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CHAPTER 74 - IGNITION

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CHAPTER 74 - IGNITION

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IGNITION - DESCRIPTION AND OPERATION

1. General
   A. The ignition system provides the means of initiating combustion for engine starting or in-flight relighting and maintaining combustion in adverse conditions.
   B. The ignition system utilizes an ignition power supply (Ref 74-11-00), high tension distribution system (Ref 74-21-00) and engine ignition control system (Ref 74-31-00) to obtain a spark to ignite the fuel.
   C. The power supply system comprises two high energy (H.E.) ignition units which are supplied with electrical power from the aircraft system via the appropriate branch of the engine electrical harness. The ignition units step up the voltage and supply high tension power to the distribution system.
   D. The high tension distribution system comprises two H.E. igniter plugs and two H.E. igniter leads. The leads convey the high tension electrical supply from the ignition units to the igniter plugs where it is dissipated in the form of an intense spark.
   E. The engine ignition control is provided by the engine start switch and ignition selection switch. With these switches properly positioned, electrical power is supplied to the exciters for use in engine ignition.

IGNITION - ADJUSTMENT/TEST

1. General
   A. Each engine has two independent ignition systems.
   B. Each ignition system has one igniter.
   C. One of the two or each of the two systems can be used by a multiple position switch on the overhead panel P5.

   TASK 74-00-00-705-001-R00

2. Audible Test - Ignition System
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 71-00-00/201, Power Plant
      (3) AMM 71-11-04/201, Fan Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser
   B. Access
      (1) Location Zones
          415 Thrust Reverser (Left)
          416 Thrust Reverser (Right)
          425 Thrust Reverser (Left)
          426 Thrust Reverser (Right)

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

   C. Procedure

      S 865-010-R00

      WARNING: DO NOT DO A CHECK OF THE IGNITION SYSTEM WHEN YOU HAVE ANY OF THE CONDITIONS THAT FOLLOW:
      - THE AIRPLANE IS IN THE HANGAR,
      - THE AIRPLANE IS NEAR BUILDINGS AND/OR OTHER AIRPLANES THAT ARE WITHIN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201), OR
      - DURING AIRPLANE FUELING.

      WARNING: MAKE SURE THAT NO PERSONS OR EQUIPMENT ARE IN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201) OF THE APPLICABLE ENGINE.

      WARNING: IGNITION VOLTAGE IS VERY DANGEROUS. DO NOT TOUCH THE IGNITER PLUGS, THE ENERGIZED PART OF THE IGNITION EXCITER OR THE LEADS DURING OPERATION.

      (1) Make sure the conditions around the airplane are correct before you do the test.

S 865-034-R00

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

CAUTION: BEFORE YOU TEST THE IGNITION SYSTEM, DRY MOTOR THE ENGINE TO REMOVE UNBURNED FUEL (AMM 71-00-00/201). UNBURNED FUEL CAN CAUSE AN INTERNAL ENGINE FIRE OR A TURBINE EXHAUST AREA FIRE.

MAKE SURE N3 ROTOR DOES NOT TURN WHEN YOU DO THE TEST OF THE IGNITION SYSTEM. IF N3 ROTOR TURNS, FUEL CAN GO INTO THE COMBUSTION CHAMBER WHEN THE FUEL CONTROL SWITCH IS PUT TO THE RUN POSITION. AN ACCIDENTAL ENGINE LIGHTUP CAN OCCUR.

(2) Do the procedure to dry motor the engine to clear the gas path of remaining fuel (AMM 71-00-00/201).

S 015-038-R00

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

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

NOTE: It is not necessary to open the fan cowl panels and the thrust reversers if the ambient noise level permits you to hear the ignition fire during the audible test.

S 015-039-R00

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

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

S 865-012-R00

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

S 865-013-R00

(6) Make sure these circuit breakers are closed:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11J2, EICAS CMPTR LEFT
      2) 11J3, EICAS UPPER DISPLAY
      3) 11J29, EICAS CMPTR RIGHT
      4) 11J30, EICAS LOWER IND

5) 11J31, EICAS DISPLAY SW
6) 11J32, EICAS PILOTS DISPLAY

S 865-014-R00
(7) Make sure the FUEL CONTROL switch is in the CUTOFF position.

S 865-015-R00
(8) For the left engine, make sure these circuit breakers are closed:
(a) P6-1 Main Power Distribution Panel
1) 6C1, FUEL COND CONT L
2) 6E1, FUEL VALVES L SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D7, ENGINES STBY IGN LEFT 1
2) 11D8, ENGINES STBY IGN LEFT 2
3) 11D19, ENGINE START CONT LEFT
4) 11L1, LEFT ENGINE IGN 1

S 865-016-R00
(9) For the right engine, make sure these circuit breakers are closed:
(a) P6-1 Main Power Distribution Panel
1) 6C2, FUEL COND CONT R
2) 6E2, FUEL VALVES R SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D9, ENGINES STBY IGN RIGHT 1
2) 11D10, ENGINES STBY IGN RIGHT 2
3) 11D20, ENGINE START CONT RIGHT
4) 11L28, RIGHT ENGINE IGN 1

S 865-017-R00
(10) Make sure the ENG VALVE, SPAR VALVE and the engine start VALVE lights are off.

S 865-018-R00
(11) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
(a) P6-1 Main Power Distribution Panel
1) 6C1, FUEL COND CONT L
2) 6E1, FUEL VALVES L SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D19, ENGINE START CONT LEFT

S 865-019-R00
(12) For the right engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
(a) P6-1 Main Power Distribution Panel
1) 6C2, FUEL COND CONT R
2) 6E2, FUEL VALVES R SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D20, ENGINE START CONT RIGHT

S 715-006-R00

(13) Do these steps to do the audible test:
  (a) Put the FUEL CONT switch to the RUN position.
  (b) Put the ignition select switch to 1.

CAUTION: DO NOT OPERATE THE IGNITERS FOR MORE THAN 10 SECONDS AT A TIME. THE IGNITION COMPONENTS MAY OVERHEAT.

  (c) Put the ENGINE START switch to the GND position.
  (d) Make sure the igniter plug fires.

NOTE: You can hear the igniter plug fire when you are near the engine.

  (e) Make sure the EICAS message IGN STBY BUS is not shown.
  (f) Put the ENGINE START switch to the OFF position.
  (g) Put the ignition select switch to 2.
  (h) Put the ENGINE START switch to the GND position.
  (i) Make sure the igniter plug fires.
  (j) Put the ENGINE START switch to the OFF position.
  (k) Put the FUEL CONT switch to the CUTOFF position.

S 865-036-R00

(14) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
  (a) P6-1 Main Power Distribution Panel
    1) 6C1, FUEL COND CONT L
    2) 6E1, FUEL VALVES L SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D19, ENGINE START CONT LEFT

S 865-020-R00

(15) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
  (a) P6-1 Main Power Distribution Panel
    1) 6C2, FUEL COND CONT R
    2) 6E2, FUEL VALVES R SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D20, ENGINE START CONT RIGHT

S 415-042-R00

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

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

S 415-043-R00

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

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

S 715-029-R00

(18) If necessary, do the task: Operational Test - Ignition System.

NOTE: If you do no more tests, do the steps that close the fan reversers. If you will do more test, let the fan reverser stay open and continue.

S 865-037-R00

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

TASK 74-00-00-705-009-R00

3. Operational Test - Ignition System

A. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/201, Power Plant
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser

B. Access

(1) Location Zones

415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

(2) Access Panels

415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

C. Procedure

S 865-011-R00

WARNING: DO NOT DO A CHECK OF THE IGNITION SYSTEM WHEN YOU HAVE ANY OF THE CONDITIONS THAT FOLLOW:

- THE AIRPLANE IS IN THE HANGAR,
- THE AIRPLANE IS NEAR BUILDINGS AND/OR OTHER AIRPLANES THAT ARE WITHIN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201), OR
- DURING AIRPLANE FUELING.

MAKE SURE THAT NO PERSONS OR EQUIPMENT ARE IN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201) OF THE APPLICABLE ENGINE.

IGNITION VOLTAGE IS VERY DANGEROUS. DO NOT TOUCH THE IGNITER PLUGS, THE ENERGIZED PART OF THE IGNITION EXCITER OR THE LEADS DURING OPERATION.

(1) Make sure the conditions around the airplane are correct before you do the test.

S 865-035-R00

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

CAUTION: BEFORE YOU TEST THE IGNITION SYSTEM, DRY MOTOR THE ENGINE TO REMOVE UNBURNED FUEL (AMM 71-00-00/201). UNBURNED FUEL CAN CAUSE AN INTERNAL ENGINE FIRE OR A TURBINE EXHAUST AREA FIRE.

MAKE SURE THE N3 ROTOR DOES NOT TURN WHEN YOU DO THE TEST OF THE IGNITION SYSTEM. IF N3 ROTOR TURNS, FUEL CAN GO INTO THE COMBUSTION CHAMBER WHEN THE FUEL CONTROL SWITCH IS PUT TO THE RUN POSITION. AN ACCIDENTAL ENGINE LIGHTUP CAN OCCUR.

(2) Do the procedure to dry motor the engine to clear the gas path of remaining fuel (AMM 71-00-00/201).

S 865-005-R00

(3) Do these steps to prepare for the operation test:
(a) If it is necessary, open the applicable thrust reverser.

NOTE: Noise levels can make it necessary to open the thrust reverser to do the operational test of the ignition system.

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

S 015-040-R00

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

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

S 015-041-R00

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

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

S 865-022-R00

(6) Make sure these circuit breakers are closed:
  (a) P11 Overhead Circuit Breaker Panel
    1) 11J2, EICAS CMPTR LEFT
    2) 11J3, EICAS UPPER IND
    3) 11J29, EICAS CMPTR RIGHT
    4) 11J30, EICAS LOWER DISPLAY
    5) 11J31, EICAS DISPLAY SW
    6) 11J32, EICAS DISPLAY SELECT

S 865-021-R00

(7) Make sure the FUEL CONTROL switch is in the CUTOFF position.

S 865-023-R00

(8) For the left engine, make sure these circuit breakers are closed:
  (a) P6-1 Main Power Distribution Panel
    1) 6C1, FUEL COND CONT L
    2) 6E1, FUEL VALVES L SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D7, ENGINES STBY IGN LEFT 1
    2) 11D8, ENGINES STBY IGN LEFT 2
    3) 11D19, ENGINE START CONT LEFT
    4) 11L1, LEFT ENGINE IGN 1

S 865-024-R00

(9) For the right engine, make sure these circuit breakers are closed:
  (a) P6-1 Main Power Distribution Panel
    1) 6C2, FUEL COND CONT R
    2) 6E2, FUEL VALVES R SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D9, ENGINES STBY IGN RIGHT 1
    2) 11D10, ENGINES STBY IGN RIGHT 2
    3) 11D20, ENGINE START CONT RIGHT
    4) 11L28, RIGHT ENGINE IGN 1

S 865-025-R00
(10) Make sure the ENG VALVE, SPAR VALVE and the engine start VALVE lights are off.

S 865-026-R00
(11) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
  (a) P6-1 Main Power Distribution Panel
    1) 6C1, FUEL COND CONT L
    2) 6E1, FUEL VALVES L SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D19, ENGINE START CONT LEFT

S 865-027-R00
(12) For the right engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:
  (a) P6-1 Main Power Distribution Panel
    1) 6C2, FUEL COND CONT R
    2) 6E2, FUEL VALVES R SPAR
  (b) P11 Overhead Circuit Breaker Panel
    1) 11D20, ENGINE START CONT RIGHT

S 715-047-R00
(13) Do the following steps to test the system:
  (a) Put the FUEL CONT switch to the RUN position.
  (b) Put the ignition select switch to the 1, 2 or BOTH position.
  (c) Put the ENGINE START switch to the FLT position.
  (d) Make sure the igniter plug fires.
  (e) Make sure the EICAS message IGN STBY BUS is not shown.
  (f) Put the ENGINE START switch to the OFF position.
  (g) Put the ignition select switch to 1.
  (h) Put the ENGINE START switch to the CONT position.
  (i) Make sure the igniter plugs fire.
  (j) Make sure the EICAS message IGN STBY BUS is not shown.
  (k) Put the ENGINE START switch to the OFF position.
  (l) Put the ignition select switch to 2.
  (m) Put the ENGINE START switch to the CONT position.
  (n) Make sure the igniter plug fires.
  (o) Put the ENGINE START switch to the OFF position.
  (p) Put the ignition select switch to the BOTH position.
  (q) Put the ENGINE START switch to the CONT position.
  (r) Make sure the igniter plug fires.
  (s) Put the ENGINE START switch to the OFF position.
  (t) Put the ENGINE ANTI-ICE switchlight to the ON position.
  (u) Put the ignition select switch to 1.
  (v) Put the ENGINE START switch to the AUTO position.
  (w) Make sure the igniter plug fires.
  (x) Make sure the EICAS message IGN STBY BUS is not shown.
  (y) Put the ENGINE START switch to the OFF position.
  (z) Put the ignition select switch to 2.

(aa) Put the ENGINE START switch to the AUTO position.
(ab) Make sure the igniter plug fires.
(ac) Put the ENGINE START switch to the OFF position.
(ad) Put the ignition select switch to the BOTH position.
(ae) Put the ENGINE START switch to the AUTO position.
(af) Make sure the igniter plug fires.
(ag) Put the ENGINE START switch to the OFF position.
(ah) Put the ENGINE ANTI-ICE switchlight to the OFF position.
(ai) Put the FUEL CONT switch to the CUTOFF position.

S 865-031-R00

(14) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P6-1 Main Power Distribution Panel
1) 6C1, FUEL COND CONT L
2) 6E1, FUEL VALVES L SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D19, ENGINE START CONT LEFT

S 865-028-R00

(15) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P6-1 Main Power Distribution Panel
1) 6C2, FUEL COND CONT R
2) 6E2, FUEL VALVES R SPAR
(b) P11 Overhead Circuit Breaker Panel
1) 11D20, ENGINE START CONT RIGHT

S 415-044-R00

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

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

S 415-045-R00

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

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

TASK 74-00-00-715-008-R00

4. Ignition System Test (Optional)

A. General

(1) This task includes an optional procedure to to use an Ignition System Flight Line Tester for trouble-shooting of the ignition system.

B. Equipment

(1) Tester - Flight Line, Power -to- Lite

BF Goodrich, Aerospace
Engine Electrical Systems Division
Norwich Oxford Road
Norwich NY 13815

C. References

(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/201, Power Plant
(3) AMM 74-11-01/401, High Energy Ignition Unit
(4) AMM 74-21-01/401, Igniter Lead
(5) AMM 74-21-02/401, Igniter Plug.

D. Access

(1) Location Zones

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

E. Ignition System - Optional Trouble-Shooting with the Flight Line Tester

NOTE: This procedure is done when there is a problem with the ignition system to find which part of the ignition system is unsatisfactory.

S 215-009-R00

(1) Visually examine the ignition system.
(a) Replace all components that are unsatisfactory.
(b) Make sure all connections are tight.

S 715-010-R00

WARNING: MAKE SURE THAT THE TESTER IS GROUNDED TO THE ENGINE. DO NOT TOUCH THE SENSOR BOX OR THE IGNITION CABLE WHILE THE IGNITION SYSTEM IS ENERGIZED. THE ELECTRICAL DISCHARGE FROM THE IGNITION SYSTEM CAN KILL YOU.

WARNING: DO NOT DO A CHECK OF THE IGNITION SYSTEM WHEN YOU HAVE ANY OF THE CONDITIONS THAT FOLLOW:
- THE AIRPLANE IS IN THE HANGAR,
- THE AIRPLANE IS NEAR BUILDINGS AND/OR OTHER AIRPLANES THAT ARE WITHIN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201), OR
- DURING AIRPLANE FUELING.

WARNING: MAKE SURE THAT NO PERSONS OR EQUIPMENT ARE IN THE JET-WAKE HAZARD AREA FOR GROUND IDLE (AMM 71-00-00/201) OF THE APPLICABLE ENGINE.

WARNING: IGNITION VOLTAGE IS VERY DANGEROUS. DO NOT TOUCH THE IGNITER PLUGS, THE ENERGIZED PART OF THE IGNITION UNIT OR THE LEADS DURING OPERATION.

(2) Do the steps that follow to do a test of the igniter lead and the ignition unit.
   (a) Disconnect the igniter lead cable from the igniter plug (AMM 74-21-01/401).

      NOTE: Do not touch the end of the igniter lead with your hands or with a dirty cloth. Oil or grease can cause the igniter lead to operate incorrectly.

      CAUTION: USE A WRENCH TO CONNECT THE IGNITER LEAD TO THE APPLICABLE REMOTE SENSOR BOX. IF YOU USE YOUR HAND, THE LOOSE CONNECTION WILL CAUSE RFI INTERFERENCE AND THE TEST BOX WILL SHUTDOWN AUTOMATICALLY.

   (b) Use a wrench to connect the igniter lead to the applicable remote sensor box.

      NOTE: The sensors have different connections for the different types of cable connectors. Make sure you use the correct sensor box.

   (c) Connect the sensor cable from the sensor box to the flight line tester.
   (d) Momentarily push the ON/OFF button to turn on the flight line tester.

(e) When the display shows "ENTER P/N TO TEST?", input the part number of the ignition unit.

NOTE: Use the manufacturer part number which is written on the installed ignition exciter. Do not use the Rolls-Royce number.

(f) Energize the ignition system.
(g) Push "ENTER" on the keypad.
(h) Allow the test box to measure the spark rate and energy of the system.

NOTE: The results will show on the LCD screen.

(i) Remove elecrical power from the ignition system.

S 715-011-R00

(3) If the system is unsatisfactory, do the steps that follow to do a test of the high energy ignition unit.
(a) Disconnect the igniter lead from the ignition unit.
(b) Connect the ignition unit to the tester, with the test cable.
(c) Push "ENTER" on the keyboard to show the "ENTER P/N TO TEST?" screen.
(d) Energize the ignition system.
(e) Push "ENTER" on the keyboard again to test the same ignition unit (same part number) again.
(f) Allow the test box to measure the spark rate and energy of the system.

NOTE: The results will show on the LCD screen.

(g) Remove electrical power from the ignition system.
(h) If the ignition unit is satisfactory, replace the igniter lead (AMM 74-21-01/401).
(i) If the ignition unit is unsatisfactory, replace the ignition unit (AMM 74-11-01/401).

S 425-012-R00

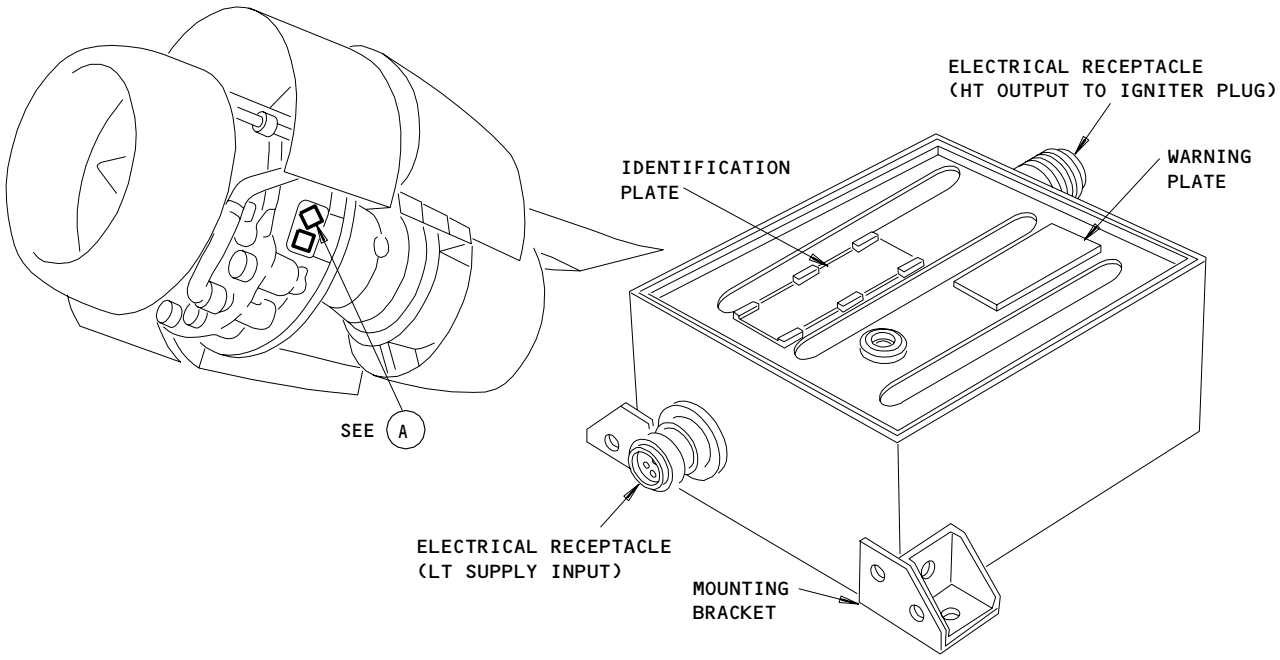
(4) If the igniter lead and the ignition unit are satisfactory, replace the igniter plug (AMM 74-21-02/401).

S 715-013-R00

(5) Do the operational test of the ignition system.

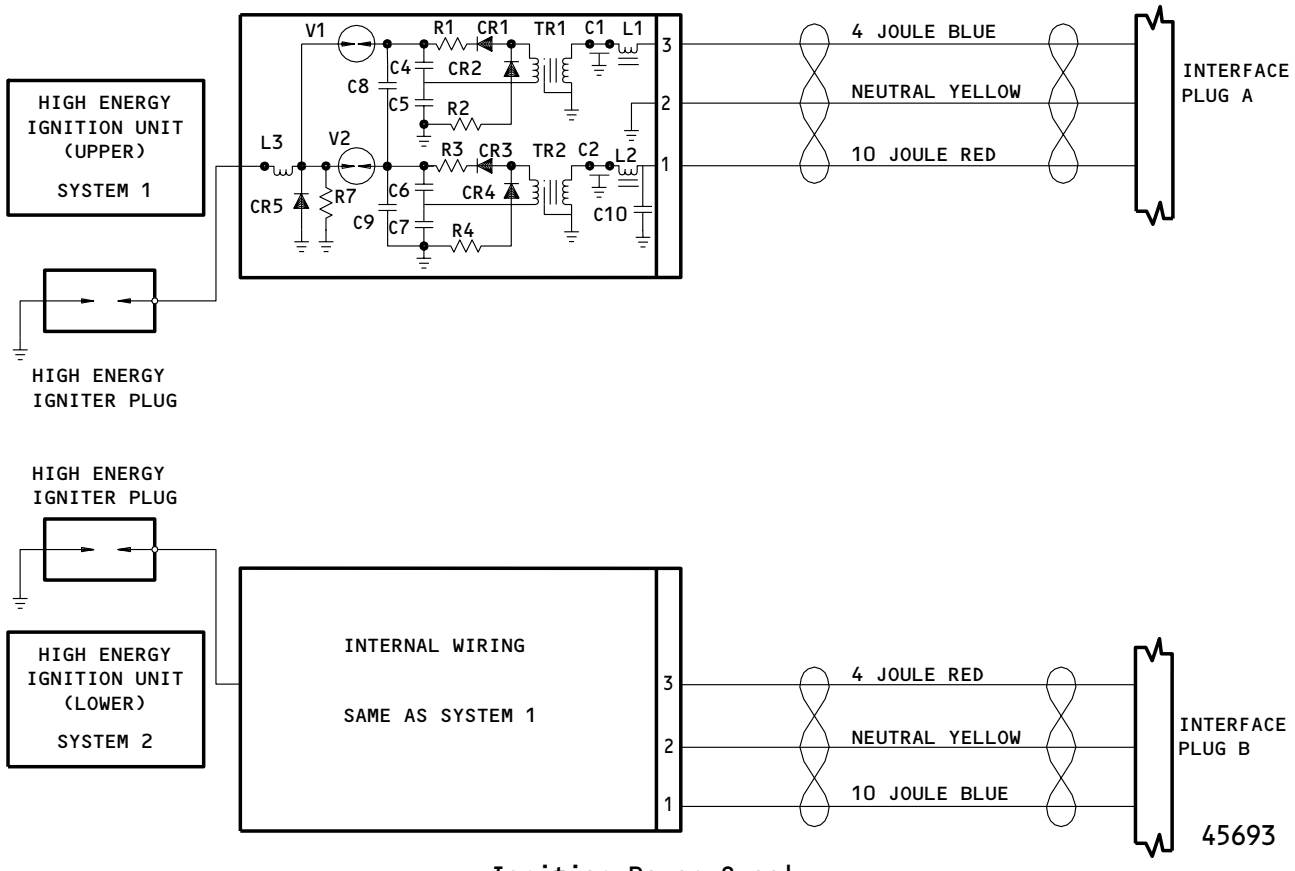
IGNITION POWER SUPPLY - DESCRIPTION AND OPERATION

1. General
   A. The ignition power supply consists of two separate high-energy ignition units for each engine. The units are mounted on the rear left-hand side of the LP compressor (fan) case.
   B. RB211-535E4 ENGINES PRE RR SB 72-C230 (PHASE II COMBUSTOR);
      The unit for system 1 is in the upper position and supplies the igniter plug located in No. 8 fuel spray nozzle. The unit for system 2 is in the lower position and supplies the igniter plug located in No. 12 fuel spray nozzle.
   C. RB211-535E4 ENGINES POST RR SB 72-C230 (PHASE V COMBUSTOR);
      The unit for system 1 is in the upper position and supplies the igniter plug located directly to the rear of the number 10 fuel spray nozzle. The unit for system 2 is in the lower position and supplies the igniter plug located directly to the rear of number 16 fuel spray nozzle.
   D. The unit for system 1 is in the upper position and supplies the igniter plug located in No. 8 fuel spray nozzle. The unit for system 2 is in the lower position and supplies the igniter plug located in No. 12 fuel spray nozzle.
2. Component Details (Fig. 1)
   A. High Energy Ignition Units
      (1) Each ignition unit comprises two semi-independent channels, one having a 10 joule capacitor and the other a 4 joule capacitor. During starting and in-flight relighting the 10 joule channel is used. When continuous ignition is selected the 4 joule channel is used.
      (2) Each ignition unit contains 2 transformers, 5 rectifiers, 9 capacitors, 5 resistors, 3 inductors and 2 barrier gaps. All components are enclosed in a housing having individual power input and high voltage output connections.
3. Operation
   A. Functional Description
      (1) When starting the engine, 115 V a.c. power is applied between pins 1 and 2, across the primary of transformer TR2. Voltage is stepped up by TR2 and supplied to a doubler circuit, comprising CR3, CR4, C6 and C7, which rectifies the current, further steps up the voltage and charges storage capacitor C9.
      (2) Capacitor C9 is charged until the voltage equals the discharge voltage of barrier gap V2. As the current from C9 through inductor L3 starts to decay, voltage is reversed on C9 and rectifier CR5 becomes conductive. The energy stored in C9 is discharged and 10 joule energy is supplied to the igniter plug through the igniter lead. Resistors R3 and R4 limit the current passing through the rectifiers during discharge of C9 when voltage is reversed.



HE IGNITION UNIT EXTERNAL VIEW

A



Ignition Power Supply
Figure 1

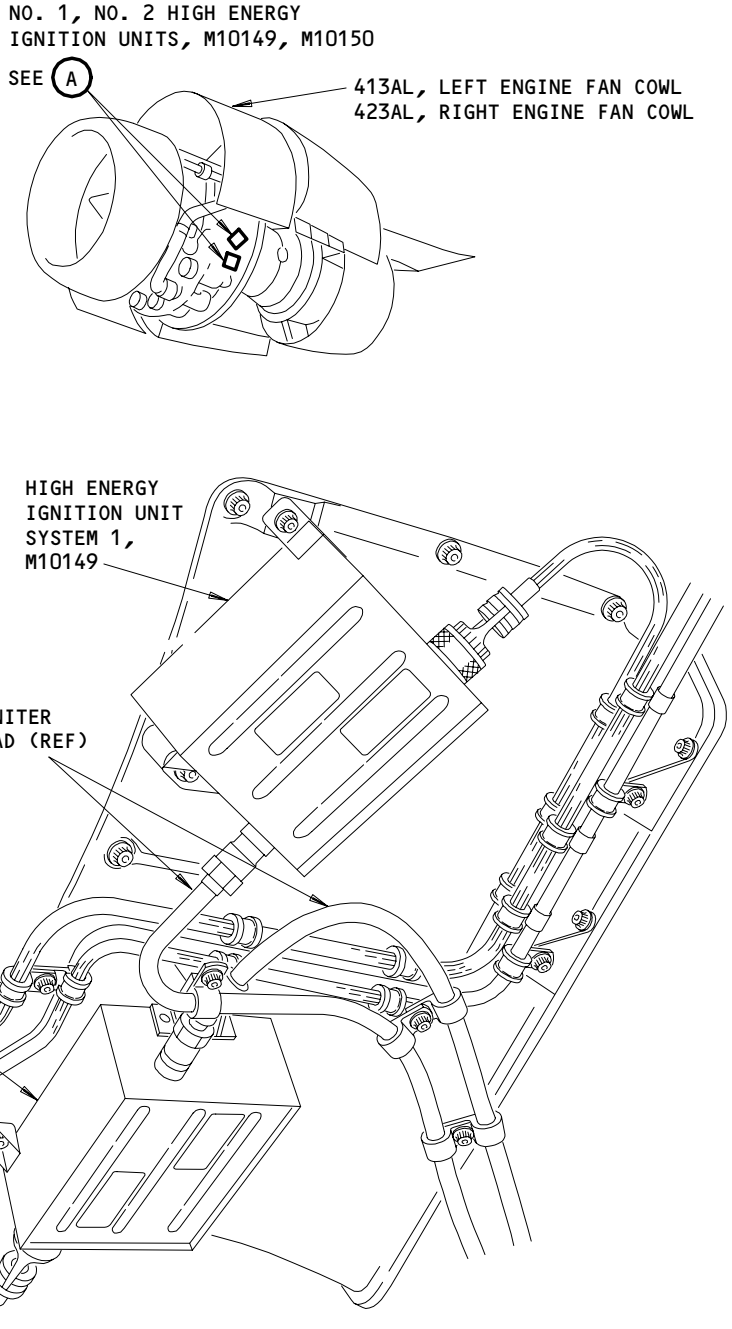
(3) When the engine is running and continuous ignition is selected, the input supply is applied between pins 2 and 3. Storage capacitor C8 is charged via transformer TR1, rectifiers CR1 and CR2, doubler capacitors C4 and C5 and current limiting resistors R1 and R2. The discharge is controlled by barrier gap V1. The energy stored in C8 is discharged and 4 joule energy is supplied for continuous ignition.

(4) Inductors L1 and L2 and feed-through capacitors C1 and C2 prevent feedback into the airplane electrical system. Inductors L1 and L2 also serve to limit spark rate variations. The breakdown voltage of barrier gap V1 is greater than that for V2, thus permitting two energy levels to feed one output circuit. Resistor R7 provides a discharge path in the event of an igniter plug failing to fire.

IGNITION POWER SUPPLY

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
RELAYS - (31-01-36/101) LEFT AUTO IGN CONT, K10401 LEFT BUS POWER SENSE, K10329 TRANSIENT PRESSURE UNIT, K10550 RELAYS - (31-01-37/101) RIGHT BUS POWER SENSE, K10331 RIGHT ENG AUTO IGN CONT, K10402 TRANSIENT PRESSURE UNIT, K10549				
UNIT - IGNITION 1, M10149	1	2	413AL, LEFT ENGINE FAN COWL, 423AL, RIGHT ENGINE FAN COWL	74-11-01
UNIT - IGNITION 2, M10150	1	2	413AL, LEFT ENGINE FAN COWL, 423AL, RIGHT ENGINE FAN COWL	74-11-01

Ignition Power Supply - Component Index
Figure 101



HIGH ENERGY IGNITION UNITS,
M10149, M10150
A

Ignition Power Supply - Component Location
Figure 102

HIGH ENERGY IGNITION UNITS - REMOVAL/INSTALLATION

TASK 74-11-01-004-001-R00

1. Remove the High Energy Ignition Unit

A. General

(1) The upper high energy ignition unit (HEIU) is used to power the system 1 igniter plug which is located next to the number 8 fuel spray nozzle. The lower HEIU is used to power the system 2 igniter plug which is located next to the number 12 fuel spray nozzle.

(2) The high energy ignition unit will be identified as the ignition unit in this procedure.

B. References

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

(2) AMM 74-00-00/501, Ignition

C. Access

(1) Location Zones

410 Left Power Plant

420 Right Power Plant

(2) Access Panels

413AL Fan Cowl Panel (left)

423AL Fan Cowl Panel (left)

D. Prepare for the Removal (Fig. 401)

S 864-003-R00

(1) For the left engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:

(a) P11 Overhead Circuit Breaker Panel

1) 11D7, ENGINES STBY IGN L 1

2) 11D8, ENGINES STBY IGN L 2

3) 11L1, LEFT ENGINE IGN 1

S 864-004-R00

(2) For the right engine, open these circuit breakers and attach a DO-NOT-CLOSE tag:

(a) P11 Overhead Circuit Breaker Panel

1) 11D9, ENGINES STBY IGN R 1

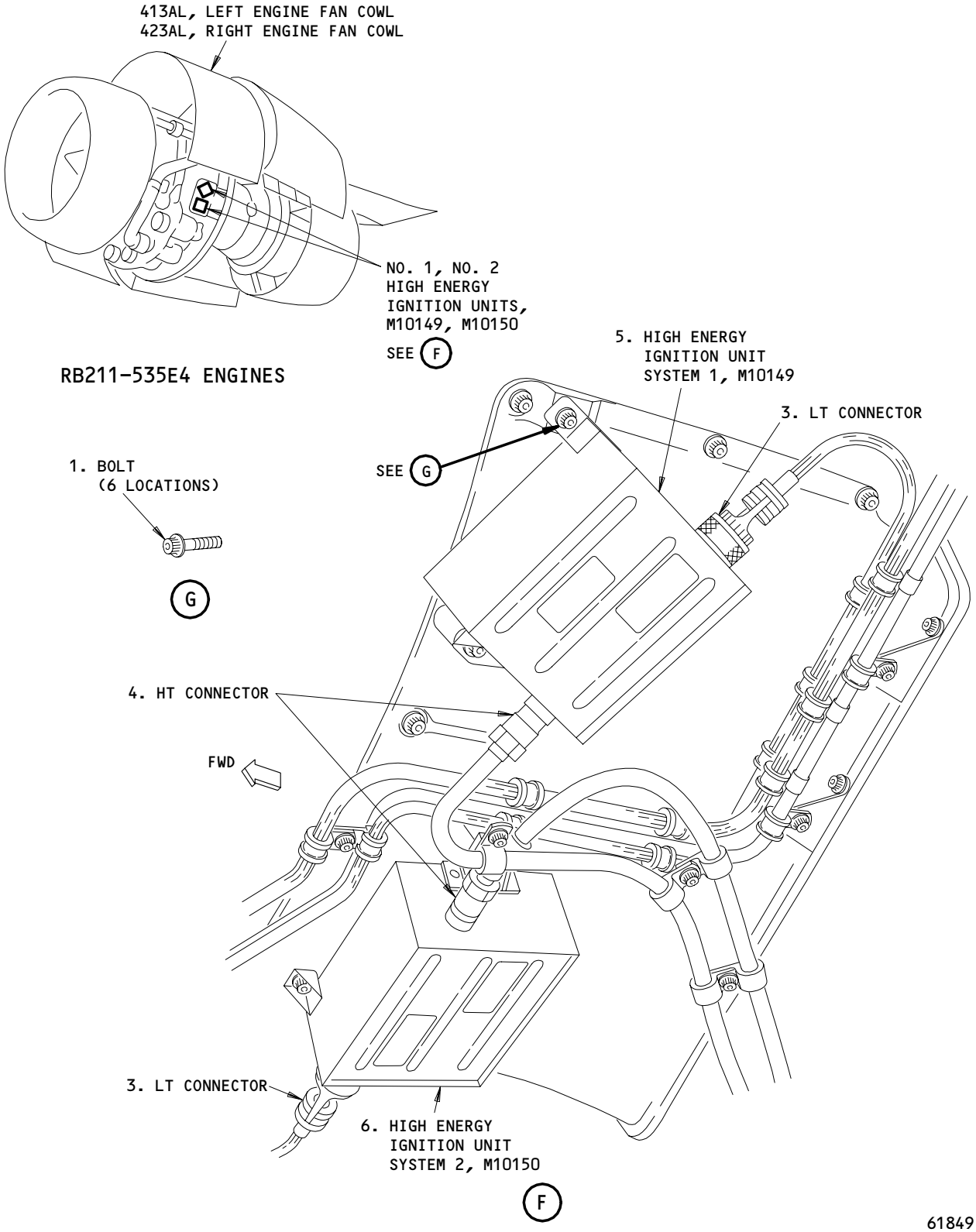
2) 11D10, ENGINES STBY IGN R 2

3) 11L28, RIGHT ENGINE IGN 1

S 014-005-R00

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

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



High Energy Ignition Unit Installation
Figure 401

S 024-006-R00

(4) Do these steps to remove the ignition unit:

(a) Disconnect the LT connector (3).

WARNING: DISCONNECT THE LOW TENSION (LT) ELECTRICAL CONNECTOR AND WAIT FOR A MINIMUM OF ONE MINUTE BEFORE YOU DISCONNECT THE HIGH TENSION (HT) ELECTRICAL CONNECTOR. HIGH ENERGY ELECTRICAL DISCHARGE IS VERY DANGEROUS AND CAN INJURE YOU.

(b) Disconnect the HT connector (4).

(c) Put dust caps on all the connectors.

(d) Remove the bolts (1).

(e) Remove the ignition unit (5, 6).

TASK 74-11-01-404-007-R00

2. Install the High Energy Ignition Unit

A. General

(1) Use the procedure in 70-51-00/201 to tighten the fasteners.

(2) Tighten the fasteners to the torque values in 70-51-00/201 unless a torque value is specified in this procedure.

(3) Use the procedure in 70-50-02/201 to tighten the electrical connectors.

B. Consumable Materials

(1) Jointing Compound
British Spec/Ref - DTD 900/4586, Hylomar PL32 (Medium)
OMat No. 4/47

(2) D00148, Methyl Ethyl Ketone
British Spec/Ref - TT-M-261

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Bolt	74-11-01	01	10
	5	Ignition Assy - High Energy			5
	6	Ignition Assy - High Energy			5

D. References

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

(2) AMM 74-00-00/501, Ignition

E. Access

(1) Location Zones

410 Left Power Plant
423 Right Power Plant

(2) Access Panels

413AL Fan Cowl Panel (left)
423AL Fan Cowl Panel (left)

F. Procedure (Fig. 401)

S 114-014-R00

(1) Do these steps before you install the ignition unit:

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

CAUTION: BE CAREFUL WHEN YOU APPLY THE SOLVENT BECAUSE YOU CAN DAMAGE THE SURFACE FINISH. YOU MUST APPLY A NEW FINISH TO ALL THE AREAS OF THE SURFACE FINISH THAT ARE DAMAGED (AMM 70-42-12/201).

(a) Use MEK to remove all of the jointing compound from the areas around the mounting feet of the ignition unit and the pillars on the IDG cooler duct.
1) Use a stiff bristle brush if necessary.
2) Let the surface dry completely.
3) If you damage the surface layer, use the procedure in AMM 70-42-12/201 to apply a new layer.

(b) Apply a layer jointing compound to the mounting feet of the ignition unit and the pillars on the IDG cooler duct.
1) Let the jointing compound dry for 10 minutes before you install the ignition unit.

S 424-009-R00

(2) Do these steps to install the ignition unit:
(a) Install the ignition unit (5, 6) with the bolts (1).
1) Tighten the bolts (1).
(b) Remove the dust caps from the connectors.
(c) Connect and tighten the HT connector (4) to 140-150 pound-inches.
1) Install lockwire on the HT connector.
(d) Connect the LT connector (3).
1) Install lockwire on the LT connector (3).

S 864-010-R00

(3) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D7, ENGINES STBY IGN L 1
      2) 11D8, ENGINES STBY IGN L 2
      3) 11L1, LEFT ENGINE IGN 1

S 864-011-R00

(4) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D9, ENGINES STBY IGN R 1
      2) 11D10, ENGINES STBY IGN R 2
      3) 11L28, RIGHT ENGINE IGN 1

S 414-012-R00

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

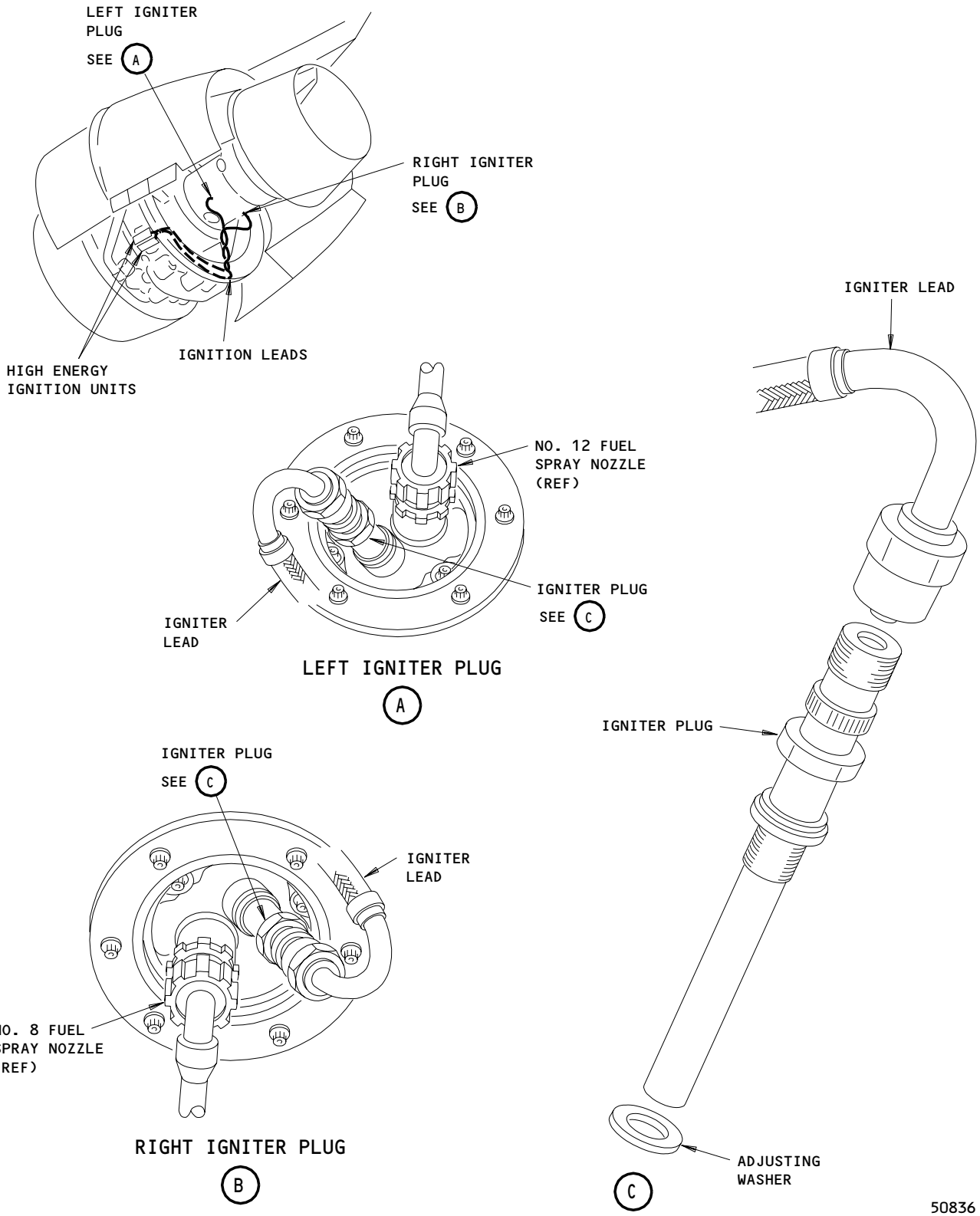
(5) Close the left fan cowl panel (AMM 71-11-04/201).

S 714-013-R00

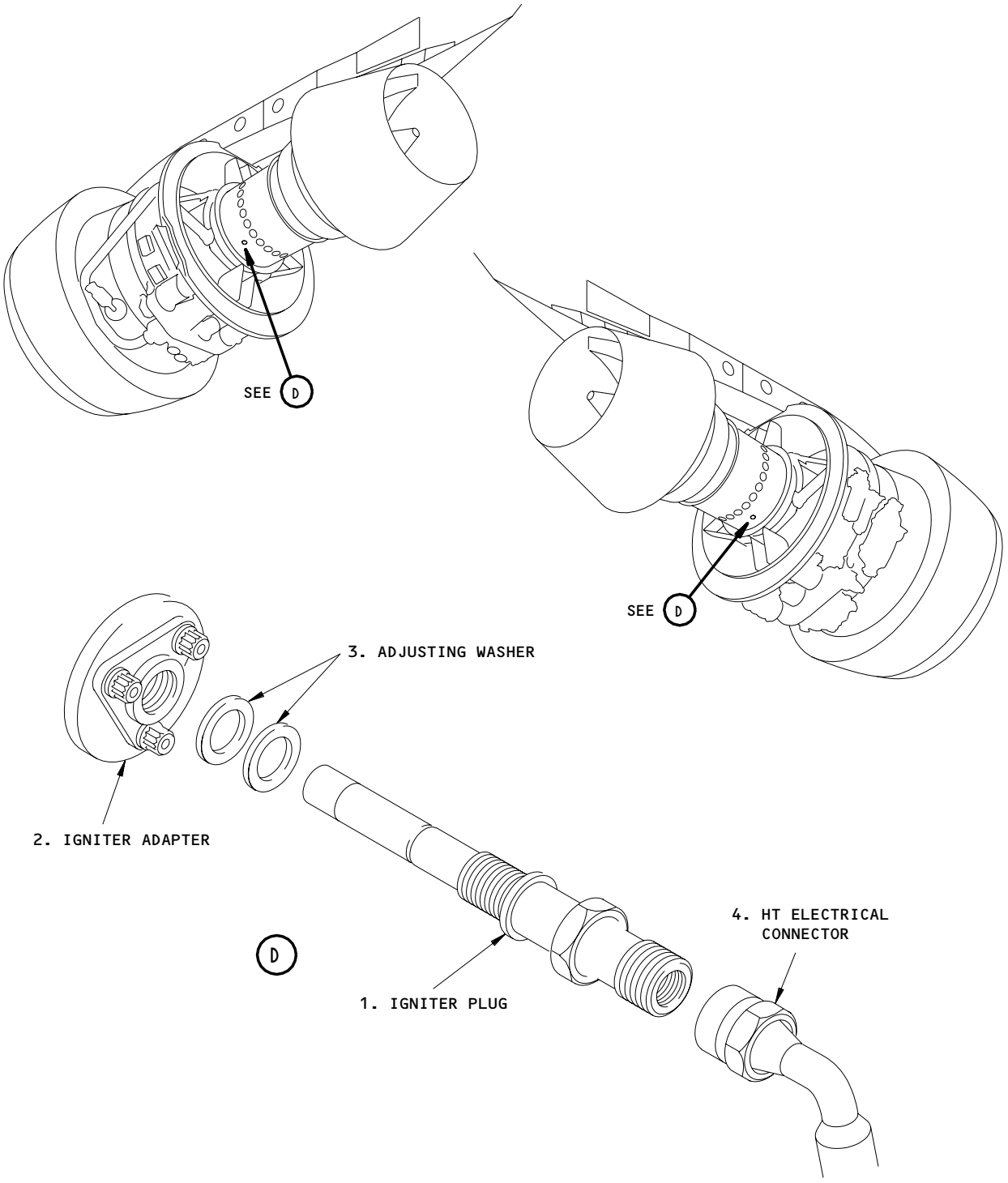
(6) Do the audible test procedure for the ignition system (AMM 74-00-00/501).

HIGH TENSION DISTRIBUTION - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The high tension distribution system comprises two igniter leads and two igniter plugs. The leads transmit the high voltage impulses from the high energy ignition units (Ref 74-11-00) to the igniter plugs which give spark to the combustion chamber.
2. Component Details
   A. Igniter Leads
      (1) The igniter leads are heavily insulated single conductor cable encased in an inner and outer braided wire shielding. The shielding is to prevent radio interference. The leads transmit the high tension supply from the high energy ignition units to the igniter plugs.
   B. Igniter Plugs
      (1) RB211-535E4 AND RB211-535E4-B ENGINES PRE RR SB 72-C230 (PHASE II COMBUSTOR);
      The igniter plugs are fitted in two places, the No./8 fuel spray nozzle (system 1), and the No./12 fuel spray nozzle (system 2). The igniters are made of a center electrode within a metal body and use a semi-conductor material tip. The electrode is insulated from the body and sealed to form a gas-tight joint.
      (2) RB211-535E4 AND E4-B ENGINES POST RR SB 72-C230 (PHASE V COMBUSTOR) AND RB211-535E4-C ENGINES;
      The igniter plugs are located directly to the rear of the No./10 (system 1) and No./16 (system 2) fuel spray nozzles. The igniters are made of a center electrode within a metal body and use a semi-conductor material tip. The electrode is insulated from the body and sealed to form a gas-tight joint.
      (3) The high tension supply is transmitted through the center electrode to the tip. Ionization occurs across the surface of the semi-conductor and provides a low resistance path for the ignition unit discharge which is in the form of an intense spark.



High Tension Distribution System
Figure 1 (Sheet 1)



DEE00Y2232

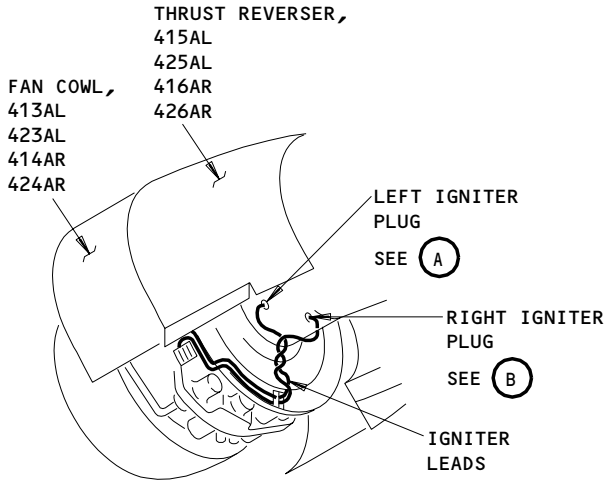
High Tension Distribution System
Figure 1 (sheet 2)

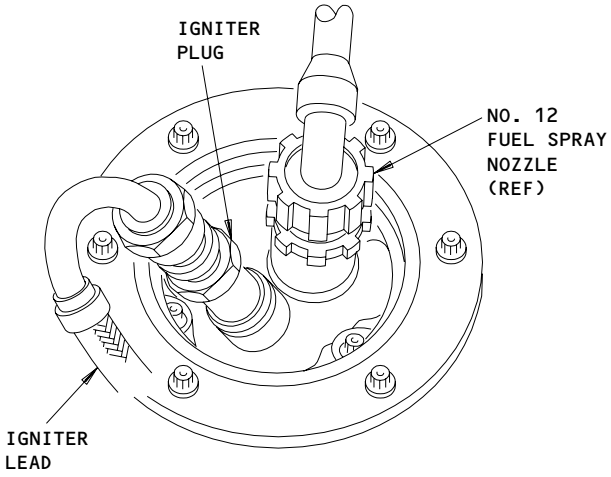
HIGH TENSION DISTRIBUTION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
LEAD - IGNITER	2	4	413AL,423AL,414AR,424AR, FAN COWL	74-21-01,02
PLUG - IGNITER	2	4	415AL,425AL,416AR,426AR, THRUST REVERSER	74-21-01,02

High Tension Distribution - Component Index
Figure 101

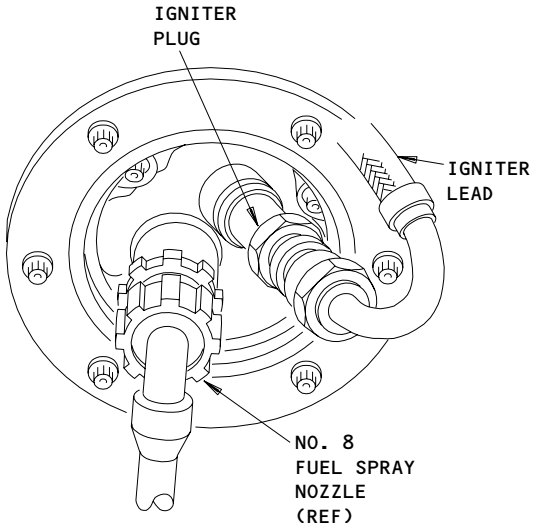
A46710





LEFT IGNITER PLUG

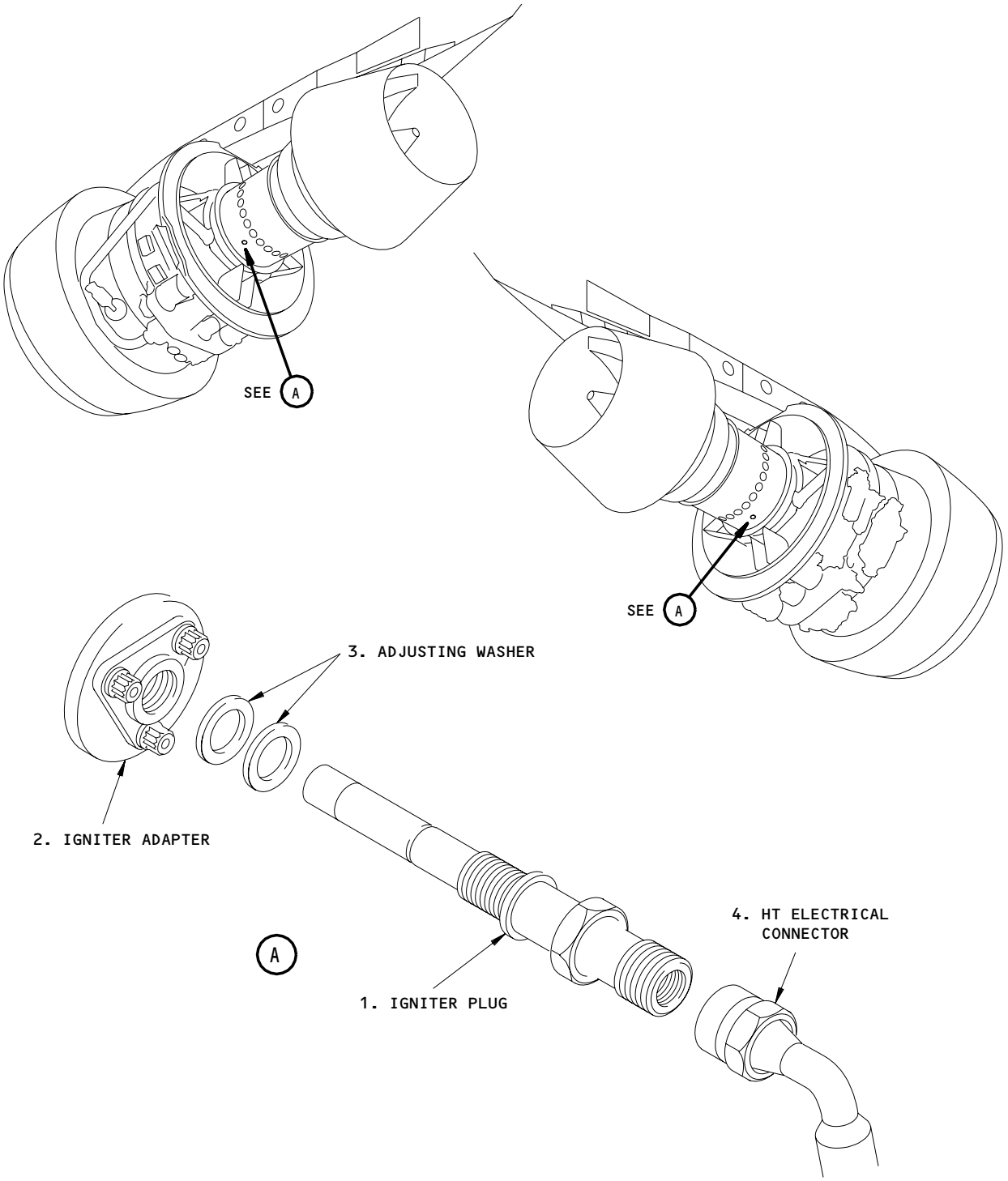
A



RIGHT IGNITER PLUG

B

High Tension Distribution - Component Location
Figure 102 (Sheet 1)



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High Tension Distribution - Component Location
Figure 102 (Sheet 2)

IGNITER LEADS - REMOVAL/INSTALLATION

TASK 74-21-01-004-001-R01

1. Remove the Igniter Leads

A. References

(1) AMM 70-50-02/201, Connection of Electrical Plugs
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 78-31-00/201, Thrust Reverser System

B. Consumable Materials

(1) Lockwire
British Spec/Ref DTD.189A 22 S.W.G.
American Spec/Ref 21 A.W.G.
OMat No. 238

C. Access

(1) Location Zones

413	Fan Cowl Panel (Left)
415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
423	Fan Cowl Panel (Left)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

(2) Access Panels

413AL	Fan Cowl Panel (Left)
415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
423AL	Fan Cowl Panel (Left)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

D. Prepare to Remove Igniter Leads

S 864-002-R01

(1) For the left engine, open these circuit breakers and attach DO-NOT-CLOSE tags:
(a) P11 Overhead Circuit Breaker Panel
1) 11D7, ENGINES STBY IGN L 1
2) 11D8, ENGINES STBY IGN L 2
3) 11L1, LEFT ENGINE IGN 1

S 864-003-R01

(2) For the right engine, open these circuit breakers and attach DO-NOT-CLOSE tags:
  (a) P11 Overhead Circuit Breaker Panel
    1) 11D9, ENGINES STBY IGN R 1
    2) 11D10, ENGINES STBY IGN R 2
    3) 11L28, RIGHT ENGINE IGN 1

S 014-004-R01

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

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

S 014-005-R01

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

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

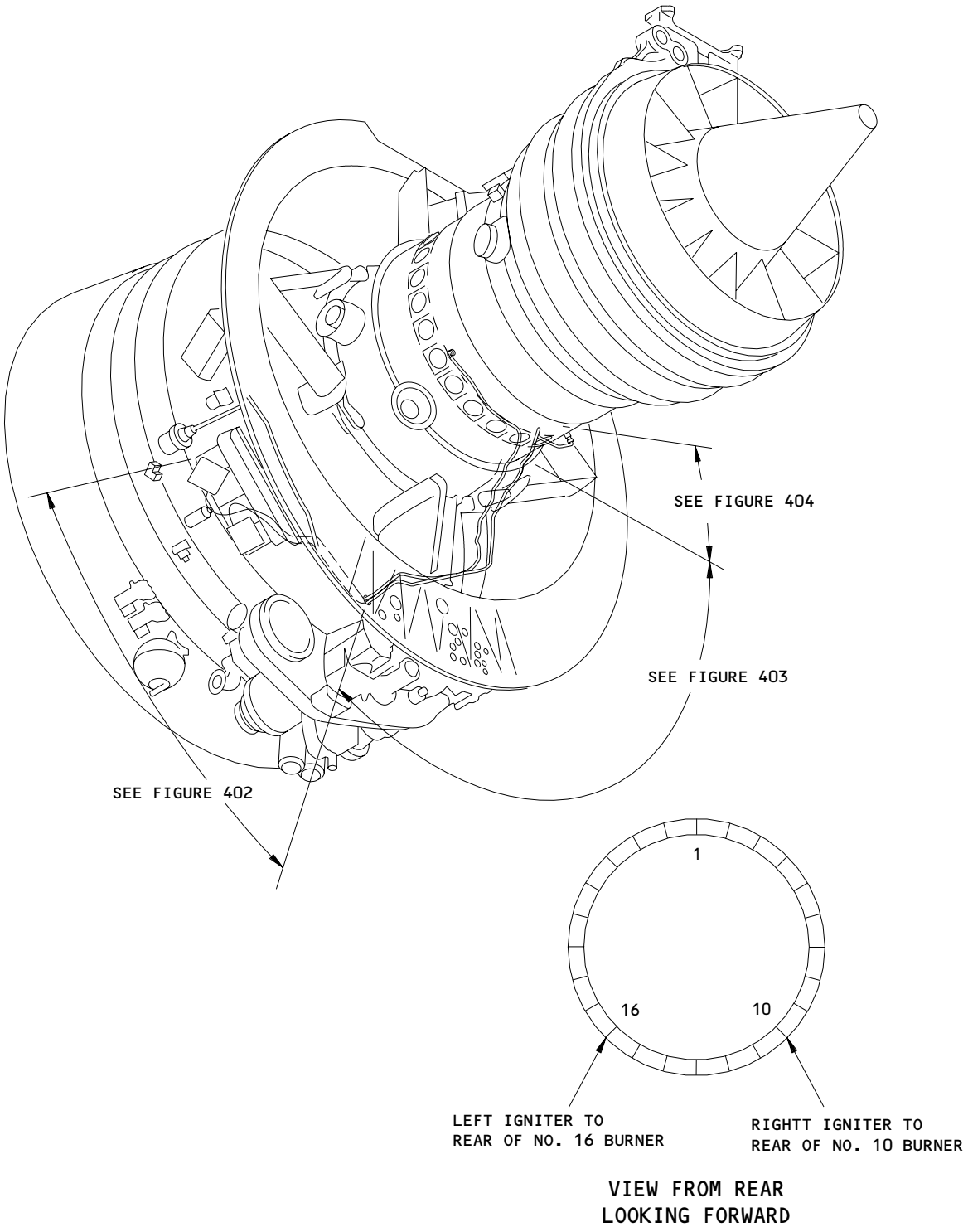
E. Remove the Igniter Leads (Fig. 401)

S 024-006-R01

(1) Disconnect the ignition lead(s) (3 and 4) from the fan case (Fig. 402).
  (a) Disconnect the low tension connectors (2 and 9) from the ignition exciter.

  WARNING: DO NOT TOUCH THE IGNITION COMPONENTS UNTIL YOU DO THESE STEPS. THESE STEPS WILL RELEASE THE HIGH VOLTAGE FROM THE IGNITION EXCITER. IF YOU DO NOT OBEY THIS PROCEDURE, INJURY TO PERSONS CAN OCCUR.

  (b) Do these steps to release the high voltage from the ignition exciter:
    1) Set the start switch to the OFF position.
    2) Stop for a minimum of 5 minutes.
    3) Disconnect the exciter-to-igniter cable terminal from the igniter plug.
    4) Ground the exciter-to-igniter cable terminal to the body shield on the igniter plug.



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Ignition Leads - General Location
Figure 401

EFFECTIVITY
RB211-535E4-B ENGINES POST RR SB 72-C230
(PHASE V COMBUSTOR)

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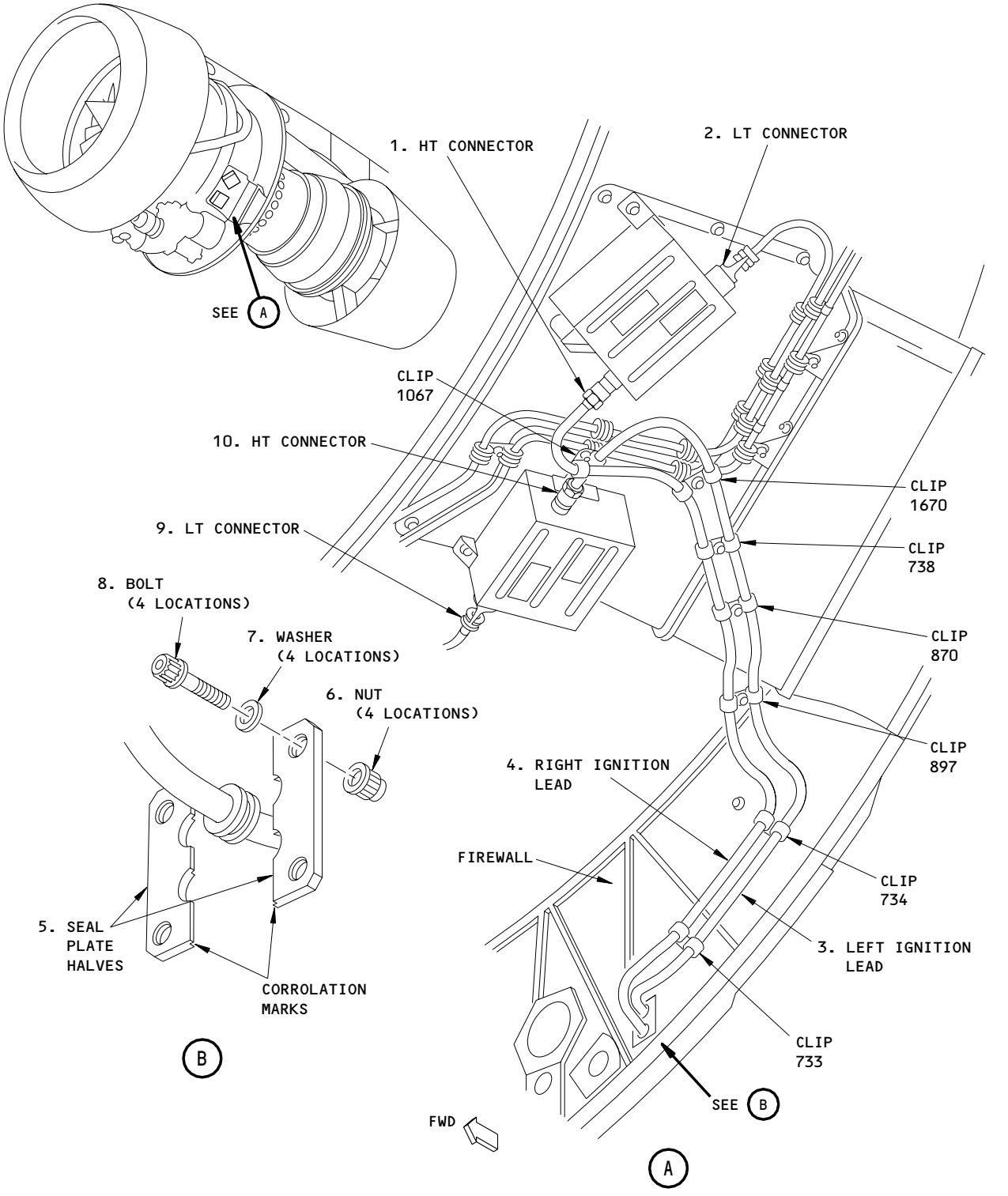


Ignition Leads - Fan Case Mounted
Figure 402

(c) One minute after you have disconnected the LT connector (2 and 9) from the ignition exciter, do the step that follows:
1) Disconnect the HT connector lead (1 and 10) from the ignition exciter.
(d) Remove clips 1067, 1670, 738, 870, 897, 734 and 733 securing the ignition leads to the fan case (Fig. 402).
(e) Remove the 4 bolts (8), washers (7) and nuts (6) that attach the seal plate (5) to the fan case.
(f) Remove the seal plate (5) from the fan case.

S 024-007-R01

(2) Disconnect the ignition leads from the fan case to core engine (Fig. 403) .
(a) For the left engine, remove clips 1922, 1604, 673, 1927, 2165, 1917 and 2135 (Fig. 405).
(b) For the right engine, remove clips 1922, 1604, 673, 2167, 2166, 1135, 1918 and 1136 (Fig. 405).

S 024-008-R01

(3) Disconnect the ignition leads from the core engine (Fig. 404).
(a) Disconnect the leads (3 and 4) from the igniter plugs (1 and 2) (Fig. 404).
(b) For the left engine, remove clips 1925, 2129, 2639 and 2666 (Fig. 405).
(c) For the right engine, remove clips 1926, 2050 and 1923.

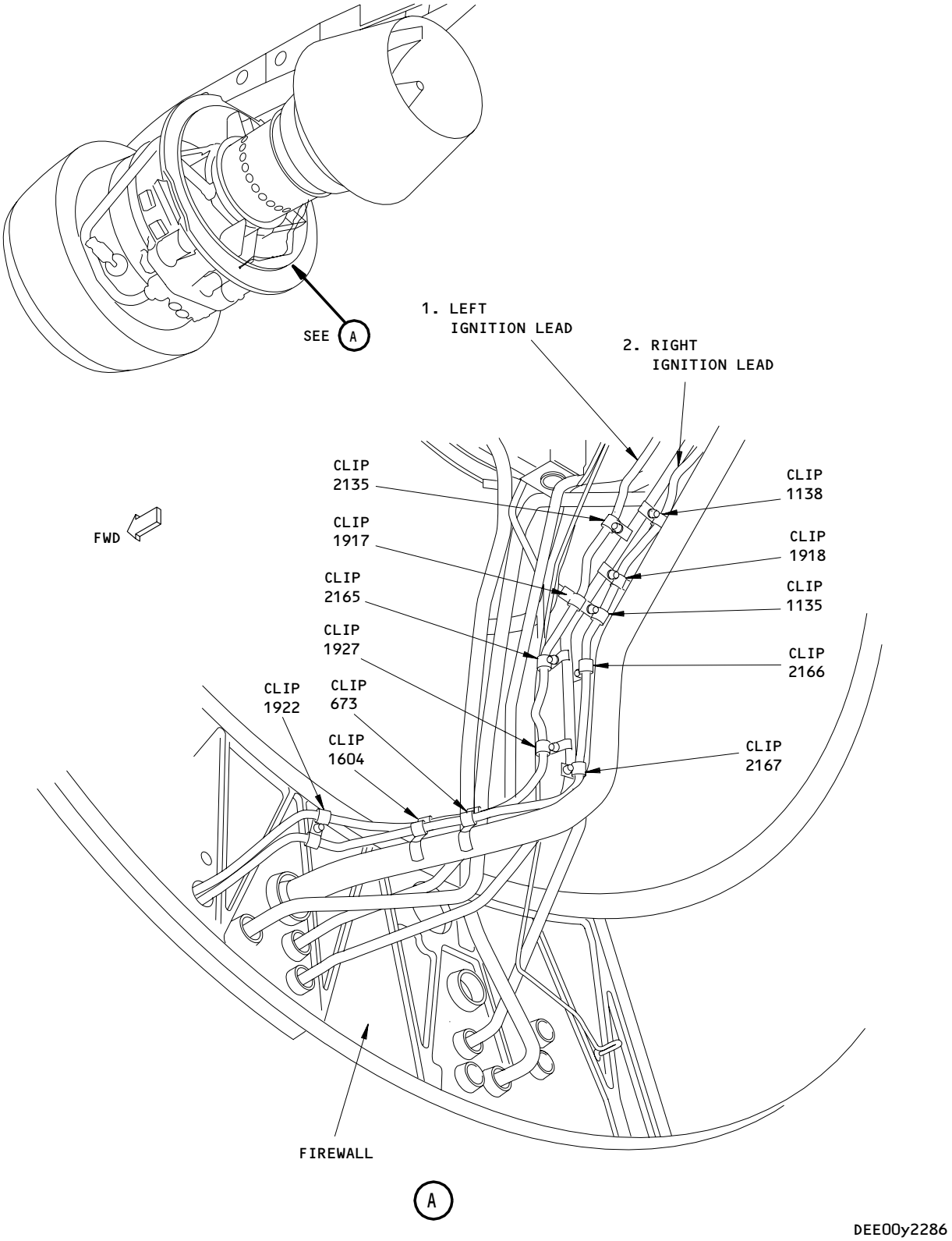
S 024-009-R01

(4) Pull the ignition lead (3 and 4) through the fan case and remove it from the engine.

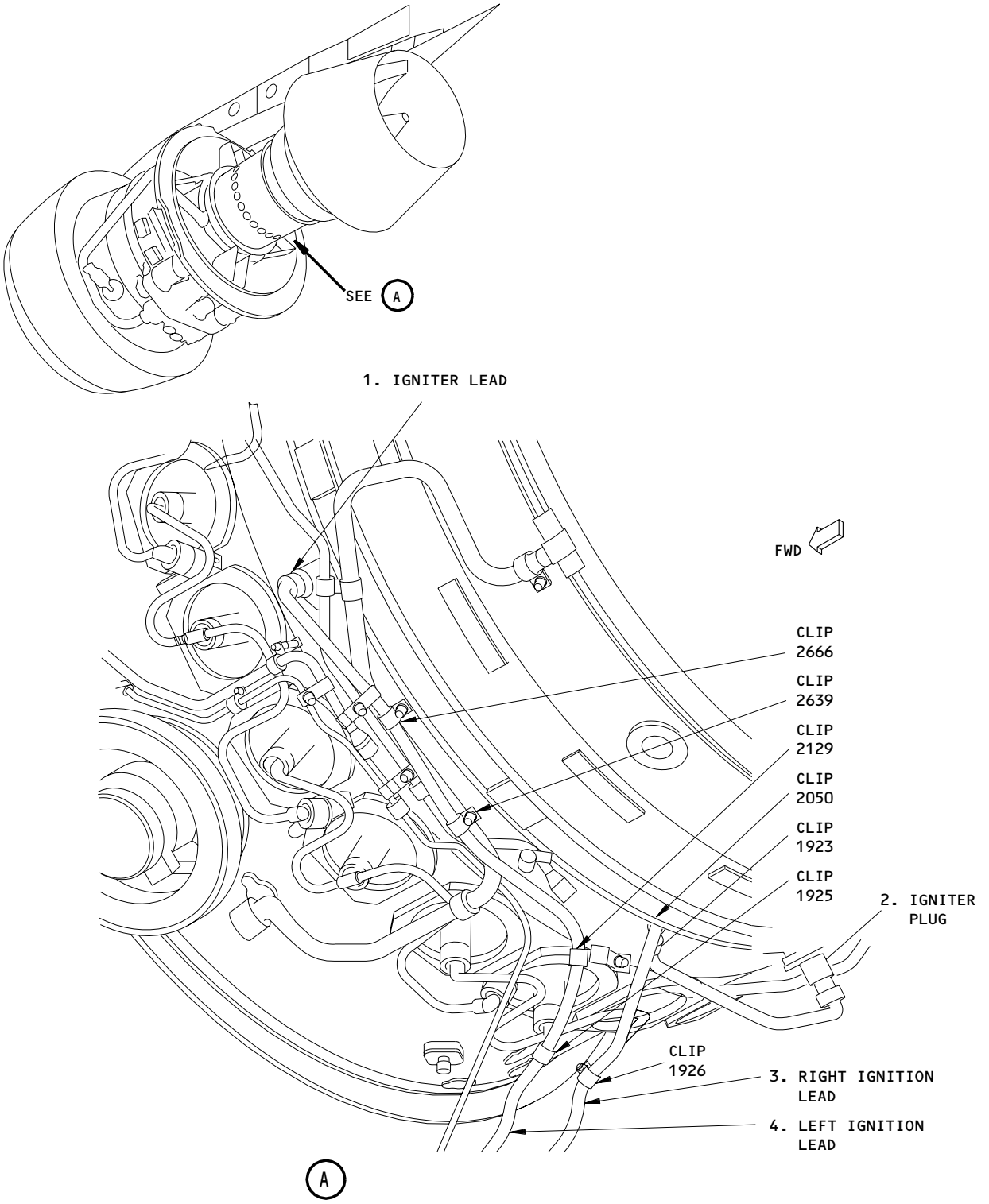
TASK 74-21-01-404-010-R01

2. Install the Igniter Leads

A. References
(1) AMM 70-50-02/201, Connection of Electrical Plugs
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 74-00-00/501, Ignition System
(5) AMM 78-31-00/201, Thrust Reverser System



Ignition Leads – Fan Case to Core Engine Mounted
Figure 403



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Ignition Leads – Core Engine Mounted
Figure 404

EFFECTIVITY
RB211-535E4-B ENGINES POST RR SB 72-C230
(PHASE V COMBUSTOR)

H72957

B. Access

(1) Location Zones

413	Fan Cowl Panel (Left)
415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
423	Fan Cowl Panel (Left)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

(2) Access Panels

413AL	Fan Cowl Panel (Left)
415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
423AL	Fan Cowl Panel (Left)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

C. Install the Igniter Leads (Fig. 401)

S 424-011-R01

(1) Install the ignition harness to the core engine (Fig. 404).

CAUTION: APPLY THE ANTI-SEIZE COMPOUND TO THE THREADED PORTION OF THE IGNITER PLUG ONLY. IT IS IMPORTANT THAT NO COMPOUND GETS INTO THE IGNITER PLUG CONTACT WELL. THIS CAN CAUSE FAILURE TO START.

(a) Connect, but do not tighten the ignition lead to the igniter plug.

NOTE: It is permissible to apply anti-seize compound, OMat 4/62, to the igniter plug threads before you connect the igniter lead to the igniter plug.

(b) Put the other end of the ignition lead through the firewall (Fig. 402).

(c) For the left ignition lead (4), loosely install the clips at postions 2666, 2639, 2129 and 1925 (Fig. 405).

(d) For the right ignition lead (3), loosely install the clips at positions 1923, 2050 and 1926 (Fig. 405).

S 424-012-R01

(2) Install the ignition lead to the core engine and fan case (Fig. 403).

(a) For the left ignition lead (1), loosely install the clips at positions 2135, 1917, 2165, 1927, 673, 1604 and 1922 (Fig. 405).

(b) For the right side ignition lead (2), loosely install the clips at positions 1136, 1918, 1135, 2166, 2167, 673, 1604 and 1922 (Fig. 405).

S 424-021-R01

(3) Install the ignition lead to the fan case (Fig. 402).
   (a) Loosely install the ignition lead clips at positions 733, 734, 897, 870, 738, 1670 and 1067.
   (b) Loosely connect the ignition leads (3 and 4) to the igntion exciters.
   (c) Place the seal halves (5) on the ignition leads and loosely install to the firewall with 4 bolts (8), washers (7), and nuts (6).

      NOTE: Make sure that the alignment marks on the seal plate are correctly aligned.

S 424-013-R01

(4) Tighten the clips securing the ignition leads.
   (a) Tighten the clip nuts and bolts (AMM 70-51-00/201).
   (b) Tighten the seal plate securing nuts and bolts (AMM 70-51-00/201).
   (c) Tighten the HT connector at the igniter plug to 140-150 pound-inches (15.8 to 16.9 Newton-meters).

      NOTE: Make sure that the ignitor plug elbow is tight so that it will not turn.

   (d) Install lockwire on the igniter plug connector.

S 424-014-R01

(5) Connect the H.T. and L.T. leads to the igntion exciter.
   (a) Tighten the H.T. lead connector on the ignition exciter to 140-150 pound-inches (15.8 to 16.9 Newton-meters).
   (b) Install the lockwire on the H.T. connector.
   (c) Connect the L.T. connector to the ignition exciter.
   (d) Tighten the L.T. connector to the ignition exciter (AMM 70-50-02/201).

D. Put the Airplane Back to Its Usual Condition

S 414-016-R01

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

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

S 414-017-R01

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

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

S 864-018-R01

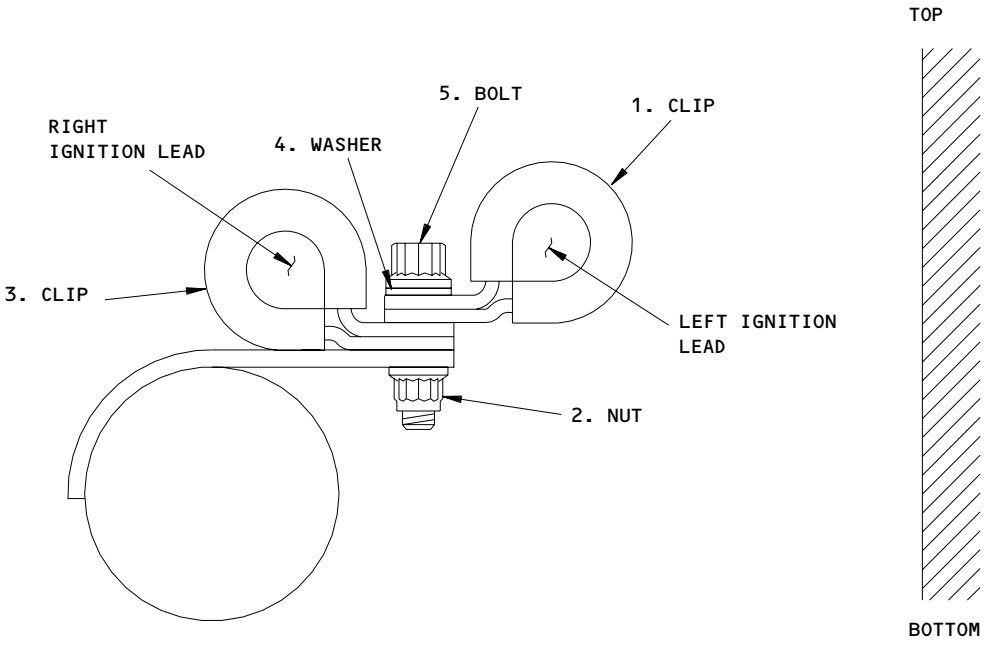
(3) For the left engine, remove DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D7, ENGINES STBY IGN L 1
      2) 11D8, ENGINES STBY IGN L 2
      3) 11L1, LEFT ENGINE IGN 1

S 864-019-R01

(4) For the right engine, remove DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D9, ENGINES STBY IGN R 1
      2) 11D10, ENGINES STBY IGN R 2
      3) 11L28, RIGHT ENGINE IGN 1

S 714-020-R01

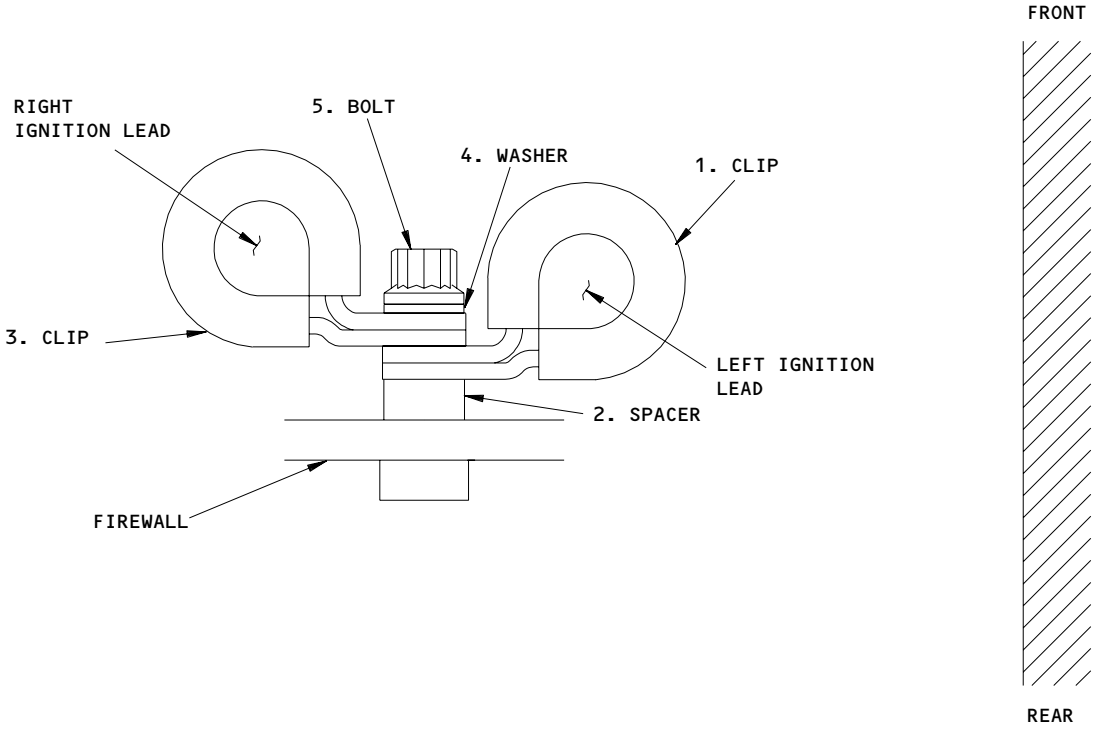
(5) Do the audible test procedure for the ignition system (AMM 74-00-00/501).



CLIP POSITION 673

DEE00y2310

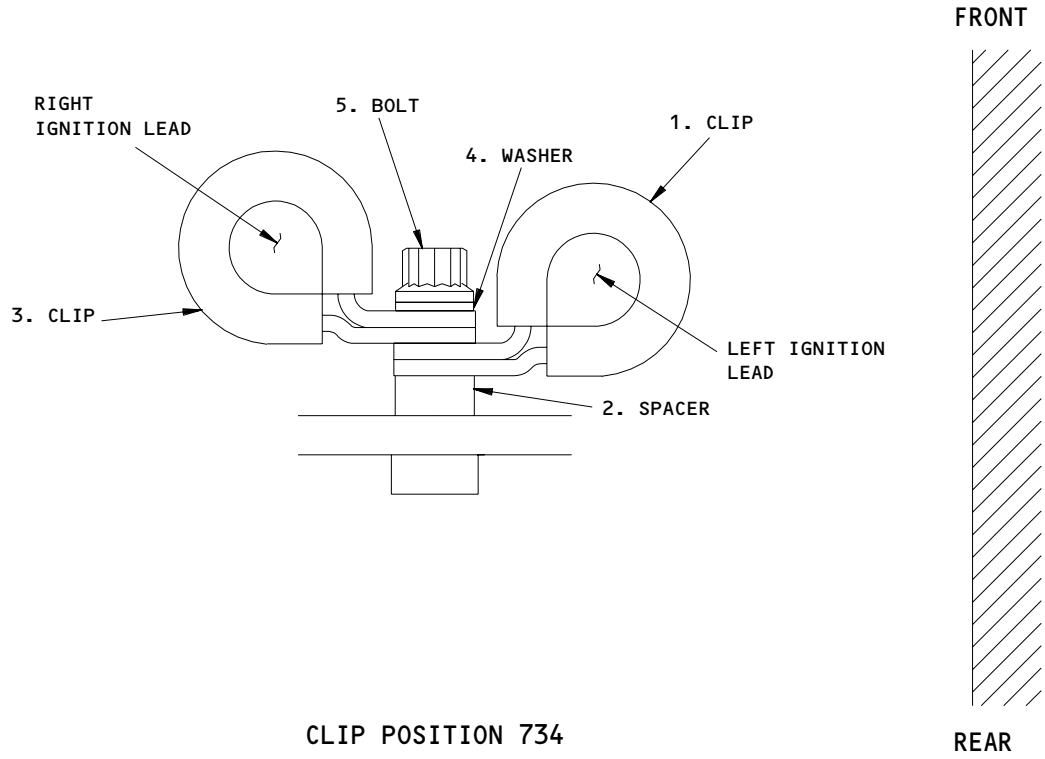
Clip Position
Figure 405 (Sheet 1)



CLIP POSITION 733

DEE00y2329

Clip Position
Figure 405 (Sheet 2)

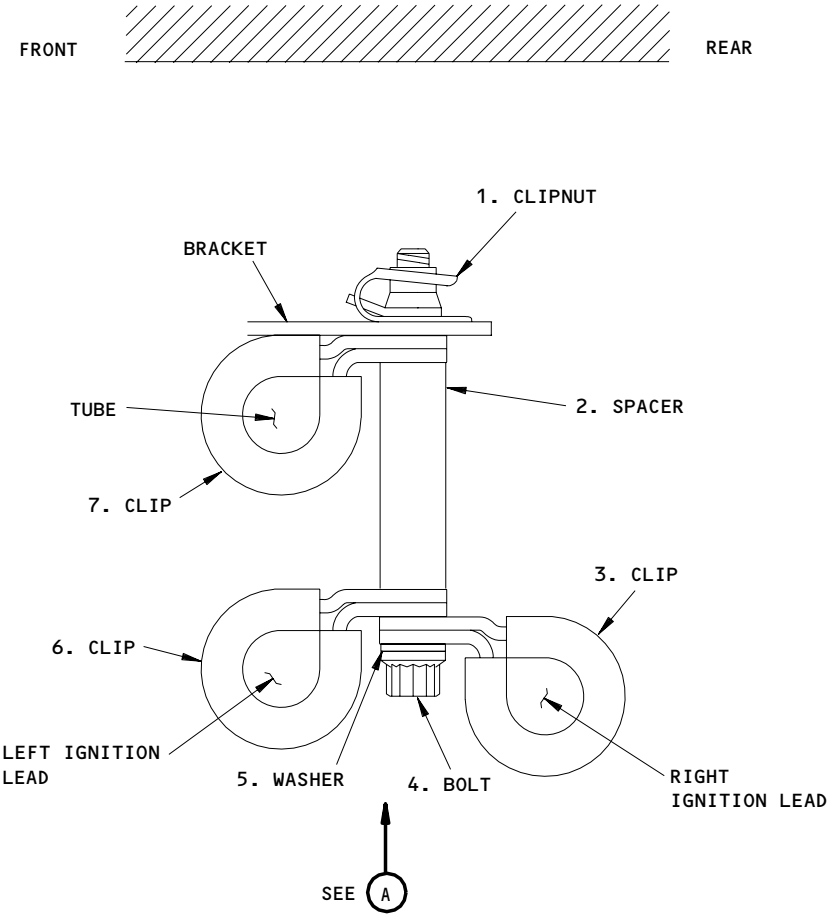


CLIP POSITION 734

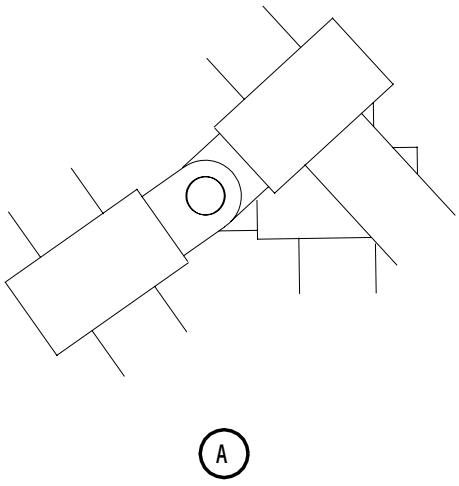
DEE00y2330

Clip Position
Figure 405 (Sheet 3)

H73387

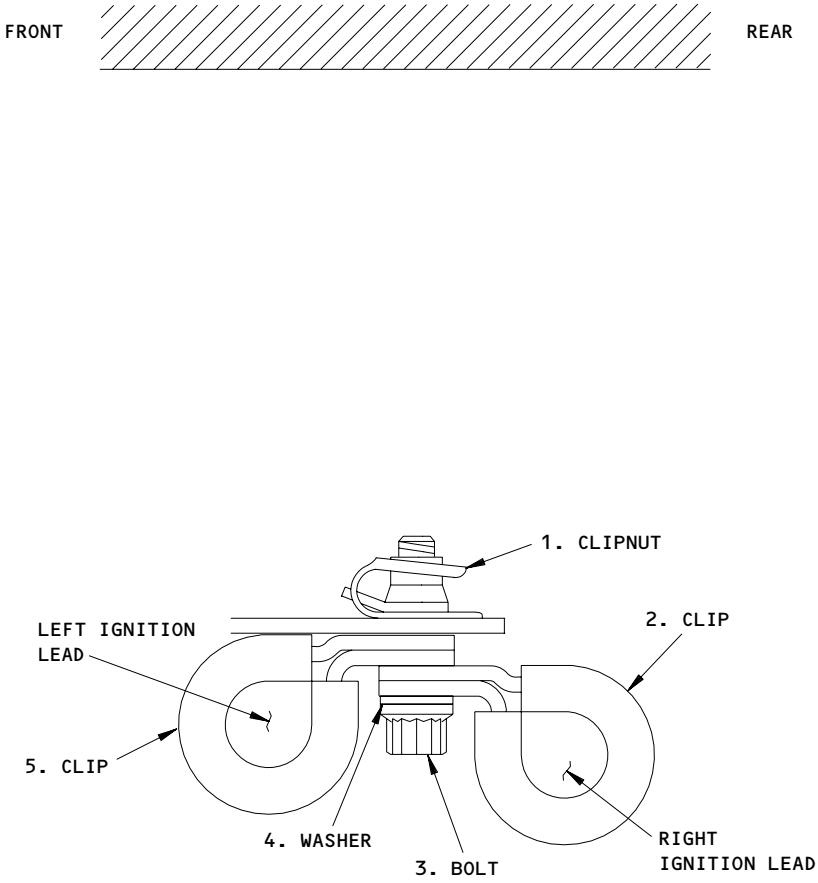


CLIP POSITION 738



DEE00y2328

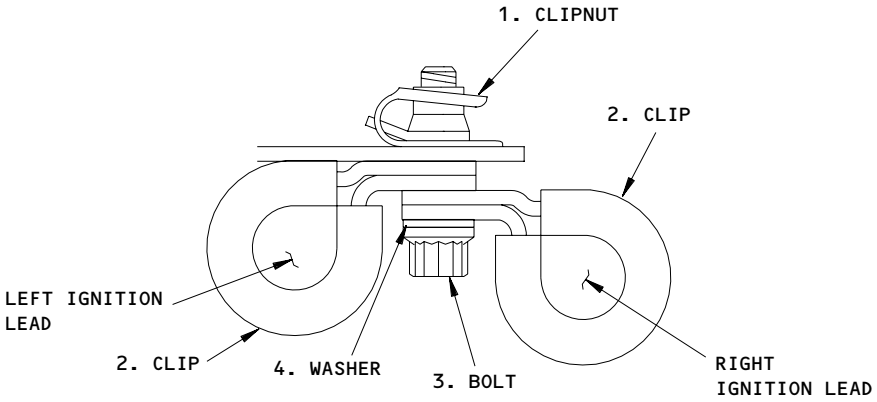
Clip Position
Figure 405 (Sheet 4)



CLIP POSITION 870

DEE00y2326

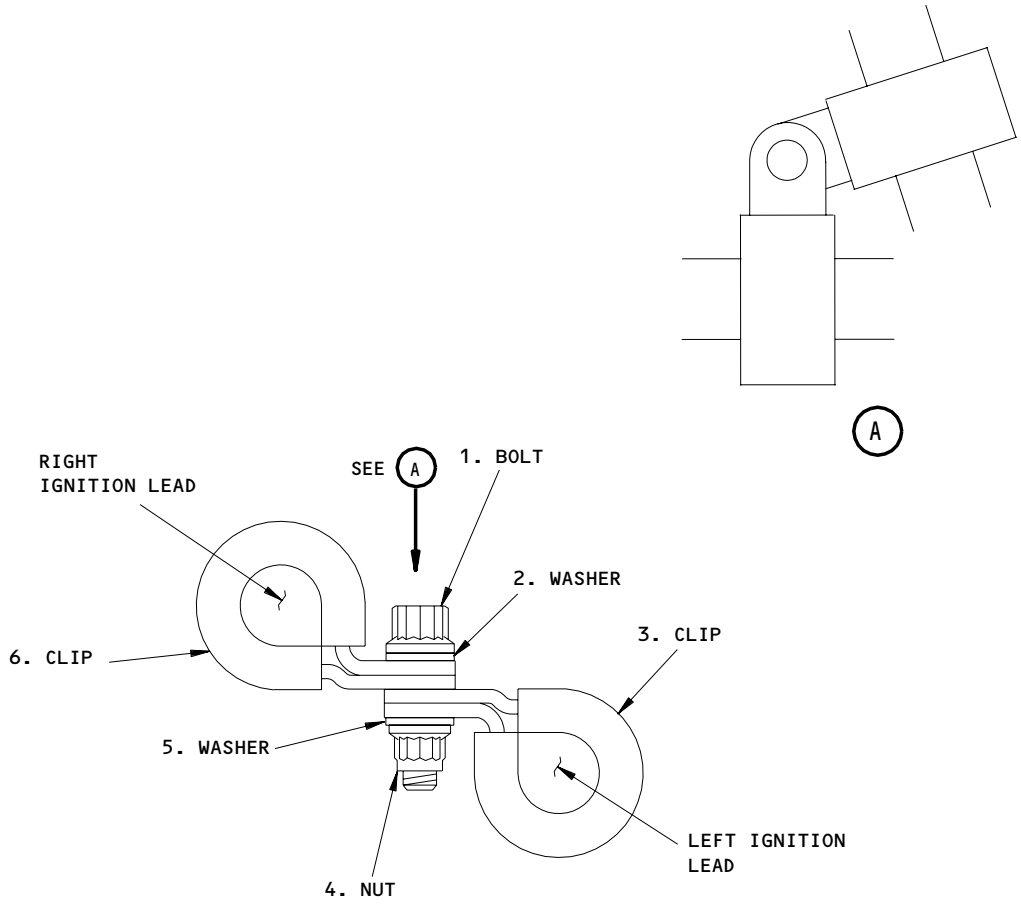
Clip Position
Figure 405 (Sheet 5)



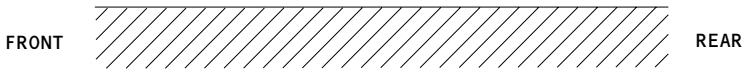
CLIP POSITION 897

DEE00y2327

Clip Position
Figure 405 (Sheet 6)

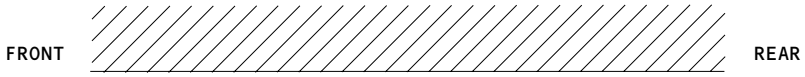


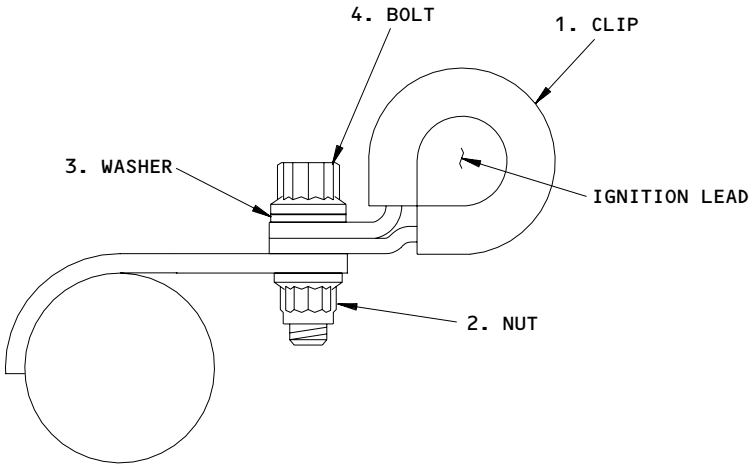
CLIP POSITION 1067



DEEOOy2325

Clip Position
Figure 405 (Sheet 7)

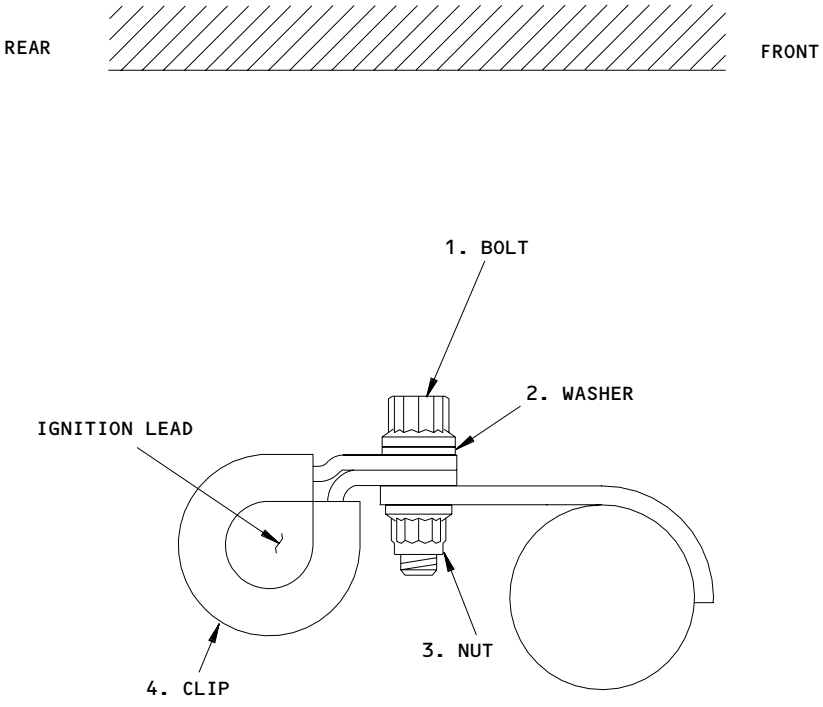




CLIP POSITION 1135

DEE00y2315

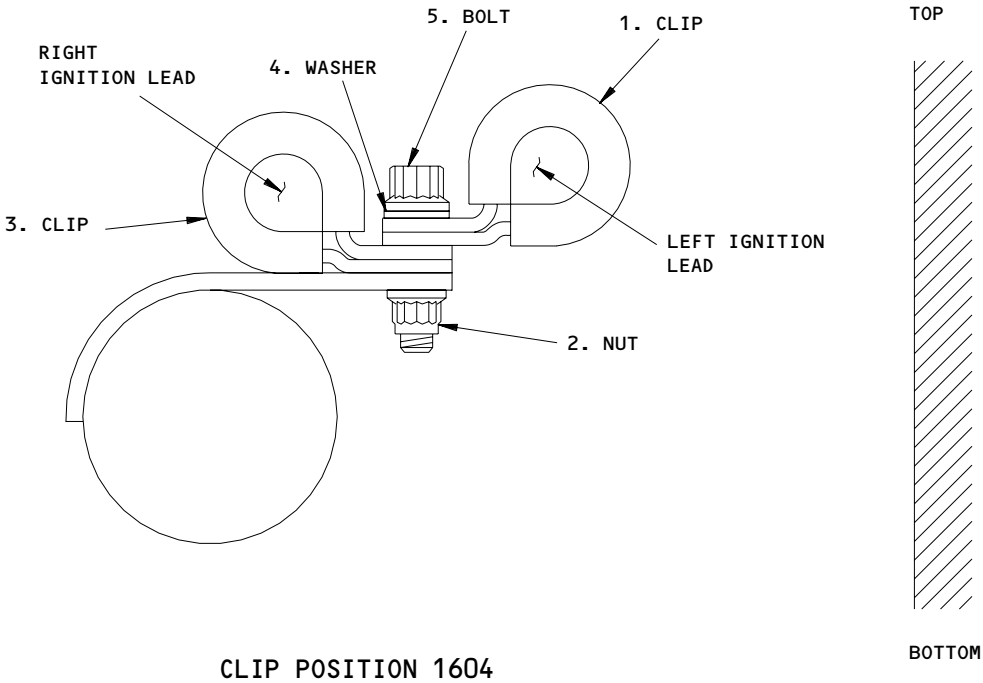
Clip Position
Figure 405 (Sheet 8)



CLIP POSITION 1136

DEE00y2326

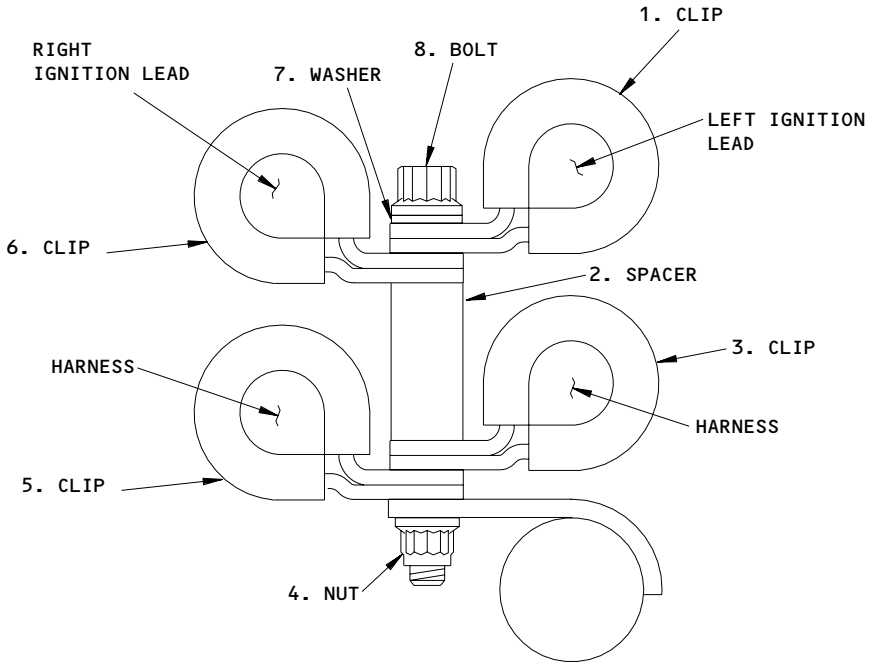
Clip Position
Figure 405 (Sheet 9)



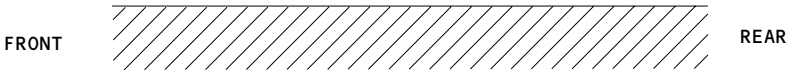
CLIP POSITION 1604

DEE00y2311

Clip Position
Figure 405 (Sheet 10)

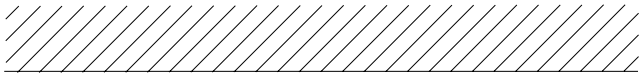


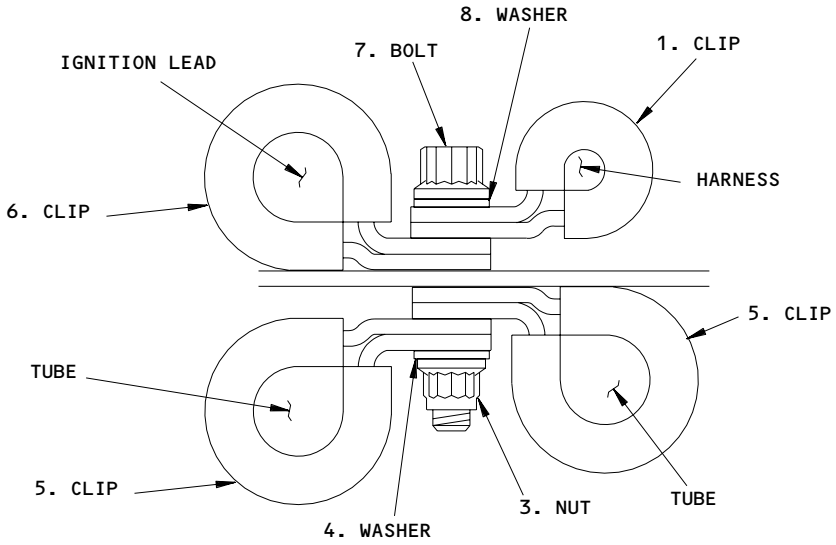
CLIP POSITION 1670



DEE00y2324

Clip Position
Figure 405 (Sheet 11)

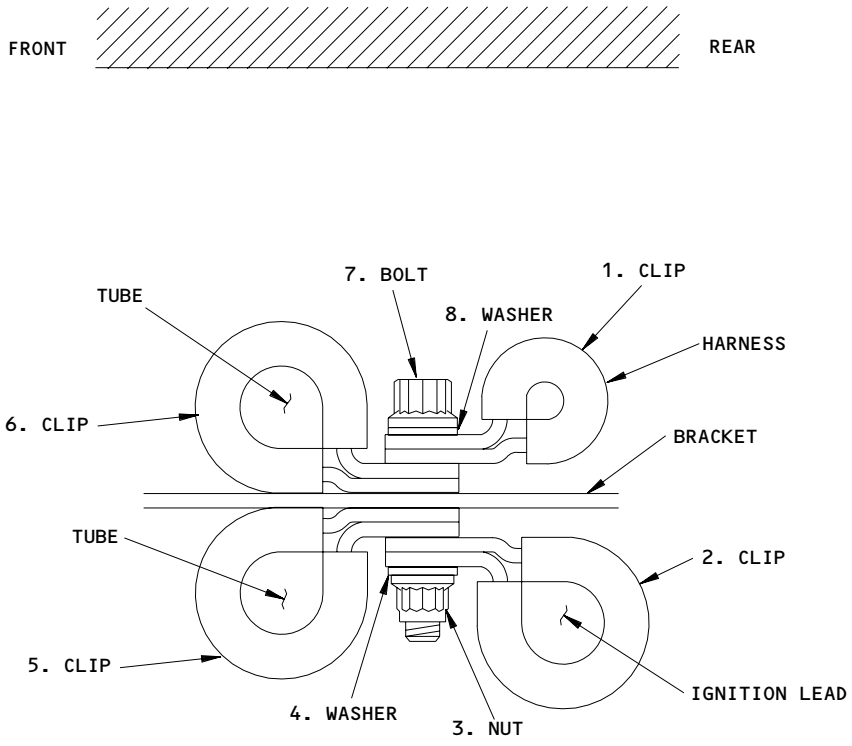




CLIP POSITION 1917

DEE00y2322

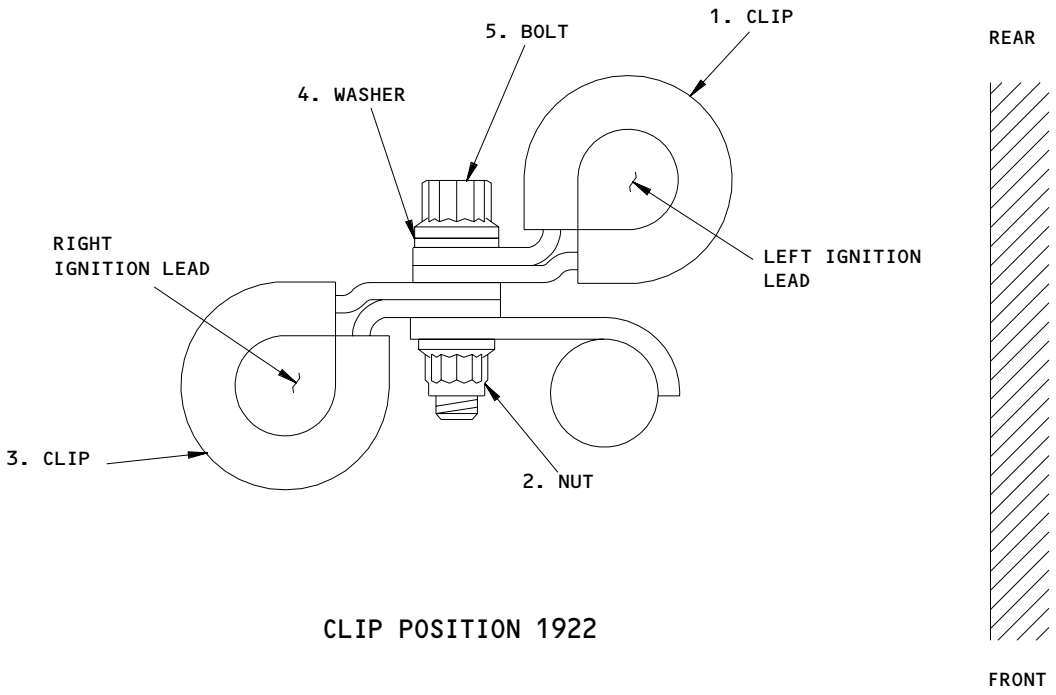
Clip Position
Figure 405 (Sheet 12)



CLIP POSITION 1918

DEE00y2323

Clip Position
Figure 405 (Sheet 13)



CLIP POSITION 1922

DEE00y2312

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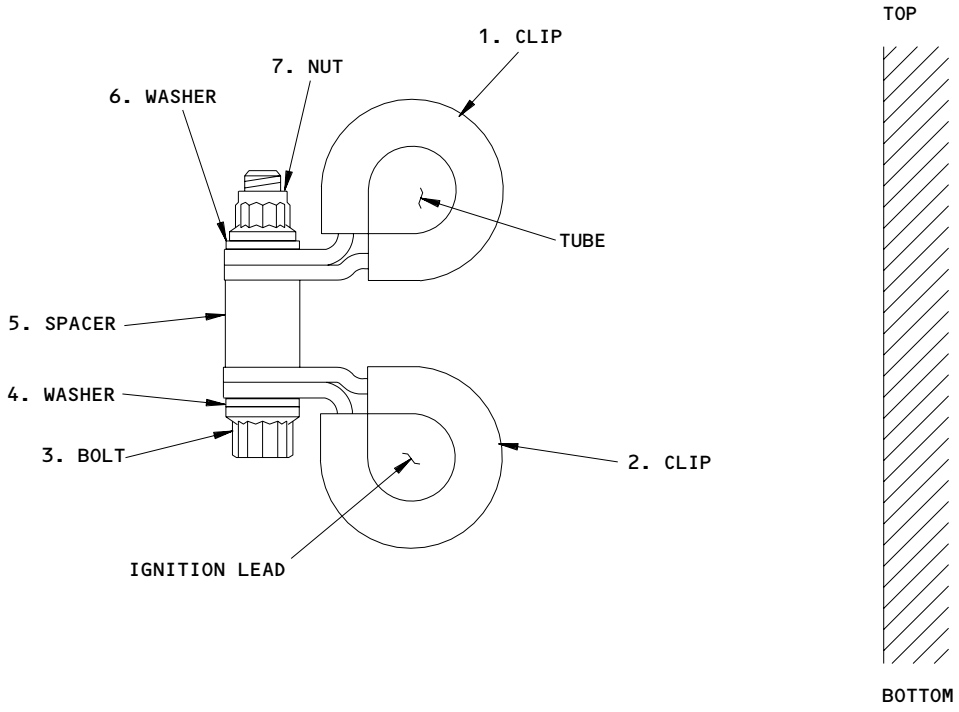
Figure 405 (Sheet 14)



CLIP POSITION 1923

DEEOOy2245

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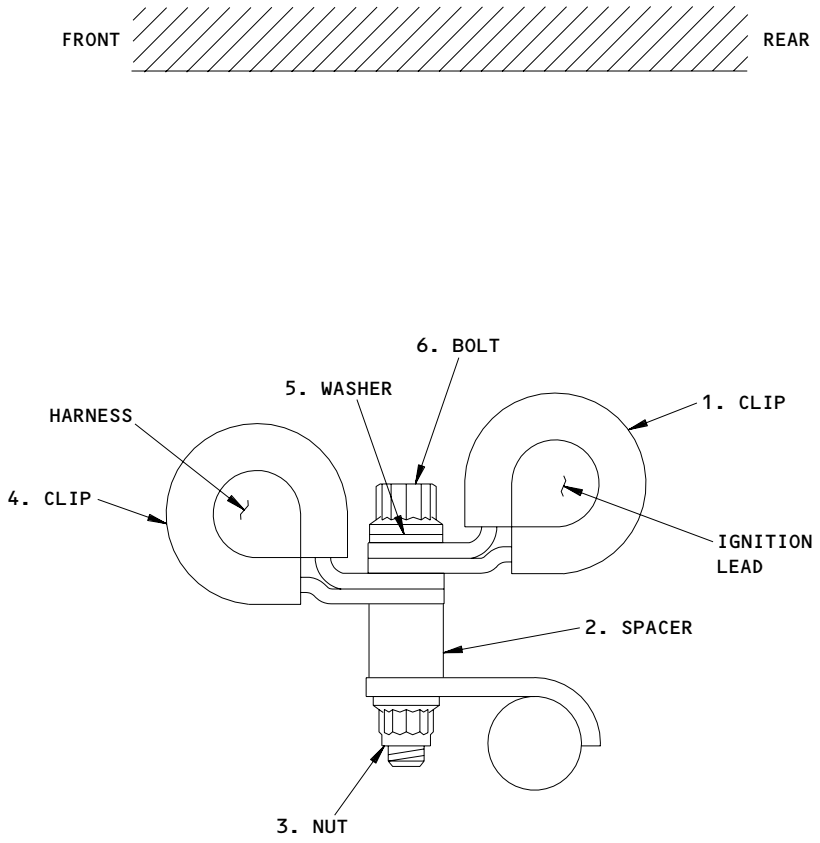
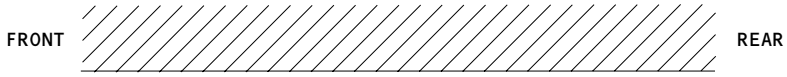
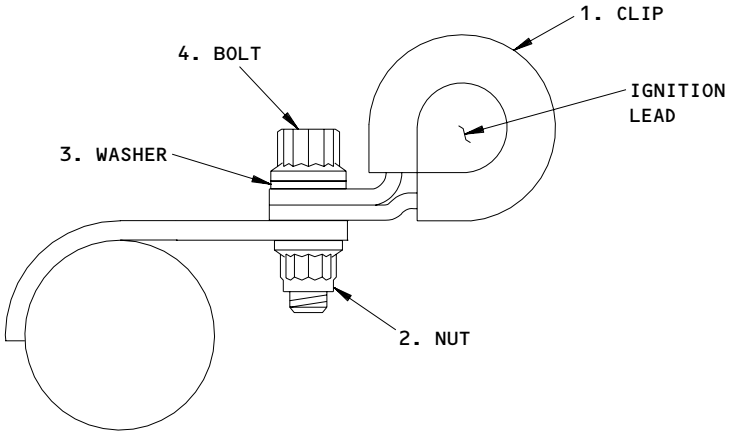


CLIP POSITION 1925

DEE00Y2317

Clip Position
Figure 405 (Sheet 16)

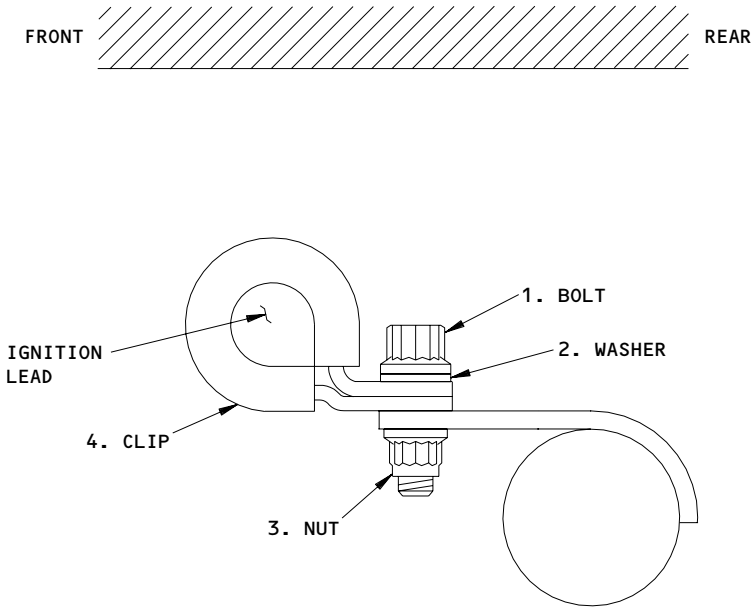




CLIP POSITION 1926

DEE00Y2316

Clip Position
Figure 405 (Sheet 17)

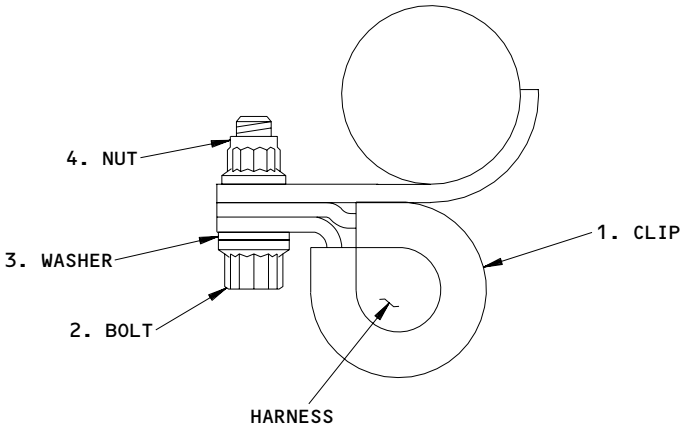


CLIP POSITION 1927

DEE00Y2321

Clip Position
Figure 405 (Sheet 18)

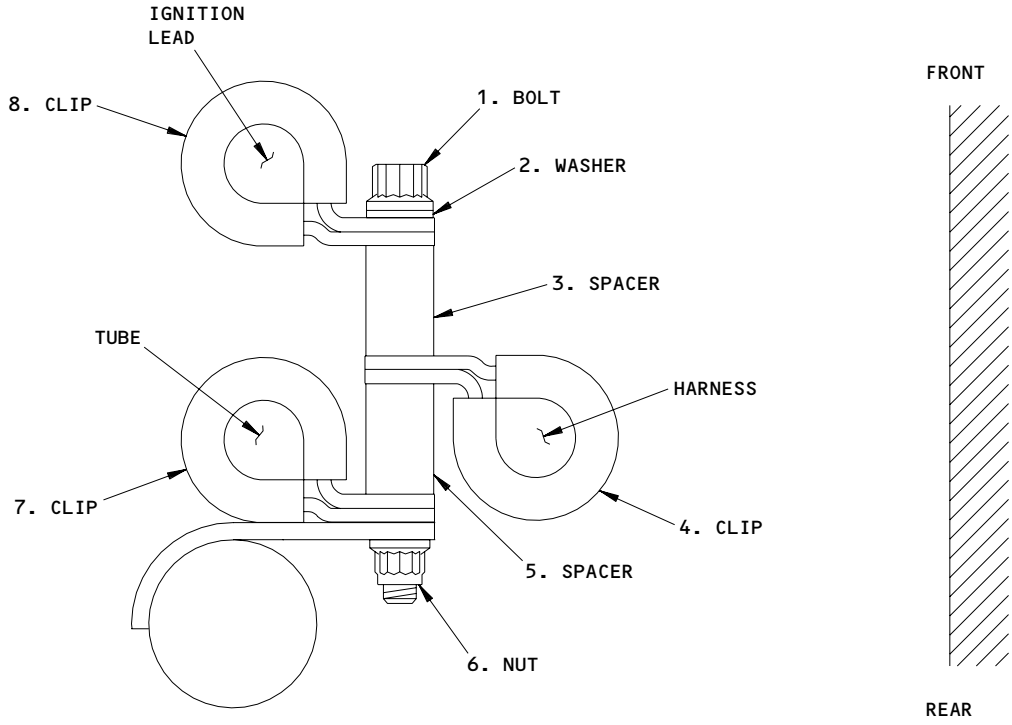
BOTTOM TOP



CLIP POSITION 2662

DEE00Y2278

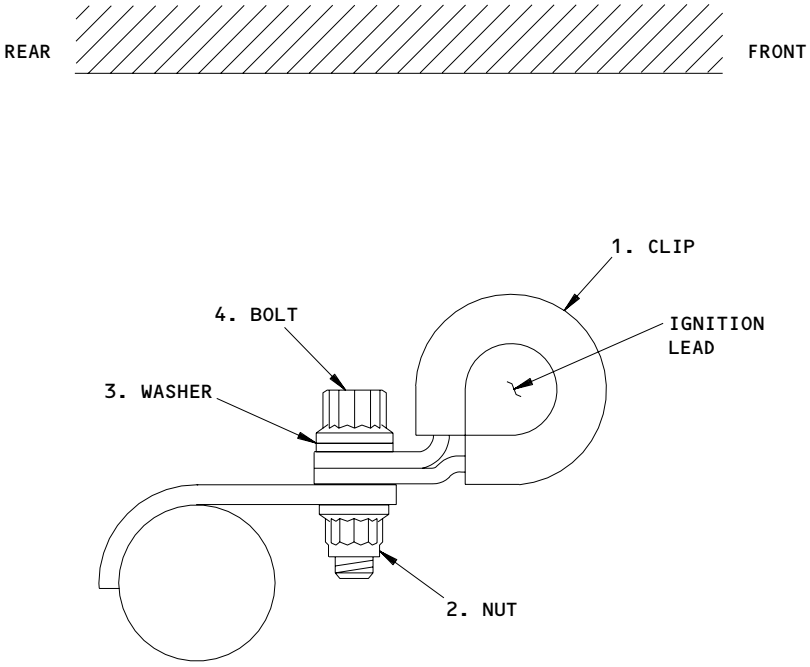
Clip Position
Figure 405 (Sheet 19)



CLIP POSITION 2129

DEEOOY2318

Clip Position
Figure 405 (Sheet 20)



CLIP POSITION 2135

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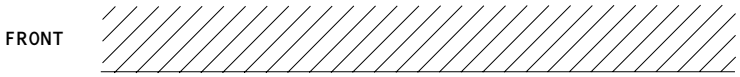
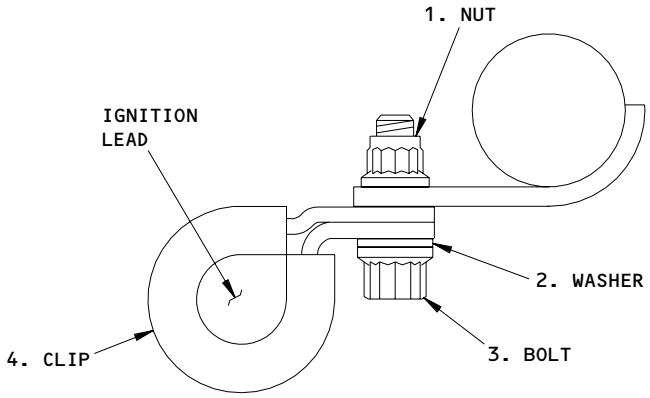
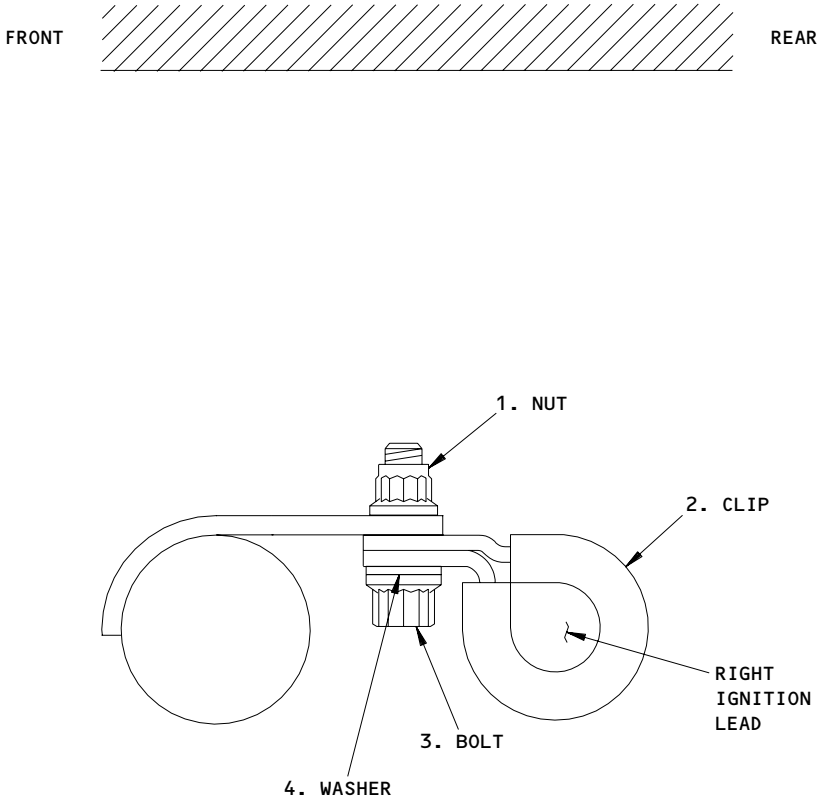




CLIP POSITION 2165

DEE00Y2320

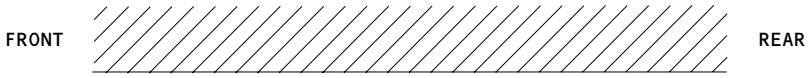
Clip Position
Figure 405 (Sheet 22)

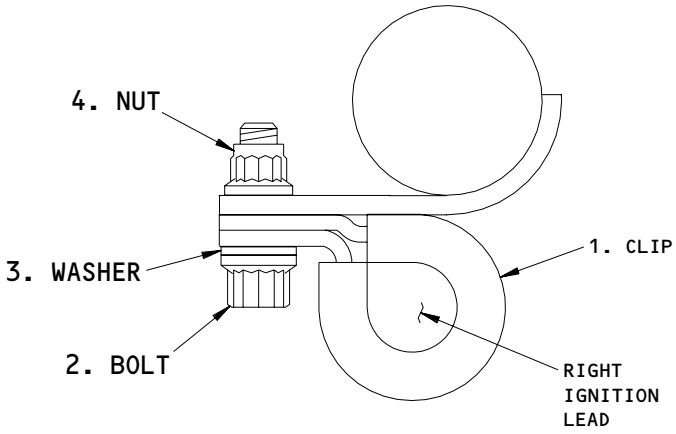


CLIP POSITION 2166

DEE00Y2313

Clip Position
Figure 405 (Sheet 23)

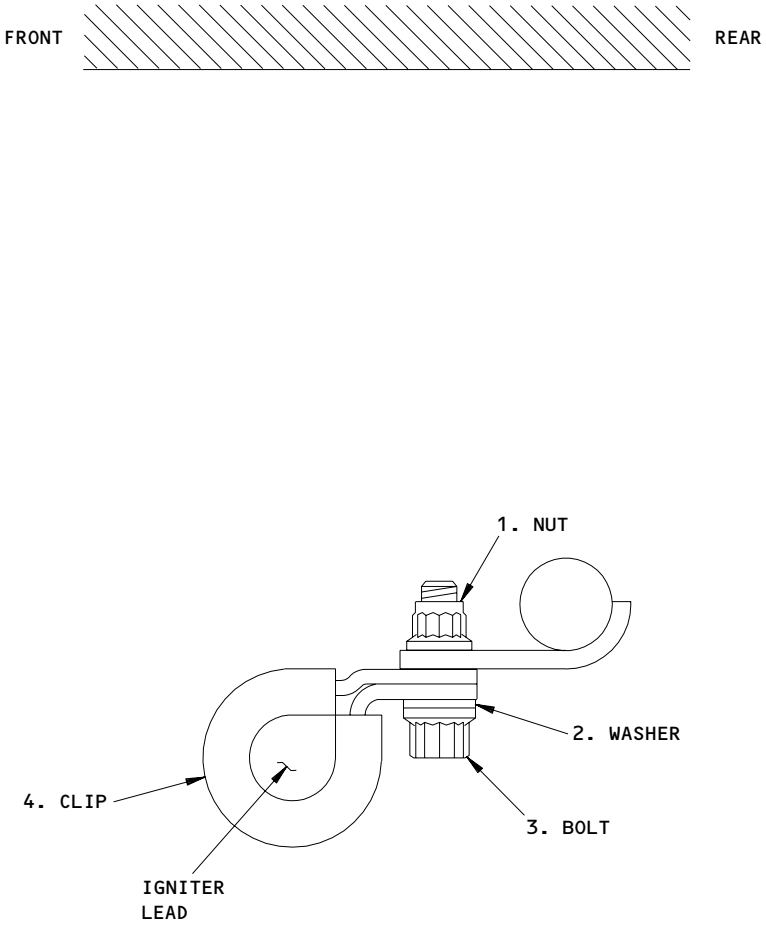




CLIP POSITION 2167

DEEOOY2314

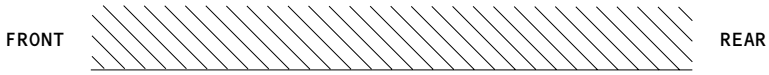
Clip Position
Figure 405 (Sheet 24)

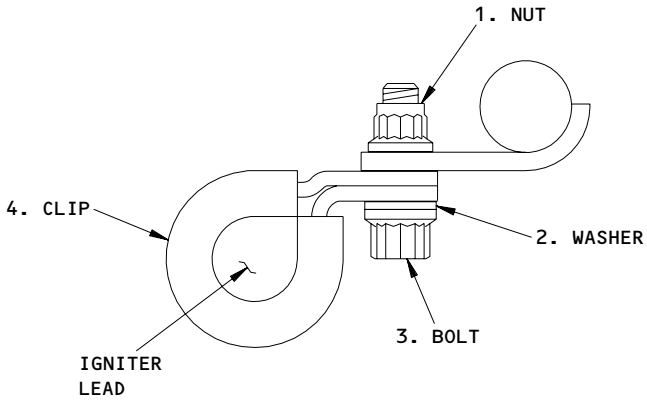


CLIP POSITION 2639

DEE00Y2254

Clip Position
Figure 405 (Sheet 25)





CLIP POSITION 2666

DEE00Y2282

Clip Position
Figure 405 (Sheet 26)

IGNITER LEADS - REMOVAL/INSTALLATION

TASK 74-21-01-004-001-R02

1. Remove the Igniter Leads

A. References

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

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

B. Access

(1) Location Zones

413	Fan Cowl Panel (left)
415	Thrust Reverser (left)
416	Thrust Reverser (right)
423	Fan Cowl Panel (left)
425	Thrust Reverser (left)
426	Thrust Reverser (right)

(2) Access Panels

413AL	Fan Cowl Panel (left)
415AL	Thrust Reverser (left)
416AR	Thrust Reverser (right)
423AL	Fan Cowl Panel (left)
425AL	Thrust Reverser (left)
426AR	Thrust Reverser (right)

C. Prepare for Removal

S 864-002-R02

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

(a) P11 Overhead Circuit Breaker Panel

1) 11D7, ENGINES STBY IGN L 1

2) 11D8, ENGINES STBY IGN L 2

3) 11L1, LEFT ENGINE IGN 1

S 864-034-R02

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

(a) P11 Overhead Circuit Breaker Panel

1) 11D9, ENGINES STBY IGN R 1

2) 11D10, ENGINES STBY IGN R 2

3) 11L28, RIGHT ENGINE IGN 1

S 014-003-R02

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

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

S 014-004-R02

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

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

D. Remove the Igniter Leads (Fig. 401 and 401A)

S 034-005-R02

(1) Disconnect the low voltage lead (2) from the ignition exciter.

S 024-006-R02

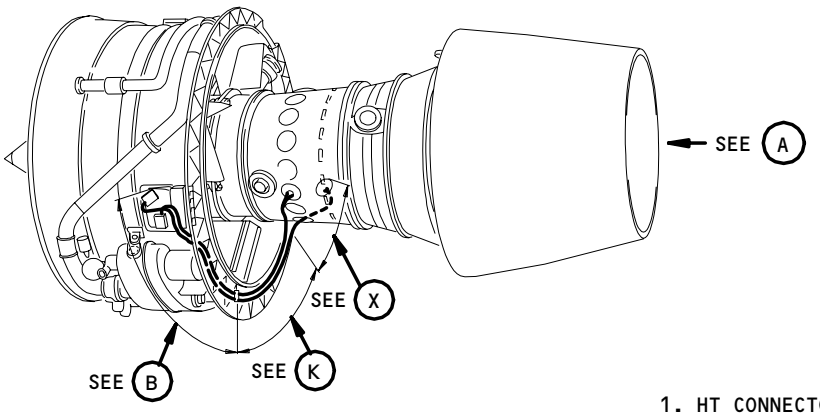
WARNING: DO NOT DISCONNECT THE HIGH VOLTAGE LEAD UNTIL THE LOW VOLTAGE LEAD TO THE IGNITION EXCITER IS DISCONNECTED FOR MORE THAN ONE MINUTE. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURY TO PERSONS CAN OCCUR.

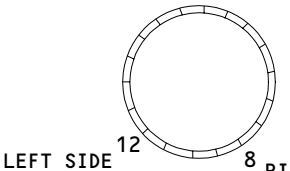
(2) One minute after you have disconnected the low voltage lead (2) from the ignition exciter, disconnect the high voltage lead (1) from the ignition exciter.

S 024-007-R02

(3) Remove the clamps that attach the igniter lead to the fan case as follows:

(a) Remove the bolts (3, 8, 11, 12), washers (4), spacers (9, 13) and nuts (7, 10) that attach the igniter leads to the fan case.

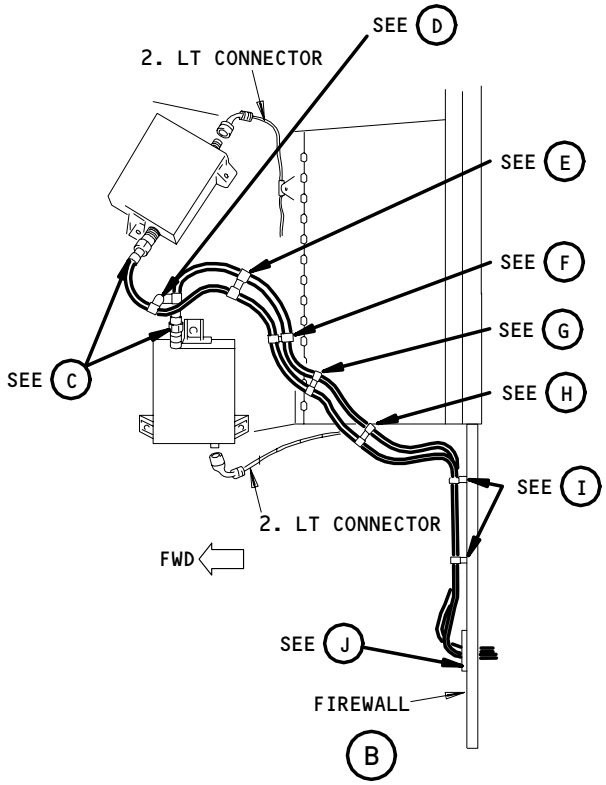




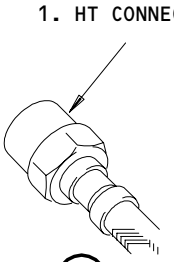
(VIEW IN THE FORWARD DIRECTION)

A

77624



B



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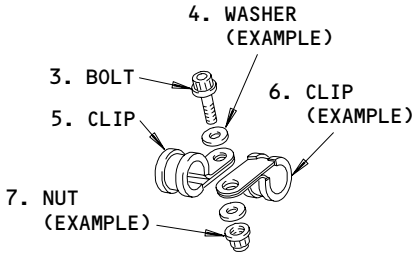

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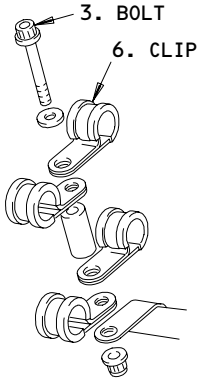

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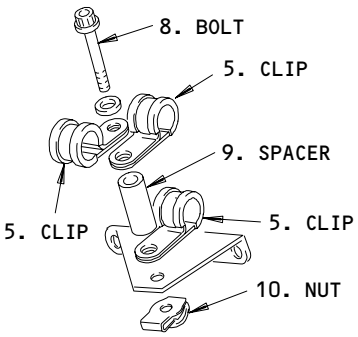

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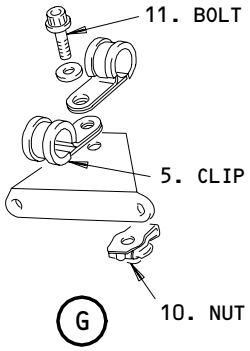

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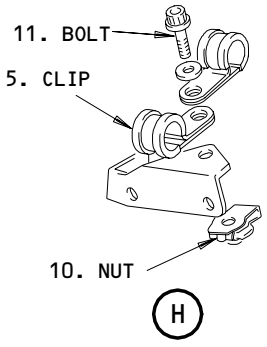

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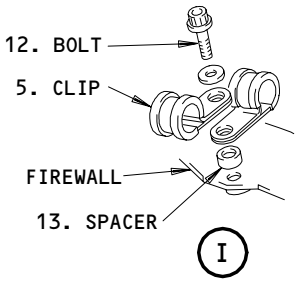

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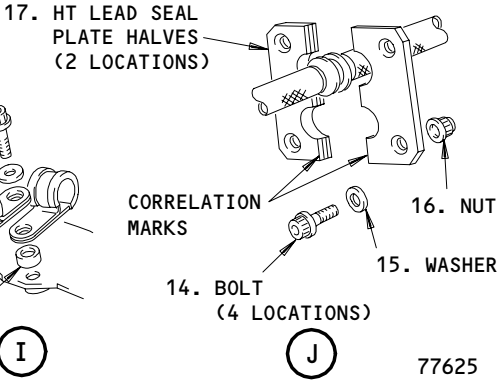


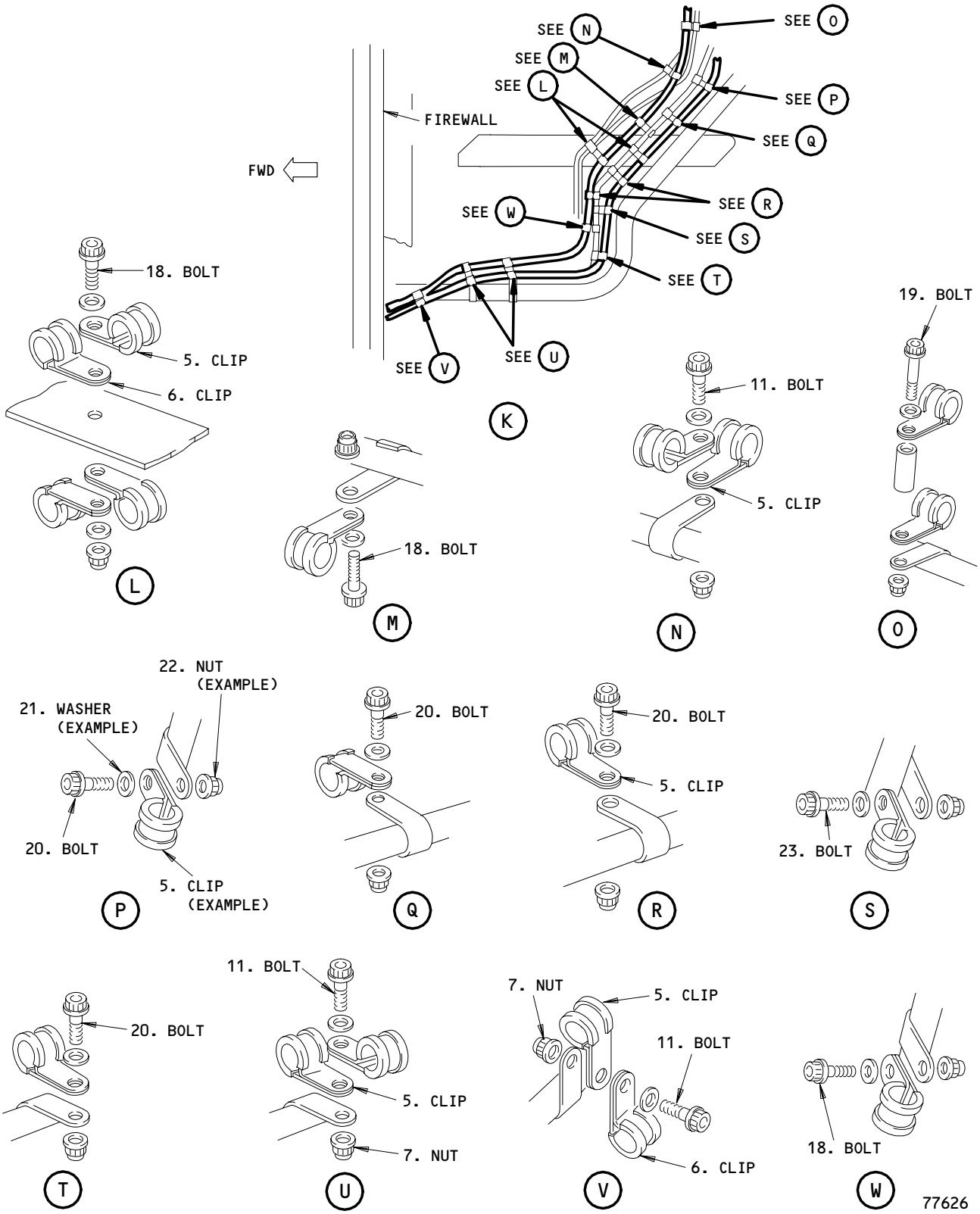
J

77625

Igniter Leads Installation
Figure 401 (Sheet 1)

EFFECTIVITY
ENGINES PRE RR SB 71-8310

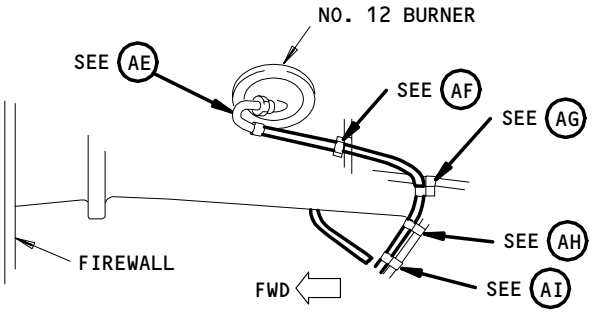
276342



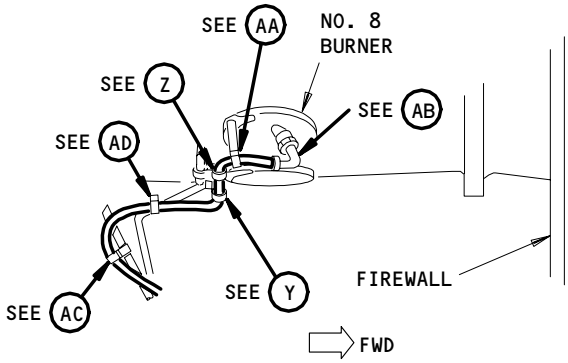
Igniter Leads Installation
Figure 401 (Sheet 2)

EFFECTIVITY
ENGINES PRE RR SB 71-8310

276337

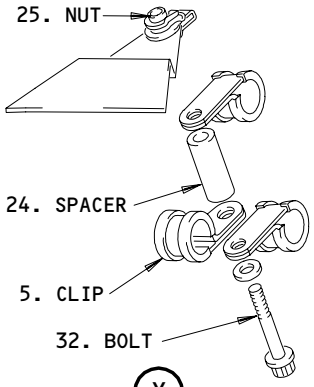


VIEW ON LEFT SIDE OF ENGINE



VIEW ON RIGHT SIDE OF ENGINE

X



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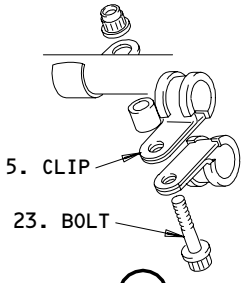

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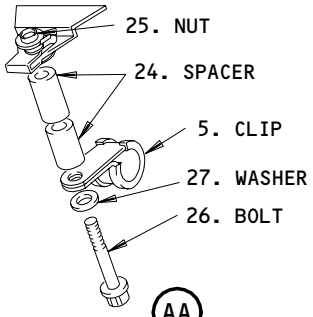

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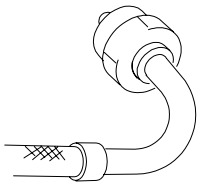

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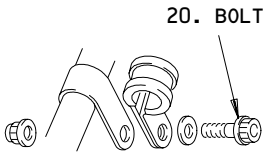

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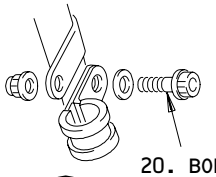

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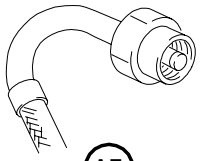

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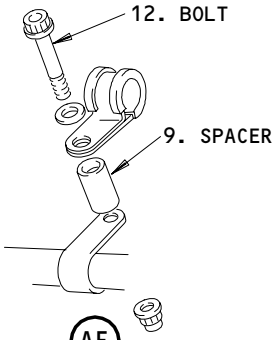

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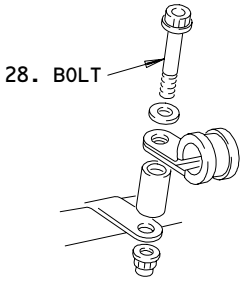

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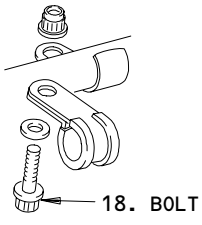

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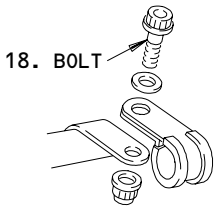


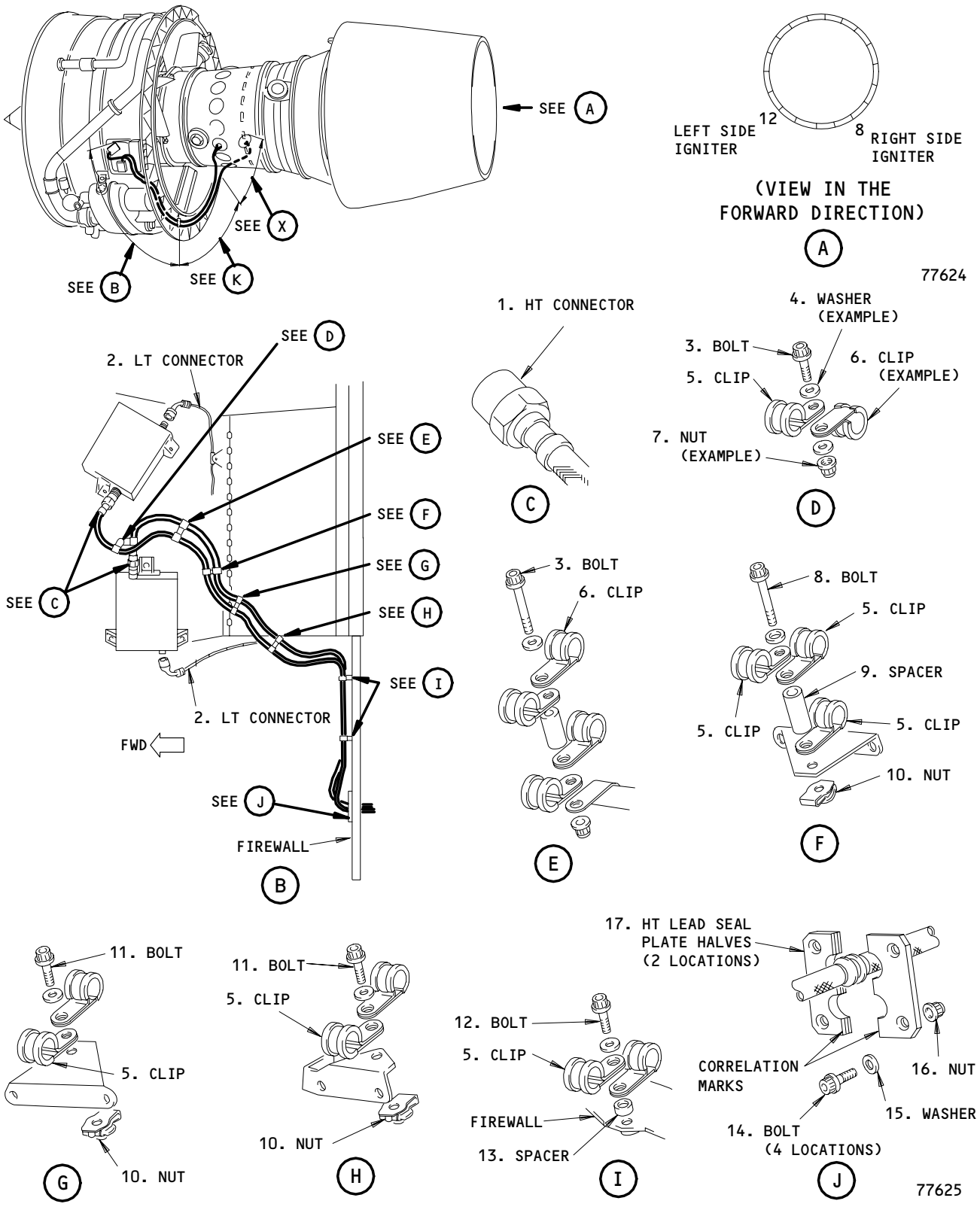
AI

77627

Igniter Leads Installation
Figure 401 (Sheet 3)

EFFECTIVITY
ENGINES PRE RR SB 71-8310

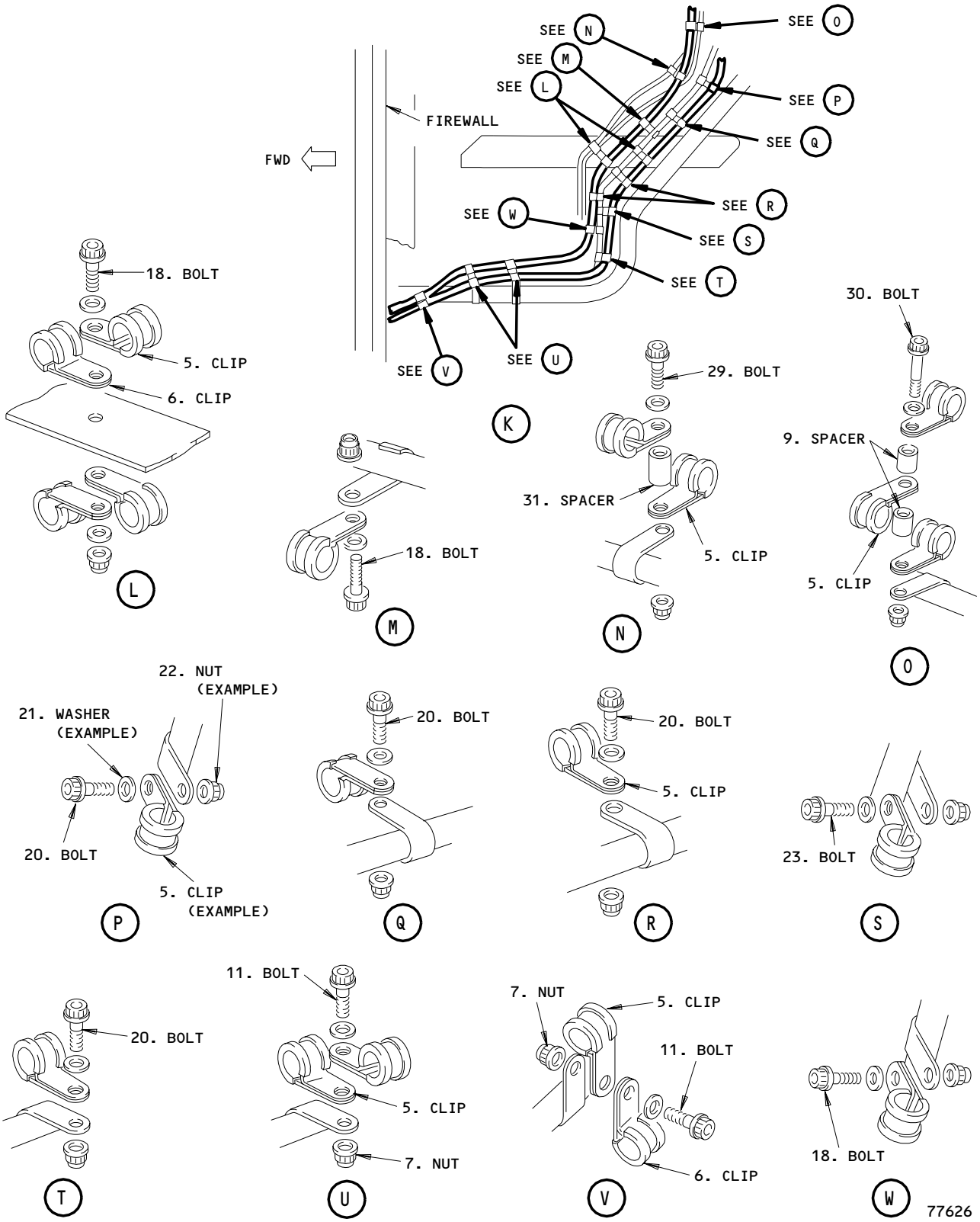
276343



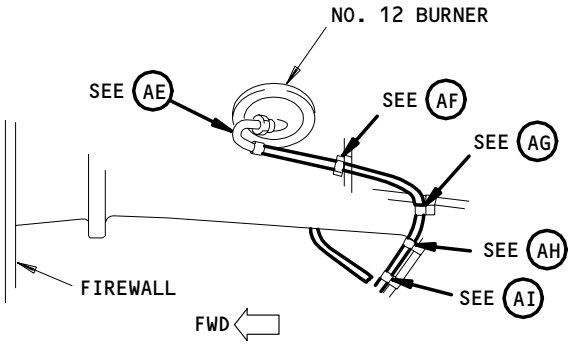
Igniter Leads Installation
Figure 401A (Sheet 1)

EFFECTIVITY
ENGINES POST RR SB 71-8310

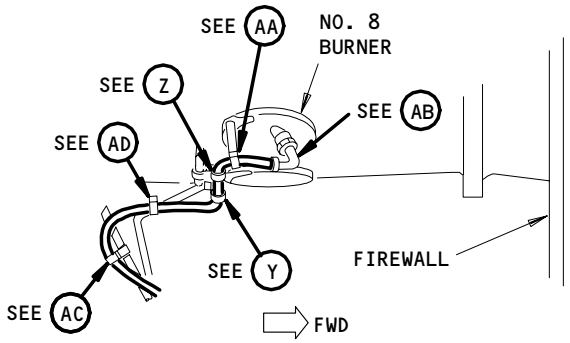
766785



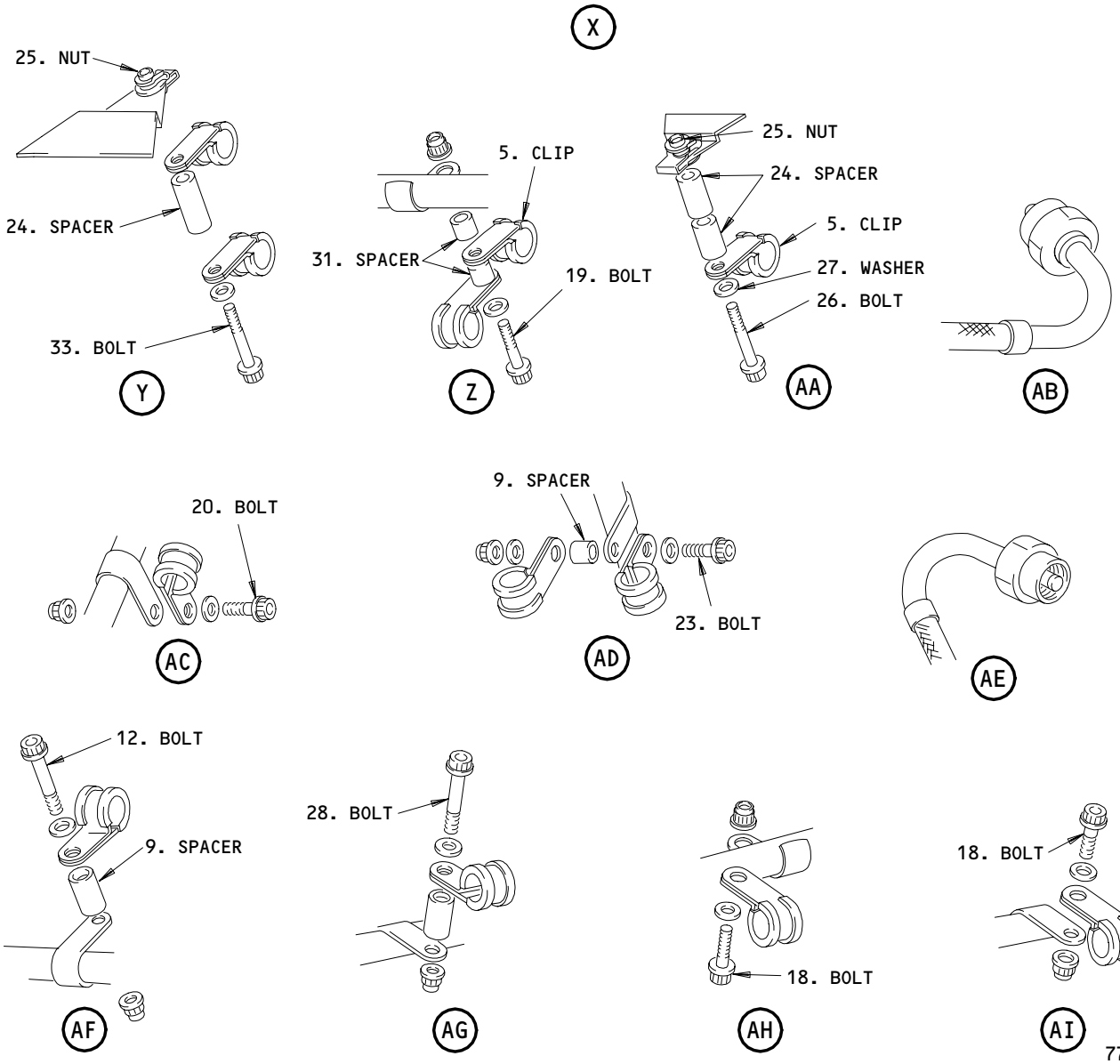
Igniter Leads Installation
Figure 401A (Sheet 2)



VIEW ON LEFT SIDE OF ENGINE



VIEW ON RIGHT SIDE OF ENGINE



Igniter Leads Installation
Figure 401A (Sheet 3)

(b) Remove the clamps (5, 6) that attach the igniter leads to the fan case.

S 034-008-R02

(4) Remove the seal plates (17) as follows:
(a) Remove the bolts (14), washers (15) and nuts (16) that attach the seal plate to the fan case.
(b) Remove the seal plate (17) from the fan case.

S 024-009-R02

(5) For the left igniter lead, do the steps that follow:
(a) ENGINES PRE RR SB 71-8310;
Remove bolts (11, 18, 19), washers (4) and nuts (7) from the rear of the fan case.
(b) ENGINES POST RR SB 71-8310;
Remove bolts (18, 29, 30), spacers (9, 31), washers (4) and nuts (7) from the rear of the fan case.
(c) Remove the clamps (5, 6) from the rear of the fan case.
(d) Remove bolts (12, 18, 28), washers (4), spacers (9) and nuts (7).
(e) Remove the clamps (6) from the engine core.

S 024-010-R02

(6) For the right igniter lead, do the steps that follow:
(a) Remove the bolts (11, 20, 23), washers (4, 21) and nuts (7, 22) from the rear of the fan case.
(b) Remove the clamps (5, 6) from the rear of the fan case.
(c) ENGINES PRE RR SB 71-8310;
Remove the bolts (20, 23, 26, 32), washers (21, 27), spacers (24) and nuts (22, 25) from the engine core.
(d) ENGINES POST RR SB 71-8310;
Remove the bolts (19, 23, 26, 33), washers (21, 27), spacer (9, 24, 31) and nuts (22, 25) from the engine core.
(e) Remove the clamp (5) from the engine core.

S 024-011-R02

(7) Disconnect the high voltage lead from the igniter plug.

S 024-012-R02

(8) Pull the high voltage lead (1) through the fan case and remove it from the engine.

TASK 74-21-01-404-013-R02

2. Install the Igniter Leads

A. General

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

(2) Use the procedure in AMM 70-50-02/201 to tighten the electrical connectors.

B. Parts

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	3	Bolt	74-21-01	01	39
	4	Washer			43
	5	Clip	74-21-01	02	6
	6	Clip	74-21-01	01	6
	7	Nut			68
	8	Bolt			33
	9	Spacer			53
	10	Nut			73
	11	Bolt			27
	12	Bolt			23
	13	Spacer			45
	14	Bolt			80
	15	Washer			85
	16	Nut			90
	17	Plate - Matched Pair Seal Halves			75
	18	Bolt			32
	19	Bolt			13
	20	Bolt	74-21-01	02	7
	21	Washer			37
	22	Nut			67
401	23	Bolt	74-21-01	02	12
	24	Spacer			50
	25	Nut			65
	26	Bolt			30
	27	Washer			38
	28	Bolt	74-21-01	01	24
	29	Bolt			22
	30	Bolt			13
	31	Spacer			44
	32	Bolt	74-21-01	02	13
	33	Bolt			19

C. References
(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 74-00-00/501, Ignition System
(3) AMM 78-31-00/201, Thrust Reverser System

D. Access

(1) Location Zones

413	Fan Cowl Panel (left)
415	Thrust Reverser (left)
416	Thrust Reverser (right)
423	Fan Cowl Panel (left)
425	Thrust Reverser (left)
426	Thrust Reverser (right)

(2) Access Panels

413AL	Fan Cowl Panel (left)
415AL	Thrust Reverser (left)
416AR	Thrust Reverser (right)
423AL	Fan Cowl Panel (left)
425AL	Thrust Reverser (left)
426AR	Thrust Reverser (right)

E. Install the Igniter Leads (Fig. 401 and 401A)

S 424-014-R02

(1) Connect the high voltage lead (1) to the igniter plug.

S 424-015-R02

(2) Put the other end of the high voltage lead (1) through the rear of the fan case.

S 424-016-R02

(3) For the left igniter lead, do the steps that follow:

(a) Install the clamps (6) that attach the high voltage lead (1) to the engine core.

(b) Install the bolts (12, 18, 28), washers (4), spacers (9) and nuts (7) that attach the clamps (6) to the engine core.

NOTE: Do not tighten the bolts at this time.

(c) Install the clamps (5, 6) that attach the high voltage lead (1) to the rear of the fan case.

(d) ENGINES PRE RR SB 71-8310;
Install the bolts (11, 18, 19), washers (4) and nuts (7) that attach the clamps (5, 6) to the rear of the fan case.

NOTE: Do not tighten the bolts at this time.

(e) ENGINES POST RR SB 71-8310;
Install the bolts (18, 29, 30), spacers (9, 31), washers (4) and nuts (7) that attach the clamps (5, 6) to the rear of the fan case.

NOTE: Do not tighten at this time.

S 424-017-R02

(4) For the right igniter lead, do the steps that follow:

(a) Install the clamps (5) that attach the high voltage lead (1) to the rear of the fan case.

(b) ENGINES PRE RR SB 71-8310;
Install the bolts (20, 23, 26, 32), washers (21, 27), spacers (24) and nuts (22, 25) that attach the clamps (5) to the rear of the fan case.

NOTE: Do not tighten the bolts at this time.

(c) ENGINES POST RR SB 71-8310;
Install the bolts (19, 23, 26, 33), washers (21, 27), spacers (9, 24, 31) and nuts (22, 25) that attach the clamps (5) to the rear of the fan case.

NOTE: Do not tighten the bolts at this time.

(d) Install the clamps (5, 6) that attach the high voltage lead (1) to the fan case.

(e) Install the bolts (11, 20, 23), washers (4, 21) and nuts (7, 22) that attach the clamps (5, 6) to the fan case.

NOTE: Do not tighten the bolts at this time.

S 424-018-R02

(5) Install the clamps that attach the igniter leads to the fan case as follows:

(a) Install the clamps (5, 6) that attach the high voltage leads (1) to the fan case.

(b) Install bolts (3, 8, 11, 12), washers (4), spacers (9, 11) and nuts (7, 10) that attach the clamps (5, 6) to the fan case.

NOTE: Do not tighten the bolts at this time.

S 424-019-R02

(6) Connect the high voltage lead (1) to the ignition exciter.

S 434-020-R02

(7) Install the seal plates (17) as follows:

(a) Put the seal plate (17) around the high voltage leads on the forward side of the firewall.

NOTE: Make sure that the seal plates are installed with the correlation marks aligned correctly.

(b) Install the bolts (14), washers (15) and nuts (16) that attach the seal plates (17) to the forward side of the firewall.

NOTE: Do not tighten the bolts at this time.

S 424-021-R02

(8) Tighten the bolts (3, 8, 11, 12, 18, 19, 20, 23) that attach the clamps (5, 6) to the engine.

S 434-022-R02

(9) Tighten the bolts (14) that attach the seal plate (17) to the firewall.

S 434-023-R02

(10) Tighten the high voltage lead (1) at the igniter plug to 140-150 pound-inches.

NOTE: Make sure the elbow on the igniter plug lead is tight so that it will not turn.

(a) Install lockwire on the igniter plug connector.

S 424-024-R02

(11) Connect the high voltage lead (1) to the ignition exciter.

S 424-025-R02

(12) Tighten the high voltage lead (1) connection on the ignition exciter to 140-150 pound-inches.

S 434-033-R02

(13) Install the lockwire on the HT connector.

S 434-026-R02

(14) Connect the low voltage lead (2) to the ignition exciter.

S 434-027-R02

(15) Tighten the low voltage lead (2) to the ignition exciter.

F. Put the Airplane Back to Its Usual Condition

S 414-028-R02

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

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

S 414-029-R02

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

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

S 864-030-R02

(3) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D7, ENGINES STBY IGN L 1
      2) 11D8, ENGINES STBY IGN L 2
      3) 11L1, LEFT ENGINE IGN 1

S 864-031-R02

(4) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
   (a) P11 Overhead Circuit Breaker Panel
      1) 11D9, ENGINES STBY IGN R 1
      2) 11D10, ENGINES STBY IGN R 2
      3) 11L28, RIGHT ENGINE IGN 1

S 714-032-R02

(5) Do the audible test procedure for the ignition system (AMM 74-00-00/501).

IGNITER PLUGS - REMOVAL/INSTALLATION

1. General
   A. This procedure gives a task to remove the igniter plug and a task to install the igniter plug.
   B. This procedure is applicable to both the left and right igniter plugs.

   TASK 74-21-02-004-001-R01

2. Remove the Igniter Plug
   A. References
      (1) AMM 70-50-02/201, Connection of Electrical Plugs
      (2) AMM 70-51-00/201, Torque Tightening Technique
      (3) AMM 71-11-04/201, Fan Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones

415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

      (2) Access Panels

415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

   C. Procedure

      S 864-002-R01
      (1) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
         (a) P11 Overhead Circuit Breaker Panel
            1) 11D7, ENGINES STBY IGN L 1
            2) 11D8, ENGINES STBY IGN L 2
            3) 11L1, LEFT ENGINE IGN 1

      S 864-003-R01
      (2) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
         (a) P11 Overhead Circuit Breaker Panel
            1) 11D9, ENGINES STBY IGN R 1
            2) 11D10, ENGINES STBY IGN R 2
            3) 11L28, RIGHT ENGINE IGN 1

S 014-004-R01

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

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

S 014-005-R01

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

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

S 024-006-R01

(5) Do these steps to remove the igniter plug (Fig. 401 and 402):

WARNING: THE ELECTRICAL DISCHARGE FROM THE HIGH ENERGY IGNITION UNITS IS VERY DANGEROUS. THE LOW TENSION (LT) LEAD TO THE UNIT MUST BE DISCONNECTED FOR ONE MINUTE BEFORE YOU DISCONNECT THE HIGH TENSION (HT) LEAD. INJURY TO PERSONS CAN OCCUR IF THESE INSTRUCTIONS ARE NOT FOLLOWED.

(a) Disconnect the applicable LT connector (1) and wait one minute before you continue the procedure.

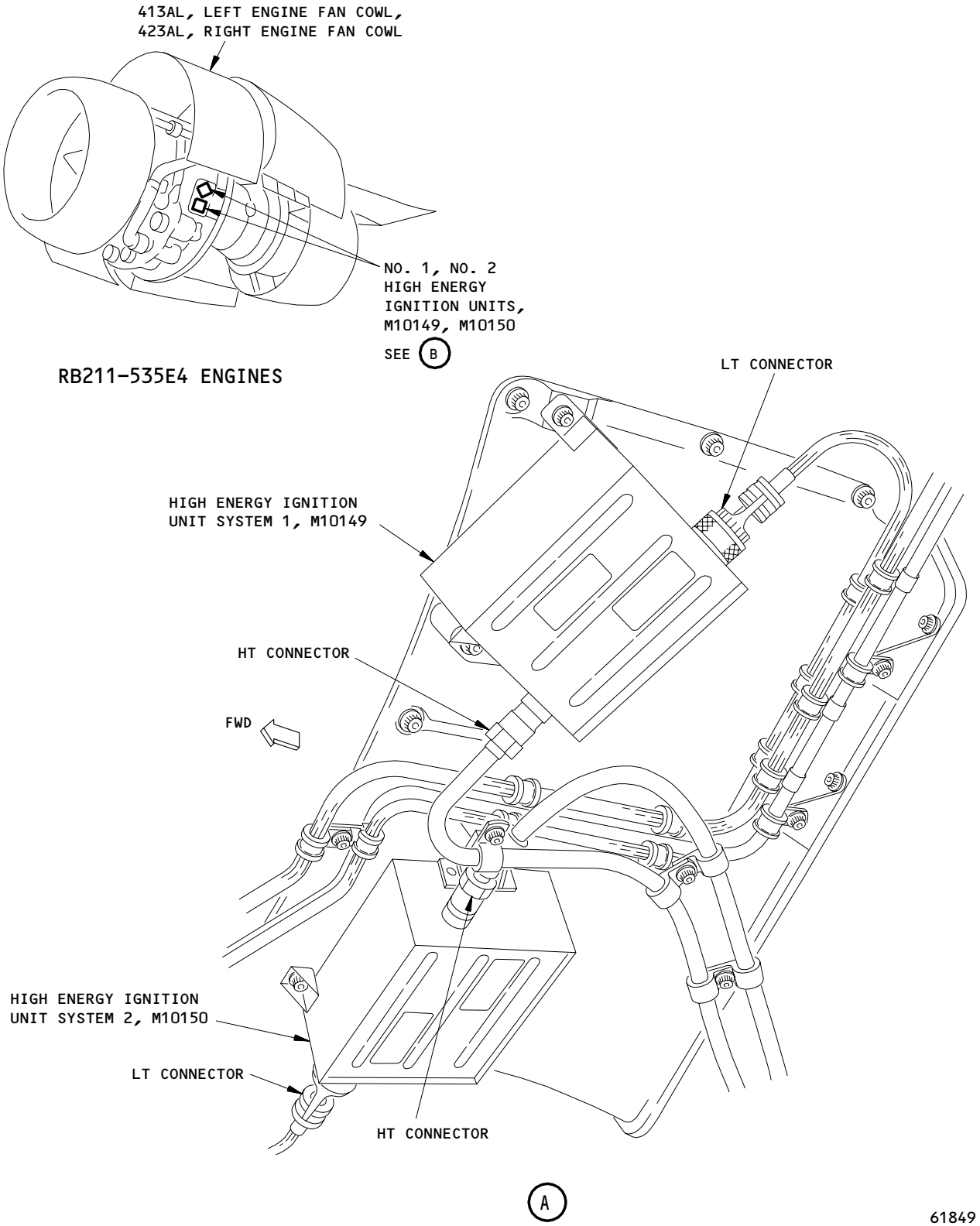
NOTE: The right igniter plug is for the No. 1 unit and the left igniter plug is for the No. 2 unit.

(b) Disconnect the HT lead (2) from the igniter plug.
(c) Remove the igniter plug (1) from the fuel spray nozzle.
1) Keep the spacer washers (3) for installation.
(d) Put dust caps on the igniter plug hole, the connector and the plug.

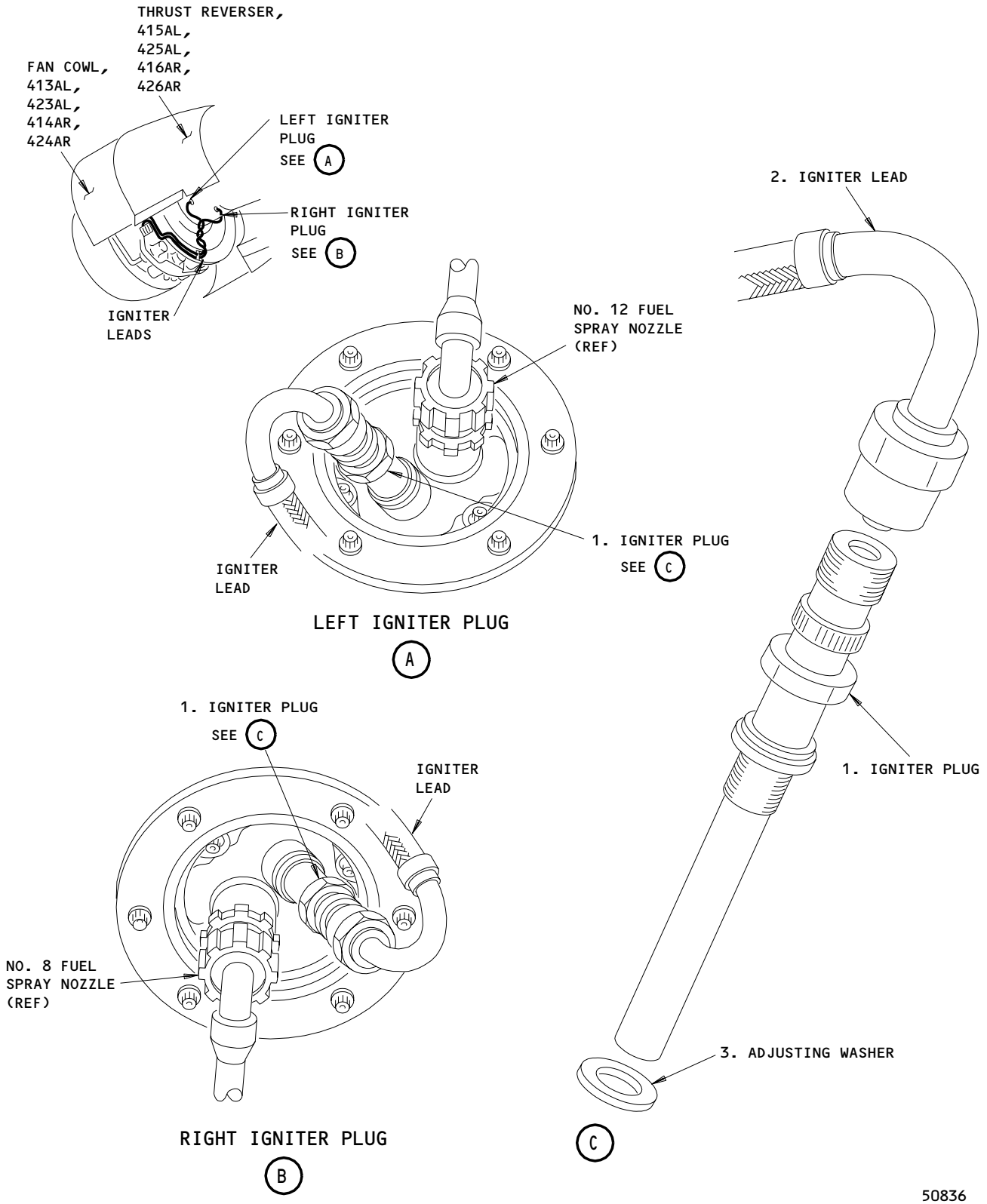
TASK 74-21-02-404-007-R01

3. Install the Igniter Plug

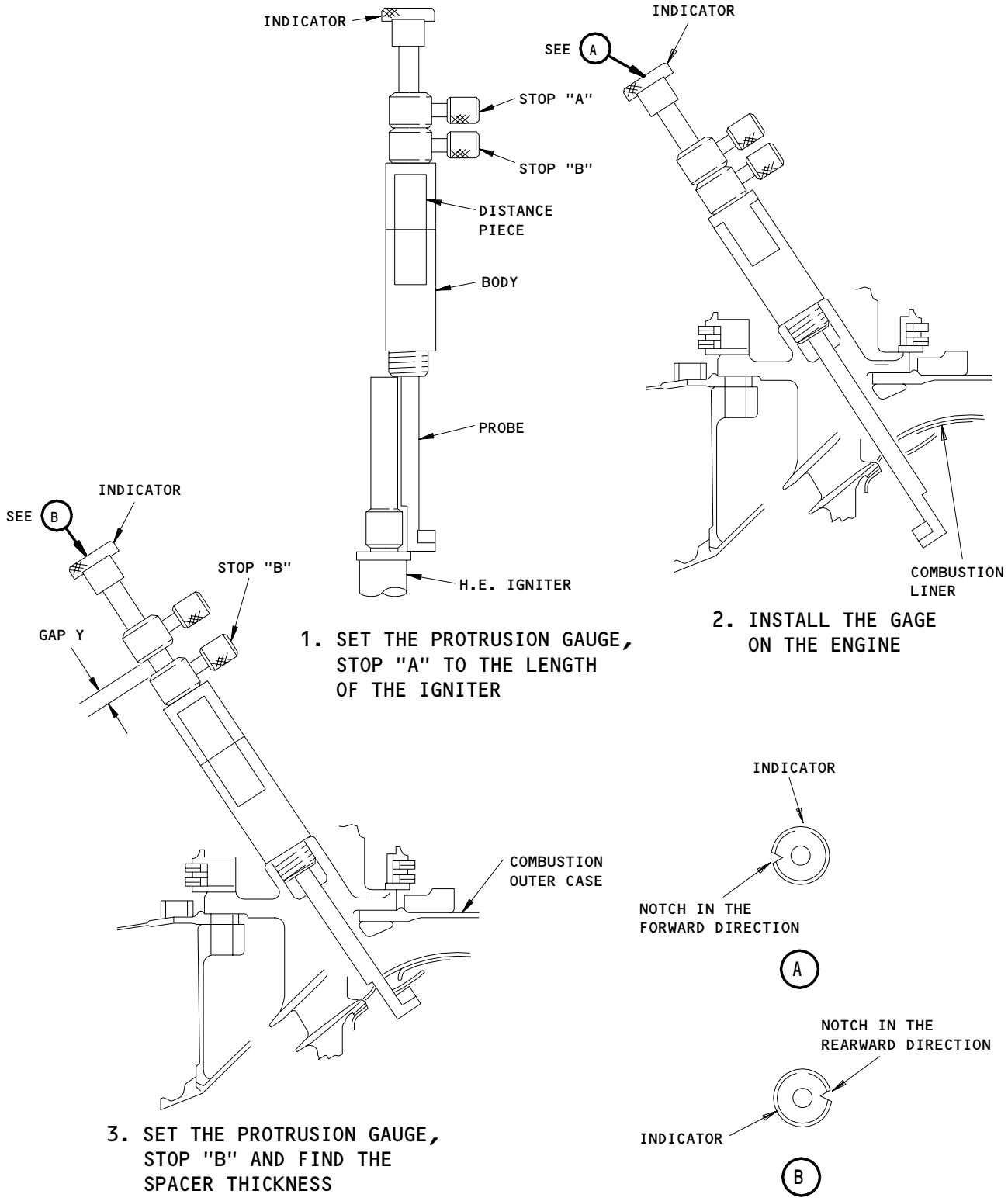
A. Equipment
(1) Rolls-Royce UT 1152 Socket wrench
or
Rolls-Royce 1702229 Socket wrench
(2) Rolls-Royce HU28096/1 Protrusion Gage



Igniter Unit Disconnect Points
Figure 401



Igniter Plug Installation
Figure 402



Igniter Plug Immersion Check
Figure 403

EFFECTIVITY
RB211-535E4 ENGINES PRE RR SB 72-C230
(PHASE II COMBUSTOR)

H70206

B. Consumable Materials
(1) D00322 Lubricant - Dry film (or lubricant of similar properties)
British Spec - PL198
OMat No. - 4/20

C. Parts

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1 3	Igniter Plug Adjusting Washers	74-21-02	01	5 10,15

D. References
(1) AMM 70-50-02/201, Connection of Electrical Plugs
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 74-00-00/501, Ignition System
(5) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zones
415 Thrust Reverser (Left)
416 Thrust Reverser (Right)
425 Thrust Reverser (Left)
426 Thrust Reverser (Right)

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

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

S 434-008-R01
(1) Remove the dust caps from the igniter plug hole, the connector and the plug.

S 224-009-R01
(2) Do the steps that follow to make a check of the immersion depth for the igniter plug (Fig. 403):
(a) Set stop A on the protrusion gage.
1) Release the lock screws on stop A and B.

2) Pull out the distance piece from the body and turn the distance piece 90 degrees to put it on the end face of the body.
3) Use the igniter plug to set the protrusion gage.
4) Make sure stop B touches the distance piece and stop A touches stop B.
5) Tighten stop A.
6) Turn the distance piece 90 degrees and push it into the body.

(b) Install the protrusion gage on the engine.
1) Turn the probe indicator notch to face forward and install the protrusion gage on the engine at the igniter plug hole.
2) Make sure the body of the protrusion gage is fully seated on the plug mounting flange.

(c) Set stop B on the protrusion gage.

CAUTION: BE CAREFUL NOT TO DAMAGE THE COMBUSTION LINER COATING WHEN YOU USE THE PROTRUSION GAGE.

1) Pull out and turn the distance piece 90 degrees to put it on the end face of the body.
2) Turn the probe indicator notch to the aft.
3) Pull out the probe until the conditions that follow have occurred:
a) The probe foot touches the combustion liner.
b) The distance piece touches the gage body.
c) Stop B touches the distance piece.
4) Tighten stop B on the protrusion gage.

(d) Turn the distance piece 90 degrees and push it into the body.
(e) Turn the probe indicator notch to face forward and remove the protrusion gage from the engine.
(f) Get the correct number of spacer washers to equal gap Y.

S 424-010-R01

(3) Do the steps that follow to install the igniter plug (1):
(a) Put the lubricant on the threads of the igniter plug (1).
(b) Install the spacer washers (3) on the igniter plug (1).
(c) Install the igniter plug into the boss on the fuel spray nozzle.
1) Tighten the igniter plug to 200 pound-inches (22.6 Newton meters) (Ref 70-51-00/201).
(d) Connect the lead (2) and tighten the connector to 140-150 pound-inches so the lead elbow cannot be turned.
1) Install lockwire on the connector.

S 434-011-R01
(4) Connect the applicable LT connector (AMM 70-50-02/201) to the igniter unit (Fig. 401).

S 414-012-R01

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

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

S 414-013-R01

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

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

S 864-014-R01
(7) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11D7, ENGINES STBY IGN L 1
2) 11D8, ENGINES STBY IGN L 2
3) 11L1, LEFT ENGINE IGN 1

S 864-015-R01
(8) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11D9, ENGINES STBY IGN R 1
2) 11D10, ENGINES STBY IGN R 2
3) 11L28, RIGHT ENGINE IGN 1

S 714-016-R01
(9) Do the ignition system audible test procedure (AMM 74-00-00/501).

IGNITER PLUGS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks as follows:
      (1) The removal of the igniter plugs
      (2) The installation of the igniter plugs.

   TASK 74-21-02-004-001-R02

2. Remove the Igniter Plug
   A. Equipment
      (1) Rolls-Royce UT1152 Socket Wrench
      (2) Rolls-Royce HU40619 Protrusion Gauge
   B. Consumable Materials
      (1) High Temperature Anti-Seize Compound, OMat 4/62
      (2) Lockwire, OMat 238 - (American Spec./Ref. 21 A.W.G.)
                             - (British Spec./Ref. DTD.189A, 22 S.W.G.)
   C. References
      (1) AMM 70-50-02/201, Connection of Electrical Plugs
      (2) AMM 70-51-00/201, Torque Tightening Technique
      (3) AMM 71-11-04/201, Fan Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   D. Access
      (1) Location Zones
          415 Thrust Reverser (Left)
          416 Thrust Reverser (Right)
          425 Thrust Reverser (Left)
          426 Thrust Reverser (Right)

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

   E. Procedure

      S 844-017-R02
      (1) Do these stps to prepare to remove the igniter plugs:
          (a) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
              1) P11 Overhead Circuit Breaker Panel
                 a) 11D7, ENGINES STBY IGN L 1
                 b) 11D8, ENGINES STBY IGN L 2
                 c) 11L1, LEFT ENGINE IGN 1

(b) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
1) P11 Overhead Circuit Breaker Panel
a) 11D9, ENGINES STBY IGN R 1
b) 11D10, ENGINES STBY IGN R 2
c) 11L28, RIGHT ENGINE IGN 1

S 014-004-R02

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

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

S 014-005-R02

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

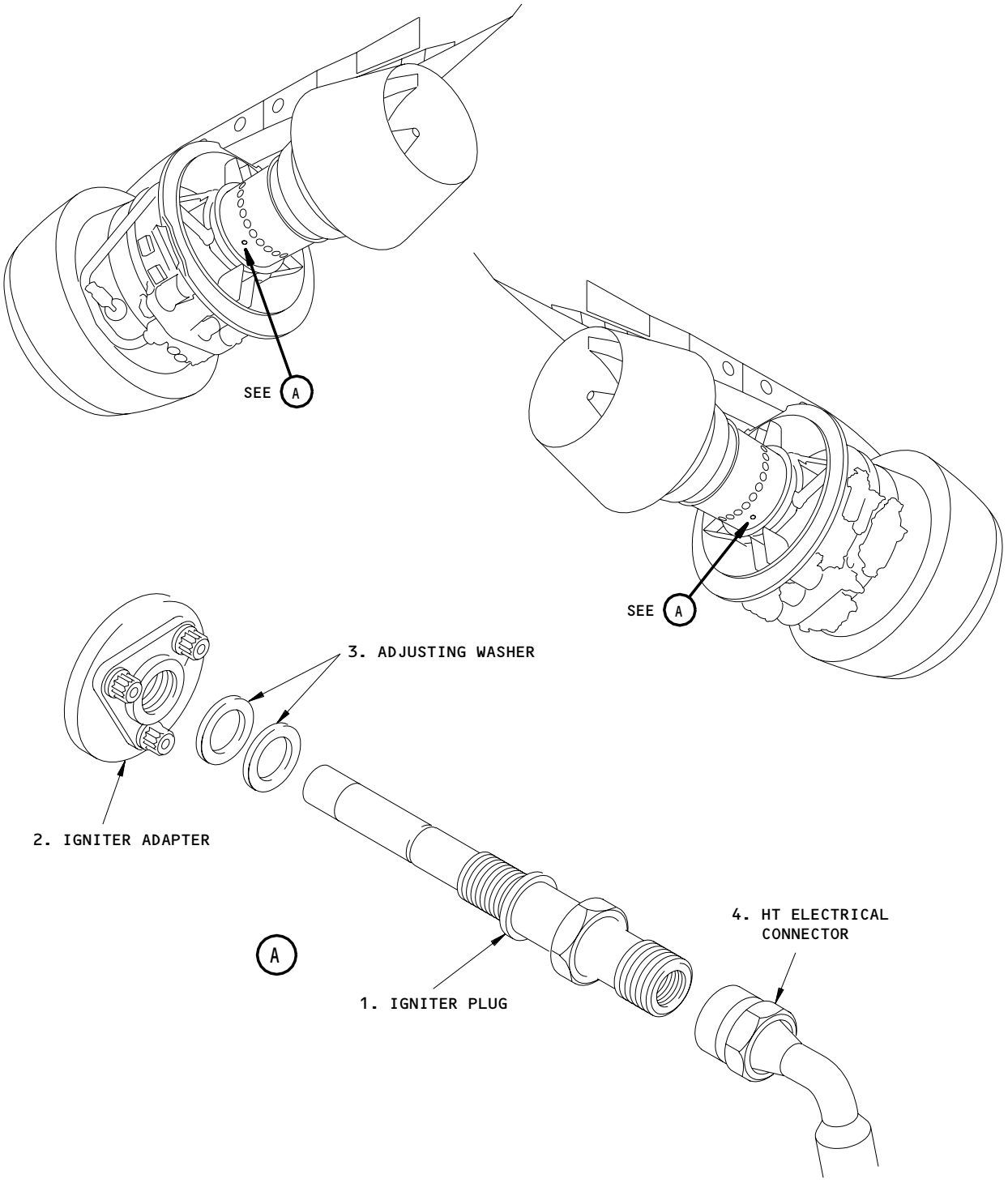
(3) Open the thrust reversers (AMM 78-31-00/201).

S 024-018-R02
(4) Remove the igniter plugs as follows (Fig. 401):
(a) Disconnect the applicable LT connector (1) (Fig. 403) and wait one minute before you continue the procedure.

NOTE: The right igniter plug is for the No. 1 unit and the left igniter plug is for the No. 2 unit.

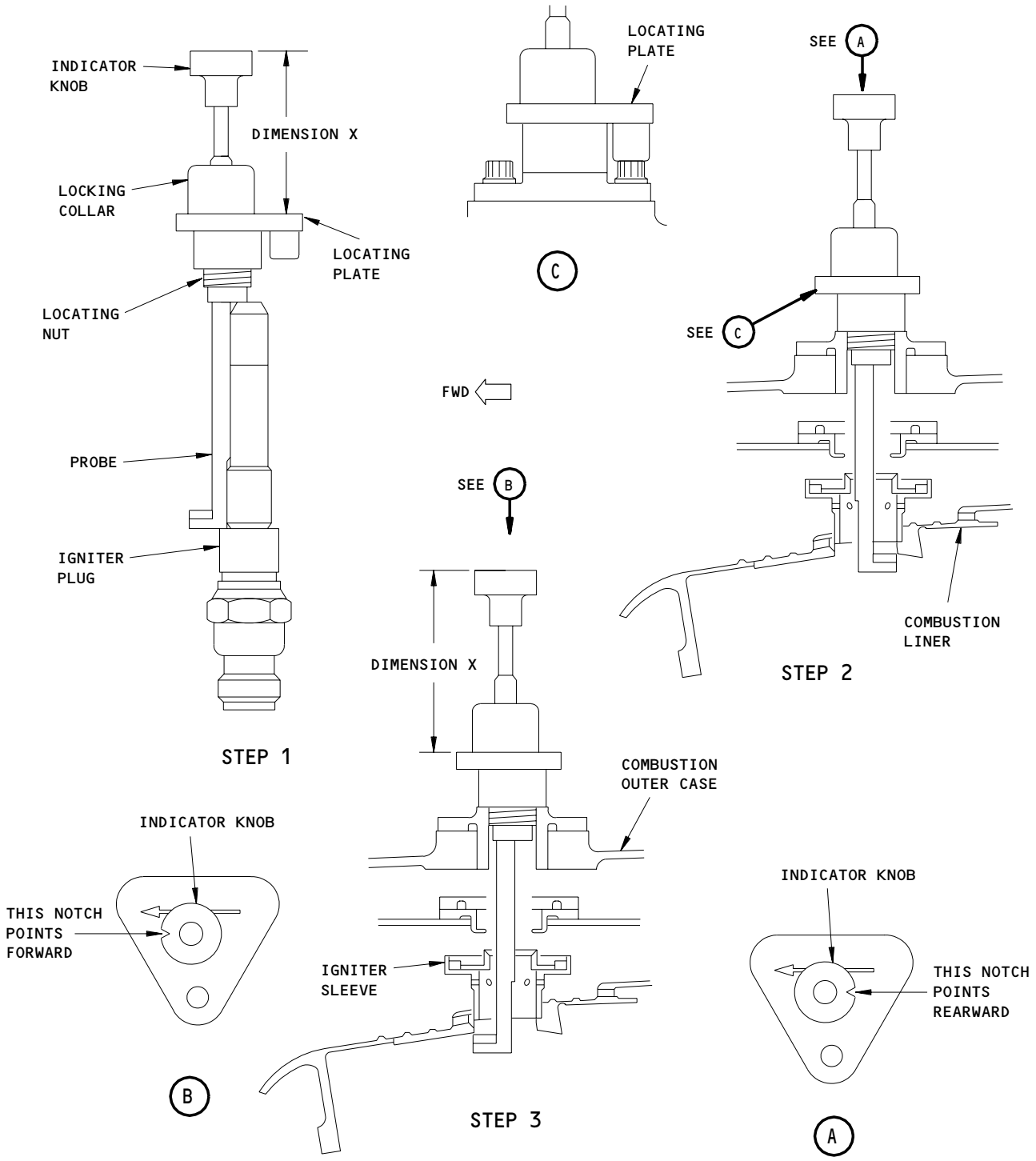
WARNING: THE LOW TENSION SUPPLY TO THE UNIT MUST BE DISCONNECTED FOR 1 MINUTE. AFTER 1 MINUTE DISCONNECT THE HIGH TENSION (H.T.) LEAD TO THE IGNITER PLUG. THE ELECTRICAL DISCHARGE FROM THE HIGH ENERGY IGNITION UNITS CAN CAUSE SERIOUS INJURY OR DEATH TO PERSONNEL.

(b) Disconnect the HT lead (4) from the igniter plug (1).
(c) Remove the igniter plug using the socket wrench and keep the adjusting washers (3).
(d) Fit the approved blanks to the igniter plug aperture and electrical connectors.

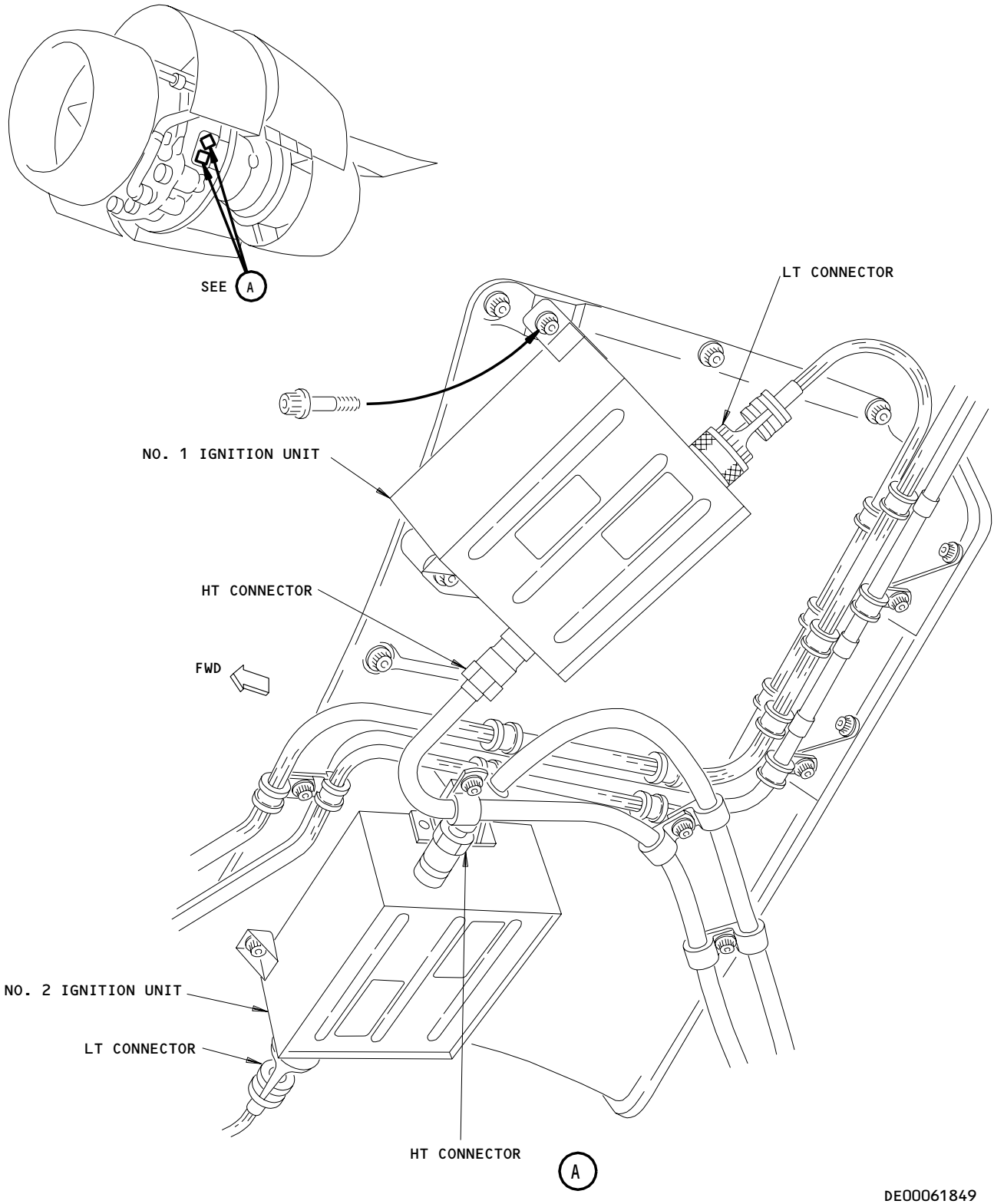


DEE00Y2232

Ignition Plug - Removal/Installation
Figure 401



Igniter Plug - Immersion Check
Figure 402



Ignition Systems Igniter Units
Figure 403

TASK 74-21-02-404-007-R02

3. Install the Igniter Plug

A. Equipment
(1) Rolls-Royce UT1152 Socket Wrench
(2) Rolls-Royce HU40619 Protrusion Gauge

B. Consumable Materials
(1) High Temperature Anti-Seize Compound, OMat 4/62
(2) Lockwire, OMat 238 - (American Spec./Ref. 21 A.W.G.)
- (British Spec./Ref. DTD.189A, 22 S.W.G.)

C. References
(1) AMM 70-50-02/201, Connection of Electrical Plugs
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 74-00-00/501, Ignition System
(5) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones

415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

(2) Access Panels

415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

E. Procedure

S 844-019-R02
(1) Prepare to install the igniter plugs.
(a) For the left engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
1) P11 Overhead Circuit Breaker Panel
a) 11D7, ENGINES STBY IGN L 1
b) 11D8, ENGINES STBY IGN L 2
c) 11L1, LEFT ENGINE IGN 1
(b) For the right engine, open these circuit breakers and attach the DO-NOT-CLOSE tags:
1) P11 Overhead Circuit Breaker Panel
a) 11D9, ENGINES STBY IGN R 1
b) 11D10, ENGINES STBY IGN R 2
c) 11L28, RIGHT ENGINE IGN 1

S 014-020-R02

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

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

S 014-021-R02

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

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

S 024-022-R02

(4) Ensure the related Low Tension (L.T.) connector (1) is disconnected.

NOTE: The right igniter plug is for the No. 1 unit and the left igniter plug is for the No. 2 unit.

S 434-008-R02

(5) Remove the dust caps from the igniter plug aperture and electrical connectors.

S 224-009-R02

(6) Check of the immersion depth for the igniter plug and determine the washer thickness (Fig. 402):
   (a) Set protrusion gauge to the depth of the igniter plug.
      1) As you make sure the locating plate is seated on the locating nut and that the plug is firmly held in the gauge by lightly tightening the locking collar, set the igniter plug against the protrusion gauge (Fig. 402).
      2) Use a depth gauge to measure dimension "X", then record dimension "X".
      3) Release the locking collar and remove the igniter plug from the gauge.
   (b) Fit the protrusion gauge to the engine (Fig. 402).

CAUTION: YOU MUST DO THE IGNITER IMMERSION DEPTH CHECK/SET PROTRUSION WHEN THE ENGINE IS COLD. YOU MUST WAIT FOR A MINIMUM TIME OF 3 HOURS AFTER ENGINE SHUT-DOWN BEFORE YOU DO THE IMMERSION DEPTH CHECK/SET PROCEDURE. IF YOU DO THE IMMERSION DEPTH CHECK/SET PROCEDURE ON A WARM ENGINE THE IGNITER PLUG IMMERSION DEPTH WILL BE INCORRECTLY SET AND COULD CAUSE ENGINE START PROBLEMS.

CAUTION: INSTALL THE PROTRUSION GAUGE CAREFULLY TO PREVENT DAMAGE TO THE COMBUSTION LINER.

1) Move the locking collar, locking plate, and locating nut towards the indicator knob and insert the probe into the igniter plug aperture.
2) Screw the locating nut into the aperture until it is fully home. Locate the locking plate over the locating nut ensuring the indicator arrow is pointing towards the front of the engine and that the locking plate is seated on one of the securing bolts.
3) Slide the probe into the engine and turn the indicator knob until the "V" notch is towards the front of the engine.
4) Carefully withdraw the probe until the probe toe touches the combustion liner. Hold the probe in position and lightly tighten the locking collar.
5) Measure and record dimension "X". Subtract the original dimension "X" from the new dimension "X". The result is the total thickness of the adjusting washers necessary to achive the correct igniter immersion.

(c) Remove the protrusion gauge from the engine.
1) Fully loosen the locking collar. Carefully slide the probe into the engine and turn the indicator knob until the "V" notch points towards the rear of the engine. Lift the locking collar and locking plate to gain access to the locating nut. Unscrew the locating nut and remove the gauge.

S 424-010-R02

(7) Install the igniter plugs (Fig. 401):
(a) Apply anti-seize compound to the igniter plug (1) threads.
(b) Fit the adjusting washer/s (3) previously retained or selected, to the igniter plug.

(c) Fit the igniter plug into the related igniter adapter (2).
1) Tighten the igniter plug to 250-300 pound-inches (28.3-39.9 Newton meters) (AMM 70-51-00/201).
(d) Connect the H.T. igniter lead (4) to the igniter plug, and tighten to 140-150 pound-inches (15.8-16.9 Newton meters), so the igniter lead elbow does not turn.
1) Install lockwire on the connector.

S 434-011-R02
(8) Connect the applicable LT connector (AMM 70-50-02/201) to the igniter unit (Fig. 403).

S 864-023-R02
(9) Restore the engine to flight status

S 414-012-R02

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

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

S 414-013-R02

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

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

S 864-014-R02
(12) For the left engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11D7, ENGINES STBY IGN L 1
2) 11D8, ENGINES STBY IGN L 2
3) 11L1, LEFT ENGINE IGN 1

S 864-015-R02
(13) For the right engine, remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) P11 Overhead Circuit Breaker Panel
1) 11D9, ENGINES STBY IGN R 1
2) 11D10, ENGINES STBY IGN R 2
3) 11L28, RIGHT ENGINE IGN 1

S 714-016-R02

(14) Do the ignition system audible test procedure (AMM 74-00-00/501).

IGNITER PLUGS - INSPECTION/CHECK

TASK 74-21-02-216-001-R01

1. Inspection of the Igniter Plugs

A. References

(1) AMM 74-00-00/501, Ignition System

(2) AMM 74-21-02/401, Igniter Plugs

B. Access

(1) Location Zones

415	Thrust Reverser (Left)
416	Thrust Reverser (Right)
425	Thrust Reverser (Left)
426	Thrust Reverser (Right)

(2) Access Panels

415AL	Thrust Reverser (Left)
416AR	Thrust Reverser (Right)
425AL	Thrust Reverser (Left)
426AR	Thrust Reverser (Right)

C. Procedure

S 026-002-R01

(1) Do the procedure to remove the igniter plugs (AMM 74-21-02/401).

S 216-003-R01

(2) Look for cracks in the body, joints and ceramic insulator in the connector well on each igniter plug.

(a) If cracks are found, replace the igniter plug with a new unit.

S 216-004-R01

(3) Look for erosion at the end of the igniter plug (Fig. 601, Fig. 602, and Fig. 603).

S 226-006-R01

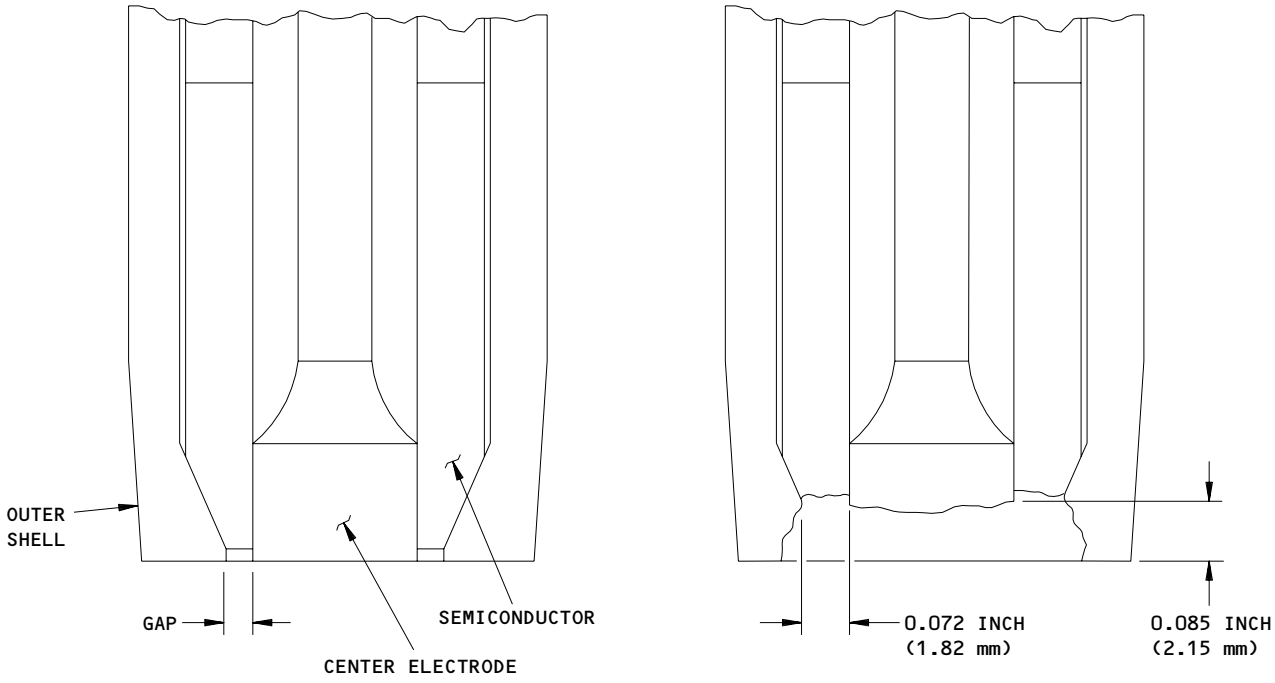
(4) Look for frettage on the outer shell of the igniter plug.

(a) Frettage in the outer shell is permitted to a maximum depth of 0.015 inch (0.381 mm).

S 216-007-R01

(5) Look for a metal shell body which has become larger or out of shape.

(a) If larger or out of shape replace the igniter plug with a new unit.

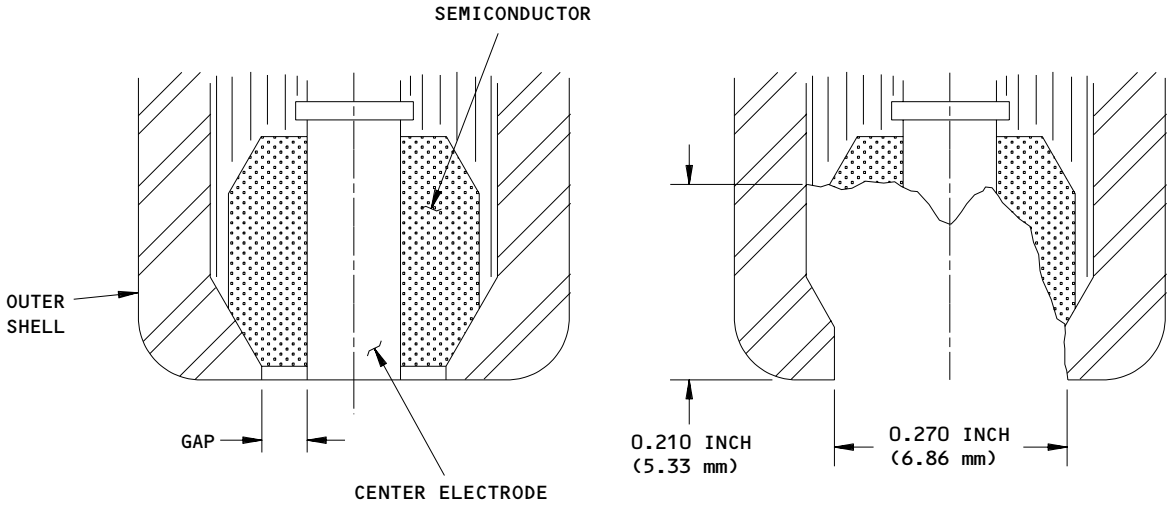


SECTIONED VIEW OF IGNITER TIP MAXIMUM ACCEPTABLE EROSION LIMITS

YA211 SERIES IGNITER PLUG
EXCEPT YA211-25

45669C

Igniter Plug Inspection
Figure 601 (Sheet 1)



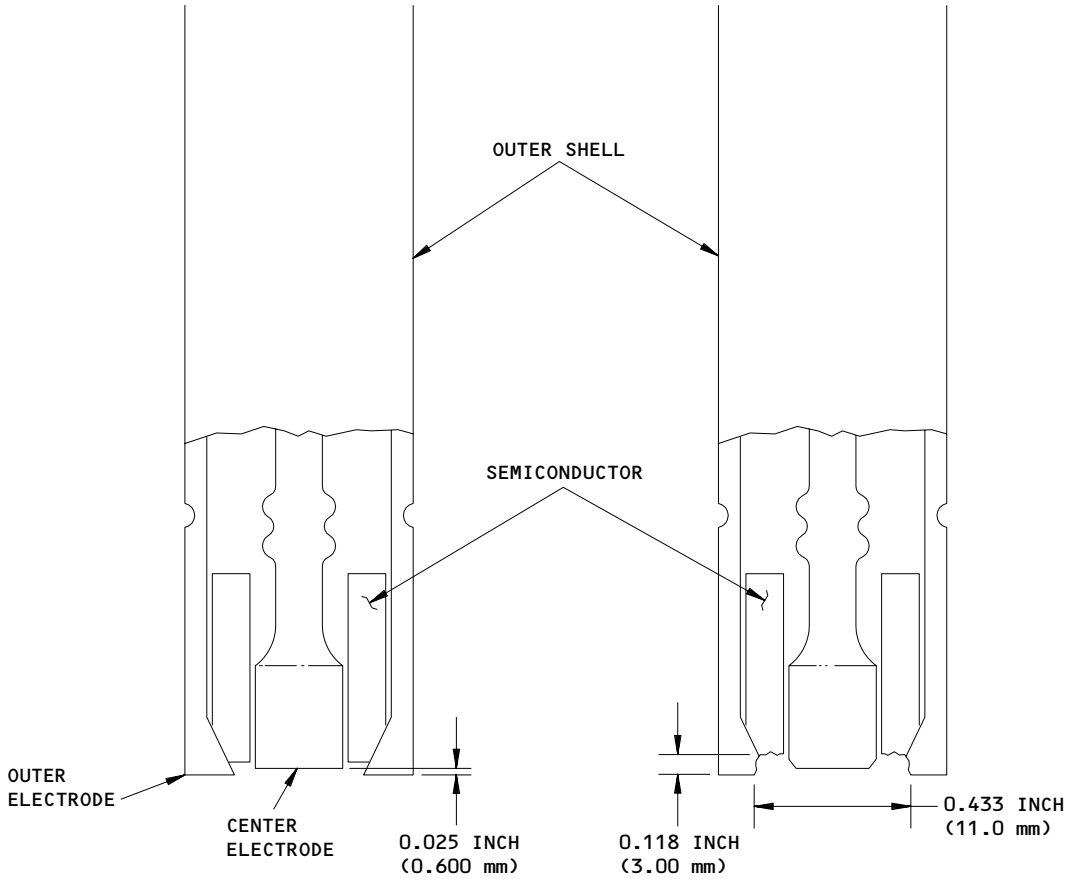
SECTIONED VIEW OF IGNITER TIP

MAXIMUM ACCEPTABLE EROSION LIMITS

YA211-25 SERIES IGNITER PLUG

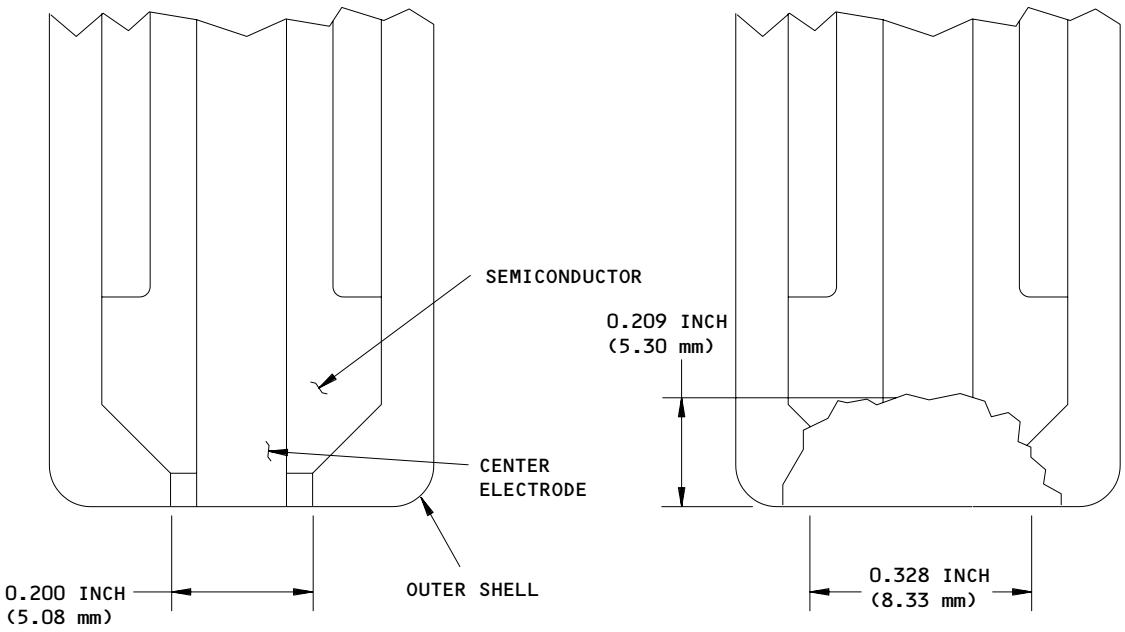
C3628

Igniter Plug Inspection
Figure 601 (Sheet 2)



C3038A

Smiths 2701-Rig-3 and Rig-4 Igniter Plug Inspection
Figure 602



SECTIONED VIEW
OF IGNITER TIP

MAXIMUM ACCEPTABLE
EROSION LIMITS

Champion CH34698 Igniter Plug Inspection
Figure 603

S 426-008-R01
(6) Do the procedure to install the igniter plugs (AMM 74-21-02/401).

S 716-009-R01
(7) Do the audible test of the ignition system (AMM 74-00-00/501).

IGNITER PLUGS - INSPECTION/CHECK

TASK 74-21-02-216-001-R02

1. Inspection of the Igniter Plugs (Fig. 601)

A. General

(1) This procedure contains three tasks:

(a) Remove the igniter plugs.

(b) Examine the igniter plugs for cracks, frettage, and erosion compared to the acceptance standards.

(c) Installation of the examined igniter plugs.

B. References

(1) AMM 72-00-00/601, Engine

(2) AMM 74-00-00/501, Ignition System

(3) AMM 74-21-02/401, Igniter Plugs

C. Access

(1) Location Zones

410 Left Engine

420 Right Engine

(2) Access Panels

415AL Thrust Reverser (Left)

416AR Thrust Reverser (Right)

425AL Thrust Reverser (Left)

426AR Thrust Reverser (Right)

D. Procedure

S 026-002-R02

(1) Remove the igniter plugs (AMM 74-21-02/401).

S 216-003-R02

(2) Do these steps to examine the igniter plug:

(a) Examine the igniter plug body, joints and connector well ceramic insulator for cracks.

(b) Examine the igniter plug outer shell for frettage.

(c) Examine the igniter plug tip for erosion.

(d) Examine the center electrode.

S 216-004-R02

(3) Use these Acceptance Standards when you examine the condition of the igniter plug:

(a) Cracks:

1) Cracks in the plug body, joints and /or connector well ceramic insulator, are not acceptable.

(b) Frettage:

1) Frettage of the plug outer shell to a maximum depth of 0.015 inch (0.38 mm) is acceptable.

(c) Erosion:

1) For erosion limits of igniter plugs, refer to Fig. 601.

(d) Center Electrode:

1) If the center electrode is gone, reject the igniter plug.

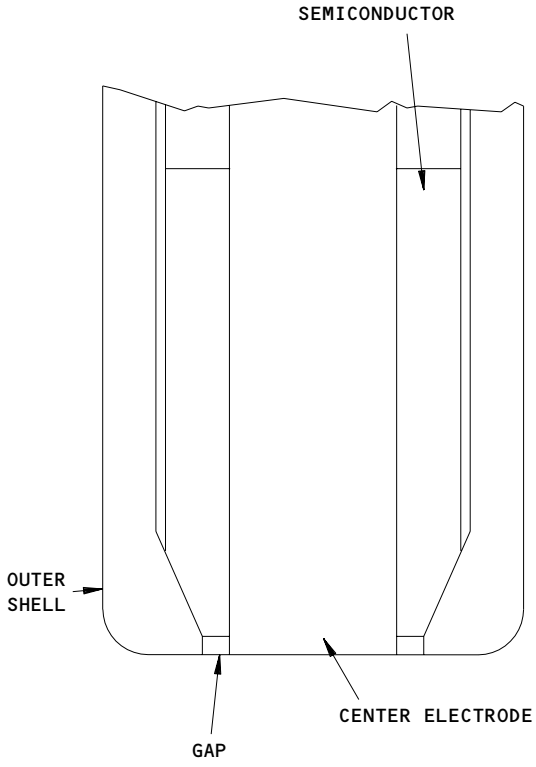
2) If you reject the igniter plug, do a borescope inspection of the H.P. Turbine (AMM 72-00-00/601).

S 426-010-R02

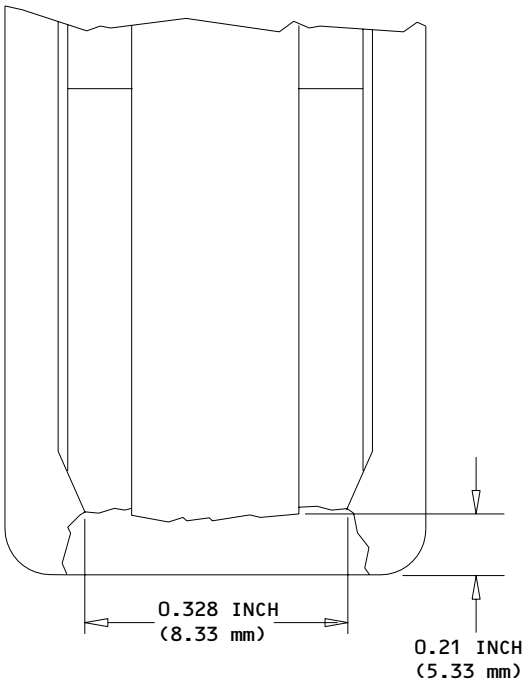
(4) Install the igniter plugs (AMM 74-21-02/401).

S 716-011-R02

(5) Do the audible test of the ignition system (AMM 74-00-00/501).



SECTION VIEW OF IGNITER TIP



MAXIMUM ACCEPTABLE EROSION LIMITS

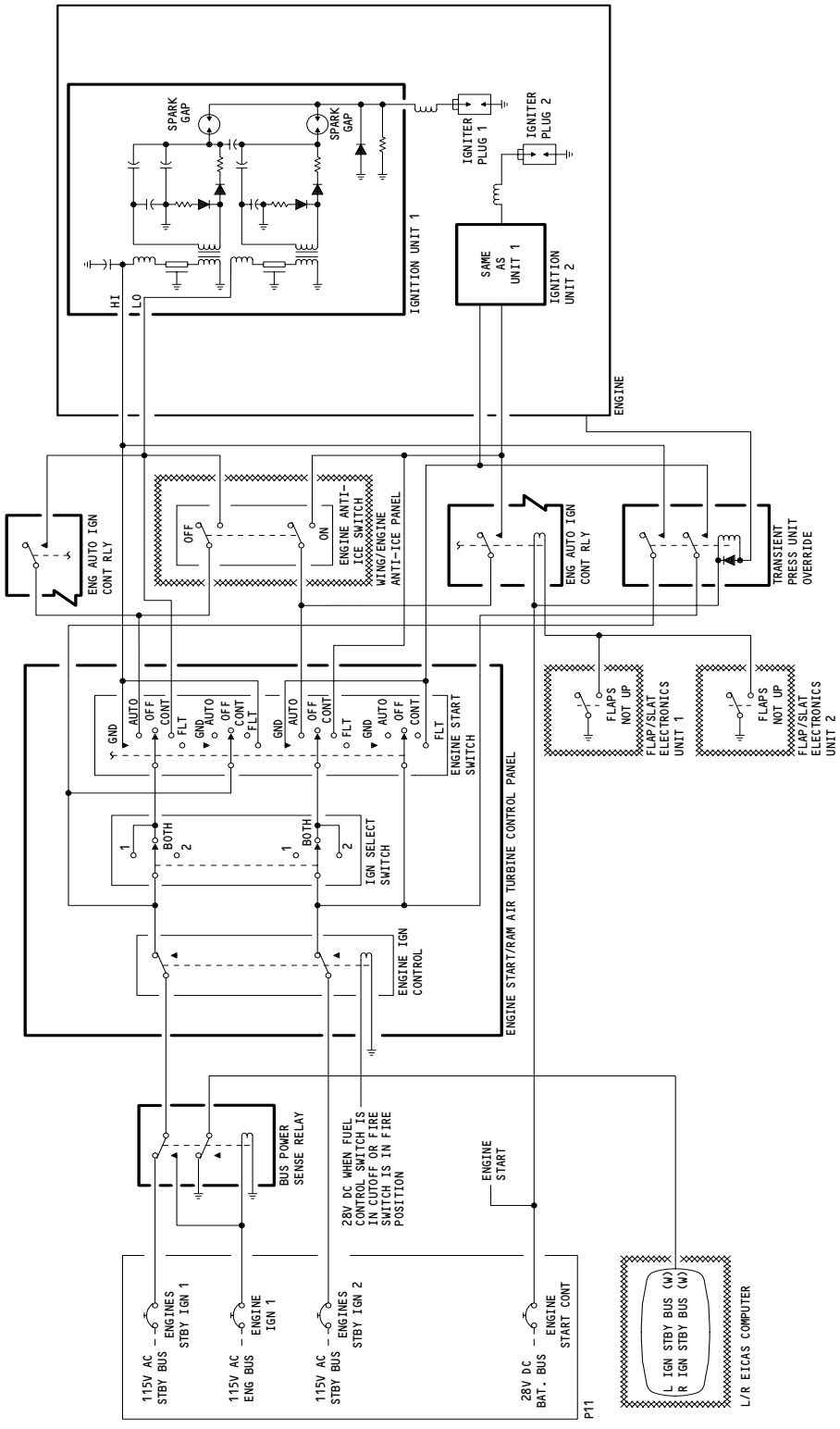
CHAMPION CH34743 IGNITER PLUG

DEE00Y2335

Acceptance Standards – Champion CH34743 Series Ignitor Plug
Figure 601

ENGINE IGNITION CONTROL - DESCRIPTION AND OPERATION

1. General
   A. Ignition control for normal operation is provided by switches on the engine start and ignition control module and the FUEL CONTROL switches. Positioning the switches properly will supply electrical power to the ignition exciters.
   B. The ignition exciters convert the input power into a high energy pulsating spark across the igniter plug gap to initiate or sustain combustion in the engine. Power for ignition control is 115 volts ac supplied from the overhead circuit breaker panel P11, left ac bus for the left engine ignition system and right ac bus for the right engine ignition system.
   C. If primary ac power is not available, transfer to standby power occurs automatically. Standby power is 115 volts ac supplied from the overhead circuit breaker panel P11. L IGN STBY BUS and R IGN STBY BUS messages are displayed on EICAS display when ignition control is powered from the standby bus.
2. Component Details
   A. Engine Start and Ignition Control Module
      (1) The engine start and ignition control module comprises two engine start switches, an ignition selection switch and two starter control VALVE disagreement lights. There is one engine start switch for each engine.
      (2) Each engine start switch has five positions: OFF, AUTO for automatic ignition under certain conditions, GND for ground start, CONT for continuous ignition and FLT for flight start.
      (3) The ignition selection switch has three positions: 1, 2 and BOTH for ignition system 1, ignition system 2 and both ignition systems, respectively.
   B. Fuel Control Module
      (1) The FUEL CONTROL switch has three positions: CUTOFF, RUN and RICH. To energize either ignition system the FUEL CONTROL switch must be in the RUN or RICH position.
3. Operation (Fig. 1)
   A. Functional Description
      (1) Engine ignition control is operative when 115 volts ac is supplied to the ignition exciters.
      (2) The engine start switch, in conjunction with the FUEL CONTROL switch, controls power application to the ignition exciters. The engine start switch also controls the starter control valve (Ref 80-11-00). The FUEL CONTROL switch allows ignition to be applied at the correct time in the engine start cycle and maintains the ignition system in the armed state during engine operation.



Engine Ignition Schematic (Example)
Figure 1

(3) To initiate ignition for engine ground start using starter assist, the engine ignition switch is positioned to applicable igniter and the engine start switch is positioned to GND. When N3 is approximately 25% the FUEL CONTROL switch is positioned to RUN or RICH (depending on conditions). This completes the ignition system circuit and supplies ac power to the applicable ignition exciters.

(4) The ignition exciters step up the input voltage and provide a high energy pulsating spark across the igniter plug gap. The spark ignites the fuel-air mixture in the engine combustion chamber which is supplied when the FUEL CONTROL switch is positioned to RUN or RICH. Ignition system operation terminates automatically at approximately 50% N3 when the holding solenoid de-energizes and the engine start switch returns to OFF or AUTO.

(5) To initiate ignition for inflight start of a windmilling engine, the engine start switch is positioned to FLT. With the FUEL CONTROL switch in RUN position the ignition selector switch is bypassed and both ignition systems are energized for the respective engine.

(6) Continuous ignition during takeoff, landing or adverse weather conditions is provided for each engine by positioning the respective ENGINE START switch to CONT. The automatic cutoff circuit is bypassed and ignition continues until the engine start switch is turned to OFF or AUTO.

(7) The AUTO position on the engine start switch allows automatic ignition during certain conditions. Usually after the engine has been started the engine start switch is positioned to AUTO instead of the OFF position. This is to prevent engine flame-out due to loss of power. Loss of power may occur when:

    (a) Wing/Engine anti-ice switch is placed on.
    (b) Flap/Slats are deployed.

(8) When primary ac power is not available, automatic transfer to the ac standby bus occurs.

(9) The VALVE disagreement light illuminates when the engine start switch is positioned to GND or FLT and the starter control valve is not open. The VALVE light also illuminates when the engine start switch is in the OFF position and the starter control valve remains open (Ref 80-11-00).

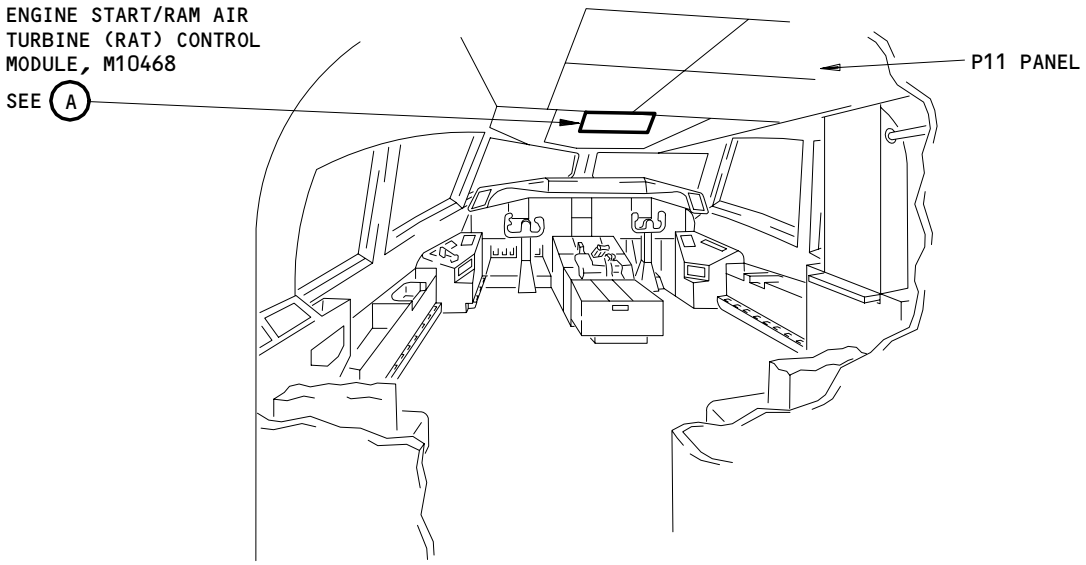
    (a) When the TPU detects a surge, it transmits a corrective control signal to energize the Engine Auto Ignition Continuous Relay to select continuous ignition. Continuous ignition is stopped when the TPU de-energizes the relay after 10 seconds.

ENGINE IGNITION CONTROL

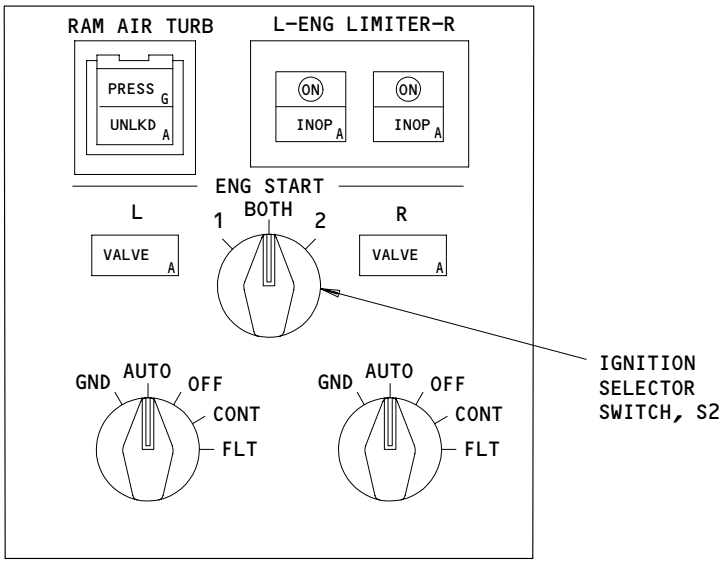
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS –	--		FLT COMPT, P11	
ENGINE IGN 1 LEFT, C1430		1	11L1	*
ENGINE IGN 1 RIGHT, C1432		1	11L28	*
ENGINE STBY IGN LEFT 1, C1434		1	11D7	*
ENGINE STBY IGN LEFT 2, C1435		1	11D8	*
ENGINE STBY IGN RIGHT 1, C1437		1	11D9	*
ENGINE STBY IGN RIGHT 2, C1438		1	11D10	*
ENGINE START CONT LEFT, C1510		1	11D19	*
ENGINE START CONT RIGHT, C1511		1	11D20	*
COMPUTERS – (31-41-00/101)				
EICAS L, M10181				
EICAS R, M10182				
MODULES – (27-50-01/101)				
FSEU 2, M10332				
L FSEU 1, M10331				
R FSEU 3, M10333				
MODULE – (30-21-00/101)				
WING/ENGINE ANTI-ICE, M10397				
MODULE – ENGINE START/RAM AIR TURBINE CONTROL, M10468	--	1	FLT COMPT, P5	*
SWITCH – IGNITION SELECTOR, S2	--	1	FLT COMPT, P5, ENG START/RAM AIR TURBINE CONTROL MODULE, M10468	

* SEE THE WDM EQUIPMENT LIST

Engine Ignition Control – Component Index
Figure 101



FLIGHT COMPARTMENT



ENGINE START/RAM AIR TURBINE (RAT)
CONTROL MODULE, M10468

(A)

Engine Ignition Control - Component Location
Figure 102