

Scandinavian Airlines System

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CHAPTER 80 - STARTING

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STARTING - DDG MAINTENANCE PROCEDURES

1. General

- A. This procedures includes these DDG maintenance procedures:
(1) DDG 80-00-2 Preparation - Engine Start Valve Inoperative
(2) DDG 80-00-2 Restoration - Engine Start Valve Inoperative

TASK 80-00-00-049-006-N00

2. DDG 80-00-2 Preparation - Engine Start Valve Inoperative (Fig. 901)

A. Access

- (1) Location Zones
411 Engine, Left
421 Engine, Right
- (2) Access Panels
417AL Core Cowl Panel (Left)
427AL Core Cowl Panel (Left)

B. Procedure

S 829-002-N00

- (1) Make sure you can speak with persons in the flight compartment.

S 989-003-N00

CAUTION: MAKE SURE THERE IS AIR PRESSURE IN THE INLET DUCT BEFORE YOU MANUALLY OPERATE THE STARTER CONTROL VALVE. IF THERE IS NOT AIR PRESSURE IN THE INLET DUCT, YOU CAN CAUSE DAMAGE TO THE STARTER CONTROL VALVE.

- (2) Do the steps that follow to manually operate the starter control valve:

NOTE: When you are told to close the starter control valve, close it immediately to prevent damage to the starter.

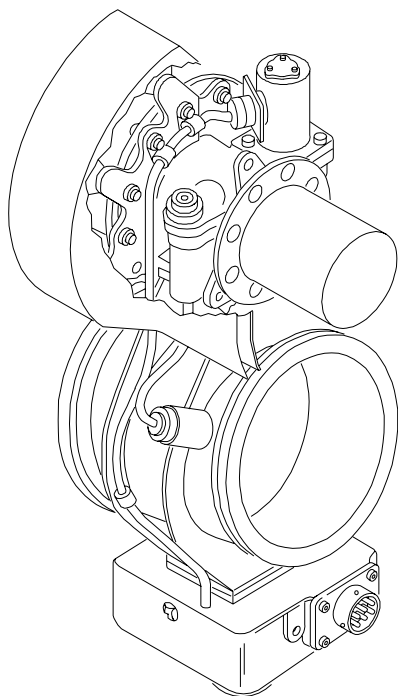
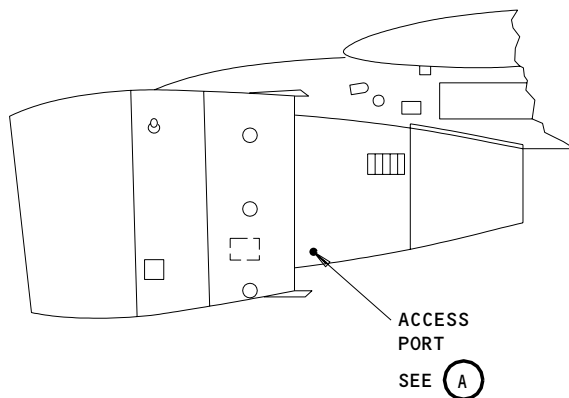
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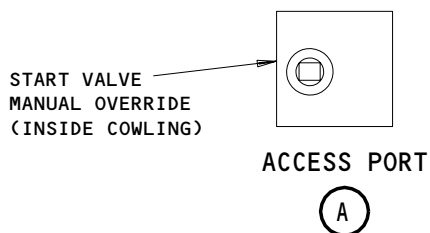
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ENGINE START CONTROL VALVE



Engine Start Valve
 Figure 901

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CAUTION: DO NOT PUT TOGETHER SHORT DRIVE PIECES TO GET A 40 INCH DRIVE. IF YOU PUT SHORT PIECES TOGETHER, THEY CAN COME APART AND CAUSE DAMAGE TO THE ENGINE.

- (a) Put a 3/8-inch square drive, that is 40 inches long, in the manual override of the start valve.

NOTE: Put the square drive through the access port of the access port of the core cowl. The core cowl panels will stay closed.

- (b) When the person in the flight compartment tells you, turn the square drive to open the valve.
- (c) When the person in the flight compartment tells you, turn the square drive to close the valve.
- (d) Remove the square drive.

TASK 80-00-00-449-004-N00

3. DDG 80-00-2 Restoration - Engine Start Valve Inoperative (Fig. 901)

A. References

- (1) AMM 80-11-02/401, Starter Control Valve

B. Access

- (1) Location Zones

411 Engine, Left
421 Engine, Right

C. Procedure

S 909-005-N00

- (1) Replace the starter control valve (AMM 80-11-02/401).

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STARTING SYSTEM - DESCRIPTION AND OPERATION

1. General (Fig. 1)

- A. The engine starting system provides the means of rotating the engine N2 compressor on the ground or in flight to an rpm at which engine start can occur. The starting system assists the engine to accelerate to approximately 50% N2 rpm, at which time the starting system will stop operating. For inflight start, the system can be energized to supplement a windmilling engine if required. System components for each engine include the pneumatic starter, starter control valve, starter QAD adapter, disagreement light for the start valve, pneumatic ducting, and necessary control circuitry. Switches on the engine start and ignition control module, located on the overhead panel P5 for the pilot, control the system operation for the engine starting.
- B. Power for the system is 28 volts dc supplied from the battery bus for the circuit breakers on the overhead panel P11.
- C. Pneumatic power can be obtained from three separate compressed air sources; the auxiliary power unit (APU) on the airplane, ground carts through service connections, or cross-bleed air from an operating engine.

2. Component Details

A. Pneumatic Starter (Fig. 2)

- (1) The engine starter converts high energy compressed air to starter shaft torque sufficient to accelerate the engine to starting speed. The starter is a lightweight, single stage, axial flow, turbine air motor consisting of a nozzle, turbine wheel and shaft, reduction gear train, exhaust screen, housing assembly, clutch mechanism, and output drive shaft. Starter operation is controlled by the starter control valve which opens on demand to permit air to flow into the starter inlet.
- (2) The starter is mounted on the aft face of the main gearbox at the 6 o'clock drive pad. It is secured to the gearbox by a Quick Attach Detach (QAD) adapter and clamp.
- (3) The starter gears and bearings are splash-lubricated by a self-contained oil system. Fill and drain ports are provided in the housing for servicing. The assembly for the magnetic drain plug consists of an inner magnetic probe and an outer drain plug. The magnetic probe can be removed to check for metallic chips without draining the oil. A check valve in the drain plug prevents draining when the magnetic probe is removed.

B. Starter Control Valve (Fig. 3, 4)

- (1) The starter control valve controls compressed air flow to the engine starter. The valve is a spring loaded closed, electrically controlled, pneumatically operated shutoff valve. The starter control valve has three major components, the valve body, the actuator, and a position indicating switch.

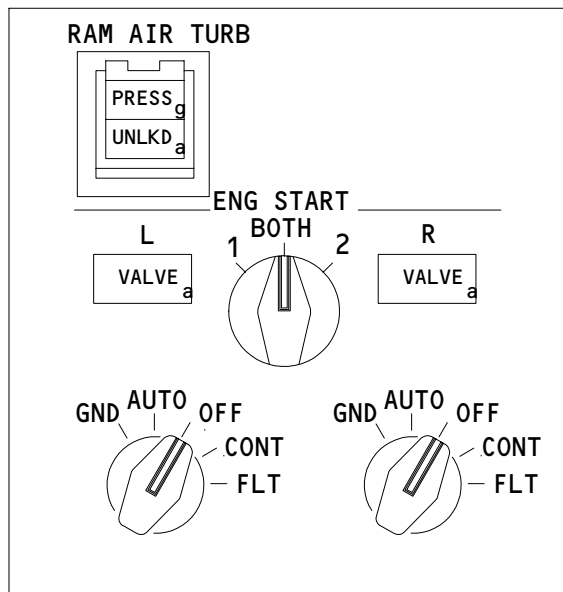
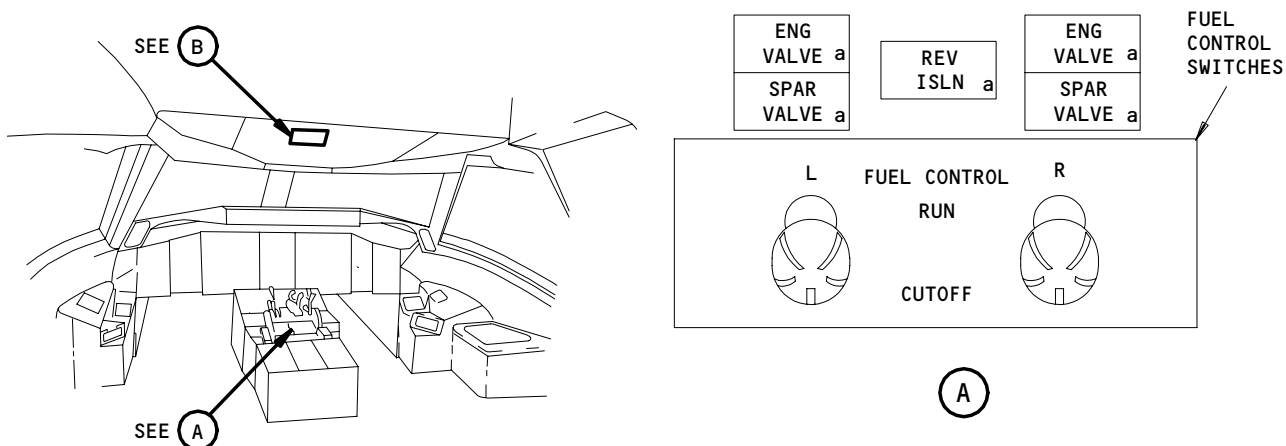
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(B)

Engine Start Controls
Figure 1

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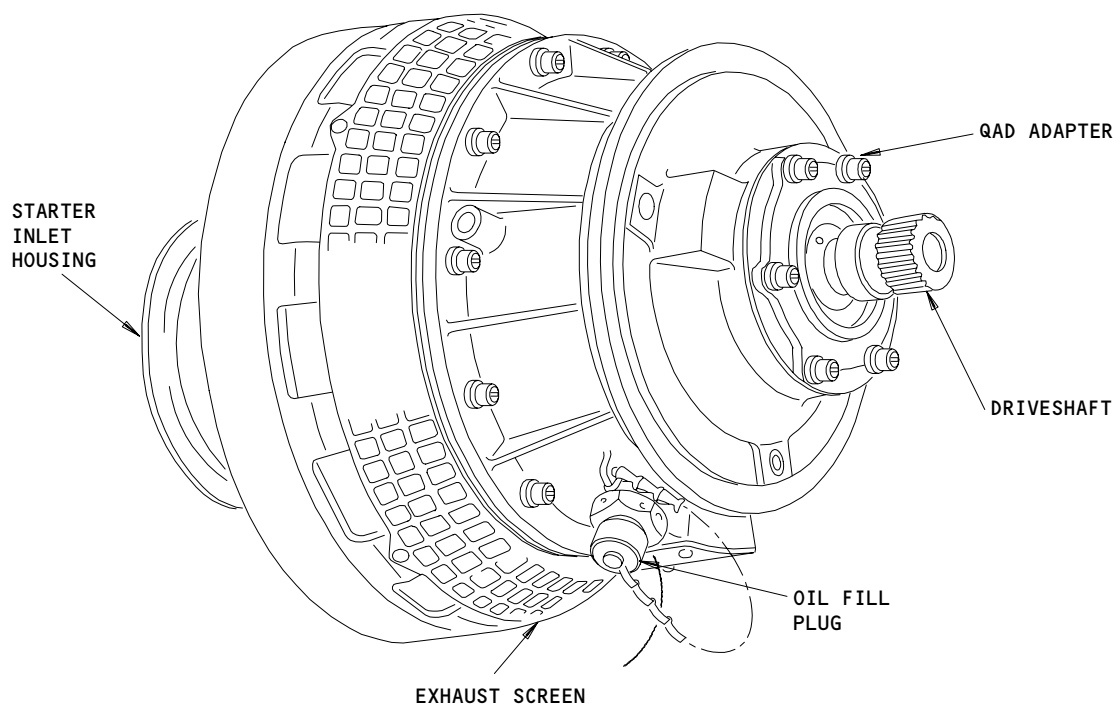
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- (2) The dual diaphragm, pneumatic actuator is torsion-spring loaded with a solenoid valve and an externally mounted relief valve. The actuator is connected to the butterfly shaft with a connecting link and arm. The solenoid valve is a three-way ball valve. A bleed-off pressure regulator is a spring-loaded, poppet type, relief valve.
- (3) The position indicating switch has two electrical switches enclosed in a housing located on the left side of the starter interconnect duct. A manual override and position indicator is located on top of the position switch.



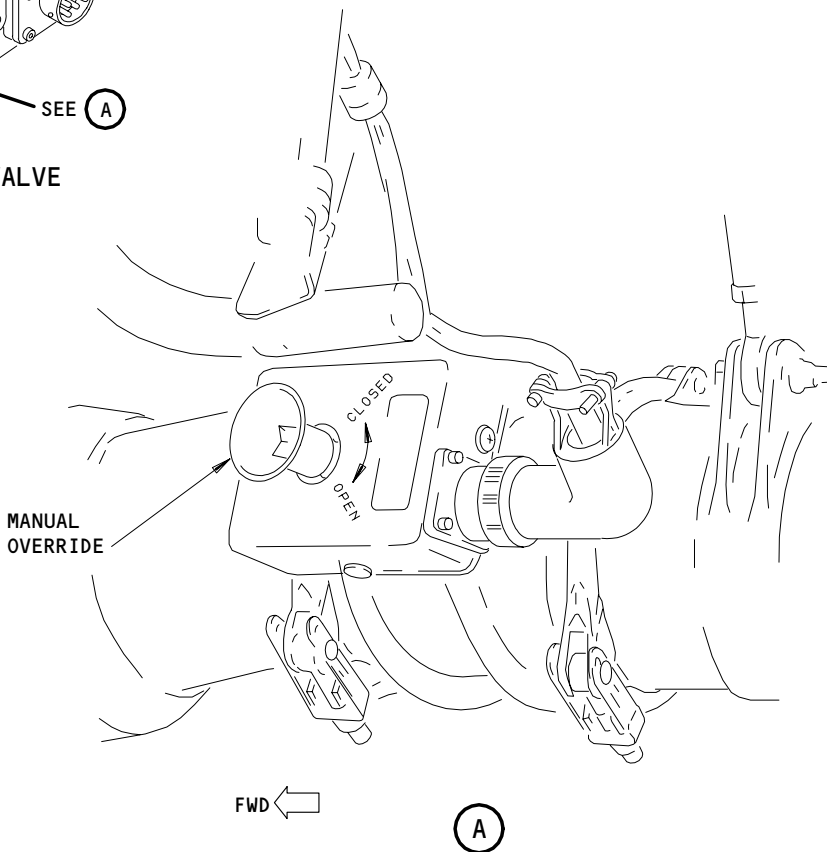
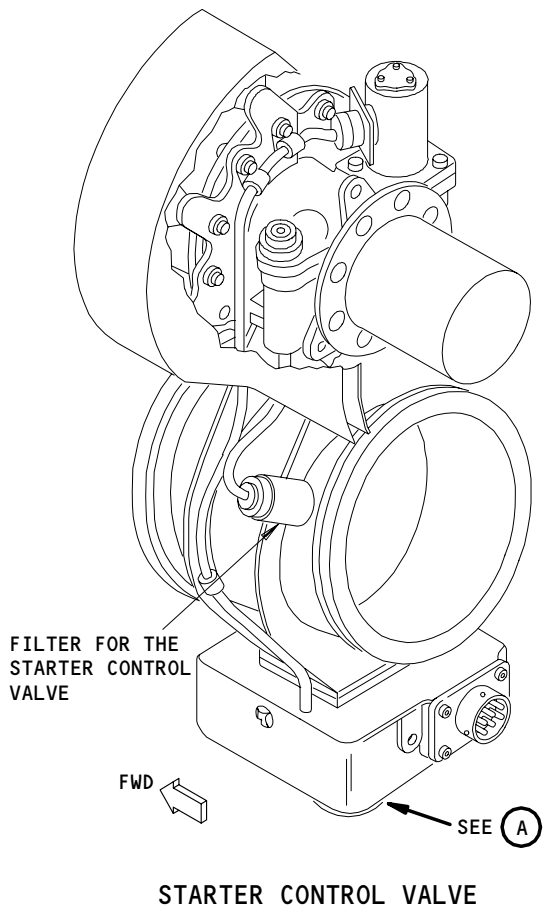
Pneumatic Starter
Figure 2

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Starter Control Valve
Figure 3

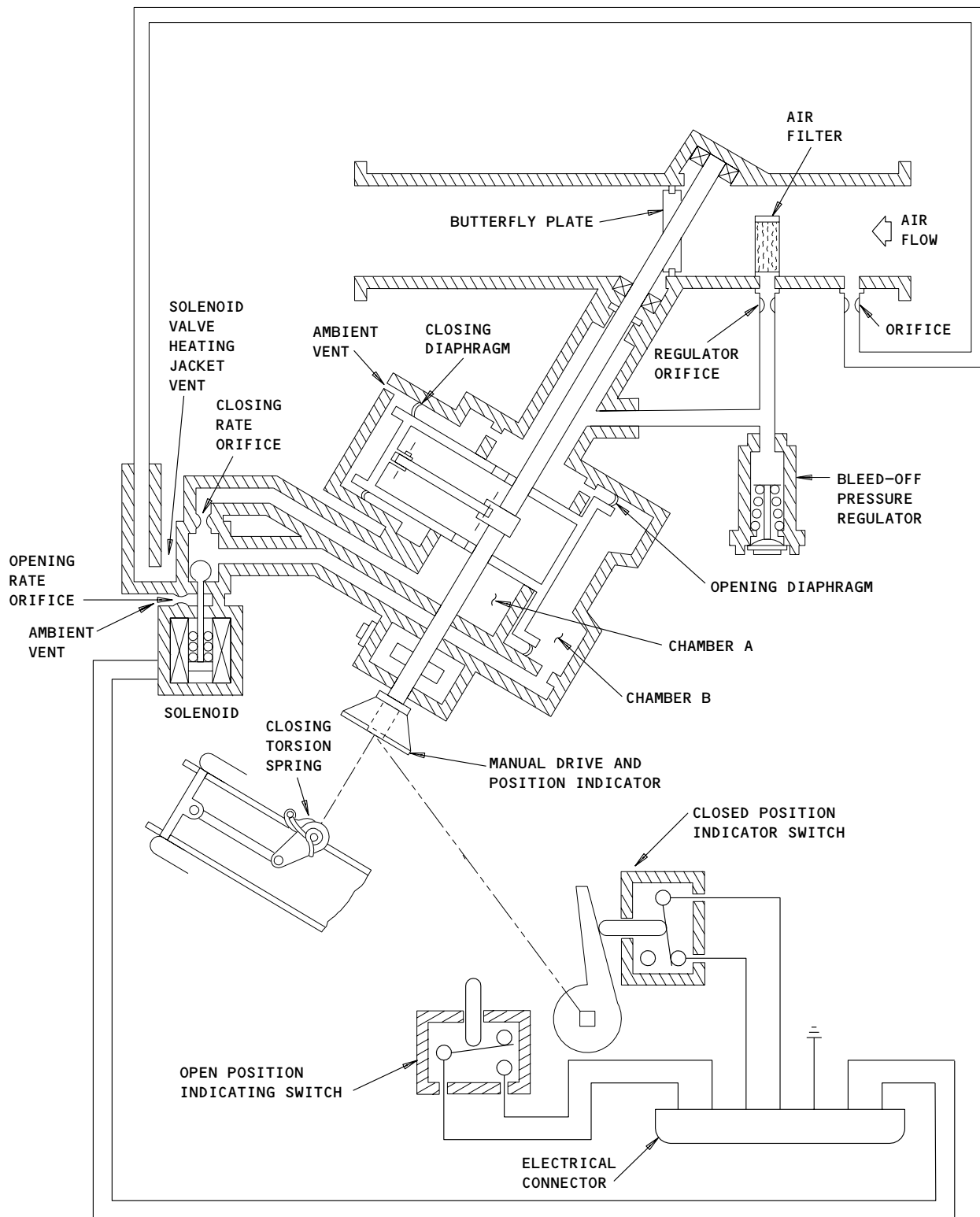
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Starter Control Valve Schematic
Figure 4

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(4) The valve body contains the butterfly shaft, bearings and a butterfly plate. The position of the butterfly plate for the starter control valve is controlled by the solenoid valve. Air immediately upstream of the butterfly plate is filtered and routed through an orifice to chamber A, the solenoid valve, and chamber B (Fig. 4). When the solenoid is energized, the ball valve moves to the opposite seat. This shuts off air pressure to chamber B and vents air pressure in chamber B to ambient through the opening rate orifice. Air pressure acts on the large diameter diaphragm against the combined force of the torsion spring and the upstream pressure acting on the small diameter diaphragm. The force from the opening diaphragm is transmitted through a mechanical linkage to rotate the butterfly plate toward the fully open position.

C. Starter QAD Adapter

(1) The aluminum adapter housing has an index pin to ensure proper installation of the starter and is attached to the gearbox with six nut studs. The starter is attached to the adapter housing with a Quick Attach Detach (QAD) clamp.

D. Engine Start and Ignition Control Module (Fig. 5)

(1) The engine start and ignition control module, on the overhead panel P5 of the pilot, is comprised of two engine start switches, an ignition select switch, and two disagreement lights for the starter control VALVE. The ignition select switch and the functions of the engine start switches pertaining to ignition are described in AMM 74-00-00/001, Ignition System - Description and Operation.

(2) The engine start switch has five positions: GND, AUTO, OFF, CONT and FLT. There is a separate start switch for each engine. The position of the engine start switch controls which ignition system will operate for that engine.

(3) GND position is a solenoid-held, push-in detented position. The GND position opens the starter control valve to supply air to the starter, and arms the selected igniter.

(4) The AUTO position closes the starter control valve after 48% N2 rpm is reached, and terminates ignition.

(5) The CONT and FLT positions have no direct use in the starting system and are more specifically related to the ignition system.

E. EICAS Messages

(1) The EICAS Advisory (Level C) message L(R) ENG STARTER will appear, after a 5 second delay, when the position of the L(R) starter valve disagrees with commanded position of the engine start switch.

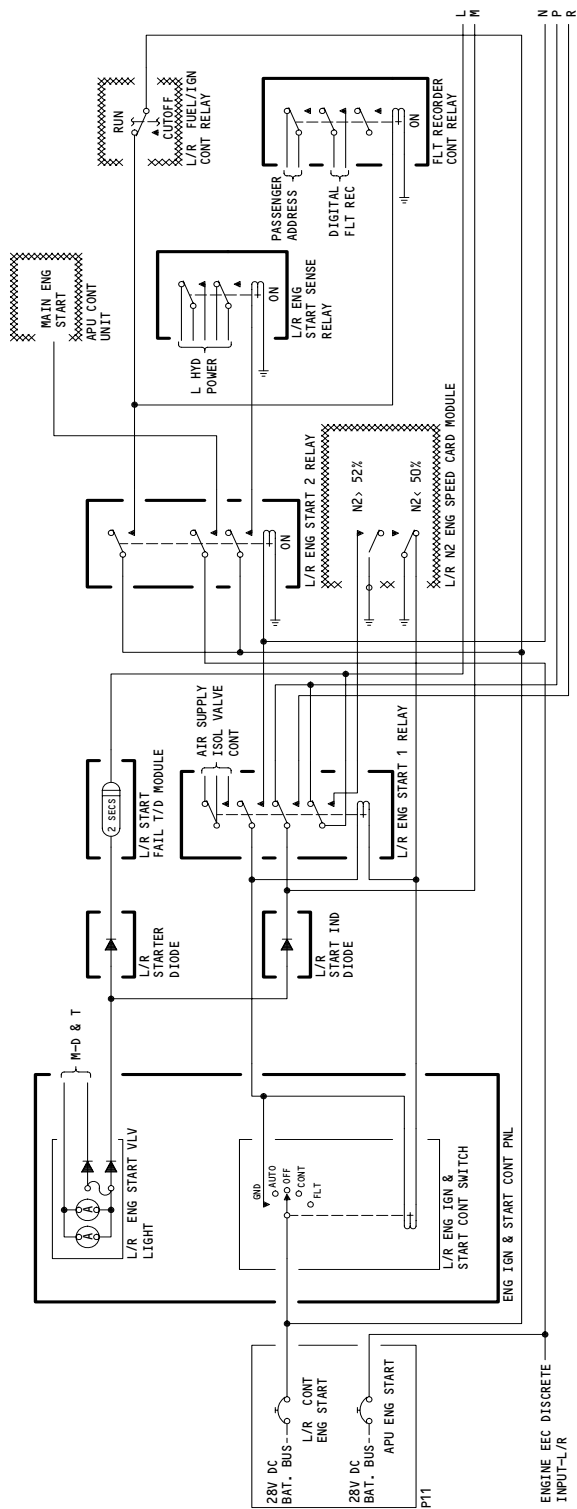
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Start System Schematic
Figure 5 (Sheet 1)

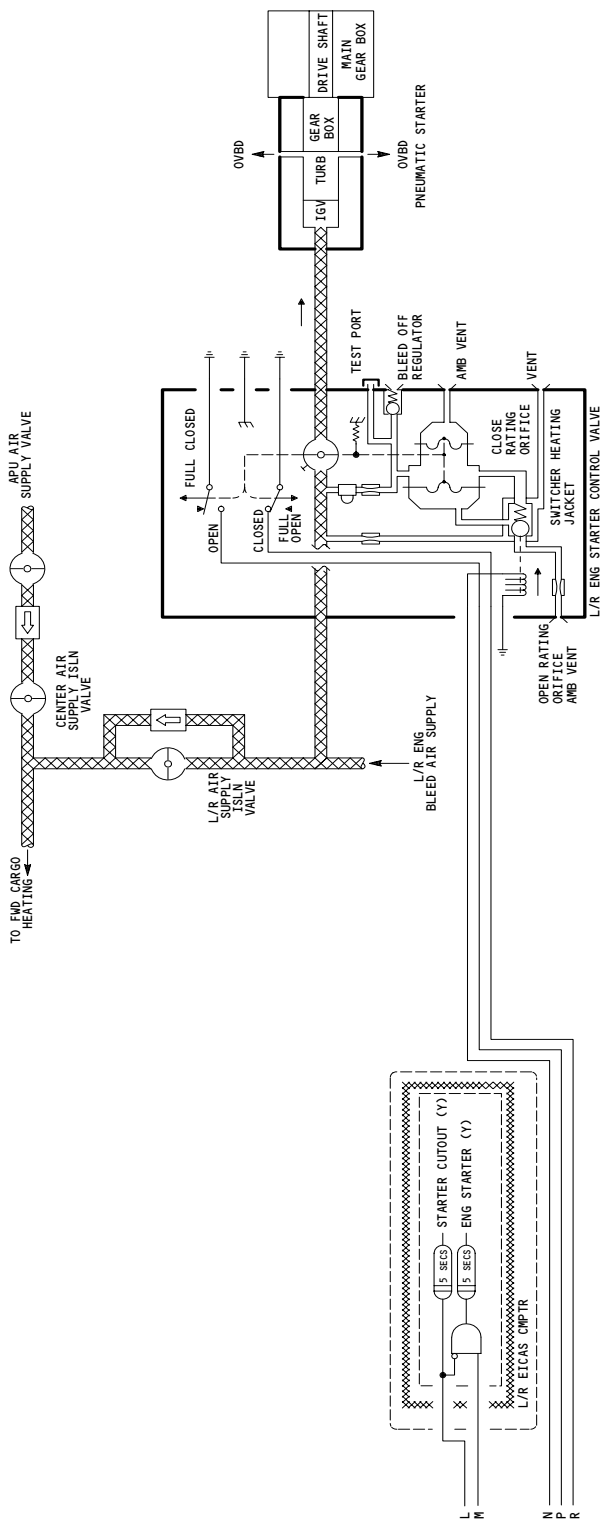
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Start System Schematic
Figure 5 (Sheet 2)

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- (2) The EICAS caution (Level B) message L(R) STARTER CUTOUT will appear on the upper display unit, after a 5 second delay, when either starter control valve is open or commanded open above 52% N2 rpm. All other existing level B and C messages are inhibited until the starter cutout condition is no longer valid, a new level B message occurs, the EICAS RECALL switch is pushed (on the center instrument panel), or after 20 seconds since its initiation, whichever occurs first.

3. Operation

A. Functional Description (Fig. 5)

- (1) With 28 volts dc power supplied to the engine start and ignition switches, the start system is armed.
- (2) For each engine, placing the corresponding engine start switch to GND causes the light for the starter control VALVE to illuminate briefly, then extinguish.
- (3) The engine start relay No. 1 is also energized when the engine start switch is placed in GND. The relay coil ground is through the N2 Speed Card. At 48% N2 rpm, the N2 speed card for the engine removes the ground, causing the start switch to automatically snap back to AUTO.
- (4) Energizing start relay No. 1 enables bat bus power of 28 volt dc to be supplied to the solenoid for the starter control valve, which causes the starter control valve to open.
- (5) With start relay No. 1 energized, this triggers the shutoff valve for pressure regulating and the high stage air to close. Energizing start relay No. 1 also enables engine start relay No. 2 to be energized.
- (6) When energized, start relay No. 2 provides a signal input to the APU, which then operates at higher rpm to supply necessary air for engine start.
- (7) Start relay No. 2 also energizes the control relay for the flight recorder, which enables the system for the flight data recorder.
- (8) When the starter control valve opens, compressed air is admitted to the starter air inlet. The air passes through the starter inlet nozzles and is directed axially through the turbine rotor, imparting high speed rotation to the rotor. Low energy exhaust air from the starter is discharged inside the engine cowling through an exhaust screen in the starter housing.
- (9) The starter rotation is transmitted through the main gearbox, horizontal layshaft, angle gearbox, and towershaft to the high pressure (N2) compressor. The N2 compressor begins to rotate and establishes airflow through the engine.
 - (a) When the N2 compressor is at the maximum motoring speed, the fuel and ignition are supplied when you put the FUEL CONTROL switch to the RUN position.

NOTE: The minimum motoring speed necessary to start the engine is 15% N2.

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- (10) The starter continues to assist the engine until the N2 speed card interrupts power to the holding switch for the engine start switch, and the switch returns to AUTO, at 48% N2 rpm. The solenoid for the starter control valve is de-energized, which causes the valve to close. The starter speed begins to drop when the starter control valve closes. As the engine continues to accelerate, the starter clutch automatically disengages the starter.
- (11) As the starter control valve closes, the VALVE light illuminates then extinguishes. If the starter valve fails to close or if electrical power to the start valve is not interrupted at 48% N2 by the N2 speed card, shut off air supply by moving engine start switch to AUTO. At 52% N2, the valve light illuminates and L(R) STARTER CUTOUT message is displayed on EICAS.
- (12) Engine Manual Start (Fig. 3)

WARNING: WHEN MANUALLY OPERATING STARTER CONTROL VALVE, HAND AND ARM COVERS MUST BE WORN. HEAT AND AIR BLAST EXHAUSTING FROM STARTER COULD RESULT IN INJURY TO PERSONNEL.

CAUTION: IF VALVE IS NOT CLOSED WHEN N2 INDICATION SHOWS 48% RPM, STARTER MAY BE DAMAGED.

MANUAL OPERATION OF STARTER CONTROL VALVE WITHOUT AIR PRESSURE IN INLET DUCT MAY DAMAGE VALVE.

- (a) If the electrical circuit for the starter control valve becomes inoperative, the valve can be operated by use of a manual override handle (Fig. 3).
 - 1) Access to the starter control valve is obtained through a hole beside the IDG access door, located under the core cowl. The hole is labeled and indicates the opening and closing instructions for the valve. Communication between ground maintenance personnel and flight compartment must be established and maintained.
 - 2) Perform normal engine start procedure except:
 - a) When start switch for engine with inoperative starter control valve is placed in GND position, instruct ground crewman to actuate and hold manual override handle.
 - b) When 48% N2 rpm is attained, instruct ground crewman to release manual override handle and observe that engine start switch returns to AUTO.

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(13) Engine Motoring

- (a) The starter can be used for motoring an engine. Motoring the engine may be required to clear the engine of trapped fuel and for other ground maintenance tasks. For motoring an engine, the ignition circuit breakers must be open and the FUEL CONTROL switch in CUTOFF position. Engine motoring is initiated by positioning the engine start switch to GND. Motoring is discontinued when the engine start switch is positioned to OFF.

B. Control

- (1) Check that the following circuit breakers on the overhead panel P11 are closed:
 - (a) 11D7, STANDBY IGNITION 1
 - (b) 11D8, STANDBY IGNITION 2
- (2) For left engine, check that the following circuit breakers on the overhead panel P11 are closed:
 - (a) 11D19, ENGINE START CONT LEFT
 - (b) 11M1, LEFT ENG IGNITION 1
 - (c) 11M9, LEFT ENG BUS POWER SENSE
 - (d) 11M28, LEFT ENG IGNITION 2
- (3) For right engine, check that the following circuit breakers on panel P11 are closed:
 - (a) 11D20, ENGINE START CONT RIGHT
 - (b) 11M2, RIGHT ENG IGNITION 1
 - (c) 11M29, RIGHT ENG IGNITION 2
 - (d) 11M36, RIGHT ENG BUS POWER SENSE
- (4) Provide electrical power.
- (5) Provide pneumatic power. For pneumatic power, refer to AMM 36-00-00/201, Pneumatic - General.
- (6) For engine start using auxiliary power unit (APU)
 - (a) Check that switch for the APU bleed air, switch for the center isolation valve, and switch for the left or right isolation valve, as applicable, are in the open position on the overhead panel P5 of the pilot.
 - (b) Check that the valve switches for the air conditioning pack are in valve closed position on panel P5.
- (7) For engine start using external air source
 - (a) Connect ground carts to the pneumatic connections for ground service.
 - (b) Close the switch for the APU bleed air on panel P5.
- (8) For engine start using cross-bleed air source
 - (a) Engine cross-bleed air start uses bleed air from an operating engine to start the other engine.
 - (b) Check that air supply switch for the pressure regulating and shutoff valve (PRSOV) of the operating engine is in the open position on the overhead panel P5 of the pilot.
- (9) Position ENGINE START switch to GND.

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- (10) Check that the light for the starter control VALVE illuminates and then extinguishes.
- (11) Check that N2 indication shows percent N2 rpm increase.
- (12) Put the FUEL CONTROL switch in the RUN position when engine is at the maximum motoring speed.

NOTE: The minimum motoring speed necessary to start the engine is 15% N2.

- (13) When N2 indication shows 48% rpm, check that the engine start switch returns to AUTO.
- (14) Check that start valve closes at 52% N2 rpm and that the light for the starter control VALVE illuminates and then extinguishes.

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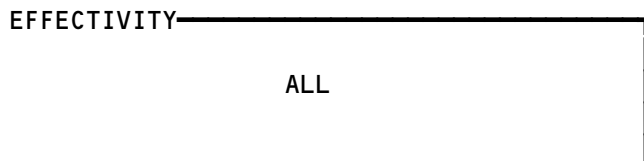
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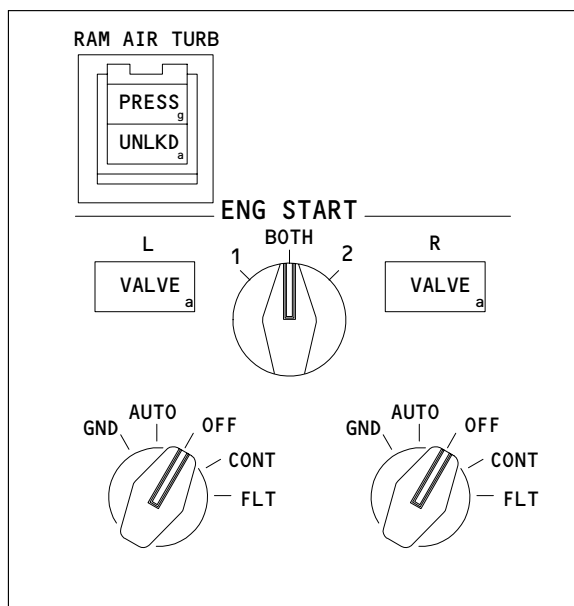
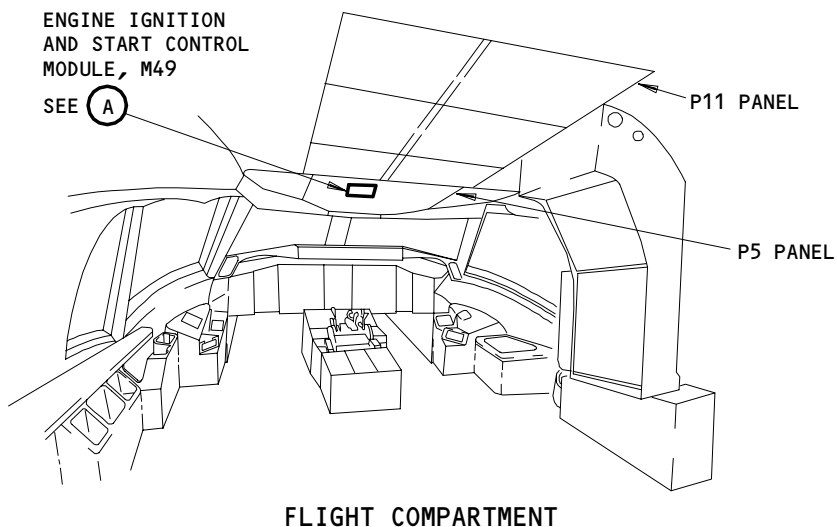
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
ADAPTER - QAD	2	1	415AL,416AR, THRUST REVERSER, L ENGINE, MAIN GEARBOX	80-11-03
ADAPTER - QAD	2	1	425AL,426AR, THRUST REVERSER, R ENGINE, MAIN GEARBOX	80-11-03
CIRCUIT BREAKERS	1		FLT COMPT, P11	*
START CONT LEFT, C1510		1	11D19	
START CONT RIGHT, C1511		1	11D20	
APU ENG START, C1512		1	11B36	
COMPUTER - (REF 31-41-00, FIG. 101)				
EICAS L, M10181				
EICAS R, M10182				
DIODES - (REF 31-01-06, FIG. 101)				
STARTER L, R225				
STARTER R, R226				
START IND L, R10119				
START IND R, R10120				
FILTER - STARTER CONTROL VALVE	2	1	417AL,418AR, CORE COWL, L ENGINE, MAIN GEARBOX	80-11-04
FILTER - STARTER CONTROL VALVE	2	1	427AL,428AR, CORE COWL, R ENGINE, MAIN GEARBOX	80-11-04
MODULE - (REF 49-61-00, FIG. 101)				
APU CONT UNIT, M206				
MODULE - ENG IGN AND START CONTROL, M49	1	1	FLT COMPT, P5	
MODULE - (REF 73-21-00, FIG. 101)				
L N2 ENG SPEEDCARD, M1093				
R N2 ENG SPEEDCARD, M1092				
MODULE (REF 31-01-06, FIG. 101)				
L START FAIL T/D, M10334				
R START FAIL T/D, M10335				
RELAY - (REF 31-01-06, FIG. 101)				
L ENG START 1, K665				
L ENG START 2, K10247				
R ENG START 1, K666				
R ENG START 2, K10250				
RELAY - (REF 31-01-36, FIG. 101)				
FLT RECORDER CONTROL, K163				
RELAY - (REF 31-01-37, FIG. 101)				
FLT RECORDER CONTROL, K164				
L ENG START SENSE, K680				
R ENG START SENSE, K681				
RELAY - (REF 76-11-00, FIG. 101)				
L FUEL/IGN CONTROL, K168				
R FUEL/IGN CONTROL, K169				
STARTER - PNEUMATIC	2	1	415AL,416AR, THRUST REVERSER, L ENGINE, MAIN GEARBOX	80-11-01
STARTER - PNEUMATIC	2	1	425AL,426AR, THRUST REVERSER, R ENGINE, MAIN GEARBOX	80-11-01
VALVE - STARTER CONTROL, V351	2	1	417AL,418AR, CORE COWL, L ENGINE, MAIN GEARBOX	80-11-02
VALVE - STARTER CONTROL, V351	2	1	427AL,428AR, CORE COWL, R ENGINE, MAIN GEARBOX	80-11-02

* SEE WM EQUIPMENT LIST

Component Index
Figure 101



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ENGINE IGNITION AND START CONTROL MODULE, M49

(A)

Starting System - Component Location
Figure 102 (Sheet 1)

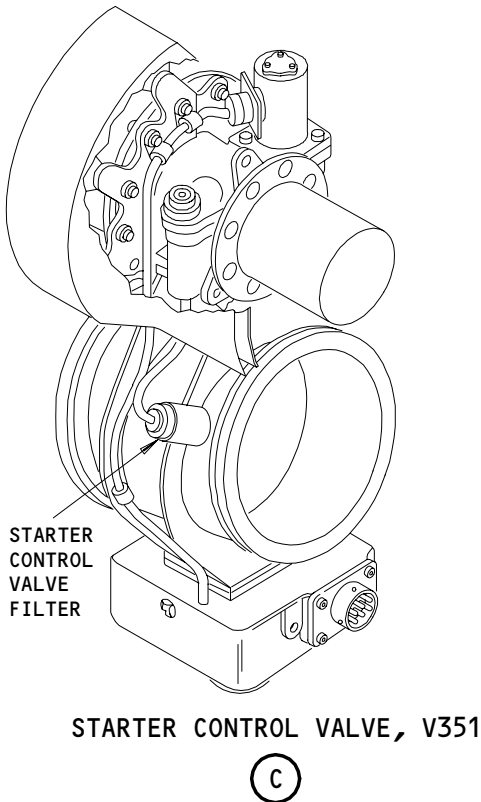
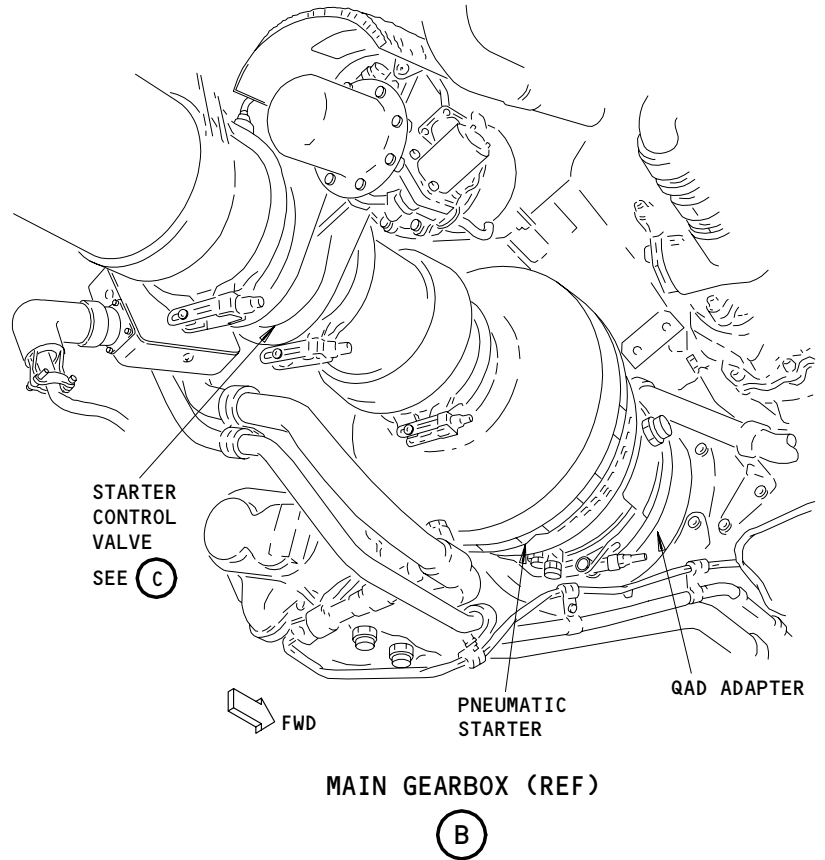
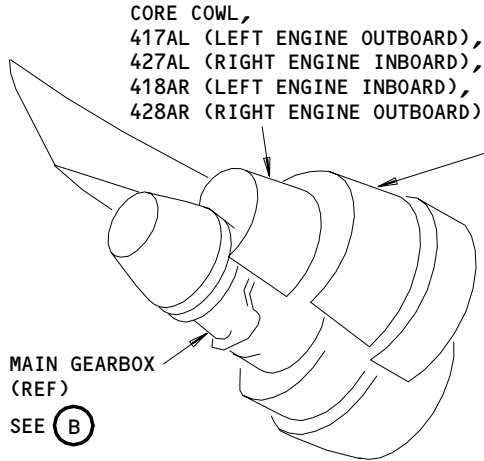
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Starting System - Component Location
Figure 102 (Sheet 2)

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ENGINE STARTING SYSTEM – ADJUSTMENT/TEST

1. General

- A. The adjustment test has an operational test and a system test for the engine starter system.
- B. The operational test makes sure that the starting system operates correctly. The test can be done when you regularly motor or start the engine.
- C. The system test makes sure that the systems that follow operate correctly.
 - (1) The circuits of the starter control valve
 - (2) The cutout warning system for the starter
 - (3) The manual override procedure for the starter control valve.

TASK 80-11-00-705-001-N00

2. Operational Test of the Engine Starting System

A. General

- (1) The limits for the operation of the engine starter are as follows.
 - (a) The usual operation cycle is two stopped starts, each one immediately followed by an engine cooling time. After the second stopped start, and subsequent engine cooling time, you must disengage the starter and let the N2 decrease to zero before you engage the starter again.

NOTE: If you motored the engine to make the starter cool immediately before the usual operation cycle, it is not necessary to disengage the starter before you try to start the engine.

- (b) The extended starter duty cycles and times that are necessary to make it cool, with the fuel and ignition off, are as follows:
 - 1) If the starter was ON from 0 to 5 minutes, let the N2 decrease to zero before you motor the engine again.
 - 2) If the starter was ON from 5 to 10 minutes, let the starter cool for 20 minutes before you motor the engine again.
 - 3) If the starter was on from 10 to 15 minutes, let the starter cool for 30 minutes before you motor the engine again.

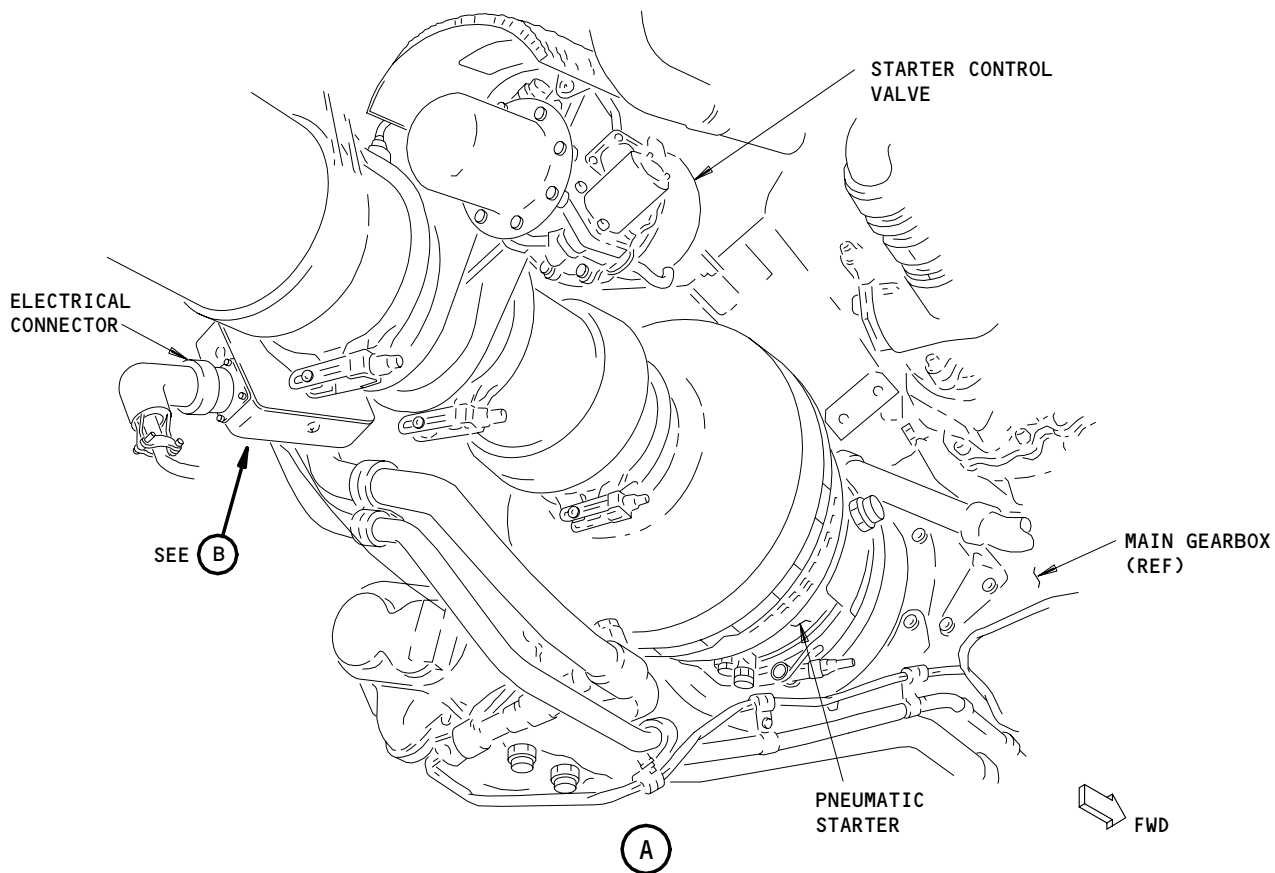
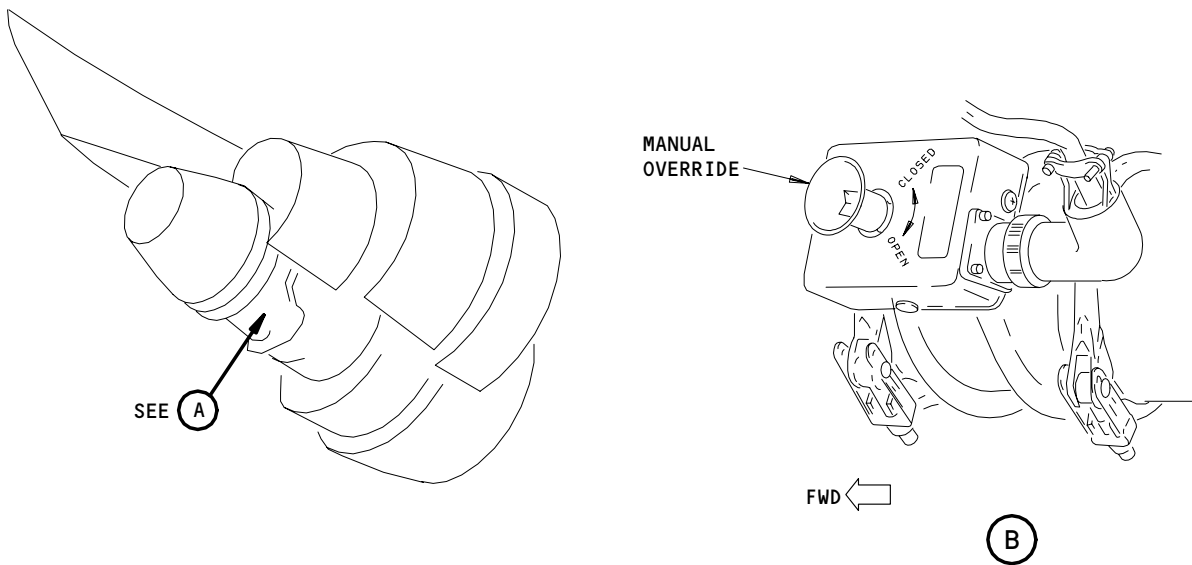
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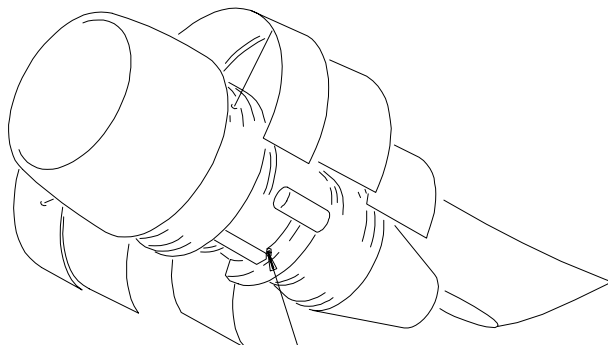
Starter Control Valve
Figure 501

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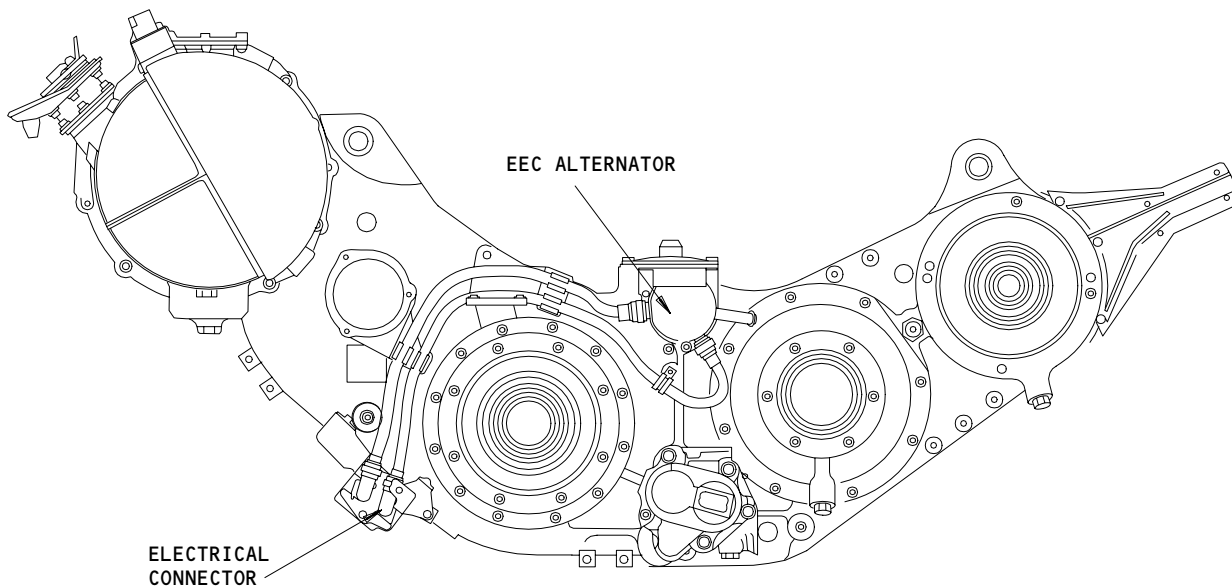
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MAIN
 GEARBOX
 SEE (A)



MAIN GEARBOX REAR VIEW (REF)

(A)

EEC Alternator Connection
 Figure 502

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- (c) The limits to engage the starter again are as follows:
- 1) We do not recommend that you engage the starter again when the N2 RPM is more than 15%. This does not include when there was a fire or when the EGT was too high.

NOTE: If it is possible, let the engine fully stop before you engage the starter again.

- 2) If the N2 RPM is not more than 30%, you can engage the starter again when these conditions occur:
- 3) There is an engine fire
- 4) The exhaust gas temperature (EGT) was too high.

B. References

- (1) AMM 12-13-02/301, Engine Starter
- (2) AMM 24-22-00/201, Electrical Power - Control
- (3) AMM 36-00-00/201, Pneumatic - General

C. Prepare for the Test

S 615-002-N00

- (1) Do this procedure: Engine Starter (Oil Replenishing) (AMM 12-13-02/301).

S 865-003-N00

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

S 865-004-N00

- (3) Supply pneumatic power (AMM 36-00-00/201).

S 865-005-N00

- (4) To make sure the engine does not start while you motor the starter, open the circuit breakers on the overhead panel, P5, and attach do not close tags:
 - (a) 11D7, STANDBY IGNITION 1
 - (b) 11D8, STANDBY IGNITION 2
 - (c) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RST L
 - (d) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RST R
 - (e) 11M1, L IGN 1
 - (f) 11M2, R IGN 1
 - (g) 11M28, L IGN 2
 - (h) 11M29, R IGN 2

S 865-006-N00

- (5) Make sure these circuit breakers on the P11 overhead panel are closed:
 - (a) 11D19, ENGINE START CONT LEFT

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(b) 11D20, ENGINE START CONT RIGHT

S 865-007-N00

- (6) For the left engine, make sure these circuit breakers on the P11 overhead panel are closed:
- (a) 11S11, L ENG BLEED CONT

S 865-008-N00

- (7) For the right engine, make sure these circuit breakers on the P11 overhead panel are closed:
- (a) 11S20, R ENG BLEED CONT

D. Do the Test of the Engine Starter System (Motoring)

S 715-009-N00

- (1) Do the steps that follow to do the operational test of the engine starter system.

WARNING: BEFORE YOU DO THIS TEST, MAKE SURE THAT THERE ARE NO PERSONS, TOOLS, OR UNWANTED OBJECTS IN THE ENGINE INLET. MAKE A SAFETY-ZONE PERIMETER AROUND THE ENGINE. IF YOU ARE NOT CAREFUL TO DO THIS, YOU CAN MAKE OBJECTS GO INTO THE ENGINE AND CAUSE DAMAGE TO THE ENGINE OR INJURY TO PERSONS.

- (a) Put the engine start switch to the GND position.
- (b) Make sure that the start VALVE light on the P5 panel comes on and quickly goes off.

CAUTION: DO NOT OPERATE THE ENGINE STARTER MORE THAN THE APPLICABLE OPERATION CYCLE DURING THE TESTS THAT FOLLOW. AFTER YOU OPERATE THE STARTER FOR 5 MINUTES, YOU MUST LET THE N2 SPEED DECREASE TO ZERO BEFORE YOU ENGAGE THE STARTER AGAIN. IF YOU OPERATE THE STARTER FOR TOO MUCH TIME, YOU CAN CAUSE DAMAGE TO THE STARTER.

CAUTION: DO NOT ENGAGE THE STARTER AGAIN WHILE THE N2 RPM IS MORE THAN 30%. IF YOU ENGAGE THE STARTER AGAIN WHILE THE N2 RPM IS MORE THAN 30%, YOU CAN CAUSE DAMAGE TO THE STARTER OR THE GEARBOX.

- (c) Let the starter motor to approximately 19 to 25% N2.
- (d) Examine the starter for too much noise or operation defects.
- (e) Put the engine start switch to the OFF position.
- (f) Make sure that the start VALVE light comes on and quickly goes off.
- (g) Make sure that the N2 speed decreases to zero.

E. Put the Airplane Back to its Usual Position.

S 865-010-N00

- (1) Remove pneumatic power (AMM 36-00-00/201).

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- S 865-011-N00
(2) Remove electrical power (AMM 24-22-00/201).

- S 945-012-N00
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 overhead panel.
(a) 11D7, STANDBY IGNITION 1
(b) 11D8, STANDBY IGNITION 2
(c) 11D25, ENGINE FUEL CONT VLV & EEC CHAN B RST L
(d) 11D26, ENGINE FUEL CONT VLV & EEC CHAN B RST R
(e) 11M1, L IGN 1
(f) 11M2, R IGN 1
(g) 11M28, L IGN 2
(h) 11M29, R IGN 2

TASK 80-11-00-705-026-N00

3. System Test for the Engine Starting System

A. Equipment

- (1) Sine Wave Signal Generator - Adjustable from 5 to 2000 Hz accuracy
(2) Electronic Counter - Accuracy ± 0.0001 Hz
(3) Test Box, Tachometer System - A77004-19

B. References

- (1) AMM 12-13-02/301, Engine Starter
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 36-00-00/201, Pneumatic - General
(4) AMM 71-11-04/201, Fan Cowl Panels
(5) AMM 71-11-06/201, Core Cowl Panels
(6) AMM 78-31-00/201, Thrust Reverser System

C. Prepare for the Systems Test

- S 615-013-N00
(1) Do this procedure: Engine Starter (Oil Replenishing) (AMM 12-13-02/301).

- S 865-014-N00
(2) Supply electrical power (AMM 24-22-00/201).

- S 865-015-N00
(3) Make sure these circuit breakers on the P11 overhead panel are closed:
(a) 11B16, AURAL WARN SPKR L
(b) 11B18, WARN ELEX B
(c) 11D15, ENGINE SPEED SENSE L2
(d) 11D16, ENGINE SPEED SENSE R2
(e) 11D19, ENGINE START CONT LEFT
(f) 11D20, ENGINE START CONT RIGHT
(g) 11D23, ENGINE SPEED SENSE L1
(h) 11D24, ENGINE SPEED SENSE R1
(i) 11H35, AURAL WARN SPKR R

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(j) 11J34, WARN ELEX A

S 045-020-N00

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

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

S 015-017-N00

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

S 015-018-N00

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

S 015-019-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU OPEN THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

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

D. Do the Test for the Engine Starter System.

S 765-021-N00

(1) Do a check of the circuits of the starter control valve (Fig. 501).

(a) Put the engine start switch to the GND position.

(b) Disconnect the applicable electrical connector, D4230 at the left starter control valve or D4220 at the right starter control valve.

(c) Connect a voltmeter between pin 4 of the applicable electrical connector, D4230 or D4220, and the airplane ground.

(d) Make sure that the voltage is between 25 and 31 volts DC.

(e) Ground pin 6 of the electrical connector.

1) Make sure that the start VALVE light, on the P5 overhead panel, comes on.

(f) Make sure that the EICAS message, L(R) ENG STARTER, shows on the top display after five seconds.

1) Make sure that the EICAS message, L(R) STARTER CUTOUT, does not show.

(g) Remove the ground from pin 6 of the electrical connector.

1) Make sure that the start VALVE light goes off and the EICAS message does not show.

(h) Ground pin 5 of the electrical connector.

1) Make sure that the start VALVE light is off.

(i) Remove the ground from pin 5.

(j) Put the engine start switch to the OFF position.

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- (k) Ground pin 5 of the electrical connector.
- (l) Make sure that the start VALVE light comes on.
- (m) Make sure that the EICAS message, L(R) STARTER CUTOUT, shows on the EICAS DISPLAY after five seconds.
- (n) Remove the ground from pin 5.
- (o) Make sure that the start VALVE light goes off and the EICAS message does not show.
- (p) Ground the pin 6 of the connector.
- (q) Make sure that the start VALVE light is off.
- (r) Remove ground.
 - 1) Make sure that the light stays off.
- (s) Connect the applicable electrical connector, D4230 at the left starter control valve or D4220 at the right starter control valve.

S 765-022-N00

- (2) Do a check of the Speed Card Cutout (Fig. 502)
 - (a) Put the engine start switch to the OFF position.
 - (b) Disconnect the electrical connector from the EEC alternator.
 - (c) Connect one end of the adapter cable for the test box to the electrical connector and the other end to the test box connector.
 - (d) Connect the signal generator and the electronic counter to the test box.
 - (e) Make an alternator frequency of 1605-1639 Hz, that is from 27 to 37 volts, the highest point to the lowest point (peak to peak).

NOTE: The alternator frequency input gives the same input that the %N2 RPM can give during the usual operation of the engine starter. This input is the same as when the N2 speed is approximately 47% to 49%.

- (f) Put the engine start switch to the GND position.
- (g) Disconnect the applicable electrical connector, D4230 at the left starter control valve or D4220 at the right starter control valve.
- (h) Connect a voltmeter between the pin 4 of the applicable electrical connector, D4230 or D4220, and the airplane ground.
- (i) Make sure that the voltage is between 25 and 31 volts DC.
- (j) Make an alternator frequency of 1745-1780 Hz, that is from 27 to 37 volts, the highest point to the lowest point (peak to peak).

NOTE: This input is the same as when the N2 speed is approximately 51% to 52%.

- (k) Make sure that the engine start switch turns to the AUTO position.
- (l) Make sure that the voltage is from -3 to +3 volts DC.

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- (m) Disconnect the signal generator and the electronic counter from the test box.
- (n) Disconnect the adapter cable of the test box from the electrical connector.
- (o) Connect the electrical connector to the EEC alternator again.
- (p) Put the test switch for channel 2 of the N2 (engine) speed card to the TEST position and hold the test switch in the TEST position.

NOTE: This test switch is on the electrical systems card file, P50.

- (q) Make sure that the test switch for channel 1 is in the NORM position on the electrical systems card file, P50.
- (r) Put the engine start switch to the GND position.
- (s) Make sure that the voltage between the pin 4 of the applicable electrical connector, D4230 or D4220, and the ground is between 25 and 31 volts DC.
- (t) Make sure that the start VALVE light on the P5 panel comes on after two seconds.
- (u) Make sure that the three conditions that follow occur.
 - 1) The EICAS message, L(R) STARTER CUTOUT, shows on the EICAS cautions and warnings after five seconds
 - 2) The amber Master Caution lights come on the two sides
 - 3) You hear a warning sound from the aural warning unit.
- (v) Release the test switch for channel 2.
- (w) Put the engine start switch to the OFF position.
- (x) Connect, again, the applicable electrical connector, D4230 or D4220, at the starter control valve.

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS WHEN YOU CLOSE THE THRUST REVERSERS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

- (y) Close the right thrust reverser (AMM 78-31-00/201).
- (z) Close the right core cowl panel (AMM 71-11-06/201).
- (aa) Close the right fan cowl panel (AMM 71-11-04/201).
- (ab) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 735-023-N00

- (3) Do the Manual Override Test.
 - (a) Supply pneumatic power (AMM 36-00-00/201).
 - (b) Open the access door for the starter control valve on the left side of the engine.

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WARNING: BEFORE YOU DO THIS TEST, MAKE SURE THAT THERE ARE NO PERSONS, TOOLS, OR UNWANTED OBJECTS IN THE ENGINE INLET. MAKE A SAFETY-ZONE PERIMETER AROUND THE ENGINE. IF YOU ARE NOT CAREFUL TO DO THIS, YOU CAN MAKE OBJECTS GO INTO THE ENGINE AND CAUSE DAMAGE TO THE ENGINE OR INJURY TO PERSONS.

(c) Open the starter control valve with the manual override and let the engine speed increase to 20% N2 RPM.

NOTE: To open the starter control valve, turn the square drive socket clockwise.

(d) Manually close the starter control valve when the N2 RPM is at 20%.

NOTE: To close the starter control valve, turn the square drive counterclockwise.

(e) Make sure that the valve closed and that the air is blocked from the starter.

(f) Close the access door for the starter control valve.

E. Put the Airplane Back to its Usual Condition.

S 865-024-N00

(1) Remove pneumatic power (AMM 36-00-00/201).

S 865-025-N00

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

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PNEUMATIC STARTER – REMOVAL/INSTALLATION

1. General

- A. This procedure gives the instructions for the removal and installation of the pneumatic starter.
- B. The pneumatic starter will be referred to as the starter for this procedure.
- C. The starter is installed on the aft side of the main gearbox at the 5 o'clock position.
- D. Access to the starter is through the thrust reversers.

TASK 80-11-01-004-001-N00

2. Remove the Starter

A. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 71-11-06/201, Core Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 80-11-02/401, Starter Control Valve

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (Left), Left Engine
- 414AR Fan Cowl Panel (Right), Left Engine
- 415AL Thrust Reverser (Left), Left Engine
- 416AR Thrust Reverser (Right), Left Engine
- 417AL Core Cowl Panel (Left), Left Engine
- 418AR Core Cowl Panel (Right), Left Engine
- 423AL Fan Cowl Panel (Left), Right Engine
- 424AR Fan Cowl Panel (Right), Right Engine
- 425AL Thrust Reverser (Left), Right Engine
- 426AR Thrust Reverser (Right), Right Engine
- 427AL Core Cowl Panel (Left), Right Engine
- 428AR Core Cowl Panel (Right), Right Engine

C. Prepare for the Removal of the Starter

S 864-002-N00

- (1) For the left engine, open this circuit breaker on the overhead panel P11 and attach a DO-NOT-CLOSE tag:
 - (a) 11D19, ENGINE START CONT LEFT

S 864-003-N00

- (2) For the right engine, open this circuit breaker on the overhead panel P11 and attach a DO-NOT-CLOSE tag:
 - (a) 11D20, ENGINE START CONT RIGHT

S 014-004-N00

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

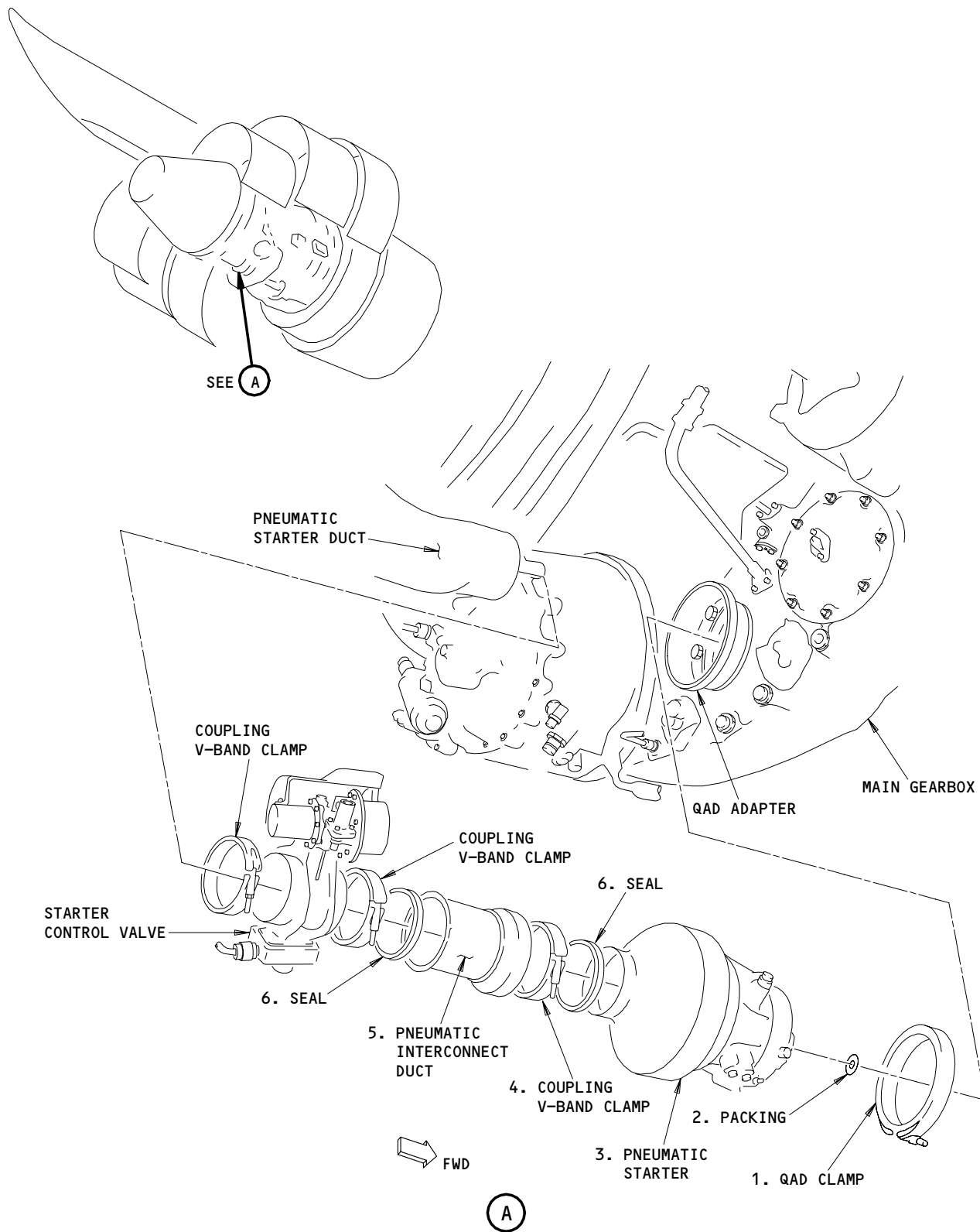
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(A)
Pneumatic Starter Installation
Figure 401

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S 044-034-N00

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

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

S 014-006-N00

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

S 014-030-N00

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

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

D. Procedure

S 014-008-N00

- (1) Remove the starter control valve (AMM 80-11-02/401).

S 024-035-N00

- (2) Remove the starter (Fig. 401):
(a) Remove the coupling V-band clamp (4) that connects the pneumatic interconnect duct (5) to the starter (3).
(b) Remove the pneumatic interconnect duct (5) and the seal (6).

WARNING: BE CAREFUL WHEN YOU REMOVE THE STARTER FROM THE MAIN GEARBOX. THE STARTER WEIGHS APPROXIMATELY 40 POUNDS (18 KILOGRAMS). INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE STARTER FALLS.

CAUTION: DO NOT LIFT THE STARTER BY THE DRIVE SHAFT. DAMAGE TO THE INTERNAL OF THE STARTER CAN OCCUR.

- (c) Remove the QAD clamp (1) that connects the starter (3) to the QAD adapter.
(d) Remove the starter (3) from the QAD adapter.
1) Remove and discard the packing (2) from the starter (3).

TASK 80-11-01-404-014-N00

3. Install the Starter

A. Consumable Materials

- (1) D00068 or D00071 Lubricant -oil, MIL-L-23699 or MIL-L-7808

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- (2) D50033 Grease, Fluorinated Lubricant - Krytox 283 (P06-059)
B. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	Packing	80-11-01	10	40
				11	190
				13	190
	3	Starter	80-11-01	10	55
				11	215
				13	215

C. References

- (1) AMM 12-13-02/301, Engine Starter Servicing
- (2) AMM 71-00-00/201, Power Plant
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 71-11-06/201, Core Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 79-21-10/601, Magnetic Chip Detector
- (7) AMM 80-11-02/401, Starter Control Valve

D. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (Left), Left Engine
- 414AR Fan Cowl Panel (Right), Left Engine
- 415AL Thrust Reverser (Left), Left Engine
- 416AR Thrust Reverser (Right), Left Engine
- 417AL Core Cowl Panel (Left), Left Engine
- 418AR Core Cowl Panel (Right), Left Engine
- 423AL Fan Cowl Panel (Left), Right Engine
- 424AR Fan Cowl Panel (Right), Right Engine
- 425AL Thrust Reverser (Left), Right Engine
- 426AR Thrust Reverser (Right), Right Engine
- 427AL Core Cowl Panel (Left), Right Engine
- 428AR Core Cowl Panel (Right), Right Engine

E. Prepare for the Installation of the Starter

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S 214-031-N00

CAUTION: BEFORE YOU INSTALL THE PNEUMATIC STARTER, LOOK FOR LOOSE OR MISSING BOLTS ON THE GEARBOX TO STARTER COUPLING. IF A BOLT HAS COME LOOSE, DAMAGE TO THE GEARBOX CAN OCCUR.

- (1) Do the steps that follow to examine the gearbox to starter coupling:
 - (a) Look for loose or missing bolts on the gearbox to starter coupling.
 - (b) If a bolt has come loose, do the steps that follow:
 - 1) Look for circular gouging or scoring on the front face of the starter output shaft.
 - 2) Examine the gearbox chip detector for spalled bearing material (AMM 79-21-10/601).
 - a) If no bearing material is found, replace the loose bolt with a new bolt.

F. Procedure

S 424-036-N00

- (1) Install the starter:
 - (a) Lubricate the new packing (2) with engine oil.
 - (b) Install the new packing on the starter drive shaft.

WARNING: BE CAREFUL WHEN YOU INSTALL THE STARTER ON THE MAIN GEARBOX. THE STARTER WEIGHS APPROXIMATELY 40 POUNDS (18 KILOGRAMS). INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN THE STARTER FALLS.

CAUTION: DO NOT LIFT THE STARTER BY THE DRIVE SHAFT. DAMAGE TO THE INTERNAL OF THE STARTER CAN OCCUR.

- (c) Install the starter on the main gearbox with the steps that follow:

NOTE: Make sure the starter, pneumatic interconnect duct and the starter control valve are correctly aligned. This is necessary for access to the manual override of the starter valve through the access hole in the core cowl panel.

- 1) Apply a thin layer of grease to the splines of the starter drive shaft.
- 2) Put the starter (3) in position on the QAD adapter on the main gearbox.
- 3) Move the starter (3) forward until the drive pad coupling and the splines on the starter drive shaft engage.
- 4) If necessary turn the starter (3) until the index spline on the starter is in line with the index spline on the QAD adapter.

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- 5) Continue to push the starter (3) forward until it stops.
- 6) Install the QAD clamp (1) to connect the starter (3) to the QAD adapter.
 - a) Measure the run-on torque value of the QAD clamp (1) and make a note of the value.
 - b) Tighten the QAD clamp (1) to a value equal to the run-on torque added to 65-75 pound-inches (7.3-8.5 newton-meters).
- (d) Connect the pneumatic interconnect duct (5) to the starter (3) with the steps that follow:
 - 1) Install the pneumatic interconnect duct (5) with the seal (6) to the starter (3).
 - 2) Install the coupling V-band clamp (4).
 - a) Tighten the coupling V-band clamp (4) to 100-115 pound-inches (11.3-13.0 newton-meters).

S 414-020-N00

- (2) Install the starter control valve (AMM 80-11-02/401).

S 614-021-N00

- (3) Fill the starter with oil (AMM 12-13-02/301).
- G. Return the Aircraft to Its Usual Condition

S 414-022-N00

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

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

S 414-024-N00

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

S 444-037-N00

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

S 414-026-N00

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

S 864-027-N00

- (5) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead P11 panel:
 - (a) 11D19, ENGINE START CONT LEFT

S 864-028-N00

- (6) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead P11 panel:
 - (a) 11D20, ENGINE START CONT RIGHT

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S 814-032-N00

CAUTION: MAKE SURE THE N2 TACHOMETER OPERATES CORRECTLY. DAMAGE TO THE STARTER CAN OCCUR BECAUSE OF AN OVERSPEED CONDITION IF THE N2 TACHOMETER DOES NOT OPERATE CORRECTLY.

- (7) If you think that starter damage occurred because of an overspeed condition without a "STARTER CUTOFF" EICAS message, do the steps that follow:
- (a) Do the Airborne Vibration Monitor Interrogation Procedure (FIM 77-31-00, Fig. 104).
 - (b) Look for an "N2 Tach Loss" fault message for the applicable engine or the applicable fault code bits and do the necessary corrective action.

S 714-029-N00

- (8) Dry motor the engine (AMM 71-00-00/201).

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PNEUMATIC STARTER – INSPECTION/CHECK

1. General

- A. The inspection of the starter includes a visual inspection of the starter, the magnetic chip detector and the pneumatic connection. Removal of the starter is not necessary unless exterior leakage is found.

TASK 80-11-01-216-001-N00

2. Inspection of the Pneumatic Starter

A. Consumable Materials

- (1) D00137 Engine Oil – PWA 521

B. References

- (1) AMM 12-13-02/301, Starter Servicing (Add Oil)
- (2) AMM 12-22-02/301, Starter Servicing (Oil Change)
- (3) AMM 71-11-04/201, Fan Cowl Panels
- (4) AMM 71-11-06/201, Core Cowl Panels
- (5) AMM 78-31-00/201, Thrust Reverser System
- (6) AMM 80-11-01/401, Pneumatic Starter

C. Access

(1) Location Zones

- 416 Fan reverser (right)
- 426 Fan reverser (right)

(2) Access Panels

- 416AR Fan reverser (right)
- 426AR Fan reverser (right)

D. Prepare for the Procedure

S 046-015-N00

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

- (1) Do the deactivation procedure for the thrust reverser for ground maintenance (AMM 78-31-00/201).

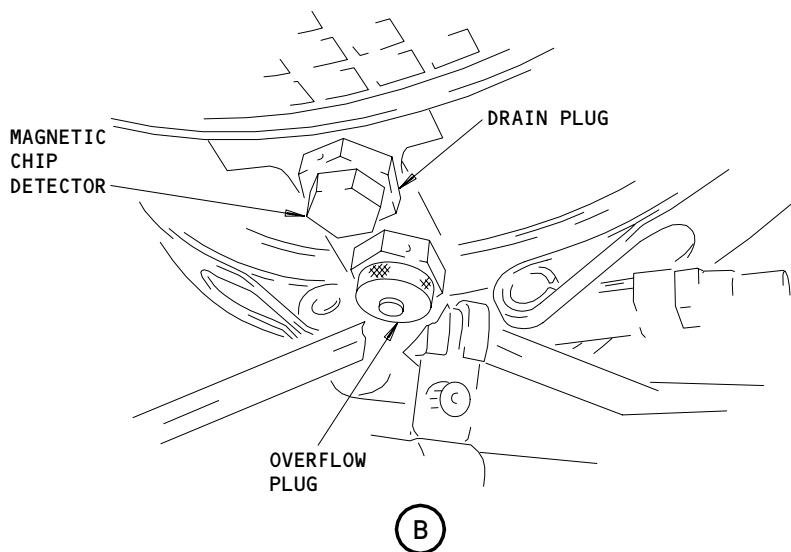
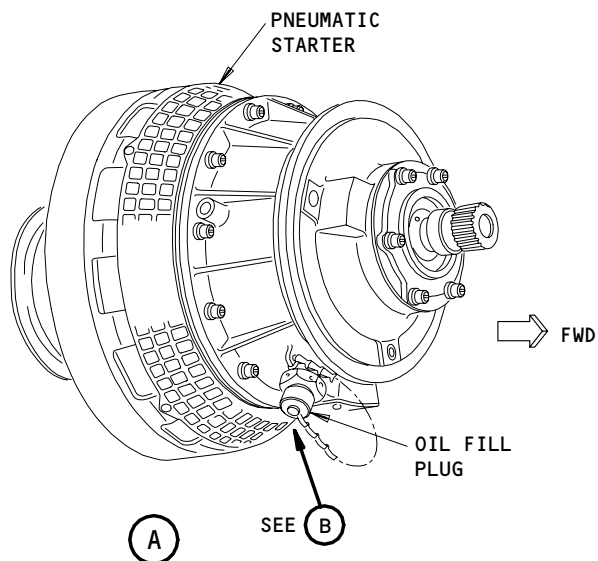
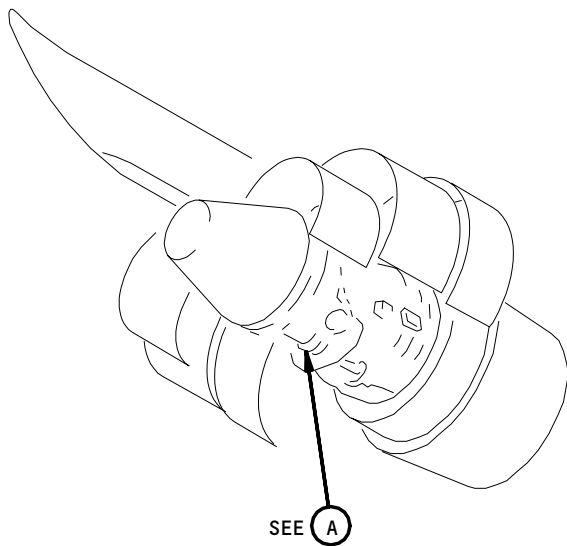
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Pneumatic Starter Inspection
Figure 601

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S 016-002-N00

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

S 016-004-N00

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

S 016-005-N00

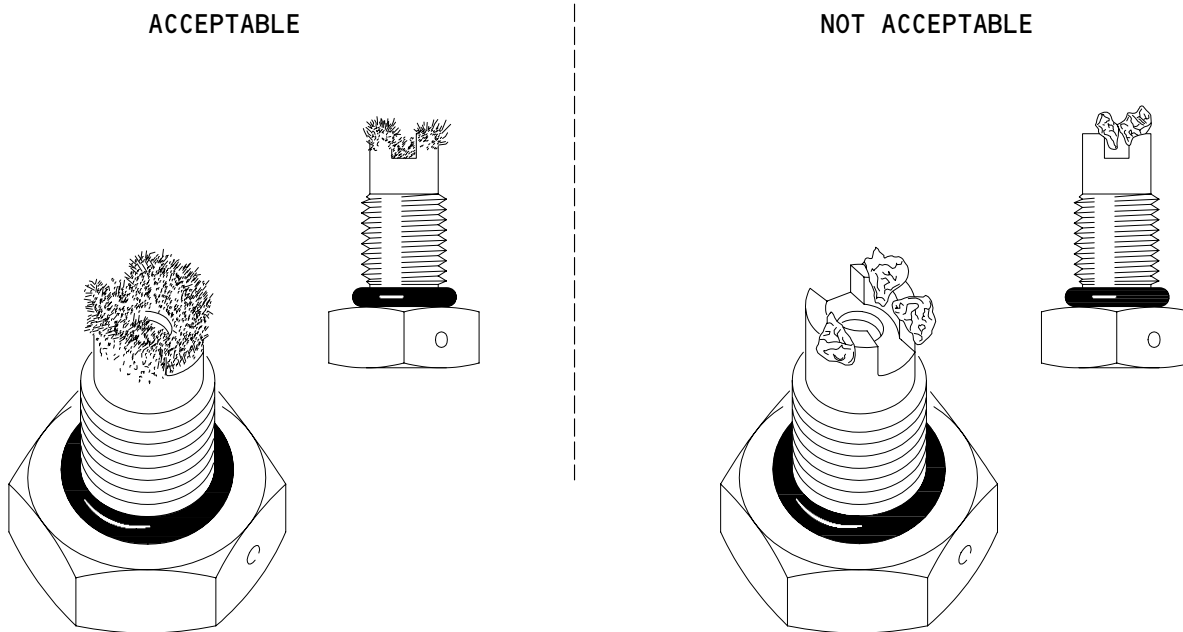
WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

E. Procedure

S 216-006-N00

- (1) Do the steps that follow to make an inspection of the magnetic chip detector:
(a) Remove the magnetic chip detector from the drain plug in the starter.



Magnetic Chip Detector Inspection
Figure 602

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- (b) Look for metal particles on the magnetic chip detector.
 - 1) Make sure no metal particle is larger than 0.1 inches (2.5 mm) in the largest dimension.

NOTE: The oil in the starter does not have to be drained to remove the magnetic chip detector. A spring loaded seal will close the opening when the magnetic chip detector is removed.

- a) If large particles are found, replace the starter (AMM 80-11-01/401).
- 2) Look for large metal parts such as pins, lockwire, or casting chips (Fig. 602).

NOTE: Small amounts of metal flakes or slivers indicate normal wear.

- a) If the unwanted material in the step before are found, replace the starter (AMM 80-11-01/401).

S 436-007-N00

- (2) Do the steps that follow to install the magnetic chip detector:
 - (a) Clean the magnetic chip detector.
 - (b) Install a new packing on the magnetic chip detector.
 - (c) Install the magnetic chip detector.
 - 1) Tighten the magnetic chip detector to 8-24 pound-inches (0.9-2.7 newton-meters).
 - 2) Install lockwire on the magnetic chip detector.

S 216-008-N00

- (3) Do the steps that follow to make an inspection of the starter for oil leakage:
 - (a) Replace the starter if oil leakage is found around the starter housing (AMM 80-11-01/401).
 - (b) If leakage is found around the oil drain plug, drain the oil and replace the packing on the oil drain plug (AMM 12-22-02/301).

NOTE: The torque value for the oil drain plug is 10-25 inch-pounds (1.1-2.8 newton-meters).

S 616-009-N00

- (4) If it is necessary, fill the starter with oil (AMM 12-13-02/301).

S 216-010-N00

- (5) Make sure the starter is installed correctly.

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S 416-011-N00

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

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

S 416-012-N00

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

S 416-014-N00

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

S 446-016-N00

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

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STARTER CONTROL VALVE – REMOVAL/INSTALLATION

1. General

- A. This procedure gives the steps to remove and install the starter control valve.
- B. The starter control valve is in the pneumatic duct line aft of the starter at the 5 o'clock position on the diffuser case.
- C. You can open the thrust reverser halves to get access to the starter control valve.

TASK 80-11-02-004-001-N00

2. Remove the Starter Control Valve

A. References

- (1) AMM 36-00-00/201, Pneumatic Power
- (2) AMM 71-11-04/201, Fan Cowl Panels
- (3) AMM 71-11-06/201, Core Cowl Panels
- (4) AMM 78-31-00/201, Thrust Reverser System

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (Left), Left Engine
- 414AR Fan Cowl Panel (Right), Left Engine
- 415AL Thrust Reverser (Left), Left Engine
- 416AR Thrust Reverser (Right), Left Engine
- 417AL Core Cowl Panel (Left), Left Engine
- 418AR Core Cowl Panel (Right), Left Engine
- 423AL Fan Cowl Panel (Left), Right Engine
- 424AR Fan Cowl Panel (Right), Right Engine
- 425AL Thrust Reverser (Left), Right Engine
- 426AR Thrust Reverser (Right), Right Engine
- 427AL Core Cowl Panel (Left), Right Engine
- 428AR Core Cowl Panel (Right), Right Engine

C. Prepare for the Removal of the Starter Control Valve (Fig. 401)

S 864-015-N00

- (1) Remove pneumatic power (AMM 36-00-00/201).

S 864-016-N00

- (2) For the left engine, open this circuit breaker on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
 - (a) 11D19, ENGINE START CONT LEFT

S 864-017-N00

- (3) For the right engine, open this circuit breaker on the overhead panel, P11, and attach a DO-NOT-CLOSE tag:
 - (a) 11D20, ENGINE START CONT RIGHT

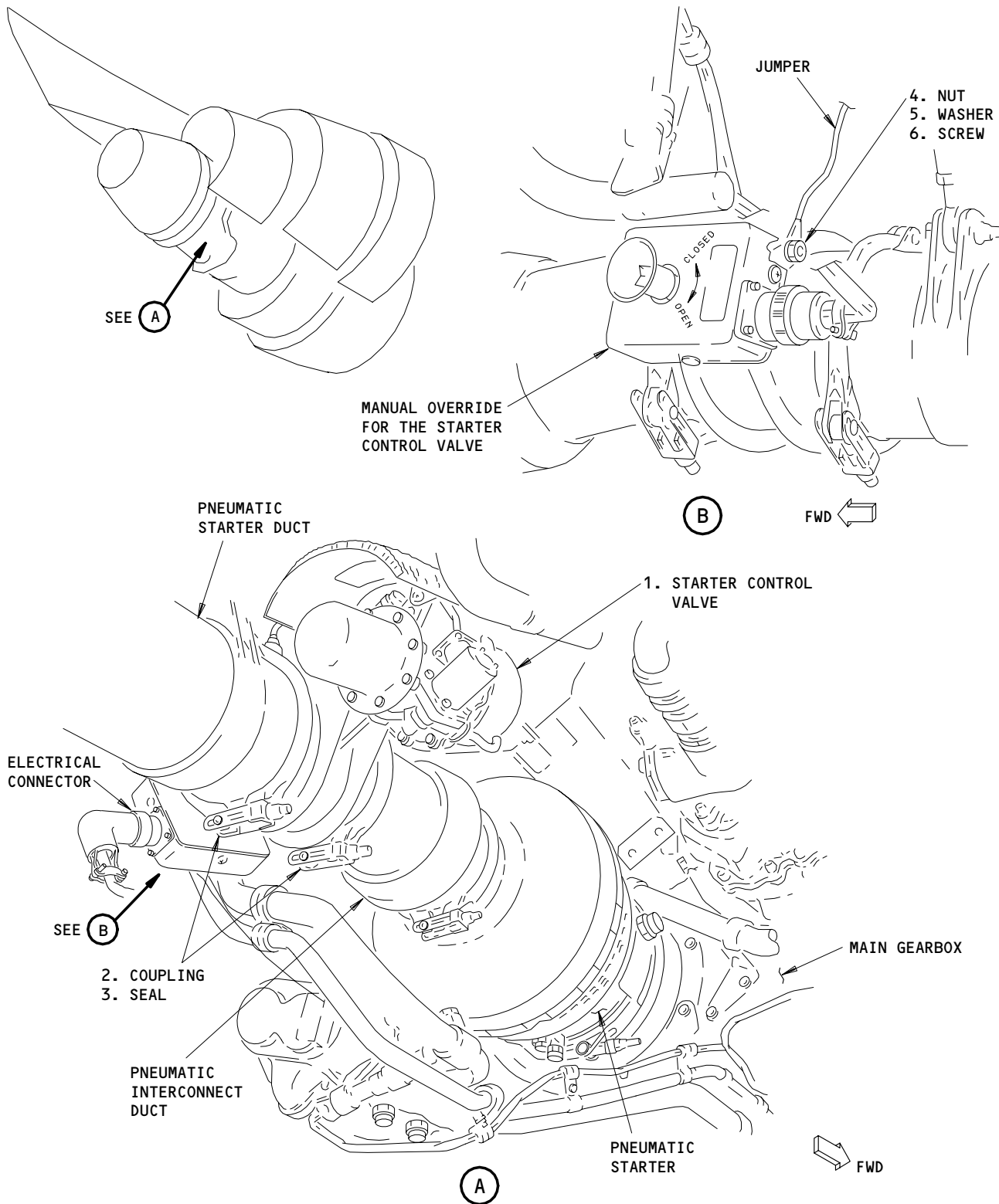
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Starter Control Valve Installation
Figure 401

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S 044-002-N00

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

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

S 014-003-N00

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

S 014-004-N00

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

S 014-005-N00

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

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

D. Procedure

S 024-007-N00

- (1) Remove the starter control valve:
- (a) Disconnect the electrical connector from the manual override for the starter control valve.
 - 1) Install protection caps on the electrical connector and the receptacle on the manual override for the starter control valve.
 - (b) Remove the nut (4), the washer (5) and the screw (6) that attach the jumper to the starter control valve (1).
 - (c) Hold the starter control valve (1) and remove the coupling V-band clamps (2) that attach the starter control valve (1) to the pneumatic ducts.
 - (d) Remove the starter control valve (1) with the seals (3).

TASK 80-11-02-404-020-N00

3. Install the Starter Control Valve (Fig. 401)

A. Parts

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AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Valve - Starter Control	80-11-01	10	57
				11	220
	3	Seal		13	220
				10	52
				11	210
				13	210

B. References

- (1) AMM 20-10-21/601, Electrical Bonding
- (2) AMM 36-00-00/201, Pneumatic Power
- (3) AMM 70-24-05/201, Electrical Harnesses
- (4) AMM 71-11-04/201, Fan Cowl Panels
- (5) AMM 71-11-06/201, Core Cowl Panels
- (6) AMM 78-31-00/201, Thrust Reverser System
- (7) AMM 80-11-00/501, Engine Starting System

C. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 413AL Fan Cowl Panel (Left), Left Engine
- 414AR Fan Cowl Panel (Right), Left Engine
- 415AL Thrust Reverser (Left), Left Engine
- 416AR Thrust Reverser (Right), Left Engine
- 417AL Core Cowl Panel (Left), Left Engine
- 418AR Core Cowl Panel (Right), Left Engine
- 423AL Fan Cowl Panel (Left), Right Engine
- 424AR Fan Cowl Panel (Right), Right Engine
- 425AL Thrust Reverser (Left), Right Engine
- 426AR Thrust Reverser (Right), Right Engine
- 427AL Core Cowl Panel (Left), Right Engine
- 428AR Core Cowl Panel (Right), Right Engine

D. Procedure

S 424-018-N00

- (1) Install the starter control valve.
 - (a) Clean the mating (bonding) flanges between the pneumatic interconnect duct and the starter control valve (1).
 - (b) Hold the seals (3) in position against the flanges of the starter control valve (1).

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- (c) Install the starter control valve (1) with the seals (3) between the pneumatic ducts.

NOTE: Make sure you align the index pin on the starter control valve (1) with the index hole in the pneumatic interconnect duct. This is necessary for access to the manual override of the starter control valve (1) through the access hole in the core cowl panel.

Also make sure that access to the manual override is clear of obstructions (such as the cooling tube).

- (d) Install the two coupling V-band clamps (2) which attach the starter control valve (1) to the pneumatic ducts.
 - 1) Tighten the nuts to 100-115 pound-inches (11.3-13.0 newton-meters).
- (e) Clean the bonding surfaces of the jumper and the starter control valve (1).
- (f) Connect the jumper to the starter control valve (1) with the screw (6), the washer (5) and the nut (4).
- (g) Do a check of the bonding resistance between the starter control valve (1) and the jumper bracket on the flange (AMM 20-10-21/601).
 - 1) The bonding resistance must not be more than 0.005 ohms.
- (h) Remove the protection caps from the electrical connector and the receptacle on the manual override for the starter control valve.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE, AND TOOLS, FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

- (i) Connect the electrical connector to the receptacle on the manual override for the starter control valve (AMM 70-24-05/201).
 - 1) Safety the electrical connector with lockwire.

E. Return the Aircraft to Its Usual Condition.

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S 414-008-N00

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

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

S 414-009-N00

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

S 414-010-N00

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

S 444-011-N00

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

S 864-014-N00

(5) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker in the P11 overhead panel:
(a) 11D19, ENGINE START CONT LEFT

S 864-013-N00

(6) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
(a) 11D20, ENGINE START CONT RIGHT

S 714-012-N00

(7) Do the Test of the Engine Starter System (Motoring) (AMM 80-11-00/501).

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STARTER QAD ADAPTER – REMOVAL/INSTALLATION

1. General

- A. This procedure gives the tasks for the removal and installation of the Quick Attach-Detach (QAD) adapter for the starter.
- B. The QAD adapter is between the starter and the main gearbox.
- C. You can open the thrust reverser halves and remove the starter to get access to the QAD adapter.

TASK 80-11-03-004-001-N00

2. Remove the Starter QAD Adapter

A. General

- (1) This procedure gives the steps for the removal of the QAD Adapter.

B. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
- (2) AMM 71-11-06/201, Core Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 80-11-01/401, Pneumatic Starter

C. Access

- (1) Location Zones
 - 411 No. 1 Engine
 - 421 No. 2 Engine

D. Prepare for the Removal of the Starter QAD Adapter (Fig. 401)

S 864-010-N00

- (1) For the left engine, open this circuit breaker on the overhead panel P11 and attach a D0-NOT-CLOSE tag:
 - (a) 11D19, ENGINE START CONT LEFT

S 864-011-N00

- (2) For the right engine, open this circuit breaker on the overhead panel P11 and attach a D0-NOT-CLOSE tag:
 - (a) 11D20, ENGINE START CONT RIGHT

S 044-002-N00

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

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

S 014-003-N00

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

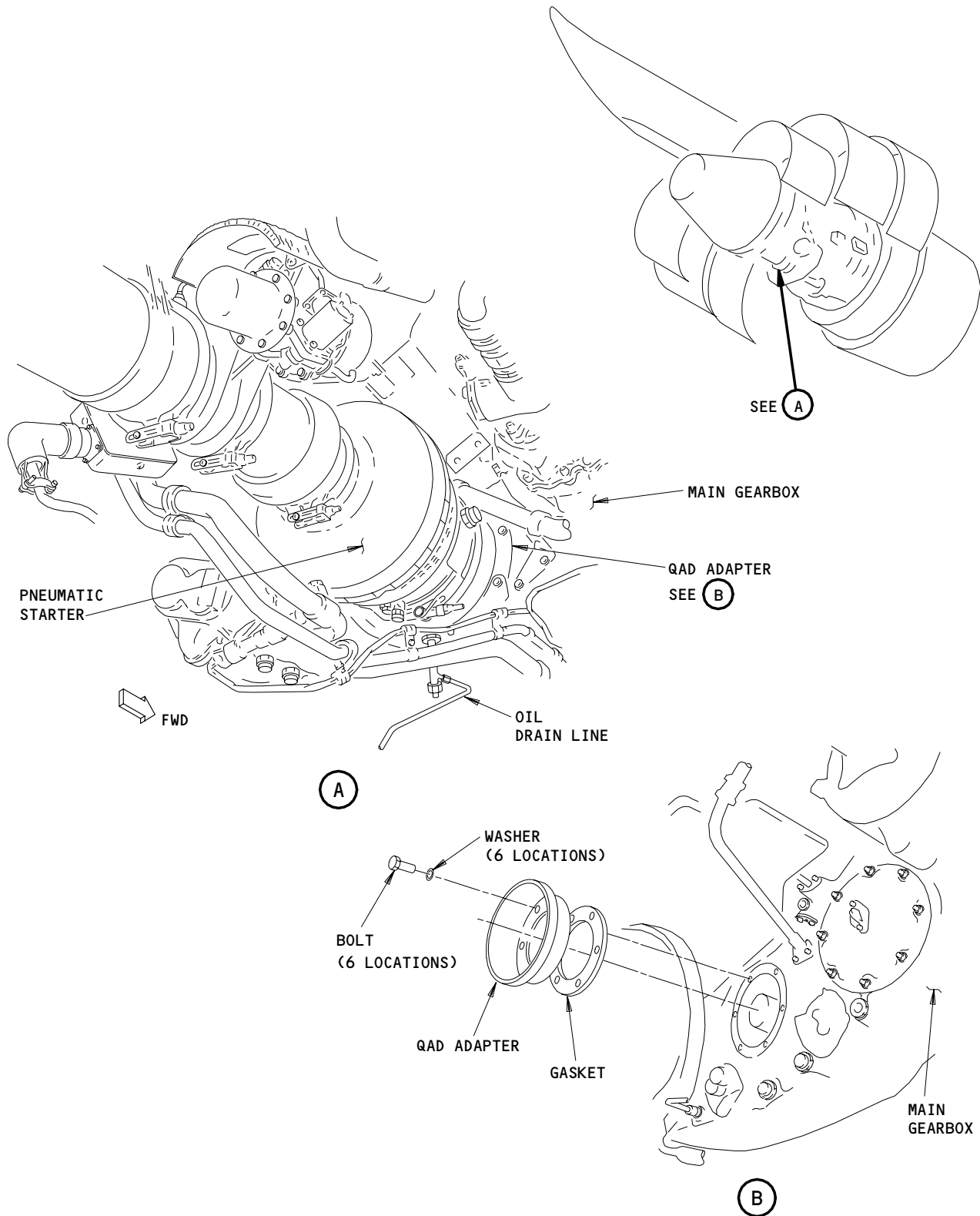
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Starter QAD Adapter Installation
Figure 401

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- S 014-004-N00
(5) Open the core cowl panels (AMM 71-11-06/201).

S 014-005-N00

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

- (6) Remove the pneumatic starter (AMM 80-11-01/401).

S 014-007-N00

- (7) Disconnect the oil drain line.

S 024-019-N00

- (8) Remove the bolts and the washers that attach the QAD adapter to the main gearbox.

S 024-020-N00

- (9) Remove the QAD adapter from the main gearbox pad.

S 024-021-N00

- (10) Remove and discard the gasket from the gearbox pad.

TASK 80-11-03-404-008-N00

3. Install the Starter QAD Adapter

A. General

- (1) This procedure gives the steps for the installation of the starter QAD adapter.

B. Consumable Materials

- (1) B00624 Compound - Anti-seize, General Purpose, Armitex
(2) D00368 Grease - Dow Corning No. 4 Silicone

C. References

- (1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System
(4) AMM 80-11-01/401, Pneumatic Starter

D. Access

- (1) Location Zones
411 No. 1 Engine
421 No. 2 Engine

E. Install the Starter QAD Adapter (Fig. 401).

S 424-012-N00

- (1) Do the steps that follow to install the starter QAD adapter.

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CAUTION: MAKE SURE THAT THE INDEX HOLE IN THE GEARBOX HAS NO UNWANTED GASKET MATERIAL. UNWANTED GASKET MATERIAL CAN CAUSE A BAD SEAL.

- (a) Make a mark on the new gasket in the location of the index pin for the starter QAD.
 - 1) Make a hole in the new gasket.
- (b) Apply a layer of grease to the mating surfaces of the main gearbox and the starter QAD adapter.
- (c) Install the new gasket on the main gearbox pad.
- (d) With the index pin correctly aligned with the index hole in the main gearbox, install the starter QAD adapter.
- (e) Lubricate the threads of the bolts with the antiseize compound.
- (f) Attach the starter QAD adapter with the bolts and washers.

NOTE: The threads on the bolts must be sufficiently clean to make sure there is an electrical bond between the mating flanges.

- (g) Torque the bolts to 260–320 pound-inches (29.4–36.2 newton-meters).
- (h) Connect the oil drain line to the drain fitting on the starter QAD adapter.

S 414-009-N00

- (2) Install the pneumatic starter (AMM 80-11-01/401).
- F. Put the Airplane Back to its Usual Condition.

S 414-013-N00

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

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

S 414-014-N00

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

S 414-015-N00

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

S 444-016-N00

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

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S 864-017-N00

- (5) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
(a) 11D19, ENGINE START CONT LEFT

S 864-018-N00

- (6) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 overhead panel:
(a) 11D20, ENGINE START CONT RIGHT

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STARTER CONTROL VALVE FILTER – MAINTENANCE PRACTICES

1. General

A. This procedure gives the instructions to remove, clean and install the filter for the starter control valve. The filter for the starter control valve will be referred to as the filter for this procedure.

NOTE: A dirty or blocked filter can cause the starter control valve to operate too slowly or to fully stop.

B. The filter is found in a mounting boss on the flow section of the starter control valve.

C. You can open the core cowl panels to get access to the filters.

TASK 80-11-04-002-027-N00

2. Remove the Starter Control Valve Filter

A. References

- (1) AMM 36-00-00/201, Pneumatic Power
- (2) AMM 71-11-06/201, Core Cowl Panels
- (3) AMM 78-31-00/201, Thrust Reverser System
- (4) AMM 80-11-02/401, Starter Control Valve

B. Access

(1) Location Zones

- 411 Left Engine
- 421 Right Engine

(2) Access Panels

- 417AL Core Cowl (Left), Left Engine
- 418AR Core Cowl (Right), Left Engine
- 427AL Core Cowl (Left), Right Engine
- 428AR Core Cowl (Right), Right Engine

C. Prepare for the Removal of the Filter.

S 862-029-N00

- (1) Remove pneumatic power (AMM 36-00-00/201).

S 862-004-N00

- (2) Open this circuit breaker on the overhead panel, P11, and attach the DO-NOT-CLOSE tag:
 - (a) 11D19, ENGINE START CONT LEFT

S 862-005-N00

- (3) Open this circuit breaker on the overhead panel, P11, and attach the DO-NOT-CLOSE tag:
 - (a) 11D20, ENGINE START CONT RIGHT

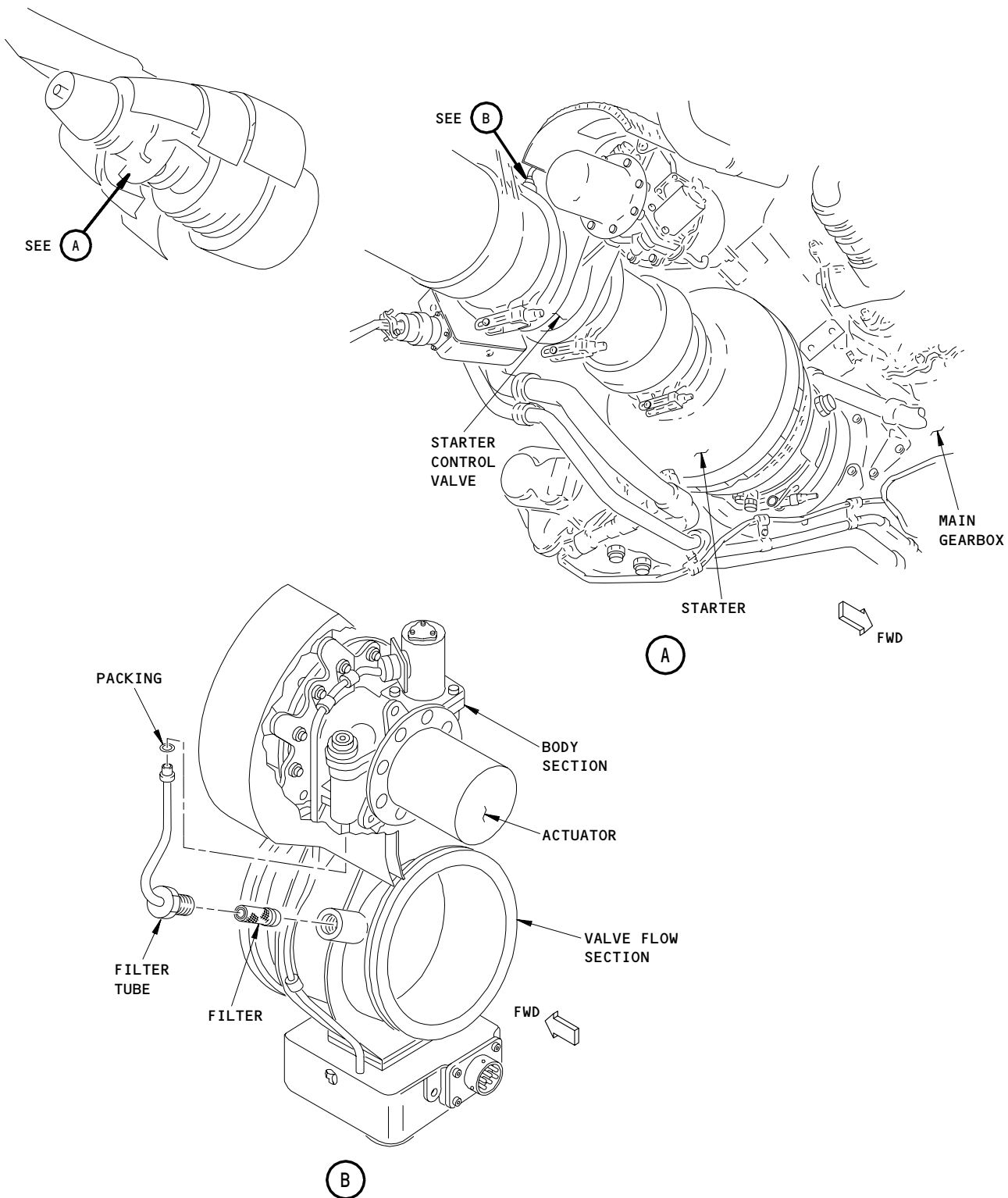
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Starter Control Valve Filter Installation
Figure 201

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S 042-026-N00

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

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

S 012-002-N00

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

D. Procedure

S 022-030-N00

- (1) Remove the filter (Fig. 201).
 - (a) Remove the starter control valve (AMM 80-11-02/401).
 - (b) Do the steps that follow to remove the filter:
 - 1) Remove the filter tube from the body section and from the valve flow section.
 - a) Discard the packing.
 - 2) Remove the filter from the boss on the valve flow section.
 - 3) If the filter is dirty, clean the filter.

TASK 80-11-04-402-024-N00

3. Install the Starter Control Valve Filter

A. Consumable Materials

- (1) D00111 Lubricant - Dry Film, MIL-L-23398

B. References

- (1) AMM 71-11-06/201, Core Cowl Panels
- (2) AMM 78-31-00/201, Thrust Reverser System
- (3) AMM 80-11-02/401, Starter Control Valve

C. Access

- (1) Location Zones
 - 411 Left Engine
 - 421 Right Engine

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(2) Access Panels

- 417AL Core Cowl (Left), Left Engine
- 418AR Core Cowl (Right), Left Engine
- 427AL Core Cowl (Left), Right Engine
- 428AR Core Cowl (Right), Right Engine

D. Procedure

S 422-031-N00

- (1) Install the filter.
 - (a) Do the steps that follow to install the filter:
 - 1) Install the filter in the boss on the valve flow section.
 - 2) Install the new packing, with lubricant, on the filter tube.
 - 3) Install the filter tube in the valve flow section and the body section.
 - (b) Install the starter control valve (AMM 80-11-02/401).

E. Return the Aircraft to Its Usual Condition.

S 412-015-N00

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

S 442-016-N00

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

S 862-017-N00

- (3) For the left engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
 - (a) 11D19, ENGINE START CONT LEFT

S 862-018-N00

- (4) For the right engine, remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
 - (a) 11D20, ENGINE START CONT RIGHT

TASK 80-11-04-102-025-N00

4. Clean the Starter Control Valve Filter

A. Consumable Materials

- (1) B00074 Solvent - Degreasing MIL-PRF-680 (Supersedes P-D-680)

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B. Procedure

S 112-033-N00

- (1) Clean the starter control-valve filter (Fig. 201):
(a) Remove the starter control-valve filter.

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

CAUTION: MAKE SURE YOU USE THE CORRECT PROCESS TO CLEAN THE PARTS. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE COMPONENT PARTS.

- (b) Clean the filter with the solvent.

WARNING: USE GOGGLES WHEN YOU USE COMPRESSED AIR. PARTICLES WHICH ARE BLOWN BY THE COMPRESSED AIR CAN CAUSE INJURY.

CAUTION: BE CAREFUL WHEN YOU USE COMPRESSED AIR TO CLEAN THE MESH OF THE FILTER SCREEN. COMPRESSED AIR CAN CAUSE DAMAGE TO THE MESH OF THE FILTER SCREEN.

- (c) Use filtered compressed air at not more than 30 psig to make the filter dry.
(d) Make sure there is no unwanted material in the filter.
1) If you find unwanted material in the filter, clean the filter again.
(e) Install the starter control valve filter.

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ENGINE IGNITION AND STARTING PANEL – REMOVAL/INSTALLATION

1. General

- A. This procedure has two tasks:
 - (1) The removal of the engine ignition and starting panel.
 - (2) The installation of the engine ignition and starting panel.
- B. Each airplane has one engine ignition and starting panel located on pilots' overhead panel P5. It has the following controls:
 - (1) Two engine start switches.
 - (2) One ignition select switch.
 - (3) Two starter control VALVE disagreement lights.
 - (4) One RAM AIR TURB deployment switch.

TASK 80-11-05-004-001-N00

2. Engine Ignition and Starting Panel Assembly Removal (Fig. 401)

- A. Access
 - (1) Location Zone
212 Flight Compartment
- B. Procedure

S 864-002-N00

- (1) Open these circuit breakers and attach DO-NOT-CLOSE tags:
 - (a) On the overhead circuit breaker panel P11:
 - 1) 11D7, STBY IGN 1
 - 2) 11D8, STBY IGN 2
 - 3) 11D19, ENGINE START CONT L
 - 4) 11D20, ENGINE START CONT R
 - 5) 11M1, ENGINES IGNITION 1 L
 - 6) 11M2, ENGINES IGNITION 1 R
 - 7) 11M9, LEFT ENGINE BUS PWR SENSE
 - 8) 11M28, ENGINES IGNITION 2 L
 - 9) 11M29, ENGINES IGNITION 2 R
 - 10) 11M36, RIGHT ENGINE BUS PWR SENSE
 - (b) On the main power distribution panel P6:
 - 1) 6C1, RAM AIR TURB MAN
 - 2) 6C2, RAM AIR TURB AUTO

S 024-003-N00

- (2) Remove the engine ignition and starting panel.
 - (a) Loosen the screws that hold the engine ignition and starting panel to the pilots' overhead panel.
 - (b) Carefully move the engine ignition and starting panel out of the pilots' overhead panel.
 - (c) Disconnect the four electrical connectors from the rear of the engine ignition and starting panel.

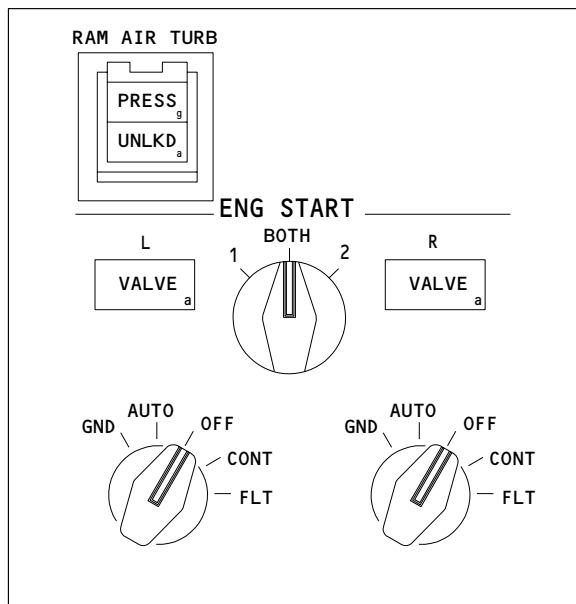
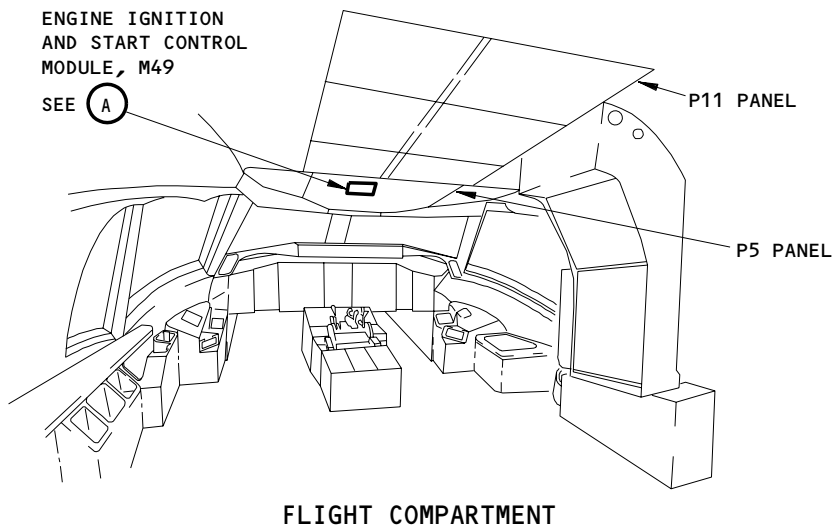
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ENGINE IGNITION AND START CONTROL MODULE, M49

(A)

Engine Ignition and Start Control Installation
Figure 401

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- (d) Remove the engine ignition and starting panel from the pilots' overhead panel.

TASK 80-11-05-404-004-N00

3. Engine Ignition and Starting Panel Installation (Fig. 401)

A. References

- (1) AMM 29-21-00/201, Ram Air Turbine (RAT) System
- (2) AMM 74-00-00/501, Ignition - General

B. Access

- (1) Location Zone
 - (a) 212 Flight Compartment

C. Procedure

S 424-005-N00

- (1) Install the engine ignition and starting panel.
 - (a) Put the engine ignition and starting panel near the pilots' overhead panel.
 - (b) Connect the four electrical connectors at the rear of the engine ignition and starting panel.
 - (c) Install the engine ignition and starting panel in the pilots' overhead panel.
 - (d) Tighten the screws that hold the engine ignition and starting panel to the pilots' overhead panel.
 - (e) Make sure the RAM AIR TURB switch is in the released position (not latched in).

S 914-008-N00

- (2) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
 - (a) On the overhead circuit breaker panel P11:
 - 1) 11D7, STBY IGN 1
 - 2) 11D8, STBY IGN 2
 - 3) 11D19, ENGINE START CONT L
 - 4) 11D20, ENGINE START CONT R
 - 5) 11M1, ENGINES IGNITION 1 L
 - 6) 11M2, ENGINES IGNITION 1 R
 - 7) 11M9, LEFT ENGINE BUS PWR SENSE
 - 8) 11M28, ENGINES IGNITION 2 L
 - 9) 11M29, ENGINES IGNITION 2 R
 - 10) 11M36, RIGHT ENGINE BUS PWR SENSE
 - (b) On the main power distribution panel P6:
 - 1) 6C1, RAM AIR TURB MAN
 - 2) 6C2, RAM AIR TURB AUTO

D. Engine Ignition and Starting Panel Installation Test

S 864-006-N00

- (1) Extend and retract the Ram Air Turbine (RAT) (AMM 29-21-00/201).

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S 714-007-N00

- (2) Do the Audible Check for the ignition system (AMM 74-00-00/501).

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ENGINE IGNITION CONTROL/FUEL JETTISON MODULE – REMOVAL/INSTALLATION

1. General

A. This procedure has two tasks:

- (1) Engine ignition control/fuel jettison module removal.
- (2) Engine ignition control/fuel jettison module installation.

TASK 80-11-06-004-001-N00

2. Engine Ignition Control/Fuel Jettison Module Removal (Fig. 401)

A. Access

(1) Location Zone

- 211 Control Cabin – Section 41 (Left)
- 212 Control Cabin – Section 41 (Right)

B. References

- (1) AMM 24-22-00/201, Electrical Power Control
- (2) AMM 28-31-08/401, Fuel Jettison Control Module
- (3) AMM 28-31-00/501, Fuel Jettison System

C. Procedure

S 864-002-N00

(1) Open these circuit breakers and attach DO-NOT-CLOSE tags.

(a) On the overhead circuit breaker panel P11:

- 1) 11M13, LEFT FUEL JETT CONT
- 2) 11M22, RIGHT FUEL JETT CONT
- 3) 11M14, LEFT JETT NOZZLE VALVE
- 4) 11M23, RIGHT JETT NOZZLE VALVE

S 014-009-N00

(2) Loosen the screws that hold the fuel jettison module, M1733.

S 014-010-N00

(3) Move the module until you can get to the electrical connectors.

S 024-011-N00

(4) Support the module and disconnect the electrical connectors.

(a) Attach identification tags to all electrical connectors.

S 024-012-N00

(5) Remove the engine ignition control/fuel jettison module, M1733.

TASK 80-11-06-404-004-N00

3. Engine Ignition Control/Fuel Jettison Module Installation (Fig. 401)

A. Access

(1) Location Zone

- 211 Control Cabin – Section 41 (Left)
- 212 Control Cabin – Section 41 (Right)

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B. References

- (1) AMM 24-22-00/201, Electrical Power Control
- (2) AMM 28-31-08/401, Fuel Jettison Control Module
- (3) AMM 28-31-00/501, Fuel Jettison System
- (4) AMM 80-11-00/501, Engine Start System Operational Test
- (5) AMM 74-00-00/501, Ignition System
- (6) AMM 71-00-00/201, Engine Start (Normal Operation - Air from an APU or Ground Cart)

C. Procedure

S 424-005-N00

- (1) Support the Engine Ignition Control/Fuel Jettison Module, M1733.
 - (a) Connect the electrical connectors.

S 424-013-N00

- (2) Attach the module with the screws to hold the fuel jettison module, M1733.

S 864-014-N00

- (3) Remove the safety tags and close these circuit breakers.
 - (a) On the overhead circuit breaker panel P11:
 - 1) 11M13, LEFT FUEL JETT CONT
 - 2) 11M22, RIGHT FUEL JETT CONT
 - 3) 11M14, LEFT JETT NOZZLE VALVE
 - 4) 11M23, RIGHT JETT NOZZLE VALVE

S 734-015-N00

- (4) Do these Fuel Jettison System test (AMM 28-31-00/501).
 - (a) Do the fuel jettison pressure switch operational test.
 - (b) Do the fuel jettison transfer valve for the ground test.
 - (c) Do the fuel jettison nozzle valve operational test.
 - (d) Do the fuel override/jettison pumps operational test.

S 714-016-N00

- (5) Do the operational test for engine start system (AMM 80-11-00/501).

S 864-017-N00

- (6) Do the system (Audible) test for the ignition system (AMM 74-00-00/501).

S 864-018-N00

- (7) Do the start the engine (Normal Operation - Air from an APU or Ground Card) (AMM 71-00-00/201).

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