B757 MANUAL SUPPLEMENT - ATP 3510
SECTION 1 CHAPTER 79
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.
79-00-00	624	* Alert	BA 79-520

D. Remove and Destroy the following TRs/Alerts:

* Indicates TRs/Alerts issued with this control page

MAINTENANCE MANUAL

ALERT No. 79-520

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).
CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 79-00-00 Page 624

REASON FOR REVISION

MANDATORY R-R Bulletins calls for tight controls for Scavenge Filter Inspection following bearing replacement, and oil filter blockage message.

ACTION

79-00-00 Page 624 Para. 4 A. is REVISED by the following:-

4. Examine the Scavenge and Pressure Oil Filter Elements
   A. General
      (1) Rolls - Royce Service Bulletin References
         (a) RR SB 72-7812-HS Gearbox; Replace the magnetic chip detectors with blanking plates.
      (2) BA procedure requires M.C.D.'s and filters to be forwarded to the Engine Health Monitoring Section (E.H.M.S.) for examination and to confirm any necessary action. Use transport boxes provided and fit clean items.

         NOTE: When removing M.C.D.'s and oil filters ensure all labels are marked with the A/C and Engine position, date, and technical log reference. The filter label must also be identified with reason for removal i.e. Service check item or non-routine task. This is essential I.A.W. R-R Mandatory Bulletin 72-C815 and for identification of source of debris.

(3) In general, it is the gradual development of failures evident by small relatively insignificant particles which the E.H.M.S. techniques identifies. However, the engineer carrying out the change is responsible for identifying any significant debris which collect on the detectors or in the filters and take appropriate action, or referring to E.H.M.S., before airplane is cleared for service.

MANDATORY REQUIREMENT (Ref.: RB211-72-C815)
Inspection of non-routine (non-service check) Scavenge filters prior to referring to E.H.M.S.

(4) Visually inspect the filter for evidence of bronze in the outer gauze, by manually separating all the all of the folds on the outer surface of the filter element.

(a) If bronze is evident in the folds of the filter contact Powerplant Engineering before further flight.

(b) If no bronze is evident on the outer gauze folds route filter by hand immediately to E.H.M.S. for detailed analysis I.A.W. RB21172-C815. Before further flight.

79-00-00 Page 626 Para. 4 D. (8) is REVISED by the ADDITION of the following:- (New sub. para. (8) and (9) with Revised sub. para. (8) to read as sub. para.(10).).

D. Procedure

MANDATORY REQUIREMENT (Ref; RB211-72-C815)
Inspection of non-routine (non-service check) Scavenge filters at E.H.M.S.

(8) Cut a segment (approximately 10 folds) of the filter media using a hacksaw.

NOTE: During this operation, support the filter in a vice with clean polythene protecting it from contamination. Cut parallel and close to the filter end caps and longitudinally at the ends of the segment. Ensure the cut penetrates the inner core of the filter.

ALERT. 79-520 (Cont'd)

(9) On a clean surface, carefully extend the filter media folds to form a flat sheet. Separate the outer gauze from the inner media for evidence of bronze.
   (a) If bronze is evident on the inner media contact Powerplant Engineering before further flight.
   (b) If bronze is not evident on the inner media and the filter was not removed for a filter blockage message no further action is necessary. Return Aircraft to service.
   (c) If bronze is not evident on the inner media and the filter was removed for a filter blockage message raise an ADD to re-inspect scavenge filter within 200 hours from the inspection being examined. Forward filter to Powerplant Engineering immediately for analysis by Rolls-Royce.

(10) Accept/Reject Standards for unwanted material found in the Scavenge and pressure filters:

NOTE: The scavenge filter standards below relate to scavenge filters removed during 'service checks' for all other removals i.e. filter blockage and ADD's carry out requirement of MANDATORY Bulletin 72-C815.

Sub. para. (10) (e) and (f). (e) is to read as follows (f) is DELETED.

(e) Evidence of bronze particles or flakes. Contact Powerplant Engineering before further flight.

GPA Group plc

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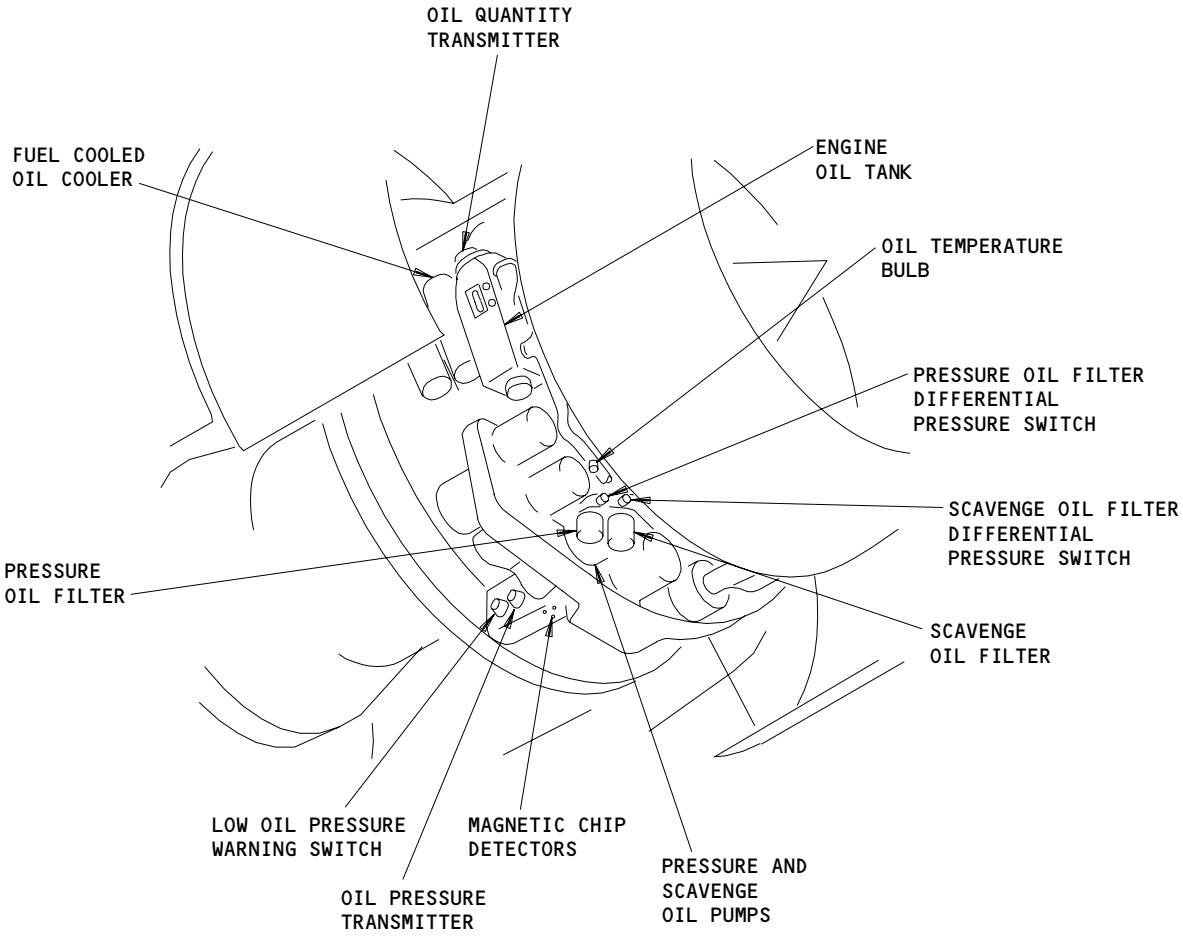
OIL - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The oil system is of the self-contained, full flow re-circulatory type and provides lubrication and cooling oil to the engine bearings, gears and splines.
   B. Oil is drawn from the oil tank (AMM 79-11-00/001) by a pressure pump and returned by seven scavenge pumps (AMM 79-21-00/001) creating a continuous re-circulatory flow.
   C. Feed oil filtration is provided by a thread and gauze filter and a convoluted gauze pressure filter. Return oil filtration is provided by gauze strainers and a convoluted gauze fine scavenge filter (AMM 79-21-00/001).
   D. The engine bearing chambers and the oil tank vent into the external gearbox. It then vents to atmosphere through a centrifugal breather (AMM 79-21-00/001).
   E. Oil cooling is effected by passing the feed oil through a heat exchanger (AMM 79-21-00/001) positioned in the low pressure fuel feed going to the high pressure fuel pump.
   F. Provision is made for flight compartment indication of the following:
      (1) Oil tank capacity (AMM 79-31-00/001)
      (2) Oil pressure (AMM 79-32-00/001)
      (3) Low oil pressure (AMM 79-33-00/001)
      (4) Oil temperature (AMM 79-34-00/001)
      (5) Filter bypass (AMM 79-35-00/001)
   G. Provision is made for engine internal condition monitoring by magnetic chip detectors positioned in the return oil system (AMM 79-21-00/001).



Engine Oil Components
Figure 1

OIL - INSPECTION/CHECK

1. General
   A. There are five tasks in this procedure.
      (1) Identification of the Unwanted Material.
      (2) Examine the Magnetic Chip Detectors (MCD).
      (3) Examine the Pressure and Scavenge Oil Filter Elements.
      (4) Examine the Scavenge Strainer.
      (5) Examine the Oil Feed and Return Tubes
   B. The inspection of the magnetic chip detectors (MCD) and the filter elements will give you an indication of the internal condition of the engine.
   C. You must keep a record of the inspections.
      (1) It will supply the necessary data when you find unwanted material on the MCD's and in the filter elements.
   D. Keep all unwanted material found on the MCD's (or in the filters and the strainers) which does not cause you to immediately reject the engine or gearbox.
      (1) This will help you to keep a record of the type of worn areas in the engine or gearbox.
      (2) This record will help you make a decision on the condition of the engine if more material is found.
   E. Refer to the material/component reference charts as an aid for material sources, Fig. 606.
   F. You must examine the magnetic chip detectors to give an indication before the start of an engine internal failure.
   G. ENGINES POST-RR-SB 72-7812;
      The magnetic chip detectors are installed at the master chip detectors and internal gearbox positions only, and blanking plates are installed at the five positions that remain.

      NOTE: You can remove the blanking plates and install MCD's for an inspection.

   H. ENGINES PRE-RR-SB 72-7812;
      The magnetic chip detectors are installed at the master chip detector, internal gearbox, high speed external gearbox, bevel box, HP/IP and LP turbine bearing housings and front bearing housing positions.

I. ENGINES POST-RR-SB 72-7911;
Revised bayonet magnetic chip detectors are installed at the master chip detectors and internal gearbox, with the high speed external gearbox installed at the operator's decision.

NOTE: You can remove the blanking plates and install MCD's to the four positions that remain for an inspection.

TASK 79-00-00-996-024-R00

2. Identification of the Unwanted Material

A. Procedure

S 996-025-R00

(1) You must keep records of the material that is found on the MCD's and in the filters.

NOTE: These records will help you make a correct decision when you find unwanted material on the MCD's and in the filters.

S 996-027-R00

(2) Examine the unwanted material with a good light and a magnifying lens to see the material ten times larger than its usual dimension.

NOTE: Send all unwanted material that is magnetic, which you can not easily identify, to the laboratory for analysis.

S 996-028-R00

(3) Small quantities of small steel particles or particles of steel on the MCD, which are almost the same shape and dimension as hair, are not always an indication of engine failure.

(a) This type of unwanted material is usually applicable to engines which have not been operated for many hours.

NOTE: These are engines that are new, or have been repaired or overhauled.

(b) These quantities must decrease as the engine hours increase.

S 996-029-R00

(4) Large quantities of steel particles on the full circumference of the MCD can show an internal failure.

(a) The filters and strainers can contain unwanted material that is magnetic and unwanted material that is not magnetic.

S 996-030-R00

(5) Unwanted Material that is Magnetic:

NOTE: Unwanted material that is magnetic can be divided in to four primary groups. The four primary groups are swarf, magnetic fines, metal flakes and chips.

(a) Swarf (Fig. 604)

1) Swarf is unwanted material that is caused when the engine components are machined.
2) This unwanted material can be in the engine after it is assembled.
3) Pieces of turning can easily be identified, but pieces of milling cannot be easily identified.
4) Carefully examine the pieces of milling that are broken to make sure they are not pieces of gear or steel seal.

(b) Magnetic Fines (Fig. 603)

1) On an MCD which has oil on it, the fines are shown as a black sludge.
   a) When you remove the black sludge, the fines can look the same as metal flakes.
   b) Fines come from worn areas in the engine, which are permitted.
2) Bearing skid can also make fines.
   a) During the regular examination of the MCD's, a large increase in the quantity of fines will be seen.
   b) This will show that bearing skid has occured.

(c) Metal Flakes (Fig. 602)

1) Metal Flakes come from the ball bearings, the roller bearings, the bearing tracks and the gear teeth.
2) Carefully examine the steel flakes that have an irregular shape to find their source.
3) Ball Bearing Track Flakes and Ball Bearing Flakes.
   a) The ball bearing track and ball bearing flakes are usually almost circular with radial cracks.
   b) When the flake is clean, the shiny side is brighter than other types of flakes.
   c) The shiny side also has small scratches which go across other small scratches.
4) Roller Bearing Track Flakes and Roller Bearing Flakes.
   a) The roller bearing track and roller bearing flakes have an almost rectangular shape.
   b) When the flake is clean, the shiny side is brighter than other types of flakes.

c) The shiny side has small scratches which go across other small scratches.

5) Gear Teeth Flakes from scuffing.

a) Gear teeth flakes are shiny with an irregular shape.

b) Gear teeth flakes can look the same as solder splashes.

c) Gear teeth flakes are usually thicker and not as bright as ball bearing or roller bearing flakes.

d) Gear tooth material is usually larger, rougher and not as bright as bearing unwanted material.

(d) Chips and Gear Teeth Fragments (Fig. 605)

1) Chips are very thick flakes or pieces of metal which usually have one smooth machined surface.

2) Gear teeth fragments are large pieces of metal which usually have two or more machined surfaces.

a) If corner pieces of gear teeth are found this can show that the gears are not correctly aligned.

S 996-031-R00

(6) Unwanted Material that is not Magnetic:

(a) Unwanted material that is not magnetic can be made of:

- magnesium
- aluminum
- silver
- bronze
- rubber sealing particles
- carbon

S 996-024-R00

(7) The accept/reject standards for the unwanted material is found in the paragraph for the applicable oil system component.

TASK 79-00-00-216-001-R00

3. Examine the Magnetic Chip Detectors (MCD)

A. General

(1) Rolls-Royce Service Bulletin References

(a) RR SB 72-7812 - HS Gearbox; Replace the magnetic chip detectors with blanking plates.

B. References
(1) AMM 72-62-01/401, HS Gearbox Radial Drive Shaft
(2) AMM 72-62-01/601, HS Gearbox Radial Drive Shaft
(3) AMM 79-21-03/401, Magnetic Chip Detector and Scavenge Strainers

C. Access
(1) Location Zones
414 Left Engine Right Fan Cowl Panel
416 Left Engine Right Thrust Reverser
424 Right Engine Right Fan Cowl Panel
426 Right Engine Right Thrust Reverser

(2) Access Panels
414CR Left Engine Master Chip Detector Access Panel
415FL Left Engine C-Duct Front Latch Access Panel
424CR Right Engine Master Chip Detector Access Panel
425FL Right Engine C-Duct Front Latch Access Panel

D. Procedure

S 026-043-R00

WARNING: DO NOT LET THE SYNTHETIC OIL USED TO LUBRICATE THE ENGINE GET ON YOUR SKIN. THE OIL CAN CAUSE SKIN IRRITATION. BE CAREFUL WHEN YOU ARE NEAR OR TOUCH THE COMPONENTS AND TUBES OF THE ENGINE OIL SYSTEM IMMEDIATELY AFTER AN ENGINE OPERATION. THE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AND CAN BURN YOU.

CAUTION: REMOVE ALL FALLEN OIL IMMEDIATELY. DO NOT GET THE OIL ON PARTS WHICH DO NOT USUALLY HAVE OIL ON THEM. THE OIL CAN CAUSE DAMAGE TO PAINT AND TO SOME TYPES OF RUBBER. USE ONLY CLEAN CONTAINERS AND EQUIPMENT. CONTAMINATION FROM ALKALINE CLEANING FLUIDS CAN CAUSE FAILURE OF SYNTHETIC OIL.

(1) Remove the magnetic chip detector (MCD) (AMM 79-21-03/401).

S 116-003-R00

(2) Remove the unwanted material that is not magnetic with one of the procedures that follow:
   (a) Put some clean kerosene in a clean container which is not made of metal.
   (b) Put the MCD probe in the clean kerosene and remove the black sludge.
   (c) Alternatively, you can apply a spray of approved solvent to the MCD to remove the black sludge.

S 216-004-R00

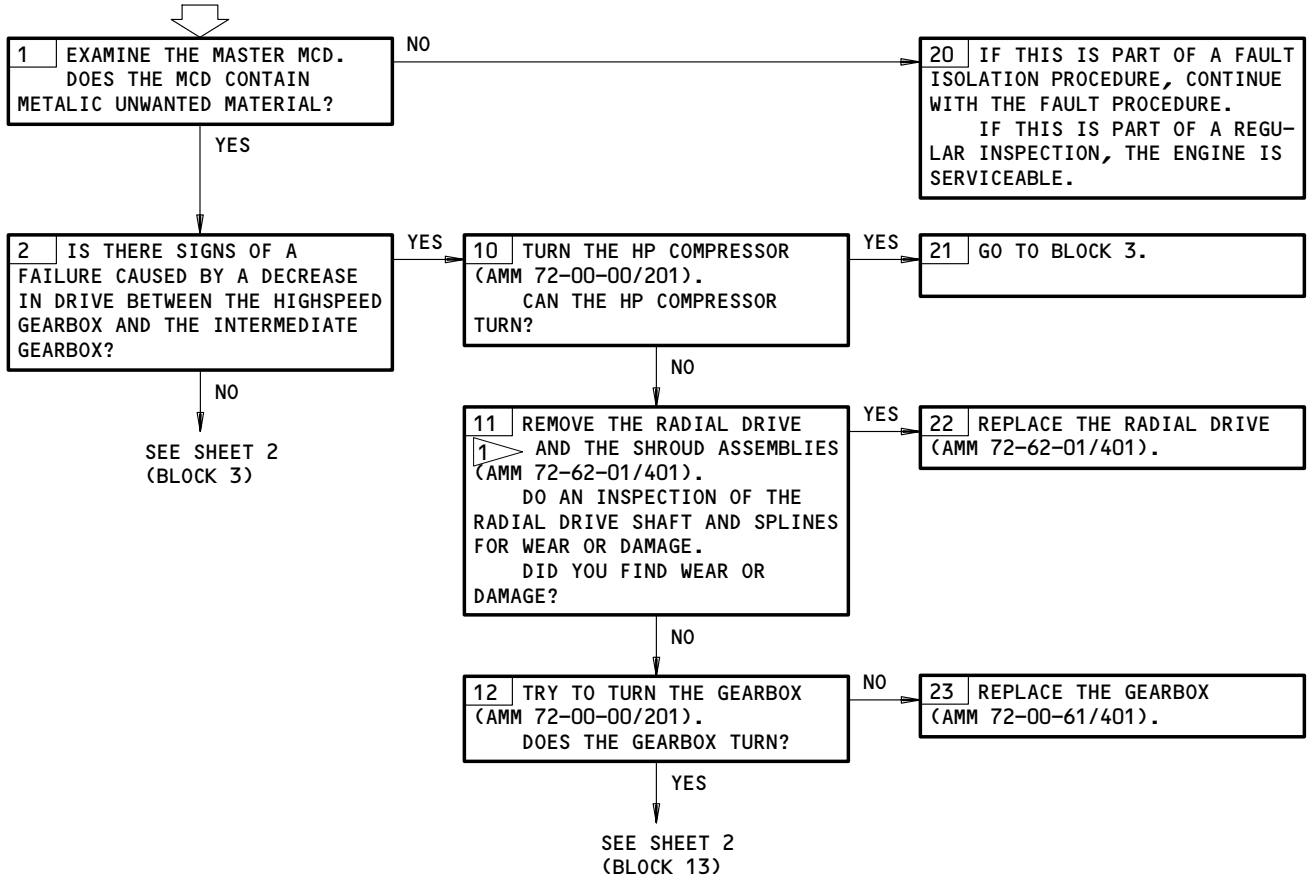
(3) Examine the unwanted material on the MCD probe in a good light.
   (a) Use a magnifying lens which will make the unwanted material look ten times larger than its usual dimension.
   (b) Use the Identification of Unwanted Material section in this procedure to identify the unwanted material.
   (c) If you find metal particles on an MCD, refer to the Accept/Reject Standards for unwanted material in this procedure and Fig. 601.
   (d) Keep all unwanted material that is metal which does not make it necessary to reject the engine or gearbox (Ref Accept/Reject Standards).

      NOTE: This unwanted material will help you keep a record of the type of wear in the engine or gearbox. The record that is kept will help you make a decision on the condition of the engine if more material is found.

   (e) You must send the metal particles, which cause an engine to be rejected, to the overhaul shop with the engine.
   (f) You must identify the MCD position on the engine and the engine date, hours and cycles.

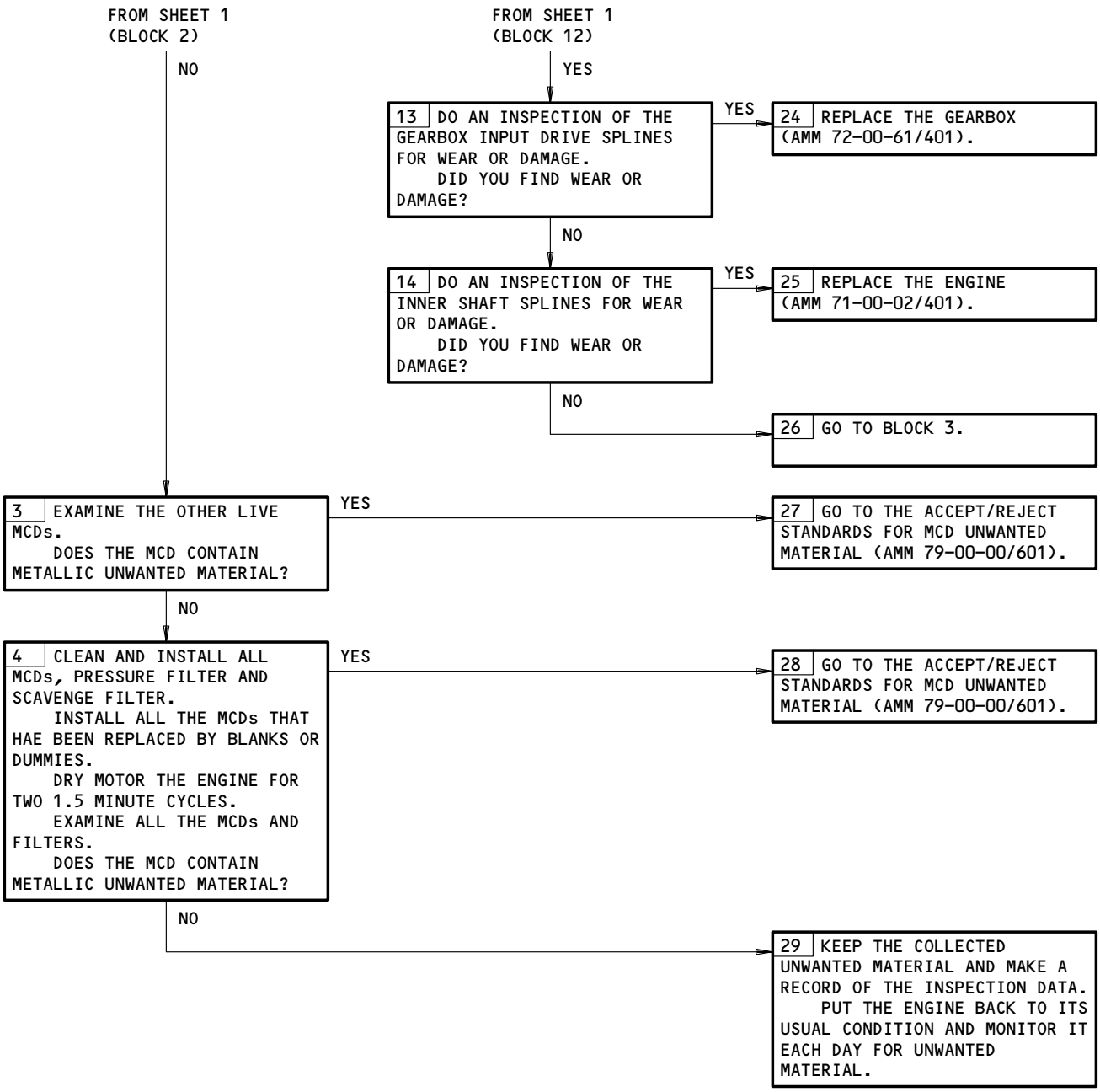
      NOTE: You can use this data to help find the cause of the rejected engine.

MAGNETIC CHIP DETECTOR (MCD) INSPECTION



1 IF AN ATTEMPT TO START THE ENGINE ON THE GROUND RESULTS IN A DECREASE OF DRIVE BETWEEN THE HSGB AND THE IGB, THERE MAY BE OIL LEAKS INTO THE HP DRUM. REPLACE THE ENGINE.

Magnetic Chip Detector (MCD) Inspection
Figure 601 (Sheet 1)



Magnetic Chip Detector (MCD) Inspection
Figure 601 (Sheet 2)

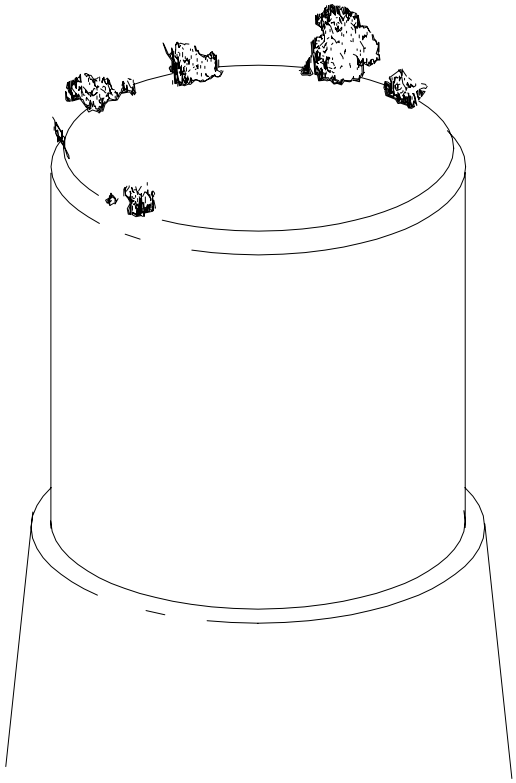
METALLIC FLAKES

THESE CAN BE SUB-DIVIDED INTO BALL BEARING, ROLLER BEARING, BEARING TRACK AND GEAR TEETH FLAKES.

(1) BALL BEARING AND BALL BEARING TRACK FLAKES ARE USUALLY ROUGHLY CIRCULAR WITH RADIAL SPLITS.

(2) ROLLER BEARING AND ROLLER BEARING TRACK FLAKES ARE ROUGHLY RECTANGULAR IN SHAPE WITH CRISS-CROSS SCRATCHES.

(3) GEAR TEETH FLAKES, RESULTING FROM SCUFFING, ARE OF IRREGULAR SHAPE AND HAVE LUSTROUS APPEARANCE.



APPROXIMATE MAGNIFICATION X10

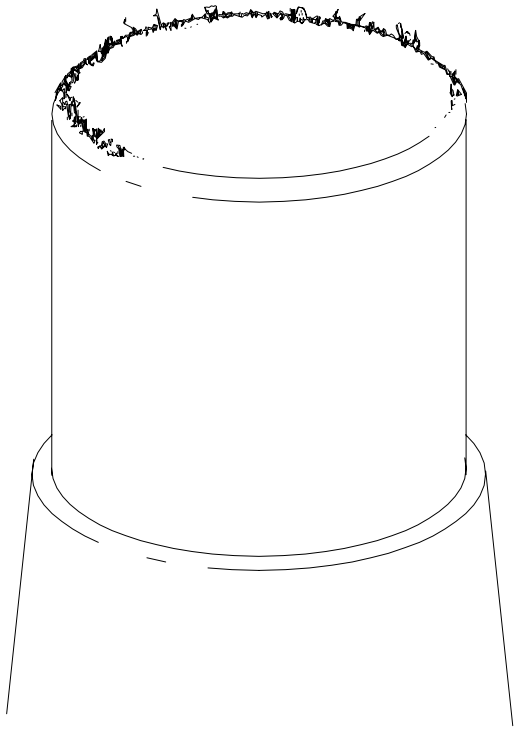
A2935

Flakes
Figure 602

MAGNETIC FINES

FINES APPEAR ON AN OILY MCD AS A BLACK SLUDGE. THESE RESULT FROM "NORMAL" ENGINE WEAR BUT AFTER BEING DEGREASED THEY CAN, WITH THE NAKED EYE, BE MISTAKEN FOR METALLIC FLAKES.

SKIDDING OF A BEARING ALSO PRODUCES QUANTITIES OF FINES BUT, AFTER "NORMAL" WEAR HAS BEEN DETERMINED BY SYSTEMATIC ANALYSIS, THE OCCURRENCE OF SKIDDING WILL BE NOTICED.



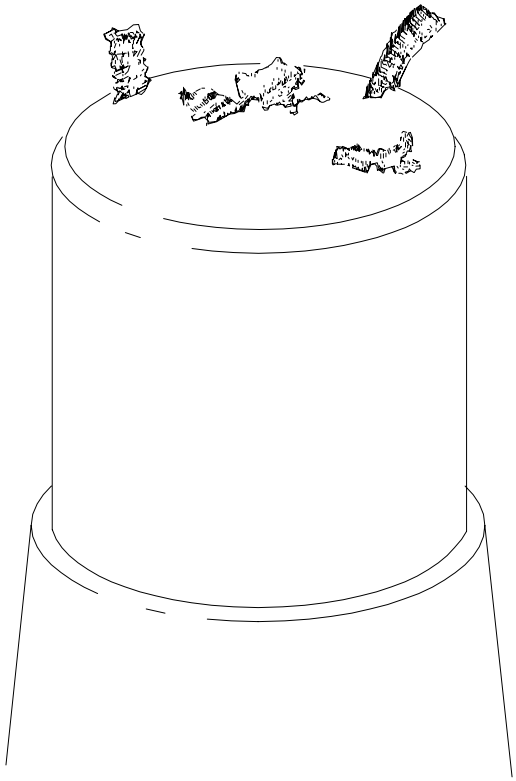
APPROXIMATE MAGNIFICATION X10

A2934

Fines
Figure 603

SWARF

THIS IS MACHINING DEBRIS – INADVERTENTLY LEFT IN THE ENGINE DURING BUILD. PIECES OF TURNING ARE EASILY IDENTIFIABLE BUT MILLING DEBRIS, WHEN BROKEN UP, COULD POSSIBLY BE CONFUSED WITH GEAR OR STEEL SEAL RUBBINGS AND MUST BE CAREFULLY EXAMINED.



APPROXIMATE MAGNIFICATION X10

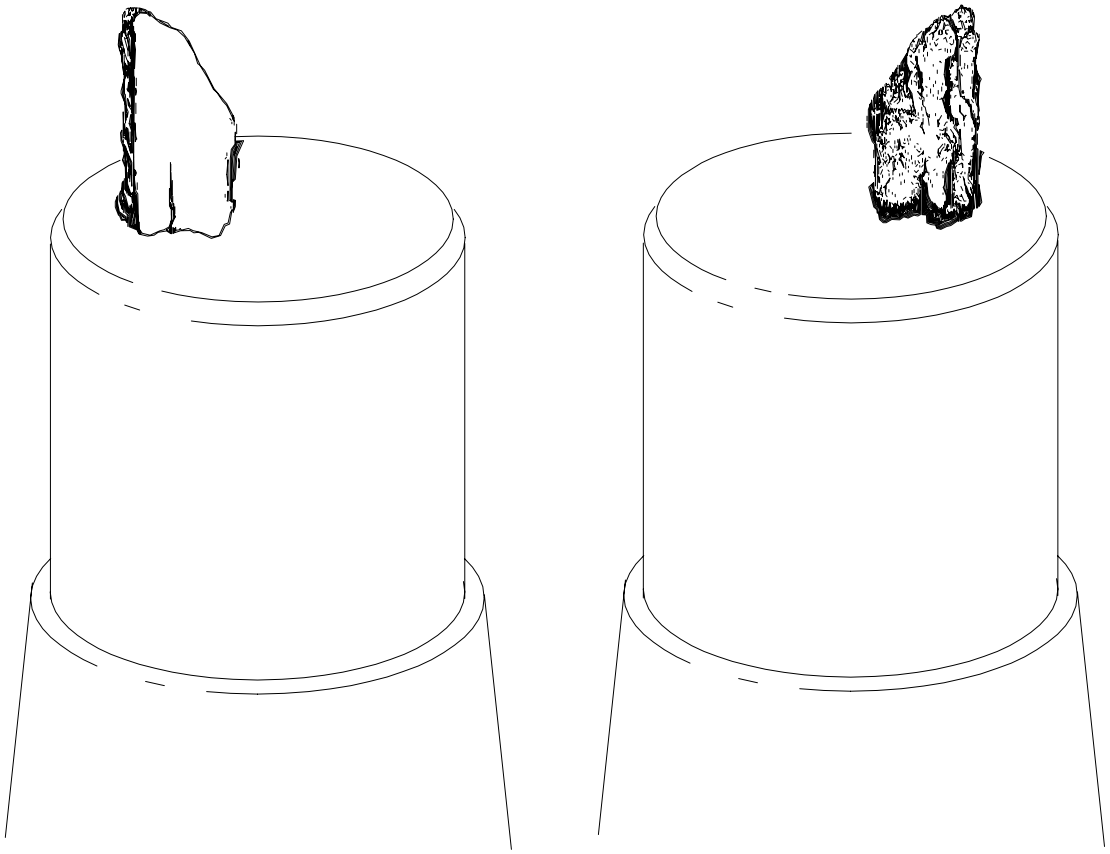
A2933

Swarf
Figure 604

CHIPS AND GEAR TEETH FRAGMENTS

CHIPS – THESE ARE VERY THICK FLAKES OR DEFINITE LUMPS OF METAL USUALLY WITH ONE GROUND (SMOOTH) SURFACE.

GEAR TEETH FRAGMENTS – CORNER PIECES OF GEAR TEETH MAY BE EVIDENCE OF INCORRECT GEAR ALIGNMENT OR BEDDING.



APPROXIMATE MAGNIFICATION X10

A2936

Chips
Figure 605

MATERIAL TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	MATERIAL COMPOSITION
S82					*		*				*					4Ni 1.2Cr 0.25Mo
EN31	*	*		*	*	*										Fe 1.4Cr 1C
RBD																Fe 10W 3Cr
18-4-1																Fe 18W 4Cr 1V
M50																4.5Mo 4Cr 1V 0.8C
JETHETE															*	12Cr 2.5Ni 1.75Mo 0.3V
HYKRO																3Cr 0.6Mo
Mg Alloy										*						3RET 2.5Zn 0.6Zr
Al Alloy								*	*			*				5Cu 1.5Ni 0.25Co 0.25Mn
STEEL																Fe 1.25Cr 0.2V
BRONZE						*										Cu 3Ni 0.65Si
BRASS						*										Cu 40Zn 2Pb

HIGH SPEED GEARBOX
TABLE A

KEY

1 = Ball
2 = Roller
3 = Inner Race
4 = Separate Inner Race
5 = Outer Race
6 = Cage
7 = Gear
8 = Air Blown Seals
9 = Oiljets
10 = Casing
11 = Pump Gears
12 = Pump Casing
13 = Secondary Pump Gears
14 = Secondary Pump Casing
15 = Stud

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

DEE0008339

Material/Component Reference
Figure 606 (Sheet 1)

MATERIAL TYPE	INNER ROLLER BEARING					OUTER ROLLER BEARING					MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	
S82				*							4Ni 1.2Cr 0.25Mo
EN31	*	*				*	*		*		Fe 1.4Cr 1C
RBD											Fe 10W 3Cr
18-4-1											Fe 18W 4Cr 1V
M50											4.5Mo 4Cr 1V 0.8C
JETHETE											12Cr 2.5Ni 1.75Mo 0.3V
HYKRO											3Cr 0.6Mo
Mg Alloy											3RET 2.5Zn 0.6Zr
Al Alloy											5Cu 1.5Ni 0.25Co 0.25Mn
STEEL											Fe 1.25Cr 0.2V
BRONZE					*					*	Cu 3Ni 0.65Si
BRASS											Cu 40Zn 2Pb

TRANSFER DRIVE BEVEL GEARBOX
(INNER ROLLER BEARING AND OUTER ROLLER BEARING)
TABLE B

KEY

1 = Roller
2 = Inner Race
3 = Separate Inner Race
4 = Outer Race
5 = Cage

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8600

Material/Component Reference
Figure 606 (Sheet 2)

MATERIAL TYPE	BALL BEARING				SHAFTS AND GEARS				MATERIAL COMPOSITION
	1	2	3	4	5	6	7	8	
S82					*	*			4Ni 1.2Cr 0.25Mo
EN31	*	*	*						Fe 1.4Cr 1C
RBD									Fe 10W 3Cr
18-4-1									Fe 18W 4Cr 1V
M50									4.5Mo 4Cr 1V 0.8C
JETHETE									12Cr 2.5Ni 1.75Mo 0.3V
HYKRO									3Cr 0.6Mo
Mg Alloy							*		3RET 2.5Zn 0.6Zr
Al Alloy									5Cu 1.5Ni 0.25Co 0.25Mn
STEEL								*	Fe 1.25Cr 0.2V
BRONZE				*					Cu 3Ni 0.65Si
BRASS									Cu 40Zn 2Pb

TRANSFER DRIVE BEVEL GEARBOX
(BALL BEARING AND SHAFTS AND GEARS)
TABLE C

KEY

1 = Ball
2 = Inner Race
3 = Outer Race
4 = Cage
5 = Shoulder Shaft
6 = Gears
7 = Casing
8 = Transfer Shaft

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8601

Material/Component Reference
Figure 606 (Sheet 3)

MATERIAL TYPE	STEADY BEARING					THRUST BEARING					MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	
S82											4Ni 1.2Cr 0.25Mo
EN31										*	Fe 1.4Cr 1C
RBD											Fe 10W 3Cr
18-4-1		*	*	•		*	*	*			Fe 18W 4Cr 1V
M50			Δ								4.5Mo 4Cr 1V 0.8C
M50NIL		Δ									4.2Mo 4.1Cr 3.4NI 1V 0.8C
JETHETE											12Cr 2.5Ni 1.75Mo 0.3V
HYKRO											3Cr 0.6Mo
Mg Alloy											3RET 2.5Zn 0.6Zr
Al Alloy											5Cu 1.5Ni 0.25Co 0.25Mn
STEEL					Δ						Fe 1.25Cr 0.2V
BRONZE					*						Cu 3Ni 0.65Si
BRASS											Cu 40Zn 2Pb

RADIAL DRIVE
(STEADY BEARING AND THRUST BEARING)
TABLE D

KEY

1 = Roller
2 = Inner Race
3 = Ball
4 = Outer Race
5 = Cage

Δ = SB 72-C925 standard Steady bearing

• = All standards of Steady bearing

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8602a

Material/Component Reference
Figure 606 (Sheet 4)

MATERIAL TYPE	INNER ROLLER BEARING					OUTER ROLLER BEARING					MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	
S82											4Ni 1.2Cr 0.25Mo
EN31					*	*	*		*	*	Fe 1.4Cr 1C
RBD				*							Fe 10W 3Cr
18-4-1	*	*									Fe 18W 4Cr 1V
M50											4.5Mo 4Cr 1V 0.8C
JETHETE											12Cr 2.5Ni 1.75Mo 0.3V
HYKRO											3Cr 0.6Mo
Mg Alloy											3RET 2.5Zn 0.6Zr
Al Alloy											5Cu 1.5Ni 0.25Co 0.25Mn
STEEL											Fe 1.25Cr 0.2V
BRONZE											Cu 3Ni 0.65Si
BRASS											Cu 40Zn 2Pb

RADIAL DRIVE
(INNER ROLLER BERING AND OUTER ROLLER BEARING)
TABLE E

KEY

1 = Roller
2 = Inner Race
3 = Separate Inner Race
4 = Outer Race
5 = Cage

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8603

Material/Component Reference
Figure 606 (Sheet 5)

F71869

MATERIAL TYPE	LP/IP/HP LOCATION BEARING					THRUST BEARING							MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	6	7	
S82											*		4Ni 1.2Cr 0.25Mo
EN31				*					*				Fe 1.4Cr 1C
RBD													Fe 10W 3Cr
18-4-1	Δ	*	*			*	*	*					Fe 18W 4Cr 1V
M50	•	•	•										4.5Mo 4Cr 1V 0.8C
JETHETE												*	12Cr 2.5Ni 1.75Mo 0.3V
HYKRO					*					*			3Cr 0.6Mo
Mg Alloy													3RET 2.5Zn 0.6Zr
Al Alloy													5Cu 1.5Ni 0.25Co 0.25Mn
STEEL													Fe 1.25Cr 0.2V
BRONZE													Cu 3Ni 0.65Si
BRASS													Cu 40Zn 2Pb

INTERNAL GEARBOX
(LP/IP/HP LOCATION BEARING AND THRUST BEARING)
TABLE F

KEY

1 = Ball
2 = Inner Race
3 = Outer Race
4 = Cage
5 = Seal Members
6 = Driven Bevel Gear
7 = Intercase

Δ = RB211-535C Engines
• = RB211-535E4 Engines
* = All Engines

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8604

Material/Component Reference
Figure 606 (Sheet 6)

MATERIAL TYPE	INNER ROLLER BEARING					OUTER ROLLER BEARING					MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	
S82											4Ni 1.2Cr 0.25Mo
EN31				*					*		Fe 1.4Cr 1C
RBD											Fe 10W 3Cr
18-4-1	*	*	*			*	*	*			Fe 18W 4Cr 1V
M50											4.5Mo 4Cr 1V 0.8C
JETHETE											12Cr 2.5Ni 1.75Mo 0.3V
HYKRO					*					*	3Cr 0.6Mo
Mg Alloy											3RET 2.5Zn 0.6Zr
Al Alloy											5Cu 1.5Ni 0.25Co 0.25Mn
STEEL											Fe 1.25Cr 0.2V
BRONZE											Cu 3Ni 0.65Si
BRASS											Cu 40Zn 2Pb

INTERNAL GEARBOX
(INNER ROLLER BEARING AND OUTER ROLLER BEARING)
TABLE G

KEY

1 = Roller
2 = Inner Race
3 = Outer Race
4 = Cage
5 = Seal Members

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8605

Material/Component Reference
Figure 606 (Sheet 7)

MATERIAL TYPE	FAN ROLLER BEARING					IPC ROLLER BEARING					MATERIAL COMPOSITION
	1	2	3	4	5	1	2	3	4	5	
S82											4Ni 1.2Cr 0.25Mo
EN31				*					*		Fe 1.4Cr 1C
RBD		*					*				Fe 10W 3Cr
18-4-1	Δ		Δ								Fe 18W 4Cr 1V
M50	•		•			*		*			4.5Mo 4Cr 1V 0.8C
JETHETE					*					*	12Cr 2.5Ni 1.75Mo 0.3V
HYKRO											3Cr 0.6Mo
Mg Alloy											3RET 2.5Zn 0.6Zr
Al Alloy											5Cu 1.5Ni 0.25Co 0.25Mn
STEEL											Fe 1.25Cr 0.2V
BRONZE											Cu 3Ni 0.65Si
BRASS											Cu 40Zn 2Pb

FRONT BEARING HOUSING
(FAN ROLLER BEARING AND IPC ROLLER BEARING)
TABLE H

KEY

1 = Roller
2 = Inner Race
3 = Outer Race
4 = Cage
5 = Oiljet

Δ RB211-535C Engines
• RB211-535E4 Engines
* All Engines

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8606

Material/Component Reference
Figure 606 (Sheet 8)

MATERIAL TYPE	HP/IP BEARING				LP BEARING				MATERIAL COMPOSITION
	1	2	3	4	1	2	3	4	
S82									4Ni 1.2Cr 0.25Mo
EN31				*				*	Fe 1.4Cr 1C
RBD		*				*			Fe 10W 3Cr
18-4-1					Δ		Δ		Fe 18W 4Cr 1V
M50	*		*		•		•		4.5Mo 4Cr 1V 0.8C
JETHETE									12Cr 2.5Ni 1.75Mo 0.3V
HYKRO									3Cr 0.6Mo
Mg Alloy									3RET 2.5Zn 0.6Zr
Al Alloy									5Cu 1.5Ni 0.25Co 0.25Mn
STEEL									Fe 1.25Cr 0.2V
BRONZE									Cu 3Ni 0.65Si
BRASS									Cu 40Zn 2Pb

TURBINE BEARING HOUSING
(HP/IP BEARING AND LP BEARING)
TABLE I

KEY

1 = Roller
2 = Inner Race
3 = Outer Race
4 = Cage

Δ RB211-535C Engines
• RB211-535E4 Engines
* All Engines

NOTE: This chart is an aid to material identification only. You must refer to the accept/reject standards to make a decision about engine serviceability.

de000c8607

Material/Component Reference
Figure 606 (Sheet 9)

(g) Make sure the seal rings are in good condition and correctly installed.

S 426-005-R00

(4) Clean and install the MCD (AMM 79-21-03/401).

S 216-037-R00

(5) Accept/Reject Standards for MCD unwanted material:

(a) Swarf (Fig. 604)

1) If you identify the unwanted material as swarf material only, the engine is serviceable.

(b) Magnetic Fines (Fig. 603)

1) If the fines are on half or less of the circumference of the MCD, the engine is serviceable.

2) If the fines are on more than half the circumference of the MCD, examine the scavenge and pressure filters.

NOTE: Refer to the Scavenge and Pressure Filter Inspections in this procedure.

3) If you can identify the fines on the internal gearbox MCD and master MCD as Jethete (material code EAD), the engine is serviceable.

a) You must schedule the Intermediate Case 03 Module for removal at the subsequent maintenance procedure at the engine shop.

(c) Metal Flakes (Fig. 602)

1) If you identify the unwanted material as metal flakes, examine the scavenge and pressure filters.

NOTE: Refer to the Scavenge and Pressure Filter Inspections in this procedure.

2) If you identify the unwanted material as gear or bearing flakes, do an inspection at intervals of not more than 20 hours of operation.

a) Make a record of the hours/cycles since the last inspection for the rate of debris generation.

b) If you continue to find unwanted material on the MCD's, reject the engine or the 06 module as applicable.

(d) Chips (Fig. 605)

1) If you find a chip which has a smooth surface on one side, reject the engine.

2) If you find a chip which does not have a smooth surface, examine the scavenge and pressure filters.

NOTE: Refer to the Scavenge and Pressure Filter Inspections in this procedure.

3) If you identify a chip, found on the HS external gearbox or the input bevel housing, as a piece of gear tooth, reject the O6 module.

(e) ENGINES PRE-RR-SB 72-7812;
Rivet Heads.

NOTE: On the LP/IP Front Bearing, the LP Turbine Bearing and the MP/IP Turbine Bearing MCD's only.

1) One rivet head from a bearing cage found on the MCD's is permitted.
   a) These can also be found in the scavenge and the pressure oil filters and strainers.
   b) Not more than 3 rivet heads is permitted.
2) If a total of 4 or more rivet heads are found during regular maintenance, do these steps:
   a) Schedule the engine to be removed before 125 hours or 25 flights are completed.
   b) You must remove the engine when it gets to the first of these two conditions.

(f) ENGINES POST-RR-SB 72-7812;
Rivet Heads.
1) One rivet head from a bearing cage found on the MCD's is permitted.
   a) These can also be found in the scavenge and the pressure oil filters and strainers.
   b) Not more than 3 rivet heads is permitted.
2) If a total of 4 or more rivet heads are found during regular maintenance, do these steps:
   a) Schedule the engine to be removed before 125 hours or 25 flights are completed.
   b) You must remove the engine when it gets to the first of these two conditions.

TASK 79-00-00-216-006-R00

4. Examine the Scavenge and Pressure Oil Filter Elements

A. General

(1) Rolls-Royce Service Bulletin References

(a) RR SB 72-7812 - HS Gearbox; Replace the magnetic chip detectors with blanking plates.

B. References
(1) AMM 72-62-01/401, HS Gearbox Radial Drive Shaft
(2) AMM 79-21-07/401, Pressure Oil Filter Element
(3) AMM 79-21-08/401, Scavenge Oil Filter Element
(4) AMM 72-62-01/601, HS Gearbox Radial Drive Shaft

C. Access
(1) Location Zones
414 Left Engine Right Fan Cowl Panel
416 Left Engine Right Thrust Reverser
424 Right Engine Right Fan Cowl Panel
426 Right Engine Right Thrust Reverser

(2) Access Panels
414CR Left Engine Master Chip Detector Access Panel
415FL Left Engine C-Duct Front Latch Access Panel
424CR Right Engine Master Chip Detector Access Panel
425FL Right Engine C-Duct Front Latch Access Panel

D. Procedure

S 026-042-R00

WARNING: DO NOT LET THE SYNTHETIC OIL USED TO LUBRICATE THE ENGINE GET ON YOUR SKIN. THE OIL CAN CAUSE SKIN IRRITATION. BE CAREFUL WHEN YOU ARE NEAR OR TOUCH THE COMPONENTS AND TUBES OF THE ENGINE OIL SYSTEM IMMEDIATELY AFTER AN ENGINE OPERATION. THE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AND CAN BURN YOU.

CAUTION: REMOVE ALL FALLEN OIL IMMEDIATELY. DO NOT GET THE OIL ON PARTS WHICH DO NOT USUALLY HAVE OIL ON THEM. THE OIL CAN CAUSE DAMAGE TO PAINT AND TO SOME TYPES OF RUBBER. USE ONLY CLEAN CONTAINERS AND EQUIPMENT. CONTAMINATION FROM ALKALINE CLEANING FLUIDS CAN CAUSE FAILURE OF SYNTHETIC OIL.

(1) Remove the filter elements (AMM 79-21-07/401 and 79-21-08/401).

S 686-008-R00
(2) Let the oil drain into a clean container which is not made of metal.

S 116-009-R00
(3) Put the drained oil through a gauze, cloth or filter paper which has smaller holes than those in the elements.

S 116-010-R00
(4) Carefully clean the filter elements and housing with clean kerosene.

NOTE: The scavenge filter element must be replaced after removal. The cleaning process is used only to separate the particles from the element for examination.

(a) Make sure you remove all unwanted material from the filter elements.

S 166-011-R00
(5) Carefully put the kerosene through a clean filter paper.

S 166-012-R00
(6) Remove all unwanted material from the filter papers.
(a) Move a magnet contained in tissue paper across the unwanted material on the filter paper to remove all magnetic particles.

S 216-013-R00
(7) Examine all unwanted material to identify its source.

NOTE: Refer to Identification of Unwanted Material and the Accept/Reject Standards.

(a) Metal particles which cause an engine to be rejected must be sent to the overhaul shop with the engine.
(b) You must identify the filter position on the engine, the engine/module date, the hours and also the cycles.
(c) You can use this data to help find the cause for which the engine was rejected.
(d) If the filter elements do not contain metal particles and the engine is to continue to be operated do the steps that follow:
1) Examine the inner part of the filter elements for carbon particles.
a) Use a good light and a magnifying lens which will show the carbon as ten times larger than its usual dimension.
2) If carbon particles are seen, the pressure and scavenge filter elements must be changed (AMM 79-21-07/401 and 79-21-08/401).
3) If the carbon particles cannot be seen, do the steps that follow:
a) Discard the dirty scavenge filter element and install a new filter element (AMM 79-21-08/401).
b) Do an inspection of the pressure filter element (AMM 79-21-07/601).
1. If the pressure filter element is serviceable, the filter element can be used again.
2. Clean the filter element (AMM 79-21-07/701).

3. The filter element can also be cleaned with kerosene and installed in the engine.

   NOTE: All the unwanted kerosene must be shaken off before the filter element is installed.

4. If the element is cleaned in kerosene, replace the element before 25 hours of engine operation is completed.

S 216-035-R00

(8) Accept/Reject Standards for unwanted material found in the Scavenge and Pressure Filters:

NOTE: Send the unwanted material that you collect to the laboratory for analysis. Carefully identify the metal particles before you reject the engine.

(a) If there are small particles of light alloy or silver, the engine is serviceable.
(b) Small quantities of magnetic particles or aluminum particles which look like fines are usually seen in the engine.
(c) If the total quantity of the fines is not more than a thin layer over a square with the dimensions 0.5 inch (12.7 mm) X 0.5 inch (12.7 mm), the engine is serviceable.
(d) If the total quantity of fines is more than a thin layer over a square with the dimensions 0.5 inch (12.7 mm) X 0.5 inch (12.7 mm), reject the engine.
(e) ENGINES WITH PRE SB 72-C925 STANDARD RADIAL DRIVE SHAFT STEADY BEARINGS;
    1) If there is a show of any bronze material, immediately remove the High Speed Gearbox Radial Drive Shaft (AMM 72-62-01/601) and examine the cage for axial and radial movement (AMM 72-62-01/601).
    2) If the steady bearing is accepted, a small quantity of bronze particles are permitted if:
        a) The total quantity must not be more than a thin layer over a square with the dimensions 0.500 inch X 0.500 inch (12.70 mm X 12.70 mm).

b) The total quantity of bronze particles found is applicable at each filter inspection.

3) Large quantities of bronze particles or flakes that are more than a thin layer over a square with the dimensions of 0.500 inch X 0.500 inch (12.70 mm X 12.70 mm) reject the High Speed Gearbox.

(f) ENGINES WITH SB 72-C925 STANDARD RADIAL DRIVE SHAFT BEARINGS;

1) A small quantity of bronze particles are permitted if:

a) The total quantity must not be more than a thin layer over a square with the dimensions of 0.500 inch X 0.500 inch (12.70 mm X 12.70 mm).

b) The total quantity of particles found is applicable at each filter inspection.

2) Large quantities of bronze particles or flakes that are more than a thin layer over a square with the dimensions of 0.500 inch X 0.500 inch(12.70 mm X 12.70 mm) reject the High Speed Gearbox.

(g) Large quantities of bronze particles or flakes that are more than a thin layer over a square with the dimensions 0.500 inch (12.70 mm) X 0.500 inch (12.70 mm) is a sign of a failure of the High Speed Gearbox or the radial driveshaft bearing.

1) You must remove the inner radial driveshaft and bearing assembly (AMM 72-62-01/401) before 300 hours of engine operation is complete.

2) Immediately examine the bearing cage for axial and radial movement (AMM 72-62-01/601) to find the source of the bronze particles.

3) This will tell you if the HS gearbox will need removal.

(h) If you identify the magnetic fines found on the internal gearbox and the master MCD's as Jethete (material code EAD), the engine is serviceable.

1) Schedule the 03 module of the intermediate case for removal at the subsequent maintenance procedure at the engine shop.

(i) Rough particles of steel (flakes, chips or gear tooth fragments) or aluminum are a sign of internal failure.

1) If you find rough particles of steel, reject the engine.

TASK 79-00-00-216-016-R00

5. Examine the Scavenge Strainer

A. General

(1) Rolls-Royce Service Bulletin References

(a) RR SB 72-7654 - HS Gearbox, removed the scavenge oil strainers.

(b) RR SB 72-7812 - HS Gearbox; Replace the magnetic chip detectors with blanking plates.

B. References

(1) AMM 72-62-01/401, HS Gearbox Radial Drive Shaft
(2) AMM 79-21-03/401, Magnetic Chip Detector and Scavenge Strainers
(3) AMM 79-21-05/601, Oil Tubes and Fittings

C. Access

(1) Location Zones

414 Left Engine Right Fan Cowl Panel
416 Left Engine Right Thrust Reverser
424 Right Engine Right Fan Cowl Panel
426 Right Engine Right Thrust Reverser

(2) Access Panels

414CR Left Engine Master Chip Detector Access Panel
415FL Left Engine C-Duct Front Latch Access Panel
424CR Right Engine Master Chip Detector Access Panel
425FL Right Engine C-Duct Front Latch Access Panel

D. Procedure

S 026-041-R00

WARNING: DO NOT LET THE SYNTHETIC OIL USED TO LUBRICATE THE ENGINE GET ON YOUR SKIN. THE OIL CAN CAUSE SKIN IRRITATION. BE CAREFUL WHEN YOU ARE NEAR OR TOUCH THE COMPONENTS AND TUBES OF THE ENGINE OIL SYSTEM IMMEDIATELY AFTER AN ENGINE OPERATION. THE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AND CAN BURN YOU.

CAUTION: REMOVE ALL FALLEN OIL IMMEDIATELY. DO NOT GET THE OIL ON PARTS WHICH DO NOT USUALLY HAVE OIL ON THEM. THE OIL CAN CAUSE DAMAGE TO PAINT AND TO SOME TYPES OF RUBBER. USE ONLY CLEAN CONTAINERS AND EQUIPMENT. CONTAMINATION FROM ALKALINE CLEANING FLUIDS CAN CAUSE FAILURE OF SYNTHETIC OIL.

(1) Remove the scavenge strainer (AMM 79-21-03/401).

NOTE: A scavenge strainer is installed at the MCD position in the high speed gearbox only.

S 216-019-R00

(2) Examine the strainer, its chamber, and the oil drained from it for unwanted material.

S 216-020-R00

(3) Examine the unwanted material to identify its source.
   (a) Refer to the Identification of Unwanted Material to idenfify the material.
   (b) Refer to the Accept/Reject Standards for the corrective action.

S 426-021-R00

(4) Clean and install the strainer (AMM 79-21-03/401).

S 216-036-R00

(5) Accept/Reject Standards for the unwanted material found in the Scavenge Strainer.
   (a) If you find isolated particles of aluminum, magnesium or small pieces of rubber seal ring or general swarf, the engine is serviceable.
   (b) If you find other metal particles, refer to the Accept/Reject Standards for MCD unwanted material in this procedure.

TASK 79-00-00-216-022-R00

6. Examine the Oil Feed and Return Tubes

A. General

(1) This procedure has one task. The task is to examine the oil feed and return tubes.

B. References

(1) AMM 79-21-05/601, Oil Tubes and Fittings

C. Procedure

S 216-025-R00

WARNING: DO NOT LET THE SYNTHETIC OIL USED TO LUBRICATE THE ENGINE GET ON YOUR SKIN. THE OIL CAN CAUSE SKIN IRRITATION. BE CAREFUL WHEN YOU ARE NEAR OR TOUCH THE COMPONENTS AND TUBES OF THE ENGINE OIL SYSTEM IMMEDIATELY AFTER AN ENGINE OPERATION. THE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AND CAN BURN YOU.

CAUTION: REMOVE ALL FALLEN OIL IMMEDIATELY. DO NOT GET THE OIL ON PARTS WHICH DO NOT USUALLY HAVE OIL ON THEM. THE OIL CAN CAUSE DAMAGE TO PAINT AND TO SOME TYPES OF RUBBER. USE ONLY CLEAN CONTAINERS AND EQUIPMENT. CONTAMINATION FROM ALKALINE CLEANING FLUIDS CAN CAUSE FAILURE OF SYNTHETIC OIL.

(1) Examine the oil feed and return tubes (AMM 79-21-05/601).

OIL SYSTEM - CLEANING/PAINTING

1. General
   A. This procedure contains three tasks. The first task is to clean the engine oil system after contamination, if the engine has not been operated or dry motored since contamination. The second task is to clean the engine oil system after contamination, if the engine has been operated or dry motored since contamination. The third task is the preservation procedure for the Main Line Bearings.

TASK 79-00-00-177-001-R00

2. Engine Oil System Inspection for Contamination
(Engine Not Operated Or Dry Motored Since Contamination)
   A. General
      (1) This inspection is to be done if one or all of these fluids have been put in to the engine oil tank:

          - Fuel
          - Hydraulic fluids
          - Mineral oils
          - Synthetic engine oils that are not approved

      (2) This inspection is not to be used if the oil system has been primed with one or all of the fluids above.
      (3) If you have taken more than one sample, the sequence they were taken must be clearly defined.
      (4) Samples of oil that have contamination from all other fluids must be sent to Rolls-Royce plc for laboratory analysis.
          (a) This is also to find if there is an effect on the engine operation.
      (5) All oil contamination must be reported to Rolls-Royce plc.
          (a) The report must contain the type and the level of the contamination.
          (b) The report must also contain the result of this contamination inspection.
      (6) The source of the contamination must be identified.
          (a) Procedures must then be given to make sure that contamination does not occur again.

B. Equipment
(1) Container - Clean, minimum capacity, 0.5 U.S. pint or 0.5 Imperial pint or 0.3 liters

C. References
(1) AMM 12-13-01/301, Engine Oil Replenishing
(2) AMM 79-11-00/301, Engine - Servicing (Oil Change)

D. Access
(1) Location Zones
414 Left Engine Right Fan Cowl Panel
416 Left Engine Right Thrust Reverser
424 Right Engine Right Fan Cowl Panel
426 Right Engine Right Thrust Reverser

(2) Access Panels
413AL Left Engine Left Fan Cowl Panel
414AR Left Engine Right Fan Cowl Panel
414CR Left Engine Master Chip Detector Access Panel
415FL Left Engine C-Duct Front Latch Access Panel
423AL Right Engine Left Fan Cowl Panel
424AR Right Engine Right Fan Cowl Panel
424CR Right Engine Master Chip Detector Access Panel
425FL Right Engine C-Duct Front Latch Access Panel

E. Engine Oil System (Without Engine Operation) Inspection

S 177-024-R00

WARNING: DO NOT LET THE ENGINE OIL CONTACT YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO TOUCH THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE A FAILURE OF THE SYNTHETIC OIL.

DO NOT PUT THE OIL DRAINED FROM THE ENGINE BACK INTO THE ENGINE.

(1) Use a clean dry container to get an oil sample of approximately 0.5 U.S. pints or 0.5 Imperial pint or 0.3 liter.

S 977-025-R00
(2) Send the oil sample for analysis and recording purposes.

S 617-026-R00
(3) Fill the oil tank with approved oil (AMM 12-13-01/301).

S 977-027-R00
(4) Oil sample analysis result.
  (a) The permitted maximum limit of contamination by volume is as follows:
    1) - Fuel (Aviation Kerosine and diesel) - 0.5%
    2) - Hydraulic oil (Mineral and Phosphate) - 0.3%
    3) - Synthetic engine oil which is not approved - 10%
    4) - Mineral oil - 2%
  (b) If the result of the oil sample analysis shows the contamination is below the maximum limits, no more maintenance steps are necessary.
  (c) If the result of the oil sample analysis shows the contamination is above the maximum limits, do the steps that follow:
    1) Drain the oil tank (AMM 79-11-00/301).
    2) Fill the oil tank with approved engine oil (AMM 12-13-01/301).
    3) Do the engine oil system (without engine operation) inspection again, until the contamination is removed.
  (d) If the oil sample analysis equipment is not immediately available, do the steps that follow:
    1) Drain the oil tank (AMM 79-11-00/301).
    2) Fill the oil tank with approved oil (AMM 12-13-01/301).
    3) This will permit the engine to be operated for a maximum of 25 flying hours.
    4) If the results of the analysis are known in less than 25 hours, then all of the necessary steps must be done immediately.

S 687-028-R00
(5) Drain the oil tank (AMM 79-11-00/301).

S 617-029-R00
(6) Fill the oil tank with approved engine oil (AMM 12-13-01/301).

S 177-030-R00
(7) Do the engine oil system (without engine operation) inspection again, until the contamination is removed.

TASK 79-00-00-177-005-R00

3. Engine Oil System Inspection For Contamination (Engine Operated Or Dry Motored Since Contamination)

A. General

(1) This inspection is to be done if one or all of these fluids have been put in to the engine oil system:

- Fuel
- Hydraulic fluids
- Mineral oils
- Synthetic engine oils that are not approved

(2) If you have taken more than one sample, the sequence they were taken must be clearly specified.

(3) Samples of oil that have contamination from all other fluids must be sent to Rolls-Royce plc for laboratory analysis.

(a) This is also to find if there is an effect on the engine operation.

(4) All oil contamination must be reported to Rolls-Royce plc.

(a) The report must contain the type and the level of the contamination.

(b) The report must also contain the result of this contamination inspection.

(5) The source of the contamination must be identified.

(a) Procedures must then be given to make sure that contamination does not occur again.

B. Equipment

(1) Container - Clean, minimum capacity, 0.5 U.S. pint or 0.5 Imperial pint or 0.3 liters

C. References

(1) AMM 12-13-01/301, Engine Oil Replenishing
(2) AMM 71-00-00/201, Power Plant
(3) AMM 79-00-00/601, Oil System
(4) AMM 79-11-00/301, Engine - Servicing (Oil Change)
(5) AMM 79-21-03/401, Magnetic Chip Detectors
(6) AMM 79-21-07/401, Pressure Oil Filter Element
(7) AMM 79-21-08/401, Scavenge Oil Filter Element

D. Access

(1) Location Zones

414 Left Engine Right Fan Cowl Panel
416 Left Engine Right Thrust Reverser
424 Right Engine Right Fan Cowl Panel
426 Right Engine Right Thrust Reverser

(2) Access Panels

413AL	Left Engine Left Fan Cowl Panel
414AR	Left Engine Right Fan Cowl Panel
414CR	Left Engine Master Chip Detector Access Panel
415FL	Left Engine C-Duct Front Latch Access Panel
423AL	Right Engine Left Fan Cowl Panel
424AR	Right Engine Right Fan Cowl Panel
424CR	Right Engine Master Chip Detector Access Panel
425FL	Right Engine C-Duct Front Latch Access Panel

E. Engine Oil System (With Engine Operation) Analysis

S 177-031-R00

WARNING: DO NOT LET THE ENGINE OIL CONTACT YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO TOUCH THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE A FAILURE OF THE SYNTHETIC OIL.

DO NOT PUT THE OIL DRAINED FROM THE ENGINE BACK INTO THE ENGINE.

(1) Use a clean dry container to get an oil sample of approximately 0.5 U.S. pints or 0.5 Imperial pint or 0.3 liter.

S 977-032-R00

(2) Send the oil sample for analysis and recording purposes.

S 977-033-R00

(3) Oil sample analysis results.
  (a) The permitted maximum limit of contamination by volume is as follows:
    1) Fuel (Aviation Kerosine and diesel) - 0.5%
    2) Hydraulic oil (Mineral and Phosphate) - 0.3%
    3) Synthetic engine oil which is not approved - 10%
    4) Mineral oil - 2%
  (b) If the result of the oil sample analysis shows the contamination is below the maximum limits, then do the step that follows:
    1) Fill the oil tank with approved engine oil (AMM 12-13-01/301), then no more maintenance steps are necessary.

(c) If the result of the oil sample analysis shows the contamination is above the maximum limits, do the steps that follow:
1) Do the Examination and Test of the Engine Oil System (With Engine Operation) procedure.
2) Do the Engine Oil System (With Engine Operation) Analysis again, until the result is below the maximum limit.

(d) If the oil sample analysis equipment is not immediately available, do the steps that follow:
1) Do the Examination and Test of the Engine Oil System (With Engine Operation) procedure.
2) Use a clean dry container to get an oil sample of approximately 0.5 U.S. pints or 0.5 Imperial pint or 0.3 liter.
3) Send the oil sample for analysis and recording purposes.
4) This will permit the engine to be operated for a maximum of 25 flying hours.
5) If the results of the analysis are known in less than 25 hours, then all of the necessary steps must be done immediately.

F. Examination and Test the Engine Oil System (With Engine Operation)

S 687-035-R00
(1) Drain the oil tank (AMM 79-11-00/301).

S 217-037-R00
(2) Examine the magnetic chip detectors (MCD) (AMM 79-00-00/601).

S 217-040-R00
(3) Examine the scavenge and the pressure oil filter element (AMM 79-00-00/601).

S 217-041-R00
(4) Examine the oil system for signs of leakage.

S 617-011-R00
(5) Fill and prime the engine oil system (AMM 12-13-01/301).

S 867-034-R00
(6) Run the Engine.
(a) Do an engine ground run at ground idle for 5 minutes (AMM 71-00-00/201).

(b) Make sure the oil pressure and the temperature are in the limits.
(c) Do the engine oil system inspection for signs of leakage - no oil leakage is permitted.

S 217-042-R00
(7) Do the Examination and Test of the Engine Oil System (With Engine Operation) procedure again.

TASK 79-00-00-627-020-R00

4. Main Line Bearings and Gearbox Preservation Procedure

A. General
(1) It is recommended that the procedure that follows is completed before you remove the engine from the airplane, if you can motor the engine without damage. If you motor the engine after it is removed, you must install it in an engine stand CP.30501 or equivalent heavy stand.

B. References
(1) AMM 12-13-01/301, Engine Oil Replenishing
(2) AMM 71-00-00/201, Power Plant
(3) AMM 79-11-00/301, Engine - Servicing (Oil Change)

C. Access
(1) Location Zones

413	Left Engine Left Fan Cowl Panel
414	Left Engine Right Fan Cowl Panel
416	Left Engine Right Thrust Reverser
423	Right Engine Left Fan Cowl Panel
424	Right Engine Right Fan Cowl Panel
426	Right Engine Right Thrust Reverser

(2) Access Panels

413AL	Left Engine Left Fan Cowl Panel
414AR	Left Engine Right Fan Cowl Panel
414CR	Left Engine Master Chip Detector Access Panel
415FL	Left Engine C-Duct Front Latch Access Panel
423AL	Right Engine Left Fan Cowl Panel
424AR	Right Engine Right Fan Cowl Panel
424CR	Right Engine Master Chip Detector Access Panel
425FL	Right Engine C-Duct Front Latch Access Panel

D. Procedure

S 687-043-R00

WARNING: DO NOT LET THE ENGINE OIL CONTACT YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO TOUCH THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE A FAILURE OF THE SYNTHETIC OIL.

DO NOT PUT THE OIL DRAINED FROM THE ENGINE BACK INTO THE ENGINE.

(1) Drain the engine oil tank (AMM 79-11-00/301).

S 687-045-R00

(2) Drain the gearbox and oil pump housing (AMM 79-11-00/301).

S 617-022-R00

(3) Fill the engine oil tank to the full mark.

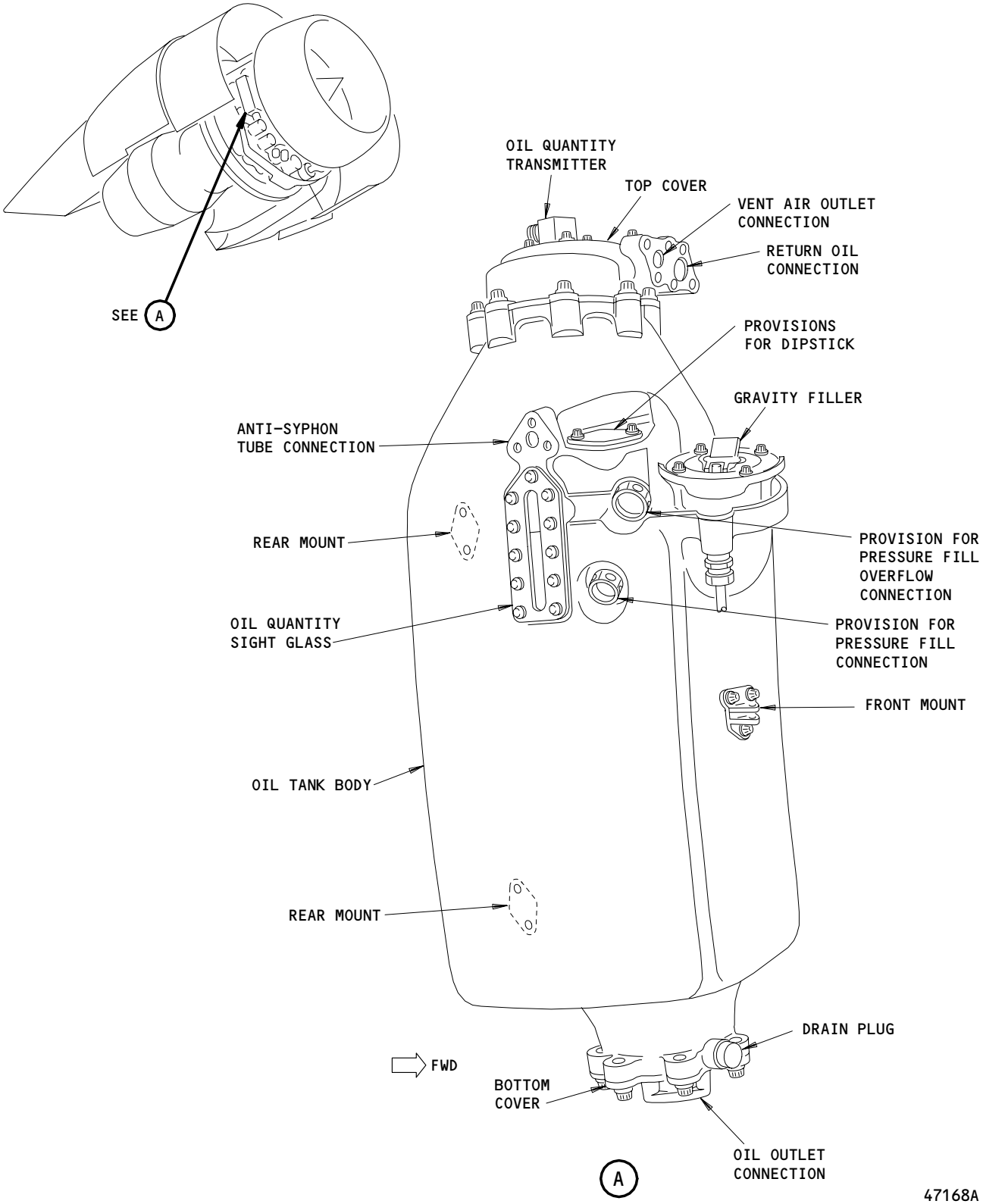
S 717-023-R00

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.

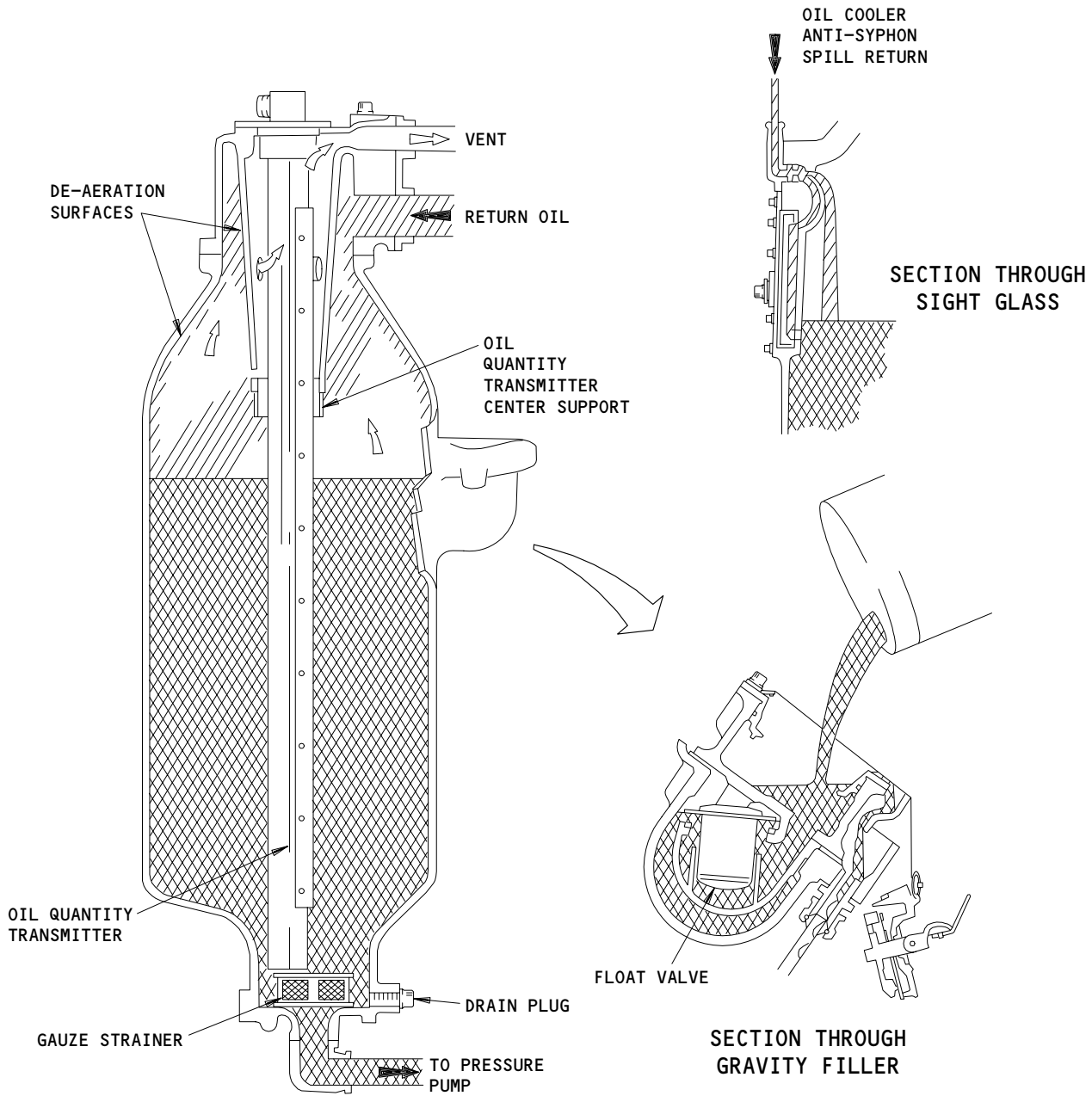
(4) Use the Power Plant Dry-Motor procedure to motor the engine until there is an oil pressure indication on the EICAS display (AMM 71-00-00/201).
   (a) If the dry-motor cycle goes longer than the starter operation limits before the oil pressure indication shows on the EICAS, stop the dry-motor procedure.
   (b) Examine the oil quantity in the engine oil tank and do the dry-motor procedure again.

ENGINE OIL STORAGE - DESCRIPTION AND OPERATION

1. General
   A. To provide a reservoir of oil for the engine recirculatory oil system, an oil tank is mounted on the right side of the LP compressor (fan) case. Nominal capacity of the tank is 41.5 U.S. pints (36.6 imp. pints, 19.7 liters) of which 10 U.S. pints (8.33 imp. pints, 4.73 liters) is unusable.
2. Component Details
   A. Engine Oil Tank (Fig. 1 and 2)
      (1) The oil tank consists of a tank body with a top and a bottom cover. Each cover incorporates a seal ring and is bolted to the body.
      (2) The top cover incorporates the scavenge oil return to tank connection, the vent air outlet connection and the top housing for the oil quantity transmitter. A cone arrangement, integral with the top cover, forms part of the return oil air separator system and accommodates a center support for the oil quantity transmitter. The bottom cover incorporates the oil outlet connection to the pressure pump, an oil strainer and the bottom housing for the oil quantity transmitter.
      (3) ENGINES POST RR SB 79-9427;
      Use the gravity fill procedure to put oil into the oil system.
      (4) ENGINES PRE RR SB 79-9427;
      Oil fill is done through a gravity filler with a quick release cap and a float valve assembly. The float valve prevents an oil leak if the cap is off or incorrectly installed. Provisions are made for the installation of the quick release pressure fill and overflow connections.
      (5) Oil tank content is registered by an oil quantity transmitter (AMM 79-31-00) mounted between the oil tank top and bottom covers. A prismatic sight glass is fitted and indicates U.S. quarts and liters required to fill the tank. Provision is made for the fitting of a dipstick.
      (6) Provision is made for draining the oil tank through a drain plug fitted at the base of the tank body. The body also incorporates the fuel cooled oil cooler anti-syphon spill return to the tank connection and restrictor.
      (7) The oil tank assembly is secured to the fan case by a three point, one front and two rear, mounting arrangement incorporating self lubricating spherical bushings. The front mount comprises a link fitted between two forked brackets, one bolted to the oil tank and the other to the fan containment ring intermediate flange. Each rear mount comprises a bracket bolted to the front suspension ring and to a bracket on the oil tank.



Engine Oil Tank
Figure 1



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Oil Tank Schematic
Figure 2

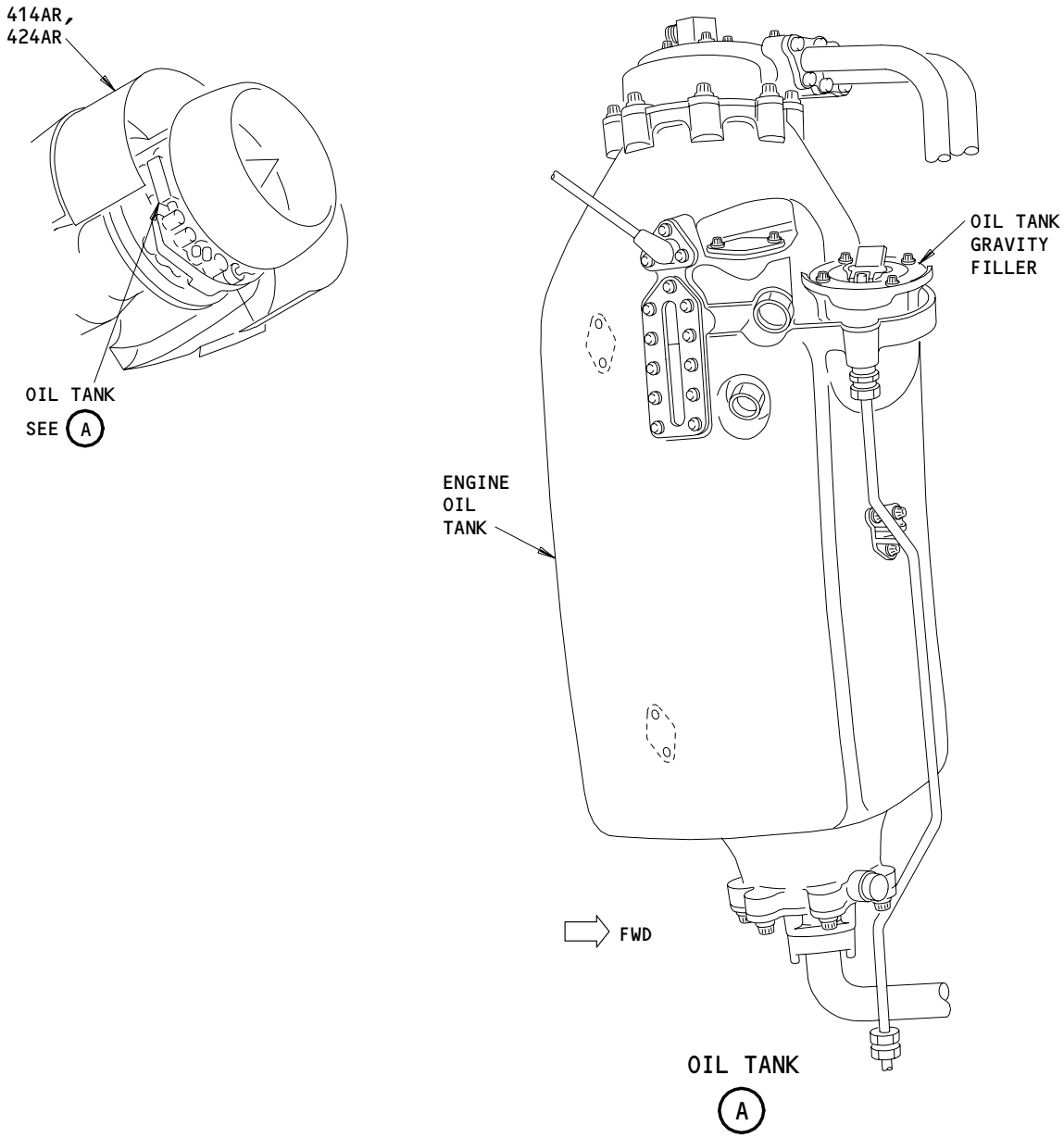
3. Operation
   A. Functional Description
      (1) Engine Oil Storage
         (a) Oil is drawn, by the oil pressure pump, from the base of the tank through the oil outlet connection in the bottom cover. The strainer, incorporated in the bottom cover, prevents contamination of the oil system by all foreign matter inadvertently put into the tank through the filler.
         (b) Scavenge oil is returned to the tank, as an oil-air mixture, through the return oil connection in the top cover. The flow is directed tangentially on the conical walls at the top of the tank and the oil is centrifuged from the air. Air, released by this process, is vented away through holes in the top cover conical section and the vent connection. The flow of oil along the walls of the tank also dissipates heat.
         (c) The flow of oil through the anti-syphon tube enters the tank above the sight glass and is directed to flow on the glass to dissipate heat.

ENGINE OIL STORAGE

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
FILLER - OIL TANK GRAVITY	--	2	414AR,424AR	79-11-03
TANK ENGINE OIL	--	2	414AR,424AR	79-11-01

Engine Oil Storage - Component Index
Figure 101

A46456



Engine Oil Storage - Component Location
Figure 102

ENGINE - SERVICING (OIL CHANGE)

1. General
   A. This procedure contains steps to change the engine oil.
   B. Use the procedures given in AMM 70-51-00/201 to tighten fasteners.
   C. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a torque value is specified in this procedure.

   TASK 79-11-00-613-001-R00

2. Engine Oil Change
   A. Equipment
      (1) Clean Container - minimum capacity:

          65 U.S. pints
          55 Imperial pints
          31 Litres
   B. Consumable Materials
      (1) Degreasing fluid (Inhibited and stabilized 1.1.1 Trichlorethane)
          British Spec/Ref - B.S. 4487, 1969
          American Spec/Ref - MIL-T-81533
          OMat No. 1/21
      (2) Cleaning fluid (Methylene Chloride) (Dichloromethane)
          British Spec/Ref - B.S. 1994, 1953
          American Spec/Ref -
          OMat No. 169
      (3) Jointing Compound
          British Spec/Ref - DTD 900/4586, PL 32
          American Spec/Ref -
          OMat No. 4/46
      (4) Lintfree cloth
   C. References
      (1) AMM 12-13-01/301, Engine - Servicing (Oil Replenishing)
      (2) AMM 71-00-00/201, Power Plant
      (3) AMM 71-11-04/201, Fan Cowl Panels
      (4) AMM 79-21-03/401, Magnetic Chip Detectors
      (5) AMM 79-21-07/401, Pressure Oil Filter Element
      (6) AMM 79-21-08/401, Scavenge Oil Filter Element
   D. Procedure

S 013-002-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 fan cowl panels (AMM 71-11-04/201).

S 683-003-R00

(2) Drain the Oil Tank as follows (Fig. 301):
(a) Put a container below the oil tank.

WARNING: DO NOT LET THE ENGINE OIL STAY ON YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

BE CAREFUL AROUND THE ENGINE OIL SYSTEM IMMEDIATELY AFTER ENGINE SHUT-DOWN. THE ENGINE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AFTER THE ENGINE SHUT-DOWN AND CAN CAUSE INJURY.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO TOUCH THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE A FAILURE OF THE SYNTHETIC OIL.

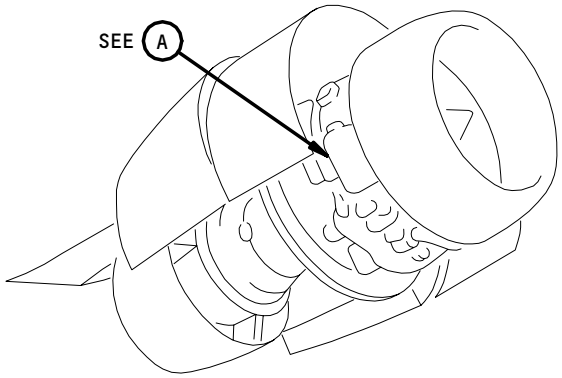
DO NOT PUT THE OIL THAT IS DRAINED FROM THE ENGINE BACK INTO THE ENGINE.

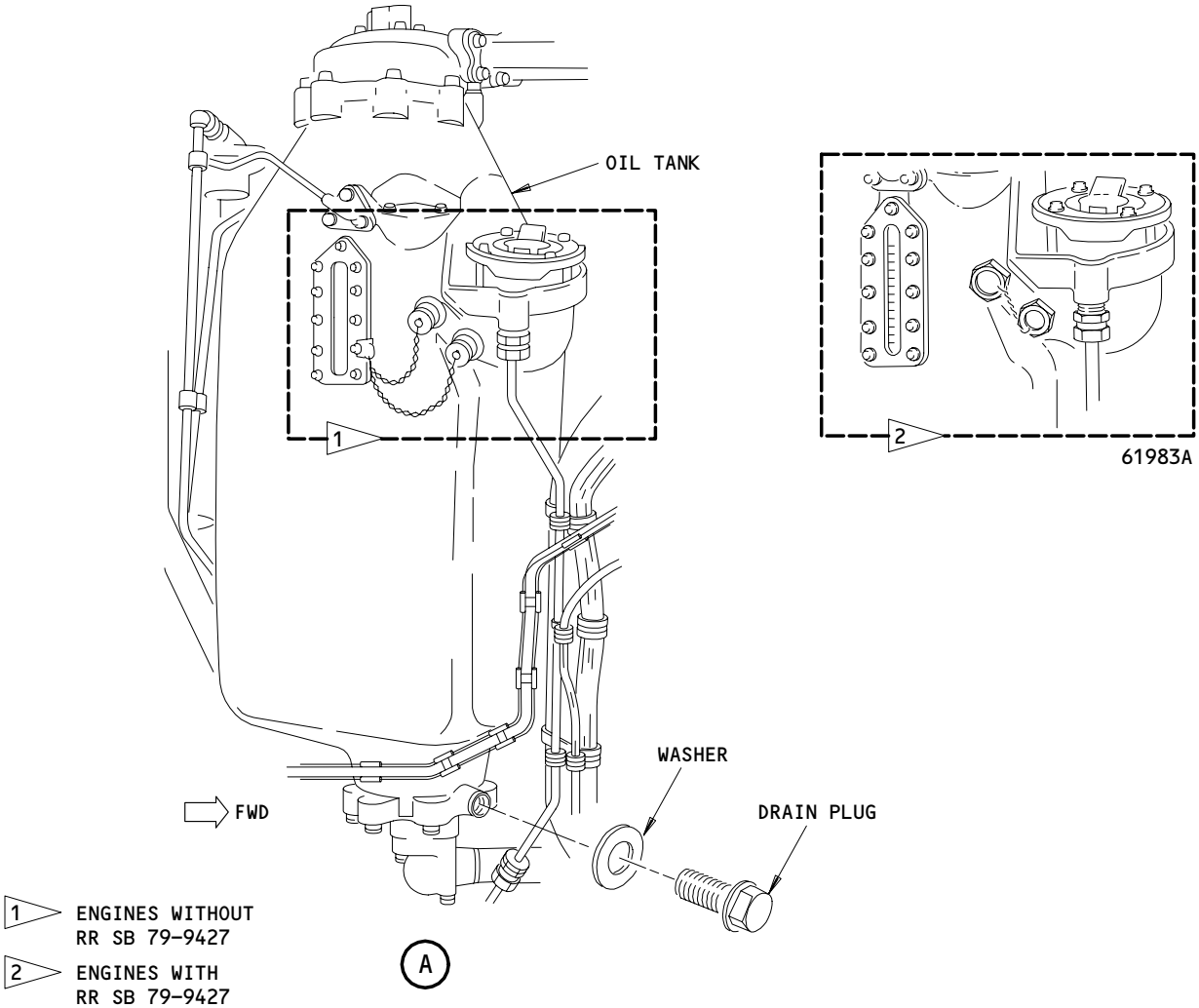
(b) Remove the drain plug and washer from the oil tank and let the oil drain.
(c) When the oil is fully drained, install the drain plug and washer to the oil tank.

S 683-004-R00

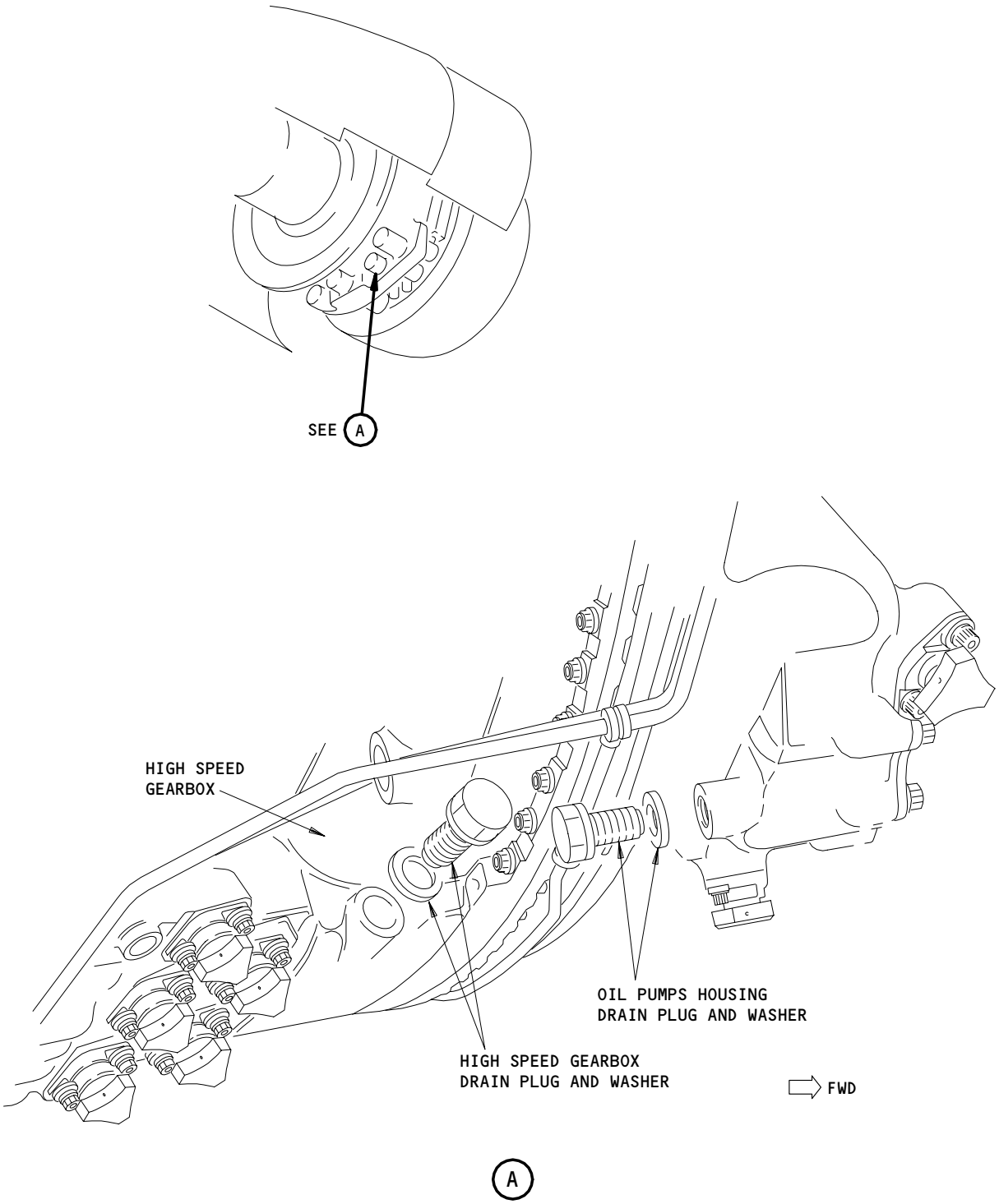
CAUTION: DO NOT REMOVE THE HIGH SPEED EXTERNAL GEARBOX CORE PLUGS TO DRAIN THE GEARBOX (THE CORE PLUGS HAVE CASTELLATED HEADS AND HAVE "KU" AND A FOUR DIGIT NUMBER WRITTEN ON THEM). IF YOU REMOVE THE CORE PLUGS TO DRAIN THE GEARBOX, THE GEARBOX WILL HAVE A LEAK AT THE CORE PLUGS AFTER YOU INSTALL THEM.

(3) Drain the High Speed (HS) Gearbox and Oil Pumps Housing as follows (Fig. 302):
(a) Put a container below the HS gearbox.





Engine Oil Tank, Location of Drain Plug
Figure 301



High Speed Gearbox and Oil Pumps Housing Drain Points
Figure 302

(b) Remove the drain plug and washer from the HS gearbox and let the oil drain.
(c) Remove the drain plug and washer from the drain point for the oil pumps housing and let the oil drain.
(d) When the oil fully drains, install the drain plugs and washers.

WARNING: DO NOT GET THE DEGREASING FLUID IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE DEGREASING FLUID. PUT ON PROTECTIVE SPLASH GOGGLES AND GLOVES WHEN YOU USE THE DEGREASING FLUID. KEEP THE DEGREASING FLUID AWAY FROM SPARKS, FLAME AND HEAT. MAKE SURE THERE IS A GOOD FLOW OF AIR IN THE AREA WHERE THE DEGREASING FLUID IS USED. DEGREASING FLUID IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: BE CAREFUL WHEN YOU USE THE DEGREASING FLUID AS SURFACE PROTECTION WILL BE REMOVED. ALL PROTECTED AREAS WHERE THE DEGREASING FLUID IS USED MUST BE PROTECTED AGAIN (AMM 70-42-12/201).

1) Put degreasing fluid on a clean, dry, lintfree cloth until it is moist.

NOTE: Put the degreasing fluid on the cloth away from the container to prevent contamination of the bulk liquid.

2) Remove the contamination from the mating surfaces with the moist cloth.

NOTE: Discard the dirty cloth after each operation and use a clean one.

CAUTION: BE CAREFUL WHEN YOU USE JOINTING COMPOUND TO MAKE SURE THE JOINTING COMPOUND DOES NOT GET INTO THE INTERNAL COMPONENTS WHEN THE DRAIN PLUGS ARE TIGHTENED. IF THE JOINTING COMPOUND GETS INTO THE INTERNAL COMPONENTS, DAMAGE TO THE INTERNAL COMPONENTS CAN OCCUR.

3) Apply the jointing compound to the mating faces of the HS gearbox, drain points for the oil pumps housing, washers, and drain plugs with a brush.
4) Let the jointing compound dry for 10 minutes.
5) Install the drain plugs and washers.

S 683-005-R00

(4) Drain the return oil tubes as follows:
  (a) Remove the scavenge strainers (AMM 79-21-03/401) and let the oil drain.
  (b) Install the scavenge strainers (AMM 79-21-03/401).

S 683-006-R00

(5) Drain the pressure and scavenge oil filter element housings as follows:
  (a) Remove the pressure and scavenge oil filter elements (AMM 79-21-07/401 and AMM 79-21-08/401) and let the oil drain.
  (b) Install the pressure and scavenge oil filter elements (AMM 79-21-07/401 and AMM 79-21-08/401).

  NOTE: The scavenge oil filter element is of the disposable type. A new element must be installed for flight.

S 613-007-R00

CAUTION: YOU MUST PRIME THE ENGINE OIL SYSTEM BEFORE YOU OPERATE THE ENGINE. ENGINE INTERNAL DAMAGE OCCUR IF THE ENGINE OIL SYSTEM IS NOT PRIMED BEFORE YOU BEGIN THE POWER PLANT TEST.

(6) Prime the engine oil system (AMM 12-13-01/301)

S 613-008-R00

(7) Fill the oil tank after the first engine run to idle (AMM 12-13-01/301)

  NOTE: If you fill the oil tank to the full mark before the first engine run to idle, the oil system will be too full. This will cause a large quantity of oil to go through the engine breather outlet duct.

S 413-009-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.

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

ENGINE OIL TANK - REMOVAL/INSTALLATION

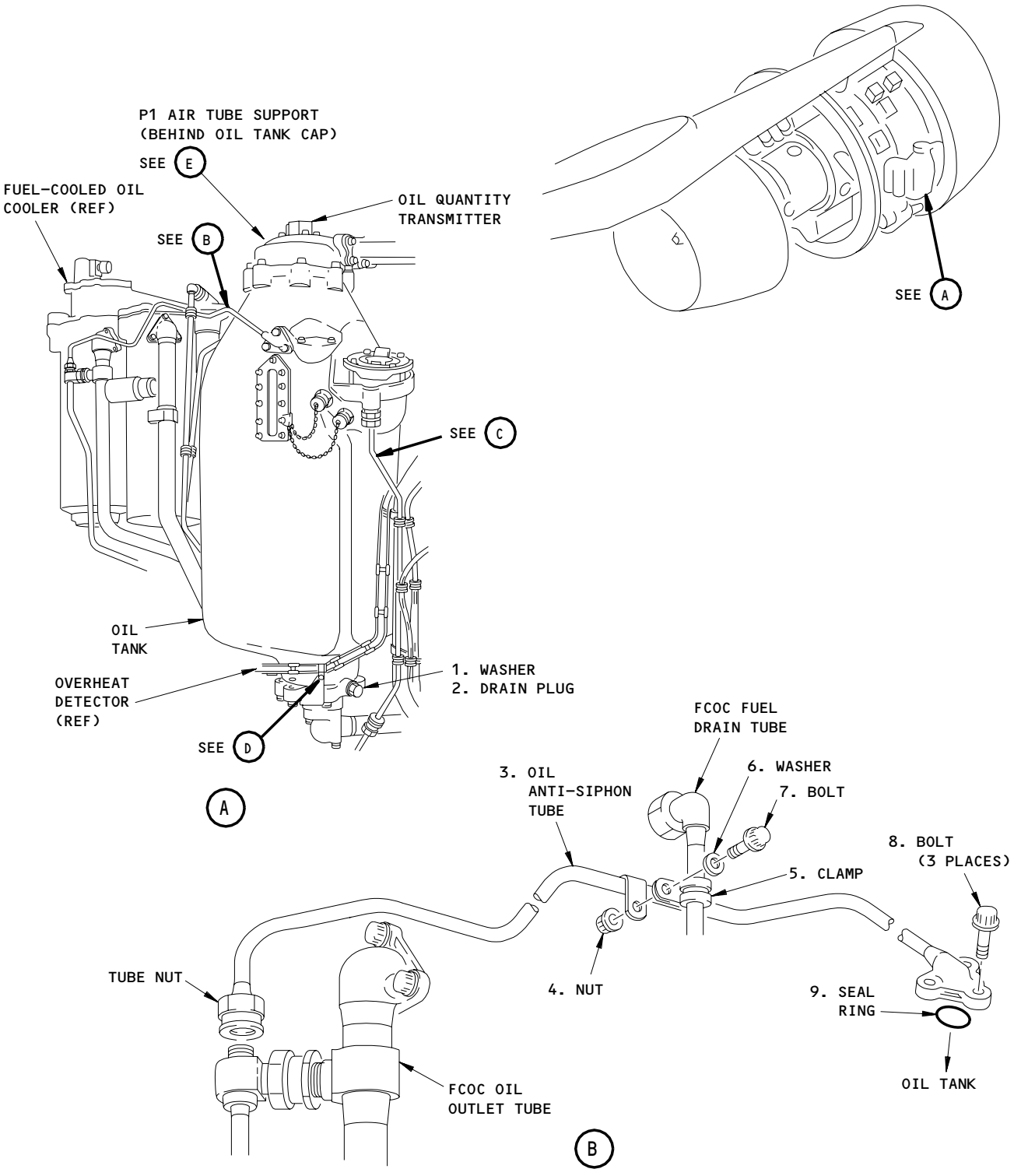
1. General
   A. This procedure contains two tasks. The first task is to remove the engine oil tank. The second task is to install the engine oil tank.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubrication, and installation of rubber seal rings.
   C. Use the procedures given in AMM 70-51-00/201 to tighten fasteners.
   D. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a torque value is specified in this procedure.

TASK 79-11-01-004-001-R00

2. Remove Oil Tank
   A. General
      (1) This procedure has one task. The task is to remove the oil tank.
   B. Equipment
      (1) Container - minimum capacity 41.5 U.S. pints (36.6 Imperial pints, 19.7 Liters)
   C. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 79-31-01/401, Oil Quantity Transmitter
   D. Access
      (1) Location Zone
          410 Left Engine
          420 Right Engine

      (2) Access Panel
          414/424 Fan Cowl Panel (RH)

   E. Prepare to Remove the Engine Oil Tank



Oil Tank Tubes and Fittings Installation
Figure 401 (Sheet 1)

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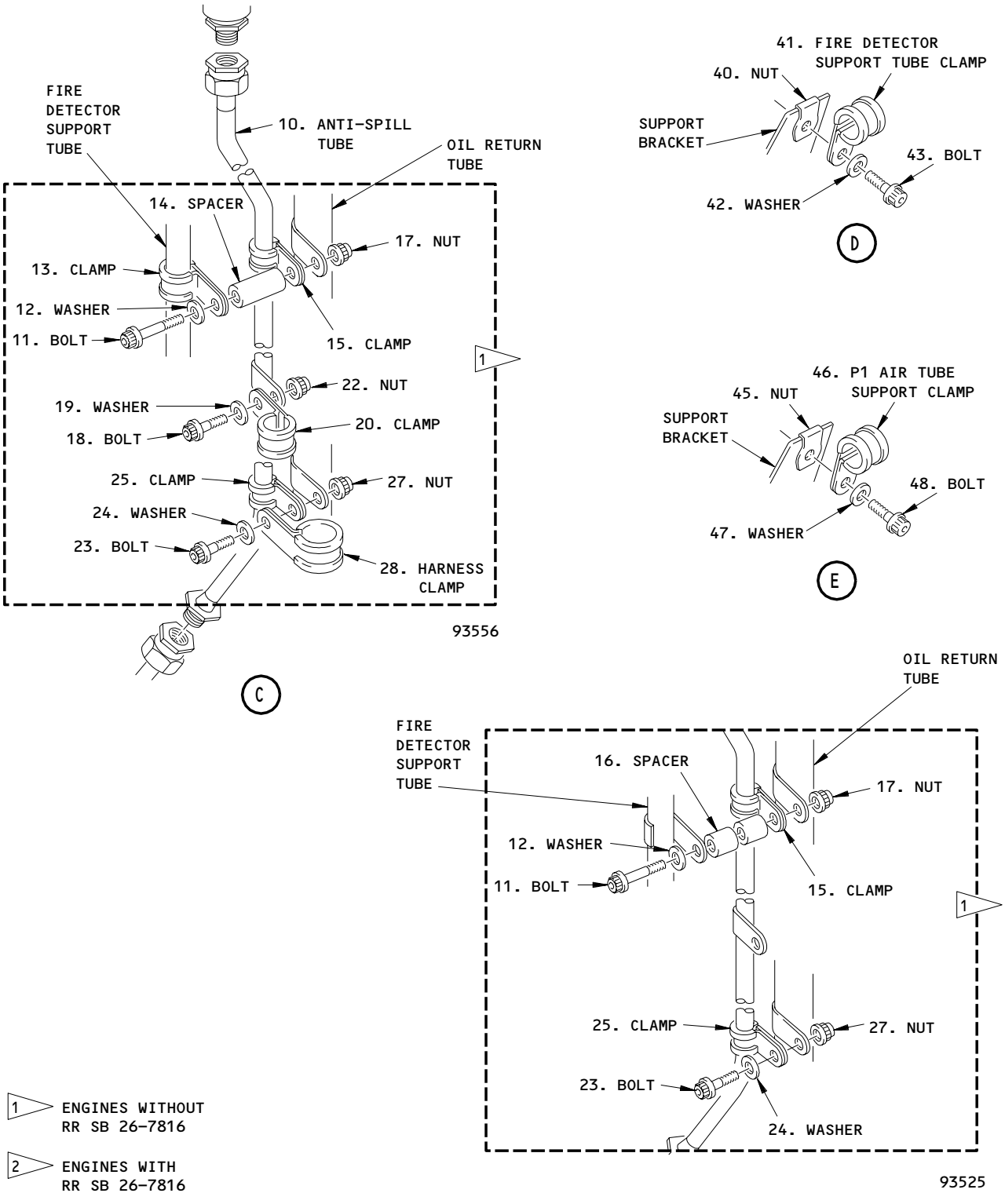
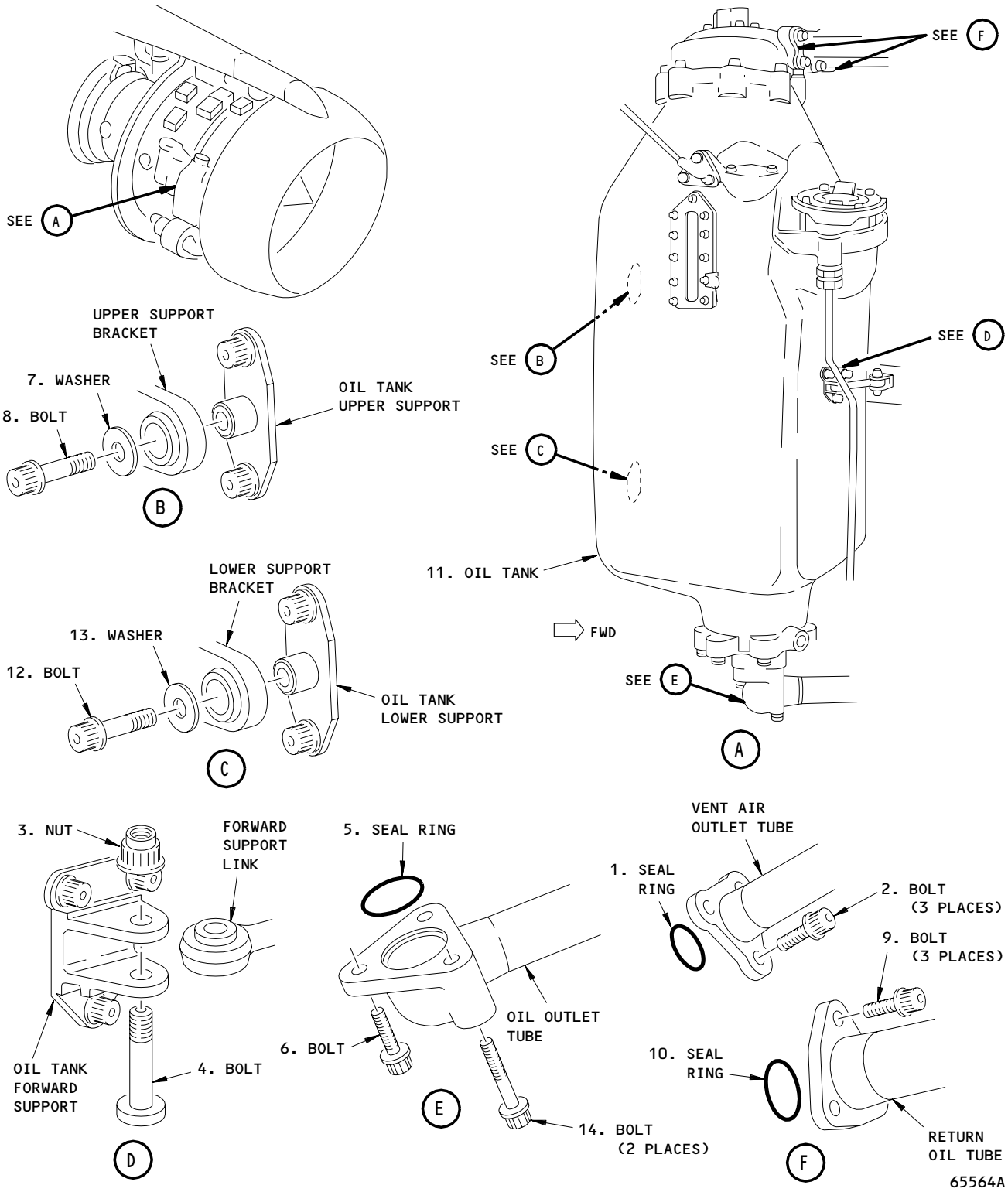


Oil Tank Tubes and Fittings Installation
Figure 401 (Sheet 2)



Engine Oil Tank Installation
Figure 402

S 024-051-R00

WARNING: DO NOT LET THE ENGINE OIL CONTACT YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

BE CAREFUL WHEN YOU ARE NEAR THE ENGINE OIL SYSTEM IMMEDIATELY AFTER ENGINE SHUT-DOWN. THE ENGINE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AFTER THE ENGINE SHUT-DOWN AND CAN CAUSE INJURY.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO CONTACT THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE FAILURE OF THE SYNTHETIC OIL.

OIL THAT IS DRAINED FROM THE ENGINE MUST NOT BE PUT BACK INTO THE ENGINE.

(1) Remove the oil quantity transmitter (AMM 79-31-01/401).

S 014-003-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.

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

S 684-049-R00

(3) Drain the oil tank as follows (Fig. 401):
  (a) Put a container below the oil tank.
  (b) Remove the oil drain plug (2).
  (c) Let the oil fully drain from the oil tank.
  (d) Install the drain plug (2) and washer (1) to the oil tank.

F. Remove the Oil Tank

S 024-007-R00

(1) Remove the anti-siphon tube as follows (Fig. 401):
  (a) Remove the bolt (7) that attaches the clamp (5) for the fuel drain tube to the oil anti-siphon tube (3).
  (b) Disconnect the oil anti-siphon tube (3) at the oil outlet tube for the fuel-cooled oil cooler (FCOC).
  (c) Remove the bolts (8) that attach the oil anti-siphon tube (3) to the oil tank.
  (d) Remove the tube (3).
    1) Discard the seal ring (9).

S 024-011-R00

(2) Remove the anti-spill tube as follows (Fig. 401):
  (a) ENGINES PRE-RR-SB 26-7816;
  Remove the bolts (11, 18 and 23) that attach the anti-spill tube to the fire detector support tube and the oil return tube.
  (b) ENGINES POST-RR-SB 26-7816;
  Remove the bolts (11 and 23) that attach the anti-spill tube to the fire detector support tube and oil return tube.
  (c) Disconnect the tube (10) ends and remove the tube.

S 024-014-R00

(3) Remove the remaining oil tubes as follows (Fig. 402):
  (a) Remove the bolts (6 and 14).
  (b) Disconnect the oil outlet tube.
  1) Discard the seal ring (5).
  (c) Remove the bolts (2).
  (d) Disconnect the vent air outlet tube.
  1) Discard the seal ring (1).
  (e) Remove the bolts (9).
  (f) Disconnect the return oil tube.
  1) Discard the seal ring (10).
  (g) Remove the bolt (43) that attaches the clamp (41) for the fire detector support tube to the support bracket at the bottom of the oil tank (Fig. 401).

S 034-018-R00

(4) Remove the bolt (48) that attaches the clamp (46) for the P1 air tube to the support bracket at the top of the oil tank (Fig. 401).

S 024-021-R00

(5) Remove the oil tank as follows (Fig. 402):
  (a) Remove the 'D' headed bolt (4) that attaches the forward support for the oil tank to the forward support link.
  (b) Hold the oil tank (11) and remove the bolts (8 and 12) that attach the top and bottom supports for the oil tank to the brackets.
  (c) Remove the oil tank (11) from the engine.
  (d) Install dust caps on all openings and connectors.

TASK 79-11-01-404-023-R00

3. Install the Oil Tank

A. General

(1) This procedure has one task. The task is to intall the oil tank.

B. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Washer	79-11-01	01	200
	2	Plug - Drain			195
	3	Tube - Anti-Siphon	79-21-05	13	70
	4	Nut	73-11-06	01	35
	6	Washer			23
	7	Bolt			5
	8	Bolt	79-21-05	13	5
	9	Seal Ring			60
	10	Tube - Anti-Spill	71-71-00	02	400
	11	Bolt			76
	12	Washer			140
	14	Spacer			206
	16	Spacer			212
	17	Nut			210
	18	Bolt	26-11-01	14	5
	19	Washer			25
	22	Nut			35
	23	Bolt	71-71-00	02	20
	24	Washer			140
	27	Nut			210
	40	Nut	26-11-01	14	30
	42	Washer			25
	43	Bolt			10
	45	Nut	73-21-13	03	44
	47	Washer			22
	48	Bolt			10

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
402	1	Seal Ring	79-21-05	09	300
	2	Bolt			270
	3	Nut	79-11-01	01	135
	4	Bolt			130
	5	Seal Ring	79-21-05	07	205
	6	Bolt			110
	7	Washer	79-11-01	01	260
	8	Bolt			250
	9	Bolt	79-21-05	13	5
	10	Seal Ring			65
	11	Oil Tank	79-11-01	01	335
	12	Bolt			215
	13	Washer			220
	14	Bolt	79-21-05	07	195

C. References
(1) AMM 12-13-01/301, Engine Oil Replenishing.
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 79-31-01/401, Oil Quantity Transmitter

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

(2) Access Panel
414/424 Fan Cowl Panel (RH)

E. Procedure

S 424-052-R00

WARNING: DO NOT LET THE ENGINE OIL CONTACT YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

BE CAREFUL WHEN YOU ARE NEAR THE ENGINE OIL SYSTEM IMMEDIATELY AFTER ENGINE SHUT-DOWN. THE ENGINE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AFTER THE ENGINE SHUT-DOWN AND CAN CAUSE INJURY.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO CONTACT THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE FAILURE OF THE SYNTHETIC OIL.

OIL THAT IS DRAINED FROM THE ENGINE MUST NOT BE PUT BACK INTO THE ENGINE.

(1) Install the oil tank as follows (Fig. 402):
  (a) Remove the dust caps from the oil tank openings and connectors.
  (b) Lubricate and install new seal rings (1, 10 and 5) in the vent air outlet, return oil and oil outlet tubes.
  (c) Put the oil tank (11) on the top and bottom support brackets.

    NOTE: Make sure the vent air outlet, return oil and oil outlet tubes are in the correct positions when you install the oil tank.

  (d) Engage the forward support link with the forward support of the oil tank.
  (e) Install the 'D' head bolt (4) and nut (3).

(f) Install the oil tank top and bottom support bolts (8 and 12) with the washers (7 and 13).
(g) Tighten the forward oil tank bolt (4).

S 434-026-R00
(2) Attach the clamp (46) for the P1 air tube to the support bracket at the top of the oil tank with the bolt (48), washer (47) and nut (45) (Fig. 401).

S 434-029-R00
(3) Attach the clamp (41) for the fire detector support tube to the support bracket at the bottom of the oil tank with the bolt (43), washer (42) and nut (40) (Fig. 401).

S 424-032-R00
(4) Connect the oil outlet tube, return oil tube and vent air tube to the oil tank (Fig. 402).

S 434-033-R00
(5) Install the bolts (6, 14, 9 and 2).

S 424-036-R00
(6) Install the anti-spill tube as follows (Fig. 401):
(a) Put the anti-spill tube (10) between the oil tank and lower tube.
(b) Connect the connectors at each end of the tube (10) and tighten them with your hand.
(c) ENGINES PRE-RR-SB 26-7816;
Install the supports as follows:
1) Attach the clamps (25, 28) to the oil return tube with the bolt (23), washer (24) and nut (27).
2) Attach the clamp (20) to the anti-spill tube (10) with the bolt (18), washer (19) and nut (22).
3) Attach the clamps (13 and 15) to the oil return tube with the bolt (11), washer (12), spacer (14) and nut (17).
(d) ENGINES POST-RR-SB 26-7816;
Install the supports as follows:
1) Attach the clamp (25) to the oil return tube with the bolt (23), washer (24) and nut (27).
2) Attach the fire detector support tube and clamp (15) to the oil return tube with the bolt (11), washer (12), spacers (16) and nut (17).
3) Tighten the tube nuts at the ends of the anti-spill tube.
4) Safety the tube nuts with a lockwire.
(e) Tighten the anti-spill tube bolts.

S 424-039-R00
(7) Install the oil anti-siphon tube as follows (Fig. 401):
(a) Lubricate and install the new seal ring (9) to the anti-siphon tube (3).

(b) Put the tube (3) between the oil tank and oil outlet tube fitting for the FCOC.
(c) Connect the tube nut to the oil outlet tube fitting for the FCOC and tighten it with your hand.
(d) Connect the oil tank end of the tube to the oil tank with the bolts (8) and tighten them with your hand.
(e) Attach the clamp (5) for the FCOC fuel drain tube to the anti-siphon tube (3) with the bolt (7), washer (6) and nut (4).
(f) Tighten the bolts (8) that attach the anti-siphon tube to the oil tank.
(g) Tighten the tube nut at the oil outlet tube fitting for the FCOC.
1) Safety the tube nut with a lockwire.

S 424-054-R00

(8) Install the oil quantity transmitter (AMM 79-31-01/401).

S 614-044-R00

(9) Fill the oil tank (AMM 12-13-01/301).

S 414-045-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 714-046-R00

(11) Do an engine test with the Power Plant Test Reference Table (AMM 71-00-00/501).

OIL TANK GRAVITY FILLER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is to remove the Oil Tank Gravity Filler. The second task is to install the Oil Tank Gravity Filler.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubrication 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 79-11-03-004-001-R00

2. Remove the Oil Tank Gravity Filler
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zone
          410 Left Engine
          420 Right Engine

      (2) Access Panel
          414/424 Fan Cowl Panel (RH)

   C. Procedure (Fig. 401)

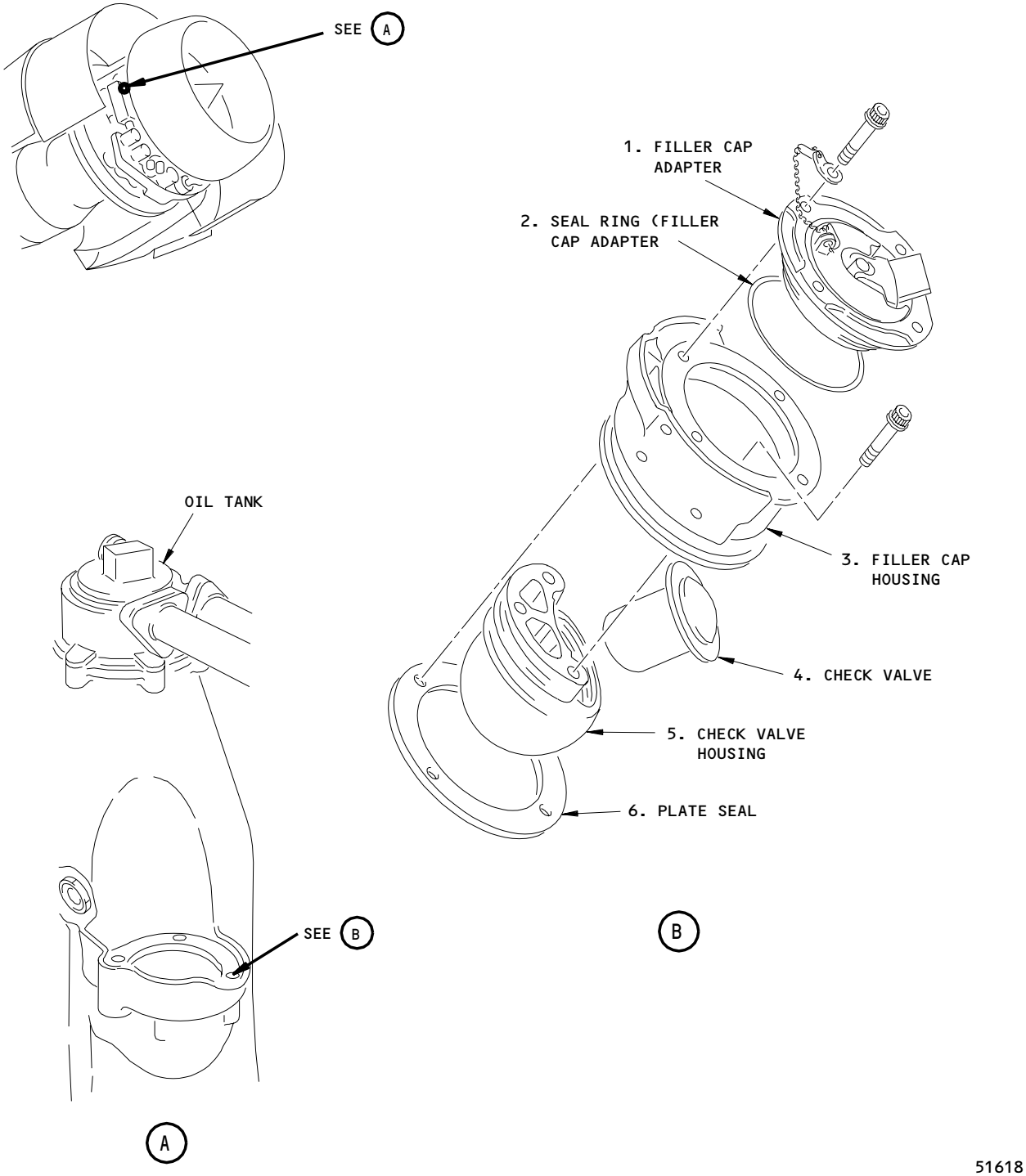
      S 014-002-R00

      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) Remove the four bolts from the filler cap.

      S 434-004-R00
      (3) Keep the lockwire washer attached to the chain.



Oil Tank Gravity Filler Installation
Figure 401

S 034-016-R00

WARNING: DO NOT LET THE ENGINE OIL STAY ON YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

BE CAREFUL AROUND THE ENGINE OIL SYSTEM IMMEDIATELY AFTER ENGINE SHUT-DOWN. THE ENGINE OIL TEMPERATURE STAYS HIGH FOR SOME TIME AFTER THE ENGINE SHUT-DOWN AND CAN CAUSE INJURY.

CAUTION: IMMEDIATELY CLEAN OFF ALL ENGINE OIL THAT FALLS ON THE PAINTED SURFACES AND RUBBER PARTS OF THE AIRPLANE. THE SPECIFIED OIL FOR THIS OIL SYSTEM WILL CAUSE DAMAGE TO THE PAINTED SURFACES AND SOME TYPES OF RUBBER AND MUST NOT BE PERMITTED TO TOUCH THESE PARTS OF THE ENGINE.

USE VERY CLEAN CONTAINERS AND EQUIPMENT. OIL CONTAMINATION BY SMALL QUANTITIES OF SOME ALKALINE CLEANERS CAN CAUSE A FAILURE OF THE SYNTHETIC OIL.

DO NOT PUT THE OIL DRAINED FROM THE ENGINE BACK INTO THE ENGINE.

(4) Remove the filler cap adapter (1).

NOTE: Some oil can drain from the engine during this procedure.

(a) Discard the seal ring (2).

S 024-006-R00

(5) Remove the gravity filler assembly.

S 034-007-R00

(6) Remove and discard the plate seal (6).

S 034-008-R00

(7) Disassemble the gravity filler assembly as follows:
(a) Remove the three bolts that attach the filler cap housing (3) to the check valve housing (5).
(b) Remove the filler cap housing from the check valve housing.
(c) Remove the check valve (4) from the check valve housing.
(d) Install a dust cap to the opening at the oil tank.

TASK 79-11-03-404-009-R00

3. Install the Oil Tank Gravity Filler

A. References

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

B. Access
(1) Location Zone
410 Left Engine
420 Right Engine

(2) Access Panel
414/424 Fan Cowl Panel (RH)

C. Procedure (Fig. 401)

S 434-010-R00
(1) Assemble the gravity filler assembly as follows:
(a) Assemble the check valve (4) to the check valve housing (5).
1) Make sure the check valve (4) will move freely.
(b) Align the check valve housing (5) with the filler cap housing (3).
(c) Install the bolts (3 locations) that attach the filler cap to the check valve housing.
(d) Remove the dust cap from the opening in the oil tank.

S 434-011-R00
(2) Install a new plate seal (6) to the oil tank.

S 424-012-R00
(3) Install the filler assembly to the oil tank and plate seal.

S 434-013-R00
(4) Lubricate and install a new seal (2) to the filler cap adapter.

S 434-014-R00
(5) Install the filler cap adapter and the lockwire washer with the bolts (4 locations).

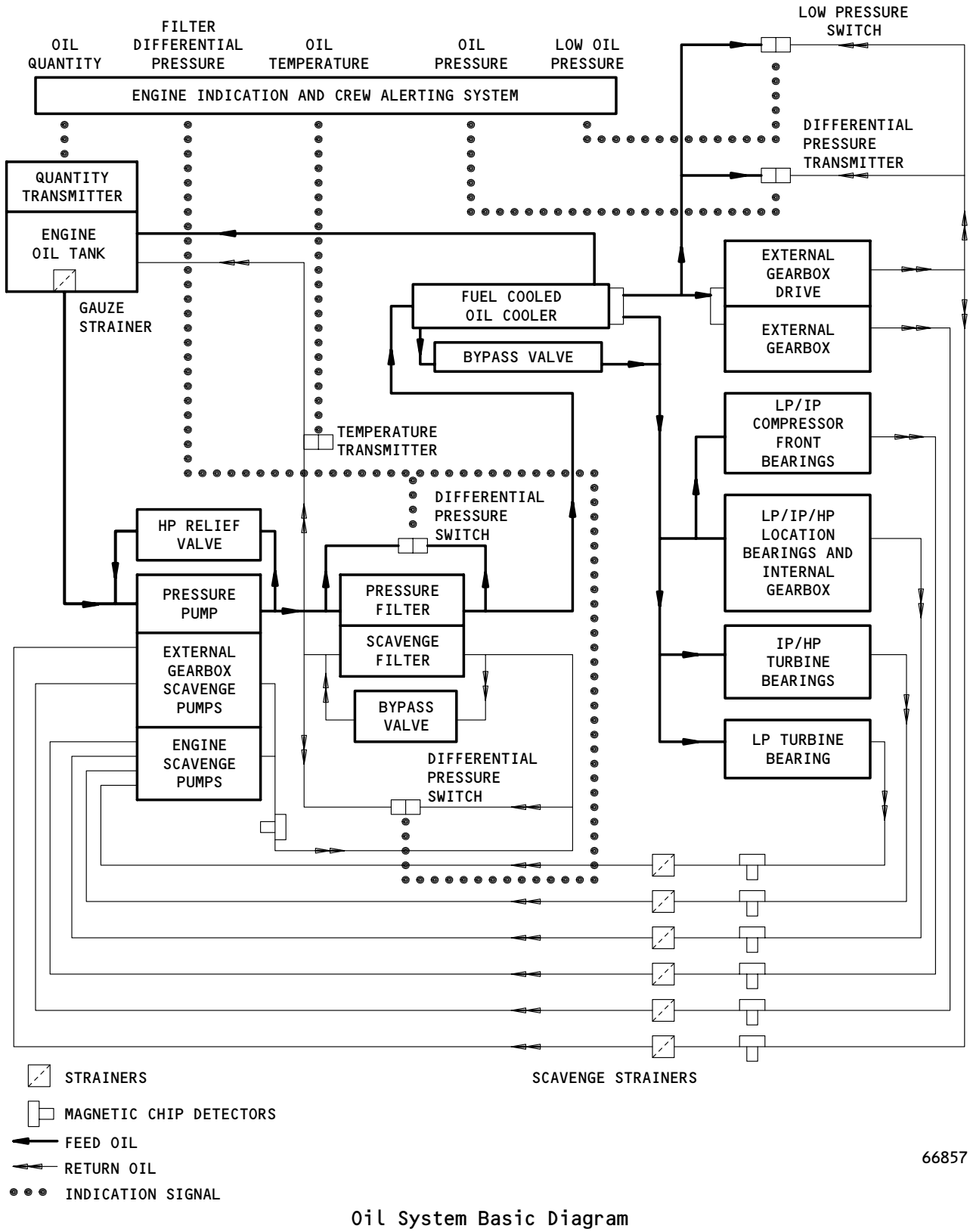
S 414-015-R00

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.

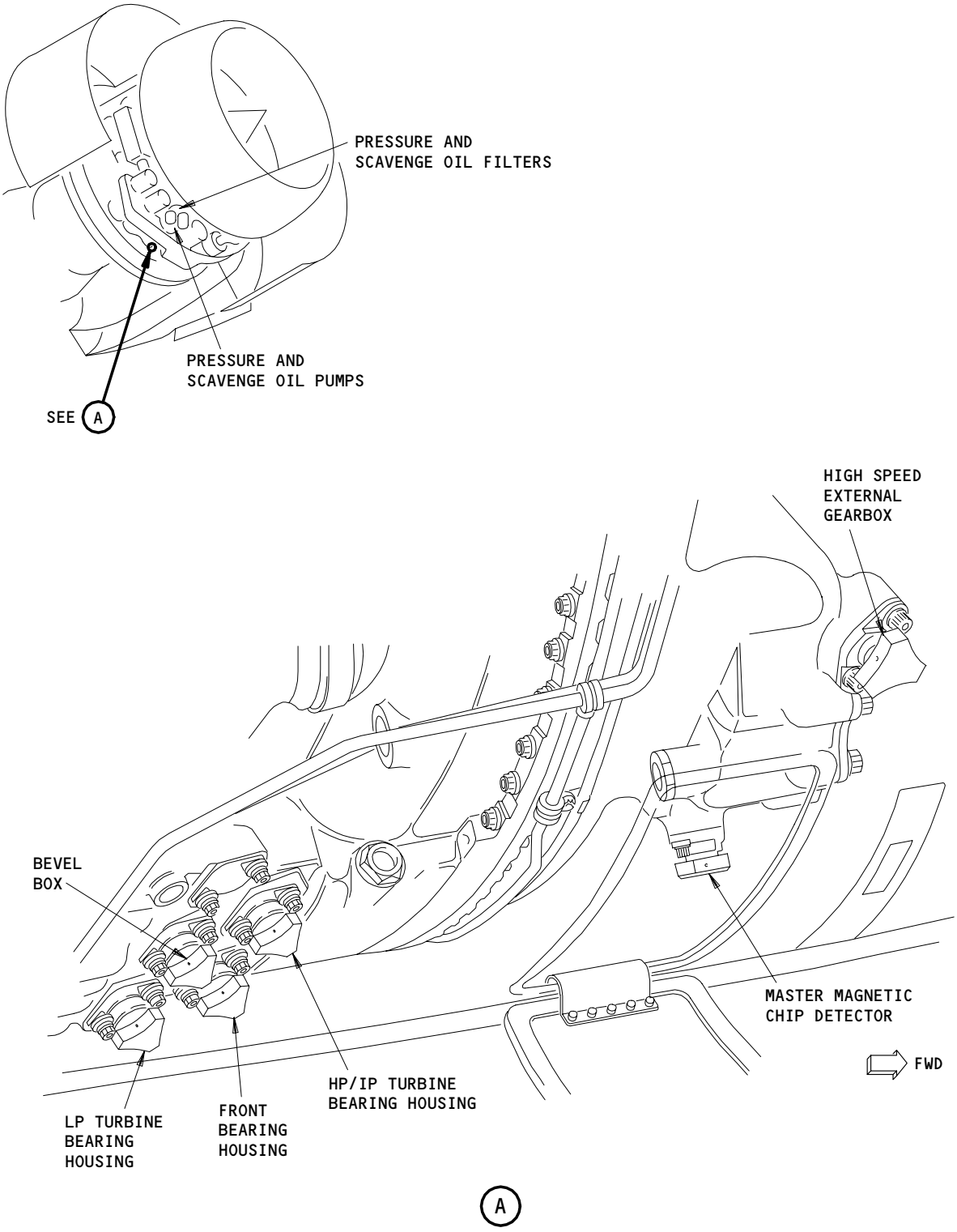
(6) Close the right fan cowl panel (AMM 71-11-04/201).

ENGINE OIL DISTRIBUTION SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The engine oil distribution system (Fig. 1) provides lubricating and cooling oil for the engine bearings, gears and splines, throughout its starting, stopping and operational sequence, by the use of a self contained, full flow, recirculatory oil system.
   B. The system is comprised of pressure and scavenge pumps, pressure and scavenge filters, a fuel cooled oil cooler (FCOC), bypass and relief valves, magnetic chip detectors (MCDs), strainers and tubes. Refer to Fig. 2 for the location of limits.
2. Description
   A. Oil Pumps
      (1) The oil pumps assembly consists of a pressure pump and seven scavenge pumps bolted together to form one unit. This unit is located in the base of the high speed external gearbox and driven through the spur gear train at approximately one-fifth of th HP shaft speed.
      (2) All the pumps are of the gear type, the scavenge pump driving gear being splined to the HP fuel pump idler gear, from which the scavenge and pressure pumps are driven.
   B. Oil Filters - Pressure and Scavenge
      (1) The pressure and scavenge filters are wire-wound elements which are contained in a separate casing, attached to the base of the high-speed external gearbox pump housing.
      (2) Two spring-loaded relief valves, one across the pressure pump, operates to relieve the system during cold start conditions, the other access the scavenge filter allows an unobstructed flow of oil to the oil tank should an obstruction in the scavenge filter occur.
      (3) An oil priming valve, situated in the base of the pressure filter casing, provides for priming of the pressure filter, fuel cooled oil cooler and the pressure feed tubes, after the system has been disturbed.
      (4) Two drain connectors, one pressure, one scavenge, upstream of the filters provides for drainage of both pressure and scavenge oil lines.
   C. Fuel Cooled Oil Cooler
      (1) The fuel cooled oil cooler (FCOC) is integral with the LP fuel filter attached to the right-hand side of the LP compressor case, adjacent to the engine oil tank. The unit consists of a series of baffle and flow plates combined with a multi-tubed matrix contained in a casing. Oil, being directed by the flow plates around the fuel filled tube matrix, provides for an exchange of temperature between fuel and oil.
      (2) An internal spring-loaded relief valve, set a predetermined value, lets oil to bypass a section of the FCOC during cold start conditions.



Oil System Basic Diagram
Figure 1



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Engine Oil Distribution – Component Locations
Figure 2

(3) An oil tube (anti-syphon) at the outlet of the FCOC to the oil tank, feeds cooled oil back to the oil tank to cool the oil tank sight glass and during engine shutdown prevents the FCOC being drained of oil due to bearing chamber suction.

D. Oil Bypass Valve FCOC

(1) An oil bypass valve is mounted to the right-hand side of the LP compressor case adjacent to the engine oil-tank, in the feed line to the FCOC.

(2) The unit consists of a poppet valve located in a flow chamber mounted in a casing. Attached to one end of the poppet valve is a pressure plate while the valve face seats against the end face of the flow chamber. A spring interposed between the pressure plate and a flange to the flow chamber and, oil at delivery pressure load the poppet valve in the closed position. Attached to one end of the casing is a cover which houses and retains the temperature sensor. The sensor element is located in the fuel line between the LP fuel filter and the HP fuel pump.

NOTE: ENGINES WITH RR SB 79-9387;
The temperature sensor is replaced with a cap.

(3) The valve is operated by oil pressure or fuel temperature at set values.

NOTE: ON ENGINES WITH RR SB 79-9387,
the valve is operated only by oil pressure.

E. Oil Seals

(1) Labyrinth and grooved seals, pressurized by the cooling and sealing air system (AMM 72-02-00/001), are utilized to prevent oil leakage from the main shaft bearings.

(2) The hydraulic pump, starter motor, integrated drive generator and centrifugal breather drive shafts within the high speed external gearbox incorporates 'air blown' seals to prevent oil leakage.

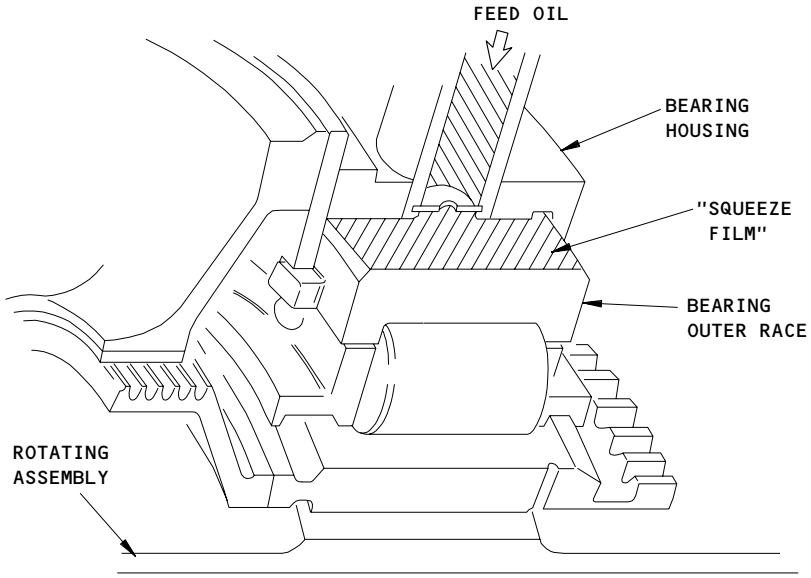
F. Bearing Suppression

(1) The main roller bearings feature oil 'squeeze film' suppression (Fig. 3) between the outer rack and bearing housing to minimize vibration, and cool the bearing outer race. To ensure effective 'squeeze film' oil flow during engine start, the LP shaft system bearings are centralized in a squeeze film annulus by a support, mounted on a spring support assembly (Fig. 3) at the base of the LP compressor and LP turbine bearing housing.

(2) Oil troughs are utilized in the bevel and internal gearbox assemblies to provide initial lubrication of the bevel gears, and to suppress engine starting loads.

G. Final Filtration

(1) Final filtration of the feed oil to the engine bearing chambers and the high-speed external gearbox is accomplished by thread, gauze or plate filters upstream of the oil jets.



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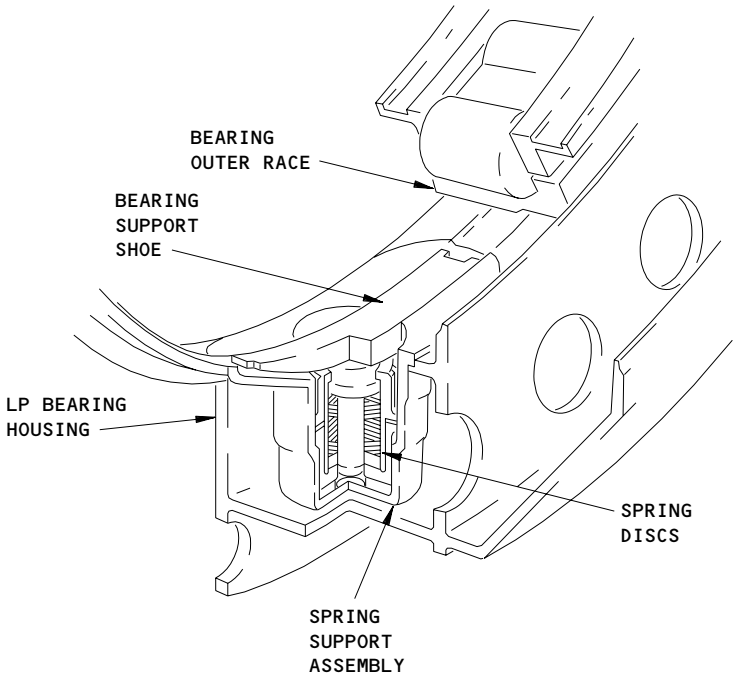
"SQUEEZE FILM" SUPPRESSION (EXAMPLE)



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Spring Support Assembly (Example)
Figure 3

H. Magnetic Chip Detectors
   (1) Magnetic chip detectors (MCDs) in the scavenge side of the oil system positioned in the base of the high-speed external gearbox and one in the return oil tube from the internal gearbox/location bearings, assist in the detection of metal fragments in the oil and provides an early warning of bearing failure.

       NOTE: Engines incorporating RR SB 72-7812 have MCDs in only the master and internal gearbox MCDs positions. All other positions have blanking plates.

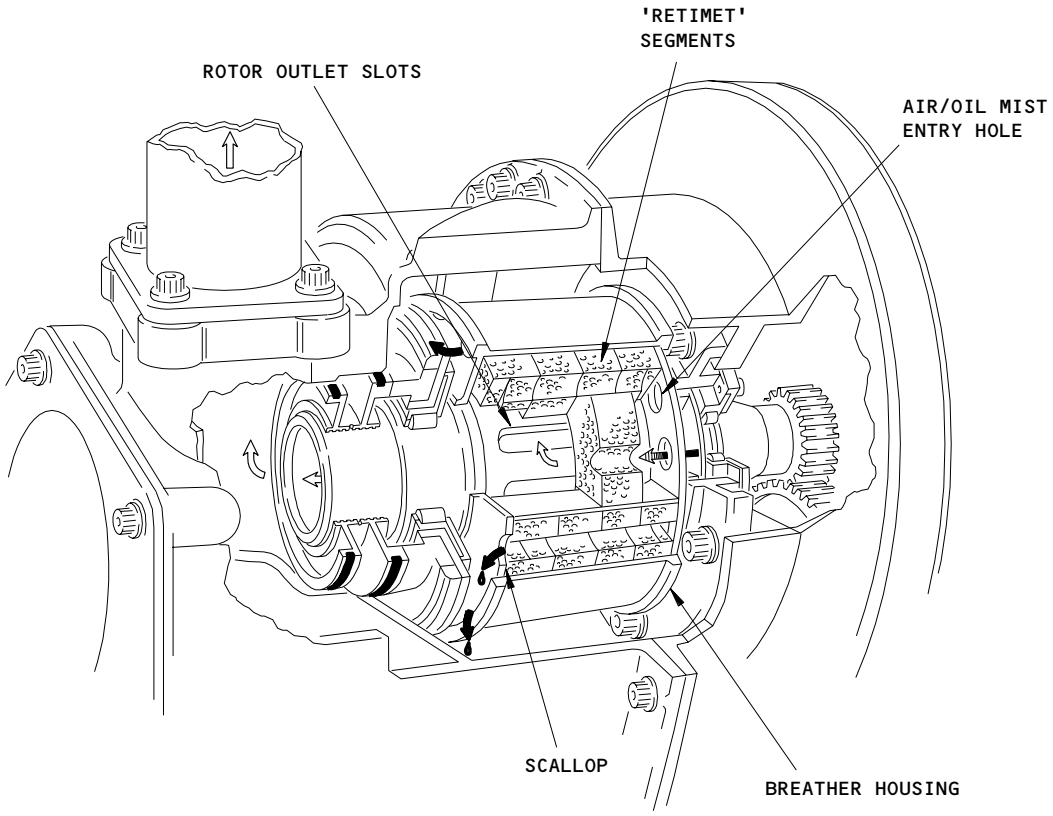
   (2) The detector consists of a permanent magnet contained in a housing. On engines not incorporating RR SB 72-7815, detectors are attached by a bayonet-type connection. On engines incorporating RR SB 72-7815 the detector is a screw-in type attached to the housing and lockwired.
   (3) All ferrous metal particles in the oil are attracted and retained by the magnet on the tip of the detector. The assembly houses a self-sealing valve which prevents loss of oil when the detector is removed for inspection.

I. Oil Strainers
   (1) Gauze strainers, located behind the MCDs in each scavenge line, with the exception of the internal gearbox/location bearings, protect the scavenge pump from deposits in the oil system.

J. Centrifugal Breather
   (1) The cenrifugal breather (Fig. 4) consists of a multi-vaned rotor located in a housing attached to the left-hand front face of the high speed external gearbox, the rotor being driven from the integrated drive generator idler gear. The unit seperates oil to be drained back into the high-speed external gearbox from pressurized air to be vented to the atmosphere by centrifugal force.

K. Oil Tubes
   (1) Rigid tubes, with a nut and a nipple or bolted flanged end connectors are used in throughout the oil system to move lubricating oil to and from the various components.

L. Oil System Monitoring
   (1) The oil system is monitored throughout the cycle; electrical signals are transmitted to the aircrafts indication system for the visual display on EICAS. Refer to AMM 79-31-00 for description and operation of the engine oil indication system.



HIGH SPEED EXTERNAL
GEARBOX

OIL TO GEARBOX

AIR/OIL MIST

AIR TO ATMOSHPERE

AIR/OIL MIST ENTERS BREATHER THROUGH HOLES IN REAR PLATE AND PASSES THROUGH THE 'RETIMET'. OIL IS CENTRIFUGED OUTWARDS AND PASSES FORWARD ALONG THE UNDERSIDE OF THE CONICAL SHROUD AND IS DISCHARED THROUGH SCALLOPS IN THE FORWARD PLATE. THE NOW RELATIVELY OIL FREE AIR EXHAUSTS THROUGH THE GEAR SHAFT OUTLET SLOTS.

6685-9

Centrifugal Breather
Figure 4

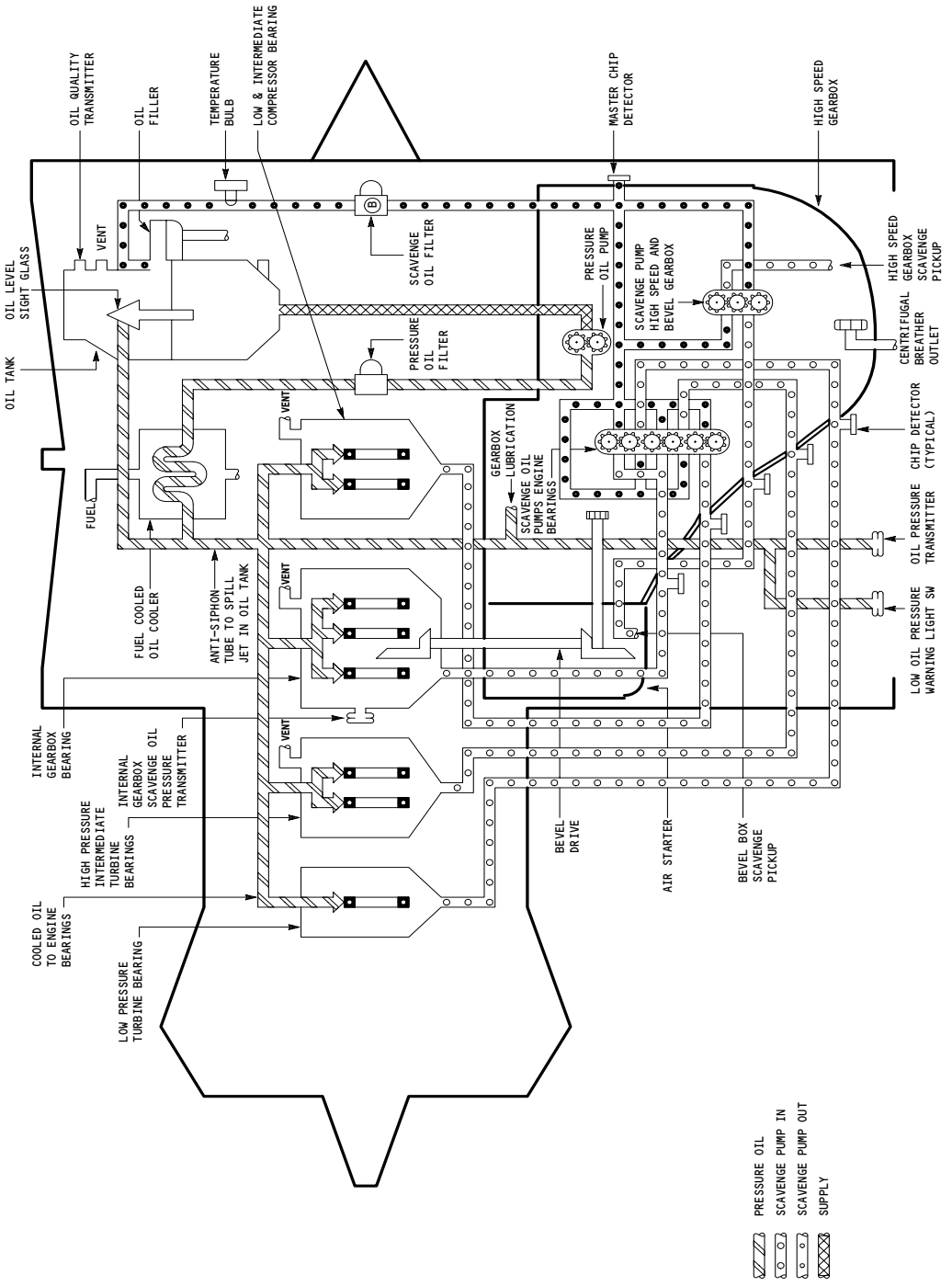
3. Operation (Fig. 5)
   A. Feed Oil
      (1) The pressure pump draws oil from the engine oil tank through a strainer and an external supply tube, and delivers oil to the pressure filter for initial filtration. The oil is then moved through an external tube to the FCOC to be cooled before entering the engine to lubricate and cool all the internal components. As the oil exits from the FCOC a small portion is directed back into the engine oil tank through an anti-syphon tube, to cool the oil tank sight glass. The remaining oil diverts through external tubes into two main streams:

          The high speed external gearbox.
          The engine main bearings and internal gearbox.

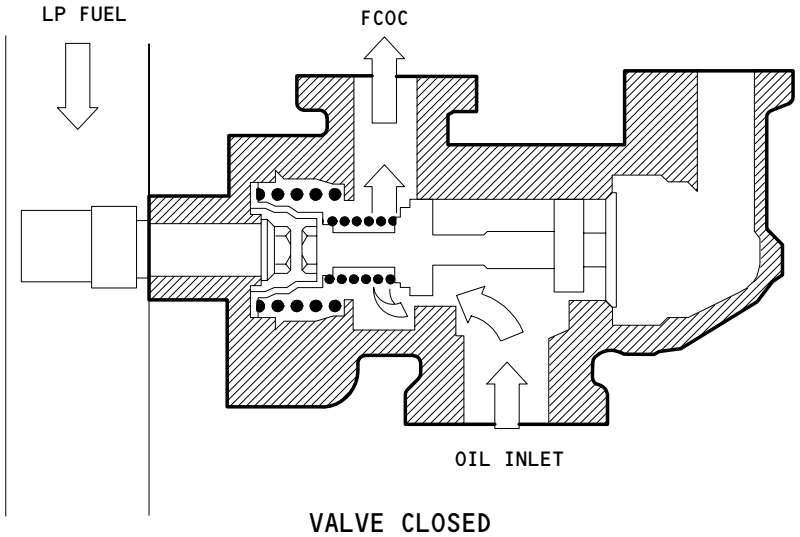
      (2) Oil on attaining the high-speed external gearbox is diverted through internal tubes, bobbins and drillings to lubricate all the internal gears, splines and bearings.
      (3) The oil supply to the engine main bearings and internal gearbox further divides and is conveyed internally through tubes, bores and bobbins to separate chambers to lubricate the various bearings, gears and splines. A central oil/signal tube is mounted within the LP shaft system which convey oil directly from the main external supply tube, to lubricate the IP and LP location bearings.
      (4) The oil is passed through thread, plate or gauze filters for final filtration before entering the oil jets.
      (5) The cold start relief valve across the pressure pump, opens at a predetermined value to prevent too much system pressure. As the relief valve pressure is approached, a differential pressure switch (AMM 79-33-00), transmits an electrical signal as a visual indication display on EICAS.
      (6) Should the oil pressure decline below a predetermined value, an oil low pressure transmitter and switch (AMM 79-33-00) transmitts an electrical signal to the flight station, to illuminate a light on the pilots panel, provide a visual display on EICAS and activate an audible tone in the cockpit.
      (7) If the oil pressure or the fuel temperature get to the set values, the FCOC by-pass valve opens (Fig. 6 Sheet 1). This lets some of the oil flow directly to the main bearing chambers.

          NOTE: ON ENGINES WITH RR SB 79-9387,
          the FCOC by-pass valve is operated only by oil pressure (Fig. 6 Sheet 2).

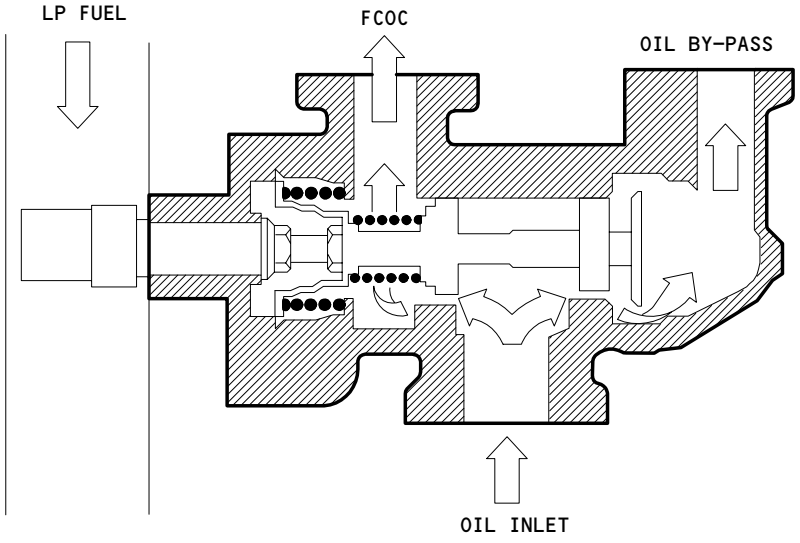
   B. Return Oil
      (1) The scavenge pumps scavenge individual return oil from the bearing chambers and high-speed external gearbox through internal and external tubes. The ouput from each scavenge pump is conveyed as a combined oil flow to the scavenge filter through bores and bobbins in the high speed external gearbox before being directed through an external tube to the engine oil tank.



Engine Oil Distribution System Schematic
Figure 5

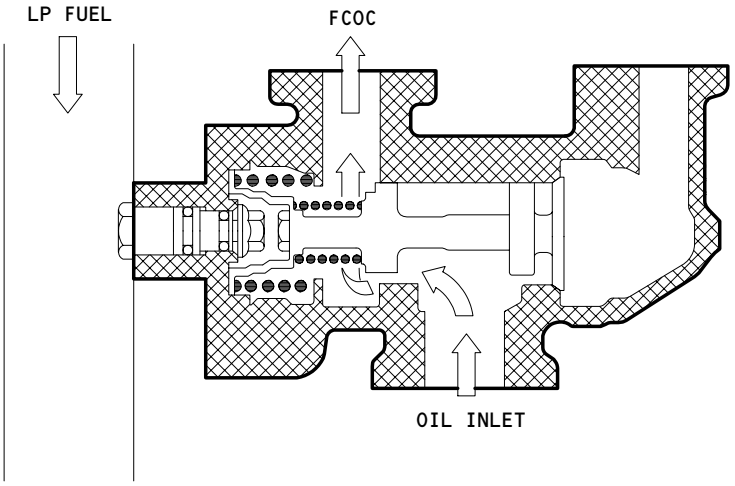


VALVE CLOSED

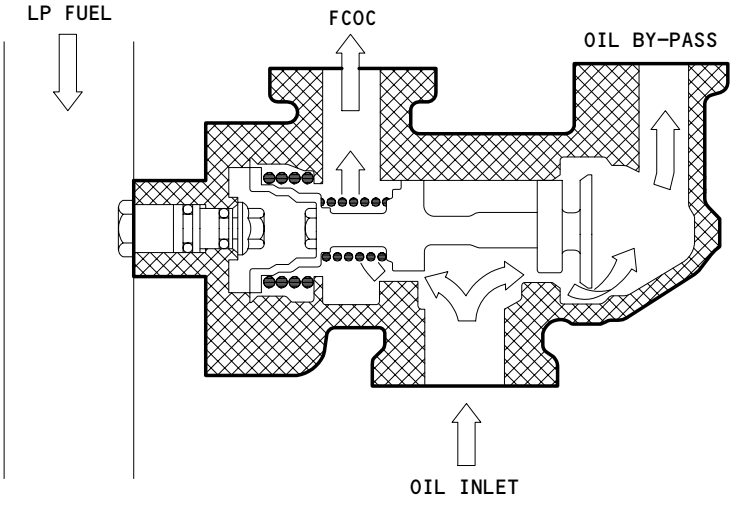


VALVE OPEN

Fuel Cooled Oil Cooler By-Pass Valve Operation
Figure 6 (Sheet 1)



VALVE CLOSED



VALVE OPEN

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Fuel Cooled Oil Cooler By-Pass Valve Operation
Figure 6 (Sheet 2)

(2) Each scavenge pump is protected by a MCDs which attracts ferrous particles, while all reminaing debris is collected by strainers. Should all ferrous particles pass through the scavenge pumps, this is then attracted to the master MCD upstream of the scavenge filter.

NOTE: Engines incorporating RR SB 72-7812 have MCDs in only the master and internal gearbox MCDs positions. All other positions have blanking plates.

(3) Should an obstruction occur in the scavenge filter, a bypass valve opens at a predetermined value to allow an unobstructed flow of oil to the engine oil tank. As the bypass pressure is approached, a differential pressure switch (AMM 79-33-00/001) transmitts an electrical signal as a visual indication display on EICAS.

(4) The oil before entering the engine oil tank, flows across a temperature transmitter (AMM 79-34-00/001) which senses the oil temeprature and transmits an electrical signal as a visual indication display on EICAS.

C. Vent Oil/Air Mist

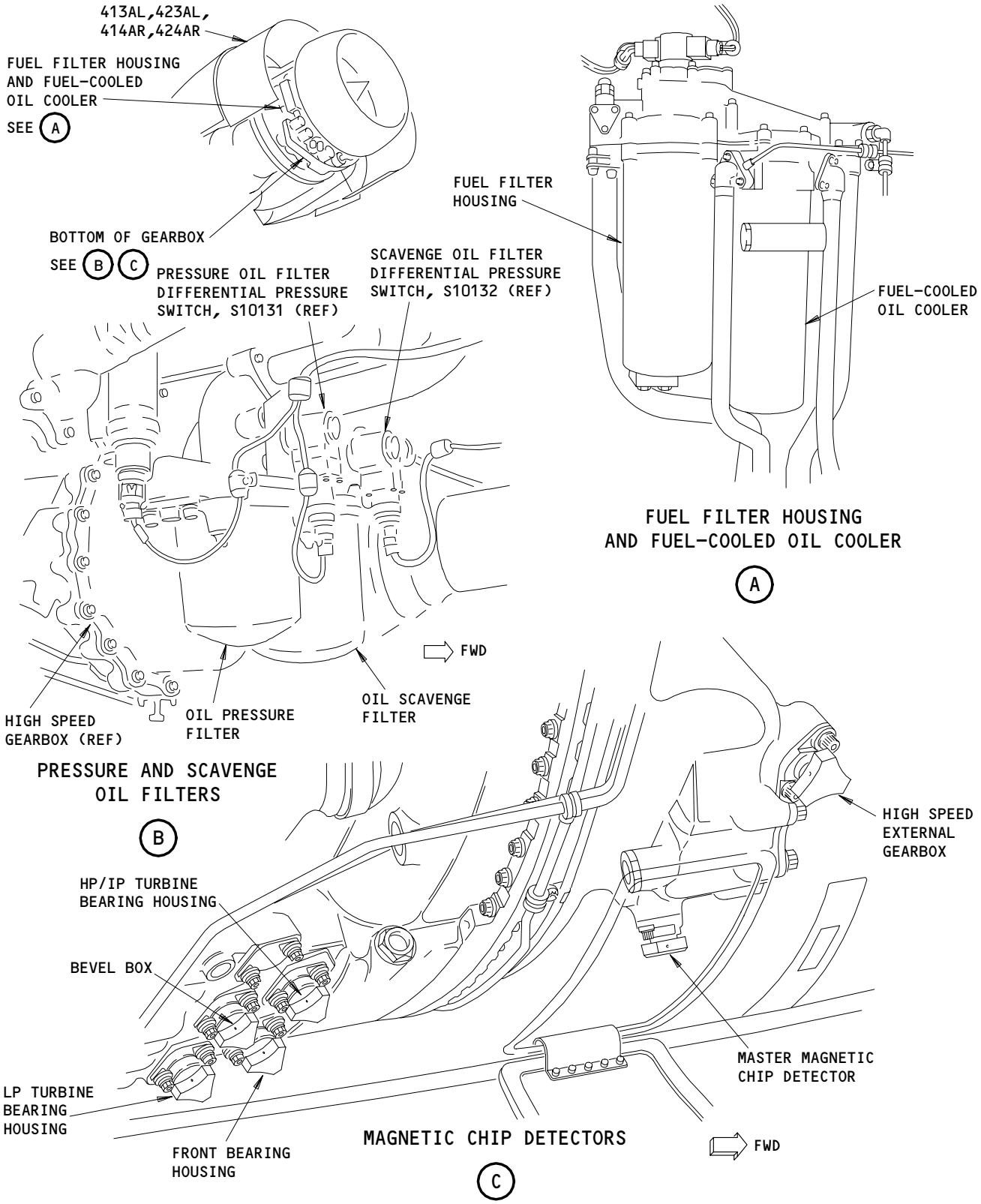
(1) The engine oil tank and bearing chambers, with the exception of the LP turbine bearing chamber which has no vent, are interconnected through internal and external tubes to combine to vent through the centrifugal breather. This prevents any pressure build-up in these compartments due to the ingress of pressurizing air through the bearing air seals.

(2) As the oil/air mist enters the centrifugal breather rotor, the oil is separated outward into an annular groove in the breather housing and drains through internal drillings back to the high speed external gearbox, while the air is directed forward through slots in the rotor to atmosphere.

ENGINE OIL DISTRIBUTION SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
COOLER - FUEL FILTER HOUSING AND FUEL-COOLED OIL	--	2	414AR,424AR, AFT OF OIL TANK	79-21-01
DETECTOR - MAGNETIC CHIP	--	12	413AL,423AL,414AR,424AR, MAIN GEARBOX	79-21-03
ELEMENT - PRESSURE OIL FILTER	--	2	414AR,424AR, MAIN GEARBOX FRONT SIDE	79-21-07
ELEMENT - SCAVENGE OIL FILTER	--	2	414AR,424AR, MAIN GEARBOX FRONT SIDE	79-21-08
PUMP - PRESSURE AND SCAVENGE OIL	--	2	414AR,424AR, MAIN GEARBOX FRONT SIDE	79-21-06
SWITCH - (FIM 79-35-00/101) PRESSURE OIL DIFFERENTIAL PRESSURE, S10131 SCAVENGE OIL DIFFERENTIAL PRESSURE, S10132				
VALVE - OIL COOLER BYPASS	--	2	414AR,424AR, AFT OF OIL TANK	79-21-09

Engine Oil Distribution System - Component Index
Figure 101



Engine Oil Distribution System - Component Location
Figure 102

FUEL FILTER HOUSING AND FUEL-COOLED OIL COOLER (FCOC) - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks.
      (1) The first task is to remove the fuel filter housing and fuel-cooled oil cooler (referred to as the FCOC),
      (2) The second task is to install the fuel filter housing and FCOC.
   B. The fuel filter housing and the fuel-cooled oil cooler stay together when you remove or install them.
   C. Use the procedures in AMM 70-51-00/201 to tighten the fasteners.
   D. Tighten the fasteners to the torque values in AMM 70-51-00/201 unless a torque value is specified in this procedure.
   E. Use the procedures in AMM 70-02-01/201 to install the seal rings.

TASK 79-21-01-004-022-R00

2. Remove the Fuel Filter Housing and Fuel-Cooled Oil Cooler (FCOC)
   A. Equipment
      (1) Container - 10 quarts (10 liters) minimum capacity
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 73-11-10/401, LP Fuel Filter Element
      (4) AMM 73-34-01/401, Differential Pressure Switch
      (5) AMM 73-35-01/401, Fuel Pressure Switch
   C. Access
      (1) Location Zones
          414 Left Engine Right Fan Cowl Panel
          424 Right Engine Right Fan Cowl Panel

      (2) Access Panels
          414AR Left Engine Right Fan Cowl Panel
          424AR Right Engine Right Fan Cowl Panel

   D. Prepare to Remove the FCOC

      S 864-023-R00
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 044-024-R00
      (2) Do these steps to make sure the fuel valves are closed:
          (a) For the left engine, make sure this circuit breaker is closed:
              1) P6-1 Main Power Distribution Panel
                  a) 6E1, FUEL VALVES L SPAR
          (b) For the right engine, make sure this circuit breaker is closed:
              1) P6-1 Main Power Distribution Panel
                  a) 6E2, FUEL VALVES R SPAR
          (c) Make sure the FUEL CONTROL switch on the control stand is in the CUTOFF position.
          (d) Attach a DO-NOT-OPERATE tag to the FUEL CONTROL switch.
          (e) Make sure the ENG VALVE and FUEL SPAR lights on the control stand are OFF.

(f) For the left engine, open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) P6-1 Main Power Distribution Panel
a) 6E1, FUEL VALVES L SPAR
(g) For the right engine, open this circuit breaker and attach a DO-NOT-CLOSE tag:
1) P6-1 Main Power Distribution Panel
a) 6E2, FUEL VALVES R SPAR

S 864-025-R00
(3) Remove the electrical power (AMM 24-22-00/201).

S 014-026-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) Open the right fan cowl panel (AMM 71-11-04/201).

S 024-027-R00
(5) Remove the fuel filter differential pressure switch (AMM 73-34-01/401).

S 024-028-R00
(6) Remove the fuel low pressure warning switch (AMM 73-35-01/401).

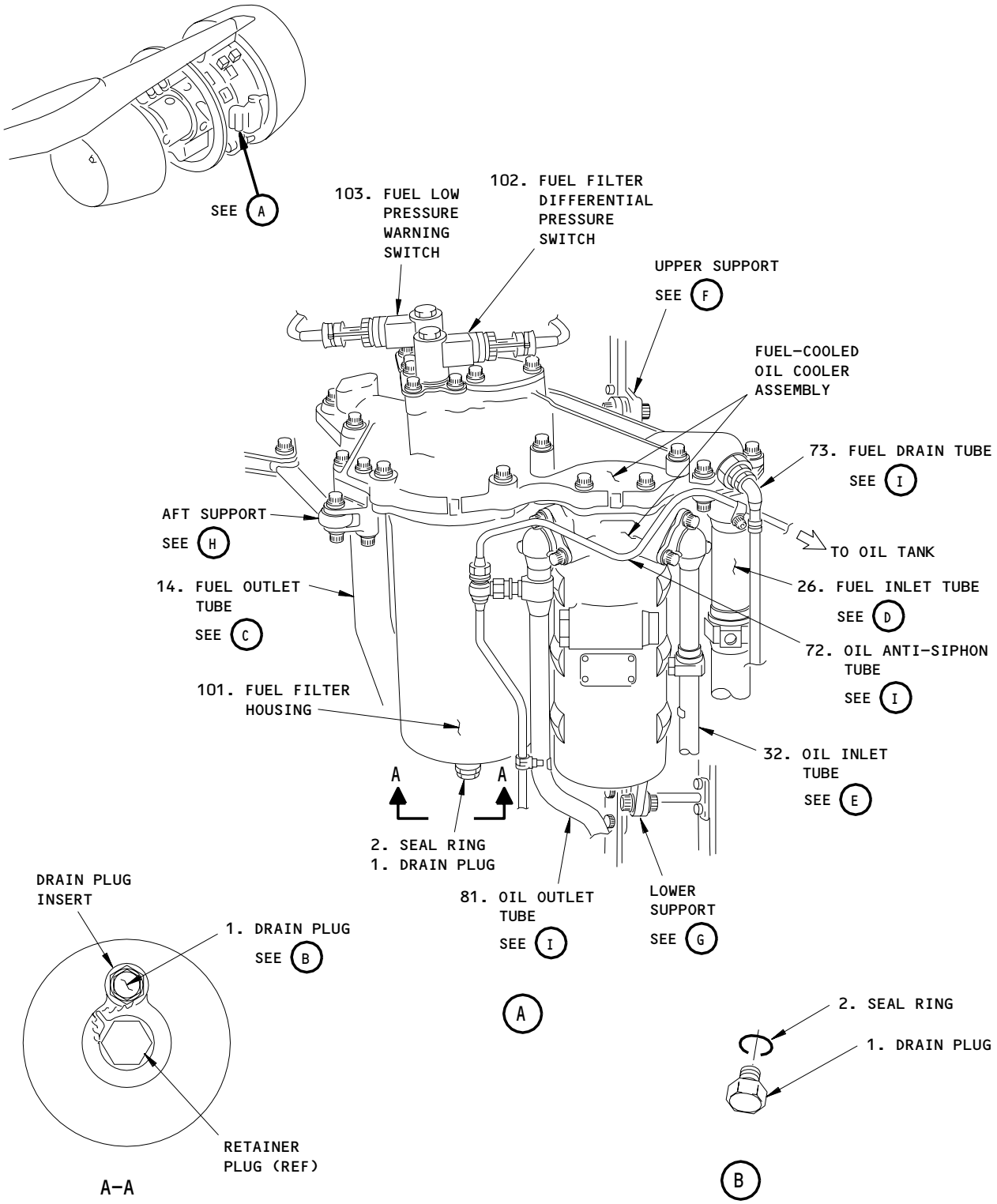
S 684-029-R00
(7) Drain the fuel from the fuel filter housing (Fig. 401).
(a) Put the container under the fuel filter drain plug.
(b) Remove the fuel filter drain plug (1) (Fig. 401, View A-A and B).

NOTE: When you remove or install the drain plug, hold the drain plug insert with a wrench so the insert does not turn.

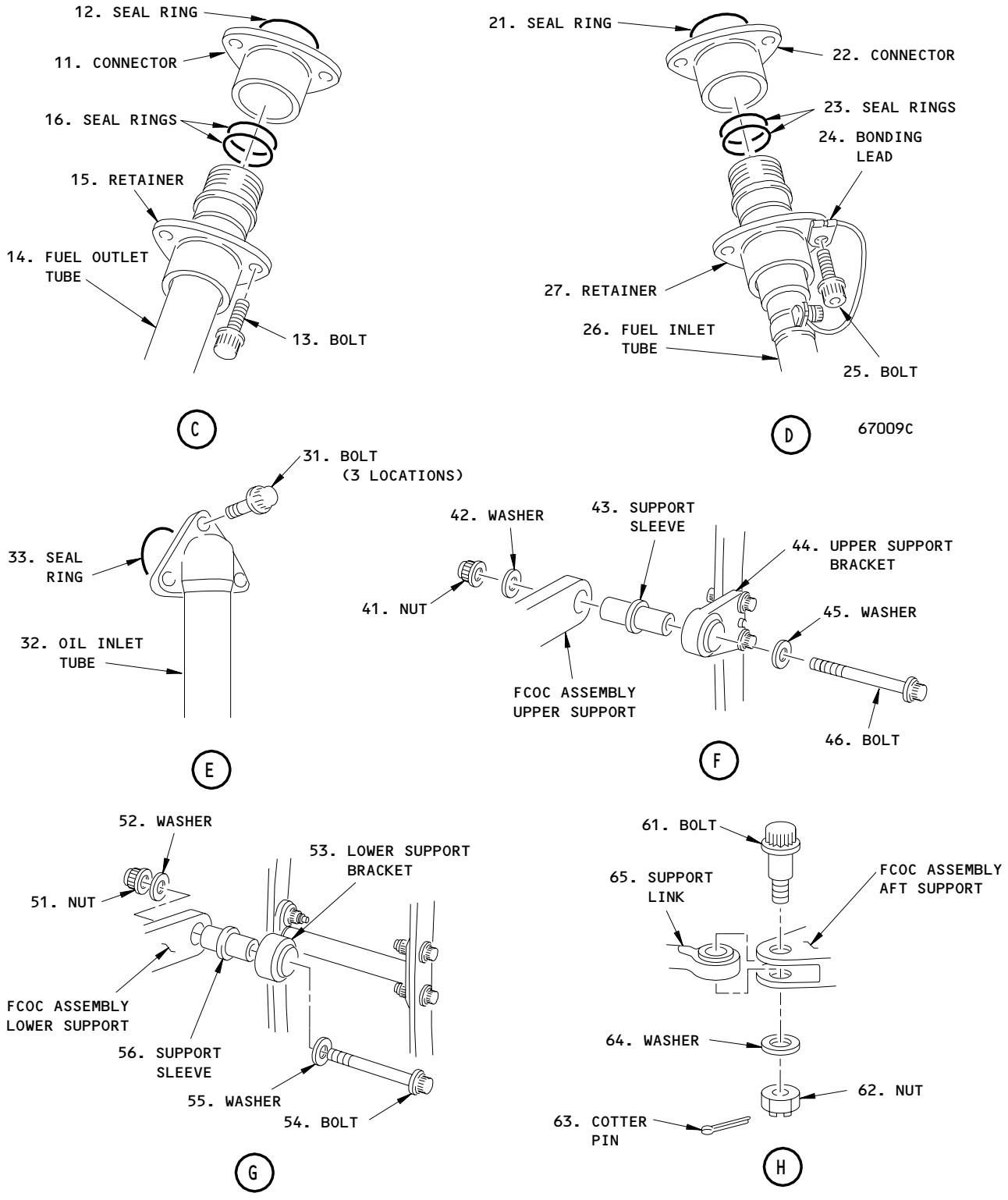
(c) Remove and discard the seal ring (2) from the drain plug.
(d) Let the fuel drain from the fuel filter housing.
(e) Lubricate and install a new seal ring (2) on the drain plug (1).
(f) Install the drain plug (1).
(g) Tighten the plug to 250 pound-inches (28.2 newton-meters).
(h) Safety the plug.

E. Remove the FCOC

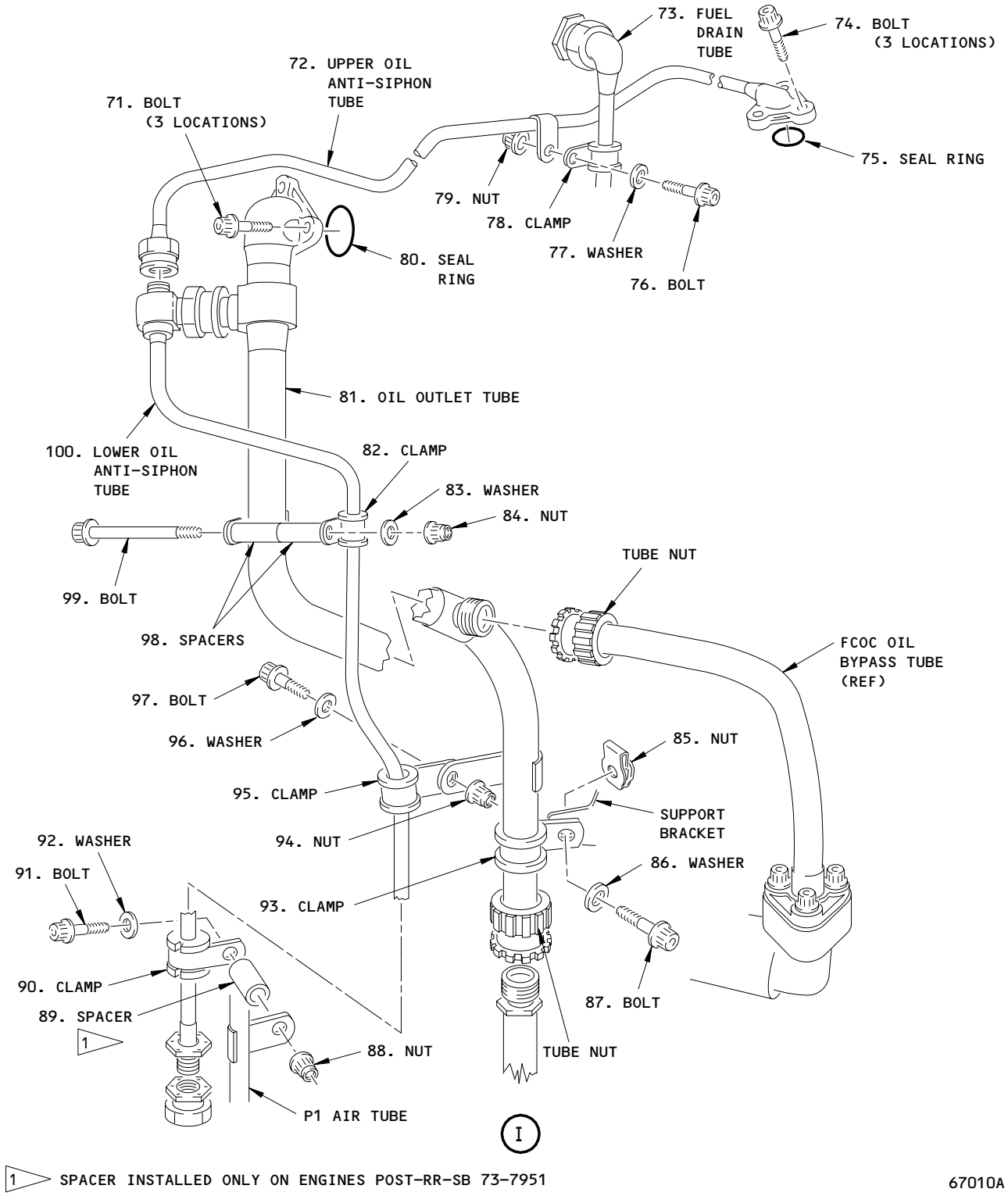
S 034-030-R00
(1) Do these steps to remove the upper oil anti-siphon tube (72) (Fig. 401, View I):
(a) Remove the bolt (76) which holds the fuel drain tube clamp (78) to the upper oil anti-siphon tube (72).



Fuel-Cooled Oil Cooler and Fuel Filter Assembly - Installation
Figure 401 (Sheet 1)



Fuel-Cooled Oil Cooler and Fuel Filter Assembly - Installation
Figure 401 (Sheet 2)



1 SPACER INSTALLED ONLY ON ENGINES POST-RR-SB 73-7951

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Fuel-Cooled Oil Cooler and Fuel Filter Assembly - Installation
Figure 401 (Sheet 3)

(b) Disconnect the fuel drain tube (73) from the FCOC.
(c) Remove the bolts (74) which hold the upper oil anti-siphon tube (72) to the oil tank.
(d) Disconnect the upper oil anti-siphon tube (72) at the lower oil anti-siphon tube (100) fitting.
(e) Remove the upper oil anti-siphon tube (72) and discard the seal ring (75).

S 034-031-R00
(2) Do these steps to remove the lower oil anti-siphon tube (100) (Fig. 401, View I):
(a) Remove the bolt (99) which holds the oil outlet tube (81) to the lower oil anti-siphon tube clamp (82).
(b) Remove the bolt (97) which holds the oil outlet tube (81) to the lower oil anti-siphon tube clamp (95).
(c) Remove the bolt (91) which holds the P1 air tube to the lower oil anti-siphon tube clamp (90).
(d) Disconnect the lower oil anti-siphon tube (100) at the lower and upper ends.
(e) Remove the lower oil anti-siphon tube (100).

S 034-032-R00
(3) Do these steps to remove the oil outlet tube (81) (Fig. 401, View I):
(a) Remove the bolt (87) which holds the oil outlet tube clamp (93) to the support bracket.
(b) Disconnect the FCOC oil bypass tube from the oil outlet tube (81).
(c) Remove the bolts (71) which hold the oil outlet tube (81) to the FCOC.
(d) Disconnect the oil outlet tube (81) at the lower end.
(e) Remove the oil outlet tube (81) and discard the seal ring (80).

S 034-033-R00
(4) Remove the bolts (31) which hold the oil inlet tube (32) to the FCOC (Fig. 401, View E).

S 034-034-R00
(5) Remove the bolts (13) which hold the fuel outlet tube (14) to the FCOC (Fig. 401, View C).

S 034-035-R00
(6) Remove the bolts (25) which hold the fuel inlet tube (26) to the FCOC (Fig. 401, View D).

S 024-036-R00
(7) Remove the bolt (61) which holds the support link (65) to the aft support of the FCOC (Fig. 401, View H).

S 024-037-R00
(8) Move the support link (65) away from the FCOC support.

S 024-038-R00

(9) Remove the bolts (46, 54) from the upper and the lower support brackets (44, 53) (Fig. 401, View F and G).

S 024-039-R00

WARNING: BE CAREFUL WHEN YOU MOVE THE FCOC. BECAUSE IT WEIGHS APPROXIMATELY 40 LBS (18 KG), INJURY TO PERSONS CAN OCCUR.

(10) Move the FCOC aft to disengage the support sleeves (43, 56) at the upper/lower support brackets (44, 53) and remove the FCOC.

S 034-040-R00

(11) Do these steps to remove the seal rings from the fuel outlet tube (14) (Fig. 401, View C):
(a) Discard the connector seal ring (12) from the fuel outlet tube.
(b) Remove the connector (11) from the fuel outlet tube end (14).
(c) Discard the seal rings (16).

S 034-041-R00

(12) Do these steps to remove the seal rings from the fuel inlet tube (26) (Fig. 401, View D):
(a) Discard the connector seal ring (21) from the fuel inlet tube.
(b) Remove the connector (22) from the fuel inlet tube end (26).
(c) Discard the seal rings (23).

S 034-042-R00

(13) Discard the connector seal ring (33) from the fuel inlet tube (Fig. 401, View E).

S 034-043-R00

(14) Install the caps on all the exposed tubes/ports.

TASK 79-21-01-404-044-R00

3. Install the Fuel Filter Housing and Fuel-Cooled Oil Cooler (FCOC)

A. Equipment
(1) Container - 10 quarts (10 liters) minimum capacity

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Drain Plug	79-11-10	01	30
	2	Seal Ring			25
	11	Connector	73-11-06	05	158
	12	Seal Ring			145
	13	Bolt			110
	16	Seal Ring			139
	21	Seal Ring			145
	22	Connector			157
	23	Seal Ring			140
	25	Bolt			110
	31	Bolt	79-21-05	07	110
	33	Seal Ring			140
	41	Nut	79-21-01	01	70
	42	Washer			60
	43	Sleeve - Support			65
	45	Washer			60
	46	Bolt			55
	51	Nut	79-21-01	01	125
	52	Washer			115
	54	Bolt			100
	55	Washer			115
	56	Sleeve - Support			120

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	61	Bolt	79-21-01	01	15
	62	Nut			25
	63	Cotter Pin			10
	64	Washer			20
	72	Tube - Upper Oil Anti-Siphon	79-21-05	13	70
	74	Bolt			5
	75	Seal Ring			60
	76	Bolt	73-11-06	05	4
	77	Washer			42,43
	79	Nut			64,67
	81	Tube - Oil Outlet	79-21-05	07	115
	71	Bolt	79-21-05	07	110
	80	Seal Ring			140

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	82	Clamp	79-21-05	07	81
	83	Washer			32
	84	Nut			67
	85	Nut			70
	86	Washer			35
	87	Bolt			10
	88	Nut			65
	89	Spacer			50
	90	Clamp			80
	91	Bolt			15
	92	Washer			35
	93	Clamp			85
	94	Nut			65
	95	Clamp			80
	96	Washer			35
	97	Bolt			5
	98	Spacer			52
	99	Bolt			7
	100	Tube - Lower Oil Anti-Siphon			130

C. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-11-04/201, Fan Cowl Panels
(3) AMM 73-11-10/401, LP Fuel Filter Element
(4) AMM 73-34-01/401, Differential Pressure Switch
(5) AMM 73-35-01/401, Fuel Pressure Switch

D. Access
(1) Location Zones
414 Left Engine Right Fan Cowl Panel
424 Right Engine Right Fan Cowl Panel

(2) Access Panels
414AR Left Engine Right Fan Cowl Panel
424AR Right Engine Right Fan Cowl Panel

E. Prepare to Install the FCOC

S 864-045-R00
(1) Supply the electrical power (AMM 24-22-00/201).

S 044-046-R00
(2) Do these steps to make sure the fuel valves are closed:
(a) Make sure the FUEL CONTROL switch on the control stand is in the CUTOFF position.

(b) Make sure a DO-NOT-OPERATE tag is attached to the FUEL CONTROL switch.
(c) Make sure the ENG VALVE and FUEL SPAR lights on the control stand are OFF.
(d) For the left engine, make sure this circuit breaker is open and a DO-NOT-CLOSE tag is attached:
1) P6-1 Main Power Distribution Panel
a) 6E1, FUEL VALVES L SPAR
(e) For the right engine, make sure this circuit breaker is open and a DO-NOT-CLOSE tag is attached:
1) P6-1 Main Power Distribution Panel
a) 6E2, FUEL VALVES R SPAR

S 864-047-R00
(3) Remove the electrical power (AMM 24-22-00/201).

S 014-048-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) Open the right fan cowl panel (AMM 71-11-04/201).

S 424-049-R00
(5) Remove the caps from the tubes and the ports.

S 434-050-R00
(6) Do these steps to install new seal rings to the fuel outlet tube (14) (Fig. 401, View C):
(a) Lubricate new seal rings (16) with oil and install them on the fuel outlet tube (14) end.
(b) Put the fuel outlet tube connector (11) on the fuel outlet tube (14) end.
(c) Lubricate a new seal ring (12) with oil and install it on the fuel outlet tube connector (11).

S 434-051-R00
(7) Do these steps to install new seal rings to the fuel inlet tube (26) (Fig. 401, View D):
(a) Lubricate new seal rings (23) with oil and install them on the fuel inlet tube (26) end.
(b) Put the fuel inlet tube connector (22) on the fuel inlet tube (26) end.
(c) Lubricate a new seal ring (21) with oil and install it on the fuel inlet tube connector (22).

S 434-052-R00
(8) Lubricate a new seal ring (33) with oil and install it on the oil inlet tube (32) connector (Fig. 401, View E).

S 434-053-R00

CAUTION: MAKE SURE THE LP FUEL FILTER IS INSTALLED IN THE FUEL FILTER HOUSING. IF A LP FUEL FILTER ELEMENT IS NOT INSTALLED, YOU CAN CAUSE DAMAGE TO THE FUEL SYSTEM COMPONENTS AND THE ENGINE.

(9) Make sure the LP fuel filter element is installed (AMM 73-11-01/401).

F. Install the FCOC

S 424-054-R00

WARNING: BE CAREFUL WHEN YOU MOVE THE FCOC. BECAUSE IT WEIGHS APPROXIMATELY 40 LBS (18 KG), INJURY TO PERSONS CAN OCCUR.

(1) Put the FCOC aft of the upper/lower support brackets (44, 53) and move it on the support sleeves (43, 56) (Fig. 401, View F and G).

S 424-055-R00

(2) Align the support link (65) with the FCOC aft support (Fig. 401, View H).

S 424-056-R00

(3) Attach the support link (65) to the FCOC aft support with the bolt (61), the washer (64), the nut (62) and the cotter pin (63).

S 424-057-R00

(4) Attach the upper support of the FCOC to the upper support bracket (44) with the bolt (46), the washers (42, 45) and the nut (41) (Fig. 401, View F).

S 424-058-R00

(5) Attach the lower support of the FCOC to the lower support bracket (53) with the bolt (54), the washers (55, 52) and the nut (51) (Fig. 401, View G).

S 434-059-R00

(6) Connect the fuel outlet tube (14) to the FCOC with the bolts (13) (Fig. 401, View C).

S 434-060-R00

(7) Connect the fuel inlet tube (26) to the FCOC with the bolts (25) (Fig. 401, View D).

S 434-061-R00

(8) Install the bonding lead (24) under the bolthead.

S 434-062-R00

(9) Connect the oil inlet tube (32) to the FCOC with the bolts (31) (Fig. 401, View E).

S 434-063-R00

(10) Do these steps to install the oil outlet tube (81) (Fig. 401, View I):
  (a) Lubricate a new seal ring (80) with oil and install it on the oil outlet tube (81) connector.
  (b) Put the oil outlet tube (81) in place on the engine.
  (c) Connect the tube nut at the lower end of the oil outlet tube (81).
  (d) Safety the tube nut.
  (e) Connect the upper end of the oil outlet tube (81) to the FCOC with the bolts (71).
  (f) Connect the FCOC oil bypass tube to the oil outlet tube (81) with the tube nut.
  (g) Safety the tube nut.
  (h) Attach the oil outlet tube clamp (93) to the support bracket with the bolt (87), the washer (86) and the nut (85).

S 434-064-R00

(11) Do these steps to install the lower oil anti-siphon tube (100) (Fig. 401, View I):
  (a) Put the lower oil anti-siphon tube (100) in place on the engine.
  (b) Connect the tube nuts at the upper and lower ends of the oil anti-siphon tube (100).
  (c) Safety the tube nuts.
  (d) Attach the lower oil anti-siphon tube clamp (82) to the oil outlet tube (81) with the bolt (99), the spacers (98), the washer (83) and the nut (84).
  (e) Attach the lower oil anti-siphon tube clamp (95) to the oil outlet tube (81) with the bolt (97), the washer (96) and the nut (94).
  (f) ENGINES POST-RR-SB 73-7951;
  Attach the lower oil anti-siphon tube clamp (90) to the P1 air tube with the bolt (91), the washer (92), the spacer (89) and the nut (88).
  (g) ENGINES PRE-RR-SB 73-7951;
  Attach the lower oil anti-siphon tube clamp (90) to the P1 air tube with the bolt (91), the washer (92) and the nut (88).

S 434-065-R00

(12) Do these steps to install the upper oil anti-siphon tube (72) (Fig. 401, View I).
  (a) Lubricate a new seal ring (75) with oil and install it on the upper oil anti-siphon tube (72) oil tank fitting.
  (b) Put the upper oil anti-siphon tube (72) in place on the engine.
  (c) Connect the upper oil anti-siphon tube (72) to the oil tank with the bolts (74).
  (d) Connect the upper oil anti-siphon tube (72) tube nut to the lower oil anti-siphon tube (100) fitting.
  (e) Safety the tube nut.

S 434-066-R00
(13) Connect the fuel drain tube (73) tube nut to the FCOC.

S 434-067-R00
(14) Safety the tube nut.

S 434-068-R00
(15) Attach the clamp (78) to the upper oil anti-siphon tube (72) with the bolt (76), the washer (77) and the nut (79).

S 424-069-R00
(16) Install the fuel filter differential pressure switch (AMM 73-34-01/401).

S 434-070-R00
(17) Install the fuel low pressure warning switch (AMM 73-35-01/401).

G. Put the Airplane Back to the its Usual Condition

S 864-071-R00
(1) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) P6-1 Main Power Distribution Panel
1) 6E1, FUEL VALVES L SPAR

S 864-072-R00
(2) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker:
(a) P6-1 Main Power Distribution Panel
1) 6E2, FUEL VALVES R SPAR

S 444-073-R00
(3) Remove the DO-NOT-OPERATE tag from the FUEL CONTROL switch.

S 414-074-R00
(4) Close the right fan cowl panel (AMM 71-11-04/201).

MAGNETIC CHIP DETECTORS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks.
      (1) Remove the magnetic chip detectors (referred to as the MCDs), and
      (2) Install the MCDs.
   B. ENGINES WITHOUT RR SB 72-7812;
      these MCDs are installed on the engine:
      (1) Master
      (2) Internal gearbox
      (3) High Speed External Gearbox
      (4) Bevel Box
      (5) LP Turbine Bearing Housing
      (6) HP/IP Turbine Bearing Housing
      (7) Front Bearing Housing
   C. ENGINES WITH RR SB 72-7812;
      these MCDs are installed on the engine:
      (1) Master
      (2) Internal gearbox
      (3) Bevel Box
      (4) High Speed External Gearbox
      (5) LP Turbine Bearing Housing
      (6) HP/IP Turbine Bearing Housing
      (7) Front Bearing Housing

   TASK 79-21-03-004-001-R00

2. Remove the Magnetic Chip Detectors
   A. General
      (1) This task has 3 parts.
         (a) Remove the MCDs,
         (b) Remove the MCD housings, and
         (c) Remove the MCD housing strainers.
      (2) It is not necessary to do all of this task if you will not remove the MCD housings or the MCD housing strainers.
   B. Equipment
      (1) Container - approximately 2 1/2 gallon (10 liter) capacity, for oil
   C. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 79-00-00/601, Oil

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

D. Access

(1) Location Zones

413 Fan Cowl Panel (Left)
414 Fan Cowl Panel (Right)
416 Thrust Reverser (Right)
423 Fan Cowl Panel (Left)
424 Fan Cowl Panel (Right)
426 Thrust Reverser (Right)

(2) Access Panels

413AL Fan Cowl Panel (Left)
414AR Fan Cowl Panel (Right)
414CR Master Chip Detector Access Panel
415FL C-Duct Front Latch Access Panel
423AL Fan Cowl Panel (Left)
424AR Fan Cowl Panel (Right)
424CR Master Chip Detector Access Panel
425FL C-Duct Front Latch Access Panel

E. Prepare to Remove the MCDs, the MCD Housings or the MCD Housing Strainers (Fig. 401, 402)

S 864-078-R00

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

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

S 014-002-R00

(2) Use the MCD vs Access Panel Table to find the correct access panel for the MCD location.

MCD vs Access Panel Table

Magnetic Chip Detector	Access Panel
Master	Master Chip Detector Access Panel
High Speed External Gearbox	Right Fan Cowl Panel
Bevel Box	Left and Right Fan Cowl Panels
LP Turbine Bearing Housing	Left and Right Fan Cowl Panels
HP/IP Turbine Bearing Housing	Left and Right Fan Cowl Panels
Front Bearing Housing	Left and Right Fan Cowl Panels
Internal Gearbox	C-Duct Front Latch Access Panel

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.

(3) Open the correct access panel for the MCD location.

NOTE: Use AMM 71-11-04/201, if it is necessary, to open the fan cowl panel.

F. Remove the MCDs (Fig. 401, 402)

S 024-005-R00

WARNING: DO NOT LET THE ENGINE OIL TOUCH YOU FOR A LONG TIME. YOU CAN ABSORB DANGEROUS MATERIALS IF YOU LET THE OIL TOUCH YOU FOR A LONG TIME.

DO NOT TOUCH THE PARTS OF THE OIL SYSTEM IF THE ENGINE IS HOT. THE OIL SYSTEM STAYS HOT FOR MORE TIME THAN THE OTHER ENGINE PARTS. INJURY CAN OCCUR IF YOU TOUCH A HOT OIL SYSTEM.

CAUTION: DO NOT LET THE ENGINE OIL TOUCH THE PARTS WHICH DO NOT USUALLY TOUCH THE OIL. THE ENGINE OIL CAN CAUSE DAMAGE TO RUBBER, PAINT, AND OTHER ENGINE PARTS. IF THE OIL TOUCHES THESE PARTS, MAKE SURE THAT YOU IMMEDIATELY CLEAN THE PARTS THAT THE OIL HAS FLOWED ON TO.

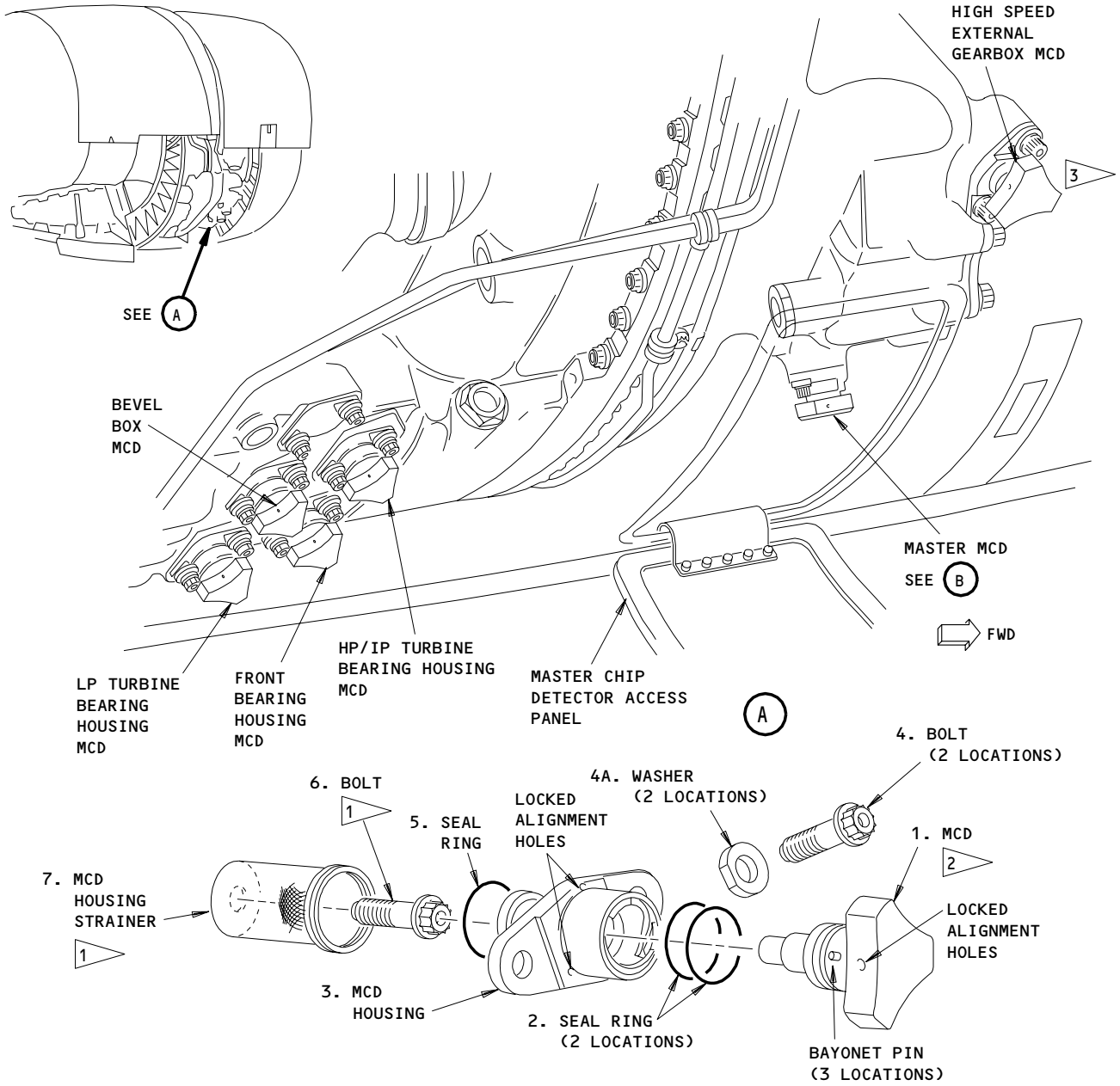
DO NOT LET ALKALINE FLUIDS (SUCH AS CLEANERS) CAUSE CONTAMINATION OF THE OIL WHICH WILL GO INTO THE ENGINE. VERY SMALL QUANTITIES OF ALKALINE FLUIDS WILL CAUSE DAMAGE TO THE ENGINE OIL. YOU MUST USE VERY CLEAN CONTAINERS AND EQUIPMENT.

DO NOT PUT OIL THAT HAS BEEN DRAINED BACK INTO THE OIL SYSTEM.

(1) ENGINES WITHOUT RR SB 72-7815;

S 024-080-R00

(2) Do these steps to remove the MCD:
(a) Push the MCD (1) in.



AT ALL MCD LOCATIONS (EXAMPLE)

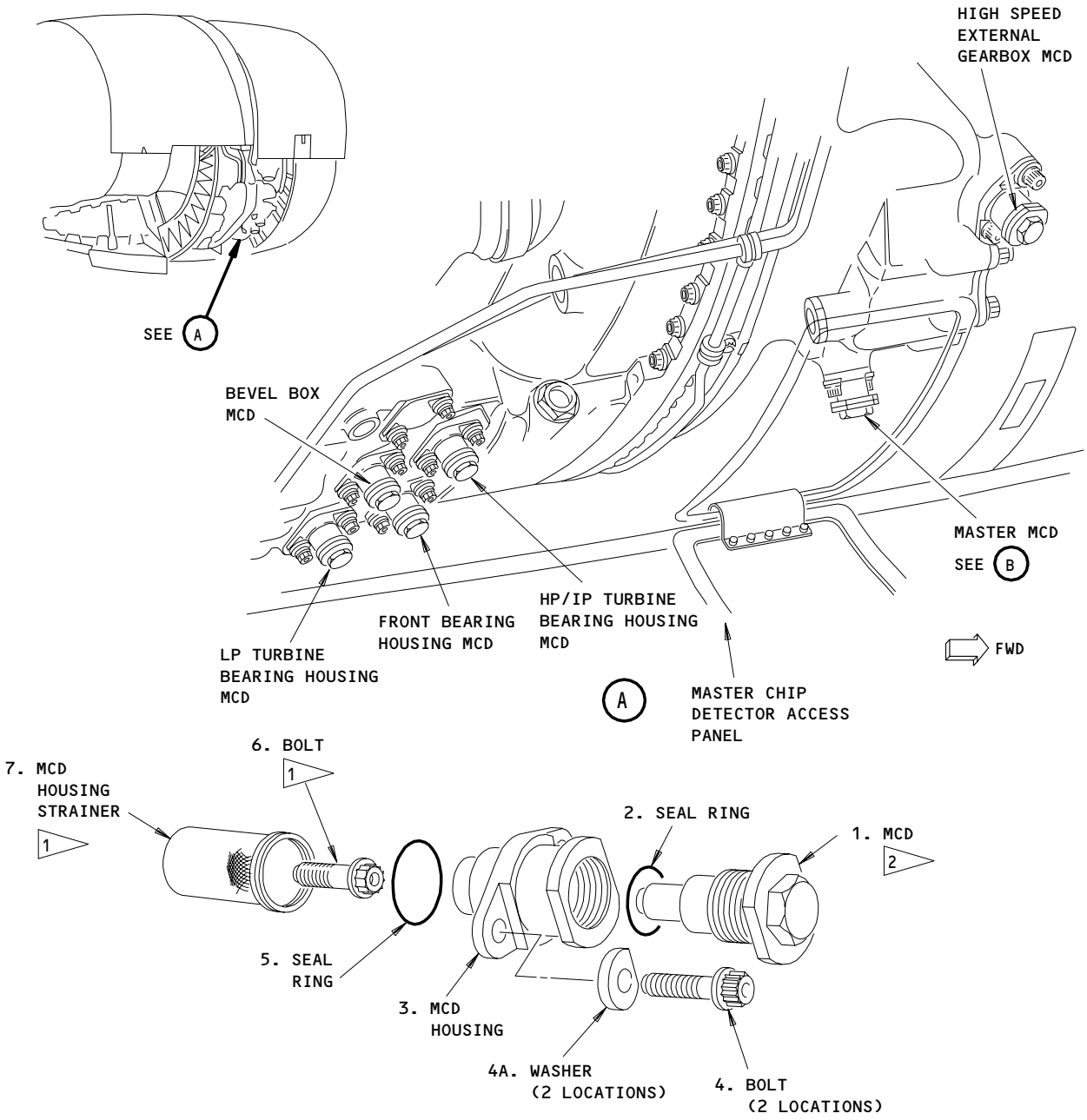
B

1 ENGINES WITH THE MCD HOUSING STRAINER INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX POSITION ONLY

2 ENGINES WITHOUT RR SB 72-7815 AND/OR WITHOUT RR SB 72-8824

3 ENGINES WITH RR SB 72-7911;
THE MCD CAN BE INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX
AT THE OPERATORS DISCRETION

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401 (Sheet 1)



AT ALL MCD LOCATIONS (EXAMPLE)

B

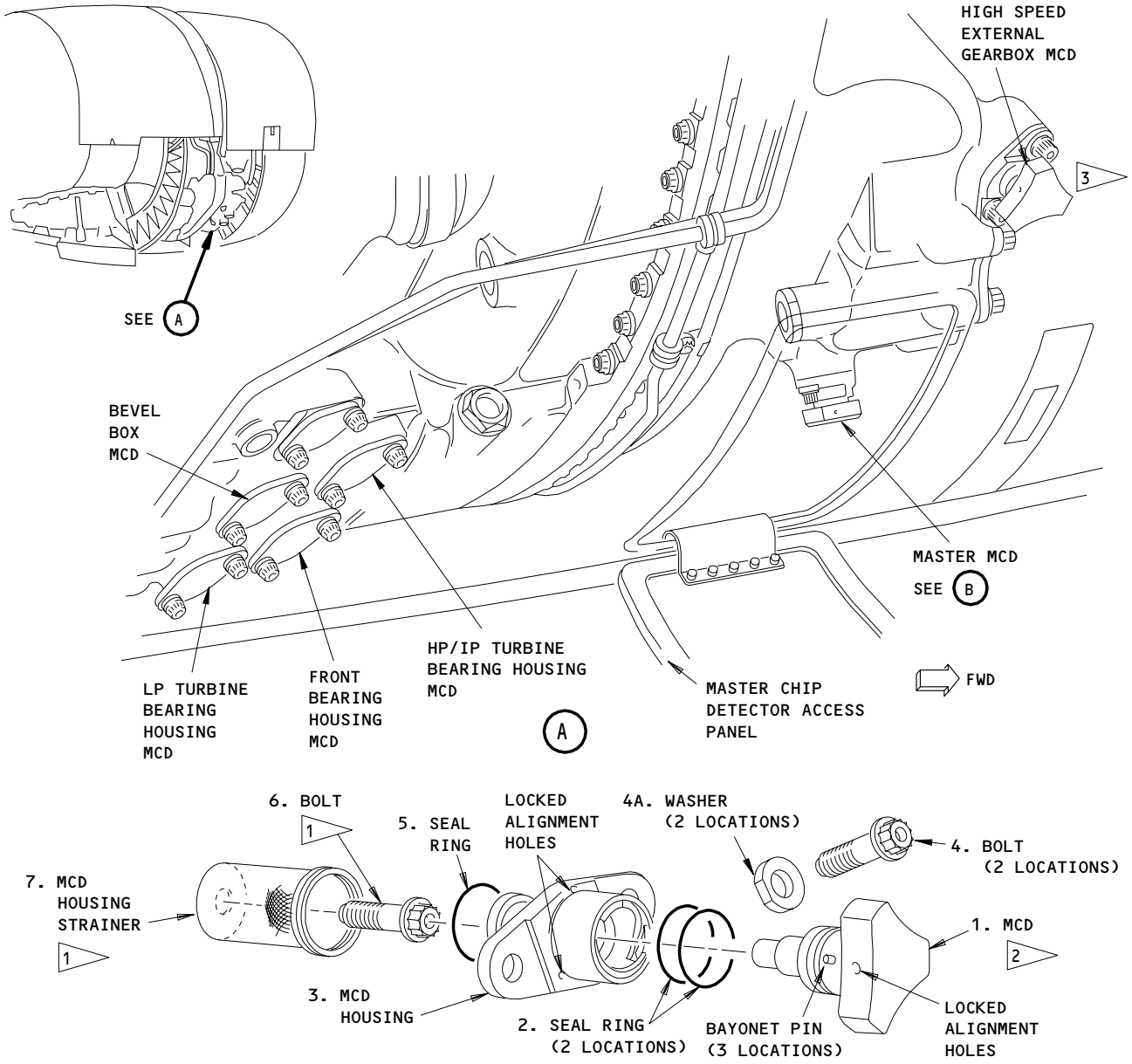
1 ENGINES WITH THE MCD HOUSING STRAINER INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX POSITION ONLY

2 ENGINES WITH RR SB 72-7815 AND/OR WITH RR SB 72-8824

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401 (Sheet 2)

EFFECTIVITY
ENGINES WITHOUT RR SB 72-7812

704489



AT ALL MCD LOCATIONS (EXAMPLE)

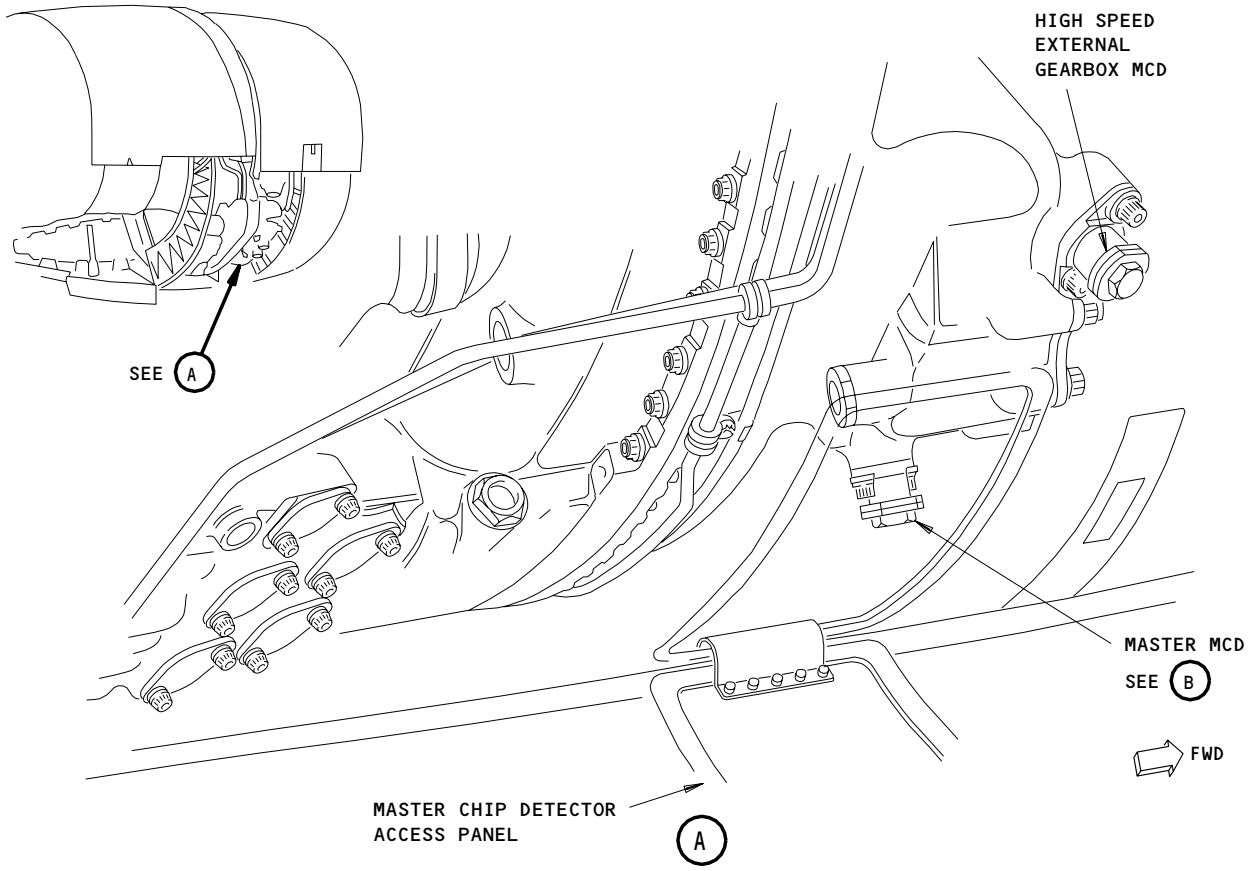
B

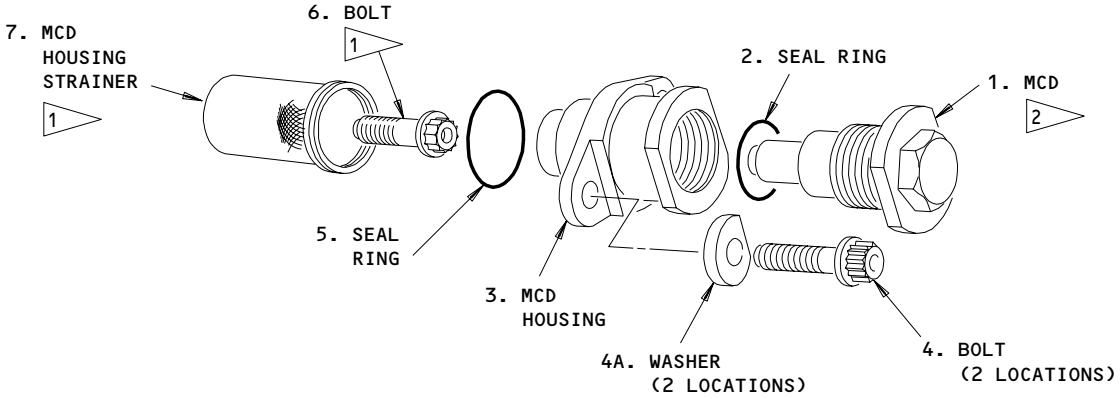
1 ENGINES WITH THE MCD HOUSING STRAINER INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX MCD ONLY

2 ENGINES WITHOUT RR SB 72-7815 AND/OR WITHOUT RR SB 72-8824

3 ENGINES WITH RR SB 72-7911; THE MCD CAN BE INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX AT THE OPERATORS DISCRETION

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401A (Sheet 1)





AT ALL MCD LOCATIONS (EXAMPLE)

B

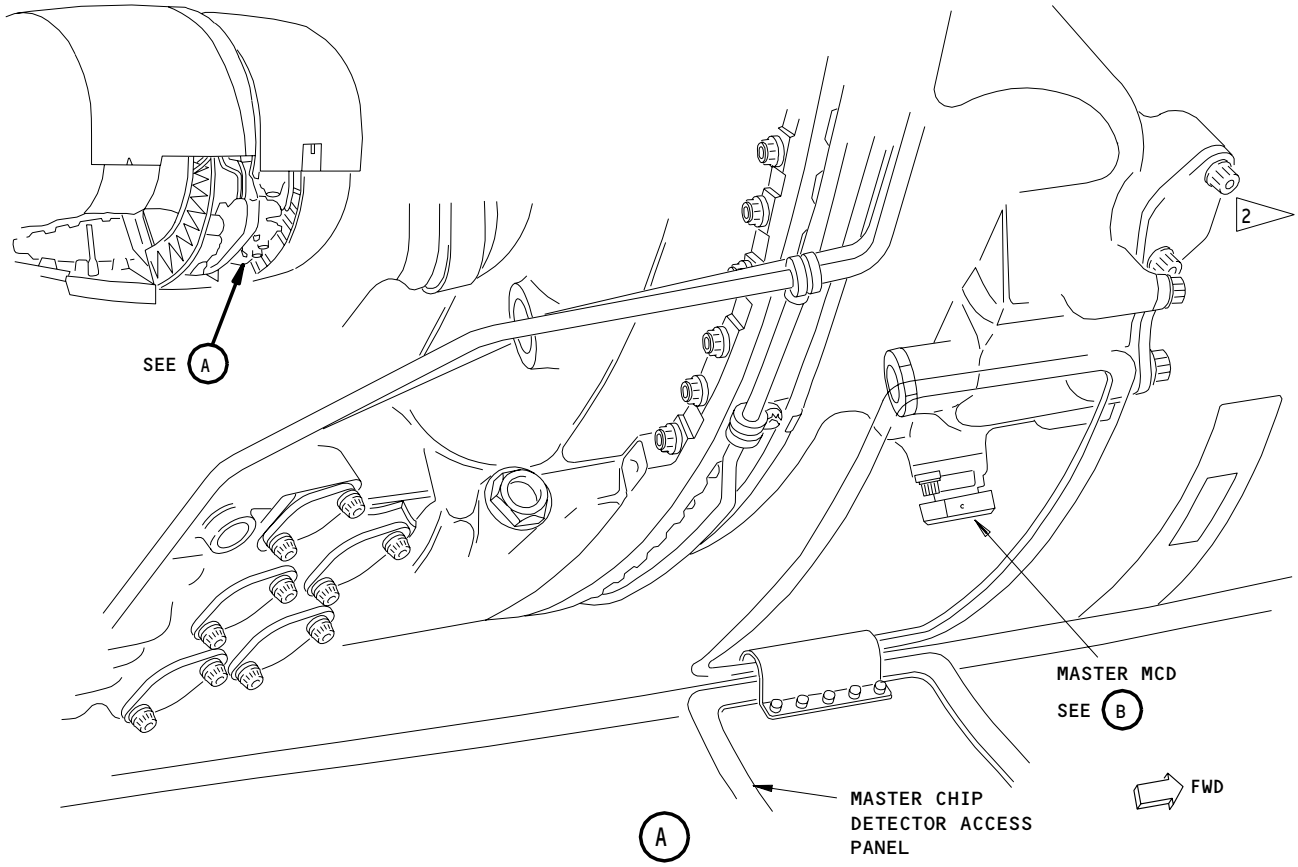
1 ENGINES WITH THE MCD HOUSING STRAINER INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX POSITION ONLY

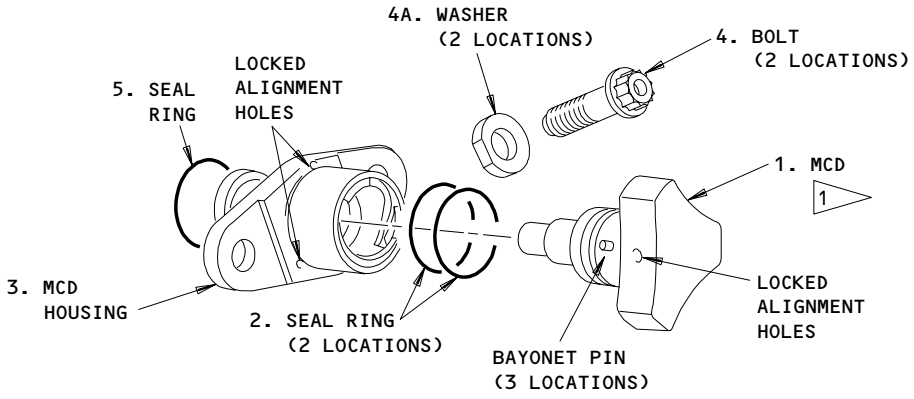
2 ENGINES WITH RR SB 72-7815 AND/OR WITH RR SB 72-8824

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401A (Sheet 2)

EFFECTIVITY
ENGINES WITH RR SB 72-7812

622378





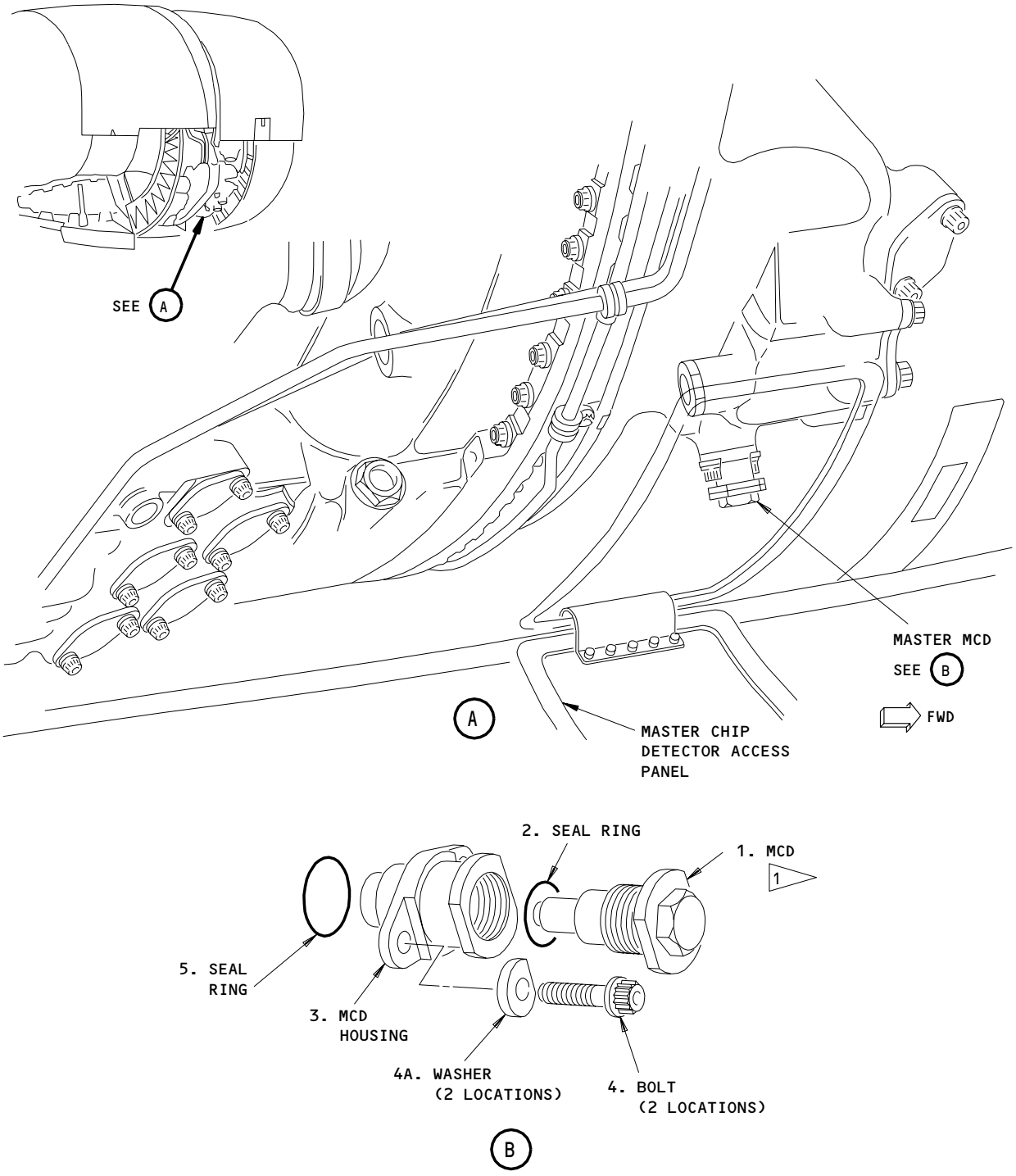
1 ENGINES WITHOUT RR SB 72-7815 AND/OR WITHOUT RR SB 72-8824

2 ENGINES WITH RR SB 72-7911, THE MCD CAN BE INSTALLED AT THE HIGH SPEED EXTERNAL GEARBOX AT THE OPERATORS DISCRETION

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401B (Sheet 1)

EFFECTIVITY
ENGINES WITH RR SB 72-7812

704611

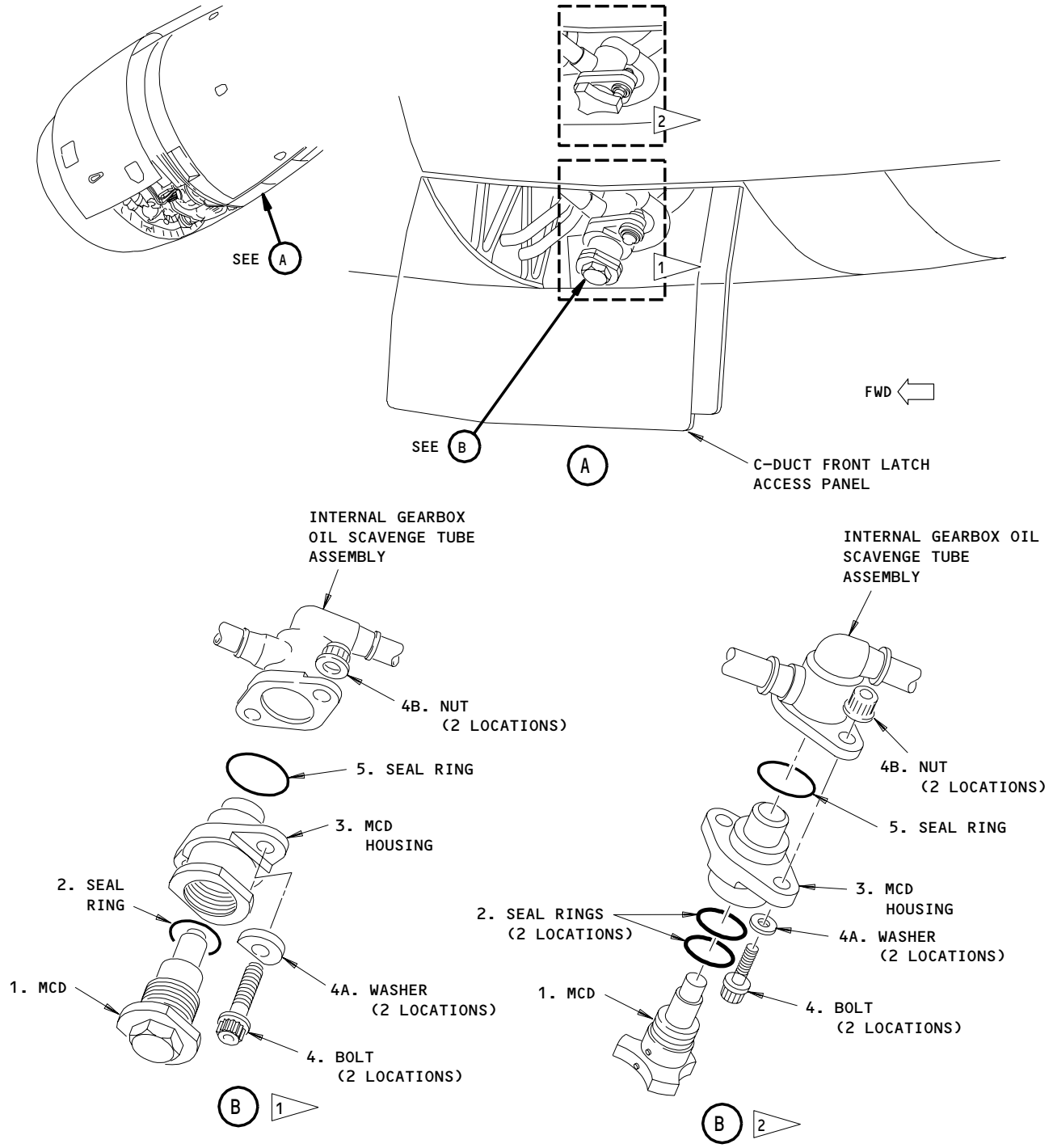


1 ENGINES WITH RR SB 72-7815 AND/OR WITH RR SB 72-8824

Gearbox Area Magnetic Chip Detectors (MCDs) Installation
Figure 401B (Sheet 2)

EFFECTIVITY
ENGINES WITH RR SB 72-7812

704622



Internal Gearbox Magnetic Chip Detector (MCD) Installation
Figure 402

(b) Turn the MCD counterclockwise.
(c) Pull the MCD out of the MCD housing (3).

S 024-007-R00
(3) ENGINES WITH RR SB 72-7815;
remove the lockwire from the MCD (1).
(a) Turn the MCD counterclockwise and remove it.

S 214-012-R00
(4) Examine the MCDs for contamination (AMM 79-00-00/601).

NOTE: If you find some contamination, make a record of the MCD on which you found the damage. This will help you identify the source of the contamination.

G. Remove the MCD Housings (Fig. 401, 402)

S 034-013-R00
(1) Remove the bolts (4).

S 684-070-R00
(2) Put the container below the MCD housing.

S 024-071-R00
(3) Pull the MCD housing (3) out of the engine.

S 684-072-R00
(4) Let the oil flow out of the engine and into the container.

H. Remove the MCD Housing Strainers (Fig. 401)

NOTE: RB211-535E4 ENGINES;
Only the MCD housing at the high speed external gearbox location has a strainer or the MCD housings do not have strainers.

NOTE: ENGINES WITH RR SB 72-7815;
Only the MCD housing at the high speed external gearbox has a strainer.

S 034-073-R00
(1) Remove the bolt (6).

S 024-010-R00
(2) Pull the MCD housing strainer (7) out of the engine.

TASK 79-21-03-404-074-R00

3. Install the Magnetic Chip Detectors

A. General

(1) This task has 3 parts.
  (a) Install the MCD housing strainers,
  (b) Install the MCD housings, and
  (c) Install the MCDs.

(2) It is not necessary to do all of this task if you did not remove the MCD housings or the MCD housing strainers.

(3) Use the procedures in AMM 70-51-00/201 to tighten the fasteners. Tighten the fasteners to the torque values in AMM 70-51-00/201 unless a torque value is specified in this procedure.

(4) Use the procedures in AMM 70-02-01/201 to install the seal rings.

B. Equipment

(1) Brush with rigid bristles, clean

(2) Cloth with no lint

C. Consumable Materials

(1) Degreasing fluid (methylene chloride)
  British Spec/Ref - BS 1994/1953
  American Spec/Ref -
  OMat No. 169

(2) Jointing compound
  British Spec/Ref - DTD 900/4586
  American Spec/Ref -
  OMat No. 4/46

(3) Clean kerosene

D. References

(1) AMM 12-13-01/301, Engine Oil Replenishing

(2) AMM 70-42-12/201, Local Surface Protection

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

(4) AMM 79-00-00/601, Oil

E. Access

(1) Location Zones

413	Fan Cowl Panel (Left)
414	Fan Cowl Panel (Right)
416	Thrust Reverser (Right)
423	Fan Cowl Panel (Left)
424	Fan Cowl Panel (Right)
426	Thrust Reverser (Right)

(2) Access Panels

413AL	Fan Cowl Panel (Left)
414AR	Fan Cowl Panel (Right)
414CR	Master Chip Detector Access Panel
415FL	C-Duct Front Latch Access Panel
423AL	Fan Cowl Panel (Left)
424AR	Fan Cowl Panel (Right)
424CR	Master Chip Detector Access Panel
425FL	C-Duct Front Latch Access Panel

F. Install the MCD Housing Strainers (Fig. 401)

NOTE: RB211-535E4 ENGINES;
Only the MCD housing at the high speed external gearbox location has a strainer or the MCD housings do not have strainers.

NOTE: ENGINES WITH RR SB 72-7815;
Only the MCD housing at the high speed external gearbox location has a strainer.

S 114-015-R00
(1) Clean the MCD housing strainer (7) with clean kerosene.

S 114-016-R00
(2) Let the MCD housing strainer become dry.

S 424-017-R00
(3) Put the MCD housing strainer into the engine opening.

S 434-018-R00
(4) Install the bolt (6) which holds the MCD housing strainer in the engine.

G. Install the MCD Housing (Fig. 401, 402)

S 114-019-R00

WARNING: USE SUFFICIENT AIR FLOW WHEN YOU USE THE DEGREASING FLUID. INJURY CAN OCCUR IF YOU BREATHE TOO MUCH OF THE GAS OF THE FLUID.
DO NOT LET THE DEGREASING FLUID TOUCH YOU FOR A LONG TIME. INJURY CAN OCCUR IF YOU LET THE DEGREASING FLUID TOUCH YOU FOR A LONG TIME.

CAUTION: ONLY PUT THE DEGREASING FLUID ON THE SPECIFIED MATING FACES. IF THE DEGREASING FLUID TOUCHES OTHER PARTS OF THE ENGINE, THE FLUID WILL REMOVE THE PROTECTION FROM THE ENGINE SURFACES.

(1) Clean the mating faces of the MCD housing and the opening in the engine.
(a) Put the degreasing fluid on the cloth.

NOTE: Let the fluid flow on cloth while you hold the cloth away from the container of the fluid. This will keep the fluid in the container clean.

(b) Rub the cloth with the degreasing fluid against the mating face of the opening in the engine to clean the face.

NOTE: Do not let the degreasing fluid touch the other parts of the engine. If the degreasing fluid touches other parts of the engine, apply protection to the surface of the part (AMM 70-42-12/201).

(c) Use a new cloth to clean the mating face of the MCD housing with the degreasing fluid.
(d) Let the mating faces dry fully.

S 394-020-R00
(2) Apply the jointing compound to the MCD housing and to the mating face in the engine opening.
(a) Use the brush to apply the jointing compound.
(b) Apply a thin, smooth layer of the jointing compound.
(c) Let the jointing compound dry for 10 minutes.

S 434-021-R00

CAUTION: INSTALL A NEW SEAL RING WHEN YOU INSTALL THE MCD HOUSING. IF YOU DO NOT INSTALL A SEAL RING, AN OIL LEAK CAN OCCUR DURING THE OPERATION OF THE ENGINE. THIS CAN CAUSE ENGINE FAILURE.

(3) Install the seal ring (5) to the housing (3).

S 424-022-R00
(4) Align the holes in the MCD housing with the bolt holes in the engine.

S 424-023-R00
(5) Put the MCD housing (3) into the opening.

S 434-024-R00
(6) At the Internal Gearbox Location:
(a) Attach the MCD housing with the bolts (4), the washers (4A) and the nuts (4B).

S 434-025-R00
(7) At All the Locations Except the Internal Gearbox Location:
(a) Attach the MCD housing with the bolts (4) and the washers (4A).

S 614-026-R00
(8) Fill the oil system (AMM 12-13-01/301).

H. Install the MCDs (Fig. 401, 402)

S 114-027-R00
(1) Clean the MCD (1) with clean kerosene.

S 214-028-R00

(2) MCDs WITH BAYONET PINS;
make sure the three bayonet pins on the MCD do not move.
(a) Try to push the pins in or out with your finger.
(b) Replace the MCD if you can push the pins in or out, or if the pins show signs of wear.

S 214-030-R00

(3) Examine the seal rings.
(a) If the seal rings are flat, twisted or damaged or if they have become larger than new seal rings, replace the seal rings.
(b) If an oil leak occurred before you removed the MCD, replace the seal rings.

CAUTION: MAKE SURE THE SEAL RINGS ARE INSTALLED BEFORE YOU INSTALL THE MCDS. THE THREADED PART OF THE PROBE CAN CAUSE DAMAGE TO THE SEAL RING WHEN THE PROBE IS REMOVED. ALWAYS REMOVE AND DISCARD THE SEAL RING FROM THE PROBE AND INSTALL A NEW SEAL RING. IF YOU DO NOT INSTALL NEW SEAL RINGS, AN OIL LEAK CAN OCCUR DURING THE OPERATION OF THE ENGINE. THIS CAN CAUSE ENGINE FAILURE.

(c) Lubricate the new seal ring with approved engine oil before you install it.
(d) MCDs WITH BAYONET PINS;
Make sure two new seal rings are installed.
(e) MCDs WITH THREADS;
Remove and discard the seal ring from the MCD and install a new seal ring.
(f) Make sure the new seal ring touches the flange of the probe head when installed.

S 644-031-R00

CAUTION: MAKE SURE THE NEW SEAL RING IS INSTALLED BEFORE YOU INSTALL THE MCDS. IF YOU DO NOT INSTALL A NEW SEAL RING AN OIL LEAK CAN OCCUR WHEN THE ENGINE IS OPERATED. THIS CAN CAUSE ENGINE FAILURE.

(4) Lubricate the new seal ring with engine oil before you install the seal ring.

S 424-034-R00

(5) ENGINES WITHOUT RR SB 72-7815 AND WITHOUT RR SB 72-7911;
Do these steps to install the MCDs:
(a) Carefully put the MCD (1) into the MCD housing (3).
(b) Turn the MCD clockwise until you cannot turn it (approximately 60 degrees).
(c) Make sure the bayonet lock is engaged.

(d) Make sure the locked alignment holes on the MCD are aligned with the locked alignment holes on the MCD housing.

S 424-038-R00

(6) ENGINES WITHOUT RR SB 72-7815 AND WITH RR SB 72-7911;
Do these steps to install the MCDs:
(a) Align the bayonet pins on the MCD with the slots in the MCD housing.
(b) Carefully put the MCD (1) into the MCD housing (3).

NOTE: If it is not easy to put the MCD into the MCD housing, remove the MCD and make sure that the seal rings are installed correctly. If the seal rings are not installed correctly, a baulking pin in the MCD will not let you install the MCD.

(c) Push the MCD into the housing as far as you can.
(d) Turn the MCD clockwise until you cannot turn it more.
(e) Release the MCD.
(f) Make sure the locked alignment holes on the MCD are aligned with the locked alignment holes on the MCD housing.
(g) Try to turn the MCD while you lightly pull on the MCD. Make sure the MCD does not turn.

S 424-043-R00

(7) ENGINES WITH RR SB 72-7815;
Do these steps to install the MCDs:
(a) Carefully put the MCD (1) into the MCD housing (3).
(b) Turn the MCD clockwise until the MCD is fully installed.
(c) Tighten the MCD to 60 - 120 pound-inches (6.78 - 13.56 Newton meters).
(d) Safety the MCD to the detector housing.

I. Put the Airplane Back to Its Initial Condition

S 414-049-R00

(1) Use the MCD vs Access Panel Table to find the correct access panel for the MCD location.

MCD vs Access Panel Table

Magnetic Chip Detector	Access Panel
Master	Master Chip Detector Access Panel
High Speed External Gearbox	Right Fan Cowl Panel
Bevel Box	Left and Right Fan Cowl Panels
LP Turbine Bearing Housing	Left and Right Fan Cowl Panels
HP/IP Turbine Bearing Housing	Left and Right Fan Cowl Panels
Front Bearing Housing	Left and Right Fan Cowl Panels
Internal Gearbox	C-Duct Front Latch Access Panel

S 414-050-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.

(2) Close the access panel for the MCD location.

NOTE: Use AMM 71-11-04/201 if it is necessary to close the fan cowl panel.

S 864-079-R00

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

S 724-077-R00

(4) If the chip detector housing was removed, do the required test for the chip detector housing (AMM 71-00-00/501).

NOTE: No test is required if only the chip detector was removed/installed.

PRESSURE AND SCAVENGE OIL FILTER ELEMENT - INSPECTION/CHECK

1. General
   A. The procedure that follows gives steps to examine the pressure and scavenge oil filter elements.
   B. An inspection is not necessary for the scavenge oil filter element. This filter element is discarded after its initial use.

TASK 79-21-04-226-001-R00

2. Examine the Pressure Oil Filter Element
   A. Equipment
      (1) Vernier Caliper
   B. Procedure

      S 216-002-R00

      (1) Examine the pressure oil filter element for worn areas on the end flange seal faces.

      S 976-003-R00

      (2) If the worn area is in the shape of a flaked area, measure the damaged area.
         (a) Use a vernier caliper to measure the width of the flaked area at the maximum width of the worn area.
   C. Accept/Reject Standards - Pressure Oil Filter Element Damage

      S 996-004-R00

      (1) If the widths of the damaged areas are more than 0.100 inches (2.54 mm) and are found on one or two end flange seal faces, reject the filter element.

OIL TUBES AND FITTINGS - INSPECTION/CHECK

1. General
   A. This procedure contains the steps to examine the oil tubes and fittings.

TASK 79-21-05-226-001-R00

2. Examine the Oil Tubes and Fittings
   A. References
      (1) AMM 70-42-11/201, Surface Repairs
   B. Access
      (1) Location Zones
          410 Left Engine
          420 Right Engine

      (2) Access Panel
          413/423 Fan Cowl Panel (LH)
          414/424 Fan Cowl Panel (RH)

   C. Procedure

      S 216-002-R00
      (1) Visually examine the oil tubes for dents, nicks, fretting and scoring.
          (a) If you remove these oil feed tubes, examine the ends of the tubes for scoring and galling:
              1) The oil-pump-to-oil-bypass-valve tube, or
              2) The oil-bypass-valve-to-FCOC tube.

      S 226-003-R00
      (2) If the damage that you find to the tubes is less than these limits, the tubes are serviceable:
          (a) Dents
              1) Smooth dents with a large area in relation to depth and which do not decrease the diameter of the tube by more than 10 percent at a given point, and they are not less than one diameter or 0.500 inch (12.7 mm) from the tube end fitting.

2) Smooth dents up to 0.125 square-inches (80.60 sq. mm) if:
   a) they have a round bottom and,
   b) their depth is not more than 0.015 inch (0.381 mm) on the outer surface of a bend and,
   c) their depth is not more than 0.025 inch (0.635 mm) on the remaining sections of the tube and,
   d) they are not less than one diameter or 0.500 inch (12.7 mm) from the tube end fitting.

(b) Nicks
1) Nicks that have round bottoms and are not more than 0.004 inch (0.102 mm) in depth if they are not on the outer surface of a bend and all burrs are removed.

(c) Fretting
1) Fretting on the feed oil tubes up to a maximum depth of 0.004 inch (0.102 mm).
2) Fretting on the return oil tubes up to 0.007 inch (0.178 mm) in depth on the outer surface of a bend and 0.010 inch (0.254 mm) on the remaining tube surface.

(d) Scoring
1) ALL AREAS EXCEPT THE OIL FEED TUBE END CONNECTORS;
Scoring less than 0.004 inch (0.102 mm) in depth, if you make the scoring smooth.
2) THE OIL FEED TUBE END CONNECTORS;
Scoring less than 0.002 inch (0.051 mm) in depth if you do the repair FRS.3253 to remove the scoring (AMM 70-42-11/201).

(e) THE OIL FEED TUBE END CONNECTORS;
Galling
1) Galling less than 0.008 inch (0.203 mm) in depth if you do the repair FRS.3253 to remove the galling (AMM 70-42-11/201).

(f) Broken or cracked clips
1) Broken or cracked upper brazed-on clips on the oil tube, UL14956, is permitted.

NOTE: ENGINES WITH RR SB 73-B048;
Turn the clip on the fuel tube so the clip does not touch the oil tube.

PRESSURE AND SCAVENGE OIL PUMPS - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is to remove the Pressure and Scavenge Oil Pumps. The second task is to install the Pressure and Scavenge Oil Pumps.
   B. Use the procedures given in AMM 70-02-01/201 for identification, lubrication and installation of rubber seal rings.
   C. Use the procedures given in AMM 70-51-00/201 to tighten fasteners.
   D. Tighten the fasteners to the torque values given in AMM 70-51-00/201 unless a torque value is specified in this procedure.

TASK 79-21-06-004-001-R00

2. Remove the Pressure and Scavenge Oil Pumps
   A. Equipment
      (1) HU27798, Extractor
   B. References
      (1) AMM 24-22-00/201, Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 79-11-00/301, Engine - Servicing (Oil Change)
      (4) AMM 79-21-07/401, Scavenge Oil Filter Element
      (5) AMM 79-21-08/401, Pressure Oil Filter Element
      (6) AMM 79-35-01/401, Pressure Oil Filter Differential Pressure Switch
      (7) AMM 79-35-02/401, Scavenge Oil Filter Differential Pressure Switch
   C. Access
      (1) Location Zone
          410 Left Engine
          420 Right Engine

      (2) Access Panel
          414/424 Fan Cowl Panel (RH)

   D. Prepare to Remove the Pressure and Scavenge Oil Pumps

      S 864-002-R00
      (1) Supply the electrical power (AMM 24-22-00/201).

      S 864-003-R00
      (2) Make sure the FUEL CONTROL switch on the control stand is in the CUTOFF position and attach a DO-NOT-OPERATE tag.

      S 864-004-R00
      (3) Remove the electrical power (AMM 24-22-00/201).

S 014-005-R00

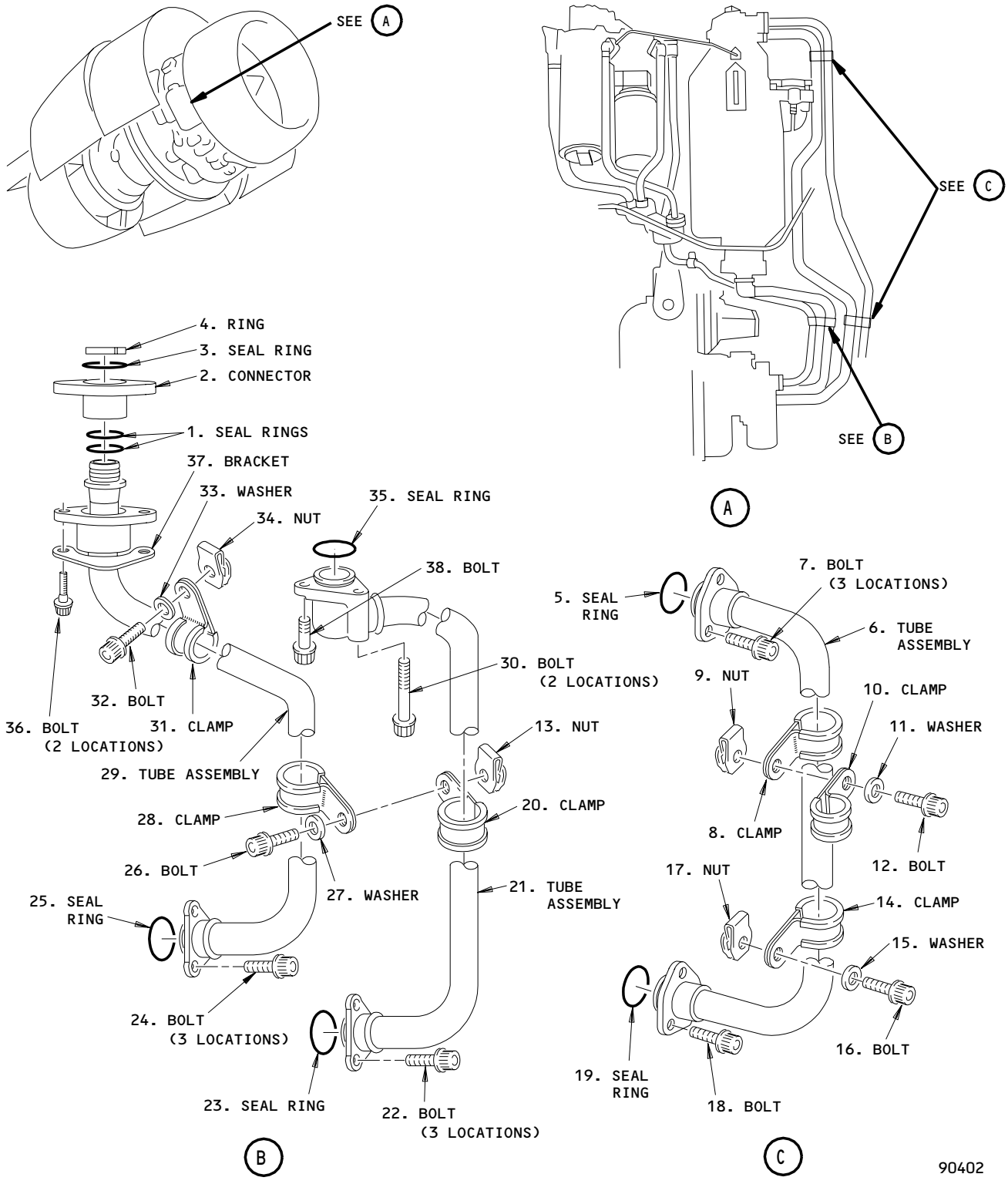
CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU OPEN THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

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

E. Procedure

S 034-006-R00

(1) Remove the connections from the oil pump cover as follows (Fig. 401):
   (a) Drain the engine oil tank (AMM 79-11-00/301).
   (b) Remove the scavenge oil filter housing and element (AMM 79-21-07/401).
   (c) Remove the pressure oil filter housing and element (AMM 79-21-08/401).
   (d) Remove the pressure oil filter differential pressure switch (AMM 79-35-01/401).
   (e) Remove the scavenge oil filter differential pressure switch (AMM 79-35-02/401).
   (f) Remove the bolt (32), washer (33), nut (34) and clamp (31) from the tube (29).
   (g) Remove the bolt (26), washer (27), nut (13) and clamps (20 and 28) from the tubes (21 and 29).
   (h) Remove the bolts (36) that attach the oil feed tube (29) to the oil bypass valve.
   (i) Remove the bracket (37), ring (4), seal rings (1 and 3) and connector (2).
      1) Discard the seal rings (1 and 3).
   (j) Remove the bolts (24).
   (k) Adjust the tube (29) to make a clearance between the tube and the oil pump cover.
   (l) Remove and discard the seal ring (25).
   (m) Remove the bolts (22, 30 and 38) that attach the oil supply tube (21) at the oil tank and oil pump cover.
   (n) Move the tube (21) to make a clearance between the tube and oil pump cover.
   (o) Remove and discard the seal rings (23 and 35).
   (p) Remove the bolt (12), washer (11), nut (9) and clamp (8) from the tube (6).
   (q) Remove the bolt (16), washer (15), nut (17) and clamp (14) from the tube (6).
   (r) Remove the bolts (7 and 18) that attach the oil return tube (6) to the oil tank and oil pump cover.



Oil Pump Cover – Oil Tube Disconnect Points
Figure 401

(s) Move the tube (6) to make a clearance between the tube and the oil pump cover.
(t) Remove and discard the seal rings (5 and 19).
(u) Install dust caps to all openings.

S 024-007-R00

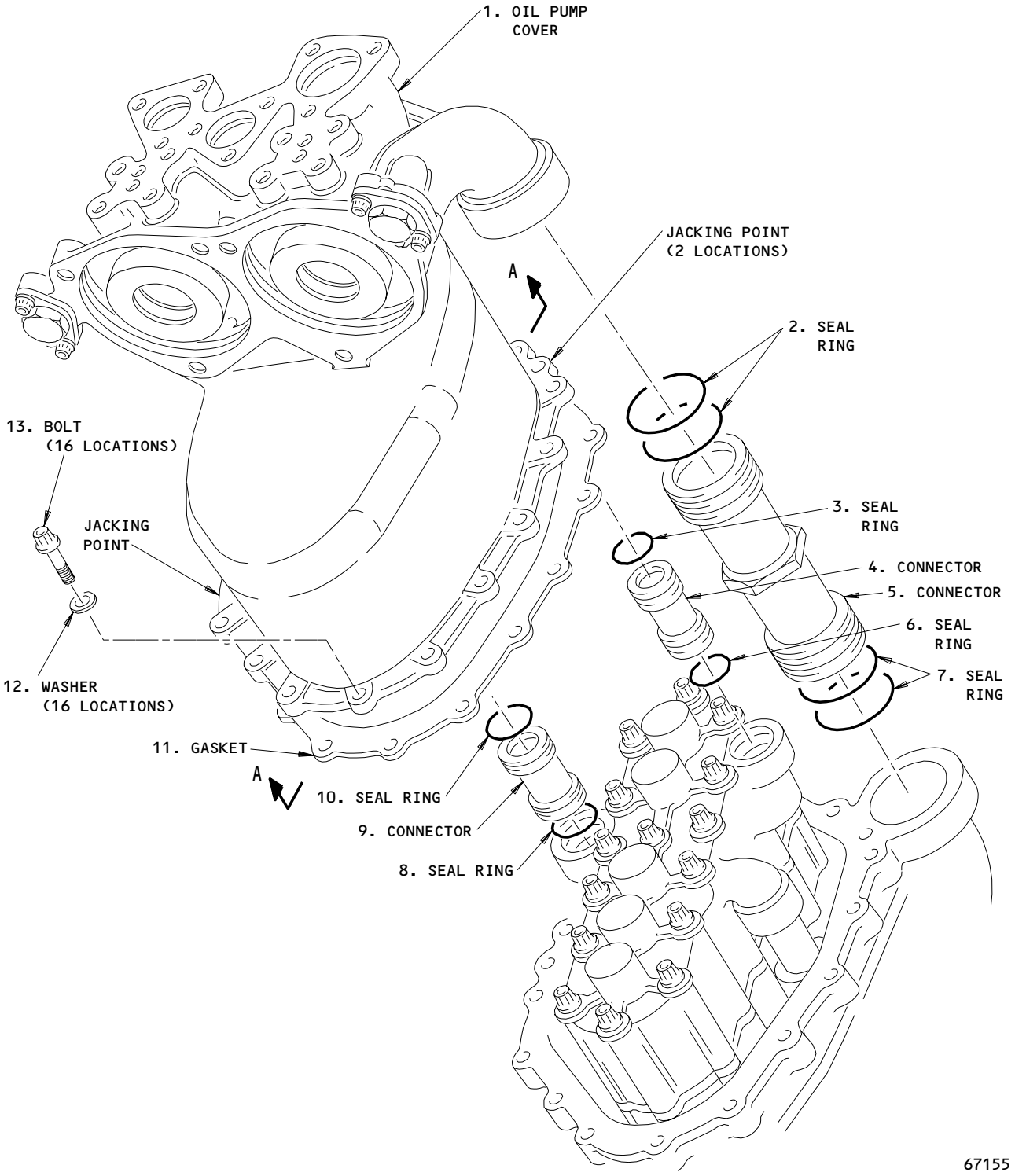
(2) Remove the oil pump cover as follows (Fig. 402):
(a) Put a clean container below the mounting face of the oil pump cover and high speed gearbox.
(b) Loosen the bolts (13) that attach the oil pump cover (1) to the gearbox mounting flange.
(c) Remove the connector (5) with your hand.
(d) Remove the bolts (13) and washers (12) that attach the oil pump cover to the gearbox.
(e) Install the bolts for the oil pump cover into the jacking points (2 locations) for the oil pump cover.
1) Turn the bolts sequentially to release the oil pump cover.
(f) Remove the oil pump cover (1) and connectors (4, 5 and 9).
(g) Remove and discard the gasket (11) and seal rings (2, 3, 6, 7, 8 and 10).
(h) Remove the bolts from the jacking points (2 locations).
(i) Install dust caps to all openings.

S 024-008-R00

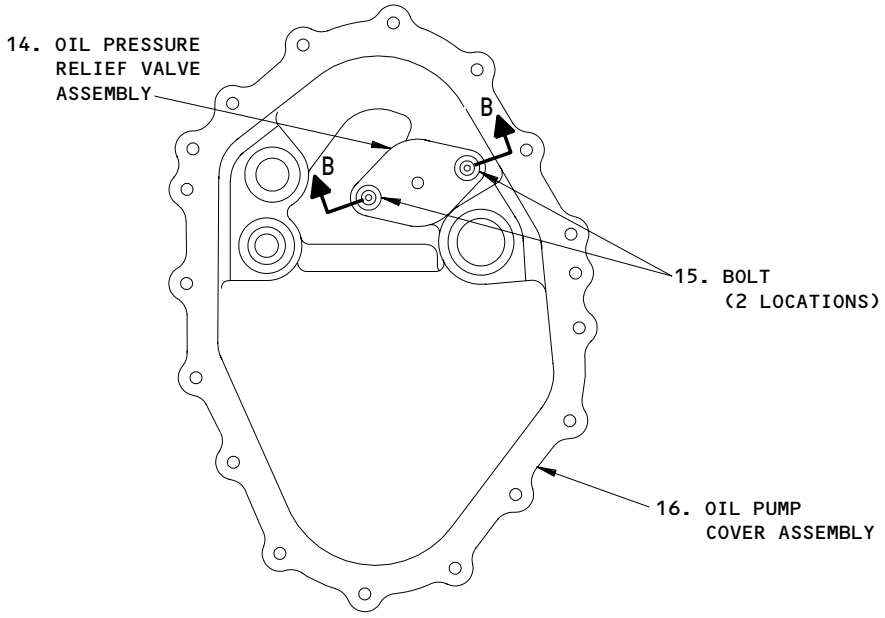
(3) Remove the oil pressure relief valve as follows. (Fig. 402 Sht. 2)
(a) Remove the two bolts (2) securing the oil pressure relief valve in the oil pump cover.
(b) Install the HU27798 Extractor to the oil pump cover as shown in Fig. 402 Sht. 3.
1) Loosen the nut on the extractor screw.
2) Place the extractor on the oil pump cover making sure the two locating pins are fully seated into the flange bolt holes.
3) Screw the extractor into the threaded hole in the center of the oil pressure relief valve. Make sure the extractor is completely seated into the valve.
(c) Tighten the nut on the extractor and withdraw the oil pressure relief valve assembly from the oil pump cover.
(d) Remove the HU27798 Extractor from the oil pressure relief valve assembly.
(e) Remove and Discard the seal rings (4) and (5) from the oil pressure relief valve housing.

S 024-009-R00

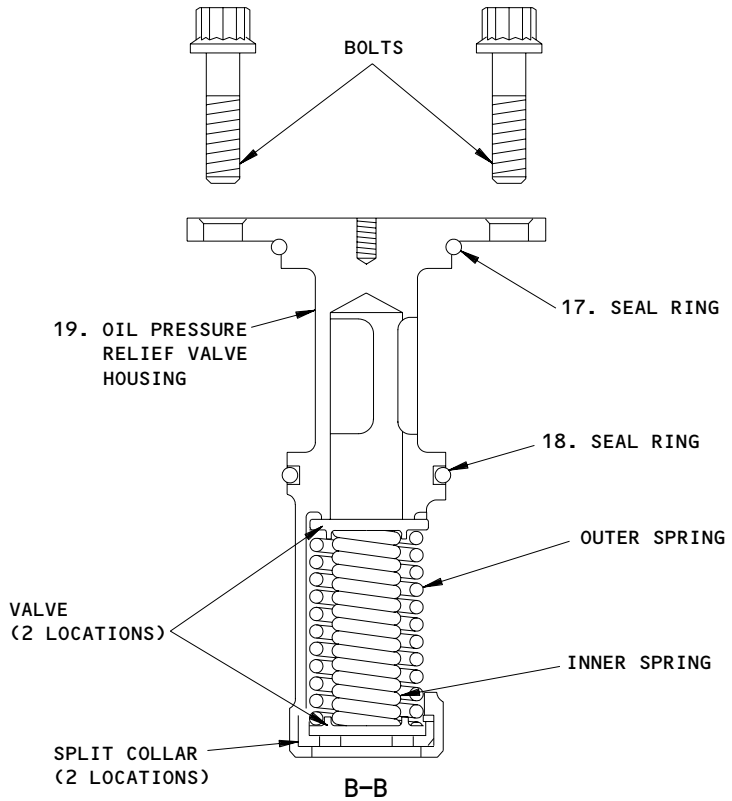
(4) Remove the oil pump assembly as follows (Fig. 403):



Oil Pressure Relief Valve Access
Figure 402 (Sheet 1)



REAR FACE OF OIL PUMP COVER
A-A



B-B

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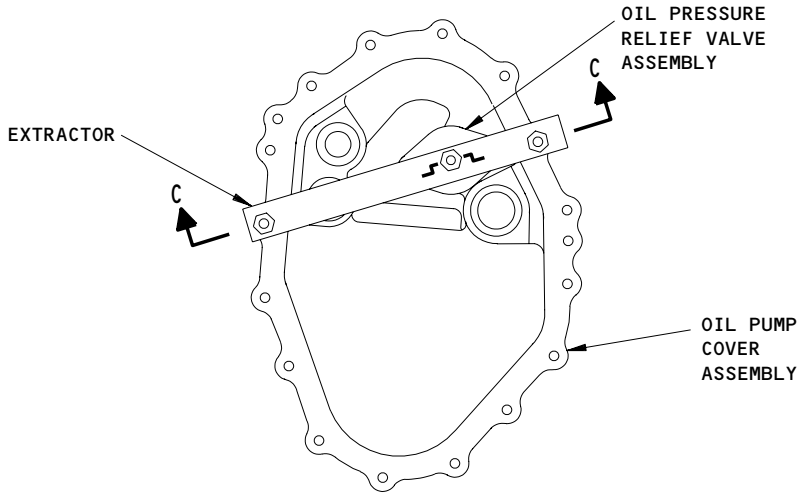
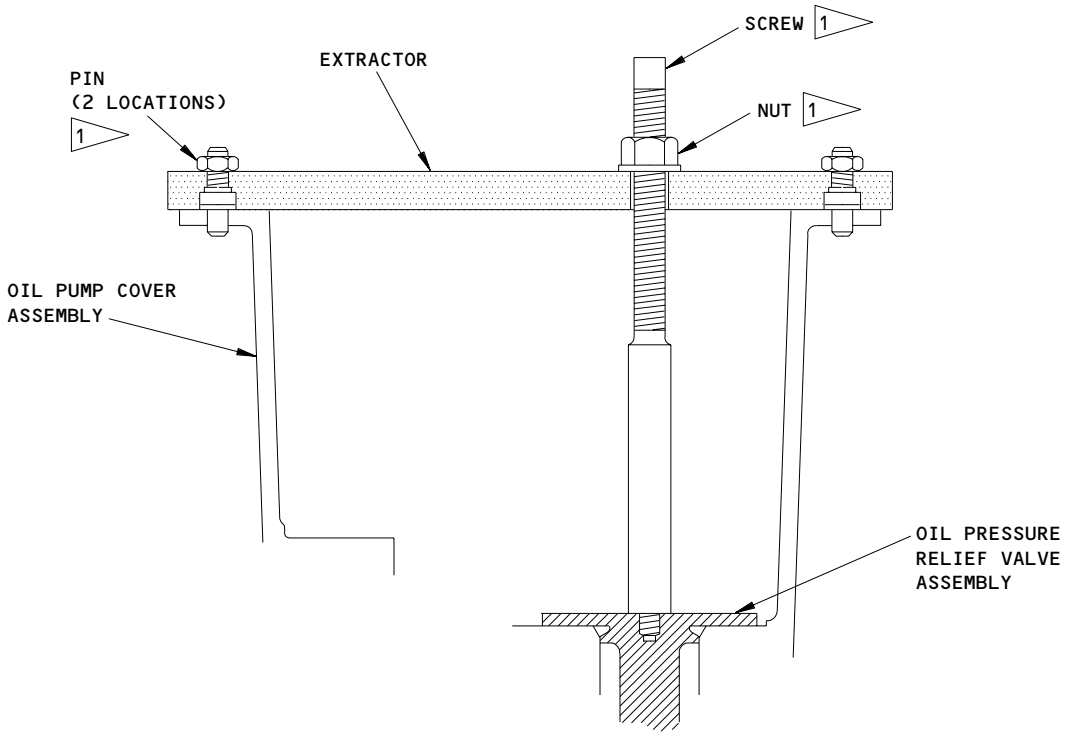
Oil Pressure Relief Valve Access
Figure 402 (Sheet 2)



REAR FACE OF OIL PUMP COVER
WITH EXTRACTOR FITTED
A-A

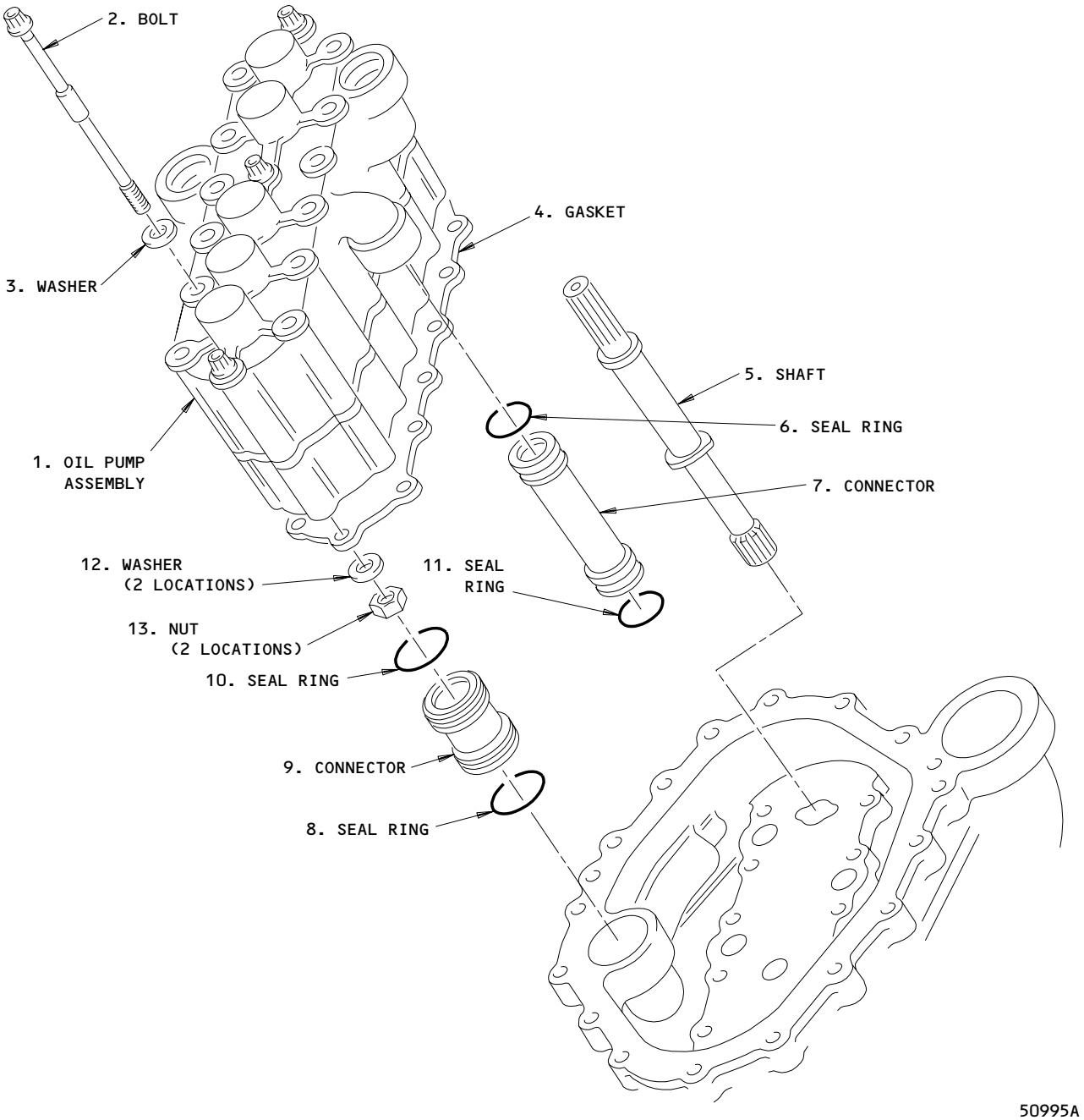


C-C

1 PART OF EXTRACTOR

DEE00Y1674

Oil Pressure Relief Valve Access
Figure 402 (Sheet 3)



Oil Pump Assembly Disconnect Points
Figure 403

(a) Loosen only the bolts (2) (Fig. 403) that have numbers below them.
(b) Loosen the bolts in the opposite sequence (Fig. 404).

NOTE: The bolts that do not have numbers below them (Fig.404) attach the oil pump sections as an assembly.

(c) Remove the bolts (2) and washers (3).
(d) Remove the pump assembly (1), drive shaft (5) and connectors (7 and 9).
(e) Remove and discard the seal rings (6, 8, 10 and 11).
(f) Remove the nuts (13), washers (12) and gasket (4).

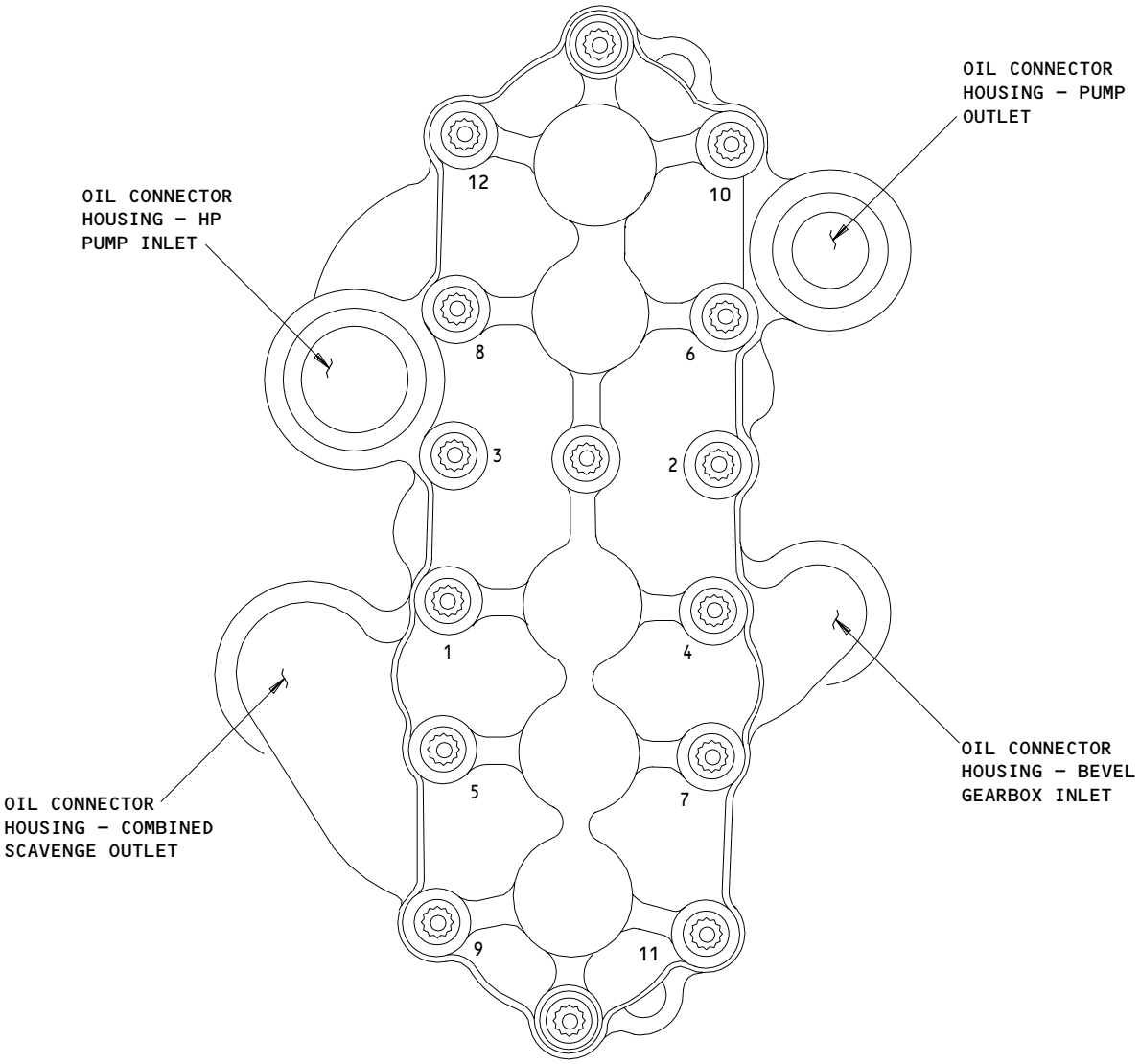
NOTE: With the nuts (13) and washers (12) removed, hold the pump assembly (1) vertical to keep it assembled.

1) Discard the gasket (4).
(g) Install approved covers to the mounting flange of the high speed gearbox and oil pump cover and all openings.

TASK 79-21-06-404-010-R00

3. Install the Pressure and Scavenge Oil Pumps

A. Equipment
(1) Clean stiff bristle brush
(2) Clean container - minimum capacity:
5 U.S. gallons
4 Imperial gallons
18 Litres
(3) Turning Tool - HP System, E2J52189 Rolls Royce



Oil Pump Assembly Securing Bolts Torque Tightening Sequence
Figure 404

B. Parts

MM			IPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	1	Seal Ring	79-21-05	07	137
	2	Connector			165
	3	Seal Ring			170
	4	Ring			175
	5	Seal Ring		13	65
	6	Tube Assy - Pump to Oil Tank			50
	7	Bolt			3,5
	8	Clip			15
	9	Nut			40,42
	11	Washer			30,33
	12	Bolt		07	20,22
	13	Nut			70
	14	Clamp		13	15
	15	Washer			33
	16	Bolt			22
	17	Nut			42
	18	Bolt			3,5
	19	Seal Ring			65
	20	Clamp		07	95
	21	Tube Assy - Oil Tank to Pump			200
	22	Bolt			110
	23	Seal Ring			205
	24	Bolt			110
	25	Seal Ring			140
	26	Bolt			12,13
	27	Washer			35
	28	Clip			90
	29	Tube Assy - Oil Pump to Oil By-Pass			190
	30	Bolt			195
	31	Clamp			90
	32	Bolt			10
	33	Washer			35
	34	Nut			70
	35	Seal Ring			205
	36	Bolt			150
	37	Bracket - Support			185
	38	Bolt			110

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
402	1	Oil Pump Cover	79-21-06	01	15
	2	Seal Ring			25
	3	Seal Ring			35
	4	Connector			30
	5	Connector			20
	6	Seal Ring			35
	7	Seal Ring			25
	8	Seal Ring			45
	9	Connector			40
	10	Seal Ring			45
	11	Gasket	72-00-61	10	90
	12	Washer	79-21-06	01	10
	13	Bolt			5
403	1	Oil Pump Assy			40
	2	Bolt			30
	3	Washer			35
	4	Gasket			70
	5	Shaft			130
	6	Seal Ring			200
	7	Connector			195
	8	Seal Ring			190
	9	Connector			185
	10	Seal Ring			190
	11	Seal Ring			200
	12	Washer			55
	13	Nut			65

C. Consumable Materials
   (1) Methylene Chloride (Dichloromethane)
       British Spec/Ref - B.S. 1994, 1953
       American Spec/Ref - MIL-D-6998
       OMat No. 169
   (2) Jointing Compound
       British Spec/Ref - PL32 (Light)
       American Spec/Ref -
       OMat No. 4/46
   (3) Clean engine oil

D. References
   (1) AMM 12-13-01/301, Engine Oil

(2) AMM 24-22-00/201, Control
(3) AMM 71-00-00/501, Power Plant
(4) AMM 71-11-04/201, Fan Cowl Panels
(5) AMM 72-00-00/201, Engine
(6) AMM 79-11-00/301, Engine - Servicing (Oil Change)
(7) AMM 79-21-07/401, Scavenge Oil Filter Element
(8) AMM 79-21-08/401, Pressure Oil Filter Element
(9) AMM 79-35-01/401, Pressure Oil Filter Differential Pressure Switch
(10) AMM 79-35-02/401, Scavenge Oil Filter Differential Pressure Switch

E. Access

(1) Location Zone

410 Left Engine
420 Right Engine

(2) Access Panel

414/424 Fan Cowl Panel (RH)

F. Procedure (Fig. 401, 402, 403, 404 and 405)

S 424-011-R00

(1) Install the oil pump assembly as follows (Fig. 403):
(a) Remove the cover from the mounting face of the high speed gearbox and oil pump cover.
(b) Make sure there is no damage to the mounting face of the oil pump assembly.
(c) Make sure there is no damage or blockage to the HS gearbox oilways and connector (7 and 9) housings.
(d) Make sure the connectors (7 and 9) and seal ring grooves are free from damage.
(e) Install the new seal rings (6, 8, 10 and 11).
(f) Remove the covers from the oil pump assembly (1).
(g) Make sure there is no damage to the oil pump assembly (1) and no blockage to the oilways.
(h) Lubricate the mounting face of the oil pump assembly and each face of the gasket (4) with clean engine oil.
(i) Install the gasket (4) on the mounting face of the oil pump assembly (1).
(j) Install the washers (12) and the nuts (13).
(k) Tighten the assembly bolts (2 locations).
(l) Lubricate the mounting face of the gearbox and oil pump assembly and the connector (7 and 9) housings with clean engine oil.
(m) Make sure there is no damage to the drive shaft (5) for the oil pump.
(n) Lubricate the drive shaft (5) with clean engine oil.
(o) Install the drive shaft (5) into the gearbox assembly.

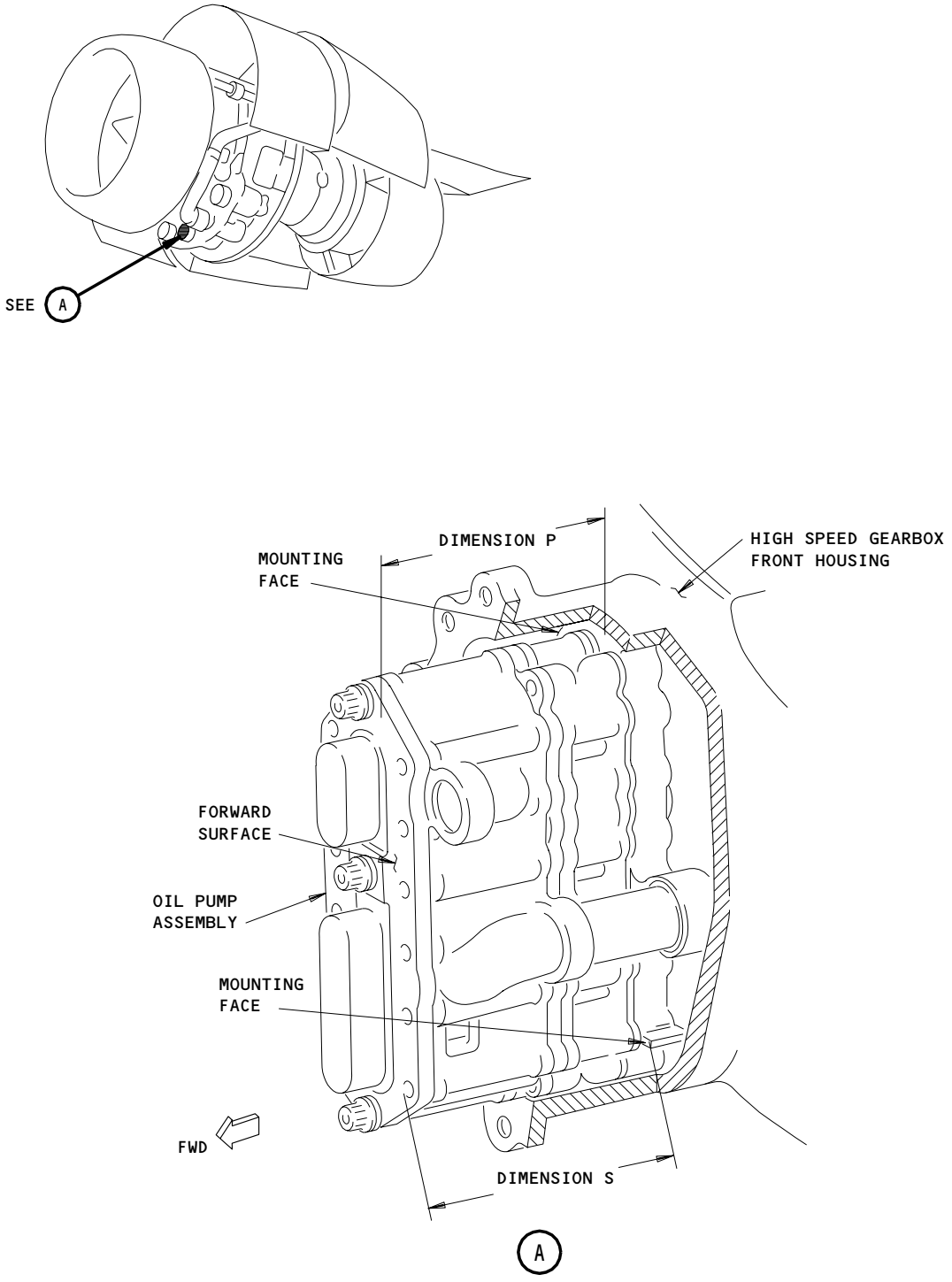
(p) Make sure the splines engage in the gearshaft assembly and the drive shaft is fully into the assembly.
(q) Lubricate and install the connectors (7 and 9) into their correct HS gearbox housings.
(r) Install the HP turning tool (AMM 72-00-00/201) into the breather rotor assembly of the gearbox and engage the splines.
(s) Align the oil pump assembly (1) with the mounting face on the gearbox assembly.
(t) Carefully move the oil pump assembly (1) aft on the drive shaft (5) and the oil connectors (7 and 9).
(u) Slowly turn the HS gearbox gears with the HP system turning tool to align and engage the drive splines of the drive shaft with the drive splines of the oil pump.

CAUTION: MAKE SURE YOU CORRECTLY ALIGN THE OIL PUMP DURING INSTALLATION. IF YOU DO NOT CORRECTLY ALIGN THE OIL PUMP, DAMAGE TO THE DRIVE SHAFT SPLINES AND OIL PUMP CAN OCCUR.

(v) Do these steps to make sure the oil pump is correctly installed (Fig. 405):
1) Measure the dimensions P and S from the forward surface of the oil pump to the mounting face for the oil pump on the HS gearbox.
2) Make sure that the dimensions P and S are not larger than 5.630 inches (143.0 mm).
3) Make sure that the difference between the dimensions P and S is less than 0.040 inch (1.00 mm).
(w) Install the bolts (2) and washers (3) and tighten the bolts in the sequence shown in Fig. 404.
(x) Remove the high pressure system turning tool (AMM 72-00-00/201).

S 424-012-R00
(2) Install the oil pressure relief valve to the oil pump cover (Fig. 402 Sht. 2).
(a) Install new seals (4) and (5) into their locations on the oil pressure relief valve housing.
(b) Put the oil pressure relief valve assembly in position in the oil pump cover (3). Align the attachment bolt holes.
(c) Install the two bolts (2).

S 424-013-R00
(3) Install the oil pump cover as follows (Fig. 402):
(a) Remove all of the dust caps.
(b) Make sure there is no damage or blockage to the oilways.



Pressure and Scavenge Oil Pump Installation
Figure 405

WARNING: DO NOT GET THE DEGREASING FLUID IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE DEGREASING FLUID. PUT ON PROTECTIVE SPLASH GOGGLES AND GLOVES WHEN YOU USE THE DEGREASING FLUID. KEEP THE DEGREASING FLUID AWAY FROM SPARKS, FLAME AND HEAT. MAKE SURE THERE IS A GOOD FLOW OF AIR IN THE AREA WHERE THE DEGREASING FLUID IS USED. DEGREASING FLUID IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION: BE CAREFUL WHEN YOU USE THE DEGREASING FLUID AS SURFACE PROTECTION WILL BE REMOVED. ALL PROTECTED AREAS WHERE THE DEGREASING FLUID IS USED MUST BE PROTECTED AGAIN (AMM 70-42-12/201).

(c) Clean the jointing compound from the oil pump cover and mounting faces of the HS gearbox with a stiff bristle brush and the chemical cleaner.
(d) Examine the mounting faces for damage after the chemical cleaner is dry.

CAUTION: MAKE SURE THAT NO JOINTING COMPOUND IS PUSHED INTO THE ENGINE OIL TUBES WHEN YOU TIGHTEN THE JOINTS. IF THE JOINTING COMPOUND IS PUSHED INTO THE ENGINE OIL TUBES, DAMAGE TO THE ENGINE CAN OCCUR.

(e) Apply the jointing compound to the mounting faces of the oil pump cover and gearbox.
(f) Let the jointing compound to become dry for 10 minutes before you install the oil pump cover.
(g) Make sure the connectors (4, 5 and 9) are free from damage or blockage.
(h) Install the seal rings (2, 3, 6, 7, 8 and 10) to each end of the connectors (4, 5 and 9).
(i) Install each connector (4, 5 and 9) in its correct housing in the oil pump cover.
(j) Install the gasket (11) on the mounting face of the gearbox and oil pump cover.
(k) Install the oil pump cover on the high speed gearbox as follows:
    1) Align the connectors (4, 5 and 9) with their correct gearbox housings.
    2) Push the oil pump cover against the mounting face.
(l) Install the bolts (13) and washers (12).

S 434-014-R00

(4) Connect the tubes and fittings on the oil pump cover as follows (Fig. 401):
   (a) Install the pressure and scavenge oil filter elements and housings (AMM 79-21-07/401 and AMM 79-21-08/401).
   (b) Remove the dust caps from the oil tubes (6, 21 and 29).
   (c) Install a new seal ring (25) to the oil tube (29) at the oil pump cover.
   (d) Install the seal rings (1 and 3), ring (4), connector (2) and bracket (37) at the bypass valve.
   (e) Install the bolts (24 and 36) that attach the oil feed tube (29) to the oil bypass valve and oil pump cover.
   (f) Attach the oil feed tube (29) with the bolt (32), washer (33), clamp (31) and nut (34).
   (g) Install a new seal rings (23 and 35) on the oil tube (21).
   (h) Install the bolts (22, 30 and 38) that attach the oil supply tube (21) at the oil pump cover and bottom of the main oil tank.
   (i) Attach the oil tubes (21 and 29) with the bolt (26), washer (27), clamps (20 and 28) and nut (13).
   (j) Install the new seal rings (5 and 19) to the oil tube (6).
   (k) Install the bolts (7 and 18) that attach the oil feed tube (6) at the oil pump cover and main oil tank.
   (l) Attach the oil return tube (6) with the bolt (12), washer (11), clamp (8) and nut (9).
   (m) Attach the oil return tube (6) with the bolt (16), washer (15), clamp (14) and nut (17).

S 424-015-R00

(5) Install the pressure oil filter differential pressure switch (AMM 79-35-01/401).

S 424-016-R00

(6) Install the scavenge oil filter differential pressure switch (AMM 79-35-02/401).

S 614-017-R00

(7) Do the engine oil tank servicing procedure (AMM 12-13-01/301).

S 614-018-R00

(8) Prime the oil pump cover panel (AMM 12-13-01/301).

S 414-019-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.

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

S 034-020-R00

(10) Remove the DO-NOT-OPERATE tag from the FUEL CONTROL switch on the control stand.

S 714-021-R00

(11) Do an engine test with the Power Plant Test Reference Table (AMM 71-00-00/501).

PRESSURE OIL FILTER ELEMENT - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the element of the pressure oil filter (referred to as the element). The second task is the installation of the element.

   TASK 79-21-07-034-001-R00

2. Remove the Element of the Pressure Oil Filter
   A. Equipment
      (1) Clean Container - minimum capacity:
          10.0 U.S. pints
          8.0 Imperial pints
          5.0 Litres
      (2) Drain Tool, RR HU31261
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   C. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

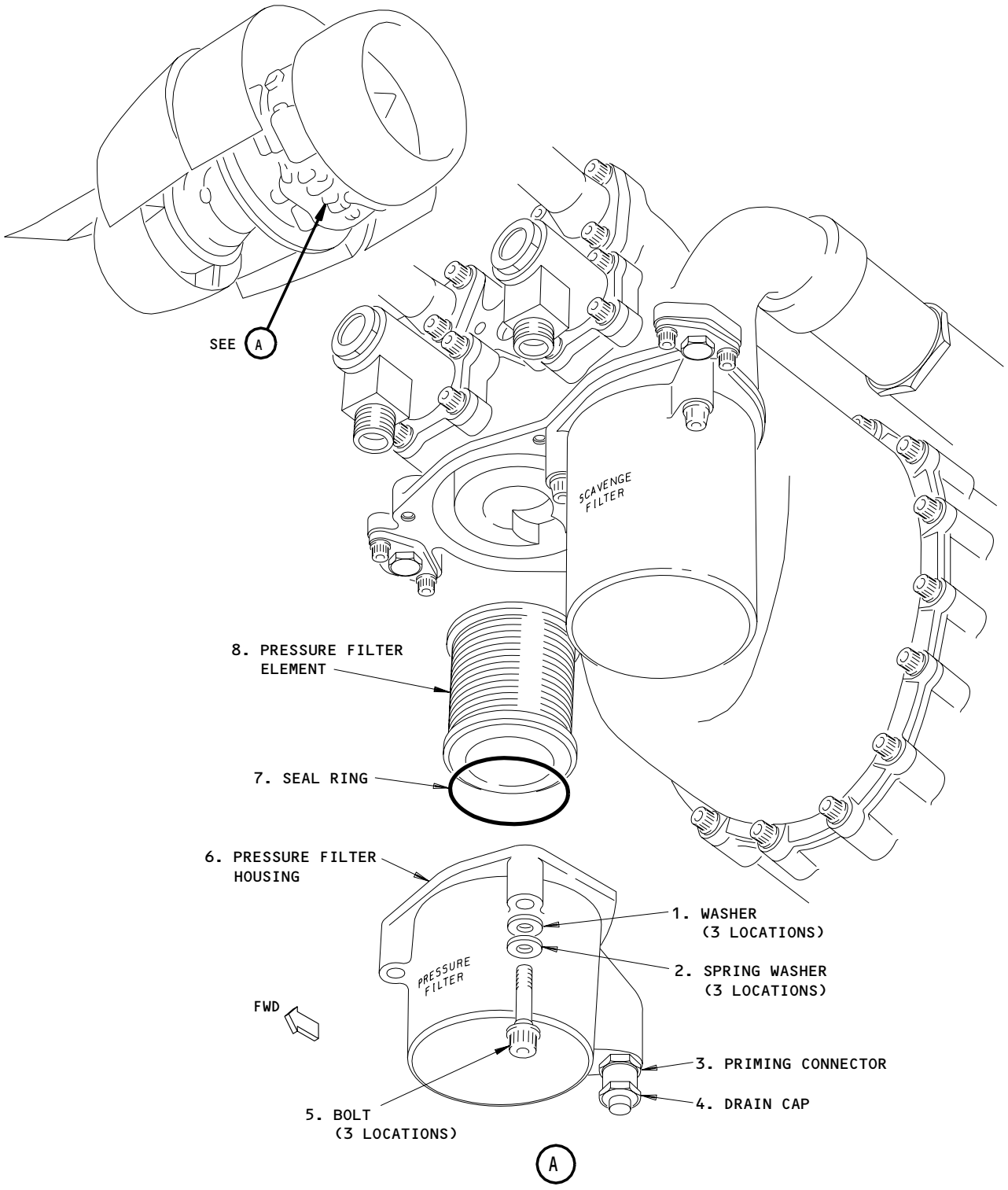
      (2) Access Panels
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

   D. Prepare for the Removal

      S 014-016-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).
   E. Remove the Element (Fig. 401)



Pressure Oil Filter Element - Installation
Figure 401

S 684-002-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS THAT HAVE OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

A SMALL QUANTITY OF ALKALINE CLEANING FLUIDS CAN CAUSE THE FAILURE OF THE SYNTHETIC OIL. USE FULLY CLEAN CONTAINERS AND EQUIPMENT FOR THE OIL. DO NOT PUT THE DRAINED OIL BACK TO THE SYSTEM. IF YOU DO NOT OBEY THESE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Drain the filter housing (6) as follows:
  (a) Put the container below the filter housing (6).
  (b) Remove the drain cap (4) from the priming connector (3).
  (c) Install the drain tool in the priming connector (3).
  (d) Turn the drain tool to let the oil drain.
  (e) Disengage the drain tool.
  (f) Install the drain cap (4) on the priming connector (3).
    1) Install the lockwire on the drain cap (4).

S 034-028-R00

(2) Remove the bolts (5), washers (1) and (2) that attach the filter housing (6).

S 034-004-R00

(3) Remove the filter housing (6).

S 024-017-R00

(4) Remove the element (8) from the filter housing (6).

S 214-036-R00
(5) Examine the filter element (8) (AMM 79-00-00/601).

TASK 79-21-07-434-007-R00

3. Install the Element of the Pressure Oil Filter

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Washer	79-21-04	01	22
	2	Washer			16
	3	Adaptor Assy Connection - Oil Priming			55
	4	Cap			50
	5	Bolt			12
	6	Housing Assy - Pressure Filter			6
	7	Ring			24
	8	Element - Pressure Filter			30

B. References
(1) AMM 12-13-01/301, Engine - Servicing (Oil Replenishing)
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 79-00-00/601, Oil
(5) AMM 79-21-07/701, Oil Filter Elements

C. Access
(1) Location Zones
414 Left Engine
424 Right Engine

(2) Access Panels
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine

D. Install the Element (Fig. 401)

S 644-032-R00
(1) Lubricate the new seal ring (7) with oil.

S 434-009-R00
(2) Install the new seal ring (7) in the pressure filter housing (6) (AMM 70-02-01/201).

S 424-018-R00
(3) Install the element (8) in the pressure filter housing (6).

NOTE: Make sure the top of the element does not stay above the lip of the housing.

S 434-011-R00

CAUTION: MAKE SURE THE FILTER ELEMENT IS INSTALLED IN THE HOUSING (6) WHEN YOU INSTALL THE HOUSING. IF THE FILTER IS NOT INSTALLED IN THE HOUSING, YOU CAN CAUSE DAMAGE TO THE OIL SYSTEM.

(4) Install the filter housing (6) to the oil pump.

S 434-012-R00
(5) Install the filter housing (6) with the bolt (5) and the washers (1 and 2).

S 614-013-R00
(6) Fill the engine oil system (AMM 12-13-01/301).

E. Put the Airplane Back to Its Usual Condition

S 414-014-R00
(1) Close the right fan cowl panel (AMM 71-11-04/201).

S 724-015-R00
(2) Do the test of the Pressure Oil Filter Element that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

PRESSURE OIL FILTER ELEMENT - INSPECTION/CHECK

1. General
   A. The procedure that follows gives steps to examine the pressure oil filter element.

TASK 79-21-07-226-001-R00

2. Examine the Pressure Oil Filter Element
   A. Equipment
      (1) Vernier Caliper
   B. Procedure

S 216-002-R00

      (1) Examine the pressure oil filter element for worn areas on the end flange seal faces.

S 976-003-R00

      (2) If the worn area is in the shape of a flaked area, measure the damaged area.
         (a) Use a vernier caliper to measure the width of the flaked area at the maximum width of the worn area.
   C. Accept/Reject Standards - Pressure Oil Filter Element Damage

S 996-004-R00

      (1) If the widths of the damaged areas are more than 0.100 inch (2.54 mm) and are found on one or two end flange seal faces, reject the filter element.

PRESSURE OIL FILTER ELEMENT - CLEANING/PAINTING

1. General
   A. This procedure contains two tasks, which are alternatives. The first task cleans the Pressure Oil Filter Element with OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol, or OMat 1/257 Desoclean. The second task cleans the Pressure Oil Filter Element with a chemical solution that has a water base.
   B. Use the procedure in AMM 70-30-00/201 for the consumble materials.

TASK 79-21-07-117-001-R00

2. Clean the Pressure Oil Filter Element
   A. Equipment
      (1) Ultrasonic Cleaner -
          (Frequency: Fixed at 40 kHz)
      (2) Filter - 10 Micron
      (3) Cleaning Bath
      (4) Tongs
      (5) Stainless Steel Basket
      (6) Gloves - Polyvinyl chloride
   B. Consumable Materials
      (1) OMat 150 ACETONE
          or
          OMat 140 ISPROPYL ALCOHOL
          OR
          OMat 1/257 DESOCLEAN 45.
      (2) Air/Nitrogen Supply
   C. Procedure

      S 117-031-R00

      WARNING: THE SOLVENTS IN THIS PROCEDURE ARE FLAMMABLE.

      (1) Do the steps that follow to clean the filter element in OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol, or OMat 1/257 Desoclean 45.
          (a) Put the filter element in a stainless steel basket.

          WARNING: DO NOT LET THE ENGINE OIL STAY ON YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

          (b) Lower the basket in the cleaner.
          (c) Soak or flush the filter element in the cleaner to remove the unwanted oil.

(d) Remove the basket from the cleaner.
    1) Drain the unwanted fluid.
(e) Clean the filter element with a brush.
(f) Lower the basket into a cleaning bath.
(g) Soak or flush the filter element in the cleaner to remove the unwanted fluid.
(h) Put the basket into the ultrasonic sump.
    1) Align the basket to keep the blockage of the ultrasonic wave to a minimum.

        NOTE: The volume of parts you clean must not be more than 25% of the working volume of the ultrasonic cleaning tank. The working volume is specified as the wetted area volume of the ultrasonic sump (1080 cubic inches).

(i) Operate the ultrasonic cleaner.
(j) Keep the filter element in the sump for 15 to 30 minutes.
    1) Turn the filter element with the tongs or the gloves to make sure the filter is clean.

        NOTE: The ultrasonic fluid must flow through a 10 micron filter.

(k) Remove the basket from the ultrasonic sump while the ultrasonic cleaner transducers operate.
(l) Stop the ultrasonic cleaner.
    1) Drain the ultrasonic fluid.
(m) Dry all filter element with blasts of clean, filtered air or nitrogen.

    NOTE: The air or nitrogen must be put through a 10 micron filter.

(n) Visually examine the filter element for all unwanted material.
(o) If there is unwanted material, clean the filter element again.

(p) If there is unwanted materials after the filter element is cleaned three times, then you must discard the filter element.
(q) Put the filter element in a clean polythene bag.

TASK 79-21-07-117-015-R00

3. Clean the Pressure Oil Filter Element With a Water Based Chemical Solution

A. Equipment
(1) Ultrasonic Cleaner -
(Frequency: Fixed at 40 kHz)
(2) Filter - 10 Micron
(3) Kerosine Bath
(4) Tongs
(5) Stainless Steel Basket
(6) Gloves - Polyvinyl chloride

B. Consumable Materials
(1) Primary Cleaner
OMat No. 1/24 or 1070
(2) Kerosine
OMat No. 101
(3) Water, Distilled or De-ionized
(4) Air/Nitrogen Supply

C. Procedure

S 117-029-R00

(1) Do the steps that follow to clean the filter element in a water based chemical solution.
(a) Put the filter element in a stainless steel basket.

WARNING: DO NOT LET THE ENGINE OIL STAY ON YOUR SKIN. IF THE ENGINE OIL STAYS ON YOUR SKIN, INJURY CAN OCCUR.

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

(b) Lower the basket in the kerosine.

(c) Soak or flush the filter element in the kerosine to remove the unwanted oil.
(d) Remove the basket from the kerosine.
    1) Drain the unwanted fluid.

CAUTION: DO NOT LET THE CONCENTRATION OF THE PRIMARY CLEANER BECOME LESS THAN 30 TO 50%. THIS WILL CAUSE DAMAGE TO THE MAGNESIUM PARTS.

(e) Prepare a solution of 30 to 50% of the primary cleaner in distilled or de-ionized water, at a temperature of 30 to 40 °C (95 to 104 °F).
(f) Put the basket into the ultrasonic sump.
    1) Align the basket to keep the blockage of the ultrasonic wave to a minimum.

        NOTE: The volume of the parts you clean must not be more than 25% of the working volume of the ultrasonic cleaning tank. The working volume is specified as the wetted area volume of the ultrasonic sump (1080 cubic inches).

(g) Operate the ultrasonic cleaner.
(h) Keep the filter element in the ultrasonic cleaner for 15 to 30 minutes.
    1) Turn the filter element with the tongs or the gloves to make sure the filter is clean.

        NOTE: The ultrasonic fluid must flow through a 10 micron filter.

(i) Remove the basket from the ultrasonic sump while the ultrasonic cleaner transducers operate.
(j) Stop the ultrasonic cleaner.
    1) Drain the ultrasonic fluid.

(k) Wash the filter element in clean, filtered water.

NOTE: The water must flow through a 10 micron filter.

(l) Put the filter element in water at a temperature of not less than 80 °C (176 °F) for 30 seconds.
(m) Dry the filter element with blasts of clean, filtered air or nitrogen.

NOTE: The air or nitrogen must be put through a 10 micron filter.

(n) Visually examine the filter element for all unwanted material.
(o) If there is unwanted material, clean the filter element again.
(p) If there is unwanted materials after the filter element is cleaned three times, then you must discard the filter element.
(q) Put the filter element in a clean polythene bag.

SCAVENGE OIL FILTER ELEMENT - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the element of the scavenge oil filter (referred to as the element). The second task is the installation of the element.

   TASK 79-21-08-034-001-R00

2. Remove the Element of the Scavenge Oil Filter
   A. Equipment
      (1) Clean container - minimum capacity:
          10.0 U.S. pints
          8.0 Imperial pints
          5.0 Litres
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   C. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

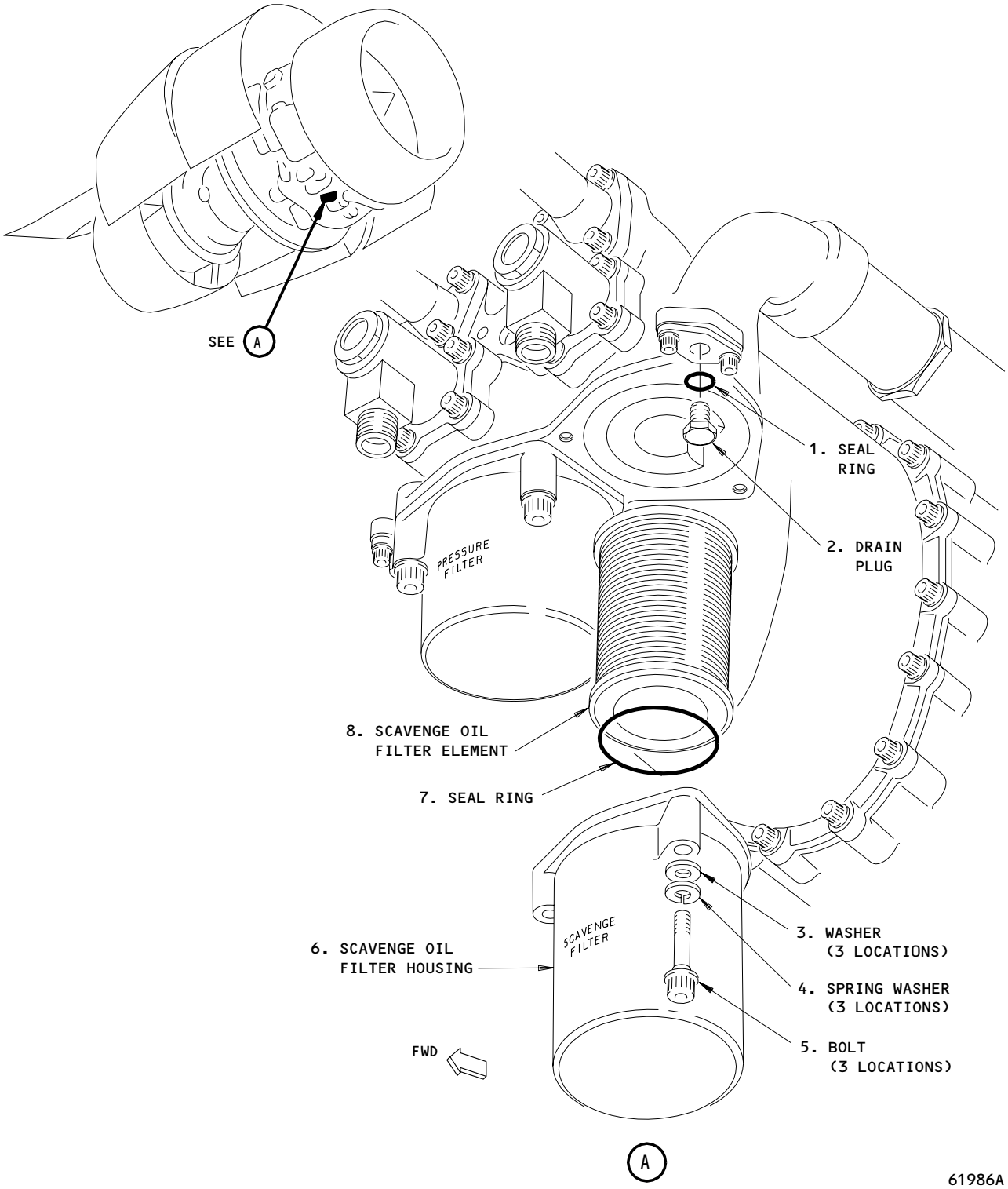
      (2) Access Panels
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

   D. Prepare for the Removal

      S 014-024-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).
   E. Remove the Element (Fig. 401)



Scavenge Oil Filter Element - Installation
Figure 401

S 684-003-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

A SMALL QUANTITY OF ALKALINE CLEANING FLUIDS CAN CAUSE THE FAILURE OF THE SYNTHETIC OIL. USE FULLY CLEAN CONTAINERS AND EQUIPMENT FOR THE OIL. DO NOT PUT THE DRAINED OIL BACK TO THE SYSTEM. IF YOU DO NOT OBEY THESE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Drain the oil line as follows:
  (a) Put the container below the housing (6) of the scavenge oil filter.
  (b) Remove the drain plug (2) to drain the oil.
  (c) Discard the seal ring (1) from the plug (2).
  (d) Lubricate the new seal ring (1) with oil.
  (e) Install the seal ring (1) on the drain plug (2).
  (f) Install the drain plug (2).
    1) Install the lockwire on the drain plug (2).

S 034-038-R00
(2) Remove the bolts (5) that attach the filter housing (6).

S 034-008-R00
(3) Remove the filter housing (6).

S 684-011-R00
(4) Remove the oil from the filter housing (6).

S 024-035-R00
(5) Remove the element (8).
  (a) Discard the seal ring (7).

(b) Examine the filter element (8) (AMM 79-00-00/601).

TASK 79-21-08-434-013-R00

3. Install the Element of the Scavenge Oil Filter

A. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Seal	79-21-04	01	165
	2	Plug			170
	3	Washer			22
	4	Washer			16
	5	Bolt			12
	6	Housing Assy - Scavenge Filter			5
	7	Ring			24
	8	Element - Scavenge Filter			35

B. References

(1) AMM 12-13-01/301, Engine - Servicing (Oil Replenishing)
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 79-00-00/601, Oil

C. Access

(1) Location Zones

414 Left Engine
424 Right Engine

(2) Access Panels

414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine

D. Install the Element (Fig. 401)

S 644-033-R00

(1) Lubricate the new seal ring (7).

S 434-015-R00

(2) Install the new seal ring (7) in the scavenge filter housing (6).

S 424-037-R00

CAUTION: DO NOT CLEAN AND REINSTALL THE ELEMENT (8) OF THE SCAVENGE OIL FILTER, USE A NEW ELEMENT. IF YOU INSTALL AN ELEMENT THAT YOU CLEANED, DAMAGE TO THE ENGINE CAN OCCUR.

(3) Install the element (8) in the scavenge filter housing (6).

NOTE: Make sure the top of the element does not stay above the lip of the housing.

S 434-017-R00

CAUTION: MAKE SURE THE FILTER (8) DOES NOT STAY OUT OF THE HOUSING (6) WHEN YOU INSTALL THE HOUSING. IF THE FILTER STAYS OUT OF THE HOUSING, YOU CAN CAUSE DAMAGE TO THE FILTER AND THE OIL SYSTEM.

(4) Install the filter housing (6) to the oil pump.

S 434-018-R00

(5) Install the filter housing (6) with the washers (3 and 4) and the bolt (5) (AMM 70-51-00/201).

S 614-019-R00

(6) Fill the engine oil system (AMM 12-13-01/301).

E. Put the Airplane Back to Its Usual Condition

S 414-021-R00

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

S 714-022-R00

(2) Do the test for the Scavenge Oil Filter Element that is shown in the Power Plant Test Reference Table (AMM 71-00-00/501).

OIL BY-PASS VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the oil by-pass valve (referred to as the valve). The second task is the installation of the valve.

   TASK 79-21-09-004-029-R00

2. Remove the Oil By-Pass Valve

   A. Equipment
      (1) Clean container - minimum capacity: 42.0 U.S. pints, 37.0 Imperial pints, 20.0 Litres
      (2) UT 630 Spanner, Rolls-Royce
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   C. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

      (2) Access Panels
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

   D. Prepare for the Removal

      S 864-002-R00
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) P11 Overhead Circuit Breaker Panel
              1) 11J2, EICAS CMPTR LEFT
              2) 11J29, EICAS CMPTR RIGHT

      S 864-003-R00
      (2) Close these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) P6-1 Main Power Distribution Panel
              1) 6E1, FUEL VALVES L SPAR

2) 6E2, FUEL VALVES R SPAR

S 864-004-R00

(3) Put the FUEL CONTROL SWITCH on the main control stand to the CUTOFF position, and install a DO-NOT-CLOSE tag.

S 014-028-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) Open the right fan cowl panel (AMM 71-11-04/201).

E. Remove the Valve (Fig. 401)

S 684-034-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THE INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

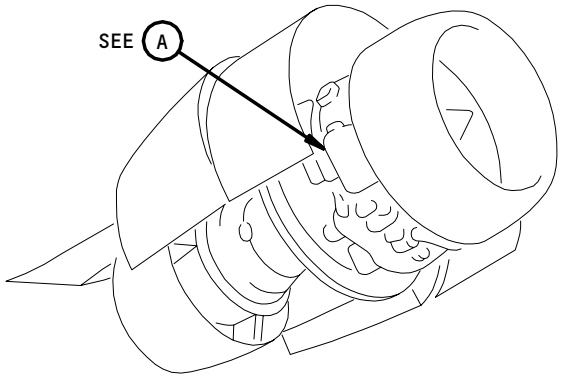
CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

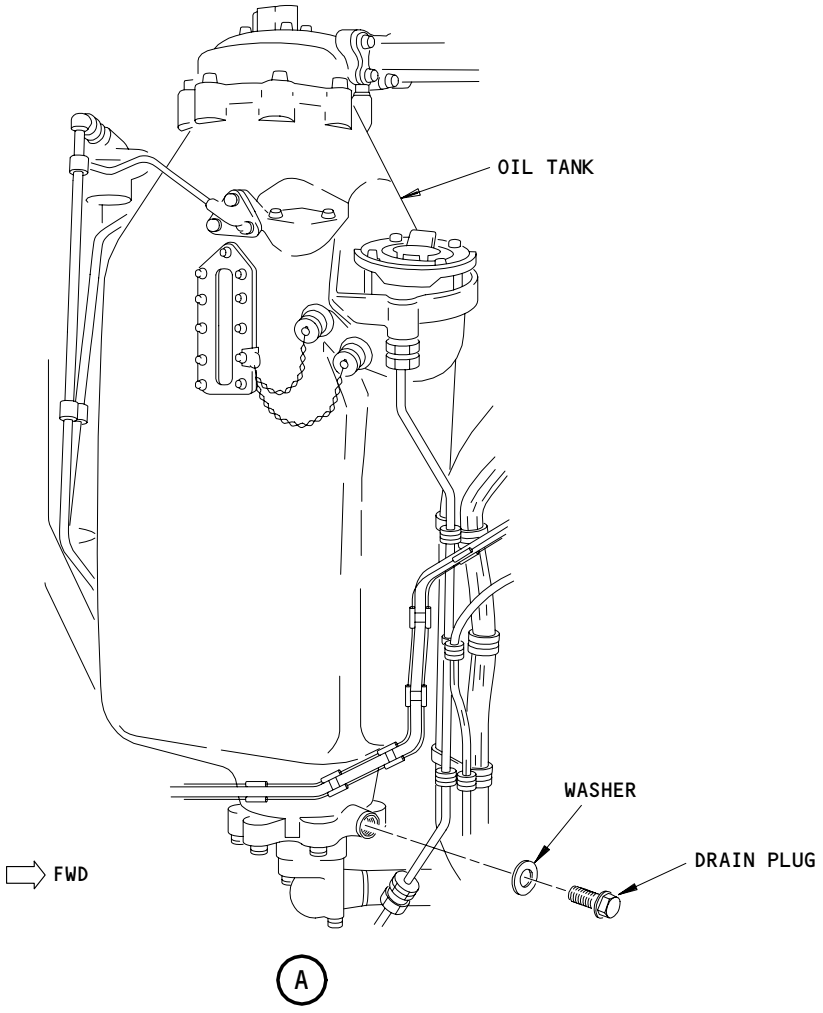
A SMALL QUANTITY OF ALKALINE CLEANING FLUIDS CAN CAUSE THE FAILURE OF THE SYNTHETIC OIL. USE FULLY CLEAN CONTAINERS AND EQUIPMENT FOR THE OIL. DO NOT PUT THE DRAINED OIL BACK TO THE SYSTEM. IF YOU DO NOT OBEY THESE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Drain the engine oil tank.
  (a) Put the container below the oil tank.
  (b) Remove the drain plug and the washer.
  (c) Drain the engine oil tank.
  (d) Install the drain plug and the washer.
  (e) Tighten the drain plug and the washer.

S 034-007-R00

(2) Remove the tube (2) between the Fuel Cooled Oil Cooler (FCOC) and the valve (Fig. 402).
  (a) Remove the bolts that attach the tube (2) to the FCOC and the valve.
  (b) Remove the tube (2).
    1) Discard the seal rings from the tube (2).





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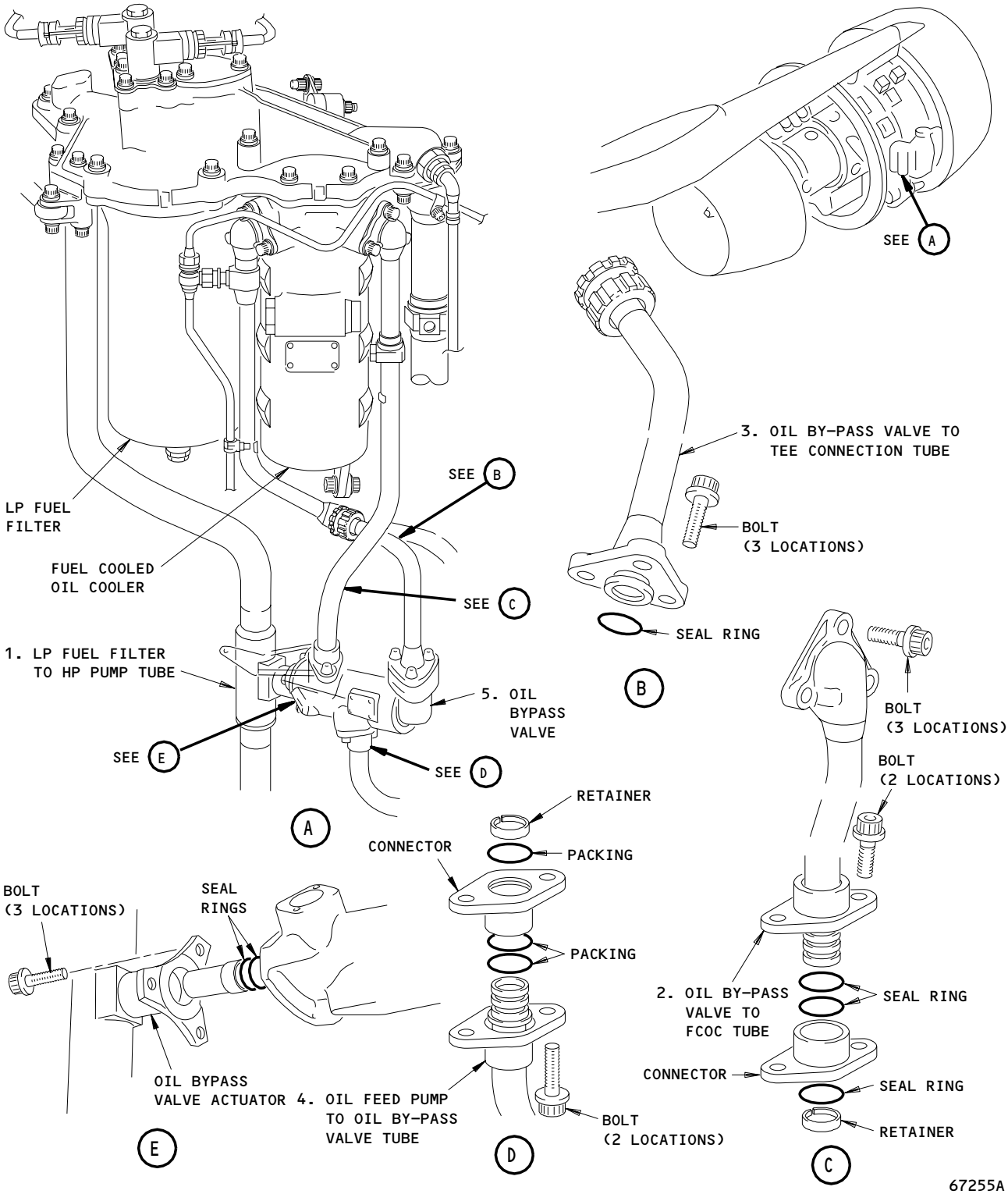
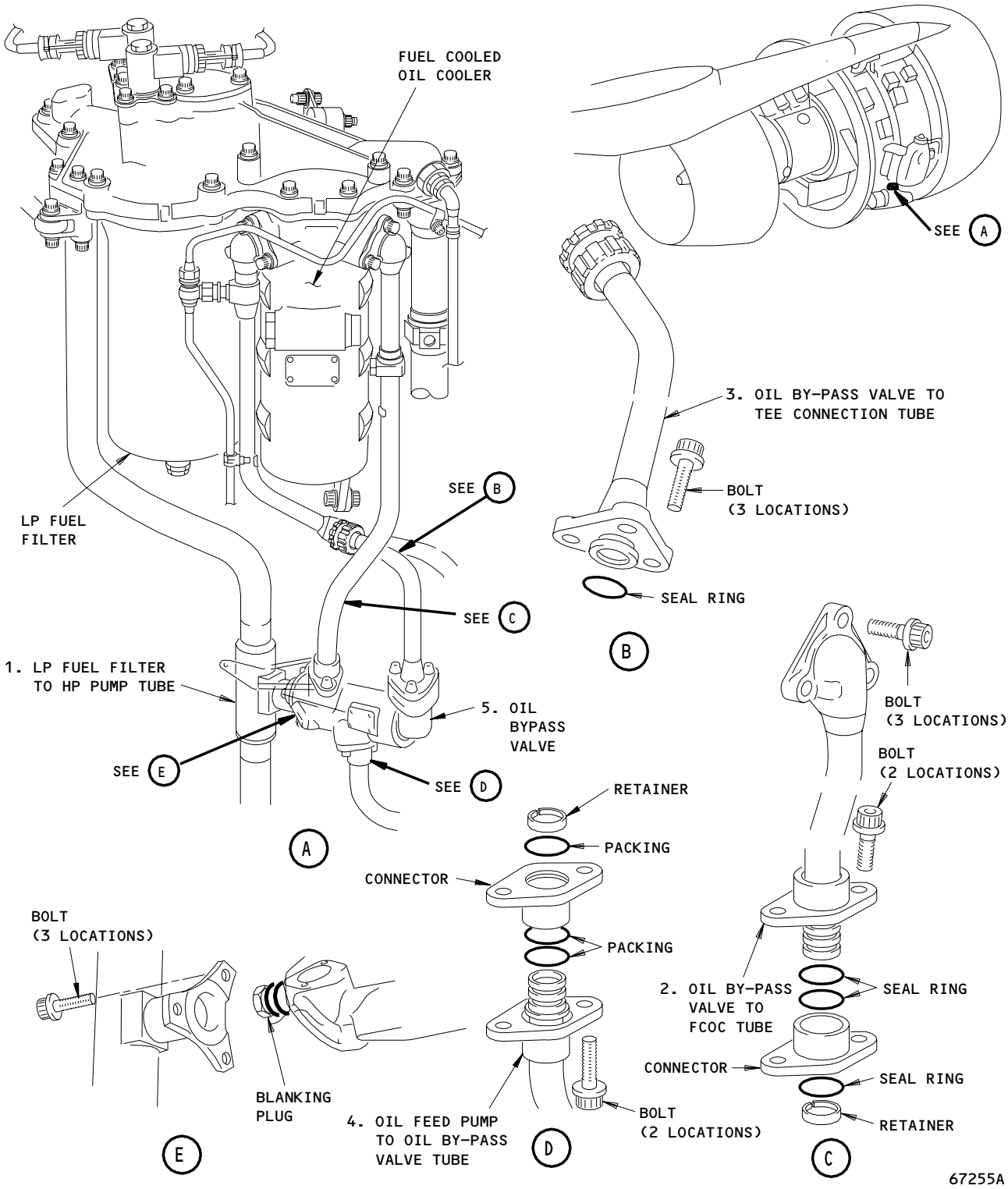
Engine Oil Tank, Location of Drain Plug
Figure 401



Oil By-Pass Valve Installation
Figure 402 (Sheet 1)

EFFECTIVITY
ENGINES WITHOUT RR SB 79-9387

140614



Oil By-Pass Valve Installation
Figure 402 (Sheet 2)

EFFECTIVITY
ENGINES WITH RR SB 79-9387

963194

S 034-008-R00
(3) Remove the tube (3) between the tee connection and the valve.
(a) Remove the bolts that attach the tube (3) to the valve.
(b) Remove the lockwire that attaches to the union.
(c) Disconnect the union that attaches the tube (3) to the tee connection.
(d) Remove the tube (3).
1) Discard the seal ring from the tube (3).

S 034-009-R00
(4) Disconnect the tube (4) between the valve and the oil feed pump.
(a) Remove the bolts that attach the tube (4) to the valve.
(b) Move the tube (4) to get a clearance at the valve.
1) Discard the seal rings from the tube (4) end.

S 034-010-R00
(5) Remove the bolts that attach the valve to the tube (1).

S 024-011-R00
(6) Remove the valve.
(a) Discard the seal ring from the valve spigot.

S 434-012-R00
(7) Install the protection caps on all the openings and the connectors.

TASK 79-21-09-424-013-R00

3. Install the Oil By-Pass Valve

A. Equipment
(1) UT 630 Spanner, Rolls-Royce
B. Consumable Materials
(1) Lockwire
British Spec/Ref - DTD. 189A, 22 SWG
American Spec/Ref - 21 AWG
OMat No. - 238

C. References
(1) AMM 12-13-01/301, Engine - Servicing (Oil Replenishing)
(2) AMM 71-00-00/501, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels

D. Access
(1) Location Zones
414 Left Engine
424 Right Engine

(2) Access Panels
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine

E. Install the Valve (Fig. 402)

S 034-035-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THE INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

A SMALL QUANTITY OF ALKALINE CLEANING FLUIDS CAN CAUSE THE FAILURE OF THE SYNTHETIC OIL. USE FULLY CLEAN CONTAINERS AND EQUIPMENT FOR THE OIL. DO NOT PUT THE DRAINED OIL BACK TO THE SYSTEM. IF YOU DO NOT OBEY THESE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Remove the protection caps from the openings and the connectors.

S 644-015-R00
(2) Lubricate the new seal rings.

S 434-016-R00
(3) Install the new seal rings on the valve spigot.

S 644-017-R00
(4) Lubricate the new seal rings.

S 434-018-R00
(5) Install the new seal rings on the tubes (2, 4).

S 434-019-R00
(6) Put the valve on the tube (1) mounting flange.

S 434-020-R00
(7) Install the bolts.
(a) Tighten the bolts (AMM 70-51-00/201).

S 024-031-R00
(8) Connect the tube (4) between the oil feed pump and the oil by-pass valve.
(a) Make sure to install the seal rings on the end of the tube correctly.
(b) Install the seal ring in a recess of the valve flange.
(c) Put the connector on the flange.
1) Install the retainer.
2) Install the bolts.
3) Tighten the bolts (AMM 70-51-00/201).

S 434-021-R00
(9) Connect the tube (3) between the valve and tee connection.
(a) Lubricate the seal ring.
(b) Install the seal ring in the recess of the valve.
(c) Put the tube on the flange.
(d) Tighten the tube with the bolts.
(e) Tighten the tube union nut at the tee connection.
1) Install the lockwire on the tube union nut.

S 434-022-R00
(10) Connect the tube (2) between the valve and the FCOC.
(a) Make sure to install the seal rings on the tube end correctly.
(b) Install the seal ring in the recess of the valve flange.
(c) Put the connector on the flange.
1) Install the retainer.
2) Install the bolts.
3) Tighten the bolts (AMM 70-51-00/201).
(d) Install the bolts that attach the tube (2) to the FCOC.
1) Tighten the bolts (AMM 70-51-00/201).

F. Put the Airplane Back to Its Usual Condition

S 614-023-R00
(1) Fill the engine oil tank (AMM 12-13-01/301).

S 864-024-R00
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11J2, EICAS CMPTR LEFT
2) 11J29, EICAS CMPTR RIGHT

S 864-025-R00
(3) Remove the DO-NOT-CLOSE tag and open this circuit breaker:
(a) P6-1 Main Power Distribution Panel
1) 6E1, FUEL VALVES L SPAR
2) 6E2, FUEL VALVES R SPAR

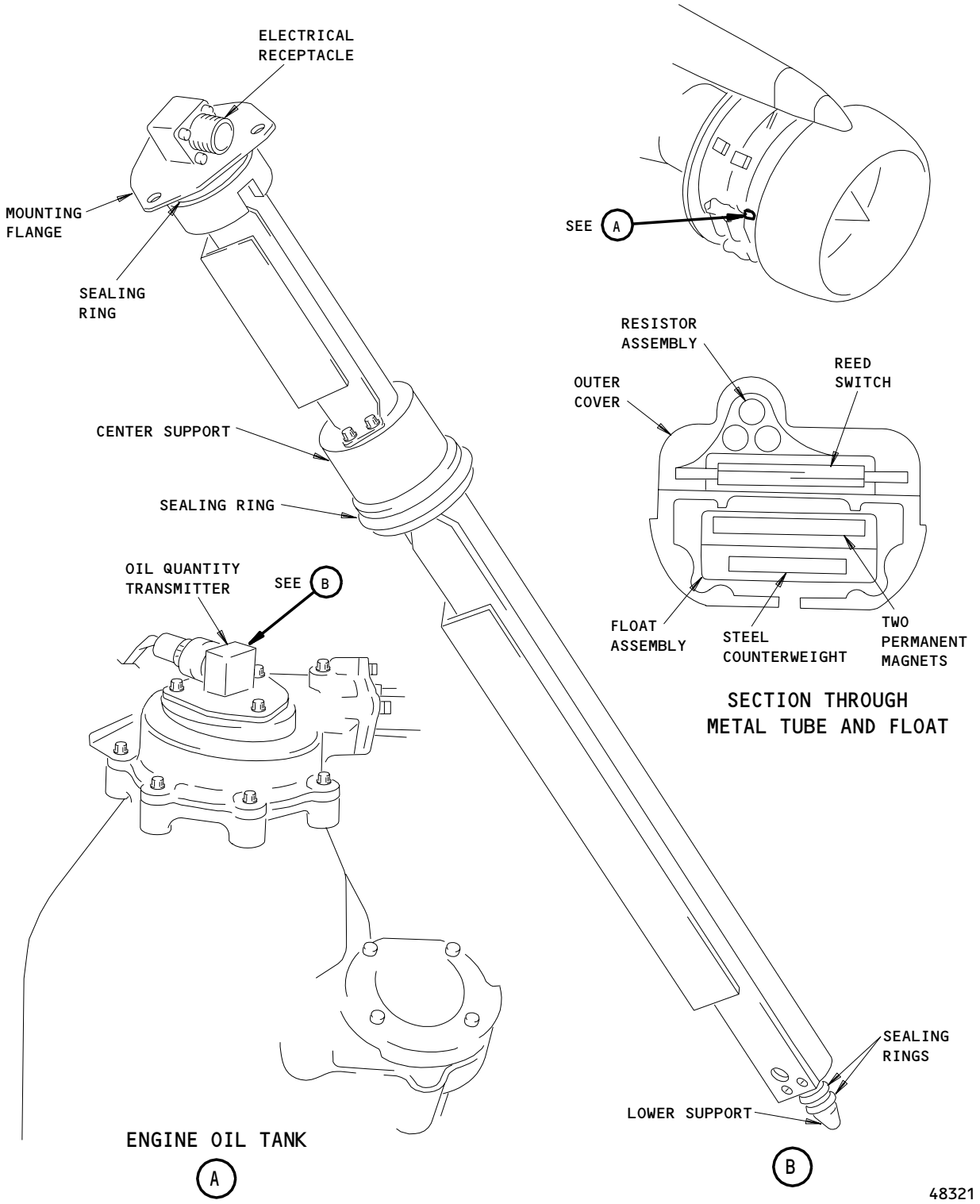
S 864-026-R00
(4) Remove the DO-NOT-CLOSE tag from the FUEL CONTROL SWITCH on the main control stand.

S 714-032-R00
(5) Do the test for the oil bypass valve that is shown in the Power-Plant Test-Reference Table (AMM 71-00-00/501).

S 414-027-R00
(6) Close the right fan cowl panel (AMM 71-11-04/201).

OIL QUANTITY INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The oil quantity indicating system provides a remote visual indication of oil level in the oil tank.
   B. The system comprises an oil quantity transmitter, which sends a signal to the lower Engine Indication and Crew Alerting Systen (EICAS) display in the flight compartment.
   C. The transmitter, which operates in conjunction with the indicator, functions as a potentiometer and when energized, with a reference voltage, provides an electrical signal proportional to oil level.
2. Component Details
   A. Oil Quantity Transmitter (Fig. 1)
      (1) The transmitter is positioned in the oil tank and comprises a metal tube containing a float assembly and a multi-switch and resistor assembly.
      (2) The float assembly is comprised of two permanent magnets and a counterweight, sealed in a chamber. The position of the float assembly in the metal tube is dependent on the oil level in the tank. The metal tube incorporates two holes, the lower hole lets oil access to the float and the upper hole vents the area above the float.
      (3) The multi-switch and resistor assembly is comprised of a ladder of switches interconnected by a resistor. Each switch consists of two, magnetically activated, flat metal reeds hermetically sealed in a glass tube. The reeds are of equal length, overlapping at the center, where they are separated by a small gap thus forming a normally open switch. The action of a switch closing and the position of that switch in the ladder, varies the resistance of the circuit through the multi-switch assembly.
      (4) With the oil tank full and therefore the float assembly at the upper extent of its travel, the magnetic field induced by the magnets in the float assembly acts on the top two switches in the ladder and causes them to close. In this configuration the electrical resistance in the circuit is at its minimum thus providing maximum output signal from the transmitter.
      (5) As the oil level and therefore the float falls, the magnetic field is removed from the top switches, which re-open, and is sensed by the next two which close. This increases the electrical resistance in the circuit and therefore reduces the transmitter output signal to the indicator system.
      (6) The output signal from the transmitter is fed to the indicator system where it is processed and displayed as an oil quantity measurement.
   B. Oil Quantity Indicator
      (1) The oil quantity indicator is located on the lower EICAS display in the flight compartment. The indicator indicates usable oil in the oil tank from 0 to 21 U.S. quarts.
      (2) Oil quantity indication is shown in a vertical scale format. Actual values are by the two analog pointers and digital readouts.



Oil Quantity Transmitter
Figure 1

(3) A white band limit area is displayed at the lower end of the analog scale of the indicator. This corresponds to 5 U.S. quarts or lower.

3. Operation

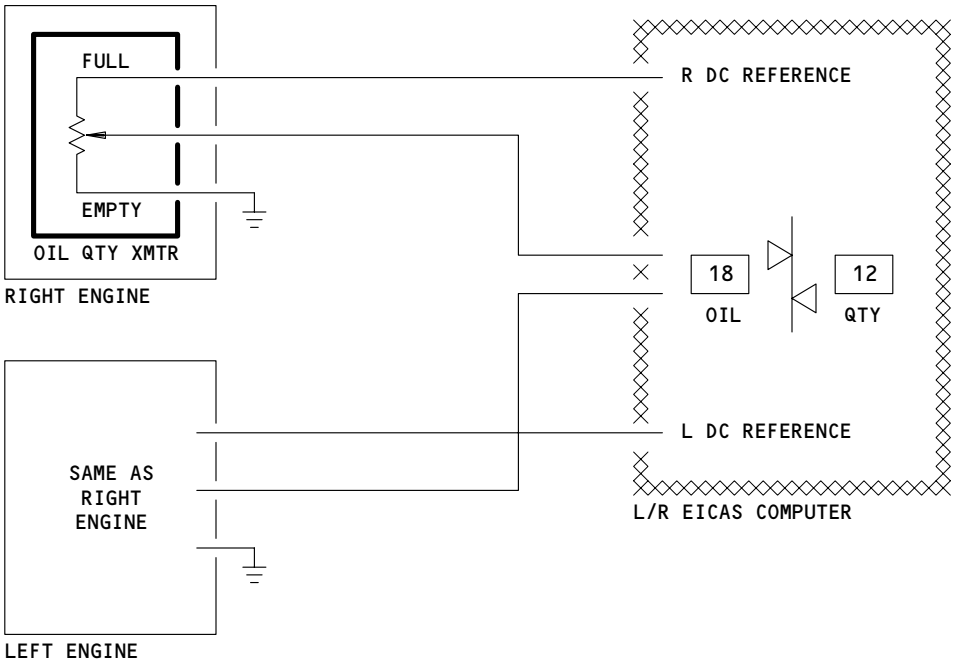
A. Functional Description

(1) Oil Quantity Indicating System (Fig. 2)

(a) With the oil tank full and therefore the float assembly at the upper extent of its travel, the magnetic field induced by the magnets in the float assembly acts on the top two switches in the ladder and causes them to close. In this configuration the electrical resistance in the circuit is at its minimum thus providing maximum output signal from the transmitter.

(b) As the oil level and therefore the float falls, the magnetic field is removed from the top switches, which re-open, and is sensed by the next two which close. This increases the electrical resistance in the circuit and therefore reduces the transmitter output signal to the indicator system.

(c) The output signal from the transmitter is fed to the indicator system where it is processed and displayed as an oil quantity measurement.

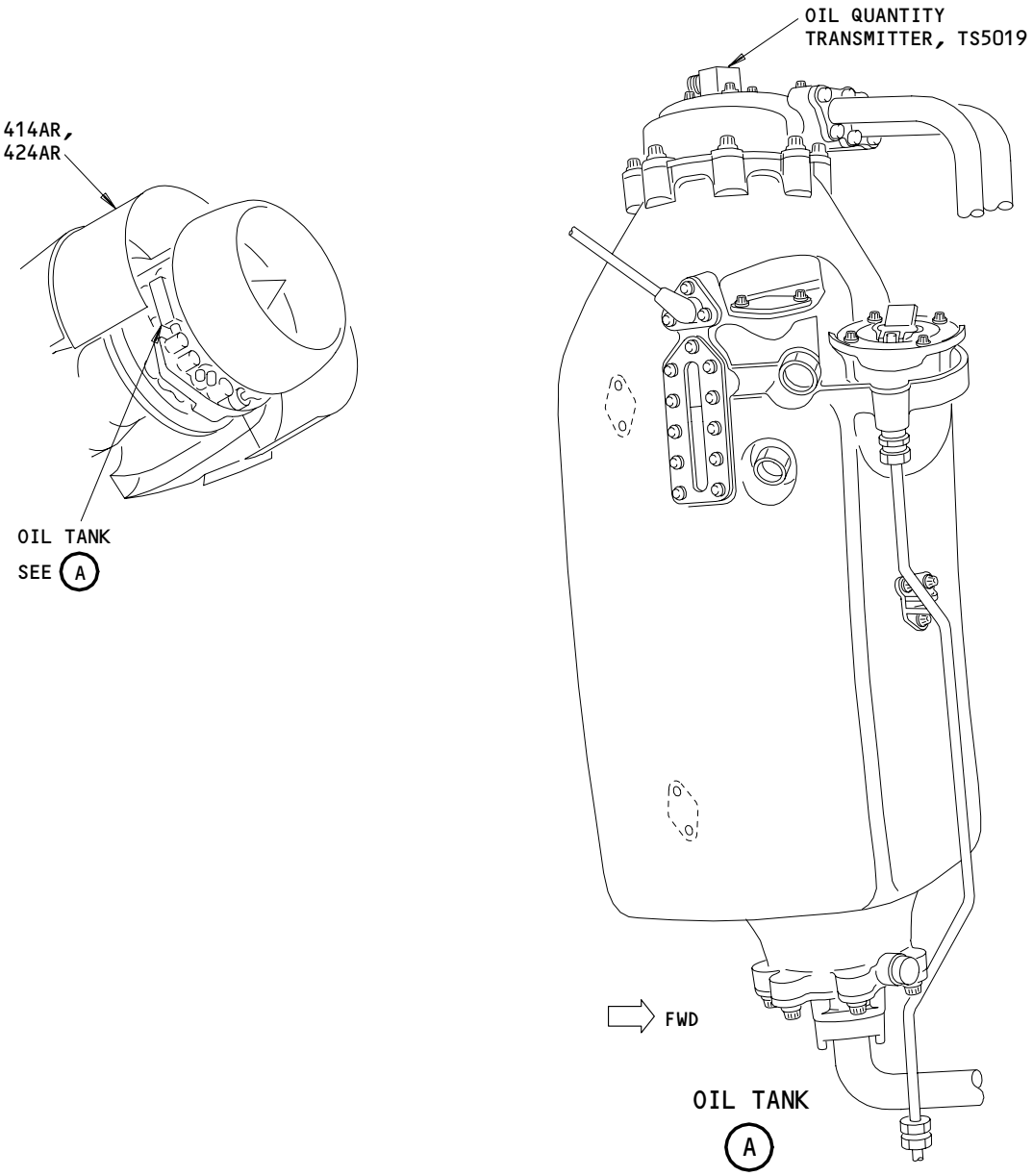


Oil Quantity Indicating System Operation Schematic
Figure 2

OIL QUANTITY INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
COMPUTERS - (31-41-00/101) EICAS L, M10181 EICAS R, M10182 TRANSMITTER - OIL QUANTITY, TS5019	--	2	414AR,424AR	79-31-01

Oil Quantity Indicating System - Component Index
Figure 101



Oil Quantity Indicating System - Component Location
Figure 102

OIL QUANTITY INDICATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks.
      (1) An operational test, and
      (2) A system test.
   B. Use the operational test if it is necessary to make sure the oil quantity indicating system operates correctly when the oil tanks are full.
   C. Use the system test when it is necessary to make sure the oil quantity indicating system operates correctly at all oil levels.
   D. Use the procedures in 70-51-00/201 to tighten the fasteners.
   E. Tighten the fasteners to the torque values in 70-51-00/201 unless a torque value is specified in this procedure.

TASK 79-31-00-715-001-R00

2. Operational Test - Oil Quantity Indicating System
   A. References
      (1) AMM 12-13-01/301, Engine - Servicing (Oil Replenishing)
      (2) AMM 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          210 Flight Compartment

   C. Prepare for Operational Test (Fig. 501)

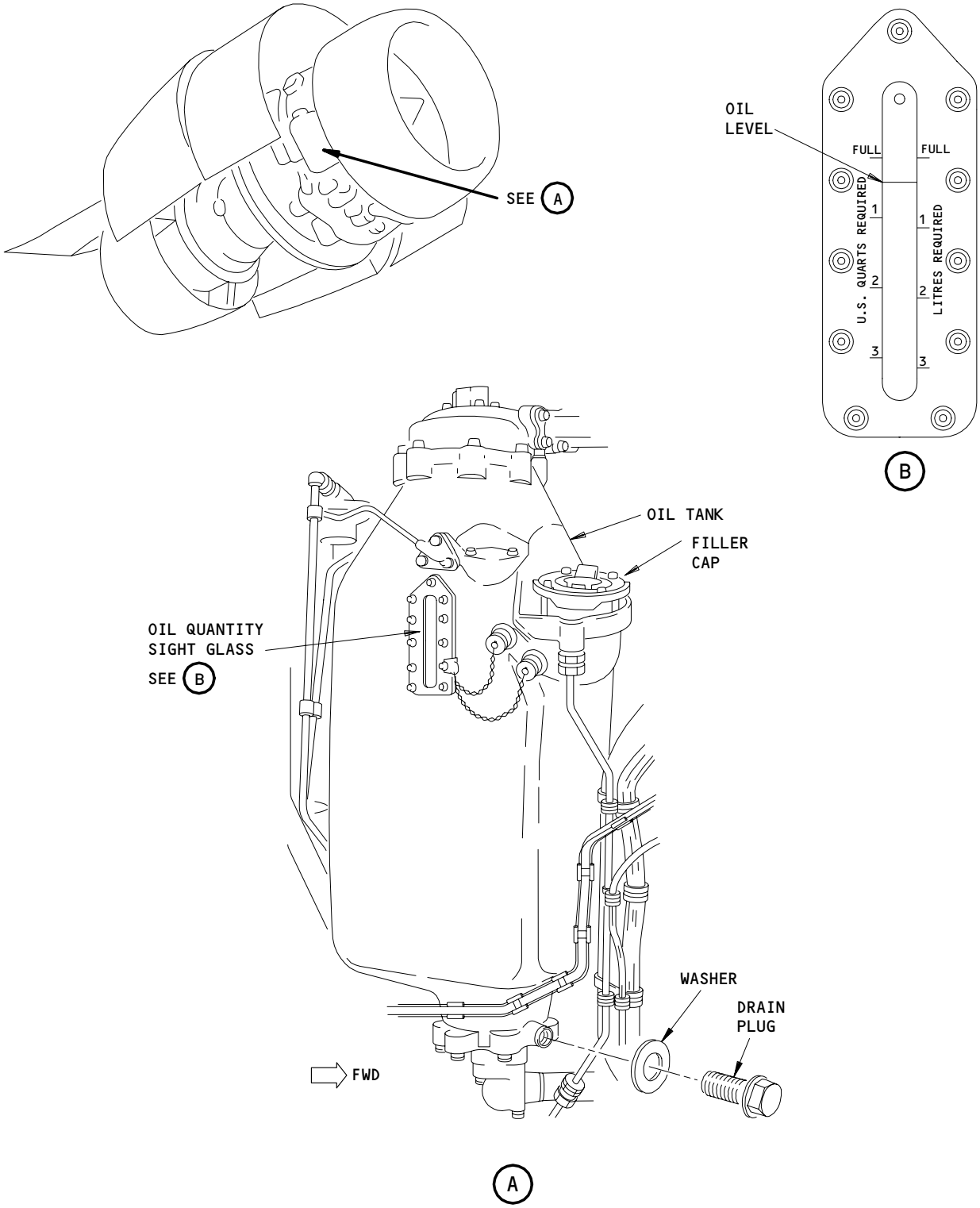
      S 215-003-R00
      (1) Find the oil level shown in the oil quantity sight glass of the oil tank.
          (a) Make sure the oil level is at the FULL mark.

              NOTE: Let the oil drain away from the sight glass after engine shut-down.

          (b) If the oil level is not at the FULL mark, add oil to the oil tank (AMM 12-13-01/301).

      S 865-004-R00
      (2) Supply the electrical power (AMM 24-22-00/201).

      S 865-005-R00
      (3) Make sure these circuit breakers are closed:
          (a) P11 Overhead Circuit Breaker Panel
              1) 11J2, EICAS CMPTR LEFT



Engine Oil Tank
Figure 501

2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 865-006-R00

(4) Push the ENGINE DISPLAY switch on the Pilot's EICAS Display Select Panel.

D. Do the Oil System Operational Test

S 215-007-R00

(1) Make sure the OIL QTY indication on the lower EICAS display shows 21 +/- 1.

E. Put the Airplane Back to Its Usual Condition

S 865-011-R00

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

TASK 79-31-00-735-012-R00

3. System Test - Oil Quantity Indicating System

A. Equipment

(1) Container - approximately 10 gallon (20 liter) capacity, for old oil
(2) Container - with 1 quart graduations, for new oil

B. Consumable Materials

(1) Oil - For RB211-535 engines (AMM 20-30-04/201)

C. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-11-04/201, Fan Cowl Panels

D. Access

(1) Location Zones

210 Flight Compartment
414 Left Engine Right Fan Cowl Panel
424 Right Engine Right Fan Cowl Panel

(2) Access Panels

414AR Left Engine Right Fan Cowl Panel
424AR Right Engine Right Fan Cowl Panel

E. Prepare for the System Test (Fig. 501)

S 015-013-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 685-014-R00

WARNING: DO NOT LET THE ENGINE OIL TOUCH YOUR SKIN FOR A LONG TIME. YOU CAN ABSORB DANGEROUS MATERIALS THROUGH YOUR SKIN IF YOU LET THE OIL TOUCH YOUR SKIN FOR A LONG TIME.

DO NOT TOUCH THE PARTS OF THE OIL SYSTEM IF THE ENGINE IS HOT. THE OIL SYSTEM STAYS HOT FOR MORE TIME THAN THE OTHER ENGINE PARTS. INJURY CAN OCCUR IF YOU TOUCH A HOT OIL SYSTEM.

CAUTION: DO NOT LET THE ENGINE OIL TOUCH THE PARTS WHICH DO NOT USUALLY TOUCH THE OIL. THE ENGINE OIL CAN CAUSE DAMAGE TO RUBBER, PAINT, AND OTHER ENGINE PARTS.

DO NOT LET ALKALINE FLUIDS (SUCH AS CLEANERS) CAUSE CONTAMINATION OF THE OIL WHICH WILL GO INTO THE ENGINE. VERY SMALL QUANTITIES OF ALKALINE FLUIDS WILL CAUSE DAMAGE TO THE ENGINE OIL.

(2) Drain the oil tank.
  (a) Put the container below the oil tank drain plug.
  (b) Remove the drain plug of the oil tank.
  (c) Let all the oil go out of the oil tank.
  (d) Install the drain plug and the washer.
  (e) Tighten the drain plug.

S 015-016-R00

(3) Open the filler cap of the oil tank.

S 865-017-R00

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

S 865-018-R00

(5) Make sure these circuit breakers are closed:
  (a) P11 Overhead Circuit Breaker Panel
    1) 11J2, EICAS CMPTR LEFT

2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 865-019-R00
(6) Push the ENGINE DISPLAY switch on the Pilot's EICAS Display Select Panel.

S 865-020-R00
(7) Turn the COMPUTER switch on the Pilot's EICAS Display Select Panel to the L position.

F. Do the Oil Quantity Indicating System Test (Fig. 501)

S 215-021-R00
(1) Make sure the OIL QTY indication on the lower EICAS display shows 0.

S 615-022-R00
(2) Add 2 quarts of oil to the oil tank.

S 215-024-R00
(3) Make sure the OIL QTY indication shows 1 +/- 1.

S 615-025-R00
(4) Add 10 quarts of oil to the oil tank.

S 215-027-R00
(5) Make sure the OIL QTY indication shows 11 +/- 1.

S 865-028-R00
(6) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the R position.

S 215-029-R00
(7) Make sure the OIL QTY indication shows 11 +/- 1.

S 615-030-R00
(8) Add 10 quarts of oil to the oil tank

S 215-032-R00
(9) Make sure the OIL QTY indication shows 21 +/- 1.

S 415-034-R00
(10) Close the filler cap of the oil tank.

S 215-035-R00
(11) Find the oil level shown in the oil quantity sight glass of the oil tank.
(a) Make sure the oil level is at the FULL mark.

G. Put the Airplane Back to Its Usual Condition

S 865-038-R00

(1) Turn the COMPUTER switch on the Pilot's EICAS Display Select Panel to the AUTO position.

S 865-036-R00

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

S 415-037-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).

OIL QUANTITY TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the oil quantity transmitter. The second task is the installation of the oil quantity transmitter.

   TASK 79-31-01-024-001-R00

2. Remove the Oil Quantity Transmitter
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

      (2) Access Panels
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

   C. Prepare for the Removal of the Oil Quantity Transmitter

      S 864-002-R00
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) P11 Overhead Circuit Breaker Panel
              1) 11J2, EICAS CMPTR LEFT
              2) 11J3, EICAS UPPER DISPLAY
              3) 11J29, EICAS CMPTR RIGHT
              4) 11J30, EICAS LOWER DISPLAY
              5) 11J31, EICAS DISPLAY SW
              6) 11J32, EICAS DISPLAY SELECT

      S 014-028-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.

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

D. Remove the Oil Quantity Transmitter (Fig. 401 and Fig. 402)

S 034-005-R00

(1) Remove the bolts (1) and the washers (2) that attach the junction test receptacle to the LP compressor case.

S 864-006-R00

(2) Disconnect the electrical connector (1).

S 034-007-R00

(3) Remove the bolts (6).

S 034-008-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: DO NOT PUT THE CABLE LOOM IN TENSION WHEN YOU MOVE THE JUNCTION TEST RECEPTACLE. IF YOU DO NOT OBEY THE INSTRUCTION, DAMAGE TO EQUIPMENT CAN OCCUR.

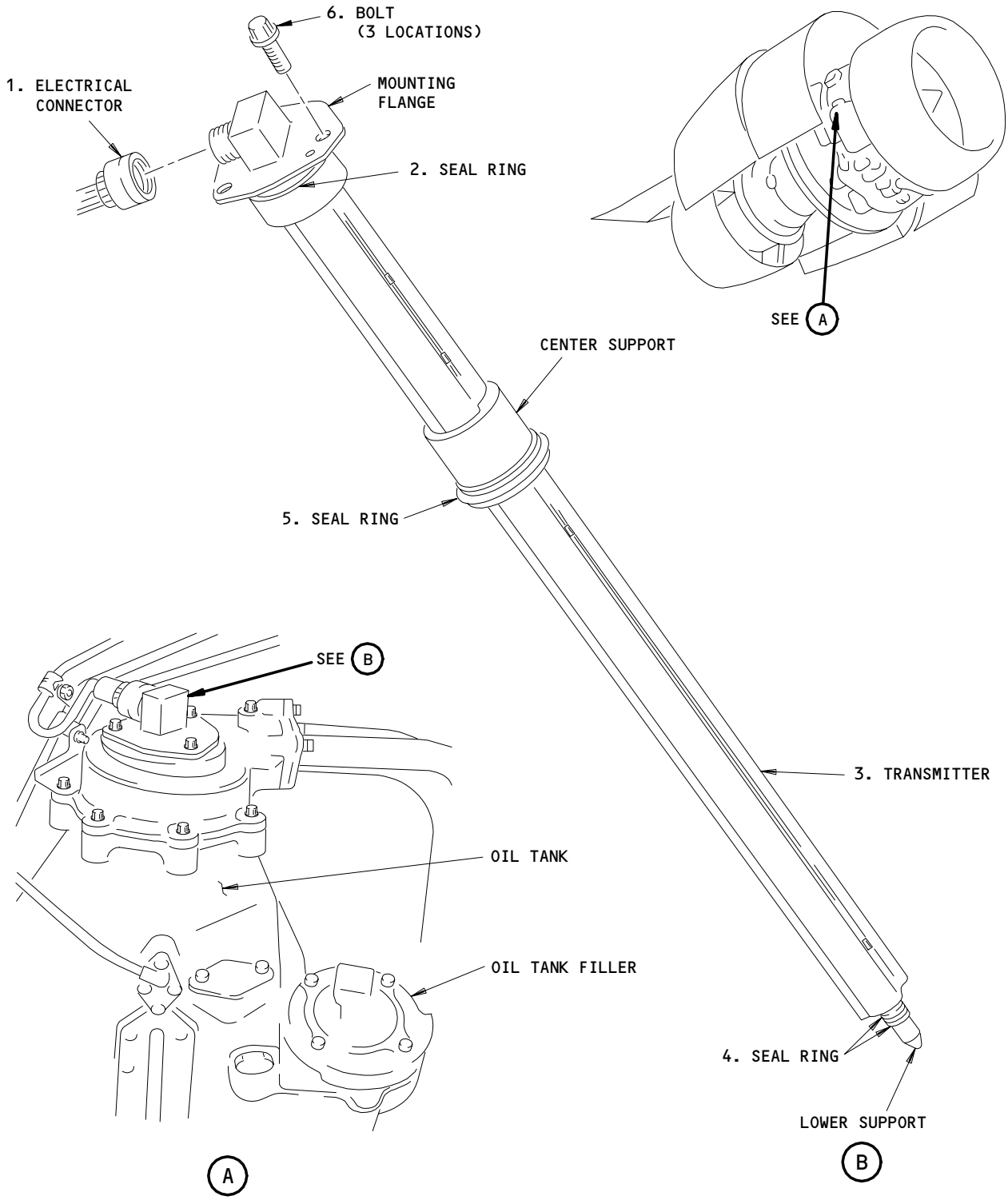
(4) Carefully lift the junction test receptacle to remove the transmitter.

S 024-010-R00

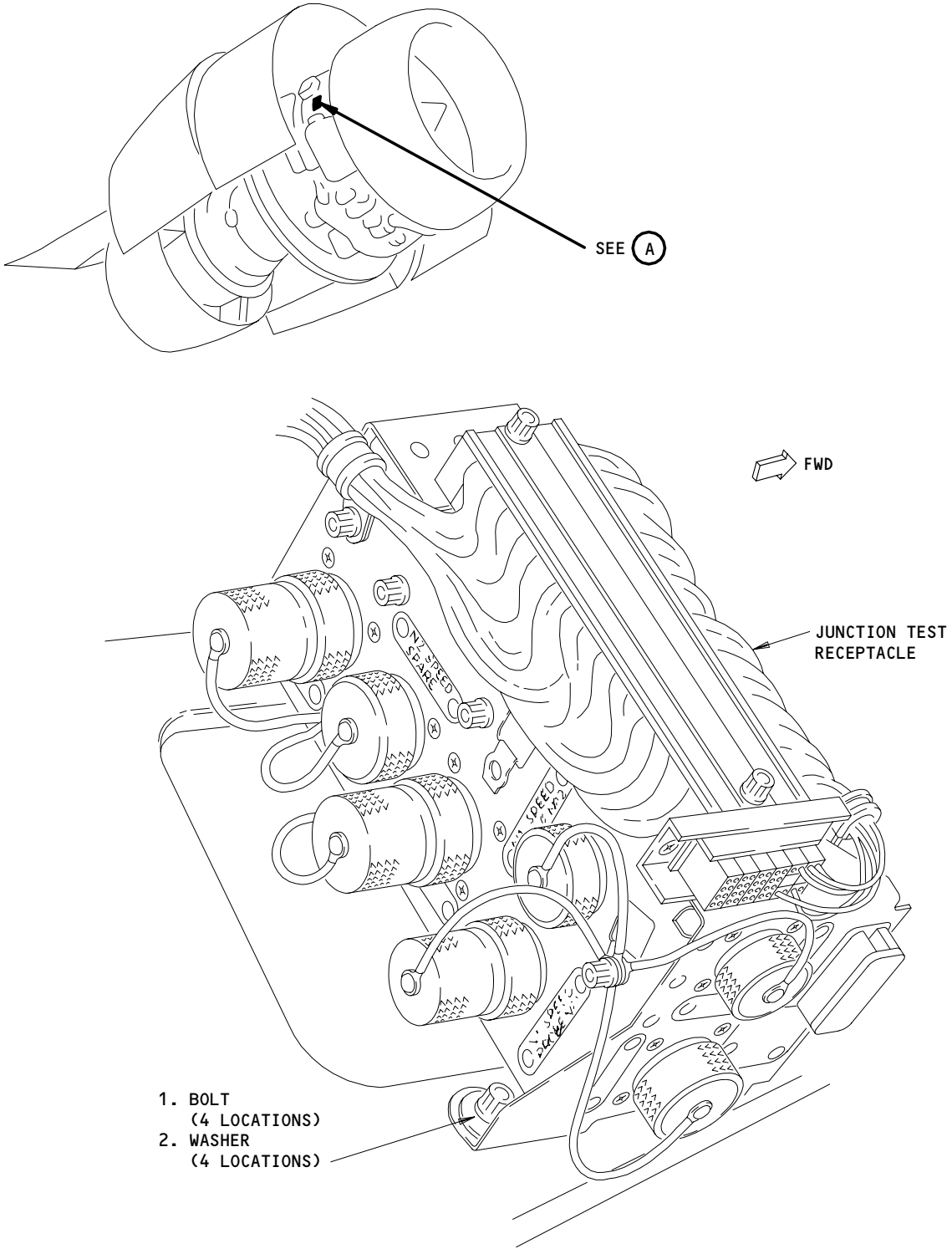
(5) Remove the transmitter (3) from the oil tank.

S 434-011-R00

(6) Install the protection caps to the opening and the electrical connector.



Oil Quantity Transmitter Installation
Figure 401



Junction Test Receptacle
Figure 402

TASK 79-31-01-424-012-R00

3. Install the Oil Quantity Transmitter

A. Equipment

(1) A clean brush with rigid bristles.

B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Seal	79-31-01	01	15
	3	Transmitter Assy - Oil Qty			5
	4	Packing			13J
	5	Seal			20
	6	Bolt			10
402	1	Bolt	71-51-60	01	290J
	2	Washer			295

C. Consumable Materials

(1) B00148 Cleaning fluid - Methylethylketone
British Spec/Ref - B.S.1940:1968
American Spec/Ref - U.S. TT-M-261
OMat No. - 135

(2) B00178 Cleaning Fluid - Acetone
British Spec/Ref - B.S. 509, 1964
American Spec/Ref -
OMat No. - 150

(3) B00191 Cleaning Fluid - Methylene Chloride (Dichloromethane)
British Spec/Ref - B.S. 1994, 1953
American Spec/Ref - MIL-D-6998
OMat No. - 169

(4) Jointing compound
British Spec/Ref - PL32 (Light)
American Spec/Ref -
OMat No. - 4/46

D. References

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

E. Access

(1) Location Zones
414 Left Engine
424 Right Engine

(2) Access Panels
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine

F. Install the Oil Quantity Transmitter (Fig. 401 and 402)

S 034-013-R00

(1) Remove the protection caps from the opening and the electrical connector.

S 114-014-R00

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

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGEASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN AMM 70-42-12/201 WHEN YOU USE THE . SOLVENT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Put the cold degreasing fluid on the mating faces of the oil tank and the transmitter.
   (a) Let the liquid degreasing fluid dry.

S 644-015-R00

(3) Lubricate the new seal rings (2, 4 and 5).

S 434-016-R00

(4) Install the new seal rings (2, 4 and 5) to the transmitter.

S 434-017-R00

CAUTION: DO NOT LET THE JOINTING COMPOUND GET IN THE AREA THE OIL GOES THROUGH. IF YOU DO NOT OBEY THE INSTRUCTION, DAMAGE TO EQUIPMENT CAN OCCUR.

(5) Put a thin layer of the jointing compound with a brush to the mating faces of the oil tank and the transmitter.
   (a) Let the compound to dry for a minimum of 10 minutes.

S 434-018-R00

CAUTION: DO NOT PUT CABLE LOOM IN TENSION WHEN YOU MOVE THE JUNCTION TEST RECEPTACLE. IF YOU DO NOT OBEY THE INSTRUCTION, DAMAGE TO EQUIPMENT CAN OCCUR.

(6) Carefully lift the junction test receptacle to remove the transmitter.

S 434-020-R00

(7) Put the transmitter (3) to the location of the lower and middle supports in the oil tank.

NOTE: One bolt hole does not align.

S 434-021-R00

(8) Install the bolts (6).

S 864-022-R00

(9) Connect the electrical connector (1).

S 434-024-R00

(10) Put the junction test receptacle on the LP compressor case.

S 434-025-R00

(11) Install the bolts (1) and the washers (2).

G. Put the Airplane Back to Its Usual Condition

S 864-026-R00

(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11J2, EICAS CMPTR LEFT
      2) 11J3, EICAS UPPER DISPLAY

3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 414-029-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.

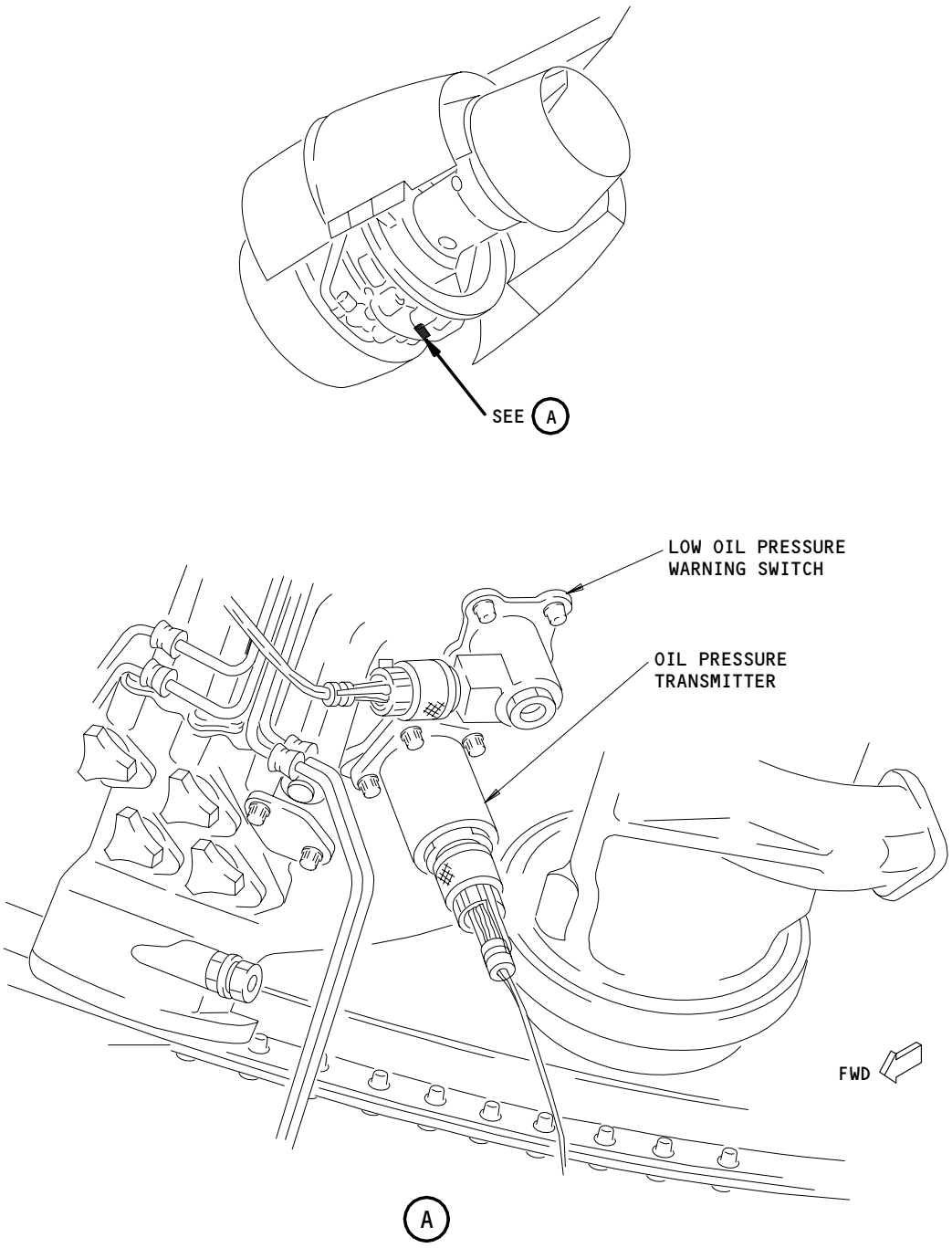
(2) Close the right fan cowl panel (AMM 71-11-04/201).

S 724-031-R00

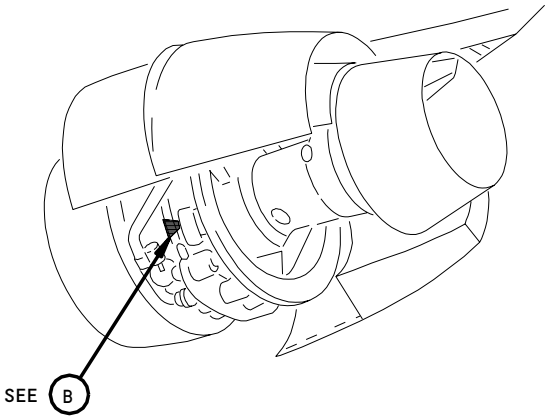
(3) Do the required tests for installation of the oil quantity transmitter (AMM 71-00-00/501).

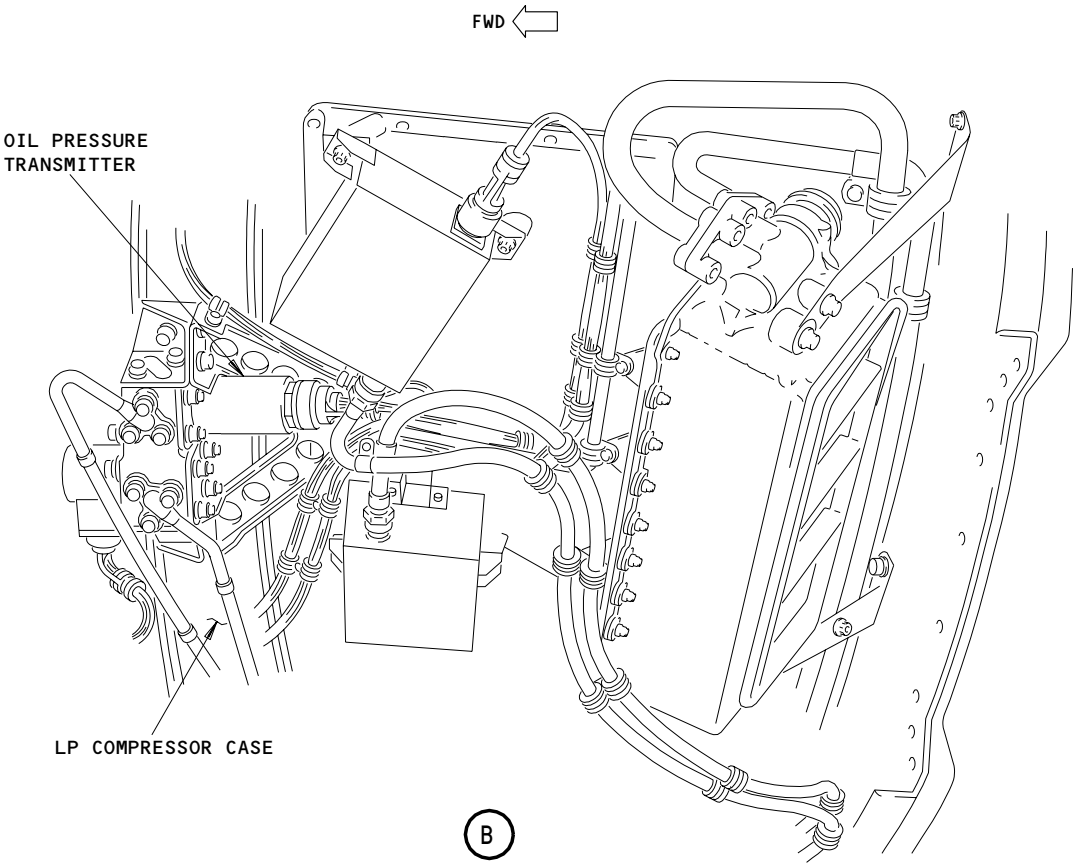
OIL PRESSURE INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The oil pressure indicating system gives a visual indication of oil pressure in the engine oil system.
   B. The system contains an engine mounted oil pressure transmitter. This transmits a signal to the lower Engine Indication and Crew Alerting System (EICAS) display in the flight compartment.
   C. The pressure transmitter measures the difference between the feed and return oil pressures. It gives electrical signals in proportion to the difference, which is transmitted to the EICAS display. Feed oil pressure is pressure pump outlet pressure and return oil pressure is internal gearbox scavenge pump inlet pressure. These two pressures are measured through holes in the external gearbox.
2. Component Details
   A. Oil Pressure Transmitter (Fig. 1)
      (1) ENGINES PRE-RR-SB 79-9179;
      The oil pressure transmitter is installed on the external gearbox to the right of the input drive housing. The transmitter has a cylindrical case which contains two stator windings. The stator windings are installed around an armature which operates on a center spindle. The spindle attaches to a capsule stack. Two holes in the transmitter base plate align with holes in the gearbox mounting face. One hole permits the main feed oil pressure to go into a chamber around the capsule stack. The other hole permits the return oil pressure to go into the capsule stack. The two stator windings connect to the engine electrical harness with a three pin electrical connector installed on the transmitter case.
      (2) ENGINES POST-RR-SB 79-9179;
      The oil pressure transmitter is installed on a manifold block on the LP fan case joint flange, forward of the intergrated drive generator cooling duct. The transmitter has a cylindrical case which contains two stator windings. The stator windings are installed around an armature which operates on a center spindle. The spindle attaches to a capsule stack. Two holes in the transmitter base plate align with holes in the manifold mounting face. One hole permits the main feed oil pressure to go into a chamber around the capsule stack. The other hole permits the return oil pressure to go into the capsule stack. The two stator windings connect to the engine electrical harness with a three pin electrical connector installed on the transmitter case.
   B. Oil Pressure Indicator
      (1) The oil pressure indicator is found on the lower EICAS display in the flight compartment. The oil pressure indicator shows the oil pressure after the fuel cooled oil cooler and before the oil goes into the engine bearings from 0-100 psi.
      (2) The oil pressure indication is shown in a vertical scale format. The values are shown by analog pointers and by digital readouts.



Oil Pressure Transmitter
Figure 1 (Sheet 1)

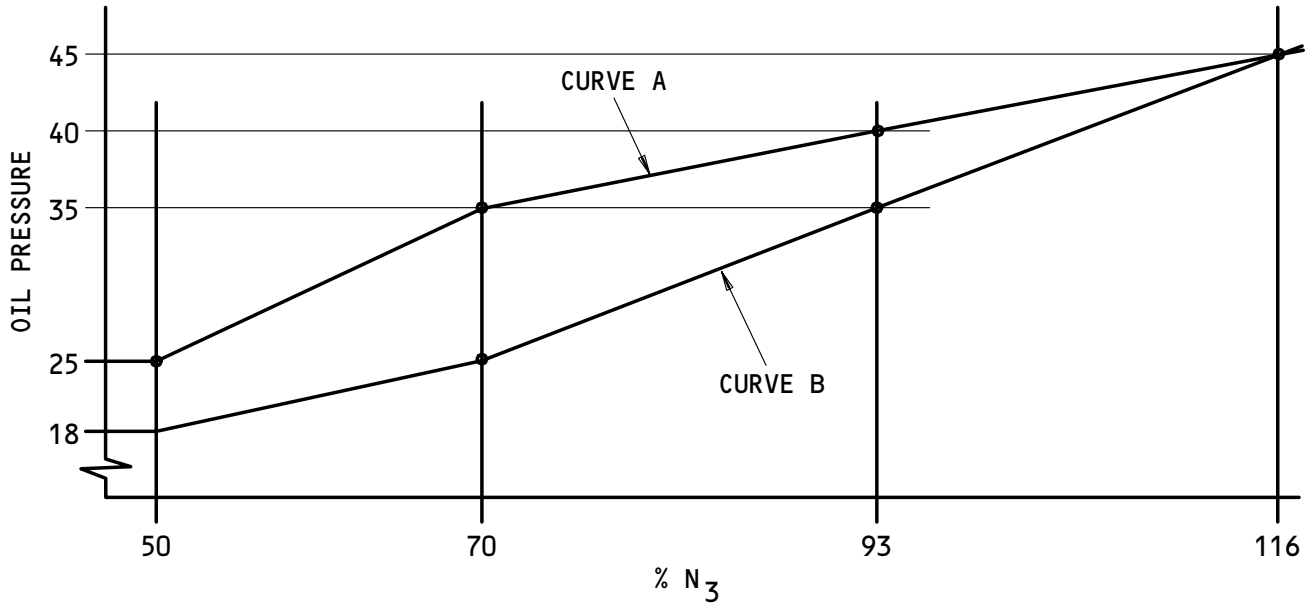




Oil Pressure Transmitter
Figure 1 (Sheet 2)

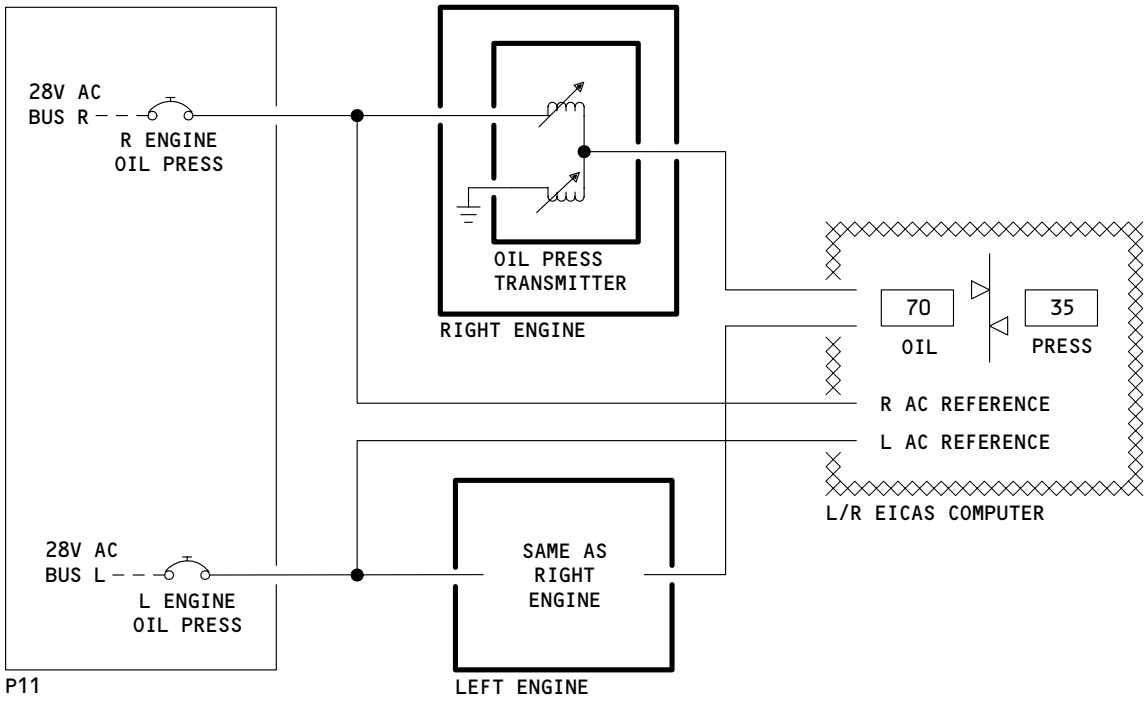
(3) Yellow band and red band exceedance areas are displayed at the lower end of the analog scale of the indicator. When there is a yellow band exceedance, an automatic display of all oil parameters on the lower EICAS display occurs. If the value pointer goes into the yellow band area, the pointer and digital readout each become yellow in color. If the actual value pointer goes into the red band area, the pointer and digital readout each become red in color.

(4) Oil pressure exceedance levels change with N3 rotation (Fig. 2). Curve B shows the yellow band exceedance values for airplanes that have their engine power setting at takeoff thrust, have been on the ground for less than one minute, or are in the air. Curve A represents all other modes. The red band has a set exceedance limit of 18 psi.



Variable Engine Oil Pressure Limits
Figure 2

3. Operation (Fig. 3)
   A. Functional Description
      (1) Oil Pressure Indicating System
         (a) A change in the differential oil pressure causes the capsule stack to become larger or smaller. This gives linear movement of the spindle and armature. This causes a change in the ratio of inductance of the two stator windings. The change in the ratio of inductance causes a change in current difference in two branches of the indication circuit. The current difference causes an increase or decrease of the indication in the flight compartment.



Oil Pressure Indicating System Operation Schematic
Figure 3

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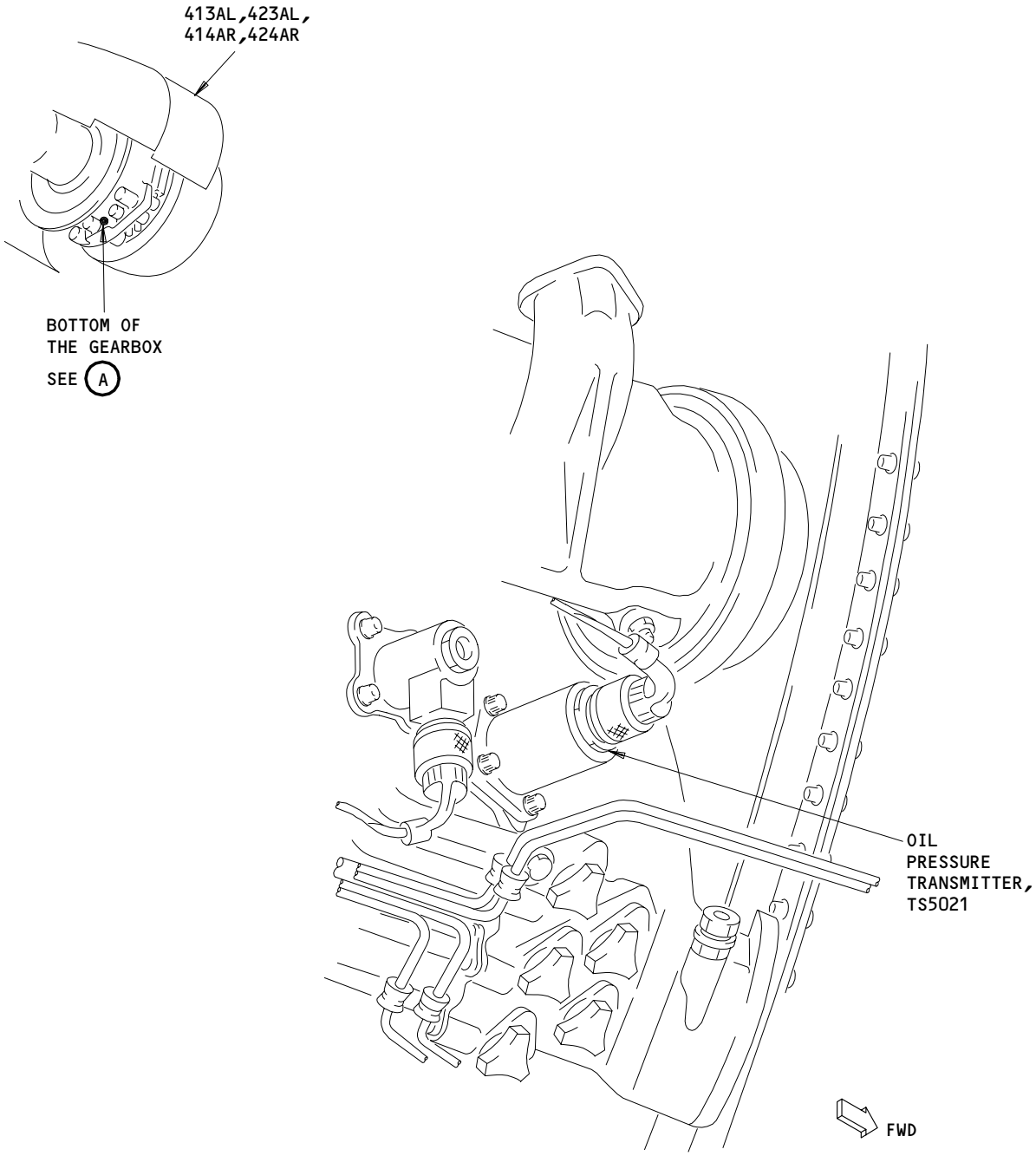
OIL PRESSURE INDICATING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS -	--		FLT COMPT, P11	
LEFT ENGINE OIL PRESS, C1498		1	11K9	*
RIGHT ENGINE OIL PRESS, C1499		1	11K35	*
COMPUTERS - (31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
TRANSMITTER - OIL PRESSURE, TS5021	--	2	413AL,423AL,414AR,424AR	79-32-01

* SEE THE WDM EQUIPMENT LIST

Oil Pressure Indicating System - Component Index
Figure 101



Oil Pressure Indicating System – Component Location
Figure 102

OIL PRESSURE INDICATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks. The first task is an operational test for the oil pressure indicating system. The second task is a system test for the oil pressure indicating system.
   B. You can do the operational test while the engine operates to make sure the indicating system operates correctly.
   C. The system test measures the percision of the indicating system.

TASK 79-32-00-715-001-R00

2. Operational Test - Oil Pressure Indicating System
   A. References
      (1) AMM 71-00-00/201, Power Plant
   B. Access
      (1) Location Zone
          211 Control Cabin (LH side)
          212 Control Cabin (RH side)

   C. Procedure

      S 865-002-R00

      WARNING: USE 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 215-003-R00
      (2) Make sure each engine operates at the same power adjustment:
          (a) Make sure the oil pressure indications on the lower Engine Indication and Crew Alerting System (EICAS) display are approximately the same for each engine.

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

TASK 79-32-00-735-005-R00

3. System Test - Oil Pressure Indicating System
   A. References
      (1) AMM 12-13-01/301, Engine
      (2) AMM 24-22-00/201, Control
      (3) AMM 36-00-00/201, Pneumatic - General
      (4) AMM 71-00-00/201, Power Plant
      (5) AMM 71-11-04/201, Fan Cowl Panels
      (6) AMM 79-21-03/401, Magnetic Chip Detectors

B. Access

(1) Location Zones

211 Control Cabin (LH side)
212 Control Cabin (RH side)
410 Left Engine
420 Right Engine

(2) Access Panels

413/423 Fan Cowl Panel (LH)
414/424 Fan Cowl Panel (RH)

C. Prepare for the System Test

S 615-006-R00

(1) Do the servicing procedure for the engine oil tank on the applicable engine (AMM 12-13-01/301).

S 865-007-R00

(2) Make sure these circuit breakers are closed:
(a) P11-3 Overhead Circuit Breaker Panel
1) 11D19, ENGINE START CONT LEFT
2) 11D20, ENGINE START CONT RIGHT

S 865-008-R00

(3) Make sure the FUEL CONTROL switch is in the CUTOFF position and attach a DO-NOT-OPERATE tag.

D. Do the System Test (Fig. 501)

S 865-009-R00

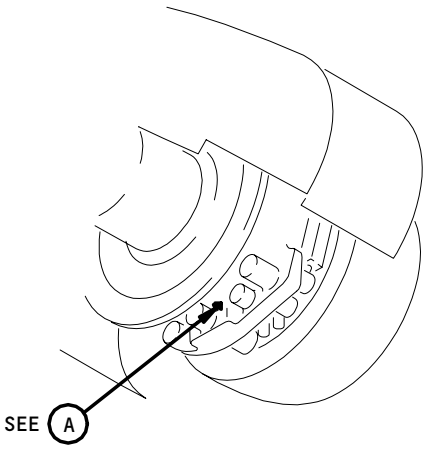
(1) Supply the electrical power (AMM 24-22-00/201).

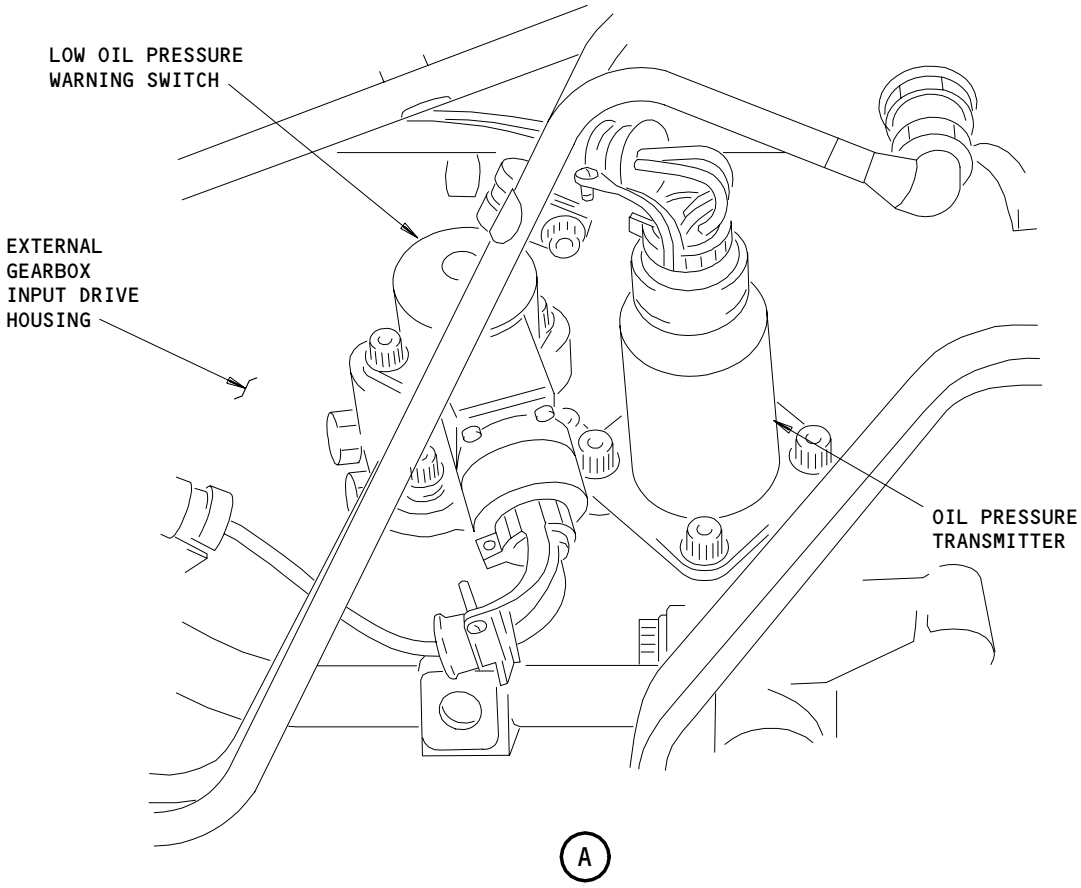
S 865-010-R00

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

S 865-011-R00

(3) Make sure these circuit breakers are closed:
(a) P11 Overhead Circuit Breaker Panel
1) 11J2, EICAS CMPTR LEFT





47204

Oil Pressure Indicating System Test
Figure 501

2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 865-012-R00

WARNING: USE 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.

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

S 865-013-R00
(5) Put the engine start switch to the GND position and let the engine motor for 30-45 seconds.

S 215-014-R00
(6) Monitor the engine oil pressure on the lower Engine Indicating and Crew Alerting System (EICAS) display and make sure it increases smoothly.

S 215-015-R00
(7) Make sure a minimum oil pressure of 18 psi shows on the indicator.

S 865-016-R00
(8) Move the engine start switch to the AUTO position.

S 865-017-R00
(9) Use the Power Plant Operation (Normal) procedure to do the engine shut-down (AMM 71-00-00/201).

S 025-018-R00
(10) Remove the master chip detector (AMM 79-21-03/401).

S 215-019-R00
(11) Make sure the master chip detector is wet with oil.

S 425-020-R00
(12) Install the master chip detector (AMM 79-21-03/401).

S 035-021-R00
(13) Remove the DO-NOT-OPERATE tag from the FUEL CONTROL switch.

S 865-022-R00

WARNING: USE 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.

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

S 865-028-R00

(15) Let the engine become stable at 50% N3.

S 215-029-R00

(16) Make sure the indication light for the oil pressure goes out at approximately 18 psi and the oil pressure becomes stable at 25 psi after 5 minutes of engine operation.

S 865-030-R00

(17) Use the Power Plant Operation (Normal) procedure to do the engine shut-down (AMM 71-00-00/201).

S 865-031-R00

(18) Remove the pneumatic power (AMM 36-00-00/201).

S 865-032-R00

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

OIL PRESSURE TRANSMITTER - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the oil pressure transmitter. The second task is the installation of the oil pressure transmitter.

   TASK 79-32-01-024-001-R00

2. Remove the Oil Pressure Transmitter
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

      (2) Access Panels
          ON ENGINES WITHOUT RR SB 79-9179,
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

          ON ENGINES WITH RR SB 79-9179,
          413 Fan Cowl Panel (LH) - Left Engine
          423 Fan Cowl Panel (LH) - Right Engine

   C. Prepare for the Removal of the Oil Pressure Transmitter

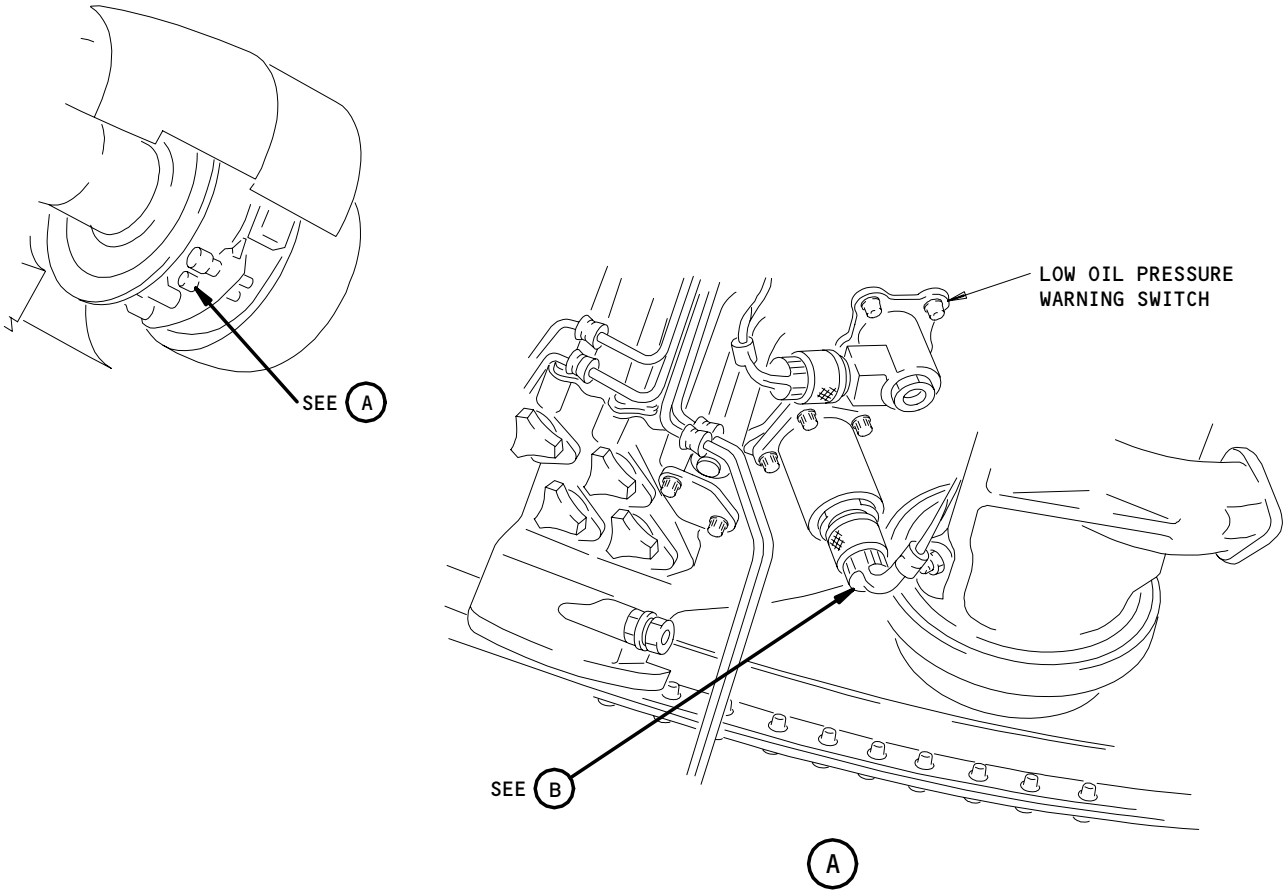
      S 864-002-R00
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
      (a) P11 Overhead Circuit Breaker Panel
          1) 11K9, LEFT ENGINE OIL PRESS
          2) 11K35, RIGHT ENGINE OIL PRESS

      S 014-035-R00

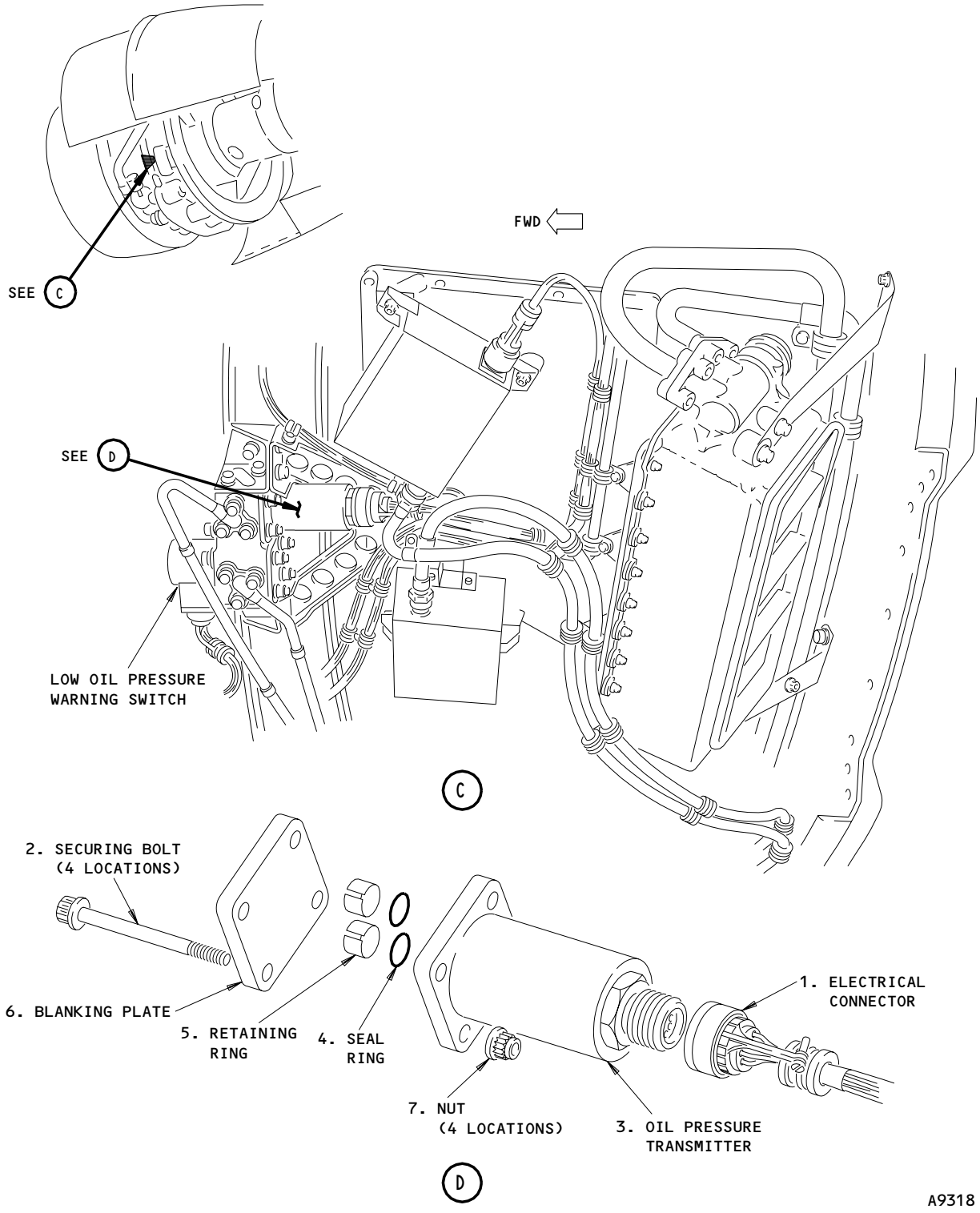
      CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU OPEN THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

      (2) ON ENGINES WITHOUT RR SB 79-9179;
      open the right fan cowl panel (AMM 71-11-04/201).

      S 014-023-R00
      (3) ON ENGINES WITH RR SB 79-9179;
      open the left fan cowl panel (AMM 71-11-04/201).
   D. Removal of the Oil Pressure Transmitter (Fig. 401)



Oil Pressure Transmitter Installation
Figure 401 (Sheet 1)



Oil Pressure Transmitter Installation
Figure 401 (Sheet 2)

EFFECTIVITY
ENGINES WITH RR SB 79-9179

963340

S 864-004-R00

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS FREE FROM LIQUID OR SOLID CONTAMINATION BEFORE YOU DISCONNECT. IF YOU HAVE CONTAMINATION, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Disconnect the electrical connector (1).

S 034-024-R00

(2) ON ENGINES WITHOUT RR SB 79-9179;
remove the bolts (2).

S 034-025-R00

(3) ON ENGINES WITH RR SB 79-9179;
remove the bolts (2), the nuts (7) and the blanking plate (6).

S 024-006-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT OBEY THE INSTRUCTIONS. INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON DURING THE SERVICING. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(4) ON ENGINES WITHOUT RR SB 79-9179;
lift the transmitter (3) from the mounting flange on the gearbox to be clear of the retaining rings.

S 024-026-R00

(5) ON ENGINES WITH RR SB 79-9179;
lift the transmitter (3) from the mounting flange on the LP compressor case to be clear of the retaining rings.
(a) Remove the transmitter (3).

(b) Drain oil to the receptacle (container).

S 034-007-R00

(6) Remove the seal rings (4) and the retaining rings (5).

S 434-008-R00

(7) Install the protection caps to all the openings and the connectors.

TASK 79-32-01-424-009-R00

3. Install the Oil Pressure Transmitter

A. Equipment

(1) A clean brush with rigid bristles.

(2) Clean receptable - minimum capacity
10.0 US Pints
8.0 Imperial Pints
5.0 Litres

B. Consumable Material

(1) B00148 Cleaning fluid - Methyl Ethyl Ketone
British Spec/Ref -
American Spec/Ref - TT-M-261
OMat No.

(2) B00178 Cleaning Fluid - Acetone
British Spec/Ref - B.S. 509, 1964
American Spec/Ref -
OMat No. -150

(3) B00191 Cleaning Fluid - Methylene Chloride (Dichloromethane)
British Spec/Ref - B.S. 1994, 1953
American Spec/Ref - MIL-D-6998
OMat No. - 169

(4) Degreasing fluid (Inhibited and Stabilized
1.1.1. trichloroethane)
British Spec/Ref - B.S. 4487, 1969
American Spec/Ref - MIL-T-81533
OMat No. 1/21

(5) Lint free cloth

C. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 79-32-00/501, Oil Pressure Indicating System

D. Access
(1) Location Zones
414 Left Engine
424 Right Engine

(2) Access Panels
ON ENGINES WITHOUT RR SB 79-9179,
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine

ON ENGINES WITH RR SB 79-9179,
413 Fan Cowl Panel (LH) - Left Engine
423 Fan Cowl Panel (LH) - Right Engine

E. Install the Oil Pressure Transmitter (Fig. 401)

S 034-010-R00
(1) Remove the protection caps from all the opening and the connectors.

S 114-021-R00

WARNING: DO NOT GET THE METHYL ETHYL KETONE (MEK) IN YOUR MOUTH, OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE MEK. PUT ON A PROTECTION SPLASH GOGGLE AND GLOVES WHEN YOU USE THE MEK. KEEP THE MEK AWAY FROM SPARKS, FLAMES, AND HEAT. MEK IS A POISONOUS AND FLAMMABLE SOLVENT WHICH CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: DO NOT GET CLEANING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. CLEANING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN WHEN YOU USE THE CLEANING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Use the cleaning fluid to remove all the jointing compound from the oil pressure transmitter and the gearbox mating faces.

S 114-027-R00
(3) ON ENGINES WITHOUT RR SB 79-9179;
do these steps to clean the mating faces of the oil pressure transmitter and the gearbox with the degreasing fluid:

S 114-028-R00
(4) ON ENGINES WITH RR SB 79-9179;
do these steps to clean the mating faces of the oil pressure transmitter and the gearbox with the degreasing fluid:

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGREASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Use a a clean, dry, and lint free cloth to moist with the degreasing fluid.

(b) Clean the mating surfaces with the cloth.
(c) Discard the dirty cloth.

NOTE: Use a new clean cloth for each operation. Make sure to put the degreasing fluid liquid to the cloth to prevent the contamination of the bulk liquid.

S 644-013-R00
(5) Lubricate the new seal rings (4) and the retaining rings (5).

S 434-029-R00

(6) ON ENGINES WITHOUT RR SB 79-9179;
install the new seal rings (4) and the retaining rings (5) in the recess of the gearbox mounting face.

NOTE: Make sure that the retaining rings for each seal installs correctly.

S 434-030-R00

(7) ON ENGINES WITH RR SB 79-9179;
install the new seal rings (4) and the retaining rings (5) in the recess of the LP compressor case mounting face.

NOTE: Make sure that the retaining rings for each seal installs correctly.

S 434-031-R00

(8) ON ENGINES WITHOUT RR SB 79-9179;
put the oil pressure transmitter on the mounting face to make sure of the correct location on the retaining rings.
(a) Install the oil pressure transmitter with the bolts (2).
(b) Tighten the bolts (2).

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS FREE FROM LIQUID OR SOLID CONTAMINATION BEFORE YOU CONNECT. IF YOU HAVE CONTAMINATION, DAMAGE TO EQUIPMENT CAN OCCUR.

(c) Connect the electrical connector (1).

S 434-032-R00

(9) ON ENGINES WITH RR SB 79-9179;
put the oil transmitter on the manifold block mounting face to make sure of the correct location on the retaining rings.
(a) Install the oil pressure transmitter with the bolts (2), nuts (7) and blanking plate (6).
(b) Tighten the nuts (7) on the bolts (2).

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS FREE FROM LIQUID OR SOLID CONTAMINATION BEFORE YOU CONNECT. IF YOU HAVE CONTAMINATION, DAMAGE TO EQUIPMENT CAN OCCUR.

(c) Connect the electrical connector (1).

S 714-018-R00
(10) Do an operational test for the oil pressure transmitter (AMM 79-32-00/501).

S 864-019-R00
(11) Remove the DO-NOT-CLOSE tags and close these circuit breaker:
(a) P11 Overhead Circuit Breaker Panel
1) 11K9, LEFT ENGINE OIL PRESS
2) 11K35, RIGHT ENGINE OIL PRESS

S 414-036-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.

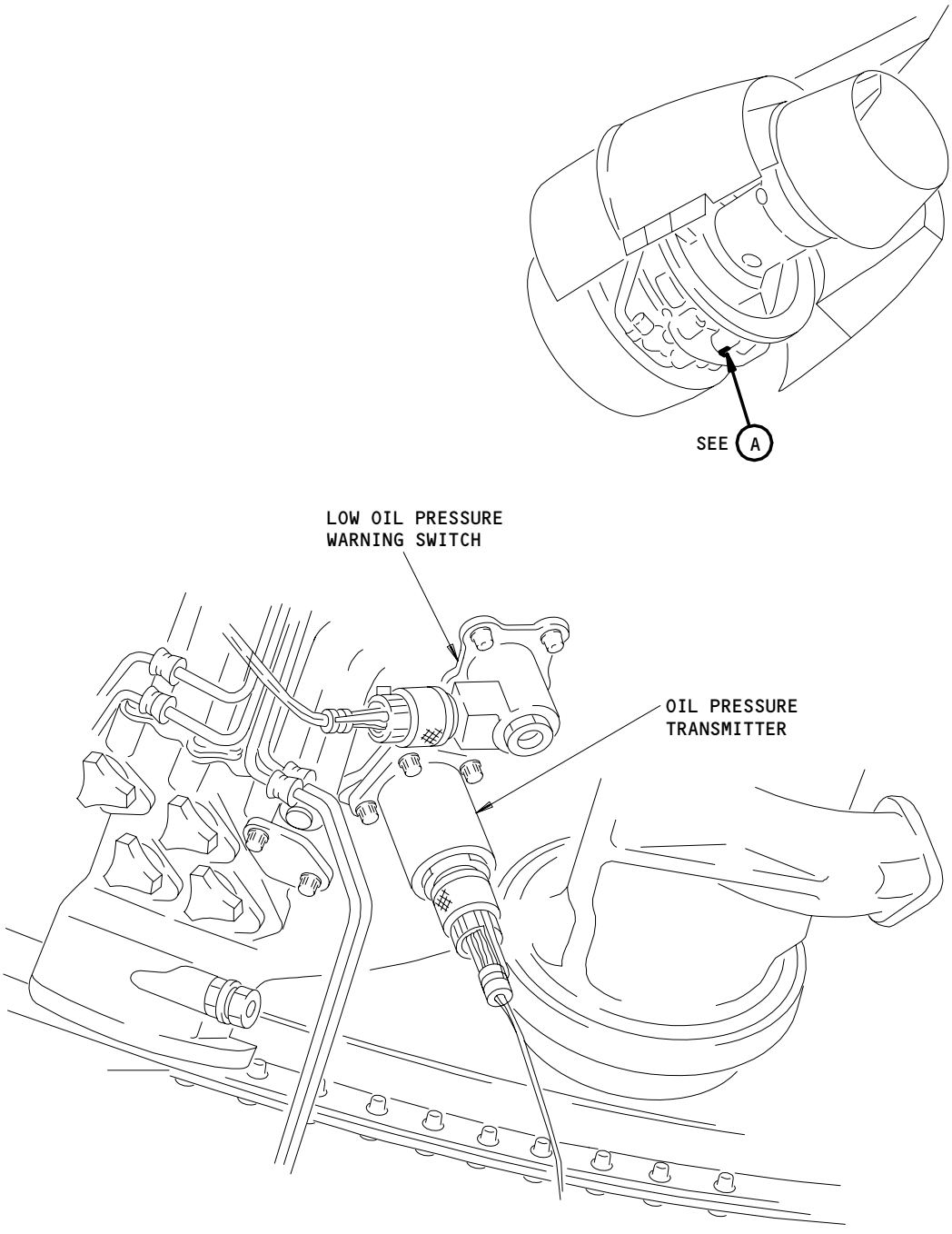
(12) ON ENGINES WITHOUT RR SB 79-9179;
close the right fan cowl panel (AMM 71-11-04/201).

S 414-034-R00
(13) ON ENGINES WITH RR SB 79-9179;
close the left fan cowl panel (AMM 71-11-04/201).

S 724-038-R00
(14) Do the required tests for installation of the oil pressure transmitter (AMM 71-00-00/501).

LOW OIL PRESSURE WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The low oil pressure warning system gives a remote visual warning when engine oil pressure decreases below 18 psi.
   B. The system includes an engine mounted differential pressure switch which sends a signal to the top Engine Indication and Crew Alerting System (EICAS) display, and to a light on the captain's instrument panel P1-3 in the flight compartment.
   C. ENGINES PRE-RR-SB 79-9179;
      The system contains an engine installed differential pressure switch. This is electrically connected through the engine electrical harness and aircraft wiring to the top Engine Indicating and Crew Alerting System (EICAS) display. The signal is also transmitted to an engine oil warning light on the instrument panel P1-3 in the flight compartment.
   D. ENGINES POST-RR-SB 79-9179;
      The system contains an engine mounted differential pressure switch and transmitter adaptor assembly. These are electrically connected through the engine electrical harness and aircraft wiring to the top Engine Indicating and Crew Alerting System (EICAS) display. The signal is also transmitted to an engine oil warning light on the instrument panel P1-3 in the flight compartment.
   E. The pressure switch measures the difference between feed and return oil pressures. The pressure switch operates at a differential pressure of 18 psi. This completes the electrical circuit which causes a warning light to come on and an EICAS message to be shown. The feed oil pressure is pressure pump outlet pressure and return oil pressure is internal gearbox scavenge pump inlet pressure. The two pressures are measured through holes in the external gearbox.
2. Component Details
   A. Low Oil Pressure Warning Switch (Fig. 1)
      (1) ENGINES PRE-RR-SB 79-9179;
          The pressure switch is installed on the external gearbox to the right of the input drive housing. The switch has a metal body that contains an electrical switch and connector. The switch also contains pressure sensing bellows to which oil is supplied through holes in the mounting face.



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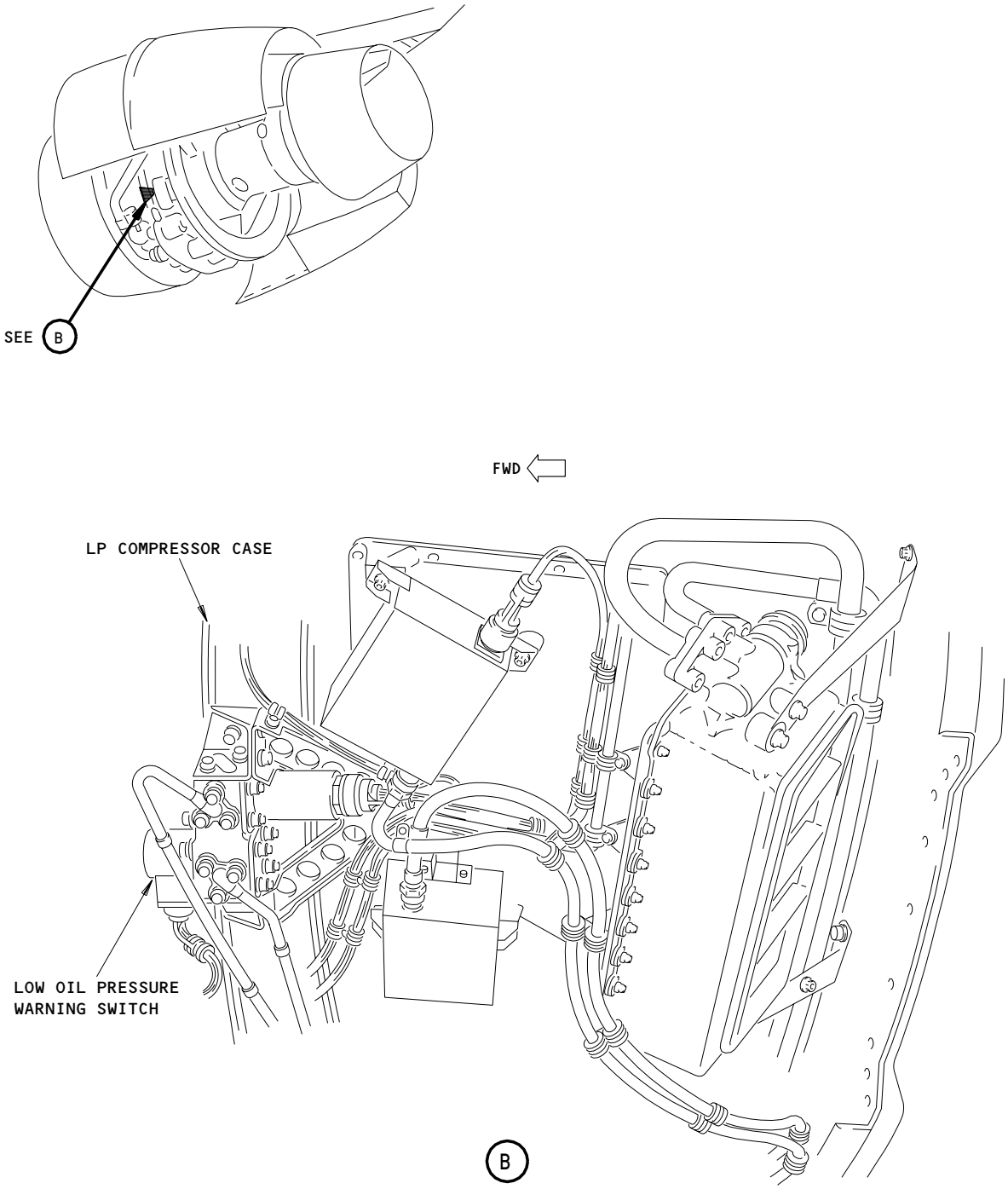
Low Oil Pressure Transmitter
Figure 1 (Sheet 1)

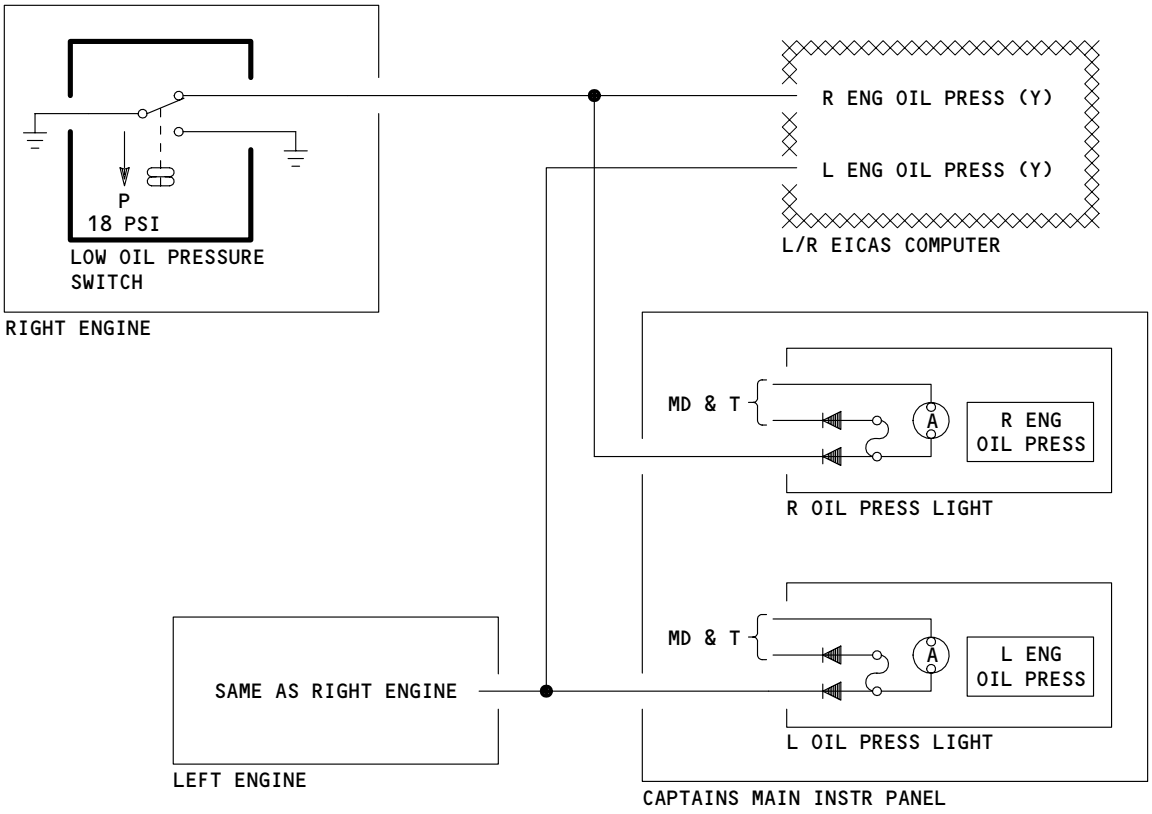


Low Oil Pressure Transmitter
Figure 1 (Sheet 2)

(2) ENGINES POST-RR-SB 79-9179;
The pressure switch is installed on a manifold block on the LP fan case joint flange, forward of the intergrated drive generator cooling duct. The switch has a metal body that contains an electrical switch and connector. The switch also contains pressure sensing bellows to which oil is supplied through holes in the mounting face.

B. Low Oil Pressure Warning Indicators
(1) The low oil pressure warning indicators are found on the top EICAS display and on the P1-3 panel in the flight compartment. The indicators come on when the engine oil pressure decreases below 18 psi.
(2) When the pressure decreases below 18 psi, the EICAS display message reads L or R ENG OIL PRESS.

3. Operation
A. Functional Description
(1) Low Oil Pressure Warning System (Fig. 2)
(a) The engine feed oil goes into the bellows and the return oil is supplied to a chamber around the bellows. The bellows are not permitted to expand until the differential oil pressure gets to 18 psi. This is done with a snap action spring.
(b) A decrease in feed oil pressure or an increase in return oil pressure will make the bellows smaller. At a pressure differential of 18 psi the switch operates to complete the circuit to the engine oil pressure warning light. This transmits a signal to the EICAS to show the warning message on the top EICAS display.



Low Oil Pressure Warning System Operation Schematic
Figure 2

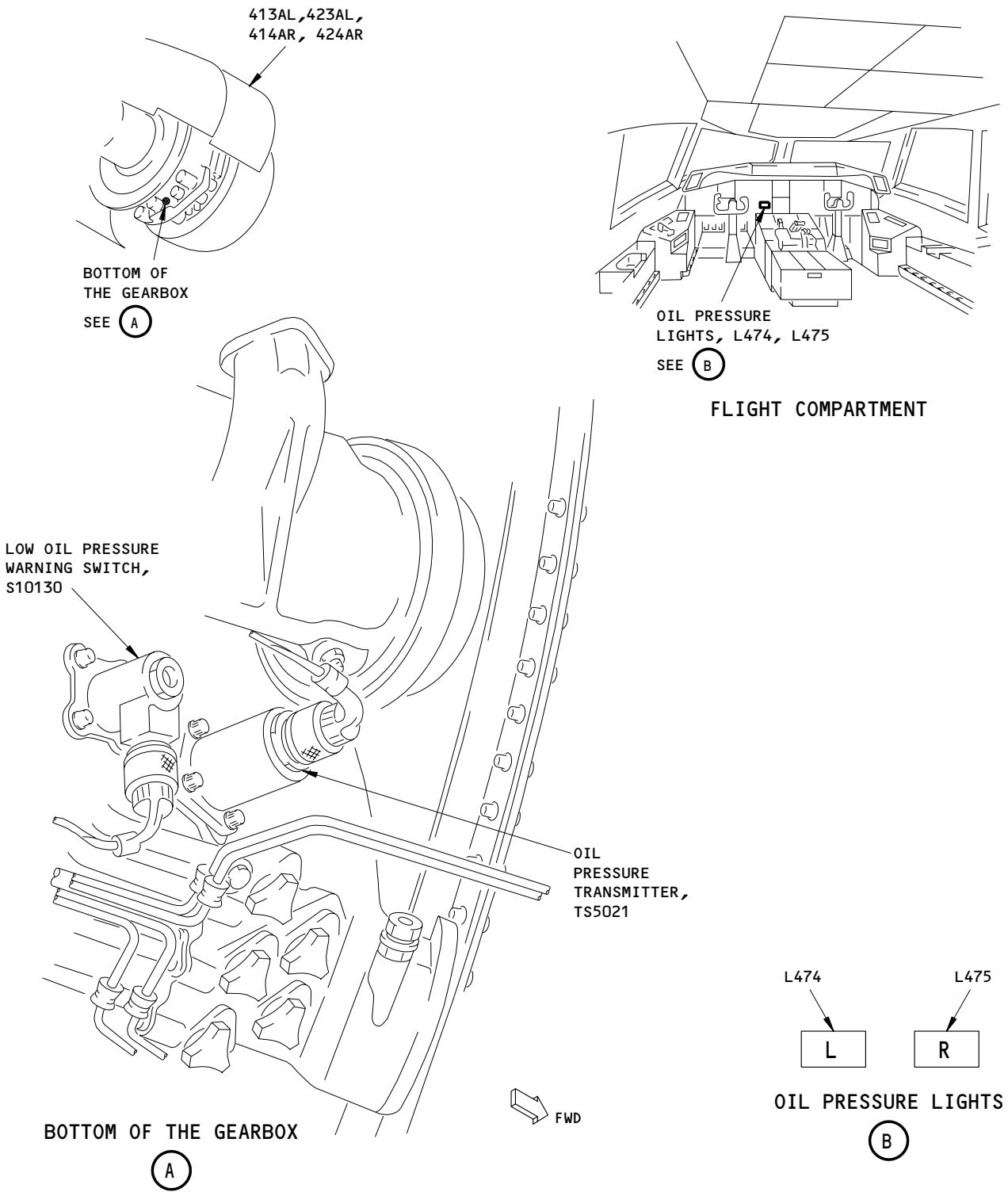
334657

LOW OIL PRESSURE WARNING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
COMPUTERS - (31-41-00/101) EICAS L, M10181 EICAS R, M10182				
LIGHT - L OIL PRESS, L474	--	1	FLT COMPT, P1-3, CAPTAIN MAIN INSTR PANEL	*
LIGHT - R OIL PRESS, L475	--	1	FLT COMPT, P1-3, CAPTAIN MAIN INSTR PANEL	*
SWITCH - LOW OIL PRESSURE WARNING, S10130	--	2	413AL, 423AL, 414AR, 424AR	79-33-01

*SEE THE WDM EQUIPMENT LIST

Low Oil Pressure Warning System - Component Index
Figure 101



Low Oil Pressure Warning System - Component Location
Figure 102

A44953

LOW OIL PRESSURE WARNING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks.
      (1) An operational test, and
      (2) A system test.
   B. Use the operational test if it is necessary to make sure the low oil pressure warning system operates.
   C. Use the system test if it is necessary to make sure the correct indications come on when the switch for the low oil pressure closes.

      NOTE: The system test does not make sure the switch for the low oil pressure closes at the correct pressure.

TASK 79-33-00-715-001-R00

2. Operational Test - Low Oil Pressure Warning System
   A. References
      (1) AMM 71-00-00/201, Power Plant (Engine Operation)
   B. Access
      (1) Location Zones
          210 Flight Compartment

   C. Do the Low Oil Pressure Warning System Operational Test

      S 715-002-R00

      WARNING: USE 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 Dry-Motor procedure to motor the engine (AMM 71-00-00/201).
          (a) Before you engage the starter, make sure the L (R) ENG OIL PRESS light is on.
          (b) Look at the oil pressure indication on the EICAS display when you engage the starter.
          (c) Make sure the L (R) OIL PRESS light goes off when the oil pressure indication is approximately 18 psi.

      S 715-003-R00
      (2) Use the Power Plant Dry-Motor procedure to do the engine shut-down (AMM 71-00-00/201).
          (a) Look at the oil pressure indication on the EICAS display when you disengage the starter.

(b) Make sure the L (R) OIL PRESS light comes on when the oil pressure indication is approximately 18 psi.

TASK 79-33-00-735-004-R00

3. System Test - Low Oil Pressure Warning System

A. Equipment
   (1) Digital Voltmeter - Fluke 8020A or equivalent
   (2) Function Generator - Hewlett Packard 3314A or equivalent
   (3) Jumper wire

B. References
   (1) AMM 24-22-00/201, Electrical Power - Control
   (2) AMM 71-11-04/201, Fan Cowl Panels

C. Access
   (1) Location Zones
       210 Flight Compartment
       414 Left Engine Right Fan Cowl Panel
       424 Right Engine Right Fan Cowl Panel

   (2) Access Panels
       414AR Left Engine Right Fan Cowl Panel
       424AR Right Engine Right Fan Cowl Panel

D. Prepare for Low Oil Pressure Warning System Operational Test (Fig. 501)

S 015-005-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 035-006-R00

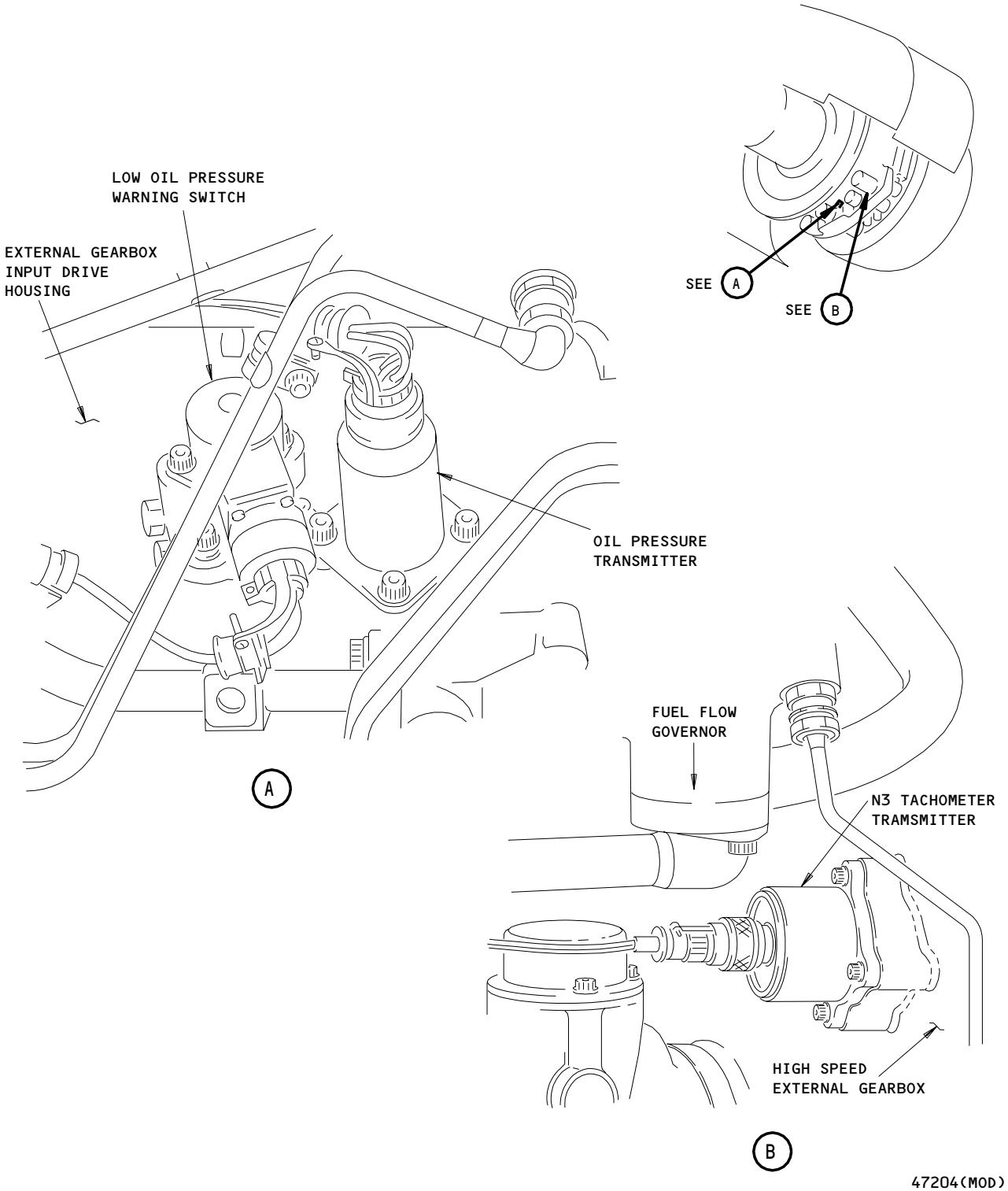
(2) Disconnect the electrical connector from the switch for the low oil pressure.

S 035-007-R00

(3) Disconnect the electrical connector from the N3 tachometer transmitter.

S 865-009-R00

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



Low Pressure Warning System Test
Figure 501

S 865-008-R00

(5) Make sure these circuit breakers are closed:

(a) P11 Overhead Circuit Breaker Panel

1) 11J2, EICAS CMPTR LEFT
2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 865-027-R00

(6) Push the ENGINE DISPLAY switch on the Select Panel for the EICAS Display.

S 865-028-R00

(7) Turn the COMPUTER switch on the Select Panel for the EICAS display to the L position.

E. Do the Low Oil Pressure Warning System Test (Fig. 501)

S 735-011-R00

(1) Connect the voltmeter and the function generator to pins 1 and 2 of the electrical connector which you removed from the N3 tachometer transmitter.

S 735-012-R00

(2) Set the function generator to 250 ±10 Hz at 3 ±0.5 volts.

S 215-013-R00

(3) Make sure the L (R) ENG OIL PRESS light is off.

S 735-014-R00

(4) Install a jumper wire from pin 2 to pin 1 of the electrical connector which you removed from the switch for the low oil pressure.

S 215-015-R00

(5) Make sure the L (R) ENG OIL PRESS light comes on.

S 215-016-R00

(6) Make sure the L (R) ENG OIL PRESS message is shown on the EICAS display.

S 865-025-R00

(7) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the R position.

S 215-026-R00

(8) Make sure the L (R) ENG OIL PRESS message is shown on the EICAS display.

S 735-017-R00
(9) Remove the jumper wire from the electrical connector.

S 215-018-R00
(10) Make sure the L (R) ENG OIL PRESS light goes off.

S 215-019-R00
(11) Make sure the L (R) ENG OIL PRESS message is not shown on the EICAS display.

S 735-020-R00
(12) Disconnect the voltmeter and the function generator from the electrical connector.

F. Put the Airplane Back to Its Usual Condition (Fig. 501)

S 865-029-R00
(1) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the AUTO position.

S 435-021-R00
(2) Connect the electrical connector to the N3 tachometer transmitter.

S 435-022-R00
(3) Connect the electrical connector to the switch for the low oil pressure.

S 415-023-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).

S 865-024-R00
(5) Remove the electrical power (AMM 24-22-00/201).

LOW OIL PRESSURE WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the warning switch of the low oil pressure (referred to as the switch). The second task is the installation of the switch.

TASK 79-33-01-024-001-R00

2. Remove the Low Oil Pressure Warning Switch
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Access Panels
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine
          or
          413 Fan cowl Panel (LH) - Left Engine
          423 Fan Cowl Panel (LH) - Right Engine
   C. Prepare for the Removal of the Switch

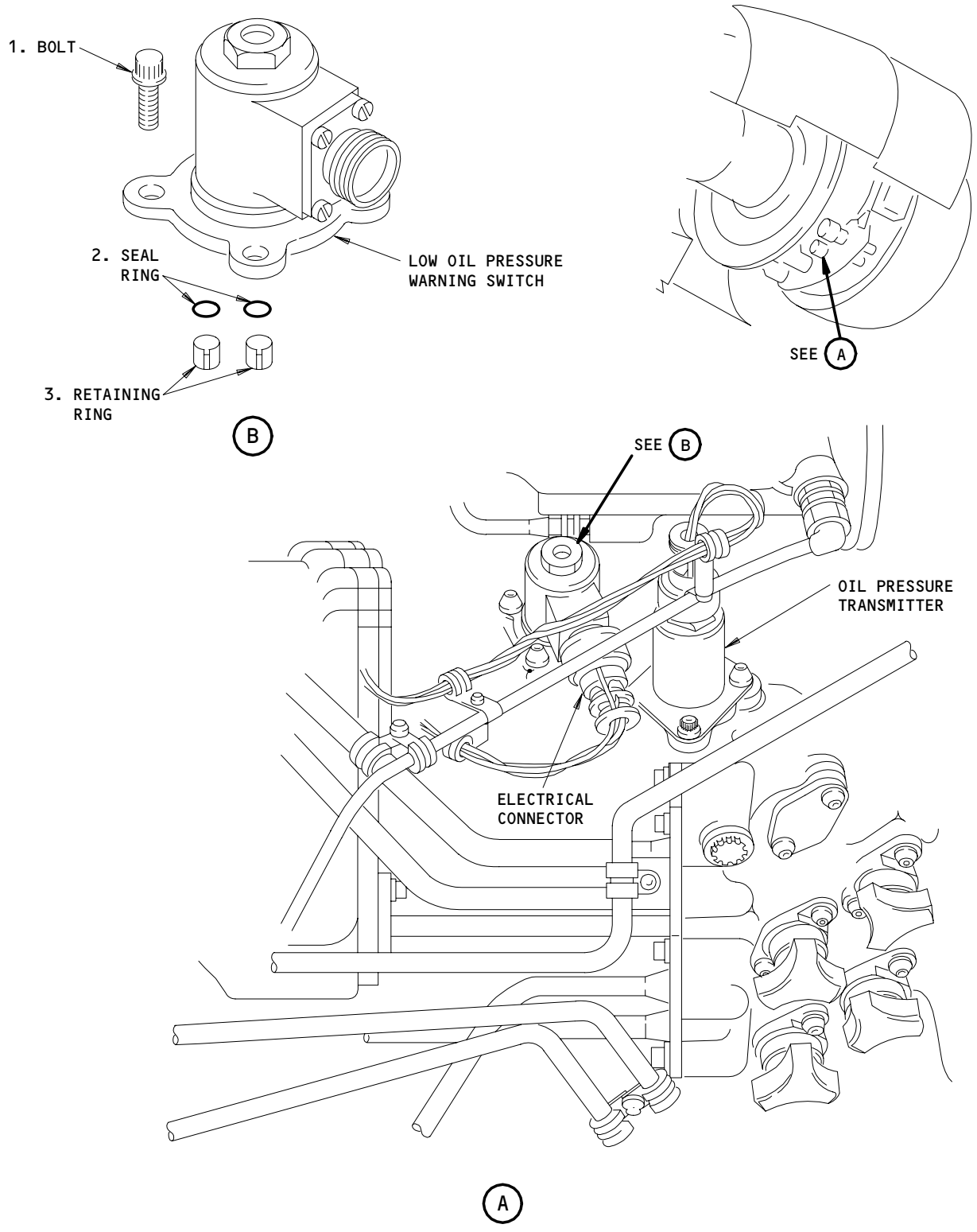
      S 864-002-R00
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) P11 Overhead Circuit Breaker Panel
              1) 11J2, EICAS CMPTR LEFT
              2) 11J3, EICAS UPPER DISPLAY
              3) 11J29, EICAS CMPTR RIGHT
              4) 11J30, EICAS LOWER DISPLAY
              5) 11J31, EICAS DISPLAY SW
              6) 11J32, EICAS DISPLAY SELECT

      S 014-021-R00

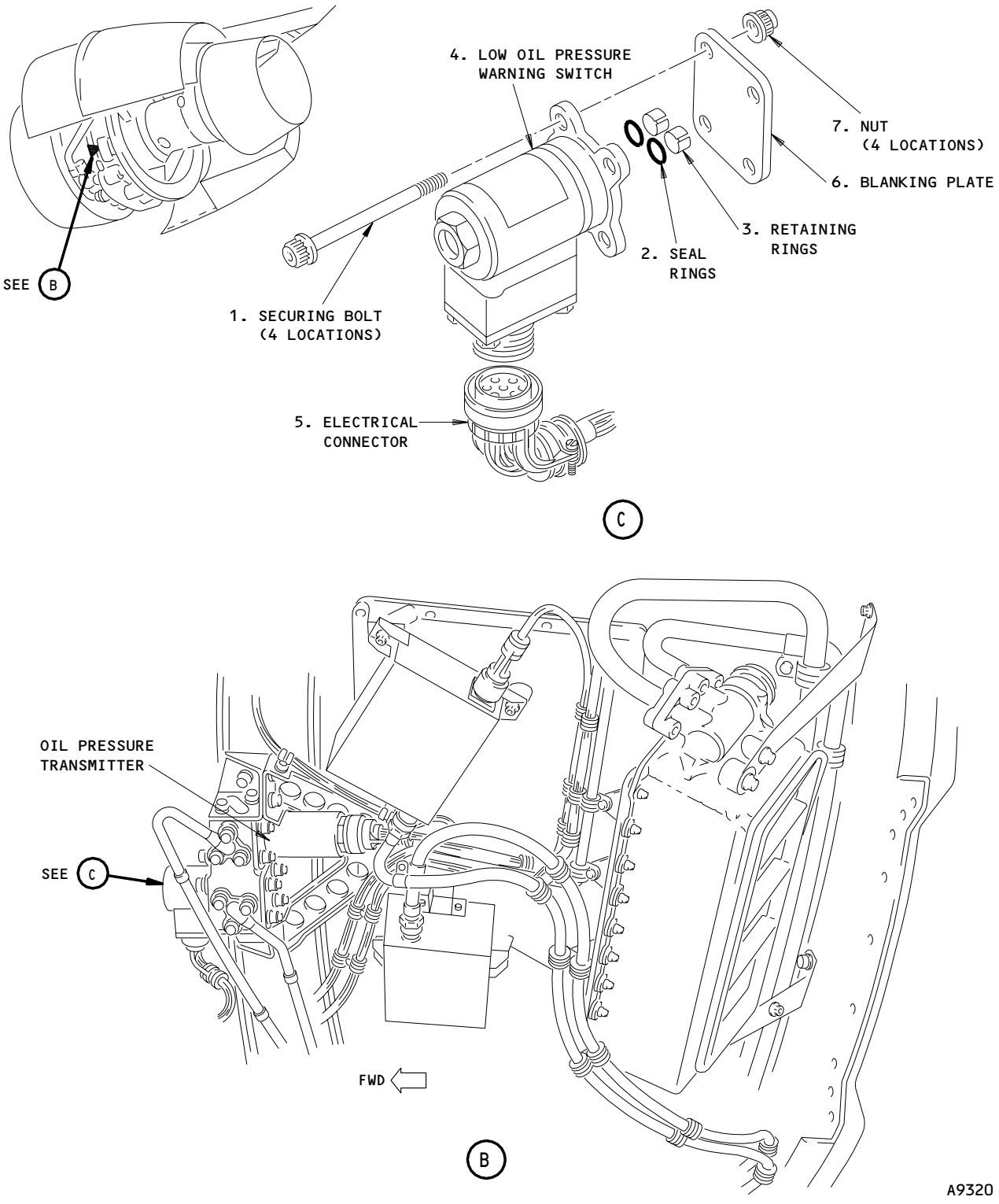
      CAUTION: OBEY THE PRECAUTIONS FOR THE KEVLAR WRAPPING WHEN YOU OPEN THE FAN COWL PANEL. IF YOU DO NOT OBEY THE PRECAUTIONS, DAMAGE TO THE KEVLAR WRAPPING CAN OCCUR.

      (2) ENGINES PRE-RR-SB 79-9179;
          Open the right fan cowl panel (AMM 71-11-04/201).

      S 014-022-R00
      (3) ENGINES POST-RR-SB 79-9179;
          Open the left fan cowl panel (AMM 71-11-04/201).
   D. Remove the Switch (Fig. 401)



Low Oil Pressure Warning Switch - Removal/Installation
Figure 401 (Sheet 1)



Low Oil Pressure Warning Switch - Removal/Installation
Figure 401 (Sheet 2)

S 864-004-R00
(1) Disconnect the electrical connector from the switch.

S 034-005-R00

WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT FOLLOW THIS INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON DURING THE SERVICING. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(2) ENGINES PRE-RR-SB 79-9179;
Remove the bolts (1) (4 locations).

S 034-023-R00
(3) ENGINES POST-RR-SB 79-9179;
Remove the bolts (1), the nuts (7) and the blanking plate (6).

S 024-006-R00
(4) Move the switch from its mounting and the dowel location.

S 684-007-R00
(5) Drain oil to the receptacle (container).

NOTE: You can disconnect the retaining rings (3) from the mating face on the gearbox.

S 034-008-R00
(6) Discard the seal rings (2).

S 434-009-R00
(7) Install the protection caps to all the opening and the connectors.

TASK 79-33-01-424-010-R00

3. Install the Low Oil Pressure Warning Switch

A. Equipment
(1) Clean receptacle - minimum capacity
10.0 U.S. Pints
8.0 Imperial Pints
5.0 Litres

B. Consumable Materials
(1) Degreasing fluid (Inhibited and Stabilized
1.1.1. trichloroethane)
British Spec/Ref - B.S. 4487, 1969
American Spec/Ref - MIL-T-81533
OMat No. - 1/21
(2) Lint-free cloth

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

D. Access
(1) Location Zones
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine
or
413 Fan Cowl Panel (LH) - Left Engine
423 Fan Cowl Panel (LH) - Right Engine

E. Install the Switch (Fig. 401)

S 034-011-R00
(1) Remove the protection caps from all the connectors and the opening.

S 434-037-R00
(2) ENGINES PRE-RR-SB 79-9179;
Make sure the retaining rings (3) have the same location in the switch to the gearbox mounting face.

S 434-038-R00
(3) ENGINES POST-RR-SB 79-9179;
Make sure the retaining rings (3) have the same location in the switch to LP compressor case mounting face.

S 644-013-R00
(4) Lubricate the new seal rings (2).

S 434-039-R00
(5) ENGINES PRE-RR-SB 79-9179;
Install the new seal rings (2) to be in a recess on the gearbox mounting face.

S 434-040-R00
(6) ENGINES POST-RR-SB 79-9179;
Install the new seal rings (2) in the recess of the LP compressor case mounting block face.

S 114-041-R00
(7) ENGINES PRE-RR-SB 79-9179;
Clean the mating faces of the switch and the gearbox as follows:

S 114-042-R00
(8) ENGINES POST-RR-SB 79-9179;
Clean the mating faces of the switch and the LP compressor case mounting block as follows:

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOU YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGREASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN AMM 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Use a clean, dry cloth without lint, that is moist with degreasing fluid.

(b) Clean the mating surfaces with the cloth.

(c) Discard the dirty cloth.

NOTE: Use a new clean cloth for each operation. Make sure to put the degreasing fluid liquid to the cloth to prevent the contamination of the bulk liquid.

S 424-030-R00

(9) ENGINES PRE-RR-SB 79-9179;
Put the switch to the gearbox to make sure the dowel location and the seal rings (2) are correctly installed.

S 424-031-R00

(10) ENGINES POST-RR-SB 79-9179;
Put the switch to the LP compressor case mounting block face to make sure the dowel location and the seal rings (2) are correctly

S 434-032-R00

(11) ENGINES PRE-RR-SB 79-9179;
Install the bolts (1).

S 434-043-R00

(12) ENGINES POST-RR-SB 79-9179;
Install the bolts (1), the blanking plate (6) and the nuts (7) (AMM 70-51-00/201).

S 864-018-R00

(13) Connect the electrical connector.

F. Put the Airplane Back to Its Usual Condition

S 864-044-R00

(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11J2, EICAS CMPTR LEFT
2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 414-036-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.

(2) ENGINES PRE-RR-SB 79-9179;
Close the right fan cowl panel (AMM 71-11-04/201).

S 414-035-R00

(3) ENGINES POST-RR-SB 79-9179;
Close the left fan cowl panel (AMM 71-11-04/201).

S 864-020-R00

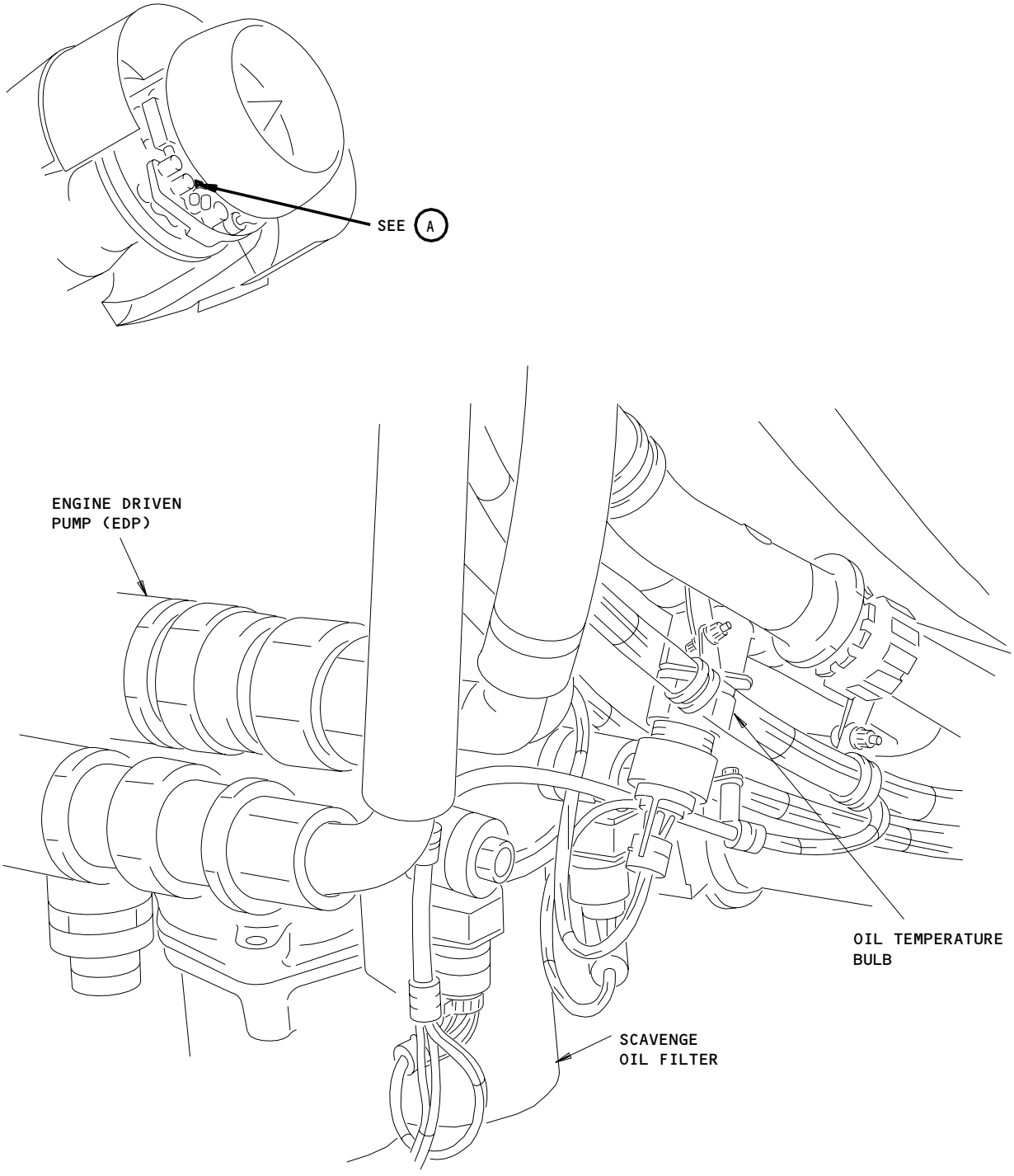
(4) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11J2, EICAS CMPTR LEFT
2) 11J3, EICAS UPPER DISPLAY
3) 11J29, EICAS CMPTR RIGHT
4) 11J30, EICAS LOWER DISPLAY
5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS DISPLAY SELECT

S 724-046-R00

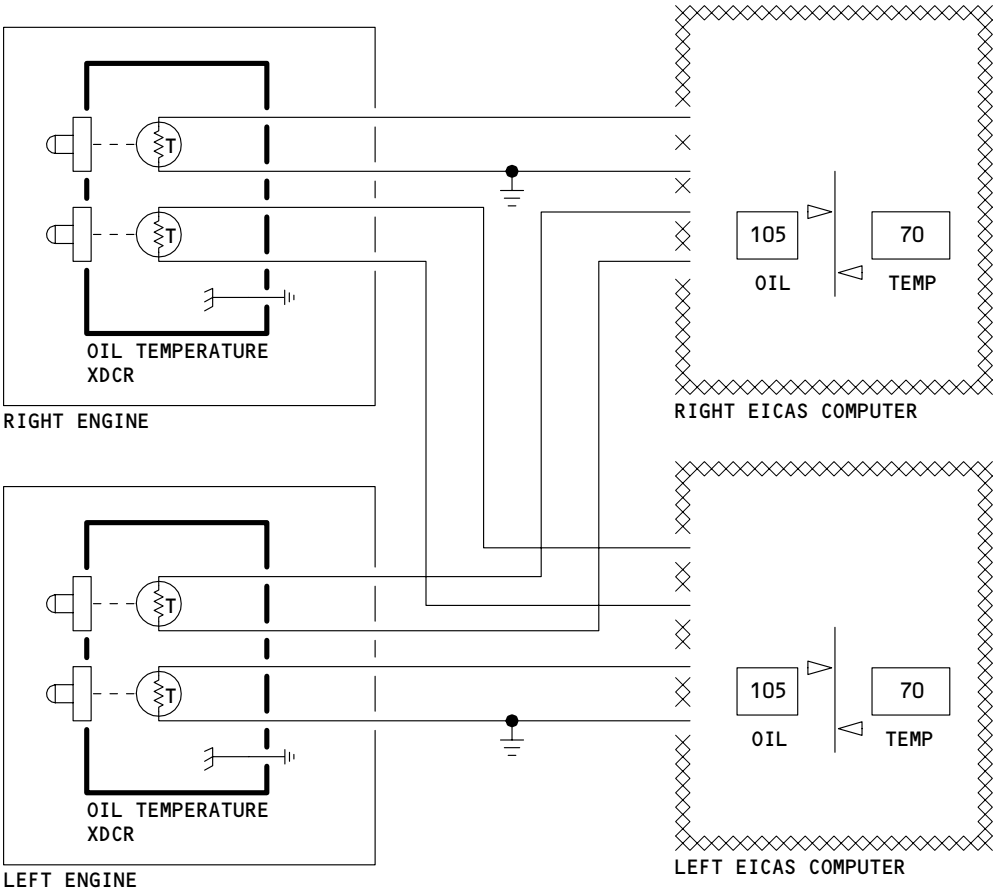
(5) Do the required tests for installation of the low pressure warning switch (AMM 71-00-00/501).

OIL TEMPERATURE INDICATING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The oil temperature indicating system gives a remote, visual indication of the return oil temperature.
   B. The system comprises an engine installed temperature bulb, which sends a signal to the lower EICAS display in the flight compartment.
   C. The temperature bulb senses the temperature of the two scavenge return oil between the scavenge filter and the oil tank.
2. Component Details
   A. Oil Temperature Bulb (Fig. 1)
      (1) The temperature bulb is in the external oil tube between the scavenge filter housing and the oil tank. The unit has a closed tube, housing two elements of spiral nickel wire, of known electrical resistance, that is connected to an electrical receptacle on the bulb. The bulb is installed to make sure the return oil flows around the tube.
   B. Oil Temperature Indicator
      (1) Refer to AMM 31-41-00 for a description of the EICAS.
3. Operation (Fig. 2)
   A. Functional Description
      (1) Oil Temperature Bulb (Fig. 2)
         (a) Variations in oil temperature causes variations in the electrical resistance of the wire elements in proportion to the temperature change. While the wire elements make one arm of a bridge in the indicating circuit, the change in resistance changes the bridge balance. This resistance change is detected by the EICAS computers and is displayed, when selected, as an indication of oil temperature on the EICAS lower display.



Oil Temperature Bulb
Figure 1



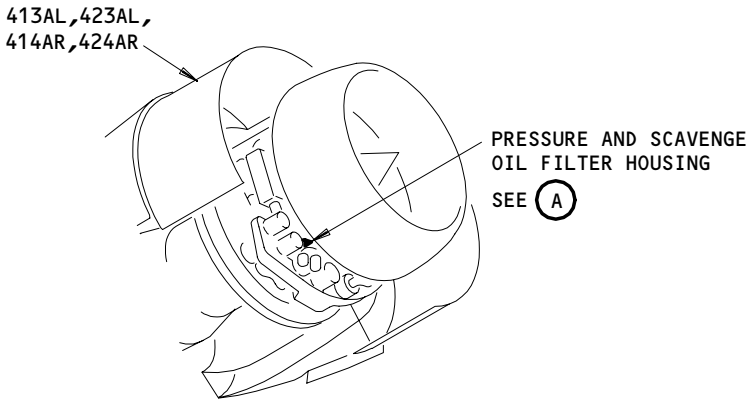
Oil Temperature Indicating System Operation Schematic
Figure 2

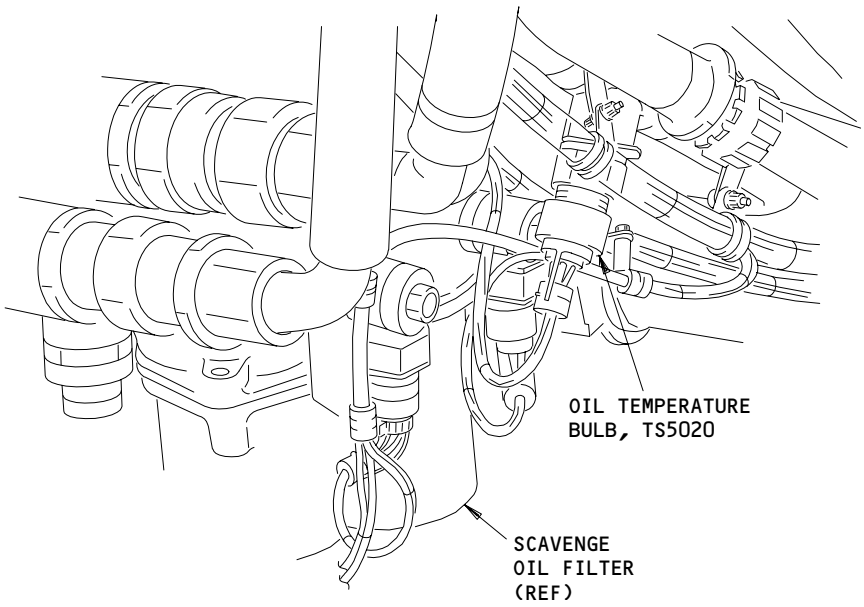
OIL TEMPERATURE INDICATION SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
COMPUTERS - (31-41-00/101) EICAS L, M10181 EICAS R, M10182 BULB - OIL TEMPERATURE, TS5020	--	2	413AL, 423AL, 414AR, 424AR	79-34-01

Oil Temperature Indication System - Component Index
Figure 101

A47444





PRESSURE AND SCAVENGE
OIL FILTER HOUSING
A

Oil Temperature Indication System - Component Location
Figure 102

OIL TEMPERATURE INDICATING SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure contains two tasks.
      (1) An operational test, and
      (2) A system test.
   B. Use the operational test if it is necessary to make sure the oil temperature indicating system operates.
   C. Use the system test if it is necessary to make sure the correct indications come on when the oil temperature bulb has a specified resistance.

      NOTE: The system test does not make sure the oil temperature bulb has the correct resistance at a specified temperature.

TASK 79-34-00-715-001-R00

2. Operational Test - Oil Temperature Indicating System
   A. References
      (1) AMM 71-00-00/201, Power Plant (Operating Procedure)
   B. Access
      (1) Location Zones
          210 Flight Compartment

   C. Do the Oil Temperature Indicating System Operational Test (Fig. 501)

      S 865-002-R00

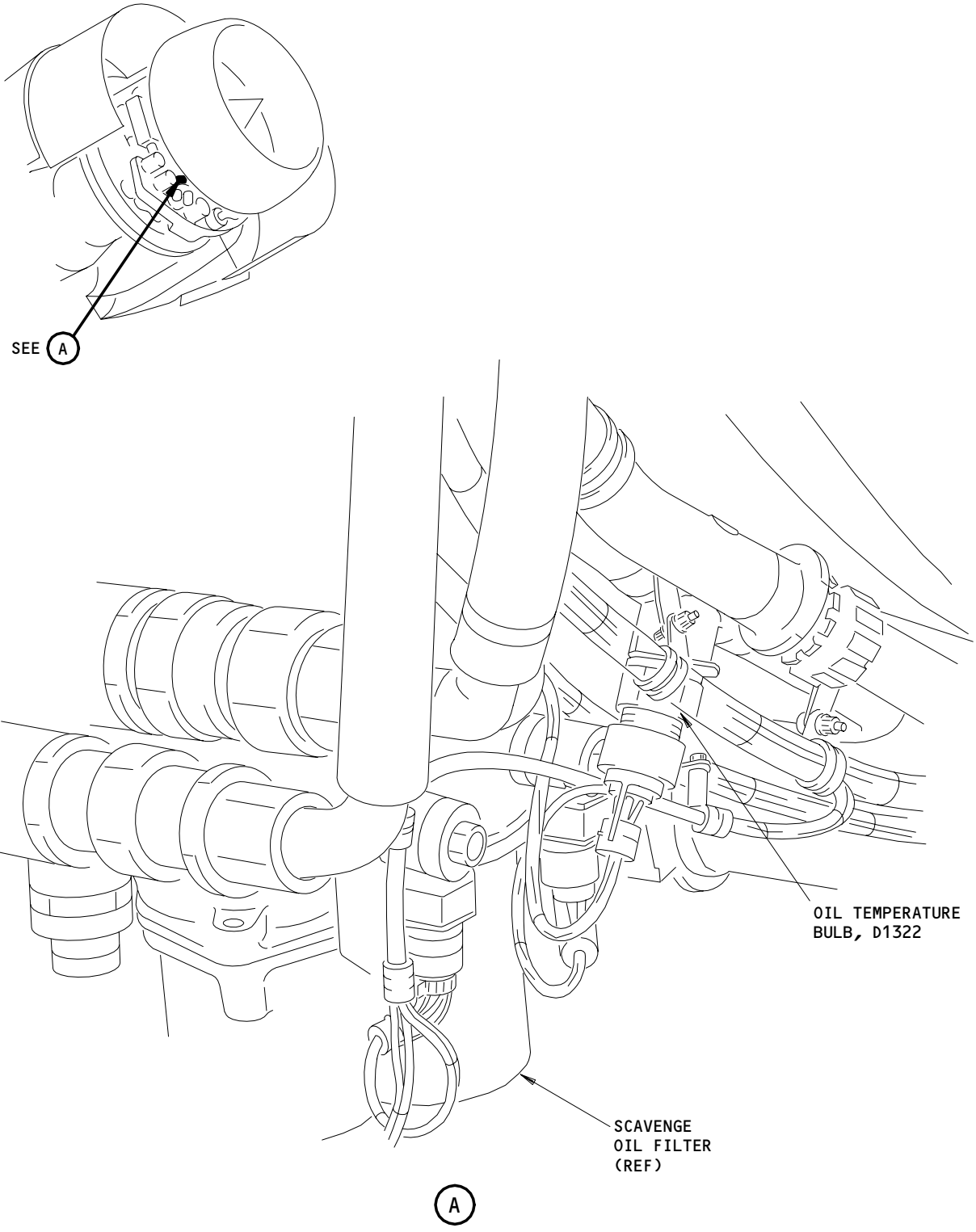
      WARNING: USE 71-00-00/201 TO OPERATE THE POWER PLANT. IF YOU DO NOT USE THIS PROCEDURE, YOU CAN CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

      (1) Use the Power Plant Operation (Normal) procedure to start the left and the right engines (AMM 71-00-00/201).

      S 865-003-R00
      (2) Make sure that the left and the right engines operate at the same EPR.

      S 715-004-R00
      (3) Make sure that the L OIL TEMP indication on the EICAS display shows approximately the same as the R OIL TEMP indication.

      S 865-005-R00
      (4) Use the Power Plant Operation (Normal) procedure to do the engine shutdown (AMM 71-00-00/201).



Oil Temperature Bulb
Figure 501

TASK 79-34-00-735-006-R00

3. System Test - Oil Temperature Indicating System

A. Equipment

(1) Variable resistor, 70-180 ohm range, 1 watt minimum - General Resistance Co. DA52-1X or equivalent

B. References

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

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

C. Access

(1) Location Zones

210	Flight Compartment
414	Left Engine Right Fan Cowl Panel
424	Right Engine Right Fan Cowl Panel

(2) Access Panels

414AR	Left Engine Right Fan Cowl Panel
424AR	Right Engine Right Fan Cowl Panel

D. Prepare for Oil Temperature Indicating System Test (Fig. 501)

S 015-007-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 035-008-R00

(2) Disconnect the connector D1322 from the oil temperature bulb.

S 865-009-R00

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

S 865-010-R00

(4) Make sure the EICAS circuit breakers on the P11 panel, row J, are closed.

S 865-011-R00

(5) Push the ENGINE DISPLAY switch on the Select Panel for the EICAS Display.

S 865-012-R00
(6) Set the variable resistor to have a resistance between 76.99 and 77.79 ohms.

E. Do the Oil Temperature Indicating System Test

S 485-013-R00
(1) Connect the resistor between pins 1 and 3 of the connector D1322 which you disconnected from the oil temperature bulb.

S 865-014-R00
(2) FOR THE LEFT ENGINE;
turn the COMPUTER switch on the Select Panel for the EICAS Display to the L position.

S 865-015-R00
(3) FOR THE RIGHT ENGINE;
turn the COMPUTER switch on the Select Panel for the EICAS Display to the R position.

S 735-016-R00
(4) Make sure the OIL TEMP indication on the EICAS display shows the correct temperature given in the Resistance verses Temperature Table.

S 485-017-R00
(5) Connect the resistor between pins 5 and 6 of the connector D1322.

S 865-018-R00
(6) FOR THE LEFT ENGINE;
turn the COMPUTER switch on the Select Panel for the EICAS Display to the R position.

S 865-019-R00
(7) FOR THE RIGHT ENGINE;
turn the COMPUTER switch on the Select Panel for the EICAS Display to the L position.

S 735-020-R00
(8) Make sure the OIL TEMP indication on the EICAS display shows the correct temperature given in the Resistance verses Temperature Table.

RESISTANCE VS TEMPERATURE TABLE	
Resistance (ohms)	Temperature (°C)
76.99 - 77.79	-38 - -22
111.78 - 112.78	52 - 68
172.15 - 173.35	179 - 201

S 865-022-R00

(9) Set the variable resistor to have a resistance between 111.78 and 112.78 ohms.

S 735-023-R00

(10) Do the Oil Temperature Indicating System Test again.

S 865-024-R00

(11) Set the variable resistor to have a resistance between 172.15 and 173.35 ohms.

S 735-025-R00

(12) Do the Oil Temperature Indicating System Test again.

F. Put the Airplane Back to Its Usual Condition

S 085-026-R00

(1) Disconnect the resistor from the electrical connector.

S 435-027-R00

(2) Connect the connector D1322 to the oil temperature bulb.

S 865-028-R00

(3) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the AUTO position.

S 865-029-R00

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

S 415-030-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.

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

OIL TEMPERATURE BULB - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the oil temperature bulb. The second task is the installation of the oil temperature bulb.

   TASK 79-34-01-024-001-R00

2. Remove the Oil Temperature Bulb
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          414 Left Engine
          424 Right Engine

      (2) Access Panel
          414 Fan Cowl Panel (RH) - Left Engine
          424 Fan Cowl Panel (RH) - Right Engine

   C. Prepare for the Removal (Fig. 401)

      S 864-002-R00

      WARNING: WHEN YOU USE THE SYNTHETIC ENGINE OIL, MAKE SURE YOU DO NOT TOUCH YOUR SKIN. IF YOU DO NOT FOLLOW THIS INSTRUCTION, INJURY TO PERSONS CAN OCCUR.

      CAUTION: THE OIL IN THIS OIL SYSTEM CAN CAUSE DAMAGE TO THE PAINT AND SOME TYPES OF RUBBER. DO NOT PERMIT THE CONTAMINATION OF THOSE PARTS OF THE ENGINE. YOU MUST CLEAN THOSE PARTS WITH OIL ON THEM. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

      (1) Open the EICAS circuit breakers on the P11 panel, row J, and attach DO-NOT-CLOSE tags.

S 014-016-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).

D. Remove the Oil Temperature Bulb

S 864-004-R00

(1) Disconnect the electrical connector (1).

S 024-005-R00

(2) Remove the temperature bulb (2) and the sealing washer (3).
(a) Drain oil into the receptacle (container).

S 434-006-R00

(3) Put the protection caps to the opening and the connector.

TASK 79-34-01-424-007-R00

3. Install the Oil Temperature Bulb

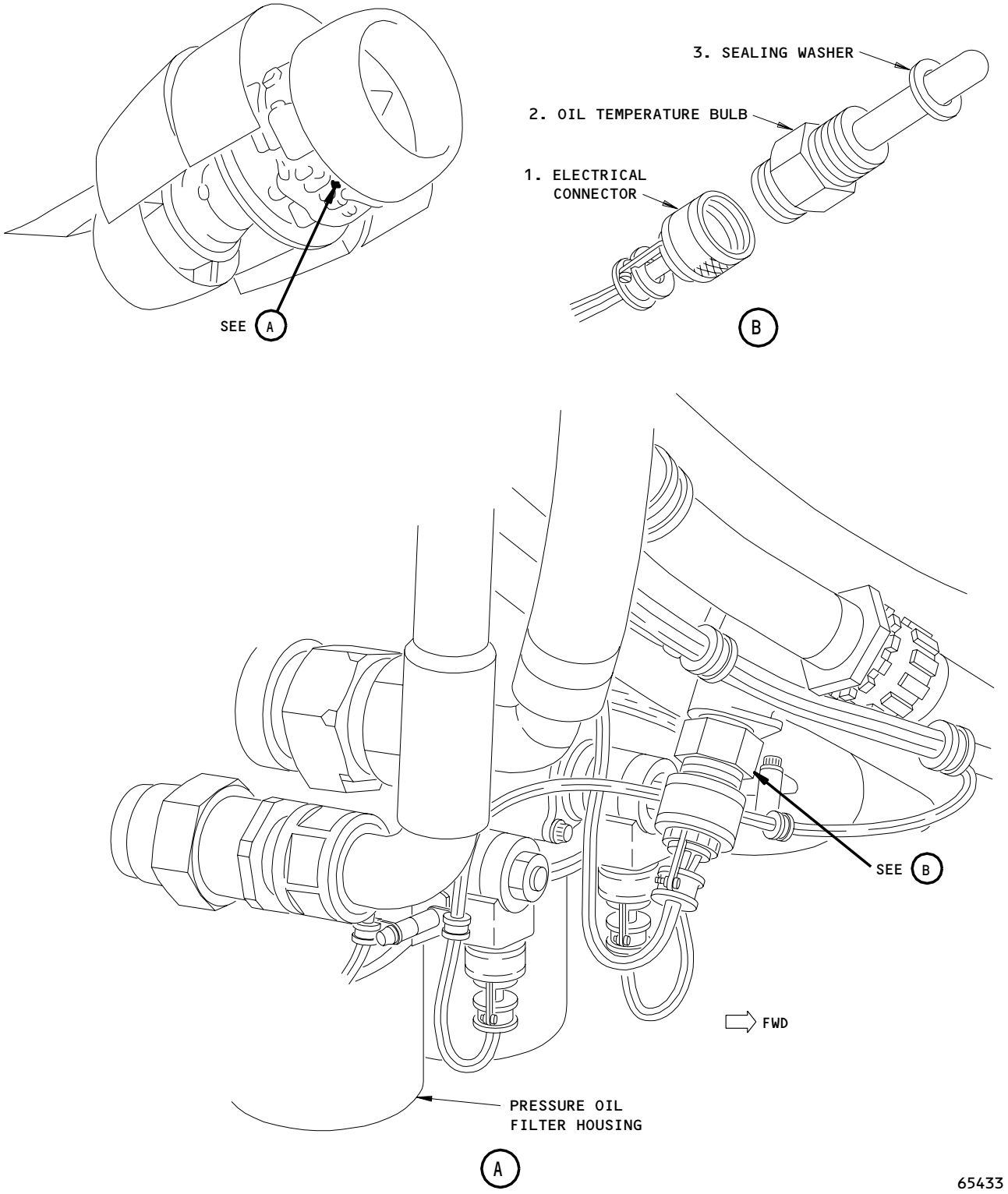
A. Equipment
(1) Clean container - minimum capacity
10.0 U.S. pints
8.0 Imperial pints
5.0 Litres

B. Consumable Materials
(1) Lockwire
British Spec/Ref - DTD.189A, 22 S.W.G.
American Spec/Ref - 21 A.W.G.
OMat No. 238
(2) Degreasing fluid (Inhibited and stabilized 1.1.1. trichloroethane)
British Spec/Ref - B.S. 4487, 1969
American Spec/Ref - MIL-T-81533
OMat No. 1/21
(3) Lint-free cloth

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

D. Access
(1) Location Zones
414 Left Engine
424 Right Engine

(2) Access Panel
414 Fan Cowl Panel (RH) - Left Engine
424 Fan Cowl Panel (RH) - Right Engine



Oil Temperature Bulb Installation
Figure 401

E. Install the Oil Temperature Bulb

S 034-008-R00

(1) Remove the protection caps from the opening and the connector.

S 114-009-R00

(2) Clean the mating faces of the temperature bulb and the oil return tube as follows:

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGREASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN AMM 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Use a clean, dry cloth without lint that is moist with degreasing fluid.
(b) Clean the mating surfaces with the cloth.
(c) Discard the dirty cloth.

NOTE: Use a new clean cloth for each operation. Make sure to put the degreasing fluid liquid to the cloth to prevent the contamination of the bulk liquid.

S 434-010-R00

(3) Put the new sealing washer (3) to the temperature bulb (2).

S 214-011-R00

(4) Make sure the mounting face on the oil return tube is free from all damage.

S 424-012-R00

(5) Install the temperature bulb.
(a) Install the lockwire on the temperature bulb.

S 864-013-R00

(6) Connect the electrical connector (1).

F. Put the Airplane Back to Its Usual Condition

S 864-015-R00

(1) Remove the DO-NOT-CLOSE tags and close the EICAS circuit breakers on the P11 panel, row J.

S 414-018-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.

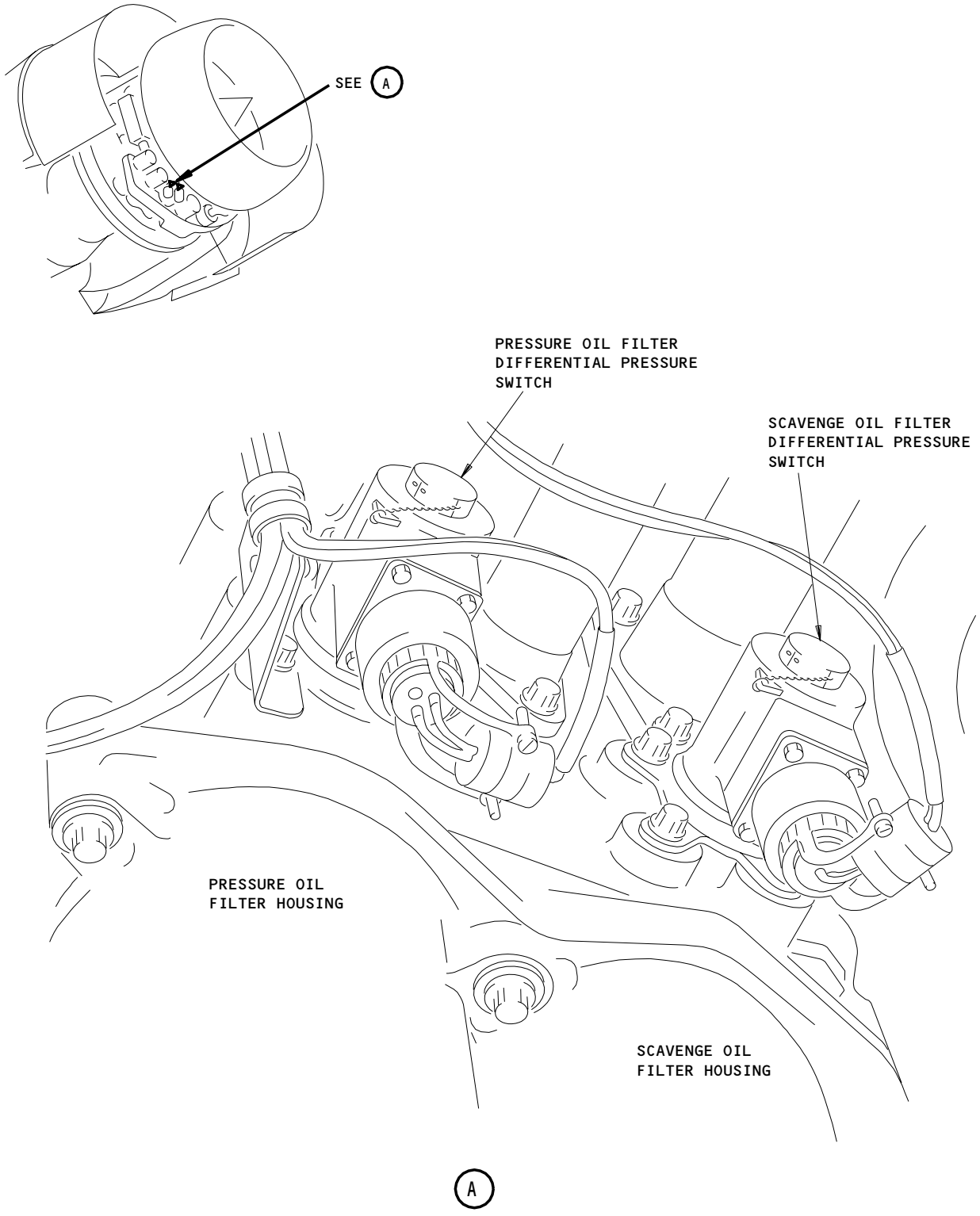
(2) Close the right fan cowl panel (AMM 71-11-04/201).

S 724-020-R00

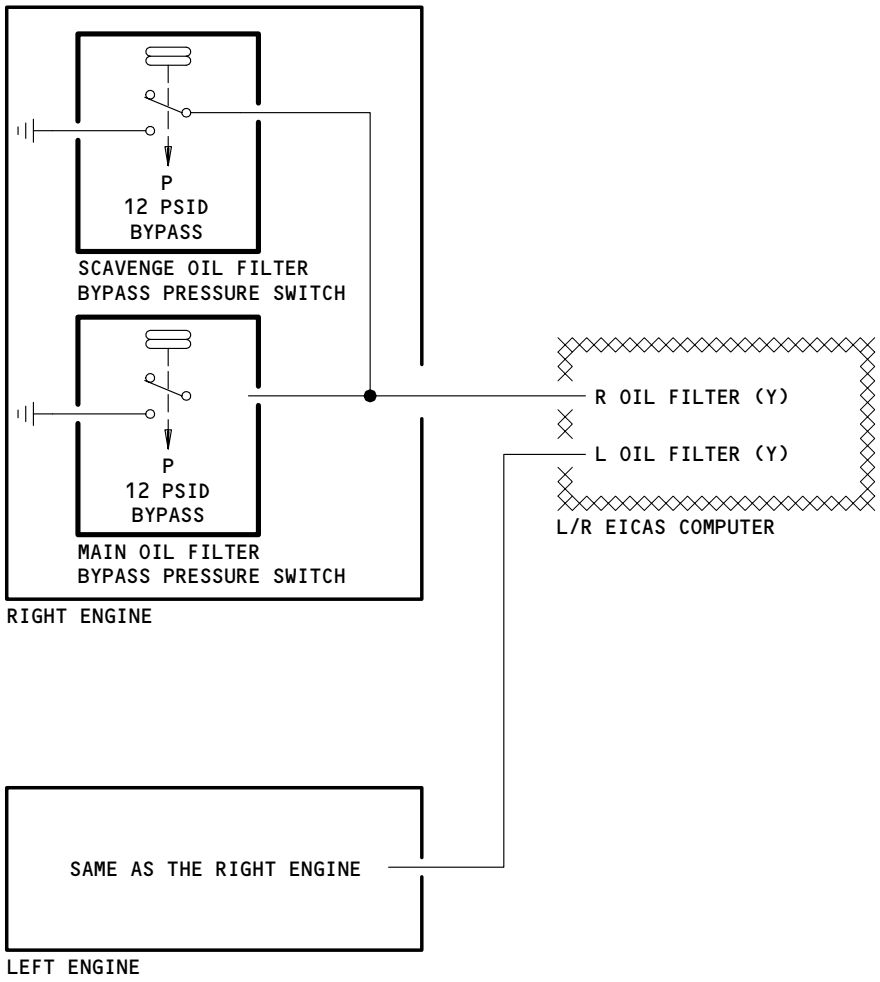
(3) Do the required tests for installation of the oil temperature bulb (AMM 71-00-00/501).

OIL FILTER BYPASS WARNING SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The oil filter bypass warning system gives a remote visual warning of too much pressure drop across the pressure oil filter or the scavenge oil filter.
   B. The system has two engine installed differential pressure switches, one for each filter, which sends a signal to the upper Engine Indicating and Crew Alerting System (EICAS) display in the flight compartment.
   C. The pressure switches sense the difference between the inlet and outlet pressures of their respective filters and operate at a predetermined differential pressure which completes the electrical circuit to illuminate an EICAS message.
2. Component Details
   A. Pressure and Scavenge Oil Filter Differential Pressure Switches (Fig. 1)
      (1) The pressure switches are located on the oil pump assembly front cover, above the filter housings, on the forward face of the engine external gearbox.
      (2) Each switch is comprised of a metal body, that houses an electrical switch and connector and a pressure sensing bellows to which oil is supplied through holes in the mounting face. Oil from the filter inlet is fed to the inside of the bellows, and oil from the filter outlet is fed to the chamber surrounding the bellows.
      (3) Expansion of the bellows is opposed by a snap action spring, which prevents the bellows actuating the switch until a predetermined oil pressure differential is reached. An increase in filter inlet pressure or a decrease in filter outlet pressure expands the bellows and, at the predetermined pressure differential, the switch is actuated to complete the circuit to the warning light.
   B. Oil Filter Differential Pressure Warning Message on EICAS.
      (1) The oil filter differential pressure warning message is located on the upper EICAS display in the flight compartment.
      (2) EICAS level C message L or R OIL FILTER will be displayed when the oil filter differential pressure is more than a certain value with the oil temperature greater than 10°C.
3. Operation (Fig. 2)
   A. Functional Description
      (1) Oil Filter Bypass Warning System (Fig. 2)
         (a) Oil from the filter inlet is fed to the inside of the bellows, and oil from the filter outlet is fed to the chamber surrounding the bellows. Expansion of the bellows is opposed by a snap action spring, which prevents the bellows actuating the switch until a predetermined oil pressure differential is reached. An increase in filter inlet pressure or a decrease in filter outlet pressure expands the bellows and, at the predetermined pressure differential, the switch is actuated to complete the circuit to the warning message on EICAS.



Oil Filter By-Pass Warning Switches
Figure 1

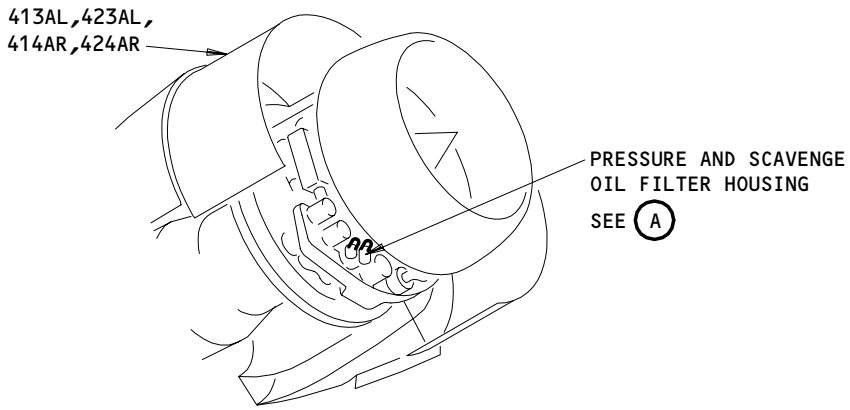


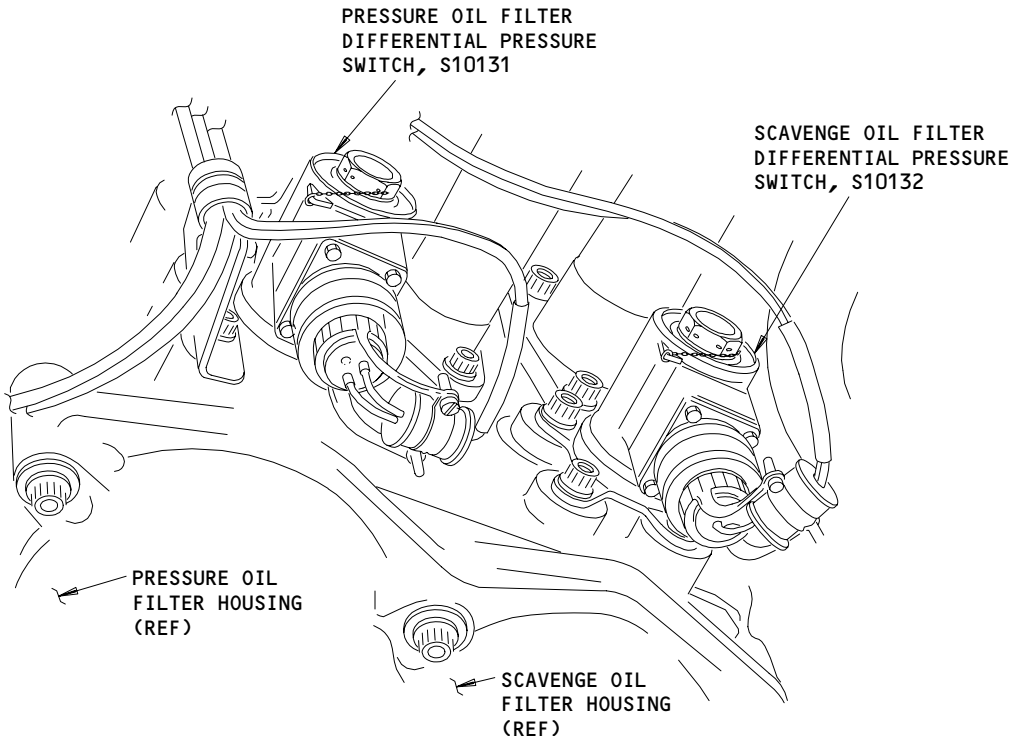
Oil Filter Bypass Warning System Operation Schematic
Figure 2

OIL FILTER BYPASS WARNING SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
COMPUTERS - (31-41-00/101) EICAS L, M10181 EICAS R, M10182				
SWITCH - PRESSURE OIL FILTER DIFFERENTIAL PRESSURE, S10131	--	2	413AL,423AL,414AR,424AR	79-35-01
SWITCH - SCAVENGE OIL FILTER DIFFERENTIAL PRESSURE, S10132	--	2	413AL,423AL,414AR,424AR	79-35-02

Oil Filter Bypass Warning System - Component Index
Figure 101





PRESSURE AND SCAVENGE
OIL FILTER HOUSING
A

Oil Filter Bypass Warning System - Component Location
Figure 102

OIL FILTER BYPASS WARNING SYSTEM - ADJUSTMENT/TEST

TASK 79-35-00-735-001-R00

1. System Test - Oil Filter Bypass Warning System

A. General

(1) This test makes sure the correct indications come on when one of these switches close:

(a) The differential pressure switch on the pressure oil filter (referred to as the pressure filter switch), or

(b) The differential pressure switch on the scavenge oil filter (referred to as the scavenge filter switch).

(2) This test does not make sure the switches close at the correct pressure difference.

B. Equipment

(1) Jumper wire

(2) 120 +/- 10 ohm resistor (fixed or variable), 1 Watt minimum, 2 necessary

C. References

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

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

(3) AMM 79-34-01/401, Oil Temperature Bulb

D. Access

(1) Location Zones

210	Flight Compartment
413	Left Engine Left Fan Cowl Panel
414	Left Engine Right Fan Cowl Panel
423	Right Engine Left Fan Cowl Panel
424	Right Engine Right Fan Cowl Panel

(2) Access Panels

413AL	Left Engine Left Fan Cowl Panel
414AR	Left Engine Right Fan Cowl Panel
423AL	Right Engine Left Fan Cowl Panel
424AR	Right Engine Right Fan Cowl Panel

E. Prepare for Oil Filter Bypass Warning System Test (Fig. 501)

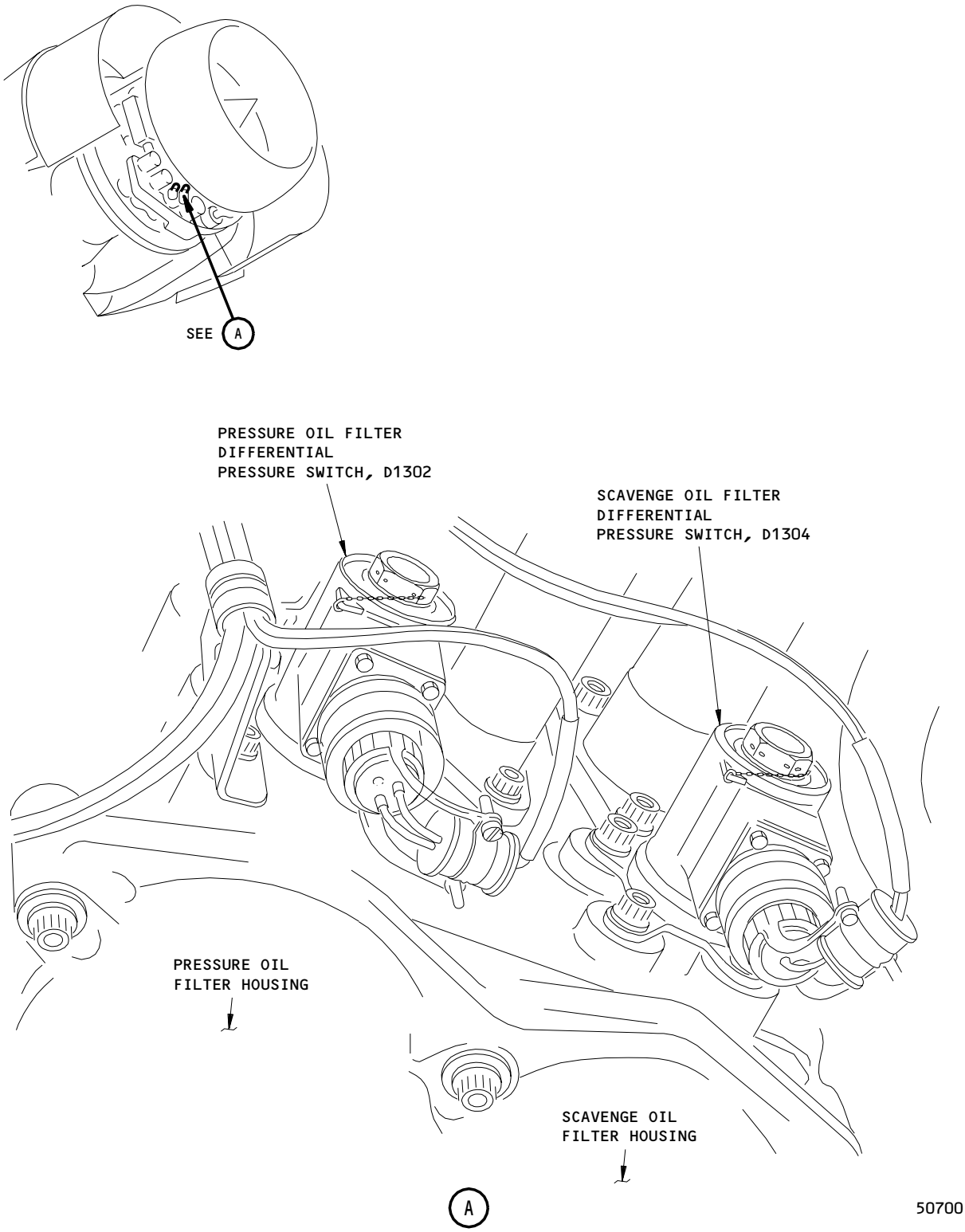
S 015-002-R00

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 035-003-R00

(2) Disconnect the electrical connector D1304 from the scavenge filter switch.



Oil Filter Differential Pressure Switches
Figure 501

S 035-004-R00
(3) Disconnect the electrical connector D1302 from the pressure filter switch.

S 865-005-R00
(4) Supply the electrical power (AMM 24-22-00/201).

S 865-006-R00
(5) Make sure the EICAS circuit breakers on the P11 panel, row J, are closed.

S 865-007-R00
(6) Push the ENGINE DISPLAY switch on the Select Panel for the EICAS Display.

S 865-008-R00
(7) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the L position.

S 865-009-R00
(8) Make sure that the oil temperature indication which is shown on the EICAS display is more than 10°C.

NOTE: Do the steps that follow if the oil temperature indication is less than 10°C:

(a) Remove the connector D1322 from the oil temperature bulb (AMM 79-34-01/401).
(b) If you use variable resistors, set the variable resistors to have a resistance of 120 ohms.
(c) Connect the resistors across these pins of the connector D1322.
1) Pins 1 and 3, and
2) Pins 5 and 6.
(d) Make sure the oil temperature indication is more than 10°C.

F. Do the Oil Filter Bypass Warning System Test

S 735-010-R00
(1) Make sure the L (R) OIL FILTER message is not shown on the EICAS display.

S 485-011-R00
(2) Connect the jumper wire between pins 1 and 3 of the connector D1304 which you disconnected from the scavenge filter switch.

S 735-012-R00
(3) Make sure the L (R) OIL FILTER message is shown on the EICAS display.

S 865-013-R00
(4) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the R position.

S 735-014-R00
(5) Make sure the L (R) OIL FILTER message is shown on the EICAS display.

S 085-015-R00
(6) Remove the jumper wire.

S 735-016-R00
(7) Make sure the L (R) OIL FILTER message is not shown on the EICAS display.

S 485-017-R00
(8) Connect the jumper wire between pins 1 and 3 of the connector D1302 which you disconnected from the pressure filter switch.

S 735-018-R00
(9) Make sure the L (R) OIL FILTER message is shown on the EICAS display.

S 865-019-R00
(10) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the L position.

S 735-020-R00
(11) Make sure the L (R) OIL FILTER message is shown on the EICAS display.

S 085-021-R00
(12) Remove the jumper wire.

S 735-022-R00
(13) Make sure the L (R) OIL FILTER message is not shown on the EICAS display.

G. Put the Airplane Back to Its Usual Condition

S 435-023-R00
(1) Connect the electrical connector D1302 to the pressure filter switch.

S 435-024-R00
(2) Connect the electrical connector D1304 to the scavenge filter switch.

S 435-029-R00
(3) Connect the electrical connector D1322 to the oil temperature bulb.

S 865-025-R00
(4) Turn the COMPUTER switch on the Select Panel for the EICAS Display to the AUTO position.

S 415-026-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.

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

S 865-027-R00
(6) Remove the electrical power (AMM 24-22-00/201).

PRESSURE OIL FILTER DIFFERENTIAL PRESSURE SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the differential pressure switch of the pressure oil filter (referred to as the switch). The second task is the installation of the switch.

   TASK 79-35-01-024-001-R00

2. Remove the Pressure Oil Filter Differential Pressure Switch
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          413 Left Engine
          414 Left Engine
          423 Right Engine
          424 Right Engine

      (2) Access Panels
          413 Fan Cowl Panel (LH) - Left Engine
          414 Fan Cowl Panel (RH) - Left Engine
          423 Fan Cowl Panel (LH) - Right Engine
          424 Fan Cowl Panel (RH) - Right Engine

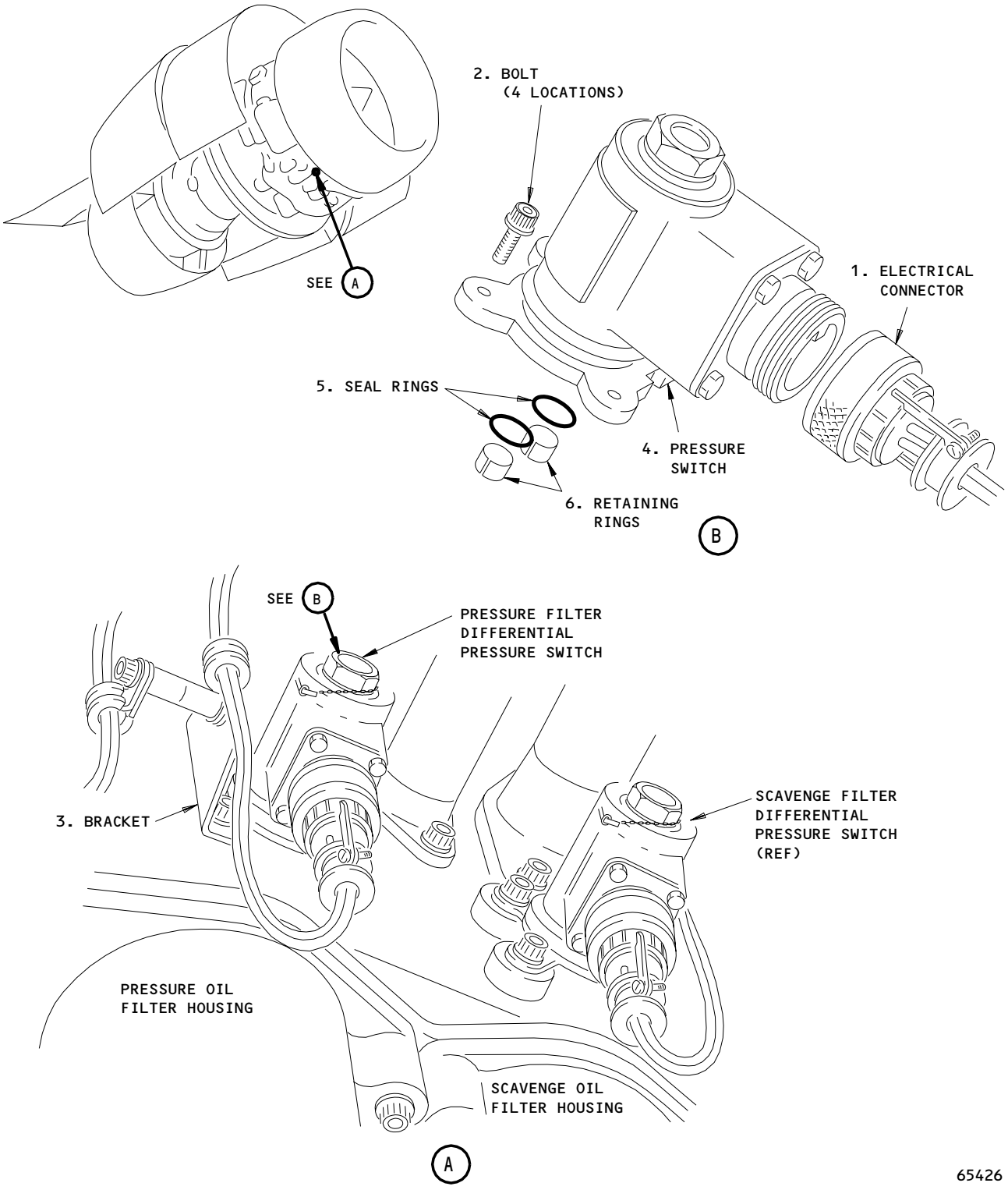
   C. Prepare for the Removal

      S 864-002-R00
      (1) Open the EICAS circuit breakers on the P11 panel, row J, and attach DO-NOT-CLOSE tags.

      S 014-021-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 fan cowl panels (AMM 71-11-04/201).
   D. Remove the switch (Fig. 401)



Pressure Oil Filter Differential Pressure Switch Installation
Figure 401

S 864-004-R00

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS FREE FROM LIQUID OR SOLID CONTAMINATION BEFORE YOU DISCONNECT. IF YOU HAVE CONTAMINATION, DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Disconnect the electrical connector (1).

S 034-005-R00

(2) Remove the bolts (2) from the bracket (3) that attach to the harness.

S 034-006-R00

(3) Lift the switch to be clear of the retaining rings.

S 024-007-R00

(4) Remove the switch.

S 034-008-R00

(5) Remove the seal rings (5) and the retaining rings (6).

S 434-009-R00

(6) Install the protection caps on the opening and the electrical connector.

TASK 79-35-01-424-010-R00

3. Install the Pressure Oil Filter Differential Pressure Switch

A. Equipment

(1) A clean brush with rigid bristles

B. Consumable Materials

(1) B00148 Cleaning Fluid - Methyl Ethyl Ketone
British Spec/Ref - TT-M-261
American Spec/Ref -
OMat No.

(2) B00178 Cleaning Fluid - Acetone
British Spec/Ref - B.S. 509, 1964
American Spec/Ref -
OMat No. - 150

(3) B00191 Cleaning Fluid - Methylene Chloride (Dichloromethane)
British Spec/Ref - B.S. 1994, 1953
American Spec/Ref - MIL-D-6998
OMat No. 169

(4) Degreasing fluid (Inhibited and stabilized 1.1.1 trichloroethane)
British Spec/Ref - B.S. 4487, 1969
American Spec/Ref - MIL-T-81533
OMat No. 1/21

(5) Lint-free cloth

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

D. Access
(1) Location Zones
413 Left Engine
414 Left Engine
423 Right Engine
424 Right Engine

(2) Access Panels
413 Fan Cowl Panel (LH) - Left Engine
414 Fan Cowl Panel (RH) - Left Engine
423 Fan Cowl Panel (LH) - Right Engine
424 Fan Cowl Panel (RH) - Right Engine

E. Install the Switch (Fig. 401)

S 864-011-R00
(1) Remove the protection caps from the opening and the electrical connector.

S 114-012-R00

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

WARNING: DO NOT GET CLEANING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. CLEANING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN AMM 70-42-12/201 WHEN YOU USE THE CLEANING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Use the cleaning fluid to remove all the jointing compound from the switch and the mating faces of the oil pump cover.

S 114-013-R00
(3) Do these steps to clean the mating faces of the switch and the oil pump cover with the degreasing fluid:

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES. PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGREASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN AMM 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE EQUIPMENT CAN OCCUR.

(a) Use a clean, dry, lint-free cloth to moist with the degreasing fluid.
(b) Discard the dirty cloth.

NOTE: Use a new clean cloth for each operation. Make sure to put the degreasing fluid liquid to the cloth to prevent the contamination of the bulk liquid.

S 644-014-R00

(4) Lubricate the new seal rings (5) and the retaining rings (6).

S 434-015-R00

(5) Install the new seal rings (5) and the retaining ring (6) to the mating face in the recess on the filter housing.

NOTE: Install the retainer for each seal correctly.

S 434-016-R00

(6) Put the switch (4) on the mating face to make sure the correct location on the retaining rings.

S 434-017-R00

(7) Put the bracket (3) on the switch flange.
(a) Install the bolts (2).
(b) Tighten the bolts (2).

S 864-022-R00

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS FREE FROM LIQUID OR SOLID CONTAMINATION BEFORE YOU CONNECT. IF YOU HAVE CONTAMINATION, DAMAGE TO EQUIPMENT CAN OCCUR.

(8) Connect the electrical connector (1).

F. Put the Airplane Back to Its Usual Condition

S 864-020-R00

(1) Remove the DO-NOT-CLOSE tags and close the EICAS circuit breakers on the P11 panel, row J.

S 414-024-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.

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

S 724-026-R00

(3) Do the required tests for installation of the oil filter pressure differential pressure switch (AMM 71-00-00/501).

SCAVENGE OIL FILTER DIFFERENTIAL PRESSURE SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task is the removal of the differential pressure switch of the scavenge oil filter (referred to as the switch). The second task is the installation of the switch.

TASK 79-35-02-024-001-R00

2. Remove the Scavenge Oil Filter Differential Pressure Switch
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   B. Access
      (1) Location Zones
          413 Left Engine
          414 Left Engine
          423 Right Engine
          424 Right Engine

      (2) Access Panels
          413 Fan Cowl Panel (LH) - Left Engine
          414 Fan Cowl Panel (RH) - Left Engine
          423 Fan Cowl Panel (LH) - Right Engine
          424 Fan Cowl Panel (RH) - Right Engine

   C. Prepare for the Removal

      S 864-002-R00
      (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) P11 Overhead Circuit Breaker Panel
              1) 11J2, EICAS CMPTR LEFT
              2) 11J3, EICAS UPPER DISPLAY
              3) 11J29, EICAS CMPTR RIGHT
              4) 11J30, EICAS LOWER DISPLAY
              5) 11J31, EICAS DISPLAY SW
              6) 11J32, EICAS DISPLAY SELECT

      S 014-023-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 fan cowl panels (AMM 71-11-04/201).

D. Remove the Switch (Fig. 401)

S 864-004-R00
(1) Disconnect the electrical connector (1).

S 034-007-R00
(2) Remove the bolts (2).

S 034-008-R00
(3) Lift the switch to remove the retaining rings.

S 034-009-R00
(4) Remove the seal rings (5) and retaining rings (6).

S 434-010-R00
(5) Install the protection caps on the opening and the electrical connector.

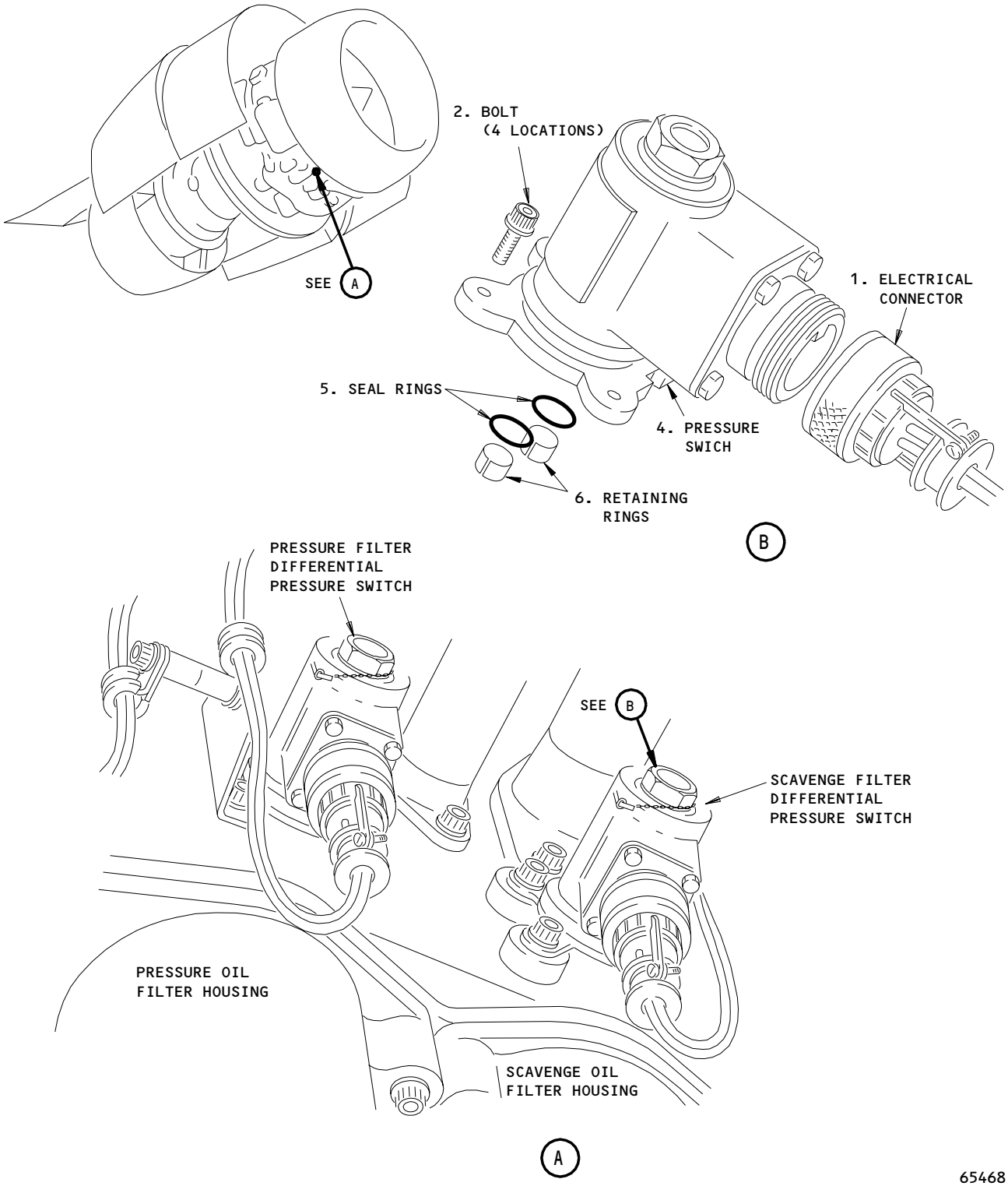
TASK 79-35-02-424-011-R00

3. Install the Scavenge Oil Filter Differential Pressure Switch

A. Equipment
(1) A clean brush with rigid bristles

B. Consumable Materials
(1) Cleaning fluid - Methylethylketone
British Spec/Ref - B.S.1940:1968
American Spec/Ref - TT-M-261
OMat No. - 135
(2) Cleaning fluid - Acetone
British Spec/Ref - B.S. 509, 1964
OMat No. - 150
(3) Cleaning fluid - Methylene Chloride (Dichloromethane)
British Spec/Ref - B.S. 1994, 1953
American Spec/Ref - MIL-D-6998
OMat No. - 169
(4) Degreasing fluid - (Inhibited and stabilized 1.1.1 trichloroethane)
British Spec/Ref - B.S. 4487, 1969
American Spec/Ref - MIL-T-81533
OMat No. - 1/21
(5) Lint-free cloth

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



Scavenge Oil Filter Differential Pressure Switch Installation
Figure 401

D. Access

(1) Location Zones

413 Left Engine
414 Left Engine
423 Right Engine
424 Right Engine

(2) Access Panels

413 Fan Cowl Panel (LH) - Left Engine
414 Fan Cowl Panel (RH) - Left Engine
423 Fan Cowl Panel (LH) - Right Engine
424 Fan Cowl Panel (RH) - Right Engine

E. Install the Switch (Fig. 401)

S 034-012-R00

(1) Remove the protection caps from the opening and the electrical connector.

S 114-013-R00

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

WARNING: WHEN YOU USE THE CLEANING FLUID, MAKE SURE TO HAVE A GOOD AIR FLOW, NOT TOUCH THE SKIN, AND NOT BREATHE THE FUME. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: OBEY THE INSTRUCTIONS IN 70-42-12/201 WHEN YOU USE THE CLEANING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Use the cleaning fluid to remove all the jointing compound from the switch and mating faces of the oil pump cover.

S 114-014-R00

(3) Do these steps to clean the mating faces of the switch and the oil pump cover with the degreasing fluid:

WARNING: DO NOT GET DEGREASING FLUID IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES . PUT ON PROTECTION SPLASH GOGGLES AND GLOVES WHEN YOU CLEAN. DEGREASING FLUID IS POISONOUS, AND CAN CAUSE INJURY TO PERSONS.

CAUTION: OBEY THE INSTRUCTIONS IN 70-42-12/201 WHEN YOU USE THE DEGREASING FLUID. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Use a clean, dry, cloth without lint that is moist with the degreasing fluid.
(b) Clean the mating surfaces with the cloth.
(c) Discard the dirty cloth.

NOTE: Use a new clean cloth for each operation. Make sure to put the degreasing fluid liquid to the cloth to prevent the contamination of the bulk liquid.

S 644-015-R00

(4) Lubricate the new seal rings (5) and the retaining rings (6).

S 434-016-R00

(5) Install the new seal rings (5) and retaining rings (6) to the mating face in the recess on the filter housing.

NOTE: Install the retainer for each seal correctly.

S 424-017-R00

(6) Put the switch (4) on the mating face to make sure the correct location on the retaining rings.

S 434-019-R00

(7) Install the bolts (2).
(a) Tighten the bolts (2).

S 864-020-R00

(8) Install the electrical connector (1).

F. Put the Airplane Back to Its Usual Condition

S 864-021-R00

(1) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
  (a) P11 Overhead Circuit Breaker Panel
    1) 11J2, EICAS CMPTR LEFT
    2) 11J3, EICAS UPPER DISPLAY
    3) 11J29, EICAS CMPTR RIGHT
    4) 11J30, EICAS LOWER DISPLAY
    5) 11J31, EICAS DISPLAY SW
    6) 11J32, EICAS DISPLAY SELECT

S 414-025-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) Close the fan cowl panels (AMM 71-11-04/201).

S 724-027-R00

(3) Do the required tests for installation of the oil pressure scavenge differential pressure switch (AMM 71-00-00/501).