CHAPTER

80

STARTING

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 80
STARTING

A = Added, R = Revised, D = Deleted, O = Overflow, C = Customer Originated Change

80-EFFECTIVE PAGES

CHAPTER 80
STARTING

GENERAL - DESCRIPTION AND OPERATION

1. General

A. The starting system utilizes conventional-type air turbine starters to start the engines. The system is integrated with the ignition system and engine bleed air ducting, which serves the environmental control system. Engine starting torque is provided by the cranking portion of the starting system.

2. Cranking

A. The cranking portion of the starting system converts pneumatic energy into shaft torque to accelerate the engine to starting speed. Provisions are incorporated to control pneumatic flow to the starter, actuate the starter shutoff valve, indicate shutoff valve position, and terminate the starting cycle. Components utilized during cranking operations of the engine include the engine start switch, starter shutoff valve, and pneumatic starter (Figure 1). For a complete description and operation of cranking (PAGEBLOCK 80-10-00/101).

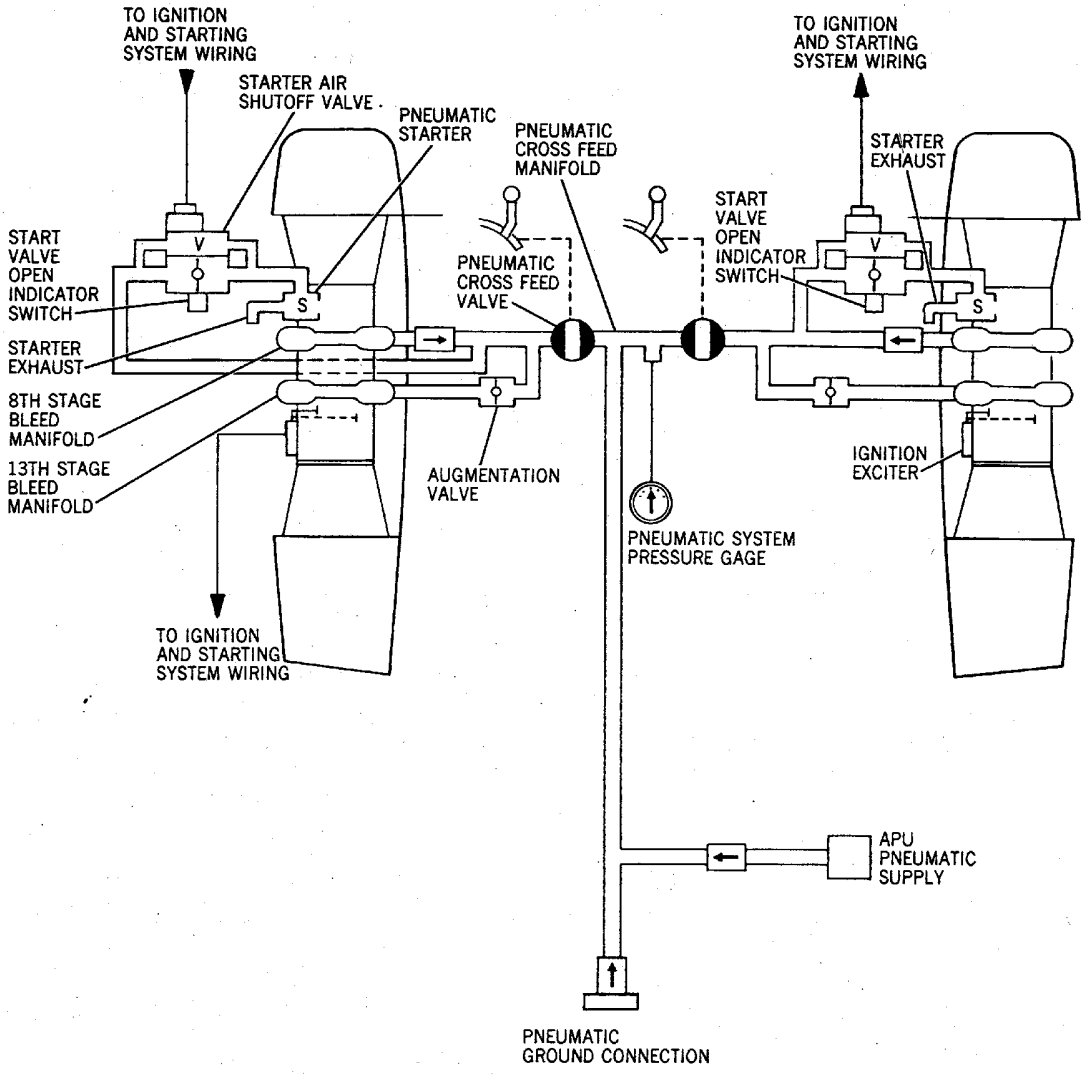
B. Electrical power for cranking operations is provided by the 28-vdc transfer bus.

C. Pneumatic power for cranking operations can be obtained from the following sources:

(1) Onboard auxiliary power unit (APU). For a complete description and operation of the APU. (SUBJECT 49-00-00)

(2) Cross-bleeding from operating engine.

(3) External pneumatic supply connected to fuselage ground pneumatic connector.



Starting System - Schematic
Figure 1/80-00-00-990-801

1. General Maintenance Features

A. Maintenance Interphone System

(1) The maintenance interphone system provides a means of communication between the flight compartment and maintenance personnel working in the other areas of the aircraft. A maintenance interphone switch, located on the overhead switch panel, is utilized to actuate the system.

(2) Two interphone jacks are accessible to personnel working in the engine areas; one each on the left and right side of fuselage adjacent to the engines.

B. Engine Accessibility

(1) Accessibility is provided to all systems and components within the engine installation and nacelle. Engine cowl doors provide access to all parts of the engine and accessories that require check, maintenance, or servicing. (SUBJECT 71-00-00)

C. Component Interchangeability

(1) Identical accessories are installed on all engines.

2. Safety and Operating Procedures

A. Circuit Breakers

WARNING: MAKE CERTAIN APPLICABLE CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR THRUST REVERSER OPERATION COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

(1) All circuit breakers opened during maintenance should be tagged to prevent inadvertent operation of affected system.

B. High Voltage System and Components

(1) Prior to performing maintenance on high voltage system or components, make certain power to system or component has been shut off and all affected circuit breakers are open and tagged.

C. Application of External Power

WARNING: INADVERTENT OPERATION OF AN AIRCRAFT SYSTEM COULD RESULT IN SERIOUS INJURY TO PERSONNEL.

WARNING: BEFORE ACTIVATING ANY FUEL, ELECTRICAL, HYDRAULIC, OR PNEUMATIC SYSTEM FOR MAINTENANCE PURPOSES, MAKE CERTAIN THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF AIRCRAFT.

D. Throttle/Thrust Reverser Lever

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR OF THRUST REVERSER. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(1) Make certain that thrust reverser control valve is in dump position and lockpin is installed. Tag throttle/thrust reverser lever.

E. Cleanup and Cleaning Solvents

WARNING: CLEANING OPERATIONS USING SOLVENTS SHOULD BE PER-FORMED IN A WELL VENTILATED AREA. EXERCISE NORMAL SAFETY PRECAUTIONS DURING USE.

(1) Spilled oil, fuel, or hydrualic fluid should be cleaned up immediately to prevent damage to wiring or other components and to prevent raise leak reports.

F. Engine Cowling Wind Restrictions

CAUTION: COWL DOORS, ALL ENGINE LOCATIONS, IN OPEN POSITION SUPPORTED BY HOLD-OPEN RODS WILL SAFELY WITHSTAND GROUND WINDS UP TO 30 KNOTS.

G. Cowl Doors

WARNING: EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

CAUTION: TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

CAUTION: OPEN UPPER COWL DOOR ONLY AS MUCH AS NECESSARY TO ALLOW HOLD-OPEN RODS TO BE CONNECTED TO ENGINE. OPENING DOOR TOO FAR MAY CAUSE DAMAGE TO PYLON HINGE POINTS.

CAUTION: MAKE CERTAIN RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU, OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

H. Open Pneumatic Ducts

(1) Cap all pneumatic ducts opened for maintenance purposes to prevent damage to ducts and contamination from entering system.

I. Pneumatic Starter

CAUTION: INTERMIXING OF DIFFERENT BRANDS OR TYPES OF OILS MUST BE AVOIDED. IN EVENT OF INADVERTENT MIXING OF APPROVED OILS, STARTER OIL SYSTEM SHOULD BE DRAINED, FLUSHED, AND FILLED WITH OIL NORMALLY USED AT EARLIEST OPPORTUNITY. NOTE TYPE OILS INTERMIXED TO DETERMINE POSSIBLE AFFECTS ON SEALS.

(1) All new or overhauled pneumatic starters that have been preserved for shipment or storage, must be depreserved and filled with approved oil before they are operated. Depreserving may be accomplished before the starter is installed on the engine.

3. General Maintenance Practices

A. Engine Access

(1) For procedures to gain access to engine, refer to PAGEBLOCK 71-10-03/201 Config 1.

B. External Electrical Power

(1) For procedures to connect external electrical power to aircraft, refer to PAGEBLOCK 24-40-00/001.

C. Engine Motoring

CAUTION: FUEL PUMP AND MAIN ENGINE CONTROL ARE FUEL-LUBRICATED. DO NOT MOTOR ENGINE UNLESS POSITIVE FUEL INLET PRESSURE IS INDICATED.

(1) For engine motoring procedures, refer to SUBJECT 71-00-00.

D. Remove/Replace Electrical Connectors

CAUTION: TO PREVENT DAMAGE TO ELECTRICAL CONNECTOR, DO NOT USE ANY TOOL OTHER THAN PLUG PLIERS TO DISCONNECT OR CONNECT PLUG. WHEN CONNECTING PLUG, DO NOT OVERTIGHTEN.

(1) When electrical connectors are disconnected, caps or other protective materials should be used to prevent entry of oil, fuel, hydrualic fluid, moisture, and other foreign material.

E. Maintenance Area

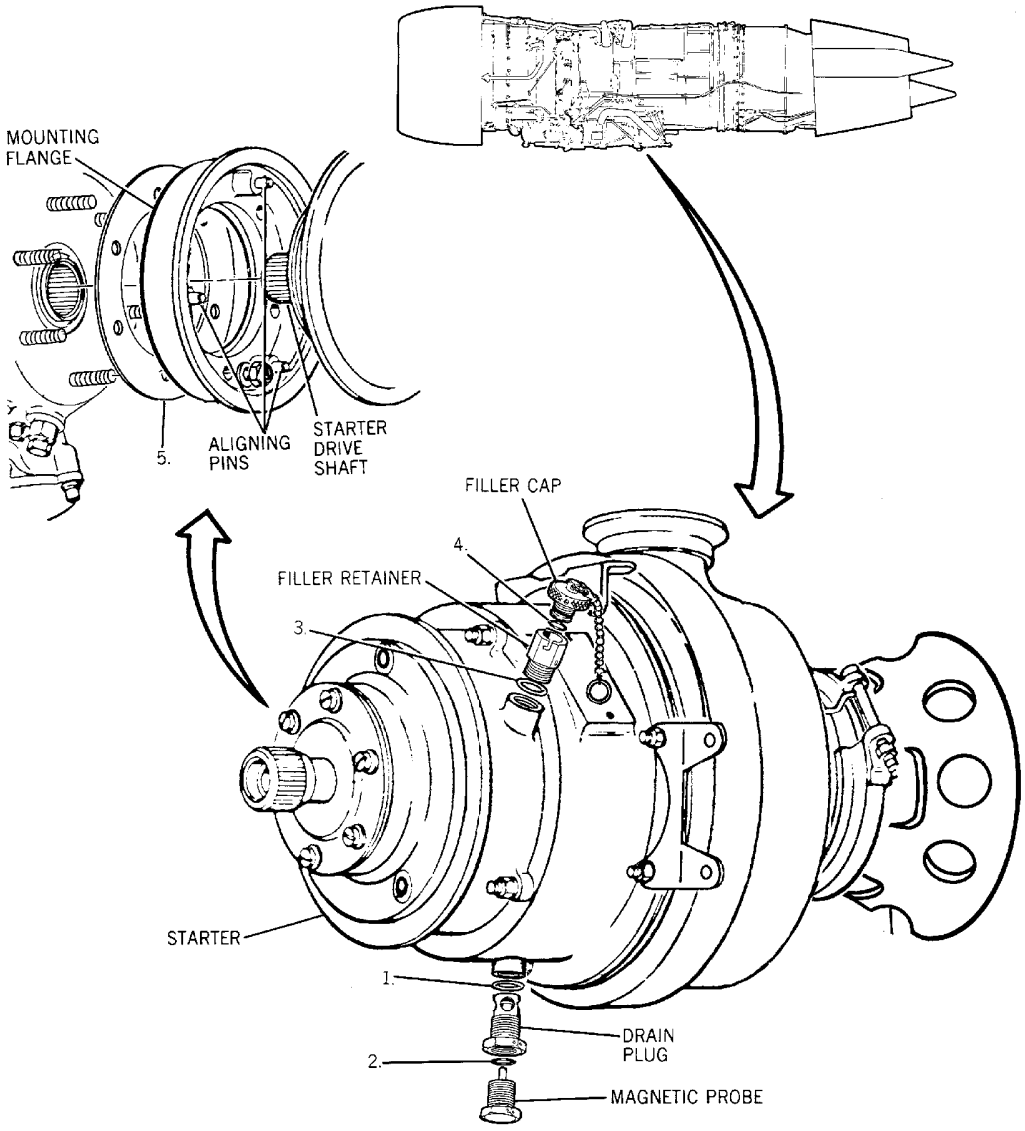
CAUTION: REMOVE ALL TOOLS, EQUIPMENT, LOOSE HARDWARE, DEBRIS, AND FOREIGN MATERIAL FROM MAINTENANCE AREA.

F. Seals, O-rings, and Gaskets

(1) Seals, O-rings, and gaskets are identified and shown in Figure 201.

G. Used O-rings

(1) Discard all used O-rings.



CODE:

1. MS35769-9 GASKET
2. S9413-008 PACKING (POST S.B. 80-1283 AIRESEARCH) MS9388-008
   S9413-552 PACKING (PRE S.B. 80-1283 AIRESEARCH) MS9388-008
3. MS35769-9 GASKET
4. S9413-012 PACKING (AIRESEARCH) MS9388-012
5. AN4047-1 GASKET

BBB2-80-11A

Seals, O-Rings, and Gaskets
Figure 201/80-00-00-990-804

CRANKING - DESCRIPTION AND OPERATION

1. General

A. The cranking portion of the engine starting system converts energy of high temperature compressed air into starting torque sufficient to accelerate the engine to starting and self-sustaining speed within the required time. Components utilized during cranking operations include the engine start switch, starter air shutoff valve, and pneumatic starter (Figure 1).

B. Pneumatic power for cranking operations is provided by the onboard APU, cross-bleeding from an operating engine, or an external power source.

C. The control and indicating system comprises the cranking portion of the engine starting system.

2. Control and Indicating

A. Description

(1) The control and indicating system provides means to actuate the starter air shutoff valve, control pneumatic supply to the starter, indicate position of starter shutoff valve, and terminate the starting cycle. The system consists of the engine start switch, starter air shutoff valve, pneumatic starter, and indicating light.

(2) Engine Start Switch - The engine start switch, located on the forward overhead panel in the flight compartment, controls the operation of the starter air shutoff valve. The switch is a toggle-type switch, and is actuated when placed and held in the ON position. The switch operates in con-junction with the ignition system controls. Power to the switch is provided by the DC TRANSFER BUS. For a complete description and operation of the ignition system (SUBJECT 74-00-00).

(3) Starter Air Shutoff Valve - The valve is a diaphragm-actuated, butterfly-type, pneumatic valve and is electrically controlled and pneumatically operated. The valve functions to control the flow of pneumatic energy to the starter. The valve consists of a valve body housing with an integral, butterfly-type closure element and appropriate inline end flanges for direct mounting; a diaphragm-type pneumatic actuator, mechanically coupled through a lever arm to the butterfly shaft; a solenoid-operated, single-ball selector valve with manual override button for control of valve position in the event of inoperative solenoid valve; a rate-control orifice which provides a controlled opening time; a stainless steel wire mesh filter; and a mechanical pointer for visual indication of valve position. The upper end of the butterfly shaft is provided with wrenching flats to allow manual opening of the valve in the event of loss of actuator supply pressure (Figure 2).

(a) An electrical switch on the lower end of the butterfly shaft energizes the indicating light on the annunciator panel in the flight compartment when the butterfly valve is open.

(b) The solenoid-operated switcher valve controls the opening rate of the butterfly to limit maximum starter impact torque experienced during running engagements, such as restarts of an engine, windmilling in flight, or coast-down after shutdown on the ground.

(c) Access to the manual override button is through starter valve and manual override access door (7707C) for left engine or (7808C) for right engine, located on the forward lower cowl door or by opening forward lower cowl door.

WJE 875-879

(4) Remote Engine Starter Control Mechanism - A lever supported by a bracket attached to the starter air shutoff valve facilitates reset of a shutoff valve by depressing the manual override button.

WJE ALL

(5) Pneumatic Starter - The starter is a single-stage turbine consisting of the following major components: scroll, turbine wheel, reduction gear train, overrunning clutch, splined output shaft, and starter housing (Figure 3).

(a) The starter gears and bearings are lubricated by a self-contained oil system. Fill and drain ports are provided in the housing for servicing the oil system. The housing also incorporates a mounting flange to match the pad on the engine accessory drive case.

(b) The starter output shaft, which is splined to the engine gearbox, is lubricated by the engine oil system. The shaft incorporates a shear section to protect the engine in the event of starter malfunction or failure.

B. Operation

(1) When the engine start switch is placed and held in the ON position, 28 vdc power is supplied to the starter air shutoff valve solenoid (Figure 1).

(2) Actuation of the shutoff valve solenoid allows inlet air pressure to be ported to the open chamber of the valve actuator. Since the effective area of the open chamber is larger, relative to the close chamber, the actuator forces open the butterfly and keeps it open. As the butterfly moves away from the closed position, the valve position indicating switch closes and completes the indicating light circuit. This action causes the valve position indicating light on the annunciator panel to come on. Opening of the valve butterfly allows air to flow to the inlet of the starter.

(3) Air entering the starter inlet flows through the stator and is directed radially inward to propel the turbine wheel to high-speed rotation. Expended air is exhausted overboard through the exhaust duct.

(4) Initial reduction of the high rotational speed is accomplished as the pinion gear on the turbine wheel shaft drives the planetary gears in the reduction gear system. The planetary gears transmit the rotary motion to the spur gearshafts on which the gears are installed. The integral spur gears on the gearshafts in turn transmit motion to the ring gear, causing a further gear reduction and increase of torque.

(5) When rotating at low speeds, the pawl springs in the clutch system drive shaft force the drive shaft to engage with the ratchet jaw-teeth on the gear and hub-jaw. This action allows the gear and hub-jaw to transmit the rotational force to the engine gearbox through the drive and output shafts. The torque-speed relationship at the output shaft, when driving the engine through the gearbox, provides power to accelerate the engine to light-off speed and to assist the engine to self-sustaining speed. When engine lightoff and acceleration occur, the drive and output shafts rotate with the engine. The overspeed rotation causes the pawl to ratchet on the teeth of the slower rotating gear and hub-jaw. As the speed of the engine increases, the pawls function as flyweights and overcome the force of the pawl springs. This allows the pawls to be completely withdrawn from engagement with the ratchet jaw-teeth of the gear and hub-jaw and to disengage the starter from the engine.

(6) Releasing the engine start switch deenergizes the starter air shutoff valve solenoid. This action causes the shutoff valve to close and terminate the starting cycle. When the butterfly reaches the closed position, the valve position indicating switch opens and deenergizes the indicating light circuit. The indicating light goes off and remains off as long as the shutoff valve is in the closed position. The starting cycle can be terminated at any time by releasing the engine start switch.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891-893

CAUTION: DO NOT OPERATE THE STARTER SHUTOFF-VALVE MANUALLY WHEN THE SYSTEM IS NOT PRESSURIZED UNLESS SPECIFIED DIFFERENTLY. THIS WILL HELP PREVENT DAMAGE TO THE STARTER SHUTOFF-VALVE DIAPHRAGMS.

CAUTION: USE ONLY HAND PRESSURE TO DEPRESS OVERRIDE BUTTON. USE OF SCREWDRIVER OR OTHER TYPE OF PRYING DEVICE TO DEPRESS OVERRIDE BUTTON CAN DEFORM SLENDER PIN MECHANISM INSIDE VALVE. A DEFORMED OVERRIDE BOTTOM PIN CAN HOLD SOLENOID SWITCHER BALL OFF ITS SEAT WHICH ALLOWS VALVE TO OPEN UNCOMMANDED WHEN AIR PRESSURE IS AVAILABLE TO ENGINE START VALVE. IF UNDETECTED OR UNCORRECTED, THIS CONDITION WILL RESULT IN SIGNIFICANT DAMAGE TO ENGINE STARTER.

(7) In the event starter air shutoff valve solenoid valve is inoperative, the solenoid manual override button is depressed to actuate the starter air shutoff valve. Depressing the button accomplishes the same function as normal electrical actuation of the valve.

NOTE: The normal stroke of the override button is approximately 1/16 inch. If the button stroke appears greater than 1/16 inch or if the return action appears sticky, then a deformed override button pin should be suspected.

CAUTION: IF STARTER SHUTOFF VALVE HAS BEEN WRENCHED OPEN, VISUALLY CHECK VALVE POSITION INDICATOR TO ENSURE IT CLOSES WHEN WRENCH IS REMOVED. STARTER CAN FAIL DUE TO AN OVER-SPEED CONDITION IF SHUTOFF VALVE IS NOT CLOSED. WRENCH VALVE CLOSED IF NECESSARY.

(8) In the event of loss of actuator supply pressure, the valve can be opened manually by engaging a wrench on the hexagon flats at the upper end of the butterfly shaft. A notch across the hexagon flats points to the words OPEN or CLOSED on the switch cover to indicate the valve butterfly position.

WJE 875-879

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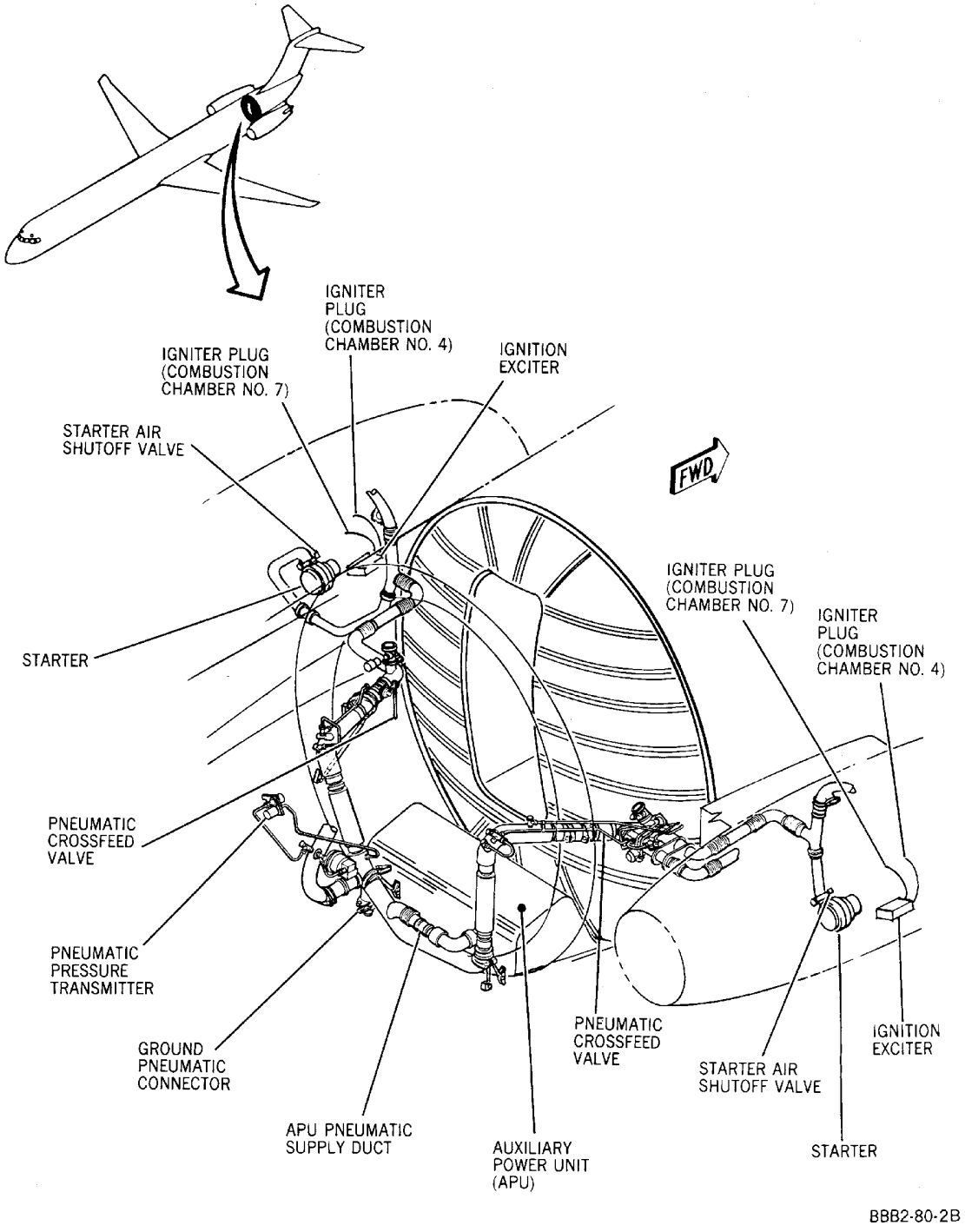
(9) In the event starter air shutoff valve solenoid valve is inoperative, the remote engine starter control mechanism lever is actuated. Actuating the lever depresses the solenoid manual override button to actuate the starter air shutoff valve. Depressing the button accomplishes the same function as normal electrical actuation of the valve.

NOTE: The normal stroke of the override button is approximately 1/16 inch. If the button stroke appears greater than 1/16 inch or if the return action appears sticky, then a deformed override button pin should be suspected.

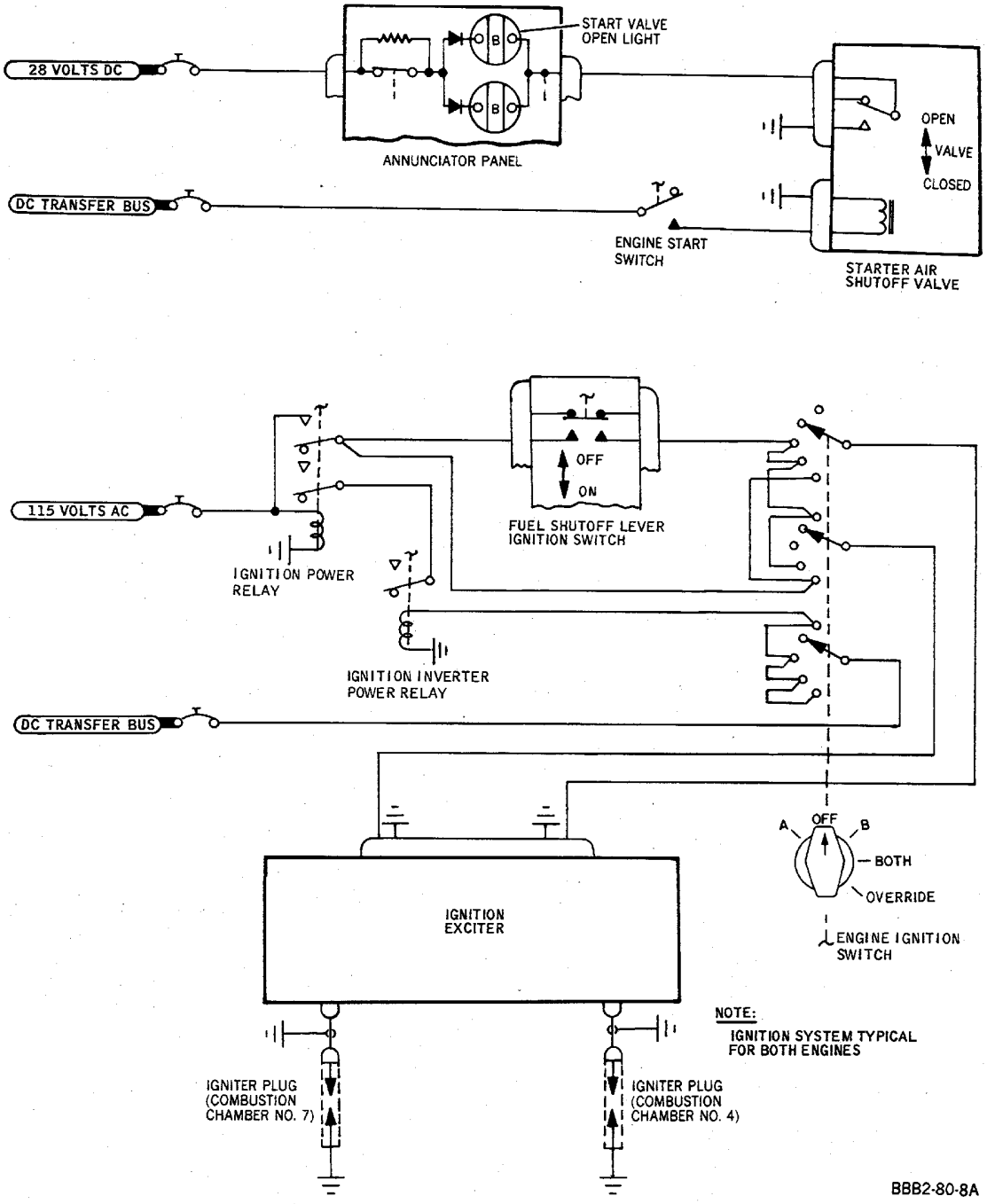
WJE 875-879 (Continued)

(10) In the event of loss of actuator supply pressure, the valve can be opened manually by engaging a wrench on the hexagon flats at the upper end of the butterfly shaft. A notch across the hexagon flats points to the words OPEN or CLOSED on the switch cover to indicate the valve butterfly position.

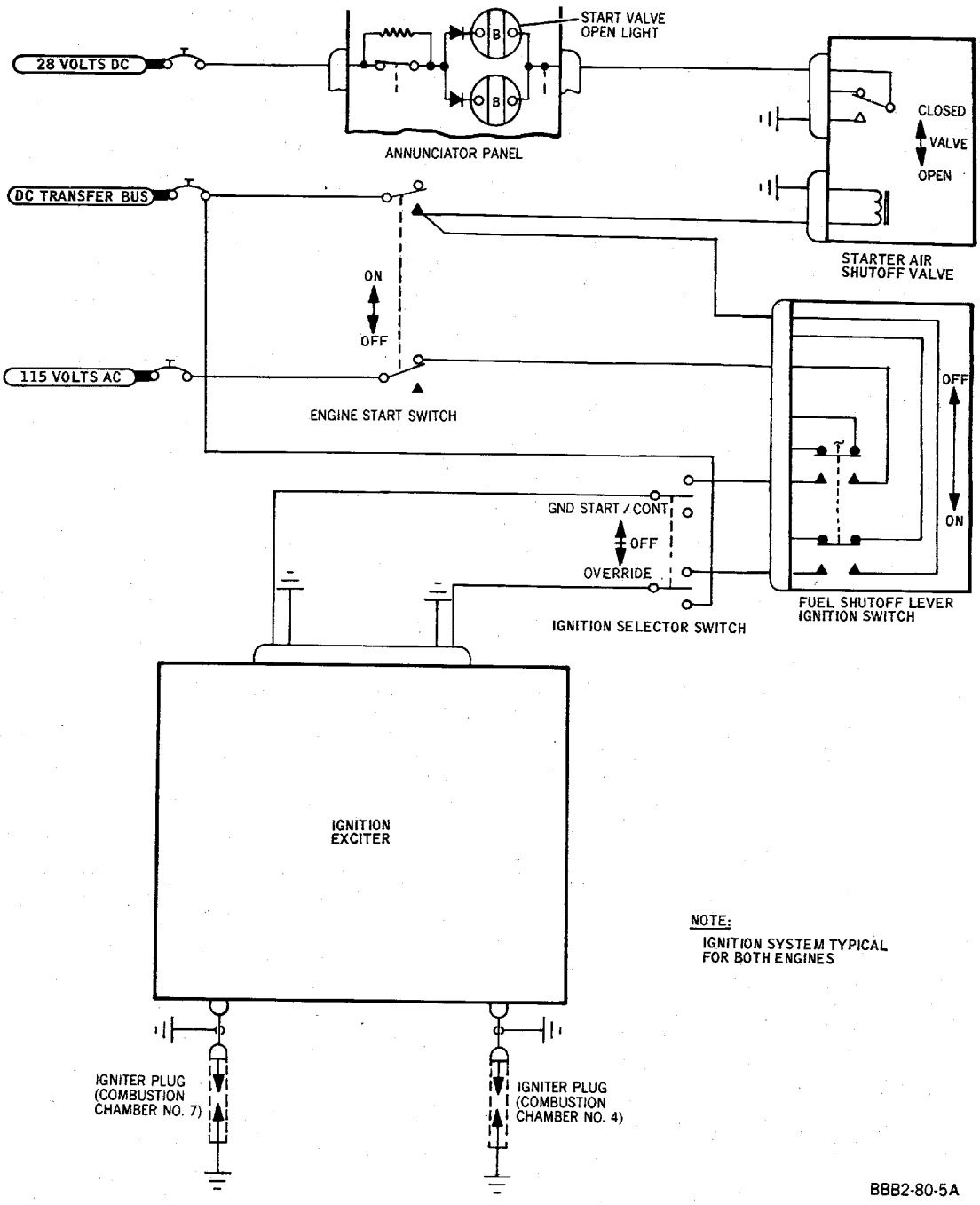
WJE ALL



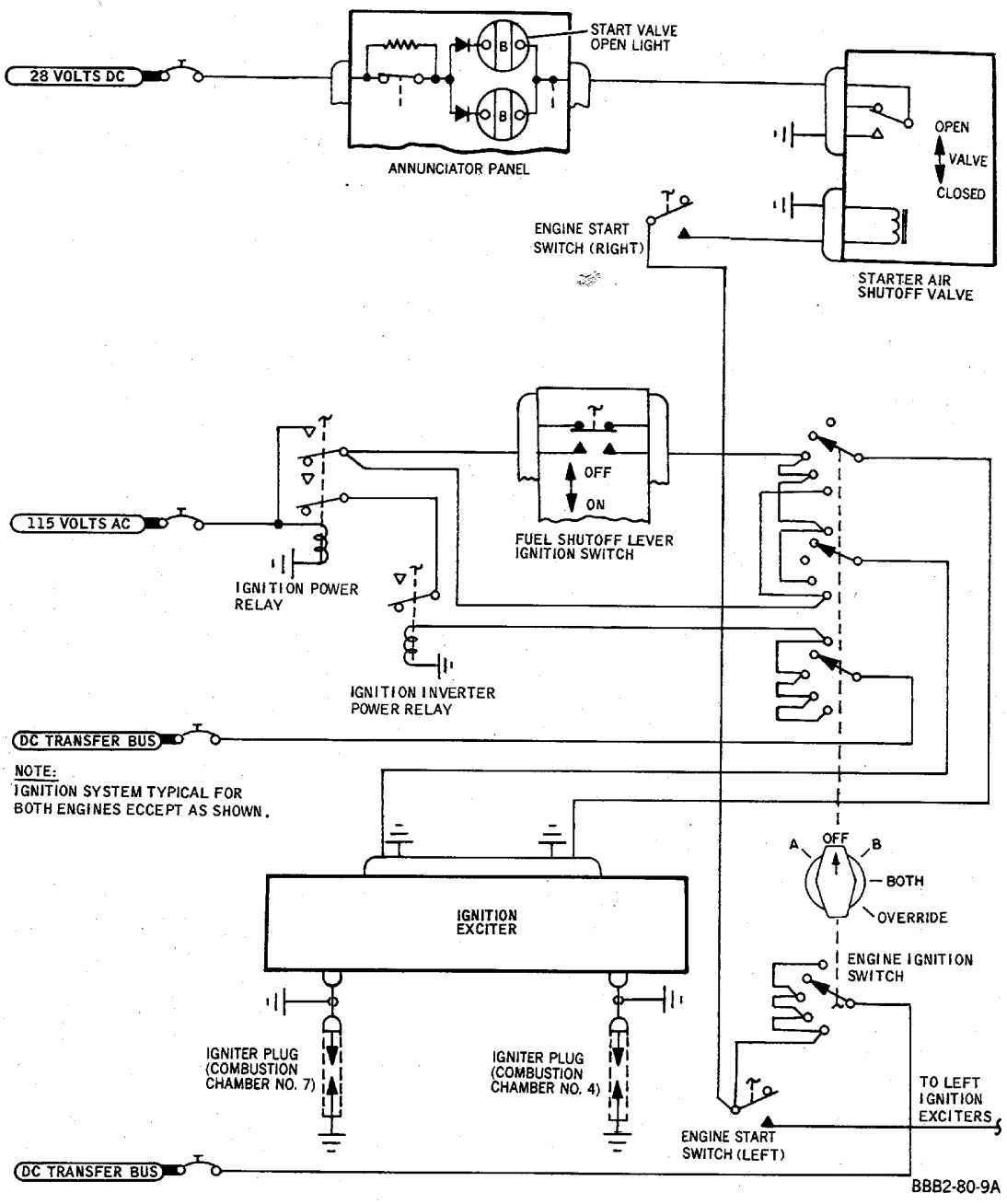
Starting and Ignition System -- Schematic
Figure 1/80-10-00-990-805 (Sheet 1 of 4)



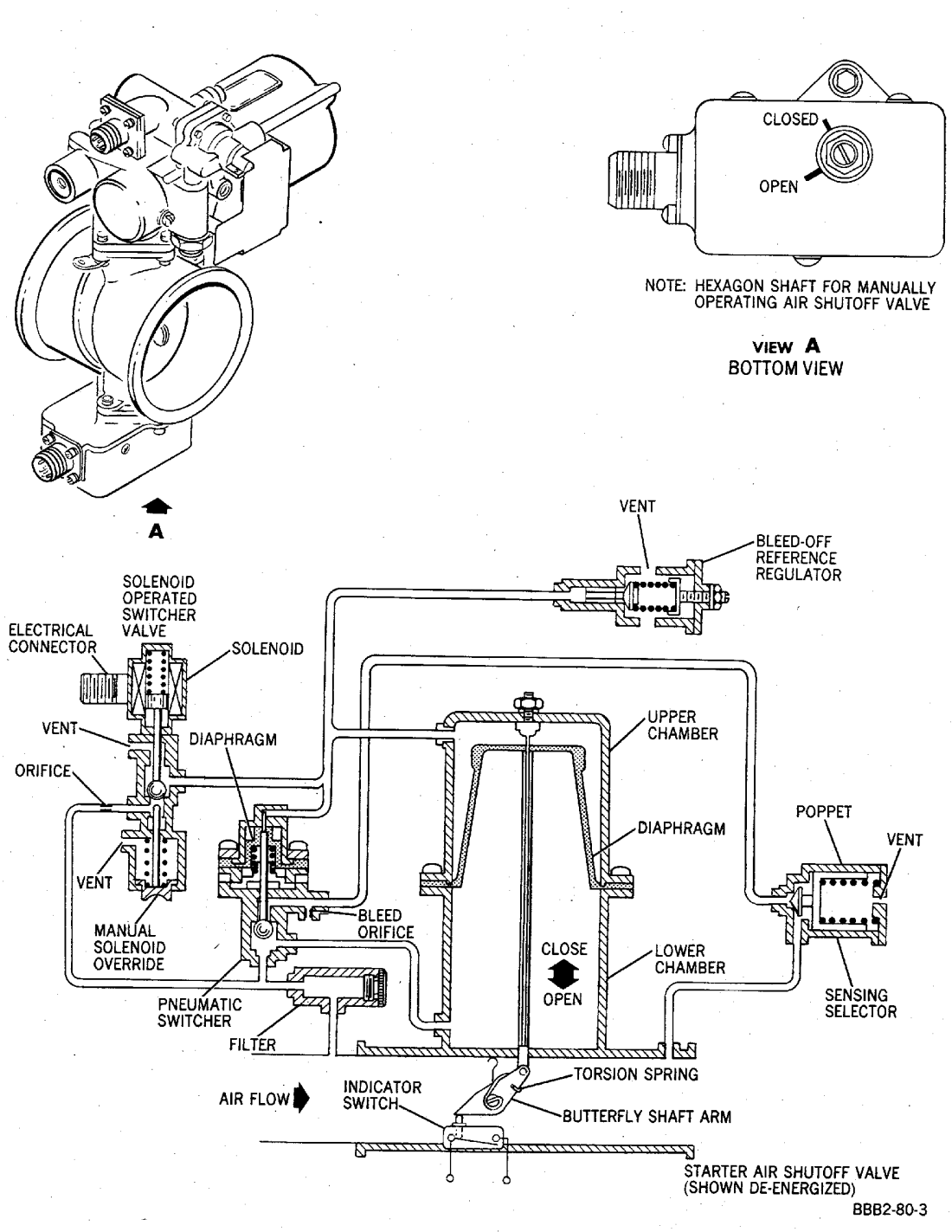
Starting and Ignition System -- Schematic
Figure 1/80-10-00-990-805 (Sheet 2 of 4)



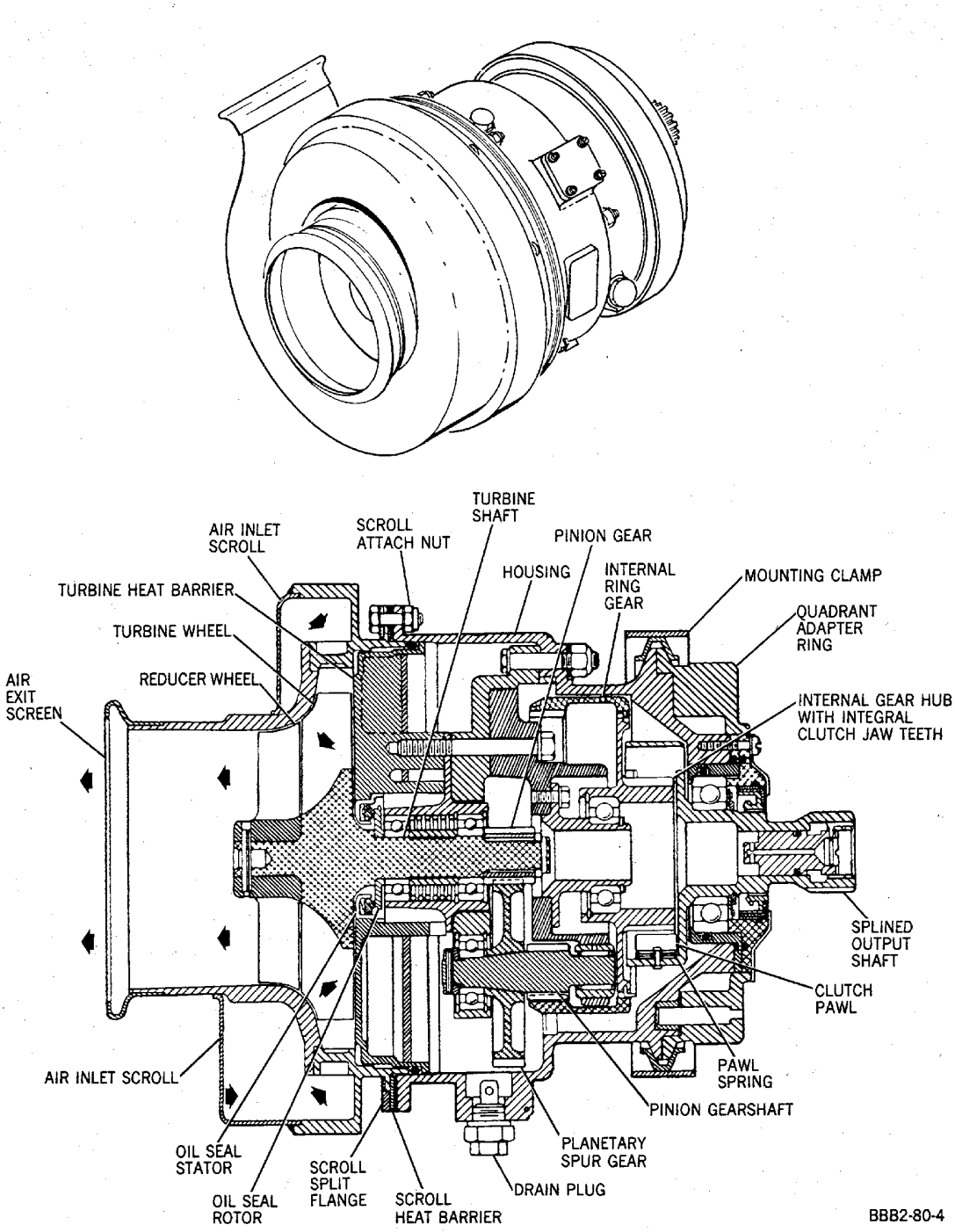
Starting and Ignition System -- Schematic
Figure 1/80-10-00-990-805 (Sheet 3 of 4)



Starting and Ignition System -- Schematic
Figure 1/80-10-00-990-805 (Sheet 4 of 4)



Starter Air Shutoff Valve -- Schematic
Figure 2/80-10-00-990-806



Starter -- Schematic
Figure 3/80-10-00-990-807

CRANKING - TROUBLE SHOOTING

1. General

A. In trouble shooting the pneumatic starter and starter shutoff valve, it is imperative that the start cart is providing its rated output (air pressure and RPM) to the start system. It is also important that no leakage exists in air ducts. Tightness and security of electrical connectors should also be checked before trouble shooting the system.

2. Control and Indicating Trouble Shooting

Table 101

Possible Causes		Isolation Procedures	Correction
A.	No rotation of starter.		
	(1) Starter Shutoff Valve	Place and hold engine start switch in ON position, starter shutoff valve should be in open position as indicated by light on annunciator panel coming on. Release engine start switch. If however, valve is in closed position, proceed with corrective action.	(1) With normal start cart input, manually position starter shut off valve open. Hold engine start switch in ON position, then release. (2) Check valve air filter, and if contam inated, clean.
			(3) Trouble-shoot electrical system. (SUBJECT 74-00-00).
			(4) Replace starter shutoff valve.
	(2) Pneumatic Starter	Check for restriction in starter inlet.	Clean starter inlet.
		Place and hold engine start switch in ON position and check for starter rotation; release engine start switch: if no rotation.	Replace starter.
B.	Low/slow starter rotation.		
	(1) Starter Shutoff Valve	Place and hold engine start switch in ON position, starter shutoff valve should be in open position. If, however, valve is only partially open, proceed with corrective action.	(1) With normal start cart input, manu ally position starter shut off valve open and closed, to insure freedom of movement. Place and hold engine start switch in ON position, then release switch.
			(2) Clean air fil ter in valve.
			(3) Replace starter shut off valve.
	(2) Pneumatic Starter	Check starter inlet for restriction.	Clean starter inlet.
		Check starter for erratic output	Replace starter

PNEUMATIC STARTER - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides servicing, removal/ installation, adjustment/test, and check instructions for the pneumatic starter. The starter is located on the lower left side of the engine and is attached to the rear drive pad of the accessory gearbox by a mounting flange and clamp.

B. Maintenance of the starter is limited to servicing, removal/installation, adjustment/test, and check. The servicing, removal/installation, adjustment/test, and check procedures for starters on all engines are identical.

C. Access to the starter is through the forward lower cowl door.

NOTE: Forward lower cowl door overlaps aft lower cowl door, and must be opened prior to opening aft lower cowl door.

WARNING: EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

CAUTION: TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

CAUTION: ENSURE RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

D. For procedures to open cowl doors on all engines, refer to PAGEBLOCK 71-00-00/201.

CAUTION: DO NOT MIX DIFFERENT TYPES OF OILS. THIS CAN CAUSE DAMAGE TO THE OIL SYSTEM COMPONENTS. IF YOU PUT AN INCORRECT MIXTURE OF OILS INTO THE SYSTEM, IMMEDIATELY DRAIN AND FLUSH THE SYSTEM. QUICKLY ADD THE CORRECT OIL. WRITE THE TYPES OF OILS USED IN THE INCORRECT MIXTURE. THIS DATA IS USED TO MAKE AN ESTIMATE OF THE DAMAGE DONE TO THE SEALS.

E. All new or overhauled pneumatic starters that have been preserved for shipment or storage, must be depreserved and filled with approved oil before they are operated. Depreserving may be accomplished before the starter is installed on the engine.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Container approximately 1 gal (3.785 l) (US gallon)	
Grease,anti-fretting compound, 730691-1 DPM 3565	Sundstrand Aerospace Rockford, ILL

Table 201 (Continued)

Name and Number	Manufacturer
Lockwire, Inconel, NASM20995N32, DPM 684	Not Specified
Lockwire, Corrosion Resistant Steel, NASM20995N32, DPM 5865	Not Specified
Oil, PWA-521 revised	
Cleaner, Handwipe; Brulin MP1793	Brulin & Company, Inc., Richmond, Ca
Torque wrench 0 in-lb (0 N·m) to 100 in-lb (11.3 N·m)	

3. **Servicing Pneumatic Starter**

A. Drain Starter Oil Sump

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

WJE 892

U	41	B1-423	ENGINE START VALVE RIGHT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891

U	42	B1-1	ENGINE IGNITION LEFT

WJE 892

U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892

K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Remove oil filler cap.

CAUTION: MINIMUM SAFE OPERATING OIL LEVEL IS 250 CUBIC CENTIMETERS (8.5 FLUID OUNCES) OF OIL. IF STARTER IS OPERATED BELOW SPECIFIED MINIMUM SAFE OPERATING OIL LEVEL, DAMAGE TO STARTER WILL OCCUR REQUIRING STARTER TO BE REMOVED AND REPLACED.

(6) Remove magnetic probe and drain plug as unit from starter housing, and drain oil into container. Discard gasket.

(7) Carefully examine oil drained from starter for metal particles. (Paragraph 6.B.)

NOTE: Fine metal particles indicate normal wear. Large pieces of metal indicate internal damage.

(8) Clean drain plug, and install new gasket on plug.

(9) Install drain plug and torque 75 in-lb (8.47 N·m) to 80 in-lb (9.04 N·m). Safety drain plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

B. Fill Starter Oil Sump

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

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(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 892			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 892			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Make certain thrust reverser control valve is in dump position and lockpin is installed.

CAUTION: DO NOT MIX DIFFERENT TYPES OF OILS. THIS CAN CAUSE DAMAGE TO THE OIL SYSTEM COMPONENTS. IF YOU PUT AN INCORRECT MIXTURE OF OILS INTO THE SYSTEM, IMMEDIATELY DRAIN AND FLUSH THE SYSTEM. QUICKLY ADD THE CORRECT OIL. WRITE THE TYPES OF OILS USED IN THE INCORRECT MIXTURE. THIS DATA IS USED TO MAKE AN ESTIMATE OF THE DAMAGE DONE TO THE SEALS.

(4) Fill starter with pre-measured quantity, 11.8 fl-oz (350 cc) of oil (PWA-521, revised).

(5) Install new packing on oil filler cap.

(6) Install oil filler cap.

(7) Remove tag from throttle/thrust reverser lever.

(8) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 892			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 892			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(9) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(10) Close access door (5901C) for left engine or (5902C) for right engine.

C. Depreserve Starter

(1) Remove oil filler cap.

(2) Remove magnetic probe and drain plug as unit from starter housing. Discard gasket.

(3) Drain preservative oil from starter into container.

(4) Install new gasket on drain plug.

(5) Install drain plug and torque 75 to 80 inch-pounds (8.48 to 9.04 N·m). Safety drain plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(6) Fill starter with approved oil. (Paragraph 3.B.)

(7) Install oil filler cap.

(8) Install starter.

(Paragraph 4.D.)

4. Removal/Installation Pneumatic Starter

A. Remove Starter

(Figure 201 (Sheet 1))

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 892			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 892			
U	42	B1-422	ENGINE START VALVE LEFT

WJE 892 (Continued)

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Remove fire detector unit. (PAGEBLOCK 26-10-01/201)

(6) For Pre S/B 80-9 starters, remove clamp and exhaust deflector from starter.

NOTE: Post S/B 80-9 have a screen with no exhaust deflector or clamp.

(7) Disconnect electrical connectors from starter air shutoff valve.

(8) Remove wiring harness support brackets from starter.

(9) Remove starter scroll clamp.

WARNING: STARTER WEIGHS APPROXIMATELY 29 POUNDS (13.15 KG). SUPPORT STARTER ADEQUATELY BEFORE REMOVING MOUNTING CLAMP.

(10) Support starter and remove starter mounting clamp.

(11) Carefully pull starter aft. Disengage starter flange from mounting flange aligning pins, and disengage starter drive shaft from accessory gearbox pad.

B. Remove Starter Mounting Flange

(1) Remove nuts attaching flange to engine accessory drive gearbox mounting studs.

(2) Disengage and remove flange from gearbox.

(3) Remove gasket from gearbox mounting pad.

C. Install Starter Mounting Flange

WARNING: USE THE HAZARDOUS MATERIAL WARNINGS GIVEN BELOW FOR THE STEPS THAT FOLLOW.

THE HAZARDOUS MATERIAL WARNINGS ARE LISTED AFTER THE INTRODUCTION SECTION IN THE FRONT OF THE AMM.

Hazardous Material Warnings

HAZMAT 1497, CLEANER/HANDWIPE (DPM 6380-1)

HAZMAT 1000, REFER TO MSDS

(WARNING PRECEDES)

(1) Clean flange and gearbox mounting pad with clean, lint-free cloth moistened with handwipe cleaner (DPM 6380-1).

(2) Install new gasket on gearbox pad and install flange on mounting studs.

(3) Install flange attaching nuts. Torque nuts 160 in-lb (18.08 N·m) to 190 in-lb (21.47 N·m).

D. Install Starter

(Figure 201 (Sheet 1))

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 892			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 892			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Make certain thrust reverser control valve is in dump position and lockpin is installed.

NOTE: If installing new starter, refer to Paragraph 3.C..

WARNING: ANTI-FRETTING COMPOUND IS AN AGENT THAT IS POISONOUS AND AN IRRITANT. MAKE SURE ALL PERSONS OBEY THE PRECAUTIONS WHEN ANTI-FRETTING COMPOUND IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET ANTI-FRETTING COMPOUND IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(4) Lightly lubricate starter drive shaft with grease anti-fretting compound, (730691-1).

WARNING: STARTER WEIGHS APPROXIMATELY 29 POUNDS (13.15 KG). SUPPORT STARTER ADEQUATELY BEFORE REMOVING MOUNTING CLAMP.

(5) Position starter with drain plug down. Carefully align starter drive shaft splines with mating splines in accessory gearbox mounting pad. Make certain starter flange engages mounting flange aligning pins.

(6) Install starter mounting clamp.

(7) Align starter scroll with air shutoff valve by loosening scroll attaching bolts sufficiently to permit rotation of scroll.

(8) Rotate scroll to desired position and install starter scroll clamp. Torque scroll attaching bolts 35 in-lb (3.95 N·m) to 45 in-lb (5.08 N·m).

(9) Torque starter mounting clamp to torque value specified on clamp. If torque value is unreadable, use 40 in-lb (4.52 N·m) to 50 in-lb (5.65 N·m). Insert safety pin.

(10) Torque starter scroll/starter air shutoff valve clamp to value specified on clamp and insert lockpin.

(11) Install wiring support brackets and torque attachment nuts 35 in-lb (3.95 N·m) to 45 in-lb (5.08 N·m).

(12) Connect electrical connectors to starter air shutoff valve. Safety connectors with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) For Pre S/B 80-9 starters,install starter exhaust deflector and clamp.

NOTE: Post S/B 80-9 starter units have a screen with no exhaust deflector or clamp.

(14) For Pre S/B 80-9 starters, torque exhaust deflector clamp nut 35 in-lb (3.95 N·m) to 50 in-lb (5.65 N·m). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Post S/B 80-9 starter units have a screen with no exhaust deflector or clamp. .

(15) Install fire detector unit. (PAGEBLOCK 26-10-01/201)

(16) Remove tag from throttle/thrust reverser lever.

(17) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

WJE 892

U	41	B1-423	ENGINE START VALVE RIGHT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891

U	42	B1-1	ENGINE IGNITION LEFT

WJE 892

U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892

K	26	B1-424	LEFT ENGINE IGNITION

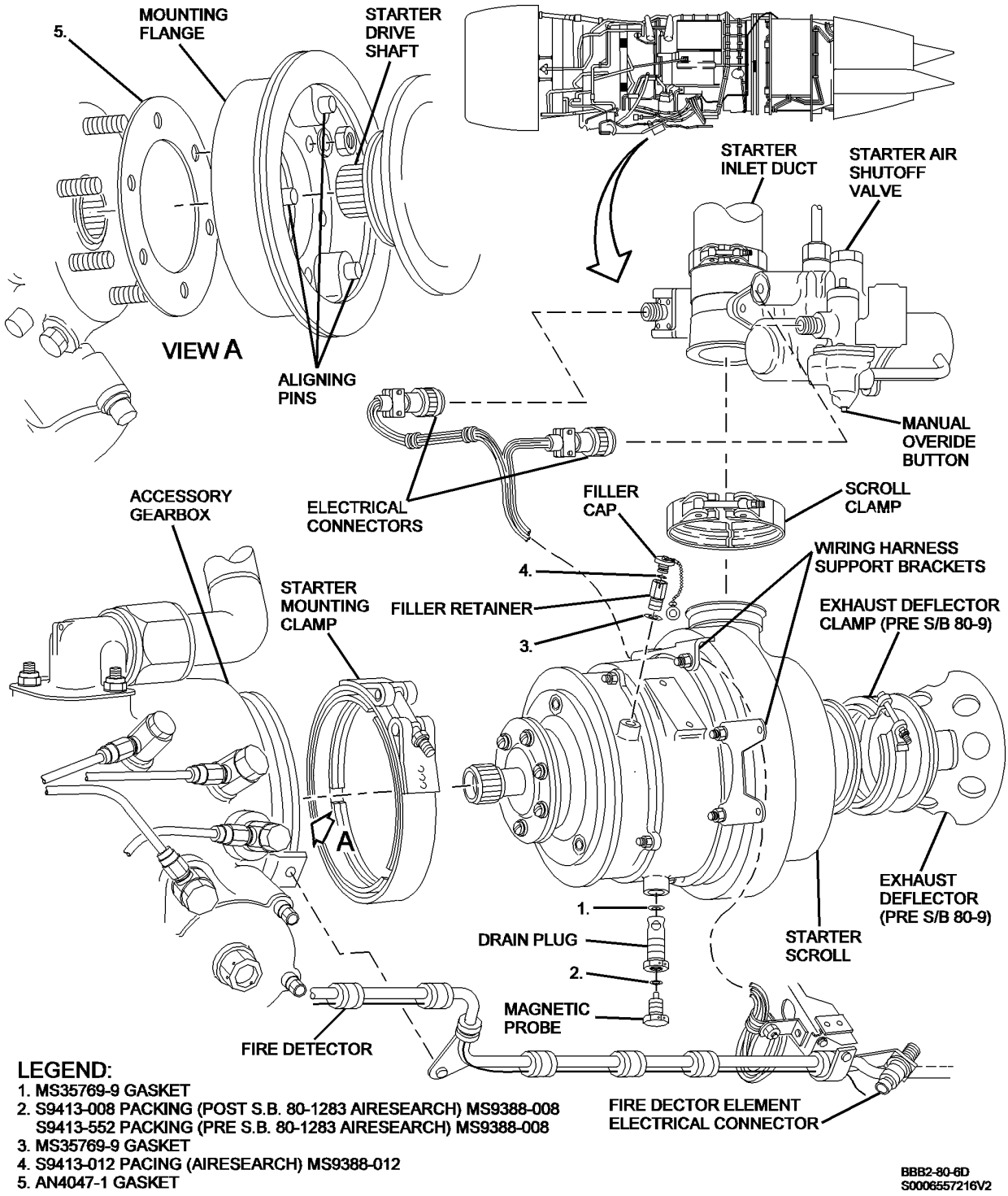
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(18) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(19) Close access door (5901C) for left engine or (5902C) for right engine.



Pneumatic Starter -- Installation
Figure 201/80-10-01-990-803

5. **Adjustment/Test Pneumatic Starter**

A. Test Starter Operation

(1) Place fuel shutoff lever in OFF position.

(2) Make certain ignition selector switch is OFF.

CAUTION: IF ENGINE START SWITCH IS RELEASED DURING STARTER ROTATION AND INTERRUPTS PNEUMATIC FLOW, DO NOT MAKE FURTHER STARTING ATTEMPTS UNTIL ENGINE STOPS COMPLETELY, OR STARTER DAMAGE WILL RESULT. MAKE CERTAIN THAT ENGINE ROTATION HAS CEASED BY WAITING APPROXIMATELY 15 SECONDS AFTER TACHOMETER READS ZERO BEFORE ATTEMPTING ANOTHER START. DO NOT EXCEED RECOMMENDED STARTER DUTY CYCLE.

(3) With electrical buses energized and regulated/pneumatic supply of 36 ±5 psig (248.2 ±34.5 kPa) minimum supplied to the starter system, place and hold engine start switch in ON position.

NOTE: Pneumatic pressure will decrease approximately 10 psig (68.9 kPa) to 15 psig (103.4 kPa) during the start cycle when starting air is supplied by auxiliary power unit.

(4) Check that START VALVE OPEN light located on annunciator panel comes on.

(5) Check for N_2 tachometer indication.

CAUTION: IF STARTER DUTY CYCLE HAS BEEN EXCEEDED, CHECK STARTER SERVICEABILITY.

WJE 415-427, 429, 861-866, 868, 869, 871, 872, 891

CAUTION: IF EXCITER UNIT HAS BEEN OPERATED BEYOND RECOMMENDED DUTY CYCLE, UNIT MUST BE REMOVED AND CHECKED PER OVERHAUL INSTRUCTIONS. INTEGRITY OF COMPONENTS WITHIN EXCITER MAY HAVE BEEN COMPROMISED DUE TO OVERHEATING.

WJE 873, 874, 892

CAUTION: FOR AIRCRAFT WITH 20-4 JOULE SINGLE PACK IGNITION SYSTEM. IF EXCITER UNIT HAS BEEN OPERATED BEYOND RECOMMENDED DUTY CYCLE, UNIT MUST BE REMOVED AND CHECKED PER OVERHAUL INSTRUCTIONS. INTERGRITY OF COMPONENTS WITHIN EXCITER MAY HAVE BEEN COMPROMISED DUE TO OVERHEATING.

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892

(6) Normal Start Cycle Limits:

NOTE: The normal start cycle duration is considered to be 30 seconds.

Table 202

NORMAL STARTING OR MOTORING	ALTERNATE CYCLES	
90 seconds ON*	90 seconds ON*	90 seconds ON
5 minutes OFF	10 minutes OFF	15 minutes OFF
30 seconds ON	60 seconds ON	90 seconds ON
5 minutes OFF	10 minutes OFF	15 minutes OFF
Sequence may continue	Sequence may continue	Sequence may continue

Table 202 (Continued)

NORMAL STARTING OR MOTORING	ALTERNATE CYCLES
*May consist of one 90 second motoring cycle or three normal 30 second start cycles in succession. With engine rotation stopped between each start.	
NOTE: Cycles based on hot air from APU bleed, engine cross-bleed, or ground cart. If cold air (100°F (38°C) maximum) is used at the starter inlet, there is no time limitation for motoring. However, continued excessive motoring will shorten service life of the starter gears and bearings.	

(7) Release engine start switch.

(8) Check that START VALVE OPEN light located on annunciator panel goes off.

(9) Deenergize electrical buses.

6. Check Pneumatic Starter

A. Check Starter Serviceability

(1) Check starter housing at oil filler cap, oil filler retainer, drain plug, magnetic probe, seams, and joints for leaks.

(2) If oil leakage is evident at seams and joints, replace starter.

(3) If leakage is evident at cap, retainer, plug, or probe, replace packing or gasket as required and torque as follows:

(a) Torque oil filler retainer 75 in-lb (8.47 N·m) to 80 in-lb (9.04 N·m). Safety retainer with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(b) Torque drain plug 75 in-lb (8.47 N·m) to 80 in-lb (9.04 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Torque magnetic probe8 in-lb (0.90 N·m) to 10 in-lb (1.13 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

B. Check Starter Magnetic Drain Plug

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

WJE 892

U	41	B1-423	ENGINE START VALVE RIGHT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891

U	42	B1-1	ENGINE IGNITION LEFT

WJE 892

U	42	B1-422	ENGINE START VALVE LEFT

WJE 892 (Continued)

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Remove magnetic probe from drain plug.

NOTE: Probe can be removed without draining oil from starter. Check valve in drain plug prevents oil from draining when plug is removed.

NOTE: Exercise care to prevent probe from picking up stray metal prior to examination for metal particles.

(6) Check probe for accumulation of metallic chips.

NOTE: If a considerable accumulation of metal chips is found on the probe magnet, internal damage to starter is indicated. A small accumulation of fine metallic particles indicates normal wear.

NOTE: Carbon and dirt may form sludge on probe along with metal particles, and cause misleading appearance in the amount of contamination.

(a) Clean probe and retain removed particles.

(b) Examine metallic contaminants using 10-power glass. Small accumulation of fine slivers and relatively flat flakes of metal indicate normal wear. Larger accumulation of particles in chunk or chip form indicate possible internal damage.

(7) If accumulation of metal chips indicates internal damage, proceed as follows:

(a) Remove drain plug and gasket; drain oil from starter into clean container. Discard gasket. (Paragraph 3.A.)

(b) Using clean fine mesh strainer, strain oil to verify presence of metal particles (Figure 202). Presence of metal, either minor or major is unacceptable. If major metal is present internal failure is indicated, replace starter. Normal fuzz is acceptable.

(8) If no indication of internal damage, clean drain plug and install new gasket on plug.

(9) Install drain plug. Torque plug 75 in-lb (8.47 N·m) to 80 in-lb (9.04 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Clean drain plug magnetic probe.

(11) Lubricate new O-ring with oil and install on magnetic probe.

(12) Install magnetic probe in drain plug. Torque probe 8 in-lb (0.90 N·m) to 10 in-lb (1.13 N·m). Safety probe with 0.032 steel corrosion resistant lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) Fill starter with clean oil. (Paragraph 3.B.)

(14) Remove tag from throttle/thrust reverser lever.

(15) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 892			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 892			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891, 892			
K	26	B1-424	LEFT ENGINE IGNITION

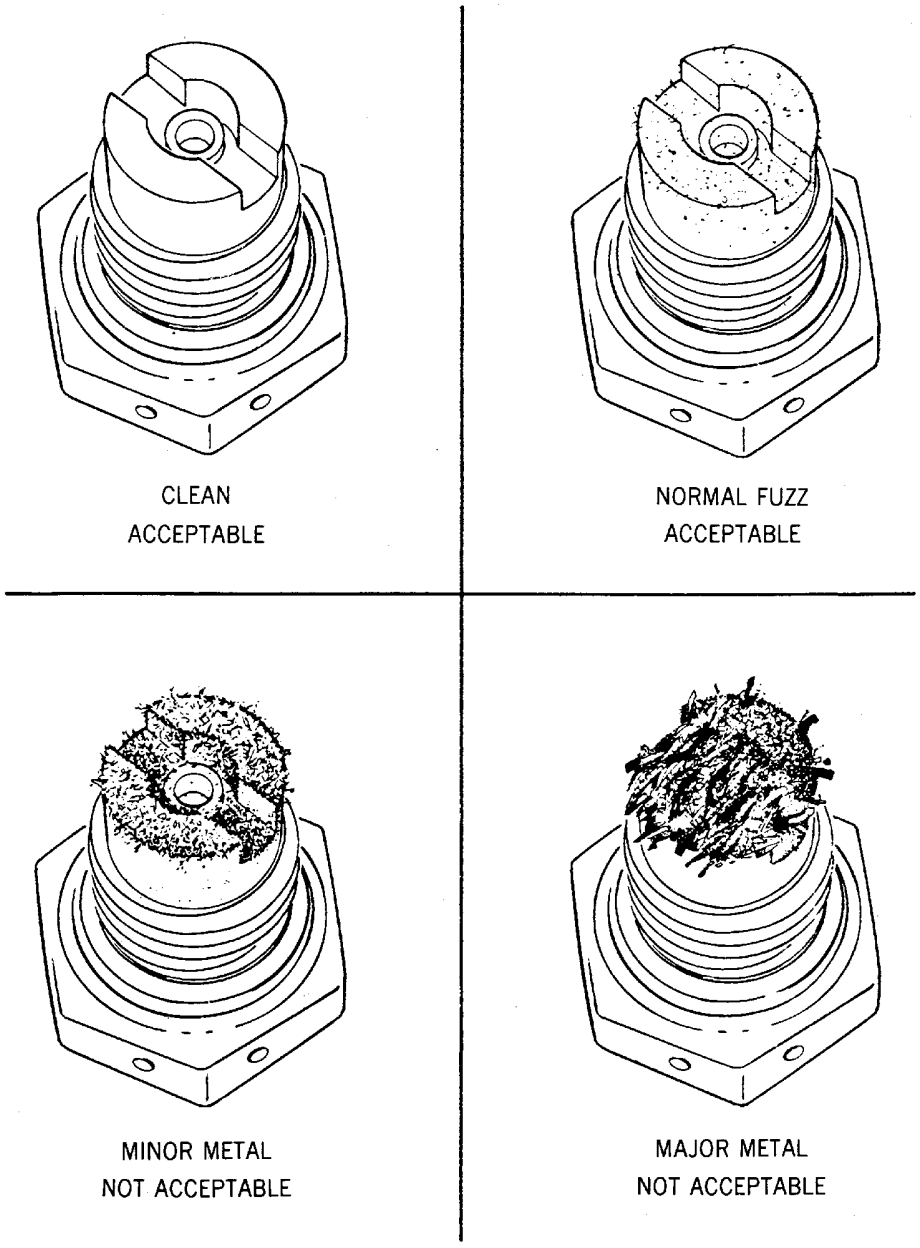
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(16) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(17) Close access door (5901C) for left engine or (5902c) for right engine.



Pneumatic Starter -- Magnetic Probe
Figure 202/80-10-01-990-804

PNEUMATIC STARTER - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides servicing, removal/ installation, adjustment/test, and check instructions for the pneumatic starter. The starter is located on the lower left side of the engine and is attached to the rear drive pad of the accessory gearbox by a mounting flange and clamp.

B. Maintenance of the starter is limited to servicing, removal/installation, adjustment/test, and check. The servicing, removal/installation, adjustment/test, and check procedures for starters on all engines are identical.

C. Access to the starter is through the forward lower cowl door.

NOTE: Forward lower cowl door overlaps aft lower cowl door, and must be opened prior to opening aft lower cowl door.

WARNING: EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

CAUTION: TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

CAUTION: ENSURE RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

D. For procedures to open cowl doors on all engines, refer to PAGEBLOCK 71-00-00/201.

CAUTION: DO NOT MIX DIFFERENT TYPES OF OILS. THIS CAN CAUSE DAMAGE TO THE OIL SYSTEM COMPONENTS. IF YOU PUT AN INCORRECT MIXTURE OF OILS INTO THE SYSTEM, IMMEDIATELY DRAIN AND FLUSH THE SYSTEM. QUICKLY ADD THE CORRECT OIL. WRITE THE TYPES OF OILS USED IN THE INCORRECT MIXTURE. THIS DATA IS USED TO MAKE AN ESTIMATE OF THE DAMAGE DONE TO THE SEALS.

E. All new or overhauled pneumatic starters that have been preserved for shipment or storage, must be depreserved and filled with approved oil before they are operated. Depreserving may be accomplished before the starter is installed on the engine.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
Container approximately 1 US gallon (3.785 liters)	
Grease, Anti-fretting compound, 730691-1 DPM 3565	Sundstrand, Aerospace Rockford, ILL

Table 201 (Continued)

Name and Number	Manufacturer
Lockwire, Inconel, NASM20995N32, DPM 684	Not Specified
Lockwire, Corrosion Resistant Steel, NASM20995C32, DPM 5865	Not Specified
Oil, PWA-521 revised	
Solvent, 1,1,1 Trichloroethane, stabilized, vapor degreasing MIL-T-81533	
Torque wrench (0-100 inch-pounds (0-11.3 N·m))	

3. **Servicing Pneumatic Starter**

A. Drain Starter Oil Sump

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Remove oil filler cap.

CAUTION: MINIMUM SAFE OPERATING OIL LEVEL IS 250 CUBIC CENTIMETERS (8.5 FLUID OUNCES) OF OIL. IF STARTER IS OPERATED BELOW SPECIFIED MINIMUM SAFE OPERATING OIL LEVEL, DAMAGE TO STARTER WILL OCCUR REQUIRING STARTER TO BE REMOVED AND REPLACED.

(6) Remove magnetic probe and drain plug as unit from starter housing, and drain oil into container. Discard gasket.

(7) Carefully examine oil drained from starter for metal particles. (Paragraph 6.B.)

NOTE: Fine metal particles indicate normal wear. Large pieces of metal indicate internal damage.

(8) Clean drain plug, and install new gasket on plug.

(9) Install drain plug and torque 75 to 80 inch-pounds (8.48 to 9.04 N·m). Safety drain plug with lockwire.

B. Fill Starter Oil Sump

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893 (Continued)

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Make certain thrust reverser control valve is in dump position and lockpin is installed.

CAUTION: DO NOT MIX DIFFERENT TYPES OF OILS. THIS CAN CAUSE DAMAGE TO THE OIL SYSTEM COMPONENTS. IF YOU PUT AN INCORRECT MIXTURE OF OILS INTO THE SYSTEM, IMMEDIATELY DRAIN AND FLUSH THE SYSTEM. QUICKLY ADD THE CORRECT OIL. WRITE THE TYPES OF OILS USED IN THE INCORRECT MIXTURE. THIS DATA IS USED TO MAKE AN ESTIMATE OF THE DAMAGE DONE TO THE SEALS.

(4) Fill starter with pre-measured quantity, 350 cubic centimeters (approximately 11.8 fluid ounces) of oil (PWA-521, revised).

(5) Install new packing on oil filler cap.

(6) Install oil filler cap.

(7) Remove tag from throttle/thrust reverser lever.

(8) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(9) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(10) Close access door (5901C) for left engine or (5902C) for right engine.

C. Depreserve Starter

(1) Remove oil filler cap.

(2) Remove magnetic probe and drain plug as unit from starter housing. Discard gasket.

(3) Drain preservative oil from starter into container.

(4) Install new gasket on drain plug.

(5) Install drain plug and torque 75 to 80 inch-pounds (8.48 to 9.04 N·m). Safety drain plug with lockwire.

(6) Fill starter with approved oil. (Paragraph 3.B.)

(7) Install oil filler cap.

(8) Install starter.(Paragraph 4.D.)

4. Removal/Installation Pneumatic Starter

A. Remove Starter (Figure 201)

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893

U	41	B1-423	ENGINE START VALVE RIGHT

WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883

U	42	B1-872	ENG START VALVE LEFT & RIGHT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893

U	42	B1-422	ENGINE START VALVE LEFT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893 (Continued)

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201).

(5) Remove fire detector unit (PAGEBLOCK 26-10-01/201)

(6) For Pre S/B 80-9 starters, remove clamp and exhaust deflector from starter. (Figure 201)

NOTE: Post S/B 80-9 starter units have a screen with no exhaust deflector or clamp.

(7) Disconnect electrical connectors from starter air shutoff valve.

(8) Remove wiring harness support brackets from starter.

(9) Remove starter scroll clamp.

WARNING: STARTER WEIGHS APPROXIMATELY 29 POUNDS (13.15 KG). SUPPORT STARTER ADEQUATELY BEFORE REMOVING MOUNTING CLAMP.

(10) Support starter and remove starter mounting clamp.

(11) Carefully pull starter aft. Disengage starter flange from mounting flange aligning pins, and disengage starter drive shaft from accessory gearbox pad.

B. Remove Starter Mounting Flange

(1) Remove nuts attaching flange to engine accessory drive gearbox mounting studs.

(2) Disengage and remove flange from gearbox.

(3) Remove gasket from gearbox mounting pad.

C. Install Starter Mounting Flange

WARNING: 1,1,1, TRICHLOROETHANE IS VAPOR TOXIC. AVOID PROLONGED OR REPEATED BREATHING OF VAPOR. AVOID CONTACT WITH SKIN AND EYES. CLEAN PARTS IN WELL-VENTILATED AREA AND USE APPROVED SAFETY EQUIPMENT.

(1) Clean flange and gearbox mounting pad with clean, lint-free cloth moistened with solvent, 1,1,1 trichloroethane.

(2) Install new gasket on gearbox pad and install flange on mounting studs.

(3) Install flange attaching nuts. Torque nuts 160 to 190 inch-pounds (18.08 to 21.47 N·m).

D. Install Starter (Figure 201)

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Make certain thrust reverser control valve is in dump position and lockpin is installed.

NOTE: If installing new starter, refer to Paragraph 3.C..

(4) Lightly lubricate starter drive shaft with grease, (anti-fretting compound, MIL-M-7866).

WARNING: STARTER WEIGHS APPROXIMATELY 29 POUNDS (13.15 KG). SUPPORT STARTER ADEQUATELY BEFORE REMOVING MOUNTING CLAMP.

(5) Position starter with drain plug down. Carefully align starter drive shaft splines with mating splines in accessory gearbox mounting pad. Make certain starter flange engages mounting flange aligning pins.

(6) Install starter mounting clamp.

(7) Align starter scroll with air shutoff valve by loosening scroll attaching bolts sufficiently to permit rotation of scroll.

(8) Rotate scroll to desired position and install starter scroll clamp. Torque scroll attaching bolts 35 to 45 inch-pounds (3.96 to 5.09 N·m).

(9) Torque starter mounting clamp 40 to 50 inch-pounds (4.52 to 5.65 N·m). Insert safety pin.

(10) Torque starter scroll/starter air shutoff valve clamp to value specified on clamp and insert lockpin.

(11) Install wiring support brackets and torque attachment nuts 35 to 45 inch-pounds (3.96 to 5.09 N·m).

(12) Connect electrical connectors to starter air shutoff valve. Safety connectors with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) For Pre S/B 80-9 starters, install starter exhaust deflector and clamp.

NOTE: Post S/B 80-9 starter units have a screen with no exhaust deflector or clamp.

(14) For Pre S/B 80-9 starters, torque exhaust deflector clamp nut 35 to 50 inch-pounds (3.96 to 5.65 N·m). Safety nut with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Post S/B 80-9 starter units have a screen with no exhaust deflector or clamp..

(15) Install fire detector unit. (PAGEBLOCK 26-10-01/201)

(16) Remove tag from throttle/thrust reverser lever.

(17) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893

U	41	B1-423	ENGINE START VALVE RIGHT

WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883

U	42	B1-872	ENG START VALVE LEFT & RIGHT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893

U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name

WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893

K	26	B1-424	LEFT ENGINE IGNITION

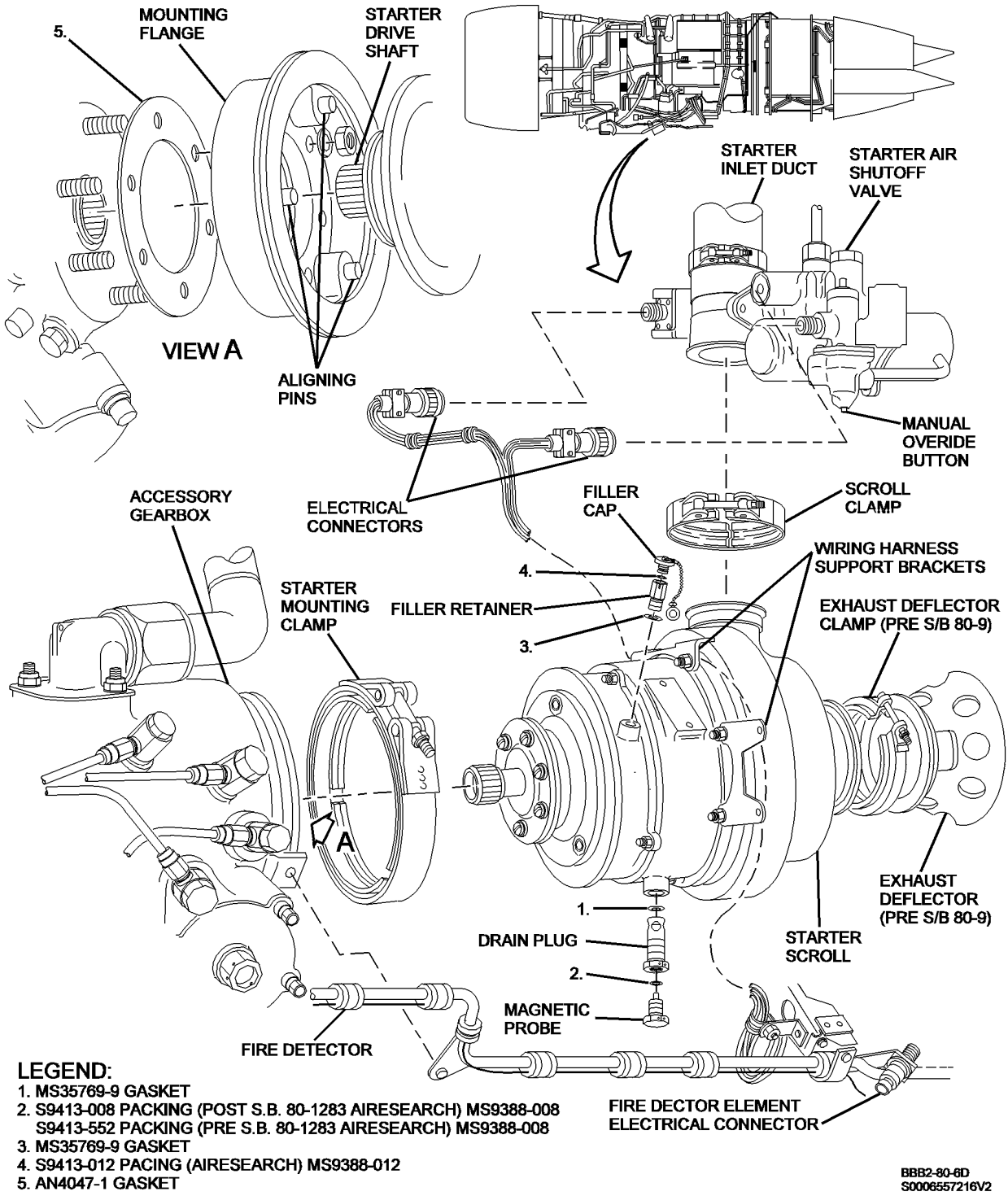
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(18) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201).

(19) Close access door (5901C) for left engine or (5902C) for right engine.



Pneumatic Starter -- Installation
Figure 201/80-10-01-990-805

EFFECTIVITY
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893

5. Adjustment/Test Pneumatic Starter

A. Test Starter Operation

CAUTION: MAKE CERTAIN FUEL SHUTOFF LEVER IS IN OFF POSITION TO PREVENT INADVERTENT ENGINE START.

(1) Place fuel shutoff lever in OFF position.

(2) Place ignition selector switch in either SYS A, SYS B, or BOTH position.

CAUTION: IF ENGINE START SWITCH IS RELEASED DURING STARTER ROTATION AND INTERRUPTS PNEUMATIC FLOW, DO NOT MAKE FURTHER STARTING ATTEMPTS UNTIL ENGINE STOPS COMPLETELY, OR STARTER DAMAGE WILL RESULT. MAKE CERTAIN THAT ENGINE ROTATION HAS CEASED BY WAITING APPROXIMATELY 15 SECONDS AFTER TACHOMETER READS ZERO BEFORE ATTEMPTING ANOTHER START. DO NOT EXCEED RECOMMENDED STARTER DUTY CYCLE.

(3) With electrical buses energized and regulated/pneumatic supply of 36(±5) psig (248.4(±34.5) kPa) minimum supplied to the starter system, place and hold engine start switch in ON position.

NOTE: Pneumatic pressure will decrease approximately 10 to 15 psig (69 to 103.5 kPa) during the start cycle when starting air is supplied by auxiliary power unit.

(4) Check that START VALVE OPEN light located on annunciator panel comes on.

(5) Check for N_2 tachometer indication.

CAUTION: IF STARTER DUTY CYCLE HAS BEEN EXCEEDED, CHECK STARTER SERVICEABILITY.

(6) Normal Start Cycle Limits:

NOTE: The normal start cycle duration is considered to be 30 seconds.

Table 202

NORMAL STARTING OR MOTORING	ALTERNATE CYCLES	
90 seconds ON*	90 seconds ON*	90 seconds ON
5 minutes OFF	10 minutes OFF	15 minutes OFF
30 seconds ON	60 seconds ON	90 seconds ON
5 minutes OFF	10 minutes OFF	15 minutes OFF
Sequence may continue	Sequence may continue	Sequence may continue
*May consist of one 90 second motoring cycle or three normal 30 second start cycles in succession. With engine rotation stopped between each start.		
NOTE: Cycles based on hot air from APU bleed, engine cross-bleed, or ground cart. If cold air (38°C(100°F) maximum) is used at the starter inlet, there is no time limitation for motoring. However, continued excessive motoring will shorten service life of the starter gears and bearings.		

(7) Release engine start switch.

(8) Check that START VALVE OPEN light located on annunciator panel goes off.

(9) Deenergize electrical buses.

6. Check Pneumatic Starter

A. Check Starter Serviceability

(1) Check starter housing at oil filler cap, oil filler retainer, drain plug, magnetic probe, seams, and joints for leaks.

(2) If oil leakage is evident at seams and joints, replace starter.

(3) If leakage is evident at cap, retainer, plug, or probe, replace packing or gasket as required and torque as follows:

(a) Torque oil filler retainer 75 to 80 inch-pounds (8.48 to 9.04 N·m). Saftey retainer with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(b) Torque drain plug 75 to 80 inch-pounds (8.48 to 9.04 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(c) Torque magnetic probe 8 to 10 inch-pounds (0.90 to 1.13 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

B. Check Starter Magnetic Drain Plug

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin (PAGEBLOCK 78-00-00/201).

(5) Remove magnetic probe from drain plug.

NOTE: Probe can be removed without draining oil from starter. Check valve in drain plug prevents oil from draining when plug is removed.

NOTE: Exercise care to prevent probe from picking up stray metal prior to examination for metal particles.

(6) Check probe for accumulation of metallic chips.

NOTE: If a considerable accumulation of metal chips is found on the probe magnet, internal damage to starter is indicated. A small accumulation of fine metallic particles indicates normal wear.

NOTE: Carbon and dirt may form sludge on probe along with metal particles, and cause misleading appearance in the amount of contamination.

(a) Clean probe and retain removed particles.

(b) Examine metallic contaminants using 10-power glass. Small accumulation of fine slivers and relatively flat flakes of metal indicate normal wear. Larger accumulation of particles in chunk or chip form indicate possible internal damage.

(7) If accumulation of metal chips indicates internal damage, proceed as follows:

(a) Remove drain plug and gasket; drain oil from starter into clean container. Discard gasket. (Paragraph 3.A.)

(b) Using clean fine mesh strainer, strain oil to verify presence of metal particles. (Figure 202) Presence of metal, either minor or major is unacceptable. If major metal is present internal failure is indicated, replace starter. Normal fuzz is acceptable.

(8) If no indication of internal damage, clean drain plug and install new gasket on plug.

(9) Install drain plug. Torque plug 75 to 80 inch-pounds (8.48 to 9.04 N·m). Safety plug with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Clean drain plug magnetic probe.

(11) Lubricate new O-ring with oil and install on magnetic probe.

(12) Install magnetic probe in drain plug. Torque probe 8 to 10 inch-pounds (0.90 to 1.13 N·m). Safety probe with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(13) Fill starter with clean oil. (Paragraph 3.B.)

(14) Remove tag from throttle/thrust reverser lever.

(15) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 893			
U	42	B1-422	ENGINE START VALVE LEFT

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE 401-412, 414, 875-881, 883, 884, 886, 887, 893			
K	26	B1-424	LEFT ENGINE IGNITION

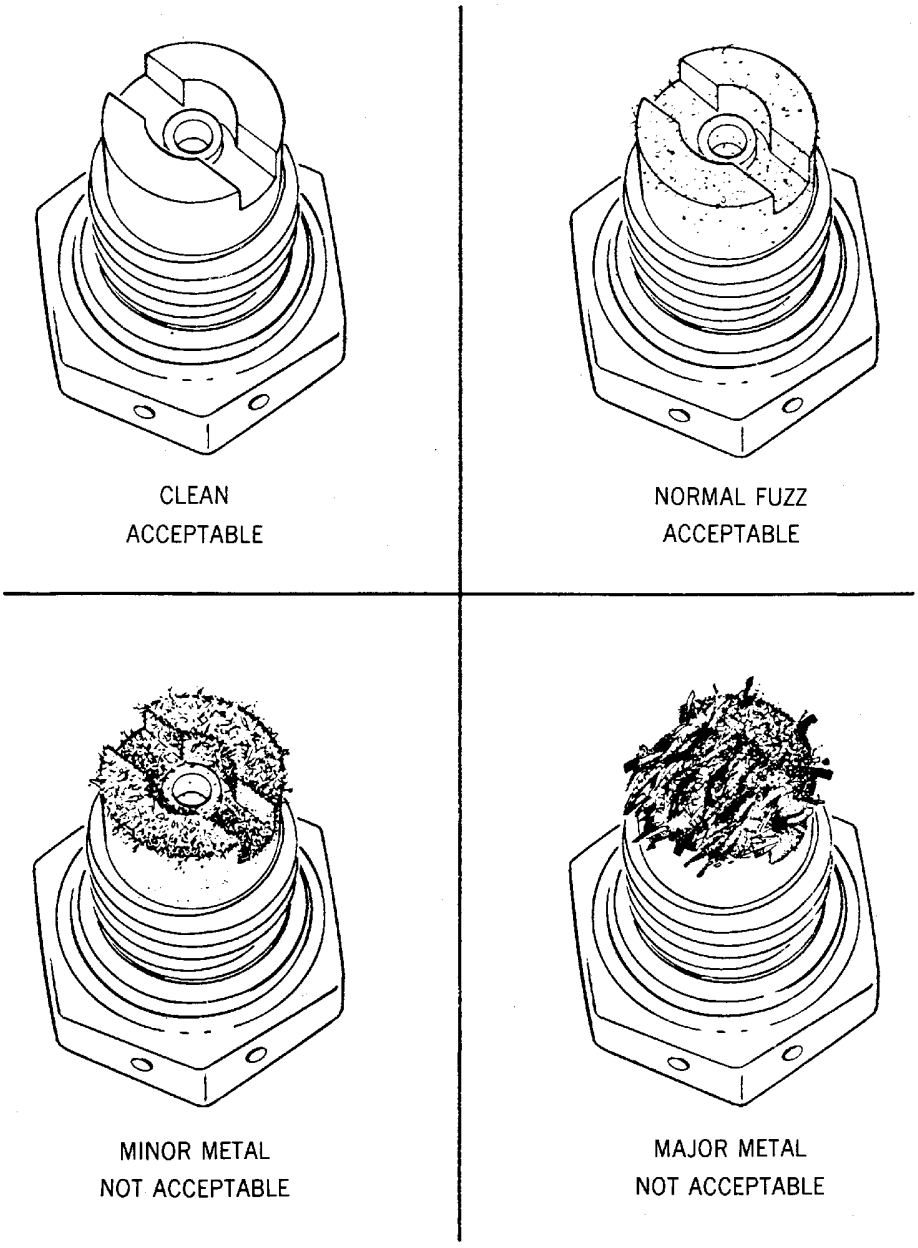
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(16) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(17) Close access door (5901C) for left engine or (5902c) for right engine.



Pneumatic Starter -- Magnetic Probe
Figure 202/80-10-01-990-806

PNEUMATIC STARTER - SERVICING

1. General

A. This procedure contains BCA recommended task card data.

TASK 80-10-01-610-801

2. Service the Left and Right Engine Starter Oil

NOTE: This procedure is a scheduled maintenance task.

A. References

Reference	Title
80-10-01 P/B 201 Config 1	PNEUMATIC STARTER - MAINTENANCE PRACTICES
80-10-01 P/B 201 Config 2	PNEUMATIC STARTER - MAINTENANCE PRACTICES

B. Service the Left and Right Engine Starter Oil

SUBTASK 80-10-01-610-001

(1) Check the left and right pneumatic engine starter magnetic drain plugs and fill engine starter with oil as required. (PNEUMATIC STARTER - MAINTENANCE PRACTICES, PAGEBLOCK 80-10-01/201 Config 1 or PNEUMATIC STARTER - MAINTENANCE PRACTICES, PAGEBLOCK 80-10-01/201 Config 2)

——— END OF TASK ———

STARTER AIR SHUTOFF VALVE - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides removal/installation and adjustment/test instructions for the starter air shutoff valve. The starter air shutoff valve is located on the left side of the engine and is connected directly in line with and between the starter and the starter inlet air duct.

B. Maintenance of the valve is limited to removal/installation and adjustment/test. The removal/installation and adjustment/test procedures for valves on all engines are identical.

C. Servicing procedures are provided for the sense line filter installed on the sensing line between the starter inlet duct and the starter air shutoff valve.

D. Removal and installation procedures are provided for the pressure relief valve installed on the starter air shutoff valve and connected to the sensing line. These procedures only apply to later aircraft or aircraft with SB 80-14 incorporated.

E. Access to the valve, sense line filter and pressure relief valve is through the forward lower cowl doors.

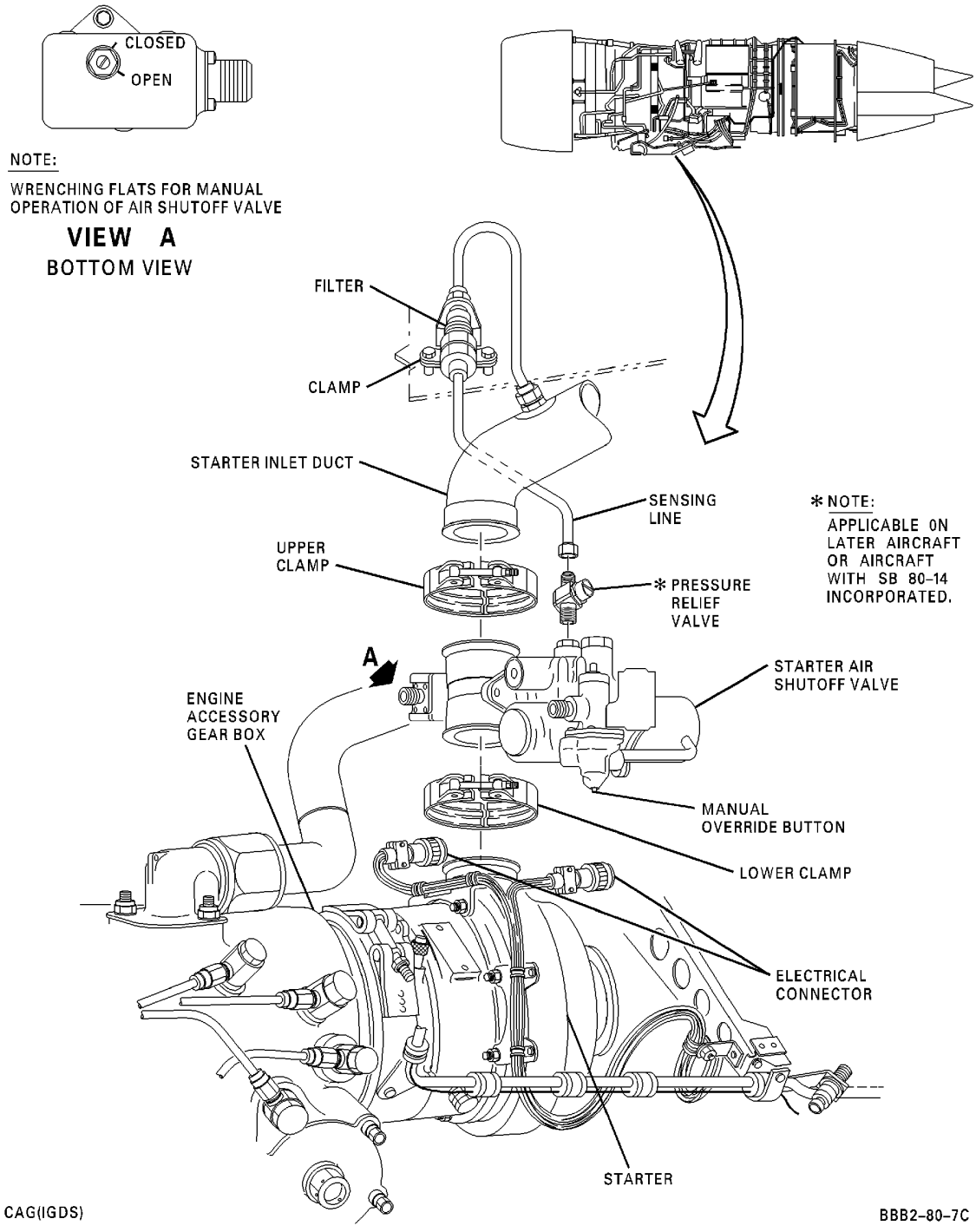
NOTE: Forward lower cowl door overlaps aft lower cowl door, and must be opened prior to opening aft lower cowl door.

WARNING: EXERCISE CARE TO AVOID STRAKES WHEN WORKING IN ENGINE AREA WITH COWL DOORS OPEN OR INJURY TO PERSONNEL COULD RESULT.

CAUTION: TO PREVENT STRUCTURAL DAMAGE, USE HOLD OPEN RODS ON EACH COWL DOOR.

CAUTION: ENSURE RIGHT ENGINE UPPER COWL DOOR IS CLOSED BEFORE OPERATING APU OR APU EXHAUST WILL IMPINGE DIRECTLY ON COWL DOOR CAUSING EXTENSIVE DAMAGE.

F. For procedures to open cowl doors on all engines. (PAGEBLOCK 71-00-00/201)



Starter Air Shutoff Valve -- Installation
Figure 201/80-10-02-990-801

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Lockwire, Inconel, NASM20995N20, DPM 684	Not Specified
Lockwire, Corrosion Resistant Steel, NASM20995C20, DPM 5865	Not Specified
Lockwire, Inconel, NASM20995N32, DPM 684	Not Specified
Lockwire, Corrosion Resistant Steel, NASM20995C32, DPM 5865	Not Specified
Solvent, cleaning P-D-680, Type I	
Source of clean, dry compressed air	
Aluminum foil	Not Specified
5X to 7X Magnifying Glass	Not Specified
Flashlight	Not Specified

3. Servicing Sense Line Filter

A. Service Sense Line Filter

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Disconnect sensing line from filter.

(6) Cut lockwire and remove screen element and metal O-ring from filter case.

(7) Discard metal O-ring.

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(8) Clean screen element and case with cleaning solvent, P-D-680, Type I.

(9) Dry screen element and case with clean, dry compressed air. Use compressed air to blow out debris in inlet and outlet ports. Allow parts to dry in ambient air.

NOTE: Air pressure is restricted to a maximum of 15 psi.

(10) With a bright light and a magnifying glass, do a close visual inspection of the filter element for deterioration, corrosion, obvious damage and general condition.

(11) Install screen element and new metal O-ring in filter case. Torque element to 65 ft-lb (88.1 N·m) to 75 ft-lb (101.7 N·m). Lockwire filter element to case.

(12) Connect sensing line to filter.

(13) Remove tag from throttle/thrust reverser lever.

(14) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(15) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(16) Close access door (5901C) for left engine or (5902C) for right engine.

4. Removal/Installation Starter Air Shutoff Valve

A. Remove Valve (Figure 201)

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT

WJE 415-427, 429, 861-866, 868, 869, 871-874, 891 (Continued)

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Disconnect electrical connectors from valve. (Figure 201)

(6) Disconnect filter sensing line.

(7) Remove clamp connecting valve to starter air inlet duct.

(8) Remove clamp connecting valve to starter.

(9) Remove valve.

(10) Remove pressure relief valve if required. (Paragraph 6.)

NOTE: Paragraph 4.A.(10)only applies to later aircraft or aircraft with SB 80-14 incorporated.

B. Install Valve (Figure 201)

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(3) Make certain thrust reverser control valve is in dump position and lockpin is installed.

(4) Position valve between starter and starter air inlet duct with flow arrow pointing towards starter and electrical connectors facing forward.

(5) Install valve-to-starter connecting clamp. (Figure 201)

NOTE: Tighten clamps fingertight so that valve can be adjusted to clear engine case before tightening to final torque.

(6) Install valve-to-starter inlet duct connecting clamp.

(7) Ensure adequate clearance exists between engine case and air shutoff valve.

(8) Torque valve connecting clamps to value indicated on clamps. Insert clamp safety pins.

(9) Install pressure relief valve if required (Paragraph 6.B.).

NOTE: Paragraph 4.B.(9)only applies to later aircraft or aircraft with SB 80-14 incorporated.

(10) Connect filter sensing line to valve.

(11) Connect electrical connectors and safety with .020 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Connector plug is properly installed when no relative motion exists between plug backshell and coupling ring.

(12) Remove tag from throttle/thrust reverser lever.

(13) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(14) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(15) Close access door (5901C) for left engine or (5902C) for right engine.

5. Adjustment/Test Starter Air Shutoff Valve

A. Test Valve Operation

CAUTION: MAKE CERTAIN FUEL SHUTOFF LEVER IS IN OFF POSITION TO PREVENT INADVERTENT ENGINE START.

(1) Place fuel shutoff lever in OFF position.

WJE 405-411, 415-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 891, 892

(2) Make certain ignition selector switch is OFF.

WJE 401-404, 412, 414, 875-879, 886, 887, 893

(3) Place ignition selector switch in either SYS A, SYS B, or BOTH position.

WJE ALL

(4) Cut one layer of aluminum foil to fit area to be tested with a 0.50 in. (12.70 mm) to 1.00 in. (25.40 mm) overlap.

(a) Fold overlap material once or twice to form a seam to seal foil to area to be tested.

(b) Put foil as tightly as possible around area to be tested, without doing damage to foil (i.e. tears, punctures).

(c) Safety foil with .032 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

CAUTION: IF ENGINE START SWITCH IS RELEASED DURING STARTER ROTATION AND INTERRUPTS PNEUMATIC FLOW, DO NOT MAKE FURTHER STARTING ATTEMPTS UNTIL ENGINE STOPS COMPLETELY, OR STARTER DAMAGE WILL RESULT. MAKE CERTAIN THAT ENGINE ROTATION HAS CEASED BY WAITING APPROXIMATELY 15 SECONDS AFTER TACHOMETER READS ZERO BEFORE ATTEMPTING ANOTHER START. DO NOT EXCEED RECOMMENDED STARTER DUTY CYCLE.

(5) With electrical buses energized and regulated pneumatic supply of 36(±5) psig (248.4(±34.5) kPa) supplied to starter system, place and hold engine start switch in ON position.

(6) Check that START VALVE OPEN light located on annunciator panel comes on.

NOTE: Communications with flight compartment is essential during this test.

(7) Check for N_2 tachometer indication.

(8) Release engine start switch.

(9) Check that START VALVE OPEN light located on annunciator panel goes off.

WJE 401-404, 412, 414, 886, 887

(10) Place ignition selector switch in OFF position.

WJE ALL

(11) Deenergize electrical buses.

(12) Enter ducting area with caution and check for leaks by inspecting aluminum foil for indication of leakage as follows:

(a) Make sure foil is not raised from its original shape.

(b) No holes in foil.

(c) If signs of leakage are found, the leak must be repaired and test done again.

B. Test Manual Override Button

(1) Place fuel shutoff lever in OFF position.

(2) Make certain ignition selector switch is OFF.

CAUTION: USE ONLY HAND PRESSURE TO DEPRESS OVERRIDE BUTTON. USE OF SCREWDRIVER OR OTHER TYPE OF PRYING DEVICE TO DEPRESS OVERRIDE BUTTON CAN DEFORM SLENDER PIN MECHANISM INSIDE VALVE. A DEFORMED OVERRIDE BOTTOM PIN CAN HOLD SOLENOID SWITCHER BALL OFF ITS SEAT WHICH ALLOWS VALVE TO OPEN UNCOMMANDED WHEN AIR PRESSURE IS AVAILABLE TO ENGINE START VALVE. IF UNDETECTED OR UNCORRECTED, THIS CONDITION WILL RESULT IN SIGNIFICANT DAMAGE TO ENGINE STARTER.

(3) With electrical buses energized and regulated pneumatic supply of 36(±5) psig (248.4(±34.5) kPa) supplied to starter system, push manual override button and hold for approximately 30 seconds, or until engine stabilizes.

NOTE: The normal stroke of the override button is approximately 1/16 inch. If the button stroke appears greater than 1/16 inch or if the return action appears sticky, then a deformed override button pin should be suspected.

(4) Release manual override button.

NOTE: If the starter air shutoff valve butterfly should stick during test, free butterfly as follows.

(5) Open or close valve as necessary using a suitable wrench on wrenching flats located on position indicator shaft end. (Figure 201)

CAUTION: DO NOT EXCEED TORQUE OF 230 INCH-POUNDS (25.99N·M) WHEN MANUALLY OPENING OR CLOSING VALVE WITH WRENCH.

WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 880, 881, 883, 884, 886, 887, 891, 892

CAUTION: IF STARTER SHUTOFF VALVE HAS BEEN WRENCHED OPEN, VISUALLY CHECK VALVE POSITION INDICATOR TO ENSURE IT CLOSES WHEN WRENCH IS REMOVED. STARTER CAN FAIL DUE TO AN OVER-SPEED CONDITION IF SHUTOFF VALVE IS NOT CLOSED. WRENCH VALVE CLOSED IF NECESSARY.

WJE ALL

CAUTION: BEFORE CLOSING VALVE WITH WRENCH, CLOSE ENGINE PNEUMATIC CROSS-FEED VALVE OTHERWISE DAMAGE TO STARTER MAY OCCUR AS RESULT OF OVERSPEED CONDITION.

(6) Deenergize electrical buses.

(7) Enter ducting area with caution and check for leaks by inspecting aluminum foil for indication of leakage as follows:

(a) Make sure foil is not raised from its original shape.

(b) No holes in foil.

(c) If signs of leakage are found, the leak must be repaired and test done again.

(8) Remove the aluminum foil upon completion of the test procedure.

6. Removal/Installation Pressure Relief Valve

NOTE: The following procedures only apply to later aircraft or aircraft with SB 80-14 incorporated.

A. Remove Relief Valve (Figure 202)

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893 (Continued)

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Disconnect sensing line from relief valve.

(6) Loosen jamnut.

CAUTION: USE WRENCH TO HOLD HOUSING WHEN REMOVING RELIEF VALVE TO PREVENT DAMAGING HOUSING.

(7) Cut lockwire and remove relief valve from housing. Remove and discard packing.

(8) Remove housing from start valve. Remove and discard packing.

B. Install Relief Valve

(1) Make certain throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Install jamnut on housing nipple.

(4) Install new packing on housing nipple.

CAUTION: MAKE CERTAIN PRESSURE RELIEF VALVE EXHAUST FACE IS POINTED OUTBOARD (AWAY FROM ENGINE, FACING COWL DOOR) TO PREVENT HEAT DAMAGE TO ADJACENT COMPONENTS.

(5) Install housing into start valve port so that dimension between housing and start valve surface is approximately 1.50 inches (38.10 mm). (Figure 202)

CAUTION: USE WRENCH TO HOLD HOUSING WHEN TIGHTENING JAMNUT TO PREVENT DAMAGING HOUSING.

(6) Tighten jamnut to torque of 190 to 220 inch-pounds (21.47 to 24.86 N·m).

(7) Install new packing on relief valve nipple.

(8) Install relief valve into housing.

CAUTION: USE WRENCH TO HOLD HOUSING WHEN TIGHTENING RELIEF VALVE TO PREVENT DAMAGING HOUSING.

(9) Tighten relief valve to torque of 190 to 220 inch-pounds (21.47 to 24.86 N·m). Safety relief valve to housing with lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

(10) Connect sensing line to relief valve.

(11) Remove tag from throttle/thrust reverser lever.

(12) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

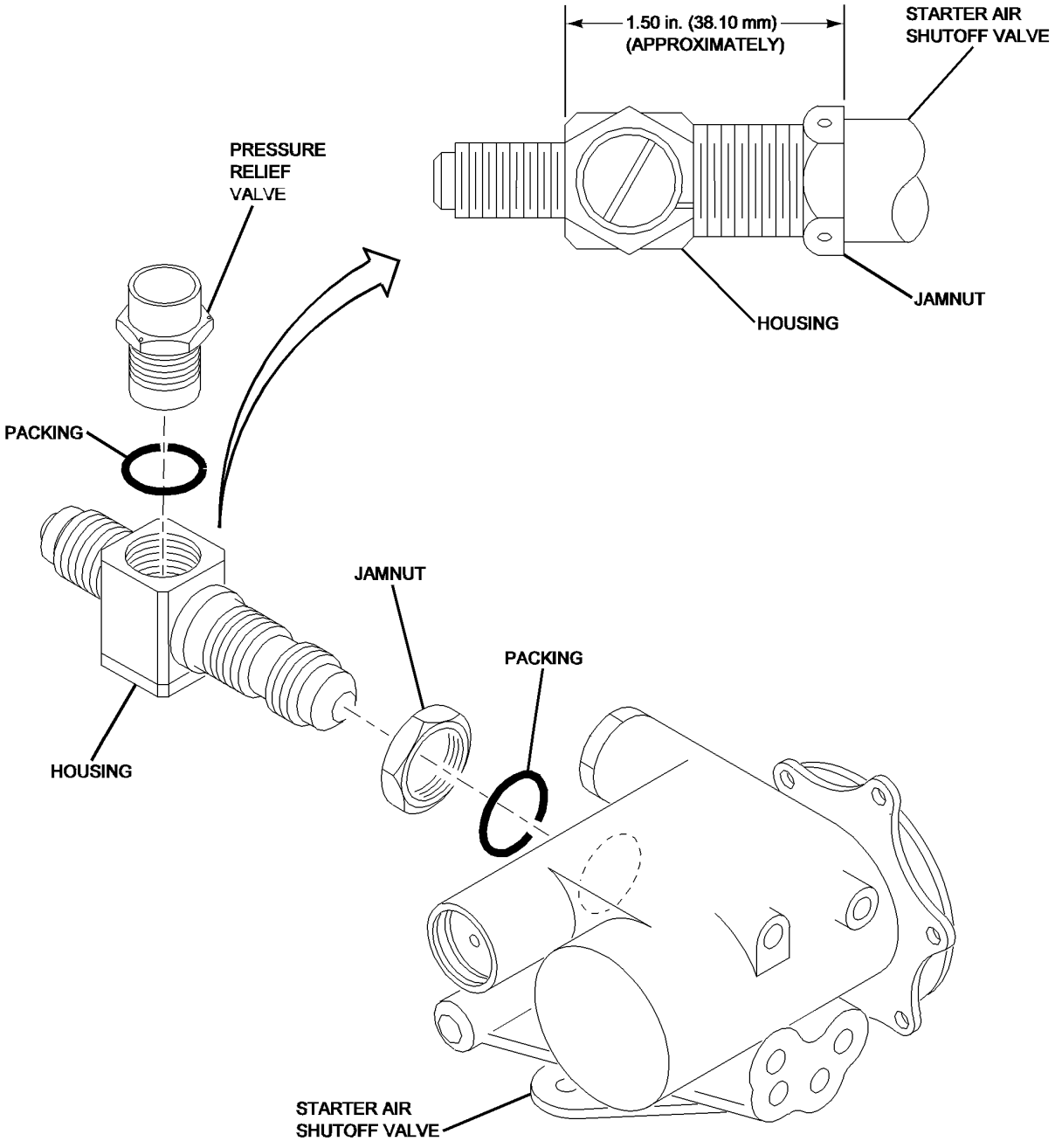
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(13) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(14) Close access door (5901C) for left engine or (5902C) for right engine.

(15) Check relief valve connections for leaks using test procedures located in Paragraph 5..



Pressure Relief Valve -- Removal/Installation (Applicable on later aircraft or aircraft with SB 80-14 incorporated)
Figure 202/80-10-02-990-803

7. Removal/Installation Remote Override Control Mechanism

NOTE: The remote override control mechanism is not installed on all engine start valves and is only limited to certain configurations.

A. Remove Control Mechanism (Figure 203)

(1) Tag throttle/thrust reverser lever.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Open access door (5901C) for left engine or (5902C) for right engine.

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(4) Place thrust reverser control valve in dump position and install lockpin. (PAGEBLOCK 78-00-00/201)

(5) Remove lockwire from 2 screws installed on remote override control mechanism.

(6) Remove screws and remove control mechanism from solenoid.

B. Install Control Mechanism

(1) Make certain that throttle/thrust reverser lever is tagged.

WARNING: MAKE CERTAIN CIRCUIT BREAKERS ARE OPEN BEFORE ATTEMPTING MAINTENANCE PROCEDURES. INADVERTENT ENGINE START OR REVERSER OPERATION COULD RESULT IN DEATH OR SERIOUS INJURY TO PERSONNEL.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Make sure that these circuit breakers are open and have safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893 (Continued)

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

(3) Install control mechanism on solenoid with screws so that lower arm is clear of override switch button.

(4) Tighten screws and safety using .032 lockwire. (LOCKWIRE SAFETYING - MAINTENANCE PRACTICES, PAGEBLOCK 20-10-18/201)

NOTE: Control mechanism should be free from binding, and the spring should return control mechanism to off position automatically when arm is released.

(5) Remove tag from throttle/thrust reverser lever.

(6) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

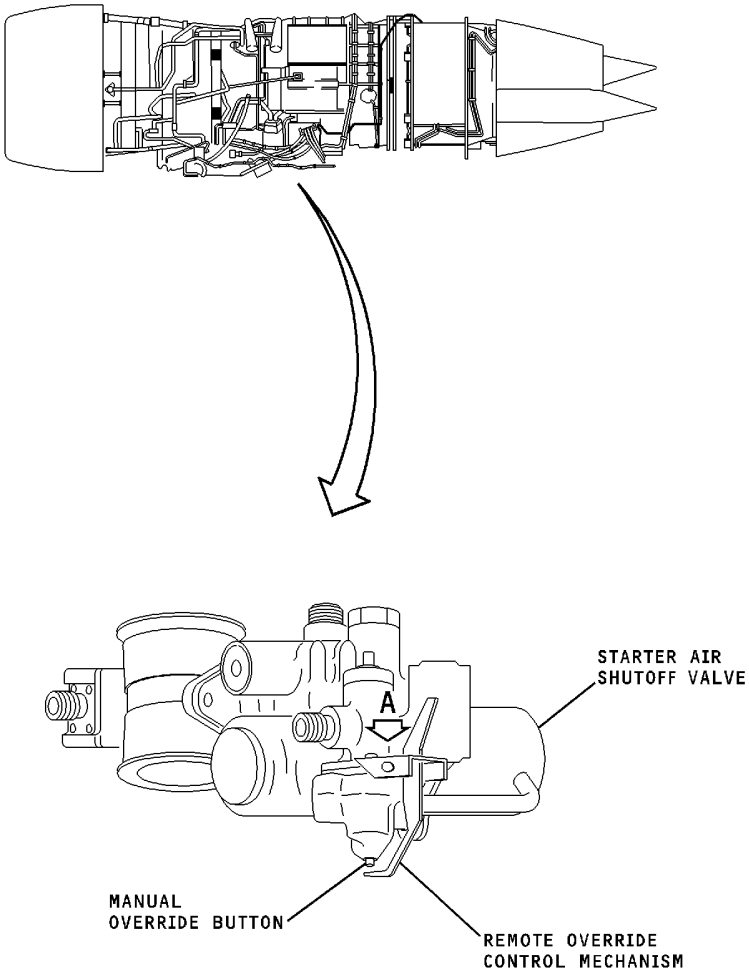
UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(7) Remove lockpin from thrust reverser control valve. Stow lockpin. (PAGEBLOCK 78-00-00/201)

(8) Close access door (5901C) for left engine or (5902C) for right engine.



Remote Override Control Mechanism Removal/Installation
Figure 203/80-10-02-990-805

STARTER AIR SHUTOFF VALVE - INSPECTION/CHECK

1. General

A. This procedure contains MSG-3 task card data.

TASK 80-10-02-211-801

2. Detailed Inspection of the Engine Start Valve Inline Filter Element

NOTE: This procedure is a scheduled maintenance task.

A. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
SPL-1024	Wrench - Torque, 0-100 ft-lbs (0 to 135.58 N·m) in 1 ft-lb Steps **MD80-81, -82, -83, -88** Part #: TE-100 Supplier: 55719
STD-566	Lens - Magnifying, 5x
STD-858	Tag - DO NOT OPERATE
STD-1081	Flashlight - Explosion Proof
STD-4406	Brush - Bristle, Soft, Natural

B. Consumable Materials

NOTE: Equivalent replacements are permitted for the items that follow.

NOTE: It is possible that some materials in the Consumable Materials chart cannot be used for some or all of the necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Reference	Description	Specification
B60101	Solvent, Degreasing (Type 2)	DPM 518 (MIL-PRF-680, Type 2)
G60037	Air - Pure Dry	DPM 5148
G60170	Lockwire - .032 Inconel Annealed	DPM 684 (NASM20995N)
G60803	Lockwire - Stainless Steel, 316 (0.032 in. diameter)	DPM 5865 (NASM20995C32)

C. Prepare Engine Start Valve Inline Filter Element for Detailed Inspection

SUBTASK 80-10-02-040-001

(1) Attach a DO NOT OPERATE tag, STD-858 to the throttle/thrust reverser lever.

SUBTASK 80-10-02-865-001

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

SUBTASK 80-10-02-010-001

(3) Open access door.

(4) Open lower cowl door.

SUBTASK 80-10-02-040-002

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(5) Place thrust reverser control valve in dump position and install lockpin.

D. Detailed Inspection of the Engine Start Valve Inline Filter Element

SUBTASK 80-10-02-020-001

(1) Remove the inline filter as follows: (Figure 601)

(a) Disconnect sensing line from filter.

(b) Cut lockwire and remove screen element and metal O-ring from filter case.

(c) Discard metal O-ring.

SUBTASK 80-10-02-110-001

WARNING: P-D-680 TYPE 1 SOLVENT IS AN AGENT THAT IS FLAMMABLE AND POISONOUS. MAKE SURE ALL PERSONS OBEY ALL OF THE PRECAUTIONS WHEN P-D-680 TYPE 1 SOLVENT IS USED.

- DO NOT USE IN AREAS WHERE THERE IS HIGH HEAT, SPARKS, OR FLAMES.
- USE IN AN AREA OPEN TO THE AIR.
- CLOSE THE CONTAINER WHEN NOT USED.
- DO NOT GET P-D-680 TYPE 1 SOLVENT IN THE EYES, ON THE SKIN, OR ON YOUR CLOTHES.
- DO NOT BREATHE THE GAS.

WARNING: REFER TO THE APPLICABLE MANUFACTURER'S OR SUPPLIER'S MSDS FOR:

- MORE PRECAUTIONARY DATA
- APPROVED SAFETY EQUIPMENT
- EMERGENCY MEDICAL AID.

TALK WITH THE LOCAL SAFETY DEPARTMENT OR AUTHORITIES FOR THE PROCEDURES TO DISCARD THIS HAZARDOUS AGENT.

(2) Clean screen element and case with Degreasing Solvent, B60101 and a brush, STD-4406.

(3) Dry screen element and case with pure dry air, G60037. Use air to blow out debris in inlet and outlet ports. Allow parts to dry in ambient air.

NOTE: Air pressure is restricted to a maximum of 15 psi.

SUBTASK 80-10-02-211-001

(4) With an explosion proof flashlight, STD-1081 and a 5x magnifying lens, STD-566, do a close visual inspection of the starter air shutoff valve inline filter for deterioration, corrosion, obvious damage and general condition.

SUBTASK 80-10-02-420-001

(5) Install screen element and new metal O-ring in filter case. Using a torque wrench 0 to 100 ft-lbs (0 to 135.58 N·m), SPL-1024, torque element to 65 ft-lb (88 N·m) to 75 ft-lb (102 N·m). Lockwire filter element to case with .032 inconel lockwire, G60170 or lockwire, G60803

(6) Connect sensing line to filter.

E. Job Close-up

SUBTASK 80-10-02-440-001

(1) Remove the DO NOT OPERATE tag, STD-858 from the throttle/thrust reverser lever.

SUBTASK 80-10-02-865-002

(2) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

SUBTASK 80-10-02-440-002

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(3) Remove lockpin from thrust reverser control valve. Stow lockpin.

SUBTASK 80-10-02-410-001

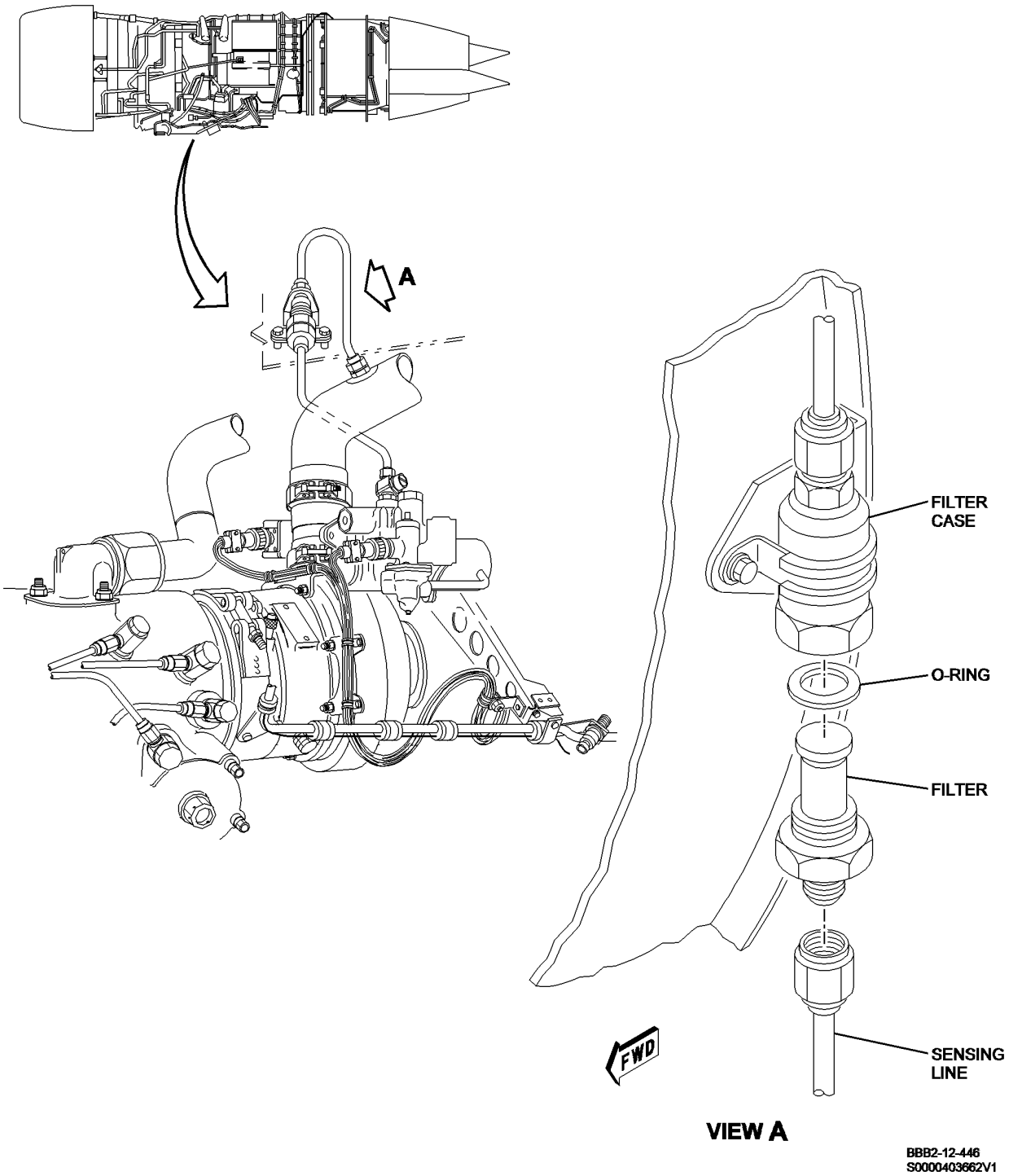
(4) Close access door.

(5) Close lower cowl door.

SUBTASK 80-10-02-942-001

(6) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———



STARTER AIR SHUTOFF INLINE FILTER
Figure 601/80-10-02-990-816

STARTER AIR SHUTOFF VALVE - REMOVAL/INSTALLATION

1. General

A. This procedure contains MSG-3 task card data.

TASK 80-10-02-901-801

2. Discard the Engine Start Valve Inline Filter Element

NOTE: This procedure is a scheduled maintenance task.

A. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
SPL-1024	Wrench - Torque, 0-100 ft-lbs (0 to 135.58 N·m) in 1 ft-lb Steps **MD80-81, -82, -83, -88** Part #: TE-100 Supplier: 55719
STD-858	Tag - DO NOT OPERATE

B. Consumable Materials

NOTE: Equivalent replacements are permitted for the items that follow.

NOTE: It is possible that some materials in the Consumable Materials chart cannot be used for some or all of the necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Reference	Description	Specification
G60170	Lockwire - .032 Inconel Annealed	DPM 684 (NASM20995N)

C. Prepare to Discard the Starter Air Shutoff Valve Inline Filter Element

SUBTASK 80-10-02-840-001

(1) Attach a DO NOT OPERATE tag, STD-858 to the throttle/thrust reverser lever.

SUBTASK 80-10-02-865-003

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT

WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883 (Continued)

(Continued)

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

SUBTASK 80-10-02-010-002

(3) Open access door.

(4) Open lower cowl door.

SUBTASK 80-10-02-840-002

WARNING: MAKE CERTAIN THAT THRUST REVERSER HYDRAULIC SYSTEM HAS DEPRESSURIZED BY CHECKING THRUST REVERSER ACCUMULATOR PRESSURE GAGE AFTER CONTROL VALVE ARM HAS BEEN LOCKPINNED IN DUMP POSITION. GAGE SHOULD READ 950 TO 1050 PSI (6550 TO 7239 KPA) (PRECHARGE PRESSURE).

(5) Place thrust reverser control valve in dump position and install lockpin.

D. Discard the Starter Air Shutoff Valve Inline Filter Element

SUBTASK 80-10-02-020-002

(1) Remove the inline filter as follows:(Figure 401)

(a) Disconnect sensing line from filter.

(b) Cut lockwire and remove screen element and metal O-ring from filter case.

(c) Discard metal O-ring.

SUBTASK 80-10-02-901-001

(2) Discard the inline filter.

SUBTASK 80-10-02-420-002

(3) Install new screen element and new metal O-ring in filter case. Using a torque wrench 0 to 100 ft-lbs (0 to 135.58 N·m), SPL-1024, torque element to 65 ft-lb (88 N·m) to 75 ft-lb (102 N·m). Lockwire filter element to case with .032 inconel lockwire, G60170.

(4) Connect sensing line to filter.

E. Job Close-up

SUBTASK 80-10-02-840-003

(1) Remove the DO NOT OPERATE tag, STD-858 from the throttle/thrust reverser lever.

SUBTASK 80-10-02-865-004

(2) Remove the safety tags and close these circuit breakers:

LOWER EPC, DC TRANSFER BUS

Row	Col	Number	Name
U	40	B1-40	ENGINE START PUMP
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	41	B1-2	ENGINE IGNITION RIGHT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	41	B1-423	ENGINE START VALVE RIGHT
WJE 401-404, 412, 414, 875, 876, 878, 879, 881, 883			
U	42	B1-872	ENG START VALVE LEFT & RIGHT
WJE 415-427, 429, 861-866, 868, 869, 871-874, 891			
U	42	B1-1	ENGINE IGNITION LEFT
WJE 405-408, 410, 411, 877, 880, 884, 886, 887, 892, 893			
U	42	B1-422	ENGINE START VALVE LEFT

LOWER EPC, ENGINE - LEFT DC BUS

Row	Col	Number	Name
WJE 405, 407-409, 411, 416, 420, 422, 424-427, 429, 861, 862, 868, 873, 874, 880, 881, 883, 884, 891-893			
S	32	B1-288	LEFT START VALVE OPEN ADVISORY

LOWER EPC, ENGINE - RIGHT DC BUS

Row	Col	Number	Name
T	32	B1-289	RIGHT START VALVE OPEN ADVISORY

UPPER EPC, ENGINE - LEFT AC BUS

Row	Col	Number	Name
WJE ALL			
K	26	B1-424	LEFT ENGINE IGNITION

UPPER EPC, ENGINE - RIGHT AC BUS

Row	Col	Number	Name
L	26	B1-425	RIGHT ENGINE IGNITION

SUBTASK 80-10-02-840-004

WARNING: MAKE CERTAIN THROTTLE/THRUST REVERSER LEVER POSITION CORRESPONDS WITH THRUST REVERSER DOOR POSITION AND THAT ALL PERSONNEL AND EQUIPMENT ARE WELL CLEAR OF THRUST REVERSER BEFORE OPERATION. ANY TIME THAT THRUST REVERSER CONTROL VALVE IS NOT IN DUMP POSITION, 3000 PSI (20,700 KPA) IS AVAILABLE AND WILL MOVE REVERSER DOORS IN RESPONSE TO THROTTLE/THRUST REVERSER LEVER MOVEMENT REGARDLESS OF WHETHER ANY ELECTRICAL OR HYDRAULIC POWER IS SUPPLIED TO AIRCRAFT.

(3) Remove lockpin from thrust reverser control valve. Stow lockpin.

SUBTASK 80-10-02-410-002

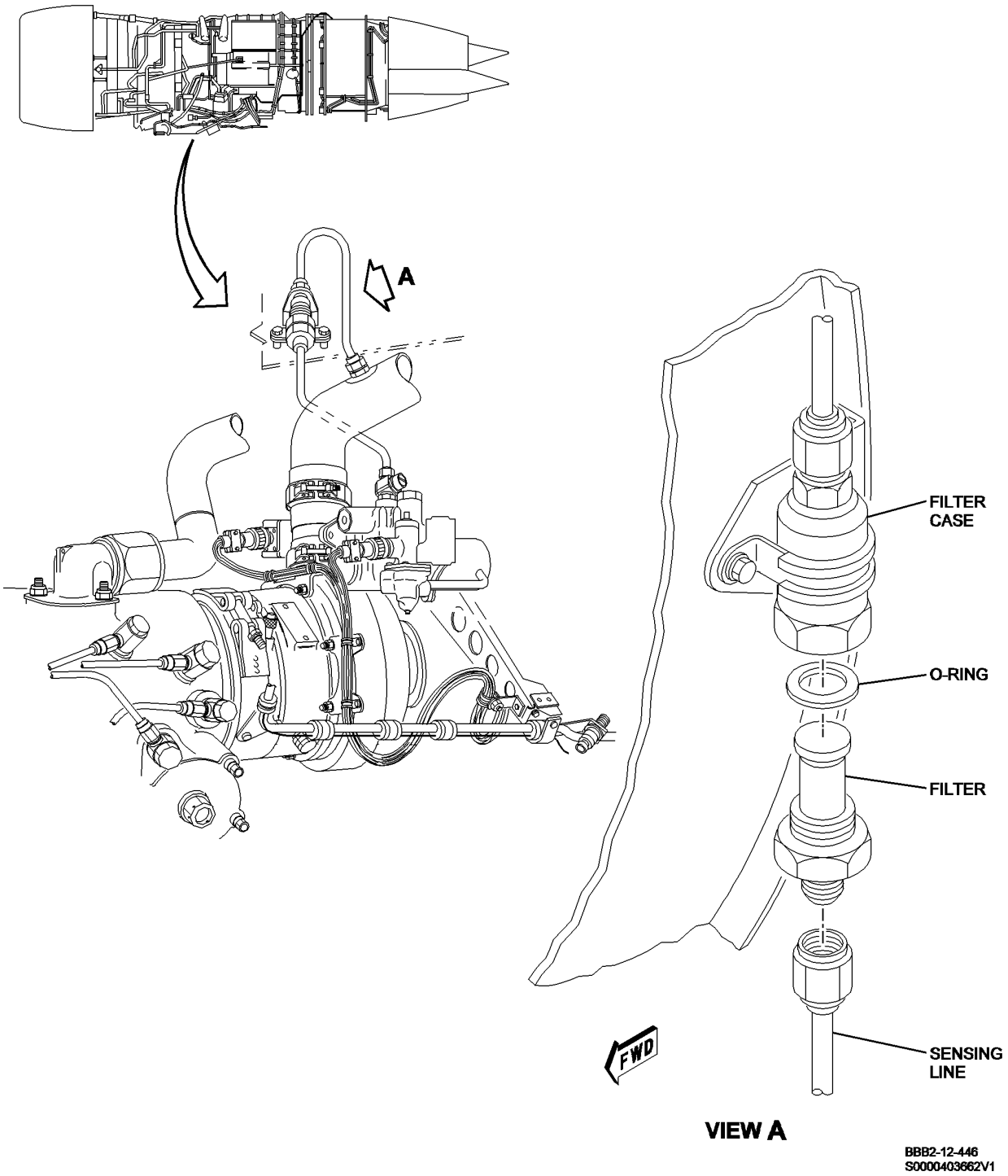
(4) Close access door.

(5) Close lower cowl door.

SUBTASK 80-10-02-942-002

(6) Remove all the tools and equipment from the work area. Make sure the area is clean.

——— END OF TASK ———



STARTER AIR SHUTOFF INLINE FILTER
Figure 401/80-10-02-990-817