On the filter–manifold (7) RETURN t–fitting (5), disconnect tubes (4) and (6).
- 2 Install a plug in each tube (4) and (6).
- 3 Install two caps on the t–fitting (5).
- 4 On the filter manifold PRESSURE OUT t–fitting (3), disconnect tubes (1) and (2).
- 5 Install a plug in each tube (1) and (2).
- 6 Install caps on the two ports of the t fitting (3).
- 7 On the filter manifold (7), disconnect the PUMP A and PUMP B pressure tubes (10) and (11).
- 8 Install a plug in each tube (10) and (11).
- 9 Install a cap on each of the check–valves (8) and (9).
- 10 Torque all caps and plugs (AMM TASK 20–22–00–910–801).

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11 Connect the hydraulic–power unit to the No. 3 hydraulic system as follows (AMM TASK 29–10–00–480–802):

- a Remove the dust caps from the PRESSURE and RETURN quick–disconnect couplings (25) and (26).
- b Connect the pressure hose of the hydraulic–power unit to the PRESSURE quick–disconnect coupling (25).
- c Connect the return hose of the hydraulic–power unit to the RETURN quick–disconnect coupling (26).

12 Pressurize the No. 3 hydraulic system as follows:

- a Open the BYPASS valve of the hydraulic–power unit.
- b Set the RESERVOIR SELECT valve of the hydraulic–power unit to the unit HYD POWER UNIT reservoir position.

NOTE: Make sure the reservoir of the hydraulic–power unit has the capacity to hold the hydraulic–system reservoir fluid.

WARNING: NO PERSON OR EQUIPMENT MUST BE NEAR THE FLIGHT CONTROLS AND THE HYDRAULIC COMPONENTS WHEN YOU PRESSURIZE THE HYDRAULIC SYSTEMS. THE FLIGHT CONTROLS CAN MOVE AND THE HYDRAULIC COMPONENTS CAN EJECT HYDRAULIC FLUID. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE EQUIPMENT.

WARNING: USE THE APPROVED EYE PROTECTION WHEN YOU ARE NEAR THE PRESSURIZED HYDRAULIC SYSTEMS. PRESSURIZED HYDRAULIC FLUID IS DANGEROUS AND CAN CAUSE INJURY TO PERSONS.

- c Energize the hydraulic–power unit.
- d Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).

CAUTION: DO NOT OPERATE THE HYDRAULIC PUMPS WHEN YOU HAVE A GROUND HYDRAULIC SOURCE CONNECTED TO THE AIRCRAFT. IF YOU DO NOT OBEY THIS INSTRUCTION, THE RESERVOIR WILL FULLY DRAIN INTO THE EXTERNAL HYDRAULIC SOURCE AND CAUSE CAVITATION IN THE PUMP. THIS CAN CAUSE DAMAGE TO THE EQUIPMENT.

- e Slowly close the hydraulic–power unit BYPASS valve.
- f Slowly open the BYPASS valve on the hydraulic–power unit.

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- g Set the EICAS to the hydraulic synoptic page.
- h Make sure the fluid temperature increases to between 80 and 100 °F (27 and 38 °C).

NOTE: Cycle the flight controls (ailerons, elevators, rudder) to increase the hydraulic fluid temperature.

- 13 Release the hydraulic pressure and install a RETURN drain line as follows:
 - a Open the hydraulic–power unit BYPASS valve.
 - b When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.
 - c Disconnect the return hose of the ground hydraulic–power unit from the RETURN quick–disconnect coupling (26).
 - d Connect a drain line to the RETURN quick–disconnect coupling (26).
 - e Put the open end of the drain line into a fluid container.
- 14 Pressurize the hydraulic system and do a check for leakage of the pressure–relief–valve as follows (AMM TASK 29–10–00–480–802):
 - a Energize the hydraulic–power unit.
 - b Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
 - c Slowly close the hydraulic–power unit BYPASS valve.
 - d Make sure the fluid temperature is between 70 and 100 °F (21 and 38 °C).
 - e Make sure there is no movement of the hydraulic systems, and do the steps that follow:
 - 1) Measure the fluid leak rate at the RETURN drain line for one minute.
 - 2) The fluid leak rate must not be more than 0.25 gpm, or 32 oz per min (1137 cc per min).
 - 3) Open the hydraulic–power unit BYPASS valve.
 - 4) When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.

- f** If the leak rate of the pressure-relief-valve is more than the permitted limit, do the steps that follow:
- 1) Disconnect the hydraulic power-unit pressure hose from the PRESSURE quick-disconnect coupling (25).
 - 2) Disconnect the drain line from the RETURN quick-disconnect coupling (26).
 - 3) Remove the defective filter manifold (AMM TASK 29-13-05-000-801).
 - 4) Install the new filter manifold (AMM TASK 29-13-05-400-801).
 - 5) Assemble the filter manifold as follows:
 - a) On the filter manifold (7), remove the caps from the PUMP A and PUMP B check valves (8) and (9).
 - b) On the filter manifold (7), remove the cap from the filter manifold (7) PRESSURE OUT t-fitting (3).
 - c) Remove the plug from filter manifold (7) PRESSURE OUT tube (1).
 - 6) Do the internal leak test of the No. 3 hydraulic system (AMM TASK 29-13-00-790-802).
- g** If the leak rate of the pressure-relief-valve is not more than the permitted limit, continue with these fault isolation procedures.
- h** Disconnect the drain line from the RETURN quick-disconnect coupling (26).
- i** Connect the return hose of the hydraulic-power unit to the RETURN quick-disconnect coupling (26).
- (b) To do the fault isolation of the valve manifold pressure-relief-valve, do the steps that follow:
- 1** Prepare the No. 3 hydraulic system as follows:
 - a** On the valve manifold (19), disconnect tubes (12), (13), (15), (17) and (21).
 - b** Install a plug in each tube (12), (13), (15), (17) and (21).
 - c** Install a cap on each fitting (14), (16), (18), (20) and (24).
 - d** On the filter manifold, remove the cap from the t-fitting (3).
 - e** Remove the plug from the pressure tube (1).

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- f Connect the tube (1) to the t-fitting (3).
 - g Torque the tube (1), caps and plugs (AMM TASK 20-22-00-910-801).
- 2 Connect the hydraulic-power unit and pressurize the No. 3 hydraulic system as follows (AMM TASK 29-10-00-480-802):
- a Open the BYPASS valve of the hydraulic-power unit.
 - b Set the RESERVOIR SELECT valve of the hydraulic-power unit to the unit HYD POWER UNIT reservoir position.
 - c Energize the hydraulic-power unit.
 - d Set the hydraulic-power unit PRESSURE to 3000 ±50 psi (20684 ± 345 kPa).
 - e Slowly close the hydraulic-power unit BYPASS valve.
 - f Set the EICAS to the hydraulic synoptic page.
 - g Make sure the fluid temperature increases to between 80 and 100 °F (27 and 38 °C).
- NOTE: Cycle the flight controls (ailerons, elevators, rudder) to increase the hydraulic fluid temperature.
- 3 Release the hydraulic pressure and install a drain line as follows:
- a Open the hydraulic-power unit BYPASS valve.
 - b When the hydraulic system pressure drops to 0 psi, set the ground hydraulic-power unit to off.
 - c Disconnect the return hose of the ground hydraulic-power unit from the RETURN quick-disconnect coupling (20).
 - d Connect a drain line to the RETURN quick-disconnect coupling (20).
 - e Put the open end of the drain line into a fluid container.
- 4 Pressurize the hydraulic system and check for leakage as follows (AMM TASK 29-10-00-480-802):
- a Energize the hydraulic-power unit.
 - b Set the hydraulic-power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
 - c Slowly close the hydraulic-power unit BYPASS valve.

- d Make sure the hydraulic fluid temperature is between 70 and 100 °F (21 and 38 °C).
- e Make sure there is no movement of the hydraulic systems, and do the steps that follow:
- 1) Measure the fluid leak rate at the RETURN drain line for one minute.
 - 2) The fluid leak rate must not be more than 0.25 gpm, or 32 oz per min (1137 cc per min).
 - 3) Open the hydraulic–power unit BYPASS valve.
 - 4) When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.
- f If the leak rate of the valve manifold pressure–relief–valve is more than the permitted limit, do the steps that follow:
- 1) On the valve manifold, remove the plugs from tubes (12), (13), (15), (17) and (21).
 - 2) On the valve manifold, remove the caps from fittings (14), (16), (18), (20) and (24).
 - 3) Remove the defective valve manifold (AMM TASK 29–13–57–000–801).
 - 4) Install a new valve manifold (AMM TASK 29–13–57–400–801).
 - 5) Assemble the filter manifold as follows:
 - a) Remove the plugs from the tubes (4) and (6).
 - b) Remove the two caps from the PRESSURE OUT t–fitting (3).
 - c) Remove the plugs from the tubes (10) and (11).
 - d) Remove the two caps from the check valves (8) and (9).
 - e) Connect the tubes (4) and (6) to the PRESSURE OUT t–fitting (3).

- f) Connect the tubes (10) and (11) to the check valves (8) and (9).
 - g) Torque the tubes (4), (6), (10) and (11) (AMM TASK 20-22-00-910-801).
- 6) Do the internal leak test of the No. 3 hydraulic system (AMM TASK 29-13-00-790-802).
- g) If the leak rate of the valve manifold pressure-relief-valve is not more than the permitted limit, do the steps that follow:
 - h) Disconnect the drain line from the RETURN quick-disconnect coupling (26).
 - i) Connect the return hose of the hydraulic-power unit to the RETURN quick-disconnect coupling (26).
 - j) Continue with the fault isolation procedures.
- (c) To do the fault isolation of the No. 3 hydraulic-system reservoir, do the steps to follow:
- 1 Prepare the No. 3 hydraulic system as follows:
 - a) Remove the cap from the valve manifold fitting (20).
 - b) Remove the plug from the tube (21).
 - c) Connect the tube (21) from the valve-manifold fitting (20).
 - d) Torque the tube (21) (AMM TASK 20-22-00-910-801).
 - e) Disconnect the tube (23) from the valve-manifold fitting (22).
 - f) Install a cap on the valve manifold fitting (22).
 - g) Install a plug in the tube (23).
 - h) Torque the cap and plug (AMM TASK 20-22-00-910-801).
 - 2 Connect the hydraulic-power unit and pressurize the No. 3 hydraulic system as follows (AMM TASK 29-10-00-480-802):
 - a) Open the BYPASS valve of the hydraulic-power unit.
 - b) Set the RESERVOIR SELECT valve of the hydraulic-power unit to the unit HYD POWER UNIT reservoir position.
 - c) Energize the hydraulic-power unit.

- d Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
- e Slowly close the hydraulic–power unit BYPASS valve.
- f Set the EICAS to the hydraulic synoptic page
- g Make sure the fluid temperature increases to between 80 and 100 °F (27 and 38 °C).

NOTE: Cycle the flight controls (ailerons, elevators, rudder) to increase the hydraulic fluid temperature.

3 Release the hydraulic pressure and install a drain line as follows:

- a Open the hydraulic–power unit BYPASS valve.
- b When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.
- c Disconnect the return hose of the ground hydraulic–power unit from the RETURN quick–disconnect coupling (20).
- d Connect a drain line to the RETURN quick–disconnect coupling (20).
- e Put the open end of the drain line into a fluid container.

4 Pressurize the hydraulic system and check for leakage as follows (AMM TASK 29–10–00–480–802):

- a Energize the hydraulic–power unit.
- b Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
- c Slowly close the hydraulic–power unit BYPASS valve.
- d Make sure the hydraulic fluid temperature is between 70 and 100 °F (21 and 38 °C).
- e Make sure there is no movement of the hydraulic systems, and do the steps that follow:
 - 1) Measure the fluid leak rate at the RETURN drain line for one minute.
 - 2) The fluid leak rate must not be more than 0.25 gpm, or 32 oz per min (1137 cc per min).

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- 3) Open the hydraulic–power unit BYPASS valve.
 - 4) When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.
- f If the leak rate of the No. 3 hydraulic–system reservoir is more than the permitted limit, do the steps that follow:
- 1) Remove the defective No. 3 hydraulic–system reservoir (AMM TASK 29–13–29–000–801).
 - 2) Install a new No. 3 hydraulic–system reservoir (AMM TASK 29–13–29–400–801).
 - 3) Prepare the No. 3 hydraulic system as follows:
 - a) At the valve manifold, remove the plugs from tubes (12), (13), (15), (17) and (21).
 - b) On the valve manifold, remove the caps from the fittings (14), (16), (18), (20) and (24).
 - c) Connect the tubes (12), (13), (15), (17) and (21) to the fittings (14), (16), (18), (20) and (24).
 - d) At the filter manifold, remove the plugs from the tubes (4), (6), (10), (11).
 - e) On the filter manifold, remove the caps from the fittings (3), (8) and (9).
 - f) Connect the tubes (4), (6), (10) and (11) to the fittings (3), (8) and (9).
 - g) Torque the tubes (4), (6), (10) and (11) (AMM TASK 20–22–00–910–801).
 - 4) Do the internal leak test of the No. 3 hydraulic system (AMM TASK 29–13–00–790–802).
- g If leak rate of the the No. 3 hydraulic–system reservoir is not more than the permitted limit, do the steps that follow:
- h Disconnect the drain line from the RETURN quick–disconnect coupling (26).
- i Connect the return hose of the hydraulic–power unit to the RETURN quick–disconnect coupling (26).
- j Continue with the fault isolation procedures.

- (d) To do the fault isolation of the ram air turbine (RAT) hydraulic pump, do the steps to follow:
- 1 Prepare the No. 3 hydraulic system as follows:
 - a Remove the cap from the valve manifold fitting (24).
 - b Remove the plug from the tube (12).
 - c Connect the tube (12) to the valve–manifold fitting (24).
 - d Torque the tube (12) (AMM TASK 20–22–00–910–801).
 - e Disconnect the tube (21) from the valve–manifold fitting (20).
 - f Install a cap on the valve manifold fitting (20).
 - g Install a plug in the tube (21).
 - h Torque the cap and plug (AMM TASK 20–22–00–910–801).
 - 2 Connect the hydraulic–power unit and pressurize the No. 3 hydraulic system as follows (AMM TASK 29–10–00–480–802):
 - a Open the BYPASS valve of the hydraulic–power unit.
 - b Set the RESERVOIR SELECT valve of the hydraulic–power unit to the unit HYD POWER UNIT reservoir position.
 - c Energize the hydraulic–power unit.
 - d Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
 - e Slowly close the hydraulic–power unit BYPASS valve.
 - f Set the EICAS to the hydraulic synoptic page.
 - g Make sure the fluid temperature increases to between 80 and 100 °F (27 and 38 °C).

NOTE: Cycle the flight controls (ailerons, elevators, rudder) to increase the hydraulic fluid temperature.
 - 3 Release hydraulic pressure and install a drain line as follows:
 - a Open the hydraulic–power unit BYPASS valve.
 - b When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.

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- c Disconnect the return hose of the ground hydraulic–power unit from the RETURN quick–disconnect coupling (20).
 - d Connect a drain line to the RETURN quick–disconnect coupling (20).
 - e Put the open end of the drain line into a fluid container.
- 4 Pressurize the hydraulic system and check for leakage as follows (AMM TASK 29–10–00–480–802):
 - a Energize the hydraulic–power unit.
 - b Set the hydraulic–power unit PRESSURE to 3000 ±50 psi (20684 ±345 kPa).
 - c Slowly close the hydraulic–power unit BYPASS valve.
 - d Make sure the hydraulic fluid temperature is between 70 and 100 °F (21 and 38 °C).
 - e Make sure there is no movement of the hydraulic systems, and do the steps that follow:
 - 1) Measure the fluid leak rate at the RETURN drain line for one minute.
 - 2) The fluid leak rate must not be more than 0.25 gpm, or 32 oz per min (1137 cc per min).
 - 3) Open the hydraulic–power unit BYPASS valve.
 - 4) When the hydraulic system pressure drops to 0 psi, set the ground hydraulic–power unit to off.
 - f If the leak rate of the RAT hydraulic pump is more than the permitted limit, do the steps that follow:
 - 1) Remove the defective RAT (AMM TASK 24–23–01–000–801).
 - 2) Install a new RAT (AMM TASK 24–23–01–400–801).
 - 3) Prepare the No. 3 hydraulic system as follows:
 - a At the valve manifold, remove the plugs from tubes (13), (15), (17), (21) and (23).
 - b On the valve manifold, remove the caps from the fittings (14), (16), (18), (20) and (22).
 - c Connect the tubes (13), (15), (17), (21) and (23) to the fittings (14), (16), (18), (20) and (22).

- d) Torque the tubes (14), (16), (18) and (20) and (22) (AMM TASK 20-22-00-910-801).
 - e) At the filter manifold, remove the plugs from the tubes (4), (6), (10), (11).
 - f) On the filter manifold, remove the caps from the fittings (3), (8) and (9).
 - g) Connect the tubes (4), (6), (10) and (11) to the fittings (3), (8) and (9).
 - h) Torque the tubes (4), (6), (10) and (11) (AMM TASK 20-22-00-910-801).
- 4) Do the internal leak test of the No. 3 hydraulic system (AMM TASK 29-13-00-790-802).
- (e) Disconnect the drain line from the RETURN quick-disconnect coupling (26).
 - (f) Disconnect the pressure line from the PRESSURE quick-disconnect coupling (25).
 - (g) Install the dust caps on the PRESSURE and RETURN quick-disconnect couplings (25) and (26).

G. Close Out

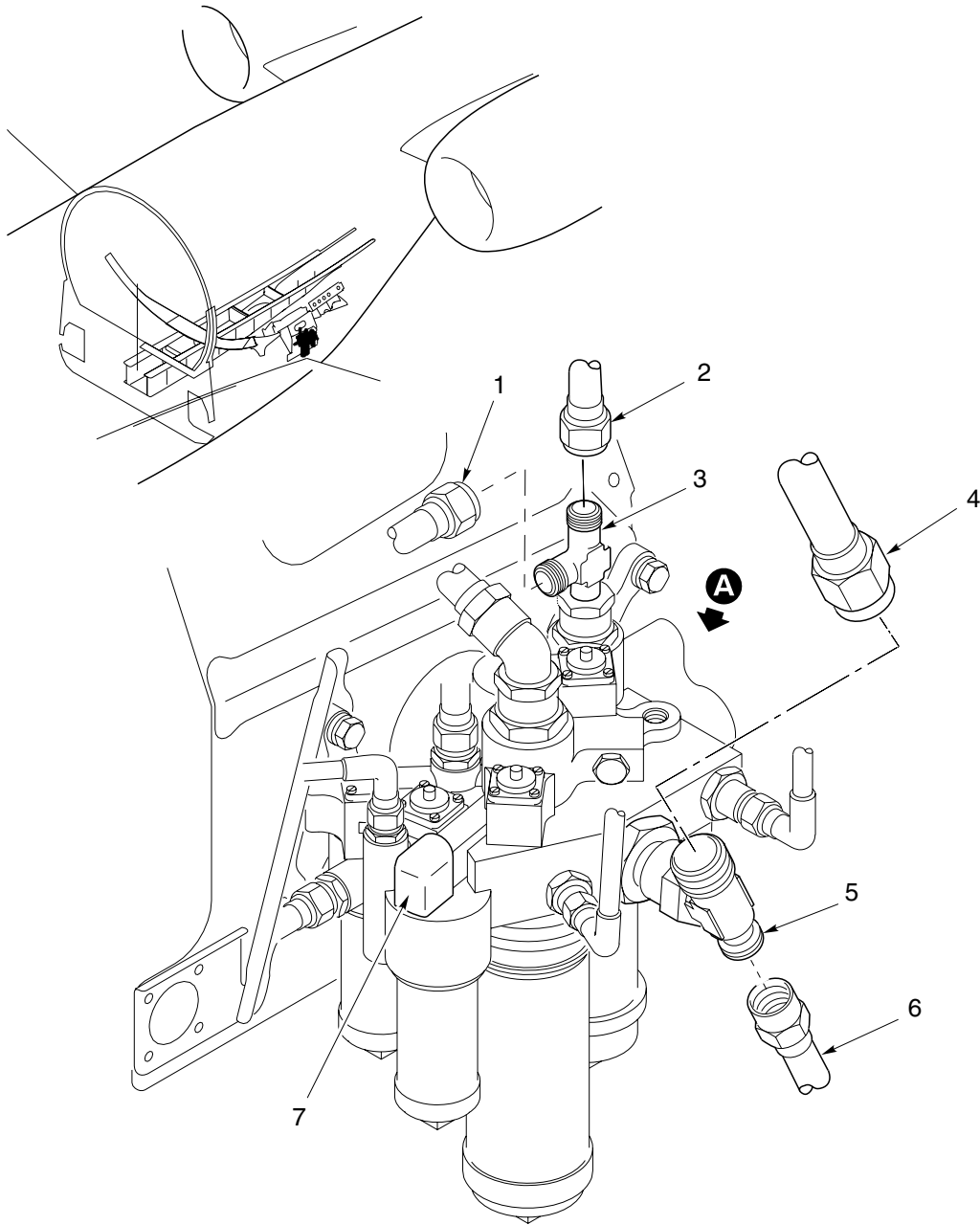
- (1) In the flight compartment, on the EMS CDU, close the circuit breakers that follow (AMM TASK 24-00-00-863-802):

SYSTEM NAME	CIRCUIT BREAKER NAME	BUS NAME
HYD	HYD PUMP 3A	AC 4
HYD	HYD PUMP 3B	AC 1

- (2) Clean all the hydraulic fluid leakage from the work area.
- (3) Remove all tools, equipment, and unwanted materials from the work area.
- (4) Close the No. 3 hydraulic system-servicing door (171AL).
- (5) Install the aft wing-to-fuselage fairings (185BL/186BR) (AMM TASK 53-61-09-400-801)

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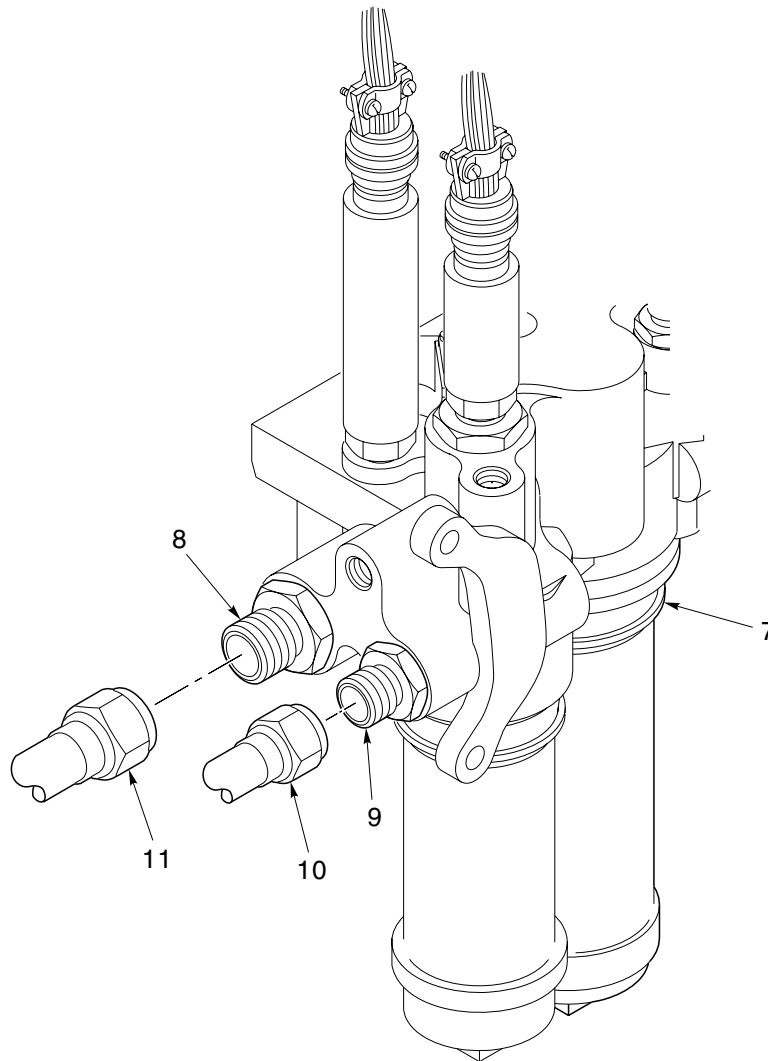
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No. 3 Hydraulic System Internal Leakage/Filter Manifold – Fault Isolation
Figure 202 (Sheet 1 of 2)

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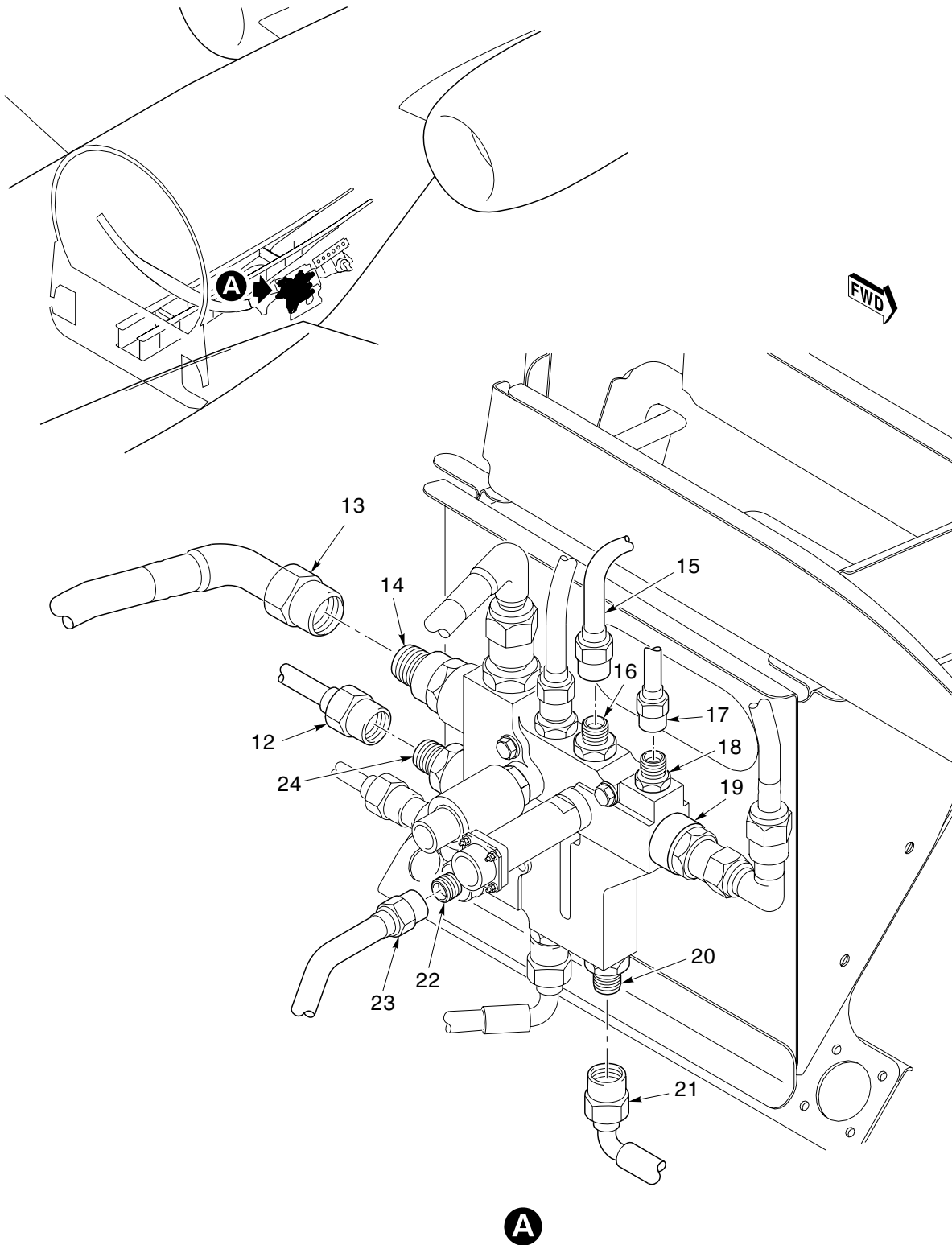
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Figure 202 (Sheet 2 of 2)

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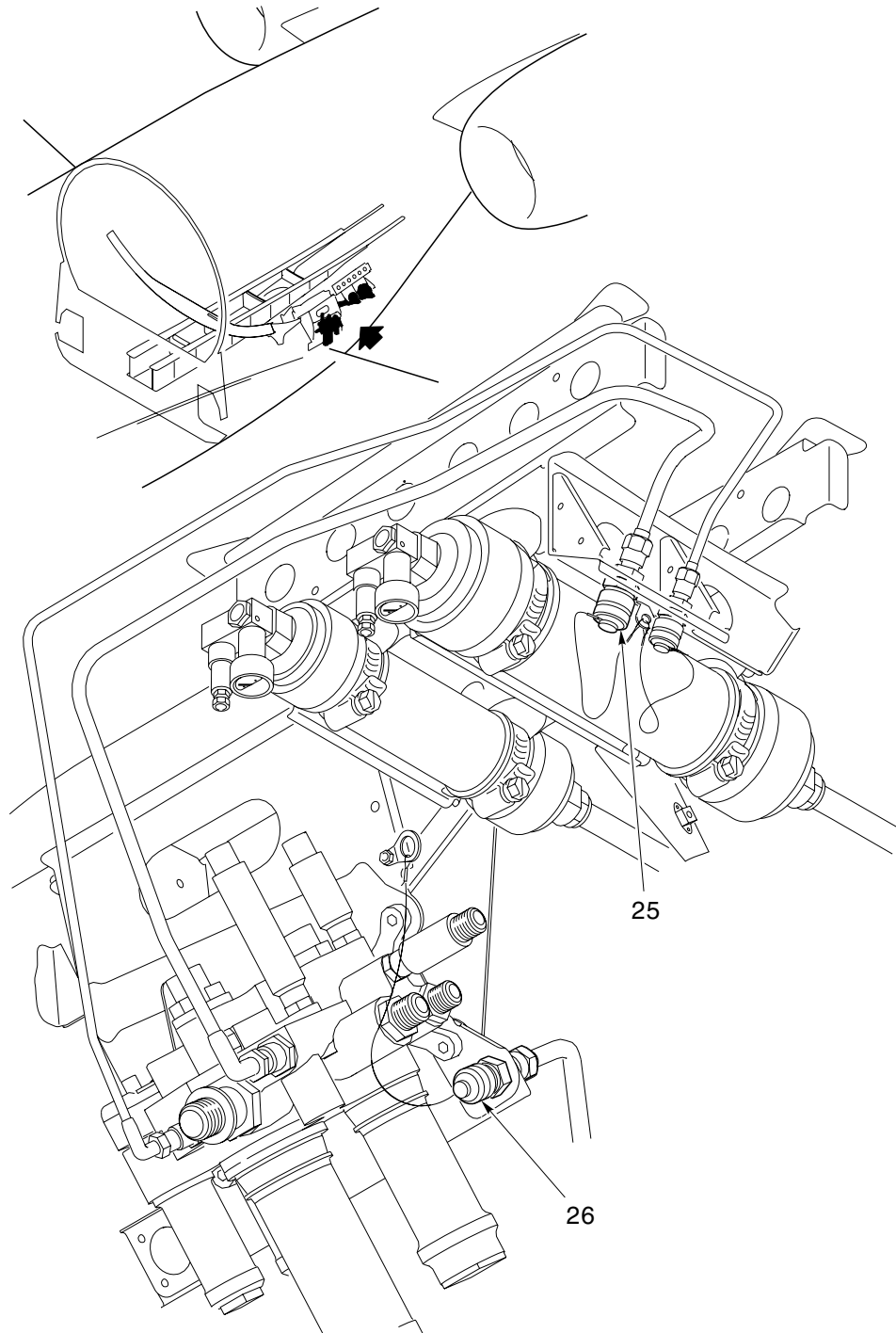


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No. 3 Hydraulic System Internal Leakage/Valve Manifold – Fault Isolation
Figure 203

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No. 3 Hydraulic System Internal Leakage/Quick Disconnect Couplings – Fault Isolation
Figure 204

EFFECTIVITY: ALL

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