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FAULT CODE INDEX

1. General

- A. The Fault Code Index includes fault isolation or corrective action for each fault code in the Fault Reporting Manual (FRM). The fault codes for each chapter are in numerical order.
 - (1) The first paragraph given with each fault code is the log book report from the FRM. The log book report is a short description of the fault.
 - (2) The numbered paragraphs after the log book report contain the fault isolation or the corrective action.
- B. The fault isolation for most EICAS messages, engine exceedances, or PFD flags includes a list of one or more possible correlated CMCS messages.
 - (1) For each CMCS message in the list, there is the message number and an ATA number. The ATA number is the prompt under which you can find the message in Existing Faults or Fault History on the CDU.
 - (2) The corrective action refers to the procedure in Figure 1 of this section. Figure 1 shows how to use the Present Leg Faults, Existing Faults, and Fault History functions of the CMC to isolate the fault to a specific CMCS message.
- C. For those EICAS status messages which latch into EIU memory when they occur, this index includes the letters NVM, NVM-A, or NVM-G to the right of the log book report.
 - (1) NVM indicates that the message latches if it occurs in the air or on the ground.
 - (2) NVM-A indicates that the message latches only if it occurs in the air.
 - (3) NVM-G indicates that the message latches only if it occurs on the ground.
 - (4) To remove the latched message from the EICAS after you correct the fault, you must use the ERASE function of the CMC.

NOTE: Do not erase a latched EICAS message until you are sure that you have corrected the fault.

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- D. When the CDU shows a large number of Flight Deck Effects (FDEs) or CMCS messages, it is possible that there is a bus failure. Do these steps to isolate the cause of the bus failure:
- (1) Look at the CMCS messages to determine which system or LRU is related to all the messages.
 - (2) Look at the wiring diagram for each system and determine if the suspect LRUs are on a common bus.
 - (3) Do a check of the wiring between each of the suspect LRUs and the common bus.
 - (4) Repair any problems that you find.
 - (5) If the problem continues, remove each LRU individually to determine which LRU is the cause of the fault.
 - (6) Replace the LRU which caused the fault.

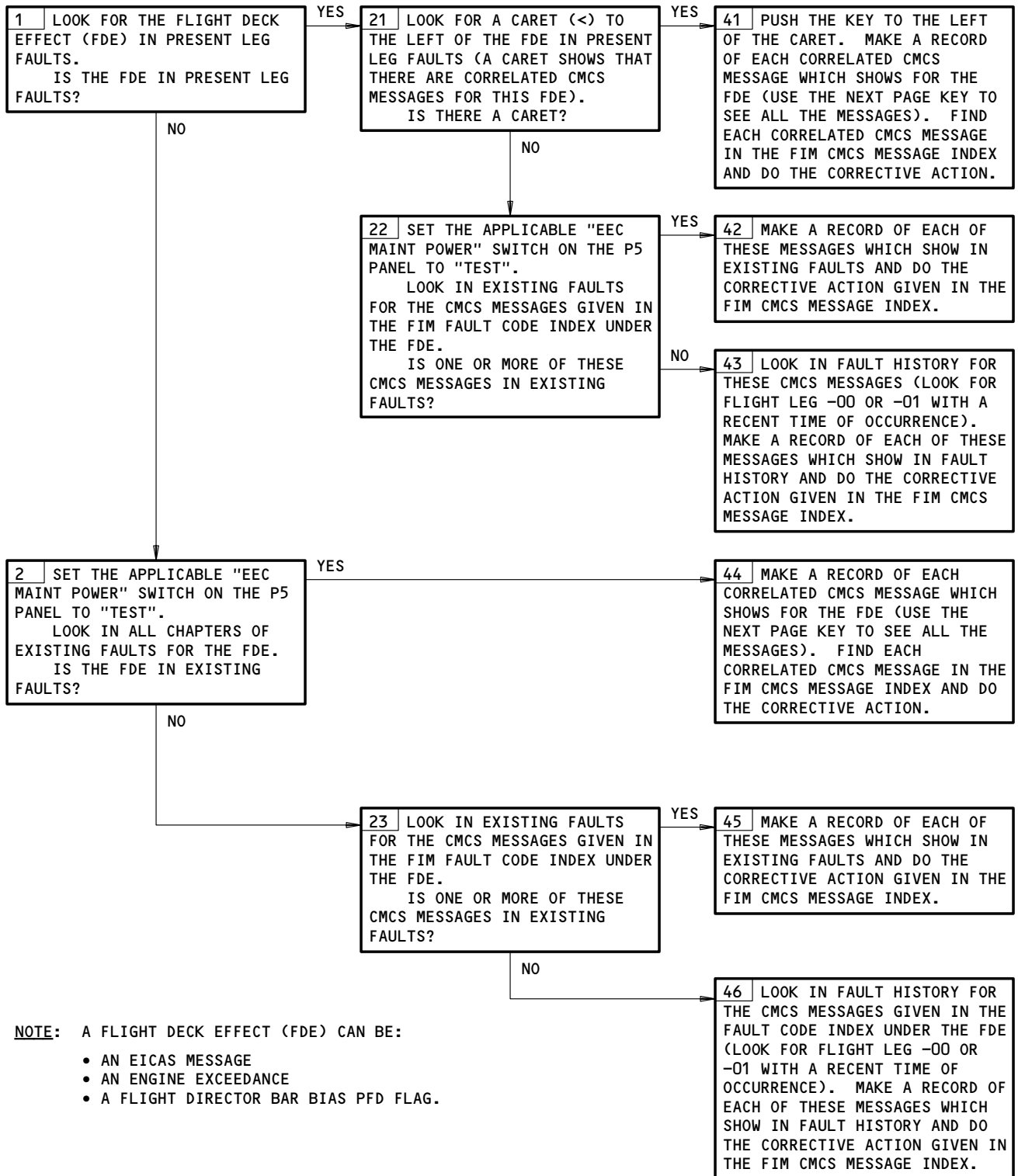
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 Fault Isolation Procedure with the CMCS
 Figure 1

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FAULT CODE	LOG BOOK REPORT/ CORRECTIVE ACTION
77 03 XA 00	<p>The flight crew found an engine start problem that is not on the fault code diagrams in the FRM. See the entry that the crew wrote in the log book.</p> <p>1. WDM 80-11-03</p>
77 03 XB 00	<p>The flight crew found an EGT abnormal problem that is not on the fault code diagrams in the FRM. See the entry that the crew wrote in the log book.</p> <p>1. FIM 77-00-00/101, Fig. 103</p>
00 17 70 01	<p>ENG 1 VIBRATION shows on the auto snapshot report of the performance page.</p> <p>1. Look at the snapshot for this message.</p>
00 17 70 02	<p>ENG 2 VIBRATION shows on the auto snapshot report of the performance page.</p> <p>1. Look at the snapshot for this message.</p>
00 17 70 03	<p>ENG 3 VIBRATION shows on the auto snapshot report of the performance page.</p> <p>1. Look at the snapshot for this message.</p>
00 17 70 04	<p>ENG 4 VIBRATION shows on the auto snapshot report of the performance page.</p> <p>1. Look at the snapshot for this message.</p>
77 03 01 00	<p>The EICAS message ENG 1 SPEED CARD (STATUS) shows. (NVM)</p> <p>CMC S/W -008;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76009 (77-12)</p> <p>CMC S/W -009;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76009 (71-00)</p>
77 03 02 00	Not Used
77 03 03 00	<p>The EICAS message ENG 2 SPEED CARD (STATUS) shows. (NVM)</p> <p>CMC S/W -008;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76010 (77-12)</p> <p>CMC S/W -009;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76010 (71-00)</p>
77 03 04 00	Not Used

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FAULT CODE	LOG BOOK REPORT/ CORRECTIVE ACTION
77 03 05 00	<p>The EICAS message ENG 3 SPEED CARD (STATUS) shows. (NVM)</p> <p>CMC S/W -008;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76011 (77-12)</p> <p>CMC S/W -009;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76011 (71-00)</p>
77 03 06 00	Not Used
77 03 07 00	<p>The EICAS message ENG 4 SPEED CARD (STATUS) shows. (NVM)</p> <p>CMC S/W -008;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76012 (77-12)</p> <p>CMC S/W -009;</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1): 76012 (71-00)</p>
77 03 08 __	<p>No. (01=1, 02=2, 03=3, 04=4) eng N2 shows zero during the start. The start valve shows open and the oil pressure did increase.</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1):</p> <p>7X310 (77-12) 7X410 (77-12) 7X547 (77-12)</p> <p>2. If none of the above messages come into view, replace the N2 speed sensor (AMM 77-12-02/401).</p>
77 03 09 __	<p>No. (01=1, 02=2, 03=3, 04=4) engine start valve closed and the engine start SW went to OFF at __% N2. The EICAS message STARTER CUTOUT (1, 2, 3, 4) showed. The start switch was manually put in OFF.</p> <p>1. Replace the applicable N2 speed card (AMM 77-12-03/401). If the problem continues, examine and repair the wiring between the switch for the module-electrical system and the engine start switch (WDM 80-11-03).</p>
77 03 10 __	<p>The No. (01=1, 02=2, 03=3, 04=4) engine start valve did not close but the engine start switch did not go to OFF at 50% N2. The EICAS message STARTER CUTOUT (1, 2, 3, 4) did come on. The start switch was manually put in the OFF position.</p> <p>1. Replace the applicable N2 speed card (AMM 77-12-03/401). If the problem continues, examine and repair the wiring between the card file for the module-electrical systems and the engine start switch (WDM 80-11-03).</p>
77 03 11 __	Not Used

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FAULT CODE	LOG BOOK REPORT/ CORRECTIVE ACTION
77 03 12 ____	<p>The No. (01=1, 02=2, 03=3, 04=4) engine slow to accelerate to idle. The starter cutout is at ____% N2.</p> <p>1. Replace the applicable N2 speed card (AMM 77-12-03/401). If the problem continues, examine and repair the wiring between the card file fwd for the module-electrical systems and the engine start switch (WDM 80-11-03).</p>
77 03 13 ____	<p>The No. (01=1, 02=2, 03=3, 04=4) engine had an impending hot start. The highest EGT was less than 750°C. The starter cutout early, at ____% N2.</p> <p>1. Replace the applicable N2 speed card (AMM 77-12-03/401). If the problem continues, examine and repair the wiring between the card file fwd for the module-electrical systems and the engine start switch (WDM 80-11-03).</p>
77 03 14 ____	<p>The No. (01=1, 02=2, 03=3, 04=4) ENG EGT fluctuates at all power positions.</p> <p>1. If no messages come into view, or if the problem continues, do the EGT indicating system inspection/check (AMM 77-21-00/601).</p>
77 03 15 ____	<p>No. (01=1, 02=2, 03=3, 04=4) ENG EGT low ____°C when compared to the other engines at the same power position.</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1):</p> <p style="padding-left: 40px;">7X310 (77-12) 7X410 (77-12) 7X547 (77-12)</p> <p>2. If no messages come into view, or if the problem continues, do the EGT indicating system inspection/check (AMM 77-21-00/601).</p>
77 03 16 ____	<p>No. (01=1, 02=2, 03=3, 04=4) ENG EGT high ____°C when you compare it to the other engines at the same power setting.</p> <p>1. Look for one or more of these CMCS MESSAGES (Fig. 1):</p> <p style="padding-left: 40px;">7X304 (77-21) 7X404 (77-21)</p> <p>2. If no messages come into view, or if the problem continues, do the EGT indicating system inspection/check (AMM 77-21-00/601).</p>
77 03 17 ____ thru 77 03 18 ____	Not Used

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FAULT CODE	LOG BOOK REPORT/ CORRECTIVE ACTION
77 03 19 _	No. (01=1, 02=2, 03=3, 04=4) eng vibration (N2, fan, LPT) is high (below 4.0 units). Other indications were correct and the vibration did not change with the movement of the thrust lever. 1. If the problem continues, use the AVM Fault Isolation procedures that you find in FIM 77-00-00/101, Fig. 103.
77 03 20 _	No. (01=1, 02=2, 03=3, 04=4) eng BB vibration displayed. 1. Examine the wiring between the AVM signal conditioner (engine 1 & M118, engine 3 & 4 M7846) to the fan and core speed sensor (WDM 77-12-11, WDM 77-12-12, WDM 77-12-13, WDM 77-12-14, WDM 77-12-21, WDM 77-12-22, WDM 77-12-23, WDM 77-12-24). 2. If the problem continues, use the AVM Fault Isolation procedures that you find in FIM 77-00-00/101, Fig. 103.
77 03 21 _	No. (01=1, 02=2, 03=3, 04=4) engine vibration indication (blank, fluctuates). 1. If the problem continues, use the AVM Fault Isolation procedures that you find in FIM 77-00-00/101, Fig. 103.

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ENGINE INDICATING - DESCRIPTION AND OPERATION

1. General

- A. The engine indicating described in this chapter consists of the engine tachometer system, 77-12-00/001, which measures rotational speed of the low speed rotor (N1) and high speed rotor (N2); the exhaust gas temperature indicating (EGT) system, 77-21-00/001; an airborne vibration monitoring (AVM) system, 77-31-00/001; Engine Condition Monitoring System, 77-34-00/001, which measures fan static discharge pressure (PS14), low pressure turbine inlet pressure (P49), compressor discharge temperature (T3), low pressure turbine discharge (T5).
- (1) Tachometer Indicating System
 - (a) Primary power indication is the low pressure (fan) rotor speed, or N1, given in percent RPM.
 - (b) Secondary power indication is the high pressure rotor speed, or N2, given in percent RPM.
 - (2) Exhaust Gas Temperature Indicating System
 - (a) An exhaust gas temperature indication is used to monitor the engine temperatures. Thermocouple probes are located between the high and low pressure turbines.
 - (3) Airborne Vibration Monitoring System
 - (a) Two sensors employing piezoelectric crystals to sense vibration of the rotors, are utilized to monitor the engine vibration. AVM Signal Conditioner units, in the Main Equipment Center, prepare the sensor signals for the Engine Indication and Crew Alerting System (EICAS display).
 - (4) Engine Condition Monitoring System
 - (a) Engine performance is monitored by pressure and temperature sensors located on the engine. These sensors report their readings to the Electronic Control Unit (ECU). Faults and performance data may be monitored by the ground or maintenance crew through the Central Maintenance Computer (CMC) display.

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COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
ACCELEROMETER - ENGINE CORE, ENG 1, T676	3	1	415, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-31-02
ACCELEROMETER - ENGINE CORE, ENG 2, T676	3	1	425, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-31-02
ACCELEROMETER - ENGINE CORE, ENG 3, T676	3	1	435, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-31-02
ACCELEROMETER - ENGINE CORE, ENG 4, T676	3	1	445, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-31-02
ACCELEROMETER - ENGINE FAN, ENG 1, T677	3	1	415, LEFT THRUST REVERSER HALF, NO. 8 FAN FRAME STRUT	77-31-01
ACCELEROMETER - ENGINE FAN, ENG 2, T677	3	1	425, LEFT THRUST REVERSER HALF, NO. 8 FAN FRAME STRUT	77-31-01
ACCELEROMETER - ENGINE FAN, ENG 3, T677	3	1	435, LEFT THRUST REVERSER HALF, NO. 8 FAN FRAME STRUT	77-31-01
ACCELEROMETER - ENGINE FAN, ENG 4, T677	3	1	445, LEFT THRUST REVERSER HALF, NO. 8 FAN FRAME STRUT	77-31-01
CABLE - EGT THERMOCOUPLE, ENG 1	2	2	417 AND 418, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-02
CABLE - EGT THERMOCOUPLE, ENG 2	2	2	427 AND 428, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-02
CABLE - EGT THERMOCOUPLE, ENG 3	2	2	437 AND 438, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-02
CABLE - EGT THERMOCOUPLE, ENG 4	2	2	447 AND 448, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-02
CARD - ENGINE SPEED, ENG 1, YMLA001	1	1	115, LEFT HAND AREA BETWEEN NOSE GEAR WELL AND FUSELAGE	77-12-01
CARD - ENGINE SPEED, ENG 2, YMLA003	1	1	115, LEFT HAND AREA BETWEEN NOSE GEAR WELL AND FUSELAGE	77-12-01
CARD - ENGINE SPEED, ENG 3, YMLA005	1	1	115, LEFT HAND AREA BETWEEN NOSE GEAR WELL AND FUSELAGE	77-12-01
CARD - ENGINE SPEED, ENG 4, YMLA007	1	1	115, LEFT HAND AREA BETWEEN NOSE GEAR WELL AND FUSELAGE	77-12-01
CIRCUIT BREAKER				
VIB AMP ENG 1&2, C101		1	6H26	*
VIB AMP ENG 3&4, C10090		1	6H27	*
JUNCTION BOX - EGT SHUNT, ENG 1	2	1	417, LEFT CORE COWL PANEL, DIFFUSER CASE	77-21-03
JUNCTION BOX - EGT SHUNT, ENG 2	2	1	427, LEFT CORE COWL PANEL, DIFFUSER CASE	77-21-03
JUNCTION BOX - EGT SHUNT, ENG 3	2	1	437, LEFT CORE COWL PANEL, DIFFUSER CASE	77-21-03
JUNCTION BOX - EGT SHUNT, ENG 4	2	1	447, LEFT CORE COWL PANEL, DIFFUSER CASE	77-21-03

* SEE WDM EQUIPMENT LIST

Engine Indicating - Component Index
Figure 101 (Sheet 1)

EFFECTIVITY

ALL

77-00-00

J01

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683748

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
PROBE - EGT THERMOCOUPLE, ENG 1	2	8	417 AND 418, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-01
PROBE - EGT THERMOCOUPLE, ENG 2	2	8	427 AND 428, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-01
PROBE - EGT THERMOCOUPLE, ENG 3	2	8	437 AND 438, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-01
PROBE - EGT THERMOCOUPLE, ENG 4	2	8	447 AND 448, LEFT AND RIGHT CORE COWL PANELS, TURBINE EXHAUST CASE	77-21-01
PROBE - P49 PRESSURE, ENG 1	4	1	417, LEFT CORE COWL PANEL, LOW PRESSURE TURBINE CASE	77-34-03
PROBE - P49 PRESSURE, ENG 2	4	1	427, LEFT CORE COWL PANEL, LOW PRESSURE TURBINE CASE	77-34-03
PROBE - P49 PRESSURE, ENG 3	4	1	437, LEFT CORE COWL PANEL, LOW PRESSURE TURBINE CASE	77-34-03
PROBE - P49 PRESSURE, ENG 4	4	1	447, LEFT CORE COWL PANEL, LOW PRESSURE TURBINE CASE	77-34-03
PROBE - T5 TEMPERATURE, ENG 1	3	1	417, LEFT CORE COWL PANEL, TURBINE REAR FRAME	77-34-07
PROBE - T5 TEMPERATURE, ENG 2	3	1	427, LEFT CORE COWL PANEL, TURBINE REAR FRAME	77-34-07
PROBE - T5 TEMPERATURE, ENG 3	3	1	437, LEFT CORE COWL PANEL, TURBINE REAR FRAME	77-34-07
PROBE - T5 TEMPERATURE, ENG 4	3	1	447, LEFT CORE COWL PANEL, TURBINE REAR FRAME	77-34-07
SENSOR - N1 FAN SHAFT SPEED, ENG 1, T430	4	1	414, RIGHT FAN COWL PANEL, NO. 3 FAN FRAME STRUT	77-12-01
SENSOR - N1 FAN SHAFT SPEED, ENG 2, T430	4	1	424, RIGHT FAN COWL PANEL, NO. 3 FAN FRAME STRUT	77-12-01
SENSOR - N1 FAN SHAFT SPEED, ENG 3, T430	4	1	434, RIGHT FAN COWL PANEL, NO. 3 FAN FRAME STRUT	77-12-01
SENSOR - N1 FAN SHAFT SPEED, ENG 4, T430	4	1	444, RIGHT FAN COWL PANEL, NO. 3 FAN FRAME STRUT	77-12-01
SENSOR - N2 SPEED, ENG 1, T417	4	1	416, RIGHT THRUST REVERSER HALF, ACCESSORY GEARBOX	77-12-02
SENSOR - N2 SPEED, ENG 2, T417	4	1	426, RIGHT THRUST REVERSER HALF, ACCESSORY GEARBOX	77-12-02
SENSOR - N2 SPEED, ENG 3, T417	4	1	436, RIGHT THRUST REVERSER HALF, ACCESSORY GEARBOX	77-12-02
SENSOR - N2 SPEED, ENG 4, T417	4	1	446, RIGHT THRUST REVERSER HALF, ACCESSORY GEARBOX	77-12-02

Engine Indicating - Component Index
Figure 101 (Sheet 2)

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COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
SENSOR - PS14 PRESSURE, ENG 1	2	1	413, LEFT FAN COWL PANEL, FAN CASE	77-34-01
SENSOR - PS14 PRESSURE, ENG 2	2	1	423, LEFT FAN COWL PANEL, FAN CASE	77-34-01
SENSOR - PS14 PRESSURE, ENG 3	2	1	433, LEFT FAN COWL PANEL, FAN CASE	77-34-01
SENSOR - PS14 PRESSURE, ENG 4	2	1	443, LEFT FAN COWL PANEL, FAN CASE	77-34-01
SENSOR - T3 TEMPERATURE, ENG 1	3	1	415, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-34-04
SENSOR - T3 TEMPERATURE, ENG 2	3	1	425, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-34-04
SENSOR - T3 TEMPERATURE, ENG 3	3	1	435, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-34-04
SENSOR - T3 TEMPERATURE, ENG 4	3	1	445, LEFT THRUST REVERSER HALF, COMPRESSOR REAR FRAME	77-34-04
SIGNAL CONDITIONER - AIRBORNE VIBRATION MONITOR, ENG 1&2, M118	1	1	117, LEFT HAND ELECTRICAL AND ELECTRONICS COMPARTMENT, E1-1	77-31-03
SIGNAL CONDITIONER - AIRBORNE VIBRATION MONITOR, ENG 3&4, M7846	1	1	118, RIGHT HAND ELECTRICAL AND ELECTRONICS COMPARTMENT, E2-1	77-31-03
UNIT - (REF 31-61-00, FIG.101) EFIS/EICAS INTERFACE, M7351 EFIS/EICAS INTERFACE, M7352 EFIS/EICAS INTERFACE, M7353				

Engine Indicating - Component Index
 Figure 101 (Sheet 3)

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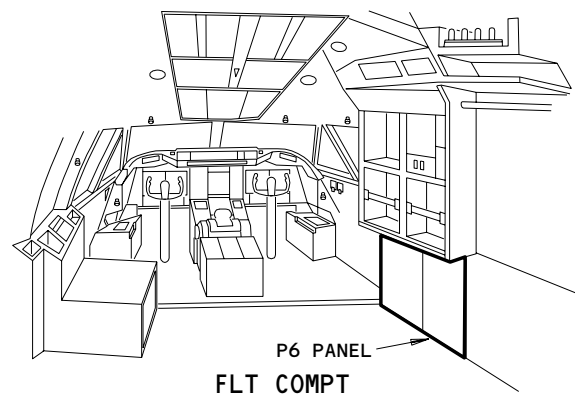
J01

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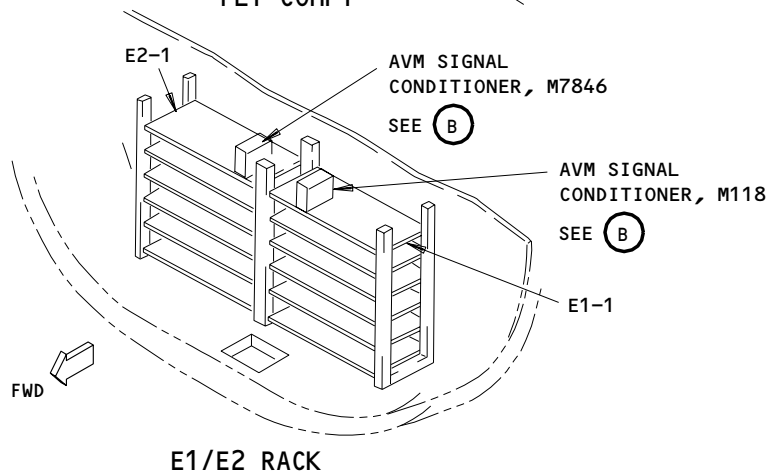
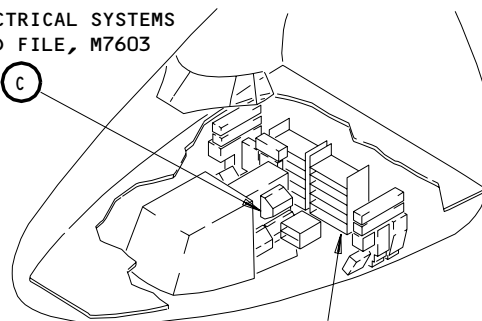
BOEING
747-400
FAULT ISOLATION/MAINT MANUAL

////////////////////
/ CF6-80C SERIES /
/ ENGINES /
////////////////////



ELECTRICAL SYSTEMS
CARD FILE, M7603

SEE (C)



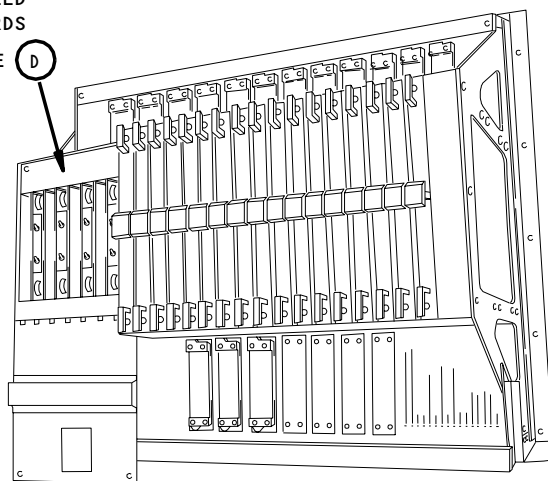
E1/E2 RACK

(A)

AVM SIGNAL CONDITIONER

(B)

ENGINE
SPEED
CARDS
SEE (D)



ELECTRICAL SYSTEMS CARD FILE M7603

(C)

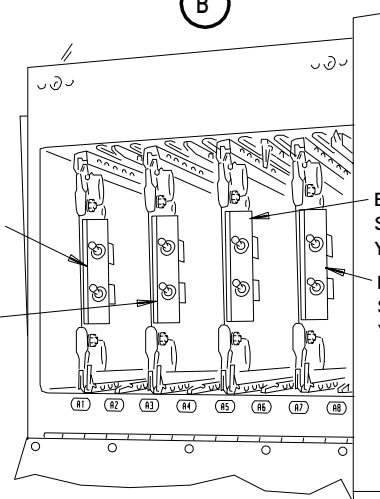
NOTE: EEC/TMC CARDS NOT
SHOWN FOR CLARITY.

ENGINE 1
SPEED CARD,
YMLA001

ENGINE 2
SPEED CARD,
YMLA003

ENGINE 3
SPEED CARD,
YMLA005

ENGINE 4
SPEED CARD,
YMLA007



ENGINE SPEED CARDS

(D)

Engine Indicating - Component Location
Figure 102 (Sheet 1)

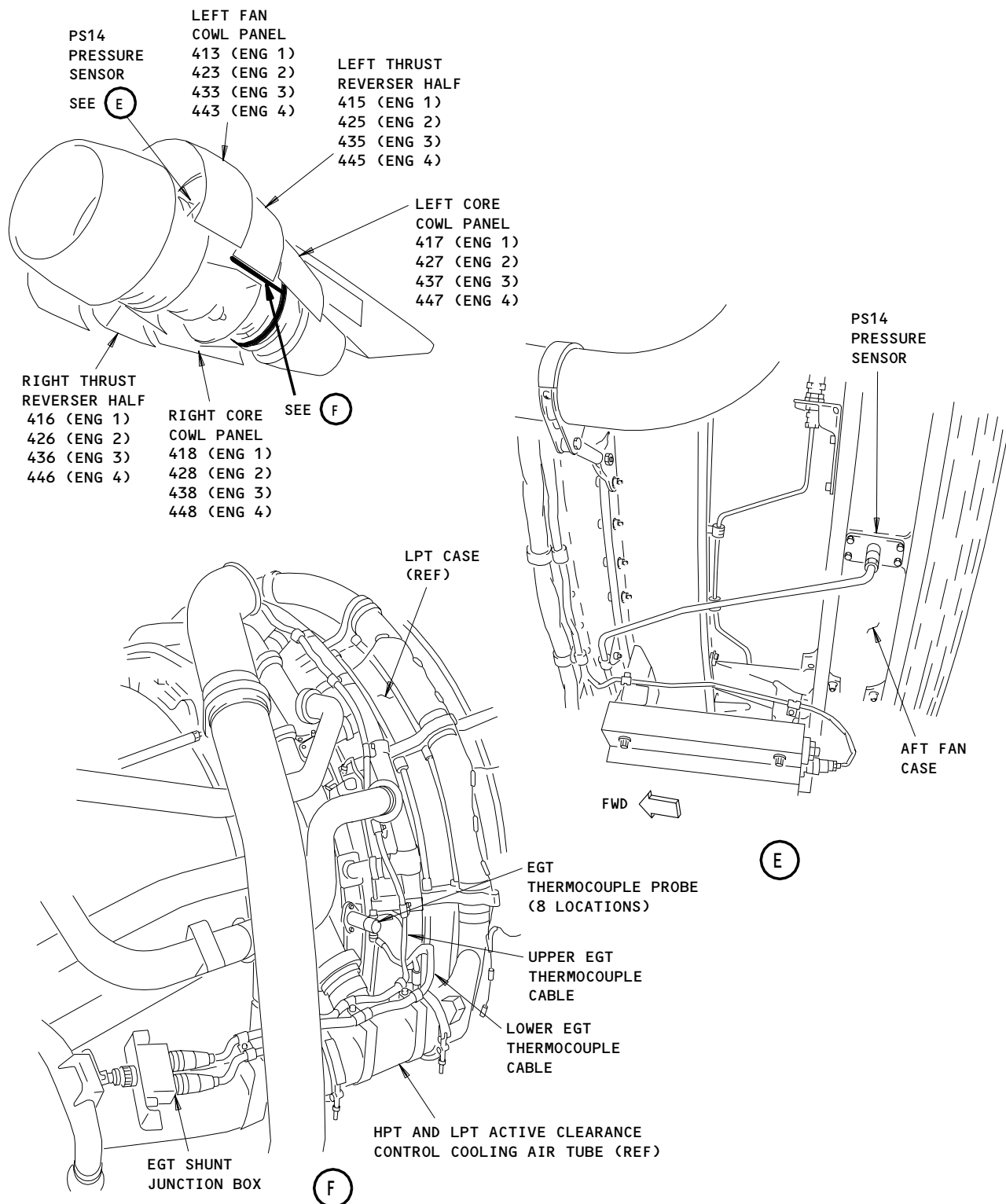
EFFECTIVITY

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Engine Indicating - Component Location
Figure 102 (Sheet 2)

EFFECTIVITY

ALL

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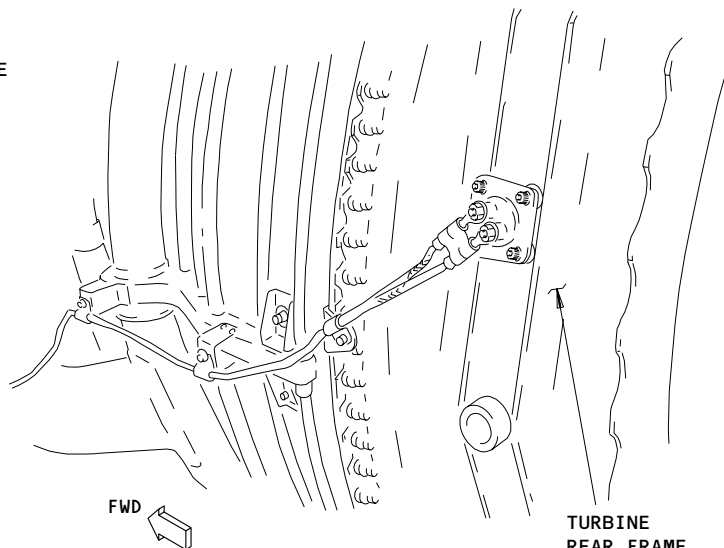
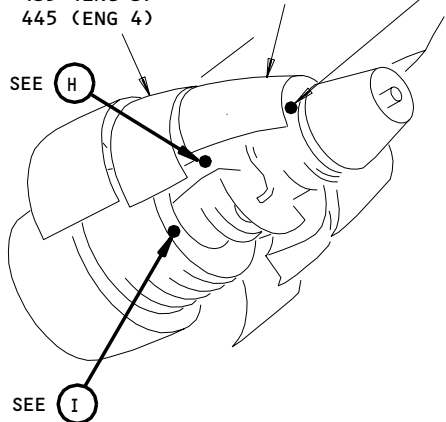
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LEFT THRUST
REVERSER HALF
415 (ENG 1)
425 (ENG 2)
435 (ENG 3)
445 (ENG 4)

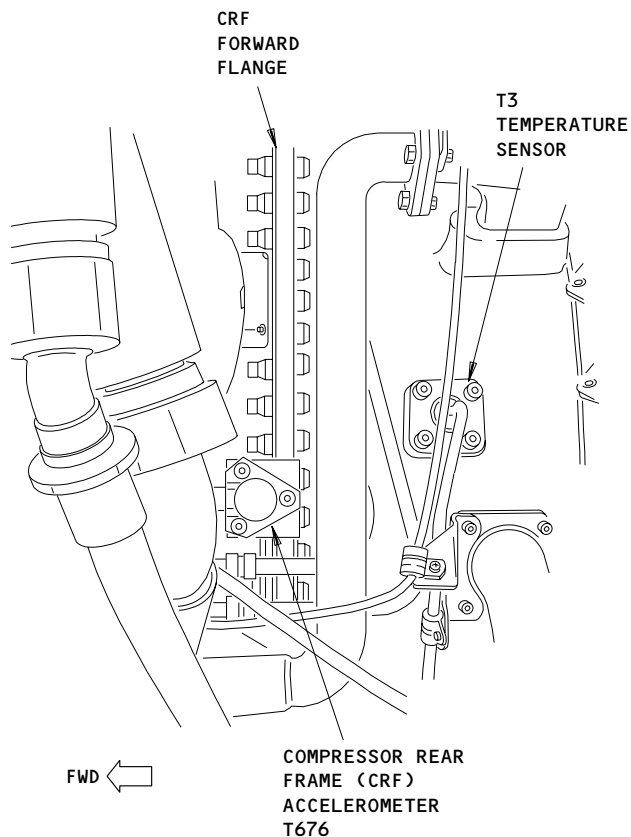
LEFT CORE
COWL PANEL
417 (ENG 1)
427 (ENG 2)
437 (ENG 3)
447 (ENG 4)

T5
TEMPERATURE
PROBE
SEE (G)

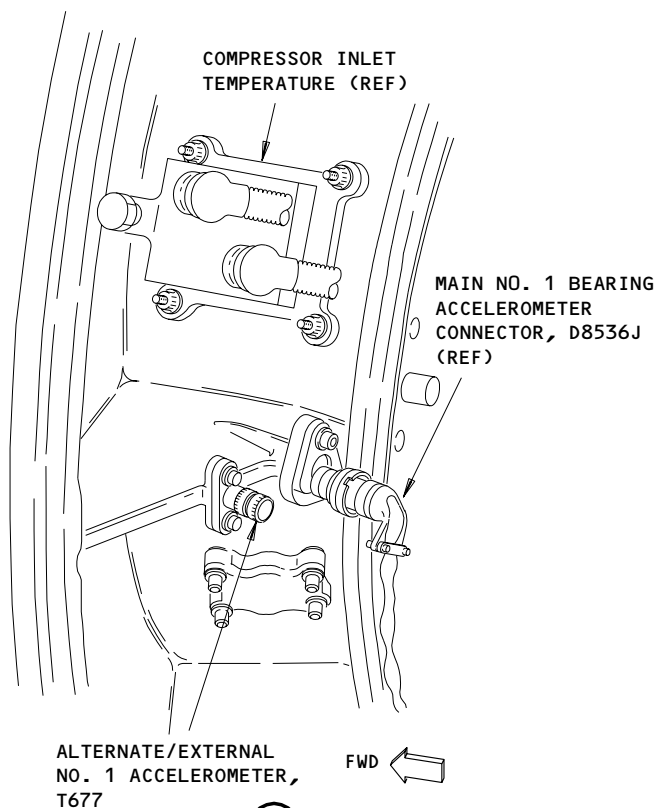


T5 TEMPERATURE PROBE

(G)



(H)



(I)

Engine Indicating Component Location
Figure 102 (Sheet 3)

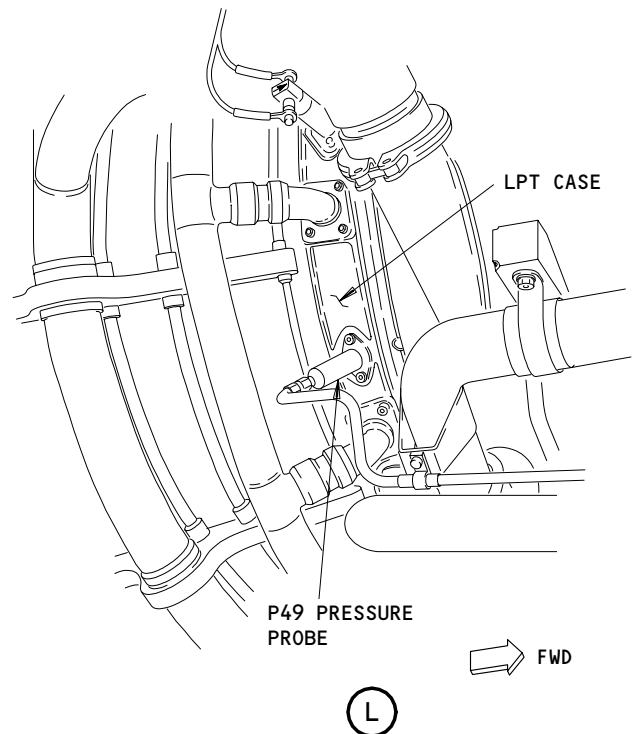
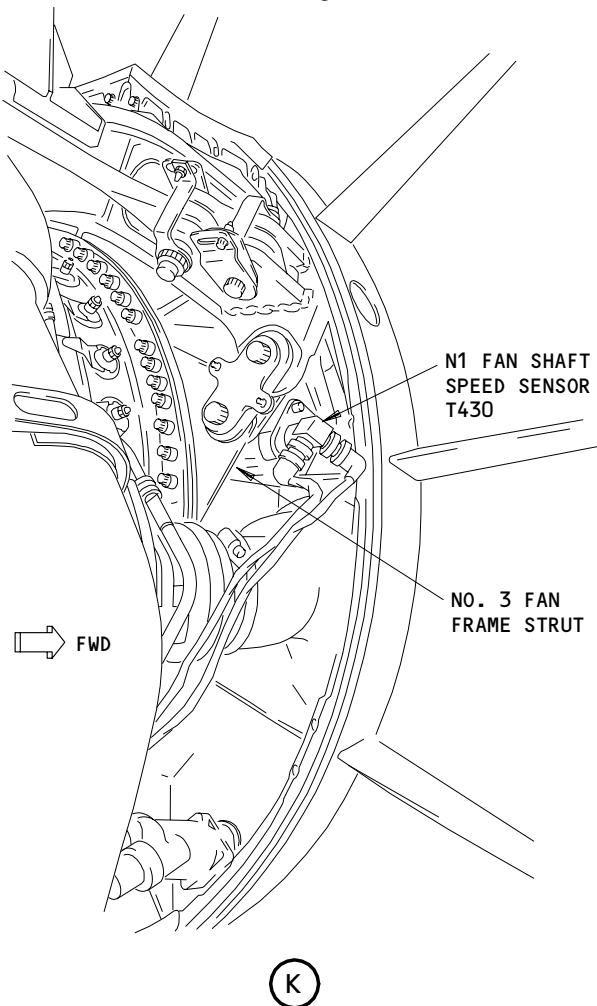
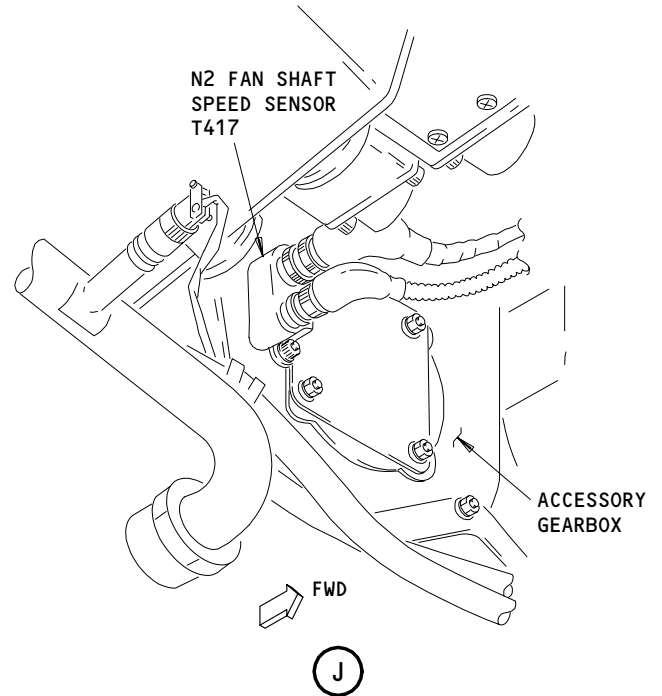
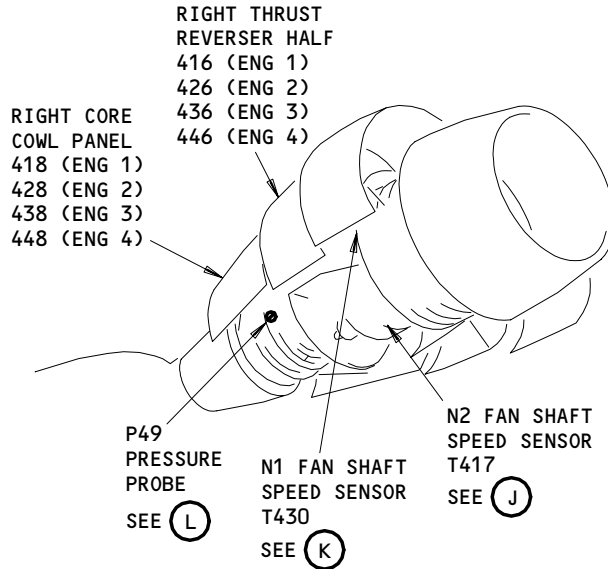
EFFECTIVITY

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Engine Indicating - Component Location
Figure 102 (Sheet 4)

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ENGINE INDICATION - FAULT ISOLATION

1. General
 - A. Engine Indication fault isolation consists of procedures to isolate and correct the cause of a AVM system fault.
2. Fault Isolation Procedures

Figure 103 AVM System Problems

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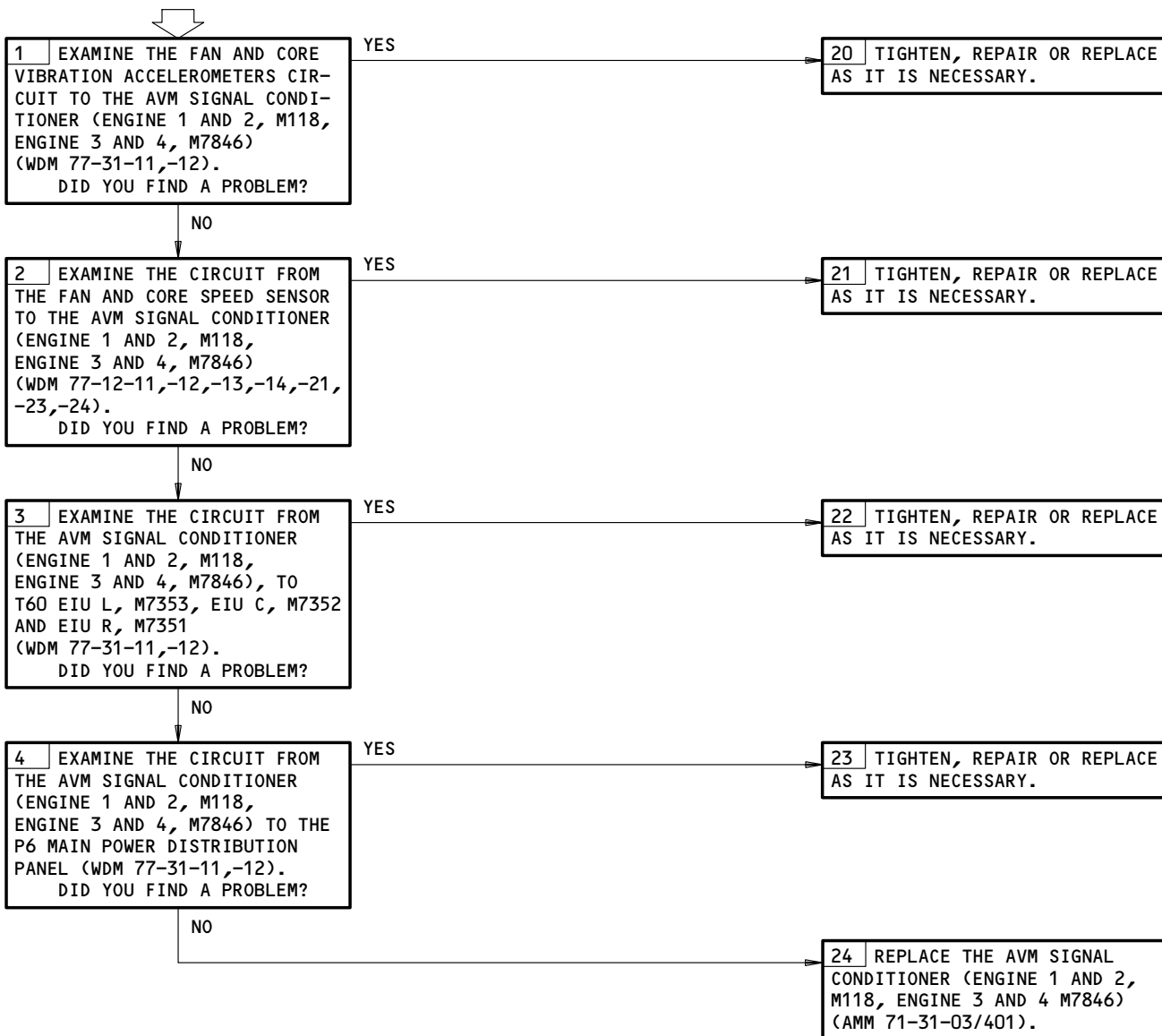
PREREQUISITES

MAKE SURE THIS SYSTEM WILL OPERATE:
EICAS (AMM 31-41-00/201)

MAKE SURE THESE CIRCUIT BREAKERS ARE CLOSED:
H26,H27

MAKE SURE THE AIRPLANE IS IN THIS CONFIGURATION:
ELECTRICAL POWER IS ON (AMM 24-22-00/201)

AVM SYSTEM PROBLEMS



AVM System Problems
Figure 103

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ENGINE TACHOMETER SYSTEM – DESCRIPTION AND OPERATION

1. General

- A. The engine tachometer system consists of two separate systems, the N1 Tachometer Indicating System and the N2 Tachometer Indicating System.
- B. The engine tachometer system measures the speed of the low speed (N1) rotor and high (N2) speed rotor and provides fan and engine speed signals to the Electronic Control Unit (ECU) and speed indication to the EFIS/EICAS Interface Unit (EIU). The actual indication can be read on the EICAS display unit located in the flight compartment.
- C. N1 speed is used to monitor engine power output, engine condition, and N1 rotor overspeed. N2 rotor speed is used to monitor engine starting, engine condition, and N2 rotor overspeed.

2. N1 Fan Shaft Speed Sensor (Fig. 1)

- A. The N1 sensor measures engine fan speed. It is an induction-type tachometer excited by a rotating cage mounted on the fan rotor. The 38-tooth cage generates a signal proportional to the fan speed as the teeth pass the sensor mounted on the fan frame. As each tooth passes the sensor, it interrupts the sensor's flux field and causes an electrical pulse. The frequency of the pulses is proportional to the fan speed.
- B. The sensor is installed into the A sump through fan frame strut number 3. A two-bolt, spring-loaded mounting flange secures the sensor tip under load into its seat in the No. 2 bearing support. The magnetic tip is protected from the sump oil by a titanium seat in the fan frame pressure sleeve.
- C. The sensor tip contains a permanent magnet wafer and three coils. The coils are part of separate circuits, two dedicated to the ECU and one for the EIU computers.

3. N2 Core Speed Sensor

- A. The N2 core speed sensor measures the engine high pressure turbine (HPT) fan speed. The sensor's magnetic speed pickup coils in the probe sensor tip detects the passing of teeth on a ferromagnetic toothed wheel installed in the accessory gearbox. As each tooth passes the sensor, it interrupts the sensor's flux field and causes an electrical pulse. The frequency of the pulses is proportional to the HPT speed.
- B. The N2 sensor is installed on the accessing gearbox near the Hydro Medical Unit (HMU) at the 5 o'clock position.
- C. The N2 sensor is a three coil magnetic speed pickup which provides three electrically isolated and independent signals with frequency proportional to core speed. Two signals are sent to the ECU. The other signal provides fan speed input to the EIU.

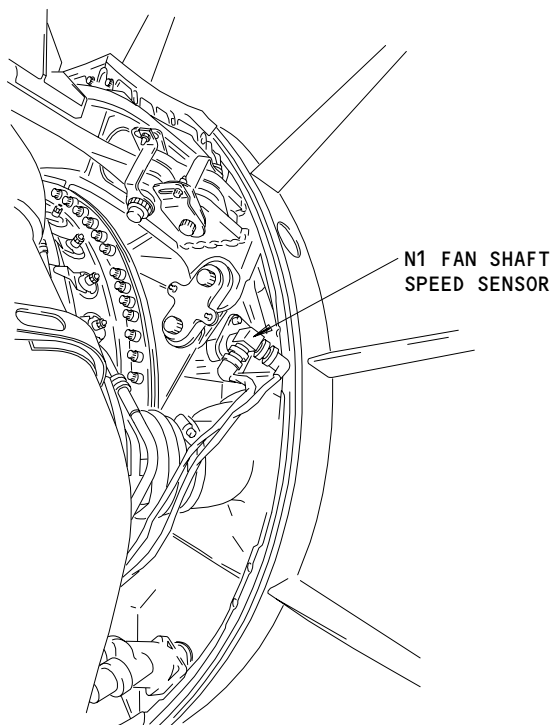
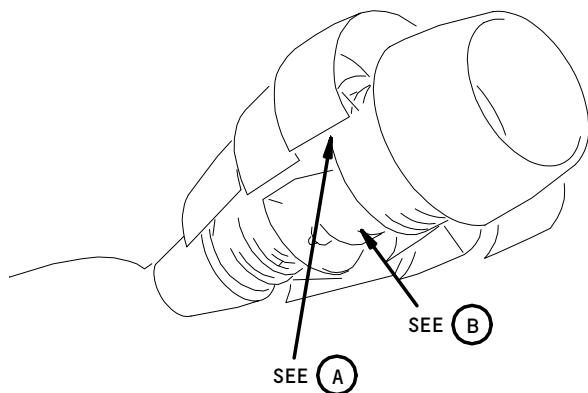
EFFECTIVITY

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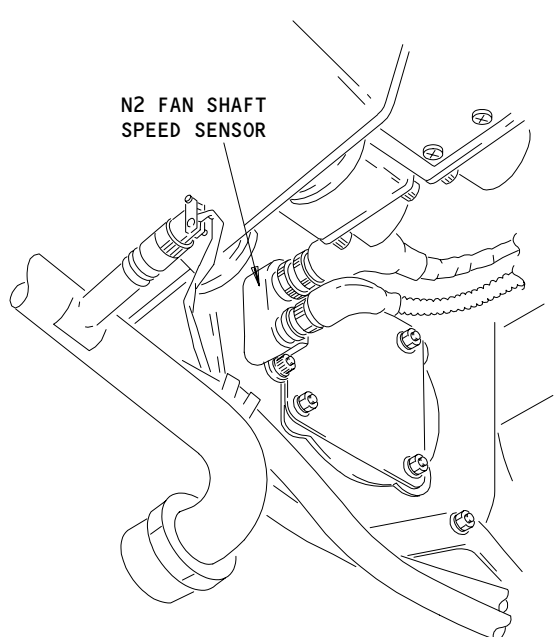
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➡ FWD



NO. 3 FAN FRAME STRUT
(A)

ACCESSORY GEARBOX
(B)

Engine Tachometer System Components
Figure 1

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4. Operation (Fig. 2)

A. N1 (Fan) Tachometer Indicating System

- (1) This system is designed to measure the rotational speed of the fan and low pressure compressor and turbine. Two analog signals are sent through the ECU where they are converted to ARINC 429 signals and sent to the EIU's. The third analog signal provides a fan speed input to the AVM filter and the EIU's. These signals are directly proportional to the fan speed and are produced by means of a rotating cage and a fan speed sensor.
- (2) N1 indication is provided on the upper EICAS display, and consists of an analog bar scale and a digital readout.
 - (a) The analog bar scale readout consists of moving bar within a vertical rectangle. The moving bar and rectangle are white. If N1 speed exceeds redline, the moving bar and rectangle change color from white to red.
 - (b) The digital readout of N1 speed is located above the analog bar scale and is enclosed in a box. Both the numerals and the box change color from white to red if redline is exceeded.
 - (c) A white command sector is displayed along the vertical of the rectangle to indicate the difference between actual and commanded N1.
 - (d) A green colored reference limit readout is displayed above each bar scale to indicate thrust reference information. The thrust reference limits are set by the flight management computer (FMC/TMC).
 - (e) Maximum thrust limit is indicated by a yellow colored bars on the analog rectangle. The value is normally acquired from the ECU but is obtained from the (FMC/TMC) if the ECU fails.

B. N2 (Fan) Tachometer Indicating System

- (1) This system is designed to measure the rotational speed of the fan and high pressure compressor and turbine. Two signals are sent through the ECU where they are converted to ARINC 429 signals and sent to the EIU's via cable W7 and W8. The third analog signal provides a fan speed input to the AVM filter via cable W7. The signal is then sent to the N2 speed card and then to the EIU's. This feature provides an analog backup of N2 in case of ECU failure.

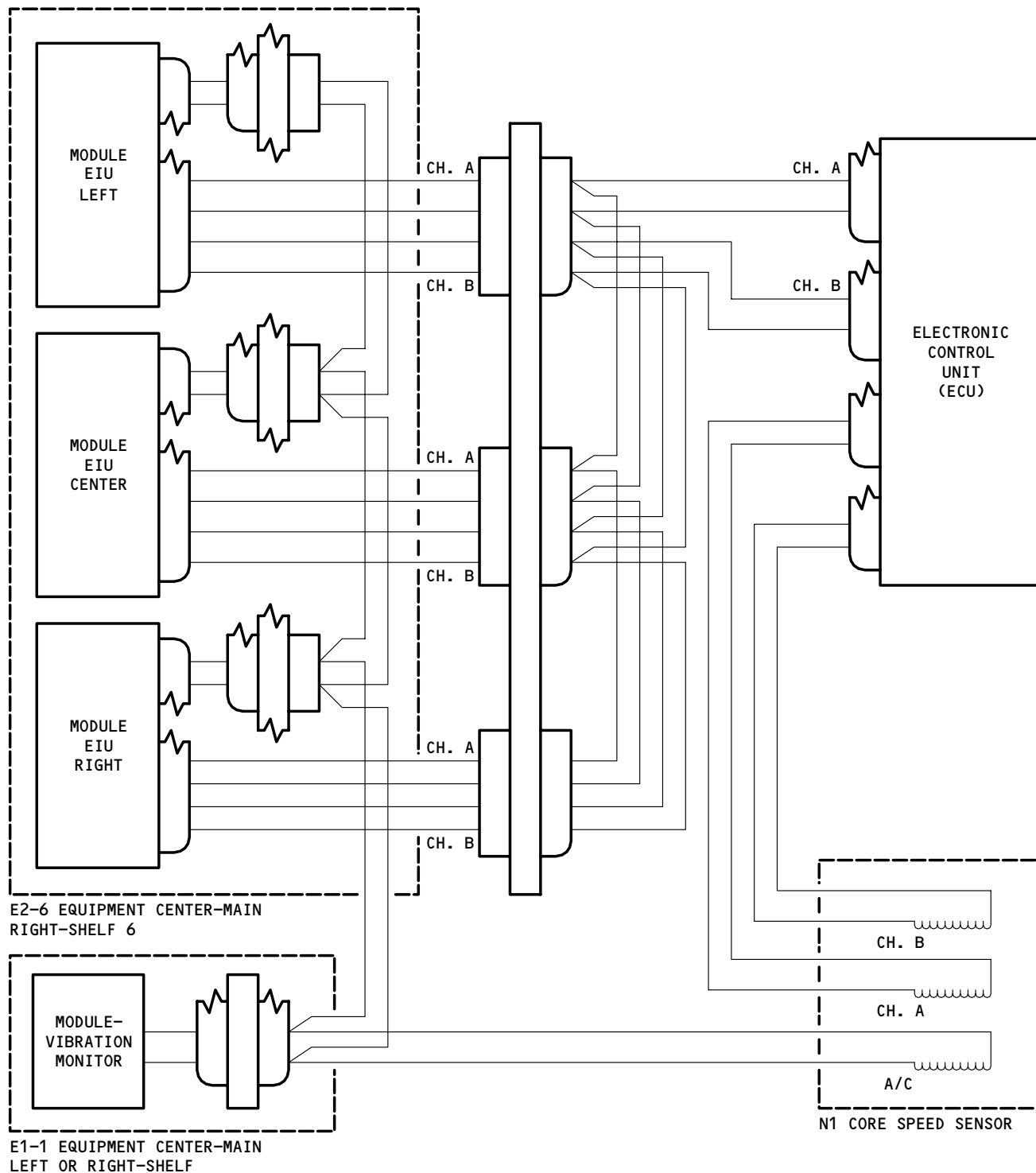
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N1 TACHOMETER INDICATING SYSTEM

Engine Tachometer System
Figure 2 (Sheet 1)

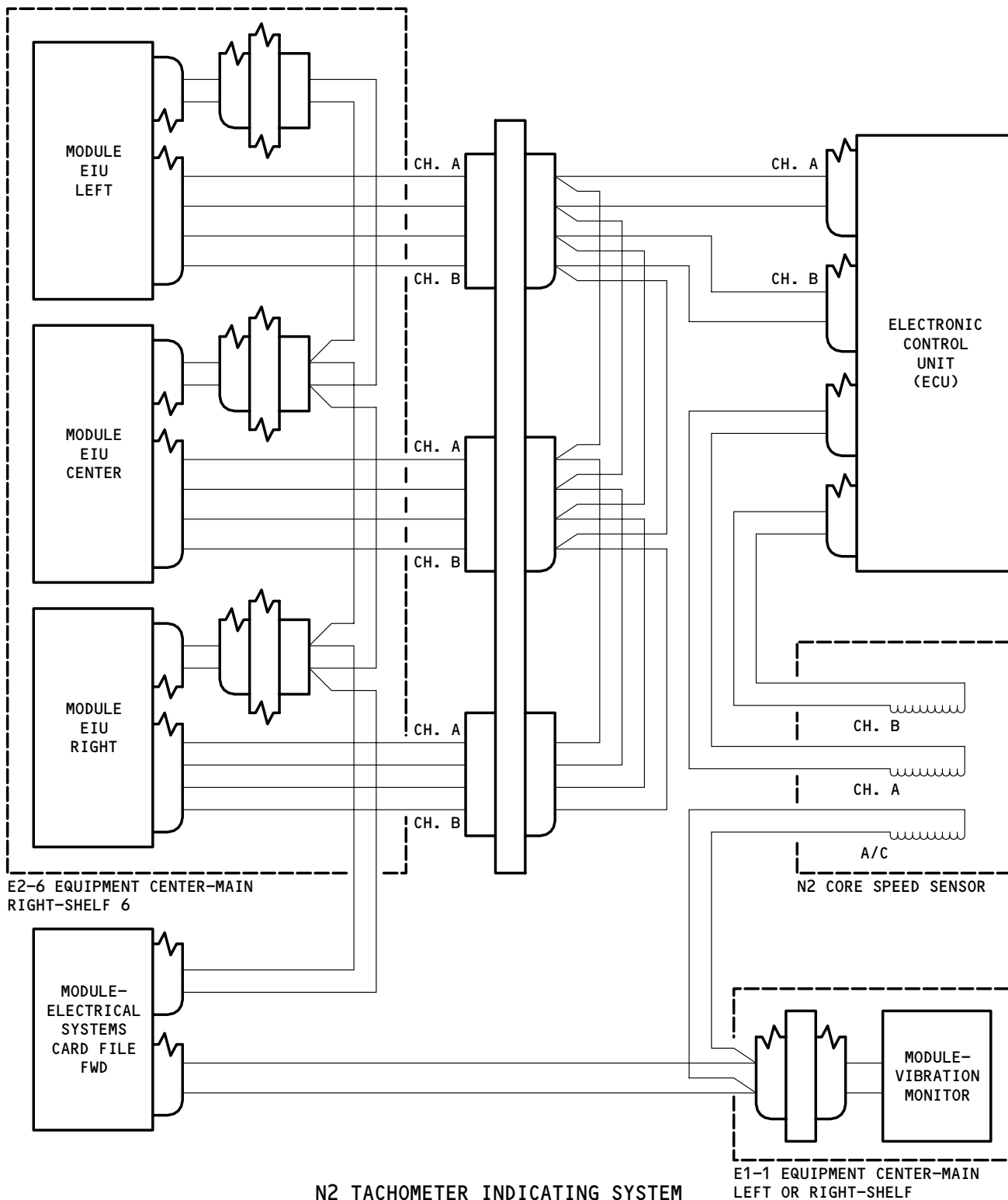
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Engine Tachometer System
Figure 2 (Sheet 2)

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- (2) N2 indication is provided in the upper right-hand corner of the secondary EICAS display, and consists of an analog bar scale and a digital readout.
- (3) The analog bar scale readout consists of a moving bar within a vertical rectangle. The moving bar and rectangle are white. If N2 speed exceeds redline, the bar scale and rectangle change color from white to red.
- (4) The readout of N2 speed is on the secondary display and shown on an analog bar scale with numerical values enclosed in a box. Both the numerals and the box change color from white to red if redline is exceeded.
- (5) The magenta limit bugs are located at 15% N2.

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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 77-12-00-705-003-J00

2. Operational Test - Engine Tachometer System (Fig. 501)

- A. References
 - (1) 71-00-00/201, Power Plant
- B. Access
 - (1) Location Zone
 - 221 Control Cabin, LH
 - 222 Control Cabin, RH
- C. Procedure
 - S 865-001-J00
 - (1) Operate the engines at equal power.
 - (a) Start the engines (Ref 71-00-00/201).
 - (b) Make sure the EGT parameter becomes stable and indicates approximately the same value for each engine.
 - S 715-002-J00
 - (2) Make sure the N1 indication on the main EICAS display is approximately the same for each engine.
 - S 715-004-J00
 - (3) Make sure the N2 indication on the auxiliary EICAS display is approximately the same for each engine.

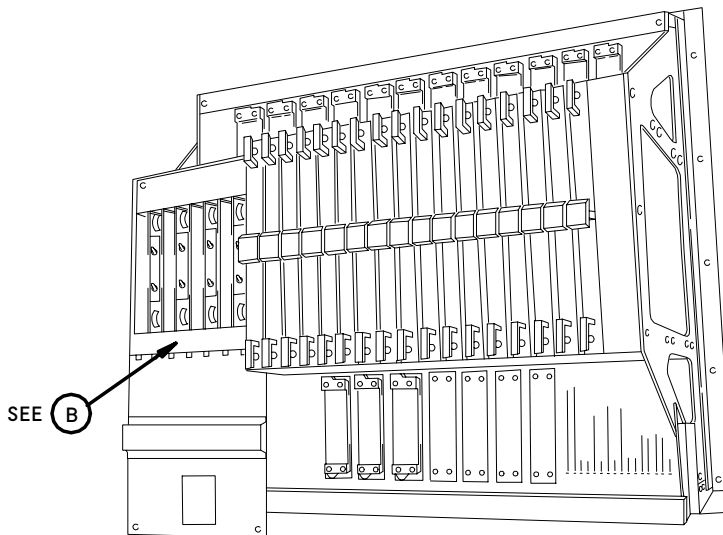
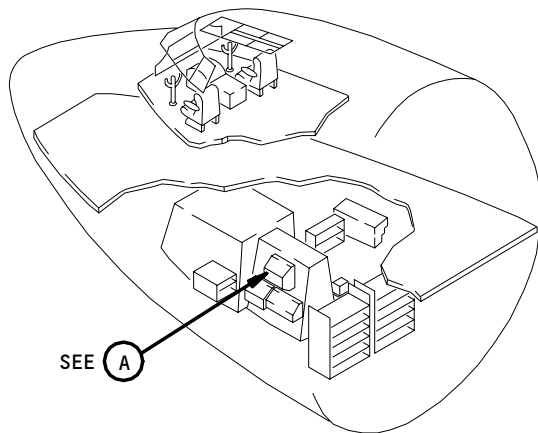
EFFECTIVITY

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ELECTRICAL SYSTEMS CARD FILE M7603

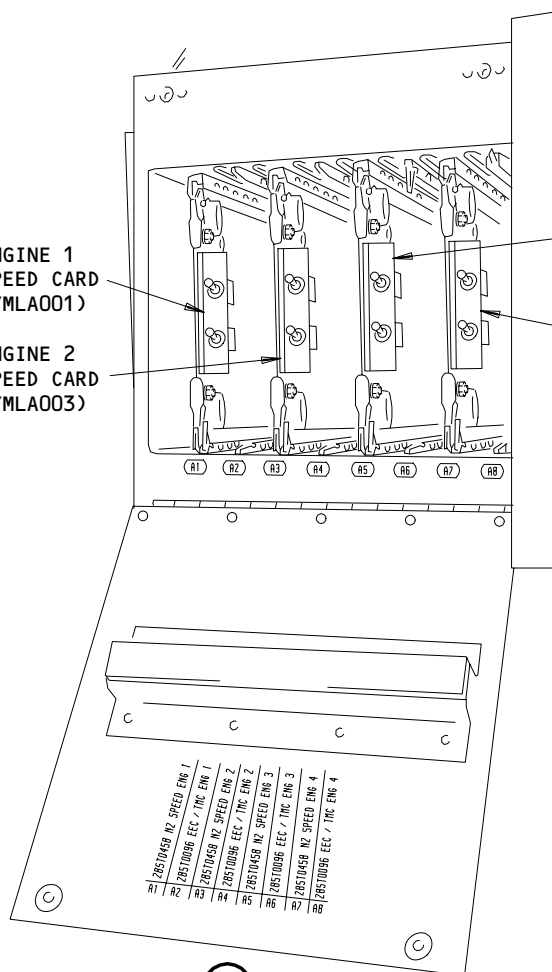
(A)

ENGINE 1
SPEED CARD
(YMLA001)

ENGINE 2
SPEED CARD
(YMLA003)

ENGINE 3
SPEED CARD
(YMLA005)

ENGINE 4
SPEED CARD
(YMLA007)



(B)

N2 Speed Card
Figure 501

NOTE: EEC/TMC CARDS NOT
SHOWN FOR CLARITY.

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- S 865-005-J00
(4) Stop the engines (Ref 71-00-00/201).

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N1 FAN SHAFT SPEED SENSOR - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the N1 fan shaft speed sensor. The other task is for the installation of the N1 speed sensor.
- B. The N1 speed sensor is installed on the No. 3 fan frame strut at the 2 o'clock position.

TASK 77-12-01-004-001-J00

2. N1 Fan Shaft Speed Sensor Removal (Fig. 401)

A. References

- (1) 71-11-04/201, Fan Cowl Panels
- (2) 78-31-00/201, Thrust Reverser System
- (3) IPC 77-12-01 Fig. 1
- (4) WDM 71-51-53

B. Access

(1) Location Zone

- 412 Engine 1 - Fan Frame at the 2 O'clock Position
(Number 3 Strut)
- 422 Engine 2 - Fan Frame at the 2 O'clock Position
(Number 3 Strut)
- 432 Engine 3 - Fan Frame at the 2 O'clock Position
(Number 3 Strut)
- 442 Engine 4 - Fan Frame at the 2 O'clock Position
(Number 3 Strut)

(2) Access Panel

- 416 Right Thrust Reverser Half - Engine 1
- 426 Right Thrust Reverser Half - Engine 2
- 436 Right Thrust Reverser Half - Engine 3
- 446 Right Thrust Reverser Half - Engine 4

C. Procedure

S 014-018-J00

- (1) Open the right thrust reverser half (Ref 78-31-00/201).

S 034-004-J00

- (2) Disconnect the electrical connectors.

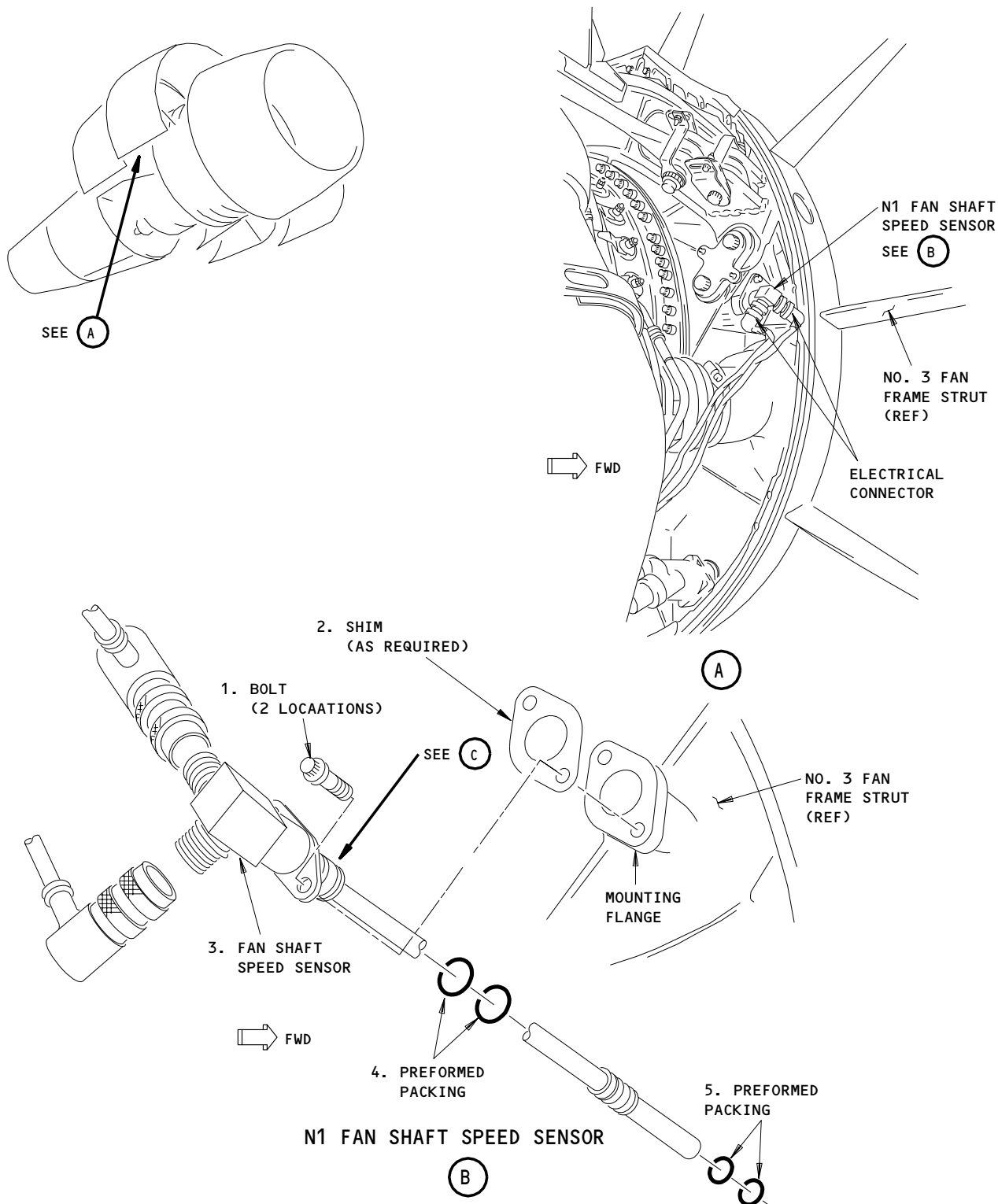
EFFECTIVITY

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77-12-01

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N1 Fan Shaft Speed Sensor Installation
Figure 401 (Sheet 1)

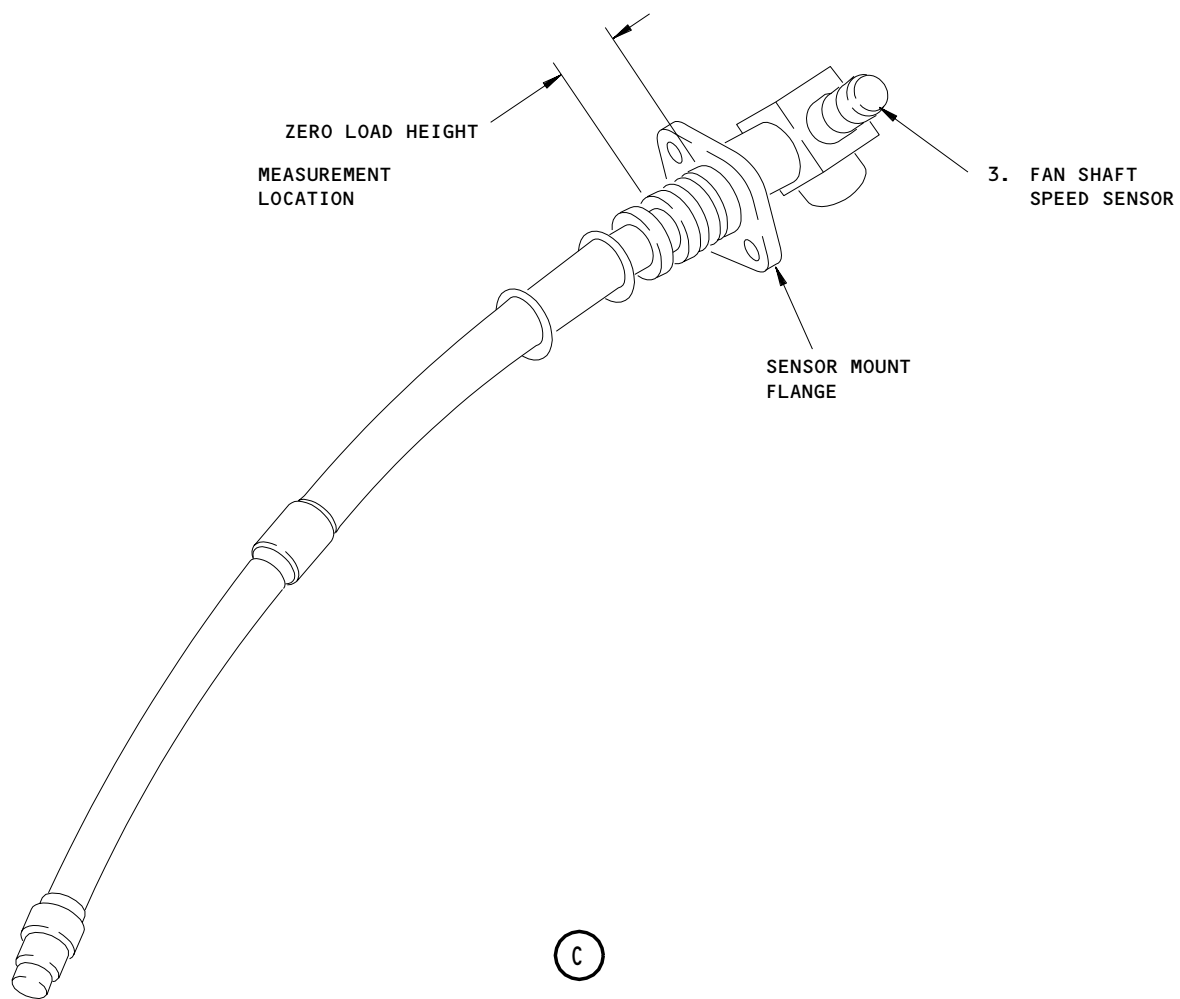
EFFECTIVITY

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1124587-00-A

N1 Fan Shaft Speed Sensor Installation
Figure 401 (Sheet 2)

EFFECTIVITY	
ALL	

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S 034-021-J00
(3) Install caps on the electrical connectors.

S 034-005-J00
(4) Remove the bolts (1).

S 024-006-J00
(5) Remove the N1 speed sensor (3) carefully.

S 034-007-J00
(6) Discard the packings (4) and (5).

S 434-008-J00
(7) Install a cover in the fan frame port.

TASK 77-12-01-404-009-J00

3. N1 Fan Shaft Speed Sensor Installation (Fig. 401)

A. Consumable Materials

(1) D00031 Lubricant - Everlube, ESNA 382 (GE C02-006)

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	77-12-01	01	5
	2	Shims			10
	3	Fan Shaft Speed Sensor			20
	4	Preformed Packing			15
	5	Preformed Packing			35

C. References

(1) 78-31-00/201, Thrust Reverser System

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(2) WDM 71-51-53

D. Access

(1) Location Zone

- 412 Engine 1 - Fan Frame at the 2 0'clock Position
(Number 3 Strut)
- 422 Engine 2 - Fan Frame at the 2 0'clock Position
(Number 3 Strut)
- 432 Engine 3 - Fan Frame at the 2 0'clock Position
(Number 3 Strut)
- 442 Engine 4 - Fan Frame at the 2 0'clock Position
(Number 3 Strut)

(2) Access Panel

- 416 Right Thrust Reverser Half - Engine 1
- 426 Right Thrust Reverser Half - Engine 2
- 436 Right Thrust Reverser Half - Engine 3
- 446 Right Thrust Reverser Half - Engine 4

E. Procedure

S 824-019-J00

(1) Measure the spring height of the speed sensor (3) with zero load (Fig. 401).

(a) Make sure the free spring height is 0.185-0.400 inches (4.6-10.1 mm) for the sensor attachment.

- 1) If the height is not correct, install shims below the sensor mount flange.

S 424-027-J00

(2) Install the N1 speed sensor (3):

- (a) Put lubricant on the new packings (4) and (5).
- (b) Install the packings (4) and (5) in the grooves on the N1 speed sensor (3).
- (c) Remove the cover from the fan frame port.
- (d) Put the N1 speed sensor (3) into the port on the fan frame carefully.
- (e) Put lubricant on the threads of the bolts (1).
- (f) Install the bolts (1).
 - 1) Tighten the bolts (1) to 55-70 pound-inches (6.2-7.9 N.m).
 - 2) Install lockwire to the bolts (1).

S 434-015-J00

(3) Remove the caps from the electrical connectors.

S 434-025-J00

(4) Connect the electrical connectors to the N1 speed sensor (3).

S 414-020-J00

(5) Close the right thrust reverser half (Ref 78-31-00/201).

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- S 714-028-J00
- (6) Do the Ground Test - Idle Power, Test No. 3 (AMM 71-00-00/501).
- (a) This test will make sure the N1 tachometer system operates correctly.

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N1 FAN SHAFT SPEED SENSOR - INSPECTION/CHECK

1. General

- A. This procedure gives the steps for the visual inspection of the N1 fan shaft speed sensor (referred to as the N1 speed sensor).

TASK 77-12-01-216-001-J00

2. N1 Speed Sensor Inspection (Fig. 601)

A. Consumable Materials

- (1) B00075 Solvent - P-D-680 Type I, Stoddard, GE C04-002

B. References

- (1) 78-31-00/201, Thrust Reverser System

C. Access

- (1) Location Zones

410 No. 1 Power Plant (Left)
420 No. 2 Power Plant (Right)

- (2) Access Panels

414AR Fan Cowl Panel (Right),
416AR Thrust Reverser (Right)
424AR Fan Cowl Panel (Right)
426AR Thrust Reverser (Right)

D. Do the Inspection of the N1 Speed Sensor.

S 016-002-J00

- (1) Open the right thrust reverser (Ref 78-31-00/201).

S 036-003-J00

- (2) Disconnect the electrical connectors from the N1 speed sensor.

S 216-004-J00

WARNING: CLEAN THE PARTS ONLY IN AN APPROVED CLEANING CABINET THAT HAS A GOOD FLOW OF AIR. DO NOT BREATHE THE FUMES FROM THE SOLVENT. KEEP THE SOLVENT AWAY FROM SPARKS, FLAME AND HEAT. THE SOLVENT IS POISONOUS AND FLAMMABLE WHICH CAN CAUSE INJURIES TO PERSONS OR DAMAGE TO THE EQUIPMENT.

- (3) Do the inspection as follows:

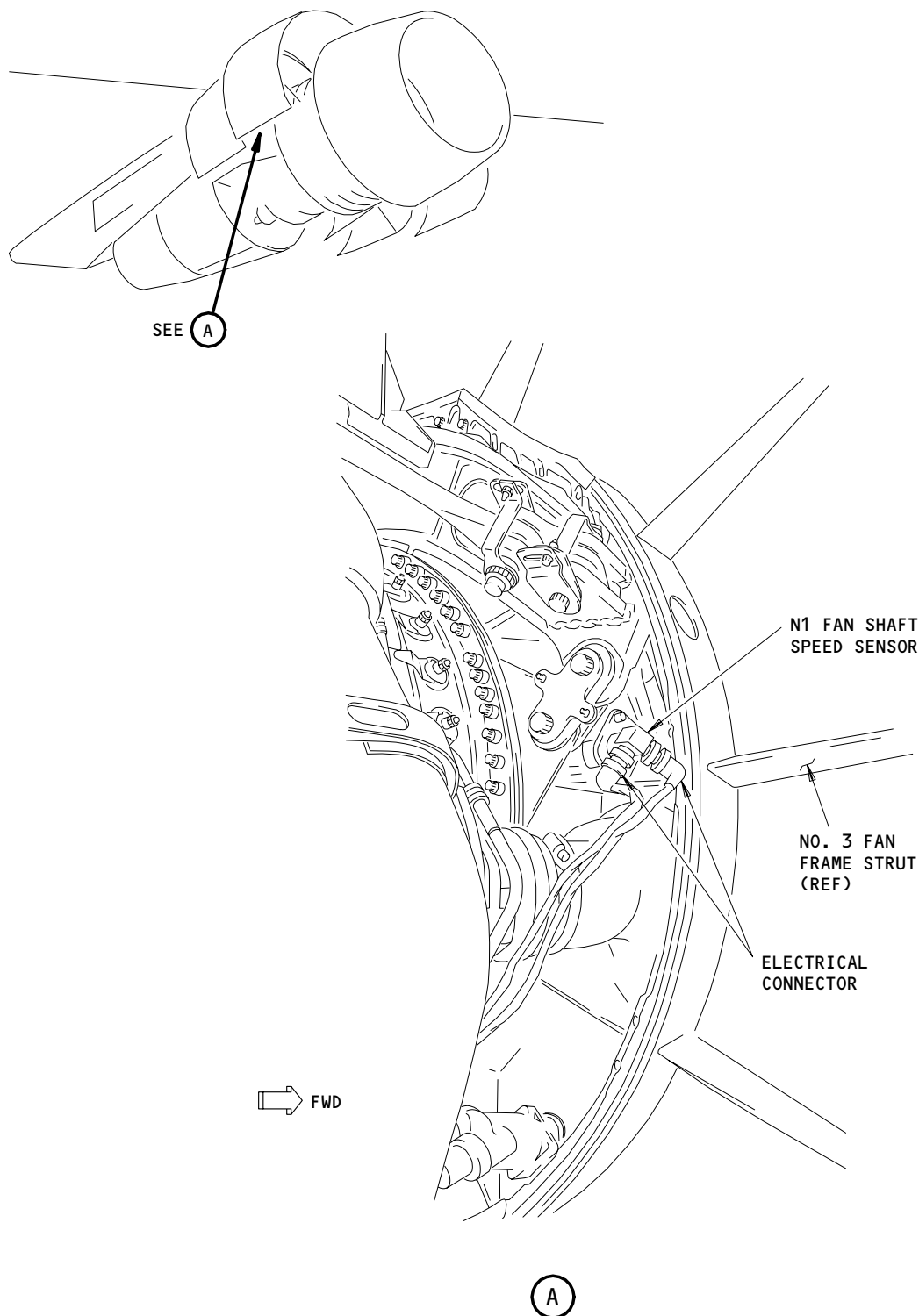
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N1 Fan Shaft Speed Sensor Inspection
Figure 601

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DO AN INSPECTION FOR:	MAXIMUM SERVICABLE LIMITS	CORRECTIVE ACTION
Cracks	None permitted	Replace the transmitter
Crossed threads	None permitted	Replace the transmitter
Nicked threads	A quantity not more than the depth of the thread	Chase the threads or replace the transmitter
Bent pins	None permitted	Replace the transmitter
Dirt in the connctor	None permitted	Clean with a soft bristle brush and solvent
Indications of a rub on the sensor tip	Minor rub permitted if the magnetic strength is more than 800 gauss	Replace the transmitter. Do a test of the magnetic strength

S 436-005-J00

(4) Connect the electrical connectors.

(a) Tighten the electrical connector with your hand.

NOTE: This will put a cover over the witness band.

(b) Use the soft-jawed pliers or a strap wrench to tighten approximately 1/8 turn.

S 416-006-J00

(5) Close the right thrust reverser (Ref 78-31-00/201).

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N2 SPEED SENSOR - REMOVAL/INSTALLATION

1. General

- A. This procedure contains two tasks. One task is for the removal of the N2 speed sensor. The other task is for the installation of the N2 speed sensor.
- B. The N2 speed sensor is installed on the forward side of the gearbox at the 5 o'clock position.

TASK 77-12-02-004-001-J00

2. N2 Speed Sensor Removal (Fig. 401)

A. References

- (1) AMM 78-31-00/201, Thrust Reverser System
- (2) AIPC 73-21-51 Fig. 5

B. Access

(1) Location Zone

- 412 Engine 1 - Gearbox 5 O'clock
- 422 Engine 2 - Gearbox 5 O'clock
- 432 Engine 3 - Gearbox 5 O'clock
- 442 Engine 4 - Gearbox 5 O'clock

(2) Access Panel

- 416 Right Thrust Reverser Half - Engine 1
- 426 Right Thrust Reverser Half - Engine 2
- 436 Right Thrust Reverser Half - Engine 3
- 446 Right Thrust Reverser Half - Engine 4

C. Procedure

S 014-002-J00

- (1) Open the right thrust reverser half (AMM 78-31-00/201).

S 034-003-J00

- (2) Disconnect the two electrical connectors from the sensor.

S 034-004-J00

- (3) Remove the two nuts that attach the sensor to the gearbox.

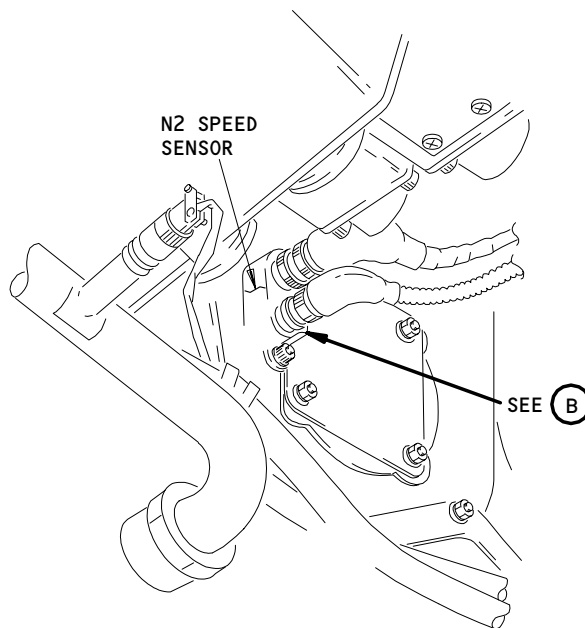
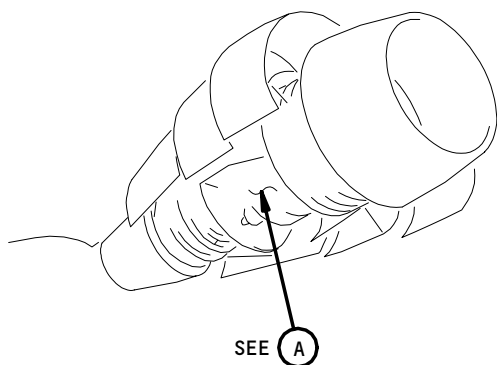
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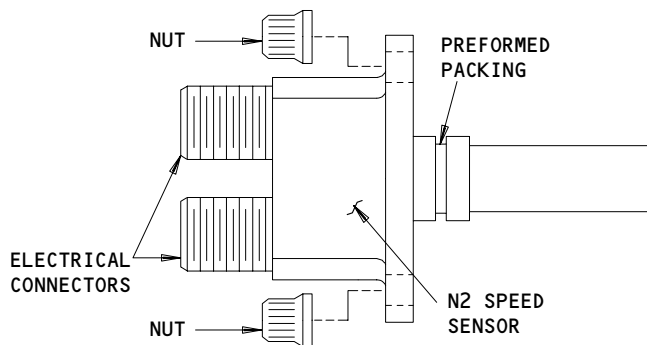
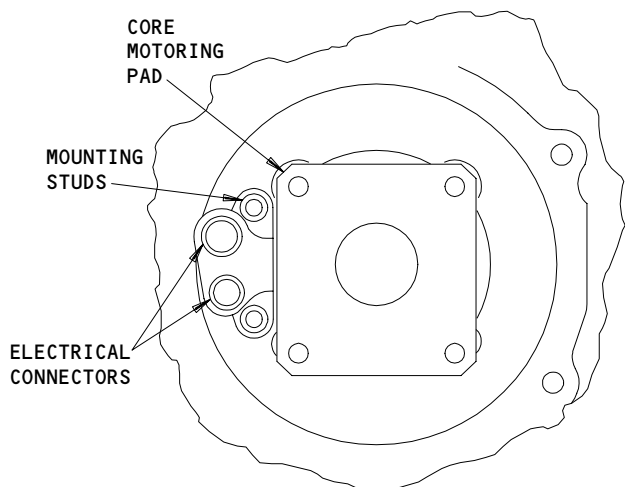
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(A)



(B)

N2 Speed Sensor Installation
Figure 401

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S 024-012-J00
(4) Remove the sensor.

S 034-013-J00
(5) Remove and discard the O-ring.

S 034-005-J00
(6) Install protective caps on the electrical connector.

S 034-014-J00
(7) Install protective caps on the electrical receptacles.

TASK 77-12-02-404-006-J00

3. N2 Speed Sensor Installation (Fig. 401)

A. References

- (1) AMM 71-00-00/501, Power Plant
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AIPC 73-21-51 Fig. 5

B. Access

(1) Location Zone

- 412 Engine 1 - Gearbox 5 O'clock
- 422 Engine 2 - Gearbox 5 O'clock
- 432 Engine 3 - Gearbox 5 O'clock
- 442 Engine 4 - Gearbox 5 O'clock

(2) Access Panel

- 416 Right Thrust Reverser Half - Engine 1
- 426 Right Thrust Reverser Half - Engine 2
- 436 Right Thrust Reverser Half - Engine 3
- 446 Right Thrust Reverser Half - Engine 4

C. Procedure

S 434-007-J00
(1) Remove the protective caps from the electrical connectors and the receptacles.

S 434-008-J00
(2) Install a new O-ring on the sensor.

S 424-015-J00
(3) Put the sensor in its position on the gearbox.

S 434-009-J00
(4) Install the two nuts that attach the N2 speed sensor to the gearbox.

S 434-016-J00
(5) Tighten the nuts to 55-70 pound-inches (6.2-7.9 N.m).

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- S 434-010-J00
- (6) Connect the two electrical connectors to the sensor.
- S 414-011-J00
- (7) Close the right thrust reverser half (AMM 78-31-00/201).
- S 714-017-J00
- (8) Do this task: Ground Test-Idle Leak Check (AMM 71-00-00/501, Test No. 3)

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ENGINE SPEED CARD - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the engine speed card. The other task is for the installation of the engine speed card.
- B. There are four engine speed cards installed in the electrical systems card file (M7603). The speed cards are identified as follows:

<u>Engine Number</u>	<u>Equipment Number</u>
1	YMLA001
2	YMLA003
3	YMLA005
4	YMLA007

TASK 77-12-03-004-001-J00

2. Engine Speed Card Removal (Fig. 401)

A. References

- (1) 20-11-22/401, Rack-Mounted Electrical/Electronic Module
- (2) IPC 73-21-80 Fig. 1
- (3) WDM 73-21-18, 77-12-21, 77-12-22, 77-12-23, 77-12-24
- (4) SSM 73-21-18, 77-12-21

B. Access

- (1) Location Zone
115 Area Between Nose Gear Well and Fuselage, LH

C. Procedure

S 864-002-J00

- (1) For the applicable engine,
Open these circuit breakers and install a DO-NOT-CLOSE tag.
 - (a) P6 Main Power Distribution Panel
 - 1) 6K10 SPEED SENSOR ENG 1 1
 - 2) 6K11 SPEED SENSOR ENG 1 2
 - 3) 6K12 SPEED SENSOR ENG 2 1
 - 4) 6K13 SPEED SENSOR ENG 2 2
 - 5) 6K14 SPEED SENSOR ENG 3 1
 - 6) 6K15 SPEED SENSOR ENG 3 2
 - 7) 6K16 SPEED SENSOR ENG 4 1
 - 8) 6K17 SPEED SENSOR ENG 4 2

S 024-003-J00

- (2) Remove the applicable engine speed card (Ref 20-11-22/401).

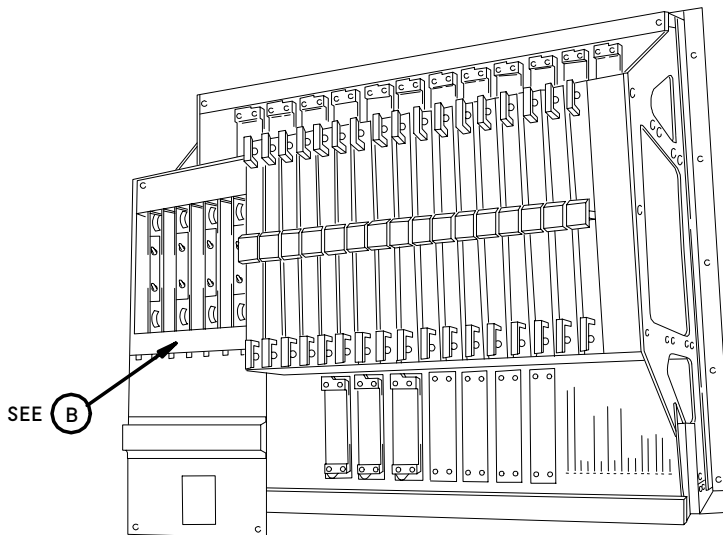
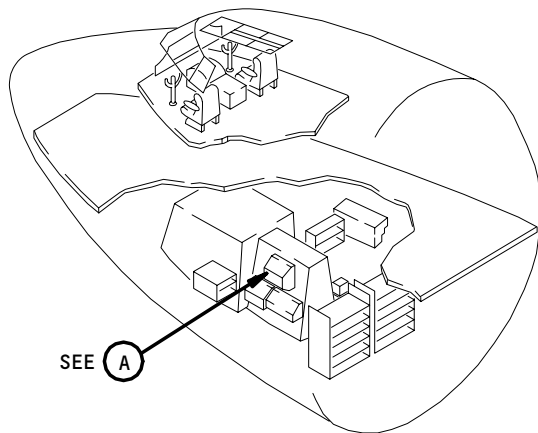
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ELECTRICAL SYSTEMS CARD FILE M7603

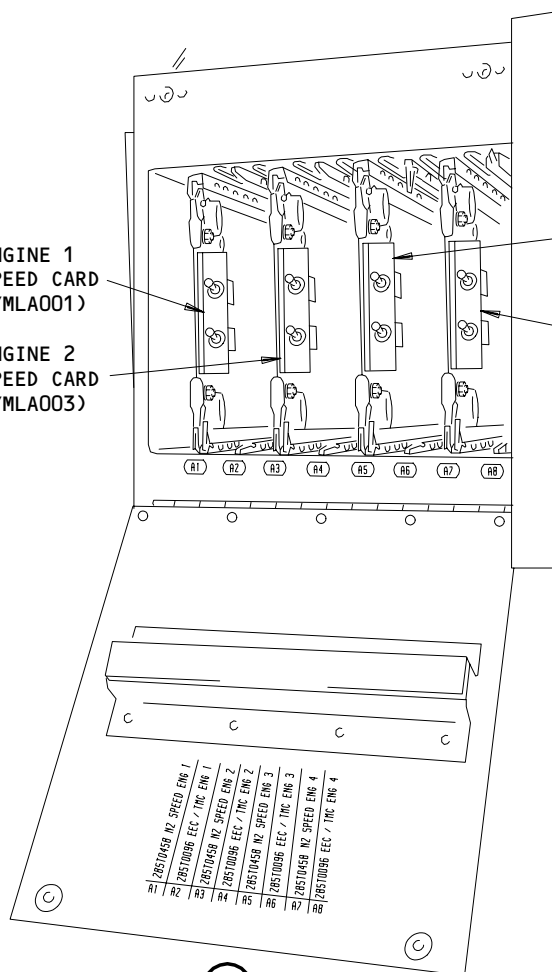
(A)

ENGINE 1
SPEED CARD
(YMLA001)

ENGINE 2
SPEED CARD
(YMLA003)

ENGINE 3
SPEED CARD
(YMLA005)

ENGINE 4
SPEED CARD
(YMLA007)



(B)

N2 Speed Card
Figure 401

NOTE: EEC/TMC CARDS NOT
SHOWN FOR CLARITY.

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TASK 77-12-03-404-004-J00

3. Engine Speed Card Installation (Fig. 401)

A. References

- (1) 20-11-22/401, Rack-Mounted Electrical/Electronic Module
- (2) 71-00-00/201, Power Plant
- (3) IPC 73-21-80 Fig. 1
- (4) WDM 77-12-21, 77-12-22, 77-12-23, 77-12-24
- (5) SSM 77-12-05, 77-12-06, 77-12-07, 77-12-08

B. Access

- (1) Location Zone
115 Area Between Nose Gear Well and Fuselage, LH

C. Procedure

S 424-005-J00

- (1) Install the applicable engine speed card (MM 20-11-22/401).

S 864-006-J00

- (2) For the applicable engine,
Close these circuit breakers and remove the DO-NOT-CLOSE tag.

(a) P6 Main Power Distribution Panel

- 1) 6K10 SPEED SENSE ENG 1 1
- 2) 6K11 SPEED SENSE ENG 1 2
- 3) 6K12 SPEED SENSE ENG 2 1
- 4) 6K13 SPEED SENSE ENG 2 2
- 5) 6K14 SPEED SENSE ENG 3 1
- 6) 6K15 SPEED SENSE ENG 3 2
- 7) 6K16 SPEED SENSE ENG 4 1
- 8) 6K17 SPEED SENSE ENG 4 2

S 714-026-J00

- (3) Do a test of the engine speed card:

S 864-010-J00

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

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S 864-024-J00

- (5) Open these circuit breakers and install DO-NOT-CLOSE tags:
- (a) P6 Main Power Distribution Panel
 - 1) 6D34 PROBE HEAT IND LEFT
 - 2) 6D35 PROBE HEAT IND RIGHT

S 864-025-J00

- (6) For the applicable engine,
Open these circuit breakers and install DO-NOT-CLOSE tags:
- (a) P6 Main Power Distribution Panel
 - 1) 6H19 PROBE HEAT ENG 1
 - 2) 6H21 PROBE HEAT ENG 2
 - 3) 6H23 PROBE HEAT ENG 3
 - 4) 6H25 PROBE HEAT ENG 4

S 864-011-J00

- (7) Erase the EICAS maintenance page.
- (a) Make sure the applicable ENG (X) SPEED CARD message is not displayed.

S 864-012-J00

- (8) Move the channel 1 test switch on the N2 speed card to the TEST position.

S 864-013-J00

- (9) Make sure the applicable ENG (X) SPEED CARD message comes on after 70 seconds.

S 864-014-J00

- (10) Move the channel 1 test switch to the NORMAL position.

S 864-015-J00

- (11) Erase the EICAS maintenance page.
- (a) Make sure the applicable ENG (X) SPEED CARD message is not displayed.

S 864-016-J00

- (12) Put the channel 2 test switch to the TEST position.

NOTE: Hold the channel 2 test switch in the TEST position.

S 864-017-J00

- (13) Make sure the applicable ENG (X) SPEED CARD message comes on after 70 seconds.

S 864-018-J00

- (14) Release the channel 2 test switch.
- (a) Make sure that the switch goes back to the NORMAL position.

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- S 864-019-J00
- (15) Erase the EICAS maintenance page.
- (a) Make sure the applicable ENG (X) SPEED CARD message does not come on.
- S 864-020-J00
- (16) Close the E/E access door.
- S 864-027-J00
- (17) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) P6 Main Power Distribution Panel
- 1) 6D34 PROBE HEAT IND LEFT
- 2) 6D35 PROBE HEAT IND RIGHT
- S 864-028-J00
- (18) For the applicable engine,
- Remove the DO-NOT-CLOSE tags and close these circuit breakers:
- (a) P6 Main Power Distribution Panel
- 1) 6H19 PROBE HEAT ENG 1
- 2) 6H21 PROBE HEAT ENG 2
- 3) 6H25 PROBE HEAT ENG 4
- S 864-021-J00
- (19) Remove the electrical power (MM 24-22-00/201).

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

1. General

- A. The exhaust gas temperature (EGT) indicating system provides a visual indication in the flight compartment of the total exhaust temperature monitored in the low pressure turbine inlet of each engine. The system consists of eight exhaust gas-immersed thermocouple probes which provide a dc voltage signal to the Engine Indication and Crew Alerting System (EICAS) computer which in turn displays the temperature in the flight deck display unit. The electrical output of each probe is combined to provide a single, average temperature indicating signal by connecting each probe in parallel through the harness to a single EGT lead going to the EICAS computer.
- B. Power for the system is 28 volts ac provided from ECU or ground test circuit. Electrical dc signals are generated by the thermocouple probes proportional to the heat in the turbine exhaust. The resulting averaged signal is measured and displayed in degrees Celsius (°C) on the the EICAS display units.

2. EGT Thermocouple Probes (Fig. 1)

- A. The thermocouple probes are wired in parallel with chromel and alumel wire. The alumel wires are spliced together in the cables while the chromel wires remain electrically separated to the shunt junction box connector.
- B. Eight individual dual immersion chromel alumel thermocouple probes are circumferentially mounted around the LPT forward case.
- C. The probes are installed at the 2, 3, 5, 6, 7, 8:30, 10:30 and 11:30 o'clock positions into eight bosses of the low pressure turbine forward case. They are located at station 4.9 just ahead of the low pressure turbine 1st-stage nozzle and aft of the high pressure turbine 2nd-stage rotor blades.
- D. Each probe has two chromel alumel sensing junction elements. The junctions are at two immersion depths within a protective sleeve. The sleeve is drilled so there is a positive circulation of gases around the probe. Each probe is clamped into the turbine case by a two-bolt mounting flange.

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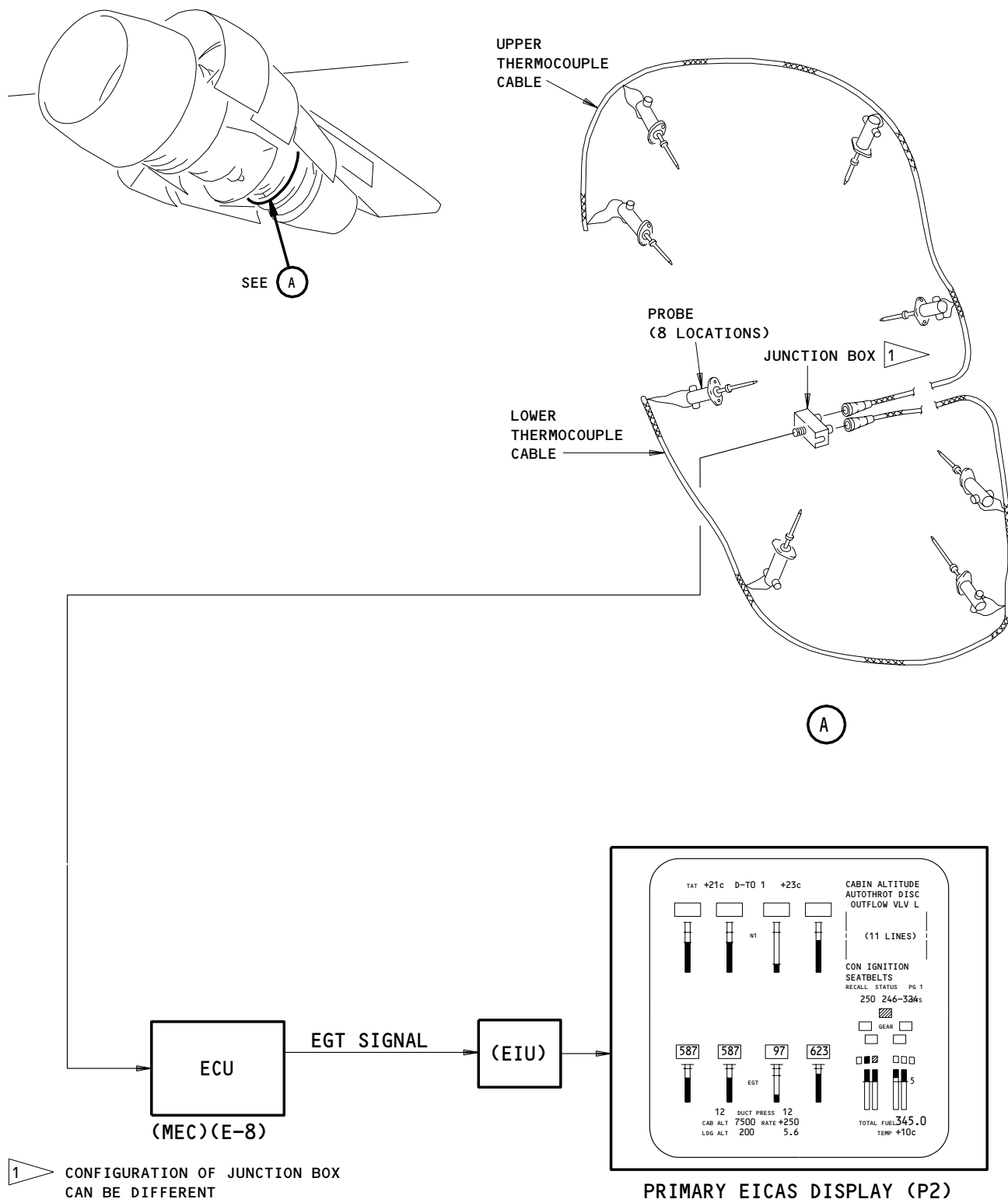
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Exhaust Gas Temperature Indicating System
Figure 1

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- E. The system provides the capability to replace individual probes. The exposed probe studs permit detection of individual probe condition by continuity and resistance checks.
3. EGT Thermocouple Cable (Fig. 1)
- A. Upper and lower thermocouple cables are mounted circumferentially around the LPT forward case. The cables are supported by bracketry attached to the LPT forward case/HPT case splitline.
- B. The forward portions of the thermocouple cables are routed along the left side of the HPC stator case and connect with the junction box. The input ends (pigtails) of the thermocouple cables attach to studs (small chromel, large alumel) on each thermocouple probe.
4. EGT Shunt Junction Box (Fig. 1)
- A. The EGT shunt junction box is mounted on a bracket attached to the LPT cooling air tube near the HPC left horizontal splitline.
- B. Both thermocouple cables connect to the EGT shunt junction box, where the chromel sides of the thermocouple probes are spliced together. The junction box averages and changes the EGT signal to reflect actual gas temperatures.
- C. The EGT junction box provides one output to the Engine Control Unit.
5. Operation (Fig. 2)
- A. Functional Description
- (1) During engine operation hot gases exiting from the high pressure turbine circulate around the probes. The hot gases heat the junction of dissimilar metals (chromel and alumel) causing a voltage potential to develop from the difference in expansion rates between the two metals. A circuit is formed in the indicating system when the other ends of the leads are joined (the cold junction) at the EICAS computer. Indication is obtained on the EICAS display unit in the flight compartment.
- (2) The EGT values are displayed on the Primary EICAS screen. When an EGT parameter becomes out of tolerance, the display is automatically changed to the alert color.

NOTE: When the thrust management computer is in the takeoff or go-around mode, the yellow band exceedance operations for the EGT are inhibited for a specified time (Ref 31-61-00/201).

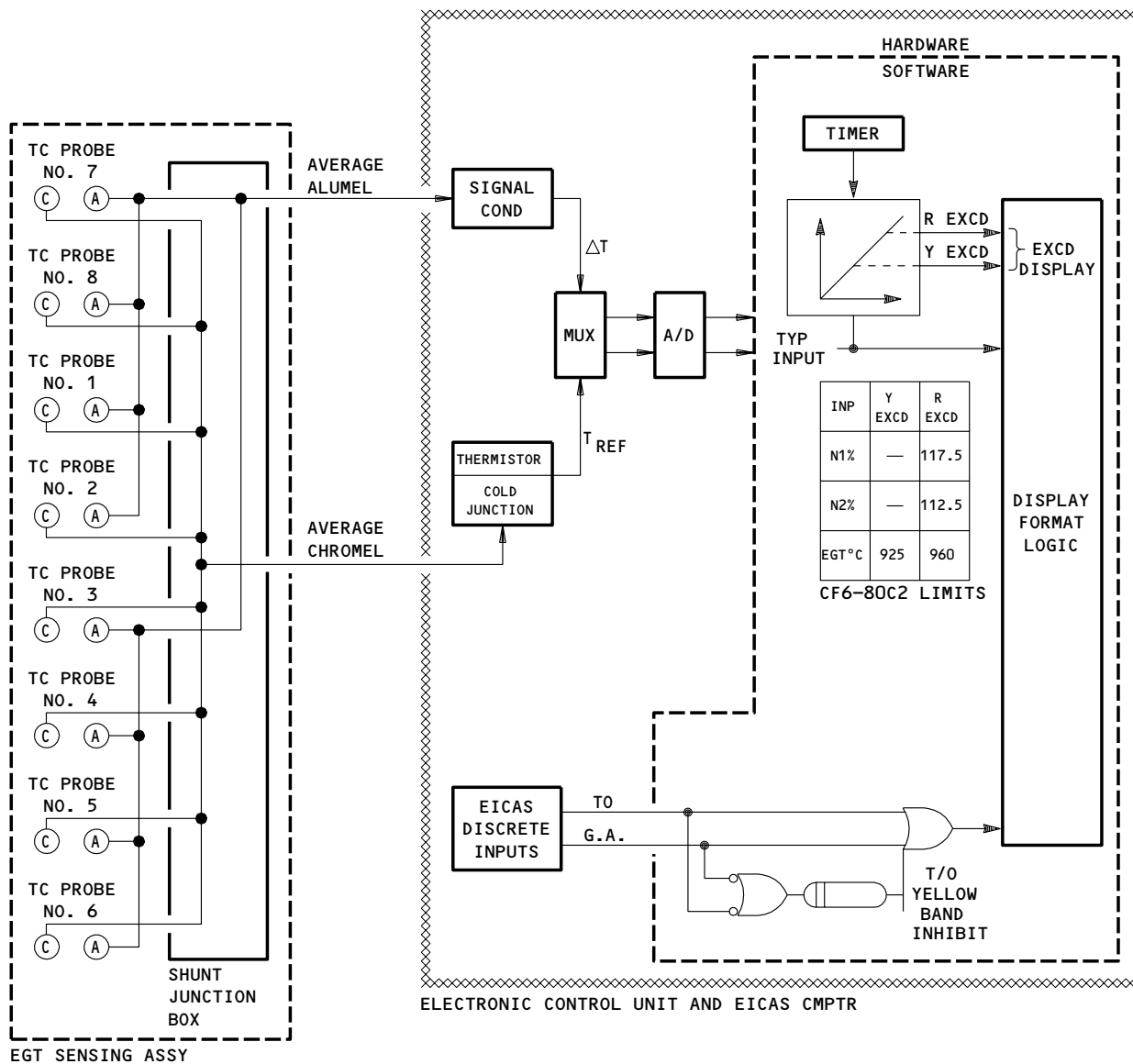
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EGT Indicating System Schematic (Typical)
Figure 2

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EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM – ADJUSTMENT TEST

1. General

- A. This section contains the data to do an operational test and an optional system test of the exhaust gas temperature (EGT) indicating system.
- B. You must operate the engines to do the operational test.
- C. Do the operational test to make sure the system operates correctly after you replace these components:
 - (1) The EGT probe
 - (2) The EGT wire harness.
 - (3) The Junction box.
- D. To do the system test, you must do the following tasks:
 - (1) Insulation resistance and continuity check with common test equipment
 - (2) Insulation resistance and continuity checks with the Barfield TT1200A EGT Indicating System Test Kit (optional)

TASK 77-21-00-715-005-J00

2. Exhaust Gas Temperature (EGT) Indicating System Operational Test

- A. References
 - (1) AMM 71-00-00/201, Power Plant
- B. Procedure
 - S 865-003-J00
 - (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) N1
 - 2) N2.
 - S 215-001-J00
 - (2) Make sure the EGT indication on the main EICAS display is approximately the same for each engine.
 - S 865-002-J00
 - (3) Stop the engines (AMM 71-00-00/201).

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TASK 77-21-00-735-007-J00

3. Exhaust Gas Temperature (EGT) Indicating System Test (optional test)

A. General

- (1) The system accuracy test does a check of the the EGT indicating system from the junction box to the flight compartment.
- (2) The resistance and the insulation tests do a check of the EGT indicating system engine-mounted components.
- (3) You can use these tests to find engine component faults.
- (4) You must do the resistance tests on a cold engine.

B. Special Tools and Equipment

- (1) EGT Indicating System Test Kit - Barfield TT1200A (RECOMMENDED):
Barfield Instrument Corp., Miami, FL
(with parts that follow)
- (2) EGT Indicating System Test Kit - Barfield TT1000A-101 (ALTERNATIVE):
Barfield Instrument Corp., Miami, FL
(with parts that follow)
 - (a) Test Set - Barfield TT1000A or TT1200A
 - (b) Adapter Unit - Barfield 101-00902
 - (c) Adapter Cable - Barfield 101-00905
 - (d) Adapter Cable - Barfield 101-00906
 - (e) Standard test leads fitted with alligator clips
 - (f) Four shorting bars

C. References

- (1) AMM 31-61-00/201, Engine Indication and Crew Alerting System
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 71-11-06/201, Core Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System

D. Access

- (1) Location Zone

221 and 222	Control Cabin
412	Engine 1
422	Engine 2
432	Engine 3
442	Engine 4

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(2) Access Panel

413 and 414	Fan Cowl Panels - Engine 1
415 and 416	Thrust Reverser Halves - Engine 1
417 and 418	Core Cowl Panels - Engine 1
423 and 424	Fan Cowl Panels - Engine 2
425 and 426	Thrust Reverser Halves - Engine 2
427 and 428	Core Cowl Panels - Engine 2
433 and 434	Fan Cowl Panels - Engine 3
435 and 436	Thrust Reverser Halves - Engine 3
437 and 438	Core Cowl Panels - Engine 3
443 and 444	Fan Cowl Panels - Engine 4
445 and 446	Thrust Reverser Halves - Engine 4
447 and 448	Core Cowl Panels - Engine 4

E. Prepare for the Test

S 865-005-J00

- (1) Make sure these circuit breakers, for the applicable engine, are closed:

(a) On the P180 DC Power Distribution Panel:

- 1) 180J5 ENG 1 EEC PWR CH A
- 2) 180J6 ENG 1 EEC PWR CH B
- 3) 180F5 ENG 2 EEC PWR CH A
- 4) 180F6 ENG 2 EEC PWR CH B
- 5) 180G20 ENG 3 EEC PWR CH A
- 6) 180G21 ENG 3 EEC PWR CH B
- 7) 180D20 ENG 4 EEC PWR CH A
- 8) 180D21 ENG 4 EEC PWR CH B

(b) On the P7 Overhead Circuit Breaker Panel:

- 1) 7H08 GND SAFETY RELAY

S 845-009-J00

- (2) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to L.

S 015-010-J00

- (3) Open the fan cowl panels (AMM 71-11-04/201).

S 015-011-J00

- (4) Open the thrust reversers (AMM 78-31-00/201).

S 015-012-J00

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

S 845-013-J00

- (6) Connect the adapter unit to the test set.

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S 845-014-J00

- (7) Turn on the test set power.

NOTE: Use only an adapter unit which has been calibrated with the test set. A non-calibrated adapter unit could give values that are not correct.

S 845-015-J00

- (8) Allow the adapter unit to become stable at ambient temperature.

NOTE: Do all resistance measurements on a cold engine. A hot engine can make EGT systems give voltages which can change the resistance values.

F. Do the steps that follow to do a test of the EGT Indicating System Accuracy:

S 735-016-J00

- (1) Disconnect the upper and lower thermocouple harness connectors P3 and P4 from the junction box.

S 735-017-J00

- (2) Connect the adapter unit to the junction box connector J3 as follows:
(a) Connect the adapter cable 101-00906 to the adapter unit cable No. 1.
(b) Connect the adapter cable 101-00906 to the junction box connector J3.

S 735-018-J00

- (3) Set the adapter unit switch to A/E.

S 735-019-J00

- (4) Set the test set FUNCTION switch to INDICATOR TEST.

S 735-020-J00

- (5) Set the test set RESISTANCE RANGE switch to 2M.

S 735-021-J00

- (6) Adjust the TEMP. ADJ. knob until the test set shows 1030°C.

S 735-022-J00

- (7) Move the ENG 1,2,3, and 4 POWER switches on EEC MAINT MODULE, located on the pilot's overhead maintenance panel P461, to TEST.
(a) Make sure the EICAS EGT numeric readout and pointer show 970 +8/-4°C and come on red.

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- S 735-023-J00
- (8) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to R.
- (a) Make sure the EICAS EGT numeric readout and pointer show 970 +8/-4°C and come on red.
- S 735-024-J00
- (9) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to C.
- (a) Make sure the EICAS EGT numeric readout and pointer show 970 +8/-4°C and come on red.
- S 735-025-J00
- (10) Adjust the TEMP. ADJ. knob until the test set shows 680°C.
- (a) Make sure the EICAS EGT numeric readout and pointer show 640 ±6°C and come on white.
- S 735-026-J00
- (11) Push the CANC switch on the EICAS display select panel, located on the forward electronics P10 panel.
- (a) Make sure the maximum EGT indication goes off.
- S 735-027-J00
- (12) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to L.
- (a) Make sure the EICAS EGT numeric readout and pointer show 640 ±6°C and come on white.
- S 735-028-J00
- (13) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to R.
- (a) Make sure the EICAS EGT numeric readout and pointer show 640 ±6°C and come on white.
- S 735-029-J00
- (14) Set the EIU SEL switch, located on the EICAS control panel on the forward electronics P10 panel, to AUTO.
- S 725-030-J00
- (15) Perform the EICAS auto event verification/erase procedure (AMM 31-61-00/201).
- S 845-031-J00
- (16) Move the ENG 1,2,3, and 4 POWER switches on EEC MAINT MODULE, located on the pilot's overhead maintenance panel P461, to NORM.

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G. Do the steps that follow for a test of the EGT Indicating System Resistance:

S 735-032-J00

- (1) Junction box resistance:
- (a) Disconnect all leads to the junction box.
 - (b) Connect the adapter unit to the junction box as follows:
 - 1) Connect the adapter unit cable No. 4 to the junction box connector J1.
 - 2) Connect the adapter cable 101-00906 to the adapter unit cable No. 5.
 - 3) Connect the adapter cable 101-00906 to the junction box connector J3.
 - (c) Set the adapter unit switch to A/B.
 - (d) Set the FUNCTION switch on the test set to RESISTANCE MEASURE.
 - (e) Set the RESISTANCE RANGE switch on the test set to 20 ohms.
 - (f) Push the black PUSH TO MEASURE switch on the test set.
 - 1) Make sure the resistance is less than 0.1 ohms.

S 735-033-J00

- (2) Harness/Probe resistance:
- (a) Disconnect the adapter cables from the junction box.
 - (b) Connect the adapter unit to the upper thermocouple cable connector P3 as follows:
 - 1) Connect the adapter cable 101-00905 to the upper thermocouple cable connector P3.
 - (c) Do the steps that follow to measure the resistance of the upper harness/probe circuits:
 - 1) Set the adapter unit switch to each position shown in the table below and push the PUSH TO MEASURE switch.

ADAPTER UNIT SWITCH POSITION	UPPER HARNESS PROBE LOCATION
A/E	No. 1
B/E	No. 2
C/E	No. 7
D/E	No. 8

- a) ENGINES WITHOUT GE SB 77-048;
Make sure the resistance is 5.26 +/- 0.47 ohms (Fig. 502).

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- b) ENGINES WITH GE SB 77-048;
Make sure the resistance is 6.24 +/- 0.62 ohms
(Fig. 501).
- (d) Disconnect the cable from the upper thermocouple cable connector P3.
- (e) Connect the adapter unit to the lower thermocouple cable connector P4 as follows:
 - 1) Connect the adapter cable 101-00905 to the adapter unit cable No. 3.
 - 2) Connect the adapter cable 101-00905 to the lower thermocouple cable connector P4.
- (f) Do the steps that follow to measure the resistance of the lower harness/probe circuits:
 - 1) Set the adapter unit switch to each position shown in the table below and push the PUSH TO MEASURE switch.

ADAPTER UNIT SWITCH POSITION	LOWER HARNESS PROBE LOCATION
A/E	No. 3
B/E	No. 4
C/E	No. 5
D/E	No. 6

- a) ENGINES WITHOUT GE SB 77-048;
Make sure the resistance is 5.26 +/- 0.47 ohms
(fig. 502).
 - b) ENGINES WITH GE SB 77-048;
Make sure the resistance is 6.24 +/- 0.62 ohms
(Fig. 501).
- S 735-034-J00
- (3) If the system resistance is correct, no further tests are necessary.
- S 735-035-J00
- (4) If any harness/probe resistances are not correct, continue the tests to measure the harness and probe resistance until you find the fault.
- S 735-036-J00
- (5) Do the steps that follow to measure the harness resistance:
 - (a) Disconnect the harness pigtail leads from the probe of applicable harness circuit.
 - (b) Connect a shorting bar across the leads.
 - (c) Set the adapter unit switch to the applicable position, and push the PUSH TO MEASURE switch on the tester.
 - 1) Make sure the resistance is 2.98 ±.36 ohms.

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S 735-037-J00

- (6) Do the steps that follow to measure the probe resistance:
- (a) Disconnect the adapter unit from the test set and attach the standard leads with alligator clips.
 - (b) Connect the alligator clips to the probe studs.
 - (c) Push the PUSH TO MEASURE switch on the test set.

NOTE: Intermix of EGT probes with different resistances may lead to different resistance measurement results, but the differences are negligible.

- 1) ENGINES WITHOUT GE SB 77-048;
Make sure the resistance is 2.28 +/- 0.30 ohms (Fig. 502).
- 2) ENGINES WITH GE SB 77-048;
Make sure the resistance is 3.26 +/- 0.50 ohms (Fig. 501).

H. Do the steps that follow to do a test of the EGT Indicating System Insulation:

S 735-038-J00

- (1) Make sure the upper and lower thermocouple harnesses are connected to the junction box.

S 735-039-J00

- (2) Make sure that all the harness pigtail leads are attached to the probes.

S 735-040-J00

- (3) Connect the adapter cable No. 4 to the junction box connector J1.

S 735-041-J00

- (4) Set the adapter unit switch to GND.

S 735-042-J00

- (5) Set the adapter unit toggle switch to B.

S 735-043-J00

- (6) Set the test set FUNCTION switch to RESISTANCE MEASURE.

S 735-044-J00

- (7) Set the test set RESISTANCE RANGE switch to 2M.

S 735-045-J00

- (8) Push the PUSH TO MEASURE switch on the tester.
(a) Make sure the resistance is 1 megohm minimum.

NOTE: The tester can show 2 megohms and then decrease. The tester indications are not correct until the unit stabilizes.

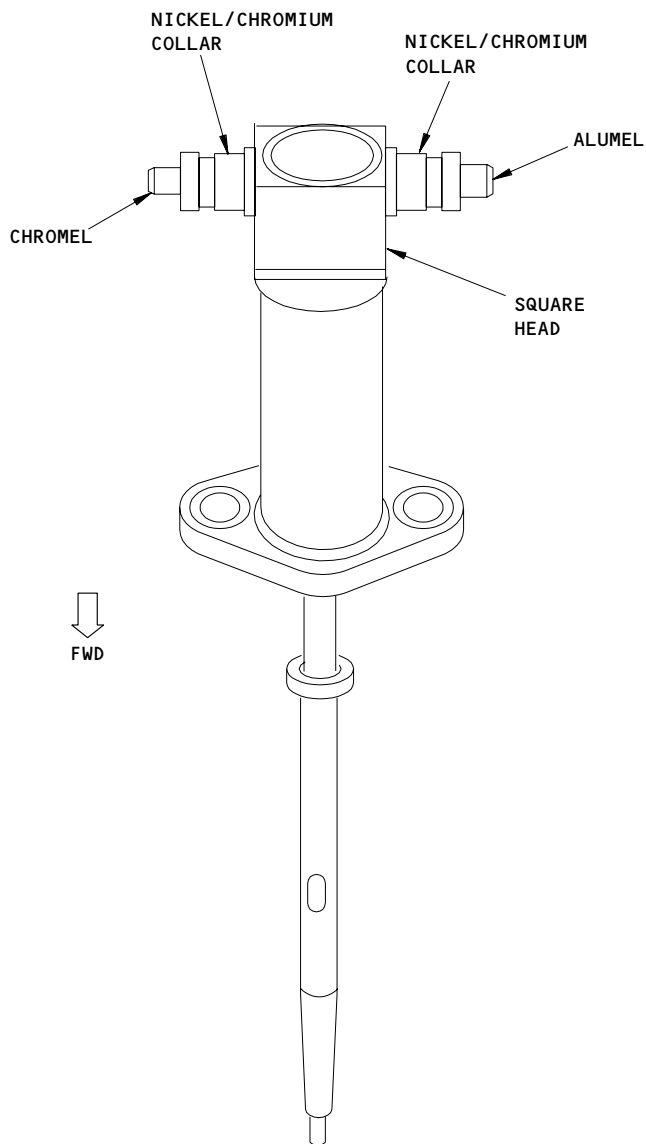
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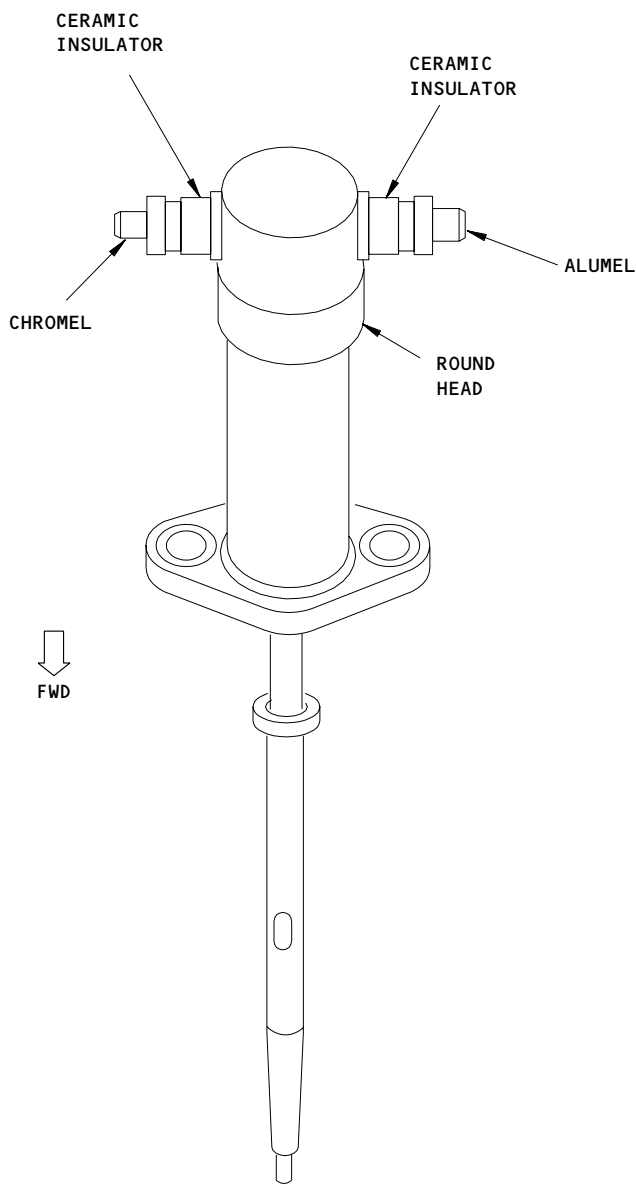
Thermocouple Probe
Figure 501

EFFECTIVITY
ENGINES WITH GE SB 72-0872.

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Thermocouple Probe
Figure 502

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ENGINES WITHOUT GE SB 72-0872.

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- (b) If the system insulation is satisfactory, no further tests are necessary.
- (c) If the system insulation resistance is less than 1 megohm, continue the tests of the junction box, the harness, and the probes until you find the problem.

S 735-046-J00

- (9) Do the steps that follow for the junction box insulation test:
 - (a) Disconnect the upper and lower harnesses from the junction box.
 - (b) Push the PUSH TO MEASURE switch on the tester.
 - 1) Make sure the resistance is greater than 1 megohm.

S 735-047-J00

- (10) Do the steps that follow for the harness insulation test:
 - (a) Connect the upper harness to the junction box and push the PUSH TO MEASURE switch on the tester.
 - (b) If the resistance is greater than 1 megohm, the upper harness is satisfactory and you must do a check of the lower harness.
 - (c) If the resistance is less than 1 megohm, do a check of the upper harness.
 - (d) Connect the defective harness to the junction box.
 - (e) Disconnect all the pigtail leads from the probes on the defective harness.
 - (f) Push the PUSH TO MEASURE switch on the tester.
 - 1) Make sure the resistance is greater than 1 megohm.

S 735-048-J00

- (11) Do the steps that follow for the insulation test of the thermocouple probes:
 - (a) Connect a harness pigtail lead pair to a thermocouple probe.
 - (b) Push the PUSH TO MEASURE switch on the tester.
 - 1) Make sure the resistance is greater than 1 megohm.
 - (c) If the resistance is greater than 1 megohm, do a check of each probe until you find the defective probe.
 - (d) Do the steps that follow to do a test of the probe only:
 - 1) Remove the pigtail leads from the probe.
 - 2) Disconnect the adapter unit from tester and attach the standard leads with alligator clips.
 - 3) Connect the clips to a probe stud and probe housing and push the PUSH TO MEASURE switch on the tester.
 - 4) Make sure the resistance is greater than 1 megohm.

I. Restore the Airplane to Normal

S 845-049-J00

- (1) Do the steps that follow to make sure all the harness pigtail leads are connected to the thermocouple probes:

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CAUTION: MAKE SURE THE EGT HARNESS LEAD IS IN THE CORRECT POSITION BEFORE YOU TIGHTEN THE CONNECTOR NUT. IF THE LEAD IS NOT IN THE CORRECT POSITION, YOU CAN CAUSE DAMAGE TO ENGINE COMPONENTS AND TO THE CONNECTOR, PROBE, AND HARNESS. EGT INDICATIONS CAN ALSO BE CHANGED.

- (a) Put the leads of the EGT harness in their position on the probe studs (1).
- (b) Install the connector nuts (4) to the studs on the probe.

NOTE: The thermocouple probe has two studs and two connector nuts. One stud has a smaller diameter than the other stud. The smaller connector nut is installed on the smaller stud. The larger connector nut is installed on the larger stud.

CAUTION: DO NOT TIGHTEN THE HARNESS CONNECTORS TOO TIGHTLY. TOO MUCH TORQUE ON THE CONNECTORS CAN CAUSE DAMAGE TO THE EGT HARNESS AND EGT PROBE.

- (c) Tighten the smaller connector nut (4) to 12-14 pound-inches (1.4-1.6 N.m).
- (d) Tighten the larger connector nut (4) to 20-30 pound-inches (2.3-3.4 N.m).

S 845-050-J00

- (2) Make sure the harness connectors P3 and P4 and forward lead connector P1 are connected to the junction box.

S 415-049-J00

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

S 415-052-J00

- (4) Close the thrust reversers (AMM 78-31-00/201).

S 415-051-J00

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

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EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM - INSPECTION/CHECK

1. General

- A. This procedure contains the data to do a check the engine EGT indicating system.

TASK 77-21-00-216-001-J00

2. Visually Check the EGT System

A. References

- (1) AMM 71-11-06/201, Core Cowl Panels
- (2) AMM 77-21-02/401, Thermocouple
- (3) AMM 77-21-03/401, Junction Box

B. Access

(1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Case
- 422 Engine 2 - Low Pressure Turbine Case
- 432 Engine 3 - Low Pressure Turbine Case
- 442 Engine 4 - Low Pressure Turbine Case

(2) Access Panels

- 417 and 418 Core Cowl Panel - Engine 1
- 427 and 428 Core Cowl Panel - Engine 2
- 437 and 438 Core Cowl Panel - Engine 3
- 447 and 448 Core Cowl Panel - Engine 4

C. Procedure

S 016-002-J00

- (1) Do the procedure to open the Core Cowl panels (AMM 71-11-06/201).

S 216-003-J00

- (2) Do a check of these components:

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Visually Check	Maximum Serviceable Limits	Remarks
(a) Upper and Lower Thermocouple Cables for:		
1) Excessive wear or damage to the socket pins	Not serviceable	Replace the defective thermocouple cable (AMM 77-21-02/401)
2) Stripped or damaged threads on the pigtail nuts	50% of one entrance thread or 10% each of two entrance threads, if unwanted metal is removed	Replace the defective thermocouple cable (AMM 77-21-02/401)
(b) Thermocouple Probes for:		
1) Stripped or damaged threads on the alumel or chromel leads	50% of one entrance thread or 10% each of two entrance threads, if unwanted metal is removed	Replace the defective thermocouple cable (AMM 77-21-02/401)

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Visually Check	Maximum Serviceable Limits	Remarks
(c) Thermocouple Probes for:		
2) Cracks, bends, dents, erosion, burns, or holes in the probe	Minor damage if it is structurally serviceable	Replace the defective thermocouple probe (AMM 77-21-02/401)
(d) Junction Box for:		
1) Too much wear, or damage to the socket pins	Not serviceable	Replace the defective junction box (AMM 77-21-03/401)
(e) Coupling Nuts for:		
1) Stripped or damaged threads	50% of one entrance thread or 10% each of two entrance threads; remove the unwanted metal	Chase the threads or replace the defective component
(f) Connectors for:		
1) Stripped or damaged threads	50% of one entrance thread or 10% each of two entrance threads; remove the unwanted metal	Chase the threads or replace the defective component

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Over-Serviceable-Limit Extensions

Visually Examine	Maximum Extension
(a) The Thermocouple Harness pigtail leads for:	
1) Breaks on one of the two alumal or chromal probe attachment points, which causes the EGT indication to fluctuate	10 cycles - one per engine, but not the two conditions at the same time, until you can correct the problem with the necessary maintenance.
2) Low I/R resistance of a EGT probe, which caused a down/up shift of (20 - 30)° C (68 - 86)° F of the indicated EGT	
<u>NOTE:</u> Do these steps to tie back the pigtails of the EGT harness:	
1. Disconnect the chromel and alumel pigtails from the EGT probe studs.	
2. Select an insulation material which can with stand the temmpatures of 700 degrees fahrenheit.	
3. Put an insulation cover on the chromel and alumel lead with the selected material.	
4. Attach the insulation material to each pigtail.	
5. Fold each pigtail onto the harness to separate each pigtail from the other to prevent an electrical short.	
6. Attach the pigtail to the EGT harness with a clamp.	

- S 416-004-J00
- (3) Do the procedure to close the Core Cowl panels (AMM 71-11-06/201).

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EGT THERMOCOUPLE PROBES - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the exhaust gas temperature (EGT) thermocouple probe. The other task is for the installation of the EGT probe.
- B. There are eight probes installed (radially) in the low pressure turbine (LPT) stator case. The removal task and the installation task is the same for each probe.
- C. To get access to the EGT probe, you must open the core cowl.

TASK 77-21-01-004-001-J00

2. EGT Thermocouple Probe Removal (Fig. 401)

A. References

- (1) 71-11-06/201, Core Cowl Panels
- (2) IPC 77-21-01 Fig. 1
- (3) WDM 71-51-53

B. Access

(1) Location Zone

- | | |
|-----|--------------------------------------|
| 412 | Engine 1 - Low Pressure Turbine Case |
| 422 | Engine 2 - Low Pressure Turbine Case |
| 432 | Engine 3 - Low Pressure Turbine Case |
| 442 | Engine 4 - Low Pressure Turbine Case |

(2) Access Panel

- | | |
|-------------|-----------------------------|
| 417 and 418 | Core Cowl Panels - Engine 1 |
| 427 and 428 | Core Cowl Panels - Engine 2 |
| 437 and 438 | Core Cowl Panels - Engine 3 |
| 447 and 448 | Core Cowl Panels - Engine 4 |

C. Procedure

S 014-002-J00

- (1) Open the core cowl panels (Ref 71-11-06/201).

S 034-003-J00

- (2) Disconnect the thermocouple harness wires (4) from the EGT probe (1).

S 034-004-J00

- (3) Remove the bolts (3) that attach the EGT probe (1) to the LPT stator case.

S 024-005-J00

- (4) Carefully remove the probe (1) from the LPT stator case.

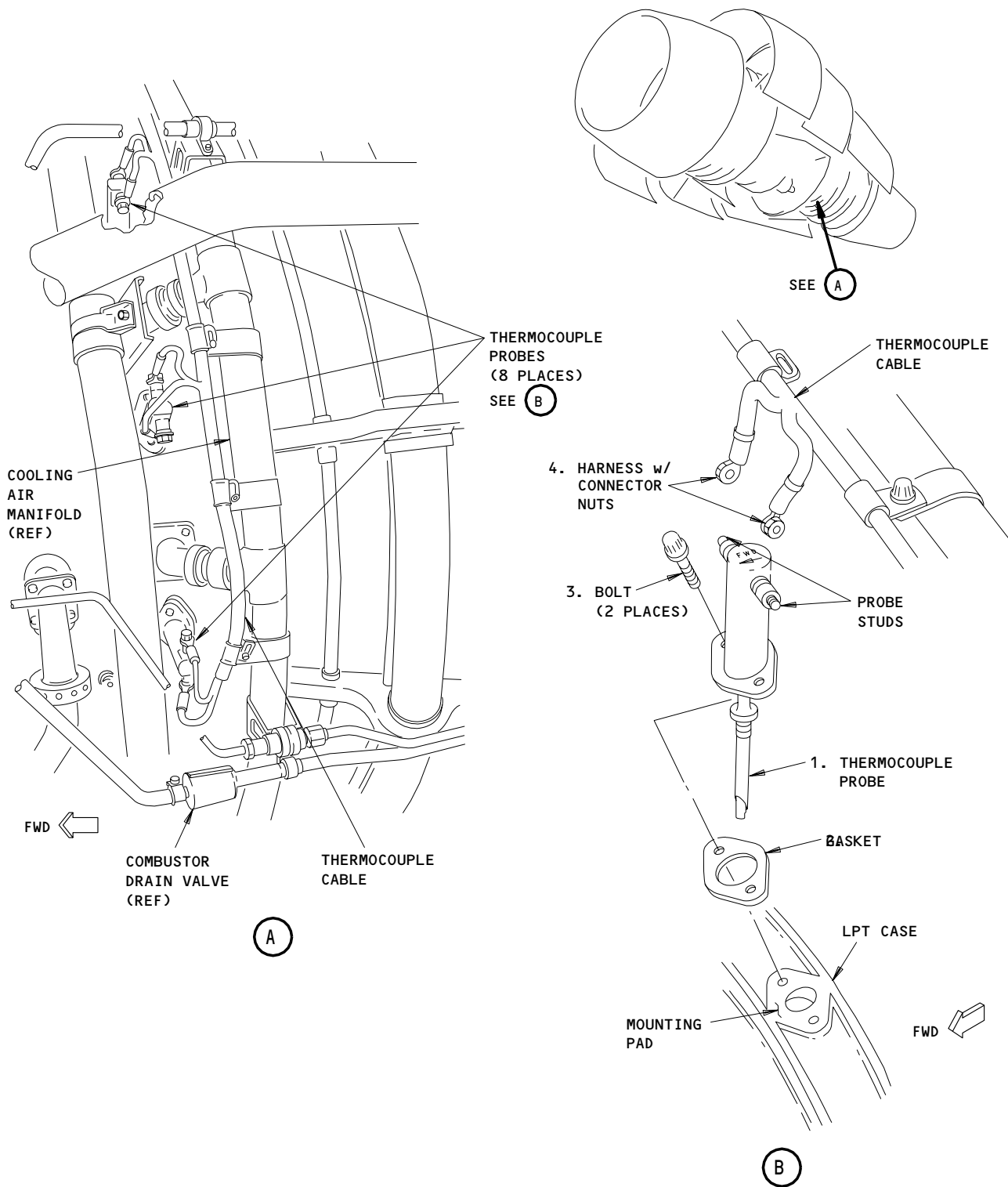
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Thermocouple Probe Installation
Figure 401

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S 034-012-J00
(5) Discard the gasket (2).

TASK 77-21-01-404-006-J00

3. EGT Thermocouple Probe Installation (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Thermocouple Probe	77-21-01	01	40
	2	Gasket			35
	3	Bolt			30
	4	Harness			20

B. References

- (1) 71-11-06/201, Core Cowl Panels
- (2) WDM 71-51-53

C. Access

(1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Case
- 422 Engine 2 - Low Pressure Turbine Case
- 432 Engine 3 - Low Pressure Turbine Case
- 442 Engine 4 - Low Pressure Turbine Case

(2) Access Panel

- 417 and 418 Core Cowl Panels - Engine 1
- 427 and 428 Core Cowl Panels - Engine 2
- 437 and 438 Core Cowl Panels - Engine 3
- 447 and 448 Core Cowl Panels - Engine 4

D. Procedure

S 424-013-J00

(1) Install the probe (1):

- (a) Put a new gasket (2) in its position on the thermocouple mounting pad.
- (b) Carefully install the probe (1).

NOTE: All the thermocouple probes (1) must be installed with the arrow on the top of the probe in the forward direction.

- (c) Install the bolts (3).
- (d) Tighten the bolts (3) to 55-70 pound-inches (6.2-7.9 N.m).
- (e) Install lockwire to the bolts (3).

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S 434-014-J00

- (2) Connect the EGT harness to the probe (1):

CAUTION: MAKE SURE THE EGT HARNESS LEAD IS IN THE CORRECT POSITION BEFORE YOU TIGHTEN THE CONNECTOR NUT. IF THE LEAD IS NOT IN THE CORRECT POSITION, YOU CAN CAUSE DAMAGE TO ENGINE COMPONENTS AND TO THE CONNECTOR, PROBE, AND HARNESS. EGT INDICATIONS CAN ALSO BE CHANGED.

- (a) Put the leads of the EGT harness in their position on the probe studs (1).
- (b) Install the connector nuts (4) to the studs on the probe.

NOTE: The thermocouple probe has two studs and two connector nuts. One stud has a smaller diameter than the other stud. The smaller connector nut is installed on the smaller stud. The larger connector nut is installed on the larger stud.

CAUTION: DO NOT TIGHTEN THE HARNESS CONNECTORS TOO TIGHTLY. TOO MUCH TORQUE ON THE CONNECTORS CAN CAUSE DAMAGE TO THE EGT HARNESS AND EGT PROBE.

- (c) Tighten the smaller connector nut (4) to 12-14 pound-inches (1.4-1.6 N.m).
- (d) Tighten the larger connector nut (4) to 20-30 pound-inches (2.3-3.4 N.m).

S 414-011-J00

- (3) Close the core cowl panels (Ref 71-11-06/201).

S 714-015-J00

- (4) Do the operational test of the Indicating System for the Exhaust Gas Temperature (EGT) (Ref 77-21-00/501).

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EGT THERMOCOUPLE CABLE - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the EGT thermocouple cable. The other task is for the installation of the cable.
- B. The EGT cable has two sections. One section is the upper cable and the other section is the lower cable.
- C. The EGT cable is installed on the ACC and the LPT air manifold.
- D. To get access to the EGT cable, you must open the core cowl panels.

TASK 77-21-02-004-001-J00

2. Remove the EGT Thermocouple Cable (Fig. 401-402)

A. References

- (1) 71-11-06/201, Cowl Panels
- (2) IPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - Mounted to the Low Pressure Turbine Air Manifold
- 422 Engine 2 - Mounted to the Low Pressure Turbine Air Manifold
- 432 Engine 3 - Mounted to the Low Pressure Turbine Air Manifold
- 442 Engine 4 - Mounted to the Low Pressure Turbine Air Manifold

(2) Access Panel

- 417 and 418 Core Cowl Panels - Engine 1
- 417 and 418 Core Cowl Panels - Engine 2
- 417 and 418 Core Cowl Panels - Engine 3
- 417 and 418 Core Cowl Panels - Engine 4

C. Procedure

S 014-014-J00

- (1) Open the core cowl panels (Ref 71-11-06/201).

S 034-015-J00

CAUTION: MAKE SURE YOU DO NOT BEND OR TWIST THE EGT CABLE WHEN YOU REMOVE THE CABLE. IF YOU BEND OR TWIST THE CABLE YOU CAN CAUSE DAMAGE TO THE CABLE.

- (2) Remove the nuts (5 and 8), the bolts (3 and 6), the washers (4 and 7), and the spacer (9).
 - (a) These parts attach the the upper and the lower EGT cable (1 and 2) to the ACC cooling air tube and the LPT manifold.

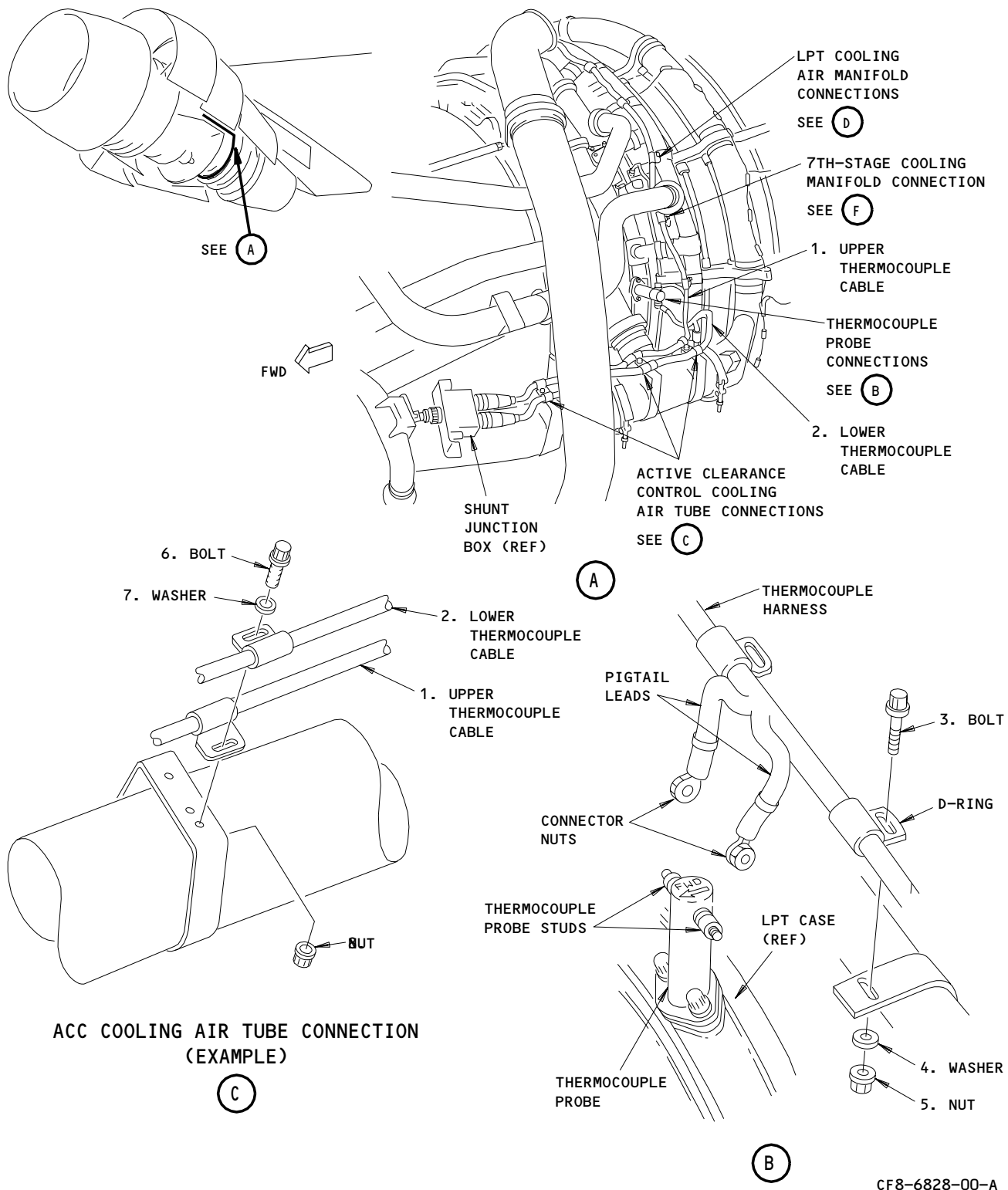
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EGT Thermocouple Cable Installation
Figure 401 (Sheet 1)

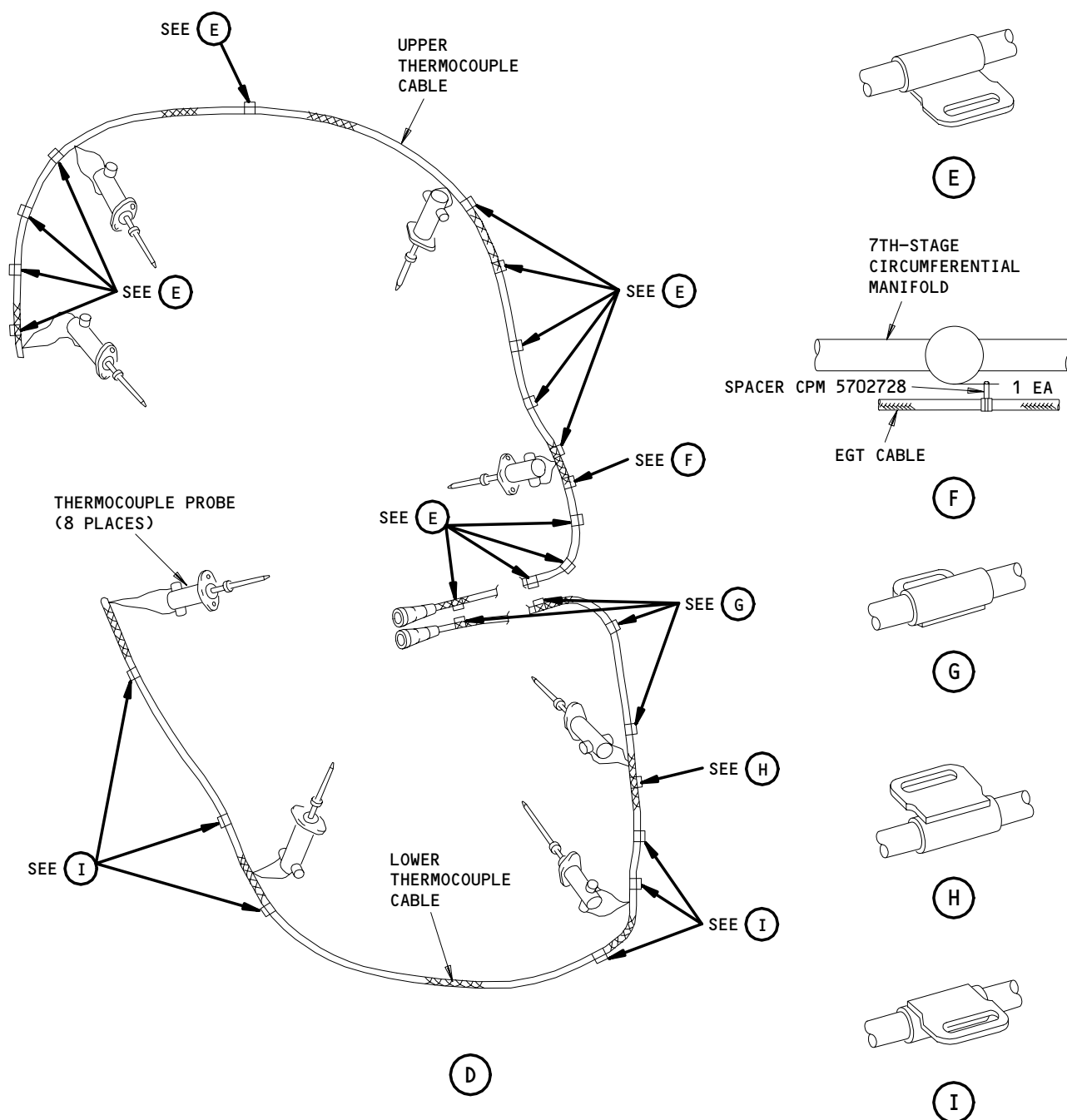
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EGT Thermocouple Cable Installation
Figure 401 (Sheet 2)

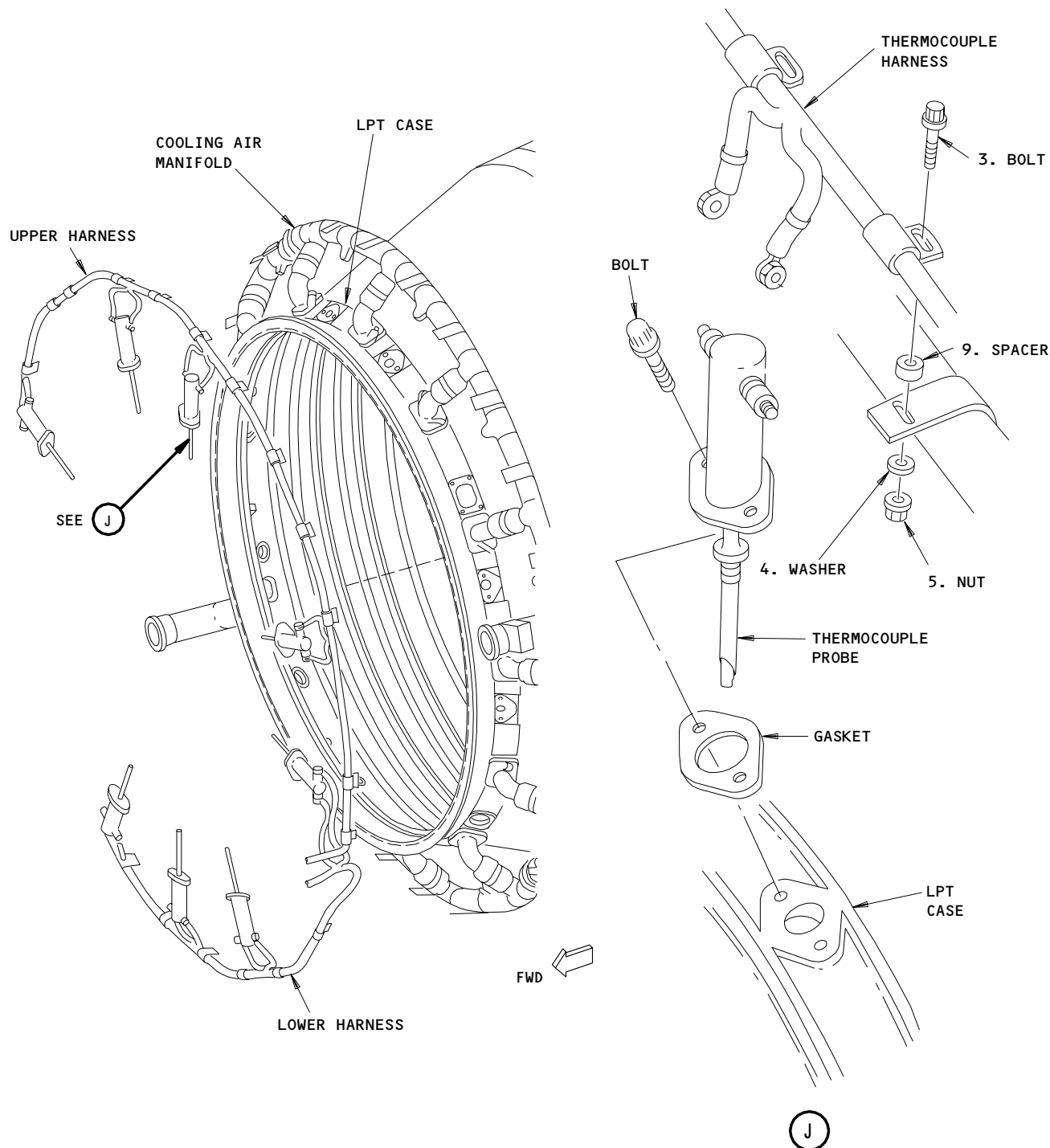
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EGT Thermocouple Cable Installation
Figure 401 (Sheet 3)

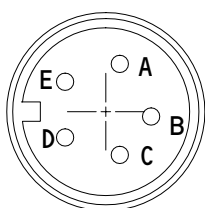
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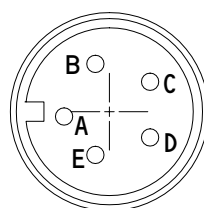
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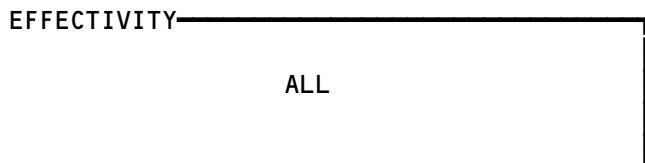


60 DEGREES HARNESS CONNECTOR



45 DEGREES HARNESS CONNECTOR

Harness Connector for the EGT
Thermocouple Cable
Figure 402



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S 034-002-J00

- (3) Remove the nuts from the thermocouple probe studs.

S 034-003-J00

- (4) Disconnect the EGT cable (1 and 2) connector from the EGT junction box.

S 024-004-J00

- (5) Carefully remove the EGT cable (1 and 2) from the engine.

TASK 77-21-02-404-005-J00

3. Install the EGT Thermocouple Cable (Fig. 401-402)

A. Standard Tools and Equipment

- (1) Torque wrench

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Upper Thermocouple Cable	77-21-01	01	20
	2	Lower Thermocouple Cable			25
	3	Bolt			5
	4	Washer			10
	5	Nut			15
	6	Bolt			85
	7	Washer			90
	8	Nut			95
	9	Spacer			12

C. References

- (1) 71-11-06/201, Cowl Panels

D. Access

- (1) Location Zone

- 412 Engine 1 - Mounted to the Low Pressure Turbine Air Manifold
- 422 Engine 2 - Mounted to the Low Pressure Turbine Air Manifold
- 432 Engine 3 - Mounted to the Low Pressure Turbine Air Manifold
- 442 Engine 4 - Mounted to the Low Pressure Turbine Air Manifold

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(2) Access Panel

- | | |
|-------------|-----------------------------|
| 417 and 418 | Core Cowl Panels - Engine 1 |
| 417 and 418 | Core Cowl Panels - Engine 2 |
| 417 and 418 | Core Cowl Panels - Engine 3 |
| 417 and 418 | Core Cowl Panels - Engine 4 |

E. Procedure

S 424-013-J00

(1) Install the EGT thermocouple cable (1 and 2):

CAUTION: MAKE SURE YOU DO NOT BEND OR TWIST THE EGT CABLE WHEN YOU INSTALL THE CABLE. IF YOU BEND OR TWIST THE CABLE, YOU CAN CAUSE DAMAGE TO THE CABLE.

- (a) Put the EGT cable (1 and 2) in its position on the engine.
- (b) Align the slots in the clamps on the EGT cable (1 and 2) with the holes in the bracket on the ACC and the LPT manifold.
- (c) Install the bolts (3 and 6), the washers (4 and 7), and the nuts (5 and 8) that attach the EGT cable to the brackets on the ACC cooling air tube and the LPT manifold.

NOTE: Do not tighten the nuts.

- (d) Make sure you install the spacer (9) between the EGT harness and the 7th-stage circumferential manifold (Fig. 401).

S 424-017-J00

CAUTION: DO NOT USE DIFFERENT CONFIGURATIONS OF EGT THERMOCOUPLE CABLES AND SHUNT JUNCTION BOXES. THE INCORRECT INSTALLATION OF THE EGT THERMOCOUPLE CABLE TO THE SHUNT JUNCTION BOX WILL CAUSE AN INCORRECT EGT INDICATION. IF YOU USE CONFIGURATIONS THAT ARE NOT THE SAME, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

(2) Install the harness connector to the shunt junction box.

- (a) Make sure you use the correct configuration of EGT thermocouple cable.

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- (b) Connect the cables to the EGT junction box.
- (c) Make sure the EGT cables are not too loose between the junction box and the first clamp.
- (d) Make sure the upper EGT cable is loose between the 2nd and the 5th clamp from the junction box.
- (e) Make sure the upper and the lower EGT cables are not too tight between the other clamps.
- (f) Put the EGT cable leads (1 and 2) in their position on the thermocouple probe stud.
- (g) Install the nuts that attach the EGT cable (1 and 2) to the probe studs.

CAUTION: DO NOT TIGHTEN THE NUT TOO TIGHT. TOO MUCH TORQUE ON THE NUT CAN CAUSE DAMAGE TO THE EGT CABLE AND THE EGT PROBE.

- (h) Tighten the connector nuts:
 - 1) Tighten the smaller nut 12-14 pound-inches (1.36-1.58 N.m).
 - 2) Tighten the larger nut to 20-30 pound-inches (2.26-3.39 N.m).
- (i) Make sure there are no bends or kinks in the EGT cables.
- (j) Tighten the nuts (5 and 8) to 33-37 pound-inches (3.7-4.2 N.m).

S 434-010-J00

- (3) Connect the EGT cable (1 and 2) connector to the EGT junction box.

S 414-011-J00

- (4) Close the core cowl panels (Ref 71-11-06/201).

S 714-016-J00

- (5) Do the Operational Test for the Indicating System for the Exhaust Gas Temperature (EGT) (Ref 77-21-00/501).

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EGT SHUNT JUNCTION BOX (FLEXIBLE LEADS) - REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks. One task is the removal of the EGT shunt junction box (trimmer). The other task is the installation of the junction box.

TASK 77-21-03-004-001-J00

2. Remove the EGT Shunt Junction Box (Fig. 401-402)

A. References

- (1) AMM 71-11-06/201, Core Cowl Panels
- (2) AIPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Cooling Air Tube
- 422 Engine 2 - Low Pressure Turbine Cooling Air Tube
- 432 Engine 3 - Low Pressure Turbine Cooling Air Tube
- 442 Engine 4 - Low Pressure Turbine Cooling Air Tube

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

C. Procedure

S 014-002-J00

- (1) Open the left core cowl panel (AMM 71-11-06/201).

S 034-012-J00

- (2) Disconnect the electrical connectors from the junction box:
- (a) Disconnect the upper thermocouple cable connector P3 (3) from the junction box (1).
 - (b) Disconnect the lower thermocouple cable connector P4 (4) from the junction box (1).
 - (c) Disconnect the forward lead connector D10990 (53) from the junction box (1).

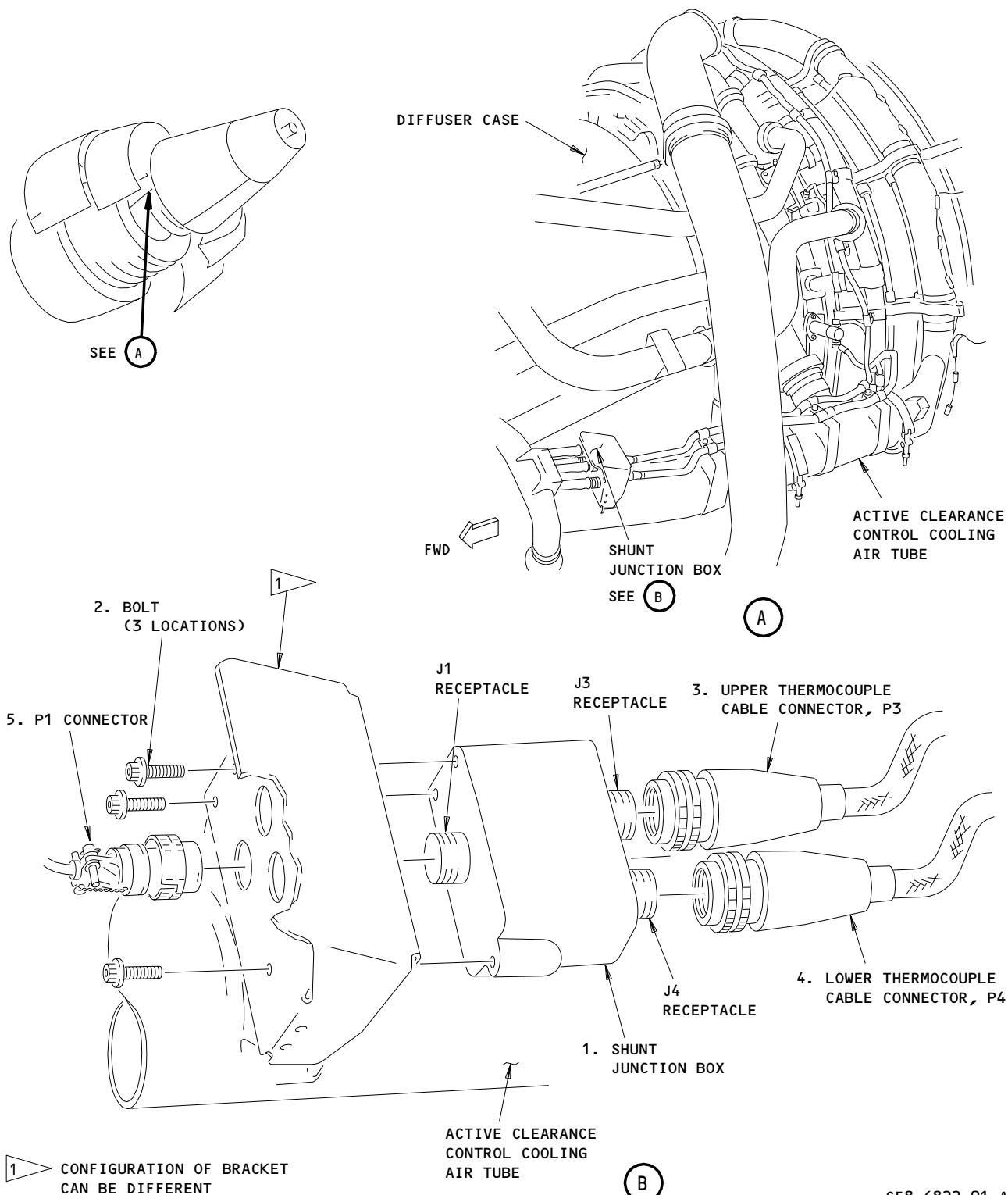
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EGT Shunt Junction Box Installation
Figure 401

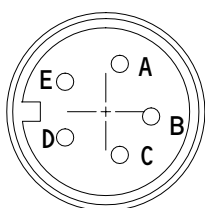
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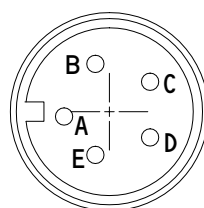
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60 DEGREES HARNESS CONNECTOR



45 DEGREES HARNESS CONNECTOR

Harness Connector for the EGT
Thermocouple Cable
Figure 402

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- (d) Install protective covers on the electrical connectors and the receptacles on the junction box.

S 024-013-J00

- (3) Remove the junction box:

- (a) Remove the two bolts (2) that attach the junction box (1) to the bracket.

NOTE: The bracket is attached to the B-sump pressurization tube.

- (b) Remove the junction box (1).

TASK 77-21-03-404-005-J00

3. EGT Shunt Junction Box Installation (Fig. 401-402)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1 2	Shunt Junction Box Bolt	77-21-01	1	65 55

B. References

- (1) AMM 71-11-06/201, Core Cowl Panels

C. Access

- (1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Cooling Air Tube
422 Engine 2 - Low Pressure Turbine Cooling Air Tube
432 Engine 3 - Low Pressure Turbine Cooling Air Tube
442 Engine 4 - Low Pressure Turbine Cooling Air Tube

- (2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
427 Left Core Cowl Panel - Engine 2
437 Left Core Cowl Panel - Engine 3
447 Left Core Cowl Panel - Engine 4

D. Procedure

S 424-014-J00

- (1) Install the junction box:

- (a) Put the junction box (1) on the bracket with the keyway of the connectors J3 and J4 pointed up.

NOTE: The bracket is attached to the B-sump pressurization tube.

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- (b) Install the two bolts (2) that attach the junction box (1) to the bracket.
- (c) Tighten the bolts (2) to 24-27 pound-inches (2.7-3.1 N.m).
- (d) Install lockwire on the bolts (2).

S 434-017-J00

CAUTION: DO NOT USE DIFFERENT CONFIGURATIONS OF EGT THERMOCOUPLE CABLES AND SHUNT JUNCTION BOXES. THE INCORRECT INSTALLATION OF THE EGT THERMOCOUPLE CABLE TO THE SHUNT JUNCTION BOX WILL CAUSE AN INCORRECT EGT INDICATION. IF YOU USE CONFIGURATIONS THAT ARE NOT THE SAME, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

- (2) Install the harness connector to the shunt junction box.
 - (a) Make sure you use the correct configuration of EGT thermocouple cable.

S 434-015-J00

- (3) Connect the electrical connectors to the junction box:
 - (a) Remove the covers from the electrical connectors.
 - (b) Connect the upper thermocouple cable connector P3 (3) to the J3 receptacle on the junction box (1).
 - (c) Connect the lower thermocouple cable connector P4 (4) to the J4 receptacle on the junction box (1).
 - (d) Connect the forward lead connector D10990 (5) to the J1 receptacle on the junction box (1).

S 414-011-J00

- (4) Close the left core cowl panel (AMM 71-11-06/201).

S 714-019-J00

- (5) Do the operational test for the Indicating System for the Exhaust Gas Temperature (EGT) (AMM 77-21-00/501).

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AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - DESCRIPTION AND OPERATION

1. General

- A. The airborne vibration monitoring (AVM) system continuously shows the engine vibration level. The system consists of two accelerometers (vibration pickups) for each engine and an AVM signal conditioner. Engine vibration indication is provided through the Engine Indication and Crew Alerting System (EICAS) display unit in the flight compartment. Power for the system is 115 volts ac supplied from the ac bus 3 and 4 on the P6 circuit breaker power panel.
- B. Abnormal engine vibration, sudden or progressive, is positive indication of engine malfunction. Abnormal vibration can be caused by compressor or turbine blade damage, bearing distress, high pressure compressor rotor imbalance, improperly functioning accessory drive gears, failure of a rotating part in one of the engine-mounted accessories, or other problems. Early warning of engine malfunction permits corrective action before extensive damage results. With engine operating, the engine accelerometers generate signals proportional to engine motion in radial direction. These signals are received by the AVM signal conditioner, where they are converted to signals suitable for the EICAS computer. Signals are then sent to the display unit from the computer where vibration velocity is read in units.

2. Engine Accelerometers (Fig. 1)

- A. Engine Accelerometers description:
- (1) The engine accelerometers sense engine vibration in terms of engine acceleration in radial direction and generate electrical signals proportional to the engine acceleration. The accelerometers are of the piezoelectric type with a charge sensitivity of 50 pC/g, except for the alternative external accelerometer which has a charge sensitivity of 100 pC/g.
- (2) Two accelerometers are used for each engine. The internal accelerometer is mounted on the number one bearing housing within the A sump. The lead connector is on the number 8 fan strut in the core engine compartment. The Compressor Rear Frame (CRF) accelerometer is mounted on the forward side of the flange between the compressor rear frame and the compressor stator at the 11 o'clock position. It is mounted to a bracket externally and connected by a hard lead to the junction box.

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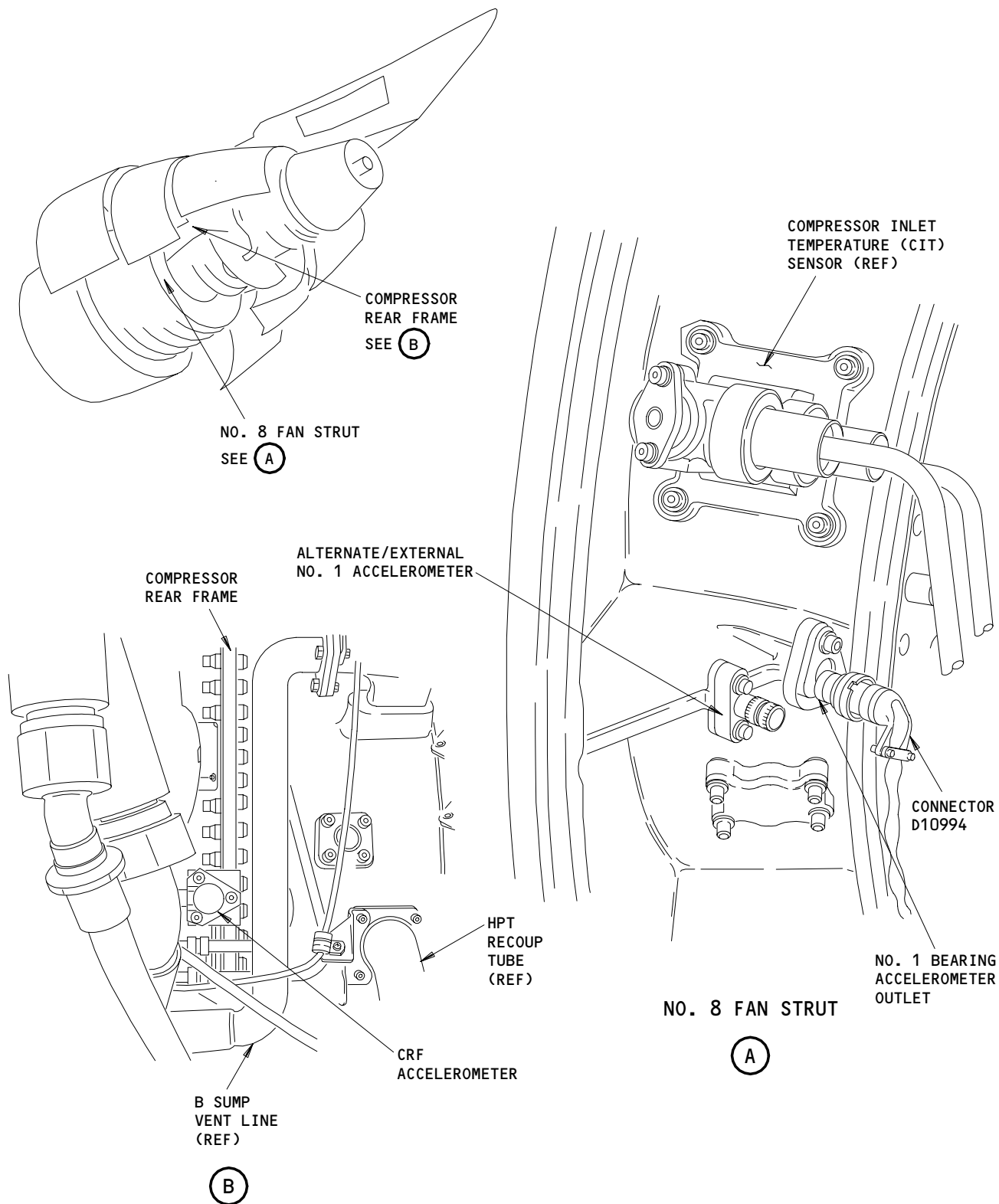
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AVM System Components
Figure 1 (Sheet 1)

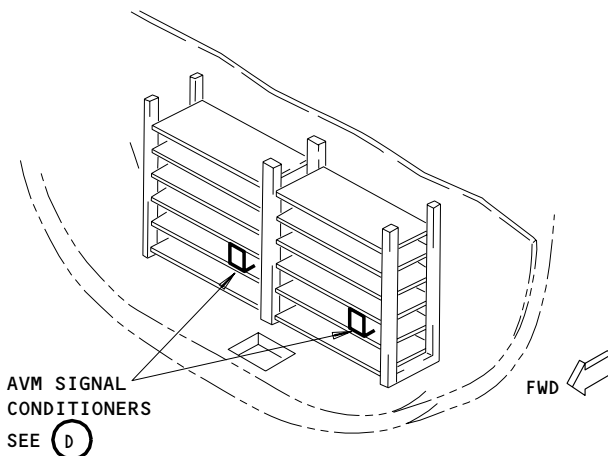
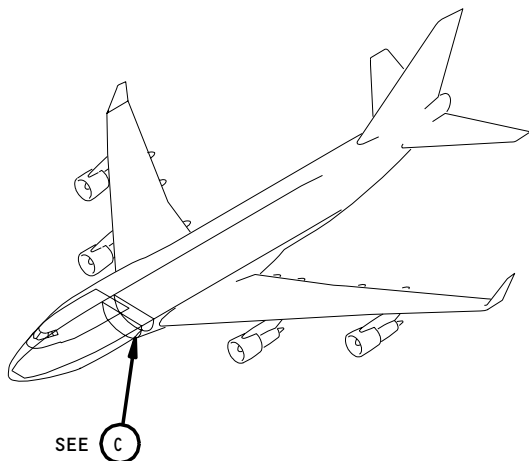
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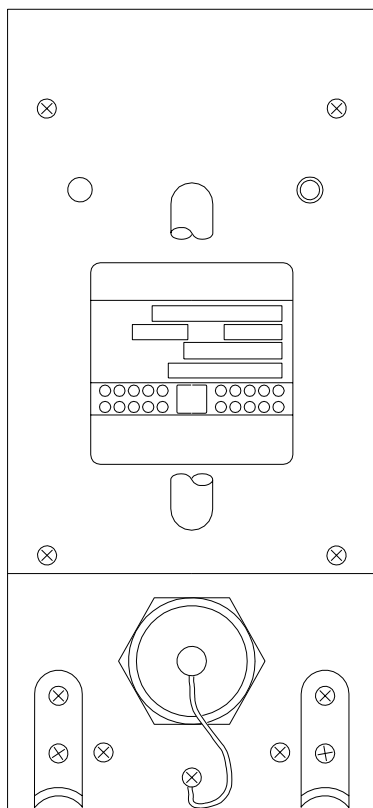
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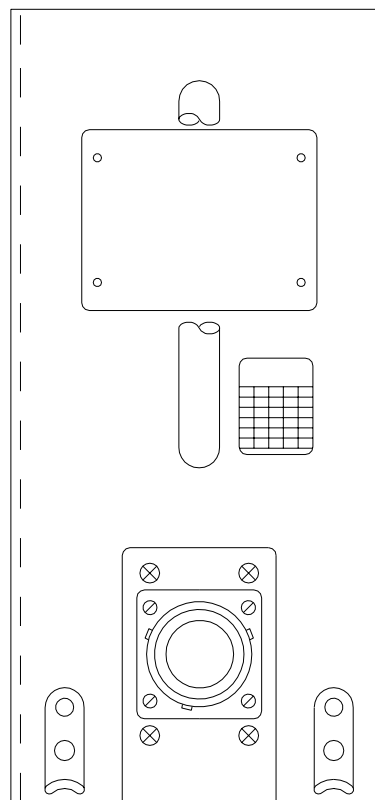
MAIN EQUIPMENT CENTER

(C)



ENDEVCO AVM SIGNAL CONDITIONER

(D)



VIBROMETER AVM SIGNAL CONDITIONER

(D)

AVM System Components
Figure 1 (Sheet 2)

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- (3) An alternate/external No. 1 accelerometer is used in the event that the internal No. 1 bearing accelerometer should fail. Because the internal accelerometer is not readily accessible at the on-line maintenance level, the external accelerometer is mounted to the 8 o'clock fan strut and used after the internal accelerometer has failed.
- (a) The alternate/external accelerometer consists of a hermetically sealed, corrosion resistant Inconel casing containing a piezoelectric measuring element. It is secured to the fan frame by two bolts which pass through the bolt holes in the accelerometer housing.

3. AVM Signal Conditioner (Fig. 1)

A. AVM description:

- (1) The signal conditioner receives two accelerometer signals from each engine along with the N1 and N2 tachometer signals from each engine. The signal conditioner converts the accelerometer change signals to velocity signals (expressed in volts) which are then processed by a digital filter whose center frequency is controlled by the tachometer signals. The signal conditioner provides an output which is sent to the three EIU computers over common ARINC 429 data cable.
- (2) If there is a tachometer fault or the signal conditioner fails to recognize a tachometer signal, EICAS will identify as BB (Broad Band). BB will also appear when power is below minimum idle. When BB appears, EICAS will display the highest vibration sensed.
- (a) Tracking Filters
- 1) It is desired to sense the amplitude of vibration of a frequency that matches the rotor speed. The filters "track" the rotor speed, and filter out any unmatched frequencies that may occur from outside sources. The fan sensor tracking filter receives N1 speed only. The core sensor is input to two tracking filters; one sensing N1 rotor speed, and the other sensing N2 rotor speed.
- (b) Multiplexer
- 1) The multiplexer samples each tracking filter. Software then compares the sensor signals with vibration limits, and determines which signal is to be input to the EICAS computer as a function of "worst case".
- (c) Indication
- 1) Separate indications are provided for each engine on the secondary EICAS display. Each engine vibration readout is a combination of a digital and an analog display. The analog display shows a vertical scale with a pointer. The digital display shows the highest vibration readout, and identifies the source of vibration. Both analog and digital displays are white in color.
- 2) If the primary EICAS display fails, EICAS will switch to a compacted mode. In the compacted mode, the analog scales and pointers are not displayed. The digital readouts display the highest vibration level for that engine, and identify the vibration source.

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- (3) The AVM signal conditioner receives inputs from vibration sensors, N1 speed sensor, and the N2 sensor. The conditioner unit is programmed to determine the N1 rotor vibration from the fan sensor and both N1 and N2 rotor vibration from the core sensor. The "worst case" is output to the EICAS computers for display on the secondary EICAS CRT. The unit is a microprocessor with BITE.

4. Operation (Fig. 2)

A. Functional Description

- (1) With the engine operating, the accelerometers sense the engine acceleration in the radial direction. As the engine vibrates, the accelerometer moves back and forth with the engine while the internal mass inside the accelerometer tends to remain at rest. When compressed a piezoelectric crystal will exhibit a minute change in its electrical charge. This change in charge is proportional to the severity of vibration. The output from the sump mounted accelerometer is very minute (50 pC/g) and is amplified by a charge amplifier before its signal is sent to the EICAS computer. The output from the external accelerometer is two times greater than that of the internal accelerometer because of its distance from the No. 1 bearing.

(2) BITE

- (a) The AVM signal conditioner performs two BITEs, a power-up BITE and a manual BITE. These two BITEs complete end-to-end checks of the AVM system and senses N1 and/or N2 tachometer input signal loss.
- (b) Faults in the AVM system, either a LRU or wiring faults, are stored in a nonvolatile memory and indication of a critical fault is the loss of AVM displayed on the EICAS CRT. Should the failure be intermittent, the indication will return when the failure is no longer sensed.

CAUTION: HOLDING DOWN MANUAL BITE BUTTON 6 SECONDS OR MORE WILL CAUSE THE SYSTEM TO REGISTER A FAILURE IN THE SWITCH AND IGNORE THE SWITCH THERE AFTER.

- (c) Manual BITE maybe activated by pushing the button on the front of the signal conditioner. The light on the face of the unit will activate. When the turns off a positive test is indicated, if the light remains for longer than 6 seconds a negative test is indicated.

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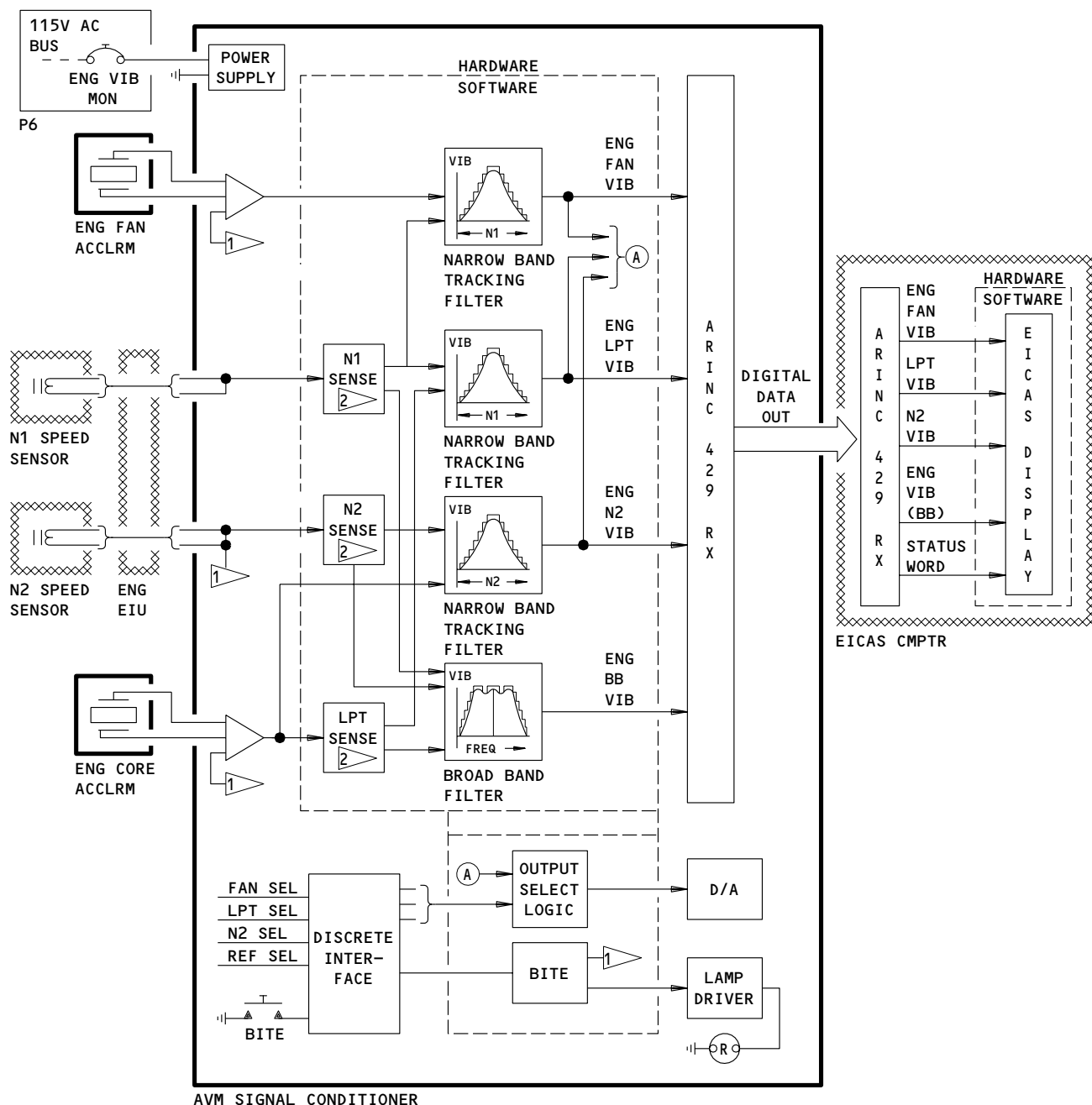
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NOTES:

- 1 BITE INPUT/WRAPAROUND
- 2 SENSE CIRCUITS DETECT ENGINE NOT RUNNING CONDITION OR WHEN TACH SIGNAL IS NOT PRESENT. BROAD BAND FILTER THEN MONITORS ENGINE VIBRATION UNDER THESE CONDITIONS.

Airborne Vibration Monitoring (AVM) System Schematic (Typical)
Figure 2

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AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - ADJUSTMENT/TEST

1. General

- A. This procedure contains two tasks:
 - (1) An operational test of the airborne vibration monitor (AVM) system.
 - (2) A system test of the airborne vibration monitor (AVM) system.
- B. You do the operational test to make sure the system operates correctly after you replace a component.
- C. The system test does a continuity check of the accelerometer signal cables which will be called accelerometer cables in this document.
 - (1) This test uses test equipment not found on the airplane.
- D. During the system test, when you see the component and plug connections, examine them for clean connectors and damaged insulation.
- E. Because of the small electrical signals transmitted through the AVM system, all damaged or defective connections decrease the system performance.

TASK 77-31-00-705-001-J00

2. Operational Test - AVM System

- A. References
 - (1) 24-22-00/201, Manual Control
 - (2) 31-61-00/201, Engine Indicating and Crew Alerting System (EICAS)
 - (3) 71-00-00/201, Power Plant
 - (4) IPC 77-31-01 Fig. 1
- B. Procedure
 - S 865-002-J00
 - (1) Supply electrical power (Ref 24-22-00/201).
 - S 215-003-J00
 - (2) Do a check of the EICAS display for AVM system fault messages on the status page (Ref 31-61-00/201).
 - S 865-004-J00
 - (3) Start the engines (Ref 71-00-00/201).
 - S 215-005-J00
 - (4) Operate all of the engines to make sure that you see the correct engine vibration levels (non-zero) for these parts on the EICAS Performance Page:
 - (a) Fan

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- (b) LPT
- (c) N2
- (d) BB

S 865-109-J00

- (5) If it is necessary, change the throttle position to increase or decrease the correct vibration levels.

S 865-006-J00

- (6) Stop the engines (Ref 71-00-00/201).

S 215-007-J00

- (7) Do a check of the EICAS display for AVM system fault messages on the status page (Ref 31-61-00/201).

S 865-008-J00

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

TASK 77-31-00-735-085-J00

3. System Test for the Airborne Vibration Monitoring (AVM) System

A. General

- (1) This system test does a continuity check of the accelerometer cables.

B. Equipment

- (1) Multimeter (Commercially Available)

C. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 77-31-03/401, Airborne Vibration Monitor Signal Conditioner
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) WDM 77-31-11
- (5) WDM 77-31-12

D. Access

- (1) Location Zone

- 412 Engine 1 - Compressor Stator Rear Flange 9:30 o'clock and
Number 1 Bearing Housing 5:30 o'clock
- 422 Engine 2 - Compressor Stator Rear Flange 9:30 o'clock and
Number 1 Bearing Housing 5:30 o'clock
- 432 Engine 3 - Compressor Stator Rear Flange 9:30 o'clock and
Number 1 Bearing Housing 5:30 o'clock
- 442 Engine 4 - Compressor Stator Rear Flange 9:30 o'clock and
Number 1 Bearing Housing 5:30 o'clock

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(2) Access Panel

- 413 Left Fan Cowl Panel - Engine 1
- 415 Left Thrust Reverser Half - Engine 1
- 423 Left Fan Cowl Panel - Engine 2
- 425 Left Thrust Reverser Half - Engine 2
- 433 Left Fan Cowl Panel - Engine 3
- 435 Left Thrust Reverser Half - Engine 3
- 443 Left Fan Cowl Panel - Engine 4
- 445 Left Thrust Reverser Half - Engine 4

E. Prepare for the test.

S 015-091-J00

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

S 015-092-J00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS (AMM 78-31-00/201). IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 865-090-J00

- (3) For the applicable engine, open these circuit breakers and attach DO-NOT-CLOSE tags:

- (a) P6 Main Power Distribution Panel
 - 1) 6H26 VIB AMP ENG 1 & 2
 - 2) 6H27 VIB AMP ENG 3 & 4

S 025-091-J00

- (4) Remove the AVM (AMM 77-31-03/401).

- (a) For a test of the engine 1 or engine 2 cables, remove the M118 AVM from the E1-1 rack.
- (b) For a test of the engine 3 or engine 4 cables, remove the M7846 AVM from the E2-1 rack.

F. Do the system test for the airborne vibration monitoring (AVM) system.

S 765-092-J00

- (1) Do a resistance check of the cable for the fan accelerometer for engine 1.

- (a) Disconnect the connector DT677 from the fan accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM118DA and pin A4 on connector DM118BA.
 - 2) Measure the resistance between ENG 1 connector DT677 pin A and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM118DA and pin B4 on connector DM118BA.

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- 4) Measure the resistance between ENG 1 connector, DT677 pin B and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
- (b) Make sure the component and plug connections are clean and the insulation is serviceable.
- (c) Connect the connector DT677 to the fan accelerometer.

S 765-093-J00

- (2) Do a resistance check of the cable for the core accelerometer for engine 1.
 - (a) Disconnect the connector DT676 from the core accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM118DA and pin A1 on connector DM118BA.
 - 2) Measure the resistance between ENG 1 connector DT676 pin 1 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM118DA and pin B1 on connector DM118BA.
 - 4) Measure the resistance between ENG 1 connector DT677 pin 2 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - (b) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (c) Connect the connector DT676 to the core accelerometer.

S 425-094-J00

- (3) Install the AVM (AMM 77-31-03/401).

S 765-096-J00

- (4) Do a resistance check of the cable for the fan accelerometer for engine 2.
 - (a) Disconnect the connector DT677 from the fan accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM118DA and pin A4 on connector DM118CA.
 - 2) Measure the resistance between ENG 2 connector DT677 pin A and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM118DA and pin B4 on connector DM118CA.
 - 4) Measure the resistance between ENG 2 connector DT677 pin B and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - (b) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (c) Connect the connector DT677 to the fan accelerometer.

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S 765-097-J00

- (5) Do a resistance check of the cable for the core accelerometer for engine 2.
- (a) Disconnect the connector DT676 from the core accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM118DA and pin A1 on connector DM118CA.
 - 2) Measure the resistance between ENG 2 connector DT676 pin 1 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM118DA and pin B1 on connector DM118CA.
 - 4) Measure the resistance between ENG 2 connector DT677 pin 2 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - (b) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (c) Connect the connector DT676 to the core accelerometer.

S 425-098-J00

- (6) Install the AVM (AMM 77-31-03/401).

S 765-099-J00

- (7) Do a resistance check of the cable for the fan accelerometer for engine 3.
- (a) Jumper pin 3 (Ground) on connector DM7846DA and pin A4 on connector DM7846BA.
 - (b) Measure the resistance between ENG 3 connector DT677 pin A and airplane ground.
 - 1) Make sure that the resistance is less than 5 ohms.
 - (c) Jumper pin 3 (Ground) on connector DM7846DA and pin B4 on connector DM7846BA.
 - (d) Measure the resistance between ENG 3 connector DT677 pin B and airplane ground.
 - 1) Make sure that the resistance is less than 5 ohms.
 - (e) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (f) Connect the connector DT677 to the fan accelerometer.

S 765-100-J00

- (8) Do a resistance check of the cable for the core accelerometer for engine 3.
- (a) Disconnect the connector DT676 from the core accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM7846DA and pin A1 on connector DM7846BA.
 - 2) Measure the resistance between ENG 3 connector DT676 pin 1 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM7846DA and pin B1 on connector DM7846BA.

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- 4) Measure the resistance between ENG 3 connector DT677 pin 2 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
- (b) Make sure the component and plug connections are clean and the insulation is serviceable.
- (c) Connect the connector DT676 to the core accelerometer.

S 425-101-J00

- (9) Install the AVM (AMM 77-31-03/401).

S 765-102-J00

- (10) Do a resistance check of the cable for the fan accelerometer for engine 4.
 - (a) Disconnect the connector DT677 from the fan accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM7846DA and pin A4 on connector DM7846CA.
 - 2) Measure the resistance between ENG 4 connector DT677 pin A and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin (Ground) on connector DM7846DA and pin B4 on connector DM7846CA.
 - 4) Measure the resistance between ENG 4 connector DT677 pin B and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - (b) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (c) Connect the connector DT677 to the fan accelerometer.

S 765-103-J00

- (11) Do a resistance check of the cable for the core accelerometer for engine 4.
 - (a) Disconnect the connector DT676 from the core accelerometer.
 - 1) Jumper pin 3 (Ground) on connector DM7846DA and pin A1 on connector DM7846CA.
 - 2) Measure the resistance between ENG 4 connector DT676 pin 1 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - 3) Jumper pin 3 (Ground) on connector DM7846DA and pin B1 on connector DM7846CA.
 - 4) Measure the resistance between ENG 4 connector DT677 pin 2 and airplane ground.
 - a) Make sure that the resistance is less than 5 ohms.
 - (b) Make sure the component and plug connections are clean and the insulation is serviceable.
 - (c) Connect the connector DT676 to the core accelerometer.

S 425-104-J00

- (12) Install the AVM (AMM 77-31-03/401).

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S 415-105-J00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS (AMM 78-31-00/201). IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 415-106-J00

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

S 865-107-J00

(15) For the applicable engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:

(a) P6 Main Power Distribution Panel

1) 6H26 VIB AMP ENG 1 & 2

2) 6H27 VIB AMP ENG 3 & 4

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ALTERNATE/EXTERNAL NO. 1 ACCELEROMETER - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the alternate/external No. 1 accelerometer. The other task is for the installation of the accelerometer.
- B. This procedure supplies instructions for the removal and installation of the alternate/external No. 1 accelerometer. The accelerometer is installed on the aft end of the fan frame at the 7:00 o'clock position.

NOTE: The No. 1 bearing alternate accelerometer can stay in continuous use until the engine is removed for a shop visit that allows replacement of the No.1 bearing internal accelerometer.

NOTE: To deactivate the (Primary) No. 1 bearing internal accelerometer, remove the electrical connector from the (Primary) No. 1 bearing internal accelerometer and connect the electrical connector to the alternate/external No. 1 bearing accelerometer.

TASK 77-31-01-004-001-J00

2. Alternate/External No. 1 Accelerometer Removal (Fig. 401)

A. References

- (1) AMM 78-31-00/201, Thrust Reverser System
- (2) AIPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - (No. 8) Fan Strut at 7:00 o'clock
- 422 Engine 2 - (No. 8) Fan Strut at 7:00 o'clock
- 432 Engine 3 - (No. 8) Fan Strut at 7:00 o'clock
- 433 Engine 4 - (No. 8) Fan Strut at 7:00 o'clock

(2) Access Panel

- 415 Left Thrust Reverser Half - Engine 1
- 425 Left Thrust Reverser Half - Engine 2
- 435 Left Thrust Reverser Half - Engine 3
- 445 Left Thrust Reverser Half - Engine 4

C. Procedure

S 864-002-J00

- (1) For the applicable engine,
Open these circuit breakers and attach DO-NOT-CLOSE tags:
 - (a) P6 Main Power Distribution Panel
 - 1) 6H26 VIB AMP ENG 1&2
 - 2) 6H27 VIB AMP ENG 3&4

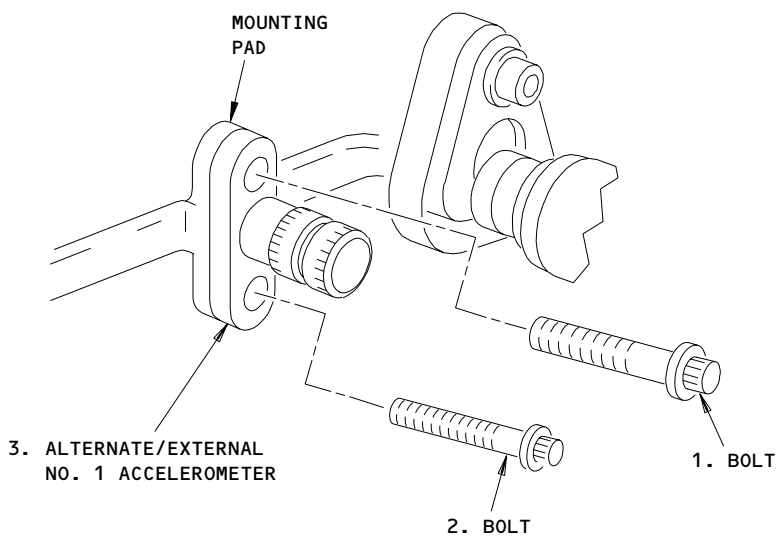
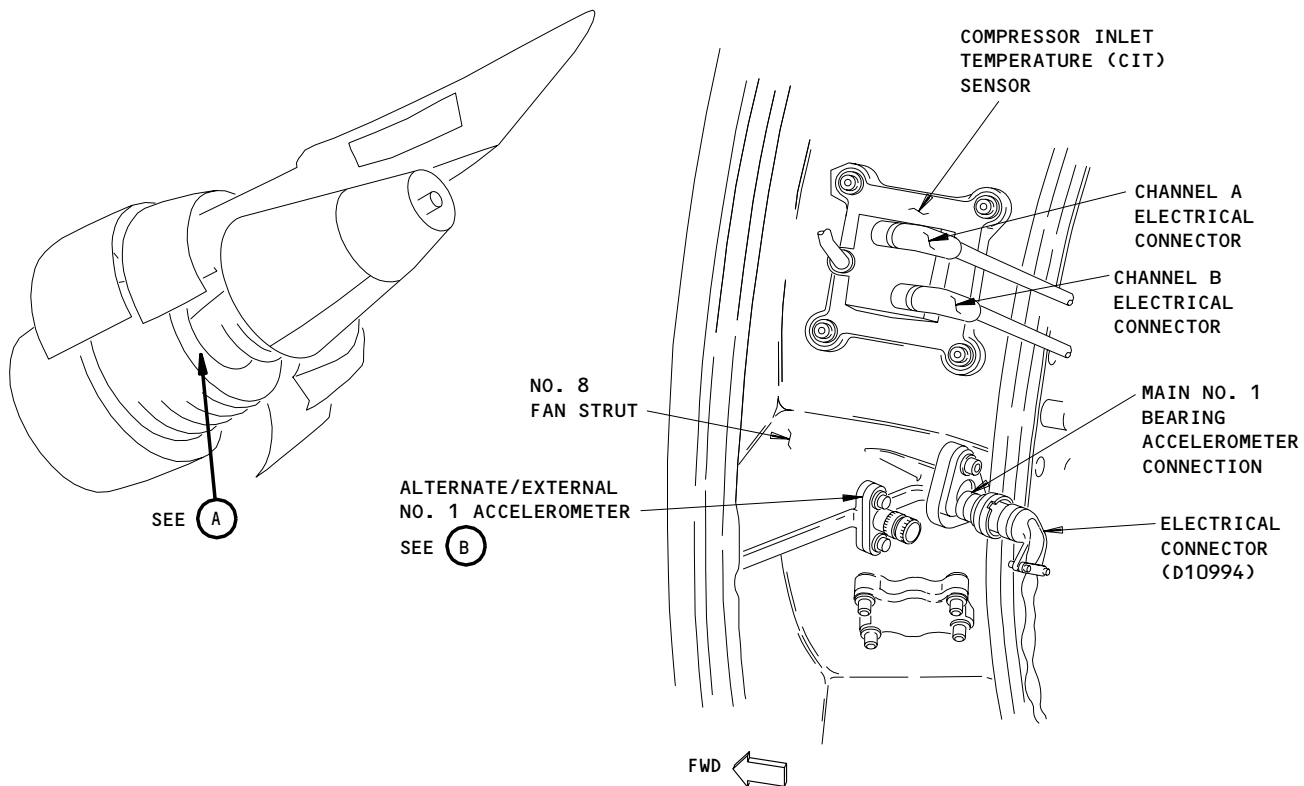
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CF8-6745-01-C

Alternate/External No. 1 Accelerometer Installation
Figure 401

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- S 014-004-J00
(2) Open the left thrust reverser half (AMM 78-31-00/201).

- S 034-005-J00
(3) Disconnect the accelerometer cable, if it is necessary.

- S 034-006-J00
(4) Remove the bolts (1) and (2) that attach the accelerometer (3) to the fan case.

- S 024-015-J00
(5) Remove the accelerometer (3).

TASK 77-31-01-404-007-J00

3. Alternate/External No. 1 Accelerometer Installation (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	77-31-01	05	10
	2	Bolt			5
	3	Alternate/External Accelerometer			15

B. References

- (1) AMM 77-31-00/501, AVM System
(2) AMM 78-31-00/201, Thrust Reverser System
(3) AIPC 77-21-01 Fig. 1

C. Access

(1) Location Zone

- 412 Engine 1 - (No. 8) Fan Strut at 7:00 o'clock
422 Engine 2 - (No. 8) Fan Strut at 7:00 o'clock
432 Engine 3 - (No. 8) Fan Strut at 7:00 o'clock
433 Engine 4 - (No. 8) Fan Strut at 7:00 o'clock

(2) Access Panel

- 415 Left Thrust Reverser Half - Engine 1
425 Left Thrust Reverser Half - Engine 2
435 Left Thrust Reverser Half - Engine 3
445 Left Thrust Reverser Half - Engine 4

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D. Procedure

S 424-016-J00

- (1) Install the accelerometer (3):
 - (a) Put the accelerometer (3) in its position on the fan strut.
 - (b) Install the bolts (1) and (2) that attach the accelerometer to the fan case.
 - 1) Tighten the smaller diameter bolt (2) to 40-60 pound-inches (4.5-6.8 N.m).
 - 2) Tighten the larger diameter bolt (1) to 70-110 pound-inches (7.9-12.4 N.m).

S 434-009-J00

- (2) Connect the cable to the accelerometer (3).

NOTE: Remove the cable from the main No. 1 bearing accelerometer outlet, if it is necessary.

S 434-017-J00

- (3) Tighten the electrical connector with your hand.

NOTE: This will put a cover over the witness band.

- (a) Use the soft-jawed pliers or a strap wrench to tighten approximately 1/8 turn.

S 414-014-J00

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

S 864-012-J00

- (5) For the applicable engine,
Close these circuit breakers and remove DO-NOT-CLOSE tags:
 - (a) P6 Main Power Distribution Panel
 - 1) 6H26 VIB AMP ENG 1&2
 - 2) 6H27 VIB AMP ENG 3&4

S 714-013-J00

- (6) Do the operational test for the AVM system (AMM 77-31-00/501).

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COMPRESSOR REAR FRAME (CRF) ACCELEROMETER AND MOUNTING BRACKET -
REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the accelerometer and mounting bracket that is installed on the compressor rear frame (CRF). The other task is for the installation of the accelerometer and the mounting bracket.
- B. The CRF accelerometer is installed on the compressor stator rear flange at the 10:30 o'clock position.
- C. To get access to the CRF accelerometer, you must open the thrust reversers.

TASK 77-31-02-004-001-J00

2. CRF Accelerometer and Mounting Bracket Removal (Fig. 401)

A. References

- (1) AMM 71-11-06/201, Core Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) IPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - Compressor Stator Rear Flange 10:30 o'clock
- 422 Engine 2 - Compressor Stator Rear Flange 10:30 o'clock
- 432 Engine 3 - Compressor Stator Rear Flange 10:30 o'clock
- 442 Engine 4 - Compressor Stator Rear Flange 10:30 o'clock

(2) Access Panel

- 415 Left Thrust Reverser Half - Engine 1
- 417 Left Core Cowl Panel - Engine 1
- 425 Left Thrust Reverser Half - Engine 2
- 417 Left Core Cowl Panel - Engine 2
- 435 Left Thrust Reverser Half - Engine 3
- 417 Left Core Cowl Panel - Engine 3
- 445 Left Thrust Reverser Half - Engine 4
- 417 Left Core Cowl Panel - Engine 4

C. Procedure

S 864-002-J00

- (1) For the applicable engine,
Open these circuit breakers and attach DO-NOT-CLOSE tags:
 - (a) P6 Main Power Distribution Panel
 - 1) 6H26 VIB AMP ENG 1 & 2

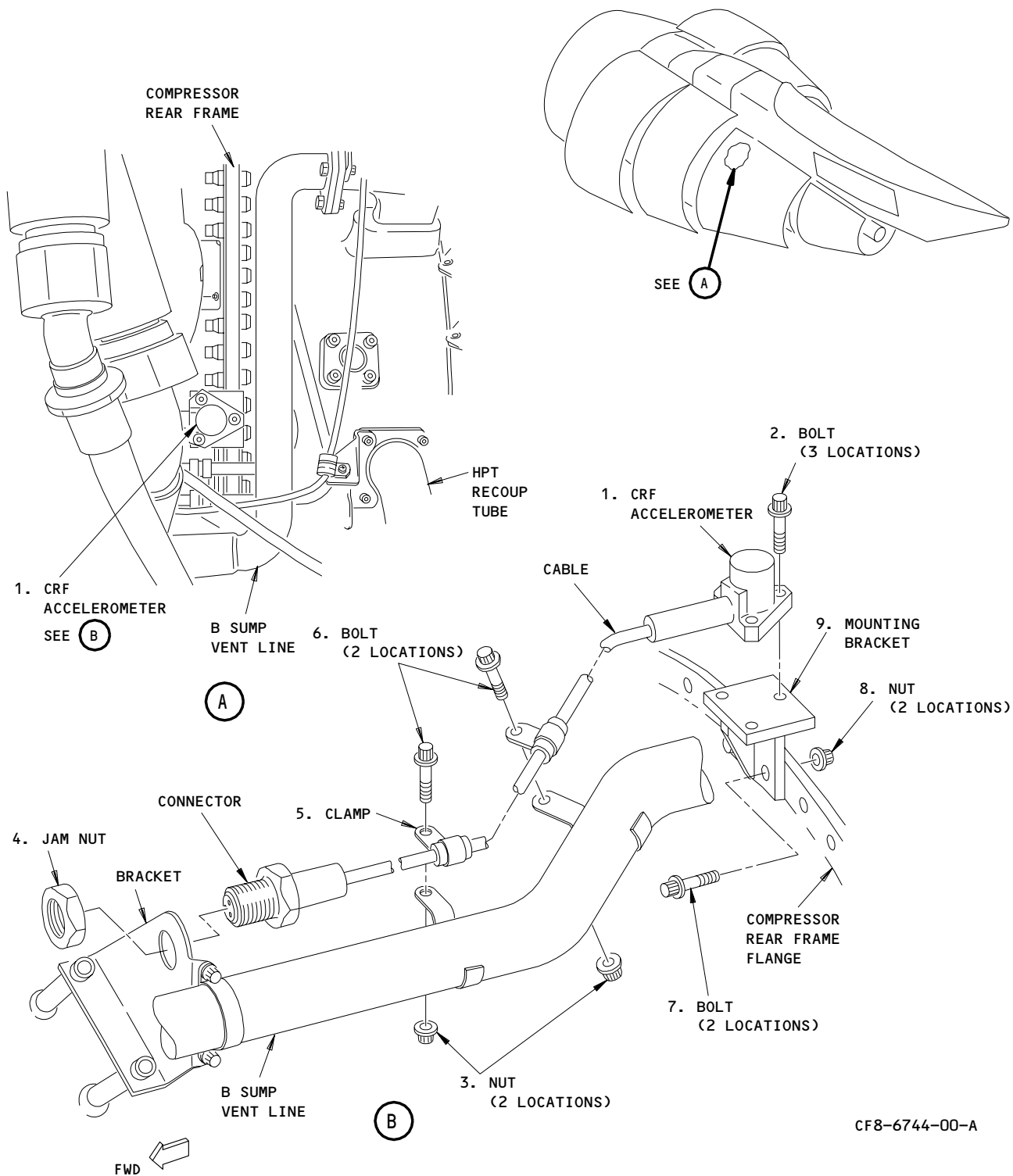
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Compressor Rear Frame (CRF) Accelerometer Installation
Figure 401

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2) 6H27 VIB AMP ENG 3 & 4

S 014-018-J00

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

S 034-027-J00

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

S 034-019-J00

- (4) Disconnect the cable from the CRF accelerometer (1).

S 034-005-J00

- (5) Remove the jamnut (8) that attaches the connector to the bracket on the B-sump vent line.

S 034-006-J00

- (6) Remove the bolts (6), the nuts (3), and the loop clamps (5) that attach the cable to the B-sump vent line.

S 034-007-J00

- (7) Remove the bolts (2) that attach the accelerometer (1) to the mounting bracket (9) on the compressor stator rear flange.

S 024-008-J00

- (8) Remove the accelerometer (1) from the mounting bracket (9) on the compressor rear flange.

S 034-029-J00

- (9) Remove the nuts (8), bolts (7), and mounting bracket (9) from the compressor rear frame flange.

TASK 77-31-02-404-009-J00

3. CRF Accelerometer and Nounting Bracket Installation (Fig. 401)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	CRF Accelerometer	77-31-01	05	50
	2	Bolt			40
	3	Nut			30
	4	Jam Nut			8
	5	Clamp			3
	6	Bolt			25
	7	Bolt	TBD		
	8	Nut	TBD		
	9	Mounting Bracket	TBD		

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B. References

- (1) 77-31-00/501, AVM System
- (2) 78-31-00/201, Thrust Reverser System
- (3) IPC 77-31-02 Fig. 1

C. Access

(1) Location Zone

- 412 Engine 1 - Compressor Stator Rear Flange 10:30 o'clock
- 422 Engine 2 - Compressor Stator Rear Flange 10:30 o'clock
- 432 Engine 3 - Compressor Stator Rear Flange 10:30 o'clock
- 442 Engine 4 - Compressor Stator Rear Flange 10:30 o'clock

(2) Access Panel

- 415 Left Thrust Reverser Half - Engine 1
- 417 Left Core Cowl Panel - Engine 1
- 425 Left Thrust Reverser Half - Engine 2
- 417 Left Core Cowl Panel - Engine 2
- 435 Left Thrust Reverser Half - Engine 3
- 417 Left Core Cowl Panel - Engine 3
- 445 Left Thrust Reverser Half - Engine 4
- 417 Left Core Cowl Panel - Engine 4

D. Procedure

S 424-030-J00

- (1) Install the mounting bracket (9):
 - (a) Put the mounting bracket (9) in position on the compressor rear frame flange.
 - (b) Install the bolts (7), and the nuts (8) that attach the mounting bracket (9) to the compressor rear frame flange.
 - (c) Tighten the bolts (7) and nuts (8) to 190-230 pound-inches (21.5-26.0N.m).

S 424-020-J00

- (2) Install the CRF accelerometer (1):
 - (a) Put the CRF accelerometer (1) in its position on the bracket on the compressor stator rear flange.
 - (b) Install the bolts (2) that attach the CRF accelerometer (1) to the bracket.
 - (c) Tighten the bolts (2) to 55-70 pound-inches (6.2-7.9 N.m).

S 434-011-J00

- (3) Install the jamnut (4) that attaches the connector to the bracket on the B-sump vent line.

S 434-021-J00

- (4) Tighten the nut (4) to 100-130 pound-inches (11.3-14.7 N.m).

S 434-022-J00

- (5) Lockwire the jamnut (4).

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- S 434-012-J00
- (6) Install the bolts (6), the nuts (3) and the clamps (5) that attach the cable to the B-sump vent line.
- S 434-023-J00
- (7) Tighten the bolts (6) to 24-27 pound-inches (2.7-3.1 N.m).
- S 434-024-J00
- (8) Connect the CRF accelerometer (1) harness to the connector.
- S 414-028-J00
- (9) Close the left core cowl panel (AMM 71-11-06/201).
- S 414-025-J00
- (10) Close the left thrust reverser half (AMM 78-31-00/201).
- S 864-017-J00
- (11) For the applicable engine,
Close these circuit breakers and remove DO-NOT-CLOSE tags:
- (a) P6 Main Power Distribution Panel
- 1) 6H26 VIB AMP ENG 1 & 2
- 2) 6H27 VIB AMP ENG 3 & 4
- S 714-016-J00
- (12) Do the operational test for the AVM system (AMM 77-31-00/501).

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COMPRESSOR REAR FRAME (CRF) ACCELEROMETER AND MOUNTING BRACKET -
INSPECTION/CHECK

1. General

- A. This procedure contains the data to do a visual examination of the compressor rear frame (CRF) accelerometer (also known as the engine core accelerometer) and mounting bracket.
- B. The CRF accelerometer and mounting bracket are located on the compressor stator rear flange at the 10:30 o'clock position.
- C. In the procedure, the compressor rear frame (CRF) accelerometer (or the engine core accelerometer) will be referred to as the accelerometer.

TASK 77-31-02-206-001-J00

2. CRF Accelerometer and Mounting Bracket Inspection

- A. Equipment
 - (1) Brush, stiff-bristle
- B. Consumable Materials
 - (1) B00074 Solvent - Stoddard, P-D-680
- C. References
 - (1) AMM 71-11-06/201, Core Cowl Panels
 - (2) AMM 78-31-00/201, Thrust Reversers
- D. Access
 - (1) Location Zone
 - 412 Engine 1 - Compressor Stator Rear Flange 10:30 o'clock
 - 422 Engine 2 - Compressor Stator Rear Flange 10:30 o'clock
 - 432 Engine 3 - Compressor Stator Rear Flange 10:30 o'clock
 - 442 Engine 4 - Compressor Stator Rear Flange 10:30 o'clock
 - (2) Access Panel
 - 415 Left Thrust Reverser Half - Engine 1
 - 417 Left Core Cowl Panel - Engine 1
 - 425 Left Thrust Reverser Half - Engine 2
 - 417 Left Core Cowl Panel - Engine 2
 - 435 Left Thrust Reverser Half - Engine 3
 - 417 Left Core Cowl Panel - Engine 3
 - 445 Left Thrust Reverser Half - Engine 4
 - 417 Left Core Cowl Panel - Engine 4
- E. Procedure

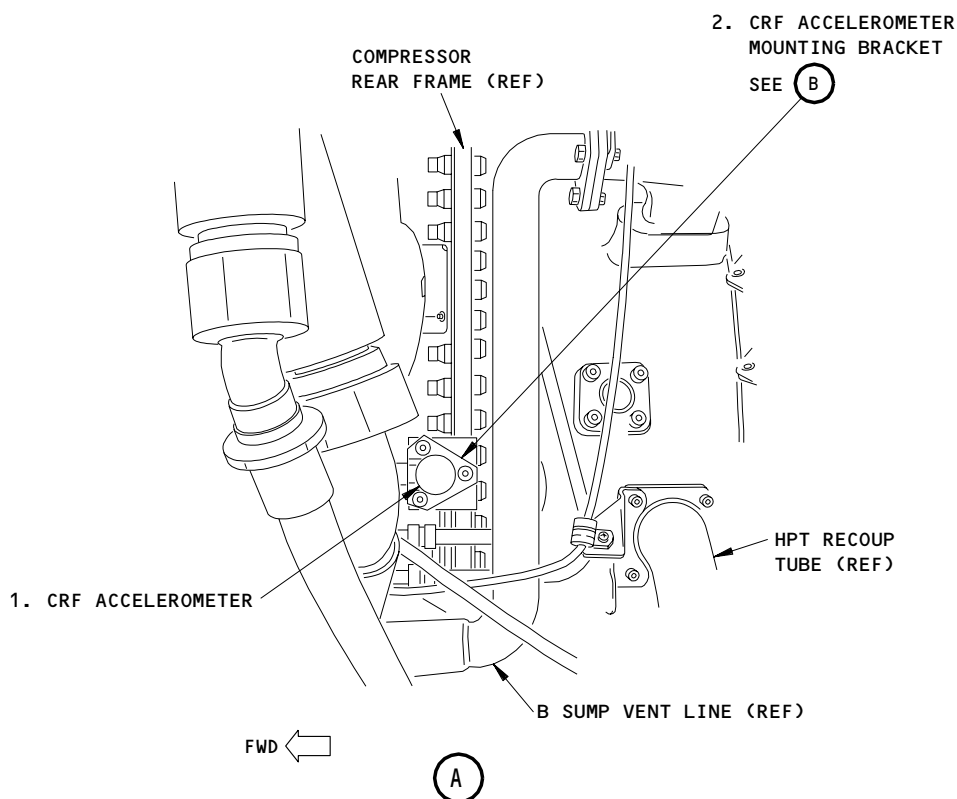
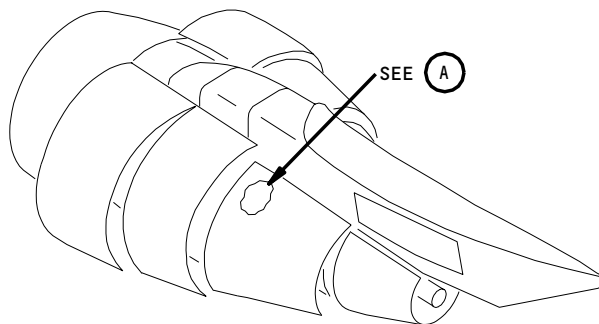
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Compressor Rear Frame (CRF) Accelerometer and Mounting Bracket Inspection
Figure 601 (Sheet 1)

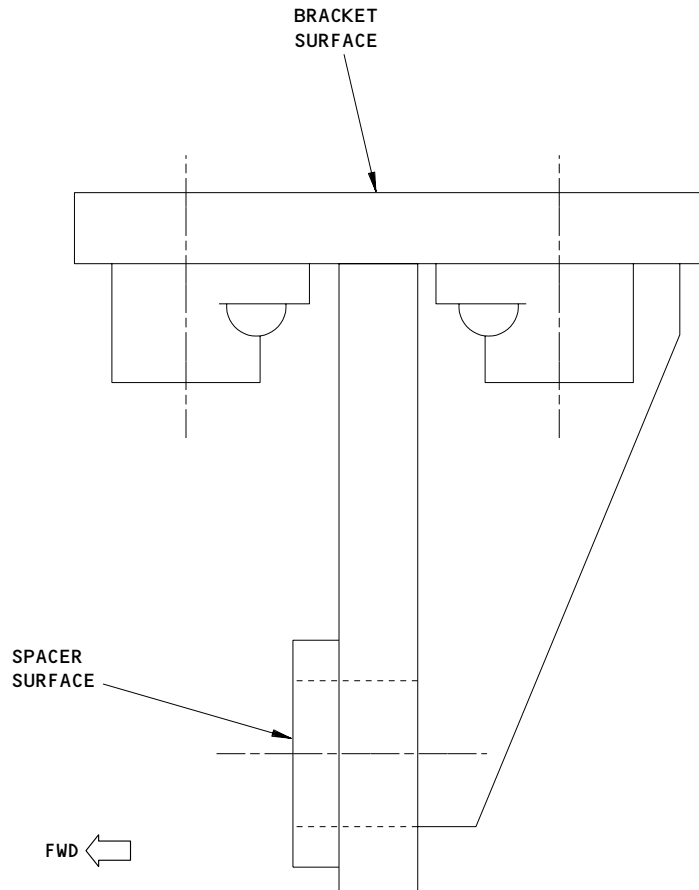
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(B)

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Compressor Rear Frame (CRF) Accelerometer and Mounting Bracket Inspection
Figure 601 (Sheet 2)

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S 016-002-J00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO OPEN THE THRUST REVERSER. IF YOU DO NOT FOLLOW THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

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

S 016-003-J00

- (2) Open the left core cowl panel (AMM 71-11-06/201).

S 116-004-J00

WARNING: DO NOT GET THE SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THIS SOLVENT. PUT ON A PROTECTIVE SPLASH GOGGLE AND GLOVES WHEN YOU USE THIS SOLVENT. KEEP THIS SOLVENT AWAY FROM SPARKS, FLAME AND HEAT. THIS SOLVENT IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

- (3) Clean the accelerometer (1) (on the compressor rear case) with the solvent.

S 216-005-J00

- (4) Examine the accelerometer and mounting bracket (2) for the conditions that follow:

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Examine For	Maximum Serviceable Limits	Corrective Action
(1) The Accelerometer Body:		
(a) Cracks, dents, and deformation in body	Surface scratches to a depth of 0.04 inch (1 mm)	Replace the accelerometer.
(b) Cracks around the mount holes	Not serviceable	Replace the accelerometer.
(2) The Connector		
(a) Cracks	Not serviceable	Replace the accelerometer.
(b) Cross-thread damage	Not serviceable	Replace the accelerometer.
(c) Nicked threads	Any amount not more than the complete depth of the thread	Repair the threads or replace the accelerometer.
(d) Bent pins	Not serviceable	Replace the accelerometer.
(e) Dirt in the connector	Not serviceable	Clean with a soft bristle brush and solvent
(3) The Mounting Bracket		
(a) Nicks, dents, and scratches on bracket surfaces	Not serviceable	Remove high metal with stone.
(b) Nicks, dents, and scratches on spacer surfaces	Less than 25% of total spacer surface area or less than 25% of total thickness between spacer ID or OD	Remove high metal with stone.
	More than 25% of total spacer surface area or more than 25% of total thickness between spacer ID or OD	Relace the mounting bracket (AMM 77-31-02/401).

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S 416-006-J00

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

S 416-007-J00

WARNING: DO THE PROCEDURE IN AMM 78-31-00/201 TO CLOSE THE THRUST REVERSER. IF YOU DO NOT FOLLOW THIS PROCEDURE, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

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

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AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER - REMOVAL/INSTALLATION

1. General

- A. This section contains two tasks. One task is for the removal of the airborne vibration monitor (AVM) signal conditioner. The other task is for the installation of the signal conditioner.
- B. There are two AVM signal conditioners. One AVM signal conditioner is located on the E1-1 shelf of the electrical and electronics rack. The other AVM signal conditioner is located on the E2-1 shelf. The AVM signal conditioners are identified as follows:

<u>Engine Number</u>	<u>Equipment Number</u>	<u>Location</u>
1 and 2	M118	E1-1
3 and 4	M7846	E2-1

TASK 77-31-03-004-001-J00

2. AVM Signal Conditioner Removal (Fig. 401)

- A. References
 - (1) 20-11-22/401, Rack-Mounted Electrical/Electronic Module
 - (2) IPC 77-31-52 Fig. 1
- B. Access
 - (1) Location Zone
 - 117 Electrical & Electronic Compartment, LH
 - 118 Electrical & Electronic Compartment, RH
- C. Procedure
 - S 864-002-J00
 - (1) For the applicable engine,
Open these circuit breakers and attach DO-NOT-CLOSE tags:
 - (a) P6 Main Power Distribution Panel
 - 1) 6H26 VIB AMP 1 & 2
 - 2) 6H27 VIB AMP 3 & 4

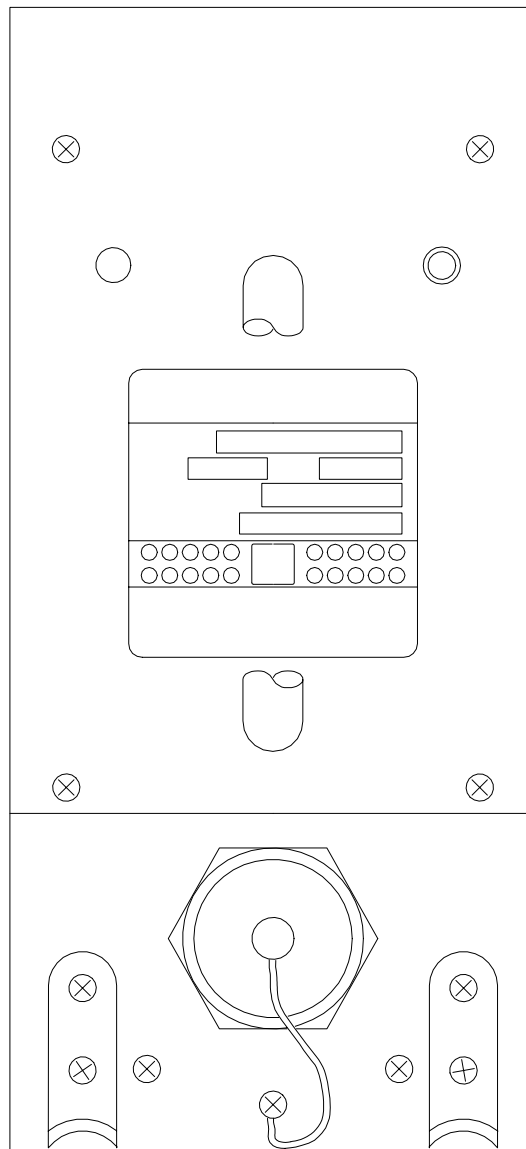
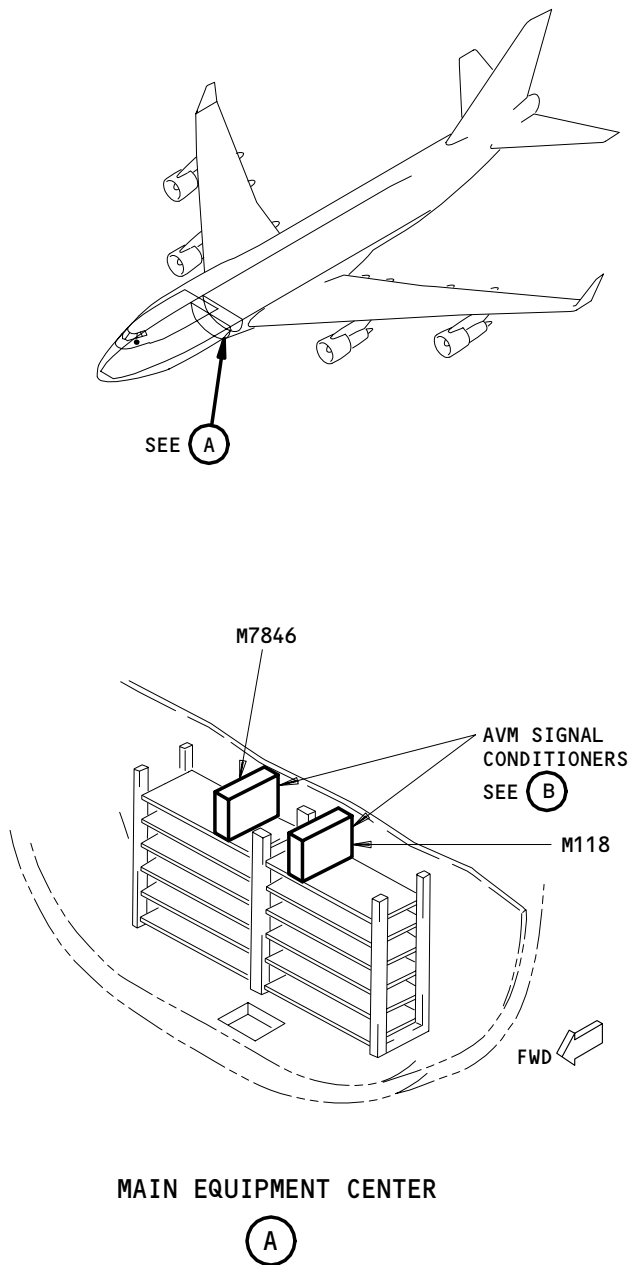
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ENDEVCO SIGNAL CONDITIONER

AVM System Components
Figure 401

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S 024-006-J00

CAUTION: DO NOT TOUCH THE CONNECTOR PINS OR OTHER CONDUCTORS ON THE AVM SIGNAL CONDITIONERS. IF YOU TOUCH THESE CONDUCTORS, ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE AVM SIGNAL CONDITIONER.

(2) Remove the applicable AVM signal conditioner (Ref 20-11-22/401).

S 434-003-J00

(3) Install dust caps on the electrical connectors.

TASK 77-31-03-404-004-J00

3. Install AVM Signal Conditioner (Fig. 401)

A. References

- (1) 20-11-22/401, Rack-Mounted Electrical/Electronic Module
- (2) 77-31-00/501, Airborne Vibration Monitoring (AVM) System
- (3) IPC 77-31-52 Fig. 1

B. Access

(1) Location Zone

- 117 Electrical & Electronic Compartment, LH
- 118 Electrical & Electronic Compartment, RH

C. Procedure

S 034-005-J00

CAUTION: DO NOT TOUCH THE CONNECTOR PINS OR OTHER CONDUCTORS ON THE AVM SIGNAL CONDITIONER. IF YOU TOUCH THESE CONDUCTORS, ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE AVM SIGNAL CONDITIONER.

(1) Remove the dust caps from the electrical connectors.

S 424-005-J00

(2) Install the AVM signal conditioner (Ref 20-11-22/401).

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S 864-007-J00

- (3) For the applicable engine,
Close these circuit breakers and remove the DO-NOT-CLOSE tags:
- (a) P6 Main Power Distribution Panel
- 1) 6H26 VIB AMP 1 & 2
 - 2) 6H27 VIB AMP 3 & 4
 - 3) Do the Operational Test for the AVM signal conditioner
(AMM 77-31-00/501).

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ENGINE-MOUNTED SENSORS – DESCRIPTION AND OPERATION

1. General

- A. The engine-mounted sensors covered by this chapter are as follows: PS14, P49, T3 and T5. Each of these sensors sends their signals to the ECU unit on each engine (AMM 73-21-00/001). Power for these units is supplied by the control alternator through the ECU.

2. Engine-Mounted Sensors

- A. On each engine, the parameters that follow are measured by the given system sensors (reference for location of sensor):
- (1) Compressor Inlet Temperature (CIT) (Pressure Probe (P25)) Sensor (AMM 73-21-02/401).
 - (2) Compressor discharge temperature, T3, Fig. 1 (AMM 77-34-04/201).
 - (3) Fan discharge static pressure, PS14, Fig. 2 (AMM 77-34-01/201).
 - (4) Low pressure turbine inlet pressure, P49, Fig. 3 (AMM 77-34-03/201).
 - (5) Low pressure turbine discharge temperature, T5, Fig. 4 (AMM 77-34-07/201).

3. Operation

- A. The engine-mounted sensors sends their values to the ECU. These values are converted with the multiplexer to digital format and then multiplexed. The ECUs then sends the engine-mounted sensor signals to the EIUs over ARINC 429 serial digital data link.

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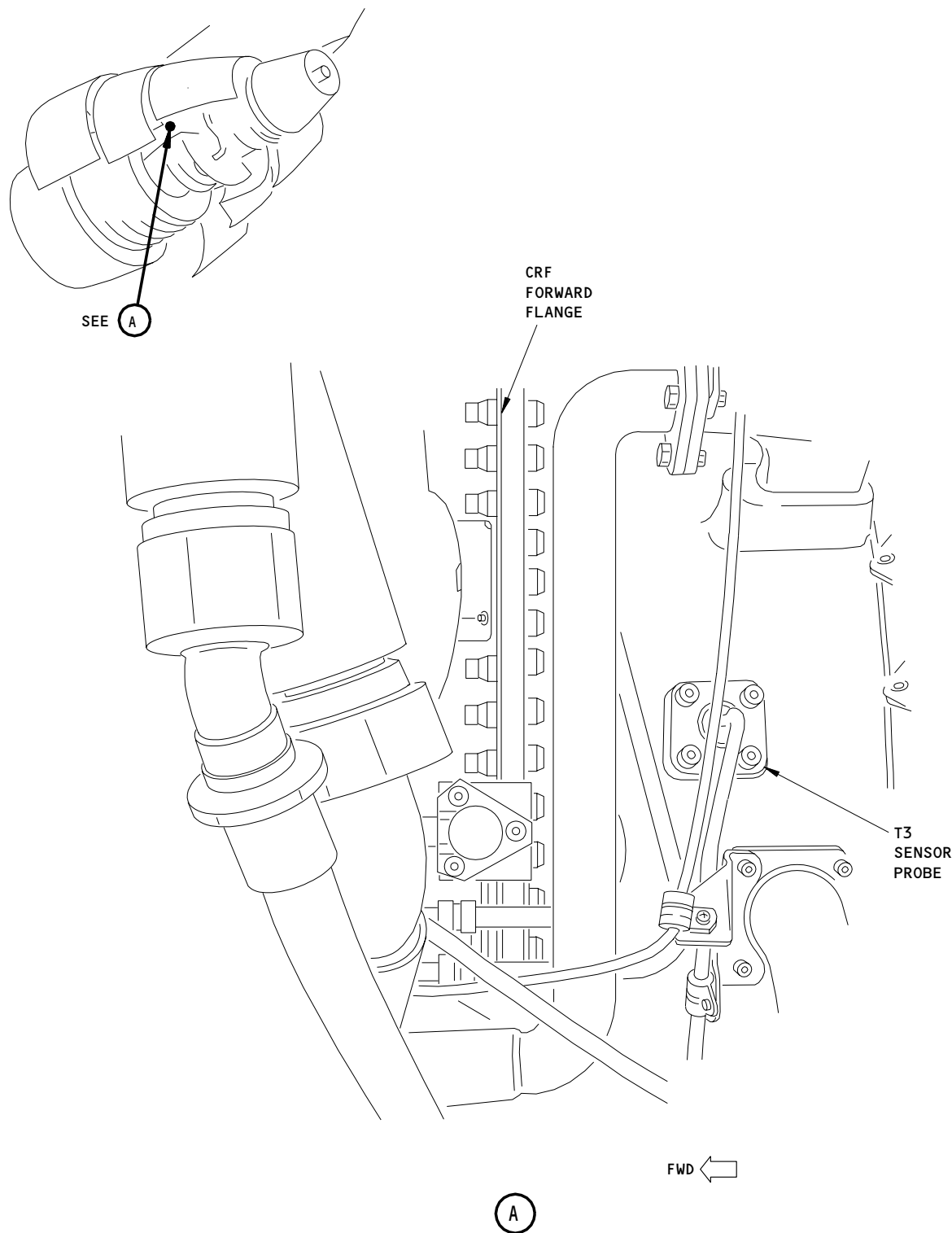
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T3 Temperature Sensor
Figure 1

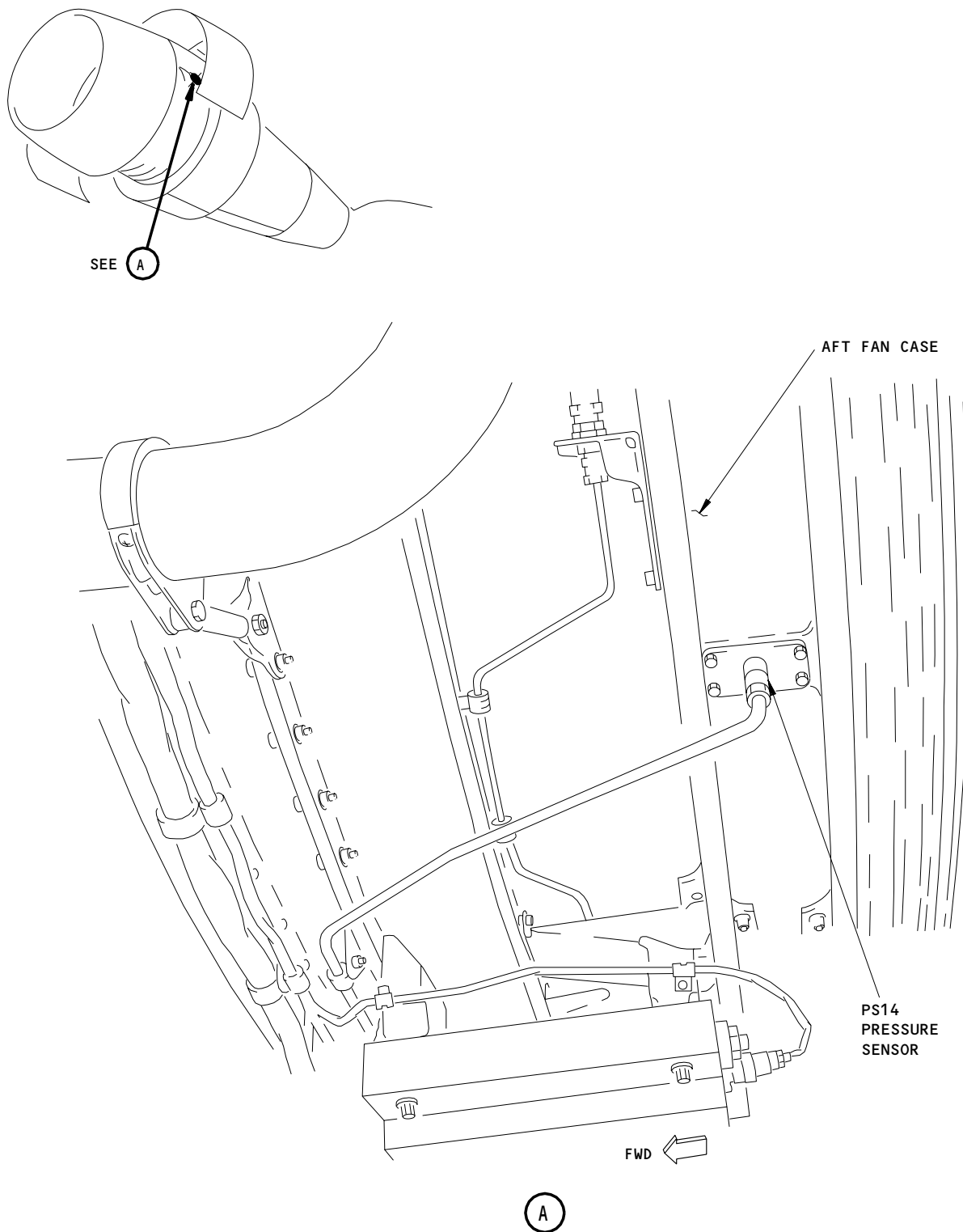
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PS14 Pressure Sensor
Figure 2

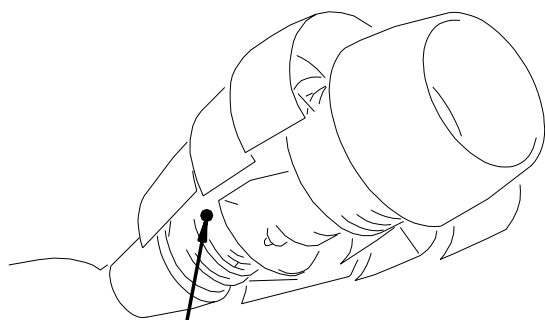
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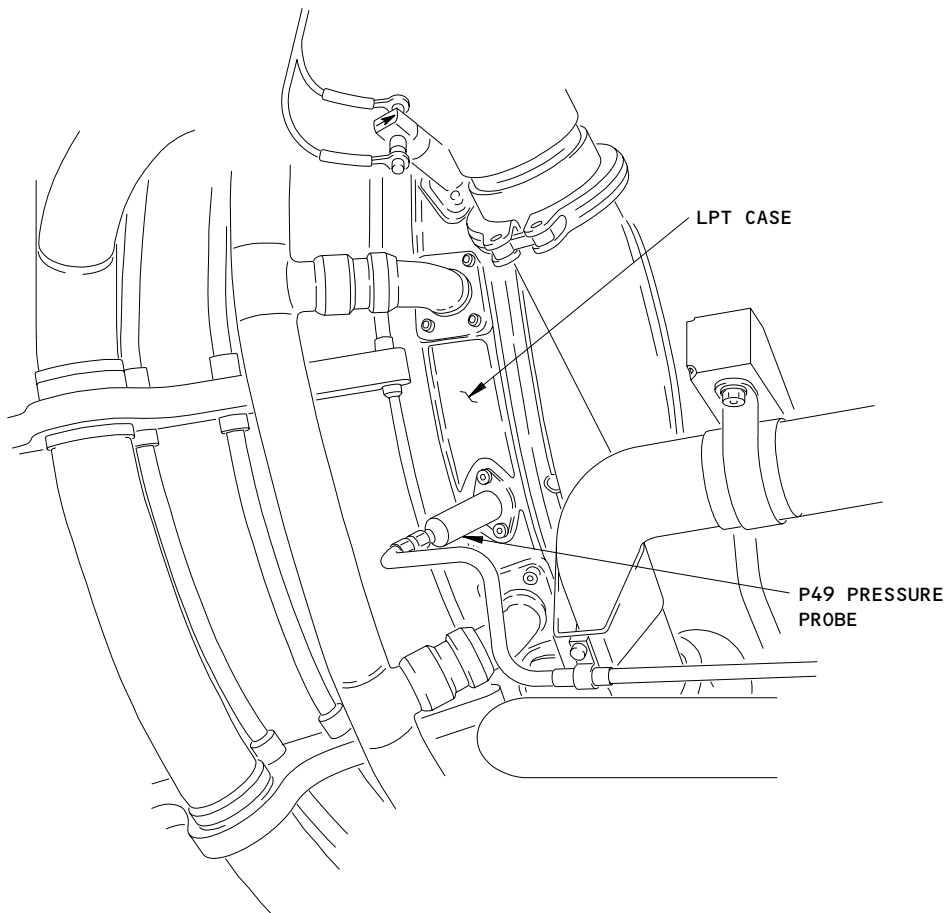
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SEE (A)



(A)

P49 Pressure Probe
Figure 3

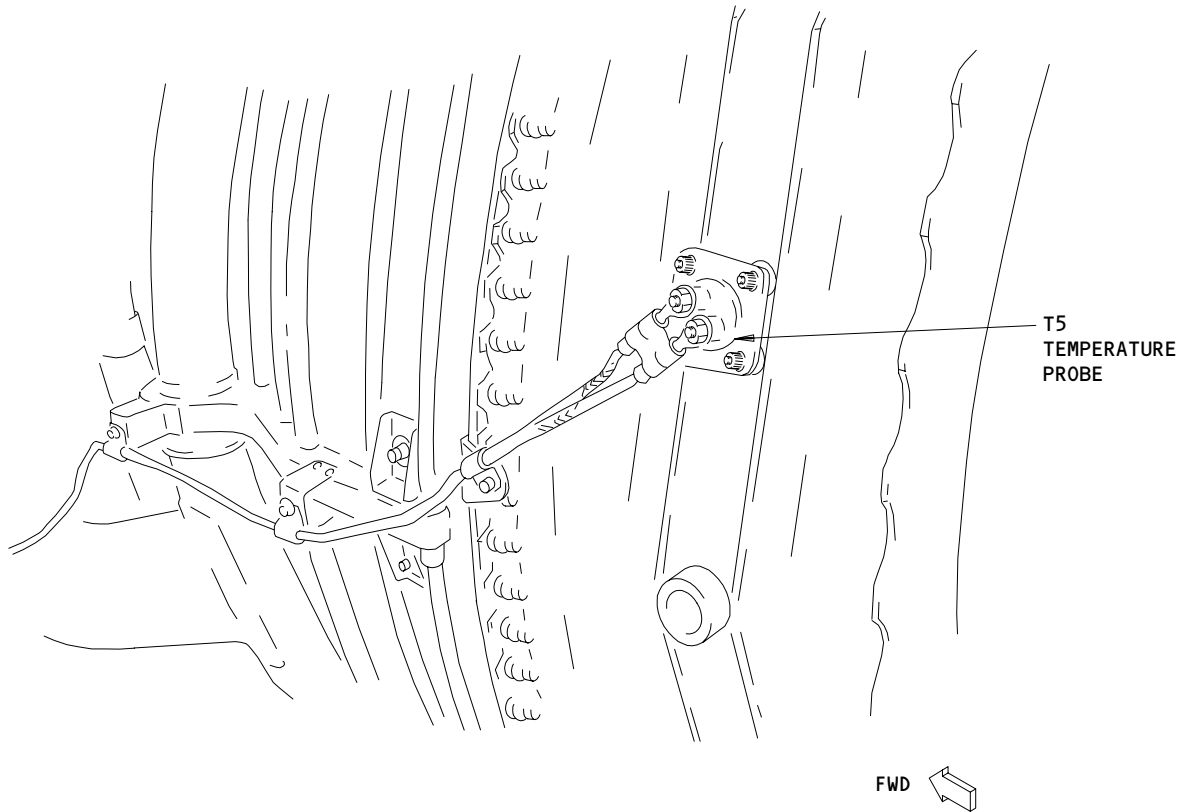
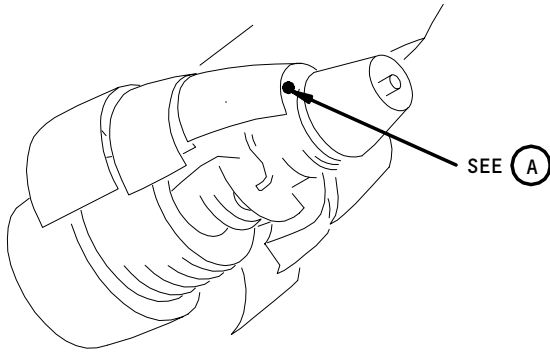
EFFECTIVITY

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(A)

T5 Temperature Probe
Figure 4

EFFECTIVITY	
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PS14 PRESSURE SENSOR - MAINTENANCE PRACTICES

1. General

- A. This section contains three tasks. One task is for the removal of the PS14 pressure sensor. The second task is for the installation of the sensor. The third task is for a visual check of the sensor.
- B. The PS14 sensor is installed on the aft fan case at the 10:30 o'clock position.
- C. You must open the left fan cowl panel to get access to the PS14 sensor.

TASK 77-34-01-002-001-J00

2. PS14 Pressure Sensor Removal (Fig. 201)

A. References

- (1) 71-11-04/201, Fan Cowl Panels

B. Access

(1) Location Zone

- 412 Engine 1 - Aft Fan Case 10:30 o'clock
- 422 Engine 2 - Aft Fan Case 10:30 o'clock
- 432 Engine 3 - Aft Fan Case 10:30 o'clock
- 442 Engine 4 - Aft Fan Case 10:30 o'clock

(2) Access Panel

- 413 Left Fan Cowl Panel - Engine 1
- 423 Left Fan Cowl Panel - Engine 2
- 433 Left Fan Cowl Panel - Engine 3
- 443 Left Fan Cowl Panel - Engine 4

C. Procedure

S 012-002-J00

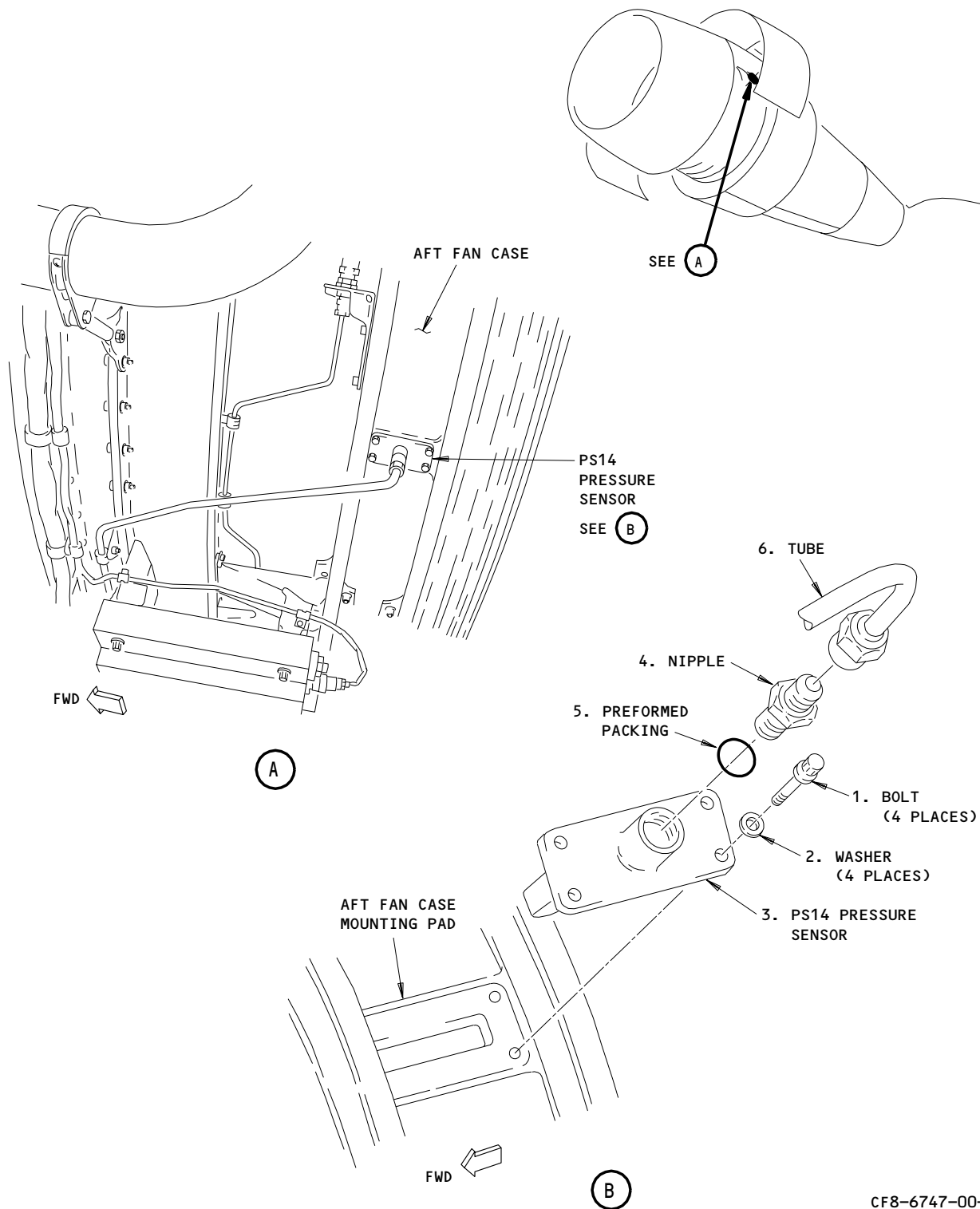
- (1) Open the left fan cowl panel (Ref 71-11-04/201).

S 032-003-J00

- (2) Disconnect the tube (6) from the sensor nipple (4).

S 032-020-J00

- (3) Put a cap on the tube (6).



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PS14 Pressure Sensor
Figure 201

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S 022-018-J00

- (4) Remove the sensor (3):
 - (a) Remove the bolt (1) and washer (2) (4 locations) that attach the sensor (3) to the aft fan case.
 - (b) Carefully remove the sensor (3).

S 032-006-J00

- (5) Remove the nipple (4) and the packing (5) from the sensor (3).

S 032-019-J00

- (6) Put a cap on the port in the sensor (3).

TASK 77-34-01-402-007-J00

3. PS14 Pressure Sensor Installation (Fig. 201)

A. Consumable Materials

- (1) D00096 Oil - MIL-L-6081, Grade 1005

B. References

- (1) 71-11-04/201, Fan Cowl Panels

C. Access

(1) Location Zone

- | | |
|-----|---------------------------------------|
| 412 | Engine 1 - Aft Fan Case 10:30 o'clock |
| 422 | Engine 2 - Aft Fan Case 10:30 o'clock |
| 432 | Engine 3 - Aft Fan Case 10:30 o'clock |
| 442 | Engine 4 - Aft Fan Case 10:30 o'clock |

(2) Access Panel

- | | |
|-----|--------------------------------|
| 413 | Left Fan Cowl Panel - Engine 1 |
| 423 | Left Fan Cowl Panel - Engine 2 |
| 433 | Left Fan Cowl Panel - Engine 3 |
| 443 | Left Fan Cowl Panel - Engine 4 |

D. Procedure

S 432-023-J00

- (1) Install the nipple (4) on the sensor (3):
 - (a) Put engine oil on a new packing (5).
 - (b) Install the packing (5) on the nipple (4).
 - (c) Remove the cap from the sensor (3).
 - (d) Install the nipple (4) on the sensor (3).
 - (e) Tighten the nipple (4) to 180-200 pound-inches (20.3-22.6 N.m).

S 422-021-J00

- (2) Install the sensor (3):
- (a) Carefully put the sensor (3) in its position in the recess and on the mounting pad.
 - (b) Install the bolts (1) and the washers (2) that attach the sensor (3) to the pad.
 - (c) Tighten the bolts (1) to 55-70 pound-inches (6.2-7.9 N.m).
 - (d) Install lockwire to the bolts (1).

S 432-022-J00

- (3) Remove the cap from the tube (6).

S 432-012-J00

- (4) Install the tube (6) from the ECU to the nipple (4) on the sensor (3).

S 432-024-J00

- (5) Tighten the coupling nut to 270-300 pound-inches (30.5-33.9 N.m).

S 412-017-J00

- (6) Close the left fan cowl panel (Ref 71-11-04/201).

TASK 77-34-01-202-013-J00

4. PS14 Pressure Sensor Visual Check

A. References

- (1) 71-11-04/201, Fan Cowl Panels

B. Access

(1) Location Zone

- 412 Engine 1 - Aft Fan Case 10:30 o'clock
- 422 Engine 2 - Aft Fan Case 10:30 o'clock
- 432 Engine 3 - Aft Fan Case 10:30 o'clock
- 442 Engine 4 - Aft Fan Case 10:30 o'clock

(2) Access Panel

- 413 Left Fan Cowl Panel - Engine 1
- 423 Left Fan Cowl Panel - Engine 2
- 433 Left Fan Cowl Panel - Engine 3
- 443 Left Fan Cowl Panel - Engine 4

C. Procedure

S 012-014-J00

- (1) Open the left fan cowl panel (Ref 71-11-04/201).

S 212-015-J00

- (2) Do a visual check of the PS14 pressure sensor.

NOTE: Use the table below to do the check.

TABLE 201		
Visually Check	Maxium Serviceable Limits	Remarks
(a) Mounting Flanges for:		
1) Cracks	Not serviceable	Replace sensor
2) Dents	Any amount, provided probe still seats properly	Replace sensor
(b) Housing for:		
1) Cracks	Not serviceable	Replace sensor
2) Dents	Not serviceable	Replace sensor
(c) Orifices for:		
1) Clogged passages	Not serviceable	Clean
2) Deformation	None visually observable	Replace sensor

S 412-016-J00

- (3) Close the left fan cowl panel (Ref 71-11-04/201).

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P49 PRESSURE PROBE - MAINTENANCE PRACTICES

1. General

- A. This section contains three tasks. The first task is for the removal of the P49 pressure probe. The second task is for the installation of the probe. The third task is a visual check of the probe.
- B. The P49 probe is installed on the forward LPT case at the 3:00 o'clock position.
- C. To get access to the P49 probe, you must open the right core cowl panel.

TASK 77-34-03-002-001-J00

2. P49 Pressure Probe Removal (Fig. 201)

A. References

- (1) 71-11-06/201, Core Cowl Panels
- (2) IPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Case, 3:00 o'clock position
- 422 Engine 2 - Low Pressure Turbine Case, 3:00 o'clock position
- 432 Engine 3 - Low Pressure Turbine Case, 3:00 o'clock position
- 442 Engine 4 - Low Pressure Turbine Case, 3:00 o'clock position

(2) Access Panel

- 418 Right Core Cowl Panel - Engine 1
- 428 Right Core Cowl Panel - Engine 2
- 438 Right Core Cowl Panel - Engine 3
- 448 Right Core Cowl Panel - Engine 4

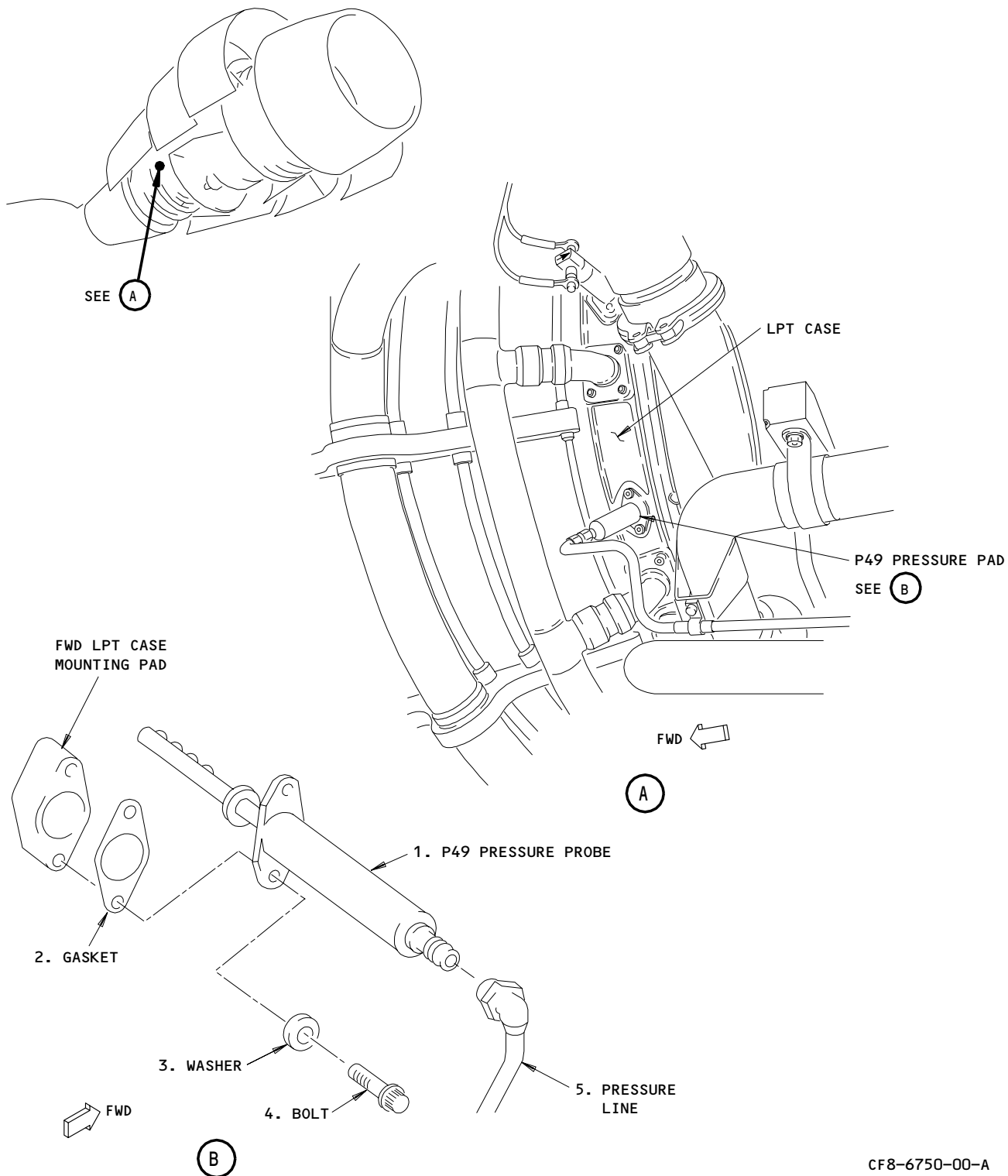
C. Procedure

S 012-002-J00

- (1) Open the right core cowl panel (Ref 71-11-06/201).

S 032-003-J00

- (2) Disconnect the pressure line (5) from the probe (1).



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P49 Pressure Probe
Figure 201

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S 032-022-J00
(3) Put a cap on the probe (1) and the pressure line (5).

S 032-004-J00
(4) Remove the bolts (4) and the washers (3) that attach the probe (1) to the LPT stator case.

S 022-021-J00
(5) Carefully remove the probe (1).

S 032-006-J00
(6) Remove and discard the gasket (2).

- TASK 77-34-03-402-010-J00
3. P49 Pressure Probe Installation (Fig. 201)
A. Consumable Materials
 (1) D01062 Never-Seez, Pure Nickel Special
B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	P49 Pressure Probe	77-34-03	01	140
	2	Gasket			90
	3	Washer			40
	4	Bolt			30
	5	Pressure Line			200

- C. References
 (1) 71-11-06/201, Core Cowl Panels
 (2) IPC 77-21-01 Fig. 1
D. Access
 (1) Location Zone
 412 Engine 1 - Low Pressure Turbine Case, 3:00 o'clock position
 422 Engine 2 - Low Pressure Turbine Case, 3:00 o'clock position
 432 Engine 3 - Low Pressure Turbine Case, 3:00 o'clock position
 442 Engine 4 - Low Pressure Turbine Case, 3:00 o'clock position

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(2) Access Panel

- 418 Right Core Cowl Panel - Engine 1
- 428 Right Core Cowl Panel - Engine 2
- 438 Right Core Cowl Panel - Engine 3
- 448 Right Core Cowl Panel - Engine 4

E. Procedure

S 422-018-J00

(1) Install the probe (1):

- (a) Put the gasket (2) in its position on the LPT case.
- (b) Carefully put the probe (1) in its position on the engine.

NOTE: Make sure the holes in the probe are forward.

- (c) Put lubricant on the threads of the bolt (4).
- (d) Install the bolts (4) and the washers (3) that attach the probe (1) to the LPT case.
- (e) Tighten the bolts (4) to 55-70 pound-inches (6.2-7.9 N.m).
- (f) Install lockwire to the bolts (4).

S 432-016-J00

(2) Remove the caps from the pressure line (5) and the probe (1).

S 432-019-J00

(3) Connect the tube nut from the pressure line (5) to the probe (1).

S 432-020-J00

(4) Tighten the tube nut to 270-300 pound-inches (30.5-33.9 N.m).

S 412-017-J00

(5) Close the right core cowl panel (Ref 71-11-06/201).

TASK 77-34-03-202-007-J00

4. P49 Pressure Probe Visual Check

A. References

- (1) 71-11-06/201, Core Cowl Panels
- (2) IPC 77-21-01 Fig. 1

B. Access

(1) Location Zone

- 412 Engine 1 - Low Pressure Turbine Case, 3:00 o'clock position
- 422 Engine 2 - Low Pressure Turbine Case, 3:00 o'clock position
- 432 Engine 3 - Low Pressure Turbine Case, 3:00 o'clock position
- 442 Engine 4 - Low Pressure Turbine Case, 3:00 o'clock position

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(2) Access Panel

- 418 Right Core Cowl Panel - Engine 1
- 428 Right Core Cowl Panel - Engine 2
- 438 Right Core Cowl Panel - Engine 3
- 448 Right Core Cowl Panel - Engine 4

C. Procedure

S 012-008-J00

- (1) Open the right core cowl panel (Ref 71-11-06/201).

S 212-009-J00

- (2) Do a visual check of the P49 pressure probe.

NOTE: Use the table that follows to do the check of the probe.

TABLE 201		
Visually Check	Maxium Serviceable Limits	Remarks
(a) Mounting Flange for:		
1) Cracks	Not Serviceable	Replace probe
2) Dents	Any amount provided probe still seats properly	
(b) Housing for:		
1) Cracks	Not serviceable	Replace probe
2) Dents	Not serviceable	Replace probe
(c) Orifices for:		
1) Deformation	0.060 inch (1.52 mm) diameter	Replace probe
2) Clogged passages	Not serviceable	Clean

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- S 412-023-J00
(3) Close the right core cowl panel (AMM 71-11-06/201).

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T3 TEMPERATURE SENSOR - MAINTENANCE PRACTICES

1. General

- A. This procedure has three tasks. The first task is the removal of the T3 temperature sensor. The second task is the installation of the sensor. The third task is an inspection of the sensor.
- B. The sensor, the sensor line, and the sensor line connector are replaced as an assembly. You must be careful to prevent damage to the adjacent tubes.

TASK 77-34-04-002-001-J00

2. T3 Temperature Sensor Removal (Fig. 201)

A. References

- (1) 71-11-06/201, Core Cowl Panels
- (2) IPC 77-34-00 Fig. 5

B. Access

(1) Location Zone

- 412 Engine 1 - Compressor Rear Frame at 9 o'clock Position
- 422 Engine 2 - Compressor Rear Frame at 9 o'clock Position
- 432 Engine 3 - Compressor Rear Frame at 9 o'clock Position
- 442 Engine 4 - Compressor Rear Frame at 9 o'clock Position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

C. Procedure

S 012-002-J00

- (1) Open the left core cowl panel (Ref 71-11-06/201).

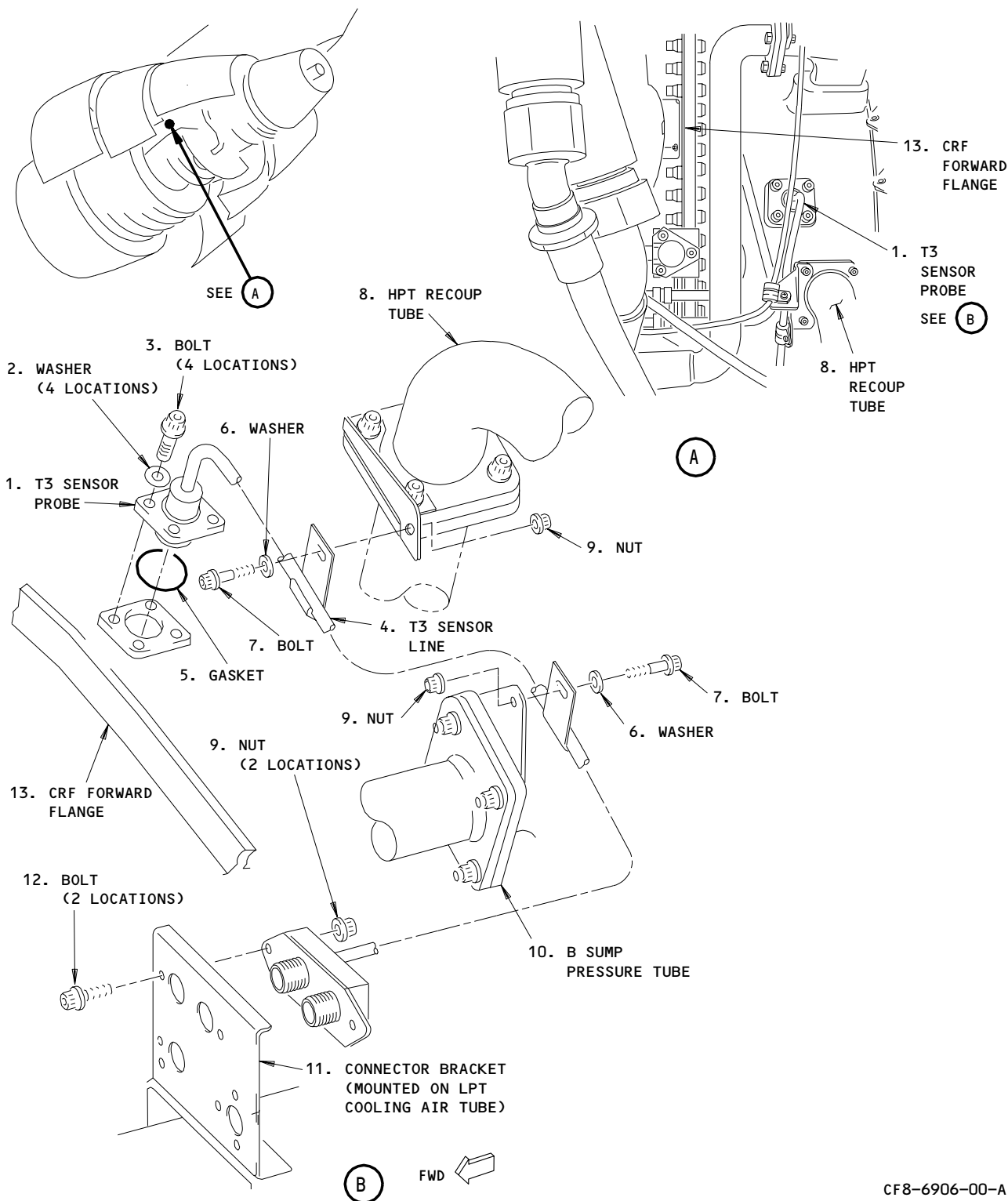
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T3 Temperature Sensor
Figure 201

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S 022-018-J00

- (2) Remove the sensor (1).
 - (a) Remove these parts that attach the sensor line to the bracket on the HPT recoup tube:
 - 1) the nut (9)
 - 2) the bolt (10)
 - 3) the washer (6).
 - (b) Remove these parts that attach the sensor line (4) to the bracket on the B-sump pressure tube:
 - 1) the nut (9)
 - 2) the bolt (7)
 - 3) the washer (6).
 - (c) Remove the nuts (9) and bolts (12) (2 locations) that attach the sensor line connector to the bracket (11) on the LPT cooling-air tube.
 - (d) Remove the bolts (3) and washers (2) (4 locations) that attach the sensor (1) to the mounting pad on the compressor rear frame (13).
 - (e) Carefully remove the sensor (1) from the recess in the compressor rear frame (13).
 - (f) Carefully remove the sensor assembly (1) from below the adjacent tubes.
 - (g) Discard the gasket (5).

TASK 77-34-04-402-007-J00

3. T3 Temperature Sensor Installation (Fig. 201)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	T3 Sensor Probe	77-34-00	5	
	2	Washer			50
	3	Bolt			40
	4	T3 Sensor Line			120
	5	Gasket			90
	6	Washer			50
	7	Bolt			10
	8	HPT Recoup Tube			
	9	Nut			80
	10	B Sump Pressure Line			
	11	Connector Bracket			
	12	Bolt			30
	13	CRF Forward Flange			

B. References

- (1) AMM 71-00-00/501, Power Plant

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(2) AMM 71-11-06/201, Core Cowl Panels

(3) AIPC 77-34-00 Fig. 5

C. Access

(1) Location Zone

- 412 Engine 1 - Compressor Rear Frame at 9 o'clock
Position
- 422 Engine 2 - Compressor Rear Frame at 9 o'clock
Position
- 432 Engine 3 - Compressor Rear Frame at 9 o'clock
Position
- 442 Engine 4 - Compressor Rear Frame at 9 o'clock
Position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

D. Procedure

S 422-020-J00

(1) Install the sensor (1).

- (a) Carefully put the sensor assembly (1) in its position between the compressor rear frame (13) and the adjacent tubes.
- (b) Install a new gasket (5) on the sensor (1).
- (c) Put the sensor (1) in the recess in the compressor rear frame (13).
- (d) Install the washers (2) and bolts (3) (4 locations) that attach the sensor to the compressor rear frame (13).

NOTE: Do not tighten the bolts.

- (e) Install the bolts (12) and nuts (9) (2 locations) that attach the sensor connector to the bracket on the LPT cooling-air tube.

NOTE: Do not tighten the bolts.

- (f) Install these parts that attach the sensor line (4) to the bracket on the B-sump pressure tube:
 - 1) the nut (9)

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- 2) the bolt (7)
- 3) the washer (6).
- (g) Tighten the bolt (7) to 24-27 pound-inches (2.7-3.1 Newton-meters).
- (h) Install these parts that attach the sensor line (4) to the bracket on the HPT recoup line (8):
 - 1) the nut (9)
 - 2) the bolt (10)
 - 3) the washer (6).
- (i) Tighten the bolt (10) to 24-27 pound-inches (2.7-3.1 Newton-meters).
- (j) Tighten the bolts (3) for the sensor (1) to 55-70 pound-inches (6.2-7.9 Newton-meters).
- (k) Tighten nuts (9) for the sensor connector to 24-27 pound-inches (2.7-3.1 Newton-meters).

S 412-014-J00

- (2) Close the left core cowl panel (Ref 71-11-06/201).

S 712-024-J00

- (3) Do this task: ECU Static Test (AMM 71-00-00/501, Test No. 11).

TASK 77-34-04-202-015-J00

4. T3 Temperature Sensor Inspection

A. References

- (1) 71-11-06/201, Core Cowl Panels

B. Access

(1) Location Zone

- 412 Engine 1 - Compressor Rear Frame at 9 o'clock Position
- 422 Engine 2 - Compressor Rear Frame at 9 o'clock Position
- 432 Engine 3 - Compressor Rear Frame at 9 o'clock Position
- 442 Engine 4 - Compressor Rear Frame at 9 o'clock Position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

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C. Procedure (Fig. 201)

S 012-016-J00

- (1) Open the left core cowl panel (Ref 71-11-06/201).

S 212-017-J00

- (2) Look for cracks around the bolt holes on the sensor mounting flange (1).
(a) Replace the sensor (1), if you find damage.

S 212-022-J00

- (3) Look for crossed threads or bent pins on the sensor connector.
(a) Replace the sensor, if you find damage.

S 412-023-J00

- (4) Close the left core cowl panel (Ref 71-11-06/201).

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T5 TEMPERATURE PROBE AND HARNESS - MAINTENANCE PRACTICES

1. General

- A. This procedure has these six tasks:
 - (1) Removal of the T5 temperature probe
 - (2) Installation of the T5 temperature probe
 - (3) A visual check of the T5 temperature probe
 - (4) A functional (thermal) check of the T5 temperature probe.
 - (5) Removal of the T5 temperature probe harness.
 - (6) Installation of the T5 temperature probe harness.
- B. You must remove the T5 temperature probe to do the functional check. Use a heat gun to apply heat to the probe. Look for an induced voltage on a millivoltmeter.
- C. The T5 temperature probe is installed in the turbine rear frame at the 9:30 o'clock position. Open the left core cowl panel to get access to the probe.
- D. The T5 temperature probe harness is installed from the turbine rear frame at the 9:30 o'clock position, along the LPT cooling air manifold, to the EGT junction box bracket on the LPT air tube.

TASK 77-34-07-002-001-J00

2. T5 Temperature Probe Removal (Fig. 201)

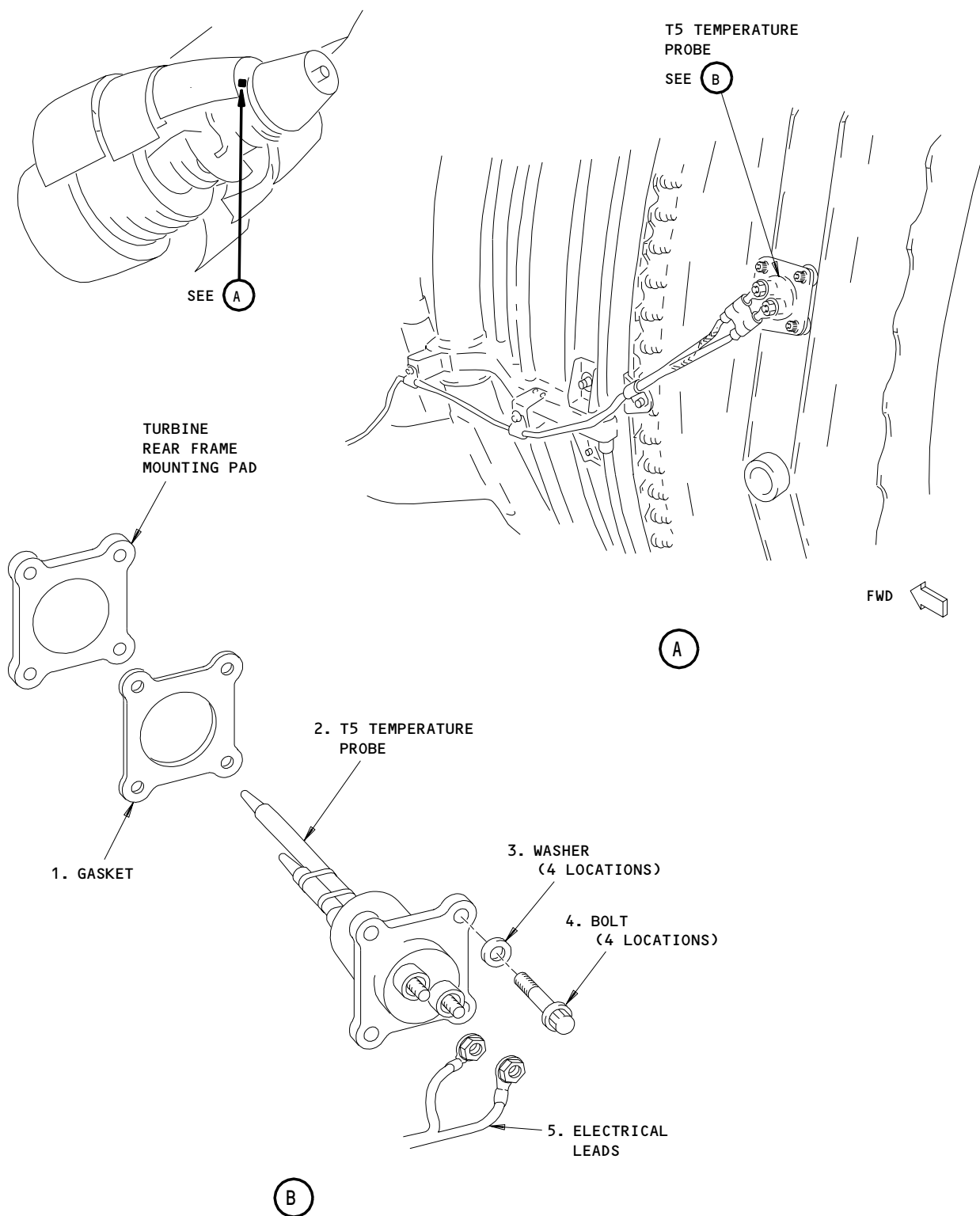
- A. References
 - (1) AMM 71-11-06/201, Core Cowl Panels
- B. Access
 - (1) Location Zone
 - 412 Engine 1 - Turbine Rear Frame at 9:30 o'clock position
 - 422 Engine 2 - Turbine Rear Frame at 9:30 o'clock position
 - 432 Engine 3 - Turbine Rear Frame at 9:30 o'clock position
 - 442 Engine 4 - Turbine Rear Frame at 9:30 o'clock position
 - (2) Access Panel
 - 417 Left Core Cowl Panel - Engine 1
 - 427 Left Core Cowl Panel - Engine 2
 - 437 Left Core Cowl Panel - Engine 3
 - 447 Left Core Cowl Panel - Engine 4
- C. Procedure
 - S 012-002-J00
 - (1) Open the left core cowl panel (AMM 71-11-06/201).
 - S 032-003-J00
 - (2) Disconnect the electrical leads (5).

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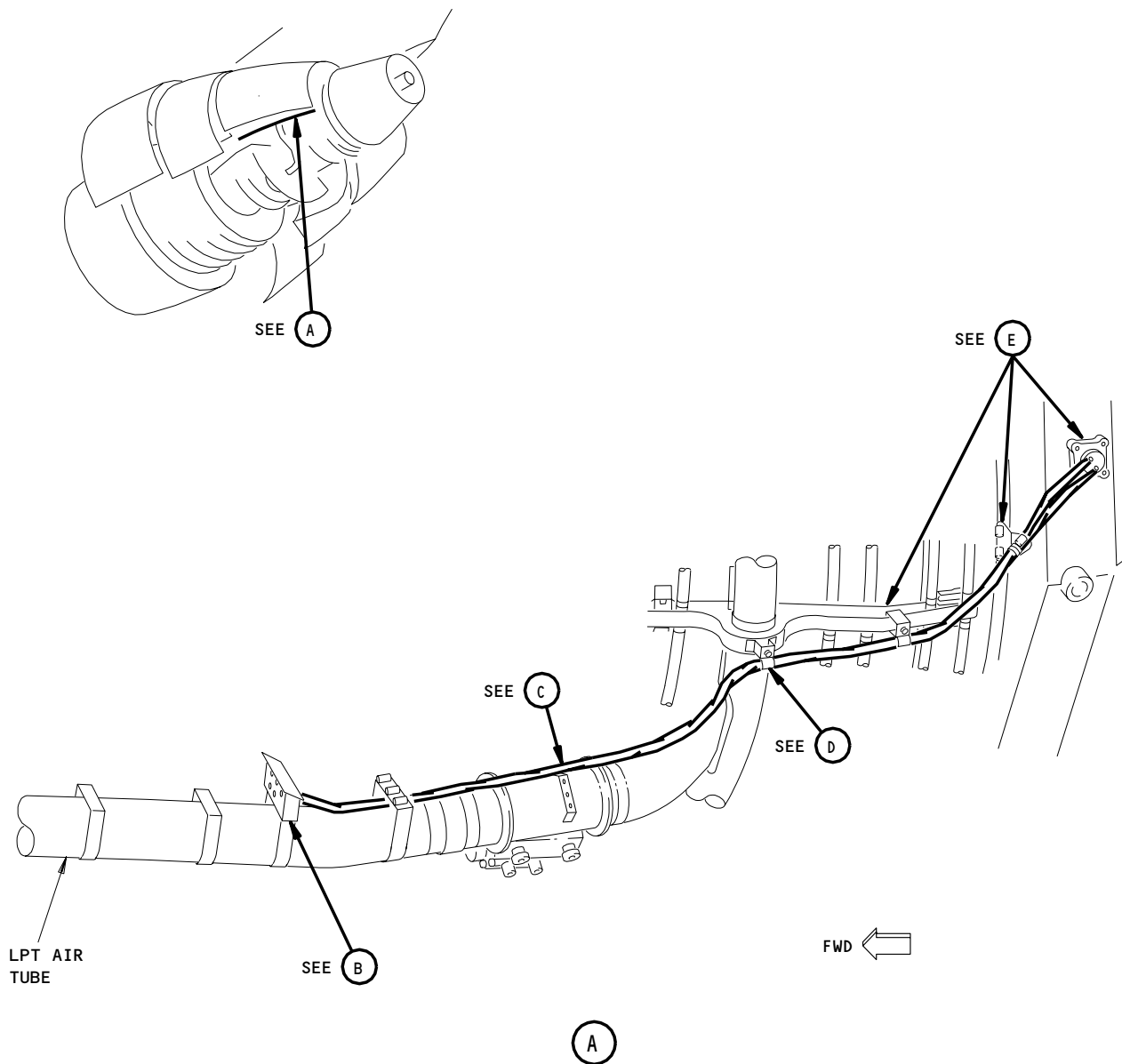
T5 Temperature Probe
Figure 201

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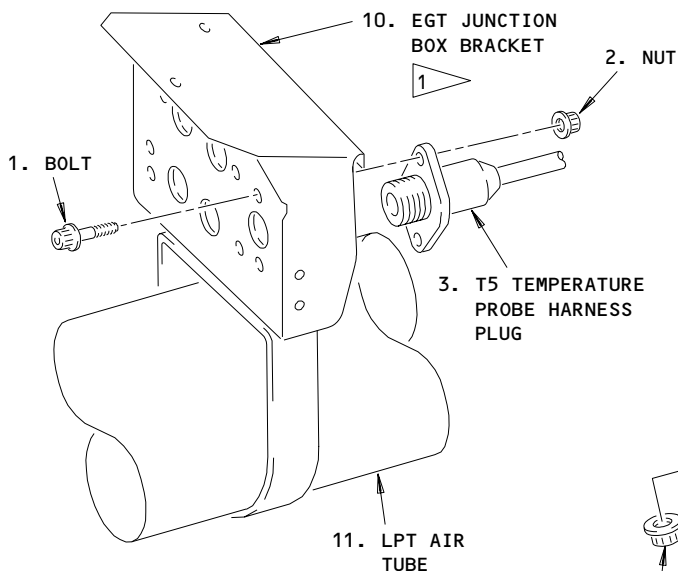
T5 Temperature Probe Harness
Figure 202 (Sheet 1)

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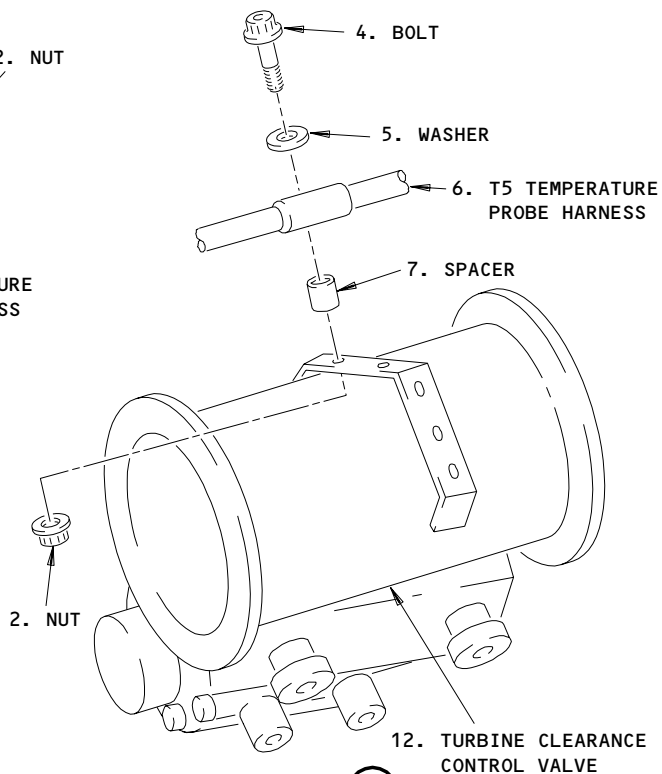
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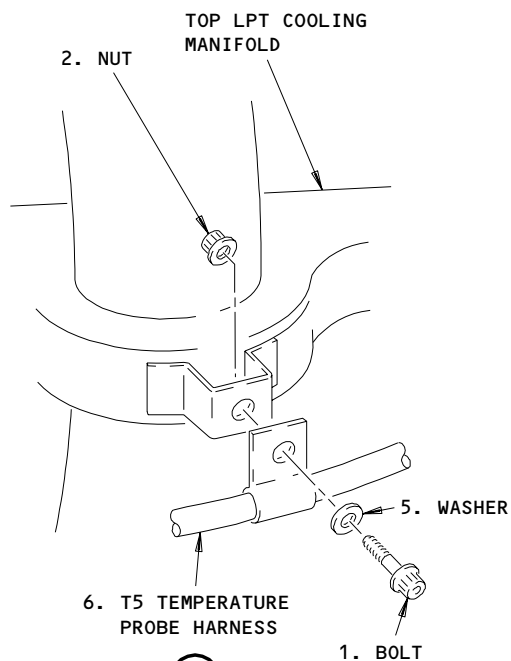
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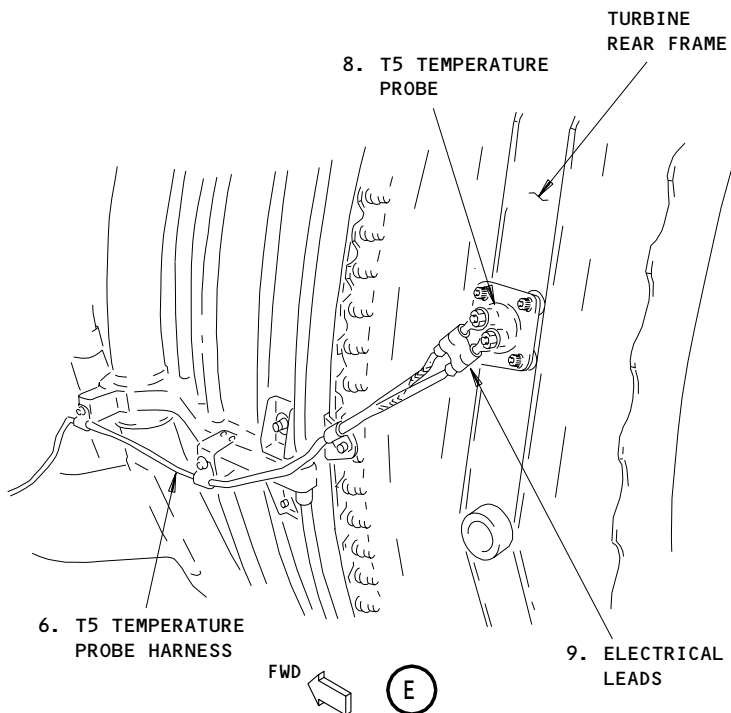
(B)



(C)



(D)



(E)

1 THE CONFIGURATION OF THE BRACKET CAN BE DIFFERENT

T5 Temperature Probe Harness
Figure 202 (Sheet 2)

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S 022-024-J00

- (3) Remove the probe (2):
- (a) Remove the bolts (4) and the washers (5) that attach the probe (2) to the turbine rear frame (TRF).
 - (b) Remove the probe (2) from the recess in the TRF.
 - (c) Discard the gasket (1).

TASK 77-34-07-402-011-J00

3. T5 Temperature Probe Installation (Fig. 201)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	Gasket	77-21-01	15	90
	2	T5 Temperature Probe			100
	3	Washer			70
	4	Bolt			60
	5	Electrical Leads			50
202	1	Bolt	77-21-01	15	10
	2	Nut			30
	3	T5 Temperature Probe Harness Plug			50
	4	Bolt			15
	5	Washer			20
	6	T5 Temperature Probe Harness			
	7	Spacer			25
	8	T5 Temperature Probe			100
	9	Electrical Leads			50
	10	EGT Junction Box Bracket			
	11	LPT Air Tube			
	12	Turbine Clearance Control Valve			

B. References

- (1) AMM 71-11-06/201, Core Cowl Panels

C. Access

(1) Location Zone

- 412 Engine 1 - Turbine Rear Frame at 9:30 o'clock position
- 422 Engine 2 - Turbine Rear Frame at 9:30 o'clock position
- 432 Engine 3 - Turbine Rear Frame at 9:30 o'clock position
- 442 Engine 4 - Turbine Rear Frame at 9:30 o'clock position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

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D. Procedure

S 422-025-J00

- (1) Install the probe (2):
 - (a) Carefully install the probe (2) in the recess of the TMF.
 - (b) Install the four bolts (3) and washers (4) that attach the probe (2) to the TMF.
 - (c) Tighten the bolts (3) to 55-70 pound-inches (6.2-7.9 Newton-meters).
 - (d) Install lockwire on the bolts (3).

S 432-026-J00

- (2) Connect the electrical leads (5):
 - (a) Install the electrical leads (5) on the probe studs.

NOTE: The studs have different dimensions.

CAUTION: BE CAREFUL WHEN YOU TIGHTEN THE NUTS ON THE STUDS. DAMAGE TO THE STUDS CAN OCCUR.

- (b) Tighten the small nut to 12-14 pound-inches (1.3-1.6 Newton-meters).
- (c) Tighten the large nut to 20-30 pound-inches (2.3-3.4 Newton-meters).

S 412-016-J00

- (3) Close the left core cowl panel (AMM 71-11-06/201).

TASK 77-34-07-202-036-J00

4. T5 Temperature Probe Visual Check

A. References

- (1) AMM 71-11-06/201, Core Cowl Panels

B. Access

(1) Location Zone

- | | |
|-----|--|
| 412 | Engine 1 - Turbine Rear Frame at 9:30 o'clock position |
| 422 | Engine 2 - Turbine Rear Frame at 9:30 o'clock position |
| 432 | Engine 3 - Turbine Rear Frame at 9:30 o'clock position |
| 442 | Engine 4 - Turbine Rear Frame at 9:30 o'clock position |

(2) Access Panel

- | | |
|-----|---------------------------------|
| 417 | Left Core Cowl Panel - Engine 1 |
| 427 | Left Core Cowl Panel - Engine 2 |
| 437 | Left Core Cowl Panel - Engine 3 |
| 447 | Left Core Cowl Panel - Engine 4 |

C. Procedure

S 012-037-J00

- (1) Open the left core cowl panel (AMM 71-11-06/201).

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S 212-038-J00

- (2) Do a visual check of the probe per Table 201.

Visually Check	Maxium Serviceable Limits	Remarks
(a) Mounting Flanges for:		
1) Cracks around the mounting holes	Not serviceable	Replace the probe
(c) Stripped or damaged threads on the alumel or the chromel terminals	50% of one entrance thread or 10% each of two entrance threads, provided you can remove the high or moved metal	Replace the probe
(d) Cracks, bends, dents, erosion, burns, or probes that break open	Minor damage if its structural integrity is not decreased	Replace the probe

TABLE 201

S 412-041-J00

- (3) Close the left core cowl panel (AMM 71-11-06/201).

TASK 77-34-07-702-017-J00

5. T5 Temperature Probe Functional Check

A. Standard Tools and Equipment

- (1) Heat Gun
- (2) Millivoltmeter

B. References

- (1) AMM 20-11-25/201, Heat Guns, Soldering Guns and/or Soldering Irons

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C. Access

(1) Location Zone

- 412 Engine 1 - Turbine Rear Frame at 9:30 o'clock position
- 422 Engine 2 - Turbine Rear Frame at 9:30 o'clock position
- 432 Engine 3 - Turbine Rear Frame at 9:30 o'clock position
- 442 Engine 4 - Turbine Rear Frame at 9:30 o'clock position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

D. Procedure

S 022-018-J00

- (1) Do this task: "T5 Temperature Probe Removal".

S 482-027-J00

- (2) Connect the millivoltmeter to the probe (2):
- (a) Connect the positive lead of the millivoltmeter to the chromel terminal stud.
 - (b) Connect the negative lead of the millivoltmeter to the alumel terminal stud.

S 882-028-J00

- (3) Apply heat to the probe junction with a heat gun (AMM 20-11-25/201).

S 722-021-J00

- (4) Make sure the voltmeter shows a positive value.
- (a) If the voltmeter does not move, replace the probe (2).

S 082-022-J00

- (5) Disconnect the millivoltmeter from the probe (2).

S 422-023-J00

- (6) Do this task: "T5 Temperature Probe Installation".

TASK 77-34-07-002-031-J00

6. T5 Temperature Probe Harness Removal (Fig. 202)

A. References

- (1) AMM 71-11-06/201, Core Cowl Panels

B. Access

(1) Location Zone

- 412 Engine 1 - Turbine Rear Frame at 9:30 o'clock position
- 422 Engine 2 - Turbine Rear Frame at 9:30 o'clock position
- 432 Engine 3 - Turbine Rear Frame at 9:30 o'clock position
- 442 Engine 4 - Turbine Rear Frame at 9:30 o'clock position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
- 427 Left Core Cowl Panel - Engine 2
- 437 Left Core Cowl Panel - Engine 3
- 447 Left Core Cowl Panel - Engine 4

C. Procedure

S 012-029-J00

- (1) Open the left core cowl panel (AMM 71-11-06/201).

S 022-030-J00

- (2) Disconnect the harness (6):

- (a) Disconnect the electrical leads (9) from the T5 temperature probe (8).
- (b) Disconnect the clamp at the forward flange of the LPT rear frame.
- (c) Disconnect the two clamps on the top LPT manifold (11) for cooling air.
- (d) Disconnect the clamp on the control valve (12) for the turbine clearance.
 - 1) Remove and keep the spacer (7).
- (e) Disconnect the clamp on the LPT air tube (11).
- (f) Disconnect the T5 harness plug (3) from the EGT junction box bracket (10).

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- S 022-035-J00
(3) Remove the T5 harness (6) from the engine.

TASK 77-34-07-402-032-J00

7. T5 Temperature Probe Harness Installation (Fig. 202)

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
201	1	Gasket	77-21-01	15	90
	2	T5 Temperature Probe			100
	3	Washer			70
	4	Bolt			60
	5	Electrical Leads			50
202	1	Bolt	77-21-01	15	10
	2	Nut			30
	3	T5 Temperature Probe Harness Plug			50
	4	Bolt			15
	5	Washer			20
	6	T5 Temperature Probe Harness			
	7	Spacer			25
	8	T5 Temperature Probe			100
	9	Electrical Leads			50
	10	EGT Junction Box Bracket			
	11	LPT Air Tube			
	12	Turbine Clearance Control Valve			

B. Reference

- (1) AMM 71-11-06/201, Core Cowl Panels

C. Access

(1) Location Zone

- 412 Engine 1 - Turbine Rear Frame at 9:30 o'clock position
422 Engine 2 - Turbine Rear Frame at 9:30 o'clock position
432 Engine 3 - Turbine Rear Frame at 9:30 o'clock position
442 Engine 4 - Turbine Rear Frame at 9:30 o'clock position

(2) Access Panel

- 417 Left Core Cowl Panel - Engine 1
427 Left Core Cowl Panel - Engine 2
437 Left Core Cowl Panel - Engine 3
447 Left Core Cowl Panel - Engine 4

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D. Procedure

S 422-033-J00

- (1) Install the harness from the forward to aft direction as follows:
 - (a) Install the plug (3) on the EGT junction box bracket (10) with the bolts (1) and nuts (2).
 - (b) Put the harness along the LPT air tube (11) and loosely install the clamp at the bracket on the LPT air tube (11).
 - (c) Continue to put the harness aft along the LPT air tube (11).

- 1) Loosely install the clamp on the control valve with these parts:

- a) the bolt (4)
 - b) the washer (5)
 - c) the spacer (7)
 - d) the nut (2).

- (d) Continue to put the harness aft along the LPT air tube (11) to the two clamps on the upper manifold for the LPT cooling air.

- 1) Loosely install the two clamps on the LPT manifold.

- (e) Continue to put the harness aft to the clamp on the forward flange of the turbine rear frame.

- 1) Loosely install the clamp at the rear frame.

- (f) Make sure you can attach the electrical leads (9) of the harness to the studs on the T5 temperature probe.

NOTE: Adjust the position of the harness at each clamp until the position is correct.

- (g) Install the electrical leads (9) on the probe studs.

NOTE: The studs have different diameters.

CAUTION: BE CAREFUL WHEN YOU TIGHTEN THE NUTS ON THE STUDS. DAMAGE TO THE STUDS CAN OCCUR.

- 1) Tighten the small nut to 12-14 pound-inches (1.3-1.6 Newton-meters).

- 2) Tighten the large nut to 20-30 pound-inches
(2.3-3.4 Newton-meters).
- (h) Tighten all the clamps that attach the harness (6).

S 412-034-J00

- (2) Close the left core cowl panel (AMM 71-11-06/201).

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