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ICE AND RAIN PROTECTION - DESCRIPTION AND OPERATION

1. Ice Protection
   A. General
      (1) The anti-icing system ensures operation and control of airplane systems under ice conditions. The anti-icing system is made up of five subsystems: wing thermal anti-icing, engine inlet thermal anti-icing, probe anti-icing, flight compartment window anti-icing, and water and drain line heaters.
   B. Component Details
      (1) Wing Thermal Anti-Icing (30-11-00)
         (a) The wing thermal anti-icing system uses engine bleed air to prevent ice formation on the leading edge slats. System components include thermal anti-ice (TAI) valves, telescoping ducts, flexible couplings, spray tubes, wing and engine anti-ice control panel, and test panel.
      (2) Engine Inlet Thermal Anti-Icing (30-21-00)
         (a) The engine inlet thermal anti-icing system uses engine bleed air to prevent ice formation on the engine inlet cowls. Engine P1 probes are electrically heated. System components include engine inlet thermal anti-ice (TAI) valves, engine inlet TAI pressure switches, engine inlet cowl ducts, engine P1 probes, and wing and engine anti-ice control panel.
      (3) Probe Anti-Icing:
         (a) Pitot Probe Anti-Icing (30-31-00)
            1) Pitot probes are electrically heated to prevent erroneous readings due to ice formation. System components are pitot probes, the test panel, and the annunciator panel.
         (b) Angle of Attack Probe Heat (30-32-00)
            1) Angle of attack probes are electrically heated to prevent erroneous readings due to ice formation. System components are angle of attack probes, the test panel, and the annunciator panel.
         (c) Total Air Temperature Probe Heat (30-33-00)
            1) The total air temperature probe is electrically heated to prevent erroneous readings due to ice formation. System components are the total air temperature probe, test panel, and annunciator panel.
         (d) Engine Probe Heat (30-34-00)
            1) Engine P1 probes are electrically heated to prevent erroneous readings due to ice formation.
      (4) Flight Compartment Window Anti-Icing (30-41-00)
         (a) Flight compartment windows are electrically heated by controllers with built-in-test (BIT) capability. System components include window heat control units, test panel, and window heat control panel.

(5) Water and Drain Line Heaters (30-71-00)

(a) Water and drain lines are heated to prevent ice formation. System components include heater tapes, heater tape thermostats, heating gaskets, and drain mast heaters.

2. Rain Protection

A. General

(1) The rain protection system provides increased forward visibility during rain or snow. The windshield wiper system and rain repellent system compose the rain protection system.

(2) AIRPLANES WITH HYDROPHOBIC COATING ON THE WINDSHIELD;
The rain repellent system consists of a hydrophobic coating applied to the number 1 window. No pilot actions are necessary to operate the system.

B. Component Details

(1) Windshield Wiper System (30-42-00)

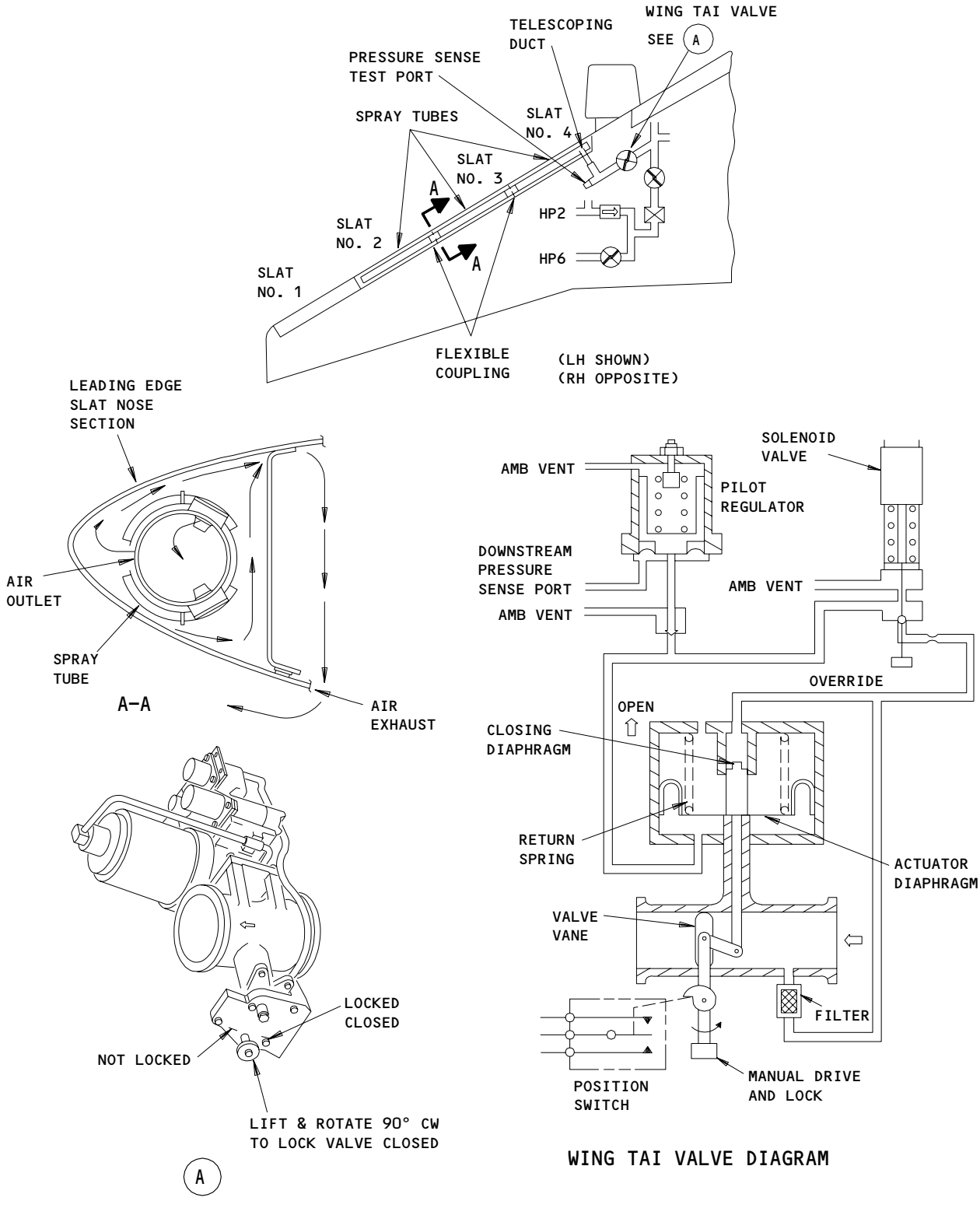
(a) Electrically operated windshield wipers increase visibility during rain and snow. Components of the windshield wiper system include: windshield wiper motors, windshield wiper arms, windshield wiper blades, and windshield wiper/rain repellent control panel.

(2) Rain Repellent System (30-43-00)

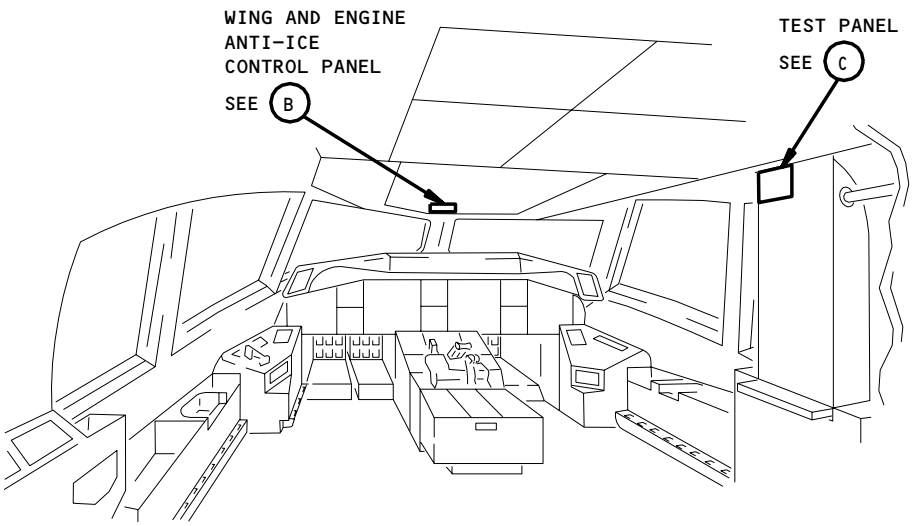
(a) Rain repellent works with the wipers to increase visibility in heavy rain or snow. The rain repellent system consists of a rain repellent bottle, rain repellent valves, spray nozzles, accumulator, and windshield wiper/rain repellent control panel.

WING THERMAL ANTI-ICING - DESCRIPTION AND OPERATION

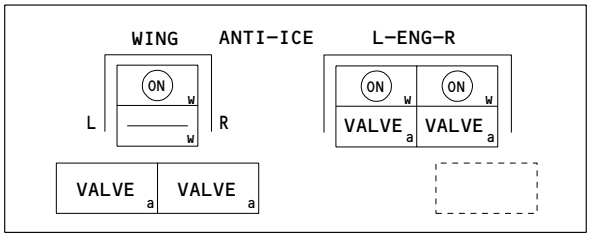
1. General
   A. Engine bleed air provides inflight thermal anti-icing to three outboard slats on each wing. System components include: wing thermal anti-ice (TAI) valves, telescoping ducts, spray tubes, wing and engine anti-ice control panel, and a test panel.
   B. System electrical power comes from a DC bus, through a circuit breaker on overhead circuit breaker panel P11.
2. Component Details (Fig. 1)
   A. Wing Thermal Anti-Ice (TAI) Valve
      (1) The wing TAI valve controls the flow of engine bleed air into the leading edge anti-ice ducts. One valve is located above the strut position in each wing. The valve is set to keep duct air pressure between 20-28 psi.
      (2) An indicator on the valve shows when it is CLOSED or NOT CLOSED. The valve can be manually set to the full open or full closed position by rotating a hex head bolt on the valve housing. The valve can only be locked in the closed position.
      (3) Energizing the TAI valve solenoid opens an upstream air passage to the actuator diaphragm. Upstream air pressure overcomes the forces of the return spring and the closing diaphragm. The actuator diaphragm opens the valve vane.
      (4) De-energizing the TAI valve solenoid closes the upstream air passage to the actuator diaphragm. The actuator diaphragm is vented to ambient air. Upstream air pressure on the closing diaphragm and the return spring close the valve vane. Upstream air pressure keeps the valve vane in closed position.
      (5) Downstream (regulated) pressure is sensed by the pilot pressure regulator. If downstream pressure exceeds the adjustment setting of the pilot regulator, a valve bleeds off actuator diaphragm pressure. The closing diaphragm and return spring partially close the valve vane, lowering downstream pressure.
   B. Telescoping Duct
      (1) Each wing has a telescoping duct connecting the wing supply manifold to the leading edge distribution duct. Bleed air can be fed to the leading edge slats regardless of slat position.
   C. Flexible Coupling
      (1) Flexible couplings join the leading edge ducts where the slats are separated. The couplings allow for alignment errors during slat movements. There are 2 couplings per wing, between the leading edge slats.
   D. Spray Tubes
      (1) Ducting on three outboard slats on each wing have spray holes to direct bleed air to the leading edge surfaces.



Wing TAI Component Location
Figure 1 (Sheet 1)

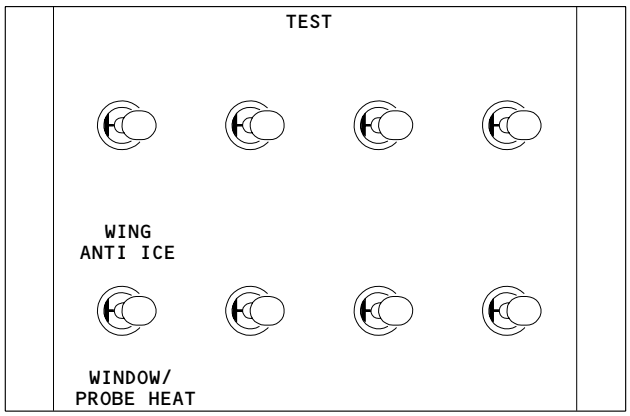


FLIGHT COMPARTMENT



WING AND ENGINE ANTI–ICE CONTROL PANEL

B



TEST PANEL

C

Wing TAI – Component Location
Figure 1 (Sheet 2)

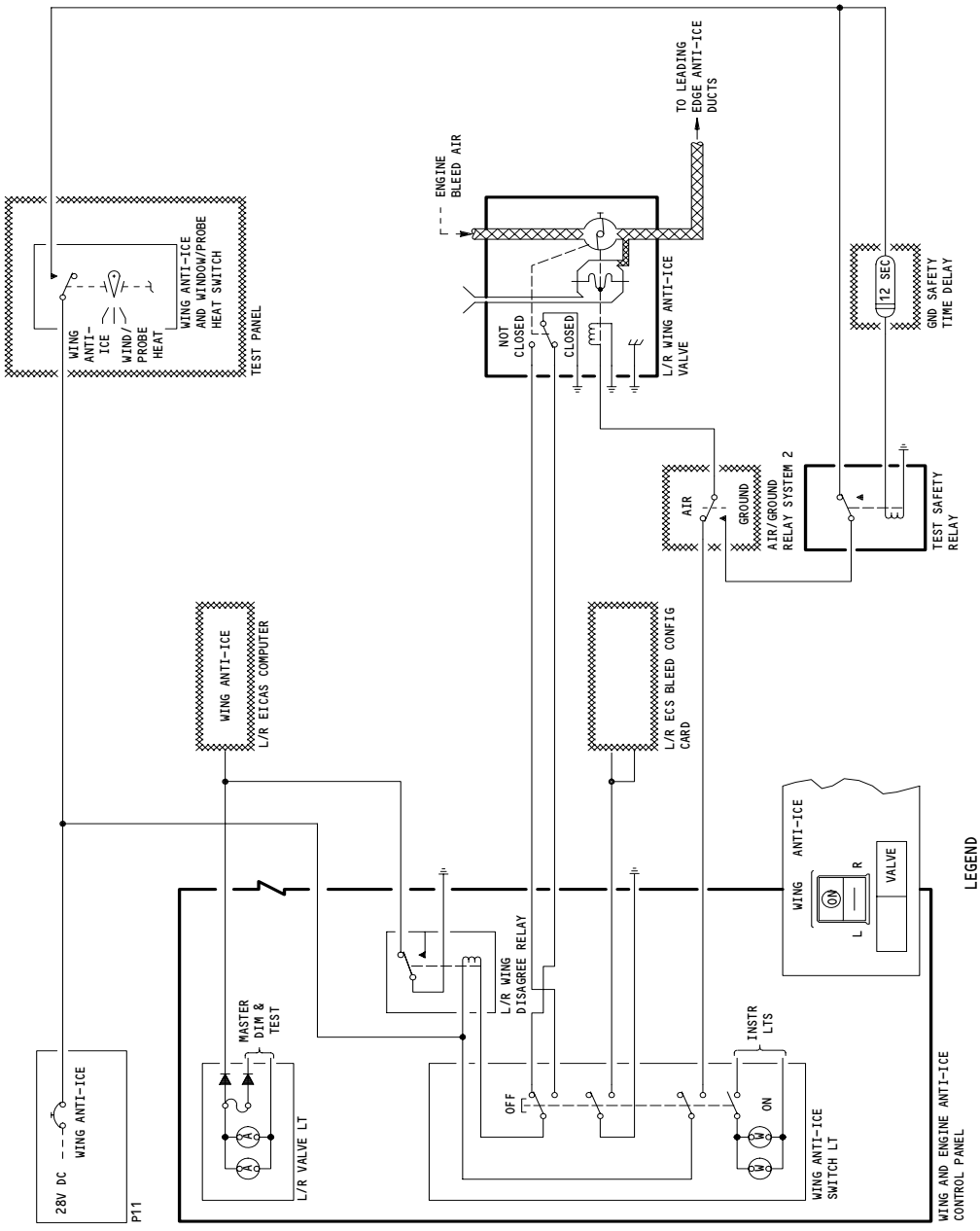
E. Wing and Engine Anti-Ice Control Panel
(1) The wing and engine anti-ice control panel M10397 controls wing thermal anti-icing with the WING ANTI-ICE switch. The M10397 panel also controls engine inlet thermal anti-icing. The M10397 panel is on pilots' overhead panel P5.

F. Test Panel
(1) The WING ANTI-ICE WINDOW/PROBE HEAT switch on the M10398 test panel allows a ground test of the wing TAI system. The M10398 panel is on right side panel P61.

3. Operation (Fig. 2)

A. Functional Description
(1) The push on/push off WING ANTI-ICE switch on the M10397 panel controls system operation in flight.
(2) Pressing the WING ANTI-ICE switch energizes the TAI valve solenoids, opening the TAI valves. Engine bleed air then flows to the leading edge ducts. Amber VALVE lights on the M10397 panel illuminate while the valve is in transit. After the valve has opened, the VALVE lights extinguishes.
(3) If the position of a wing's TAI valve disagrees with its commanded position, that wing's VALVE light illuminates.
(4) EICAS computers monitor valve/switch disagreement. If valve position disagrees with commanded position for more than 2.5 seconds, a wing anti-ice message is shown on EICAS display P2 (AMM 31-41-00).
(5) Engine bleed control cards (EBCCs) monitor TAI valve position. The EBCCs have outputs to the electronic engine control unit (EEC). The EEC readjusts engine trim to meet changing bleed air requirements (AMM 73-21-00).
(6) A capped test port downstream of the TAI valve allows on-the-ground checking of duct pressure.

B. Ground Test
(1) An air/ground relay prevents system operation on the ground. A ground test can be performed with the WING ANTI-ICE WINDOW/PROBE HEAT switch on the M10398 test panel. The switch is a three position, spring loaded, center off switch. Test indications depend on the position of the WING ANTI-ICE switch (on P5).
(2) With the WING ANTI-ICE switch off, holding the test switch in the WING ANTI-ICE position will open the TAI valves. The VALVE lights will be illuminated as long as test switch is held up to a maximum of 12 seconds. A ground safety time delay relay automatically closes the valve after 12 seconds to prevent duct overheating. Retesting can only be performed by releasing and then holding the test switch.



Wing Anti-Ice Schematic
Figure 2

(3) With the WING ANTI-ICE switch on, the VALVE lights will be illuminated. Holding the test switch in the WING ANTI-ICE position will open the TAI valves. The VALVE lights will extinguish as long as test switch is held for a minimum of 12 seconds. A ground safety time delay relay automatically closes the TAI valves after 12 seconds to prevent duct overheating. Retesting can only be performed by releasing and holding the test switch.

C. Control

(1) To place the system in operation, provide electrical power to the right main DC bus (AMM 24-22-00).

(2) Pressurize pneumatic system (AMM 36-11-00).

(3) Ensure that WING ANTI-ICE circuit breaker on overhead circuit breaker panel P11 is closed.

(4) To operate the system on the ground, use the WING ANTI-ICE WINDOW/PROBE HEAT switch on right side panel P61. Holding the switch in the WING ANTI-ICE position will operate the system.

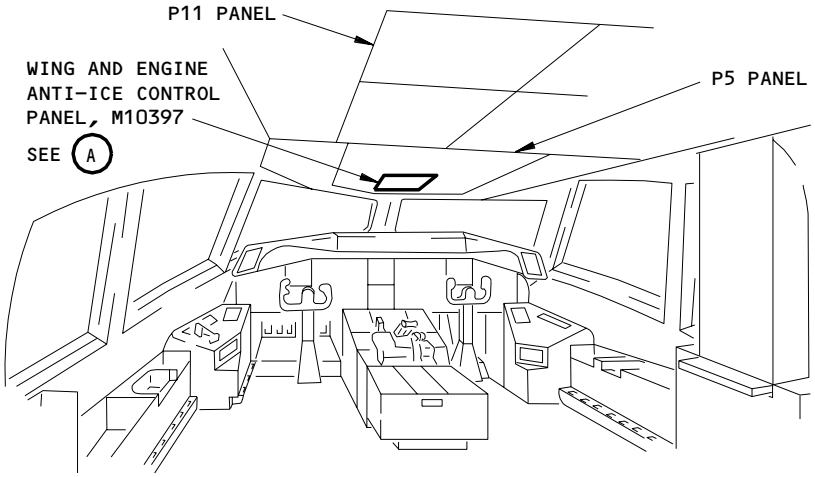
WING THERMAL ANTI-ICE SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CARD - (FIM 36-10-00/101)				
LEFT ECS BLEED CONFIGURATION, M10313				
RIGHT ECS BLEED CONFIGURATION, M10312				
CIRCUIT BREAKER -			FLT COMPT, P11	*
WING ANTI-ICE, C1132	--	1	1> 11C28, 11R20, 11C29 OR 11D29	
COMPUTER - (FIM 31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
LIGHT - VALVE, L1	--	1	FLT COMPT, P5, ANTI-ICE CONTROL PANEL, M10397	*
LIGHT - VALVE, L2	--	1	FLT COMPT, P5, ANTI-ICE CONTROL PANEL, M10397	*
MODULE -	--		MAIN EQUIP CTR, P37 PANEL	
GROUND SAFETY TIME DELAY, M10479		1		*
PANEL - (FIM 30-32-00/101)				
MISC TEST, M10398				
PANEL - ANTI-ICE CONTROL, M10397	--	1	FLT COMPT, P5	30-11-01
RELAY -	--		MAIN EQUIP CTR, P37 PANEL	
AIR/GND SYS 2, K204		1		*
TEST SAFETY, K10403		1		*
RELAY - L WING DISAGREE, K1	--	1	FLT COMPT, P5, ANTI-ICE CONTROL PANEL, M10397	*
RELAY - R WING DISAGREE, K2	--	1	FLT COMPT, P5, ANTI-ICE CONTROL PANEL, M10397	*
SWITCH-LIGHT - WING ANTI-ICE, S3	--	1	FLT COMPT, P5, ANTI-ICE CONTROL PANEL, M10397	*
VALVE - L WING ANTI-ICE, V52	--	1	521UBX, FIXED WING LOWER PANEL	30-11-02
VALVE - R WING ANTI-ICE, V57	--	1	621UBX, FIXED WING LOWER PANEL	30-11-02

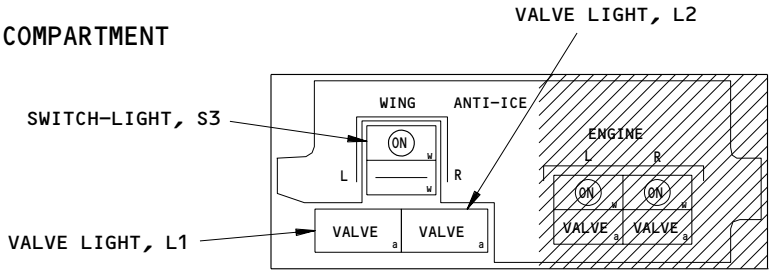
* SEE THE WDM EQUIPMENT LIST

1> THIS CIRCUIT BREAKER CAN BE IN ONE OF THESE LOCATIONS

Wing Thermal Anti-Ice System - Component Index
Figure 101

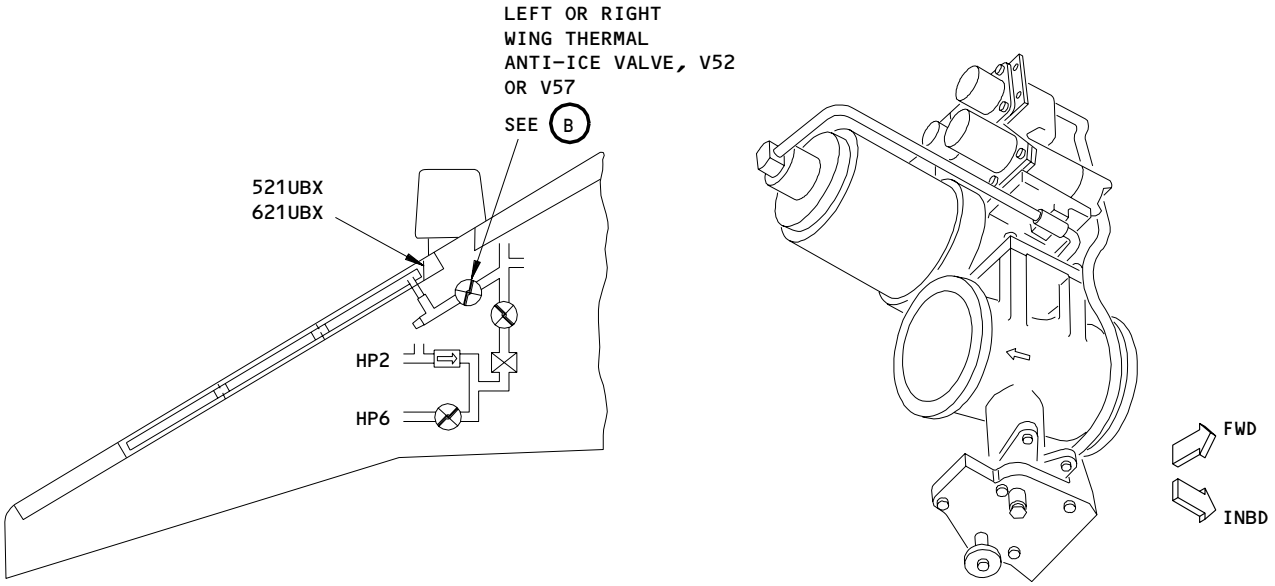


FLIGHT COMPARTMENT



WING AND ENGINE ANTI-ICE CONTROL PANEL, M10397

A



LEFT OR RIGHT WING THERMAL
ANTI-ICE TAI VALVE, V52 OR V57

B

Wing Thermal Anti-Ice System - Component Location
Figure 102

WING THERMAL ANTI-ICING - ADJUSTMENT/TEST

1. General
   A. This procedure contains four tasks. The first two tasks are a test of the left and right wing thermal anti-ice (TAI) system. The second two tasks are an alternate test of the left and right wing TAI system that allows the use of a hotter ground air supply.

TASK 30-11-00-735-001

2. Test - Left Wing TAI System
   A. Equipment
      (1) Timing Device - 15 seconds minimum
      (2) Ground Air Supply (80 lbs/min at 13 to 25 psig)
      (3) Pressure Gage - 0-50 psig ±1% accuracy with hose and fittings
   B. References
      (1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (4) AMM 32-09-02/201, Air/Ground Relays
      (5) AMM 36-00-00/201, Pneumatic - General
      (6) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          521 Leading edge to front spar (left)
          522 Slat No. 4 (left)
      (2) Access Panels
          521AB Fixed lower wing panel
          522BL Fixed upper wing panel
   D. Prepare for the Test (Fig. 501)

S 865-143

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OFF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-003
(2) Remove the fixed upper wing panel 522BL (AMM 06-44-00/201).

S 015-004
(3) Remove the fixed lower wing panel 521AB (AMM 06-44-00/201).

S 865-005
(4) Supply electrical power (AMM 24-22-00/201).

S 865-006
(5) Make sure the ISOLATION VALVE switch-light on the P5 panel is in the OFF position.

S 865-007
(6) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 495-008

WARNING: YOU MUST USE EYE AND EAR PROTECTIVE DEVICES. THE HOT AIR IN THE PRESSURIZED DUCTS CAN CAUSE INJURY TO PERSONS.

CAUTION: DO NOT USE A GROUND AIR SUPPLY THAT IS HOTTER THAT 200°F WHEN THE AIRPLANE IS IN FLIGHT MODE. THE HOT AIR IN THE WING TAI DUCT CAN CAUSE DAMAGE TO THE LEADING EDGE PANELS.

(7) Supply pneumatic power with the ground air source to a pressure of 13 - 25 psi (AMM 36-00-00/201).
   (a) To supply pneumatic power, hold the left pneumatic service connector open, and connect the air supply to the left pneumatic service connector. There are alternate ways for providing pneumatic power using a ground air source, operating the auxiliary power unit (APU), or operating an engine (AMM 36-00-00/201).

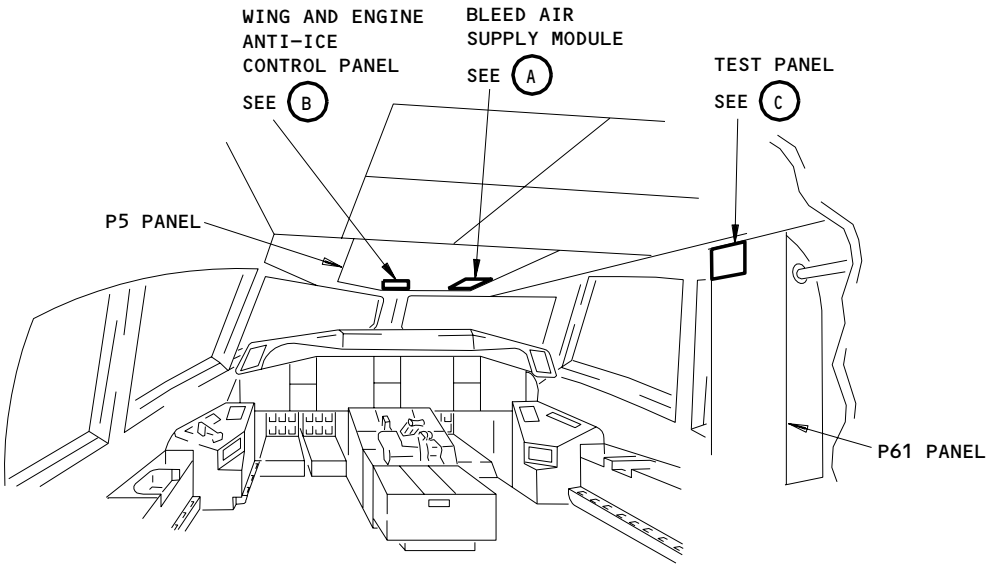
NOTE: Pressure derived from an engine or APU instead of a ground air source can not be regulated, but is sufficient to open the TAI valve.

E. Procedure (Fig. 501, 502)

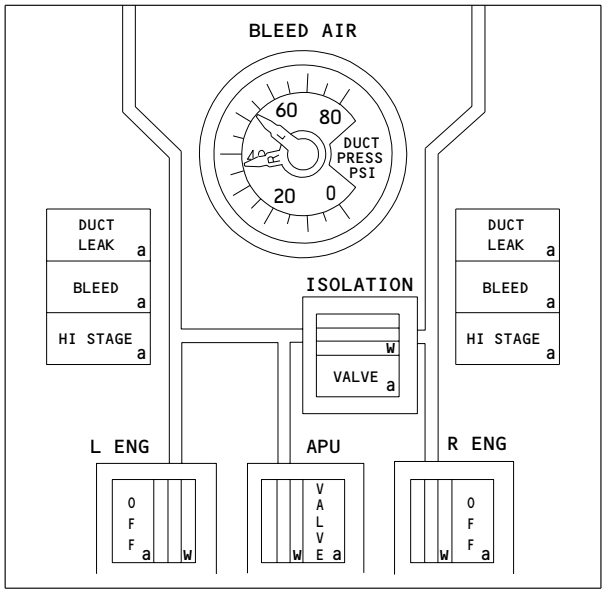
NOTE: This test confirms the capability of the TAI valves to open when sufficient pressure (13 to 25 psi) is supplied. It is not intended to test the pressure regulating capabilities of the TAI valves at normal operating pressure (20 to 28 psi).

S 485-012
(1) Attach a pressure gage to the fitting on the outboard end of the left TAI tee duct.

S 865-138
(2) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position. Start the operation of the timing device at the same time.

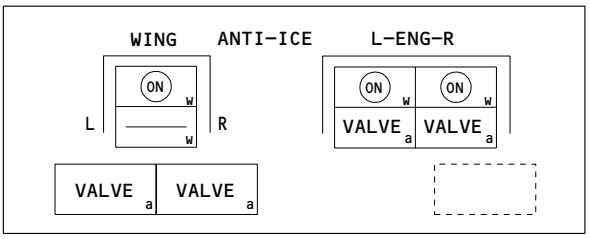


FLIGHT COMPARTMENT



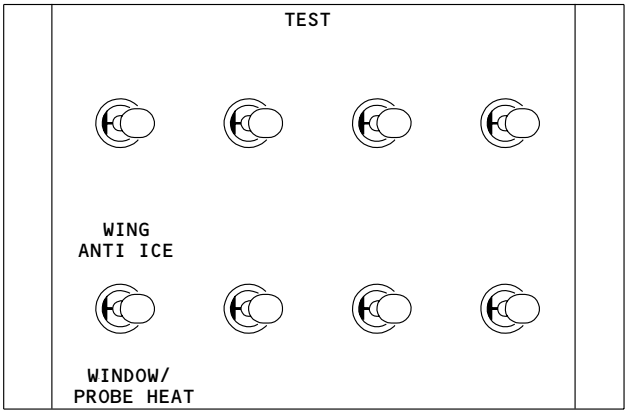
BLEED AIR SUPPLY MODULE

A



WING AND ENGINE ANTI-ICE CONTROL PANEL

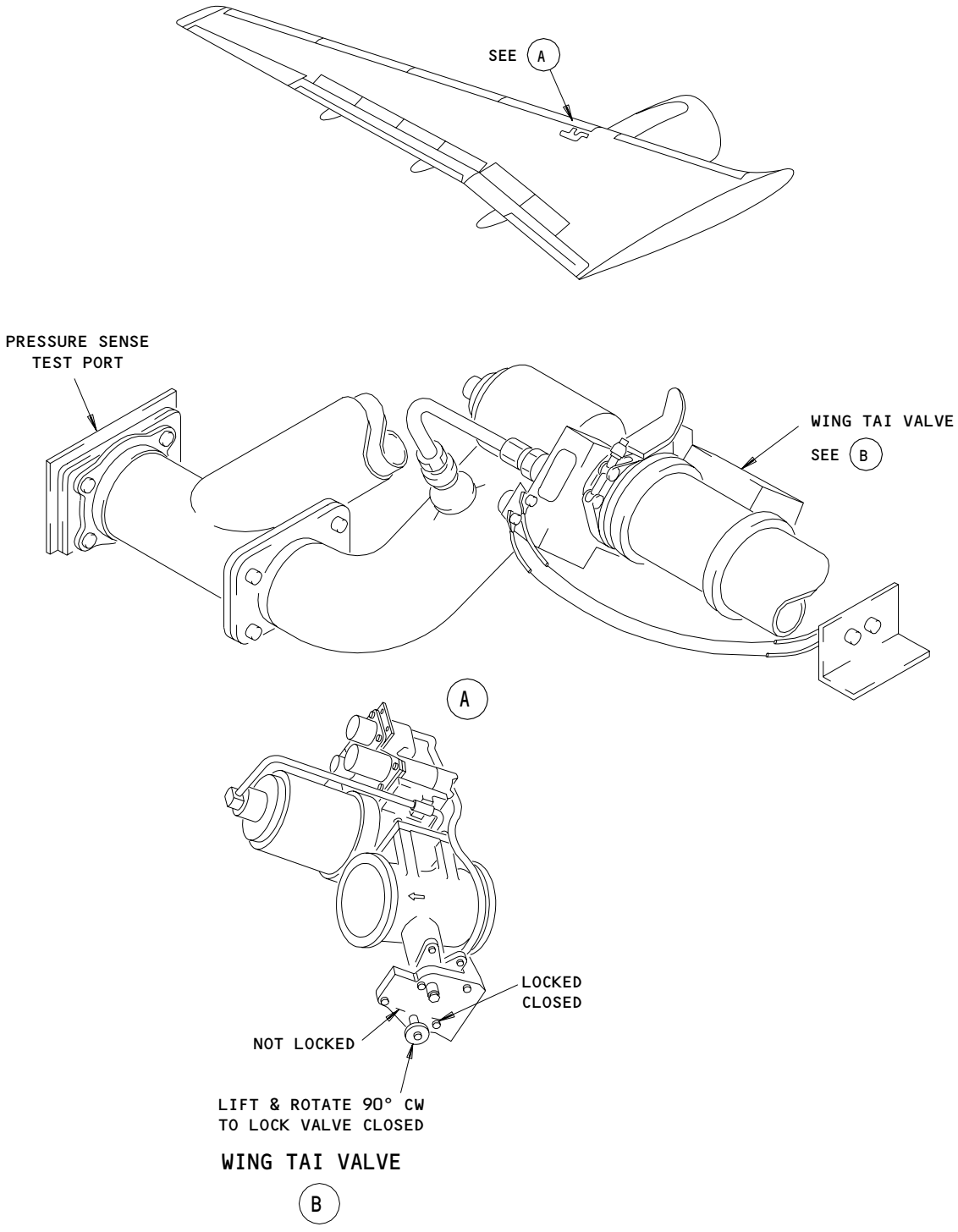
B



TEST PANEL

C

Wing TAI Control
Figure 501



Wing TAI Valve
Figure 502

S 215-014
(3) Make sure the L VALVE light comes on, and the EICAS message L WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message will show in 2 to 3 seconds.

S 215-015
(4) Make sure the pressure gage shows 13-25 psig.

S 215-035
(5) Make sure the L VALVE light on the P5 panel goes off, and the EICAS message L WING ANTI-ICE does not show after approximately 12 seconds.

S 865-139
(6) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 045-004

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(7) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

S 865-159
(8) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 865-140
(9) Put the WING ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the white ON light comes on.

S 215-020
(10) Make sure the R VALVE light on the P5 panel comes on, and R WING ANTI-ICE shows on the EICAS display.

NOTE: The L VALVE light will go on and then go off.

S 215-021
(11) Make sure the position indicator on the left TAI valve shows the full open position.

S 755-067

WARNING: DO NOT TRY TO TIGHTEN CLAMPS OR FLANGES WHEN THE DUCTS ARE PRESSURIZED. THE HOT PRESSURIZED AIR CAN CAUSE INJURY TO PERSONS.

(12) Make sure there is not too much leakage at any duct position downstream of the left TAI valve.

NOTE: Some leakage is permitted, but no fast air movement should be felt 12 inches from a leak.

S 215-023

(13) Make sure the pressure gage shows 13-25 psig.

NOTE: If the duct pressure is not 13-25 psig and no bad leaks are found, replace the wing TAI valve.

S 865-024

(14) Put the WING ANTI-ICE switch-light on the P5 panel in the OFF position. Make sure the ON light goes off.

S 215-025

(15) Make sure the R VALVE light on the P5 panel goes off.

S 215-026

(16) Make sure R WING ANTI-ICE does not show on the EICAS display.

S 865-014

(17) Remove the DO-NOT-CLOSE tag and close these P11 panel circuit breakers:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN

(b) 11S23, LANDING GEAR POS SYS 2

S 085-028
(18) Remove the pressure gage from the tee duct.

S 415-029
(19) Put the cap on the fitting.

F. Put the Airplane Back In Its Usual Condition.

S 445-005
(1) Put the safety-sensitive systems back to their initial conditions (AMM 32-09-02/201).

S 095-030
(2) Remove the pneumatic power source and the opposite pneumatic service outlet blocking device, if it is not necessary (AMM 36-00-00/201).

S 415-031
(3) Install the fixed upper wing panel 522BL (AMM 06-44-00/201).

S 415-032
(4) Install the fixed lower wing panel 521AB (AMM 06-44-00/201).

S 445-034
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

NOTE: If you plan to do the next task in this procedure (the test for the right wing TAI system), do not do this step.

S 865-033
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 30-11-00-735-035

3. Test - Right Wing TAI System

A. Equipment
(1) Timing Device - 15 seconds minimum
(2) Ground Air Supply (80 lbs/min at 13 to 25 psig)
(3) Pressure Gage - 0-50 psig ±1% accuracy with hose and fittings

B. References
(1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
(4) AMM 32-09-02/201, Air/Ground Relays
(5) AMM 36-00-00/201, Pneumatic - General

(6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

621 Leading edge to Front Spar (Right)
622 Slat No. 7 (Right)

(2) Access Panels

621AB Fixed lower wing panel
622BR Fixed upper wing panel

D. Prepare for the Test (Fig. 501)

S 865-036

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-037

(2) Remove the fixed upper wing panel 622BR (AMM 06-44-00/201).

S 015-146

(3) Remove the fixed lower wing panel 621AB (AMM 06-44-00/201).

S 865-039

(4) Supply electrical power (AMM 24-22-00/201).

S 215-040

(5) Make sure the ISOLATION VALVE switch-light on the P5 panel is in the OFF position.

S 215-041

(6) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 495-042

WARNING: YOU MUST USE EYE AND EAR PROTECTIVE DEVICES. THE HOT AIR IN THE PRESSURIZED DUCTS CAN CAUSE INJURY TO PERSONS.

CAUTION: DO NOT USE A GROUND AIR SUPPLY THAT IS HOTTER THAT 200°F WHEN THE AIRPLANE IS IN FLIGHT MODE. THE HOT AIR IN THE WING TAI DUCT CAN CAUSE DAMAGE TO THE LEADING EDGE PANELS.

(7) Supply pneumatic power with the ground air source to a pressure of 13 - 25 psi (AMM 36-00-00/201).

(a) To supply pneumatic power, hold the right pneumatic service connector open, and connect an air supply to the right pneumatic service connector (AMM 36-00-00/201).

E. Procedure (Fig. 501, 502)

NOTE: This test confirms the capability of the TAI valves to open when sufficient pressure (13 to 25 psi) is supplied. It is not intended to test the pressure regulating capabilities of the TAI valves at normal operating pressure (20 to 28 psi).

S 485-044

(1) Attach the pressure gage to the fitting on the outboard end of the right TAI tee duct.

S 865-045

(2) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position. Start the operation of timing device at the same time.

S 215-046

(3) Make sure the R VALVE light on the P5 panel comes on, and R WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message shows in 2 to 3 seconds.

S 215-147

(4) Make sure the pressure gage shows 13-25 psig.

S 215-148

(5) Make sure the R VALVE light on the P5 panel goes off, and the EICAS message R WING ANTI-ICE does not show after approximately 12 seconds.

S 865-049

(6) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the P61 panel.

S 045-006

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(7) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

S 865-160
(8) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 865-142
(9) Put the WING ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the white light comes on.

S 215-053
(10) Make sure the L VALVE light on the P5 panel comes on, and L WING ANTI-ICE shows on the EICAS display.

NOTE: The R VALVE light will go ON then go OFF.

S 215-141
(11) Make sure the position indicator on the right TAI valve shows the full open position.

S 755-068

WARNING: DO NOT TRY TO TIGHTEN THE CLAMPS OR FLANGES WHEN THE DUCTS ARE PRESSURIZED. THE HOT PRESSURIZED AIR CAN CAUSE INJURY TO PERSONS.

(12) Make sure that there is not too much leakage at any duct position downstream of the right TAI valve.

NOTE: Some leakage is permitted, but no fast air movement should be felt 12 inches from a leak.

S 215-056
(13) Make sure the pressure gage shows 13-25 psig.

NOTE: If the duct pressure is not 13-25 psig and no bad leaks are found, replace the wing TAI valve.

S 865-057
(14) Put the WING ANTI-ICE switch-light on the P5 panel in the OFF position. Make sure the ON light goes off.

S 215-058
(15) Make sure the L VALVE light on the P5 panel goes off.

S 215-137
(16) Make sure L WING ANTI-ICE does not show on the EICAS display.

S 865-161
(17) Remove the DO-NOT-CLOSE tag and close these P11 panel circuit breakers:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 085-061
(18) Remove the pressure gage from the tee duct.

S 415-062
(19) Put the cap on the fitting.

F. Put the Airplane Back In Its Usual Condition

S 445-007
(1) Put the safety-sensitive systems back to their initial conditions (AMM 32-09-02/201).

S 095-063
(2) Remove the pneumatic power source and the opposite pneumatic service outlet blocking device, if it is not necessary (AMM 36-00-00/201).

S 415-064
(3) Install the fixed upper wing panel 622BR (AMM 06-44-00/201).

S 415-145
(4) Install the fixed lower wing panel 621AB (AMM 06-44-00/201).

S 445-069
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-066
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 30-11-00-735-036

4. Alternate Test - Left Wing TAI System

A. General

(1) These two tasks are an alternate test of the left and right wing TAI system that allows the use of a hotter ground air supply.

B. Equipment
   (1) Timing Device - 15 seconds minimum
   (2) APU source of pneumatic power (80 lbs/min at 13 to 35 psig with an air temperature less than 450°F)
   (3) Pressure Gage - 0-50 psig ±1% accuracy with hose and fittings

C. References
   (1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels
   (2) AMM 24-22-00/201, Electrical Power - Control
   (3) AMM 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
   (4) AMM 32-09-02/201, Air/Ground Relays
   (5) AMM 36-00-00/201, Pneumatic - General
   (6) AMM 78-31-00/201, Thrust Reverser System

D. Access
   (1) Location Zones
       521 Leading edge to front spar (left)
       522 Slat No. 4 (left)
   (2) Access Panels
       521AB Fixed lower wing panel
       522BL Fixed upper wing panel

E. Prepare for the Test (Fig. 501)

S 865-037

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-149
(2) Remove the fixed upper wing panel 522BL (AMM 06-44-00/201).

S 015-039
(3) Remove the fixed lower wing panel 521AB (AMM 06-44-00/201).

S 865-040
(4) Supply electrical power (AMM 24-22-00/201).

S 865-042
(5) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 865-043

WARNING: YOU MUST USE EYE AND EAR PROTECTIVE DEVICES. THE HOT AIR IN THE PRESSURIZED DUCTS CAN CAUSE INJURY TO PERSONS.

(6) To supply pneumatic power from the APU, refer to task 36-00-00-862-012.

F. Procedure (Fig. 501, 502)

S 485-045
(1) Attach a pressure gage to the fitting on the outboard end of the left TAI tee duct.

S 865-000

CAUTION: DO NOT OPERATE THE WING ANTI-ICE WINDOW/PROBE HEAT TEST SWITCH IN THE WING ANTI-ICE POSITION FOR MORE THAN 7 CYCLES AT AN AMBIENT TEMPERATURE OF 50°F, OR FOR MORE THAN 4 CYCLES AT AN AMBIENT TEMPERATURE OF 100°F. INTERPOLATE OR EXTRAPOLATE FOR AMBIENT TEMPERATURES INSIDE OR OUTSIDE OF THIS RANGE TO OBTAIN THE MAXIMUM NUMBER OF CYCLES. DAMAGE TO THE LEADING EDGE PANELS CAN OCCUR IF THE WING ANTI-ICE TEST SWITCH IS OPERATED FOR MORE THAN THE SPECIFIED NUMBER OF CYCLES.

(2) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position. Start the operation of the timing device at the same time.

S 215-150
(3) Make sure the L VALVE light comes on and L WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message will be shown in 2 to 3 seconds.

S 215-151
(4) Make sure the pressure gage shows 13-30 psig.

S 215-049
(5) Make sure the L VALVE light on the P5 panel goes off, and the EICAS message L WING ANTI-ICE does not show after approximately 12 seconds.

S 865-050
(6) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 865-001

(7) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position.

NOTE: The leakage test is done during the 12 second cycle that the wing TAI valve is open. Repeated cycles of the WING ANTI-ICE WINDOW/PROBE HEAT test switch can be necessary to complete the leakage test.

S 755-103

WARNING: DO NOT TRY TO TIGHTEN THE CLAMPS OR FLANGES WHEN THE DUCTS ARE PRESSURIZED. THE HOT PRESSURIZED AIR CAN CAUSE INJURY TO PERSONS.

(8) Make sure there is not too much leakage at any duct position downstream of the left TAI valve.
   (a) Some leakage is permitted, but no fast air movement should be felt 12 inches from a leak.
   (b) Repair a large air leakage by a joint or coupling adjustment, or by a duct replacement.

S 865-104

(9) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 085-105

(10) Remove the pressure gage from the tee duct.

S 415-106

(11) Put the cap back on the fitting.

S 095-104

(12) Remove the pneumatic power source and the blocking device for the opposite pneumatic service outlet (AMM 36-00-00/201).

S 045-008

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(13) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

S 865-015
(14) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 215-064
(15) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 865-134

WARNING: LET THE WING TAI DUCT BECOME COOL BEFORE YOU MOVE THE WING TAI VALVE. THE DUCT CAN BE HOT. A HOT DUCT CAN CAUSE INJURY TO PERSONS.

(16) Manually put the left wing TAI valve in the open position.

S 215-066
(17) Make sure the L VALVE light on the P5 panel comes on and stays on, and L WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message will show in 2 to 3 seconds.

S 865-067
(18) Manually put the left wing TAI valve in the closed position.

S 215-068
(19) Make sure the L VALVE light on the P5 panel goes off and stays off, and L WING ANTI-ICE does not show on the EICAS display.

S 865-053
(20) Put the WING ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the white ON light comes on.

S 215-153
(21) Make sure the L VALVE and R VALVE lights on the P5 panel come on, and L WING ANTI-ICE and R WING ANTI-ICE show on the EICAS display.

NOTE: The EICAS messages will show in 2 to 3 seconds.

S 865-069
(22) Manually put the left wing TAI valve in the open position.

S 215-055
(23) Make sure the L VALVE light on the P5 panel goes off, and L WING ANTI-ICE does not show on the EICAS display.

NOTE: The R VALVE light on the P5 panel will stay on, and R WING ANTI-ICE will show on the EICAS display.

S 865-157
(24) Manually put the left wing TAI valve in the closed position.

S 215-071
(25) Make sure the L VALVE light on the P5 panel comes on, and L WING ANTI-ICE shows on the EICAS display.

NOTE: The R VALVE light on the P5 panel will stay on, and R WING ANTI-ICE will show on the EICAS display.

S 865-058
(26) Put the WING ANTI-ICE switch-light on the P5 panel in the OFF position. Make sure the white ON light goes off.

S 215-154
(27) Make sure the L VALVE and R VALVE lights on the P5 panel go off.

S 215-072
(28) Make sure L WING ANTI-ICE and R WING ANTI-ICE do not show on the EICAS display.

S 865-020
(29) Remove the DO-NOT-CLOSE tag and close these P11 panel circuit breakers:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN

(b) 11S23, LANDING GEAR POS SYS 2

G. Put the Airplane Back in Its Usual Condition

S 445-009

(1) Put the safety-sensitive systems back to their initial conditions (AMM 32-09-02/201).

S 415-155

(2) Install the fixed upper wing panel 522BL (AMM 06-44-00/201).

S 415-066

(3) Install the fixed lower wing panel 521AB (AMM 06-44-00/201).

S 445-068

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

NOTE: If you plan to do the next task in this procedure (the test for the right wing TAI system), do not do this step.

S 865-012

(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 30-11-00-735-069

5. Alternate Test - Right Wing TAI System

A. Equipment

(1) Timing Device - 15 seconds minimum

(2) APU source of pneumatic power (80 lbs/min at 13 to 35 psig with air temperature less than 450°F)

(3) Pressure Gage - 0-50 psig ±1% accuracy with hose and fittings

B. References

(1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels

(2) AMM 24-22-00/201, Electrical Power - Control

(3) AMM 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)

(4) AMM 32-09-02/201, Air/Ground Relays

(5) AMM 36-00-00/201, Pneumatic - General

(6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

621 Leading edge to Front Spar (Right)

622 Slat No. 7 (Right)

(2) Access Panels

621AB Fixed lower wing panel

622BL Fixed upper wing panel

D. Prepare for the Test (Fig. 501)

S 865-156

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

S 015-071

(2) Remove the fixed upper wing panel 622BR (AMM 06-44-00/201).

S 015-072

(3) Remove the fixed lower wing panel 621AB (AMM 06-44-00/201).

S 865-073

(4) Supply electrical power (AMM 24-22-00/201).

S 215-075

(5) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 865-076

WARNING: YOU MUST USE EYE AND EAR PROTECTIVE DEVICES. THE HOT AIR IN THE PRESSURIZED DUCTS CAN CAUSE INJURY TO PERSONS.

(6) To supply pneumatic power from the APU, refer to task 36-00-00-862-012.

E. Procedure (Fig. 501, 502)

S 485-077

(1) Attach the pressure gage to the fitting on the outboard end of the right TAI tee duct.

S 865-107

CAUTION: DO NOT OPERATE THE WING ANTI-ICE WINDOW/PROBE HEAT TEST SWITCH IN THE WING ANTI-ICE POSITION FOR MORE THAN 7 CYCLES AT AN AMBIENT TEMPERATURE OF 50°F, OR FOR MORE THAN 4 CYCLES AT AN AMBIENT TEMPERATURE OF 100°F. INTERPOLATE OR EXTRAPOLATE FOR AMBIENT TEMPERATURES INSIDE OR OUTSIDE OF THIS RANGE TO OBTAIN THE MAXIMUM NUMBER OF CYCLES. DAMAGE TO THE LEADING EDGE PANELS CAN OCCUR IF THE WING ANTI-ICE TEST SWITCH IS OPERATED FOR MORE THAN THE SPECIFIED NUMBER OF CYCLES.

(2) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position. Start the operation of timing device at the same time.

S 215-079

(3) Make sure the R VALVE light on the P5 panel comes on, and R WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message shows in 2 to 3 seconds.

S 215-080

(4) Make sure the pressure gage shows 13-30 psig.

S 215-081

(5) Make sure the R VALVE light on the P5 panel goes off, and the EICAS message R WING ANTI-ICE does not show after approximately 12 seconds.

S 865-082

(6) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 865-158

(7) Hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the right sidewall panel, P61, in the WING ANTI-ICE position.

NOTE: The leakage test is done during the 12 second cycle that the wing TAI valve is open. Repeated cycles of the WING ANTI-ICE WINDOW/PROBE HEAT test switch can be necessary to complete the leakage test.

S 755-108

WARNING: DO NOT TRY TO TIGHTEN THE CLAMPS OR FLANGES WHEN THE DUCTS ARE PRESSURIZED. THE HOT PRESSURIZED AIR CAN CAUSE INJURY TO PERSONS.

(8) Make sure there is not too much leakage at any duct position downstream of the right TAI valve.
   (a) Some leakage is permitted, but no fast air movement should be felt 12 inches from a leak.
   (b) Repair a large air leakage by a joint or coupling adjustment, or by a duct replacement.

S 865-109

(9) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 085-110

(10) Remove the pressure gage from the tee duct.

S 415-111

(11) Put the cap back on the fitting.

S 095-124

(12) Remove the pneumatic power source and the blocking device for the opposite pneumatic service outlet (AMM 36-00-00/201).

S 045-010

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(13) Prepare the safety-sensitive systems for air mode simulation (AMM 32-09-02/201).

S 865-162
(14) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 865-125
(15) Make sure the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 865-135

WARNING: LET THE WING TAI DUCT BECOME COOL BEFORE YOU MOVE THE WING TAI VALVE. THE DUCT CAN BE HOT. A HOT DUCT CAN CAUSE INJURY TO PERSONS.

(16) Manually put the right wing TAI valve in the open position.

S 215-127
(17) Make sure the R VALVE light on the P5 panel comes on and stays on, and R WING ANTI-ICE shows on the EICAS display.

NOTE: The EICAS message will show in 2 to 3 seconds.

S 865-129
(18) Manually put the right wing TAI valve in the closed position.

S 215-130
(19) Make sure the R VALVE light on the P5 panel goes off and stays off, and R WING ANTI-ICE does not show on the EICAS display.

S 865-114
(20) Put the WING ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the white ON light comes on.

S 215-115
(21) Make sure the L VALVE and R VALVE lights on the P5 panel come on, and L WING ANTI-ICE and R WING ANTI-ICE show on the EICAS display.

NOTE: The EICAS messages will show in 2 to 3 seconds.

S 865-131
(22) Manually put the right wing TAI valve in the open position.

S 215-116
(23) Make sure the R VALVE light on the P5 panel goes off, and R WING ANTI-ICE does not show on the EICAS display.

NOTE: The L VALVE light on the P5 panel will stay on, and L WING ANTI-ICE will show on the EICAS display.

S 865-132
(24) Manually put the right wing TAI valve in the closed position.

S 215-132
(25) Make sure the R VALVE light on the P5 panel comes on, and R WING ANTI-ICE shows on the EICAS display.

NOTE: The L VALVE light on the P5 panel will stay on, and L WING ANTI-ICE will show on the EICAS display.

S 865-117
(26) Put the WING ANTI-ICE switch-light on the P5 panel in the OFF position. Make sure the white ON light goes off.

S 215-118
(27) Make sure the L VALVE and R VALVE lights on the P5 panel go off.

S 215-133
(28) Make sure L WING ANTI-ICE and R WING ANTI-ICE do not show on the EICAS display.

S 865-017
(29) Remove the DO-NOT-CLOSE tag and close these P11 panel circuit breakers:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN

(b) 11S23, LANDING GEAR POS SYS 2

F. Put the Airplane Back in Its Usual Condition

S 445-011

(1) Put the safety-sensitive systems back to their initial conditions (AMM 32-09-02/201).

S 415-120

(2) Install the fixed upper wing panel 522BL (AMM 06-44-00/201).

S 415-121

(3) Install the fixed lower wing panel 521AB (AMM 06-44-00/201).

S 445-122

(4) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 865-123

(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

WING AND ENGINE ANTI-ICE CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. Ths first task is the removal of the Wing and Engine Anti-Ice Control Panel. The second task is the installation procedure and a test of the Wing and Engine Anti-Ice Control Panel.
   B. The wing and engine anti-ice control panel M10397 is on the pilots overhead P5 panel.

TASK 30-11-01-004-001

2. Remove the Control Panel
   A. Access
      (1) Location Zones
          211 Control cabin (Left)
          212 Control cabin (Right)
   B. Procedure

      S 864-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11C26 or 11C27, ENG ANTI-ICE LEFT
          (b) 11A34, INDICATOR LIGHTS 3
          (c) 11A35, INDICATOR LIGHTS 4
          (d) 11R19, ICE DETECTOR (IF INSTALLED)

      S 864-021
      (2) Open the applicable circuit breaker on the overhead breaker panel, P11 and attach a DO-NOT-CLOSE tag:
          (a) 11C28, WING ANTI-ICE or ANTI-ICE WING
          (b) 11C29, WING ANTI-ICE
          (c) 11D29, WING ANTI-ICE
          (d) 11R20, WING ANTI-ICE

      S 024-003
      (3) Remove the wing and engine anti-ice control panel from the P5 panel.

TASK 30-11-01-404-004

3. Install Control Panel
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 36-00-00/201, Pneumatic - General

B. Access
(1) Location Zones
211 Control cabin (Left)
212 Control cabin (Right)

C. Procedure

S 424-005
(1) Install the wing and engine anti-ice control panel in the P5 panel.

S 864-006
(2) Remove the DO-NOT-CLOSE tags, and close these P11 panel circuit breakers:
(a) 11C26 or 11C27, ENG ANTI-ICE LEFT
(b) 11A34, INDICATOR LIGHTS 3
(c) 11A35, INDICATOR LIGHTS 4
(d) 11R19, ICE DETECTOR (IF INSTALLED)

S 864-022
(3) Remove the DO-NOT-CLOSE tags, and close the applicable P11 panel circuit breakers:
(a) 11C28, WING ANTI-ICE or ANTI-ICE WING
(b) 11C29, WING ANTI-ICE
(c) 11D29, WING ANTI-ICE
(d) 11R20, WING ANTI-ICE

D. Do a test of the control panel as follows:

S 864-009
(1) Supply electrical power (Ref 24-22-00).

S 864-010
(2) Remove the pressure from the pneumatic system (Ref 36-00-00).

S 864-011
(3) Push and release the WING ANTI-ICE switch-light and do the steps that follow:
(a) Make sure the WING ANTI-ICE switch latches.
(b) Make sure the WING ANTI-ICE switch-light comes on and shows ON.
(c) Make sure the two wing anti-ice VALVE lights come on.

S 864-012
(4) Push and release the WING ANTI-ICE switch-light and do the steps that follow:
(a) Make sure the WING ANTI-ICE switch-light is released.
(b) Make sure the WING ANTI-ICE switch-light goes out.
(c) Make sure the two wing anti-ice VALVE lights go out.

S 864-013
(5) Push and release the L ENGINE ANTI-ICE switch-light and do the steps that follow:
(a) Make sure the L ENGINE ANTI-ICE switch-light latches.

(b) Make sure the L ENGINE ANTI-ICE switch-light comes on and shows ON.
(c) Make sure the left engine anti-ice VALVE light comes on.

S 864-014
(6) Push and release the R ENGINE ANTI-ICE switch-light and do the steps that follow:
(a) Make sure the R ENGINE ANTI-ICE switch-light latches.
(b) Make sure the R ENGINE ANTI-ICE switch-light comes on and shows ON.
(c) Make sure the right engine anti-ice VALVE light comes on.

S 864-015
(7) Push and release the two ENGINE ANTI-ICE switch-lights and do the steps that follow:
(a) Make sure the two ENGINE ANTI-ICE switch-lights release.
(b) Make sure the two ENGINE ANTI-ICE switch-lights go out.
(c) Make sure the two engine anti-ice VALVE lights go out.

S 864-018
(8) Put the switches to the OFF position if it is necessary.

S 864-008
(9) Remove electrical power if it is not necessary (Ref 24-22-00).

WING THERMAL ANTI-ICE VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. Ths first task is the removal of the Wing Thermal Anti-Ice Valve. The second task is the installation and a test of the Wing Thermal Anti-Ice Valve.
   B. The wing TAI valves are on the wing thermal anti-icing ducts above the engine strut on each wing. The procedures are the same for the two valves.

TASK 30-11-02-004-001

2. Remove the Wing Thermal Anti-Ice Valve (Fig. 401)
   A. References
      (1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          511 Leading edge to front spar (Left)
          521 Leading edge to front spar (Left)
          611 Leading edge to front spar (Right)
          621 Leading edge to frontspar (Right)
      (2) Access Panels
          511KT Fixed wing upper panel
          521UBX Fixed wing lower panel
          611KT Fixed wing upper panel
          611UBX Fixed wing lower panel
   C. Procedure

S 864-002

(1) Open the circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11A35, INDICATOR LIGHTS 4

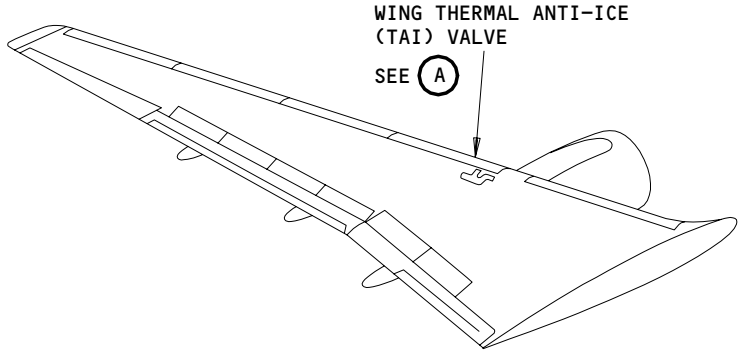
S 864-033

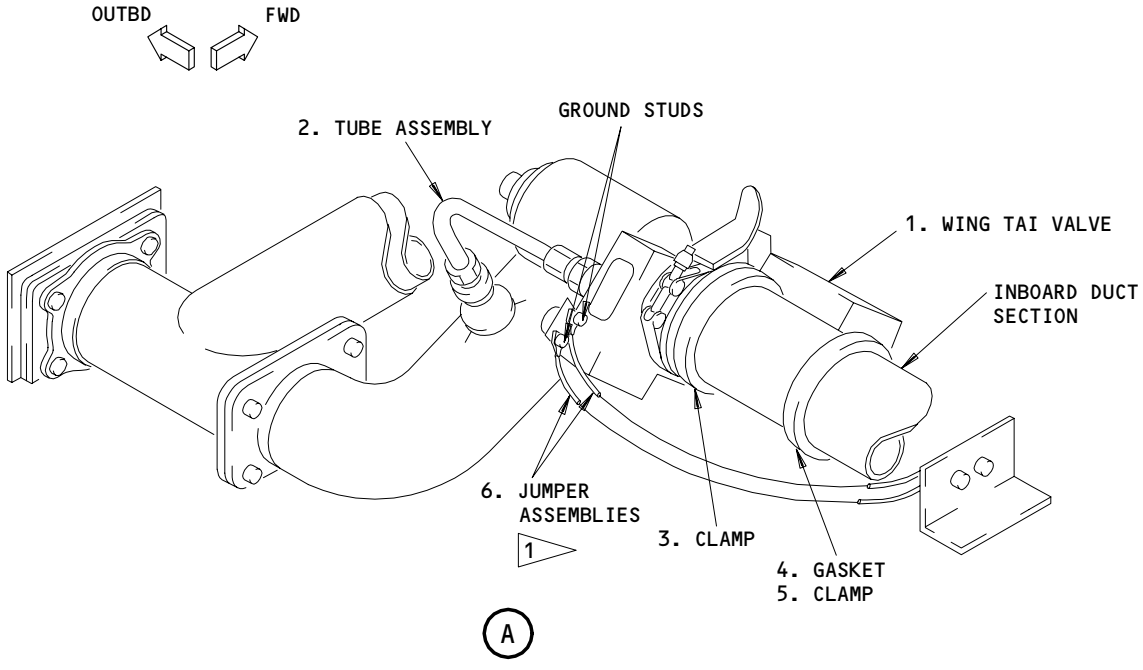
(2) Open this circuit breaker on the overhead breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C28, 11C29, 11D29, or 11R20, WING ANTIC ICE or ANTI-ICE WING

S 864-003

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVESER. ACCIDENTIAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

(3) Do the Thrust-reverser Deactivation for Ground Maintenance procedure (AMM 78-31-00/201).





1 ONLY ONE JUMPER ASSEMBLY INSTALLED ON SOME AIRPLANES

Wing TAI Valve Installation
Figure 401

S 014-004
(4) Remove these panels to get access the Wing TAI valves:
(a) For the left wing TAI valve (V52) remove the fixed wing upper panel 511KT and the fixed wing lower panel 521UBX (AMM 06-44-00/201).
(b) For right wing TAI valve (V57) remove the fixed wing upper panel 611KT and the fixed wing lower panel 621UBX (AMM 06-44-00/201).

S 034-005

WARNING: YOU MUST LET THE DUCT TO BECOME COOL. THE DUCT CAN BE HOT. A HOT DUCT CAN CAUSE INJURY TO PERSONS.

(5) Remove the electrical connector from the wing TAI valve (1).

S 034-006
(6) Remove the jumper assemblies (6) from the wing TAI valve (1).

NOTE: Only one jumper assembly is installed on some airplanes.

S 034-007
(7) Remove the tube assembly (2) from the wing TAI valve (1).

S 034-008
(8) Remove the clamp (3) from the wing TAI valve (1).

S 024-009
(9) Remove the clamp (5) and the gasket (4) from the wing TAI valve (1).

S 024-010
(10) Remove the wing TAI valve (1).

S 034-011
(11) Remove the ground studs from the wing TAI valve (1).

TASK 30-11-02-404-031

3. Install Wing Thermal Anti-Ice Valve (Fig. 401)

A. Parts

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Valve, Wing TAI	30-11-01	01	70
	2	Tube Assy (LH side)			40
	2	Tube Assy (RH side)			45
	3	Clamp			100
	4	Gasket			110
	5	Clamp			105
	6	Jumper Assy			10

B. References

(1) AMM 06-44-00/201, Wings (Major Zones 500 and 600) Access Doors and Panels
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 36-00-00/201, Pneumatic - General
(4) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones
    511 Leading edge to front spar (Left)
    521 Leading edge to front spar (Left)
    611 Leading edge to front spar (Right)
    621 Leading edge to frontspar (Right)
(2) Access Panels
    511KT Fixed wing upper panel
    521UBX Fixed wing lower panel
    611KT Fixed wing upper panel
    611UBX Fixed wing lower panel

D. Procedure

S 434-013

(1) Install the ground studs on the new wing TAI valve (1).

S 824-014

CAUTION: MAKE SURE THAT THERE IS A MINIMUM CLEARANCE OF 0.75 INCH BETWEEN THE WING TAI VALVE (1) AND THE ADJACENT STRUCTURE. DAMAGE TO THE WING TAI VALVE (1), THE STRUCTURE, OR OTHER EQUIPMENT CAN OCCUR IF YOU DO NOT KEEP THIS MINIMUM CLEARANCE.

(2) Put the wing TAI valve (1) in position so that you keep a minimum clearance of 0.75 inch between the wing TAI valve (1) and any equipment or structure. Install the clamp (3) in this position.

S 434-015

(3) Install the gasket (4) between the wing TAI valve (1) and the inboard duct section.

S 434-016

(4) Install the clamp (5).

S 434-017

(5) Connect the tube assembly (2) to the wing TAI valve (1).

S 434-018

(6) Connect the electrical connector to the wing TAI valve (1).

S 434-019

(7) Connect the jumper assemblies (6) to the wing TAI valve (1).

S 414-019

(8) Install the fixed wing upper and lower access panels, 511KT and 521UBX, or 611KT and 611UBX (Ref 06-44-00).

S 864-020

(9) Remove the DO-NOT-CLOSE tag and close the P11 panel circuit breaker:
(a) 11A35, INDICATOR LIGHTS 4

S 864-034
(10) Remove the DO-NOT-CLOSE tag and close the applicable P11 panel circuit breaker:
(a) 11C28, 11C29, 11D29, or 11R20, WING ANTIC ICE or ANTI-ICE WING

E. Do a test of the wing thermal anti-ice valve installation:

S 864-023
(1) Supply electrical power (AMM 24-22-00/201).

S 864-024
(2) Make sure that the ISOLATION VALVE switch-light on the P5 panel is in the OFF position.

S 864-025
(3) Make sure that the WING ANTI-ICE switch-light on the P5 panel is in the OFF position.

S 864-026

WARNING: YOU MUST WEAR EAR AND EYE PROTECTIVE DEVICES. THE HOT AIR IN THE PRESSURIZED DUCTS CAN CAUSE INJURY TO PERSONS.

CAUTION: DO NOT USE A GROUND AIR SUPPLY THAT IS HOTTER THAN 200°F WHEN THE AIRPLANE IS IN FLIGHT MODE. THE HOT AIR IN THE WING TAI DUCT CAN CAUSE DAMAGE TO THE LEADING EDGE PANELS.

(4) Supply pneumatic (ground service source) power as follows (AMM 36-00-00/201):
(a) For the left wing anti-ice system, hold the right pneumatic service connector open and connect the air supply to the left pneumatic service connector.
(b) For the right wing anti-ice system, hold the left pneumatic service connector open and connect the air supply to the right pneumatic service connector.

S 864-027
(5) Hold the WING ANTI-ICE WINDOW/PROBE HEAT switch, on the miscellaneous test panel M10398, in the WING ANTI-ICE position.

S 214-028
(6) Make sure the correct amber VALVE light, on the wing and engine anti-ice control panel M10397, comes on for 12 seconds then goes out.

S 864-029
(7) Release the WING ANTI-ICE WINDOW/PROBE HEAT switch.

S 864-022
(8) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 444-030
(9) Do the Activate the Thrust Reverser for Ground Maintenance procedure (AMM 78-31-00/201).

WING TAI TELESCOPING DUCTS - REMOVAL/INSTALLATION

1. General

A. This procedure contains two tasks. The first task is the removal of the lower telescoping duct and the upper telescoping duct. The second task is the installation of the lower telescoping duct and the upper telescoping duct.

TASK 30-11-05-004-001

2. Remove the Telescoping Duct

A. References

(1) 06-44-00/201, Wing Access Panels
(2) 24-22-00/201, Electrical Power - Control
(3) 27-81-00/201, Leading Edge Slat System
(4) 36-00-00/201, Pneumatic - General
(5) 36-11-01/401, Upper Strut Pneumatic Y-Duct
(6) 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

511 Leading edge to front spar (Left)
521 Leading edge to front spar (Left)
522 Slat No. 4 (Left)
611 Leading edge to front spar (Right)
621 Leading edge to front spar (Right)
622 Slat No. 7 (Right)

(2) Access Panels

511KT
521AB
521UBX
522JL
522BL
611KT
621AB
621UBX
622JR
622BR

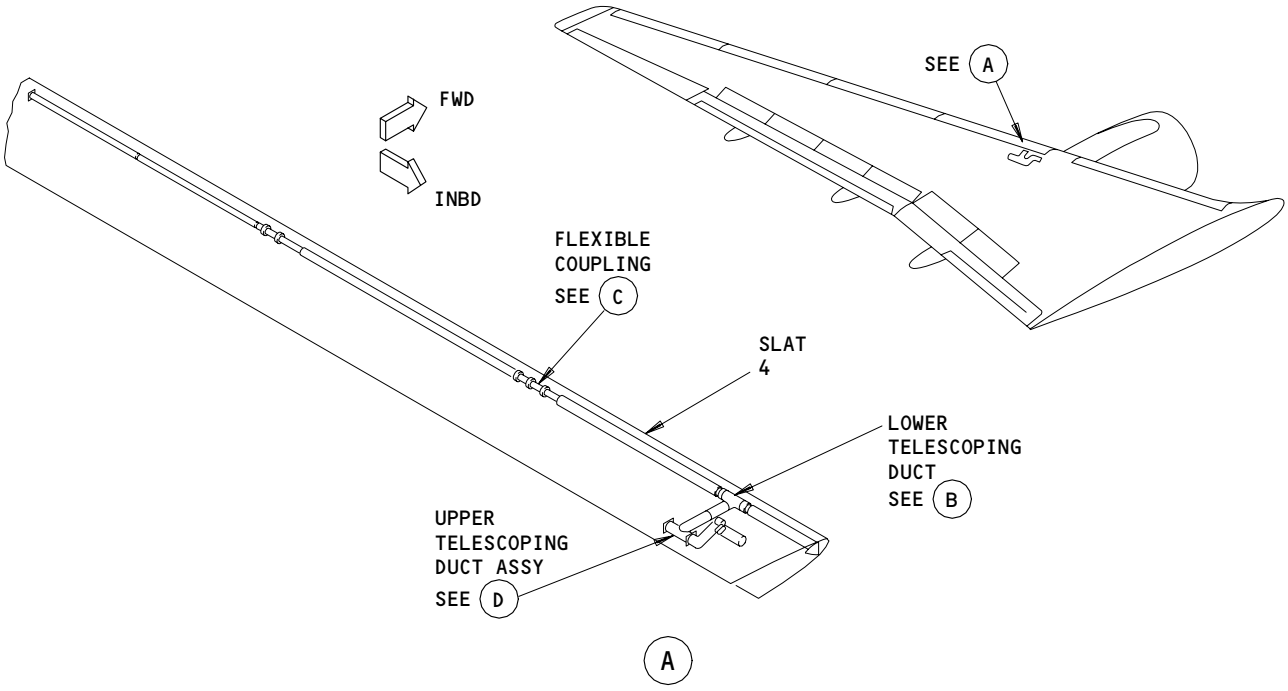
C. Prepare for Removal

S 864-002

(1) Supply electrical power (Ref 24-22-00).

S 864-003

(2) Put the leading edge slats in the fully extended position. Use the electric or hydraulic drive systems (Ref 27-81-00).



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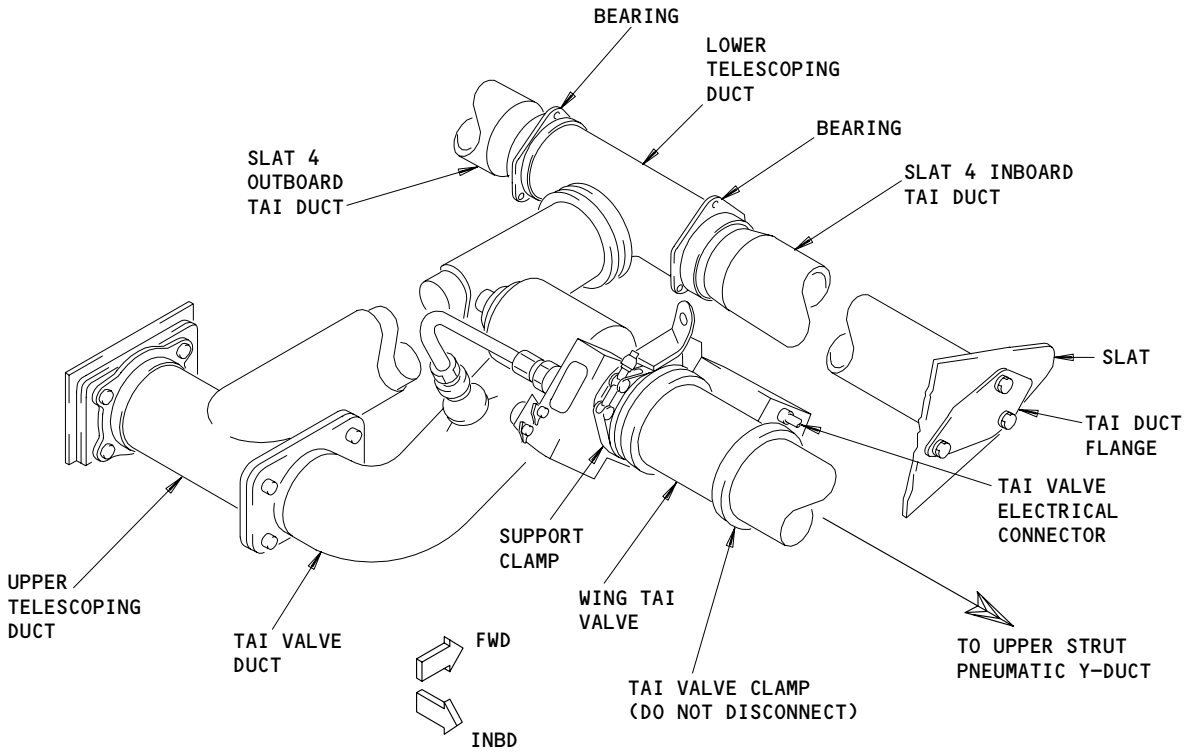
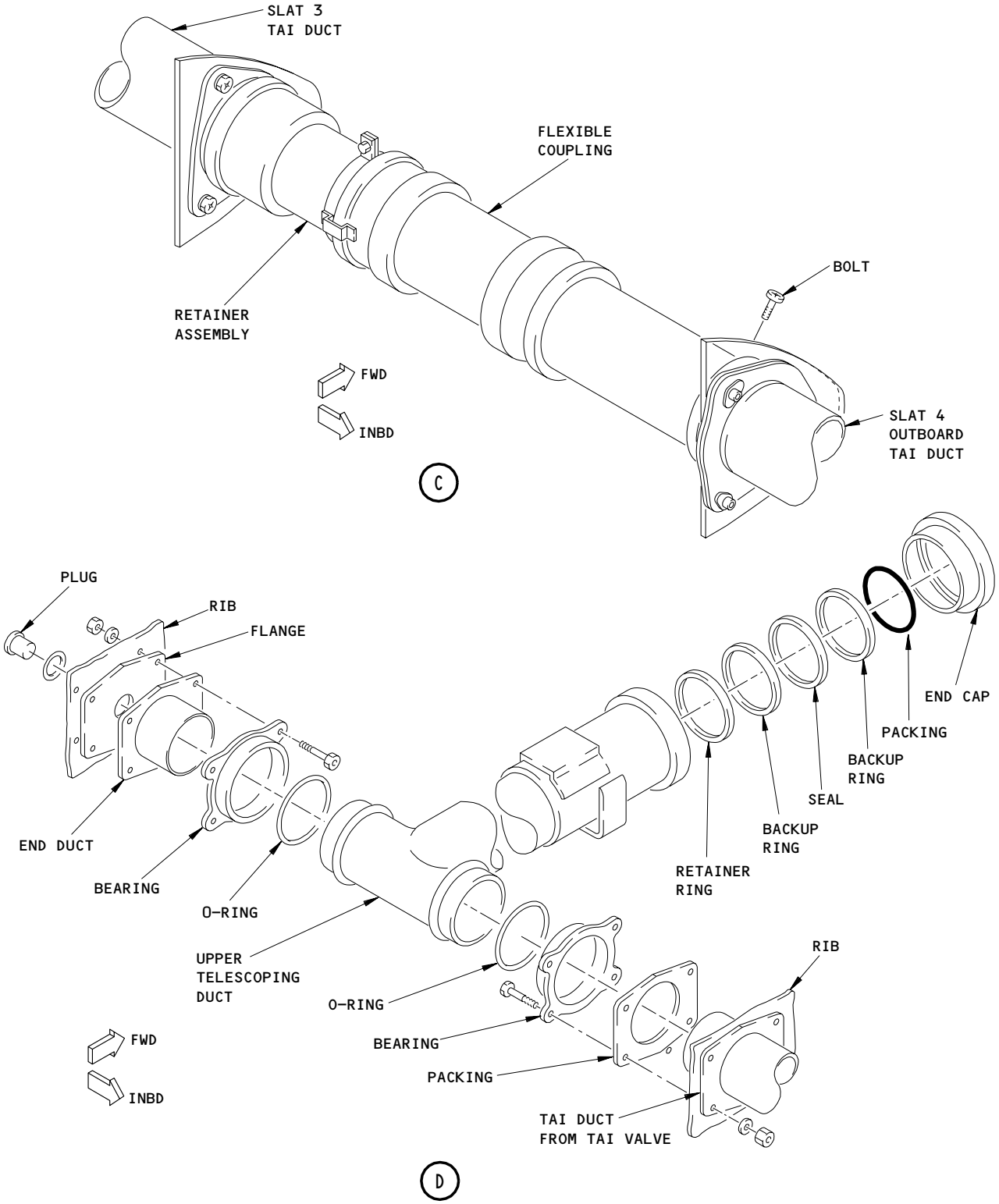


B

Wing Telescoping Ducts Installation
Figure 401 (Sheet 1)



Wing Telescoping Ducts Installation
Figure 401 (Sheet 2)

S 044-004

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO THE EQUIPMENT.

(3) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (Ref 78-31-00).

S 044-005

(4) Do the Slat Drive System Deactivation procedure (Ref 27-81-00).

S 014-006

(5) Open these access doors and panels (Ref 06-44-00):
(a) For the left wing,
522BL, 522JL, 521UBX, 521AB, 511KT
(b) For the right wing,
622BR, 622JR, 621UBX, 621AB, 611KT

S 864-007

(6) Remove pneumatic power (Ref 36-00-00).

D. Procedure - Remove the Lower Telescoping Duct (Fig. 401)

S 864-020

(1) Do the Prepare for Removal paragraph.

S 034-054

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

WARNING: YOU MUST LET THE DUCT BECOME COOL. THE DUCT CAN BE HOT. A HOT DUCT CAN CAUSE INJURY TO PERSONS.

(2) Remove the bolts that hold the inboard TAI duct flange to the slat at the inboard end of slat 4 (View B, Fig. 401). Move the TAI duct inboard the minimum distance necessary to be clear of the lower telescoping duct.

S 034-051

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

(3) Remove the bolt that holds the outboard TAI duct to the outboard end of slat 4 (View C). Move the TAI duct outboard in the flexible coupling the minimum distance necessary to be clear of the lower telescoping duct (View B).

S 034-010

(4) Remove the most forward bolt that holds the two lower telescoping duct bearings to the structure.

S 024-011

(5) Move the lower telescoping duct forward to disengage it from the upper telescoping duct. Carefully lower the upper telescoping duct to prevent separation of the torsion springs from the aerodynamic curtain.

E. Procedure - Remove the Upper Telescoping Duct (Fig. 401)

S 864-021

(1) Do the Prepare for Removal paragraph, if it was not done before.

S 864-012

(2) Open the applicable circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C28, WING ANTI-ICE
(b) 11R20, WING ANTI-ICE
(c) 11C29, WING ANTI-ICE
(d) 11D29, WING ANTI-ICE

S 034-013

(3) Disconnect the electrical connector from the TAI valve (View B).

S 034-014

(4) Disconnect the jumper cable from the TAI valve.

S 024-015

(5) Remove the two bolts to separate the TAI seal door from the upper telescoping duct.

S 034-052

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

(6) Remove the TAI duct section that is inboard of the duct section that is connected to wing TAI valve (Ref 36-11-01). Do not remove duct section connected to the TAI valve.

NOTE: This will give you sufficient clearance to move the TAI valve and ducts connected to it inboard to be clear of the upper telescoping duct.

S 034-017

(7) Remove the bolts that hold the upper telescoping duct to the structure and to the TAI valve duct.

S 034-053

WARNING: DO NOT LET OBJECTS GET IN THE HOUSING ASSEMBLY OF THE SLAT TRACK. THIS WILL HELP PREVENT A PUNCTURE OF THE HOUSING ASSEMBLY THAT COULD CAUSE A FUEL LEAK. THE FUEL LEAK COULD CAUSE A FIRE AND POSSIBLE DEATH OR INJURY TO PERSONNEL.

(8) Hold the TAI valve, and the ducts connected to it, and unclamp the TAI valve duct from the structure. Move the TAI valve and ducts inboard to be clear of the upper telescoping duct.

S 024-019

(9) Remove the upper telescoping duct from the wing.

TASK 30-11-05-404-048

3. Install Upper Telescoping Duct

A. Consumable Materials

(1) D00203 Lubricant - SUPER-O-LUBE

B. References

(1) 06-44-00/201, Wing Access Panels
(2) AMM 20-10-23/401, Standard Practices Lockwire
(3) 24-22-00/201, Electrical Power - Control
(4) 27-81-00/201, Leading Edge Slat System
(5) 36-11-01/401, Upper Strut Pneumatic Y-Duct
(6) 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

511 Leading edge to front spar (Left)
521 Leading edge to front spar (Left)
522 Slat No. 4 (Left)
611 Leading edge to front spar (Right)
621 Leading edge to front spar (Right)
622 Slat No. 7 (Right)

(2) Access Panels

511KT
521AB
521UBX
522JL
522BL
611KT
621AB
621UBX
622JR
622BR

D. Procedure - Install the Upper Telescoping Duct (Fig. 401)

S 034-022

(1) Remove the end cap, packing, seal, backup rings, and the retainer ring from upper telescoping duct (View D).

S 644-023

(2) Apply the lubricant to the seal.

S 434-024

(3) Move the end cap, packing, backup ring, seal, the second backup ring, and the retainer ring (in that order) on the lower telescoping duct.

S 644-025

(4) Apply the lubricant to the O-rings and install them in the upper telescoping duct (View D).

S 434-026

(5) Assemble the bearings, end duct, packing, and the flange on the upper telescoping duct. Put them in position in the wing.

S 824-027

(6) Move the wing TAI valve duct and the TAI valve outboard in the upper telescoping duct.

S 034-028

(7) Install the bolts that connect the upper telescoping duct and the TAI valve duct to the ribs. Do not tighten the bolts.

S 824-029
(8) Align the telescoping duct and bearings so the duct can rotate without binding. Tighten the bolts and monitor the duct as you tighten the bolts to make sure the duct does not bind.

S 434-030
(9) Install the clamp that supports the TAI valve duct (View B).

S 424-031
(10) Install the TAI duct section that is inboard of the duct section that is connected to the wing TAI valve (AMM 36-11-01/401).

S 434-032
(11) Connect the jumper cable and electrical connector to the TAI valve.

E. Procedure - Install the Lower Telescoping Duct (Fig. 401).

S 424-033
(1) Insert the lower telescoping duct into the upper telescoping duct.

S 434-034
(2) Insert the inboard and outboard TAI ducts for slat No. 4 in the lower telescoping duct (View B). Install the TAI duct fasteners and bearings bolts.

S 434-035
(3) Carefully move the retainer ring, backup rings, seal, and packing into the upper telescoping duct and install end cap (View D).

S 434-045
(4) Torque the end cap nuts to 250-370 pound-inches.

S 434-046
(5) Safety the end cap nuts with wire (AMM 20-10-23/401).

S 444-036
(6) Do the Slat Drive System Activation procedure (Ref 27-81-00).

S 714-037
(7) Retract the slats electrically to make sure the upper and lower telescoping ducts are correctly aligned (Ref 27-81-00).

S 714-038
(8) Operate the slats to make sure the telescoping ducts rotate and do not bind. If the ducts bind, do the steps that follow:
(a) Loosen the bolts and align the ducts one more time.
(b) Tighten the bolts.

S 424-039
(9) Install the TAI seal door to the upper telescoping duct.

S 714-049
(10) Operate the slats to make sure the aerodynamic curtain functions correctly as slat moves.

F. Put the Airplane Back to its Usual Condition.

S 864-040
(1) Retract the slats (Ref 27-81-00).

S 864-041
(2) Remove the DO-NOT-CLOSE tag and close the applicable P11 circuit breaker:
(a) 11C28, WING ANTI-ICE
(b) 11R20, WING ANTI-ICE
(c) 11C29, WING ANTI-ICE
(d) 11D29, WING ANTI-ICE

S 414-042
(3) Close these access doors and panels (Ref 06-44-00):
(a) For the left wing,
522BL, 522JL, 521UBX, 521AB, 511KT
(b) For the right wing,
622BR, 622JR, 621UBX, 621AB, 611KT

S 444-043
(4) Do the Thrust Reverser Activation procedure (Ref 78-31-00).

S 864-044
(5) Remove electrical power, if it is not necessary (Ref 24-22-00).

FLEXIBLE COUPLINGS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains three tasks. The first task is the removal of the flexible couplings. The second task is the installation of the flexible couplings. The third task is an inspection/adjustment of the flexible couplings.
   B. Flexible coupling are also known as interstitial joint couplings and Vibreaker assemblies.
   C. There are two flexible couplings in each wing. On the left wing, the flexible couplings are between slats 2 and 3 and between slats 3 and 4. On the right wing, the flexible couplings are between slats 7 and 8 and between slats 8 and 9.

TASK 30-11-06-002-001

2. Remove the Flexible Couplings
   A. References
      (1) 06-44-00/201, Wings Access Doors and Panels
      (2) 27-81-00/201, Leading Edge Slat System
      (3) 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          511/521 Leading Edge to Front Spar (Left)
          611/621 Leading Edge to Front Spar (Right)

      (2) Access Panels
          523AL/522JL
          524AL/523HL
          623AR/622JR
          624AR/623HR

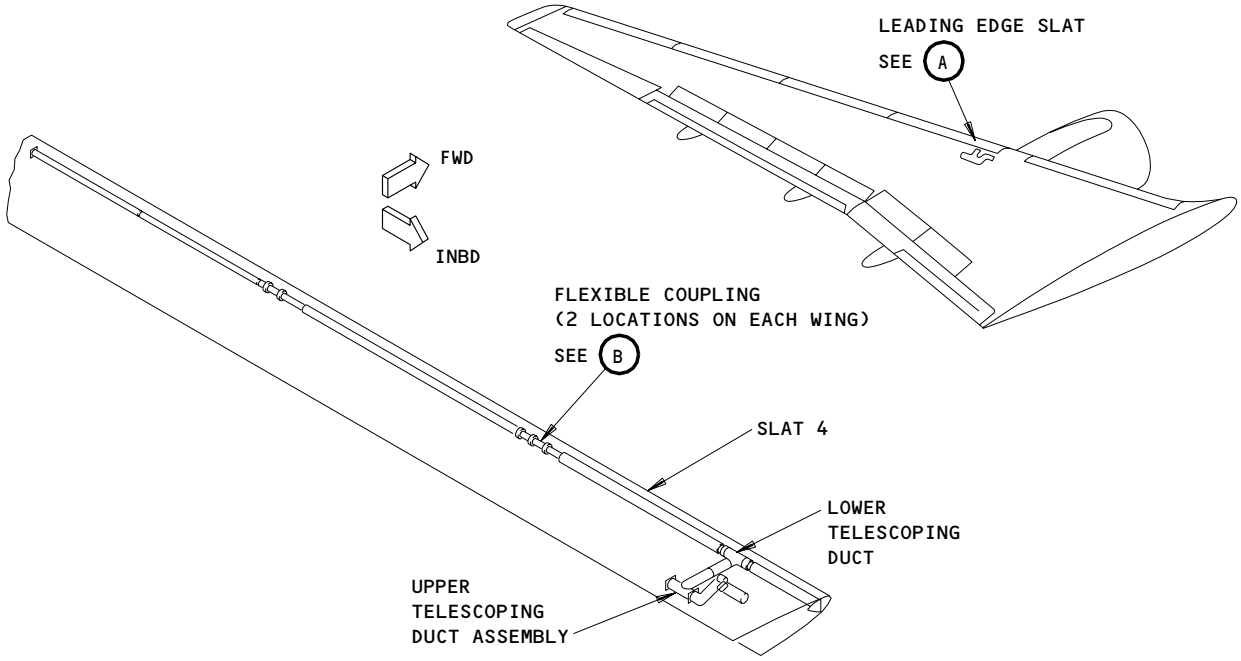
   C. Procedure

      S 842-002

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

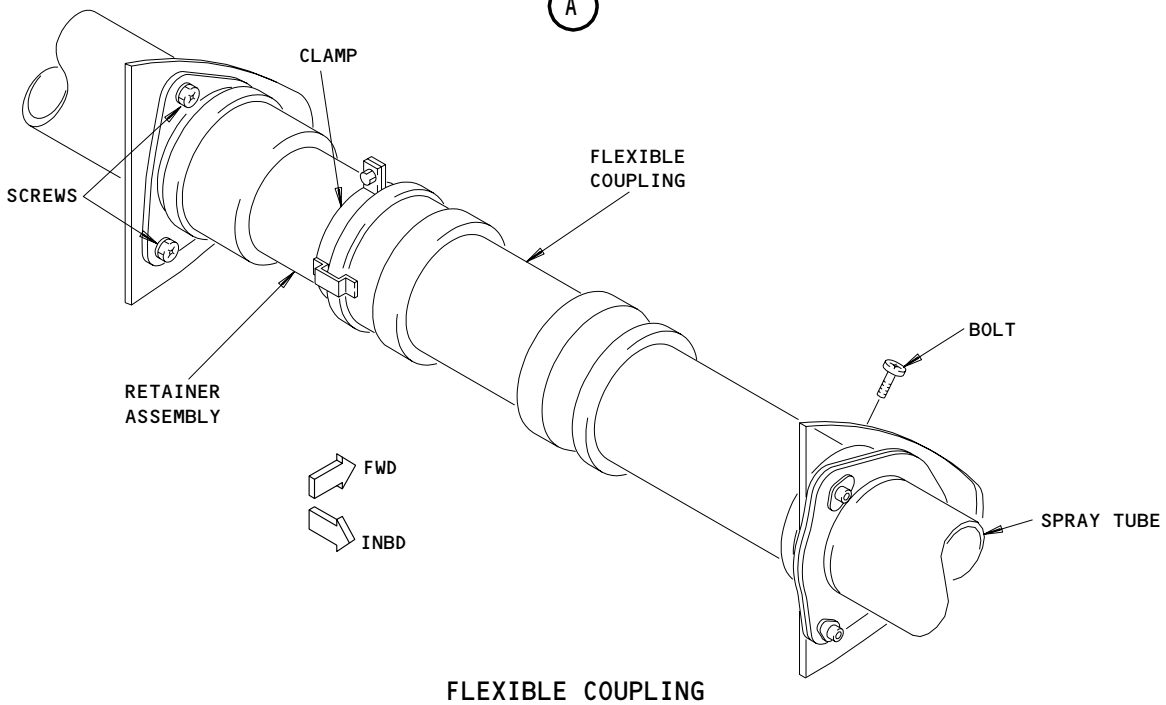
      (1) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (Ref 78-31-00).

      S 842-003
      (2) Do the Slat Drive System Deactivation procedure (Ref 27-81-00).



LEADING EDGE SLAT

A



FLEXIBLE COUPLING

B

Wing Flexible Coupling Installation
Figure 201

S 012-004
(3) Remove the necessary access panels (Ref 06-44-00):
(a) To get access to the flexible coupling between slats 2 and 3, remove access panels 524AL and 523HL.
(b) To get access to the flexible coupling between slats 3 and 4, remove access panels 523AL and 522JL.
(c) To get access to the flexible coupling between slats 7 and 8, remove access panels 624AR and 623HR.
(d) To get access to the flexible coupling between slats 8 and 9, remove access panels 623AR and 622JR.

S 032-005
(4) Remove the clamp from the flexible coupling.

S 032-006
(5) Move the flexible coupling onto the spray tube.

S 032-007
(6) Remove the screws from the retainer assembly and remove the retainer assembly.

S 022-008
(7) Remove the flexible coupling.

TASK 30-11-06-402-009

3. Install the Flexible Couplings

A. Equipment
(1) Source of Compressed Air - Commercially Available
(2) Brush - Commercially Available

B. Consumable Materials
(1) Use one of these solvents:
(a) B00184 Cleaning Solvent, Presealing, BMS 11-7
(b) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261
(c) B00742 1,1,1 - Trichloroethane, O-T-620

(d) B00130 Solvent - Isopropyl Alcohol
(e) B00068 Solvent - Ethyl Alcohol
(2) G00033 Wiper, Absorbent, BMS 15-5 Class A
(3) G02185 Parting Agent, 598-5002, Green Strippable Coating
(4) G00270 Masking Tape
(5) A00474 Dow Corning 93-006 Silicone Sealant
(6) C00580 Dow Corning 1200 Primer

C. References
(1) 06-44-00/201, Wings Access Doors and Panels
(2) 27-81-00/201, Leading Edge Slat System
(3) 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
511/521 Leading Edge to Front Spar (Left)
611/621 Leading Edge to Front Spar (Right)

(2) Access Panels
523AL/522JL
524AL/523HL
623AR/622JR
624AR/623HR

E. Procedure

S 422-010
(1) Put the flexible coupling on the spray tube.

S 432-011
(2) Install the retainer assembly with the screws.

S 432-012
(3) Install the clamp.

S 432-013
(4) Move the flexible coupling onto the retainer assembly.

S 432-014
(5) Attach the clamp to the flexible coupling.

S 432-015
(6) Move the clamp to the center of the primer strip on the retainer assembly.

S 432-016
(7) Torque the clamp fastener to 15-20 pound-inches.

S 962-017
(8) If you can turn the clamp after you torque the clamp fastener, replace the clamp.

S 212-018
(9) Examine the formed-in-place gaskets for damage.

S 392-019
(10) If you find damage, do these steps to repair the formed-in-place gaskets:

WARNING: DO NOT GET SOLVENTS IN YOU EYES, OR YOUR MOUTH OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(a) Clean the damaged area with a clean wiper and a specified solvent.
    1) Make sure you clean an area larger than where you will apply sealant.
(b) On assembled faying surfaces, use compressed air to remove all the solvent.
(c) Clean the surface again with a wiper that is lightly moist with solvent.
(d) Dry the surface with a clean wiper.
(e) Apply the parting agent to one of the surfaces.
(f) Let the parting agent dry.

CAUTION: MAKE SURE ALL SURFACES AND TOOLS THAT TOUCH THE SEALANT ARE CLEAN. OBJECTS THAT ARE NOT CLEAN CAN CAUSE CONTAMINATION TO THE SEALANT. CONTAMINATION CAN CAUSE THE SEALANT TO BOND UNSATISFACTORILY.

(g) Apply the sealant to the surface with the parting agent or to the opposite cleaned surface.
(h) Assemble the surfaces.

S 392-020
(11) Install the access panels with an aerodynamic seal:
(a) Clean the slat and access panel edges where you will do the aerodynamic seal.

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1) Use a clean wiper and solvent to clean an area on the surfaces larger than where you will put sealant.
2) On assembled faying surfaces, use compressed air to remove all the solvent.
3) Clean the surfaces again with a wiper that is lightly moist with solvent.
4) Dry the surfaces with a clean wiper.

(b) Use a brush or clean wiper to apply the primer to the surfaces you will seal.
1) Let the primer dry for a minimum of one hour but not more than 24 hours.

CAUTION: MAKE SURE ALL SURFACES AND TOOLS THAT TOUCH THE SEALANT ARE CLEAN. OBJECTS THAT ARE NOT CLEAN CAN CAUSE CONTAMINATION TO THE SEALANT. CONTAMINATION CAN CAUSE THE SEALANT TO BOND UNSATISFACTORILY.

(c) If the surface with primer becomes dirty, clean the surface again and apply primer again.
(d) Apply masking tape adjacent to the slots and recesses you will seal.
(e) Apply sealant with a sealing gun.

NOTE: If you cannot get access to an area with the sealing gun, use a paper cone or spatula.

1) To push sealant into slots and recesses, push out a bead of sealant in front of the nozzle of the sealing gun.
a) Make sure the slots and recesses are fully filled and no air is caught below the sealant.

(f) Use a scraping tool that is not metal to make the sealant level with the masking tape.
(g) Remove the masking tape while the sealant is wet.
(h) To make the sealant smooth with the surface, rub the sealant with a clean cloth that is moist with one of the specified solvents.

S 842-021
(12) Do the Slat Drive System Activation procedure (Ref 27-81-00).

S 842-022
(13) Do the Thrust Reverser Activation procedure (Ref 78-31-00).

TASK 30-11-06-202-023

4. Inspection and Adjustment of Flexible Couplings

A. Equipment

(1) Source of Compressed Air - Commercially Available

B. Consumable Materials

(1) Use one of these solvents:

(a) B00184 Cleaning Solvent, Presealing, BMS 11-7

(b) B00148 Solvent - Methyl Ethyl Ketone (MEK), TT-M-261

(c) B00742 1,1,1, - Trichloroethane, O-T-620

(2) G00033 Wiper, Absorbent, BMS 15-5 Class A

(3) G02185 Parting Agent, 598-5002, Green Strippable Coating

(4) A00474 Dow Corning 93-006 Silicone Sealant

(5) C00580 Dow Corning 1200 Primer

(6) G00270 Masking Tape

C. References

(1) 06-44-00/201, Wings Access Doors and Panels

(2) 27-81-00/201, Leading Edge Slat System

(3) 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

511/521 Leading Edge to Front Spar (Left)
611/621 Leading Edge to Front Spar (Right)

(2) Access Panels

523AL/522JL
524AL/523HL
623AR/622JR
624AR/623HR

E. Procedure

S 842-024

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

(1) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (Ref 78-31-00).

S 842-025

(2) Do the Slat Drive System Deactivation procedure (Ref 27-81-00).

S 012-026

(3) Remove the necessary access panels (Ref 06-44-00): 524AL, 523AL, 624AR, or 623AR.

S 212-027
(4) Examine the retainer assembly to make sure the clamp is tight and on the center of the primer strip.

NOTE: The primer strip is 4 inches inboard from the flange of the retainer assembly.

S 822-028
(5) If the clamp is loose or is not on the center of the primer strip, do these steps:
(a) Remove the adjacent access panel (Ref 06-44-00): 523HL, 522JL, 623HR, or 622JR.
(b) Remove the clamp from the flexible coupling.
(c) Move the flexible coupling onto the spray tube.
1) Examine the seal.
2) If necessary, replace the seal.
(d) Move the flexible coupling onto the retainer assembly.
1) Examine the other seal.
2) If necessary, replace the other seal.
(e) Move the flexible coupling back to its initial position.
(f) Install the clamp on the flexible coupling.
(g) Move the clamp to the center of the primer strip on the retainer assembly.
(h) Torque the clamp fastener to 15-20 pound-inches.
(i) If you can turn the clamp after you torque the clamp fastener, replace the clamp.

S 212-029
(6) Examine the formed-in-place gaskets for damage.

S 392-030
(7) If you find damage, do these steps to repair the formed-in-place gaskets:

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(a) Clean the damaged surface with a clean wiper and solvent.
    1) Make sure you clean an area larger than where you will apply sealant.
(b) On assembled faying surfaces, use compressed air to remove all the solvent.
(c) Clean the surface again with a wiper that is lightly moist with solvent.
(d) Dry the surface with a clean wiper.
(e) Apply the parting agent to one of the surfaces.
(f) Let the parting agent dry.

CAUTION: MAKE SURE ALL SURFACES AND TOOLS THAT TOUCH THE SEALANT ARE CLEAN. OBJECTS THAT ARE NOT CLEAN CAN CAUSE CONTAMINATION TO THE SEALANT. CONTAMINATION CAN CAUSE THE SEALANT TO BOND UNSATISFACTORILY.

(g) Apply the sealant to the surface with the parting agent or to the opposite cleaned surface.
(h) Assemble the surfaces.

S 392-031

(8) Install the access panels with an aerodynamic seal:
    (a) Clean the slat and access panel edges where you will do the aerodynamic seal.

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        1) Use a clean wiper and solvent to clean an area on the surfaces larger than where you will put sealant.
        2) On assembled faying surfaces, use compressed air to remove all the solvent.
        3) Clean the surfaces again with a wiper that is lightly moist with solvent.
        4) Dry the surfaces with a clean wiper.
    (b) Use a brush or clean wiper to apply the primer to the surfaces you will seal.
        1) Let the primer dry for minimum of 1 hour but not more than 24 hours.

CAUTION: MAKE SURE ALL SURFACES AND TOOLS THAT TOUCH THE SEALANT ARE CLEAN. OBJECTS THAT ARE NOT CLEAN CAN CAUSE CONTAMINATION TO THE SEALANT. CONTAMINATION CAN CAUSE THE SEALANT TO BOND UNSATISFACTORILY.

(c) If the surface with primer becomes dirty, clean the surface again and apply primer again.
(d) Apply masking tape adjacent to the slots and recesses you will seal.
(e) Apply sealant with a sealing gun.

NOTE: If you cannot get access to an area with the sealing gun, use a paper cone or spatula.

1) To push sealant into slots and recesses, push out a bead of sealant in front of the nozzle of the sealing gun.
a) Make sure the slots and recesses are fully filled and no air is caught below the sealant.

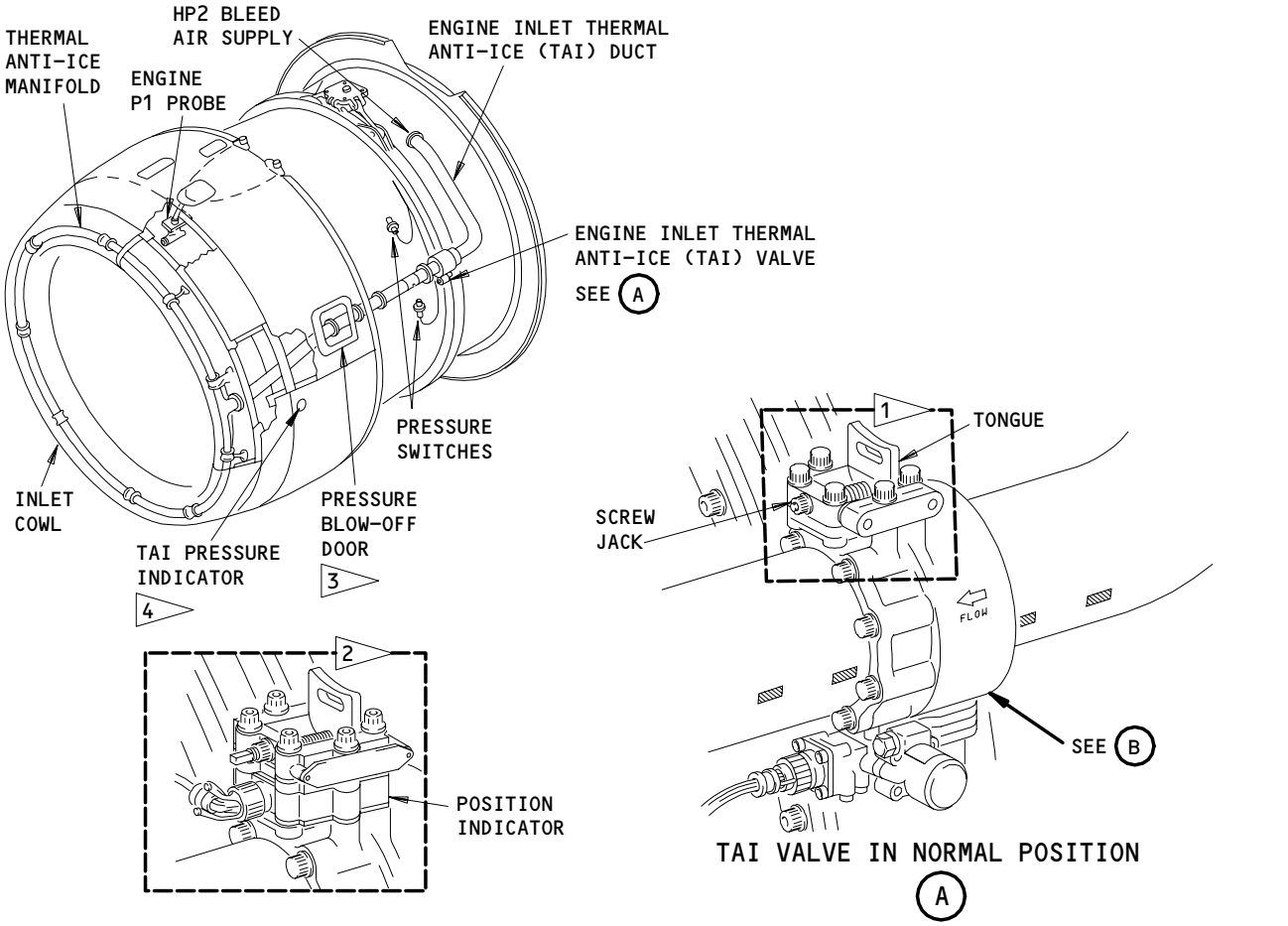
(f) Use a scraping tool that is not metal to make the sealant level with the masking tape.
(g) Remove the masking tape while the sealant is wet.
(h) To make the sealant smooth with the surface, rub the sealant with a clean cloth that is moist with one of the specified solvents.

S 842-032
(9) Do the Slat Drive System Activation procedure (Ref 27-81-00).

S 842-033
(10) Do the Thrust Reverser Activation procedure (Ref 78-31-00).

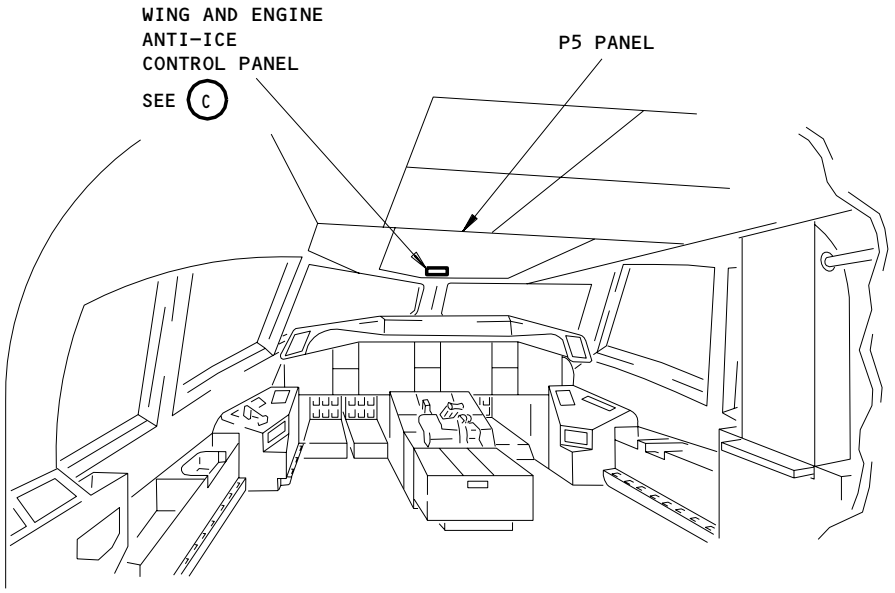
ENGINE INLET THERMAL ANTI-ICING - DESCRIPTION AND OPERATION

1. General
   A. The engine inlet cowls are anti-iced by engine bleed air. System components include engine inlet thermal anti-ice (TAI) valves, engine inlet TAI low and high pressure switches, engine inlet TAI ducts, and a wing and engine anti-ice control panel. System electrical power comes from the 28v dc battery bus, through circuit breakers on the overhead circuit breaker panel, P11.
   B. Engine anti-ice maintenance operation should be limited to bleed duct temperature of 450 degree F maximum for less than 5 munites duration.
2. Component Details (Fig. 1)
   A. Engine Inlet Thermal Anti-Ice (TAI) Valves
      (1) The engine inlet TAI valve controls the flow of engine bleed air to the engine inlet TAI duct. One valve is located in the left side of each engine, aft of the pressure blow-out door. The valve is set to keep duct pressure between 24-28 psi.
      (2) The TAI valve can be manually set and locked in one of two positions (VALVE LOCKED PART OPEN or VALVE LOCKED CLOSED) by a manual override assembly and an engraved locking plate. These are installed at the top of the valve and do not move or operate when the valve is in the normal position.
      (3) The manual override assembly consists of a jackscrew that operates a tongue. When the valve is in the normal position, the long end of the tongue points up and can be seen at the top of the valve. The opposite end of the tongue engages with a slot in the engraved plate. When the valve is in the locked position, the long end of the tongue points down and engages with the slot at the top of the valve. The opposite end of the tongue engages with one of the two slots in the engraved plate that lock the valve (Fig. 1).
      (4) To lock the valve, the manual override assembly and engraved plate are removed, turned through 180 degrees, and then the override assembly is put back on the valve with the tongue engaged in the slot at top of the valve. This permits you to manually position the valve with the jackscrew until it aligns with the applicable slot in the engraved plate. The engraved plate is then installed on top of the override assembly, and is used to lock and show the manually set position of the valve.
      (5) RB211-535E4 SERIES ENGINES WITH THE TAI VALVE POSITION SWITCH; A valve position switch is installed at the top of the engine TAI valve and below the manual override assembly and the engraved locking plate. During the normal valve operation, an extension lever of the valve position switch engages with the slot at the top of the valve, and moves with the valve.

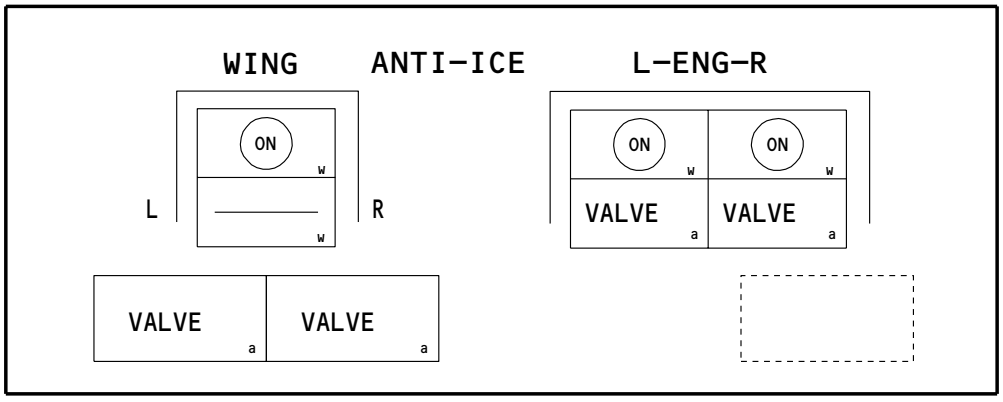


1 ENGINES WITHOUT RR SB 30-9534
2 ENGINES WITH RR SB 30-9534
3 ENGINES WITHOUT RR SB 71-9634
4 ENGINES WITH RR SB 71-9634

Engine Inlet TAI - Component Location
Figure 1 (Sheet 1)



FLIGHT COMPARTMENT



WING AND ENGINE ANTI-ICE CONTROL PANEL

C

Engine Inlet TAI Component Location
Figure 1 (Sheet 2)

(a) The manual override procedure is almost the same for engines with this valve position switch. The switch is removed and turned through 180 degrees in the same step as before, together with the manual override assembly and engraved locking plate. As an added final step, the valve position switch is installed on top of the engraved plate with its lever pointed up.

(b) A cap and stow provision is also installed for the related electrical connector that connects to the valve position switch. This permits you to install an older configuration of the engine TAI valve (without the valve position switch) on the newer configuration engine. You can also install the newer configuration of the engine TAI valve (with the valve position switch) on an older configuration engine. If this occurs, the reliability for the VALVE disagree light will not be increased.

(6) When it is necessary to manually position the valve, do the procedure that follows:

(a) RB211-535E4 SERIES ENGINES WITHOUT THE TAI VALVE POSITION SWITCH;
Remove the six bolts that attach the manual override assembly to the valve body. Remove the manual override assembly together with its locking plate and related gaskets from the locator dowels.

(b) RB211-535E4 SERIES ENGINES WITH THE TAI VALVE POSITION SWITCH;
Remove the six bolts that attach the manual override assembly and position indicator assembly to the valve body. Remove the manual override assembly and the valve position indicator assembly together with the locking plate and related gaskets.

CAUTION: WHEN YOU MANUALLY POSITION THE VALVE, MAKE SURE THE TONGUE OF THE JACKSCREW ENGAGES WITH THE SLOT IN THE VALVE HEAD AND THE SLOT IN THE LOCKING PLATE. WHEN YOU INSTALL THE LOCKING PLATE, IT MUST BE FULLY DOWN ON THE VALVE ASSEMBLY AND NOT REQUIRE "PULLING DOWN" WITH THE RETAINING BOLTS. FAILURE TO COMPLY CAN RESULT IN DAMAGE TO THE VALVE.

(c) The manual override assembly is turned through 180 degrees and installed on the valve body. Make sure the tongue of the jackscrew engages with the groove in the valve head. During this operation, it is possible to see the valve head through the housing of the override assembly. The webs on the valve head prevent the incorrect location of the tongue.

(d) The gaskets and locking plate are then put on top of the assembly. The necessary valve position, as engraved on the plate, will show above the jackscrew (the position will be on the forward edge of the plate).

CAUTION: WHEN YOU MANUALLY POSITION THE VALVE, MAKE SURE THE TONGUE OF THE JACKSCREW ENGAGES WITH THE SLOT IN THE VALVE HEAD AND THE SLOT IN THE LOCKING PLATE. WHEN YOU INSTALL THE LOCKING PLATE, IT MUST BE FULLY DOWN ON THE VALVE ASSEMBLY AND NOT REQUIRE "PULLING DOWN" WITH THE RETAINING BOLTS. FAILURE TO COMPLY CAN RESULT IN DAMAGE TO THE VALVE.

(e) To position the valve head, turn the jackscrew with a wrench. Do this until the lug on the jackscrew engages in the slot on the bottom of the locking plate.

(f) RB211-535E4 SERIES ENGINES WITH THE TAI VALVE POSITION SWITCH; The valve position indicator assembly is then installed. Make sure the lever of the indicator assembly points up.

(g) Install the six bolts and tighten them to attach the assembly (Ref 70-51-00/201).

B. Engine Inlet Thermal Anti-Ice (TAI) Pressure Switches

(1) Two pressure switches (high and low) are located on the left side of each engine. The high pressure switch is above the TAI valve and the low pressure switch is below the TAI valve.

(2) The low pressure switch is used to indicate valve position. The high pressure switch senses a failure in the pressure regulating function of the TAI valve.

C. RB211-535E4 SERIES ENGINES WITH THE TAI VALVE POSITION SWITCH; Engine Inlet Thermal Anti-Ice (TAI) Valve Position Switch

(1) A valve position switch is installed at the top of the engine TAI valve and below the manual override assembly (the jackscrew and tongue). During the normal valve operation, the valve position switch is electrically in series with the low pressure switch.

(2) The movement of the engine TAI valve mechanically operates the valve position switch, which opens or closes when the valve does. The valve position switch prevents an unwanted display of the VALVE disagree light on the M10397 (P5) panel.

D. Engine Inlet Thermal Anti-Ice (TAI) Ducts
(1) The engine TAI ducts carry engine bleed air along the left side of each engine to the inlet cowls.
(2) ENGINES WITH RR SB71-9634;
The ducting includes a thermal anti-icing pressure indicator. This gives a visual indication if the TAI supply duct is defective. An operated pressure indicator will be seen during a pre-flight check.

E. Wing and Engine Anti-Ice Control Panel
(1) The wing and engine anti-ice control panel, M10397, controls the engine inlet thermal anti-icing. Control is provided with two push-on/push-off L and R ENGINE ANTI-ICE switches. The M10397 panel also controls the wing thermal anti-icing. The panel is located on the pilots' overhead panel, P5.

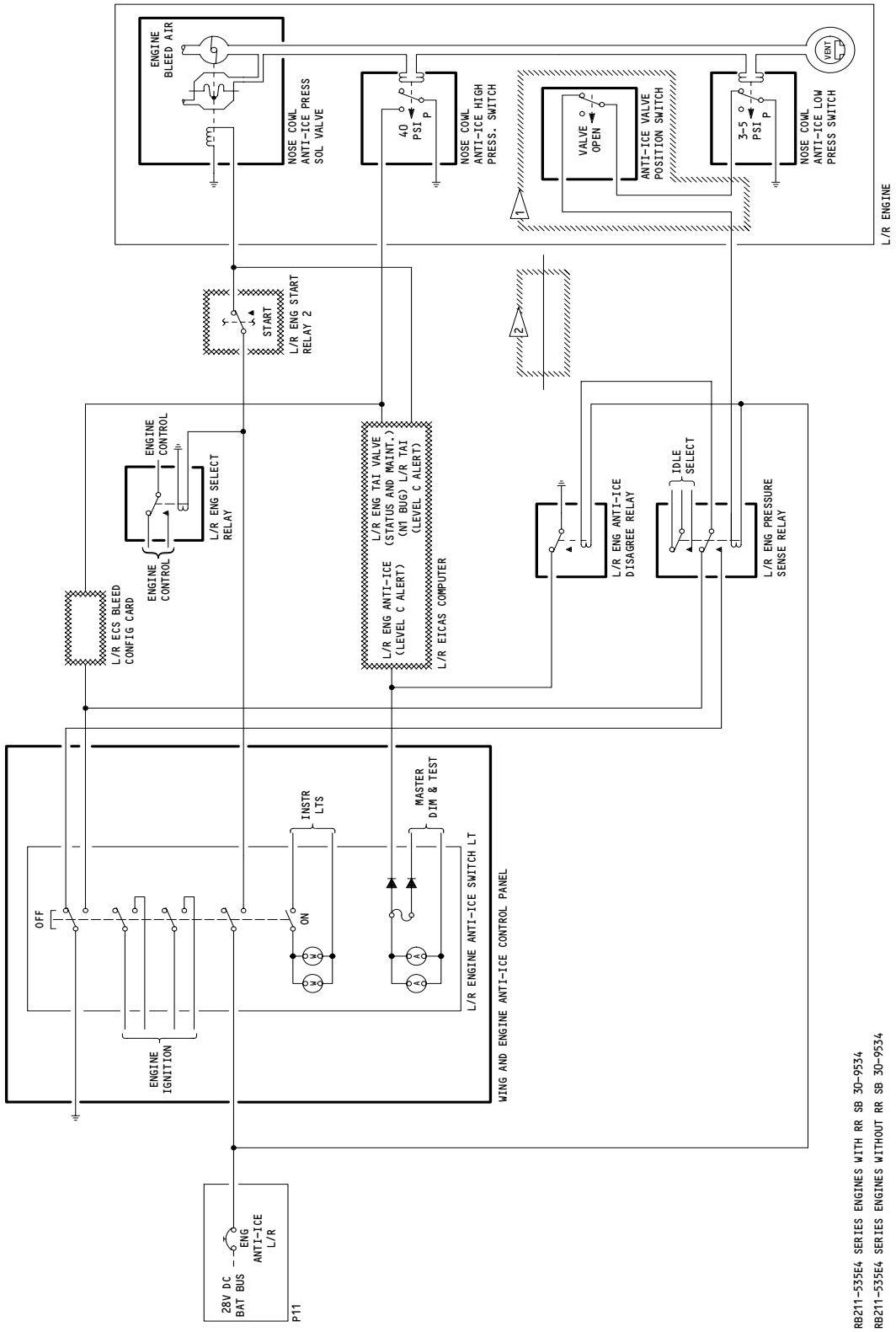
3. Operation (Fig. 2)
A. Functional Description
(1) The push-on/push-off L and R ENGINE ANTI-ICE switch/light on the M10397 (P5) panel control the system. Each switch controls one valve. When the switch is pressed the white"ON"light will illuminate to indicate engine anti-icing is selected.
(2) Pressing a L or R ENGINE ANTI-ICE switch/light ON energizes the TAI valve. The amber VALVE light inside the switch/light illuminates. The TAI valve opens to permit bleed air into the anti-ice duct.
(3) When the duct pressure is more than 3-5 psi, the low pressure switch opens and the amber VALVE light goes off.

NOTE: The ENGINE VALVE light on the wing and engine anti-ice control panel and the EICAS indication can come on when you select anti-ice ON with the engine at ground idle. The lights should go off when you move the power lever to taxi and/or take-off.

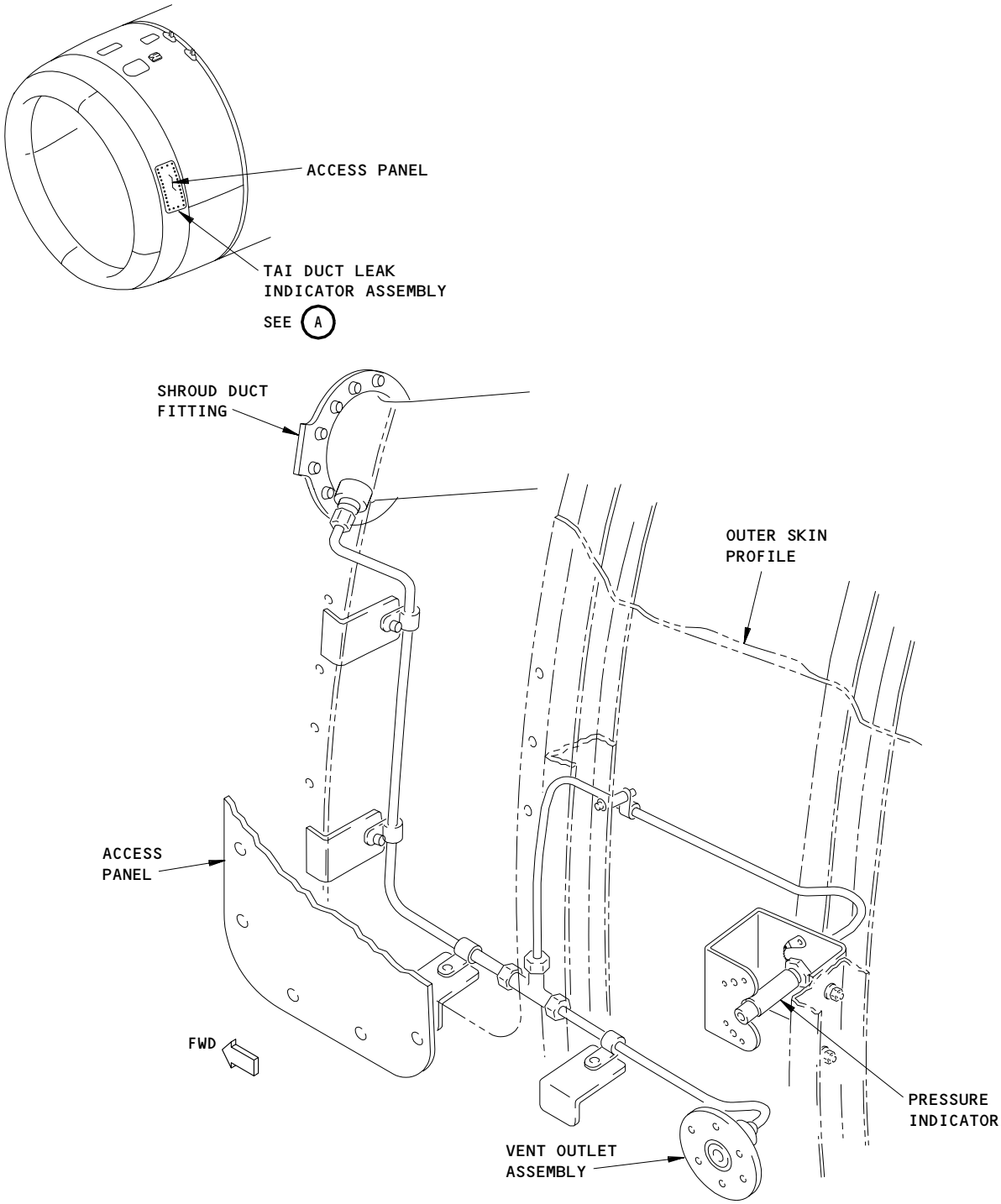
With the anti-ice selected off at a high altitude and a high rate of descent (high mach number), it is possible that the engine VALVE disagree light and the EICAS indication can come on. They should go off when the altitude or airspeed are decreased.

The anti-ice valve position switch inhibits an engine anti-ice caution message when there is low TAI duct pressure and the nose cowl anti-ice valve is fully open.

NOTE: RB211-535 SERIES ENGINES WITH RR SB 30-8504;
The low pressure switch opens at pproximately 3 psi.
RB211-535 SERIES ENGINES WITHOUT RR SB 30-8504,
RB211-535 SERIES ENGINES WITH RR SB 30-9534;
The low pressure switch opens at pproximately 5 psi.



Engine Inlet Thermal Anti-Ice Schematic
Figure 2



TAI DUCT LEAK INDICATOR ASSEMBLY

A

Engine Inlet Cowl TAI Pressure Indicator – Component Location
Figure 3

(4) The VALVE light comes on when the position of the TAI valve disagrees with its commanded position.
(5) An engine start relay closes the TAI valve when the engine is started (on ground only).
(6) ENGINES WITH RR SB71-9634;
The ducting in the inlet cowl is shrouded (Fig. 3). The shroud prevents damage to the inlet cowl if the duct is damaged. A thermal anti-icing pressure indicator is used to show a duct failure. The indicator has one port connected to the shroud around the duct and one port to ambient pressure. A pressure difference of more than 3 psi (which shows the duct has failed) will operate the indicator. This will cause the indicator to move 0.75 inches (19 mm) out of the inlet cowl.
(7) An engine bleed control card (EBCC) has inputs from the ANTI-ICE ENGINE L or R switch and high pressure switch. The EBCC provides inputs to the electronic engine control unit for changing engine trim (Ref 73-21-00).
(8) The ANTI-ICE ENGINE L or R switch also controls standby ignition in case the engine shuts down (Ref 74-31-00).

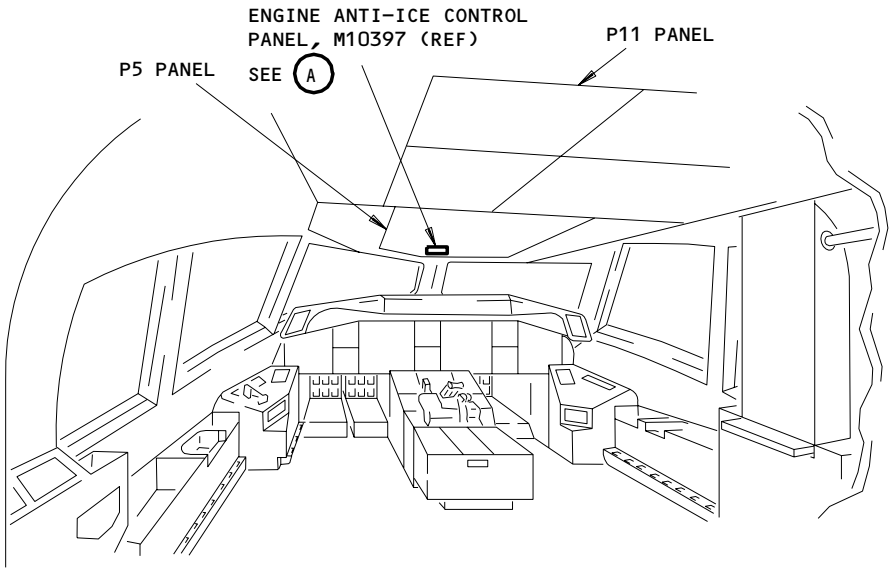
B. Control
(1) To place the system in operation, provide electrical power to the 28-v dc battery bus (Ref 24-22-00).
(2) Pressurize the pneumatic system while the engine operates (Ref 36-00-00).
(3) Check that the ENG ANTI-ICE L and R circuit breakers on overhead circuit breaker panel P11-3 are closed.
(4) To turn on the system, press the L or R ENGINE ANTI-ICE switches to ON position.

ENGINE INLET THERMAL ANTI-ICE SYSTEM

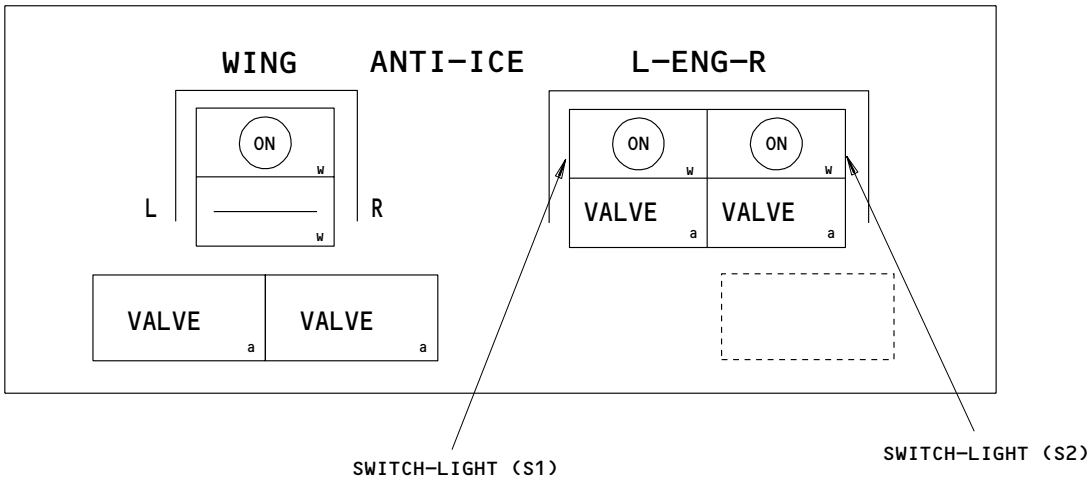
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CARD - (FIM 36-10-00/101)				
L ECS BLEED CONFIG, M10313				
R ECS BLEED CONFIG, M10312				
CIRCUIT BREAKER -			FLT COMPT, P11	
ENG ANTI-ICE L, C1147		1	11C27	*
ENG ANTI-ICE R, C1148		1	11C28	*
COMPUTER - (FIM 31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
DIODE - R10293	--	1	MAIN EQUIP CTR, P36	*
DIODE - R10294	--	1	MAIN EQUIP CTR, P37	*
PANEL - (FIM 30-11-00/101)				
ENGINE/WING ANTI-ICE CONTROL, M10397				
RELAY -	--	1	MAIN EQUIP CTR, P36	
L ENG ANTI-ICE DISAGREE, K10601		1		*
L ENG PRESSURE SENSE, K10060		1		*
L ENG SELECT, K10061		1		*
L ENGINE START, K10247		1		*
RELAY -	--	1	MAIN EQUIP CTR, P37	
R ENG ANTI-ICE DISAGREE, K10602		1		*
R ENG PRESSURE SENSE, K10062		1		*
R ENG SELECT, K10063		1		*
R ENGINE START, K10250		1		*
SWITCH - L ENG INLET ANTI-ICE, HIGH PRESSURE, S10137	1	1	413AL, ENGINE COWL	30-21-01
SWITCH - L ENG INLET ANTI-ICE, LOW PRESSURE, S10135	1	1	413AL, ENGINE COWL	30-21-01
SWITCH - R ENG INLET ANTI-ICE, HIGH PRESSURE, S10137	1	1	423AL, ENGINE COWL	30-21-01
SWITCH - R ENG INLET ANTI-ICE, LOW PRESSURE, S10135	1	1	423AL, ENGINE COWL	30-21-01
SWITCH/LIGHT - L ENGINE ANTI-ICE, S1	1	1	FLT COMPT, P5, ENG/WING ANTI-ICE CONT PNL M10397 (REF)	*
SWITCH/LIGHT - R ENGINE ANTI-ICE, S2	1	1	FLT COMPT, P5, ENG/WING ANTI-ICE CONT PNL M10397 (REF)	*
VALVE - L ENG INLET THERMAL ANTI-ICE, PRESSURE REG, V10028	1	1	413AL, ENGINE COWL	30-21-03
VALVE - R ENG INLET THERMAL ANTI-ICE, PRESSURE REG, V10028	1	1	423AL, ENGINE COWL	30-21-03

* SEE THE WDM EQUIPMENT LIST

Engine Inlet Thermal Anti-Ice System - Component Index
Figure 101



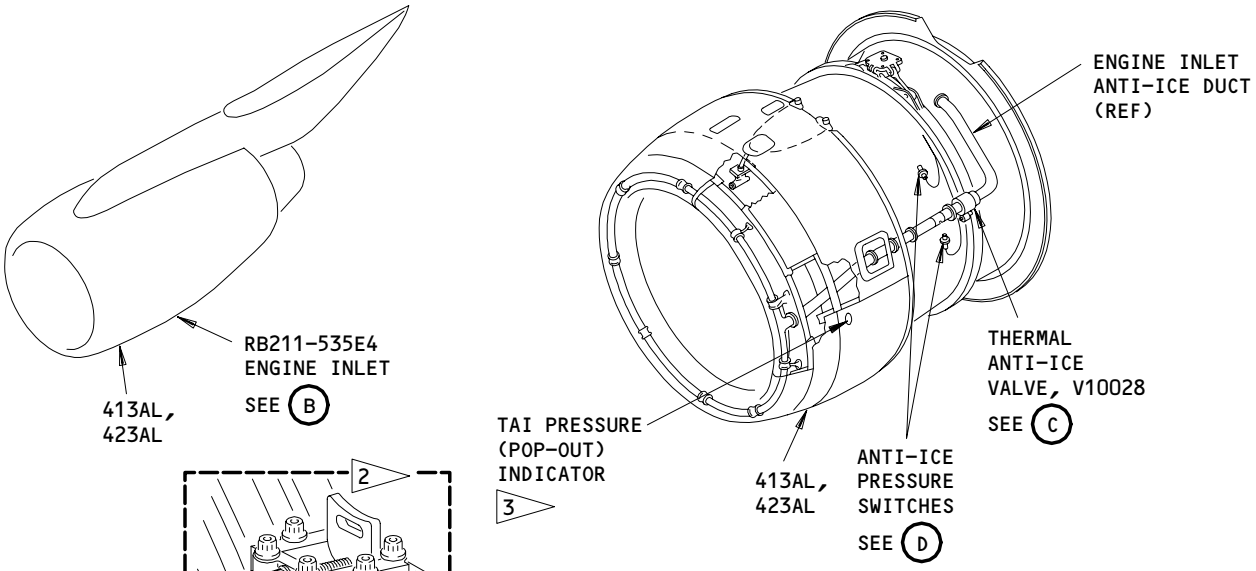
FLIGHT COMPARTMENT



ENGINE/WING ANTI-ICE CONTROL PANEL, M10397 (REF)

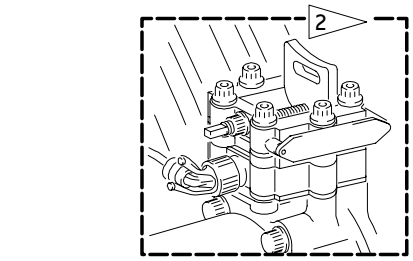
A

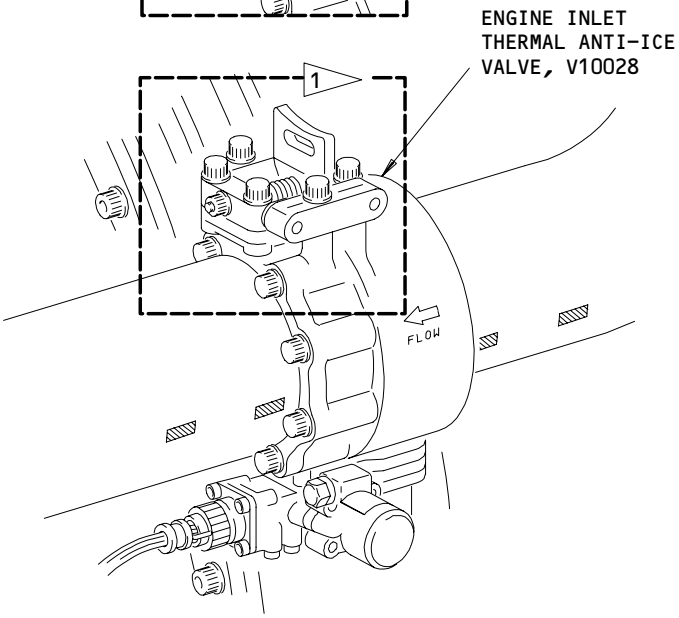
Engine Inlet Thermal Anti-Ice System - Component Location
Figure 102 (Sheet 1)



RB211-535E4 ENGINE INLET

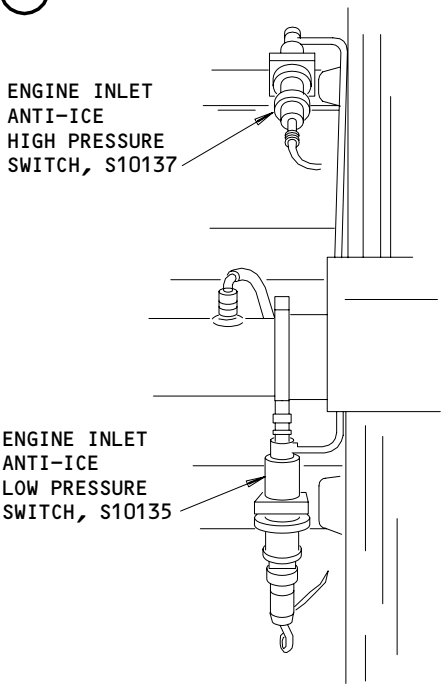
B





THERMAL ANTI-ICE VALVE, V10028

C



ENGINE INLET ANTI-ICE
PRESSURE SWITCHES

D

1 ENGINES WITHOUT THE VALVE POSITION INDICATOR SWITCH (ONE ELECTRICAL CONNECTOR ON THE VALVE)

2 ENGINES WITH THE VALVE POSITION INDICATOR SWITCH (TWO ELECTRICAL CONNECTORS ON THE VALVE)

3 ENGINES WITH RR SB 71-9634

Engine Inlet Thermal Anti-Ice System - Component Location
Figure 102 (Sheet 2)

ENGINE INLET THERMAL ANTI-ICING - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first task is the system test of the engine inlet thermal anti-icing system. The second task is the scheduled maintenance test procedure for the engine thermal anti-ice system.

TASK 30-21-00-735-001

2. System Test - Engine Inlet Thermal Anti-Ice (TAI) System
   A. General
      (1) The left and right engine inlet TAI system tests are given in this task.
   B. Equipment
      (1) Volt-ohmmeter - Simpson 260
   C. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (3) 71-11-04/201, Fan Cowl Panels
      (4) 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones
          410 No. 1 power plant
          420 No. 2 power plant
      (2) Access Panels
          413 Fan cowl panel (Left)
          414 Fan cowl panel (Right)
          423 Fan cowl panel (Left)
          424 Fan cowl panel (Right)
   E. Prepare for Test

      S 865-093
      (1) Supply electrical power (Ref 24-22-00).

      S 865-098
      (2) Remove the engine shutdown inhibit from the EICAS computer (Ref 31-41-00).

      NOTE: A 3 1/2 minute time delay will occur before any EICAS messages is shown after the engine shutdown inhibit is removed from the EICAS computer.

      S 045-094

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

      (3) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (Ref 78-31-00).

S 015-095
(4) Open the left fan cowl on the left or right engine. Obey the CAUTIONS for the Kevlar wrapping (Ref 71-11-04).

F. Test - Left Engine TAI System (Fig. 501)

S 865-099
(1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
(a) 11C27, ENG ANTI-ICE LEFT (Without EROPS)
11C27, ANTI-ICE ENG LEFT (WITH EROPS)

S 035-077
(2) Disconnect the electrical connectors that follow:
(a) The high pressure switch
(b) The low pressure switch
(c) The Thermal Anti-Ice (TAI) valve.

S 865-100
(3) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
(a) 11C27, ENG ANTI-ICE LEFT (Without EROPS)
11C27, ANTI-ICE ENG LEFT (With EROPS)

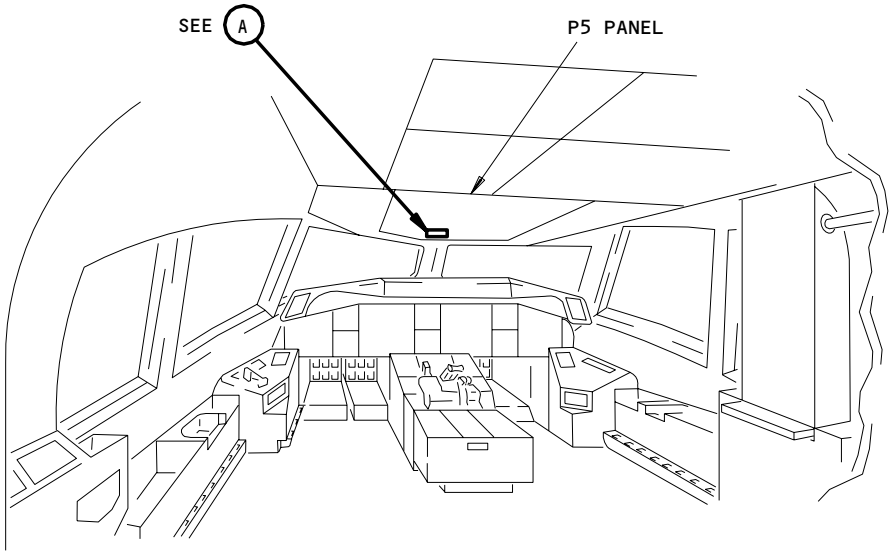
S 865-011
(4) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

S 765-012
(5) Measure the voltage at pin 1 of the TAI valve electrical connector. Make sure the voltage is less than 2v dc.

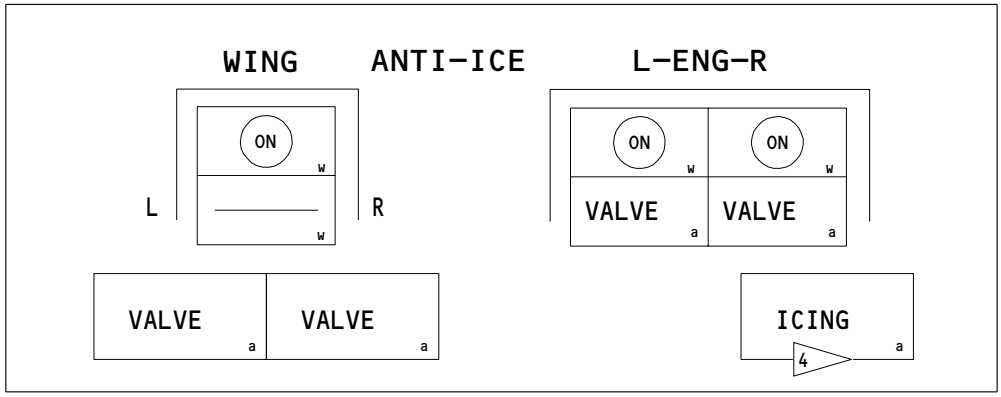
S 765-013
(6) Measure the voltage at pin 1 of the low pressure switch electrical connector. Make sure the voltage is 23 to 32v dc.

S 865-078
(7) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the ON position.

S 765-015
(8) Measure the voltage at pin 1 of the TAI valve electrical connector. Make sure the voltage is 23 to 32v dc.



FLIGHT COMPARTMENT

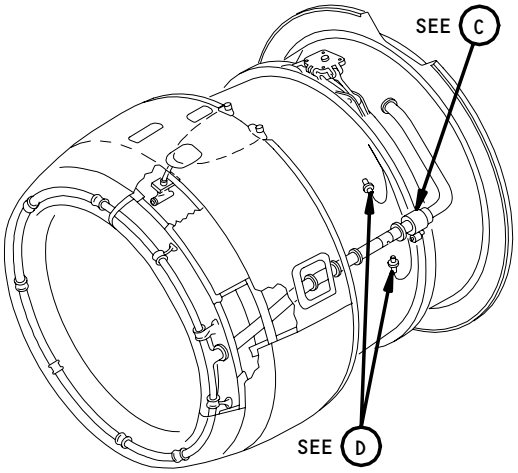


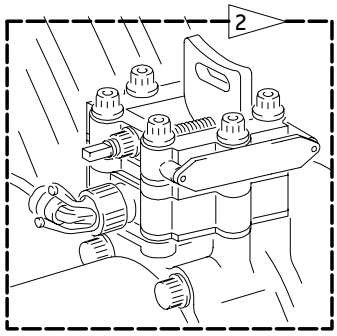
WING AND ENGINE ANTI-ICE CONTROL PANEL

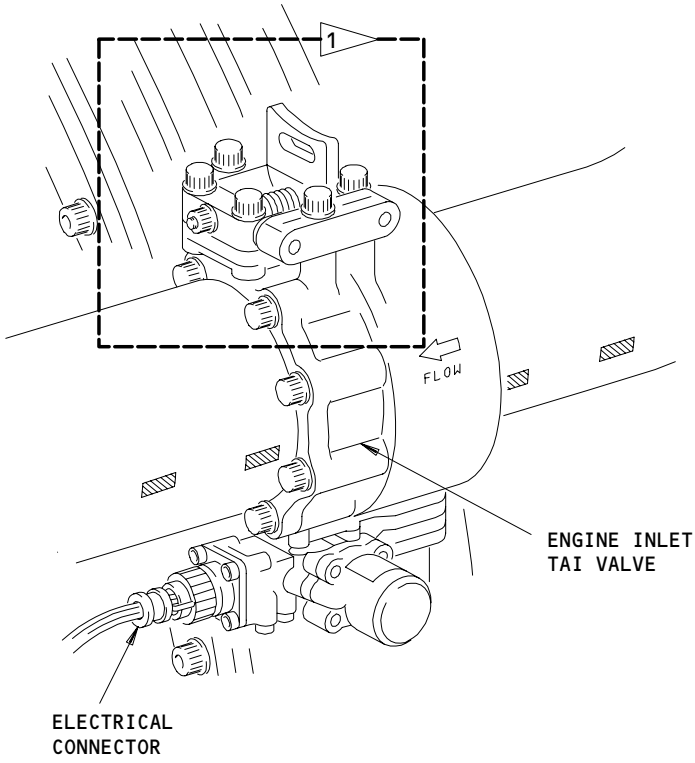
A

4 NOT ON ALL AIRPLANES

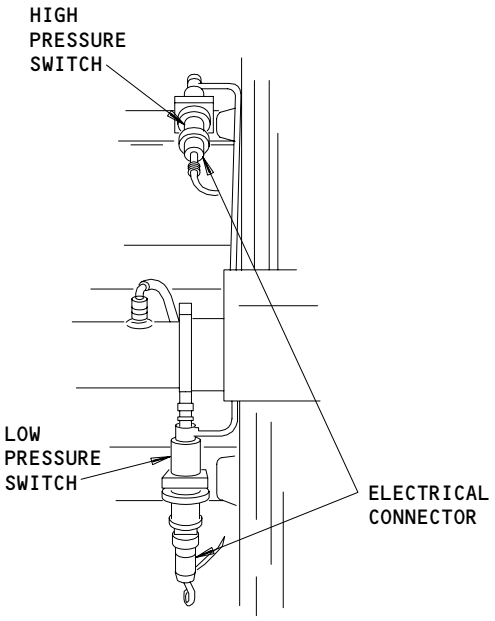
Engine Inlet TAI Test
Figure 501 (Sheet 1)







ENGINE INLET THERMAL ANTI-ICE VALVE
C



ANTI-ICE HIGH AND LOW PRESSURE SWITCHES
D

1 ENGINES WITHOUT RR SB 30-9534
2 ENGINES WITH RR SB 30-9534

Engine Inlet TAI Test
Figure 501 (Sheet 2)

S 765-052
(9) Measure the voltage at pin 1 of the low pressure switch electrical connector. Make sure the voltage is 23 to 32v dc.

S 865-079
(10) Make sure the six EICAS circuit breakers on the P11 panel are closed.

S 215-018
(11) Make sure the EICAS message L TAI message is shown on the EICAS display.

S 435-019
(12) Connect the electrical connector to the low pressure switch.

S 215-020
(13) Make sure the left engine anti-ice VALVE light on the P5 panel comes on.

S 215-021
(14) Make sure the EICAS level C alert message L ENG ANTI-ICE is shown on the EICAS display.

S 485-080
(15) Put a jumper between pins 1 and 2 of the high pressure switch electrical connector. Make sure the EIACS message L ENG TAI VALVE message is shown on the EICAS display.

S 085-081
(16) Remove the jumper from pins 1 and 2 of the high pressure switch electrical connector.

S 435-096
(17) Connect the electrical connector to the high pressure switch.

S 435-025
(18) Connect the electrical connector to the TAI valve.

S 865-089
(19) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

G. Test - Right Engine TAI System (Fig. 501)

S 865-101
(1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C28, ENG ANTI-ICE RIGHT (Without EROPS)
11C28, ANTI-ICE ENG RIGHT (With EROPS)

S 035-082
(2) Disconnect the electrical connectors that follow:
(a) The high pressure switch
(b) The low pressure switch
(c) The Thermal Anti-Ice (TAI) valve.

S 865-102
(3) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
(a) 11C28, ENG ANTI-ICE RIGHT

S 865-031
(4) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

S 765-032
(5) Measure the voltage at pin 1 of the TAI valve electrical connector. Make sure the voltage is less than 2v dc.

S 765-033
(6) Measure the voltage at pin 1 of the low pressure switch electrical connector. Make sure the voltage is 23 to 32v dc.

S 865-083
(7) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the ON position.

S 765-035
(8) Measure the voltage at pin 1 of the low pressure switch electrical connector. Make sure the voltage is 23 to 32v dc.

S 765-036
(9) Measure the voltage at pin 1 of the TAI valve electrical connector. Make sure the voltage is 23 to 32v dc.

S 865-084
(10) Make sure the six EICAS circuit breakers on the P11 panel are closed.

S 215-038
(11) Make sure the EICAS message R TAI message is shown on the EICAS display.

S 435-039
(12) Connect the electrical connector on the low pressure switch.

S 215-040
(13) Make sure the right engine anti-ice VALVE light on the P5 panel comes on.

S 215-041
(14) Make sure the EICAS level C alert message R ENG ANTI-ICE is shown on the EICAS display.

S 485-085
(15) Put a jumper between pins 1 and 2 of the high pressure electrical connector. Make sure the EICAS message R ENG TAI VALVE is shown on the EICAS display.

S 085-086
(16) Remove the jumper from between pins 1 and 2 of the high pressure switch electrical connector.

S 435-097
(17) Connect the electrical connector to the high pressure switch.

S 435-045
(18) Connect the electrical connector to the TAI valve.

S 865-090
(19) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

H. Test the Engine TAI Valve

S 445-092
(1) Do the Thrust Reverser Activation procedure (AMM 78-31-00/201).

S 865-135

WARNING: DO NOT OPERATE BLEED DUCTS AT TEMPERATURES HIGHER THAN 450°F. DO NOT OPERATE ENGINE ANTI-ICE FOR MORE THAN 30 SECONDS. DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Supply pneumatic power while the engine operates (AMM 36-00-00/201).

S 215-131
(3) Put ENGINE ANTI-ICE switch-light on the P5 panel in the ON position and make sure the white ON light comes on.

S 865-132
(4) Make sure the amber VALVE light comes on for approximately 2 seconds, then goes off.

S 865-133
(5) Set the ENGINE ANTI-ICE switch-light in the OFF position
(a) Make sure that the ON light goes off.

S 865-134
(6) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

I. Put the Airplane Back to Its Usual Condition

S 415-091
(1) Close the left fan cowl on the left or right engine (Ref 71-11-04).

S 865-088
(2) Put the engine shutdown inhibit back on the EICAS computers (Ref 31-41-00).

S 865-087
(3) Remove electrical power, if it is not necessary (Ref 24-22-00).

TASK 30-21-00-735-053

3. Operational Test - Engine Inlet TAI High Pressure Switch Circuitry

NOTE: This procedure is a scheduled maintenance task.

A. References
(1) 24-22-00/201, Electrical Power - Control
(2) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
(3) 71-11-04/201, Fan Cowl Panels
(4) 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones
410 No. 1 power plant
420 No. 2 power plant
(2) Access Panels
413 Fan cowl panel (Left)
414 Fan cowl panel (Right)
423 Fan cowl panel (Left)
424 Fan cowl panel (Right)

C. Prepare for Test

S 865-103
(1) Supply electrical power (Ref 24-22-00).

S 865-104
(2) Remove the engine shutdown inhibit from the EICAS computer (Ref 31-41-00).

NOTE: A 3 1/2 minute time delay will occur before any EICAS messages is shown after the engine shutdown inhibit is removed from the EICAS computer.

S 045-105

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

(3) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (Ref 78-31-00).

S 015-106
(4) Open the left fan cowl on the left or right engine. Obey the CAUTIONS for the Kevlar wrapping (Ref 71-11-04).

D. Test - Left Engine TAI System (Fig. 501)

S 865-107
(1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
(a) 11C27, ENG ANTI-ICE LEFT (Without EROPS)
11C27, ANTI-ICE ENG LEFT (With EROPS)

S 035-108
(2) Disconnect the electrical connectors that follow:
(a) The high pressure switch

S 865-109
(3) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
(a) 11C27, ENG ANTI-ICE LEFT (Without EROPS)
11C27, ANTI-ICE ENGleft (With EROPS)

S 865-110
(4) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the ON position.

S 865-111
(5) Make sure the six EICAS circuit breakers on the P11 panel are closed.

S 485-112
(6) Put a jumper between pins 1 and 2 of the high pressure switch electrical connector. Make sure the EIACS message L ENG TAI VALVE message is shown on the EICAS display.

S 085-113
(7) Remove the jumper from pins 1 and 2 of the high pressure switch electrical connector.

S 435-114
(8) Connect the electrical connector to the high pressure switch.

S 865-115
(9) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

E. Test - Right Engine TAI System (Fig. 501)

S 865-116
(1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C28, ENG ANTI-ICE RIGHT (Without EROPS)
11C28, ANTI-ICE ENG RIGHT (With EROPS)

S 035-117
(2) Disconnect the electrical connectors that follow:
(a) The high pressure switch

S 865-118
(3) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
(a) 11C28, ENG ANTI-ICE RIGHT (Without EROPS)
11C28, ANTI-ICE ENG RIGHT (With EROPS)

S 865-119
(4) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the ON position.

S 865-120
(5) Make sure the six EICAS circuit breakers on the P11 panel are closed.

S 485-121
(6) Put a jumper between pins 1 and 2 of the high pressure electrical connector. Make sure the EICAS message R ENG TAI VALVE is shown on the EICAS display.

S 085-122
(7) Remove the jumper from between pins 1 and 2 of the high pressure switch electrical connector.

S 435-123
(8) Connect the electrical connector to the high pressure switch.

S 865-124
(9) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the OFF position.

F. Put the Airplane Back to its Usual Condition

S 415-125
(1) Close the left fan cowl on the left or right engine (Ref 71-11-04).

S 865-126
(2) Put the engine shutdown inhibit back on the EICAS computers (Ref 31-41-00).

S 445-127
(3) Do the Thrust Reverser Activation procedure (Ref 78-31-00).

S 865-128
(4) Remove electrical power, if it is not necessary (Ref 24-22-00).

ENGINE INLET THERMAL ANTI-ICE HIGH AND LOW PRESSURE SWITCHES - REMOVAL/INSTALLATION

1. General
   A. This procedure contains five tasks:
      (1) The first task is the removal of the high pressure switch.
      (2) The second task is the removal of the low pressure switch.
      (3) The third task is the installation of the low pressure switch.
      (4) The fourth task is the installation of the high pressure switch.
      (5) The fifth task is a test of the low and high pressure switch installations.

TASK 30-21-01-004-002

2. Remove the High Pressure Switch (Fig. 401)
   A. References
      (1) AMM 70-50-02/201, Connection of Electrical Plugs
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          413 No. 1 Power plant
          423 No. 2 Power plant
      (2) Access Panels
          413AL Fan cowl panel (Left)
          423AL Fan cowl panel (Right)
   C. Procedure - Remove the High Pressure Switch

      S 864-003
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11C27 or 11C26, ENG ANTI-ICE LEFT
          (b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

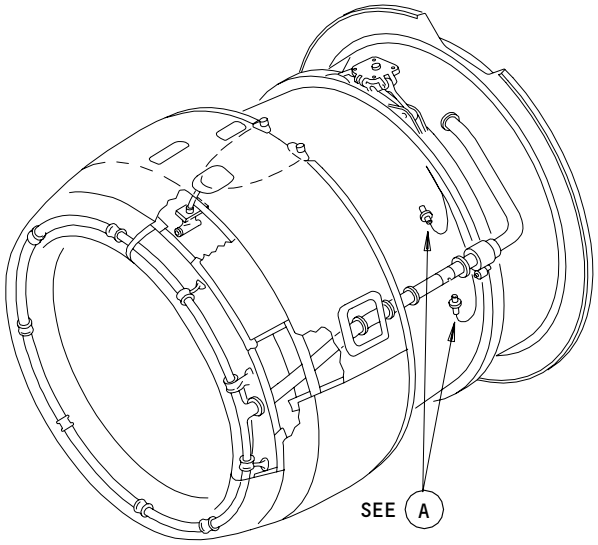
      S 044-004

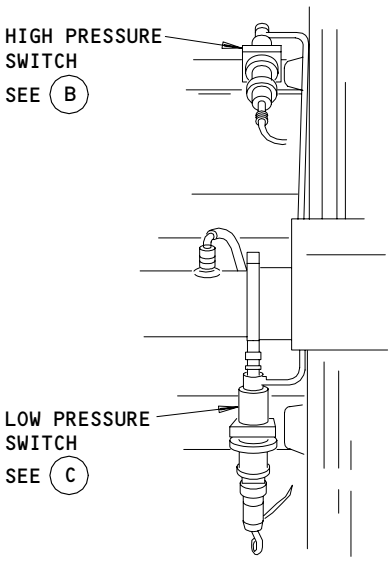
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

      (2) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (AMM 78-31-00/201).

      S 014-005
      (3) Open the left fan cowl panel. Obey the precautions for the Kevlar wrapping (AMM 71-11-04/201).

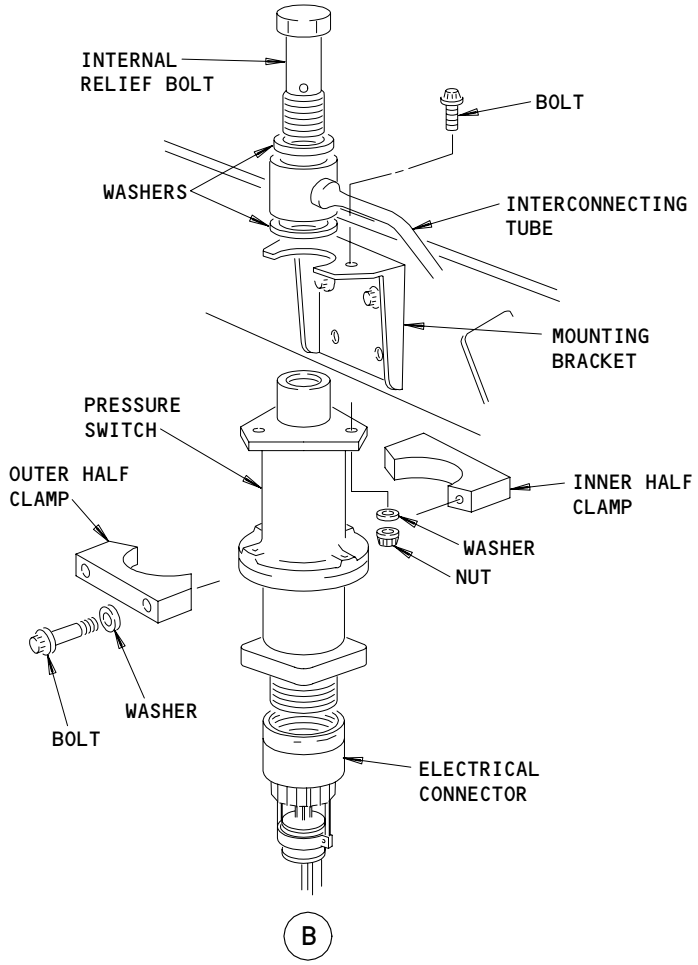
      S 034-006
      (4) Disconnect the electrical connector (AMM 70-50-02/201).





ANTI-ICE HIGH AND LOW PRESSURE SWITCHES

A



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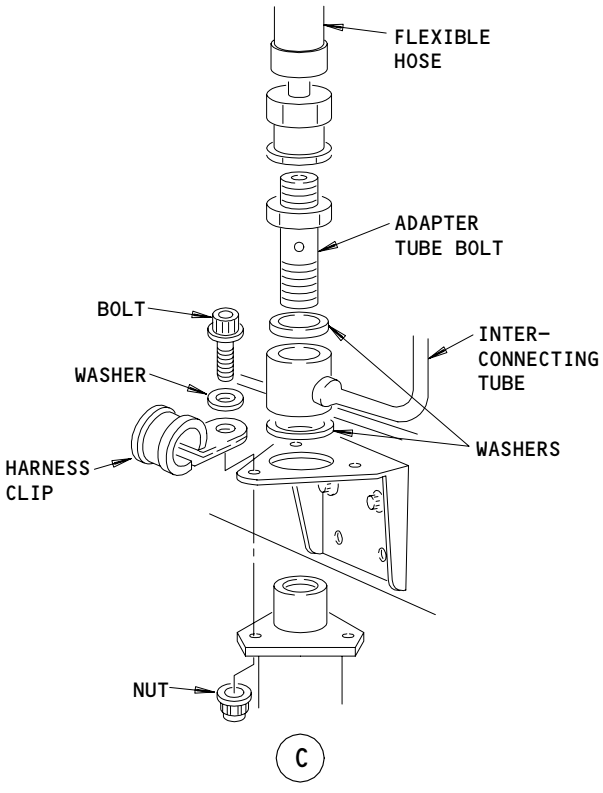


C

Engine Inlet Thermal Anti-Ice High and Low Pressure Switches Installation
Figure 401

S 034-017
(5) Remove the internal relief bolt and the flat washers from the sides of the interconnecting tube.

S 034-069
(6) Remove the two bolts, washers and the outer half clamp. Keep the pressure switch on the mounting bracket.

S 034-068
(7) Remove the three nuts, washers and bolts that hold the pressure switch to the mounting bracket.

S 424-067
(8) Move the pressure switch from the mounting bracket and remove them together with the inner half clamp.

S 494-066
(9) Put covers on the openings and connectors.

TASK 30-21-01-004-018

3. Remove the Low Pressure Switch (Fig. 401)

A. References
(1) AMM 70-50-02/201, Connection of Electrical Plugs
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

B. Access
(1) Location Zones
413 No. 1 Power plant
423 No. 2 Power plant
(2) Access Panels
413AL Fan cowl panel (Left)
423AL Fan cowl panel (Right)

C. Procedure - Remove the Low Pressure Switch

S 864-076
(1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11C27 or 11C26, ENG ANTI-ICE LEFT

(b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

S 044-077

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

(2) Do the Thrust Reverser Deactivation for Ground Maintenance procedure (AMM 78-31-00/201).

S 014-078

(3) Open the left fan cowl panel. Obey the precautions for the Kevlar wrapping (AMM 71-11-04/201).

S 034-079

(4) Disconnect the electrical connector (AMM 70-50-02/201).

S 034-019

(5) Disconnect the flexible hose from the adapter tube bolt.

S 034-020

(6) Remove adapter tube bolt and the flat washers from the sides of the interconnecting tube.

S 034-021

(7) Remove the nut, bolt and washer that hold the harness clip.

S 034-022

(8) Remove the two bolts, washers and the outer half clamp. Keep the pressure switch on the mounting bracket.

S 034-037

(9) Remove the three nuts, washers and bolts that hold the pressure switch to the mounting bracket.

S 024-024

(10) Move the pressure switch from the mounting bracket and remove them together with the inner half clamp.

S 494-023

(11) Put the covers on the openings and connectors.

TASK 30-21-01-404-039

4. Install the High Pressure Switches (Fig. 401)

A. References

(1) AMM 20-10-22/701, Metal Surfaces Cleaning/Painting
(2) AMM 70-50-02/201, Connection of Electrical Plugs
(3) AMM 70-51-00/201, Torque Tightening Technique
(4) AMM 71-11-04/201, Fan Cowl Panels

B. Access

(1) Location Zones
413 No. 1 Power plant
423 No. 2 Power plant
(2) Access Panels
413AL Fan cowl panel (Left)
423AL Fan cowl panel (Right)

C. Procedure - Install the High Pressure Switch

S 014-041
(1) Remove the covers from the openings and connectors.

S 164-042
(2) Clean the pressure switch and mounting bracket faying surfaces to make sure there is a good electrical bond (AMM 20-10-22/701).

S 424-043
(3) Put the inner half clamp around the pressure switch. Move the switch and the half clamp together in position on the mounting bracket.

S 434-044
(4) Put the outer half clamp around the pressure switch and loosely install the two bolts and washers.

S 434-045
(5) Install the three nuts, washers and bolts on the mounting bracket, then tighten the half-clamp bolts (AMM 70-51-00/201).

S 434-046
(6) Install the electrical connector (AMM 70-50-02/201).

S 434-051
(7) Install the internal relief bolt, with a flat washer between the bolt and the interconnecting tube, and between the interconnecting tube and the pressure switch (AMM 70-51-00/201).

S 414-053
(8) Close the left fan cowl panel (AMM 71-11-04/201).

S 864-054
(9) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
(a) 11C27 or 11C26, ENG ANTI-ICE LEFT
(b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

S 704-055
(10) Do the Test paragraph.

TASK 30-21-01-404-038

5. Install the Low Pressure Switch (Fig. 401)

A. References
(1) AMM 20-10-22/701, Metal Surfaces Cleaning/Painting
(2) AMM 70-50-02/201, Connection of Electrical Plugs
(3) AMM 70-51-00/201, Torque Tightening Technique
(4) AMM 71-11-04/201, Fan Cowl Panels

B. Access
(1) Location Zones
413 No. 1 Power plant
423 No. 2 Power plant
(2) Access Panels
413AL Fan cowl panel (Left)
423AL Fan cowl panel (Right)

C. Procedure - Install the Low Pressure Switch

S 094-070
(1) Remove the covers from the openings and connectors.

S 164-071
(2) Clean the pressure switch and mounting bracket faying surfaces to make sure there is a good electrical bond (AMM 20-10-22/701).

S 424-072
(3) Put the inner half clamp around the pressure switch. Move the switch and the half clamp together into the correct position on the mounting bracket.

S 434-073
(4) Put the outer half clamp around the pressure switch and loosely install the two bolts and washers.

S 434-074
(5) Install the three nuts, washers and bolts on the mounting bracket, then tighten the half-clamp bolts (AMM 70-51-00/201).

S 434-075
(6) Install the electrical connector (AMM 70-50-02/201).

S 434-058
(7) Install the adapter bolt, with a flat washer between the bolt and the interconnecting tube, and between the interconnecting tube and the pressure switch (AMM 70-51-00/201).

S 434-059
(8) Safety the adapter bolt to the mounting bracket with lockwire.

S 434-060
(9) Install the flexible hose to the adapter tube bolt (AMM 70-51-00/201).

S 434-061
(10) Safety the hose connector and the adapter bolt with lockwire.

S 434-062
(11) Install the harness clip with the nut, bolt and washer (AMM 70-51-00/201).

S 414-063
(12) Close the left fan cowl panel (AMM 71-11-04/201).

S 864-064
(13) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
(a) 11C27 or 11C26, ENG ANTI-ICE LEFT
(b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

S 704-065
(14) Do the Test paragraph.

TASK 30-21-01-714-040

6. Test - High and Low Pressure Switch Installation

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 36-00-00/201, Pneumatics - General
(3) AMM 78-31-00/201, Thrust Reverser System

B. Procedure

S 864-081
(1) Supply pneumatic power while the engine operates (AMM 36-00-00/201).

S 864-036
(2) Make sure the six EICAS circuit breakers on the P11 panel are closed.

S 864-035
(3) Push the EICAS display switch on the P9 panel to show the status mode on the bottom EICAS display.

S 864-034
(4) Put the L ENGINE ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the ON light comes on.

S 214-033
(5) Make sure the EICAS messages ENG ANTI-ICE L or ENG TAI VALVE L are not shown on the EICAS display.

S 864-032
(6) Put the L ENGINE ANTI-ICE switch-light in the OFF position.

S 864-031
(7) Put the R ENGINE ANTI-ICE switch-light on the P5 panel in the ON position. Make sure the ON light comes on.

S 214-030
(8) Make sure the EICAS messages ENG ANTI-ICE R or ENG TAI VALVE R are not shown on the EICAS display.

S 864-029
(9) Put the R ENGINE ANTI-ICE switch-light in the OFF position.

S 444-028
(10) Do the Activate the Thrust Reverser procedure (AMM 78-31-00/201).

S 864-027
(11) Remove electrical power if it is not necessary (AMM 24-22-00/201).

ENGINE INLET THERMAL ANTI-ICING HIGH AND LOW PRESSURE SWITCHES - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first task is a functional test of TAIV Low-pressure switch. The second task is a functional test of the TAIV high-pressure switch.

   TASK 30-21-01-725-001

2. Functional Test - Engine Inlet Thermal Anti-Icing Low-Pressure Switch
   A. General
      (1) The test of the left and the right low-pressure (LP) switches is given in this task
   B. Equipment
      (1) Pneumatic Test Set- locally available
      (2) Digital Multimeter
      (3) Reducer adapter to fit over pressure switch sense line - locally available
   C. References
      (1) AMM 30-21-01/401 Engine Inlet Thermal Anti-icing High and Low Pressure Switches
      (2) AMM 70-50-02/201, Connection of Electrical Plugs
      (3) AMM 71-11-04/201, Fan Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones
          413 No. 1 Power plant
          423 No. 2 Power plant
      (2) Access Panels
          413AL Fan cowl panel (Left)
          423AL Fan cowl panel (Right)
   E. Prepare for the test

      S 865-002
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11C27 or 11C26, ENG ANTI-ICING LEFT
          (b) 11C28 or 11C27, ENG ANTI-ICING RIGHT

      S 045-003

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

      (2) Do the Thrust Reverser deactivation for Ground Maintenance procedure (AMM 78-31-00/201).

S 015-004
(3) Open the left fan cowl panel. Obey the precautions for the Kevlar wrapping (AMM 71-11-04/201).

S 035-006
(4) Disconnect the electrical connector (D1320) from the Low Pressure switch (AMM 30-21-01/401).

S 015-007
(5) Do the steps that follow:
(a) FOR RB211-535C ENGINES;
Disconnect the sense line flexible hose from the adapter tube bolt on the HP pressure switch (AMM 30-21-01/401).
(b) FOR RB211 535E4 ENGINES;
Disconnect the sense line flexible hose from the adapter tube bolt on the LP Pressure switch (AMM 30-21-01/401).

S 785-008
(6) Connect a Pneumatic Test Set to the sense connection with a reducer adapter and a 0-15 psi pressure gauge.

F. Test

S 485-009
(1) Connect a digital multimeter across pins 1 and 2 on the LP pressure switch.

S 485-010
(2) Slowly increase the supply pressure. At the same time, measure the resistance for continuity, to indicate that the LP switch has opened.
(a) POST SB30-8504;
If the LP switch opens at between 2.5 psi and 4.5 psi, increase the supply pressure to 10 psi.
1) Slowly release the supply pressure. At the same time, measure the resistance for an infinite open circuit. This will indicate that the LP switch has closed.
(b) If the LP switch does not open, or opens outside of the range 2.5 to 4.5 psi, replace the LP switch (AMM 30-21-01/401).
(c) PRE SB30-8504 OR POST SB30-9534;
If the LP switch opens at between 4.5 psi and 6.5 psi, increase the supply pressure to 10 psi.
1) Slowly release the supply pressure. At the same time, measure the resistance for an infinite open circuit. This will indicate that the LP switch has closed.

(d) If the LP switch does not open, or opens outside of the range 4.5 to 6.5 psi, replace the LP switch (AMM 30-21-01/401).
(e) POST SB30-8504;
If the LP switch does not close, or closes outside of the range 2.5 to 4.5 psi, replace the LP switch (AMM 30-21-01/401).
(f) PRE SB30-8504, OR POST SB30-9534;
If the LP switch does not close, or closes outside of the range 4.5 to 6.5 psi, replace the LP switch (AMM 30-21-01/401).

S 485-012
(3) Disconnect the Pneumatic Test Set and the reducer adapter from the LP switch.

S 725-013
(4) Do the steps that follow:
(a) FOR RB211-535C ENGINES;
Connect the sense line flexible hose to the adapter tube bolt on the HP pressure switch (AMM 30-21-01/401).
(b) FOR RB211-535E4 ENGINES;
Connect the sense line flexible hose to the adapter tube bolt on the LP Pressure switch (AMM 30-21-01/401).
(c) Connect the electrical connector D1320 (AMM 30-21-01/401).
(d) Close the left fan cowl panel.
1) Obey the precautions for kevlar wrapping (AMM 71-11-04/201).
(e) Do The Thrust Reverser Reactivation for Ground Maintenance procedure (AMM 78-31-00/201).
(f) Close these circuit breakers on the overhead circuit breaker panel P11, and remove DO-NOT-CLOSE tags:
1) 11C27 or 11C26, ENG ANTI-ICE LEFT
2) 11C28 or 11C27, ENG ANTI-ICE RIGHT

TASK 30-21-01-725-011

3. Functional Test - Engine Inlet Thermal Anti-Icing HP-Pressure Switch

A. General
(1) The test of the left and the right high-pressure (HP) switches is given in this task.

B. Equipment
(1) Pneumatic Test Set- locally available
(2) Digital Multimeter
(3) Reducer adapter to fit over pressure switch sense line - locally available

C. References
(1) AMM 30-21-01/401 Engine Inlet Thermal Anti-icing High and Low Pressure Switches
(2) AMM 70-50-02/201, Connection of Electrical Plugs

(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones
413 No. 1 Power plant
423 No. 2 Power plant

(2) Access Panels
413AL Fan cowl panel (Left)
423AL Fan cowl panel (Right)

E. Prepare for the test

S 865-014

(1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11C27 or 11C26, ENG ANTI-ICING LEFT
(b) 11C28 or 11C27, ENG ANTI-ICING RIGHT

S 045-024

WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

(2) Do the Thrust Reverser deactivation for Ground Maintenance procedure (AMM 78-31-00/201).

S 015-016

(3) Open the left fan cowl panel. Obey the precautions for the Kevlar wrapping (AMM 71-11-04/201).

S 025-017

(4) Disconnect the electrical connector (D1422) from the High Pressure switch (AMM 30-21-01/401).

S 725-018

(5) Do the steps that follow:
(a) FOR RB211-535C ENGINES;
Disconnect the sense line flexible hose from the adapter tube bolt on the HP Pressure switch (AMM 30-21-01/401).
(b) FOR RB211 535E4 ENGINES;
Disconnect the sense line flexible hose from the adapter tube bolt on the LP Pressure switch (AMM 30-21-01/401).

S 415-019

(6) Connect the Pneumatic Test with the reducer adapter and a 0 to 50 psi pressure gauge.

F. Test

S 485-020
(1) Connect a digital multimeter across pins 1 and 2 on the LP pressure switch.

S 725-021
(2) Slowly increase the supply pressure, at the same time measure the resistance for continuity. This indicate that the HP switch opens.
  (a) If the HP switch does not open, or it opens outside the range 39.5 psi to 42.5 psi, replace the HP pressure switch (AMM 30-21-01/401).
  (b) Increase the air to a gauge pressure of 45 psi.
    1) Slowly release the supply pressure. At the same time, measure the resistance for an infinite open circuit. This will indicate that the HP switch has closed.
    2) If the HP switch does not close, or it closes outside of the range 39.5 psi to 42.5 psi, replace the HP pressure switch (AMM 30-21-01/401).

S 085-022
(3) Disconnect the Pneumatic Test Set.

S 725-023
(4) Do the steps that follow:
  (a) FOR RB211-535C ENGINES;
  Connect the sense line flexible hose to the adapter tube bolt on the HP pressure switch (AMM 30-21-01/401).
  (b) FOR RB211-535E4 ENGINES;
  Connect the sense line flexible hose to the adapter tube bolt on the LP Pressure switch (AMM 30-21-01/401).
  (c) Connect the electrical connector D1320 (AMM 30-21-01/401).
  (d) Close the left fan cowl panel.
    1) Obey the precautions for kevlar wrapping (AMM 71-11-04/201).
  (e) Do The Thrust Reverser Reactivation for Ground Maintenance procedure (AMM 78-31-00/201).
  (f) Close these circuit breakers on the overhead circuit breaker panel P11, and remove DO-NOT-CLOSE tags:
    1) 11C27 or 11C26, ENG ANTI-ICE LEFT
    2) 11C28 or 11C27, ENG ANTI-ICE RIGHT

ENGINE INLET THERMAL ANTI-ICE VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is to remove the left or right engine inlet Thermal Anti-Ice (TAI) valve. The second task is to install the left or right engine TAI valve. The second task also includes an installation test of the left or right engine TAI valve.
   B. RB211-535E4 SERIES ENGINES WITH A TAI VALVE POSITION SWITCH;
      A valve position switch is installed on the engine inlet TAI valve which adds an additional electrical connector. A cap and stow provision for this connector is also installed. If an engine inlet TAI valve without a valve position switch is installed, use the cap and stow provision for the connector.

TASK 30-21-03-004-017

2. Remove the Engine Inlet TAI Valve (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          413 No. 1 Power plant
          423 No. 2 Power plant
      (2) Access Panels
          413AL Engine fan cowl
          423AL Engine fan cowl
   C. Prepare for Removal

      S 864-001

      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11C27 or 11C26, ENG ANTI-ICE LEFT
          (b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

      S 044-002

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

      (2) Do the procedure Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

D. Procedure

S 014-003
(1) Open the engine fan cowl (413AL or 423AL) and obey the precautions for the Kevlar (AMM 71-11-04/201).

S 034-047
(2) ENGINE TAI VALVE WITHOUT A TAI VALVE POSITION SWITCH;
Disconnect the electrical connector (AMM 70-50-02/201).

S 034-049
(3) ENGINE TAI VALVE WITH A TAI VALVE POSITION SWITCH;
Disconnect the two electrical connectors (AMM 70-50-02/201).

NOTE: A TAI valve without a position switch has only one electrical connector. For valves in "LOCKED OUT" condition (AMM 30-21-00/501) to prevent possible damage to the position switch assembly. The manual lockout assembly should be restored to the normal condition, with position switch lever arm engaged in the valve slide notch and lock tongue exposed before valve is placed in unserviceable stock.

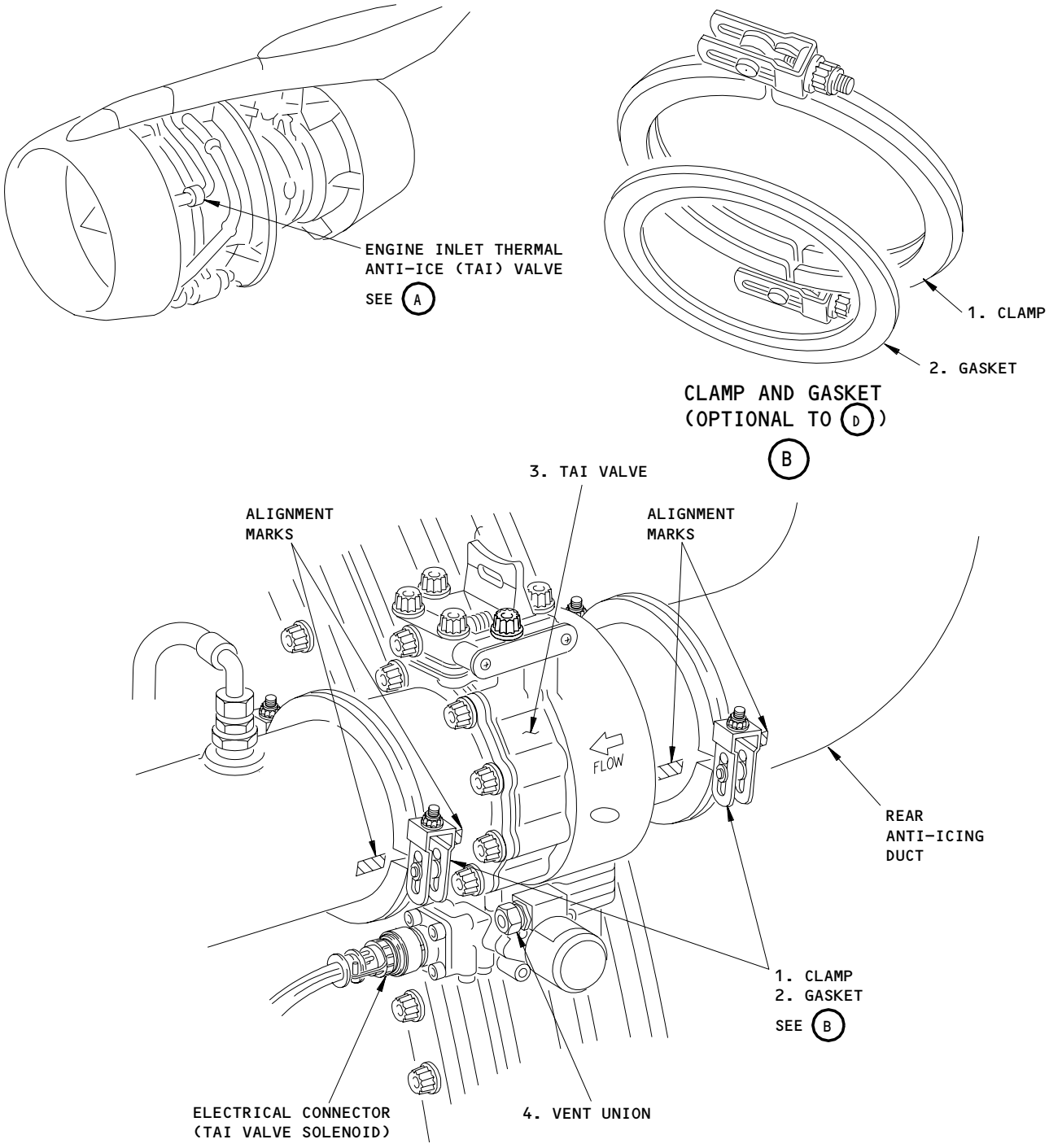
S 034-009
(4) Hold the TAI valve (3) and release the coupling clamps (1) (AMM 70-12-02/201).

S 034-011
(5) Move the rear anti-icing duct aft and remove the TAI valve (3) from the engine.

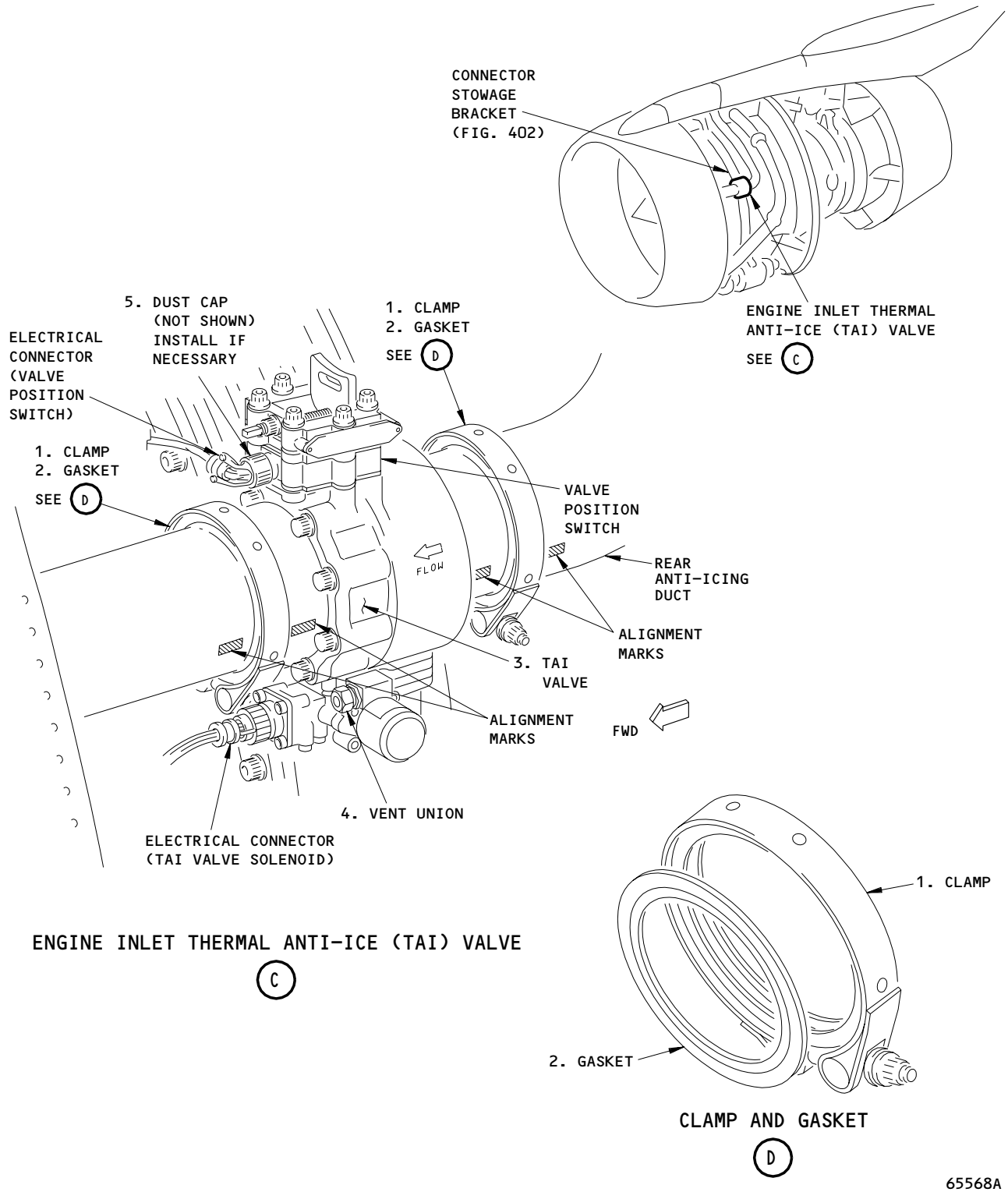
S 034-013
(6) Remove the gaskets (2) from both ends of the TAI valve (3) (AMM 70-12-02/201).

NOTE: Examine the gasket for wear, cracks, dents, foreign objects or other damage. Replace the gasket if you find damage. You can use the gasket again if you do not find damage.

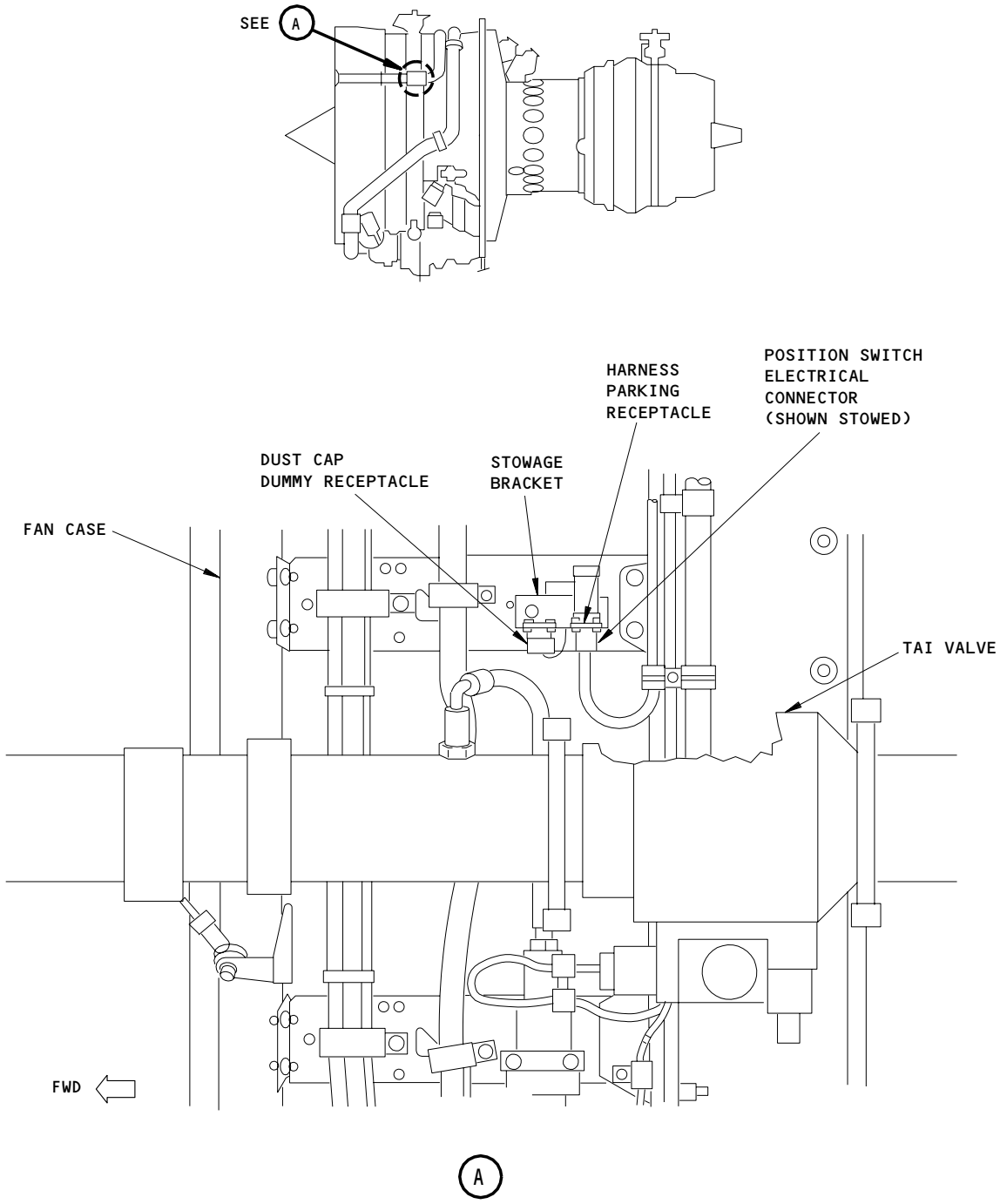
S 494-015
(7) Install covers in all of the openings and connectors.



Engine Inlet Thermal Anti-Ice (TAI) Valve Installation
Figure 401 (Sheet 1)



Engine Inlet Thermal Anti-Ice (TAI) Valve Installation
Figure 401 (Sheet 2)



NOTE: USE THE STOWAGE BRACKET TO CONNECT THE VALVE POSITION SWITCH CONNECTOR WHEN YOU INSTALL A VALVE WITHOUT A POSITION SWITCH.

Engine Inlet Thermal Anti-Ice (TAI) Valve Electrical Connector Stowage Bracket
Figure 402

TASK 30-21-03-404-016

3. Install Engine Inlet TAI Valve (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Clamp Assembly	30-21-01	01	5
	2	Gasket			40
	3	Valve - TAI			50J
	4	Vent Union			60
	5	Dust Cap (If necessary)	71-51-56	03	520

B. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 36-00-00/201, Pneumatics - General
(3) AMM 70-12-02/201, Fitting Vee Band Coupling Clamps
(4) AMM 70-42-12/201, Local Surface Protection
(5) AMM 70-50-02/201, Connection of Electrical Plugs
(6) AMM 70-51-00/201, Torque Tightening Technique
(7) AMM 71-11-04/201, Fan Cowl Panels
(8) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones
413 No. 1 Power plant
423 No. 2 Power plant

(2) Access Panels
413AL Engine fan cowl
423AL Engine fan cowl

D. Procedure

S 034-018

(1) Remove all the covers from the openings and connectors.

S 424-059

(2) Install the vent union (4).

S 164-019

(3) Clean the surfaces of the anti-icing duct and TAI valve (3) where they touch.

S 114-020

WARNING: YOU MUST HAVE SUFFICIENT QUANTITY OF CLEAN AIR TO BREATHE WHEN YOU USE THE DEGREASING FLUID. DO NOT TOUCH THE DEGREASING FLUID. THE DEGREASING FLUID CAN CAUSE INJURY TO PERSONS.

CAUTION: REFER TO AMM 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. THE DEGREASING FLUID CAN CAUSE DAMAGE TO SOME SURFACES.

(4) Clean the mating surfaces with degreasing fluid (AMM 70-42-12/201).

S 844-022

(5) Prepare the coupling clamps (1) for installation (AMM 70-12-02/201).

S 434-023

(6) Put the gaskets(2) on both ends of the TAI valve (3). (AMM 70-12-02/201).
   (a) Make sure the gaskets (2) fit correctly on the TAI valve (3) and on the ducts (AMM 70-12-02/201).

S 424-025

(7) Move the rear duct aft to get clearance and install the TAI valve (3).

S 824-026

CAUTION: DO NOT LET THE FULL WEIGHT OF THE TAI VALVE (3) TO BE HELD BY THE DUCTS. THE TAI VALVE (3) IS HEAVY AND CAN CAUSE DAMAGE TO THE DUCTS.

(8) Put the TAI valve (3) in position so the flow arrow indicates forward and align the yellow alignment marks.

S 434-021

(9) Install and tighten the two coupling clamps (1) that hold the TAI valve (3) to the ducts (AMM 70-12-02/201).

NOTE: Install TAI valve and clamp assembly in such a way as not to make contact with the fan cowl.

S 434-027

(10) RB211-535C ENGINES;
Connect the flexible hose to the TAI valve (3). Tighten the union nut (AMM 70-51-00/201) and install lockwire.

S 434-064

(11) RB211-535E4 SERIES ENGINES;
Connect the vent union to the TAI valve (3). Tighten the union nut (AMM 70-51-00/201) and install lockwire.

S 434-065
(12) RB211-535C AND RB211-535E4 SERIES ENGINES;
Connect the solenoid electrical connector (AMM 70-50-02/201).

S 434-066
(13) RB211-535E4 SERIES ENGINES WITH PROVISIONS FOR A TAI VALVE WITH A VALVE POSITION INDICATORS;
Connect the position indicator electrical connector (AMM 70-50-02/201).

S 434-067
(14) If you replace a TAI valve with a position indicator with a TAI valve without a position indicator, you must do the procedure that follows:
(a) Remove the dust cap (5) from the harness parking receptacle.

NOTE: The dust cap (5) and the parking receptacles are mounted on a fan case bracket near the top of the TAI valve.

(b) Install the dust cap (5) on the dummy receptacle (Fig. 402).
(c) Install the electrical connector that usually connects to the valve position indicator switch on the engine mounted parking receptacle (Fig. 402).

NOTE: Incorrect installation of the electrical connector will result in an EICAS message (R/L ENG ANTI-ICE) on the flight deck at power up.

1) Attach the dust cap (5) to its holder.

S 864-033
(15) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
(a) 11C27 or 11C26, ENG ANTI-ICE LEFT

(b) 11C28 or 11C27, ENG ANTI-ICE RIGHT

E. Do a Test of the TAI Valve Installation

S 864-034

(1) Supply electrical power (AMM 24-22-00/201).

S 864-058

WARNING: DO NOT OPERATE BLEED DUCTS AT TEMPERATURES ABOVE 450 DEGREES F AND DO NOT OPERATE ENGINE ANTI-ICE FOR MORE THAN 30 SECONDS.

(2) Supply pneumatic power while the engine operates (AMM 36-00-00/201).

S 864-036

(3) Put ENGINE ANTI-ICE switch-light on the P5 panel in the ON position and make sure the white ON light comes on.

S 214-037

(4) Make sure the amber VALVE light comes on for approximately 2 seconds, then goes off.

S 864-038

(5) Put the ENGINE ANTI-ICE switch-light in the OFF position and make sure the ON light goes off.

S 864-039

(6) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 864-040

(7) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 414-041

(8) Close the fan cowls (AMM 71-11-04/201).

S 444-043

(9) Do the Thrust Reverser Activation procedure (AMM 78-31-00/201).

ENGINE TO THERMAL ANTI-ICING RING DUCT AND PRESSURE INDICATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure is only applicable to RB211-535E4 engines with SB 71-9634.
   B. This procedure has these tasks:
      (1) A removal and installation of the engine to thermal anti-icing ring duct.
      (2) A removal and installation of the pressure indicator.
   C. Service Bulletins referred to:
      (1) RR SB 71-9634 Nose Cowl - Introduction of Composite Acoustic Liner and Re-designed Thermal Anti-icing TAI System
      (2) RR SB71-9850 Thermal Anti-icing (TAI) Visual Indication - Modified Support Bracket

TASK 30-21-04-024-001

2. Remove the Engine to TAI Ring Ducts
   A. Reference
      (1) 30-21-04/601, Engine to TAI Ring Duct
      (2) 36-00-00/201, Pneumatic - General
      (3) 71-11-04/201, Fan Cowl Panels
      (4) 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          413 No. 1 Power Plant
          423 No. 2 Power Plant

      (2) Access Panels
          413AL Engine Fan Cowl
          423AL Engine Fan Cowl

   C. Prepare to Remove the Engine to TAI Ring Ducts (Fig. 401)

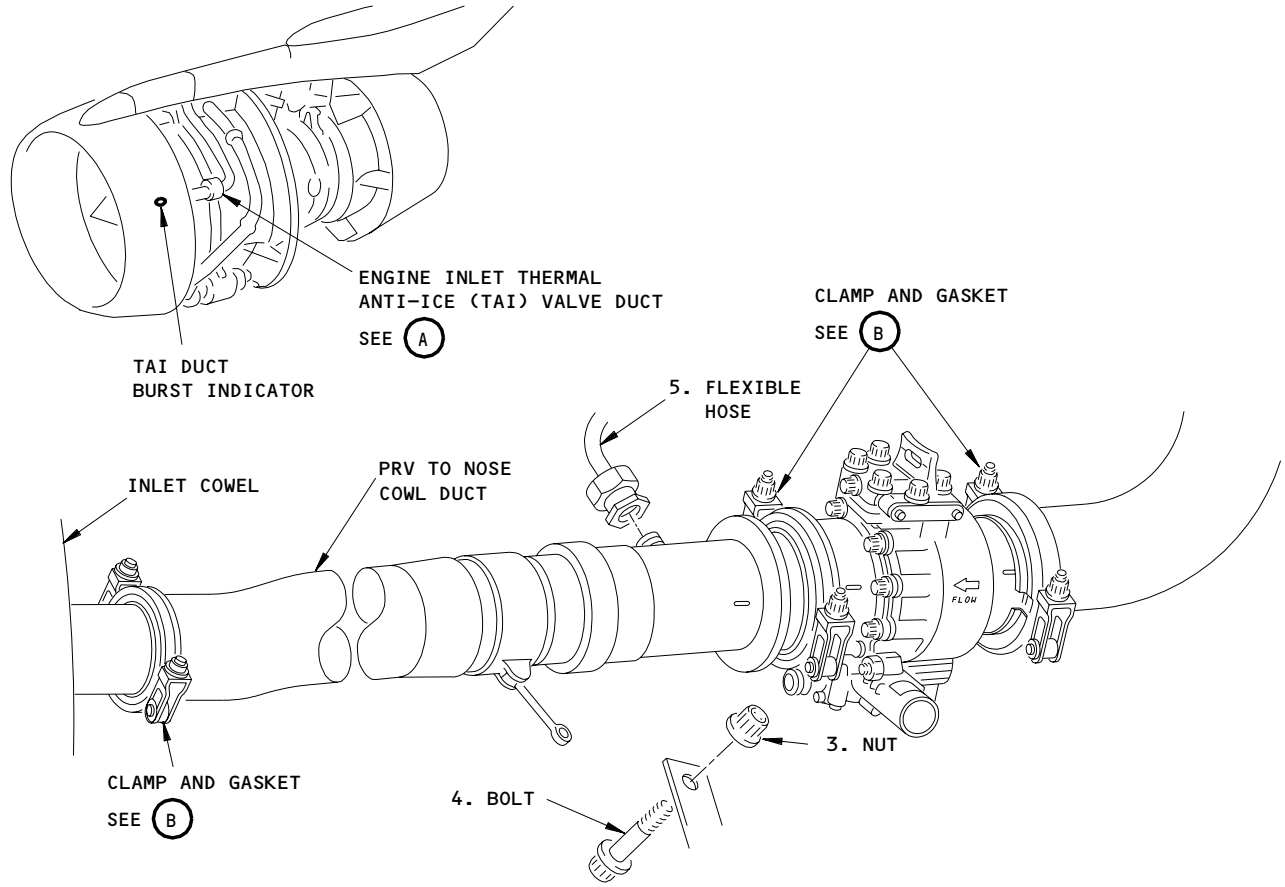
      S 864-002
      (1) Make sure you remove pneumatic power from the engine (AMM 36-00-00/201).

      S 864-003
      (2) Open these circuit breakers on the overhead circuit breaker panel P11, and attach DO-NOT-CLOSE tags:
          (a) 11C27, ENG ANTI-ICE LEFT
          (b) 11C28, ENG ANTI-ICE RIGHT

      S 044-004

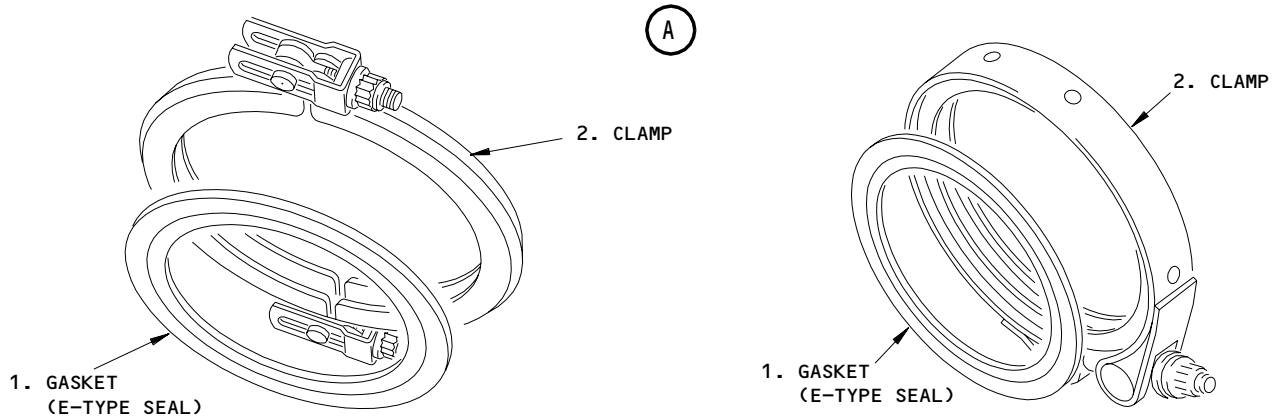
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY OR DAMAGE.

      (3) Do the procedure Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).



ENGINE INLET THERMAL ANTI-ICE (TAI) VALVE DUCT

A



CLAMP AND GASKET

B 1

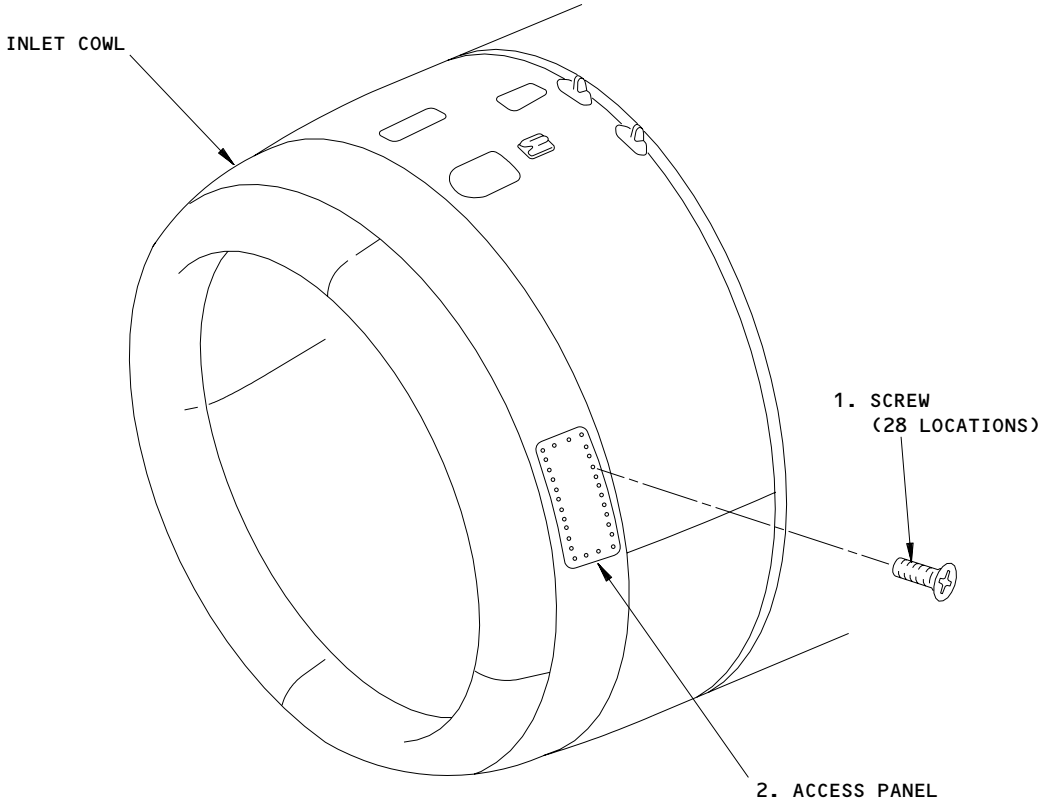
CLAMP AND GASKET

B 2

1 ENGINE WITHOUT RR SB 30-9534

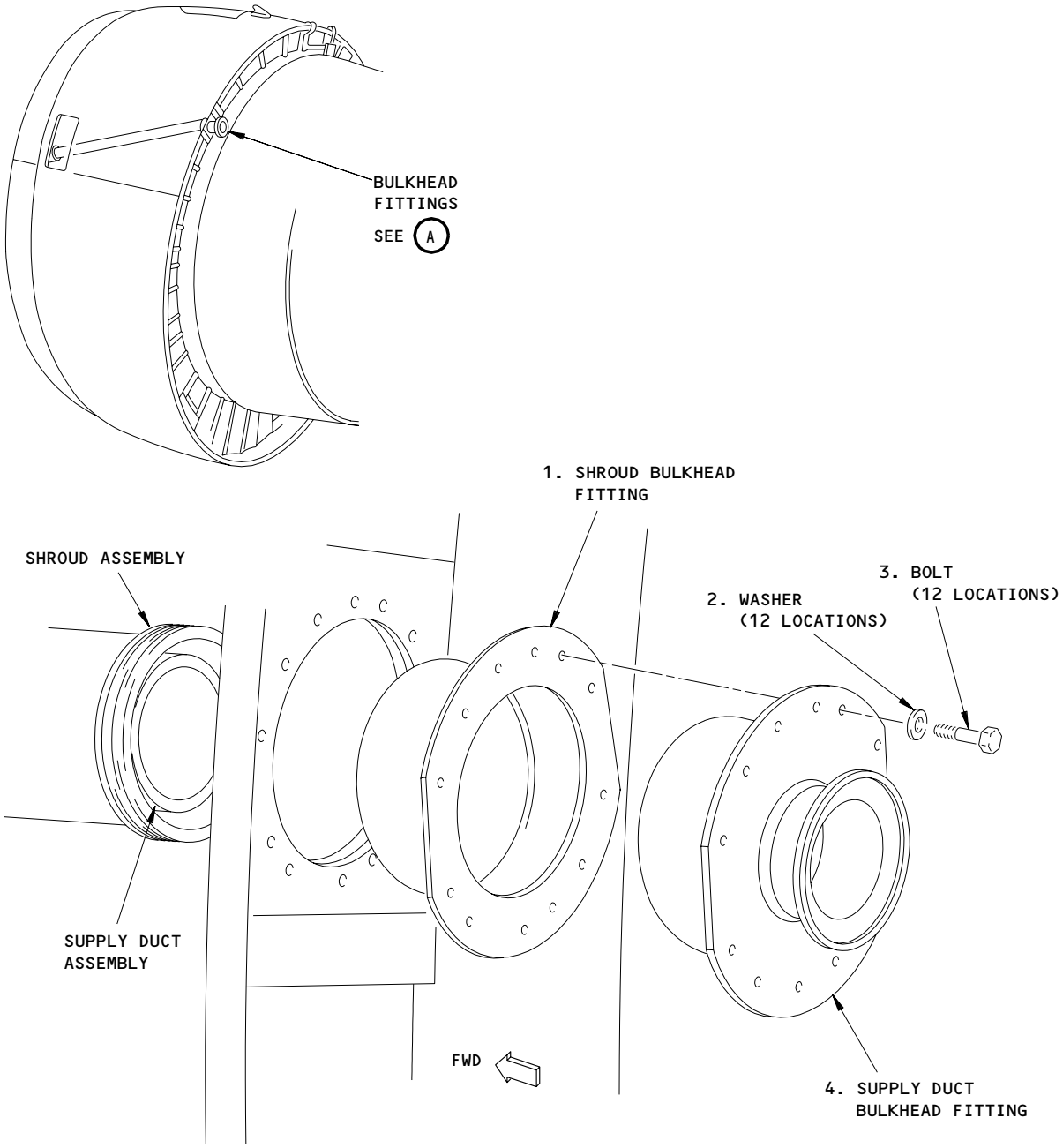
2 ENGINES WITH RR SB 30-9534

Engine Inlet Cowel Anti-Icing Ring Duct Iinstallation
Figure 401

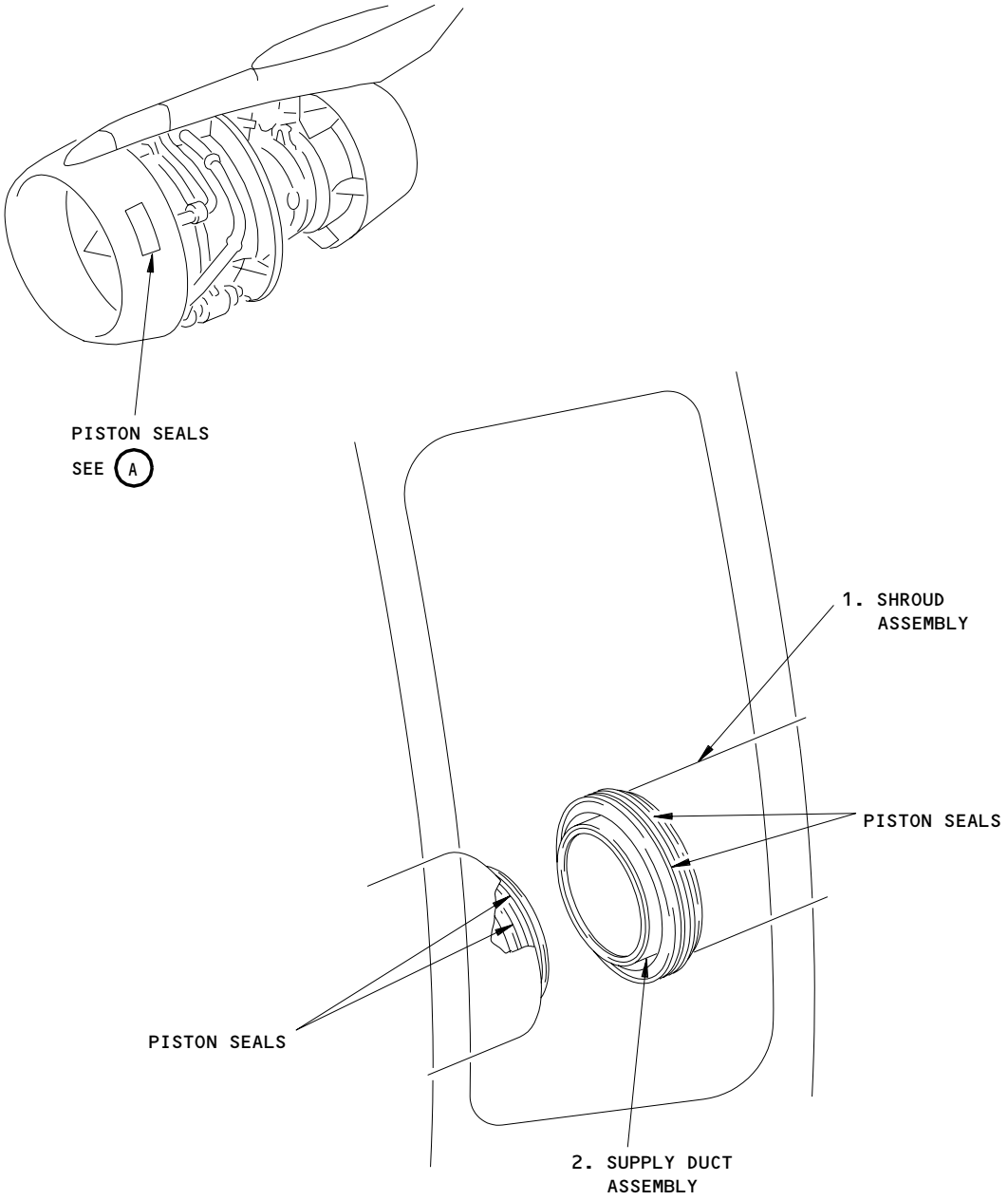


C3671

Engine Inlet Cowl Anti-Icing Ring Duct Access
Figure 402



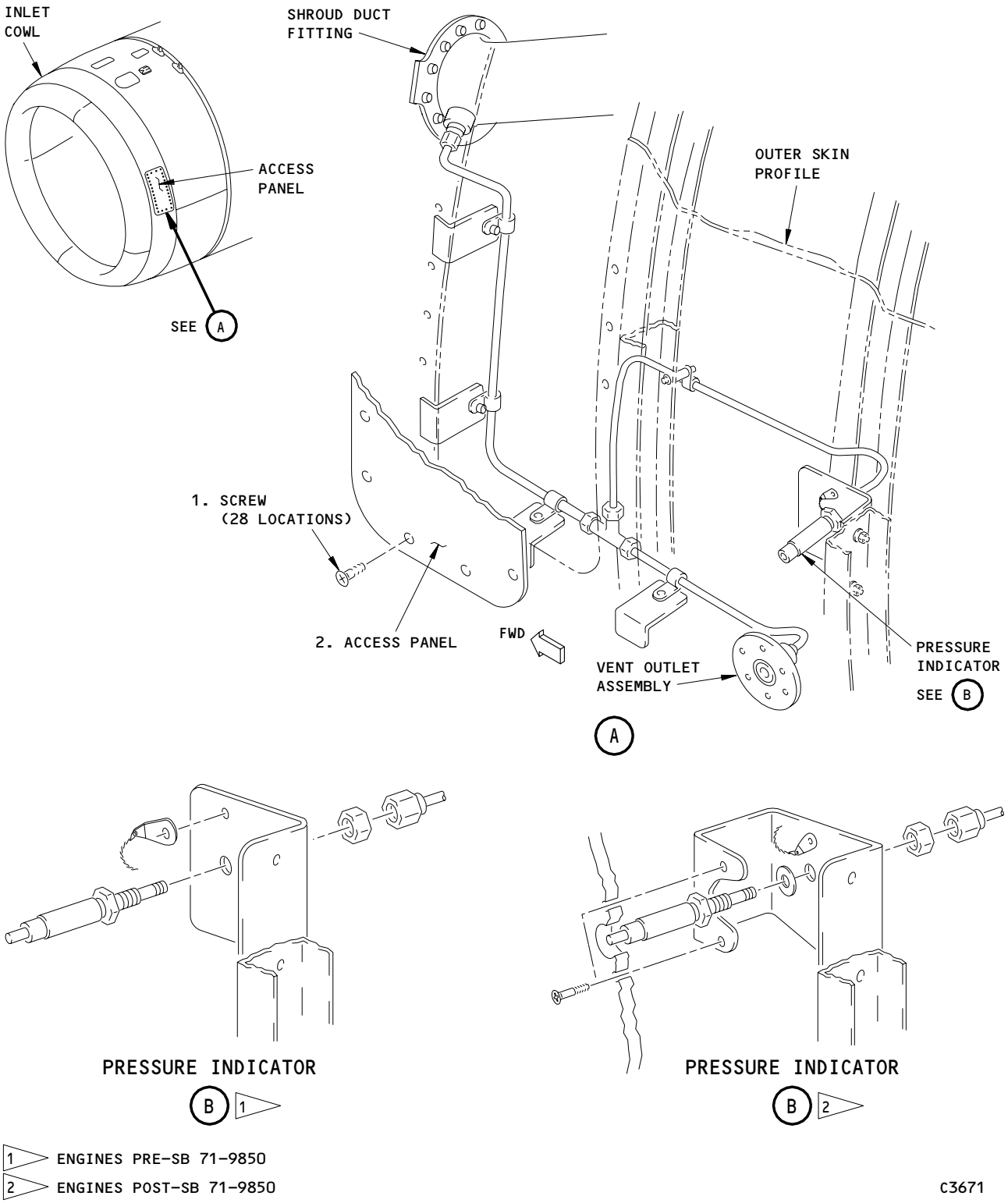
Engine Inlet Cowel Anti-Icing Ring Duct Bulkhead Fittings
Figure 403



Engine Inlet Cowl Anti-Icing Duct Piston Seals
Figure 404

EFFECTIVITY
RB211-535E4 ENGINES WITH TAI DUCT BURST (POP-OUT) INDICATOR (LEFT SIDE OF INLET COWL)

C12263



Engine Inlet Cowl TAI Pressure Indicator Installation
Figure 405

S 014-005

CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING ON THE FAN CASE WHEN YOU OPEN THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

(4) Open the left fan cowl panel (AMM 71-11-04/201).

S 034-006

(5) Remove the flexible hose (5) from the PRV to nose cowl duct.

S 034-007

(6) Remove the vee-clamps (2) and the gaskets (1).

S 034-008

(7) Remove the nut (3) and the bolt (4).
(a) Carefully remove the PRV to nose cowl duct.

S 034-009

(8) Remove the screws (1) that attach the access panel (2) to the inlet cowl (Fig. 402).

S 014-010

(9) Remove the access panel (2) (Fig. 402).

D. Remove the Engine to TAI Ring Ducts

S 014-011

(1) Remove the bolts (3) and the washers (2) (Fig. 403).

S 034-012

(2) Carefully remove the supply duct bulkhead fitting (4) and the shroud bulkhead fitting (1) (Fig. 403).

NOTE: You must be careful not to damage the shroud assembly and supply duct assembly when you remove the bulkhead fitting.

S 034-013

(3) Carefully remove the supply duct assembly (2) and the shroud assembly (1) (Fig. 404).

NOTE: You must support the duct assembly and the shroud assembly during removal to prevent damage to them.

S 434-014

(4) Install the approved caps to all openings.

S 214-015
(5) Inspect the supply duct assembly and the shroud assembly (AMM 30-21-04/601).

TASK 30-21-04-024-033

3. Remove The Engine TAI Pressure Indicator

A. Access

(1) Location Zones

413 No. 1 Power Plant
423 No. 2 Power Plant

B. Prepare to Remove the Engine TAI Pressure Indicator (Fig. 405)

S 034-034
(1) Remove the screws that attach the access panel to the inlet cowl.

S 014-035
(2) Remove the access panel.

C. Remove the Engine TAI Pressure Indicator (Fig. 405)

S 034-036
(1) Disconnect the pipe from the pressure indicator.

S 034-037
(2) Cut and discard the lockwire between the pressure indicator and the lock tab.

S 034-038
(3) Release the nut and remove the pressure indicator.

S 024-039
(4) ENGINES WITH SB 71-9850;
Remove and keep the shim washer for use during the installation.

S 424-040
(5) Install approved caps on all openings.

TASK 30-21-04-424-016

4. Install the Engine to TAI Ring Duct

A. Reference

(1) 70-12-02/201, Fitting Vee-Bank Coupling Clamps
(2) 70-51-00/201, Torque Tightening Technique
(3) 71-11-04/201, Fan Cowl Panels
(4) 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

413 No. 1 Power Plant
423 No. 2 Power Plant

(2) Access Panels
413AL Engine Fan Cowl
423AL Engine Fan Cowl

C. Procedure

S 034-017
(1) Remove the caps from the openings.

S 424-018

CAUTION: YOU MUST BE CAREFUL TO NOT DAMAGE THE PISTON SEALS DURING INSTALLATION. THE SEALS ARE EASILY DAMAGED IF NOT HANDLED CAREFULLY.

(2) Carefully install the supply duct assembly (2) (Fig. 404).

S 434-019
(3) Carefully install the shroud assembly (1) (Fig. 404).

S 434-020
(4) Carefully push the shroud bulkhead fitting (1) onto the shroud assembly (Fig. 403).

S 434-021
(5) Carefully push the supply duct bulkhead fitting (4) onto the supply duct assembly (Fig. 403).

S 434-022
(6) Install the washers (2) and the bolts (3) (Fig. 403).
(a) Torque the bolts (3) to the standard load (AMM 70-51-00/201).

S 434-023
(7) Install the access panel (2) and the screws (1) (Fig. 403).
(a) Torque the bolts (3) to the standard load (AMM 70-51-00/201).

S 414-024
(8) Install the access panel (2) and the screws (1) (Fig. 402).
(a) Torque the screws to the standard load (AMM 70-51-00/201).

S 984-025
(9) Carefully position the PRV to nose cowl duct (Fig. 401).

S 434-026
(10) Install the nut (3) and the bolt (4) (Fig. 401).
(a) Torque the bolt to the standard load (AMM 70-51-00/201).

S 434-027
(11) Install the gaskets (1) and the vee-clamps (2) (AMM 70-12-02/201) (Fig. 401).

S 434-028
(12) Install the flexible hose (5) to the PRV to nose cowl duct (Fig. 401).
(a) Torque the hose to the standard load (AMM 70-51-00/201).

D. Return the Airplane to Its Normal Condition

S 414-031

CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING ON THE FAN CASE WHEN YOU CLOSE THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

(1) Close the left fan cowl panel (AMM 71-11-04/201).

S 444-032
(2) Do the Thrust Reverser Activation procedure (AMM 78-31-00/201).

S 864-029
(3) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers.
(a) 11C27, ENG ANTI-ICE LEFT
(b) 11C28, ENG ANTI-ICE RIGHT

TASK 30-21-04-424-049

5. Install the Engine TAI Pressure Indicator

A. References
(1) 30-21-04/601, Engine to Thermal Anti-Icing Ring Duct and Pressure Indicator
(2) 70-51-00/201, Torque Tightening Technique

B. Access
(1) Location Zones
413 No. 1 Power Plant
423 No. 2 Power Plant

C. Install the Pressure Indicator (Fig. 405)

S 024-050
(1) Remove the caps from the openings.

S 424-051
(2) ON ENGINES WITHOUT SB 71-9850;
Install the pressure indicator and the nut to the bracket.

S 424-052
(3) ON ENGINES WITH SB 71-9850;
Install the pressure indicator, shim washer and the nut to the bracket.

S 434-053
(4) Hand-tighten the nut.

S 214-054

(5) Adjust the pressure indicator to make sure it does not touch the outer skin (AMM 30-21-04/601).
   (a) Tighten the nut on the pressure indicator to 44 inch-pounds (5 newton-meters).

S 424-055

(6) Install the safety lock wire on the pressure indicator and the locktab. Use ATA 189A lockwire (.032 inch).

S 434-056

(7) Connect the pipe to the pressure indicator.
   (a) Tighten to the standard load (AMM 70-51-00/201).

S 414-057

(8) Install the access panel to the inlet cowl and fasten with the screws (Fig. 405).
   (a) Tighten to the standard load (AMM 70-51-00/201).

ENGINE TO THERMAL ANTI-ICING RING DUCT AND PRESSURE INDICATOR - INSPECTION/CHECK

1. General
   A. This procedure is only applicable to RB211-535E4 engines with SB 71-9634 or the production equivalent, which has installed the TAI duct burst (pop-out) indicator on the inlet cowl.
   B. You can use one of the three criteria that follow to make sure of the integrity of the TAI duct:
      (1) A visual inspection of the inner wall of the duct and duct fittings.
      (2) The replacement indicator does not operate during subsequent flights.
      (3) The indicator stays set during a ground run of the affected engine at 1.065 EPR (high idle). This gives the maximum regulated pressure in the duct.
   C. This procedure has these tasks:
      (1) An inspection of the engine to Thermal Anti-ice (TAI) Ring Duct.
      (2) An inspection of the TAI Pressure Indicator.
   D. Service Bulletins referred to:
      (1) RR SB 71-9634 Nose Cowl - Introduction of Composite Acoustic Liner and Re-designed Thermal Anti-icing TAI System

TASK 30-21-04-216-001

2. Inspection/Check - Engine to Thermal Anti-Ice (TAI) Ring Duct
   A. General
      (1) This procedure is done after the Engine to TAI Ring Duct is removed and has the steps for the inspection of the duct and the recommended acceptance standards which are necessary when you do the inspection.
      (2) The left and right Engine to TAI Ring Duct inspection procedures are given in this task.
   B. Reference
      (1) 30-21-04/401, Engine to TAI Ring Duct
   C. Access
      (1) Location Zones
          410 No. 1 power plant
          420 No. 2 power plant
      (2) Access Panels
          413 Fan cowl panel (Left)
          414 Fan cowl panel (Right)
          423 Fan cowl panel (Left)
          424 Fan cowl panel (Right)
   D. Procedure

      S 016-002
      (1) Remove the engine to TAI ring duct components (AMM 30-21-04/401).

      S 216-003
      (2) Inspect the duct assembly and shroud assembly for cracks, dents, nicks, galling, fretting, and damaged piston seals:
          (a) Acceptance Standards
              1) Cracks - Reject.

2) Smooth dents with a large outer diameter can be accepted if:
   a) No metal has been removed
   b) The indentation is smooth and does not end in a sharp point.
   c) The dent does not decrease the diameter by more than 6.35 mm (0.250 inches).
3) Smooth dents with a small outer diameter can be accepted if the dent is less than 1.905 mm (0.075 inches) in depth.
4) Nicks - Reject.
5) Galling - Reject.
6) Pitting - Reject.
7) Damaged piston seals - Obvious excessive damage, reject

S 416-004

(3) Install the engine to TAI ring ducts (AMM 30-21-04/401).

TASK 30-21-04-216-005

3. Inspection/Check - Thermal Anti-Ice (TAI) Pressure Indicator

A. General

(1) This procedure is done after the TAI Pressure Indicator has operated and can be used for the left and right engines.

B. Access

(1) Location Zones
   410 No. 1 power plant
   420 No. 2 power plant

C. Procedure

S 216-006

(1) Examine the indicator to make sure it does not touch the nose cowl outer skin. There must be equal clearance between the indicator and the opening in the nose cowl outer skin.

S 826-007

(2) Two procedures are available to get the correct clearance.
   (a) Adjust the indicator on the support bracket.
   (b) Adjust the support bracket on the nose cowl outer skin.

S 826-008

(3) Adjust the indicator to get clearance.

S 446-009

(4) Reset the TAI Pressure indicator.
   (a) If the TAI Pressure Indicator does not operate during the next flight, no more steps are necessary.
   (b) If the TAI Pressure Indicator operates during the next flight then make a record to show this.

(c) Set the indicator button again and hold it in position with adhesive tape. Examine the TAI duct at the next A-check or before 650 hours of operation (use the first limit to occur).
(d) Alternatively, replace the TAI indicator at the first opportunity.
(e) If the replacement TAI indicator operates, examine the TAI duct at the next A-check or before 650 hours of operation (use the first limit to occur).

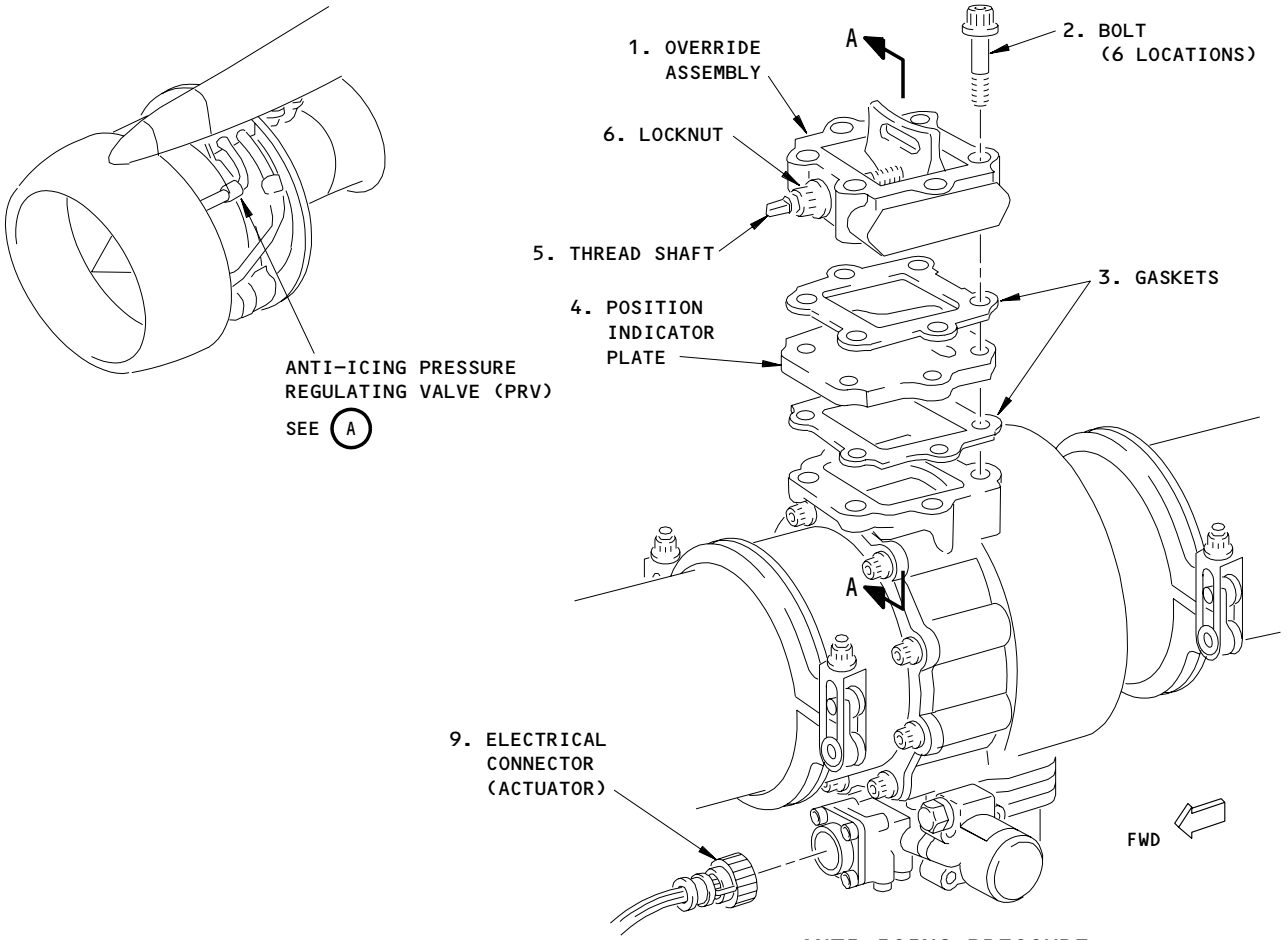
ENGINE ANTI-ICE VALVES - MAINTENANCE PRACTICES (MEL)

1. General
   A. This procedure has these tasks:
      (1) Separate tasks to lock the engine anti-ice PRV (valve) in the closed or open position as shown in the Minimum Equipment List (MEL).
         (a) These tasks are necessary when the airplane is sent with an engine anti-ice PRV that does not operate.
         (b) The position of the engine anti-ice PRV, closed or open, should be indicated in the dipatch instructions.
      (2) A task to put the engine anti-ice PRV back to normal operating condition.
      (3) A task to make sure that the engine anti-ice PRV operates when the VALVE light is inoperative.
         (a) This procedure is necessary when an airplane is dispatched with a light(s) for the engine anti-ice PRV that does not operate.

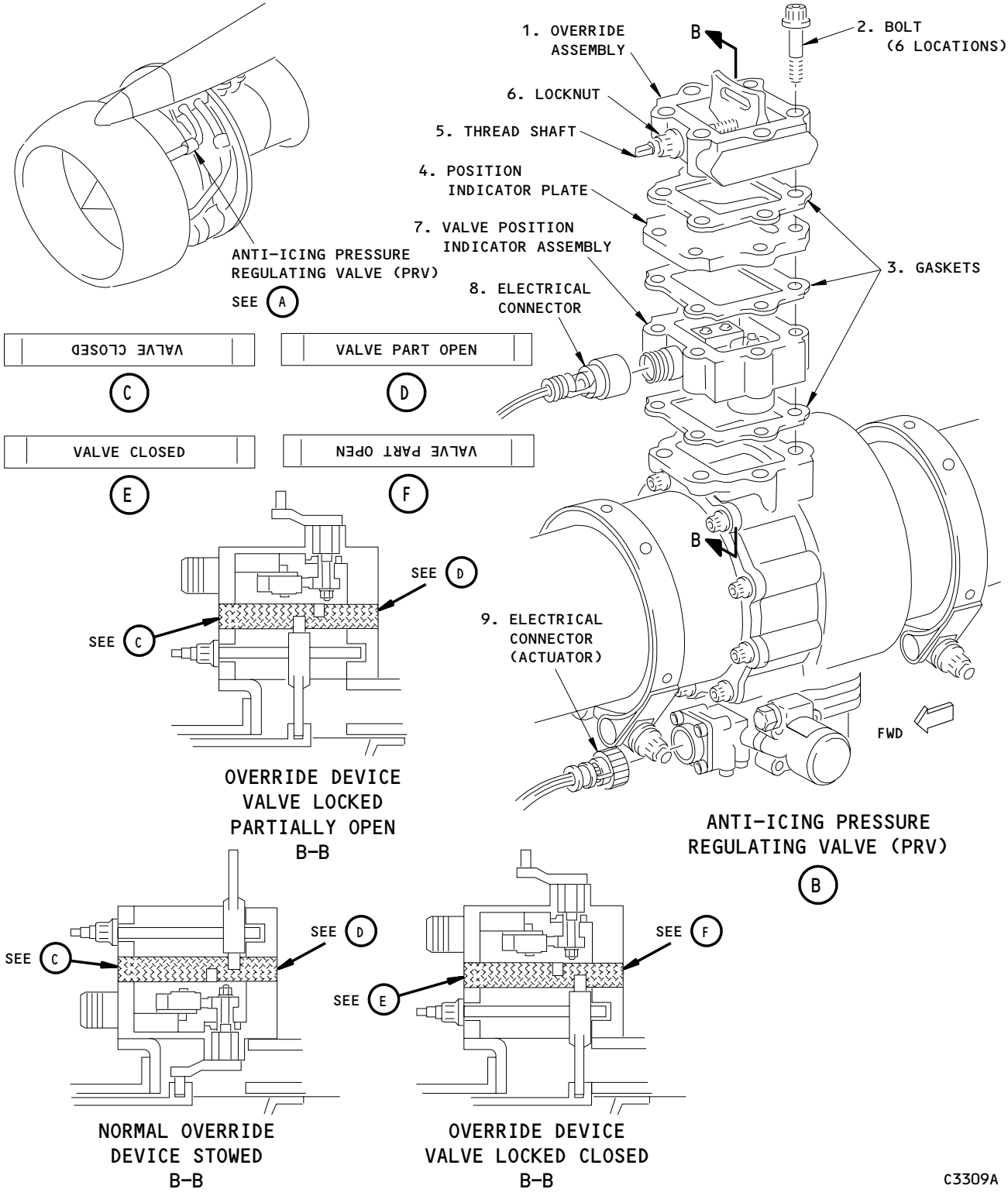
TASK 30-21-99-042-063

2. Put the Anti-Ice PRV Override Devices to the Valve Locked Closed Position (Fig. 201)
   A. References
      (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
      (2) AMM 70-50-02/201, Connection of Electrical Plugs
      (3) AMM 70-51-00/201, Torque Tightening Technique
      (4) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
         410/420 No. 1 and No. 2 Powerplant
      (2) Access Panels
         413AL Fan Cowl Panel - Left
         423AL Fan Cowl Panel - Right
   C. ON ENGINES WITHOUT SB 30-9534;
      Procedure

      S 862-028
      (1) Open the circuit breakers on the overhead panel P11 to isolate the anti-icing PRV, and attach a DO-NOT-CLOSE tags.



Inlet Cowl Anti-icing Pressure Valve - Manual Override Setting
Figure 201 (Sheet 1)



Inlet Cowl Anti-icing Pressure Valve - Manual Override Setting
Figure 201 (Sheet 2)

EFFECTIVITY
AIRPLANES WITH SB 30-9534

E29362

S 012-006

(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kevlar wrapping.

S 022-094

(3) Disconnect, cap and stow the valve actuation electrical connector (9).

S 032-010

(4) Remove the bolts (2) that hold the override assembly (1) to the valve body.

S 022-011

(5) Remove the override assembly (1), the gaskets (3), and the position indicator plate (4) from the valve body.

S 432-018

(6) Put the gasket (3) and the override assembly (1) on the valve body. Make sure the tongue is engaged with the groove in the valve head. Move the valve head manually, if necessary, to engage the tongue (Fig. 201, Detail A).

S 432-013

(7) Put the gasket (3) and the position indicator plate (4) on the override assembly. The words 'VALVE LOCKED CLOSED' must be in the highest position.

S 852-029

(8) Loosen the locknut (6) and turn the threaded shaft (5). Do this until the tongue engages in the slot on the bottom of the position indicator plate (4).

S 852-100

CAUTION: WHEN YOU MANUALLY POSITION THE VALVE, MAKE SURE THE TONGUE OF THE JACKSCREW ENGAGES WITH THE SLOT IN THE VALVE HEAD AND THE SLOT IN THE LOCKING PLATE. WHEN YOU INSTALL THE LOCKING PLATE, IT MUST BE FULLY DOWN ON THE VALVE ASSEMBLY AND NOT REQUIRE "PULLING DOWN" WITH THE RETAINING BOLTS. FAILURE TO COMPLY CAN RESULT IN DAMAGE TO THE VALVE.

(9) Install and torque tighten the bolts (2) (AMM 70-51-00/201).

S 862-016
(10) Close the fan cowl panel (AMM 71-11-04/401).

S 852-017
(11) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back power to the anti-icing PRV.

D. ON ENGINES WITH SB 9534;
Procedure

S 862-060
(1) Open the circuit brekers on the overhead panel P11 to isolate the anti-icing PRV, and attach DO-NOT-CLOSE tags.

S 012-017
(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kelvar wrapping.

S 022-095
(3) Disconnect, cap and stow the valve actuation electrical connector (9).

S 032-018
(4) Disconnect the electrical connector (8) from the valve position indicator assembly.

S 022-019
(5) Remove the bolts (2) that attach the override assembly (1) and the valve position indicator assembly (7) to the valve body.

S 032-020
(6) Remove the override assembly (1), the gaskets (3), the position indicator plate (4) and the position indicator assembly (7) from the valve body.

S 432-021
(7) Put the gasket (3) and the override assembly (1) on the valve body. Make sure the tongue is engaged with the groove in the valve head. Move the valve head manually if necessary to engage the tongue (Fig. 201, Detail B).

S 432-022
(8) Put the gasket (3) and the indicator plate (4) on the override assembly (1). The plate has the words 'VALVE CLOSED' on its edge. These words must be the right way up and point forwards.

S 852-023
(9) Loosen the locknut (6) and turn the threaded shaft (5). Do this until the lug on the tongue engages in the slot on the underside of the position indicator plate (4).

S 432-024
(10) Install the gasket (3) and the valve position indicator assembly (7). The valve position indicator assembly should be installed with the lever up (Fig. 201, Detail B).

S 432-025
(11) Install and torque tighten the bolts (2) (AMM 70-51-00/201).

S 432-026
(12) Stow the electrical connector (8) to the caped jumper plug at the mounting bracket next to the valve.

S 862-027
(13) Close the fan cowl panel (AMM 71-11-04/401).

S 862-061
(14) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back the power to the anti-icing PRV.

TASK 30-21-99-042-064

3. Put the Anti-Ice PRV Override Devices to Valve Locked Partially Open Position (Fig. 201)
   A. References
      (1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
      (2) AMM 70-50-02/201, Connection of Electrical Plugs
      (3) AMM 70-51-00/201, Torque Tightening Technique
      (4) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          410/420 No. 1 and No. 2 Powerplant

(2) Access Panels
413AL Fan Cowl Panel - Left
423AL Fan Cowl Panel - Right

C. ON ENGINES WITHOUT SB 30-9534;
Procedure

S 862-029
(1) Open the circuit breakers on the overhead panel P11 to isolate the anti-icing PRV and attach DO-NOT-CLOSE tags.

S 012-030
(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kevlar wrapping.

S 022-096
(3) Disconnect, cap and stow the valve actuation electrical connector (9).

S 032-031
(4) Remove the bolts (2) that hold the override assembly (1) to the valve body.

S 032-032
(5) Remove the override assembly (1), the gaskets (3), and the position indicator plate (4) from the valve body.

S 432-033
(6) Put the gasket (3) and the override assembly (1) on the valve body. Make sure the tongue is engaged with the groove in the valve head. Move the valve head manually if necessary, to engage the tongue (Fig. 201, Detail A).

S 432-034
(7) Put the gasket (3) and the position indicator plate (4) on the override assembly. The words 'VALVE LOCKED PARTIALLY OPEN' must be in the highest position.

S 852-035
(8) Loosen the locknut (6) and turn the threaded shaft (5). Do this until the tongue engages in the slot on the bottom of the position indicator plate (4).

S 432-036
(9) Install and torque tighten the bolts (4) (AMM 71-11-04/401).

S 862-037
(10) Close the fan cowl panel (AMM 71-11-04/401).

S 862-038
(11) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back power ot the anti-icing PRV.

D. ON ENGINES WITH SB 30-9534;
Procedure

S 862-039
(1) Open the circuit breakers on the overhead panel P11 to isolate the anti-icing PRV, and attach a DO-NT-CLOSE tags.

S 012-040
(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kevlar wrapping.

S 022-097
(3) Disconnect, cap and stow the valve actuation electrical connector (9).

S 032-041
(4) Disconnect the electrical connector (8) from the valve position indicator assembly.

S 022-042
(5) Remove the bolts (2) that attach the override assembly (1) and the valve position indicator assembly (7) to the valve body.

S 032-043
(6) Remove the override assembly (1), the gaskets (3), the position indicator plate (4) and the position indicator assembly (7) from the valve body.

S 432-044

(7) Put the gasket (3) and the override assembly (1) on the valve body. Make sure the tongue is engaged with the groove in the valve head. Move the valve head manually if necessary to engage the tongue (Fig. 201, Detail B).

S 432-045

(8) Put the gasket (3) and the indicator plate (4) on the override assembly (1). The plate has the words 'VALVE PARTIALLY OPEN' on its edge. These words must be the right way up and point forwards.

S 852-046

(9) Loosen the locknut (6) and turn the threaded shaft (5). Do this until the lug on the tongue engages in the slot on the underside of the position indicator plate (4).

S 432-047

(10) Install the gasket (3) and the valve position indicator assembly (7). The valve position indicator assembly should be installed with the lever up (Fig. 201, Detail B).

S 852-101

CAUTION: WHEN YOU MANUALLY POSITION THE VALVE, MAKE SURE THE TONGUE OF THE JACKSCREW ENGAGES WITH THE SLOT IN THE VALVE HEAD AND THE SLOT IN THE LOCKING PLATE. WHEN YOU INSTALL THE LOCKING PLATE, IT MUST BE FULLY DOWN ON THE VALVE ASSEMBLY AND NOT REQUIRE "PULLING DOWN" WITH THE RETAINING BOLTS. FAILURE TO COMPLY CAN RESULT IN DAMAGE TO THE VALVE.

(11) Install and torque tighten the bolts (2) (AMM 70-51-00/201).

S 432-049

(12) Connect the electrical connector (8) to the valve position indicator assembly (7) (AMM 70-50-02/201).

S 862-050

(13) Close the fan cowl panel (AMM 71-11-04/401).

S 862-051

(14) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back the power to the anti-icing PRV.

TASK 30-21-99-442-065

4. Put the Anti-Ice PRV back to Normal Operating Condition (Fig. 201)

A. References

(1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels
(2) AMM 70-50-02/201, Connection of Electrical Plugs
(3) AMM 70-51-00/201, Torque Tightening Technique

(4) AMM 71-11-04/201, Fan Cowl Panels

B. Access

(1) Location Zones

410/420 No. 1 and No. 2 Powerplant

(2) Access Panels

413AL Fan Cowl Panel - Left
423AL Fan Cowl Panel - Right

C. ON ENGINES WITHOUT SB 30-9534;
Procedure

S 862-052

(1) Open the circuit breakers on the overhead panel P11 to isolate the anti-icing PRV, and attach a DO-NOT-CLOSE tags.

S 012-053

(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kevlar wrapping.

S 032-054

(3) Remove the bolts (2) that hold the override assembly (1) to the valve body.

S 032-092

(4) Remove the override assembly (1), the gaskets (3), and the position indicator plate (4) from the valve body.

S 432-055

(5) Put the position indicator plate (4) and the gasket (3) on the valve body (Fig. 201, Detail A).

S 432-056

(6) Install the override assembly (1), with the tongue up, on the position indicator plate (4) (Fig. 201, Detail A).

S 432-102

CAUTION: WHEN YOU MANUALLY POSITION THE VALVE, MAKE SURE THE TONGUE OF THE JACKSCREW ENGAGES WITH THE SLOT IN THE VALVE HEAD AND THE SLOT IN THE LOCKING PLATE. WHEN YOU INSTALL THE LOCKING PLATE, IT MUST BE FULLY DOWN ON THE VALVE ASSEMBLY AND NOT REQUIRE "PULLING DOWN" WITH THE RETAINING BOLTS. FAILURE TO COMPLY CAN RESULT IN DAMAGE TO THE VALVE.

(7) Install and torque tighten the bolts (2) (AMM 70-51-00/201).

S 422-099
(8) Connect the valve actuation electrical connector (9).

S 862-058
(9) Close the fan cowl panel (AMM 71-11-04/401).

S 862-059
(10) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back the power to the anti-icing PRV.

D. ON ENGINES WITH SB 9534;
Procedure

S 862-066
(1) Open the circuit breakers on the overhead panel P11 to isolate the anti-icing PRV, and attach a DO-NT-CLOSE tags.

S 012-067
(2) Open the left fan cowl panel (AMM 71-11-04/401). Obey the precautions that apply to Kevlar wrapping.

S 032-068
(3) Disconnect the electrical connector (8) from the valve position indicator assembly.

S 032-069
(4) Remove the bolts (2) that hold the override assembly (1) to the valve body.

S 032-070
(5) Remove the valve position indicator assembly (7), the gaskets (3), the position indicator plate (4) and the override assembly (1) from the valve body.

S 432-071
(6) Install the gasket (3) and the valve position indicator assembly (7). Make sure the pin on the valve position indicator assembly engages with the groove in the valve head (Fig. 201, Detail B).

NOTE: Do not force the lever arm if it does not move easily, if the arm is not in the correct position, remove the assembly and carefully move the microswitch actuating roller arm to release the cam. The lever arm should now turn freely and can be installed.

S 432-072
(7) Install the gasket (3) and the position indicator plate (4) (Fig. 201, Detail B).

S 432-073
(8) Install the gasket (3) and the override assembly (1), with the tongue up, on the indicator plate (4) (Fig. 201, Detail B).

S 432-074
(9) Install and torque tighten the bolts (2) (AMM 70-51-00/201).

S 432-075
(10) Connect the electrical connector (8) to the valve position indicator assembly (7) (AMM 70-50-02/201).

S 422-098
(11) Connect the valve actuation electrical connector (9).

S 412-076
(12) Close the fan cowl panel (AMM 71-11-04/401).

S 862-077
(13) On the overhead circuit breaker panel P11, remove the DO-NOT-CLOSE tags and close the circuit breaker to put back the power to the anti-icing PRV.

TASK 30-21-99-712-088

5. Engine Anti-Ice Valve Lights - Maintenance Practices (MEL)

A. General

(1) This procedure makes sure the engine thermal anti-ice (TAI) PRV (valves) operates as shown in the Minimum Equipment List (MEL).

(2) This procedure is necessary when an airplane is sent with a light(s) for the engine anti-ice PRV that does not operate.

B. References

(1) AMM 06-43-00/201, Engine and Nacelle Strut Access Doors and Panels

(2) AMM 24-22-00/201, Electrical Power - Control

C. Access

(1) Location Zones

410/420 No. 1 and No. 2 Powerplant

(2) Access Panels

413AL Fan Cowl Panel - Left

423AL Fan Cowl Panel - Right

D. Procedure

S 862-079

(1) Supply electrical power (AMM 24-22-00/201).

S 982-080

(2) Put an observer adjacent to the fan cowl panel in the area of the engine TAI valve (Fig. 202):

(a) Left Engine 413AL

(b) Right Engine 423AL

S 862-081

(3) Push the applicable ENGINE ANTI-ICE switch to the ON position.

S 862-082

(4) Stop for 10 seconds.

S 862-083

(5) Push the applicable ENGINE ANTI-ICE switch to the OFF position.

S 722-084

(6) The ground observer must hear the solinoid operate.

NOTE: If it is to noisey to hear the solinoid operate, it can be necessary to open the cowl access panel.

NOTE: If the valve does not opearte, refer to the MEL procedure, ENGINE ANTI-ICE VALVES (in this procedure), for operation of the airplane with the engine anti-ice valves locked in the open or closed position.

S 852-085

(7) Attach an "ENGINE ANTI-ICE VALVE LIGHT INOP" placard to the applicable light on the P5 Panel.

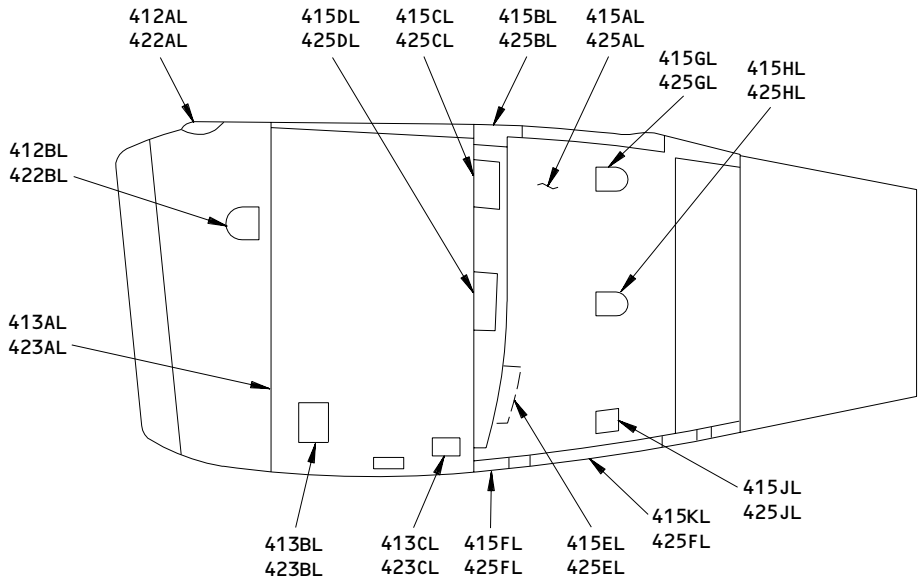
E. Put the Airplane Back to Its Usual condition.

S 862-087

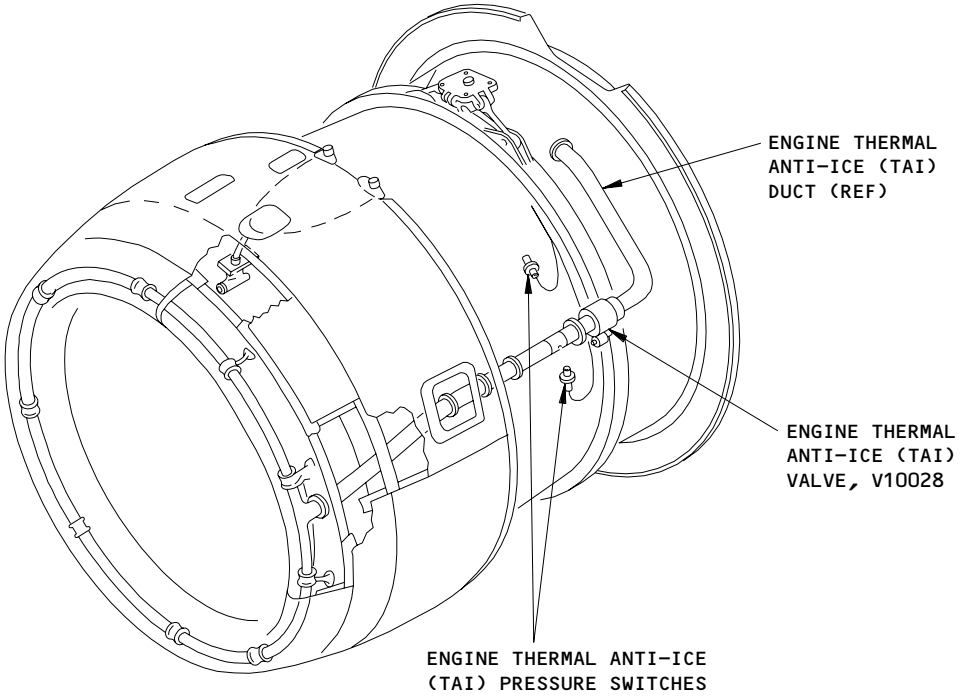
(1) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 412-086

(2) Install all access panels you removed during this procedure.



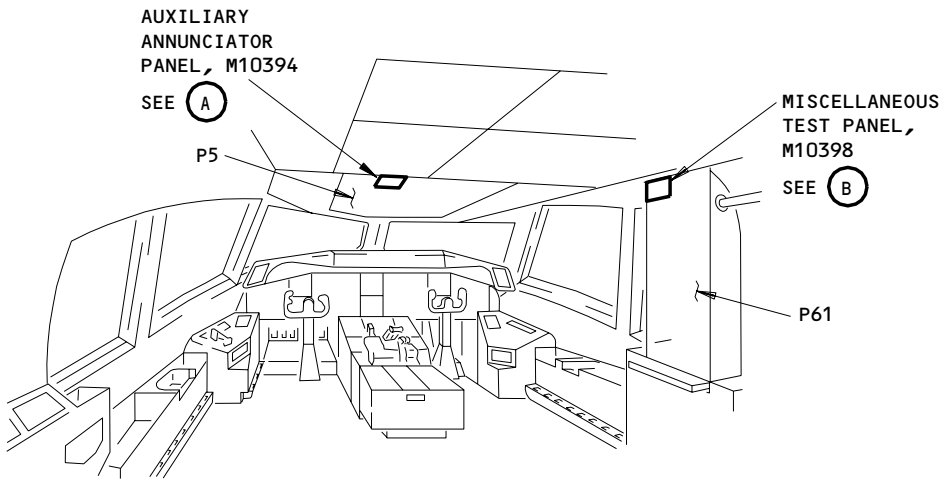
ENGINES NO. 1 LEFT AND NO. 2 RIGHT
RB211-535E4
LEFT SIDE VIEW



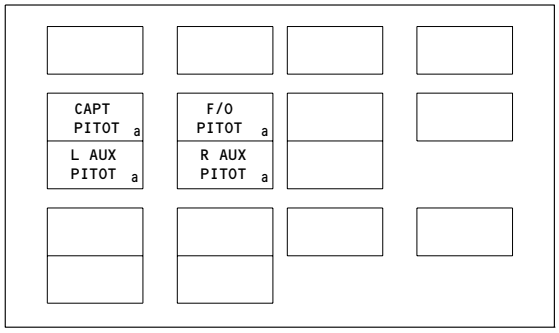
Engines No. 1 Left and No. 2 Right
Figure 202

PITOT PROBE ANTI-ICING - DESCRIPTION AND OPERATION

1. General
   A. Four pitot probes (two on each side) are electrically heated to prevent erroneous readings due to ice conditions. Pitot probe anti-icing system components include: pitot probes, the auxiliary annunciator panel, and the miscellaneous test panel.
   B. System electrical power comes from the 28-volt dc buses, and the 115-volt ac buses. Circuit breakers are on overhead circuit breaker panel P11, and main power distribution panel P6.
2. Component Details (Fig. 1)
   A. Pitot Probes
      (1) Two pitot probes are located on each side, halfway down the fuselage, under the left and right No. 2 flight deck windows. Two levels of pitot probe heating are used, depending on whether the plane is on the ground or in flight.
   B. Auxiliary Annunciator Panel
      (1) Auxiliary annunciator panel M10394 is located on pilots' overhead panel P5. The annunciator panel contains four amber lights, one for each pitot probe. The lights are identified as: CAPT PITOT, F/O PITOT, L AUX PITOT, and R AUX PITOT. These lights come on to identify a probe heater failure.
   C. Miscellaneous Test Panel
      (1) Miscellaneous test panel M10398 provides for ground testing of the probe heaters. The test panel is on right side panel P61.
3. Operation
   A. Functional Description (Fig. 2)
      (1) Pitot probe heating is automatically controlled. This is done by action of air/ground relays, and relays whose position depends on engine speed from engine speed cards. The only action initiated from the flight deck is probe heater testing.
      (2) On the ground pitot probe heating depends on engine speed. If both engines are off, the ENG OUT relays are de-energized. The ENG OUT relays are controlled by engine speed cards in card file P50. (The ENG OUT relays associated with the CAPT and L AUX pitot probes are in left miscellaneous electrical equipment panel P36. The ENG OUT relays associated with the F/O and R AUX pitot probes are in right miscellaneous electrical equipment panel P37.) The circuit connecting electrical power to the probe heaters is open. The probes are not heated. This results in the current sensing relay (CSR) associated with each pitot probe heater to be de-energized. (The CSRs associated with the CAPT and L AUX pitot probes are in miscellaneous electrical equipment panel P33. The CSRs associated with the F/O and R AUX pitot probes are in P37.) This provides a closed path to ground for the pitot lights in the auxiliary annunciator panel. Therefore, on the ground with engines off, no pitot probes are heated, and all amber pitot lights on P5 are on.

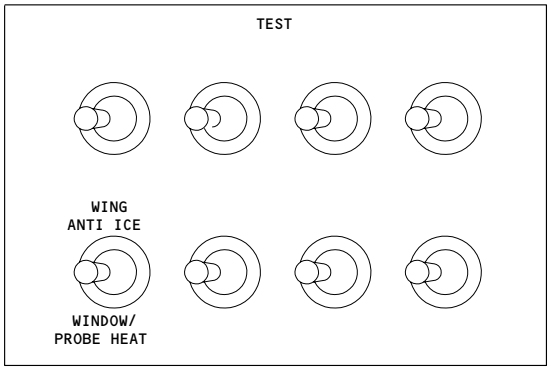


FLIGHT COMPARTMENT



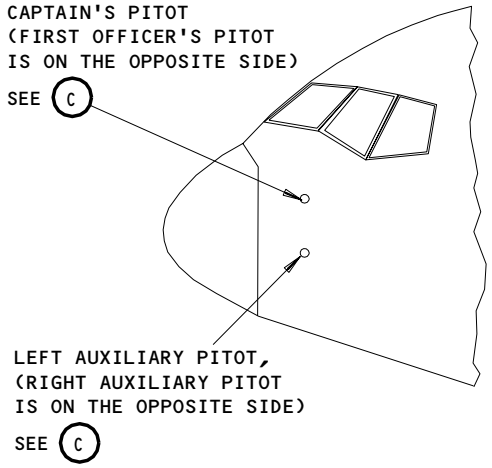
AUXILIARY ANNUNCIATOR PANEL (P5)

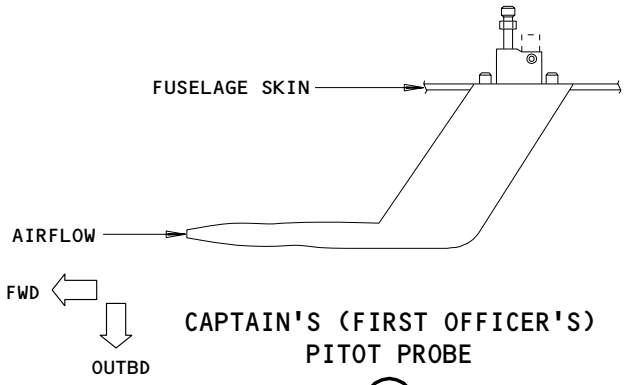
A



MISCELLANEOUS TEST PANEL (P61)

B

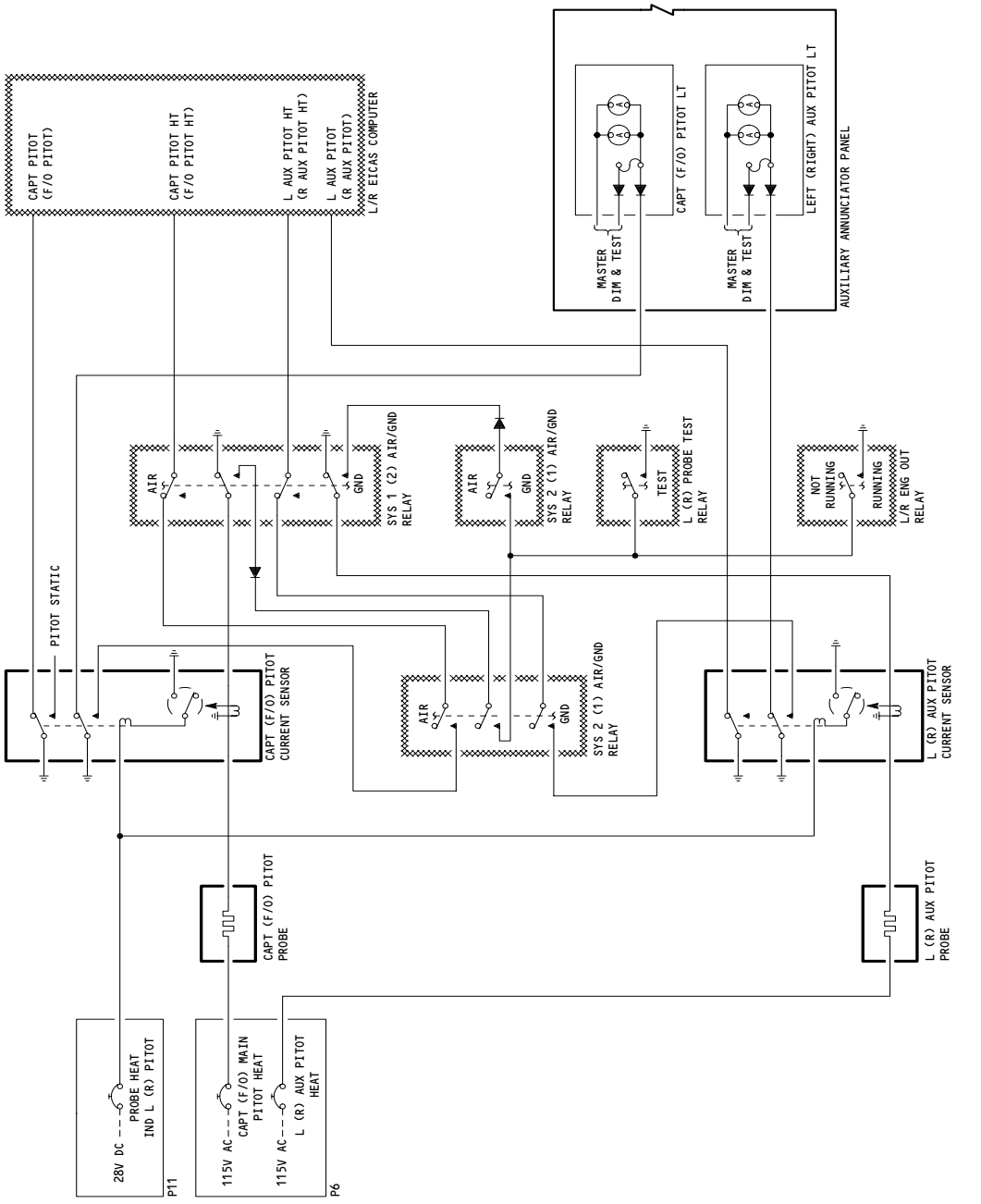




CAPTAIN'S (FIRST OFFICER'S)
PITOT PROBE

C

Pitot Probe Anti-Icing - Component Location
Figure 1



Pitot Probe Anti-Icing Schematic
Figure 2

(3) If one or both engines are operating on the ground, engine speed card(s) energizes the ENG OUT relay associated with each "on" engine. Each pitot probe heater is then powered by rectified one phase, 115-volt ac power. The air/ground relays, in P36 and P37, complete the circuit through a diode when in the ground position. The CSRs are energized due to current flow in the heaters. This opens the ground path for the pitot lights on the auxiliary annunciator panel. Therefore, on the ground with at least one engine running, each pitot probe heater is powered by half-wave rectified 115-volt ac power, and no pitot lights on P5 are on. If a probe heater failure occurs, the associated amber pitot probe light comes on and a pitot message is displayed on the EICAS (Ref 31-41-00).

(4) In the air, all air/ground relays are in the air position. This connects 115-volt ac power to each pitot probe heater directly. The CSRs energize due to current flow in the heaters. Each pitot probe heater is connected to single phase, 115-volt ac power. A ground path for the pitot lights on the auxiliary annunciator panel opens. Therefore, in the air all pitot probes are heated by 115-volt ac power, and no pitot lights are on. If a probe heater failure occurs, the associated amber pitot probe light comes on and a pitot message is displayed on the EICAS (Ref 31-41-00).

(5) If two or more probe heaters have failed, the EICAS displays a consolidated PROBE HEAT message. The individual probe heat failure messages are not displayed. (This applies to any two probe heater failures in the entire system. Included are pitot, angle of attack, and total air temperature probes.)

B. Ground Test (Fig. 2)

(1) The pitot probe heaters are tested on the ground with engines off. The test is done by the WING ANTI-ICE WINDOW/PROBE HEAT switch, on the miscellaneous test panel. The switch is a momentary action, center off type. Holding the switch in the WINDOW/PROBE HEAT position energizes the left and right PROBE HT TEST relays. (The left PROBE HT TEST relay is in P33. The right PROBE HT TEST relay is in P37.) The test relays provide a path for rectified 115-volt ac power to flow through the pitot probe heaters. If all heaters are working, no pitot probe heater lights on P5 are on. If a probe heater fails the test, its amber heater light comes on. When the switch is released after testing, the system returns to normal ground operation. (The WINDOW/PROBE HEAT switch position tests all other probe heaters also.)

C. Control

(1) To place system in operation, apply electrical power (AMM 24-22-00/201).

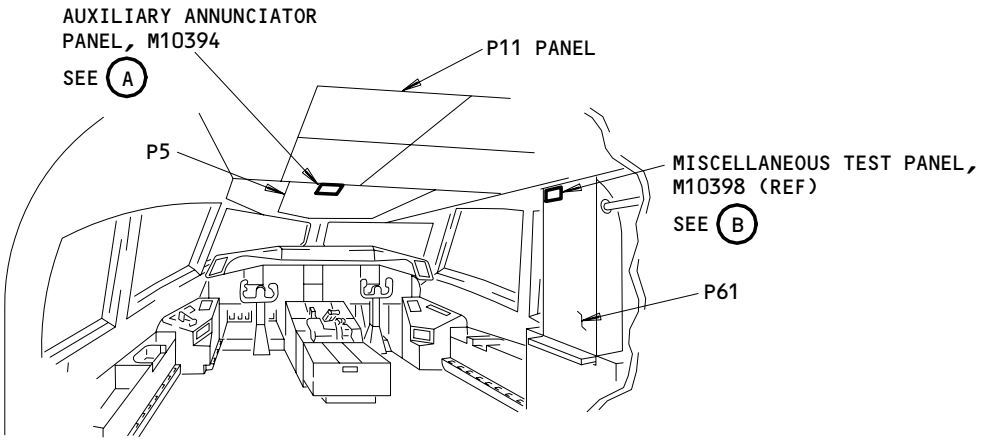
(2) Check that the following circuit breakers on main power distribution panel P6 are closed:
    (a) PITOT HEAT CAPT MAIN
    (b) PITOT HEAT L AUX
    (c) PITOT HEAT F/O MAIN
    (d) PITOT HEAT R AUX
(3) Check that the following circuit breakers on overhead circuit breaker panel P11 are closed:
    (a) PROBE HEAT IND PITOT R
    (b) PROBE HEAT IND PITOT L

PITOT PROBE ANTI-ICING SYSTEM

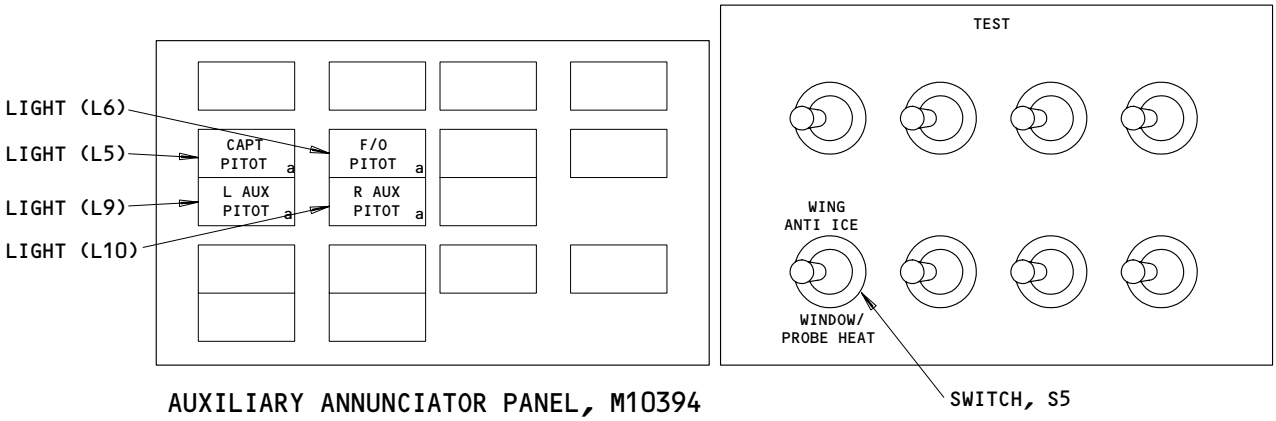
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER -	1		FLT COMPT, P6	
PITOT HEAT CAPT MAIN, C1110		1	6L15	*
PITOT HEAT F/O MAIN, C1116		1	6L22	*
PITOT HEAT L AUX, C1112		1	6L16	*
PITOT HEAT R AUX, C1114		1	6L21	*
CIRCUIT BREAKER -			FLT COMPT, P11	
PITOT PROBE HEAT IND L, C1120		1	11D4	*
PITOT PROBE HEAT IND R, C1121		1	11C21	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
LIGHT - CAPT PITOT, L5	1	1	FLT COMPT, P5, AUX ANN PNL, M10394	*
LIGHT - F/O PITOT, L6	1	1	FLT COMPT, P5, AUX ANN PNL, M10394	*
LIGHT - L AUX PITOT, L9	1	1	FLT COMPT, P5, AUX ANN PNL, M10394	*
LIGHT - R AUX PITOT, L10	1	1	FLT COMPT, P5, AUX ANN PNL, M10394	
PANEL - (FIM 30-32-00/101)				
MISC TEST, M10398				
PANEL - AUX ANNUNCIATOR, M10394	1	1	FLT COMPT, P5	*
PROBE - (FIM 34-11-00/101)				
CAPT PITOT, B26				
F/O PITOT, B28				
L AUX PITOT, B27				
R AUX PITOT, B29				
RELAY -	--		MAIN EQUIP CTR, P33 PANEL	
CAPT, PITOT CURRENT SENSING, K243		1		*
LEFT AUX, PITOT CURRENT SENSING, K242		1		*
LEFT PROBE TEST, K10265		1		*
RELAY -	--		MAIN EQUIP CTR, P36 PANEL	
AIR/GND, SYS 1, K178		1		*
AIR/GND, SYS 1, K10107		1		*
AIR/GND, SYS 1, K10307		1		*
L ENG OUT, K10337		1		*
R ENG OUT, K10340		1		*
RELAY -	--		MAIN EQUIP CTR, P37 PANEL	
AIR/GND, SYS 2, K204		1		*
AIR/GND, SYS 2, K10308		1		*
AIR/GND, SYS 2, K10309		1		*
F/O, PITOT CURRENT SENSING, K310		1		*
L ENG OUT, K10338		1		*
R ENG OUT, K10341		1		*
RIGHT AUX, PITOT CURRENT SENSING, K312		1		*
RIGHT PROBE TEST, K10264		1		*
SWITCH - (WING ANTI-ICE) WINDOW/PROBE HEAT, S5	1	1	FLT COMPT, P61, MISC TEST PNL, M10398	*

* SEE THE WDM EQUIPMENT LIST

Pitot Probe Anti-Icing System - Component Index
Figure 101



FLIGHT COMPARTMENT

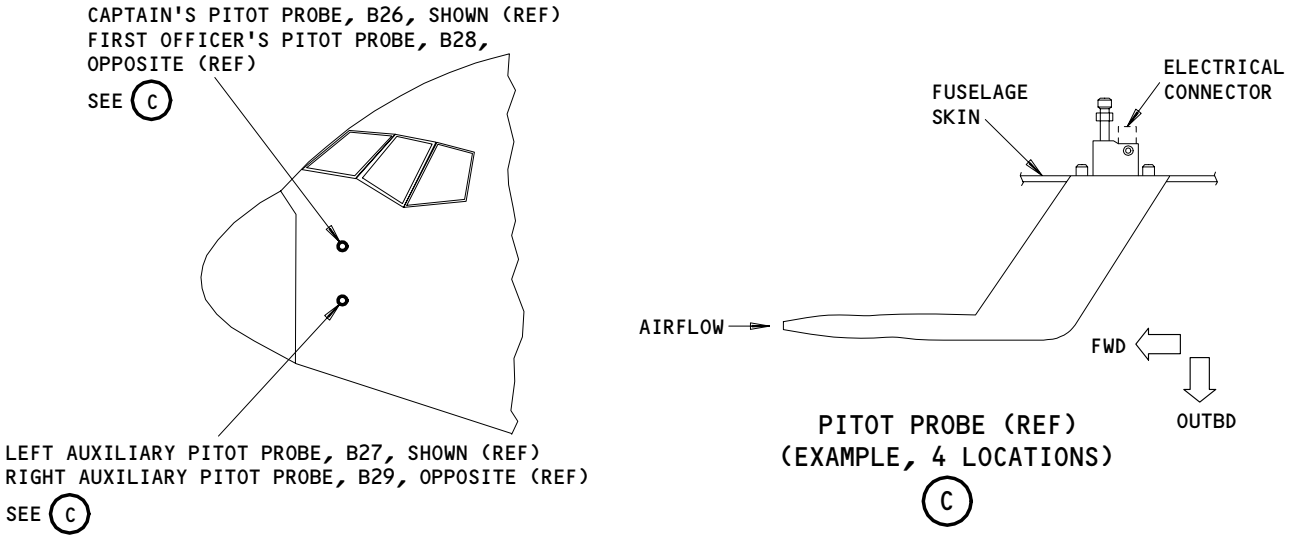


AUXILIARY ANNUNCIATOR PANEL, M10394

(A)

MISCELLANEOUS TEST PANEL, M10398 (REF)

(B)



PITOT PROBE (REF)
(EXAMPLE, 4 LOCATIONS)

(C)

Pitot Probe Anti-Icing System - Component Location
Figure 102

PITOT PROBE ANTI-ICING - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. The task is an operational test of the pitot probe anti-icing system. This system includes four pitot probe heat systems: captain's, left auxiliary, first officer's, and right auxiliary.

   TASK 30-31-00-705-001

2. Operational Test - Pitot Probe Anti-Icing System
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
      (3) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (4) 32-09-02/201, Air/Ground Relays
      (5) 33-16-00/501, Master Dim and Test
      (6) 77-12-03/201 Engine Running Simulation
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Prepare for the Test

      S 215-002
      (1) Make sure that no test equipment or covers are installed on the pitot probes, the angle of attack probes, or the total air temperature probe.

      S 865-003
      (2) Supply electrical power (Ref 24-22-00/201).

      S 715-004
      (3) Make sure the master dim and test system operates for the CAPT PITOT, L AUX PITOT, F/O PITOT, and R AUX PITOT annunciator lights (AMM 33-16-00/501).

      S 715-005
      (4) Make sure the Engine Indication and Crew Alerting System (EICAS) operates (Ref 31-41-00/201).

      S 215-006
      (5) Make sure these annunciator lights on the auxiliary annunciator panel M10394 (panel P5) are on:
          (a) CAPT PITOT
          (b) L AUX PITOT
          (c) F/O PITOT
          (d) R AUX PITOT

S 865-007

(6) Put the computer select switch on the EICAS control panel (panel P9) in the AUTO position.

S 215-008

(7) Make sure the EICAS message, PROBE HEAT, shows on the top EICAS display (panel P2).

S 215-009

(8) Make sure these EICAS messages do not show on the EICAS display:
   (a) CAPT PITOT HEAT
   (b) L AUX PITOT HEAT
   (c) F/O PITOT HEAT
   (d) R AUX PITOT HEAT

D. Do a Test of the Pitot Probe Heat Systems

S 865-010

WARNING: DO NOT TOUCH THE PROBES DURING THE TEST. THE PROBES BECOME VERY HOT AND CAN BURN YOU.

CAUTION: DO NOT OPERATE THE PROBE HEAT FOR MORE THAN 2 MINUTES. DAMAGE TO THE PROBE CAN OCCUR.

(1) Push and hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the M10398 test panel (P61), in the WINDOW/PROBE HEAT position.

S 215-011

(2) Make sure that the CAPT PITOT, L AUX PITOT, F/O PITOT, and R AUX PITOT annunciator lights are off.

S 215-012

(3) Make sure that the EICAS messages, CAPT PITOT HEAT; L AUX PITOT HEAT; F/O PITOT HEAT; and R AUX PITOT HEAT, do not show on the EICAS display.

S 215-044

(4) Do the steps that follow to do a check of the pitot heat EICAS messages:

(a) Open each of the given circuit breakers on the main power distribution panel, P6 and make sure the correct EICAS message shows and the annunciator light is on:

CIRCUIT BREAKER	EICAS MESSAGE AND ANNUNCIATOR
6L13,6L14,6L15, PITOT HEAT CAPT MAIN	CAPT PITOT
6L14,6L15 or 6L16, PITOT HEAT L AUX	L AUX PITOT
6L21, PITOT HEAT R AUX	R AUX PITOT
6L22, PITOT HEAT F/O MAIN	F/O PITOT

(b) Close the circuit breaker after you see its message and annunciator light.

S 865-016

(5) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 045-038

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS DURING THIS PROCEDURE. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(6) Do the deactivation procedure for the spoilers (Ref 27-61-00/201), or move all persons and equipment away from the spoilers during this procedure.

S 045-036

WARNING: PREPARE THE SAFETY-SENSITIVIE SYSTEMS FOR AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(7) Prepare the safety-sensitive systems for air mode simulation (Ref 32-09-02/201).

S 865-030

(8) Open this circuit breaker on the overhead panel, P11, and attach DO-NOT-CLOSE tag:
(a) 11S15, AIR/GND SYS 1

S 215-018

(9) Make sure the annunciator lights that follow are correct (on/off) and the EICAS message, PROBE HEAT, shows on the EICAS display:
(a) CAPT PITOT (off)
(b) L AUX PITOT (off)
(c) AIRPLANES WITHOUT TRUCK TILT SENSOR (PRE SB 757-27A0130 OR PRR 54530-210);
1) F/O PITOT (on)
2) R AUX PITOT (on)
(d) AIRPLANES WITH TRUCK TILT SENSOR;
1) F/O PITOT (off)
2) R AUX PITOT (off)

S 865-033

(10) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11S15, AIR/GND SYS 1

S 865-040

(11) Open these circuit breakers on the overhead panel P11 and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN

(b) 11S23, LANDING GEAR POS SYS 2

S 215-021

(12) Make sure the annunciator lights that follow are correct (on/off) and the EICAS message, PROBE HEAT, shows on the EICAS display:
(a) CAPT PITOT (on)
(b) L AUX PITOT (on)
(c) F/O PITOT (off)
(d) R AUX PITOT (off)

S 865-041

(13) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the P11 panel:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 865-045

(14) Do this task to simulate engine running for the left engine speed card, M10298 : Simulate the Engine Operation (AMM 77-12-03/201).
(a) Do not open the pitot heat system circuit breakers as stated in the referenced procedure.

S 215-024

(15) Make sure the CAPT PITOT, L AUX PITOT, F/O PITOT, and R AUX PITOT annunciator lights are off.

S 215-025

(16) Make sure the EICAS messages, CAPT PITOT HEAT; L AUX PITOT HEAT; F/O PITOT HEAT; and R AUX PITOT HEAT, do not show on the EICAS display.

S 865-047

(17) Do the steps in this task to stop the engine running simulation: Simulate the Engine Operation (AMM 77-12-03/201).

S 865-027

(18) Do the previous steps for engine running simulation again, for the right engine speed card, M10311.
(a) Make sure the annunciators and EICAS messages are not on, as described in the previous steps.

E. Put the Airplane Back to Its Usual Condition

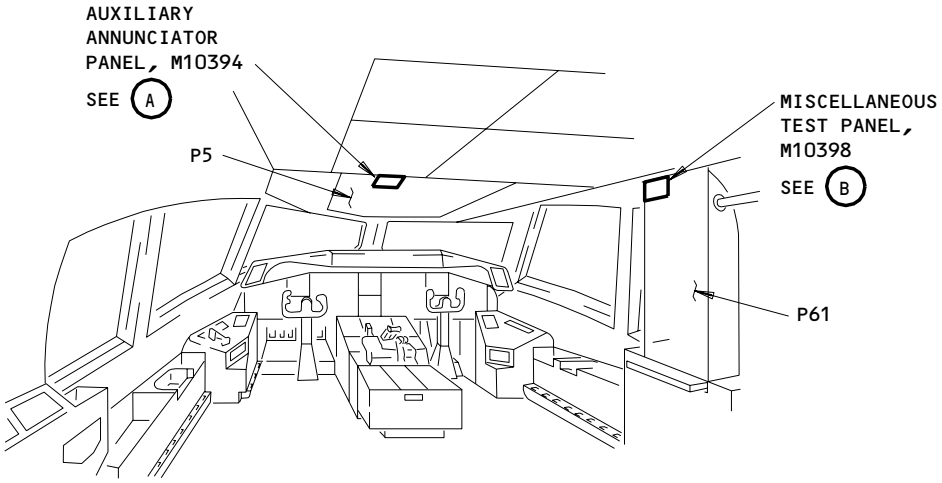
S 445-037
(1) Put the safety-sensitive systems back to their initial conditions (Ref 32-09-02/201).

S 445-039
(2) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00/201).

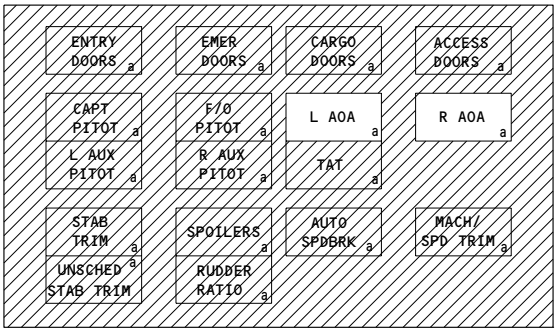
S 865-028
(3) Remove electrical power if it is not necessary (Ref 24-22-00/201).

ANGLE OF ATTACK PROBE HEAT - DESCRIPTION AND OPERATION

1. General
   A. Two angle of attack (AOA) probes (one on each side) are electrically heated to prevent erroneous readings due to ice conditions. AOA probe heat system components include: AOA probes, the auxiliary annunciator panel, and the miscellaneous test panel.
   B. System electrical power comes from the 28v dc buses, and the 115v ac buses. Circuit breakers are on overhead circuit breaker panel P11, and main power distribution panel P6.
2. Component Details (Fig. 1)
   A. AOA Probes
      (1) One AOA probe is located on each side, halfway down the fuselage under the left and right No. 2 flight deck windows. Each AOA probe has a vane heater and a case heater. The vane is heated to maintain an efficient vane airfoil. The case is heated to ensure free rotation of the vane. Only one level of AOA probe heating is used both on the ground and in flight.
      (2) The vane and case heaters are independently wired to enable positive fault detection in the vane heater circuit.
   B. Auxiliary Annunciator Panel
      (1) Auxiliary annunciator panel M10394 is located on pilots' overhead panel P5. The annunciator panel contains two amber lights, one for each AOA probe. The lights are identified as: L AOA, R AOA. These lights come on to identify a probe heater or system failure.
   C. Miscellaneous Test Panel
      (1) Miscellaneous test panel M10398 provides for ground testing of the probe heaters. The test panel is on right side panel P61.
3. Operation
   A. Functional Description (Fig. 2)
      (1) AOA probe heating is automatically controlled. This is done by action of air/ground relays, and relays whose position depends on engine speed from engine speed cards. The only action initiated from the flight deck is probe heat testing.
      (2) On the ground, AOA probe heating depends on engine speed. The air/ground relays will be energized to the ground position. This opens the probe heating circuit. (The air/ground relays are in left miscellaneous relay panel P36, and right miscellaneous electrical equipment panel P37.) If both engines are off, the left and right engine speed cards de-energize the ENG OUT relays. (Two ENG OUT relays are in P36 and P37.) The probe heating circuit remains open. The probes are not heated. This results in the current sensing relay (CSR) associated with each AOA probe to be de-energized. (The CSR associated with the left AOA probe is in P33. The CSR associated with the right AOA probe is in P37.) This provides a closed path to ground for the AOA lights on the auxiliary annunciator panel. Therefore, on the ground with engines off, neither AOA probe is heated, and both amber AOA lights on P5 are on.

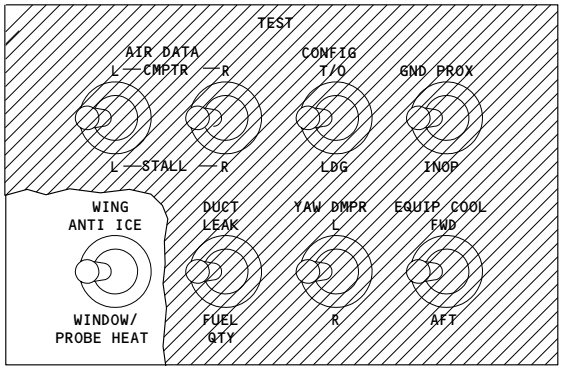


FLIGHT COMPARTMENT



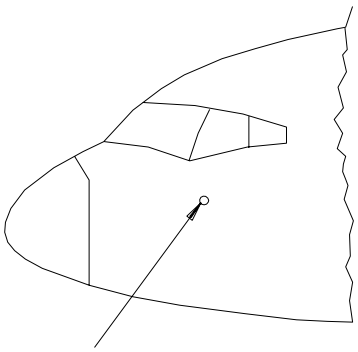
AUXILIARY ANNUNCIATOR PANEL, M10394 (P5)

A

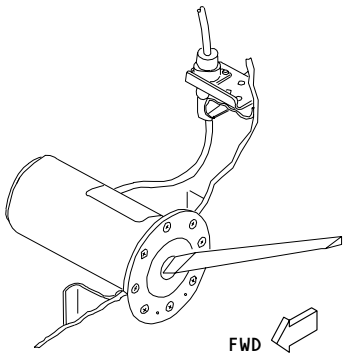


MISCELLANEOUS TEST PANEL, M10398 (P61)

B



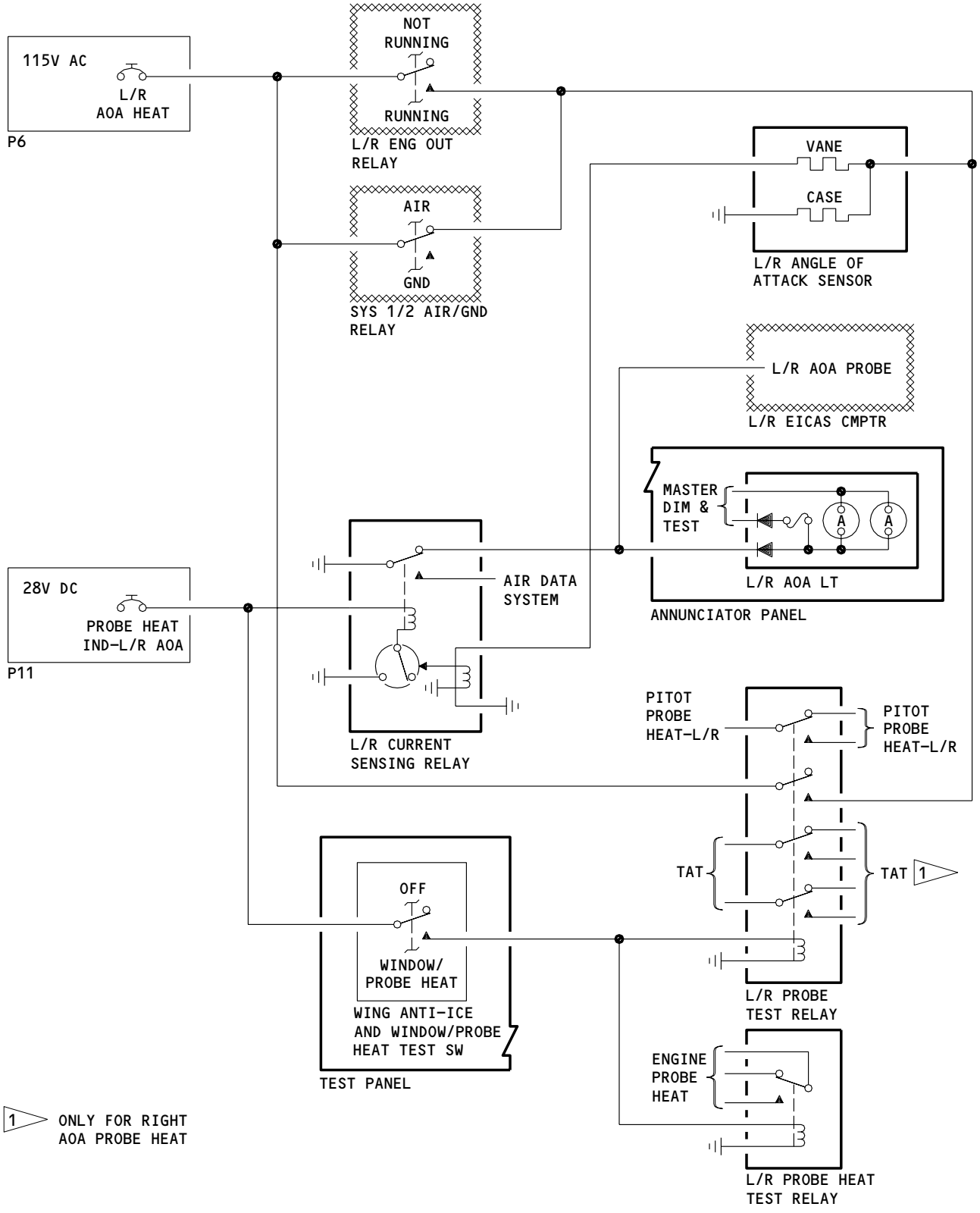
LEFT ANGLE OF ATTACK PROBE, TS12
(RIGHT ANGLE OF ATTACK PROBE, TS13
IS ON THE OPPOSITE SIDE)
SEE C



ANGLE OF ATTACK PROBE
(EXAMPLE, LEFT SIDE IS SHOWN)

C

Angle of Attack Probe Heat - Component Location
Figure 1



Left/Right Angle of Attack Probe Heat Schematic
Figure 2

(3) If one or both engines are operating on the ground, the ENG OUT relay associated with each "on" engine energizes. This provides a path from the 115v ac power source, through the heaters, to ground. The CSRs energize due to current flow in the heaters. This opens the ground path for the AOA lights on the auxiliary annunciator panel. Therefore, on the ground with at least one engine running, both AOA probes are heated by 115v ac power, and neither AOA light on P5 comes on. There is also a message on the EICAS display if an AOA probe heater fails (Ref 31-41-00).

(4) In the air, the ENG OUT and air/ground relays both provide a path for current flow through the heaters. Probe heating is identical to when at least one engine is operating on the ground. (This is described in the preceding paragraph.) If an AOA probe heater loses power, the associated amber AOA light on P5 comes on. There is also a message on the EICAS display if an AOA probe heater fails (Ref 31-41-00).

(5) If two or more probe heaters have failed, the EICAS display shows the advisory message PROBE HEAT. The individual probe heat failure messages are not displayed. (This applies to any two probe heater failures in the entire system. Included are pitot, angle of attack, and total air temperature probes.)

B. Ground Test (Fig. 2)

(1) The AOA probe heaters are tested on the ground with the engines off. This is done by the WING ANTI-ICE WINDOW/PROBE HEAT switch on the miscellaneous test panel. The switch is a momentary action, center off type. Holding the switch in the WINDOW/PROBE HEAT position energizes the left and right PROBE HT TEST relays. (The left PROBE HT TEST relay is in P33. The right PROBE HT TEST relay is in P37.) This provides a path for 115v ac power to flow through the AOA probe heaters. The CSRs energize, removing ground paths for the AOA lights on the auxiliary annunciator panel. If all heaters are working right, neither AOA light on P5 is on. If a probe heater fails the test, its amber probe heater light comes on. When the switch is released after testing, the system returns to normal ground operation. (The WINDOW/PROBE HEAT switch position tests all other probe heaters also.)

C. Control

(1) To place system in operation, apply electrical power (Ref 24-22-00).

(2) Check that R AOA HEAT and L AOA HEAT circuit breakers on main power distribution panel P6 are closed.

(3) Check that PROBE HEAT IND AOA R and PROBE HEAT IND AOA L circuit breakers on overhead circuit breaker panel P11 are closed.

ANGLE OF ATTACK PROBE HEAT SYSTEM

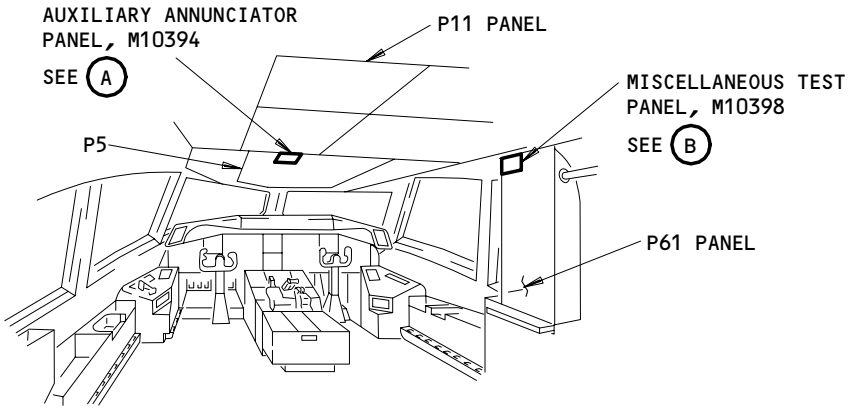
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER -			FLT COMPT, P6	
L AOA HEAT, C1134		1	6L17	*
R AOA HEAT, C1135		1	6L23	*
CIRCUIT BREAKER -			FLT COMPT, P11	
PROBE HEAT IND AOA LEFT, C4194		1	1> 11D5 OR 11R18	*
PROBE HEAT IND AOA R, C4195		1	11R27	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
LIGHT - L AOA, L7	1	1	FLT COMPT, P5, MISC ANNUN PNL, M10394	*
LIGHT - R AOA, L8	1	1	FLT COMPT, P5, MISC ANNUN PNL, M10394	*
PANEL - (FIM 30-31-00/101)				
AUX ANNUNCIATOR, M10394				
PANEL - MISC TEST, M10398	1	1	FLT COMPT, P61	*
PROBE - (FIM 34-12-00/101)				
L AOA, TS12				
R AOA, TS13				
RELAY -	--		MAIN EQUIP CTR, P33 PANEL	
L CURRENT SENSING, K401		1		*
L PROBE TEST, K10265		1		*
RELAY -	--		MAIN EQUIP CTR, P36 PANEL	
AIR/GND, SYS 1, K144		1		*
L ENG OUT, K10337		1		*
R ENG OUT, K10340		1		*
RELAY -	--		MAIN EQUIP CTR, P37 PANEL	
AIR/GND, SYS 2, K213		1		*
L ENG OUT, K10338		1		*
R CURRENT SENSING, K400		1		*
R ENG OUT, K10341		1		*
R PROBE TEST, K10264		1		*
SWITCH - WINDOW/PROBE HEAT TEST, S5	1	1	FLT COMPT, P61, M10398, MISC TEST PANEL	*

* SEE THE WDM EQUIPMENT LIST

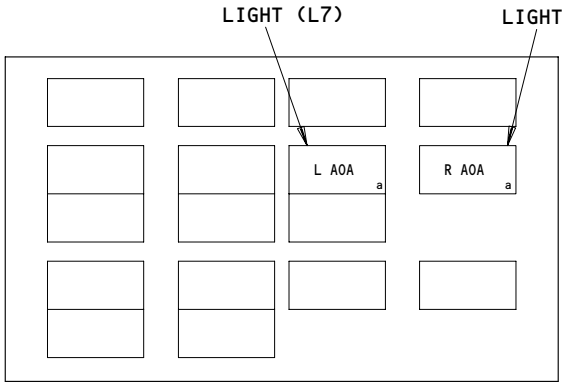
1> THIS CIRCUIT BREAKER CAN BE IN ONE OF THESE TWO LOCTIONS.

Angle of Attack Probe Heat System - Component Index
Figure 101

601543

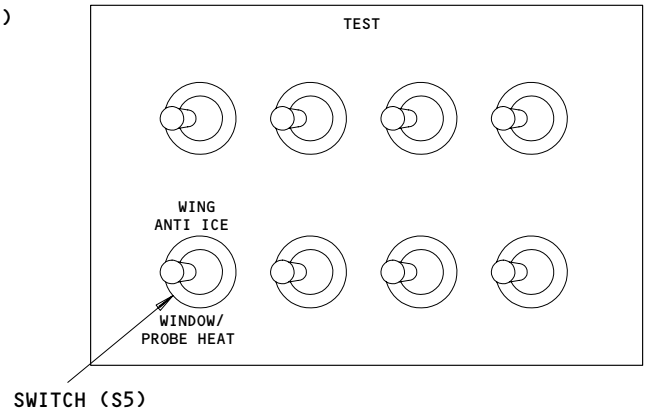


FLIGHT COMPARTMENT



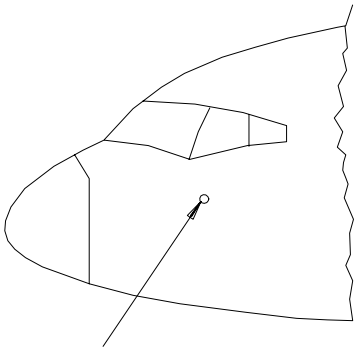
AUXILIARY ANNUNCIATOR PANEL, M10394

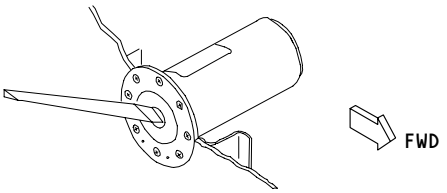
A



MISCELLANEOUS TEST PANEL, M10398

B





LEFT OR RIGHT ANGLE OF ATTACK PROBE,
TS12 OR TS13

C

Angle of Attack Probe Heat System - Component Location
Figure 102

ANGLE OF ATTACK PROBE HEAT - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. The task is an operational test of the two angle of attack (AOA) probe heat systems.

   TASK 30-32-00-715-001

2. Operational Test - Angle of Attack Probe Heat System
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
      (3) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (4) 32-09-02/201, Air/Ground Relays
      (5) 33-16-00/501, Master Dim and Test
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Prepare for the Test

      S 215-002
      (1) Make sure that no test equipment or covers are installed on the pitot probes, the angle of attack probes, or the total air temperature probe.

      S 865-003
      (2) Supply electrical power (Ref 24-22-00/201).

      S 715-004
      (3) Make sure the master dim and test system operates for the L AOA and R AOA annunciators (Ref 33-16-00/501).

      S 715-005
      (4) Make sure the Engine Indication and Crew Alerting System (EICAS) operates (Ref 31-41-00/201).

      S 215-006
      (5) Make sure the L AOA and R AOA annunciators on the auxiliary annunciator panel M10394 (panel P5) are on.

      S 865-007
      (6) Put the computer select switch on the EICAS control panel (panel P9) in the AUTO position.

      S 215-008
      (7) Make sure the EICAS message, PROBE HEAT, shows on the top EICAS display (panel P2).
   D. Do a Test of the Angle of Attack Probe Heat System

S 865-009

WARNING: DO NOT TOUCH THE PROBES DURING THE TEST. THE PROBES BECOME VERY HOT AND CAN BURN YOU.

CAUTION: DO NOT OPERATE THE PROBE HEAT FOR MORE THAN 2 MINUTES. DAMAGE TO THE PROBE CAN OCCUR.

(1) Push and hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the M10398 test panel (P61), in the WINDOW/PROBE HEAT position.

S 215-010
(2) Make sure the L AOA and R AOA annunciators are off.

S 215-031
(3) Make sure the EICAS messages, L AOA and R AOA PROBE, do not show on the top EICAS display.

S 865-011
(4) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6L16 or 6L17, L AOA HEAT

S 215-012
(5) Make sure the L AOA annunciator is on.

S 215-013
(6) Make sure the EICAS message, L AOA PROBE, shows on the top EICAS display.

S 865-014
(7) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6L16 or 6L17, L AOA HEAT

S 865-015
(8) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6L23, R AOA HEAT

S 215-016
(9) Make sure the R AOA annunciator is on.

S 215-017
(10) Make sure the EICAS message, R AOA PROBE, shows on the top EICAS display.

S 865-018
(11) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6L23, R AOA HEAT

S 865-019
(12) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 045-043

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS DURING THIS PROCEDURE. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(13) Do the deactivation procedure for the spoilers (Ref 27-61-00/201), or move all persons and equipment away from the spoilers during this procedure.

S 045-040

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(14) Prepare the safety-sensitive systems for air mode simulation (Ref 32-09-02/201).

S 865-034
(15) Open this circuit breaker on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11S15, AIR/GND SYS 1

S 215-021
(16) Make sure the L AOA annunciator is off.

S 865-035
(17) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11S15, AIR/GND SYS 1

S 865-044
(18) Open these circuit breakers on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 215-024
(19) Make sure the R AOA annunciator is off.

S 865-045
(20) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the P11 panel:
(a) 11C19, LANDING GEAR POS SYS 2 ALTN
(b) 11S23, LANDING GEAR POS SYS 2

S 865-026
(21) Connect a jumper between the test receptacle J1 on the Left Engine Speed Card M10298 (P50 card file) and the airplane ground.

S 215-027
(22) Make sure the L AOA and R AOA annunciators are off.

S 865-028
(23) Remove the jumper lead.

S 215-029
(24) Do the above three steps again for the Right Engine Speed Card M10311 (P50 card file).

E. Put the Airplane Back to Its Usual Condition

S 445-041
(1) Put the safety-sensitive systems back to their initial conditions (Ref 32-09-02/201).

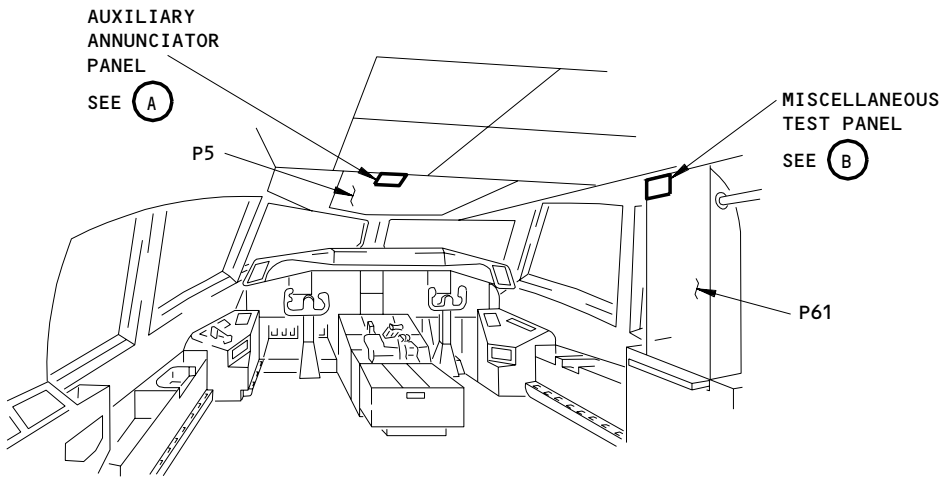
S 445-042
(2) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00/201).

S 865-030

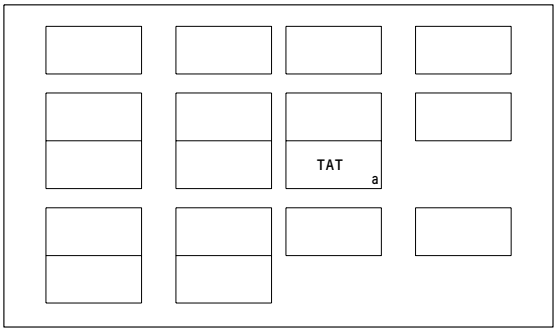
(3) Remove electrical power if it is not necessary (Ref 24-22-00/201).

TOTAL AIR TEMPERATURE PROBE HEAT - DESCRIPTION AND OPERATION

1. General
   A. The total air temperature (TAT) probe is electrically heated to prevent erroneous readings due to ice conditions. TAT system components include: the TAT probe, the auxiliary annunciator panel, and the miscellaneous test panel.
   B. System electrical power comes from the right main 28-volt dc bus and the right main 115-volt ac bus. Circuit breakers are on overhead circuit breaker panel P11, and main power distribution panel P6.
2. Component Details (Fig. 1)
   A. TAT Probe
      (1) The TAT probe is located on the right side, halfway down the fuselage, aft of the nose gear. Only one level of TAT probe heating is used.
   B. Auxiliary Annunciator Panel
      (1) Auxiliary annunciator panel M10394 is located on pilots' overhead panel P5. The annunciator panel contains an amber TAT probe light. The light comes on to identify a TAT probe heater failure.
   C. Miscellaneous Test Panel
      (1) Miscellaneous test panel M10398 provides for ground testing of the probe heater. The test panel is on right side panel P61.
3. Operation
   A. Functional Description (Fig. 2)
      (1) TAT probe heating is automatically controlled by air/ground relays. The only action initiated from the flight deck is probe heat testing.
      (2) On the ground the TAT probe is not heated. The energized air/ground relays open the heater circuit. (The air/ground relays are in right miscellaneous electrical equipment panel P37, and left miscellaneous electrical equipment panel P36.) The condition of the TAT light depends on the right and left ENG OUT relays. (These relays are in P37.)
      (3) If both engines are off, the left and right engine speed cards de-energize the ENG OUT relays. This closes a circuit from the TAT light, through the current sensing relay (CSR), to ground, and the TAT light comes on. (The CSR is in P37.)

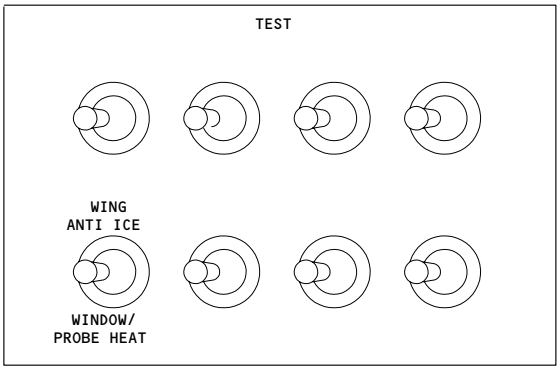


FLIGHT COMPARTMENT



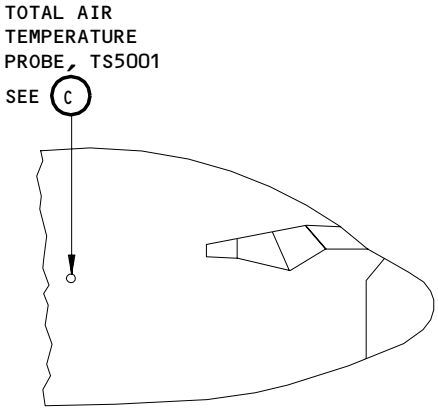
AUXILIARY ANNUNCIATOR PANEL (P5)

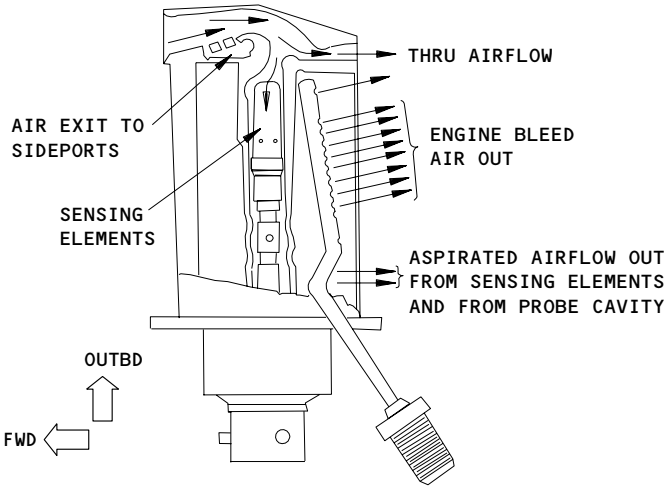
A



MISCELLANEOUS TEST PANEL (P61)

B

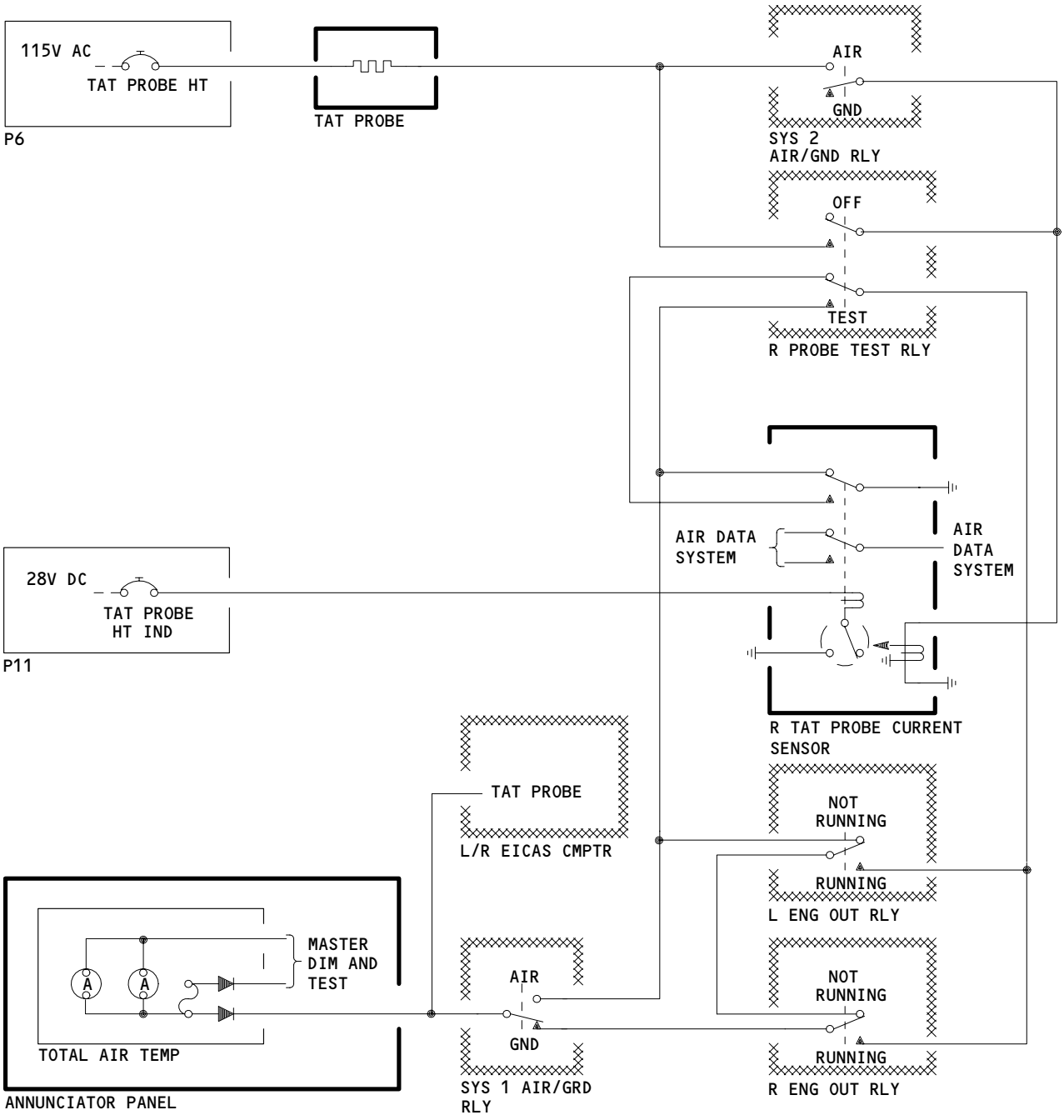




TOTAL AIR TEMPERATURE PROBE, TS5001

C

Total Air Temperature Probe Heat - Component Location
Figure 1



Total Air Temperature Probe Heat Schematic
Figure 2

(4) If one engine is on, the engine speed card energizes the corresponding ENG OUT relay. This opens the ground path for the TAT probe heater light. Therefore, with at least one engine operating on the ground, both the TAT probe heater and TAT light are off.

(5) The air/ground relays de-energize in the air. This allows current to flow through the TAT probe heater and its CSR. The TAT probe is heated by 115-volt ac power. The current flow energizes the CSR, which opens the ground for the TAT light. The TAT light on P5 will be off. If there is no current flow sensed by the CSR, the TAT will light. There is also a message on the EICAS display, if the TAT probe heater fails (Ref 31-41-00).

(6) If two or more probe heaters have failed, the EICAS display shows the advisory message PROBE HEAT. The individual probe heat failure messages are not displayed. (This applies to any two probe heater failures in the entire system. Included are pitot, angle of attack, and total air temperature probes.)

B. Ground Test (Fig. 2)

(1) The TAT probe heater is tested on the ground with the engines off. This is done by the WING ANTI-ICE WINDOW/PROBE HEAT switch, on the miscellaneous test panel. The switch is a momentary action, center off type. Holding the switch in the WINDOW/PROBE HEAT position energizes the right PROBE HT TEST relay. (This relay is in P37.) This provides a path for 115-volt ac power to flow through the TAT probe heater.

(2) The current flow to the TAT probe heater energizes the CSR, which removes the ground path for the TAT light on the auxiliary annunciator panel. If the heater operates correctly, the TAT light on P5 goes off. If the probe heater fails the test, the amber TAT probe heater light comes on. When the switch is released after testing, the system returns to normal ground operation. (The WINDOW/PROBE HEAT switch position tests all other probe heaters also.)

C. Control

(1) To operate the system, supply electrical power (Ref 24-22-00).

(2) Make sure the TAT PROBE HEAT circuit breaker on the main power distribution panel, P6, is closed.

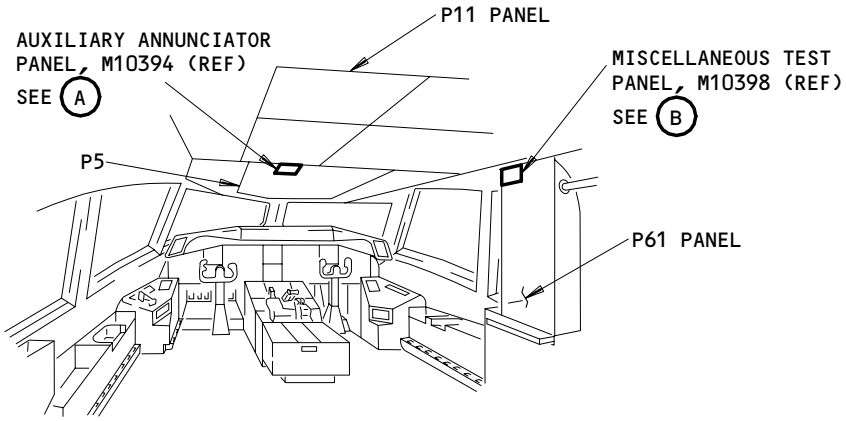
(3) Make sure the PROBE HEAT IND TAT circuit breaker on the overhead circuit breaker panel, P11, is closed.

TOTAL AIR TEMPERATURE PROBE HEAT SYSTEM

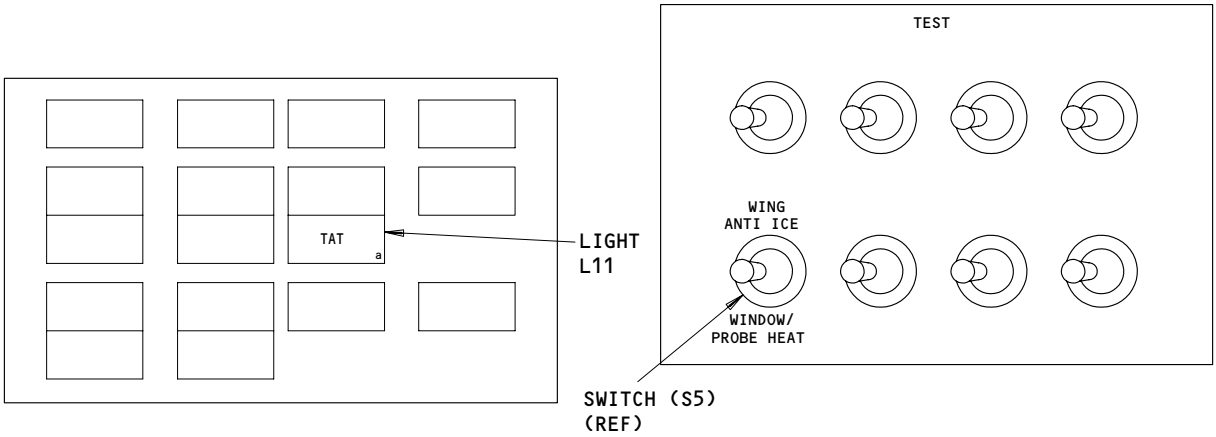
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –	--		FLT COMPT, P6	
TAT PROBE HEAT, C4003		1	6L24	*
CIRCUIT BREAKER –			FLT COMPT, P11	
PROBE HEAT IND TAT, C4131			11R25	
COMPUTER – (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
LIGHT – TAT HEAT, L11	--	1	FLT COMPT, P5, AUX ANNUN PANEL, M10394	*
PANEL – (FIM 30-31-00/101)				
AUX ANNUN, M10394				
PANEL – (FIM 30-32-00/101)				
MISC TEST, M10398				
PROBE – (FIM 34-12-00/101)				
TAT, TS5001				
RELAY –	--		MAIN EQUIP CTR, P36 PANEL	
AIR/GND, SYS 1, K143		1		*
RELAY –	--		MAIN EQUIP CTR, P37 PANEL	
AIR/GND, SYS 2, K203		1		*
CURRENT SENSING, R TAT PROBE, K410		1		*
L ENGINE OUT, K10339		1		*
R ENGINE OUT, K10342		1		*
R PROBE TEST, K10264		1		*
SWITCH – (FIM 30-32-00/101)				
WINDOW/PROBE HEAT TEST, S5				

* SEE THE WDM EQUIPMENT LIST

Total Air Temperature Probe Heat System – Component Index
Figure 101



FLIGHT COMPARTMENT

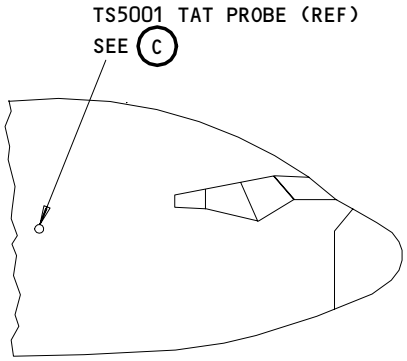


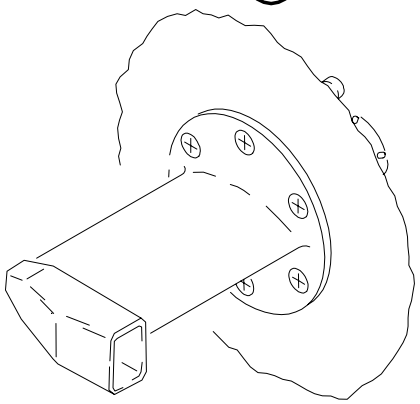
AUXILIARY ANNUNCIATOR PANEL, M10394 (REF)

A

MISCELLANEOUS TEST PANEL, M10398 (REF)

B





TOTAL AIR TEMPERATURE PROBE, TS5001 (REF)

C

Total Air Temperature Probe Heat System - Component Location
Figure 102

TOTAL AIR TEMPERATURE PROBE HEAT - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. The task is an operational test for the total air temperature (TAT) probe heat system.
   B. The removal/installations instructions for the TAT Probe are in AMM 34-12-02-4.

TASK 30-33-00-715-001

2. Operational Test - Total Air Temperature Probe Heat System
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
      (3) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (4) 32-09-02/201, Air/Ground Relays
      (5) 33-16-00/501, Master Dim and Test
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Prepare for the Test

      S 215-002
      (1) Make sure no test equipment or covers are installed on the pitot probe, the total air temperature probe, or the angle of attack probe.

      S 865-003
      (2) Supply electrical power (Ref 24-22-00/201).

      S 715-004
      (3) Make sure the master dim and test system operates for the TAT annunciator (Ref 33-16-00/501).

      S 715-005
      (4) Make sure the Engine Indication and Crew Alerting System (EICAS) operates (Ref 31-41-00/201).

      S 215-006
      (5) Make sure the TAT light on the M10394 auxiliary annunciator panel (P5 panel) is on.

      S 865-007
      (6) Put the computer select switch on the EICAS control panel (panel P9) in the AUTO position.

      S 215-008
      (7) Make sure the EICAS message, PROBE HEAT, shows on the top EICAS display (panel P2).
   D. Do a Test of the Total Air Temperature Probe Heat System

S 865-009

WARNING: DO NOT TOUCH THE PROBE DURING THE TEST. THE PROBE BECOMES VERY HOT AND CAN BURN YOU.

CAUTION: DO NOT OPERATE THE PROBE HEATERS FOR MORE THAN 2 MINUTES. DAMAGE TO THE PROBE CAN OCCUR.

(1) Push and hold the WING ANTI-ICE WINDOW/PROBE HEAT test switch on the M10398 test panel (P61), in the WINDOW/PROBE HEAT position.
   (a) Make sure the TAT annunciator is off.
   (b) Make sure the EICAS messages, PROBE HEAT and TAT PROBE, do not show on the top EICAS display.
   (c) Open this circuit breaker on the main power distribution panel P6 and attach a DO-NOT-CLOSE tag:
      1) 6L24, TAT PROBE HEAT
   (d) Make sure the TAT annunciator is on.
   (e) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
      1) 6L24, TAT PROBE HEAT

S 865-010

(2) Release the WING ANTI-ICE WINDOW/PROBE HEAT test switch.

S 045-010

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS DURING THIS PROCEDURE. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(3) Do the deactivation procedure for the spoilers (Ref 27-61-00/201), or move all persons and equipment away from the spoilers during this procedure.

S 045-011

WARNING: PREPARE THE SAFETY-SENSITIVE SYSTEMS FOR THE AIR MODE BEFORE YOU OPEN THE AIR/GROUND CIRCUIT BREAKERS. IN THE AIR MODE, MANY OF THE AIRPLANE SYSTEMS CAN OPERATE AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(4) Prepare the safety-sensitive systems for air mode simulation (Ref 32-09-02/201).

S 865-020

(5) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
   (a) 11C19, LANDING GEAR POS SYS 2 ALTN
   (b) 11S15, AIR/GND SYS 1
   (c) 11S23, LANDING GEAR POS SYS 2

S 215-012

(6) Make sure the TAT annunciator is off.

S 865-021

(7) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11C19, LANDING GEAR POS SYS 2 ALTN
   (b) 11S15, AIR/GND SYS 1
   (c) 11S23, LANDING GEAR POS SYS 2

S 845-027

(8) Do the simulation of the engine operation.
   (a) ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
   Connect a jumper test wire between the test point J1 on the front of the card and the airplane electrical ground.
   (b) ENGINE SPEED CARDS WITH A TEST SWITCH;
   Move the test switch on the front of the card to the TEST position.

(c) Do the tests that are necessary with the engine operation simulated with the engine speed card.
(d) ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
Remove the jumper test wire from the test point J1 on the card and the airplane electrical ground.
(e) ENGINE SPEED CARDS WITH A TEST SWITCH;
Move the test switch on the front of the card to the NORMAL position.

S 805-016
(9) Do the above steps for the Right Engine or the Left Engine Speed Card M10311 (P50 Card File).

E. Put the Airplane Back to Its Usual Condition

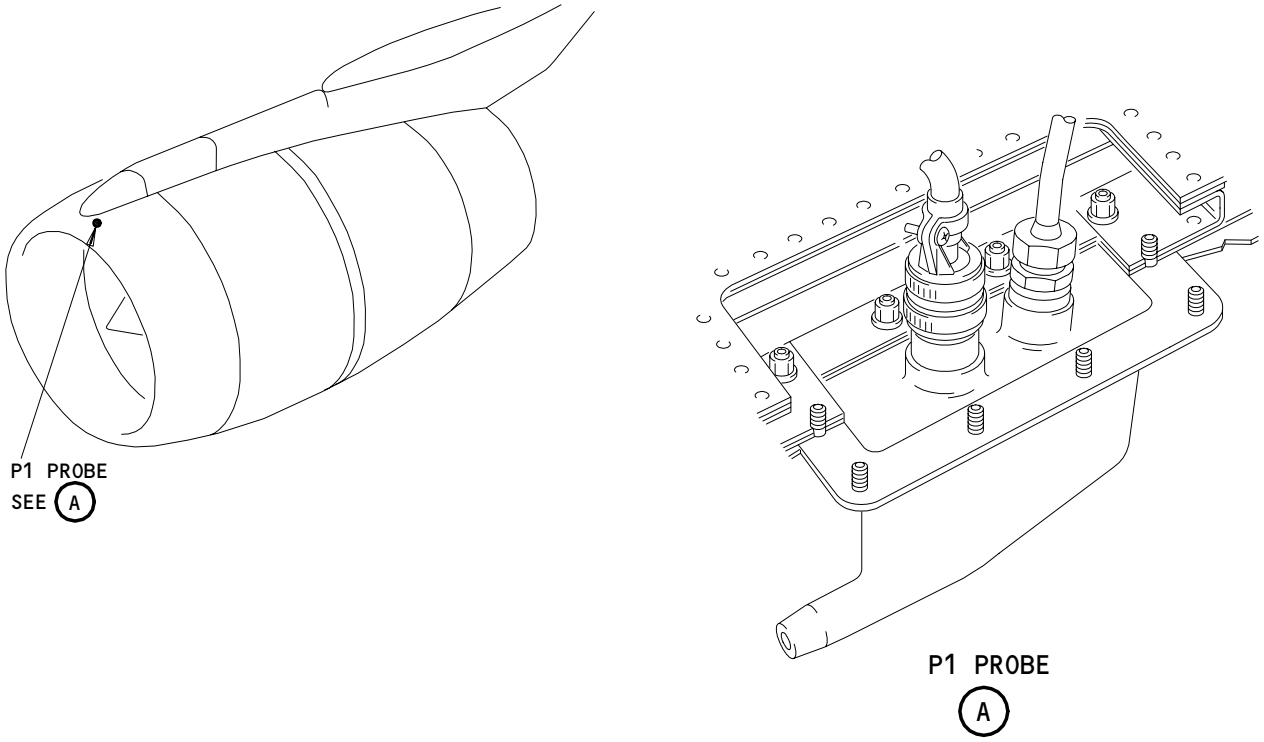
S 445-013
(1) Put the safety-sensitive systems back to their initial conditions (Ref 32-09-02/201).

S 445-012
(2) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00/201).

S 865-017
(3) Remove electrical power if it is not necessary (Ref 24-22-00/201).

ENGINE PROBE HEAT - DESCRIPTION AND OPERATION

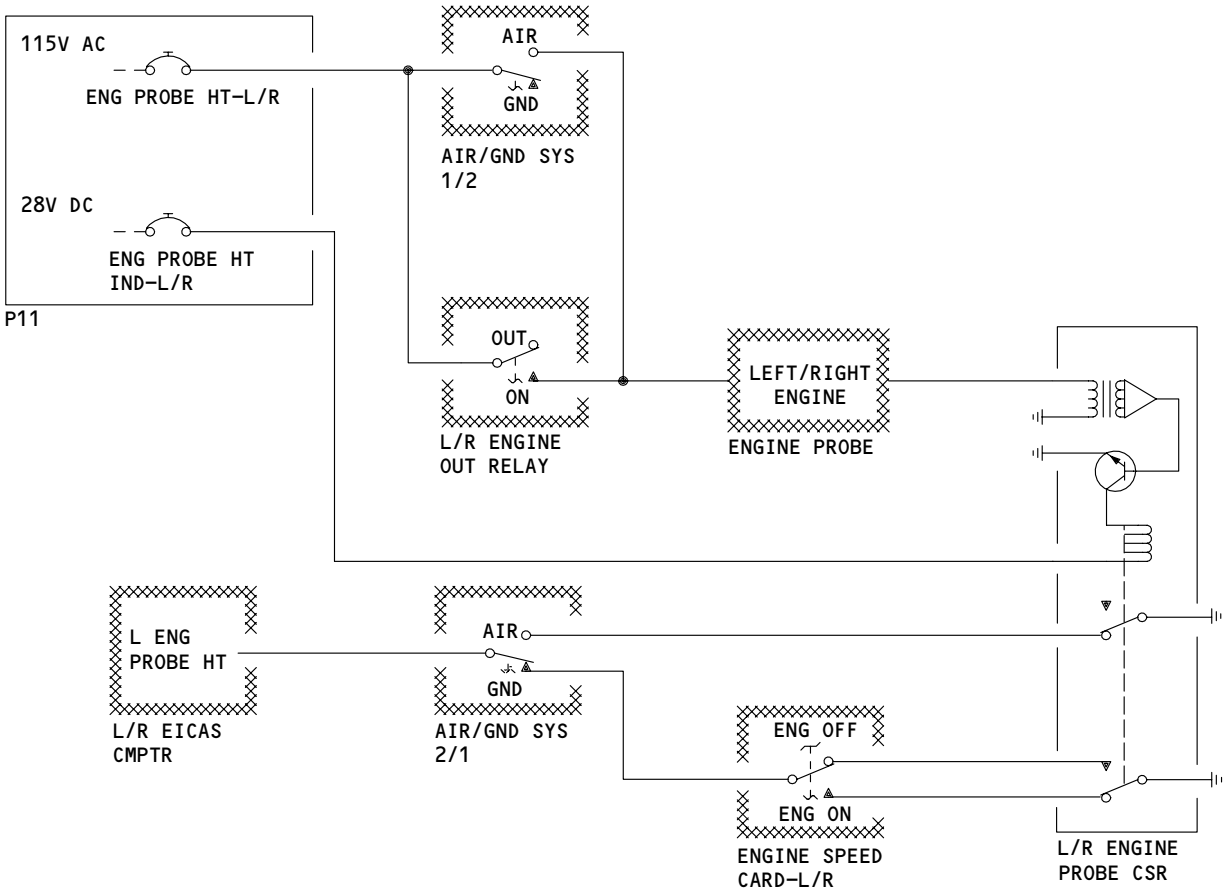
1. General
   A. Two engine probes (one for each engine) are electrically heated to prevent erroneous readings due to ice conditions. Engine probe heat system components consist of the engine probes. System electrical power comes from the main left and right 28v dc buses, and the main left and right 115v ac buses. Circuit breakers are on overhead circuit breaker panel P11.
   B. The engine probes are identified as P1 probes and they will be referred to as the engine probes in this procedure.
2. Component Details (Fig. 1)



Engine Probe Heat Component Location
Figure 1

A. Engine Probes
(1) One engine probe is located on the upper inside surface of the inlet cowl. The probe measures total pressure in the inlet air stream entering the engine LP compressor.
(2) The probe is heated by an electrical heating element which provides one level of heating. The heater uses 115v ac power.

3. Operation (Fig. 2)
A. Functional Description
(1) Engine probe heating is automatically controlled. This is done by action of air/ground relays and engine out relays whose position depends on outputs from engine proximity switches and speed cards.
(2) On the ground, engine probe heating depends on engine speed from engine speed cards. If both engines are off, the engine out relays are de-energized. (The left and right engine out relays are in left miscellaneous relay panel P36 and right miscellaneous relay panel P37 respectively.) The circuit connecting power to the probes is open. The probes are not heated. This results in the Current Sensing Relay (CSR) associated with each engine probe to be de-energized. (The left and right CSR for the engine probes are in left miscellaneous relay panel P36 and right miscellaneous relay panel P37 respectively.)
(3) If one engine is operating on the ground, and engine speed N2 is greater than 38.8% the engine out relay associated with the "on" engine energizes. This provides a path from the 115v ac power source, through the engine probe heater, to ground. The CSR associated with the engine probe of the "on" engine energizes. This opens the ground paths for left and right Engine Indication And Crew Alerting System (EICAS) computers.
(4) Therefore, with one engine operating on the ground, the engine probe associated with the "on" engine is heated with 115v ac power. If the engine probe heater of the operating engine fails, a status and maintenance EICAS message L (R) ENG PROBE HEAT appears (Ref 31-41-00).
(5) If both engines are operating on the ground, the engine out relays of both engines energize. This provides heating to the engine probes of both engines. All the CSRs energize, opening the corresponding ground paths for left and right EICAS computers.



Engine Probe Heat Schematic
Figure 2

(6) Therefore, on the ground with both engines running the engine probes are heated. If either engine probe heater fails, its corresponding EICAS status and maintenance message L (R) ENG PROBE HEAT appears. If both engine probe heaters fail, both L and R ENG PROBE HEAT messages appear.

(7) In the air, all air/ground relays de-energize to allow heating of the engine probe of each engine. Engine probe failure annunciation is identical as with two engine operation on the ground.

B. Control

(1) To operate the system, supply electrical power to main ac buses (Ref 24-22-00).

(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11 are closed:

(a) ENG PROBE HTR LEFT

(b) ENG PROBE HTR RIGHT

(c) PROBE HEAT IND ENG LEFT

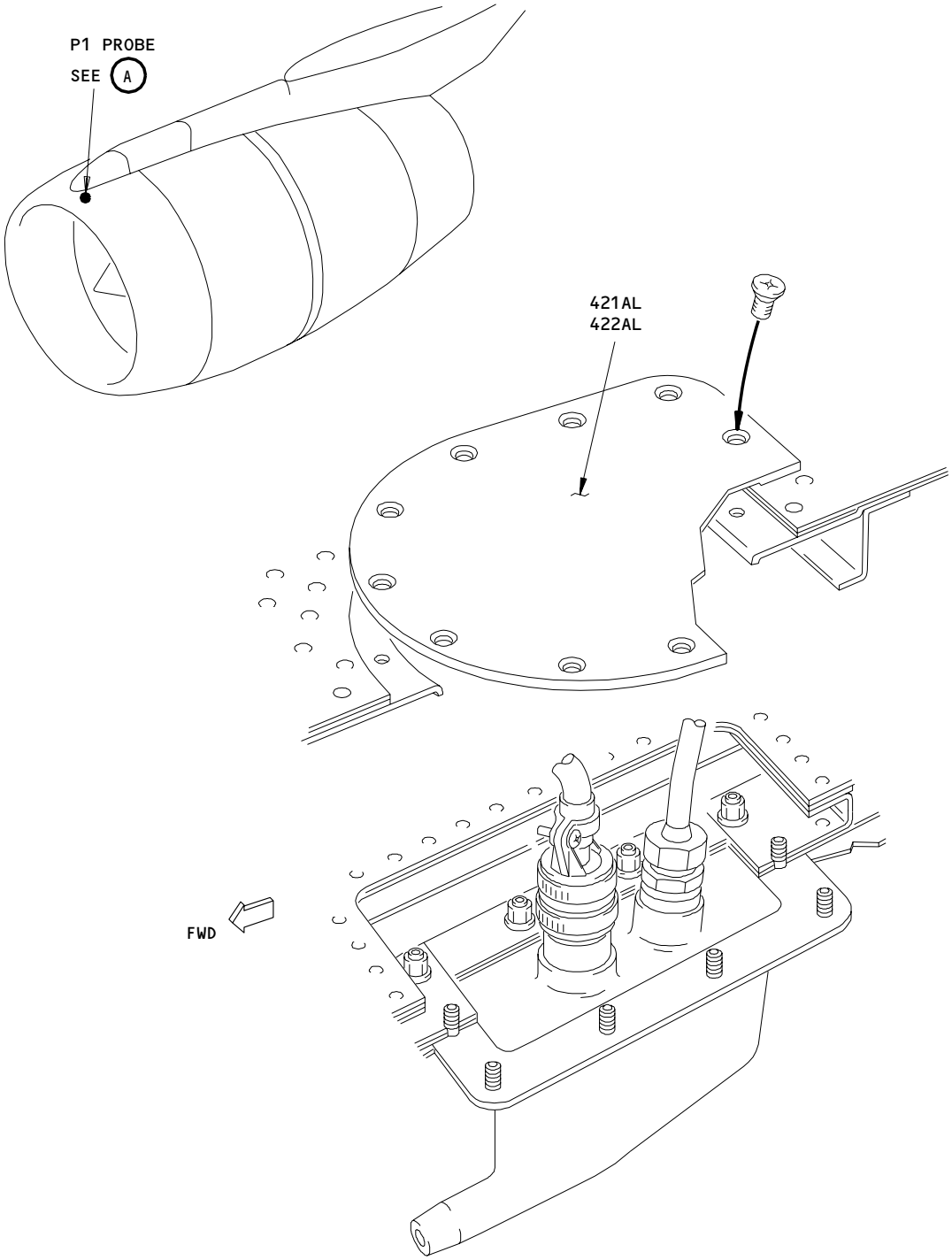
(d) PROBE HEAT IND ENG RIGHT

ENGINE PROBE HEAT SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CARD - (FIM 73-12-00/101)				
L ENG SPEED, M10298				
R ENG SPEED, M10311				
CIRCUIT BREAKER -			FLT COMPT, P11	
ENG PROBE HTR L, C4298		1	11R14	*
ENG PROBE HTR R, C4299		1	11R23	*
PROBE HEAT IND ENG L, C4308		1	11R16	*
PROBE HEAT IND ENG R, C4309		1	11R24	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
PROBE - (FIM 73-21-00/101)				
L AND R ENG P1 HEATER, B10010				
RELAY - (FIM 31-01-36/101)	--		MAIN EQUIP CTR, P36 PANEL	
AIR/GND, SYS 1, K178		1		*
AIR/GND, SYS 1, K10107		1		*
L ENG OUT, K10337		1		*
L ENG PROBE CURRENT SENSING, K10478		1		*
RELAY - (FIM 31-01-37/101)	--		MAIN EQUIP CTR, P37 PANEL	
AIR/GND, SYS 2, K213		1		*
AIR/GND, SYS 2, K10308		1		*
R ENG OUT, K10341		1		*
R ENG PROBE CURRENT SENSING, K10479		1		*

* SEE THE WDM EQUIPMENT LIST

Engine Probe Heat System - Component Index
Figure 101



P1 PROBE
A

Engine Probe Heat System Component Location
Figure 102

ENGINE PROBE HEAT - ADJUSTMENT/TEST

1. General
   A. This procedure contains one task. The task is an operational test of the engine probe heat system.
   B. The engine probes are identified as P1 probes.

   TASK 30-34-00-715-001

2. Operational Test - Engine Probe Heat System
   A. Equipment
      (1) Thermocouple, commercially available
   B. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
      (3) 31-41-00/201, Engine Indication and Crew Alerting System (EICAS)
      (4) 32-09-02/201, Air/Ground Relays
      (5) 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   D. Prepare for the Test

      S 865-002
      (1) Supply electrical power (Ref 24-22-00/201).

      S 715-003
      (2) Make sure the Engine Indication and Crew Alerting System (EICAS) operates (Ref 31-41-00/201).

      S 865-004
      (3) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
          (a) 6L15, PITOT HEAT CAPT MAIN
          (b) 6L16, PITOT HEAT L AUX
          (c) 6L17, L AOA HEAT
          (d) 6L21, PITOT HEAT F/O AUX
          (e) 6L22, PITOT HEAT F/O MAIN
          (f) 6L23, R AOA HEAT
          (g) 6L24, TAT PROBE HEAT

      S 215-005
      (4) Make sure the EICAS circuit breakers (six locations) on panel P11 are closed.

      S 865-006
      (5) Erase the status/maintenance messages from the EICAS memory (Ref 31-41-00/201).

S 865-007

(6) Remove the engine shutdown inhibit from the EICAS computers (Ref 31-41-00/201).

S 865-008

(7) Push the STATUS switch on the EICAS display select panel on panel P9.

S 045-009

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE THRUST REVERSER ISOLATION VALVE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(8) Do the deactivation procedure for the thrust reverser isolation valve for ground maintenance (Ref 78-31-00/201).

E. Test - Engine Probe Heat System

S 865-032

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN MOVE QUICKLY AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: DO NOT OPERATE THE PROBE HEATERS FOR MORE THAN 2 MINUTES. LET THE PROBE BECOME COOL FOR 5 MINUTES BETWEEN THE 2 MINUTES OPERATIONAL CYCLE. DAMAGE TO THE PROBES CAN OCCUR.

(1) Do the deactivation procedure for the spoilers (Ref 27-61-00/201) or move all persons and equipment away from the control surfaces.

S 045-026

WARNING: OBEY THE PROCEDURE THAT PUTS THE AIRPLANE IN THE AIR MODE. IF YOU DO THE PROCEDURE INCORRECTLY, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Put the air/ground relay system (systems No. 1 and No. 2) in the air mode (Ref 32-09-02/201).

NOTE: Make sure these circuit breakers are closed on the overhead panel, P11, during the preparation of sensitive-systems for air mode simulation:
11R14, ENG PROBE HTR LEFT
11R23, ENG PROBE HTR RIGHT

S 215-011

(3) Make sure the EICAS messages, L ENG PROBE HEAT and R ENG PROBE HEAT do not show on the bottom EICAS display.

S 865-014

(4) Open these circuit breakers on the overhead panel P11:
  (a) 11R14, ENG PROBE HTR LEFT
  (b) 11R23, ENG PROBE HTR RIGHT

S 215-015

(5) Make sure the EICAS messages, L ENG PROBE HEAT and R ENG PROBE HEAT, show on the bottom EICAS display.

S 975-012

WARNING: DO NOT TOUCH THE PROBES. THE PROBES BECOME VERY HOT AND CAN BURN YOU.

CAUTION: DO NOT PERMIT THE PROBE TEMPERATURE TO INCREASE TO MORE THAN 200°F (93°C). DAMAGE TO THE PROBE CAN OCCUR.

(6) Do these steps, for one probe at a time, to make sure the left and right P1 probes operate correctly:
  (a) Close the applicable circuit breaker on the P11 panel:
    1) FOR THE LEFT HEATER,
       11R14, ENG PROBE HTR LEFT
    2) FOR THE RIGHT HEATER,
       11R23, ENG PROBE HTR RIGHT
  (b) Monitor the temperature of the left (right) P1 probe with the handheld thermocouple.
    1) Make sure the P1 probe temperature increases to more than 150°F (65°C).
  (c) Open the applicable circuit breaker on the P11 panel:
    1) FOR THE LEFT HEATER,
       11R14, ENG PROBE HTR LEFT
    2) FOR THE RIGHT HEATER,
       11R23, ENG PROBE HTR RIGHT

S 445-030

(7) Put the air/ground system back to the ground mode (Ref 32-09-02/201).

S 865-016
(8) Close these circuit breakers on the P11 panel:
(a) 11R14, ENG PROBE HTR LEFT
(b) 11R23, ENG PROBE HTR RIGHT

S 445-029
(9) Do the activation procedure for the spoilers (Ref 27-61-00/201) if you did the deactivation procedure.

S 865-018
(10) Erase the status/maintenance messages from the EICAS memory (Ref 31-41-00/201).

S 865-019
(11) Push the STATUS switch on the EICAS display select panel on panel P9.

S 215-020
(12) Make sure the EICAS messages, L ENG PROBE HEAT and R ENG PROBE HEAT, do not show on the bottom EICAS display.

F. Put the Airplane Back to Its Usual Condition

S 865-021
(1) Put back the engine shutdown inhibit in the EICAS computer (Ref 31-41-00/201).

S 865-022
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6L15, PITOT HEAT CAPT MAIN
(b) 6L16, PITOT HEAT L AUX
(c) 6L17, L AOA HEAT
(d) 6L21, PITOT HEAT R AUX
(e) 6L22, PITOT HEAT F/O MAIN
(f) 6L23, R AOA HEAT
(g) 6L24, TAT PROBE HEAT

S 445-024
(3) Do the activation procedure for the thrust reverser (Ref 78-31-00/201).

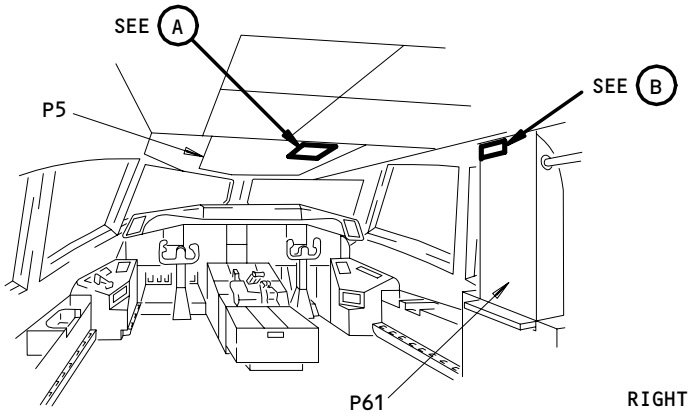
S 865-023

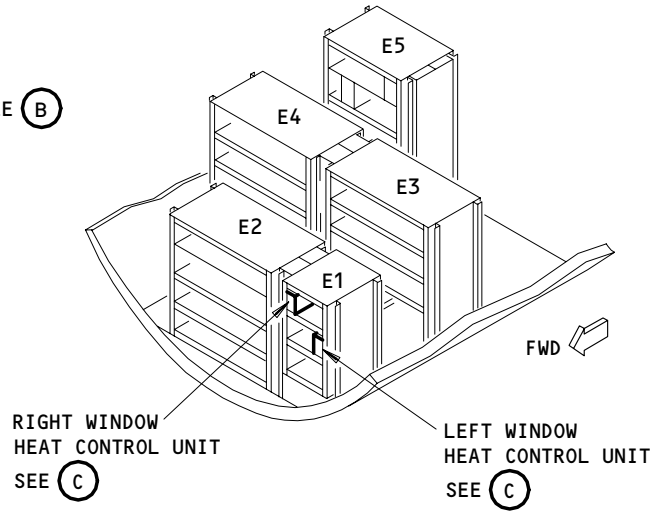
(4) Remove electrical power if it is not necessary (Ref 24-22-00/201).

FLIGHT COMPARTMENT WINDOW ANTI-ICING - DESCRIPTION AND OPERATION

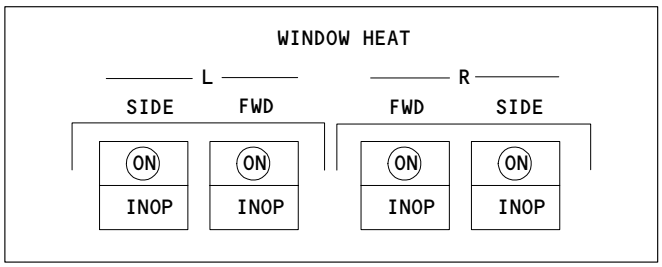
1. General
   A. The captain's and first officer's No. 1, No. 2 and No. 3 windows are heated. The main components are the windows, window heat control units, the window heat control panel, and the miscellaneous test panel. System power comes from the main left 28-volt dc bus, and the main left and right 115-volt ac buses.
2. Component Details (Fig. 1)
   A. Windows
      (1) A conductive film or wire net between the outer pane and the core provides electrical heating of the window.
   B. Window Heat Control Unit (WHCU)
      (1) Two window heat control units (WHCUs), each with built-in-test equipment (BITE), regulate heating and isolate system failures. The left WHCU is on shelf 2 of left forward equipment center rack E1. The right WHCU is on shelf 1 of E1. BITE pushbuttons, fault indicating lights, and BITE instructions are on the unit face.
      (2) The WHCU uses 200 volts (No. 1 window) and 115 volts (No. 2 and 3 windows) ac power for heating. Twenty-eight volt dc power is used by the WHCUs for system testing.
   C. Window Heat Control Panel
      (1) Window heat control panel M10395 is located on pilots' overhead panel P5. The panel contains four WINDOW HEAT switches to control window heating.
   D. Miscellaneous Test Panel
      (1) Miscellaneous test panel M10398 provides for testing of the window heat system. The test panel is on right side panel P61.
3. Operation
   A. Functional Description (Fig. 2, 3, and 4)
      (1) Each window has its own control channel, temperature sensor, and heater. The control channel regulates power to the window heater in response to demands from the sensor. The sensor keeps window temperature at a preset value.
      (2) Each window heat control unit (WHCU) contains one front (No. 1) window channel and the opposite two side (No. 2 and No. 3) window channels.
      (3) Pressing the WINDOW HEAT switches on window heat control panel M10395 to ON turns on window heating. These are push on/push off switches which latch in when ON. Each switch contains a white ON light and an amber INOP light.
      (4) The L and R FWD switches control heat to the respective No. 1 windows. The L and R SIDE switches control heat to the respective No. 2 and 3 windows.
      (5) The amber INOP switchlight illuminates to indicate a failure in the heating channels controlled by that switch. A window heat failure also causes a message to appear on the EICAS display (Ref 31-41-00).

         NOTE: INOP light may illuminate with outside ambient temperatures above 85°F (29.5°C).



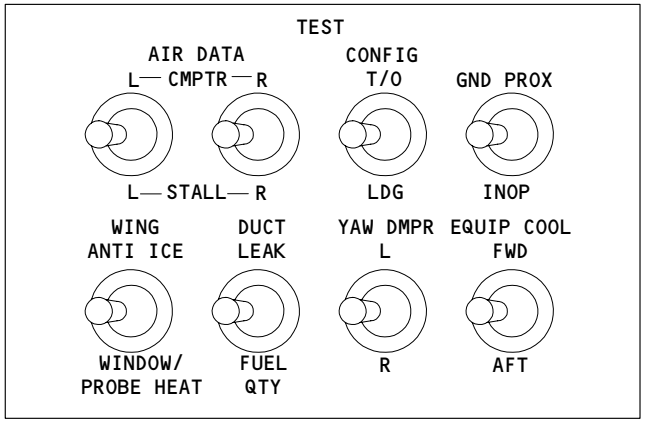


MAIN EQUIPMENT CENTER



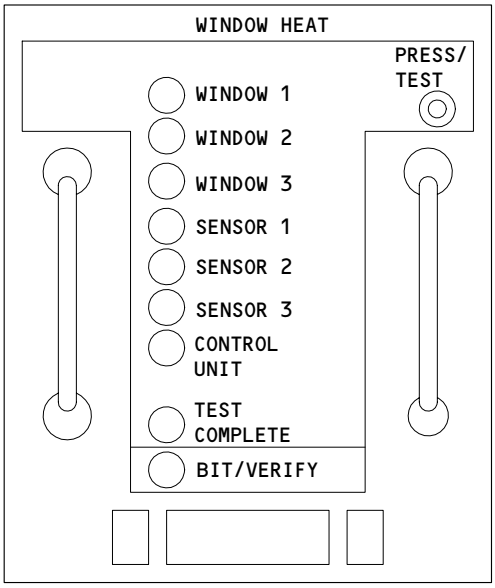
M10395 WINDOW HEAT CONTROL PANEL (P5)

A



M10398 MISCELLANEOUS TEST PANEL (P61)

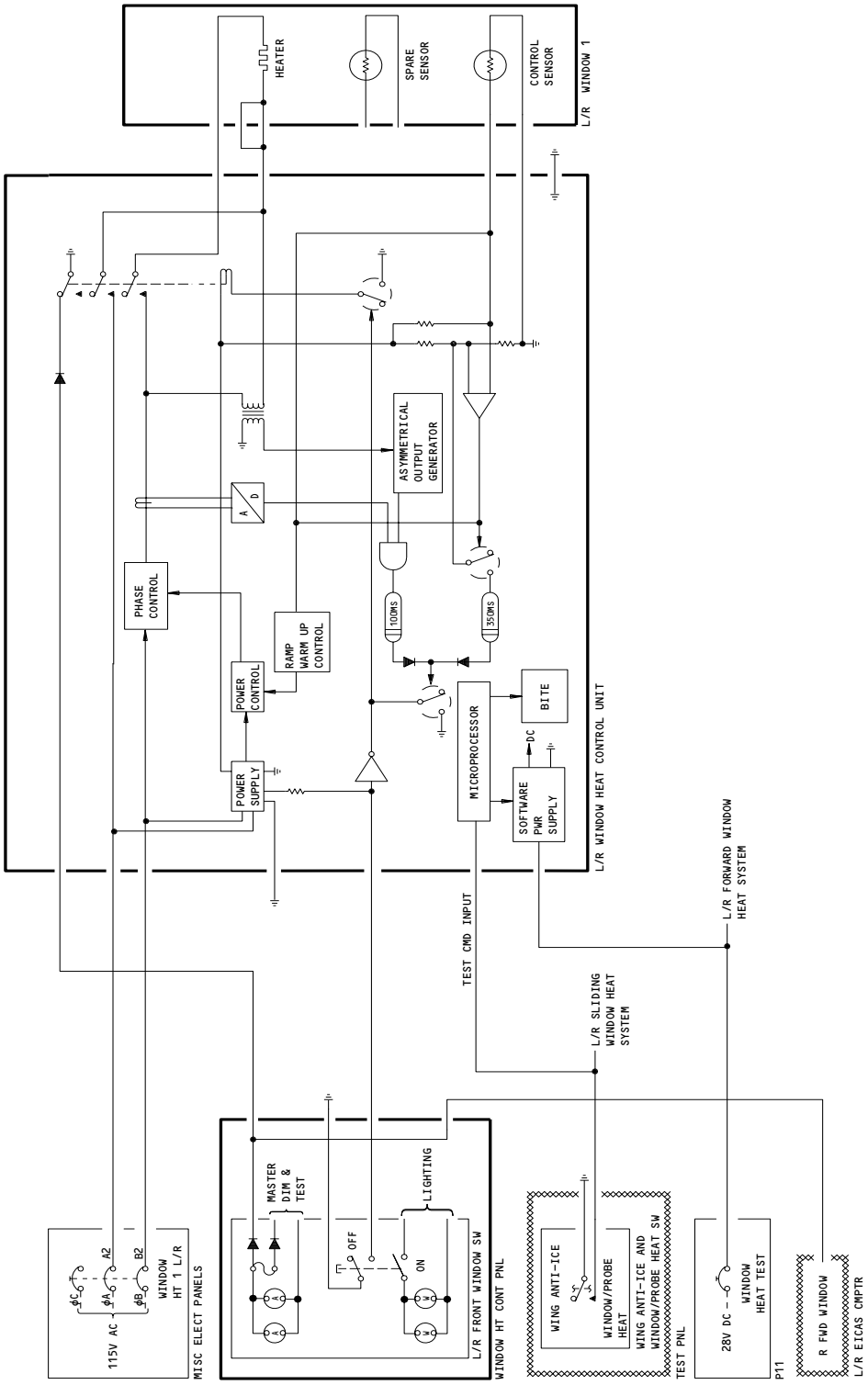
B



WINDOW HEAT CONTROL UNIT M191/M192

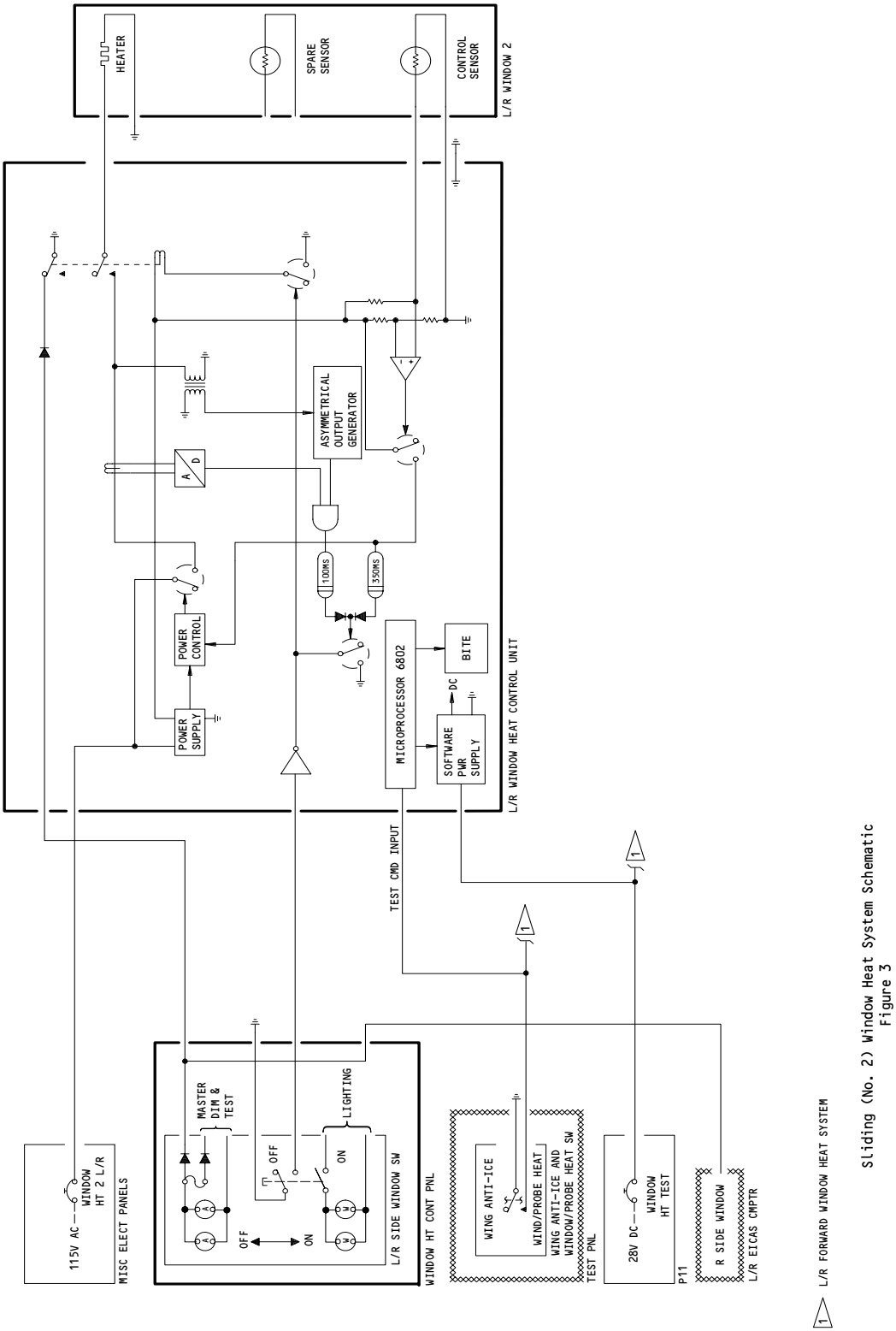
C

Flight Compartment Window Anti-Icing Component Location
Figure 1

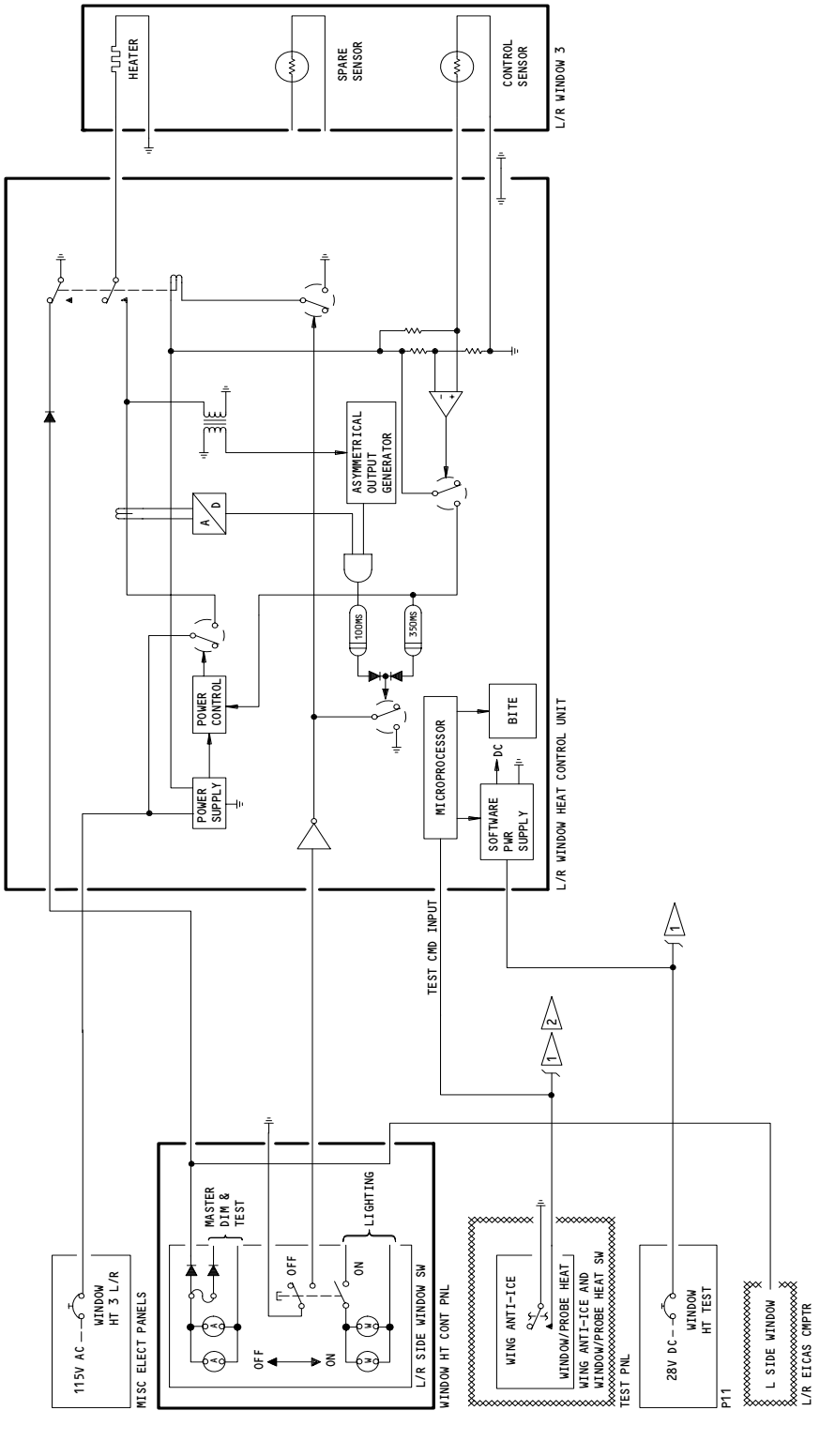


Forward (No. 1) Window Heat System Schematic
Figure 2

55620



Sliding (No. 2) Window Heat System Schematic
Figure 3



Side (No. 3) Window Heat System Schematic
Figure 4

(6) No. 1 Windows

(a) The No. 1 windows are electrically heated to prevent icing and fogging. Each No. 1 window channel can supply from zero to 4000 watts of power to its heater, to keep window temperature at 95°F (32.8°C). After ramp warm-up, the amount of power to the heaters depends on the error between the desired window temperature of 95°F (32.8°C) and actual window temperature. The further the actual temperature is below the desired temperature, the larger the power to the window heater.

(b) To prevent thermal shock to a cold window, ramp warm-up is applied to the window before full power is applied to it. After six minutes, full power to a No. 1 window is reached, ramp operation ceases and the proportional mode starts.

(7) No. 2 and No. 3 Windows

(a) The No. 2 and No. 3 windows are electrically heated to prevent fogging. Power to the side window (No. 2 and No. 3) heaters is not continuously modulated as for the front window (No. 1) heaters. The side window control channels operate either on or off. When a side window channel is on, 800 watts is supplied to its heater. The heater is not powered when its channel is off.

(b) When the temperature sensor in a side window senses a temperature of 105°F (40.6°C), the control channel will cause its side window heater to turn off. When the side window temperature is below 100°F (37.8°c), the control channel comes on and supplies power to the heaters. The side windows are not warmed up before full power is applied.

(8) System Protection

(a) Circuits in the window heat control unit (WHCU) continuously monitor the status of the control unit, window sensors, and window heaters. The controller power line feeding each window heater contains a fail-safe relay which opens (removing heater power) due to any of the following conditions present for more than 350 milliseconds: input power not present, shorted sensor, open sensor, overheat, demand without heat, heat without demand, asymmetrical output, power on with switch in off position. Any of these conditions cause the failed channels INOP light on the window heat contol panel to illuminate and message to appear on the EICAS display (Ref 31-41-00).

B. Ground Test (Fig. 2, 3, and 4)

(1) The ground test of the window heat system requires the four WINDOW HEAT switches to be ON (latched-in). The system is tested by the WING ANTI-ICE WINDOW/PROBE HEAT switch on the miscellaneous test panel. The switch is a momentary action, center off type. The test is done by holding the switch in the WINDOW/PROBE HEAT position. Each window heat control unit (WHCU) performs a continuity check of its window heaters, a resistance check (open/short test) of its temperature sensors, and a check of its own functions. The overheat circuits are checked last. Successful completion of this test causes the amber INOP lights on the window heat control panel to illuminate. When all four INOP lights are illuminated the system is OK. Both WHCUs (all six window channels) are reset to normal flight condition by releasing the WING ANTI-ICE WINDOW/PROBE HEAT switch. (The switch returns to the center position.) The test takes 3 seconds.

(2) Window Heat Control Unit Testing

(a) Failure of an INOP light to illuminate during the ground test indicates a system failure. The failed channels are then associated with the switch containing the off light. The WHCU controlling the failed channel is then tested to find the defective channel components.

(b) Built in test equipment of the WHCU is started by pressing the BIT/VERIFY pushbutton on the front of the unit. If no fault is found, only the TEST COMPLETE light on the WHCU will be illuminated. The unit returns automatically to normal flight condition within three minutes of test initiation. If a fault is found, the defective component is indicated by the appropriate light on the unit.

(c) The lights on the WHCU are checked by pressing the PRESS/TEST pushbutton. All lights should be illuminated.

C. Control

(1) To place system in operation, apply electrical power to main ac buses (Ref 24-22-00).

(2) Make sure these circuit breakers are closed on the miscellaneous relay panel P70:

(a) WINDOW HTR 1L
(b) WINDOW HTR 2R
(c) WINDOW HTR 3R

(3) Make sure these circuit breakers are closed on the right miscellaneous electrical equipment panel P37:

(a) WINDOW HTR 1R
(b) WINDOW HTR 2L
(c) WINDOW HTR 3L

(4) Make sure these circuit breakers are closed on the overhead circuit breaker panel P11:

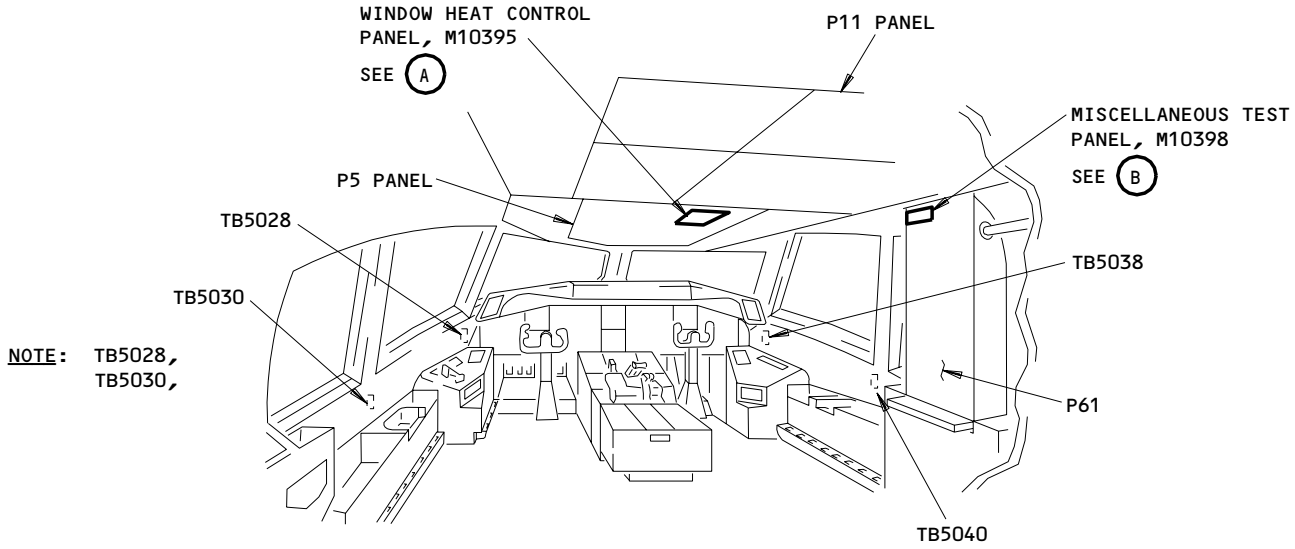
(a) WINDOW HEAT TEST

FLIGHT COMPARTMENT WINDOW ANTI-ICING SYSTEM

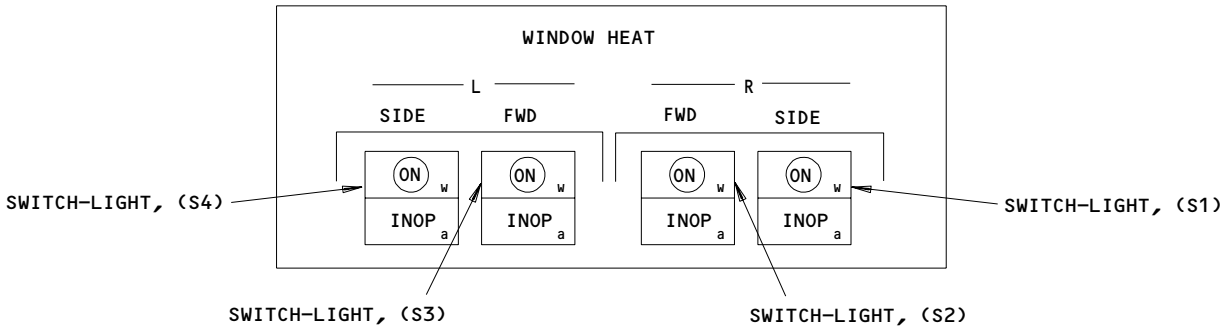
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER -	1		FLT COMPT, P11	
WINDOW HEAT TEST, C1128		1	11R15	*
CIRCUIT BREAKER -			119BL, MAIN EQUIPT CTR, P37	
WINDOW HTR 1R, C392		1	37J2	*
WINDOW HTR 2L, C1124		1	37E3	*
WINDOW HTR 3L, C1126		1	37E4	*
CIRCUIT BREAKER -			119BL, MAIN EQUIPT CTR, P70	
WINDOW HTR 1L, C391		1	70C13	*
WINDOW HTR 2R, C1125		1	70A3	*
WINDOW HTR 3R, C1127		1	70A4	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
PANEL - (FIM 30-32-00/101)				
MISC TEST, M10398				
PANEL - WINDOW HEAT CONTROL, M10395		1	FLT COMPT, P5	30-41-02
SWITCH-LIGHT - WINDOW HEAT L FWD, S3	1	1	FLT COMPT, P5, M10395, WINDOW HEAT CONTROL PANEL	*
SWITCH-LIGHT - WINDOW HEAT R FWD, S2	1	1	FLT COMPT, P5, M10395, WINDOW HEAT CONTROL PANEL	*
SWITCH-LIGHT - WINDOW HEAT R SIDE, S1	1	1	FLT COMPT, P5, M10395, WINDOW HEAT CONTROL PANEL	*
SWITCH-LIGHT - WINDOW HEAT L SIDE, S4	1	1	FLT COMPT, P5, M10395, WINDOW HEAT CONTROL PANEL	*
SWITCH - (FIM 30-32-00/101)				
WINDOW/PROBE HEAT TEST, S5				
UNIT - L WINDOW HEAT CONTROL, M191	2	1	119BL, MAIN EQUIPT CTR, E1-2	30-41-01
UNIT - R WINDOW HEAT CONTROL, M192	2	1	119BL, MAIN EQUIPT CTR, E1-1	30-41-01

* SEE THE WDM EQUIPMENT LIST

Flight Compartment Window Anti-Icing System - Component Index
Figure 101

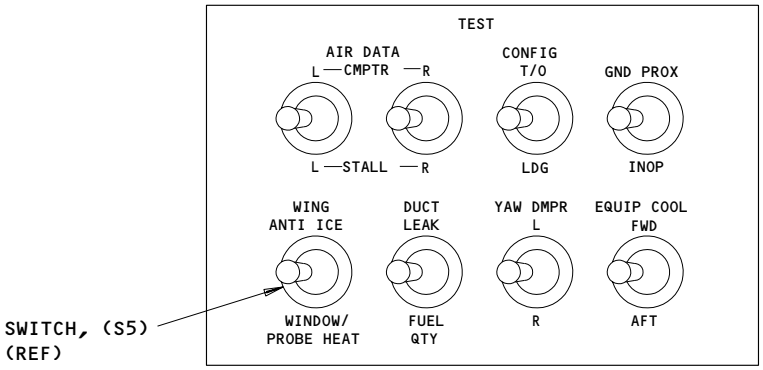


FLIGHT COMPARTMENT



WINDOW HEAT CONTROL PANEL, M10395

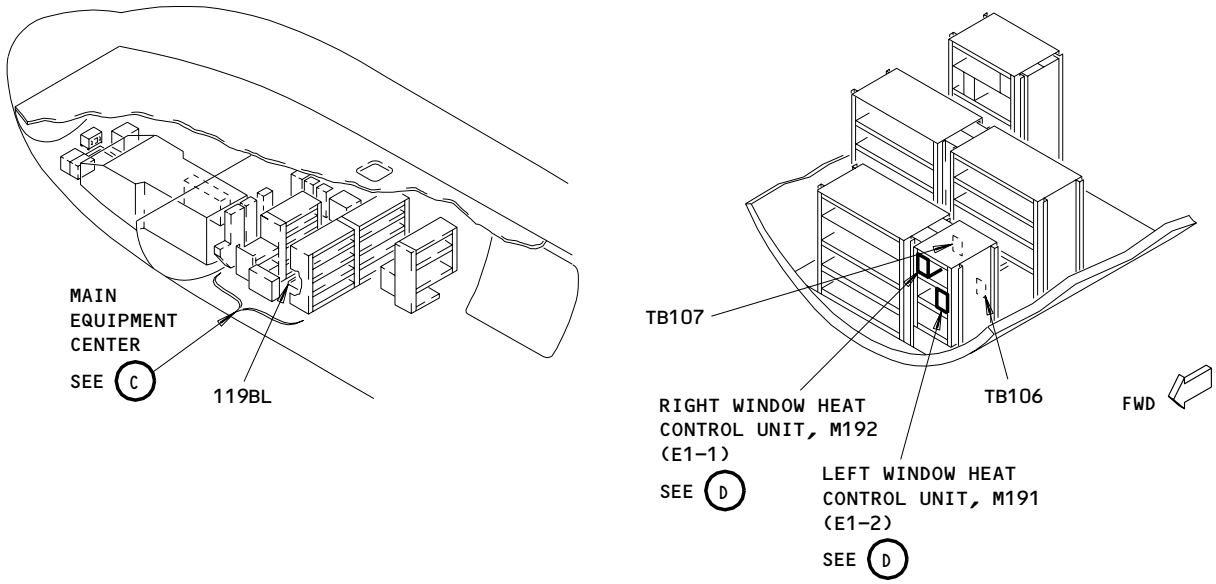
A



MISCELLANEOUS TEST PANEL, M10398 (REF)

B

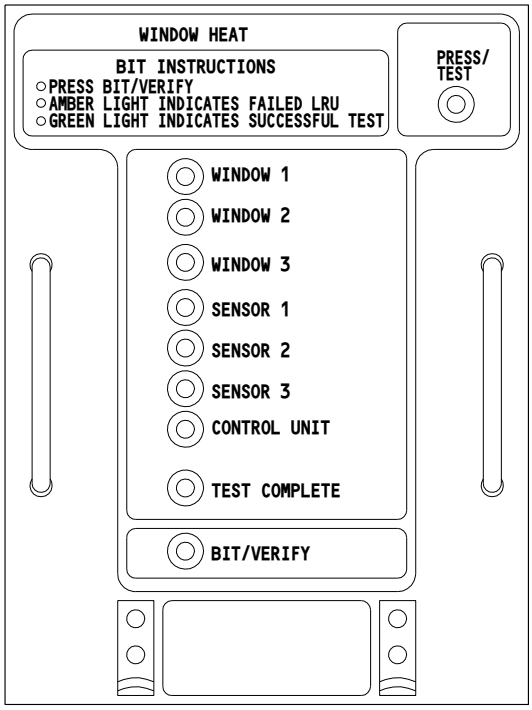
Flight Compartment Window Anti-Icing System - Component Location
Figure 102 (Sheet 1)



NOTE: IF INSTALLED, TB106 AND TB107 ARE AT THE REAR OF THE E1 SHELF.

MAIN EQUIPMENT CENTER

C



NOTE: THIS UNIT IS NOT ELECTROSTATIC SENSITIVE.

LEFT OR RIGHT WINDOW HEAT CONTROL UNIT, M191 OR M192

D

Flight Compartment Window Anti-Icing System - Component Location
Figure 102 (Sheet 2)

FLIGHT COMPARTMENT WINDOW ANTI-ICING - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first task is an operational test of the window anti-icing system for the flight compartment. The second task is a test of the resistances of the window heater element loop.
   B. The tests are done on the flight deck and in the main E/E equipment bay, with only the test equipment on the airplane.
   C. This procedure includes the resistance values for the window heater element. You can use these resistance values to find if the window heating element loop has the correct specification. These values are only for checks made across the window heater terminals.

TASK 30-41-00-715-001

2. Operational Test - Flight Compartment Window Anti-Icing System
   A. References
      (1) 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
      (2) 24-22-00/201, Electrical Power - Control
      (3) 31-41-00/501, Engine Indication and Crew Alerting System (EICAS)
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Control Cabin - Section 41

      (2) Access Panel
          119BL E/E Bay Access Door

   C. Prepare for the Test

      S 865-002
      (1) Supply electrical power (Ref 24-22-00).

      S 715-003
      (2) Make sure the Engine Indication and Crew Alerting System (EICAS) is serviceable (Ref 31-41-00).

      S 215-004
      (3) Make sure the four WINDOW HEAT switches on the window heat control panel M10395 (panel P5) are in the OFF position.

      S 215-005
      (4) Make sure the amber INOP lights in each switch are on.

      S 215-006
      (5) Make sure the EICAS message, WINDOW HEAT, shows on the top EICAS display on panel P2.

S 865-007
(6) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
(a) 6L15, PITOT HEAT CAPT MAIN
(b) 6L16, PITOT HEAT L AUX
(c) 6L17, L AOA HEAT
(d) 6L21, PITOT HEAT R AUX
(e) 6L22, PITOT HEAT F/O MAIN
(f) 6L23, R AOA HEAT
(g) 6L24, TAT PROBE HEAT

D. Test - Flight Compartment Window Anti-Icing System

S 865-008
(1) Put the four WINDOW HEAT switches on the M10395 panel (panel P5) in the ON position.

S 215-009
(2) Make sure the white ON lights in each switch are on.

NOTE: The amber INOP light in each switch must be off.

S 215-010
(3) Make sure these messages do not show on the top EICAS display on panel P2:
(a) L FWD WINDOW
(b) L SIDE WINDOW
(c) R FWD WINDOW
(d) R SIDE WINDOW
(e) WINDOW HEAT

S 865-018
(4) Hold the WING ANTI-ICE WINDOW/PROBE HEAT switch on the M10398 panel (panel P61) in the WINDOW/PROBE HEAT position.

S 215-017
(5) Make sure the amber INOP lights in each WINDOW HEAT switch come on after approximately three seconds.

S 865-016
(6) Release the WING ANTI-ICE WINDOW/PROBE HEAT switch.

S 215-015
(7) Make sure each INOP light in the four WINDOW HEAT switches (panel P5) are off.

S 015-014
(8) Open the E/E bay access door 119BL (Ref 06-41-00).

S 865-013
(9) Find the Window Heat Control Units (WHCUs) in the main E/E equipment bay.

NOTE: WHCU M191 is on shelf E1-2 and WHCU M192 is on shelf E1-1.

S 865-012
(10) Push the PRESS/TEST switch on the front of the WHCU.

S 215-011
(11) Make sure all the indicators on the front of the WHCU come on.

NOTE: There are seven amber LEDs and one green LED on the front of the WHCU.

S 865-019
(12) Release the PRESS/TEST switch.

S 865-020
(13) Push and hold the BIT/VERIFY switch on the front of the WHCU.

S 215-021
(14) Make sure the green TEST COMPLETE light comes on in approximately 10 seconds.

S 865-022
(15) Release the BIT/VERIFY switch.

S 215-023
(16) Do the last six steps again for the other WHCU.

E. Put the Airplane Back to Its Usual Condition

S 415-024
(1) Close the E/E bay access door 119BL.

S 865-025
(2) Remove the DO-NOT-CLOSE tags and close these P6 panel circuit breakers:
(a) 6L15, PITOT HEAT CAPT MAIN
(b) 6L16, PITOT HEAT L AUX
(c) 6L17, L AOA HEAT
(d) 6L21, PITOT HEAT R AUX
(e) 6L22, PITOT HEAT F/O MAIN
(f) 6L23, R AOA HEAT
(g) 6L24, TAT PROBE HEAT

S 865-026
(3) Put the four WINDOW HEAT switches on the M10395 panel (panel P5) in the OFF position.

S 865-027
(4) Remove electrical power, if it is not necessary (Ref 24-22-00).

TASK 30-41-00-765-028

3. Test - Window Heater Element Loop Resistances

NOTE: The resistance values given do not change much with changes in the ambient temperature.

A. References
(1) 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Prepare for the Test

S 865-029
(1) Remove electrical power (Ref 24-22-00).

S 865-030
(2) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
(a) 6L15, PITOT HEAT CAPT MAIN
(b) 6L16, PITOT HEAT L AUX
(c) 6L17, L AOA HEAT
(d) 6L21, PITOT HEAT R AUX
(e) 6L22, PITOT HEAT F/O MAIN
(f) 6L23, R AOA HEAT
(g) 6L24, TAT PROBE HEAT

D. Procedure - Window Heater Element Loop Resistances Test (Fig. 501)

S 035-031

CAUTION: MAKE SURE THE WINDOW HEAT TERMINAL BLOCKS ARE HELD IN POSITION WHEN YOU CONNECT OR DISCONNECT THE ELECTRIAL CONNECTORS. THIS PREVENTS DAMAGE TO THE TERMINALS ON THE WINDOWS.

(1) Disconnect the applicable electrical connectors for the flight compartment window.

NOTE: It is not necessary to remove protective covers from the window heat electrical connectors when you remove the electrical connectors.

S 765-032

(2) Make sure the resistances for the window heating element loop are as shown in Table 501.
   (a) For No. 1 window, measure the resistances for the window heating element loop between power terminals J1 to J5 or J4 to J5 (Fig. 501).

S 435-033

CAUTION: MAKE SURE THE WINDOW HEAT TERMINAL BLOCKS ARE HELD IN POSITION WHEN YOU CONNECT OR DISCONNECT THE ELECTRICAL CONNECTORS. THIS PREVENTS DAMAGE TO THE TERMINALS ON THE WINDOWS.

(3) Connect the electrical connectors to the window terminals.

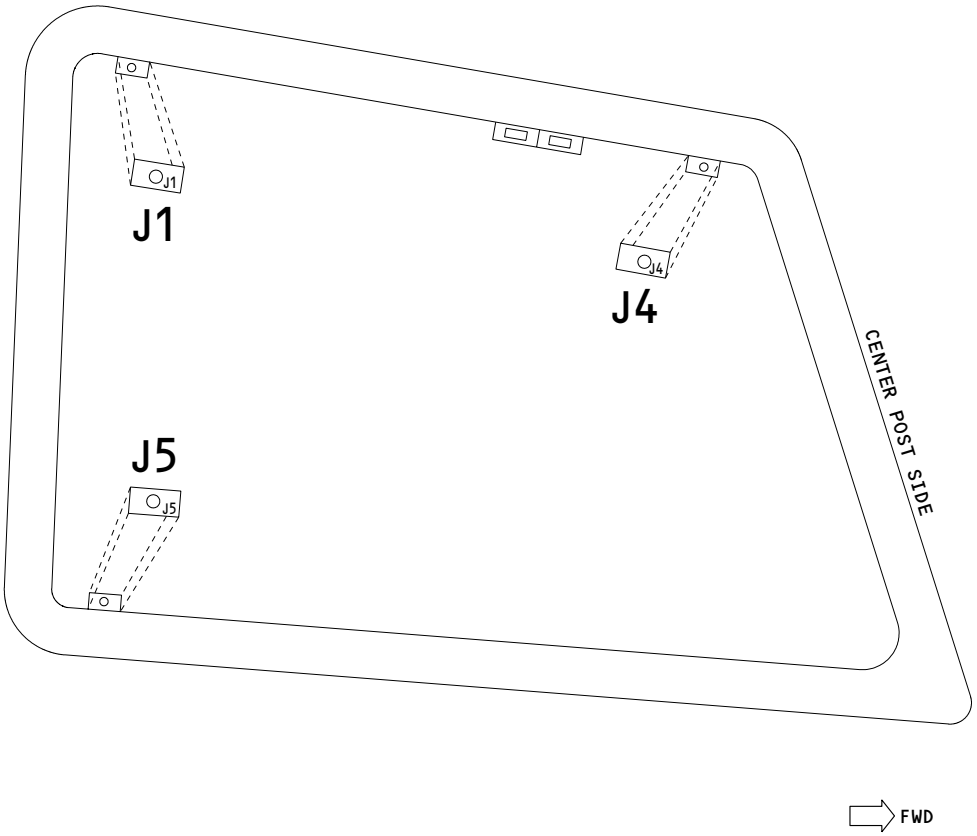
S 435-034

WARNING: INSTALL PROTECTIVE COVERS ON ALL WINDOW TERMINAL ELECTRICAL CONNECTORS. EXPOSED WINDOW HEAT ELECTRICAL CONNECTORS ARE AT HIGH VOLTAGE POTENTIALS AND CAN CAUSE INJURY TO PERSONS.

(4) Make sure you install the protective covers on all window terminal electrical connectors.

S 865-035

(5) Remove the DO-NOT-CLOSE tags and close these P6 panel circuit breakers:
   (a) 6L15, PITOT HEAT CAPT MAIN
   (b) 6L16, PITOT HEAT L AUX
   (c) 6L17, L AOA HEAT
   (d) 6L21, PITOT HEAT R AUX
   (e) 6L22, PITOT HEAT F/O MAIN
   (f) 6L23, R AOA HEAT
   (g) 6L24, TAT PROBE HEAT



BAC-291 LEFT SIDE SHOWN
(BAC-292 RIGHT SIDE OPPOSITE)
(INBOARD SURFACE SHOWN)

Power Terminals - No. 1 Window
Figure 501

M33536

Table 501		
WINDOW	RESISTANCE (OHMS)	NOMINAL OPERATING VOLTAGE (VOLTS)
No. 1	11.15 max/9.12 min	186
*[1] No. 2	28.2 max/23.0 min	109
*[2] No. 2	25.9 max/19.1 min	109
*[1] No. 3	38.5 max/31.5 min	109
*[2] No. 3	29.6 max/21.8 min	109

*[1] WINDOWS WITH WIRE RESISTANCE HEATERS
*[2] WINDOWS WITH ELECTRICALLY CONDUCTIVE COATING

FLIGHT COMPARTMENT WINDOW ANTI-ICING - APPROVED REPAIRS

1. General
   A. This procedure contains one task. The task is the connection of the spare window temperature sensor.
   B. The captain's and first officer's No.1, No.2, and No.3 windows are electrically heated. Each window has a control and a spare temperature sensor.
   C. This procedure gives the steps necessary to disconnect the defective control temperature sensor and connect the spare temperature sensor. If none of the sensors operate, you must replace the window.

TASK 30-41-00-408-001

2. Connect the Spare Window Temperature Control Sensor (Fig. 801)
   A. References
      (1) AMM 24-22-00/201, Control
      (2) WDM 30-41-11, WDM 30-41-12
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

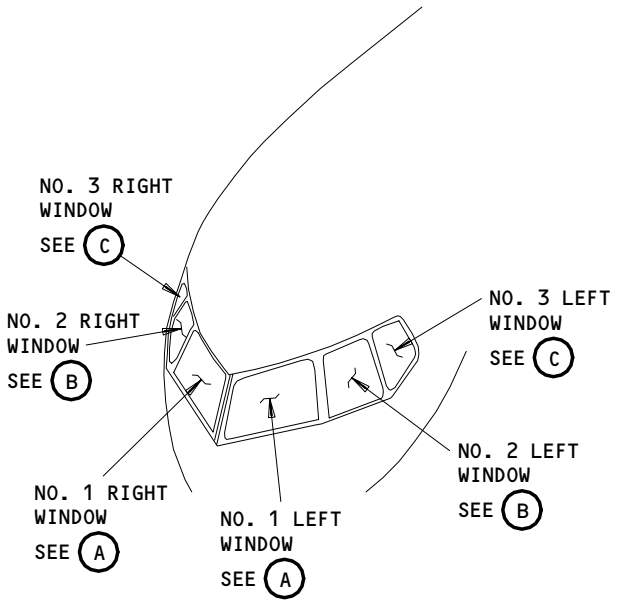
      S 868-002
      (1) For the No. 1 left (1L) window, open this circuit breaker on the Misc. Relay Panel, P70, and attach a DO-NOT-CLOSE tag:
          (a) 70C13, WINDOW HTR 1L

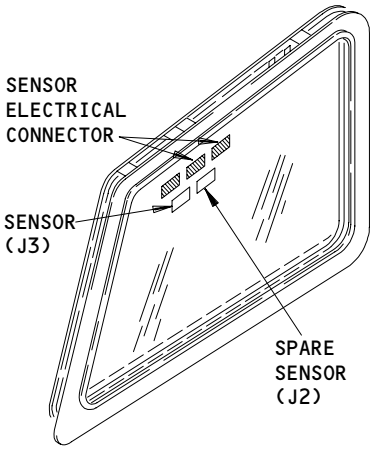
      S 868-004
      (2) For the No. 2 left (2L) window, open this circuit breaker on the Right Misc. Electrical Equipment panel, P37, and attach a DO-NOT-CLOSE tag:
          (a) 37E5, WINDOW HTR 2L

      S 868-005
      (3) For the No. 3 left (3L) window, open this circuit breaker on the Right Misc. Electrical Equipment panel, P37, and attach a DO-NOT-CLOSE tag:
          (a) 37E4, WINDOW HTR 3L

      S 868-006
      (4) For the No. 1 right (1R) window, open this circuit breaker on the Right Misc. Electrical Equipment panel, P37, and attach a DO-NOT-CLOSE tag:
          (a) 37J2, WINDOW HTR 1R

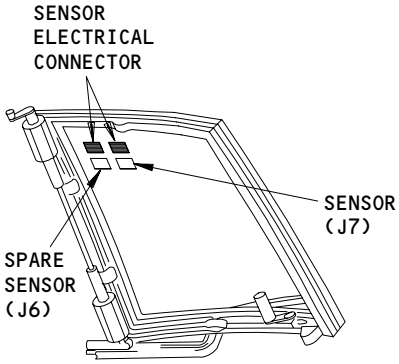
      S 868-007
      (5) For the No. 2 right (2R) window, open this circuit breaker on the Misc. Relay Panel, P70, and attach a DO-NOT-CLOSE tag:
          (a) 70A3, WINDOW HTR 2R





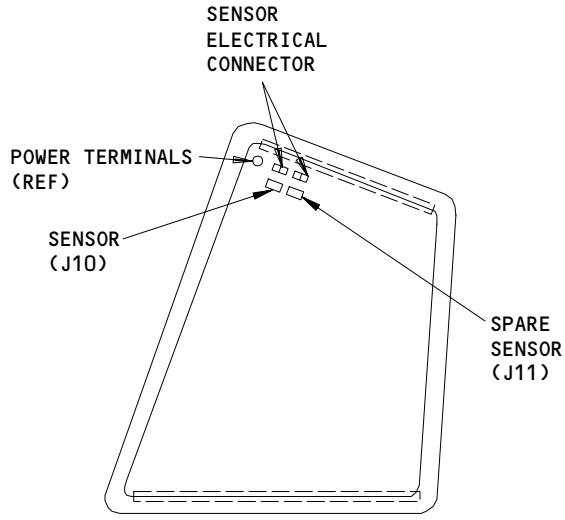
NO. 1 WINDOWS

A



NO. 2 WINDOWS

B



NO. 3 WINDOWS

C

Flight Compartment Window Temperature Sensor Connections
Figure 801

676163

S 868-009

(6) For the No. 3 right (3R) window, open this circuit breaker on the Misc. Relay Panel, P70, and attach a DO-NOT-CLOSE tag:
(a) 70A4, WINDOW HTR 3R

S 908-030

(7) For the No. 1L and No. 3R Windows (WDM 30-41-11, WDM 30-41-12):
(a) Locate the connectors on the window which are used for each temperature sensor.
(b) Label both electrical connectors for the control and spare temperature sensors (WDM 30-41-11, WDM 30-41-12).

NOTE: Use care when working on the connectors mounted on the windows. Replacement of the connectors is not possible. The window and connector must be replaced together.

CAUTION: DO NOT APPLY TOO MUCH TORQUE TO THE SCREWS. TOO MUCH TORQUE COULD CAUSE DAMAGE TO THE TERMINALS.
DO NOT APPLY TOO LITTLE TORQUE TO THE SCREWS. TOO LITTLE TORQUE COULD CAUSE ELECTRICAL ARCING AND SMOKE IN THE COCKPIT.
DO NOT GUESS, USE THE APPROPRIATE TOOLING TO ACCURATELY MEASURE THE TORQUE. HOLD THE TERMINAL WHILE TIGHTENING THE SCREWS.

(c) Connect the electrical connector that was connected to the control sensor to the spare sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).
(d) Connect the electrical connector that was connected to the spare sensor to the control sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).

S 908-027

(8) For the No. 1R and No. 3L Windows (WDM 30-41-11, WDM 30-41-12):
(a) Locate the connectors on the window which are used for each sensor.
(b) Label the electrical connectors from the control and spare temperature sensors (WDM 30-41-11, WDM 30-41-12).

NOTE: Use care when working on the connectors mounted on the windows. Replacement of the connectors is not possible. The window and connector must be replaced together.

CAUTION: DO NOT APPLY TOO MUCH TORQUE TO THE SCREWS. TOO MUCH TORQUE COULD CAUSE DAMAGE TO THE TERMINALS.
DO NOT APPLY TOO LITTLE TORQUE TO THE SCREWS. TOO LITTLE TORQUE COULD CAUSE ELECTRICAL ARCING AND SMOKE IN THE COCKPIT.
DO NOT GUESS, USE THE APPROPRIATE TOOLING TO ACCURATELY MEASURE THE TORQUE. HOLD THE TERMINAL WHILE TIGHTENING THE SCREWS.

(c) Connect the electrical connector that was connected to the control sensor to the spare sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).
(d) Connect the electrical connector that was connected to the spare sensor to the control sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).

S 908-028
(9) For the No. 2L Window (WDM 30-41-12) or the No. 2R Window (WDM 30-41-11):
(a) Label the electrical connectors for the control and spare temperature sensors (WDM 30-41-11, WDM 30-41-12).
(b) Remove four screws to disconnect the electrical connectors from the control and spare sensors.

CAUTION: DO NOT APPLY TOO MUCH TORQUE TO THE SCREWS. TOO MUCH TORQUE COULD CAUSE DAMAGE TO THE TERMINALS.
DO NOT APPLY TOO LITTLE TORQUE TO THE SCREWS. TOO LITTLE TORQUE COULD CAUSE ELECTRICAL ARCING AND SMOKE IN THE COCKPIT.
DO NOT GUESS, USE THE APPROPRIATE TOOLING TO ACCURATELY MEASURE THE TORQUE. HOLD THE TERMINAL WHILE TIGHTENING THE SCREWS.

(c) Connect the electrical connector that was connected to the control sensor to the spare sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).
(d) Connect the electrical connector that was connected to the spare sensor to the control sensor.
1) Tighten the screws that connect the electrical wires to the sensor to 12-15 inch-pounds (1.35-1.69 Nm).

S 868-017
(10) For the No. 1 left (1L) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70C13, WINDOW HTR 1L

S 868-019
(11) For the No. 2 left (2L) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37E5, WINDOW HTR 2L

S 868-020
(12) For the No. 3 left (3L) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37E4, WINDOW HTR 3L

S 868-021
(13) For the No. 1 right (1R) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37J2, WINDOW HTR 1R

S 868-022
(14) For the No. 2 right (2R) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70A3, WINDOW HTR 2R

S 868-024
(15) For the No. 3 right (3R) window, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P70 panel:
(a) 70A4, WINDOW HTR 3R

S 718-026

(16) Do a test on the temperature control sensor connections:

(a) Supply electrical power (AMM 24-22-00/201).

(b) Push the BIT/VERIFY switch on the window heat control unit.

(c) Make sure the TEST COMPLETE light on the window heat control unit comes on after 5 seconds.

(d) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

WINDOW HEAT CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the heat control unit for the windows. The second task is the installation of the heat control unit for the windows.
   B. The heat control unit, M191, for the left forward/right side window is on shelf 2 of the left forward equipment center rack, E1. The heat control unit, M192, for the right forward/left side window is on shelf 1 of E1. The removal/installation procedure is the same for the two heat control units.

TASK 30-41-01-004-001

2. Remove the Heat Control Unit
   A. References
      (1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
      (2) AMM 20-10-01/401, E/E Rack Mounted Components
      (3) AMM 20-41-01/201, Electrostatic Sensitive Devices
      (4) AMM 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Control Cabin - Section 41

      (2) Access Panel
          119BL E/E Bay Access Door

   C. Procedure

      S 014-003
      (1) Open the E/E bay access door 119BL (AMM 06-41-00/201).

      S 864-004
      (2) If you remove the heat control unit, M191, for the left forward/right side window, do these steps:
          (a) Open these circuit breakers on the miscellaneous electrical equipment panel, P7O, and attach DO-NOT-CLOSE tags:
              1) 7OA3, WINDOW HTR 2R
              2) 7OA4, WINDOW HTR 3R
              3) 7OC13, WINDOW HTR 1L

      S 864-006
      (3) If you remove the heat control unit, M192, for the right forward/left side window, do this step:
          (a) Open these circuit breakers on the right miscellaneous electrical equipment panel, P37, and attach DO-NOT-CLOSE tags:
              1) 37E3, WINDOW HTR 2L
              2) 37E4, WINDOW HTR 3L
              3) 37J2, WINDOW HTR 1R

S 014-007

(4) Get access to the heat control units (WHCU) in the main E/E equipment bay.

NOTE: WHCU M191 is on shelf E1-2 and WHCU M192 is on shelf E1-1.

S 024-008

CAUTION: DO NOT TOUCH THE HEAT CONTROL UNITS BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01/201). ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE HEAT CONTROL UNITS.

(5) Remove the applicable heat control unit (AMM 20-10-01/401).

TASK 30-41-01-404-009

3. Install the Heat Control Unit

A. References

(1) AMM 06-41-00/201, Fuselage (Major Zones 100 and 200) Access Doors and Panels
(2) AMM 20-10-01/401, E/E Rack Mounted Components
(3) AMM 20-41-01/201, Electrostatic Sensitive Devices
(4) AMM 24-22-00/201, Electrical Power - Control

B. Access

(1) Location Zones

119/120 Main Equipment Center
211/212 Control Cabin - Section 41

(2) Access Panel

119BL E/E Bay Access Door

C. Procedure

S 424-010

CAUTION: DO NOT TOUCH THE HEAT CONTROL UNITS BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01/201). ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE HEAT CONTROL UNITS.

(1) Install the heat control unit (AMM 20-10-01/401).

S 864-012

(2) If you installed the heat control unit, M191, for the left forward/right side window do these steps:
   (a) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
      1) 70C13, WINDOW HTR 1L
      2) 70A3, WINDOW HTR 2R
      3) 70A4, WINDOW HTR 3R (70A4)

S 864-014

(3) If you installed the heat control unit, M192, for the right forward/left side window do this step:
   (a) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
      1) 37E3, WINDOW HTR 2L
      2) 37E4, WINDOW HTR 3L
      3) 37J2, WINDOW HTR 1R

S 714-015

(4) Do a test on the installation of the heat control unit:
   (a) Supply electrical power to the main AC buses (AMM 24-22-00/201).
   (b) Push the BIT/VERIFY switch on the heat control unit.
   (c) Make sure the TEST COMPLETE light on control unit comes on after about 2 ±0.5 seconds and stays on approximately 20 seconds.
   (d) Close the E/E bay access door 119BL (AMM 06-41-00/201).
   (e) Remove electrical power if it is not necessary (AMM 24-22-00/201).

WINDOW HEAT CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the window heat control panel, M10395. The second task is the installation of the window heat control panel, M10395.
   B. The window heat control panel is on the pilots' overhead panel, P5. In this procedure, the window heat control panel is referred to as the control panel.

TASK 30-41-02-004-001

2. Remove the Control Panel
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

      S 864-003
      (1) Open these circuit breakers on the miscellaneous electrical equipment panel, P70, and attach DO-NOT-CLOSE tags:
          (a) 70A3, WINDOW HTR 2R
          (b) 70A4, WINDOW HTR 3R
          (c) 70C13, WINDOW HTR 1L

      S 864-004
      (2) Open these circuit breakers on the right miscellaneous electrical equipment panel, P37, and attach DO-NOT-CLOSE tags:
          (a) 37E3, WINDOW HTR 2L
          (b) 37E4, WINDOW HTR 3L
          (c) 37J2, WINDOW HTR 1R

      S 864-005
      (3) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11P2, L IND LTS 2
          (b) 11P29, R IND LTS 2
          (c) 11R15, WINDOW HEAT TEST

      S 024-006
      (4) Remove the control panel.

TASK 30-41-02-404-007

3. Install the Control Panel
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Procedure

S 424-008
(1) Install the control panel.

S 864-009
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 864-012
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-013
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11P2, L IND LTS 2
(b) 11P29, R IND LTS 2
(c) 11R15, WINDOW HEAT TEST

S 714-014
(5) Do a test of the control panel installation:
(a) Supply electrical power to the main AC buses (AMM 24-22-00/201).
(b) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
1) 6L13 or 6L14 or 6L15, PITOT HEAT CAPT MAIN

2) 6L14 or 6L15 or 6L16, PITOT HEAT L AUX
3) 6L17, L AOA HEAT
4) 6L21, PITOT HEAT R AUX
5) 6L22, PITOT HEAT F/O MAIN
6) 6L23, R AOA HEAT
7) 6L24, TAT PROBE HEAT

(c) Push the four switches on the control panel to the ON position.
1) Make sure the white ON lights in the switches are on.

(d) Hold the WING ANTI-ICE WINDOW/PROBE HEAT switch on the M10398 miscellaneous test panel in the WINDOW/PROBE HEAT position.

NOTE: The M10398 panel is on right side panel P61.

(e) Make sure the amber INOP light in each WINDOW HEAT switch comes on after about three seconds.

(f) Release the WING ANTI-ICE WINDOW/PROBE HEAT switch.

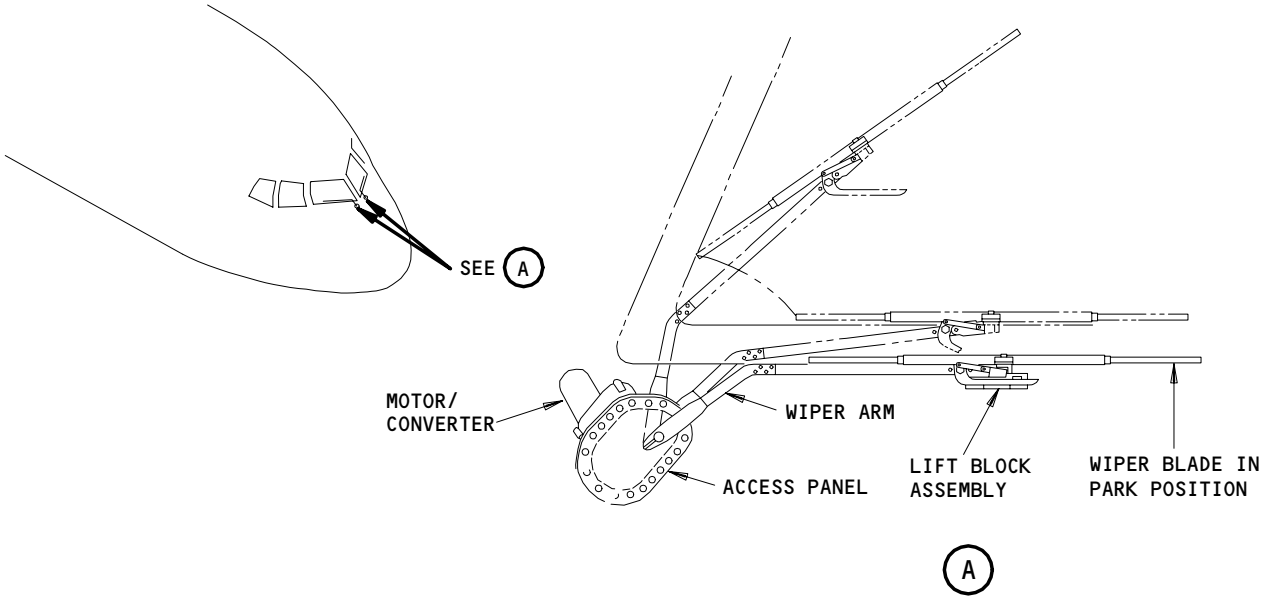
(g) Put the four WINDOW HEAT switches to the off position.
1) Make sure the amber INOP light in each switch is on.

(h) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
1) 6L13 or 6L14 or 6L15, PITOT HEAT CAPT MAIN
2) 6L14 or 6L15 or 6L16, PITOT HEAT L AUX
3) 6L17, L AOA HEAT
4) 6L21, PITOT HEAT R AUX
5) 6L22, PITOT HEAT F/O MAIN
6) 6L23, R AOA HEAT
7) 6L24, TAT PROBE HEAT

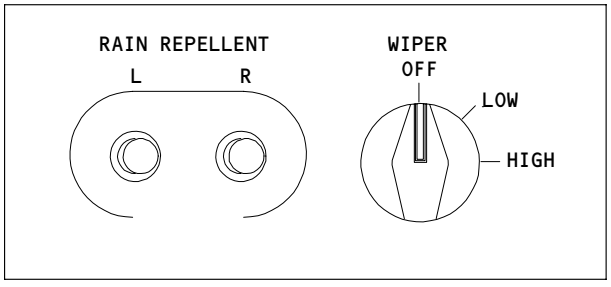
(i) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

WINDSHIELD WIPER SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Two windshield wipers clear the captain's and first officer's No. 1 windows during takeoff, approach, and landing in rain or snow. Each wiper is driven by a separate motor to ensure clear vision through one window if one motor fails. System components include: the windshield wiper/rain repellent control panel, windshield wiper motor/converter, windshield wiper arm, and windshield wiper blades. The system uses main left and right 28-volt dc power, through circuit breakers on overhead circuit breaker panel P11.
2. Component Details (Fig. 1)
   A. Windshield Wiper/Rain Repellent Control Panel
      (1) Windshield wiper/rain repellent control panel M10023 is on pilots' overhead panel P5. The control panel contains a switch to control the windshield wiper system. Switches controlling the rain repellent system are also on the panel.
   B. Windshield Wiper Motor/Converter
      (1) The two windshield wipers are driven by separate motor/converters. The motor/converter is a single unit. Each unit is mounted to an access panel below its respective window.
      (2) The rotary motion of the motor is changed by the converter to produce the sweeping motion of the wiper arm. The motor runs at low or high speed, depending on the wiper speed chosen by a switch setting in the flight deck. A parking switch in the motor/converter sets the wiper blade to the park position when the wiper is turned off. The windshield motors use 28-volts dc power. A connector on each unit supplies power and control.
   C. Windshield Wiper Arm
      (1) The wiper arm connects the output shaft of the motor/converter to the wiper blade.
   D. Windshield Wiper Blade
      (1) The wiper blade consists of a wiper edge connected to a metal channel. This channel attaches to the wiper arm.
3. Operation
   A. Functional Description (Fig. 2)
      (1) Windshield wiper/rain repellent control panel M10023 contains one rotary WIPER switch controlling both windshield wipers. The switch has OFF, LOW, and HIGH settings.
      (2) The LOW and HIGH positions change the speed at which the wiper blades are driven on the windshield.



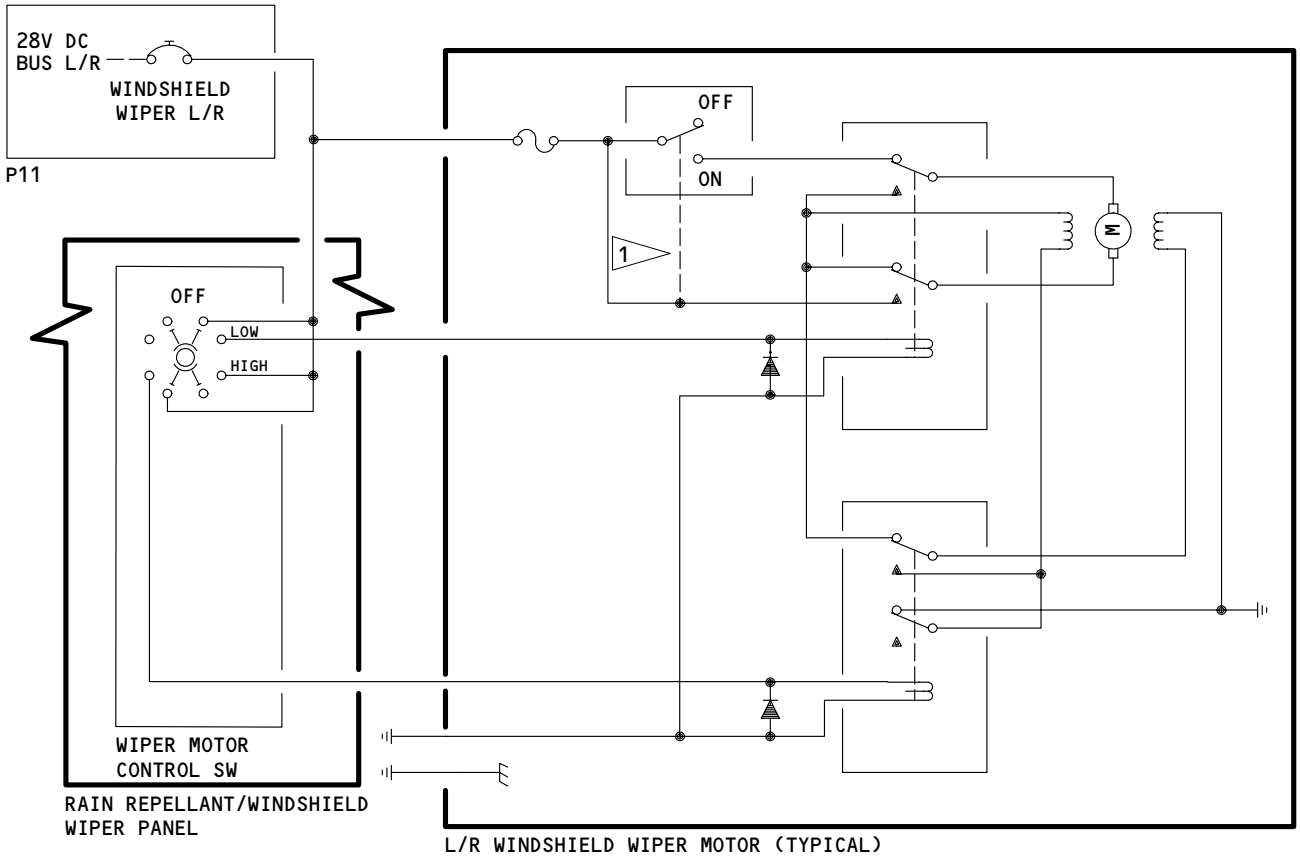
FLIGHT COMPARTMENT



WINDSHIELD WIPER/RAIN REPELLENT CONTROL PANEL (P5)

B

Windshield Wiper System - Component Location
Figure 1



1 AFTER SELECTING "WIPER OFF" WIPER MOTOR CONTROL SWITCH REMAINS IN ON POSITION UNTIL WIPERS ARE PARKED

Windshield Wiper System Schematic Diagram
Figure 2

(3) In the OFF position, the park switch in each motor/converter closes. This causes the blades to position themselves on the lift blocks at the bottom of each windshield. To prevent dirt from building up between each blade and its window, the blades sit about 0.3-inch above the surface.

B. Control

(1) To place system in operation, apply electrical power to main ac buses (Ref 24-22-00).

(2) Check that the WSHLD WIPER R and WSHLD WIPER L circuit breakers on overhead circuit breaker panel P11 are closed.

WINDSHIELD WIPER SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ARM - WINDSHIELD WIPER	1	2	L&R OUTER FWD WINDOW SILL AREA	30-42-03
BLADE - WINDSHIELD WIPER	1	2	L&R OUTER FWD WINDOW SILL AREA	30-42-03
CIRCUIT BREAKER -			FLT COMPT, P11	
WSHLD WIPER LEFT, C1143		1	11R13	*
WSHLD WIPER RIGHT, C1144		1	11R22	*
MOTOR/CONVERTER - LEFT, M237	1	2	L FWD WINDOW SILL AREA	30-42-02
MOTOR/CONVERTER - RIGHT, M238	1	1	R FWD WINDOW SILL AREA	30-42-02
PANEL - WINDSHIELD WIPER/RAIN REPELLENT, M10023	1	1	FLT COMPT, P5	30-42-01

* SEE THE WDM EQUIPMENT LIST

Windshield Wiper System - Component Index
Figure 101

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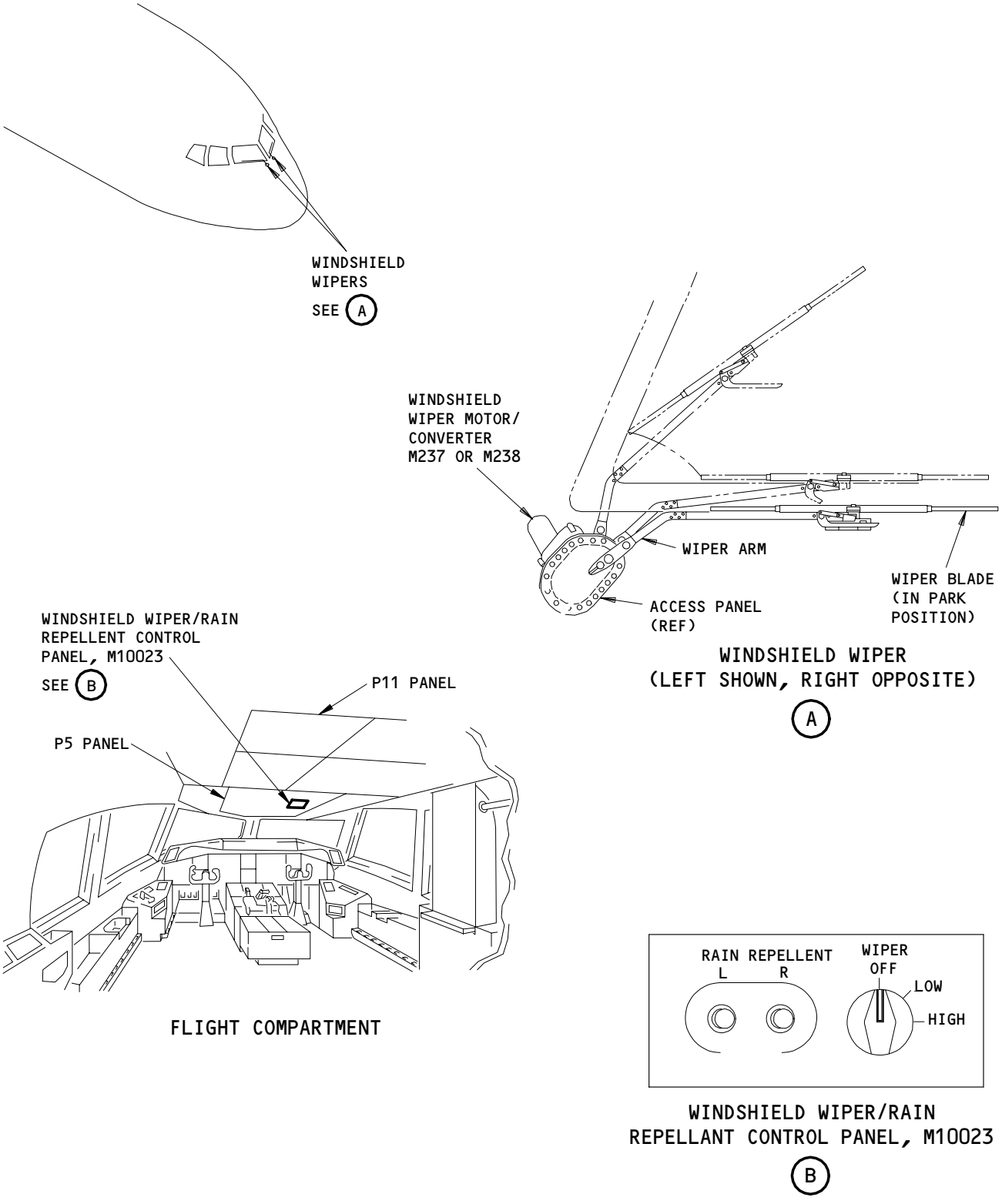


Windshield Wiper System – Component Location
Figure 102

WINDSHIELD WIPER SYSTEM - ADJUSTMENT/TEST

1. General
   A. This section contains two tasks. The first task is an Operational Test of the Windshield Wiper System. The second task is the Adjustment of the Windshield Wiper System.
   B. The operational test makes sure that the windshield wiper system is serviceable with only the equipment installed in the airplane.
   C. The adjustment procedures included in this section are wiper sweep and speed adjustment, wiper arm/blade park position adjustment, and wiper arm pressure adjustment.

TASK 30-42-00-715-001

2. Operational Test - Windshield Wiper System
   A. General
      (1) The Operational Check is to make sure of good windshield wiper system performance. It is not to prove adjustments or to substitute for the system test.
   B. References
      (1) 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zones
          211 Control cabin - section 41 (Left)
          212 Control cabin - section 41 (Right)
   D. Operational Check - Windshield Wipers

      S 865-002
      (1) Make sure the WIPER switch on the windshield wiper/rain repellent module on the pilots' overhead panel P5 is in the OFF position.

      S 865-003
      (2) Supply electrical power to the main ac buses (Ref 24-22-00).

      S 865-004

      CAUTION: DO NOT OPERATE THE WIPERS ON A DRY WINDSHIELD. THE WINDSHIELD CAN BE DAMAGED BY THE WIPER MOVEMENT.

      (3) Supply water to keep the windshield wet when the wipers are in operation.

      S 865-006
      (4) Put the WIPER switch on panel P5 in the HIGH position.

      S 715-007
      (5) Make sure the wipers move smoothly and freely at the high speed.

      S 715-008
      (6) Make sure the wiper sweep is on the windshield, and that the blades do not go over the windshield seal.

S 865-009
(7) Put the WIPER switch in the LOW position.

S 715-010
(8) Make sure the wipers move smoothly and freely at the low speed.

S 215-011
(9) Make sure the wiper blade is on the windshield and that the blades do not go over the windshield seal.

S 865-012
(10) Put the WIPER switch in the OFF position.

S 865-013
(11) Remove electrical power, if it is not necessary (Ref 24-22-00).

TASK 30-42-00-825-005

3. Adjustment of Windshield Wiper System

A. General
(1) This paragraph gives instructions to make sure the wiper system is correctly adjusted after you have done the Wiper Speed, Sweep, and Park Position and the Wiper Arm Pressure Adjustment/Tests.

B. Equipment
(1) Counter (0-300 strokes per minute) - Commercially available
(2) Spring scale - 0 to 20 pounds
(3) Sealing gun - 6-inch length cartridge
(4) Sealing compound cutting tool - hardwood or plexiglass
(5) Varnish brush - 1 or 2 inch
(6) Spatula
(7) Pad to prevent wiper arm from scratching windshield

C. Consumable Materials

(1) A00247 Sealing compound - BMS 5-95, Class B
(2) B00083 Aliphatic Naphtha - TT-N-95

D. References
(1) 24-22-00/201, Electrical Power - Control
(2) 30-42-02/401, Windshield Wiper Motor/Converter

E. Access
(1) Location Zones
211 Control cabin - section 41 (Left)
212 Control cabin - section 41 (Right)

F. Prepare for Adjustment/Test

S 865-049

WARNING: BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD WIPER SYSTEM, OPEN THE WINDOW HEAT CIRCUIT BREAKERS IN THE STEPS THAT FOLLOW. IF THESE CIRCUIT BREAKERS ARE NOT OPEN, YOU CAN GET AN ELECTRICAL SHOCK IF YOU TOUCH THE WINDSHIELD.

(1) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 865-018
(2) Open these circuit breakers on the miscellaneous electrical equipment panel, P70, and attach DO-NOT-CLOSE tags:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 865-019
(3) Make sure the WIPER switch on the windshield wiper/rain repellent panel (M10023) on the P5 panel is in the OFF position.

S 865-020
(4) Supply electrical power to the main ac buses (Ref 24-22-00).

S 865-021
(5) If you will adjust only the left wiper, do these steps:
(a) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
1) 11R22, WSHLD WIPER RIGHT
(b) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
1) 11R13, WSHLD WIPER LEFT

S 865-022
(6) If you will adjust only the right wiper, do these steps:
(a) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
1) 11R13, WSHLD WIPER LEFT
(b) Remove the DO-NOT-CLOSE tag and close this P11 panel circuit breaker:
1) 11R22, WSHLD WIPER RIGHT

G. Procedure - Wiper Arm Pressure Adjustment/Test

S 915-047

CAUTION: DO NOT OPERATE THE WIPERS ON A DRY WINDSHIELD. THE WINDSHIELD CAN BE DAMAGED BY THE WIPER MOVEMENT.

(1) Supply water to keep the windshield wet when the wipers are in operation.

S 865-030

(2) Put the WIPER switch on the P5 panel in the INT position.

NOTE: For wiper systems without INT setting use LOW setting and stop the windshield wipers in midstroke.

S 865-031

(3) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags to stop the windshield wipers in the midstroke.
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 915-032

(4) Stop the flow of water to the windshield.

S 485-033

(5) Connect a spring scale to the locknut that holds the blade to the wiper arm.

S 735-034

CAUTION: DO NOT LIFT THE ARM TOO FAR. IF YOU LIFT THE ARM TOO FAR, DAMAGE TO THE ARM CAN OCCUR.

(6) Slowly pull the scale perpendicular from the windshield surface, until the arm is off of the windshield surface or touches at only one tip. Make sure the scale indicates 15 ±1 pounds.

S 085-035

(7) Remove the spring scale.

S 825-036

(8) If the wiper pressure was not 15 ±1 pounds, do the steps that follow:
(a) If it is necessary, remove the sealing compound from the head of the pressure adjusting bolt on the wiper arm hub.
(b) Clean the pressure adjusting bolt with a brush and fresh aliphatic naphtha. Dry the area with a clean cloth.
(c) If the blade pressure was low, tighten the adjusting bolt. If the blade pressure was too high, loosen the bolt.

(d) Make sure the wiper arm pressure is 15 ±1 pounds, and adjust it again if it is necessary.

H. Procedure - Wiper Arm Speed Test (Fig. 501)

S 915-023

CAUTION: DO NOT OPERATE THE WIPERS ON A DRY WINDSHIELD. THE WINDSHIELD CAN BE DAMAGED BY THE WIPER MOVEMENT.

(1) Supply water to keep the windshield wet when the wipers are in operation.

S 865-025

(2) Put the WIPER switch on the P5 panel in the LOW position and do the steps that follow:
(a) Make sure the wiper operates at a minimum of 130 sweeps per minute.

NOTE: A sweep is considered the travel of a wiper from the park position to the top of the window, or from the top of the window to the park position.

(b) Make sure the wiper moves smoothly and effectively.
(c) Make sure the wiper sweep is on the windshield and that the blade does not go over the windshield seal (Fig. 501).

S 865-024

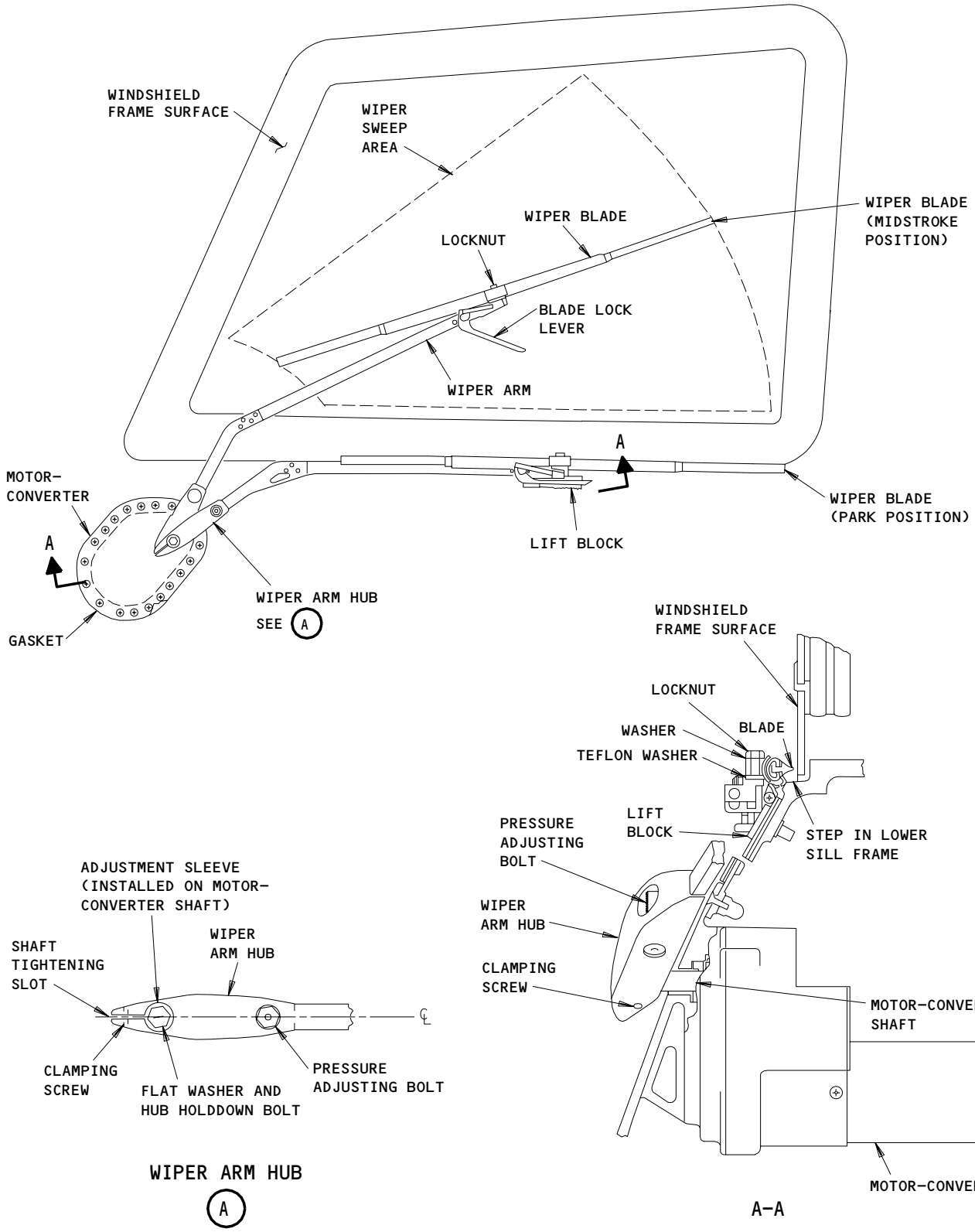
(3) Put the WIPER switch on the P5 panel in the HIGH position and do the steps that follow:
(a) Make sure the wiper operates at a minimun of 185 sweeps per minute.
(b) Make sure the wiper operates smoothly and effectively.
(c) Make sure the wiper sweep is on the windshield and that the blade does not go over the windshield seal (Fig. 501).

S 865-026

(4) Put the WIPER switch in the OFF position and do the steps that follow:
(a) Make sure the wiper arm is on the lift block to hold the wiper blade away from the windshield frame surface.

S 905-027

(5) If wiper speed was not within the limits, replace the motor-converter (Ref 30-42-02).



Windshield Wiper Arm and Blade
Figure 501

S 825-028
(6) If the wiper sweep or park position was not correct (Fig. 501), adjust them as follows:

I. Procedure - Sweep and Park Position Adjustment/Test
(Fig. 501)

S 865-052
(1) Put the wiper blade in the INT position before adjustment and shut off after one full cycle.

NOTE: For wiper systems without intermitent setting, use LOW setting.

(a) If it is necessary, remove the sealing compound from the head of the pressure adjusting bolt on the wiper arm hub (View A-A).
(b) If it is necessary, remove the sealing compound from the heads of the screws, bolts, and shaft tightening slot on the wiper arm hub.
(c) Loosen the pressure adjusting bolt to release the pressure from the wiper arm.
(d) Loosen the hub clamping screw.

CAUTION: DISCARD THE HUB HOLDDOWN BOLT. THE BOLT CAN BECOME LOOSE IF YOU USE THE BOLT AGAIN.

(e) Remove the hub holddown bolt and flat washer. Discard the hub holddown bolt.
(f) Remove the wiper arm and adjustment sleeve. Rotate the wiper arm hub and adjustment sleeve in the direction(s) necessary to move the wiper arm tip. See figure 502. Install the wiper arm and adjustment sleeve.

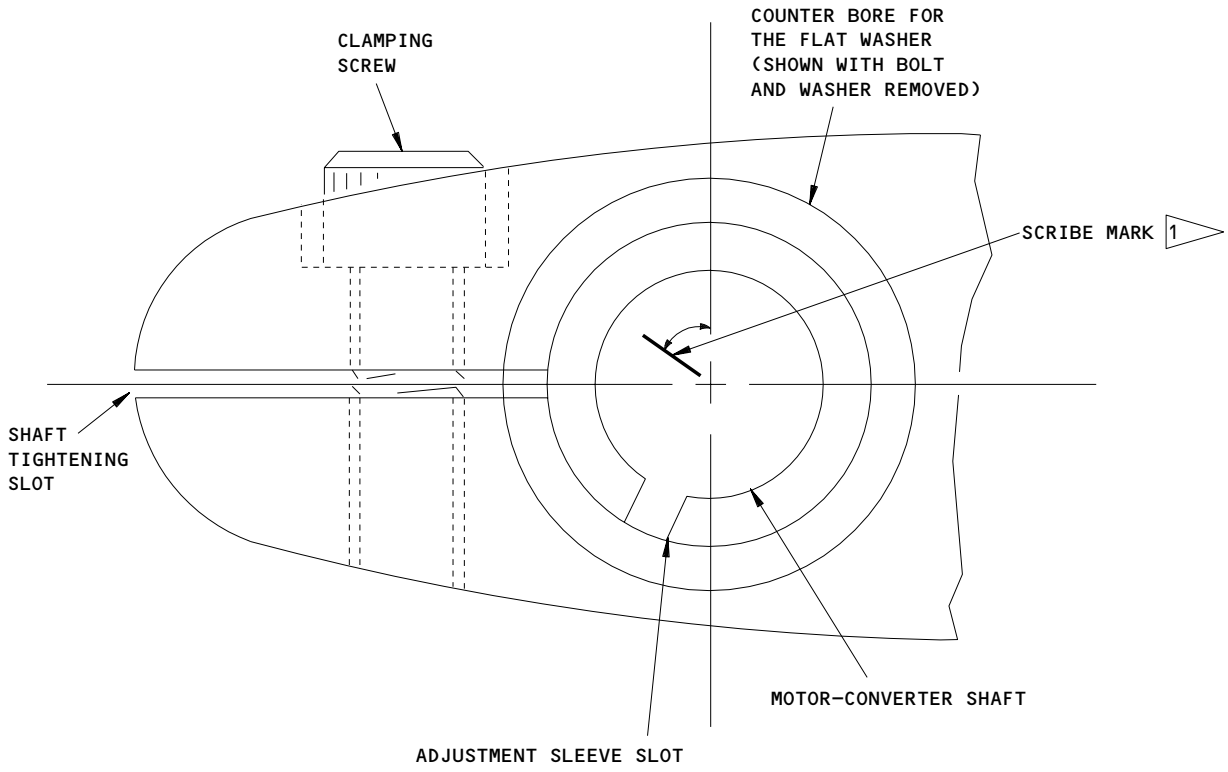
NOTE: It may take several adjustments to get the proper sweep pattern.

CAUTION: DISCARD THE HUB HOLDDOWN BOLT. THE BOLT CAN BECOME LOOSE IF YOU USE THE BOLT AGAIN.

(g) Install a new hub holddown bolt and the flat washer.
1) Tighten the hub holddown bolt to 20-30 inch-pounds.
(h) Tighten the hub clamping screw to 60-100 inch-pounds.
(i) Do the Wiper Arm Pressure Adjustment/Test paragraph.

J. Put the Airplane to its Usual Condition

S 395-037
(1) Apply sealing compound over the bolts and screws, and in the shaft tightening slot of the wiper arm hub. Use a spatula to get a smooth surface and to remove unwanted compound.



DESIRED BLADE TIP MOVEMENT INCHES (mm)	TURN THE BUSHING RELATIVE TO SHAFT	TURN THE ARM ASSEMBLY RELATIVE TO BUSHING
0.09 (2.29)	1 TOOTH IN THE DESIRED DIRECTION	1 TOOTH IN THE OPPOSITE DIRECTION
1.20 (30.48)	1/4 TURN IN THE DESIRED DIRECTION	IN THE OPPOSITE DIRECTION TO THE DESIRED POSITION WHERE THE ARM ENGAGES SPLINES ON THE BUSHING
2.40 (60.96)	1/2 TURN IN THE DESIRED DIRECTION	IN THE OPPOSITE DIRECTION TO THE DESIRED POSITION WHERE THE ARM ENGAGES SPLINES ON THE BUSHING
3.60 (91.44)	3/4 TURN IN THE DESIRED DIRECTION	IN THE OPPOSITE DIRECTION TO THE DESIRED POSITION WHERE THE ARM ENGAGES SPLINES ON THE BUSHING
4.67 (118.62)	NONE	1 TOOTH IN THE DESIRED DIRECTION
4.76 (120.90)	1 TOOTH IN THE DESIRED DIRECTION	NONE

1 INSTALL WIPER ARM WITH SLOTS IN LINE WITH THE SCRIBE MARK FOR INITIAL SWEEP CHECK. ADJUST AS NECESSARY ACCORING TO TABLE.

Windshield Wiper Arm and Blade - Adjustment
Figure 502

S 865-038
(2) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 865-041
(3) Remove the DO-NOT-CLOSE tags and close these P37 panel circuit breakers:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 865-042
(4) Remove the DO-NOT-CLOSE identifiers, and close the P70 panel circuit breakers that follow:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 865-043
(5) Remove electrical power if it is not necessary (Ref 24-22-00).

WINDSHIELD WIPER SYSTEM - INSPECTION/CHECK

1. General
   A. This procedure contains two tasks. The first task is an inspection of the windshield wiper arm. The second task is an inspection of the windshield wiper blade.

   TASK 30-42-00-206-001

2. Windshield Wiper Arm Inspection
   A. Consumable Materials
      (1) A00247 Sealant - BMS 5-95, Class B
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 30-42-02/401, Windshield Wiper Motor/Converter
      (3) AMM 30-42-03/401, Windshield Wiper Arm/Blade
      (4) AMM 51-31-01/201, Seals and Sealing
   C. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   D. Examine the Windshield Wiper Arm

      S 866-002
      (1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

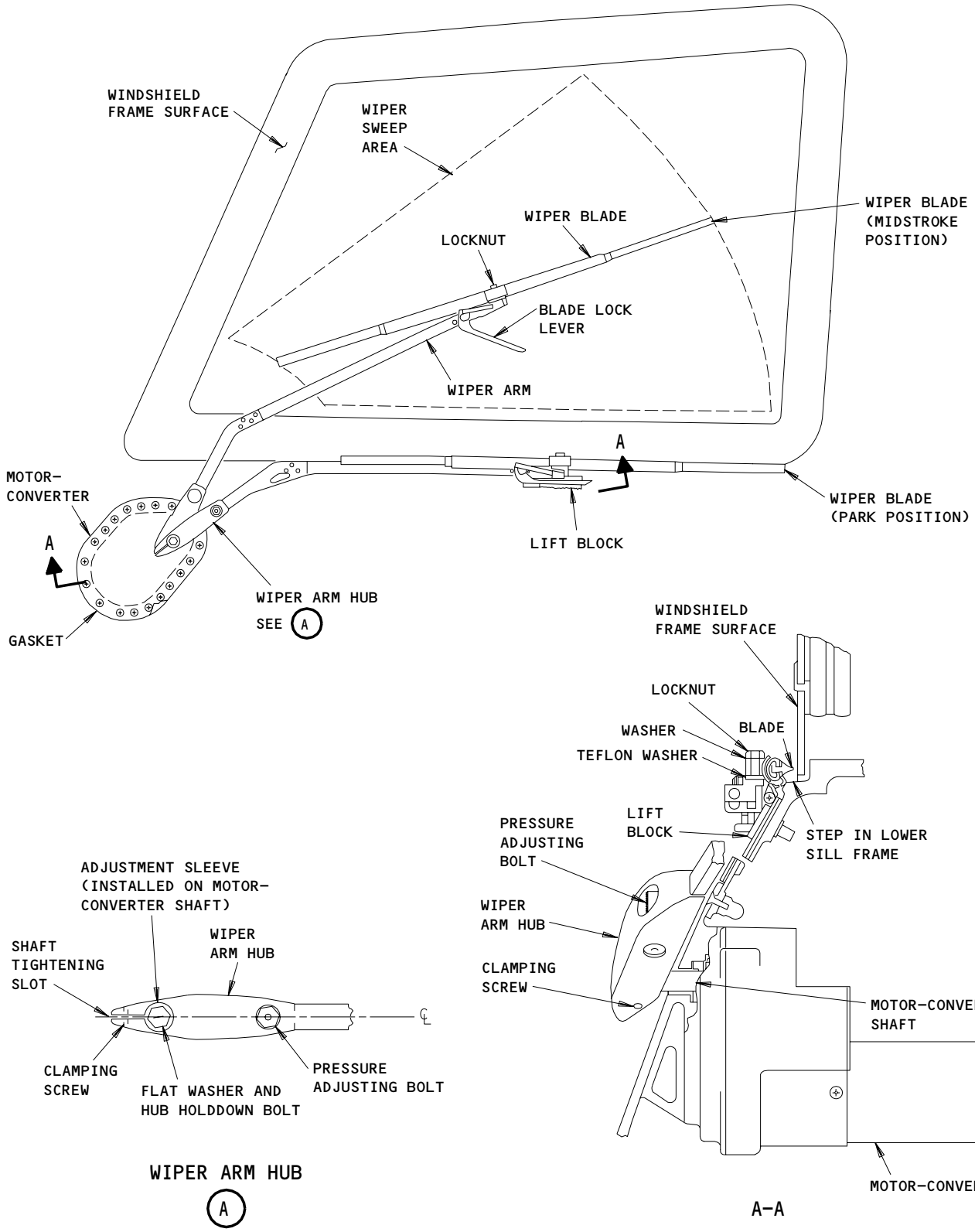
      S 866-003
      (2) Put the WIPER switch on the P5 panel in the OFF position to put the motor/converter unit in the park position.

      S 866-004
      (3) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11R13, WSHLD WIPER LEFT
          (b) 11R22, WSHLD WIPER RIGHT

      S 866-005

      WARNING: OPEN THE WINDOW HEAT CIRCUIT BREAKERS BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD WIPER SYSTEM. IF THE CIRCUIT BREAKERS ARE NOT OPEN DURING MAINTENANCE, PERSONS CAN GET AN ELECTRICAL SHOCK WHEN THEY TOUCH THE WINDSHIELD.

      (4) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
          (a) 37E3, WINDOW HTR 2L
          (b) 37E4, WINDOW HTR 3L
          (c) 37J2, WINDOW HTR 1R



Windshield Wiper Arm and Blade
Figure 601

S 866-008
(5) Open these circuit breakers on the miscellaneous electrical equipment panel, P70, and attach DO-NOT-CLOSE tags:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 216-009
(6) Examine the sealant.
(a) Remove all sealant that has cracks.

S 216-010
(7) Examine the wiper arm for corrosion and loose fasteners.
(a) If necessary, replace wiper arm (AMM 30-42-03/401).

S 216-011

CAUTION: DO NOT TIGHTEN THE HUB HOLDDOWN BOLT IF IT IS LOOSE. REPLACE IT. THE HUB HOLDDOWN BOLT CAN BECOME LOOSE IF IT IS USED AGAIN.

(8) Make sure the hub holddown bolt is tightly held to the motor/converter shaft (Fig. 601).
(a) If the hub holddown bolt is loose, replace it with a new bolt and tighten.

S 216-012
(9) Make sure the clamping screw is tight (Fig. 601).
(a) Tighten the clamping screw if necessary.

S 216-014
(10) Examine the motor/converter shaft for corrosion and wear (Fig. 601).
(a) If necessary, replace the motor/converter (AMM 30-42-02/401).

S 396-042
(11) If you removed sealant, apply new sealant. Put sealant over the bolts and screws and in the shaft tightening slot of the wiper arm hub (AMM 51-31-01/201).

S 866-043
(12) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 866-046
(13) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 866-047
(14) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P7O panel:
(a) 7OA3, WINDOW HTR 2R
(b) 7OA4, WINDOW HTR 3R
(c) 7OC13, WINDOW HTR 1L

S 866-048
(15) Remove electrical power, if it is not necessary.

TASK 3O-42-OO-2O6-O15

3. Windshield Wiper Blade Inspection

A. References
(1) AMM 24-22-OO/2O1, Electrical Power - Control
(2) AMM 3O-42-O3/4O1, Windshield Wiper Arm/Blade

B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Examine the Windshield Wiper Blade

S 866-O16
(1) Supply electrical power to the main AC buses (AMM 24-22-OO/2O1).

S 866-017
(2) Put the WIPER switch in the OFF position to put the motor/converter unit in the park position.

S 866-018
(3) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 866-019

WARNING: OPEN THE WINDOW HEAT CIRCUIT BREAKERS BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD WIPER SYSTEM. IF THE CIRCUIT BREAKERS ARE NOT OPEN DURING MAINTENANCE, PERSONS CAN GET AN ELECTRICAL SHOCK WHEN THEY TOUCH THE WINDSHIELD.

(4) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 866-023
(5) Open these circuit breakers on the miscellaneous electrical equipment panel, P7O, and attach DO-NOT-CLOSE tags:
(a) 7OA3, WINDOW HTR 2R
(b) 7OA4, WINDOW HTR 3R
(c) 7OC13, WINDOW HTR 1L

S 216-024

CAUTION: DO NOT LIFT THE WIPER ARM HIGHER THAN NECESSARY. DAMAGE TO THE WIPER ARM CAN OCCUR IF YOU LIFT IT TOO HIGH.

(6) Make sure the wiper blade is tightly attached to the wiper arm (Fig. 6O1).
(a) If necessary, tighten the locknut to 25-32 pound-inches.

S 216-025
(7) Make sure the wiper blade is not worn.
(a) If necessary, replace the wiper blade (AMM 3O-42-O3/4O1).

S 396-038
(8) If you removed sealant, apply new sealant. Put sealant over the bolts and screws and in the shaft tightening slot of the wiper arm hub (AMM 51-31-O1/2O1).

S 866-035
(9) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 866-036
(10) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 866-039
(11) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 866-037
(12) Remove electrical power, if it is not necessary.

WINDSHIELD WIPER/RAIN REPELLENT CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the windshield wiper/rain repellent control panel, M10023. The second task is the installation of the windshield wiper/rain repellent control panel, M10023.
   B. In this procedure, the windshield wiper/rain repellent control panel, M10023, is referred to as the control panel. It is on the pilots' overhead panel, P5.

TASK 30-42-01-004-001

2. Remove the Control Panel
   A. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   B. Procedure

      S 864-002
      (1) Open these circuit breakers on the overhead panel, P11 and attach DO-NOT-CLOSE tags:
          (a) 11R12, RAIN REPEL RIGHT
          (b) 11R13, WSHLD WIPER LEFT
          (c) 11R21, RAIN REPEL LEFT
          (d) 11R22, WSHLD WIPER RIGHT

      S 024-003
      (2) Remove the control panel.

TASK 30-42-01-404-004

3. Install the Control Panel
   A. Equipment
      (1) Water Source - to wet windshield during wiper operation.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control

C. Access
(1) Location Zones
211/212 Control Cabin - Section 41

D. Procedure

S 424-005
(1) Install the control panel.

S 864-006
(2) Remove the DO-NOT-CLOSE tags, and close these circuit breakers on the P11 panel:
(a) 11R12, RAIN REPEL RIGHT
(b) 11R13, WSHLD WIPER LEFT
(c) 11R21, RAIN REPEL LEFT
(d) 11R22, WSHLD WIPER RIGHT

S 714-007
(3) Do a test of the control panel installation:
(a) Supply electrical power (AMM 24-22-00/201).
(b) Use a water source to make the windshield wet.

CAUTION: DO NOT LET THE WIPERS OPERATE ON A DRY WINDSHIELD. WINDSHIELD DAMAGE CAN OCCUR.

(c) Turn the WIPER switch to the LOW position.
1) Make sure the two wipers operate correctly.
(d) Turn the WIPER switch to the OFF position.
(e) Remove the water source.
(f) Remove electrical power if it is not necessary (AMM 24-22-00/201).

WINDSHIELD WIPER MOTOR/CONVERTER - REMOVAL/INSTALLATION

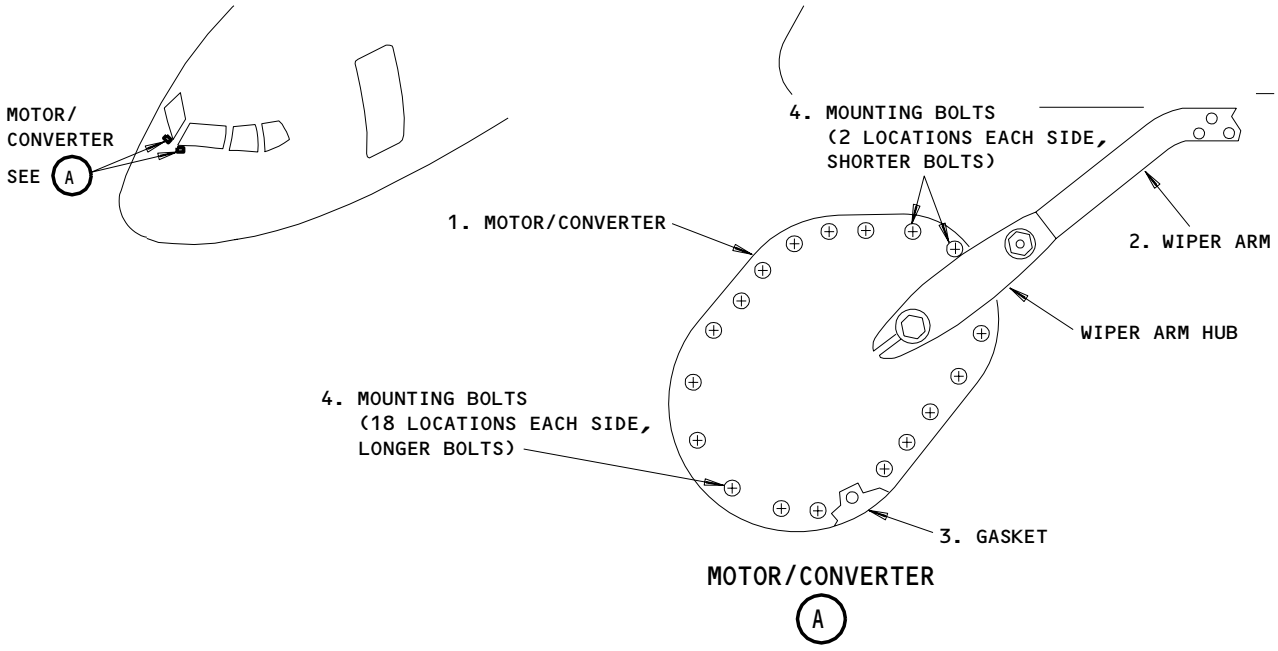
1. General
   A. This procedure contains two tasks. The first task is the removal of the windshield wiper motor/converter. The second task is the installation of the windshield wiper motor/converter.
   B. This procedure refers to the windshield wiper motor/converter as the motor/converter.
   C. Each motor/converter is installed forward of and below the windshield. Each motor/converter is a plug-type panel that installs into the outer airplane skin.

TASK 30-42-02-004-013

2. Remove the Motor/Converter (Fig. 401)
   A. References
      (1) AMM 30-42-03/401, Windshield Wiper Arm/Blade - Removal/Installation
   B. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   C. Procedure

      S 864-001
      (1) To remove the left motor/converter (1), open this circuit breaker on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11R13, WSHLD WIPER LEFT



Windshield Wiper Motor/Converter Installation
Figure 401

S 864-002
(2) To remove the right motor/converter (1), open this circuit breaker on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11R22, WSHLD WIPER RIGHT

S 864-005
(3) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-006
(4) Open these circuit breakers on the miscellaneous electrical equipment panel, P7O, and attach DO-NOT-CLOSE tags:
(a) 7OA3, WINDOW HTR 2R
(b) 7OA4, WINDOW HTR 3R
(c) 7OC13, WINDOW HTR 1L

S 034-007
(5) Remove the sealing compound from the heads of the wiper arm hub screws, the bolts, and the shaft tightening slot.

S 034-008
(6) Remove the wiper arm (2) (AMM 30-42-03/401).

S 034-009
(7) Remove the bolts (4).

S 024-010
(8) Remove the motor/converter (1).

S 034-011
(9) Remove the electrical connector from the side of the motor/converter (1).

TASK 30-42-02-404-012

3. Install the Motor/Converter (Fig. 401)

A. Equipment

(1) Sealing gun - 6-inch cartridge
(2) Sealing compound cutting tool - hardwood or plexiglass
(3) Varnish brush - 1 or 2 inch
(4) Non-metal Spatula

B. Consumable Materials

(1) A00247 Sealing Compound - BMS 5-95, Class B
(2) B00083 Aliphatic Naphtha - TT-N-95
(3) A00153, Cement, Low Odor, Synthetic Rubber, Adhesive - BMS 5-30, Type II.

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Motor/Converter (Left Side)	30-42-01	05	25
	1	Motor/Converter (Right Side)			30
	3	Gasket (Left Side)			40
	3	Gasket (Right Side)			45

D. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 30-42-03/401, Windshield Wiper Arm/Blade - Removal/Installation

E. Access

(1) Location Zones
211/212 Control Cabin - Section 41

F. Procedure

S 034-014

(1) Remove the sealing compound from the access opening with an aerodynamic-smoother cutting tool.

S 114-015

(2) Clean the access opening with a varnish brush and fresh aliphatic naphtha.
   (a) Rub the opening with a clean cloth before the aliphatic naphtha dries.

S 394-016

(3) Use a brush to apply a light layer of rubber cement to the panel. This bonds the gasket (3) to the motor/converter (1).
   (a) Let the rubber cement dry for approximately 15 minutes.

S 434-017

(4) Connect the electrical connector to the motor/converter (1).

S 424-018

(5) Install the motor/converter (1).

S 434-019

CAUTION: MAKE SURE YOU INSTALL THE BOLTS IN THE CORRECT POSITIONS. BOLTS INSTALLED INCORRECTLY CAN CAUSE DAMAGE TO THE EQUIPMENT.

(6) Install the bolts (4).

S 864-020

(7) Supply electrical power (AMM 24-22-00/201).

S 864-021

(8) If you replaced the left motor/converter (1), remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
   (a) 11R13, WSHLD WIPER LEFT

S 864-022

(9) If you replaced the right motor/converter (1), remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
   (a) 11R22, WSHLD WIPER RIGHT

S 864-023
(10) Put the WIPER switch on the windshield control panel in the LOW position.

S 214-024
(11) Make sure the wiper drive shaft on the new motor/converter (1) moves.

S 864-025
(12) Put the WIPER switch in the OFF position.

S 864-026
(13) If you replaced the left motor/converter (1), open this circuit breaker on the P11 panel and attach a DO-NOT-CLOSE tag:
(a) 11R13, WSHLD WIPER LEFT

S 864-027
(14) If you replaced the right motor/converter (1), open this circuit breaker on the P11 panel and attach a DO-NOT-CLOSE tag:
(a) 11R22, WSHLD WIPER RIGHT

S 394-028
(15) Apply the sealing compound to these areas:
(a) The joint between the motor/converter (1) and the airplane skin
(b) The heads of the wiper arm screws
(c) The heads of the bolts (4)
(d) The shaft tightening slot.

S 394-029
(16) Use a spatula to make the surfaces smooth and to remove the unwanted sealing compound.

S 434-030
(17) Install the wiper arm (2) (AMM 30-42-03/401).

S 864-031
(18) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 864-034
(19) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-035
(20) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 864-036
(21) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

WINDSHIELD WIPER ARM/BLADE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains four tasks. The first task is the removal of the windshield wiper blade. The second task is the installation of the windshield wiper blade. The third task is the removal of the windshield wiper arm. The fourth task is the installation of the windshield wiper arm.

TASK 30-42-03-004-001

2. Removal of the Windshield Wiper Blade
   A. Equipment
      (1) Pad - To prevent windshield scratches caused by the wiper arm
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 30-42-00/501, Windshield Wiper System
   C. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   D. Prepare for Removal

      S 864-059
      (1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

      S 864-060
      (2) Put the WIPER switch in the OFF position to put the motor/converter unit in the park position.

      S 864-062
      (3) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11R13, WSHLD WIPER LEFT
          (b) 11R22, WSHLD WIPER RIGHT

      S 864-070

      WARNING: BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD WIPER SYSTEM, OPEN THE WINDOW HEAT CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPEN, PERSONS CAN GET AN ELECTRICAL SHOCK WHEN THEY TOUCH THE WINDSHIELD.

      (4) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
          (a) 37E3, WINDOW HTR 2L

(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-063
(5) Open these circuit breakers on the miscellaneous electrical equipment panel, P7O, and attach DO-NOT-CLOSE tags:
(a) 7OA3, WINDOW HTR 2R
(b) 7OA4, WINDOW HTR 3R
(c) 7OC13, WINDOW HTR 1L

E. Remove the Windshield Wiper Blade (Fig. 4O1)

S 434-009

CAUTION: DO NOT LIFT THE WIPER ARM HIGHER THAN NECESSARY. DAMAGE TO THE WIPER ARM CAN OCCUR IF YOU LIFT IT TOO HIGH.

(1) Put the pad between the wiper arm and the windshield to protect the windshield.

S 024-010
(2) Remove the locknut and wiper blade (View A-A).
(a) Lower the wiper arm to the pad.
(b) Keep the washer and teflon washer for installation.

TASK 30-42-03-404-011

3. Installation of the Windshield Wiper Blade (Fig. 4O1)
A. References
(1) AMM 24-22-OO/2O1, Electrical Power - Control
B. Access
(1) Location Zones
211/212 Control Cabin - Section 41

C. Procedure

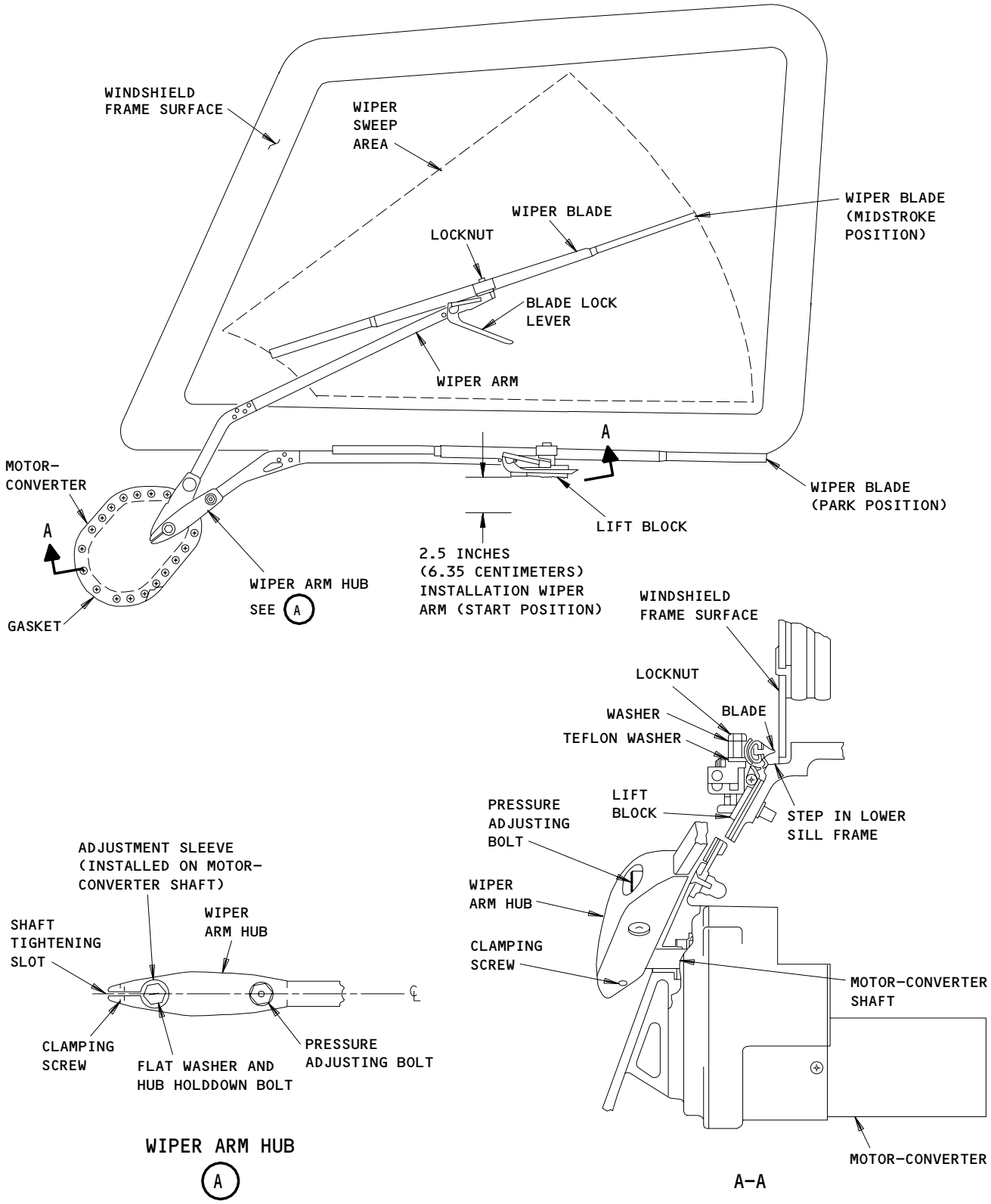
S 424-012

CAUTION: DO NOT LIFT THE WIPER ARM HIGHER THAN NECESSARY. DAMAGE TO THE WIPER ARM CAN OCCUR IF YOU LIFT IT TOO HIGH.

(1) Install the wiper blade on the wiper arm with the teflon washer, washer, and a new locknut.
(a) Tighten the locknut to 25-32 pound-inches (Fig. 4O1, View A-A).
(b) Make sure the blade turns freely.

S 434-014
(2) Push the blade lock lever and put the blade parallel to the arm.

S 864-013
(3) Lower the blade with the outboard end of the arm over the lift block.



Windshield Wiper Arm and Blade
Figure 401

S 034-015
(4) Remove the pad from between the wiper arm and windshield.

S 824-016
(5) If the wiper arm pressure on the windshield is not correct, do the Wiper Arm Pressure - Adjustment/Test procedure (AMM 30-42-00/501).

S 824-017
(6) If the wiper sweep or park position is not correct, do the Wiper Speed, Sweep and Park Position - Adjustment/Test procedure (AMM 30-42-00/501).

D. Put the Airplane Back to Its Usual Condition

S 864-078
(1) Put the WIPER switch to OFF.

S 864-079
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 864-082
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-083
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

S 864-084
(5) Remove electrical power from the main AC buses if it is not necessary (AMM 24-22-00/201).

TASK 30-42-03-004-018

4. Removal of the Windshield Wiper Arm

A. Equipment
(1) Pad - To prevent windshield scratches caused by the wiper arm
(2) Sealant compound cutting tool - Hardwood or plexiglass

B. References
(1) AMM 24-22-00/201, Electrical Power - Control

C. Access
(1) Location Zones
211/212 Control Cabin - Section 41

D. Prepare for Removal

S 864-072
(1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

S 864-073
(2) Put the WIPER switch in the OFF position to put the motor/converter unit in the park position.

S 864-074
(3) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 864-075

WARNING: BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD WIPER SYSTEM, OPEN THE WINDOW HEAT CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPEN, PERSONS CAN GET AN ELECTRICAL SHOCK WHEN THEY TOUCH THE WINDSHIELD.

(4) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 864-077
(5) Open these circuit breakers on the miscellaneous electrical equipment panel, P70, and attach DO-NOT-CLOSE tags:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

E. Remove the Windshield Wiper Arm (Fig. 401)

S 434-019

CAUTION: DO NOT LIFT THE WIPER ARM HIGHER THAN NECESSARY. DAMAGE TO THE WIPER ARM CAN OCCUR IF YOU LIFT IT TOO HIGH.

(1) Put the pad between the wiper arm and windshield to protect the windshield surface.

S 034-020
(2) Remove the sealant from the heads of the screws, bolts, and shaft tightening slot on the wiper arm hub.

S 034-021

(3) Loosen the pressure adjusting bolt to release the pressure on the wiper arm.

S 034-022

(4) Loosen the clamping screw on the wiper arm hub.

S 024-093

CAUTION: DISCARD THE HUB HOLDDOWN BOLT. THE HUB HOLDDOWN BOLT CAN BECOME LOOSE IF USED AGAIN.

(5) Remove the hub holddown bolt, flat washer, wiper arm, and adjustment sleeve.

S 024-024

(6) Remove the wiper blade from the wiper arm (AMM 30-42-03/401).

NOTE: Do this to keep the wiper blade if needed, to install on replacement motor/converter.

TASK 30-42-03-404-025

5. Installation of the Windshield Wiper Arm

A. Equipment
   (1) Sealing Gun - 6 inch length cartridge
   (2) Varnish brush - 1 or 2 inch
   (3) Non-metal spatula

B. Consumable Materials
   (1) A00247 Sealant - BMS 5-95, Class B
   (2) B00316 Solvent - Aliphatic Naphtha TT-N-95
   (3) D00633 Grease - BMS 3-33 (Preferred)
   (4) D00013 Grease - MIL-PRF-23827 (Supersedes MIL-G-23827) (Alternate)

C. References
   (1) AMM 24-22-00/201, Electrical Power - Control
   (2) AMM 30-42-00/501, Windshield Wiper System
   (3) AMM 51-31-01/201, Seals and Sealing

D. Access
   (1) Location Zones
       211/212 Control Cabin - Section 41

E. Install the Windshield Wiper Arm

S 864-088

CAUTION: MAKE SURE MOTOR/CONVERTER IS IN THE PARKED POSITION. THE WIPER ARM AND MOTOR CAN BE DAMAGED IF THIS IS NOT DONE.

(1) Make sure the motor converter is in the park position.

S 434-026
(2) Install the wiper blade on the wiper arm (AMM 30-42-03/401).

NOTE: Use this to install wiper arm on replacement motor converter as needed.

S 644-027
(3) Apply grease to the serrations on the wiper arm hub and on the motor/converter shaft.

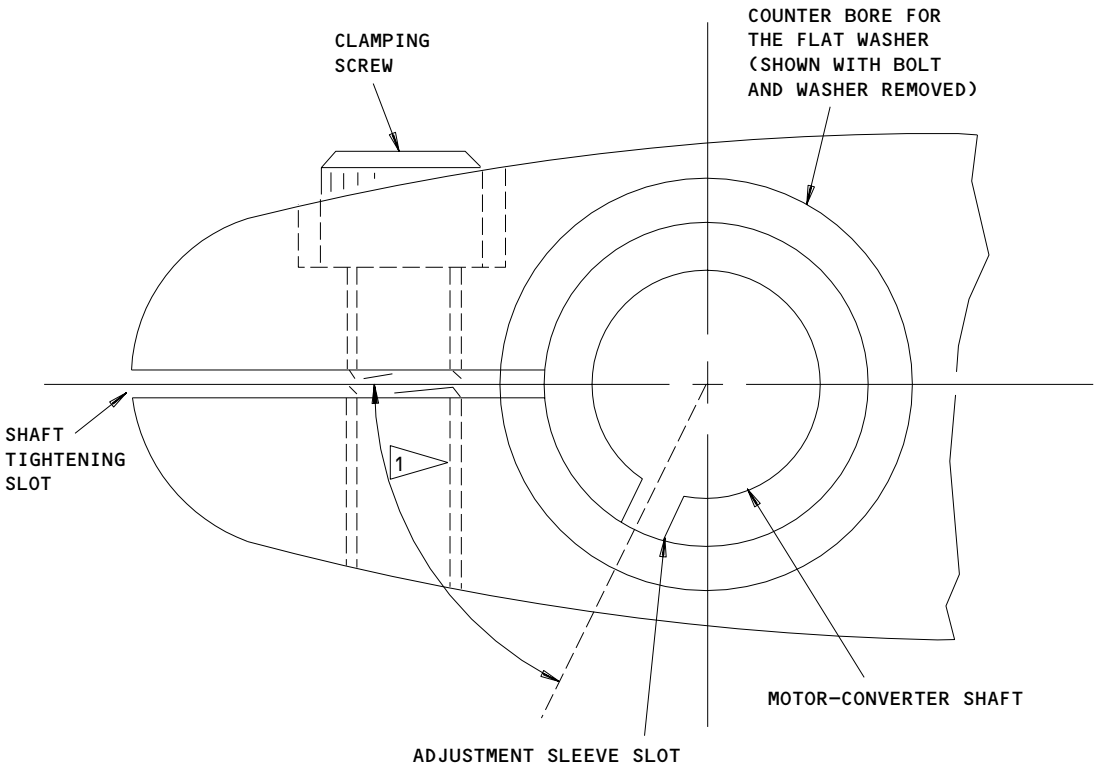
S 034-028
(4) Loosen the pressure adjusting bolt on the wiper arm hub.

S 034-031
(5) Install the adjustment sleeve on the motor-converter shaft (Detail A).

S 644-032
(6) Apply grease to the sleeve.

S 434-036
(7) Push down the blade lock lever to put the wiper blade parallel with wiper arm.

S 434-035
(8) Hold the wiper arm and blade in a position 2.5 inches (6.35 centimeters) below the lift block (measured between the wiper blade locknut and lift block) and install the wiper arm hub on the motor converter shaft.



BUSHING MOVEMENT	MOVEMENT AT BLADE ATTACHMENT POINT
ONE TOOTH BETWEEN OUTPUT SHAFT AND BUSHING	APPROXIMATELY 2 3/4 INCHES
ONE TOOTH BETWEEN BUSHING AND HOUSING	APPROXIMATELY 3 1/4 INCHES
ONE TOOTH CLOCKWISE BETWEEN OUTPUT SHAFT AND BUSHING, THEN TOOTH COUNTERCLOCKWISE BETWEEN BUSHING AND HOUSING	APPROXIMATELY 1/2 INCH

APPROXIMATE MOVEMENT CORRELATION CHART

1 PUT THE SLOTS LESS THAN 90° APART WHEN YOU INSTALL THE WIPER ARM HUB TO THE ADJUSTMENT SLEEVE

Windshield Wiper Arm and Blade
Figure 402

S 824-037
(9) Lift the wiper arm and blade (just enough to go over the lift block) and put them on the lift block (parked position).

S 434-038

CAUTION: DISCARD THE OLD HUB HOLDDOWN BOLT. THE HUB HOLDDOWN BOLT CAN BECOME LOOSE IF USED AGAIN.

(10) Install a new hub holddown bolt and flat washer.
(a) Tighten the hub holdown bolt to 20-30 inch-pounds.

S 434-039
(11) Tighten the hub clamping screw to 60-100 inch-pounds.

S 434-040
(12) Lightly tighten the pressure adjusting bolt.

S 034-041
(13) Remove the pad between the wiper arm and windshield.

S 824-042
(14) Examine and adjust the wiper arm pressure, sweep, and park position (AMM 30-42-00/501).

S 394-043
(15) Apply sealant to the shaft tightening slot, the boltheads, and the screw heads (AMM 51-31-01/201).

F. Put the Airplane Back to Its Usual Condition

S 864-071
(1) Put the WIPER switch to OFF.

S 864-064
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 864-065
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P37 panel:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

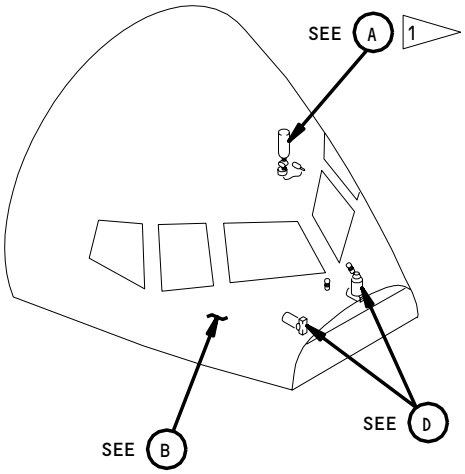
S 864-066
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P70 panel:
(a) 70A3, WINDOW HTR 2R

(b) 7OA4, WINDOW HTR 3R
(c) 7OC13, WINDOW HTR 1L

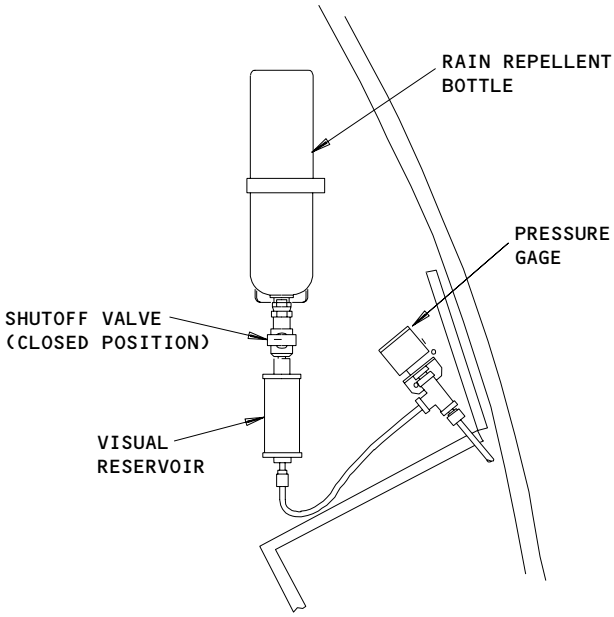
S 864-061
(5) Remove electrical power from the main AC buses if it is not necessary (AMM 24-22-00/201).

WINDSHIELD RAIN REPELLENT SYSTEM - DESCRIPTION AND OPERATION

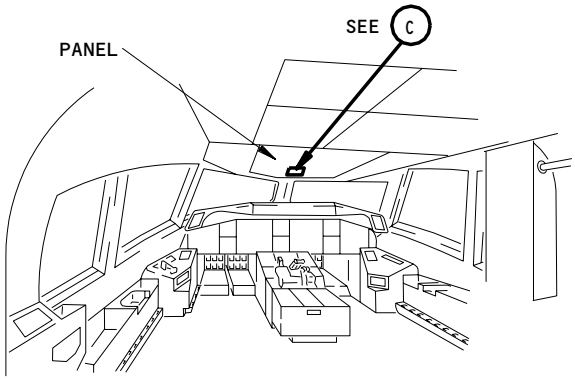
1. General
   A. Rain repellent is sprayed on the captain's and/or first officer's No. 1 window to provide a water repellent coating. The system uses main left and right 28-volt dc power, through circuit breakers on overhead circuit breaker panel P11.
   B. System components include:
      (1) The windshield wiper/rain repellent control panel
      (2) Solenoid valves
      (3) Spray nozzles
      (4) A rain repellent container
      (5) A pressure gage
   C. AIRPLANES WITH HYDROPHOBIC COATING ON THE WINDSHIELD;
      The rain repellent system consists of a hydrophobic coating applied to the number 1 window. No pilot actions are necessary to operate the system.
      (1) Periodic maintenance is necessary to test and restore the coating on the windshield surface. A reference to the kit and procedures for this is in AMM 30-43-00/201.
2. Component Details (Fig. 1)
   A. Windshield Wiper/Rain Repellent Control Panel
      (1) Windshield wiper/rain repellent control panel M10023 is on pilots' overhead panel P5. The control panel contains two switches to control the rain repellent system. A switch controlling the windshield wipers is also on the panel.
   B. Solenoid Valves
      (1) Two electrically operated solenoid valves control the flow of rain repellent to the No. 1 windows. The right solenoid valve is behind first officer's instrument panel P3. The left solenoid valve is behind captain's instrument panel P1.
   C. Spray Nozzles
      (1) Two nozzles on the fuselage and forward of the windshield, direct the rain repellent spray onto the windshields.
   D. Rain Repellent Container
      (1) A pressurized rain repellent container is located forward of the left hand-side flight deck partition. The container is replaced when empty.
   E. Pressure Gage
      (1) A pressure gage indicates when repellent container replacement is needed. The pressure gage is located on the flight deck partition, aft of the first observer's seat, next to the rain repellent container.



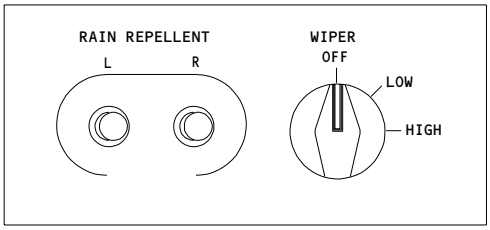
FLIGHT COMPARTMENT



BOTTLE ASSEMBLY
A



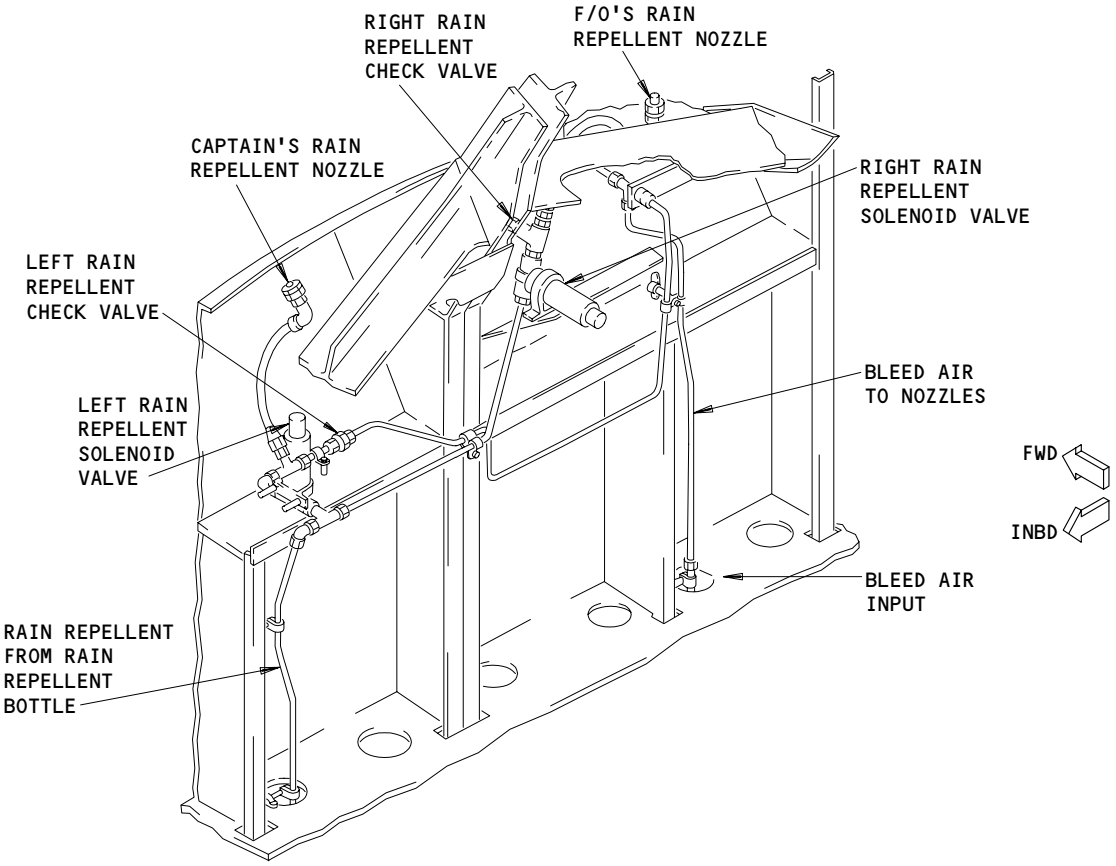
FLIGHT COMPARTMENT
B



WINDSHIELD WIPER/RAIN
REPELLENT CONTROL PANEL (P5)
C

1 LOCATED ON AFT FLIGHT COMPARTMENT BULKHEAD

Windshield Rain Repellent System Component Location
Figure 1 (Sheet 1)



RAIN REPELLENT COMPONENTS

(D)

Windshield Rain Repellent System Component Location
Figure 1 (Sheet 2)

66740

(2) An accumulator is installed to prevent back flow of rain repellent fluid into the pneumatic system in the case of check valve failure. The accumulator is located forward of the pilot's center instrument panel, left of the airplane centerline.

3. Operation

A. Functional Description (Fig. 2)

(1) Windshield wiper/rain repellent control panel M10023 contains two RAIN REPELLENT switches. The switches control the flow of repellent to the No. 1 windows. The switches are momentary action type, and are marked L and R. Pushing a switch once activates the respective sides rain repellent system. The solution is spread on the window by water flowing over the repellent and by wiper blade action.

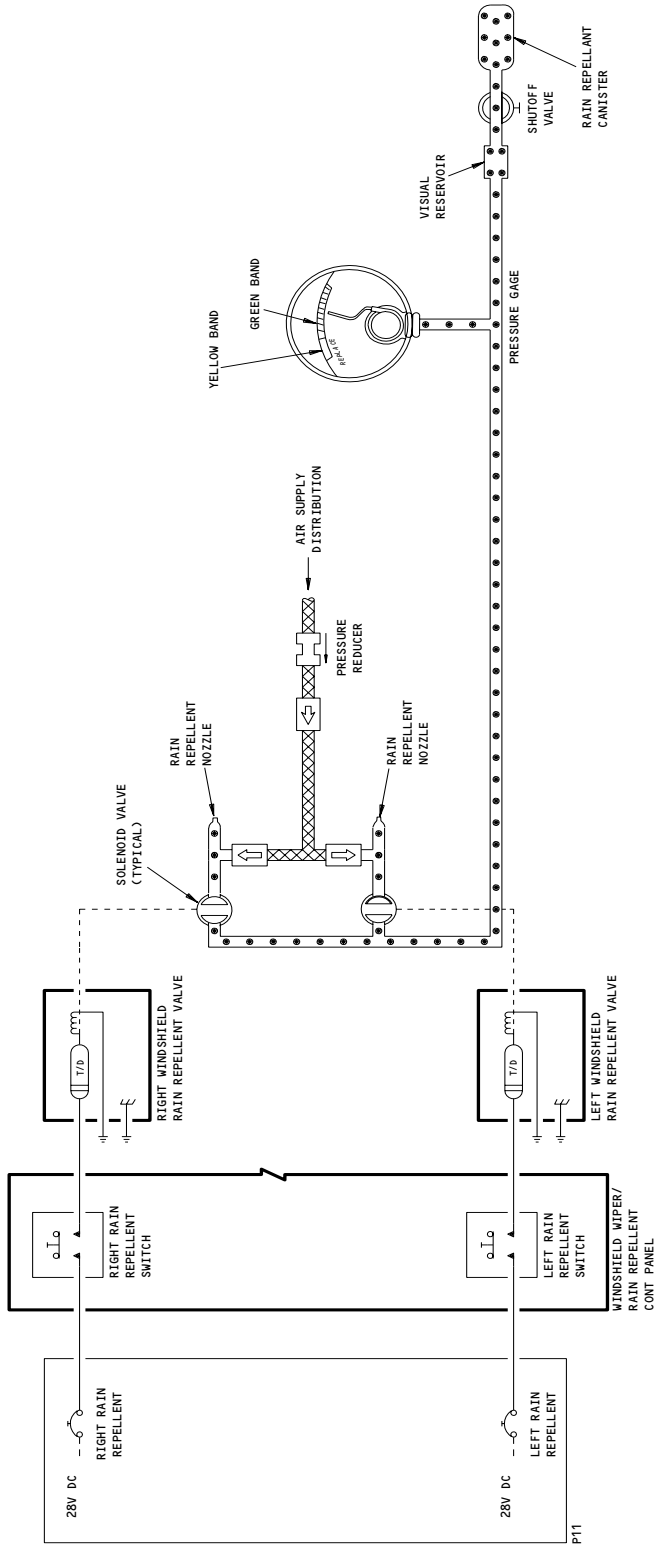
(2) The repellent fluid is stored in the pressurized rain repellent container which is replaced when empty. The container is connected through a shutoff valve to a fluid reservoir, mounted below the container. The reservoir contains a float lever indicator for checking the repellent fluid in the container.

(3) The rain repellent is propelled on the windows by the pressure of the fluid container. This pressure is checked by a pressure gage below the reservoir.

(4) Aluminum tubing feeds rain repellent from the pressure gage, along the flight compartment sidewall, to a T-connection behind the pilot's instrument panel. The T-connection distributes repellent to each windshields rain repellent valve. A tube leads from each valve to the spray nozzle. The spray nozzles are below the No. 1 windows, inboard of the windshield wipers.

(5) Pushing a window's RAIN REPELLENT button allows 28-volts dc to activate its rain repellent valve. This causes repellent to flow to the spray nozzles, and onto the windows. A time delay circuit in the valve controls the amount of repellent by closing the valve after 0.4 second.

(6) Each tube to the spray nozzles is joined by an air hose. Engine bleed air prevents clogging of the tubes and spray nozzles by repellent.



Windshield Rain Repellent System Schematic Diagram
Figure 2

55624

(7) Check valves are used to prevent presurized rain repellent fluid from entering the air tubes.

B. Control

(1) To operate the system, supply electrical power to main ac buses (AMM 24-22-00/201).

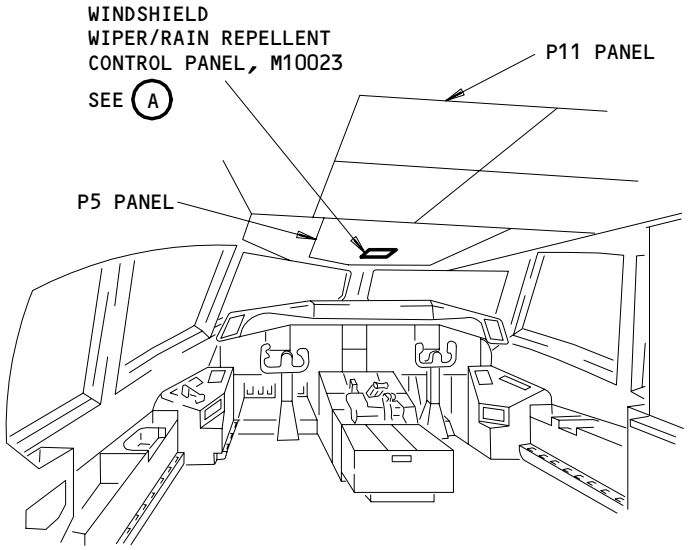
(2) Check that the RAIN REPEL R and RAIN REPEL L circuit breakers on overhead circuit breaker panel P11 are closed.

WINDSHIELD RAIN REPELLENT SYSTEM

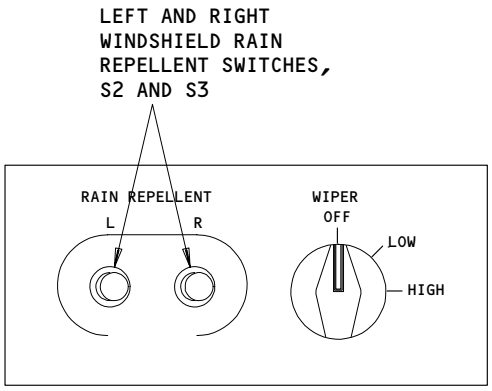
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BOTTLE - WINDSHIELD RAIN REPELLENT	1	1	FLT COMPT, ON WALL BEHIND CAPT	30-43-00
CIRCUIT BREAKER -			FLT COMPT, P11	
RAIN REPEL LEFT, C1145		1	11R21	*
RAIN REPEL RIGHT, C1136		1	11R12	*
GAGE - PRESSURE	1	1	FLT COMPT, ON WALL BEHIND CAPT	30-43-00
NOZZLE - L AND R WINDHIELD RAIN REPELLENT	2	2	FLT COMPT, BEHIND P1,P3	30-43-01
PANEL - WINDSHIELD WIPER/RAIN REPELLENT, M10023 (FIM 30-42-00/101)				
RESERVOIR - VISUAL	1	1	FLT COMPT, ON WALL BEHIND CAPT	30-43-00
SWITCH - L WINDSHIELD RAIN REPELLENT, S2	2	1	FLT COMPT, P5, WINDSHIELD WIPER/RAIN REPELLENT CONTROL PANEL, M10023	30-43-00
SWITCH - R WINDSHIELD RAIN REPELLENT, S3	2	1	FLT COMPT, P5, WINDSHIELD WIPER/RAIN REPELLENT CONTROL PANEL, M10023	30-43-00
VALVE - CHECK	2	3	FLT COMPT, BEHIND P1,P3	30-43-03
VALVE - L AND R SOLENOID, V118,V119	2	2	FLT COMPT, BEHIND P1,P2,P3	30-43-02
VALVE - SHUTOFF	1	1	FLT COMPT, ON WALL BEHIND CAPT	30-43-00

* SEE THE WDM EQUIPMENT LIST

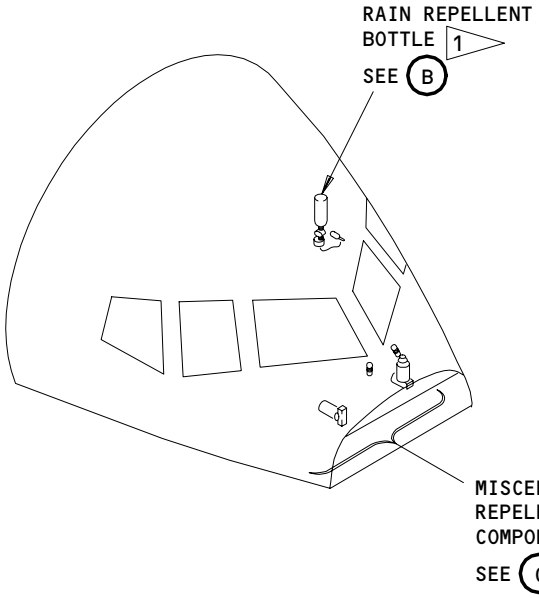
Windshield Rain Repellent System - Component Index
Figure 101

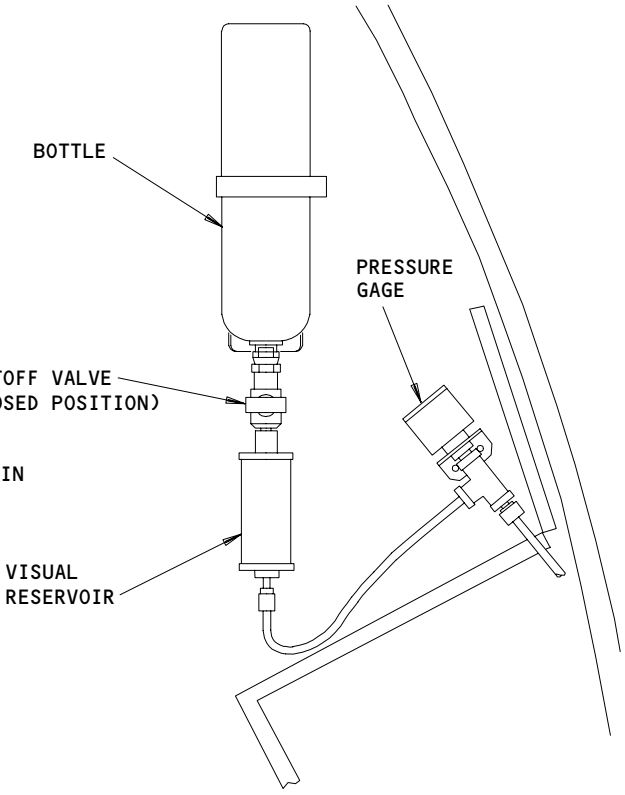


FLIGHT COMPARTMENT



WINDSHIELD WIPER/RAIN REPELLENT
CONTROL PANEL, M10023 (REF)
A

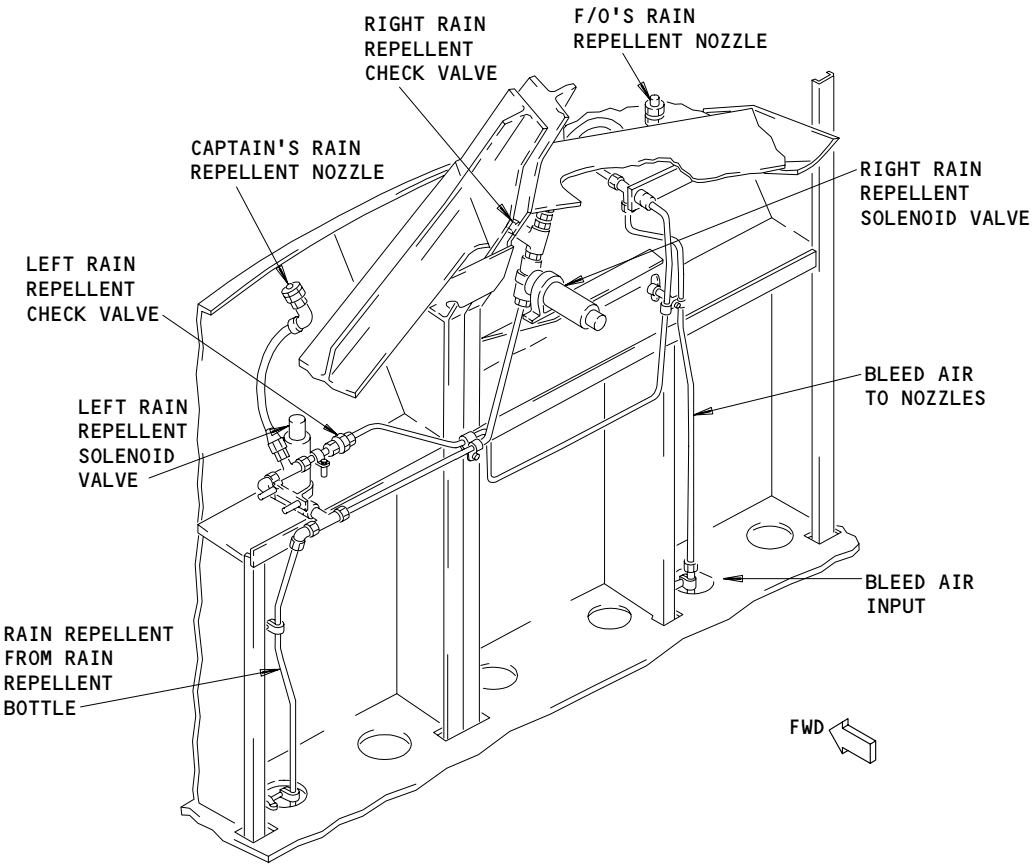




RAIN REPELLENT BOTTLE
B 1

1 ON THE FLIGHT COMPARTMENT AFT BULKHEAD

Windshield Rain Repellent System - Component Location
Figure 102 (Sheet 1)



MISCELLANEOUS RAIN REPELLENT SYSTEM COMPONENTS

(C)

Windshield Rain Repellent System - Component Location
Figure 102 (Sheet 2)

F09664

WINDSHIELD RAIN REPELLENT SYSTEM - MAINTENANCE PRACTICES

1. General
   A. This procedure contains two tasks. The first task is to clean the windshield rain repellent system. The second task is an operational test of the windshield rain repellent system.

   TASK 30-43-00-102-001-001

2. Clean the Rain Repellent System
   A. Equipment
      (1) Cleaning Tank Assembly - B30002
      (2) Dry air source - to give 45 psig and 100 psig
      (3) Plastic Bags - clear, fluid-tight
      (4) Test Equipment, Windshield Rain Repellent System - B30001-7
   B. Consumable Materials
      (1) B00037 Solvent - Freon TF or
          B00090 Solvent - 1 1 1 Trichloroethane, MIL-T-81533A
   C. References
      (1) AMM 12-16-01/301, Rain Repellent Bottle
      (2) AMM 12-25-01/301, Exterior Airplane Cleaning
      (3) AMM 24-22-00/201, Electrical Power - Control
      (4) AMM 30-43-03/401, Windshield Rain Repellent Check Valve - Removal/Installation
      (5) AMM 36-00-00/201, Pneumatic - General
      (6) AMM 49-11-00/201, Auxiliary Power Unit
   D. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   E. Prepare to Clean

      S 862-004-001
      (1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

      S 862-065-001
      (2) Start the APU (AMM 49-11-00/201), or supply ground pneumatic source (AMM 36-00-00/201).

S 492-006-001
(3) Install fluid-tight plastic bags around the rain repellent nozzles to collect and contain the repellent fluid.

S 862-007-001
(4) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 092-008-001

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

(5) Release the bottle clamp and remove the rain repellent bottle from the receptacle.

F. Clean the Rain Repellent System

S 482-009-001
(1) Connect the test equipment to the rain repellent bottle receptacle.

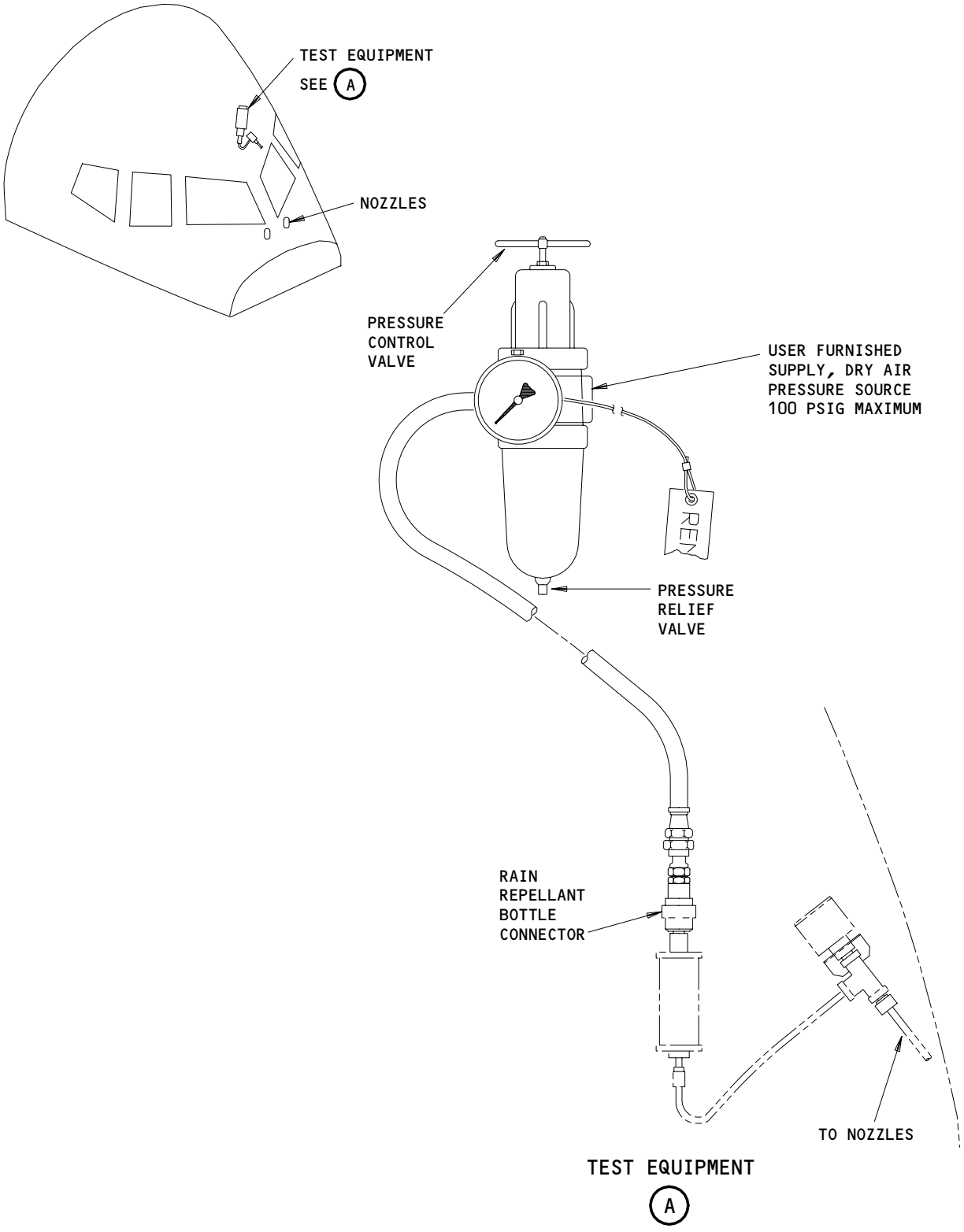
S 492-010-001
(2) Connect the dry air source to the test equipment.

S 862-011-001
(3) If the APU is used as the air supply, push the APU switch, on the bleed air supply panel M10259 (panel P5), to the ON position.
(a) Make sure the white bar light in the switch comes on.

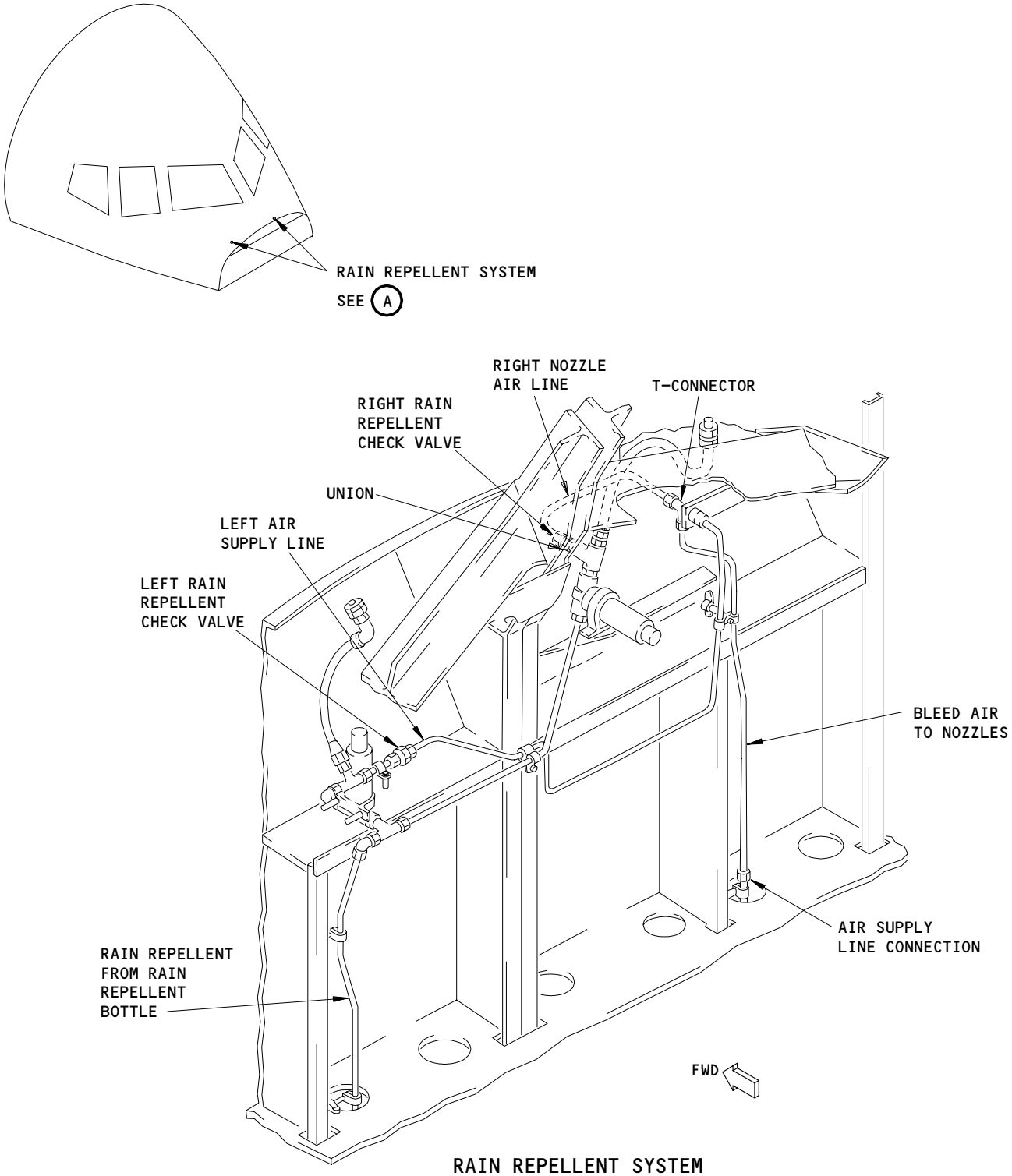
S 212-067-001

CAUTION: DO NOT OPERATE THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR. OPERATION OF THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR CAN CAUSE THE SYSTEM TO BECOME CLOGGED.

(4) Make sure there is a strong flow of air at the rain repellent nozzles.



Test Equipment for the Windshield Rain Repellent System
Figure 201



Windshield Rain Repellent Pneumatic Lines
Figure 202

S 112-012-001
(5) Push and release the RAIN REPELLENT L and R switches, on the windshield wiper/rain repellent panel M10023 (panel P5), until no fluid flows from the nozzles.

NOTE: It can be necessary to push the switches many times until no fluid flows from the nozzles.

S 492-013-001
(6) Set the dry air source to supply air at 100 psi.

S 862-014-001
(7) Turn the rain repellent shutoff valve to the open (vertical) position.

S 112-015-001
(8) Push and release the RAIN REPELLENT L and R switches until no fluid flows from the nozzles.

NOTE: It can be necessary to push the switches many times to remove all the fluid from the system.

S 862-016-001
(9) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 492-017-001
(10) Put the dry air source in the OFF position.

S 082-018-001
(11) Remove the test equipment from the rain repellent bottle receptacle.

S 862-019-001
(12) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 862-020-001
(13) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 492-021-001
(14) Connect the cleaning tank assembly with solvent to the rain repellent bottle receptacle.

S 862-022-001
(15) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 112-023-001
(16) Push and release the RAIN REPELLENT L and R switches until the fluid flows from the nozzles.

NOTE: It will be necessary to push the switches more than one time. Replace the plastic bags on the nozzles, if the bags are full.

S 112-024-001
(17) Push and release the RAIN REPELLENT L and R switches until a spray of the fluid comes from each nozzle ten times.

S 862-025-001
(18) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 092-026-001

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

CAUTION: IF RAIN REPELLENT GETS ON THE AIRPLANE GLASS OR SKIN, CLEAN THE AIRPLANE IMMEDIATELY (AMM 12-25-01/301). THE RAIN REPELLENT IS CORROSIVE AND CAN CAUSE A STAIN.

(19) Remove the plastic bags from the rain repellent nozzles.

S 092-027-001
(20) Disconnect the cleaning tank assembly from the rain repellent bottle receptacle.

S 482-028-001
(21) Connect the test equipment and the dry air source to the rain repellent bottle receptacle.

S 482-029-001
(22) Set the dry air source to supply air at 100 psi.

S 862-030-001
(23) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 112-031-001
(24) Push and release the RAIN REPELLENT L and R switches until no fluid flows from the nozzles.

NOTE: It can be necessary to push the switches many times. During this step, it is possible that solvent will touch the airplane skin and glass.

S 862-032-001
(25) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 862-033-001
(26) Put the dry air source in the OFF position.

S 092-034-001
(27) Remove the dry air source from the test equipment fitting.

S 082-035-001
(28) Remove the test equipment from the rain repellent bottle receptacle.

S 862-036-001
(29) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 862-037-001
(30) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 012-038-001
(31) Disconnect the air supply line for the rain repellent system at one of these locations (Fig. 202):
(a) Connection where the line comes through the flight compartment floor
(b) ON AIRPLANES WITH AN ACCUMULATOR;
The connection is below the accumulator.
(c) T-connector in the air supply line which is to the right of the right solenoid

S 492-039-001

(32) Connect the dry air source to the tee connection or the air line near the flight compartment floor.

S 822-077-001

(33) ON AIRPLANES WITH AN ACCUMULATOR;
Do not connect the air source to the accumulator.
(a) Set the dry air source to 45 psig.
(b) Make sure there is a strong flow of air at the rain repellent nozzles.
(c) If air flow is not sufficient, remove and clean the pneumatic lines (Fig. 202).
(d) If necessary, clean or replace the check valves (AMM 30-43-03/401).

G. Put the Airplane Back to Its Usual Condition

S 422-040-001

CAUTION: TIGHTEN THE BOTTLE WITH YOUR HAND. TOO MUCH TORQUE ON THE BOTTLE CAN CAUSE LEAKAGE.

(1) Install a rain repellent bottle and tighten it with your hands (AMM 12-16-01/301).
(a) Make sure you install a bottle with an approved rain repellent fluid and not the container that contains the solvent.

S 432-041-001

(2) Tighten the bottle clamp.

S 862-042-001

(3) Turn the rain repellent shutoff valve to the open (vertical) position.

S 092-074-001

(4) Disconnect the air source from the air supply line or t-connector.

S 432-075-001

(5) Connect the air supply line to the rain repellent system line.

S 712-043-001

(6) Do this task: Rain Repellent System - Operational Test.

NOTE: This task is in this procedure.

TASK 30-43-00-712-044-001

3. Rain Repellent System - Operational Test

A. Equipment
(1) Water Source - to wet windshield for test
(2) Plastic bags - clear, fluid-tight

B. References
(1) AMM 12-16-01/301, Rain Repellent Bottle
(2) AMM 12-25-01/301, Exterior Airplane Cleaning
(3) AMM 24-22-00/201, Electrical Power - Control
(4) AMM 36-00-00/201, Pneumatic - General
(5) AMM 49-11-00/201, Auxiliary Power Unit

C. Access
(1) Location Zones
211/212 Control Cabin - Section 41

D. Prepare for Test

S 862-045-001
(1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

S 862-068-001
(2) Start the APU (AMM 49-11-00/201) or supply a ground pneumatic source (AMM 36-00-00/201).

S 862-047-001
(3) If the APU is used to supply air, push the APU switch on the bleed air supply panel M10259 (panel P5) to the ON position.
(a) Make sure the white bar light in the switch comes on.

S 212-069-001

CAUTION: DO NOT OPERATE THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR. OPERATION OF THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR CAN CAUSE THE SYSTEM TO BECOME CLOGGED.

(4) Make sure there is a strong flow of air at the rain repellent nozzles.

S 862-048-001
(5) Get the captain's and first officer's No. 1 windows wet with water.

S 492-070-001
(6) Put the fluid-tight plastic bags around the two rain repellent nozzles to collect the repellent fluid.

S 712-049-001
(7) Push the RAIN REPELLENT L switch to make sure the fluid flows out of the left nozzle smoothly (there must be no air bubbles).

NOTE: If you removed all fluid from the system or installed a new rain repellent bottle, it will be necessary to push the switch more than one time.

S 712-050-001

(8) Push and hold the RAIN REPELLENT L switch.
  (a) Make sure the fluid comes out of the four nozzle holes in equal flows.
  (b) Make sure the spray pattern is in the area where the windshield wiper blade operates.
  (c) Make sure the fluid flow stops about 0.4 second after you push the switch.

S 862-051-001

(9) Release the RAIN REPELLENT L switch.

S 712-052-001

(10) Push the RAIN REPELLENT R switch to make sure the fluid flows out of the right nozzle smoothly (there must be no air bubbles).

NOTE: If you removed all fluid from the system or installed a new rain repellent bottle, it will be necessary to push the switch more than one time.

S 712-053-001

(11) Push and hold the RAIN REPELLENT R switch.
  (a) Make sure the fluid comes out of the four nozzle holes in equal flows.
  (b) Make sure the spray pattern is in the area where the windshield wiper blade operates.
  (c) Make sure the fluid flow stops about 0.4 second after you pushed the switch.

S 862-054-001

(12) Release the RAIN REPELLENT R switch.

S 092-072-001

(13) Remove the plastic bags from the rain repellent nozzles.

S 102-055-001

CAUTION: REMOVE THE REPELLENT FLUID FROM THE AIRPLANE SKIN AND GLASS IMMEDIATELY. THE REPELLENT FLUID CAN CAUSE A STAIN.

(14) Immediately and fully clean the airplane skin and windows to remove repellent fluid (AMM 12-25-01/301).

S 212-073-001

(15) Make sure there is a strong flow of air at the rain repellent nozzles.

S 212-056-001
(16) Make sure there is no leakage under the center instrument panels P1, P2, and P3.

S 212-057-001
(17) Make sure there are no leaks around the rain repellent bottle or receptacle.

S 212-058-001
(18) Make sure the rain repellent fluid level is above the replacement level in the sight gage.

S 962-059-001
(19) Replace the bottle, if necessary (AMM 12-16-01/301).

S 212-060-001
(20) Make sure the rain repellent fluid pressure gage indicator is in the green band.

S 962-061-001
(21) Replace the bottle, if necessary (AMM 12-16-01/301).

E. Put the Airplane Back to Its Usual Condition

S 862-062-001
(1) If the APU was used as the air source, push the APU switch, on the bleed air supply panel M10259 (panel P5), to the OFF position.

S 862-071-001
(2) Shut down the APU (AMM 49-11-00/201) or turn off the ground pneumatic source (AMM 36-00-00/201).

S 862-064-001
(3) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

WINDSHIELD RAIN REPELLENT SYSTEM - MAINTENANCE PRACTICES

1. General
   A. This procedure lists the equipment necessary to test and reapply the hydrophobic coating.
   B. A vendor kit is necessary to do this procedure.

TASK 30-43-00-302-001-002

2. Hydrophobic Coating Maintenance Practices
   A. General
      (1) The maintenance procedures for the hydrophobic coating are contained in the Master Kit listed below.
   B. References

      NOTE: These references are in the Master Kit.

      (1) Maintenance Assessment, Aplication Procedures for Boeing Aircraft Models
      (P/N DSS 1022)
      (2) Coating-Efficiency Assessment - Video Tape
      (P/N DSS 1023)
      (3) Re-application and First Time Application - Video Tape
      (P/N DSS 1024)
   C. Equipment
      (1) Application Kit Complete
      (P/N DSS 0100)

      PPG Industries, Inc
      Aircraft Products Sales
      P.O Box 040004
      Huntsville, AL. 35804 USA
      FAX 205-851-8822
      (2) Stand - 15 feet minimum
   D. Prepare for the Test/Re-application

      S 862-002-002

      WARNING: BEFORE YOU DO MAINTENANCE ON THE WINDSHIELD, OPEN THE WINDOW HEAT CIRCUIT BREAKERS. IF YOU DO NOT OPEN THESE CIRCUIT BREAKERS DURING MAINTENANCE, YOU CAN GET AN ELECTRICAL SHOCK WHEN YOU TOUCH THE WINDOW.

      (1) Open these circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags:
      (a) 37E3, WINDOW HTR 2L
      (b) 37E4, WINDOW HTR 3L

(c) 37J2, WINDOW HTR 1R

S 862-010-002

(2) Open these circuit breakers on the miscellaneous electrical equipment panel, P70, and attach DO-NOT-CLOSE tags:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

E. Procedures

NOTE: Use the procedure in the master kit to do these maintenance tasks:

S 162-003-002

(1) Cleaning Procedure

S 212-004-002

(2) Coating Efficiency Assessment

S 352-005-002

(3) Coating Application

S 862-019-002

(4) Return the Airplane to Its Usual Condition

S 862-012-002

(5) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
(a) 11R13, WSHLD WIPER LEFT
(b) 11R22, WSHLD WIPER RIGHT

S 862-015-002

(6) Remove the DO-NOT-CLOSE tags and close these P37 panel circuit breakers:
(a) 37E3, WINDOW HTR 2L
(b) 37E4, WINDOW HTR 3L
(c) 37J2, WINDOW HTR 1R

S 862-016-002

(7) Remove the DO-NOT-CLOSE identifiers, and close the P70 panel circuit breakers that follow:
(a) 70A3, WINDOW HTR 2R
(b) 70A4, WINDOW HTR 3R
(c) 70C13, WINDOW HTR 1L

WINDSHIELD RAIN REPELLENT NOZZLE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the windshield rain repellent nozzle. The second task is the installation of the windshield rain repellent nozzle.
   B. This procedure refers to the windshield rain repellent nozzles as nozzles.
   C. The nozzles are in front of the captain's and first officer's No. 1 windows, forward of the windshield wiper arm. The removal/installation procedure is the same for the two nozzles.

TASK 30-43-01-004-001

2. Remove the Nozzle
   A. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

   B. Procedure (Fig. 401)

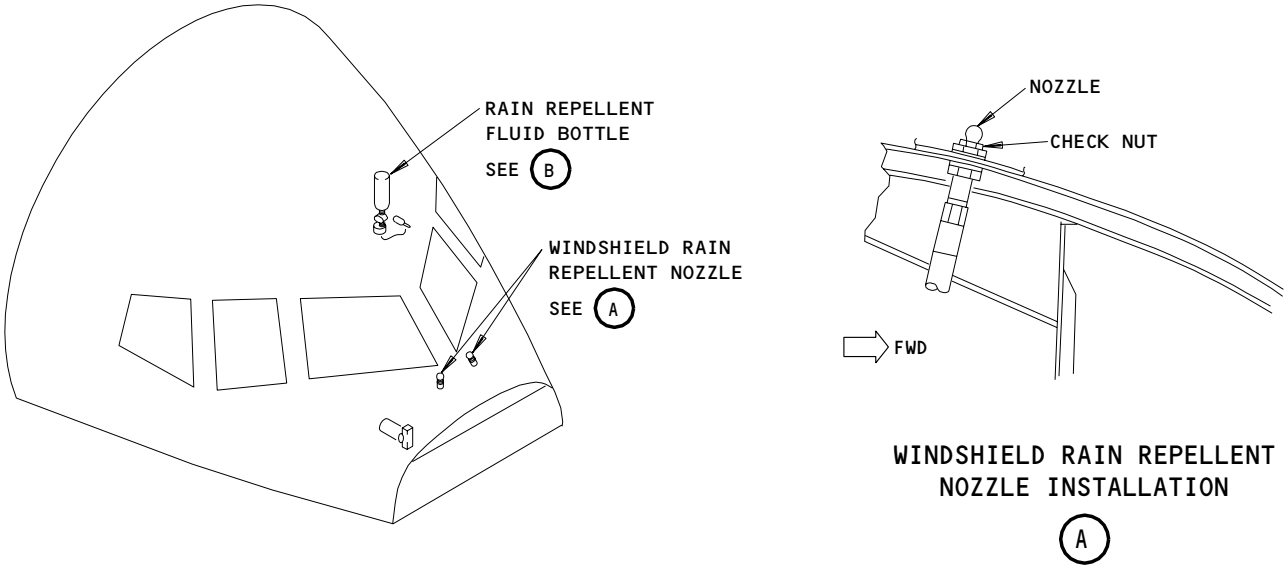
      S 864-002
      (1) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11R12, RAIN REPEL RIGHT
          (b) 11R21, RAIN REPEL LEFT

      S 034-003
      (2) Loosen the check nut on the nozzle assembly.

      S 024-004
      (3) Remove the nozzle assembly.

TASK 30-43-01-404-005

3. Install the Nozzle
   A. Equipment
      (1) Water Source - to wet windshield



Windshield Rain Repellent Nozzle Installation
Figure 401

(2) Plastic Bags - Clear, fluid-tight

B. References
(1) AMM 12-16-01/301, Rain Repellent Bottle
(2) AMM 12-25-01/301, Exterior Airplane Cleaning
(3) AMM 24-22-00/201, Electrical Power - Control
(4) AMM 36-00-00/201, Pneumatic - General
(5) AMM 49-11-00/201, Auxiliary Power Unit

C. Access
(1) Location Zones
211/212 Control Cabin - Section 41

D. Procedure (Fig. 401)

S 434-006
(1) Install the check nut on the nozzle assembly.

S 424-007

CAUTION: INSTALL THE NOZZLES IN THE CORRECT POSITIONS. THE CAPTAIN'S AND FIRST OFFICER'S NOZZLES ARE NOT THE SAME. INCORRECT SPRAY PATTERNS WILL OCCUR IF THE NOZZLES ARE INSTALLED IN THE INCORRECT POSITIONS.

(2) Install the nozzle with the slot parallel to the window sill and the spray holes to the window.

NOTE: The captain's nozzle has an "L" on the top directly across from the spray holes. The first officer's nozzle has an "R".

S 434-008
(3) Tighten the check nut.

S 864-009
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11R12, RAIN REPEL RIGHT
(b) 11R21, RAIN REPEL LEFT

E. Do a Test of the Nozzle Installation

S 864-010
(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 864-032
(2) Start the APU (AMM 49-11-00/201) or supply a ground pneumatic source (AMM 36-00-00/201).

S 214-012

(3) If the APU is used as the air source, push the APU switch on the bleed air supply panel M10259 (P5) to the ON position.
(a) Make sure the white bar light in the switch comes on.

S 214-027

CAUTION: DO NOT OPERATE THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR. OPERATION OF THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR CAN CAUSE THE SYSTEM TO BECOME CLOGGED.

(4) Make sure there is a strong flow of air at the rain repellent nozzles.

S 864-013

(5) Supply a flow of water to keep the captain's and first officer's No. 1 windows wet.

S 494-028

(6) Install the fluid-tight bags around the two rain repellent nozzles to collect the repellent fluid.

S 864-014

(7) If you replaced the captain's nozzle,
push the RAIN REPELLENT L switch on the windshield wiper/rain repellent control panel M10023 (P5) to the ON position.

S 864-015

(8) If you replaced the first officer's nozzle,
push the RAIN REPELLENT R switch on the windshield wiper/rain repellent control panel M10023 (P5) to the ON position.

S 214-016

(9) Make sure that sufficient repellent fluid comes out of the four nozzle holes in equal flows.

S 214-017

(10) Make sure there are no leaks around the nozzle assembly.

S 864-018

(11) Remove the water source.

S 114-019

CAUTION: CLEAN THE AIRPLANE SKIN AND GLASS TO REMOVE ALL THE RAIN REPELLENT FLUID. THE REPELLENT FLUID CAN CAUSE A STAIN.

(12) Immediately and fully clean the airplane skin and windows (Ref 12-25-01).

S 094-029
(13) Remove the plastic bags from the rain repellent nozzles.

S 214-030
(14) Make sure there is a strong flow of air at the rain repellent nozzles.

S 214-020
(15) Make sure the rain repellent fluid level is above the replacement level in the sight gage.

S 964-021
(16) Replace the bottle, if necessary (Ref 12-16-01).

S 214-022
(17) Make sure the pressure gage indicator for the repellent fluid is in the green band.

S 964-023
(18) Replace the bottle, if necessary (Ref 12-16-01).

S 864-024
(19) If the APU was used as the air source, push the APU switch on the bleed air supply panel M10259 (panel P5) to the OFF position.

S 864-031
(20) Stop the APU (AMM 49-11-00/201) or remove the ground pneumatic source (AMM 36-00-00/201).

S 864-026
(21) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

WINDSHIELD RAIN REPELLENT SOLENOID VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the rain repellent solenoid valves. The second task is the installation of the rain repellent solenoid valves.
   B. The two rain repellent solenoid valves, one for each windshield, are found behind the forward instrument panels.

TASK 30-43-02-004-035

2. Removal of the Rain Repellant Solenoid Valves
   A. Equipment
      (1) Plastic Bags - clear, fluid-tight
   B. References
      (1) AMM 12-25-01/301, Exterior Airplane Cleaning
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (4) AMM 30-42-02/401, Windshield Wiper Motor/Converter
      (5) AMM 36-00-00/201, Pneumatic - General
      (6) AMM 49-11-00/501, Auxiliary Power Unit
   C. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

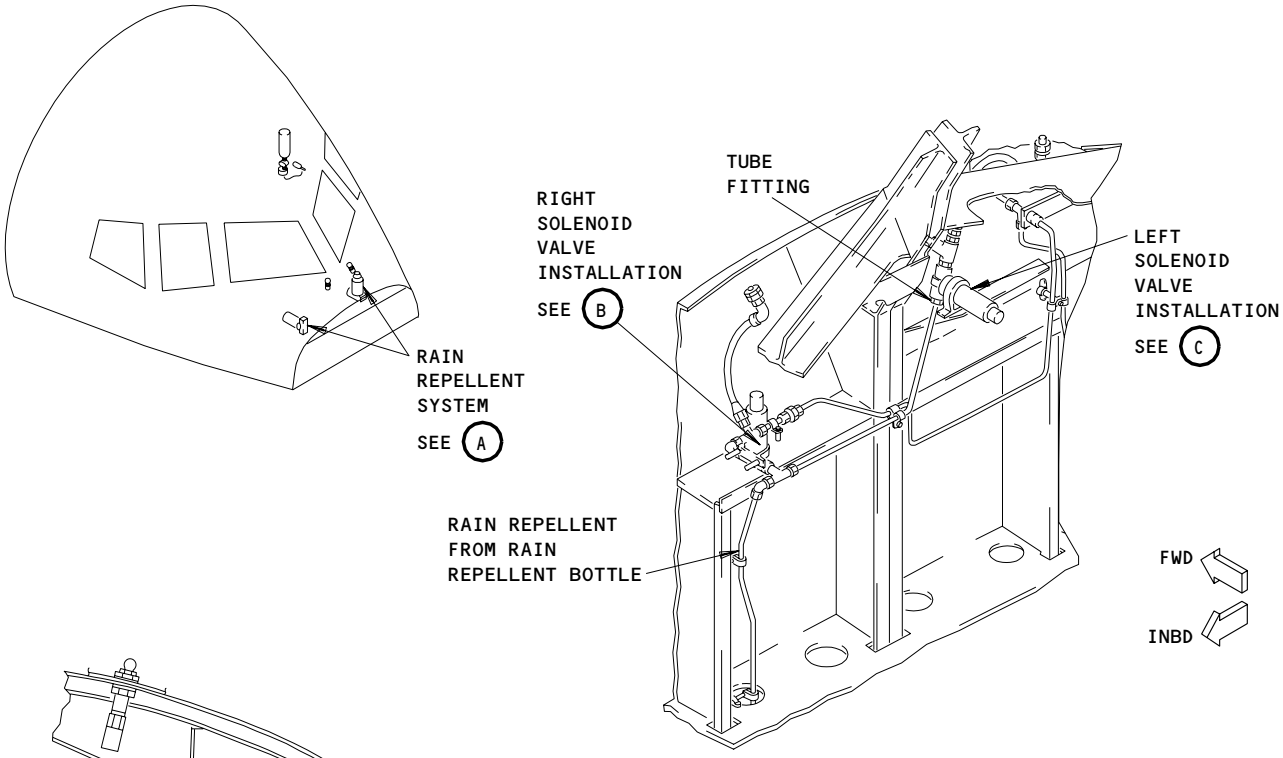
      (2) Access Panel
          P1-3 Captain's Instrument Panel

   D. Prepare for Removal

      S 864-001
      (1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

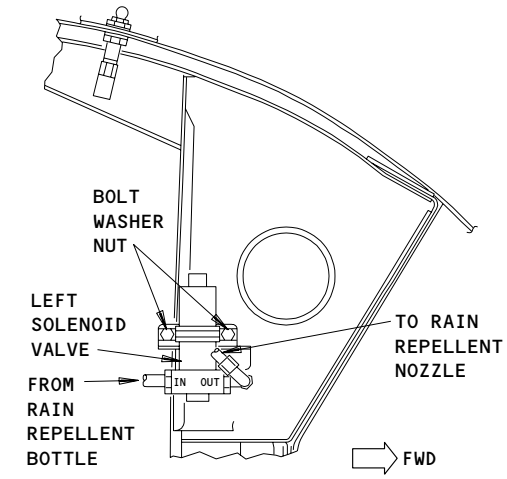
      S 864-036
      (2) Start the APU (AMM 49-11-00/201) or supply a ground pneumatic source (AMM 36-00-00/201).

      S 214-003
      (3) If the APU is used as the air source, push the APU switch on the bleed air supply panel M10259 (panel P5) to the ON position.
          (a) Make sure the white bar light in the switch is on.



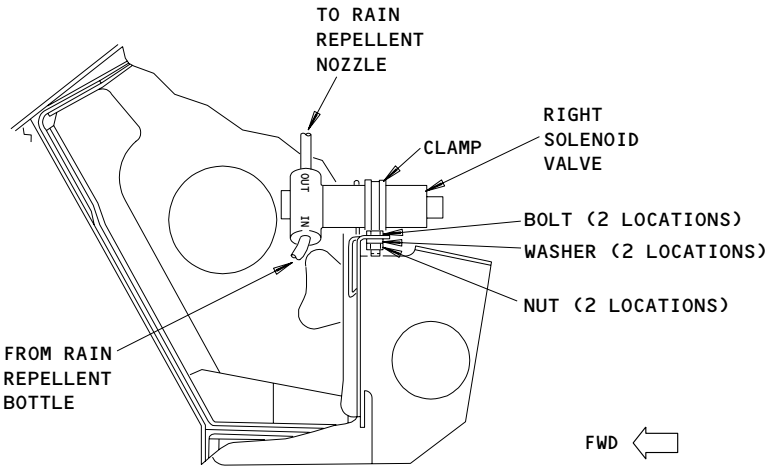
RAIN REPELLENT SYSTEM

A



LEFT SOLENOID VALVE INSTALLATION

B



RIGHT SOLENOID VALVE INSTALLATION

C

Windshield Rain Repellent Solenoid Valve Installation
Figure 401

S 214-037

CAUTION: DO NOT OPERATE THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR. OPERATION OF THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR CAN CAUSE THE SYSTEM TO BECOME CLOGGED.

(4) Make sure there is a strong flow of air at the rain repellent nozzles.

S 494-004

(5) Install fluid-tight bags on the rain repellent nozzles.

S 864-005

(6) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 684-006

(7) Push the RAIN REPELLENT L and R switches on the windshield wiper/rain repellent control panel M10023 (panel P5) until no fluid flows from the nozzles.

NOTE: It will be necessary to push the switches many times with at least 30 seconds between each time to let the APU bleed air clear the nozzles of remaining fluid.

S 864-038

(8) Stop the APU (AMM 49-11-00/201) or remove the ground pneumatic source (AMM 36-00-00/201).

S 864-008

(9) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11A31, INDICATOR LIGHTS TEST
(b) 11A32, INDICATOR LIGHTS 1
(c) 11A33, INDICATOR LIGHTS 2
(d) 11A34, INDICATOR LIGHTS 3
(e) 11A34, INDICATOR LIGHTS 4
(f) 11P1, L IND LTS 1 (11P1)
(g) 11P2, L IND LTS 2
(h) 11P5, IND LTS DIM CONT
(i) 11P28, R IND LTS 1
(j) 11P29, R IND LTS 2

S 864-009

WARNING: REFER TO AMM 27-61-00/201 FOR THE APPLICABLE SPOILER/SPEEDBRAKE DEACTIVATION PROCEDURE. ACCIDENTAL SPOILER MOVEMENT CAUSED BY THE SUBSEQUENT STEP CAN CAUSE INJURY TO PERSONS.

(10) Remove electrical power from the main AC buses (AMM 24-22-00/201).

NOTE: External power can supply ground service and/or ground handling buses during removal and installation.

S 864-010

(11) Put the STBY POWER switch on the pilots' overhead panel, P5, in the OFF position.

E. Remove the Rain Repellent Solenoid Valve (Fig. 401)

S 014-011

(1) Remove the captain's instrument panel, P1-3, to get access to the left rain repellent solenoid valve.

S 014-012

(2) Remove the right windshield wiper motor/converter to get access to the right rain repellent solenoid valve (AMM 30-42-02/401).

S 804-013

CAUTION: PUT A CLOTH UNDER THE LINE FITTINGS TO ABSORB RAIN REPELLENT THAT CAN FALL FROM THE LINES WHEN THEY ARE DISCONNECTED. THE RAIN REPELLENT IS CORROSIVE AND CAN CAUSE A STAIN.

(3) Put a cloth under the solenoid valve.

S 034-014

(4) Remove the electrical connector from the solenoid valve.

S 034-015

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

(5) Disconnect the two tube fittings from the solenoid valve.

S 804-016

(6) Discard the O-rings. Save the nuts and washers.

S 034-017

(7) Remove the bolt, washer, and nut (2 locations).

S 024-018
(8) Release the solenoid valve and clamp from the structure and move the solenoid valve out of the clamp.

S 094-019

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

CAUTION: IF RAIN REPELLENT GETS ON THE AIRPLANE SKIN OR GLASS, CLEAN THE AREA IMMEDIATELY (REF 12-25-01). THE RAIN REPELLENT CAN CAUSE A STAIN ON THE AIRPLANE SKIN OR GLASS.

(9) Remove the plastic bags from the rain repellent nozzles.

TASK 30-43-02-404-020

3. Install the Rain Repellent Solenoid Valve (Fig. 401)

A. Consumable Materials
(1) D00062 Lubricant - rubber to metal parts, pneumatic system thread MIL-G-4343 grease

B. References
(1) AMM 30-42-02/401, Windshield Wiper Motor/Converter
(2) AMM 30-43-00/201, Rain Repellant System

C. Access
(1) Location Zones
211/212 Control Cabin - Section 41

(2) Access Panel
P1-3 Captain's Instrument Panel

D. Procedure

S 434-021
(1) Move the solenoid valve into the valve clamp.

NOTE: For the left solenoid valve, the "out" indication on the valve must point forward. For the right solenoid valve, the "out" indication on the valve must point up.

S 434-022
(2) Put the valve in a position that lets you connect the tubing.

S 424-023
(3) Install the solenoid valve and clamp on the structure with the bolts, washers and nuts.

S 644-024
(4) Lubricate the new O-rings with MIL-G-4343 lubricating fluid.

S 434-025
(5) Install the washer and O-ring on each rain repellent tube fitting. Make sure you install the O-ring on the valve side of valve-fitting connection.

S 434-026
(6) Connect the two tube fittings to the rain repellent valve.

S 804-027
(7) Remove the cloth from below the solenoid valve.

S 434-028
(8) Install the electrical connector to the valve.

S 414-029
(9) For the left rain repellent solenoid valve, install the captain's instrument panel, P1-3.

S 414-030
(10) For the right rain repellent solenoid valve, install the right windscreen wiper motor/converter (AMM 30-42-02/401).

E. Put the Airplane Back to Its Usual Condition

S 864-031
(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11A31, INDICATOR LIGHTS TEST
(b) 11A32, INDICATOR LIGHTS 1
(c) 11A33, INDICATOR LIGHTS 2
(d) 11A34, INDICATOR LIGHTS 3
(e) 11A35, INDICATOR LIGHTS 4
(f) 11P1, L IND LTS 1
(g) 11P2, L IND LTS 2
(h) 11P5, IND LTS DIM CONT
(i) 11P28, R IND LTS 1
(j) 11P29, R IND LTS 2

S 864-032
(2) Put the STBY POWER switch on the pilot's overhead panel, P5, in the AUTO position.

S 864-033
(3) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 734-034
(4) Do the Rain Repellent System Test (AMM 30-43-00/201).

WINDSHIELD RAIN REPELLENT CHECK VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the rain repellent check valve. The second task is the installation of the rain repellent check valve.
   B. Two rain repellent check valves, with different removal/installation procedures, are found behind the center instrument panels.

TASK 30-43-03-004-011

2. Remove the Rain Repellent Check Valve (Fig. 401)
   A. Equipment
      (1) Plastic Bags - clear, fluid-tight
   B. References
      (1) AMM 12-25-01/301, Exterior Airplane Cleaning
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (4) AMM 30-42-02/401, Windshield Wiper Motor/Converter
      (5) AMM 36-00-00/201, Pneumatic - General
      (6) AMM 49-11-00/501, Auxiliary Power Unit
   C. Access
      (1) Location Zones
          211/212 Control Cabin - Section 41

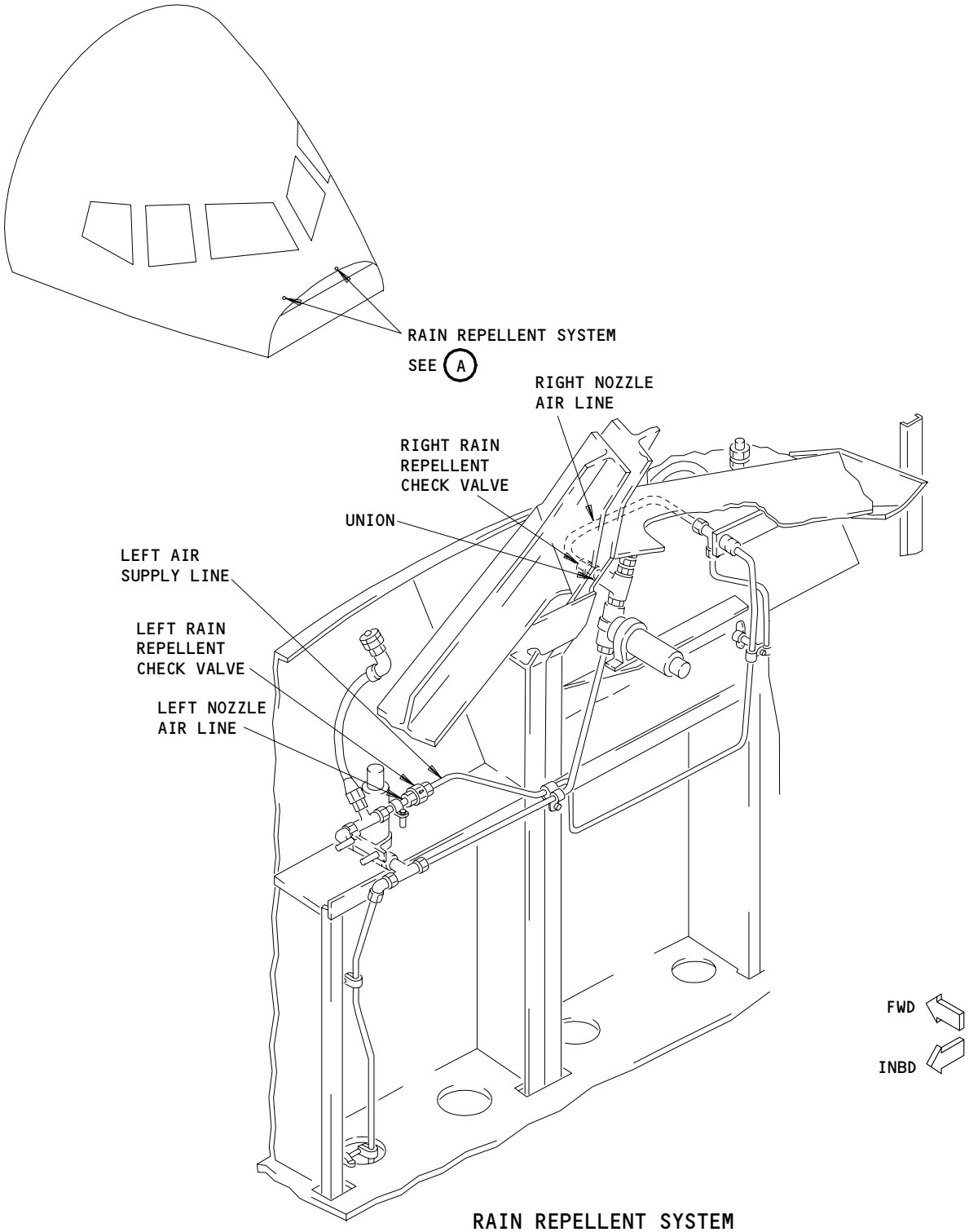
   D. Prepare for Removal

      S 864-001
      (1) Supply electrical power to the main AC buses (AMM 24-22-00/201).

      S 494-002
      (2) Install fluid-tight bags on the rain repellent nozzles.

      S 864-029
      (3) Start the APU (AMM 49-11-00/201) or supply a ground pneumatic source (AMM 36-00-00/201).

      S 864-004
      (4) If the APU is used as the air source, push the APU switch on the bleed air supply panel M10259 (panel P5) to the ON position.
          (a) Make sure the white bar light in the switch is on.



RAIN REPELLENT SYSTEM

(A)

Windshield Rain Repellent Check Valve Installation
Figure 401

S 214-030

CAUTION: DO NOT OPERATE THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR. OPERATION OF THE RAIN REPELLENT SYSTEM WITHOUT BLEED AIR CAN CAUSE THE SYSTEM TO BECOME CLOGGED.

(5) Make sure there is a strong flow of air at the rain repellent nozzles.

S 864-005

(6) Turn the rain repellent shutoff valve to the closed (horizontal) position.

S 864-006

(7) Push the RAIN REPELLENT R and L switches on the windshield wiper/rain repellent control panel M10023 until no fluid flows from the nozzles.

NOTE: You must push the switches many times with a minimum of 30 seconds between each time. The APU bleed air removes the remaining fluid from the nozzles.

S 864-031

(8) Stop the APU (AMM 49-11-00/201) or remove the ground pneumatic source (AMM 36-00-00/201).

S 864-008

(9) Open these circuit breakers on the overhead panel, P11, and attach DO-NOT-CLOSE tags:
(a) 11A31, INDICATOR LIGHTS TEST
(b) 11A32, INDICATOR LIGHTS 1
(c) 11A33, INDICATOR LIGHTS 2
(d) 11A34, INDICATOR LIGHTS 3
(e) 11A35, INDICATOR LIGHTS 4
(f) 11P1, L IND LTS 1
(g) 11P2, L IND LTS 2
(h) 11P5, IND LTS DIM CONT
(i) 11P28, R IND LTS 1
(j) 11P29, R IND LTS 2

S 864-009

WARNING: REFER TO AMM 27-61-00/201 FOR THE APPLICABLE SPOILER/SPEEDBRAKE DEACTIVATION PROCEDURE. ACCIDENTAL SPOILER MOVEMENT CAUSED BY THE SUBSEQUENT STEP CAN CAUSE INJURY TO PERSONS.

(10) Remove electrical power from the main AC buses (AMM 24-22-00/201).

NOTE: External power can supply ground service and/or ground handling buses during the removal/installation.

S 864-010

(11) Put the STBY POWER switch on the pilot's overhead panel, P5, in the OFF position.

E. Procedure

S 014-012

(1) Remove the captain's instrument panel P1-3 to get access to the left rain repellent check valve.

S 014-013

(2) Remove the right windscreen wiper motor/converter to get access to the right rain repellent check valve (AMM 30-42-02/401).

S 804-014

CAUTION: PUT A CLOTH UNDER THE CHECK VALVES TO ABSORB RAIN REPELLENT THAT FALLS FROM THE DISCONNECTED LINES. THE RAIN REPELLENT IS CORROSIVE AND CAN CAUSE A STAIN.

(3) Put a cloth under the check valve.

S 034-015

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

(4) For the left check valve, loosen the fittings to disconnect the left air supply line and the left nozzle air lines from the check valve.

S 034-016

(5) For the right check valve, loosen the fittings to disconnect the right nozzle air line from the check valve.
(a) Remove the check valve from the union.
(b) Discard the O-ring.

S 024-017

(6) Remove the check valve.

S 094-018

WARNING: DO NOT LET THE RAIN REPELLENT FLUID TOUCH YOUR SKIN OR EYES. THE FLUID CAN CAUSE IRRITATION. DO NOT BREATHE THE FUMES. IF THE FLUID TOUCHES YOU, WASH YOUR SKIN OR EYES WITH WATER.

CAUTION: IF THE RAIN REPELLENT GETS ON THE AIRPLANE GLASS OR SKIN, CLEAN THE THE AREA IMMEDIATELY (REF 12-25-01). THE RAIN REPELLENT IS CORROSIVE AND CAN CAUSE A STAIN.

(7) Remove the plastic bags from the rain repellent nozzles.

TASK 30-43-03-404-019

3. Install the Rain Repellent Check Valve (Fig. 401)

A. Consumable Materials

(1) D00062 Lubricant - rubber to metal parts, pneumatic system thread MIL-G-4343 grease

B. References

(1) AMM 30-42-02/402, Windshield Wiper Motor/Converter

(2) AMM 30-43-00/201, Windshield Rain Repellant System

C. Access

(1) Location Zones

211/212 Control Cabin - Section 41

D. Procedure

S 424-020

(1) For the left check valve, do the steps that follow:

(a) Connect the check valve to the left air supply line.

NOTE: The arrow on the fitting must point outboard. Tighten the fitting.

(b) Connect the left nozzle air line to the check valve. Tighten the fitting.

S 424-021

(2) For the right check valve, do the steps that follow:

(a) Lubricate the O-ring.

(b) Install the O-ring on the union-valve interface side of the check valve.

(c) Install the check valve to the union.

NOTE: The arrow on the check valve must point to the union.

(d) Connect the right nozzle air line to the check valve. Tighten the fitting.

S 804-022

(3) Remove the cloth from under the check valve.

S 414-023
(4) For the left check valve, install the captain's instrument panel P1-3.

S 414-024
(5) For the right check valve, install the right windscreen wiper motor/converter (AMM 30-42-02/401).

S 864-025
(6) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11A31, INDICATOR LIGHTS TEST
(b) 11A32, INDICATOR LIGHTS 1
(c) 11A33, INDICATOR LIGHTS 2
(d) 11A34, INDICATOR LIGHTS 3
(e) 11A35, INDICATOR LIGHTS 4
(f) 11P1, L IND LTS 1
(g) 11P2, L IND LTS 2
(h) 11P5, IND LTS DIM CONT
(i) 11P28, R IND LTS 1
(j) 11P29, R IND LTS 2

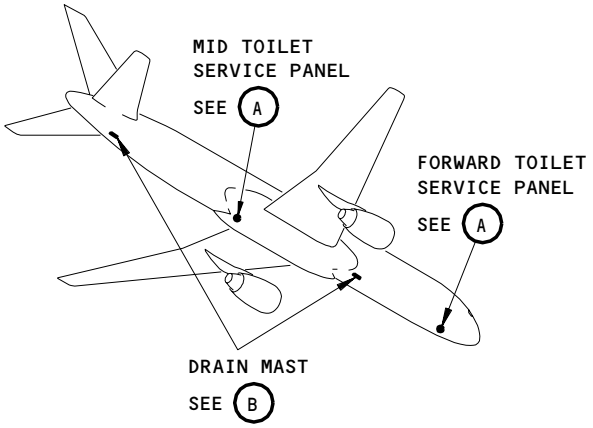
S 864-026
(7) Put the STBY POWER switch on the pilots' overhead panel, P5, in the AUTO position.

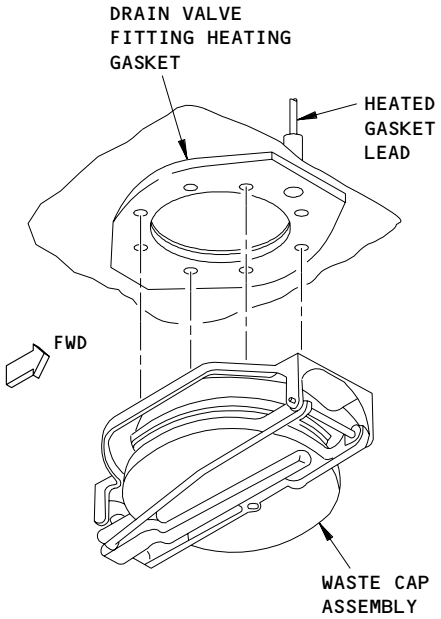
S 864-027
(8) Slowly turn the rain repellent shutoff valve to the open (vertical) position.

S 734-028
(9) Do the Rain Repellent System Test (AMM 30-43-00/201).

WATER AND DRAIN LINE HEATERS - DESCRIPTION AND OPERATION

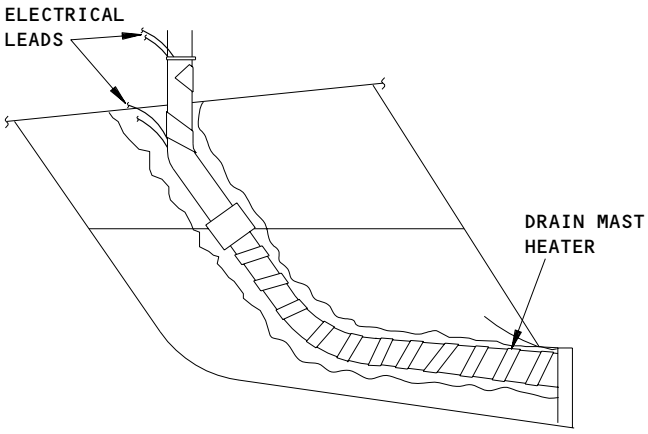
1. General
   A. Water supply and drain lines are electrically heated to prevent ice formation. System components include heater tapes, blankets, heater tape thermostats, drain pipe heater gaskets, and drain mast heaters. System electrical power comes from the 115-volt ac ground service bus through circuit breakers on right miscellaneous electrical equipment panel P37.
2. Component Details (Fig. 1)
   A. Heater Tapes, Blankets
      (1) Heater tapes, blankets are wrapped on some water supply and drain lines to prevent freezing. Temperatures of the heaters are controlled by thermostats. Some heaters are equipped with integral thermostats, while others use external thermostats.
   B. Heaters Thermostats
      (1) Thermostats are used to control the temperatures of the heaters. The thermostats will open when their temperatures exceeds 60 ±5°F (15.5 ±3°C), and will reclose when temperatures drops below 45 ±5°F (7.2 ± 3°C).
   C. Drain Pipe Heater Gaskets
      (1) Heater gaskets are installed on the fitting ends of the toilet drain pipes. The heater gaskets are not temperature-controlled by thermostats.
   D. Drain Mast Heaters
      (1) The forward and aft drain masts are heated to allow for inflight drainage without freezing. Drain mast heater temperature is controlled by an air/ground relay. Low heat is provided on the ground, and high heat is provided inflight.
3. Operation (Fig. 2)
   A. Functional Description
      (1) There are no control switches for the water and drain line heaters. All heaters are powered when the ground service bus is energized (Ref 24-51-00).
      (2) In flight, all heaters operate as they do on the ground except for the drain masts and one heater tape. The drain masts and heater tape are connected to the high voltage (115-volt AC) tap of the autotransformer through the air/ground relay.





TOILET SERVICE PANEL

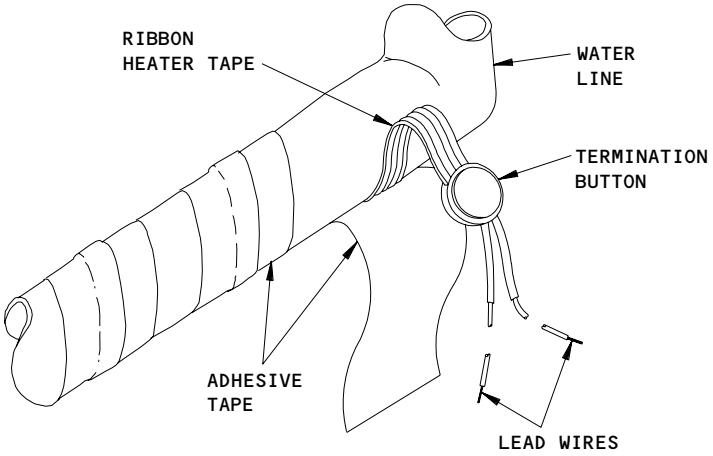
A



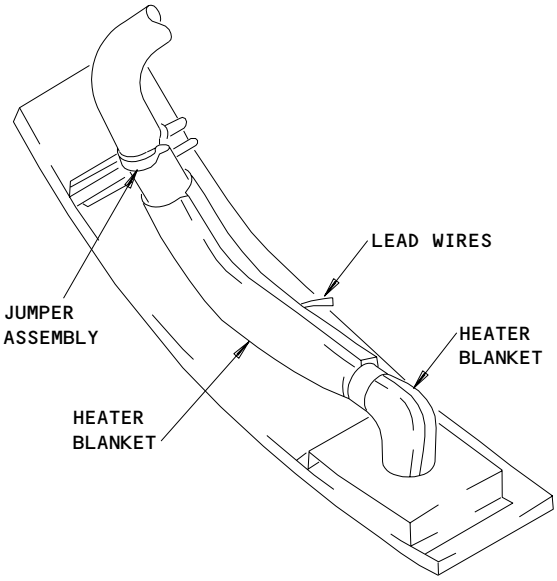
DRAIN MAST

B

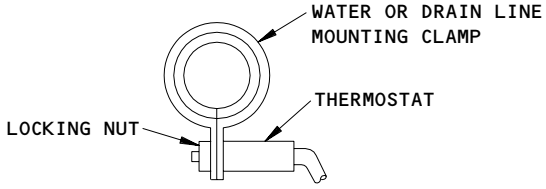
Water and Drain Line Heaters – Component Location
Figure 1 (Sheet 1)



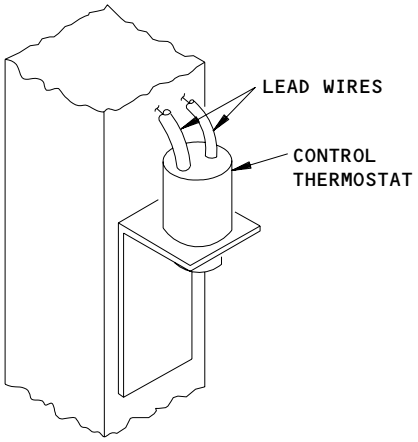
WATER LINE HEATER TAPE
(EXAMPLE)



HEATER BLANKET INSTALLATION
(EXAMPLE)

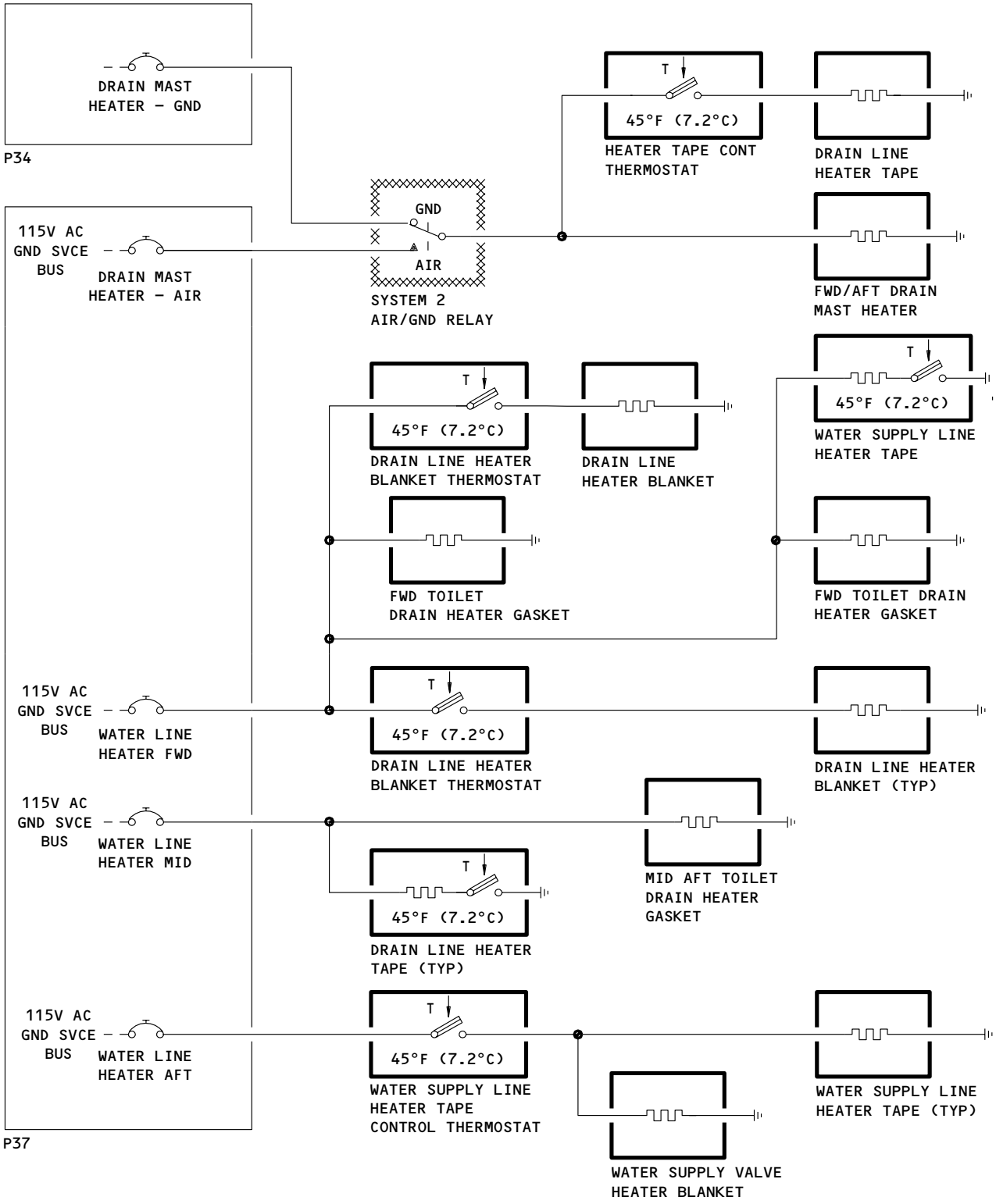


THERMOSTAT INSTALLATION
(EXAMPLE)



HEATER TAPE CONTROL THERMOSTAT
(EXAMPLE)

Water and Drain Line Heaters - Component Location
Figure 1 (Sheet 2)



Water and Waste System Heaters Schematic
Figure 2

B. Control

(1) To place the system in operation, perform the following:

(a) Supply electrical power to the ground service bus (Ref 24-22-00).

(b) Make sure the following circuit breaker for the drain mast, on the APU/External power panel P34(B) is closed.

1) 34B3, DRAIN MAST HEATER-GND

(c) Make sure the following right misc. electrical equipment panel P37 circuit breakers are closed:

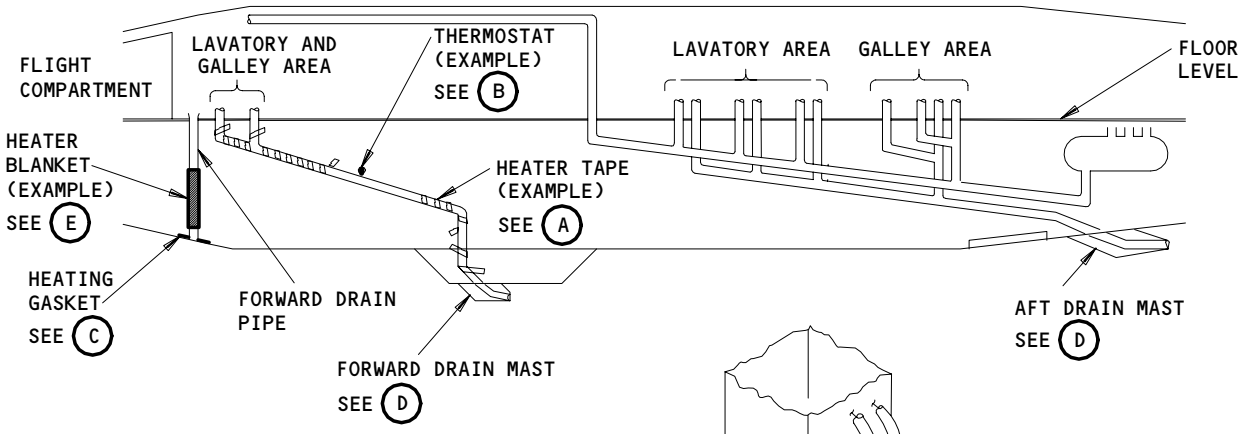
1) 37F7, DRAIN MAST HEATER-AIR
2) 37F5, WATER LINE HEATERS FWD
3) 37F6, WATER LINE HEATERS MID
4) 37E1, WATER LINE HEATER AFT

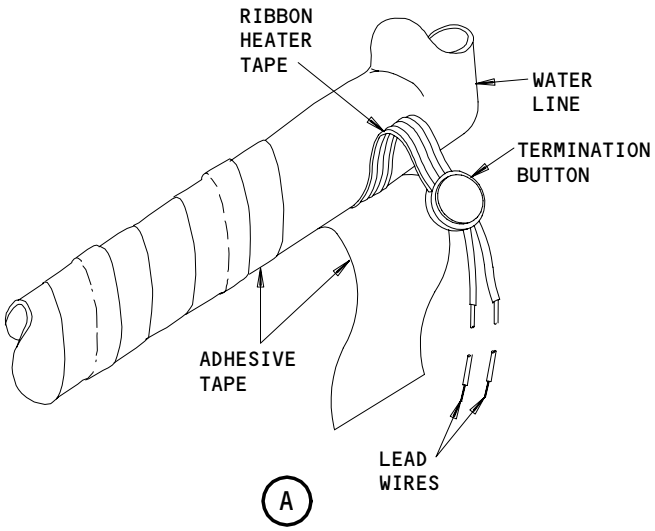
WATER AND DRAIN LINE HEATERS

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	--		119BL, MAIN EQUIP CTR, P34	
HEATERS DRAIN MST GND, C4367		1	34B3 (B)	*
CIRCUIT BREAKERS	--		119BL, MAIN EQUIP CTR, P37	
AFT WATERLINE HEATERS, C4262		1	37E1	*
HEATERS DRAIN MST AIR, C1142		1	37F7	*
HEATERS WATERLINE FWD, C1149		1	37F5	*
HEATERS WATERLINE MID, C1150		1	37F6	*
HEATER - AFT DRAIN MAST, B42	--	1	SECTION 46, BOTTOM OF FUSELAGE	30-71-03
HEATER - FWD DRAIN MAST, B41	--	1	SECTION 43, BOTTOM OF FUSELAGE	30-71-03
HEATER - FWD TOILET DRAIN GASKET, B43	--	1	SECTION 41, FWD LAVATORY WASTE SERVICE PANEL	30-71-04
HEATER - MID TOILET DRAIN GASKET, B92	--	1	SECTION 43, BOTTOM OF FUSELAGE	30-71-03
HEATER TAPE - WATER SUPPLY LINE, B10217	--	1	SECTION 43, LWR FUSELAGE DRAIN LINE	30-71-01
HEATER BLANKETS - FWD DRAIN LINE, B107,B117	--	2	SECTION 41, LWR FUSELAGE DRAIN LINE	30-71-01
HEATER TAPES - AFT SUPPLY LINE, B10219, B10221,B10220,B10222	--	4	SECTION 46, LWR FUSELAGE DRAIN LINE	30-71-01
HEATER TAPE - DRAIN LINE HEATER TAPE, B10063	--	1	SECTION 43, LWR FUSELAGE DRAIN LINE	30-71-01
HEATER TAPE - MID SUPPLY LINE, B10126, B10127	--	2	SECTION 43, LWR FUSELAGE SUPPLY LINE	30-71-01
HEATER THERMOSTAT - AFT SUPPLY LINE, B10223	--	1	SECTION 46, LWR FUSELAGE SUPPLY LINE	30-71-02
HEATER THERMOSTAT - FWD DRAIN LINE, B85	--	1	SECTION 41, LWR FUSELAGE DRAIN LINE	30-71-02
HEATER THERMOSTAT - FWD DRAIN LINE, B10064	--	1	SECTION 43, LWR FUSELAGE DRAIN LINE	30-71-02
RELAY - (REF 31-01-37, FIG. 101) AIR/GND, SYS 2, K205				

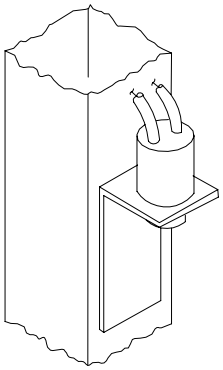
* SEE THE WDM EQUIPMENT LIST

Water and Drain Line Heaters - Component Index
Figure 101



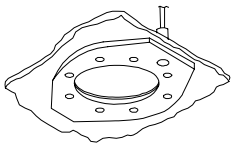


A



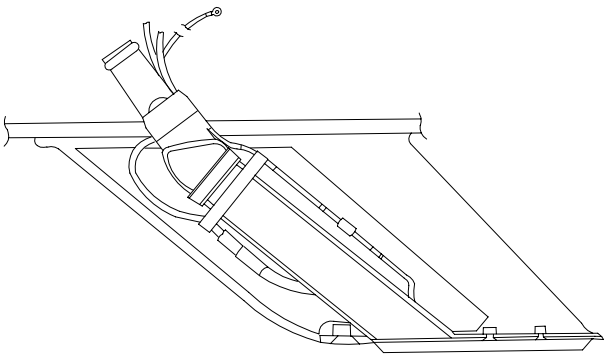
THERMOSTAT (EXAMPLE)

B



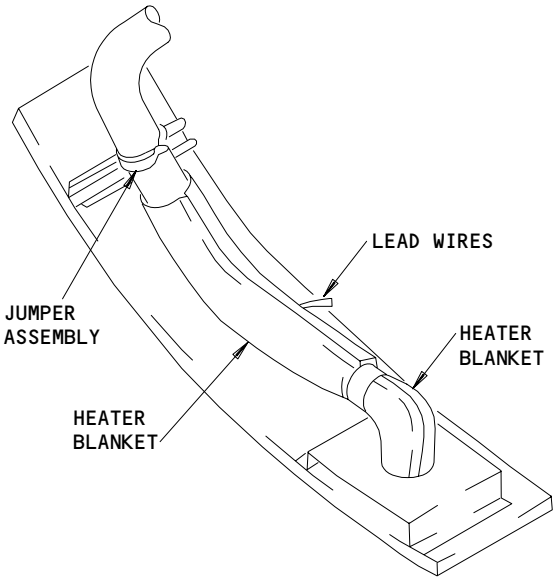
GASKET HEATER (EXAMPLE)

C



FORWARD DRAIN MAST
(AFT DRAIN MAST IS ALMOST THE SAME)

D



HEATER BLANKET INSTALLATION
(EXAMPLE)

E

Water and Drain Line Heaters – Component Location
Figure 102

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TABLE 101 (Cont)		
INOPERATIVE HEATER	CIRCUIT BREAKER	CORRECTIVE ACTION 1
B41 FWD DRAIN MAST HTR B42 AFT DRAIN MAST HTR	C1142, HEATERS DRAIN MST AIR (37F7) AND C4367, HEATERS DRAIN MST GND (34B3(B))	IF BOTH DRAIN MAST HEATERS BECAME DEFECTIVE IN THE AIR, EXAMINE SYS 2 AIR/GND RELAY K205 FOR THE CORRECT OPERATION (MM 32-09-02/201). REPLACE IF DEFECTIVE. IF THE PROBLEM CONTINUES, REPLACE DEFECTIVE DRAIN MAST (MM 38-31-01/401).
B10063 DRAIN LINE HTR TAPE	C1142, HEATERS DRAIN MST AIR (37F7) AND C4367, HEATERS DRAIN MST GND (34B3(B))	EXAMINE THERMOSTAT B10064 FOR THE CORRECT OPERATION (MM 30-71-02/401). REPLACE IF DEFECTIVE; IF NOT, REPLACE HEATING ELEMENT (MM 30-71-01/401).

Heater and Thermostat Fault Isolation
Figure 103 (Sheet 2)

WATER SUPPLY AND DRAIN LINE HEATER TAPES - REMOVAL/INSTALLATION

1. General (Fig. 401)
   A. This procedure contains two tasks. The first task is the removal of heater tapes. The second task is the installation of heater tapes.
   B. Heater tapes and blankets are wound around water supply lines and some drain lines to keep off ice.
   C. Heater tapes are in the rear of the cargo compartment wall and floor panels.
   D. Removal/installation procedures are the same for all units.

TASK 30-71-01-004-001

2. Remove the Heater Tapes
   A. Prepare for Removal

S 014-002

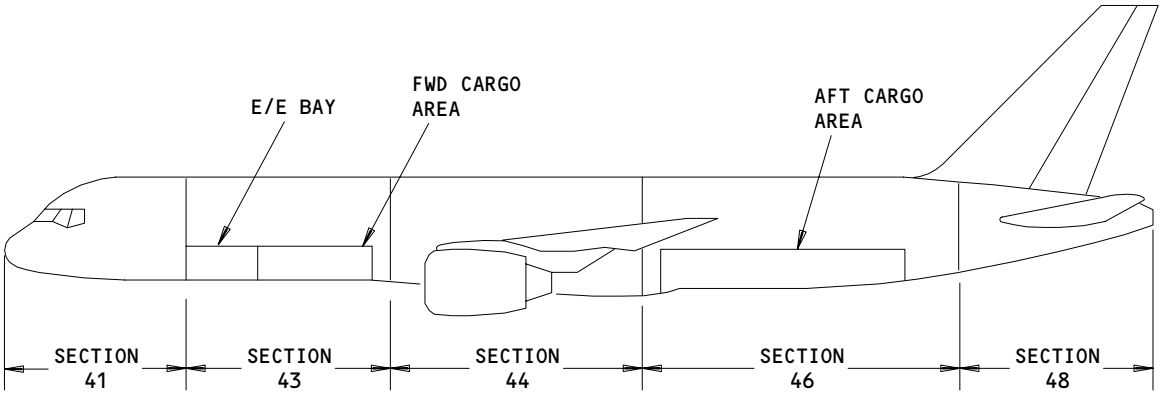
(1) Remove the necessary floor or wall panels.

S 864-005

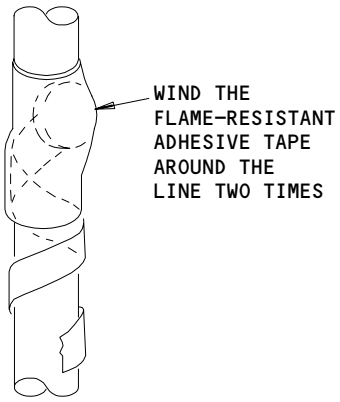
(2) Open the applicable circuit breakers on the right miscellaneous relay panel, P37, and attach DO-NOT-CLOSE tags (see table).

NOTE: Circuit breaker 34B3(B), HEATERS DRAIN MST GND, is on the APU/External Power Panel P34(B).

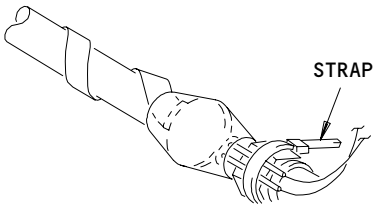
REF NO.	TYPE OF HEATER	CIRCUIT BREAKER
B43	FWD TOILET DRAIN GASKET	37F5, HEATERS WATERLINE FWD
B107	DRAIN LINE BLANKET	37F5, HEATERS WATERLINE FWD
B117	DRAIN LINE BLANKET	37F5, HEATERS WATERLINE FWD
B118	DRAIN LINE TAPE	37F5, HEATERS WATERLINE FWD
B10102	DRAIN LINE BLANKET	37F5, HEATERS WATERLINE FWD
B10122	MID FWD TOILET DRAIN GASKET	37F5, HEATERS WATERLINE FWD



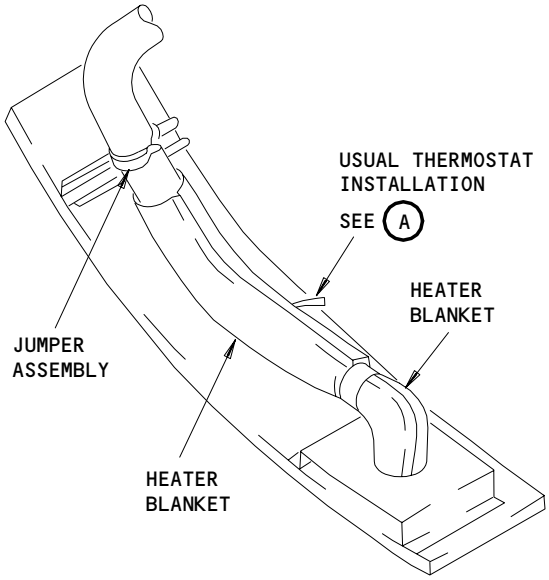
GENERAL LOCATION OF HEATERS AND THERMOSTATS



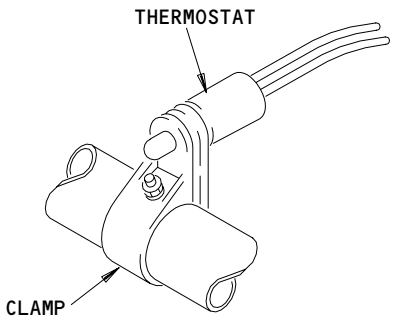
USUAL HEATER TAPE END INSTALLATION



USUAL STRAP INSTALLATION



USUAL HEATER BLANKET INSTALLATION



USUAL THERMOSTAT INSTALLATION

(A)

Heater Tape Installation
Figure 401

REF NO.	TYPE OF HEATER	CIRCUIT BREAKER
B92	MID AFT TOILET DRAIN GASKET	37F6, HEATERS WATERLINE MID
B10126	DRAIN LINE TAPE	37F6, HEATERS WATERLINE MID
B10127	DRAIN LINE TAPE	37F6, HEATERS WATERLINE MID
B10074	WATER SUPPLY VALVE BLANKET	37E1, AFT WATERLINE HEATERS
B10217	WATER SUPPLY LINE TAPE	37E1, HEATERS WATERLINE AFT
B10219	WATER SUPPLY LINE TAPE	37E1, HEATERS WATERLINE AFT
B10220	WATER SUPPLY LINE TAPE	37E1, HEATERS WATERLINE AFT
B10221	WATER SUPPLY LINE TAPE	37E1, HEATERS WATERLINE AFT
B10222	WATER SUPPLY LINE TAPE	37E1, HEATERS WATERLINE AFT
B10063	DRAIN LINE TAPE	37F7, HEATERS DRAIN MST AIR and 34B3(B), HEATERS DRAIN MST GND
B41	FWD DRAIN MAST HEATER	37F7, HEATERS DRAIN MST AIR and 34B3(B), HEATERS DRAIN MST GND
B42	AFT DRAIN MAST HEATER	37F7, HEATERS DRAIN MST AIR and 34B3(B), HEATERS DRAIN MST GND

B. Procedure

S 014-006
(1) Remove the insulation from the water lines, if necessary.

S 034-007
(2) Remove the MS3367 strap from around the electrical leads.

S 034-008
(3) Cut the electrical leads near the terminal button.

NOTE: Keep the cut leads in position to help you find the location for the splice.

S 024-009
(4) Remove the heater tape.

TASK 30-71-01-404-010
3. Install the Heater Tapes (Fig. 401)

NOTE: If you have too much heater tape, you can wind it more times if it does not make an overlap.

Attach flat-wound heater tapes to the lines with continuous flame-resistant adhesive tape above the center of the heater tape. Make sure you wind the flame-resistant adhesive tape around the heater line on 7-inch (17.78 cm) centers.

Attach spirally wound heater tapes to the lines with continuous flame-resistant adhesive tape above the center of the heaters.

Make sure the maximum line without heat is 1.0 inch (2.54 cm). Install heater tapes flat on joints.

A. Consumable Materials
(1) Tape, Adhesive, Flame Resistant - 1.5 inches wide (use one of these tapes):
(a) G00295 3M No. 474
(b) G02129 Permacel P-29 Silver
(c) G00348 Permacel P-621
(2) G00646, Strap - MS 3367-1-9 (commercially available)

(3) Tape, Hook/Loop Fastener (use one of these tapes):
(a) G02360 BMS8-285, Type IV
(b) G50333 BMS8-372, Type I

B. Equipment
(1) Thermometer, 0 to 120 degrees F (0 degree to 49 degrees C), commercially available
(2) Volt-ohmmmeter - Simpson 260

C. References
(1) 24-22-00/201, Electrical Power - Control

D. Procedure

S 434-011

CAUTION: DO NOT LET HEATER TAPES MAKE OVERLAPS. DO NOT INSTALL THE STRAPS ON THE HEATER TAPES. PERMIT 1.0 INCH (2.54 cm) MINIMUM CLEARANCE BETWEEN THE HEATER TAPES AND INSULATION. INCORRECT INSTALLATION OF THE HEATER TAPES CAN CAUSE TOO MUCH HEAT TO COLLECT IN THE HEATER TAPES.

FAILURE TO OBEY THESE PRECAUTIONS CAN CAUSE LOCAL DAMAGE OR HEATER TAPE FAILURE BEFORE THE USUAL TIME.

(1) Put the heater tape terminal button on the line and attach it with two wraps of flame-resistant adhesive tape.

S 424-012
(2) Wind the heater tape on the line.

S 434-013
(3) Attach the other end of the heater tape with two wraps of flame-resistant adhesive tape.

S 434-014
(4) Continuously wind the flame-resistant adhesive tape around the heater tape.

S 964-015
(5) Remove the old electrical leads and install new leads with a splice.

S 434-016

CAUTION: DO NOT INSTALL THE STRAP ON THE HEATER TAPE. THE STRAP COULD CAUSE TOO MUCH HEAT TO COLLECT IN THE HEATER TAPES. THIS COULD CAUSE LOCAL DAMAGE OR FAILURE OF THE HEATER TAPE BEFORE THE USUAL TIME.

(6) Attach the leads with the MS3367 strap.

E. Put the Airplane Back to Its Usual Condition

S 704-017

(1) Do a test of the heater tape installation.
   (a) Remove the DO-NOT-CLOSE tags and close the applicable circuit breakers on the P34(B) or P37 panel (see table).
   (b) Supply electrical power (Ref 24-22-00).
   (c) Make sure the heater tape becomes warm.

NOTE: The heater tape will not become warm if the thermostat temperature is more than 60°F (15.5°C).

1) You can use a thermometer or other temperature measuring device to make sure there is an increase of at least 10 degrees F (6 degrees C) above the ambient air temperature.
2) As an alternative, you can use a current meter or equivalent to measure the current to the heater.

   (d) Remove electrical power, if it is not necessary.

S 434-026

CAUTION: DO NOT INSTALL INSULATION BLANKETS OVER THE HEATER TAPES. PROVIDE 1.0 INCH (25.4 MM) MINIMUM CLEARANCE BETWEEN HEATER TAPES AND INSULATION.

(2) ALL AIRPLANES PRE SEP 2, 2003 FAR STD; AIRPLANES WITHOUT FAR 25.856 AND FAR 121.312(e) COMPLIANT THERMAL/ACOUSTIC INSULATION MATERIALS: If applicable, install the insulation on the water or drain lines with the hook/loop fastening tape, G02360, or tape, G50333.

NOTE: Hook and loop tape (BMS8-372) is FAR 25.856 and FAR 121.312(e) compliant, and it is the preferred alternative to hook and loop tape (BMS8-285).

S 434-027

CAUTION: DO NOT INSTALL INSULATION BLANKETS OVER THE HEATER TAPES. PROVIDE 1.0 INCH (25.4 MM) MINIMUM CLEARANCE BETWEEN HEATER TAPES AND INSULATION.

(3) ALL AIRPLANES POST SEP 2, 2003 FAR STD; AIRPLANES WITH FAR 25.856 AND FAR 121.312(e) COMPLIANT THERMAL/ACOUSTIC INSULATION MATERIALS: If applicable, install the insulation on the water or drain lines with the hook/loop fastening tape, G50333.

S 414-020

(4) Install the floor or wall panels, if applicable.

HEATER TAPE THERMOSTATS - REMOVAL/INSTALLATION

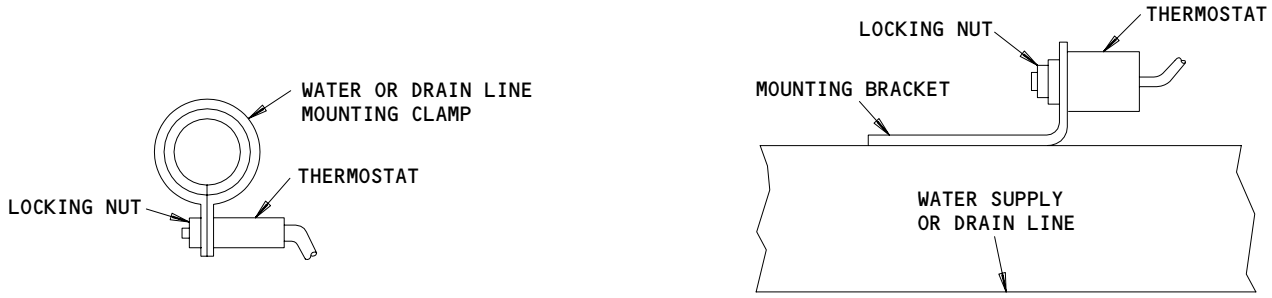
1. General
   A. This procedure contains two tasks. The first task is the removal of the heater tape thermostats. The second task is the installation of the heater tape thermostats.

   TASK 30-71-02-004-001

2. Remove the Thermostat (Fig. 401)
   A. Procedure

      S 864-003

      (1) Open the applicable circuit breakers on the right miscellaneous relay panel, P37, or the APU external power panel, P34(B), and attach DO-NOT-CLOSE tags (see table).



Usual Heater Tape Thermostat Installation
Figure 401

THERMOSTAT	HEATERS CONTROLLED	CIRCUIT BREAKER
B85	B107, B117	37F5, HEATERS DRAIN LINE BLANKET or HEATERS WATERLINE FWD
B10104	B10102	37F5, HEATERS WATERLINE FWD or HEATER FWD WATERLINE
B10223	B10217, B10219 B10220, B10221 B10222	37E1, AFT WATERLINE HEATER
B10064	B10063	34B3(B), DRAIN MAST HTR GND 37F7, HEATERS DRAIN MST AIR

S 014-006

(2) Remove the floor or wall panels, if applicable, to get access to the thermostat.

S 034-008

(3) Cut the electrical leads near the thermostat.

NOTE: Keep the cut leads in position to help you find the location for the splice.

S 034-009

(4) Remove the locking nut.

S 024-010

(5) Remove the thermostat.

TASK 30-71-02-404-011

3. Install Thermostat (Fig. 401)

A. Consumable Materials

(1) Dry Ice (Commercial source)

(2) Cooling Spray, commercially available

B. References

(1) AMM 24-22-00/201, Electrical Power - Control

C. Procedure

S 424-012

(1) Install the thermostat and attach it with the locking nut.

S 964-013

(2) Remove the old electrical leads and install new leads with a splice.

S 864-017

(3) Remove the DO-NOT-CLOSE tags and close the applicable circuit breakers on the P34(B) or P37 panel (see table).

S 704-018

(4) Do a test of the thermostat installation.

(a) Supply electrical power (AMM 24-22-00/201).

(b) Use dry ice or cooling spray to cool the thermostat to less than 30°F (-1°C).

(c) Make sure the applicable heater tape becomes warm.

(d) Remove electrical power, if it is not necessary (AMM 24-22-00/201).

S 414-019

(5) Install the floor and wall panels, if necessary.

DRAIN MAST HEATERS - REMOVAL/INSTALLATION

1. General
   A. The drain mast heater is a part of the drain mast.

   TASK 30-71-03-004-001
2. Remove/Install the Drain Mast Heater
   A. General
      (1) Refer to 38-31-01/401 for the removal/installation procedure.

DRAIN PIPE HEATER GASKET - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the drain pipe heater gasket. The second task is the installation of the drain pipe heater gasket.
   B. Drain pipe heater gaskets prevent ice on the drain pipes. The heater gaskets are around the drain pipe below the drain cap. Access is through the applicable drain service door.

TASK 30-71-04-004-001

2. Remove the Drain Pipe Heater Gasket (Fig. 401)
   A. References
      (1) AMM 38-32-16/401, Waste Tank Drain Duct Nipple
   B. Procedure

      S 034-002
      (1) Remove the drain duct nipple assembly (AMM 38-32-16/401).

      S 034-003
      (2) Cut the lead wires near the heater gasket.

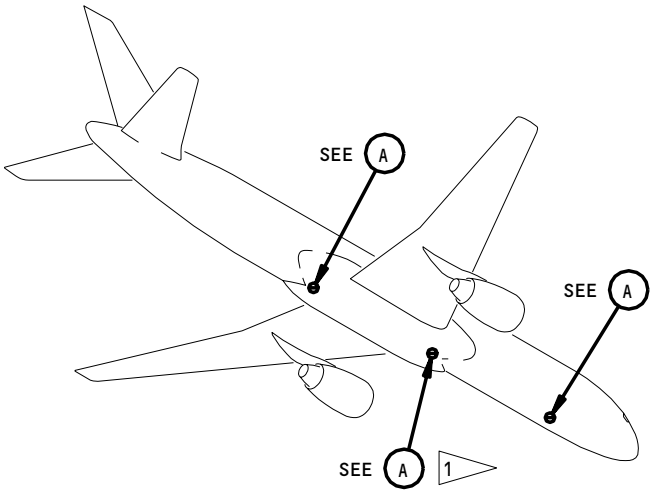
      NOTE: You can keep the lead wires in position to help you find the location of the splice. Remove the wires before you install the new heater gasket.

      S 024-004
      (3) Remove the heater gasket and the shim.

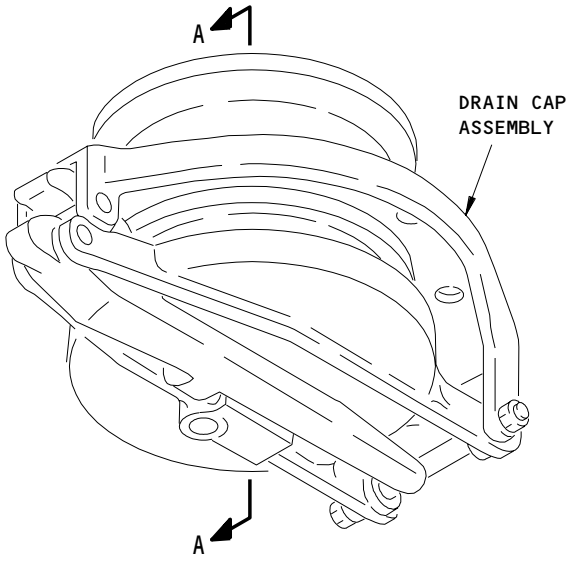
      S 214-005
      (4) Examine the shim.
         (a) Replace the shim, if necessary (AMM 38-32-16/401).

TASK 30-71-04-404-006

3. Install the Drain Pipe Heater Gasket (Fig. 401)
   A. Consumable Materials
      (1) A00247 Sealant, Chromate Type - BMS 5-95
      (2) G50368 Agent, Parting - Conforms with BAC5000 and PSD 6-187.
      (3) B00148 Solvent - Methyl Ethyl Ketone (MEK)-TT-M-261
      (4) B00299 Abrasive - Scotch-Brite type A, 100-grit or finer
      (5) G00033 Cheesecloth - BMS 15-5
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 38-32-16/401, Waste Tank Drain Duct Nipple

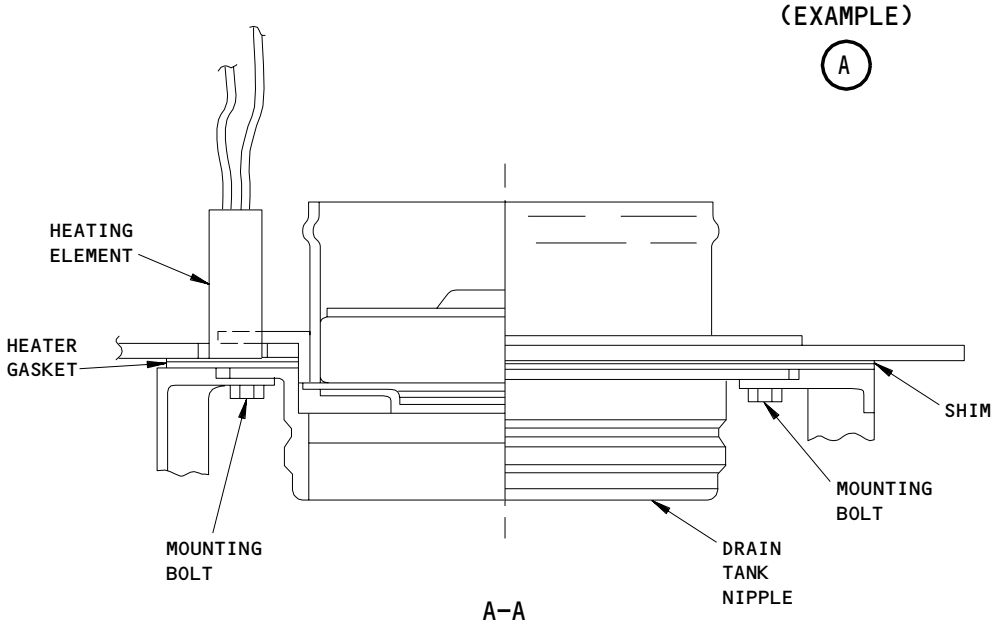


(EXAMPLE OF WASTE
DRAIN CAP LOCATIONS)



(EXAMPLE)

A



A-A

1 OPTIONAL INSTALLATION

Drain Pipe Heating Gasket Installation
Figure 401

C. Procedure

S 114-028

WARNING: DO NOT GET SOLVENTS IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE A HAZARDOUS MATERIAL. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMNTS FOR PROPER HANDLING PROCEDURES.

(1) Clean the mount surfaces and the bolts with solvent Series 92 (SOPM 20-30-92), to remove sealant.

S 124-008

CAUTION: DO NOT CAUSE DAMAGE TO THE ENAMEL. CORROSION CAN OCCUR.

(2) To prepare the enamel surface for sealant, rub the surface with abrasive until you remove the surface gloss.

S 964-009

(3) Remove the used heater leads and install the new heater leads with a splice.

S 114-029

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH, OR YOUR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(4) Clean the surfaces with a cheesecloth that is moist with solvent, Series 92 (AMM/SOPM 20-30-92) .

S 804-011

(5) Apply the parting agent to the two faces of the heater gasket and shim.

S 394-012

(6) Apply the sealant to the external skin surface and to the two faces of the shim and heater gasket.

S 424-013
(7) Install the shim and heater gasket.
(a) Make sure none of the wires stay out.

S 434-024
(8) Install the drain duct nipple (AMM 38-32-16/401).

S 704-025
(9) Do a test of the drain duct heating gasket installation.
(a) Supply electrical power (AMM 24-22-00/201).
(b) Make sure the heater gasket becomes warm.
(c) Close the drain service door.
(d) Remove electrical power, if it is not necessary.