B757 MANUAL SUPPLEMENT - ATP 3510
SECTION 1 CHAPTER 77
CONTROL PAGE - INITIAL ISSUE

A. File the attached Temporary Revision/Alerts in the Manual Supplement in ATA Chapter/Section/Subject/Page sequence

B. File this Control Page in front of the Chapter TRs/Alerts.

C. The following list shows active TRs/Alerts together with TRs/Alerts added by this control page.

Chapter Section Subject	Page		TR/Alert No.
77-11-01	406	*	BA 77-522

D. Remove and Destroy the following TRs/Alerts:

* Indicates TRs/Alerts issued with this control page

ATP TEMPORARY REVISION

AIRPLANE

NB322

20 October, 1998

757 MAINTENANCE MANUAL

TEMPORARY REVISION No. 77-522

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA) AND COMPLIES WITH BCAR'S CHAPTER A5-3, B5-3 AND/OR TSS No. 0-2 AS REQUIRED. CAA DESIGN APPROVAL No. DAI/8566/78.

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 77-11-01 Page 406

REASON FOR REVISION

To prevent possible airborne returns following fitment of an 'S'EPR transmitter from stores. The subsequent flight will be 'EEC's Out'.

ACTION

D. Install the EPR transmitter

Ignore existing step (5) and read the following

(5) Do the functional test for the EPR system (AMM 77-11-00/501).

NOTE: If a new or overhauled EPR transmitter is installed, this test is not necessary, the following sector however must be carried out in accordance with DDM 77-11-1 EPR SYSTEM INOP to confirm engine EPR indication serviceability.

Originator: K.BROWNE
Reference: 3329
Workbook: ENG-407

GPA Group plc

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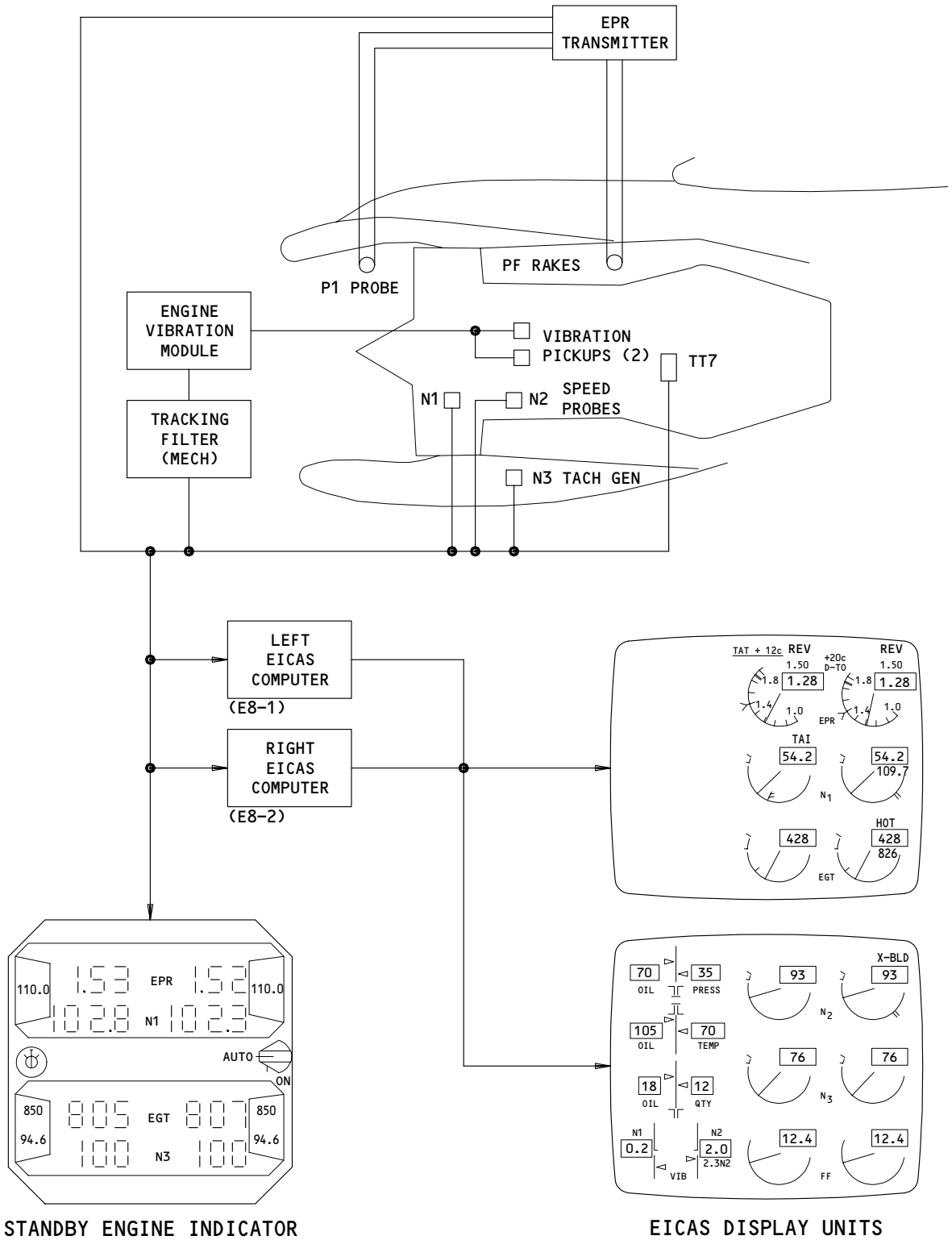
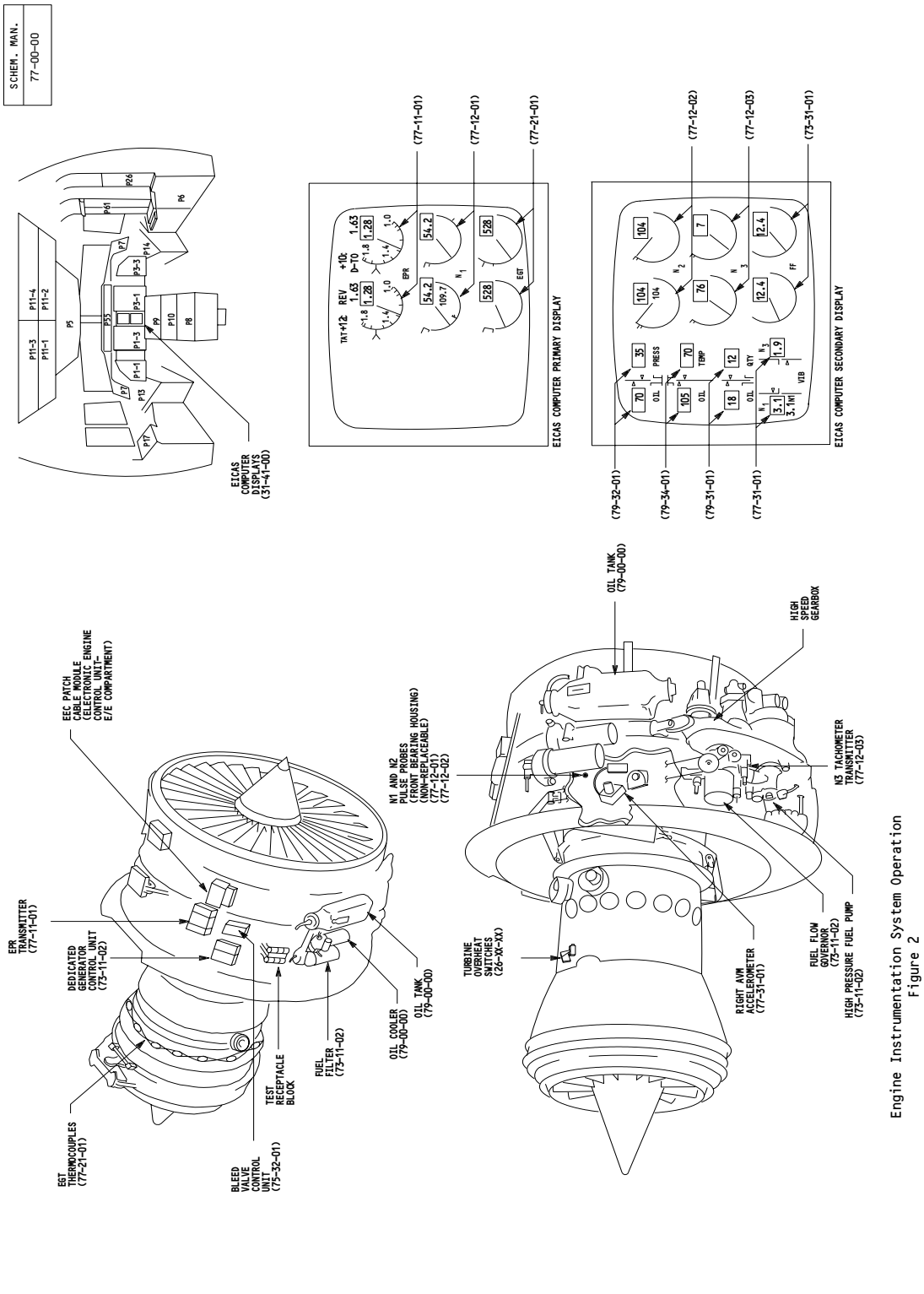
ENGINE INDICATING - DESCRIPTION AND OPERATION

1. General
   A. Engine indicating is comprised of the following: engine pressure ratio (EPR) indicating system (AMM 77-11-00/001), engine tachometer system (AMM 77-12-00/001), exhaust gas temperature (EGT) indicating system (AMM 77-21-00/001), airborne vibration monitoring (AVM) system (AMM 77-31-00/001), and standby engine indication system (AMM 77-41-00/001).
   B. The EPR indicating system compares fan exhaust pressure to inlet pressure and sends this value to the upper Engine Indication and Crew Alerting System (EICAS) display. EPR is used as the main thrust parameter.
   C. The engine tachometer system measures N1, N2, and N3 shaft speeds and displays N1 speed on the upper EICAS display and N2 and N3 speeds on the lower EICAS display.
   D. The EGT indicating system measures the temperature into the low pressure turbine and sends this temperature to the upper EICAS display.
   E. The AVM system senses engine vibration and relates this vibration to N1, N2, and N3 shaft speeds by way of the signal conditioner which sends the most abnormal vibration level to the lower EICAS display.
   F. The standby engine indication system receives N1, N3, EGT, and EPR signals from their appropriate sources. The system is normally off and is turned on manually or automatically when the EICAS fails.



Engine Indicating System
Figure 1



Engine Instrumentation System Operation
Figure 2

ENGINE INDICATING - INSPECTION/CHECK

TASK 77-00-00-206-001-R00

1. Engine Indicating Inspection/Check

A. References

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

(2) AMM 72-03-01/401, Compressor Fairings

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

B. Access

(1) Location Zones

410 Left Engine

420 Right Engine

(2) Access Panels

413/423 Fan Cowl Panel (LH)

414/424 Fan Cowl Panel (RH)

415/425 Thrust Reverser (LH)

416/426 Thrust Reverser (RH)

C. Do the Engine Indicating Inspection/Check.

S 016-002-R00

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

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

S 016-003-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 216-004-R00

(3) Examine the PINT and P1 air tubes to the EPR transmitter for damage.

S 216-005-R00

(4) Examine the PF air rake and tubing to the multiple connector for damage.

S 216-006-R00

(5) Examine the EPR transmitter and its wires for damage.

S 216-007-R00

(6) Examine the N1 and N2 pulse probes wires for damage.

S 216-008-R00
(7) Examine the N3 tachometer transmitter and wires for damage.

S 216-009-R00
(8) Examine the EGT electrical cables for damage.

S 016-010-R00
(9) Remove the right side and top compressor fairings (AMM 72-03-01/401).

S 216-011-R00
(10) Examine the Airborne Vibration Monitoring (AVM) Transmitters, junction boxes and wires for damage.

S 416-012-R00
(11) Install the right side and top compressor fairings (AMM 72-03-01/401).

S 416-013-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

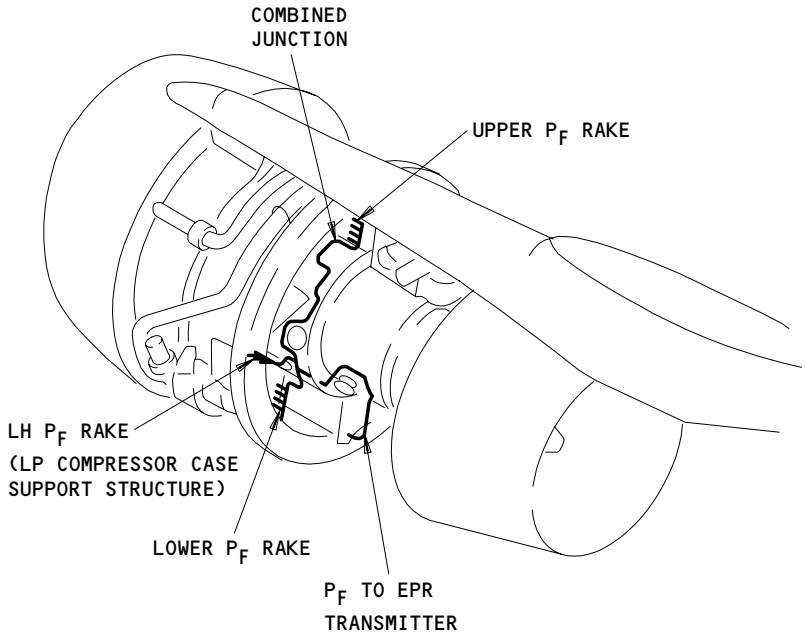
S 416-014-R00

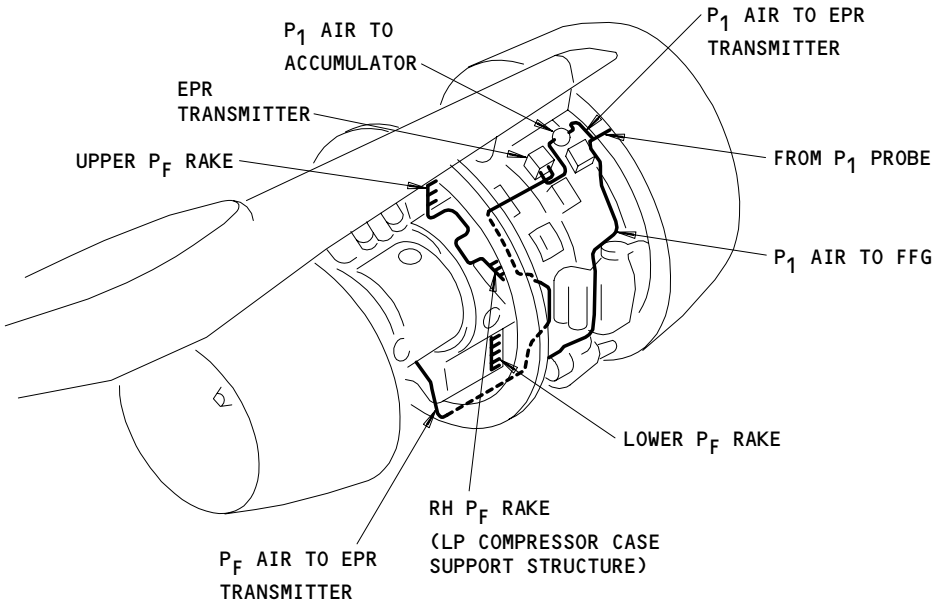
CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU CLOSE THE FAN COWL PANEL. IF THE PRECAUTIONS ARE NOT OBEYED, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

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

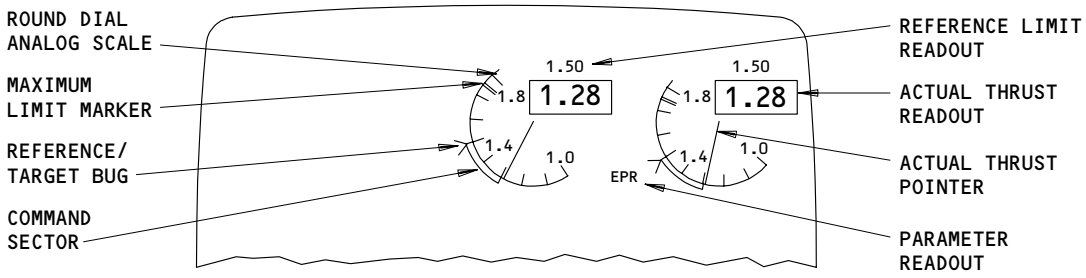
ENGINE PRESSURE RATIO (EPR) INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The engine pressure ratio (EPR) indicating system is used as the parameter for monitoring and setting power. EPR is directly related to engine gross thrust.
   B. The EPR indicating system uses the ratio of pressure signals from LP compressor cold (PF) exhaust stream, and engine air intake pressure (P1) to provide an indication of engine thrust in flight compartment.
   C. The EPR system is comprised of the low pressure (LP) exhaust pressure (PF) sensing system, EPR transmitter, trimmer plug, P1 air accumulator and a display of EPR on the Engine Indication and Crew Alerting System (EICAS).
2. Component Details (Fig. 2)
   A. PF Sensing System
      (1) The PF sensing system comprises four rake tubes. The left and right rakes are formed by the hollow LP compressor case support assembly struts at the lower left and upper right positions. The upper rake is a tube mounted in the nose section of the upper interservices splitter fairing. The lower rake is a tube mounted on the leading edge of the radial drive fairing.
      (2) Each support strut rake incorporates six forward facing shrouded pitot heads which are bonded into the rake tubes. A raised pad at the inner end of each strut forms a tube connection, holes connect the pad to the rake tube.
      (3) The upper rake tube incorporates five forward facing shrouded pitot heads which project through the fairing leading edge. The tube is secured to the fairing inner wall by brackets and the inner end of the tube spigots into a flanged adapter secured to the splitter floor.
      (4) The lower rake tube incorporates five forward facing shrouded pitot heads and is attached to the outer surface of the radial drive fairing leading edge. The innerend of the tube is connected to a common tube with the three remaining rakes.
      (5) The rakes are connected by external tubes to a combined junction located at the top of the compressor intermediate case. The system provides a mean PF pressure signal which is passed to the EPR transmitter.

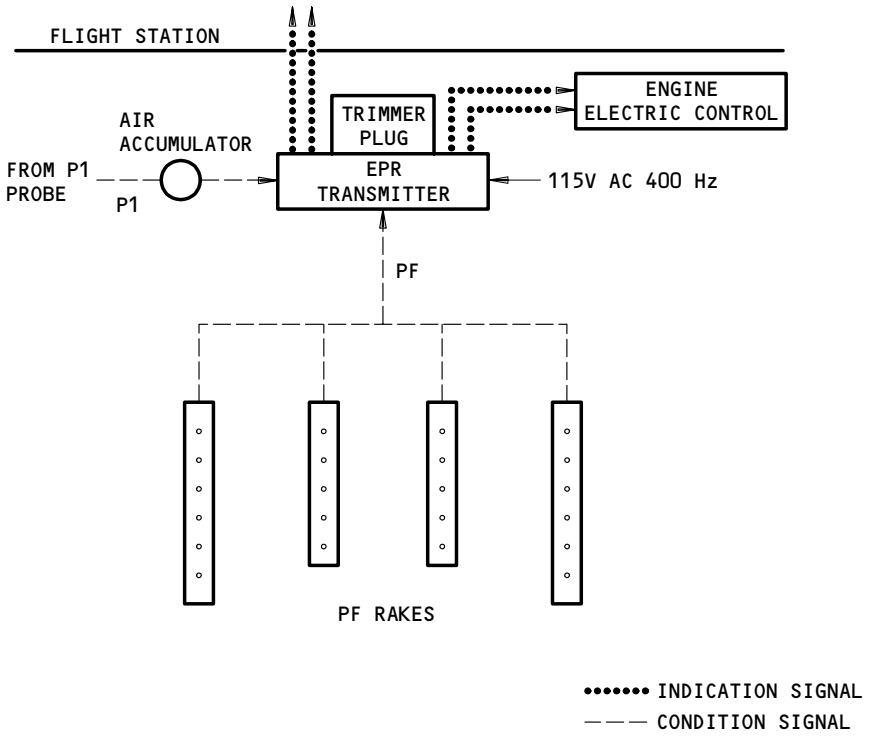




Engine Pressure Ratio System Arrangement and Location of Units
Figure 1



UPPER EICAS DISPLAY



69707

Engine Pressure Ratio System Basic Diagram
Figure 2

B. EPR Transmitter
   (1) The EPR transmitter is secured to a raft by four antivibration mounts on the upper right side of the LP compressor case. The transmitter senses engine air intake pressure (P1) and LP compressor cold exhaust pressure (PF).
   (2) P1 is tapped (via the accumulator) from the P1 air tube to the fuel flow governor on the right side of the LP compressor case. PF air pressure is received directly from the four PF rakes. The air pressures are passed, by rigid tubes, to connectors secured to the transmitter mounting raft and then by flexible tubes to the transmitter.
   (3) The engine air pressures are sensed by two vibrating cylinder pressure transducers, incorporated in the transmitter, which vibrate at frequencies relative to the air pressures. From these vibration frequencies, electrical signals of EPR are computed. The transmitter provides two identical outputs, in digital form, for the EICAS display and the EEC. The transmitter also provides an electrical signal of P11 for the EEC.
   (4) To ensure that the indicated EPR is the same for both engines at the same thrust, it is necessary to trim the transmitter output to suit individual engine characteristics. A receptacle on the transmitter front panel has five active and five grounded sockets and various degrees of trim are obtained by different combinations of connecting the active to the grounded sockets. These combinations are achieved by a trimmer plug fitted to the receptacle.

C. Trimmer Plug
   (1) The trimmer plug is fitted to a receptacle on the transmitter front panel and basically comprises a plug and a dust cover. A cable attached to the dust cover is secured to the transmitter mounting raft so that the plug remains with the engine.
   (2) The trimmer plug is wired to give the trim resistance to suit the individual engine characteristics. Different combinations of wiring give different resistance values and each valve is allocated a trim code letter. The trim code for an individual plug is marked on the dust cover together with the part number.

D. P1 Air Accumulator
   (1) The accumulator (Fig. 1) is mounted on support brackets attached to the EEC guard bracket on the right side of the LP compressor case.
   (2) The P1 air pressure tapped from the P1 tube between the P1 probe and the FFG and passes through the accumulator to the EPR transmitter.

E. EPR Indication on EICAS
   (1) EPR indication is displayed in the upper right corner of the upper EICAS display. The indication receives signals from the EICAS computer which receives its signals from the EPR transmitter, thrust management computer (TMC), and pilot.
   (2) The EICAS computer supplies EPR indication with actual EPR using a pointer with values of 1.0, 1.4 and 1.8 on the dial and digital readout.

(3) The TMC supplies EPR indication with command and maximum limit EPR. The command EPR is displayed by a white band starting from the commanded EPR to the actual EPR. This band disappears as the actual EPR reaches the commanded EPR. The maximum limit EPR is a double amber line on the pointer scale.

(4) The pilot sets the reference limit cursor to the approximate EPR needed. The cursor is green and looks like a Y. This value is also in digital display above the actual EPR digital display.

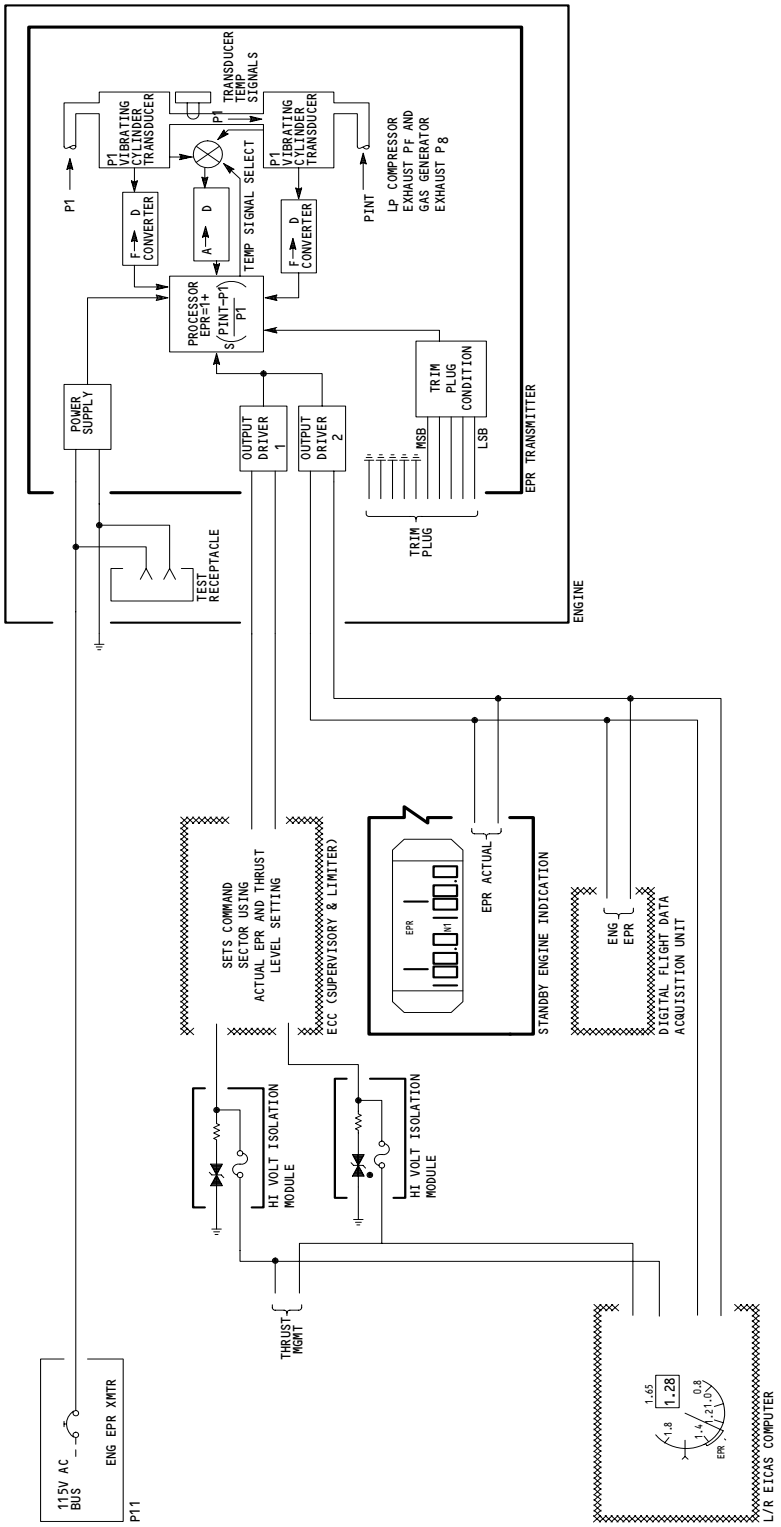
3. Operation (Fig. 3)

A. Functional Description

(1) The EPR indicating system measures cold gas stream exhaust pressures and compares them to inlet pressure to obtain EPR. This EPR is then transmitted to the flight compartment for use in setting engine thrust.

(2) The cold stream pressure is sensed by four PF rakes in the fan exit casing. These pressures are fed to the EPR transmitter.

(3) PF air is fed to the EPR transmitter which also senses intake total head pressure P1. The EPR transmitter takes PF and P1, and operating on the vibrating cylinder principle, computes PF/P1 in digital format and sends this ratio to the EICAS computer and the electronic engine control. It is then used for setting engine thrust.



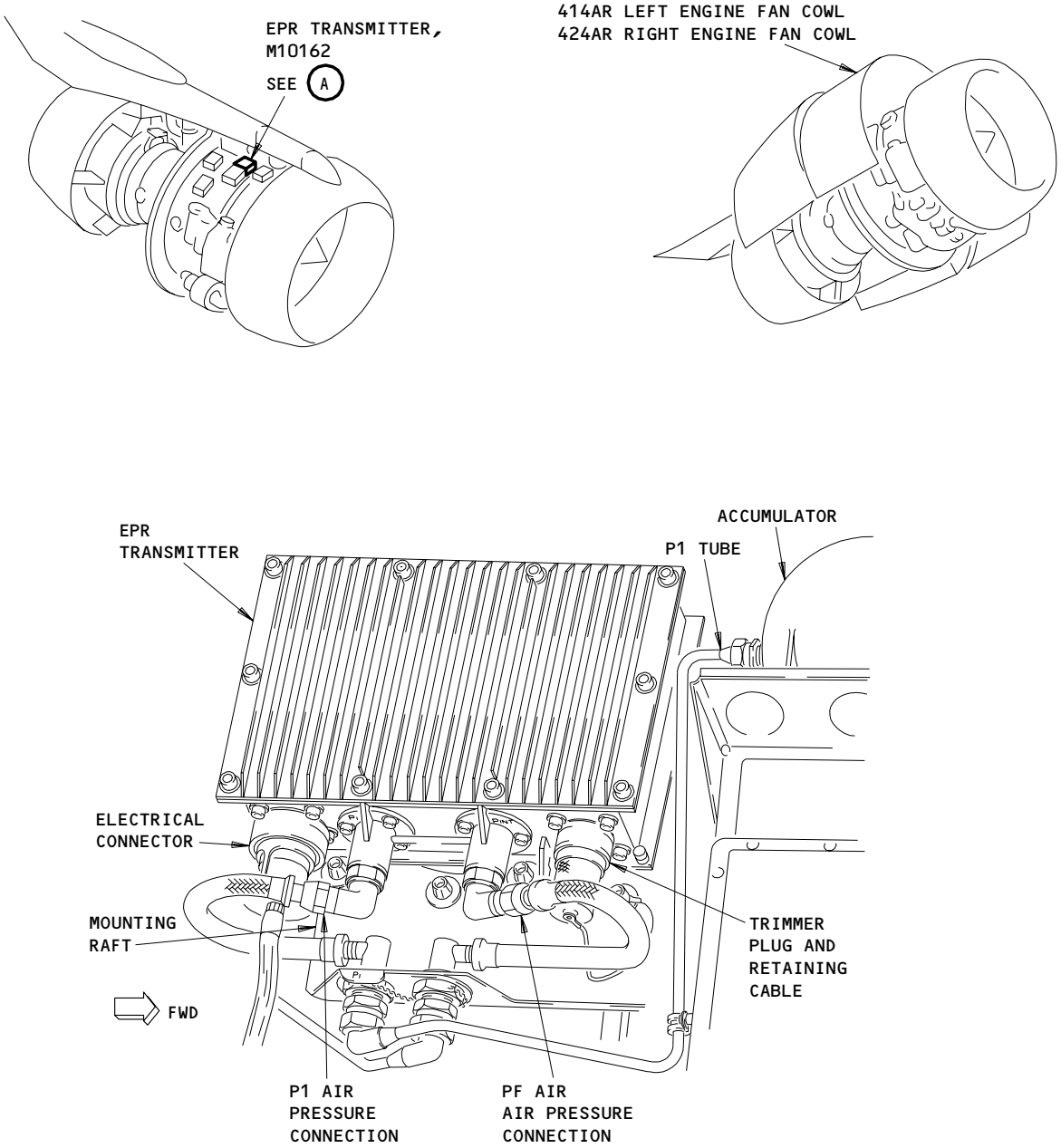
Engine Pressure Ratio (EPR) Indication System Operation
Figure 3

ENGINE PRESSURE RATIO (EPR) INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
TRANSMITTER - EPR, M10162	--	2	414AR L ENG FAN COWL 424AR R ENG FAN COWL	77-11-01

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

E49045



EPR TRANSMITTER, M10162

A

NOTE: ON AIRPLANES WITH RB211-535E4 ENGINES, THE PF AIR LINE IS CONNECTED TO THE FITTING WITH THE PINT PLACARD ON THE EPR TRANSMITTER

69706-A

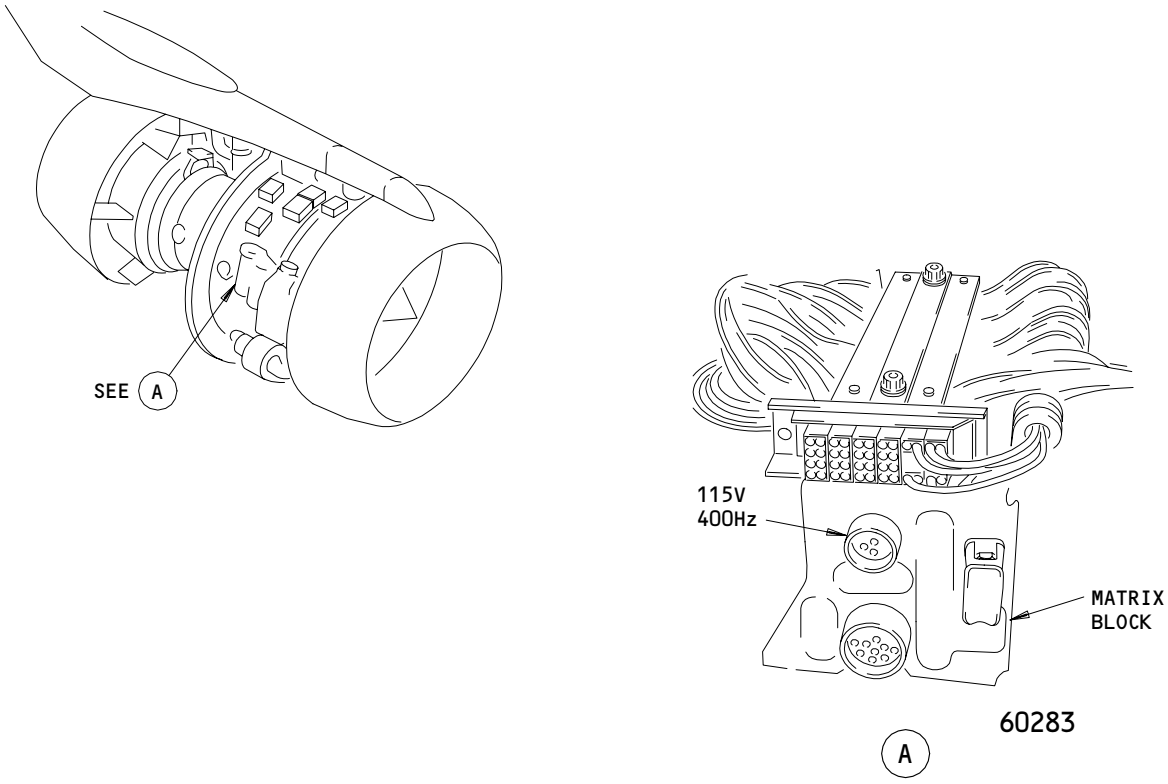
Engine Pressure Ratio (EPR) Indicating System - Component Location
Figure 102

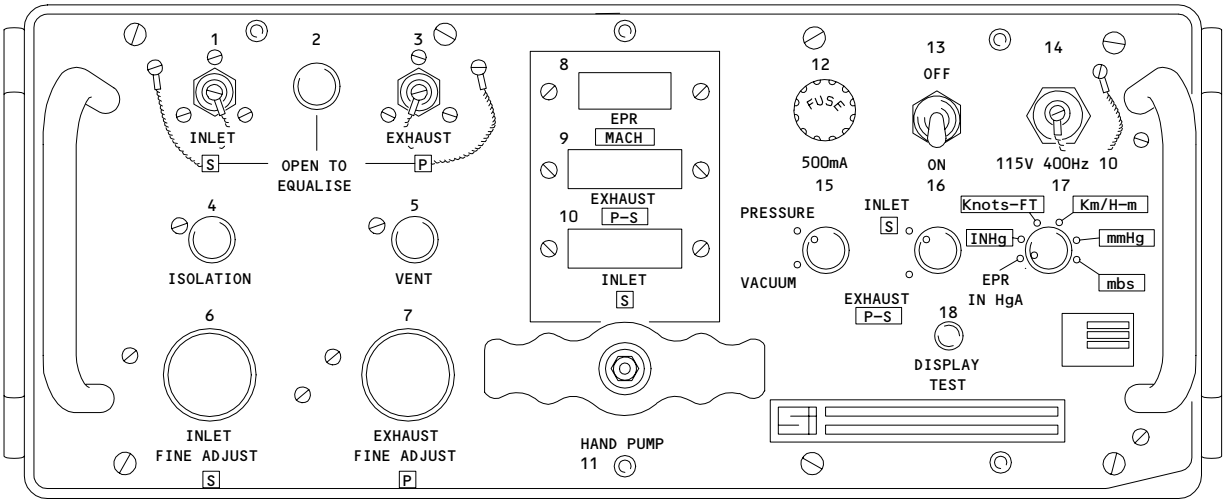
ENGINE PRESSURE RATIO (EPR) INDICATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks.
      (1) The first task gives the functional test of the Engine Pressure Ratio (EPR) transmitter and indicator.
      (2) The second task gives the system test for the air tubes of the P1 sensing system.
      (3) The third task gives the system pressure test for the PF air tubes.

   TASK 77-11-00-725-001-R00

2. Functional Test - EPR Transmitter and Indicator
   A. Equipment
      (1) Smiths Test Equipment
         (a) EPR Test Set, Smiths 3204-KTQ-1 or RR 1702409
         (b) EPR Power Lead - power input, Smiths 0101-KCQ-20 or RR 1702384
         (c) EPR Pressure Hose (2 locations) Smiths 0101-KHQ-20 or RR 1702388
         (d) Adapter - Rolls-Royce, UT1277 (Qty 2)
         (e) Hose - to fit over the P1 probe and the adapter above, Locally available
   B. Consumable Materials
      (1) Tape Sealing - Local resources
      (2) Lockwire
         British Spec/Ref - DTD 189A, 22SWG
         American Spec/Ref - 21 AWG
         OMat No. 238
   C. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 70-51-00/201, Torque Tightening Technique
      (3) AMM 71-11-04/201, Fan Cowl Panels
   D. Access
      (1) Location zones
         210 Control Cabin
         410 Power Plant Nacelle Left
         420 Power plant Nacelle Right
         413/414 Fan Cowl Panel Left
         423/424 Fan Cowl Panel Right





Test Set and Power Supply Connection
Figure 501

E. Prepare to do the Test for the EPR Transmitter and Indicator (Fig. 501)

S 415-002-R00

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

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

S 975-003-R00

(2) Find the letter code for the EPR trim plug on the engine data slip plate.
   (a) Make a record of the letter code for the EPR trim plug.

S 485-004-R00

(3) Connect the 115V, 400 Hz Power Input lead to the engine supply connector and the input connector 14 of the test set.

S 865-005-R00

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

S 865-006-R00

(5) For the left engine, make sure this circuit breaker on the P11 overhead panel is closed:
   (a) 11L9, LEFT ENGINE EPR XMTR

S 865-007-R00

(6) For the right engine, make sure this circuit breaker on the P11 overhead panel is closed:
   (a) 11L36, RIGHT ENGINE EPR XMTR

S 865-008-R00

(7) Make sure the EICAS circuit breakers (6 places) on the P11 overhead panel are closed.

S 865-009-R00

(8) Push the PERF/APU button on the EICAS MAINT panel to get the engine performance page.

S 865-010-R00

(9) Prepare the test set.

(a) Set the power switch on the test set to ON (16).

1) Let the test set become stable for 2 minutes.

(b) Push and hold the DISPLAY TEST switch (18).

NOTE: The test sequence will continue only when you push and hold the test switch. The test set pressure display (8) and the EPR/MACH display (9 and 10) will first show all 8's then show the complete digital sequence, all 0's to all 9's.

(c) Open the OPEN TO EQUALISE valve (2) and the VENT valve (5).

(d) Set the selector (17) to EPR IN HgA.

1) The EXHAUST (9) and INLET (10) pressure displays will show the atmospheric pressure in inches-of-mercury (in.Hg).

(e) Set the selector (15) to PRESSURE.

(f) Open the ISOLATION (4) valve.

(g) Close the VENT (5) valve.

(h) Make sure the OPEN TO EQUALISE (2) valve is open.

(i) Make sure that caps are installed on the INLET connector (1) and the EXHAUST (3) connector.

(j) Use the HAND PUMP (11) to increase the pressure to approximately 70 in.Hg.

1) The pressure will be shown on the EXHAUST (9) and the INLET (10) displays.

(k) Close the ISOLATION valve (4).

NOTE: Wait for a minimum of 10 minutes after you pressurize the system before you make a check for leaks.

1) Make sure the displays do not change.

(l) Open the VENT valve (5).

(m) Remove the caps from the INLET connector (1) and the EXHAUST connector (3).

S 485-011-R00

(10) Connect the hoses to the EPR transmitter and the test set (Fig. 502).

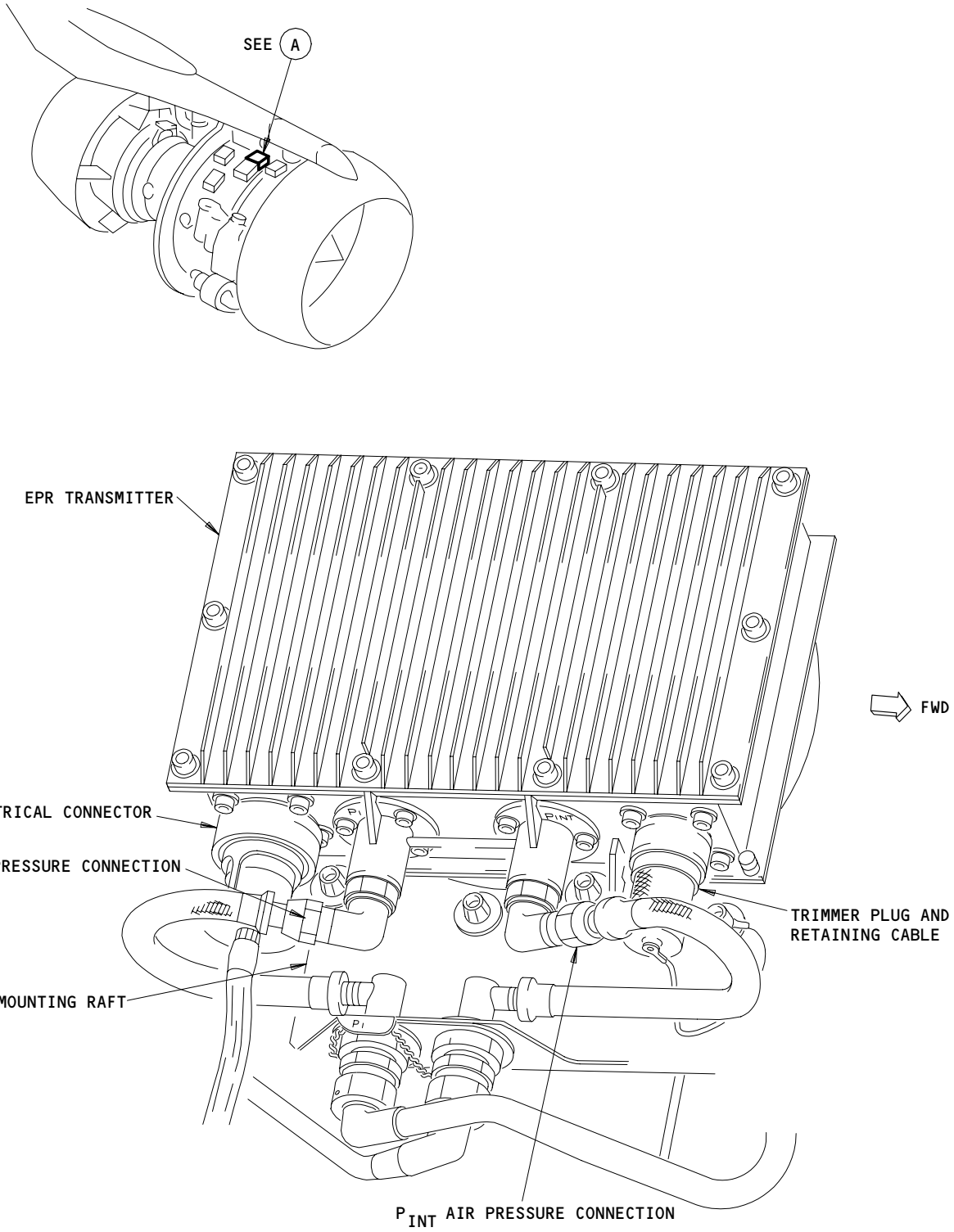
(a) Disconnect the P1 tube from the EPR transmitter and connect the adapter to the P1 connector on the transmitter.

(b) Disconnect the PF tube from the EPR transmitter.

(c) Connect the second adapter to the PINT connector on the transmitter.

(d) Connect the hose from the P1 adapter on the EPR transmitter to the test set INLET connector 1 (Fig. 501).

(e) Connect the hose from the PINT adapter on the EPR transmittter to the EXHAUST connector (3) on the test set (Fig. 501).



EPR Transmitter Test Points
Figure 502

F. Do the test for the EPR Transmitter and the Indicators (Fig. 501)

S 725-012-R00

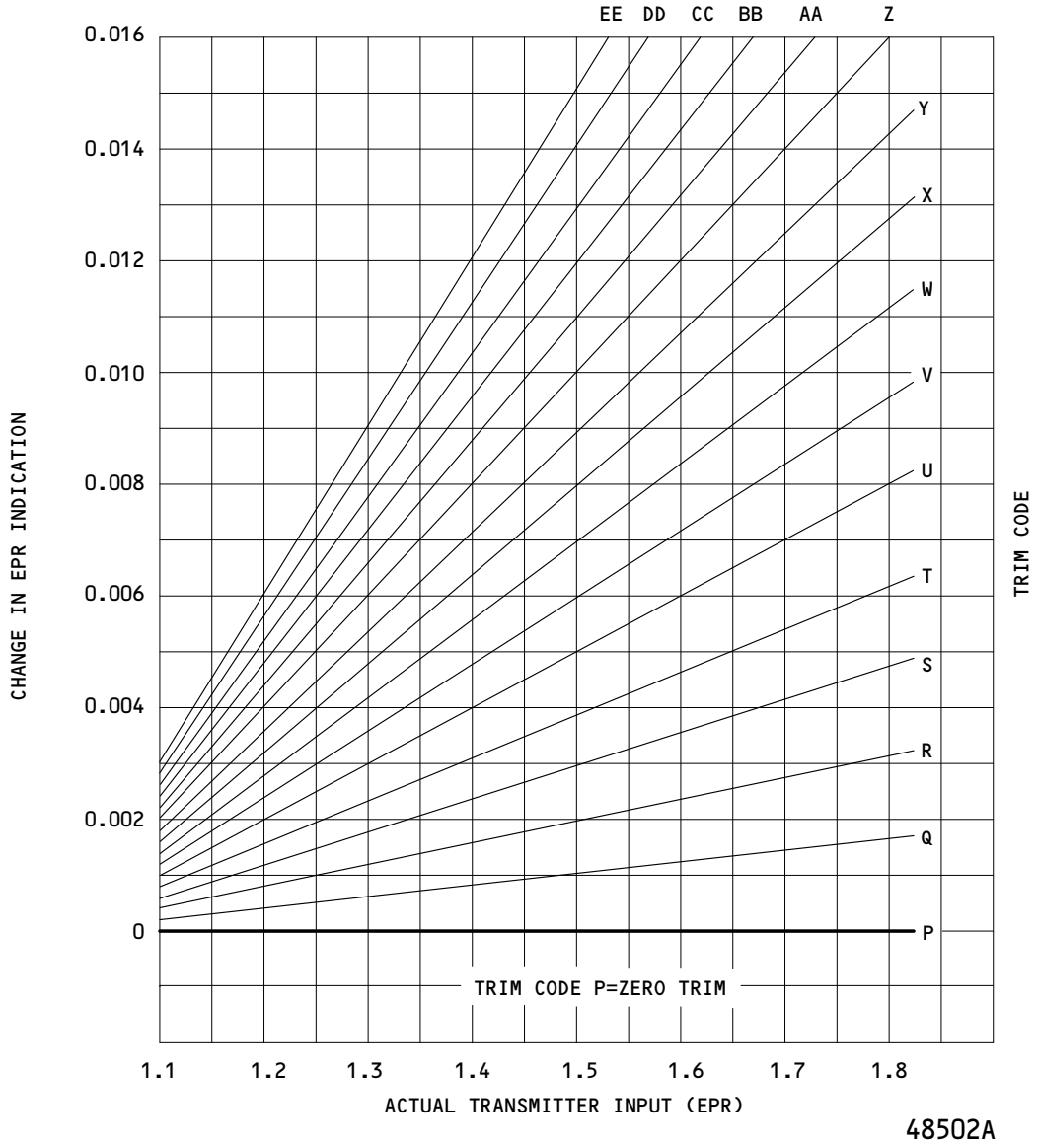
(1) Do the test of the EPR calibration at ambient barometric pressure.
  (a) Set the switch (17) to EPR IN HgA.
  (b) Set the switch (15) to PRESSURE.
  (c) Set the switch (16) to EXHAUST.
  (d) Make sure the OPEN TO EQUALISE valve (2) is fully closed.
  (e) Close the VENT valve (5).
  (f) Open the ISOLATOR valve (4).
  (g) Get the EICAS EPR values for EPR values from the test set.
    1) Use the hand pump to increase the pressure to get an EPR value of approximately 1.1 on the EPR display (8).

      NOTE: Use the EXHAUST FINE ADJUST control (7) to get the correct value.

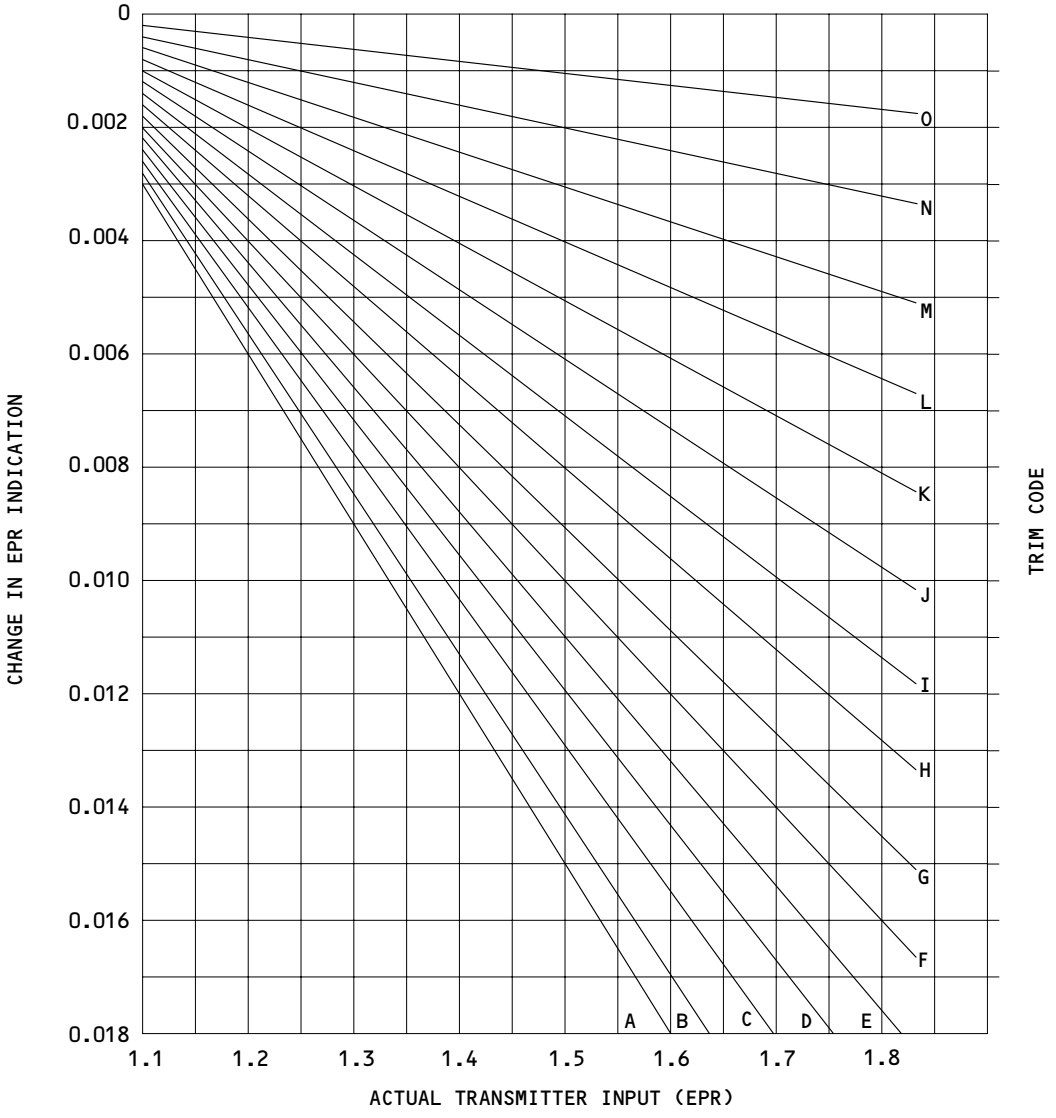
    2) If the EPR transmitter goes off-line, open and close the applicable circuit breaker on the P11 overhead panel to reset the transmitter.

      NOTE: If the EPR value is more than 2.0, the EPR transmitter will go off-line.

      a) 11L9, L ENG EPR XMTR
      b) 11L36, R ENG EPR XMTR
    3) Make a record of the EPR value from display (8) on the test set.
    4) Make a record of the EICAS EPR value.
    5) Do these steps again at EPR values of approximately 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, and 1.8.
  (h) Find the CHANGE IN EPR INDICATION value for the applicable letter code for the EPR trim plug (Fig. 503).
    1) Make a record of the CHANGE IN EPR INDICATION value for each of the EPR values, 1.1 through 1.8.
  (i) Calculate the corrected EICAS EPR.
    1) For the letter codes P through EE (Fig. 503, Sheet 1), subtract the CHANGE IN EPR INDICATION value from the EICAS EPR.
    2) For the letter codes A through O (Fig. 503, Sheet 2), add the CHANGE IN EPR INDICATION value to the EICAS EPR.
    3) Make a record of the corrected EICAS EPR values.
  (j) Subtract the corrected EICAS EPR values from the EPR values on the test set (1.1 through 1.8).
    1) Make a record of the difference between the EICAS EPR corrected and the EPR values on the test set.
  (k) Get the EICAS EPR tolerance values for the EPR values from the test set (Fig, 504).
    1) Use the ambient barometric pressure, P1, (in.Hg.) and the EPR values, 1.1 through 1.8, to find the EICAS EPR tolerance.



Trim Code Corrections for Indicated EPR
Figure 503 (Sheet 1)



Trim Code Corrections for Indicated EPR
Figure 503 (Sheet 2)

(l) Make sure the difference in EPR values are not more than the values for the EPR tolerance.
(m) Open the VENT valve (5).

S 725-013-R00
(2) Do the test for Altitude EPR calibration (Fig. 501)
(a) Set the switch (15) to VACUUM.
(b) Set the switch (16) to INLET.
(c) Open the OPEN TO EQUALISE valve (2).
(d) Use the HAND PUMP (11) to get the value of 10.00 in. Hg on the display (9) and display (10).
(e) Close the ISOLATOR valve (4).
(f) Close the OPEN TO EQUALISE valve (2).
(g) Set the switch (16) to EXHAUST.
(h) Set the switch (15) to PRESSURE.
(i) Get the EICAS EPR values for EPR values from the test set.
1) Open the ISOLATOR valve (4).

NOTE: The value on the display (9) will show an increase.

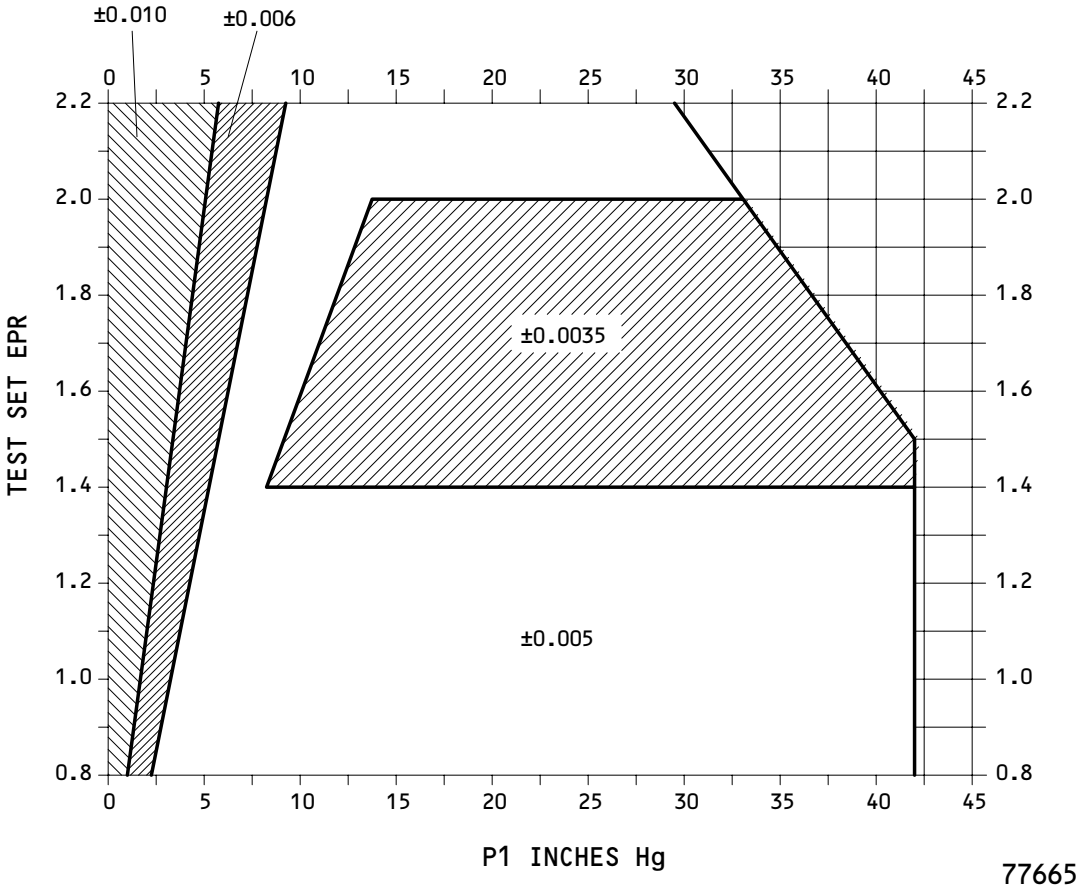
2) Close the ISOLATOR valve (4) when the EPR on display (8) is 1.1.
3) Make a record of the EPR value from display (8) on the test set.
4) Make a record the EICAS EPR value.
5) Do these steps again for each of these EPR values: 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, and 1.8.

NOTE: To get these EPR values, use the HAND PUMP (11) or the EXHAUST FINE ADJUST valve (7) on the test set if it is necessary.

(j) Find the CHANGE IN EPR INDICATION value for the applicable letter code for the EPR trim plug (Fig. 503).
1) Make a record of the CHANGE IN EPR INDICATION value for each of the EPR values, 1.1 through 1.8.
(k) Calculate the corrected EICAS EPR.
1) For the letter codes P through EE (Fig. 503, Sheet 1), subtract the CHANGE IN EPR INDICATION value from the EICAS EPR.
2) For the letter codes A through O (Fig. 503, Sheet 2), add the CHANGE IN EPR INDICATION value to the EICAS EPR.
3) Make a record of the corrected EICAS EPR values.
(l) Find the EICAS indicated EPR tolerance for applicable test set EPR with the ambient atmospheric pressure, P1 (Fig. 504).

G. Put the Airplane Back to the Usual Position.

S 865-014-R00
(1) Stop the operation of the test set.
(a) Open the OPEN TO EQUALISE valve (2).
(b) Open the VENT valve (5).



EICAS Tolerance For Test Set EPR
Figure 504

(c) Set the power supply switch (13) to OFF.

S 865-015-R00

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

S 085-016-R00

(3) Remove the test set and the equipment.
(a) Disconnect the (115V, 400 Hz) power input lead from the engine supply connector.
(b) Disconnect the input connector (14) from the test set.
(c) Disconnect the hoses from the EPR transmitter and the test set (Fig. 502).
1) Disconnect the hoses from the P1 connector and the PINT connector on the EPR transmitter.
2) Remove the adapters from the P1 connector and the PINT connector on the EPR transmitter.
3) Connect the PF tube to the EPR transmitter.
a) Tighten the tubes (AMM 70-51-00/201).
b) Install the lockwire.
4) Disconnect the hoses from the test set.
5) Install a cap on the INLET connector (1) and the EXHAUST connector (3) (Fig. 501).

S 415-017-R00

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

(4) Close the right fan cowl panel (AMM 71-11-04/201).

TASK 77-11-00-735-018-R00

3. EPR P1 System Test

A. Equipment
(1) Smiths Test Equipment
(a) EPR Test Set, Smiths 3204-KTQ-1 or RR 1702409
(b) EPR Power Lead - power input, Smiths 0101-KCQ-20 or RR 1702384
(c) EPR Pressure Hose (2 locations) Smiths 0101-KHQ-20 or RR 1702388
(d) Adapter - Rolls-Royce, UT1277 (Qty 2)
(e) Hose - to fit over the P1 probe and the adapter above, Locally available

(2) Pitot Static Test Set

NOTE: Approved for operation in the range of 0 to 10 in. Hg (0 to 5 psi, 0 to 434 kts) with a precision of ±0.2 psi.

(a) Hose - to fit on the P1 probe and connect to the test set, Locally available
(b) Adapter - Nav-Aids LTD, P18815DM-4
(c) Clean Container - minimum capacity 0.25 liters, 0.5 US/Imperial pints

B. Consumable Materials
(1) Sealing Tape - Local resources
(2) Lockwire
British Spec/Ref - DTD 189A 22 SWG
American Spec/Ref - 21 AWG
OMat No. 238

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels

D. Access
(1) Location zones

210	Control Cabin
410	Power Plant Nacelle Left
420	Power Plant Nacelle Right
413/414	Fan Cowl Panel Left
423/424	Fan Cowl Panel Right

E. Prepare for the System Test

S 015-020-R00

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

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

S 865-021-R00
(2) Examine the Smiths test set (Fig. 501)
(a) Remove the protective cap from the 115V 400 Hz connector on the matrix junction block.
(b) Remove the protective cap from the 115v 400 Hz connector (14) on the test set.
(c) Connect the power lead to the 115v 400 Hz connectors on the matrix junction block and the test set.
(d) Supply the electrical power (Ref 24-22-00/201).
(e) Put the power switch (13) to the ON position.

(f) Push the DISPLAY TEST (18) button and monitor the test sequence.

NOTE: The test sequence will continue only while you push and hold the button (18).

1) The EPR/MACH (8), EXHAUST (9) and INLET (10) display will first show all 8's followed by an increment unit count from all 0's to all 9's.

(g) Open the OPEN TO EQUALISE valve (2) and the VENT valve (5).
(h) Set the selector (17) to EPR IN HgA.
1) The EXHAUST (9) and INLET (10) pressure displays will show the atmospheric pressure in inches-of-mercury (in.Hg).
(i) Set the selector (15) to PRESSURE.
(j) Open the ISOLATION valve (4).
(k) Close the VENT valve (5).
(l) Make sure the OPEN TO EQUALISE valve (2) is open.
1) Make sure that caps are installed on the INLET connector (1) and the EXHAUST connector (3).
(m) Operate the HAND PUMP (11) to increase the pressure.
1) Increase the pressure to approximately 70 in.Hg.

NOTE: The pressure is shown on the EXHAUST (9) and the INLET (10) displays.

(n) Close the ISOLATION valve (4) and make sure the displays stay stable.

NOTE: Examine the system for leaks at least 10 minutes after you apply pressure to the system.

(o) Open the VENT valve (5).

S 865-022-R00

(3) Examine the Pitot test set.
(a) Refer to the manufacturers instructions and examine the test set.

S 865-023-R00

(4) Prepare the P1 system air tubes and the test set for the system test.
(a) Drain the P1 system.
1) Put the container below the drain point.
2) Remove the lockwire and disconnect the P1 drain cap.
a) Let the system drain.

CAUTION: YOU MUST CONNECT AND TIGHTEN THE P1 DRAIN CAP CORRECTLY. LEAKAGE IN THE P1 SYSTEM WILL CAUSE A REDUCTION IN ENGINE POWER.

3) Install the drain cap.

4) Install a lockwire on the P1 drain cap.
5) Loosen the P clips at the locations A, B, C, and D (Fig. 506).

S 865-024-R00

(5) Prepare the Smiths test set to examine the P1 system.
(a) Make a record of the INLET (10) display as the barometric pressure.
(b) Remove the cap from the INLET connector (1).
(c) Connect the hose to the INLET connector (1) and the engine P1 probe.
1) Make sure there are no air leaks.
(d) Seal the drain hole on the bottom of the P1 probe with seal tape.
1) Make sure there are no air leaks.
(e) Close the VENT valve (5).
(f) Set the selector (16) to INLET.
(g) Open the ISOLATION valve (4).

S 865-025-R00

(6) Prepare the Pitot test set to examine the P1 system.
(a) Connect the hose assembly to the P1 probe.
1) Make sure there are no air leaks.
(b) Seal the drain hole on the bottom of the P1 probe with seal tape.
1) Make sure there are no air leaks.
(c) Prepare the test set to apply pressure.

F. Do the pressure test for the P1 system.

S 735-026-R00

(1) Do the P1 pressure test with the Smiths test set.

CAUTION: YOU MUST PREVENT DAMAGE TO THE FUEL FLOW GOVERNOR (FFG) AND THE EPR TRANSMITTER. DO NOT INCREASE THE PRESSURE MORE THAN 10 INCHES HG (5 PSI, 434 KTS) FROM THE BAROMETERIC PRESSURE.

(a) Operate the hand pump (11) slowly to increase the pressure.
1) Increase the pressure to 8 in. Hg (4 psi, 392 kts) more than the barometric pressure.
(b) Close the ISOLATOR valve (4).
(c) Hold the pressure for two minutes.

NOTE: Use the INLET FINE ADJUST (6) to get the correct pressure, if it is necessary.

(d) Let the system become stable.
(e) Monitor the INLET (10) display for pressure leakage.
1) Wait for 2 minutes.
2) If the leakage is less than 1 in Hg (0.5 psi, 20 kts), do the paragraph: Examine the drain hole of the P1 probe for blockage.
3) If the leakage is more than 1 in Hg (0.5 psi, 20 kts), do the paragraph: Repair the leakage from the air tubes of the P1 system.
(f) Open the VENT valve (5).

S 735-027-R00
(2) Do the P1 pressure test with the pitot test set.

CAUTION: YOU MUST PREVENT DAMAGE TO THE FUEL FLOW GOVERNOR (FFG) AND THE EPR TRANSMITTER. DO NOT INCREASE THE PRESSURE MORE THAN 10 INCHES HG (5 PSI, 434 KTS) FROM THE BAROMETRIC PRESSURE.

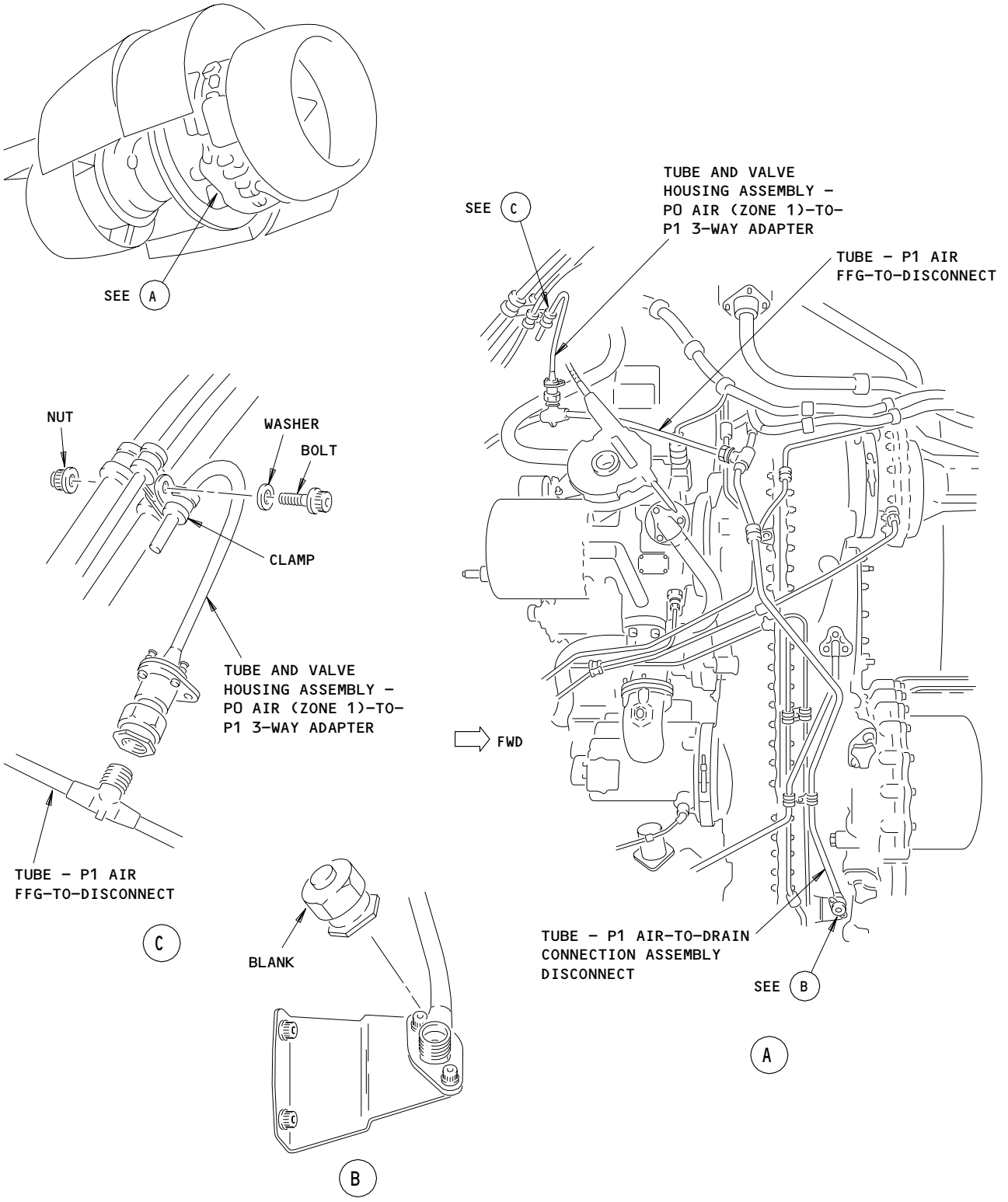
(a) Increase the pressure to 8 in. Hg (4 psi, 392 kts) more than the barometric pressure.
(b) Hold the pressure for 2 minutes.
1) Let the system become stable.
(c) Monitor the pressure leakage.
1) Wait for two minutes.
2) If the leakage is less than 1 in Hg (0.5 psi, 20 kts), do the paragraph: Examine the drain hole for the P1 probe for blockage.
3) If the leakage is more than 1 in Hg (0.5 psi, 20 kts), do the paragraph: Repair the leakage from the air tubes for the P1 system.
(d) Release the pressure.

G. Examine the drain hole for the P1 probe for blockage.

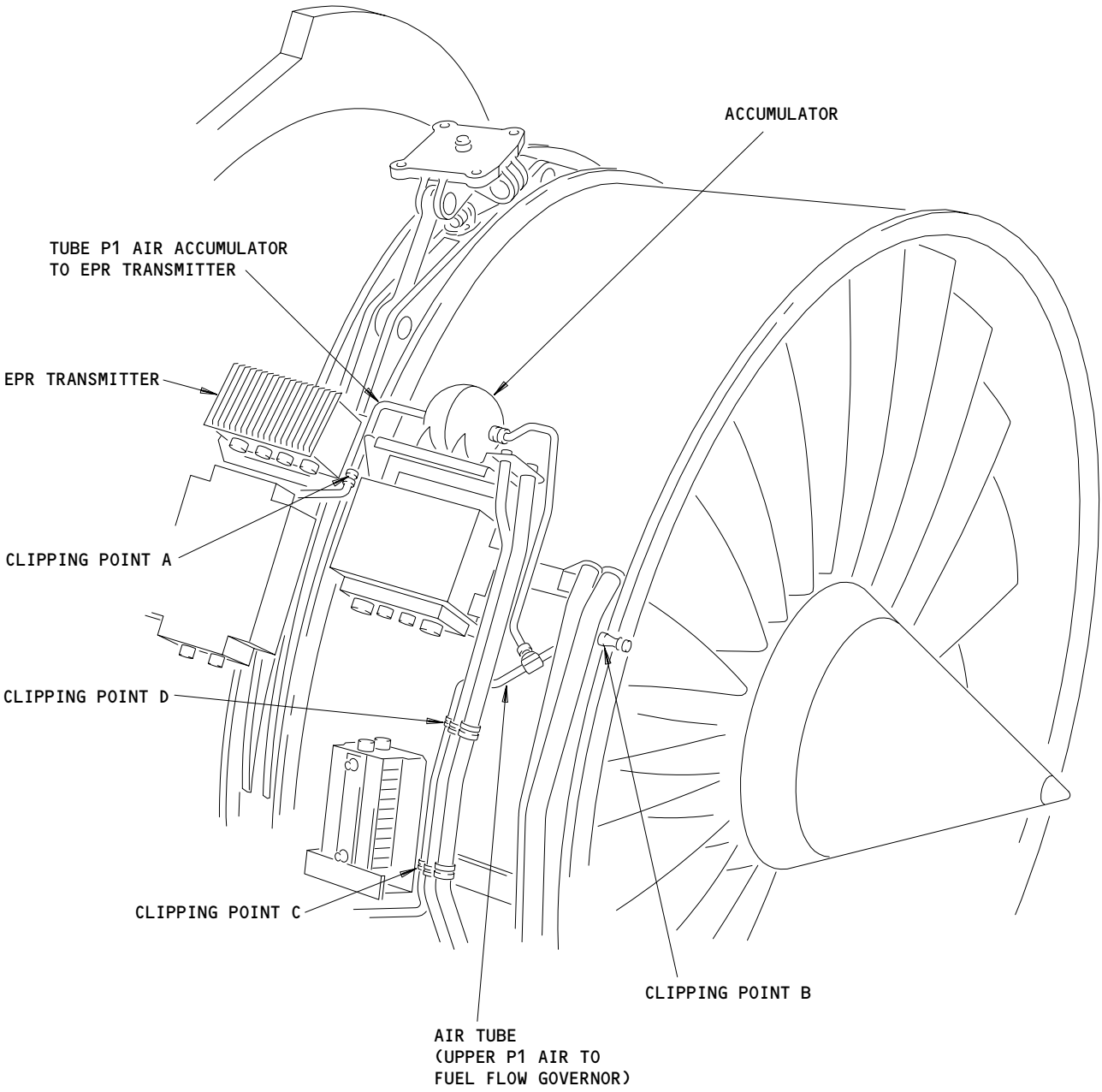
S 215-052-R00
(1) Examine the drain hole for the P1 probe for blockage.
(a) Apply a pressure of four psi to the system.
(b) Remove the seal tape from the drain hole of the P1 probe.
(c) If the pressure does not decrease, examine the P1 drain for blockage.

H. Repair the leakage from the air tube in the P1 system (Fig. 505).

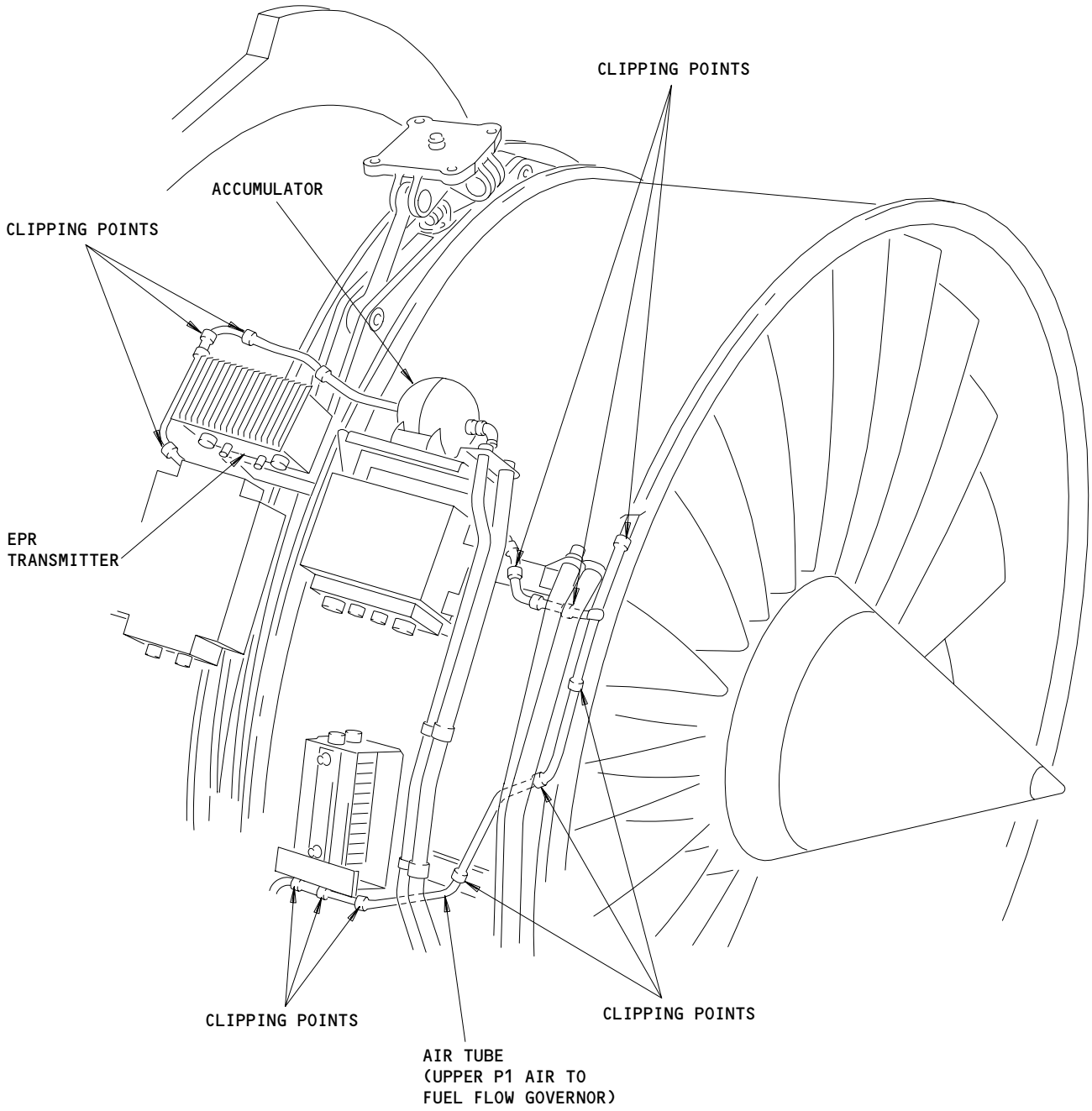
S 735-029-R00
(1) Do the P1 system pressure test with your finger over the open tube vent of the tube and valve assembly.
(a) If the pressure is stable, replace the P0 Air (Zone 1) tube and valve housing.
(b) If the pressure is not stable, examine the flange on the valve housing of the P0 Air (Zone 1) tube (3) for leakage (Fig. 505):
1) If leakage is found, replace the P0 Air (Zone 1) tube.



PO Air (Zone 1) to P2 Tube and Valve Housing Assembly and P1 Air Drain Connection
Figure 505



Clip Points for the P1 System Air Tubes
Figure 506 (Sheet 1)



Clip Points for the P1 System Air Tubes
Figure 506 (Sheet 2)

2) If leakage is not found, do these steps:
   a) Examine the hose connection.
   b) Examine the tape that seals the drain hole on the P1 probe.
   c) Examine the air tube connections on the P1 system.
   d) Examine the accumulator and the blank (Fig. 505).
   e) Do the repairs if it is necessary.
   f) Do the pressure test for the P1 system again.

S 305-030-R00

(2) Replace the (P0 air (zone 1)-to-P1 3-way adapter) tube and valve assembly (Fig. 505).
   (a) Remove the lockwire on the P0 Air (Zone 1) tube.
   (b) Disconnect the P0 Air (Zone 1) tube from the P1 Air (FFG-to-Disconnect) tube.
   (c) Remove the nut, the bolt, and the washer that attaches the clamp.
   (d) Remove the P0 Air (zone 1) tube and the clamp.
   (e) Remove the clamp.
   (f) Put the clamp on the replacement tube.

CAUTION: YOU MUST CONNECT AND TIGHTEN THE P1 SYSTEM CONNECTIONS CORRECTLY. LEAKAGE IN THE P1 SYSTEM WILL CAUSE A REDUCTION IN ENGINE POWER.

   (g) Connect the P0 Air (Zone 1) tube to the P1 Air (FFG-to-Disconnect) tube.
      1) Do not tighten the tube union nut at this time.
   (h) Install the clamp with the nut, the bolt and the washer (Ref 70-51-00/201).
   (i) Tighten the tube union nut that attaches the P0 Air (Zone 1) tube to the P1 Air (FFG-to-Disconnect) tube (AMM 70-51-00/201).
   (j) Install a lockwire on the tube union nut.
   (k) Do the P1 system pressure test again.

I. Put the Airplane Back to Its Usual Condition.

S 085-031-R00

(1) Disconnect the Smiths test set:
   (a) Remove the hose from the engine P1 probe and test set.
   (b) Remove the tape that seals the P1 probe drain hole.
   (c) Put the power switch (13) to the OFF position (Fig. 501).
   (d) Remove the electrical power if it is no longer necessary.
   (e) Disconnect the power lead from the matrix junction block and test set.
   (f) Install the protective caps to the 115v 400 Hz connectors on the matrix junction block and test set.
   (g) Install the blank to the INLET (1) connector.

S 085-032-R00

(2) Disconnect the Pitot test set:
  (a) Remove the hose from the engine P1 probe and test set.
  (b) Remove the seal tape from the P1 probe drain hole.
  (c) Install the protective cap to the INLET (1) connector.

S 435-033-R00

(3) Tighten the P clips that were loosened (AMM 70-51-00/201).

S 865-034-R00

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

(4) Close the right fan cowl panel (AMM 71-11-04/201).

TASK 77-11-00-705-108-R00

4. PF System Air Tubes - Pressure Test

A. Equipment
  (1) Smiths Test Equipment
    (a) Test Set (Smiths 3204-KTQ-1) - Rolls Royce 1702409
    (b) Powerlead (Smith 0101-KCQ-20) - Rolls Royce 1702384
    (c) Hose (Smiths 0101-KHQ-20) - Rolls Royce 1702388
    (d) Adapter to fit hose (c) and connector and PF air tube end connector - Local manufacure
  (2) Pitot Static Test Set (Alternate)

    NOTE: Approved for operation in the range of 0 to 10 in. Hg (0 to 5 psi, 0 to 434 kts) with a precision of ±0.2 psi.

  (3) PR Rake Blanks
    (a) Rubber bungs to fit each pitot tube - local manufacture

B. Consumable Materials
  (1) Soap and water solution to identify leaks - local suppply

C. References
  (1) AMM 24-22-00/201, Electrical Power
  (2) AMM 70-51-00/201, Torque Tightening Technique
  (3) AMM 71-11-04/201, Fan Cowl Panels
  (4) AMM 72-03-01/401, Compressor Faisings
  (5) AMM 77-11-04/601, EPR Indicating System Air Tubes
  (6) AMM 78-31-00/201, Thrust Reverser System

D. Prepare for the Test

S 015-056-R00

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

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

S 015-102-R00

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

(2) Open the left and the right-hand thrust reverser C-ducts (AMM 78-31-00/201).

E. Do a check of the airflow through the system.

S 025-058-R00

(1) Disconnect the PF tube from the EPR transmitter (Fig. 506).

S 485-059-R00

(2) Connect a low pressure air supply to the PF tube.

S 865-060-R00

(3) Supply air to the tube at 10 psig.

S 795-061-R00

(4) Make sure that there is a free flow of air from each of the PF pitot heads.
(a) If you find a blockage, you must remove it before you do the system pressure test.

F. Do a check with the test set (Fig. 501/507).

S 845-062-R00

(1) Identify the 115V 400Hz connector at the power source.
(a) Remove the cover that protects the socket.

S 215-063-R00

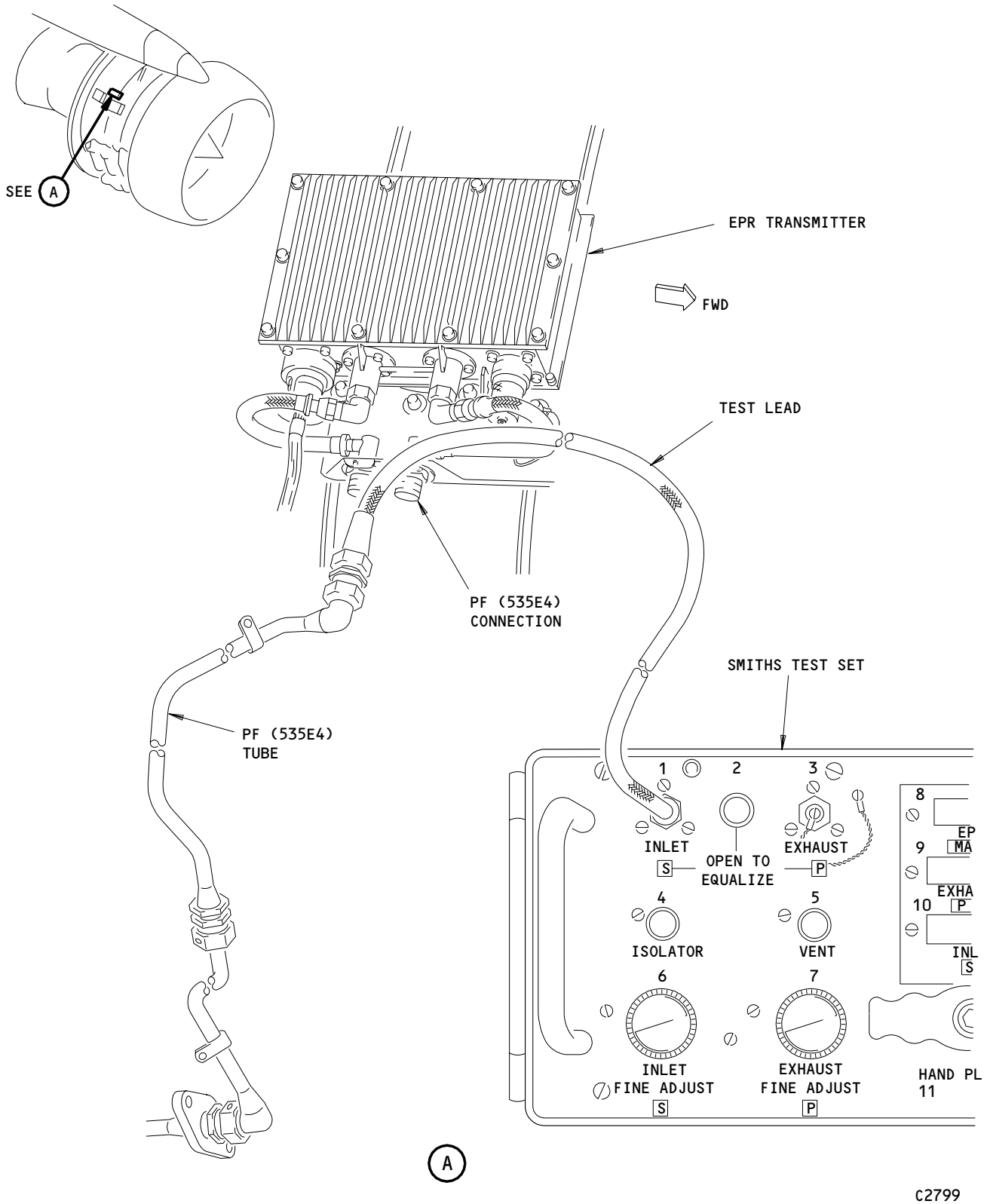
(2) Identify the 115V 400Hz connector (14) on the test set.
(a) Remove the cover that protects the socket.

S 485-064-R00

(3) Connect the power lead to the 115V 400Hz connectors at the power source and on the test set.

S 865-065-R00

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



Smiths Test Set to Engine - Test Lead Connections
Figure 507

S 865-109-R00
(5) Put the power switch (13) to the ON position.

S 735-066-R00
(6) Push and hold the DISPLAY TEST button (18) and monitor the test sequence.

NOTE: The test sequence will continue only while you push the DISPLAY TEST button (18).

(a) The EPR (8), EXHAUST (9) and INLET (10) displays will initially show 8 at all positions.
(b) The displays will then show a test count from 0 at all positions through 9 at all positions in increments of one.

S 735-067-R00
(7) Open the OPEN TO EQUALIZE (2) and the VENT (5) valves.

S 735-068-R00
(8) Set the selector (17) to the EPR in HgA position.
(a) The EXHAUST (9) and INLET (10) displays will show the atmospheric pressure in inches-of-mercury (in. Hg.).

S 735-069-R00
(9) Set the selector (15) to the PRESSURE position.

S 735-070-R00
(10) Open the ISOLATOR valve (4).

S 735-071-R00
(11) Close the VENT valve (5).

S 735-072-R00
(12) Make sure that the OPEN TO EQUALIZE valve (2) is in the open position.
(a) Make sure that the blanks are installed on the INLET (1) and EXHAUST (3) connectors.

S 735-073-R00
(13) Use the HAND PUMP (11) to increase the pressure to approximately 70 in. Hg.
(a) This value will be shown on the EXHAUST (9) and INLET (10) displays.

S 735-074-R00
(14) Close the ISOLATOR valve (4). Make sure that the values, shown on the displays, stay stable.

NOTE: Let the system be pressurized for more than 10 minutes before you do a check for leaks.

S 735-075-R00
(15) Open the VENT valve (5).

G. Prepare the System for the Pressure Test.

S 485-076-R00
(1) Install the rubber bungs in each of the PF rakes:
- In the upper splitter fairing
- In the left and the right A frame structures
- In the radial drive fairing

H. Prepare the Test Set for the Pressure Test (Fig. 501).

S 735-077-R00
(1) Make sure that the selector (17) is set to the EPR in HgA position.

S 735-078-R00
(2) Make a note of the value shown on the INLET display (10). Write this value as a barometric pressure.

S 735-079-R00
(3) Remove the blank from the INLET connector (1) on the test set.

S 485-080-R00
(4) Use the adapter to connect the hose to the disconnected end of the PF tube (at the EPR transmitter).

S 485-081-R00
(5) Connect the free end of the hose to the INLET connector (1) on the test set.

S 735-082-R00
(6) Close the VENT valve (5).

S 735-083-R00
(7) Close the OPEN TO EQUALIZE valve (2).

S 735-084-R00
(8) Set the selector (16) to the INLET position.

S 735-085-R00
(9) Open the ISOLATOR valve (4).

I. Do a Pressure Check of the System.

S 735-086-R00
(1) Operate the HAND PUMP (11) until you see an EPR value of 1.8 on the EPR display (8).

S 735-087-R00
(2) Close the ISOLATOR valve (4).

NOTE: The total length of the tubes in the PF system is very long. There is also a device in the system that puts a limit on the flow of air through the tubes. It is possible that you will have to operate the pump seven times or more to completely pressurize the system.

S 795-088-R00
(3) If you cannot pressurize the system, it is possible that the system has a leak.
(a) If you think there is a leak, do the step: Find the leaks in the system.

S 735-089-R00
(4) Monitor the EPR display (8) for 2 minutes.
(a) If the EPR value becomes less than 1.6, open the VENT valve (5) and do the step: Find the leaks in the system.
(b) If the EPR value does not become less than 1.6, open the VENT valve (5) and do the step: Put the engine back to its initial condition.

J. Find the Leaks in the System.

NOTE: Use a soap and water solution to identify leaks. You will see bubbles where there are leaks.

S 215-090-R00
(1) Do a check of the hose connections and each of the rubber bungs in the PF rakes.

S 015-091-R00
(2) Remove the IP gas generator fairings (AMM 72-03-01/401).

S 215-092-R00
(3) Do a check of all the areas that follow:
(a) The tube connectors
(b) The three bolt flanges
1) Do a check of the torque of the bolts (AMM 70-51-00/201).

S 215-093-R00
(4) Do a check of the tubes for damage (AMM 77-11-04/601).

S 365-094-R00
(5) Repair any leaks or damage that you find.

S 415-095-R00
(6) Install the IP gas generator fairing (AMM 72-03-01/401).

S 215-096-R00
(7) Do this step again: Do a pressure check of the system.

K. Put the Engine Back to its Initial Condition.

S 735-097-R00
(1) Put the power switch (13) on the test set to the OFF position.

S 865-110-R00
(2) Remove the electrical power (AMM 24-22-00/201).

S 085-098-R00
(3) Remove the power lead from the 115V 400Hz connectors at the power source and the test set.

S 845-107-R00
(4) Install the cover that protects the power source.

S 845-106-R00
(5) Install the cover that protects the power socket (14) on the test set.

S 085-100-R00
(6) Remove the hose and the adapter from the PF tube.

S 845-101-R00
(7) Remove the hose from the INLET connector (1) on the test set.

S 845-102-R00
(8) Install the blank on the INLET connector (1) on the test set.

S 085-103-R00
(9) Remove the test set.

S 085-104-R00
(10) Remove all of the rubber bungs in each of the PF rakes:
(a) In the upper splitter fairing.
(b) In the left and the right A frame structures.
(c) In the radial drive fairing.

S 425-111-R00
(11) Connect the PF tube to the EPR transmitter (Fig. 507). Tighten the connector (AMM 70-51-00/201) and safety with lockwire.

S 415-103-R00

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

(12) Close the left and the right-hand thrust reverser C-ducts (AMM 78-31-00/201).

S 415-104-R00

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

(13) Close the right fan cowl panel (AMM 71-11-04/201).

ENGINE PRESSURE RATIO (EPR) TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the EPR transmitter. The second task installs the EPR transmitter.

TASK 77-11-01-004-001-R00

2. Remove the EPR Transmitter
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location zones
          210 Control Cabin
          410 Power Plant Nacelle Left
          420 Power Plant Nacelle Right
          413/414 Fan Cowl Panel Left
          423/424 Fan Cowl Panel Right

   C. Remove the EPR transmitter (Fig. 401).

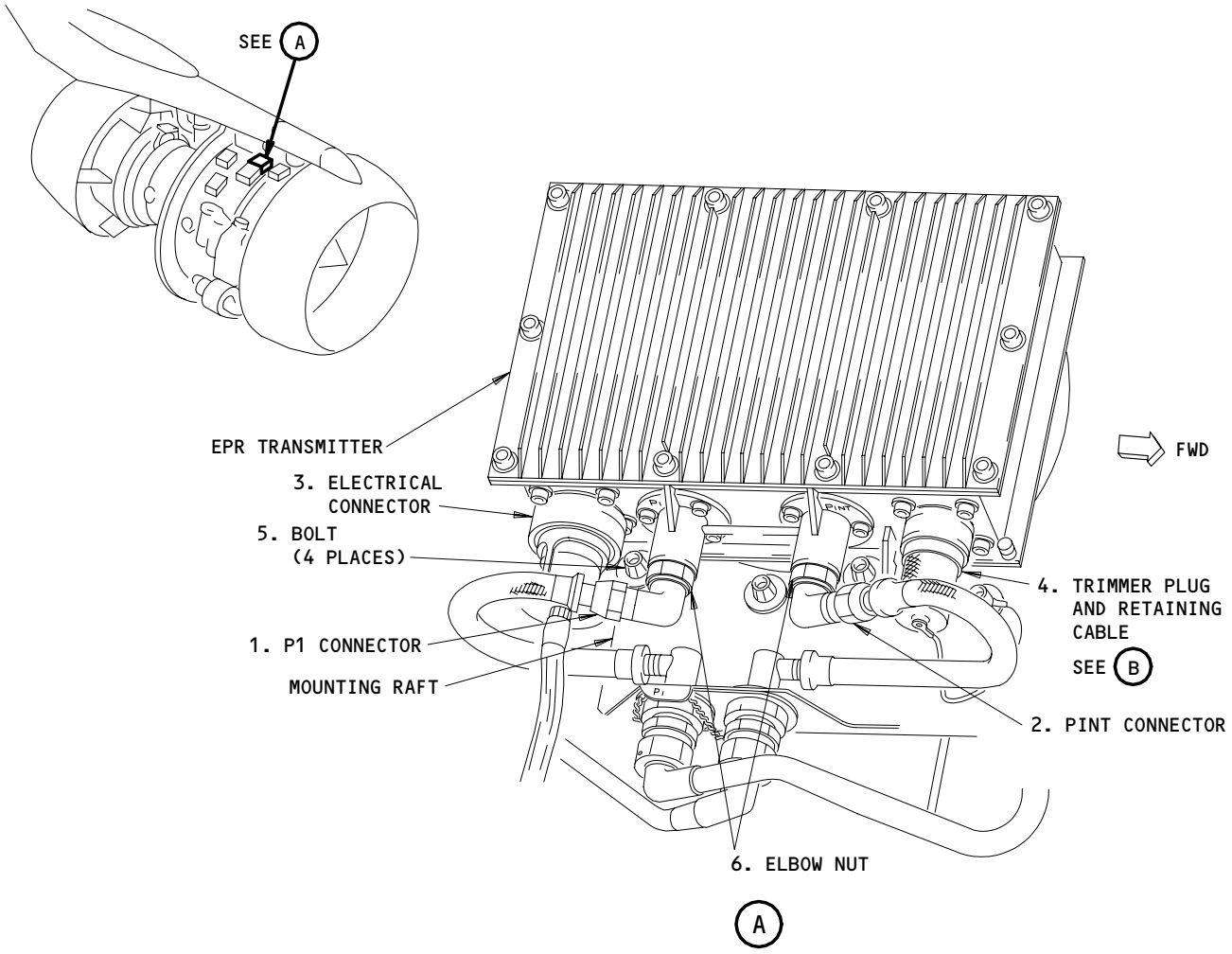
      S 864-002-R00
      (1) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
          (a) 11L9, LEFT ENGINE EPR XMTR

      S 864-003-R00
      (2) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
          (a) 11L36, RIGHT ENGINE EPR XMTR

      S 014-004-R00

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

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



EPR Transmitter Installation
Figure 401

S 024-005-R00

(4) Remove the transmitter from the engine.
  (a) Disconnect the P1 connector (1).
  (b) Disconnect the PINT connector (2).

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR DOES NOT HAVE CONTAMINATION FROM UNWANTED LIQUIDS AND SOLIDS BEFORE YOU DISCONNECT THE CONNECTOR. DAMAGE TO THE AIRPLANE CAN OCCUR.

  (c) Disconnect the electrical connector (3).

CAUTION: DO NOT REMOVE THE COVER FROM THE TRIMMER PLUG. DAMAGE OR THE CONTAMINATION OF THE TRIMMER PLUG CAN OCCUR.

  (d) Disconnect the trimmer plug (4).
    1) Do not remove the cable and the plug from to the mounting raft of the EPR transmitter.
  (e) ENGINES POST-RR-SB 72-9461;
    Disconnect the bonding lead from the EPR transmitter.
    1) Remove the nut, bolt and washers.
  (f) Hold the EPR transmitter.
  (g) Remove the four bolts (5) to remove the transmitter.

S 864-006-R00

(5) Install the dust caps on all open holes and connectors.

TASK 77-11-01-404-007-R00

3. Install the EPR Transmitter

A. Consumable Materials
  (1) Cleaning fluid, Isopropanol (Isopropanol alcohol)
    British Spec/Ref - "Analar" grade
    OMat No. 1/119
  (2) Cloth - Lint free
  (3) Lacing tape 274

B. References
  (1) AMM 70-50-02/201, Connection of Electrical Plugs
  (2) AMM 70-51-00/201, Torque Tightening Technique
  (3) AMM 71-11-04/201, Fan Cowl Panels
  (4) AMM 77-11-00/501, Engine Pressure Ratio (EPR) Indicating System

C. Access
(1) Location zones
210 Control Cabin
410 Power Plant Nacelle Left
420 Power Plant Nacelle Right
413/414 Fan Cowl Panel Left
423/424 Fan Cowl Panel Right

D. Install the EPR transmitter (Fig. 401).

S 864-008-R00
(1) Remove the dust caps from all holes and connectors.

S 424-009-R00
(2) Install the transmitter on the engine.
(a) Put the EPR transmitter on the mounting raft.
(b) Install the four bolts (5) (AMM 70-51-00/201).
(c) ENGINES POST RR SB 72-9461;
Install the bonding lead to the EPR transmitter.
1) Install the nut, bolt, and washers and tighten the nut (AMM 70-51-00/201).

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR DOES NOT HAVE CONTAMINATION FROM UNWANTED LIQUIDS AND SOLIDS BEFORE YOU CONNECT THE CONNECTOR. DAMAGE TO THE AIRPLANE CAN OCCUR.

(d) Install the electrical connector (3) (AMM 70-50-02/201).
(e) Install the trimmer plug (4).
1) Install the trimmer plug (4) to the transmitter (AMM 70-50-02/201).

WARNING: WHEN YOU USE THE CLEANING FLUID, MAKE SURE THE WORK AREA HAS A GOOD FLOW OF AIR. DO NOT LET THIS MATERIAL TOUCH YOUR SKIN. DO NOT BREATH THE GAS FROM THIS MATERIAL. THIS MATERIAL CAN INJURE YOU.

2) Degrease the trimmer plug cover and external surfaces of the retaining cable.
a) Wipe the cleaning fluid on the cover and the surfaces with a swab.
b) Let the cover and the surfaces become dry.
3) Wrap the retaining cable around the trimmer plug cover (Fig. 401).
4) Attach the cable at two locations with the lacing tape.
a) The length of the ends of the knot must be 0.394 inch (10.00 mm).

CAUTION: YOU MUST CONNECT AND TIGHTEN THE P1 SYSTEM CONNECTIONS CORRECTLY. LEAKAGE IN THE P1 SYSTEM WILL CAUSE A REDUCTION IN ENGINE POWER.

(f) Connect the P1 connector (1) and tighten to 26 pound-inches (2.9 Nm).
(g) Loosen the P1 elbow nut (6).
(h) Adjust the position of flexible P1 air tube to get a minimum clearance of 0.250 inch (6.35 mm) between the tube and adjacent backclamp of the electrical connector (3).

CAUTION: YOU MUST CONNECT AND TIGHTEN THE P1 SYSTEM CONNECTIONS CORRECTLY. LEAKAGE IN THE P1 SYSTEM WILL CAUSE A REDUCTION IN ENGINE POWER.

(i) Tighten the P1 elbow nut to 30-40 pound-inches (3.39-4.52 Nm).
(j) Connect the PINT connector (2) and tighten to 26 pound-inches (2.9 Nm).
(k) Loosen the PINT elbow nut (6).
(l) Adjust the position of flexible PINT air tube to get a minimum clearance of 0.50 inch (12.7 mm) between the tube and adjacent hardware.
(m) Tighten the PINT elbow nut (6) to 30-40 pound-inches (3.39-4.52 Nm).

S 864-010-R00

(3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel.
(a) 11L9, LEFT ENGINE EPR XMTR

S 864-011-R00

(4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breakeron the P11 overhead panel.
(a) 11L36, RIGHT ENGINE EPR XMTR

S 724-012-R00

(5) Do the functional test for the EPR system (AMM 77-11-00/501).

NOTE: This test is not necessary if the replacement EPR transmitter is new, was overhauled in the shop or was repaired and tested in the shop.

S 414-013-R00

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

(6) Close the right fan cowl panel (AMM 71-11-04/201).

P1 AIR ACCUMULATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the P1 air accumulator. The second task installs the P1 air accumulator.

   TASK 77-11-02-004-001-R00

2. Remove the P1 Air Accumulator
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

      (2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

   C. Remove the P1 Air Accumulator (Fig. 401)

      S 014-002-R00

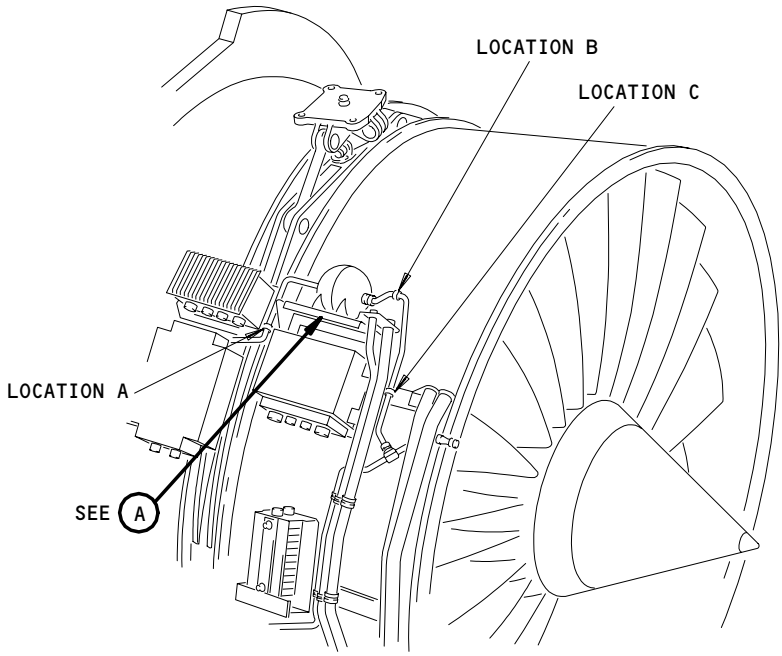
      CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU OPEN THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

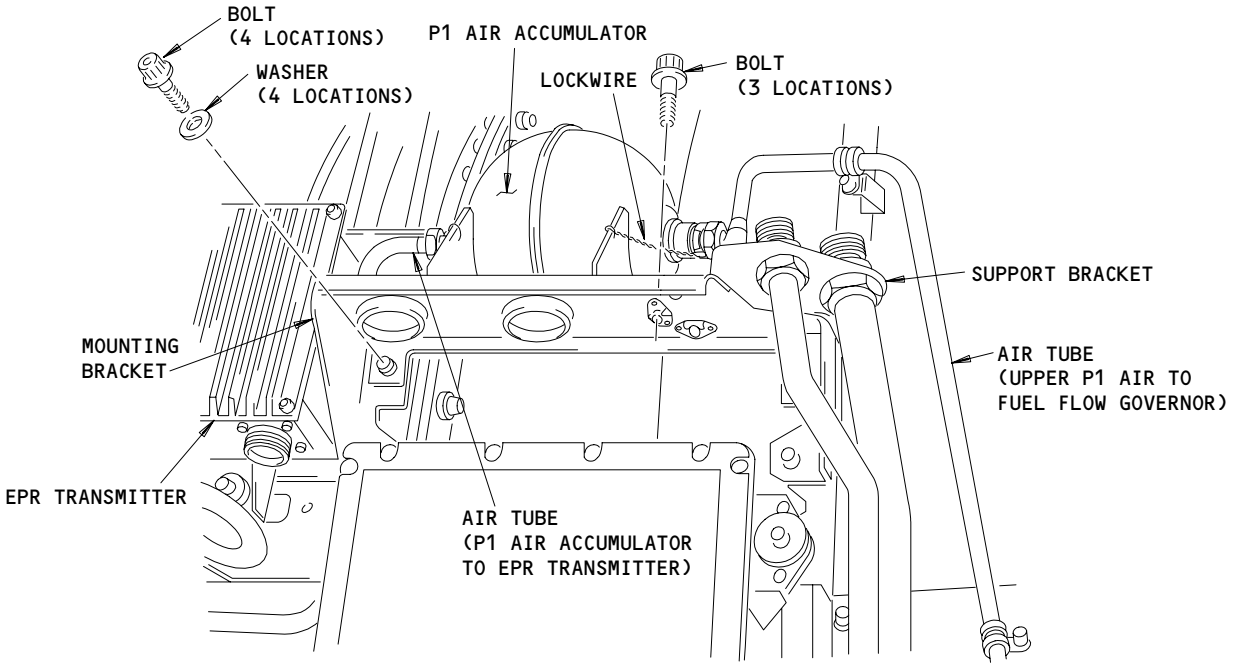
      (1) Open the right fan cowl panel (AMM 71-11-04/201).

      S 034-003-R00
      (2) Disconnect the two air tubes on the P1 air accumulator:
         (a) Remove the lockwire from the connectors for the two air tubes.
         (b) Disconnect the air tube from the EPR transmitter.
         (c) Disconnect the air tube from the fuel flow governor.
         (d) Remove the tube clamps at the locations A, B, and C (Fig. 401).

      S 034-004-R00
      (3) Remove the three bolts that attach the support bracket to the mounting bracket for the P1 air accumulator.

      S 024-005-R00
      (4) Remove the P1 air accumulator:
         (a) Remove the four bolts and the four washers from the mounting bracket of the P1 air accumulator.





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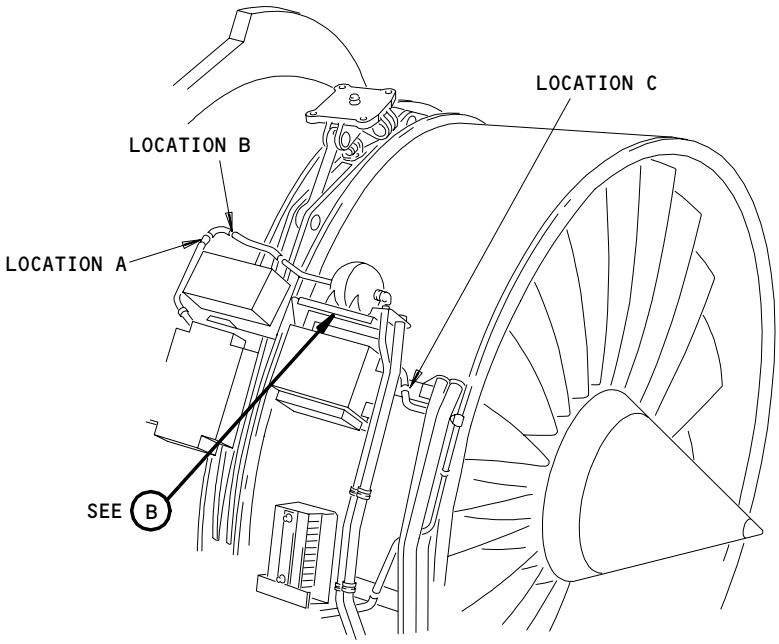
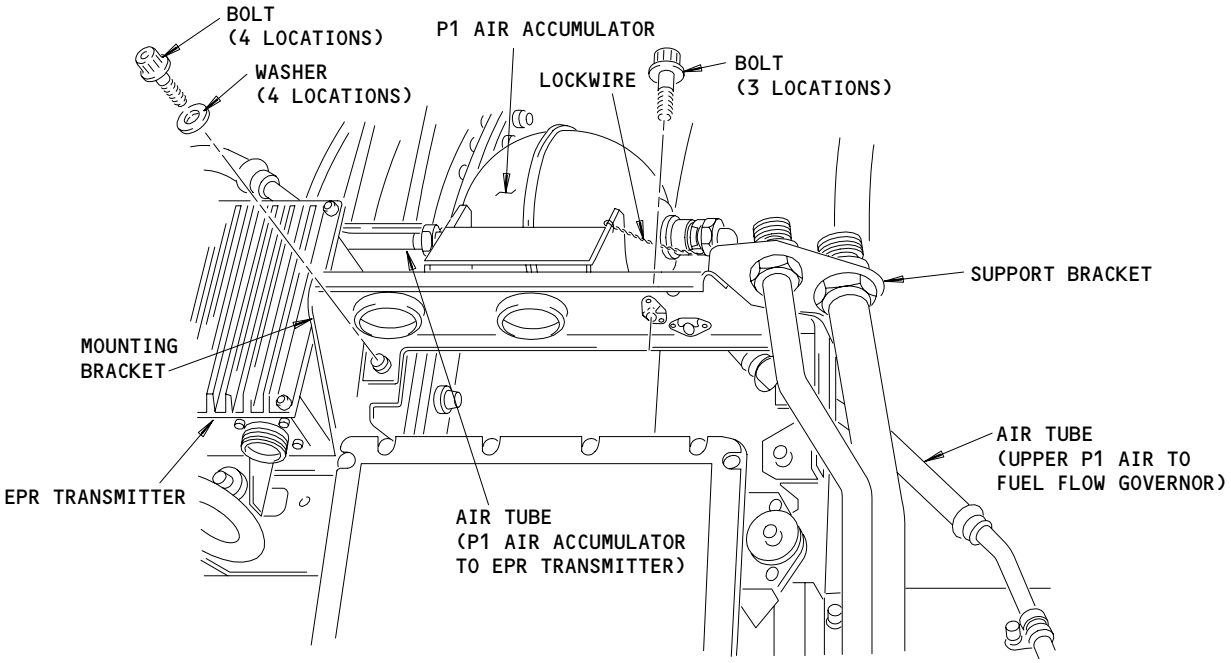
P1 Air Accumulator Installation
Figure 401 (Sheet 1)





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P1 Air Accumulator Installation
Figure 401 (Sheet 2)

(b) Remove the P1 air accumulator from the fan case bracket.

S 864-006-R00

(5) Install dust caps on all the tube ends.

TASK 77-11-02-404-007-R00

3. Install the P1 Air Accumulator

A. Consumable Materials

(1) Lockwire
British Spec/Ref - DTD 189A 22 SWG
American Spec/Ref - 21 AWG
OMat No. 238

B. References

(1) AMM 70-51-00/201, Torque Tightening Technique
(2) AMM 71-11-04/201, Fan Cowl Panels

C. Access

(1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

(2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

D. Install the P1 Air Accumulator (Fig. 401)

S 864-008-R00

(1) Remove the dust caps from all the tube ends.

S 424-009-R00

(2) Install the P1 air accumulator:
(a) Put the P1 air accumulator into the correct position on the fan case bracket.
(b) Install the four bolts and the four washers through the mounting bracket on the P1 air accumulator.
1) Do not tighten the four bolts at this time.

S 434-010-R00

(3) Install the three bolts to attach the support bracket to the mounting bracket on the P1 air accumulator.
(a) Tighten the three bolts (AMM 70-51-00/201).

S 424-011-R00

(4) Tighten the four bolts in the mounting bracket of the P1 air accumulator (AMM 70-51-00/201).

S 434-015-R00

CAUTION: YOU MUST CONNECT AND TIGHTEN THE P1 SYSTEM CONNECTIONS CORRECTLY. LEAKAGE IN THE P1 SYSTEM WILL CAUSE A REDUCTION IN ENGINE POWER.

(5) Connect the two air tubes to the P1 air accumulator:
  (a) Connect the air tube from the EPR transmitter.
  (b) Connect the air tube from the fuel flow governor.
  (c) Install the clamps on the tubes at the locations A, B and C (Fig. 401).
    1) Tighten the clamp bolts (AMM 70-51-00/201).

S 414-013-R00

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

(6) Close the right fan cowl panel (AMM 71-11-04/201).

P1 AIR ACCUMULATOR - INSPECTION/CHECK

1. General
   A. This procedure has one task. This task examines the P1 air accumulator.

   TASK 77-11-02-206-001-R00

2. P1 Air Accumulator - Inspection/Check
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 77-11-02/401, P1 Air Accumulator
   B. Access
      (1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

      (2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

   C. Examine the P1 Air Accumulator (Fig. 601)

      S 016-002-R00

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

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

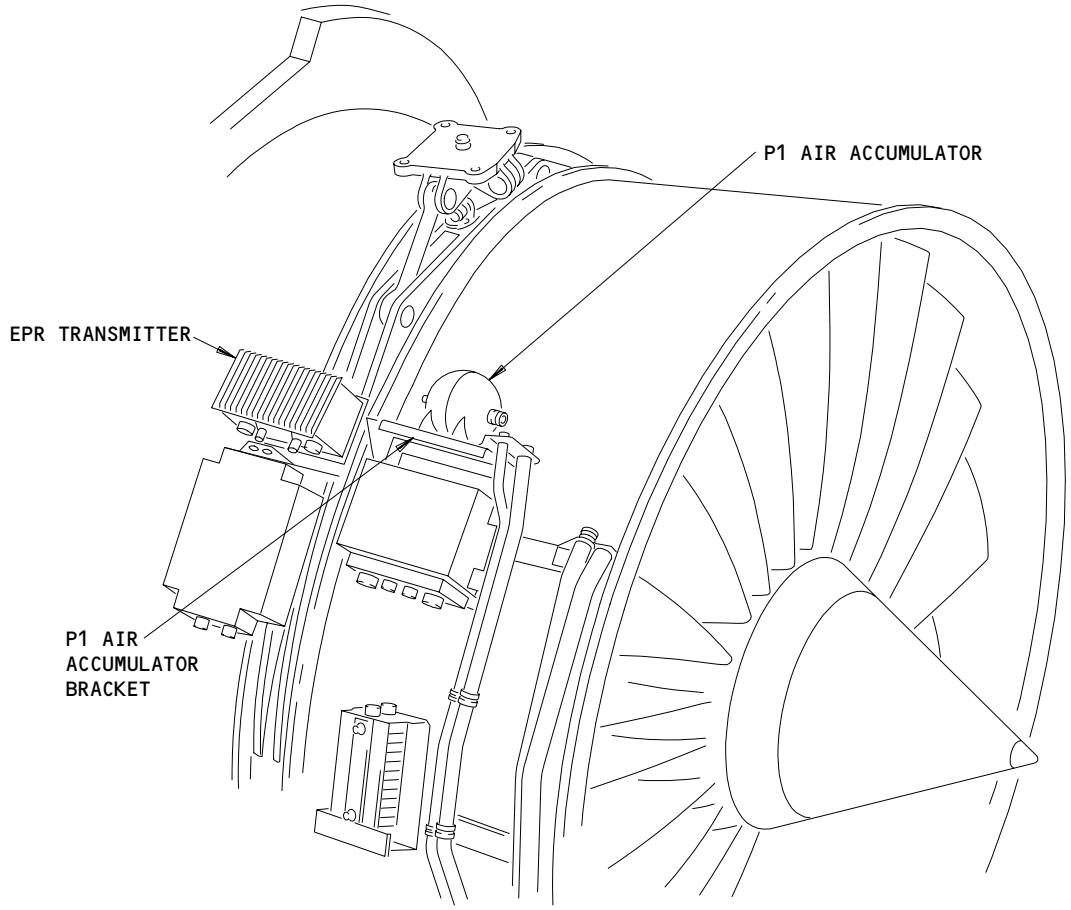
      S 216-003-R00

      (2) Visually examine the mounting bracket on the P1 air accumulator for cracks.
         (a) If there are cracks in the mounting bracket of the P1 air accumulator, replace the P1 air accumulator (AMM 77-11-02/401).

      S 416-004-R00

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

      (3) Close the right fan cowl panel (AMM 71-11-04/201).



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P1 Air Accumulator Inspection
Figure 601

PF RAKES - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the steps to do a temporary repair of the PF rakes when a pitot head is not there.

TASK 77-11-04-422-001-R00

2. Install a Blank on the PF Rake Holes
   A. General
      (1) Use this procedure to cover the holes if not more than two pitot heads are not there.
   B. Reference
      (1) AMM 78-31-00/201, Thrust Reverser System
          AMM 72-34-10/801, LP Compressor
   C. Consumable Material
      (1) Adhesive Tape (Speed Tape), OMat No. 2/115 or OMat No. 298
   D. Access
      (1) Location Zones
          410 Left Power Plant
          420 Right Power Plant

      (2) Access Panels
          415AL Thrust Reverser Cowl, Left
          416AR Thrust Reverser Cowl, Right
          425AL Thrust Reverser Cowl, Left
          426AR Thrust Reverser Cowl, Right

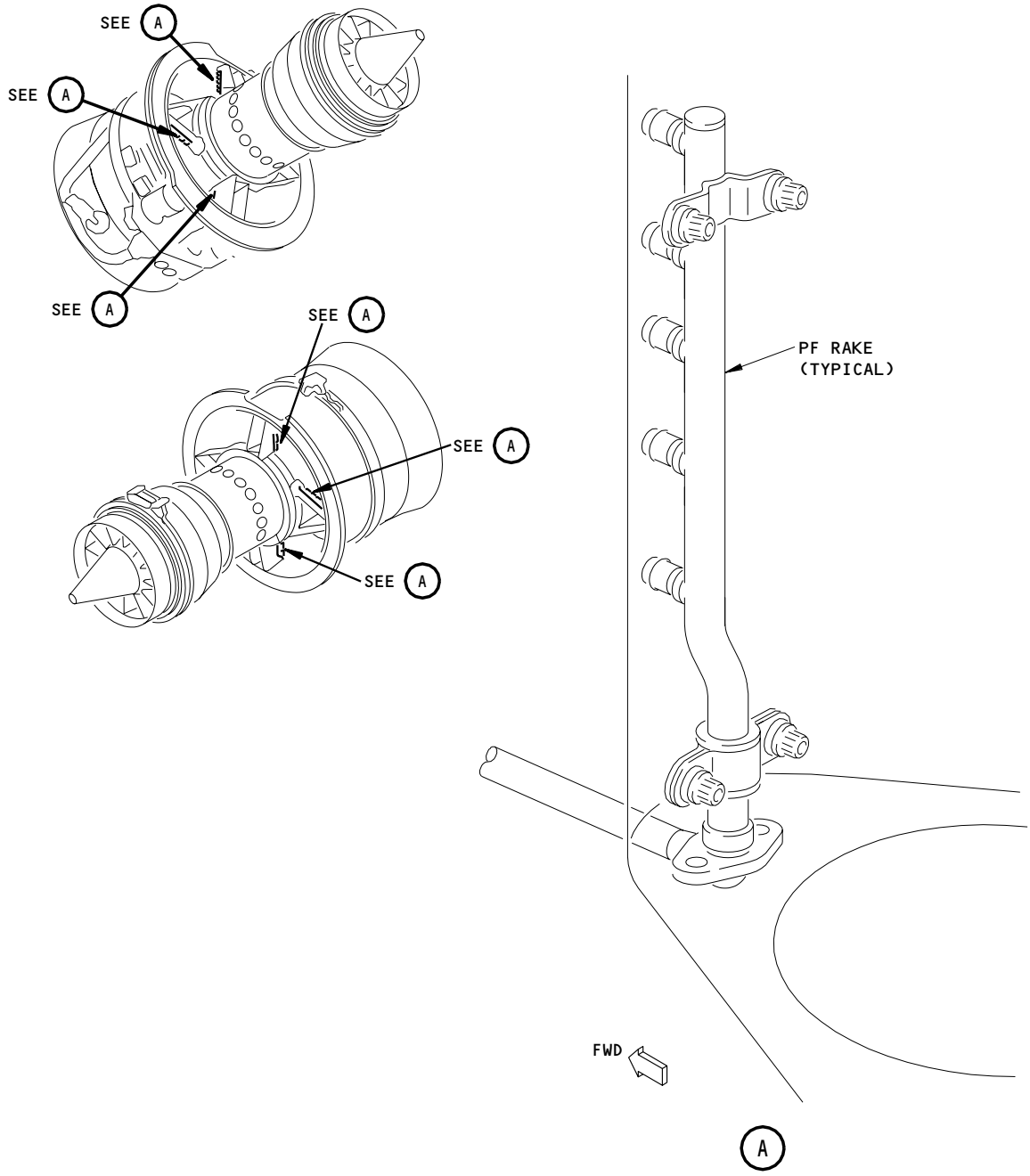
   E. Procedure

      S 012-002-R00
      (1) Prepare the airplane for the repair.

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

      (a) Open the thrust reversers (AMM 78-31-00/201).
      (b) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 352-003-R00
      (2) Repair the PF rakes (Fig. 201).
      (a) Cover the hole in the PF rake where the pitot head is not there. Use adhesive tape, OMat No. 2/115 approximately 1.5 inches (38.1 mm) long.



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PF Rakes
Figure 201

(b) If more than two pitot heads are not there, replace the pitot heads to FRS7101 (AMM 72-34-10/801)
(c) Replace the missing pitot heads at the subsequent engine removal.

S 412-004-R00

(3) Put the airplane back to its usual condition.

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

(a) Close the thrust reversers (AMM 78-31-00/201).
(b) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

EPR INDICATING SYSTEM AIR TUBES - INSPECTION/CHECK

TASK 77-11-04-206-012-R00

1. Examine the EPR Indicating System Air Tubes

A. References

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

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

B. Access

(1) Location Zones

410 Left Engine

420 Right Engine

(2) Access Panels

413AL	Fan Cowl Panel (LH)
423AL	Fan Cowl Panel (LH)
414AR	Fan Cowl Panel (RH)
424AR	Fan Cowl Panel (RH)
415AL	Thrust Reverser (LH)
425AL	Thrust Reverser (LH)
416AR	Thrust Reverser (RH)
426AR	Thrust Reverser (RH)

C. Examine the EPR Indicating System Air Tubes.

S 016-003-R00

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

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

S 016-004-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 216-001-R00

(3) Examine the rigid air tubes for cracks, dents, nicks, fretting, and scoring.

S 216-005-R00
(4) Make sure the air tubes are attached correctly.

S 216-008-R00
(5) Examine the flexible air tubes, P1 and PF, to the EPR transmitter for kinks and chafing.

S 216-009-R00
(6) Use the standards given below to examine the air tubes.
  (a) Cracks - No cracks are permitted.
  (b) Dents
    1) Smooth dents with a large area in relation to depth are permitted if:
      a) The diameter of the tube has not decreased by more than 10 per cent.
      b) The dents are not less than 0.500 in (12.725 mm) or one diameter of the tube if this is larger, from the tube end fitting.
      c) The dents are not on the outside surface of a bend.
    2) Smooth dents not more than 0.125 sq. in. (80.60 sq. mm) in area are permitted if:
      a) The dents are rounded at the bottom.
      b) The dents on the outside surface of a bend are not more than 0.015 in. (0.381 mm) in depth.
      c) The dents on the remaining section of the tube are not more than 0.025 in. (0.635 mm) in depth.
      d) The dents are not less than 0.500 in. (12.725 mm) or one diameter of the tube if this is larger, from the tube end fitting.
  (c) Nicks - Nicks that are rounded at the bottom, if they are not more than 0.004in. (0.101 mm.) in depth and all burrs are removed - are permitted.
  (d) Fretting - Fretting up to a maximum depth of 0.007 inches (0.177 mm.) on the outside surface of a bend or 0.010 inches (0.254 mm.) on the remaining sections of tube - is permitted.
  (e) Scoring - Light scoring can be made smooth if not more than than 0.005 inch (0.127 mm.) of metal in depth is removed from tube wall.
  (f) Kinks - Kinks felt below the braided sleeve of the flexible P1, PF tubes - Reject.
  (g) Chafing - Chafing that shows the plastic tube below the braided sleeve of the flexible P1, PF tubes - Reject.

S 216-014-R00

(7) Examine the pitot tube heads for loose or missing heads.

S 216-015-R00

(8) Use the standards given below to examine the pitot heads.
   (a) Up to two pitot tube heads are missing - Do a Temporary Repair (AMM 77-11-04/201).
   (b) More than two pitot tube heads are missing, replace the pitot tube heads to FRS7101 (AMM 72-34-10/801).

S 416-010-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

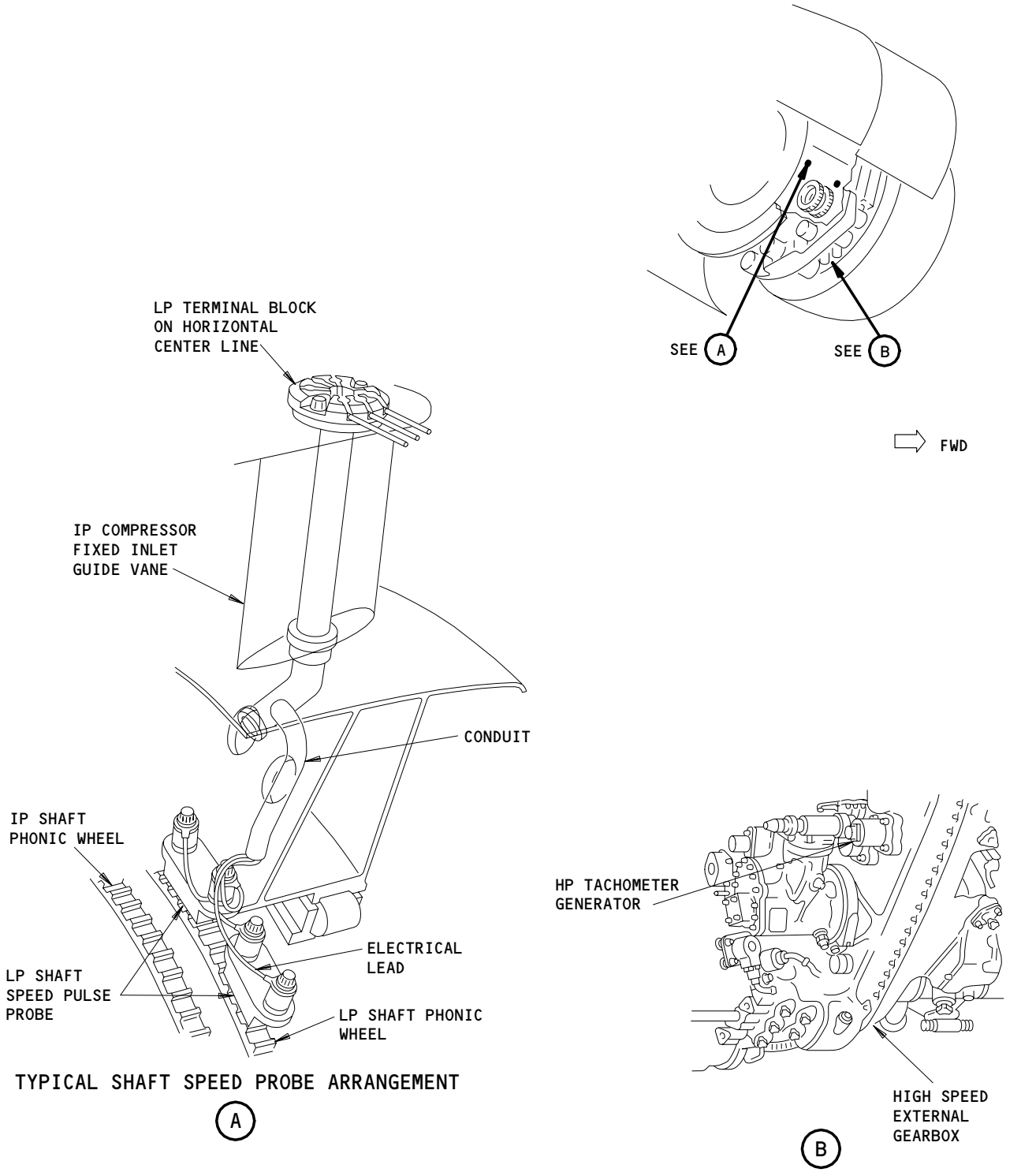
S 416-011-R00

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

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

ENGINE TACHOMETER SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The engine tachometer system measures the rotational speed of the low pressure (LP) (N1), intermediate pressure (IP) (N2), and high pressure (HP) (N3) compressor shafts. These speeds are measured independently, by speed probes for N1 and N2 and by a tachometer transmitter for N3.
   B. These speeds are in percent RPM and are transmitted to the flight compartment for indication on the Engine Indication and Crew Alerting System (EICAS).
   C. There are two N1 speed probes, three N2 speed probes, and one N3 tachometer transmitter. N1 is indicated on the upper EICAS display and N2 and N3 are indicated on the lower EICAS display.
2. Component Details (Fig. 1)
   A. N1 (LP) and N2 (IP) Pulse Probes (Fig. 2)
      (1) The shaft speed pulse probes, which are identical, are electro-magnetic sensors designed to interact with the teeth of phonic wheels and produce signals to accurately determine the rotational speed of the appropriate shaft. The phonic wheels are integral parts of the LP compressor shaft and the IP compressor front stub shaft. The probes are mounted circumferentially inside the front bearing housing where they align with the phonic wheel.
      (2) Each probe comprises two permanent magnets and three pole pieces, with a wire coil wound around the center pole piece. The whole probe is encapsulated in a fiberglass reinforced polyimide moulding. The spacing of the pole pieces is equal to the pitch of the teeth on the phonic wheel.
      (3) Conduits carry the wires from the probe assemblies, through two of the radial service tubes in the front bearing housing and through the IP compressor fixed inlet guide vanes, to terminal blocks on the front bearing housing. The terminal blocks are connected through the engine electrical harness (AMM 70-50-02/201) to a junction block on the LP compressor case.
      (4) From the junction block the LP and IP shaft speed wiring connects to the engine/airplane interface connector. The LP shaft speed wiring is also connected to the EEC limiter. The IP shaft speed wiring is also connected to the bleed valve control unit (BVCU).
      (5) Of the two LP pulse probes, only one is connected at a time for operation. Of the three IP pulse probes, two of them are connected for operation. One is used primarily for the BVCU and the other is also for the BVCU plus everywhere else that receives N2 indication. The second LP and third IP pulse probes are used as alternates if one of the other probes become defective.



50213

Engine Tachometer System Components
Figure 1

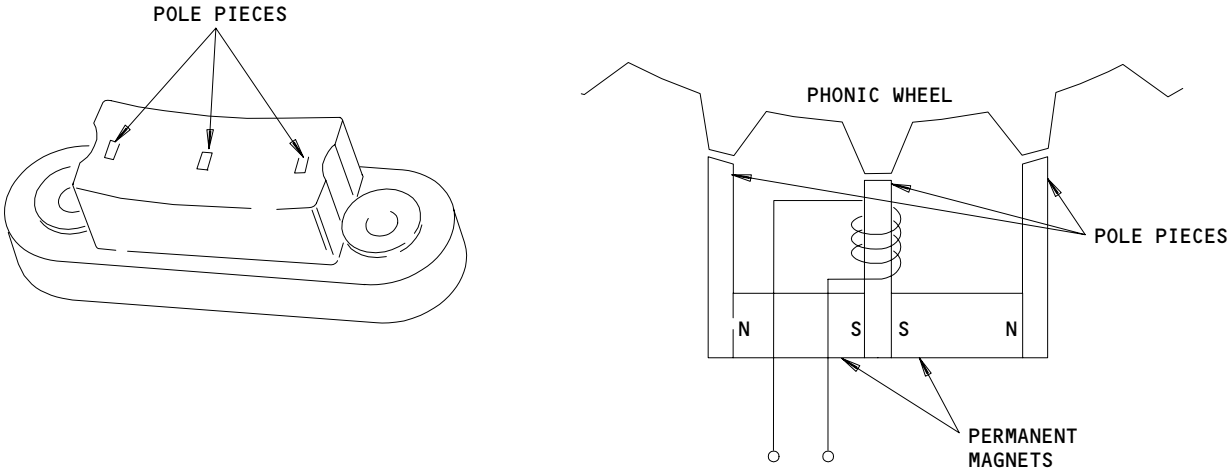
B. N3 (HP) Tachometer Generator

(1) The HP tachometer generator is mounted on the high speed external gearbox. The generator comprises a case, housing a twelve pole permanent magnet rotor, supported on ball bearings within a single phase stator. One end of the rotor shaft forms a self-aligning square drive for engaging the gearbox drive. The case is flanged to provide a mounting to the gearbox, and a receptacle on the rear of the case provides connection for the engine electrical harness. The generator bearings are lubricated from the engine oil system (AMM 79-21-00/001), through scallops in the rotor shaft square drive. The HP tachometer generator is connected through the engine electrical harness to the junction block on the LP compressor case. From the junction block the generator wires are connected to the engine/airplane interface and the engine test connector.

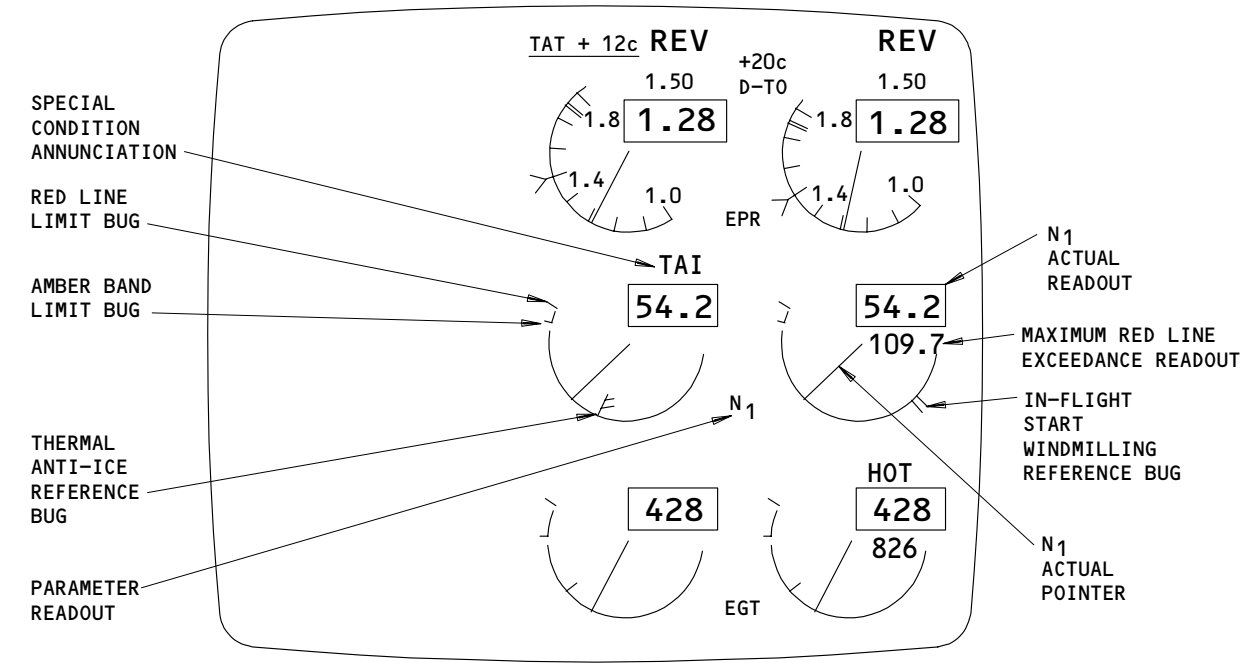
C. N1, N2, and N3 Indication on EICAS (Fig. 3)

(1) N1 indication is on the upper EICAS display and N2 and N3 indications are on the lower EICAS display. All three indications are in percent RPM and are given in both pointer and digital readout. The indications for N1, N2, and N3 are basically the same except for a few minor differences.

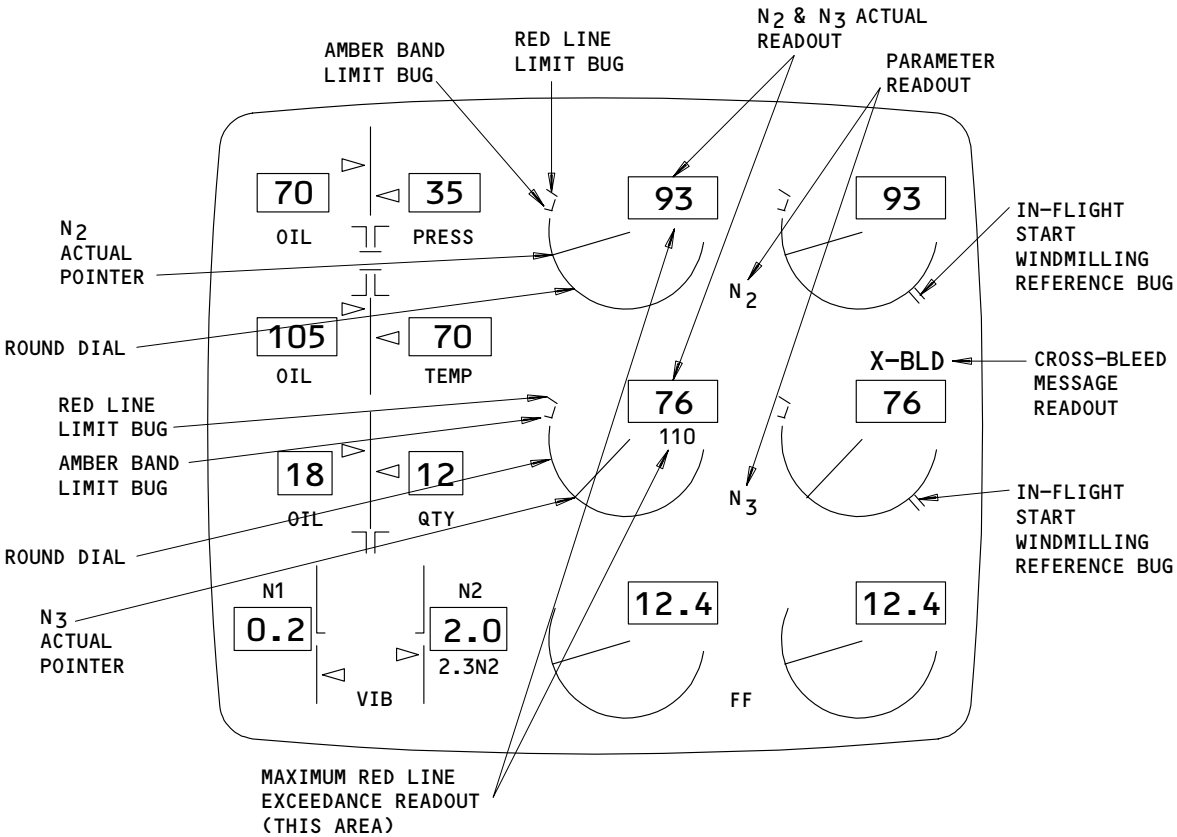
(2) The pointer extends from the center of the white banded dial face and moves clockwise from about the 3 o'clock position to about the 10 o'clock position. The pointer will change colors to match the color of the dial face when the pointer reaches either the amber zone or red line limit.



Shaft Speed Pulse Probe
Figure 2



UPPER EICAS DISPLAY



LOWER EICAS DISPLAY

N1, N2, and N3 Indication on EICAS
Figure 3

(3) The digital readout is in the upper right corner of the indicator. It gives the same value and changes color the same as the pointer. Below the digital readout, the maximum red line exceeded value is displayed until cleared.

(4) An in-flight start windmilling reference bug is displayed on the indicators to reference maximum and minimum rpm limits for in-flight starts.

(5) Above the N1 digital readout, the letters TAI is displayed when the respective engine inlet TAI is activated. A TAI reference bug is displayed on the dial face when N1 speed is critical to proper anti-ice operation.

(6) Above the N3 digital readout, the letters X-BLD is displayed when cross bleed action is required for start.

D. Engine Speed Card

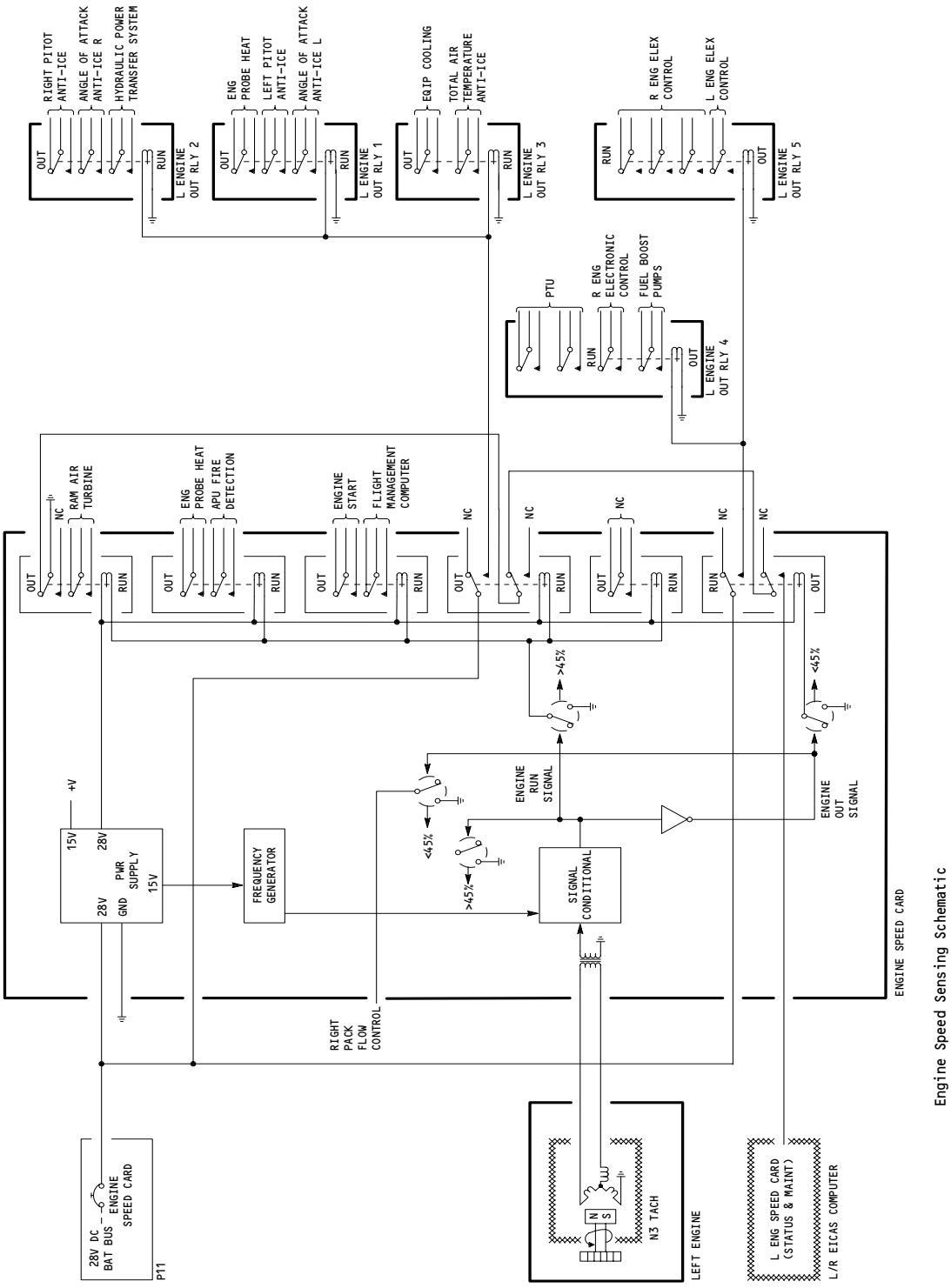
(1) The engine speed card located in the P50 card file receives an input from the N3 tachometer transmitter. The voltage output of the N3 tachometer transmitter is proportional to the N3 rotor speed. The engine speed card inputs "Engine Run/Not Running" information to various systems. The engine speed card receives 28v dc power from the standby bus.

(2) The engine speed card sends engine run/not running signals to the equipment cooling system (AMM 21-58-00/001), APU fire extinguishing (AMM 26-22-00/001), fuel boost pumps (AMM 28-22-00/001), power transfer unit (AMM 29-22-00/201), ram air turbine (AMM 29-21-00/001), angle of attack probe heat (AMM 30-32-00/001), pitot-static probe anti-icing (AMM 30-31-00/001), total air temperature probe heat (AMM 30-33-00/001), flight management computer (AMM 34-61-00/001), electronic engine control (AMM 73-21-00/001) engine start system (AMM 80-11-00/001), and the air cooling pack system (AMM 21-51-00/001).

(3) For information on use of this signal by the user systems, refer to the applicable subjects as referenced above.

(4) With the engine not running, the cards fault indication circuitry can be tested by placing the card in the engine running position. This will verify that the engine speed card and EICAS are in disagreement, whether the engine is running or not running. When this happens, a message is displayed on EICAS.

3. Operation (Fig. 4)
   A. Functional Description
      (1) LP and IP Shaft Speed Indicating
         (a) The LP and IP shaft speed indicating system uses pulse probes to measure rotational speed of the shafts and displays this speed in percent RPM on EICAS display in the flight compartment. LP shaft speed is also sent to the EEC supervisory and limiter, standby engine indicator, and AVM signal conditions. IP shaft speed is also sent to the BVCU and AVM signal conditioner.
         (b) When the teeth of the phonic wheel are in line with the pole pieces of the pulse probe, a path of relatively low reluctance is provided. As the phonic wheel rotates and the teeth are between the pole pieces, a path of greater reluctance exists. The resulting flux change in the magnetic circuit induces a voltage into the coil, producing a pulse at the output terminals.
         (c) The pulse frequency is equal to the rate at which the teeth pass the pole pieces and is, therefore, directly proportional to the speed of rotation of the compressor shaft phonic wheel.
         (d) This frequency is received by the EICAS computer and then displayed on the upper EICAS display for N1 and lower EICAS display for N2 in percent RPM. As the shaft speed increases, the pointer rotates around the dial face clockwise. If the pointer reaches the amber zone or red line limit, the pointer will change from white to that color. The digital display reads the same as the pointer and also changes color.
      (2) HP Shaft Speed Indicating
         (a) The HP shaft speed indicating system uses a transmitter to measure rotational speed of the shaft and displays this speed in percent RPM on EICAS display in the flight compartment. HP shaft speed is also sent to the engine speed card, standby engine indicator, and AVM signal conditioner.
         (b) As the HP assembly rotates and the transmitter is driven through the high-speed external gearbox, the rotor rotates with the stator coil to produce an electrical signal, the frequency of which is directly proportional to the speed of rotation of the rotor and, therefore, the HP compressor shaft.
         (c) This frequency is received by the EICAS computer and then displayed on the lower EICAS display as percent RPM. As the shaft speed increases, the pointer rotates around the dial face clockwise. If the pointer reaches the amber zone or red line limit, the pointer will change from white to that color. The digital display reads the same as the pointer and also changes color.



Engine Speed Sensing Schematic
Figure 4

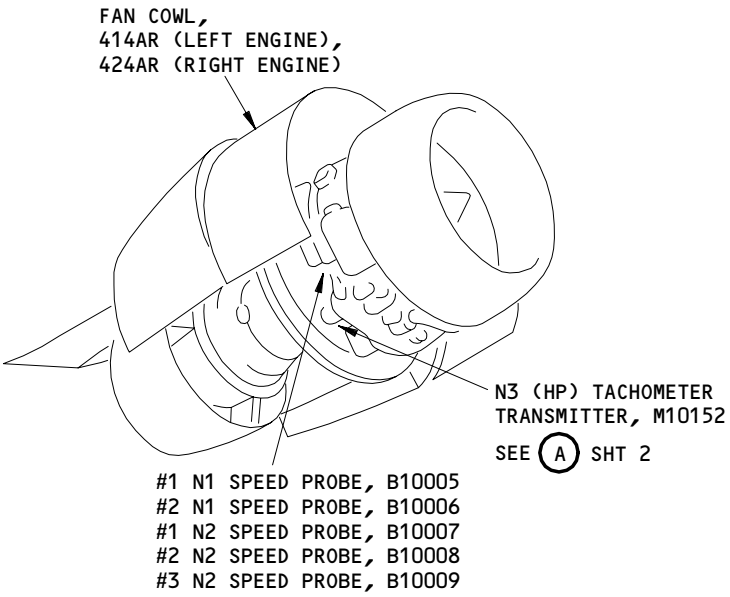
(3) Takeoff/go-around Mode
  (a) When the thrust management computer is in either the takeoff or go-around mode, the yellow band exceedance operations are inhibited for five minutes. Automatic secondary data initiation does not occur until the red band area is entered. All parameter pointers and readouts remain white until the red band area is entered.

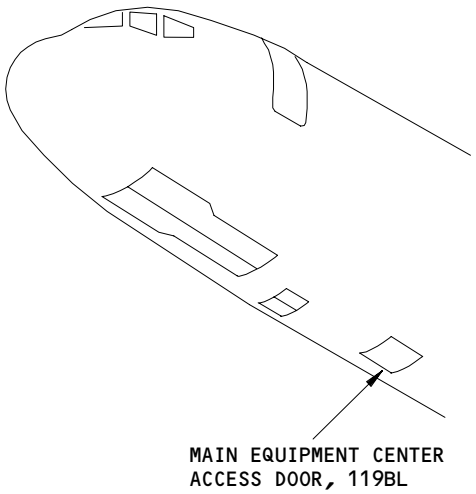
(4) Engine Speed Card
  (a) The engine speed card monitors N3 RPM and sends engine running/not running signals to various components. This card also sends this information to EICAS computer (AMM 31-41-00/001).
  (b) If a disagreement exists between the engine speed card and the EICAS computer on whether the engine is running or not running, the message L ENG SPEED CARD or R ENG SPEED CARD will appear on the EICAS display.

ENGINE TACHOMETER SYSTEM

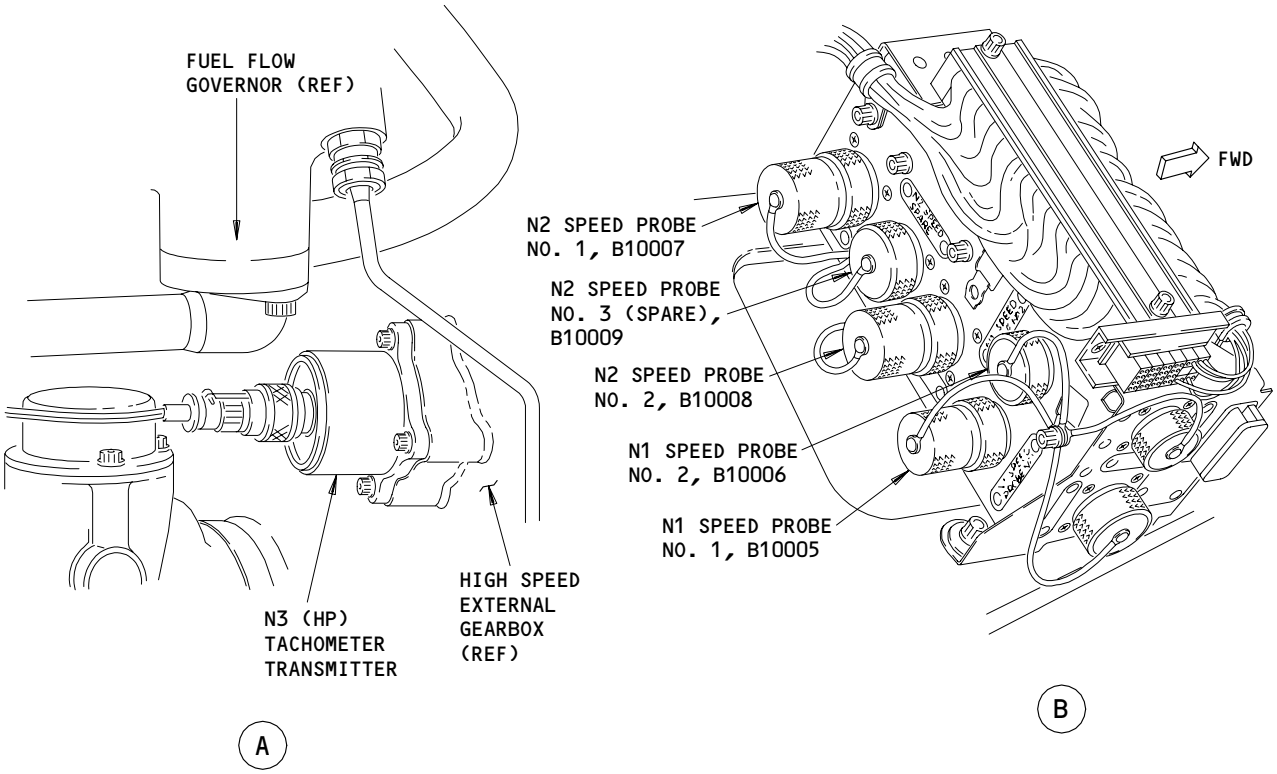
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CARD - LEFT ENGINE SPEED, M10298	2	1	119BL, MAIN EQUIP CTR, P50	77-12-03
CARD - RIGHT ENGINE SPEED, M10311	2	1	119BL, MAIN EQUIP CTR, P50	77-12-03
PROBE - #1 N1 SPEED, B10005	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-01
PROBE - #2 N1 SPEED, B10006	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-01
PROBE - #1 N2 SPEED, B10007	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-01
PROBE - #2 N2 SPEED, B10008	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-01
PROBE - #3 N2 SPEED, B10009	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-01
RELAY - (FIM 31-01-36/101) L ENG OUT 1, K10337 L ENG OUT 4, K10398 R ENG OUT 1, K10340 RELAY - (FIM 31-01-37/101) L ENG OUT 2, K10338 L ENG OUT 3, K10339 L ENG OUT 5, K10446 R ENG OUT 2, K10341 R ENG OUT 3, K10342 R ENG OUT 4, K10399 R ENG OUT 5, K10444 R ENG OUT 6, K10448				
TRANSMITTER - N3 (HP) TACHOMETER 2	2	2	414AR, L ENG FAN COWL 424AR, R ENG FAN COWL	77-12-02

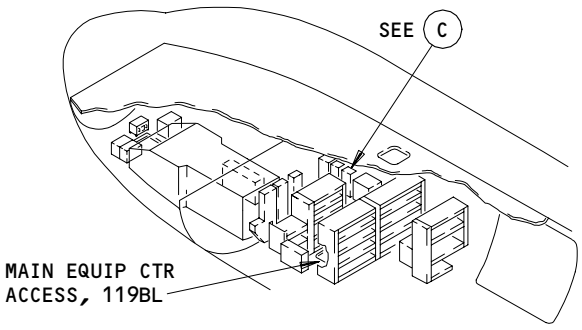
Engine Tachometer System - Component Index
Figure 101



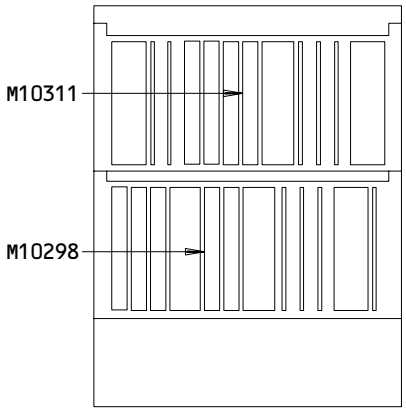


Engine Tachometer System - Component Location
Figure 102 (Sheet 1)





MAIN EQUIP CTR



ELEC SYS CARD FILE P50

C

Component Location
Figure 102 (Sheet 2)

ENGINE TACHOMETER SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has two tasks for the engine tachometer system. The first task is an operational test. The second task is a system test.
   B. You can do the operational test when you operate the engines.
      (1) The operational test is used to check that the system operates correctly.
   C. The system test is used to test the accuracy of the system.

TASK 77-12-00-715-001-R00

2. Operational Test - Engine Tachometer System
   A. General
      (1) This test examines the N1, N2, and N3 indication systems during an engine operation.
   B. References
      (1) AMM 71-00-00/201, Power Plant
   C. Access
      (1) Location Zones
          210 Control Cabin
          410 Power Plant Nacelle Left
          420 Power plant Nacelle Right

   D. Do the Test for the Engine Tachometer System

      S 865-002-R00
      (1) Do the Power Plant Operation (Normal) procedure to start the engines (AMM 71-00-00/201).
          (a) Operate the two engines at the same power setting.

      S 715-003-R00
      (2) Make sure that the N1, N2, and N3 speeds for one engine reads approximately the same as for the other engine.

      S 865-004-R00
      (3) Do the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

TASK 77-12-00-735-005-R00

3. System Test - Engine Tachometer System
   A. General
      (1) This test examines the accuracy of the N1, N2, and N3 indication systems.
      (2) The tests are in this order:
          (a) The N1 Indication test.
          (b) The N2 Indication Test.

(c) The N3 Indication Test.

B. Equipment
(1) Digital Voltmeter
(2) Signal Generator - Hewlitt Packard 3312A
(3) Universal Counter/Timer - Fluke Mfg 7261A

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 77-12-03/401, Engine Speed Card
(4) AMM 77-31-03/401, Airborne Vibration Monitor Signal Conditioner

D. Access
(1) Location Zones

210	Control Cabin
410	Power Plant Nacelle Left
420	Power plant Nacelle Right
413/414	Fan Cowl Panel Left
423/424	Fan Cowl Panel Right

E. Prepare to Do the Test for the Engine Indication System

S 865-006-R00
(1) Make sure these circuit breakers on the P11 overhead panel are closed:
(a) 11D23, STBY IND or ENGINE STBY IND 1
(b) 11D24, ENGINE STBY IND 2 (IF INSTALLED)
(c) EICAS circuit breakers (row J)

S 865-007-R00
(2) Supply the electrical power (AMM 24-22-00/201).

S 415-008-R00

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

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

F. N1 Indication System Test

S 035-009-R00
(1) Disconnect the electrical connector D1428 from the engine test receptacle.
(a) Install a dust cap on the receptacle.

S 485-010-R00

(2) Connect the signal generator and electronic counter to the pin 2 and the pin 6 of the electrical connector D1428.

S 735-011-R00

(3) Do the test for the N1 indication system.
  (a) Set the signal generator to 0 Hz.
  (b) Make sure that N1 is shown on the right side of the upper EICAS CRT unit.
    1) Make sure that N1 is shown in a white digital readout (enclosed in a box).
    2) Make sure there is a circular analog scale (210 degree) and a pointer.
  (c) Put the display control switch on the standby engine indicator (SEI) to the ON position.
    1) Make sure the N1 value shown is zero.
  (d) Set the signal generator to 891 Hz at 6.0 ±0.3 V RMS.
    1) Make sure the N1 indication on the EICAS shows 19.8 ±1%.
    2) Make sure the N1 indication on the SEI shows 19.8 ±0.1%.
  (e) Set the signal generator to 4905 Hz at 7.0 ±0.3V RMS for 2 minutes.
    1) Make a record of the start time.
    2) Make a record of the stop time.
    3) Monitor the N1 indication on the upper EICAS CRT.
      a) Make sure the N1 indication on the EICAS shows 109 ±1% in red digits.
      b) Make sure the analog scale is red beyond the yellow limit band and the analog pointer is red.
      c) Make sure the N1 indication of 109 ±1% is shown in small, bright white digits below the red digital N1 indication.
      d) Make sure the N1 indication on the SEI shows 109 ±0.1%.
  (f) Set the signal generator to 0 Hz.
  (g) Push the ENG EXCD button on the EICAS MAINT panel on the P61 panel.
  (h) Make sure the ENG EXCD page made a record of the time interval and maximum N1 exceedance value during the steps when signal generator is set to 4905 Hz.
  (i) Push the AUTO switch on the EICAS MAINT panel.
  (j) Push and hold the ERASE button on the EICAS MAINT panel.
  (k) Put the display control switch on the SEI to AUTO.
  (l) Push the MAX IND RESET switch on the forward electronics panel below the EICAS CRTs.

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU REMOVE THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(m) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(n) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR
(o) Remove the applicable AVM signal conditioner (AMM 77-31-03/401).
1) Remove the left AVM signal conditioner (L ENG VIB MONITOR, M132) to get access to connector D4240A on the E4-2 shelf.
2) Remove the right AVM signal conditioner (R ENG VIB MONITOR, M10571) to get access to connector D5602B on the E4-2 shelf.
(p) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR
(q) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR
(r) Measure the voltage across the pins A8 and B8 of the connector D4240A or the connector D5602B with a voltmeter.
1) Make sure the voltage across the pins A8 and B8 is 7.0 ±0.5v rms.

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU INSTALL THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(s) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(t) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR
(u) Install the AVM signal conditioner (AMM 77-31-03/401).
(v) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR
(w) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR

S 085-012-R00

(4) Remove the signal generator and the electronic counter from the electrical connector D1428.

S 435-013-R00

(5) Connect the electrical connector D1428 to the engine test receptacle.

G. N2 Indication System Test

S 035-014-R00

(1) Disconnect the electrical connector D1432 from the engine test receptacle.
   (a) Install a dust cap on the receptacle.

S 485-015-R00

(2) Connect the signal generator and the electronic counter to the pin 4 and pin 6 of the electrical connector D1432.

S 735-016-R00

(3) Do the test for the N2 indication system.
   (a) Set the signal generator to 0 Hz.
   (b) Push the ENGINE switch on pilots' display panel.
   (c) Make sure that N2 is shown on the right side of the lower EICAS CRT unit.
      1) Make sure that N2 is shown in a white digital readout (enclosed in a box).
      2) Make sure there is a circular analog scale (210 degree) and a pointer.
   (d) Set the signal generator to 6986 Hz at 6.0 ±0.3V RMS for 2 minutes.
      1) Make a record of the start time.
      2) Make a record of the stop time.
      3) Monitor the N2 indication on the lower EICAS CRT.
         a) Make sure the N2 indication on the EICAS shows 99.8 ±1% in red digits.
         b) Make sure the analog scale is red beyond the yellow limit band and the analog pointer is red.
         c) Make sure the N2 indication of 99.8 ±1% is shown in small, bright white digits below the red digital N1 indication.
   (e) Set the signal generator to 0 Hz.
   (f) Push the ENG EXCD button on the EICAS MAINT panel on the P61 panel.

(g) Make sure the ENG EXCD page made a record of the time interval and the maximum N2 indication when the signal generator was set to 6986 Hz.
(h) Push the AUTO switch on EICAS MAINT panel on the P61 panel.
(i) Push the ERASE switch on EICAS MAINT panel on the P61 panel.
(j) Push the MAX IND RESET switch on forward electronics panel below the lower EICAS CRT.

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU REMOVE THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(k) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(l) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR
(m) Remove the applicable AVM signal conditioner (AMM 77-31-03/401).
1) Remove the left AVM signal conditioner (L ENG VIB MONITOR, M132) to get access to connector D4240A on the E4-2 shelf.
2) Remove the right AVM signal conditioner (R ENG VIB MONITOR, M10571) to get access to connector D5602B on the E4-2 shelf.
(n) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR
(o) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR
(p) Measure the voltage across the pins C10 and D10 of the connector D4240A or the connector D5602B with a voltmeter.
1) Make sure the voltage across the pins C10 and D10 is 6.0 ±0.5V RMS.

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU INSTALL THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(q) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(r) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR

(s) Install the AVM signal conditioner (AMM 77-31-03/401).
(t) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR
(u) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR

S 085-017-R00
(4) Remove the signal generator and the electronic counter from the electrical connector D1432.

S 435-018-R00
(5) Connect the electrical connector D1432 to the engine test receptacle.

H. N3 Indication System Test

S 035-019-R00
(1) Disconnect the electrical connector D1338 from the N3 tachometer transmitter.
(a) Install a dust cap on the receptacle.

S 485-020-R00
(2) Connect a signal generator and a electronic counter to pin 1 and pin 2 of the electrical connector D1338.

S 735-021-R00
(3) Do the test for the N3 indication system.
(a) Set the signal generator to 0 Hz.
(b) Push the ENGINE switch on the pilots' display panel.
(c) Make sure that N3 is shown on the right side of the lower EICAS CRT unit.
1) Make sure that N3 is shown with a white digital readout (enclosed in a box).
2) Make sure there is a circular analog scale (210 degree) and a pointer.
(d) Put the display control switch on the standby engine indicator (SEI) from AUTO to ON.
1) Make sure that the N3 indication is zero.
(e) Set the signal generator to 414.54 Hz at 2.0 ±0.3v rms for 2 minutes.
1) Make a record for the start time.
2) Make a record of the stop time.
3) Monitor the N3 indication on the lower EICAS CRT.
a) Make sure the N3 indication on the EICAS shows 98.7 ±1% in red digits.

b) Make sure the analog scale is red beyond the yellow limit band and the analog pointer is red.
c) Make sure the N2 indication of 98.7 ±1% is shown in small, bright white digits below the red digital N1 indication.

(f) Set the signal generator to zero.
(g) Make sure the ENG EXCD page made a record of the time interval and the maximum N3 value when the signal generator was set to 414.54 Hz.
(h) Push the AUTO switch on EICAS MAINT panel on the P61 panel.
(i) Push the ERASE button on the EICAS MAINT panel.
(j) Push the MAX IND RESET switch on forward electronics panel below the lower EICAS CRT.
(k) Put the display control switch on the SEI to AUTO.
(l) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11B31 or 11D11 , ENGINES SPEED CARD L
(m) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11B32 or 11D12, ENGINES SPEED CARD R
(n) Remove the applicable engine speed card (AMM 77-12-03/401).
1) Remove the left engine speed card (L ENG SPEED IND CARD, M10298) to get access to connector D2996 on the E4-2 shelf.
2) Remove the right engine speed card (R ENG SPEED IND CARD, M10311) to get access to connector D2838 on the E4-2 shelf.
(o) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11B31 or 11D11, ENGINES SPEED CARD L
(p) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11B32 or 11D12, ENGINES SPEED CARD R
(q) Measure the voltage across the pins 1 and 2 of the connector D2996 or the connector D2838 with a voltmeter.
1) Make sure the voltage across the pins 1 and 2 of the is 6.0 ±0.5V RMS.
(r) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11B31 or 11D11, ENGINES SPEED CARD L
(s) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11B32 or 11D12, ENGINES SPEED CARD R
(t) Install the engine speed card (AMM 77-12-03/401).
(u) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11B31 or 11D12, ENGINES SPEED CARD L

(v) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11B32 or 11D12, ENGINES SPEED CARD R

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU REMOVE THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(w) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(x) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR
(y) Remove the applicable AVM signal conditioner (AMM 77-31-03/401).
1) Remove the left AVM signal conditioner (L ENG VIB MONITOR, M132) to get access to connector D4240A on the E4-2 shelf.
2) Remove the right AVM signal conditioner (R ENG VIB MONITOR, M10571) to get access to connector D5602B on the E4-2 shelf.
(z) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR
(aa) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR
(ab) Measure the voltage across the pin A12 and pin C12 of the connector D4240A or the connector D5602B with a voltmeter.
1) Make sure the voltage across the pin A12 and pin C12 is 6.0 ±0.5V RMS.

CAUTION: REMOVE THE ELECTRICAL POWER FROM THE INDICATION SYSTEM BEFORE YOU INSTALL THE AVM SIGNAL CONDITIONER. DAMAGE TO THE INDICATION SYSTEM CAN OCCUR.

(ac) For the left engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K2, VIB MONITOR
(ad) For the right engine, open this circuit breaker on the P11 overhead panel and attach a DO-NOT-CLOSE tag:
1) 11K28, VIB MONITOR
(ae) Install the AVM signal conditioner (AMM 77-31-03/401).
(af) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K2, VIB MONITOR

(ag) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
1) 11K28, VIB MONITOR

S 085-022-R00

(4) Remove the signal generator and the electronic counter from the N3 electrical connector D1338.

S 435-023-R00

(5) Connect the electrical connector D1338 to the N3 tachometer transmitter.

I. Put the Airplane Back to the Usual Condition.

S 415-024-R00

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

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

S 865-025-R00

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

N1 (LP) AND N2 (IP) PULSE PROBES - MAINTENANCE PRACTICES

1. General
   A. This procedure has one task. This task connects the alternate pulse probe.
   B. You must do this procedure if there is a failure of the main pulse probe.
   C. This procedure is the same for LP (N1) and IP (N2) pulse probes.

   TASK 77-12-01-802-001-R00

2. Connect the Alternative Pulse Probe
   A. References
      (1) AMM 70-50-02/201, Connection of Electrical Plugs
      (2) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones

210	Control Cabin
410	Power Plant Nacelle Left
420	Power Plant Nacelle Right
413/414	Fan Cowl Panel Left
423/424	Fan Cowl Panel Right

   C. Connect the Alternative Pulse Probe (Fig. 201).

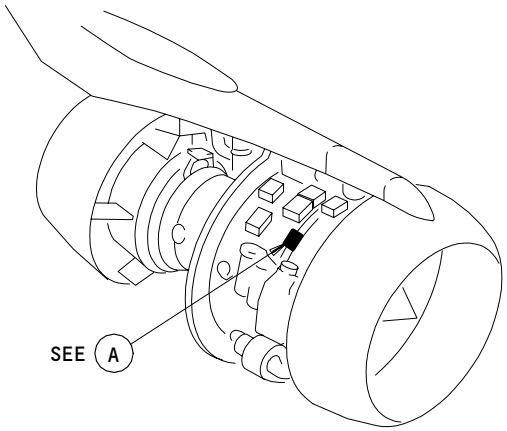
      S 012-002-R00

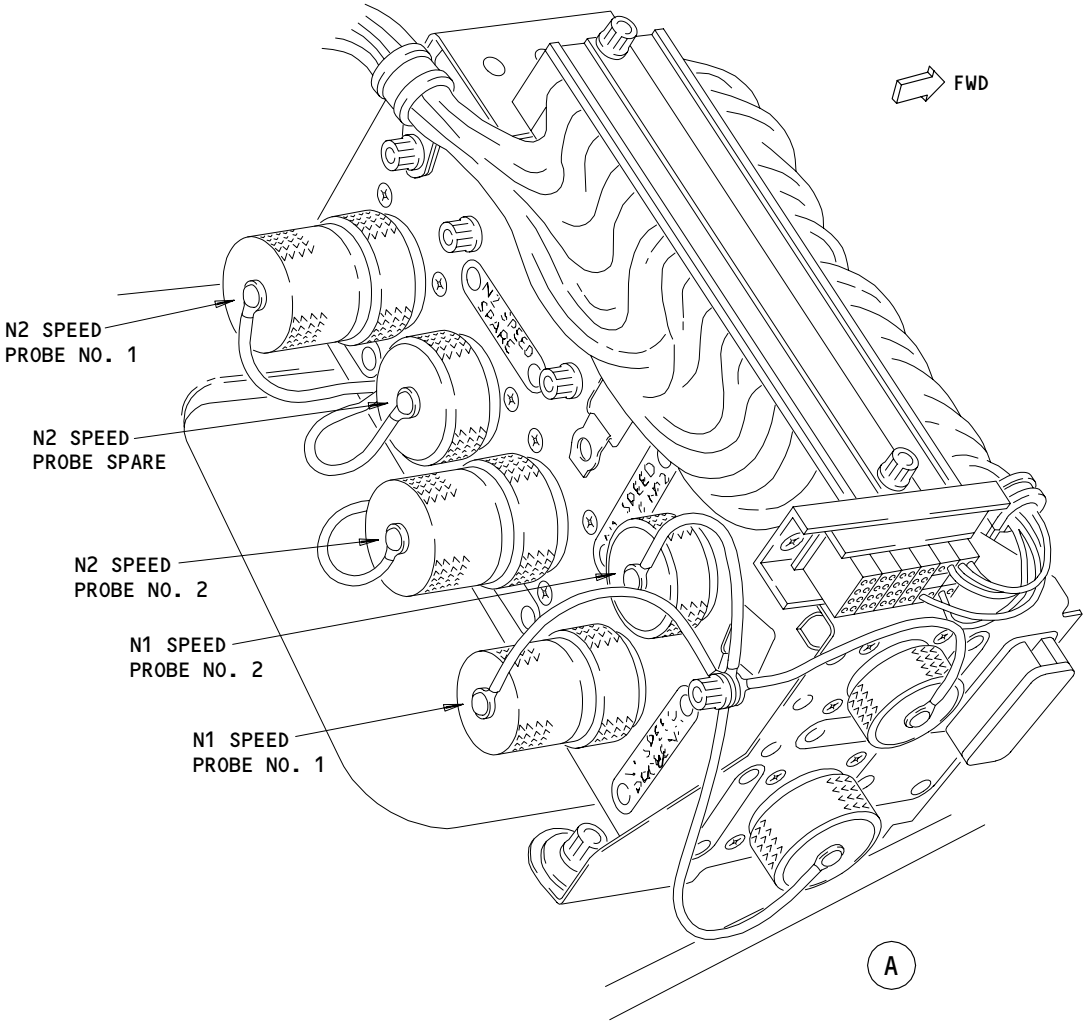
      CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU OPEN THE FAN COWL PANEL. IF THE PRECAUTIONS ARE NOT OBEYED, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

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

      S 022-003-R00
      (2) Remove the plug from the position of the appropriate system.

      S 032-004-R00
      (3) Remove the blank from the No. 2 position (or spare on N2) of the appropriate system.





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Alternative N1 and N2 Pulse Probe Connection
Figure 201

S 422-005-R00

(4) Connect the plug to the No. 2 position (or spare on N2) (AMM 70-50-02/201).

S 432-010-R00

(5) Install the blank at the position that is not used.

S 412-007-R00

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

(6) Close the right fan cowl panel (AMM 71-11-04/201).

N3 (HP) TACHOMETER TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the N3 tachometer transmitter. The second task installs the N3 tachometer transmitter.

TASK 77-12-02-004-001-R00

2. Remove the N3 (HP) Tachometer Transmitter
   A. References
      (1) AMM 70-50-02/201, Connection of Electrical Plugs
      (2) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

      (2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

   C. Remove the N3 (HP) Tachometer Transmitter (Fig. 401)

S 014-002-R00

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

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

S 024-003-R00

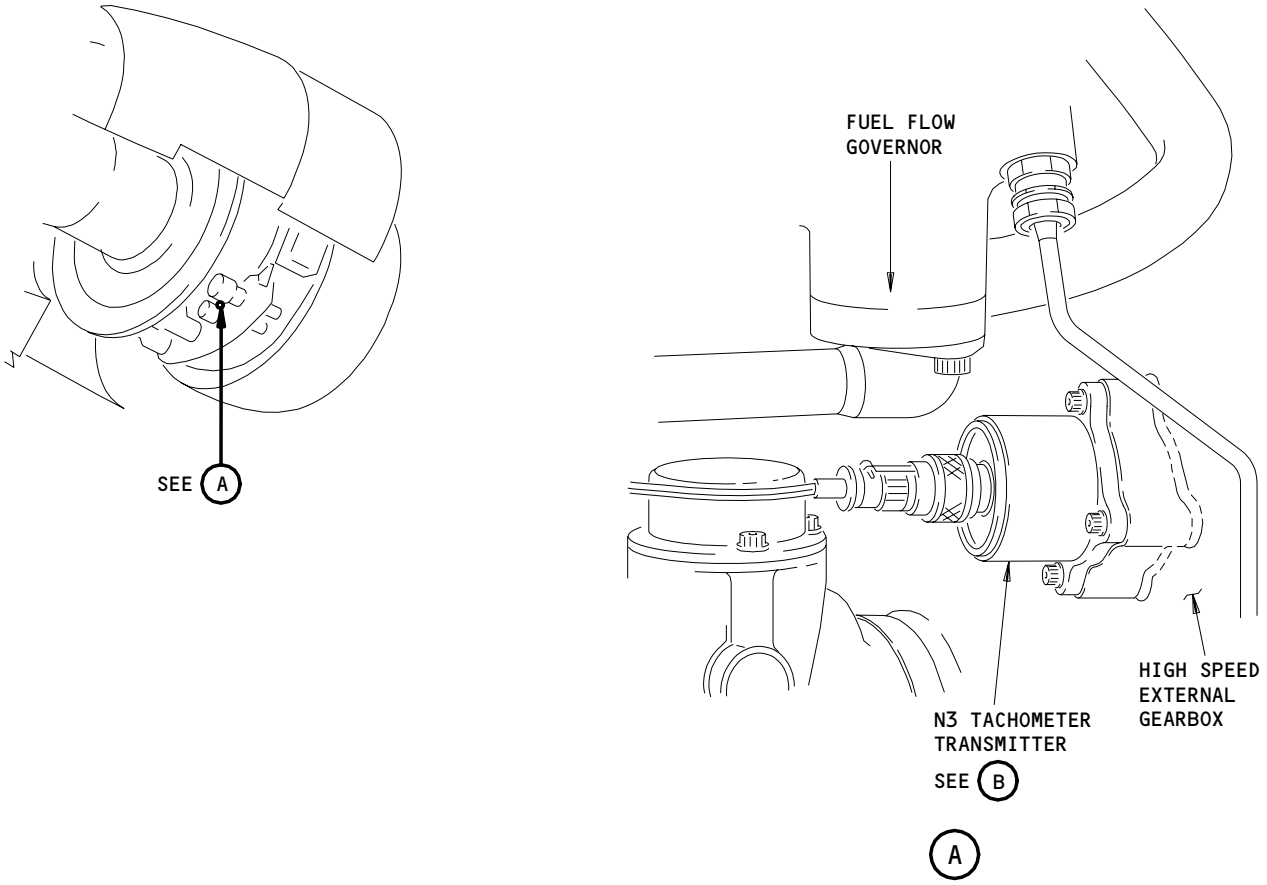
(2) Remove the transmitter.

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR DOES NOT HAVE CONTAMINATION FROM WATER AND DIRT BEFORE YOU DISCONNECT THE CONNECTOR. THE WATER AND DIRT CAN CAUSE DAMAGE TO THE CONNECTOR.

(a) Disconnect the electrical connector (1).
(b) Remove the bolts (2).
(c) Remove the lockwire washer (3).
(d) Remove the transmitter (4) and the gasket (5) from the mounting face.

S 864-004-R00

(3) Install the dust caps to all openings and connectors.



N3 (HP) Tachometer Transmitter Installation
Figure 401

TASK 77-12-02-404-005-R00

3. Install the N3 (HP) Tachometer Transmitter

A. Consumable Materials

(1) Lockwire - Chromium Nickel Stabilized Steel
0.018 inches (0.45 mm) diameter

B. References

(1) AMM 70-50-02/201, Connection of Electrical Plugs

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

C. Access

(1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

(2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

D. Install the N3 (HP) Tachometer Transmitter (Fig. 401)

S 864-006-R00

(1) Remove the dust caps from all openings and connectors.

S 424-007-R00

(2) Install the transmitter.

(a) Put the gasket (5) and transmitter (4) on the mounting face of the high-speed external gearbox.

1) Make sure the gasket and the transmitter can fit correctly on the mounting face of the high-speed external gearbox.

2) Make sure the drive location is correct.

(b) Install the bolts (2).

(c) Install the lockwire washer (3) below the bolthead.

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR DOES NOT HAVE CONTAMINATION FROM WATER AND DIRT BEFORE YOU INSTALL THE CONNECTOR. THE WATER AND DIRT CAN CAUSE DAMAGE TO THE CONNECTOR.

(d) Install the electrical connector (AMM 70-50-02/201).

(e) Install the lockwire on the electrical connector (1).

S 414-008-R00

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

(3) Close the right fan cowl panel (AMM 71-11-04/201).

ENGINE SPEED CARD - MAINTENANCE PRACTICES (SIMULATED ENGINE OPERATION)

1. General
   A. This procedure gives a method to simulate the engine operation with the engine speed card when you test the airplane components.

TASK 77-12-03-802-001-R00

2. Simulate the Engine Operation
   A. Equipment
      (1) Jumper Test Wire, B21003-1

          NOTE: This wire is used on Engine Speed Cards without a test switch.

   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zones

110	Lower Forward Fuselage
210	Control Cabin

      (2) Access Panels

113AL	Forward Equipment Bay

   D. Simulate the engine operation with the speed card.

      S 862-043-R00
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 862-003-R00
      (2) Open these circuit breakers on the P11 overhead panel and attach a DO-NOT-CLOSE tags:
          (a) 11D26, HYDRAULICS RAT CONT or HYDRAULICS RAT AUTO CONT
          (b) 11D27, HYDRAULICS RAT AUTO or HYDRAULICS RAT AUTO PWR
          (c) 11B23 or 11B24, FIRE DETECTION APU 1
          (d) 11B24 or 11B25, FIRE DETECTION APU 2
          (e) 11D31, HYDRAULICS PTU CONT

      S 862-004-R00
      (3) For the left engine, open these circuit breakers on the P11 overhead panel and attach a DO-NOT-CLOSE tags:
          (a) 11D19, ENGINE START CONT LEFT
          (b) 11E9, FMCS CMPTR LEFT
          (c) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV
          (d) 11M13, LEFT PACK FLOW CONT or
              11A14, AIR COND PACK LEFT FLOW CONT

S 862-005-R00
(4) For the right engine, open these circuit breakers on the P11 overhead panel and attach a DO-NOT-CLOSE tags:
(a) 11D20, ENGINE START CONT RIGHT
(b) 11E30, FMCS CMPTR RIGHT
(c) 11L32, RIGHT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M22, RIGHT PACK FLOW CONT or
11A29, AIR COND PACK RIGHT FLOW CONT

S 862-006-R00
(5) Open these circuit breakers on the P6, main power distribution panel and attach DO-NOT-CLOSE tags:
(a) 6F1, RAT MAN PWR or RAT MAN
(b) 6L24, TAT PROBE HEAT
(c) 6L23, R AOA HEAT
(d) 6L22, PITOT HEAT F/O MAIN
(e) 6L21, PITOT HEAT R AUX
(f) 6L17, L AOA HEAT
(g) 6L13 or 6L15, PITOT HEAT CAPT MAIN
(h) 6L14 or 6L16, PITOT HEAT L AUX

S 862-010-R00
(6) For the left engine, make sure this circuit breaker on the P11 overhead panel is closed:
(a) 11B31 or 11D11, ENGINES SPEED CARD LEFT

S 862-012-R00
(7) For the right engine, make sure this circuit breaker on the P11, overhead panel is closed:
(a) 11B32 or 11D12, ENGINES SPEED CARD RIGHT

S 012-013-R00
(8) Open access door, 113AL, to get access to the main equipment center (AMM 06-41-00/201).

S 012-014-R00
(9) Open the door on the P50, electrical system card file.

S 842-015-R00
(10) Do the simulation of the engine operation.

CAUTION: THE ENGINE SPEED CARD IS ELECTROSTATIC SENSITIVE. DO NOT TOUCH THE CARD BEFORE YOU READ THE PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (AMM 20-41-01/201). THE CARD CONTAINS DEVICES THAT CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE.

(a) ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
Connect a jumper test wire between the test point J1 on the front of the card and the airplane electrical ground.

(b) ENGINE SPEED CARDS WITH A TEST SWITCH;
Move the test switch on the front of the card to the TEST position.
(c) Do the tests that are necessary with the engine operation simulated with the engine speed card.
(d) ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
Remove the jumper test wire from the test point J1 on the card and the airplane electrical ground.
(e) ENGINE SPEED CARDS WITH A TEST SWITCH;
Move the test switch on the front of the card to the NORMAL position.

S 412-016-R00
(11) Close the access door on the P50, electrical system card file.

S 412-017-R00
(12) Close the access door, 113AL, to the main equipment center (AMM 06-41-00/201).

S 862-018-R00
(13) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D26, HYDRAULICS RAT CONT or HYDRAULICS RAT AUTO CONT
(b) 11D27, HYDRAULICS RAT AUTO or HYDRAULICS RAT AUTO PWR
(c) 11B23 or 11B24, FIRE DETECTION APU 1
(d) 11B24 or 11B25, FIRE DETECTION APU 2
(e) 11D31, HYDRAULICS PTU CONT

S 862-019-R00
(14) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D19, ENGINE START CONT LEFT
(b) 11E9, FMCS, CMPTR LEFT
(c) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M13, LEFT PACK FLOW CONT or
11A14, AIR COND PACK LEFT FLOW CONT

S 862-020-R00
(15) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D20, ENGINE START CONT RIGHT
(b) 11E30, FMCS CMPTR RIGHT
(c) 11L32, RIGHT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M22, RIGHT PACK FLOW CONT or
11A29, AIR COND PACK RIGHT FLOW CONT
(e) 11E30, FMCS CMPTER R

S 862-021-R00
(16) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6, main power distribution panel:
(a) 6F1, RAT MAN PWR or RAT MAN

(b) 6L24, TAT PROBE HEAT
(c) 6L23, R AOA HEAT
(d) 6L22, PITOT HEAT F/O MAIN
(e) 6L21, PITOT HEAT R AUX
(f) 6L17, L AOA HEAT
(g) 6L13 or 6L15, PITOT HEAT CAPT MAIN
(h) 6L14 or 6L16, PITOT HEAT L AUX

S 862-022-R00

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

ENGINE SPEED CARD - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the engine speed card. The second task installs the engine speed card.
   B. The engine speed cards are located in the P50 panel in the main equipment center.

TASK 77-12-03-004-001-R00

2. Remove the Engine Speed Card
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zones

110	Lower Forward Fuselage
210	Control Cabin

      (2) Access Panels

119BL	Main Equipment Center

   C. Remove the engine speed card (Fig. 401).

S 914-002-R00

CAUTION: THE ENGINE SPEED CARD IS ELECTROSTATIC SENSITIVE. DO NOT TOUCH THE CARD BEFORE YOU READ THE PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (AMM 20-41-01/201). THE CARD CONTAINS DEVICES THAT CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE.

      (1) Read the procedure for electrostatic discharge sensitive devices (AMM 20-41-01/201).

S 864-006-R00

      (2) For the left engine, open these circuit breakers on the P11 overhead panel and attach DO-NOT-CLOSE tags:
      (a) 11B31 or 11D11, ENGINES SPEED CARD L

S 864-008-R00

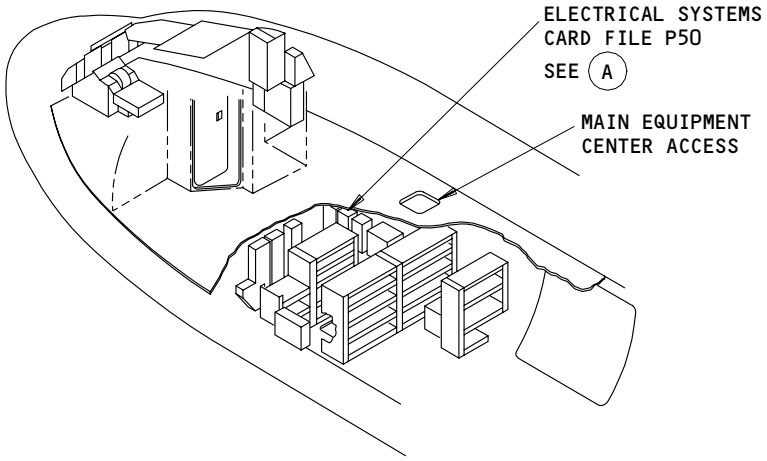
      (3) For the right engine, open this circuit breaker on the P11 overhead panel and attach DO-NOT-CLOSE tags:
      (a) 11B32 or 11D12, ENGINES SPEED CARD R

S 014-009-R00

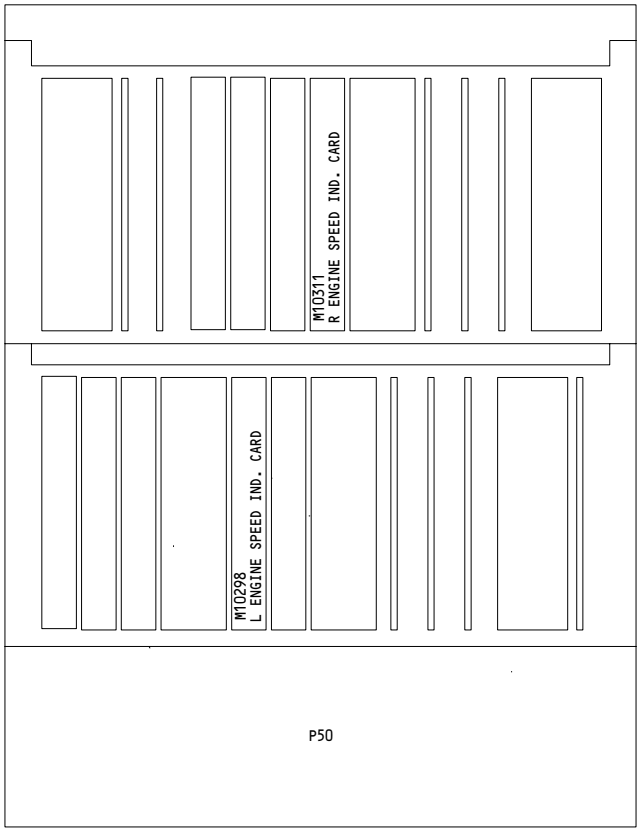
      (4) Open the access door, 119BL, to get access to the main equipment center (AMM 06-41-00/201).

S 024-010-R00

      (5) Remove the engine speed card from the P50 panel.



MAIN EQUIPMENT CENTER (MEC)



Engine Speed Card Installation
Figure 401

TASK 77-12-03-404-011-R00

3. Install the Engine Speed Card

A. References

(1) AMM 06-41-00/201, Fuselage Access Doors and Panels

(2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices

(3) AMM 77-12-03/501, Engine Speed Card

B. Access

(1) Location Zones

110 Lower Forward Fuselage

(2) Access Panels

119BL Main Equipment Center

C. Install the engine speed card (Fig. 401).

S 914-012-R00

CAUTION: THE ENGINE SPEED CARD IS ELECTROSTATIC SENSITIVE. DO NOT TOUCH THE CARD BEFORE YOU READ THE PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (AMM 20-41-01/201). THE CARD CONTAINS DEVICES THAT CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE.

(1) Read the procedure for electrostatic discharge sensitive devices (AMM 20-41-01/201).

S 424-013-R00

(2) Install the engine speed card on the P50 panel.

S 864-017-R00

(3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
(a) 11B31 or 11D11, ENGINES SPEED CARD L

S 864-019-R00

(4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
(a) 11B32 or 11D12, ENGINES SPEED CARD R

S 724-020-R00

(5) Do the test for the engine speed card (AMM 77-12-03/501).

S 414-021-R00

(6) Close the access door, 119BL (AMM 06-41-00/201).

ENGINE SPEED CARD - ADJUSTMENT/TEST

1. General
   A. This task gives the procedure to test the fault indication circuits in the engine speed card.

TASK 77-12-03-705-001-R00

2. Engine Speed Card Test
   A. Equipment
      (1) Jumper Test Wire, B21003-1

          NOTE: This wire is used on Engine Speed Cards without a test switch.

   B. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zones
          110 Lower Forward Fuselage
          210 Control Cabin

      (2) Access Panels
          119BL Main Equipment Center Access Door

   D. Do a Test of the Engine Speed Card

      S 865-002-R00
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 015-003-R00
      (2) Open the access door, 119BL, to the main equipment center (AMM 06-41-00/201).

      S 865-004-R00
      (3) Open these circuit breakers on the P6, main power distribution panel and attach DO-NOT-CLOSE tags:
          (a) 6L24, TAT PROBE HEAT
          (b) 6L23, R AOA HEAT
          (c) 6L22, PITOT HEAT F/O MAIN
          (d) 6L21, PITOT HEAT R AUX
          (e) 6L17, L AOA PROBE HEAT
          (f) 6L13 or 6L15, PITOT HEAT CAPT MAIN
          (g) 6L14 or 6L16, PITOT HEAT L AUX
          (h) 6F1, RAT MAN or RAT MAN PWR

      S 865-005-R00
      (4) Open these circuit breakers on the P11, overhead panel and attach DO-NOT-CLOSE tags:
          (a) 11D26, HYDRAULIC RAT CONT or HYDRAULICS RAT AUTO CONT
          (b) 11D27, HYDRAULIC RAT AUTO or HYDRAULICS RAT AUTO PWR

(c) 11B24, FIRE DETECTION APU 1
(d) 11B25, FIRE DETECTION APU 2
(e) 11D31, HYDRAULIC PTU CONT

S 865-006-R00

(5) For the left engine, open these circuit breakers on the P11, overhead panel and attach DO-NOT-CLOSE tags:
(a) 11D19, ENGINE START CONT LEFT
(b) 11E9, FMCS CMPTR LEFT
(c) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M13, LEFT PACK FLOW CONT or
11A14, AIR COND PACK LEFT FLOW CONT

S 865-007-R00

(6) For the right engine, open these circuit breakers on the P11, overhead panel and attach DO-NOT-CLOSE tags:
(a) 11D20, ENGINE START CONT RIGHT
(b) 11E30, FMCS CMPTR RIGHT
(c) 11L32, RIGHT ENGINE ELECTRONIC CONTROL SUPV
(d) 11M22, RIGHT PACK FLOW CONT or
11A29, AIR COND PACK RIGHT FLOW CONT

S 865-011-R00

(7) For the left engine, make sure this circuit breaker on the P11, overhead panel is closed:
(a) 11B31 or 11D11, ENGINES SPEED CARD LEFT

S 865-013-R00

(8) For the right engine, make sure this circuit breaker on the P11, overhead panel is closed:
(a) 11B32 or 11D12, ENGINES SPEED CARD RIGHT

S 865-021-R00

CAUTION: THE ENGINE SPEED CARD IS ELECTROSTATIC SENSITIVE. DO NOT TOUCH THE CARD BEFORE YOU READ THE PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (AMM 20-41-01/201). THE CARD CONTAINS DEVICES THAT CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE.

(9) Read the procedure for electrostatic discharge sensitive devices (AMM 20-41-01/201).

S 725-015-R00

(10) Do the test for the engine speed card.
(a) On the EICAS maintenance panel on the P61 panel, push the ECS/MSG button.
1) Make sure the ECS/MSG format is shown on the EICAS display.

(b) Push the AUTO-EVENT READ button.
1) Make sure the AUTO-EVENT data is shown at bottom of the EICAS display.
(c) Push and hold the ERASE switch for approximately 3 seconds.
(d) Examine the PAGE readout.
1) If the readout shows an additional page of messages, push and hold the ERASE button for about 3 seconds.

NOTE: The next page of messages will be shown.

2) If readout is blank, do the next step.
(e) Do the last two steps again until the page readout becomes blank or shows PAGE 1.
(f) ON ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
connect a jumper test wire between the test point J1 on the front of the card to the airplane electrical ground.
(g) ON ENGINE SPEED CARDS WITH A TEST SWITCH;
move the test switch on the front of the card to the TEST position.
(h) Wait for 10 seconds.
(i) Make sure the L or R ENG SPEED CARD message is shown as a STATUS message on the EICAS.
(j) ON ENGINE SPEED CARDS WITHOUT A TEST SWITCH;
remove the jumper test wire from the card and the airplane electrical ground.
(k) ON ENGINE SPEED CARDS WITH A TEST SWITCH;
move the test switch on the front of the card to the NORMAL position.
(l) On the EICAS maintenance panel at the P61 panel, push the ECS/MSG button.
1) Make sure the ECS/MSG format is shown on the EICAS display.
(m) Push the AUTO-EVENT READ button.
1) Make sure the AUTO-EVENT data is shown at bottom of the EICAS display.
(n) Push and hold the ERASE switch for approximately 3 seconds.

S 415-016-R00
(11) Close the access door, 119BL, to the main equipment center (AMM 06-41-00/201).

S 865-017-R00
(12) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D19, ENGINE START CONT LEFT
(b) 11E9, FMCS CMPTR LEFT
(c) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M13, LEFT PACK FLOW CONT or
11A14, AIR COND PACK LEFT FLOW CONT

S 865-018-R00

(13) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D20, ENGINE START CONT RIGHT
(b) 11E30, FMCS CMPTR RIGHT
(c) 11L32, RIGHT ENGINE ELECTRONIC ENGINE CONTROL SUPV
(d) 11M22, RIGHT PACK FLOW CONT or
11A29, AIR COND PACK RIGHT FLOW CONT

S 865-022-R00

(14) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11D26, HYDRAULIC RAT CONT or HYDRAULICS RAT AUTO CONT
(b) 11D27, HYDRAULIC RAT AUTO or HYDRAULICS RAT AUTO PWR
(c) 11B24, FIRE DETECTION APU 1
(d) 11B25, FIRE DETECTION APU 2
(e) 11D31, HYDRAULIC PTU CONT

S 865-019-R00

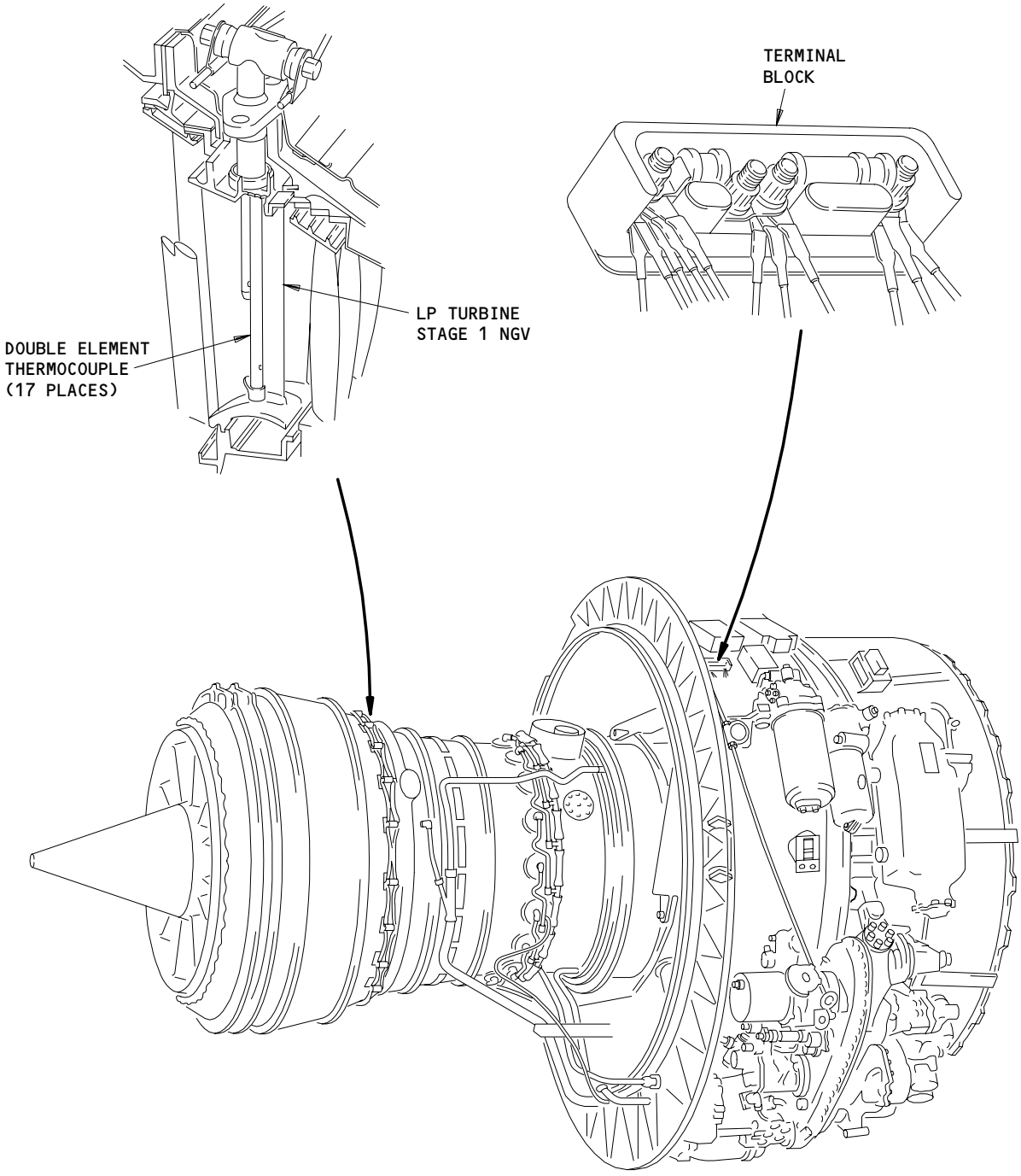
(15) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 main power distribution panel:
(a) 6F1, RAT MAN or RAT MAN PWR
(b) 6L13 or 6L15, PITOT HEAT CAPT MAIN
(c) 6L14 or 6L16, PITOT HEAT L AUX
(d) 6L17, L AOA HEAT
(e) 6L21, PITOT HEAT R AUX
(f) 6L22, PITOT HEAT F/O MAIN
(g) 6L23, R AOA HEAT
(h) 6L24, TAT PROBE HEAT

S 865-020-R00

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

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

1. General (Fig. 1)
   A. An EGT indicating system is incorporated in each engine to effectively measure the temperature of the exhaust gases as they enter the turbines and provide indication of this in the flight compartment. EGT indication is achieved by measuring an electrical signal produced by a system of thermocouples positioned in the hot gas stream and wired to form a parallel circuit.
   B. The thermocouples sense LP turbine inlet temperature (T7) and transmit a signal for indication on the Engine Indication and Crew Alerting System (EICAS).
   C. ENGINES PRE RR SB 71-8093;
      The double element thermocouple provides a second signal for maximum temperature control through the limiter channel of the Electronic Engine Control (EEC).
   D. The EGT system for each engine comprises 17 double element thermocouples sensing T7, a thermocouple harness and a terminal block assembly. The temperature reading is displayed on EICAS.
2. Component Details (Fig. 2)
   A. EGT Thermocouple Probe
      (1) The thermocouples are equally spaced around the periphery of the front section of the turbine outer case and locate in the LP turbine stage one nozzle guide vanes. The two elements in each thermocouple are of different lengths, thus the temperature is sampled at 34 points across the engine. The outputs of the two elements are paralleled at common terminals to form a single thermocouple unit.
      (2) Each thermocouple comprises two metal sheaths, brazed together and attached to a mounting flange and terminal head. The sheaths are of different lengths and each encloses bi-metal elements that are joined at the lower ends. The elements are insulated from the sheaths and connected, in parallel, to two insulated terminal posts, colored white (positive) and green (negative) corresponding to the thermocouple harness. Holes in the sheaths allow hot gases to flow around the bi-metal junction.
   B. EGT Thermocouple Harness
      (1) The thermocouple harness consists of two separate leads, positive (chromel) colored white and negative (alumel) colored green, each being a braided conductor in an insulated sleeve. The leads are connected to the appropriately colored terminal post on the thermocouple by captive bolts fitted with spring washers, and secured to terminal plates that are spot welded to the harness braid at intervals along its length.
      (2) Extension leads connect the harness to the terminal block mounted on the combustion outer case, from where further leads connect to the engine/airplane interface. The extension leads are colored corresponding to the harness.



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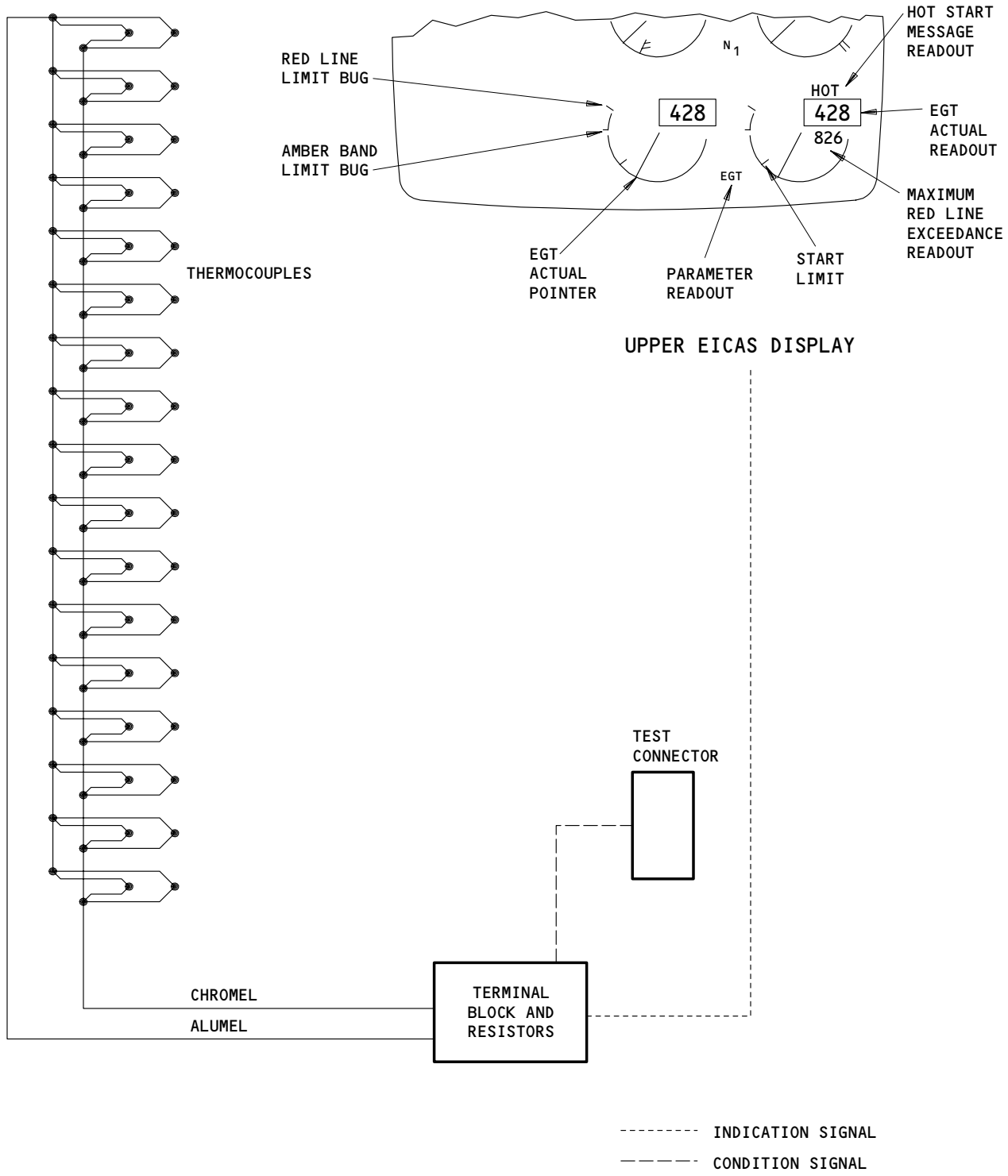
EGT Indicating System Component Locations
Figure 1



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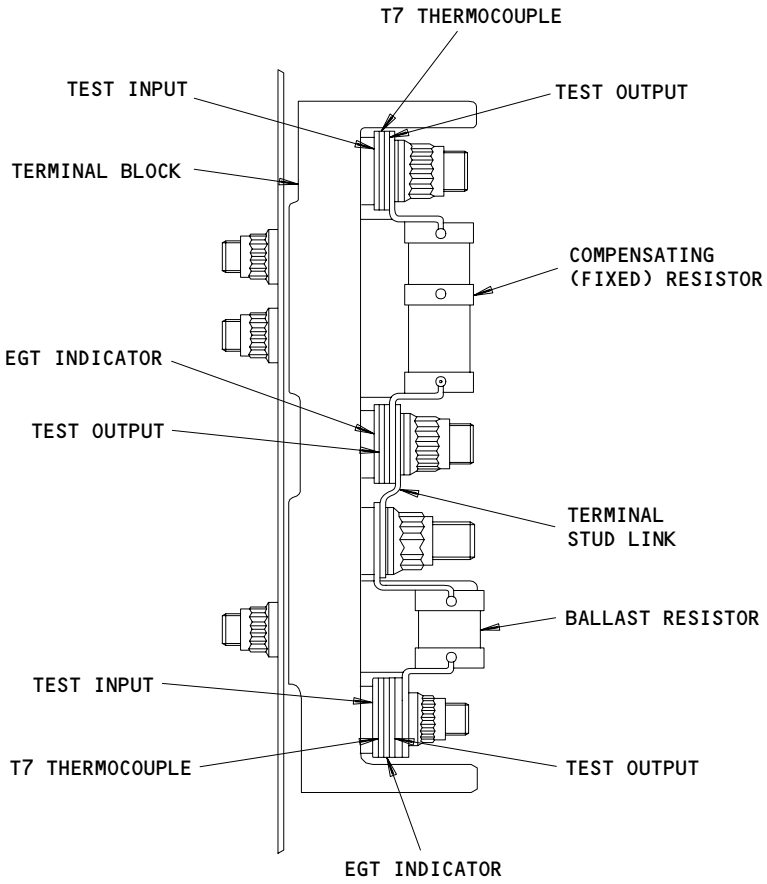
EGT Indicating System Basic Diagram
Figure 2

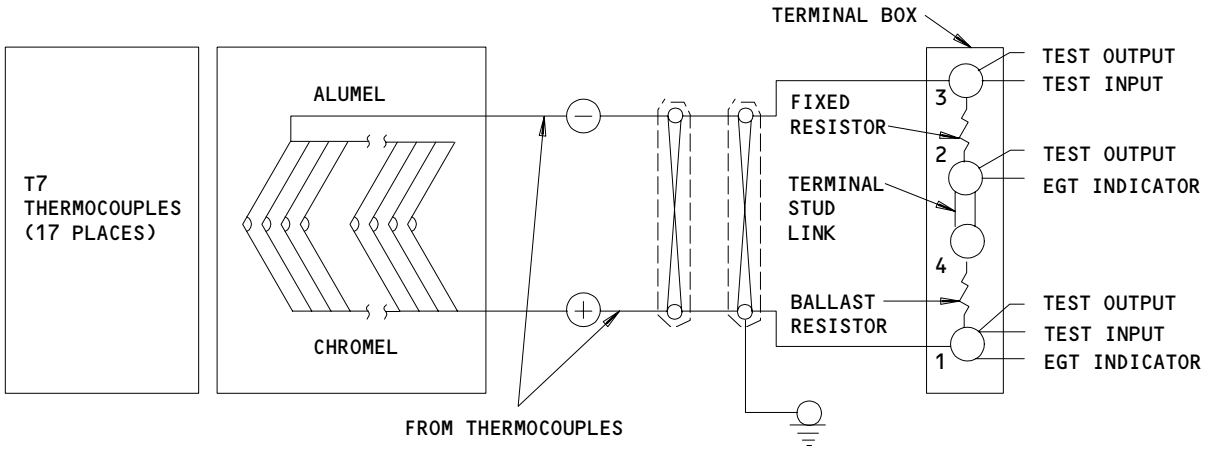
C. EGT Electrical Cables, Terminal Block and Resistors (Fig. 3)
   (1) The terminal block features four terminal posts, interconnected by two resistors and a terminal stud link. The resistors; a compensating resistor of fixed value, and a ballast resistor of selected value, form a potential divider system across the output of the thermocouples to present a reduced voltage to the indicating system, resulting in a reduced indicated EGT compared with that sensed by the thermocouples.
   (2) The terminal stud link is fitted across the two center terminal posts, joining ballast and trim resistors. This arrangement enables the link to be replaced by a remote switch to facilitate system testing.

D. EGT Indication on EICAS
   (1) EGT indication is displayed by both a pointer and digital readout on the upper EICAS display. The pointer extends from the center of the white dial face and rotates clockwise from about the 3 o'clock position to about the 10 o'clock position. The digital readout is in the upper right corner of the indication and displays what the pointer indicates.
   (2) There is a yellow zone and a red line limit on the dial face. When the pointer reaches either of these colors it will change to that color along with the digital readout. When the red line limit is exceeded the dial face will extend with the pointer and the maximum value will be displayed under the digital readout.
   (3) When the EGT rate of rise is faster then normal the word HOT will appear above the digital readout. This is to show that a hot start may occur.
   (4) The use of splices is not recommended in thermocouple circuits.
      (a) Splices have been known to cause incorrect EGT indication.

3. Operation (Fig. 4)

A. Functional Description
   (1) The EGT indicating system is operational when the EICAS system is activated. This supplies a small voltage through the EGT system which arms the system. During engine operation the hot stream gases flow through the holes in the nozzle guide vanes to heat the hot junction of the thermocouples.
   (2) Heating of the hot junctions provides a multivolt output which is proportional to the average temperature of the junctions. The potential divider system on the terminal block reduces the voltage signal to the indicator, and thus the indicated temperature, by an amount proportional to the value of the ballast resistor. The resulting voltage signal is processed by the EICAS computer and displayed in degrees Centigrade.
   (3) ENGINES PRE RR SB 71-8093;
   The full voltage signal from the thermocouples is directed from the terminal block to the engine limiter control system in the engine fuel control system (AMM 73-21-00/001).





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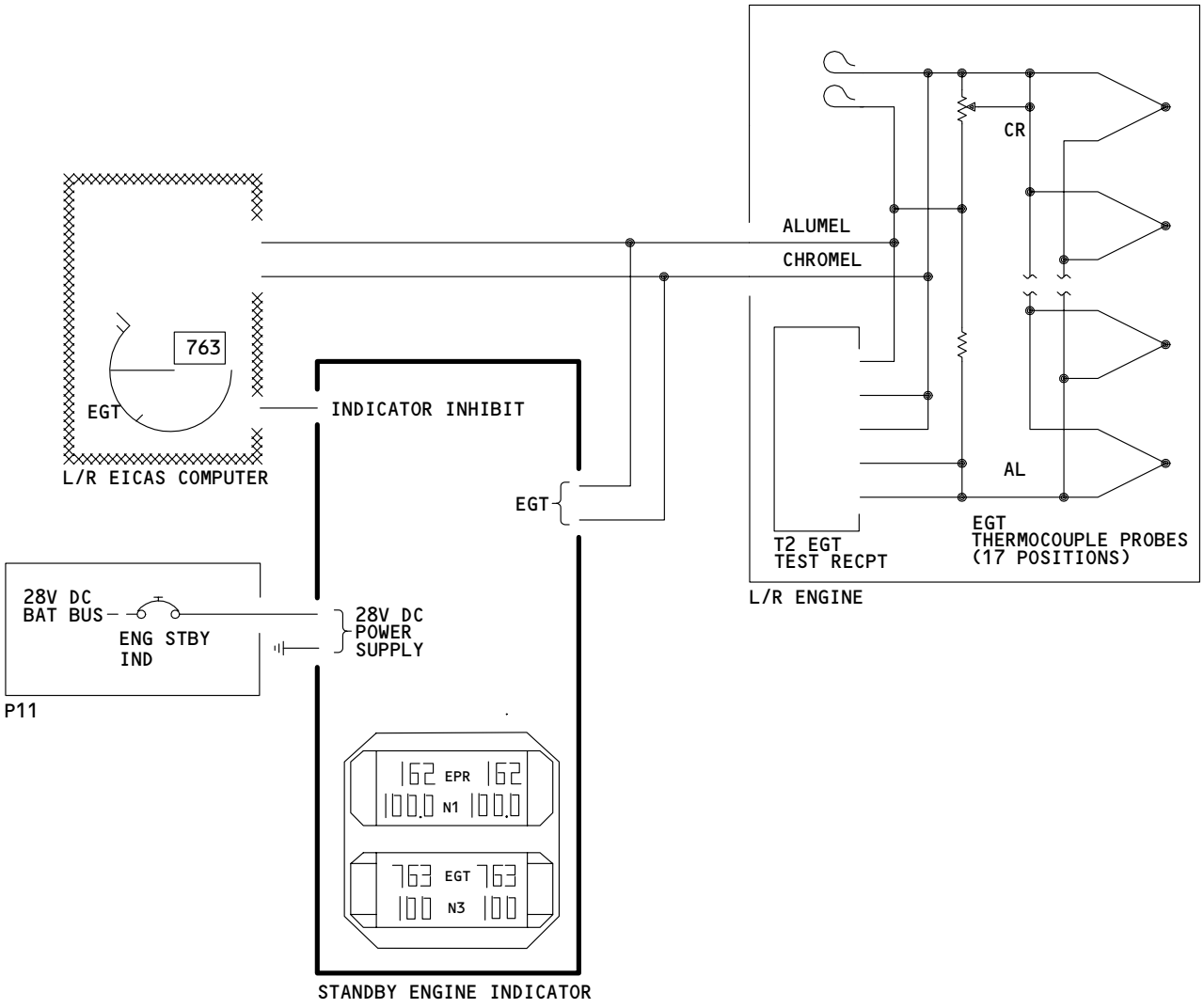
EGT Indicating System Terminal Locations
Figure 3

(4) The EGT indicator receives its signal from the EICAS computer and displays actual EGT in pointer and digital readout. When EGT nears or reaches maximum the pointer and digital readout will change from white to yellow to red accordingly. If maximum EGT or above is reached, this value will be displayed beneath the digital readout.

(5) Takeoff/go-around Mode

(a) When the thrust management computer is in either the takeoff or go-around mode, the yellow band exceedance operations are inhibited for five minutes. Automatic secondary data initiation does not occur until the red band area is entered. All parameter pointers and readouts remain white until the red band area is entered.

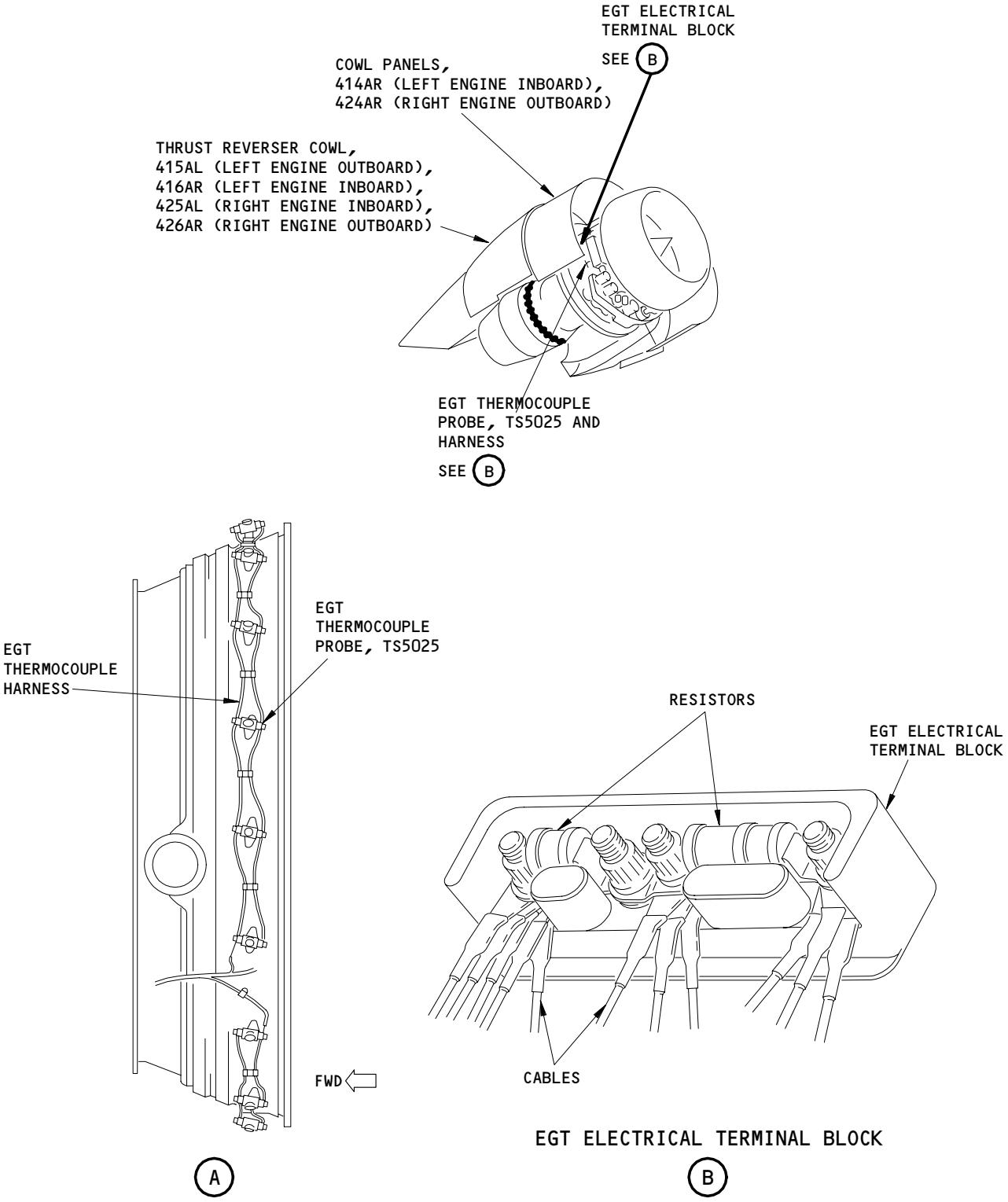


Exhaust Gas Temperature Indication Schematic
Figure 4

EXHAUST GAS TEMPERATURE (EGT) INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BLOCK - EGT ELECTRICAL CABLES AND RESISTORS TERMINAL	--	2	414AR,424AR COWL PANELS	77-21-03
HARNESS - EGT THERMOCOUPLE	--	2	415AL,425AL,416AR,426AR COWL PANELS	77-21-02
PROBE - EGT THERMOCOUPLE, TS5025	--	34	415AL,425AL,416AR,426AR COWL PANELS	77-21-01

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



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

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

1. General
   A. This section gives an operational test and a system test for the EGT indicating system. You can do the operational test when you operate the engines to make sure that the system operates. Do the system test to examine the precision of the system.

TASK 77-21-00-715-001-R00

2. Operational Test - EGT Indicating System
   A. References
      (1) AMM 71-00-00/201, Power Plant
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Do the Test for the EGT Indicating System

S 865-002-R00

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

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

S 865-003-R00

(2) Make sure you operate the two engines at the same power position.

S 715-004-R00

(3) Make sure the EGT for the engine that you test is approximately the same as the other engine.

S 865-005-R00

(4) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

TASK 77-21-00-735-006-R00

3. System Test - EGT Indicating System
   A. Equipment
      (1) EGT Test Set

NOTE: Use any signal generator that can give the necessary range and precision of millivolt signals. See the table (AMM 77-21-00/501).

(2) Test Lead

NOTE: Make a test harness to install between the signal generator and the D1110J or D1210J connector. This test harness can be made from any available 18 gage wire. Use P/N BACC47ES2 pins to connect with the socket in the connectors D1110J and D1210J in terminal locations 6 and 7.

B. References
(1) AMM 24-22-00/201, Control - Electrical Power
(2) AMM 54-52-01/401, Strut Fairings
(3) AMM 71-11-04/201, Fan Cowl Panels

C. Access
(1) Location Zones

211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine
430	Nacelle Strut, Left Engine
440	Nacelle Strut, Right Engine

(2) Access Panels

415AL	Thrust Reverser, Left Engine
416AR	Thrust Reverser, Left Engine
425AL	Thrust Reverser, Right Engine
426AR	Thrust Reverser, Right Engine
431AL	Aft Forward Fairing, Left Engine
441AR	Aft Forward Fairing, Right Engine

D. Prepare to Do the Test For the EGT Indicating System

S 015-008-R00
(1) Open the fan cowl panels (AMM 71-11-04/201).

S 015-012-R00
(2) Remove the applicable aft forward fairing from the left or right engine strut (AMM 54-52-01/401).

S 035-013-R00
(3) Disconnect the applicable electrical connector plug from the connector D1110J or D1210J on the connector panel on the left or right engine strut.

S 485-016-R00
(4) Install the test lead to the pins 6 and 7 of the applicable connector D1110J or D1210J.

S 485-017-R00
(5) Connect the test lead to the test set.

S 865-019-R00
(6) Make sure the EICAS circuit breakers on the overhead circuit breaker panel, P11, row J, are closed.

S 865-120-R00
(7) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11D23, ENG STBY IND 1 or STBY IND
(b) 11D24, ENG STBY IND 2 (if installed)

E. Do the Test For the EGT Indicating System

S 865-029-R00
(1) Supply the electrical power (AMM 24-22-00/201).

S 865-031-R00
(2) Make all necessary adjustments to the test set.

NOTE: Let the test set become warm for approximately 5 minutes.

S 865-032-R00
(3) Set the temperature on the test set to 410 ±1°C.

Test Set Signal (millivolts)	True EGT (degrees C)	EICAS/SEI EGT Ind. (degrees C)
16.818 ±0.040	410 ±1	410 ±10
29.338 ±0.040	705 ±1	705 ±4
35.314 ±0.040	850 ±1	850 ±4
36.202 ±0.040	872 ±1	872 ±7

S 865-033-R00
(4) Set the Engine Indicating and Crew Alerting System (EICAS) computer switch to the L EICAS position.

S 215-034-R00
(5) Make sure that the EGT indication on the top EICAS display shows 410 ±10°C.

S 865-035-R00
(6) Set the EICAS computer switch to the R EICAS position.

S 215-036-R00
(7) Make sure that the EGT indication on the top EICAS display shows 410 ±10°C.

S 865-037-R00
(8) Set the standby engine indicator (SEI) switch to the ON position.
(a) Make sure that the EGT indication shows 410 ±10°C.

S 865-038-R00
(9) Set the temperature on the test set to 872 ±1°C.
(a) Make a record of the time that you stay at this position.

S 215-039-R00
(10) Make sure that the EGT indication on the EICAS display is red in color and shows 872 ±7°C.

S 865-040-R00
(11) Set the EICAS computer switch to the L EICAS position.

S 215-041-R00
(12) Make sure that the EGT indication on the EICAS display is red in color and shows 872 ±7°C.

S 215-042-R00
(13) Make sure that the EGT indication on the SEI shows 872 ±7°C.

S 865-043-R00
(14) Set the temperature on the test set to 410 ±1°C.

S 215-044-R00
(15) Make sure that the EGT indication on the EICAS display (is white in color) and the SEI shows 410 ±1°C.

S 865-045-R00
(16) Set the SEI switch to the AUTO position and make sure that the SEI indication goes off.

S 865-046-R00
(17) Open these circuit breakers on the P11 panel and make sure that the EICAS indication goes off and the SEI shows 410 ±10°C on the EGT indication:
(a) 11J2, LEFT EICAS CMPTR or EICAS CMPTR LEFT
(b) 11J29, RIGHT EICAS CMPTR or EICAS CMPTR RIGHT

S 865-047-R00
(18) Close these circuit breakers on the P11 panel and make sure that the EICAS indication comes on and the SEI indication goes off for the EGT:
(a) 11J2, LEFT EICAS CMPTR or EICAS CMPTR LEFT
(b) 11J29, RIGHT EICAS CMPTR or EICAS CMPTR RIGHT

S 215-048-R00
(19) Make sure that the EGT indication on the EICAS shows 410 ±10°C.

S 865-049-R00
(20) Push the ENG EXCD button on the EICAS MAINT panel found on the right side panel, P61.

S 215-050-R00
(21) Make sure that an exceedance value is shown for the EGT of 872 ± 7°C for the time that you made a record of before ± 15 seconds.

S 865-051-R00
(22) Push and hold the ERASE button on the EICAS MAINT panel until the exceedance value goes out of view.

S 865-052-R00
(23) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 865-053-R00
(24) Turn the test set OFF.

F. Put the Airplane Back to Its Usual Condition

S 085-057-R00
(1) Remove the test lead from the test set and the applicable strut receptacle D1110J or D1210J.

S 435-060-R00
(2) Install the electrical connector plug to the applicable strut receptacle D1110J or D1210J.

S 415-061-R00
(3) Install the aft forward fairing (431AL or 441AR) to the engine strut (AMM 54-52-01/401).

S 415-062-R00
(4) Close the fan cowl panels (AMM 71-11-04/201).

EGT THERMOCOUPLE PROBE - REMOVAL/INSTALLATION

1. General
   A. This section contains two tasks. The first task gives the steps to remove the EGT thermocouple probe. The second task gives the steps to install the thermocouple probe. Baulking pins are found at the bottom of the stage 1 vanes for the low pressure turbine to prevent an incorrect thermocouple installation.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubricant, and installation of rubber seal rings.
   C. Use the procedures given in AMM 70-51-00/201 to tighten fasteners. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a torque value is specified in this procedure.

TASK 77-21-01-004-001-R00

2. Remove the EGT Thermocouple Probe
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine

      (2) Access Panels

415AL/416AR	Fan Reverser, Left Engine
425AL/426AR	Fan Reverser, Right Engine

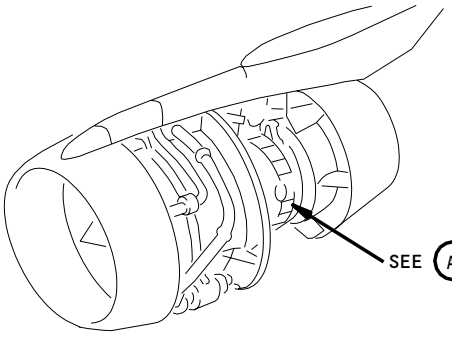
   C. Prepare to remove the EGT thermocouple probe

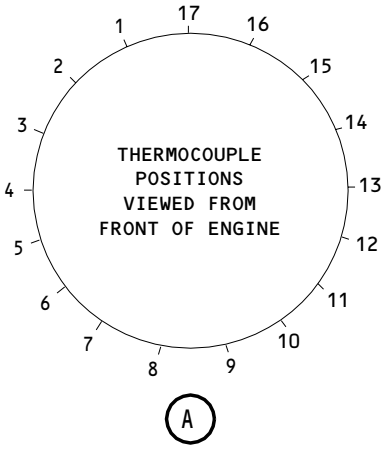
S 864-002-R00

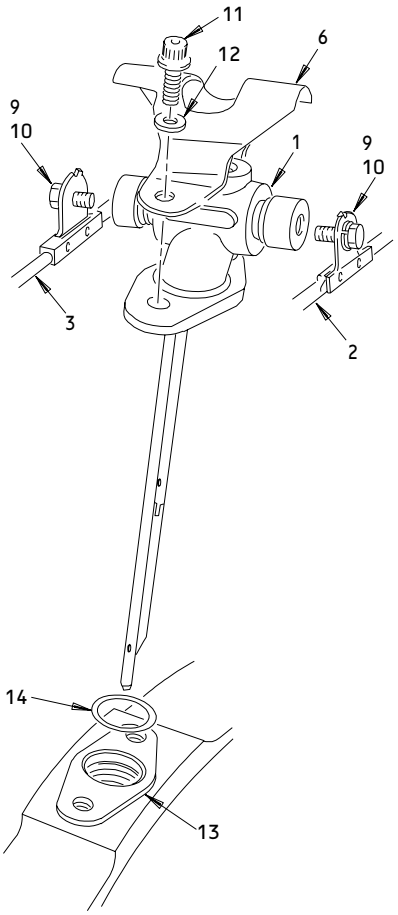
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
         (a) 11L4, LEFT ENGINE ELECTRONIC ENGINE CONTROL LIMITER
         (b) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV

S 864-003-R00

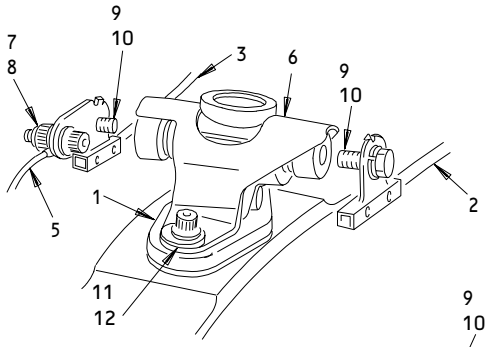
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
         (a) 11L31, RIGHT ENGINE ELECTRONIC ENGINE CONTROL LIMITER
         (b) 11L32, RIGHT ENGINE ELECTRONIC ENGINE CONTROL SUPV



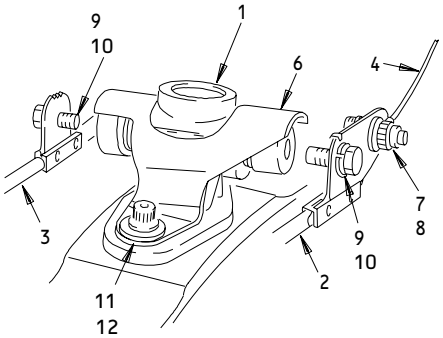




THE INSTALLATION AT THE POSITIONS 4 TO 8 AND 10 TO 16



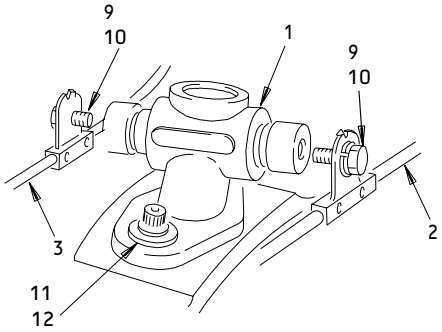
THE INSTALLATION AT THE POSITION 3



THE INSTALLATION AT THE POSITION 2

INSTALLATION AT ALL POSITIONS

1. THERMOCOUPLE
2. POSITIVE LEAD (WHITE)
3. NEGATIVE LEAD (GREEN)
4. POSITIVE EXTENSION LEAD
5. NEGATIVE EXTENSION LEAD
6. SHROUD
7. BOLT
8. WASHER
9. BOLT
10. WASHER
11. BOLT
12. WASHER
13. THERMOCOUPLE SLEEVE
14. SEAL RING



THE INSTALLATION AT THE POSITIONS 1,9 AND 17

93402A

EGT Thermocouple Probe Installation
Figure 401

S 014-004-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

D. Remove the EGT Thermocouple Probe

S 934-006-R00

(1) Make a temporary mark on each thermocouple shroud, thermocouple, and their positions to make the installation procedure easier.

NOTE: The shrouds are installed at the positions 2 through 8 and 10 through 16 only.

S 024-012-R00

(2) Do the steps that follow to remove the thermocouple at position 2:
   (a) Remove the bolt (7) and release the positive extension lead (4).
   (b) Remove the bolts (9) that attach the harness leads (2 and 3) to the thermocouple (1).
   (c) Remove the bolts (11) that attach the thermocouple (1) and shroud (6) to the engine case.
   (d) Remove the thermocouple and shroud.
      1) Discard the seal ring (14).

S 024-014-R00

(3) Do the steps that follow to remove the thermocouple at position 3:
   (a) Remove the bolt (7) and release the negative extension lead (5).
   (b) Remove the bolts (9) that attach the harness leads (2 and 3) to the thermocouple (1).
   (c) Remove the bolts (11) that attach the thermocouple (1) and shroud (6) to the engine case.
   (d) Remove the thermocouple and shroud.
      1) Discard the seal ring (14).

S 024-016-R00

(4) Do the steps that follow to remove the thermocouples at positions 4 through 8 and 10 through 16:
   (a) Remove the bolts (9) that attach the harness leads (2 and 3) to the thermocouple (1).
   (b) Remove the bolts (11) that attach the thermocouple (1) and shroud (6) to the engine case.

(c) Remove the thermocouple and shroud.
1) Discard the seal ring (14).

S 024-018-R00

(5) Do the steps that follow to remove the thermocouples at positions 1, 9, and 17:
(a) Remove the bolts (9) that attach the harness leads (2 and 3) to the thermocouple (1).
(b) Remove the bolts (11) that attach the thermocouple (1) to the engine case.
(c) Remove the thermocouple.
1) Discard the seal ring (14).

S 214-046-R00

(6) Examine the thermocouples.
(a) A maximum of three thermocouple tips which are caught in the NGV can be accepted if you do the steps that follow:

NOTE: The thermocouple tips can become disconnected from the thermocouple and become caught in the LP1 Nozzle Guide Vanes (NGV).

1) Cut the broken thermocouple elements approximately level with the face of the head mounting flange.
2) Do an insulation/resistance test of the damaged thermocouples (AMM 77-21-01/501).
3) After installation of the thermocouples, do the insulation/resistance test again (AMM 77-21-01/501).
4) Make a note in the engine log book for maintenance action at the next removal of the engine during which the 05 module will be overhauled.

NOTE: A maximum of three damaged thermocouples can be accepted on the engine.

a) The disconnected tips must be removed from the LP1 NGV and the thermocouples replaced.
5) If more than three thermocouple tips are missing - reject the engine.

TASK 77-21-01-404-019-R00

3. Install the EGT Thermocouple Probe

A. Consumable Materials
(1) B00090 Cleaning Fluid,
Inhibited and Stabilized, 1.1.1. Trichloroethane
British Spec/Ref - B.S.4487:1969
OMat No. 1/21.
(2) D00322 Thixotropic Dry Film Lubricant,
OMat 4/20
(3) D00632 High Temperature Anti-Seize Compound,
OMat 4/62

B. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Thermocouple Assy - T7	77-21-01	01	5
	6	Shroud			25
	7	Bolt	77-21-51	01	15
	8	Nut			50
	11	Bolt	77-21-01	01	10
	12	Washer			15
	13	Sleeve			30
	14	Seal Ring			45

C. References
(1) AMM 70-42-12/201, Local Surface Protection
(2) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones
211 Flight Compartment
212 Flight Compartment
410 Left Engine
420 Right Engine

(2) Access Panels
415AL/416AR Fan Reverser, Left Engine
425AL/426AR Fan Reverser, Right Engine

E. Procedure

S 114-040-R00

(1) Clean the faces of the E.G.T. thermocouple probes and the outer case that will touch when assembled:

WARNING: DO NOT USE CLEANING FLUID NEAR HEAT OR IGNITION SOURCES. CLEANING FLUID IS HIGHLY FLAMMABLE.

WARNING: DO NOT LET THE CLEANING FLUID TOUCH YOUR SKIN. USE THE CORRECT HAND PROTECTION. INJURY CAN OCCUR.

WARNING: CLEANING FLUID IS HIGHLY TOXIC. USE THE CLEANING FLUID IN AN AREA THAT HAS A GOOD FLOW OF AIR. DO NOT BREATHE THE FUMES FROM THE CLEANING FLUID. INJURY CAN OCCUR.

CAUTION: DO NOT GET THE CLEANING FLUID ON THE SURFACE OF THE OUTER CASE. THE CLEANING FLUID WILL DAMAGE THE SURFACE PROTECTION ON THE OUTER CASE. IF THE SURFACE PROTECTION IS DAMAGED, REFER TO AMM 70-42-12/201 FOR THE PROCEDURE TO REPROTECT THE SURFACE OF THE OUTER CASE.

(a) Clean the old film lubricant from the faces of thermocouple sleeves (13) and the thermocouples (1) that will touch when assembled and clean the thermocouple probe tip.
1) Use a lint free cloth that is moist with degreasing fluid.

(b) If the thermocouple sleeves are removed with the thermocouples, do the steps that follow:
1) Clean the faces of the thermocouple sleeves (9) and the thermocouple bosses of the turbine case that will touch when assembled.
2) Make sure that all of the faces that will touch when assembled are clean and not damaged.

S 644-044-R00

(2) Lubricate each of the thermocouples:
(a) Apply the OMat 4/20 film lubricant to the faces of the thermocouple sleeve (13) and the thermocouple (1) that will touch when assembled.
(b) Apply the OMat 4/62 anti-seize compound to the thermocouple (1) probe tip but not the thermocouple air holes.

NOTE: Install all of the components while the lubricant is still wet.

S 434-027-R00

(3) Install the thermocouple sleeves (13) if you removed them.

S 424-029-R00

(4) Do the steps that follow to install the thermocouple at position 2:
   (a) Install the new seal ring (14) in the thermocouple sleeve (13).
   (b) Install the thermocouple (1) and shroud (6) with the bolts (11) and the washers (12).
   (c) Install the harness leads (2 and 3) with the bolts (9) and the washers (10).
      1) Tighten the bolts (9) to 25 pound-inches (2.82 newton-meters).
   (d) Install the positive extension lead (4) with the bolt (7) and the nut (8).

S 424-031-R00

(5) Do the steps that follow to install the thermocouple at position 3:
   (a) Install the new seal ring (14) in the thermocouple sleeve (13).
   (b) Install the thermocouple (1) and the shroud (6) with the bolts (11) and the washers (12).
   (c) Install the harness leads (2 and 3) with the bolts (9) and the washers (10).
      1) Tighten the bolts (9) to 25 pound-inches (2.82 newton-meters).
   (d) Install the negative extension lead (5) with the bolt (7) and the nut (8).

S 424-033-R00

(6) Do the steps that follow to install the thermocouples at positions 4 through 8 and 10 through 16:
   (a) Install the new seal ring (14) in the thermocouple sleeve (13).
   (b) Install the thermocouple (1) and the shroud (6) with the bolts (11) and the washers (12).
   (c) Install the harness leads (2 and 3) with the bolts (9) and the washers (10).
      1) Tighten the bolts (9) to 25 pound-inches (2.82 newton-meters).

S 424-035-R00

(7) Do the steps that follow to install the thermocouples at positions 1, 9, and 17:
   (a) Install the new seal ring (14) in the thermocouple sleeve (13).
   (b) Install the thermocouple (1) with the bolts (11) and the washers (12).
   (c) Install the harness leads (2 and 3) with the bolts (9) and the washers (10).
      1) Tighten the bolts (9) to 25 pound-inches (2.82 newton-meters).

F. Put the Airplane Back to Its Usual Condition

S 414-036-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

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

S 864-037-R00

(2) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11L4, LEFT ENGINE ELECTRONIC ENGINE CONTROL LIMITER
   (b) 11L5, LEFT ENGINE ELECTRONIC ENGINE CONTROL SUPV

S 864-038-R00

(3) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
   (a) 11L31, RIGHT ENGINE ELECTRONIC ENGINE CONTROL LIMITER
   (b) 11L32, RIGHT ENGINE ELECTRONIC ENGINE CONTROL SUPV

EGT THERMOCOUPLE PROBE - ADJUSTMENT/TEST

1. General
   A. This procedure gives the steps to do an adjustment test on the EGT thermocouple probe.

TASK 77-21-01-735-011-R00

2. Adjustment Test - EGT Thermocouple Probe
   A. Equipment
      (1) Wheatstone Bridge or equivalent test instrument
      (2) Insulation Tester
   B. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine

      (2) Access Panels

415AL/416AR	Fan Reverser, Left Engine
425AL/426AR	Fan Reverser, Right Engine

   D. Prepare to Do the Test For the EGT Thermocouple Probe

      NOTE: You must connect the test leads directly to the thermocouple that the test is for with the bolts and not probes or crocodile clips.

      S 865-002-R00
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
      (a) 11J2, L EICAS CMPTR or EICAS CMPTR LEFT
      (b) 11J29, R EICAS CMPTR or EICAS CMPTR RIGHT

      S 015-003-R00

      WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

E. Do the Test for the EGT Indicating System

S 025-004-R00

(1) Remove the bolts that attach the harness to the thermocouple and move the harness to be clear of the thermocouple.

S 735-005-R00

(2) Examine the thermocouple resistance.
  (a) Connect the test leads of known resistance to each thermocouple terminal.
  (b) Use the Wheatstone Bridge to measure and make a record of the circuit resistance.
    1) Subtract the value of the test leads.
    2) The corrected circuit resistance must be between 8.05 to 8.35 ohms at 20 degrees C.
      a) For each degree C that the thermocouple is above or below 20 degrees C, correct the measured resistance value by subtraction or addition respectively of 0.05 percent. See the two example calculations below.
      b) EXAMPLE 1

        Thermocouple temperature = 30 degrees C.

        Measured resistance (minus test leads) = 8.3 ohms.

        Correction = 0.05% x (difference in temperature from 20 degrees C) x (measured resistance) = (0.05/100 x (30-20) x (8.3) = 0.04 ohms.

        Because the thermocouple temperature is more than 20 degrees C, to find the corrected resistance you must subtract the correction from the measured resistance.
      c) EXAMPLE 2

        Thermocouple temperature = 15 degrees C.

        Measured resistance (minus test leads) = 8.1 ohms.

        Correction = 0.05% x (difference in temperature from 20 degrees C) x (measured resistance) = (0.05/100 x (15-20) x (8.1) = 0.02 ohms.

        Because the thermocouple temperature is less than 20 degrees C, to find the corrected resistance you must add the correction from the measured resistance.
  (c) Disconnect the Wheatstone Bridge and the test leads.

S 735-006-R00

(3) Examine the thermocouple insulation resistance.

(a) Use the insulation test meter to measure the resistance between each terminal and ground.

1) The resistance must not be less than 170,000 ohms in each test.

(b) Disconnect the insulation test meter.

S 425-007-R00

(4) Install the thermocouple harness to the thermocouple with the bolts.

S 425-008-R00

(5) Tighten the bolts to 25 pound-inches (2.82 newton meters).

F. Put the Airplane Back to Its Usual Condition

S 415-009-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 865-010-R00

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:

(a) 11J2, L EICAS CMPTR or EICAS CMPTR LEFT

(b) 11J29, R EICAS CMPTR or EICAS CMPTR RIGHT

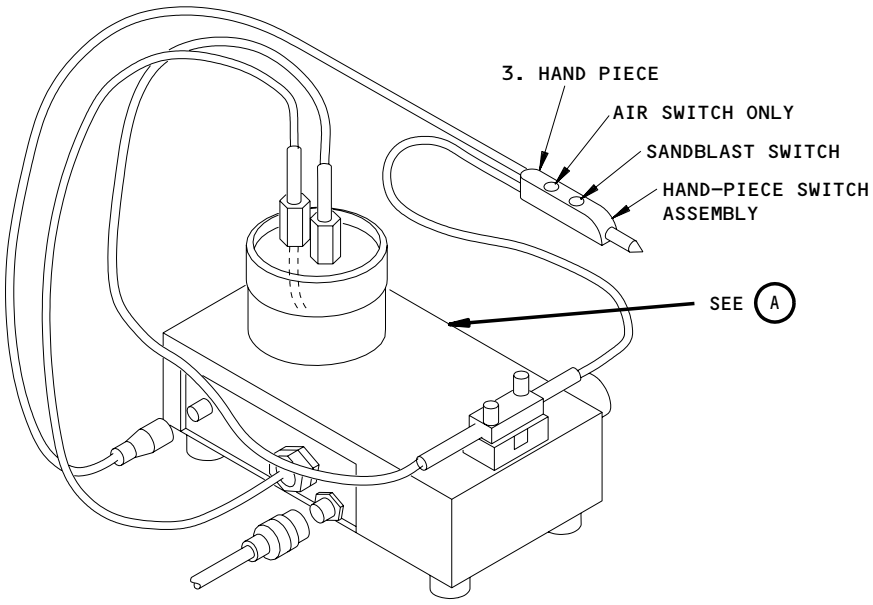
EXHAUST GAS TEMPERATURE (EGT) THERMOCOUPLE PROBE - CLEANING

1. General
   A. This procedure enables the operator to maintain the EGT thermocouple while the engine is on the wing. This procedure should not be used for off-wing engine overhaul work.
   B. References
      (1) AMM 77-21-02/401, EGT Thermocouple Harness.
      (2) AMM 78-31-00/201, Thrust reverser System.
      (3) AMM 77-21-00/501, Adjustment/Test EGT Indicating System.
   C. Tools
      (1) Aero-blaster glass glass bead cleaning unit (Weston Aerospace - Part Number TS4022) Contact Rolls-Royce PLC.
      (2) Dust recovery module.
      (3) Compressed air supply.
      (4) Non-electrical vacuum supply and connection tube.
   D. Consumable materials
      (1) Glass bead blast media 0-44 micron OMat No. 1/263
   E. Access
      (1) location Zones
         (a) 211 Flight Compartment
         (b) 212 Flight Compartment
         (c) 410 Left Engine
         (d) 420 Right Engine
      (2) Access Panels
         (a) 415AL/416AR Fan Reverser, Left Engine
         (b) 425AL/426AR Fan Reverser, Right Engine

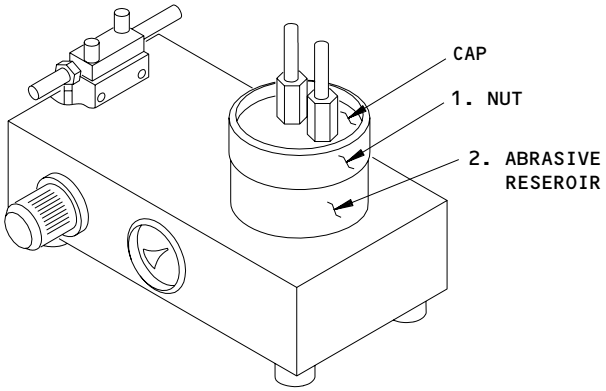
   TASK 77-21-01-727-024-R00
2. Clean the EGT Thermocouple probe
   A. Prepare to clean the EGT thermocouple probe

      S 027-001-R00
      (1) For the left engine, open these circuit breakers on the overhead circuit breaker panel, P11 , and attach DO-NOT-CLOSE tags:
         (a) 11L4, Left Engine Electronic Control Limiter
         (b) 11L5, Left Engine Control Supv

      S 027-002-R00
      (2) For the right engine, open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
         (a) 11L31, Right Engine Electronic Engine Control Limiter
         (b) 11L32, Right Engine Electronic Engine Control Supv



AERO–BLASTER UNIT



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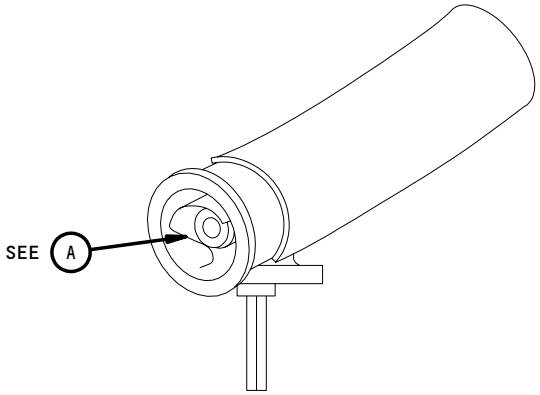
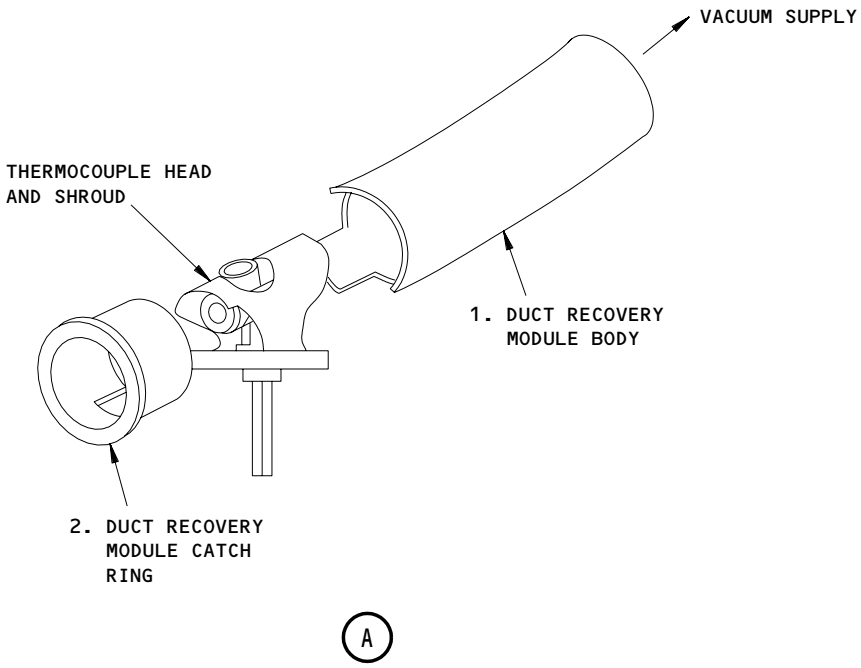
Setup Of The Aero–Blaster Unit
Figure 701



DUST RECOVERY MODULE



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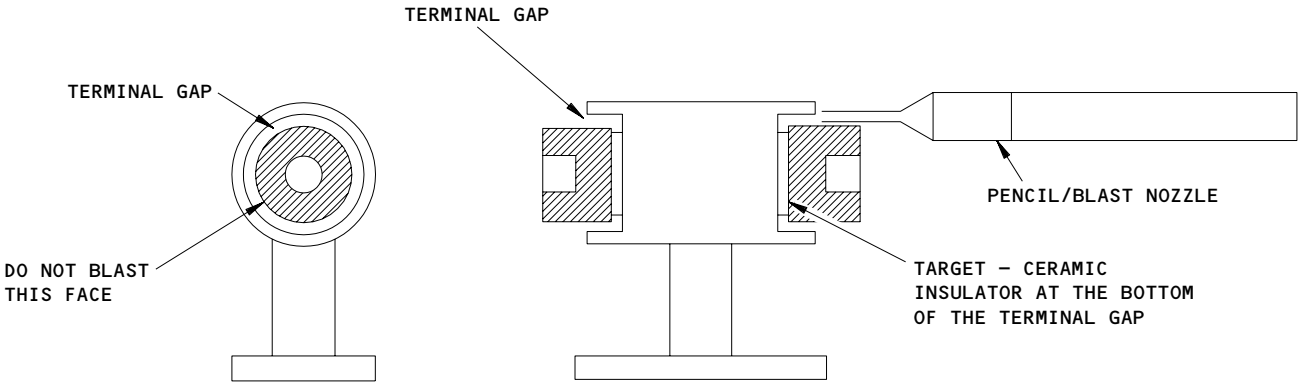
Installation of The Dust Recovery Module
Figure 702



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Cleaning of The Terminal Head Details
Figure 703

S 027-010-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

B. Clean the EGT Thermocouple Probe.

S 027-011-R00

CAUTION: IF THE HARNESS IS NOT SUFFICIENTLY LOOSENED, DAMAGE TO THE HARNESS AND/OR THE RECOVERY MODULE CAN OCCUR.

(1) Disconnect the EGT probe harness from the affected and adjacent EGT thermocouples and clipping points (AMM 77-21-02/401).

S 487-003-R00

(2) Set up the Aero-Blaster unit in accordance with the manufacturer's instructions.

S 027-004-R00

(3) Unscrew the cap nut (1) and remove the cap from the brasive reservoir (Fig. 701).

S 487-005-R00

(4) Fill the abrasive reservoir (2) with Glass Beads OMat 1/263 about 2/3 full and leave a minimum of 0.5 in. (12.5 mm) distance to the rim.

S 447-006-R00

(5) Remove any media from the rim and replace the cap and cap nut (1).

S 487-007-R00

(6) Hand tighten the cap nut (1) to ensure a tight seal is made.

S 487-008-R00

(7) Connect the Aero-blaster unit to the compressed air supply. Leave the valve in the off position until ready for use.

S 487-009-R00

(8) Connect the dust recovery module (1) around the head of the thermocouple (Fig. 702).

(a) Put the slot of the Dust Recovery Module (1) under the Thermocouple head and shroud.

NOTE: There are two slots that can be used, adjust to position the module for best fit

(b) Put the slot of the dust recovery module catch ring (2) under the thermocouple head until it connects fully with the dust recovery module body.

S 457-012-R00

(9) Connect the hose from the vacuum supply to the Dust Recovery Module (1).

S 487-021-R00

WARNING: DO NOT USE MAIN'S POWERED ELECTRICAL DEVICES WHILE YOU WORK ON-WING. THEY ARE NOT RESISTANT TO EXPLOSIONS AND CAN CAUSE INJURY TO INDIVIDUALS OR DAMAGE TO EQUIPMENT.

(10) Turn on the vacuum supply.

S 487-013-R00

(11) Turn on the compressed air.

S 487-014-R00

(12) Adjust the pressure regulator on the unit until 100 psi is reached on the pressure gauge.

S 487-015-R00

(13) Position the nozzle directly on the terminal gap between the thermocouple head and the terminal. The nozzle head should rest on the terminal (Fig. 703).

S 127-016-R00

(14) Operate the switch on the hand piece (Fig. 701) (3) and move the nozzle slowly around the terminal circumference to ensure an even cover.

NOTE: Do not clean the face of the terminal with the abrasive blast.

S 167-017-R00

(15) When the cleaning has been completed, remove any unwanted media that remains in the thermocouple terminal gap. Use a clean air blast or a wooden toothpick.

S 217-022-R00

CAUTION: METAL TOOLS MUST NOT BE USED NEAR THE CERAMIC BECAUSE SCORING MAY OCCUR. THIS CAN CAUSE A LOW RESISTANCE IN THE PRIOBE.

(16) Inspect the terminal gap to ensure no contamination remains. If contamination remains, do the cleaning process again.

S 217-018-R00

(17) Do the above procedures for both forward and aft terminals of each affected EGT probe.

S 427-019-R00

(18) Connect the EGT probe harness and clipping points (AMM 77-21-02/401).

S 717-020-R00

(19) Do the Adjustment/Test of the EGT indicating system (AMM 77-21-00/501).

EGT THERMOCOUPLE HARNESS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and the installation tasks for the EGT thermocouple harness.
   B. Use the procedure in AMM 70-51-00/201 to tighten the fasterers. Tighten the fasteners to the torque values in AMM 70-51-00/201 unless a torque value is specified in this procedure.

TASK 77-21-02-004-001-R00

2. Remove the EGT Thermocouple Harness (Fig. 401)
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panels
          415AL/416AR Fan Reverser, Left Engine
          425AL/426AR Fan Reverser, Right Engine

   C. Prepare to Remove the EGT Thermocouple Harness

      S 014-002-R00

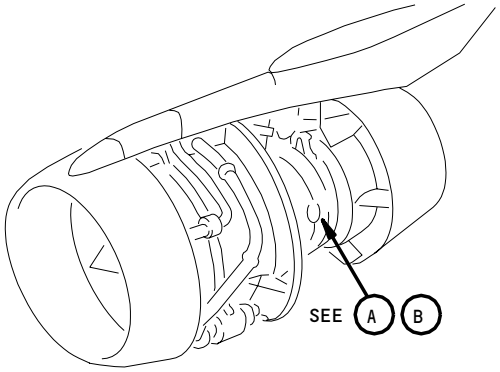
      WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

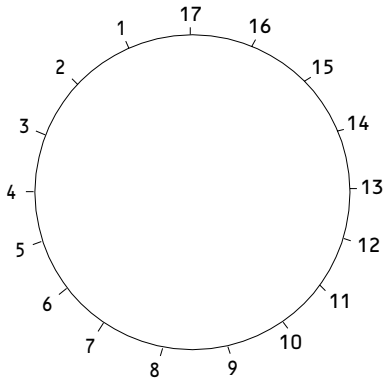
      (1) Open the thrust reversers (AMM 78-31-00/201).
   D. Remove the EGT Thermocouple Harness

      S 024-005-R00
      (1) Remove the bolts (6) that attach the extension leads (4 and 5) to the thermocouple harnesses at the thermocouple positions 2 and 3.

      S 024-006-R00
      (2) Remove the bolts (8) that attach the thermocouple harnesses to the thermocouple (1) at all 17 positions.

      S 024-007-R00
      (3) Release the clamps (12), bolts (10), washers (11) and nuts (13) and remove the harness.





THERMOCOUPLE POSITIONS
(VIEW IN THE AFT DIRECTION)

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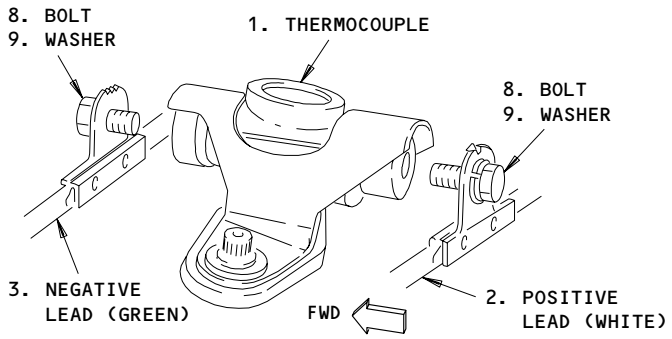
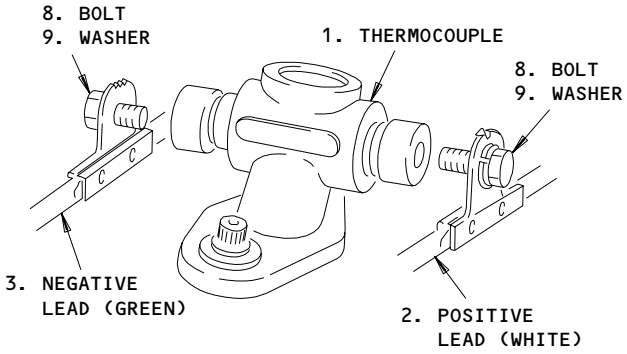
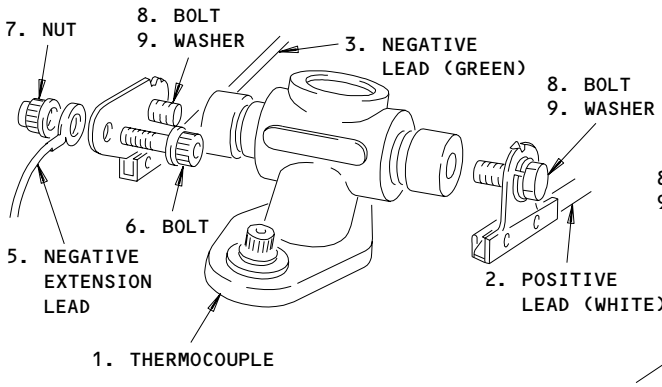


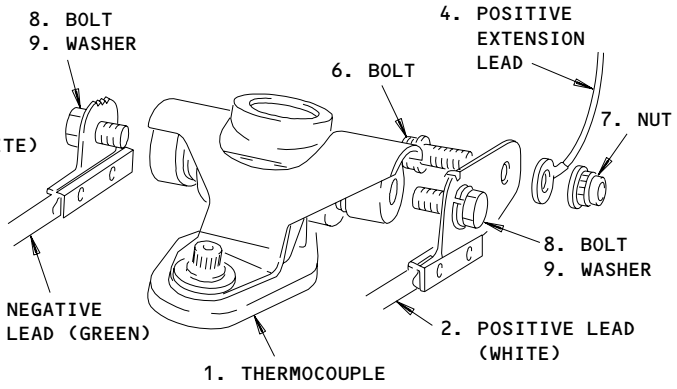
THE INSTALLATION AT THE POSITIONS
4 THROUGH 8 AND 10 THROUGH 16



THE INSTALLATION AT THE POSITIONS
1, 9, AND 17



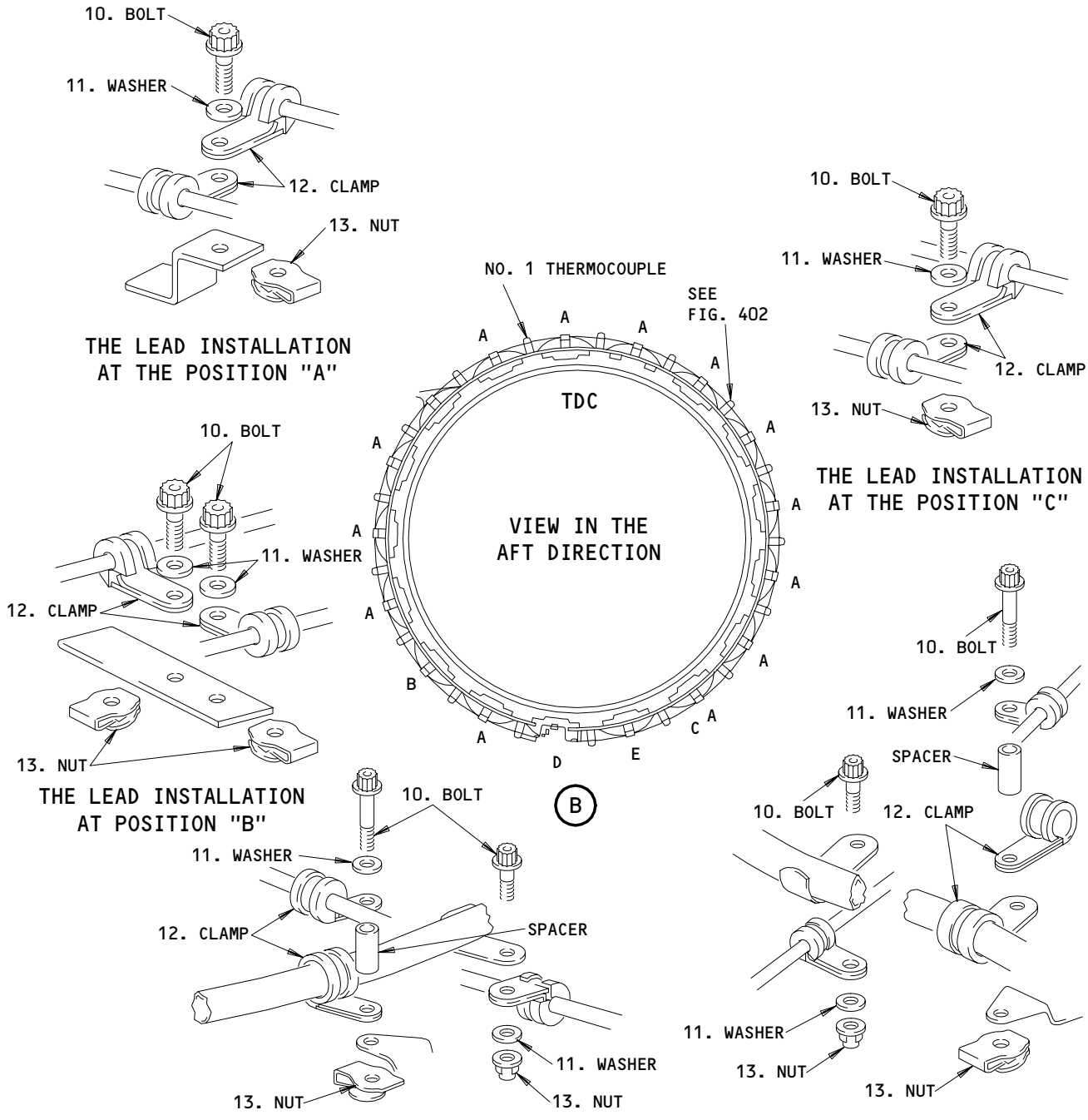
THE INSTALLATION AT THE POSITION 3



THE INSTALLATION AT THE POSITION 2

77524A

EGT Thermocouple Harness Installation
Figure 401 (Sheet 1)



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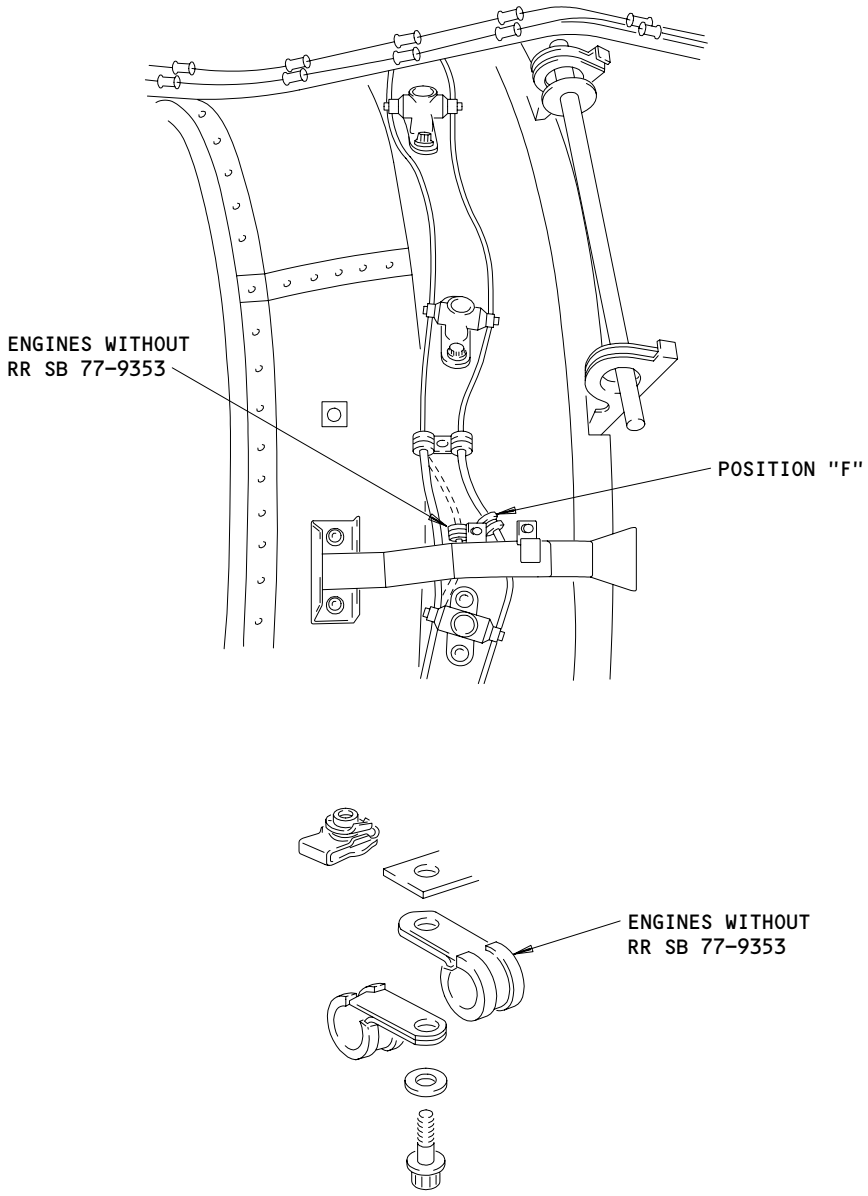
EGT Thermocouple Harness Installation
Figure 401 (Sheet 2)



THE LEAD INSTALLATION AT THE POSITION "F"

A9725

EGT Thermocouple Harness
Figure 402

S 034-008-R00
(4) Remove the clips from the harness.
(a) Keep the clips to put them on the replacement harness.

TASK 77-21-02-404-009-R00

3. Install the EGT Thermocouple Harness (Fig. 401)

A. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	2	Lead Assy - Positive T7 Thermocouple	77-21-02	01	30
	3	Lead Assy - Negative T7 Thermocouple			25
	6	Bolt	77-21-51	01	15
	7	Nut			50
	10	Bolt	77-21-01	01	10
	11	Washer			15
	12	Clip	77-21-02	01	5
	13	Nut			20

B. References
(1) AMM 78-31-00/201, Thrust Reverser System

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

(2) Access Panels
415AL/416AR Fan Reverser, Left Engine
425AL/426AR Fan Reverser, Right Engine

D. Procedure

S 424-010-R00
(1) Attach the negative lead (green) (3) to the forward face of the thermocouples 1 through 17 with the washers (9) and the bolts (8).
(a) Tighten the bolts to 25 pound-inches (2.82 newton meters).

S 424-011-R00
(2) Attach the positive lead (white) (2) to the rear face of the thermocouples 1 through 17 with the washers (9) and the bolts (8).
(a) Tighten the bolts to 25 pound-inches (2.82 newton meters).

S 424-014-R00

(3) Attach the positive extension lead (4) to the thermocouple lead (2) at the thermocouple position 2 with the nut (7) and the bolt (6).
(a) Tighten the nut (7) and the bolt (6).

S 424-017-R00

(4) Attach the negative extension lead (5) to the thermocouple lead (3) at the thermocouple position 3 with the nut (7) and the bolt (6).
(a) Tighten the nut (7) and the bolt (6).

S 424-018-R00

(5) Attach the harness with the clamps (12), bolts (10), washers (11), and nuts (13).
(a) Tighten the bolts (10).

E. Put the Airplane Back to Its Usual Condition

S 414-019-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

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

EGT THERMOCOUPLE HARNESS - ADJUSTMENT/TEST

1. General
   A. This procedure gives the steps to do a test on the EGT thermocouple harness.

TASK 77-21-02-735-012-R00

2. Adjustment Test - EGT Thermocouple Harness
   A. Equipment
      (1) Wheatstone Bridge or equivalent test instrument
   B. References
      (1) AMM 77-21-02/401, EGT Thermocouple Harness
      (2) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

410	Left Engine
420	Right Engine

      (2) Access Panels

415AL/416AR	Fan Reverser, Left Engine
425AL/426AR	Fan Reverser, Right Engine

   D. Prepare to Do the Test For the EGT Thermocouple Harness

      NOTE: You must connect the test leads directly to the harness that the test is for with the nuts and bolts and not probes or crocodile clips.

      S 015-002-R00

      WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

      (1) Open the thrust reversers (AMM 78-31-00/201).
   E. Do the Test For on the EGT Thermocouple Harness

      S 025-003-R00
      (1) Remove the EGT thermocouple harness (AMM 77-21-02/401).

      S 485-004-R00
      (2) Connect the test leads of the known resistance value to each end of the chromel harness (white).

      S 975-013-R00
      (3) Use the Wheatstone Bridge to measure and make a record of the circuit resistance.
         (a) Subtract the value of the test leads.

(b) The circuit resistance must be 0.35 to 0.47 ohms.

S 085-006-R00

(4) Disconnect the test leads from the chromel harness.

S 485-007-R00

(5) Connect the test leads to each end of the alumel harness (green).

S 975-014-R00

(6) Use the Wheatstone Bridge to measure and make a record of the circuit resistance.
(a) Subtract the value of the test leads.
(b) The circuit resistance must be 0.14 to 0.20 ohms.

S 085-009-R00

(7) Disconnect the test leads from the alumel harness.

F. Put the Airplane Back to Its Usual Condition

S 425-010-R00

(1) Install the EGT thermocouple harness (AMM 77-21-02/401).

S 415-011-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

EGT TERMINAL BLOCK AND RESISTORS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the terminal block and resistor. The second task installs the terminal block and resistor.

TASK 77-21-03-004-002-R00

2. Remove the EGT Terminal Block and Resistors
   A. References
      (1) AMM 70-51-00/201, Torque Tightening Techniques
      (2) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          210 Control Cabin
          410 Power Plant Nacelle Left
          420 Power Plant Nacelle Right

      (2) Access Panels
          113AL Forward Equipment Center Access Door
          414AR Fan Cowl Panel (Right)
          424AR Fan Cowl Panel (Right)

   C. Remove the EGT Terminal Block and Resistors (Fig.401)

      S 864-013-R00
      (1) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:

      NOTE: An "red" EICAS autoevent can be recorded if power is not removed from the EICAS computers before this procedure is started. This can result in loss of data that was previously recorded for an autoevent with lower priority (i.e. an "amber" EGT exceedance).

      (a) 11J2, L EICAS CMPTR
      (b) 11J29, R EICAS CMPTR

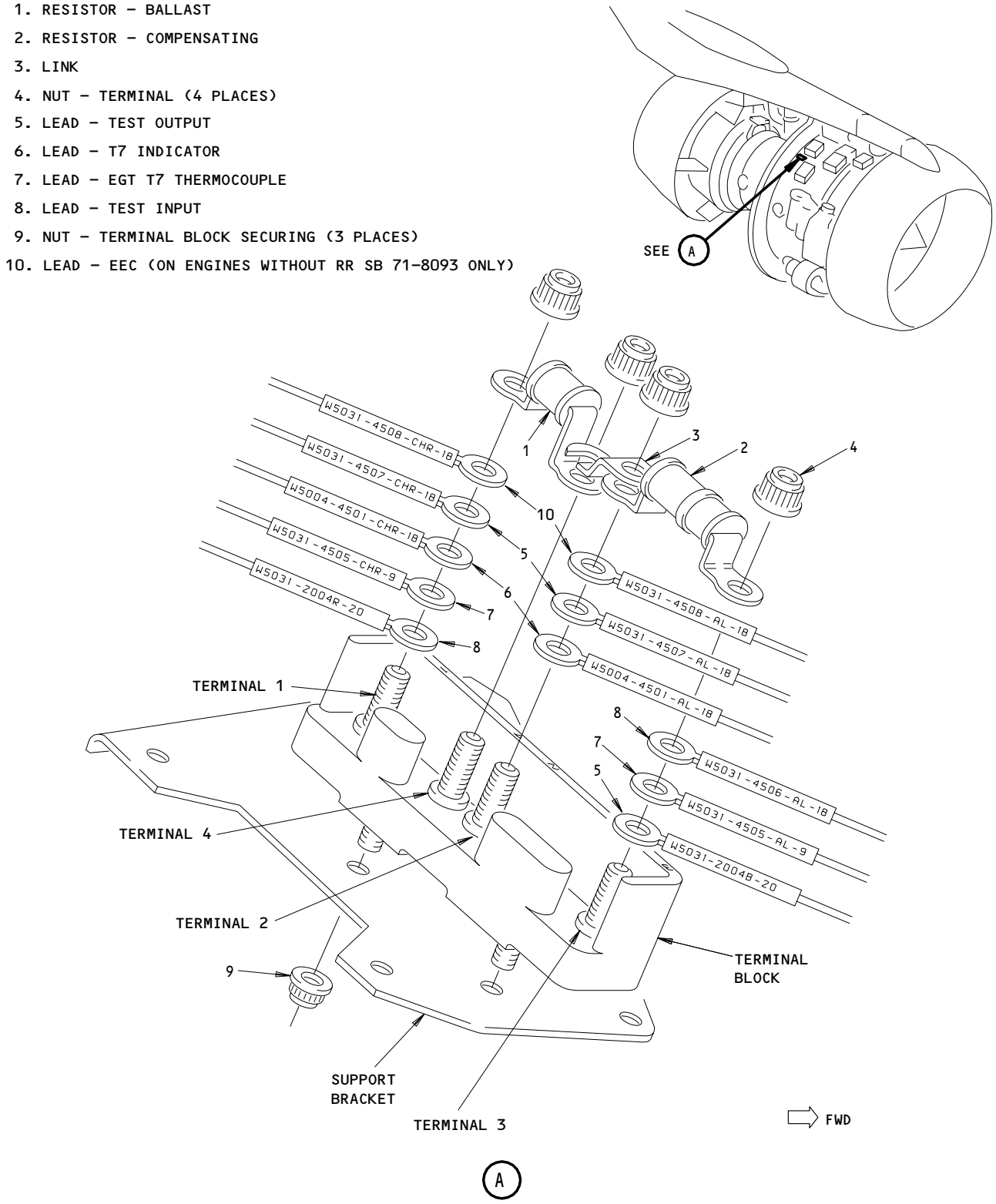
      S 014-003-R00

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

      (2) Open the right fan cowl panel (AMM 71-11-04/201).

      S 024-005-R00
      (3) Remove the resistors:
          (a) Remove the terminal nuts (4).
          (b) Remove the resistors (1) and (2), and the link (3).

1. RESISTOR – BALLAST
2. RESISTOR – COMPENSATING
3. LINK
4. NUT – TERMINAL (4 PLACES)
5. LEAD – TEST OUTPUT
6. LEAD – T7 INDICATOR
7. LEAD – EGT T7 THERMOCOUPLE
8. LEAD – TEST INPUT
9. NUT – TERMINAL BLOCK SECURING (3 PLACES)
10. LEAD – EEC (ON ENGINES WITHOUT RR SB 71-8093 ONLY)



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EGT Terminal Block and Resistors Installation
Figure 401

S 024-006-R00

(4) Remove the terminal block:
  (a) Remove the cables from the terminal posts.
  (b) Remove the nuts (9) to remove the terminal block from the support bracket.

TASK 77-21-03-404-007-R00

3. Install the EGT Terminal Block and Resistors

A. References
  (1) AMM 70-51-00/201, Torque Tightening Techniques
  (2) AMM 71-11-04/201, Fan Cowl Panels

B. Access
  (1) Location Zones
    210 Control Cabin
    410 Power Plant Nacelle Left
    420 Power Plant Nacelle Right

  (2) Access Panels
    113AL Forward Equipment Center Access Door
    414AR Fan Cowl Panel (Right)
    424AR Fan Cowl Panel (Right)

C. Install the EGT Terminal Block and Resistors (Fig. 401)

S 424-008-R00

(1) Install the terminal block:
  (a) Install the terminal block on the support bracket.
    1) Install the nuts (9) and tighten (AMM 70-51-00/201).
  (b) Put the cables on the terminal posts in the correct stacking order.

S 424-009-R00

(2) Install the resistors:
  (a) Put the compensating resistor (2) on the terminals 2 and 3.
    1) Install the nut (4) on terminal 3.
    2) Tighten the nut with your fingers.
  (b) Put the ballast resistor (1) on the terminals 1 and 4 with the longest support tab on terminal 4.
    1) Install the nut (4) on terminal 1.
    2) Tighten the nut with your fingers.
  (c) Put the link (3) on the terminals 2 and 4 with the slotted hole on terminal 4.
    1) Install the nuts (4) on the terminals 2 and 4.
    2) Tighten the nut with your fingers.
  (d) Tighten all the nuts (4) on the terminals (AMM 70-51-00/201).

S 414-012-R00

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

(3) Close the right fan cowl panel (AMM 71-11-04/201).

S 864-029-R00

(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
(a) 11J2, L EICAS CMPTR
(b) 11J29, R EICAS CMPTR

EGT TERMINAL BLOCK AND RESISTORS - ADJUSTMENT/TEST

1. General
   A. This procedure has one task. This task examines the resistance of the ballast and the compensating resistors.

   TASK 77-21-03-705-001-R00

2. Examine the Resistance of the Ballast and Compensating Resistors
   A. Equipment
      (1) Wheatstone Bridge
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 77-21-03/401, EGT Terminal Block and Resistors
   C. Access
      (1) Location Zones

210	Control Cabin
410	Power Plant Nacelle Left
420	Power Plant Nacelle Right

      (2) Access Panels

414AR	Fan Cowl Panel (Right)
424AR	Fan Cowl Panel (Right)

   D. Examine the Resistance of the Ballast and Compensating Resistors.

      S 015-003-R00

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

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

      S 865-019-R00
      (2) Remove the resistors from the EGT terminal block (AMM 77-21-03/401).

      S 765-005-R00
      (3) Examine the resistance of the ballast resistors.
         (a) Connect the test leads (with a known resistance value) to the ballast resistor.
            1) Connect the test leads to the resistor with the bolts and the nuts.
         (b) Connect the wheatstone bridge to the test leads.

(c) Measure the resistance of the ballast resistor.
(d) Subtract the resistance value of the test leads from the value you measured.
(e) The resistance of the ballast resistors must be as follows:

Code E	72.33 to 73.79 ohms
Code F	69.44 to 70.84 ohms
Code G	66.80 to 68.20 ohms
Code K	59.92 to 61.13 ohms
Code L	57.90 to 58.90 ohms
Code M	56.07 to 57.21 ohms
Code N	54.35 to 55.45 ohms
Code P	52.72 to 53.78 ohms
Code S	50.60 to 52.60 ohms
Code T	49.73 to 50.73 ohms
Code U	48.36 to 49.34 ohms
Code W	47.00 to 48.00 ohms
Code X	45.84 to 46.76 ohms
Code Y	44.68 to 45.58 ohms
Code AA	43.57 to 44.45 ohms
Code AB	42.52 to 43.38 ohms
Code AC	41.52 to 42.36 ohms
Code AD	40.56 to 41.38 ohms
Code AE	39.65 to 40.45 ohms
Code AF	38.78 to 39.56 ohms
Code AG	37.95 to 38.71 ohms

(f) Disconnect the test leads from the ballast resistor.

S 765-006-R00

(4) Examine the resistance of the compensating resistors.
(a) Connect the test leads (with a known resistance) to the compensating resistor.
1) Connect the test leads to the resistor with the bolts and the nuts.
(b) Measure the resistance of the compensating resistor.
(c) Subtract the resistance value of the test leads from the value you measured.
(d) The resistance of the compensating resistor must be as follows:

1) Code A – 2.27 to 2.33 ohms

(e) Disconnect the test leads from the compensating resistor.
(f) Disconnect the wheatstone bridge from the test leads.

S 425-007-R00

(5) Install the resistors to the EGT terminal block (AMM 77-21-03/401).

S 415-009-R00

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

(6) Close the right fan cowl panel (AMM 71-11-04/201).

EGT CABLES - ADJUSTMENT/TEST

1. General
   A. This procedure has one task. This task examines the resistance of the EGT cables.

   TASK 77-21-04-705-001-R00

2. Examine the Resistance of the EGT Cables
   A. Equipment
      (1) Wheatstone Bridge
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 77-21-02/401, EGT Thermocouple Harness
      (3) AMM 77-21-03/401, EGT Terminal Block and Resistors
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones

211/212	Control Cabin
410	No. 1 Power Plant (Left)
420	No. 2 Power Plant (Right)

      (2) Access Panels

414AR	Fan Cowl Panel (Right)
415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
424AR	Fan Cowl Panel (Right)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

   D. Examine the Resistance of the EGT Cables

      S 045-002-R00

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

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

      S 015-003-R00

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

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

S 015-004-R00

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

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

S 025-026-R00

(4) Disconnect the resistors and the cable leads from the EGT terminal block (AMM 77-21-03/401).

S 035-008-R00

(5) Disconnect the cable leads from the thermocouples at the positions 2 and 3 (AMM 77-21-02/401).

S 765-009-R00

(6) Examine the resistance of the test cables:
  (a) Connect the test leads (with a known resistance value) to each end of the chromel cable.
    1) Attach the test leads to the chromel cable with the bolts and the nuts.
  (b) Connect the wheatstone bridge to the test leads.
  (c) Measure the resistance of the chromel cable.
  (d) Subtract the resistance value of the test leads from the value you measured.
  (e) The resistance of the chromel cable must be 0.325 ohms ±0.020 ohms.
  (f) Disconnect the test leads from the chromel cable.
  (g) Connect the test leads to the alumel cable.
    1) Attach the test leads to the alumel cable with the bolts and the nuts.
  (h) Measure the resistance of the alumel cable.
  (i) Subtract the resistance value of the test leads from the value you measured.
  (j) The resistance of the alumel cable must be 0.147 ohms ±0.009 ohms.

(k) Disconnect the test leads from the alumel cable.
(l) Disconnect the wheatstone bridge from the test leads.

S 435-010-R00
(7) Install the resistors and the cable leads to EGT terminal block (AMM 77-21-03/401).
(a) Connect the cable leads to the EGT terminal block in the correct stacking order.

S 435-013-R00
(8) Connect the cable leads to the thermocouples at the positions 2 and 3 (AMM 77-21-02/401).

S 415-014-R00

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

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

S 415-015-R00

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

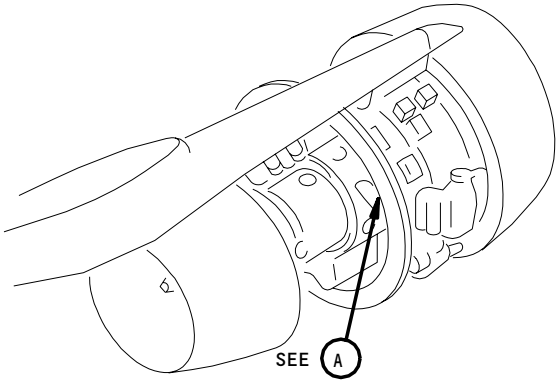
(10) Close the right fan cowl panel (AMM 71-11-04/201).

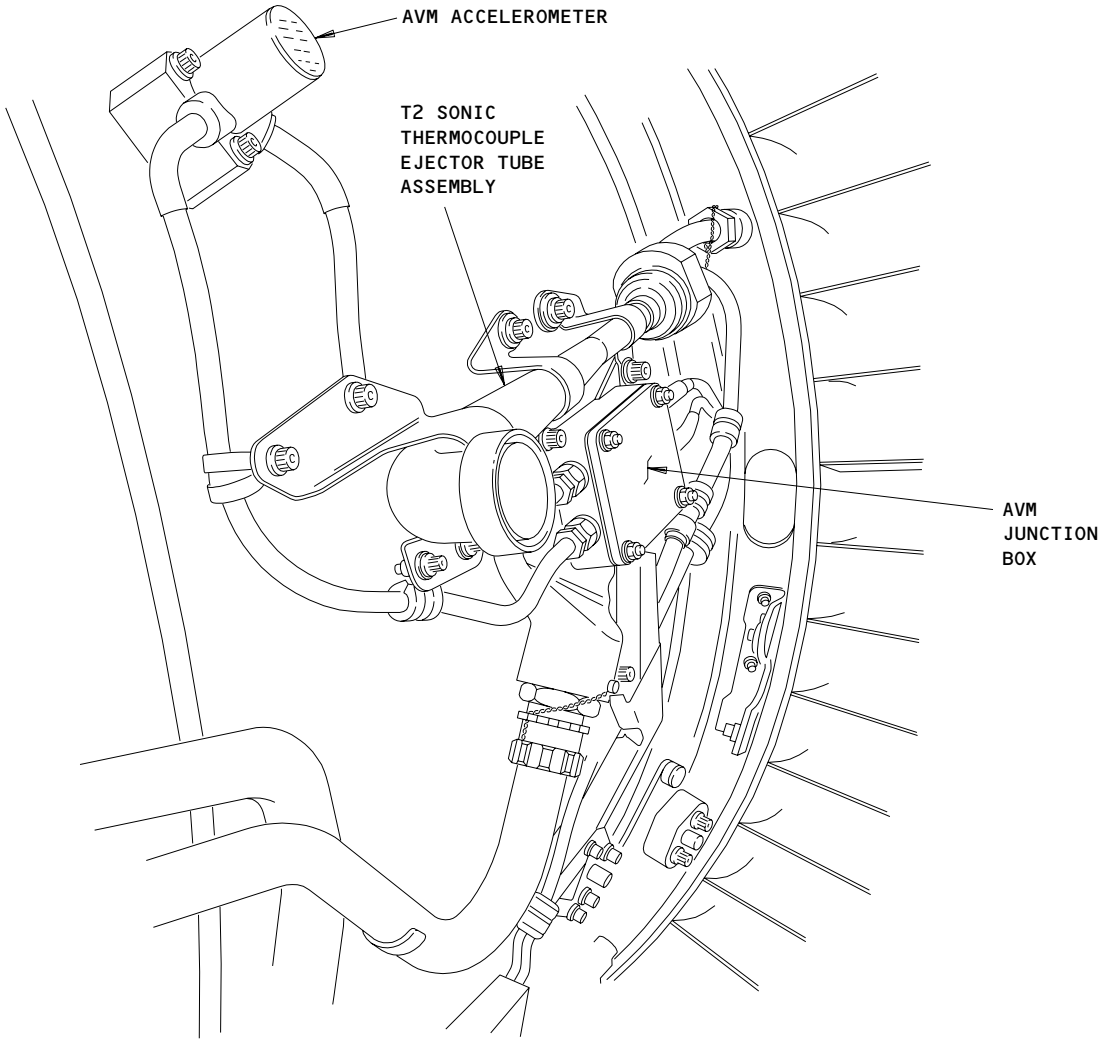
S 865-028-R00
(11) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The AVM system provides a continuous indication of engine vibration levels. It senses LP (N1), IP (N2) HP (N3), and Broadband (BB) vibrations.
   B. A dual output vibration transmitter (accelerometer) on each engine is used to sense vibration caused by inbalance of the engine main rotating assemblies. The transmitter is connected through the engine electrical harness, airplane wiring and a signal conditioner unit to an indicator at the flight compartment. The indicator is incorporated into the Engine Indication and Crew Alerting System (EICAS) (Ref 31-41-00), through which flight crews are alerted to any abnormal vibration levels.

2. Component Details
   A. AVM Accelerometer (Fig. 1)
      (1) The transmitter is basically a dual output accelerometer, comprising of two piezoelectric crystal stack sensing elements, mechanically loaded with an electrically insulated seismic mass. The unit is sensitive to engine vibration and the sensing element provides a symmetrical charge signal that is proportional to the acceleration component of engine vibration.
      (2) Each sensing element has an integral lead that, together with the transmitter, forms an hermetically sealed assembly. The transmitter is located on a radial dowel that locates the internal gearbox support structure into the engine intermediate case outer shell, and is circumferentially located at strut position 3. Strut positions are 1 to 10 clockwise when viewed from the rear. Number 1 position is at top center position.
   B. AVM Junction Box
      (1) The transmitter is connected to a junction box, mounted on the IP compressor case, forward of the transmitter. The junction box is a dual sectioned insulated box, each section providing the engine interface for interconnection of one of the integral leads with the airplane cables. From the junction box, flexible low noise cables connect to the signal conditioner.
   C. AVM Signal Conditioner
      (1) The signal conditioner unit houses the AVM system electronic components for processing the output charge signals.
3. Operation
   A. Functional Description (Fig. 2)
      (1) During engine operation the vibration transmitter is subjected to engine vibration, causing the sensing elements to generate output charge signals proportional to engine vibration amplitude. The electrical signals produced are transmitted to the signal conditioner.





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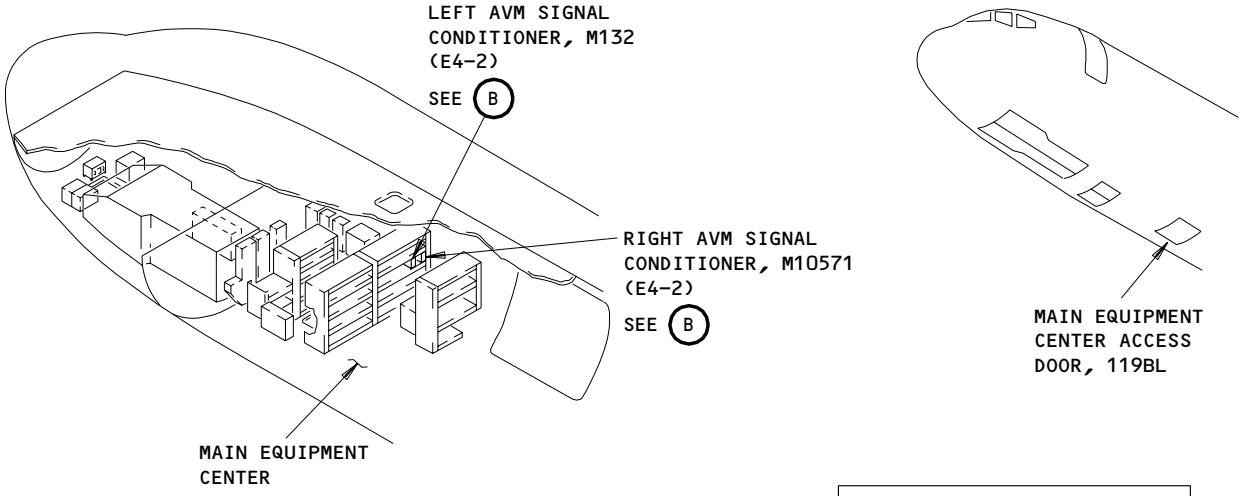
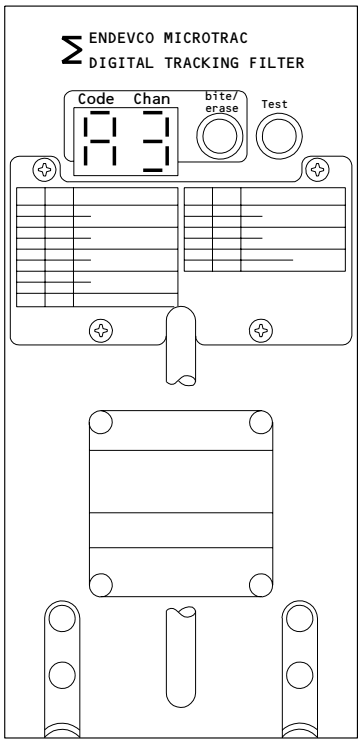
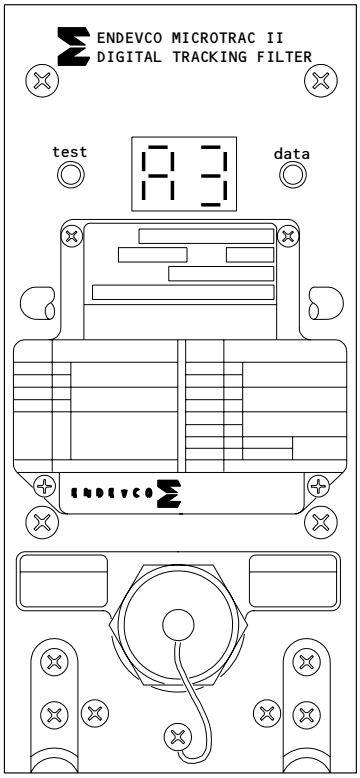
Airborne Vibration Monitor (AVM) System
Figure 1 (Sheet 1)





AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132 OR M10571

B 1



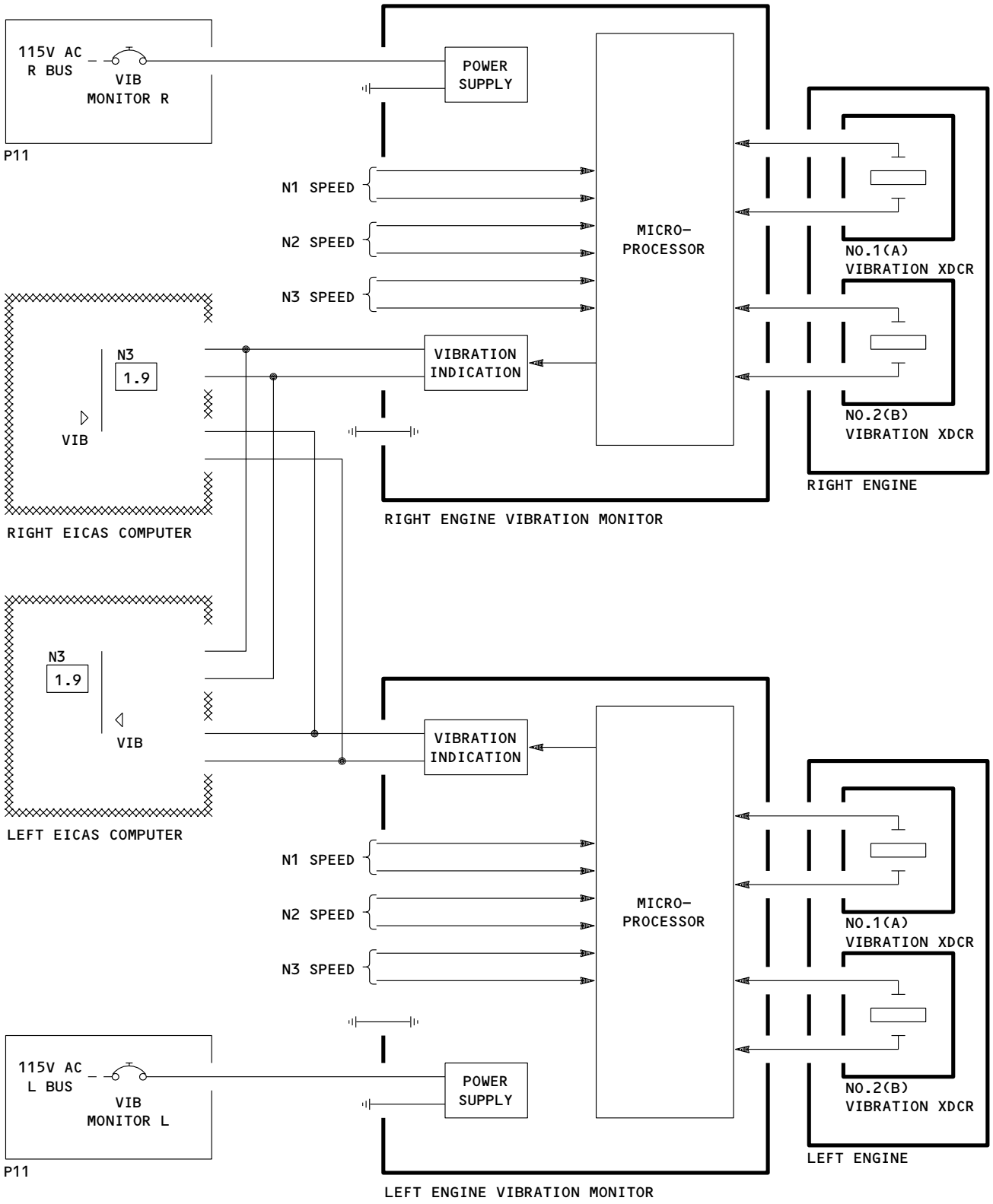
AIRBORNE VIBRATION MONITOR SIGNAL CONDITIONER, M132 OR M10571

B 2

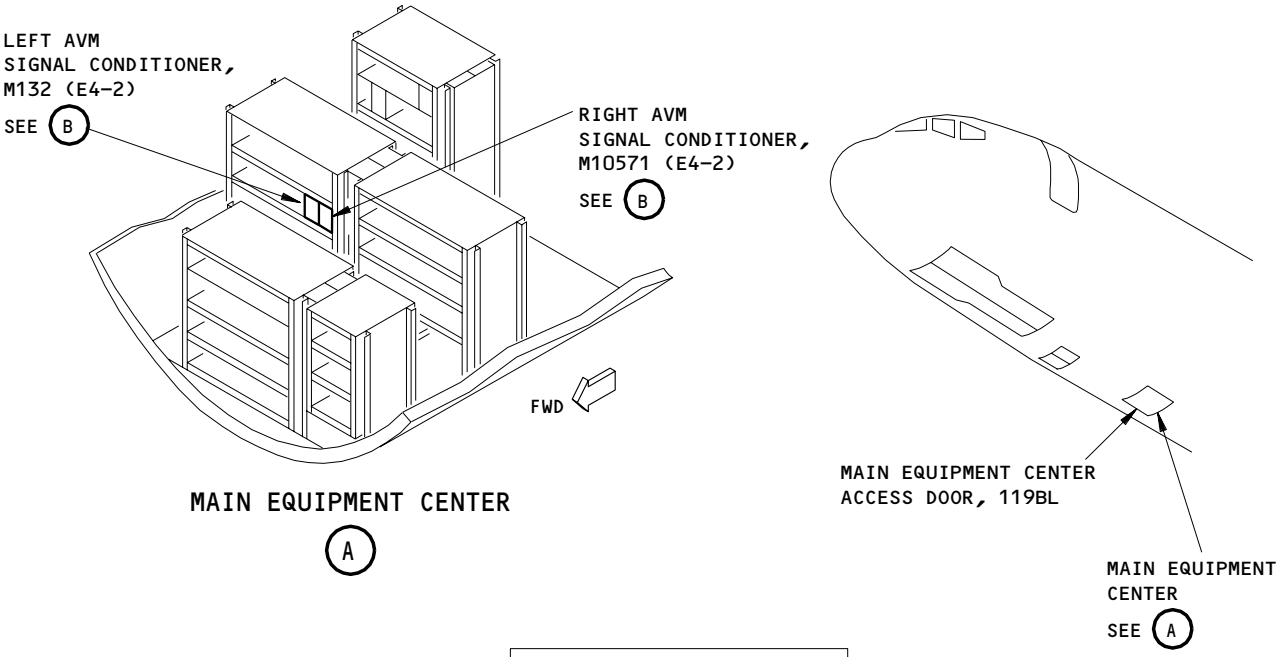
1 AIRPLANES WITH -18 OR -20 AVM SIGNAL CONDITIONER

2 AIRPLANES WITH -451 AVM SIGNAL CONDITIONER

Airborne Vibration Monitor (AVM) System
Figure 1 (Sheet 2)

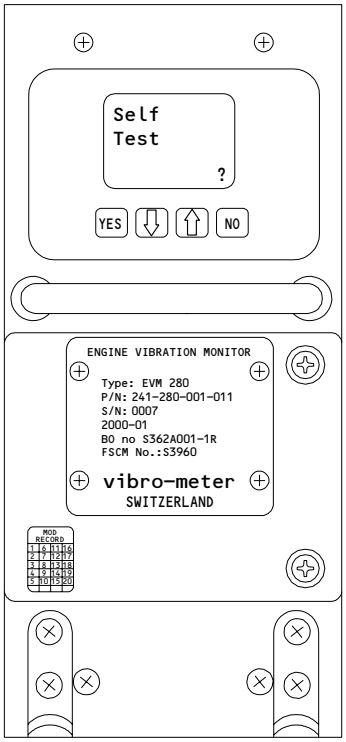


Airborne Vibration Monitoring System Schematic
Figure 2



MAIN EQUIPMENT CENTER

A



LEFT (RIGHT) AVM SIGNAL CONDITIONER, M132 (M10571)

B

Universal Airborne Vibration Monitoring (AVM) System
Figure 3

EFFECTIVITY
AIRPLANES WITH S362A001 UNIVERSAL AVM
SIGNAL CONDITIONER

M56790

(2) The signal conditioner processes both charge signals from the transmitter and converts then to velocity signals, which are then further processed to provide output signals suitable for EICAS display.
(3) If there is a tachometer fault or the signal conditioner fails to recognize a tachometer signal, EICAS will identify as broadband (BB) vibration.
    (a) A tachometer problem or an airplane wiring problem could degrade the N1 and N3 signals and cause the signals to be below the threshold that the AVM signal conditioner needs to determine if the engine is running. An AVM BITE fault code would not occur.
(4) Loss of any of the tachometer signals to the AVM signal conditioner would cause BB to appear, and give a display of a fault code on the AVM BITE.
    (a) A fault code for a tachometer signal loss requires that the fault exists for approximately 60 seconds with two valid tachometer signals.
(5) When the engine speed is below minimum idle, BB will also appear.
    (a) BB should not appear at minimum idle thrust during normal conditions.
(6) When the two engines are shutdown (static), BB with a value of 0.0 will appear.
(7) EICAS Indication - AVM Logic
    (a) When a high vibration is encountered, above 2.5, for more than 8 seconds, the vibration indication will appear on the lower EICAS display with the digital readout and analog pointer colored amber. This display will remain until the exceedance no longer exists and the display is deselected. The color will return to white if the vibration goes below 2.5. The highest broadband value and the summated time of exceedance is recorded on the EICAS ENG EXC'D page, and an AUTO EVENT snapshot will be taken.
    (b) If left or right engine AVM detects dispatch critical fault for 8 seconds, then L or R ENG VIB message will appear on the status page.
    (c) If AVM detects fault in itself in left or right AVM for 10 seconds, then L or R ENG VIB BITE message will appear on EICAS maintenance page.
    (d) If left or right engine high broadband vibration occurs for more than 2 seconds, then L or R ENG BB VIB message will be logged on EICAS maintenance page.

B. BITE
(1) AIRPLANES WITH -18, -20, -451 OR -452 AVM SIGNAL CONDITIONERS; Bite is activated when power is supplied to the signal conditioner and the BITE button on the face of the signal conditioner is pushed. The following fault codes could appear:
    (a) A9 - Signal conditioner inoperable fault
    (b) A8 - right engine signal loss from accelerometer B and cable
    (c) A7 - right engine signal loss from accelerometer A and cable
    (d) A6 - left engine signal loss from accelerometer B and cable

(e) A5 - left engine signal loss from accelerometer A and cable
(f) A4 - right engine high noise from accelerometer B and cable
(g) A3 - right engine high noise from accelerometer A and cable
(h) A2 - left engine high noise from accelerometer B and cable
(i) A1 - left engine high noise from accelerometer A and cable
(j) B8 - right engine accelerometer A ≠ B
(k) B7 - left engine accelerometer A ≠ B
(l) B6 - right engine N3 tachometer signal faulty
(m) B5 - right engine N2 pulse probe signal faulty
(n) B4 - right engine N1 pulse probe signal faulty
(o) B3 - left engine N3 tachometer signal faulty
(p) B2 - left engine N2 pulse probe signal faulty
(q) B1 - left engine N1 pulse probe signal faulty

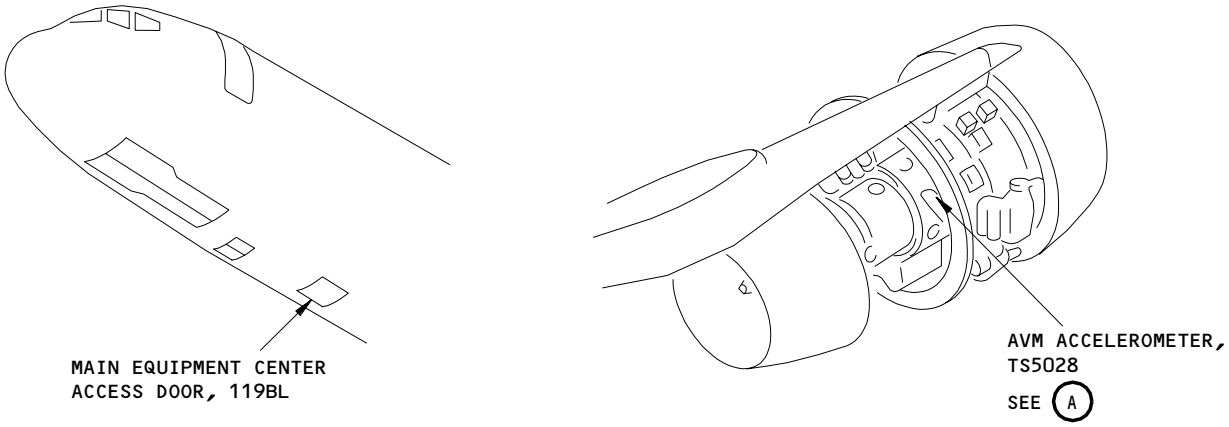
(2) AIRPLANES WITH THE S362A001 UNIVERSAL AVM SIGNAL CONDITIONER;
BITE is activated when power is supplied to the signal conditioner and you push and release one of the four buttons on the front panel. The following fault codes could appear when the BITE maintenance messages are read (AMM 77-31-00/201):
(a) Config Fault right engine
(b) Config Fault left engine
(c) 1/Rev Loss right engine
(d) 1/Rev Loss left engine
(e) A High noise right engine
(f) A High noise left engine
(g) B High noise right engine
(h) B High noise left engine
(i) AB Not equal right engine
(j) AB Not equal left engine
(k) A Low sig right engine
(l) A Low sig left engine
(m) B Low sig right engine
(n) B Low sig left engine
(o) N3 Tacho loss right engine
(p) N3 Tacho loss left engine
(q) N2 Tacho loss right engine
(r) N2 Tacho loss left engine
(s) N1 Tacho loss right engine
(t) N1 Tacho loss left engine
(u) Fault Numbers 00 through 49

AIRBORNE VIBRATION MONITORING (AVM) SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
ACCELEROMETER - AVM, TS5028	2	2	425AL, R ENG FAN C-DUCT AND THRUST REVERSER	77-31-01
BOX - AVM JUNCTION	2	2	425AL, R ENG FAN C-DUCT AND THRUST REVERSER	77-31-04
CONDITIONER, LEFT AVM SIGNAL, M132	2	1	119BL, MAIN EQUIP CTR, E4-2	77-31-03
CONDITIONER, RIGHT AVM SIGNAL, M10571	2	1	119BL, MAIN EQUIP CTR, E4-2	77-31-03

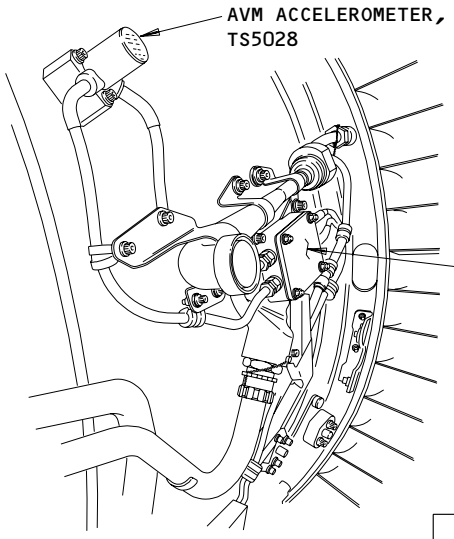
Airborne Vibration Monitoring System (AVM) - Component Location
Figure 101

E48334

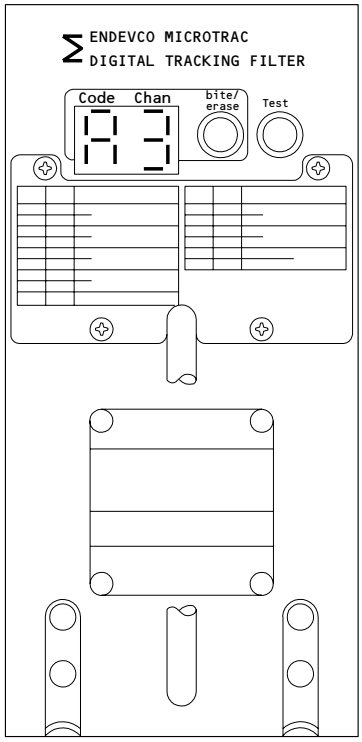


MAIN EQUIPMENT CENTER

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

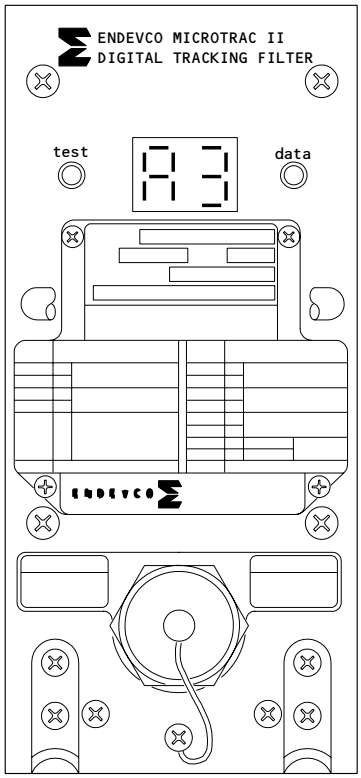


A



AIRBORNE VIBRATION MONITOR
SIGNAL CONDITIONER, M132 OR M10571

B 1



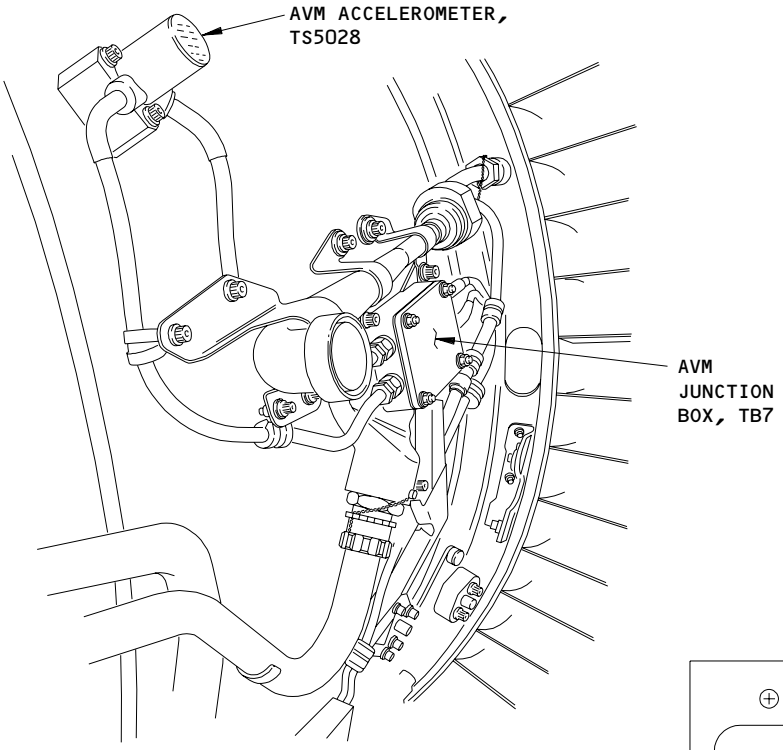
AIRBORNE VIBRATION MONITOR
SIGNAL CONDITIONER, M132 OR M10571

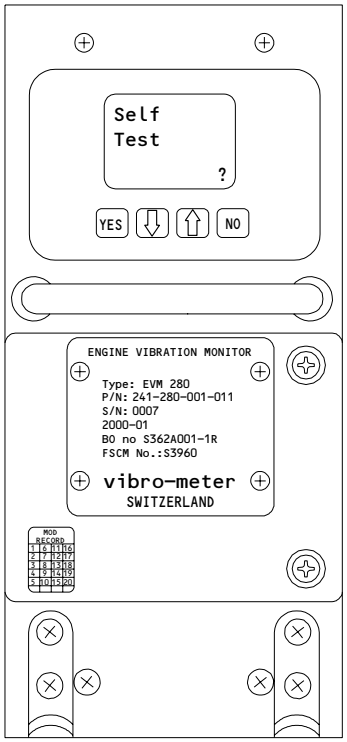
B 2

1 AIRPLANES WITH -18 OR -20 AVM SIGNAL CONDITIONER

2 AIRPLANES WITH -451 AVM SIGNAL CONDITIONER

Airborne Vibration Monitoring System (AVM) - Component Location
(Details from Sht 1)
Figure 102 (Sheet 2)





LEFT (RIGHT) AVM SIGNAL CONDITIONER, M132 (M10571)

B

Airborne Vibration Monitoring (AVM) System - Component Location
(Details from Sht 1)
Figure 102 (Sheet 3)

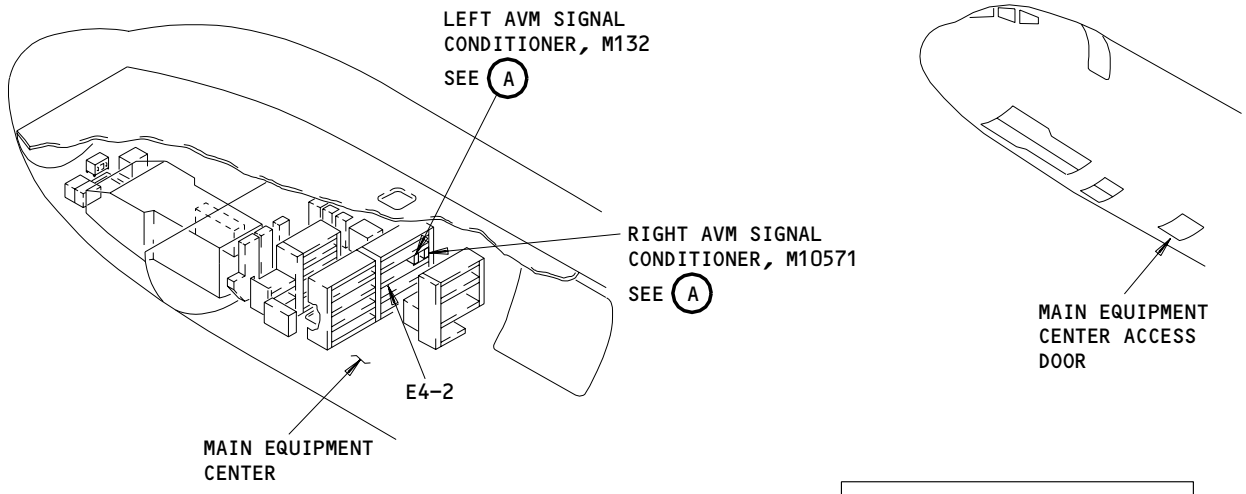
M56785

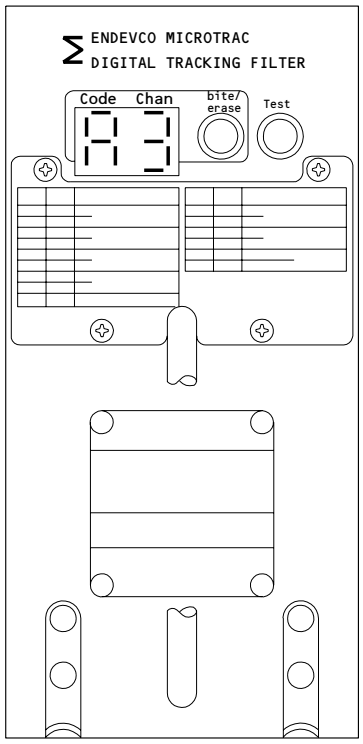
AIRBORNE VIBRATION MONITORING SYSTEM - MAINTENANCE PRACTICES

1. General
   A. This procedure has two tasks:
      (1) This first task applies to airplanes with -18, -20, -451 or -452 AVM signal conditioners. It tells how to read the fault codes received from the airborne vibration monitoring (AVM) signal conditioner unit BITE procedure.
      (2) This second task applies to airplanes with S362A001 Universal AVM Signal Conditioners. It tells how to read the fault codes received from the airborne vibration monitoring (AVM) signal conditioner unit BITE procedure.

TASK 77-31-00-702-001-R00

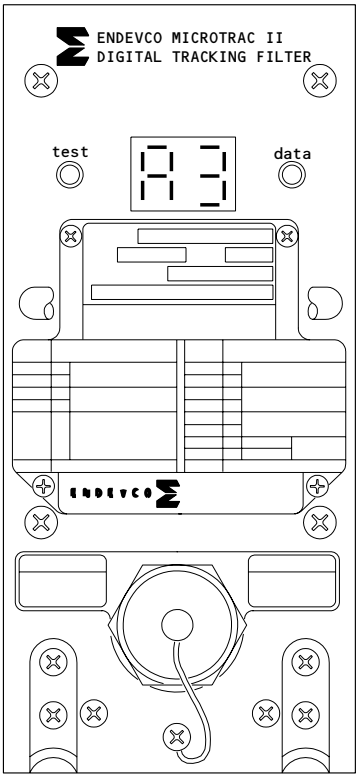
2. AIRPLANES WITH -18, -20, -451 OR -452 AVM SIGNAL CONDITIONERS;
   Read the AVM Signal Conditioner Fault Code Data
   A. General
      (1) To make on-wing maintenance possible without the use of test equipment, the signal conditioner unit has built-in test equipment (BITE) that monitors system faults that can occur in the signal conditioner and its external sensors.
      (2) Faults that are found are put in the signal conditioner unit memory and on EICAS.
         (a) System faults that are dispatch requirements are shown on EICAS as a STATUS message (L(R) ENG VIB).
         (b) All system failures will be put in memory as a MAINTENANCE message (L(R) ENG VIB BITE) and shown on the EICAS maintenance page.
      (3) The signal conditioner monitors failures in two ways (Fig. 201):
         (a) The signal conditioner has a self-test feature.
            1) When power is initially applied to the signal conditioner, a self test is done to examine the system for unit failures.
            2) The self-test is also done when you push the self-test button on the front panel of the signal conditioner.
            3) A code 88 is shown on the signal conditioner LED display during the self-test.
            4) Failure of the self-test is shown by code A9 on the signal conditioner LED display.
            5) The self-test is OK when the signal conditioner LED display goes out of view.
            6) ALL system failures are put in memory as MAINTENANCE messages (L(R) ENG VIB BITE) and are shown on the EICAS maintenance page.
         (b) The signal conditioner continuously monitors the AVM system during engine operation.
            1) All failures cause BITE faults.





AIRBORNE VIBRATION MONTOR
SIGNAL CONDITIONER,
M132 OR M10571

A 1



AIRBORNE VIBRATION MONITOR
SIGNAL CONDITIONER,
M132 OR M10571

A 2

1 AIRPLANES WITH -20 AVM SIGNAL CONDITIONER

2 AIRPLANES WITH -451 AVM SIGNAL CONDITIONER

Airborne Vibration Monitor (AVM) Signal Conditioner
Figure 201

2) The fault is shown by an EICAS STATUS or MAINTENANCE message and put in the signal conditioner non-volatile memory.

B. Procedure

S 742-002-R00

(1) Fault Code Sequence

(a) All fault codes are put in the non-volatile memory of the signal conditioner.

1) The EICAS maintenance message L(R) ENG VIB BITE identifies that the L(R) signal conditioner found a failure and has fault codes in its non-volatile memory.

(b) AIRPLANES WITH -451 AVM SIGNAL CONDITIONERS;
The DATA button on the front panel of the signal conditioner can be used to see the fault codes that are put in memory. Each time the DATA button is pushed, the next fault code is shown and the fault code shown before is erased from memory. When all fault codes are erased, the LED display will go out of view.

(c) AIRPLANES WITH -20 AVM SIGNAL CONDITIONERS;
The BITE/ERASE button on the front panel of the signal conditioner can be used to see the fault codes that are put in memory. Each time the BITE/ERASE button is pushed, the next fault code is shown and the fault code shown before is erased from memory. When all fault codes are erased, the LED display will go out of view.

S 742-004-R00

(2) The fault codes for the signal conditioner interrogation are shown in the Fault Description Table that follows. The fault codes shown are applicable to all AVM signal conditioners unless shown differently.

FAULT DESCRIPTION TABLE			
FAULT CODE	FAULT TITLE	FAULT DESCRIPTION	EFFECT ON SYSTEM
A9	Signal Conditioner Fault Self-test Failure	The Signal Conditioner Self-test has found a fault in one or more of these functions: -Program Memory -Front panel or internal switches -Hardware installation check -Test oscillator -Channel A and/or B tracking or broadbond filters	The signal conditioner has found an internal failure that will decrease the performance of the AVM system.
A5-A8 (AIRPLANES WITH -451 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Signal Loss Accel/ Cable	All the monitored component values of a channel (N1, N2, and N3) are below 0.1 units and the N1 rotor speed is more than or equal to 65% RPM. When this condition occurs continuously for 8 seconds, the signal conditioner makes the Best Channel Selection to monitor vibration levels. When this condition occurs continuously for 60 seconds the signal conditioner sets a BITE fault code. If this condition goes away for 10 seconds, the BITE fault code is removed.	The low vibration levels identify a failure of an accelerometer or a failure in the signal wiring.

FAULT DESCRIPTION TABLE			
FAULT CODE	FAULT TITLE	FAULT DESCRIPTION	EFFECT ON SYSTEM
A5-A8 (AIRPLANES WITH -20 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Signal Loss Accel/ Cable	All the monitored component values of a channel (N1, N2, and N3) are below 0.1 units and the N1 rotor speed is more than or equal to 65% RPM. This condition must occur for a minimum of 8 seconds.	The low vibration levels identify a failure of an accelerometer or a failure in the signal wiring.
A1-A4 (AIRPLANES WITH -451 SIGNAL CONDITIONERS ONLY).	Left (Right) Engine Signal High Noise Accel/Cable	The signal conditioner makes the Best Channel Selection when the conditions that follow occur for 8 seconds and sets a BITE fault code when the conditions that follow occur for 60 seconds: -The difference between channel A and B broadband is 0.75 units -Half the difference between channel A and B broadbank is more than the differences of the sum of channel A and B track filter data. -Broadband data for that channel is more than the broadband data for the other channel. If these conditions go away for 10 seconds, the BITE fault code is removed	The fault identifies that external noise is found on one of the channels. The noise can be caused by a loose accelerometer, an accelerometer failure, or a signal wire fault.

FAULT DESCRIPTION TABLE			
FAULT CODE	FAULT TITLE	FAULT DESCRIPTION	EFFECT ON SYSTEM
A1-A4 (AIRPLANES WITH -20 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Signal High Noise Accel/Cable	The signal conditioner makes the Best Channel Selection and sets a BITE fault code when the conditions that follow occur for 8 seconds: -The difference between channel A and B broadband is 0.75 units. -Half the difference between channel A and B broadband is more than the differences of the sum of channel A and B track filter data. -The broadband data for that channel is more than the broadband data for the other channel. -The broadband data is more than 1.5 times the sum of the track filter data plus 0.64 units on channel A and B.	The fault identifies that external noise is found on one of the channels. The noise can be caused by a loose accelerometer, an accelerometer failure, or a signal wire fault.
B8-B7 (AIRPLANES WITH -451 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Channel A Not Equal to Channel B	The tracking filter data of channel A is not equal to the tracking filter data of channel B for 60 seconds. (The differences are more than ±0.5 units for N1 and N3, ±0.3 units for N2). The fault code is removed when this condition goes away for 10 seconds.	The fault identifies that external noise is found on one of the channels. The noise can be caused by a loose accelerometer, an accelerometer failure or a signal wire fault.

FAULT DESCRIPTION TABLE			
FAULT CODE	FAULT TITLE	FAULT DESCRIPTION	EFFECT ON SYSTEM
B8-B7 (AIRPLANES WITH -20 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Channel A Not Equal to Channel B	The tracking filter data of channel A is not equal to the tracking filter data of channel B for 60 seconds. (The differences are more than ±0.5 units for N1 and N3, ±0.3 units for N2).	The fault identifies that external noise is found on one of the channels. The noise can be caused by a loose accelerometer, an accelerometer failure or a signal wire fault.
B1-B6 (AIRPLANES WITH -451 SIGNAL CONDITIONERS ONLY)	Left (Right) Engine Tachometer Signal Loss (N1, N2, and N3)	The signal conditioner sets the fault code when the conditions that follow occur continuously for 60 seconds: -N3 is more than 48% RPM with no satisfactory N1 signal -N1 is more than 19% RPM with no satisfactory N2 signal -N1 is more than 19% RPM with no satisfactory N3 signal. If this condition goes away for 10 seconds, the fault code is removed.	The signal conditioner identified that one or more satisfactory tachometer signals are not available. The vibration display will change to the broadband display until all tachometer signals are satisfactory.
B1-B6 (AIRPLANES WITH -20 SIGNAL CONDITIONERS ONLY)	Left(Right) Engine Tachometer Signal Loss (N1, N2 and N3)	The signal conditioner sets the fault code when the tachometer signal is continuously less than the threshold and at least one other tachometer signal on the same engine is continuously more than the threshold for 60 seconds. The threshold values are: -N1 = 21.4% RPM -N2 = 21.8% RPM -N3 = 22.3% RPM.	The signal conditioner identified that one or more satisfactory tachometer signals are not available. The vibration display will change to the broadband display until all tachometer signals are satisfactory.

TASK 77-31-00-732-007-R00

3. AIRPLANES WITH THE S362A001 UNIVERSAL AVM SIGNAL CONDITIONER;
Airborne Vibration Monitoring (AVM) System - System Test

A. General

(1) This task is the system test procedure for the universal airborne vibration monitoring (AVM) system.

(2) Use this procedure for the AVM signal conditioner with this part number:

(a) Boeing part number - S362A001-1.

(b) Supplier part number - Vibro-meter P/N 241-280-051-012

(3) This AVM signal conditioner has a digital display of three lines of eight (8) characters in each line.

(4) This procedure uses the Built-In Test Equipment in the AVM signal conditioner.

(5) The AVM signal conditioner shows the Built-In Test Equipment Maintenance Messages first and then the flight history.

(6) This procedure refers to the Built-In Test Equipment as the BITE.

B. References

(1) AMM 77-31-00/501, Airborne Vibration Monitoring (AVM) System

(2) FIM 77-31-00/101, Airborne Vibration Monitoring (AVM) System

C. Access

(1) Location Zones

110 Lower Forward Fuselage

210 Control Cabin

(2) Access Panel

119BL Main Equipment Center

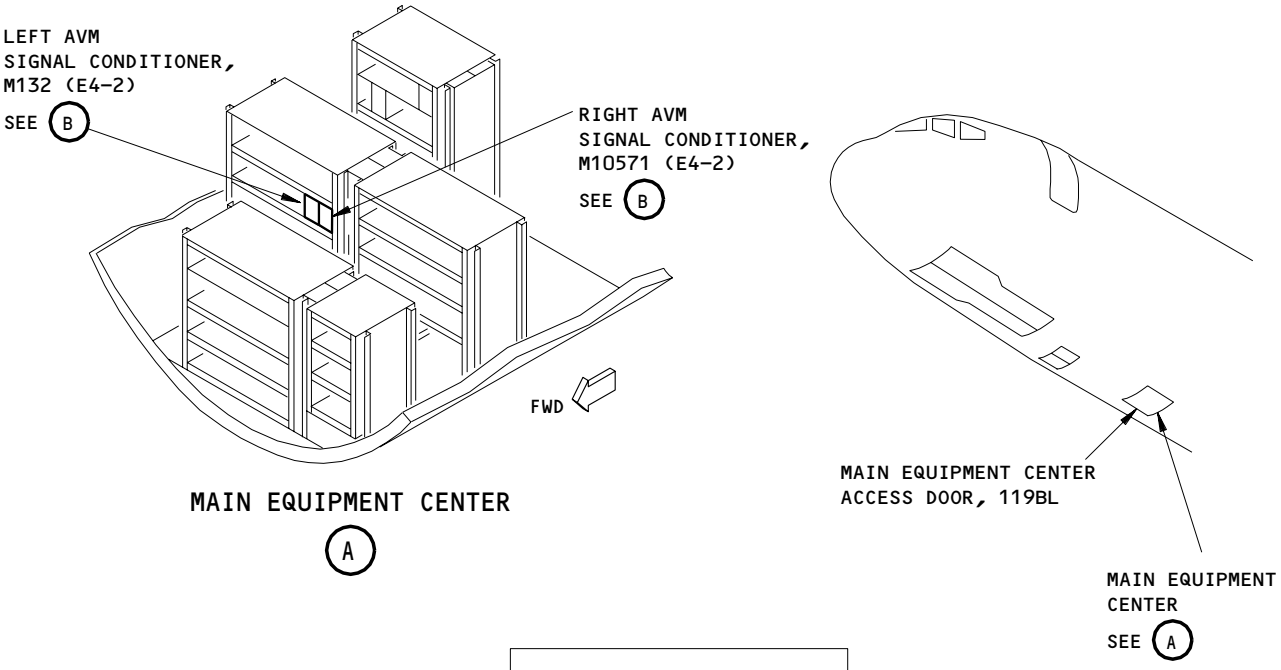
D. Prepare to Read the BITE Maintenance Messages

S 442-008-R00

(1) Make sure that this circuit breaker is closed:

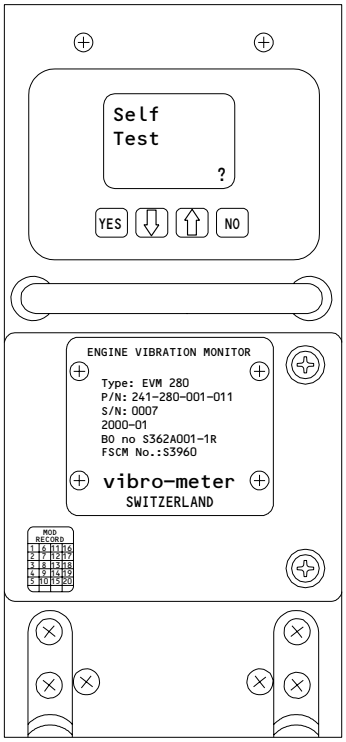
(a) Circuit Breaker Panel, P11

1) 11K2, L ENG VIBRATION MON



MAIN EQUIPMENT CENTER

A



LEFT (RIGHT) AVM SIGNAL CONDITIONER, M132 (M10571)

B

Universal Airborne Vibration Monitor (AVM) Signal Conditioner
Figure 202

EFFECTIVITY
AIRPLANES WITH S362A001 UNIVERSAL AVM
SIGNAL CONDITIONER

M56788

FAULT DESCRIPTION TABLE FOR VIBRO-METER S362A001		
FAULT MESSAGE	FAULT DESCRIPTION	CORRECTIVE ACTION
1/REV LOSS E2	R ENG 1/REV MISSING	1. REMOVE THE ACCELEROMETER LEADS FROM THE TERMINAL POSTS 1, 2, 3 AND 4 IN THE AVM JUNCTION BOX TB7. 2. INSTALL A 1000-PICOFARAD CAPACITOR ACROSS THE TERMINAL POSTS 1 AND 2 AND THE TERMINAL POSTS 3 AND 4. 3. WARNING: USE AMM 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS. USE THE POWER PLANT OPERATION (NORMAL) PROCEDURE TO START THE ENGINE (AMM 71-00-00/201). 4. PUSH THE PERF/APU BUTTON ON THE EICAS MAINTENANCE PANEL, P61. 5. SLOWLY MOVE THE ADVANCE THRUST LEVER FORWARD TO THE TAKEOFF POWER POSITION AND LET THE ENGINE BECOME STABLE FOR 15 SECONDS. NOTE: WHEN N1 IS MORE THAN 65%, CHANNEL "A" AND CHANNEL "B" SIGNAL LOSS WILL SHOW IN THE FAULT CODE WINDOW ON THE L (R) AVM SIGNAL CONDITIONER AND THE MESSAGE L (R) ENG VIB WILL SHOW ON THE EICAS DISPLAY. 6. SLOWLY MOVE THE THRUST LEVER REARWARD TO THE IDLE POSITION. 7. MAKE SURE THE ENGINE VIBRATION INDICATIONS BB, N1, N2, AND N3 STAY AT 0.1 UNITS OR LESS DURING THE ACCELERATION AND DECELERATION. WRITE DOWN ALL INDICATIONS THAT ARE MORE THAN 0.0 UNITS. NOTE: IF THE EICAS MODEL NUMBER IS S242N701-105, -106, -107, -108, -109, DO STEPS 8-12. IF NOT, GO TO STEP 13. 8. DISCONNECT A TACHOMETER INPUT TO THE AVM SIGNAL. DISCONNECT THE TACHOMETER INPUT OF THE ROTOR THAT SHOWS THE LOWEST VIBRATION IN STEP 7. IF ALL THE VIBRATION LEVELS ARE APPROXIMATELY EQUAL, DISCONNECT THE N2 TACHOMETER INPUT. 9. SLOWLY MOVE THE THRUST LEVER FORWARD TO THE TAKEOFF POWER POSITION AND LET THE ENGINE BECOME STABLE FOR 15 SECONDS. NOTE: WHEN N1 IS MORE THAN 65%, CHANNEL "A" AND CHANNEL "B" SIGNAL LOSS WILL SHOW IN THE FAULT CODE WINDOW ON THE L (R) AVM SIGNAL CONDITIONER AND THE MESSAGE L (R) ENG VIB WILL SHOW ON THE EICAS DISPLAY. 10. MAKE SURE THE ENGINE VIBRATION INDICATIONS (TRACKED AND BROADBAND) STAY AT 0.1 UNITS OR LESS DURING THE ACCELERATION AND DECELERATION. WRITE DOWN ALL INDICATIONS THAT ARE MORE THAN 0.0 UNITS.
1/REV LOSS E1	L ENG 1/REV MISSING	
A HIGH NOISE E2	R ENG ACC A HIGH NOISE	
A HIGH NOISE E1	L ENG ACC A HIGH NOISE	
B HIGH NOISE E2	R ENG ACC B HIGH NOISE	
B HIGH NOISE E1	L ENG ACC B HIGH NOISE	
A B NOT EQUAL E2	R ENG ACC A ≠ ACC B	

TABLE 2

AVM BITE Procedure
Figure 203 (Sheet 1)

M57039

FAULT DESCRIPTION TABLE FOR VIBRO-METER S362A001		
FAULT MESSAGE	FAULT DESCRIPTION	CORRECTIVE ACTION
A B NOT EQUAL E1	L ENG ACC A ≠ ACC B	11. SLOWLY MOVE THE THRUST LEVER REARWARD TO THE IDLE POSITION. 12. CONNECT THE TACHOMETER INPUT TO THE AVM SIGNAL CONDITIONER. 13. USE THE POWER PLANT OPERATION (NORMAL) PROCEDURE TO DO THE ENGINE SHUTDOWN (AMM 71-00-00/201). 14. REMOVE THE CAPACITOR FROM THE TERMINAL POSTS 1 AND 2, AND THE TERMINAL POSTS 3 AND 4. 15. IF VIBRATION INDICATION IS MORE THAN 0.1 UNITS, EXAMINE AND REPAIR THE CIRCUIT BETWEEN THE AVM JUNCTION BOX AND L (R) AVM SIGNAL CONDITIONER M132 (M10571)(WDM 71-51-11 AND WDM 71-31-11): 1 AVM JUNCTION BOX TB7 TERMINAL POSTS TO AVM SIGNAL CONDITIONER CONNECTOR D4240B (D5602B) 1 A1 2 B1 3 A4 4 B4 MAKE SURE THE L (R) AVM SIGNAL CONDITIONER M132 (M10571) IS INSTALLED CORRECTLY (AMM 77-31-03/401). 16. IF THE VIBRATION INDICATION STAYS AT 0.1 UNITS OR LESS, CONNECT THE ACCELEROMETER LEADS TO THE TERMINAL POSTS 1, 2, 3, AND 4 IN THE AVM JUNCTION BOX TB7 AND REPLACE THE AVM ACCELEROMETER TS5028 (AMM 77-31-01). 17. IF THE FAULT CONTINUES, EXAMINE THE GEARBOX FOR LOOSE COMPONENTS AND BORESCOPE THE ENGINE (AMM 72-00-00/601).
A LOW SIG E2	R ENG ACC A LOW SIGNAL	
A LOW SIG E1	L ENG ACC A LOW SIGNAL	
B LOW SIG E2	R ENG ACC B LOW SIGNAL	
B LOW SIG E1	L ENG ACC B LOW SIGNAL	
FAULT NUMBERS: 00 THROUGH 49	INTERNAL FAULT CODES	REMOVE THE AVM SIGNAL CONDITIONER (AMM 77-31-03/401). NOTE: FAULT NUMBER 06 IS AN INDICATION OF AIRCRAFT WIRING OR EVM CONNECTOR PROBLEMS.
CONFIG FAULT	R ENG AVM WIRING INCORRECTLY INSTALLED OR NOT THERE	ON THE R AVM SIGNAL CONDITIONER M10571, CONNECTOR D5602A, MAKE SURE PIN A2 IS CONNECTED TO PIN D13, PIN A13 IS CONNECTED TO C13, AND PIN A11 IS CONNECTED TO PIN C9.
CONFIG FAULT	L ENG AVM WIRING INCORRECTLY INSTALLED OR NOT THERE	ON THE L AVM SIGNAL CONDITIONER M132, CONNECTOR D4240A, MAKE SURE PIN A2 IS CONNECTED TO PIN D13, PIN A13 IS CONNECTED TO C13, AND PIN A11 IS CONNECTED TO PIN C9.

TABLE 2

1 INCLUDE THE SHIELD, GROUND, AND CONNECTORS. CLEAN THE CONNECTORS (WDM 20-60-01) BEFORE YOU CONNECT THEM.

AVM BITE Procedure
Figure 203 (Sheet 2)

FAULT DESCRIPTION TABLE FOR VIBRO-METER S362A001		
FAULT MESSAGE	FAULT DESCRIPTION	CORRECTIVE ACTION
N3 TACHO LOSS E2	R ENG TACHO LOSS N3	EXAMINE THE CIRCUIT FROM PIN Z9 AND Z10 ON TB207 AND R AVM SIGNAL CONDITIONER M10571 CONNECTOR D5602B PINS A12 AND C12 (WDM 77-12-31). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 105, BLOCK 1 ACTION.
N2 TACHO LOSS E2	R ENG TACHO LOSS N2	EXAMINE THE CIRCUIT FROM PIN YA8 AND YA7 ON TB207 AND R AVM SIGNAL CONDITIONER M10571 CONNECTOR D5602B PINS D10 AND C10 (WDM 77-12-21). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 104A, BLOCK 1 ACTION.
N1 TACHO LOSS E2	R ENG TACHO LOSS N1	EXAMINE THE CIRCUIT FROM PIN Z106 AND Z107 ON TB207 AND R AVM SIGNAL CONDITIONER M10571 CONNECTOR D5602B PINS A8 AND B8 (WDM 77-12-11). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 104, BLOCK 1 ACTION.
N3 TACHO LOSS E1	L ENG TACHO LOSS N3	EXAMINE THE CIRCUIT FROM PIN Z15 AND Z16 ON TB207 AND L AVM SIGNAL CONDITIONER M132 CONNECTOR D4240A PINS C12 AND A12 (WDM 77-12-11). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 105, BLOCK 1 ACTION.
N2 TACHO LOSS E1	L ENG TACHO LOSS N2	EXAMINE THE CIRCUIT FROM PIN YC8 AND YC7 ON TB207 AND L AVM SIGNAL CONDITIONER M132 CONNECTOR D4240A PINS D10 AND C10 (WDM 77-12-21). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 104A, BLOCK 1 ACTION.
N1 TACHO LOSS E1	L ENG TACHO LOSS N1	EXAMINE THE CIRCUIT FROM PIN Z111 AND Z112 ON TB207 AND L AVM SIGNAL CONDITIONER M132 CONNECTOR D4240A PINS A8 AND B8 (WDM 77-12-11). REPAIR THE PROBLEMS THAT YOU FIND. IF THE PROBLEMS CONTINUES, DO THIS PROCEDURE: FIM 77-12-00/101, FIG. 104, BLOCK 1 ACTION.

TABLE 2

NOTE: ENGINE E1 OR ENGINE E2 IS SPECIFIED BY EX.

AVM BITE Procedure
Figure 203 (Sheet 3)

2) 11K28, R ENG VIBRATION MON

S 012-009-R00

(2) Open the Main Equipment Center Access Door, 119BL.

E. Read the BITE Maintenance Messages

S 742-010-R00

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

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

(a) From the Self Test? display, push and release the NO button to show Fault History? on the AVM signal conditioner.
(b) After Fault History?, push and release the YES button to show XX Faults? on the front display of the AVM signal conditioner.

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

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

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

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

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

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

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

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

(f) After Clear Faults Memory? display shows:

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

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

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

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

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

(g) If there are BITE maintenance messages, do the applicable corrective action that shows in Fig. 203.

F. Read the Flight History

S 742-011-R00

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

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

FLIGHT HISTORY		
WHAT BUTTON ON THE AVM SIGNAL CONDITIONER TO PUSH	FRONT DISPLAY OF THE AVM SIGNAL CONDITIONER	DESCRIPTION OF FRONT DISPLAY
One of the four buttons.	Self-Test?	Sequence Start for self-test
NO button	Fault History?	Fault History
NO button	Flight History?	Sequence Start for flight history
YES button	XX Flights Display? *[1] or NO Flight Data	Total number of flights or no data
YES button	Flight XX? *[2]	Flight number, XX = 0-31
YES button	FXX E1 *[3] *[4] N1 n.nn *[6] N1 yyy % *[5]	Engine 1 (E1) *[4] N1 vibration - E1 N1 Speed (%) - E1
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E1 N3 Speed (%) - E1 yy.y = Time in hours from Power-up
DOWN button	Fxx E1 *[3] *[4] N2 n.nn *[6] N1 yyy% *[5]	Engine 1 - E1 *[4] N2 Vibration - E1 N1 Speed (%) - E1
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E1 N3 Speed (%) - E1 yy.y = Time in hours from power-up
DOWN button	FXX E1 *[3] *[4] N3 n.nn *[6] N1 yyy % *[5]	Engine 1 (E1) *[4] N3 vibration - E1 N1 Speed (%) - E1
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E1 N3 Speed (%) - E1 yy.y = Time in hours from Power-up

FLIGHT HISTORY		
WHAT BUTTON ON THE AVM SIGNAL CONDITIONER TO PUSH	FRONT DISPLAY OF THE AVM SIGNAL CONDITIONER	DESCRIPTION OF FRONT DISPLAY
To see Engine 1 (E1) data again push and release the DOWN button.		
NO button	FXX E2 *[3] *[4] N1 n.nn *[6] N1 yyy % *[5]	Engine 2 (E2) *[4] N1 vibration - E2 N1 Speed (%) - E2
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E2 N3 Speed (%) - E2 yy.y = Time in hours from power-up
DOWN button	Fxx E2 *[3] *[4] N2 n.nn *[6] N1 yyy% *[5]	Engine 2 - E2 *[4] N2 Vibration - E2 N1 Speed (%) - E2
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E2 N3 Speed (%) - E2 yy.y = Time in hours from power-up
DOWN button	Fxx E2 *[3] *[4] N3 n.nn *[6] N1 yyy% *[5]	Engine 2 - E2 *[4] N3 Vibration - E2 N1 Speed (%) - E2
DOWN button	N2 yyy% *[5] N3 yyy% *[5] T yy.y h *[7]	N2 Speed (%) - E2 N3 Speed (%) - E2 yy.y = Time in hours from power-up

FLIGHT HISTORY		
WHAT BUTTON ON THE AVM SIGNAL CONDITIONER TO PUSH	FRONT DISPLAY OF THE AVM SIGNAL CONDITIONER	DESCRIPTION OF FRONT DISPLAY
To see Engine 2 (E2) data again push and release the DOWN button. To see data for other flights push and release the NO button until you get to the flight number you want to see.		

*[1] Total number of flights, XX = 1 to 32
*[2] Last flight is Flight 0, the flight before is Flight 1 to Flight 31
*[3] FXX = Flight number 0 to 31
*[4] E1 is Engine 1; E2 is Engine 2
*[5] yyy% is the percent RPM measured for the N1, N2 and N3 shaft.
*[6] n.nn is vibration in scalar units (0.00 to 5.00)
*[7] Elapsed time from engine start in hours

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

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

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

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

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

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

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

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

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

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

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

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

1) Record the flight history data that you want.

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

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

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

(i) Push and release the NO button to show the subsequent flight number message that was set.

1) If you push and release the DOWN ARROW button after the last flight history data, the most recent flight history data will show on the front display of the AVM signal conditioner.

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

NOTE: Record all of the Flight History data before you push the YES Button. You will erase all the Flight History data when you push the YES Button with Clear Flight Memory? on the display.

After Clear Flight Memory?, if the NO button is pushed again the front display will show Balance?.

S 412-012-R00

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

AIRBORNE VIBRATION MONITOR (AVM) SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks.
      (1) The first task gives the operational test for the AVM system.
      (2) The second task gives the Self-Test for the Universal Airborne Vibration Monitor (AVM) Signal Conditioner.
   B. Do the operational test when you operate the engines.

TASK 77-31-00-705-001-R00

2. Operational Test - Airborne Vibration Monitor System
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-00-00/201, Power Plant
      (3) AMM 77-31-00/201, Airborne Vibration Monitor System
   B. Do the Operational Test for the Airborne Vibration Monitor System

      S 865-002-R00
      (1) Make sure this circuit breaker on the P11 overhead panel is closed.
         (a) 11K2, VIB MONITOR

      S 865-003-R00
      (2) Make sure the six EICAS circuit breakers on the P11 overhead panel are closed.

      S 865-004-R00
      (3) Supply the electrical power (AMM 24-22-00/201).

      S 975-005-R00
      (4) Make a record of the AVM fault codes before you start the engine.
         (a) Push the ECS/MSG button on the EICAS MAINT panel on the P61 panel.
         (b) Look for the (L,R) ENG VIB BITE message on the EICAS ECS/MSG page.
         (c) If the message is shown on the EICAS, read the fault codes on the AVM signal conditioner (AMM 77-31-00/201).

            NOTE: These fault codes are for faults that occurred during a previous flight or engine run.

            1) Make a record of the fault codes.

S 865-006-R00

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

NOTE: Operate only one engine when you do this test.

S 715-007-R00

(6) Do the operational test:
   (a) Operate the engine at more than 70% N1 for two minutes.
   (b) Push the PERF/APU button on the EICAS MAINT panel on the P61 panel.
   (c) Make sure the AVM indicators are not out of view on the EICAS display.
   (d) Make sure the value shown on the AVM indicators is 0.1 or more for N1 and N2.
   (e) Push the ECS/MSG button on the EICAS MAINT panel on the P61 panel.
   (f) Look for the L(R) ENG VIB BITE message on the EICAS ECS/MSG page.

S 865-008-R00

(7) Do the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).

S 865-009-R00

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

TASK 77-31-00-745-015-R00

3. Universal Airborne Vibration Monitor (AVM) Signal Conditioner - Self Test

A. General

(1) This task is the self test procedure for the Vibro-Meter S362A001 Universal Airborne Vibration Monitor (AVM).

(2) This procedure refers to the Built-In Test Equipment as the BITE.
(3) The self test does a check of the AVM signal conditioner.
  (a) The self test makes sure that the AVM signal conditioner operates correctly.
  (b) The self test does not display BITE maintenance messages or flight history.

B. References
(1) AMM 24-22-00/201, Electrical Power
(2) AMM 77-31-00/201, Airborne Vibration Monitoring System
(3) AMM 77-31-03/401, AVM Signal Conditioner

C. Access
(1) Location Zones
  110 Lower Forward Fuselage
  210 Control Cabin

(2) Access Panels
  119BL Main Equipment Center

D. Prepare to Do the Self Test of the AVM Signal Conditioner

S 865-011-R00
(1) Supply electrical power (AMM 24-22-00/201).

S 865-012-R00
(2) Make sure that this circuit breaker on the overhead panel P11 is closed:
  (a) 11K2, L ENG VIBRATION MON
  (b) 11K28, R ENG VIBRATION MON

S 015-013-R00
(3) Open the main equipment center access door, 119BL.

E. Do the Self Test of the AVM Signal Conditioner

S 725-014-R00
(1) Do these steps to do a self test of the AVM signal conditioner:
  (a) Make sure that the VIB indicators on the EICAS maintenance page show 0 ±0.1 units.

    NOTE: If the circuit breaker is closed, the VIB indicators on the EICAS maintenance page will show 0. If the circuit breaker was open, the VIB indicators on the EICAS maintenance page will not show.

  (b) Push and release one of the four buttons on the front display of the AVM signal conditioner. This will turn on the front panel display.
    1) If the front display on the AVM signal conditioner is blank, replace the AVM signal conditioner and do the self test again.
  (c) The AVM signal conditioner will show Self Test?.

(d) Push and release the YES button on the front display of the AVM signal conditioner.
(e) The AVM signal conditioner will show the hardware and software versions for 12 seconds, then show "Test in Progress" for approximately two seconds.

NOTE: Make sure the third line of the display reads R211-535 for RR. If not, then do the corrective action for the fault message "CONFIG FAULT" (AMM 77-31-00/201).

(f) Make sure that the AVM signal conditioner shows Test OK.

NOTE: The AVM signal conditioner passed the self test. After Test OK, push and release the NO button to show Fault History? on the front display of the AVM signal conditioner. After five minutes, the display will then turn off.

(g) If the AVM signal conditioner shows XX Faults Display? or is blank, there is a failure of the AVM signal conditioner system.

NOTE: XX is the total number of faults.

1) If the front display on the AVM signal conditioner is blank, replace the AVM signal conditioner and do the self test again (AMM 77-31-03/401).
2) If there are XX Faults Display?, do the system test for the Airborne Vibration Monitoring (AVM) System (AMM 77-31-00/201).

AVM ACCELEROMETER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and the installation tasks for the AVM accelerometer.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubricant, and installation of rubber seal rings.
   C. Use the procedures given in AMM 70-51-00/201 to tighten fasteners. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a torque value is specified in this procedure.

TASK 77-31-01-004-001-R00

2. Remove the AVM Accelerometer
   A. References
      (1) AMM 72-03-01/401, Compressor Fairings
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

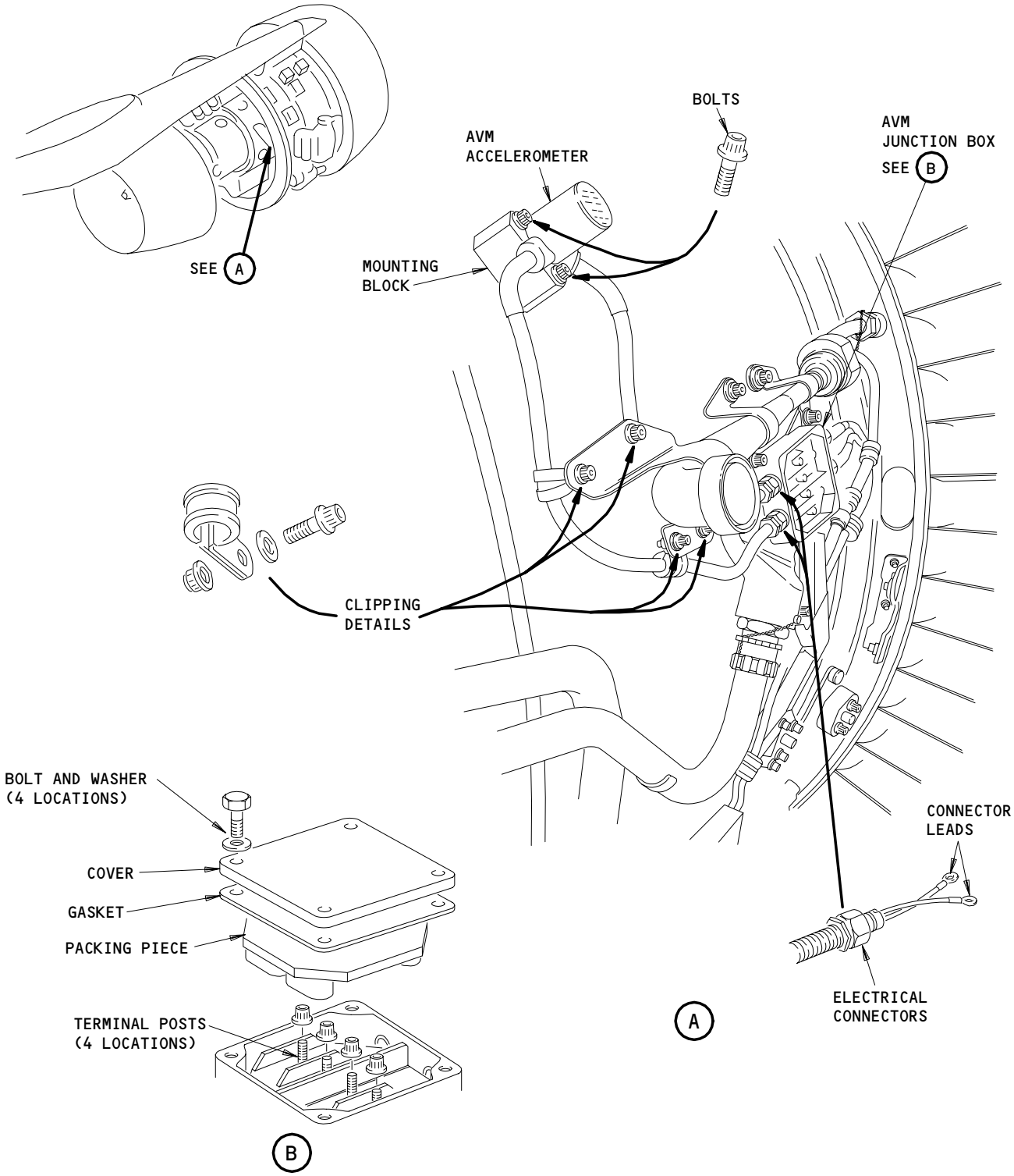
211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine

      (2) Access Panels

416AR	Fan Reverser, Left Engine
421ML	Upper RH Fairing, Left Engine
421NL	Side RH Fairing, Left Engine
421SR	Upper RH Fairing, Right Engine
421PR	Side RH Fairing, Right Engine
426AR	Fan Reverser, Right Engine

   C. Prepare for the Removal of the AVM Accelerometer

      S 864-003-R00
      (1) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
      (a) 11K2, L ENG VIB MONITOR



AVM Accelerometer Installation
Figure 401

S 864-004-R00

(2) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11K28, R ENG VIB MONITOR

S 014-005-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 014-006-R00

(4) Remove the right side and the upper compressor fairings (AMM 72-03-01/401).

D. Remove the AVM Accelerometer (Fig. 401)

S 034-044-R00

(1) Do these steps to remove the cover:
(a) Remove the bolts and washers that attach the junction box cover.
(b) Remove the junction box cover.
(c) Remove and discard the gasket from the junction box.

S 024-014-R00

(2) Remove the nuts that attach the connector leads to the terminal posts.

S 024-015-R00

(3) Release the connectors.
(a) Remove the leads from the junction box.

S 024-016-R00

(4) Release the clipping details that attach the accelerometer harness.
(a) Remove the clipping details.

S 024-017-R00

CAUTION: CAREFULLY MOVE THE AVM ACCELEROMETER. IF YOU HIT THE AVM ACCELEROMETER, DAMAGE TO THE INTERNAL COMPONENTS CAN EASILY OCCUR.

(5) Remove the bolts that attach the AVM accelerometer.

S 024-018-R00

(6) Remove the AVM accelerometer and the harness assembly from the engine.

S 864-019-R00
(7) Install the dust caps to the openings.

TASK 77-31-01-404-020-R00

3. Install the AVM Accelerometer

A. Consumable Materials

(1) Lockwire
British Spec - DTD. 189A; 22 S.W.G.
American Spec - 21 A.W.G.
OMat No. - 238

(2) BOOO9O Degreasing Fluid
(Inhibited and Stabilized 1,1,1 trichorethane)
British Spec - BS4487; 1969
American Spec - MIL-T-81533
OMat No. - 1/21

(3) A cloth without lint

B. References

(1) AMM 7O-42-12/2O1, Local Surface Protection
(2) AMM 72-O3-O1/4O1, Compressor Fairings
(3) AMM 77-31-OO/5O1, Airborne Vibration Monitoring (AVM) System
(4) AMM 78-31-OO/2O1, Thrust Reverser System

C. Access

(1) Location Zones

211	Flight Compartment
212	Flight Compartment
41O	Left Engine
42O	Right Engine

(2) Access Panels

416AR	Fan Reverser, Left Engine
421ML	Upper RH Fairing, Left Engine
421NL	Side RH Fairing, Left Engine
421SR	Upper RH Fairing, Right Engine
421PR	Side RH Fairing, Right Engine
426AR	Fan Reverser, Right Engine

D. Procedure

S 864-O21-R00
(1) Remove the dust caps from the openings.

S 114-O22-R00
(2) Do the steps that follow to clean the AVM accelerometer and the mating faces of the mounting pin:

WARNING: MAKE SURE YOU HAVE A GOOD FLOW OF AIR WHEN YOU USE THE DEGREASING FLUID. DO NOT BREATHE THE FUMES FROM THE DEGREASING FLUID. DO NOT LET THE DEGREASING FLUID TOUCH YOUR SKIN. KEEP THE DEGREASING FLUID AWAY FROM SPARKS, FLAME, AND HEAT. THE DEGREASING FLUID IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: DO NOT LET THE DEGREASING FLUID TOUCH THE ENAMEL SURFACES. IF THE DEGREASING FLUID TOUCHES AN ENAMEL SURFACE, USE THE PROCEDURE IN AMM 70-42-12/201 TO CLEAN THE ENAMEL SURFACE. IF YOU DO NOT FOLLOW THE PROCEDURE, DAMAGE TO THE ENAMEL SURFACE CAN OCCUR.

(a) Make a clean, dry, lintfree cloth moist with the degreasing fluid.

NOTE: To prevent contamination of all the liquid, do not touch the container with the cloth when you make the cloth moist.

The degreasing fluid will cause corrosion to the enamel surfaces.

(b) Use a new cloth for each operation.
(c) Rub the surfaces with the moist cloth.

S 424-023-R00

CAUTION: CAREFULLY MOVE THE AVM ACCELEROMETER. IF YOU HIT THE AVM ACCELEROMETER, DAMAGE TO THE INTERNAL COMPONENTS CAN EASILY OCCUR.

(3) Install the AVM accelerometer on the mounting block with the bolts.
(a) Tighten the bolts.

S 034-026-R00

(4) Remove the junction box cover, packing piece and the nuts that attach the connector.

S 424-027-R00

(5) Put the connector leads into the junction box.

S 424-045-R00

(6) Do these steps to connect the leads and install the cover:
  (a) Install the connector leads on the terminal posts with the nuts.
    1) Tighten the nuts.
    2) Install lockwire on the nuts.
  (b) Install a new gasket on the junction box.
  (c) Install the junction box cover with the bolts and washers.
    1) Tighten the bolts to 62 pound-inches (7 newton-meters).

S 434-037-R00

(7) Attach the accelerometer harness with the clipping details.
  (a) Tighten the bolts.

E. Put the Airplane Back to Its Usual Condition

S 414-038-R00

(1) Install the right side and the upper compressor fairings (AMM 72-03-01/401).

S 414-039-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

S 864-040-R00

(3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
  (a) 11K2, L ENG VIB MONITOR

S 864-041-R00

(4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
  (a) 11K28, R ENG VIB MONITOR

S 714-042-R00

(5) Do the AVM system adjustment test (AMM 77-31-00/501).

AVM SIGNAL CONDITIONERS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the signal conditioner. The second task installs the signal conditioner.
   B. The two AVM signal conditioners are in the main equipment center on shelf E4-2.

TASK 77-31-03-004-001-R00

2. Remove the AVM Signal Conditioner
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels
      (2) AMM 20-10-01/401, E/E Rack-Mounted Components
   B. Access
      (1) Location Zones
          110 Lower Forward Fuselage
          210 Control Cabin

      (2) Access Panels
          119BL Main Equipment Center

   C. Remove the AVM signal conditioners.

      S 864-002-R00
      (1) Open these circuit breakers on the P11 overhead panel and attach DO-NOT-CLOSE tags:
          (a) 11K2, L ENG VIBRATION MON
          (b) 11K28, R ENG VIBRATION MON

      S 014-003-R00
      (2) Open the access door, 119BL, to get access to the main equipment center (AMM 06-41-00/201).

      S 024-004-R00
      (3) Remove the AVM signal conditioner with the procedure for the E/E Rack-Mounted Components (AMM 20-10-01/401).

TASK 77-31-03-404-005-R00

3. Install the AVM Signal Conditioner
   A. References
      (1) AMM 06-41-00/201, Fuselage Access Doors and Panels

(2) AMM 20-10-01/401, E/E Rack-Mounted Components
(3) AMM 24-22-00/201, Electrical Power - Control
(4) AMM 77-31-00/501, Airborne Vibration Monitoring System

B. Access

(1) Location Zones

110	Lower Forward Fuselage
210	Control Cabin

(2) Access Panels

119BL	Main Equipment Center

C. Install the AVM Signal Conditioner

S 424-006-R00
(1) Install the AVM signal conditioner with the procedure for the E/E Rack-Mounted Component (AMM 20-10-01/401).

S 864-007-R00
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel:
(a) 11K2, L ENG VIBRATION MON
(b) 11K28, R ENG VIBRATION MON

S 864-008-R00
(3) Supply the electrical power if it is necessary (AMM 24-22-00/201).

S 714-009-R00
(4) AIRPLANES WITH -18, -20, -451 OR -452 AVM SIGNAL CONDITIONERS; Do the self test of the signal conditioner.
(a) Push the TEST switch on the signal conditioner.
(b) Make sure the code 88 goes out of view after approximately 6 seconds.

NOTE: The self test is completed when code 88 goes out of view.

S 714-013-R00
(5) AIRPLANES WITH THE S362A001 UNIVERSAL AVM SIGNAL CONDITIONER;
Do the self test of the signal conditioner (AMM 77-31-00/501).

S 414-010-R00
(6) Close the access door, 119BL (AMM 06-41-00/201).

S 864-011-R00
(7) Remove the electrical power if it is not necessary
(AMM 24-22-00/201).

AVM JUNCTION BOX - REMOVAL/INSTALLATION

1. General
   A. This procedure contains the removal and the installation tasks for the AVM junction boxes.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubricant, and installation of rubber seal rings.
   C. Use the procedures given in AMM 70-51-00/201 to tighten fasteners. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a different torque value is specified in this procedure.
   D. Use the same removal and installation procedure for the two No. 1 and No. 2 AVM junction boxes.

TASK 77-31-04-004-001-R00

2. Remove the AVM Junction Boxes
   A. References
      (1) AMM 72-03-01/401, Compressor Fairings
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

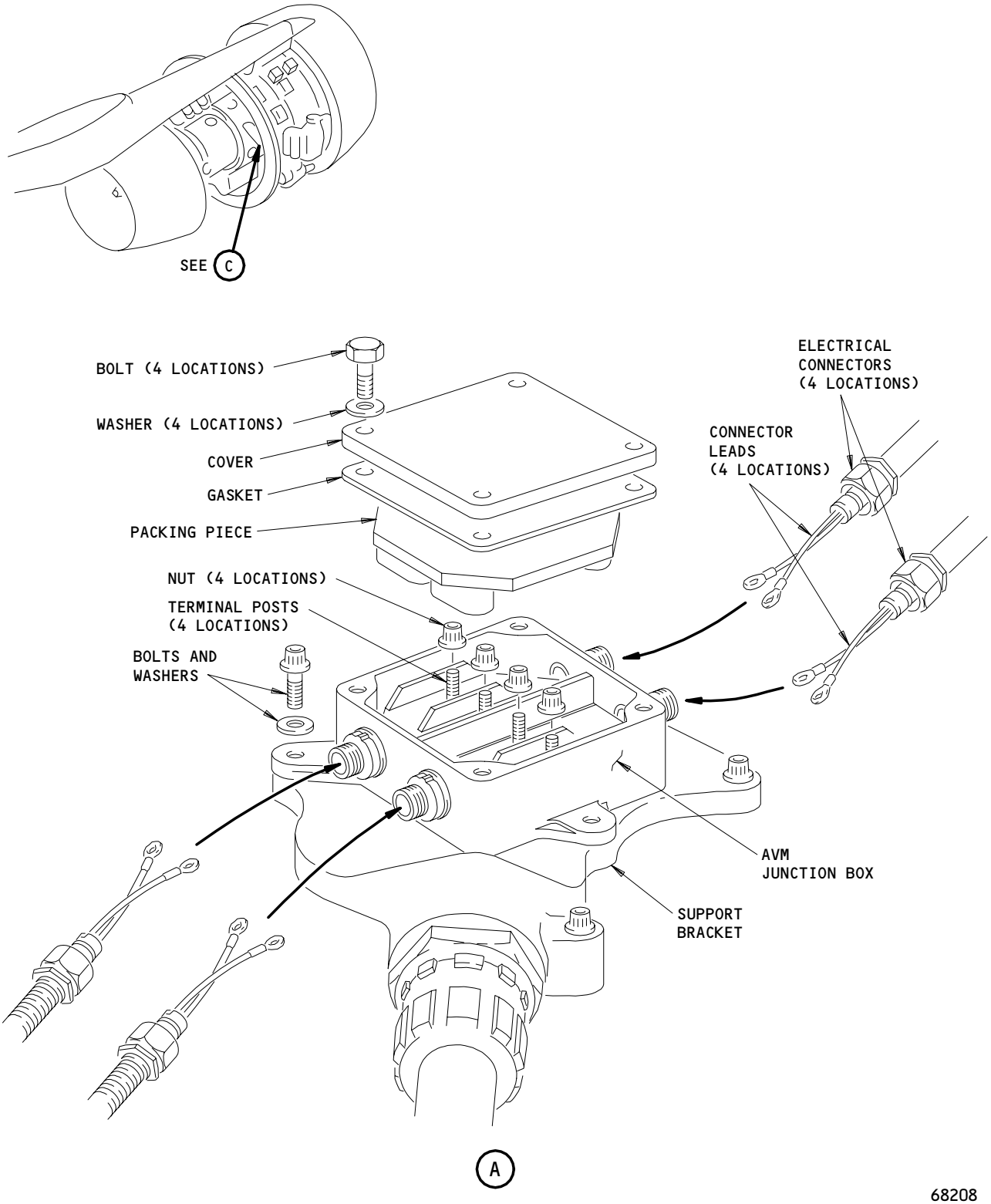
211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine

      (2) Access Panels

416AR	Fan Reverser, Left Engine
421ML	Upper RH Fairing, Left Engine
421NL	Side RH Fairing, Left Engine
421SR	Upper RH Fairing, Right Engine
421PR	Side RH Fairing, Right Engine
426AR	Fan Reverser, Right Engine

   C. Prepare for the Removal of the AVM Junction Boxes

      S 864-003-R00
      (1) For the left engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
         (a) 11K2, L ENG VIB MONITOR



AVM Junction Box Installation
Figure 401

S 864-004-R00

(2) For the right engine, open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
(a) 11K28, R ENG VIB MONITOR

S 014-005-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 014-006-R00

(4) Remove the right side and upper compressor fairings (AMM 72-03-01/401).

D. Remove the AVM Junction Boxes (Fig. 401)

S 034-009-R00

(1) Remove the bolts and washers that attach the junction box cover.

S 034-010-R00

(2) Remove the junction box cover.

S 034-011-R00

(3) Remove the packing piece.

S 034-012-R00

(4) Remove the nuts that attach the connector leads to the terminal posts.

S 034-013-R00

(5) Release the connectors.
(a) Remove the connector leads from the junction box.

S 024-014-R00
(6) Remove the nuts that attach the junction box to the support bracket.

S 024-015-R00
(7) Remove the junction box.

S 034-016-R00
(8) Install the dust caps to the electrical connectors.

TASK 77-31-04-404-017-R00

3. Install AVM Junction Boxes

A. Consumable Materials

(1) Degreasing Fluid (Inhibited and stabilized 1,1,1, trichloroethane)

British Spec.- BS 4487, 1969,
American Spec.- MIL-T-81533,
Omat No.- 1/21

(2) Lockwire
British Spec. - DTD 189A, 22 S.W.G
American Spec. - 21 A.W.G.
OMat No. - 238

(3) Cloth without lint

B. References

(1) AMM 70-42-12/201, Local Surface Protection
(2) AMM 72-03-01/401, Compressor Fairings
(3) AMM 77-31-00/501, Airborne Vibration Monitor (AVM) System
(4) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones

211	Flight Compartment
212	Flight Compartment
410	Left Engine
420	Right Engine

(2) Access Panels

416AR	Fan Reverser, Left Engine
421ML	Upper RH Fairing, Left Engine
421NL	Side RH Fairing, Left Engine
421SR	Upper RH Fairing, Right Engine
421PR	Side RH Fairing, Right Engine
426AR	Fan Reverser, Right Engine

D. Procedure

S 114-019-R00

(1) Do the steps that follow to clean the junction box and the mating face on the support bracket:

WARNING: MAKE SURE YOU HAVE A GOOD FLOW OF AIR WHEN YOU USE THE DEGREASING FLUID. DO NOT BREATHE THE FUMES FROM THE DEGREASING FLUID. DO NOT LET THE DEGREASING FLUID TOUCH YOUR SKIN. KEEP THE DEGREASING FLUID AWAY FROM SPARKS, FLAME, AND HEAT. THE DEGREASING FLUID IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: DO NOT LET THE DEGREASING FLUID TOUCH THE ENAMEL SURFACES. IF THE DEGREASING FLUID TOUCHES AN ENAMEL SURFACE, USE THE PROCEDURE IN AMM 70-42-12 TO CLEAN THE ENAMEL SURFACE. IF YOU DO NOT FOLLOW THE PROCEDURE, DAMAGE TO THE ENAMEL SURFACE CAN OCCUR.

(a) Make a clean, dry, lintfree cloth moist with the degreasing fluid.

NOTE: To prevent contamination of all the liquid, do not touch the container with the cloth when you make the cloth moist.

The degreasing fluid will cause corrosion to the enamel surfaces.

(b) Use a new cloth for each operation.
(c) Rub the surfaces with the moist cloth.

S 424-020-R00

(2) Install the junction box on the support bracket with the nuts.
(a) Tighten the nuts.

S 034-021-R00
(3) Remove the junction box cover, packing piece and the nuts on the terminal posts.

S 434-022-R00
(4) Remove the dust caps from the electrical connectors.

S 434-040-R00
(5) Put the connector leads into the junction box.

S 434-039-R00
(6) Do these steps to connect the leads and install the box cover:
(a) Install the connector leads on the terminal posts with the nuts.
1) Tighten the nuts.
2) Install a lockwire to the nuts.
(b) Install a new gasket on the junction box.
(c) Install the junction box cover with the bolts and washers.
1) Tighten the bolts to 63 pound-inches (7 newton-meters).

E. Put the Airplane Back to Its Usual Condition

S 414-033-R00
(1) Install the right side and upper compressor fairings (AMM 72-03-01/401).

S 414-034-R00

WARNING: OBEY THE INSTRUCTIONS IN AMM 78-31-00/201 WHEN YOU CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Close the right thrust reverser (AMM 78-31-00/201).

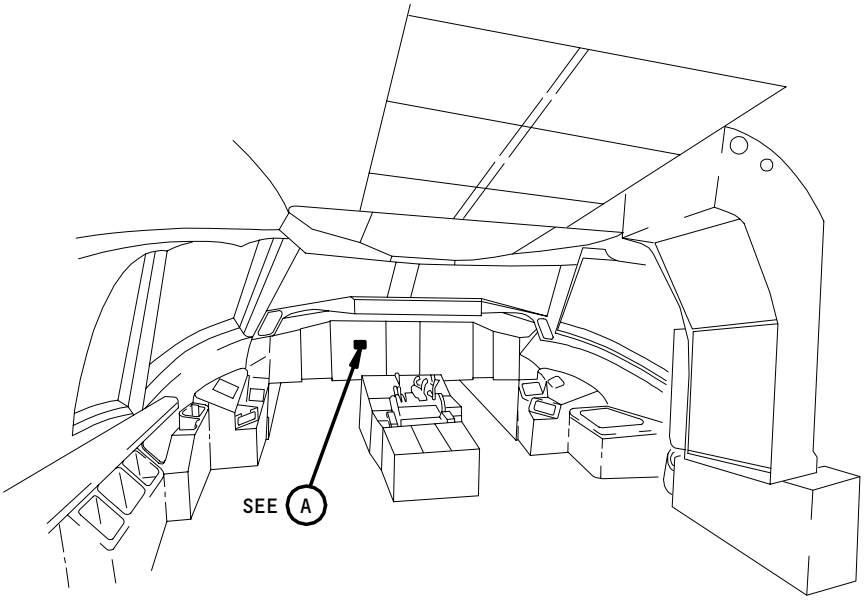
S 864-035-R00
(3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11K2, L ENG VIB MONITOR

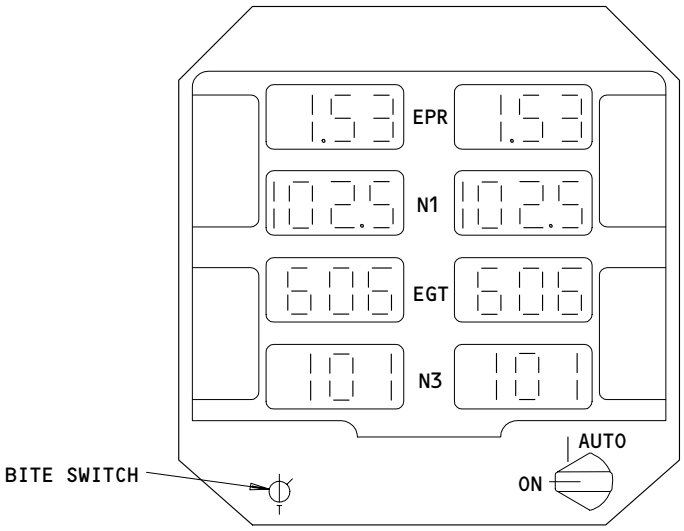
S 864-036-R00
(4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11K28, R ENG VIB MONITOR

S 714-037-R00
(5) Do the AVM system adjustment test (AMM 77-31-00/501).

STANDBY ENGINE INDICATION - DESCRIPTION AND OPERATION

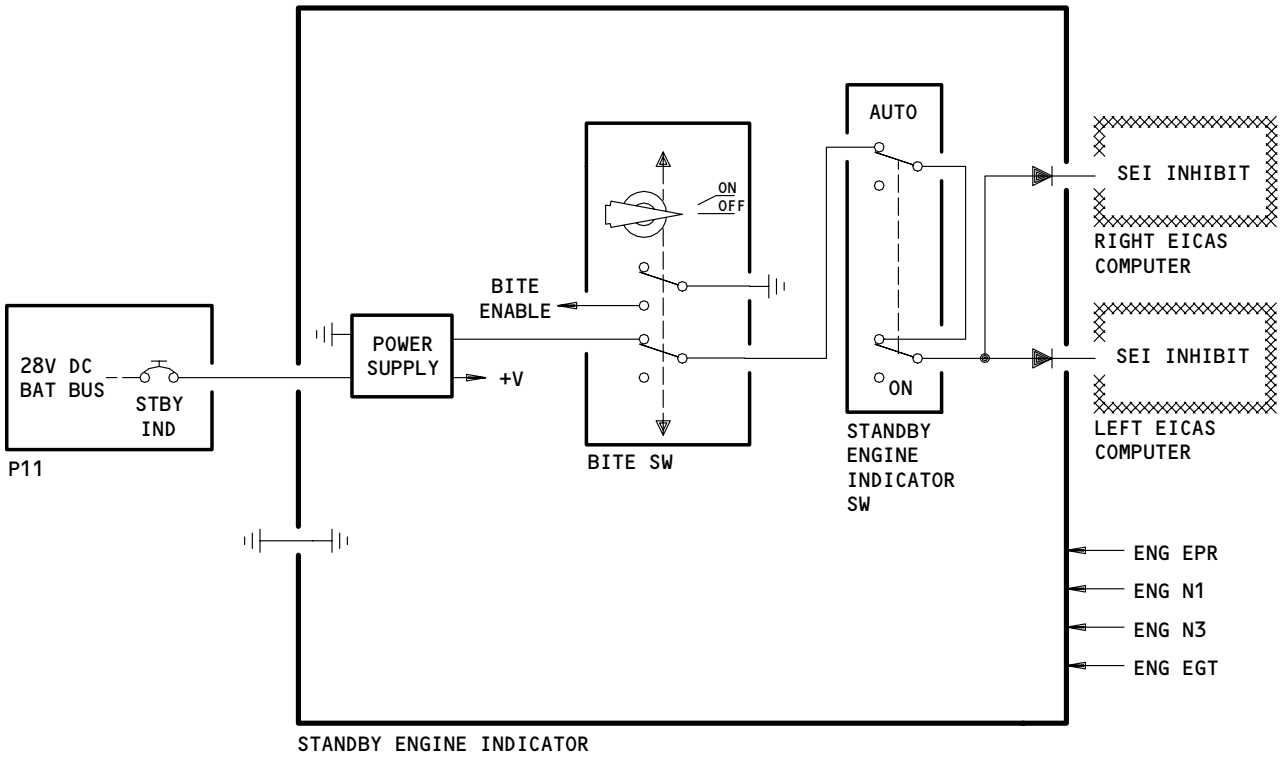
1. General (Fig. 1)
   A. Back-up display of EPR, N1, EGT, and N3 is provided by the standby indicator on the P1-3 panel. Respective sensor signals are input directly to the indicator, to assure display in the event the Engine Indication and Crew Alerting System (EICAS) display units or EICAS computers fail.
2. Operation (Fig. 2)
   A. Functional Description
      (1) The indicator can operate in one of two modes:
         (a) AUTO- When EICAS is operating, the indicator will be turned off. However, if EICAS fails or is shut down, a discrete signal turns the indicator on, displaying engine parameters (EPR, N1, EGT and N3) exactly as would be shown on the EICAS displays.
         (b) ON- Whether EICAS is on or off, the indicator will display engine parameters.
   B. BITE
      (1) The one power supply within the indicator can be tested individually by using the BITE switch on the lower left side of the indicator. Clockwise rotation of the switch tests the power supply. The SEI (Standby Engine Indicator) has a LED Display.





STANDBY ENGINE INDICATOR
A

Standby Engine Indication System
Figure 1

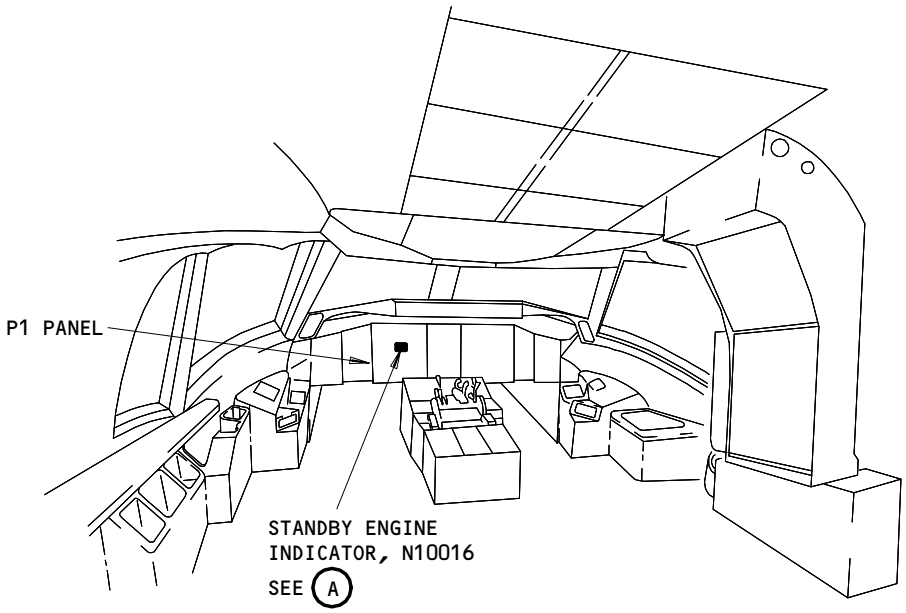


Standby Engine Indication Operation Schematic
Figure 2

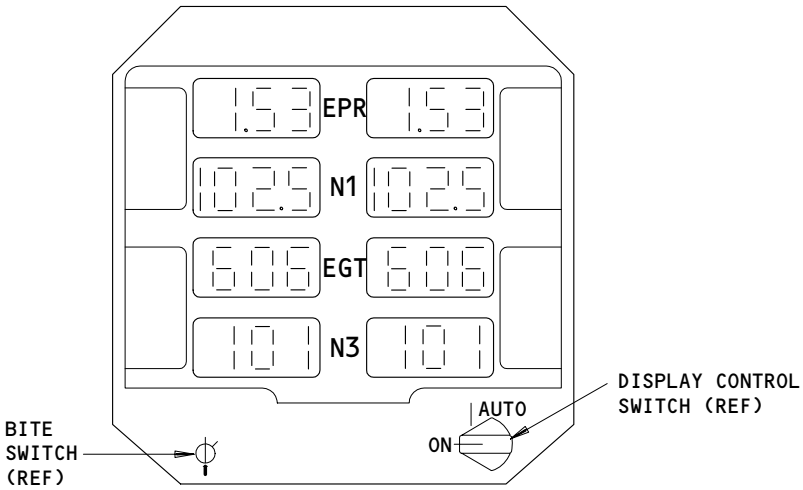
STANDBY ENGINE INDICATION SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
INDICATOR - STANDBY ENGINE, N10016	--	1	FLT COMPT, P1 PANEL	77-41-01

Standby Engine Indication System - Component Index
Figure 101



FLIGHT COMPARTMENT



STANDBY ENGINE INDICATOR, N10016

(A)

Standby Engine Indication System - Component Location
Figure 102

STANDBY ENGINE INDICATOR - REMOVAL/INSTALLATION

1. General
   A. The standby engine indicator is found on the pilots main panel (P1-3).
   B. This procedure contains tasks for the standby engine indicator, referred to as the indicator in this procedure. The tasks are the removal, installation, and a system check.

TASK 77-41-01-004-001-R00

2. Remove the Standby Engine Indicator (Fig. 401, 402)
   A. References
      (1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zones
          211 Flight Compartment
          212 Flight Compartment

   C. Prepare for the Removal of the Standby Engine Indicator

      S 914-002-R00

      CAUTION: DO NOT TOUCH THE STANDBY ENGINE INDICATOR BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STANDBY ENGINE INDICATOR.

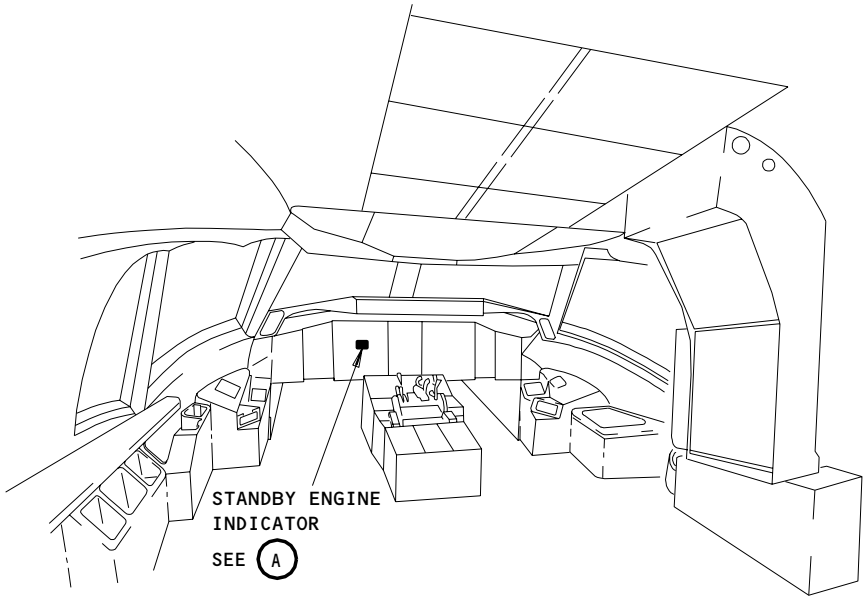
      (1) Read the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

      S 864-020-R00
      (2) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11D23, ENGINE STBY IND
   D. Remove the Standby Engine Indicator (Fig. 401)

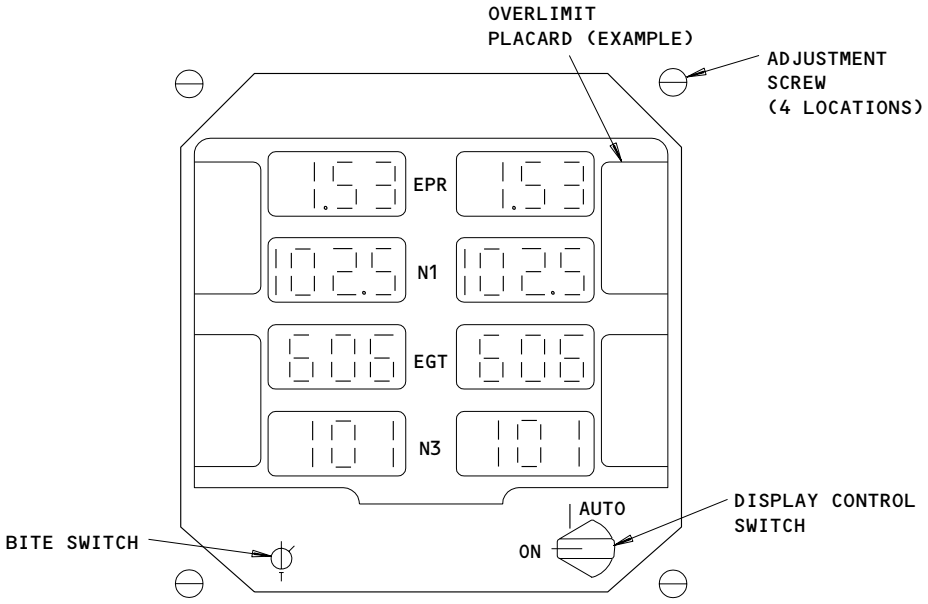
      S 034-021-R00
      (1) Loosen the adjustment screws on the indicator mounting clamp.

          NOTE: The larger screws found at the top right position and lower left position are the adjustment screws.

      S 034-022-R00
      (2) Push on the adjustment screws to loosen the indicator mounting clamp.



FLIGHT COMPARTMENT



STANDBY ENGINE INDICATOR

A

NOTE: NUMBERS DISPLAYED ON INDICATOR FOR REFERENCE ONLY.

Standby Engine Indicator Installation and System Check
Figure 401

S 024-023-R00

CAUTION: MAKE SURE THE INDICATOR HOUSING IS FREE FROM THE RETAINING CLAMP BEFORE YOU MOVE THE INDICATOR FROM THE PANEL. IF THE INDICATOR HOUSING IS NOT FREE, DAMAGE CAN OCCUR TO THE INDICATOR BEZEL.

(3) Remove the indicator from the panel.

S 024-024-R00

(4) Remove the applicable overlimit placards (Fig. 402):

CAUTION: PREVENT CONTAMINATION DURING THE PLACARD REMOVAL. CAREFULLY REMOVE THE PLACARDS TO PREVENT CONTAMINATION.

(a) Loosen the two captive screws that hold the placard on the indicator.
(b) Remove the placard.

S 024-025-R00

(5) Remove the indicator.
(a) Disconnect the two electrical connectors.
(b) Install the dust caps on the connectors.

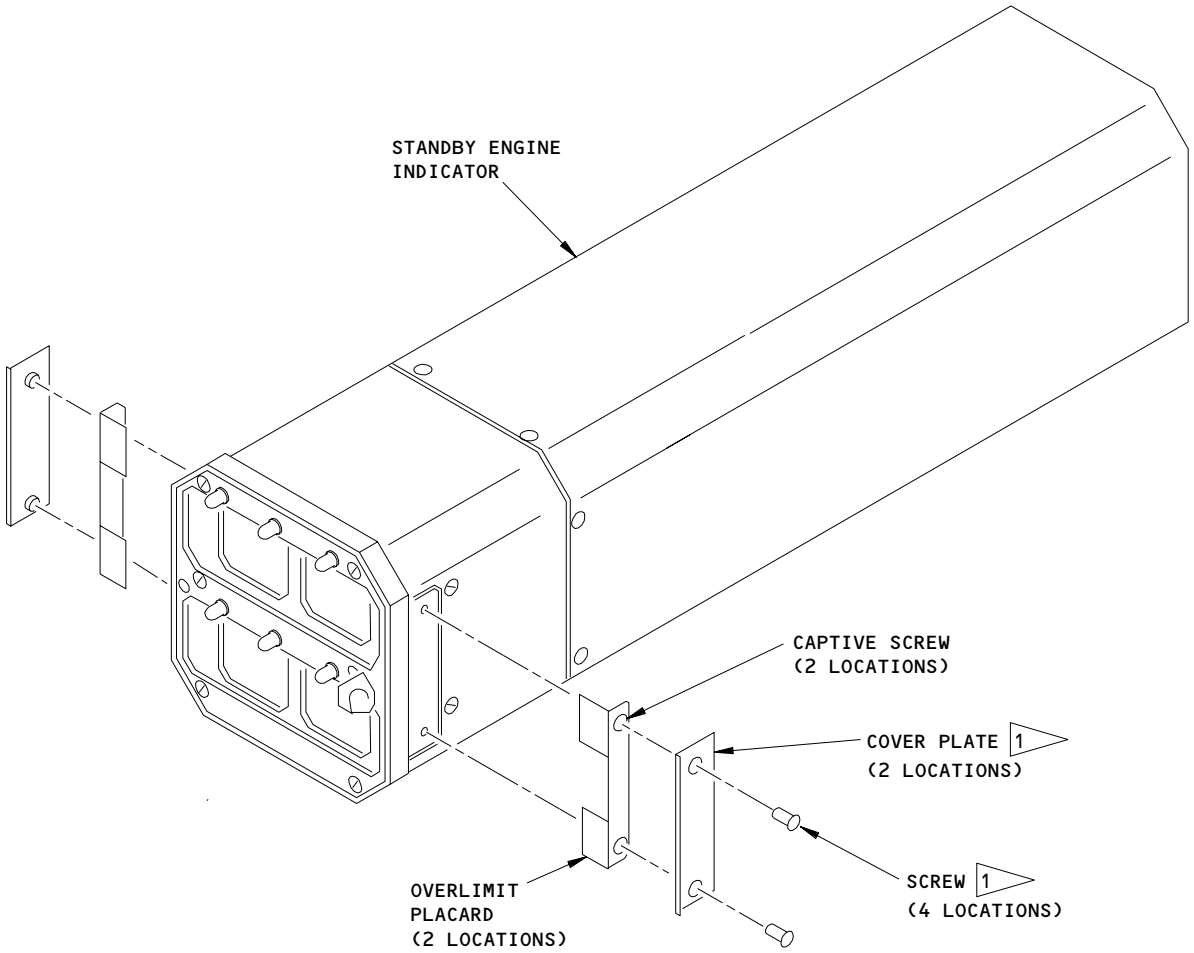
TASK 77-41-01-404-026-R00

3. Install the Standby Engine Indicator (Fig. 401, 402)

A. References
(1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices

B. Access
(1) Location Zones
211 Flight Compartment
212 Flight Compartment

C. Procedure



1 IT IS NECESSARY TO REMOVE THESE FROM THE NEW INDICATOR

Overlimit Placard Installation
Figure 402

S 914-027-R00

CAUTION: DO NOT TOUCH THE STANDBY ENGINE INDICATOR BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STANDBY ENGINE INDICATOR.

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

S 434-028-R00

(2) Remove the dust caps from the connectors.

S 424-029-R00

(3) Connect the two electrical connectors to the indicator.

S 424-030-R00

(4) Install the applicable overlimit placard (Fig. 402):

CAUTION: PREVENT CONTAMINATION DURING THE PLACARD INSTALLATION. CAREFULLY INSTALL THE PLACARDS TO PREVENT CONTAMINATION.

(a) Remove the two screws that hold the cover on the indicator.
(b) Remove the cover.
(c) Install the placard to the indicator.
(d) Tighten the captive screws.

S 824-031-R00

(5) Align the indicator with the panel.

S 424-032-R00

(6) Put the indicator in the panel.

S 424-033-R00

CAUTION: DO NOT TIGHTEN THE ADJUSTMENT SCREWS MORE THAN IT IS NECESSARY. IF YOU TIGHTEN THE ADJUSTMENT SCREWS MORE THAN IT IS NECESSARY, DAMAGE TO THE INDICATOR CAN OCCUR.

(7) Tighten the adjustment screws to 5-10 pound-inches (0.6 to 1.1 newton meters) (Fig. 401).

NOTE: The larger screws at the top right position and bottom left position are the adjustment screws.

D. Put the Airplane Back to Its Usual Condition

S 864-051-R00
(1) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11D23, ENGINE STBY IND

TASK 77-41-01-744-052-R00

4. Standby Engine Indicator System Check (Fig. 401)

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

B. Access
(1) Location Zones
211 Flight Compartment
212 Flight Compartment

C. Prepare for the Procedure

S 864-053-R00
(1) Supply the electrical power (AMM 24-22-00/201).

S 864-054-R00
(2) Put the display control switch for the standby engine indicator to the ON position.

D. Procedure

S 864-091-R00
(1) Move the BITE switch to the ON position and keep the switch in this position.

S 974-092-R00
(2) Make sure that the SEI shows the values that follow in about 10 seconds:
(a) 1.88 for EPR
(b) 188.8 for N1
(c) 1888°C for EGT
(d) 188 for N3

S 864-093-R00
(3) Let the BITE switch go back to the OFF position.

S 864-094-R00
(4) Move the display control switch to the AUTO position.

S 864-095-R00
(5) Remove the electrical power if it is not necessary (AMM 24-22-00/201).