Scandinavian Airlines System

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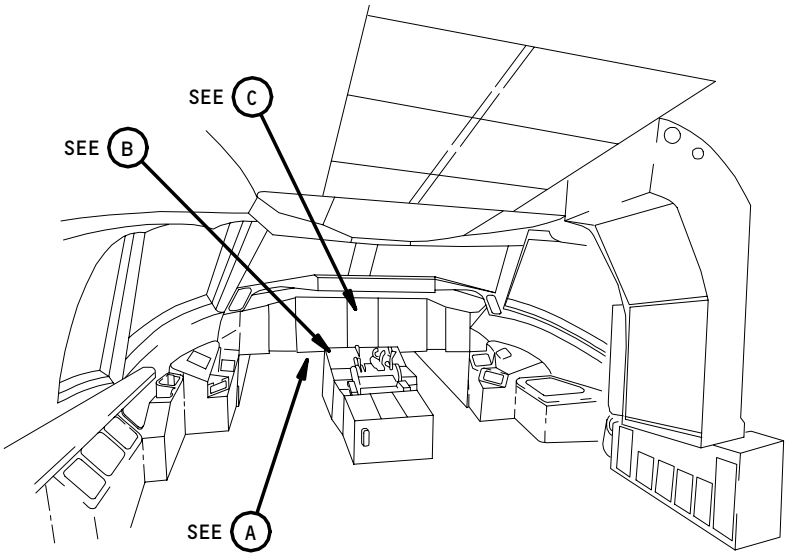
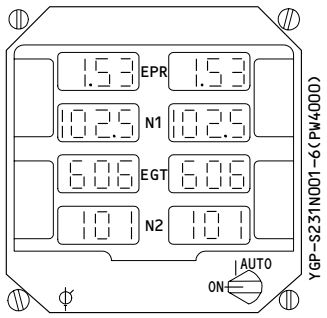
ENGINE INDICATING - DESCRIPTION AND OPERATION

1. General
   A. The engine indicating system includes these components:
      (1) Engine Pressure Ratio (EPR) indication system, AMM 77-11-00
      (2) Engine tachometer system, AMM 77-12-00
      (3) Exhause Gas Temperature (EGT) indicating system, AMM 77-21-00
      (4) Airborne Vibration Monitoring (AVM) system, AMM 77-31-00
      (5) Electronic Propulsion Control System (EPCS) monitoring system, AMM 77-35-00
      (6) Standby engine indicating system, AMM 77-41-00
   B. EPR Indicating System
      (1) The EEC senses PT2 and PT4.95 and calculates the ratio of PT4.95/PT2. EPR parameters are transmitted from the EEC to EICAS over a 429 data bus, and are displayed on the upper EICAS display.
   C. Engine Tachometer System
      (1) The engine tachometer system provides both N1 and N2 speeds to EICAS. N1 speed is displayed on the upper EICAS display, and N2 speed is displayed on the lower EICAS display.
   D. EGT Indicating System
      (1) EGT is sensed by thermocouple probes located in the struts of the turbine exhaust case. The EEC transforms the EGT probe signals into signals suitable for transmission on a 429 data bus. EGT parameters are displayed on the upper EICAS display. The EGT probe signals are also sent (in analog form) to the SEI.
   E. AVM System
      (1) Engine vibration is sensed by accelerometers mounted on the engine case. The AVM monitor unit converts the accelerometer signals into signals suitable for display on EICAS. Vibration levels are displayed on the lower EICAS display.
   F. EPCS Monitoring System
      (1) The Electronic Propulsion Control System (EPCS) Monitoring System allows for testing and fault monitoring of the electronic engine controls. EEC fault data are stored in non-volatile memory inside the Propulsion Interface Monitor Unit (PIMU).
   G. System for the Standby Engine Indication
      (1) A LED display provides a readout of EPR, N1, N2, and EGT parameters in case of EICAS failure.
2. Component Details
   A. EICAS Displays
      (1) The EPR indication displays the commanded, actual, and limit values of engine pressure ratio on the upper EICAS display.
      (2) The N1 indication displays the rotational speed, in percent, of the fan and low pressure compressor on the upper EICAS display.
      (3) The N2 indication displays the rotational speed, in percent, of the high pressure compressor on the lower EICAS display.
      (4) The parameters of the exhaust gas temperature (EGT) are displayed on the upper EICAS display.

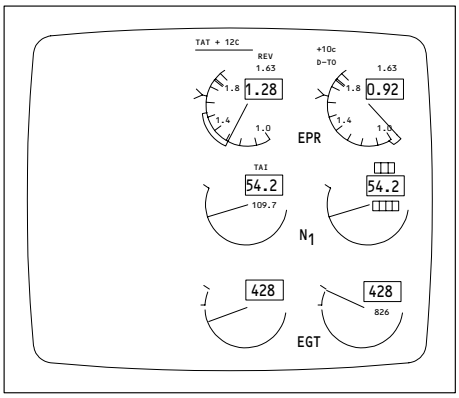


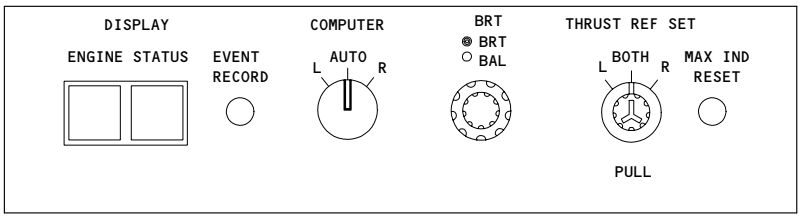
FLIGHT COMPARTMENT



STANDBY ENGINE INDICATOR (P1-3)

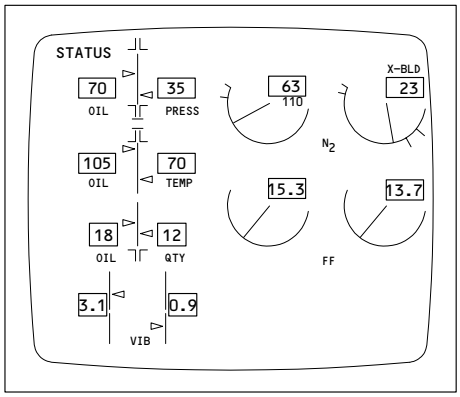
A





DISPLAY SELECT PANEL FOR THE PILOT (P9)

B



EICAS DISPLAY UNITS (P2)

C

Flight Compartment Engine Indication
Figure 1

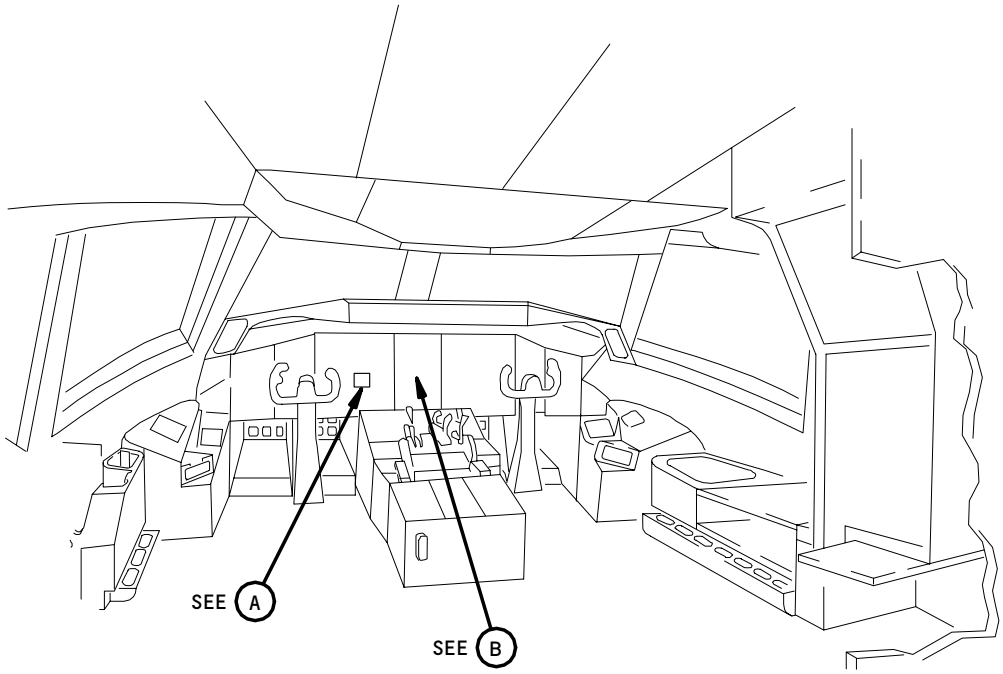
(5) Engine vibration (VIB) levels are displayed on the lower EICAS display.
(6) A TAI annunciation is displayed above the N1 readout when engine thermal anti-icing (TAI) is on (AMM 30-21-00/001).
(7) Fuel flow is indicated on the lower EICAS display. Indication is in pounds (mass) per hour (AMM 73-00-00/001).
(8) Engine oil pressure (AMM 79-32-00/001) and temperature (AMM 79-34-00/001) indications are provided on the lower EICAS display.

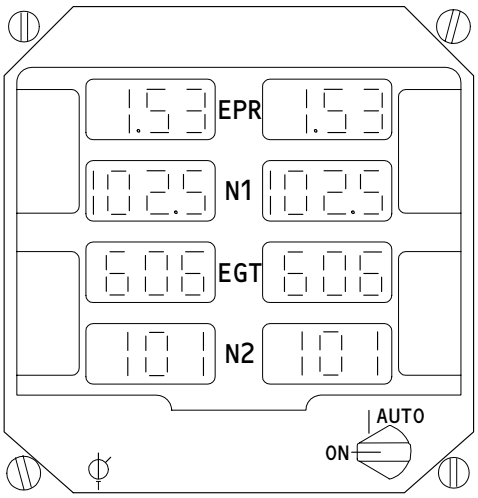
B. Display Select Panel for the Pilot
(1) The display select panel for the pilot is located on the forward electronics panel, P9. Knobs on the panel control display brightness and set thrust reference levels (AMM 77-11-00/001).
(2) Two pushbutton switches (ENGINE, STATUS) on the panel control the display format of the lower EICAS display. Pressing the ENGINE switch causes N2, fuel flow, VIB, oil temp, oil pressure, and oil quantity parameters to be displayed. Pressing the STATUS switch causes status messages, flight control positions, and hydraulic system parameters to be displayed.
(3) The MAX IND RESET switch will clear the maximum redline exceedances for the appropriate parameter displays if the parameter is below redline. Pressing the switch has no effect on data stored on the APU/PERF or ENG EXCD pages.

C. Standby Engine Indicator (SEI)
(1) The SEI provides backup displays of EPR, N1, N2, and EGT in case of EICAS failure. The SEI is a LED display with three modes of operation (refer to AMM 77-41-00/001 for the detailed operation).

ENGINE PRESSURE RATIO (EPR) INDICATING SYSTEM - DESCRIPTION AND OPERATION

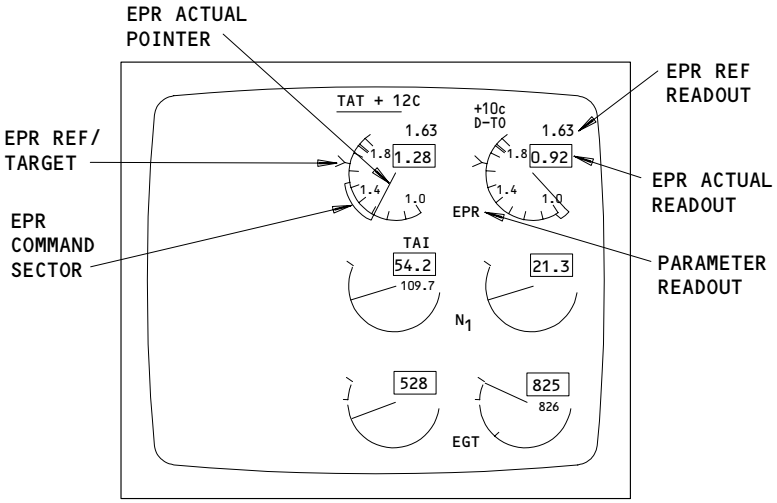
1. General
   A. The indicating system for the engine pressure ratio (EPR) shows engine power output. The system is used for setting engine thrust and for monitoring engine performance.
   B. Engine inlet and exhaust pressures are sensed by probes and sent to the electronic engine control (EEC). The EEC converts pressure signals to an EPR signal and sends the EPR signal to the flight compartment.
   C. The system consists of an inlet total pressure/temperature probe (AMM 73-21-00), exhaust probes, EEC (AMM 73-21-00), EICAS (AMM 31-41-00), and the standby engine indicator (SEI) (AMM 77-41-00).
2. Component Details (Fig. 1)
   A. EEC Total Pressure/Temperature (PT2/TT2) Probe for the Engine Inlet (AMM 73-21-00)
      (1) The PT2/TT2 probe supplies inlet pressure to each channel of the EEC.
   B. Exhaust Pressure (PT4.95) Probes
      (1) Exhaust pressure data is furnished by probes integral to the struts of the turbine exhaust case. A manifold averages each pressure signal and routes the average pressure to the EEC.
   C. Electronic Engine Control (AMM 73-21-00)
      (1) The electronic engine control takes the inlet and exhaust pressure signals and calculates PT4.95/PT2 (EPR). Each channel of the EEC determines EPR and sends EPR data to the flight compartment via separate ARINC 429 data buses.
3. Operation
   A. Functional Description
      (1) EPR System Operation
         (a) The PT2 and PT4.95 probes route their respective pressures to the EEC. The EEC converts pressure to electrical signals and calculates the ratio PT4.95/PT2 (EPR). EPR data is transmitted over ARINC 429 data buses to EICAS, SEI, flight recorder, and thrust management computer (TMC).
         (b) The primary channel of the EEC provides two ARINC 429 bus outputs for EPR data. One output is used exclusively to provide the SEI with EPR data. The other output of the primary channel feeds EICAS, flight recorder, and TMC.
      (2) EPR Indication Description
         (a) The upper EICAS display shows a continuous analog and digital readout of EPR. The analog readout of EPR consists of two white round dials with scale markings of 1.0, 1.4, and 1.8. Each scale graduation represent a change of 0.1 EPR.





STANDBY ENGINE INDICATOR

A

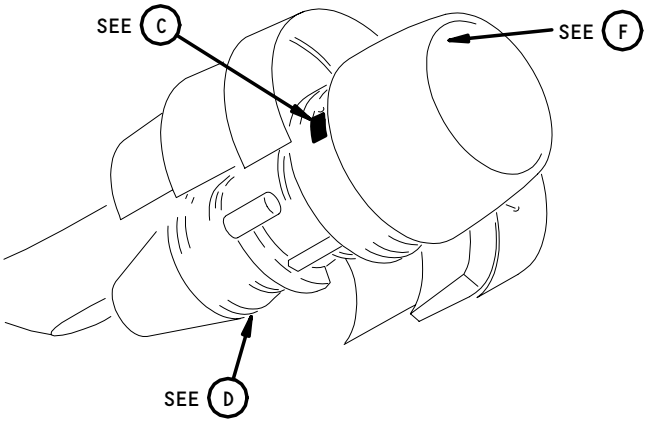


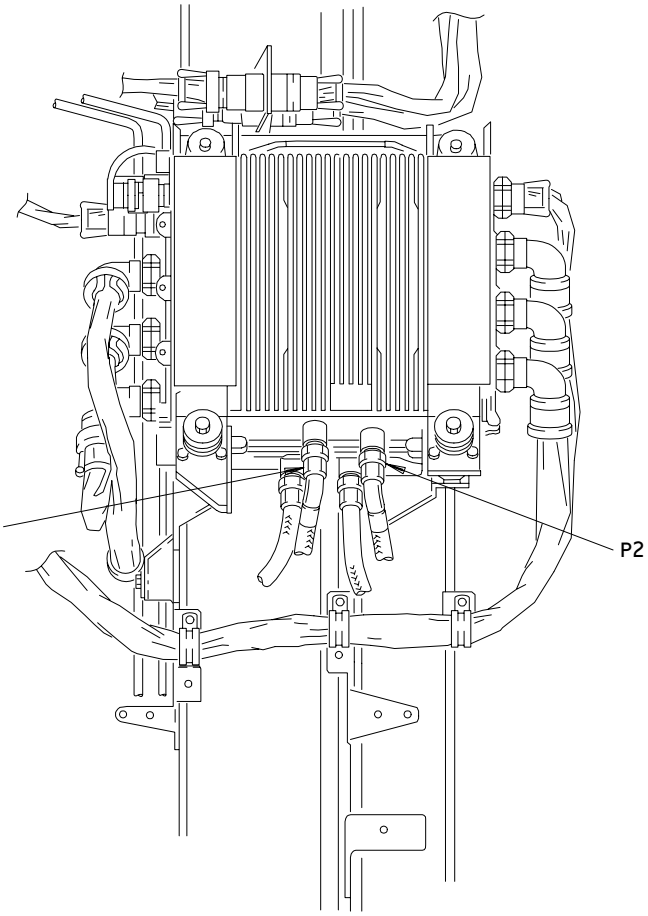
UPPER EICAS DISPLAY

B

NOTE: NUMBERS DISPLAYED ON INDICATOR FOR REFERENCE ONLY

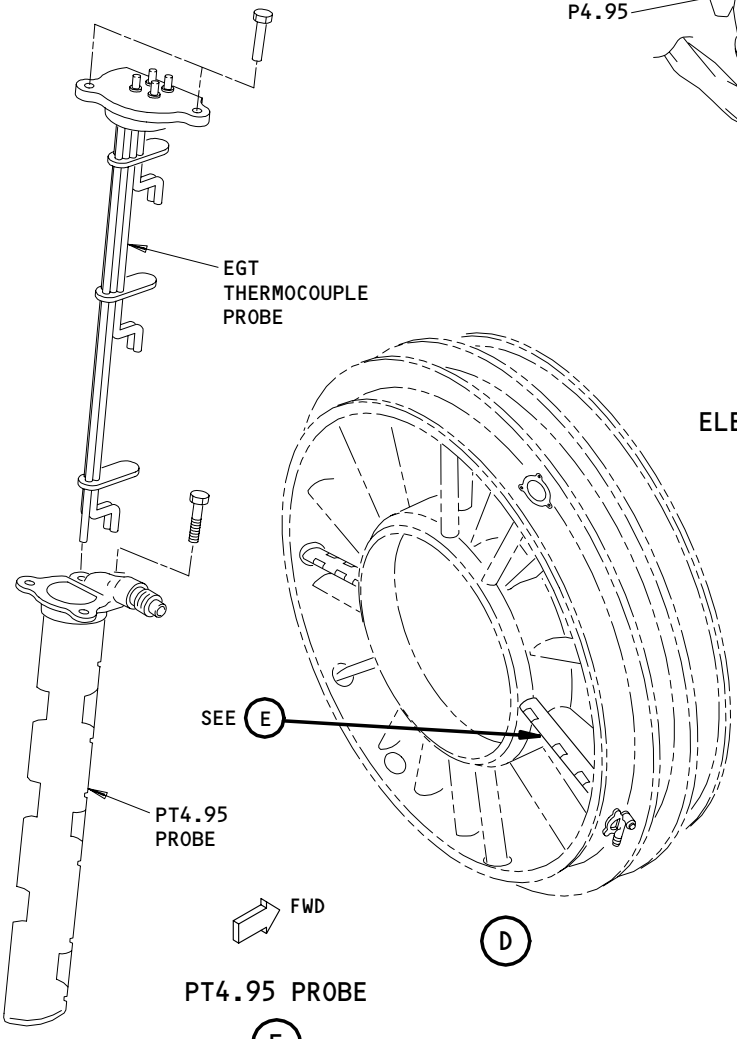
Engine Pressure Ratio Components
Figure 1 (Sheet 1)





ELECTRONIC ENGINE CONTROL (EEC)

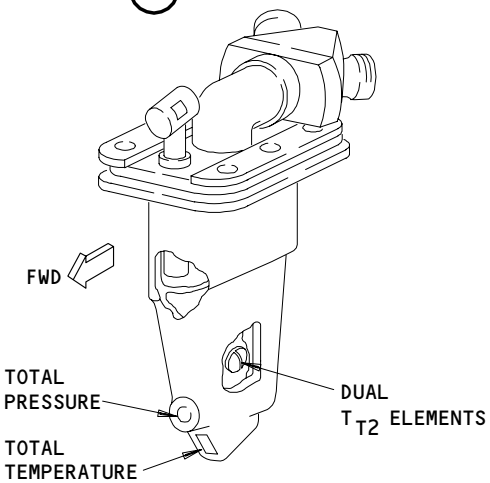
C



D

PT4.95 PROBE

E



PT2/TT2 PROBE

F

Engine Pressure Ratio Components
Figure 1 (Sheet 2)

(b) A green colored reference limit readout is displayed above each respective round dial to provide thrust reference information. When the THRUST REF SET knob on the EICAS display select panel is pulled out, manual EPR settings from 1.0 to 1.8 EPR can be displayed selectively or simultaneously. When the THRUST REF SET knob is reset (pushed in), the thrust reference limits are provided by the TMC.

(c) Actual thrust readout is enclosed in a white box directly below each reference limit readout. The actual thrust pointer is a straight white line extending from the center of the dial to the edge of the scale.

(d) The command sector is located adjacent to each scale and indicates the momentary difference between commanded EPR and actual EPR. As engine thrust changes, the actual thrust pointer will move the commanded thrust level, erasing the sector.

(e) Maximum thrust limit is indicated by two yellow colored bars on the analog dial. The value is normally acquired from the EEC, but is obtained from the TMC if the EEC fails.

(f) The TMC receives discrete signals for the bleed air condition from each engine. These signals show changes in the ECS, wing TAI or cowl TAI use. A single discrete signal then is transmitted digitally to the EECs of the two engines. Each EEC uses this data to calculate the thrust rating and limits. The operation of the ECS, or the wing or cowl TAI causes the EECs to lower the maximum EPR values. The maximum and commanded EPR limits will decrease on the EICAS display.

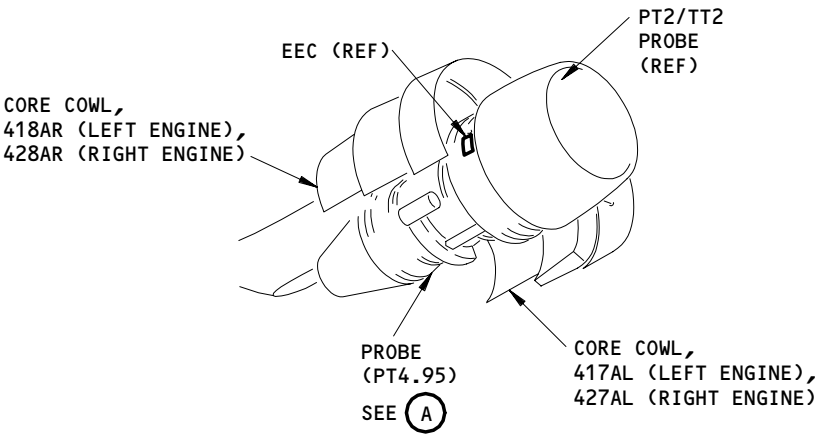
(g) Setting the SEI mode switch to AUTO causes the SEI display to blank unless an EICAS display failure occurs. Turning the mode switch to ON causes the SEI display to be on continuously. The data for the display is supplied by the EEC. There will be no display of data unless the EEC has power applied (AMM 73-21-00/001).

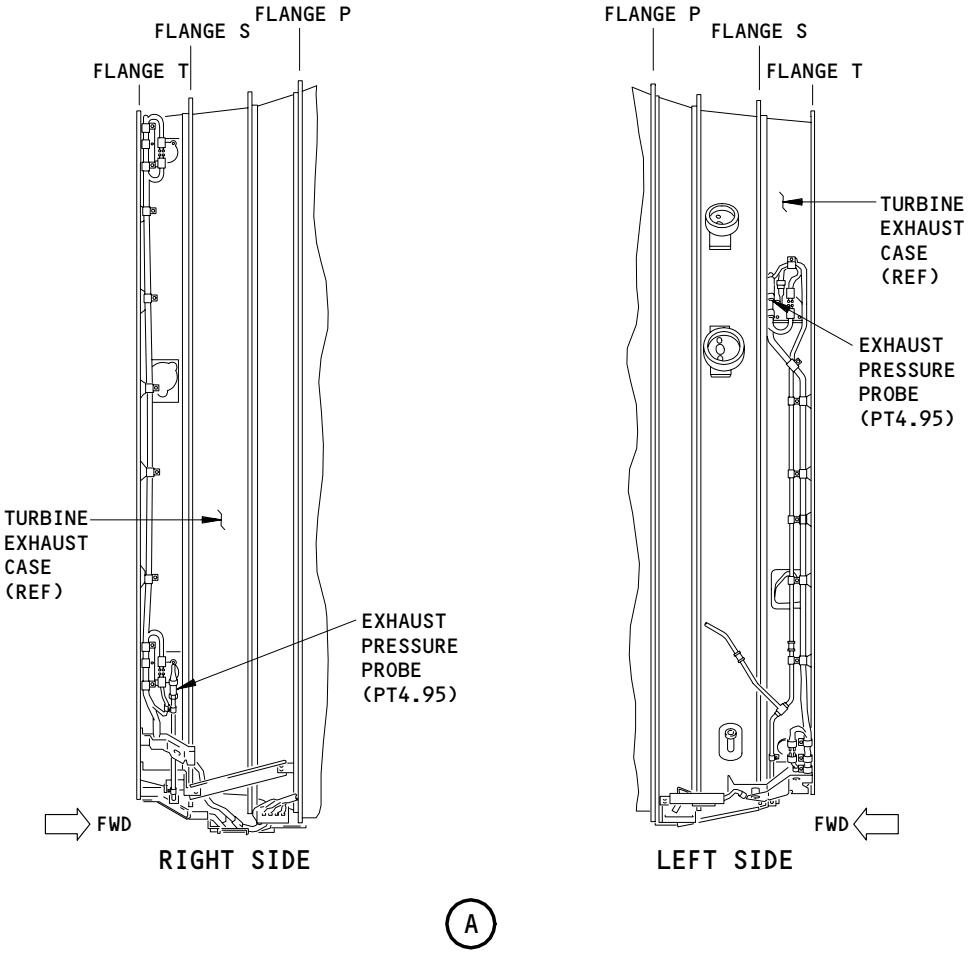
ENGINE PRESSURE RATIO (EPR) INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
COMPUTER – (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
CONTROL – (FIM 73-21-00/101)				
ELECTRONIC ENGINE (EEC), M7198				
INDICATOR – (FIM 77-41-00/101)				
STANDBY ENGINE, N10016				
PROBE – L ENG EXHAUST PRESSURE, PT4.95	--	2	417AL,418AR, CORE COWL PANELS	77-11-01
PROBE – R ENG EXHAUST PRESSURE, PT4.95	--	2	427AL,428AR, CORE COWL PANELS	77-11-01
PROBE – (FIM 73-21-00/101)				
EEC INLET TOTAL PRESSURE/TEMPERATURE, PT2/TT2				

* SEE THE WDM EQUIPMENT LIST

Engine Pressure Ratio (EPR) Indicating System – Component Index
Figure 101





Engine Pressure Ration (EPR) Indicating System - Component Location
Figure 102

ENGINE PRESSURE RATIO (EPR) PT4.95 PROBE - REMOVAL/INSTALLATION

1. General
   A. In this procedure the engine pressure ratio (EPR) PT4.95 probe is referred to as the EPR probe. The exhaust gas temperature (EGT) TT4.95 probe is referred to as the EGT probe.
   B. The two EPR probes are installed on the turbine exhaust case for each engine. The probes are installed at approximately the 4 o'clock and 10 o'clock positions. You can get access to the EPR probes when you open the core cowl panels.
   C. You must remove the EGT probe before you can remove the EPR probe.

TASK 77-11-01-004-001-N00

2. Remove the EPR Probe (Fig. 401)
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Procedure

      S 044-003-N00

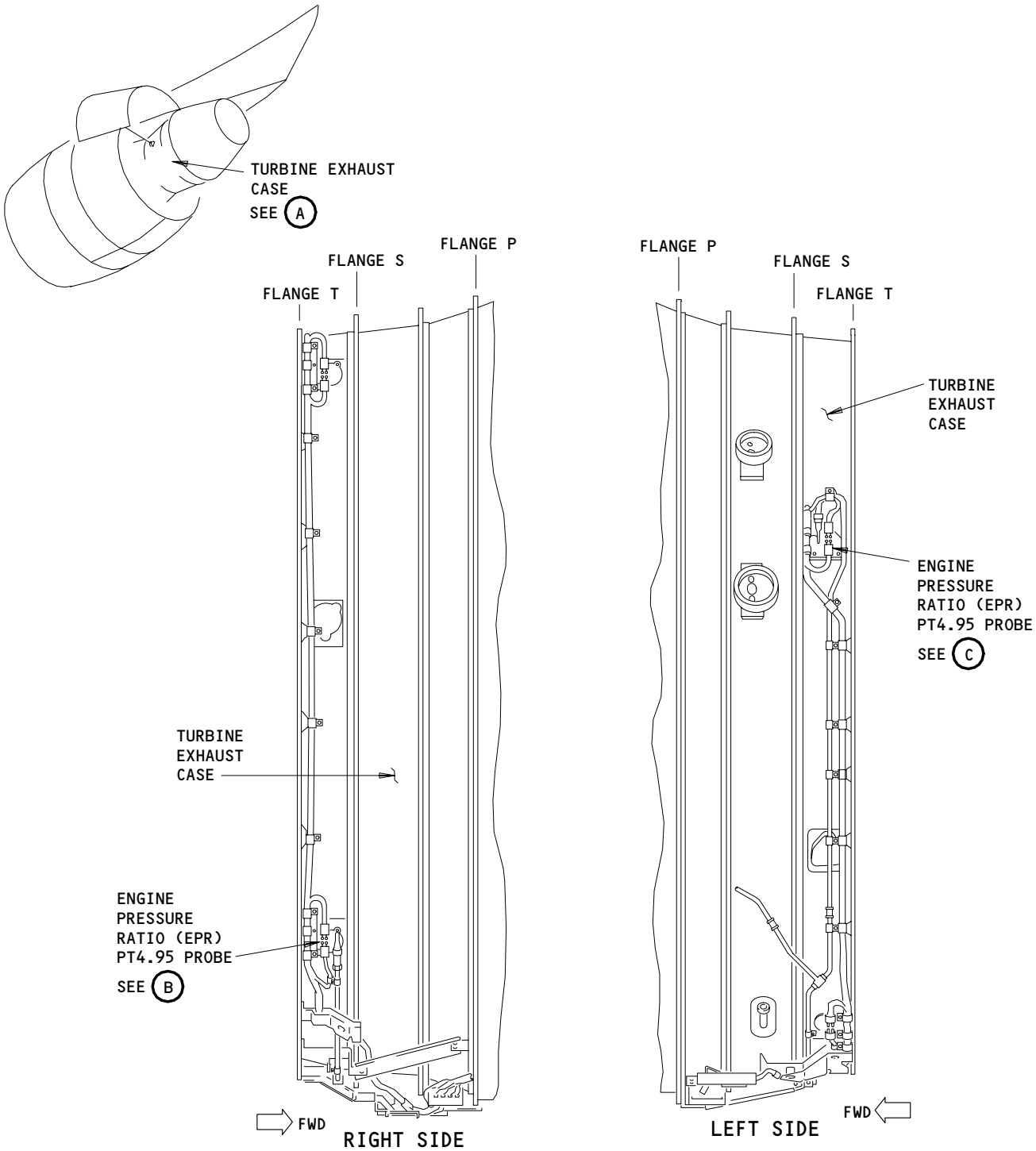
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

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

      S 014-002-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).

      S 034-014-N00
      (3) Remove the nuts and lockwashers that attach the wires to the EGT probe.
          (a) Remove the wire ends from the EGT probe.

      S 014-033-N00
      (4) Do the steps that follow to remove the EGT probe at the 10 o'clock position:
          (a) Remove the bolt and the nut for the clamp that is attached to the bracket on the pressure manifold.

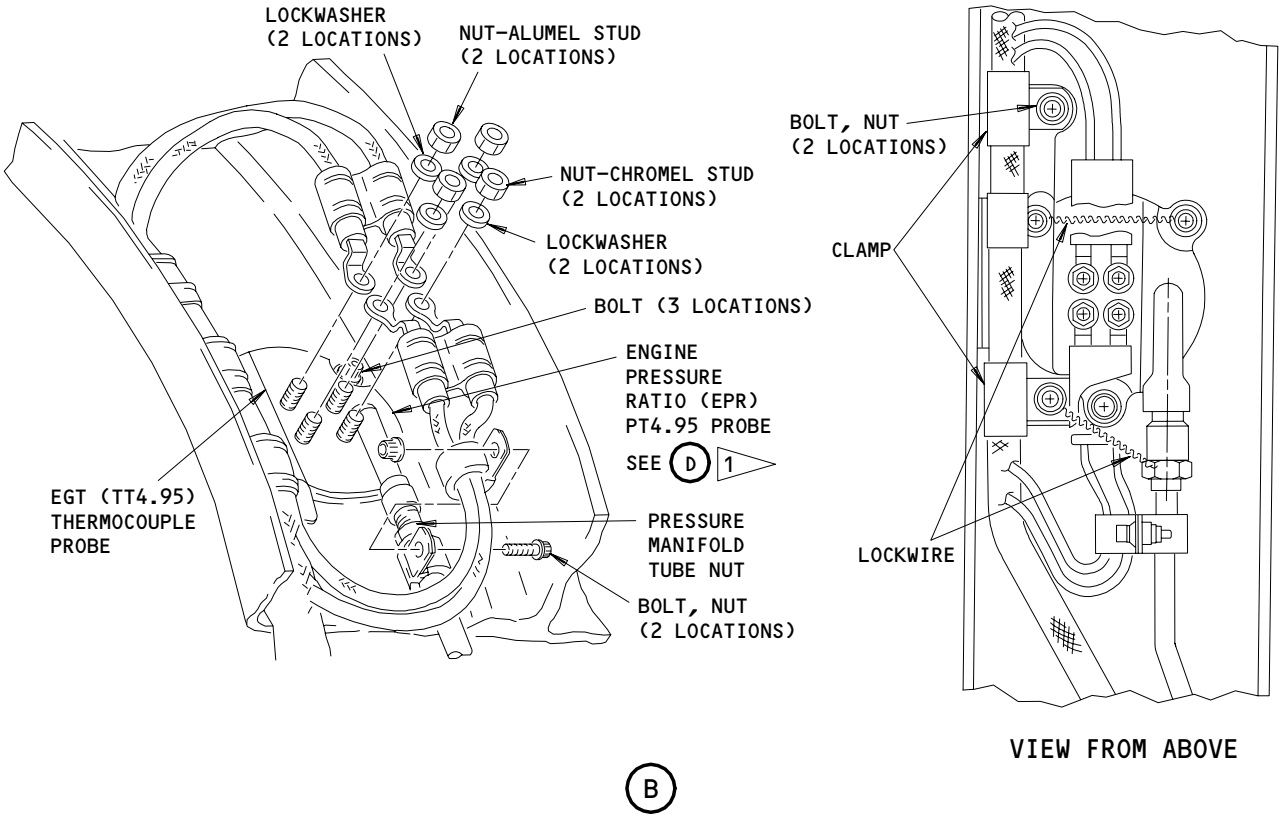


TURBINE EXHAUST CASE

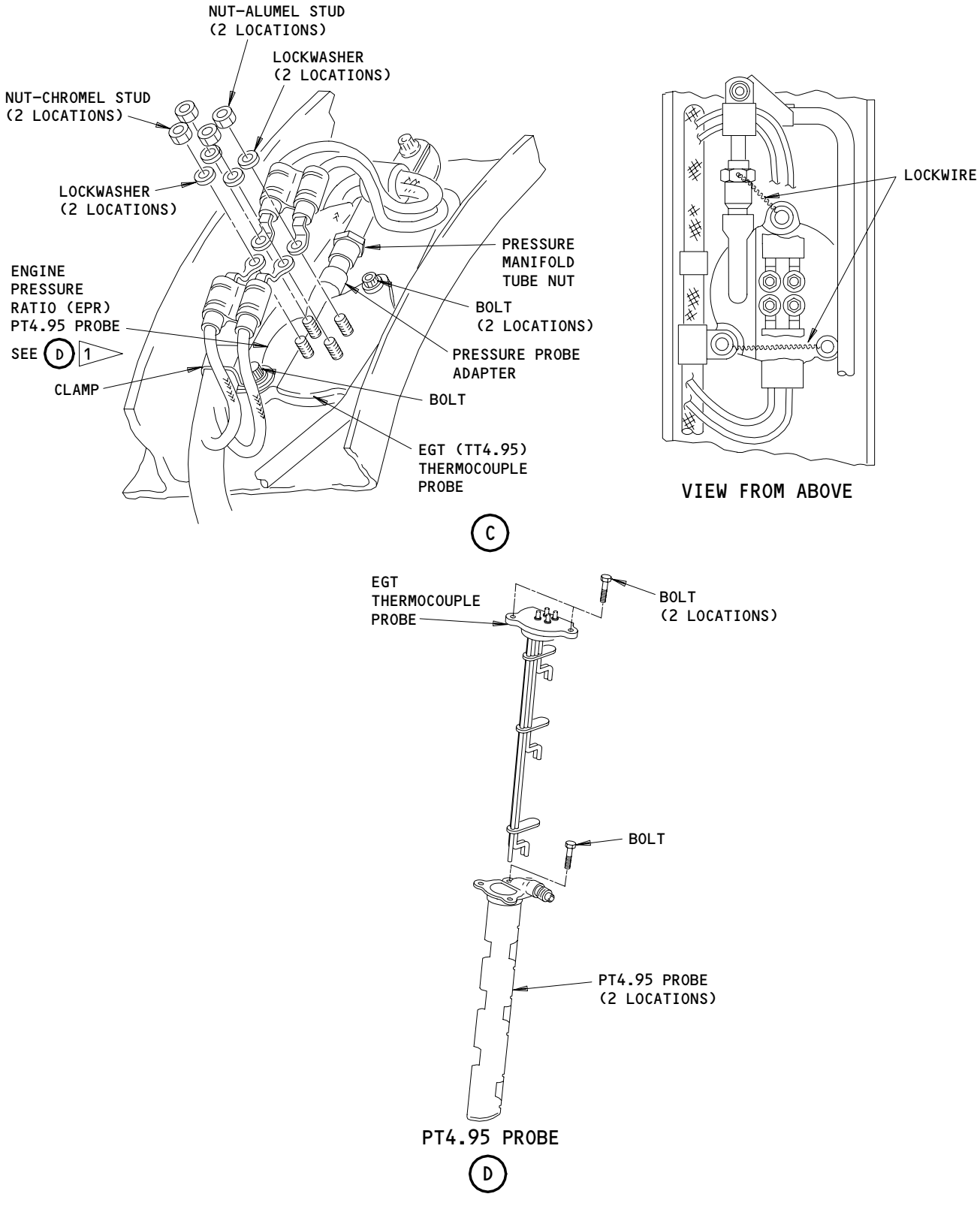
A

1 THE PT4.95 PROBE IS ALSO THE EGT THERMOCOUPLE PROBE HOUSING

Engine Pressure Ratio (EPR) PT4.95 Probe Installation
Figure 401 (Sheet 1)



Engine Pressure Ratio (EPR) PT4.95 Probe Installation
Figure 401 (Sheet 2)



Engine Pressure Ratio (EPR) PT4.95 Probe Installation
Figure 401 (Sheet 3)

(b) Remove the lockwire and disconnect the pressure manifold from the pressure probe.
(c) Loosen the bolts that attach the pressure manifold to the brackets on the flange T, as necessary.

NOTE: This will give you the clearance to remove the EGT probe.

(d) Remove the lockwire and two bolts that attach the EGT probe to its housing on the exhaust case.
(e) Remove the EGT probe from the exhaust case.

S 014-034-N00

(5) Do the steps that follow to remove the EGT probe at the 4 o'clock position:
(a) Remove the bolt and the nut that attaches the clamp for the EGT probe wires to the pressure manifold.
(b) Remove the lockwire and disconnect the pressure manifold from the pressure probe.
(c) Remove the bolts and nuts for the clamps that attach the EGT probe cable to the bracket.
(d) Remove the lockwire and the two bolts that attach the EGT probe and bracket to the exhaust case.
1) Move the bracket rearward and remove the EGT probe.

S 024-029-N00

(6) Do the steps that follow to remove the EPR probe:
(a) Disconnect the pressure manifold from the EPR probe.
(b) Remove the remaining bolt that attaches the EPR probe to the exhaust case.
(c) Remove the EPR probe from the exhaust case.

S 034-018-N00

(7) Install the protection covers on the hole in the exhaust case, on the pressure manifold, and on the EPR and EGT probes.

TASK 77-11-01-404-004-N00

3. Install the EPR Probe (Fig. 401)
A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies
170 Greg Street
P.O. Box 1300
Lodi New Jersey 07644 USA
B. Consumable Materials
(1) D00244 Silver Goop, PWA-36001

(2) GO2332 Ferrule, Safety Cable (PO5-292)
(3) GO2334 Lockwire, AS3214-02
(4) GO2335 Cable, Safety (PO5-291)

C. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 77-11-01/501, Engine Pressure Ratio (EPR) PT4.95 Probe
(4) AMM 78-31-00/201, Thrust Reverser

D. Access
(1) Location Zones
410 Left Engine
420 Right Engine

(2) Access Panels
417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

E. Procedure

S 014-009-N00
(1) Remove the protection covers on the probe and the hole on the turbine exhaust case.

S 024-030-N00
(2) Do the steps that follow to install the EPR probe:
(a) Install the EPR probe into the exhaust case and align the holes for the bolts.
(b) Install the bolt that attaches the EPR probe to the exhaust case.
1) Lubricate the threads of the bolt with the Silver Goop.
2) Tighten the bolt to 54-60 pound-inches (6.1-6.8 newton-meters).

S 414-031-N00
(3) Do the steps that follow to install the EGT probe at the 10 o'clock position:
(a) Install the EGT probe into the EPR probe and align the holes for the bolts.
(b) Lubricate the threads of the bolts with the Silver Goop.
(c) Install the bolts.
1) Tighten the bolts to 54-60 pound-inches (6.1-6.8 newton-meters).

2) Install lockwire or the optional safety cable and ferrule to the bolts.

CAUTION: DO NOT USE LUBRICANTS ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. IF YOU USE LUBRICANTS ON THESE PARTS, CONTAMINATION OF THE EEC CAN OCCUR.

(d) Connect the pressure manifold to the probe adapter.
1) Tighten the manifold nut to 135-150 pound-inches (15.3-17.0 newton-meters).
(e) Install lockwire or the optional safety cable and ferrule to the manifold nut and to the bolts that attach the EGT probe to the exhaust case.
(f) Tighten the clamp bolts for the pressure manifold that were loosened, to 36-40 pound-inches (4.1-4.5 newton-meters).
(g) Install the probe wires to the bracket on the pressure manifold with the clamp, nuts, and bolts.
1) Lubricate the threads of the bolts with the Silver Goop.
2) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 414-032-N00
(4) Do the steps that follow to install the EGT probe at the 4 o'clock position:
(a) Install the EGT probe into the EPR probe and align the holes for the bolts.
(b) Align the bracket and install the bolts.
1) Lubricate the threads of the bolts with the Silver Goop.
2) Tighten the bolts to 54-60 pound-inches (6.1-6.8 newton-meters).
(c) Install the clamps for the EGT probe cable on the bracket with bolts and nuts.
1) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

CAUTION: DO NOT USE LUBRICANTS ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. IF YOU USE LUBRICANTS ON THESE PARTS, CONTAMINATION OF THE EEC CAN OCCUR.

(d) Connect the pressure manifold to the probe adapter.
1) Tighten the manifold nut to 135-150 pound-inches (15.3-17.0 newton-meters).
(e) Install lockwire or the optional safety cable and ferrule to the manifold nut and to the bolts that attach the EGT probe to the exhaust case.
(f) Install the probe wires to the bracket on the pressure manifold, with the clamp and the bolt.
1) Lubricate the threads of the bolt with the Silver Goop.
2) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-012-N00

CAUTION: DO NOT TIGHTEN THE NUTS THAT ATTACH THE PROBE WIRES TO MORE THAN THE SPECIFIED TORQUE. TOO MUCH TORQUE ON THE EGT PROBE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE EGT PROBE STUDS.

(5) Connect the probe wires to the EGT probe.

NOTE: The EGT probe has two types of studs. One stud has a larger diameter and is made of alumel. The other stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the probe wires to the studs have different dimensions, thus they are not interchangeable.

(a) Install the lockwashers and nuts.
1) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
2) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).
3) After the nuts are tightened, make sure the adjacent ends of the cable do not touch.
a) Make sure the ends of cable do not touch the lockwire or the bolt heads in the area.

S 794-037-N00
(6) Do this task: Do a Leak Test of the Engine Pressure Ratio (EPR) PT4.95 Probe System (AMM 77-11-01/501).

S 414-005-N00
(7) Close the core cowl panels (AMM 71-11-06/201).

S 714-038-N00
(8) Do the test of the EGT probe that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

S 444-006-N00
(9) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

ENGINE PRESSURE RATIO (EPR) PT4.95 PROBE - ADJUSTMENT/TEST

1. General
   A. This procedure is a leak test of the Engine Pressure Ratio (EPR) PT4.95 Probe system. Repair any leaks found whe you do this test.
   B. There are two Engine Pressure Ratio (EPR) PT4.95 probes installed in the turbine exhaust case at approximately the 4 and 10 o'clock positions.
   C. The Engine Pressure Ratio (EPR) PT4.95 probe is referred to as the EPR probe in this procedure.

TASK 77-11-01-705-010-N00

2. Do a Leak Test of the Engine Pressure Ratio (EPR) PT4.95 Probe System
   A. Equipment
      (1) Regulator (air pressure), with isolation shutoff valve
      (2) Pressure Gage, with a range of 10 PSIG (68.9 KPa), and a precision of ±10 percent
      (3) Tygon Flexible Tubing, 0.250 inch (6.350 mm) ID or the equivalent
      (4) Ground Pneumatic Cart, to supply clean dry air at 10 PSIG (68.9 KPa)
      (5) PWA 102283 - Kit, EPR PT4.95 Pressure
      (6) M303, M305 or M307 Bergen Mechanical Crimper
          Bergen Cable Technologies Inc
          170 Gregg St
          P.O. Box 1300
          Lodi, NJ 07644-9982
   B. Consumable Materials
      (1) G02151 Fluid, Leak Check (bubble type) PMC 9569 or PMC 2277
      (2) Ferrule, Safety Cable (P05-292)
      (3) Lockwire, (P05-289) 0.032 inch (0.813 mm) - AS3214-02
      (4) Cable, Safety (P05-291)
   C. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 77-11-01/601, Engine Pressure Ratio (EPR) PT4.95 Probe
      (4) AMM 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel, Left Engine
414AR	Fan Cowl Panel, Left Engine
416AR	Fan Reverser, Left Engine
417AL	Core Cowl, Left Engine
418AR	Core Cowl, Left Engine
423AL	Fan Cowl Panel, Right Engine
424AR	Fan Cowl Panel, Right Engine
426AR	Fan Reverser, Right Engine
427AL	Core Cowl, Right Engine
428AR	Core Cowl, Right Engine

E. Do a test of the EPR Probe System (Fig. 501).

S 865-011-N00

(1) Prepare for the test.

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

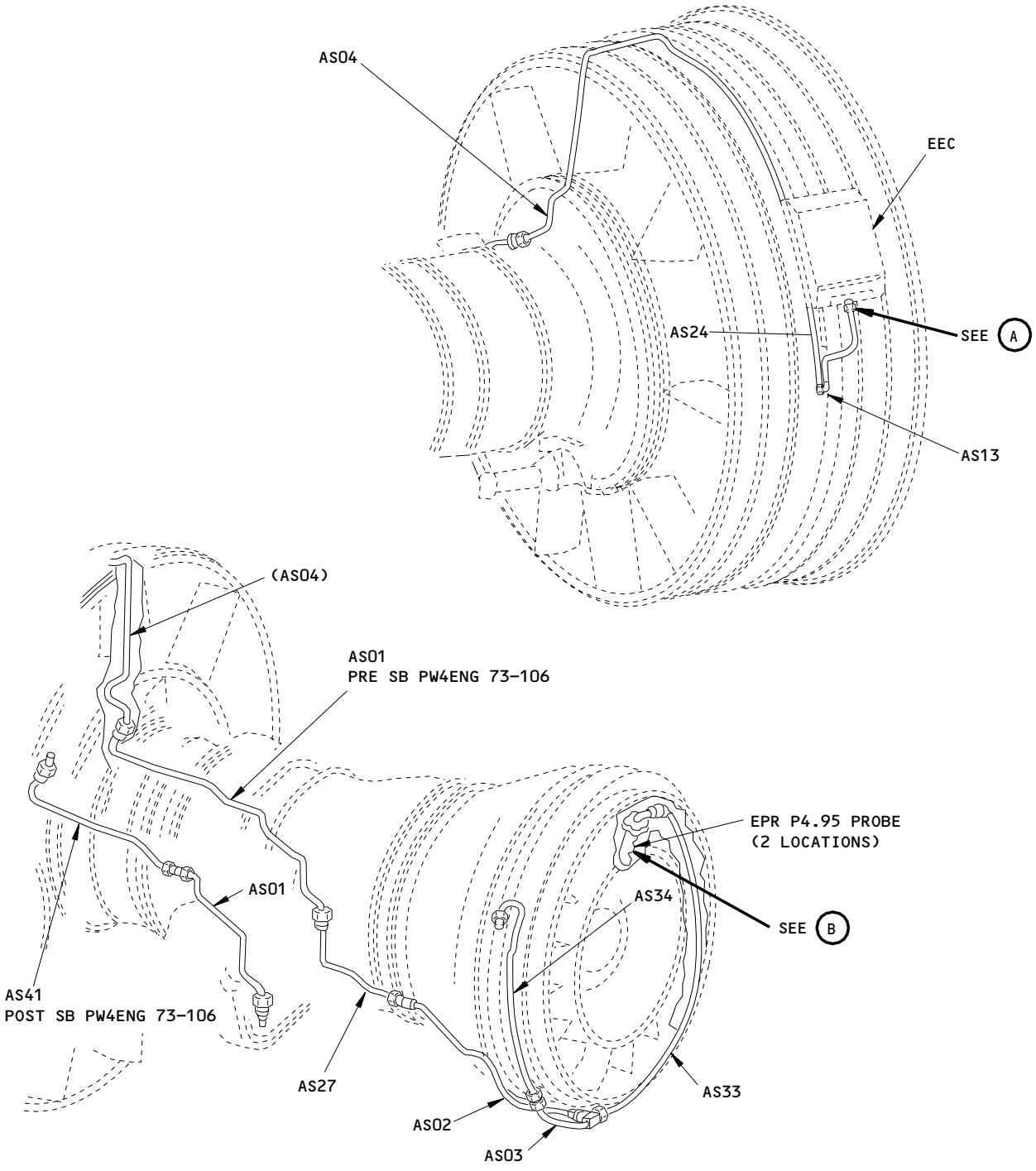
(a) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).
(b) Open the fan cowl panels (AMM 71-11-04/201).
(c) Open the core cowl panels (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(d) Open the left thrust reverser (AMM 78-31-00/201).

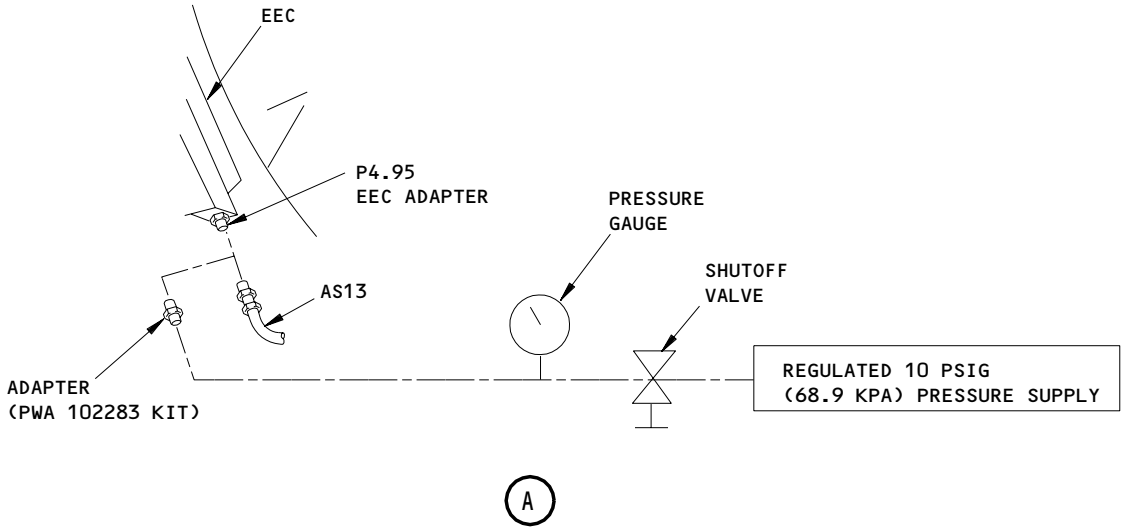
WARNING: MAKE SURE THAT ENGINE SHUTDOWN OCCURRED NOT LESS THAN 60 MINUTES BEFORE YOU DO THIS PROCEDURE. IF YOU DO NOT WAIT FOR THE ENGINE TO COOL DOWN, YOU CAN CAUSE INJURY TO YOURSELF.

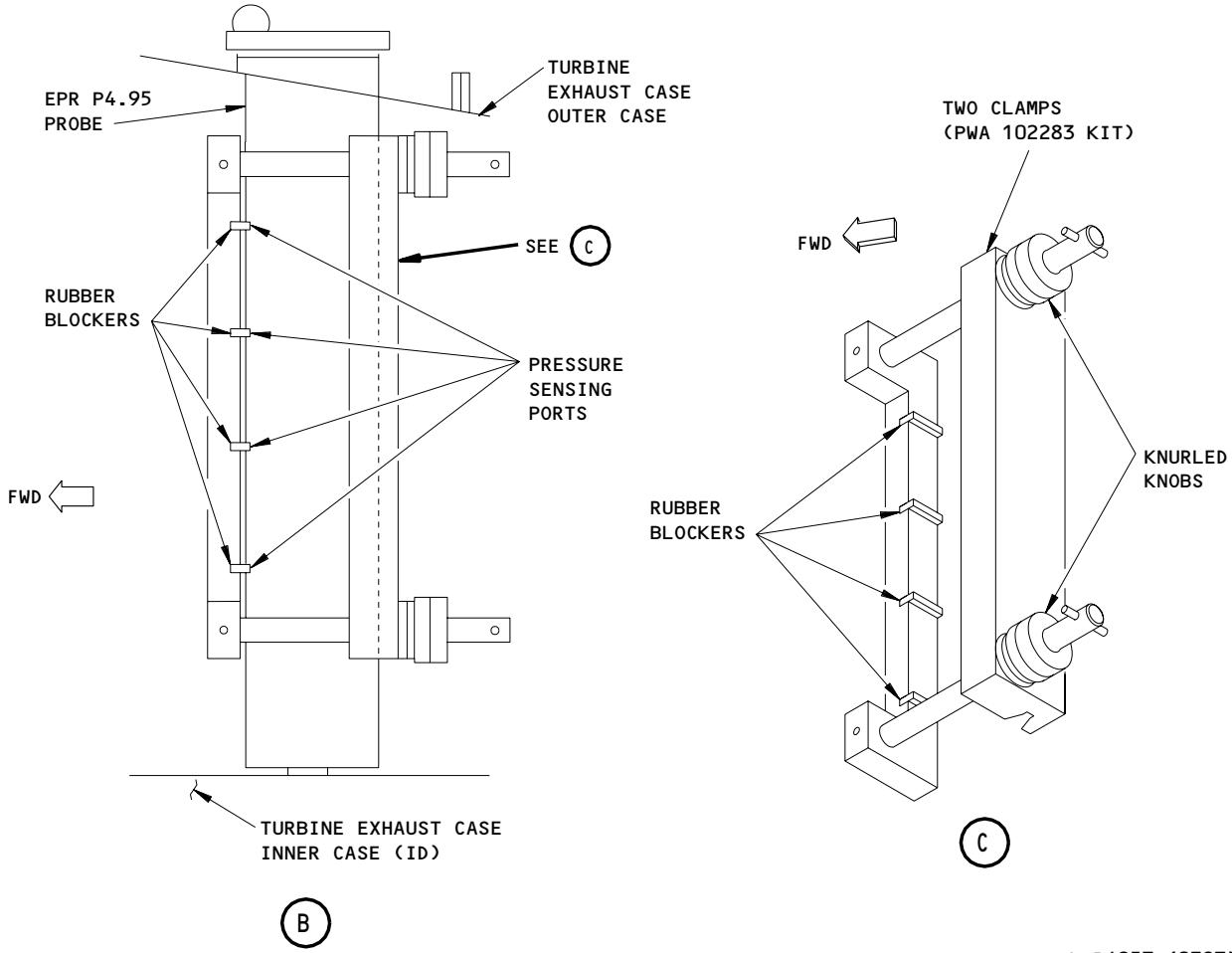
(e) Before you do this test, examine the EPR PT4.95 sensing system for damage with the steps that follow:
1) Make sure that the tube connections are not loose.
2) Make sure that the tubes are not cracked or broken.
3) Make sure that the tubes are not worn through at the clamp locations.
4) Make sure that the brackets which attach the tubes are not cracked, broken or loose.
5) Make sure that the hoses at the EEC are not damaged.



L-B4724 (0397)

Engine Pressure ratio (EPR) Manifold System Leak Check
Figure 501 (Sheet 1)





L-B4857 (0397)
PW V

Engine Pressure Ratio (EPR) Manifold System Leak Check
Figure 501 (Sheet 2)

(f) Install a clamp from the PWA 102283 kit to each of the EPR probes with the steps that follow:
1) Put the clamp over the front of the probe.
a) Make sure that the ID marking is towards the inner case.
b) Make sure that the rubber blockers are over the four pressure sensing ports.
2) Tighten the two knobs equally in small increments until the blockers seal the four sensing ports.

CAUTION: DO NOT LET THE AIR PRESSURE GO INTO THE EEC. HIGH PRESSURE AIR CAN CAUSE DAMAGE TO THE EEC.

(g) Do the steps that follow to connect the pressure source:
1) Find the PT4.95 sensing hose (AS13) which is connected to the bottom of the EEC.
2) Hold the EEC adapter with a wrench and disconnect the hose (AS13) from the EEC.
3) Install and tighten the Adapter from the PWA102283 kit to the open end of the hose (AS13).
4) Adjust the regulator on the pressure source to 0 psig (0 kPa).
5) Attach the supply hose from the regulated pressure source to the Adapter on the hose (AS13).

CAUTION: DO NOT LET THE PRESSURE SUPPLY GO TO MORE THAN 10 PSIG (68.9 KPA) WHEN CONNECTED TO THE SENSING SYSTEM. HIGHER PRESSURE CAN CAUSE DAMAGE TO SOME EQUIPMENT, SENSORS OR PROBES.

6) Supply 10 psig (68.9 kPa) to the sensing system.

NOTE: Nitrogen gas is optional to clean dry air for this procedure.

(h) Do the steps that follow to do the leak test.
1) With 10 psig (68.9 kPa) supplied to the system, close the shutoff valve to isolate the EPR system from the source.
2) Make sure that the pressure in the system does not decrease more than 0.5 psig (3.4 kPa) in approximately one minute.
3) Use the leak check compound to find a leak in the system.

(i) If you think you have a leak, do the steps that follow:

CAUTION: BEFORE YOU REPAIR A LEAK, ADJUST THE PRESSURE TO 0 PSIG (0 KPA). IF YOU DO NOT DO THIS, THE PRESSURE CAN INCREASE WHEN YOU REPAIR THE LEAK AND EXCEED THE LIMIT. DAMAGE TO THE SENSOR SYSTEM CAN OCCUR.

1) Adjust the regulator to 0 psig (0 kPa).
2) Repair all the leaks that you find.
3) Do the leak test again.

4) If you still think you have a leak, remove the EPR adapter and replace the packing.

(j) Remove the regulated pressure supply from the Adapter on the AS13 hose.

(k) Remove the test Adapter from the AS13 hose.

(l) Remove the two test clamps from the two EPR probes.

(m) Do these steps to connect the AS13 hose to the EEC.

CAUTION: DO NOT APPLY LUBRICANT TO ANY EEC SENSING HOSE, TUBE, ADAPTER OR PACKING. CONTAMINATION OF THE EEC CAN OCCUR.

1) Do not apply lubricant to the hose or to the adapter.
2) Install the AS13 sensing hose on the EEC adapter.
3) Hold the adapter with a wrench and tighten the AS13 hose to 135-140 pound-inches (15.3-16.9 newton-meters).
4) Install the safety wire or install the safety cable and safety cable ferrule on the tube nuts.

(n) Examine the four pressure sensing ports in the front of each probe to make sure that there is no damage or blockage (AMM 77-11-01/601).

S 865-012-N00

(2) Put the Airplane Back to Its Usual Condition.

(a) Remove the air supply equipment from the engine.

(b) Make sure that the work area is clean and remove all tools and other items.

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(c) Close the left thrust reverser (AMM 78-31-00/201).

(d) Close the core cowl panels (AMM 71-11-06/201).

(e) Close the fan cowl panels (AMM 71-11-04/201).

(f) Do this procedure: Thrust Reverser Activation After Ground Maintenance (AMM 78-31-00/201).

ENGINE PRESSURE RATIO (EPR) PT4.95 PROBE - INSPECTION/CHECK

1. General
   A. This procedure has a check of the Engine Pressure Ratio (EPR) PT4.95 Probe to make sure it is serviceable.
   B. The Engine Pressure Ratio (EPR) PT4.95 probe is referred to as the EPR probe in this procedure.

TASK 77-11-01-206-001-N00

2. Do a Check of the Engine Pressure Ratio (EPR) PT4.95 Probe
   A. References
      (1) AMM 77-11-01/401, Engine Pressure Ratio (EPR) PT4.95 Probe
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panels
          417AL/427AL Core Cowl (left side)
          418AR/428AR Core Cowl (right side)

   C. Equipment
      (1) Ground Pneumatic Cart
   D. Do a Check of the EPR Probe (Fig. 601).

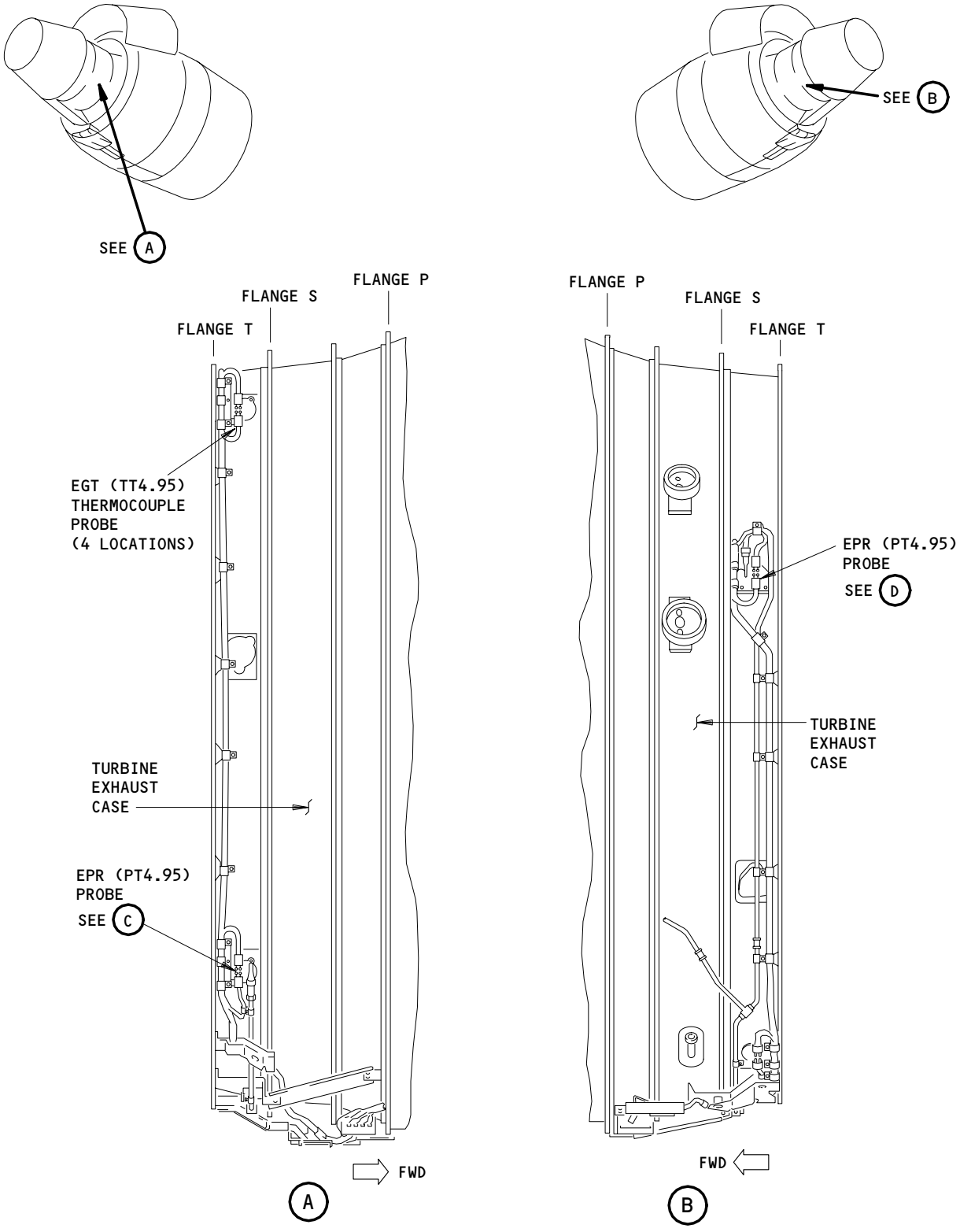
      S 026-002-N00
      (1) Remove the EPR probe (AMM 77-11-01/401).

      S 216-003-N00
      (2) Examine the EPR probe for cracks and damage.

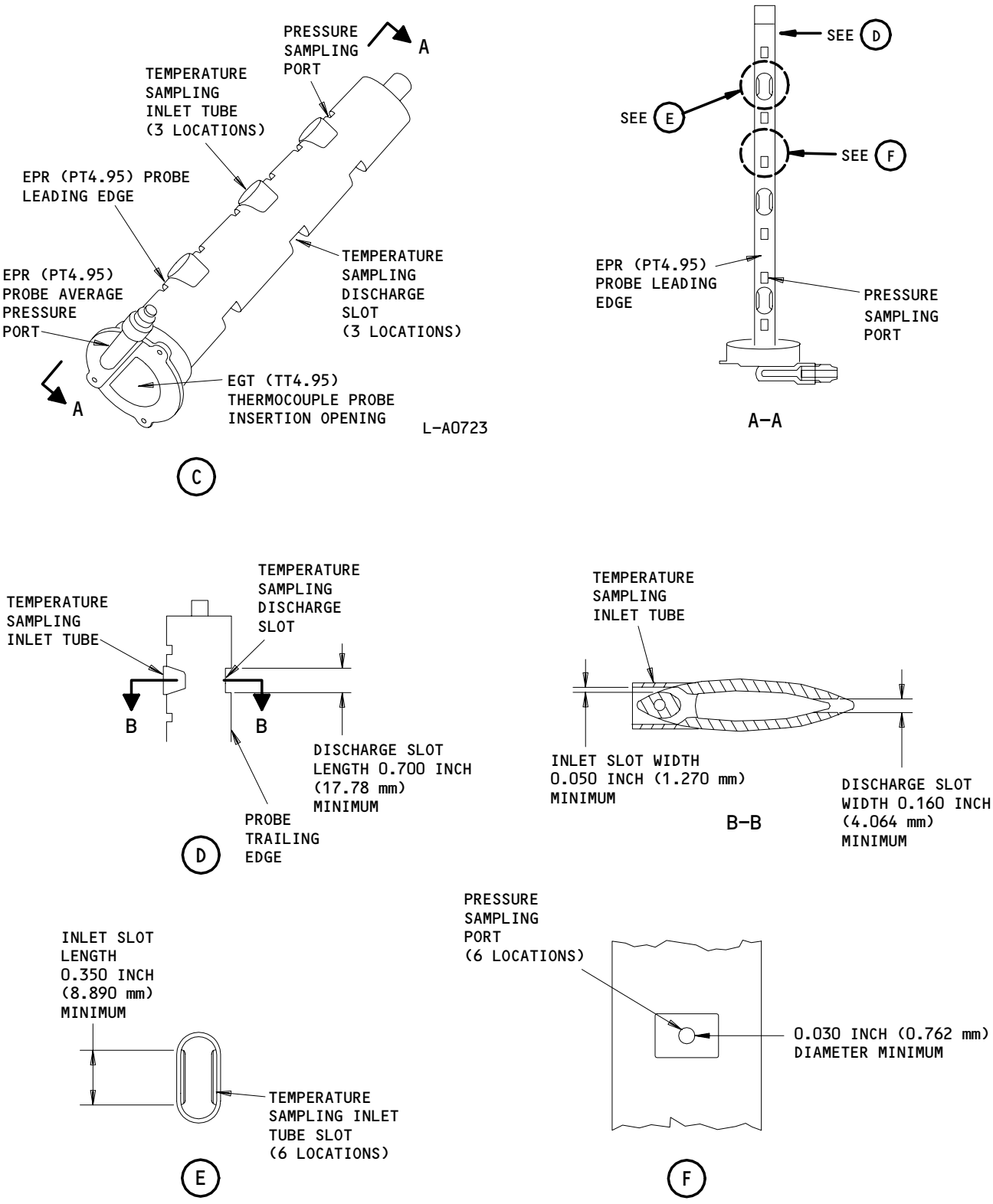
          NOTE: EPR probes with small nicks and damage are serviceable. Those with distortion caused by heat are serviceable if you can use the correct procedure, with no problems, to install them. Do not install EPR probes that have cracks.

      S 216-004-N00
      (3) Examine the probe average pressure port on the EPR probe for thread damage.
          (a) Repair the damaged threads if it is necessary.

      S 216-005-N00
      (4) Examine the temperature sampling inlet tubes and discharge slots in the EPR probe casting for the blockage.
          (a) Remove the blockage to make sure you can see through the slots in the EPR probe.



Engine Pressure Ratio (EPR) PT4.95 Probe Inspection
Figure 601 (Sheet 1)



Engine Pressure Ratio (EPR) PT4.95 Probe Inspection
Figure 601 (Sheet 2)

S 226-008-N00

(5) Examine the six pressure sampling ports on the leading edge of the EPR probe for minimum opening dimensions.
   (a) You can use a 0.030 inch (0.762 mm) diameter hand-held drill bit to remove the unwanted material.
   (b) Connect the probe to the ground pressure cart.
   (c) Blow air at a maximum pressure of 125 PSIG (861.8 KPaG) through the tube fittings.

      NOTE: If you hold a piece of paper up to the pressure sampling ports while the air is flowing, it should move about the same distance away from each port.

   (d) Disconnect the probe from the Ground Pneumatic Cart.
   (e) If you cannot repair the EPR probe to the minimum necessary dimensions, replace the EPR probe (AMM 77-11-01/401).

S 226-007-N00

(6) Measure the temperature sampling inlet tubes and discharge slots to make sure the dimensions are correct.

S 426-006-N00

(7) Install the EPR probe (AMM 77-11-01/401).

ENGINE PRESSURE RATIO (EPR) PT4.95 MANIFOLD - REMOVAL/INSTALLATION

1. General
   A. In this procedure, the engine pressure ratio (EPR) PT4.95 manifold is referred to as the manifold.
   B. You can get access to the manifold when you open the core cowl panels.

   TASK 77-11-02-004-005-N00

2. Remove the EPR Manifold (Fig. 401)
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          410 Power Plant (Left)
          420 Power Plant (Right)

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Procedure

      S 044-006-N00

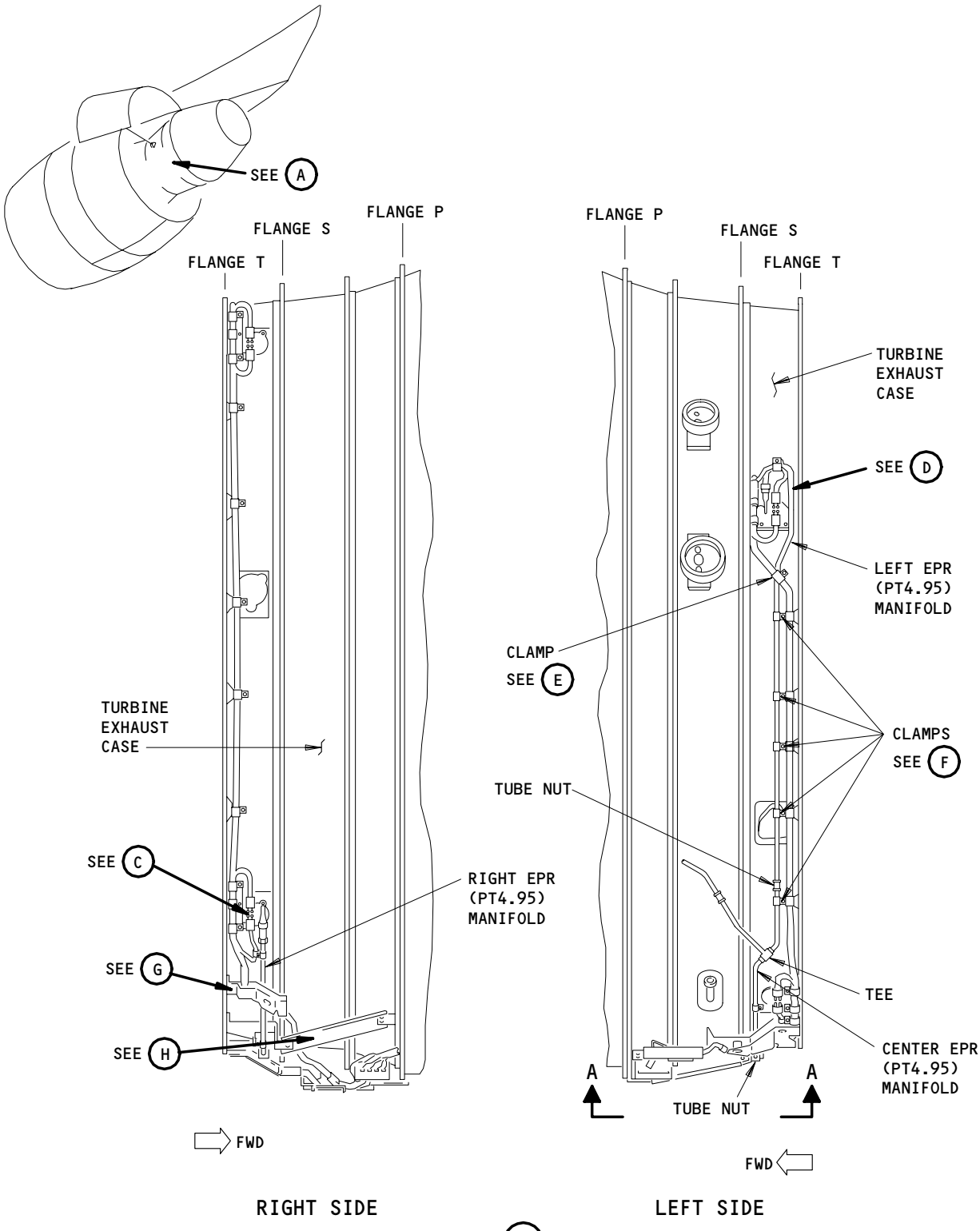
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

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

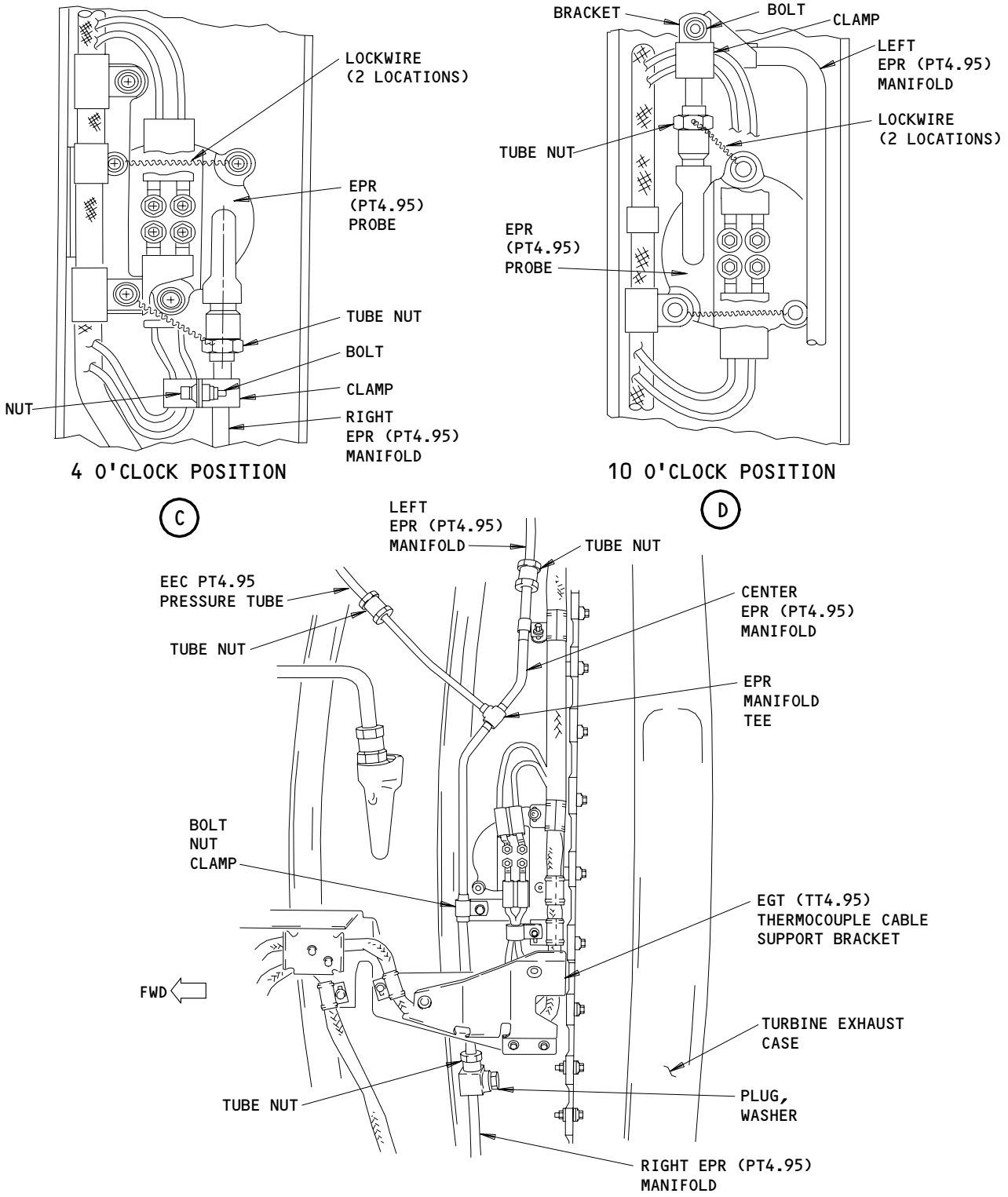
      S 014-007-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).

      S 034-009-N00
      (3) Do the steps that follow to disconnect the manifolds from the components on the turbine exhaust case:
          (a) Disconnect the tube nuts for the manifold from the EPR probes.

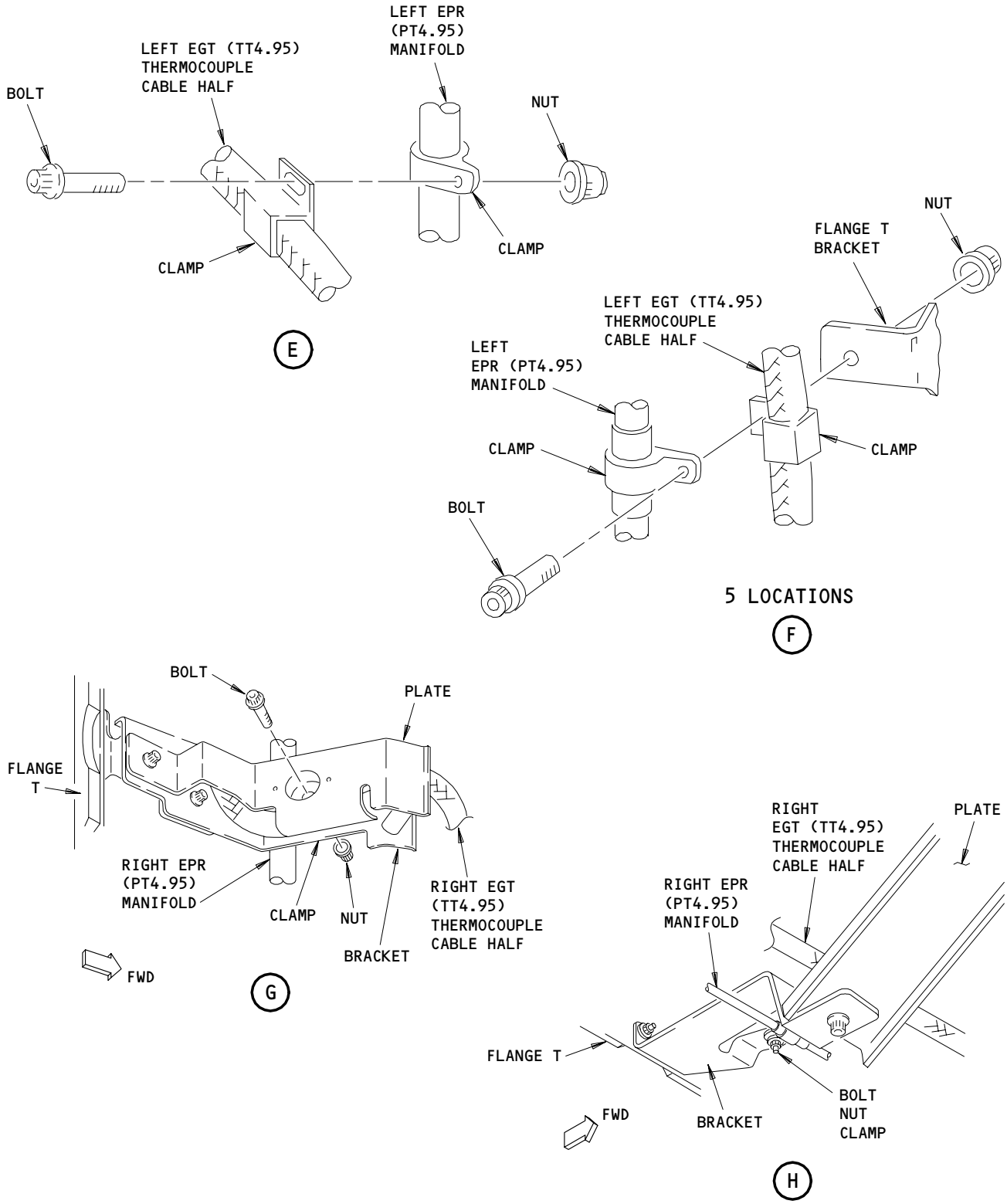
              NOTE: The EPR probes are found at approximately the 4:30 o'clock and 10 o'clock positions on the turbine exhaust case.



Engine Pressure Ratio (EPR) PT4.95 Manifold Installation
Figure 401 (Sheet 1)



Engine Pressure Ratio (PT4.95) Manifold Installation
Figure 401 (Sheet 2)



Engine Pressure Ratio (PT4.95) Manifold Installation
Figure 401 (Sheet 3)

(b) Disconnect the connections between the left, right, and the center manifolds.
(c) Disconnect the PT4.95 pressure tube for the EEC.
(d) Remove the plug from the manifold tee at approximately the 6 o'clock position.

NOTE: This manifold tee is rearward of the flange S and to the right of the support bracket for the EGT probe cable.

(e) Do the step that follows for the manifold section at the 10 o'clock position:
1) Remove the bolt that attaches the clamp for the EGT probe wires to the bracket on the manifold.
(f) Remove the bolts that attach the clamps for the manifold to the flange T brackets.

S 024-010-N00

(4) Turn the left, right, and the center manifolds as necessary, and remove them from the engine.

S 034-011-N00

(5) Install protection covers on the EPR probe and sense tube connections on the engine.

S 034-012-N00

(6) Install protection covers on the manifold ends.

TASK 77-11-02-404-004-N00

3. Install the EPR Manifold (Fig. 401)

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies
170 Greg Street
P.O. Box 1300
Lodi New Jersey 07644 USA

B. Consumable Materials
(1) D00137 Oil, PWA-521
(2) G02332 Ferrule, Safety Cable (P05-292)
(3) G02334 Lockwire, AS3214-02
(4) G02335 Cable, Safety (P05-291)

C. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 77-11-01/501, Engine Pressure Ratio (EPR) PT4.95 Probe
(4) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
410 Power Plant (Left)
420 Power Plant (Right)

(2) Access Panels
417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

E. Procedure

S 434-013-N00
(1) Remove the protection covers from the EPR probes, the sense tube, and the manifold ends.

S 424-014-N00
(2) Do the steps that follow to install the manifolds:

CAUTION: DO NOT USE LUBRICANTS ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. IF YOU USE LUBRICANTS ON THESE PARTS, CONTAMINATION OF THE EEC CAN OCCUR.

(a) Turn the manifolds as it is necessary to put them (the left, right, and the center manifolds) in their positions on the turbine exhaust case.
(b) Connect the manifolds to the EPR probe adapters and to the EEC sense tube.
(c) Connect the manifolds together.
(d) Tighten the tube and manifold nuts by hand.

S 434-015-N00
(3) Do the steps that follow to attach the manifold to the turbine exhaust case:
(a) Install the clamps that attach the manifolds to the brackets on the turbine exhaust case, with the bolts and nuts.
1) Lubricate the threads of the bolts with oil.
2) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

(b) Attach the EGT probe wires (at the 10 o'clock position) to the manifold bracket with the clamp, bolt, and the nut.
  1) Lubricate the threads of the bolt with oil.
  2) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(c) Tighten the manifold tube nuts at these locations to 135-150 pound-inches (15.3-17.0 newton-meters):
  1) The connections at the EPR probes.
  2) The connection between the left and the center manifolds.
(d) Tighten the manifold tube nuts at these locations to 270-300 pound-inches (30.5-33.9 newton-meters):
  1) The connection between the manifold and the pressure tube for the EEC.
  2) The connection between the manifold and the tee with the plug (at approximately the 6 o'clock position).
(e) Install lockwire or the optional safety cable and ferrule to each of the tube nuts.
(f) Install the washer and the plug to the tee at the 6 o'clock position.
  1) Tighten the plug to 40-50 pound-inches (4.5-5.6 newton-meters).
  2) Install lockwire or the optional safety cable and ferrule to the plug.

S 794-017-N00

(4) Do this task: Do a Leak Test of the Engine Pressure Ratio (EPR) PT4.95 Probe System (AMM 77-11-01/501).

S 414-003-N00

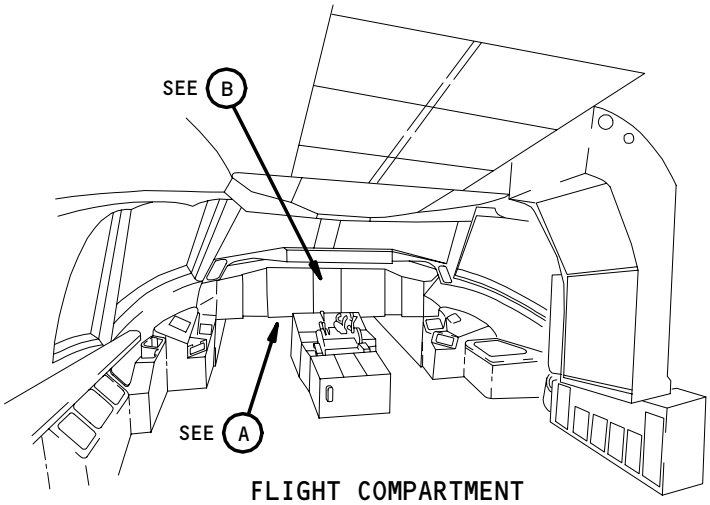
(5) Close the core cowl panels (AMM 71-11-06/201).

S 444-002-N00

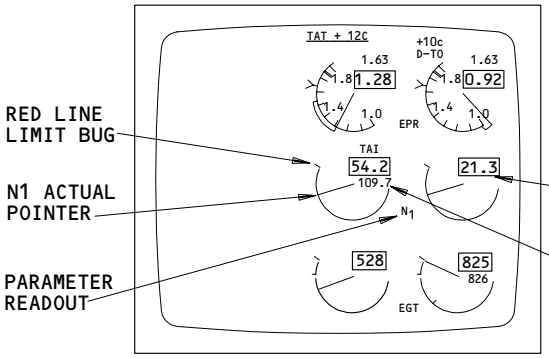
(6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

ENGINE TACHOMETER SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Engine indicating for the engine tachometer system uses engine indicating and crew alerting system (EICAS) to display N1 and N2 speeds for each engine.
   B. The speed for the low pressure rotor (N1) is used to monitor overspeed conditions and is also used with engine anti-icing (AMM 30-21-00).
   C. System components include N1 speed transducer (AMM 73-21-00), EEC alternator (AMM 73-21-00), EICAS (AMM 31-41-00), and standby engine indicator (SEI) (AMM 77-41-00).
2. Component Details (Fig. 1)
   A. Engine Speed Card
      (1) The engine speed card receives an input from N2 tachometer (EEC alternator). The frequency output of the N2 tachometer is proportional to the N2 rotor speed.
      (2) The engine speed card compares the N2 tachometer signal frequency to a known frequency to determine when the N2 rpm exceeds a set value. Relays are actuated when the N2 rpm reaches a specific value. The relays send signals that are used as control inputs for several systems. Most systems use the signals as indication that the engine is running at or above idle speed.
      (3) The engine speed card continually conducts a self-test. When a fault is detected the EICAS status message ENG SPEED CARD is displayed. An engine running signal can be simulated using the channel test switch on panel P50 in the main equipment center.
   B. N1 Speed Transducer (AMM 73-21-00)
      (1) The N1 speed transducer provides a signal that has a frequency proportional to N1 speed to the electronic engine control (EEC). The pickup head of the transducer contains two sensing coils, one for each channel of the EEC. The N1 transducer signal also sent to the system for the airborne vibration monitoring (AVM) (AMM 77-31-00) and the standby engine indicator (SEI) (AMM 77-41-00).
   C. EEC Alternator (AMM 73-21-00)
      (1) The EEC alternator contains three separate output windings. Two windings are used to power the respective channel of the EEC and provide N2 data to that channel. The third winding provides N2 signals directly to EICAS, SEI, the system for the airborne vibration monitoring (AVM) (AMM 77-31-00) and the engine speed card.



FLIGHT COMPARTMENT



RED LINE LIMIT BUG

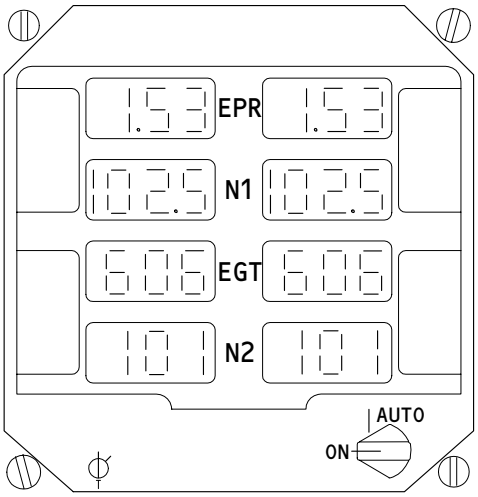
N1 ACTUAL POINTER

PARAMETER READOUT

N1 ACTUAL READOUT

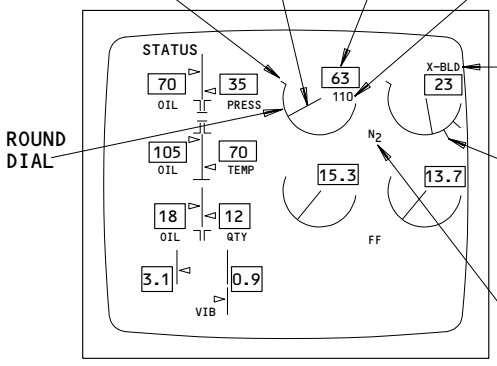
EXCEEDANCE READOUT FOR THE MAXIMUM REDLINE

UPPER EICAS DISPLAY



STANDBY ENGINE INDICATOR, N10016

(A)



LIMIT BUG FOR THE REDLINE

N_2 ACTUAL POINTER

N_2 ACTUAL READOUT

EXCEEDANCE READOUT FOR THE MAXIMUM REDLINE

CROSS-BLEED MESSAGE READOUT

ROUND DIAL

REFERENCE BUG FOR THE IN-FLIGHT START WINDMILLING

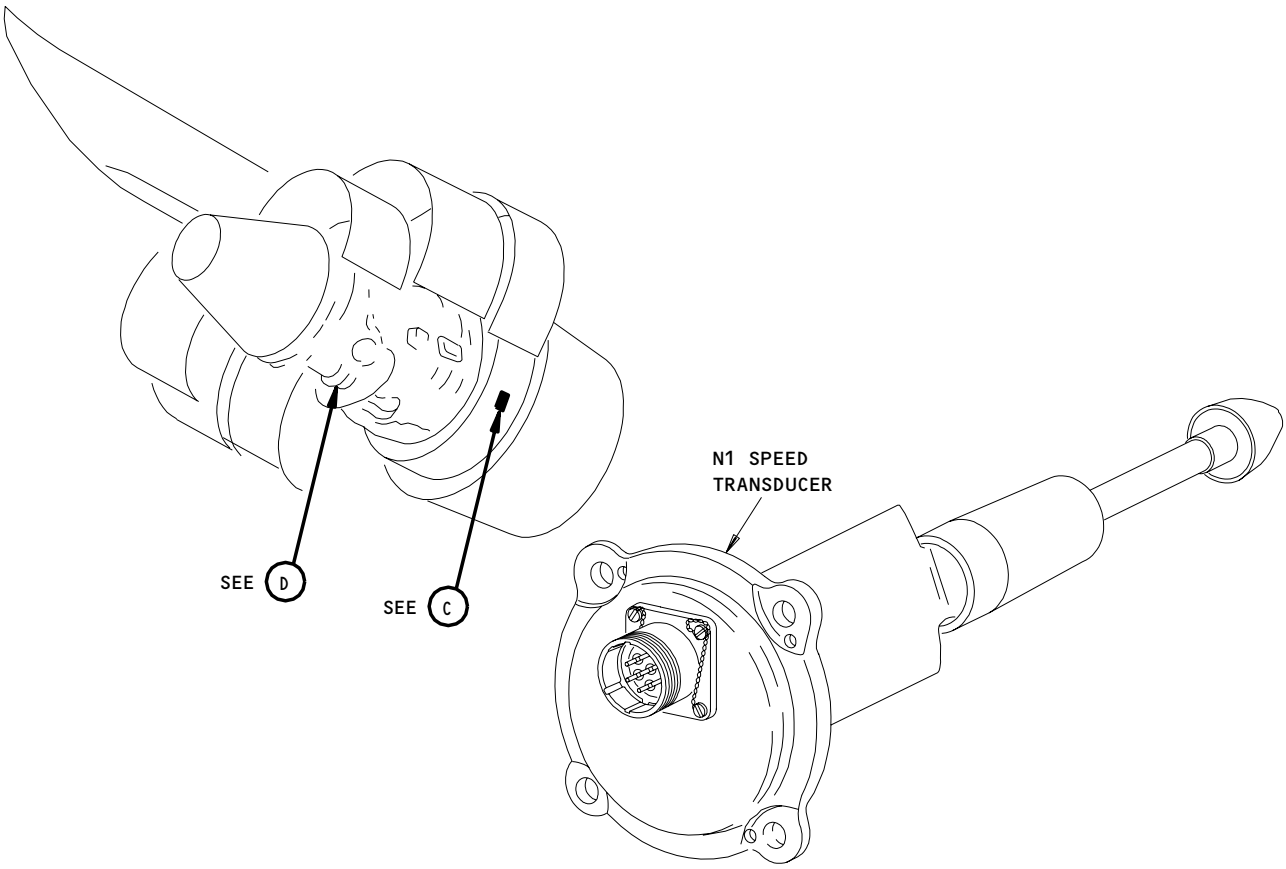
PARAMETER READOUT

LOWER EICAS DISPLAY

(B)

NOTE: NUMBERS SHOWN ON THE INDICATOR ARE FOR REFERENCE ONLY.

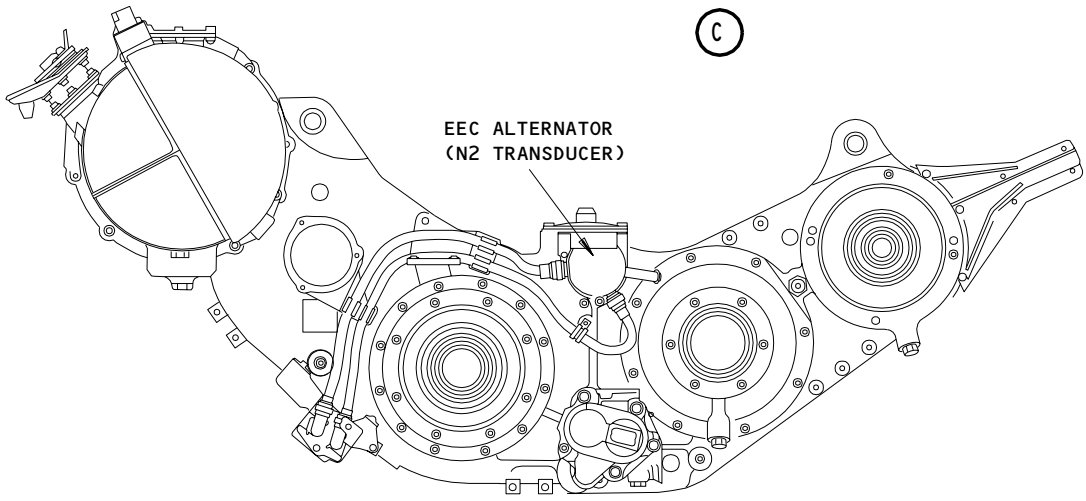
Engine Tachometer System Conponents
Figure 1 (Sheet 1)



L-A0222

N1 SPEED TRANSDUCER

C



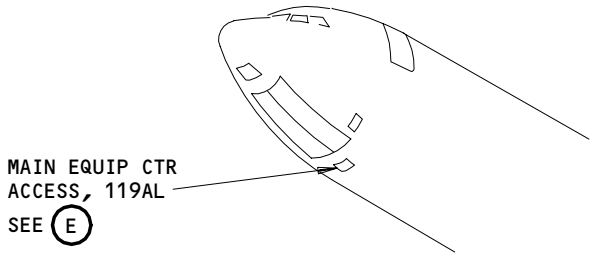
L-A2339

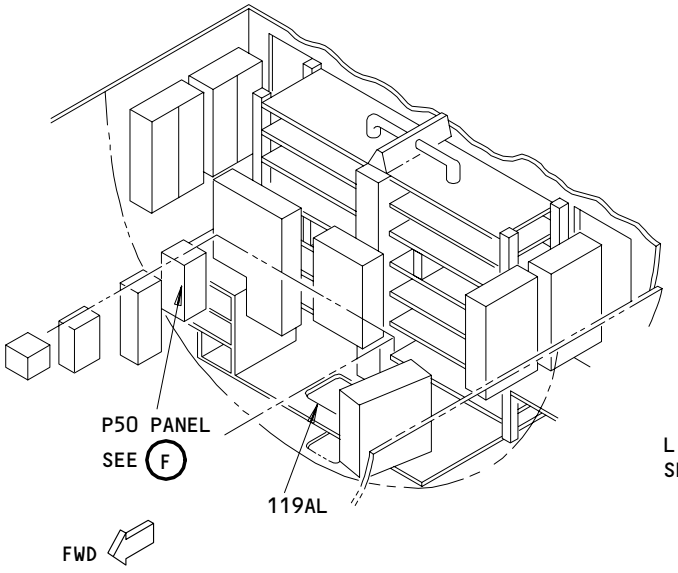
EEC ALTERNATOR (N2 TRANSDUCER)

D

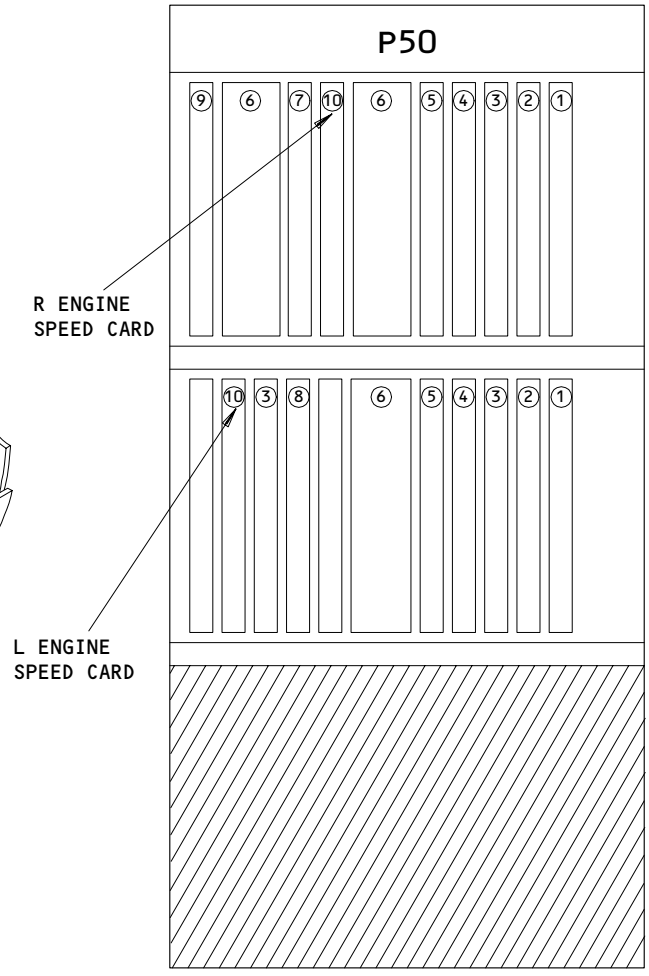
1 TIGHTEN BOLT TO 65-85 POUND-INCHES
(7.344-9.604 NEWTON-METERS)

Engine Tachometer System Components
Figure 1 (Sheet 2)





MAIN EQUIP CENTER
E



F

Engine Tachometer System Components
Figure 1 (Sheet 3)

3. Operation

A. Functional Description

(1) N1 Tachometer System

(a) Magnetic field lines from the N1 speed transducer are cut by teeth machined into the shaft for the low pressure rotor. The cutting of the magnetic field lines causes a voltage to be induced into the coils of the N1 speed transducer. The frequency of the resultant voltage pulses is proportional to N1 speed.

(b) Each coil of the N1 speed transducer supplies the N1 signal to its respective channel of the EEC. Each channel of the EEC converts the N1 signal to serial digital data suitable for transmission over a 429 data bus to EICAS. In addition, the secondary channel of the EEC conditions the N1 signal for direct input to the SEI and the AVM system.

(2) N2 Tachometer System

(a) N2 signals are obtained from all three windings of the EEC alternator. Two three-phase windings provide power and N2 signals to each channel of the EEC. A single-phase winding provides a separate N2 signal for EICAS, SEI, and the AVM system. The N2 signal is also routed to the engine speed card, for controlling other airplane systems that depend on engine speed.

(3) N1 Indication

(a) N1 indication is provided on the upper EICAS display, and is diplayed directly beneath the EPR parameters.

(b) The N1 parameter display consists of analog dial and digital readouts.

(c) The analog dial readout consists of an arc and a pointer. The arc and pointer are white with a red line displayed on the upper left end of the arc. If N1 speed exceeds red line, the arc and pointer will change color from white to red.

(d) The digital readout of N1 speed is located above the analog dial, and is enclosed in a box. Both numerals and the box change color from white to red if red line is exceeded.

(e) TAI is diplayed above the digital readout whenever thermal anti-icing (TAI) is on. A TAI reference bug is displayed on the analog dial to show the minimum N1 speed allowed for effective anti-icing.

(f) Maximum red line exceedance is provided just below the digital readout whenever the red line limit is exceeded. The maximum exceedance will be displayed until the MAX IND RESET pushbutton is pressed. The exceedance readout can only be cleared if the exceedance no longer exists.

(4) N2 Indication

(a) N2 parameters are displayed in the upper right-hand corner of the lower EICAS display.

(b) The N2 parameter display consists of analog dial and digital readouts.

(c) The analog dial readout consists of an arc and a pointer. The arc and pointer are white with a red line displayed on the upper left end of the arc. If N2 speed exceeds red line, the pointer will change color from white to red.

(d) The digital readout of N2 speed is located above the analog dial, and is enclosed in a box. Both the numerals and the box change color from white to red if red line is exceeded.

(e) The X-BLD message is displayed above the N2 actual readout box and appears when the airplane is in the air and is within the in-flight start envelope and airspeed is such that cross-bleed start is required.

1) The in-flight start envelope is displayed on EICAS primary below the warning/caution/advisory message list. This envelope displays three flight levels (barometric altitude in hundreds of feet) and permitted minimum and maximum speed ranges in knots.

2) The in-flight start envelope is initiated and continued if all of the following conditions are true.
   a) Airplane is in the air.
   b) Fuel control switch is in CUTOFF position.
   c) Engine fire switch is not pulled.
   d) EICAS primary and EICAS secondary - full is selected.

3) The in-flight start envelope is terminated if any of the following conditions are true.
   a) Airplane is on the ground.
   b) Engine fire switch is pulled.
   c) Engine is running.
   d) EICAS primary and secondary - full is not displayed.

(f) Fuel on command bar is displayed along the outside of the analog dial and is located at 18% N2. The bar will be visible under the following conditions.

1) Airplane is on the ground, fire switch is not pulled, and switch for the engine fuel control is in CUTOFF position.

2) Airplane is in the air and the respective X-BLD message is displayed on EICAS above the N2 actual readout box.

(g) Maximum exceedance for the redline is provided just below the digital readout whenever the redline limit is exceeded. The maximum exceedance will be displayed until the MAX IND RESET pushbutton is pressed. The exceedance readout can only be cleared if the exceedance no longer exists.

(5) Engine Exceedance Indications

(a) When N1 or N2 speed exceeds the redline limit, an exceedance indication for the maximum redline appears below the digital readout of the affected parameter. Pushing the MAX IND RESET pushbutton switch on the EICAS display select panel will clear the indication if the exceedance is no longer present.

(b) The PERF/APU page of EICAS automatically records all engine parameters when N1 or N2 exceeds red line. Pressing the MAX IND RESET switch has no effect on the data.

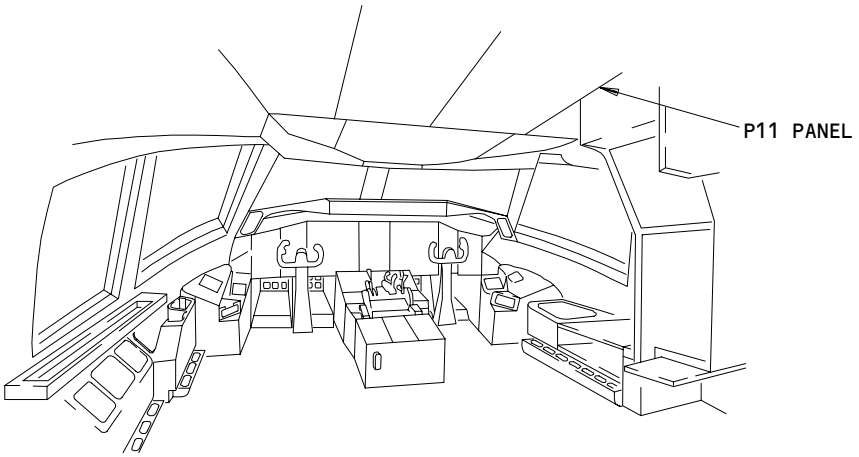
(c) The ENG EXCD page of EICAS keeps track of the exceedance parameter for the maximum redline and the cumulative time that a parameter exceeded redline limits. Pressing the MAX IND RESET switch has no effect on the data.

ENGINE TACHOMETER SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ALTERNATOR - (FIM 73-21-00/101)				
EEC (N2 TRANSDUCER), T1519				
CARD - LEFT N2 ENGINE SPEED, M1093	2	1	119AL, MAIN EQUIP CTR, P50 ELECTRICAL SYSTEM CARD FILE	77-12-01
CARD - RIGHT N2 ENGINE SPEED, M1092	2	1	119AL, MAIN EQUIP CTR, P50 ELECTRICAL SYSTEM CARD FILE	77-12-01
CIRCUIT BREAKER -	1		FLIGHT COMPT, P11	
ENGINE SPEED SENSE L1, C1428			11D23	*
ENGINE SPEED SENSE R1, C1429			11D24	*
ENGINE SPEED SENSE L2, C1426			11D15	*
ENGINE SPEED SENSE R2, C1427			11D16	*
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
INDICATOR - (FIM 77-41-00/101)				
STANDBY ENGINE, N10016				
TRANSDUCER - (FIM 73-21-00/101)				
EEC SPEED, N1				

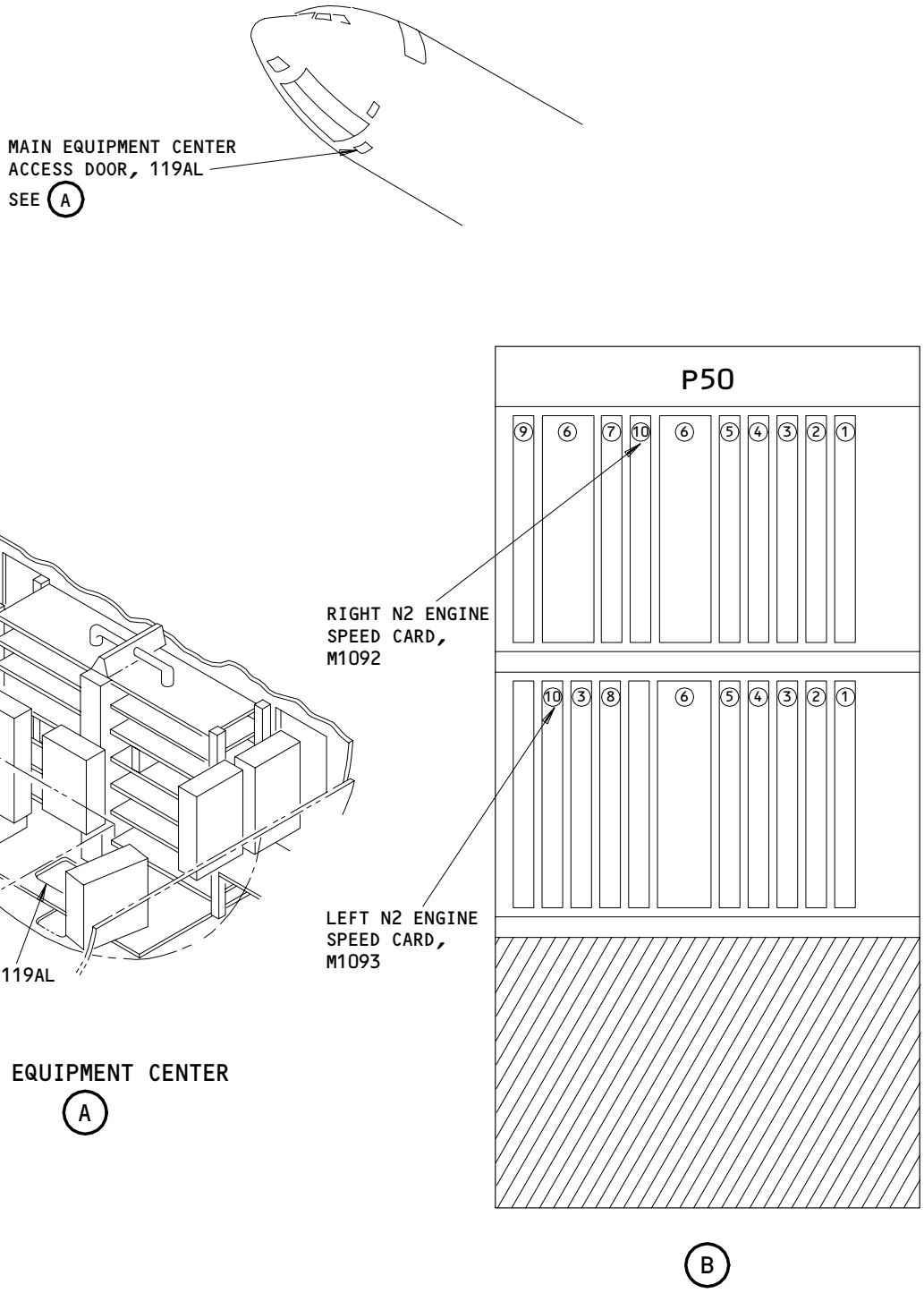
* SEE THE WDM EQUIPMENT LIST

Engine Tachometer System - Component Index
Figure 101



FLIGHT COMPARTMENT

Engine Tachometer System - Component Location
Figure 102 (Sheet 1)



Engine Tachometer System - Component Location
Figure 102 (Sheet 2)

ENGINE TACHOMETER SYSTEM - ADJUSTMENT/TEST

1. General
   A. This section contains the task to do an operational test of the engine tachometer system.
   B. To do the operational test, you must operate the engines.
   C. Do the operational test to make sure the system operates correctly after you replace these components:
      (1) The EEC Speed Transducer (N1)
      (2) The EEC Alternator (N2 transducer).

TASK 77-12-00-715-007-N00

2. Engine Tachometer System Operational Test (Fig. 501)
   A. References
      (1) AMM 71-00-00/201, Power Plant
   B. Access
      (1) Location Zone
          211 Control Cabin, LH
          212 Control Cabin, RH

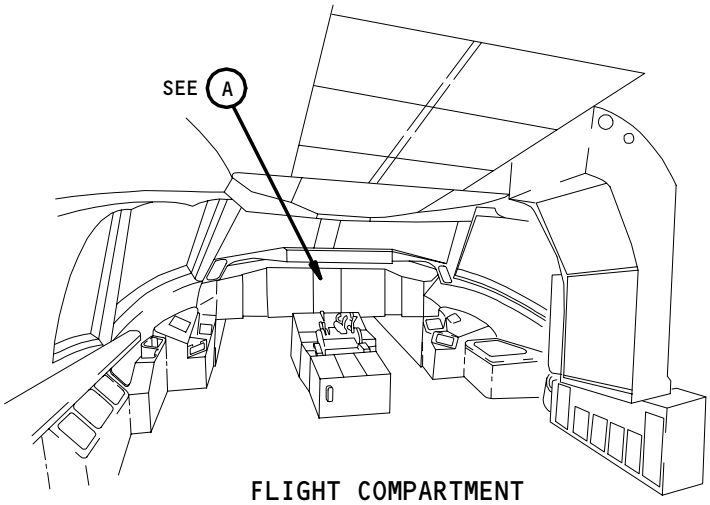
   C. Procedure

      S 865-008-N00
      (1) Operate the engines at equal power.
          (a) Start the engines (AMM 71-00-00/201).
          (b) Make sure these engine parameters become stable and indicate approximately the same value:
              1) EPR
              2) EGT.

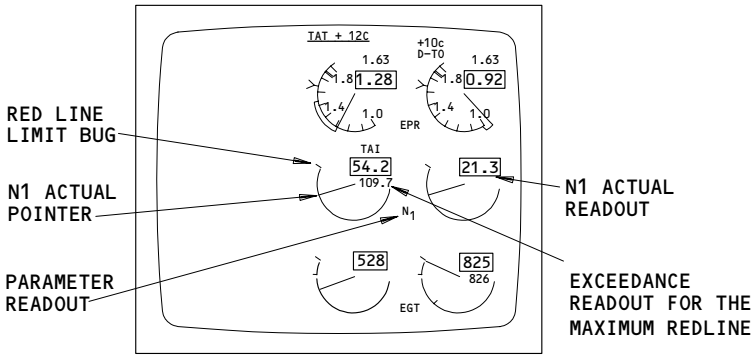
      S 715-009-N00
      (2) Make sure the N1 indication on the upper EICAS display is approximately the same for each engine.

      S 715-010-N00
      (3) Make sure the N2 indication on the lower EICAS display is approximately the same for each engine.

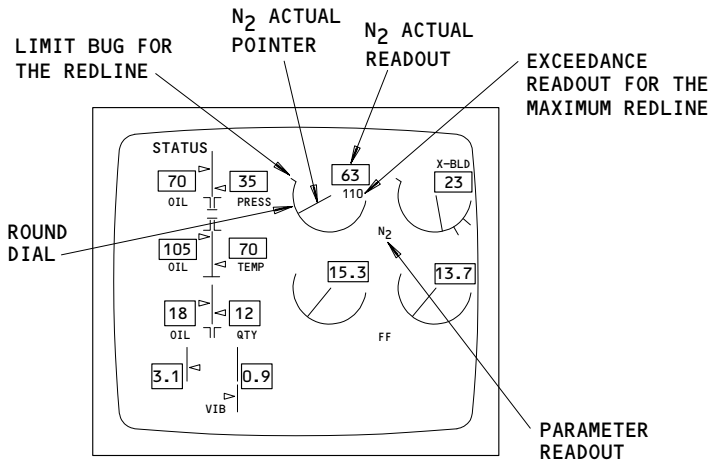
      S 865-011-N00
      (4) Stop the engines (AMM 71-00-00/201).



FLIGHT COMPARTMENT



UPPER EICAS DISPLAY



LOWER EICAS DISPLAY

NOTE: NUMBERS SHOWN ON THE INDICATOR ARE FOR REFERENCE ONLY.

(A)

Engine Tachometer Indication
Figure 501

ENGINE SPEED CARD - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the engine speed card. The second task installs the engine speed card.
   B. The engine speed card is found on the P50 panel in the main equipment center aft of the nose wheel.

TASK 77-12-01-004-001-N00

2. Remove the Engine Speed Card
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 20-10-01/401, E/E Rack Mounted Components
      (3) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zone
          119 Main Equipment Center (lower fuselage, forward)

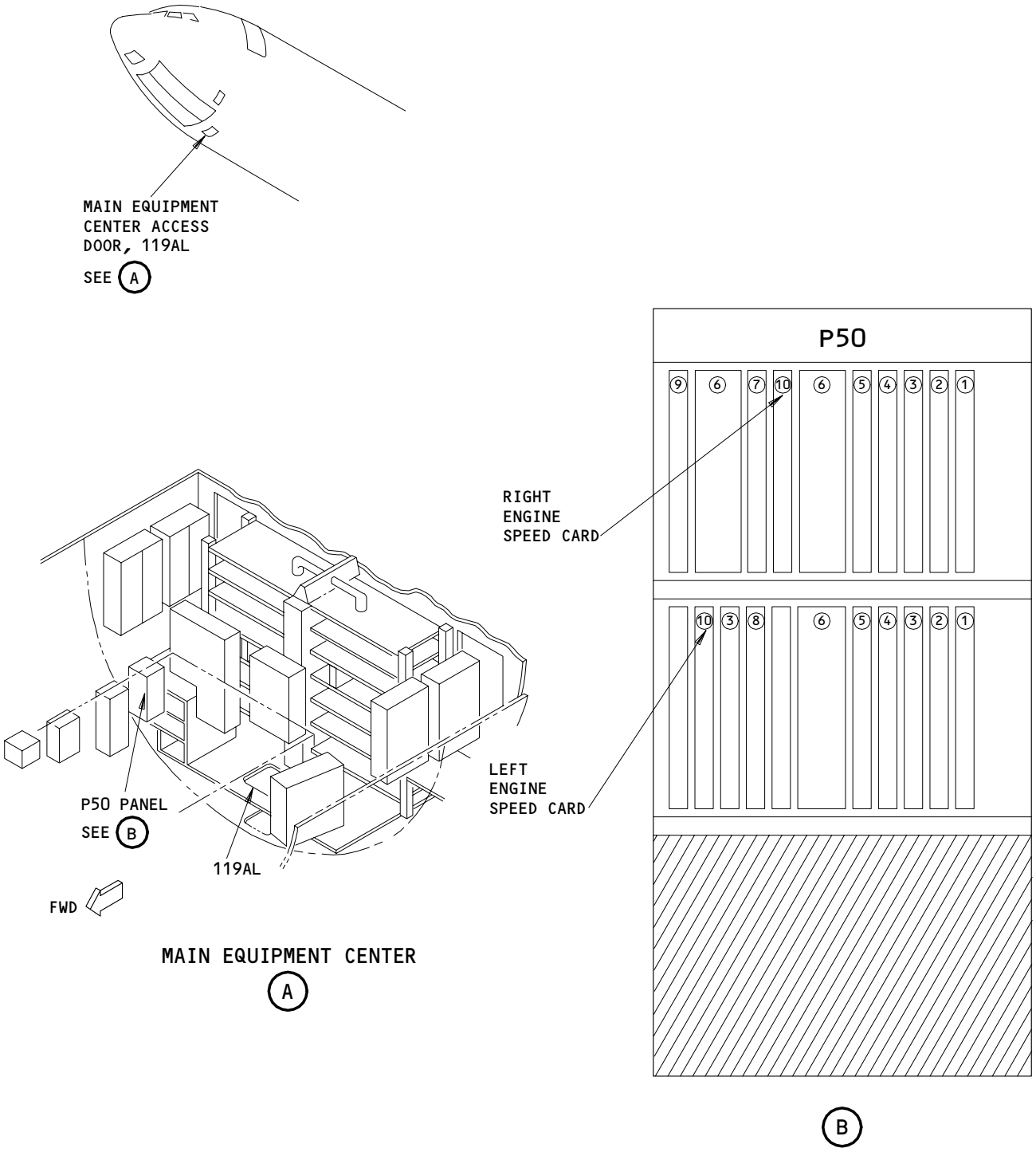
      (2) Access Panel
          119AR Main Equipment Center Panel

   C. Prepare to Remove the Engine Speed Card (Fig. 401).

      S 864-002-N00
      (1) For the left engine, open these circuit breakers on the overhead panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11D15, ENGINE SPEED SENSE L2
          (b) 11D23, ENGINE SPEED SENSE L1

      S 864-003-N00
      (2) For the right engine, open these circuit breakers on the overhead panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11D16, ENGINE SPEED SENSE R2
          (b) 11D24, ENGINE SPEED SENSE R1
   D. Remove the Engine Speed Card (Fig. 401).

      S 014-004-N00
      (1) Go into the main equipment center through the access panel, 119AL (AMM 06-41-00/201).



Engine Speed Card Removal/Installation
Figure 401

S 914-025-N00

CAUTION: DO NOT TOUCH THE ENGINE SPEED CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01). ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE ENGINE SPEED CARD.

(2) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 024-006-N00

(3) Remove the engine speed card (AMM 20-10-01/401).

TASK 77-12-01-404-007-N00

3. Install the Engine Speed Card

A. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels
(2) AMM 20-10-01/401, E/E Rack Mounted Components
(3) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
(4) AMM 24-22-00/201, Electrical Power

B. Access

(1) Location Zone
119 Main Equipment Center (lower fuselage, forward)

(2) Access Panel
119AR Main Equipment Center Panel

C. Install the Engine Speed Card (Fig. 401).

S 014-008-N00

(1) Go into the main equipment center through the access panel, 119AL (AMM 06-41-00/201).

S 914-026-N00

CAUTION: DO NOT TOUCH THE ENGINE SPEED CARD BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE (AMM 20-41-01). ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE ENGINE SPEED CARD.

(2) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-010-N00
(3) Install the engine speed card (AMM 20-10-01/401).

S 864-011-N00
(4) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead panel, P11:
(a) 11D15, ENGINE SPEED SENSE L2
(b) 11D23, ENGINE SPEED SENSE L1

S 864-012-N00
(5) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead panel, P11.
(a) 11D16, ENGINE SPEED SENSE R2
(b) 11D24, ENGINE SPEED SENSE R1

S 864-013-N00
(6) Supply electrical power (AMM 24-22-00/201).

S 714-014-N00
(7) Erase the EICAS maintenance page and make sure the applicable EICAS message, L(R) ENG SPEED CARD, does not show.

S 714-015-N00
(8) Put the channel 1 switch on the N2 speed card to the TEST position.

S 714-016-N00
(9) Make sure the applicable EICAS message, L(R) ENG SPEED CARD, shows after 5 to 15 seconds.

S 714-017-N00
(10) Put the channel 1 switch back to the NORMAL position.

S 714-018-N00
(11) Erase the EICAS maintenance page and make sure the applicable EICAS message, L(R) ENG SPEED CARD, does not show.

S 714-024-N00

CAUTION: DO NOT OPERATE THE CHANNEL 2 TEST SWITCH MORE THAN 30 SECONDS IN EACH 5 MINUTES. IF YOU OPERATE IT FOR MORE THAN 30 SECONDS, DAMAGE TO THE PROBE HEATER FOR THE ENGINE INLET CAN OCCUR.

(12) Put the channel 2 switch on the N2 speed card to the TEST position.

NOTE: The channel 2 switch is a momentary switch. You must hold it in the TEST position.

S 714-020-N00

(13) Make sure the EICAS message, L(R) ENG SPEED CARD, shows after you hold the switch for 5 to 15 seconds.

S 714-021-N00

(14) Release the channel 2 switch and make sure it goes back to the NORMAL position.

S 714-022-N00

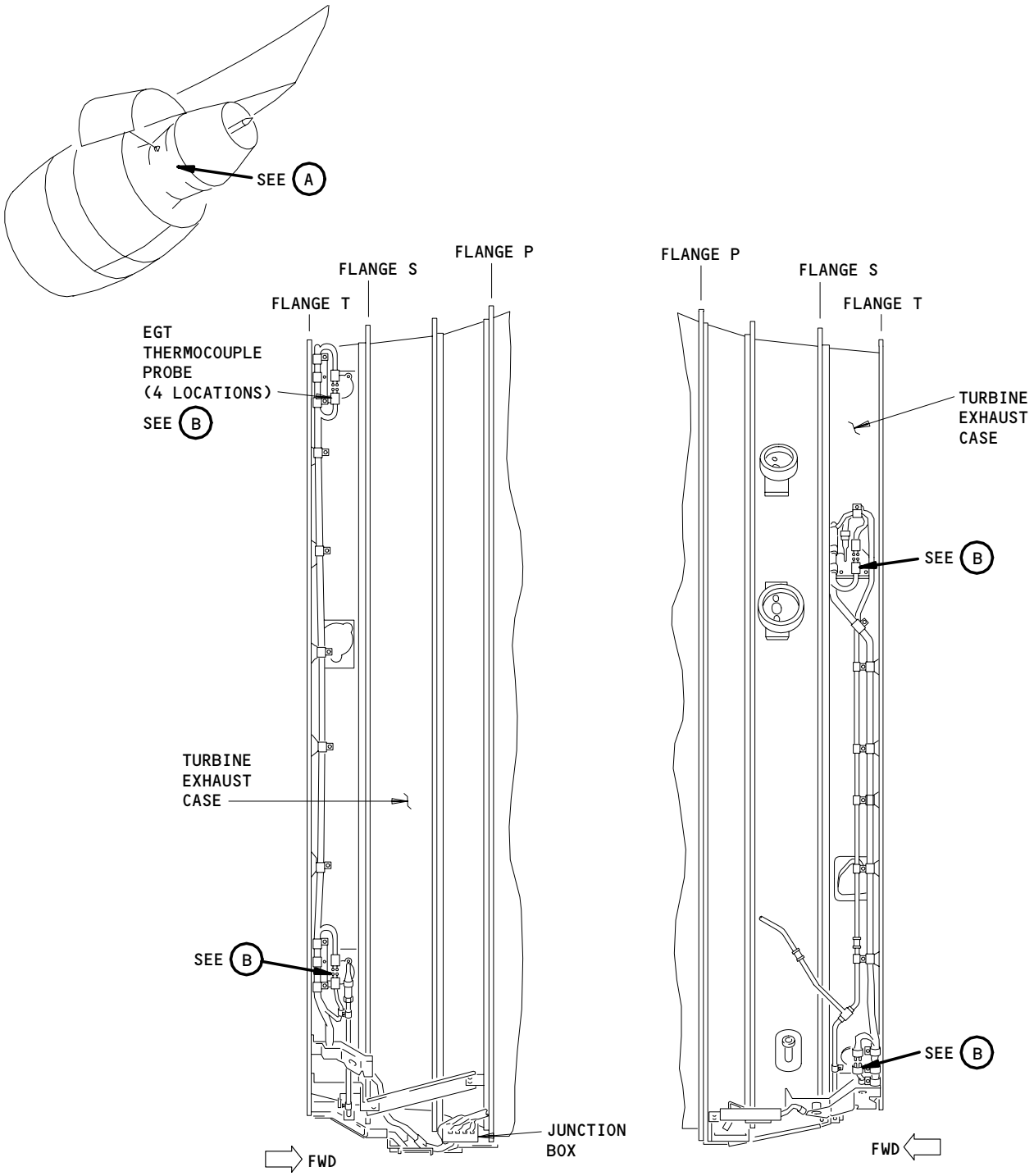
(15) Erase the EICAS maintenance page and make sure the applicable EICAS message, L(R) ENG SPEED CARD, does not show.

S 864-023-N00

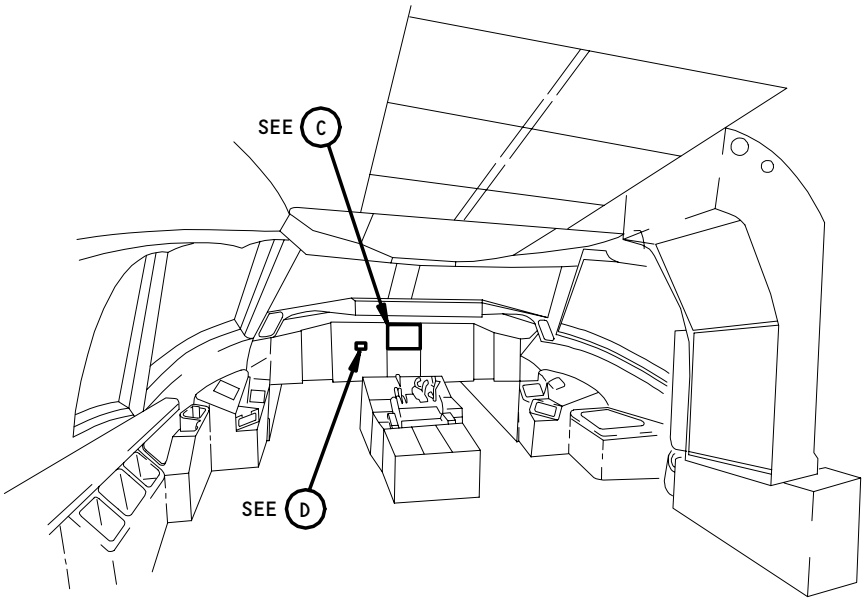
(16) Remove the electrical power (AMM 24-22-00/201).

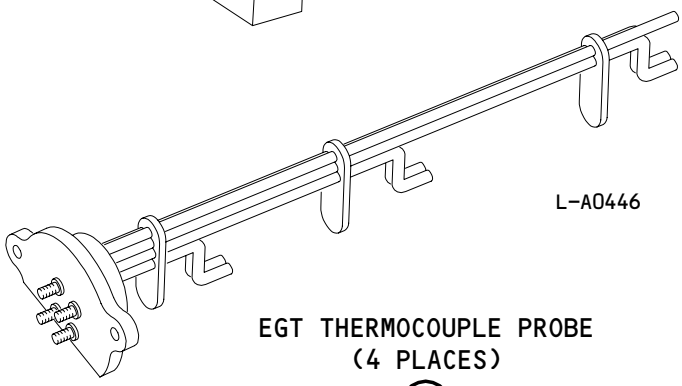
EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. Exhaust gas temperature (EGT) is sensed by thermocouple probes installed in the struts of the turbine exhaust case.
   B. The EGT indicating system monitors exhaust gas temperature sensed at the exit of the low pressure turbine. Signals from the EGT probes are provided to the EEC where they are then transmitted to the flight compartment for display. EGT data is visually displayed on EICAS and the standby engine indicator.
   C. The EGT system consists of four thermocouple probes, two EGT thermocouple cables, and a junction box.
2. Component Details (Fig. 1)
   A. EGT (TT4.95) Thermocouple Probes
      (1) The EGT (TT4.95) thermocouple probes provide the EEC with two separate electrical signals representing the temperature of exhaust gas as it exits the low pressure turbine.
      (2) The four EGT probes are located in the turbine exhaust case. Two probes are located in thermocouple housings at the 1 and 7 o'clock positions with the remaining two probes located in combination Engine Pressure Ratio (EPR)/Exhaust Gas Temperature (EGT) probes at the 5 and 10 o'clock positions. Each probe is secured with two bolts.
      (3) Each thermocouple probe contains six alumel-chromel elements which are located in three different engine radial positions. Three thermocouple elements, one from each engine radial position, are connected to an alumel stud and chromel stud at the head of the probe. The other three thermocouple elements are connected to a second set of alumel and chromel studs.
   B. EGT Thermocouple Cables and Box
      (1) Two EGT thermocouple cables connect the EGT probes to the junction box. Each cable contains alumel and chromel wires protected by a steel-braid outer casing. Each cable interconnects the probes on one side of the engine.
      (2) The junction box is located on the turbine case at about 7 o'clock. The box interconnects the thermocouples in parallel to provide an average EGT reading.
3. Operation (Fig. 2)
   A. Functional Description (Fig. 3)
      (1) Indicating System for the Exhaust Gas Temperature
         (a) EGT is sensed by the parallel thermocouple circuit. The alumel-chromel junction in each thermocouple generates an EGT-proportional voltage due to heating by the exhaust gases. The EGT signals are sent to the EEC and to the flight compartment.
      (2) EGT Display
         (a) EGT parameters are displayed on the upper EICAS display, below the N1 displays. The display format includes a digital readout plus an analog dial display. The normal display color is white.



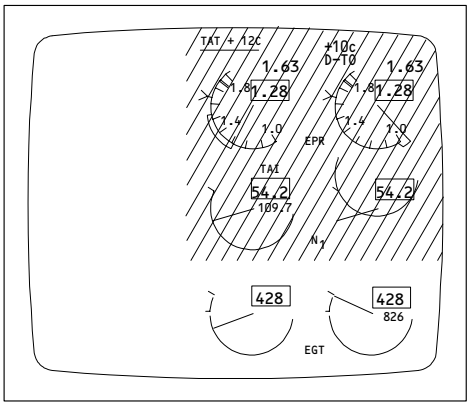
Exhaust Gas Temperature Components
Figure 1 (Sheet 1)





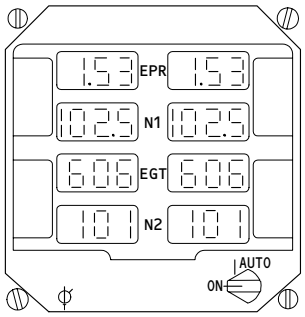
EGT THERMOCOUPLE PROBE
(4 PLACES)

B



UPPER EICAS DISPLAY (P2)

C



STANDBY ENGINE INDICATOR
(P1-3)

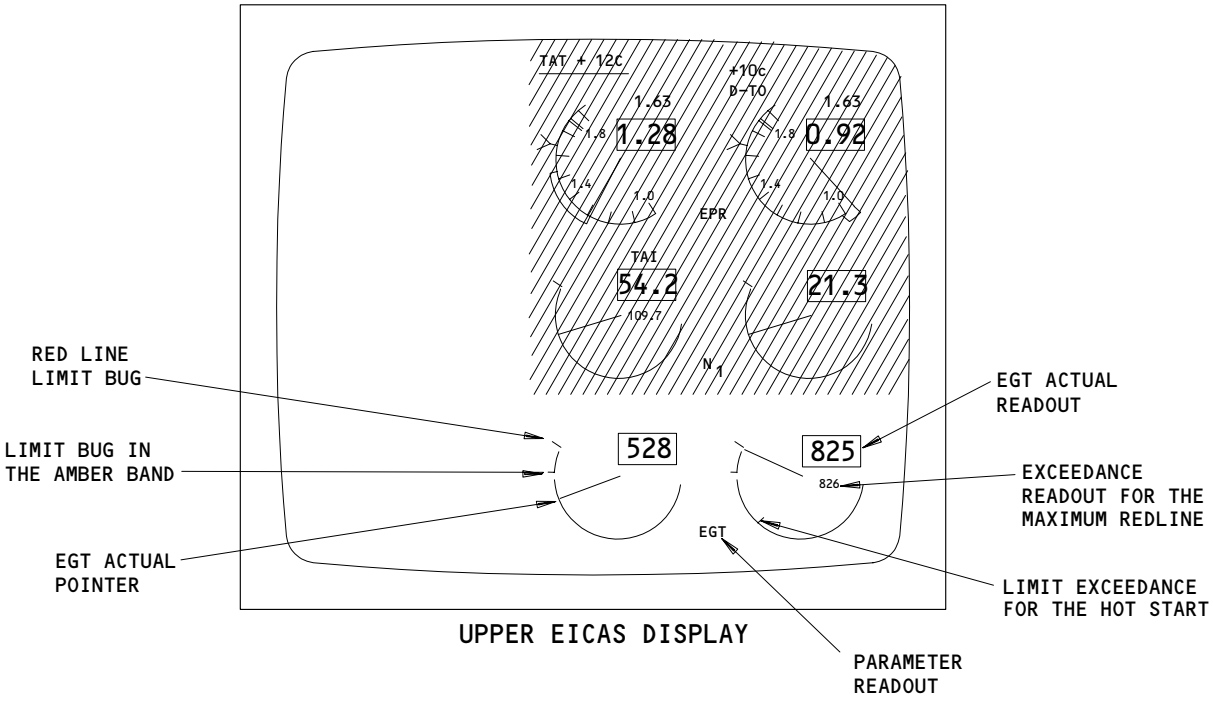
D

Exhaust Gas Temperature Components
Figure 1 (Sheet 2)

(b) Amber band and redline exceedance bugs are part of the analog dial display. The color of the dial pointer and digital readout changes from white to amber to red as EGT exceeds the limits set by the bugs. If EGT exceeds the read line limit, a digital readout of maximum red line exceedance will be displayed just below the normal digital readout. The highest exceedance value attained will be displayed until cleared with the MAX IND RESET switch on the display select panel for the EICAS. The exceedance readout will only be cleared if the exceedance no longer exists.

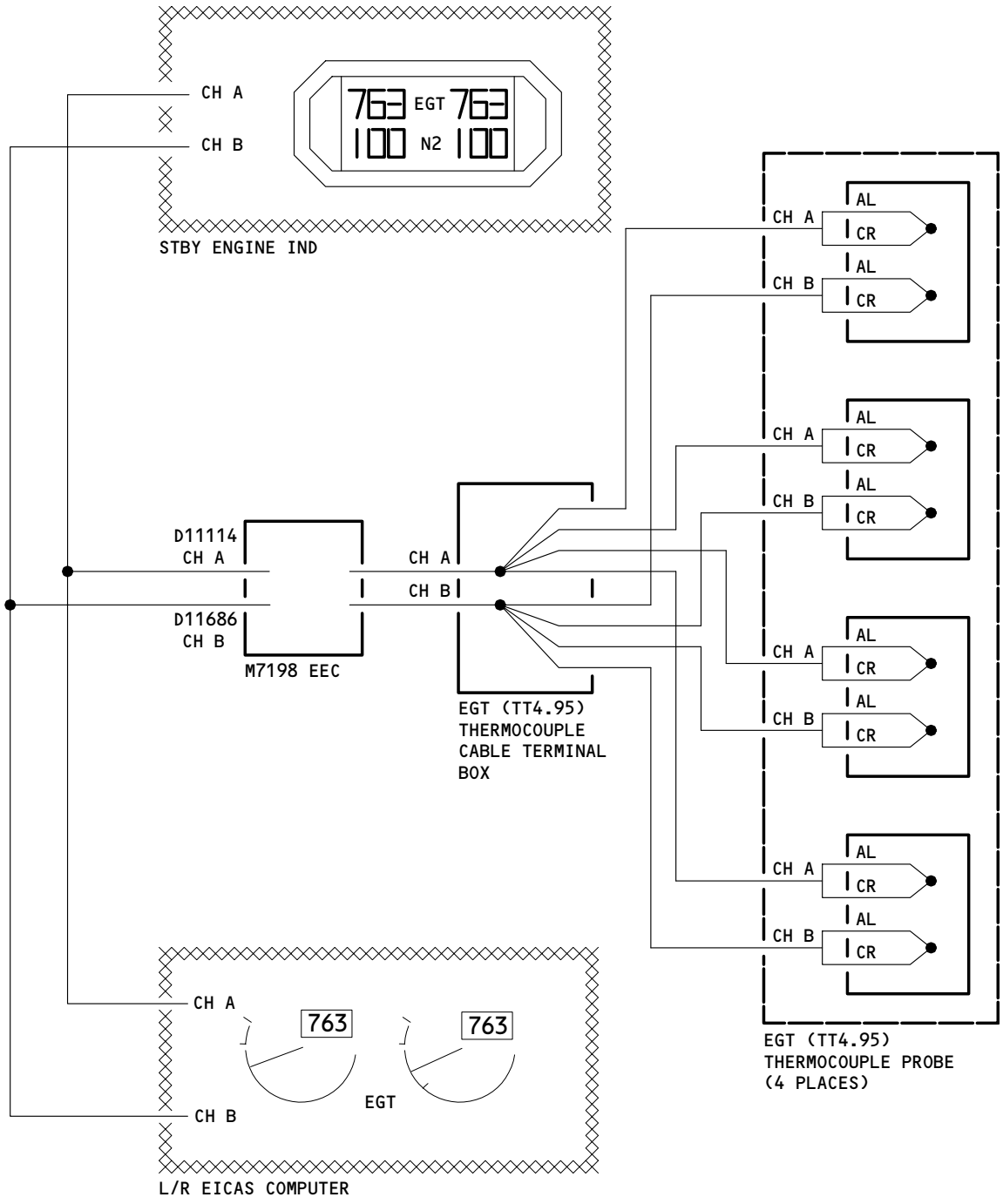
(c) A hot start limit bug will be displayed during a hot start. The dial pointer and digital readout will change color from white to red if EGT exceeds the hot start limit.

(d) EGT exceedance values and durations are stored on the ENG EXCD page of EICAS.



UPPER EICAS DISPLAY

EGT Display Description
Figure 2

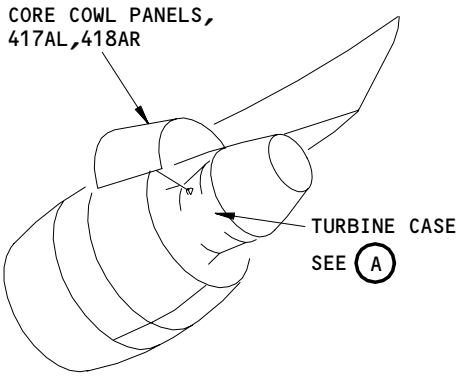


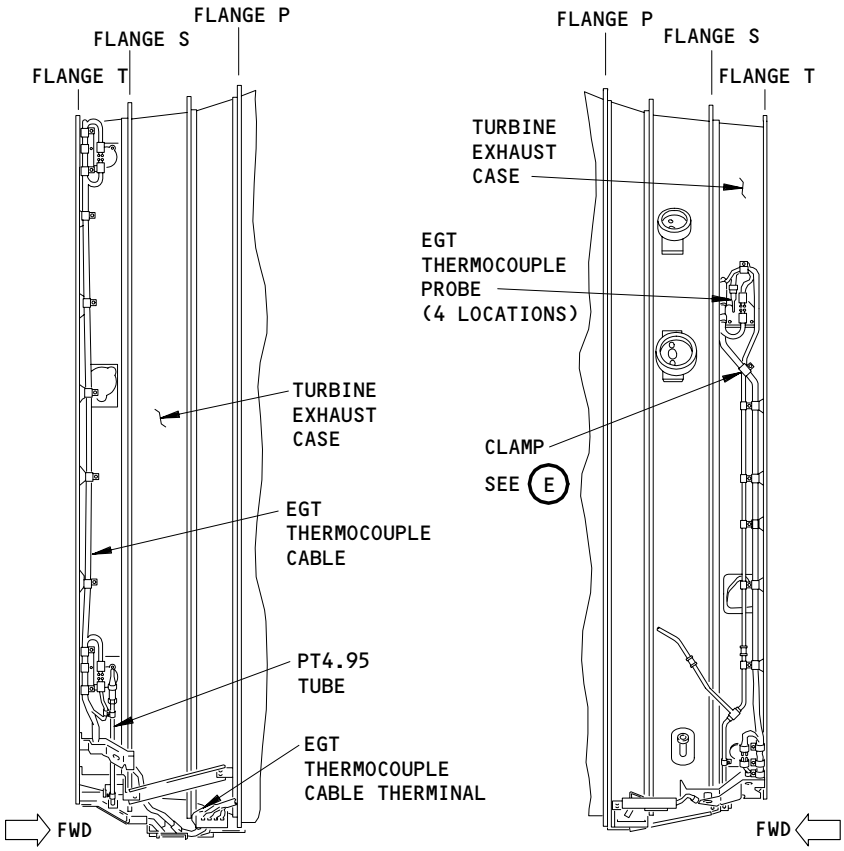
Exhaust Gas Temperature Indication Schematic
Figure 3

EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BOX - EGT THERMOCOUPLE CABLE TERMINAL	--	1	417AL,418AR, CORE COWL PANELS	77-21-04
CABLE - EGT THERMOCOUPLE	--	2	417AL,418AR, CORE COWL PANELS	77-21-02
COMPUTER - (FIM 31-41-00/101)				
L EICAS, M10181				
R EICAS, M10182				
INDICATOR - (FIM 77-41-00/101)				
STANDBY ENGINE, N10016				
PROBE - EGT THERMOCOUPLE	--	4	417AL,418AR, CORE COWL PANELS	77-21-01

Exhaust Gas Temperature (EGT) Indicating System - Component Index
Figure 101





TURBINE CASE

A

Exhaust Gas Temperature (EGT) Indicating System - Component Location
Figure 102

EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. In this procedure, you will do a check of the exhaust gas temperature (EGT) indicating system while the engines operate.
   B. The exhaust gas temperature indication is referred to as the EGT indication in this procedure.
   C. This procedure compares the EGT indication on the standby engine indicator with that shown on the EICAS display.

TASK 77-21-00-705-001-N00

2. Do a Check of the Exhaust Gas Temperature (EGT) Indicating System
   A. References
      (1) AMM 71-00-00/201, Power Plant
   B. Access
      (1) Location Zone
          211/212 Flight Compartment

   C. Do a Check of the EGT Indicating System.

      S 865-007-N00

      WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

      (1) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

      S 865-003-N00
      (2) Set the two engines at the same power level.

      S 715-004-N00
      (3) Make sure the difference between the EGT indication on the EICAS and the standby engine indicator is 10°C or less for each engine.

      S 715-005-N00
      (4) Make sure the two engines have approximately the same EGT when they are set at the same power level. EGT differences can be up to 40°C for new verses deteriorated engine condition.

      NOTE: Higher EGT levels caused by engine condition should have a higher fuel flow. To help determine if the EGT difference is expected or caused by an EGT indicating problem use the trade factor of 1.5% increase fuel flow for each 10°C difference between engines.

      S 865-006-N00
      (5) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

EXHAUST GAS TEMPERATURE (TT4.95) THERMOCOUPLE PROBE - REMOVAL/INSTALLATION

1. General
   A. In this procedure, the exhaust gas temperature (TT4.95) thermocouple probe is referred to as the EGT probe.
   B. There are four EGT probes installed on each engine. Two of the probes are on the left side of the turbine exhaust case. The other two probes are on the right side of the turbine exhaust case. You get access to the probes when you open the core cowl panels.

TASK 77-21-01-004-001-N00

2. Remove the EGT Probe (Fig. 401)
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Procedure

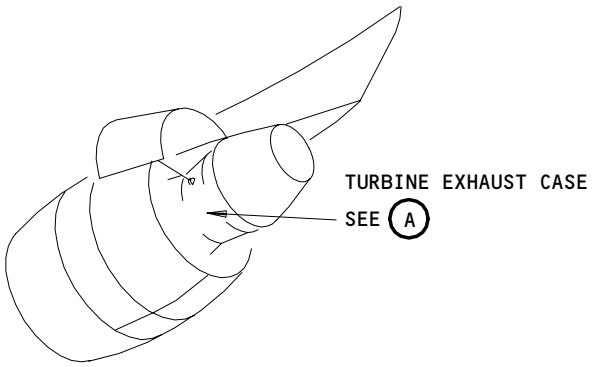
      S 044-004-N00

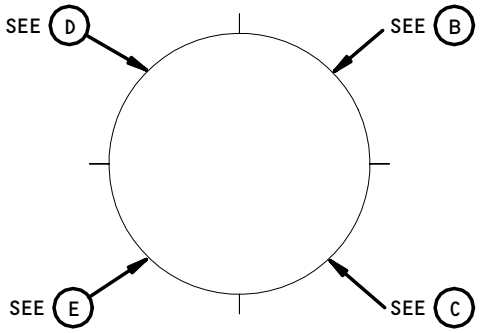
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

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

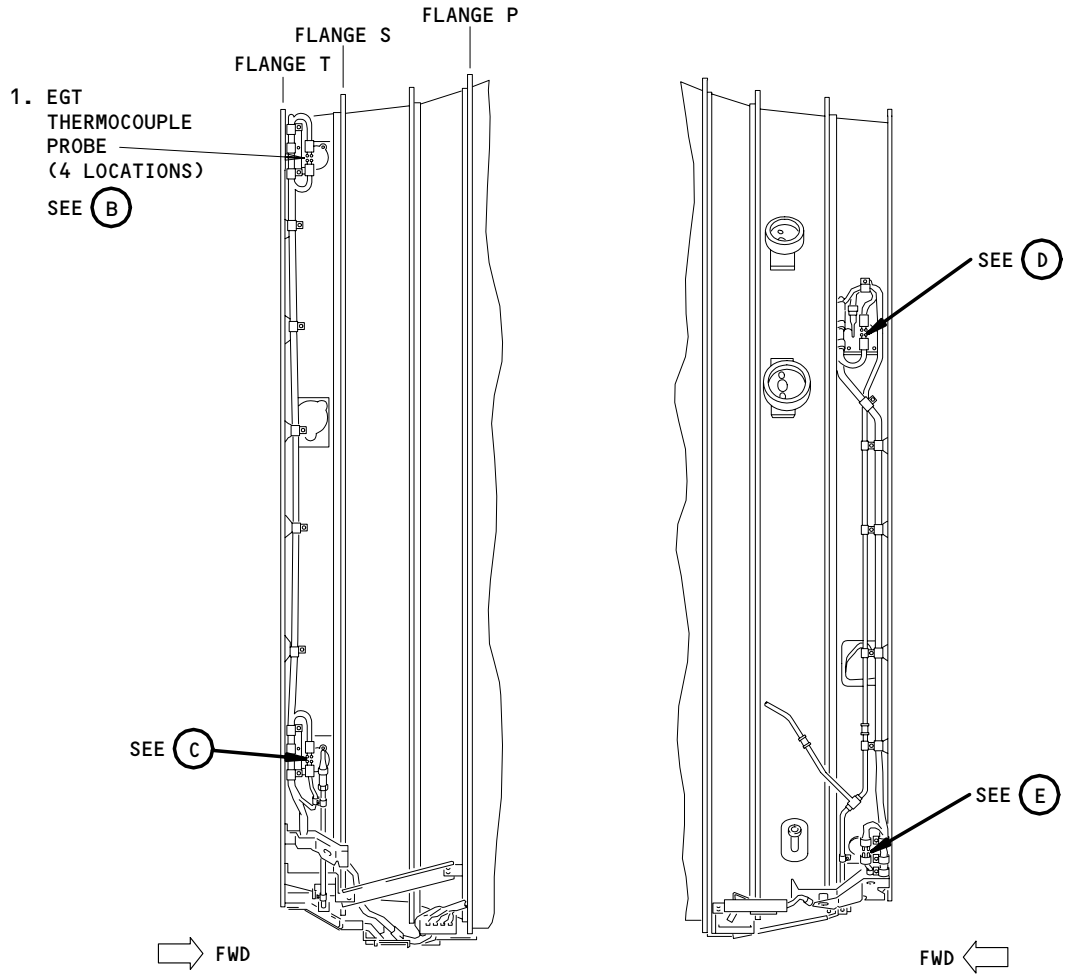
      S 014-005-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).

      S 034-008-N00
      (3) Remove the four nuts (2, 3) and lockwashers (4, 5) that attach the probe wires to the EGT probe.
          (a) Remove the ends of the probe wires from the EGT probe (1).





VIEW FROM THE REAR

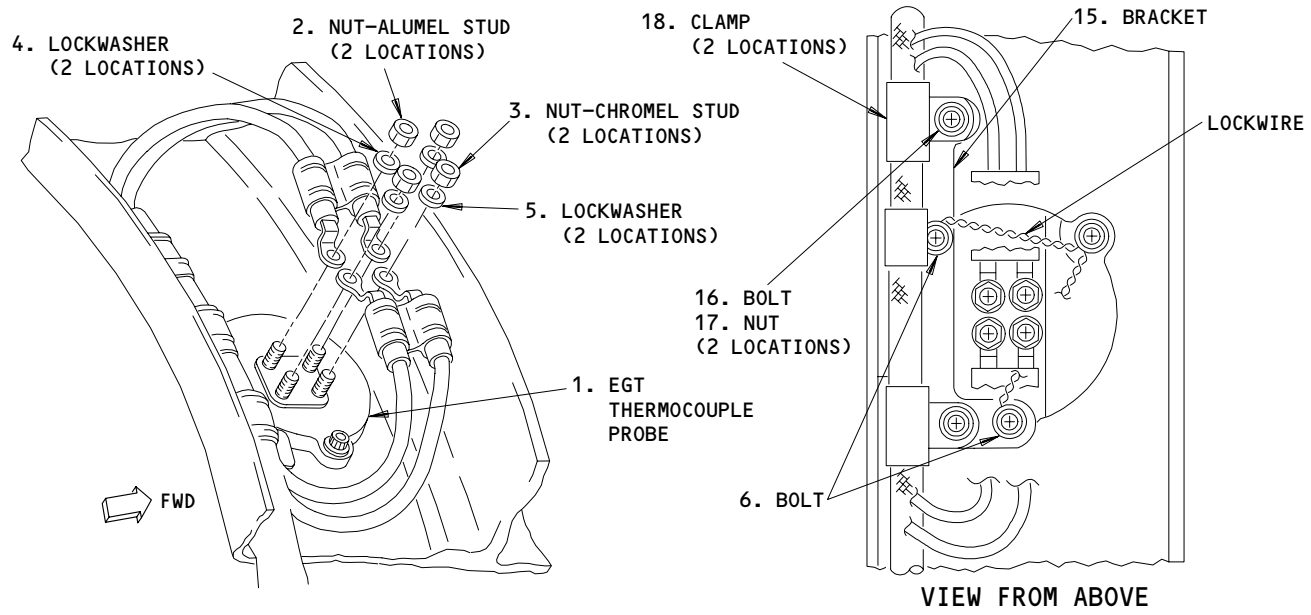


RIGHT SIDE LEFT SIDE

TURBINE EXHAUST CASE

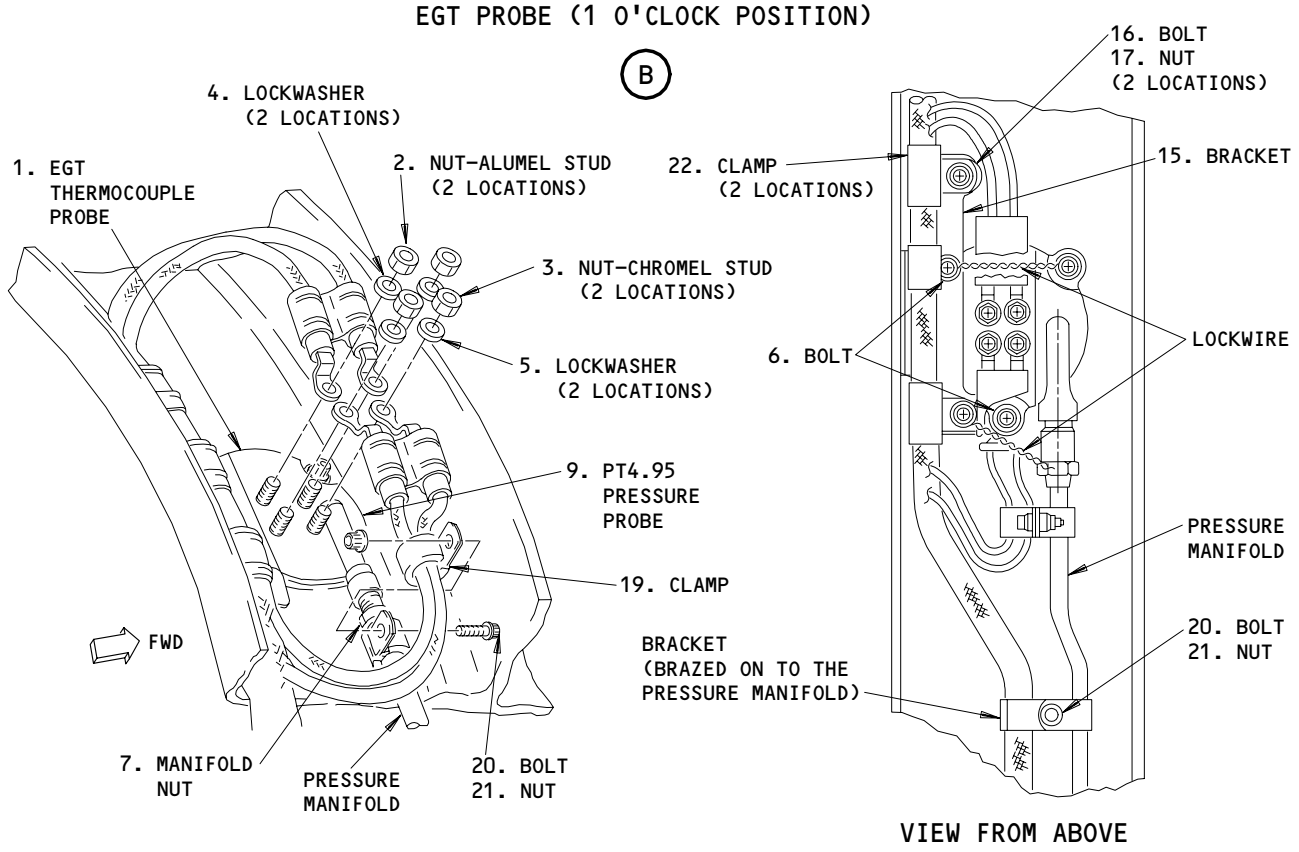
A

EGT (TT4.95) Thermocouple Probe Installation
Figure 401 (Sheet 1)



EGT PROBE (1 O'CLOCK POSITION)

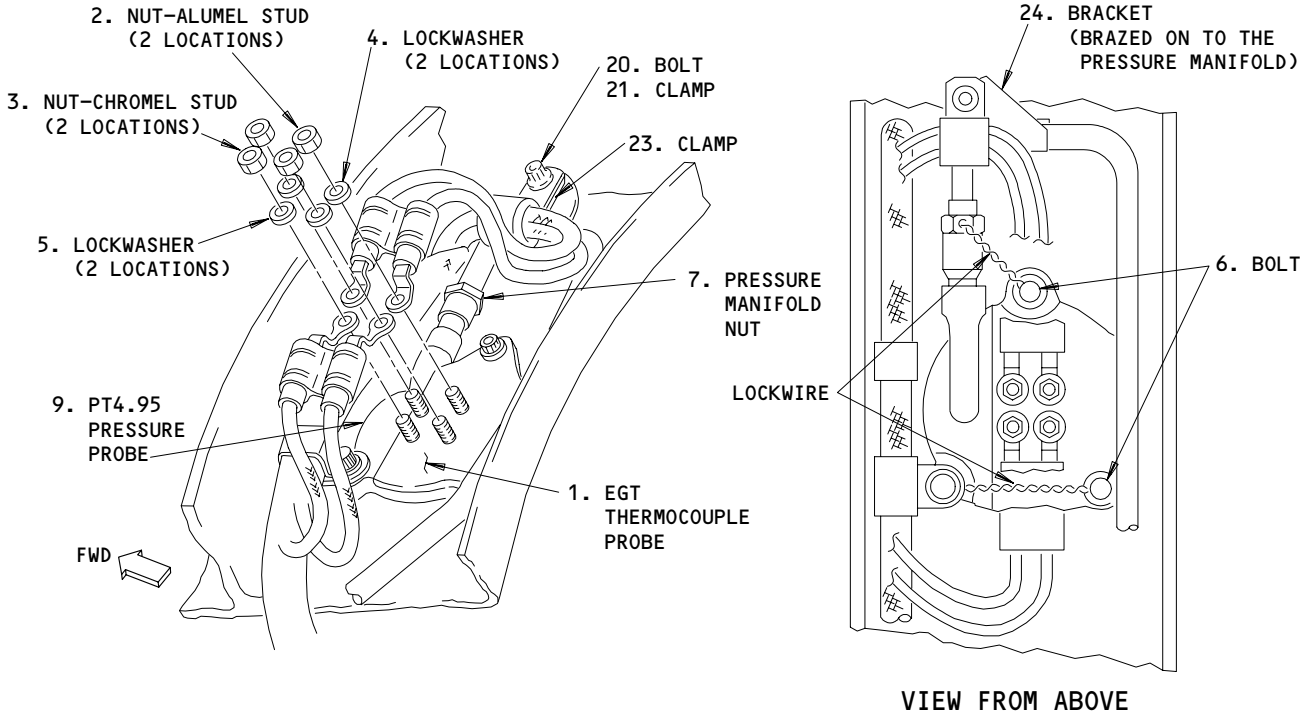
B



EGT PROBE (4 O'CLOCK POSITION)

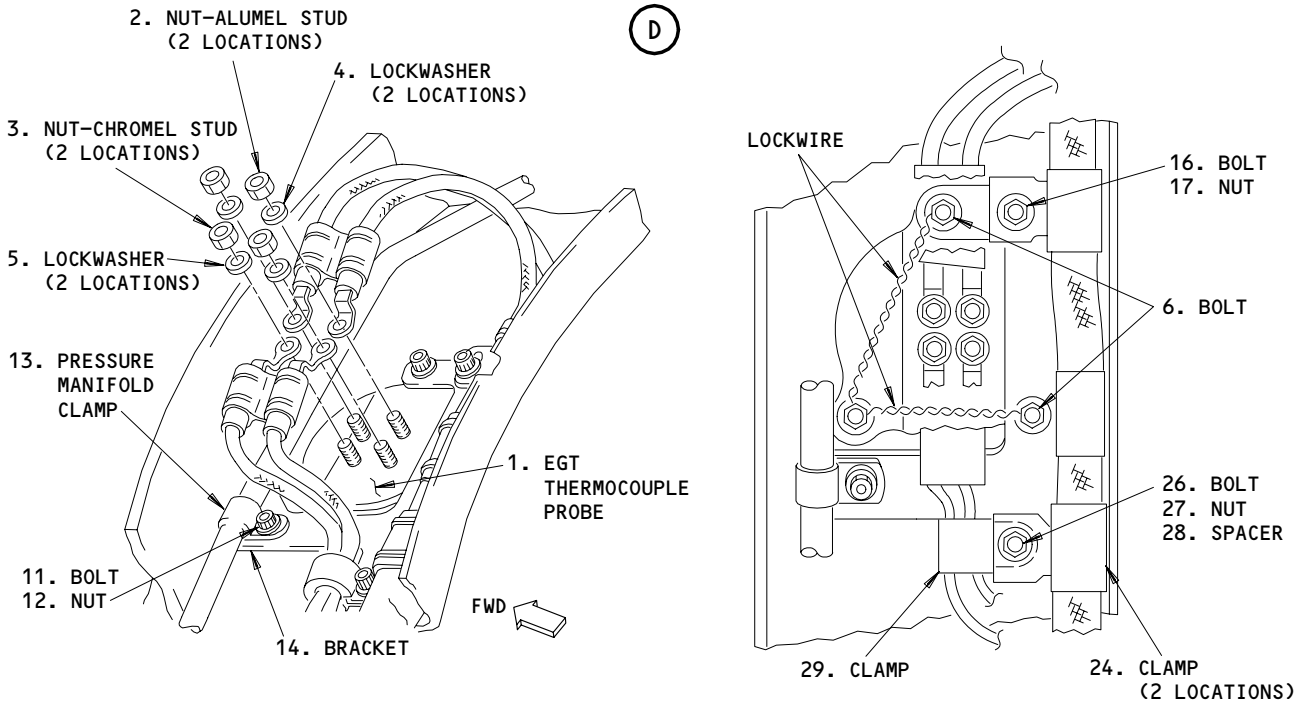
C

EGT (4.95) Thermocouple Probe Installation
Figure 401 (Sheet 2)



EGT PROBE (10 O'CLOCK POSITION)

D



EGT PROBE (7 O'CLOCK POSITION)

E

EGT (4.95) Thermocouple Probe Installation
Figure 401 (Sheet 3)

S 024-009-N00

(4) Do the steps that follow to remove the EGT probe at the 10 o'clock position:
   (a) Remove the bolt (20) and nut (21) for the clamp (23) that is attached to the bracket (24) (it is brazed on to the pressure manifold).
   (b) Remove the lockwire and disconnect the pressure manifold from the pressure probe (9).
   (c) Loosen the bolts that attach the pressure manifold to the brackets on the flange T, as necessary.

      NOTE: This will give you the clearance to remove the EGT probe.

   (d) Remove the lockwire and two bolts (6) that attach the EGT probe (1) to its housing on the exhaust case.
   (e) Remove the EGT probe from the exhaust case.

S 024-010-N00

(5) Do the steps that follow to remove the EGT probe at the 7 o'clock position:
   (a) Remove the bolt (11) and the nut (12) that attaches the clamp (13) for the pressure manifold, to the bracket (14) on flange T.
   (b) Remove the bolt (26), nut (27), and the spacer (28) that attach the clamp (29) for the EGT probe wires.
   (c) Remove the bolt (16) and the nut (17) for the clamp (24) that attaches the EGT probe cable to the bracket (14).
   (d) Remove the lockwire and the two bolts (6) that attach the EGT probe and bracket (14) to the exhaust case.

      NOTE: Move the EGT probe cable rearward if it is necessary.

      1) Move the bracket (14) rearward and remove the EGT probe.

S 024-011-N00

(6) Do the steps that follow to remove the EGT probe at the 4 o'clock position:
   (a) Remove the bolt (20) and the nut (21) that attaches the clamp (19) for the EGT probe wires to the pressure manifold.
   (b) Remove the lockwire and disconnect the pressure manifold from the pressure probe.

(c) Remove the bolts (16) and nuts (17) for the clamps (22) that attach the EGT probe cable to the bracket (15).
(d) Remove the lockwire and the two bolts (6) that attach the EGT probe and bracket (15) to the exhaust case.
1) Move the bracket (15) rearward and remove the EGT probe (1).

S 024-022-N00

(7) Do the steps that follow to remove the EGT probe at the 1 o'clock position:
(a) Remove the bolts (16) and nuts (17) for the clamps (18) that attach the EGT probe cable to the bracket (15).
(b) Remove the lockwire and the bolts (6) that attach the EGT probe (1) and the bracket (15) to the exhaust case.
1) Move the bracket (15) rearward and remove the EGT probe (1).

S 034-014-N00

(8) Install the protection on the the hole where the EGT probe was installed on the exhaust case.

TASK 77-21-01-404-002-N00

3. Install the EGT Probe (Fig. 401)
A. Equipment
(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies
170 Greg Street
P.O. Box 1300
Lodi New Jersey 07644 USA
B. Consumable Materials
(1) D00244 Silver Goop, PWA 36001
(2) G02332 Ferrule, Safety Cable (P05-292)
(3) G02334 Lockwire, AS3214-02
(4) G02335 Cable, Safety (P05-291)

C. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Probe - EGT Thermocouple	77-21-01	05	30

D. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zones
410 Power Plant (Left)
420 Power Plant (Right)

(2) Access Panels
417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

F. Procedure

S 434-013-N00
(1) Remove the protection covers on the probe and the exhaust case.

S 424-018-N00
(2) Do the steps that follow to install the EGT probe at the 10 o'clock position:
(a) Install the EGT probe (1) into the exhaust case and align the holes for the bolts.
(b) Lubricate the threads of the bolts (6) with the Silver Goop.
1) Tighten the bolts (6) to 54-60 pound-inches (6.1-6.8 newton-meters).

2) Install lockwire or the optional safety cable and ferrule to the bolts (6).

CAUTION: DO NOT USE LUBRICANTS ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. IF YOU USE LUBRICANTS ON THESE PARTS, CONTAMINATION OF THE EEC CAN OCCUR.

(c) Connect the pressure manifold to the pressure probe (9).
1) Tighten the manifold nut (7) to 135-150 pound-inches (15.3-17.0 newton-meters).
(d) Install lockwire or the optional safety cable and ferrule to the manifold nut (7) and to the bolts (6).
(e) Tighten the clamp bolts for the pressure manifold that were loosened, to 36-40 pound-inches (4.1-4.5 newton-meters).
(f) Attach the probe wires to the bracket (24) on the pressure manifold with the clamp (23), nut (21), and the bolt (20).
1) Lubricate the threads of the bolt (20) with the Silver Goop.
2) Tighten the bolt (20) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-017-N00

(3) Do the steps that follow to install the EGT probe at the 7 o'clock position:
(a) Install the EGT probe (1) into the exhaust case and align the holes for the bolts.
(b) Align the bracket (14) and install the two bolts (6).
1) Lubricate the threads of the bolts (6) with the Silver Goop.
2) Tighten the bolts (6) to 54-60 pound-inches (6.1-6.8 newton-meters).
3) Install lockwire or the optional safety cable and ferrule to the bolts (6).
(c) Attach the clamp (13) for the pressure manifold to the bracket (14) with the bolt (11) and the nut (12).
1) Lubricate the threads of the bolt (11) with the Silver Goop.
2) Tighten the bolt (11) to 36-40 pound-inches (4.1-4.5 newton-meters).
(d) Install the clamp (24) for the EGT probe cable with the bolt (16) and the nut (17) to the bracket (14).
1) Lubricate the threads of the bolt (16) with the Silver Goop.
2) Tighten the bolt (16) to 36-40 pound-inches (4.1-4.5 newton-meters).

(e) Install the probe wires to the bracket (14) with the clamp (29), spacer (28), bolt (26) and the nut (27).
1) Install the spacer (28) between the clamp (29) for the probe wires (which is installed adjacent to the bracket (14)) and the cable clamp (24).
2) Lubricate the threads of the bolt (26) with the Silver Goop.
3) Tighten the bolt (26) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-020-N00

(4) Do the steps that follow to install the EGT probe at the 4 o'clock position:
(a) Install the EGT probe (1) into the exhaust case and align the holes for the bolts.
(b) Align the bracket (15) and install the bolts (6).
1) Lubricate the threads of the bolts (6) with the Silver Goop.
2) Tighten the bolts (6) to 54-60 pound-inches (6.1-6.8 newton-meters).
(c) Install the clamps (22) for the EGT probe cable on the bracket (15) with bolts (16) and nuts (17).
1) Tighten the bolts (16) to 36-40 pound-inches (4.1-4.5 newton-meters).

CAUTION: DO NOT USE LUBRICANTS ON THE EEC SENSE TUBES, ADAPTERS, OR PACKINGS. IF YOU USE LUBRICANTS ON THESE PARTS, CONTAMINATION OF THE EEC CAN OCCUR.

(d) Connect the pressure manifold to the pressure probe.
1) Tighten the manifold nut (7) to 135-150 pound-inches (15.3-17.0 newton-meters).
(e) Install lockwire or the optional safety cable and ferrule to the manifold nut (7) and to the bolts (6).
(f) Install the probe wires to the clamp on the pressure manifold, with the clamp (19), bolt (20), and the nut (21).
1) Lubricate the threads of the bolt (20) with the Silver Goop.
2) Tighten the bolt (20) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-021-N00

(5) Do the steps that follow to install the EGT probe at the 1 o'clock position:
(a) Install the EGT probe (1) into the exhaust case and align the holes for the bolts.
(b) Align the bracket (15) and install bolts (6).
1) Lubricate the threads of the bolts (6) with the Silver Goop.
2) Tighten the bolts (6) to 54-60 pound-inches (6.1-6.8 newton-meters).

3) Install lockwire or the optional safety cable and ferrule to the bolts (6).

(c) Install the clamps (18) for the EGT probe cable with bolts (16) and nuts (17) to the bracket (15).
1) Lubricate the threads of the bolts (16) with the Silver Goop.
2) Tighten the bolts (16) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-019-N00

CAUTION: DO NOT TIGHTEN THE NUTS THAT ATTACH THE PROBE WIRES TO MORE THAN THE SPECIFIED TORQUE. TOO MUCH TORQUE ON THE EGT PROBE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE EGT PROBE STUDS.

(6) Connect the probe wires to the EGT probe.

NOTE: The EGT probe has two types of studs. One stud has a larger diameter and is made of alumel. The other stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the probe wires to the studs have different dimensions, thus they are not interchangeable.

(a) Install the lockwashers (4, 5) and nuts (2, 3).
1) Tighten the nuts (2) on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
2) Tighten the nuts (3) on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7- 2.0 newton-meters).
3) After the nuts (2, 3) are tightened, make sure the adjacent ends of the cable do not touch.
a) Make sure the ends of the cable do not touch the lockwire or the bolt heads in the area.

S 414-006-N00

(7) Close the core cowl panels (AMM 71-11-06/201).

S 444-007-N00

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

S 714-003-N00

(9) Do this procedure: Do A Check Of The Exhaust Gas Temperature (EGT) Indicating System (AMM 77-21-00/501).

EXHAUST GAS TEMPERATURE (TT4.95) THERMOCOUPLE PROBE - ADJUSTMENT/TEST

1. General
   A. This procedure does a test of the exhaust gas temperature (TT4.95) thermocouple probe.
   B. You must remove and clean the exhaust gas temperature (TT4.95) thermocouple probe before you do this test.
   C. The exhaust gas temperature (TT4.95) thermocouple probe is referred to as the thermocouple probe in this procedure.

TASK 77-21-01-705-001-N00

2. Do a Test of the Exhaust Gas Temperature (TT4.95) Thermocouple Probe
   A. Equipment
      (1) Electronic Multimeter - Simpson 2795
      (2) Heat Gun - Commercially available (minimum heat rate of 700°F [371°C])
   B. References
      (1) AMM 71-00-00/501, Power Plant
      (2) AMM 77-21-00/501, EGT Indicating System
      (3) AMM 77-21-01/401, EGT Thermocouple Probe
      (4) AMM 77-21-01/701, EGT Thermocouple Probe
   C. Access
      (1) Location Zones
          410 Power Plant (Left)
          420 Power Plant (Right)

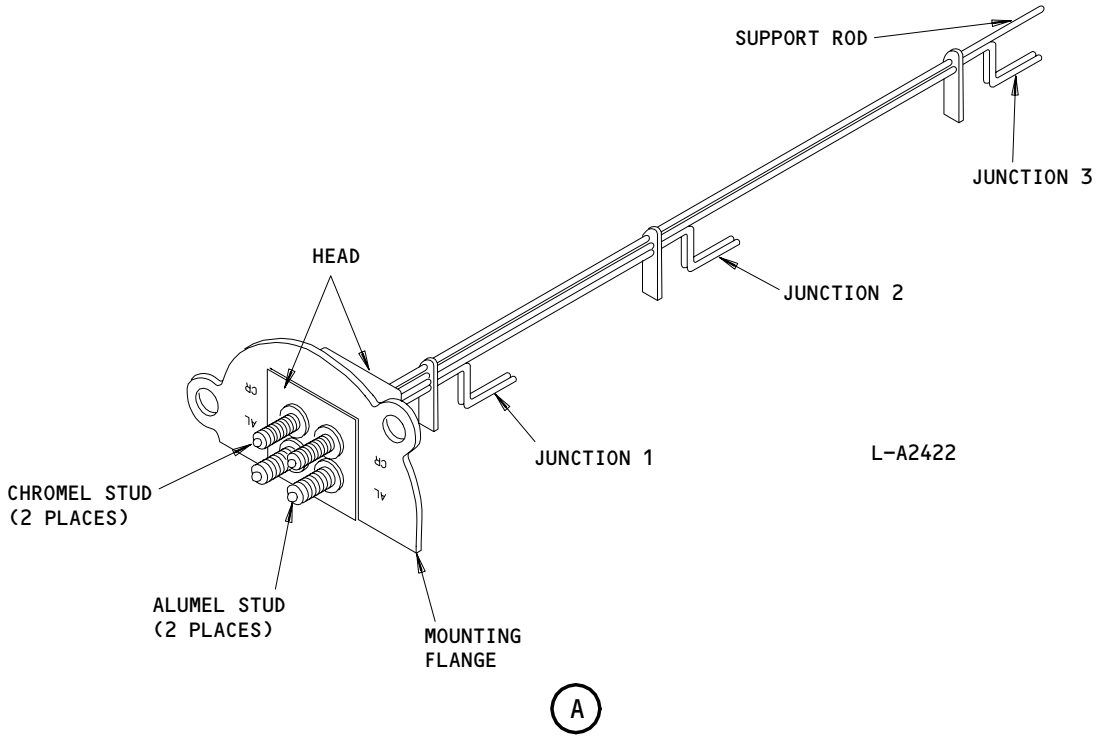
      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   D. Prepare to do the Test for the Exhaust Gas Temperature (TT4.95) Thermocouple Probe.

      S 025-002-N00
      (1) Remove the thermocouple probe (AMM 77-21-01/401).

      S 115-010-N00
      (2) Clean the thermocouple probe (AMM 77-21-01/701).
   E. Do the Test for the Exhaust Gas Temperature (TT4.95) Thermocouple Probe (Fig. 501).

      S 765-004-N00
      (1) Do a test of the thermocouple probe for continuity.
          (a) Apply the heat from the heat gun to the junctions of the thermocouple probe.
          (b) Connect the leads from the meter to circuit A of the thermocouple probe.
              1) Connect one lead to the alumel stud of circuit A.



EGT Thermocouple Probe Testing
Figure 501

2) Connect the other lead to the chromel stud of circuit A.

(c) Examine the meter to make sure that there is continuity.

NOTE: The needle on the meter will move if there is continuity.

(d) Connect the leads from the meter to circuit B of the thermocouple probe.
1) Connect one lead to the alumel stud of circuit B.
2) Connect the other lead to the chromel stud of circuit B.

(e) Examine the meter to make sure that there is continuity.

NOTE: The needle on the meter will move if there is continuity.

S 765-005-N00

(2) Do a test of the thermocouple probe for insulation resistance.
(a) Connect one lead of the meter to the alumel stud of circuit A and the other lead to the thermocouple probe flange.
(b) Examine the meter to make sure it does not show less than 50,000 ohms of resistance for 25 seconds.
(c) Connect one lead of the meter to the chromel stud of circuit A and the other lead to the thermocouple probe flange.
(d) Examine the meter to make sure it does not show less than 50,000 ohms of resistance for 25 seconds.
(e) Connect one lead of the meter to the alumel stud of circuit B and the other lead to the thermocouple probe flange.
(f) Examine the meter to make sure it does not show less than 50,000 ohms of resistance for 25 seconds.
(g) Connect one lead of the meter to the chromel stud of circuit B and the other lead to the thermocouple probe flange.
(h) Examine the meter to make sure it does not show less than 50,000 ohms of resistance for 25 seconds.

S 765-006-N00

(3) Do a test of the thermocouple probe for secondary junctions (short circuits in the thermocouple probe).
(a) Connect the leads of the meter to the alumel and chromel studs of circuit A on the thermocouple probe.
(b) Apply the heat from the heat gun to the head (stud end) of the thermocouple probe until it is 600°-700°F (316°-371°C).
(c) Examine the meter to make sure the needle does not move.

(d) Connect the leads of the meter to the alumel and chromel studs of circuit B on the thermocouple probe.
(e) Apply the heat from the heat gun to the head (stud end) of the thermocouple probe until it is 600°-700°F (316°-371°C).
(f) Examine the meter to make sure the needle does not move.

S 965-007-N00

(4) Replace the thermocouple probes that have one or more of these conditions:
(a) There is no continuity in the circuit.
(b) The insulation has low resistance.
(c) The circuit has a secondary junction (short circuit).

S 425-008-N00

(5) Install the thermocouple probe (AMM 77-21-01/401).

S 715-012-N00

(6) Do the test of the EGT probe that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EXHAUST GAS TEMPERATURE (TT4.95) THERMOCOUPLE PROBE - INSPECTION/CHECK

1. General
   A. This procedure has an inspection of the exhaust gas temperature (TT4.95) thermocouple probe.
   B. You must remove and clean the exhaust gas temperature (TT4.95) thermocouple probe before you do this inspection.
   C. The exhaust gas temperature (TT4.95) thermocouple probe is referred to as the thermocouple probe in this procedure.

TASK 77-21-01-206-003-N00

2. Inspection of the Exhaust Gas Temperature (TT4.95) Thermocouple Probe
   A. References
      (1) AMM 71-00-00/501, Power Plant
      (2) AMM 77-21-00/501, EGT Indicating System
      (3) AMM 77-21-01/401, EGT Thermocouple Probe
      (4) AMM 77-21-01/501, EGT Thermocouple Probe
      (5) AMM 77-21-01/701, EGT Thermocouple Probe
   B. Access
      (1) Location Zones
          410 Power Plant (Left)
          420 Power Plant (Right)

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Prepare to Make an Inspection of the Exhaust Gas Temperature (TT4.95) Thermocouple Probe.

      S 026-001-N00
      (1) Remove the thermocouple probe (AMM 77-21-01/401).

      S 116-002-N00
      (2) Clean the thermocouple probe (AMM 77-21-01/701).

D. Make an Inspection of the Exhaust Gas Temperature (TT4.95) Thermocouple Probe.

S 216-010-N00
(1) Examine all surfaces of the thermocouple probe for cracks.
(a) If you find cracks, replace the thermocouple probe.

NOTE: Do not replace the thermocouple probe if it only has small nicks.

S 216-005-N00
(2) Examine the terminal studs on the end of the thermocouple probe for tightness and damage to the threads.

S 766-006-N00
(3) Do a test of the thermocouple probe for continuity (AMM 77-21-01/501).

S 766-007-N00
(4) Do a test of the thermocouple probe for insulation resistance (AMM 77-21-01/501).

S 426-009-N00
(5) Install the thermocouple probe (AMM 77-21-01/401).

S 716-012-N00
(6) Do the test of the EGT probe that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EXHAUST GAS TEMPERATURE (TT4.95) THERMOCOUPLE PROBE - CLEANING/PAINTING

1. General
   A. The exhaust gas temperature (TT4.95) thermocouple probe is referred to as the EGT probe in this procedure.
   B. This procedure gives instructions to clean the EGT probe.
   C. There are four EGT probes on the turbine exhaust case of each engine. The EGT probes are installed at the 1, 4, 7 and 10 o'clock positions on the turbine exhaust case.
   D. You must open the applicable core cowl panel to get access to the EGT probes.

TASK 77-21-01-107-001-N00

2. Clean the Exhaust Gas Temperature (TT4.95) Thermocouple Probe
   A. Equipment
      (1) Brush - Rigid Bristle that is not metal (Tampico), Stanley Home Products, 116 Pleasant St., Easthampton, Massachusetts 01027.
      (2) Compressed Air, 30 psig (206.8 kPa) and 100 psig (689.5 kPa).
      (3) Cleaner - Thermocouple Sheath, make locally (Ref Fig. 701)
   B. Consumable Materials
      (1) E00015 Cloth - Lint-free, Commercially available
      (2) B00737 Solvent - Trichloroethane, PMC-9056 (AMM 70-30-00)
   C. References
      (1) AMM 77-21-01/401, EGT Thermocouple Probe
   D. Clean the EGT Probe (Fig. 701).

      S 027-002-N00

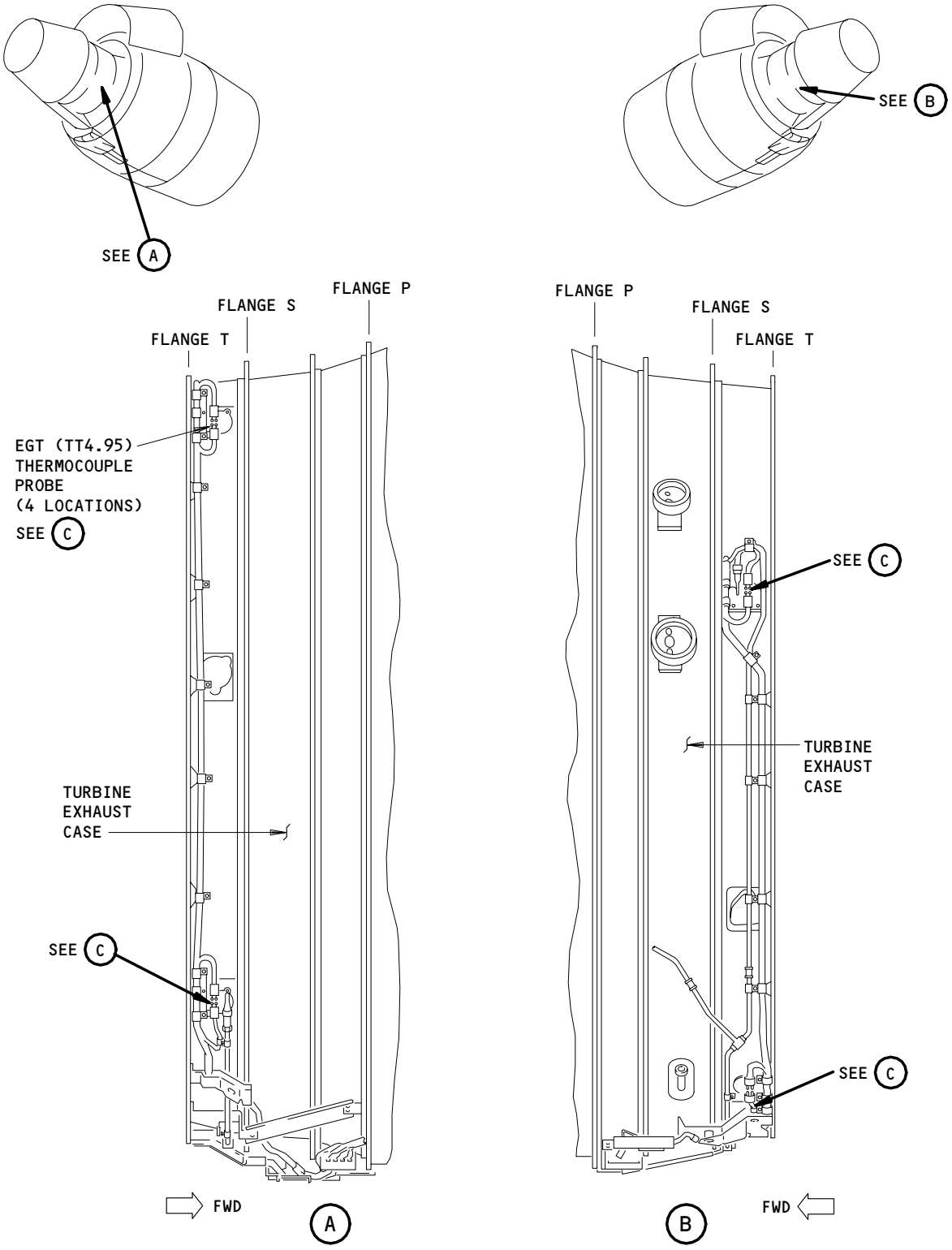
      (1) Remove the EGT Probe (AMM 77-21-01/401).

      S 117-006-N00

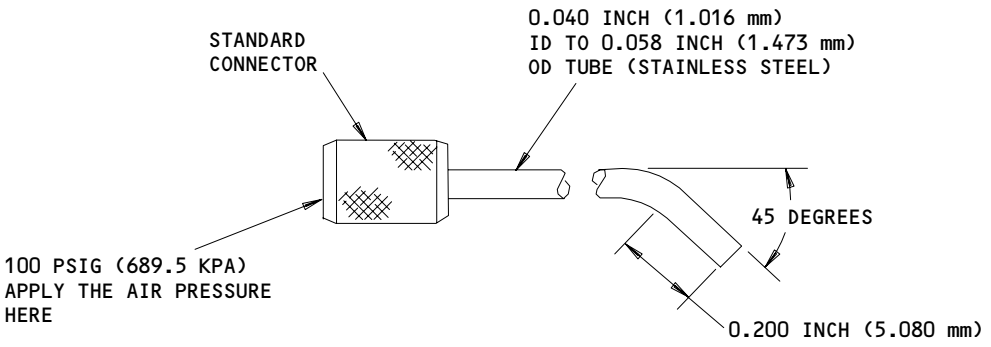
      WARNING: MAKE SURE YOU USE THE SOLVENT IN AN AREA THAT HAS A GOOD FLOW OF AIR. DO NOT PERMIT THE SOLVENT TO TOUCH YOUR SKIN. THE SOLVENT IS VERY FLAMMABLE.

      CAUTION: DO NOT USE TOO MUCH SOLVENT ON THE EGT PROBE. TOO MUCH SOLVENT ON THE EGT PROBE WILL PERMIT THE SOLVENT TO BE ABSORBED BY THE INSULATION IN THE EGT PROBE. SOLVENT IN THE EGT PROBE INSULATION CAN CAUSE THE EGT PROBE TO OPERATE INCORRECTLY.

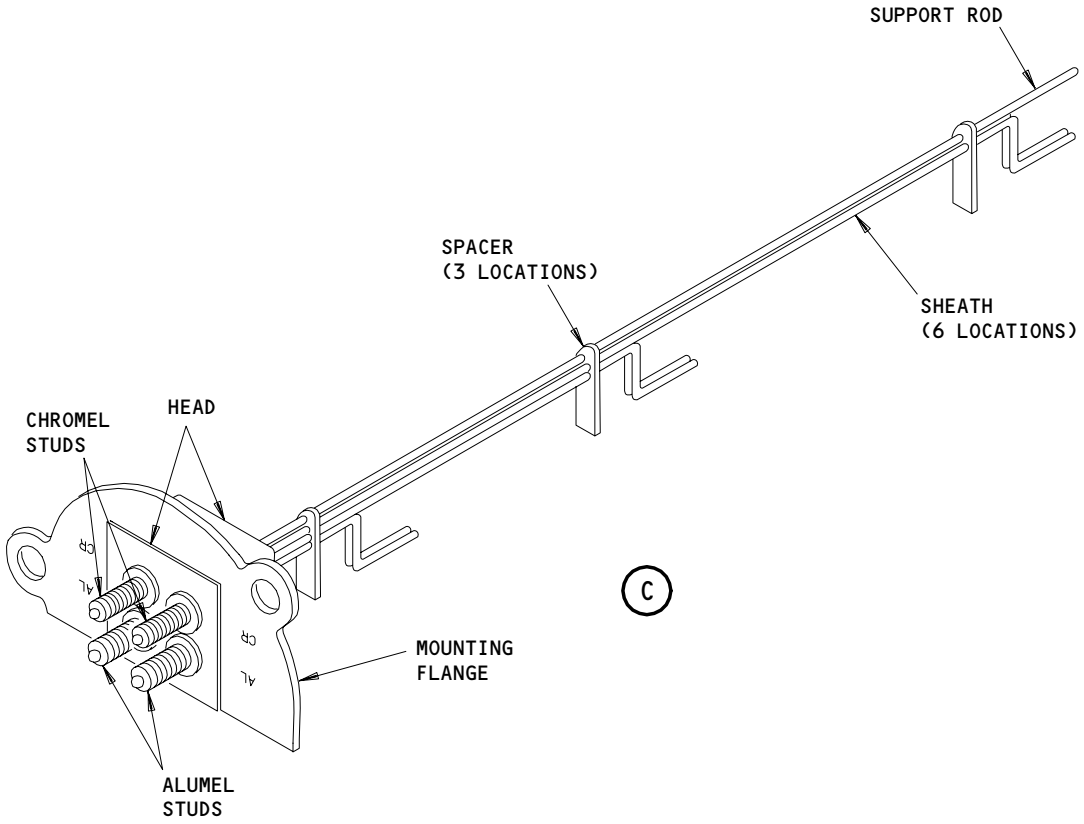
      (2) To remove the unwanted material from the head of the EGT probe, do these steps:
         (a) Clean the head of the EGT probe with the brush and the solvent.



Exhaust Gas Temperature (TT4.95) Thermocouple Probe Cleaning
Figure 701 (Sheet 1)



CLEANING NOZZLE



Exhaust Gas Temperature (TT4.95) Thermocouple Probe Cleaning
Figure 701 (Sheet 2)

(b) Put the solvent on the clean, lint-free cloth.
(c) Rub the head of the EGT probe with the cloth.
(d) Dry the EGT probe with compressed air at a maximum of 30 psi (200 kPa).

S 167-004-N00
(3) Remove the loose carbon material from the EGT probe sheath with compressed air at a maximum of 100 psi (700 kPa).

S 117-005-N00
(4) To remove the hard carbon material from the EGT probe sheath, do these steps:
(a) Clean the EGT probe sheath with the brush and the solvent.
(b) Put the solvent on the clean, lint-free cloth.
(c) Rub the EGT probe sheath with the cloth.
(d) Dry the EGT probe with compressed air at a maximum of 30 psi (200 kPa).

S 427-007-N00
(5) Install the EGT probe (AMM 77-21-01/401).

EGT (TT4.95) THEROMOCOUPLE CABLE - REMOVAL/INSTALLATION

1. General
   A. In this procedure, the EGT (TT4.95) thermocouple cable is referred to as the EGT probe cable.
   B. There are two EGT cable assemblies. One assembly for the EGT probes is on the left side of the engine. The other assembly for the EGT probes is on the right side of the engine. The cables are connected to a junction box which is found at the 6 o'clock position.
      (1) The left and the right EGT probe cables can be removed and installed independently.
   C. If you want to remove the left and right cable assemblies together with the terminal box, refer to AMM 77-21-03/401.

TASK 77-21-02-004-001-N00

2. Remove the EGT Probe Cables (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser
   B. Access
      (1) Location Zones
          410 Power Plant (Left)
          420 Power Plant (Right)

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Prepare to Remove the EGT Probe Cables

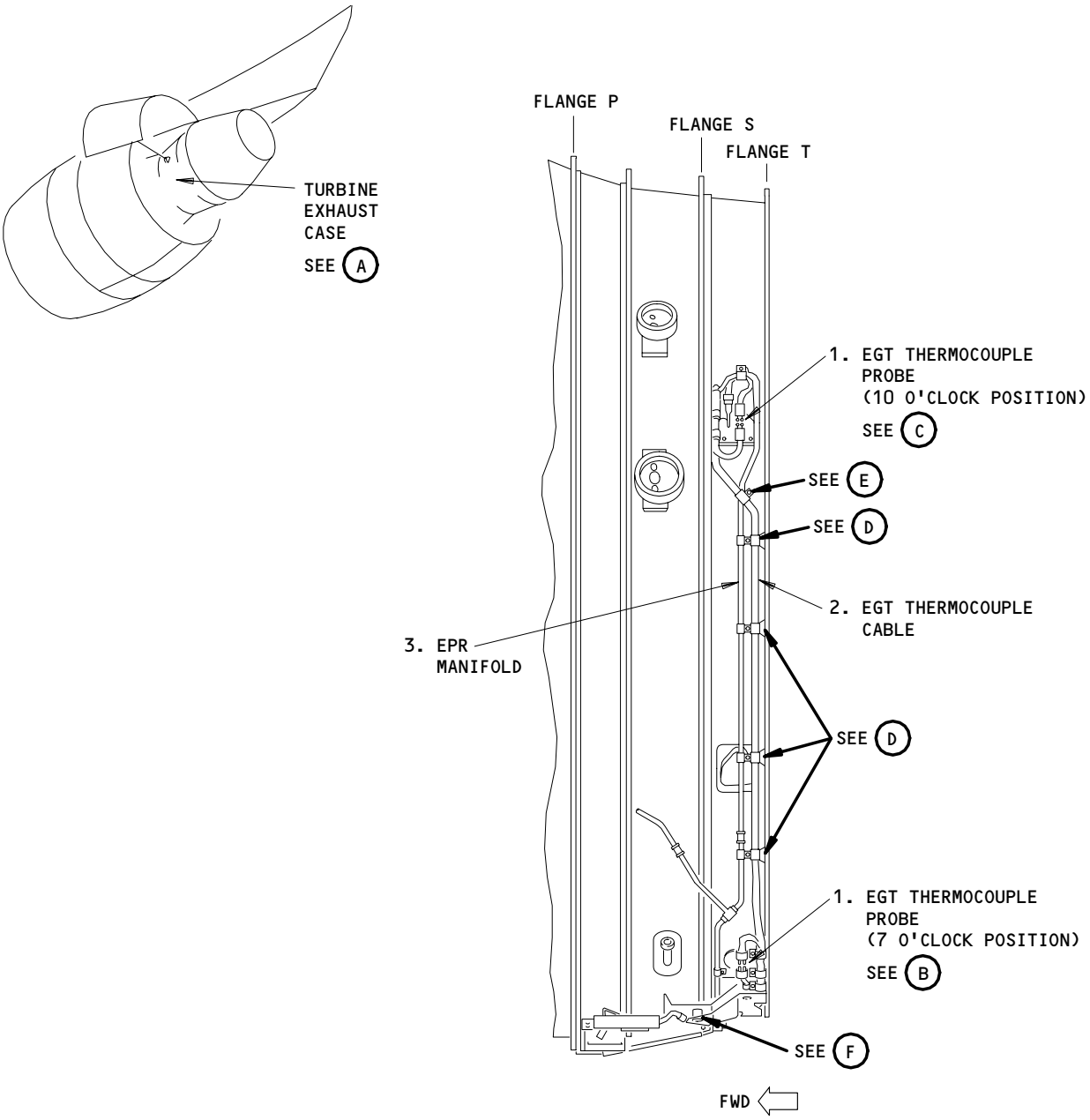
      S 044-002-N00

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

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

          S 014-003-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).

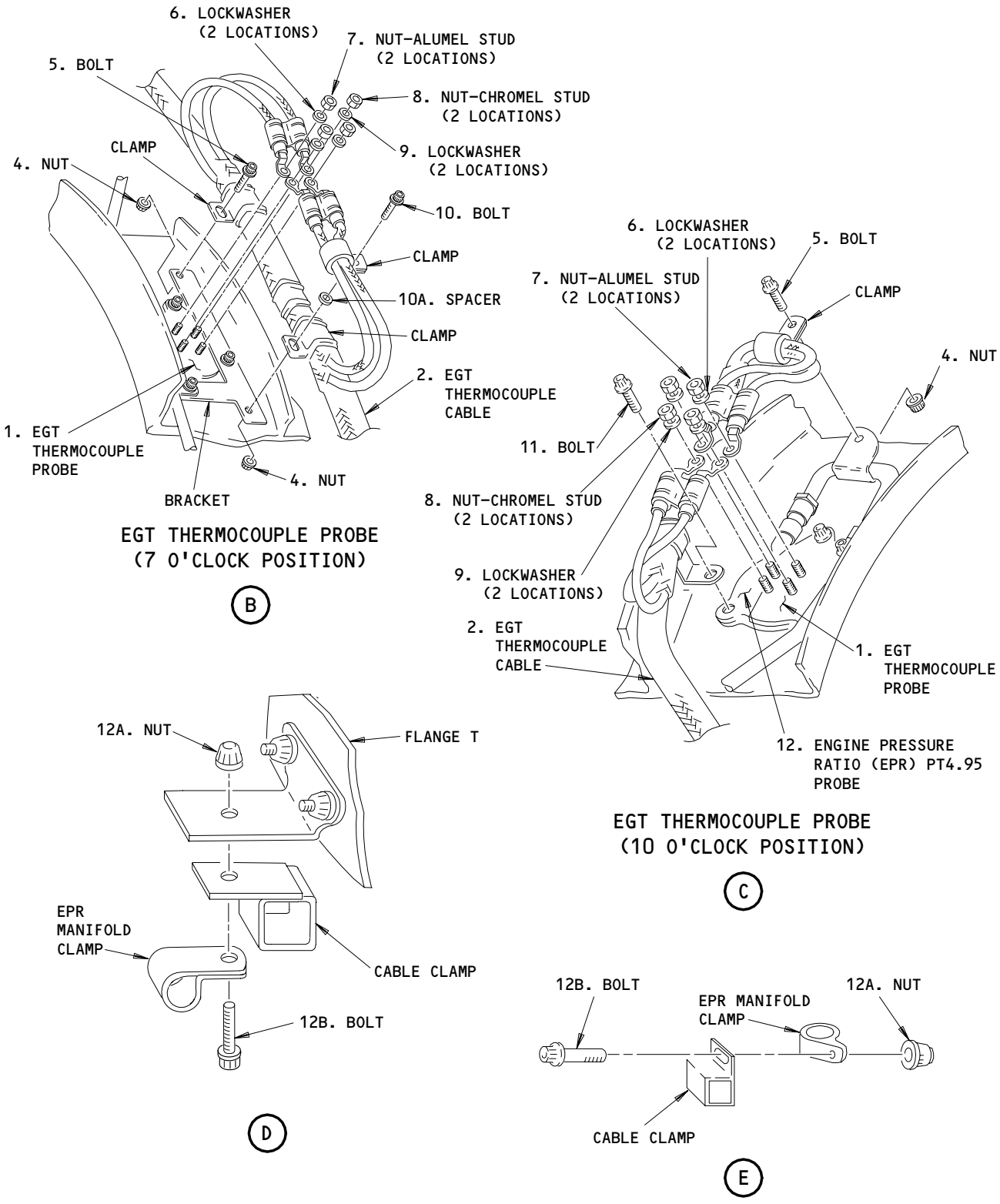
          S 864-004-N00
      (3) Remove electrical power (AMM 24-22-00/201).



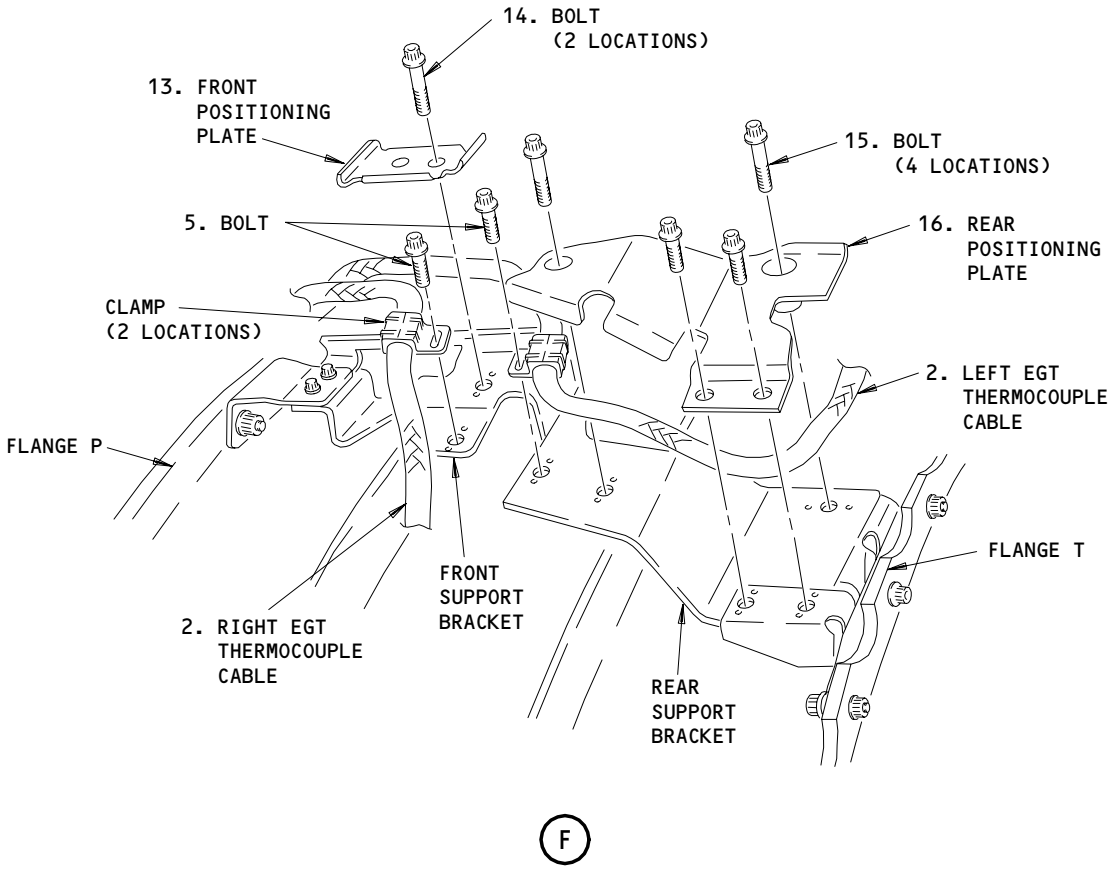
TURBINE EXHAUST CASE
(LEFT SIDE)

A

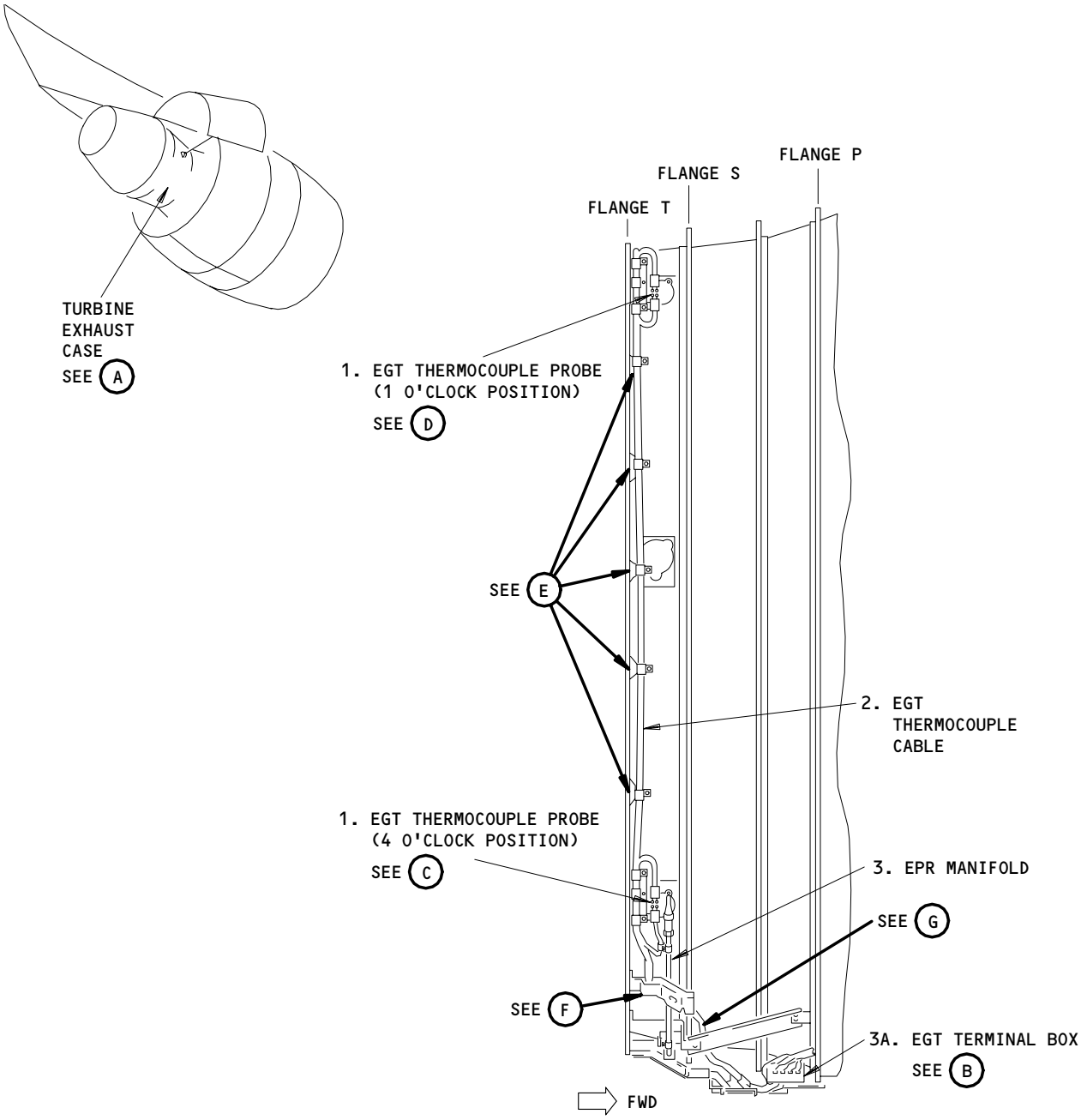
EGT (TT4.95) Thermocouple Cable (Left Side) Installation
Figure 401 (Sheet 1)



EGT (TT4.95) Thermocouple Cable (Left Side) Installation
Figure 401 (Sheet 2)



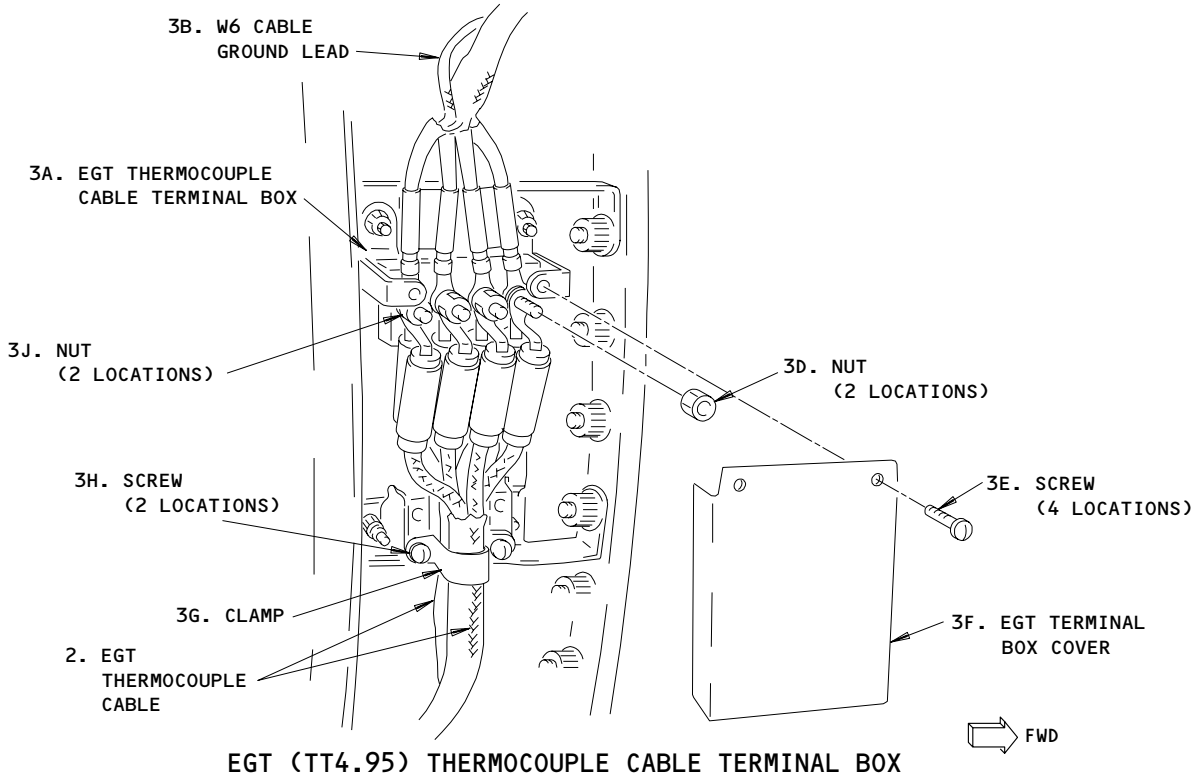
EGT (TT4.95) Thermocouple Cable (Left Side) Installation
Figure 401 (Sheet 3)



TURBINE EXHAUST CASE
(RIGHT SIDE)

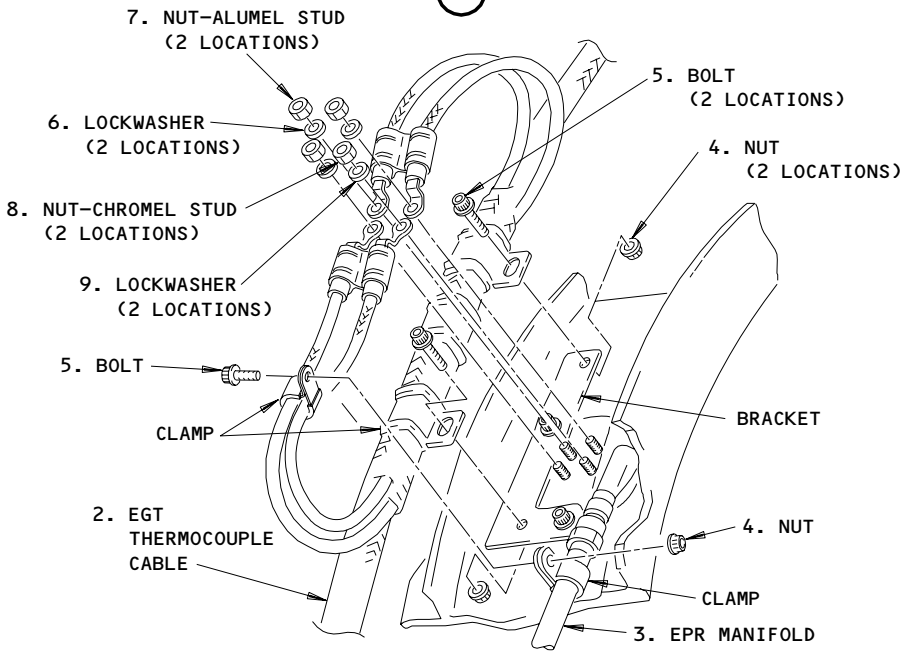
A

EGT (TT4.95) Thermocouple Cable (Right Side) - Installation
Figure 402 (Sheet 1)



EGT (TT4.95) THERMOCOUPLE CABLE TERMINAL BOX

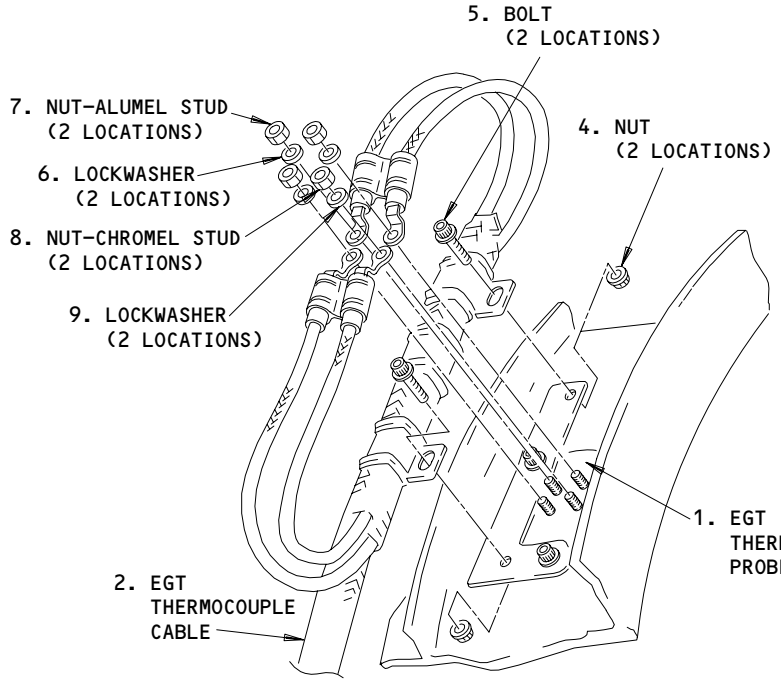
(B)



EGT THERMOCOUPLE PROBE
(4 O'CLOCK POSITION)

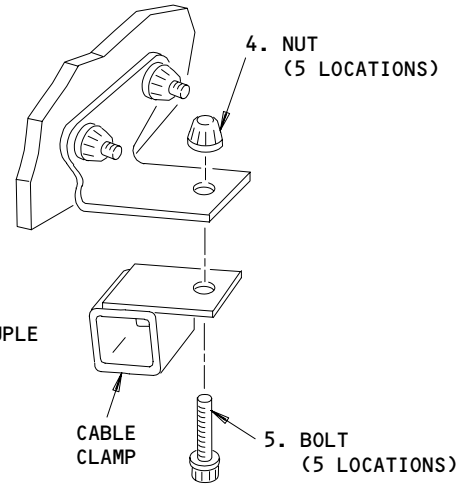
(C)

EGT (TT4.95) Thermocouple Cable (Right Side) - Installation
Figure 402 (Sheet 2)



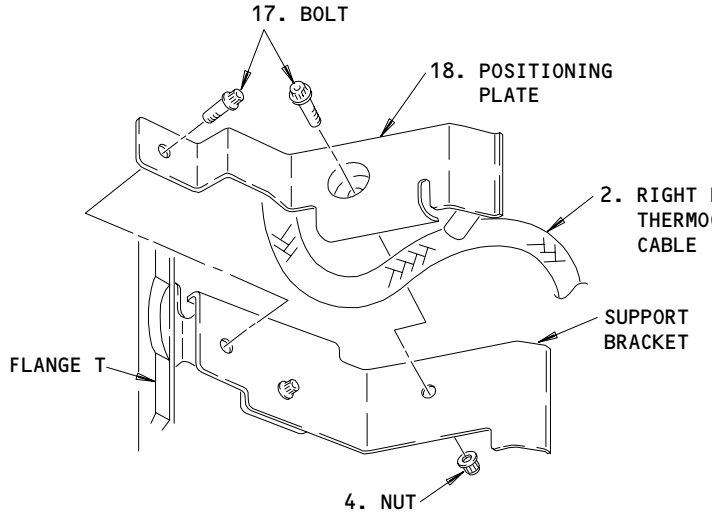
EGT THERMOCOUPLE PROBE
(1 O'CLOCK POSITION)

D

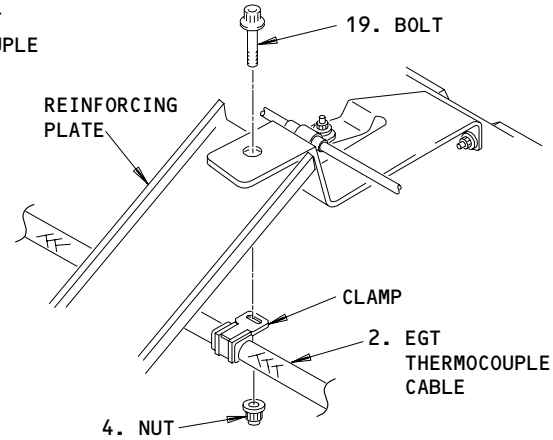


5 LOCATIONS

E



F



G

EGT (TT4.95) Thermocouple Cable (Right Side) - Installation
Figure 402 (Sheet 3)

S 034-005-N00

(4) Do the steps that follow to disconnect the EGT probe cable from the terminal box (Fig. 402):

(a) Remove the lockwire and the screws (3E) that attach the terminal box cover (3F) and the ground wire (for the W6 cable (3B)) to the terminal box (3A).

1) Remove the cover (3F).

(b) Put tags on the W6 cable ends to identify where they are installed.

NOTE: This will help you make sure that the cables get installed in the correct location.

(c) Remove the nuts (3D, 3J) that attach the W6 cable ends to the terminal box (3A) studs.

1) Remove the W6 cable ends from the studs.

2) Remove the applicable, left or right side, cable ends from the studs.

3) Install the nuts (3D, 3J) for the studs on the box.

a) Tighten the nuts (3D, 3J) hand tight.

D. Remove the EGT Probe Cable on the Left Side of the Engine

S 034-006-N00

(1) Do the steps that follow to remove the positioning plates (13, 16) (Fig. 401):

NOTE: The positioning plates (13, 16) are found forward of the EGT probe at the 7 o'clock position.

(a) Remove the bolts (14) that attach the front positioning plate (13) to the front support bracket on the exhaust case.

1) Remove the front positioning plate (13).

(b) Remove the bolts (15) that attach the rear positioning plate (16) to the rear support bracket on the exhaust case.

1) Remove the rear positioning plate (16).

(c) Remove the bolts (5) that attach the cable clamps to the front and the rear support brackets.

S 034-007-N00

(2) Do the steps that follow to disconnect the wires that are attached to the EGT probes (Fig. 401):

NOTE: The steps for each of the EGT probes is the same.

(a) Remove the four nuts (7, 8) and lockwashers (6, 9) which attach the probe wires to the EGT probe (1).

1) Remove the ends of the probe wires from the EGT probe.

(b) Do the steps to disconnect the probe wires for the other EGT probe.

S 034-008-N00

(3) Do the step that follows to remove the clamps for the EGT probe cable at the 7 o'clock position (Fig. 401):
   (a) Remove the bolts (5, 10), spacer (10A), and the nuts (4) that attach the cable clamps to the bracket on the turbine exhaust case.

S 034-009-N00

(4) Do the steps that follow to remove the clamps for the EGT probe cable at the 10 o'clock position (Fig. 401):
   (a) Remove the bolt (5) and the nut (4) that attaches the clamp for the probe wires to the bracket on the EPR manifold.
   (b) Remove the bolt (11) that attaches the clamp for the probe cable and the EPR probe (12) to the exhaust case.

S 034-010-N00

(5) Remove the bolt (12B) and the nut (12A) that attaches the cable clamp to the clamp on the EPR manifold.

S 034-011-N00

(6) Remove the bolts (12B) and the nuts (12A) that attach the clamps to the brackets on the left side of the exhaust case.

NOTE: Two clamps are installed at each location. One clamp is for the cable and the other clamp is for the EPR manifold.

S 024-012-N00

(7) Remove the EGT probe cable (2).

E. Remove the EGT Probe Cable on the Right Side of the Engine

S 034-013-N00

(1) Do the steps that follow to remove the positioning plate (18) below the EGT probe at the 4 o'clock position (Fig. 402):
   (a) Remove the bolts (17) and the nut (4) that attach the positioning plate (18) to the support bracket.

(b) Remove the positioning plate (18).

S 034-014-N00

(2) Remove the bolt (19) and the nut (4) that attaches the clamp for the cable to the reinforcing plate (Fig. 402).

NOTE: The reinforcing plate is found below the positioning plate (18).

S 034-015-N00

(3) Do the steps that follow to disconnect the wires that are attached to the EGT probes (Fig. 402):

NOTE: The steps for each of the EGT probes is the same.

(a) Remove the four nuts (7, 8) and lockwashers (6, 9) which attach the probe wires to the EGT probe (1).
1) Remove the ends of the probe wires from the EGT probe.
(b) Do the steps to disconnect the probe wires for the other EGT probe.

S 034-016-N00

(4) Do the steps that follow to remove the clamps for the EGT probe cable at the 4 o'clock position (Fig. 402):
(a) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the bracket on the exhaust case.
(b) Remove the bolt (5) and the nut (4) that attaches the clamp for the probe wires to the clamp on the EPR manifold (3).

S 034-017-N00

(5) Do the step that follows to remove the clamps for the EGT probe cable at the 1 o'clock position (Fig. 402):
(a) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the bracket on the turbine exhaust case.

S 034-018-N00

(6) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the brackets on the right side of the exhaust case.

S 024-019-N00

(7) Remove the EGT probe cable (2).

TASK 77-21-02-404-020-N00

3. Install the EGT Probe Cables (Fig. 401)

A. Consumable Materials

(1) D00137 Engine Oil - PWA 521

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Cable, EGT	77-21-03	05	140 145

C. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 77-21-00/501, EGT Indicating System
(5) AMM 78-31-00/201, Thrust Reverser

D. Access

(1) Location Zones

410 Power Plant (Left)
420 Power Plant (Right)

(2) Access Panels

417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

E. Connect the EGT Probe Cable to the EGT Probes and to the Terminal Box

NOTE: The steps for the cable on the left and right sides of the engine are equivalent.

S 434-021-N00

(1) Do the steps that follow to connect the probe wires to the EGT probes (Fig. 401, 402):
   (a) Remove the nuts (7, 8) and the lockwashers (6, 9) from the EGT the probe (1).
   (b) Install the cable ends to the studs on the EGT probes.
   (c) Install the lockwashers (6, 9) and the nuts (7, 8).

      NOTE: The EGT probe has two types of studs. One stud has a larger diameter and is made of alumel. The other stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the probe wires to the studs have different dimensions, thus they are not interchangeable.

      1) Tighten the nuts (7, 8) only hand tight at this time.
   (d) Do the steps to connect the probe wires for the other EGT probe.

S 434-022-N00

(2) Do the steps that follow to connect the EGT probe cable to the terminal box (Fig. 402):
   (a) Remove the nuts (3D, 3J) from the terminal box studs.
   (b) Attach the applicable, left or right side, cable ends to the studs on the terminal box.
   (c) Attach the W6 cable ends to the terminal box studs with the nuts (3D, 3J).

      NOTE: The terminal box has two types of studs. One type of stud has a larger diameter and is made of alumel. The other type of stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the wires to the studs have different dimensions, thus they are not interchangeable.

      1) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
      2) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).

(d) Install the cover (3F) on the terminal box (3A).
1) Put the ground wire for the W6 cable (3B) below the rear corner of the cover (3F).

NOTE: If the ground wire on the W6 cable at the EGT Thermocouple Terminal Box is damaged or missing, you must repair the cable per Unison SB 420081-73-46 or replace it.

2) Attach the cover (3F) and the ground wire for the W6 cable (3B) with the screws (3E).
a) Lubricate the threads of the screws (3E) with engine oil.
b) Tighten the screws (3E) to 16-22 pound-inches (1.8-2.5 newton-meters).

F. Install the EGT Probe Cable on the Left Side of the Engine

S 424-028-N00
(1) Do the steps that follow to attach the cable for the EGT probe at the 10 o'clock position (Fig. 401):
(a) Attach the cable clamp and the EGT probe (1) to the exhaust case with the bolt (11).
1) Lubricate the threads of the bolt (11) with oil.
2) Tighten the bolt (11) to 75-85 pound-inches (8.47-9.60 newton meters).
(b) Attach the probe wires to the bracket on the EPR manifold (3) with the clamp, bolt (5), and the nut (4).
1) Lubricate the threads of the bolt (5) with oil.
2) Tighten the bolt (5) to 36-40 pound-inches (4.1- 4.5 newton-meters).

S 434-024-N00
(2) Do the steps that follow to install the cable clamps that are between the EGT probes on the left side of the engine (Fig. 401):

NOTE: These probes are at the 7 and the 10 o'clock positions.

(a) Lubricate the threads of the bolt (12B) with oil.
(b) Install the bolt (12B) and the nut (12A) that attaches the cable clamp to the clamp on the EPR manifold (3).

NOTE: These clamps are found where the cable goes across the EPR manifold.

(c) Attach the cable clamps and the EPR manifold clamps to the brackets on flange T, with bolts (12B) and nuts (12A).
(d) Tighten the bolts (12B) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-025-N00

(3) Do the steps that follow to attach the cable for the EGT probe at the 7 o'clock position (Fig. 401):
   (a) Lubricate the threads of the bolts (5, 10) with oil.
   (b) Attach the higher cable clamp to the bracket adjacent to the EGT probe (1) with the bolt (5) and the nut (4).
   (c) Attach the lower cable clamp and the clamp for the probe wires as follows:
      1) Install the spacer (10A) between the clamp for the probe wires (which is installed adjacent to the bracket) and the cable clamp.
      2) Install the clamps and the spacer (10A) with the bolt (10) and the nut (4).
   (d) Tighten the bolts (5, 10) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-026-N00

(4) Do the steps that follow to install the positioning plates that are forward of the EGT probe at the 7 o'clock position (Fig. 401):
   (a) Attach the cable clamp for the left probe cable to the rear support bracket with the bolt (5).
   (b) Attach the cable clamp for the right probe cable to the front support bracket with the bolt (5).
   (c) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).
   (d) Do the steps that follow to install the rear positioning plate (16):

      NOTE: The cables that are installed below the positioning plate are compressed by the plate when you tighten the bolts.

      1) Install the plate (16) as follows:
         a) Make sure the rear spacer is on the inner side of the cable loop.
         b) Make sure the front spacer is on the inner side of the cable that is adjacent to the cable clamp.
      2) Attach the plate (16) to the rear support bracket with bolts (15).
         a) Lubricate the bolts (15) with oil.
         b) Tighten the bolts (15) to 36-40 pound-inches (4.1-4.5 newton-meters).

(e) Do the steps that follow to install the front positioning plate (13):

NOTE: The cables that are installed below the positioning plate are compressed by the plate when you tighten the bolts.

1) Install the plate (13) on the support bracket with its spacers between the cable.
2) Attach the front positioning plate (13) to the front support bracket with the bolts (14).
   a) Lubricate the bolts (14) with oil.
   b) Tighten the bolts (14) to 36-40 pound-inches (4.1-4.5 newton-meters).

G. Install the EGT Probe Cable on the Right Side of the Engine

S 424-027-N00

(1) Do the steps that follow to attach the cable for the EGT probe at the 1 o'clock position (Fig. 402):
   (a) Attach the cable clamps to the bracket adjacent to the EGT probe with the bolts (5) and the nuts (4).
      1) Lubricate the threads of the bolts (5) with oil.
      2) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-029-N00

(2) Do the steps that follow to install the cable clamps (that are between the EGT probes) on the right side of the engine (Fig. 402):

NOTE: These probes are found at the 1 and the 4 o'clock positions.

   (a) Lubricate the threads of the bolts (5) with oil.
   (b) Install the bolts (5) and the nuts (4) that attach the cable clamps to the brackets on flange T.
   (c) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-030-N00

(3) Do the steps that follow to attach the cable for the EGT probe at the 4 o'clock position (Fig. 402):
   (a) Lubricate the threads of the bolts (5) with oil.
   (b) Install the bolts (5) and the nuts (4) that attach the cable clamps to the bracket that is adjacent to the EGT probe (1).
   (c) Install the clamp that attaches the probe wires to the EPR manifold (3) as follows:
      1) Make sure the clamp on the EPR manifold is approximately 0.5 inch (12.7 mm) from the manifold nut.
      2) Attach the clamps with the bolt (5) and the nut (4).
   (d) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-031-N00

(4) Do the steps that follow to install the positioning plate that is 5 o'clock position (Fig. 402):

(a) Install the plate (18) on the support bracket as follows:

1) Make sure the cable is to the left of the inner spacer on the plate (18).

2) Make sure the cable is to the right of the outer spacer on the plate (18).

(b) Attach the plate (18) and the clamp on the EPR manifold to the support bracket with the bolts (17) and the nut (4).

1) Lubricate the threads of the bolts (17) with oil.

2) Tighten the bolts (17) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-032-N00

(5) Attach the cable clamp to the inboard side of the reinforcing plate (at the 5:30 o'clock position) with the bolt (19) and the nut (4) (Fig. 402).

(a) Lubricate the threads of the bolt (17) with oil.

(b) Tighten the bolts (17) to 36-40 pound-inches (4.1-4.5 newton-meters).

H. Put the Airplane Back to Its Usual Condition

S 434-033-N00

(1) Do the steps that follow to tighten the nuts for the probe wires on the EGT probes (Fig. 401, 402):

(a) Align the probe wires that are attached to the EGT probe so the wires are parallel.

CAUTION: DO NOT TIGHTEN THE NUTS THAT ATTACH THE PROBE WIRES TO MORE THAN THE SPECIFIED TORQUE. TOO MUCH TORQUE ON THE EGT PROBE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE EGT PROBE STUDS.

(b) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).

(c) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
(d) After the nuts (7, 8) are tightened, make sure the adjacent ends of the cable do not touch.
(e) Make sure the ends of the cable do not touch the lockwire or the bolt heads in the area.

S 414-034-N00
(2) Close the core cowl panels (AMM 71-11-06/201).

S 444-035-N00
(3) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-036-N00
(4) Supply electrical power (AMM 24-22-00/201).

S 714-039-N00
(5) Do the test of the EGT box and cable that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EXHAUST GAS TEMPERATURE THERMOCOUPLE (TT4.95) BOX AND CABLE - REMOVAL/INSTALLATION

1. General
   A. In this procedure, the exhaust gas temperature thermocouple (TT4.95) box and cable is referred to as the EGT probe box and cable.
   B. There are four EGT probes installed on each engine. Two of the probes are on the left side of the turbine exhaust case. The other two probes are on the right side of the turbine exhaust case. The box is also on the turbine exhaust case at approximately the 6 o'clock position.
   C. This procedure supplies the steps to remove and install the cable and the box as a unit.
   D. If you want to remove only the left or only the right cable assembly, refer to AMM 77-21-02/401.

TASK 77-21-03-004-001-N00

2. Remove the EGT Probe Box and Cable
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser
   B. Access
      (1) Location Zones
          410 Power Plant (Left)
          420 Power Plant (Right)

      (2) Access Panels
          417AL/427AL Core Cowl (Left)
          418AR/428AR Core Cowl (Right)

   C. Procedure

      S 044-002-N00

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

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

S 014-003-N00
(2) Open the core cowl panels (AMM 71-11-06/201).

S 864-004-N00
(3) Remove electrical power (AMM 24-22-00/201).

S 034-005-N00
(4) Do the steps that follow to disconnect the wires that are attached to the EGT probes (Fig. 401, Fig. 402):

NOTE: The steps for each of the four EGT probes is the same.

(a) Remove the four nuts (7, 8) and lockwashers (6, 9) which attach the probe wires to the EGT probe (1).
1) Remove the ends of the probe wires from the EGT probe.
(b) Do the steps to disconnect the probe wires for each of the other EGT probes.

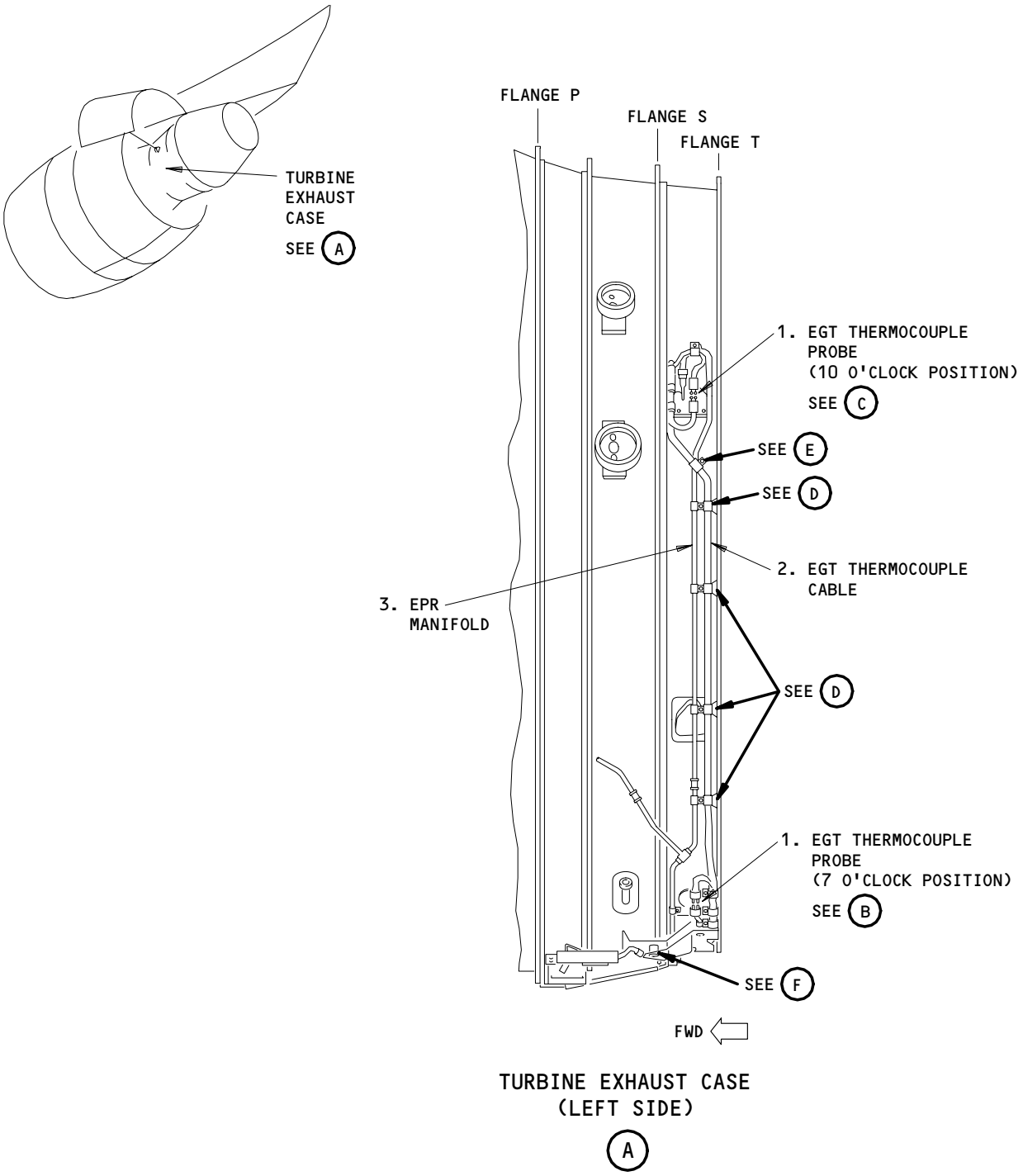
S 034-006-N00
(5) Do the steps that follow to remove the clamps for the EGT probe cable at the 4 o'clock position (Fig. 402):
(a) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the bracket on the exhaust case.
(b) Remove the bolt (5) and the nut (4) that attaches the clamp for the probe wires to the clamp on the EPR manifold (3).

S 034-007-N00
(6) Do the steps that follow to remove the positioning plate (18) below the EGT probe at the 4 o'clock position (Fig. 402):
(a) Remove the bolts (17) and the nut (4) that attach the positioning plate (18) to the support bracket.
(b) Remove the positioning plate (18).

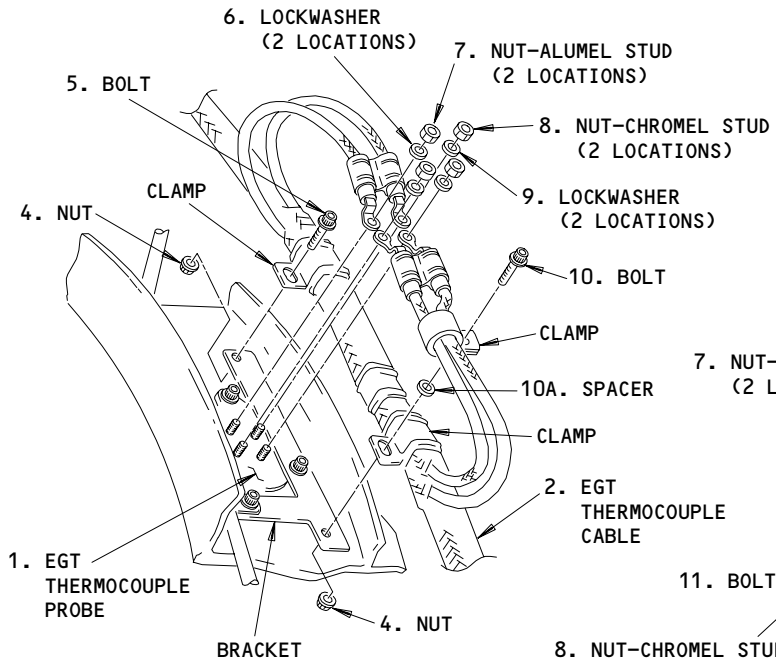
S 034-008-N00
(7) Remove the bolt (19) and the nut (4) that attaches the clamp for the cable to the reinforcing plate (Fig. 402).

NOTE: The reinforcing plate is found below the positioning plate (18).

S 034-009-N00
(8) Do the steps that follow to remove the cable terminal box from the exhaust case (Fig. 402):
(a) Remove the lockwire and the screws (3E) that attach the terminal box cover (3F) and the ground wire (for the W6 cable (3B)) to the terminal box (3A).
1) Remove the cover (3F).

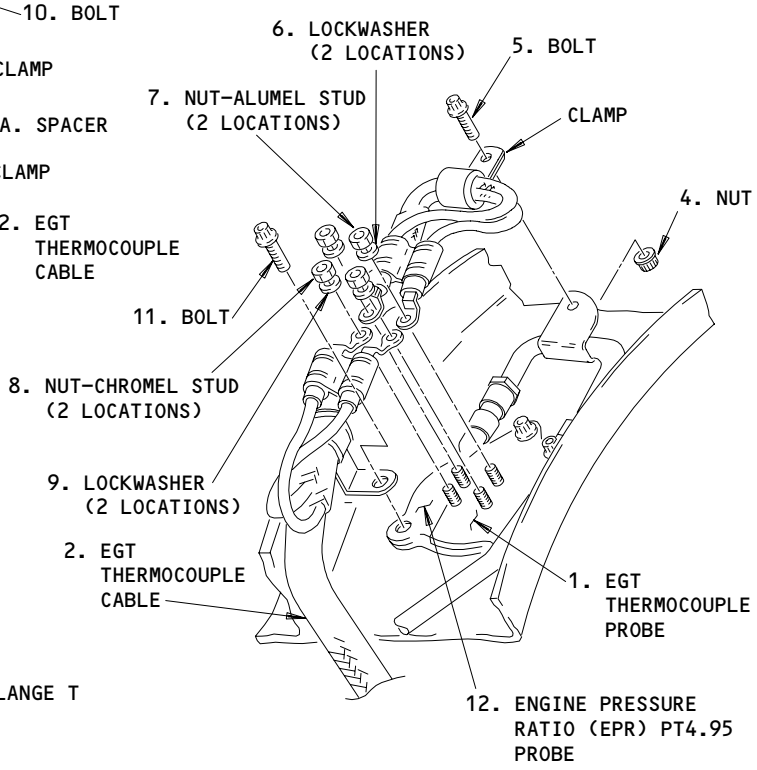


EGT (TT4.95) Thermocouple Box and Cable (Left Side) Installation
Figure 401 (Sheet 1)



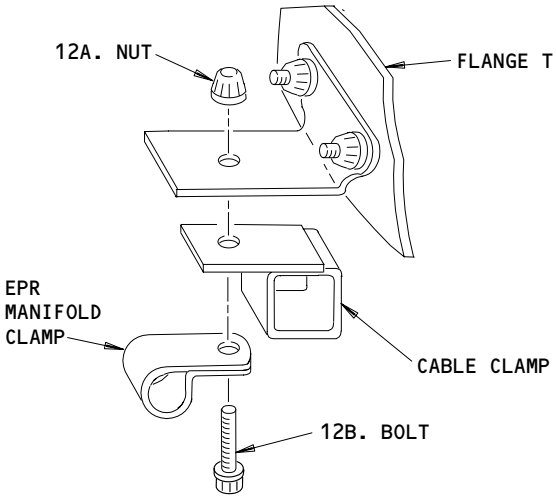
EGT THERMOCOUPLE PROBE
(7 O'CLOCK POSITION)

B

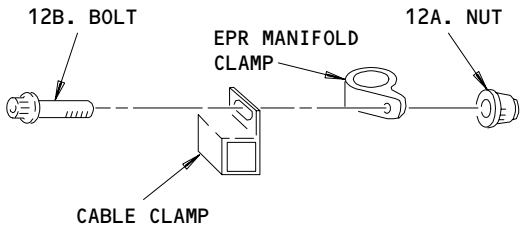


EGT THERMOCOUPLE PROBE
(10 O'CLOCK POSITION)

C

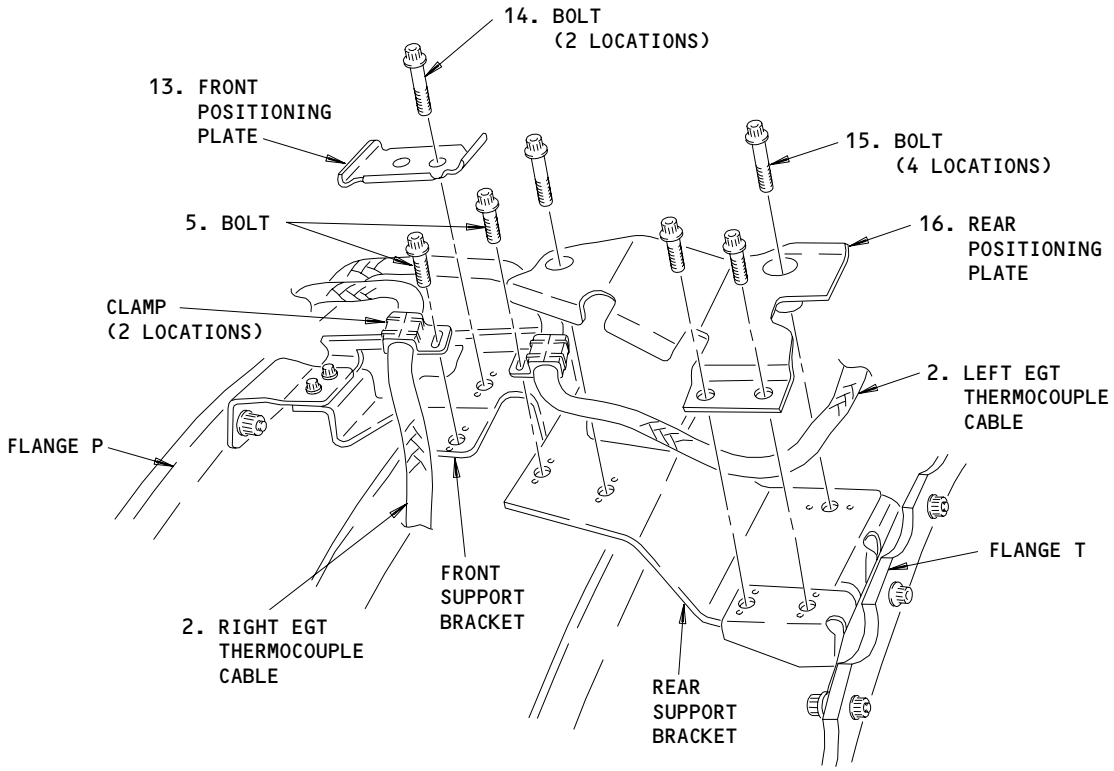


D

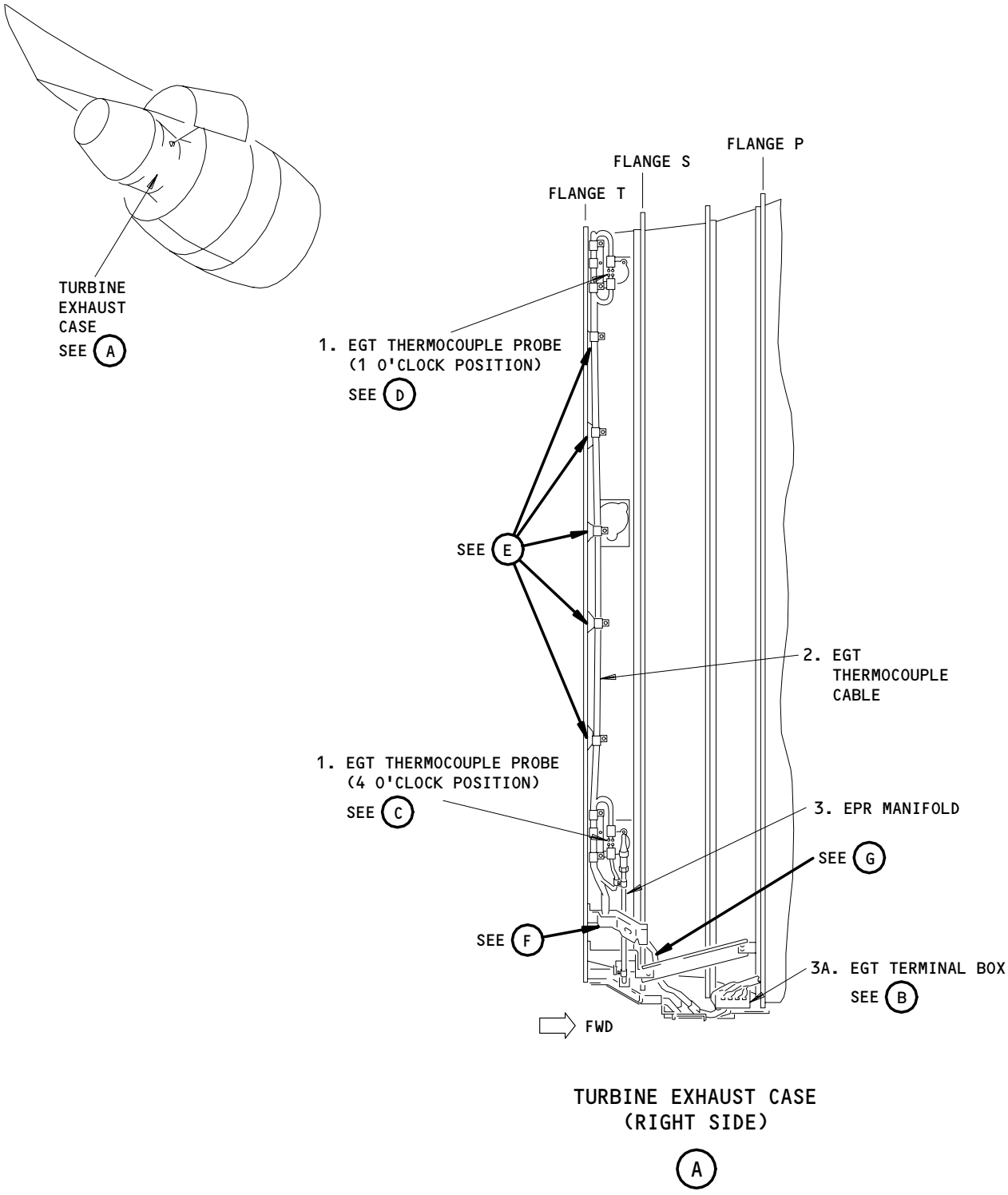


E

EGT (TT4.95) Thermocouple Box and Cable (Left Side) Installation
Figure 401 (Sheet 2)



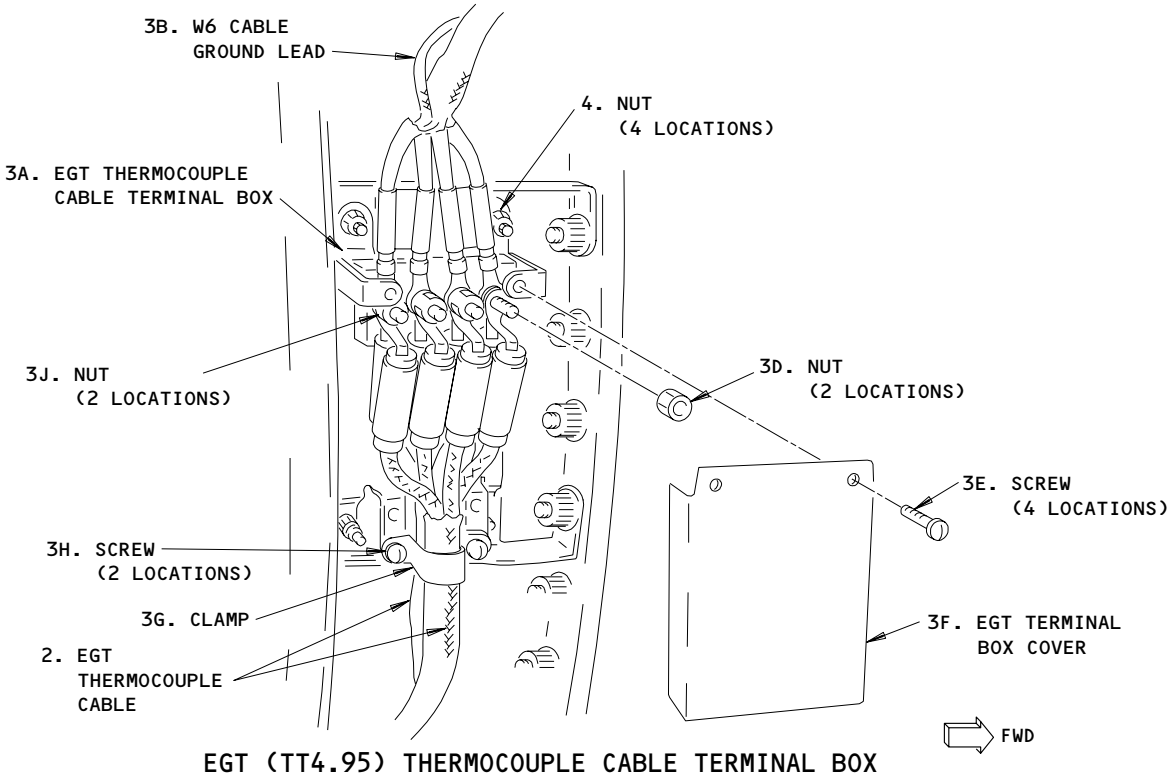
EGT (TT4.95) Thermocouple Box and Cable (Left Side) Installation
Figure 401 (Sheet 3)



TURBINE EXHAUST CASE
(RIGHT SIDE)

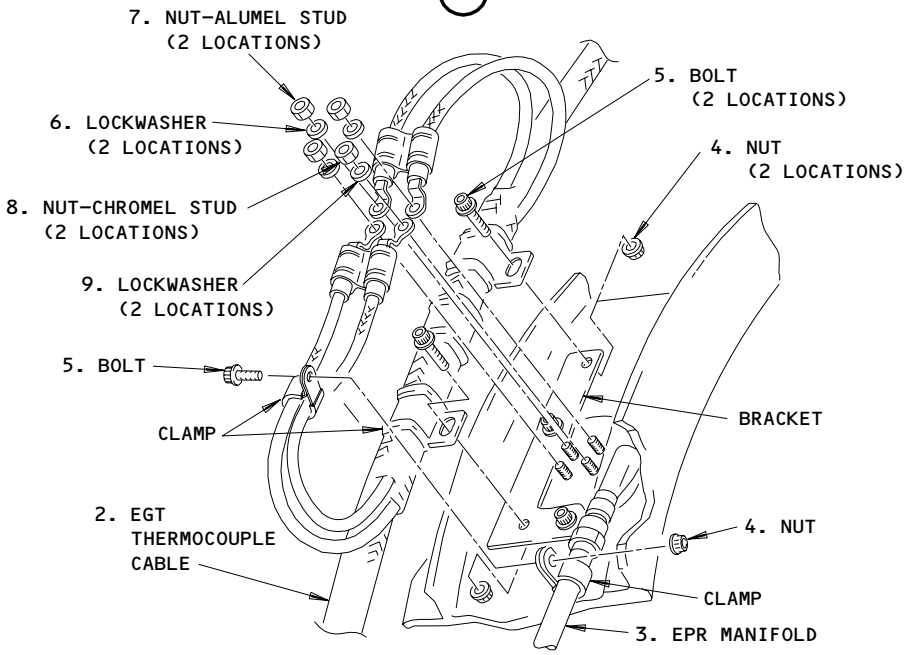
A

EGT (TT4.95) Thermocouple Box and Cable (Right Side) - Installation
Figure 402 (Sheet 1)



EGT (TT4.95) THERMOCOUPLE CABLE TERMINAL BOX

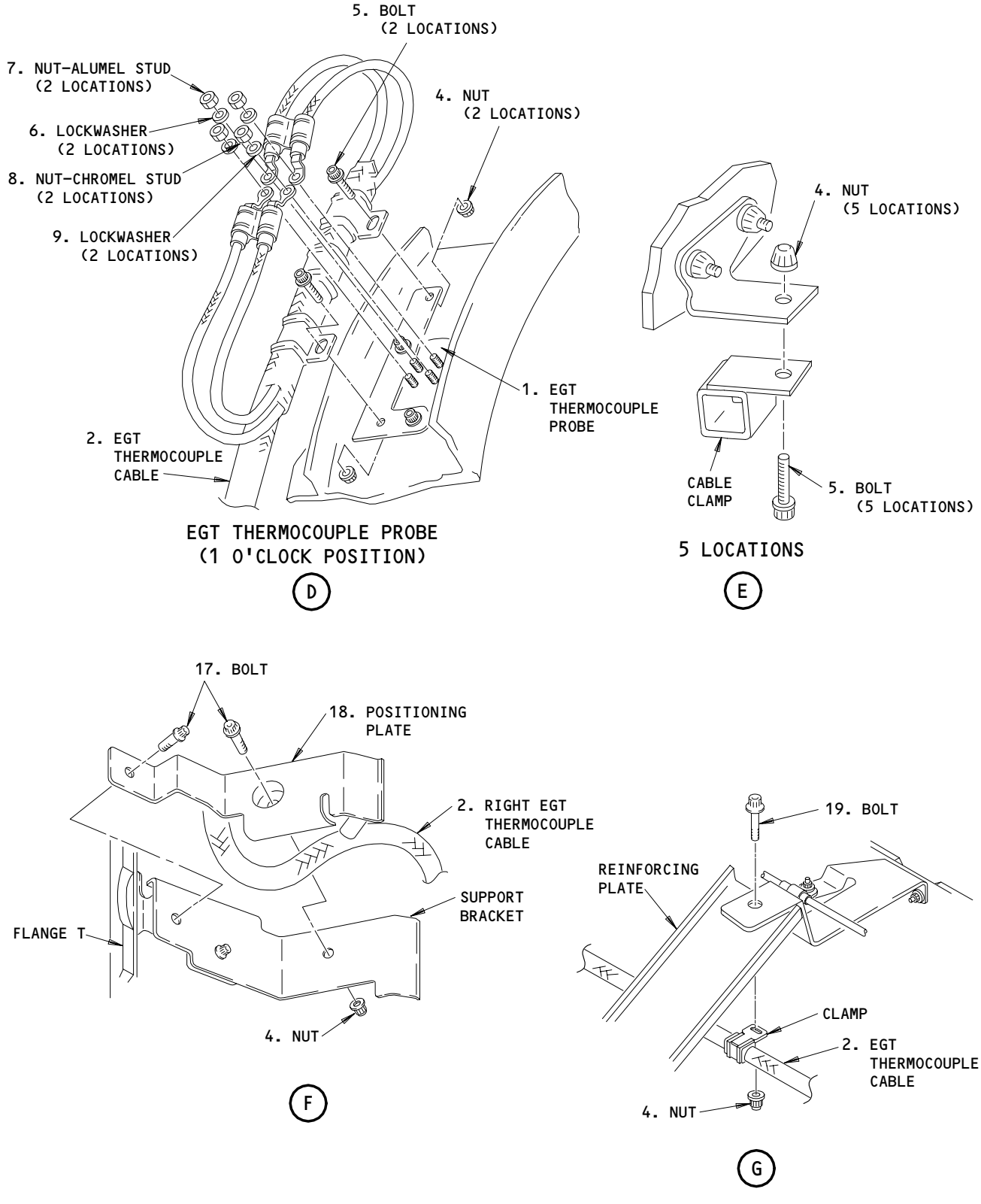
B



EGT THERMOCOUPLE PROBE
(4 O'CLOCK POSITION)

C

EGT (TT4.95) Thermocouple Cable (Right Side) - Installation
Figure 402 (Sheet 2)



EGT (TT4.95) Thermocouple Cable (Right Side) - Installation
Figure 402 (Sheet 3)

(b) Put tags on the W6 cable ends to identify where they are installed.

NOTE: This will help you make sure that the cables get installed in the correct location.

(c) Remove the nuts (3D, 3J) that attach the W6 cable ends to the terminal box (3A) studs.
1) Remove the W6 cable ends from the studs.
2) Install the nuts (3D, 3J) for the terminals on the box.
a) Tighten the nuts (3D, 3J) hand tight.

(d) Remove the nuts (4) that attach the terminal box (3A) to the bracket on the exhaust case.

S 034-010-N00

(9) Do the steps that follow to remove the positioning plates (13, 16) (Fig. 401):

NOTE: The positioning plates (13, 16) are found forward of the EGT probe at the 7 o'clock position.

(a) Remove the bolts (14) that attach the front positioning plate (13) to the front support bracket on the exhaust case.
1) Remove the front positioning plate (13).

(b) Remove the bolts (15) that attach the rear positioning plate (16) to the rear support bracket on the exhaust case.
1) Remove the rear positioning plate (16).

(c) Remove the bolts (5) that attach the cable clamps to the front and the rear support brackets.

S 034-011-N00

(10) Do the step that follows to remove the clamps for the EGT probe cable at the 7 o'clock position (Fig. 401):
(a) Remove the bolts (5, 10), spacer (10A), and the nuts (4) that attach the cable clamps to the bracket on the turbine exhaust case.

S 034-012-N00

(11) Do the steps that follow to remove the clamps for the EGT probe cable at the 10 o'clock position (Fig. 401):
(a) Remove the bolt (5) and the nut (4) that attaches the clamp for the probe wires to the bracket on the EPR manifold.
(b) Remove the bolt (11) that attaches the clamp for the probe cable and the EPR probe (12) to the exhaust case.

S 034-013-N00

(12) Remove the bolt (12B) and the nut (12A) that attaches the cable clamp to the clamp on the EPR manifold.

S 344-034-N00

(13) Remove the bolts (12B) and the nuts (12A) that attach the clamps to the brackets on the left side of the exhaust case.

NOTE: Two clamps are installed at each location. One clamp is for the cable and the other clamp is for the EPR manifold.

S 034-014-N00

(14) Do the step that follows to remove the clamps for the EGT probe cable at the 1 o'clock position (Fig. 402):

(a) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the bracket on the turbine exhaust case.

S 034-015-N00

(15) Remove the bolts (5) and the nuts (4) that attach the cable clamps to the brackets on the right side of the exhaust case.

S 024-016-N00

(16) Remove the cable and box assembly.

TASK 77-21-03-404-019-N00

3. Install the EGT Probe Box and Cable (Fig. 401)

A. Consumable Materials

(1) D00137 Engine Oil - PWA 521

B. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	2	Cable, EGT	77-21-03	05	100 140 145
402	3A	Terminal Box			150 155

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 77-21-00/501, EGT Indicating System
(5) AMM 78-31-00/201, Thrust Reverser

D. Access
(1) Location Zones
410 Power Plant (Left)
420 Power Plant (Right)

(2) Access Panels
417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

E. Procedure

S 434-044-N00
(1) Install the terminal box and cable assembly (3A) on the bracket on flange P.
(a) Put the terminal box and cable assembly (3A) on the bracket on flange P.
(b) Lubricate the threads of the bolts on the bracket with engine oil.
(c) Attach the terminal box (3A) to the bracket with nuts (4).
(d) Tighten the nuts (4) to 36-40 inch-pounds (4.1-4.5 newton-meters).

S 434-017-N00
(2) Do the steps that follow to install the terminal box on the exhaust case (Fig. 402):
(a) Remove screws (3E) that attach the cover (3F) to the terminal box (3A).
1) Remove the cover (3F).

S 024-043-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR LOCK NUTS.

(3) ENGINES PRE-SB PW4ENG 77-20;
Connect the W6 cable leads.
(a) Remove the nuts (3D, 3J) from the terminal box studs.

(b) Connect the W6 cable to the studs.
(c) Install the nuts.
(d) Tighten the alumel (larger) nuts to 18-22 inch-pounds (2-034-2.486 newton-meters).
(e) Tighten the chromel (smaller) nuts to 15-18 inch-pounds (1.695-2.034 newton-meters).

S 024-038-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR LOCK NUTS.

CAUTION: ONCE A POST-SB PW4ENG 77-20 NUT IS INSTALLED ONTO THE MATING STUD YOU MUST NOT INSTALL PRE-SB PW4ENG 77-20 NUT ONTO THE STUD

(4) ENGINES POST-SB PW4ENG 77-20;
Connect the W6 cable leads.
(a) Remove the nuts (3D, 3J) from the terminal box studs.
(b) Connect the W6 cable leads to the studs.
(c) Connect averaging circuit leads to thermocouple junction box terminals.
(d) Run the nut onto the stud until finger tight so that the locking thread is in contact with the stud thread.
(e) Use a torque wrench with a resolution of 1.0 in-lbs (0.113 N.m) or smaller and run-on the nut to the stud as follows:
1) Minimum run-on torque for the smaller (0.164-32) thread diameter nut shall be 1.5 in-lbs. (0.169 N.m).
2) Maximum run-on torque for the smaller (0.164-32) thread diameter nut shall be 9.0 in-lbs. (1.017 N.m)
3) Minimum run-on torque for the larger (0.190-32) thread diameter nut shall be 2.0 in-lbs. (0.226 N.m).
4) Maximum run-on torque for the larger (0.190-32) thread diameter nut shall be 13.0 in-lbs. (1.47 N.m).
(f) Perform a run-on test as follows:

NOTE: You must perform a run-on test to each nut as it is installed.

1) Use a torque wrench to install the nuts while you measure and record the torque necessary to run the nut down to the stud shoulder.
2) If any nut fails to meet the minimum or maximum torque requirement, use a new nut and repeat the test.

3) If a second nut fails to meet the minimum or maximum torque requirement, replace the stud.

(g) Tighten the larger thread diameter nuts to 25-30 inch-pounds (2.825-3.390 newton-meters).

(h) Tighten the smaller thread diameter nuts to 20-25 inch-pounds (2.825-3.390 newton-meters).

S 434-045-N00

(5) Install the cover (3F) on the terminal box (3A).

(a) Put the ground wire for the W6 cable (3B) below the rear corner of the cover (3F).

NOTE: If the ground wire on the W6 cable at the EGT Thermocouple Terminal Box is damaged or missing, you must repair the cable per Unison SB 420081-73-46 or replace it.

(b) Attach the cover (3F) and the ground wire for the W6 cable (3B) with the screws (3E).

1) Lubricate the threads of the screws (3E) with engine oil.

2) Tighten the screws (3E) to 16-22 inch-pounds (1.8-2.5 newton-meters).

S 434-018-N00

(6) Do the steps that follow to connect the probe wires to the EGT probes (Fig. 401, Fig. 402):

(a) Remove the nuts (7, 8) and the lockwashers (6, 9) from EGT the probe (1).

(b) Install the cable ends to the studs on the EGT probes.

(c) Install the lockwashers (6, 9) and the nuts (7, 8).

NOTE: The thermocouple probe has two types of studs. One type of stud has a larger diameter and is made of alumel. The other type of stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the probe wires to the studs have different dimensions, thus they are not interchangeable.

1) Tighten the nuts (7, 8) only hand tight at this time.

(d) Do the steps to connect the probe wires for each of the other three EGT probes.

S 434-020-N00

(7) Do the steps that follow to attach the cable for the EGT probe at the 10 o'clock position (Fig. 401):
   (a) Attach the cable clamp and the EGT probe (1) to the exhaust case with the bolt (11).
      1) Lubricate the threads of the bolt (11) with oil.
      2) Tighten the bolt (11) to 75-85 pound-inches (8.5-9.6 newton-meters).
   (b) Attach the probe wires to the bracket on the EPR manifold (3) with the clamp, bolt (5), and the nut (4).
      1) Lubricate the threads of the bolt (5) with oil.
      2) Tighten the bolt (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-021-N00

(8) Do the steps that follow to install the cable clamps that are between the EGT probes on the left side of the engine (Fig. 401):

NOTE: These probes are at the 7 and the 10 o'clock positions.

   (a) Lubricate the threads of the bolt (12B) with oil.
   (b) Install the bolt (12B) and the nut (12A) that attaches the cable clamp to the clamp on the EPR manifold (3).

      NOTE: These clamps are found where the cable goes across the EPR manifold.

   (c) Attach the cable clamps and the EPR manifold clamps to the brackets on flange T, with bolts (12B) and nuts (12A).
   (d) Tighten the bolts (12B) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-022-N00

(9) Do the steps that follow to attach the cable for the EGT probe at the 7 o'clock position (Fig. 401):
   (a) Lubricate the threads of the bolts (5, 10) with oil.

(b) Attach the higher cable clamp to the bracket adjacent to the EGT probe (1) with the bolt (5) and the nut (4).
(c) Attach the lower cable clamp and the clamp for the probe wires as follows:
1) Install the spacer (10A) between the clamp for the probe wires (which is installed adjacent to the bracket) and the cable clamp.
2) Install the clamps and the spacer (10A) with the bolt (10) and the nut (4).
(d) Tighten the bolts (5, 10) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-023-N00
(10) Do the steps that follow to attach the cable for the EGT probe at the 1 o'clock position (Fig. 402):
(a) Attach the cable clamps to the bracket adjacent to the EGT probe with the bolts (5) and the nuts (4).
1) Lubricate the threads of the bolts (5) with oil.
2) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-024-N00
(11) Do the steps that follow to install the cable clamps that are between the EGT probes on the right side of the engine (Fig. 402):

NOTE: These probes are found at the 1 and the 4 o'clock positions.

(a) Lubricate the threads of the bolts (5) with oil.
(b) Install the bolts (5) and the nuts (4) that attach the cable clamps to the brackets on flange T.
(c) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-025-N00
(12) Do the steps that follow to attach the cable for the EGT probe at the 4 o'clock position (Fig. 402):
(a) Lubricate the threads of the bolts (5) with oil.

(b) Install the bolts (5) and the nuts (4) that attach the cable clamps to the bracket that is adjacent to the EGT probe (1).
(c) Install the clamp that attaches the probe wires to the EPR manifold (3) as follows:
1) Make sure the clamp on the EPR manifold is approximately 0.5 inch (12.7 mm) from the manifold nut.
2) Attach the clamps with the bolt (5) and the nut (4).
(d) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-026-N00

(13) Do the steps that follow to install the positioning plates that are forward of the EGT probe at the 7 o'clock position (Fig. 401):
(a) Attach the cable clamp for the left probe cable to the rear support bracket with the bolt (5).
(b) Attach the cable clamp for the right probe cable to the front support bracket with the bolt (5).
(c) Tighten the bolts (5) to 36-40 pound-inches (4.1-4.5 newton-meters).
(d) Do the steps that follow to install the rear positioning plate (16):

NOTE: The cables that are installed below the positioning plate are compressed by the plate when you tighten the bolts.

1) Install the plate (16) as follows:
a) Make sure the rear spacer is on the inner side of the cable loop.
b) Make sure the front spacer is on the inner side of the cable that is adjacent to the cable clamp.
2) Attach the plate (16) to the rear support bracket with bolts (15).
a) Lubricate the bolts (15) with oil.
b) Tighten the bolts (15) to 36-40 pound-inches (4.1-4.5 newton-meters).

(e) Do the steps that follow to install the front positioning plate (13):

NOTE: The cables that are installed below the positioning plate are compressed by the plate when you tighten the bolts.

1) Install the plate (13) on the support bracket with its spacers between the cable.
2) Attach the front positioning plate (13) to the front support bracket with the bolts (14).
   a) Lubricate the bolts (14) with oil.
   b) Tighten the bolts (14) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-027-N00

(14) Do the steps that follow to install the positioning plate that is 5 o'clock position (Fig. 402):
(a) Install the plate (18) on the support bracket as follows:
1) Make sure the cable is to the left of the inner spacer on the plate (18).
2) Make sure the cable is to the right of the outer spacer on the plate (18).
(b) Attach the plate (18) and the clamp on the EPR manifold to the support bracket with the bolts (17) and the nut (4).
1) Lubricate the threads of the bolts (17) with oil.
2) Tighten the bolts (17) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-028-N00

(15) Attach the cable clamp to the inboard side of the reinforcing plate, at the 5:30 o'clock position, with the bolt (19) and the nut (4) (Fig. 402).
(a) Lubricate the threads of the bolt (17) with oil.
(b) Tighten the bolts (17) to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-029-N00

(16) Do the steps that follow to tighten the nuts for the probe wires on the EGT probes (Fig. 401, Fig. 402):
(a) Align the probe wires that are attached to the EGT probe so the wires are parallel to each other.

CAUTION: DO NOT TIGHTEN THE NUTS THAT ATTACH THE PROBE WIRES TO MORE THAN THE SPECIFIED TORQUE. TOO MUCH TORQUE ON THE EGT PROBE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE EGT PROBE STUDS.

(b) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).

(c) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).
(d) After the nuts (7, 8) are tightened, make sure the adjacent ends of the cable do not touch.
(e) Make sure the ends of the cable do not touch the lockwire or the bolt heads in the area.

S 414-030-N00
(17) Close the core cowl panels (AMM 71-11-06/201).

S 444-031-N00
(18) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-032-N00
(19) Supply electrical power (AMM 24-22-00/201).

S 714-036-N00
(20) Do the test of the EGT box and cable that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EGT (TT4.95) THERMOCOUPLE BOX AND CABLE - ADJUSTMENT/TEST

1. General
   A. The electrical tests made in the field are only as good as the limits in the ohmmeter. The ohmmeter is not a good source to find the most accurate wire resistances of the EGT thermocouple box and cable. But, you can use it to find the very bad failures such as open or intermittent circuits, and metal-to-metal short circuits. Also, you can examine the approximate insulation resistance if you use specified precautions. The ohmmeter used in the tests that follow must not have a bad meter needle, with the pinjacks, test leads, and dry cells in good condition to permit a full scale movement for all positions in the range of the switch.
   B. The EGT thermocouple box and cable test is done if you do not get the necessary values for the system test (AMM 77-21-00/501).
   C. The EGT thermocouple box and cable test does a check of the continuity, insulation resistance, and short circuit test.

TASK 77-21-03-735-001-N00

2. EGT (TT4.95) Thermocouple Box and Cable Test
   A. Equipment

      WARNING: DO NOT USE THE HIGH VOLTAGE TEST EQUIPMENT. THE HIGH VOLTAGE TEST EQUIPMENT CAN START IGNITION OF THE FUEL GAS IN THE ENGINE AREA.

      (1) Electronic Multimeter - Model 2795 Simpson Electric Co. American Gage & Machine Co. (Katy Industries Inc.) 853 Dundee Avenue, Elgin, IL 60012O

   B. Consumable Materials
      (1) D00137 Engine Oil - PWA 521

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 77-21-00/501, EGT Indicating System
(5) AMM 77-21-02/401, EGT Thermocouple Cable
(6) AMM 77-21-03/601, EGT Thermocouple Box and Cable
(7) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
411 Left Engine
421 Right Engine

(2) Access Panels
417AL Core Cowl (Left)
418AR Core Cowl (Right)
427AL Core Cowl (Left)
428AR Core Cowl (Right)

E. Prepare for the test of the EGT (TT4.95) Thermocouple Box and Cable (Fig. 501)

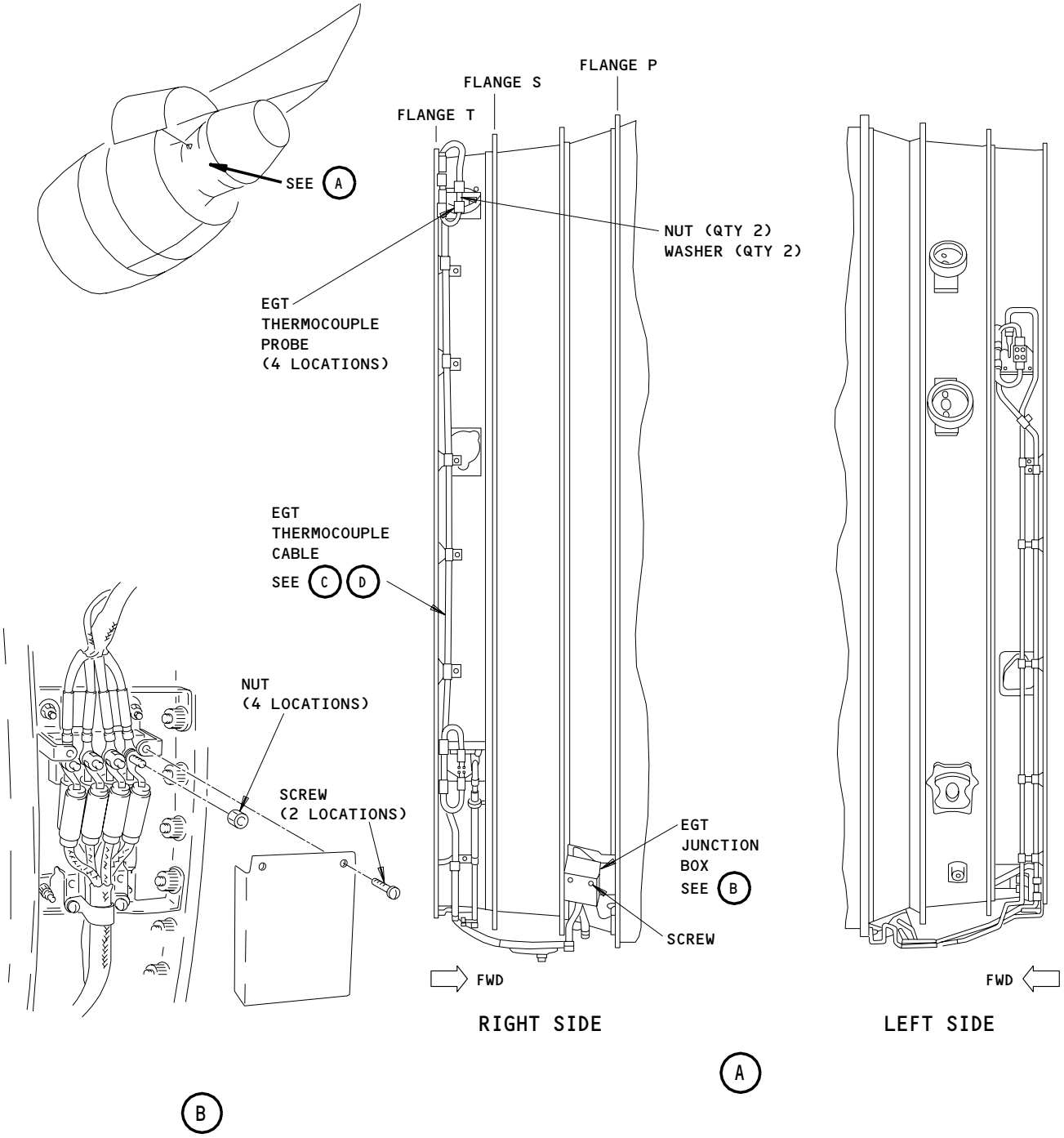
S 865-002-N00
(1) Remove electrical power (AMM 24-22-00/201).

S 045-003-N00

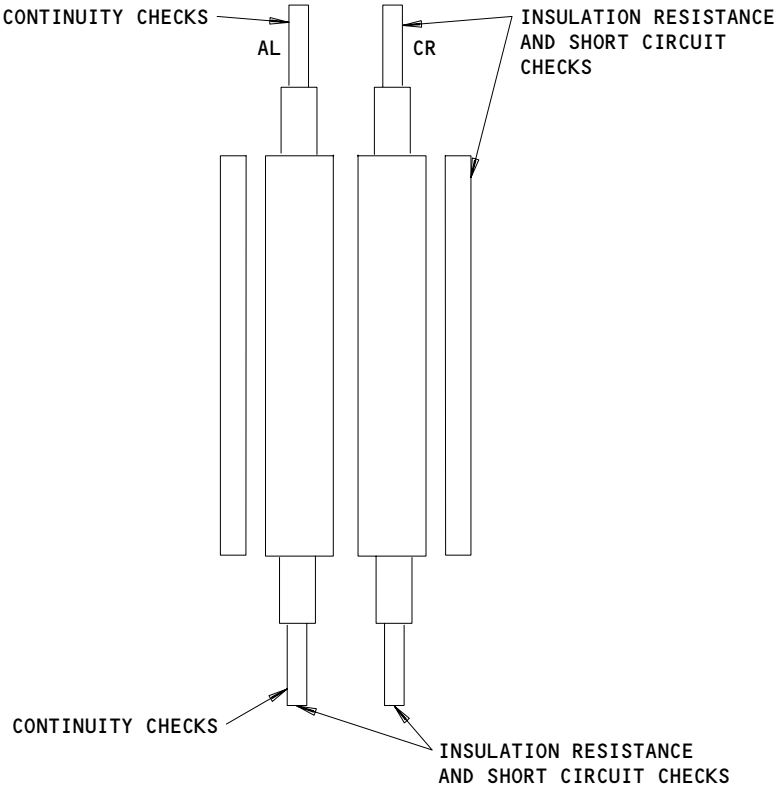
WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

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

S 015-004-N00
(3) Open the core cowl panels (AMM 71-11-06/201).

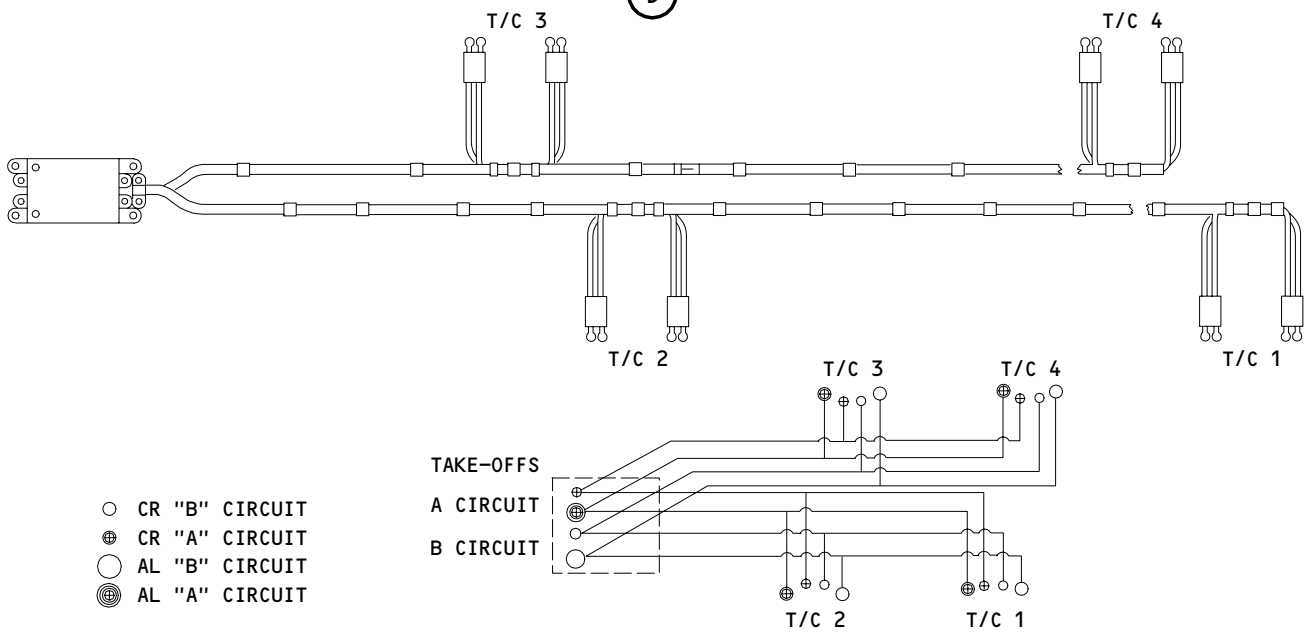


EGT (TT 4.95) Thermocouple Cable Test
Figure 501 (Sheet 1)



EGT CABLE INSULATION RESISTANCE TEST

(D)



EGT CABLE TEST SCHEMATIC

(C)

L-A2425
L-A2424

EGT (TT 4.95) Thermocouple Box and Cable Test
Figure 501 (Sheet 2)

S 215-005-N00
(4) Examine the EGT thermocouple box and cable (Ref 77-21-03/601).

S 435-006-N00
(5) Put a tag on all thermocouple leads to make sure you install it correctly.

NOTE: The diameters of the stud and nut of the alumel terminals are larger than those of the chromel terminals.

S 035-007-N00
(6) Remove the nuts which attach the thermocouple cable leads to the thermocouple probe terminals.

S 035-008-N00
(7) Remove the thermocouple cable from the thermocouple probe.
(a) Install the nuts and washers on the studs.

S 035-009-N00
(8) Remove the screws which attach the cover for the EGT junction box to the EGT junction box.
(a) Remove the cover from the engine.

S 035-010-N00
(9) Disconnect the circuit leads from the terminals in the EGT junction box (circuit A and circuit B).

NOTE: Each circuit has two pairs of leads and a shield.

(a) Move each circuit lead apart.
(b) Put a label on each circuit lead.
(c) Install the nuts on the terminals.

F. Do a Test of the EGT (TT4.95) Thermocouple Box and Cable.

S 765-011-N00
(1) Do a test of the thermocouple cable for continuity.
(a) Set the ohmmeter range switch to the range which has the center scale value of approximately 10 ohms.
(b) Do the continuity test with the wire and test schematic (Fig. 501).
1) Touch one lead of the ohmmeter to the thermocouple cable at the EGT junction box.
2) Touch the other lead of the ohmmeter with the applicable thermocouple cable at the thermocouple probe.

3) Monitor the meter needle to make sure it shows an indication.
   a) If the ohmmeter needle is not stable or has no indication, there is no continuity.
4) Lightly bend the thermocouple cable.

   NOTE: Broken wires which touch intermittently when you bend the thermocouple cable will cause the meter needle to not be stable. Incorrect intermittent indications will be the result if the ohmmeter prods do not correctly touch with the clean terminals, also, if the ohmmeter prods, leads, or jack are defective.

   a) Monitor the ohmmeter needle to make sure it is stable.
5) If there is no continuity, replace the defective thermocouple cable (AMM 77-21-02/401).
6) Do the steps from above again for the other thermocouple cable leads.

S 765-012-N00

(2) Do the test of the resistance of the thermocouple cable insulation.
   (a) Make sure the EGT thermocouple box and cables are correctly installed in the clamps.
   (b) Make sure that all the thermocouple cable leads are disconnected and do not touch other objects.
   (c) Use the ohmmeter to examine the insulation for short circuits, leakage, and areas where the internal insulation rubs.

   NOTE: Use the low voltage ohmmeter, which uses less than 40 volts (DC) and keeps an tolerance of five percent, to find the insulation resistance. Do not use the test equipment with high voltage.

   (d) Touch one prod to the steel braid cover for the thermocouple cable and the other prod to one of the studs on the EGT junction box (Fig. 501).

   NOTE: Do the steps that follow for the circuit A and circuit B.

   1) Alumel, T/C3 and T/C4
   2) Alumel, T/C2 and T/C1
   3) Chromel, T/C5 and T/C4
   4) Chromel, T/C2 and T/C1
   (e) Read the ohmmeter.
   (f) If the resistance which is monitored was less than 50,000 ohms, do the steps that follow:
   1) If a full-scale deflection (zero ohms) is monitored and no terminals accidentally touch, replace the defective thermocouple cable (AMM 77-21-02/401).

2) If a large (but not a full-scale) movement is monitored, it is possibly a sign of carbon or moisture.

NOTE: The carbon shows almost stable values. The moisture usually shows values which are not stable after 5-30 seconds. If there are signs of moisture, apply heat to the thermocouple cable at 220°-250°F (104°-121°C) for one hour and do the check again.

Indications which are not stable are possibly because of the voltage. To make sure there is a stable output of the voltage, touch the prods with each other for ten seconds. The ohmmeter must have a stable full-scale movement.

(g) Do a resistance check of the insulation between the conductors with the ohmmeter.
1) Touch one prod on the common stud of the alumel circuit A and the other prod on the system output stud of the chromel circuit A.
2) If the resistance which is monitored is less than 50,000 ohms, replace the defective thermocouple cable (AMM 77-21-02/401).
(h) If it is not done, do the steps from above for the circuit B.

S 765-013-N00

(3) Do a test of the thermocouple cable for short circuits.
(a) Set the ohmmeter range switch to the range which has a center scale value of approximately 10 ohms.
(b) Touch one prod of the ohmmeter with the steel braid cover for the thermocouple cable and the other prod with the studs of the EGT junction box that follows:
1) Alumel, T/C3 and T/C4
2) Alumel, T/C2 and T/C1
3) Chromel, T/C5 and T/C4
4) Chromel, T/C2 and T/C1
(c) Lightly bend the thermocouple cable along the full length of the conductors which the test is done on.
1) Monitor the ohmmeter needle.
(d) If there is a movement of the ohmmeter needle (unless the movement is caused by the accidental touch between the other terminals of the thermocouple cable), replace the defective thermocouple cable (AMM 77-21-02/401).

G. Put the Airplane Back to Its Usual Condition

S 405-026-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR LOCK NUTS.

(1) Remove the nuts from the studs in the EGT junction box.

S 435-015-N00

(2) Airplanes pre SB PW4ENG 77-20:
Restore to pretest configuration. Install all of the thermocouple cable connections to the applicable studs with the applicable nuts.
(a) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
(b) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).

S 405-025-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR LOCK NUTS.

CAUTION: ONCE A POST SB PW4ENG NUT IS INSTALLED ONTO THE MATING STUD, YOU MUST NOT INSTALL PRE SB PW4ENG 77-20 NUT ONTO THE STUD.

(3) Airplanes post SB PW4ENG Restore to pretest configuration.
(a) Connect averaging circuit leads to thermocouple junction box terminals.
(b) Run the nut onto the stud until finger tight so that the locking thread is in contact with the stud thread.

(c) Use a torque wrench with a resolution of 1 in-lbs (0.113N.m) or smaller and run-on the nut to the stud as follows.

NOTE: You must perform a run-on test to each nut as it is installed.

1) Minimum run-on torque for the smaller (0.164-32) thread diameter nut shall be 1.5 inch pounds (0.169 N.m).
2) Maximum run-on torque for the smaller (0.164-32) thread diameter nut shall be 9.0 inch pounds (1.017 N.m).
3) Minimum run-on torque for the larger (0.190-32) thread diameter nut shall be 2.0 inch pounds (0.226 N.m).
4) Maximum run-on torque for the smaller (0.190-32) thread diameter nut shall be 13.0 inch pounds (1.47 N.m).

(d) Perform a run-on test as follows.
1) Use the torque wrench to install the nuts while you measure and record the torque necessary to run the nut down to the stud shoulder.
2) If any nut fails to meet the minimum or maximim torque requirement, use a new nut and repeat the test.
3) If a second nut fails to meet the minimum or maximum torque requirment, replace the stud.

(e) Torque the larger thread diameter nuts to 25-30 inch-pounds (2.825-3.390N.m).

(f) Torque the smaller thread diameter nuts to 20-30 inch- pounds (2.260 - 2.825N.m).

(g) Position junction box cover on junction box, install attaching bolts, and lockwire.

(h) Position thermocouple cable leads on probe stud treminals, install lockwashers and nuts. Torque chromel (smaller) nuts on terminals to 8-12 inch pounds (0.904-1.356 N.m).

(i) Torque alumel (larger) nuts on terminals to 10-15 inch pounds (1.130 - 1.695 N.m).

S 435-016-N00

(4) Install the cover for the EGT junction box with the screws.

(a) Put the ground wire for the W6 cable below the rear corner of the cover.

NOTE: If the ground wire on the W6 cable at the EGT Thermocouple Terminal Box is damaged or missing, you must repair the cable per Unison SB 420081-73-46 or replace it.

(b) Attach the cover and the ground wire for the W6 cable with the screws.
1) Lubricate the threads of the screws with engine oil.
2) Tighten the screws to 16-22 pound-inches (1.8-2.5 newton-meters).
3) Install the lockwire to the screws.

S 035-017-N00

CAUTION: DO NOT APPLY TOO MUCH TORQUE (MORE THAN THE MAXIMUM TORQUE) ON THE NUTS WHICH HOLD THE THERMOCOUPLE CABLE TO THE STUDS IN THE EGT JUNCTION BOX. TOO MUCH TORQUE ON THE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE STUDS.

(5) Remove the nuts and washers from the terminals in the EGT thermocouple probe.

S 435-018-N00
(6) Connect the thermocouple cable leads to the applicable terminals with the applicable nuts and washers.
(a) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
(b) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).

S 435-019-N00
(7) Do the step above for each of three remaining EGT thermocouple probes.

S 415-020-N00
(8) Close the core panels (AMM 71-11-06/201).

S 445-021-N00
(9) Do the activation procedure for the thrust reversers (AMM 78-31-00/201).

S 715-024-N00

(10) Do the test of the EGT box and cable that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EGT (TT4.95) THERMOCOUPLE BOX AND CABLE - INSPECTION/CHECK

1. General
   A. This procedure contains a task to do a visual check of the EGT (TT4.95) thermocouple box and cable.
   B. In this procedure, the EGT (TT4.95) thermocouple cable is referred to as the EGT probe cable. The EGT (TT4.95) thermocouple cable and box is referred to as the cable and box assembly.

TASK 77-21-03-206-001-N00

2. EGT (TT4.95) Thermocouple Box and Cable Check
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 73-21-07/601, EEC Wiring Harness
      (3) AMM 77-21-02/401, EGT (TT4.95) Thermocouple Cable
      (4) AMM 77-21-04/401, EGT (TT4.95) Thermocouple Cable Terminal Box
      (5) AMM 77-21-03/501, EGT (TT4.95) Thermocouple Box and Cable
      (6) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zone
          411 Left Engine
          421 Right Engine

      (2) Access Panel
          417AL Core cowl, left engine
          418AR Core cowl, left engine
          427AL Core cowl, right engine
          428AR Core cowl, right engine

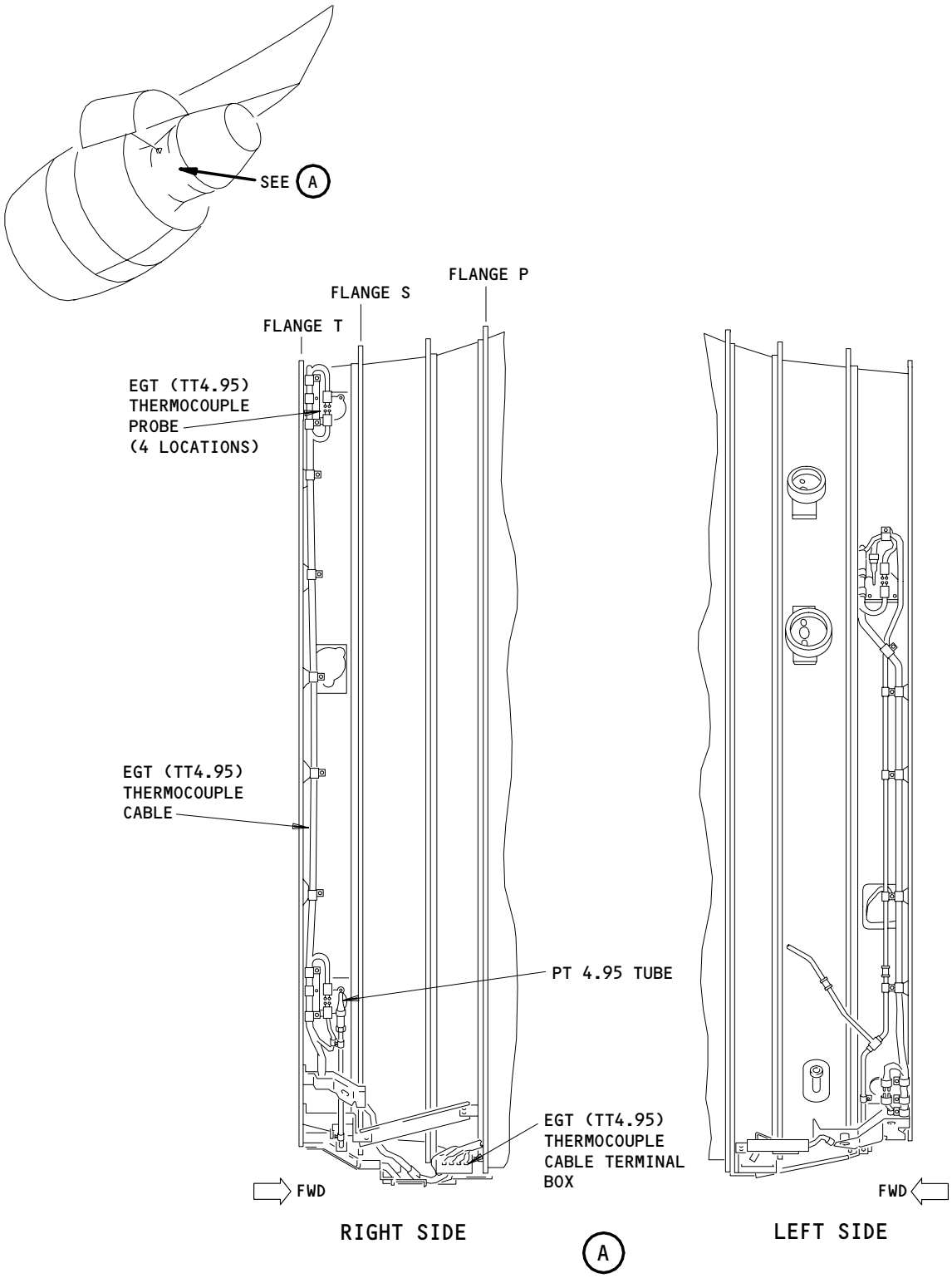
   C. Procedure

      S 046-010-N00

      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 AND DAMAGE TO EQUIPMENT.

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

      S 016-003-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).



EGT (TT 4.95) Thermocouple Cable Installation
Figure 601

S 216-004-N00
(3) Examine the EGT probe cable for damage to the steel braid.

NOTE: Refer to AMM 73-21-07/601 to make an inspection of the W6 EEC cable.

(a) If you find damage to the steel braid, replace the EGT probe Cable (AMM 77-21-02/401).

S 216-005-N00
(4) Examine the EGT probe cable for damage at the connectors.
(a) If you find damage to the connectors on the EGT probe cable, replace the EGT probe cable (AMM 77-21-02/401).

S 216-006-N00
(5) Examine the cable and box assembly for damage to the thermocouple cable connections.
(a) If you find damage to the thermocouple cable connections on the terminal box, replace the cable and box assembly (AMM 77-21-04/401).

S 766-007-N00
(6) Do a continuity and insulation resistance test of the box and cable assembly (AMM 77-21-03/501).

S 416-008-N00
(7) Close the core cowl panel (AMM 71-11-06/201).

S 446-011-N00
(8) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

EGT (TT4.95) THERMOCOUPLE CABLE TERMINAL BOX - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks for the EGT (TT4.95) thermocouple cable terminal box. One task is for the removal instructions and one for the installation instructions.

TASK 77-21-04-004-001-N00

2. Remove EGT (TT4.95) Thermocouple Cable Terminal Box (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zone
          411 Left Engine
          421 Right Engine

      (2) Access Panel
          418AR Core cowl, left engine
          428AR Core cowl, right engine

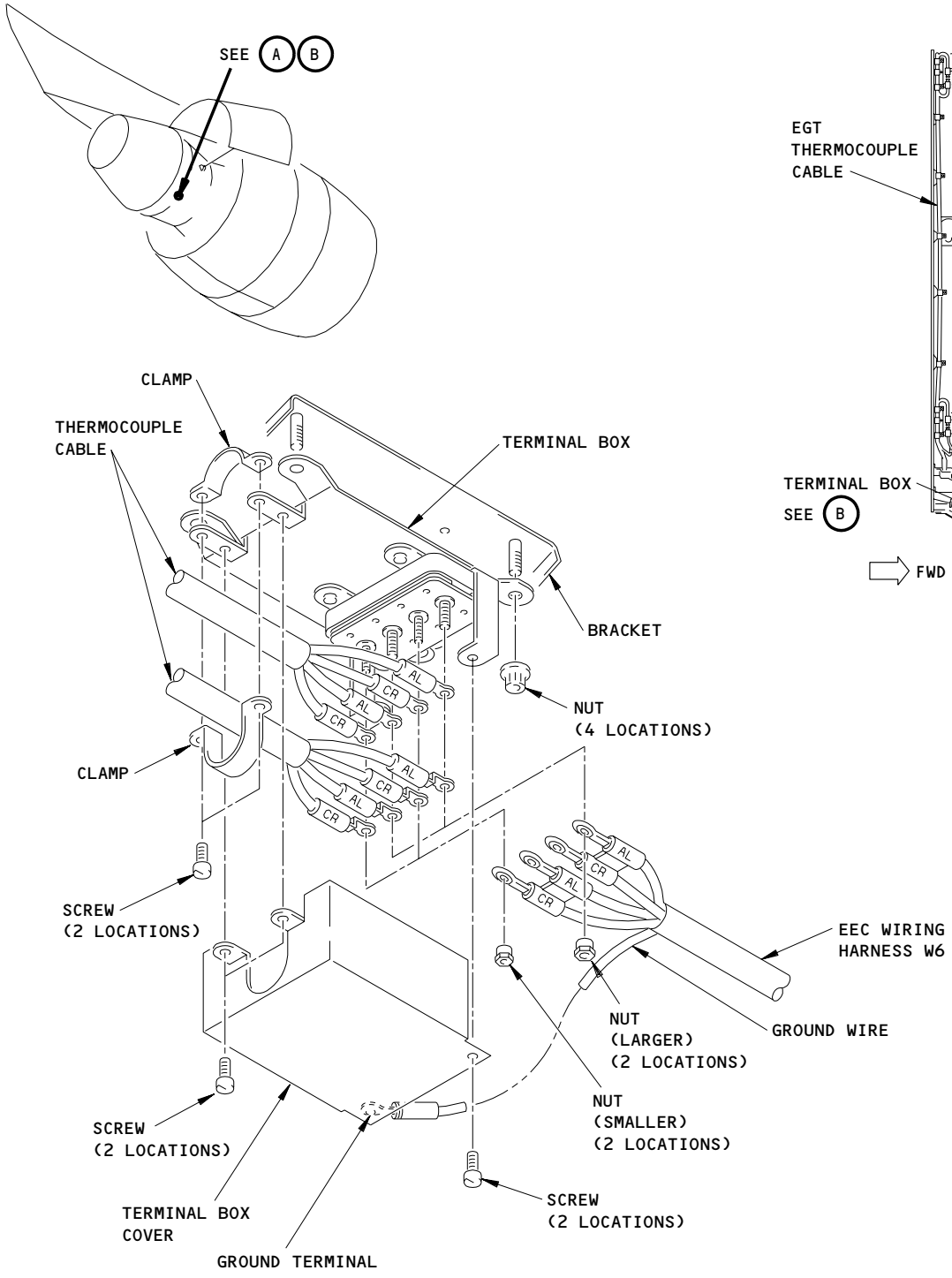
   C. Procedure (Fig. 401)

      S 864-002-N00

      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. THE 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 864-004-N00
      (2) Remove the electrical power (AMM 24-22-00/201).



EGT (TT4.95) Thermocouple Cable
Terminal Box
Figure 401

S 014-005-N00

(3) Open the right core cowl panel (AMM 71-11-06/201).

S 024-006-N00

(4) Remove the terminal box for the EGT (TT4.95) thermocouple cable as follows:
   (a) Remove lockwire and four screws which attach the terminal box cover and ground terminal to the terminal box.
   (b) Remove the terminal box cover.
   (c) Before you disconnect the electrical leads, tag each lead and stud to facilitate proper reinstallation.
   (d) Remove two screws which attach the upper and lower clamp halves and thermocouple cable to terminal box.
      1) Remove the clamp halves.
   (e) Remove nuts and disconnect W6 cable and thermocouple cable leads from terminal box studs.
      1) Reinstall the nuts on the studs.
   (f) Remove the four nuts which attach the terminal box to the bracket on Flange P, and remove the terminal box from the engine.

      NOTE: For more information concerning detailed maintenance of box and cable assembly, see EGT (TT4.95) Thermocouple Box And Cable Component Maintenance Manual, 77-21-04 (Harco Laboratories).

TASK 77-21-04-404-007-N00

3. Install the EGT (TT4.95) Thermocouple Cable Terminal Box (Fig. 401)
   A. Consumable Materials
      (1) D00137 Engine Oil - PWA 521B
      (2) G50006 Lockwire, MS9226-03
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-06/201, Core Cowl Panels
(4) AMM 77-21-00/501, EGT Indicating System
(5) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zone
411 Left Engine
421 Right Engine

(2) Access Panel
418AR Core cowl, left engine
428AR Core cowl, right engine

D. Procedure (Fig. 401)

S 424-022-N00

(1) Install the terminal box on Flange P bracket.
(a) Lubricate the threads of the bracket studs with engine oil.
(b) Attach the terminal box to the bracket with the nuts.
(c) Tighten the nuts to 32-36 inch-pounds (3.616-4.067 newton-meters).

S 034-032-N00

(2) Remove the nuts from the terminal box studs.

S 424-029-N00

CAUTION: DO NOT ATTACH THE GROUND WIRE TO THE TERMINAL STUDS.

(3) Connect and attach the thermocouple cable and W6 cable leads to the studs with the nuts.
(a) Align leads so they are parallel to one another.

S 424-030-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR NUTS.

(4) AIRPLANES PRE-SB PW4ENG 77-20;
Tighten the terminal box stud nuts as follows:
(a) Tighten alumel connections (larger stud) to 18-22 inch-pounds (2.034-2.486 newton-meters).

(b) Tighten chromel connections (smaller stud) to 15-18 inch-pounds (1.695-2.034 newton-meters).

S 434-031-N00

CAUTION: TOO MUCH TORQUE (MORE THAN MAXIMUM TORQUE) ON THE THERMOCOUPLE NUTS CAN LOOSEN OR DAMAGE THE THERMOCOUPLE STUDS.

CAUTION: USE OF LUBRICATION IS NOT PERMITTED ON EITHER THE STUDS OR LOCK NUTS.

CAUTION: ONCE A POST-SB PW4ENG 77-20 NUT IS INSTALLED ON THE MATING STUD, YOU MUST NOT INSTALL A PRE-SB PW4ENG 77-20 NUT ONTO THE STUD.

(5) AIRPLANES POST-SB PW4ENG 77-20;
Tighten the junction box stud nuts as follows:
(a) Connect averaging circuit leads to thermocouple junction box terminals.
(b) Run the nut onto the stud until finger tight so that the locking thread is in contact with the stud thread.
(c) Use a torque wrench with a resolution of 1.0 inch-pound (0.113 newton-meter) or larger and run-on the nut to the stud as follows:

NOTE: You must perform a run-on test per the steps below to each nut as it is installed.

1) Minimum run-on torque for the smaller (0.164-32) thread diameter nut shall be 1.5 inch-pound (0.169 newton-meter)
2) Maximum run-on torque for the smaller (0.164-32) thread diameter nut shall be 9.0 inch-pound (1.017 newton-meter).
3) Minimum run-on torque for the larger (0.190-32) thread diameter nut shall be 2.0 inch-pound (0.226 newton-meter)
4) Maximum run-on torque for the larger (0.190-32) thread diameter nut shall be 13.0 inch-pound (1.47 newton-meter).

(d) Perform a run-on test as follows:
1) Use the torque wrench to install the nuts while you measure and record the torque necessary to run the nut down to the stud shoulder.

2) If any nut fails to meet the minimum or maximum torque requirement, use a new nut and repeat the test.
3) If a second nut fails to meet the minimum or maximum torque requirement, replace the stud.

(e) Tighten the larger thread diameter nuts to 25-30 inch-pounds (2.825-3.390 newton-meters).

(f) Tighten the smaller thread diameter nuts to 20-25 inch-pounds (2.260-2.825 newton-meters).

S 434-009-N00

(6) Install the clamp halves around the thermocouple cables.
(a) Lubricate the threads of the screws with engine oil.
(b) Put the clamp halves around the thermocouple cables and attach with the two screws.
(c) Tighten the screws to 16-22 inch-pounds (1.808-2.486 newton-meters).

S 424-010-N00

(7) Install the terminal box cover on the terminal box.
(a) Install the ground terminal for the W6 cable below the front corner of the terminal box cover.
(b) Attach the terminal box cover and ground terminal with four screws.
(c) Tighten the screws to 16-22 inch-pounds (1.808-2.486 newton-meters).
(d) Install lockwire to the screws.

NOTE: Do not lockwire the clamp half screws together. Lockwire the clamp half screws to the cover screws.

S 414-011-N00

(8) Close the right core cowl panel (AMM 71-11-06/201).

S 864-012-N00

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

S 864-013-N00

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

S 714-016-N00

(11) Do the test of the EGT box and cable that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EGT (TT4.95) THERMOCOUPLE HOUSING - REMOVAL/INSTALLATION

1. General
   A. In this procedure, the EGT (TT4.95) thermocouple probe housing is referred to as the EGT probe housing.
   B. The EGT thermocouple probe contains the EGT probe. The probe must be removed before the housing is removed.
   C. There are four EGT probes installed on each engine.
      (1) This procedure removes and installs the EGT probe housings that are installed at the 1 o'clock and the 7 o'clock positions.
      (2) The probes that are installed at the 4 o'clock and the 10 o'clock positions use the EPR probe as its housing.
         (a) Refer to AMM 77-11-01/401 for the procedure to remove and install these EPR probes.

TASK 77-21-05-004-004-N00

2. Remove the EGT Probe Housing (Fig. 401)
   A. References
      (1) AMM 71-11-06/201, Core Cowl Panels
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
         410 Power Plant (Left)
         420 Power Plant (Right)

      (2) Access Panels
         417AL/427AL Core Cowl (Left)
         418AR/428AR Core Cowl (Right)

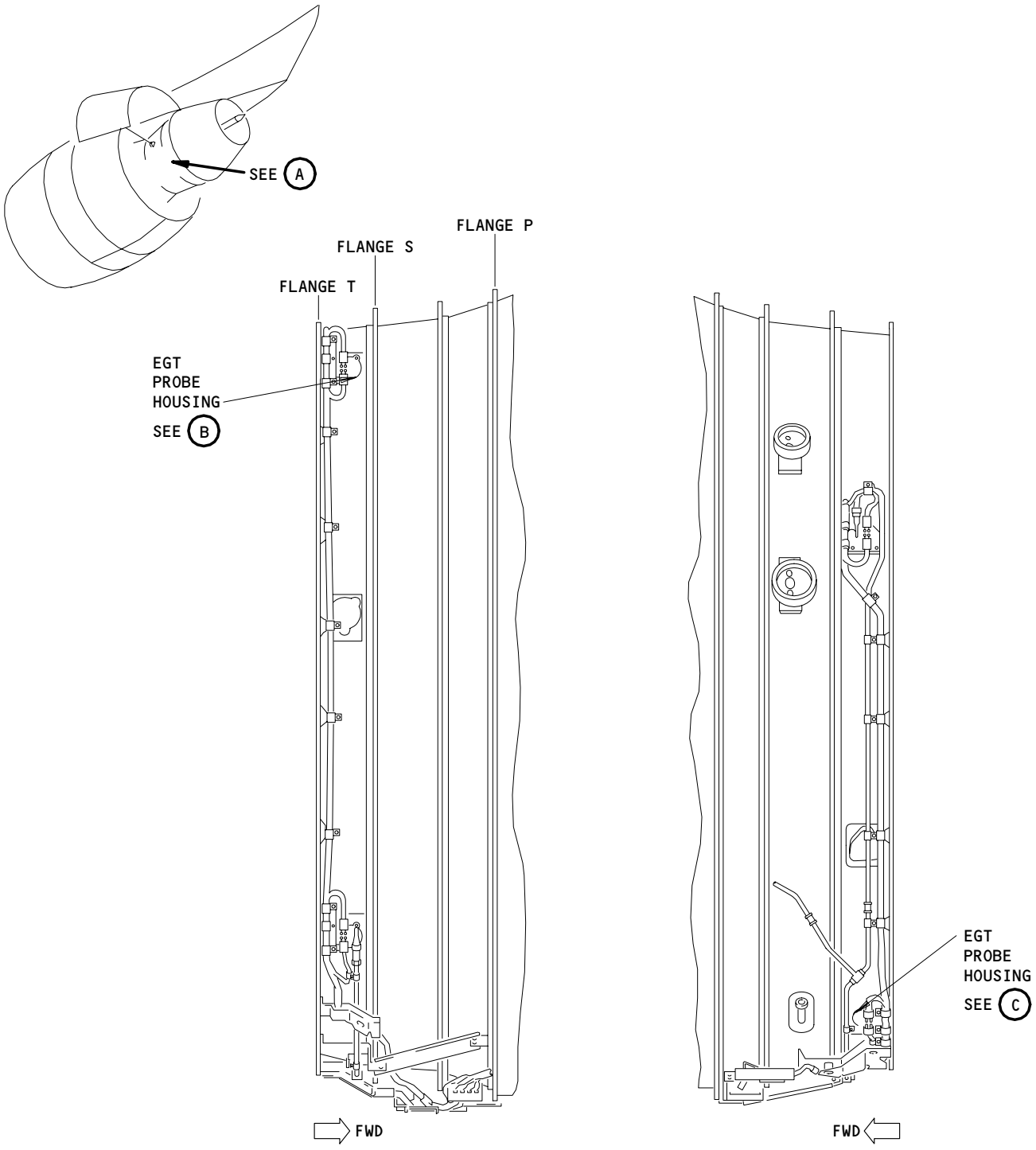
   C. Procedure

      S 044-005-N00

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

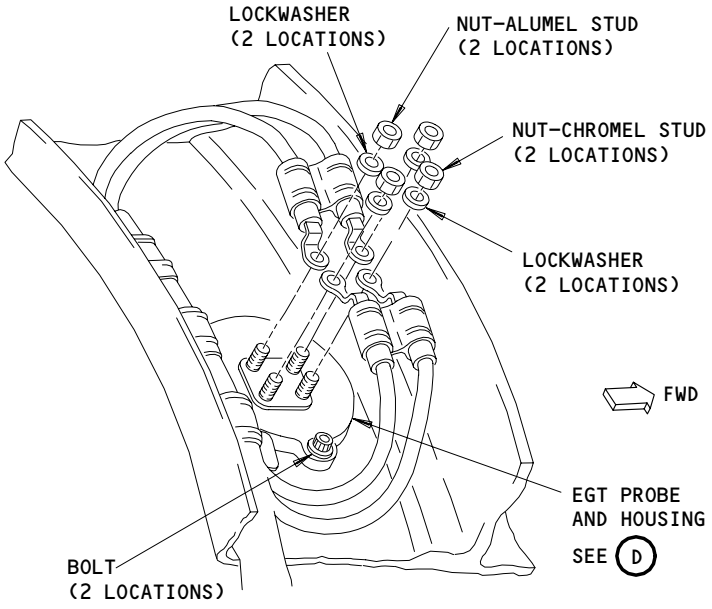
      (1) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-006-N00
      (2) Open the core cowl panels (AMM 71-11-06/201).



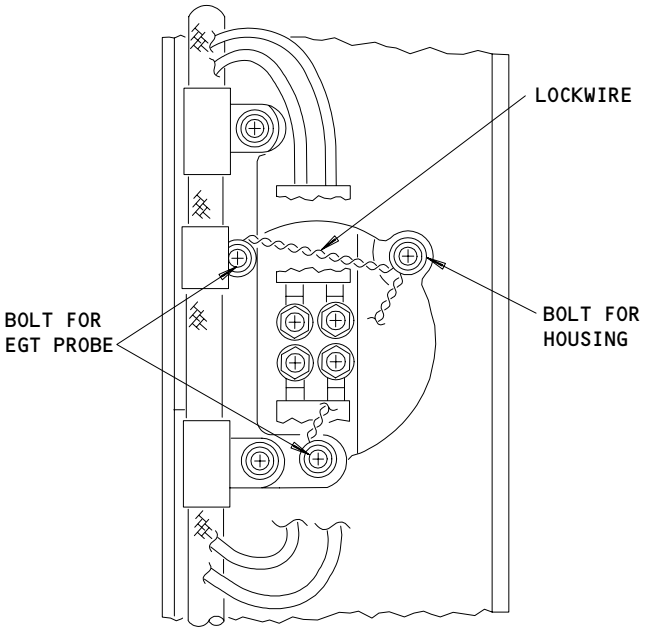
A

EGT Probe Housing Installation
Figure 401 (Sheet 1)



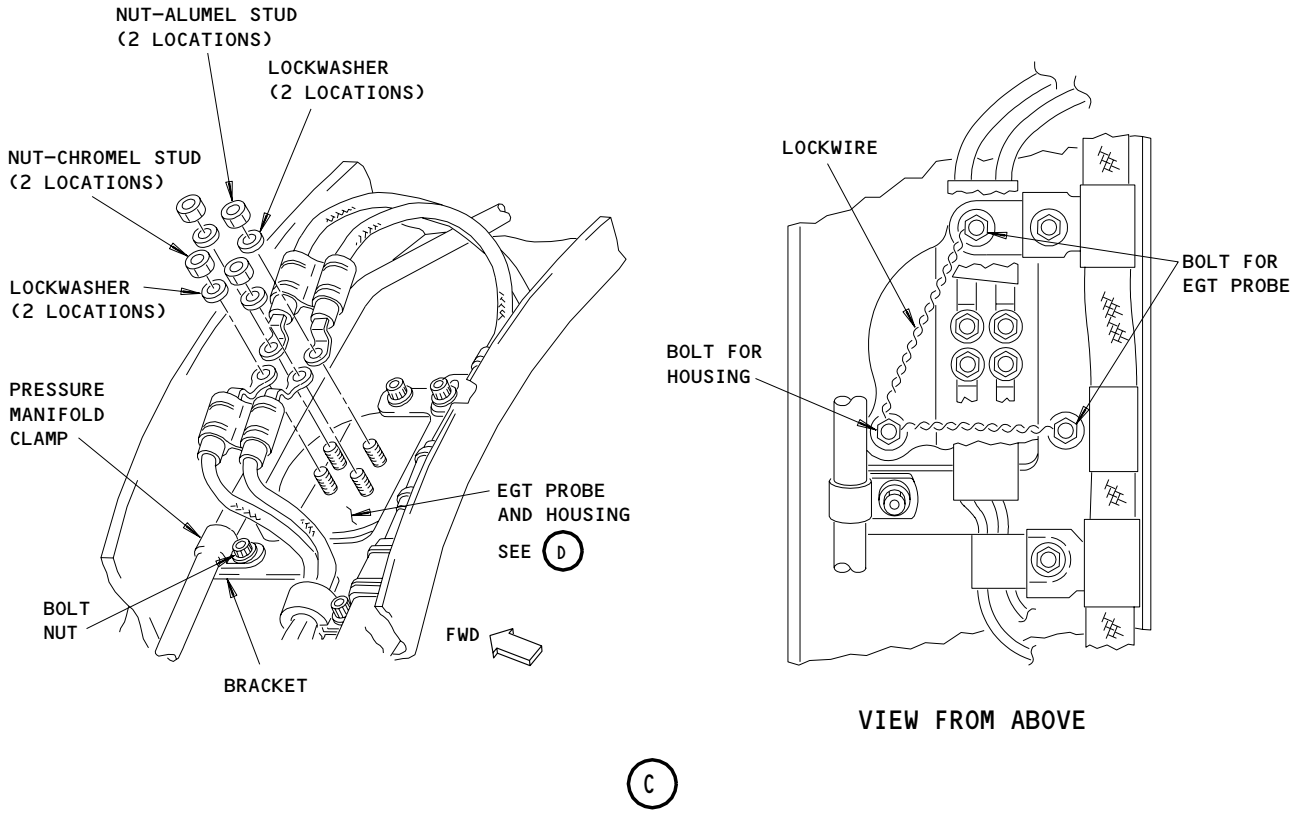
EGT PROBE HOUSING
(1 O'CLOCK POSITION)

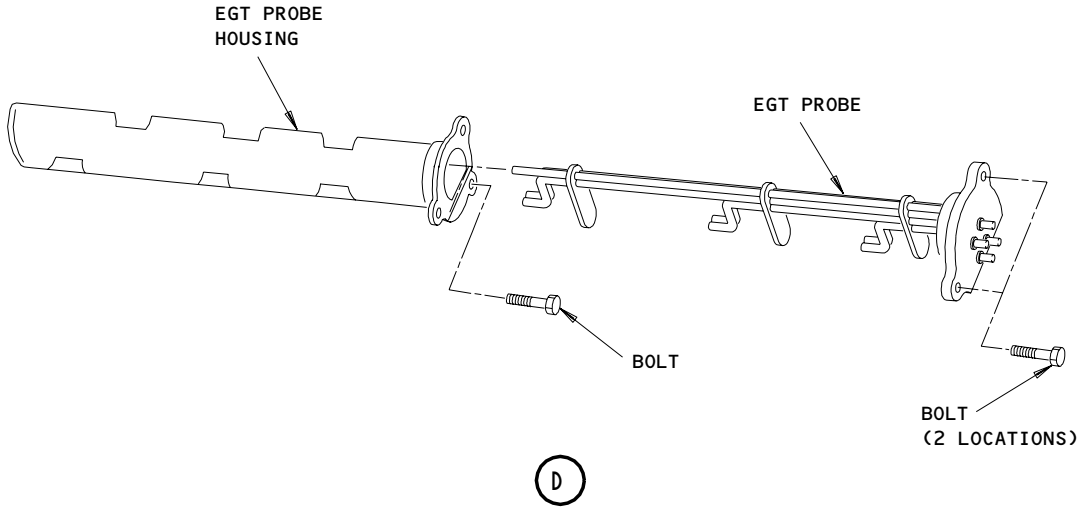
B



VIEW FROM ABOVE

EGT Probe Housing Installation
Figure 401 (Sheet 2)





EGT Probe Housing Installation
Figure 401 (Sheet 3)

S 034-007-N00

(3) Remove the nuts and lockwashers that attach the wires to the EGT probe.
   (a) Remove the wire ends from the EGT probe.

S 014-020-N00

(4) Do the steps that follow to remove the EGT probe housing at the 1 o'clock position:
   (a) Remove the bolts and nuts for the clamps that attach the EGT probe cable to the bracket.
   (b) Remove the lockwire and the bolts that attach the EGT probe and the bracket to the exhaust case.
      1) Move the bracket rearward and remove the EGT probe.

S 014-021-N00

(5) Do the steps that follow to remove the EGT probe housing at the 7 o'clock position:
   (a) Remove the bolt and the nut that attaches the clamp for the pressure manifold, to the bracket on flange T.
   (b) Remove the bolt, nut, and the spacer that attach the clamp for the EGT probe wires.
   (c) Remove the bolt and the nut for the clamp that attaches the EGT probe cable to the bracket.
   (d) Remove the lockwire and the two bolts that attach the EGT probe and bracket to the exhaust case.

      NOTE: Move the EGT probe cable rearward if it is necessary.

      1) Move the bracket rearward and remove the EGT probe.

S 034-011-N00

(6) Remove the remaining bolt that attaches the probe housing to the exhaust case.

S 024-012-N00

(7) Remove the probe housing from the exhaust case.

S 034-009-N00

(8) Install the protection covers on the exhaust case where the EGT probe housing was installed and on the EGT probe.

TASK 77-21-05-404-003-N00

3. Install the EGT Probe Housing (Fig. 401)

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies
170 Greg Street
P.O. Box 1300
Lodi New Jersey 07644 USA

B. References
(1) AMM 71-00-00/501, Power Plant
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System

C. Consumable Materials
(1) D00244 Silver Goop, PWA 36001
(2) G02332 Ferrule, Safety Cable (P05-292)
(3) G02334 Lockwire, AS 3214-02
(4) G02335 Cable, Safety (P05-291)

D. Access
(1) Location Zones
410 Power Plant (Left)
420 Power Plant (Right)

(2) Access Panels
417AL/427AL Core Cowl (Left)
418AR/428AR Core Cowl (Right)

E. Procedure

S 434-015-N00
(1) Remove the protection cover from the exhaust case.

S 424-016-N00
(2) Put the EGT probe housing into the exhaust case and align the holes for the bolts.
(a) Lubricate the threads of the bolt with the Silver Goop.
(b) Install the bolt that attaches the probe housing to the exhaust case.
(c) Tighten the bolt to 54-60 pound-inches (6.1-6.8 newton-meters).

S 424-019-N00
(3) Do the steps that follow to install the EGT probe at the 1 o'clock position:
(a) Install the EGT probe into the exhaust case and align the holes for the bolts.
(b) Align the bracket and install the bolts.
1) Lubricate the threads of the bolts with the Silver Goop.
2) Tighten the bolts to 54-60 pound-inches (6.1-6.8 newton-meters).

3) Install lockwire or the optional safety cable and ferrule to the bolts.

(c) Install the clamps for the EGT probe cable with the bolts and the nuts to the bracket.
1) Lubricate the threads of the bolts with the Silver Goop.
2) Tighten the bolts to 36-40 pound-inches (4.1-4.5 newton-meters).

S 424-018-N00

(4) Do the steps that follow to install the EGT probe at the 7 o'clock position:
(a) Install the EGT probe into the exhaust case and align the holes for the bolts.
(b) Align the bracket and install the two bolts.
1) Lubricate the threads of the bolts with the Silver Goop.
2) Tighten the bolts to 54-60 pound-inches (6.1-6.8 newton-meters).
(c) Attach the clamp for the pressure manifold to the bracket with the bolt and the nut.
1) Lubricate the threads of the bolt with the Silver Goop.
2) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(d) Install the clamp for the EGT probe cable with the bolt and the nut to the bracket.
1) Lubricate the threads of the bolt with the Silver Goop.
2) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).
(e) Install the probe wires to the bracket with the clamp, spacer, bolt, and the nut.
1) Install the spacer between the clamp for the probe wires, which is installed adjacent to the bracket, and the cable clamp.
2) Lubricate the threads of the bolt with the Silver Goop.
3) Tighten the bolt to 36-40 pound-inches (4.1-4.5 newton-meters).

S 434-017-N00

CAUTION: DO NOT TIGHTEN THE NUTS THAT ATTACH THE PROBE WIRES TO MORE THAN THE SPECIFIED TORQUE. TOO MUCH TORQUE ON THE EGT PROBE NUTS CAN LOOSEN OR CAUSE DAMAGE TO THE EGT PROBE STUDS.

(5) Connect the wires to the EGT probe.

NOTE: The EGT probe has two types of studs. One stud has a larger diameter and is made of alumel. The other stud has a smaller diameter and is made of chromel. The stainless steel nuts that attach the probe wires to the studs have different dimensions, thus they are not interchangeable.

(a) Install the lockwashers and the nuts on the probe studs.
1) Tighten the nuts on the alumel studs (the larger nuts) to 18-22 pound-inches (2.0-2.5 newton-meters).
2) Tighten the nuts on the chromel studs (the smaller nuts) to 15-18 pound-inches (1.7-2.0 newton-meters).
3) After the nuts are tightened, make sure the adjacent ends of the cable do not touch.
4) Make sure the ends of the cable do not touch the lockwire or the bolt heads in the area.

S 414-002-N00
(6) Close the core cowl panels (AMM 71-11-06/201).

S 444-022-N00
(7) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 714-001-N00
(8) Do the test of the EGT probe that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

EXHAUST GAS TEMPERATURE THERMOCOUPLE (TT4.95) HOUSING - INSPECTION/CHECK

1. General
   A. This procedure has a check of the Exhaust Gas Temperature (EGT) Thermocouple TT4.95 Housing to make sure it is serviceable.
   B. The Exhaust Gas Temperature (EGT) Thermocouple TT4.95 Housing is referred to as the EGT thermocouple housing in this procedure.

TASK 77-21-05-206-001-N00

2. Do a Check of the Exhaust Gas Temperature (EGT) Thermocouple TT4.95 Housing
   A. References
      (1) AMM 77-21-05/401, EGT Thermocouple Housing
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panels
          417AL/427AL Core Cowl (left side)
          418AR/428AR Core Cowl (right side)

   C. Do a Check of the EGT Thermocouple Housing (Fig. 601).

      S 026-002-N00
      (1) Remove the EGT thermocouple housing (AMM 77-21-05/401).

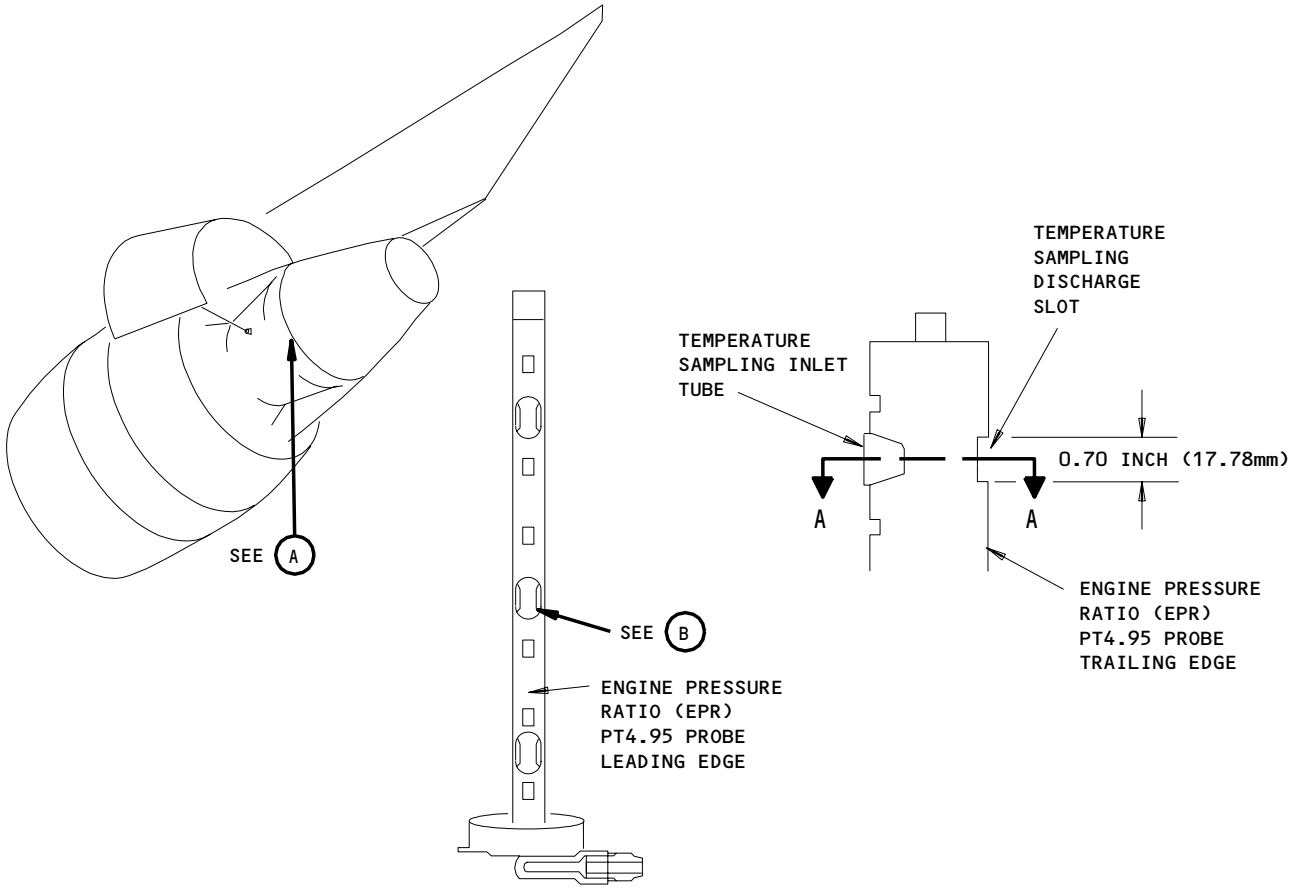
      S 216-003-N00
      (2) Examine the EGT thermocouple housing for cracks and damage.

          NOTE: EGT thermocouple housings with small nicks and damage are serviceable. Those with distortion caused by heat are serviceable if you can use the correct procedure, with no problems, to install them. Do not install EGT thermocouple housings that have cracks.

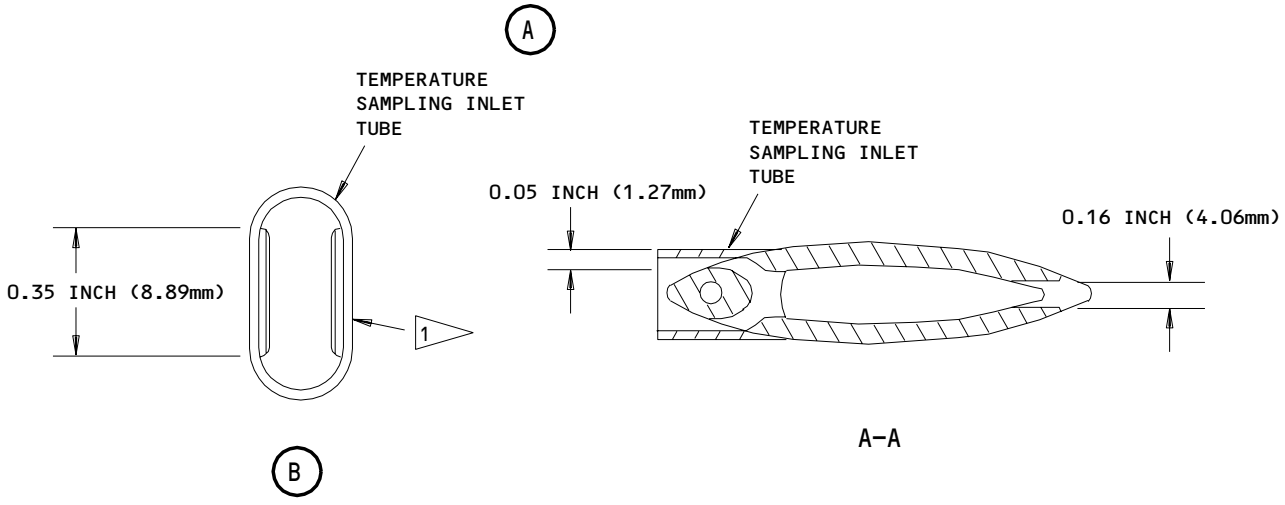
      S 216-004-N00
      (3) Examine the temperature sampling inlet tubes and discharge slots in the EGT thermocouple housing for the blockage.
          (a) Remove the blockage to make sure you can see through the slots in the EGT thermocouple housing.

      S 226-005-N00
      (4) Measure the temperature sampling inlet tubes and discharge slots to make sure they are the dimensions shown in Figure 601.

      S 426-006-N00
      (5) Install the EGT thermocouple housing (AMM 77-21-05/401).



ENGINE PRESSURE RATIO (EPR) PT4.95 PROBE
(FRONT VIEW)



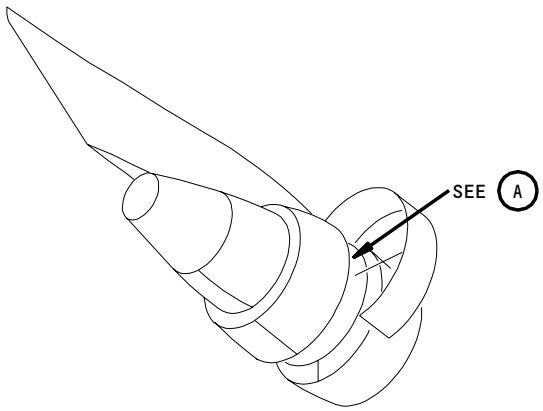
1 YOU MUST SEE 80% OF THE SLOT WHEN YOU LOOK AT THE FRONT OF THE EXHAUST GAS TEMPERATURE (EGT) THERMOCOUPLE TT4.95 HOUSING.

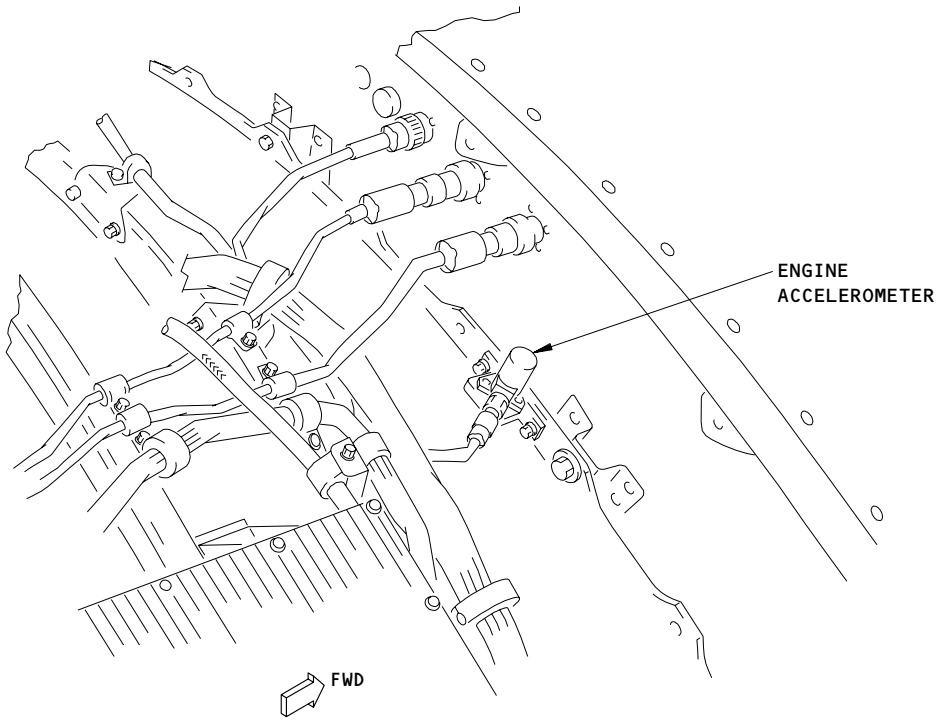
L-A0724

Exhaust Gas Temperature (EGT) Thermocouple TT4.95 Housing Inspection/Check
Figure 601

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - DESCRIPTION AND OPERATION

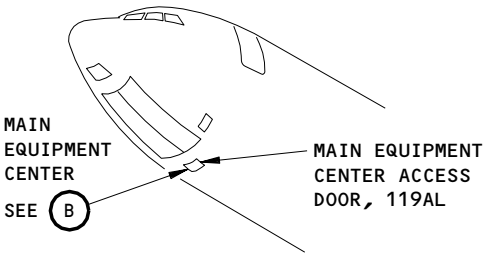
1. General
   A. The system for airborne vibration monitoring (AVM) uses the lower display of the Engine Indication and Crew Alerting System (EICAS) in the flight compartment to indicate the vibration from the engines.
   B. The AVM system displays the engine vibration level. Analysis of these vibrations indicates the condition of the engines. Abnormal engine vibration, sudden or progressive, is positive indication of engine malfunction.
   C. Abnormal vibration could be caused by rotor blade damage, bearing distress, rotor imbalance, damaged accessory drive gears, and other reasons. Early warning of engine malfunction permits repair before major damage results.
   D. The AVM system consists of the components that follow:
      (1) Signal conditioner
      (2) Inlet vibration accelerometer (each engine)
2. Component Details (Fig. 1)
   A. Engine Accelerometer
      (1) The engine accelerometer is located on the A flange of the fan case at about the 12:30 o'clock position. The accelerometer senses engine vibration in terms of engine acceleration in the radial direction and transmits these signals to the signal conditioner.
      (2) The accelerometer consists of a stack of piezo-electric discs and a colinearly mounted seismic mass. The discs and seismic mass are prestressed by an axial steel rod attached to the base of the unit. The whole assembly is enclosed in an hermetically sealed inconel housing.
   B. Signal Conditioner for the Airborne Vibration Monitor
      (1) The signal conditioner for the airborne vibration monitor is located in the E/E equipment compartment. The signal conditioner receives signals from the accelerometer and processes the engine acceleration input and outputs a signal to the EICAS computer proportional to engine vibration.
      (2) The signal conditioner consists of one power supply module, two channel modules, one balancing module, and one data processing module.

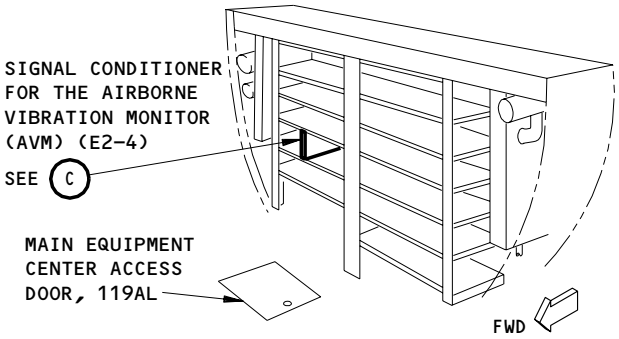




ENGINE ACCELEROMETER
A

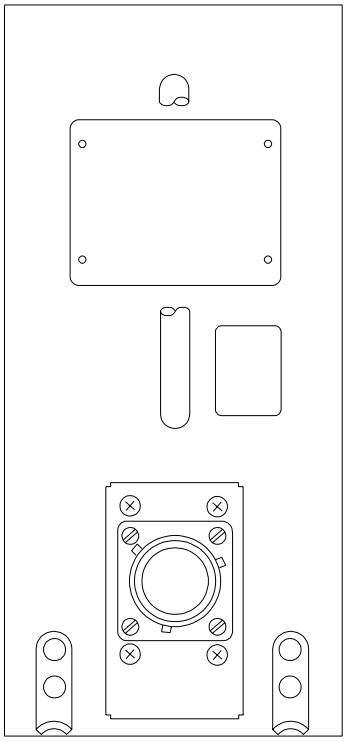
AVM Components
Figure 1 (Sheet 1)





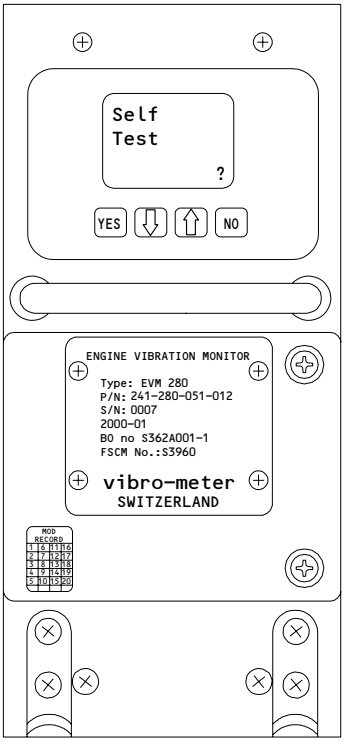
MAIN EQUIPMENT CENTER

B



AVM SIGNAL CONDITIONER
(VIBROMETER S360N021-700 OR -750)

C



AVM SIGNAL CONDITIONER
(VIBROMETER S362A001)

C

AVM Components
Figure 1 (Sheet 2)

(3) The signal conditioner will start a self test each time you apply system power.

(4) AIRPLANES WITH VIBRO-METER S362A001 AVMS;
A 3 line, 8 character per line LED display on the AVM front panel will give the fault history.

(a) The AVM's Built-In Test Equipment (BITE) will give the fault history.

(b) Push and release one of the four buttons on the front panel of the AVM signal conditioner to do a self test of the AVM signal conditioner. Only the AVM signal conditioner is tested. The procedure to do a self test of the AVM signal conditioner is given in the adjustment/test (AMM 77-31-00/501).

(c) The procedure to read the fault history is given in the maintenance practices (AMM 77-31-00/201).

C. Engine Vibration Indication

(1) The engine vibration indication is part of the EICAS lower display located on the pilot's center instrument panel (P2). Both engines use the same display which has a separate scale for the vibration level for each engine.

(2) The EICAS display receives signals from the signal conditioner and provides them for each engine on the vibration level scales.

3. Operation

A. Functional Description

(1) System for the Airborne Vibration Monitoring (AVM)

(a) The signal conditioner operates on 115 volts ac power.

(b) With the engines operating, the accelerometers sense the engine vibration in the radial direction. The charge signal at the output of the accelerometer is coupled to a charge amplifier in the input circuits of the signal conditioner installed in the aircraft.

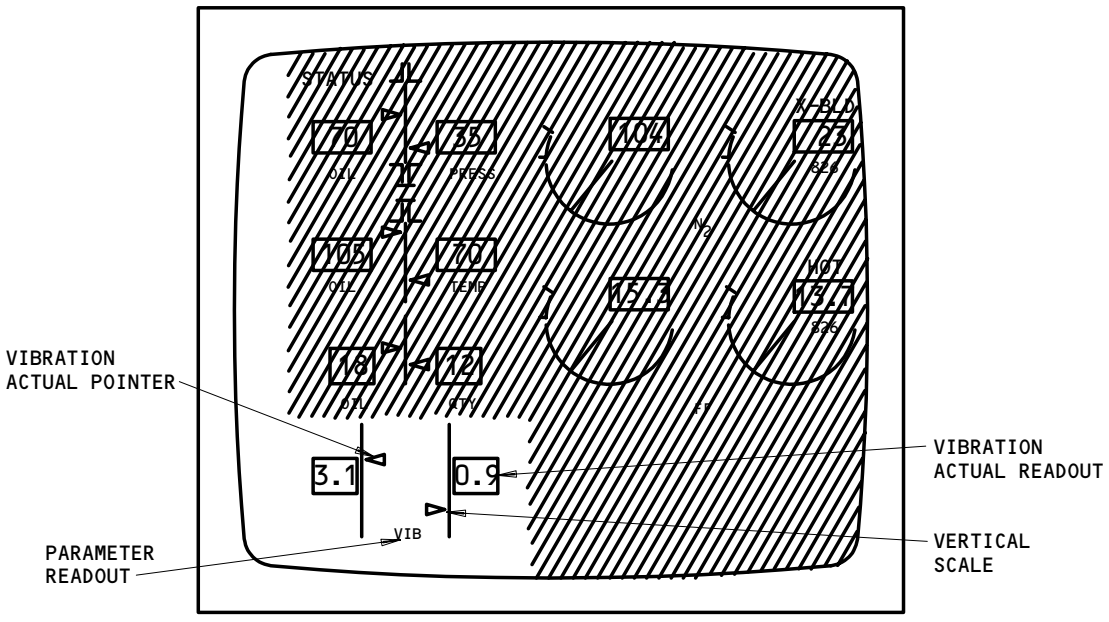
(2) Vibration Display Description (Fig. 2)

(a) Engine vibration parameters are displayed directly beneath the oil quantity parameters by two vertical scales that are white with triangular analog pointers.

(b) Parameter (VIB) readout is positioned below and between the two vertical scales.

(c) Vibration actual readout is a white numeric readout enclosed in a white box. It is displayed outside each vertical scale.

(d) Vibration actual pointer is a white triangular shaped pointer positioned on the inside of each vertical scale to provide actual vibration information.



LOWER EICAS DISPLAY

Vibration Display Description
Figure 2

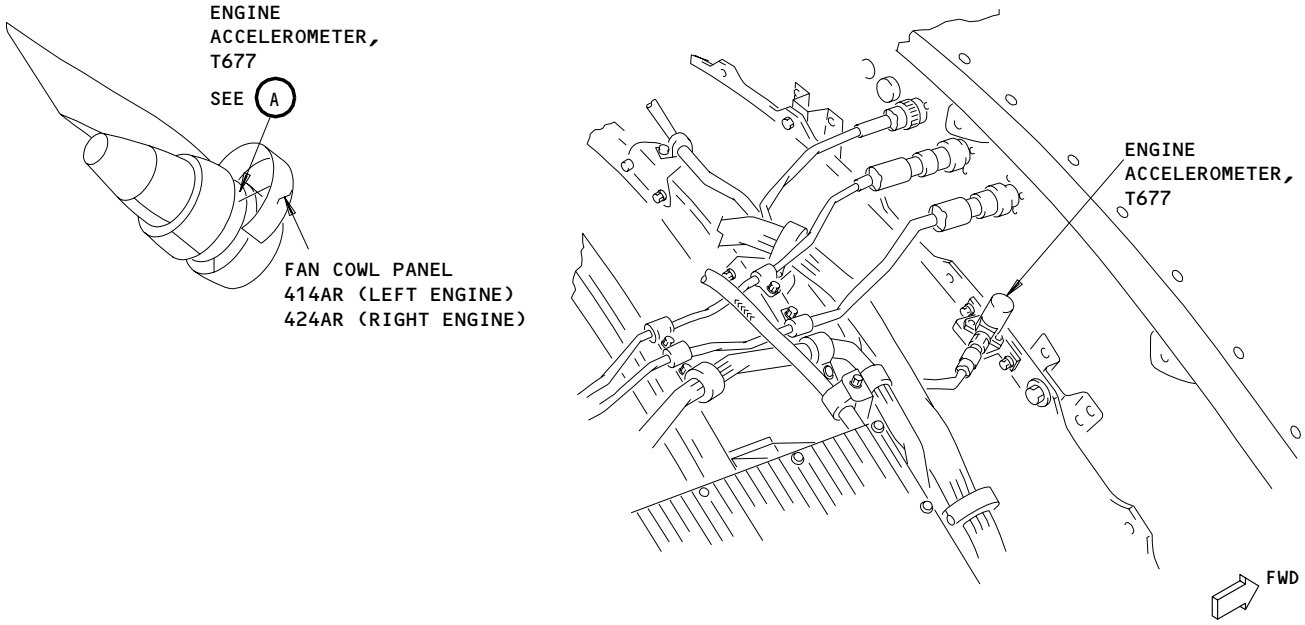
287429

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACCELEROMETER - L ENGINE, T677	--	1	414AR, RIGHT FAN COWL PANEL	77-31-01
ACCELEROMETER - R ENGINE, T677	--	1	424AR, RIGHT FAN COWL PANEL	77-31-01
CIRCUIT BREAKER -	--		FLT COMPT, P11	
VIB MONITOR, C1464		1	11K1	*
COMPUTER - (FIM 31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
CONDITIONER - AIRBORNE VIBRATION MONITOR (AVM) SIGNAL, M132	--	1	119AL, MAIN EQUIP CTR, E2-4	77-31-03

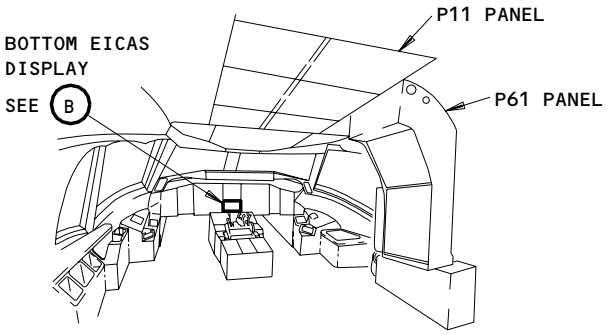
* SEE THE WDM EQUIPMENT LIST

Airborne Vibration Monitoring (AVM) System - Component Index
Figure 101

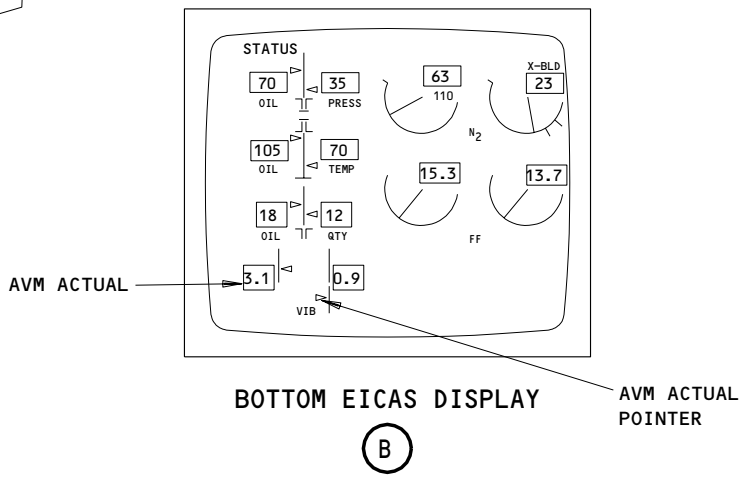


ENGINE ACCELEROMETER, T677

A



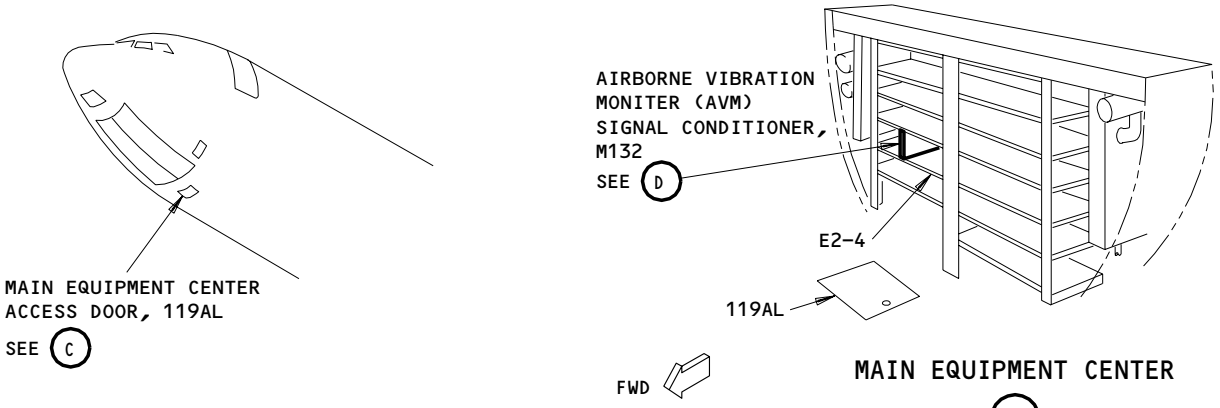
FLIGHT COMPARTMENT



BOTTOM EICAS DISPLAY

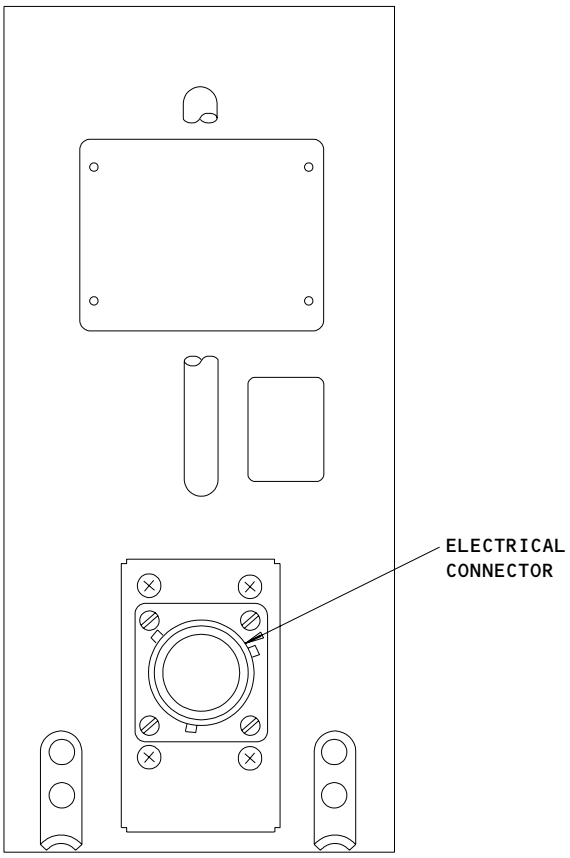
B

Airborne Vibration Monitoring (AVM) System – Component Location
Figure 102 (Sheet 1)



MAIN EQUIPMENT CENTER

C



AVM SIGNAL CONDITIONER, M132

D

Airborne Vibration Monitoring (AVM) System - Component Location
Figure 102 (Sheet 2)

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM

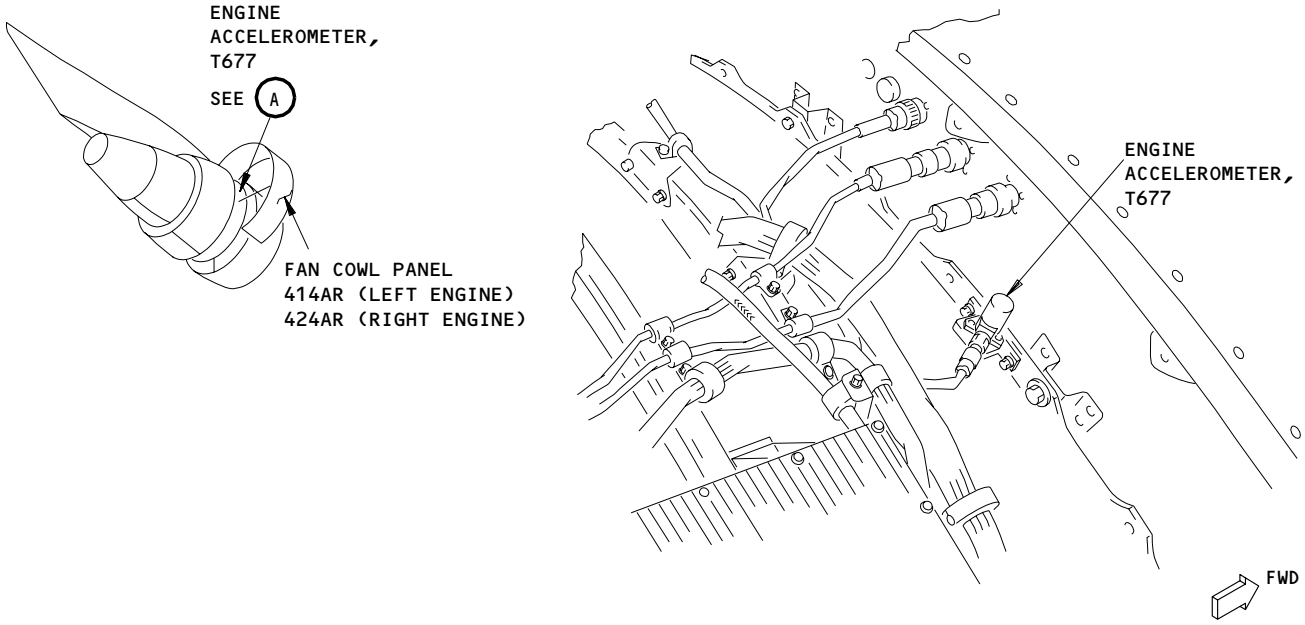
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACCELEROMETER - L ENGINE, T677	--	1	414AR, RIGHT FAN COWL PANEL	77-31-01
ACCELEROMETER - R ENGINE, T677	--	1	424AR, RIGHT FAN COWL PANEL	77-31-01
CIRCUIT BREAKER -	--		FLT COMPT, P11	
VIB MONITOR, C1464		1	11K1	*
COMPUTER - (FIM 31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
CONDITIONER - AIRBORNE VIBRATION MONITOR (AVM) SIGNAL, M132	--	1	119AL, MAIN EQUIP CTR, E2-4	77-31-03

* SEE THE WDM EQUIPMENT LIST

Airborne Vibration Monitoring (AVM) System - Component Index
Figure 101

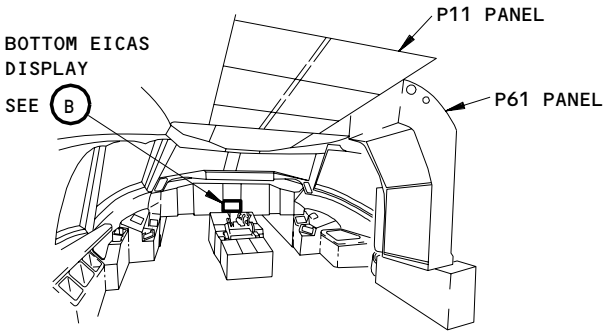
EFFECTIVITY
AIRPLANES WITH S362A001 UNIVERSAL AVM SIGNAL CONDITIONER

M59379

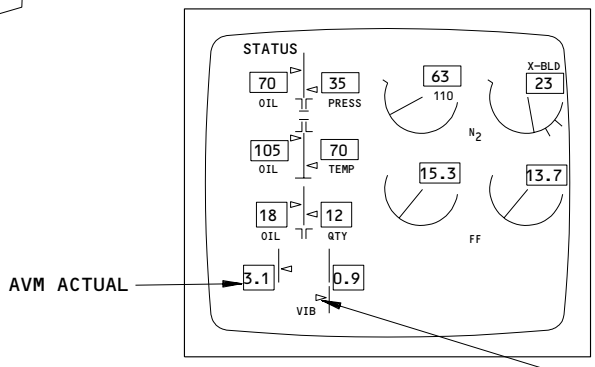


ENGINE ACCELEROMETER, T677

A



FLIGHT COMPARTMENT



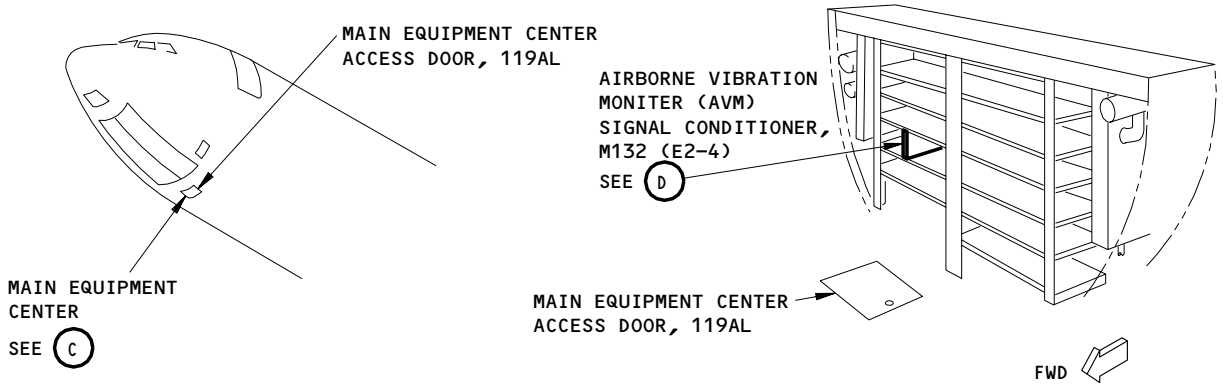
BOTTOM EICAS DISPLAY

B

Airborne Vibration Monitoring (AVM) System – Component Location
Figure 102 (Sheet 1)

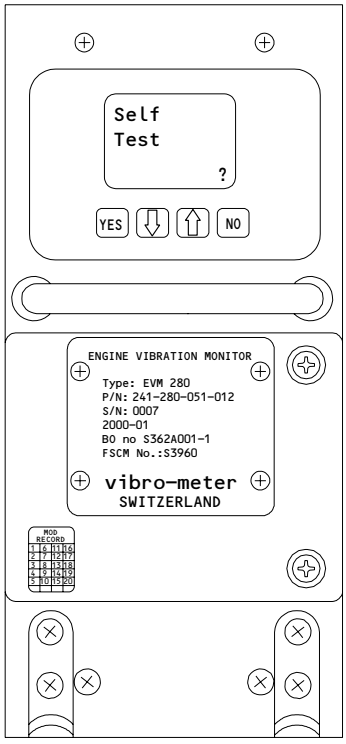
EFFECTIVITY
AIRPLANES WITH S362A001 UNIVERSAL AVM
SIGNAL CONDITIONER

M59381



MAIN EQUIPMENT CENTER

C



AVM SIGNAL CONDITIONER, M132

D

Airborne Vibration Monitoring (AVM) System - Component Location
Figure 102 (Sheet 2)

EFFECTIVITY
AIRPLANES WITH S362A001 UNIVERSAL AVM
SIGNAL CONDITIONER

M59388

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - MAINTENANCE PRACTICES

1. General
   A. This procedure contains this task:
      (1) AVM SIGNAL CONDITIONER VIBRO-METER;
          The system test for the airborne Vibration Monitoring (AVM) System

   TASK 77-31-00-772-001-N00

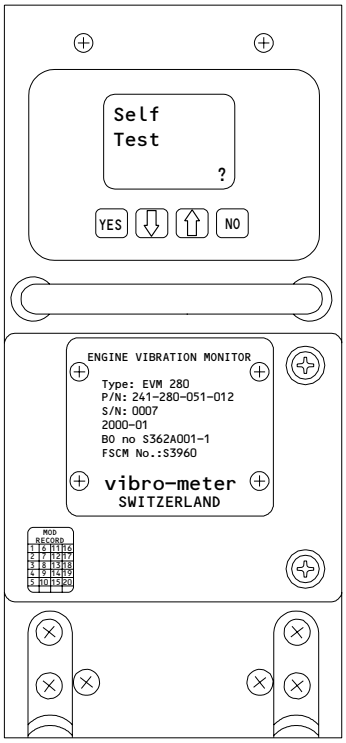
2. AIRPLANES WITH THE 362A001 UNIVERSAL AVM SIGNAL CONDITIONER;
   Airborne Vibration Monitoring (AVM) System - System Test
   A. General
      (1) This task is the system test procedure for the universal airborne vibration monitoring (AVM) system.
      (2) Use this procedure for the AVM signal conditioner with this part number:
          (a) Boeing part number - S362A001.
          (b) Supplier part number - Vibro-meter P/N 241-280-051-012
      (3) This AVM signal conditioner has a digital display of three lines of eight (8) characters in each line.
      (4) This procedure uses the Built-In Test Equipment in the AVM signal conditioner.
      (5) The AVM signal conditioner shows the Built-In Test Equipment Maintenance Messages first and then the flight history.
      (6) This procedure refers to the Built-In Test Equipment as the BITE.
   B. References
      (1) FIM 77-31-00/101, Airborne Vibration Monitoring (AVM) System
   C. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Control Cabin

      (2) Access Panel
          119AL Main Equipment Center

   D. Prepare to Read the BITE Maintenance Messages

      S 862-002-N00
      (1) Make sure that this circuit breaker is closed:
          (a) Circuit Breaker Panel, P11
              1) 11K1, VIB MONITOR

      S 012-003-N00
      (2) Open the Main Equipment Center Access Door, 119AL.



AVM SIGNAL CONDITIONER

Universal AVM
Figure 201

E. Read the BITE Maintenance Messages

S 742-004-N00

(1) Push and release one of the four buttons to show Self Test? on the front display of the AVM signal condidtioner.

NOTE: If faults are present press the YES button to view faults then scroll using the Up and Down Arows.
You can move up or down the Self Test? menue with UP or DOWN ARROW buttons, but can only exit with the NO button.

(a) From the Self Test? display, push and release the YES button to show Fault History? on the AVM signal conditioner.
(b) After Fault History?, push and release the YES button to show XX Faults?/on the front display of the AVM signal conditioner.

NOTE: The XX refers to the total number of faults in storage memory. If No Fault message is displayed, there are no BITE maintenance message to view.

1) Push and release the YES button to show the first fault.
2) The following table shows the possible displays and the explanation of each.

BITE MAINTENANCE MESSAGES	
MAINTENANCE MESSAGES	DESCRIPTION
No Fault *[1]	No Faults in Non-Volatile Memory
XX Faults Display? *[1]	XX=Total Number of Stored Faults
Fault YY *[1] *[2]	YY=Fault Number
AVM Syst Fault ZZ *[3]	ZZ=Fault Code

*[1] Display message only
*[2] Fault YY is the fault number
*[3] ZZ is the fault code

(c) Record this BITE maintenance message before you show subsequent BITE maintenance message.
(d) Push and release the DOWN ARROW button to show the next stored BITE maintenance message.
1) Record each BITE maintenance sessage before you show subsequent BiTE maintenance messages.

2) If you push and release the DOWN ARROW button after the last BITE maintenance message, the first BITE maintenance message will show on the front display of the AVM signal conditioner.

(e) When you have recorded all stored BITE maintenance messages, Push and release the NO button to show Clear Faults Memory?.

NOTE: Record all of the BITE Maintenande messages before you push the YES Button again. You will erase all the BITE Maintenance messages when you push the YES Button with Clear Faults Memory? on the display.

(f) After Clear Faults Memory? display shows:

1) Push and release the YES button again to clear faults.

NOTE: The BITE maintenance messages will not be erased unless the YES button is pushed while Clear Faults Memory? shows on the front of the AVN signal condidtioner.

2) If you do not want to continue, if you want to keep the BITE maintenance messages or you want to interrogate the flight history, do the following steps.

a) Push and release the NO button again to show the main menu.

NOTE: The AVM signal conditioner can keep 32 BITE maintenance messages in the storage memory.

(g) If there are BITE maintenance messages, do the applicable corrective action that shows in Fig. 202.

F. Read the Flight History

S 972-005-N00

(1) Do these steps to read the flight history:

NOTE: The AVM records the highest vibration level of all the engine rotors.

FAULT MESSAGE	FAULT DESCRIPTION	CORRECTION
N1 TACH LOSS EX	E1/E2 TACHO LOSS N1	EXAMINE THE CIRCUITS FROM THE AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132, TO THE EEC, M7198 (WDM 77-12-11; WDM 77-31-11). REPAIR THE PROBLEMS THAT YOU FIND. ENG CONNECTOR PIN TO CONNECTOR PIN L D2708A A8 D11686 A B8 E R D2708B A8 D11686 A B8 E IF THE PROBLEM CONTINUES, REPLACE THE AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132 (AMM 77-31-03/401).
N2 TACH LOSS EX	E1/E2 TACHO LOSS N2	EXAMINE THE CIRCUITS FROM THE AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132, TO THE L (R) ENGINE SPEED CARD, M1093 (M1092) (WDM 77-12-12; WDM 77-31-11). REPAIR THE PROBLEMS THAT YOU FIND. ENG CONNECTOR PIN TO CONNECTOR PIN L D2708A C10 D10064 9 D10 13 R D2708B C10 D10062 9 D10 13 IF THE PROBLEM CONTINUES, REPLACE THE AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132 (AMM 77-31-03/401).
XX (WHERE XX IS A 2 DIGIT NUMERIC CODE 00 THROUGH 49	INTERNAL SIGNAL CONDITION MONITOR FAULT	AVM SYSTEM FAULT CODE 06 MAY INDICATE NON-VALID AIRPLANE TYPE; COMPARE AVM CONNECTOR TO THE WIRING DIAGRAM (WDM 77-12-11). FOR ALL OTHER 2 DIGIT NUMERIC CODES REPLACE SIGNAL CONDITION MONITOR (AMM 77-31-03/401).
A HIGH NOISE EX	E1/E2 ACC A HIGH NOISE	EXAMINE THE ENGINE ACCELEROMETER AND CABLE FOR LOOSE MOUNTING SCREWS, CLAMPS AND DAMAGE. IF PROBLEMS FOUND, REPLACE THE ENGINE ACCELEROMETER, T677 (AMM 77-31-01/401). IF THE PROBLEM CONTINUES, EXAMINE THE CIRCUIT FROM THE ENGINE ACCELEROMETER, T677, CONNECTOR D10994, PINS, 1 AND 2, TO THE AVM SIGNAL CONDITIONER, M132, CONNECTOR D270B, PINS, A15 AND A14 (PINS, C15 AND D15). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEM CONTINUES, REMOVE THE L (R) EICAS COMPUTER, M10181 (M10182)(AMM 31-41-02/401). EXAMINE THE CIRCUIT FROM THE AVM SIGNAL CONDITIONER, M132 CONNECTOR D2708B, PINS, A8 AND B8, TO THE EICAS COMPUTER, M10181 (M10182), CONNECTOR D881A (D883A), PINS, F1 AND F2 (WDM 77-31-11). REPAIR THE PROBLEMS THAT YOU FIND. INSTALL THE EICAS COMPUTERS.
B HIGH NOISE EX	E1/E2 ACC B HIGH NOISE	
AB NOT EQUAL EX	E1/E2 ACC A ≠ ACC B	
1/REV LOSS EX	MISSING 1/REV MARKER PULSE FROM N1 TACHOMETER.	REPLACE THE N1 SPEED TRANSDUCER FOR THE ENGINE (AMM 73-21-06/401).

TABLE 101

Airborne Vibration Monitor Interrogation Procedure
Figure 202

FLIGHT HISTORY		
WHAT BUTTON ON THE AVM SIGNAL CONDITIONER TO PUSH	FRONT DISPLAY OF THE AVM SIGNAL CONDITIONER	DESCRIPTION OF FRONT DISPLAY
One of the four buttons.	Self-Test?	Sequence Start for self-test
NO button	Fault History?	Fault History
NO button	Flight History?	Sequence Start for flight history
YES button	XX Flights Display? *[1] or NO Flight Data	Total number of flights or no data
YES button	Flight XX? *[2]	Flight number, XX = 0-31
YES button	FXX E1 *[3] *[4] FAN n.nn *[6] N1 yyy % *[5]	Engine 1 (E1) *[4] N1 vibration - E1 N1 Speed (%) - E1
DOWN button	N2 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E1 yy.y = Time in hours from Power-up
DOWN button	Fxx E1 *[3] *[4] N1 n.nn *[6] N2 n.nn *[6]	Engine 1 - E1 *[4] N2 Vibration - E1 N1 Vibration - E1
DOWN button	N1 yyy% *[5] N2 yyy% *[5] T yy.y h *[7]	N1 Speed (%) - E1 N2 Speed (%) - E1 yy.y = Time in hours from power-up

FLIGHT HISTORY		
WHAT BUTTON ON THE AVM SIGNAL CONDITIONER TO PUSH	FRONT DISPLAY OF THE AVM SIGNAL CONDITIONER	DESCRIPTION OF FRONT DISPLAY
To see Engine 1 (E1) data for other flights push and release the DOWN button until you get to the flight number you want to see.		
NO button	FXX E2 *[3] *[4] FAN n.nn *[6] N1 yyy % *[5]	Engine 2 (E2) *[4] N1 vibration - E2 N1 Speed (%) - E2
DOWN button	N2 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E2 yy.y = Time in hours from power-up
DOWN button	Fxx E2 *[3] *[4] N1 n.nn *[6] N2 n.nn *[6]	Engine 2 - E2 *[4] N2 Vibration - E2 N1 Vibration - E2
DOWN button	N1 yyy% *[5] N2 yyy% *[5] T yy.y h *[7]	N1 Speed (%) - E2 N2 Speed (%) - E2 yy.y = Time in hours from power-up
To see Engine 2 (E2) data for other flights push and release the DOWN button until you get to the flight number you want to see.		

*[1] Total number of flights, XX = 1 to 32
*[2] Last flight is Flight 0, the flight before is Flight 1 to Flight 31
*[3] FXX = Flight number 0 to 31
*[4] E1 is Engine 1; E2 is Engine 2
*[5] yyy% is the percent RPM measured for the N1 and N2 shaft
*[6] n.nn is vibration in scalar units (0.00 to 5.00)
*[7] Elapsed time from engine start in hours

(a) If the AVM is turned off, use the following steps to find the Flight History? display, otherwise use the NO button to view the main menu to find the Flight History? display.

(b) Push and release one of the four buttons to show Self Test? on the front display of the AVM signal conditioner.

NOTE: The NO button is used to review all the main menus.

(c) After Self Test?, push and release the NO button to show Fault History? on the front display of the AVM signal conditioner.

NOTE: If Fault History? is displayed, see the BITE maintenance message steps above.

(d) After Fault History?, push and release the NO button to show Flight History? on the front display of the AVM signal conditioner.

NOTE: The flight history will not be erased unless the YES button is pushed after Clear Flight Memory? is displayed on the front display of the AVM signal conditioner. The AVM signal conditioner can keep 32 flights in the storage memory. The YES button is used to review each menu.

(e) After Flight History?, push and release the YES button to show XX Flights Display? on the front display of the AVM signal conditioner.

NOTE: The XX refers to the total number of flights in storage memory. If No Flight Data shows, there is no flight history to view. After No Flight Data, if the NO button is pushed the front display will show Balance?.

(f) After XX Flights Display?, push and release the YES button to show Flight XX? on the front display of the AVM signal conditioner.

(g) After Flight XX?, push and release the YES button to show the most recent flight history data for engine 1 that was set.

NOTE: The UP or DOWN ARROW button can be used to review all the flight history data for engine 1.

1) Record the flight history data that you want.

(h) If you are done looking at flight history data for engine 1, push and release the NO button to show the most recent flight history data for engine 2 that was set.

NOTE: The UP or DOWN ARROW button can be used to review all the flight history data for engine 2.

1) Record the flight history data, that you want, before you get the subsequent flight history data.

(i) Push and release the NO button to show the subsequent flight number message that was set.
1) If you push and release the DOWN ARROW button after the last flight history data, the most recent flight history data will show on the front display of the AVM signal conditioner.

(j) If you want to erase the Flight History data, push and release the NO button to show Clear Flight Memory? on the front display of the signal conditioner. Then press and release the YES button to clear Flight History Memory for both engines, and show Flight Memory Cleared on the front display.

NOTE: Record all of the Flight History data before you push the YES button. You will erase all of the Flight History data when you push the YES button with Clear Flight Memory? on the display.
After Clear Flight Memory?, if the NO button is pushed again the display will read Balance?.

1) To do a engine trim balance using the information in the Balance? menu see:
Engine Trim Balance with the Universal Airborne Vibration Monitor (AMM 72-31-00/501).

S 412-006-N00

(2) Close the Main Equipment Center Access Door, 119AL.

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure does a check of the airborne vibration monitoring (AVM) system to make sure it is serviceable.
   B. You must operate only one engine when you do this test.
   C. The airborne vibration monitoring (AVM) system is referred to as the AVM system in this procedure.

TASK 77-31-00-705-016-N00

2. Airborne Vibration Monitoring (AVM) System Test
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-00-00/201, Power Plant
   B. Access
      (1) Location Zone
          211/212 Flight Compartment

   C. Do the Test for the Airborne Vibration Monitoring (AVM) System.

      S 865-003-N00
      (1) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
          (a) 11K1, VIB MONITOR

      S 865-004-N00
      (2) Supply electrical power (AMM 24-22-00/201).

      S 715-005-N00
      (3) Make sure ENG VIB BITE does not show on the bottom EICAS display.

      S 865-001-N00

      WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

      (4) Use the Power Plant Operation (Normal) procedure to start the engine (AMM 71-00-00/201).

          NOTE: Operate only one engine for this test.

      S 865-006-N00
      (5) Operate the engine at the minimum power.

      S 865-017-N00
      (6) Push the PERF/APU DISPLAY SELECT switch on the right side panel, P61.

S 715-009-N00

(7) Make sure the VIB indications (N1, N2, and BB) for the applicable engine show on the EICAS display.

S 715-014-N00

(8) Make sure the EICAS message ENG VIB BITE does not show on the EICAS display.

S 865-015-N00

(9) Use the Power Plant Operation (Normal) procedure to shut-down the engine (AMM 71-00-00/201).

S 865-018-N00

(10) Remove electrical power (AMM 24-22-00/201).

TASK 77-31-00-715-020-N00

3. Universal Airborne Vibration Monitor (AVM) Signal Conditioner - Self Test

A. General

(1) This task is the self test procedure for the Vibro-Meter S362A001 Universal Airborne Vibration Monitor (AVM).

(2) This procedure refers to the Built-In Test Equipment as the BITE.

(3) The self test does a check of the AVM signal conditioner.

(a) The self test makes sure that the AVM signal conditioner operates correctly.

(b) The self test does not display BITE maintenance messages or flight history.

B. Access

(1) Location Zones

119/120	Main Equipment Center
211/212	Control Cabin

(2) Access Panels

119AL	Main Equipment Center

C. Prepare to Do the Self Test of the AVM Signal Conditioner

S 865-021-N00
(1) Supply electrical power (AMM 24-22-00/201).

S 865-022-N00
(2) Make sure that this circuit breaker on the overhead panel P11 is closed:
(a) 11K2, VIB MONITOR

S 015-023-N00
(3) Open the main equipment center access door, 119AL.

D. Do the Self Test of the AVM Signal Conditioner

S 745-024-N00
(1) Do these steps to do a self test of the AVM signal conditioner:
(a) Make sure that the VIB indicators on the EICAS maintenance page show 0 ±0.1 units.

NOTE: If the circuit breaker is closed, the VIB indicators on the EICAS maintenance page will show 0. If the circuit breaker was open, the VIB indicators on the EICAS maintenance page will not show.

(b) Make sure that the VIB indicators on the MCDP/MSG maintenance page show 0 ±0.1 units.

NOTE: If the circuit breaker is closed, the VIB indicators on the MCDP/MSG maintenance page will show 0. If the circuit breaker was open, the VIB indicators on the MCDP/MSG maintenance page will not show.

(c) Push and release one of the four buttons on the front display of the AVM signal conditioner. This will turn on the front panel display.
1) If the front display on the AVM signal conditioner is blank, replace the AVM signal conditioner and do the self test again.
(d) The AVM signal conditioner will show Self Test?.
(e) Push and release the YES button on the front display of the AVM signal conditioner.
(f) The AVM signal conditioner will show the hardware and software versions for 12 seconds, then show Test in progress for approximately two seconds.

NOTE: Make sure the third line of the display reads PW 4000. If not, then do the corrective action for the fault message "CONFIG FAULT" (AMM 77-31-00/201).

(g) Make sure that the AVM signal conditioner shows Test OK.

NOTE: The AVM signal conditioner passed the self test. After Test OK, push and release the NO button to show Fault History? on the front display of the AVM signal conditioner. If the AVM signal conditioner is left alone for 5 minutes, the display will then turn off.

(h) If the AVM signal conditioner shows XX Faults Display? or is blank, there is a failure of the AVM signal conditioner system.

NOTE: XX is the total number of faults.

1) If the front display on the AVM signal conditioner is blank, replace the AVM signal conditioner and do the self test again.
2) If there are XX Faults Display?, do the system test for the Airborne Vibration Monitoring (AVM) System (AMM 77-31-00/201).

ENGINE ACCELEROMETER - REMOVAL/INSTALLATION

1. General
   A. This procedure supplies instructions for the removal and installation of the engine accelerometer. The engine accelerometer is installed on the fan case at the 1:00 o'clock position.

   TASK 77-31-01-004-002-N00

2. Remove the Engine Accelerometer (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zone
          411 Left Engine
          421 Right Engine

      (2) Access Panel
          414AR Fan Cowl Panel (RH)
          424AR Fan Cowl Panel (RH)

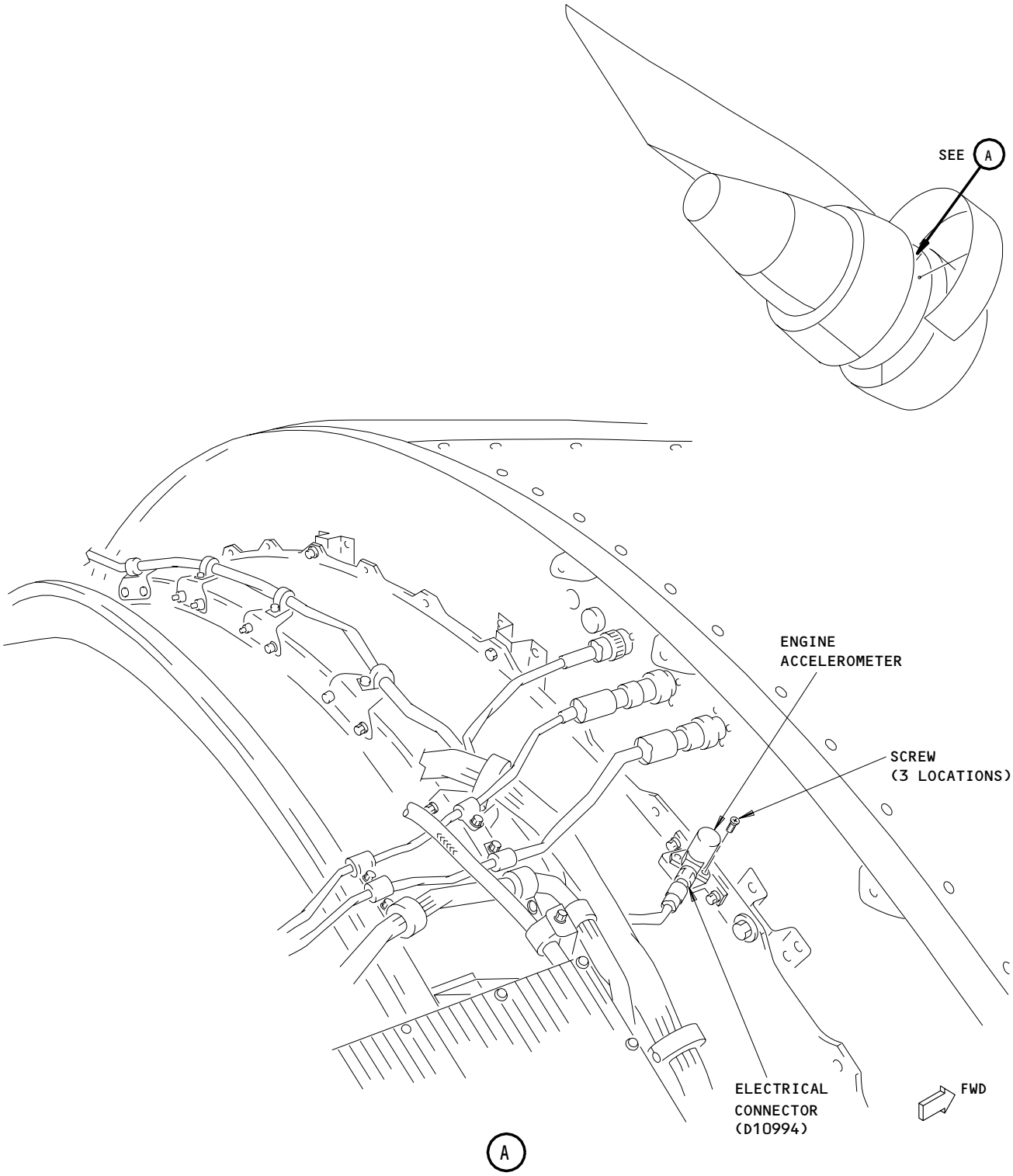
   C. Procedure

      S 864-003-N00
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tag:
          (a) 11K1, VIB MONITOR

      S 014-004-N00
      (2) Open the right fan cowl panel (AMM 71-11-04/201).

      S 034-005-N00
      (3) Disconnect the electrical connector from the engine accelerometer.

      S 034-006-N00
      (4) Install covers on the electrical connectors.



Engine Accelerometer Installation
Figure 401

S 024-007-N00
(5) Remove the screws that attach the engine accelerometer to the fan case.

S 024-008-N00
(6) Remove the engine accelerometer from the engine.

TASK 77-31-01-404-009-N00

3. Install the Engine Accelerometer (Fig. 401)

A. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 77-31-00/501, Airborne Vibration Monitoring System

B. Access
(1) Location Zone
411 Left Engine
421 Right Engine

(2) Access Panel
414AR Fan Cowl Panel (RH)
424AR Fan Cowl Panel (RH)

C. Procedure

S 424-010-N00
(1) Put the engine accelerometer on the bracket on the fan case so that the electrical connector points aft.

S 424-011-N00
(2) Attach the engine accelerometer to the bracket with the screws.

S 424-012-N00
(3) Tighten the screws to 15-17 pound-inches (1.7-1.9 newton-meters).

S 424-013-N00
(4) Install the lockwire on the screws.

S 434-014-N00
(5) Remove the covers from the electrical connectors.

S 434-015-N00
(6) Connect the electrical connectors to the engine accelerometer.

S 414-016-N00
(7) Close the right fan cowl panel (AMM 71-11-04/201).

S 864-017-N00
(8) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel.
(a) 11K1, VIB MONITOR

S 714-018-N00

(9) Do the operational test of the AVM system (AMM 77-31-00/501).

AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER - REMOVAL/INSTALLATION

1. General
   A. The Airborne Vibration Monitor Signal Conditioner is referred to as the AVM signal conditioner in this procedure.
   B. This procedure has two tasks. The first task removes the AVM signal conditioner. The second task installs the AVM signal conditioner and does a test to make sure it is serviceable.
   C. The AVM signal conditioner is found in the main equipment center on the E2-4 shelf.

TASK 77-31-03-004-001-N00

2. Remove the Airborne Vibration Monitor Signal Conditioner
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zone
          119 Main Equipment Center

      (2) Access Panel
          119AL Main Equipment Center

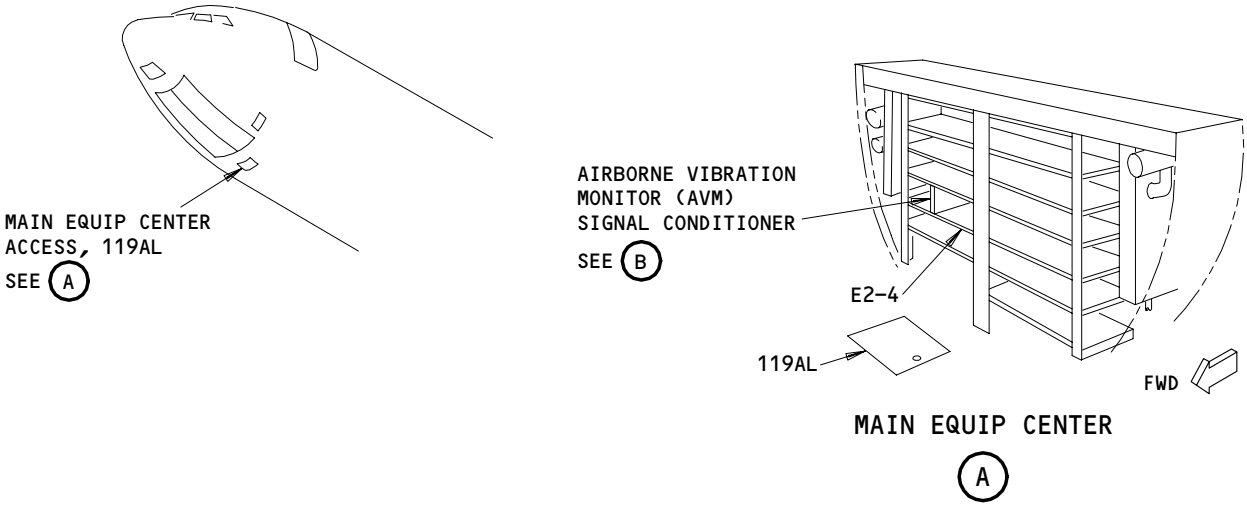
   C. Remove the AVM Signal Conditioner (Fig. 401).

      S 864-002-N00
      (1) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tag:
          (a) 11K1, VIB MONITOR

      S 024-003-N00
      (2) Remove the AVM signal conditioner (AMM 20-10-01/401).

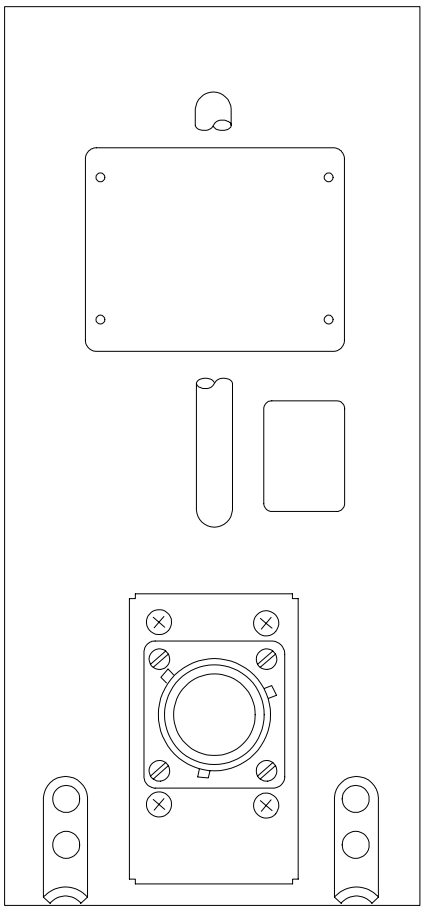
TASK 77-31-03-404-004-N00

3. Install the Airborne Vibration Monitor Signal Conditioner
   A. Parts



MAIN EQUIP CENTER

A



AVM SIGNAL CONDITIONER

B

Airborne Vibration Monitor Signal Conditioner Installation
Figure 401

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Unit- AVM Signal Conditioner	77-31-03	01 01B 02	15, 16 50, 51 15, 16

B. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/201, EICAS

C. Access
(1) Location Zone
119 Main Equipment Center

(2) Access Panel
119AL Main Equipment Center

D. Install the AVM Signal Conditioner (Fig. 401).

S 424-005-N00
(1) Install the AVM signal conditioner (AMM 20-10-01/401).

E. Do a test of the AVM signal conditioner.

S 864-010-N00
(1) Supply electrical power (AMM 24-22-00/201).

S 714-012-N00
(2) Look for ENG VIB BITE on the maintenance page of the EICAS display.
(a) If ENG VIB BITE shows, do the EICAS erase procedure (AMM 31-41-00/201).

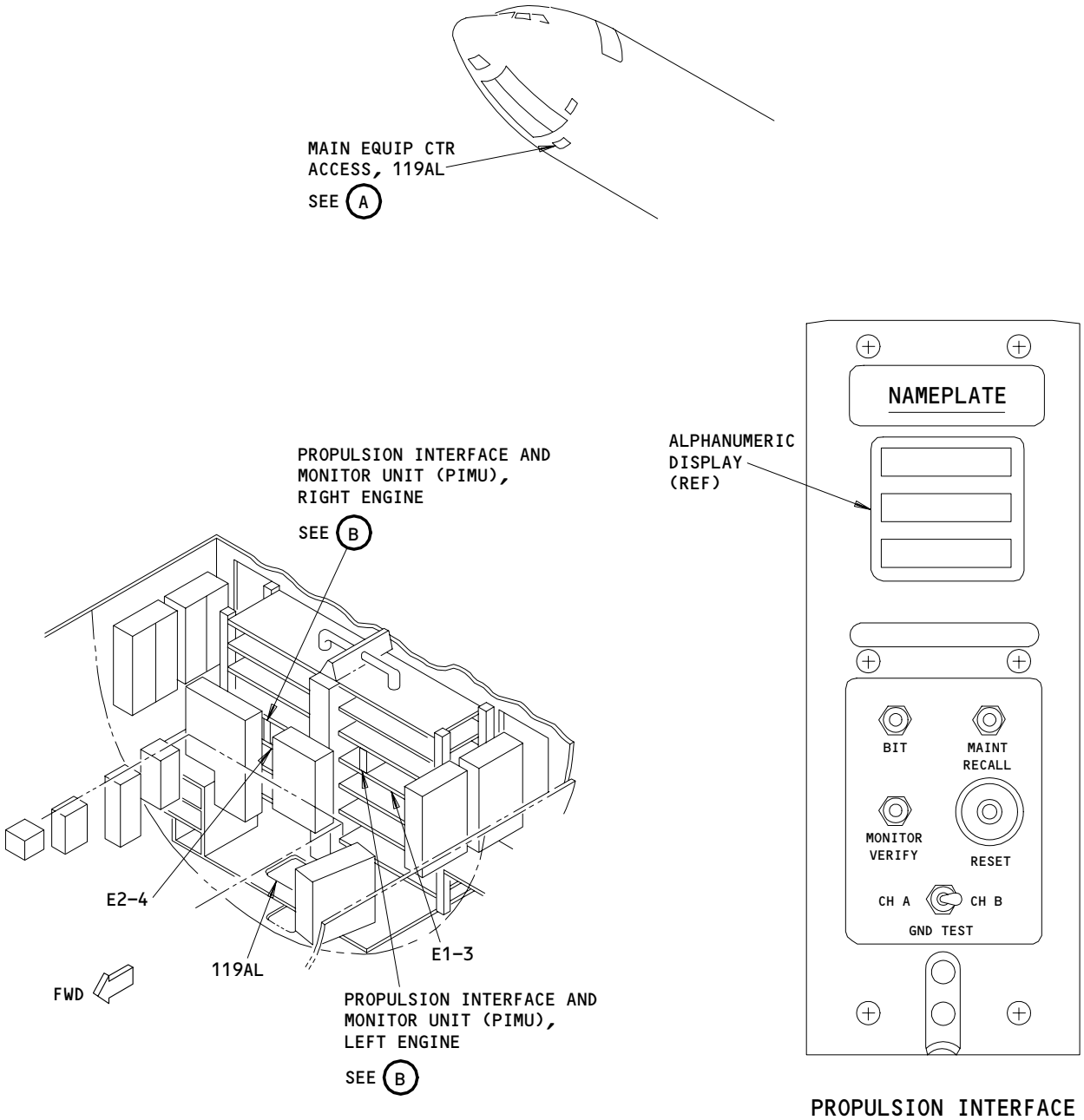
S 864-013-N00
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
(a) 11K1, VIB MONITOR

S 714-014-N00
(4) Stop for ten seconds, then make sure ENG VIB BITE does not show on the EICAS display.

S 864-016-N00
(5) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

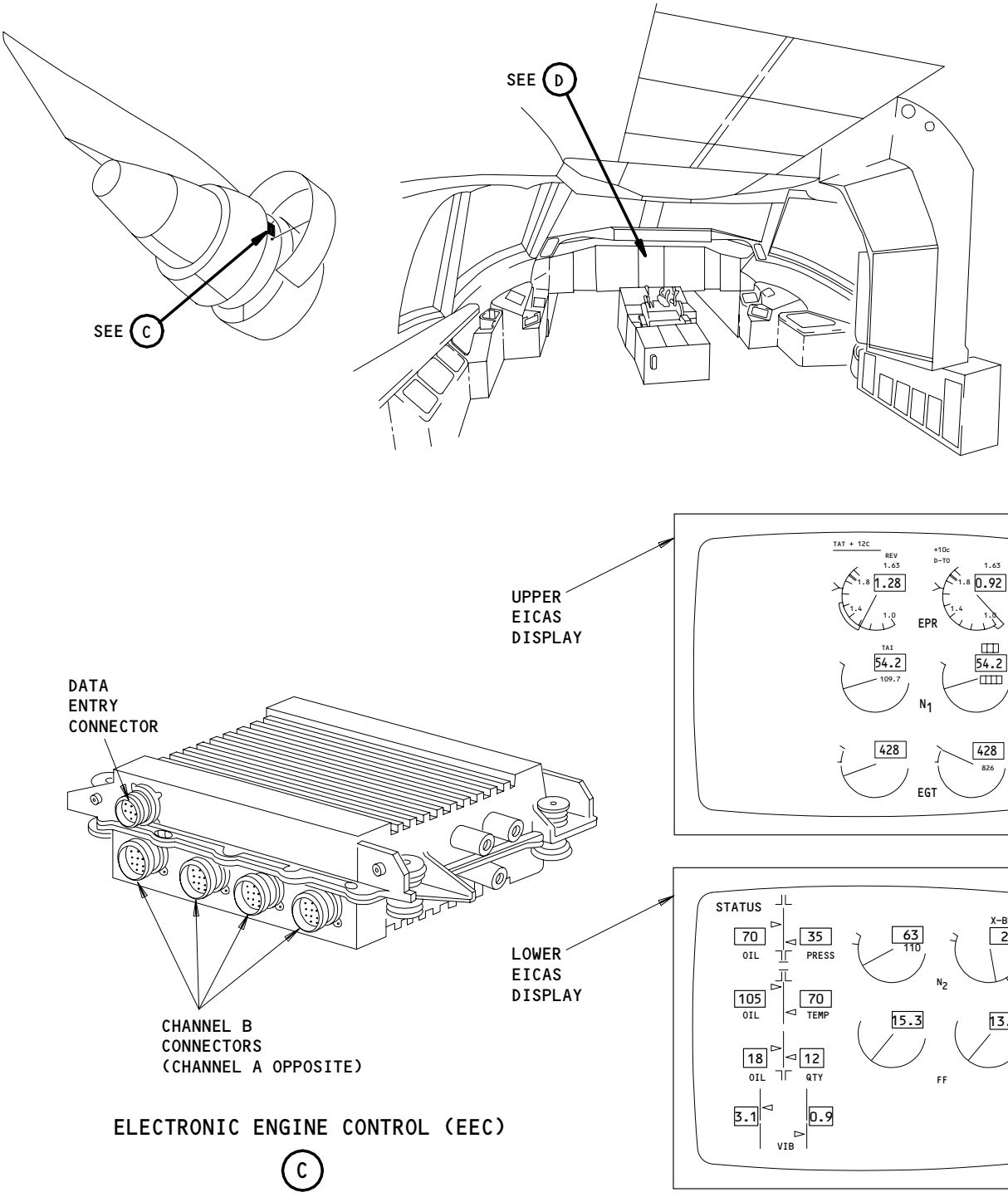
ELECTRONIC PROPULSION CONTROL SYSTEM (EPCS) - DESCRIPTION AND OPERATION

1. General
   A. The Electronic Propulsion Control System (EPCS) has full authority and fly-by-wire digital electronics. The EPCS consists of the Electronic Engine Control System (EECS) on each engine, and the airframe elements which interface with them.
   B. Each of the two engines incorporates an Electronic Engine Control (EEC) which has dual channels and is self-powered, self-checking and automatic-fault-accommodating.
   C. The EPCS elements include the thrust lever mechanisms, the control logic for the thrust reverser, and the interfaces with other systems, such as the Engine Indicating and Crew Alerting System (EICAS), the two Air Data Computers (ADC), the Thrust Management Computer (TMC) and the Standby Engine Indicator (SEI).
   D. Two tiers of maintenance condition indications for the EPCS are provided. The first tier consists of general status and maintenance messages displayed on EICAS. The second tier consists of fault messages displayed on the Propulsion Interface and Monitor Unit (PIMU). These messages assist maintenance personnel in isolating system faults to a particular Line Replaceable Unit (LRU) or to the interfacing circuits between LRUs.
   E. The EICAS message L (R) PIMU indicates that the PIMU self-test has detected a fault.
   F. The PIMU records and stores faults from the EEC. The PIMU receives EEC fault data for a five second period via separate ARINC 429 channel A and channel B data buses either automatically when the air/ground relay closes upon landing, or manually by actuation of the GND TEST switch on the face of the PIMU with an engine running or with ground power applied to the EEC. With ground power applied to the EEC, some systems that require engine rotation will be inoperative. Fault data received is stored in non-volatile memory of the PIMU. Stored fault data may be manually retrieved for visual display on the face of the PIMU.
2. Component Details (Fig. 1)
   A. Electronic Propulsion Control System (EPCS)
      (1) During engine operation, the engine control system constantly tests itself. When a fault is detected, the appropriate discrete bit (or bits) is set in the discrete data word for the serial data bus. When the engine is not running, the EEC can be activated by using the EEC MAINT L (R) ENG POWER switch. In this mode, however, the setting of many bits is suppressed by the EEC since without engine rotation, certain functions are inoperative.



Electronic Propulsion Control System (EPCS) Components
Figure 1 (Sheet 1)

316378



ELECTRONIC ENGINE CONTROL (EEC)

C

EICAS DISPLAY UNITS

D

Electronic Propulsion Control System (EPCS) Components
Figure 1 (Sheet 2)

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(2) Each EEC channel on each engine will detect anomalies and hard faults in its processor, its inputs and its outputs. In some cases the exact faulty unit in the system cannot be totally isolated by automatic means; only the particular "LRU loop" can be flagged. The "LRU loop" includes the EEC interface circuitry, circuits from the EEC to the sensor, servo or other components, and the interfacing component itself.

(3) Certain status or maintenance messages displayed on EICAS are directly related to fault messages displayed on the PIMU. The EICAS message L (R) ENG CONTROL corresponds to the PIMU message EEC CH-A/B CONTROL. In most cases, when the above EICAS message is displayed its corresponding PIMU message will be present when the PIMU is interrogated. If the above EICAS message appears immediately after the engine is shut down, with the airplane on the ground, the message is the result of the engine failing the spool down overspeed test. In this case, the corresponding PIMU message will not be present when the PIMU is interrogated. To determine if an engine control fault really exists an engine run may be necessary (FIM 73-21-00).

(4) The EICAS message L (R) EEC FAULT C1 and L (R) EEC FAULT C2 correspond to the PIMU messages EEC CH-A/B FAULT CAT 1 and EEC CH-A/B FAULT CAT 2, respectively. Whenever one of these two EICAS messages are displayed, its corresponding PIMU message should always be present when the PIMU is interrogated.

(5) Fault codes identify a particular EPCS component malfunction or a related circuit problem. Included in the system are possible internal EEC failures.

B. Propulsion Interface and Monitor Unit (PIMU)

(1) There is a separate monitor unit for each engine. The PIMU units are located in the main equipment center. The monitor unit for the left engine is located on the E1-3 shelf and the monitor unit for the right engine is located on the E2-4 shelf.

(2) The front panel of the monitor unit has the following features:

(a) A alphanumeric display with 24 characters in three eight character lines, to annunciate stored faults. The top line is used to annunciate the associated channel A or channel B fault. The second and third line are used to annunciate an alphanumeric fault label.

(b) A BIT switch that initiates power up of the memory recall function of the unit and annunciation of the first of any discrete faults stored in memory. Subsequent depression and release of the switch initiates annunciation of additional discrete fault data, one at a time.

(c) A MONITOR VERIFY switch when depressed causes all segments of the alphanumeric display to illuminate. Release of the switch initiates a self-test. The self-test verifies the operating integrity of the monitor unit without actually receiving data from active ARINC 429 inputs.

(d) A GND TEST switch verifies operation of the selected CH A or CH B data bus and the associated ARINC 429 receiver of the monitor unit by receiving and decoding ARINC 429 inputs.

(e) A RESET switch when depressed will cause all stored faults to be cleared and the display to go dark immediately. The RESET switch is guarded to prevent inadvertent operation.

(f) A MAINT RECALL switch clears the RAM fault storage area, triggers the EEC to enter the fault recall mode, reads the data bus until all fault codes have been received and stores the faults and flight leg number in the RAM fault storage area. The monitor then displays the message FLIGHT LEG #. Depressing the BIT switch causes the fault codes for this flight leg to be displayed.

(3) Use the PIMU BITE Procedure (FIM 71-PIMU MESSAGE INDEX) to interrogate the PIMU for EEC fault messages that are set if the fault occurred between engine start and before the aircraft landing for a given flight leg. This is because the PIMU stores EEC related fault messages when the aircraft nose landing gear touches the ground.

(4) Use the PIMU Maintenance Recall procedure (FIM 71-PIMU MESSAGE INDEX) to interrogate the EEC for fault messages that are stored in the memory of the EEC. These are fault messages that are set during landing roll, taxi, engine shutdown from idle, or fault messages which occur during any ground operation which does not end in aircraft takeoff, such as motoring, ground run, and rejected takeoff. You can also use Maintenance Recall to look at fault history for any fault messages that are set during any flight phase.

3. Operation

A. The PIMU is operational when 115 volts of ac power (Ref 27-51-00) is supplied to the PIMU. The system begins functioning when the air/ground relay switches to the ground position.

B. The unit performs a self-test that verifies the intergrity of the monitor unit and the operation of both data buses. Upon successful completion of the self-test the unit receives fault data for a five second period and stores faults in a non-volatile memory. If the monitor fails the self-test, an indication is sent to EICAS and the monitor turns off.

C. During the five second operating period the monitor unit receives low speed ARINC 429 serial digital data from channel A and channel B of the corresponding EEC. The data received by the monitor unit contains EEC SYSTEM FAULT bits.

D. A fault is identified by a single data bit. A specific fault associated with a bit is defined by the location of the bit in the word. The words received by the ARINC 429 receiver must contain 32 bits and pass a parity test before the words are read and recorded. The fault data must be received two times consecutively during the sample period before being stored as a fault. Once a fault has been stored in non-volatile memory it can be cleared by operation of the RESET switch.

E. Before recalling the faults stored in memory, the monitor unit can be checked by pressing the MONITOR VERIFY switch. With the switch depressed, all segments of the alphanumeric display are illuminated. Release of the switch initiates a self-test which verifies the operating integrity of the monitor unit without actually receiving data from the ARINC 429 inputs.

F. If the self-test takes longer than three seconds to accomplish the message TEST IN PROGESS will be displayed until the test is complete. Successful completion of the self-test is annunciated by displaying READY for ten seconds. Failure of the test is annunciated by displaying PIMU MONITOR FAIL for ten seconds.

G. The ARINC 429 receiver and data bus may also be tested by actuation of the GND TEST switch. The ground test will verify the operation of the data bus for the selected channel A/B and ARINC 429 receiver. The verification is accomplished by successfully receiving and decoding the data inputs. Data is received by actuating the GND TEST switch with an engine running or with ground power applied to the EEC. Ground test failure will cause the message CH A or CH B DATA BUS INOP to be displayed for ten seconds.

H. After verifying the operation of the data bus, the unit is enabled for a five second period to store any fault data received during the test of the selected channel. The applicable CH A or CH B TEST IN PROGRESS message is displayed while the unit is enabled. After the five second period the unit will turn off.

I. To recall faults stored in memory the BIT switch is depressed and released. On release the monitor unit turns on and annunciates the first of any discrete faults stored in memory.

J. The annunciation of discrete faults are in the form of alphanumeric messages. The message corresponding to each discrete fault is displayed on the second and third line of the alphanumeric display. The first line will display the applicable message EEC CH A/B.

K. The message is displayed on the screen until the BIT switch is depressed again. All channel A faults messages are displayed followed by all channel B faults messages.

L. After the last fault message has been displayed, pressing the BIT switch will cause the monitor to display the message END for ten seconds. At the end of this ten second period the display will automatically blank.

M. Depression of the MAINT RECALL switch sets an internal maintenance latch which will remain set until reset by a ground to air transition or operation of the MONITOR VERIFY switch. The RESET switch and GND TEST switch are disabled when the maintenance mode latch is set.

N. The monitor then clears the RAM fault storage area, triggers the EEC to enter the fault recall mode, reads the data bus until all fault words have been received and stores the faults and flight leg number in the RAM fault storage area. The applicable message CH A or CH B TEST IN PROGRESS will be displayed while the data bus is being read and faults are being stored.

O. If all labels of Channel A were not received within two seconds, the message CH A DATA BUS INOP will be displayed. If all labels were received, the message FLIGHT LEG # will be displayed. The character # will be replaced by the actual flight number for flight legs 0 through 63 and *** for flight legs 64 or higher.

P. Depression of the BIT switch causes the first of any faults for this flight leg to be displayed. Subsequent depression of the BIT switch causes any remaining fault messages to be displayed, one at a time. Fault messages displayed in maintenance mode are the same as those displayed for normal operation except that a dollar sign ($) replaces the space between EEC and CH (e. g. EEC$CH).

Q. After the last CH A fault message has been displayed, pressing the BIT switch will cause the monitor to display the message END CH A.

R. Pressing the BIT switch again will cause one of two messages to appear. If all labels of Channel B were not received within two seconds, the message CH B DATA BUS INOP will be displayed. If all labels were received, the message FLIGHT LEG # will be displayed. The character # will be replaced by the actual flight number for flight legs 0 through 63 and *** for flight legs 64 or higher. The flight leg for Channel A and Channel B may be different.

S. Depression of the BIT switch causes the first of any faults for this flight leg to be displayed. Subsequent depression of the BIT switch causes any remaining fault messages to be displayed, one at a time.

T. After the last CH B fault message has been displayed, pressing the BIT switch will cause the monitor to display the message END CH B.

U. Pressing the BIT switch again will cause the above fault recall procedure to be repeated for the same flight leg number.

V. Pressing the MAINT RECALL switch will begin the above fault recall procedure for the next previous flight leg for which faults are stored. No additional fault messages are available for recall when FLIGHT LEG 0 is displayed with no fault messages.

W. Depression of the MONITOR VERIFY switch will cause the PIMU to leave the maintenance mode and return to normal operation.

X. Depression of the RESET switch will cause both the RAM and the non-volatile memory of the PIMU to be cleared.

Y. The EEC will remain in the fault recall mode until it is depowered or the L (R) FUEL CONTROL switch is moved to the RUN position.

ELECTRONIC PROPULSION CONTROL SYSTEM (EPCS) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives three tasks. The three tasks are the failure recall of the propulsion interface and monitor unit (PIMU), the PIMU ground test, and the PIMU maintenance mode. Each task gives different procedures to get the failure message(s) from the electronic engine control (EEC) to the PIMU.
   B. For a description of each PIMU fault message, go to the applicable corrective action which is found in FIM 71-PIMU Message Index.
   C. Two PIMUs are in the main equipment center, one for each engine. The left engine PIMU is on the E1-3 shelf and the right PIMU is on the E2-4 shelf.
   D. The EPCS has a built-in test equipment (BITE) to monitor the failures. With the BITE you can do the maintenance without more test equipment while the engine is on the wing. The system problems, as found by the EEC, are shown as the status messages on the Engine Indicating and Crew Alerting System (EICAS) with their failure messages shown on the PIMU.

   E. The PIMU Failure Recall
      (1) The PIMU automatically keeps the failure messages in its nonvolatile memory when the air/ground relay is cycled when the airplane makes a landing.
      (2) You can look at the PIMU messages when you use the failure recall procedure.
      (3) Power to the EEC is not necessary to look at the PIMU messages.
   F. The PIMU Ground Test
      (1) You can make a copy of the failures to the PIMU from the EEC when you do the PIMU Ground Test. Then you can look at the PIMU messages.
      (2) You must apply power to the EEC to do the PIMU Ground Test.
      (3) You can supply power to the EEC during the PIMU operation with one of two steps.
         (a) One step uses the EEC MAINT L (R) ENG POWER switch on the P61 panel.
         (b) The other step is to motor the engine to more than 8-12 percent N2.

G. The PIMU Maintenance Mode
   (1) The EEC keeps all failures and the flight leg numbers on each failure occurred in its nonvolatile memory. When you do the maintenance mode procedure, you can transmit data from the EEC to the PIMU for a display.
   (2) You must supply power to the EEC for this procedure. You can supply power when you put the EEC MAINT L (R) ENG POWER switch to the TEST position.

H. Always write the PIMU messages as they show on the monitor. After you write all the PIMU messages, erase the memory.

I. To erase the PIMU's memory, push the RESET switch on the front of the PIMU. This will erase the RAM and nonvolatile memory.

TASK 77-35-00-742-001-N00

2. The Propulsion Interface and Monitor Unit (PIMU) Fault Recall

A. General
   (1) This procedure gives the steps to show the PIMU messages again.
   (2) There can be many PIMU messages in the memory. For this procedure we show you four examples. There are two channel A examples and two channel B examples.

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

C. Access
   (1) Location Zones
       119 Main Equipment Center (LH)
       120 Main Equipment Center (RH)

   (2) Access Panels
       119AL Main Equipment Center

D. Procedure

   S 862-002-N00
   (1) Supply electrical power (AMM 24-22-00/201).

   S 742-003-N00
   (2) Push and hold the MONITOR VERIFY switch on the front of the PIMU.
       (a) Make sure all segments of the display come on.

S 742-007-N00
(3) Release the MONITOR VERIFY switch.

NOTE: This will start the PIMU self-test procedure.

(a) If the self-test continues for more than three seconds, the PIMU will show this:

TEST IN
PROGRESS

(b) When the PIMU completes the self-test without failure, the PIMU will show this for ten seconds:

READY

S 742-008-N00
(4) Push the BIT switch on the front of the PIMU.

NOTE: This will cause the first PIMU message to show.

(a) Write the failure message shown.

NOTE: All channel A failures show before all channel B failures.

Example: EEC CH-A
FAULT
CAT 2

(b) Push the BIT switch on the front of the PIMU and write the failure message.

Example: EEC CH-A
AOC TR-
CK FAIL

(c) Push the BIT switch on the front of the PIMU and write the failure message.

Example: EEC CH-B
SVA FD-
BK FAIL

(d) Push the BIT switch on the front of the PIMU and write the failure message.

Example: EEC CH-B
FMU T/M
W/A FAIL

S 742-009-N00

(5) Push the BIT switch and this will show for ten seconds if all PIMU messages showed:

END

NOTE: If you push the BIT switch again, the procedure will start again. The same PIMU messages will show again one at a time until you get to END a second time.

S 712-010-N00

(6) Push the RESET switch on the front of the PIMU and erase the PIMUs RAM and nonvolatile memory.

S 862-004-N00

(7) Remove electrical power (AMM 24-22-00/201).

TASK 77-35-00-742-005-N00

3. The Propulsion Interface and Monitor Unit (PIMU) Ground Test

A. General

(1) This task gives the steps to do the PIMU ground test.

(2) The EEC keeps the data on the engine component failures in the memory. For this procedure we show you five examples. There are three channel A examples and two channel B examples.

B. References

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

(2) AMM 71-00-00/201, Power Plant

C. Access

(1) Location Zones

119 Main Equipment Center (LH)
120 Main Equipment Center (RH)

(2) Access Panels

119AL Main Equipment Center

D. Procedure

S 862-011-N00

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

S 862-012-N00

(2) Do one of the two steps to supply power to the EEC.

(a) Motor the applicable engine to more than 8-12 percent N2 (AMM 71-00-00/201).

(b) Put the EEC MAINT L (R) ENG POWER switch on the P61 panel to the TEST position.

S 742-013-N00

(3) Push and hold the MONITOR VERIFY switch on the front of the PIMU.

(a) Make sure all segments of the display come on.

S 742-014-N00

(4) Release the MONITOR VERIFY switch.

NOTE: This will start the PIMU self-test procedure.

(a) If the self-test continues for more than three seconds, the PIMU will show the message TEST IN PROGRESS.

TEST IN
PROGRESS

(b) If the PIMU completes the self-test without a failure, the PIMU will show the message READY for ten seconds.

READY

S 742-016-N00

(5) Do the PIMU ground test as follows:

(a) Temporarily move and release the GND TEST switch on the front of the PIMU to the CH A position.

NOTE: This will cause the PIMU to read the data bus of the EEC channel A. The PIMU will keep the channel A failures in the nonvolatile memory.

1) Make sure the message shows on the PIMU display while the PIMU receives and keeps the data from the EEC.

CH A
TEST IN
PROGRESS

(b) When the message does not show on the PIMU display, temporarily move and release the GND TEST switch to the CH B position.

NOTE: This will cause the PIMU to read the data bus of the EEC CH B. The PIMU will keep the channel B failures in the nonvolatile memory.

1) Make sure the message shows on the PIMU display while the PIMU receives and keeps the data from the EEC.

CH B
TEST IN
PROGRESS

(c) Push the BIT switch on the front of the PIMU.

NOTE: This will cause the PIMU message to show.

1) Write the PIMU message.

NOTE: All channel A messages will show before all channel B messages.

Example: EEC CH-A
N1 RANGE
FAIL

(d) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC CH-A
T5 CROSS
-CK FAIL

(e) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC CH-A
STRT SOL
W/A FAIL

(f) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC CH-B
XLINK
FAIL

(g) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC CH-B
L ADC
CHANFAIL

(h) Push the BIT switch on the front of the PIMU.
(i) If there are no more PIMU messages, the message END will show for ten seconds.

END

NOTE: If you push the BIT switch again, the first message from channel A will show for a second time.

1) If you push the BIT switch again, all of the messages will show again one at a time.

S 862-017-N00

(6) Push the RESET switch on the front of the PIMU to erase the RAM and nonvolatile memory from the PIMU.

S 862-029-N00

(7) Remove the power from the EEC with one of two steps that follow:
  (a) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).
  (b) Put the EEC MAINT L (R) ENG POWER switch to the NORM position.

S 862-006-N00

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

TASK 77-35-00-742-020-N00

4. The Propulsion Interface and Monitor Unit (PIMU) Maintenance Mode

A. General

(1) This task gives the steps to show the failure messages and their flight leg numbers.

(2) The EEC can find and keep many failures during many flights. For this procedure we show you six examples for ten flights. There are three channel A examples and three channel B examples.

B. References

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

C. Access

(1) Location Zones

119	Main Equipment Center (LH)
120	Main Equipment Center (RH)

(2) Access Panels

119AL	Main Equipment Center

D. Procedure

S 862-021-N00

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

S 742-022-N00

(2) Push and hold the MONITOR VERIFY switch on the front of the PIMU.
  (a) Make sure all segments of the display on the PIMU come on.

S 742-023-N00

(3) Release the MONITOR VERIFY switch.

NOTE: This will start the PIMU self-test procedure.

(a) If the self-test continues for more than three seconds, the PIMU will show the message TEST IN PROGRESS.

TEST IN
PROGRESS

(b) If the PIMU completes the self-test without a failure, the PIMU will show the message READY for ten seconds.

READY

S 862-024-N00

(4) Make sure the L (R) FUEL CONTROL switch is in the CUTOFF position.

S 742-025-N00

(5) Transmit the EEC failure codes to the PIMU as follows:

(a) Move the EEC MAINT L (R) ENG POWER switch on the P61 panel to the TEST position.

(b) Push the MAINT RECALL switch on the front of the PIMU.

NOTE: After you push the switch, the PIMU will read the data buses of the EEC channel A and channel B. The PIMU will keep the flight leg number with the failure messages in the RAM memory of the PIMU.

After the PIMU receives all the data from the EEC, the PIMU will show the FLIGHT LEG #. The actual number will show in place of the "#" for the flight legs 0 through 63. the "***" will show in place of "#" for the flight legs 64 or higher.

1) Make sure the message shows while the PIMU reads the data bus of the EEC channel A.

CH A
TEST$IN
PROGRESS

2) Make sure the message shows while the PIMU reads the data bus of the EEC channel B.

CH B
TEST$IN
PROGRESS

(c) Look and write the FLIGHT LEG # shown after the PIMU receives all the data from the EEC.

NOTE: The FLIGHT LEG 0 tells that the failures were the ground failures. The EEC kept a record of the failures in one of two conditions. One is since the last engine shutdown if the airplane did not make a flight. The other is during the last ground run and the airplane did not make a flight since.

The FLIGHT LEG 1 tells that the failures were flight failures. The EEC kept a record during the last flight.

The FLIGHT LEG 0 with no failure messages tells that no more failure messages are available for recall.

Example: FLIGHT
LEG 3

(d) Push the BIT switch on the front of the PIMU and write the PIMU message.

NOTE: This will cause the first PIMU message for this flight leg to show.

The PIMU messages recalled in the maintenance mode are same as those showed in the normal operation with a dollar sign $ in the space between EEC and CH-A/B (EEC$CH-A/B).

Example: EEC$CH-A
SVA TR-
CK FAIL

(e) Push the BIT switch on the front of the PIMU and write the PIMU message.

1) If all of the failure messages from the channel A showed the PIMU will show the message.

END$CH A

(f) Push the BIT switch on the front of the PIMU and write the PIMU message.

FLIGHT
LEG 3

(g) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example; EEC$CH-B
T2 RANGE
FAIL

(h) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example; EEC$CH-B
REVERSER
INTRLOCK

(i) Push the BIT switch on the front of the PIMU.

END$CH B

NOTE: If all the failure messages in the channel B showed, the PIMU will show the message END$CH B.

If you push the BIT switch again, the procedure for same flight leg will start again. As you push the BIT switch more, the same PIMU messages will show one at a time until you see the message END$CH B.

(j) Push the MAINT RECALL switch on the front of the PIMU.
1) Make sure the message shows while the PIMU reads the data bus of the channel A.

CH A
TEST$IN
PROGRESS

2) Make sure the message shows while the PIMU reads the data bus of the channel B.

CH B
TEST$IN
PROGRESS

(k) Look and write the flight leg number shown on the display after the PIMU receives all the failure messages from the EEC.

FLIGHT
LEG 5

(l) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC$CH-A
STAB SOL
W/A FAIL

(m) Push the BIT switch on the front of the PIMU.

END$CH A

(n) Push the BIT switch on the front of the PIMU.

FLIGHT
LEG 6

(o) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC$CH-B
DOT3 RNG
FAIL

(p) Push the BIT switch on the front of the PIMU.

END$CH B

(q) Push the MAINT RECALL switch on the front of the PIMU.
1) Make sure the message shows while the PIMU reads the data bus of the channel A.

CH A
TEST$IN
PROGRESS

2) Make sure the message shows while the PIMU reads the data bus of the channel B.

CH B
TEST$IN
PROGRESS

(r) Look and write the flight leg number shown on the display after the PIMU receives all the failure messages from the EEC.

EEC$CH-A
FLIGHT
LEG 9

(s) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC$CH-A
STAB SOL
W/A FAIL

(t) Push the BIT switch on the front of the PIMU.

END$CH A

(u) Push the BIT switch on the front of the PIMU.

EEC$CH-B
FLIGHT
LEG 6

(v) Push the BIT switch on the front of the PIMU and write the PIMU message.

Example: EEC$CH-B
MODE IND
W/A FAIL

(w) Push the BIT switch on the front of the PIMU.

END$CH B

(x) Push the MONITOR VERIFY switch on the front of the PIMU.

NOTE: This will cause the PIMU to stop the maintenance mode and go back to the usual operation.

S 742-026-N00

(6) Push the RESET switch on the front of the PIMU and erase the RAM and nonvolatile memory from the PIMU.

S 862-027-N00

(7) Move the EEC MAINT L (R) ENG POWER switch on the P61 panel to the NORM position.

S 862-028-N00

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

PROPULSION INTERFACE AND MONITOR UNIT (PIMU) - REMOVAL/INSTALLATION

1. General
   A. The propulsion interface and monitoring units are installed in the main equipment center on shelves E1-3 and E2-4.
   B. The propulsion interface and monitoring unit will be identified as the PIMU in this procedure.

TASK 77-35-01-004-002-N00

2. Remove the Propulsion Interface and Monitor Unit (PIMU) (Fig. 401)
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zones
          119 Main equipment center (LH)
          120 Main equipment center (RH)

      (2) Access Panels
          119AL Main equipment center

   C. Remove the PIMU

      S 864-003-N00
      (1) For the left engine, open this circuit breaker on the forward miscellaneous electric equipment panel, P33 and attach a DO-NOT-CLOSE tag:
          (a) 33D4, L ENG PIMU

      S 864-004-N00
      (2) For the right engine, open this circuit breaker on the forward miscellaneous electric equipment panel, P33 and attach a DO-NOT-CLOSE tag:
          (a) 33D5, R ENG PIMU

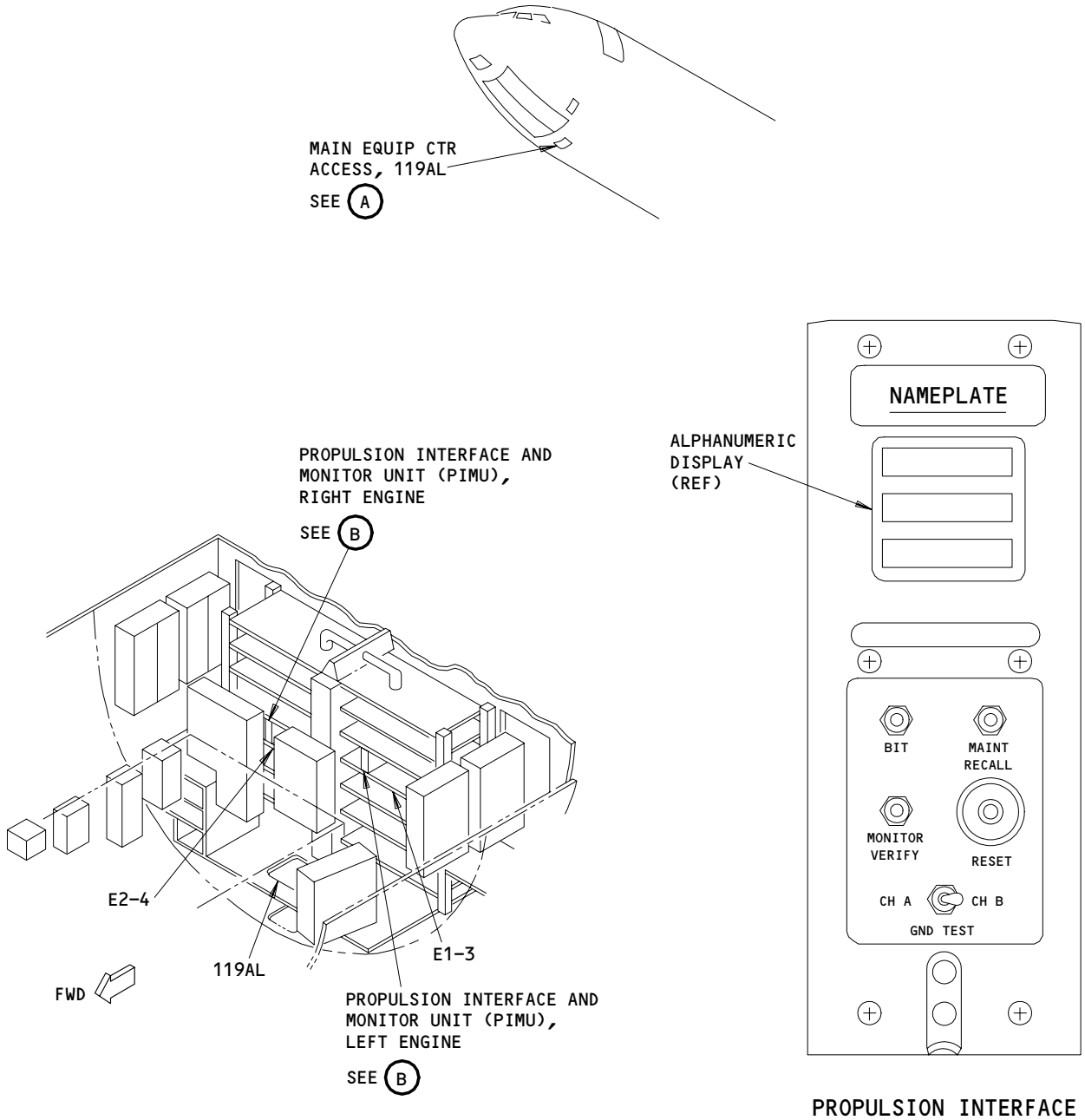
      S 914-005-N00

      CAUTION: DO NOT TOUCH THE PIMU BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE PIMU.

      (3) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

      S 014-006-N00
      (4) Open the main equipment center access door.

      S 024-007-N00
      (5) Remove the PIMU (AMM 20-10-01/401).



Propulsion Interface and Monitor Unit (PIMU) Installation
Figure 401

TASK 77-35-01-404-008-N00

3. Install the Propulsion Interface and Monitor Unit (PIMU) (Fig. 401)

A. References

(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
(3) AMM 24-22-00/201, Electrical Power - Control

B. Access

(1) Location Zones

119 Main equipment center (LH)
120 Main equipment center (RH)

(2) Access Panels

119AL Main equipment center

C. Install the PIMU.

S 914-009-N00

CAUTION: DO NOT TOUCH THE PIMU BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE PIMU.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-010-N00

(2) Install the PIMU (AMM 20-10-01/401).

S 864-011-N00

(3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the forward miscellaneous electric equipment panel, P33:
(a) 33D4, L ENG PIMU

S 864-012-N00

(4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the forward miscellaneous electric equipment panel, P33:
(a) 33D5, R ENG PIMU

S 744-013-N00

(5) Do a test of the PIMU as follows:
(a) Supply electrical power (AMM 24-22-00/201).
(b) Push and hold the MONITOR VERIFY switch on the front panel of the PIMU.

(c) Make sure that all lights of the LED display on the front panel of the PIMU are on.

NOTE: The PIMU will work satisfactorily even if the display flashes on and off.

(d) Release the MONITOR VERIFY switch.
(e) Make sure that the message READY is shown on the PIMU.

NOTE: The message will be shown on the display for ten seconds.

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

S 414-014-N00
(6) Close the main equipment center access door.

STANDBY ENGINE INDICATION SYSTEM - DESCRIPTION AND OPERATION

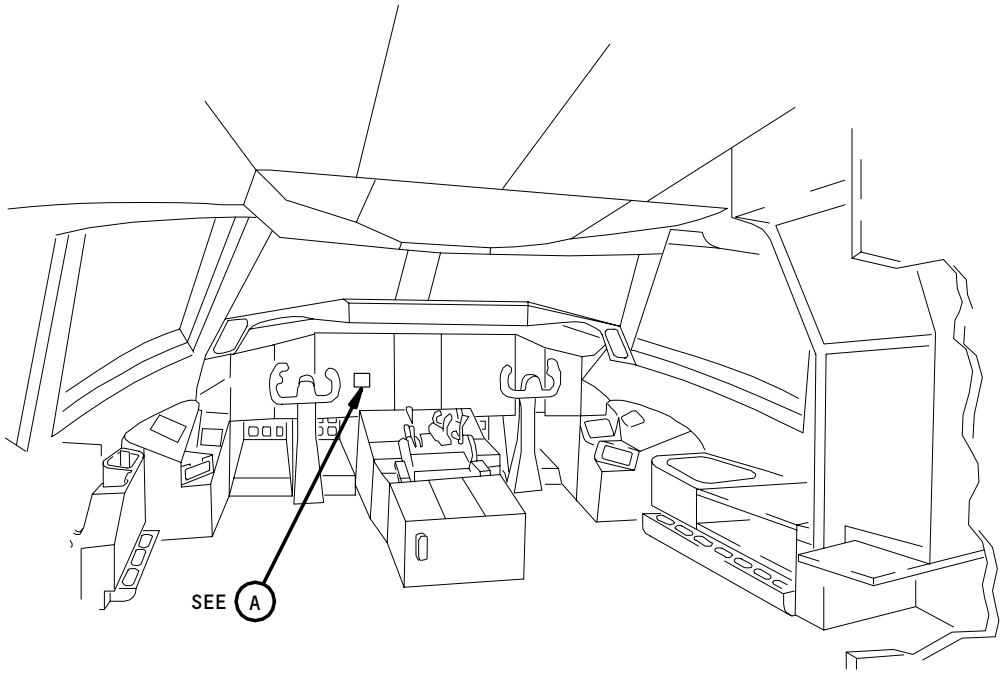
1. General
   A. Back-up display of EPR, N1, EGT, and N2 is provided by the standby engine indicator (SEI) on the P1-3 panel. The data is supplied by the EEC. There will be no display of the data unless the EEC has power applied (AMM 73-21-00/001) . Parameter redline limits for the engine are provided on overlimit placards located on the indicator. Respective sensor signals are input directly to the SEI to ensure display in case of EICAS failure.
2. Operation
   A. Functional Description (Fig. 1)
      (1) The SEI can operate in three modes:
         (a) AUTO - When EICAS is operating, the SEI will be turned off. If EICAS fails or is shut down, a discrete signal activates the SEI, and engine parameters are displayed in a digital format.
         (b) ON - SEI indicates engine parameters continuously, independent of whether EICAS is on or off.
         (c) BITE - Specific indications will be displayed to determine indicator integrity, overriding both AUTO and ON modes.
   B. BITE
      (1) You can test the SEI with the BITE switch located on the lower left side of the bezel. When you rotate the switch in a clockwise direction with a screwdriver, a microprocessor does a check of the indicator. Any faults which are found will show on the display as follows:

      111 EPROM check-sum failure
      222 RAM failure
      333 Power Supply failure
      444 ARINC receiver (Channel 1, bus A)
      555 ARINC receiver (Channel 1, bus B)
      666 ARINC receiver (Channel 2, bus A)
      777 ARINC receiver (Channel 2, bus B)

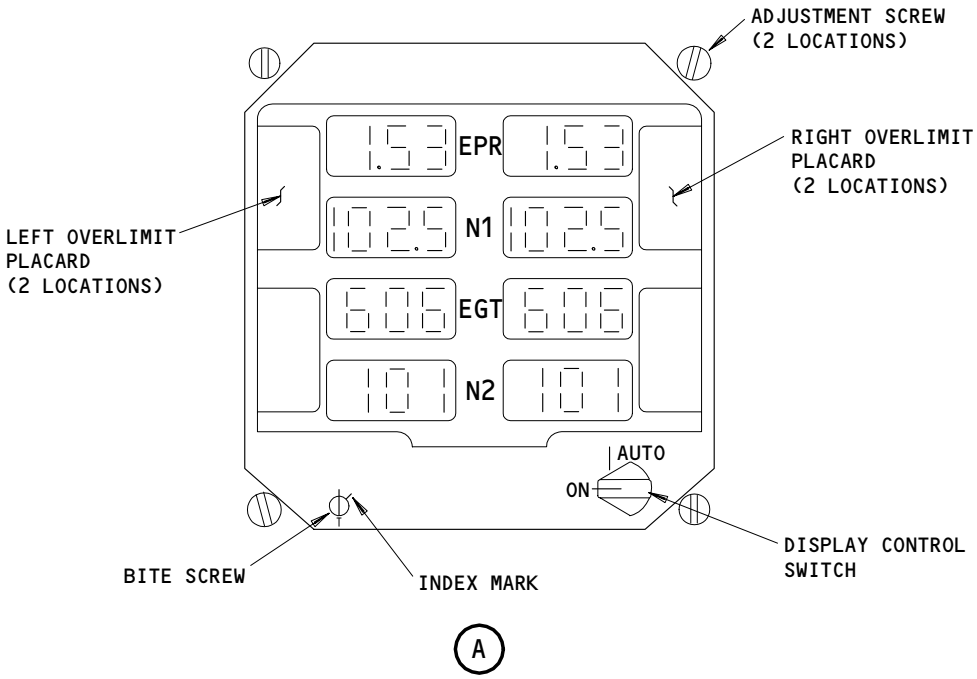
      If no failure is found, the following displays will show for as long as the BITE switch is operated:

      EPR 2.88
      N1 188.8
      EGT 1888
      N2 188

      When you release the BITE switch, the indicator will return to normal operation.



FLIGHT COMPARTMENT



NOTE: NUMBERS SHOWN ON THE INDICATOR ARE FOR REFERENCE ONLY.

Standby Engine Indication System Components
Figure 1

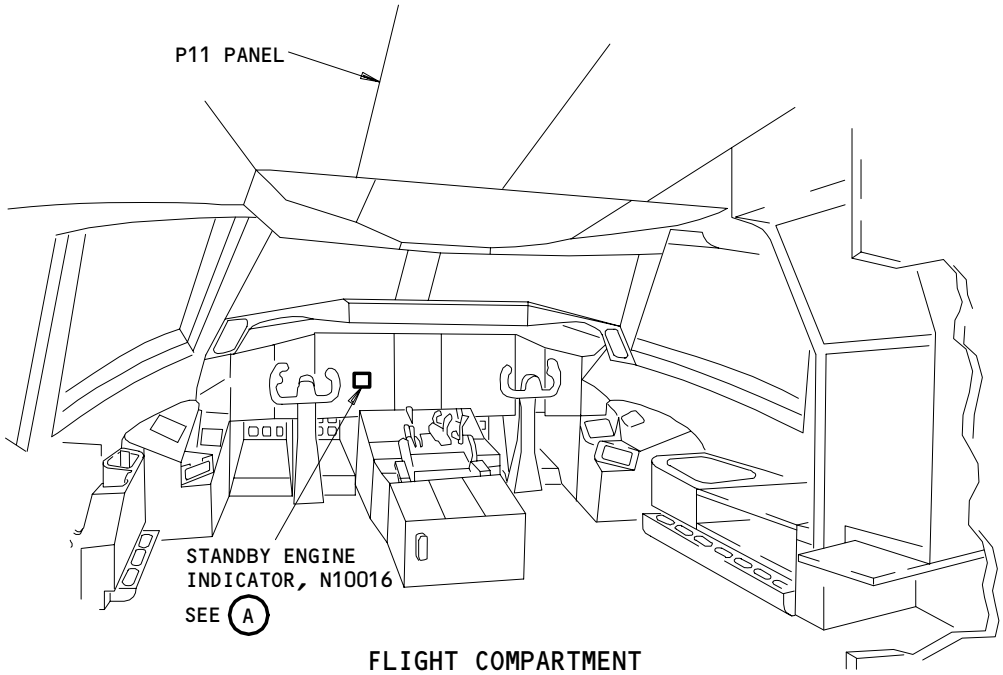
(2) When you apply power to the SEI, an automatic test is performed to make sure that the operation of the indictor is correct. If the operation is not correct, a row of horizontal bars will show across the N1 displays.

STANDBY ENGINE INDICATION SYSTEM

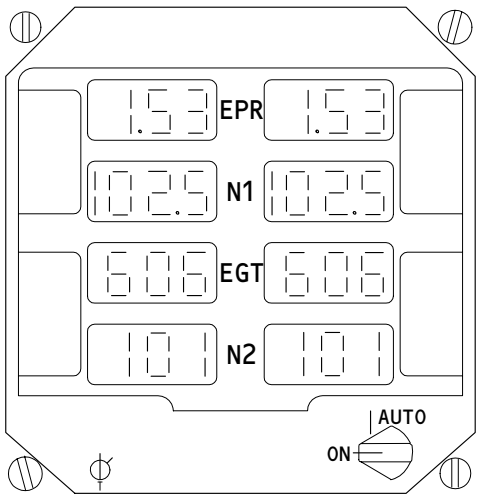
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
ALTERNATOR - (73-21-00/101) EEC (N2 TRANSDUCER), T686 CIRCUIT BREAKER - ENGINE STBY IND 1, C4151 COMPUTERS - (31-41-00/101) EICAS L, M10181 EICAS R, M10182 CONTROL - (73-21-00/101) ELECTRONIC ENGINE, M7198	--	1	FLT COMPT, P11 11D27	*
INDICATOR, STANDBY ENGINE, N10016	--	1	FLT COMPT, P1	77-41-01
PROBE - (77-21-00/101) EGT (TT4.95) THERMOCOUPLE TRANSDUCER - (73-21-00/101) EEC SPEED (N1)				

* SEE THE WDM EQUIPMENT LIST

Standby Engine Indication System - Component Index
Figure 101



FLIGHT COMPARTMENT



STANDBY ENGINE INDICATOR, N10016

(A)

NOTE: THE NUMBERS SHOWN ON THE INDICATOR
ARE FOR REFERENCE ONLY.

Standby Engine Indication System - Component Location
Figure 102

STANDBY ENGINE INDICATOR - REMOVAL/INSTALLATION

1. General
   A. The standby engine indicator (SEI) is found on the captain's main instrument panel, P1-3.
   B. The standby engine indicator is referred to as the SEI in this procedure.

TASK 77-41-01-004-003-N00

2. Remove the Standby Engine Indicator (SEI)
   A. References
      (1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zone
          211/212 Flight Compartment

   C. Prepare to Remove the Standby Engine Indicator (SEI).

      S 864-004-N00
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach the DO-NOT-CLOSE tags:
          (a) 11D27, ENGINE STBY IND 1
          (b) 11D28, ENGINE STBY IND 2
   D. Remove the Standby Engine Indicator (SEI) (Fig. 401).

      S 914-001-N00

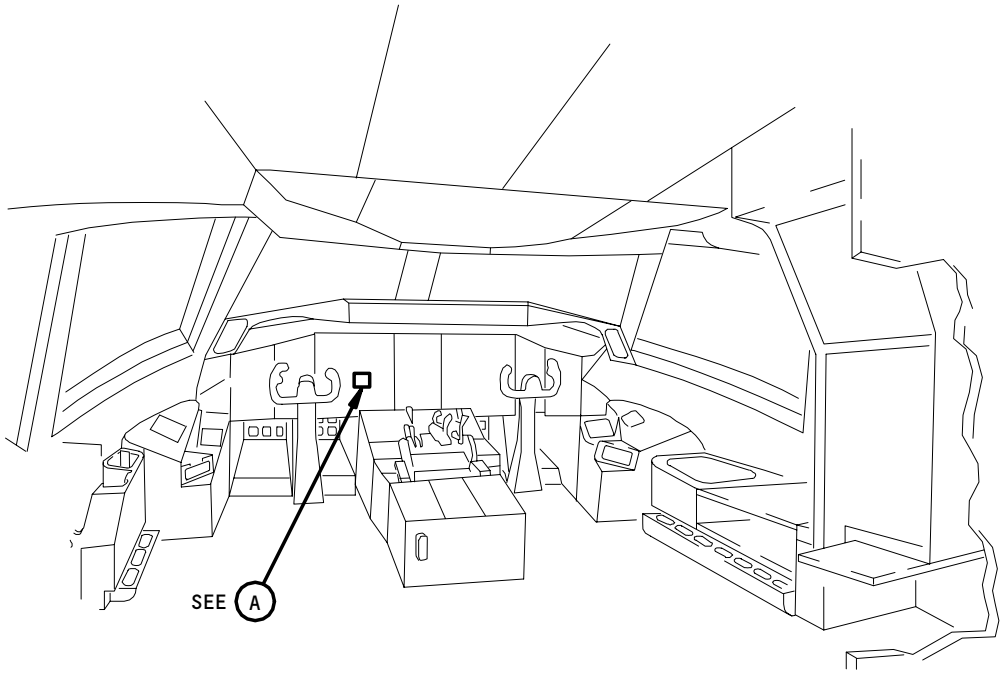
      CAUTION: DO NOT TOUCH THE STANDBY ENGINE INDICATOR BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STANDBY ENGINE INDICATOR.

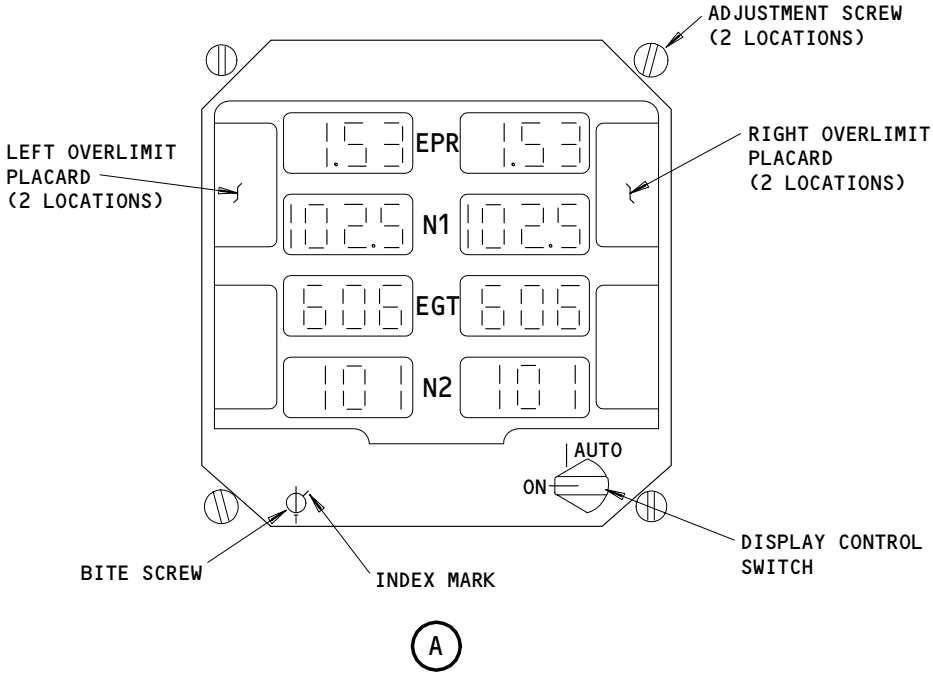
      (1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

      S 034-017-N00
      (2) Loosen the adjustment screws for the SEI mounting clamp.

          NOTE: The adjustment screws are the large screws found at the top right and the bottom left corners of the SEI.

      S 034-005-N00
      (3) Push on the adjustment screws to loosen the mounting clamp.





NOTE: THE NUMBERS SHOWN ON THE STANDBY ENGINE INDICATOR ARE GIVEN AS AN EXAMPLE ONLY.

Standby Engine Indicator Installation
Figure 401

S 024-018-N00

CAUTION: MAKE SURE THE MOUNTING CLAMP FULLY RELEASES THE SEI HOUSING BEFORE YOU REMOVE THE SEI FROM THE INSTRUMENT PANEL. IF YOU DO NOT DO THIS, DAMAGE TO THE BEZEL ON THE SEI CAN OCCUR.

(4) Move the SEI out of the instrument panel.

S 034-019-N00

CAUTION: BE CAREFUL TO KEEP THE CONTAMINATION OUT OF THE SEI AND THE INSTRUMENT PANEL WHEN YOU REMOVE THE PLACARDS. IF YOU DO NOT DO THIS, DAMAGE TO THE SEI OR OTHER INSTRUMENTS CAN OCCUR.

(5) Remove the four screws to release the two placard covers and the two placards from the SEI.

S 034-008-N00

(6) Disconnect the electrical connectors from the SEI.
(a) Install the protection covers on the electrical connectors.

TASK 77-41-01-404-009-N00

3. Install the Standby Engine Indicator (SEI)

A. References
(1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices

B. Access
(1) Location Zone
211/212 Flight Compartment

C. Install the Standby Engine Indicator (SEI) (Fig. 401).

S 914-002-N00

CAUTION: DO NOT TOUCH THE STANDBY ENGINE INDICATOR BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STANDBY ENGINE INDICATOR.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 434-010-N00

(2) Remove the protection covers from the electrical connectors.

S 434-011-N00
(3) Install the electrical connectors on the SEI.

S 434-020-N00

CAUTION: BE CAREFUL TO KEEP THE CONTAMINATION OUT OF THE SEI AND THE INSTRUMENT PANEL WHEN YOU INSTALL THE PLACARDS. IF YOU DO NOT DO THIS, DAMAGE TO THE SEI OR OTHER INSTRUMENTS CAN OCCUR.

(4) Attach the placards and the placard covers to the SEI with the four small screws.

S 424-013-N00
(5) Align the SEI with the instrument panel and move it into the mounting clamp.

S 434-021-N00

CAUTION: DO NOT TIGHTEN THE ADJUSTMENT SCREWS ON THE SEI MORE THAN THE CORRECT TORQUE. IF YOU TIGHTEN THE ADJUSTMENT SCREWS MORE THAN THE CORRECT TORQUE, DAMAGE TO THE SEI CAN OCCUR.

(6) Tighten the adjustment screws for the mounting clamp to 5-10 pound-inches (0.6-1.1 newton-meters).

NOTE: The adjustment screws are the large screws that go into the top right and the bottom left corners of the SEI.

S 864-015-N00
(7) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
(a) 11D27, ENGINE STBY IND 1
(b) 11D28, ENGINE STBY IND 2

S 714-016-N00
(8) Do the operational test of the SEI to make sure it is serviceable.

TASK 77-41-01-704-023-N00

4. Do the Operational Test of the Standby Engine Indicator (SEI)

A. General
(1) The standby engine indicator (SEI) is found on the captain's main instrument panel, P1-3.
(2) The standby engine indicator is referred to as the SEI in this procedure.

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

C. Access
(1) Location Zone
211/212 Flight Compartment

D. Do the Operational Test of the Standby Engine Indicator (SEI) (Fig. 401).

S 864-024-N00
(1) Supply electrical power (AMM 24-22-00/201).

S 864-025-N00
(2) Put the control switch for the SEI display to ON.

S 714-026-N00
(3) Turn the BITE screw to the index mark with a small screwdriver and hold it in that position.

S 714-027-N00
(4) Make sure these indications show on the SEI in three seconds or less:
(a) 2.88 for EPR
(b) 188.8 for N1
(c) 1888 for EGT
(d) 188 for N2

E. Put the airplane back to its usual condition.

S 864-028-N00
(1) Turn the BITE screw on the SEI back to its initial position.

S 864-029-N00
(2) Put the control switch for the SEI display to AUTO.

S 864-030-N00
(3) Remove the electrical power if it is not necessary (AMM 24-22-00/201).