Scandinavian Airlines System

PAGE	DATE	CODE
CHAPTER 24 TAB		
ELECTRICAL POWER		
EFFECTIVE PAGES		
SEE LAST PAGE OF LIST FOR		
NUMBER OF PAGES		
24-CONTENTS		
1	DEC 22/08	SAS
2	DEC 22/01	SAS
3	APR 22/06	SAS
4	APR 22/06	SAS
5	DEC 22/01	SAS
6	DEC 22/02	SAS
7	APR 22/02	SAS
8	AUG 22/02	SAS
9	AUG 22/02	SAS
10	AUG 10/98	SAS
24-00-00		
1	APR 22/02	13
2	DEC 22/01	20
24-00-00		
901	APR 22/01	01
902	AUG 22/99	01
903	APR 22/01	02
904	APR 22/01	01
905	APR 22/01	02
906	APR 22/01	02
907	APR 22/04	02
908	APR 22/01	01
909	APR 22/01	01
910	APR 22/01	01
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4	FEB 10/88	06
5	DEC 22/01	07
6	DEC 22/01	09
7	DEC 22/01	05
8	DEC 22/01	12
9	DEC 22/01	07
10	DEC 22/01	09
11	DEC 22/01	09
12	DEC 22/01	13
13	APR 22/00	19
14	NOV 10/97	20
15	DEC 22/01	22
16	APR 22/02	20
17	APR 22/02	17
18	NOV 10/97	19

PAGE	DATE	CODE
24-11-00		
101	AUG 10/90	08
102	NOV 10/90	08
103	NOV 10/90	07
104	BLANK	
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201	AUG 22/01	01
202	NOV 10/94	01
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204	APR 10/98	01
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507	APR 22/99	02
508	APR 22/99	02
509	APR 22/99	27
510	APR 22/99	16
511	APR 22/99	02
512	APR 22/99	03
513	APR 22/03	02
514	APR 22/99	03
515	DEC 22/08	02
516	DEC 22/08	25
517	APR 22/99	14
518	APR 22/99	04
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204	AUG 22/04	02
205	AUG 22/04	02
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406	AUG 10/97	04
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410	AUG 22/01	03
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412	DEC 22/02	03
413	AUG 22/01	04
414	DEC 22/01	04

PAGE	DATE	CODE
24-11-01		CONT.
415	AUG 22/01	04
416	AUG 22/01	02
24-11-01		
601	APR 22/09	03
602	APR 10/98	01
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605	APR 22/09	19
606	APR 22/09	04
607	APR 22/09	03
608	APR 22/09	10
609	APR 22/09	04
610	APR 22/09	01
611	APR 22/05	01
612	APR 22/05	08
613	AUG 22/07	13
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616	APR 22/09	03
R 617	AUG 22/09	05.1
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619	APR 22/99	01
620	AUG 22/99	06
621	AUG 22/07	09
622	APR 22/09	02
623	APR 22/09	02
624	APR 22/09	03
625	APR 22/00	06
626	APR 22/09	01
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601	AUG 22/99	01
602	AUG 22/99	01
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604	AUG 22/99	01

Scandinavian Airlines System

PAGE	DATE	CODE
24-11-12		
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403	FEB 10/97	02
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411	AUG 22/01	03
412	APR 22/08	03
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404	AUG 22/01	02
24-11-19		
401	AUG 10/97	01
402	AUG 10/97	01
403	AUG 10/97	01
404	AUG 10/97	01
24-11-20		
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402	APR 22/02	01
403	APR 22/02	01
404	AUG 22/99	01
405	APR 22/02	01
406	AUG 22/99	01
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12	DEC 22/01	15
13	DEC 22/01	01
14	DEC 22/01	01

PAGE	DATE	CODE
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404	APR 22/08	01
405	DEC 22/01	01
406	APR 22/09	05
407	APR 22/07	05
408	DEC 22/07	04
409	APR 22/09	02
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411	APR 22/03	02
412	BLANK	
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2	NOV 01/86	06
3	APR 22/00	01
4	APR 22/00	01
5	APR 22/00	01
6	NOV 10/95	06
7	APR 22/00	03
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9	APR 22/00	07
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102	FEB 10/95	08
24-22-00		
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202	AUG 22/99	01
203	APR 22/01	01
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205	APR 22/01	01
206	DEC 22/04	01
207	DEC 22/04	01
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PAGE	DATE	CODE
24-22-00		CONT.
211	DEC 22/04	01
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214	BLANK	
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526	DEC 22/00	01
527	APR 22/02	01
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529	DEC 22/01	01
530	AUG 22/01	01
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402	APR 22/99	02
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404	APR 22/00	01
24-22-03		
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Scandinavian Airlines System

PAGE	DATE	CODE
24-22-04		
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12	DEC 22/99	03
13	AUG 10/94	01
14	AUG 10/89	03
15	NOV 10/96	02
16	NOV 10/95	01
24-23-00		
101	AUG 22/99	01
102	NOV 10/90	01
24-23-01		
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402	AUG 22/99	02
403	AUG 22/99	02
404	AUG 22/99	02
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406	AUG 22/99	01
24-25-00		
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2	DEC 22/99	01
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5	APR 22/02	02
6	DEC 22/01	01
7	DEC 22/01	01
8	DEC 22/01	01
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24-25-00		
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PAGE	DATE	CODE
24-25-00		CONT.
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506	AUG 22/07	09
507	DEC 22/01	08
508	AUG 22/07	09
509	AUG 22/08	08
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405	AUG 22/08	04
406	AUG 22/08	04
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507	APR 22/09	02
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514	DEC 22/00	01

PAGE	DATE	CODE
24-30-00		CONT.
515	AUG 22/06	02
516	AUG 22/06	05
517	APR 22/09	03
518	APR 22/09	02
519	DEC 22/00	08
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24-31-05		
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402	AUG 22/05	01
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Scandinavian Airlines System

PAGE	DATE	CODE
24-31-05		CONT.
405	APR 22/09	02
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1	APR 22/00	17
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PAGE	DATE	CODE
24-41-00		CONT.
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Scandinavian Airlines System

PAGE	DATE	CODE
24-51-00		CONT.
5	FEB 01/86	01
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24-51-05		
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401	NOV 10/95	01
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403	NOV 10/95	01
404	BLANK	

PAGE	DATE	CODE

CHAPTER 24 – ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 – ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 – ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 – ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

CHAPTER 24 – ELECTRICAL POWER

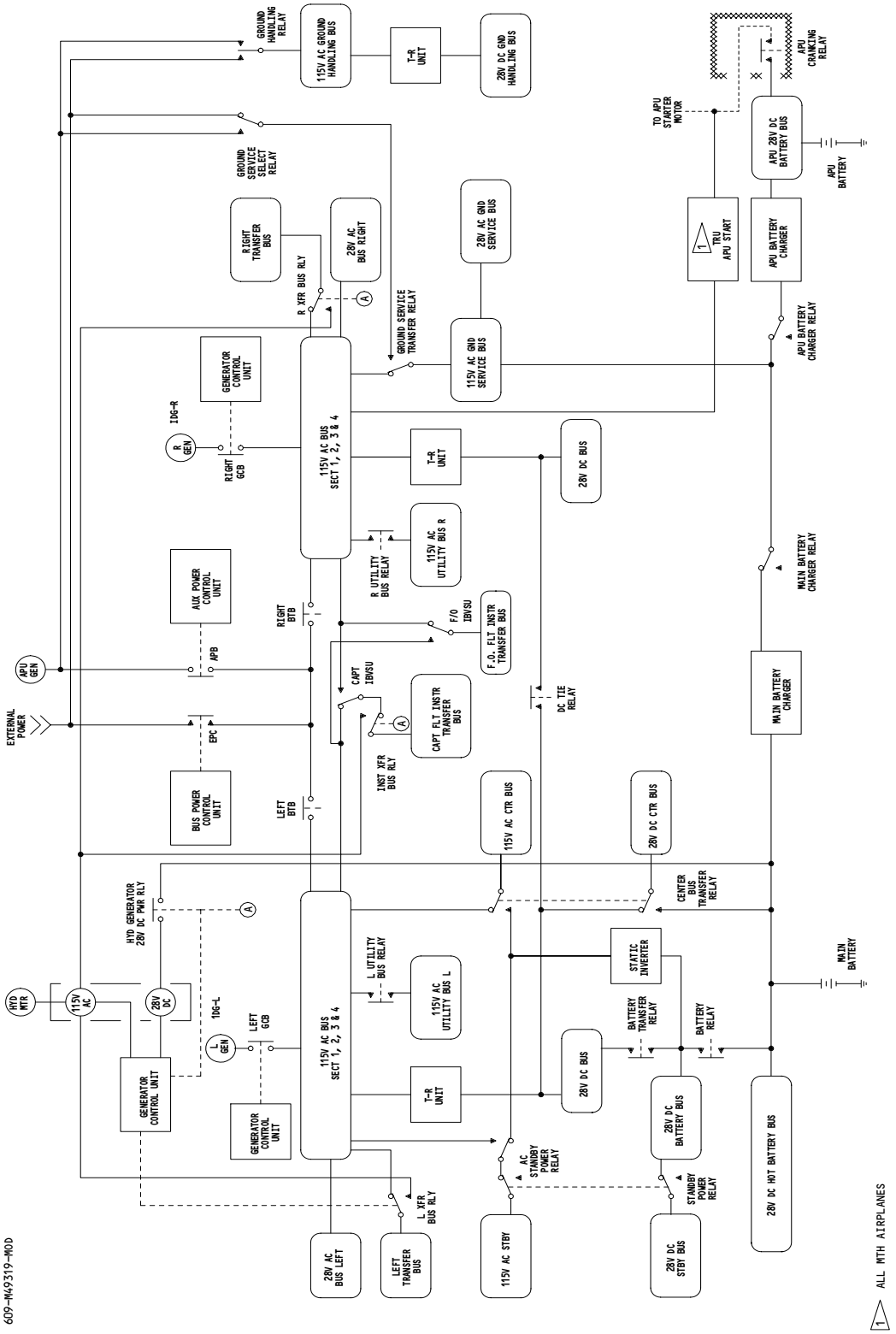
TABLE OF CONTENTS

CHAPTER 24 - ELECTRICAL POWER

TABLE OF CONTENTS

ELECTRICAL POWER - GENERAL - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The electrical power system consists of a 115-volt ac system and a 28-volt dc system.
   B. AC Electrical Power
      (1) The electrical power system generates and controls 115/200-volt, 3-phase, 400-Hz ac power. Two integrated drive generators (IDGs), one mounted to and driven by each engine, supply main ac power (AMM 24-11-00). An auxiliary power unit driven generator supplies ground power and serves as an alternate for an IDG when the IDG is not operated (AMM 24-21-00). The external power supplies power for airplane ground operations (AMM 24-41-00). The system is controlled by three generator control units (AMM 24-22-00) and one bus power control unit (AMM 24-41-00).
      (2) The system normally provides two isolated power channels. During a category III autoland, the static inverter is powered from the hot battery bus to provide a third independent ac power channel (AMM 24-33-00).
   C. DC Electrical Power
      (1) Two main 28-volt dc power channels are supplied by two transformer rectifier units (TRUs). The TRUs convert 115-volt ac power to 28-volt dc power (AMM 24-32-00).
      (2) The main battery and its charger provide a backup source for the standby power system. During a category III autoland, the main battery and its charger provide a third independent dc power channel (AMM 24-33-00).
      (3) An independant non-time-limited standby power system is installed on extended range airplanes. Power is provided by a hydraulic motor-driven generator which is activated automatically when power is lost at both main ac buses (AMM 24-25-00).



Electrical Power Block Diagram
Figure 1

ELECTRICAL POWER - DDG MAINTENANCE PROCEDURES

1. General
   A. This procedure contains maintenance tasks that are necessary for the operation of the airplane as shown in the Minimum Equipment List (MEL). The procedure also contains maintenance tasks to put the airplane back in its usual condition after an operation with MEL specifications. The tasks are:
      (1) DDG 24-00-1 Preparation - Engine Driven Generator Inoperative
      (2) DDG 24-00-1 Restoration - Engine Driven Generator Inoperative
      (3) DDG 24-00-2 Preparation - APU Driven Generator Inoperative
      (4) DDG 24-00-2 Restoration - APU Driven Generator Inoperative
      (5) DDG 24-25-1 Preparation - Hydraulic Motor Generator Inoperative
      (6) DDG 24-25-1 Restoration - Hydraulic Motor Generator Inoperative
      (7) DDG 24-31-1 Preparation - APU Battery Inoperative
      (8) DDG 24-31-1 Restoration - APU Battery Inoperative
      (9) DDG 24-31-2 Preparation - APU Battery Charger Inoperative
      (10) DDG 24-31-2 Restoration - APU Battery Charger Inoperative

TASK 24-00-00-769-001

2. DDG 24-00-1 Preparation - Engine Driven Generator Inoperative
   A. General
      (1) This task contains maintenance instructions to verify the APU generator channel is operational, disconnect the Integrated Drive Generator and placard the non-operational engine driven generator control switch "INOP".

          NOTE: This deactivation procedure applies only when an airplane is to be dispatched in accordance with the MEL.

   B. References
      (1) AMM 24-11-00/501, Integrated Drive Generator
      (2) AMM 24-11-01/401, Integrated Drive Generator
      (3) AMM 24-22-00/201, Electrical Power - Control
      (4) AMM 71-00-00/201, Power Plant (Operating Procedures)
   C. Access
      (1) 211/212 Flight Compartment
   D. IDG Deactivation Procedure

          S 769-002
      (1) Check that L, R and APU generator control units and APU generator are operative.
          (a) Press BAT switch on pilots' overhead panel P5 to ON (latched-in position). Verify white ON light in switch is on.
          (b) Press two BUS TIE switches (P5) to ISLN (out position). Verify amber ISLN light in each switch is on.

(c) Make sure the two amber BUS OFF lights (P5) are on.
(d) Press APU GEN CONT switch (P5) to OFF (out position). Verify amber OFF light in switch is on.
(e) Make sure the amber OFF lights in the L and R GEN CONT switches (P5) are on.
(f) Press APU GEN CONT switch (P5) to ON (latched-in position). Make sure the OFF light in the switch is off.
(g) Start APU (Ref. 49-11-00). Wait 60 seconds.
(h) Make sure the OFF light in APU GEN CONT switch (P5) remains off.
(i) Make sure the following amber lights on P5 remain on:
1) ISLN lights in two BUS TIE switches.
2) OFF lights in L and R GEN CONT switches.
3) Two BUS OFF lights.
(j) Press two BUS TIE switches (P5) to AUTO (latched-in position).
(k) Make sure the following lights on P5 are off.
1) ISLN lights in two BUS TIE switches.
2) Two BUS OFF lights.
(l) Make sure amber OFF lights in L and R GEN CONT switches (P5) remain on.
(m) Shutdown APU (Ref. 49-11-00).
(n) Press BAT switch (P5) to OFF (out position).

S 719-036

(2) Do these steps to disconnect the Integrated Drive Generator (IDG):

NOTE: With an engine driven generator channel not in operation, it is recommended that you disconnect the integrated drive generator (IDG) to keep the possibility of damage to the IDG to a minimum. If you can see that the IDG has a mechanical problem, disconnect the IDG.

CAUTION: DO NOT OPERATE THE DISCONNECT SWITCH UNLESS THE ENGINE IS AT OR ABOVE THE IDLE SPEED. IF YOU DISCONNECT THE IDG BELOW THE IDLE SPEED, DAMAGE CAN OCCUR TO THE IDG.

DO NOT OPERATE THE DISCONNECT SWITCH FOR MORE THAN 3 SECONDS. STOP FOR A MINIMUM OF 60 SECONDS BETWEEN THE OPERATION TIMES.

(a) Momentarily push the L (or R) GEN DRIVE DISC switch (P5).
(b) Make sure these lights are on:
1) The amber DRIVE light in the L (or R) GEN DRIVE DISC switch(P5).

2) the white FIELD off light in the left (or right) generator field switch (P61).

(c) Make sure these indications for the left power channel show on the lower EICAS display:
1) AC volts = 0 ±5
2) Frequency = 0 ±5

(d) Make sure these messages show on the EICAS display:
1) L (or R) GEN OFF
2) L (or R) GEN DRIVE

S 719-059

(3) For Extended Range (ER) operations, make sure the Hydraulic Driven Generator operates correctly as shown in MEL item 24-00-2, APU Driven Generator.

S 939-037

(4) Placard applicable (L or R) GEN CONT switch (P5)-"INOP".

TASK 24-00-00-409-040

3. DDG 24-00-1 Restoration - Engine Driven Generator Inoperative

A. General

(1) This task contains the instructions to put the airplane back in its usual condition after an operation with MEL 24-00-1 Engine Driven Generator.

B. Reference

(1) AMM 24-11-01/401, Integrated Drive Generator
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(4) AMM 71-00-00/201, Power Plant (Operating Procedures)
(5) AMM 71-11-04/201, Fan Cowl Panels
(6) AMM 78-31-00/201, Thrust Reverser System

C. Access

(1) Location Zones
211/212 Flight Compartment
119/120 Main Equipment Center
410/420 Power Plant Nacelle

(2) Access Panels
413/423 Fan Cowl Panels (Left)
414/424 Fan Cowl Panels (Right)
119/120 Main Equipment Center

D. Activate the Integrated Drive Generator (IDG)

S 729-041

(1) If the IDG did not operate correctly, replace the IDG (AMM 24-11-01/401).

TASK 24-00-00-009-042

4. DDG 24-00-2 Preparation - APU Driven Generator Inoperative

A. General

(1) This task contains maintenance instructions to remove the APU generator and install a protective cover over the generator drive prior to placarding the APU GEN CONT switch "INOP". Also, this task contains instructions to check the HMG for Extended Range operation.

NOTE: This deactivation procedure applies only when an airplane is to be dispatched in accordance with the MEL.

B. References

(1) AMM 24-21-01/401

C. Access

(1) Location Zones
315/316 APU Compartment

D. Deactivate the APU generator:

S 029-005

(1) Remove APU generator (AMM 24-21-01/401).

S 989-006

(2) Set nuts on APU mount pad studs so that at least one inch is between nuts and seal plates.

S 989-007

(3) Secure the four power leads disconnected from the generator to prevent damage.

S 989-008

(4) Position Generator Cover Box to mate with APU mounting pad studs.

NOTE: Generator Cover Box (Garrett P/N 3862212) was delivered with the airplane.

S 989-009

(5) Pass APU mounting pad studs through keyholes in Generator Cover Box.

S 989-010

(6) Rotate Generator Cover Box counterclockwise to allow studs to move into smaller part of the Generator Cover Box keyholes.

S 429-011

(7) Tighten stud nuts to 260-320 pound-inches.

S 619-012
(8) Replenish APU oil (AMM 12-13-04/301).

S 419-013
(9) Close APU access door.

S 989-014
(10) Placard APU GEN CONT switch - "INOP".

S 979-015
(11) Account for weight and balance affect with generator removed.

E. Hydraulic Motor Generator operation check (for ER operations)

S 869-035
(1) With the power supplied to the center hydraulic system and the electrical systems, do these steps:
(a) Move and hold the EQUIP COOL/HYD GEN test switch, on the P61 panel, to the HYD GEN position.

NOTE: If air is supplied to the ADP and the ADP select switch is in the AUTO position, the ADP will start.

(b) Make sure these EICAS status messages show:
1) HYD GEN ON
2) HYD GEN VALVE
(c) Use the EICAS ELEC/HYD maintenance page to examine the electrical output of the generator.
(d) Make sure the ELEC/HYD display shows as follows:
1) HYD GEN DC-V 28 +/- 4
2) HYD GEN AC-V 115 +/- 5
3) HYD GEN FREQ 400 +/- 5
(e) Release the test switch and make sure the EICAS status messages HYD GEN ON and HYD GEN VALVE go off.

S 869-034
(2) Put the systems back to the usual condition if it is necessary.

TASK 24-00-00-409-048

5. DDG 24-00-2 Restoration - APU Driven Generator Inoperative

A. General
(1) This task contains the instructions to put the airplane back in its usual condition after an operation with MEL 24-00-2 APU Driven Generator.

B. References
(1) AMM 24-21-01/401
C. Access
(1) Location Zones
315/316 APU Compartment
D. Activate the APU Generator

S 969-049
(1) If the APU generator did not operate correctly, replace the APU generator (AMM 24-21-01/401).

TASK 24-00-00-009-043

6. DDG 24-25-1 Preparation - Hydraulic Motor Generators (HMG) Inoperative
A. General
(1) This task contains maintenance instructions to prepare the airplane for an operation with MEL 24-25-1 Hydraulic Motor Generator (HMG) Failure.
B. References
(1) AMM 24-25-01/401
C. Access
(1) Location Zones
143/144 Main Landing Gear Wheel Well
D. Deactivate the HMG

S 019-051
(1) Open this circuit breaker on the main power distribution panel, P6, and install a circuit breaker lock:
(a) 6A7 HYD GEN CONT POWER

S 849-052
(2) Do these steps to safety the valve in the closed position:
(a) Open the door for the left MLG wheel well, and install the door lock (AMM 32-00-15).
(b) Move the position indicator for manual override on the valve to the closed position (position 1).

(c) Safety the valve with a wire in the closed position.

NOTE: This will make sure that the valve with no power will not vibrate to the open position.

(d) Remove the lock from the left MLG wheel well (AMM 32-00-15).

TASK 24-00-00-409-053

7. DDG 24-25-1 Restoration - Hydraulic Motor Generators (HMG) Inoperative

A. General

(1) This task contains the instructions to put the airplane back in its usual condition after an operation with MEL 24-25-1 Hydraulic Motor Generator.

B. References

(1) AMM 24-25-01/401

C. Access

(1) Location Zones
143/144 Main Landing Gear Wheel Well

D. Activate the Hydraulic Motor Generator

S 869-064

(1) Remove the circuit breaker lock and close this circuit breaker on the main power distribution panel, P6:
(a) 6A7 HYD GEN CONT POWER

S 969-054

(2) If the HMG did not operate correctly, replace the HMG (AMM 24-25-01/401).

TASK 24-00-00-769-016

8. DDG 24-31-1 Preparation - APU Battery Inoperative

A. General

(1) This task contains maintenance instructions to remove the APU battery and placard APU control panels "INOP".

NOTE: This deactivation procedure applies only when an airplane is to be dispatched in accordance with the MEL.

B. References

(1) AMM 24-31-04/401

C. Access

(1) Location Zones
154 Aft cargo compartment (Right)

(2) Access Panels
822 Aft cargo compartment door

D. Remove the APU Battery (E6-4)

S 019-017

(1) Open APU BAT CHGR (33E5) circuit breaker on right miscellaneous electrical equipment panel P33, and attach DO-NOT-CLOSE identifier.

S 019-018
(2) Open APU BAT CHGR circuit breaker on forward side of rack E6, and attach DO-NOT-CLOSE identifier.

S 019-019
(3) Remove APU battery connector.

S 029-020
(4) Remove thermal sensor connector.

S 029-021

WARNING: BATTERY WEIGHS 96 POUNDS. DO NOT ATTEMPT REMOVAL ALONE AS INJURY MAY RESULT.

(5) Remove APU battery.

S 989-022
(6) Each operator shall provide for weight and balance accountability when the battery is removed.

S 869-023
(7) Notify dispatch that APU is inoperative.

S 939-024
(8) Placard both APU control panels - "INOP - BATTERY REMOVED".

TASK 24-00-00-409-055

9. DDG 24-31-1 Restoration - APU Battery Inoperative

A. General
(1) This task contains the instructions to put the airplane back in its usual condition after an operation with MEL 24-31-1 APU Battery.

B. References
(1) AMM 24-31-04/401

C. Access
(1) Location Zones
154 Aft Cargo compartment (Right)
(2) Access panels
822 Aft cargo compartment door

D. Install the APU Battery

S 419-056
(1) Do this task: "Install the APU Battery" (AMM 24-31-04/401).

TASK 24-00-00-769-025

10. DDG 24-31-2 Preparation - APU Battery Charger Inoperative

A. General

(1) This task contains maintenance instructions to deactivate the APU battery charger either by: 1) Remove the APU battery charger or 2) Open the circuit breakers.

NOTE: This deactivation procedure applies only when an airplane is to be dispatched in accordance with the MEL.

B. References

(1) AMM 24-31-05/401

C. Access

(1) Location Zones
154 Aft cargo compartment (right)

(2) Access Panels
822 Aft cargo compartment door

D. Deactivate the APU Battery Charger by removal the charger:

S 019-026

(1) Open APU BAT CHGR (33E5) circuit breaker on forward miscellaneous electrical equipment panel P33, and attach DO-NOT-CLOSE identifier.

S 019-027

(2) Open APU BAT CHGR circuit breaker on forward side of rack E6, and attach DO-NOT-CLOSE identifier.

S 029-028

(3) Remove connector from charger.

S 029-029

(4) Remove terminal block cover.

S 029-030

(5) Remove terminal block leads and identify for reinstallation.

S 029-031

(6) Remove APU battery charger (Ref 20-10-01).

S 939-044

(7) Placard APU control panel "APU BATT CHARGER INOP".

E. Deactivate APU Battery Charger by opening the circuit breakers:

S 019-045

(1) Open APU BAT CHGR (33E5) circuit breaker on forward miscellaneous electrical equipment panel P33, and attach DO-NOT-CLOSE identifier.

S 019-046

(2) Open APU BAT CHGR circuit breaker on forward side of rack E6, and attach DO-NOT-CLOSE identifier.

S 939-047

(3) Placard APU control panel "APU BATT CHARGER INOP".

TASK 24-00-00-409-057

11. DDG 24-31-2 Restoration - APU Battery Charger Inoperative

A. General

(1) This task contains the instructions to put the airplane back in its usual condition after an operation with MEL 24-31-2 APU Battery Charger.

B. References

(1) AMM 24-31-05/401

C. Access

(1) Location Zones
154 Aft cargo compartment (right)

(2) Access Panels
822 Aft cargo compartment door

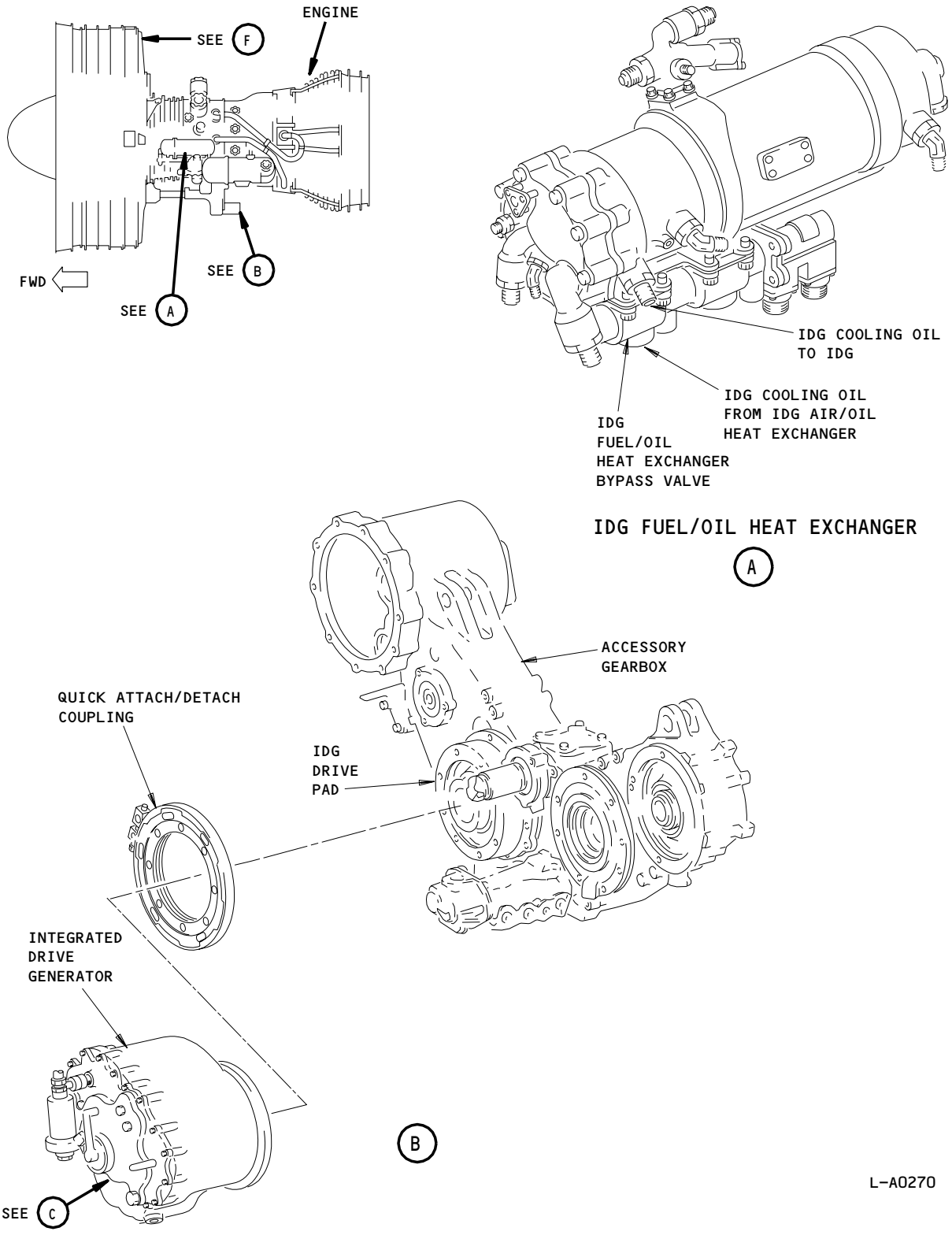
D. Activate the APU Battery Charger

S 969-058

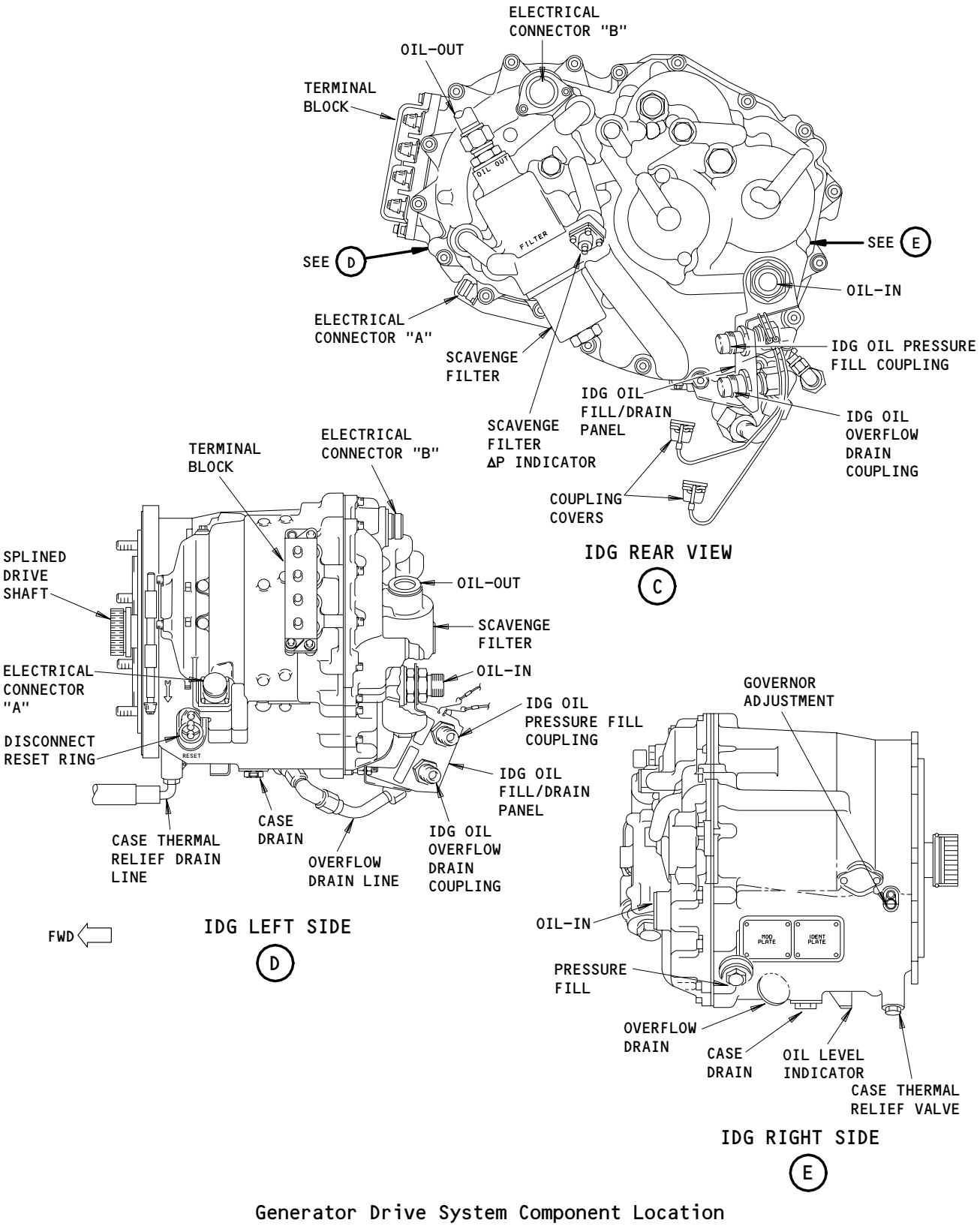
(1) If the APU Battery Charger did not operate correctly, replace the APU Battery Charger (AMM 24-31-05/403).

GENERATOR DRIVE SYSTEM - DESCRIPTION AND OPERATION

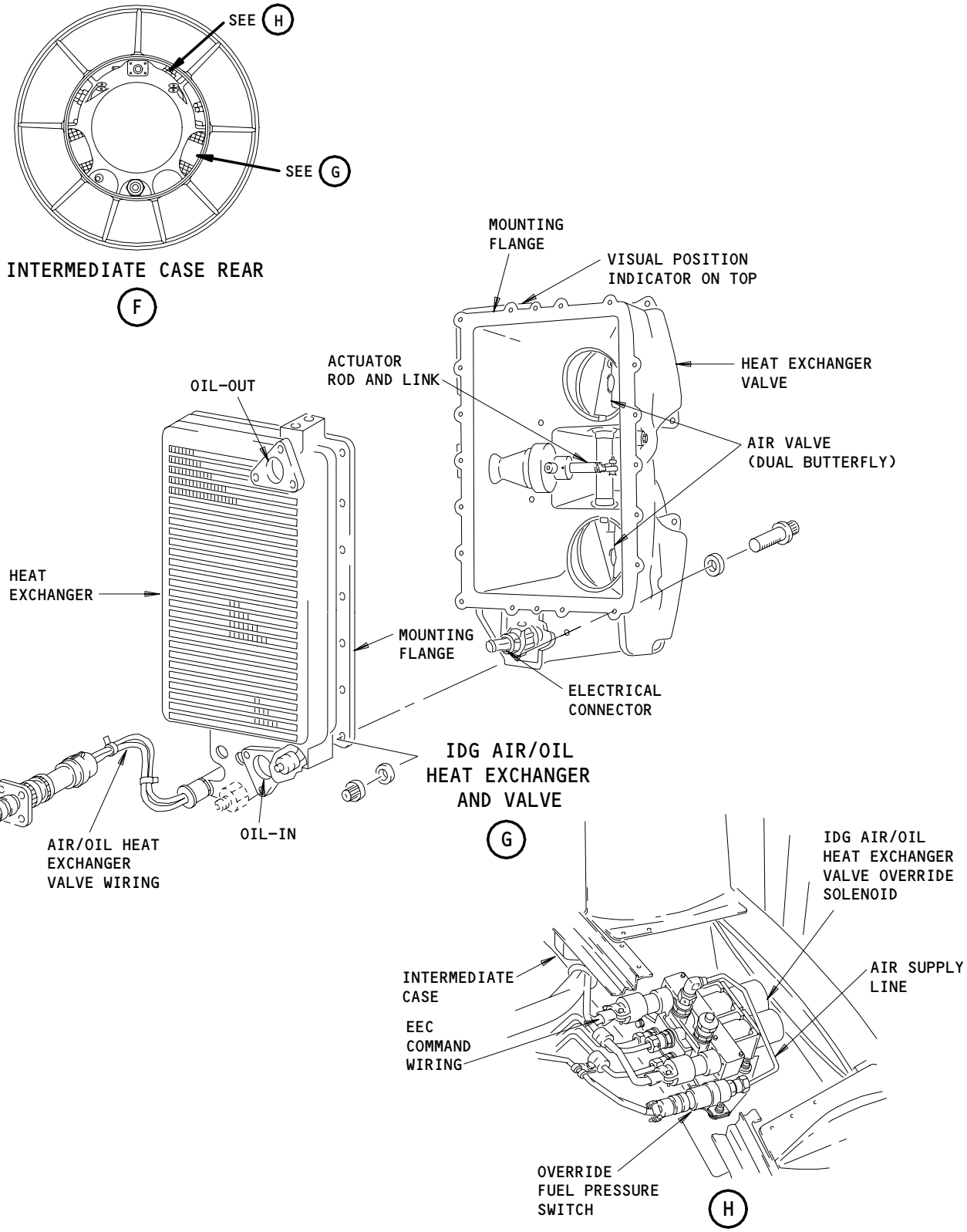
1. General
   A. The purpose of the generator drive system is to convert mechanical power into electrical power. The major components are two integrated drive generators (IDGs), one mounted to each engine. Additional components include two heat exchangers for IDG oil cooling.
2. Component Details
   A. Integrated Drive Generator
      (1) An integrated drive generator (IDG) is located on the left aft side of each engine, and is mounted on the engine accessory gearbox. The IDG converts the varying input speed of the engine into 115/200-volt, 3-phase, 90-KVA, 400±4-Hz power. The IDG weighs 118 pounds.
   B. Scavenge Filter
      (1) The scavenge filter is a replaceable component, which filters oil flowing out of the integrated drive generator (IDG). The oil then goes to the external heat exchangers. The scavenge filter is located in the aft end of the IDG housing.
   C. IDG Air/Oil Heat Exchanger
      (1) The IDG air/oil heat exchanger is used to cool IDG oil. The heat exchanger consists of a tube and fin type cooling system. Hot oil enters through the oil inlet, passes through the exchanger core, to the oil outlet port. Ducted cooling air controlled by the IDG air/oil heat exchanger valve flows through the heat exchanger core, taking heat from the oil. The unit is mounted on the right side of each engine in the intermediate case rear cavity.
   D. IDG Air/Oil Heat Exchanger Air Shutoff Valve
      (1) The dual butterfly air shutoff valve controls engine fan air flow through the IDG air/oil heat exchanger. The valve is connected between the air/oil heat exchanger, and the air/oil heat exchanger inlet duct. The valve is spring loaded to the open position and closes when a solenoid in the valve is energized. The solenoid is energized when the IDG oil temperature rises, or the engine speed decreases beyond predetermined levels. A mechanical position indicator is provided at the valve, and dual rotary switches in the valve provide valve position signals.



Generator Drive System Component Location
Figure 1 (Sheet 1)



Generator Drive System Component Location
Figure 1 (Sheet 2)



Generator Drive System Component Location
Figure 1 (Sheet 3)

E. IDG Fuel/Oil Heat Exchanger

(1) The fuel/oil heat exchanger consists of a tube bundle and casing assembly. Hot oil flows from the oil-in port, through the case of the heat exchanger, to the oil-out port. At the same time fuel travels from the fuel-in port, through tubes in the core, to the fuel-out port. The fuel flow through the tubes takes heat from oil flowing through the case (and around the fuel tubes). A fuel/oil heat exchanger is located on the right side of each engine, and is attached to the engine accessory gearbox. The unit is located below the IDG air/oil heat exchanger.

F. Quick Attach/Detach Coupling

(1) The quick attach detach (QAD) kit allows rapid installation and removal of the IDG to and from the engine accessory gearbox. The kit includes a QAD ring, and an adapter plate. The ring mates along the outside edge of the adapter plate. The adapter plate is mounted to the accessory gearbox. An IDG mounting flange (on the IDG), mates the IDG with the QAD. The QAD ring secures the IDG in a breech-type lockup.

G. Override Pressure Switch

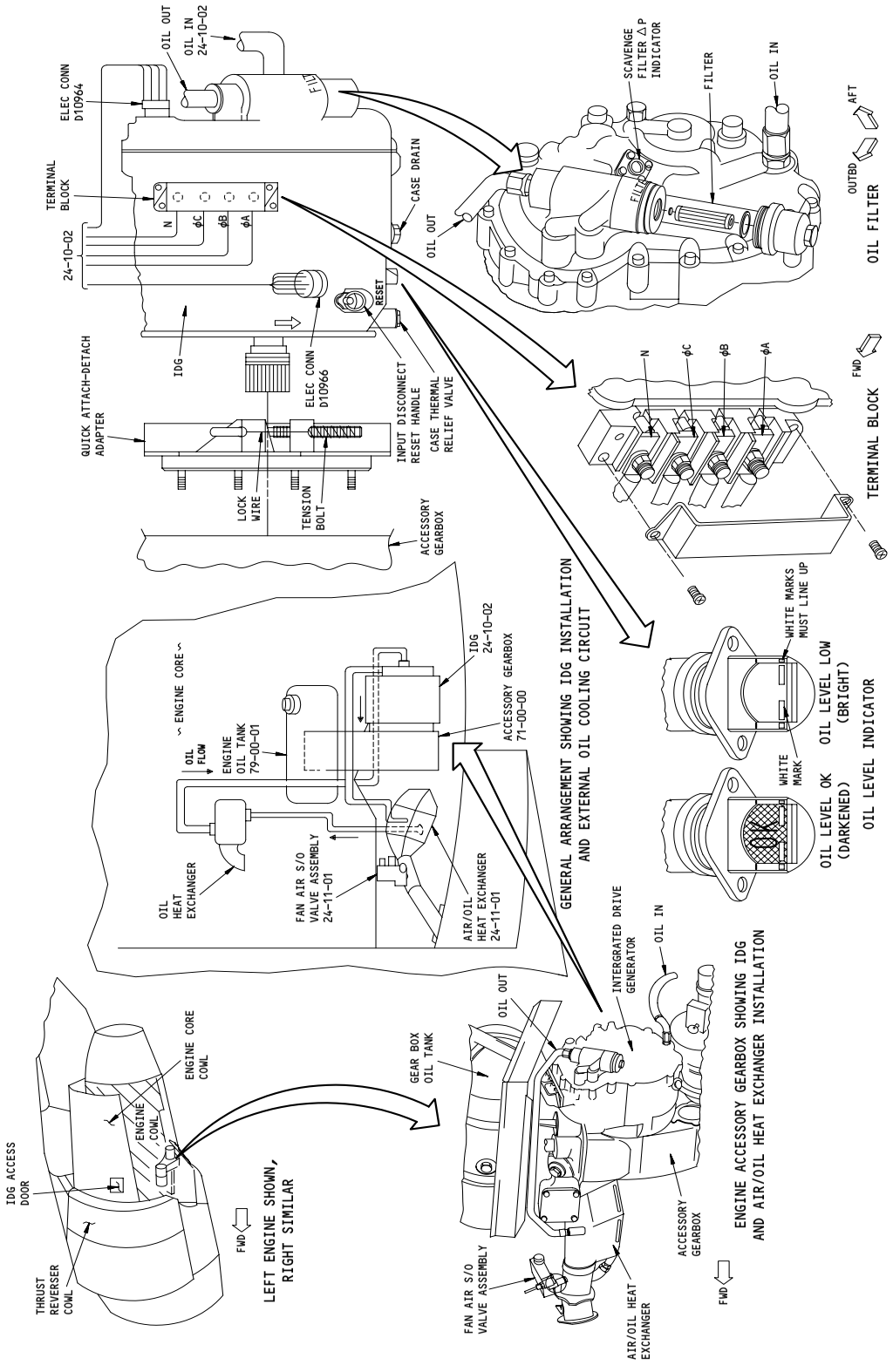
(1) The override pressure switch controls the 28v dc power to the IDG air/oil heat exchanger valve. The switch is a single pole double throw type spring loaded to the open position. The switch closes when PS3 pressure is 75 psig. In the closed position the IDG air/oil heat exchanger valve is controlled by the generator control unit. In the open position the generator control unit is overridden, and the valve is controlled by engine electronic control logic. The switch is located in the engine intermediate case near cavity at 12:30 position.

3. Operation

A. Functional Description

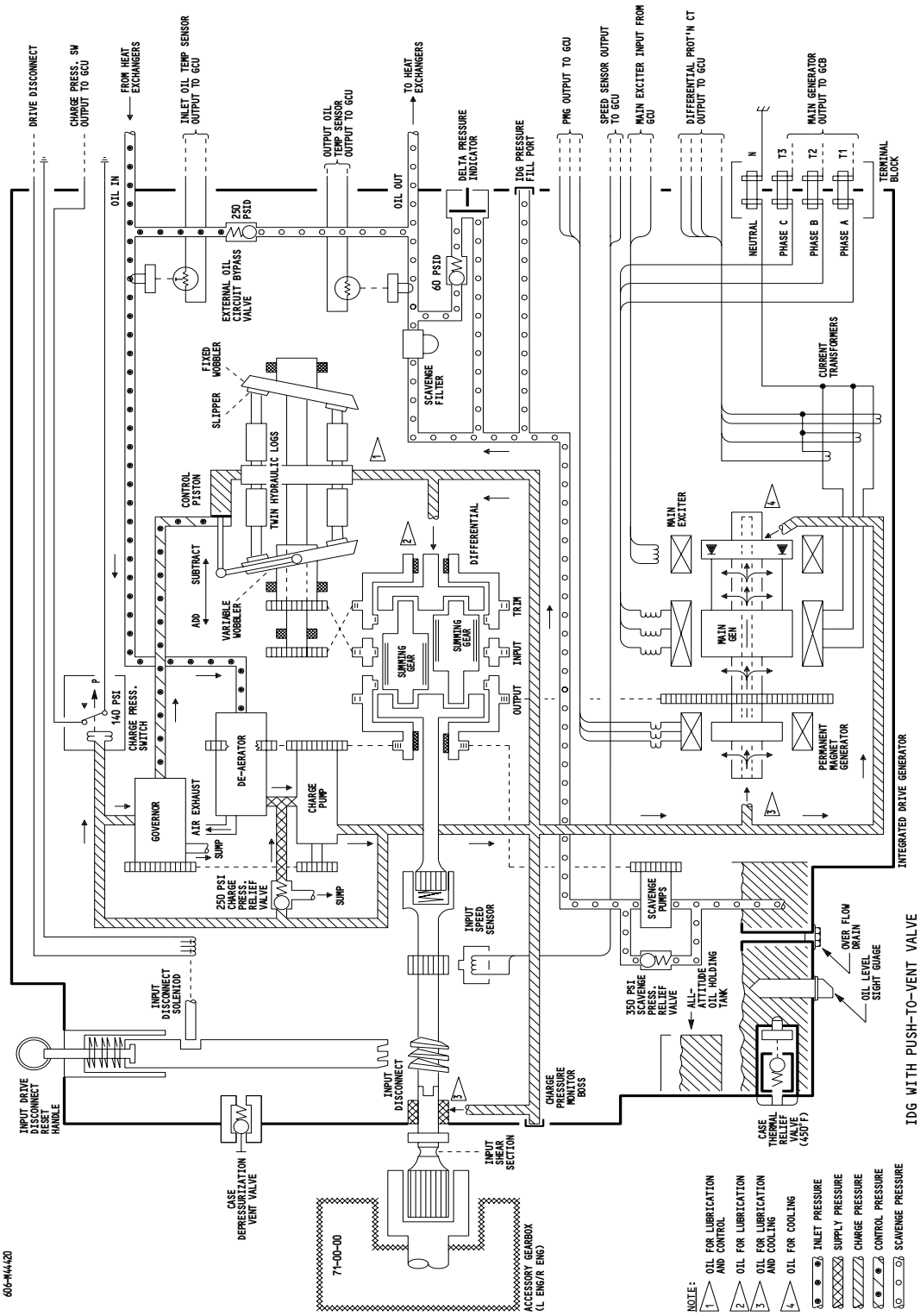
(1) The integrated drive generator (IDG) consists of an axial gear differential/hydraulic speed control section, and a generator section, mounted side-by-side in a single housing.

(2) The axial gear differential/hydraulic speed control section in the IDG converts a varying engine input speed of 4,500-9,075 rpm, to a constant output speed of 12,000±150 rpm. The constant output speed allows the generator section of the IDG to produce ac power with a frequency of 400±5-Hz.



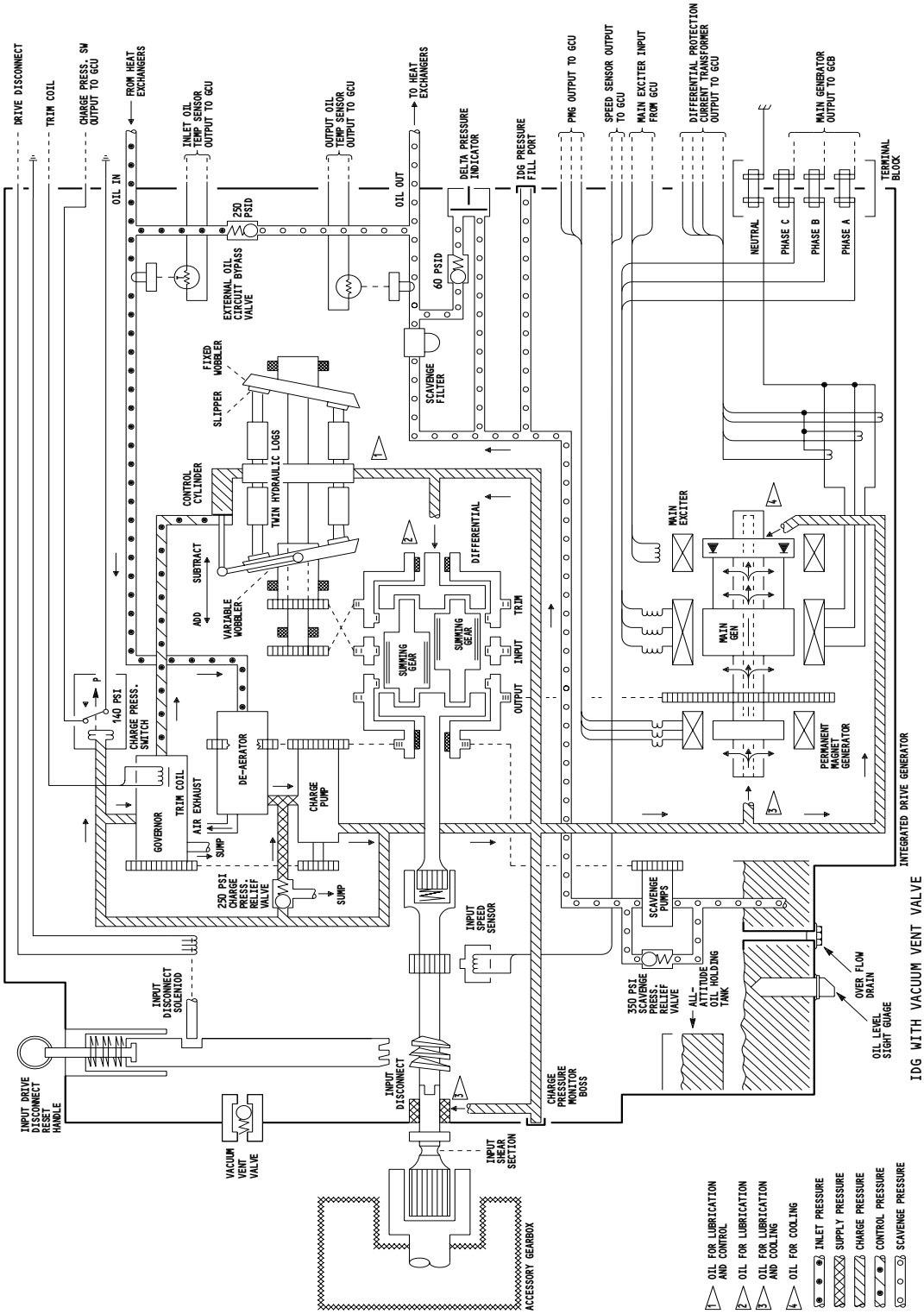
Integrated Drive Generator Installation
Figure 2

C04628



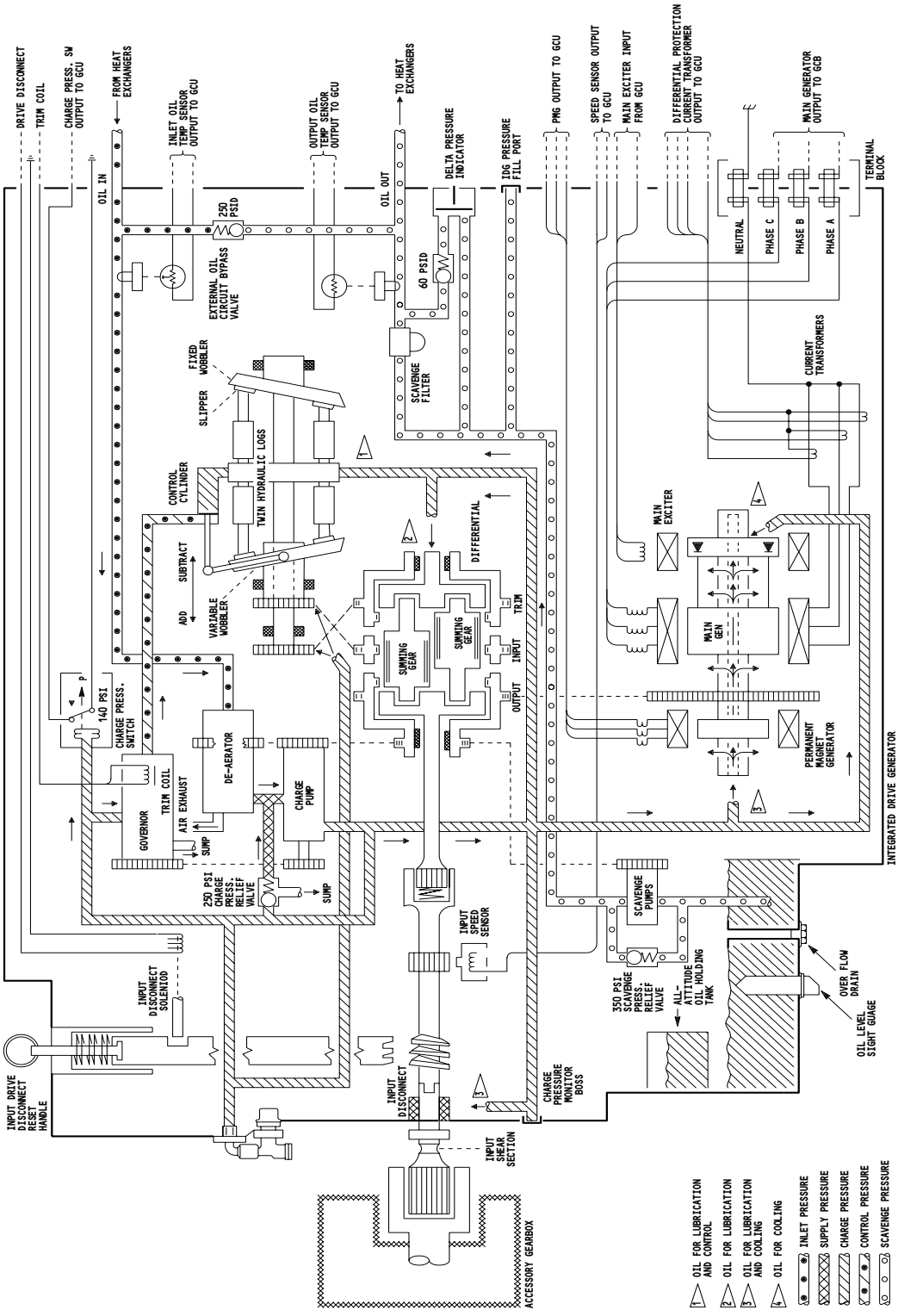
IDG WITH PUSH-TO-VENT VALVE
Integrated Drive Generator Schematic
Figure 3 (Sheet 1)

859534



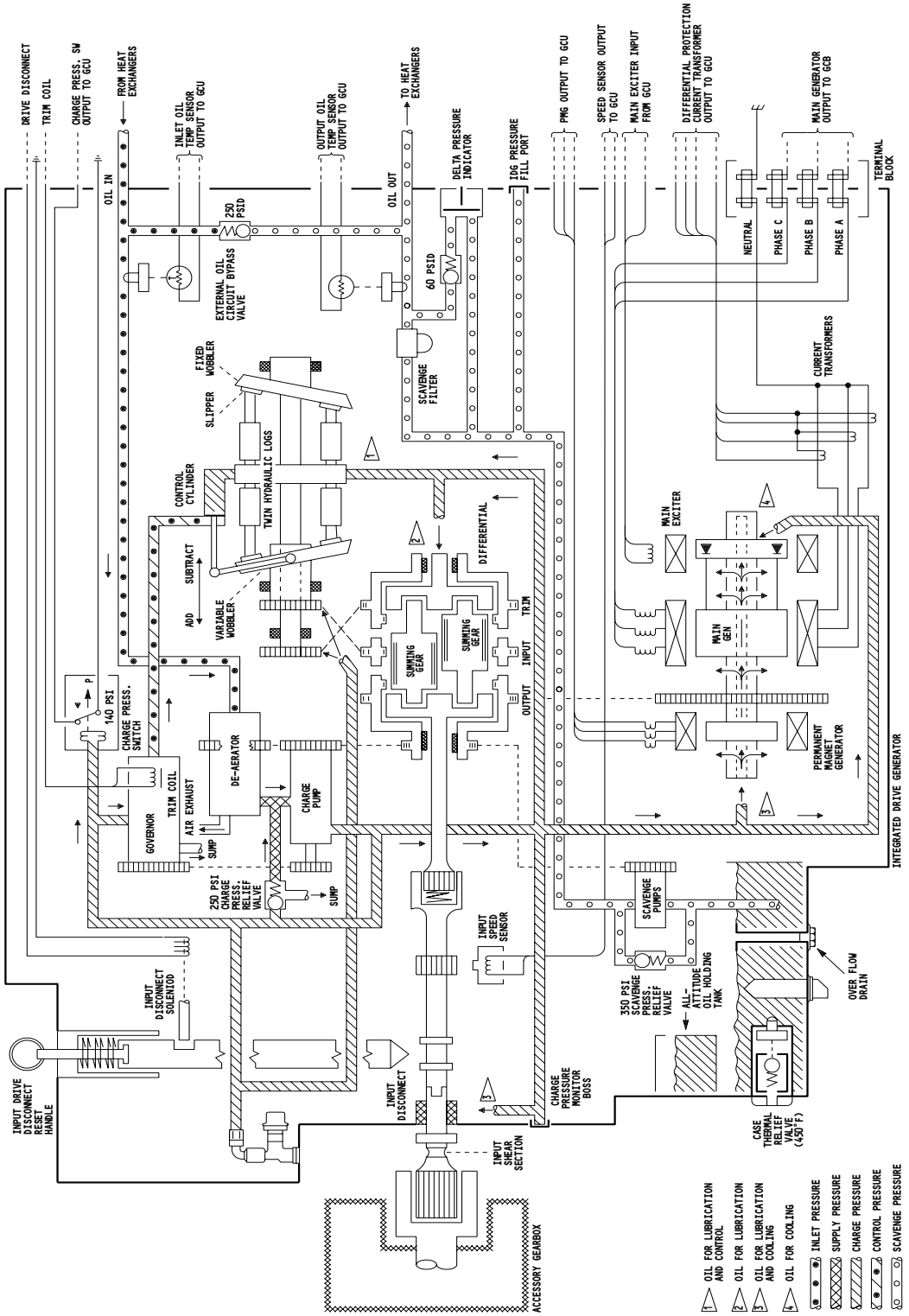
IDG WITH VACUUM VENT VALVE
Integrated Drive Generator Schematic
Figure 3 (Sheet 2)

691377



IDG WITH EXTERNAL ASPIRATOR CASE VENT SYSTEM
Integrated Drive Generator Schematic
Figure 3 (Sheet 3)

691378



IDG WITH INTERNAL ASPIRATOR CASE VENT SYSTEM
Integrated Drive Generator Schematic
Figure 3 (Sheet 4)

691379

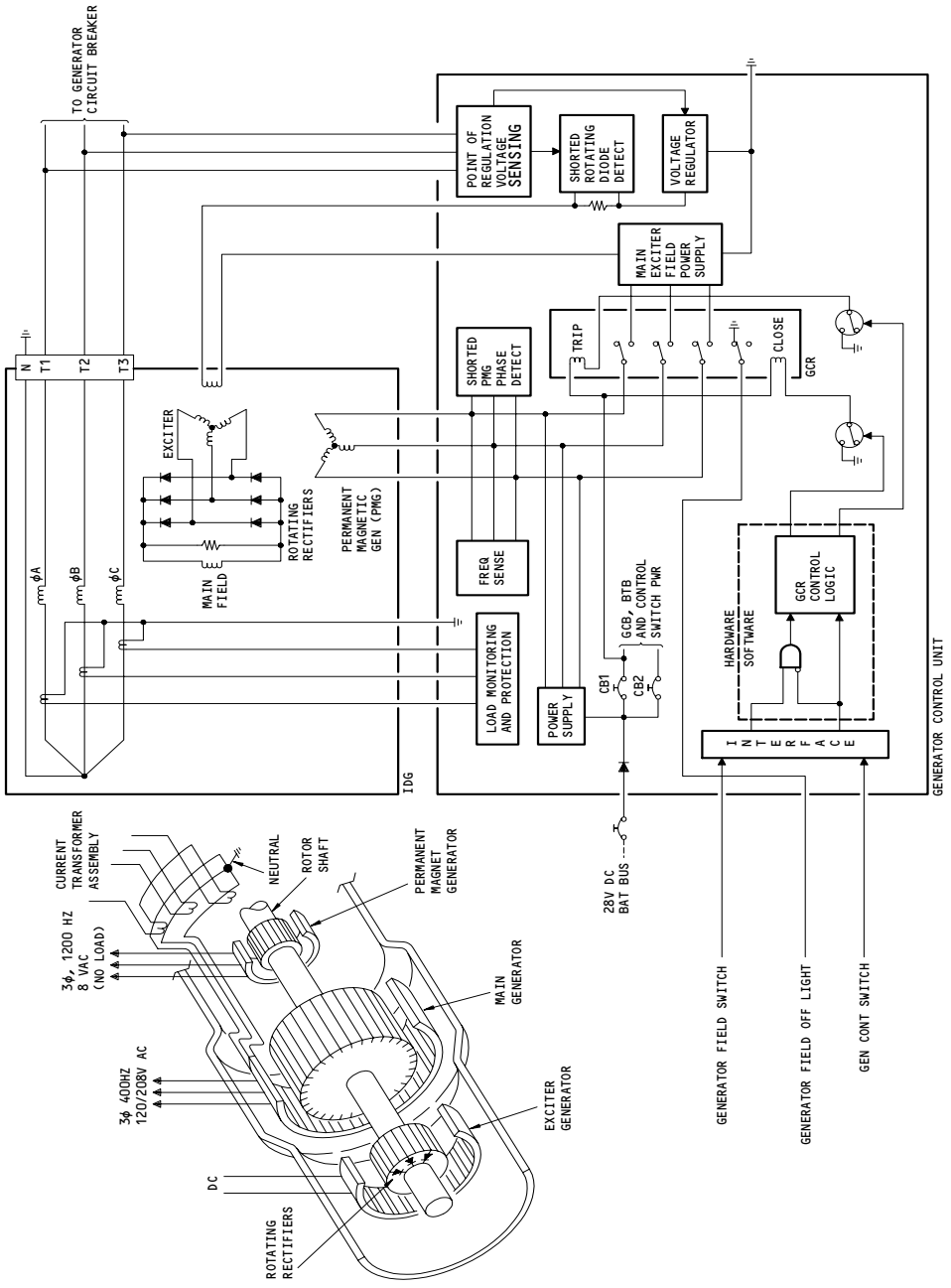
(3) A governor adjustment screw, on the IDG housing, allows one to fine tune the output speed of the hydraulic speed control section. This corrects IDG electrical frequency, if it falls outside the 400±5-Hz range.

(4) The power generation section in the IDG converts mechanical power (from the IDG axial gear differential/hydraulic speed control section), into electrical power. The generator outputs 115/200-volt, 3-phase, 90-Kva, 400-Hz ac power. This ac power is fed to the electrical system through four terminal studs on the IDG housing.

(5) Each IDG is automatically controlled by a separate generator control unit (GCU). The GCU also works with flight compartment switches for manual IDG control (Ref 24-22-00). The GCU regulates IDG output voltage, and provides IDG protection (Ref 24-23-00). System status signals, shown on flight compartment indicators, are from the GCU.

(6) Voltage on the generator side of the generator circuit breaker (GCB) is regulated by the generator control unit (GCU). The GCU maintains this point at 115 ±1v ac, line-to-neutral, 400 ±4-Hz, for loads up to 90 - Kva (Voltage is regulated within 115 ±1.5v ac for loads up to 112.5 kva). The GCU voltage regulator varies exciter field current flow in the generator to keep output voltage within these limits. Two electrical connectors on the IDG housing allow the GCU to control IDG output, and provide IDG permanent magnet generator (PMG) power to the GCU.

(7) Pressurized oil is used for integrated drive generator (IDG) lubrication, cooling, and control. The IDG charge system supplies this oil to the speed control and power generation sections. If this charge pressure falls below 140 psi, a ground circuit in the IDG closes. A signal is sent to the generator control unit, causing the appropriate amber DRIVE light in the GEN DRIVE DISC switch to come on. The switch is on electrical systems panel M10063. (The M10063 panel is on pilots' overhead panel P5). In addition to the DRIVE light, the EICAS display will show a level C alert: L (or R) GEN DRIVE (Ref 31-41-00). (The appropriate engine must be running for the EICAS message to appear. This message results in an ELEC AUTO EVENT in the EICAS system). To avoid further damage to the IDG, the guarded GEN DRIVE DISC switch should be pressed. This activates the input disconnect mechanism.



IDG Power Generation Block Diagram
Figure 4

(8) AIRPLANES POST-SB 24-80;
The GCU counts the number of times the pressure switch closes. If that number is over 30 but less than 360 over a 10 second interval, the GCU will supply a ground to the R (or L) EICAS computer causing the R (or L) IDG OIL LEVEL message to appear on the EICAS display. R (or L) IDG OIL LEVEL is a maintenance level EICAS message. If this message appears, the corresponding IDG should be serviced (Ref 12-13-03).
If the number of pressure switch closures is more than 360 during a 10 second interval or the switch stays closed constantly, the GCU will supply a ground to the R (or L) EICAS computers causing the R (or L) GEN DRIVE message to appear on the EICAS display.

(9) The input disconnect mechanism disconnects the IDG input shaft from the drive section of the IDG. This removes mechanical input power from the IDG. The mechanism is controlled by two guarded GEN DRIVE DISC switches on M10063. These switches are momentary action type, pushing a switch once activates the disconnect. This separates the gearbox drive shaft from the IDG input shaft. The GEN DRIVE DISC switch should be pushed when the amber DRIVE light in the switch is on. The light is on when charge pressure falls below 140 psi, or IDG oil-out temperature reaches 365 ±9°F (185 ±5°C). An EICAS level C alert also appears (if the corresponding engine is running): L (or R) GEN DRIVE. Failure to disconnect the IDG can further damage it. (The EICAS message results in an ELEC AUTO EVENT in the EICAS system).

(10) AIRPLANES WITH -39 IDGS AND ON;
The IDG is equipped with an automatic thermal decoupler. The thermal decoupler protects the IDG from severe internal damage due to excessive operating temperatures. The thermal decoupler will automatically disconnect the IDG from the engine when the IDG oil sump temperature reaches 415°F.

(11) SAS 050-154, 275, 276 POST-SB 24-59;
SAS 155-274, 277-999;
An inhibit IDG disconnect circuit is provided, using the fuel control switch, to avoid nuisance disconnects when the engine is not running.

(12) After the input disconnect mechanism has been activated, the IDG input shaft and the CSD section of the IDG can only be reconnected on the ground. This is done by pulling the input drive disconnect reset ring fully out. This ring is on the IDG housing.

(13) A disconnected IDG that remains mounted to an engine for about 50 flight hours can receive damage to the ball bearing assembly for the IDG input shaft.

(14) Oil exiting the IDG flows through the IDG scavenge filter. The oil then goes through the external oil coolers. A delta-pressure indicator, is used to indicate a clogged scavenge filter. The delta-pressure indicator is located next to the filter housing. The indicator causes a red button to pop out, if the pressure across the filter reaches 60 psig. This shows that the filter is clogged. The indicator is prevented from operating when oil temperature is below 145°F (63°C).

(15) An oil level indicator is on the bottom of the IDG. The indicator consists of a display prism with two white marks for viewing alignment. The indicator only shows whether the IDG oil level is low. The indicator does not show a high level, nor does it indicate the system oil quantity numerically. A dark prism indicates the IDG oil level is adequate. A shiny bright prism indicates the IDG oil level is low.

(16) IDG oil is drained through the case drain plug. Oil is replenished through the pressure fill elbow coupling. The overflow drain coupling is used to drain excess oil during replenishing.

(17) The case thermal relief valve allows oil to flow out of the IDG sump, if IDG oil becomes too hot. The solder plug in the relief valve opens at approximately 430°F (221°C). Oil then flows through a drain line and overboard.

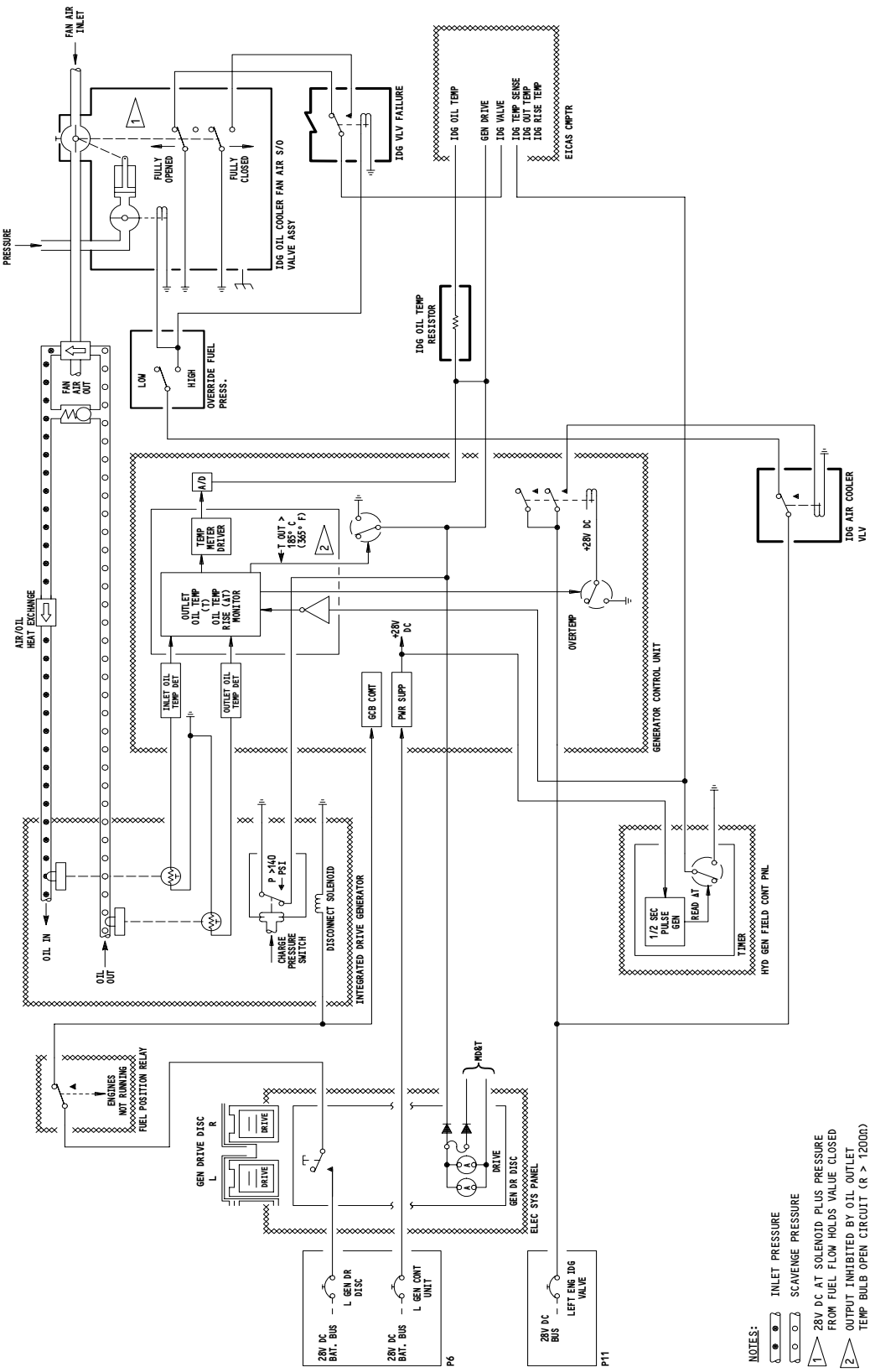
(18) The IDG oil cooling system consists of two series connected heat exchangers: One air/oil heat exchanger, and one fuel/oil heat exchanger. Oil entering the air/oil heat exchanger is directly from the IDG oil-out port. After passing through the air/oil heat exchanger, oil flows to the fuel/oil heat exchanger. After the oil passes through the fuel/oil heat exchanger, it returns to the IDG.

(19) A valve in the IDG limits the pressure seen across the oil heat exchangers. If external circuit pressure reaches 250 psi, the valve opens. Oil then flows from the output of the scavenge filter, back through the IDG. The external oil cooling circuit is bypassed.

(20) The fuel/oil heat exchanger provide continuous IDG oil cooling. The air/oil heat exchanger supplies added IDG oil cooling when the airplane is on the ground, fuel flow is low, and/or IDG oil-out temperature is high.

(a) During normal operation the IDG cooling system is controlled by aircraft logic as a function of IDG oil temperature and engine N2 speed. In this mode of operation the IDG oil cooling solenoid is energized, directing PS3 flow to the override pressure switch, closing it. This provides an electrical path for airplane power (28v dc) to control the IDG air/oil heat exchanger valve.

(b) During override operation if the electronic engine control senses an increasing engine oil temperature or N2 speed drops below 70 percent, it removes the command signal to the IDG oil cooling solenoid, de-energizing it. Anytime the solenoid is de-energized, a path is provided for PS3 to vent from the pressure switch causing the pressure switch to open. This opens the electrical circuit to the solenoid, causing the heat exchanger valve to open.



IDG Oil Cooling Schematic (Example)
Figure 5

(21) The GCU keeps track of the IDG oil-in temperature. If this temperature reaches 260°F (127°C), a relay in the GCU closes. The IDG air/oil cooler valve relay opens and removes 28 volts dc from the IDG air/oil heat exchanger shutoff valve allowing the valve to open. When the valve opens, engine fan air provides further IDG oil cooling. If the valve fails to open, a ground circuit within the valve closes, energizing the IDG VLV FAILURE relay causing an EICAS message to appear on the status and maintenance pages: L (or R) IDG VALVE. The message is stored in EICAS memory. The GCU allows the IDG air valve to close when IDG oil-in temperature falls below 220°F (104°C).

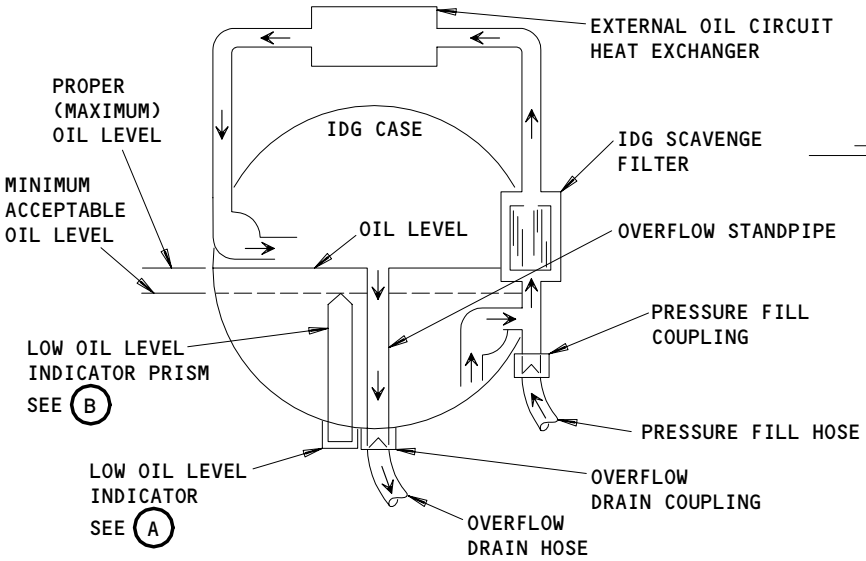
(22) If IDG oil-out temperature reaches 365° ± 9°F (185° ± 5°C), the appropriate amber DRIVE light in the GEN DRIVE DISC switch comes on. An EICAS level C alert also appears (if the corresponding engine is on): L (or R) GEN DRIVE. (The GEN DRIVE message is stored in memory by EICAS, and an ELEC AUTO EVENT occurs in the EICAS system). To avoid further damage to the IDG, the guarded GEN DRIVE DISC switch should be pressed. This activates the input disconnect mechanism.

(23) AIRPLANES WITH L (R) IDG OIL TEMP EICAS MESSAGE;
If IDG oil-out temperature remains above 311°F (155°C) for 10 minutes, an EICAS message appears on the status and maintenance pages: L (or R) IDG OIL TEMP. (The IDG OIL TEMP message is stored in memory by EICAS, and an ELEC AUTO EVENT occurs in the EICAS system).

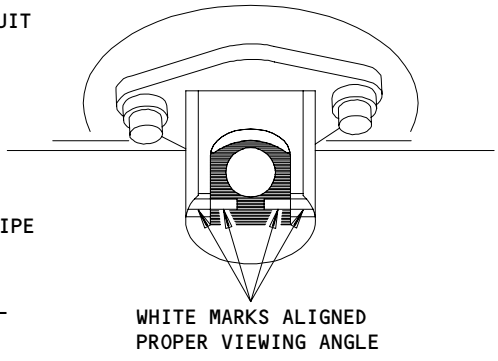
(24) The maintenance page of EICAS displays IDG oil out temperature, and IDG oil rise temperature. The rise temperature is the difference between oil-out temperature and oil-in temperature. The rise temp is continuously monitored by the corresponding generator control unit. A timer is set to display the most recently calculated rise temperature every 0.55 seconds. (The timer is in right side panel P61).

(25) AIRPLANES WITH IDG RISE TEMP EICAS MESSAGE;
If the difference between the two IDG rise temperatures is greater than approximately 42.8°F (6°C), for more than 10 minutes, an EICAS message is displayed on the maintenance page: IDG RISE TEMP. (Both engine generators must be running for this message to be displayed. The EICAS message is stored in memory, and an ELEC AUTO EVENT occurs in the EICAS system).

(26) If an oil temperature sensor failure occurs, a L (or R) IDG TEMP SENS EICAS message is displayed on the maintenance page. On some EICAS computers, the message is also displayed on the status page.
(27) If the difference between the left and right IDG oil temperatures exceeds 20°C, an EICAS message IDG OUT TEMP is displayed on the maintenance page.
(28) IDG Servicing Features (Fig. 6).
  (a) An indicator is provided to show when the oil level is low. The indicator has a prism inside the IDG that reflects light back to the viewer when it is not covered with oil. When the prism is covered with oil, the light is absorbed into the oil and not reflected back to the viewer. When the legend OK is visible, the IDG has enough oil and oil servicing is not required. When there is a silver spot (large or small) in the viewing area, the oil level is low and the IDG requires servicing.
  (b) The low oil level indicator can operate on low levels of light. Light sufficient to see the white alignment marker is all the light that is needed to view the indicator. Shining a flashlight (or other light source) directly into or onto the viewing face can induce too much light and cause reflections resulting in incorrect interpretation of the indicator.
  (c) The indicator viewing face must be clean before attempting to view the indicator. A dirty viewing face (and back face in early configured indicators) can also cause reflections resulting in incorrect interpretation.
  (d) Filling the IDG through the pressure fill valve causes oil to first flow through the IDG scavenge filter, then through the external oil circuit, and into the IDG case. Air that is in the circuit is forced out ahead of the oil and escapes through the overflow drain. The oil level rises in the IDG sump until the oil level rises above the top of the standpipe and then flows from the overflow drain.
  (e) The overflow drain establishes the proper fill level for the IDG oil system. The IDG oil level is correct when oil overflows from the overflow drain and then slows to drops. The overflow standpipe establishes the maximum oil level in the IDG case.

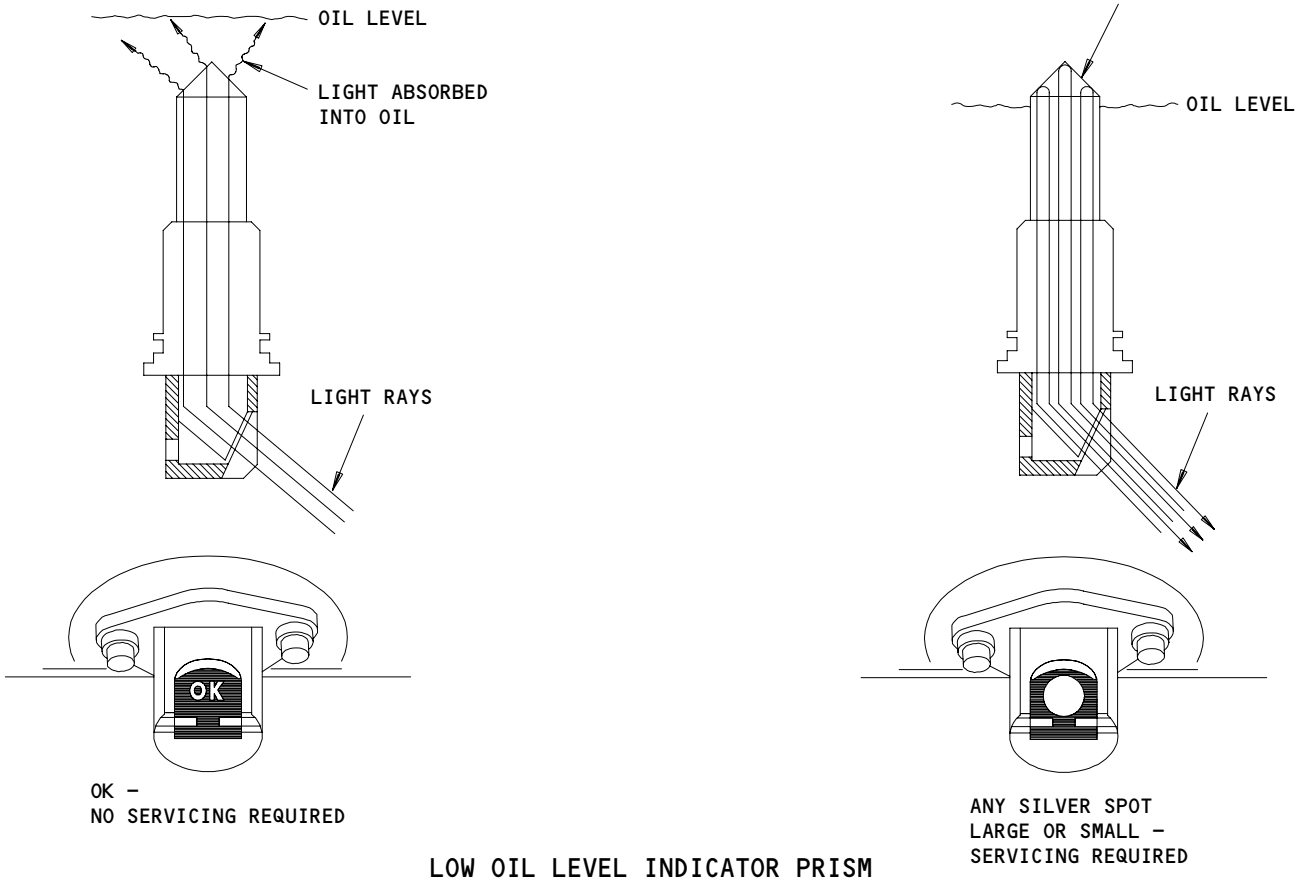


IDG SERVICING DIAGRAM



LOW OIL LEVEL INDICATOR

A



LOW OIL LEVEL INDICATOR PRISM

B

A54536

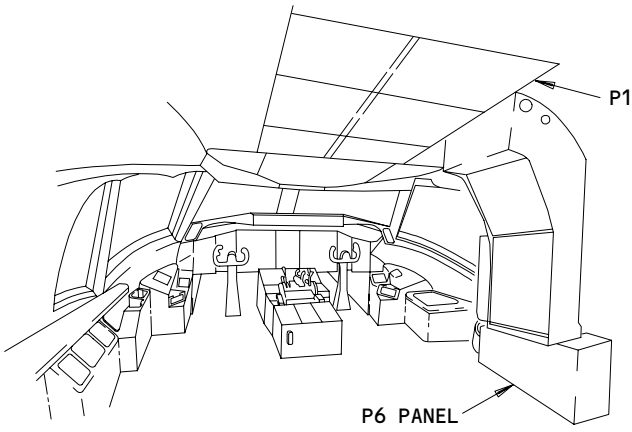
IDG Servicing Features
Figure 6

GENERATOR DRIVE SYSTEM

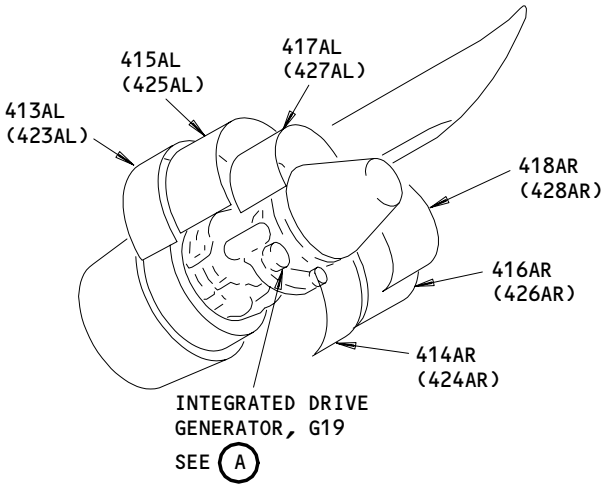
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS			FLT COMPT, P6	
L GEN CONT UNIT, C804		1	6B1	*
R GEN CONT UNIT, C805		1	6B2	*
L GEN DRIVE DISC, C807		1	6B5	*
R GEN DRIVE DISC, C808		1	6B6	*
CIRCUIT BREAKERS			FLT COMPT, P11	
LEFT ENG IDG VALVE, C837		1	11M4	*
RIGHT ENG IDG VALVE, C838		1	11M31	*
COUPLING - QUICK ATTACH/DETACH	1	2	415AL,425AL	24-11-03
EXCHANGER - IDG AIR/OIL HEAT	2	2	413AL,423AL	24-11-12
EXCHANGER - IDG FUEL/OIL HEAT	2	2		79-21-01
GENERATOR - INTEGRATED DRIVE, G19	1	2	415AL,425AL	24-11-01
RELAY - (REF 31-01-06, FIG. 101)				
L IDG AIR COOLER VALVE, K1031	1	1	415AL,425AL	
R IDG AIR COOLER VALVE, K971				
LEFT TD IDG VALVE FAILURE, K1033				
RIGHT TD IDG VALVE FAILURE, K1032				
SWITCH - OVERRIDE FUEL PRESS, S1611	2	2	413AL,423AL	24-11-13
VALVE - IDG AIR/OIL HEAT EXCHANGER AIR SHUTOFF, V350	2	2	415AL,425AL	24-11-12

* SEE THE WDM EQUIPMENT LIST

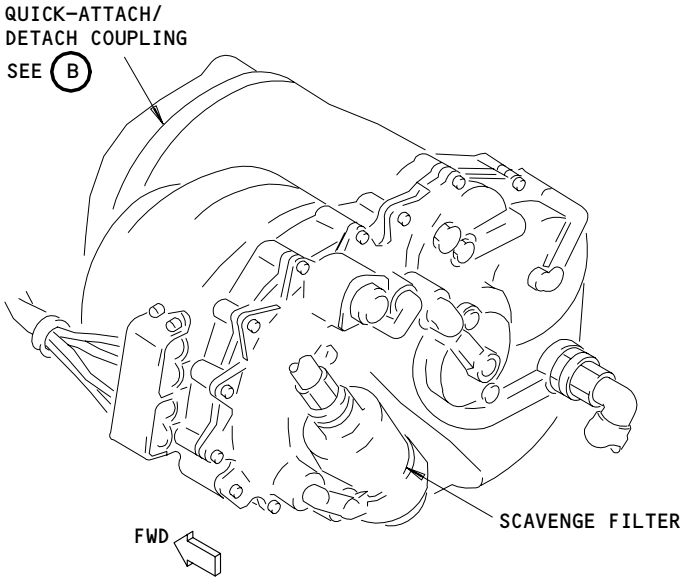
Generator Drive System - Component Index
Figure 101



FLIGHT COMPARTMENT

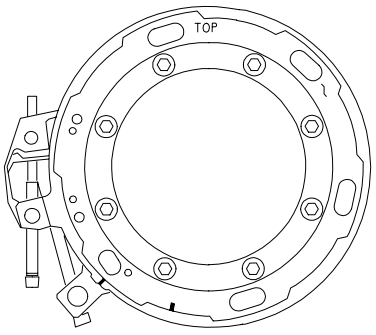


NO. 1 ENGINE (NO. 2 ENGINE)



INTEGRATED DRIVE GENERATOR, G19

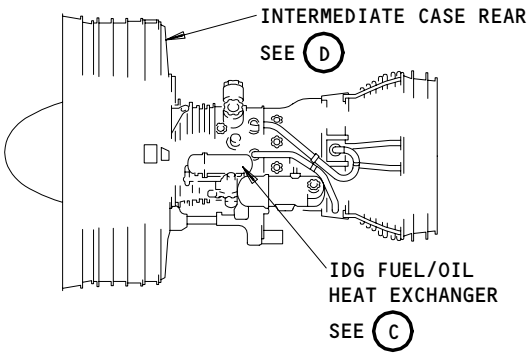
A

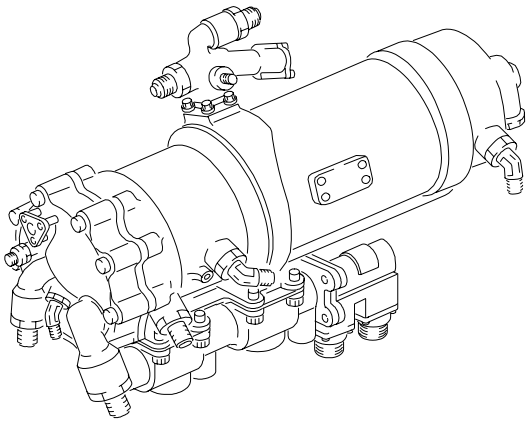


QUICK-ATTACH/DETACH COUPLING

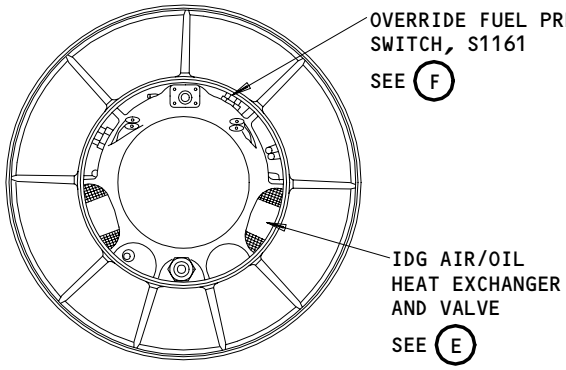
B

Generator Drive System - Component Location
Figure 102 (Sheet 1)

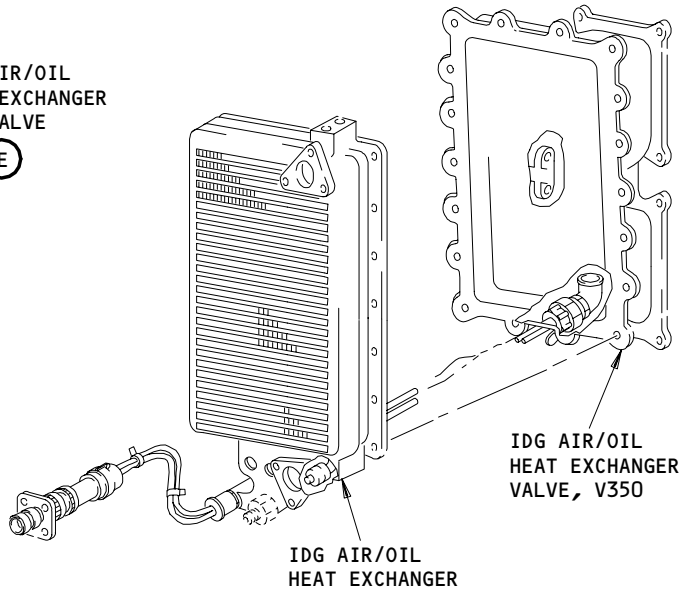




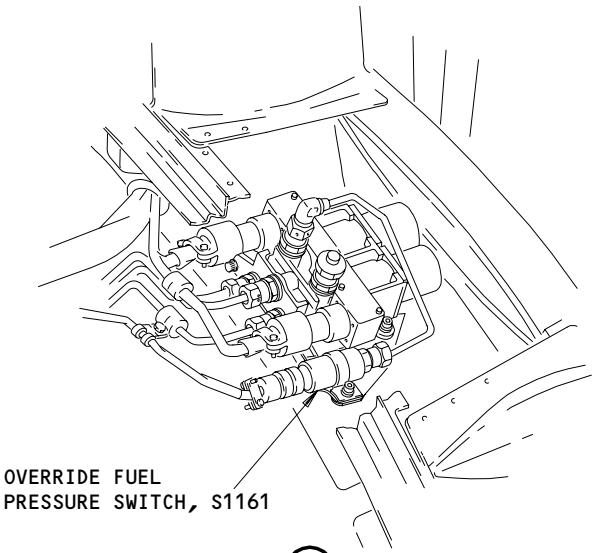
IDG FUEL/OIL
HEAT EXCHANGER
C



INTERMEDIATE CASE REAR
D



IDG AIR/OIL HEAT EXCHANGER AND VALVE
E



F

L-A2109

Generator Drive System - Component Location
Figure 102 (Sheet 2)

GENERATOR DRIVE SYSTEM – MAINTENANCE PROCEDURES

1. General
   A. This procedure contains these tasks:
      (1) IDG Oil System Pressure Release.
      (2) IDG Oil System Static Leak Check.

TASK 24-11-00-862-001

2. IDG Oil System Pressure Release (Fig. 201)
   A. General
      (1) This task gives instructions to release the pressure from the IDG oil system.
   B. Standard Tools and Equipment
      (1) Adapter – Outlet, OMP2505-3, Ozone Metal Products, 101-32 101th Street, Ozone Park, Long Island, NY 11416
      (2) Hose – To connect to outlet adapter
      (3) Container – 2 U.S. gallon (8 liter) capacity, suitable to collect oil drainage from IDG
   C. Access
      (1) Location Zone
          412 Engine 1 – Main Gearbox Aft Face 7 o'clock
          422 Engine 2 – Main Gearbox Aft Face 7 o'clock

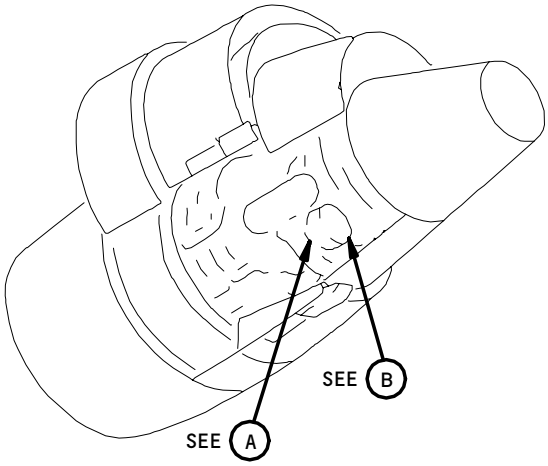
      (2) Access Panel
          417CL IDG Service Pressure Relief Access Door
          427CL IDG Service Pressure Relief Access Door

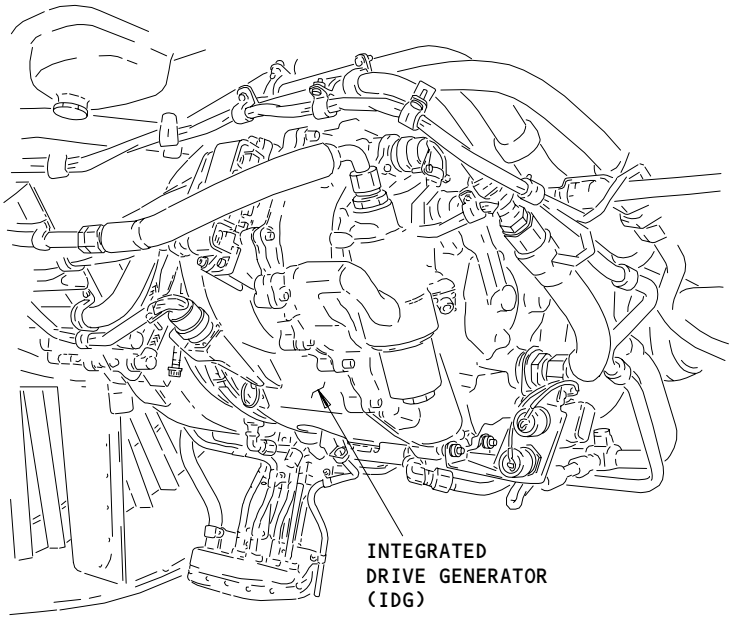
   D. Procedure

      S 122-048
      (1) Open the IDG service access door on the left core cowl panel.

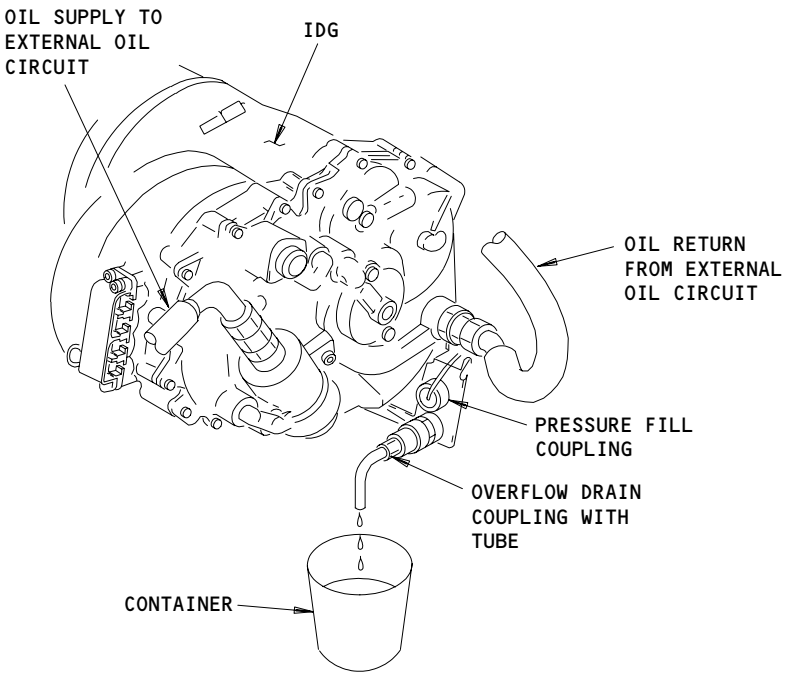
      S 032-004
      (2) Remove the cover from the overflow drain coupling on the IDG.

      S 862-030
      (3) Put the free end of the outlet hose into a container.





A



B

Integrated Drive Generator Depressurization
Figure 201

S 862-005

WARNING: BE CAREFUL WHEN YOU CONNECT THE OUTLET ADAPTER TO THE OVERFLOW DRAIN COUPLING. USE A RAG AROUND THE FITTING TO PREVENT THE OIL SPRAY CAUSED BY PRESSURE IN THE IDG CASE. HOT OIL CAN CAUSE INJURIES.

(4) Connect the adapter and the oil outlet hose to the overflow drain coupling on the IDG.

NOTE: It is usual for some oil to drain, when you connect the adapter to the coupling.

(a) Permit the oil that drains from the hose to flow into the container.
(b) Keep the free end of the hose below the level of the IDG.

S 092-006
(5) Disconnect the adapter and the outlet hose from the overflow drain coupling.

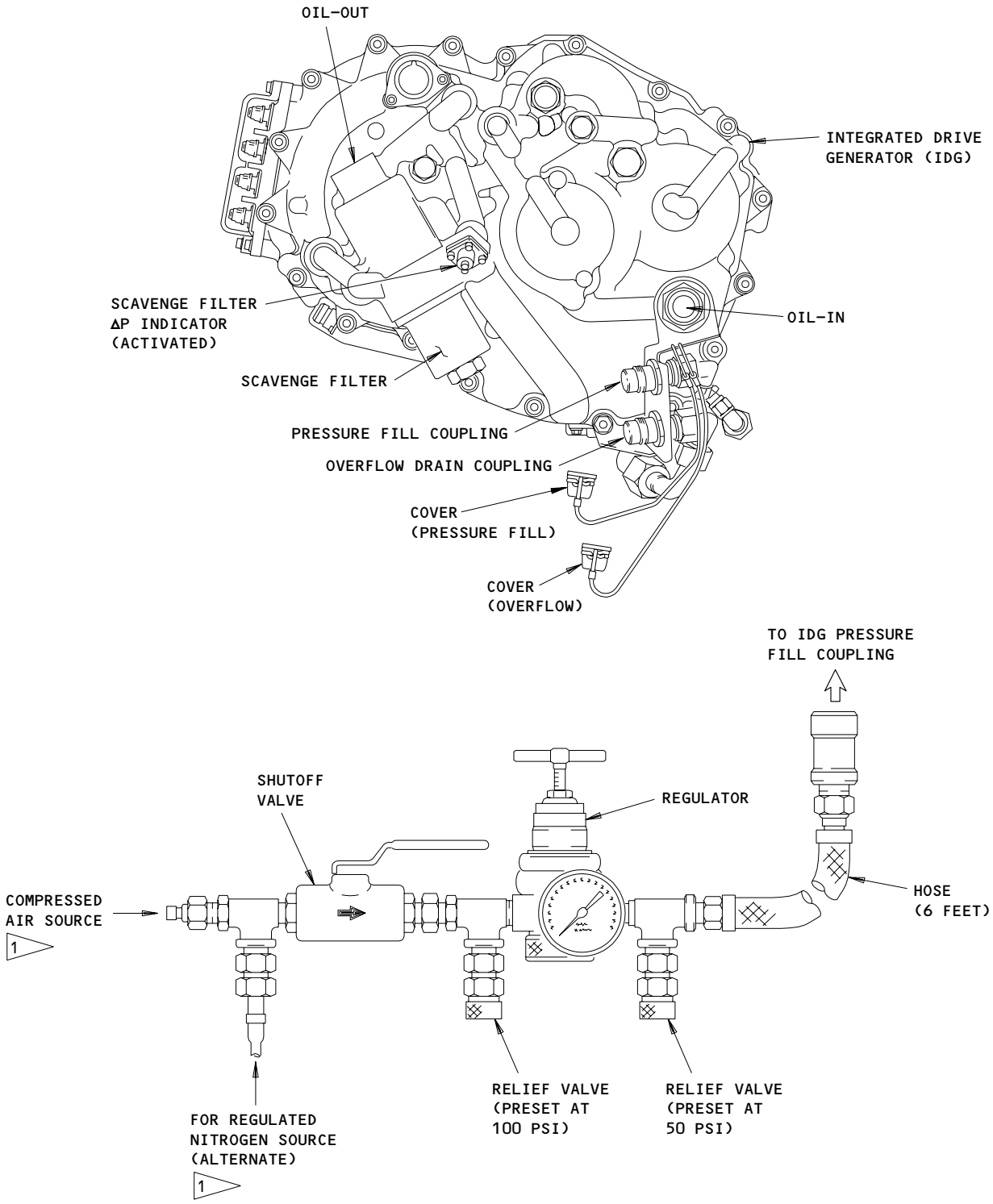
S 432-007
(6) Install the cover on the overflow drain coupling.

S 862-044
(7) Put the Airplane in Its Usual Condition

NOTE: If you will continue to do other tasks on the IDG do not do the steps that close access to the IDG.

S 412-050
(8) Close the service access door for the IDG on the left core cowl panel.

TASK 24-11-00-792-010
3. IDG Oil System Static Leak Check (Fig. 202)



1 IF A REGULATED NITROGEN SOURCE IS TO BE USED, THE COMPRESSED AIR SOURCE PORT MUST BE PLUGGED

IDG Oil System Static Leak Test
Figure 202

A. General
(1) This task gives instructions to do a static leak check of the IDG oil system. The static leak check applies compressed air or nitrogen to the IDG oil system and monitor the pressure to find out if the system has a leak.

B. Standard Tools and Equipment
(1) Adapter - Inlet, OMP2506-3, Ozone Metal Products, 101-32 101th Street, Ozone Park, Long Island, NY 11416
(2) Air Source - clean, dry, compressed (100 psi maximum)

NOTE: A regulated nitrogen source (100 psi maximum) may be used as an alternate to a compressed air source.

(3) Fittings - as necessary
(4) Hose - Flexible, 6 feet, capable of withstanding 100 psi
(5) Regulator - Pressure, with 0 to 100 psi pressure gauge.
(6) Valve - Relief, preset at 50 psi
(7) Valve - Relief, preset at 100 psi
(8) Valve - Shutoff

C. Consumable Materials
(1) D00192 Lubricant-Oil - PWA 521, MIL-PRF-23699
(2) G02151 Detector - Leak, or soap solution.

D. References
(1) AMM 12-13-03/301, IDG - Servicing (Oil Replenishing)
(2) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zone
412 Engine 1 - Main Gearbox Aft Face 7 o'clock
422 Engine 2 - Main Gearbox Aft Face 7 o'clock

(2) Access Panel
417CL IDG Service Pressure Relief Access Door
427CL IDG Service Pressure Relief Access Door

F. Procedure

S 012-036
(1) Open the thrust reverser halves (AMM 78-31-00/201).

S 862-013
(2) Do this task: "Release the Pressure from the IDG Oil System" (AMM 24-11-00/201).

S 862-014
(3) Assemble the leak test equipment as shown in Fig. 202.

S 862-015
(4) Set the shutoff valve on the leak test equipment to OFF.

S 862-016
(5) Turn off the regulator valve on the leak test equipment to prevent over pressurization of the IDG case.

S 032-017
(6) Remove the cover from the pressure fill coupling.

S 482-018
(7) Connect the hose adapter of the leak test equipment to the pressure fill fitting.

S 482-019
(8) Connect the other end of the leak test equipment to a compressed air or a regulated nitrogen source.

NOTE: If you use a regulated nitrogen source, the compressed air port must be sealed.

S 862-020

CAUTION: DO NOT APPLY MORE THAN 50 PSI. TOO MUCH PRESSURE CAN CAUSE DAMAGE TO THE IDG.

(9) Turn the shutoff valve to ON and adjust the regulator to 25 psi.

S 862-047
(10) Turn the shutoff valve to OFF.

S 862-021
(11) Monitor the pressure gauge for approximately 5 minutes.

NOTE: The indicated pressure may decrease by a small amount within 1 to 2 minutes after shutoff of the pressurized gas source because of thermal equalization. Then the pressure will become stable at a constant value if there are no leaks.

S 212-039
(12) If the pressure gauge continues to show a decreasing gas pressure without reaching a stable value, do these steps:
(a) Visually examine the system for a leak.
(b) If you do not find a leak, do a leak check with a leak detector fluid or a soap solution.
(c) Do this task: " Release the Pressure from the IDG Oil System" (AMM 24-11-00/201).
(d) Repair the leaks you found and do the leak check again.

S 862-023

(13) Do this task: "Release the Pressure from the IDG Oil System" (AMM 24-11-00/201).

S 082-024

(14) Disconnect the test equipment.

S 612-025

(15) Add oil to the IDG, if it is necessary (AMM 12-13-03/301).

S 432-026

(16) Install the cover on the pressure fill coupling.

G. Put the Airplane in Its Usual Condition

S 412-040

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

INTEGRATED DRIVE GENERATOR (IDG) SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks:
      (1) The BITE Test and the RESET Test
      (2) The Operational Test for the Left IDG
      (3) The Operational Test for the Right IDG
      (4) The Frequency Adjustment of the IDG
   B. Do these tests after an IDG replacement.
   C. You must operate an engine to do the operational test of the generator drive system.

TASK 24-11-00-745-001

2. The BITE Test and the RESET Test
   A. General
      (1) This procedure does a test of the electrical power system BITE test with the bus power control unit (BPCU).
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zones
          212 Flight Compartment (RH Side)
          119/120 Main Equipment Center
      (2) Access Panels
          119BL Main Equipment Center Panel
   D. Prepare for the Test

          S 865-002
      (1) Set the BAT switch (P5) to the ON position.

          S 865-032
      (2) Momentarily push the RESET switch on the front of the BPCU.

          S 865-033
      (3) Make sure these indications show on the BPCU.
          (a) EXTERNAL POWER SYSTEM

(b) LEFT GEN POWER SYSTEM
(c) RIGHT GEN POWER SYSTEM
(d) APU GEN POWER SYSTEM

E. Procedure

S 745-004

(1) Do the BITE test as follows:
(a) Momentarily push the PERIODIC TEST switch on the BPCU (E2-4).
(b) Make sure these indications show on the BPCU:
1) EXTERNAL POWER SYSTEM
2) OK
3) LEFT GEN POWER SYSTEM
4) OK
5) RIGHT GEN POWER SYSTEM
6) OK
7) APU GEN POWER SYSTEM
8) OK
9) LAST FLT OO END OF DATA
10) FOR PREVIOUS FLT PUSH NOW

NOTE: The above sequence is for a power system with no faults found. If a fault is found in a control unit or in the airplane equipment it governs, the applicable messages will be displayed in place of the OK message.

(c) Repair any message which is displayed on the BPCU.
(d) If it is necessary to see this display again, stop until the FOR PREVIOUS FLT PUSH NOW indication goes off, then push the PERIODIC TEST switch.

TASK 24-11-00-715-005

3. The Operational Test for the Left IDG

A. General
(1) This procedure does these tests:
(a) The Operation Test
(b) The Load Test
(c) The IDG Disconnect Test and the Connect Test.

B. References
(1) AMM 24-11-01/401, Integrated Drive Generator
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(4) AMM 71-00-00/201, Power Plant (Operating Procedures)

(5) AMM 71-00-00/501, Power Plant
(6) AMM 71-11-04/201, Fan Cowl Panels
(7) AMM 71-11-06/201, Core Cowl Panels
(8) AMM 78-31-00/201, Thrust Reverser System

C. Access
(1) Location Zones
212 Flight Compartment (RH Side)
119/120 Main Equipment Center
410 Power Plant Nacelle (Left)
420 Power Plant Necelle (Right)
(2) Access Panels
413/423 Fan Cowl Panels (Left)
414/424 Fan Cowl Panels (Right)
119/120 Main Equipment Center

D. Prepare for the Test

S 045-010

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 745-100
(2) Do the BITE test (AMM 24-11-00/501).

S 865-027
(3) Apply external or APU power to the main AC Buses (AMM 24-22-00/201).

E. The Operation Test

S 715-101
(1) Do the operation test as follows:
(a) Set the L GEN CONT switch on the P5 panel to the OFF position.
(b) Set the R GEN CONT switch on the P5 panel to the OFF position.
(c) Push the ELECT/HYD switch on the right side panel P61.

(d) Make sure these lights are on:
    1) The yellow OFF light in the L GEN CONT switch (P5).
    2) The yellow DRIVE light in the L GEN DRIVE DISC switch (P5).
    3) The white FIELD OFF light in the left generator field switch (P61).
(e) Start the left engine (AMM 71-00-00/201).

CAUTION: MAKE SURE THE DRIVE LIGHT IN THE L GEN DRIVE DISC SWITCH (P5) GOES OFF AFTER YOU START THE ENGINE. HIGH OIL OUT TEMPERATURE OR LOW OIL PRESSURE CAN CAUSE DAMAGE TO THE IDG.

(f) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch (P5) is off.
    1) If the DRIVE light stays on, or comes on while the engine operates, push the L GEN DRIVE DISC switch.
        a) Stop the engine (AMM 71-00-00/201).
        b) Isolate the failure which caused the DRIVE light to come on.
(g) Make sure these lights are on:
    1) The yellow OFF light in the L GEN CONT switch (P5).
    2) The white FIELD OFF light in the left generator field switch (P61).
(h) Push the left generator field switch (P61).
    1) Make sure the FIELD OFF light in the switch goes off.
(i) Make sure the DRIVE light in the L GEN DRIVE DISC switch (P5) is off.
(j) Make sure these red lights on P31 are on:
    1) The L GEN HOT BUS WARN.
    2) The L 115 AC HOT BUS WARN.
(k) Make sure these indications for the left power channel show on the EICAS display:
    1) AC Volts = 115 ±5
    2) Frequency = 400 ±5
(l) Make sure the L GEN OFF shows on the EICAS display.

(m) Make sure that no L GEN DRIVE shows on the EICAS display.
(n) Push the L GEN CONT switch (P5) to the ON position.
(o) Make sure these lights are off:
1) The OFF light in the L GEN CONT switch (P5).
2) The two BUS OFF lights (P5).
3) The DRIVE light in the L GEN DRIVE DISC switch (P5).
4) The FIELD OFF light in the left generator field switch (P61).
(p) If ExternaL Power is ON, push and release the EXT PWR switch to remove power.
(q) If the APU is running, push the APU GEN CONT switch on the P5 panel to the OFF position.
(r) Make sure the RIGHT BUS OFF light on the P5 panel is off.
(s) Push the left BUS TIE switch on the P5 panel to the ISLN (out) position.
(t) Make sure the right BUS OFF light on the P5 panel is on.
(u) Push the left BUS TIE switch on the P5 panel to the AUTO (in) position.
(v) Make sure the right BUS OFF light on the P5 panel is off.
(w) Stop the left engine (AMM 71-00-00/201).
(x) Make sure these lights come on:
1) The yellow OFF light in the L GEN CONT switch (P5).
2) The yellow DRIVE light in the L GEN DRIVE DISC switch (P5).
(y) Make sure these lights are off:
1) The FIELD OFF light in the left generator field switch (P61).
2) The L GEN HOT BUS WARN light (P31).

S 755-035
(2) Do the BITE test (AMM 24-11-00/501).

F. The Load Test

S 715-099
(1) Start the left engine (AMM 71-00-00/201).

S 715-097
(2) Do the load test as follows:
(a) Do these steps until the EICAS display shows a LOAD of not less than 0.50 for the left power channel.

(b) If external power is on, push the EXT PWR switch to the OFF position.
(c) If the APU is operating, push the APU GEN CONT switch to the OFF position.

CAUTION: DO NOT OPERATE THE BOOST PUMPS WITH THE FUEL TANKS EMPTY. DAMAGE TO THE BOOST PUMPS CAN OCCUR.

(d) Put these switches on the fuel management control panel (P5) to the ON position.
1) L AFT PUMP
2) L FWD PUMP
3) R AFT PUMP
4) R FWD PUMP
5) LEFT C PUMP
6) RIGHT C PUMP
(e) Put these switches on the hydraulic system control panel (P5) to the ON position:
1) L ELEC HYD PUMP
2) C ELEC 1 HYD PUMP
3) R ELEC HYD PUMP
(f) Push these switches on the air conditioning control module (P5) to the ON position.
1) L RECIRC FAN
2) R RECIRC FAN
(g) Make sure these indications for the left power channel show on the lower EICAS display:
1) AV-C = 115 ±5
2) FREQ = 400 ±5
3) LOAD = 0.50 or larger
(h) Make sure all switches set to the ON position during the test are in the OFF position.
(i) Push the EXT PWR or the APU switch (P5) to restore power to the main AC buses. .
1) Make sure the white ON light in the switch comes on.

(j) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
(k) Make sure the two BUS OFF lights (P5) are off.

S 745-098
(3) Do the BITE test (AMM 24-11-00/501).

G. The IDG Disconnect Test and the Connect Test

S 715-104
(1) Do the IDG disconnect test and the connect test as follows:
(a) Supply External Power or APU generator power to the right 115V ac bus (AMM 24-22-00/201).
(b) Supply left IDG power to the left 115V ac bus (AMM 24-22-00/201).
(c) Make sure these lights are off:
1) The two BUS OFF lights (P5).
2) The DRIVE light in the L GEN DRIVE DISC switch (P5).
3) The FIELD OFF light in the left generator field switch (P61).
(d) Push the ELEC/HYD switch (P61).
(e) Make sure these indications for the left power channel show on the EICAS display:
1) AC Volts = 115 ±5
2) Frequency = 400 ±5

CAUTION: DO NOT OPERATE THE DISCONNECT SWITCH UNLESS THE ENGINE IS AT OR ABOVE IDLE SPEED. IF YOU DISCONNECT THE IDG BELOW THE ENGINE IDLE SPEED DAMAGE CAN OCCUR TO THE IDG. DO NOT ACTUATE THE DISCONNECT SWITCH FOR LONGER THAN 3 SECONDS. ALLOW A MINIMUM OF 60 SECONDS BETWEEN ACTUATIONS.

(f) Momentarily push the L GEN DRIVE DISC switch (P5).
(g) Make sure these lights are on:
1) The yellow DRIVE light in the L GEN DRIVE DISC switch (P5).
2) The yellow OFF light in the L GEN CONT switch (P5).

3) The yellow left BUS OFF light (P5).
4) The white FIELD OFF light in the left generator field switch (P61).

(h) Make sure these indications for the left power channel show on the EICAS display:
1) AC Volts = 0
2) Frequency = 0

(i) Make sure these indications show on the EICAS display:
1) L GEN DRIVE (level C message)
2) L GEN OFF (level C message)

(j) Push the L GEN CONT switch (P5) or the L FIELD OFF switch (P61) twice.

(k) Stop the left engine (AMM 71-00-00/201).

(l) Remove the APU electrical power or external power (AMM 24-22-00/201).

(m) Push the BAT switch (P5) to the OFF position.

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

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

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

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

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

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

(r) Slowly pull the disconnect-connect ring on the IDG to the outer limit and monitor the force necessary.
1) The operation of the ring must be smooth and must move freely.
2) A click will be felt while you pull the ring to the outer limit.

(s) Permit the ring to go back slowly to the maximum inner position.
1) The operation of the ring must be smooth and must move freely.
(t) Slowly pull the ring to the outer limit, and monitor the force necessary.
1) The force must be less than when you pulled the ring the first time.
2) There must be no click.
(u) Permit the ring to slowly go back to the maximum inner position.
1) If the IDG does not correctly set, replace the IDG (AMM 24-11-01/401).

S 715-116
(2) SAS 050-154, 275, 276 POST-SB 24-59;
SAS 155-274, 277-999;
Do The Disconnect Inhibit Check as follows:
(a) Make sure the left engine fuel cutoff switch on the P10 panel is in the CUTOFF position.

NOTE: The IDG disconnect function is inhibited when the fuel cutoff switch is in the CUTOFF position.

CAUTION: DO NOT ACTUATE DISCONNECT SWITCH FOR LONGER THAN 3 SECONDS. ALLOW A MINIMUM OF 60 SECONDS BETWEEN ACTUATION PERIODS. FAILURE TO FOLLOW THESE RULES COULD DAMAGE IDG DISCONNECT FUNCTION.

(b) Momentarily push the L GEN DRIVE DISC switch (P5).
(c) Slowly pull the disconnect-connect ring to the outer travel limit.
1) Make sure there is no click when you pull the disconnect reset ring.
(d) Permit the ring to slowly go back to the maximum inner position.

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

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

(f) Close the core cowl panels (AMM 71-11-06/201).
(g) Close the fan cowl panel (AMM 71-11-04/201).
(h) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
(i) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 845-109
(3) Put the Airplane back to its Usual Condition

TASK 24-11-00-715-006
4. The Operational Test for the Right IDG
A. General
(1) This procedure does these tests:
(a) The Operation Test
(b) The Load Test
(c) The IDG Disconnect Test and the Connect Test
B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(3) AMM 71-00-00/201, Power Plant (Operating Procedures)
(4) AMM 71-00-00/501, Power Plant
(5) AMM 71-11-04/201, Fan Cowl Panels
(6) AMM 71-11-06/201, Core Cowl Panels
(7) AMM 78-31-00/201, Thrust Reverser System
C. Access
(1) Access Panels
413/423 Fan Cowl Panels (Left)
414/424 Fan Cowl Panels (Right)
119/120 Main Equipment Center
D. Prepare for the Test

S 045-011

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 745-102
(2) Do the BITE test (AMM 24-11-00/501).

S 865-037
(3) Apply external or APU power to main AC buses (AMM 24-22-00/201).

E. The Operation Test

S 715-103

(1) Do the operation test as follows:

(a) Set the R GEN CONT switch on the pilots' overhead panel P5 to the OFF position.

(b) Set the L GEN CONT switch on the P5 panel to the OFF position.

(c) Push the ELEC/HYD switch on the right side panel P61.

(d) Make sure these lights are on:

1) The yellow OFF light in the R GEN CONT switch (P5).

2) The yellow DRIVE light in the R GEN DRIVE DISC switch (P5).

3) The white FIELD OFF light in the right generator field switch (P61).

(e) Start the right engine (AMM 71-00-00/201).

CAUTION: MAKE SURE THE DRIVE LIGHT IN THE R GEN DRIVE DISC SWITCH (P5) GOES OFF AFTER YOU START THE ENGINE. HIGH OIL OUT TEMPERATURE OR LOW OIL PRESSURE CAN CAUSE DAMAGE TO THE IDG.

1) Make sure the DRIVE light in the R GEN DRIVE DISC switch (P5) is off.

2) If the DRIVE light stays on, or comes on while the engine operates, push the R GEN DRIVE DISC switch.

a) Stop the engine (AMM 71-00-00/201).

b) Isolate the failure which caused the DRIVE light to come on.

(f) Make sure these lights are on:

1) The yellow OFF light in the R GEN CONT switch (P5).

2) The white FIELD OFF light in the right generator field switch (P61).

(g) Push the right generator field switch (P61).

(h) Make sure the FIELD OFF light in the right generator field switch goes off.

(i) Make sure the DRIVE light in the R GEN DRIVE DISC switch (P5) is off.

(j) Make sure these red lights on P31 are on:

1) The R GEN HOT BUS WARN.

2) The R 115 AC HOT BUS WARN.

(k) Make sure these indications for the right power channel show on the EICAS display:

1) AC Volts = 115 ±5

2) Frequency = 400 ±5
3) Make sure the R GEN OFF shows on the EICAS display.
4) Make sure that no R GEN DRIVE shows on the EICAS display.

(l) Push the R GEN CONT switch (P5) to the ON position.
(m) Make sure these lights are off:
1) The OFF light in the R GEN CONT switch (P5).
2) The two BUS OFF lights (P5).
3) The DRIVE light in the R GEN DRIVE DISC switch (P5).
4) The FIELD OFF light in the right generator field switch (P61).
(n) If External Power is ON, push and release the EXT PWR switch to remove power.
(o) If the APU is on, push the APU GEN CONT switch to the OFF position.
(p) Make sure the LEFT BUS OFF light is off.
(q) Push the right BUS TIE switch to the ISLN (out) position.
(r) Make sure the left BUS OFF light is on.
(s) Push the right BUS TIE switch to the AUTO (in) position.
(t) Make sure the left BUS OFF light is off.
(u) Make sure no R GEN OFF, or R GEN DRIVE shows on the EICAS display.
(v) Stop the right engine (AMM 71-00-00/201).
(w) Make sure these lights come on:
1) The yellow OFF light in the R GEN CONT switch (P5).
2) The yellow DRIVE light in the R GEN DRIVE DISC switch (P5).
(x) Make sure these lights are off:
1) The FIELD OFF light in the right generator field switch (P61).
2) The R GEN HOT BUS WARN light (P31).

S 745-067
(2) Do the BITE test (AMM 24-11-00/501).

F. The Load Test

S 715-105
(1) Start the right engine (AMM 71-00-00/201).

S 715-106

(2) Do the load test as follows:

(a) Do these steps until the EICAS display shows a LOAD of not less than 0.50 for the right power channel.

CAUTION: DO NOT OPERATE THE BOOST PUMPS WITH THE FUEL TANKS EMPTY. DAMAGE TO THE BOOST PUMPS CAN OCCUR.

(b) If external power is on, push the EXT PWR switch to the OFF position.

(c) If the APU is on, push the APU GEN CONT switch to the OFF position.

(d) Put these switches on the fuel management control panel (P5) to the ON position.
1) L AFT PUMP
2) L FWD PUMP
3) R AFT PUMP
4) R FWD PUMP
5) LEFT C PUMP
6) RIGHT C PUMP

(e) Put these switches on the hydraulic system control panel (P5) to the ON position:
1) L ELEC HYD PUMP
2) C ELEC 1 HYD PUMP
3) C ELEC 2 HYD PUMP
4) R ELEC HYD PUMP

(f) Push these switches on the air conditioning control module (P5) to the ON position.
1) L RECIRC FAN
2) R RECIRC FAN

(g) Make sure these indications for the right power channel show on the lower EICAS display:
1) AV-C = 115 ±5
2) FREQ = 400 ±5

3) LOAD = 0.50 or larger

(h) Put to the OFF position all switches put to the ON position in the test.

(i) Push the EXT PWR switch (P5).

1) Make sure the white ON light in the switch comes on.

(j) Make sure the yellow OFF light in the R GEN CONT switch (P5) is on.

(k) Make sure the two BUS OFF lights (P5) are off.

S 745-107

(3) Do the BITE test.

G. The IDG Disconnect Test and the Connect Test (Right Engine)

S 715-108

(1) Do the IDG disconnect test and the connect test as follows:

(a) Supply right IDG power to the right 115V ac bus (AMM 24-22-00/201).

(b) Supply External Power or APU generator power to the left 115V ac bus (AMM 24-22-00/201).

(c) Make sure these lights are off:

1) The two BUS OFF lights (P5).

2) The OFF light in the R GEN CONT switch (P5).

3) The DRIVE light in the R GEN DRIVE DISC switch (P5).

4) The FIELD OFF light in the right generator field switch (P61).

(d) Push the ELEC/HYD switch (P61).

(e) Make sure these indications for the right power channel show on the EICAS display:

1) AC Volts = 115 ±5

2) Frequency = 400 ±5

CAUTION: DO NOT OPERATE THE DISCONNECT SWITCH UNLESS THE ENGINE IS AT OR ABOVE IDLE SPEED. IF YOU DISCONNECT THE IDG BELOW THE ENGINE IDLE SPEED DAMAGE CAN OCCUR TO THE IDG. DO NOT ACTUATE THE DISCONNECT SWITCH FOR LONGER THAN 3 SECONDS. ALLOW A MINIMUM OF 60 SECONDS BETWEEN ACTUATIONS.

(f) Momentarily push the R GEN DRIVE DISC switch (P5).

(g) Make sure these lights are on:
  1) The DRIVE light in the R GEN DRIVE DISC switch (P5).
  2) The yellow OFF light in the R GEN CONT switch (P5).
  3) The yellow right BUS OFF light (P5).
(h) Make sure these indications for the right power channel show on the EICAS display:
  1) AC Volts = 0
  2) Frequency = 0

(i) Make sure these indications show on the EICAS display:
  1) R GEN DRIVE (level C message)
  2) R GEN OFF (level C message)
(j) Push the R GEN CONT switch (P5) or the R FIELD OFF switch (P61) twice.
(k) Stop the right engine (AMM 71-00-00/201).
(l) Remove the APU electrical power (AMM 24-22-00/201).
(m) Push the BAT switch (P5) to the OFF position.

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

(n) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).
(o) Open the fan cowl panels (AMM 71-11-04/201).
(p) Open the core cowl panels (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

(q) Open the thrust reverser (AMM 78-31-00/201).
(r) Slowly pull the disconnect-connect ring on the IDG to the outer limit and monitor the force necessary.
  1) The operation of the ring must be smooth and must move freely.
  2) A click may be heard or felt while you pull the ring to the outer limit.

    NOTE: The "click" may not be heard or felt if there is too much noise in the area.

(s) Permit the ring to go back slowly to the maximum inner position.
  1) The operation of the ring must be smooth and must move freely.

(t) Slowly pull the ring to the outer limit, and monitor the force necessary.
1) The force must be less than when you pulled the ring the first time.
2) There must be no click.
(u) Permit the ring to slowly go back to the maximum inner position.
1) If the IDG does not correctly set, replace the IDG (AMM 24-11-01/401).

S 715-115
(2) SAS 050-154, 275, 276 POST-SB 24-59;
SAS 155-274, 277-999;
Do the Disconnect Inhibit Check as follows:
(a) Make sure the right engine fuel cutoff switch on the P10 panel is in the CUTOFF position.

NOTE: The IDG disconnect function is inhibited when the fuel cutoff switch is in the CUTOFF position.

CAUTION: DO NOT ACTUATE DISCONNECT SWITCH FOR LONGER THAN 3 SECONDS. ALLOW A MINIMUM OF 60 SECONDS BETWEEN ACTUATION PERIODS. FAILURE TO FOLLOW THESE RULES COULD DAMAGE IDG DISCONNECT FUNCTION.

(b) Momentarily push the R GEN DRIVE DISC switch (P5).
(c) Slowly pull the disconnect-connect ring to the outer travel limit.
1) Make sure there is no click when you pull the disconnect reset ring.
(d) Permit the ring to slowly go back to the maximum inner position.

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

(e) Close the thrust reverser (AMM 78-31-00/201).
(f) Close the core cowl panels (AMM 71-11-06/201).
(g) Close the fan cowl panel (AMM 71-11-04/201).

(h) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
(i) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 845-110
(3) Put the Airplane back to its Usual Condition

TASK 24-11-00-825-012

5. The Frequency Adjustment of the IDG

A. General
(1) The IDG frequency can be manually adjusted.
(a) The IDG frequency adjustment is not a usual maintenance procedure.
(b) If the frequency is larger than 400 + 5 hertz, but less than 400 ±20 hertz, an adjustment can be done.
(c) If the frequency is out of limits after one adjustment, remove the IDG (AMM 24-11-01/401).

B. References
(1) AMM 24-11-01/401, Integrated Drive Generator
(2) AMM 71-00-00/201, Power Plant (Operating Procedures)
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 78-31-00/201, Thrust Reverser System

C. Prepare for the Adjustment

S 715-013
(1) Stop the engine (AMM 71-00-00/201).

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

(a) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).
(b) Open the fan cowl panels (AMM 71-11-04/201).
(c) Open the core cowl panels (AMM 71-11-06/201).

WARNING: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO OPEN THE THRUST REVERSERS. IF YOU DO NOT OBEY THE INSTRUCTIONS INJURY TO PERSONS OR DAMAGE TO EQUIPMENT COULD OCCUR.

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

D. Procedure

S 825-014
(1) Adjust the system
(a) Remove the lockwire from the governor adjustment screw.

(b) Turn the adjustment screw clockwise to decrease the IDG frequency.
1) Adjustment must set the generator to 400 ±1 hertz.
2) One turn of the screw is equal to a change of 3.0 - 3.5 Hz.
(c) Lock the adjustment screw with a wire.

S 845-015
(2) Put the Airplane back to its Usual Condition

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

(a) Close the thrust reverser (AMM 78-31-00/201).
(b) Close the core cowl panels (AMM 71-11-06/201).
(c) Close the fan cowl panel (AMM 71-11-04/201).
(d) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).
(e) After the adjustment of the IDG continue with the operational test.

INTEGRATED DRIVE GENERATOR - MAINTENANCE PRACTICES

1. General
   A. This procedure has instructions to flush the IDG oil lines when the IDG scavenge filter is breached.
   B. This procedure is used only when the IDG oil lines are not available for replacement.
   C. This procedure is not a replacement for an overhaul shop external cooling system cleaning maintenance program.
   D. When an engine is removed for overhaul the external cooling system components are removed and sent to an overhaul shop for proper cleaning.
   E. Integrated Drive Generator Oil Cooling System Leak Check (Talcum Powder).

TASK 24-11-01-022-001

2. IDG oil lines flushing (Scavenge Filter is damaged)
   A. Equipment
      (1) IDG oil overflow drain hose with outlet adapter, Ozone OMP2505-3 or Risbridger tool DRG 1827.
      (2) Container - 2 gallon capacity
      (3) Nitrogen - gas (minimum of 239 cubic feet bottle) and regulator from 20 to 250 psig
   B. References
      (1) AMM 24-11-01/401, Integrated Drive Generator
      (2) AMM 24-11-12/401, IDG Air/Oil Heat Exchanger and Valve
      (3) AMM 79-21-01/401, IDG Fuel/Oil Heat Exchanger
      (4) AMM 71-11-04/201, Fan Cowl Panels
      (5) AMM 71-11-06/201, Core Cowl Panels
      (6) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          410 Power Plant Nacelle (Left)
          420 Power Plant Nacelle (Right)
      (2) Access Panels
          413/423 Fan Cowl Panels (Left)
          414/424 Fan Cowl Panels (Right)
          415/425 Thrust Reverser Panels (Left)
          416/426 Thrust Reverser Panels (Right)
          417/427 Core Cowl Panels (Left)
          418/428 Core Cowl Panels (Right)
   D. Prepare for the IDG oil lines flushing.

      S 012-002
      (1) Open the fan cowl panels (AMM 71-11-04/201).

S 012-040

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 reverser (AMM 78-31-00/201).

S 862-003

(3) Remove pressure from the IDG cooling system as follows:
   (a) If the IDG has a Push-To-Vent valve, push the valve until the internal pressure is released.
   (b) If the IDG does not have a Push-To-Vent valve, do the following:
      1) Put the container under the IDG to catch the oil.
      2) Remove the cover from the overflow drain coupling (pressure oiler) on the IDG.
      3) Put the end of the drain hose in the container.

      WARNING: USE CARE WHEN YOU CONNECT THE DRAIN HOSE. PRESSURE IN THE IDG CAN CAUSE HOT OIL TO COME OUT OF THE COUPLING. HOT OIL CAN CAUSE SERIOUS INJURY.

      4) Connect the oil-drain hose to the overflow drain coupling on the IDG. Allow the surplus oil to drain into the container.
      5) Remove the oil-drain hose.
      6) Install the cover on overflow drain coupling (pressure oiler).

E. Procedure

S 022-074

(1) Remove the IDG (AMM 24-11-01/401).

S 022-009

(2) AIRPLANES WITH PW4000 SERIES ENGINES;
Remove the air/oil heat exchanger (AMM 24-11-12/401).

S 022-042
(3) AIRPLANES WITH PW4000 SERIES ENGINES;
Remove the IDG Fuel/Oil Heat Exchanger (AMM 79-21-01/401).

S 222-004
(4) Do these steps to flush each IDG oil line:
(a) Put a container under the oil line.
(b) Remove the IDG oil line.
(c) Allow the oil in the line to drain into the container.
(d) Drain the oil from the container.
(e) Attach a nitrogen bottle to the IDG oil line.

NOTE: Use the nitrogen to purge the external cooling system. Begin the task with a full bottle of dry nitrogen.

(f) Apply 250 psi to the IDG oil line until the nitrogen gas bottle is empty.
(g) Remove the IDG oil line from the nitrogen gas bottle.

S 432-075
(5) Install the IDG oil lines.

S 422-045
(6) AIRPLANES WITH PW4000 SERIES ENGINES;
Replace the air/oil heat exchanger (AMM 24-11-12/401).

S 422-047
(7) AIRPLANES WITH PW4000 SERIES ENGINES;
Replace the IDG Fuel/Oil Heat Exchanger (AMM 79-21-01/401).

S 422-039
(8) Replace the IDG (AMM 24-11-01/401).

TASK 24-11-01-702-076

3. Integrated Drive Generator Oil Cooling System Leak Check (Talcum Powder)

A. General

(1) This check is used to check for oil leakage in the IDG external cooling circuit.

B. Equipment
(1) Talcum powder or foot powder - commerically available
(2) Nitrogen - gas (minimum of 239 cubic feet bottle) and regulator from 20 - 250 psig.

C. References
(1) AMM 12-13-03/301, Integrated Drive Generator - Servicing
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 71-00-00/201, Power Plant
(4) AMM 71-00-00/501, Power Plant Adjustment - Test
(5) AMM 71-11-04/201, Fan Cowl Panels
(6) AMM 71-11-06/201, Core Cowl Panels
(7) AMM 78-31-00/201, Thrust Reverser System
(8) WDM 24-11-11 thru WDM 24-11-21
(9) SSM 24-10-02 thru SSM 24-11-01

D. Access
(1) Location Zones
212 Flight Compartment
410 Power Plant Nacelle (Left)
420 Power Plant Nacelle (Right)

E. Access Panels
(1) Access Panels
413/423 Fan Cowl Panels (Left)
414/424 Fan Cowl Panels (Right)
415/425 Thrust Reverser Panels (Left)
416/426 Thrust Reverser Panels (Right)
417/427 Core Cowl Panels (Left)
418/428 Core Cowl Panels (Right)

F. Prepare for the IDG external oil cooling circuit leak check.

S 012-089
(1) Open the fan cowl panels (AMM 71-11-04/201).

S 012-095
(2) Open the left core cowl half (AMM 71-11-06/201).

S 012-094

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) AIRPLANES WITH JT9D, CF6-80A, CF6-80C2 ENGINES;
Open the left thrust reverser half (AMM 78-31-00/201).

G. Procedure

S 162-079
(1) Use nitrogen gas to remove any oil, hydraulic fuild or jet fuel that has leaked on the engine, IDG or IDG external cooling system components.

NOTE: Do not completely dry the engine, IDG or IDG external cooling system componets. A slight residue of oil is needed to make sure the talcum powder sticks to the components.

S 792-080
(2) Spray the talcum powder or foot powder over the IDG and the IDG external cooling circuit.

S 792-081
(3) Dry motor the engine for one minute (AMM 71-00-00/201).

S 212-082
(4) Check for oil leaks from the IDG or IDG external cooling circuit.

NOTE: Oil leaks will show as streaks in the talcum powder.

(a) If the oil leaks are found, repair or replace the components as needed.

S 612-083
(5) Service the IDG (AMM 12-13-03/301).

S 712-084
(6) Do the engine ground test - idle power procedure to do a check for leaks (AMM 71-00-00/501).

S 212-085
(7) Examine the IDG oil level (AMM 12-13-03/301).

S 612-086
(8) Service the IDG (AMM 12-13-03/301).

S 412-087
(9) AIRPLANES WITH JT9D, CF6-80A, CF6-80C2 ENGINES;
Close the left thrust reverser half (78-31-00/201).

S 412-096
(10) Close the left core cowl half (AMM 71-11-06/201).

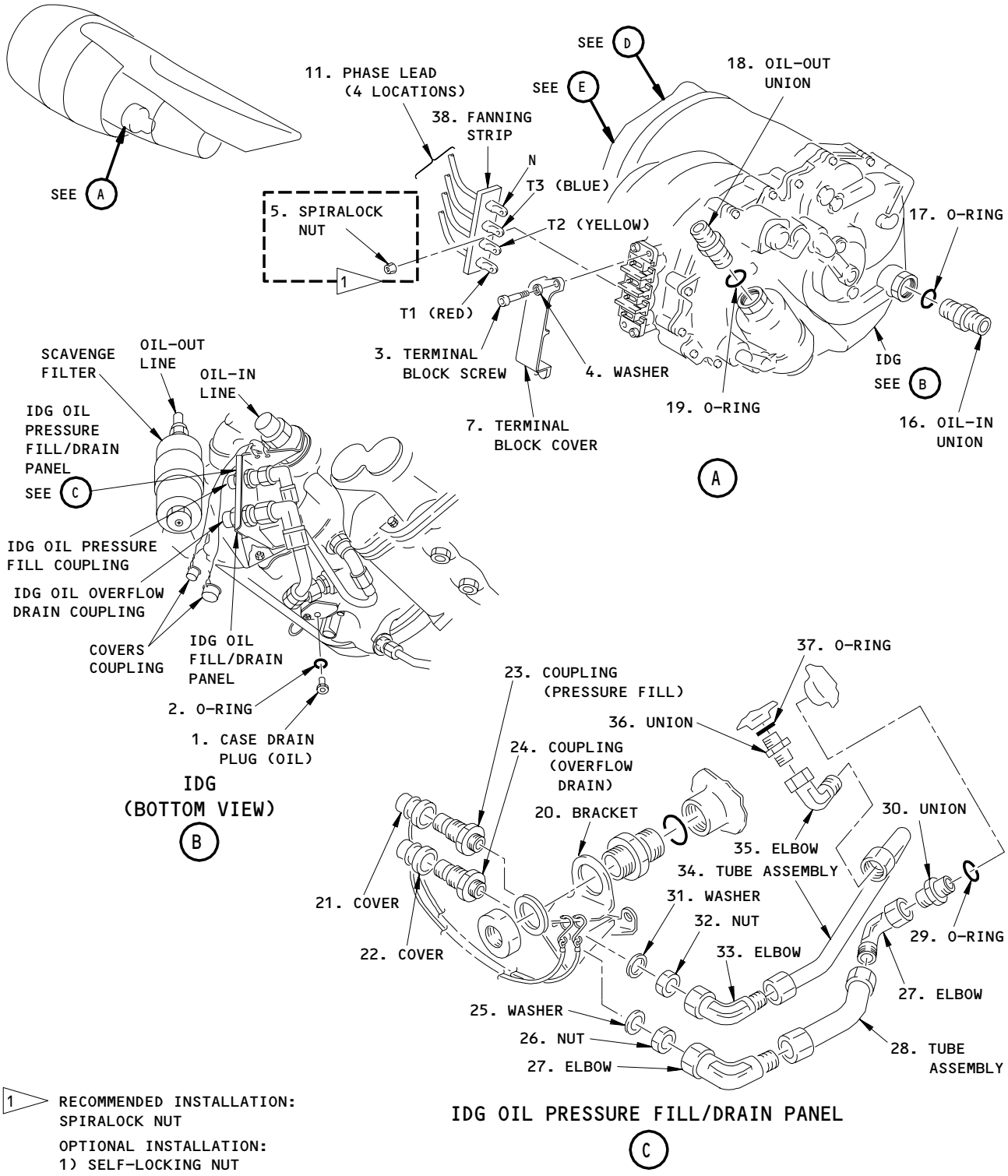
S 412-092
(11) Close the fan cowl panels (AMM 71-11-04/201).

INTEGRATED DRIVE GENERATOR - REMOVAL/INSTALLATION

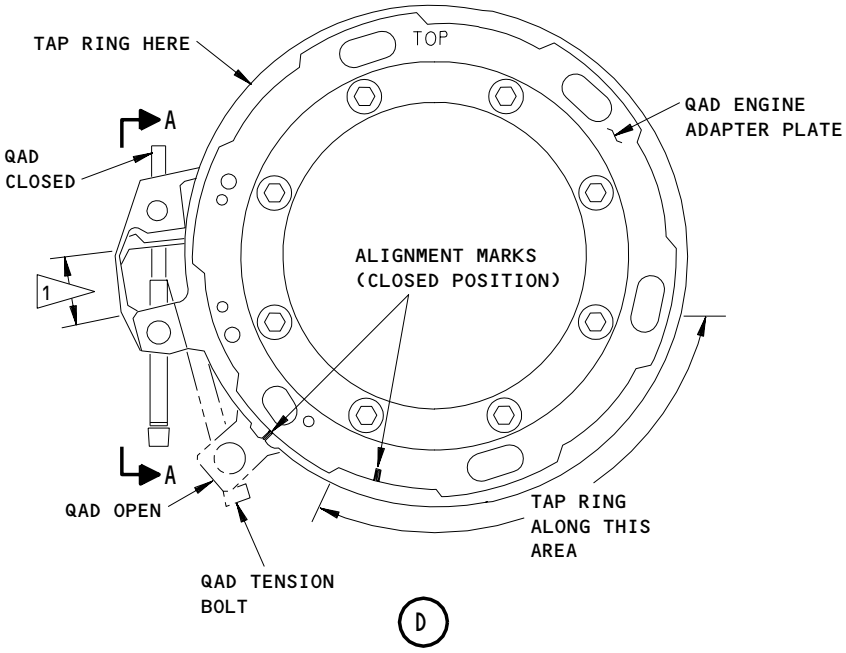
1. General
   A. This procedure has two tasks. The first task removes the integrated drive generator (IDG) from the airplane. The second task installs the IDG on the airplane.
   B. An IDG static disconnect test, and an IDG input shaft reconnect procedure are included in the IDG installation procedure.

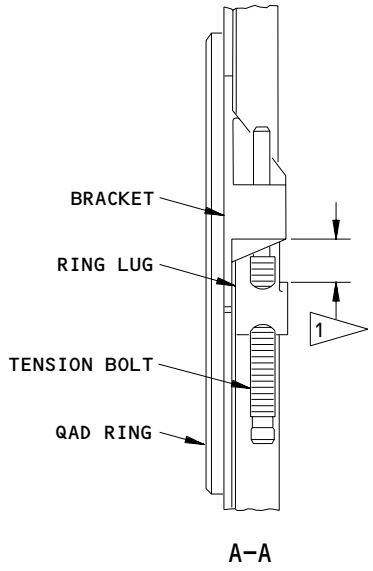
TASK 24-11-01-004-001

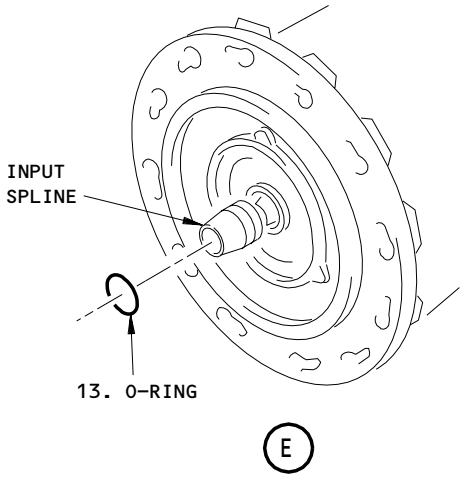
2. Remove the Integrated Drive Generator (Fig. 401)
   A. Equipment
      (1) Hoist Adapter, IDG
         (a) Option 1: Hoist Adapter, IDG - A71013-55
         (b) Option 2: Hoist Adapter, IDG A71013-32
         (c) Option 3: Hoist Adapter, IDG A71013-82
      (2) Hoist Assembly
         (a) Option 1 or 3: Lifting Fixture, engine accessory A71015-107
         (b) Option 2: Hein Werner Model 62 Jack with,
            1) Spacer Assembly, A71013-19 and
            2) Spacer Assembly, A71013-40 and
            3) Spacer Assembly, A71013-45
      (3) 1.5 - gallon container to collect oil drainage.
      (4) IDG oil overflow drain hose with outlet adapter Ozone OMP2505-3
   B. References
      (1) AMM 24-11-02/201, Scavenge Filter
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
         212 Flight Compartment
         410 Power Plant Nacelle (Left)
         420 Power Plant Nacelle (Right)



Integrated Drive Generator Installation
Figure 401 (Sheet 1)







1 DISTANCE MUST BE EQUAL TO OR GREATER THAN 0.562 INCH

Integrated Drive Generator Installation
Figure 401 (Sheet 2)

(2) Access Panels

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

D. Prepare for Removal

S 864-002

(1) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
(a) 6B5, L GEN DRIVE DISC
(b) 6B6, R GEN DRIVE DISC

S 044-004

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

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

S 014-038

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

S 014-037

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

S 014-005

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

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

S 864-006

(6) Remove the pressure from the IDG oil cooling system:

(a) Remove the dust cover from the overflow drain coupling on the IDG.

(b) Put the container below the IDG to catch the oil.

(c) Put the end of the overflow drain hose in the container.

(d) Connect the overflow drain hose to the overflow drain coupling on the IDG, and allow the surplus oil to flow into the container.

(e) Remove the overflow drain hose.

E. Procedure

S 684-007

(1) Drain the IDG cooling oil as follows:

(a) Put the container below the IDG to catch the oil.

WARNING: USE EXTREME CARE WHEN YOU DRAIN THE IDG OIL. WEAR SPLASH GOGGLES, INSULATED GLOVES, AND PROTECTION GEAR. CONTACT WITH HOT OIL CAN CAUSE SERIOUS INJURY.

(b) Remove the case drain plug (1) and O-ring (2).

(c) Allow the oil to flow from the IDG into the container.

(d) Discard the O-ring.

S 024-008

(2) Remove and inspect the scavenge filter (AMM 24-11-02/201).

(a) Lubricate and install a new O-ring (2) on the case drain plug (1).

(b) Install case drain plug (1). Tighten to 55-75 pound-inches.

S 014-009

(3) Remove the thermal relief valve drain line as follows:

(a) Disconnect the thermal relief line union. Discard O-ring.

(b) Remove the thermal relief drain line.

S 014-010

(4) Disconnect the oil-in and oil-out lines from the IDG as follows:

WARNING: HOT OIL MAY FLOW OUT OF THE DISCONNECTED OIL LINES. WEAR SPLASH GOGGLES, INSULATED GLOVES, AND PROTECTION GEAR. HOT OIL CAN CAUSE INJURY.

(a) Disconnect the oil-in and oil-out lines from the IDG. Allow the oil from the lines to drain into the container.
(b) Cap the oil-in line and remove the oil-out flex tube from the engine.
(c) Remove the oil-in unions (16) and oil-out unions (18). Keep the unions (16, 18) for subsequent installation. Discard the O-rings.

S 014-014

(5) Remove the pressure fill/drain tubing as follows:
(a) Disconnect the pressure fill tube assy coupling nuts at the IDG and the IDG fill/drain panel.
(b) Remove the tube assy (34). Keep for subsequent installation.
(c) Remove the elbow (35), union (36) and O-ring (37) from the IDG. Keep the elbow (35) and union (36) for subsequent installation. Discard O-ring (37).
(d) Install a plug in the IDG pressure fill opening.
(e) Disconnect the overflow drain tube assy (28). Keep for subsequent installation.
(f) Remove the elbow (27), union (30) and O-ring (29) from the IDG. Keep the elbow (27) and union (30) for subsequent installation. Discard the O-ring (27).
(g) Install a plug in the IDG overflow drain opening.

S 014-013

(6) Remove the fill/drain panel as follows:
(a) Remove the nut and washer holding the IDG oil fill/drain panel to the oil-in fitting.
(b) Remove the nuts and washers holding the IDG oil fill/drain panel to the IDG. Remove the fill/drain panel and keep for subsequent installation.

(c) Remove the oil-in fitting (16) and O-ring (17). Keep the fitting for subsequent installation. Discard the O-ring.

S 034-015

(7) Remove the electrical connectors:
(a) Remove the wiring harness electrical connectors D10964 and D10966 from the IDG.
(b) Install protective caps on the IDG and ship side electrical connectors.

S 014-016

(8) Remove the power leads from the IDG:
(a) Remove the two screws (3) and the two washers (4) which attach the terminal block cover (7) to the IDG.
(b) Remove the spiralock nuts (5), the self-locking nuts, or the terminal nuts and washers which are installed on the terminal studs.
(c) Make sure the fanning strip is not damaged or loose over the power feeder cables.
(d) Make sure the phase color sleeves on the power feeder cables are not damaged or missing.
(e) If the fanning strip or phase color sleeves are damaged or missing, identify the generator power wires for the subsequent installation.
(f) Remove the four power leads and identify the leads for subsequent installation.
(g) Install the spiralock nuts (5), the self-locking nuts, or the washers and terminal nuts on the terminal studs (tighten by hand).
(h) Install the terminal block cover (7) with the washers (4) and the screws (3).

S 024-017

(9) Remove the IDG.
(a) Move the lift fixture under the IDG. Lift the hoist adapter to touch the IDG.

CAUTION: DO NOT SUPPLY MORE LIFT THAN NECESSARY TO HOLD THE IDG. EXCESSIVE LIFT OR FAILURE TO HOLD THE IDG PROPERLY CAN DAMAGE THE INPUT SEAL.

(b) Attach the hoist to the IDG.
(c) Lift the adapter to take some of the weight of the IDG.
(d) Remove the lockwire from the QAD tension bolt.
(e) Loosen the tension bolt to allow movement of the IDG.
(f) Adjust the hoist adapter to fully hold the weight of IDG and remove any weight on the QAD and the IDG input shaft.
(g) Loosen the QAD tension bolt until the stripe marks on the QAD ring and IDG housing align. The QAD kit is in the open position and clamping lugs will be disengaged when the stripe marks align.

CAUTION: DO NOT USE THE IDG INPUT SHAFT TO LIFT THE IDG. THIS WILL DAMAGE THE SHAFT. GUIDE THE IDG OUT IN A STRAIGHT LINE. IF YOU BIND THE INPUT SHAFT YOU CAN DAMAGE THE IDG INPUT SEAL.

(h) Pull the hoist adapter straight back to remove the IDG from QAD clamping lugs, and spline the shaft from engine gearbox.

NOTE: If the QAD ring rotates off the alignment marks on the adapter plate, the IDG cannot be removed. Turn the QAD tension bolt to maintain alignment during removal if necessary.

(i) Plug the oil-in and oil-out openings on IDG.
(j) Remove and discard the O-ring (13) from the IDG input spline.

TASK 24-11-01-404-034

3. Install Integrated Drive Generator (Fig. 401)

NOTE: To prevent foreign material from entering the IDG, leave the plugs in the ports until the fittings are to be installed.

A. Equipment
   (1) Hoist Adapter, IDG
      (a) Option 1: Hoist Adapter, IDG - A71013-55
      (b) Option 2: Hoist Adapter, IDG A71013-32
      (c) Option 3: Hoist Adapter, IDG A71013-82
   (2) Hoist Assembly
      (a) Option 1 or 3: Lifting Fixture, engine accessory A71015-107
      (b) Option 2: Hein Werner Model 62 Jack with,
         1) Spacer Assembly, A71013-19 and
         2) Spacer Assembly, A71013-40 and
         3) Spacer Assembly, A71013-45

B. References
   (1) AMM 12-13-03/301, Integrated Drive Generator (IDG)
   (2) AMM 20-10-23/401, Lockwires
   (3) AMM 24-11-00/501, Integrated Drive Generator.
   (4) AMM 24-11-03/401, Quick Attach Detach (QAD) Coupling
   (5) AMM 24-11-03/601, Quick Attach/Detach (QAD) Coupling

(6) AMM 71-00-00/201, Power Plant - Maintenance Practices
(7) AMM 71-11-04/201, Fan Cowl Panels
(8) AMM 71-11-06/201, Core Cowl Panels
(9) AMM 71-71-00/601, Engine Vents and Drains - Inspection/Check
(10) AMM 78-31-00/201, Thrust Reverser System

C. Parts
(1) Refer to the AIPC for part numbers and effectivities of items in the table that follows.

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	2	O-ring	24-11-01	11	25
	13	O-ring		11	235
	17	O-ring		02	60
	19	O-ring		02	165
	29	O-ring		02	70
	37	O-ring		02	65

D. Consumable Materials
(1) Oil - Aircraft turbine engines, synthetic base, MIL-L-23699 or MIL-L-7808 (AMM 20-30-04/201).

E. Access
(1) Location Zones
212 Flight Compartment
410 Power Plant Nacelle (Left)
420 Power Plant Nacelle (Right)

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

F. Prepare for Installation

S 684-036
(1) Drain the IDG of the preservation oil.

NOTE: The IDG will have preservation oil in the case when it is delivered. This oil should be replaced with new oil before operation of the IDG.

(a) Remove the IDG case drain plug and allow the oil to drain into a suitable container.

(b) Install the IDG case drain plug.

S 214-019

(2) Visually examine the QAD ring for damage.

S 434-020

(3) Lubricate and install the new O-ring (13) on the IDG input spline.

G. Procedure

S 424-021

(1) Install the IDG as follows:

CAUTION: DO NOT ALLOW THE IDG TO HANG ON THE INPUT SHAFT DURING INSTALLATION. FAILURE TO SUPPORT THE IDG PROPERLY CAN DAMAGE THE INPUT SEAL.

(a) Use the hoist adapter and lift fixture, to put the IDG toward the mounting pad and hold it so that no weight is put on the input shaft.
(b) Turn the QAD tension bolt to open the QAD ring. Align the mark on the QAD ring with the mark on the QAD engine adapter plate.

CAUTION: THE IDG MUST BE MOUNTED CORRECTLY. IF THE IDG IS NOT MOUNTED CORRECTLY DAMAGE TO MATING PARTS CAN OCCUR.

(c) Put the IDG input spline into the gearbox mating spline.
(d) Make sure the locating dowl pin on the IDG is aligned with a hole in QAD ring.
(e) Position the IDG to allow the lugs on the IDG input flange to mate with QAD ring openings.

NOTE: If the QAD ring moves off the alignment marks on the adapter plate, the IDG cannot be installed. Turn the QAD tension bolt to maintain alignment during installation if necessary.

(f) Lubricate the threads on the tension bolt.

CAUTION: MAKE SURE THE QAD RING DOES NOT BIND OR SNAG WHEN YOU TIGHTEN IT, TO PREVENT QAD DAMAGE.

(g) Tighten the QAD tension bolt as follows:
1) Torque the QAD tension bolt to 240-264 pound-inches.

CAUTION: TAP THE QAD RING ONLY IN THE AREA SHOWN IN FIG. 401. DAMAGE TO THE QAD RING COULD RESULT IF YOU TAP IT WITH EXCESSIVE FORCE.

2) Tap the QAD with a soft mallet (rubber, fiber, or equivalent) to center the ring. Tap along the area in D.
3) Make a check of the torque value of the tension bolt. If the torque is less than 180 pound-inches, tighten the tension bolt to 240-264 pound-inches. Continue to alternately tap and torque the bolt to 240-264 pound-inches until a minimun of 180 pound-inches is measured at the beginning of the torque step.

NOTE: If the tension bolt does not drop below 180 pound-inches after first tapping, repeat tapping on ring. If the tension bolt does not drop below 180 pound-inches after second tapping, tighten bolt to 240-264 pound-inches.

4) Torque the QAD tension bolt to 240-264 pound-inches.
(h) Remove the hoist adapter from the IDG.
(i) Make sure the distance between the ring lug and the bracket on the QAD ring is equal to or greater than 0.562 inch. Replace the QAD coupling if the dimension is less than 0.562 inch (AMM 24-11-03/401).

S 434-022
(2) Lock the QAD tension bolt with a wire (AMM 20-10-23/401).

S 434-031

(3) Install the power leads:

(a) If the phase color sleeves on the power feeder cables are damaged or missing, replace the sleeves (SWPM 20-10-14).

(b) If the fanning strip is damaged or loose, replace the fanning strip.

(c) Do these steps if you install the spiralock nuts:

1) Make sure nuts do not have rundown resistance. If nuts have rundown resistance, inspect the studs for any sharp threads or any rounded threads.

2) If the studs have any sharp threads or any rounded threads, replace the terminal block assembly (AMM 24-11-20/401).

CAUTION: MAKE SURE THAT YOU CONNECT THE GENERATOR WIRES TO THE CORRECT TERMINAL STUDS ON THE IDG. AN INCORRECT INSTALLATION CAN CAUSE DAMAGE TO ELECTRICAL EQUIPMENTS.

(d) Put the four power leads on the terminal studs.

(e) Install the spiralock nuts (5), the self-locking nuts, or the washers and terminal nuts on the terminal studs.

CAUTION: MAKE SURE THAT YOU TIGHTEN THE NUTS TO THE SPECIFIED TORQUE VALUE. A LOW TERMINAL NUT TORQUE WILL CAUSE LOW CONDUCTIVITY OF THE PHASE LEAD. LOW PHASE LEAD CONDUCTIVITY WILL RESULT IN RESISTANCE HEATING AND BURNING OF THE PHASE LEAD AND THE TERMINAL BLOCK.

(f) Tighten the terminal nuts to 144-168 pound-inches. Make sure the terminal studs do not rotate when the terminal nuts are tightened. If the terminal studs rotate when the nuts are tightened, replace the terminal block.

NOTE: The torque is the same for the regular nut or the lock nut. A torque wrench adapter might be useful to tighten the nuts to the specified torque value.

(g) Install the terminal block cover (7) with the two screws (3) and the two 2 washers (4).
(h) Tighten the screws to 20-22 pound-inches.

S 434-023
(4) Install the electrical connectors:
(a) Remove the caps from the two IDG electrical connectors on the IDG.

S 434-024
(5) Connect the wiring harness electrical connectors D10964 and D10966 to the IDG.

S 434-032
(6) Install the oil-in and oil-out tubing as follows:

CAUTION: MAKE SURE THERE IS SUFFICENT CLEARANCE BETWEEN THE OIL-IN TUBE AND THE OIL-OUT TUBE. IF THE TUBES RUB TOGETHER DAMAGE CAN OCCUR TO THE TUBES.

(a) Remove the plugs from oil-in and oil-out openings on the IDG.
(b) Lubricate and install the O-rings to oil-in and oil-out unions.
(c) Install the oil-in union. The O-ring should be on the IDG side of the union.
(d) Tighten the oil-in union to 150-200 to 150-200 pound-inches.
(e) Install the oil-out union. The O-ring should be on the IDG side of the union.
(f) Tighten the oil-out union to 130-175 pound inches.
(g) Put the IDG oil fill/drain panel on IDG and attach with nuts and washers.
(h) Install nut and washer on the oil-in fitting.

CAUTION: USE TWO WRENCHES TO HOLD FITTINGS WHEN YOU TORQUE THE OIL-IN AND OIL-OUT LINES. IF THE DOUBLE-WRENCH METHOD IS NOT FOLLOWED, EXCESS TORQUE MAY BE TRANSFERRED TO THE IDG FITTINGS, THIS COULD CAUSE DAMAGE TO THE IDG BOSSES.

(i) Connect the oil-in and oil-out lines to the IDG.

(j) Install a new or shop pressure tested oil-in coupling and tighten to 150-200 pound-inches.

NOTE: It is recommended that a new oil-in coupling be installed in the IDG to prevent oil leakage.

S 434-028

(7) Install the case drain plug as follows:
(a) Lubricate and install the O-ring (2) on the case drain plug (1).
(b) Install the case drain plug (1). Tighten to 55-75 pound-inches.
(c) Lockwire the case drain plug (1).

S 434-033

(8) Install pressure fill/drain tubing as follows:
(a) Remove the pressure fill plug from the pressure fill opening on the IDG.
(b) Lubricate a new O-ring (37) with engine oil.
(c) Install the new O-ring (37) and the union (36) to the IDG. Tighten the union (36) from 257 to 273 pound-inches.
(d) Connect and tighten the elbow (35) that holds the pressure fill tube (34) to the union (36).
(e) Connect the elbow (33) that holds the pressure fill tube (34) to the pressure fill coupling (23) and tighten the pressure fill coupling (23) from 257 to 273 pound-inches.
(f) Remove the plug in the IDG overflow drain opening.
(g) Lubricate a new O-ring (29) with engine oil.
(h) Install the new O-ring (29) and the union (30) to the IDG. Tighten the overflow drain union from 475 to 525 pound-inches.
(i) Connect and tighten the elbow (27) that holds the overflow drain tube (28) to the union (30).
(j) Connect the elbow (27) that hold the overflow drain tube (28) to the overflow drain coupling (24).
(k) Tighten the overflow drain coupling from 475 to 525 pound-inches.

(l) Lubricate and install the O-ring on the thermal relief line.
(m) Install the thermal relief line.

S 614-025
(9) Do this task to fill the IDG oil: "IDG Oil Servicing" (AMM 12-13-03/301).

S 414-026

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

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

S 414-039
(11) Close the core cowl panel (AMM 71-11-06/201).

S 414-040
(12) Close the fan cowl panels (AMM 71-11-04/201).

S 444-027
(13) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-029
(14) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6B5, L GEN DRIVE DISC
(b) 6B6, R GEN DRIVE DISC

S 794-042
(15) Do this task: "Dry Motor the Engine" (AMM 71-00-00/201).

S 794-043
(16) Stop the engine and wait for five minutes for the oil level to become stable.

S 724-049
(17) Do a check for oil leaks at the IDG and external oil cooling system. Repair any leaks you find or refer to Permitted Leakage table (AMM 71-71-00/601).

S 794-044
(18) Do this task: "IDG Oil Level Check" (AMM 12-13-03/301).

S 614-046
(19) If the oil level is incorrect, do this task: "IDG Oil Servicing" (AMM 12-13-03/301).

S 724-030
(20) Do the IDG Adjustment/Test (AMM 24-11-00/501).

S 724-048
(21) Do a check for oil leaks at the IDG and external oil cooling system. Repair any leaks you find or refer to Permitted Leakage table (AMM 71-71-00/601).

INTEGRATED DRIVE GENERATOR (IDG) - INSPECTION/CHECK

1. General
   A. This procedure contains these tasks:
      (1) Check the integrated drive generator (IDG) disconnect function.
      (2) Connect the IDG drive shaft to the engine.
      (3) Examine the pressure differential indicator (the red button) and the scavenge filter on the IDG.
      (4) Examine the oil in the IDG.
      (5) Examine the IDG pressure oiler (service fitting) and pressure cover.

TASK 24-11-01-726-001

2. Check IDG Disconnect Function (Fig. 601)
   A. General
      (1) This task has these checks:
         (a) IDG Disconnect Inhibit Function Check
         (b) IDG Disconnect Check
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
         211/212 Flight Compartment
         410 Power Plant Nacelle
         420 Right Power Plant Nacelle

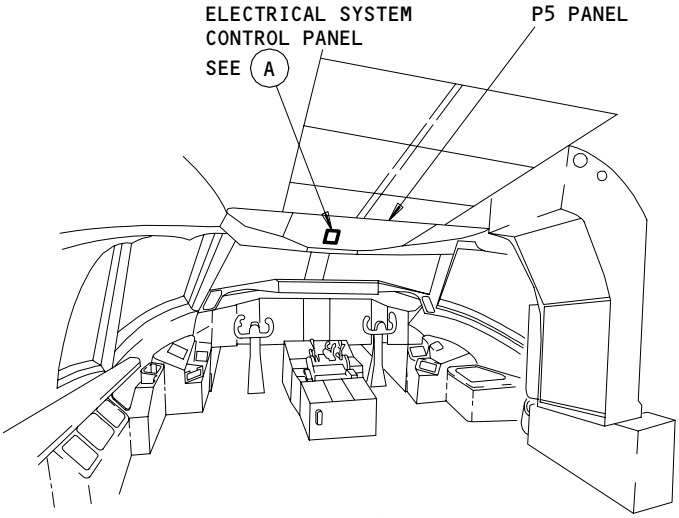
      (2) Access Panels
         413/423 Fan Cowls Left
         414/424 Fan Cowls Right
         417/427 Core Cowls Left
         418/428 Core Cowls Right

   D. Prepare for Check

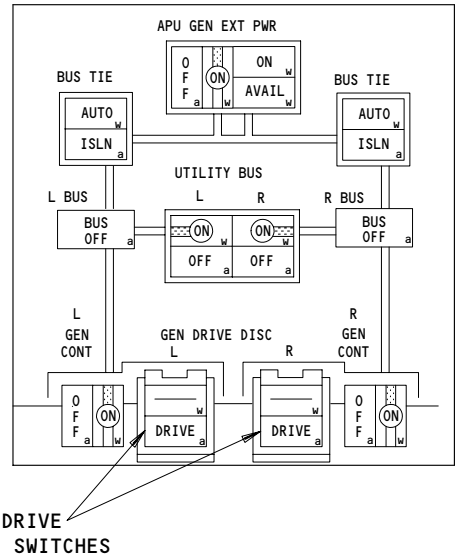
      S 216-002
      (1) Make sure the engines are not running.

      S 866-003
      (2) Supply External Power to the main AC buses (AMM 24-22-00/201).

      S 866-004
      (3) Make sure these circuit breakers on the main power distribution panel, P6, are closed.
         (a) 6B1, L GEN CONT UNIT
         (b) 6B2, R GEN CONT UNIT
         (c) 6B5, L GEN DRIVE DISC
         (d) 6B6, R GEN DRIVE DISC

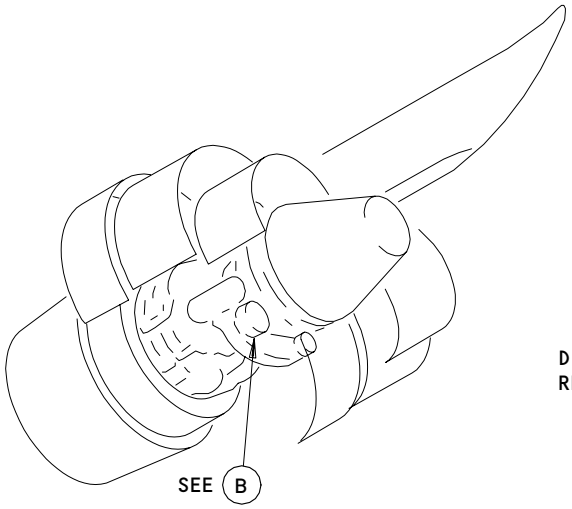


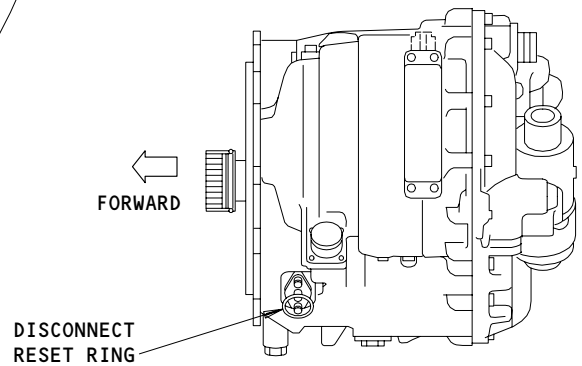
FLT COMPT



M10063 – ELECTRICAL SYSTEM CONTROL PANEL

A

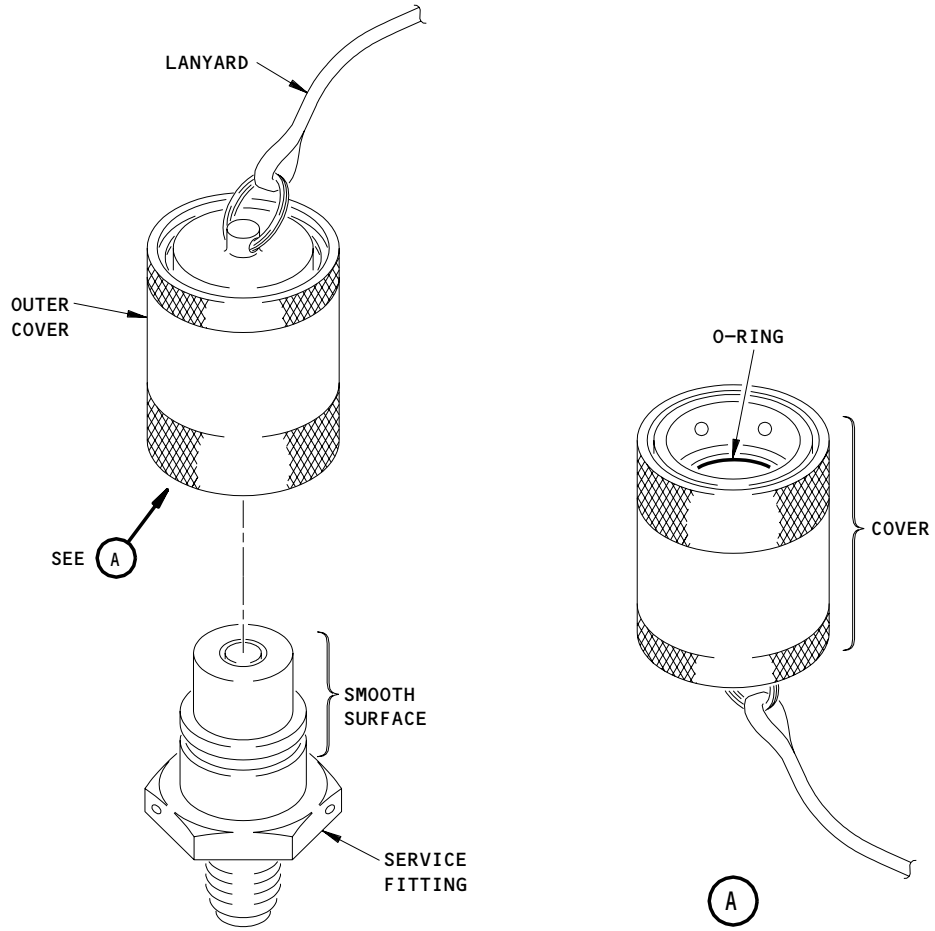




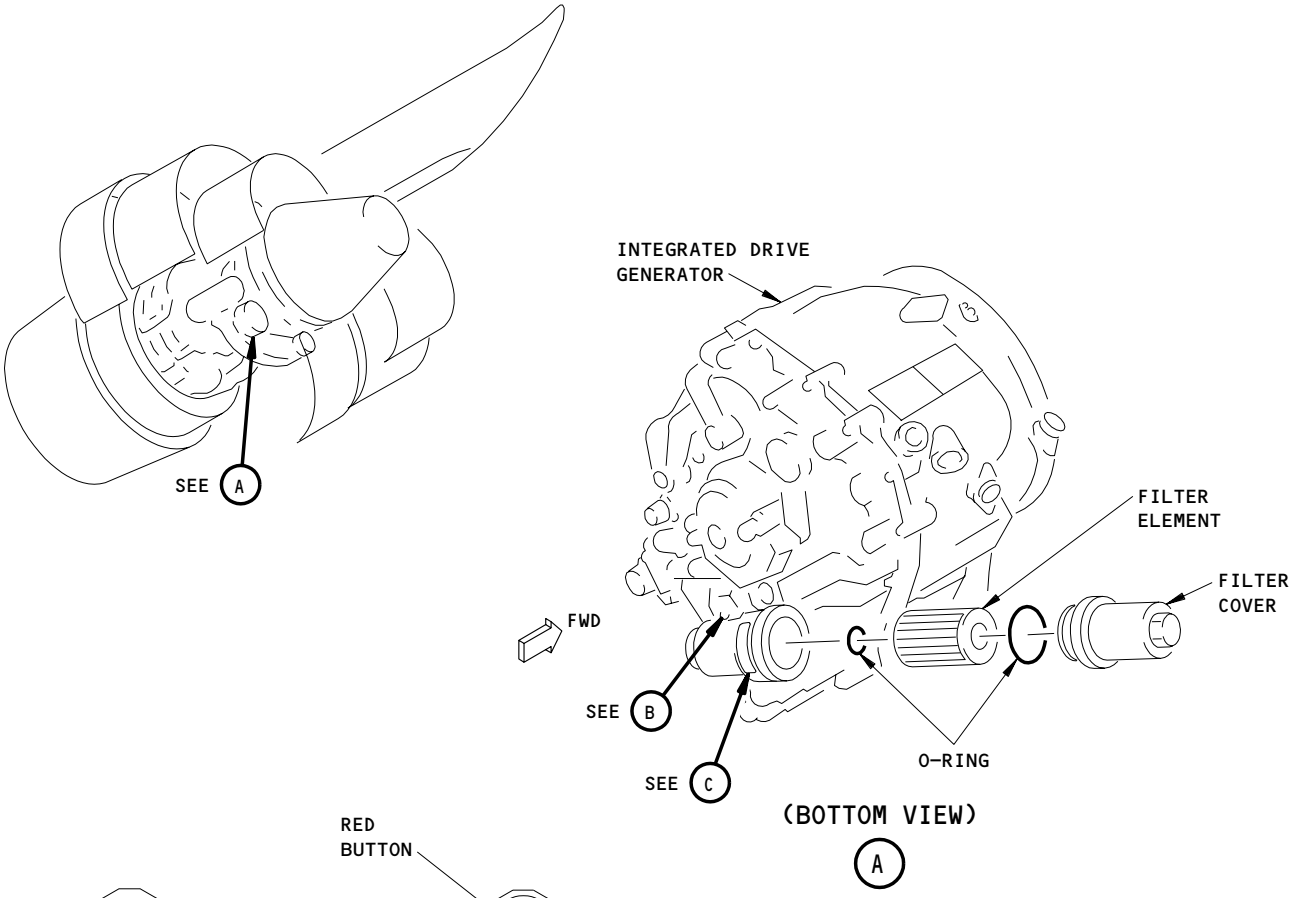
INTEGRATED DRIVE GENERATOR

B

IDG Disconnect Drive System
Figure 601



IDG Service Fitting and Pressure Cap Inspection
Figure 602



DPI Reset Procedure
Figure 603

S 016-194

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

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

E. SAS 050-154, 275, 276 WITH SB 24-59 AND SAS 155-274, 277-999; IDG Disconnect Inhibit Function Check

S 716-215

(1) Do these steps:

(a) Make sure the applicable engine fuel cutoff switch on the P10 panel is in the CUTOFF position.

NOTE: The IDG disconnect function is inhibited when the fuel cutoff switch is in the CUTOFF position.

CAUTION: DO NOT ACTUATE DISCONNECT SWITCH FOR LONGER THAN 3 SECONDS. ALLOW A MINIMUM OF 60 SECONDS BETWEEN ACTUATION PERIODS. FAILURE TO FOLLOW THESE RULES COULD DAMAGE IDG DISCONNECT FUNCTION.

(b) Momentarily push the DRIVE DISC switch on the P5 panel for the applicable IDG.

(c) Slowly pull the disconnect reset ring to the outer travel limit.

1) Make sure there is no "click" sound when you pull the disconnect reset ring.

(d) Permit the ring to slowly go back to the maximum inner position.

S 866-213

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

F. IDG Disconnect Check

S 716-214

(1) Do this check of the IDG:

(a) Start the applicable engine (AMM 71-00-00/201).

(b) Make sure the DRIVE light in the applicable GEN DRIVE DISC switch is off.

CAUTION: DO NOT OPERATE THE DISCONNECT SWITCH UNLESS THE ENGINE IS AT OR ABOVE IDLE SPEED. IF YOU DISCONNECT THE IDG BELOW THE ENGINE IDLE SPEED, DAMAGE TO THE IDG CAN OCCUR.

DO NOT PUSH AND HOLD THE DRIVE DISC SWITCH FOR MORE THAN THREE SECONDS. DAMAGE TO THE DISCONNECT SOLENOID CAN OCCUR.

IF THE IDG DOES NOT DISCONNECT, DO NOT PUSH PUSH THE DRIVE DISC SWITCH AGAIN FOR 60 SECONDS. YOU WILL CAUSE DAMAGE TO THE DISCONNECT SOLENOID.

(c) Momentarily push the DRIVE DISC switch on the P5 panel for the applicable IDG.
(d) Make sure the yellow DRIVE light in the applicable DRIVE DISC switch comes on.
(e) Stop the engine (AMM 71-00-00/201).
(f) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-11-01-436-006

3. Connect the IDG Input Shaft (Fig. 601)

A. References
(1) AMM 24-11-01/401, Integrated Drive Generator
(2) AMM 78-31-00/201, Thrust Reverser System

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

(2) Access Panels
413/423 Fan Cowls Left
414/424 Fan Cowls Right
417/427 Core Cowls Left
418/428 Core Cowls Right

C. Procedure

S 726-007
(1) Connect IDG as follows:
(a) Open the thrust reverser (AMM 78-31-00/201).

CAUTION: DO NOT RECONNECT THE IDG UNTIL ENGINE ROTATION STOPS (WIND MILLING SPEEDS THAT ARE LESS THAN 100 RPM ARE ACCEPTABLE FOR RECONNECTION). IF YOU RECONNECT THE IDG DURING ENGINE ROTATION IT COULD DAMAGE THE DOG TEETH AND SEAL ON THE IDG INPUT SHAFT.

(b) Slowly pull the disconnect reset ring on the IDG to the outer limit.

NOTE: The operation of the ring must be smooth and must move freely.

(c) Make sure you feel the "click" in the disconnect reset ring as it gets near the outer limit.

NOTE: The "click" may not be heard or felt if there is too much noise in the area.

(d) Allow the disconnect reset ring to slowly return to the inner position.

(e) Slowly pull the disconnect reset ring to the outer limit again. Note the amount of force required.

1) Make sure that the force required is less than the force required the first time you pulled the disconnect reset ring.
2) If the force is not less than the force the first time you pulled the disconnect reset ring, replace the IDG (AMM 24-11-01/401).
3) Make sure there is no "click" when you pull the disconnect reset ring.
4) If there is a "click" when you pull the disconnect reset ring, replace the IDG (AMM 24-11-01/401).

(f) Allow the disconnect reset ring to slowly return to the inner position.

S 416-025

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

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

TASK 24-11-01-286-076

4. Examine the Pressure Differential Indicator and the Scavenge Filter

A. General

(1) When the Pressure Differential Indicator (DPI) on the IDG is extended, the scavenge filter and the IDG oil must be examined.

(2) If the scavenge filter and IDG oil condition are not satisfactory, or the DPI Resets decal shows it is the 4th extension, the IDG must be replaced.

B. References

(1) AMM 12-12-03/301, IDG - Servicing
(2) AMM 24-11-00/501, IDG System
(3) AMM 24-11-02/201, Scavenge Filter
(4) AMM 24-11-12/401, IDG Air/Oil Heat Exchanger
(5) AMM 78-31-00/201, Thrust Reverser System

C. Equipment

(1) Container - 2 U.S. gallon (8 liter) capacity, suitable to collect oil drainage from the IDG

(2) Overflow drain hose with an adapter, Ozone OMP2505-3 or Risbridger tool DRG 1827.

D. Access

(1) Location Zones

410 Left Power Plant Nacelle
420 Right Power Plant Nacelle

(2) Access Panels

413/423 Fan Cowls Left
414/424 Fan Cowls Right
417/427 Core Cowls Left
418/428 Core Cowls Right

E. Procedure

S 016-106

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

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

S 286-207

(2) OPERATORS USING SINGLE DPI EXTENSION PROCEDURE;
Do these steps to examine the pressure differential indicator (DPI):

NOTE: The DPI is the red button which is adjacent to the scavenge filter on the IDG.

(a) If the DPI is in the up position, do these steps:
1) Examine the scavenge filter condition, the IDG oil condition and do actions in the DPI Extension table.

NOTE: Scavenge filter and oil inspection is a check to see if it is necessary to replace the cooler and oil lines.

2) Replace the IDG (AMM 24-11-01/401).

(b) If the DPI is in the down position, do these steps:
1) If other regular IDG service maintenance is not required, no more work is necessary.
2) If other regular IDG service maintenance tasks are required, do these tasks.

S 986-209

(3) OPERATORS USING THE ALTERNATE DPI EXTENSION PROCEDURE;
Do these steps to examine the pressure differential indicator (DPI):

NOTE: The DPI is the red button which is adjacent to the scavenge filter on the IDG.

(a) If the DPI is in the down position, do these steps:
1) If other regualr IDG service maintenance tasks are required, do those tasks.
2) If other regular IDG service maintenance task is not required, no more work is necessary.

(b) If the DPI is in the up position, examine the scavenge filter condition, the IDG oil condition and do actions in the DPI Extension table:

NOTE: When the DPI is in the up position and if the DPI Resets decal shows it is the 4th DPI extension, the IDG must be replaced.

DPI EXTENSION		
SCAVENGE FILTER CONDITION	IDG CONDITION	ACTION
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	No oil discoloration, no signs of over-heating or chemical contamination of the oil is suspected	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Service with oil (AMM 12-13-03/301).
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Hydraulic fluid and water)	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Service with oil (AMM 12-13-03/301). 4. Run the engine until the IDG oil temperature is 175 degrees F. 5. Drain the oil. 6. Replace the scavenge filter (AMM 24-11-02/201). 7. Service with oil (AMM 12-13-03/301).

DPI EXTENSION		
SCAVENGE FILTER CONDITION	IDG CONDITION	ACTION
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Fuel)	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Replace fuel/oil cooler (AMM 79-21-01/401). 4. Service IDG with oil (AMM 12-13-03/301). 5. Run the engine until the IDG oil temperature is 175 degrees F. 6. Drain the oil. 7. Replace the scavenge filter (AMM 24-11-02/201). 8. Service IDG with oil (AMM 12-13-03/301).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	No oil discoloration, no signs of over-heating or chemical contamination of the oil is not suspected	1. Replace the IDG (AMM 24-11-01/401).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	Oil discoloration, Signs of overheating or chemical contamination of the oil is suspected. (Hydraulic fluid and water)	1. Remove the IDG (AMM 24-11-01/401). 2. Flush the IDG oil system (AMM 12-13-03/301). 3. Replace the IDG (AMM 24-11-01/401).

DPI EXTENSION		
SCAVENGE FILTER CONDITION	IDG CONDITION	ACTION
No visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Fuel)	1. Drain the oil 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Replace fuel/oil cooler (AMM 79-21-01/401). 4. Service IDG with oil (AMM 12-13-03/301). 5. Run the engine until the IDG oil temperature is 175 degrees F. 6. Drain the oil. 7. Replace the scavenge filter (AMM 24-11-02/201). 8. Service IDG with oil (AMM 12-13-03/301).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is damaged (filter element by pass condition) (See NOTE for more scavenge filter data) *[1]	Oil condition is not a factor	1. Remove the IDG (AMM 24-11-01/401). 2. Replace fuel/oil cooler (AMM 79-21-01/401). 3. Replace the air/oil cooler (AMM 24-11-12/401) 4. Replace the oil cooler lines. 5. Install the IDG (AMM 24-11-01/401).

DPI EXTENSION		
SCAVENGE FILTER CONDITION	IDG CONDITION	ACTION
*[1] NOTES: If the scavenge filter element or filter cover shows a number of moderately scattered, small metallic flakes (bronze or silver colored metal), flakes of generator insulation, black epoxy flakes, or sleeving, do not replace the IDG. These products are normal wear during IDG operation. If the filter element shows bright metal deposits that can be clearly specified as chunks or pieces caused by breakage, or a large number of small metallic flakes (bronze or silver-colored metal), replace the IDG. These are indications of IDG internal damage. The filter is breached if the filter is damaged or missing, the O-ring is damaged or missing, or the filter cap is damaged or loose.		

(c) If you already replaced the IDG, no more work is necessary.
(d) If you did not replace the IDG, check the DPI reset decal on the scavenge filter cover for the number of DPI resets that has been done (Fig. 603).

NOTE: When the DPI is in the up position and if the actions in the DPI Extension table does not require to replace the IDG, the DPI can be reset three times.

1) If the DPI resets decal shows it is the fourth (4) DPI extension, replace the IDG (AMM 24-11-01/401).
2) If the DPI resets decal shows it is not the fourth (4) DPI extension, do these steps to reset the DPI:
   a) Use a blunt tool to rub out the next number on the DPI resets decal.
   b) Push the DPI button down.

TASK 24-11-01-286-075

5. Examine The Oil In The IDG.
   A. General
      (1) The Visual Oil Check procedure will visually examine the oil for contamination, the oil color, sign of overheating or chemical contamination.
      (2) The Specific Gravity Oil Check procedure examines the specific gravity of the IDG oil to find if there is fuel, hydraulic fluid or water in the IDG oil. This check should be done when it is difficult to smell fuel in the oil.
      (3) The Water in Oil Check procedure will find if there is water in the oil.

B. References
   (1) AMM 12-13-03/301, IDG - Servicing
   (2) AMM 24-11-00/501, Generator Drive System
   (3) AMM 24-11-02/201, Scavenge Filter
   (4) AMM 78-31-00/201, Thrust Reverser System

C. Standard Tools and Equipment
   (1) Container - 2 U.S. gallon (8 liter) capacity, suitable to collect oil drainage from the IDG
   (2) Overflow drain hose with an adapter, Ozone OMP2505-3 or Risbridger tool DRG 1827
   (3) Hydrometer

D. Prepare for the Oil Check

S 046-116

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

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

E. Visual Oil Check

S 916-117

CAUTION: DO NOT PUT A TOOL INSIDE THE PRESSURE OILER (SERVICE FITTING) TO REMOVE IDG INTERNAL PRESSURE. DAMAGE TO THE PRESSURE OILER AND LEAKAGE OF IDG OIL CAN OCCUR.

(1) If the IDG has a PUSH-TO-VENT button, push the button to release the internal IDG pressure.

S 216-118

(2) Make sure the IDG pressure covers are not leaking.
   (a) If the pressure covers are leaking, do the Pressure Oiler and Pressure Cover check (AMM 24-11-01/601).

S 026-119

(3) Remove the pressure cover from the pressure oiler (overflow drain coupling) on the IDG.

S 426-120

(4) Put the free end of the drain hose into a container.

S 426-127

WARNING: WHEN YOU CONNECT THE OUTLET ADAPTER TO THE PRESSURE OILER (OVERFLOW DRAIN COUPLING) USE A RAG AROUND THE FITTING. THIS WILL PREVENT A SPRAY CAUSED BY PRESSURE IN THE IDG CASE. HOT OIL CAN CAUSE INJURIES.

(5) Connect the adapter and the oil drain hose to the pressure oiler (overflow drain) on the IDG.

NOTE: When you connect the adapter to the pressure oiler, it is usual for some oil to drain.

S 216-204

(6) Examine the oil for contamination, discoloration, sign of overheating or chemical contamination.

(a) If the oil is contaminated, discolored or overheated, do the Scavenge Filter and Oil Condition Check (AMM 24-11-01/601).

(b) When you are not sure the IDG oil is contaminated with fuel, hydraulic fluid or water, do the Specific Gravity Oil Check or the Water in the Oil Check (AMM 24-11-01/601).

NOTE: Some types of IDG oils are black. A visual inspection of the oil cannot detect if the oil has been overheated or mixed with other types of oil.

NOTE: Clear IDG oil is not always an indication of good oil. Hydraulic fluid will lose its color over a short time. Old hydraulic fluid is clear in color.

S 216-128

(7) Examine the amount of oil collected in the container.

(a) If more than 1 pint (1/2 liter) is removed from the IDG, smell the IDG oil for fuel. When fuel is in the IDG oil do the Scavenge filter and Oil Condition Check (AMM 24-11-01/601).

NOTE: When it is difficult to smell fuel in the IDG oil, do a Specific Gravity Oil Check.

(b) If more than 1 pint (1/2 liter) is removed from the IDG and there is no fuel in the oil, the IDG may have been over-serviced. Do the Scavenge Filter and Oil Condition check (AMM 24-11-01/601).

F. Specific Gravity Oil Check

S 686-167

(1) Do these steps to examine the specific gravity of IDG oil:

(a) Get a sample of the new IDG oil that has not been used.

(b) Examine the specific gravity of the new IDG oil.

(c) Get a sample of the used IDG oil.

(d) Examine the specific gravity of the used IDG oil.

(e) Compare the specific gravity readings of the IDG oil sample and the new oil.

(f) If the specific gravity reading of the used IDG oil is lower than the specific gravity reading of the new oil, fuel may be in the IDG oil. Do the Scavenge Filter and Oil Condition Check (AMM 24-11-01/601).

(g) If the specific gravity reading of the used IDG oil is above the specific gravity reading of the new oil, hydraulic fluid or water may be in the IDG oil. Do the Scavenge Filter and Oil Condition Check (AMM 24-11-01/601).

G. Water In The Oil Check

S 686-168

(1) Get a sample of the oil in a glass container.

NOTE: The amount of oil used for a sample is not important.

S 756-169

WARNING: DO NOT GET METHYL ALCOHOL IN YOUR MOUTH EYES OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THIS MATERIAL. PUT ON A PROTECTIVE SPLASH GOGGGLE AND GLOVES WHEN YOU USE METHYL ALCOHOL. KEEP METHYL ALCOHOL AWAY FROM SPARKS, FLAME AND HEAT. METHYL ALCOHOL IS POISONOUS AND FLAMMABLE AND CAN CAUSE INJURY.

(2) Add 3 parts of methyl alcohol to the oil sample.

NOTE: The methyl alcohol must be from an unopened container.

S 916-170

(3) Discard the unused methyl alcohol.

NOTE: Methyl alcohol absorbs water from the air. Methyl alcohol used from a container which has been opened and stored on the shelf will give unsatisfactory results.

S 756-171

(4) Shake the mixture of IDG oil and methyl alcohol for one minute.

S 756-172

(5) Wait one (1) minute and check the mixture.
   (a) If the mixture is clear, there is no water in the IDG oil.
   (b) If the mixture is cloudy, water is in the IDG oil. Do the Scavenge Filter and Oil Condition Check (AMM 24-11-01/601).

H. Scavenge Filter and Oil Condition Check

S 286-205

(1) Examine the scavenge filter condition, the IDG oil condition and do actions in the Scavenge Filter and Oil Condition Check table:

SCAVENGE FILTER AND OIL CONDITION CHECK		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	No oil discoloration, no signs of over-heating or chemical contamination of the oil is not suspected	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Service with oil (AMM 12-13-03/301).
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Hydraulic fluid and water)	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Service with oil (AMM 12-13-03/301). 4. Run the engine until the IDG oil temperature is 175 degrees F. 5. Drain the oil. 6. Replace the scavenge filter (AMM 24-11-02/201). 7. Service with oil (AMM 12-13-03/301).

SCAVENGE FILTER AND OIL CONDITION CHECK		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
No visible magnetic or non-metallic particles (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Fuel)	1. Drain the oil. 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Replace fuel/oil cooler (AMM 79-21-01/401). 4. Service IDG with oil (AMM 12-13-03/301). 5. Run the engine until the IDG oil temperature is 175 degrees F. 6. Drain the oil. 7. Replace the scavenge filter (AMM 24-11-02/201). 8. Service IDG with oil (AMM 12-13-03/301).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	No oil discoloration, no signs of over-heating or chemical contamination of the oil is not suspected	1. Replace the IDG (AMM 24-11-01/401).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	Oil discoloration, Signs of overheating or chemical contamination of the oil is suspected. (Hydraulic fluid and water)	1. Remove the IDG (AMM 24-11-01/401). 2. Flush the IDG oil system (AMM 12-13-03/301). 3. Replace the IDG (AMM 24-11-01/401).

SCAVENGE FILTER AND OIL CONDITION CHECK		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
No visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is not damaged. (See NOTE for more scavenge filter data) *[1]	Oil discoloration, signs of overheating or chemical contamination of the oil is suspected (Fuel)	1. Drain the oil 2. Replace the scavenge filter (AMM 24-11-02/201). 3. Replace fuel/oil cooler (AMM 79-21-01/401). 4. Service IDG with oil (AMM 12-13-03/301). 5. Run the engine until the IDG oil temperature is 175 degrees F. 6. Drain the oil. 7. Replace the scavenge filter (AMM 24-11-02/201). 8. Service IDG with oil (AMM 12-13-03/301).
Visible magnetic or non-metallic particles in the scavenge filter. The scavenge filter or the scavenge filter o-ring is damaged (filter element by pass condition) (See NOTE for more scavenge filter data) *[1]	Oil condition is not a factor	1. Remove the IDG (AMM 24-11-01/401). 2. Replace fuel/oil cooler (AMM 79-21-01/401). 3. Replace the air/oil cooler (AMM 24-11-12/401) 4. Replace the oil cooler lines. 5. Install the IDG (AMM 24-11-01/401).

SCAVENGE FILTER AND OIL CONDITION CHECK		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
*[1] NOTES: If the scavenge filter element or filter cover shows a number of moderately scattered, small metallic flakes (bronze or silver colored metal), flakes of generator insulation, black epoxy flakes, or sleeving, do not replace the IDG. These products are normal wear during IDG operation. If the filter element shows bright metal deposits that can be clearly specified as chunks or pieces caused by breakage, or a large number of small metallic flakes (bronze or silver-colored metal), replace the IDG. These are indications of IDG internal damage. The filter is breached if the filter is damaged or missing, the O-ring is damaged or missing, or the filter cap is damaged or loose.		

S 416-174

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

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

TASK 24-11-01-216-108

6. Check the IDG Pressure Oiler (Service Fitting) and Pressure Cover (Fig. 602)
   A. General
      (1) This task does an oil leakage check for the pressure oiler (service fittings) and the pressure cover.
   B. References
      (1) AMM 24-11-02/201, Scavenge Filter
      (2) AMM 78-31-00/201, Thrust Reverser System

C. Equipment
(1) Container - 2 U.S. gallon (8 liter) capacity, suitable to collect oil drainage from the IDG

D. Access
(1) Location Zones
410 Left Power Plant Nacelle
420 Right Power Plant Nacelle

(2) Access Panels
413/423 Fan Cowls Left
414/424 Fan Cowls Right
417/427 Core Cowls Left
418/428 Core Cowls Right

E. Prepare for the IDG Pressure Oiler and Pressure Cover Check

S 016-139

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

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

F. Procedure

S 286-140
(1) Do these steps to examine the pressure covers:
(a) Make sure there is no oil leaking from the pressure cover.

CAUTION: DO NOT PULL ON THE LAYNARD OR SPLIT RING TO REMOVE THE COVER. PULL ON THE OUTER COVER OF THE PRESSURE COVER TO REMOVE THE COVER. IF YOU PULL ON THE LANYARD OR SPLIT RING TO REMOVE THE COVER, DAMAGE TO THE LANYARD OR SPLIT RING WILL OCCUR.

(b) Pull on the outer cover of the pressure cover and remove the pressure cover.

(c) Examine the pressure cover O-ring for cuts, nicks or a hard O-ring.
1) If damage to the O-ring is found, replace the O-ring.
(d) Examine the ball bearings in the cover and the bore of the cover for cuts, nicks gouges or missing bearings.
1) If damage to the pressure cover bore is found, replace the cover.
(e) Clean the oil from the inside of the cover with Isopropyl alcohol. Dry the cover with dry compressed air or nitrogen.

NOTE: Do not use chlorinated solvent to clean the pressure cover. Chlorinated solvents can cause damage to the IDG and the IDG oil system.

S 286-141
(2) Do these steps to examine the pressure oiler:

CAUTION: DO NOT USE A BLUNT TOOL TO PUSH ON THE PRESSURE OILER SPRING POPPET. VENT THE IDG OIL SYSTEM WITH AN OIL FILLING ADAPTER. THE BLUNT TOOL CAN CAUSE DAMAGE TO THE PRESSURE OILER AND IDG OIL LEAKAGE CAN OCCUR.

(a) Make sure the pressure oiler does not have any nicks, scratches or gouges in the O-ring grove or on the sides of the oiler.
(b) Make sure oil does not leak from the pressure oiler.
1) If oil is not leaking from the pressure oiler, clean the oil from the pressure oiler with Isporopyl alcohol. Dry the oiler with dry compressed air or nitrogen.

NOTE: Do not use chlorinated solvents to clean the pressure oiler. Chlorinated solvents can cause damage to the IDG and the IDG oil system.

(c) If oil is leaking from the pressure oiler poppet, do the following:
1) If the IDG has a Push-To-Vent button, push the button.
2) Put a container below the IDG to catch the oil which will flow from the IDG.
3) Put the end of the overflow drain hose into the container.

WARNING: BE CAREFUL WHEN YOU CONNECT THE OVERFLOW DRAIN HOSE. THE PRESSURE IN THE IDG CAN CAUSE HOT OIL TO COME OUT OF THE OVERFLOW DRAIN COUPLING. HOT OIL CAN CAUSE INJURY TO PERSONS.

CAUTION: USE THE CORRECT ADAPTER TO RELEASE THE PRESSURE FROM THE IDG. AN INCORRECT ADAPTER WILL NOT RELEASE THE PRESSURE IN THE IDG. THIS CAN CAUSE AN INCORRECT OIL LEVEL IN THE IDG AND THE SUBSEQUENT FAILURE OF THE IDG.

4) Connect the overflow drain hose to the pressure oiler on the IDG.
5) After the pressure in the IDG is vented, remove the overflow drain coupling.
6) Remove the IDG end of the oil line to the pressure oiler. Place the oil line into a container.
7) Connect the hose on the oil service equipment to the pressure oiler.

CAUTION: WHEN THE PRESSURE OILER IS FLUSHED, DO NOT MIX TYPES OF OIL. IF THE OIL TYPES ARE MIXED DAMAGE TO THE IDG CAN OCCUR.

8) Flush the pressure oiler with 1/2 quart of oil.
9) Remove the oil service equipment to the pressure oiler.
10) Connect the oil service equipment to the hose end of the pressure oiler.
11) Clean the oil from the pressure oiler with Isopropyl alcohol. Dry the oiler with dry compressed air or nitrogen.

NOTE: Do not use chlorinated solvents to clean the pressure oiler. Chlorinated solvents can cause damage to the IDG and the IDG oil system.

12) Apply pressure for a minimum of 20 seconds to the adapter fitting with the oil servicing tool and check the pressure oiler for leaks.

NOTE: Apply between 50 and 500 psig to the pressure oiler. Do not apply more than 500 psig to the pressure oiler.

13) If the pressure oiler leaks, flush the pressure oiler with oil and do the pressure test.
14) If the pressure oiler leaks after the (2) second pressure test, replace the pressure oiler.

(d) Clean the oil from the pressure oiler with Isopropyl alcohol. Dry the oiler with dry compressed air or nitrogen.

NOTE: Do not use chlorinated solvents to clean the pressure oiler. Chlorinated solvents can cause damage to the IDG and the IDG oil system.

S 416-143

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

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

SCAVENGE FILTER - MAINTENANCE PRACTICES

1. General
   A. This procedure has these tasks:
      (1) Scavenge Filter Removal
      (2) Scavenge Filter Inspection/Check
      (3) Scavenge Filter Installation

   TASK 24-11-02-022-001

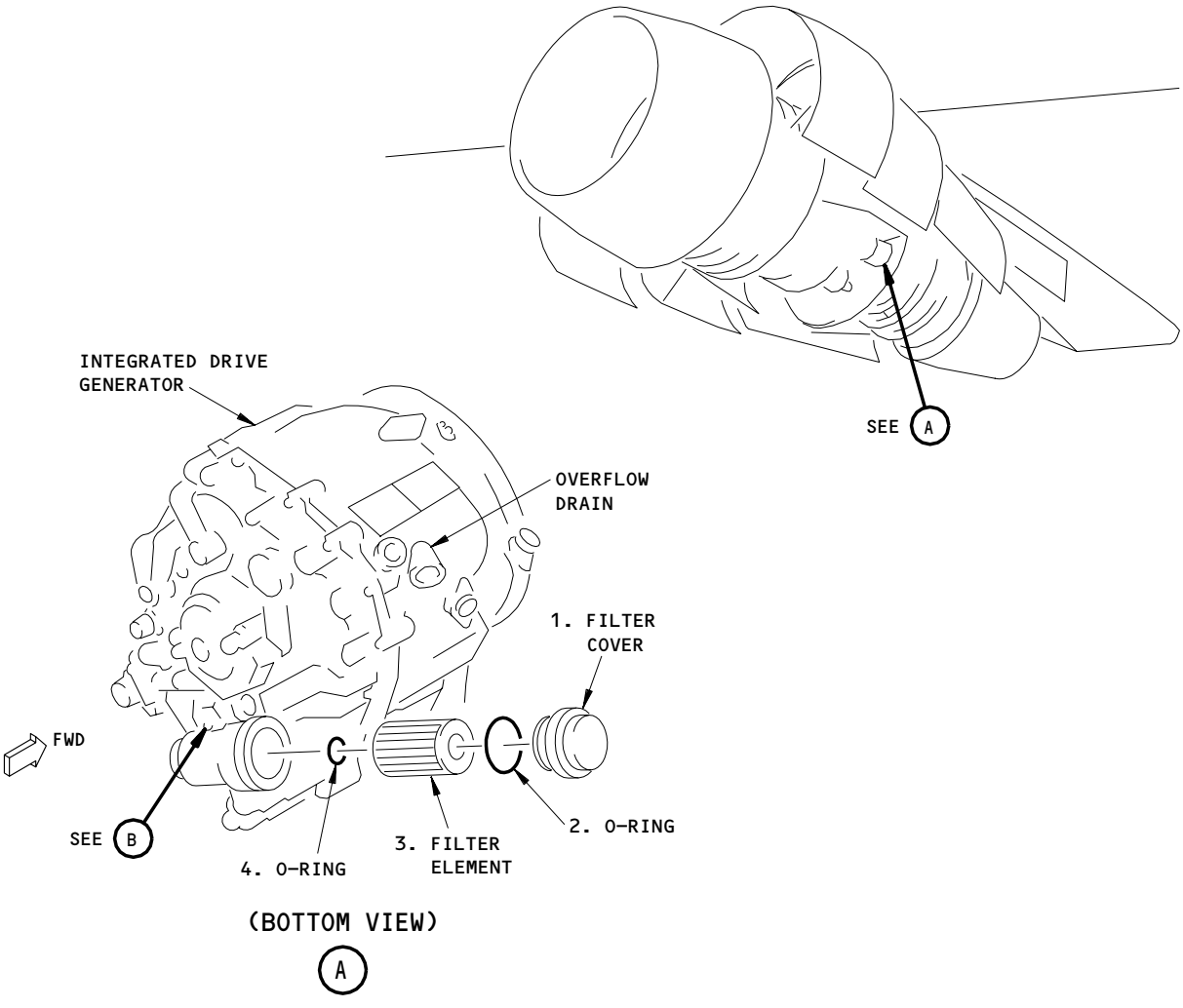
2. Scavenge Filter Removal (Fig. 201)
   A. General
      (1) If the IDG is replaced, the IDG Scavenge Filter must be reinstalled into the IDG and sent to the repair shop for analysis.
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   C. Equipment
      (1) Container - 5 gallon capacity.
      (2) IDG oil overflow drain hose with outlet adapter, Ozone OMP2505-3
   D. Access
      (1) Location Zones
          212 Flight Compartment
          410 Power Plant Nacelle (Left)
          420 Power Plant Nacelle (Right)
      (2) Access Panels
          413, 423 Fan Cowl Panels (Left)
          414, 424 Fan Cowl Panels (Right)
          415, 425 Thrust Reverser Panels (Left)
          416, 426 Thrust Reverser Panel (Right)
   E. Prepare for the Removal

      S 012-008
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 042-009

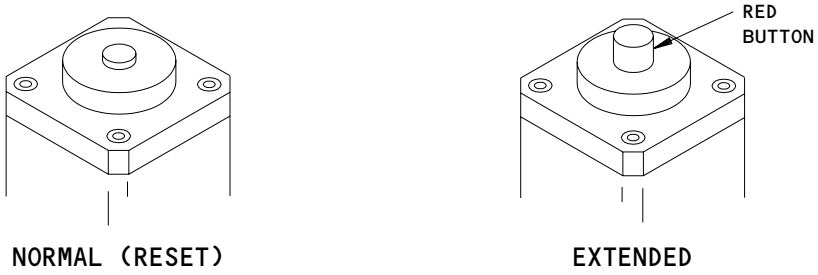
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

      (2) Do the procedure Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).



(BOTTOM VIEW)

A



PRESSURE DIFFERENTIAL INDICATOR

B

Scavenge Filter Installation
Figure 201

S 012-022

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 reverser (AMM 78-31-00/201).

S 012-010

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

S 862-012

(5) Do these steps to release the pressure from the IDG:
  (a) Put the container under the IDG to catch the oil.
  (b) Remove the cover from the overflow drain coupling on the IDG.
  (c) Put the end of the drain hose into the container.

WARNING: WHEN YOU CONNECT THE OVERFLOW DRAIN HOSE TO THE OVERFLOW DRAIN COUPLING, USE A RAG AROUND THE FITTING. THIS WILL PREVENT OIL SPRAY CAUSED BY PRESSURE IN THE IDG CASE. HOT OIL CAN BURN YOU.

  (d) Connect the overflow drain hose with outlet adapter, Ozone OMP2505-3, to the overflow drain coupling and allow the oil to drain into the container.
  (e) Disconnect the overflow drain hose with outlet adapter, Ozone OMP2505-3, from the overflow drain coupling.

F. Procedure

S 022-013

(1) Remove the scavenge filter as follows:
  (a) Remove the wire which locks the scavenge filter cover.

WARNING: USE CARE WHEN REMOVING THE FILTER COVER. HOT OIL MAY FLOW FROM THE SCAVENGE FILTER WHEN THE FILTER COVER IS REMOVED. HOT OIL CAN CAUSE SERIOUS INJURY.

  (b) Remove the filter cover (1) and allow the oil to flow out of the filter into the container.

NOTE: Inspect the oil in the filter cover for contamination before you discard the oil.

(c) Remove and discard the O-ring (2) from the filter cover (1).
(d) Remove the filter element (3) and discard the O-ring (4).

TASK 24-11-02-212-002

3. Scavenge Filter Inspection/Check (Fig. 201)
   A. General
      (1) When the Differential Pressure Indicator is extended, the entire Scavenge Filter Inspection/Check must be examined to see if more work is necessary.
   B. References
      (1) AMM 24-11-01/401, Integrated Drive Generator
      (2) AMM 24-11-01/601, Integrated Drive Generator
      (3) AMM 79-21-01/401, IDG Fuel/Oil Heat Exchanger
   C. Procedure

      S 212-014

      (1) Do a check for the oil and filter as follows:
         (a) Is there contamination on the scavenge filter element, or in the oil drained from the filter cavity?
            1) Contamination is defined as bright metal deposits which can be clearly defined as chunks or pieces caused by breakage (in contrast to nonmagnetic flakes or slivers caused by normal wear).

               NOTE: A moderate number of scattered small metallic flakes (bronze or silver colored metal), or flakes of generator insulation are normal products of wear during operation. Even a considerable number of nonmetallic items such as black epoxy chips, sleeving, and other forms of generator insulation do not always indicate damage to IDG.

            2) Fuel, hydraulic fluid or water in IDG oil is liquid contamination.
         (b) Is there a condition that would allow contaminated oil to bypass the filter and enter the external oil cooling circuit?
            1) The condition that would allow oil to bypass the scavenge filter are damaged O-rings or a damaged filter.

S 422-040

(2) If the differential pressure indicator (DPI) is not extended, do these steps:

(a) If no contamination is found in the filter and in the IDG oil, install a new filter element per section Scavenge Filter Installation.

(b) If contamination is found on the filter or in the IDG oil, do the "Examine The Oil In The IDG" (AMM 24-11-01/601).

S 422-015

(3) If the differential pressure indicator (DPI) is extended, perform the following:

(a) Do the "Examine the Pressure Differential Indicator and the Scavenge Filter" (AMM 24-11-01/601).

TASK 24-11-02-422-041

4. Scavenge Filter Installation (Fig. 201)

A. General

(1) A removed filter element should not be used again, even if the filter looks clean. Always install a new filter element.

B. References

(1) AMM 12-13-03/301, Integrated Drive Generator Servicing
(2) AMM 71-00-00/201, Power Plant - Maintenance Practices
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-11-06/201, Core Cowl Panels
(5) AMM 78-31-00/201, Thrust Reverser System

C. Consumable Materials

(1) D00657 Lubricant, O-ring - Acryloid HF825
(2) D00109 Oil, Aircraft Turbine Engine, synthetic base - MIL-PRF-23699
(3) G01505 Lockwire - Safety and Lock (NASM20995)

D. Parts

(1) Refer to the AIPC for part numbers and effectivities of items in the table that follows:

(a) AIRPLANES WITH PW4000 SERIES ENGINE;
Refer to the table that follows:

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
201	2	Packing	24-11-01	11	125
	3	Filter element			130
	4	Packing			135

E. Access

(1) Location Zones

212 Flight Compartment
410 Power Plant Nacelle (Left)
420 Power Plant Nacelle (Right)

(2) Access Panels

413, 423 Fan Cowl Panels (Left)
414, 424 Fan Cowl Panels (Right)
415, 425 Thrust Reverser Panels (Left)
416, 426 Thrust Reverser Panel (Right)

F. Procedure

S 422-004

(1) Install the scavenge filter as follows:
(a) Apply Acryloid HF825 lubricant, or MIL-PRF-23699 oil to the O-ring (2).
(b) Install the O-ring (2) on the filter cover (1).
(c) Apply Acryloid HF825 lubricant, or MIL-PRF-23699 oil to the O-ring (4).
(d) Install the O-ring (4) on a new filter element (3).
(e) Install the new filter element (3) in the cavity on the IDG and make sure the O-ring makes a seal.

WARNING: MAKE SURE THE FILTER ELEMENT IS SEATED CORRECTLY IN THE FILTER CAVITY BEFORE YOU INSTALL THE FILTER COVER. DO NOT TIGHTEN THE FILTER COVER TO FORCE THE FILTER ELEMENT INTO THE HOUSING. IF YOU DO, DAMAGE TO THE FILTER ELEMENT CAN OCCUR.

(f) Install the filter cover (1) and tighten the cover to 156-180 pound-inches (17.6 - 20.3 N.m).
(g) Install a lockwire, G01505, on the filter cover (1).

S 612-005

(2) Service the IDG (AMM 12-13-03/301).

S 412-018
(3) Close the core cowl panels (AMM 71-11-06/201).

S 412-027

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.

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

S 442-020
(5) Activate the thrust reverser (AMM 78-31-00/201).

S 412-019
(6) Close the fan cowl panel (AMM 71-11-04/201).

S 722-042
(7) Do the test in (AMM 71-00-00/501) and check for leak.

S 792-035
(8) Stop the engine and wait for five minutes for the oil level to become stable.

S 792-036
(9) Do this task: "IDG Oil Level Check" (AMM 12-13-03/301).

S 612-037
(10) If the oil level is incorrect, do this task: "IDG Oil Servicing" (AMM 12-13-03/301).

S 722-038
(11) Do a check for oil leaks at the IDG and external oil cooling system. Repair any leaks you find.

QUICK ATTACH/DETACH (QAD) COUPLING - REMOVAL/INSTALLATION

1. General
   A. This procedure has these tasks:
      (1) Remove Quick Attach/Detach Coupling
      (2) Install Quick Attach/Detach Coupling

   TASK 24-11-03-004-001

2. Remove Quick Attach/Detach Coupling (Fig. 401)
   A. References
      (1) AMM 24-11-01/401, Integrated Drive Generator
   B. Access
      (1) Location Zones
          410 Power Plant Nacelle (Left)
          420 Power Plant Nacelle (Right)

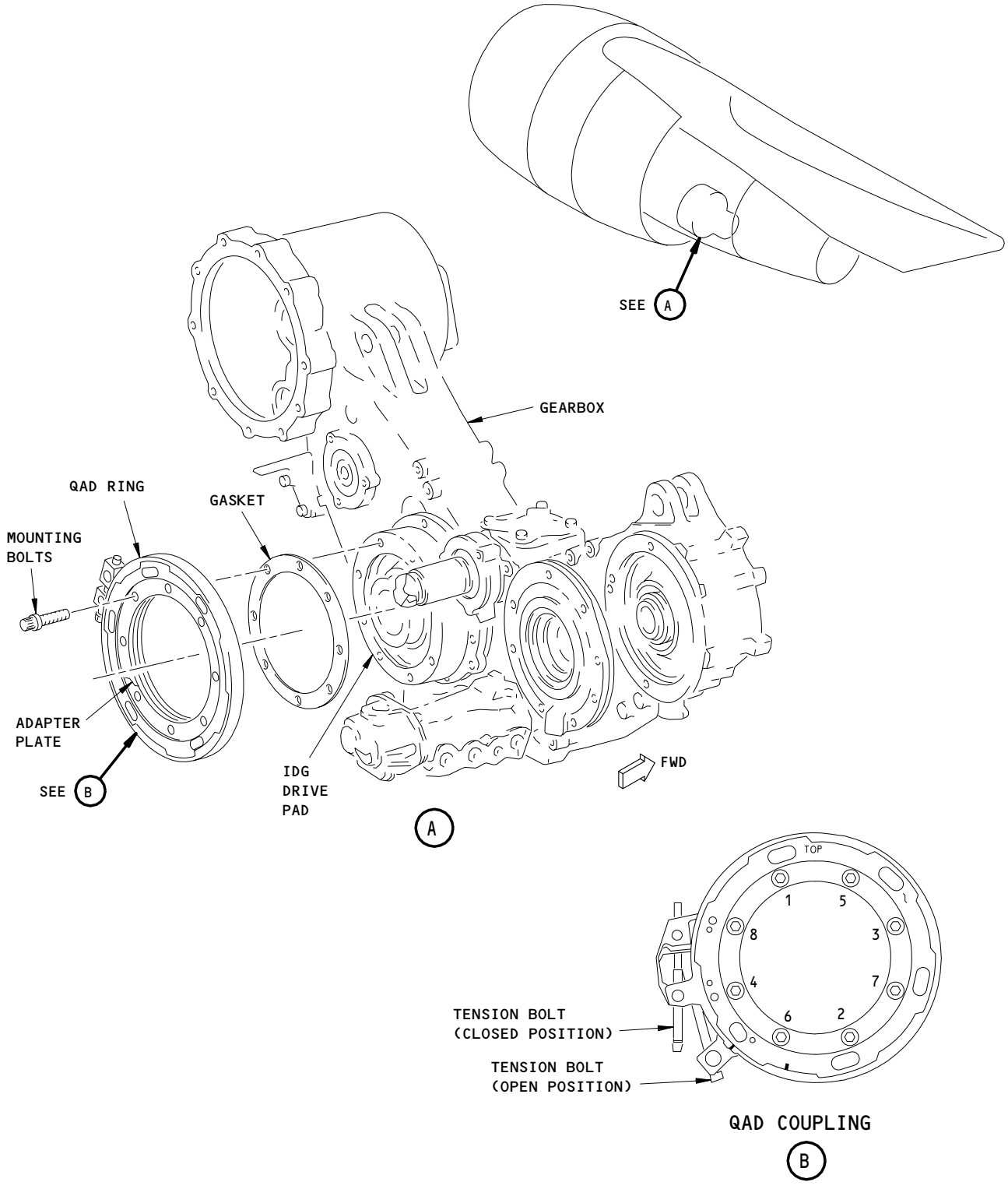
      (2) Access Panels
          413, 423 Fan Cowl Panels (Left)
          414, 424 Fan Cowl Panels (Right)
          415, 425 Thrust Reverser Panels (Left)
          416, 426 Thrust Reverser Panel (Right)
   C. Prepare for Removal

      S 024-002
      (1) Remove the IDG (AMM 24-11-01/401).
   D. Remove the QAD Coupling

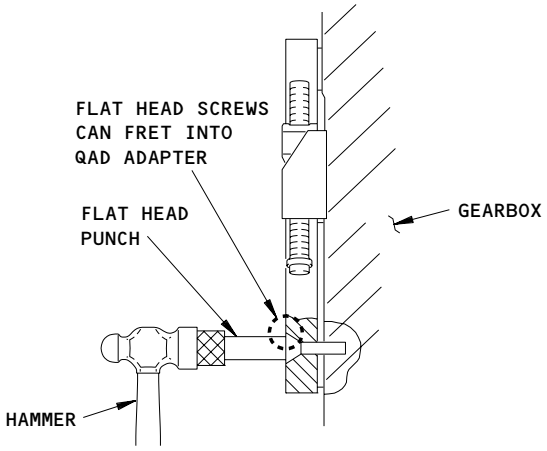
      S 024-003
      (1) Do these steps to remove the QAD coupling:

      CAUTION: USE A STUBBY 3/8 INCH DRIVE HEX DRIVER. THE STANDARD OR LONG HEX DRIVER WILL CAUSE THE DRIVER TO CAM OUT. THIS COULD CAUSE DAMAGE TO THE QAD RING BOLTS.

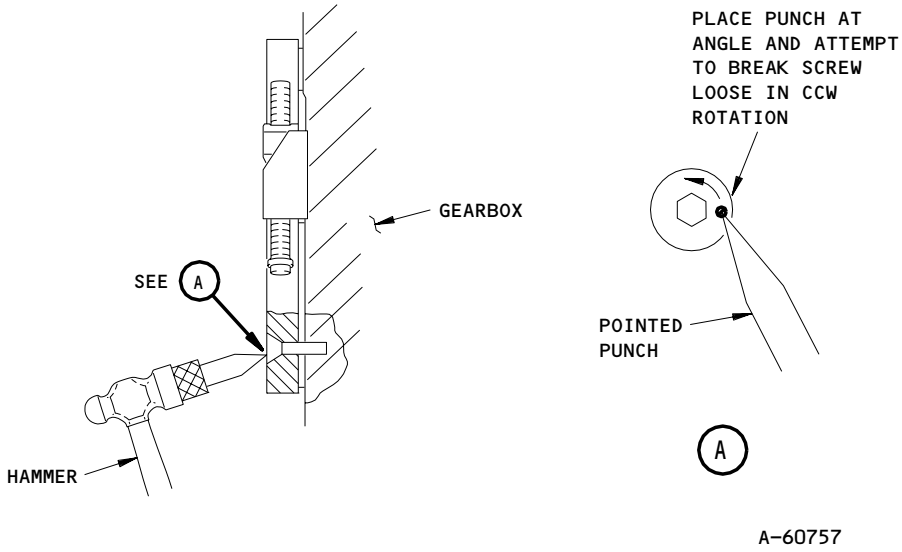
      (a) Remove the mounting bolts that attach the QAD coupling to the gearbox. If the bolts are tight or damaged, do these steps to remove the bolts (Fig. 402):
          1) Hit the bolts with a flat punch.



Quick Attach/Detach Coupling Installation
Figure 401



FLAT PUNCH



POINTED PUNCH

QAD Adapter Screws - Removal Methods
Figure 402

2) Or hit the bolts with a pointed punch pointed at an angle to turn the bolts in a counter-clockwise direction.

(b) Remove the QAD coupling and gasket from the engine accessory gearbox.

TASK 24-11-03-404-004

3. Install Quick Attach/Detach Coupling (Fig. 401)

A. Consumable Materials

(1) D00068 Oil, Turbine Engine, MIL-L-23699

B. References

(1) AMM 24-11-01/401, Integrated Drive Generator

(2) AMM 24-11-03/601, Quick Attach/Detach Coupling

C. Access

(1) Location Zones

410 Power Plant Nacelle (Left)

420 Power Plant Nacelle (Right)

(2) Access Panels

413, 423 Fan Cowl Panels (Left)

414, 424 Fan Cowl Panels (Right)

415, 425 Thrust Reverser Panels (Left)

416, 426 Thrust Reverser Panel (Right)

D. Prepare for Installation

S 214-005

(1) Visually examine the mating surfaces of the QAD coupling and the gearbox mounting pad.

(a) Make sure the surfaces are smooth and clean.

S 644-006

CAUTION: DO NOT ALLOW EXCESS LUBRICANT TO COLLECT IN DOWEL PIN HOLES AND BOLT HOLES. GEARBOX DAMAGE MAY OCCUR DUE TO PRESSURE BUILD UP WHEN BOLTS ARE INSTALLED.

(2) Apply a thin layer of oil to the tension bolt threads.

S 644-013
(3) Apply a thin coat of anti-seize to the threads and under the head of the mounting bolts.

E. Install QAD Coupling

S 424-007
(1) Do these steps to install QAD coupling:
(a) Install the gasket on the side of the QAD coupling that connects with the gearbox mounting pad.
(b) Make sure the hole pattern of the gasket aligns with the hole pattern of the QAD coupling.
(c) Attach the QAD coupling assembly to the gearbox mounting pad.
(d) Install the bolts that attach the QAD ring to the gearbox.
(e) Tighten the bolts in two steps as follows:
1) Tighten the bolts in the sequential order as shown in Fig. 401 at initial torque of 180-204 pound-inches (20.3-23.0 N.m.).
2) Tighten the bolts in the sequential order as shown in Fig. 401 to a final torque of 276-300 pound-inches (31.2-33.9 N.m.).
(f) Use a clean dry cloth to clean the excess anti-seize on the QAD.

S 714-009
(2) Do this procedure: QAD Coupling - Inspection/Check (AMM 24-11-03/601).

S 424-010
(3) Install the IDG (AMM 24-11-01/401).

S 844-012
(4) Put the Airplane Back to Its Usual Condition.

QUICK ATTACH/DETACH (QAD) COUPLING - INSPECTION/CHECK

1. General
   A. This procedure has two tasks:
      (1) QAD coupling Inspection
      (2) QAD Coupling Torque Check.

TASK 24-11-03-206-001

2. QAD Coupling Inspection. (Fig.601)
   A. General
      (1) Do this inspection after you install the QAD coupling on the engine accessory gearbox, but before you install the IDG.
   B. Equipment
      (1) Simulated IDG input flange inspection plate (Sundstrand P/N 900-24999).
   C. Access
      (1) Location Zones
          410/420 Power Plant Nacelles
      (2) Access Panels
          413/423 Fan Cowls Left
          414/424 Fan Cowls Right
   D. Procedure

S 216-003

      (1) Inspect the QAD coupling as follows:
          (a) Visually examine the surface of the QAD coupling for damage.
              1) Use a fine file to remove any burrs found on the surface of the QAD coupling.
          (b) Visually examine the holes on the QAD coupling that engage the IDG installation pins for damage.
              1) Use a fine file to remove any burrs found in or around the guide holes.
          (c) Examine the tension bolts and the tension bolt nuts for damage.
          (d) Examine the inside surfaces of the clamp tract area on the QAD coupling.

              NOTE: The clamp track area is the area where the IDG mounting flange touches the QAD coupling when the IDG is installed.

              1) If the contact area is more worn in one location than another location, replace the QAD coupling.
          (e) Install the simulated IDG input flange inspection plate to the QAD coupling. Tighten the QAD tension bolt to 240-264 pound-inches (27-30 N.m).
          (f) Measure the distance between the ring lug and the bracket on the QAD ring.
              1) If the distance is 0.562 inch (14.28 mm) or more, the QAD ring is satisfactory.

2) If the distance is less than 0.562 inch (14.28 mm), replace the IDG QAD ring (AMM 24-11-03/401).

(g) Remove the simulated IDG input flange inspection plate.

TASK 24-11-03-206-002

3. QAD Coupling Torque Check (Fig. 601)

A. General

(1) This procedure does a torque check of the tension bolt on the QAD coupling with the IDG installed.

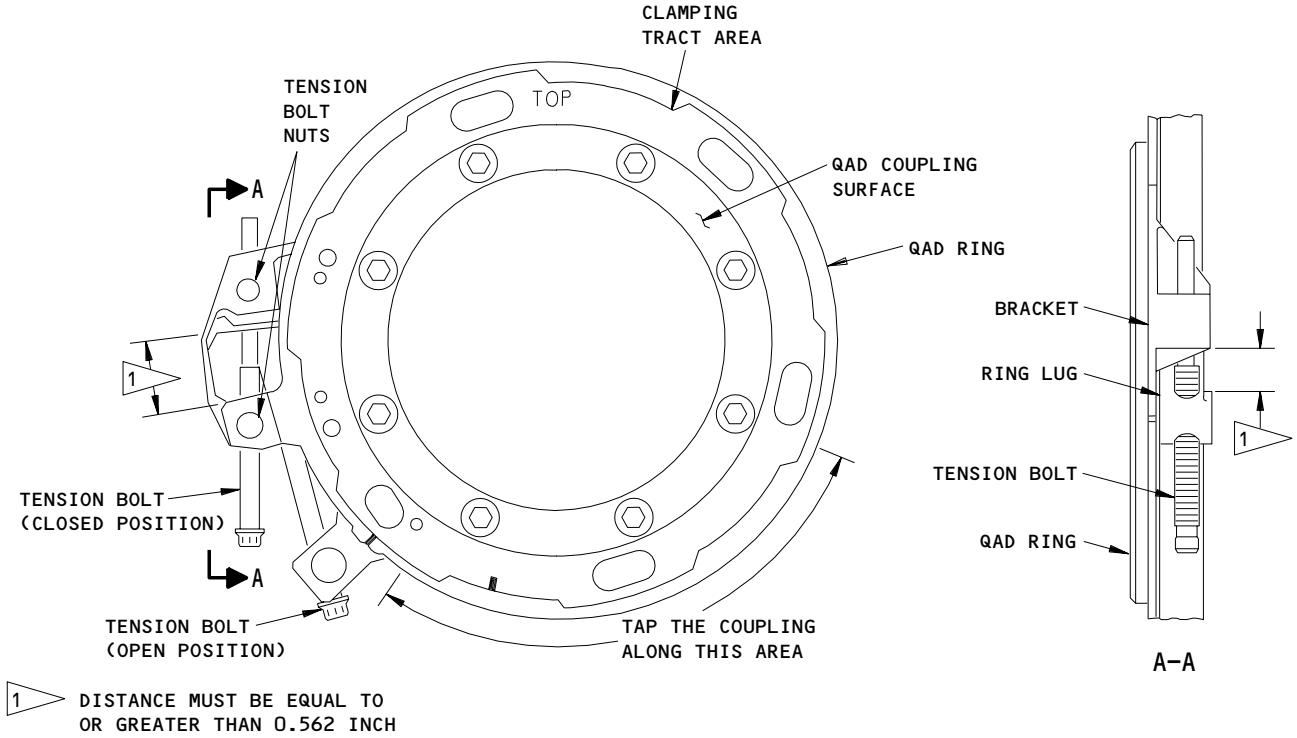
B. References

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

C. Access

(1) Location Zones
410/420 Power Plant Nacelles
(2) Access Panels
413/423 Fan Cowls Left
414/424 Fan Cowls Right
417/427 Core Cowls Left
418/428 Core Cowls Right

D. Prepare to check QAD coupling torque



Quick Attach/Detach (QAD) Coupling
Figure 601

S 046-010

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

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

S 016-018

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

S 016-011

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

S 016-012

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

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

E. Procedure

S 216-004

(1) Make a check of the torque value as follows:

S 026-006

(2) Remove the locking wire from the QAD coupling tension bolt.

CAUTION: MAKE SURE THAT THE QAD RING DOES NOT BIND OR CATCH WHILE YOU TIGHTEN THE TENSION BOLT. THIS CAN CAUSE DAMAGE TO THE QAD RING.

(a) Tap the edge of the QAD ring with a brass drift to adjust the ring and to prevent incorrect torque values.

NOTE: Tap the edge of the ring from the 4 O'clock to 7 O'clock positions.

(b) Measure the torque on the tension bolt.
1) If the torque is more than 180 pound-inches (20 N.m), do these steps:
a) Tighten the tension bolt to a torque of 240-264 pound-inches (27-30 N.m).
b) Secure the tension bolt with lockwire.
2) If the torque is less than 180 pound-inches (20 N.m), do these steps:
a) Tighten the tension bolt to a torque of 240-264 pound-inches (27-30 N.m).
b) Tap the QAD ring again and measure the torque on the tension bolt.
c) If the torque is less than 180 pound-inches again, tighten the bolt to the torque of 240-264 pound-inches and tap the ring. Do this step again until the torque does not drop below 180 pound-inches after you tap the QAD ring.
d) Tighten the tension bolt to a torque of 240-264 pound-inches (27-30 N.m).
e) Secure the tension bolt with lockwire.

S 416-005

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

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

S 416-018
(4) Close the core cowl panels (AMM 71-11-06/201).

S 416-024
(5) Close the fan cowl panels (AMM 71-11-04/201).

S 446-023
(6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

IDG AIR/OIL HEAT EXCHANGER AND VALVE - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the integrated drive generator (IDG) air/oil heat exchanger and valve as an assembly from the airplane. The second task installs the IDG air/oil heat exchanger and valve on the airplane.

   TASK 24-11-12-024-001

2. Remove the IDG Air/Oil Heat Exchanger and Valve (Fig. 401)
   A. Equipment
      (1) Container - 2 gallon (8 liter) capacity to catch oil from heat exchanger - commercially available
      (2) Adapter, torque -PWA 85853: Pratt & Whitney, East Hartford, CT 06108
   B. References
      (1) AMM 12-13-03/301, Servicing
      (2) AMM 70-50-00/201, Standard Torque Values
      (3) AMM 72-34-03/401, Liner Segments
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Access
      (1) Location Zones
          410 Power Plant Nacelle (Left)
          420 Power Plant Nacelle (Right)
      (2) Access Panels
          413, 423 Fan Cowl Panels (Left)
          414, 424 Fan Cowl Panels (Right)
          415, 425 Thrust Reverser Panels (Left)
          416, 424 Thrust Reverser Panels (Right)
          417, 427 Core Cowl Panels (Left)
          418, 428 Core Cowl Panels (Right)
   D. Prepare for Removal

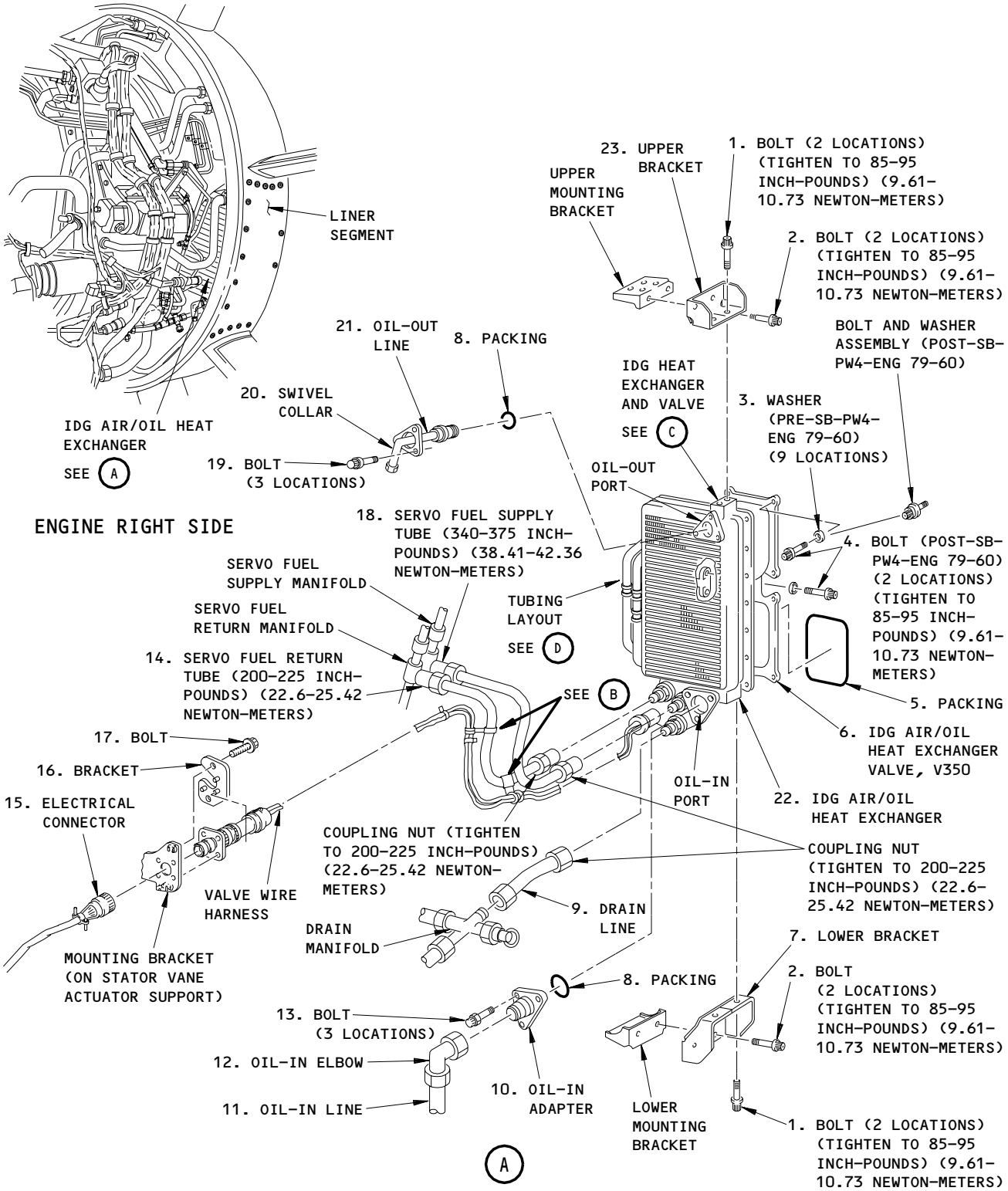
      S 014-003
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 044-004

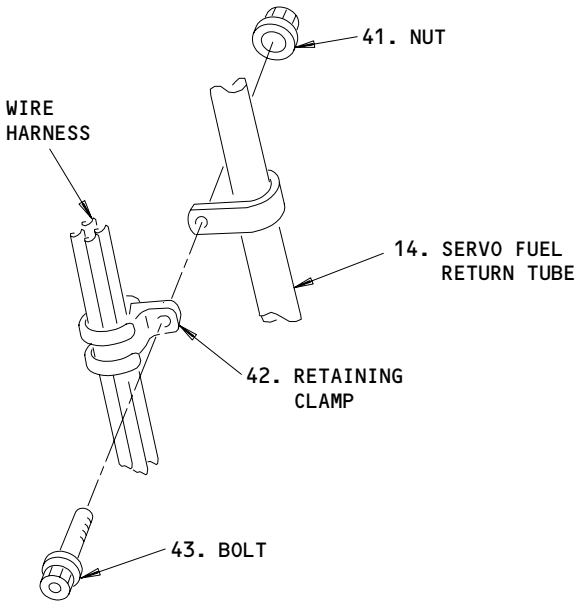
      WARNING: DO THE THRUST REVERSER DEACTIVATION PROCEDURE TO PREVENT THE OPERATION OF THE THRUST REVERSER. ACCIDENTAL OPERATION OF THE THRUST REVERSER CAN CAUSE INJURY TO YOU OR DAMAGE TO EQUIPMENT.

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

      S 014-017
      (3) Open the core cowl panels (AMM 78-31-00/201).

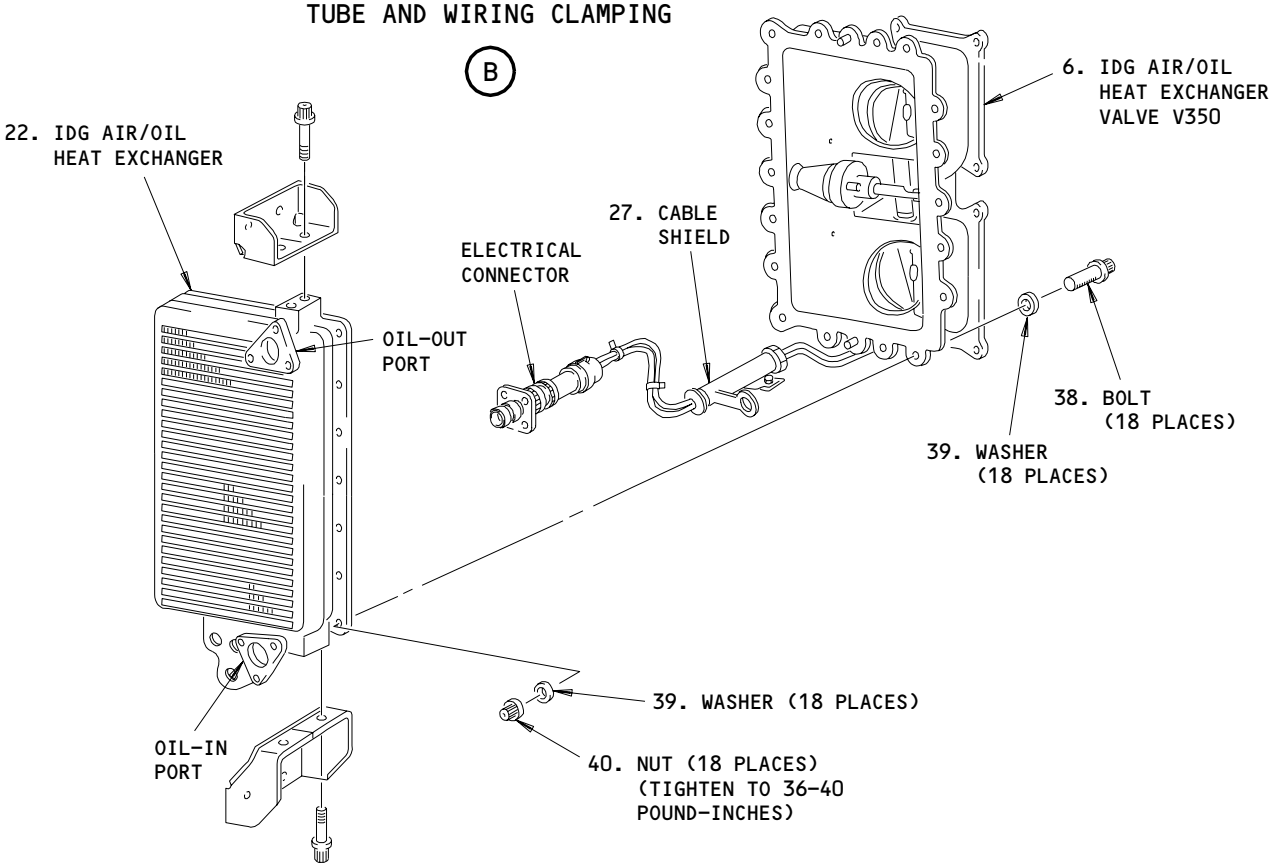


IDG Air/Oil Heat Exchanger and Valve Installation
Figure 401 (Sheet 1)



TUBE AND WIRING CLAMPING

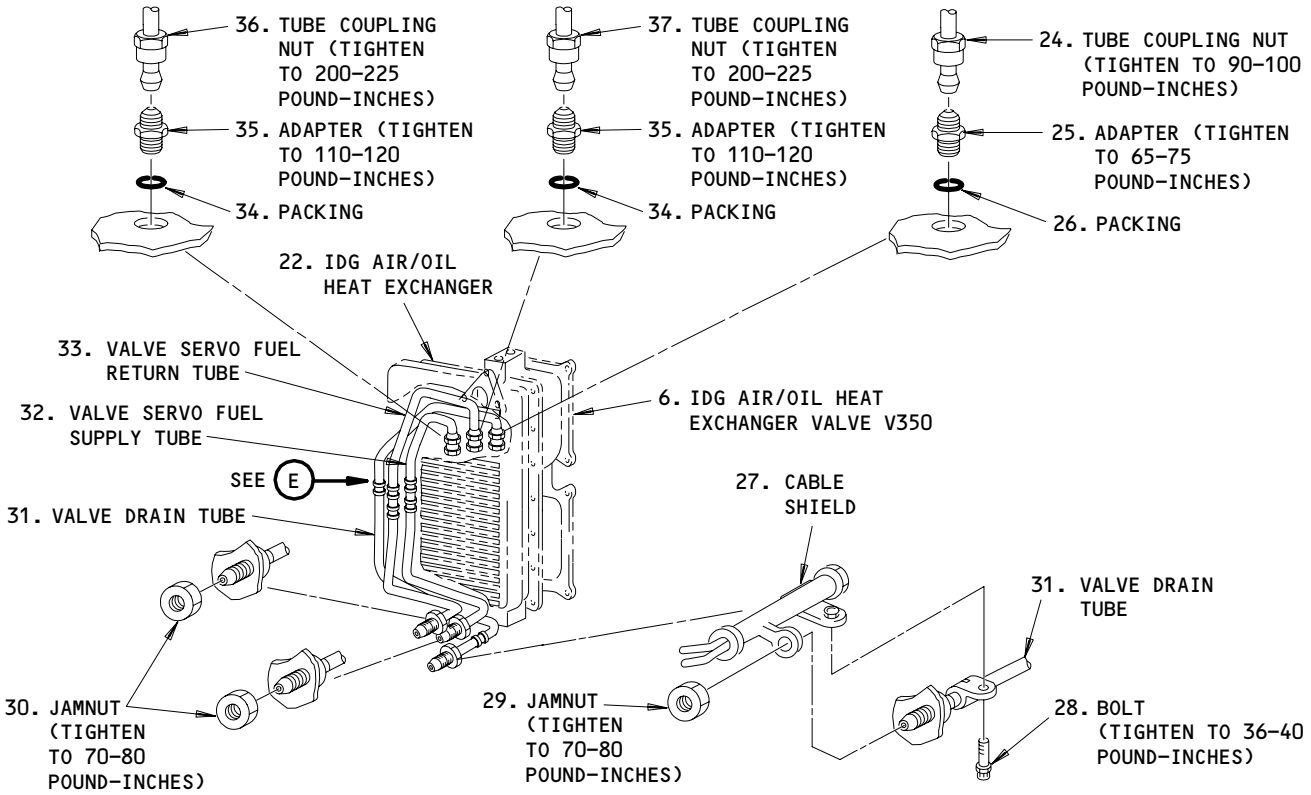
B



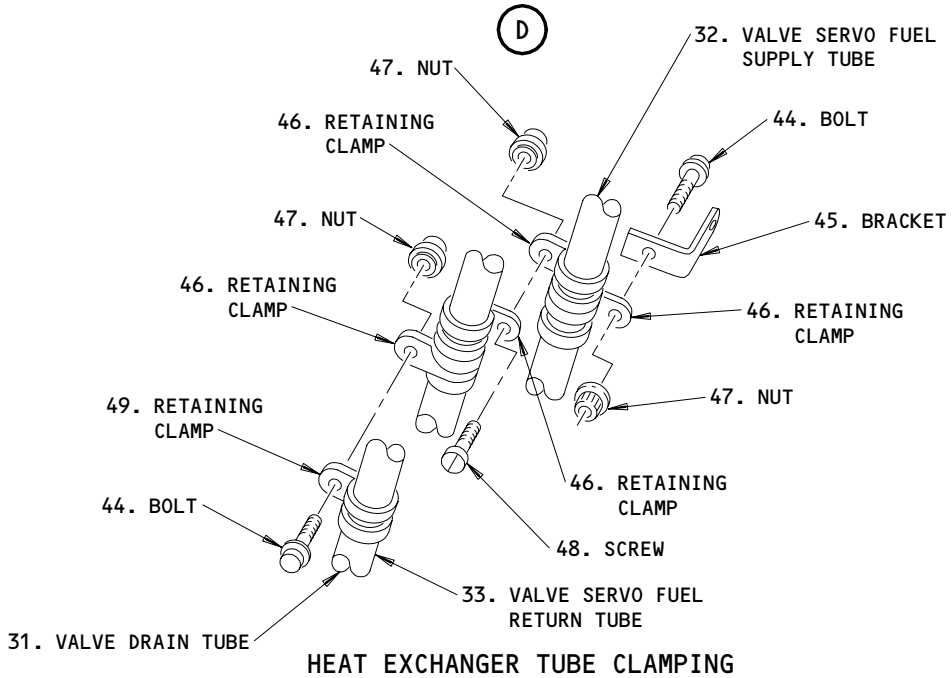
IDG HEAT EXCHANGER AND VALVE

C

IDG Air/Oil Heat Exchanger Installation
Figure 401 (Sheet 2)



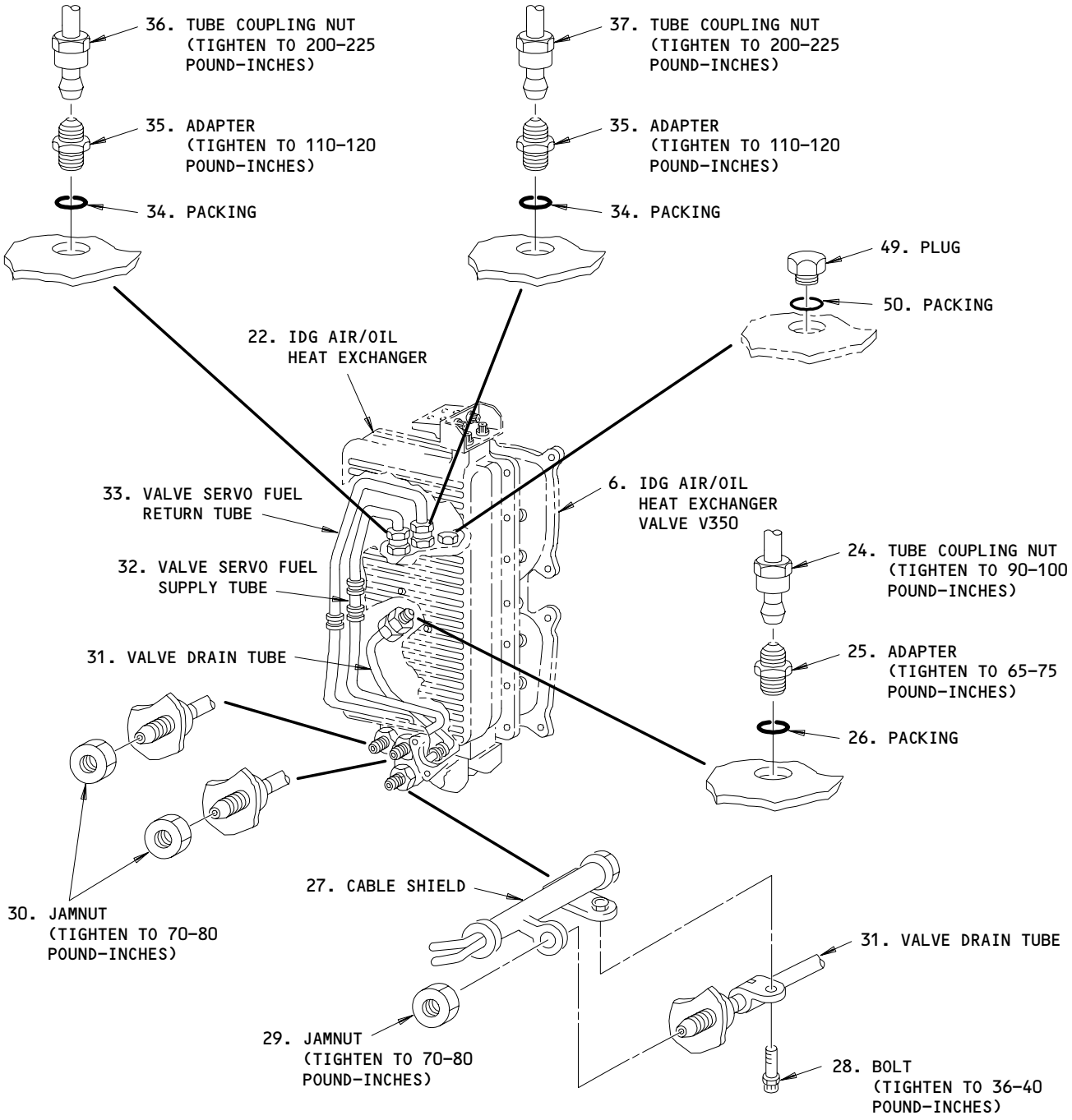
HEAT EXCHANGER TUBING LAYOUT



HEAT EXCHANGER TUBE CLAMPING

E

IDG Air/Oil Heat Exchanger and Valve Installation
Figure 401 (Sheet 3)



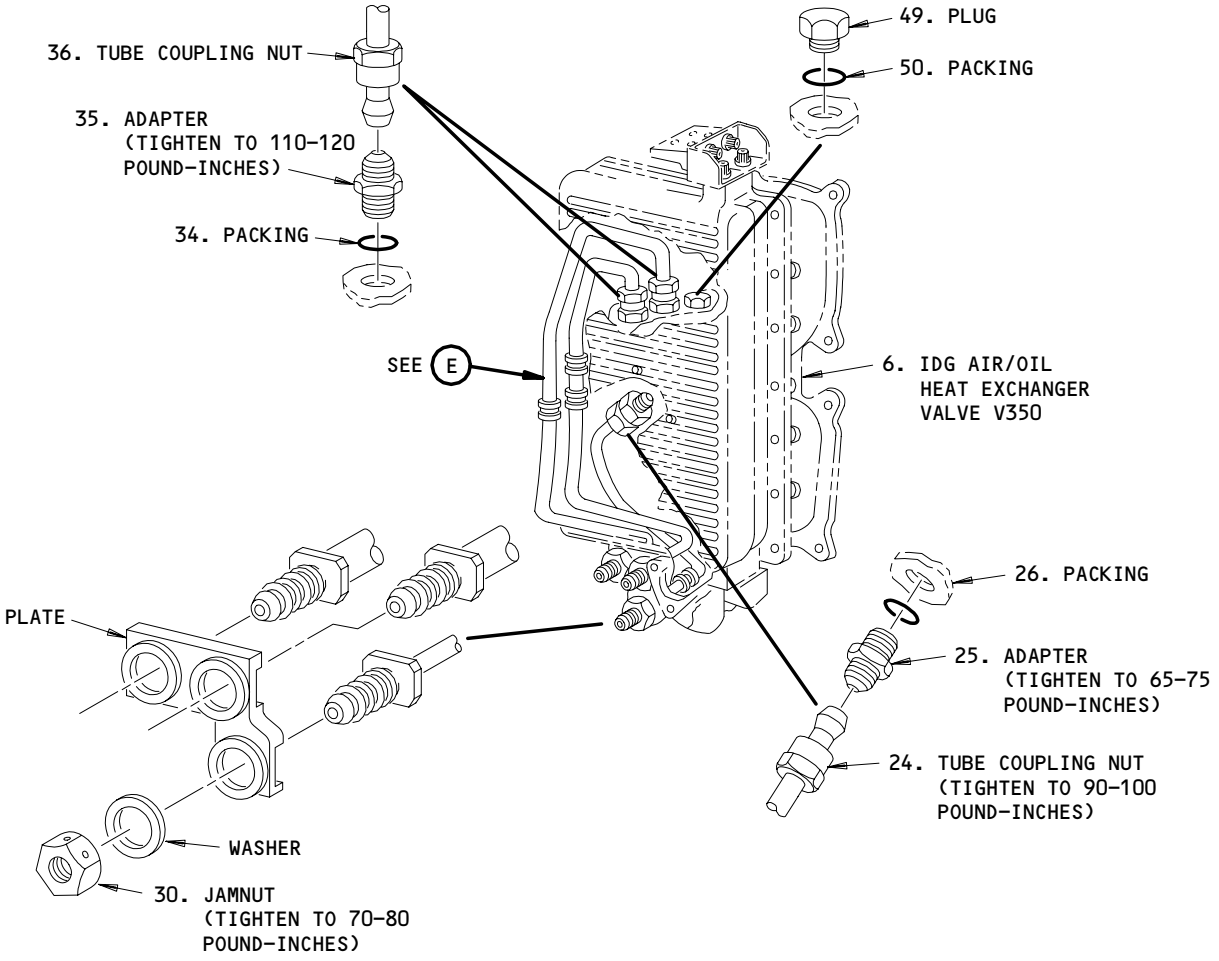
HEAT EXCHANGER TUBING LAYOUT

(D)

IDG Air/Oil Heat Exchanger Installation
Figure 401 (Sheet 4)

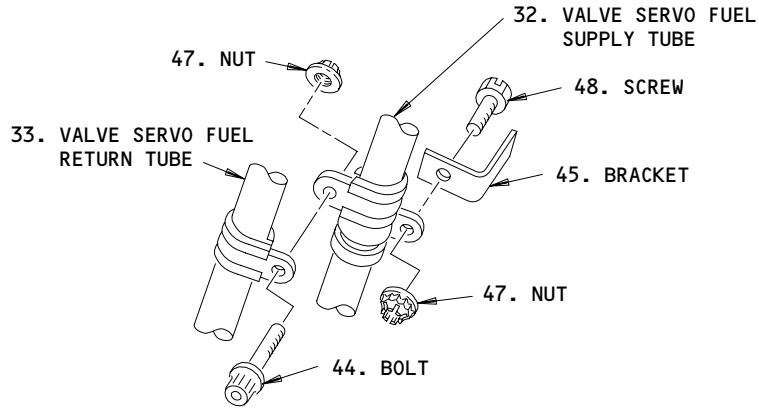
EFFECTIVITY
ENGINES WITH PRATT AND WHITNEY SB
PW4ENG 24-4

671146



HEAT EXCHANGER TUBING LAYOUT

D



HEAT EXCHANGER TUBE CLAMPING

E

L-A6820

IDG Air/Oil Heat Exchanger Installation
Figure 401 (Sheet 5)

S 014-005

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 864-006

(5) Remove the pressure from the IDG oil cooling system:
  (a) Remove the cover from the overflow drain coupling on the IDG.
  (b) Put the container below the IDG to catch the oil.
  (c) Put the end of the overflow drain hose in the container.
  (d) Connect the overflow drain hose to the IDG overflow drain coupling and allow the surplus oil to flow into the container.
  (e) Remove the overflow drain hose.

S 684-007

(6) Drain the IDG cooling oil as follows:
  (a) Put the container below the IDG to catch the oil.

  WARNING: USE EXTREME CARE WHEN YOU DRAIN THE IDG OIL. WEAR SPLASH GOGGLES, INSULATED GLOVES, AND PROTECTION GEAR. CONTACT WITH HOT OIL CAN CAUSE SERIOUS INJURY.

  (b) Remove the case drain plug (1) and O-ring (2).
  (c) Allow the oil to flow from the IDG into the container.
  (d) Discard the O-ring.

S 014-016

(7) Remove the segment liner at the 4 o'clock position of the intermediate case (AMM 72-34-03/401).

S 864-004

(8) Open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:
  (a) 11M4, L ENG IDG VALVE
  (b) 11M31, R ENG IDG VALVE

E. Procedure

S 024-005

(1) Remove the IDG air/oil heat exchanger as follows:
  (a) Disconnect the electrical connector (15) at the mounting bracket on the stator vane actuator support. Install a protective cap.
  (b) Remove the two bolts (17) and the bracket (16). Install a protective cap on the air/oil heat exchanger valve harness electrical connector.

(c) Remove the bolts (43), nuts (41), and the retaining clamps (42) which attach the valve electrical harness to the servo fuel return tube (16).

WARNING: TAKE CARE WHEN YOU REMOVE THE OIL LINES. HOT OIL FROM THE DISCONNECTED LINES CAN CAUSE INJURY.

(d) Disconnect oil-out line (21) from heat exchanger as follows. Remove the three bolts (19) which attach the swivel collar (20) to the heat exchanger.
(e) Disconnect the oil-in line (11) from heat exchanger as follows. Remove the three bolts (13) which attach the oil-in adapter (10) to the heat exchanger (22).
(f) Disconnect the drain line (9) at the heat exchanger (22).
(g) Disconnect the tube coupling nuts on the servo fuel supply tube (18) from the air/oil heat exchanger (22).
(h) Disconnect the tube coupling nuts on the servo fuel return tube (14) from the air/oil heat exchanger (22).
(i) PRE-SB PWENG 79-60;
Remove the four outboard bolts (4) and the washers (3) and loosen the four inboard bolts (4) as follows:
1) Remove the four outboard bolts and the washers that attach the valve inlet collars to the rear of the intermediate case.
2) Use the PWA 85853 torque adapter to loosen the four inboard bolts and washers that attach the valve inlet collars to the rear of the intermediate case. Do not remove the inboard bolts and washers from the intermediate case.

NOTE: The four bolt holes in the valve inlet case are slotted to make it easier to remove the heat exchanger and valve.

(j) POST-SB PWENG 79-60;
Remove the four outboard bolt and washer assemblies, and loosen the four inboard bolt and washer assemblies from the valve inlet collars as follows:
1) Remove the four outboard bolt and washer assemblies that attach the valve inlet collars to the rear of the intermediate case.
2) Use the PWA 85853 torque adapter to loosen the four inboard bolt and washer assemblies that attach the valve inlet collars to the rear of the intermediate case. Do not remove the inboard bolt and washer assemblies from the intermediate case.

NOTE: The washers are captive, part of the washer and bolt assembly.

(k) Remove the two bolts (4) and the washers (3) which attach the bracket on the forward side of the valve to the intermediate case.
(l) Remove the two bolts (1) which attach the lower bracket (7) to the IDG air/oil heat exchanger (22). Remove the two bolts (2) which attach the lower bracket (7) to the lower mounting bracket on the intermediate case. Remove the lower bracket(7).
(m) Remove the two bolts (1) which attach the upper bracket (23) to the IDG air/oil heat exchanger (22). Remove the two bolts (2) which attach the upper bracket (23) to the upper mounting bracket on the intermediate case. Remove the upper bracket(23).
(n) Remove the heat exchanger (22) and valve assembly (6) from the engine. Discard thetwo packings (5). Discard the two packings (8).
(o) Cap or plug the disconnected lines.

S 024-006
(2) If separation of the IDG air/oil heat exchanger (22) and the IDG air/oil heat exchanger valve (6) is required, continue as follows:
(a) Put the IDG air/oil heat exchanger (22) and the valve assembly (6) on a work bench.
(b) ENGINES PRE-PRATT AND WHITNEY SB PW4ENG 24-4;
Remove the two bolts (44), one screw (48), three nuts (47), and five retaining clamps (46 and 49). These items attach the tubes that connect the IDG air/oil heat exchanger (22) and the valve (6).
(c) ENGINES POST-PRATT AND WHITNEY SB PW4ENG 24-4;
Remove the one bolts (44), one screw (48), two nuts (47), and three retaining clamps (46). These items attach the tubes that connect the IDG air/oil heat exchanger (22) and the valve (6).
(d) Remove the jamnut (30) and the washer (if installed) which attach the valve servo fuel return tube (33) to the IDG air/oil heat exchanger (22).
(e) Remove the jamnut (30) and the washer (if installed) which attach the valve servo fuel supply tube (32) to the IDG air/oil heat exchanger (22).
(f) Remove the jamnut (29) and the washer (if installed) which attach the valve drain tube (31) to the IDG air/oil heat exchanger (22).
(g) Remove the bolt (28) which attach the cable shield (27) to the valve drain tube (31).
(h) Remove the 20 bolts (38), nuts (40), and washers (39) from the valve and heat exchanger mating flange.
(i) Separate the valve (6) from the heat exchanger (22).

S 024-007
(3) If a new IDG air/oil heat exchanger valve (6), is to be installed, continue as follows:
(a) Disconnect the tube coupling nut (37) on the valve servo fuel return tube (33) and remove the tube.

(b) Disconnect the tube coupling nut (36) on the valve servo fuel supply tube (32) and remove the tube.
(c) Disconnect the tube coupling nut (24) on the valve drain tube (31) and remove the tube.
(d) Remove the adapter (35) from the servo fuel supply port on the IDG air/oil heat exchanger valve (6). Discard the packing (34).
(e) Remove the adapter (35) from the servo fuel return port on the IDG air/oil heat exchanger valve (6). Discard the packing (34).
(f) Remove the adapter (25) from the valve drain port on the IDG air/oil heat exchanger valve (6). Discard the packing (26).
(g) Cap or plug the disconnected lines.
(h) ENGINES POST-PRATT AND WHITNEY SB PW4ENG 24-4;
Remove the plug (49) and discard the packing (50).

TASK 24-11-12-424-002

3. Install the IDG Air/Oil Heat Exchanger and Valve (Fig. 401)

A. Equipment
(1) Adapter, Torque - PWA 85853; Pratt & Whitney, East Hartford, CT 06108
(2) Positioner PWA 87505
(3) Crimper, Mechanical (optional) - Bergen Model M303 or M305 or M307

B. Consumable Materials
(1) Oil, Engine (AMM 20-30-04/201)
(2) Anti-seize paste, P06-054 (AMM 70-00-00/201)
(3) Lubricant - Petrolatum White VV-P-236 (AMM 20-30-04/201)
(4) Beeswax
(5) Lockwire (AS3214-02)
(6) Cable, safety (optional)
(7) Ferrule, safety cable (optional)

C. Parts
(1) Refer to the IPC for part numbers and effectivities of items in the table that follows:

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	3	Washer	24-11-14	01	30
	5	Packing			67
	6	Valve, IDG Air/Oil Heat Exchanger			65
	8	Packing			37

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
	22	Heat Exchanger, IDG Air/Oil			60
	26	Packing			125
	34	Packing			130

D. References
(1) AMM 12-13-03/301, Servicing
(2) AMM 71-00-00/501, Power Plant
(3) AMM 72-34-03/401, Liner Segments
(4) AMM 78-31-00/201, Thrust Reverser System

E. Access
(1) Location Zones
410 Power Plant Nacelle (Left)
420 Power Plant Nacelle (Right)
(2) Access Panels
413, 423 Fan Cowl Panels (Left)
414, 424 Fan Cowl Panels (Right)
415, 425 Thrust Reverser Panels (Left)
416, 424 Thrust Reverser Panels (Right)
417, 427 Core Cowl Panels (Left)
418, 428 Core Cowl Panels (Right)

F. Procedure

S 424-008
(1) If the IDG air/oil heat exchanger (22) and the valve assembly (6) were separated, continue as follows:
(a) Remove the protective plugs from the IDG air/oil heat exchanger (22) and the valve(6).
(b) Put the IDG air/oil heat exchanger valve on a bench with the two, four-hole ducts downward and the three end ports facing the operator.

(c) Put the air/oil heat exchanger (22) on the valve (6) with the three-hole tube bracket towards the operator.
(d) Attach the IDG air/oil heat exchanger (22) and bracket (45) to the valve (6). Use the bolts (38), washers (39), and nuts (40). Lubricate the bolt threads with engine oil.
(e) Tighten the nuts (40) to 36-40 pound-inches.

S 424-009
(2) If a new IDG air/oil heat exchanger valve (6) is to be installed, continue as follows:
(a) ENGINES POST-PRATT AND WHITNEY SB PW4ENG 24-4;
Install the packing (50) lubricated with Petrolatum White on the plug (49). Lubricate the plug threads with engine oil. Install the plug in the smaller port of the three ports at the end of the valve. Tighten the plug to 65-75 pound-inches.
(b) Install the packing (26), lubricated with Petrolatum White, on the drain tube adapter (25). Lubricate the adapter threads with engine oil, and install adapter in valve (6). Tighten the adapter (25) to 65-75 pound-inches.
(c) Install a packing (34), lubricated with Petrolatum White, on the servo fuel supply adapter (35). Lubricate the adapter threads with engine oil, and install in the valve (6). Tighten adapter to 110-120 pound-inches.
(d) Install a packing (34), lubricated with Petrolatum White, on the servo fuel return adapter (35). Lubricate the adapter threads with engine oil, and install in the valve (6). Tighten adapter to 110-120 pound-inches.
(e) Install the air shutoff valve drain tube as follows:
1) PRE-SB PW4ENG 79-49;
Lubricate the threads of the smaller adapter with anti-seize paste (P06-054), and attach the tube to the adapter and to the hole in tube bracket on the heat exchanger. Secure the coupling on the tube to the heat exchanger with a jamnut, threads lubricated with Engine Oil (P03-001).

2) POST-SB PW4ENG 79-49;
Lubricate the threads of the smaller adapter with anti-seize paste (PO6-054), and attach the tube to the adapter and to the hole in tube bracket on the heat exchanger with a plate between flats on the tube and the bracket. Lubricate the threads on the coupling end of the tube with Engine Oil (PO3-001) and secure it with a washer and a jamnut.

3) Torque the tube nut to 90-100 lb-in. (10.169-11.298 Nm). Torque the jamnut to 70-80 lb-in. (7.909-9.039 Nm). Lockwire or safety cable and safety cable ferrule the tube nut and the jamnut.

(f) Install the air/oil cooler valve return tube and the air/oil cooler valve hydraulic tube as follows:

1) PRE-SB PW4ENG 79-49;
Lubricate the threads of the remaining adapters with anti-seize paste (PO6-054). Attach the tubes to the remaining adapters, with the couplings on the tubes through the bracket on the heat exchanger. Lubricate the threads on the couplings with Engine Oil (PO6-003) and secure them with the jamnuts.

2) POST-SB PW4ENG 79-49;
Lubricate the threads on the remaining adapters with anti-seize paste (PO6-054). Attach the tubes to the remaining adapters, with the couplings on the tubes through the plate and the bracket on the heat exchanger. Lubricate the threads on the couplings with Engine Oil (PO3-001) and secure them to the tubes with washers and the jamnuts.

NOTE: POST-SB PW4ENG 24-7;
New CP09 and CR11 tubes with revised clamping were introduced to raise the natural frequency of these tubes well above the engine operating range.

NOTE: POST-SB PW4ENG 24-9;
Further modified CP09 and CR11 tubes and tube clamping were provided to better align and fit the tubes than those introduced on SB PW4ENG 24-7.

3) Torque the tube nuts to 200-225 lb-in. (22.597-25.422 Nm). Lockwire or safety cable and safety cable ferrule the tube nuts and the jamnuts.

(g) ENGINES PRE-PRATT AND WHITNEY SB PW4ENG 24-49;
Install the two bolts (44), one screw (48), three nuts (47) and five retaining clamps (46 and 49).These items attach the valve servo fuel supply (32), valve servo fuel return (33) and valve drain tubes (31). The tubes connect the IDG air/oil heat exchanger (22) and valve (6).

(h) ENGINES POST-PRATT AND WHITNEY SB PW4ENG 24-49;
Install one bolt (44), one screw (48), two nuts (47) and three retaining clamps (46) securing valve servo fuel supply tube (32), and valve servo fuel return tube (33) to IDG air/oil heat exchanger (22) and valve (6) assembly.

(i) Install the bolt (28), threads lubricated with engine oil, which attach the cable shield (27) to valve drain tube (31).

(j) Install the drain tube clamp to the cable shield with bolt (28), threads lubricated with engine oil.

S 424-010

(3) Install the IDG air/oil heat exchanger (22) and valve (6) as follows:

(a) Install the upper bracket (23) and lower bracket (7) on heat exchanger (22). Attach the brackets with bolts (1), threads lubricated with engine oil. Tighten bolts to 85-95 pound-inches.

(b) PRE-SB PW4ENG 79-60;
Make sure that the four inboard bolts (4) and washers (3) are installed loosely to the rear of the intermediate case as follows:

1) Make sure the four bolt threads are lubricated with engine oil P03-001 and the washers are sealed to the bolt heads with beeswax P06-015.

(c) POST-SB PW4ENG 79-60;
Make sure that the four inboard bolt washer assemblies are loosely installed in the rear of the intermediate case.

S 984-019

(4) Set the height of the inboard bolts (part of the bolt washer assembly) with a PWA 87505 positioner.

(a) Install the two packings (5), lubricated with petrolatum white, to the front of the inlet collars.

(b) Remove the protective covers, plugs, and caps from air/oil heat exchanger and mating tubes to allow proper tube alignment.

(c) Install two packing (8), lubricated with engine oil, into groove on swivel collars (10) and (20).

(d) Put the air/oil heat exchanger (22) and valve (6) assembly in the intermediate case. Align the inboard slotted holes in valve ducts with four bolts (4) installed in the intermediate case.

(e) Attach the upper bracket (23) on the heat exchanger (22) to the bracket on the intermediate case with two bolts (2), threads lubricated with engine oil. Tighten bolts the hand-tight.

(f) Attach the bracket (7) to the bracket on the intermediate case with two bolts (2), threads lubricated with engine oil. Tighten the bolts hand-tight.

(g) Attach the bracket on the forward side of the valve to the intermediate case with two bolts (4), threads lubricated with engine oil, and washers. Tighten the bolts hand-tight.

(h) PRE-SB PW4ENG 79-60;
Attach the valve inlet collars to the rear of the intermediate case as follows:

1) Lubricate the threads of the four outboard bolts (4) with engine oil P03-001.

2) Install the four outboard bolts (4) and washers (3) in the outboard holes.

3) Tighten by hand the four inboard bolts and the four outboard bolts.

(i) POST-SB PW4ENG 79-60;
Attach the valve inlet collars to the rear of the intermediate case as follows:

1) Lubricate the threads of the four outboard bolt washer assembles with engine oil P03-001.

2) Install the four outboard bolt and washer assemblies in the outboard holes.

3) Tighten by hand the four inboard bolt and washer assemblies and the four outboard bolt and washer assemblies.

CAUTION: ADJUST TORQUE WRENCH READINGS WHEN USING ADAPTER (AMM 70-50-00/201). TOO MUCH TORQUE CAN DAMAGE THREADED PARTS.

(j) Use the torque adapter to tighten the previously installed bolts and bolt washer assemblies to 85-95 pound-inches.

(k) Connect the air/oil heat exchanger oil-out line (21) to the heat exchanger oil out port as follows:
   1) Connect the oil-out line (21), which attach the swivel collar (20) to the heat exchanger (22) with three bolts (19), threads lubricated with engine oil. Tighten bolts (19).

(l) Install the air/oil heat exchanger valve servo fuel return tube (14) as follows:
   1) Lubricate the tube coupling nut threads with antiseize compound and connect the valve fuel return tube (14) to the air/oil heat exchanger (22).
   2) Tighten the coupling nut on the heat exchanger end to 200-225 pound-inches.
   3) Tighten the coupling nut on the manifold end to 200-225 pound-inches.
   4) Lockwire or safety cable and safety cable ferrule the tube nut.

(m) Install the air/oil heat exchanger valve servo fuel supply tube (18) as follows:
   1) Remove the protective plugs from the IDG air/oil heat exchanger valve servo fuel supply tube (18).
   2) Lubricate the tube coupling nut threads with antiseize compound and connect the tube (smaller nut) to the air/oil heat exchanger (22) and the servo fuel supply manifold.
   3) Tighten the coupling nut on the heat exchanger end to 200-225 pound-inches.
   4) Tighten the coupling nut on the manifold end to 340-375 pound-inches.
   5) Lockwire or safety cable and safety cable ferrule the tube nuts.

(n) Install the air/oil heat exchanger drain line (9) as follows:
   1) Remove the protective plugs from the heat exchanger.
   2) Lubricate the drain line (9) coupling nut with antiseize compound and connect the tube to the overboard drain connection at the heat exchanger (22).
   3) Tighten the nut to 140-160 pound-inches.
   4) Lockwire or safety cable and safety cable ferrule the tube nut.

(o) Remove the protective cap from the valve electrical connector. Put the connector between the bracket (16) and the mounting bracket on the stator vane actuator support. Align the holes in the connector flange with the holes in the brackets. Attach the connector with the bolts (17), threads lubricated with antiseize compound. Tighten the nuts on valve cable connector.

(p) Connect the air/oil heat exchanger oil-in line (11) to the heat exchanger oil-in port as follows:

   1) Install the oil-in line (11), which attach the swivel collar (10) to heat exchanger (22). Use the three bolts (13), with the threads lubricated with engine oil. Tighten the bolts.

(q) Connect the electrical connector (15) to the IDG air/oil heat exchanger valve electrical connectors.

S 864-011

(5) Remove the DO-NOT-CLOSE tags, and close these P11 circuit breakers:
(a) 11M4, L ENG IDG VALVE
(b) 11M31, R ENG IDG VALVE

S 414-012

(6) Install the liner segment (AMM 72-34-03/401).

S 614-013

(7) Fill the IDG with oil (AMM 12-13-03/301).

S 444-014

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.

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

S 444-018

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

S 714-015

(10) Test the engine in accordance with the Power Plant Reference Table (AMM 71-00-00/501).

IDG AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SWITCH - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks. The first task removes the IDG air/oil heat exchanger valve override switch. The second task installs the IDG air/oil heat exchanger valve override switch.

TASK 24-11-13-004-001

2. Remove IDG Air/Oil Heat Exchanger Valve Override Switch (Fig. 401)
   A. References
      (1) AMM 72-34-03/401, Fan Exit Liner Segment
      (2) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zones
          410 Left Power Plant Nacelle
          411 Right Power Plant Nacelle

      (2) Access Panels
          416 426 Thrust Reverser Panels Right

   C. Prepare for Removal

      S 864-002
      (1) Open these circuit breakers on the overhead panel P11 and attach DO-NOT-CLOSE tags:
          (a) 11M4, L ENG IDG VALVE
          (b) 11M31, R ENG IDG VALVE

      S 044-003

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

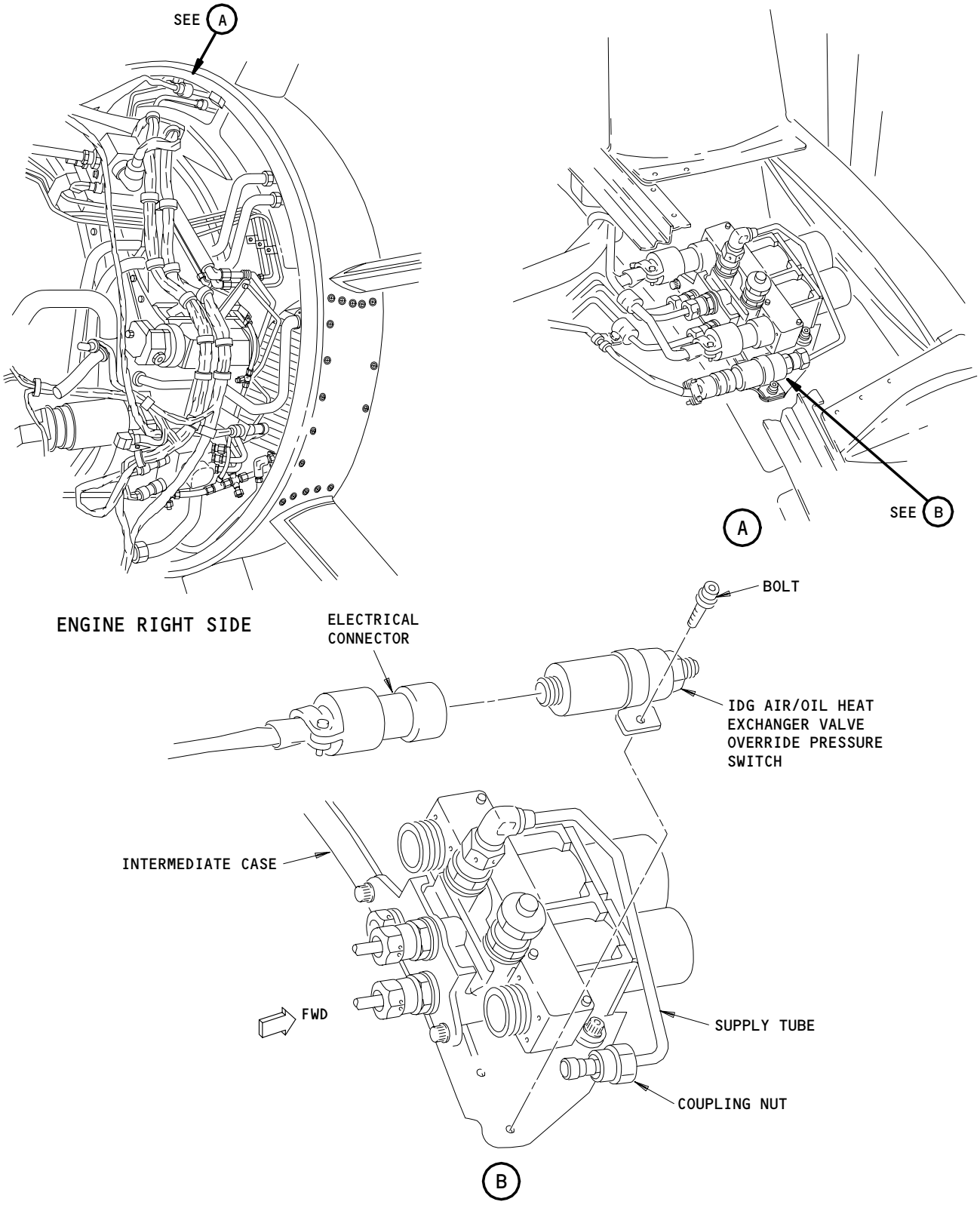
      (2) Do this procedure: Thrust Reverser Deactivation for Ground Maintenance (AMM 78-31-00/201).

      S 014-004

      WARNING: FAILURE TO FOLLOW AMM 78-31-00/201 WHEN OPENING THRUST REVERSERS COULD RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

      (3) Open the right thrust reverser (AMM 78-30-00/201).

      S 024-014
      (4) Remove the fan exit liner segment No. 1 (AMM 72-34-03/401).



IDG Air/Oil Heat Exchanger Valve Override Switch Installation
Figure 401

D. Remove Switch

S 024-005

(1) Do these steps:

(a) Disconnect the electrical connector from the switch.

(b) Disconnect the supply tube from the switch.

(c) Remove the two bolts which attach the switch to the bracket and remove the switch.

S 034-006

(2) Install protective caps on the switch, the electrical connector, and the supply tube.

TASK 24-11-13-404-007

3. Install IDG Air/Oil Heat Exchanger Valve Override Switch (Fig. 401)

A. Consumable Materials

(1) D00005 Antiseize Compound - Fel-Pro 2000

B. References

(1) AMM 72-34-03/401, Fan Exit Liner Segment

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

C. Access

(1) Location Zones

410 Left Power Plant Nacelle

411 Right Power Plant Nacelle

(2) Access Panels

416 426 Thrust Reverser Panels Right

D. Install the switch.

S 434-008

(1) Remove protective caps from the switch, the electrical connector and the supply tube.

S 424-009

(2) Do these steps:

(a) Put the switch on the bracket, with the electrical connector aft. Attach the switch with two bolts, that have threads lubricated with engine oil. Tighten bolts to 36-40 pound-inches.

(b) Lubricate adapter threads with antiseize compound and connect the supply tube coupling nut. Tighten coupling nut to 65-70 pound-inches.
(c) Connect the electrical connector to the switch.

S 414-010

(3) Install fan exit liner segment No. 1 (AMM 72-34-03/401).

S 414-011

WARNING: FAILURE TO FOLLOW AMM 78-31-00/201 WHEN CLOSING THRUST REVERSERS COULD RESULT IN INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

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

S 444-012

(5) Activate the thrust reverser (AMM 78-31-00/201).

S 864-013

(6) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead panel P11:
(a) 11M4, L ENG IDG VALVE
(b) 11M31, R ENG IDG VALVE

OIL LEVEL INDICATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) The first task removes the integrated drive generator (IDG) oil level indicator from the airplane.
      (2) The second task installs the IDG oil level indicator on the airplane.

TASK 24-11-19-024-001

2. Remove the Oil Level Indicator (Fig. 401)
   A. Equipment
      (1) Container - 1 gallon container to catch oil drainage.
   B. References
      (1) AMM 12-13-03/301, Servicing
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 71-11-06/201, Core Cowl Panels
      (4) AMM 78-31-00/201, Thrust Reverser System
   C. Prepare for the Removal

S 044-004

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

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

S 014-003

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

S 014-006

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

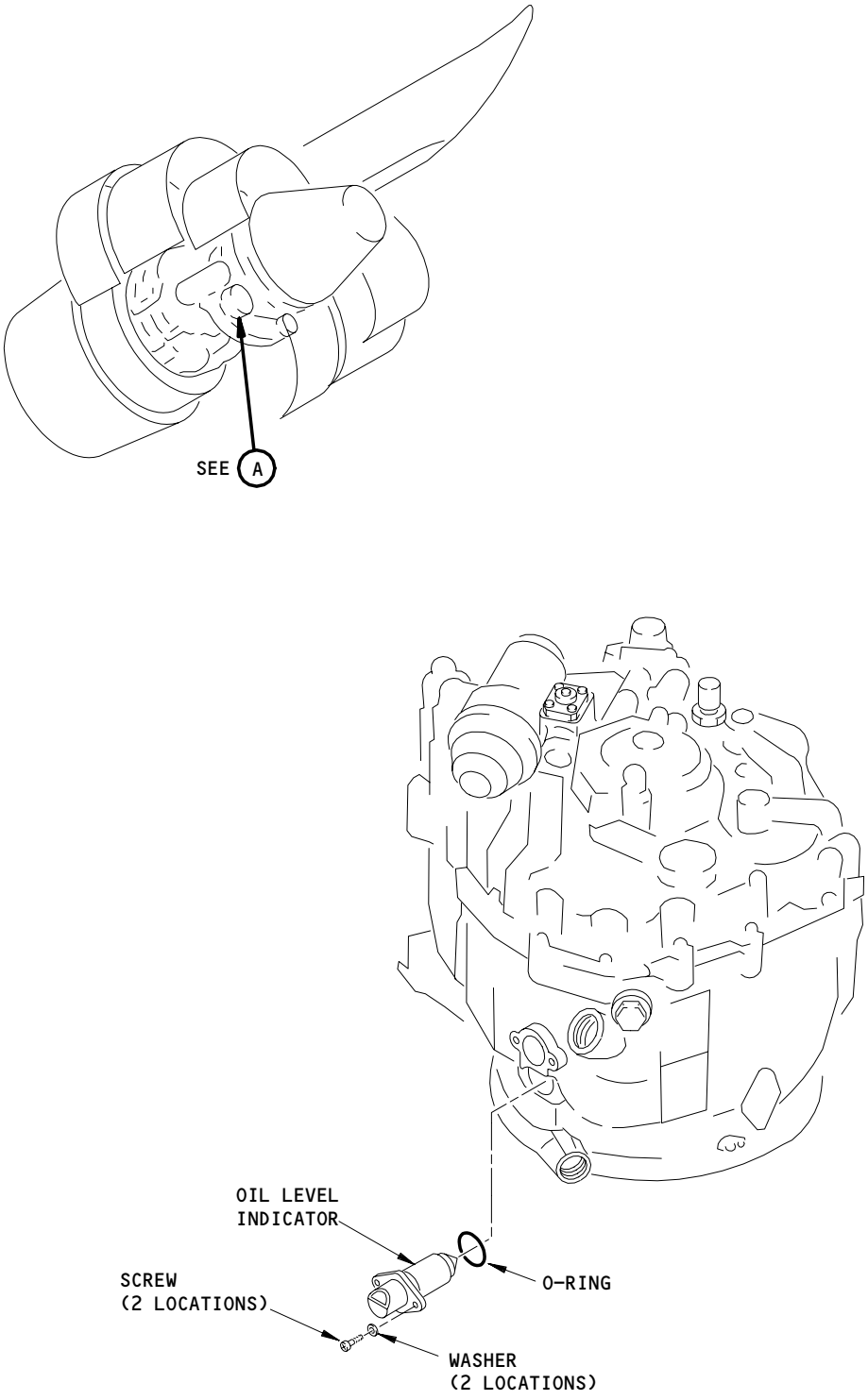
S 014-010

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

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

S 684-012

(5) Do this task, IDG Oil Drain (AMM 12-13-03/301).



Oil Level Indicator
Figure 401

D. Procedure

S 024-012

(1) Remove the oil level indicator as follows:

(a) Put the container under the oil level indicator.

WARNING: USE CARE WHEN REMOVING THE INDICATOR. HOT OIL MAY FLOW FROM THE OIL LEVEL INDICATOR WHEN IT IS REMOVED. HOT OIL CAN CAUSE SERIOUS INJURY.

(b) Remove two retaining screws from oil level indicator. Keep both retating screws and washers.

WARNING: USE CARE WHEN REMOVING THE INDICATOR. THE INDICATOR IS EASY TO BREAK.

(c) Remove the indicator. Allow the oil to flow into the container.

(d) Discard the O-ring.

TASK 24-11-19-424-018

3. Install the Oil Level Indicator (Fig. 401)

A. References

(1) AMM 12-13-03/301, Servicing

(2) AMM 71-00-00/501, Power Plant Adjustment Test

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

(4) AMM 71-11-06/201, Core Cowl Panels

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

B. Procedure

S 424-019

(1) Install the oil level indicator as follows:

(a) Lubricate and install a new O-ring on the indicator.

WARNING: USE CARE WHEN WORKING ON THE INDICATOR. THE INDICATOR IS EASY TO BREAK.

(b) Install the indicator in the indicator cavity on IDG.

(c) Install two indicator retaining screws with washers. Torque retaining screws to 51-56 inch-lbs.

S 614-020

(2) Do this task, IDG Oil Servicing (AMM 12-13-03/301).

S 414-022

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

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

S 414-023
(4) Close the core cowl panels (AMM 71-11-06/201).

S 414-029
(5) Close the fan cowl panel (AMM 71-11-04/201).

S 444-026
(6) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 864-025
(7) Motor the engine (AMM 71-00-00/501).

S 794-015
(8) Check the IDG oil level indicator for leaks.

IDG TERMINAL BLOCK ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks:
      (1) IDG Terminal Block Removal.
      (2) IDG Terminal Block Assembly Installation.

TASK 24-11-20-004-001

2. IDG Terminal Block Assembly Removal (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-11-06/201, Core Cowl Panels
      (3) AMM 78-31-00/201, Thrust Reverser System
   B. Access
      (1) Location Zone

212	Flight Compartment
410	Power Plant Nacelle (Left Engine)
420	Power Plant Nacelle (Right Engine)

      (2) Access Panel

413, 423	Fan Cowl Panels (Left)
414, 424	Fan Cowl Panels (Right)
415, 425	Thrust Reverser Panels (Left)
416, 426	Thrust Reverser Panels (Right)
417, 427	Core Cowl Panels (Left)
418, 428	Core Cowl Panels (Right)

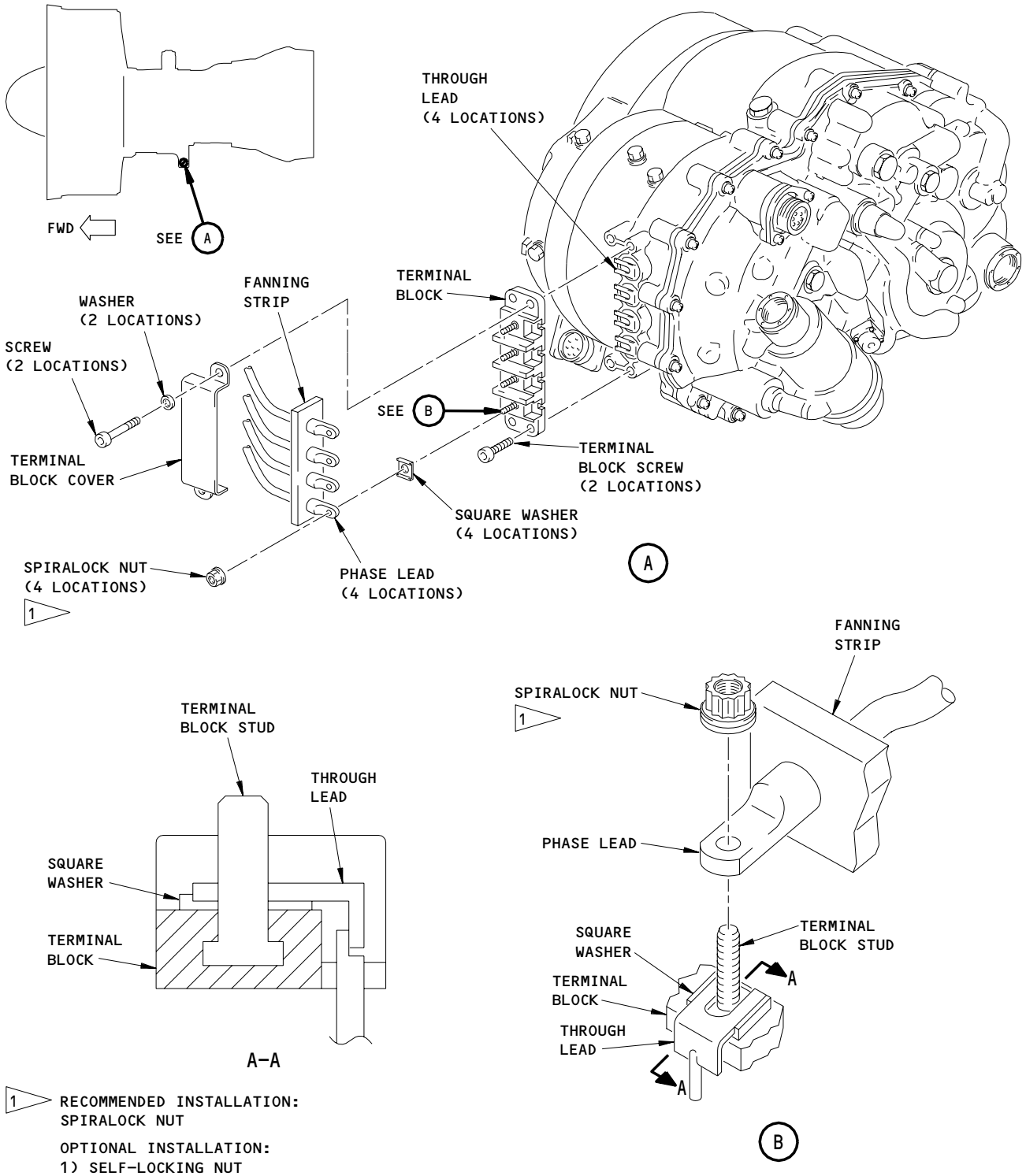
   C. Prepare for Removal

      S 864-002
      (1) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
      (a) 6B5, L GEN DRIVE DISC
      (b) 6B6, R GEN DRIVE DISC

      S 044-004

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

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



1 RECOMMENDED INSTALLATION:
SPIRALOCK NUT

OPTIONAL INSTALLATION:
1) SELF-LOCKING NUT
2) TERMINAL NUT AND WASHER

IDG Terminal Block Assembly
Figure 401

S 014-005
(3) Open the fan cowl panels (AMM 71-11-04/201).

S 014-006
(4) Open the core cowl panels (AMM 71-11-06/201).

S 014-011

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

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

D. Procedure

S 034-012
(1) Loosen the screws and remove the terminal block cover. Do not remove the screws and washers from the terminal block unless the terminal block is damaged.

S 034-013
(2) Remove the spiralock nuts, the self-locking nuts, or the terminal nuts and washers on the terminal studs.

S 034-015
(3) Remove the four phase leads.

S 034-016
(4) Remove the terminal block screws.

S 024-017
(5) Do these steps to remove the terminal block:
(a) Push the terminal block to the input end of the IDG to remove it from the through leads.

(b) Remove the terminal block from the IDG.

S 034-018

(6) Remove the square washers from the terminal block.

TASK 24-11-20-404-019

3. Terminal Block Assembly Installation (Fig. 401)

A. References

(1) AMM 71-11-04/201, Fan Cowl Panels
(2) AMM 71-11-06/201, Core Cowl Panels
(3) AMM 78-31-00/201, Thrust Reverser System
(4) AMM 24-11-00/501, Integrated Drive Generator

B. Access

(1) Location Zone

212	Flight Compartment
410	Power Plant Nacelle (Left Engine)
420	Power Plant Nacelle (Right Engine)

(2) Access Panel

413, 423	Fan Cowl Panels (Left)
414, 424	Fan Cowl Panels (Right)
415, 425	Thrust Reverser Panels (Left)
416, 426	Thrust Reverser Panels (Right)
417, 427	Core Cowl Panels (Left)
418, 428	Core Cowl Panels (Right)

C. Procedure

S 434-020

(1) Install the square washers on the terminal block.

S 424-021

(2) Do these steps to install the terminal block:

CAUTION: MAKE SURE THE SQUARE WASHERS ARE PUT BELOW THE THROUGH LEAD STRAPS. IF YOU INSTALL THE WASHERS INCORRECTLY, IT WILL CAUSE TOO MUCH HEAT AND DAMAGE THE IDG.

(a) Put the terminal block and the square washers below the through lead straps.

(b) Make sure the square washers are below the through lead straps.
(c) Install the terminal block screws. Tighten the screws to 20-22 pound-inches (2.26-2.48 N.m).

S 434-023
(3) Do these steps to install the phase leads:

CAUTION: DO NOT PUT ANY WASHERS BELOW THE PHASE LEADS. IF YOU PUT WASHERS BELOW THE PHASE LEADS, THE TERMINAL BLOCK WILL BECOME TOO HOT AND DAMAGE THE IDG.

(a) Install the four phase leads on the terminal block studs.
(b) Make sure the four phase leads are on the correct studs.
(c) Install the spiralock nuts, the self-locking nuts, or the washers and terminal nuts on the terminal studs.

CAUTION: MAKE SURE THAT YOU TIGHTEN THE NUTS TO THE SPECIFIED TORQUE VALUE. A LOW TERMINAL NUT TORQUE WILL CAUSE LOW CONDUCTIVITY OF THE PHASE LEAD. LOW PHASE LEAD CONDUCTIVITY WILL RESULT IN RESISTANCE HEATING AND BURNING OF THE PHASE LEAD AND THE TERMINAL BLOCK.

(d) Tighten the terminal nuts to 144-168 pound-inches. Make sure the terminal studs do not rotate when the terminal nuts are tight. If the terminal studs rotate when the nuts are tight, replace the terminal block.

NOTE: The torque value is the same for all the nuts. A torque wrench adapter might be useful to tighten the nuts to the specified torque value.

S 434-026
(4) Install the terminal block cover with washers and screws.
(a) Tighten the screws to 20-22 pound-inches (2.26-2.48 N.m).

S 414-028

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

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

S 414-029
(6) Close the core cowl panels (AMM 71-11-06/201).

S 414-034
(7) Close the fan cowl panel (AMM 71-11-04/201).

S 444-035

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

S 864-040

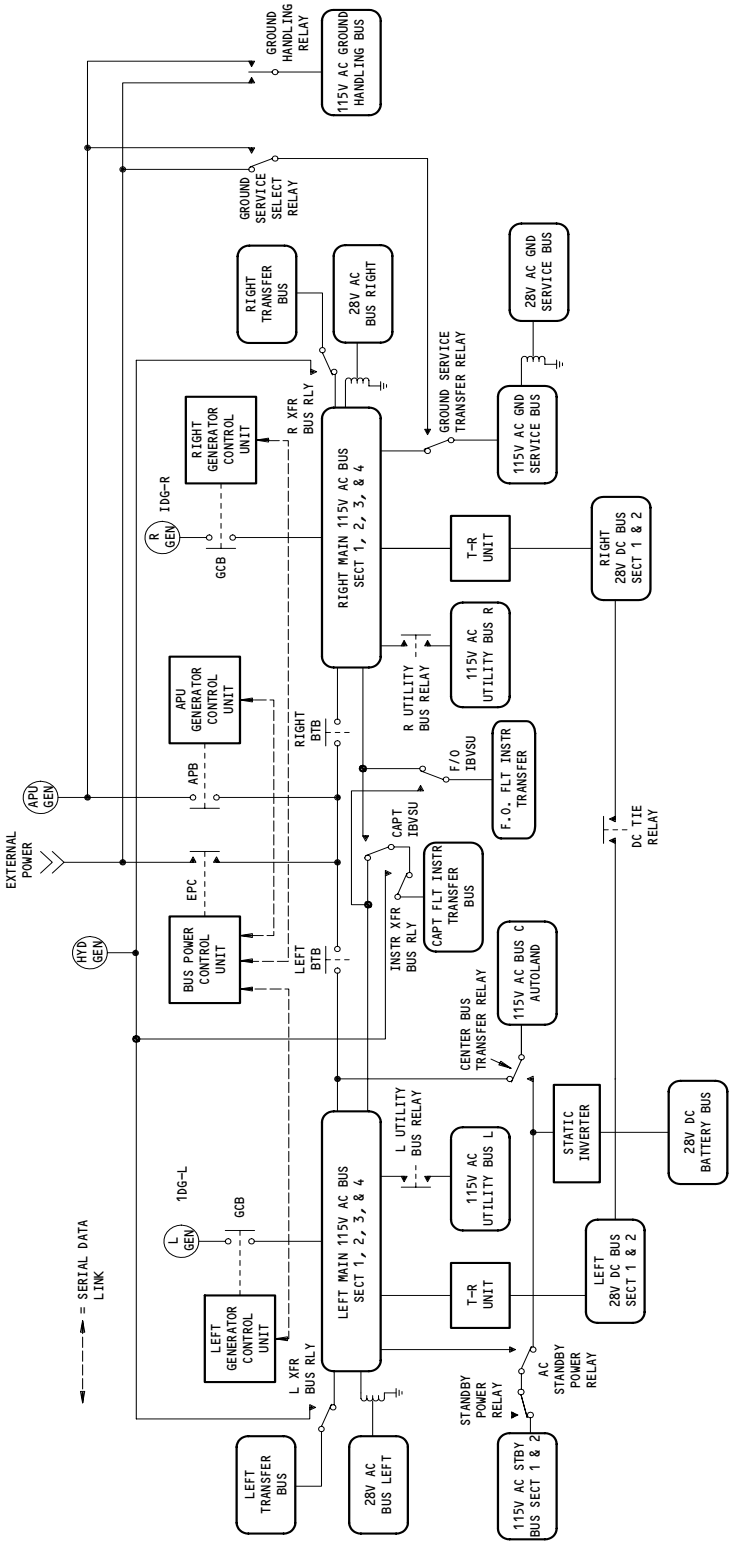
(9) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6B5, L GEN DRIVE DISC
(b) 6B6, R GEN DRIVE DISC

S 724-041

(10) Do the IDG Operation Test, the Disconnect Test, and the Reset test (AMM 24-11-00/501).

AC GENERATION - DESCRIPTION AND OPERATION

1. General (Fig. 1, 2, 3)
   A. The ac generation system consists of two integrated drive generators (IDGs), one auxiliary power unit (APU) generator, and an external power source receptacle. All sources are rated to supply 115/200-volt, 3-phase, 400-Hz, 90-kva ac power continuously, 112.5-kva for 5 minutes, and 150 kva for 5 seconds. System control and protection is provided by units in the electrical/electronics equipment compartment.
   B. Two IDGs, one mounted to the accessory gearbox of each engine, supply main power (AMM 24-11-00).
   C. The APU generator is mounted to, and driven by, the APU. On the ground, the unit can supply ground service, ground handling, and/or main power. Inflight, the APU generator is a substitute power source for either IDG (AMM 24-21-00).
   D. External power may be connected to supply ground service, ground handling, and/or main power (AMM 24-41-00).
   E. The power system includes three generator control units (GCUs). One GCU provides protection and control for each IDG. The third GCU controls the APU generator. The GCUs work with flight compartment switches to control breakers connecting power to the main ac, and ac tie buses (AMM 24-22-00). The three GCUs are interchangeable.
   F. The bus power control unit (BPCU) oversees system operation. Each GCU is connected to the BPCU through a serial data link. The BPCU sends commands and exchanges system status with the GCUs. The BPCU controls external power, ground service, and ground handling operation (AMM 24-41-00).
   G. Built-in-test equipment (BITE) in the GCUs and BPCU checks operation of the units and stores fault information. BITE information is shown on the BPCU display (AMM 24-23-00).
   H. Control switches are on electrical systems control panel M10063. This panel is on pilots' overhead panel P5. Electrical system indications such as AC and DC load, frequency, and voltage appear on the ELEC/HYD page of the engine indication and crew alerting system (EICAS) display (AMM 31-41-00). The EICAS display panel is P2. This ELEC/HYD page is for maintenance functions only and is not accessible to the crew in - flight.
   I. A hydraulic motor driven generator is provided as a non-time-limited backup source of electrical power. It comes on line automatically when power is lost at both main AC busses. The system is rated to supply 115/200 volt, 3-phase 5 kva ac power continuously.



AC Generation Block Diagram
Figure 1

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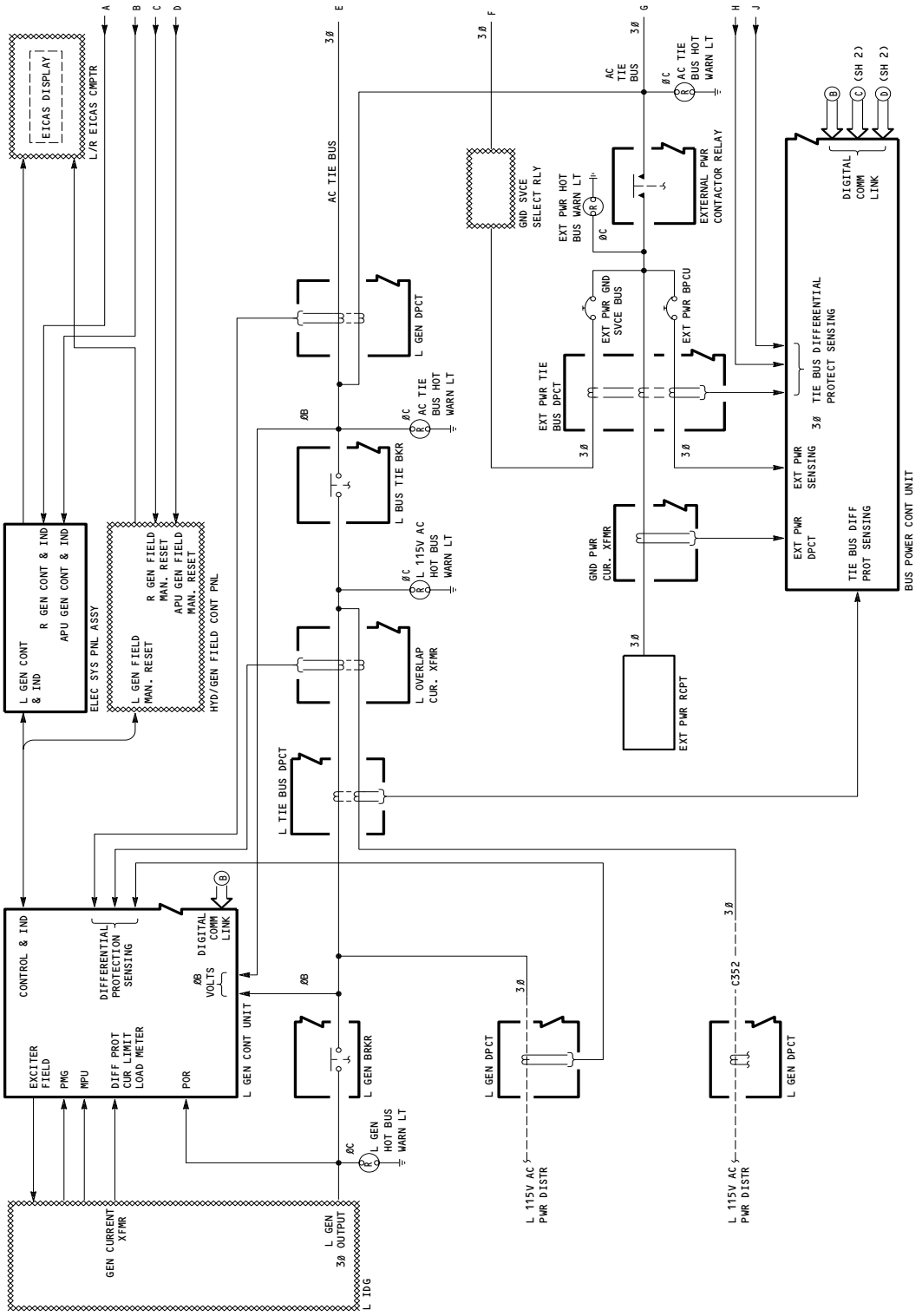
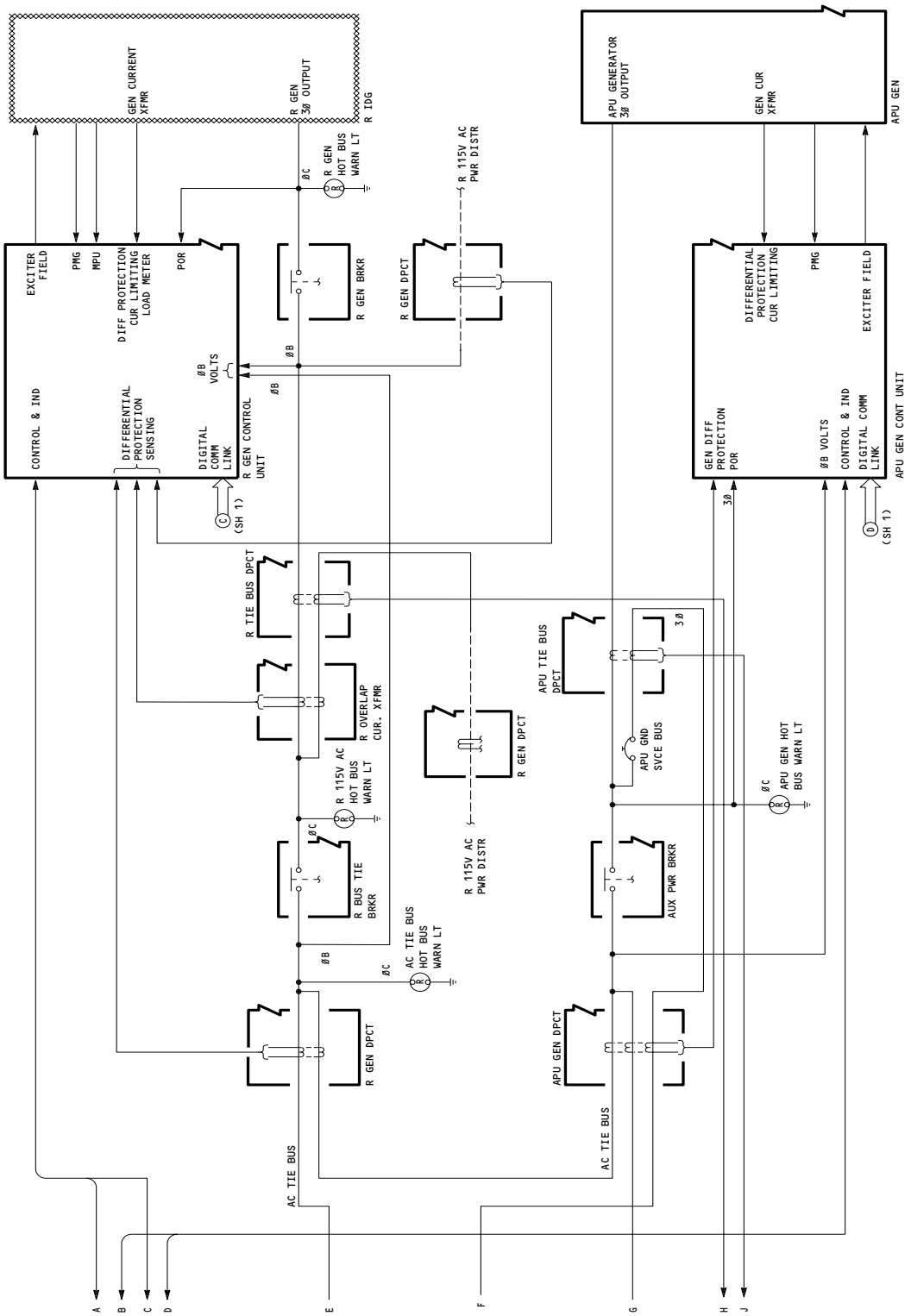


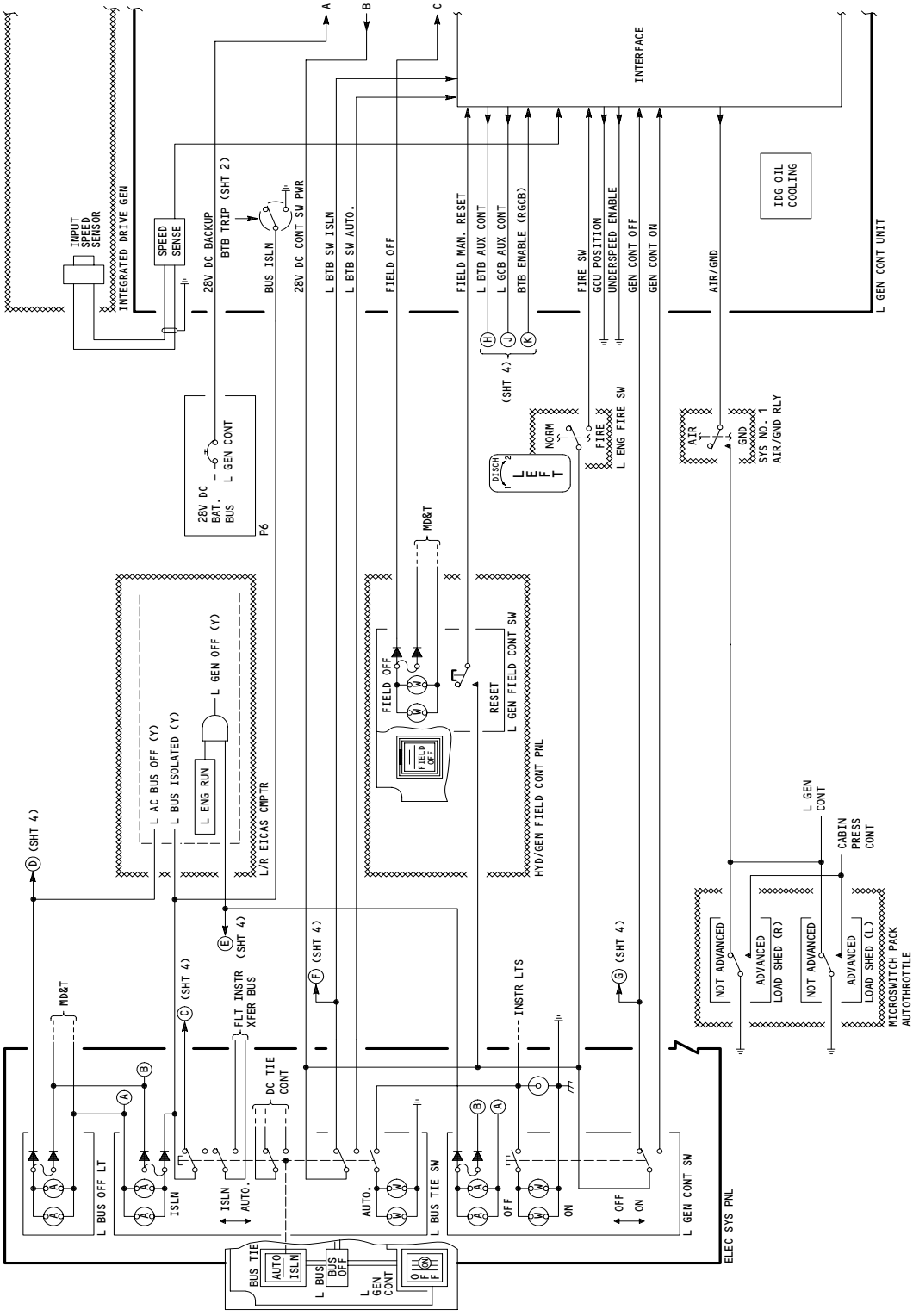
AC Power Generation Schematic
Figure 2 (Sheet 1)

82628

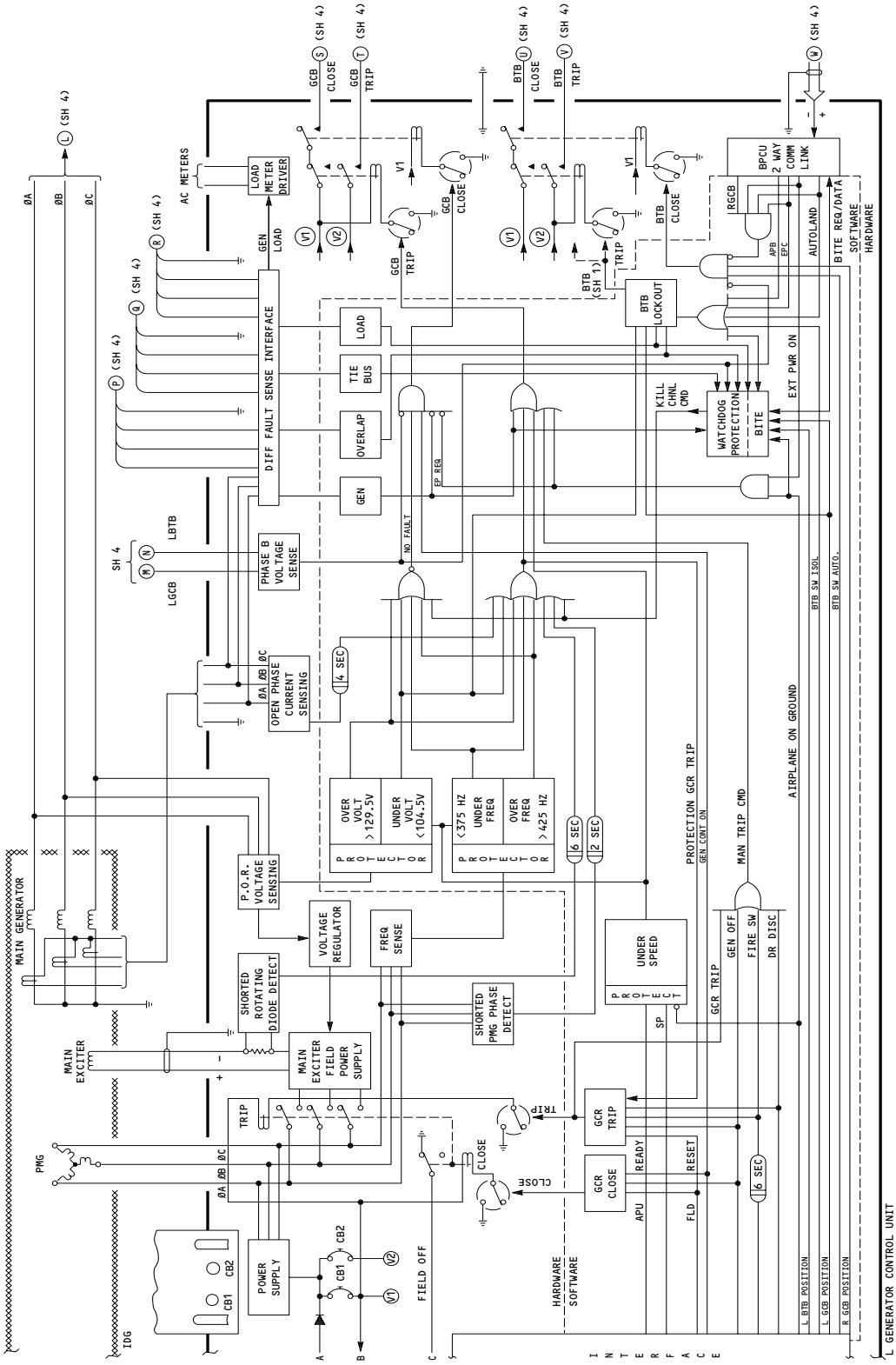


AC Power Generation Schematic
Figure 2 (Sheet 2)

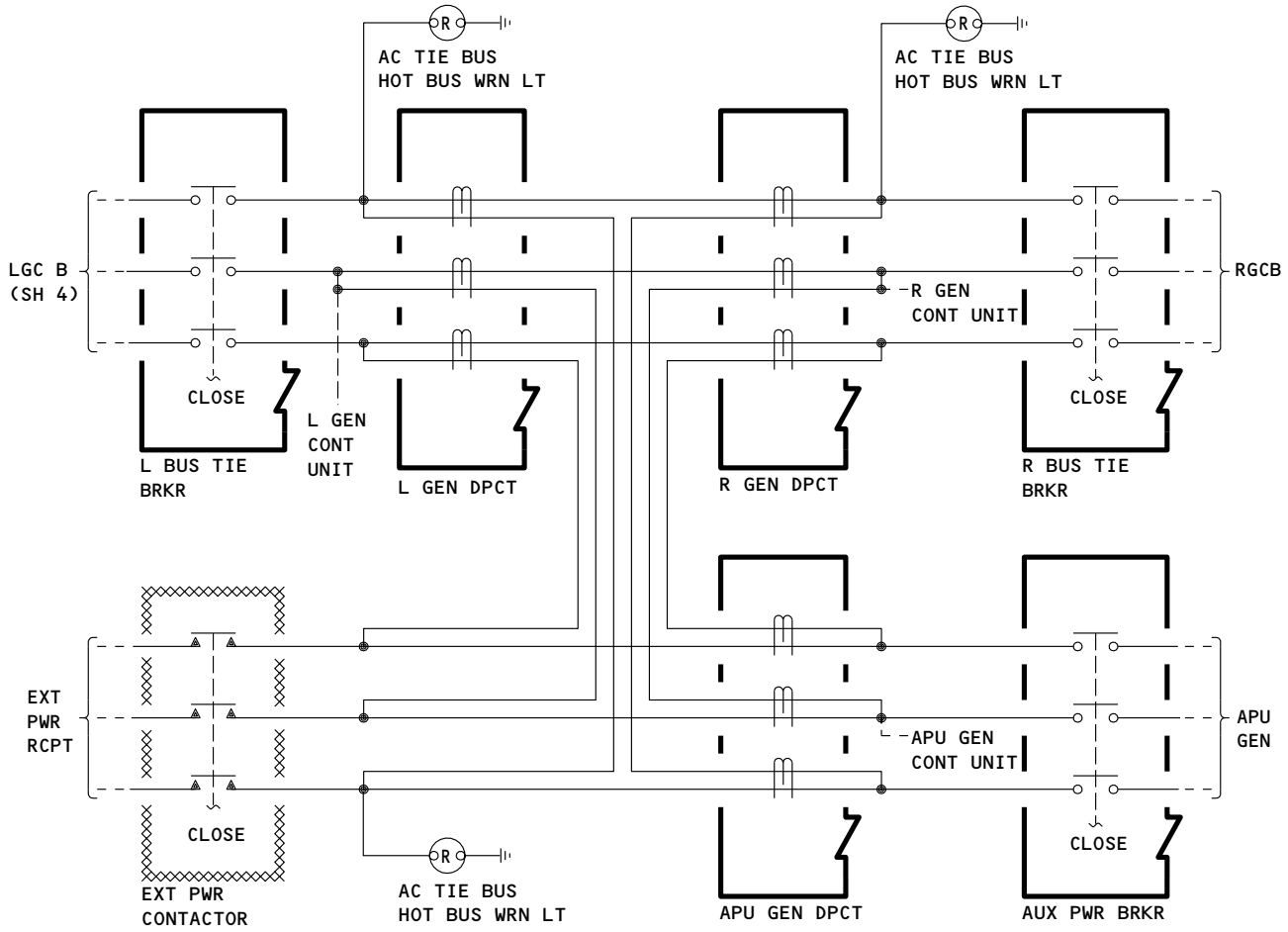
9G9G



Left Generator Control Schematic
Figure 3 (Sheet 1)

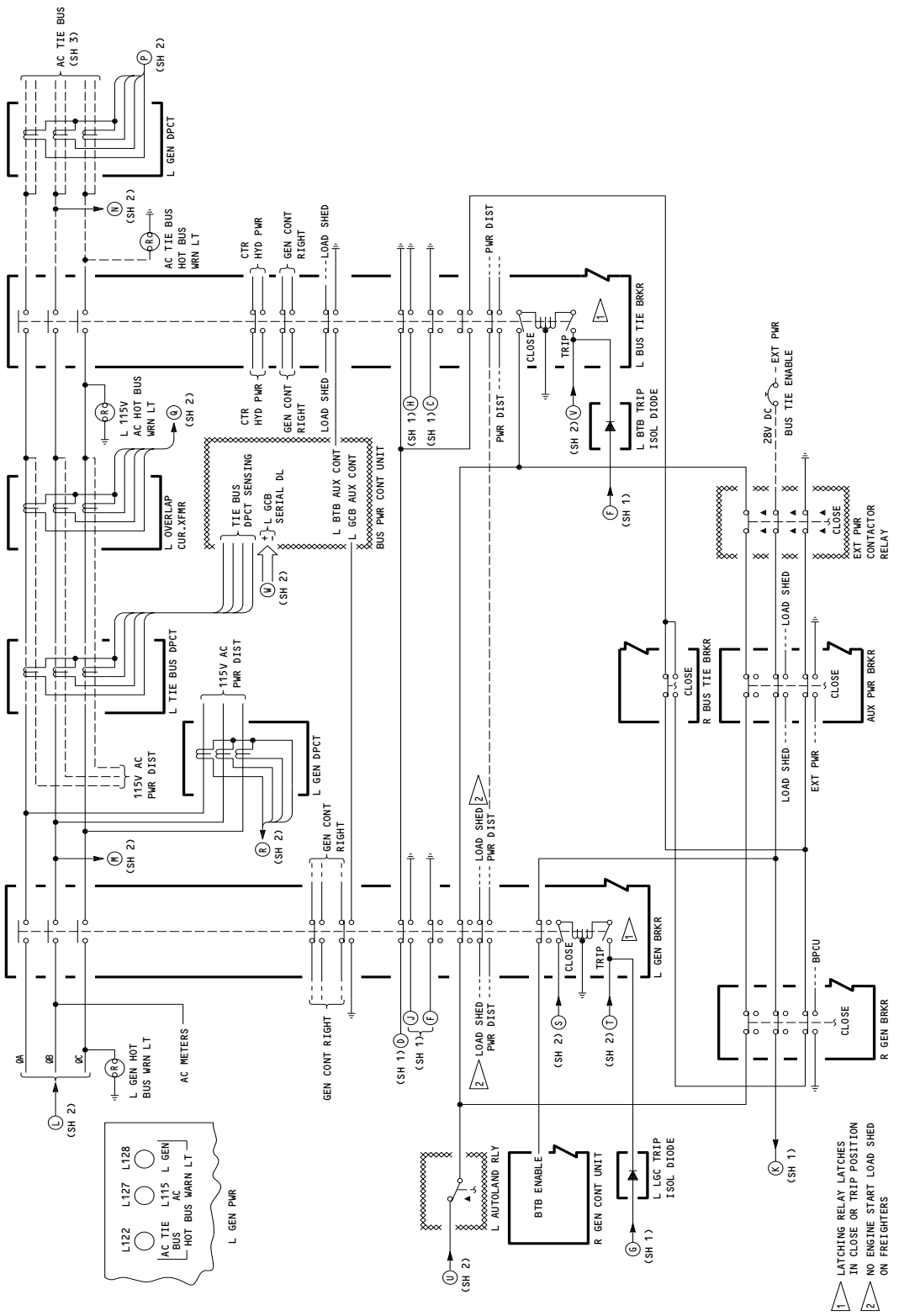


Left Generator Control Schematic
Figure 3 (Sheet 2)

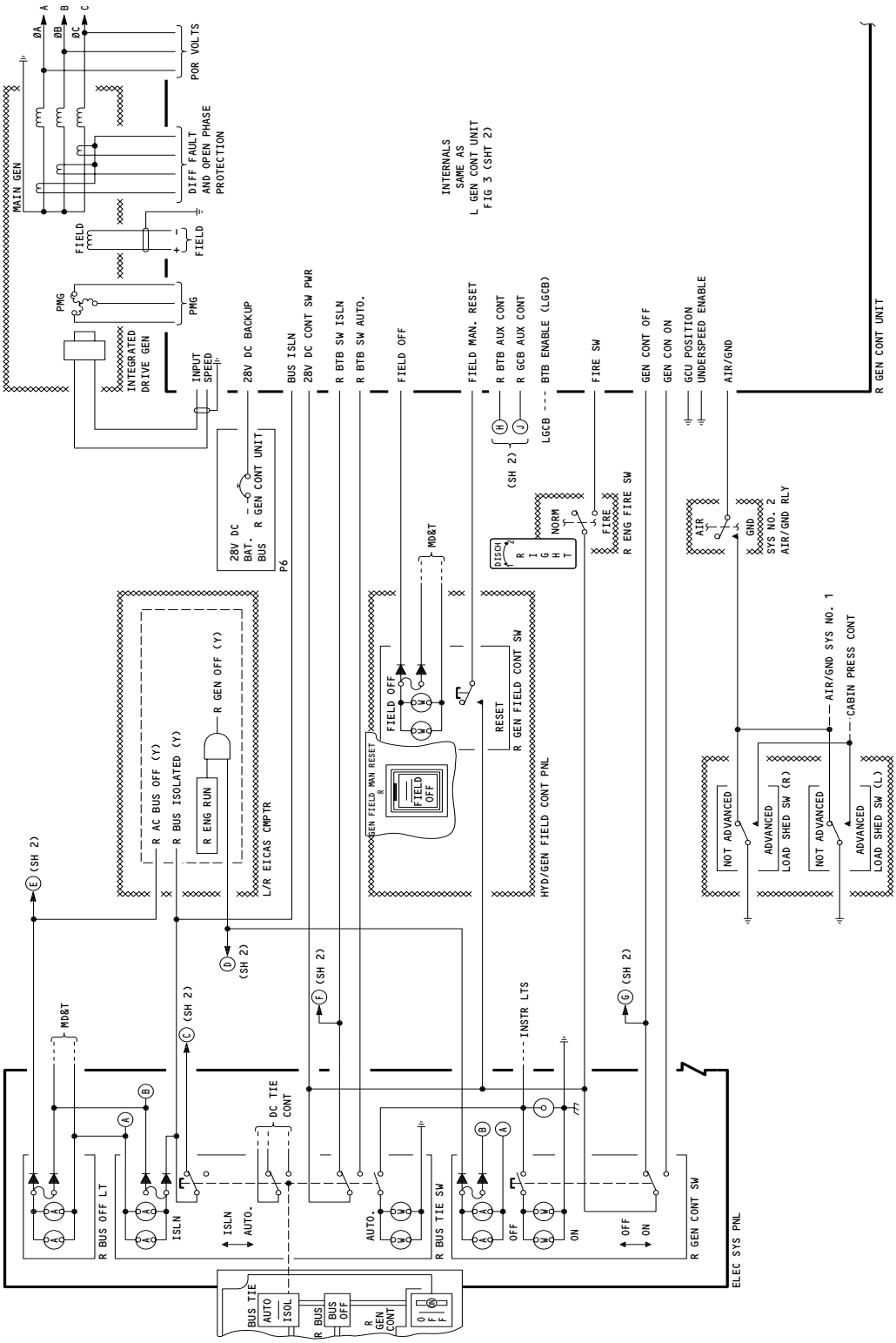


AC TIE BUS

Left Generator Control Schematic
Figure 3 (Sheet 3)

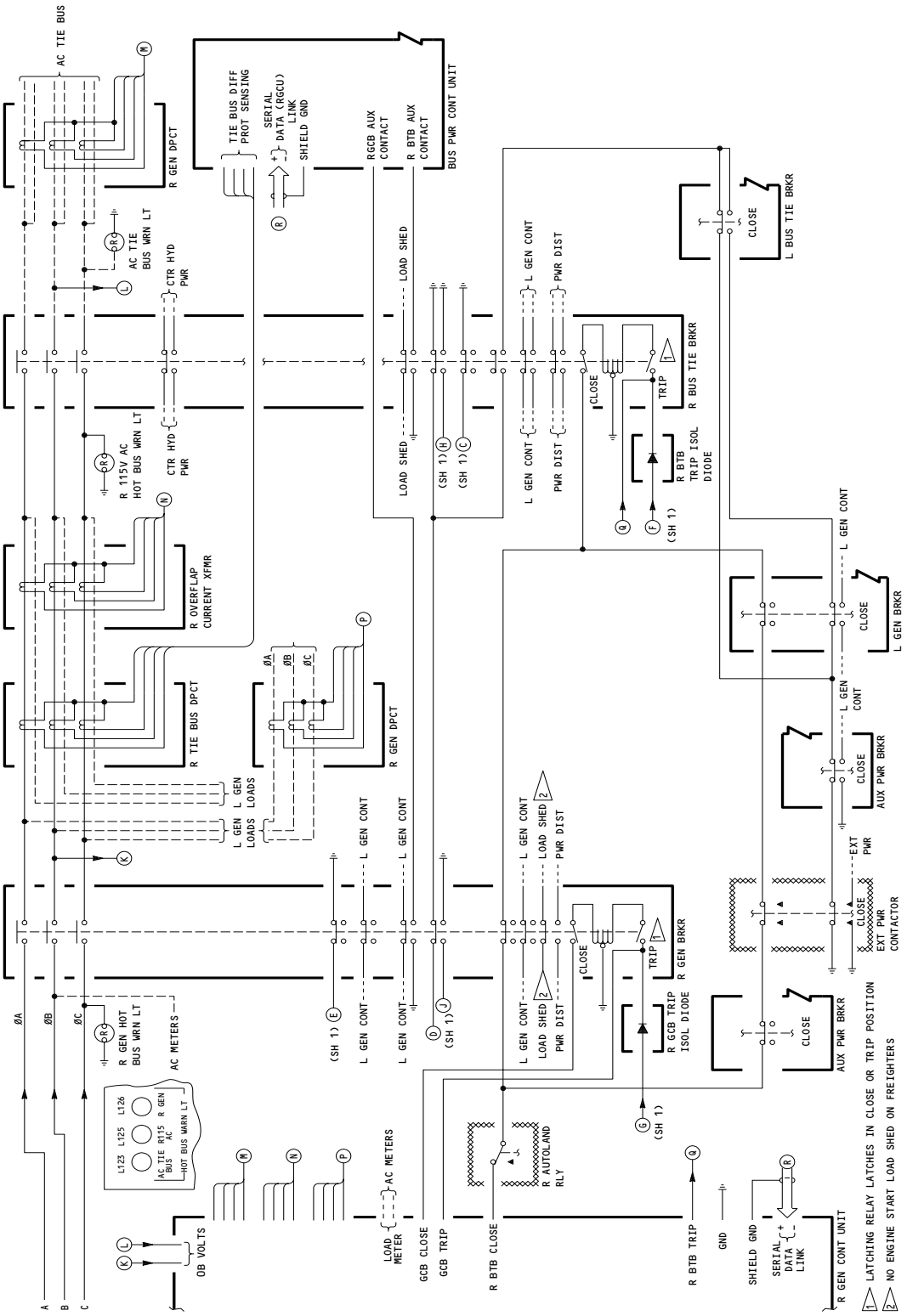


Left Generator Control Schematic
Figure 3 (Sheet 4)

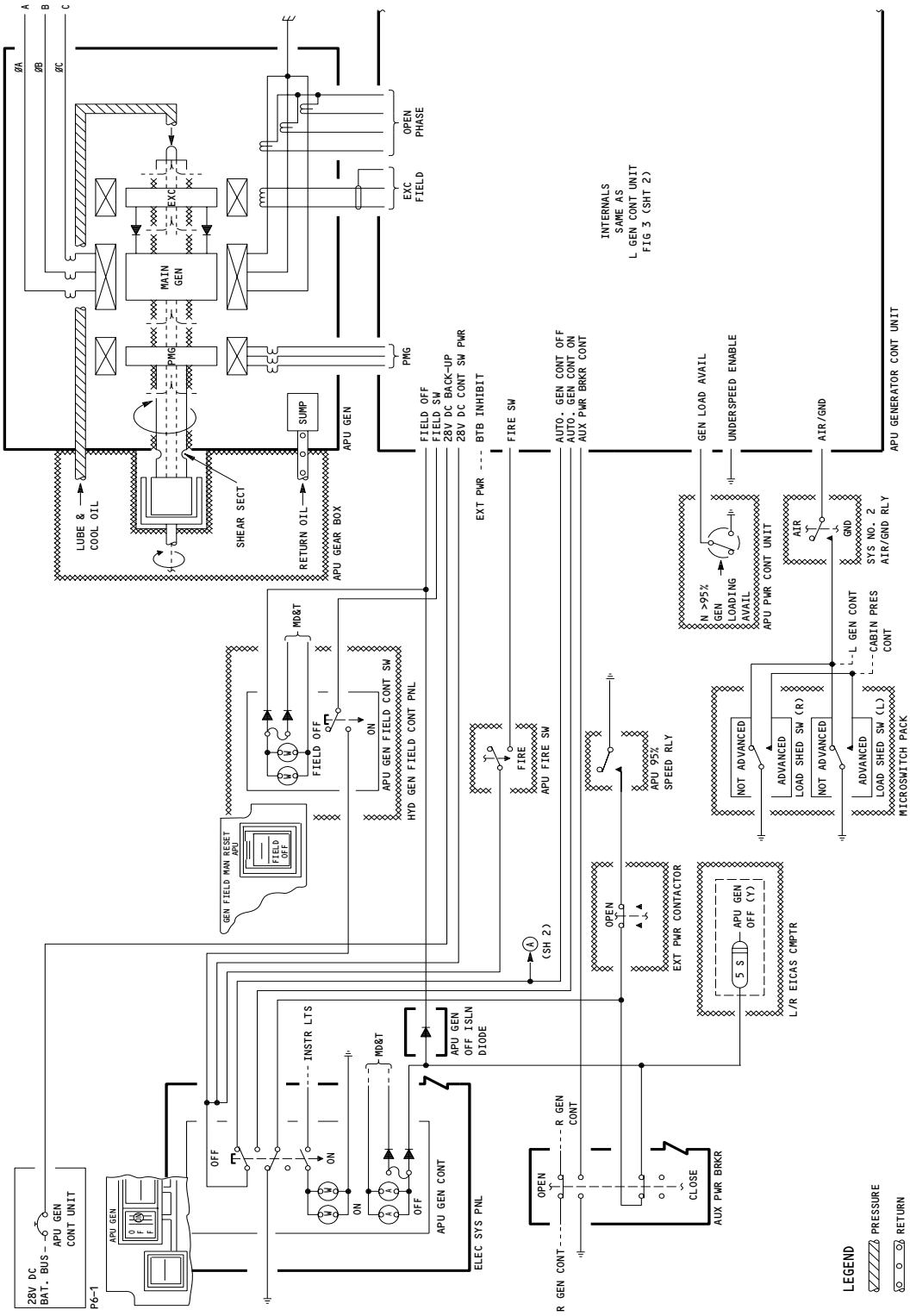


Right Generator Control Schematic
Figure 4 (Sheet 1)

9S02S

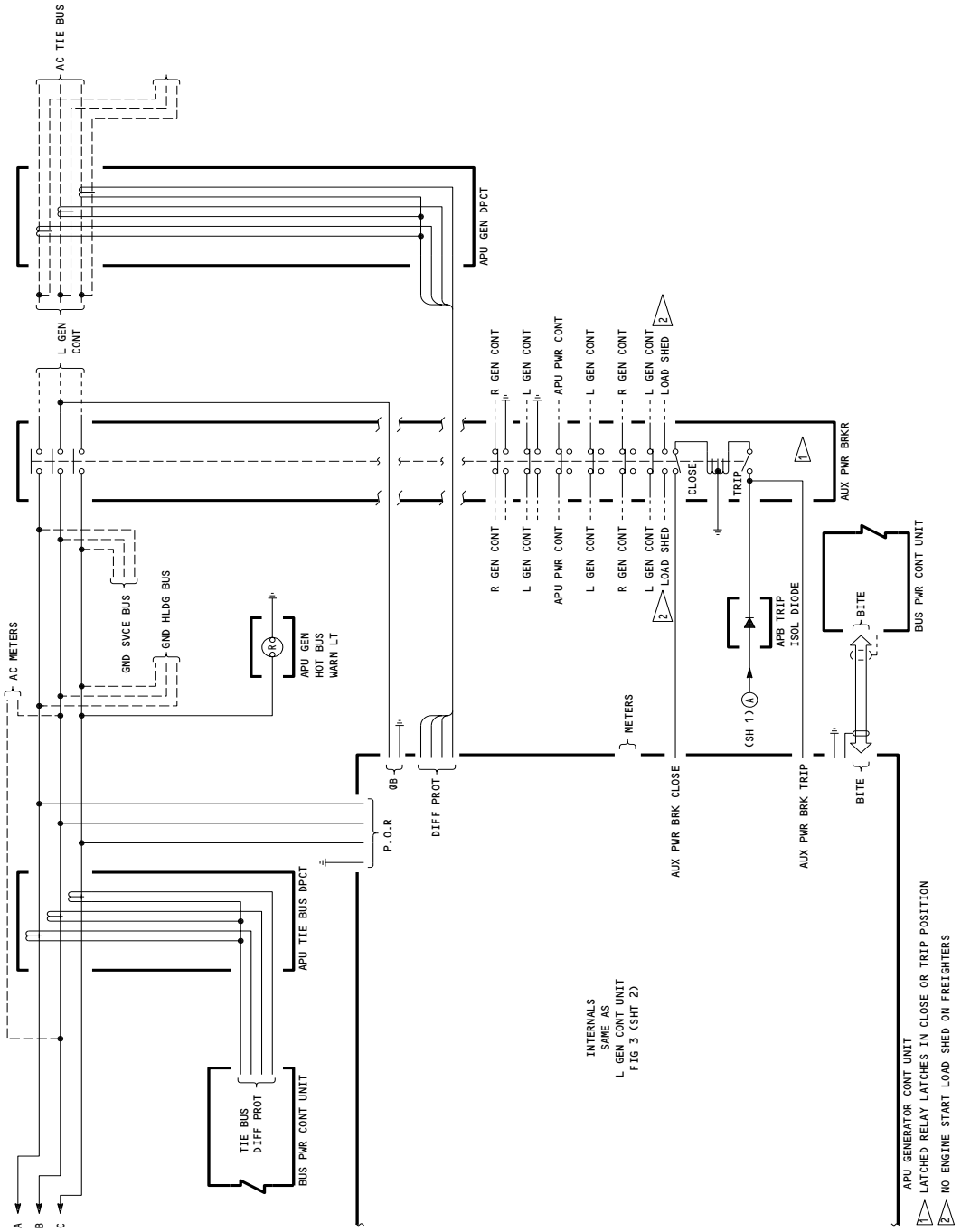


Right Generator Control Schematic
Figure 4 (Sheet 2)

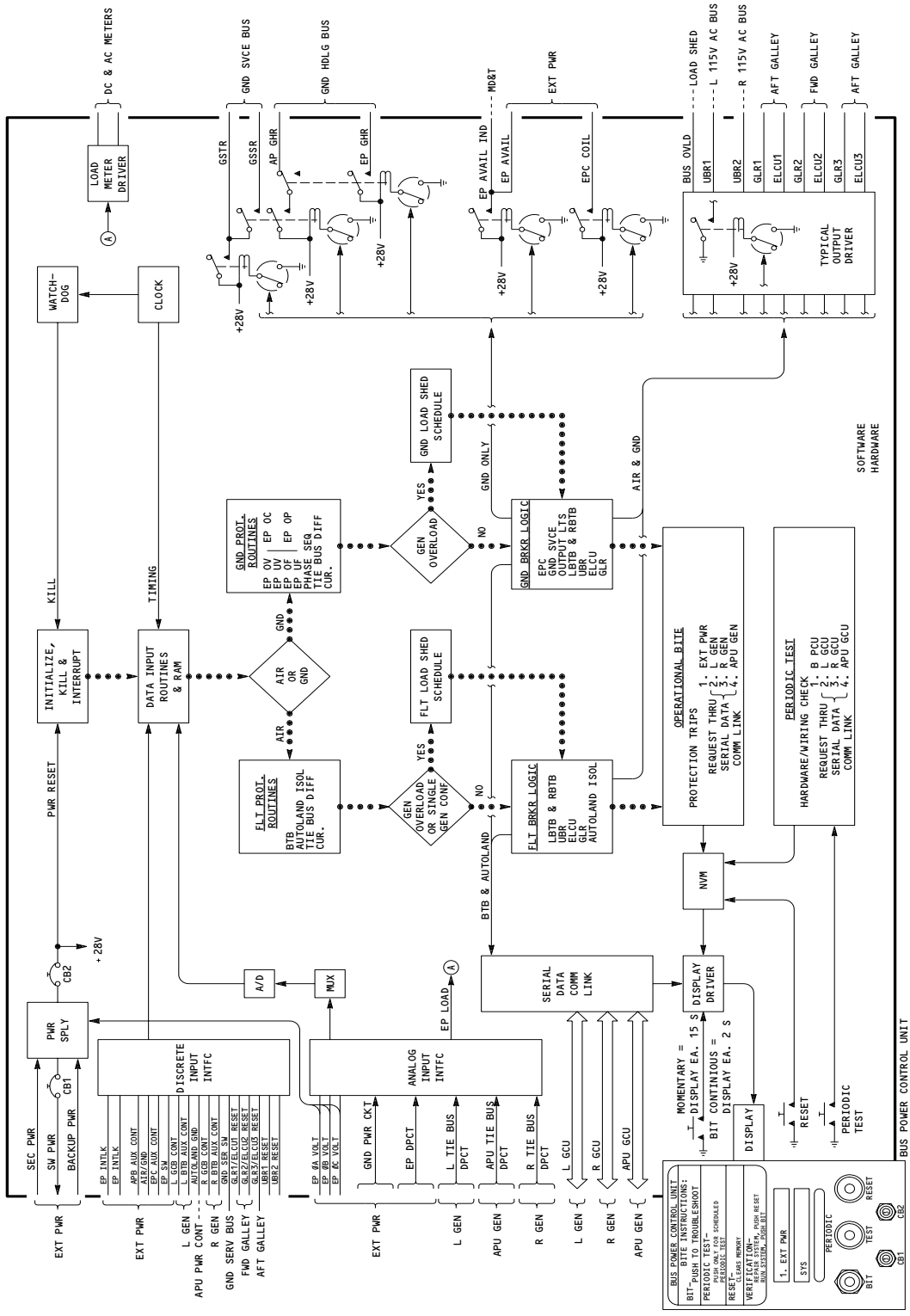


APU Generator Control Schematic
Figure 5 (Sheet 1)

G51881



APU Generator Control Schematic
Figure 5 (Sheet 2)

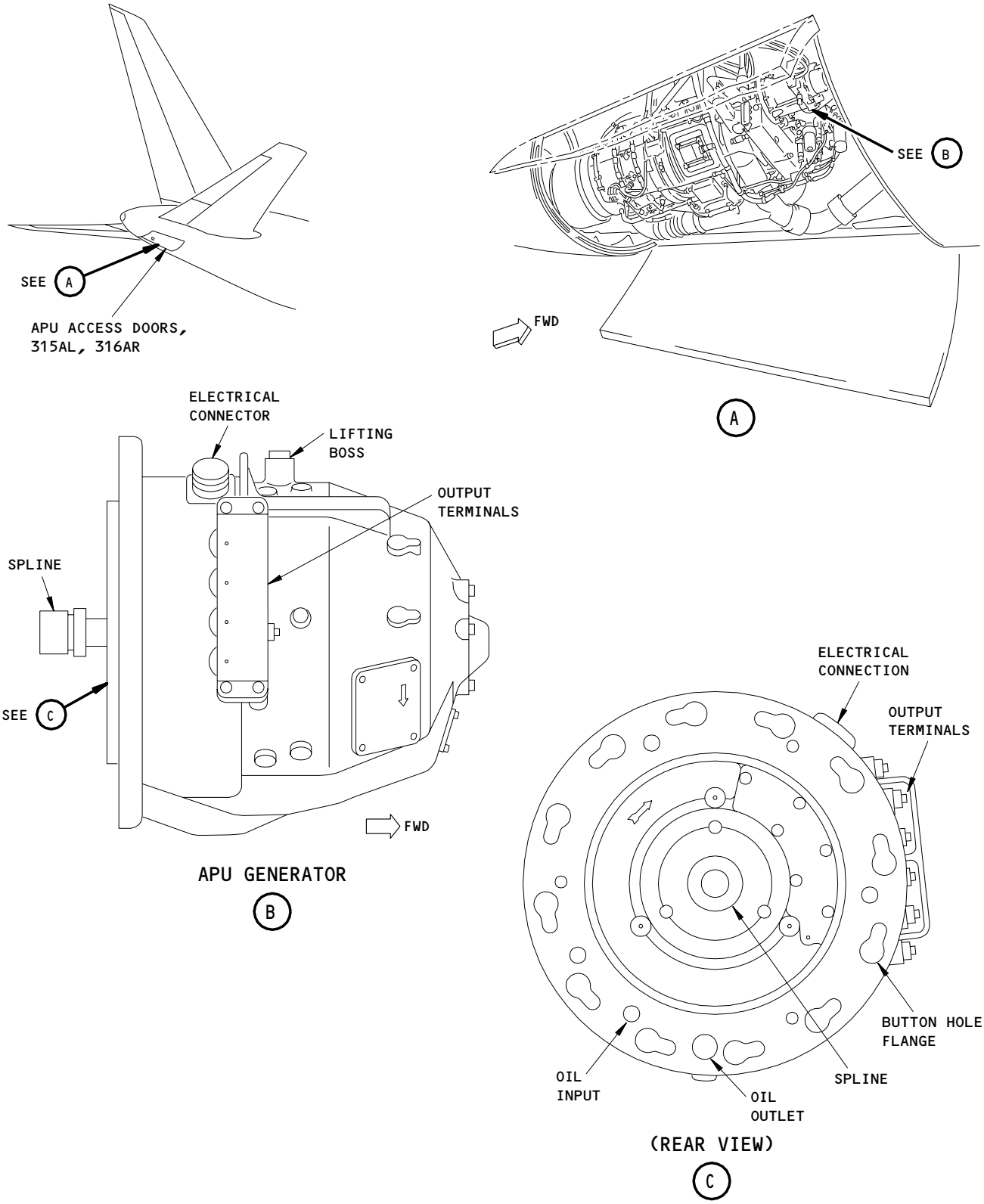


Bus Power Control Unit Schematic
Figure 6

95043

POWER AND REGULATION - DESCRIPTION AND OPERATION

1. General
   A. The auxiliary power unit (APU) generator supplies electrical power on the ground when external power is not available and the integrated drive generators are not operating.
   B. The APU generator supplies electrical power inflight due to an integrated drive generator outage.
2. Component Details (Fig. 1)
   A. APU Generator
      (1) The APU generator converts mechanical power, supplied by the APU, into electrical power. The generator has four terminal studs on its housing. An electrical connector is above the terminal studs. The generator weighs 62 pounds.
3. Operation
   A. Functional Description
      (1) The APU generator is mounted to the APU by a keyhole flange. The APU drives the APU generator input shaft at a constant speed of 12,000-rpm. The generator converts this mechanical input into 115/200-volt, 3-phase, 90-Kva, 400 ±5-Hz ac electrical power. The electrical output power is available at four terminal studs on the APU generator. Leads run from the terminal studs to the auxiliary power breaker (APB). The power is then distributed to the system.
      (2) Voltage on the generator side of the APB is regulated by the APU generator control unit (GCU). The GCU maintains this point at 115 ±1 volt ac, line-to-neutral, at 400-Hz, for loads up to 90 kva. (Voltage is regulated within 115 ±1.5 volts ac for loads up to 112.5 kva, and within 115 ±2 volts ac for loads up to 150 kva). The APU GCU's voltage regulator varies dc current to the generator field, to control generator output voltage. The electrical connector on the generator housing allows the GCU to control generator output and provide generator power to the APU GCU. The APU GCU is located on shelf 4 of right forward equipment center rack E2.
      (3) The APU supplies oil to cool and lubricate the generator. Oil enters and exits through holes in the mounting flange. Exiting oil is cooled and filtered by the APU before it is returned to the APU generator.

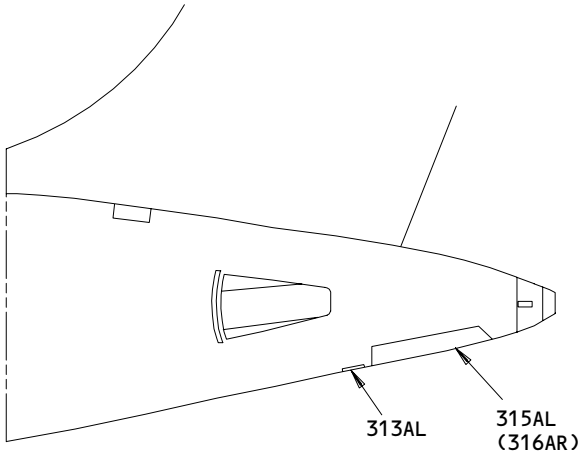


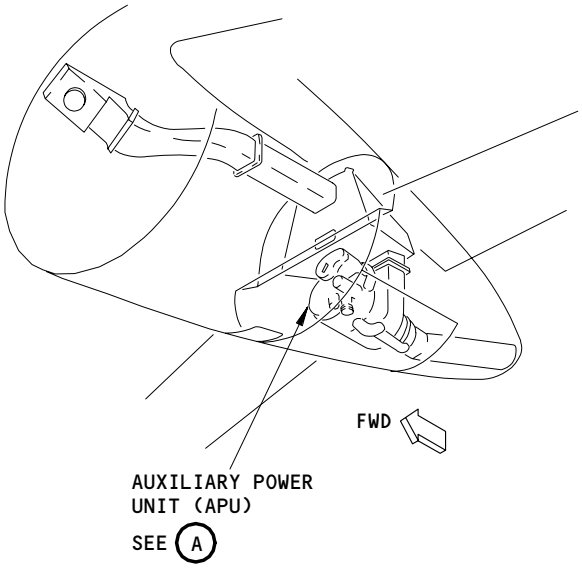
APU Generator - Component Location
Figure 1

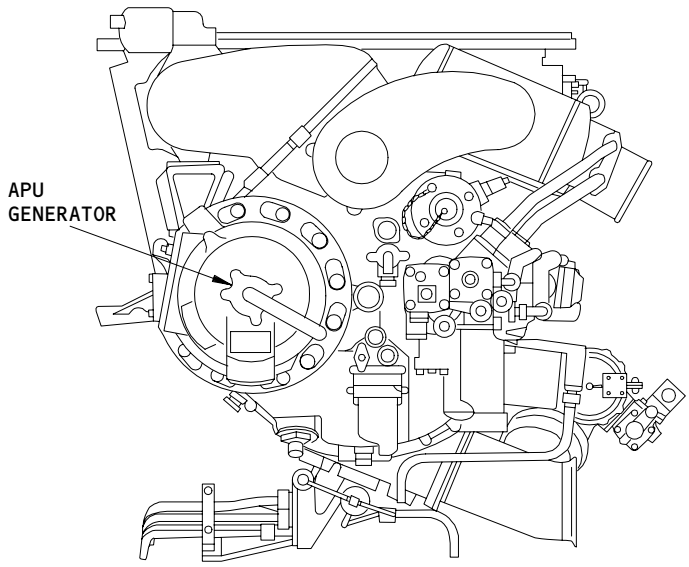
POWER AND REGULATION

COMPONENT	FIG. 102 SHT		ACCESS/AREA	AMM REFERENCE
GENERATOR – APU	--	1	APU	24-21-01

Power and Regulation – Component Index
Figure 101







AUXILIARY POWER UNIT (APU)
(FRONT VIEW)
(A)

Power and Regulation - Component Location
Figure 102

APU GENERATOR - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks:
      (1) Operational Test of APU Generator
      (2) System Test of APU Generator

   TASK 24-21-00-715-001
2. Operational Test - APU Generator
   A. General
      (1) The operational test does these tests:
         (a) The BITE Test
         (b) The APU Generator Test
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (3) AMM 49-11-00/501, Auxiliary Power Unit (APU)
   C. Access
      (1) Location Zones
         212 Flight Compartment (RH Side)
         119/120 Main Equipment Center
      (2) Access Panels
         119BL Main Equipment Center Panel
   D. Prepare for the Test

      S 045-010

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

         NOTE: If the spoilers are extended, and electrical power is removed, the spoilers will retract in less than one second.

      S 865-002
      (2) Supply external power to the 115V ac buses (AMM 24-22-00/201).
   E. Procedure

      S 745-019
      (1) Do the BITE test as follows:
         (a) Momentarily push the BIT switch on the BPCU (E2-4).
            1) Make sure this indication sequence shows on the BPCU:
               a) EXTERNAL POWER SYSTEM
               b) OK
               c) LEFT GEN POWER SYSTEM

d) OK
e) RIGHT GEN POWER SYSTEM
f) OK
g) APU GEN POWER SYSTEM
h) OK
i) LAST FLT 00 END OF DATA
j) FOR PREVIOUS FLT PUSH NOW
k) If it is necessary to see this display again, stop until the FOR PREVIOUS FLT PUSH NOW indication goes off.
l) Momentarily push the PERIODIC TEST switch.

S 715-004

(2) Do the APU Generator Test as follows:
(a) Start the APU (AMM 49-11-00/501).
(b) Make sure these lights are on:
1) The yellow OFF light in the APU GEN switch on the P5 panel.
2) The white APU FIELD OFF light on the P61 panel.
(c) Make sure the APU PWR HOT BUS WARN light on the P34 panel is off.
(d) Push the ECS/MSG switch on the P61 panel.
1) Make sure the APU GEN OFF (level C-message) shows on the top EICAS display.
(e) Push the ELEC/HYD switch on the P61 panel.
1) Make sure these values are shown below the APU on the bottom EICAS display:
a) AC Volts = 0
b) Frequency = 0
(f) Push the APU GEN FIELD MAN RESET switch on the P61 panel.
1) Make sure the APU FIELD OFF light in the switch goes off.
2) Make sure these lights are on:
a) The yellow OFF light in the APU GEN switch (P5).
b) The red APU PWR HOT BUS WARN light (P34).
3) Make sure the two BUS OFF lights (P5) are off.

4) Make sure these values are shown below the APU on the bottom EICAS display:
   a) AC Volts = 115 ±5
   b) Frequency = 400 ±5

(g) Push the APU GEN switch (P5) to the ON position.
1) Make sure the OFF light in the switch goes off.
2) Make sure the white ON light in the EXT PWR switch (P5) stays ON.

(h) Push the ECS/MSG switch on the P61 panel.
1) Make sure APU GEN OFF does not show on the EICAS display.

(i) Push the EXT PWR switch (P5).
1) Make sure the ON light in the switch goes off.
2) Make sure these lights are off:
   a) The OFF light in the APU GEN switch (P5).
   b) The two BUS OFF lights (P5).
3) Make sure these red lights are on:
   a) The APU PWR HOT BUS WARN (P34).
   b) The TIE BUS HOT BUS WARN (P34).
   c) The AC TIE BUS HOT BUS WARN (P31).
   d) The AC TIE BUS HOT BUS WARN (P32).

(j) Push the APU GEN switch (P5) to the OFF position.
1) Make sure these lights are on:
   a) The yellow OFF light in the APU GEN switch (P5).
   b) The two yellow BUS OFF lights (P5).
   c) The white APU FIELD OFF light (P61).

(k) Push the APU GEN switch (P5) to the ON position.
1) Make sure these lights are off:
   a) The OFF light in the APU GEN switch (P5).
   b) The two BUS OFF lights (P5).
   c) The APU FIELD OFF light (P61).

(l) Push the external power switch (P5) to ON.

(m) Stop the APU (AMM 49-11-00/501).

S 745-023

(3) Do the BITE test.

S 845-022
(4) Put the airplane to its usual condition

S 845-006
(5) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-007
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-21-00-735-008

3. System Test - APU Generator

A. General
(1) The system test does these tests:
(a) The Ground Service Relays Test.
(b) The Load Test.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(3) AMM 32-09-02/201, Air/Ground Relays
(4) AMM 49-11-00/201, Auxiliary Power Unit (APU)

C. Access
(1) Location Zones
212 Flight Compartment (RH Side)
119/120 Main Equipment Center
(2) Access Panels
119BL Main Equipment Center Panel

D. Prepare for the Test

S 045-009

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

NOTE: If the spoilers are extended, and electrical power is removed, the spoilers will retract in less than one second.

E. Procedure

S 725-012

(1) Do the Ground Service Relays test as follows:
  (a) Supply APU generator power to the 115V ac buses (AMM 24-22-00/201).
  (b) Push the right BUS TIE switch on the P5 panel to the ISLN position.
  (c) Make sure these yellow lights on the P5 panel are on:
    1) The ISLN light in the right BUS TIE switch.
    2) The right BUS OFF light.
  (d) Push the GRND SERV BUS switch on the flight attendant's panel P21.
    1) Make sure the white light in the switch comes on.
    2) Make sure the red 115V GND SVCE HOT BUS WARNING light on the P33 panel is on.
  (e) Push the ANTI-COLLISION-RED light switch (P5) to ON.
    1) Make sure the red anti-collision lights are on.
  (f) Push the GRND SERV BUS switch (P21).
    1) Make sure the white light in the switch goes off.
    2) Make sure the 115V GND SVCE HOT BUS WARNING light on the P33 panel is off.
    3) Make sure the red anti-collision lights are off.
  (g) Push the GRND SERV BUS switch on the P21 panel.
    1) Make sure the white ON light in the switch is on.
  (h) Push the right BUS TIE switch on the P5 panel to the AUTO position.
    1) Make sure the yellow ISLN light in the switch is off.
  (i) Make sure the ON light in the GRND SERV BUS switch on the P21 panel is off.
  (j) Push the GRND SERV BUS switch on the P21 panel.
    1) Make sure the ON light in the switch stays off.
  (k) Push the ANTI-COLLISION-RED light switch (P5) to OFF.

S 725-014

(2) Do the load test as follows:
  (a) Make sure these lights are off:
    1) The OFF light in APU GEN switch (P5).

2) The APU FIELD OFF light (P61).
3) The two amber BUS OFF lights (P5).

(b) Push the ELEC/HYD switch on the EICAS maintenance panel (P61).

(c) Make sure these indications show on the APU channel of the EICAS display:
1) AC Volts = 115 ±5
2) Frequency = 400 ±5

(d) Do these steps until the EICAS display shows a LOAD of 0.50 minimum for the APU/BAT power.
1) Make a note of the switches pushed to ON in these steps:
2) These switches will be pushed to OFF at the end of the test.

CAUTION: DO NOT OPERATE THE BOOST PUMPS WITH THE FUEL TANKS EMPTY. DAMAGE TO THE BOOST PUMPS CAN OCCUR.

(e) Put these switches on the fuel management control panel (P5) to the ON position.
1) L AFT PUMP
2) L FWD PUMP
3) R AFT PUMP
4) R FWD PUMP
5) LEFT C PUMP
6) RIGHT C PUMP

(f) Put these switches on the hydraulic system control panel (P5) to the ON position:
1) L ELEC HYD PUMP
2) C ELEC 1 HYD PUMP
3) C ELEC 2 HYD PUMP
4) R ELEC HYD PUMP

(g) Put these switches on the air conditioning control module (P5) to the ON position:
1) L RECIRC FAN
2) R RECIRC FAN

(h) Make sure these indications on the APU channel show on the EICAS display:
1) AC-V = 115 ±5

2) FREQ = 400 ±5
3) LOAD = 0.50 or larger

(i) Push OFF all the switches pushed ON.

(j) Make sure these indications of the APU channel show on the EICAS display:
1) AC-V = 115 ±5
2) FREQ = 400 ±5

S 745-024

(3) Do the BITE test.

S 845-016

(4) Put the airplane to its usual condition.

S 845-025

(5) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-026

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

APU GENERATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the APU generator from the airplane. The second task installs the APU generator on the airplane.

   TASK 24-21-01-024-001

2. Remove APU Generator (Fig. 401)
   A. Equipment
      (1) Fishpole - Commercially Available
      (2) Fishpole Hoist for lifting 62-pound generator (Commercially Available)
      (3) Lifting eye - A49002-1 or A49002-2
      (4) Container - 0.5-gallon container to catch oil drainage
      (5) APU Generator Input Shipping Cover - (Sundstrand P/N 733740)
   B. Consumable Materials
      (1) Lubricant - Acryloid HF825 (AMM 20-30-04)
   C. References
      (1) AMM 49-27-03/401, APU Generator Scavenge Filter
      (2) AMM 49-27-06/401, APU Generator Seal Plate
   D. Access
      (1) Location Zones
          315/316 APU Compartment

      (2) Access Panels
          315AR/316AL APU Compartment

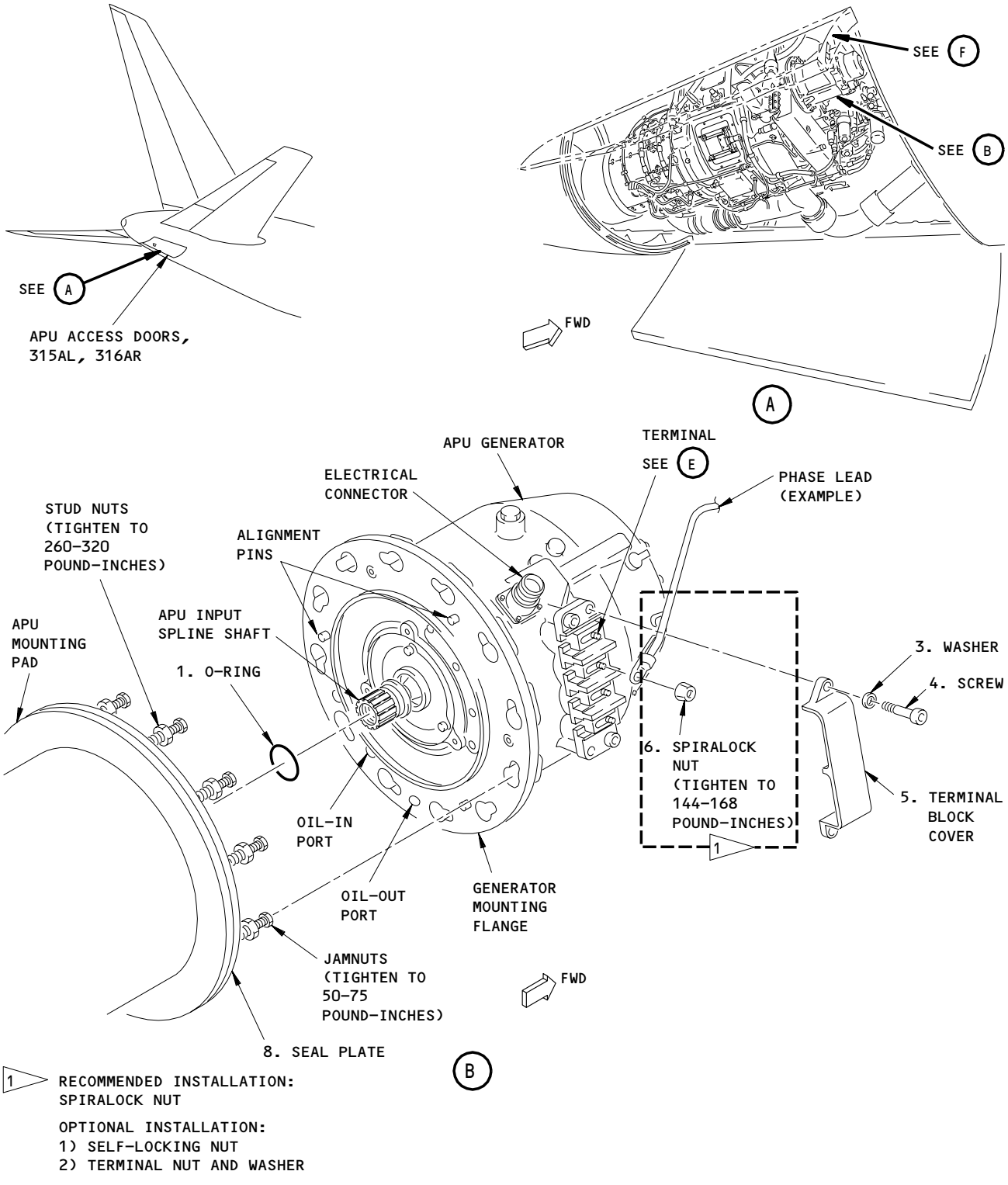
   E. Prepare to Remove APU Generator

      S 864-004
      (1) Open this circuit breaker on the main power distribution panel P6 and attach a DO-NOT-CLOSE tag:
          (a) 6B3, APU GEN CONT UNIT

      S 864-005
      (2) Make sure that the APU control switch is in the off position and attach a DO-NOT-OPERATE tag.

      S 014-006
      (3) Do these steps to open the two APU access doors:
          (a) While you hold the left access door in the closed position, open the four latches on the right access door.

              NOTE: The left access door will open fully and the right access door will drop approximately one inch (2.5 cm) from the fuselage frame when the last latch is opened.



APU Generator Installation
Figure 401 (Sheet 1)

EFFECTIVITY
AIRPLANES WITH STUD NUTS
AND JAM NUTS ON APU
MOUNTING PAD

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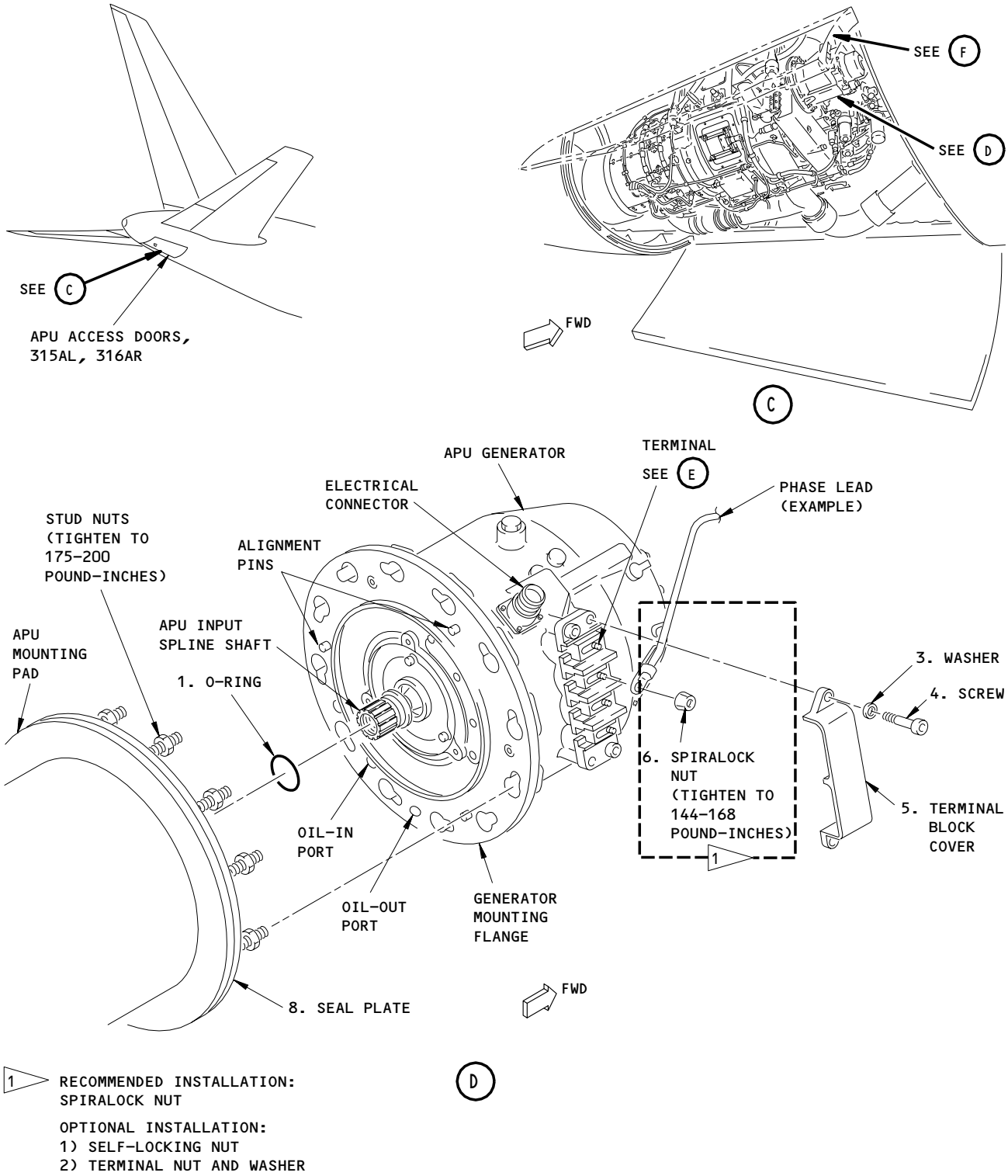


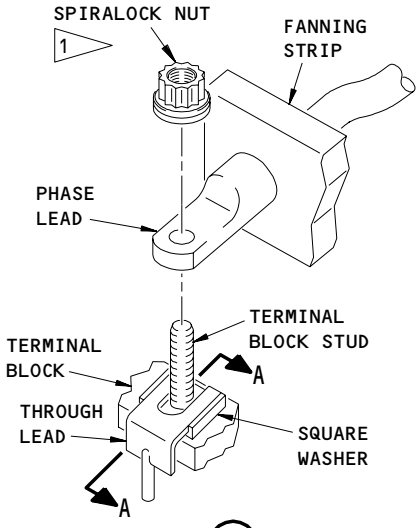
1 RECOMMENDED INSTALLATION:
SPIRALOCK NUT

OPTIONAL INSTALLATION:
1) SELF–LOCKING NUT
2) TERMINAL NUT AND WASHER

APU Generator Installation
Figure 401 (Sheet 2)

EFFECTIVITY
AIRPLANES WITH STUD NUTS
ON APU MOUNTING PAD

F87337



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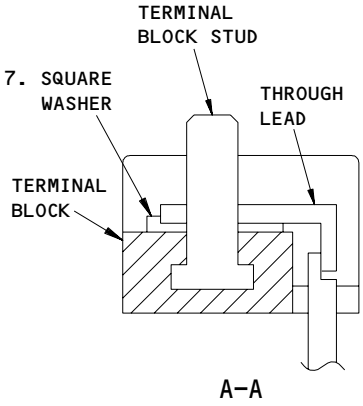
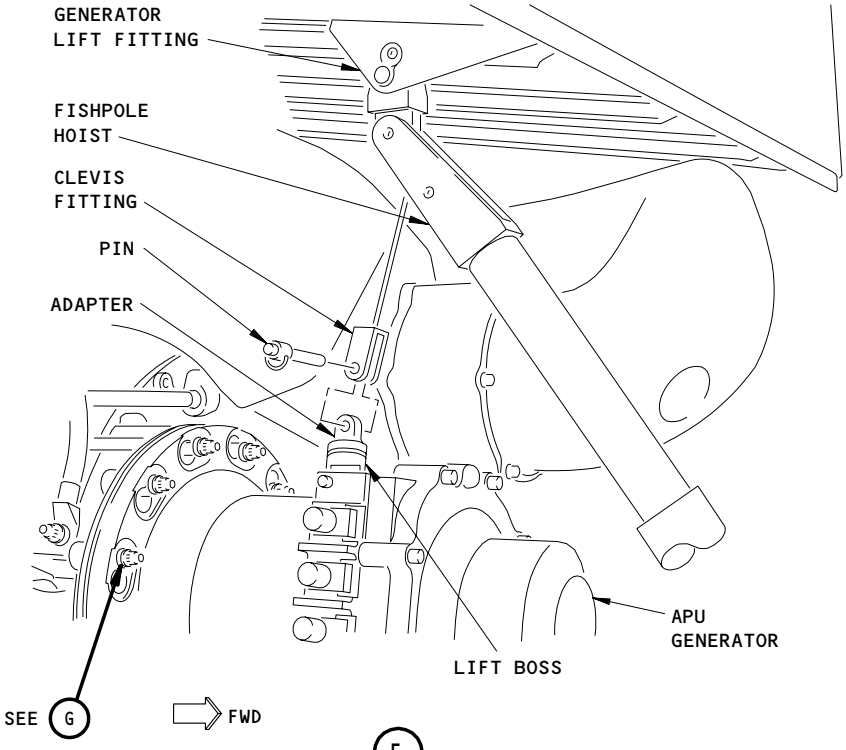


A–A



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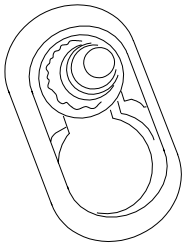


CORRECT INSTALLATION OF THE NUT

G

APU Generator Installation
Figure 401 (Sheet 3)

(b) Open the left access door to the fully open position and manually lock the hold-open strut.

NOTE: You push the center knob down and turn the knob clockwise to manually lock the hold-open strut.

(c) Push the right access door up and pull the detent latch aft until the latch disengages and releases the access door from the fuselage frame.

NOTE: The location of the detent latch is at the forward end of the right access door.

(d) Open the right access door to the fully open position and manually lock the hold-open strut.

F. Remove the APU Generator

S 034-007

(1) Remove the electrical connections:
(a) Disconnect the electrical connector on the APU generator.
(b) Install a protective cap on the electrical connector.
(c) Remove the screws (4) and washers (3) from the terminal block cover.
(d) Remove the terminal block cover (5) from the generator.
(e) Remove the spiralock nuts (6), the self-locking nuts, or the terminal nuts and washers from the terminal studs.
(f) Label the phase leads (N, T1, T2, T3) for installation.
(g) Remove the four phase leads from the terminal studs.
(h) Install the spiralock nuts (6), the self-locking nuts, or the washers and terminal nuts on the terminal studs (tighten by hand).
(i) Install the terminal block cover (5) with the washers (3) and the screws (4) (tighten by hand).

S 024-008

(2) Remove the APU generator:
(a) Remove the bolt from the lift boss.

CAUTION: USE CORRECT LIFTING EYE FOR THE APU GENERATOR. INCORRECT LIFTING EYE CAN CAUSE DAMAGE TO THE LIFT BOSS.

(b) AIRPLANES WITH HELICOIL INSERT (NO FLANGE) IN THE LIFT BOSS; Install the lifting eye A49002-1 (3/8-24UNF-2A threads) into the lift boss.
(c) AIRPLANES WITH FLANGED STAINLESS STEEL INSERT IN THE LIFT BOSS; Install the lifting eye A49002-2 (3/8-16UNC-2A threads) into the lift boss.
(d) Attach the fishpole hoist to the generator lift fitting.
(e) Use the pin to connect clevis fitting to the adapter.

CAUTION: DO NOT ALLOW GENERATOR TO HANG ON INPUT SHAFT AND DO NOT LIFT THE GENERATOR MORE THAN NECESSARY. INCORRECT SUPPORT CAN CAUSE DAMAGE TO THE INTERNAL SPLINE OF THE GENERATOR.

(f) Use the fishpole hoist to hold the generator so that no weight is on the input shaft.
(g) Loosen all nuts that attach the generator mounting flange to the seal plate.
(h) AIRPLANES WITH STUD NUT AND JAMNUT;
Do the steps that follow:
1) Loosen the locknut three complete turns with a socket wrench.
2) Firmly tap the socket wrench axially towards the APU.

NOTE: The tapping action releases the self-locking feature of the locknut and permits further loosening with greatly reduced free running torque.

3) Continue to loosen the locknut by hand if necessary until the locknut lightly contacts the stop nut.
(i) Place the container below the APU generator.

NOTE: Oil leakage occurs during APU generator removal.

WARNING: HOT OIL OUT OF APU CAN CAUSE SEVERE BURNS. PROLONGED CONTACT OF OIL WITH SKIN CAN CAUSE DERMATITIS. OIL WILL STAIN CLOTHING AND CAN STAIN PAINT.

CAUTION: DO NOT USE A SCREWDRIVER OR OTHER METAL OBJECT TO DISCONNECT THE GENERATOR FROM THE GEARBOX. THIS CAN CAUSE DAMAGE TO THE SURFACE.

(j) Pull the generator axially away from the gearbox so the alignment pins on the generator mounting flange are free from the mating holes.

NOTE: if it is necessary, use a nylon probe to disconnect the generator from the gearbox.

(k) Turn the generator clockwise until the nuts are aligned with the large part of the keyhole slots in the generator input flange.

CAUTION: GUIDE THE SHAFT OUT HORIZONTALLY TO PREVENT DAMAGE TO GENERATOR INPUT SHAFT SEAL. DO NOT USE EXTERNAL PARTS TO PULL OR LIFT GENERATOR.

(l) Horizontally pull the generator from the gearbox.

S 984-033
(3) Use the fishpole hoist to lower the generator.

S 864-034
(4) Put the generator on an applicable cart.

S 024-035
(5) Remove the lifting eye from the lift boss.

S 424-036
(6) Install the bolt on the lift boss.

S 024-037
(7) Remove and discard the O-ring (1).

S 034-010
(8) Remove and examine the APU generator scavenge filter (AMM 49-27-03/401).

S 434-011
(9) Install the APU generator shipping cover.

S 214-009
(10) Do this task: APU Generator Seal Plate Inspection (AMM 49-27-06/601).

TASK 24-21-01-424-002

3. Install the APU Generator (Fig. 401)

A. Equipment

(1) Fishpole hoist, for lifting 62-pound generator (Commercial source)

(2) Lifting eye - A49002-1 or A49002-2

B. Consumable Materials

(1) Lubricant - Acryloid HF825 (AMM 20-30-04)

C. Parts

(1) Refer to the AIPC for part numbers and effectivities of items in the table that follows:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	1	Packing	24-21-01	01	35
401	1	Packing	24-21-01	04	45
401	9	APU Generator	24-21-01	01	5
401	9	APU Generator	24-21-01	04	5

D. References

(1) AMM 12-13-04/301, Auxiliary Power Plant

(2) AMM 24-22-00/201, Electrical Power - Control

(3) AMM 49-11-00/501, Auxiliary Power Unit

(4) AMM 49-27-06/401, APU Generator Seal Plate

E. Access

(1) Location Zones

315/316 APU Compartment

(2) Access Panels

315AR/316AL APU Compartment

F. Prepare for the APU Generator Installation

S 034-012

(1) Remove the cover from the generator input face.

S 434-013

(2) Lubricate a new O-ring (1) with Acryloid and install the O-ring on the generator input spline.

S 144-031

(3) Clean grease from APU generator input spline shaft before installing APU generator.

S 034-028

CAUTION: REMOVE SHIPPING PLUGS FROM OIL-IN AND OIL-OUT PORTS OF GENERATOR. PLUGS WILL PREVENT FLOW OF COOLING/LUBRICATING OIL RESULTING IN DAMAGE TO GENERATOR.

(4) Remove the shipping plugs from the oil-in and the oil-out ports of the generator.

G. Procedure

S 424-018

(1) Install the APU generator as follows:
(a) Remove the bolt from the lift boss.

CAUTION: USE CORRECT LIFTING EYE FOR THE APU GENERATOR. INCORRECT LIFTING EYE CAN CAUSE DAMAGE TO THE LIFT BOSS.

(b) AIRPLANES WITH HELICOIL INSERT (NO FLANGE) IN THE LIFT BOSS; Install the lifting eye A49002-1 (3/8-24UNF-2A threads) into the lift boss.
(c) AIRPLANES WITH FLANGED STAINLESS STEEL INSERT IN THE LIFT BOSS; Install the lifting eye A49002-2 (3/8-16UNC-2A threads) into the lift boss.

CAUTION: DO NOT ALLOW GENERATOR TO HANG ON INPUT SHAFT DURING INSTALLATION. FAILURE TO SUPPORT THE GENERATOR PROPERLY, OR BUMPING THE SHAFT, CAN DAMAGE THE SHAFT.

(d) Use the fishpole hoist to lift and hold the generator in the installation position.
(e) Hold the generator correctly and make sure no weight is put on the splined shaft.
(f) Do these steps at the same time:
1) Connect the splined shaft and gearbox spline of the generator.
2) Put the nuts through the large part of the keyhole slots in the generator input flange.
(g) Turn the generator counterclockwise.
1) Make sure the alignment pins on the generator is aligned with the mating holes on the gearbox mounting pad.
2) Make sure the gearbox studs are in the small part of the keyhole slots.
(h) AIRPLANES WITH SELF-LOCKING RETENTION NUT NAS1805-6P; Tighten the self-locking retention nuts to a torque of 175-200 pound-inches (19.8 - 22.6 Newton-meters).
(i) AIRPLANES WITH RETENTION NUT 624AG5HD AND JAM NUT; Tighten the retention nuts to 260-320 pound-inches (29.4-36.2 Newton-meters). Tighten the jam nuts to 50-75 pound-inches (5.6-8.5 Newton-meters).

(j) Make sure that the nuts are installed correctly (See Fig. 401 Sheet 3).
(k) Make sure that there is no visible gap between the generator flange and seal plate.

S 024-038
(2) Remove the fishpole hoist.

S 024-039
(3) Remove the lifting eye from the lift boss.

S 424-040
(4) Install the bolt on the lift boss.

S 434-019
(5) Connect the electrical connections as follows:
(a) Remove the screws (4) and washers (3) from the terminal block cover (5).
(b) Remove the terminal block cover (5) from the generator.
(c) Remove the spiralock nuts (6), the self-locking nuts, or the terminal nuts and washers from the terminal studs.

CAUTION: MAKE SURE THE POWER LEADS ARE CORRECTLY INSTALLED. INCORRECT INSTALLATION WILL RESULT IN CIRCUIT MALFUNCTION AND/OR DAMAGED EQUIPMENT.

(d) Make sure the square washers (7) are below the through leads on terminal studs.
(e) Put the four phase leads on the generator terminal studs.
(f) Make sure the phase leads (N, T1, T2, T3) agree with the terminal labels.
(g) If you put the labels (N, T1, T2, T3) on the leads, remove them.
(h) Do these steps if you install the spiralock nuts:
1) Make sure nuts do not have rundown resistance. If nuts have rundown resistance, inspect the studs for any sharp threads or any rounded threads.
2) If the studs have any sharp threads or any rounded threads, replace the terminal block assembly (AMM 24-11-20/401).
(i) Install the spiralock nuts (6), the self-locking nuts, or the washers and terminal nuts on the terminal studs.
(j) Tighten the terminal nuts to 144-168 pound-inches (16-19 Newton-meters).
(k) Install the terminal block cover (5) on the generator.
(l) Install the washer (3) and screws (4). Tighten the screws (4) to 20-22 pound-inches (2.3 - 2.5 Newton-meters).
(m) Remove the protective caps from the generator electrical connector.

CAUTION: ELECTRICAL CONNECTOR PLUG AND CONNECTOR PINS MUST BE ALIGNED BEFORE INSTALLATION. MISALIGNMENT CAN CAUSE DAMAGE TO CONNECTOR AND/OR PINS.

(n) Install the APU generator electrical connector.

S 614-003

(6) Replenish the APU oil (AMM 12-13-04/301).

S 414-021

(7) Do these steps to close the two APU access doors:
(a) Manually unlock the two hold-open struts from the two APU access doors.

NOTE: You turn the center knob counterclockwise and pull the knob up to manually unlock the hold-open strut.

(b) Lift the right access door until the detent latch engages and holds the access door on the fuselage frame.
(c) Lift the left access door until the two APU access doors are approximately aligned.
(d) Close the two APU access doors.
(e) Close the four latches on the right access door.

S 864-020

(8) Remove the DO-NOT-CLOSE tag and close the following P6 panel circuit breaker.
(a) 6B3, APU GEN CONT UNIT

H. Test the APU generator.

S 734-029

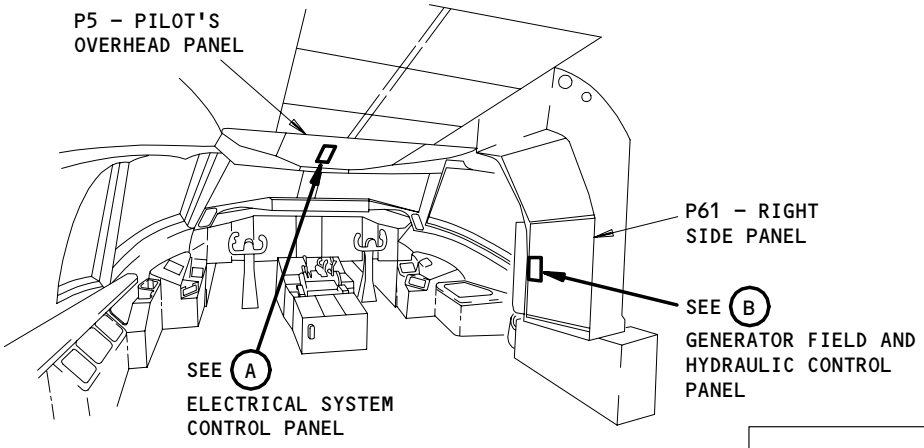
(1) Do this task: APU GENERATOR SYSTEM TEST (AMM 24-21-00/501).

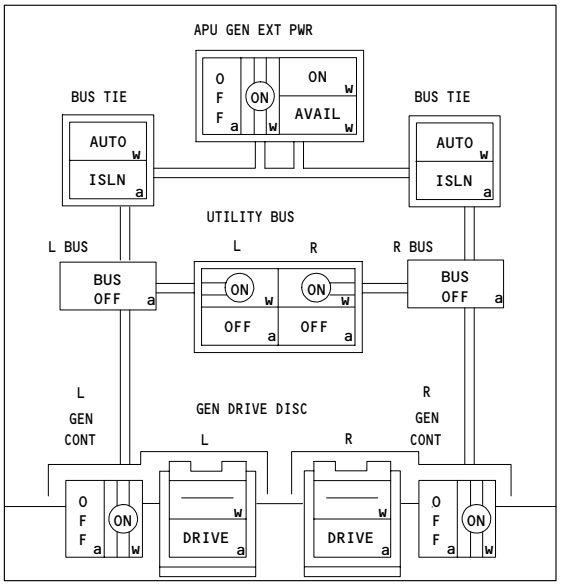
S 864-027

(2) Remove electrical power if no longer required (AMM 24-22-00/201).

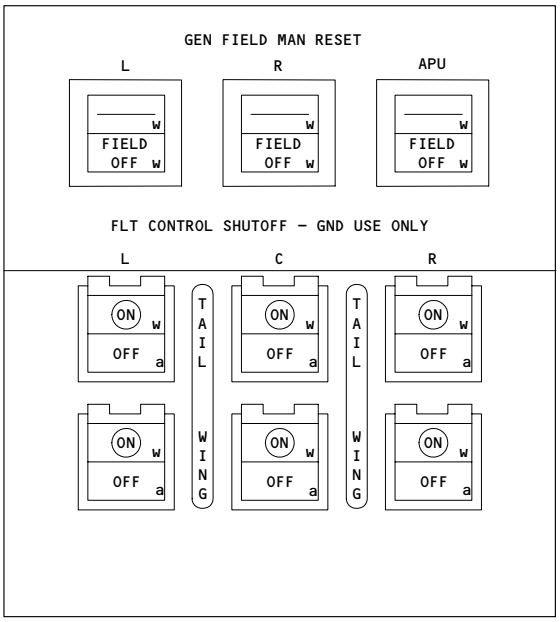
CONTROL - DESCRIPTION AND OPERATION

1. General
   A. Flight compartment switches and indicators work with control units to provide manual and automatic distribution of ac power. The major components are three generator control units (GCUs), and a bus power control unit (BPCU) (AMM 24-41-00/001).
2. Component Details (Fig. 1)
   A. Generator Control Unit (GCU)
      (1) The electrical power system contains three GCU's. Each GCU regulates the output voltage of its generator, and coordinates system protection with the bus power control unit (BPCU). The GCU's isolate faults and show failure information on the BPCU display. (The GCU's are connected to the BPCU by a serial data link.) The left and right GCU's work with flight compartment switches to control a relay and two contactors associated with each generator: The generator field control relay, generator circuit breaker, and bus tie breaker. The APU GCU works with flight compartment switches to control the APU generator field control relay, and the auxiliary power breaker.
      (2) Each GCU receives 95-volt ac power from the permanent magnet generator (PMG) section of its generator. This ac power goes through a transformer-rectifier in the GCU to produce 28-volt dc power. The dc power is used for GCU control. The left, right, and APU GCU's get 28-volt dc backup power from the battery bus, through circuit breakers on main power distribution panel P6.
      (3) The left and right GCU's receive additional dc power for their generator drive disconnect, and IDG air/oil heat exchanger air shutoff valve functions. This power is from the battery bus through circuit breakers on P6, and overhead circuit breaker panel P11.
      (4) The left GCU is on shelf 2 of left forward equipment center rack E1. The APU GCU, and the right GCU is on shelf 4 of right forward equipment center rack E2. The front of each GCU has a nameplate, and two circuit breakers. An electrical connector is mounted on the rear of the unit.
   B. GCB/APB/BTB
      (1) The generator circuit breakers (GCB's), auxiliary power breaker (APB), and bus tie breakers (BTB's) are identical. Each breaker contains three main contacts, along with seven normally open and seven normally closed auxiliary contacts. The main contacts are rated for continuous operation of 115/200-volt, 400-Hz, 275-amp ac power. Main ac power flows through these contacts. Six terminal studs on the breaker provide main contactor connections. The auxiliary contacts provide control to the breaker, and breaker status information to the GCU and BPCU. An electrical connector provides power to the auxiliary contacts as well as the trip and close coils.



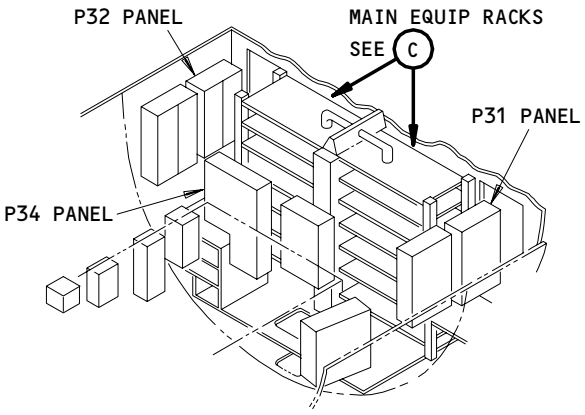


M10063 ELECTRICAL SYSTEM
CONTROL PANEL (P5)



M1087 GENERATOR FIELD AND
HYDRAULIC CONTROL PANEL (P61)

A



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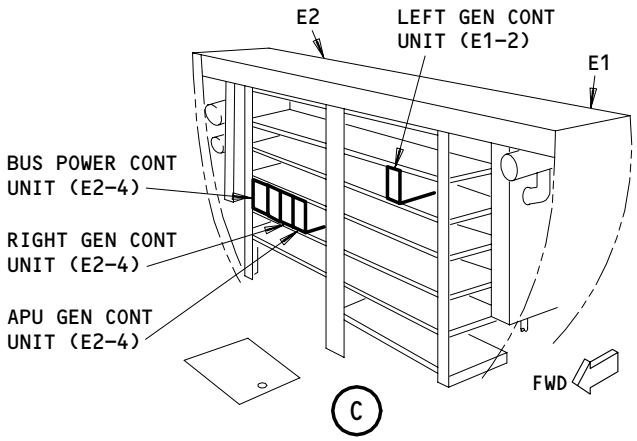

C

Electrical Control Component Location
Figure 1

(2) The main contacts are kept open by spring force. Only a momentary voltage is needed to the breaker coils to change position. No holding current is necessary. The breaker closes when 15.0 to 29.5-volts dc is applied to the breaker close coil. To trip (open) the main contacts, 15.0 to 29.5-volts dc are applied to the breaker trip coil. This returns the contacts to their original position. Spring force again keeps the main contacts open.

(3) The left BTB, and left GCB are in left generator power panel P31. The right BTB, and right GCB are in right generator power panel P32. The APB is in APU/external power panel P34.

C. Electrical Systems Control Panel

(1) Electrical systems control panel M10063 is on pilots' overhead panel P5. The M10063 panel contains switches controlling the ac power system: Two main generator control switches, one auxiliary generator control switch, two guarded generator drive disconnect switches, two bus tie breaker switches, two utility bus switches, and one external power switch. The panel also contains amber left and right BUS OFF lights for system indication.

D. Generator Field and Hydraulic Control Panel

(1) Generator field and hydraulic control panel M1087 is on right side panel P61. Along with hydraulic switches, the panel contains three field switches: one for each of the left, right and APU generators. A white FIELD OFF light is located in each switch.

3. Operation

A. Functional Description

(1) Generator Field Control Relay (GCR) Control

(a) Each generator control unit (GCU) contains a GCR. The GCR connects dc power from a rectifier in the GCU to the field winding of the generator. Without the field current, no ac power is produced by the generator.

(b) The GCU's work with the GEN CONT switches on the M10063 panel and the field switches on the M1087 panel to control the GCRs. The GEN CONT switches are push on/push off type, which latch in when on. When latched, an ON indicator in the switch is visible. The field switches are momentary action type, which do not latch in. Pushing a field switch once turns it on, pushing it again turns it off.

(c) The right and left GEN CONT switches control their respective GCR and generator circuit breaker (GCB). When a GEN CONT switch is off (out), its GCR and GCB are open. (The GCB opens the circuit connecting generator output power to its main ac bus.) To close the GCR and GCB, the GEN CONT switch is pressed ON (in). The GCU first energizes the close coil of the GCR. The GCR closes, allowing dc current to energize the exciter field windings of the generator. The GCU monitors generator output power until the quality is acceptable. The GCU then sends 28-volts dc to the close coil of the GCB. This allows the generator to supply ac power to its main bus. (The OFF light in the GEN CONT switch goes off when the GCB closes.)

(d) Four conditions can trip (open) a generator GCR and GCB:
- Pressing the GEN CONT switch off (out)
- pressing the appropriate guarded GEN DRIVE DISC switch on M10063
- pulling the engine fire switch on aft pilots' control stand P8
- a protective trip by the GCU (AMM 24-23-00).

1) Any of these conditions cause the GCU to energize the trip coils of the GCR and GCB. This stops generator operation, and isolates the generator from its bus. (An integrated drive generator under- speed protection function only trips the GCB, not the GCR. All other protection functions trip the GCR and GCB.)

(e) The field switch operates only if its corresponding GEN CONT switch is off. The field switch controls the GCR, but has no effect on the GCB. The GCB remains open. With the field switch on, the associated GCR is energized to close. The generator produces ac power. The field switch allows a check of the generator voltage and frequency without connecting it to the bus. Pushing the field switch again, opens the GCR. The GCR may also be tripped by:
- Pressing the appropriate guarded GEN DRIVE DISC switch
- pulling the engine fire switch on aft pilots' control stand P8
- a protective trip by the GCU.

1) When a GCR is open, the white FIELD OFF light in its field switch is on.

(f) The APU field control switch is also located on generator field and hydraulic control panel M1087. (The M1087 panel is on right side panel P61.) This is a momentary action switch. Pushing the switch once turns it on, pushing it again turns it off. The field switch only operates if the APU GEN CONT switch is off. The field switch controls the APU GCR, but has no affect on the auxiliary power breaker (APB). The APB remains open. With the field switch on, the APU GCR is energized to close. The generator produces ac power. The field switch allows a check of the generator voltage and frequency without connecting power to a bus. The APU GCR is tripped by:
- Pushing the field switch off
- pulling the APU fire switch on P8
- a protective trip by the APU GCU.

1) When the APU GCR is open, the white FIELD OFF light in the switch is on.

(2) Generator Circuit Breaker (GCB) Control

(a) The left and right GEN CONT switches on M10063 control their respective GCBs. The switches work with their generator control units (GCUs), to open and close the GCBs. In the closed position, the GCB connects generator output to the generator main ac bus. With the GCB in the trip position, the circuit is open. The amber OFF light in the GEN CONT switch is on when its GCB is open. Also, the EICAS display provides the R (or L) GEN OFF message when the corresponding GCB is open, and the corresponding engine is on. (This is a level C EICAS message.) Each GCU contains separate GCB close and trip relays. To close a GCB, its GEN CONT switch is set to ON (in). The generator field control relay (GCR) closes, allowing the generator to operate. The GCU checks power quality. When the quality is acceptable, the GCU sends 28-volts dc to the GCB close coil. The GCB closes. The GEN CONT switches are normally ON.

(b) Five conditions can trip (open) a GCB:

- Pressing the GEN CONT switch off (out)
- pressing the appropriate guarded GEN DRIVE DISC switch on M10063
- pulling the engine fire switch on aft pilots' control stand P8
- a protective trip by the GCU (AMM 24-23-00)
- an engine shutdown.

1) If external power is available, pushing the EXT PWR switch (on M10063), also trips the GCBs. External power then supplies main ac bus power (AMM 24-41-00). Any of these conditions cause the GCU to send 28-volts to the GCB trip coil. When the GCB opens, its GEN CONT switch amber OFF light comes on. If the corresponding engine is on, a level C EICAS message also appears: L (or R) GEN OFF. If the GEN DRIVE DISC switch is pressed, the amber DRIVE light in this switch comes on.

(c) A GCB is reset after a protective trip by cycling its GEN CONT switch. The GEN CONT switch is first pressed to off (out), then to ON (in). If the amber OFF light comes on again, the GCB is still open. (The fault condition remains.) The OFF light in the GEN CONT switch may thus be on at the same time that the switch is in the ON position. The light indicates GCB position. The switch directs the GCB to close if the GCU allows it. A protective function may not allow the GCB to close.

(3) Bus Tie Breaker (BTB) Control

(a) The left and right BUS TIE switches on the M10063 panel control their respective BTBs. Each switch is a push on/push off type, which latches in when on. When latched, an AUTO indicator in the switch is visible. An amber ISLN light is also in the switch.

(b) The object of the BTBs is to avoid a power loss on either main ac bus. If a main bus loses power, its BTB closes. The main ac bus is then connected to the ac tie bus. This allows the main bus to receive alternate power from: 1) An external power source, 2) the APU generator, or 3) the other main generator. (The numbers correspond to alternate source priority. Each main bus generator always has highest priority.)

(c) Each generator control unit (GCU) contains separate BTB close and trip relays. The GCU in the APU position does not control either BTB. The left and right GCU control their respective BTB. To close a BTB, the GCU close relay sends 28-volts dc to the BTB close coil. To open a BTB, the GCU trip relay sends 28-volts dc to the BTB trip coil.

(d) Normally, both BUS TIE switches are set to AUTO (in). The position of the BTBs is then determined by GCU logic and wiring between the power breakers. If each main ac bus is supplied by its generator the BTBs are open. The main ac buses are isolated from each other, and the ac tie bus. The ISLN lights in the BUS TIE switches will not be on. An ISLN light only comes on due to a system fault, or the corresponding BUS TIE switch being in the out position.

(e) If the main ac buses are not energized, the battery switch must be ON for automatic BTB control. The BAT switch is on the standby power panel M10062. (This panel is on P5.)

(f) Both BTBs close if one generator circuit breaker (GCB) opens, and no auxiliary or external power is available. (The auxiliary power breaker (APB), and the external power contactor (EPC), are open.) The one operating generator supplies both main ac buses. Both BTBs also close if both GCBs open. Any available source then supplies the main buses.

(g) With a GCB open, its associated BTB closes. Any available source supplies power to the main ac bus. This BTB opens, if its GCB closes. However, the BTB remains closed if the APB, EPC, and the other GCB are open. The one operating generator then supplies power to both main ac buses. If the APB, EPC, or other GCB then closes, the BTB opens. Power sources cannot be paralleled.

(h) When a BUS TIE switch is off (out), its BTB cannot close. The amber ISLN light in the switch is on. Also, the EICAS display provides the L (or R) BUS ISOLATED message when the corresponding BUS TIE switch is set to ISLN. (This is a level C EICAS message.) The main ac bus will remain isolated from the other power sources even if the bus loses power.

(i) The left and right BUS TIE switches control the automatic switching of power to the captain's and first officer's flight instrument transfer buses (AMM 24-51-00). This switching maintains power on the buses if their primary source fails. For automatic control of power to the captain's flight instrument transfer bus, the left BUS TIE switch must be set to AUTO (in). If the captain's instrument transfer bus switches to its alternate source while its main source (left ac bus) still has power, an EICAS message CAPT INSTR XFER appears on the status and maintenance pages. For automatic control of power to the first officer's flight instrument transfer bus, the right BUS TIE switch must be set to AUTO (in). If the first officer's instrument transfer bus switches to its alternate source while its main source (right ac bus) still has power, an EICAS message F/O INSTR XFER appears on the status and maintenance pages.

(j) An uncleared differential fault on the ac tie or main ac buses causes the GCUs to lock-out the BTBs (AMM 24-23-00). The BTBs are kept open by the GCUs. If a GCU detects an undervoltage and overload at the same time, the GCU locks-out its BTB. When a BTB is locked-out, its BUS TIE switch ISLN light comes on. (The L (or R) BUS ISOLATED message also appears on the EICAS display.) A locked-out BTB is reset by first pressing its switch to off (out), then to AUTO (in). If the ISLN light doesn't go off, the BTB is still locked-out. The condition which caused the lock-out still remains.

(k) During a category III autoland, the main ac buses are prevented from being supplied by a common source. The autoland condition is started by the flight control computers (AMM 22-11-00). The computers provide a ground to the isolation request relay (K122). The isolation relay energizes, allowing a 28-volt dc signal to be sent to the bus power control unit (BPCU). (The autoland condition is inhibited if the dc tie relay is closed, tying both main dc buses together.) The 28-volt dc signal is also routed through each open BTB, which energizes the BTB's autoland relay. (Each BTB has its own autoland relay.) When the autoland relays energize, they open circuits to the close coils of their respective BTB. The BTB's are unable to close. If only one BTB is open prior to autoland, only it is kept from closing. If both BTB's are closed, the autoland lock-out will not occur. (An autoland relay cannot energize when its associated BTB is closed.) The autoland lock-out does not cause the ISLN lights in the BUS TIE switches to come on, nor will the L or R BUS ISOLATED message appear on the EICAS display. The autoland lock-out cannot be removed by cycling the BUS TIE switches. Autoland is only removed when the flight control computers remove the ground from the isolation request relay (K122). The isolation request relay then de-energizes, restoring the system to normal.

(l) When the airplane is in the autoland mode, the dc tie relay is actuated by the captain's or first officer's instrument bus voltage sensing unit (IBVSU). When the IBVSUS sense a loss of power on either main ac bus, a ground is applied thru the autoland bus isolation relay to actuate the dc tie relay, which in turn restores the dc power. When the dc tie relay actuates, the EICAS message TR UNIT appears on the status and maintenance pages.

(4) Auxiliary Power Breaker (APB) Control

(a) The APU GEN switch on M10063 controls the auxiliary power breaker (APB). The switch is a push on/push off type, which latches in when on. When latched, an ON indicator in the switch is visible. The switch works with the APU generator control unit (GCU) to open and close the APB. In the closed position, the APB connects APU generator output power to the ac tie bus. With the APB in the trip position, the circuit is open.

1) AIRPLANES WITHOUT APU GEN OFF ISLN DIODE R824 (PRE-SB 24-103);
The amber OFF light in the switch is on when the APB is open and the APU generator switch is off, or the APB and external power contactor are open with the APU is operating above 95 percent full speed.

2) AIRPLANES WITH APU GEN OFF ISLN DIODE R824 (POST-SB 24-103);
The amber OFF light in the switch is on when the APB is open and the APU generator switch is off, or the APB and external power contactor are open with the APU is operating above 95 percent full speed, or APU generator field off.

(b) Along with the amber OFF light in the APU GEN switch, an APU GEN OFF message appears on the EICAS display. (The APU must be running, with the failure existing, for the EICAS message to appear.) This is a level C EICAS message.

(c) The APU GCU contains separate APB close and trip relays. To close the APB, the close relay sends 28-volts dc to the APB close coil. The APB opens when the trip relay sends 28-volts dc to the APB trip coil.

(d) Normally, the APU GEN switch is ON (in). After the APU is started, the auxiliary power control unit monitors APU input speed. When the APU generator input shaft is at or above 95 per cent full speed, the control unit sends a 28-volt dc APU "ready" signal to the APU GCU. (Full input shaft speed is 12,000 rpm.) The GCU energizes the close coil of the APU generator field control relay (GCR). The APU generator then produces power (AMM 24-21-00).

(e) When APU power quality is acceptable, the APU GCU allows the APB to close. The APB closes when external power is not connected to the ac tie bus (external power contactor is open). An open GCB results in its bus tie breaker closing. (The BUS TIE switches are assumed to be in their normal (AUTO) position.) The APU generator supplies main ac bus power. The OFF light in the APU GEN CONT switch should not come on as long as the APU GEN CONT switch is ON (latched-in position).

(f) The APU generator can be used to supply main ac bus power before the integrated drive generators are on. The external power contactor, and the GCBs are then open. The BTBs are closed. Upon engine start, the BTBs open and the GCBs close. The IDGs then supply power to their main ac buses. The APB remains closed. (Load shedding takes place when the engines are started with APU air, while the APU generator is supplying main ac bus power (AMM 24-23-00).)

(g) The APB trips (opens) due to:
- Pressing the APU GEN CONT switch off (out)
- pressing the EXT PWR switch (on M10063) with external power available
- the APU generator input shaft falling below 95 per cent full speed
- pulling the APU fire switch on aft pilots' control stand P8
- a protective trip by the APU GCU (AMM 24-23-00).

CONTROL

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKER - (REF 31-01-31, FIG. 101)				
LEFT BUS TIE, C902			119AL, MAIN EQUIP CTR, P31	24-22-03
LEFT GENERATOR, C901				24-22-03
CIRCUIT BREAKER - (REF 31-01-32, FIG. 101)				
RIGHT BUS TIE, C904				24-22-03
RIGHT GENERATOR, C903				24-22-03
CIRCUIT BREAKER (REF 31-01-34, FIG. 101)				
AUXILIARY POWER C905				24-22-03
PANEL - GENERATOR FIELD AND HYDRAULIC CONTROL, M1087	--	1	FLT COMPT, P61	24-22-04
PANEL - ELECT SYS CONTROL, M10063	--	1	FLT COMPT, P5	24-22-01
UNIT - APU GENERATOR CONTROL, M143	--	1	119AL, MAIN EQUIP CTR, E2-4	24-22-02
UNIT - LEFT GENERATOR CONTROL, M144	--	1	119AL, MAIN EQUIP CTR, E1-2	24-22-02
UNIT - RIGHT GENERATOR CONTROL, M146	--	1	119AL, MAIN EQUIP CTR, E2-4	24-22-02

Control - Component Index
Figure 101

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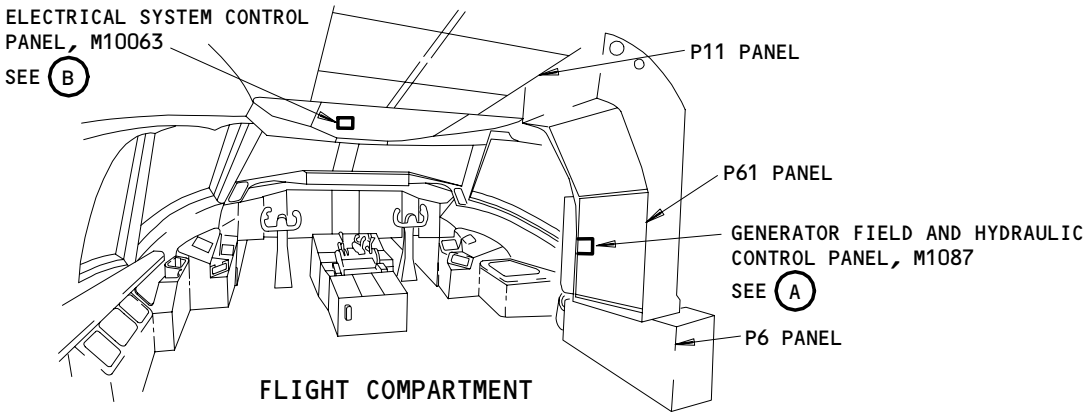
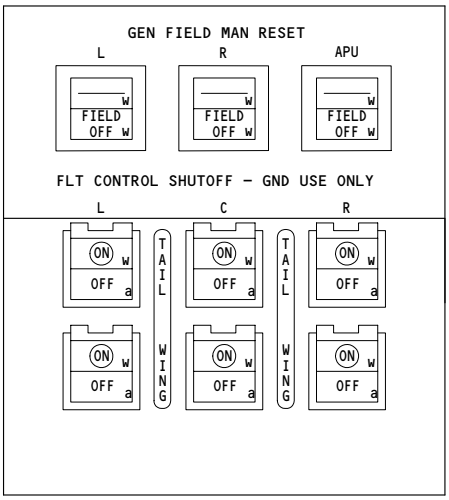
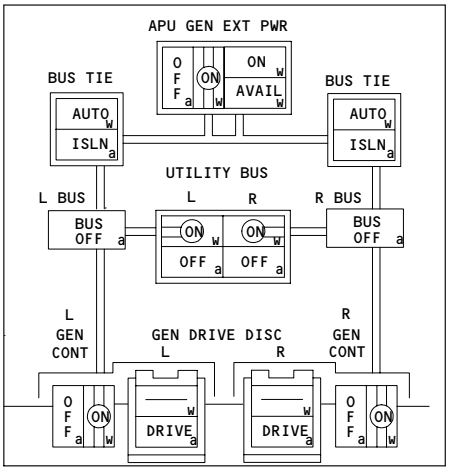


FLIGHT COMPARTMENT



GENERATOR FIELD AND HYDRAULIC CONTROL PANEL, M1087

A



ELECTRICAL SYSTEM CONTROL PANEL, M10063

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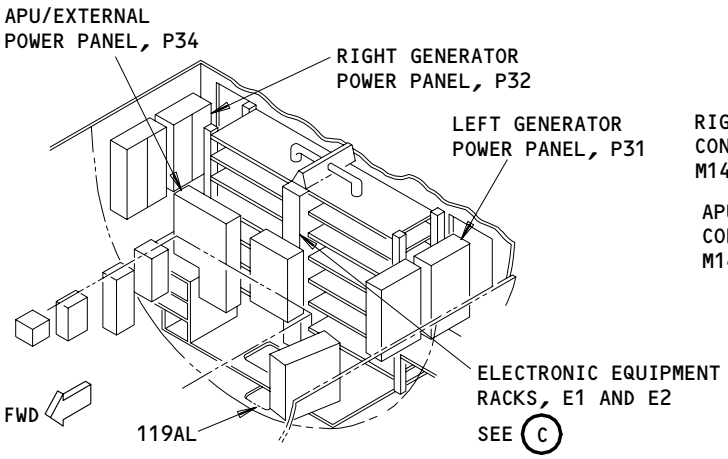
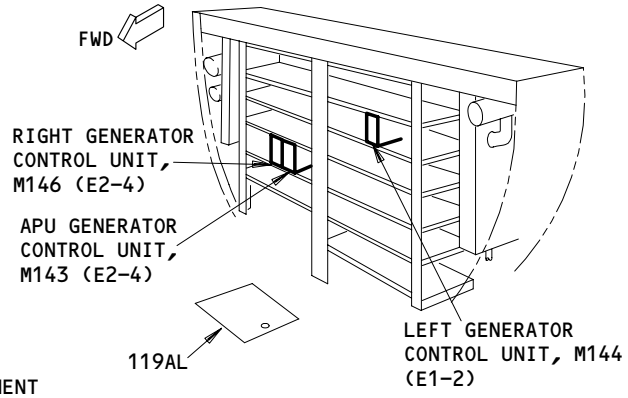


MAIN EQUIPMENT CENTER



ELECTRONIC EQUIPMENT RACKS, E1 AND E2

C

Control – Component Location
Figure 102

CONTROL (SUPPLY POWER) - MAINTENANCE PRACTICES

1. General
   A. This procedure has these tasks:
      (1) Supply and Remove External Power.
      (2) Supply and Remove APU Power.
      (3) Supply and Remove IDG Power.

TASK 24-22-00-862-001

2. Supply and Remove External Power
   A. General
      (1) This task has these parts:
         (a) Reset the ground handling relay.
         (b) Supply the external power to the ground handling bus.
         (c) Remove the external power from the ground handling bus.
         (d) Supply the external power to the ground service bus.
         (e) Remove the external power from the ground service bus.
         (f) Supply the external power to the 115V ac buses:

            NOTE: The ground handling bus energizes automatically when the external power is supplied to the receptacle. The ground service bus is energized automatically when the external power is supplied to the right 115V ac bus.

         (g) Remove the external power from the 115V ac buses.
   B. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (2) AMM 38-10-00/201, Potable Water System
   C. Equipment
      (1) External power supply - 115/200-volt ac, 3-phase, 400-Hz, 90-Kva
      (2) Support - electrical ground power cable - A24007-1
   D. Access
      (1) Location Zones
         212 Flight Compartment

(2) Access Panel
120AR External Power Panel

E. Prepare for the Test

S 042-005

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers. If the spoilers are extended and electrical power is removed, the spoilers will retract in less than one second.

F. Procedure

S 862-007

(1) Do these steps to reset the ground handling relay (GHR):
(a) If the electrical power on the ground handling bus is suddenly lost while the external power cable is still energized and connected to the external power receptacle, do one of these procedures to reset the GHR:

NOTE: If the BPCU senses any one of these faults: an open phase, over current, differential fault, over/under frequency, over/under voltage or internal failure of BPCU, the external power is removed from the ground handling bus. You must do one of the reset procedures to supply the power to the ground handling bus.

1) Remove and install the electrical power plug from/to the 120AR External Power Panel:
a) Remove the electrical power from the external power cable.

b) Remove the external power cable from the receptacle.
c) Install the external power cable in the external power receptacle and hold the cable with support A24007-1.
d) Energize the power cable.

2) Remove and supply the electrical power to the BPCU:
a) Remove the electrical power from the external power cable.
b) Make sure the BAT switch (P5) is in the OFF position.
c) Energize the external power cable.

3) Operate the GRND SERV BUS Switch:
a) Make sure the external power plug is connected to the receptacle.
b) Make sure the CONNECTED light in the receptacle panel P30 is on.
c) Push and release the GRND SERV BUS switch on the P21 panel.

S 862-006

(2) Do these steps to supply the external power to the ground handling bus:

(a) Open the cover on the external power panel P30.

WARNING: IF THE EXTERNAL POWER SUPPLY HAS AN EARTH GROUNDED NEUTRAL, THERE MUST NOT BE AN OPEN OR FLOATING GROUND IN THE NEUTRAL CIRCUIT WIRING OF THE SUPPLY OR THE AIRPLANE. IF AN OPEN OR FLOATING GROUND IS PRESENT, THE AIRPLANE CAN BE PUT AT AN ELECTRICAL POTENTIAL ABOVE EARTH GROUND. THIS ELECTRICAL POTENTIAL CAN RESULT ELECTRIC SHOCK WITH POSSIBLE SEVERE INJURY TO PERSONNEL WHO TOUCH THE AIRPLANE.

(b) Make sure the external power supply operates correctly before you supply external power to the airplane.
1) If the ground return (neutral) circuit on the external power supply or the external power receptacle does not operate correctly, do this task: Static Grounding (AMM 24-41-02/201).

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU CONNECT THE CABLE TO THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

(c) Install the power cable in the external power receptacle.
1) Hold the cable with the support A24007-1.
(d) Energize the power cable.
(e) Make sure these white lights on the P30 panel are on:
1) The CONNECTED light.
2) The NOT IN USE Light.

S 862-008

(3) Do these steps to remove the external power from the ground handling bus:
  (a) Remove the power from the external power cable.
  (b) Make sure these lights on the P30 panel are off:
    1) The CONNECTED light.
    2) The NOT IN USE light.

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU REMOVE THE CABLE FROM THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

  (c) Remove the external power cable.
  (d) Close the cover on the P30 panel.

S 862-009

(4) Do these steps to supply the external power to the ground service bus:

NOTE: The ground handling bus energizes automatically when the external power is supplied to the receptacle.

  (a) Open the cover on the external power panel P30.

WARNING: IF THE EXTERNAL POWER SUPPLY HAS AN EARTH GROUNDED NEUTRAL, THERE MUST NOT BE AN OPEN OR FLOATING GROUND IN THE NEUTRAL CIRCUIT WIRING OF THE SUPPLY OR THE AIRPLANE. IF AN OPEN OR FLOATING GROUND IS PRESENT, THE AIRPLANE CAN BE PUT AT AN ELECTRICAL POTENTIAL ABOVE EARTH GROUND. THIS ELECTRICAL POTENTIAL CAN RESULT ELECTRIC SHOCK WITH POSSIBLE SEVERE INJURY TO PERSONNEL WHO TOUCH THE AIRPLANE.

  (b) Make sure the external power supply operates correctly before you supply external power to the airplane.
    1) If the ground return (neutral) circuit on the external power supply or the external power receptacle does not operate correctly, do this task: Static Grounding (AMM 24-41-02/201).

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU CONNECT THE CABLE TO THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

  (c) Install the power cable in the external power receptacle.
    1) Hold the cable with the support A24007-1.
  (d) Energize the power cable.
  (e) Make sure these white lights on the P30 panel are on:
    1) The CONNECTED light.
    2) The NOT IN USE light.

(f) Push the GRND SERV BUS switch on the left forward attendant's panel P21.
1) Make sure the light in the GRND SERV BUS switch is on.
(g) Make sure the NOT IN USE light on the P30 panel is off.

S 862-010
(5) Do these steps to remove the external power from the ground service bus:
(a) Push the GRND SERV BUS switch on the left forward attendant's panel P21.
1) Make sure the light in the switch is off.
(b) Make sure the white NOT IN USE light on the external power panel P30 is on.
(c) Remove the power from the external power cable.
(d) Make sure these lights on the P30 panel are off.
1) The CONNECTED light.
2) The NOT IN USE light.

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU REMOVE THE CABLE FROM THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

(e) Remove the external power cable.
(f) Close the cover on the P30 panel.

S 862-011
(6) Do these steps to supply the external power to the 115V ac buses:

NOTE: The ground handling bus energizes automatically when the external power is supplied to the receptacle. The ground service bus is energized automatically when the external power is supplied to the right 115V ac bus.

(a) Open the cover on the external power panel P30.

WARNING: IF THE EXTERNAL POWER SUPPLY HAS AN EARTH GROUNDED NEUTRAL, THERE MUST NOT BE AN OPEN OR FLOATING GROUND IN THE NEUTRAL CIRCUIT WIRING OF THE SUPPLY OR THE AIRPLANE. IF AN OPEN OR FLOATING GROUND IS PRESENT, THE AIRPLANE CAN BE PUT AT AN ELECTRICAL POTENTIAL ABOVE EARTH GROUND. THIS ELECTRICAL POTENTIAL CAN RESULT ELECTRIC SHOCK WITH POSSIBLE SEVERE INJURY TO PERSONNEL WHO TOUCH THE AIRPLANE.

(b) Make sure the external power supply operates correctly before you supply external power to the airplane.
1) If the ground return (neutral) circuit on the external power supply or the external power receptacle does not operate correctly, do this task: Static Grounding (AMM 24-41-02/201).

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU CONNECT THE CABLE TO THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

(c) Install the power cable in the external power receptacle.
    1) Hold the cable with the support A24007-1.
(d) Energize the power cable.
(e) Make sure these white lights on the P30 panel are on:
    1) The CONNECTED light.
    2) The NOT IN USE light.
(f) Push the BAT switch on the pilots' overhead panel P5 to the ON position.
(g) Turn the STBY POWER switch on the P5 panel to the AUTO position.
(h) Make sure the white AVAIL light in the EXT PWR switch P5 is on.
(i) Push the EXT PWR switch on the P5 panel.
    1) Make sure the white ON light in the switch comes on.
(j) Make sure the NOT IN USE light in the P30 panel is off.
(k) Make sure the BUS TIE switches on the P5 panel are in the AUTO position.
    1) Make sure the L BUS and the R BUS off lights are off.
(l) Do these steps to supply power to the utility/galley buses:
    1) Push the applicable L or R UTILITY BUS switch on the P5 panel to the ON position.
    2) Make sure the yellow OFF light in the switch goes off.

S 862-027

(7) Do these steps to remove the External Power from the 115V ac buses:
    (a) Push the EXT PWR switch on the P5 panel and make sure the white ON light in the switch goes off.
    (b) Make sure the yellow (L BUS) BUS OFF light on P5 is on.
    (c) Make sure the yellow (R BUS) BUS OFF light on P5 is on.
    (d) Turn the STBY POWER switch on the P5 panel to the OFF position.
    (e) Push the BAT switch on P5 to the off position.

(f) Make sure the white NOT IN USE light on P30 is on.
(g) Remove the power from the external power cable.
(h) Make sure the CONNECTED and the NOT IN USE lights on P30 are off.

WARNING: REMOVE THE ELECTRICAL POWER FROM THE EXTERNAL POWER CABLE BEFORE YOU REMOVE THE CABLE FROM THE AIRPLANE. INJURY TO PERSONS CAN BE CAUSED BY AN ELECTRICAL SHOCK.

(i) Remove the external power cable.
(j) Close the cover on the P30 panel.

TASK 24-22-00-862-002

3. Supply and Remove APU Generator Power

A. General

(1) This task has these parts:
(a) Supply the APU generator power to the ground handling bus.
(b) Remove the APU generator power from the ground handling bus.
(c) Supply the APU generator power to the ground service bus.
(d) Remove the APU generator power from the ground service bus.
(e) Supply the APU generator power to the 115V ac buses.
(f) Remove the APU generator power from the 115V ac buses.

B. References

(1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(2) AMM 38-10-00/201, Potable Water System
(3) AMM 49-11-00/501, Auxiliary Power Unit

C. Prepare for the Test

S 042-014

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers. If the spoilers are extended and electrical power is removed, the spoilers will retract in less than one second.

D. Procedure

S 862-013

(1) Do these steps to supply the APU generator power to the ground handling bus:

NOTE: If the external power and the APU generator power are available, the external power automatically supplies the ground handling bus. External power must be removed to permit the APU generator to supply the ground handling bus.

(a) Push the BAT switch on the P5 panel to the ON position.
(b) Make sure the APU GEN switch on P5 is in the OFF position.
(c) Make sure the two BUS TIE switches (P5) are in the ISLN position.
1) Make sure the yellow ISLN light in each switch is on.
(d) Start the APU (AMM 49-11-00/501).
(e) Make sure the white FIELD OFF light in the APU GEN FIELD switch on P61 is on.
(f) Make sure the yellow (L BUS) BUS OFF light on P5 is on.
(g) Push the APU GEN FIELD switch (P61).
(h) Make sure the FIELD OFF light in the APU GEN FIELD switch (P61) is off.

S 862-015

(2) Do these steps to remove the APU generator power from the ground handling bus:
(a) Stop the APU (AMM 49-11-00/501).
(b) Push the BAT switch on P5 to the OFF position.

S 862-021

(3) Do these steps to supply the APU generator power to the ground service bus:

NOTE: The ground handling bus is automatically energized when the APU power is satisfactory. If the right 115V ac bus is energized, the ground service bus is automatically energized from the right 115Vac bus.

(a) Push the BAT switch on the P5 panel to the ON position.
(b) Make sure the APU GEN switch on P5 is in the OFF position.
(c) Start the APU (AMM 49-11-00/501).
(d) Make sure the white FIELD OFF light in the APU GEN FIELD switch goes on.
(e) Push the APU GEN FIELD switch (P61).
(f) Make sure the FIELD OFF light in the APU GEN FIELD switch (P61) is off.
(g) Push the GRND SERV BUS switch on the P21 panel.
1) Make sure the yellow light in the switch is on.

S 862-016

(4) Do these steps to remove the APU generator power from the ground service bus:
   (a) Stop the APU (AMM 49-11-00/501).
   (b) Push the BAT switch on P5 to the off position.

S 862-017

(5) Do these steps to supply the APU generator power to the 115V ac buses:

   NOTE: The ground handling bus is automatically energized when the APU power is satisfactory. The ground service bus is automatically energized when the right 115V ac bus is energized.

   (a) Push the BAT switch on the P5 panel to the ON position.
   (b) Make sure the APU GEN switch on the P5 panel is in the OFF position.
   (c) Make sure the BUS TIE switches on P5 are set to the ISLN position.
      1) Make sure the yellow ISLN light in each switch is on.
   (d) Make sure the two yellow BUS OFF lights on P5 are on.
   (e) Start the APU (AMM 49-11-00/501).
   (f) Push the APU GEN switch (P5) to the ON position.
   (g) Make sure the yellow OFF light in the APU GEN switch on P5 is off.
   (h) Push the left BUS TIE switch on P5 to the AUTO position to energize the left 115V ac bus.
      1) Make sure the (L BUS) BUS OFF light on P5 is off.
   (i) Push the right BUS TIE switch on P5 to the AUTO position to energize the right 115v ac bus.

      NOTE: The ground service bus is automatically energized by the power from the right 115V ac bus.

      1) Make sure the (R BUS) BUS OFF light on P5 is off.
   (j) Do these steps to supply power to the utility/galley buses:
      1) Push the applicable L or R UTILITY BUS switch on P5 to the ON position.
      2) Make sure the yellow OFF light in the switch goes off.

S 862-018

(6) Do these steps to remove the APU generator power from the 115V ac buses:

NOTE: If the electrical power is removed for more than 8 hours, remove the pressure from the potable water system (AMM 38-10-00/201).

(a) Push the BUS TIE switches on the P5 panel to the ISLN position.
1) Make sure the yellow ISLN light in each switch goes on.
(b) Make sure the two yellow BUS OFF lights on P5 are on.
(c) Stop the APU (AMM 49-11-00/501).
(d) Push the BAT switch on P5 to the off position.

TASK 24-22-00-862-003

4. Supply and Remove IDG Power

A. General
(1) This task has these parts:
(a) Supply the IDG power to the 115V ac buses:
(b) Remove the IDG power from the 115V ac buses:

B. References
(1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(2) AMM 71-00-00/501, Power Plant

C. Access
(1) Location Zones
212 Flight Compartment

D. Prepare for the Test

S 042-019

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers. If the spoilers are extended and electrical power is removed, the spoilers will retract in less than one second.

E. Procedure

S 862-020

(1) Do these steps to supply the IDG Power to the 115V ac buses:
(a) Set the BAT switch on the P5 panel to the ON position.
(b) Make sure the two yellow BUS OFF lights on P5 are on.
(c) Do these steps to energize the left 115V ac bus with the left generator power:
1) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch on P5 is on.
2) Operate the left engine (AMM 71-00-00/501).

CAUTION: MAKE SURE THE YELLOW DRIVE LIGHT IN THE L GEN DRIVE DISC SWITCH (P5) GOES OFF AFTER YOU START THE ENGINE. HIGH OIL OUT TEMPERATURE OR LOW OIL PRESSURE CAN CAUSE DAMAGE TO THE IDG.

3) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch is off.
   a) If the DRIVE light in the L GEN DRIVE DISC switch comes on, push the L GEN DRIVE DISC switch and stop the engines (AMM 71-00-00/501).
   b) Isolate the failure which caused the DRIVE light to come on (FIM 24-20-00/101).
4) Push the L GEN CONT switch on P5 to the ON position.
5) Make sure the (L BUS) BUS OFF light on P5 is off.

(d) Do these steps to energize the right 115V ac bus with the left generator power:

NOTE: The right 115V ac bus must not be energized by the external power, the APU generator, or the right generator. The APU GEN and the EXT PWR switches on P5 must be off. The right engine must be off, or the R GEN CONT switch must be OFF.

1) Energize the left 115V ac bus with the left generator power (AMM 24-22-00/201).
2) Push the two BUS TIE switches on P5 to the AUTO position.
   a) Make sure the ISLN light in each switch goes off.
3) Make sure the BUS OFF lights on P5 are off.

(e) Do these steps to energize the right 115V ac bus with the right generator power:

1) Make sure the yellow DRIVE light in the R GEN DRIVE DISC switch on P5 is on.
2) Operate the right engine (AMM 71-00-00/501).

CAUTION: MAKE SURE THE YELLOW DRIVE LIGHT IN THE R GEN DRIVE DISC SWITCH (P5) GOES OFF AFTER YOU START THE ENGINE. HIGH OIL OUT TEMPERATURE OR LOW OIL PRESSURE CAN CAUSE DAMAGE TO THE IDG.

3) Make sure the yellow DRIVE light in the R GEN DRIVE DISC switch is off.
   a) If the DRIVE light in the R GEN DRIVE DISC switch comes on, push the R GEN DRIVE DISC switch and stop the engine (AMM 71-00-00/501).
   b) Isolate the failure which caused the DRIVE light to come on (AMM 24-20-00/201).
4) Push the R GEN CONT switch on P5 to the ON position.
5) Make sure the right (R BUS) BUS OFF light on P5 is off.

(f) Do these steps to energize the left 115V ac bus with the right generator power:

NOTE: Do not energize the left 115V ac bus by the external power, the APU generator, or the left generator. The APU GEN and EXT PWR switches on P5 must be off. The left engine must be off, or the L GEN CONT switch (P5) must be off.

1) Energize the right 115V ac bus with the right generator power (AMM 24-22-00/201).
2) Push the two BUS TIE switches on P5 to the AUTO position.
   a) Make sure the ISLN light in each switch goes off.
3) Make sure the two BUS OFF lights on P5 are off.

(g) Do these steps to supply power to the utility/galley bus:
1) Energize the applicable 115V ac bus which supplies power to the utility/galley bus:
2) Push the applicable (L or R) UTILITY BUS switch on P5 to the ON position.
   a) Make sure the yellow OFF light in the switch goes off.

(h) Do these steps to the manually reset the utility/galley buses:
1) If a load shed occurs for a one power source and locks out the automatic set for the utility/galley bus, do these steps to manually reset:
   a) Set one or two of the throttle levers to the idle detent position.
   b) Stop for a minimum of 10 seconds.
   c) Operate the applicable utility bus switch off and on.
   d) Make sure the yellow OFF light in each switch is off.

S 862-022

(2) Do these steps to remove the IDG power from the 115V ac buses:
(a) Stop the engine(s) (AMM 71-00-00/501).
(b) Make sure the yellow DRIVE lights in the L and R GEN DRIVE DISC switches on P5 are on.
(c) Make sure the yellow OFF lights in the L and R GEN CONT switches are on.
(d) Make sure the two BUS OFF lights on the P5 panel are on.
(e) Push the BAT switch on P5 to the off position.

F. Put the Airplane Back to Its Usual Condition

S 862-033

(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

AC POWER CONTROL - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks:
      (1) Operational Test - AC Power System.
      (2) System test - AC Power System.
      (3) BPCU BITE/Periodic Test
      (4) Autoland DC Tie Test

   TASK 24-22-00-715-001
2. Operational Test - AC Power System
   A. General
      (1) The operational test does these tests:
         (a) BPCU BITE/PERIODIC TEST.
         (b) Engine Start with External Power and Switch Check
         (c) Field Control Relay for the L and R IDG
         (d) Bus Tie Breakers and Generator Circuit Breakers
         (e) Engine Shutdown.
         (f) Switch Check with External Power and APU Power
         (g) Field Control Relay for the APU Generator
         (h) Engine Start with APU Power and Switch Check
         (i) Engine Shutdown with APU Generator.
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 31-41-00/501, EICAS
      (3) AMM 49-11-00/501, Auxiliary Power Unit (APU)
      (4) AMM 71-00-00/501, Power Plant
   C. Access
      (1) Location Zones
         119/120 Main Equipment Center
         211/212 Flight Compartment

      (2) Access Panel
         119AL Main Equipment Center

   D. Prepare for the Test

      S 865-002
      (1) Set the BAT switch on the P5 panel to the ON position.

S 865-083

(2) Make sure the EXT PWR, APU GEN, LEFT GEN CONT, and RIGHT GEN CONT switches are OFF.

E. BPCU BITE/PERIODIC TEST

NOTE: Use battery power to supply the BPCU. Do not use the IDGs, APU generator, or External power to supply power to the BPCU.

S 745-004

(1) Do the PERIODIC TEST as follows:
   (a) Momentarily push the PERIODIC TEST switch on the BPCU (E2-4).
   (b) Make sure the indication sequence shows on the BPCU:
      1) EXTERNAL POWER SYSTEM
      2) OK
      3) LEFT GEN POWER SYSTEM
      4) OK
      5) RIGHT GEN POWER SYSTEM
      6) OK
      7) APU GEN POWER SYSTEM
      8) OK
      9) LAST FLT OO END OF DATA
      10) FOR PREVIOUS FLT PUSH NOW

         NOTE: The above sequence is for a power system with no faults found. If a fault is found in a control unit or in the airplane equipment it governs, the applicable messages will be displayed in place of the OK message.

   (c) Repair any message which is displayed on the BPCU.
   (d) If it is necessary to view this display again, stop until the FOR PREVIOUS FLT PUSH NOW indication has extinguished. Then, momentarily push the PERIODIC TEST switch.
   (e) Push the RESET switch on the front of the BPCU.
   (f) Make sure the indication sequence shows on the BPCU:
      1) EXTERNAL POWER SYSTEM
      2) LEFT GEN POWER SYSTEM
      3) RIGHT GEN POWER SYSTEM
      4) APU GEN POWER SYSTEM

S 865-086

(2) Set the BAT switch on the P5 panel to the OFF position.

F. Engine Start with External Power and Switch Check

S 865-093
(1) Supply the External Power to the main ac buses (AMM 24-22-00/201).

S 865-105
(2) Make sure the STBY POWER switch (P5) is in the AUTO position.

S 715-007
(3) Do a check of the L and R GEN CONT switches:
  (a) Set the GEN CONT switches on the P5 panel to the OFF position.
    1) Make sure the yellow OFF lights in the GEN CONT switches are on.
  (b) Set the GEN CONT switches on the P5 panel to the ON position.
    1) Make sure the yellow OFF lights in the GEN CONT switches stay on.

S 715-009
(4) Do a check of these lights:
  (a) Make sure the white ON light in the EXT PWR switch on the P5 panel is on.
  (b) Make sure the two BUS OFF lights on the P5 panel are off.
  (c) Make sure the yellow DRIVE lights in the GEN DRIVE DISC switches, on the P5 panel, are on.

S 715-010
(5) Operate the left engine (AMM 71-00-00/501).

S 715-011
(6) Do a check of these lights:
  (a) Make sure these lights are off:
    1) The DRIVE light in the L GEN DRIVE DISC switch (P5).
    2) The OFF light in the L GEN CONT switch (P5).
    3) The two BUS OFF lights (P5).
  (b) Make sure these lights are on:
    1) The yellow OFF light in the switch for the R GEN CONT (P5).
    2) The yellow DRIVE light in the R GEN DRIVE DISC switch (P5).

S 715-012
(7) Do a check of the EICAS displays:
(a) Push the selection switch for the ELEC/HYD display on the right side panel (P61).
(b) Make sure these values show on the bottom EICAS display:
1) For the left generator,
AC Volts = 115 ± 5,
Frequency = 400 ± 5.
For the right generator,
AC Volts = 0,
Frequency = 0.

S 715-016
(8) Push the EXT PWR switch on the P5 panel.

S 715-096
(9) Make sure these lights are on:
(a) The yellow OFF light in the L GEN CONT switch (P5).
(b) The white ON light in the EXT PWR switch (P5).

S 715-097
(10) Make sure these lights are off:
(a) The two BUS OFF lights (P5).
(b) The L FIELD OFF light (P61).

S 715-021
(11) Operate the right engine (AMM 71-00-00/501).

S 715-022
(12) Do a check of these lights:
(a) Make sure these lights are off:
1) The DRIVE light in the R GEN DRIVE DISC switch (P5).
2) The OFF light in the R GEN CONT switch (P5).
3) The two BUS OFF lights (P5).

(b) Make sure these lights are on:
1) The yellow OFF light in the L GEN CONT switch (P5).

S 715-098
(13) Make sure these values show on the bottom EICAS display:
(a) For the left generator,
AC Volts = 115 ± 5.
Frequency = 400 ± 5.
For the right generator,
AC Volts = 115 ± 5,
Frequency = 400 ± 5.

S 715-026
(14) Push the EXT PWR switch (P5).

S 715-100
(15) Make sure these lights are on:
(a) The yellow OFF light in the R GEN CONT switch (P5).
(b) The white ON light in the EXT PWR switch (P5).

S 715-101
(16) Make sure these lights are off:
(a) The two BUS OFF lights (P5).
(b) The L and R FIELD OFF lights (P61).

S 715-029
(17) Push the L GEN CONT switch (P5) to the OFF position, then push to the ON position.
(a) Make sure these lights are off:
1) The OFF light in the L GEN CONT switch (P5).
2) The two BUS OFF lights (P5).
3) The L FIELD OFF light (P61).

S 715-031
(18) Push the R GEN CONT switch (P5) to the OFF position, then push to the ON position.
(a) Make sure these lights are off.
1) The OFF light in the R GEN CONT switch (P5).

2) The two BUS OFF lights (P5).
3) The ON light in the EXT PWR switch (P5).
4) The R FIELD OFF light (P61).

G. Field Control Relay for the L and R IDG

S 715-035

(1) Do a check on the field control relay for the L and R IDG:
(a) Push the L GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch is on.
2) Make sure the white L FIELD OFF light (P61) is on.
(b) Push the R GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch is on.
2) Make sure the white R FIELD OFF light (P61) is on.
(c) Make sure the white ON light in the EXT PWR switch (P5) is on.
(d) Make sure the ELEC/HYD page shows on the bottom EICAS display.
(e) Make sure the EICAS display shows:
1) For the left generator,
AC Volts = 0
Frequency = 0
For the right generator,
AC Volts = 0
Frequency = 0
(f) Push the L GEN FIELD switch (P61).
1) Make sure the L FIELD OFF light in the switch goes off.
2) Make sure the yellow OFF light in L GEN CONT switch (P5) is on.
(g) Make sure the EICAS display shows:
1) For the left generator,
AC Volts = 115 ± 5
Frequency = 400 ± 5
For the right generator,
AC Volts = 0
Frequency = 0
(h) Push the R GEN FIELD switch (P61).
1) Make sure the R FIELD OFF light in the switch goes off.
2) Make sure the yellow OFF light in the R GEN CONT switch (P5) is on.

(i) Make sure the EICAS display shows:
    1) For the left generator,
       AC Volts = 115 ± 5
       Frequency = 400 ± 5.
       For the right generator,
       AC Volts = 115 ± 5
       Frequency = 400 ± 5.
(j) Push the L GEN FIELD switch (P61).
    1) Make sure the white FIELD OFF light in the switch comes on.
    2) Make sure the yellow OFF light in the L GEN CONT switch (P5) stays on.
(k) Make sure the EICAS display shows:
    1) For the left generator,
       AC Volts = 0
       Frequency = 0.
       For the right generator,
       AC Volts = 115 ± 5
       Frequency = 400 ± 5.
(l) Push the R GEN FIELD switch (P61).
    1) Make sure the white FIELD OFF light in the switch comes on.
    2) Make sure the yellow OFF light in the R GEN CONT switch (P5) stays on.
(m) Make sure the EICAS display shows:
    1) For the left generator,
       AC Volts = 0
       Frequency = 0.
       For the right generator,
       AC Volts = 0
       Frequency = 0.
(n) Push the R GEN CONT switch (P5) to the ON position.
    1) Make sure the OFF light in the switch goes off.
    2) Make sure the R FIELD OFF light (P61) is off.
(o) Push the R GEN FIELD switch (P61) two times.
    1) Make sure the FIELD OFF light stays off, after each push.
(p) Push the R GEN CONT switch (P5) to the OFF position.
    1) Make sure the yellow light in the switch comes on.

(q) Push the L GEN CONT switch (P5) to the ON position.
1) Make sure the OFF light in the switch goes off.
2) Make sure the L FIELD OFF light (P61) is off.
(r) Push the L GEN FIELD switch (P61) two times.
1) Make sure the FIELD OFF light stays off, after each push.
(s) Push the L GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.

H. Bus Tie Breakers and Generator Circuit Breakers

S 715-036

(1) Do a check on the bus tie breakers and the generator circuit breakers:
(a) Make sure the R GEN CONT switch (P5) is in the OFF position.
(b) Make sure the L GEN CONT switch (P5) is in the OFF position.
(c) Push the EXT PWR switch on the P5 panel.
1) Make sure the white ON light in the switch comes on.
(d) Make sure these messages show on the EICAS display:
1) L GEN OFF
2) R GEN OFF
(e) Push the right BUS TIE switch (P5) to the ISLN position.
(f) Make sure these lights are on:
1) The yellow ISLN light in the right BUS TIE switch (P5).
2) The yellow right BUS OFF light (P5).
3) The yellow OFF light in the R GEN CONT switch (P5).
(g) Make sure these indications show on the EICAS display:
1) R AC BUS OFF
(h) Push the R GEN CONT switch (P5) to the ON position.
(i) Push the EXT PWR switch on the P5 panel and make sure the white ON light in the switch goes off.
(j) Make sure these lights are off:
1) The OFF light in the R GEN CONT switch (P5).
2) The right BUS OFF light (P5).
(k) Make sure the yellow ISLN light in the right BUS TIE switch (P5) stays on.
(l) Make sure no R GEN OFF, or R AC BUS OFF indication shows on the EICAS display.

(m) Make sure the R BUS ISOLATED indication shows on the EICAS display.
(n) Make sure the left BUS OFF light (P5) is on.
(o) Push the right BUS TIE switch (P5) to the AUTO position.
1) Make sure the ISLN light in the switch goes off.
(p) Make sure no R BUS ISOLATED indication shows on the EICAS display.
(q) Push the left BUS TIE switch (P5) to the ISLN position.
(r) Make sure these lights are on:
1) The yellow ISLN light in the left BUS TIE switch (P5).
2) The yellow left BUS OFF light (P5).
3) The yellow OFF Light in the L GEN CONT switch (P5).
(s) Make sure these indications show on the EICAS display:
1) L AC BUS OFF
2) L BUS ISOLATED
3) L GEN OFF
(t) Push the L GEN CONT switch (P5) to the ON position.
(u) Make sure these lights are off:
1) The OFF light in the L GEN CONT switch (P5).
2) The left BUS OFF light (P5).
(v) Make sure the yellow ISLN light in the left BUS TIE switch stays on.
(w) Make sure no L GEN OFF or L AC BUS OFF indication show on the EICAS display.
(x) Make sure the L BUS ISOLATED indication shows on the EICAS display.
(y) Push the left BUS TIE switch (P5) to the AUTO position.
1) Make sure the ISLN light in the switch goes off.
(z) Make sure no L BUS ISOLATED indication shows on the EICAS display.

I. Engine Shutdown

S 715-037
(1) Do the engine shutdown procedure:
(a) Make sure the OFF light in the L GEN CONT switch (P5) is off.

(b) Make sure the OFF light in the R GEN CONT switch (P5) is off.
(c) Make sure the ON light in the EXT PWR switch (P5) is off.

S 715-038
(2) Shutdown the left engine (AMM 71-00-00/501).

S 715-039
(3) Do a check on these lights:
(a) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch (P5) is on.
(b) Make sure the yellow DRIVE light in the R GEN DRIVE DISC switch (P5) is off.
(c) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
(d) Make sure the left BUS OFF light stays off.
(e) Make sure no L AC BUS OFF, L GEN OFF, or L GEN DRIVE indication shows on the EICAS display.

S 715-040
(4) Do the right engine shutdown procedure (AMM 71-00-00/501).

S 715-041
(5) Do a check on these lights:
(a) Make sure the yellow DRIVE lights in the L and R GEN DRIVE DISC switches (P5) are on.
(b) Make sure these lights are on:
1) The yellow OFF lights in the L and R GEN CONT switches (P5).
2) The yellow BUS OFF lights (P5).

J. Switch Check with External Power and APU Power

S 865-042
(1) Supply the external power to the main ac buses (AMM 24-22-00/201).

S 715-043
(2) Do the switch check procedure with the external power and the APU power.
(a) Push the APU GEN switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch is on.

(b) Push the APU GEN switch (P5) to the ON position.
1) Make sure the OFF light in the APU GEN switch (P5) is on.

S 715-044
(3) Start the APU (AMM 49-11-00/501).
(a) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The two BUS OFF lights (P5).
3) The APU FIELD OFF light (P61).
(b) Make sure the ON light in the EXT PWR switch (P5) is on.
(c) Push the APU GEN switch (P5) to the OFF position.
(d) Make sure these lights are on:
1) The yellow OFF light in the APU GEN switch (P5).
2) The white APU FIELD OFF light (P61).
(e) Make sure the APU GEN OFF (level C message) shows on the EICAS display.
(f) Push the APU GEN switch (P5) to the ON position.
(g) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The APU FIELD OFF light (P61).
(h) Make sure the white ON light in the EXT PWR switch (P5) is on.
(i) Make sure no APU GEN OFF indication shows on the EICAS display.
(j) Push the EXT PWR switch (P5).
(k) Make sure these lights are off:
1) The ON light in the EXT PWR switch (P5).
2) The OFF light in the APU GEN switch (P5).
3) The two BUS OFF lights (P5).
(l) Push the APU GEN switch (P5) to the OFF position.
(m) Make sure these lights are on:
1) The yellow OFF light in the APU GEN switch (P5).
2) The two yellow BUS OFF lights (P5).
3) The white APU FIELD OFF light (P61).
(n) Push the APU GEN switch (P5) to the ON position.
(o) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).

2) The two BUS OFF lights (P5).
3) The APU FIELD OFF light (P61).

(p) Push the EXT PWR switch (P5).
1) Make sure the white ON light in the switch comes on.

(q) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The two BUS OFF lights (P5).
3) The APU FIELD OFF light (P61).

K. Field Control Relay for the APU Generator

S 715-045

(1) Do a check of the field control relay for the APU generator.
(a) Push the APU GEN switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch is on.
2) Make sure the white APU FIELD OFF light (P61) is on.
3) Make sure the APU GEN OFF (level C message) shows on the EICAS display.

(b) Push the APU GEN FIELD switch (P61).
1) Make sure the FIELD OFF light in the switch goes off.
2) Make sure the yellow OFF light in the APU GEN switch (P5) stays on.
3) Make sure the APU GEN OFF indication shows on the EICAS display.

(c) Make sure the ELEC/HYD page is shows on the bottom EICAS display.

(d) Make sure these values show below APU/BAT on the EICAS display:
1) AC Volts: 115 ± 5
Frequency: 400 ± 5

(e) Push the APU GEN FIELD switch (P61).
1) Make sure the white FIELD OFF light in the switch comes on.
2) Make sure the yellow OFF light in the APU GEN switch (P5) stays on.
3) Make sure these values show below APU/BAT on the EICAS display:
AC Volts: 0
Frequency: 0

(f) Push the APU GEN switch (P5) to the ON position.
(g) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The APU FIELD OFF light (P61).
3) Make sure these values show below APU/BAT on the EICAS display:
AC Volts: 115 ± 5
Frequency: 400 ± 5
(h) Push the selection switch for the ECS/MSG display (P61).
1) Make sure no APU GEN OFF indication shows on the EICAS display.
(i) Push the APU GEN FIELD switch (P61) two times . Make sure the FIELD OFF light stays off after each push.

L. Engine Start with APU Power and Switch Check

S 715-046

(1) Do the procedure for the engine start with APU power and the switch check:
(a) Make sure the APU GEN switch (P5) is in the ON position.
1) Make sure the OFF light in the switch is off.
(b) If the white ON light in the EXT PWR switch (P5) is on, push the EXT PWR switch.
1) Make sure the ON light in the switch goes off.
(c) Make sure the two BUS OFF lights (P5) are off.
(d) Push the L and R UTILITY BUS switches (P5) to the OFF position.
1) Make sure the yellow OFF light in each switch comes on.
(e) Make sure these indications show on the EICAS display:
1) L UTIL BUS OFF (level C message)
2) R UTIL BUS OFF (level C message)
(f) Push the L and R UTILITY BUS switches (P5) to the ON position. Make sure the yellow OFF light in each switch goes off.
(g) Make sure no L UTIL BUS OFF, or R UTIL BUS OFF indications show on the EICAS display.
(h) Make sure the L and R GEN CONT switches (P5) are in the ON position.
1) Make sure the yellow OFF light in each switch is on.

(i) Make sure the yellow DRIVE lights in the L and R GEN DRIVE DISC switches (P5) are on.

S 715-047

(2) Start the left engine (AMM 71-00-00/501).
  (a) Make sure these indications occur for approximately 30 seconds during the left engine start:
    1) The yellow OFF lights in the L and R UTILITY BUS switches (P5) come on.
    2) The two BUS OFF lights (P5) are off.
  (b) One minute after the left engine start, make sure these indications occur:
    1) The DRIVE light in the L GEN DRIVE DISC switch (P5) is off.
    2) The Off light in the L GEN CONT switch (P5) is off.
    3) The two BUS OFF lights (P5) are off.
    4) The OFF light in the APU GEN CONT switch (P5) is off.
    5) The OFF lights in the L and R UTILITY BUS switches (P5) are off.
  (c) Push the APU GEN switch (P5) to the OFF position.
    1) Make sure the yellow OFF light in the switch comes on.
  (d) Make sure these lights are off:
    1) The OFF light in the L GEN CONT switch (P5).
    2) The two BUS OFF lights (P5).
    3) The left FIELD OFF light (P61).
  (e) Make sure the yellow OFF light in the R GEN CONT switch (P5) stays on.
  (f) Push the APU GEN switch (P5) to the ON position.
    1) Make sure the OFF light in the switch goes off.
  (g) Make sure these lights are off:
    1) The OFF light in the L GEN CONT switch (P5).
    2) The two BUS OFF lights (P5).
    3) The L ,R and APU FIELD OFF lights (P61).

S 715-048

(3) Operate the right engine (AMM 71-00-00/501).
  (a) Make sure these indications occur for approximately 30 seconds after the right engine start:
    1) The yellow OFF light in the R UTILITY BUS switch (P5) comes on.

2) The OFF light in the L UTILITY BUS switch (P5) stays off.
3) The two BUS OFF lights (P5) stay off.

(b) One minute after the right engine start, make sure these indications occur:
1) The DRIVE lights in the L and R GEN DRIVE DISC switches (P5) are off.
2) The OFF lights in the L and R GEN CONT switches (P5) are off.
3) The two BUS OFF lights (P5) are off.
4) The OFF light in the APU GEN switch (P5) is off.
5) The OFF lights in the L and R UTILITY BUS switches (P5) are off.

(c) Push the APU GEN switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.

(d) Make sure these lights are off.
1) The OFF lights in the L and R GEN CONT switches (P5).
2) The two BUS OFF lights (P5).
3) The L and R FIELD OFF lights (P61).

(e) Push the APU GEN switch (P5) to the ON position.
1) Make sure the OFF light in the switch goes off.

(f) Make sure these lights are off:
1) The OFF lights in the L and R GEN CONT switches (P5).
2) The two BUS OFF Lights (P5).
3) The L, R and APU FIELD OFF lights (P61).

M. Engine Shutdown with APU Generator

S 715-102

(1) Do the left engine shutdown procedure (AMM 71-00-00/501).
(a) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch (P5) is on.
(b) Make sure the DRIVE light in the R GEN DRIVE DISC switch (P5) is off.
(c) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
(d) Make sure these lights are off:
1) The OFF light in the APU and the R GEN CONT switches (P5).

2) The two BUS OFF lights (P5).

S 715-051

(2) Do the right engine shutdown procedure (AMM 71-00-00/501).
(a) Make sure the yellow DRIVE lights in the L and R GEN DRIVE DISC switches (P5) are on.
(b) Make sure the yellow OFF lights in the L and R GEN CONT switches (P5) are on.
(c) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The two BUS OFF lights (P5).
3) The white APU FIELD OFF light (P61).
(d) Push the EXT PWR switch (P5). Make sure the white ON light in the switch is on.

S 715-052

(3) Do the APU shutdown procedure (AMM 49-11-00/501).
(a) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The two BUS OFF lights (P5).

S 865-053

(4) Remove electrical power if it is not necessary.
(a) Make sure the BAT switch (P5) is in the OFF position.

TASK 24-22-00-725-003

3. System Test - AC Power System

A. General
(1) The system test has an Air Mode Test and an Autoland Mode Test.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 32-09-02/201, Air/Ground Relays
(3) AMM 49-11-00/501, Auxiliary Power Unit
(4) AMM 71-00-00/501, Power Plant

C. Access
(1) Location Zones
119/120 Main Equipment Center
211/212 Flight Compartment

(2) Access Panel
119AL Main Equipment Center

D. Equipment
(1) Multimeter - 0-1000 VDC, 0-750 VAC, 0-2 amps, 0-20 megohms
(2) Support - A24007-1

E. Air Mode Test

S 845-081

CAUTION: REFER TO AMM 32-09-02/201 FOR FLIGHT MODE SIMULATION. EQUIPMENT DAMAGE CAN OCCUR IF THE INSTRUCTIONS ARE NOT FOLLOWED.

(1) Put the system No.1 and 2 air/ground relays in the flight mode (AMM 32-09-02/201).

S 845-055
(2) Put the airplane in the air mode (AMM 32-09-02/201).

S 015-056
(3) Open the access cover on the external power panel P30.

S 865-057
(4) Install the power cable in the external power receptacle. Hold the cable with the support A24007-1.
(a) Energize the power cable.

S 865-058
(5) Supply integrated drive generator power to the main ac buses (AMM 24-22-00/201).

S 725-059
(6) Do a check on the air mode:
(a) Make sure the DRIVE lights in the L and R GEN DRIVE DISC switches (P5) are off.

(b) Make sure the two BUS TIE switches (P5) are set to the AUTO position.
    1) Make sure the ISLN light in each switch is off.
(c) Push the R GEN CONT switch on pilots' overhead panel P5 to the OFF position.
    1) Make sure the yellow OFF light in the switch comes on.
(d) Make sure these lights are off:
    1) The OFF light in the L GEN CONT switch (P5).
    2) The two BUS OFF lights (P5).
    3) The ON light in the EXT PWR switch (P5).
(e) Push the EXT PWR switch (P5).
(f) Make sure these lights stay off:
    1) The ON light in the EXT PWR switch (P5).
    2) The two BUS OFF lights (P5).
    3) The OFF light in the L GEN CONT switch (P5).
(g) Push the L GEN CONT switch (P5) to the OFF position.
    1) Make sure the yellow OFF light in the switch comes on.
    2) Make sure the yellow BUS OFF lights (P5) come on.
    3) Make sure the ON light in the EXT PWR switch (P5) is off.
(h) Push the R GEN CONT switch (P5) to the ON position.
(i) Make sure these lights are off:
    1) The OFF light in the R GEN CONT switch (P5).
    2) The two BUS OFF lights (P5).
(j) Push the EXT PWR switch (P5).
(k) Make sure these lights stay off:
    1) The On light in the EXT PWR switch (P5).
    2) The two BUS OFF lights (P5).
    3) The OFF light in the R GEN CONT switch.
(l) Push the L GEN CONT switch (P5) to the ON position.
(m) Make sure these lights are off:
    1) The OFF light in the L and R GEN CONT switch (P5).
    2) The two BUS OFF lights (P5).
    3) The ON light in the EXT PWR switch.
(n) Push the EXT PWR switch (P5).
(o) Make sure these lights are off:
    1) The OFF light in the L and R GEN CONT switch (P5).

2) The two BUS OFF lights (P5).
3) The ON light in the EXT PWR switch.

(p) Push the GRND SERV BUS switch on the forward attendant's panel P21.
1) Make sure the light in the switch stays on.

(q) Push the L GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.

(r) Push the R GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.

(s) Make sure the two yellow BUS OFF lights are on.

(t) Push the GRND SERV BUS switch on the forward attendant's panel P21.
1) Make sure the ON light in the switch stays off.

S 715-061

(7) Start the APU (AMM 49-11-00/501).

(a) Make sure the yellow OFF light in the APU GEN switch (P5) stays on.

(b) Push the APU GEN switch (P5) to the ON position.

(c) Make sure these lights are off:
1) The two BUS OFF lights (P5).
2) The OFF light in the APU GEN switch (P5).

(d) Make sure the yellow OFF lights in the L and R GEN CONT switch (P5) stay on.

(e) Push the L GEN CONT switch (P5) to the ON position.

(f) Make sure these lights are off:
1) The OFF lights in the L and APU GEN switches (P5).
2) The two BUS OFF Lights (P5).

(g) Make sure the yellow OFF light in the R GEN CONT switch (P5) stays on.

(h) Push the switch for the GRND SERV BUS (P21).
1) Make sure the ON light in the switch stays off.

(i) Push the R GEN CONT switch (P5) to ON.

(j) Make sure these lights are off:
1) The OFF lights on the L and R and APU GEN switches (P5).
2) The two BUS OFF lights (P5).

S 715-062

(8) Do the left engine shutdown procedure (AMM 71-00-00/501).

(a) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch (P5) comes on.

(b) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
(c) Make sure these lights are off:
1) The OFF lights in the R and the APU GEN switches (P5).
2) The two BUS OFF Lights (P5).

S 715-063
(9) Shutdown the right engine (AMM 71-00-00/501).
(a) Make sure the yellow DRIVE light in the R GEN DRIVE DISC switch (P5) comes on.
(b) Make sure the yellow OFF lights in the L and the R GEN CONT switches (P5) are on.
(c) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).
2) The two BUS OFF lights (P5).

S 715-103
(10) Remove the APU generator power from the main ac buses.

S 715-104
(11) Remove the power from the external power cable.

S 845-065
(12) Put the airplane in the ground mode (AMM 32-09-02/201).

F. Autoland Mode Test

S 725-060
(1) Do these steps to test the autoland mode on airplane with SB 24-64 (These airplanes have K2127 and K2128 in the P6 panel, wiring diagram 24-51-31):
(a) Remove the electrical power from the main ac buses (AMM 24-22-00/201).
(b) Open the following circuit breakers on the P11 panel and attach DO-NOT-CLOSE identifiers:
1) 11E17, L FLT CONT CMPTR PWR

2) 11E20, C FLT CONT CMPTR PWR
3) 11E35, R FLT CONT CMPTR PWR

(c) Install a jumper to ground at TB127, terminal G45 (E1-4 shelf) to enable the K122 ISOLATION REQUEST relay (WDM 22-11-32).
(d) Open the following overhead panel P11 circuit breakers and attach DO-NOT-CLOSE identifiers:
1) 11D6, CAT III BUS ISOL BAT
2) 11T3, CAT III BUS ISOL L
3) 11T30, CAT III BUS ISOL R
(e) Supply left and right IDG power to the main ac buses (AMM 24-22-00/201).
(f) Make sure the L and R main AC BUS OFF lights (P5) are off.
(g) Make sure the two BUS TIE switches (P5), are set to the AUTO position.
1) Make sure the ISLN light, in each switch, is off.

WARNING: BE CAREFUL WHEN YOU WORK ON THE P11 PANEL. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(h) Open the P11 panel.
(i) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(j) Measure 115 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(k) Open the CENTER BUS AC circuit breaker (6J18) on the P6 panel.
(l) Open the CENTER BUS PWR circuit breaker (6C10) on the P6 panel.
(m) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(n) Measure 0 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(o) Push the R BUS TIE switch (P5) to the ISLN position.
(p) Push the R GEN CONT switch (P5) to the OFF position.
(q) Make sure the R BUS OFF light (P5) is on.
(r) Make sure the L BUS OFF light (P5) is off.
(s) Open this circuit breaker on the P6 panel, INVERTER CENTER BUS AC (6L15).

(t) Close this circuit breaker on the P11 panel, CAT III BUS ISOL L (11T3).
(u) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(v) Close this circuit breaker on the P6 panel, INVERTER CENTER BUS AC (6L15).
(w) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(x) Measure 115 ±5 volts AC at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(y) Open this circuit breaker on the P6 panel, INVERTER CENTER BUS AC (6L15).
(z) Measure 0 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(aa) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ab) Close this circuit breaker on the P6 panel, INVERTER CENTER BUS AC (6L15).
(ac) Open this circuit breaker on the P6 panel, CENTER BUS CONT (6G7).
(ad) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ae) Close the CENTER BUS CONT circuit breaker (6G7) on the P6 panel.
(af) Open the CAT III BUS ISOL L circuit breaker (11T3) on P11 panel.
(ag) Push the R GEN CONT switch (P5) to the ON position.
(ah) Push the L BUS TIE switch (P5) to the ISLN position.
(ai) Push the L GEN CONT switch (P5) to the OFF position.
(aj) Make sure the R BUS TIE switch (P5) is in the ISLN position.
(ak) Make sure the L BUS OFF light (P5) is on.
(al) Make sure the R BUS OFF light (P5) is off.
(am) Close the CAT III BUS ISOL R circuit breaker (11T30) on the P11 panel.
(an) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.

(ao) Open the CAT III BUS ISOL R circuit breaker (11T30) in the P11 panel.
(ap) Close the CAT III BUS ISOL BAT circuit breaker (11D6) on the P11 panel.
(aq) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ar) Push the L GEN CONT switch (P5) to the ON position.
(as) Push the R GEN CONT switch (P5) to the OFF position.
(at) Make sure the R BUS OFF light (P5) is on.
(au) Make sure the L BUS OFF light (P5) is off.
(av) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(aw) Push the R BUS TIE switch (P5) to the AUTO position.
(ax) Push the R GEN CONT switch (P5) to the ON position.
(ay) Push the L GEN CONT switch (P5) to the OFF position.
(az) Make sure the L BUS OFF light (P5) is on.
(ba) Make sure the R BUS OFF light (P5) is off.
(bb) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(bc) Open this circuit breaker on the P11 panel, CAT III BUS ISOL BAT (11D6).
(bd) Remove IDG power from the main ac buses (AMM 24-22-00/201).
(be) Remove the jumper to ground from TB127, terminal G45 (E1-4 shelf).
(bf) Remove DO-NOT-CLOSE identifiers and close following P11 panel circuit breakers:
    1) 11D6, CAT III BUS ISOL BAT
    2) 11E17, L FLT CONT CMPTR PWR
    3) 11E20, C FLT CONT CMPTR PWR
    4) 11E35, R FLT CONT CMPTR PWR
    5) 11T3, CAT III BUS ISOL L
    6) 11T30, CAT III BUS ISOL R
(bg) Close the following circuit breakers on the P6 panel:
    1) 6J18, CENTER BUS AC
    2) 6C10, CENTER BUS PWR

S 725-091

(2) Do these steps to test the autoland mode on airplane without SB 24-64 (These airplanes don't have K2127 and K2128 in the P6 panel, wiring diagram WDM 24-51-31):

(a) Remove the electrical power from the main ac buses (AMM 24-22-00/201).

(b) Open the following circuit breakers on the P11 panel and attach DO-NOT-CLOSE identifiers:

1) 11E17, L FLT CONT CMPTR PWR
2) 11E20, C FLT CONT CMPTR PWR
3) 11E35, R FLT CONT CMPTR PWR

(c) Install a jumper to ground at TB127, terminal G45 (E1-4 shelf) to enable the K122 ISOLATION REQUEST relay (WDM 22-11-32).

(d) Open the following overhead panel P11 circuit breakers and attach DO-NOT-CLOSE identifiers:

1) 11D6, CAT III BUS ISOL BAT
2) 11T3, CAT III BUS ISOL L
3) 11T30, CAT III BUS ISOL R

(e) Supply left and right IDG power to the main ac buses (AMM 24-22-00/201).

(f) Make sure the L and R main AC BUS OFF lights (P5) are off.

(g) Make sure the two BUS TIE switches (P5), are set to the AUTO position.

1) Make sure the ISLN light, in each switch, is off.

WARNING: BE CAREFUL WHEN YOU WORK ON THE P11 PANEL. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(h) Open the P11 panel.

(i) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.

(j) Measure 115 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.

(k) Open the CENTER BUS AC circuit breaker (6J18) on the P6 panel.

(l) Open the CENTER BUS PWR circuit breaker (6C10) on the P6 panel.
(m) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(n) Measure 0 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(o) Push the R BUS TIE switch (P5) to the ISLN position.
(p) Push the R GEN CONT switch (P5) to the OFF position.
(q) Make sure the R BUS OFF light (P5) is on.
(r) Make sure the L BUS OFF light (P5) is off.
(s) Close this circuit breaker on the P6 panel, CAT III BUS ISOL L (11T3).
(t) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(u) Measure 115 ±5 volts ac at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20) on P11.
(v) Open this circuit breaker on the P6 panel, CENTER BUS CONT (6G7).
(w) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(x) Close the CENTER BUS CONT circuit breaker (6G7) on the P6 panel.
(y) Open the CAT III BUS ISOL L circuit breaker (11T3) on P11 panel.
(z) Push the R GEN CONT switch (P5) to the ON position.
(aa) Push the L BUS TIE switch (P5) to the ISLN position.
(ab) Push the L GEN CONT switch (P5) to the OFF position.
(ac) Make sure the R BUS TIE switch (P5) is in the ISLN position.
(ad) Make sure the L BUS OFF light (P5) is on.
(ae) Make sure the R BUS OFF light (P5) is off.
(af) Close the CAT III BUS ISOL R circuit breaker (11T30) on the P11 panel.
(ag) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ah) Open the CAT III BUS ISOL R circuit breaker (11T30) in the P11 panel.

(ai) Close the CAT III BUS ISOL BAT circuit breaker (11D6) on the P11 panel.
(aj) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ak) Push the L GEN CONT switch (P5) to the ON position.
(al) Push the R GEN CONT switch (P5) to the OFF position.
(am) Make sure the R BUS OFF light (P5) is on.
(an) Make sure the L BUS OFF light (P5) is off.
(ao) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(ap) Push the R BUS TIE switch (P5) to the AUTO position.
(aq) Push the R GEN CONT switch (P5) to the ON position.
(ar) Push the L GEN CONT switch (P5) to the OFF position.
(as) Make sure the L BUS OFF light (P5) is on.
(at) Make sure the R BUS OFF light (P5) is off.
(au) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21) on P11.
(av) Open this circuit breaker on the P11 panel, CAT III BUS ISOL BAT (11D6).
(aw) Remove IDG power from the main ac buses (AMM 24-22-00/201).
(ax) Remove the jumper to ground from TB127, terminal G45 (E1-4 shelf).
(ay) Remove DO-NOT-CLOSE identifiers and close following P11 panel circuit breakers:
1) 11D6, CAT III BUS ISOL BAT
2) 11E17, L FLT CONT CMPTR PWR
3) 11E20, C FLT CONT CMPTR PWR
4) 11E35, R FLT CONT CMPTR PWR
5) 11T3, CAT III BUS ISOL L
6) 11T30, CAT III BUS ISOL R
(az) Close the following circuit breakers on the P6 panel:
1) 6J18, CENTER BUS AC
2) 6C10, CENTER BUS PWR

TASK 24-22-00-745-071

4. BPCU BITE/Periodic Test

NOTE: This is a scheduled maintenance task.

A. Reference
(1) FIM 24-20-00/101, AC Generation
(2) AMM 24-22-00/201, Electrical Power - Control

B. Procedure

S 865-084
(1) Set the BAT switch on the P5 panel to the ON position.

S 865-085
(2) Make sure the EXT PWR, APU GEN, LEFT GEN CONT, and RIGHT GEN CONT switches are OFF.

S 745-082
(3) Do the PERIODIC TEST:

NOTE: Use battery power to supply the BPCU. Do not use the IDGs, External Power or the APU generator to supply power.

(a) Momentarily push the PERIODIC TEST switch on the BPCU (E2-4).
(b) Make sure the indication sequence shows on the BPCU:
1) EXTERNAL POWER SYSTEM
2) OK
3) LEFT GEN POWER SYSTEM
4) OK
5) RIGHT GEN POWER SYSTEM
6) OK
7) APU GEN POWER SYSTEM
8) OK
9) LAST FLT 00 END OF DATA
10) FOR PREVIOUS FLT PUSH NOW

NOTE: The above sequence is for a power system with no faults found. If a fault is found in a control unit or in the airplane equipment it governs, the applicable messages will be displayed in place of the OK message.

(c) Repair any message which is displayed on the BPCU (FIM 24-20-00/101).
(d) If it is necessary to view this display again, stop until the FOR PREVIOUS FLT PUSH NOW indication has extinguished. Then, momentarily push the PERIODIC TEST switch.
(e) Push the RESET switch on the front of the BPCU.
(f) Make sure the indication sequence shows on the BPCU:
1) EXTERNAL POWER SYSEM
2) LEFT GEN POWER SYSTEM
3) RIGHT GEN POWER SYSTEM
4) APU GEN POWER SYSTEM

S 865-088
(4) Set the BAT switch on the P5 panel to the OFF position.

TASK 24-22-00-725-073
5. Autoland DC Tie Test

NOTE: This is a scheduled maintenance task.
There alternative access for the Autoland DC Tie Test, use the forward cargo compartment sidewall panels 121AW & 121BW
A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 31-41-00/501 EICAS
B. Procedure

S 725-089
(1) Do a test on the autoland DC Tie:
(a) Remove the electrical power from the 115V ac buses if it is on (AMM 24-22-00/201).
(b) Make sure the BAT switch on the P5 panel is in the OFF position.
(c) Open the following circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
1) 11E17, L FLT CONT CMPTR PWR
2) 11E20, C FLT CONT CMPTR PWR
3) 11E35, R FLT CONT CMPTR PWR

(d) Install a jumper to ground at the terminal block TB127, terminal G45 (E1-4 shelf) to enable the K122 ISOLATION REQUEST relay (WDM 22-11-32).
(e) Install a jumper from terminal FC123 to terminal FC101 of the terminal block TB176 on the E2-4 shelf (WDM 24-51-31).

NOTE: The jumper is installed to energize the Center Bus Isln relay K123.

(f) Make sure these P11 panel circuit breakers are closed:
1) 11D6, CAT III BUS ISOL BAT
2) 11S7, F/O INST TRANSFER ALTN BUS ϕA
3) 11S8, F/O INST TRANSFER ALTN BUS ϕB
4) 11S9, F/O INST TRANSFER ALTN BUS ϕC
5) 11S34, CAPT INST TRANSFER ALTN BUS ϕA
6) 11S35, CAPT INST TRANSFER ALTN BUS ϕB
7) 11S36, CAPT INST TRANSFER ALTN BUS ϕC
8) 11T3, CAT III BUS ISOL L
9) 11T30, CAT III BUS ISOL R
(g) Make sure these P6 panel circuit breakers are closed:
1) 6A6, DC BUS TIE CONT
2) 6A18, 115V AC BUS LEFT SEC 2
3) 6A24, 115V AC BUS RIGHT SEC 2
4) 6J14, CAPT PRIM INST BUS ϕA
5) 6J15, CAPT PRIM INST BUS ϕB
6) 6J16, CAPT PRIM INST BUS ϕC
7) 6L15, INVERTER CTR BUS ISLN PWR
8) 6L20, F/O PRIM INST BUS ϕA
9) 6L21, F/O PRIM INST BUS ϕB
10) 6L22, F/O PRIM INST BUS ϕC
(h) Supply external power to the 115V ac buses (AMM 24-22-00/201).
(i) Make sure the battery switch (P5) is in the ON position.
(j) Make sure the two BUS TIE switches (P5) are set to the AUTO position.
1) Make sure the ISLN light in each switch is off.
(k) Make sure the EICAS operates (AMM 31-41-00/501).
(l) Push the STATUS switch on the EICAS select panel (P9).
(m) Make sure the TR UNIT, CAPT INSTR XFER, and F/O INSTR XFER indications are not shown on the lower EICAS display.
(n) Open the CAPT PRIM INSTR BUS ϕA (6J14) circuit breaker.
1) Make sure the CAPT INSTR XFER and the TR UNIT indications show on the lower EICAS display.
(o) Close the CAPT PRIM INSTR BUS ϕA (6J14) circuit breaker.
1) Make sure the CAPT INSTR XFER and the TR UNIT indications do not show on the lower EICAS display.

(p) Open the F/O PRIM INSTR BUS ϕA (6L20) circuit breaker.
    1) Make sure the F/O INSTR XFER and the TR UNIT indications show on the lower EICAS display.
(q) Close the F/O PRIM INSTR BUS ϕA (6L20) circuit breaker.
    1) Make sure the F/O INSTR XFER and the TR UNIT indications do not show on the lower EICAS display.
(r) Remove the external power from the 115V ac buses (AMM 24-22-00/201).
(s) Make sure the BAT switch (P5) is set to the OFF position.
(t) Remove the jumper from terminal FC123 to terminal FC101 of the terminal block TB176 (E2-4 shelf).
(u) Remove the jumper to ground at the terminal block TB127, terminal G45 (E1-4 shelf).
(v) Remove DO-NOT-CLOSE tags and close the following circuit breakers on the P11 panel:
    1) 11E17, L FLT CONT CMPTR PWR
    2) 11E20, C FLT CONT CMPTR PWR
    3) 11E35, R FLT CONT CMPTR PWR

ELECTRICAL SYSTEM CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. The electrical system control panel, M10063, (referred to as the control panel) is installed on the pilot's overhead panel, P5.
   B. This procedure contains two tasks. The first task removes the control panel. The second task installs the control panel and does a test of the installation.

TASK 24-22-01-004-001

2. Remove the Electrical System Control Panel
   A. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Procedure

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

      S 864-003
      (2) Remove electrical power (AMM 24-22-00/201).

      S 864-004
      (3) Make sure the BAT switch on the P5 panel is in the off position (the switch is pulled out), and attach a DO-NOT-OPERATE tag.

      S 024-006
      (4) Remove the control panel.

TASK 24-22-01-404-007

3. Install the Electrical System Control Panel
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access

(1) Location Zones

211/212 Flight Compartment

C. Install the electrical system control panel

S 424-021

(1) Install the control panel.

S 864-008

(2) Remove the DO-NOT-OPERATE tag from the BAT switch on the P5 panel.

D. Do a test of the control panel installation

S 864-022

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

S 864-010

(2) Make sure the BAT switch is in the ON position (the switch is in the latched-in position).

S 864-012

(3) Make sure the APU GEN switch is in the the OFF position (the switch is out).

S 864-023

(4) Make sure the two BUS TIE switches are in the OFF position.

S 864-014

(5) Make sure these lights on the electrical power system control panel are on:

(a) The yellow ISLN lights in the two BUS TIE switches.

(b) The yellow left and right BUS OFF lights.

(c) The yellow OFF light in the APU GEN switch.

(d) The yellow OFF light in the left and right GEN CONTROL switches.

(e) The DRIVE indication in the left and right IDG disconnect switches.
(f) The white AVAIL light in the EXT PWR switch.

S 864-020
(6) Put the BAT switch to the OFF position.

S 864-024
(7) Remove electrical power if it is not necessary (AMM 24-22-00/201).

APU, LEFT, AND RIGHT GENERATOR CONTROL UNITS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Remove the Generator Control Unit
      (2) Install the Generator Control Unit

   TASK 24-22-02-004-001

2. Remove the Generator Control Unit
   A. General
      (1) This task is for the removal of the generator control units. The APU generator control unit, M143, and the right generator control unit, M146, are installed on shelf 4 of the right forward equipment center rack E2. The left generator control unit, M144, is installed on shelf 2 of the left forward equipment center rack E1.
   B. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
      (3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   C. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Flight Compartment

      (2) Access Panel
          119AL Main Equipment Center

   D. Remove the Generator Control Unit

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

S 864-003

WARNING: DO NOT REMOVE OR INSTALL THE GENERATOR CONTROL UNITS WHEN THE ENGINES OR THE APU ARE IN OPERATION. THE HIGH VOLTAGE AT THE CONNECTOR CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Make sure the engines and APU are not in operation.

S 864-007

(3) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
(a) 6A1, BAT BUS DISTR

S 914-008

CAUTION: DO NOT TOUCH THE GENERATOR CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE GENERATOR CONTROL UNIT.

(4) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 024-009

(5) Remove the generator control unit (AMM 20-10-01/401).

TASK 24-22-02-404-010

3. Install the Generator Control Unit

A. General

(1) This task is for the installation of the generator control units. The APU generator control unit, M143, and the right generator control unit, M146, are installed on shelf 4 of the right forward equipment center rack E2. The left generator control unit, M144, is installed on shelf 2 of the left forward equipment center rack E1.

B. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices

C. Access
(1) Location Zones
119/120 Main Equipment Center
211/212 Flight Compartment

(2) Access Panel
119AL Main Equipment Center

D. Install the Generator Control Unit

S 974-011

CAUTION: DO NOT TOUCH THE GENERATOR CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE GENERATOR CONTROL UNIT.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-012
(2) Install the generator control unit (AMM 20-10-01/401).

S 864-013
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6A1, BAT BUS DISTR

E. Test the generator control unit

S 714-014
(1) Do these steps to test the left, right, and APU generator control unit:
(a) Push the BAT switch on the pilot's overhead panel (P5) to the ON position.
(b) Push the RESET button on the BPCU on shelf E2-4 in the main equipment center.

(c) Make sure this message sequence is shown on the BPCU display:
EXTERNAL POWER SYSTEM
LEFT GEN POWER SYSTEM
RIGHT GEN POWER SYSTEM
APU GEN POWER SYSTEM

(d) Push the BIT switch on the bus power control unit on shelf E2-4 in the main equipment center.

(e) Make sure this message sequence is shown on the BPCU display:
EXTERNAL POWER SYSTEM
OK
LEFT GEN POWER SYSTEM
OK
RIGHT GEN POWER SYSTEM
OK
APU GEN POWER SYSTEM
OK

NOTE: The above sequence is for a power system with no faults found. If a fault is found in a control unit or in the airplane equipment it governs, the applicable messages will be displayed in place of the OK message.

(f) If any fault is reported on the BPCU, see the FIM for corrective actions (FIM 24-20-00/101).

(g) Push the BAT switch (P5) to the OFF position.

GENERATOR, BUS TIE, AND AUXILIARY POWER BREAKERS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) A removal of the circuit breakers.
      (2) An installation of the circuit breakers.
      (3) The circuit breakers are:
         (a) The two generator circuit breakers (GCBs), C901 and C903.
         (b) The two bus tie breakers (BTBs), C902 and C904.
         (c) The auxiliary power breaker (APB), C905.

TASK 24-22-03-864-010

2. Generator, Bus Tie, and Auxiliary Power Breaker Removal (Fig. 401).
   A. General
      (1) The removal task is the same for all the breakers.
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Activate/Deactivate Spoilers
   C. Access
      (1) Location Zones
         211/212 Flight Compartment
         119/120 Main Equipment Center
      (2) Access Panels
         119BL Main Equipment Center Panel
   D. Prepare for the Removal

S 044-001

WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

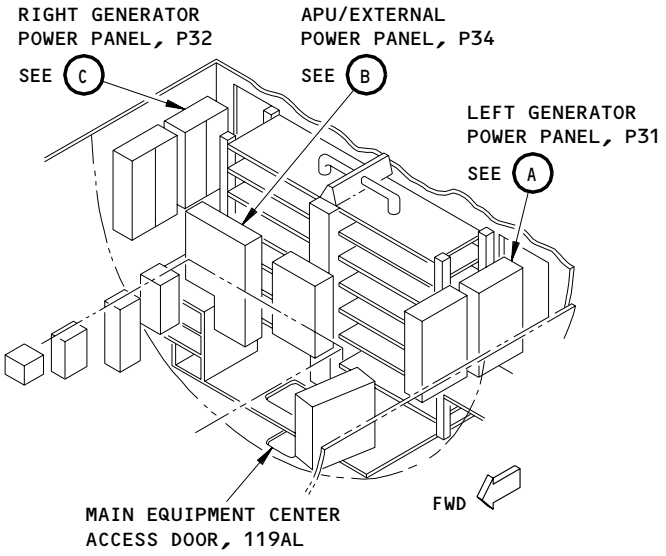
(1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

S 864-011

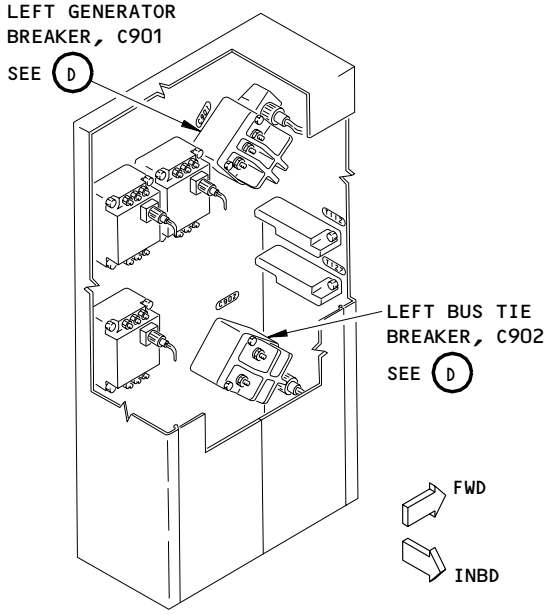
(2) Remove the electrical power (AMM 24-22-00/201).

S 864-012

(3) Make sure the BAT switch is in the OFF position.

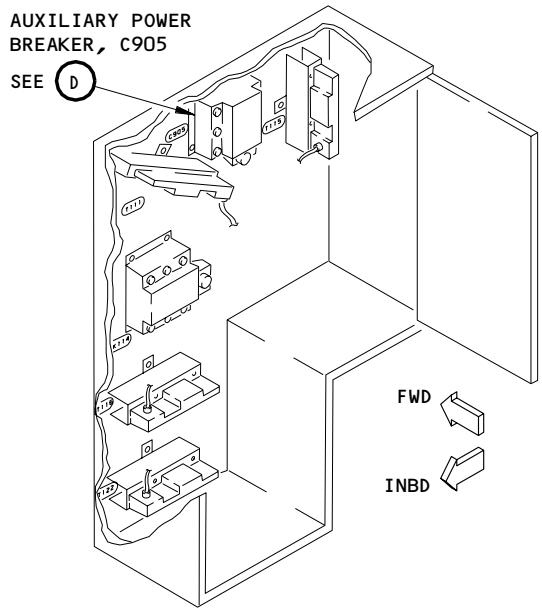


MAIN EQUIPMENT CENTER



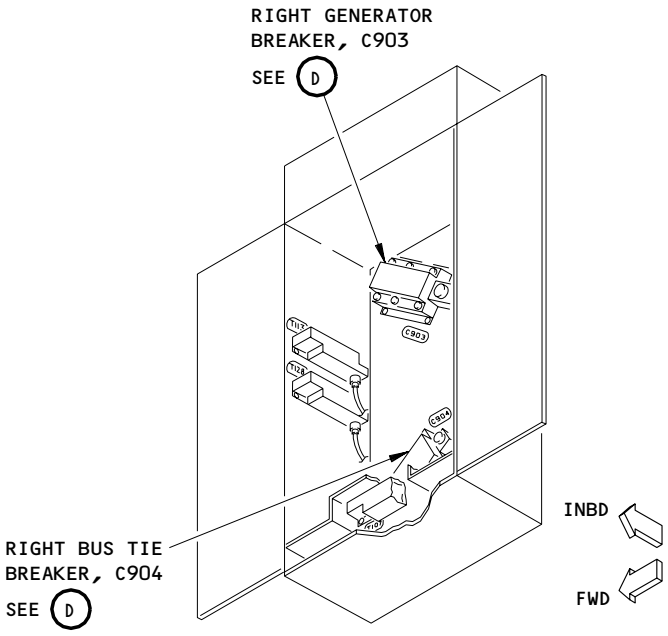
LEFT GENERATOR POWER PANEL, P31

A



APU/EXTERNAL POWER PANEL, P34

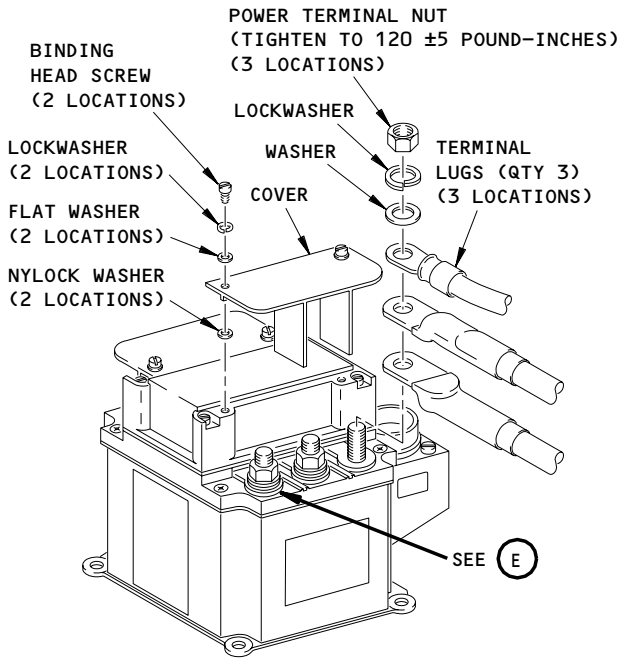
B



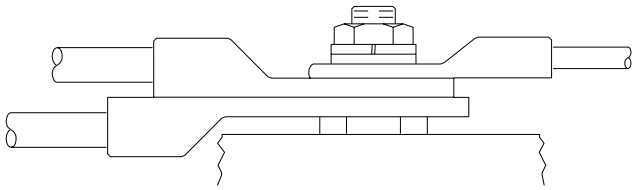
RIGHT GENERATOR POWER PANEL, P32

C

Generator, Bus Tie, and Auxiliary Power Breakers Installation
Figure 401 (Sheet 1)



BREAKER
(EXAMPLE)
D



(TYPICAL BACK-TO-BACK INSTALLATION)
E

Generator, Bus Tie, and Auxiliary Power Breakers Installation
Figure 401 (Sheet 2)

E. Procedure

S 014-014

(1) Open the applicable panel to get access to the breaker that you want to remove.

(a) The circuit breakers are in these panels:

Circuit Breaker			Panel
Right	GCB	C903	P32
Right	BTB	C904	P32
	APB	C905	P34
Left	GCB	C901	P31
Left	BTB	C902	P31

S 034-015

(2) Disconnect the electrical connector on the circuit breaker.

S 034-016

(3) Disconnect the electrical leads from the breaker:

(a) Loosen the screws that attach the two terminal covers to the breaker.

(b) Remove the terminal covers.

(c) Remove the nuts and the washers that attach the electrical leads to the terminal studs on the breaker.

(d) Attach an identification tag to each electrical lead.

(e) Remove the electrical leads from the terminal studs.

S 024-017

(4) Remove the circuit breaker:

(a) Remove the four screws that attach the breaker to the panel.

(b) Remove the breaker from the panel.

(c) Install the terminal washers, the terminal nuts, and the terminal cover.

TASK 24-22-03-424-006

3. Generator, Bus Tie, and Auxiliary Power Breaker Installation (Fig. 401).

A. General

(1) The installation task is the same for all the breakers.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Activate/Deactivate Spoilers

C. Access
(1) Location Zones
211/212 Flight Compartment
119/120 Main Equipment Center
(2) Access Panels
119BL Main Equipment Center Panel

D. Procedure

S 424-005
(1) Install the circuit breaker:
(a) Put the circuit breaker in its position.
(b) Install the four screws that attach the breaker to the panel.
(c) Tighten the screws.

S 424-022
(2) Connect the electrical leads to the breakers:
(a) Loosen the screws that attach the two terminal covers to the breaker.
(b) Remove the terminal covers.
(c) Remove the nuts and the washers from the terminal studs on the breaker.

CAUTION: MAKE SURE YOU CONNECT THE CORRECT ELECTRICAL LEAD TO EACH STUD ON THE BREAKER. AN INCORRECT INSTALLATION CAN CAUSE A MALFUNCTION OF THE CIRCUIT AND DAMAGE TO THE EQUIPMENT.

(d) Connect the electrical leads to the terminal studs on the circuit breaker.

NOTE: If there are more than one electrical leads on the same stud, put the power feeder lead on the base of the stud and the leads might be installed back-to-back.

CAUTION: DO NOT INSTALL THE WASHERS BELOW THE ELECTRICAL LEADS. THIS WILL CAUSE HEAT THAT CAN BURN THE STUDS ON THE BREAKER.

(e) Install the washers, the lock washers and the nuts on the terminal studs.
(f) Tighten the power terminal nuts to 120 +/- 5 pound-inches.
(g) Remove the identification tags from the electrical leads.
(h) Install the terminal cover.
(i) Install the electrical connector to the circuit breaker.
(j) Close the panel.

S 444-021
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

E. Do a test of the circuit breaker installation.

S 714-018
(1) If you replaced the generator circuit breaker (GCB), do a test for the GCB as follows:
(a) Push the BAT switch (P5) to the ON position.
(b) Start the applicable engine (AMM 71-00-00/501).
(c) Make sure the DRIVE light in the applicable GEN DRIVE DISC switch (P5) is off.
(d) Make sure the two BUS TIE switches (P5) are set to the AUTO position.
1) Make sure the ISLN lights in the switches are off.
(e) Push the applicable GEN CONT switch (P5) to the ON position.
(f) Make sure the yellow L and R BUS OFF lights (P5) are off.
(g) Push the applicable GEN CONT switch (P5) to the OFF position.
(h) Make sure the two BUS OFF lights (P5) are on.
(i) Stop the applicable engine (AMM 71-00-00/501).

S 714-019
(2) If you replaced the bus tie breaker (BTB), do a test for the BTB as follows:
(a) Supply the external power to the 115v ac buses (AMM 24-22-00/201).
(b) Make sure the two BUS TIE switches (P5) are in the AUTO position.
(c) Make sure the two BUS OFF lights (P5) are off.
(d) Push the L BUS TIE switch (P5) to the ISLN position.
(e) Make sure the L BUS OFF light (P5) is on.
(f) Push the L BUS TIE switch (P5) to the AUTO position.
(g) Make sure the L BUS OFF light (P5) is off.
(h) Push the R BUS TIE switch (P5) to the ISLN position.
(i) Make sure the R BUS OFF light (P5) is on.
(j) Push the R BUS TIE switch (P5) to the AUTO position.
(k) Make sure the R BUS OFF light (P5) is off.
(l) Remove the External Power from the 115v ac buses (AMM 24-22-00/201).

S 714-020

(3) If you replaced the auxiliary power breaker (APB), do a test for the APB as follows:
   (a) Push the BAT switch (P5) to the ON position.
   (b) Make sure the APU GEN switch (P5) is in the OFF position.
   (c) Make sure the BUS TIE switches (P5) are in the AUTO position.
   (d) Make sure the two BUS OFF lights (P5) are on.
   (e) Start the APU (AMM 49-11-00/501).
   (f) Make sure the OFF light in the APU GEN switch (P5) is off.
   (g) Make sure the two BUS OFF lights (P5) are off.
   (h) Push the APU GEN switch (P5) to the OFF position.
   (i) Make sure the two BUS OFF lights (P5) are on.
   (j) Stop the APU (AMM 49-11-00/501).

GENERATOR FIELD AND HYDRAULIC CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Generator Field and Hydraulic Control Panel Removal.
      (2) Generator Field and Hydraulic Control Panel Installation.

   TASK 24-22-04-024-001

2. Generator Field and Hydraulic Control Panel Removal (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          211/212 Flight Compartment
   C. Prepare for the removal

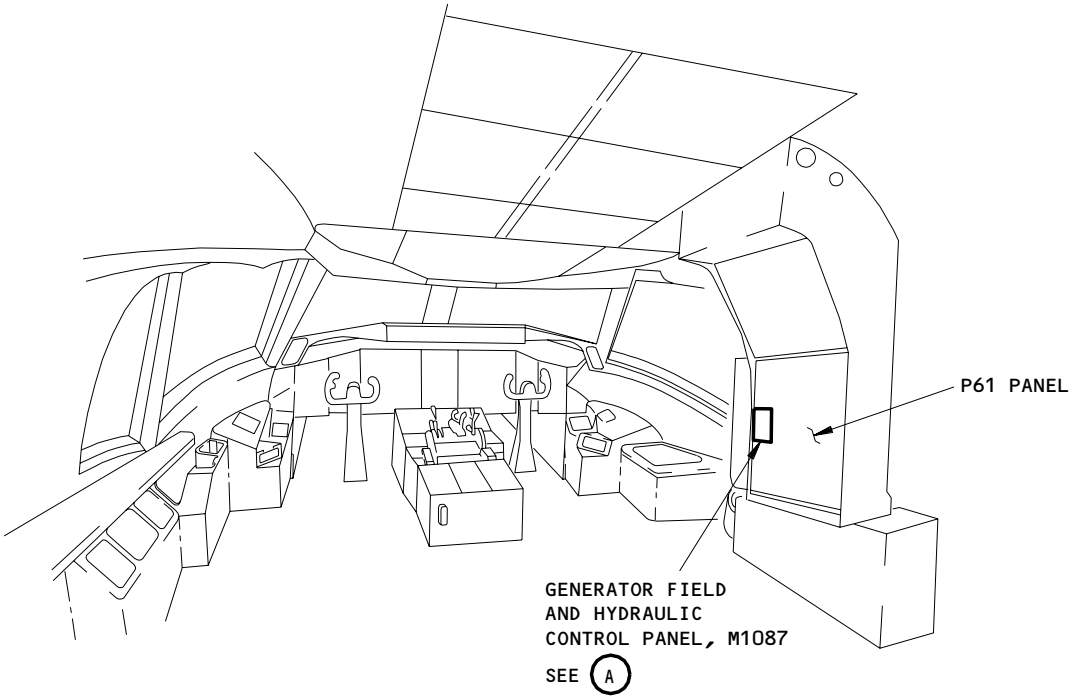
      S 714-003
      (1) Make sure all electrical power is off (AMM 24-22-00/201).

      S 864-002
      (2) Push the BATTERY switch (P5) to the OFF position and attach a DO-NOT-OPERATE tag.

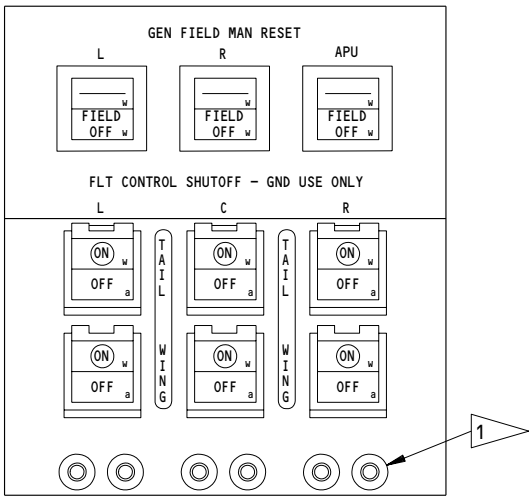
      S 864-004
      (3) Open these circuit breakers on the overhead circuit breaker panel P11 and attach DO-NOT-CLOSE tags:

          (a) 11A33, IND LTS 1
          (b) 11A34, IND LTS 2
          (c) 11H15, FLT CONTROL SHUTOFF WING L
          (d) 11H16, FLT CONTROL SHUTOFF WING C
          (e) 11H17, FLT CONTROL SHUTOFF TAIL L
          (f) 11H18, FLT CONTROL SHUTOFF TAIL C
          (g) 11H26, FLT CONTROL SHUTOFF WING R
          (h) 11H27, FLT CONTROL SHUTOFF TAIL R
   D. Procedure

      S 024-005
      (1) Do these steps to remove the control panel:
          (a) Turn the fasteners that attach the module to the P61 panel counterclockwise 90 degrees.



FLIGHT COMPARTMENT



GENERATOR FIELD AND HYDRAULIC
CONTROL PANEL, M1087

A

1 AIRPLANES WITH HYDRAULIC LEAKAGE DETECTION SYSTEM

Generator Field and Hydraulic Control Panel Installation
Figure 401

(b) Disconnect the electrical connectors from the module.
(c) Remove the module from the P61 panel.
(d) Install caps on all electrical connectors.

TASK 24-22-04-424-006

3. Generator Field and Hydraulic Control Panel Installation (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-13-00/601, Aileron and Spoiler Hydraulic Shutoff Valves
(3) AMM 27-23-00/501, Rudder and Elevator Shutoff Valves

B. Access
(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 424-007

(1) Do these steps to install the control panel:
(a) Remove all caps from the electrical connectors.
(b) Connect the electrical connectors to the receptacles on the module.
(c) Put the module in its position on the P61 panel.
(d) Turn the fasteners that attach the module to the P61 panel clockwise 90 degrees.

S 864-008

(2) Remove the DO-NOT-CLOSE tags, and close these circuit breakers on the P11 panel:
(a) 11A33, IND LTS 1
(b) 11A34, IND LTS 2
(c) 11H15, FLT CONTROL SHUTOFF WING L
(d) 11H16, FLT CONTROL SHUTOFF WING C
(e) 11H17, FLT CONTROL SHUTOFF TAIL L
(f) 11H18, FLT CONTROL SHUTOFF TAIL C
(g) 11H26, FLT CONTROL SHUTOFF WING R
(h) 11H27, FLT CONTROL SHUTOFF TAIL R

S 864-012

(3) Remove the DO-NOT-OPERATE tag from the BATTERY switch.

D. Do a test for the control panel

S 714-014

(1) Do a check for the APU GEN FIELD switch (P61) as follows:
   (a) Push the BAT switch on the P5 panel to the ON position.
   (b) Push the APU GEN switch (P5) to OFF.
   (c) Make sure the FIELD OFF light in the APU GEN FIELD switch (P61) is on.
   (d) Push the APU GEN FIELD switch (P61).
   (e) Make sure the FIELD OFF light in the APU GEN FIELD switch (P61) goes off.
   (f) Push the APU GEN FIELD switch (P61).
   (g) Make sure the FIELD OFF light in the APU GEN FIELD switch (P61) is on.
   (h) Push the APU GEN switch (P5) to ON.

S 714-015

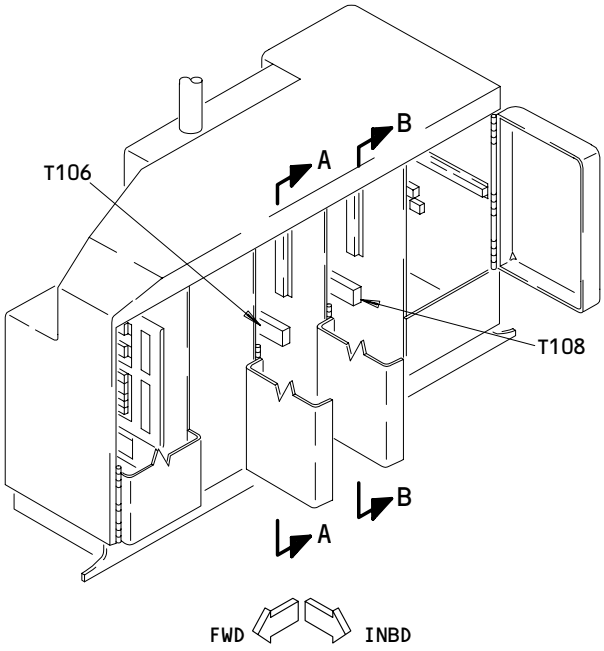
(2) Do a check for the L and R GEN FIELD switch (P61) as follows:
   (a) Make sure the BAT switch on the P5 panel is in the ON position.
   (b) Push the L GEN switch (P5) to OFF.
   (c) Make sure the FIELD OFF light in the L GEN FIELD switch (P61) is on.
   (d) Push the L GEN FIELD switch (P61).
   (e) Make sure the FIELD OFF light in the L GEN FIELD switch (P61) goes off.
   (f) Push the L GEN FIELD switch (P61).
   (g) Make sure the FIELD OFF light in the L GEN FIELD switch (P61) is on.
   (h) Push the L GEN switch (P5) to ON.
   (i) Push the R GEN switch (P5) to OFF.
   (j) Make sure the FIELD OFF light in the R GEN FIELD switch (P61) is on.
   (k) Push the R GEN FIELD switch (P61).
   (l) Make sure the FIELD OFF light in the R GEN FIELD switch (P61) goes off.

(m) Push the R GEN FIELD switch (P61).
(n) Make sure the FIELD OFF light in the R GEN FIELD switch (P61) is on.
(o) Push the R GEN switch (P5) to ON.

S 714-013
(3) Do these tests for the Flight Control Shutoff switches:
Aileron and Spoiler Shutoff Valve - Check (AMM 27-13-00/601),
Rudder and Elevator Shutoff Valve - System Test (AMM 27-23-00/501).

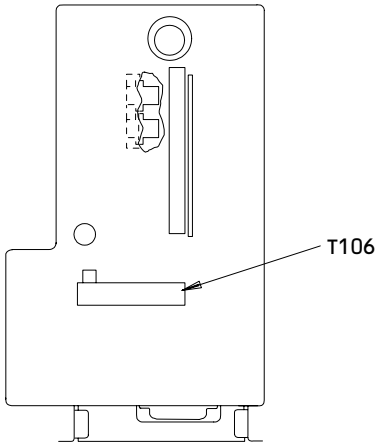
FAULT SENSING - DESCRIPTION AND OPERATION

1. General
   A. The electrical power system is protected against source overloads and faults occuring during power distribution. Source power is continuously monitored and disconnected if its quality is unacceptable. System failure information is stored in the built-in-test equipment (BITE) of the control units. This information can be accessed from the bus power control unit (BPCU).
2. Component Details (Fig. 1)
   A. Current Transformer Assemblies
      (1) Twelve current transformer assemblies are used to sense differential faults, and source overloads. The transformers are located on the main ac, ac tie, each generator, and external power buses. Data monitored by the current transformers is sent to the generator control units (GCUs), or the bus power control unit.
      (2) The current transformers operate at frequencies between 340-440 Hz ac power. They are rated for continuous operation with primary currents up to 250 amps/phase.
      (3) The following table lists the names and locations of the current transformers in the system.

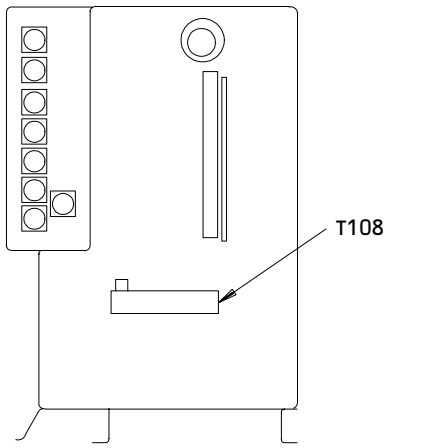


MAIN POWER DISTRIBUTION PANEL P6

(A)

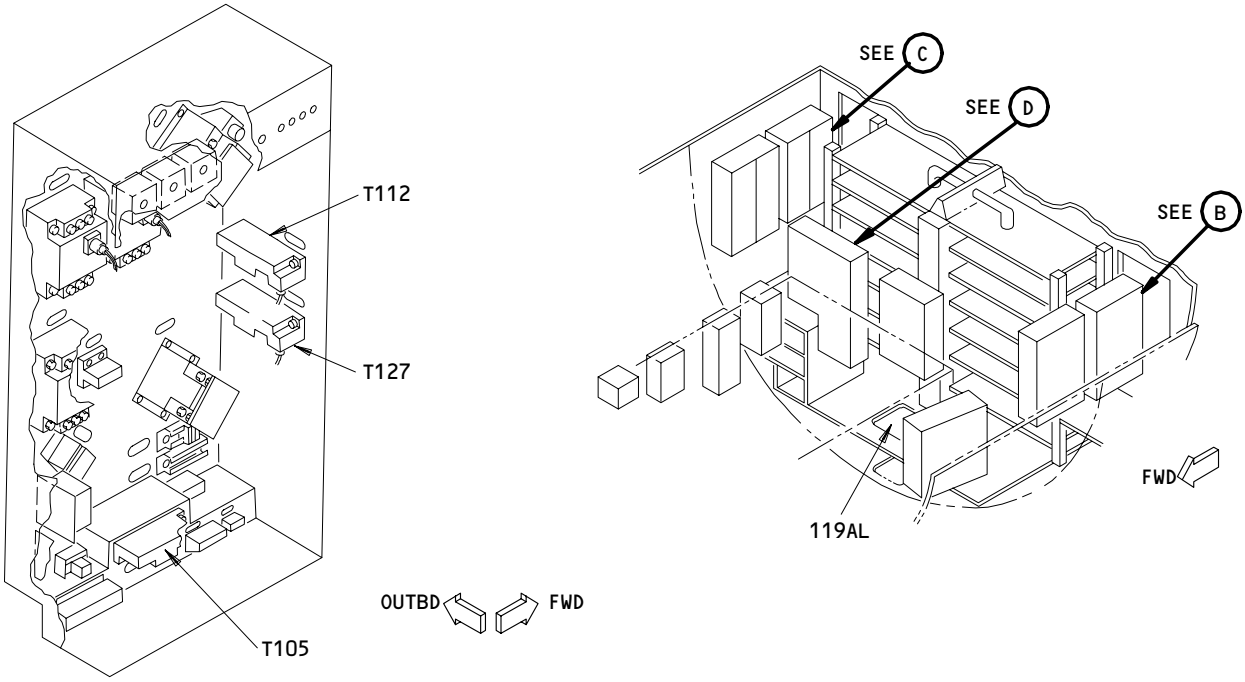


A–A



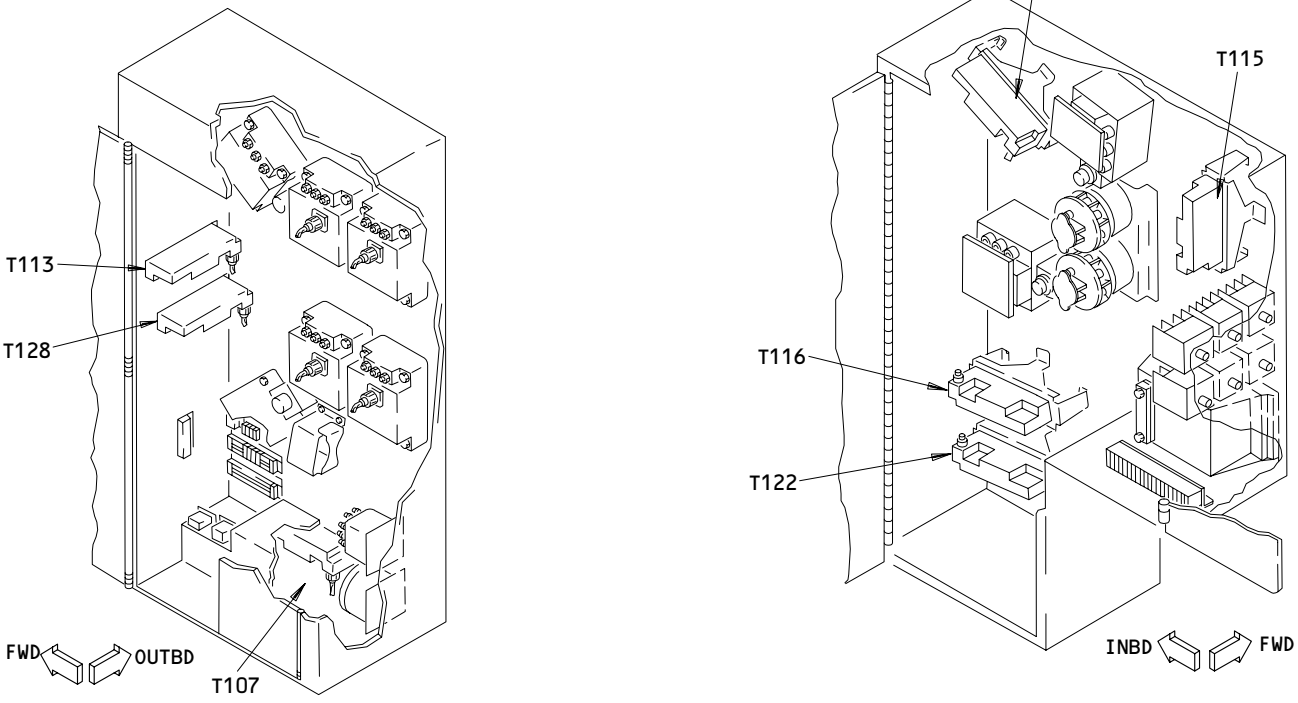
B–B

Current Transformer Component Locations
Figure 1 (Sheet 1)



LEFT GENERATOR POWER PANEL P31

B



RIGHT GENERATOR POWER PANEL P32

C

APU/EXTERNAL POWER PANEL P34

D

Current Transformer Component Locations
Figure 1 (Sheet 2)

33617

Name	Location
Left generator differential protection current transformer (DPCT) No. 1	P31 (Left generator power panel)
Left generator DPCT No. 2	P6 (Main Power distribution panel)
Left overlap current transformer	P31
Right generator DPCT No. 1	P32 (Right generator power panel)
Right generator DPCT No. 2	P6
Right overlap current transformer	P32
APU generator DPCT	P34 (APU/external power panel)
Ground power current transformer	P34
R tie bus DPCT	P32
L tie bus DPCT	P31
APU tie bus DPCT	P34
External power tie bus DPCT	P34

3. Operation
   A. Functional Description
      (1) Generator Control Unit Protection
         (a) The generator control units continuously monitor power quality. Each provides the following protection functions: over/under voltage, over/under frequency, open phase, shorted rotating diode, shorted permanent magnet generator, differential current and overload. (The rotating diode and PMG are components in the IDG.) The APU GCU functions identically but has no IDG underspeed protection.
         (b) A GCU detecting an IDG underspeed condition opens only its GCB. A GCU detecting any other protection condition opens its generator field control relay (GCR) and GCB. An APU protection function causes the APU GCU to open the APU GCR and the auxiliary power breaker (APB).
         (c) Each GCU monitors voltage on the generator side of its GCB or APB. An overvoltage condition occurs if any phase voltage is greater than 130v ac. The larger the overvoltage, the faster the effected breakers are tripped.

(d) For undervoltage protection, each GCU takes the average of its three phase voltages. If this voltage remains at or below 104.5 ±1.5v ac, an undervoltage condition exists. The breakers effected open in 9 ±1 seconds. Undervoltage protection is prevented from operating by underspeed or underfrequency activation, as well as an open GCR.

(e) Each GCU monitors its associated IDG for over/under frequency protection. The underfrequency level begins at 370-375 Hz. Minimum overfrequency levels are 425-430 Hz. An overfrequency level of 425-430 Hz for 0.8 to 1.6 seconds trips the GCB and GCR. Overfrequency protection is locked out by shorted rotating diode protection (only if frequency does not exceed 435-445 Hz). An underfrequency level of 370-375 Hz for 0.8 to 1.6 seconds trips the GCB and GCR. For an underfrequency level of 345-355 Hz the GCB and GCR trip after 0.1 to 0.2 seconds. Underfrequency detection locks out under speed protection. Underfrequency protection is prevented from operating by underspeed activation.

(f) Open phase protection is in effect when the lowest phase current is 6 ±5 amps, and the next lowest phase current is 40 ±5 amps or more. The effected breakers open in 4 ±0.5-seconds.

(g) The right and left GCU's provide IDG underspeed protection. Each GCU monitors input shaft speed of its generator. An underspeed condition occurs when shaft speed falls to, and remains below, 4,300 ±30 rpm. The GCB of the IDG effected is tripped in 0.15 ±0.05 seconds. Underspeed activation prevents operation of undervoltage and underfrequency protection functions.

(h) The APU GCU has no underspeed protection. This is replaced by the APU "ready" signal from the auxiliary power control unit. When APU generator input shaft speed is 95-percent maximum, the signal is sent. This allows flight compartment switches to close the APU GCR. The APU generator can then produce power. The APU "ready" signal is removed if shaft speed falls below 95-percent maximum (an APU fire signal or APU protection function also removes the "ready" signal).

(i) Each GCU monitors the field voltage of its generator to sense a shorted rotating diode. The effected breakers open in 5.5 to 7.0 seconds. This protection is prevented from operating if this fault occurs to the last generator on line. Shorted rotating diode protection locks out overfrequency protection.

(j) Each GCU monitors its IDG to sense a shorted permanent magnet generator. The effected breakers open in 2.5 seconds.

(k) The GCU provides a BTB lockout protection function. The protection function prevents BTB closure if:
   1) A differential fault exists on the associated generator bus, or
   2) A differential fault exists on the tie bus, or
   3) An undervoltage and an overload condition exists on the associated generator.

(l) The GCU sends a lockout signal to the BTB, preventing the BTB from closing and connecting the main buses. A BTB lockout causes the amber ISLN light in the BUS TIE switch to come on. The BTB lockout can be removed by cycling the appropriate BUS TIE switch when the fault no longer exists.

(m) If the GCB fails to open following a GCR trip, the associated BTB is opened and locked-out. This action prevents motoring of the IDG through power delivered (to the IDG) by a closed BTB. The BTB opens in 0.05 ±0.02 seconds. (The GCB should open in 0.02-seconds following a GCR trip.)

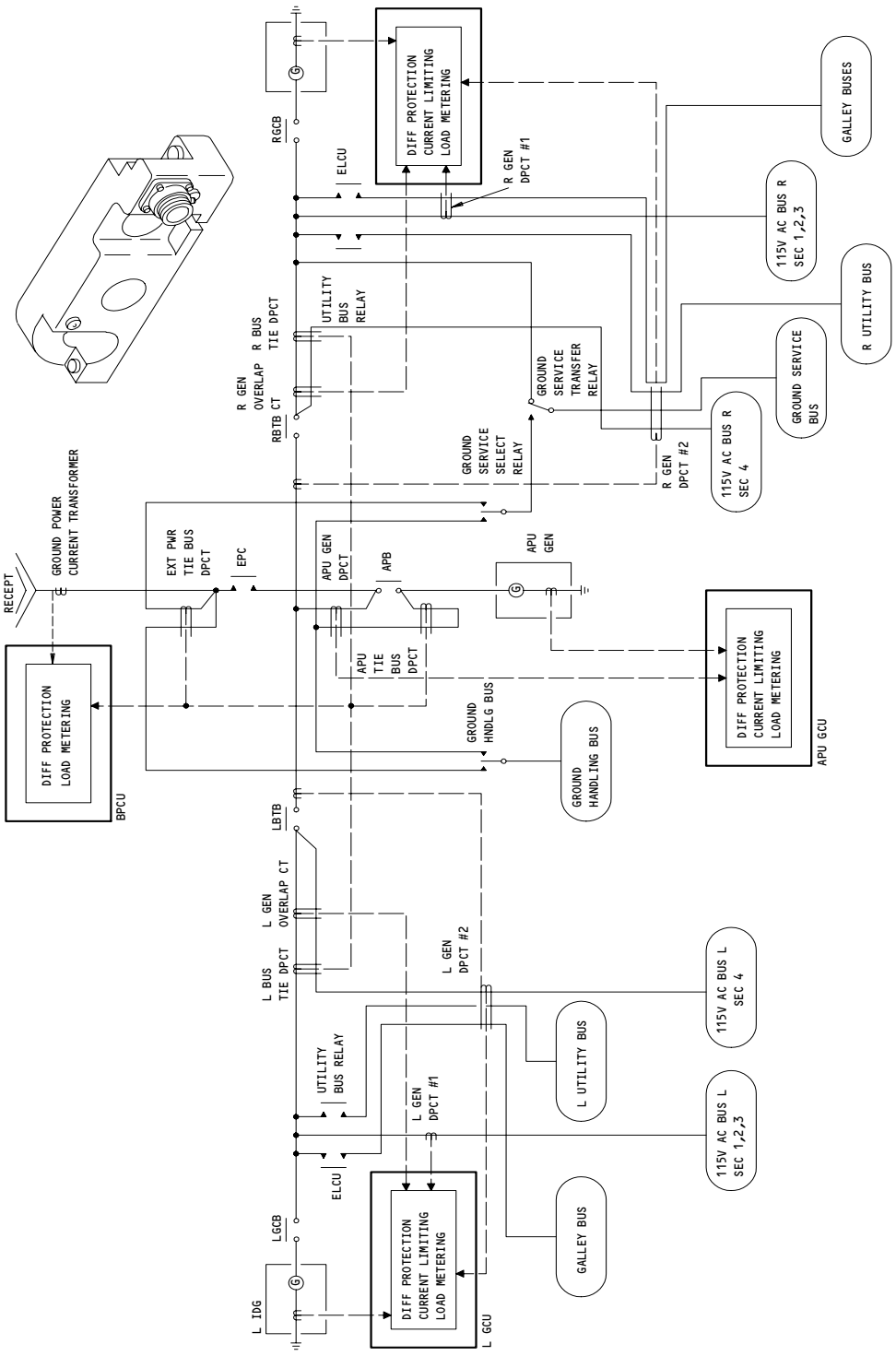
(n) Each GCU contains a watchdog circuit. If a GCU has an internal failure, the circuit opens the GCB and GCR. (The watchdog circuit in the APU opens the APU GCR and APB.)

(2) Differential Fault Sensing (Fig. 2)

(a) The differential protection current transformers (DPCT's) provide current signals to the generator control units (GCU's), and the bus power control unit (BPCU). The BPCU, by means of four DPCT assemblies, monitors the tie bus. (This is the area between the two bus tie breakers (BTB's), the auxiliary power breaker (APB), and the external power contactor (EPC).) A tie bus fault occurs when a 28 to 35 amp differential current is sensed by the four DPCT's. The left and right GCU's, by means of four DPCT assemblies each, monitor their respective buses for a differential current of 28 to 35 amps. The APU GCU, by means of two DPCT assemblies, monitors its buses for a differential current of 28 to 35 amps.

(b) When a differential fault is detected, a flag is set in the appropriate BPCU and/or GCU's. The BPCU and GCU's then communicate via the serial link to isolate the fault to a large zone. Tripping of various breakers (generator field control relay (GCR), generator circuit breaker (GCB), BTB, APB, EPC) then isolates the fault to a smaller zone.

(c) Isolation of a fault may trip the GCB's, APB, and/or the BTB's. If a GCB or APB trips (opens), the amber OFF light in the corresponding GEN CONT switch (P5) comes on. The upper EICAS will display the EICAS message L (R, or APU) GEN OFF. If a BTB trips, the amber ISLN light in the corresponding BUS TIE switch (P5) comes on. The upper EICAS will display the EICAS message L (or R) BUS ISOLATED. Tripping of the EPC causes the ON light in the EXT PWR switch (P5) to go off.



Fault Current Sensing Block Diagram
Figure 2

(d) If a breaker has been tripped due to fault isolation. The breaker may be reset by cycling the corresponding control switch. The switch is pressed to OFF (or ISLN for the BUS TIE switch), then the switch is pressed to ON (or AUTO for BUS TIE switch). If the fault condition remains, the breakers remain open (they are locked-out). The amber OFF (or ISLN for BUS TIE switches) light comes on, and the corresponding EICAS message is displayed.

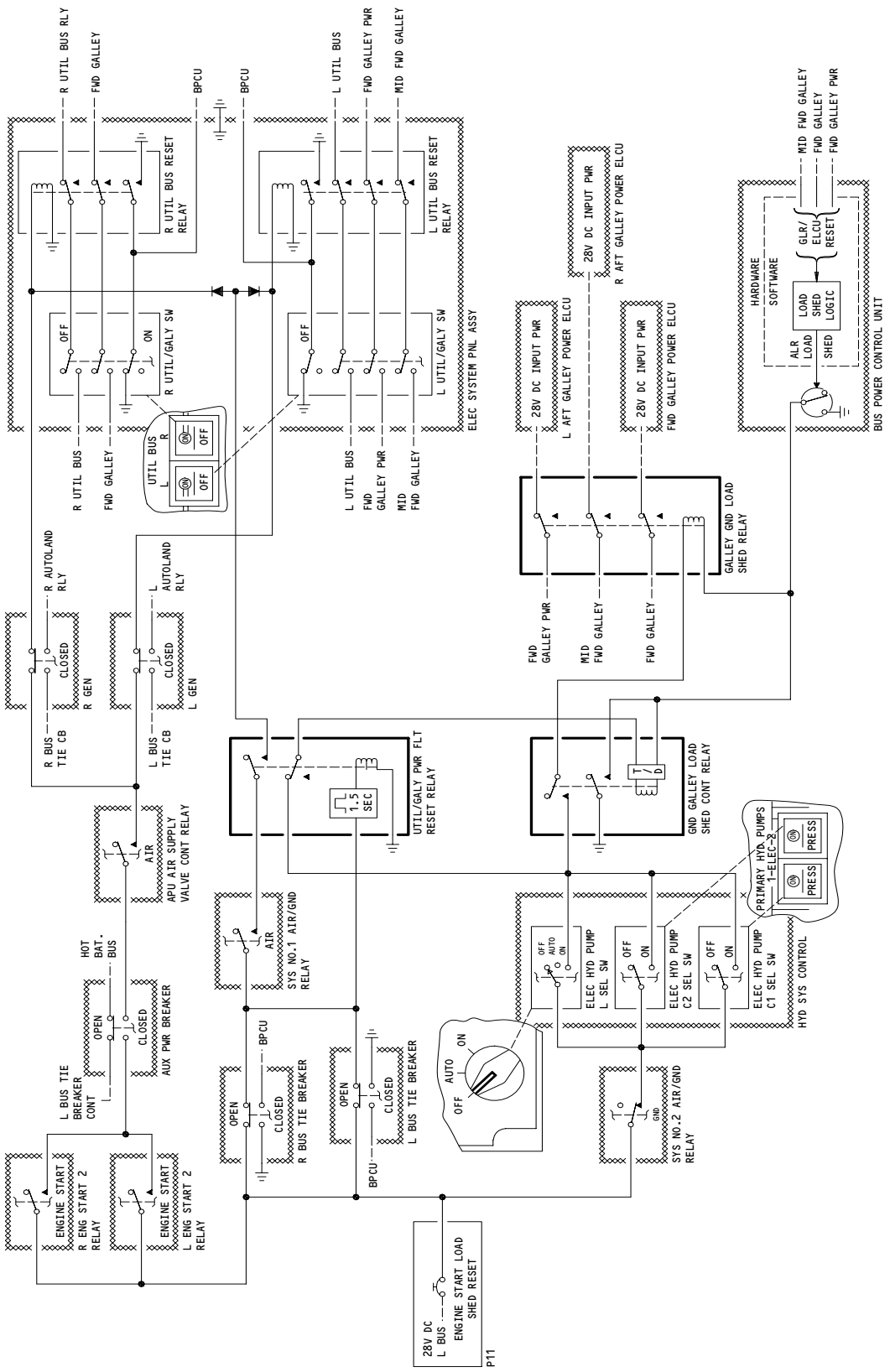
(3) Load Shedding (Fig. 3)

(a) To reduce generator loads, the utility bus relays (UBRs) and electrical load control units (ELCUs) are de-energized. This removes power to the utility and galley buses. In some cases the shed buses are automatically reset. This is done by relays and circuit interlocks. In other cases reset is accomplished by cycling the UTILITY BUS switches.

(b) The UTILITY BUS switches are on electrical systems control panel M10063, located on pilots' overhead panel P5. The switches are push on/push off type which latch in when on. When latched, an ON indicator in the switch is visible. The left UTILITY BUS switch controls the left UBR, and the left galley ELCU. The right UTILITY BUS switch controls the right UBR, and two right galley ELCUs. If a UBR is de-energized, an amber OFF light in the UTILITY BUS switch controlling that UBR comes on. A two-step process manually resets the UBR and its associated ELCU(s). The controlling switch is pressed to off (out), then pressed on (in). If the overload remains, the contactors again de-energize. The amber OFF light in the switch again comes on.

(c) When a UBR is de-energized, the amber OFF light in the associated UTILITY BUS switch comes on. Also, EICAS will display the corresponding level C message, (L or R) UTIL BUS OFF. The EICAS messages are inhibited from being displayed during engine start. (The amber OFF lights in the UTILITY BUS switch can still come on.)

(d) The following paragraphs describe the conditions which cause load shedding. The L and R GEN CONT switches are assumed to be in their normal ON position (latched-in). The L and R BUS TIE switches are assumed to be in their normal AUTO position (latched-in). These switches are on P5.



Electrical Load Shedding Schematic
Figure 3

(4) Pre-Engine Start Load Shedding (Galleys Shed)
  (a) Pre-engine start load shedding occurs when:
    1) The airplane is on the ground, and
    2) airplane power is supplied by the APU generator or external power, and
    3) a center or left hydraulic pump switch on pilots' overhead panel P5 is on, and
    4) the load supplied by the power source (APU gen or ext pwr) is greater than 90 kva.
  (b) When the power source load exceeds 90 kva, a switch in the BPCU closes a path to ground. This allows the GND GALLEY LOAD SHED relay to energize after a 3-second delay. If the overload disappears within these 3 seconds, the relay will not energize. Energizing of the load shed relay energizes the GALLEY GND LOAD SHED relay also. This removes power from the galley buses. (The galley ELCUs lose coil power.) The OFF lights in the UTILITY BUS switches do not come on after the galleys are shed. The GALLEY GND LOAD SHED and GND GALLEY LOAD SHED relays are in left miscellaneous electrical equipment panel P36.
  (c) The galley buses remain off until either the L, C1, and C2 hydraulic pump switches are off, or two generators are available, or until the airplane transitions to the air mode.
  (d) This load shed circuit was designed to prevent a source overload (and subsequent shedding), when essential loads are turned on just prior to engine start. (Examples of essential loads are hydraulic pumps, and fuel pumps.)
(5) Engine Start with APU (Galley and Utility Buses Shed)
  (a) This circuit is implemented by relays and interlocks external to the BPCU. Galley and utility bus power is interrupted by removing 28v dc power to the UBRs and galley ELCUs.
  (b) Engine start load shedding occurs when:
    1) The airplane is on the ground or inflight, and
    2) an engine is started using APU pneumatics (APU air supply valve relay K23 is closed), and
    3) the auxiliary power breaker (APB) is closed. (APU generator supplying electrical power.)
  (c) Since the IDG associated with an "off" engine is not operating, the IDG's generator circuit breaker (GCB) is open. Also, when the engine is started (and the above conditions are satisfied), the associated ENG START 2 relay energizes. The GCB and START relay positions provide a closed path for 28v dc to energize the UTIL BUS RESET relay of any "off" engine. Energizing the RESET relay(s) opens the path providing coil power for the UBR(s) and galley ELCU(s). All utility and galley buses that are not supplied by their associated IDG, are shed. The amber OFF light in the UTILITY BUS switch(es) will come on. However the L and R UTIL BUS OFF messages on EICAS are inhibited during engine start.

(d) The utility and galley buses are automatically reset. When the engine has started, the associated engine start relay opens. Also, when the IDG produces correct power quality, its GCB closes. These contactor actions remove 28v dc power from the UTIL BUS RESET relay(s). This once again closes the path that energizes the UBRs and galley ELCUs. Power is restored to the utility and galley buses.

(e) If both engines are initially off, at the time of the first engine start all UBRs and galley ELCUs are de-energized. All utility and galley buses lose power. When the engine IDG comes on line (GCB closes), all UBRs and ELCUs are again energized. The operating IDG will supply its respective utility and galley buses. The APU generator supplies the other utility and galley buses. When the other engine is started, the utility and galley buses supplied by the APU generator are shed. The utility and galley buses being supplied by the operating IDG are not shed. After the second IDG comes on line, the shed buses are reset. Each IDG supplies its own utility and galley buses.

(6) Source Overload (Galleys and Utility Buses Shed)

(a) Source overload shedding is controlled by the BPCU. The BPCU monitors the load supplied by both IDGs, the APU generator, and external power. Source overload shedding occurs when:

1) The airplane is on the ground or inflight, and
2) any source (L IDG, R IDG, APU, or EXT PWR) is loaded,
   a) above 90 kva for 4.5 minutes,
   or
   above 112.5 kva for 4 seconds.
3) When the conditions above are met, the galley and utility buses supplied from the overloaded source are shed. The UBR(s) and galley ELCU(s) associated with the overloaded source de-energize. (The right main ac bus has two galley ELCUs. The left main ac bus has one.) The associated amber OFF light in the UTILITY BUS switch comes on, and the L (or R) UTIL BUS OFF message appears on the EICAS display. (This is a level C EICAS message.) The 90-kva level corresponds to about a 1.00 AC LOAD indication on the ELEC/HYD maintenance page of EICAS. The 112-kva level corresponds to about a 1.25 AC LOAD on EICAS. The BPCU initiates utility and galley bus shedding by removing grounds to the GLRs, ELCUs, and UBRs.

(b) If one source is supplying both main ac buses at the time of the overload, the galley and utility buses buses will be shed. If a separate source is supplying each main ac bus, only the galley and utility buses supplied by the overloaded source are affected by shedding. During normal two generator operation, source loading will not exceed 90 kva.

(c) Resetting a source overload shed is done by cycling the UTILITY BUS switch controlling the shed utility and galley buses. If the overload continues, the buses will again be shed after the source overload time delay.

(7) Single Source Operation

(a) Load shedding occurs when single generator operation occurs inflight, or during the takeoff roll. The takeoff mode is sensed by the advanced position of both thrust levers. The takeoff mode load shed is needed to assure adequate generator voltage for hydraulic pump starting. This is needed for braking in the event of a refused takeoff due to engine failure.

(b) All galley and utility buses are immediately shed if:

1) One source (L IDG, R IDG, or APU) must supply electrical power to both main ac buses, and

2) the airplane is inflight,

or

both thrust levers are advanced on the ground.

(c) When the conditions above are met, the BPCU de-energizes all UBRs and galley ELCUs. The galley and utility buses have no power. The amber OFF light in the UTILITY BUS switches comes on, and the L and R UTIL BUS OFF level C EICAS messages appear. The BPCU does not allow the utility and galley buses to energize as long as the above conditions continue. (The BPCU initiates utility and galley bus shedding by removing grounds to the UBRs and ELCUs.)

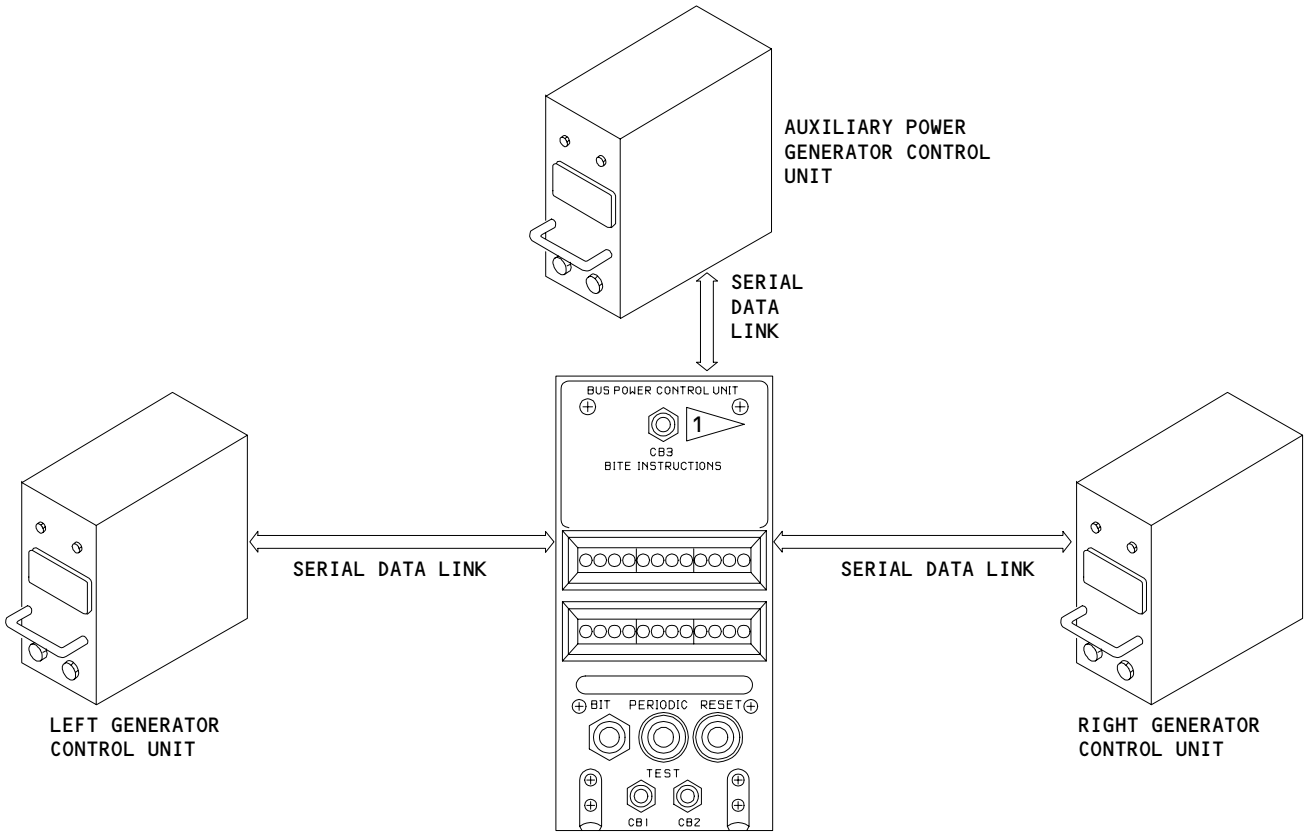
(d) If a second source (either IDG or APU generator) comes on line to supply main ac bus power, the utility and galley buses are automatically reset. This reset is accomplished by relay and interlock circuits external to the BPCU. With only one source operating, both bus tie breakers (BTBs) are closed. When the second source comes on line, at least one BTB opens, to prevent parallel source operation. This provides 28v dc to the UTIL/GLY PWR FLT RESET relay. This one shot relay energizes the L and R UTIL BUS RESET RELAYS FOR 1.5 seconds. This relay action has the same effect as manually cycling the UTILITY BUS switches. Power to the utility and galley buses is restored.

(e) The utility and galley buses can be manually reset if the airplane is on the ground and at least one thrust lever is not advanced. When these 2 conditions are met, the BPCU receives a "ground mode" signal. After a 10 second time delay, the utility and galley buses can be reset by cycling the UTILITY BUS switches.

(8) Engine Out Operation

(a) If an engine shutdown occurs in flight, selected loads are shed by the BPCU. These loads include parts of the ground service bus. This is to partially offset the increased hydraulic system electrical loading demand of an AC motor pump now operating in the left or right hydraulic system. Additional loads shed include all cabin indirect ceiling lights, and the forward direct ceiling lights. The additional load shedding is external to the BPCU, and uses N2 engine speed card logic.

B. BITE (Fig. 4)



1 AIRPLANES WITH S281T001-40
TO S281T001-99 BPCU

AC Generation Built-In-Test (BIT)
Figure 4

(1) Built-in-test equipment (BITE) in the generator control units (GCU's) and bus power control unit (BPCU) isolates faults quickly and reliably. Two forms of testing are used in the GCU and BPCU: operational and maintenance. Operational BITE continually monitors protective trips, control commands, and control unit status. If a protection trip occurs, operational testing finds the defective line replaceable unit (LRU) or associated wiring. Operational testing makes sure that control commands are followed. For example, if a command is given to trip a breaker, does the trip occur? The testing also tries to find failures which do not cause a protective trip.

(2) Maintenance testing runs a complete end-to-end check of the GCU and BPCU circuits. The input, output, control, and protection circuits are checked. Communication on the GCU-BPCU data serial link is also tested. Maintenance BITE detects failures that do not cause protective trips, then isolates the LRU. The maintenance test verifies the findings of the operational test, and identifies any software failures in the control units.

(3) A 2-line, 24-character alphanumeric display is on the front of the BPCU. Three pushbuttons are also on the face of the unit: a BIT pushbutton, a guarded PERIODIC TEST pushbutton, and a guarded RESET pushbutton.

(4) Pressing the BIT pushbutton shows any failures picked up by operational BITE. All protective trip information appears on the BPCU display. The display identifies the power channel first, and any fault on that channel next. (With faults that cause a protective breaker trip, two fault messages appear. The first identifies what trip occurred (Example: UNDER VOLT TRIP). The second message identifies what LRU failed.) If no fault is found on a power channel, the display shows OK. Power channel information is displayed in the following sequence: 1) external power, 2) left generator, 3) right generator, and 4) APU generator. The first time BIT is pressed, the information of the most recent flight is displayed. The BPCU then identifies the end of this flight cycle. If BIT is again pressed, the data from one flight earlier is shown. This process can be repeated to show seven previous flight cycles, each 1-cycle earlier than the previous one. If a flight cycle ends, and BIT is not pressed during the FOR PREVIOUS FLT PUSH NOW message, the display will go blank again. Pushing BIT then displays information from the most recent flight. As an example, a right channel overvoltage fault results in the following display:

DISPLAY	TIME OF DISPLAY (SECONDS)
EXTERNAL POWER SYSTEM	2
OK	2
LEFT GEN POWER SYSTEM	2
OK	2
RIGHT GEN POWER SYSTEM	2
OVER VOLT TRIP	15
GCU FAILED CODE 34	15

The error code refers to the failure in the GCU, causing the trip.

APU GEN POWER SYSTEM	2
OK	2
LAST FLT ( ) END OF DATA	2

The number in the parenthesis indicates the flight cycle just viewed. The most recent cycle is identified (00), the cycle before (01), two cycles before (02). The earliest flight cycle that can be viewed is (07).

FOR PREVIOUS FLT PUSH NOW	15

If BIT is pushed, one earlier flight cycle is displayed. If BIT is not pushed, display sequence ends.

(5) The PERIODIC TEST pushbutton starts the maintenance test. The BPCU display shows the four power channels and any errors detected on them. If no defects are found, the display indicates "OK". The PERIODIC TEST should be performed with only battery power applied to the plane (No AC power. When AC power is applied, the BPCU fails to interrogate the circuits actively involved in normal monitoring. The results of the periodic test under these conditions will be inconclusive). The maintenance test should only be performed during major airplane maintenance, not during routine checks.

(6) The time that each BITE message appears on the BPCU display can be cut by repressing the button that started the display sequence. Thus if BIT is initially pushed, pressing BIT during a particular message will advance the display to the next message. In this way the display sequence can be speeded up.

(7) Each GCU and the BPCU can store 63 messages over the last eight flight cycles. The RESET pushbutton makes previous flight BITE information inaccessible.

(8) A BPCU flight cycle is defined as follows: With both engines initially shut off, the cycle starts with the first engine start. The cycle must then include a ground-air ground cycle. The cycle continues after both engines are shut down. A new cycle starts with the next engine start.

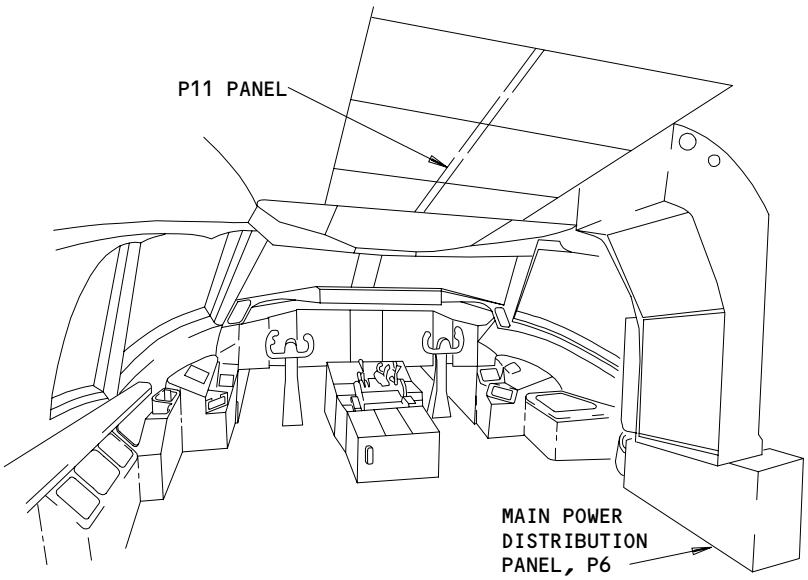
(9) When BIT or PERIODIC TEST is pushed on the BPCU, all BITE information stored for the latest flight cycle appears on the BPCU display. If two identical messages are stored in BITE memory, the same BITE message will be displayed twice. BITE does not disregard a message, even if it was already displayed during a flight cycle. A situation which can induce identical BITE messages occurs when the airplane is on the ground, and the BPCU's power is switched on and off. When BPCU power is first applied, any detected fault causes a BITE message to be stored in memory. Upon removal of BPCU power, the BITE message remains in memory. If BPCU power is again applied and the fault condition remains, a second identical BITE message will be stored in memory during the same flight cycle.

(10) The BITE system does not cover the following areas: 1) Standby and dc power systems; 2) electrical power flight compartment lights (ac and dc), and, 3) electrical power flight compartment instruments (ac and dc).

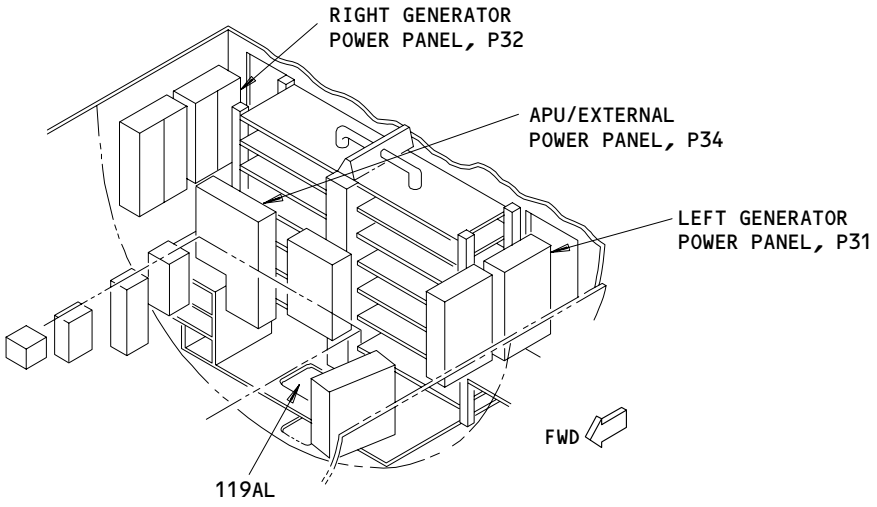
FAULT SENSING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
TRANSFORMER - CURRENT, DIFFERENTIAL PROTECTION				
LEFT GENERATOR NO. 1, T105	--	1	119AL, MAIN EQUIP CTR, P31	24-23-01
LEFT GENERATOR NO. 2, T106	--	1	FLT COMPT, P6	24-23-01
RIGHT GENERATOR NO. 1, T107	--	1	119AL, MAIN EQUIP CTR, P32	24-23-01
RIGHT GENERATOR NO. 2, T108	--	1	FLT COMPT, P6	24-23-01
APU GENERATOR, T111	--	1	119AL, MAIN EQUIP CTR, P34	24-23-01
LEFT TIE BUS, T112	--	1	119AL, MAIN EQUIP CTR, P31	24-23-01
RIGHT TIE BUS, T113	--	1	119AL, MAIN EQUIP CTR, P32	24-23-01
APU TIE BUS, T115	--	1	119AL, MAIN EQUIP CTR, P34	24-23-01
EXTERNAL POWER TIE BUS, T116	--	1	119AL, MAIN EQUIP CTR, P34	24-23-01
GROUND POWER, T122	--	1	119AL, MAIN EQUIP CTR, P34	24-23-01
LEFT OVERLAP, T127	--	1	119AL, MAIN EQUIP CTR, P31	24-23-01
RIGHT OVERLAP, T128	--	1	119AL, MAIN EQUIP CTR, P32	24-23-01

Fault Sensing - Component Index
Figure 101



FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER

Fault Sensing - Component Location
Figure 102

CURRENT TRANSFORMER ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Current Transformer Assembly Removal.
      (2) Current Transformer Assembly Installation.

   TASK 24-23-01-024-001

2. Current Transformer Assembly Removal
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          212 Flight Compartment (RH Side)
          119/120 Main Equipment Center
      (2) Access Panels
          119BL Main Equipment Center Panel
   C. Prepare for the Removal

      S 044-002

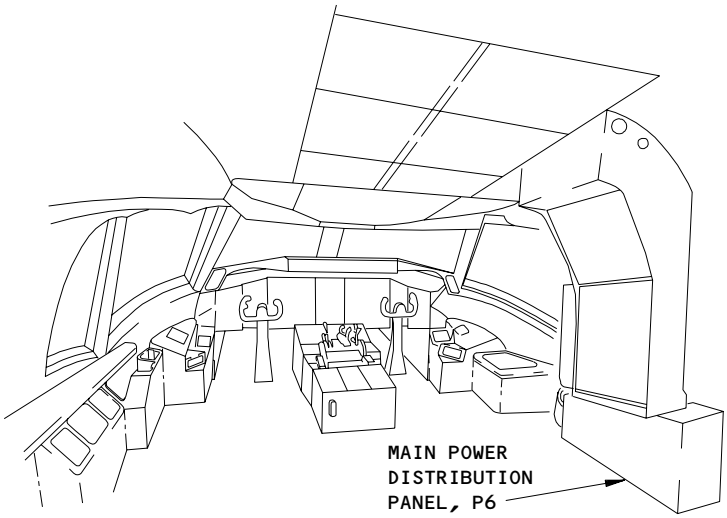
      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

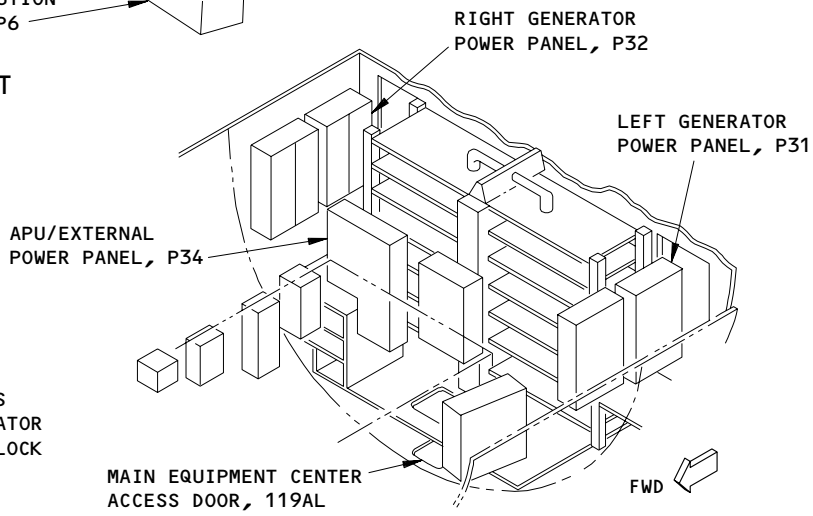
      S 864-003

      WARNING: ELECTRICAL POWER MUST BE REMOVED FROM THE AIRPLANE BEFORE YOU REMOVE COMPONENTS FROM THE POWER PANELS. HIGH VOLTAGES CAN KILL.

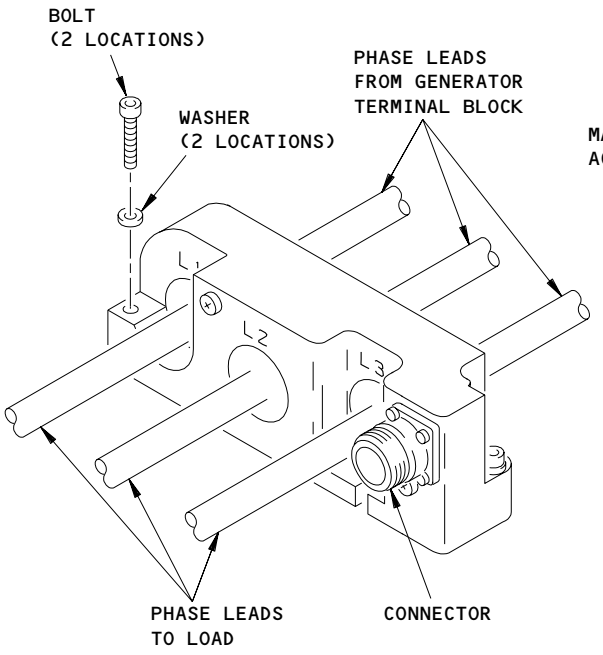
      (2) Remove the electrical power (AMM 24-22-00/201).



FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER



CURRENT TRANSFORMER
(EXAMPLE)

Current Transformer Installation
Figure 401

S 014-004
(3) Open the applicable panel to get access to the transformer:

Transformer.	Location.
T105	P31 - Left Generator Power Panel
T106	P6 - Main Power Distribution Panel
T107	P32 - Right Generator Power Panel
T108	P6
T111	P34 - APU/External Power Panel
T112	P31
T113	P32
T115	P34
T116	P34
T122	P34
T127	P31
T128	P32

D. Procedure

S 024-006
(1) Do these steps to remove the current transformer assembly:
  (a) Remove the wire which locks the electrical connector to the current transformer.
  (b) Remove the electrical connector from the current transformer.
  (c) Tag each wire which goes through the current transformer with these data:
    1) The equipment number of the current transformer.
    2) The hole in the transformer (left, right or center).
    3) The side of the transformer (L or T) which the wire goes through.
  (d) Remove the wires.
  (e) Remove the lockwire on the two bolts that attach the current transformer to the panel.

(f) Remove the two bolts and washers.
(g) Remove the transformer from the panel.

TASK 24-23-01-424-005

3. Current Transformer Assembly Installation

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zones
212 Flight Compartment (RH Side)
119/120 Main Equipment Center
(2) Access Panels
119BL Main Equipment Center Panel

C. Procedure

S 424-008

(1) Do these steps to install the current transformer:
(a) Put the transformer in its position in the applicable panel.
(b) Install the washers and bolts that attach the transformer to the panel.
(c) Install the lockwires on the two bolts.

CAUTION: MAKE SURE THE POWER WIRES GO THROUGH THE CORRECT HOLES IN THE CURRENT TRANSFORMER ASSEMBLY. AN INCORRECT INSTALLATION WILL CAUSE A CIRCUIT MALFUNCTION.

(d) Install the power wires through the correct holes in the current transformer assembly.
(e) Connect the electrical connector to the current transformer.
(f) Install the lockwire on the electrical connector.
(g) Remove the tags on the wires.
(h) Close the applicable panel.

D. Do a test for the current transformer

S 724-009

(1) If the current transformer T107, T108 or T128 was replaced, do this test:
(a) Supply the right IDG power to the two 115V ac buses (AMM 24-22-00/201).

(b) Make sure these lights on the P5 panel are off:
1) The two BUS OFF lights.
2) The ISLN lights in the two BUS TIE switches.
3) The OFF light in the R GEN CONT switch.
(c) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 724-010
(2) If the current transformer T105, T106 or T127 was replaced, do this test:
(a) Supply the left IDG power to the two 115V ac buses (AMM 24-22-00/201).
(b) Make sure these lights on the P5 panel are off:
1) The two BUS OFF lights.
2) The ISLN lights in the two BUS TIE switches.
3) The OFF light in the L GEN CONT switch.
(c) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 724-011
(3) If the current transformer T112, T113, T116 or T122 was replaced, do this test:
(a) Supply external power to the 115V ac buses (AMM 24-22-00/201).
(b) Make sure these lights on the P5 panel are off:
1) The two BUS OFF lights.
2) The ISLN light in each BUS TIE switch.
(c) Push the R BUS TIE switch on the P5 panel to the ISLN position.
(d) Make sure these lights on the P5 panel are on:
1) The yellow right BUS OFF light.
2) The yellow ISLN light in the right BUS TIE switch.
(e) Push the GROUND SERVICE switch on the forward attendant panel P21.
1) Make sure the white light in the GROUND SERVICE switch on the P21 panel comes on.
(f) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 724-012

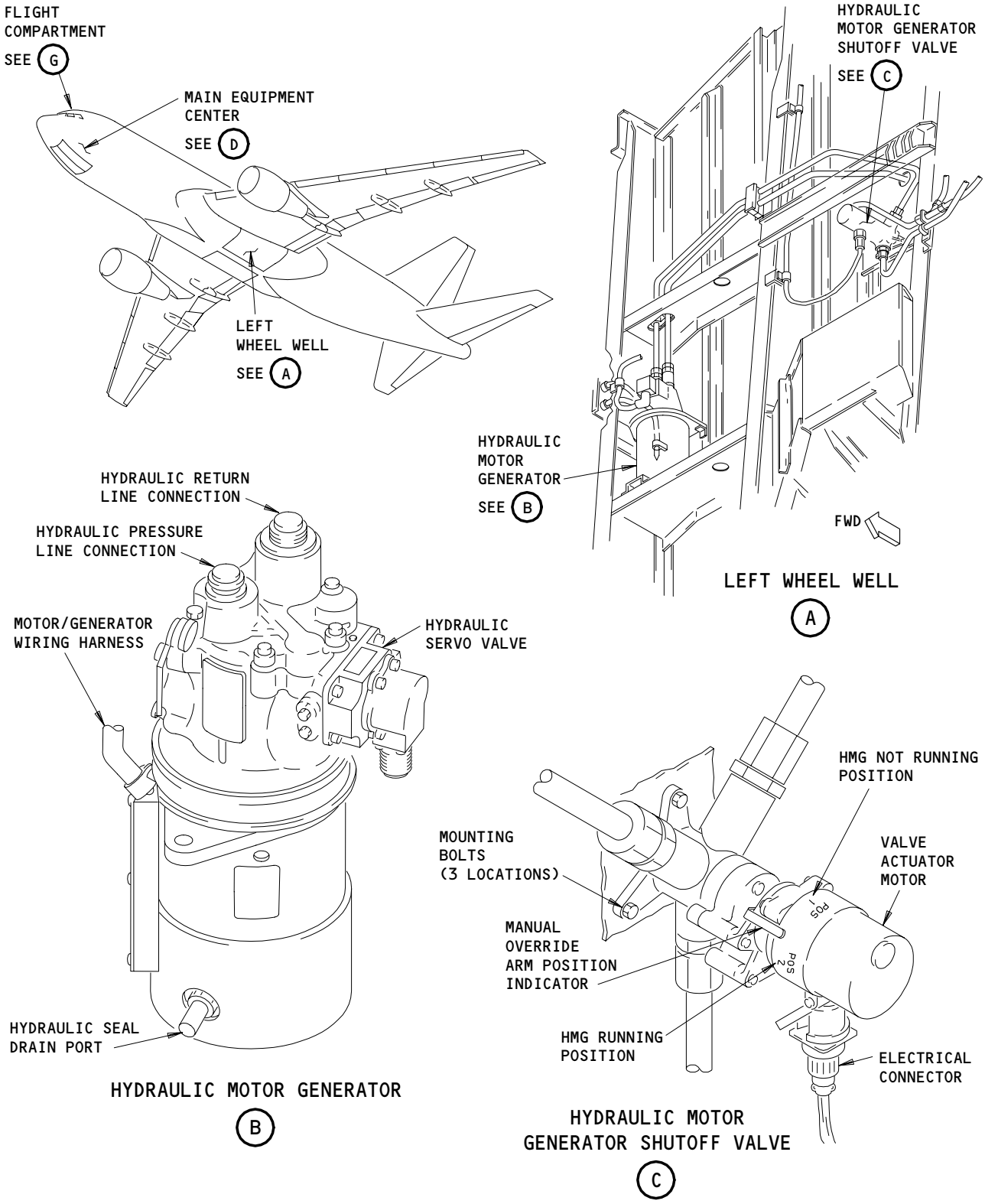
(4) If current transformer T111 or T115 was replaced, do this test:
  (a) Supply APU power to the 115V ac buses (AMM 24-22-00/201).
  (b) Make sure these lights on the P5 panel are off:
    1) The OFF light in the APU GEN switch.
    2) The ISLN light in each BUS TIE switch.
    3) The two BUS OFF lights.
  (c) Push the R BUS TIE switch (P5) to the ISLN position.
  (d) Make sure these lights on the P5 panel are on:
    1) The R BUS OFF light.
    2) The ISLN light in the right BUS TIE switch.
  (e) Push the GROUND SERVICE switch on the forward attendant panel P21.
  (f) Make sure the white light in the GROUND SERVICE switch (P21) comes on.

S 844-013

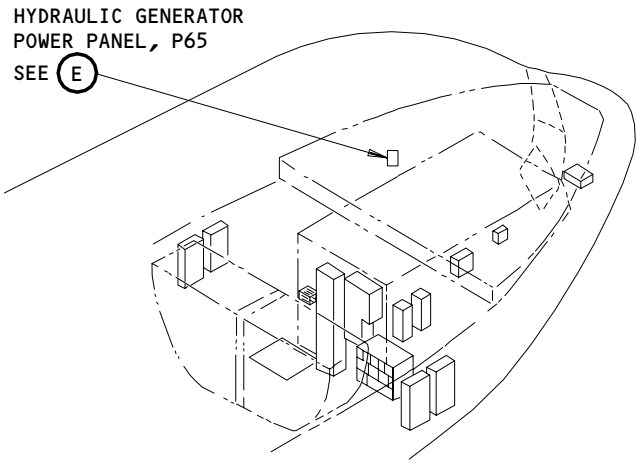
(5) Put the Airplane Back to its Usual Condition
  (a) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).
  (b) Remove electrical power if it is not necessary (AMM 24-22-00/201).

HYDRAULIC MOTOR-DRIVEN GENERATOR SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The hydraulic motor-driven generator system is an independant, non-time-limited, backup electrical power supply. It is activated automatically in flight when power loss occurs at both main AC buses.
   B. This power source supplies ac power to the L and R 115v ac transfer buses and the captains 115v ac flight instrument transfer bus. It also provides DC power to the hot battery bus.
   C. System components are a hydraulic motor-driven generator, hydraulic shutoff valve, generator control unit, relays and a test switch.
   D. The system is driven by the center hydraulic system which is pressurized by the air-driven hydraulic pump (ADP).
2. Component Details (Fig. 1)
   A. Hydraulic Motor-Driven Generator
      (1) The hydraulic motor-driven generator is mounted on the inboard bulkhead of the left wheel well. It consists of two major parts; an oil-cooled, brushless generator and a hydraulic motor.
         (a) Generator
            1) The generator operates at 12000 rpm and develops ac and dc outputs. The ac output is 3-phase, 4-wire, wye connected, rated at 115/200 volts rms, 400 Hz, 5.0 KVA at 0.75 to unity power factor. The dc output is supplied by a 3-phase delta-connected winding feeding into a full-wave diode rectifier bridge network. The dc output is rated at 28 volts dc, 50 amps. The ac and dc output ratings apply concurrently.
            2) A permanent magnet generator section provides 3-phase, 400 Hz power to the generator control unit for control and protection functions.
            3) A permanent magnet generator section supplies 3-phase output to a full-wave rectifier bridge in the GCU for main field excitation. Excitation is controlled by the generator control unit to maintain a nominal 118 volts rms line to neutral at the end of the ac feeders in the P65 panel. The dc output is unregulated except for indirect control of the ac regulation.
         (b) Motor
            1) The hydraulic motor is a servo-controlled, 12000 rpm constant speed variable displacement unit designed for operation in a 3000-psi hydraulic system. The nominal flow rate to the unit is 9.5 gpm when supplying extended range operation loads. Peak flow rate during low pressure transient conditions is approximately 24 gpm.

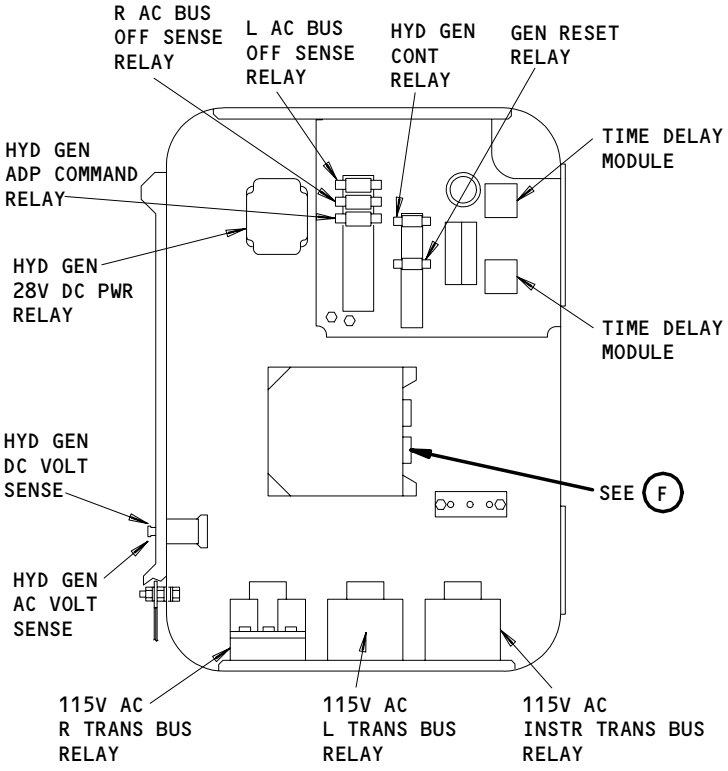


Hydraulic Motor Generator System – Component Location
Figure 1 (Sheet 1)



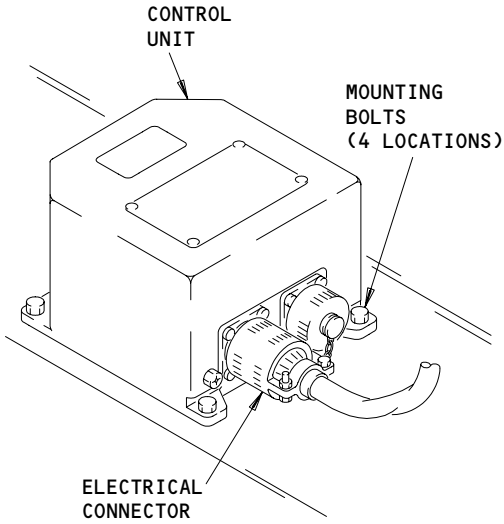
MAIN EQUIPMENT CENTER

D



HYDRAULIC GENERATOR POWER PANEL, P65

E

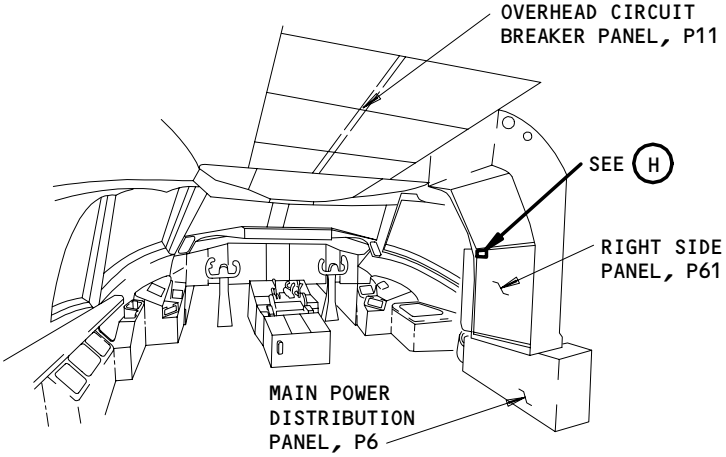


HYDRAULIC MOTOR DRIVEN
GENERATOR CONTROL UNIT

F

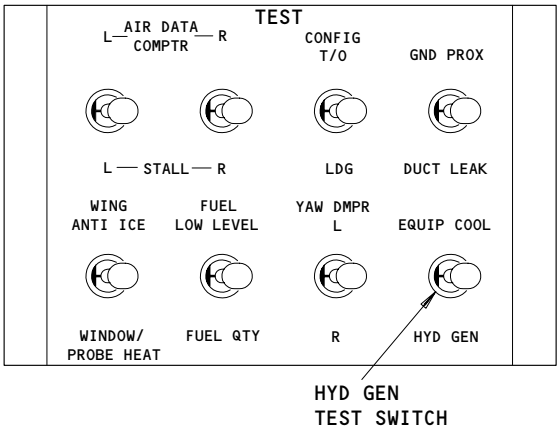
Hydraulic Motor Driven Generator System – Component Location
Figure 1 (Sheet 2)

147141



FLIGHT COMPARTMENT

G



MISCELLANEOUS TEST PANEL

H

Hydraulic Motor Driven Generator System – Component Location
Figure 1 (Sheet 3)

2) An electrohydraulic servo-valve is attached to the motor. The valve is controlled by feedback signals from the generator output frequency to maintain 400 ±2 Hz under steady state conditions.
3) A mechanical overspeed governor maintains generator output frequency within 430 ±10 Hz if the servo control system fails.

B. Generator Control Unit
(1) The generator control unit is located in the hydraulic generator power panel P65 which is mounted on the left sidewall adjacent to the nose wheel well. It is convection-cooled, solid-state unit which provides dc control power, and voltage regulation. It also provides undervoltage and underfrequency protection; power ready, anticycling, voltage and frequency control functions for the extended range operations system.

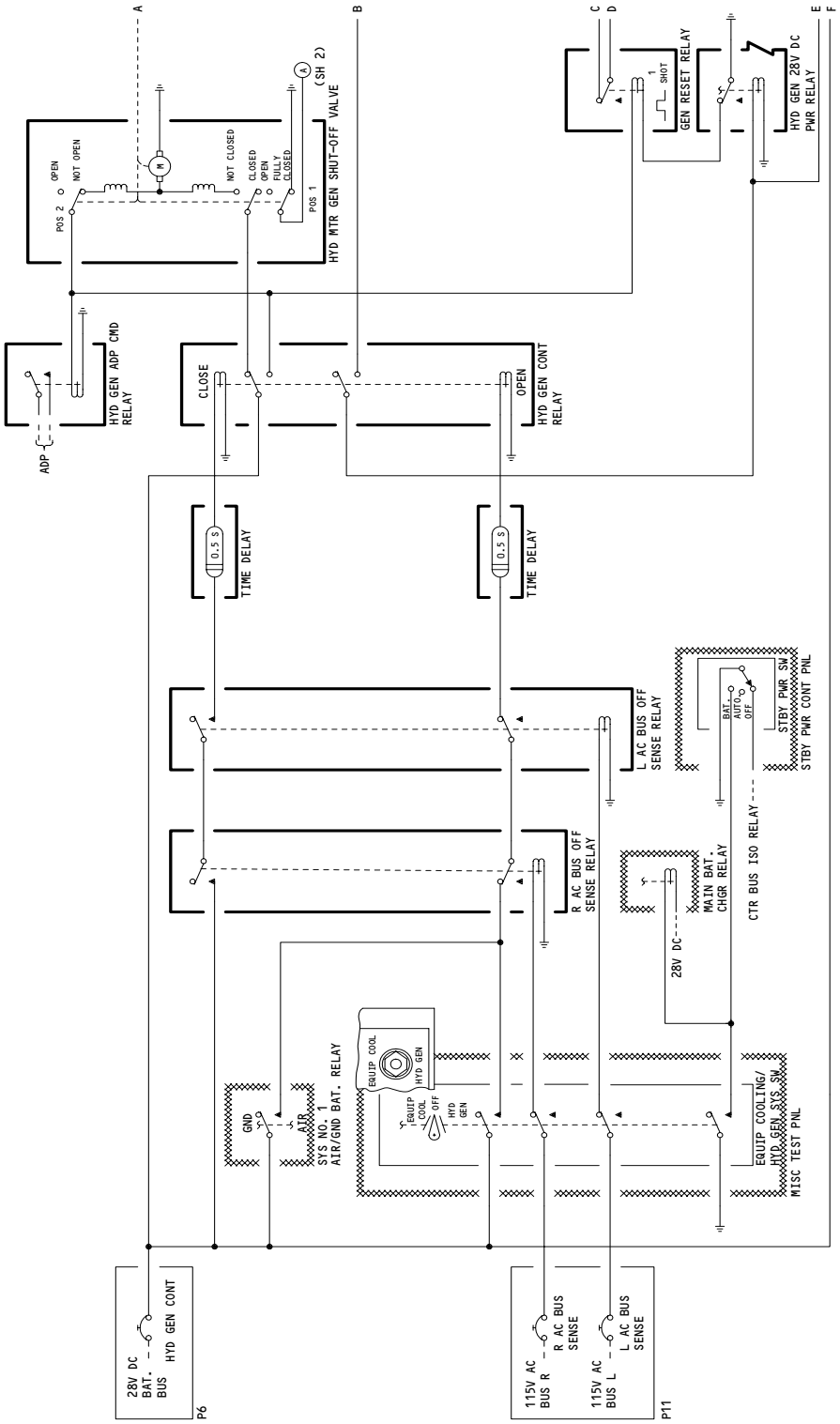
C. Hydraulic Shutoff Valve
(1) The hydraulic motor-driven generator shutoff valve is located on the inboard bulkhead of the left wheel well. It controls hydraulic fluid supply to the hydraulic motor generator, and is operated by a 28-volt dc motor. The valve can be operated by hand using the valve position indicator as a handle.

D. Hydraulic Generator Power Control Panel P65
(1) P65 mounts on the left sidewall adjacent to the nose wheel well. It contains all the relays, time delays, generator control unit, and control circuitry for the extended range operations system.

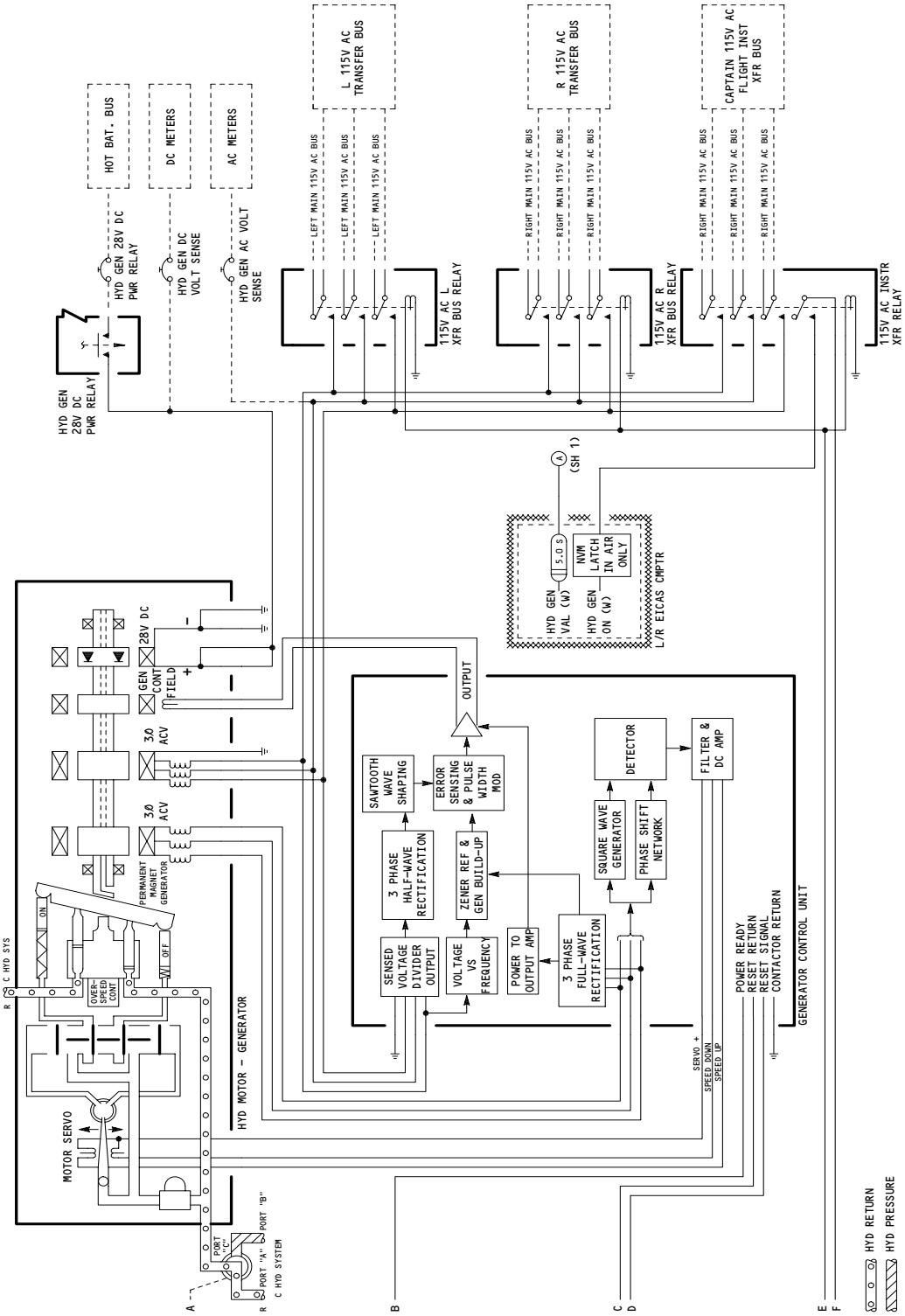
E. Test Switch
(1) A momentary on manual toggle switch (EQUIP COOL/HYD GEN) is provided for system checkout. It is located on the right side panel P61 in the flight deck.

3. Operation (Fig. 2)

A. Functional Description
(1) When loss of power at both main ac buses is sensed during flight, the hydraulic motor-driven generator starts. After a 0.5 second time delay, 28 volt dc from the battery bus starts the air-driven hydraulic pump (ADP) and drives the hydraulic motor-driven generator shutoff valve to the open position. Hydraulic pressure is then applied to the hydraulic motor-driven generator via the shutoff valve and the generator begins to operate.
(2) When the generator output voltage and frequency reaches power ready limits, the generator control unit provides a 28 volt dc output. This output closes the bus transfer relays to connect the generator ac and dc outputs to their respective buses.
(3) The dc output is connected to the hot battery bus through the HYD GEN 28v dc PWR relay. The HMG is in parallel with the main battery output. The ac output is connected to the captain's flight instrument bus through 115v ac INSTR XFR relay. The ac output also feeds the left and right transfer buses through the 115v ac L XFR BUS, and the 115v ac R XFR BUS relays respectively.
(4) The ac standby bus is supplied by the left ac transfer bus. The battery bus, and dc standby, is supplied from the hot battery bus.



Hydraulic Generator Control Schematic
Figure 2 (Sheet 1)



Hydraulic Generator Control Schematic
Figure 2 (Sheet 2)

(5) The hydraulic motor generator dc output normally exceeds battery terminal voltage, so the battery will not discharge. However, when the hydraulic motor generator first begins to operate, the battery terminal voltage may be higher than the hydraulic generator output, so the battery may be discharged until the battery voltage is equal to the HMG output. This is normal operation of the standby power systems.

(6) If normal power is recovered during flight and both main ac buses are energized, the ADP ON signal is removed. After a 0.5 second time delay, the hydraulic shutoff valve closes and the generator shuts down. The bus transfer relays de-energize and the system returns to normal.

(7) If an undervoltage or underfrequency occurs during hydraulic generator operation, the bus transfer relays will trip but the generator will remain excited. The time delay for this fault is 9 seconds. After 1.5 seconds a reset signal is automatically applied to the system. If the fault has not cleared, the reset circuit will continue to cycle until either the fault has cleared, the fusible links in the HMG burn open, the HMG is commanded off, or the center hydraulic system is depressurized. If the fault has cleared, the bus transfer relays will energize and supply the loads.

(8) The momentary on toggle switch EQUIP COOL/HYD GEN provided on the right side panel (P61) in the flight deck allows system checkout.

(9) Checkout is accomplished with the main buses energized, EICAS operating, and the center hydraulic system pressurized. The center hydraulic system can be pressurized using a hydraulic ground cart, the air-driven pump or the C1 and C2 electrically driven hydraulic pumps.

(10) Setting the test switch to HYD GEN position opens the sensing leads to the L and R main bus off sensing relays. It also provides an inflight logic signal to start the hydraulic generator and deactivates the battery charger.

(11) When the generator has started, and the buses transferred, a status message HYD GEN ON is displayed on the EICAS lower display panel. Transfer of the captain's instrument bus relay is sensed to provide the signal to EICAS.

(12) If the hydraulic shutoff valve is not fully closed a status message HYD GEN VAL appears after a 5 second delay on EICAS.

(13) The EICAS maintenance page displays the ac and dc voltages, and ac frequency during checkout.

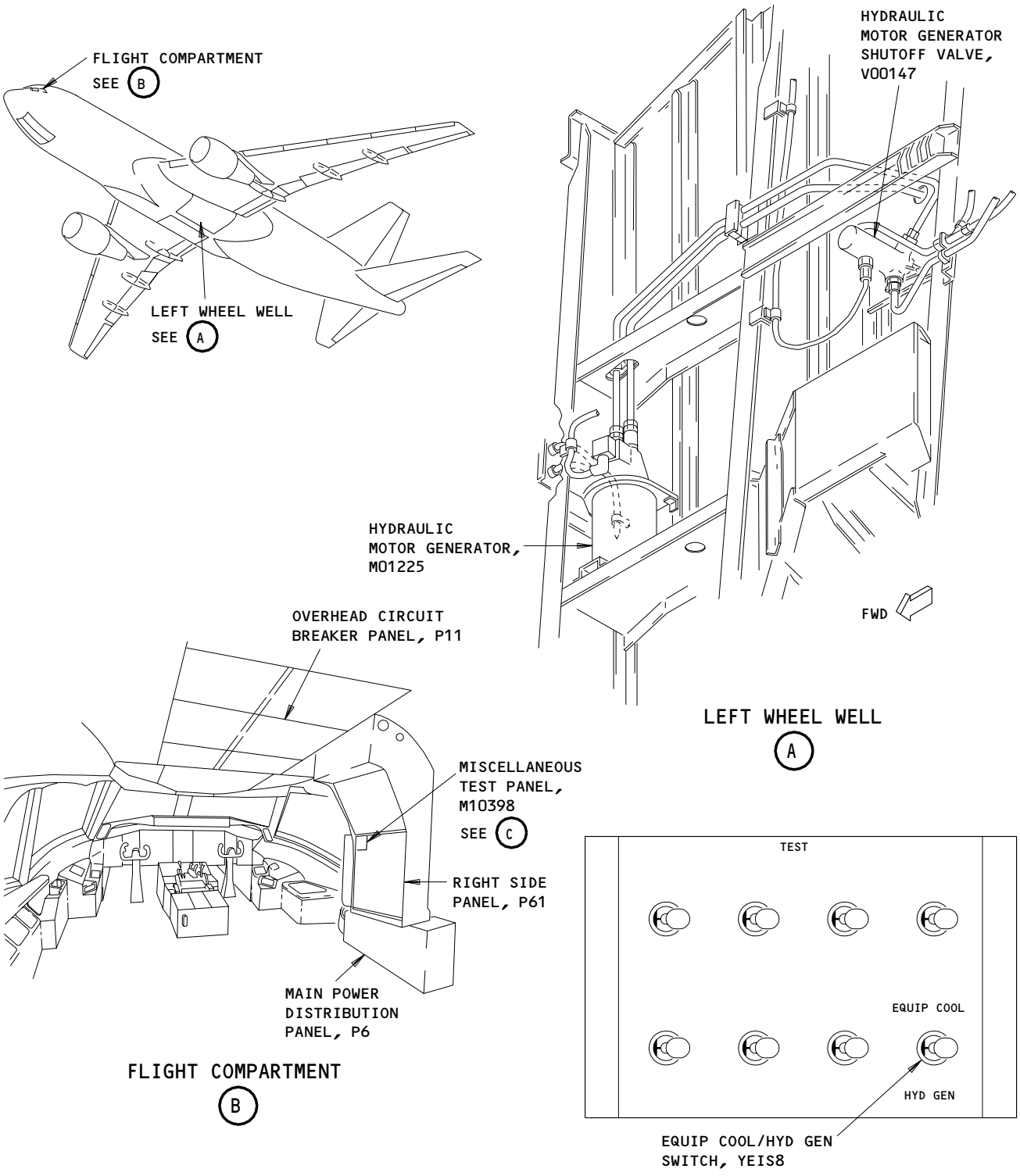
HYDRAULIC MOTOR GENERATOR SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKERS	1		FLT COMPT, P6,P11	
HYD GEN CONTR POWER, C906		1	6A7	*
HYD GEN 28V DC PWR, C830		1	6G12	*
L AC BUS SENSE, C847		1	11R4	*
R AC BUS SENSE, C848		1	11R31	*
CIRCUIT BREAKERS	2		119AL, MAIN EQUIP CTR, P65	
HYD GEN AC VOLT SENSE, C846		1		*
HYD GEN DC VOLT SENSE, C845		1		*
CONTROL UNIT - GEN HYD, M01226	2	1	119AL, MAIN EQUIP CTR, P65	24-25-02
GENERATOR - HYD MOTOR, M01225	1	1	LEFT WHEEL WELL	24-25-01
MODULE - TIME DELAY, M01228	2	1	119AL, MAIN EQUIP CTR, P65	*
MODULE - TIME DELAY, M01230	2	1	119AL, MAIN EQUIP CTR, P65	*
PANEL - (FIM 28-43-00/101) MISC TEST, M10398				
RELAY - CAPT 115V AC FLT INST TRANS, K00862	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - GEN RESET ENABLE, K00873	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - HYD GEN ADP COMMAND, K00865	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - HYD GEN CONTROL, K00860	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - HYD GEN 28V DC POWER, K00861	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - LEFT AC BUS OFF SENSE, K00858	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - RIGHT AC BUS OFF SENSE, K00859	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - VAC L TRANSFER, K00863	2	1	119AL, MAIN EQUIP CTR, P65	*
RELAY - VAC R TRANSFER, K00864	2	1	119AL, MAIN EQUIP CTR, P65	*
SWITCH - EQUIP COOL/HYD GEN, YEIS8	1	1	FLT COMPT, P61, MISC TEST PANEL, M10398	*
VALVE - HYD MTR GEN S/O, V00147	1	1	LEFT WHEEL WELL	24-25-03

* SEE THE WDM EQUIPMENT LIST

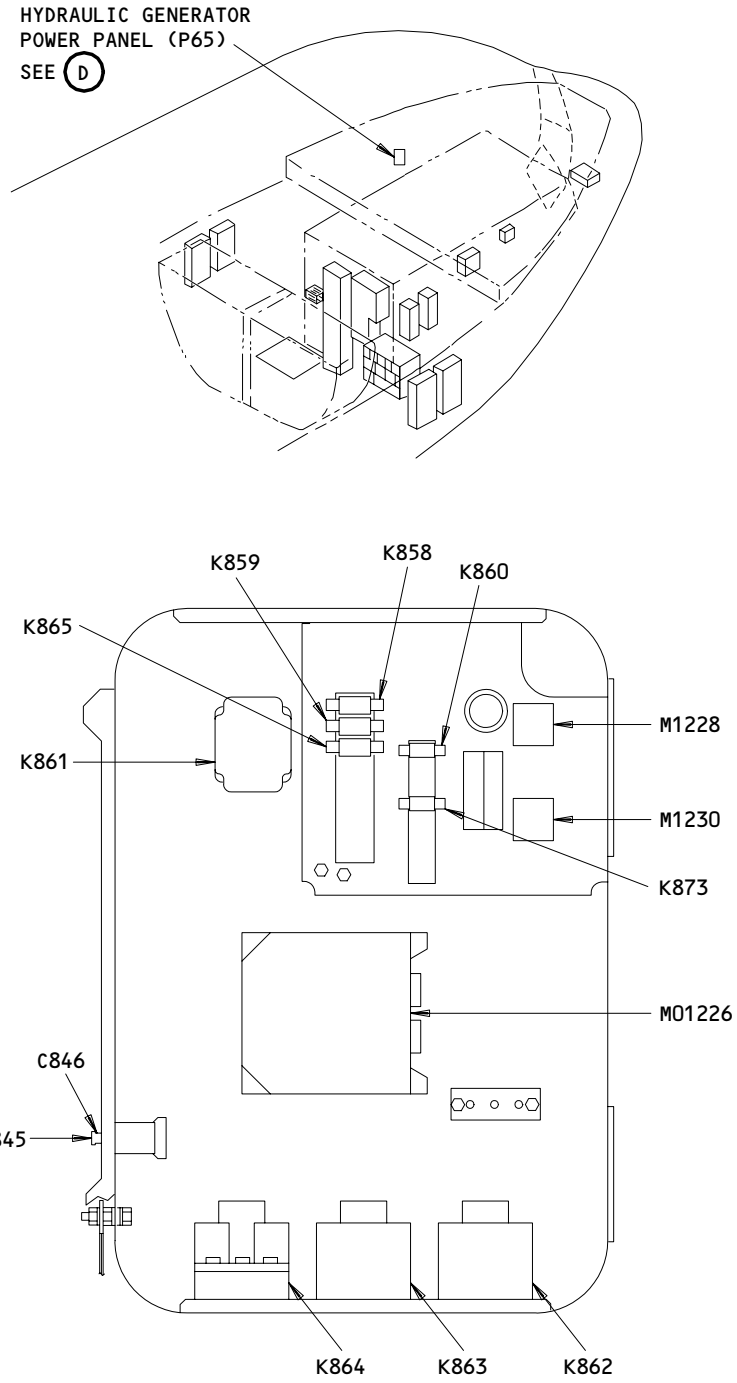
Hydraulic Motor Generator System - Component Index
Figure 101

147213



Hydraulic Motor Generator System – Component Location
Figure 102 (Sheet 1)

147582



HYDRAULIC GENERATOR POWER PANEL (P65)
D

Hydraulic Motor Generator System – Component Location
Figure 102 (Sheet 2)

HYDRAULIC MOTOR GENERATOR SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has two tasks:
      (1) Operational Test of the Hydraulic Motor Generator System.
      (2) Functional Test of the Hydraulic Motor Generator System.

   TASK 24-25-00-715-001

2. Operational Test - Hydraulic Motor Generator System (Fig. 501)
   A. General
      (1) The operational test does a quick system check. It uses the EICAS displays to monitor the system. No tools are required.
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 29-11-00/201, Main Hydraulic Systems
      (3) AMM 36-00-00/201, Pneumatic General
   C. Equipment
      (1) Hydraulic Service Cart, 0 to 3000 psi, with hydraulic fluid, fire resistant, BMS 3-11 - commercially available (required for Instrument Bus Power Transfer Test)
   D. Prepare for Test

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

      S 865-003
      (2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel P11 are closed.

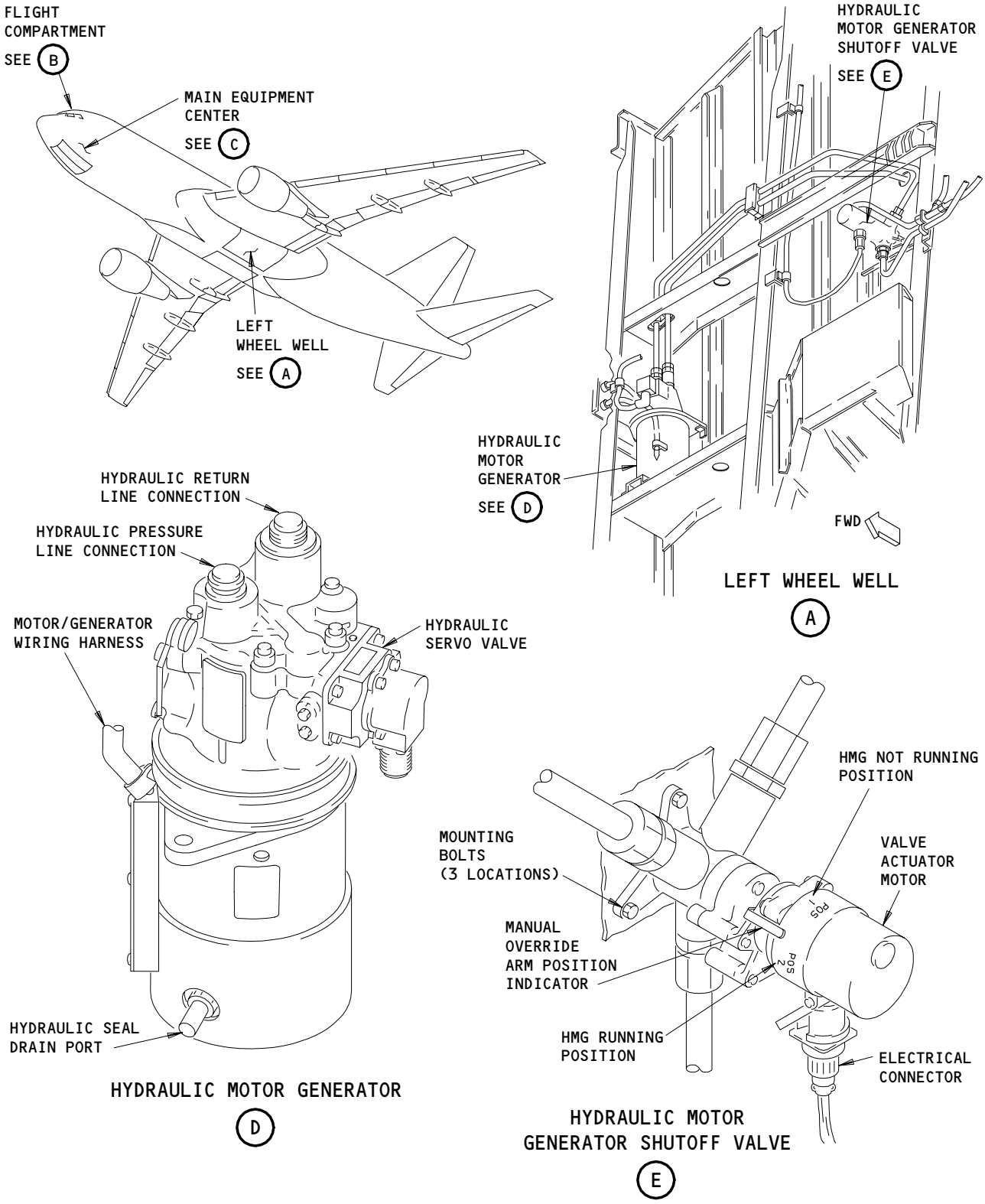
      S 865-005
      (3) Make sure these circuit breakers on the overhead circuit breaker panel P11 are closed:
         (a) 11R4, AC BUS SENSE L
         (b) 11R31, AC BUS SENSE R

      S 865-006
      (4) Make sure this circuit breaker on the main power distribution panel, P6, is closed:
         (a) 6A7, HYD GEN CONTR POWER

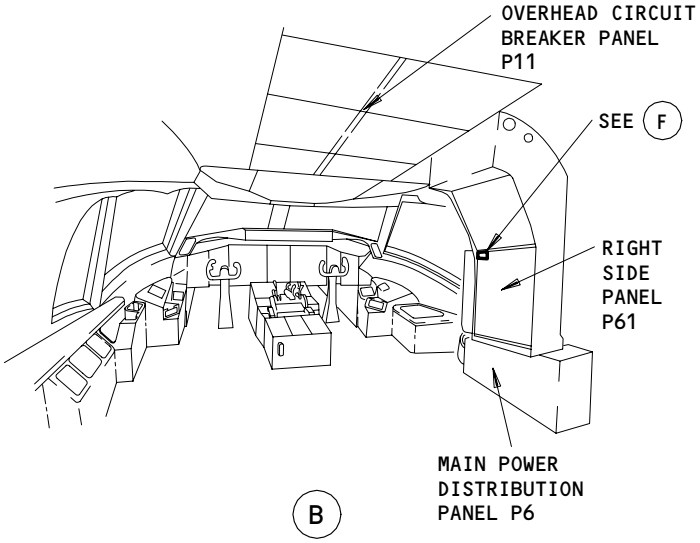
      S 615-007
      (5) Pressurize the center hydraulic system with one of these methods:

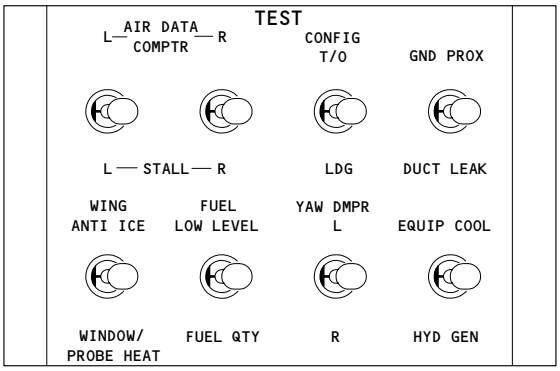
         NOTE: When the ACMPs do not produce enough flow to pressurize the HMG, use the air driven pump.

         (a) Both ACMP C1 and C2 (AMM 29-11-00/201).
            1) Put both ACMP C1 and C2 switches on the hydraulic control panel (P5) to ON (AMM 29-11-00/201).



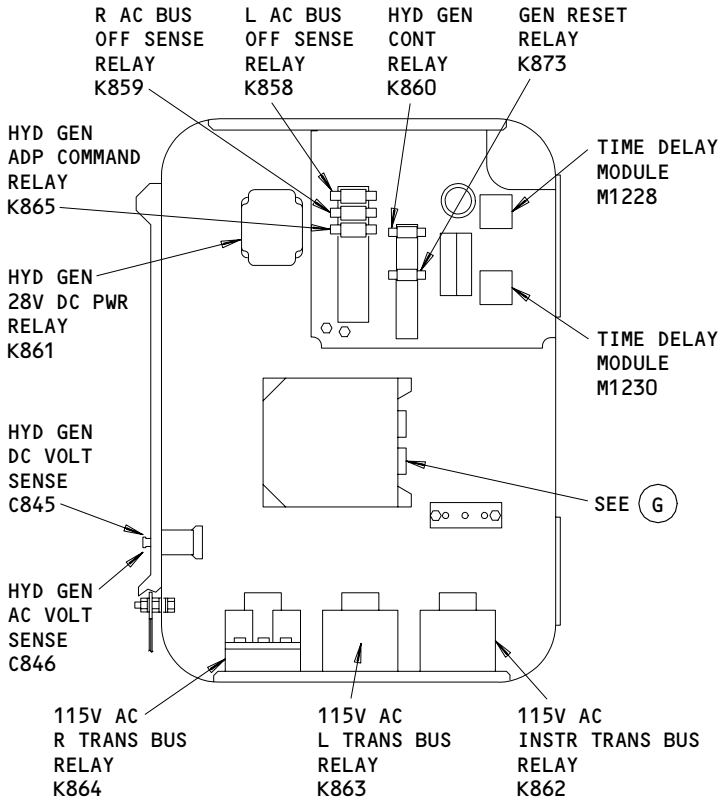
Hydraulic Motor Generator System – Adjustment/Test
Figure 501 (Sheet 1)





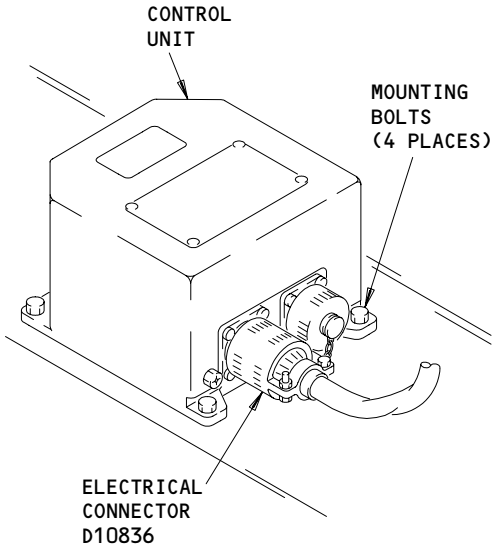
MISCELLANEOUS TEST PANEL

F



HYD GEN POWER PANEL P65

C



HYDRAULIC MOTOR DRIVEN GENERATOR CONTROL UNIT

G

Hydraulic Motor Driven Generator System Component Location
Figure 501 (Sheet 2)

(b) The air driven pump:
1) Supply pneumatic power (AMM 36-00-00/201).
2) Put the C DEMAND HYD PUMPS AIR switch on the hydraulic control panel (P5) to the AUTO position.

E. Procedure

S 715-010
(1) Do this operational test of the HMG system:
(a) Push the STATUS switch on the EICAS display select panel P9.
(b) Hold the EQUIP COOL/HYD GEN switch on the miscellaneous test panel (P61) in the HYD GEN position.
(c) If the ADP is used, make sure the ADP starts to operate.
(d) Make sure the status messages HYD GEN ON and HYD GEN VAL appear on the EICAS lower display unit on P2.
(e) Push the ELEC/HYD switch on the EICAS MAINT panel (P61) and make sure these values are shown on the lower EICAS display:

1) HYD GEN DC-V	28 ±3
2) HYD GEN AC-V	118 ±5
3) HYD GEN FREQ	400 ±5

NOTE: The HYD GEN DC-V display is an indication of hot battery bus voltage (HMG dc output in parallel with the HMG).

(f) Release the EQUIP COOL/HYD GEN switch on the P61 panel. If the ADP was used, make sure the ADP stops.
(g) Make sure these values are shown on the lower EICAS display:

1) HYD GEN DC-V	0 ±4
2) HYD GEN AC-V	0 ±5
3) HYD GEN FREQ	0 ±5

(h) Push the ECS/MSG switch on the EICAS MAINT panel (P61).
(i) Push and hold the ERASE switch (P61) for 3 seconds.
(j) Make sure the status messages HYD GEN ON and HYD GEN VAL on the EICAS lower display unit go out of view.

S 865-015
(2) Remove the hydraulic power if it is not necessary (AMM 29-11-00/201).

S 865-030
(3) Remove pneumatic power if it is not necessary (AMM 36-00-00/201).

S 865-016
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-25-00-735-017

3. Functional Test - Hydraulic Motor Generator System (Fig. 501)

A. General

(1) This task contains:

(a) HMG ADP ON Command Check

(b) HMG Reset Signal Check

(c) Hydraulic Shutoff Valve and Valve Control Circuit Check

(d) HMG Bus Power Transfer Check

B. Equipment

(1) MULTIMETER 0-1000v dc ±1%, 0-750 ac, 0-2 amps, 0-2 meg ohms - Commercially available.

(2) Test Box - A24008-37 (Preferred)
Test Box - A24008-27 (Optional)
Test Box - A24008-19 (Optional)

C. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 29-11-00/201, Main Hydraulic Systems

(3) AMM 32-09-02/201, Air Ground Relays

(4) AMM 32-00-15/201, Main Gear Door Locks

D. Access

(1) Location Zones

211/212	Flight Compartment
143	Main Landing Gear Body (LH Side)

(2) Access Panels

732	Main Landing Gear Body Doors (LH Side)

E. Prepare for Test

S 415-045

(1) Open the left wheel well doors and install the door locks (AMM 32-00-15/201).

S 035-062

(2) Remove the connector D466 from the ADP pressure switch (S29). The switch is located on the ADP pressure/case drain filter module in the left wheel well.

S 415-063

(3) Remove the left wheel well door lock and close wheel well door (AMM 32-00-15/201).

S 865-018

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

S 865-019

(5) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel P11 are closed.

F. Procedure

S 725-022

(1) Do the HMG ADP ON Command Check as follows:
  (a) Remove the ground from test point as follows:
    1) Make sure the landing gear, landing gear doors, flaps and slats are in agreement with their selected positions.
    2) Make sure the spoiler handle on P10 is in the DOWN position.
    3) Make sure the AIR HYD PUMP select switch on the hydraulic system control panel P5 is in the OFF position.
    4) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
      a) 11L15, HYD ELEC PUMP C1
    5) Push the C1 ELEC HYD PUMP switch on the hydraulic system control panel P5 to ON.
  (b) Make sure that there is no continuity between the terminal FA21 of TB176 (E2-4) and ground (WDM 29-11-32).
  (c) Make sure this circuit breaker on the main power distribution panel P6 is closed:
    1) 6A7, HYD GEN CONTR POWER
  (d) Make sure these P11 panel circuit breakers are closed:
    1) 11R4, AC BUS SENSE L
    2) 11R31, AC BUS SENSE R
  (e) Hold the EQUIP COOL/HYD GEN switch on the miscellaneous test panel (P61) in HYD GEN position.
  (f) Make sure that there is continuity between terminal FA21 of TB176 (E2-4) and ground (WDM 29-11-32).
  (g) Release the EQUIP COOL/HYD GEN switch.
  (h) Return the C1 ELECT HYD PUMP switch to OFF.
  (i) Remove DO-NOT-CLOSE identifier and close the following P11 panel circuit breaker:
    1) 11L15, HYD ELEC PUMP C1
  (j) Open the left wheel well doors and install the door locks (AMM 32-00-15/201).
  (k) Connect connector D466 to ADP pressure switch.

S 725-023

(2) Do the HMG Reset Signal Check as follows:
  (a) Open this circuit breaker on the main power distribution P6 panel and attach a DO-NOT-CLOSE tag:
    1) 6A7, HYD GEN CONT
  (b) Disconnect the electrical connector D10836 from the HMG control unit and then connect D10836 to the HMG tester A24008.
  (c) Put the HMG tester RELAY POWER and POWER switches to OFF.
  (d) Connect HMG tester to 115v ac, 400 Hz power source.
  (e) Put the tester POWER switch and the RELAY POWER switch to ON. Make sure the tester RESET light comes on.

(f) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R

(g) Remove the electrical connector D10834 from the HMG shutoff valve V147 in the left wheel well.

(h) Remove the DO-NOT-CLOSE tag and close the HYD GEN CONT (6A7) circuit breaker on the P6 panel.

(i) Make sure 28 ±3 vdc is at pin 3 of connector D10834.

(j) Make sure 0 ±3 vdc is at pin 2 of connector D10834.

(k) Hold the EQUIP COOL/HYD GEN test switch on the miscellaneous test panel (P61) in the HYD GEN position.

NOTE: The test switch must be held for a minimum of 0.5 second for the hydraulic generator control relay K860 to latch in the commanded position.

(l) Release the EQUIP COOL/HYD GEN test switch.

(m) Make sure 28 ±3 vdc is at pin 2 of electrical connector D10834.

(n) Make sure 0 ±3 vdc is at pin 3 of electrical connector D10834.

(o) Put the tester RELAY POWER switch to OFF. Make sure the RESET light goes out for 1.5 seconds and then comes on.

(p) Push the ECS/MSG switch on the EICAS MAINT panel (P61).

(q) Push and hold the ERASE switch (P61) for 3 seconds.

(r) Make sure the HYD GEN ON message is not displayed on the EICAS.

(s) Put the tester RELAY POWER switch to ON. Make sure the RESET light remains on.

(t) Make sure the HYD GEN ON message is displayed on the EICAS.

(u) Open the HYD GEN CONT (6A7) circuit breaker on the P6 panel and attach a DO-NOT-CLOSE tag.

(v) Connect the electrical connector D10834 to the HMG shutoff valve V147 in the left wheel well.

(w) Put the POWER switch of the tester to the OFF position and remove the HMG tester. Connect the electrical connector D10836 to the HMG control unit.

(x) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R

(y) Remove the DO-NOT-CLOSE tag and close the HYD GEN CONT (6A7) circuit breaker on the P6 panel.

S 725-024

(3) Do the Hydraulic Shutoff Valve and Valve Control Circuit Check as follows:

CAUTION: REFER TO AMM 32-09-02/201 FOR FLIGHT MODE SIMULATION. EQUIPMENT DAMAGE MAY OCCUR IF INSTRUCTIONS ARE NOT FOLLOWED.

(a) Simulate System No. 1 air/ground relays in flight mode by placing actuators and deactuators on proximity sensors (AMM 32-09-02/201).
(b) Open these P11 panel circuit breakers and attach DO-NOT-CLOSE tags:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R
(c) Make sure the hydraulic shutoff valve moves to the open position (2).
(d) Make sure the status message HYD GEN VAL is displayed on the lower EICAS display unit.
(e) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R
(f) Make sure the hydraulic shutoff valve moves to the closed position (1).
(g) Make sure the status message HYD GEN VAL is not displayed on the lower EICAS display unit.

S 725-025
(4) Do the HMG Bus Power Transfer Check as follows:
(a) Open these circuit breakers to de-energize all the hydraulic generator powered buses:
1) 6D15, 115V AC L TRANSFER BUS
2) 6F18, 115V AC R TRANSFER BUS
3) 6J14, CAPT PRIMARY INSTR BUS PH A
4) 6J15, CAPT PRIMARY INSTR BUS PH B
5) 6J16, CAPT PRIMARY INSTR BUS PH C
6) 11S34, CAPT ALT INST BUS PH A
7) 11S35, CAPT ALT INST BUS PH B
8) 11S36, CAPT ALT INST BUS PH C
(b) Make sure the transfer buses are not powered by doing a voltage check at these circuit breakers:

BUS	CIRCUIT BREAKER	TERMINAL	VOLTAGE
115v ac L Transfer	L IRS (11F1) C611	2	0 ±5 ac
115v ac R Transfer	R AIR SUPPLY VALVE PWR (11S21) C1331	2	0 ±5 ac
Captains Instr	L IAS (11E1) C580	1	0 ±5 ac
Hot Battery	HYD GEN 28V DC POWER relay, K861	A2	28 ±3 dc

(c) Open this circuit breaker and attach the DO-NOT-CLOSE tag :
1) Main Power Distribution Panel P6:
a) 6G12, HYD GEN 28V DC PWR

(d) Make sure 0 ±3 vdc at terminal A2 of the HYD GEN 28V DC POWER relay, K861 in the P65 panel.

(e) Pressurize the center hydraulic system using the hydraulic service cart or by operating both ACMP C1 and C2 (AMM 29-11-00/201).

(f) Open these P11 panel circuit breakers and attach DO-NOT-CLOSE tags:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R

(g) Make sure the hydraulic motor generator supplies power to the transfer buses by doing a voltage check at these circuit breakers:

BUS	CIRCUIT BREAKER	TERMINAL	VOLTAGE
115v ac L Transfer	L IRS (11F1) C611	2	118 ±5ac
115v ac R Transfer	R AIR SUPPLY VALVE PWR (11S21) C1331	2	118 ±5ac
Captains Instr	L IAS (11E1) C580	1	118 ±5ac
HMG DC Output	HYD GEN 28V DC POWER relay, K861	A2	>28 dc *(1)

*(1) DC voltage is unregulated and when the HMG is unloaded, it will typically rise above 28 Vdc during this test.

(h) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
1) 11R4, AC BUS SENSE L
2) 11R31, AC BUS SENSE R

(i) Close these circuit breakers on the main power distribution panel P6:
1) 6G12, HYD GEN 28V DC PWR
2) 6D15, 115V AC L TRANSFER BUS
3) 6F18, 115V AC R TRANSFER BUS
4) 6J14, CAPT PRIMARY INSTR BUS PH A
5) 6J15, CAPT PRIMARY INSTR BUS PH B
6) 6J16, CAPT PRIMARY INSTR BUS PH C

(j) Close these circuit breakers on the overhead circuit breaker panel P11:
1) 11S34, CAPT ALT INST BUS PH A
2) 11S35, CAPT ALT INST BUS PH B
3) 11S36, CAPT ALT INST BUS PH C

G. Put the Airplane Back to Its Usual Condition

S 845-029

(1) Return System No. 1 air/ground relays to ground mode by removing actuators and deactuators from proximity sensors (AMM 32-09-02/201).

S 415-028

(2) Remove the left wheel well door lock and close wheel well door if no longer required (AMM 32-00-15/201).

S 865-026

(3) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

S 865-027

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

HYDRAULIC MOTOR GENERATOR REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Hydraulic Motor Generator Removal
      (2) Hydraulic Motor Generator Installation.

   TASK 24-25-01-024-001

2. Hydraulic Motor Generator Removal (Fig. 401)
   A. References
      (1) AMM 12-25-01/301, Exterior Cleaning
      (2) AMM 29-11-00/201, Main Hydraulic Systems
      (3) AMM 32-00-15/201, Main Gear Door Locks
   B. Access
      (1) Location Zones
          143/144 Main Landing Gear Wheel Well
          211/212 Control Cabin

      (2) 732/742 Main Landing Gear Body Doors
   C. Prepare for Removal

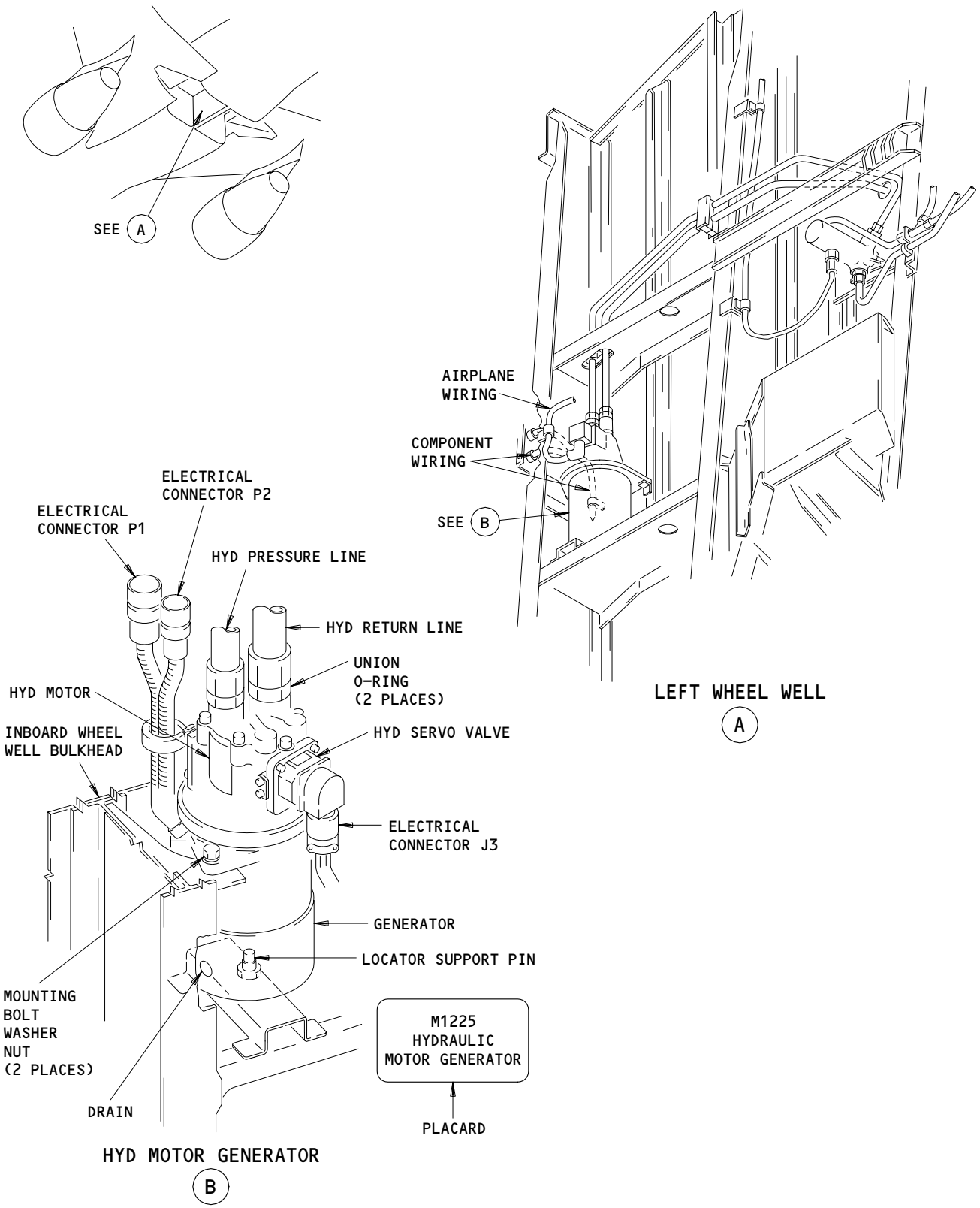
      S 014-003

      WARNING: REFER TO AMM 32-00-15/201 TO INSTALL THE DOOR LOCK. RAPID ACTION OF DOORS MAY INJURE PERSONNEL OR DAMAGE EQUIPMENT IF LOCKS ARE NOT PROPERLY INSTALLED.

      (1) Open the applicable wheel well door and install door lock (AMM 32-00-15/201).

      S 864-006
      (2) Remove the pressure from the center hydraulic system and reservoir (AMM 29-11-00/201).

      S 864-001
      (3) Open this circuit breakers on the main power distribution panel P6 and attach a DO-NOT-CLOSE tag :
      (a) 6A7, HYD GEN CONTR POWER



Hydraulic Motor Driven Generator Installation
Figure 401

D. Procedure

S 024-007

(1) Do these steps to remove the HMG:

(a) Remove the electrical connector from the servo valve on hydraulic motor generator.

(b) Remove the two generator wiring harness connectors from the airplane wiring.

(c) Disconnect the hydraulic pressure line at the generator. Install cap and plug.

(d) Disconnect the hydraulic return line at the generator. Install cap and plug.

(e) Remove the two generator mounting bolts, washers and nuts.

(f) Lift the generator above the locator support pin and remove the generator.

S 144-008

CAUTION: QUICKLY CLEAN THE SPILLED HYDRAULIC FLUID IN THE INSTALLATION AREA. HYDRAULIC FLUID CAN DAMAGE AIRPLANE EQUIPMENT.

(2) Clean the spilled hydraulic fluid in the installation area (AMM 12-25-01/301).

S 034-009

(3) Remove the two unions from the hydraulic motor. Discard the O-rings.

TASK 24-25-01-424-005

3. Hydraulic Motor Generator Installation (Fig. 401)

A. References

(1) AMM 12-12-01/301, Hydraulic Systems

(2) AMM 24-22-00/201, Electrical Power - Control

(3) AMM 24-25-00/501, Hydraulic Motor Generator System - Adjustment/Test

(4) AMM 29-11-00/201, Main Hydraulic Systems

B. Access

(1) Location Zones

143/144 Main Landing Gear Wheel Well

211/212 Control Cabin

(2) 732/742 Main Landing Gear Body Doors

C. Prepare for Installation

S 644-010

(1) Install the new O-rings on the unions. Apply hydraulic lubricant or hydraulic fluid to the O-rings and the union threads.

S 434-011

(2) Install the unions in the hydraulic motor ports.

D. Procedure

S 424-012

(1) Do these steps to install the HMG:
   (a) Put the generator on the locator support pin and install the two mounting bolts, washers and nuts.
   (b) Remove the cap and plug and connect the hydraulic return line to the generator.
   (c) Remove the cap and plug and connect the hydraulic pressure line to the generator.
   (d) Connect the electrical connector to the servo valve.
   (e) Connect the two generator wiring harness connectors to the airplane wiring.

S 864-002

(2) Remove the DO-NOT-CLOSE tag and close this P6 panel circuit breaker:
   (a) 6A7, HYD GEN CONTR POWER

S 614-013

(3) Service the applicable hydraulic system (AMM 12-12-01/301).

E. Test the HMG Installation.

S 864-014

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

S 714-018

(2) Do the Replacement Test of the Hydraulic Motor Generator System as follows:
   (a) Push the STATUS switch on the EICAS display select panel P9.
   (b) Hold the EQUIP COOL/HYD GEN switch on the miscellaneous test panel (P61) in the HYD GEN position.
   (c) If the ADP is used, make sure the ADP starts to operate.
   (d) Make sure the status message HYD GEN ON and HYD GEN VAL appear on the EICAS lower display unit on P2.

(e) Open this circuit breaker on the main distribution panel P6:
1) 6G12, HYD GEN 28V DC PWR
(f) Push the ELEC/HYD switch on the EICAS MAINT panel (P61) and make sure these values are shown on the lower EICAS display:
1) HYD GEN DC-V 33 ±3
2) HYD GEN AC-V 115 ±5
3) HYD GEN FREQ 400 ±5
(g) Release the EQUIP COOL/HYD GEN switch on the P61 panel. If the ADP was used, make sure the ADP stops.
(h) Close this circuit breaker on the main distribution panel P6:
1) 6G12, HYD GEN 28V DC PWR
(i) Make sure these values are shown on the lower EICAS display:
1) HYD GEN DC-V 0 ±4
2) HYD GEN AC-V 0 ±5
3) HYD GEN FREQ 0 ±5
(j) Push the ECS/MSG switch on the EICAS MAINT panel (P61).
(k) Push and hold the ERASE switch (P61) for 3 seconds.
(l) Make sure the status messages HYD GEN ON and HYD GEN VAL on the EICAS lower display unit go out of view.

S 214-022
(3) Make sure there is no hydraulic fluid leak from the hydraulic lines.

S 864-019
(4) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

S 864-020
(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

HYDRAULIC MOTOR GENERATOR CONTROL UNIT REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Hydraulic Motor Generator Control Unit Removal
      (2) Hydraulic Motor Generator Control Unit Installation.

TASK 24-25-02-024-001

2. Hydraulic Motor Generator Control Unit Removal (Fig 401)
   A. Access
      (1) Location Zones
          211/212 Flight Compartment
          119/120 Main Equipment Center

      (2) Access Panels
          119AL Main Equipment Center

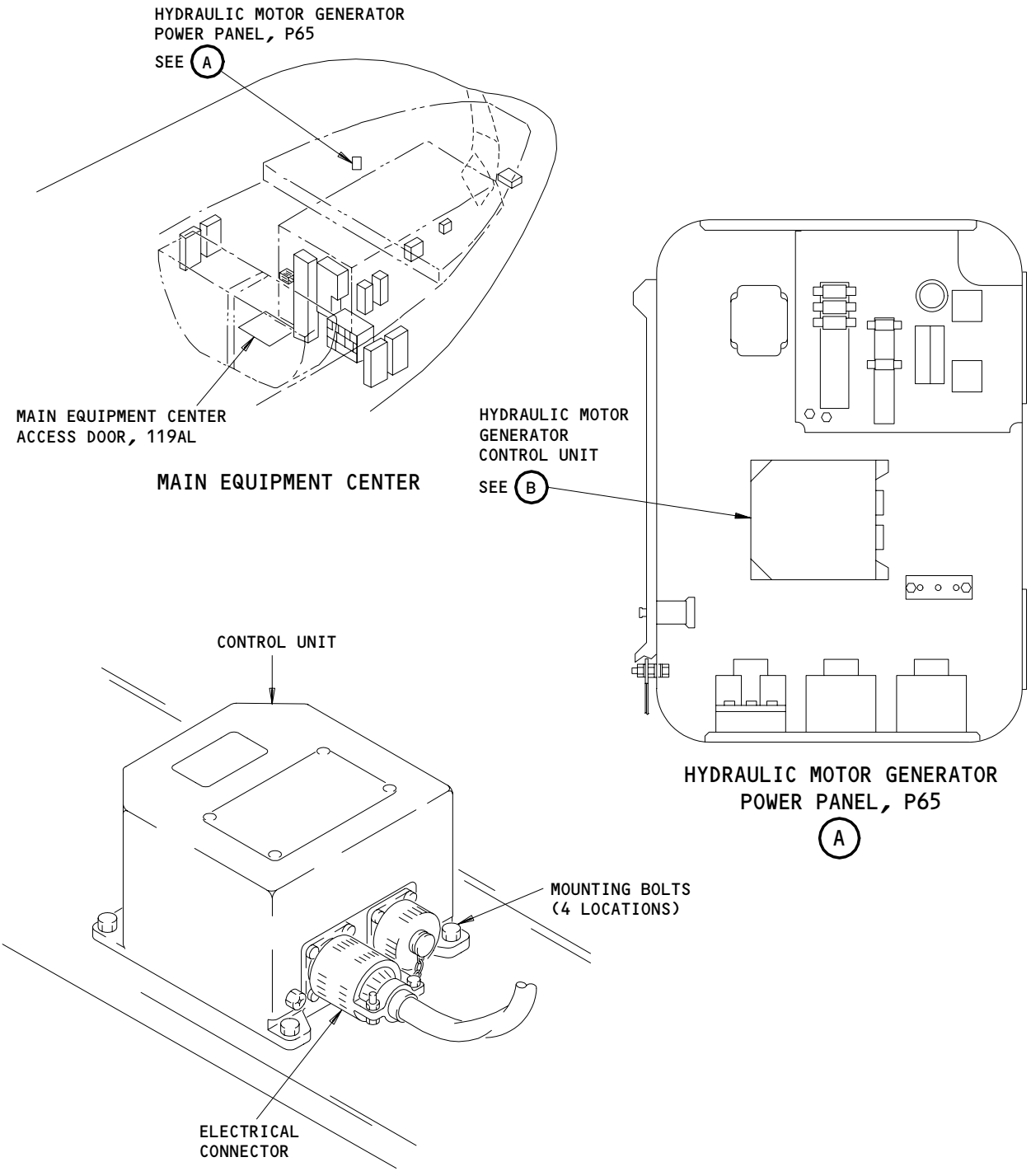
   B. Prepare for HMG Control Unit Removal

      S 864-003
      (1) Open this circuit breaker on the main power distribution panel P6 and attach DO-NOT-CLOSE tag:
          (a) 6A7, HYD GEN CONTR POWER
   C. Procedure

      S 024-004
      (1) Do these steps to remove the HMG Control Unit:
          (a) Open the HYD GEN POWER PANEL (P65) in the forward equipment center.
          (b) Remove the electrical connector D10836 from the control unit.
          (c) Remove the four mounting screws.
          (d) Remove the control unit.

TASK 24-25-02-424-003

3. Hydraulic Motor Generator Control Unit Installation (Fig 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control



MAIN EQUIPMENT CENTER

HYDRAULIC MOTOR GENERATOR
POWER PANEL, P65
A

HYDRAULIC MOTOR GENERATOR
CONTROL UNIT
B

Hydraulic Motor Generator Control Unit Installation
Figure 401

(2) AMM 24-25-00/501, Hydraulic Motor Generator System - Adjustment/Test.
(3) AMM 29-11-00/201, Main Hydraulic Systems

B. Access

(1) Location Zones

211/212	Flight Compartment
119/120	Main Equipment Center

(2) Access Panels

119AL	Main Equipment Center

C. Procedure

S 424-005
(1) Do these steps to install the HMG control unit:
(a) Put the control unit in its position in the P65 panel and install with four mounting screws.
(b) Connect the electrical connector D10836 to the control unit.
(c) Close the P65 panel.

S 864-006
(2) Remove the DO-NOT-CLOSE tag and close this P6 circuit breaker:
(a) 6A7, HYD GEN CONTR POWER

D. Test the HMG Control Unit Installation.

S 864-004
(1) Supply electrical power (AMM 24-22-00/201).

S 714-000
(2) Do the Operational Test of the Hydraulic Motor Generator System (AMM 24-25-00/501).

S 864-002
(3) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

S 864-001
(4) Remove electrical power if it not necessary (AMM 24-22-00/201).

HYDRAULIC MOTOR GENERATOR SHUTOFF VALVE REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks:
      (1) Hydraulic Motor Generator Shutoff Valve Removal
      (2) Hydraulic Motor Generator Shutoff Valve Installation.

   TASK 24-25-03-024-001

2. Hydraulic Motor Generator Shutoff Valve Removal (Fig. 401)
   A. References
      (1) AMM 12-25-01/301, Exterior Cleaning
      (2) AMM 29-11-00/201, Main Hydraulic Systems
      (3) AMM 32-00-15/201, Main Gear Door Locks
   B. Access
      (1) Location Zones
          143 Main Landing Gear Wheel Well
          211/212 Flight Compartment

      (2) Access Panels
          732 Main Landing Gear Body Door (LH Side)

   C. Prepare for Removal

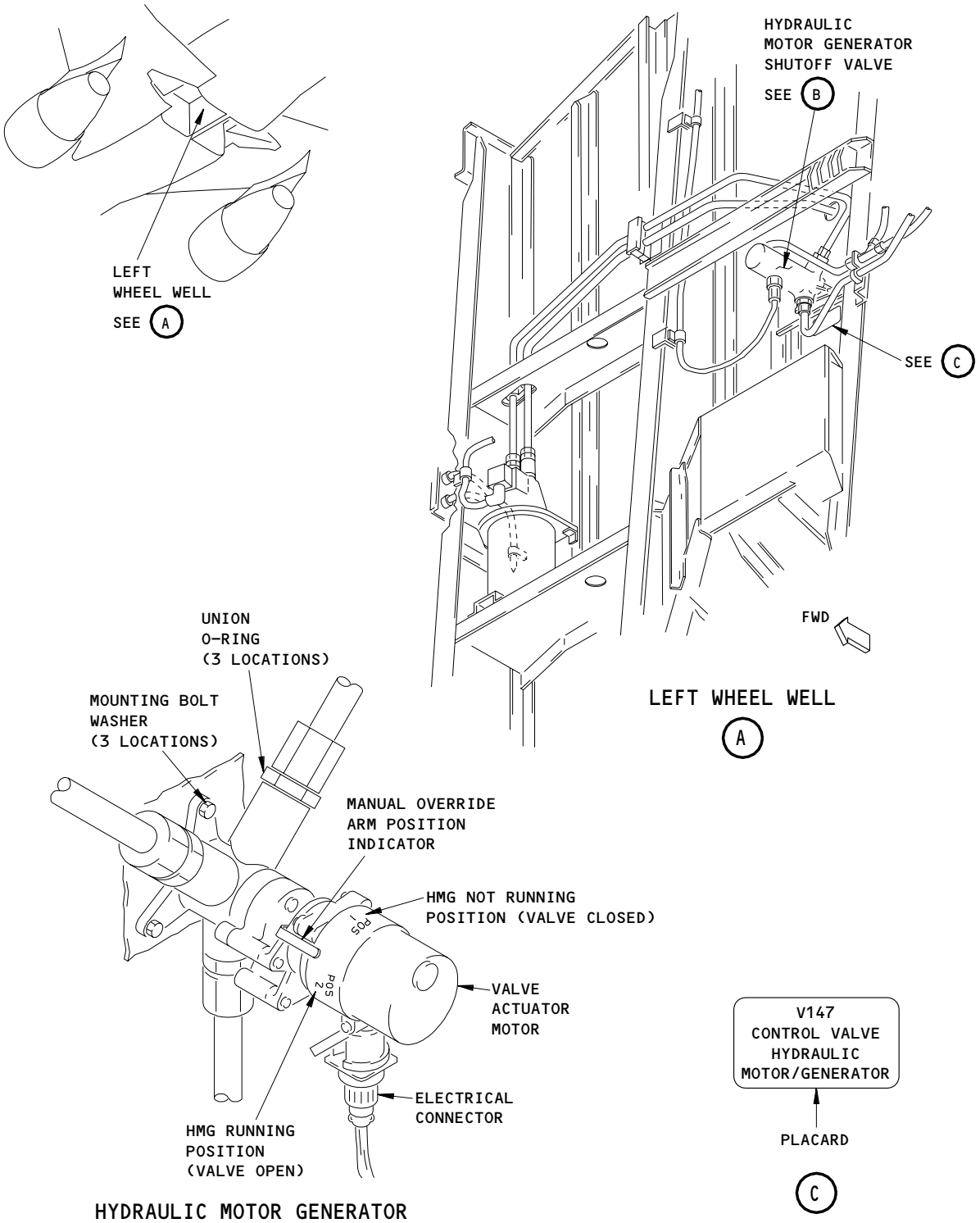
      S 014-003

      WARNING: USE THE PROCEDURE IN AMM 32-00-15/201 TO INSTALL THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT

      (1) Open the doors for the left main gear and install the door locks (AMM 32-00-15/201).

      S 864-004
      (2) Remove the pressure from the center hydraulic system and reservoir (AMM 29-11-00/201).

      S 864-005
      (3) Open this circuit breaker on the main power distribution panel P6 and attach a DO-NOT-CLOSE tag:
          (a) 6A7, HYD GEN CONTR POWER



Hydraulic Motor Generator Shutoff Valve Installation
Figure 401

D. Procedure

S 024-007

(1) Remove the HMG shutoff valve as follows:

(a) Remove the electrical connector D10834 from the HMG shutoff valve.

(b) Disconnect the three hydraulic lines from the HMG shutoff valve and install caps and plugs.

(c) Remove the three mounting bolts and washers.

(d) Remove the HMG shutoff valve.

S 164-008

CAUTION: SPILLED HYDRAULIC FLUID SHOULD BE PROMPTLY CLEANED AND REMOVED. HYDRAULIC FLUID CAN DAMAGE AIRPLANE EQUIPMENT.

(2) Clean any spilled hydraulic fluid from installation area (AMM 12-25-01/301).

S 034-009

(3) Remove the three unions from the HMG shutoff valve. Keep the unions for installation. Discard the O-rings.

TASK 24-25-03-424-025

3. Hydraulic Motor Generator Shutoff Valve Installation (Fig. 401)

A. References

(1) AMM 12-12-01/301, Hydraulic Systems

(2) AMM 24-22-00/201, Electrical Power - Control

(3) AMM 24-25-00/501, Hydraulic Motor Generator System - Adjustment/Test

(4) AMM 29-11-00/201, Main Hydraulic Systems

(5) AMM 32-00-15/201, Main Gear Door Locks

B. Equipment

(1) Bonding meter - Model T-477W,
Avtron Manufacturing, Inc.,
Cleveland, Ohio

C. Access

(1) Location Zones

143 Main Landing Gear Wheel Well

211/212 Flight Compartment

(2) Access Panels

732 Main Landing Gear Body Door (LH Side)

D. Prepare for Installation

S 644-010

(1) Install new O-rings on the unions.

(a) Apply hydraulic lubricant or hydraulic fluid to the O-rings and union threads.

S 434-011
(2) Install the unions in HMG shutoff valve ports.

E. Procedure

S 424-012
(1) Install the HMG shutoff valve as follows:
(a) Put the HMG shutoff valve in its position and install the three washers and bolts.
(b) Make sure the bonding resistance at three mounting points is not more than 0.0025 ohm (SWPM 20-20-00).
(c) Remove the caps and plugs.
(d) Connect the three hydraulic lines to the HMG shutoff valve.
(e) Install the electrical connector D10834 to the HMG shutoff valve.

S 864-013
(2) Remove the DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
(a) 6A7, HYD GEN CONTR POWER

S 614-015
(3) Service the center hydraulic system (AMM 12-12-01/301).

F. Test the HMG shutoff valve installation.

S 864-016
(1) Supply electrical power (AMM 24-22-00/201).

S 714-028
(2) Do this operational check of the valve:
(a) Make sure the doors for the left main gear are open and the door locks are installed (AMM 32-00-15/201).
(b) Make sure the valve indicator is in position 1 (CLOSED).
(c) Hold the EQUIP COOL/HYD GEN test switch on the miscellaneous test panel (P61), in the HYD GEN position.
(d) Make sure the valve indicator moves to position 2 (OPEN).
1) Listen to the valve motor and make sure it stops when the valve is in the fully open position.

(e) Release the EQUIP COOL/HYD GEN test switch.
(f) Make sure the valve indicator moves to position 1 (CLOSED).
    1) Listen to the valve motor and make sure it stops when the valve is in fully closed position.
(g) Open this circuit breaker on the main power distribution panel (P6):
    1) 6A7, HYD GEN CONTR POWER
(h) Manually position the valve indicator midway between position 1 and position 2.

    NOTE: When you move the position indicator to the middle position, the actuator must be directed to the middle position with one direction of movement only. For example when you go from position 1 to position 2, do not go past the middle position and then change direction to move to the middle position. This can cause the valve switches to reset.

(i) Close this circuit breaker on the main power distribution panel (P6):
    1) 6A7, HYD GEN CONTR POWER
(j) Make sure the valve indicator moves to position 1 (CLOSED).
    1) Listen to the valve motor and make sure it stops when the valve is in the fully closed position.
(k) Hold the EQUIP COOL/HYD GEN test switch on the miscellaneous test panel (P61), in the HYD GEN position. Hold the switch in this position for the next five steps.
(l) Make sure the valve indicator moves to position 2 (OPEN).
    1) Listen to the valve motor and make sure it stops when the valve is in the fully open position.
(m) Open this circuit breaker on the main power distribution panel (P6):
    1) 6A7, HYD GEN CONTR POWER
(n) Manually position the valve indicator midway between position 1 and position 2.

    NOTE: When you move the position indicator to the middle position, the actuator must be directed to the middle position with one direction of movement only. For example when you go from position 1 to position 2, do not go past the middle position and then change direction to move to the middle position. This can cause the valve switches to reset.

(o) Close this circuit breaker on the main power distribution panel (P6):
    1) 6A7, HYD GEN CONTR POWER

(p) Make sure the valve indicator moves to position 2 (OPEN).
1) Listen to the valve motor and make sure it stops when the valve is in the fully open position.
(q) Release the EQUIP COOL/HYD GEN test switch.
(r) Make sure the valve indicator moves to position 1 (CLOSED).
1) Listen to the valve motor and make sure it stops when the valve is in the fully closed position.
(s) If the valve does not meet any of the requirements of this test, replace the valve and perform the test again.

S 714-022
(3) Do the Operational Test of the Hydraulic Motor Generator System (AMM 24-25-00/501).

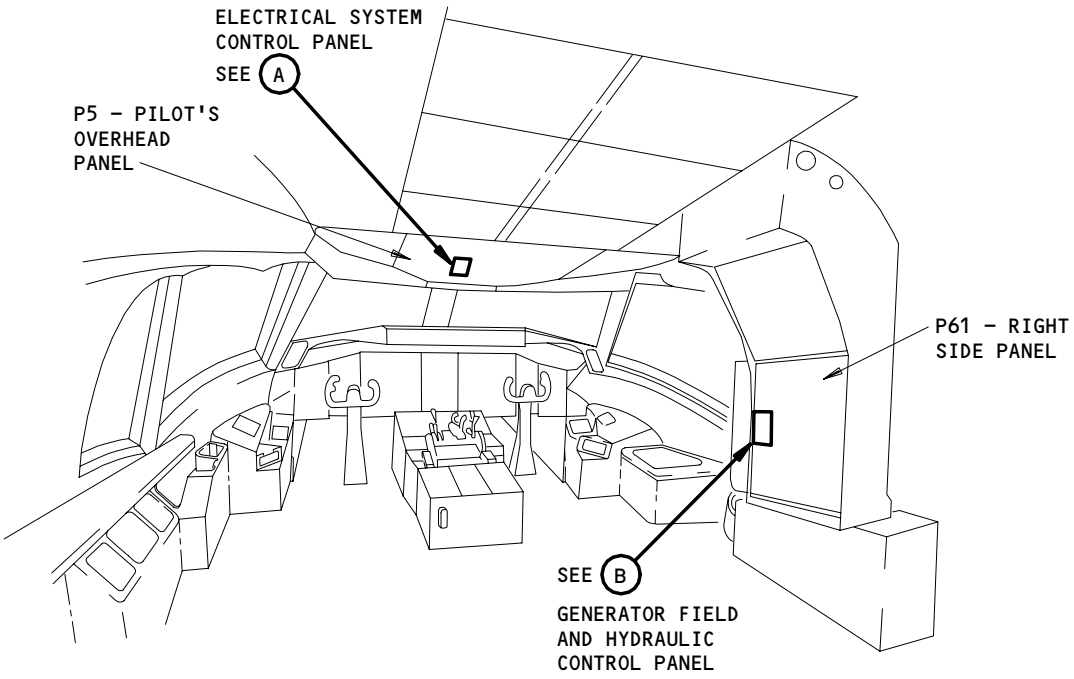
S 214-027
(4) Make sure there is no hydraulic fluid leak from the hydraulic lines.

S 864-023
(5) Remove the hydraulic power if it is not necessary (AMM 29-11-00/201).

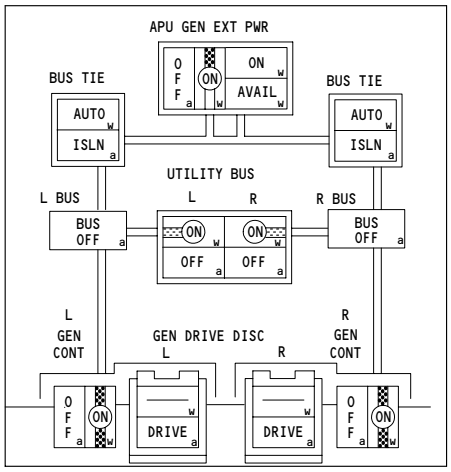
S 864-024
(6) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

AC GENERATION ANNUNCIATION - DESCRIPTION AND OPERATION

1. General
   A. Electrical power system status is indicated by lights and EICAS messages on the flight deck.
2. Component Details (Fig. 1)
   A. Electrical System Control Panel
      (1) Electrical system control panel M10063 is on pilots' overhead panel P5. The panel contains: Two main GEN CONT switches with amber OFF lights, two guarded GEN DRIVE DISC switches with amber DRIVE lights, two BUS TIE switches with amber ISLN lights, two amber BUS OFF lights, an APU GEN CONT switch with an amber OFF light, an EXT PWR switch with white ON and AVAIL lights, and two UTILITY BUS switches with amber OFF lights.
   B. Generator Field and Hydraulic Control Panel
      (1) Generator Field and Hydraulic Control Panel M1087 is on right side panel P61. The panel contains three (L, R, and APU) GEN FIELD MANUAL RESET switches. Each switch contains a white FIELD OFF light. There are also flight control switches on the panel.
3. Operation
   A. Functional Description
      (1) The L and R GEN CONT switches on electrical systems control panel M10063 control generator circuit breaker (GCB) operation (AMM 24-22-00). The amber OFF light in the GEN CONT switch indicates the GCB is open. This is due to: 1) The GEN CONT switch being off (AMM 24-22-00); or 2) the GCB being opened by a generator control unit (GCU) protection function (AMM 24-23-00). A (L or R) GEN OFF message appears on the EICAS display when the GCB is open, and the corresponding engine is running. This is a level C EICAS Message. (The EICAS display is on pilots' center instrument panel P2.)
      (2) The three (L, R, and APU) GEN FIELD MANUAL RESET switches control the generator field control relays (GCRs) (AMM 24-22-00). The white FIELD OFF light in the switch is on when the corresponding GCR is open.
      (3) The GEN DRIVE DISC switches on M10063 contain amber DRIVE lights to indicate integrated drive generator (IDG) failures. The DRIVE light comes on when: 1) IDG oil-out temperature reaches too high a value, or 2) internal IDG oil pressure is too low (AMM 24-11-00). Along with the DRIVE light, a (L or R) GEN DRIVE level C message appears on the EICAS display, when the failure situation exists with the corresponding engine running.
      (4) The BUS TIE switches control bus tie breaker operation (AMM 24-22-00). The amber ISLN light in the switch comes on when: 1) The BUS TIE switch is off (out position), or 2) the bus tie breaker has automatically been locked open due to a system protection function, such as a differential current fault (AMM 24-23-00). Along with the ISLN light, a (L or R) BUS ISOLATED message appears on the EICAS display. This is a level C message.

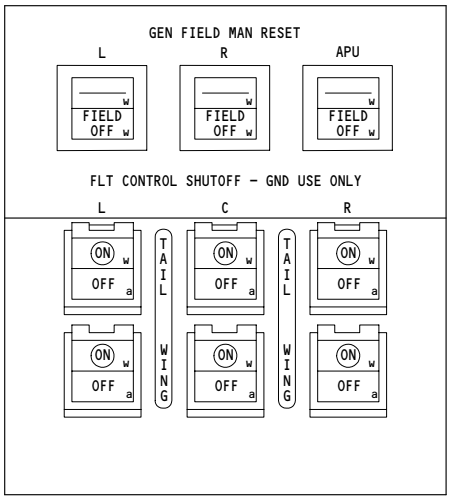


FLT COMPT



M10063 – ELECTRICAL SYSTEM CONTROL PANEL

A



M1087 – GENERATOR FIELD AND HYDRAULIC CONTROL PANEL

B

AC Generation Annunciation Component Location
Figure 1

(5) Each main ac bus has an amber BUS OFF light on the M10063 panel. This light comes on when its associated main ac bus loses power. This occurs when the main bus generator circuit breaker (GCB) is open and:
   (a) The main bus tie breaker (BTB) is open; or
   (b) The main bus BTB is closed; the opposite bus BTB, external power contactor (EPC),and auxiliary power breaker (APB) are open; or
   (c) Both BTBs are closed; the opposite bus GCB, EPC, and APB are open.

(6) Along with the BUS OFF light, a (L or R) AC BUS OFF message appears on the EICAS display. This is a level B EICAS message.

(7) The APU GEN CONT switch controls operation of the auxiliary power breaker (APB) (AMM 24-22-00).
   (a) AIRPLANES WITHOUT APU GEN OFF ISLN DIODE R824 (PRE-SB 24-103);
   The amber OFF light in the switch is on when the APB is open and the APU generator switch is off, or the APB and external power contactor are open with the APU is operating above 95 percent full speed.
   (b) AIRPLANES WITH APU GEN OFF ISLN DIODE R824 (POST-SB 24-103);
   The amber OFF light in the switch is on when the APB is open and the APU generator switch is off, or the APB and external power contactor are open with the APU is operating above 95 percent full speed, or APU generator field off.

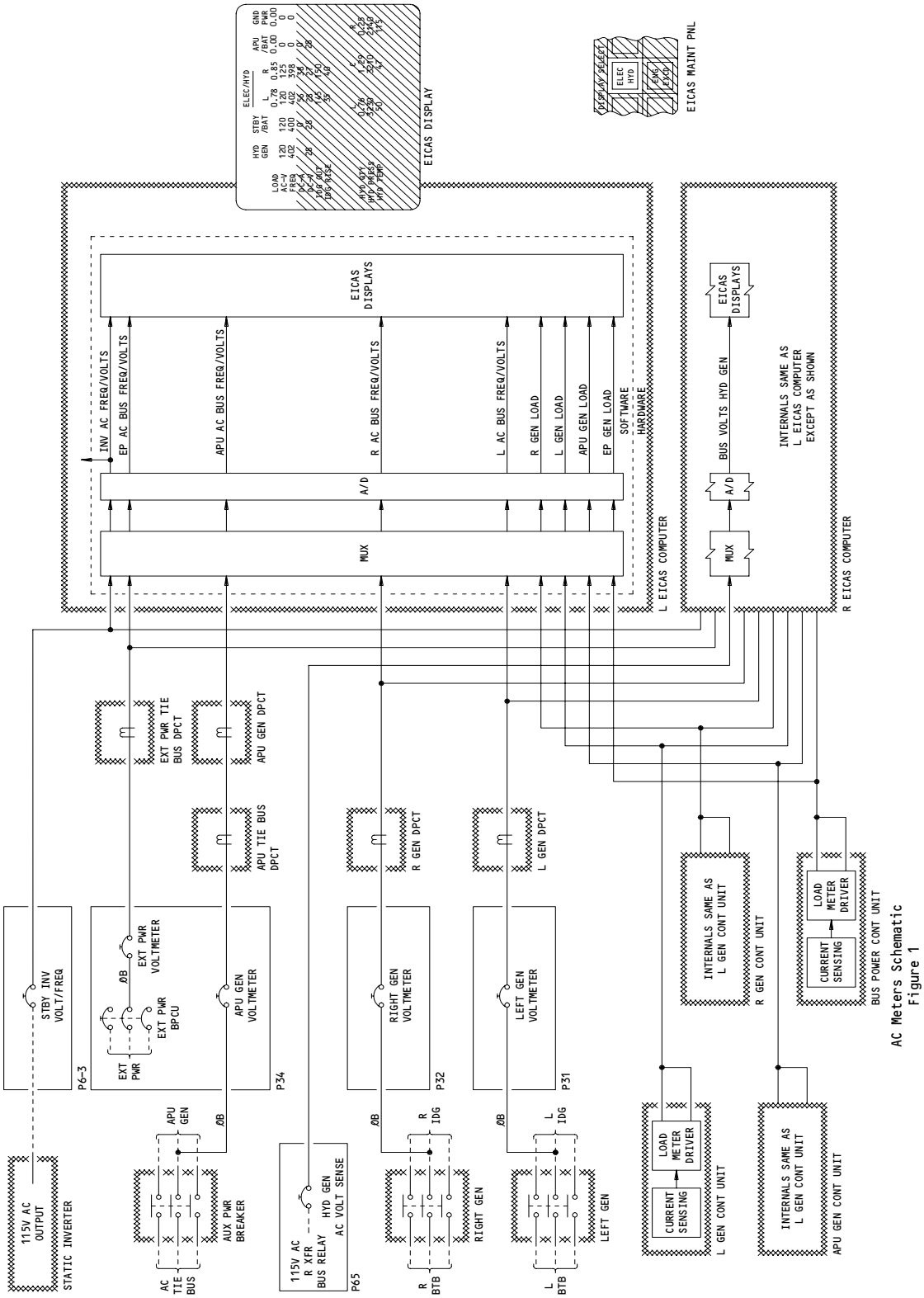
(8) Along with the amber OFF light in the APU GEN CONT switch, an APU GEN OFF message appears on the EICAS display. (The APU must be running, with the failure exisitng, for the EICAS message to appear). This is a level C EICAS message.

(9) The EXT PWR switch controls the external power contactor (EPC) (AMM 24-41-00). The white AVAIL light is on when external power of correct quality is available at the external power receptacle. The ON light is on when the EPC is closed.

(10) The L and R UTILITY BUS switches control their respective utility bus relay (UBR). The amber OFF light is on when: 1) The utility bus switch is off (out position); and 2) the main bus supplying the utility bus is powered. The amber OFF light is also on when: 1) The utility bus switch is on, 2) the main bus supplying the utility bus is powered, and 3) the UBR has been opened by the load shed system. Along with the OFF light a (L or R) UTIL BUS OFF message appears on the EICAS display. This is a level C EICAS message.

AC METERS - DESCRIPTION AND OPERATION

1. General
   A. The ac electrical power system values are shown on the EICAS display.
2. Operation (Fig. 1)
   A. Functional Description
      (1) AC power system voltage, frequency, and load are shown on the EICAS display. (The EICAS display is on pilots' center panel P2.) These values only appear on the maintenance page of the EICAS system. Therefore, the electrical system values can only be viewed on the ground, not inflight.
      (2) The output voltage and frequency of the left and right integrated drive generators (IDGs), APU generator, external power, and static inverter, are monitored by the EICAS system. The voltage and frequency of the IDGs is measured on the generator side of the generator circuit breakers. APU generator power is measured on the generator side of the auxiliary power breaker. External power is measured on the receptacle side of the external power contactor. (One phase of the three-phase power channels is monitored.) The output of the static inverter is taken directly for measurement. Each of the measuring points provide inputs to the right and left EICAS computers. The values are then shown on the EICAS display.
      (3) The EICAS display shows the load supplied by the left, right, and APU generators; as well as the external power source. Each generator control unit (GCU) monitors the load of its associated generator. The external power load is monitored by the bus power control unit (BPCU). The GCUs and BPCU send a dc current proportional to the load each unit senses to the left and right EICAS computers. The values are then shown on the EICAS display. EICAS displays this load in per unit values. A 1.0 reading is the rated generator load of 90-kva. (A 1.5 reading indicates the generator is supplying 150 per cent rated load.) A 1.0 external power load equals 90-kva.
      (4) The hydraulic motor-driven generator frequency, and ac voltage are also displayed on EICAS maintenance page.

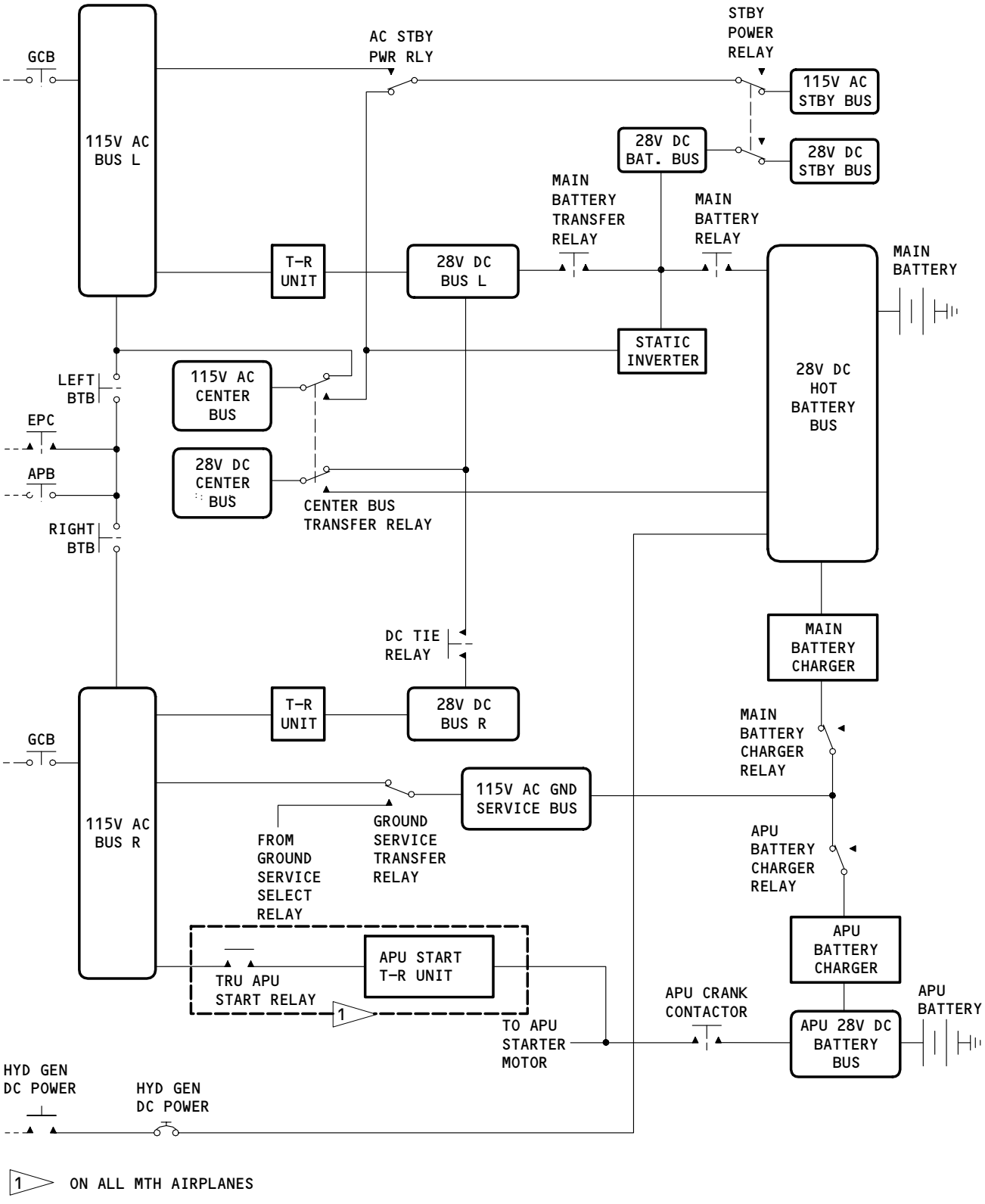


AC Meters Schematic
Figure 1

DC GENERATION - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The DC generation system consists of the following subsystems:
      (1) Primary DC system
      (2) Standby system
      (3) Battery and battery charger system
      (4) SAS 275-999;
          APU start TRU system.
   B. Primary DC System (Ref 24-32-00)
      (1) The primary DC system consists of two transformer-rectifier (T-R) units. The T-R units convert 115v ac power to 28v dc power for the DC buses.
   C. SAS 275-999;
      APU Start TRU (Ref 24-32-00)
      (1) The APU start TRU is the primary source of power for starting the APU. The TRU receives input power from the right main ac bus, and converts it to dc power for the APU starter motor. Main system components are the APU start TRU and the TRU APU start relay.
   D. Standby System (Ref 24-33-00)
      (1) The standby power system provides 28-volt dc and/or 115-volt, single-phase, 400-Hz ac power to critical flight loads in case of a loss of main dc and/or ac power. The system can supply these loads for 30 minutes. The system also serves as the third independent power source during category III autoland. Power is obtained from the main battery and its charger. The system operates automatically, with flight compartment switches provided for manual control.

   E. Battery and Battery Charger System (Ref 24-31-00)
      (1) The main battery/charger system provides 28-volt dc power for loads on the hot battery bus, supplies power to the APU controller during APU starting, and serves as the primary source for the standby power system.
      (2) The APU battery/charger system provides 28-volt dc power for APU starting and for the loads on the APU hot battery bus.



DC Generation Block Diagram
Figure 1

664478

DC GENERATION - ADJUSTMENT/TEST

1. General
   A. This adjustment/test procedure has two tasks, an operational test and a system test.

TASK 24-30-00-705-001

2. Operational Test - DC Generation System
   A. General
      (1) The operational test does a quick check of the DC generation system and uses only equipment found on the airplane. The operation test includes these procedures:
         (a) Main Battery Charger and Battery Current Monitor Test
         (b) DC Tie Control Unit and DC Tie Relay Test
         (c) APU Battery Charger Test
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (3) AMM 31-41-00/201, EICAS
   C. Access
      (1) Location Zone
          211/212 Flight Compartment

   D. Prepare for the Operational Test

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

      S 865-003

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

      (2) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 865-004
      (3) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

      S 865-006
      (4) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
         (a) 6A1, BAT BUS DISTR
         (b) 6A2, DC STBY
         (c) 6A4, BAT CUR MON PWR
         (d) 6A5, STBY PWR CONT

(e) 6A6, DC BUS TIE CONT
(f) 6C11, BAT BUS CONT
(g) 6C12, L DC VOLT SENSE
(h) 6C18, L TRU
(i) 6C24, R TRU
(j) 6D1, BAT OVHT PROT
(k) 6D2, BAT XFER CONT
(l) 6D8, SEC 2
(m) 6D9, SEC 1
(n) 6D10, TIE L
(o) 6D11, INV PWR TRU
(p) 6D12, BAT BUS PWR TRU
(q) 6G6, STBY BUS OFF LT/BAT VM
(r) 6G8, SEC 2
(s) 6G9, SEC 1
(t) 6G10, TIE R
(u) 6G11, R DC VOLT SENSE
(v) 6J9, MAIN BAT CHGR
(w) 6J10, HOT BAT BUS
(x) 6J11, BAT BUS PWR
(y) 6J12, INV PWR BAT
(z) 6J17, AC STBY BUS PWR
(aa) 6L16, INVERTER VOLT SENSE

S 865-007
(5) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11D1, STANDBY BUS AC
(b) 11D2, STANDBY BUS DC

S 865-008
(6) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) R GEN GND SVCE BUS

S 865-009
(7) Make sure this circuit breaker on the forward miscellaneous electrical equipment panel, P33, is closed:
(a) 33E2, BATTERY CHARGER MAIN
(b) 33E5, BATTERY CHARGER APU

S 865-010
(8) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

S 865-011
(9) Make sure these circuit breakers on the aft equipment center rack, E6, are closed:
(a) APU BAT OVHT PROT
(b) APU BAT DC VOLTS

(c) APU BAT CHGR
(d) APU BAT BUS

E. Perform the Operational Test

S 865-013
(1) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

S 215-015
(2) Do these steps on the standby power control panel on the pilots' overhead panel (referred to as the P5 panel):
(a) Turn the STBY POWER switch to the AUTO position.
(b) Make sure the ON light in the BAT switch is on.
(c) Make sure the DISCH light is off.
(d) Make sure the standby bus OFF light is off.

S 215-016
(3) Make sure these dc voltage values show on the bottom EICAS display:
(a) L 28 ±2
(b) R 28 ±2
(c) STBY/BAT 28 ±2
(d) APU/BAT 28 ±2

S 215-018
(4) Make sure these dc current values show as positive and not zero on the bottom EICAS display:
(a) L
(b) R

S 215-020
(5) Make sure these values show below SYBY/BAT on the bottom EICAS display. These are the static inverter output values.
(a) AC-V 115 ±5
(b) FREQ, 400 ±5

S 215-022
(6) Make sure these messages do not show on the top EICAS display:
(a) STANDBY BUS OFF
(b) BATTERY OFF
(c) MAIN BAT DISCH

S 865-024
(7) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

S 215-023
(8) Make sure these messages do not show on the bottom EICAS display:
(a) T-R UNIT
(b) STBY INVERTER
(c) MAIN BAT CHGR

S 715-027

(9) Main Battery Charger and Battery Current Monitor Test

(a) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.

(b) Make sure the BAT switch on the P5 panel is set to the ON position.

(c) Turn the STBY POWER switch on the P5 panel to the BAT position.

(d) Make sure the DISCH light on the P5 panel comes on.

(e) Make sure the EICAS message, MAIN BAT DISCH, shows on the top EICAS display.

NOTE: This message does not show for ten seconds.

(f) Make sure these values show below STBY/BAT on the bottom EICAS display:

DC-V	25±3
DC-A	greater than 4 amps discharge

NOTE: There is a minus sign in front of the number to show that it is a dischage current. Discharge current value can vary from 4 to 75 amps, depending on the configuration of the airplane and the condition of the battery.

(g) After one minute, turn STBY POWER switch on the P5 panel to the AUTO position.

(h) Make sure the DC-A value below STBY/BAT is 38 ±5 (BA06) or 45 ±10 (BA35) on the bottom EICAS display.

(i) Make sure the DC-V value below STBY/BAT increases to 33 ±4 and then decreases to 28 ±2 on the bottom EICAS display.

NOTE: It will usually take from one to five minutes for the voltage value to increase and then decrease. But a fully discharged battery will extend this time to 75 minutes.

(j) After the DC-V value below STBY/BAT decreases to 28 ±2, make sure the DC-A value below STBY/BAT is 0 ±5 on the bottom EICAS display.

(k) Make sure the DISCH light on the P5 panel is off.

(l) Make sure the EICAS message, MAIN BAT DISCH, does not show on the top display.

(m) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

(n) Make sure the EICAS message, MAIN BAT CHGR, does not show on the bottom display.

S 715-029

(10) DC Tie Control Unit and DC Tie Relay Test

(a) Make sure the two BUS TIE switches on the P5 panel are set to the AUTO position. The ISLN light in each switch should be off.

(b) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.

(c) Make sure these values are below L and R on the bottom EICAS display:

DC-V	28 +/-2
DC-A	greater than 5

(d) Open this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU

(e) Make sure these values are below R for approximately 11 seconds on the bottom EICAS display:

DC-V	0 ±1
DC-A	0

(f) After approximately 12 seconds, make sure these values are below R on the bottom EICAS display:

DC-V	28 ±2
DC-A	0

(g) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

(h) Make sure the EICAS message, T-R UNIT, shows on the bottom display.

(i) Close this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU

(j) Make sure the EICAS message, T-R UNIT, still shows on the bottom display.

(k) Push the right BUS TIE switch on the P5 panel to the ISLN position. Make sure the yellow ISLN light in the switch comes on.

(l) After three seconds (minimum), push the right BUS TIE switch on the P5 panel to the AUTO position. Make sure the yellow ISLN light in the switch goes off.

(m) Make sure the EICAS message, T-R UNIT, does not show on the bottom EICAS display.

(n) Push the ELEC HYD switch on the EICAS MAINT panel.
(o) Make sure these values are below L and R on the bottom EICAS display:

DC-V	28 ±2
DC-A	greater than 0

(p) Open this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU
(q) Make sure these values show below L on the bottom EICAS display for approximately 11 seconds:

DC-V	0 ±1
DC-A	0

(r) After approximately 12 seconds, make sure these values show below L on the bottom EICAS display:

DC-V	28 ±2
DC-A	0

(s) Push the ECS MSG switch on the EICAS MAINT panel.
(t) Make sure the EICAS message, T-R UNIT, shows on the bottom EICAS display.
(u) Close this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU
(v) Push the left BUS TIE switch on the P5 panel to the ISLN position. Make sure the yellow ISLN light in the switch comes on.
(w) After 3 seconds (minimum), push the left BUS TIE switch on the P5 panel to the AUTO position. Make sure the yellow ISLN light in the switch goes off.
(x) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.
(y) Push the ELEC HYD switch on the EICAS MAINT panel.
(z) Make sure these values show below L and R on the bottom EICAS display:

DC-V	28 ±2
DC-A	greater than 0

S 715-030

(11) APU Battery Charger Test

(a) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel, if necessary.

(b) Make sure the STBY POWER switch on the P5 panel is set to the AUTO position.

(c) Make sure the BAT switch on the P5 panel is set to the ON position.

(d) Turn the STBY POWER switch on the P5 panel to the BAT position for one minute.

(e) Make sure these values show below APU/BAT on the bottom EICAS display:

DC-V	26 ±3
DC-A	0

(f) Turn the STBY POWER switch on the P5 panel to the AUTO position.

(g) Make sure these steps occur below APU/BAT on the bottom EICAS display:

1) DC-A value increases quickly to 38 ±5 (BA06) or 45 ±10 (BA35).

2) DC-V value increases to 33 ±4 and then decreases to 28/±2.

NOTE: It will usually take less than one minute for the voltage value to increase and then decrease. But, a fully discharged battery can extend this time to 75 minutes.

3) After the DC-V value decreses to 28 ±2, make sure the DC-A value is 0 ±5 below APU/BAT.

S 215-031

(12) Turn the STBY POWER switch on the P5 panel to the OFF position and make sure these steps occur:

(a) The EICAS message, STANDBY BUS OFF, shows on the top display.

(b) The standby bus OFF light on the P5 panel comes on.

S 215-032

(13) Push the BAT switch on the P5 panel to the OFF position and make sure these steps occur:

(a) The yellow OFF light in the BAT switch comes on.

(b) The white ON light in the BAT switch goes off.

(c) The EICAS message, BATTERY OFF, shows on the top display.

S 215-033
(14) Push the BAT switch on the P5 panel to the ON position and make sure these steps occur:
(a) The yellow OFF light in the BAT switch goes off.
(b) The white ON light in the BAT switch comes on.
(c) The standby bus OFF light on the P5 panel comes on.
(d) The EICAS message, STANDBY BUS OFF, shows on the top display.
(e) The EICAS message, BATTERY OFF, does not show on the top display.

S 215-034
(15) Turn the STBY POWER switch to the AUTO position and make sure these steps occur:
(a) The standby bus OFF light on the P5 panel is off.
(b) The EICAS messages, STANDBY BUS OFF and BATTERY OFF and MAIN BAT DISCH, do not show on the top display:
(c) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
(d) The EICAS messages, T-R UNIT and STBY INVERTER and MAIN BAT CHGR, do not show on the bottom display.

S 865-035
(16) Open this circuit breaker on the main power distribution panel, P6:
(a) 6D11, INV PWR TRU

S 215-036
(17) Make sure the EICAS message, STBY INVERTER, shows on the bottom display.

S 865-038
(18) Close this circuit breaker on the main power distribution panel, P6:
(a) 6D11, INV PWR TRU

S 715-105
(19) Make sure the EICAS message, STBY INVERTER, still shows.

S 865-039
(20) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).

S 865-040
(21) Push the BAT switch on the P5 panel to the OFF position.

S 865-041
(22) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-042
(23) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-30-00-705-043

3. System Test - DC Generation System

A. General

(1) The system test does a detailed test of each transformer-rectifier unit (referred to as a TRU). The system test includes these procedures:

(a) Left TRU Load Test

(b) Right TRU Load Test

B. Equipment

(1) Option 1: Load Bank - 1000 watt with 500 watt tap (for 28 volta dc)

(2) Option 2: A24005-1 - DC Load Bank

C. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

(3) AMM 31-41-00/201, EICAS

D. Access

(1) Location Zones

119/120	Main Equipment Center
211/212	Flight Compartment

(2) Access Panel

119AL	Main Equipment Center Access

E. Prepare for the System Test

S 865-044

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

S 865-045

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(2) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-046

(3) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 865-048

(4) Make sure these circuit breakers on the main power distribution panel, P6, are closed:

(a) 6A1, BAT BUS DISTR

(b) 6A2, DC STBY

(c) 6A4, BAT CUR MON PWR
(d) 6A5, STBY PWR CONT
(e) 6A6, DC BUS TIE CONT
(f) 6B4, BUS PWR CONT UNIT
(g) 6C11, BAT BUS CONT
(h) 6C12, L DC VOLT SENSE
(i) 6C18, L TRU
(j) 6C24, R TRU
(k) 6D1, BAT OVHT PROT
(l) 6D2, BAT XFER CONT
(m) 6D8, SEC 2
(n) 6D9, SEC 1
(o) 6D10, TIE L
(p) 6D11, INV PWR TRU
(q) 6D12, BAT BUS PWR TRU
(r) 6G6, STBY BUS OFF LT/BAT VM
(s) 6G8, SEC 2
(t) 6G9, SEC 1
(u) 6G10, TIE R
(v) 6G11, R DC VOLT SENSE
(w) 6J9, MAIN BAT CHGR
(x) 6J10, HOT BAT BUS
(y) 6J11, BAT BUS PWR
(z) 6J12, INV PWR BAT
(aa) 6J17, AC STBY BUS PWR
(ab) 6L16, INVERTER VOLT SENSE

S 865-181

(5) Open these circuit breakers on the main power distribution panel (P6) and attach DO-NOT-CLOSE tags:
(a) 6K14, PITOT HEAT CAPT PH A
(b) 6K15, PITOT HEAT CAPT PH B
(c) 6K16, PITOT HEAT R AUX PH B
(d) 6K17, PITOT HEAT R AUX PH C
(e) 6K20, PITOT HEAT L AUX PH C
(f) 6K21, PITOT HEAT L AUX PH B
(g) 6K22, PITOT HEAT F/O PH B
(h) 6K23, PITOT HEAT F/O PH A
(i) 6K24, PITOT HEAT R AOA
(j) 6K25, PROBE HEAT R ENG
(k) 6L17, PROBE HEAT L AOA
(l) 6L18, PROBE HEAT L TAT
(m) 6L19, PROBE HEAT L ENG

S 865-049

(6) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11D1, STANDBY BUS AC
(b) 11D2, STANDBY BUS DC

S 865-050
(7) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) R GEN GND SVCE BUS

S 865-051
(8) Make sure these circuit breakers on the forward miscellaneous electrical equipment panel, P33, are closed:
(a) 33E2, BATTERY CHARGER MAIN
(b) 33E5, BATTERY CHARGER APU

S 865-052
(9) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

S 865-053
(10) Make sure these circuit breakers on the aft equipment center rack, E6, are closed:
(a) APU BAT OVHT PROT
(b) APU BAT DC VOLTS

S 865-182
(11) Make sure these circuit breakers on the APU auxiliary panel, P49, are closed:
(a) APU BAT CHGR
(b) APU BAT BUS

S 865-054
(12) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the AUTO position.

F. Perform the System Test

S 735-055
(1) Left TRU Load Test
(a) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C18, L TRU

CAUTION: MAKE SURE THESE CIRCUIT BREAKERS ARE OPENED BEFORE YOU CONNECT THE LOAD BANK, AND STAY OPEN DURING THE LOAD TEST. DAMAGE TO THE TRU CAN OCCUR IF ONE OF THESE CIRCUIT BREAKERS IS CLOSED DURING THE LOAD TEST.

(b) Open these circuit breakers on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6A6, DC BUS TIE CONT
2) 6C10, C BUS PWR
3) 6D8, SEC 2
4) 6D9, SEC 1

5) 6D10, TIE L
6) 6D11, INV PWR TRU
7) 6D12, BAT BUS PWR TRU

(c) Remove the terminal cover from the left TRU in the main equipment center.

(d) Connect a 500 watt load bank to the output terminals on the TRU.

NOTE: Do not disconnect the leads from the TRU because they are needed to measure the voltage levels on EICAS.

(e) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.

(f) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU

(g) Make sure these values show below L on the bottom EICAS display:
1) DC-V 28 ±2
2) DC-A 18 ±2

(h) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C18, L TRU

(i) Remove the 500 watt load bank from the terminals on the left TRU.

(j) Connect the 1000 watt load bank to the terminals on the left TRU.

(k) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU

(l) Make sure these values show below L on the bottom EICAS display:
1) DC-V 28 ±2
2) DC-A 38 ±5

(m) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C18, L TRU

(n) Remove the 1000 load bank from terminals on the left TRU.

(o) Install the terminal cover on the left TRU.

(p) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the main power distribution panel, P6:
1) 6A6, DC BUS TIE CONT
2) 6C10, C BUS PWR
3) 6C18, L TRU
4) 6D8, SEC 2
5) 6D9, SEC 1
6) 6D10, TIE L
7) 6D11, INV PWR TRU
8) 6D12, BAT BUS PWR TRU

S 735-056

(2) Right TRU Load Test

(a) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C24, R TRU

CAUTION: MAKE SURE THESE CIRCUIT BREAKERS ARE OPENED BEFORE YOU CONNECT THE LOAD BANK, AND STAY OPEN DURING THE LOAD TEST. DAMAGE TO THE TRU CAN OCCUR IF ONE OF THESE CIRCUIT BREAKERS IS CLOSED DURING THE LOAD TEST.

(b) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
1) 6A6, DC BUS TIE CONT
2) 6G8, SEC 2
3) 6G9, SEC 1
4) 6G10, TIE R

(c) Remove the terminal cover from the right TRU in the main equipment center.

(d) Connect the 500 watt load bank to the output terminals on the right TRU.

NOTE: Do not disconnect the leads from the TRU because they are needed to measure the voltage levels on EICAS.

(e) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.

(f) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU

(g) Make sure these values show below R on the bottom EICAS display:
1) DC-V 28 ±2
2) DC-A 18 ±2

(h) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C24, R TRU

(i) Remove the 500 watt load bank from the terminals on the right TRU.

(j) Connect the 1000 watt load bank to the terminals on the right TRU.

(k) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU

(l) Make sure these values show below R on the bottom EICAS display:
1) DC-V 28 ±2
2) DC-A 38 ±5

(m) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
1) 6C24, R TRU
(n) Remove the 1000 watt load bank fron the terminals on the right TRU.
(o) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
1) 6A6, DC BUS TIE CONT
2) 6C24, R TRU
3) 6G8, SEC 2
4) 6G9, SEC 1
5) 6G10, TIE R
6) 6K14, PITOT HEAT CAPT PH A
7) 6K15, PITOT HEAT CAPT PH B
8) 6K16, PITOT HEAT R AUX PH B
9) 6K17, PITOT HEAT R AUX PH C
10) 6K20, PITOT HEAT L AUX PH C
11) 6K21, PITOT HEAT L AUX PH B
12) 6K22, PITOT HEAT F/O PH B
13) 6K23, PITOT HEAT F/O PH A
14) 6K24, PITOT HEAT R AOA
15) 6K25, PROBE HEAT R ENG
16) 6L17, PROBE HEAT L AOA
17) 6L18, PROBE HEAT L TAT
18) 6L19, PROBE HEAT L ENG

S 865-106
(3) Restore Airplane to Normal
(a) Perform EICAS status/maintenance message erase procedure (AMM 31-41-00/201).
(b) Activate spoilers (AMM 27-61-00/201) if deactivated.
(c) Remove electrical power (AMM 24-22-00/201) if no longer required.

TASK 24-30-00-715-079

4. The Battery Charger Test and the Current Monitor Test

NOTE: This is a scheduled maintenance task.

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(3) AMM 31-41-00/201, EICAS
B. Access
(1) Location Zone
211/212 Flight Compartment

C. Prepare for the Battery Charger Test and the Current Monitor Test.

S 865-082
(1) Supply electrical power (AMM 24-22-00/201).

S 865-083

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(2) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-084

(3) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 865-086

(4) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
(a) 6A1, BAT BUS DISTR
(b) 6A2, DC STBY
(c) 6A4, BAT CUR MON PWR
(d) 6A5, STBY PWR CONT
(e) 6A6, DC BUS TIE CONT
(f) 6C11, BAT BUS CONT
(g) 6C12, L DC VOLT SENSE
(h) 6C18, L TRU
(i) 6C24, R TRU
(j) 6D1, BAT OVHT PROT
(k) 6D2, BAT XFER CONT
(l) 6D8, SEC 2
(m) 6D9, SEC 1
(n) 6D10, TIE L
(o) 6D11, INV PWR TRU
(p) 6D12, BAT BUS PWR TRU
(q) 6G6, STBY BUS OFF LT/BAT VM
(r) 6G8, SEC 2
(s) 6G9, SEC 1
(t) 6G10, TIE R
(u) 6G11, R DC VOLT SENSE
(v) 6J9, MAIN BAT CHGR
(w) 6J10, HOT BAT BUS
(x) 6J11, BAT BUS PWR
(y) 6J12, INV PWR BAT
(z) 6J17, AC STBY BUS PWR
(aa) 6L16, INVERTER VOLT SENSE

S 865-087
(5) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11D1, STANDBY BUS AC
(b) 11D2, STANDBY BUS DC

S 865-088
(6) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) R GEN GND SVCE BUS

S 865-089
(7) Make sure this circuit breaker on the forward miscellaneous electrical equipment panel, P33, is closed:
(a) 33E2, BATTERY CHARGER MAIN
(b) 33E5, BATTERY CHARGER APU

S 865-090
(8) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

S 865-091
(9) Make sure these circuit breakers on the aft equipment center rack, E6, are closed:
(a) APU BAT OVHT PROT
(b) APU BAT DC VOLTS
(c) APU BAT CHGR
(d) APU BAT BUS

S 715-092
(10) The Main Battery Charger Test and the Battery Current Monitor Test
(a) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.
(b) Make sure the BAT switch on the P5 panel is set to the ON position.
(c) Turn the STBY POWER switch on the P5 panel to the BAT position.
(d) Make sure the DISCH light on the P5 panel comes on.
(e) Make sure the EICAS message, MAIN BAT DISCH, shows on the top EICAS display.

NOTE: This message does not show for ten seconds.

(f) Make sure these values show below STBY/BAT on the bottom EICAS display:

DC-V	25±2

DC-A	greater than 4 amps discharge

NOTE: There is a minus sign in front of the number to show that it is a dischage current. Discharge current value can vary from 4 to 75 amps, depending on the configuration of the airplane and the condition of the battery.##

(g) After one minute, turn STBY POWER switch on the P5 panel to the AUTO position.
(h) Make sure the DC-A value below STBY/BAT is 38 ±5 (BA06) or 45 ±10 (BA35) on the bottom EICAS display.
(i) Make sure the DC-V value below STBY/BAT increases to 33 ±4 and then decreases to 28 ±2 on the bottom EICAS display.

NOTE: It will usually take from one to five minutes for the voltage value to increase and then decrease. But a fully discharged battery will extend this time to 75 minutes.

(j) After the DC-V value below STBY/BAT decreases to 28 ±2, make sure the DC-A value below STBY/BAT is 0 ±5 on the bottom EICAS display.
(k) Make sure the DISCH light on the P5 panel is off.
(l) Make sure the EICAS message, MAIN BAT DISCH, does not show on the top display.
(m) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
(n) Make sure the EICAS message, MAIN BAT CHGR, does not show on the bottom display.

S 715-094
(11) The APU Battery Charger Test
(a) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel, if necessary.
(b) Make sure the STBY POWER switch on the P5 panel is set to the AUTO position.
(c) Make sure the BAT switch on the P5 panel is set to the ON position.
(d) Turn the STBY POWER switch on the P5 panel to the BAT position for one minute.
(e) Make sure these values show below APU/BAT on the bottom EICAS display:

DC-V	26 ±3
DC-A	0

(f) Turn the STBY POWER switch on the P5 panel to the AUTO position.
(g) Make sure these steps occur below APU/BAT on the bottom EICAS display:
1) DC-A value increases quickly to 38 ±5 (BA06) or 45 ±10 (BA35).
2) DC-V value increases to 33 ±4 and then decreases to 28/±2.

NOTE: It will usually take less than one minute for the voltage value to increase and then decrease. But, a fully discharged battery can extend this time to 75 minutes.

3) After the DC-V value decreases to 28 ±2, make sure the DC-A value is 0 ±5 below APU/BAT.

S 045-107
(12) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-108
(13) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-30-00-715-080
5. The DC Tie Control Unit Test and the DC Tie Relay Test

NOTE: This is a scheduled maintenance task.

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(3) AMM 31-41-00/201, EICAS
B. Access
(1) Location Zone
211/212 Flight Compartment

C. Prepare for the DC Tie Control Unit Test and the DC Tie Relay Test

S 865-095
(1) Supply electrical power (AMM 24-22-00/201).

S 865-096

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(2) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-097
(3) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 865-099
(4) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
(a) 6A1, BAT BUS DISTR
(b) 6A2, DC STBY
(c) 6A4, BAT CUR MON PWR
(d) 6A5, STBY PWR CONT
(e) 6A6, DC BUS TIE CONT
(f) 6C11, BAT BUS CONT
(g) 6C12, L DC VOLT SENSE
(h) 6C18, L TRU
(i) 6C24, R TRU
(j) 6D1, BAT OVHT PROT
(k) 6D2, BAT XFER CONT
(l) 6D8, SEC 2
(m) 6D9, SEC 1
(n) 6D10, TIE L
(o) 6D11, INV PWR TRU
(p) 6D12, BAT BUS PWR TRU
(q) 6G6, STBY BUS OFF LT/BAT VM
(r) 6G8, SEC 2
(s) 6G9, SEC 1
(t) 6G10, TIE R
(u) 6G11, R DC VOLT SENSE
(v) 6J9, MAIN BAT CHGR
(w) 6J10, HOT BAT BUS
(x) 6J11, BAT BUS PWR
(y) 6J12, INV PWR BAT
(z) 6J17, AC STBY BUS PWR
(aa) 6L16, INVERTER VOLT SENSE

S 865-100
(5) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11D1, STANDBY BUS AC
(b) 11D2, STANDBY BUS DC

S 865-101
(6) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) R GEN GND SVCE BUS

S 865-102
(7) Make sure this circuit breaker on the forward miscellaneous electrical equipment panel, P33, is closed:
(a) 33E2, BATTERY CHARGER MAIN

(b) 33E5, BATTERY CHARGER APU

S 865-103

(8) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

S 715-104

(9) The DC Tie Control Unit Test and the DC Tie Relay Test
(a) Make sure the two BUS TIE switches on the P5 panel are set to the AUTO position. The ISLN light in each switch should be off.
(b) Make sure the bottom EICAS display is in the ELEC/HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel if necessary.
(c) Make sure these values are below L and R on the bottom EICAS display:

DC-V	28 ±2
DC-A	greater than 5

(d) Open this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU
(e) Make sure these values are below R for 11 +5 seconds on the bottom EICAS display:

DC-V	0 ±1
DC-A	0

(f) After 12 seconds, make sure these values are below R on the bottom EICAS display:

DC-V	28 ±2
DC-A	0

(g) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
(h) Make sure the EICAS message, T-R UNIT, shows on the bottom display.
(i) Close this circuit breaker on the main power distribution panel, P6:
1) 6C24, R TRU
(j) Make sure the EICAS message, T-R UNIT, still shows on the bottom display.
(k) Push the right BUS TIE switch on the P5 panel to the ISLN position. Make sure the yellow ISLN light in the switch comes on.

(l) After three seconds (minimum), push the right BUS TIE switch on the P5 panel to the AUTO position. Make sure the yellow ISLN light in the switch goes off.
(m) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.
(n) Push the ELEC HYD switch on the EICAS MAINT panel.
(o) Make sure these values are below L and R on the bottom EICAS display:

DC-V	28 ±2
DC-A	greater than 0

(p) Open this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU
(q) Make sure these values show below L on the bottom EICAS display for 11 +5 seconds:

DC-V	0 ±1
DC-A	0

(r) After 12 seconds, make sure these values show below L on the bottom EICAS display:

DC-V	28 ±2
DC-A	0

(s) Push the ECS MSG switch on the EICAS MAINT panel.
(t) Make sure the EICAS message, T-R UNIT, shows on the bottom EICAS display.
(u) Close this circuit breaker on the main power distribution panel, P6:
1) 6C18, L TRU
(v) Make sure the EICAS message, T-R UNIT, still shows on the bottom display.
(w) Push the left BUS TIE switch on the P5 panel to the ISLN position. Make sure the yellow ISLN light in the switch comes on.
(x) After 3 seconds (minimum), push the left BUS TIE switch on the P5 panel to the AUTO position. Make sure the yellow ISLN light in the switch goes off.
(y) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.
(z) Push the ELEC HYD switch on the EICAS MAINT panel.
(aa) Make sure these values show below L and R on the bottom EICAS display:

DC-V	28 ±2
DC-A	greater than 0

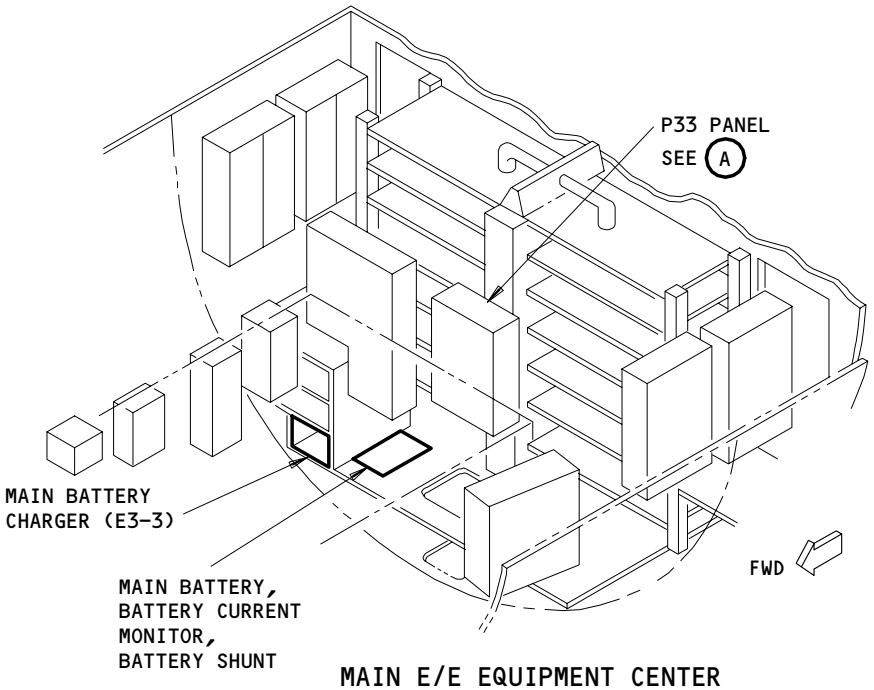
S 445-109
(10) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-110
(11) Remove electrical power if it is not necessary (AMM 24-22-00/201).

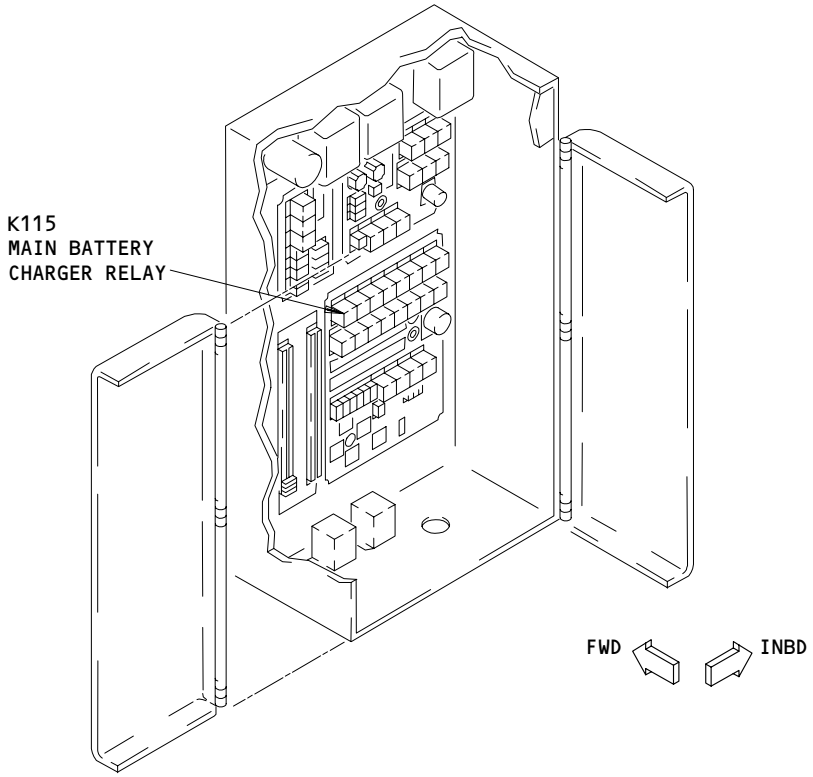
S 865-111
(12) Push the BAT switch on the P5 panel to the OFF position.

BATTERIES - DESCRIPTION AND OPERATION

1. General
   A. The battery system is composed of the main battery system and the APU battery system. System components include batteries, battery chargers, battery shunts, a battery current monitor, main battery charger relay, and APU battery charger relay.
2. Component Details (Fig. 1)
   A. Batteries
      (1) The main and APU batteries are identical. They are nominal 24-volt dc, 20 cell, nickel-cadmium units, rated at 40 amp-hours. Battery weight is 96 pounds. The main battery is located next to main equipment center rack E3. The APU battery is located in aft equipment center rack E6.
      (2) Each battery contains a thermistor which indicates battery temperature and provides an input to the charger to determine the voltage at which constant current charging will cease.
      (3) Each battery contains a thermal switch which closes at 155°F (68°C) to provide backup overtemperature protection.
   B. Battery Chargers
      (1) The main and APU battery chargers are identical. Each charger operates from 115-volt, 3 phase, 400 Hz power supplied from the ac ground service bus. Each charger can recharge a completely discharged battery in 75 minutes. The battery charger operates in three distinctive modes.
         (a) In the constant current charge mode, the charger provides a constant-current charge of 38 amps to the battery. Battery temperature, as measured by the thermistor inside the battery, and battery voltage are sensed by the charger. As charging progresses the battery voltage will rise. The charger counts the constant current charge time required to reach a temperature compensated voltage inflection point (approx. 31v dc at room temperature). When this point is reached, the charger continues the charge for an additional 12% of the base charge time.
         (b) The charger will switch to the constant-potential charge mode upon completion of the constant current base charge and 12% overcharge. The charger acts as a voltage regulated power supply at approximately 28 volts dc with a current limit level of 38 amps. In this mode the charger will supply the hot battery bus loads thus preventing slow depletion of the battery and the corresponding requirement to recharge the battery.
         (c) In the constant-potential T-R mode the charger acts as a voltage regulated power supply at approximately 28 volts dc with a current limit level of 64 amps.



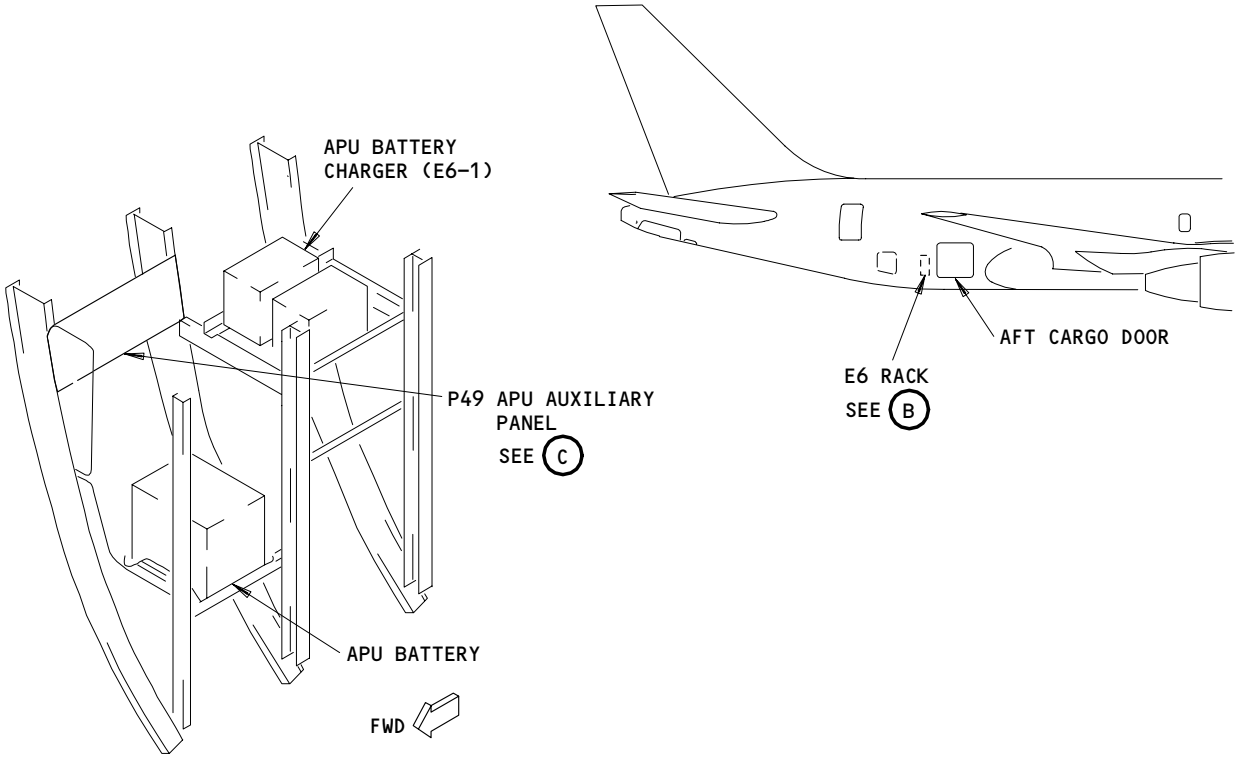
MAIN E/E EQUIPMENT CENTER



P33 – FORWARD MISC. ELECTRICAL EQUIPMENT PANEL

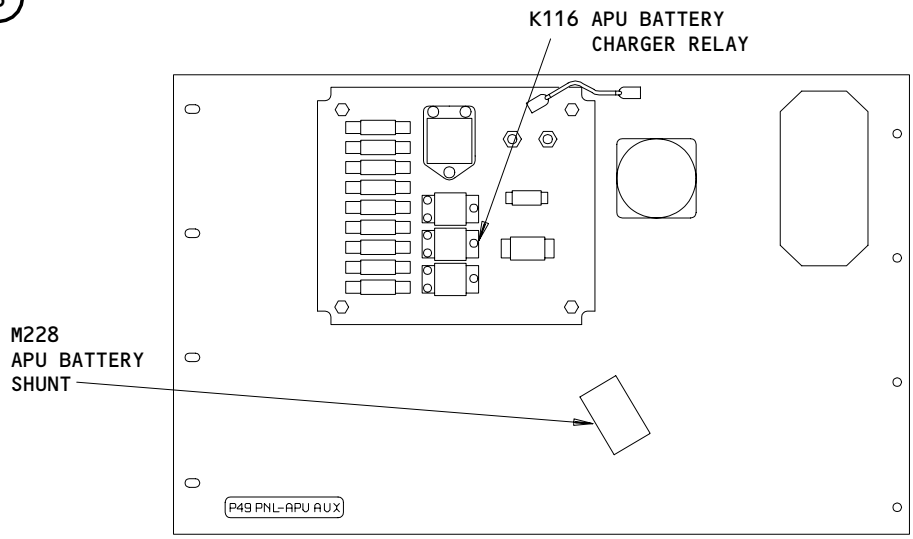
(A)

Battery Component Location
Figure 1 (Sheet 1)



E6 - AFT EQUIPMENT CENTER RACK

B



P49 - APU AUXILIARY PANEL

C

Batteries Component Location
Figure 1 (Sheet 2)

(2) Battery charger shutdown occurs under any of the following circumstances:
  (a) Sensed battery voltage below 4.0v dc.
  (b) When the battery interlock circuit closes. This occurs when the battery temperature is 155 degrees F (68 degrees C) or above.
  (c) Input voltage over 134 volts ac or under 94 volts ac.
  (d) When the battery thermistor reads a temperature greater than 145° F (63° C).
  (e) Loss of input power.

(3) The following circumstances will command the battery charger to initiate a new constant current charge cycle:
  (a) Input power is applied (or reapplied after an interruption of 0.5 second).
  (b) Sensed battery voltage below 23 volts.
  (c) The charger has operated more than 0.5 second in the T-R mode and is switched to the charge mode.

(4) A charger failure signal is present if any of the following conditions exist:
  (a) Battery interlock circuit open (sense connector disconnected).
  (b) Battery temperature greater than 155°F.
  (c) Loss of input power.

(5) AIRPLANES WITH CHARGER AND BATTERY LED's ON THE BATTERY CHARGER; There are two LED's (CHARGER and BATTERY) on the front panel of the battery charger. Both LED's are on when the battery and charger are in normal operation. If the battery is not in normal operation, then the BATTERY LED will be off. If the charger is not in normal operation, then the CHARGER LED will be off. If both LED's are off, then there is no 115 VAC input power to the charger.

(6) The main battery charger is located in E3 rack, and the APU battery charger is in E6 rack.

C. Battery Shunts

(1) Battery shunts provide for battery current measurement. The measurement is sent to the EICAS computers. The APU battery shunt is installed in the ground lead of the APU battery charger, and is located in APU auxiliary panel P49. The main battery shunt is installed in the ground lead of the main battery, and is located adjacent to the main battery in the main equipment center.

D. Battery Current Monitor

(1) The battery current monitor is installed around the ground lead of the main battery. The monitor magnetically senses the magnitude and direction of battery current. The monitor is located next to the battery.

(2) If battery discharge current is more than the monitor's threshold current, the current monitor provides a ground to the DISCH light on the standby power control panel, causing the light to come on. The current monitor also supplies a ground to EICAS causing the MAIN BAT DISCH advisory message to be shown on the upper display.

(3) The threshold current is 4 amps for current monitor which has part number 1566-1-1. For current monitor which has part number 1566-1-2, the threshold current is 6 amps.

E. Main Battery Charger Relay

(1) The main battery charger relay (MBCR) energizes to remove ac ground service bus power from the main battery charger input whenever the STBY POWER switch is in the BAT position or the battery thermal switch is closed (battery temperature above 155°F). The MBCR is located in forward miscellaneous electrical equipment panel P33.

F. APU Battery Charger Relay

(1) The APU battery charger relay (ABCR) provides ac power from the ground service bus to the APU battery charger inputs whenever the STBY POWER switch is not in the BAT position, the APU battery thermal switch is open (battery temperature below 155°F), or APU starting is not being attempted (APU start relay de-energized). The ABCR is located in APU auxiliary panel P49.

3. Operation

A. Functional Description

(1) Main Battery System (Fig. 2)

(a) Under normal operating conditions with ac power on, the BAT switch ON, and the STBY POWER switch in AUTO, the battery and charger are connected to and supply the loads of the hot battery bus. The remaining standby buses are supplied from the normal left ac and dc sources.

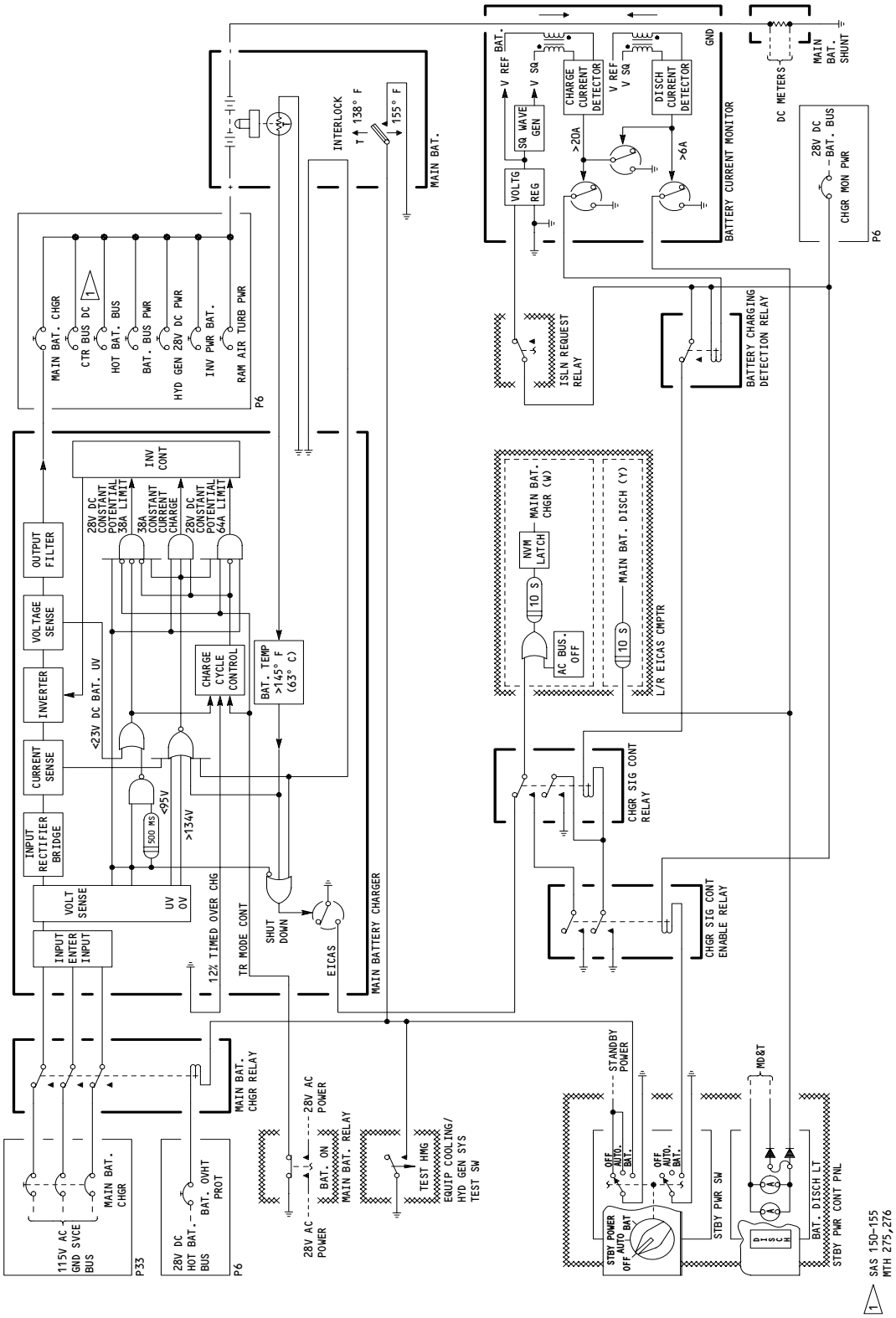
(b) Upon loss of left primary power, the battery supplies the standby buses through the main battery relay. The battery charger if energized, will operate in the T-R mode.

(c) Turning the STBY POWER switch to BAT position, simulates loss of primary power and forces transfer of the standby load to the battery. The charger under this condition is de-energized via the battery charger relay.

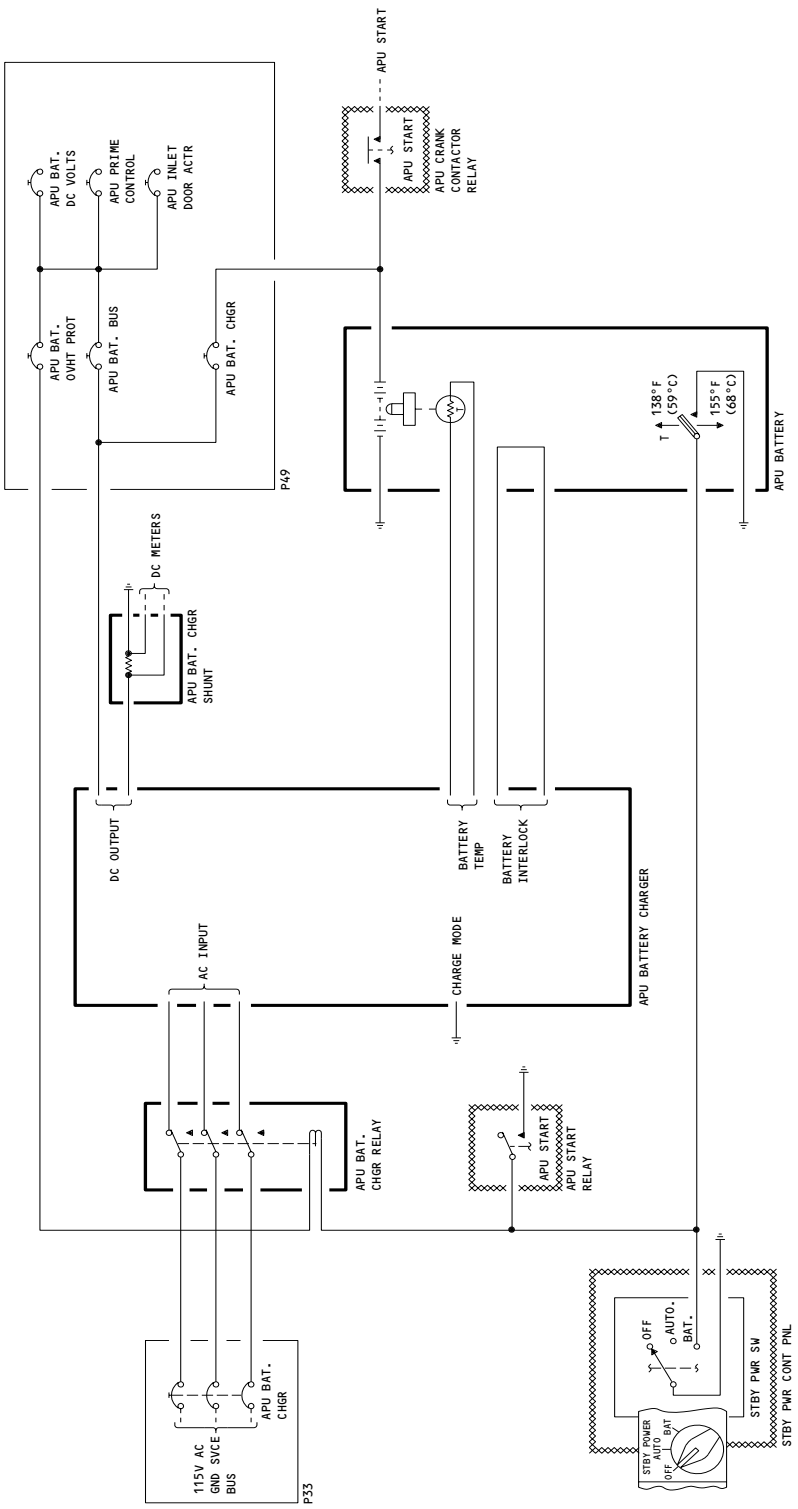
(d) A thermal switch inside the battery closes at 155°F (68°C) to energize the MBCR, disconnecting charger input power. The switch opens when temperature drops below 138°F (58°C).

(e) Returning the STBY POWER switch to the AUTO position, enables transfer of the standby loads back to the main dc bus and reestablishes ac input to the charger. Failure of the charger to initiate a constant-current charge cycle upon reapplication of power is detected by the battery charging detection, charger signal control and charger signal control enable relays, and the battery current monitor. Failure to initiate a charge cycle will be annunicated on EICAS as a MAIN BAT CHGR status/maintenance message.

(2) APU Battery System (Fig. 3)



Main Battery Schematic
Figure 2



APU Battery Schematic
Figure 3

(a) Under normal conditions with ac power on, the APU battery and charger are connected to and supply the loads of the APU battery bus.
(b) The APU battery charger relay is energized and removes APU battery charger input power if the STBY POWER switch is in the BAT position, if an APU start is attempted (APU start relay is energized), or if APU battery temperature exceeds 155°F (68°C).
(c) A temperature switch in the battery closes at 155°F (68°C), energizing the ABCR, removing charger input power. The switch reopens when battery temperature drops below 138°F (58°C).
(d) APU battery charger current is monitored by the APU battery shunt and is displayed on the EICAS maintenance page.

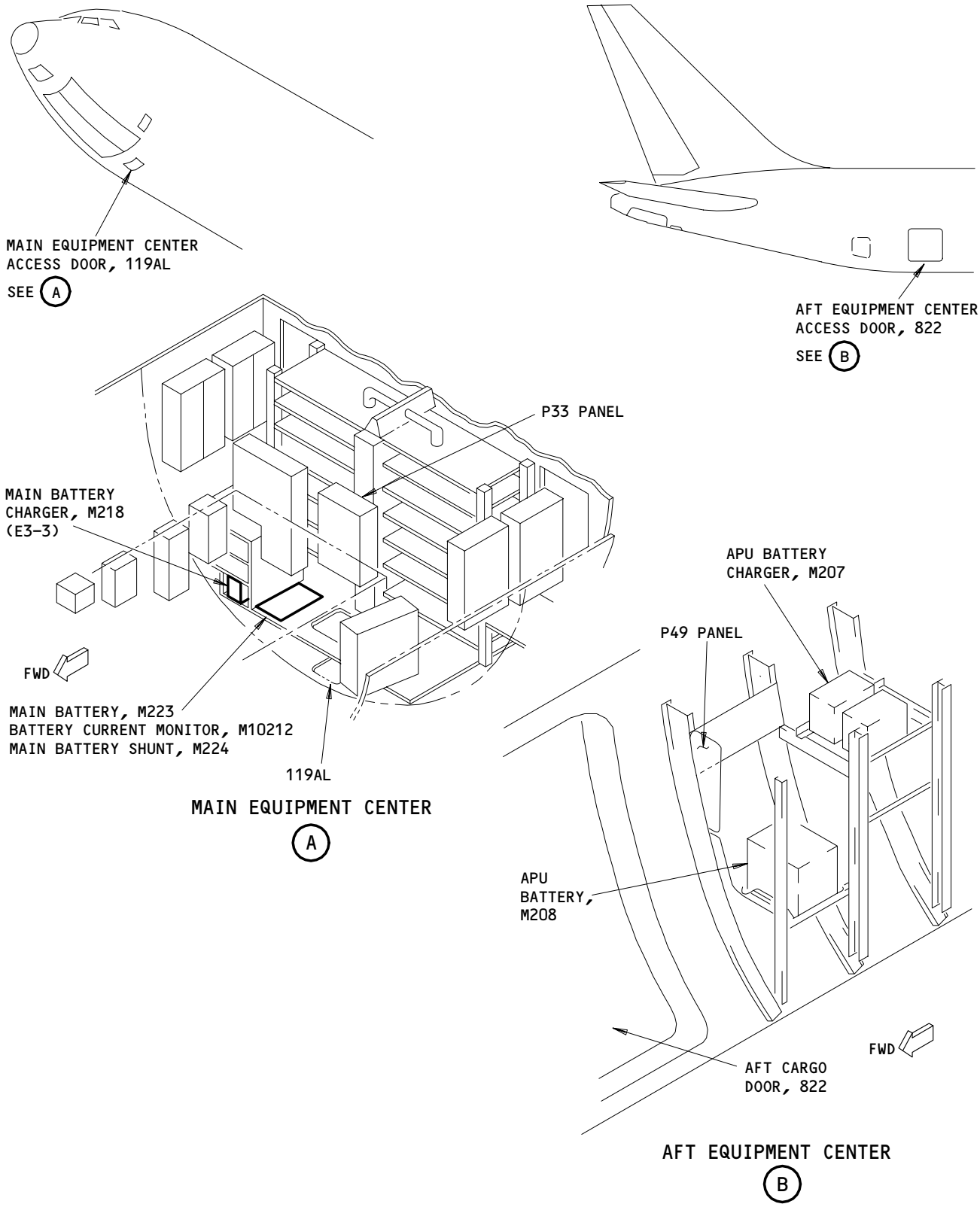
BATTERIES

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
BATTERY - APU, M208	--	1	822, AFT CARGO COMPT, E6-1	24-31-04
BATTERY - MAIN, M223	--	1	119AL, MAIN EQUIP CTR, E3-2	24-31-01
CHARGER - APU BATTERY, M207	--	1	822, AFT CARGO COMPT, E6-1	24-31-05
CHARGER - MAIN BATTERY, M218	--	1	119AL, MAIN EQUIP CTR, E3-2	24-31-02
CIRCUIT BREAKERS	--		FLT COMPT, P6	
BAT BUS PWR, C898	--	1	6J11	*
BAT CUR MON PWR, C4097	--	1	6A4	
BAT OVHT PROT, C827		1	6D1	*
CENTER BUS DC, C899 1	--	1	6J13	*
HOT BAT BUS, C897	--	1	6J10	*
HYD GEN 28V DC PWR, C830	--	1	6G12	
INV PWR BAT, C813	--	1	6J12	*
MAIN BAT CHGR, C896		1	6J9	*
RAM AIR TURBINE PWR, C1088	--	1	6J8	*
CIRCUIT BREAKERS	--		822, AFT CARGO COMPT, P49	
APU BAT BUS, C869		1	822, AFT CARGO COMPT, P49	*
APU BAT CHGR, C868		1	822, AFT CARGO COMPT, P49	*
APU BAT DC VOLTS, C821	--	1	822, AFT CARGO COMPT, P49	*
APU BAT OVHT PROT, C820		1	822, AFT CARGO COMPT, P49	*
APU INLET DOOR ACT, C1385	--	1	822, AFT CARGO COMPT, P49	
APU PRIME CONT, C1383	--	1	822, AFT CARGO COMPT, P49	
CIRCUIT BREAKERS	--		119AL, MAIN EQUIP CTR, P33	
BATTERY CHARGER APU, C302		1	33E5	*
BATTERY CHARGER MAIN, C301		1	33E2	*
COMPUTER - (REF 31-41-00, FIG. 101)				
LEFT, RIGHT EICAS, M10181,M10182				
CONTACTOR - (REF 49-41-00, FIG. 101)				
APU CRANK, K117				
MONITOR - BATTERY CURRENT, M10212	--	1	119AL, MAIN EQUIP CTR, E3-2	24-31-03
PANEL - (REF 24-33-00, FIG. 101)				
STANDBY POWER CONTROL, M10062				
RELAY - (REF 31-01-06, FIG. 101)				
BAT CHGING DET, K694				
CHGR SIG CONTROL, K695				
CHGR SIG CONT ENABLE, K696				
MAIN BAT, K104				
RELAY - (REF 31-01-33, FIG. 101)				
MAIN BATTERY CHARGER, K115				
RELAY - (REF 31-01-49, FIG. 101)				
APU BATTERY CHARGER, K116				
APU START, K197				
SHUNT - (REF 31-01-49, FIG. 101)				
APU BATTERY CHARGER, M228				
SHUNT - MAIN BATTERY, M224	--	1	119AL, MAIN EQUIP CTR, E3-2	*

* SEE THE WDM EQUIPMENT LIST

1 SAS 150-155
MTH 275,276

Batteries - Component Index
Figure 101



Batteries - Component Location
Figure 102

MAIN BATTERY - REMOVAL/INSTALLATION

1. General
   A. The main battery, M223, is on the floor of the main equipment center adjacent to the E3 equipment rack.

TASK 24-31-01-004-001

2. Remove the Main Battery
   A. Equipment
      (1) Fishpole hoist, to lift 96-pound battery, commercially available
      (2) A24001-1, Hoist Equipment - LRU's Main EE Bay
   B. Access
      (1) Location Zone
          119/120 Main Equipment Center

      (2) Access Panel
          119AL Main Equipment Center Access

   C. Prepare for Removal (Fig. 401)

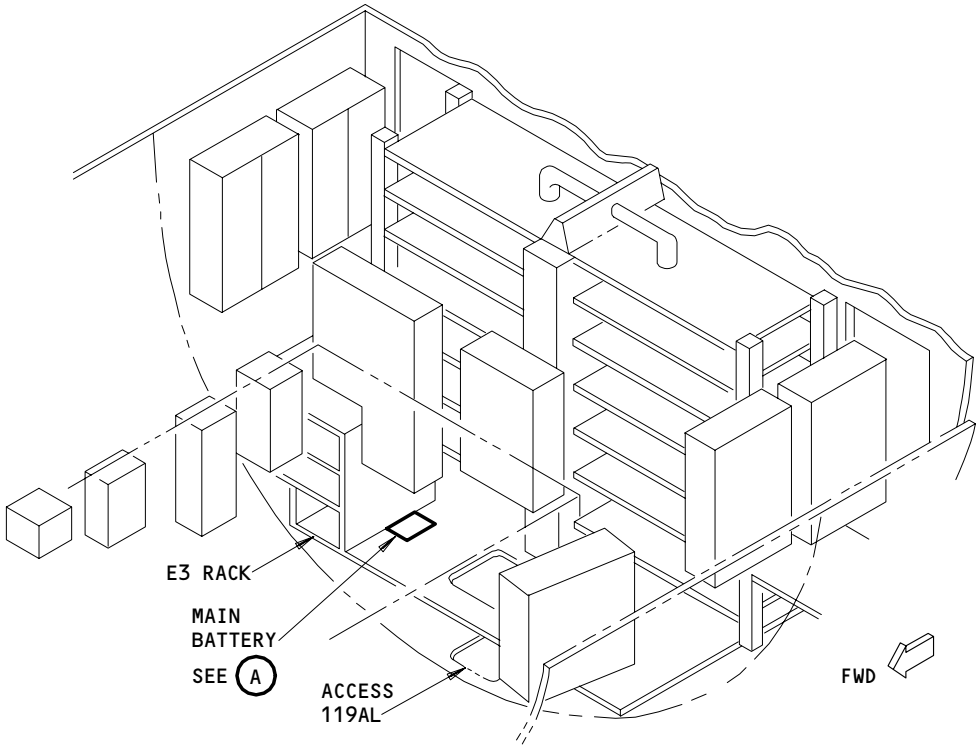
      S 864-002
      (1) Push the BAT switch to the OFF position at the standby power control panel on the pilots' overhead panel (referred to as the P5 panel).

      S 864-004
      (2) Open this circuit breaker on the forward miscellaneous electrical equipment panel (referred to as the P33 panel) and attach a DO-NOT-CLOSE tag:
          (a) 33E2, BATTERY CHARGER MAIN
   D. Remove the Main Battery

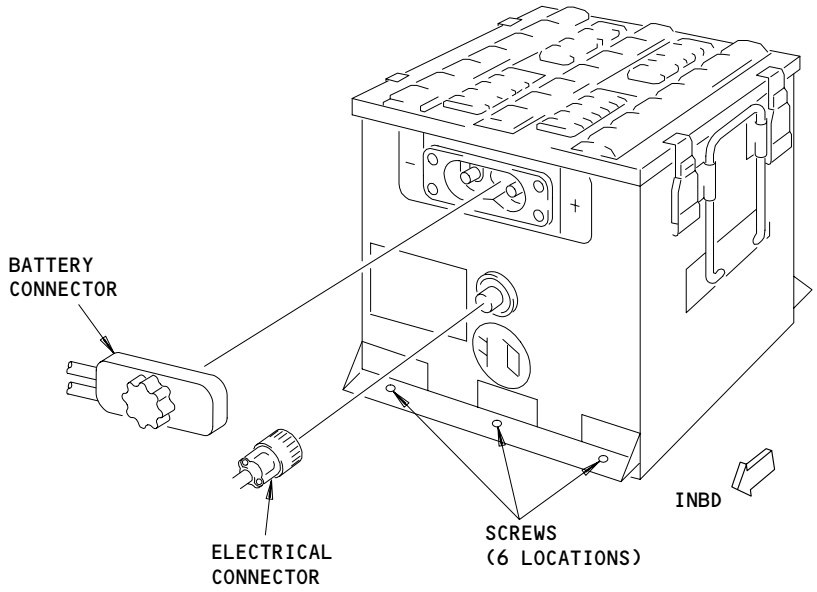
      S 024-005
      (1) Do these steps to remove the main battery:

          CAUTION: THE MAIN BATTERY MAY BE REMOVED WHILE THE AIRPLANE IS SUPPLIED WITH EXTERNAL POWER. DO NOT REMOVE THE MAIN BATTERY IF THE AIRPLANE IS SUPPLIED WITH APU OR IDG POWER. THE APU OR IDG WILL SHUTDOWN WHEN THE BATTERY IS REMOVED.

          (a) Remove the battery connector from the main battery.



MAIN EQUIP CTR



MAIN BATTERY

A

Main Battery Installation
Figure 401

(b) Remove the lockwire from the battery connector and the electrical connector (AMM 20-10-23/401).
(c) Remove the electrical connector from the main battery.
(d) Remove the six screws that hold the main battery.

WARNING: STAY AWAY FROM THE AREA BELOW THE MAIN BATTERY WHEN THE BATTERY IS HUNG FROM THE HOIST. DO NOT MOVE THE MAIN BATTERY ABOVE PERSONS DURING REMOVAL. THE BATTERY WEIGHS 96 POUNDS AND FAILURE OF THE HOIST COULD INJURE PERSONS.

(e) Use the fishpole hoist and spreader bar to remove the main battery.

TASK 24-31-01-404-006

3. Install Main Battery (Fig. 401)

A. Equipment
(1) Fishpole hoist to lift 96-pound battery, commercially available
(2) Bonding meter - Model T-477W,
Avtron Manufacturing, Inc.,
Cleveland, Ohio
(3) A24001-1, Hoist Equipment - LRU's Main EE Bay

B. References
(1) SWPM 20-20-00, Standard Wiring Practice Manual D6-544446
(2) AMM 24-22-00/201, Electrical Power - Control

C. Access
(1) Location Zones
119/120 Main Equipmnet Center
211/212 Flight Compartment

(2) Access Panel
119AL Main Equipment Center Access

D. Install the Main Battery

S 424-007
(1) Do these steps to install the main battery:

WARNING: STAY AWAY FROM THE AREA BELOW THE MAIN BATTERY WHEN THE BATTERY IS HUNG FROM THE HOIST. DO NOT MOVE THE MAIN BATTERY ABOVE PERSONS DURING INSTALLATION. THE BATTERY WEIGHS 96 POUNDS AND FAILURE OF THE HOIST COULD INJURE PERSONS.

(a) Use the fishpole hoist and spreader bar to set the main battery in the main equipment center.

(b) Install the six screws that hold the main battery.
(c) Connect the electrical connector to the main battery.
(d) Install the lockwire to the electrical connector (AMM 20-10-23/401).

CAUTION: DO NOT PULL ON THE BATTERY GROUND WIRE. LOOSE FASTENERS ON THE SHUNT STUDS CAN CREATE AN OPEN CIRCUIT OR HIGH RESISTANCE IN THE MAIN BATTERY GROUND STUD CONNECTION WHICH CAN CAUSE AIRPLANE SYSTEMS MALFUNCTION.

(e) Connect the battery connector to the main battery.
(f) Install the lockwire from the connector knob to one of the connector bolts (AMM 20-10-23/401).

NOTE: NASM20995CY20 or MS20995CY20 lockwire can be used.

S 864-008
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P33 panel:
(a) 33E2, BATTERY CHARGER MAIN

S 864-014
(3) Set the airplane clocks to the correct time and date (AMM 31-25-00/501).

E. Do these steps to check the main battery shunt:

S 964-018
(1) If there is a crack in the battery shunt body, a thread damage to the terminal posts, or a corrosion on the terminal posts, do these steps to replace the battery shunt:
(a) Replace the battery shunt.
(b) Make sure each jamnut is torqued to 35 ±5 pound-inch (SWPM 20-30-00).
(c) Make sure the main battery ground stud nut is torqued between 65-70 pound-inch (SWPM 20-20-00).
(d) Make sure the bonding resistance between the main battery ground stud and airplane structure is not more than 0.001 ohm (SWPM 20-20-00), D6-54446.

S 164-019
(2) Clean the area next to the battery shunt and the ground stud nut. Make sure the area is free of dust and dirt.

F. Do a test of the main battery installation.

S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 864-011
(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-012

(3) Do a test of the main battery, as follows:

(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(b) Make sure this value shows below STBY/BAT on the lower EICAS display:

DC-V	28 ±4

S 864-013

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

MAIN BATTERY CHARGER - REMOVAL/INSTALLATION

1. General
   A. The main battery charger, M218, is on shelf 3 of the main equipment center rack E3.

TASK 24-31-02-004-001

2. Main Battery Charger Removal
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Sensitive Devices
   B. Access
      (1) Location Zones
          119/120 Main equipment center

      (2) Access Panels
          119AL Main equipment center access

   C. Removal

      S 864-018

      CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE MAIN BATTERY CHARGER.

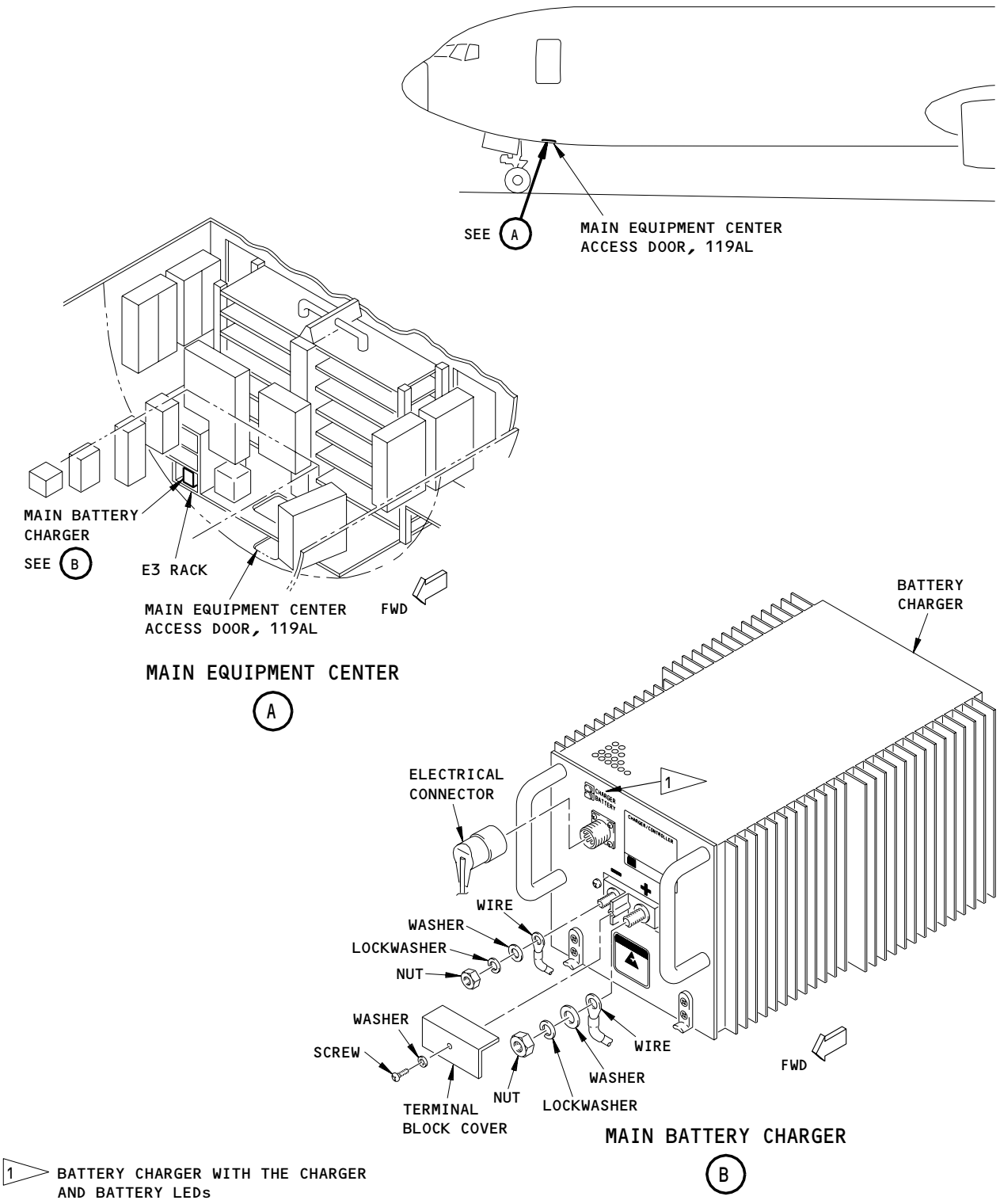
      (1) Open this circuit breaker on the P33 forward miscellaneous electrical equipment panel and attach a DO-NOT-CLOSE tag:
          (a) 33E2, BATTERY CHARGER MAIN

      S 864-020
      (2) Open this circuit breaker on the P6 main power distribution panel and attach a DO-NOT-CLOSE tag:
          (a) 6J9, MAIN BAT CHGR

      S 024-004
      (3) Do these steps to remove the main battery charger:

          CAUTION: DO NOT TOUCH THE MAIN BATTERY CHARGER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE MAIN BATTERY CHARGER.

          (a) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).
          (b) Remove the electrical connector from the main battery charger.
          (c) Remove the cover from the terminal block on the main battery charger.
          (d) Identify the wires on the terminal block for installation.



Main Battery Charger Installation
Figure 401

(e) Remove the wires from the terminal block.
(f) Remove the main battery charger (AMM 20-10-01/401).

TASK 24-31-02-404-007

3. Main Battery Charger Installation

A. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
(3) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
119/120 Main equipment center
211/212 Flight compartment

(2) Access Panels
119AL Main equipment center access

C. Installation

S 914-008

CAUTION: DO NOT TOUCH THE MAIN BATTERY CHARGER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE MAIN BATTERY CHARGER.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-009
(2) Install the main battery charger (AMM 20-10-01/401).

S 434-009
(3) Do these steps to connect the main battery charger:
(a) Install the wire, washer, lockwasher and nut on the positive terminal of the battery charger.
(b) Tighten the nut on the positive terminal of the battery charger to 170-190 inch-pounds (19.2-21.5 Newton meters).

(c) Install the wire, washer, lockwasher and nut on the negative terminal of the battery charger.
(d) Tighten the nut on the negative terminal of the battery charger to 135-145 inch-pounds (15.3-16.4 Newton meters).
(e) Install the terminal cover on the battery charger.
(f) Connect the electrical connector to the main battery charger.

S 864-019

CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE MAIN BATTERY CHARGER.

(4) Remove the DO-NOT-CLOSE tag and close this P6 panel circuit breaker:
(a) 6J9, MAIN BAT CHGR

S 864-010
(5) Remove the DO-NOT-CLOSE tag and close this P33 panel circuit breaker:
(a) 33E2, BATTERY CHARGER MAIN

D. Do a test of the main battery charger:

S 864-012
(1) Supply electrical power (AMM 24-22-00/201).

S 714-014
(2) Do a test of the main battery charger, as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(b) Push the BAT switch on the P5 panel to the ON position.
(c) Turn the STBY POWER switch on the P5 panel to the BAT position for one minute.
(d) Turn the STBY POWER switch to the AUTO position and make sure these values are below STBY/BAT on the bottom EICAS display:

DC-A	If Battery BA35: 45±10 If Battery BA06-01: 38±5
DC-V	increases to 33 ±4 then decreases to 28 ±2

NOTE: The main battery is in a charge cycle. A charge cycle of one to five minutes is usual, but a fully discharged battery could extend this time to 75 minutes.

(e) Push the BAT switch on the P5 panel to the OFF position.

S 864-016
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

BATTERY CURRENT MONITOR - REMOVAL/INSTALLATION

1. General
   A. The battery current monitor, M10212, is on the floor of the main equipment center adjacent to the main battery.

TASK 24-31-03-004-001

2. Remove the Battery Current Monitor (Fig 401)
   A. Access
      (1) Location Zone
          119/120 Main equipment center

      (2) Access Panels
          119BL Main equipment center access

   B. Prepare for Removal

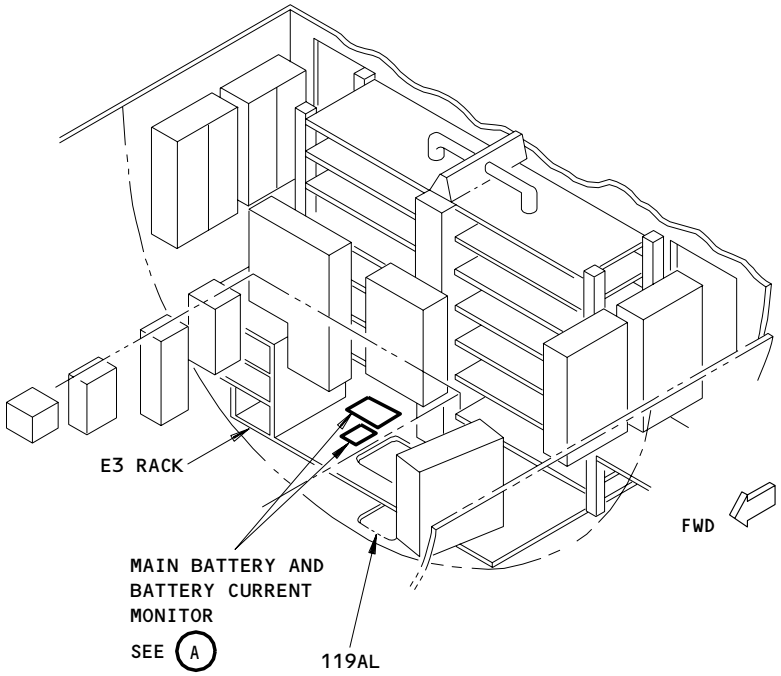
S 864-002

CAUTION: OPEN THE CIRCUIT BREAKER ON THE P33 PANEL BEFORE YOU OPEN THE CIRCUIT BREAKERS ON THE P6 PANEL. DAMAGE TO THE MAIN BATTERY CHARGER CAN OCCUR IF THE CIRCUIT BREAKER ON THE P33 PANEL IS NOT OPENED FIRST.

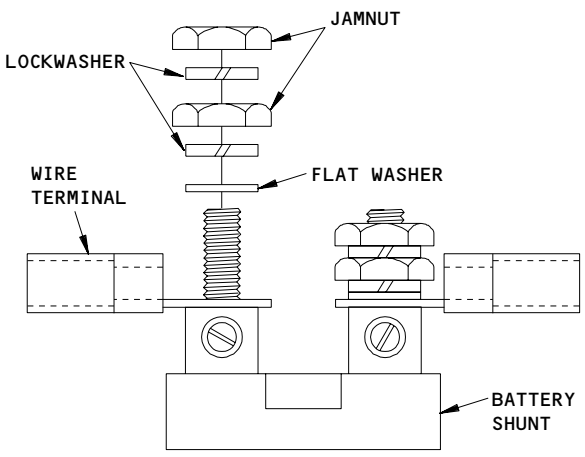
(1) Open this circuit breaker on the forward miscellaneous electrical equipment panel (referred to as the P33 panel) and attach a DO-NOT-CLOSE tag:
(a) 33E2, BATTERY CHARGER MAIN

S 864-003
(2) Open these circuit breakers on the main power distribution panel (referred to as the P6 panel) and attach DO-NOT-CLOSE tags:
(a) 6A4, BAT CUR MON PWR
(b) 6J9, MAIN BAT CHGR

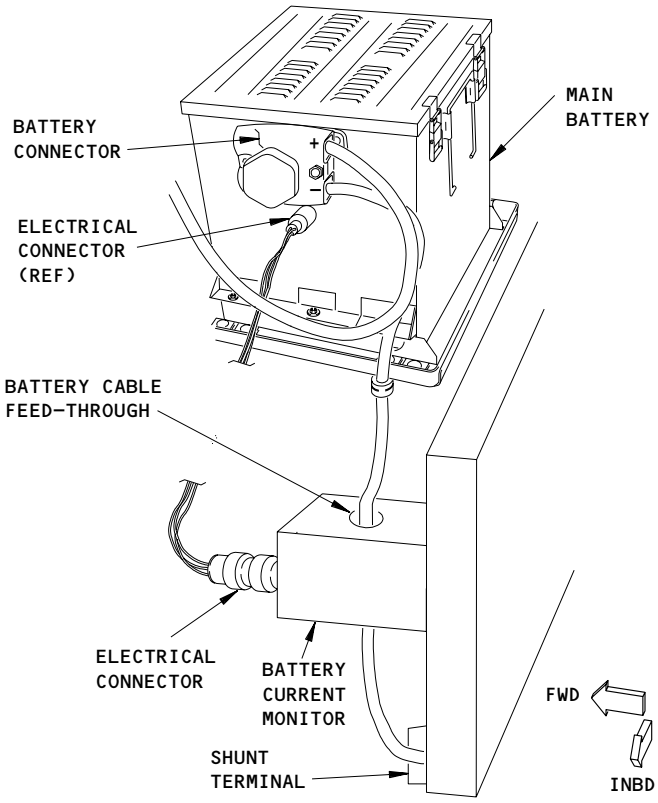
S 024-004
(3) Do these steps to remove the battery current monitor:
(a) Remove the battery connector, D366, from the main battery.



MAIN EQUIPMENT CENTER



BATTERY SHUNT BUILDUP



MAIN BATTERY AND BATTERY CURRENT MONITOR
A

Battery Current Monitor Installation
Figure 401

(b) Remove the battery ground lead from the main battery shunt.
(c) Move the ground lead through the battery current monitor.
(d) Remove the electrical connector from the battery current monitor.
(e) Remove the four screws and washers that hold the battery current monitor.
(f) Remove the batery current monitor.

TASK 24-31-03-404-005

3. Install Battery Current Monitor (Fig 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
119/120 Main equipment center
211/212 Flight compartment

(2) Access
119BL Main equipment center access

C. Install the Battery Current Monitor

S 424-006
(1) Do these steps to install the battery current monitor:
(a) Move the ground lead through the battery current monitor. Make sure the BAT end of the monitor is to the main battery.
(b) Put the battery current monitor in position and install the four screws and washers that hold the monitor.
(c) Connect the electrical connector to the battery current monitor.
(d) Make sure there is no thread damage on the battery shunt terminals. If the thread is damage, replace the battery shunt.
(e) Make sure there is no crack in the battery shunt body. If there is a crack, replace the battery shunt.
(f) Connect the battery ground lead to the main battery shunt and tighten the nuts on the battery shunt to 35 +/-5 inch-pounds.
(g) Connect the battery connector to the main battery.

S 864-007

CAUTION: CLOSE THE CIRCUIT BREAKERS ON THE P6 PANEL BEFORE YOU CLOSE THE CIRCUIT BREAKER ON THE P33 PANEL. DAMAGE TO THE MAIN BATTERY CHARGER CAN OCCUR IF THE CIRCUIT BREAKERS ON THE P6 PANEL ARE NOT CLOSED FIRST.

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6A4, BAT CUR MON PWR
(b) 6J9, MAIN BAT CHGR

S 864-008
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P33 panel:
(a) 33E2, BATTERY CHARGER MAIN

S 864-014
(4) Set the airplane clocks to the correct time and date (AMM 31-25-00/501)

D. Do a test of the battery current monitor.

S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 864-010
(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11A33, IND LIHGTS 1
(b) 11P3, INSTRUMENT & PANEL OVHD

S 714-011
(3) Do a test of the battery current monitor, as follows:
(a) Do these steps at the standby power control panel on the pilots overhead panel P5:
1) Push the BAT switch to the ON position. Make sure the white ON light in the switch comes on.
2) Turn the STBY POWER switch to the BAT position.

3) Make sure the DISCH light comes on.
4) Turn the STBY POWER switch to the AUTO position.
5) Make sure the DISCH light goes off.
6) Push the BAT switch to the OFF position. Make sure the yellow OFF light in the switch comes on.

S 864-012

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

APU BATTERY - REMOVAL/INSTALLATION

1. General
   A. The APU battery, M208, is in the E6 equipment rack of the aft equipment center.

TASK 24-31-04-004-001

2. Remove the APU Battery
   A. Equipment
      (1) PASSENGER AIRPLANES;
      A24006-1, APU Battery Hoist (preferred)

      Fishpole Hoist used with the A24006-1 battery hoist to lift 96 lb. battery

      PF-51 Hoist, Fishpole
      P.F. Industries
      9320 15th Ave. So. Seattle, WA 98108
      (Alternative)

      Minilift Hoist, Fishpole
      Didsbury Engineering Co. Ltd.
      Manchester M19 3 EJ
      (Alternative)

      Hoist, Fishpole - Commercially Available

      Fishpole hoist not required for use with A49006-26.

      (2) PASSENGER AIRPLANES;
      A49006-26, APU Battery Hoist (alternate, no longer available)

   B. Access
      (1) Location Zone
      154 Aft Cargo Compartment (Right)

      (2) Access Panel
      822 Aft Cargo Compartment Door

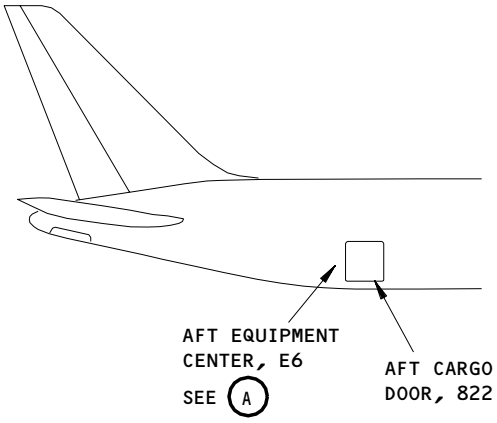
   C. Prepare for Removal

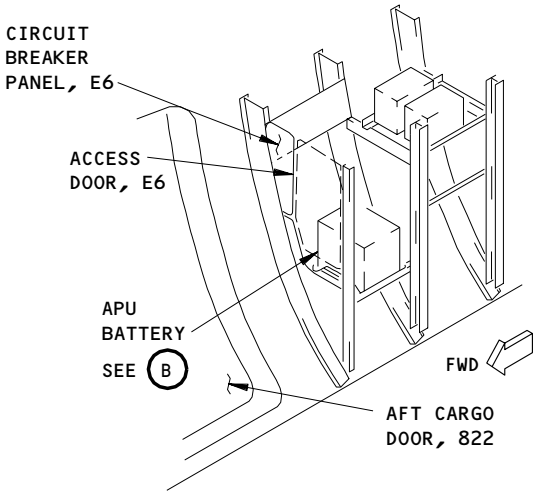
      S 864-014

      (1) Open this circuit breaker on the forward miscellaneous electrical equipment panel (referred to as the P33 panel) and attach a DO-NOT-CLOSE tag:

      NOTE: Make sure the APU is not operating when you open this circuit breaker. The APU will automatically shut down when you open this circuit breaker.

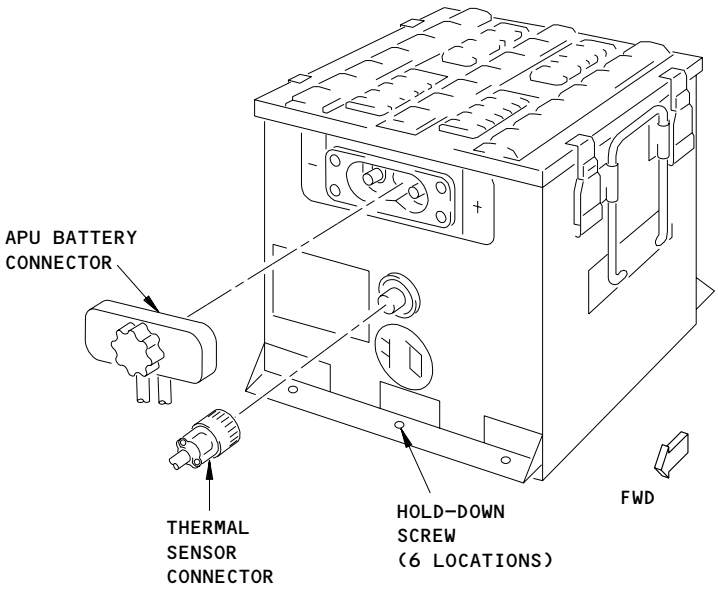
      (a) 33E5, BATTERY CHARGER APU





AFT EQUIPMENT CENTER, E6

A



APU BATTERY

B

APU Battery Installation
Figure 401

H34552

S 864-003

(2) Open these circuit breakers on the aft equipment center rack (referred to as the E6 rack) and attach a DO-NOT-CLOSE tag:

NOTE: Make sure the APU is not operating when you open these circuit breakers. The APU will automatically shut down when you open these circuit breakers.

(a) APU PRIME CONTROL
(b) APU BAT CHGR

S 024-004

(3) Do these steps to remove the APU battery:
(a) Open the access cover on the forward side of the E6 rack.
(b) Remove the lockwire from the electrical connector and the battery connector (AMM 20-10-23/401).
(c) Remove the electrical connector and battery connector from the APU battery.
(d) Remove the six screws that hold the APU battery.

WARNING: DO NOT REMOVE THE APU BATTERY WITHOUT AID. BATTERY WEIGHS 96 POUNDS AND INJURY CAN OCCUR IF BATTERY REMOVAL IS DONE WITHOUT AID.

(e) PASSENGER AIRPLANES;
Use the hoist to remove the APU battery from the E6 rack.
(f) FREIGHTER AIRPLANES;
Use special care to manually remove the APU battery from the E6 rack.

TASK 24-31-04-404-005

3. Install the APU Battery (Fig. 401)

A. Equipment
(1) PASSENGER AIRPLANES;
A24006-1, APU Battery Hoist (preferred)
Fishpole Hoist used with the A24006-1 battery hoist to lift 96 lb. battery is commercially available. Fishpole hoist not required for use with A49006-26.
(2) PASSENGER AIRPLANES;
A49006-26, APU Battery Hoist (alternate, no longer available)
(3) Bonding meter - Model T-477W, Microhm Bridge,
Avtron Manufacturing, Inc.,
Cleveland, Ohio

B. References
(1) SWPM 20-20-00, Standard Wiring Practices Manual D6-544446
(2) AMM 24-22-00/201, Electrical Power - Control

C. Access
(1) Location Zones
154 Aft Cargo Compartment (Right)
211/212 Flight Compartmnet

(2) Access panel
822 Aft Cargo Compartment Door

D. Install the APU Battery

S 424-006
(1) Do these steps to install the APU battery:
(a) PASSENGER AIRPLANES;
Use the hoist to install the APU battery in the E6 rack.
(b) FREIGHTER AIRPLANES;
Use special care to manually install the APU battery in the E6 rack.
(c) Install the six screws that hold the APU battery.
(d) Connect the electrical connector and battery connector to the APU battery.
(e) Install the lockwire to the electrical connector (AMM 20-10-23/401).
(f) Install the lockwire from the connector knob to one of the connector bolts (AMM 20-10-23/401).

NOTE: NASM20995CY20 or MS20995CY20 lockwire can be used.

(g) Close the access cover on the forward side of the E6 rack.

S 864-007
(2) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the E6 rack:
(a) APU PRIME CONTROL
(b) APU BAT CHGR

S 864-008
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P33 panel:
(a) 33E5, BATTERY CHARGER APU

E. Do these steps to check the APU battery ground stud:

S 214-018

(1) If the terminal lug, ground strap or stud is damaged, deformed, discolored or annealed, do these steps:

(a) Repair or replace the terminal lug, ground strap or stud (SWPM 20-30-00).

NOTE: The terminal lug can become annealed (soft) because it is heated and cooled again and again. If the terminal lug is annealed, replace it with a high temperature terminal lug (SWPM 20-30-11).

CAUTION: DO NOT PULL ON THE GROUND WIRE AFTER THE GROUND STUD IS TIGHTENED. DAMAGE TO EQUIPMENT OR AIRPLANE STRUCTURE MAY OCCUR.

(b) Make sure each APU ground stud nut is torqued from 180 to 200 pound-inch (SWPM 20-30-00).

(c) Make sure the electrical bonding of the APU battery ground is 0.0001 ohms (SWPM 20-20-00).

S 214-019

(2) If the terminal lug, ground strap or stud is not damaged, deformed, discolored or annealed but the electrical bonding of the ground stud is in question, do the following steps:

CAUTION: DO NOT PULL ON THE GROUND WIRE AFTER THE GROUND STUD IS TIGHTENED. DAMAGE TO EQUIPMENT OR AIRPLANE STRUCTURE MAY OCCUR.

(a) Make sure each APU ground stud nut is torqued from 180 to 200 pound-inch (SWPM 20-30-00).

(b) Make sure the electrical bonding of the APU battery ground is 0.0001 ohm (SWPM 20-20-00).

S 164-020

(3) Clean the fuselage next to the APU ground studs. Make sure the battery ground stud area is free of dust and dirt.

F. Do a test of the APU battery installation.

S 864-009

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

S 864-010

(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-012

(3) Do a test of the APU battery, as follows:

(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(b) Make sure this value is below APU/BAT on the bottom EICAS display:

DC-V	28 ±4

S 864-013

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

APU BATTERY CHARGER - REMOVAL/INSTALLATION

1. General
   A. The APU battery charger, M207, is located on the E6-1 equipment rack in the aft equipment center.

TASK 24-31-05-004-001

2. APU Battery Charger Removal
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
   B. Access
      (1) Location Zones
          154 Aft cargo compartment (Right)
      (2) Access Panels
          822 Aft cargo compartment door
   C. Removal

S 864-002

(1) Open this circuit breaker on the P33 forward miscellaneous electrical equipment panel and attach a DO-NOT-CLOSE tag:

NOTE: Make sure the APU is not operating when you open this circuit breaker. The APU will automatically shut-down when you open this circuit breaker.

(a) 33E5, APU BAT CHARGER

S 864-003

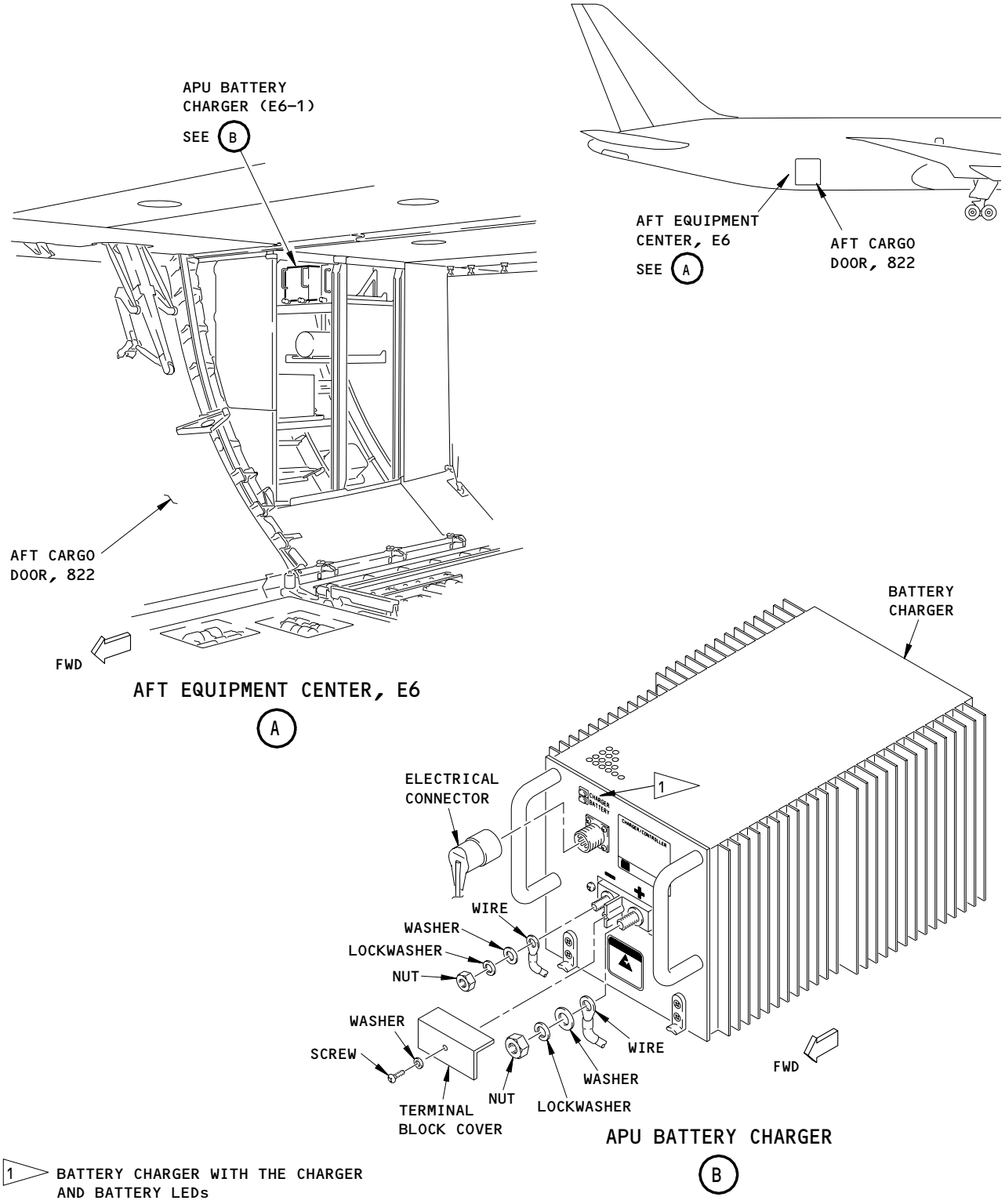
(2) Open this circuit breaker on the P49 APU Auxiliary panel or the E6-1 aft equipment center rack and attach a DO-NOT-CLOSE tag:

NOTE: Make sure the APU is not operating when you open this circuit breaker. The APU will automatically shut-down when you open this circuit breaker.

(a) 49E4, APU BAT CHGR

S 024-008

(3) Do these steps to remove the APU battery charger:
(a) Open the access cover on the forward side of the E6 rack.



APU Battery Charger Removal/Installation
Figure 401

CAUTION: DO NOT TOUCH THE APU BATTERY CHARGER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE APU BATTERY CHARGER.

(b) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).
(c) Remove the electrical connector from the APU battery charger.
(d) Remove the cover from the terminal block on the APU battery charger.
(e) Identify the wires on the terminal block for installation.
(f) Remove the wires from the terminal block.
(g) Remove the APU battery charger (AMM 20-10-01/401).

TASK 24-31-05-424-007

3. APU Battery Charger Installation

A. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
(3) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
154 Aft cargo compartment (Right)
211/212 Flight compartment
(2) Access Panels
822 Aft cargo compartment door

C. Installation

S 914-005

CAUTION: DO NOT TOUCH THE APU BATTERY CHARGER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE APU BATTERY CHARGER.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-006
(2) Install the APU battery charger (AMM 20-10-01/401).

S 434-006
(3) Do these steps to connect the APU battery charger:
(a) Install the wire, washer, lockwasher and nut on the positive terminal of the battery charger.

(b) Tighten the nut on the positive terminal of the battery charger to 170-190 inch-pounds (19.2-21.5 Newton meters).
(c) Install the wire, washer, lockwasher and nut on the negative terminal of the battery charger.
(d) Tighten the nut on the negative terminal of the battery charger to 135-145 inch-pounds (15.3-16.4 Newton meters).
(e) Install the terminal cover on the battery charger.
(f) Connect the electrical connector to the APU battery charger.

S 214-017
(4) Do a visual check of the APU Battery Charger Shunt. Check for cracks in the shunt body, thread damage or corrosion on terminals. If any of these conditions exist, replace the shunt and do the following:
(a) Torque the jam nuts on the shunt to 35 +/- 5 inch-pounds.

S 414-016
(5) Close the access cover on the forward side of the E6 rack.

S 864-007
(6) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P49 panel or E6 rack:
(a) 49E4, APU BAT CHGR

S 864-008
(7) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P33 panel:
(a) 33E5, APU BAT CHGR

D. Do a test of the APU battery charger:

S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 714-012
(2) Do a test of the APU battery charger as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(b) Make sure the STBY POWER switch on the P5 panel is set to the AUTO position.
(c) Make sure the BAT switch on the standby power panel is in the ON position.
(d) Turn the STBY POWER switch on the P5 panel to the BAT position for one minute.
(e) Make sure these values are below APU/BAT on the bottom EICAS display:

DC-V	26 ±3
DC-A	0

(f) Turn the STBY POWER switch on the standby power panel to the AUTO position.

NOTE: Watch the EICAS display closely. The values on the display will change quickly.

(g) Make sure these values show below APU/BAT on the bottom EICAS display:
1) DC-A value increases quickly to 38 ±5 (BA06) or 45 ±5 (BA35).
2) DC-V value increases to 33 ±4 then decreases to 28 ±2.

NOTE: It will usually take less than one minute for the voltage value to increase and then decrease. A fully discharged battery can extend this time to 75 minutes.

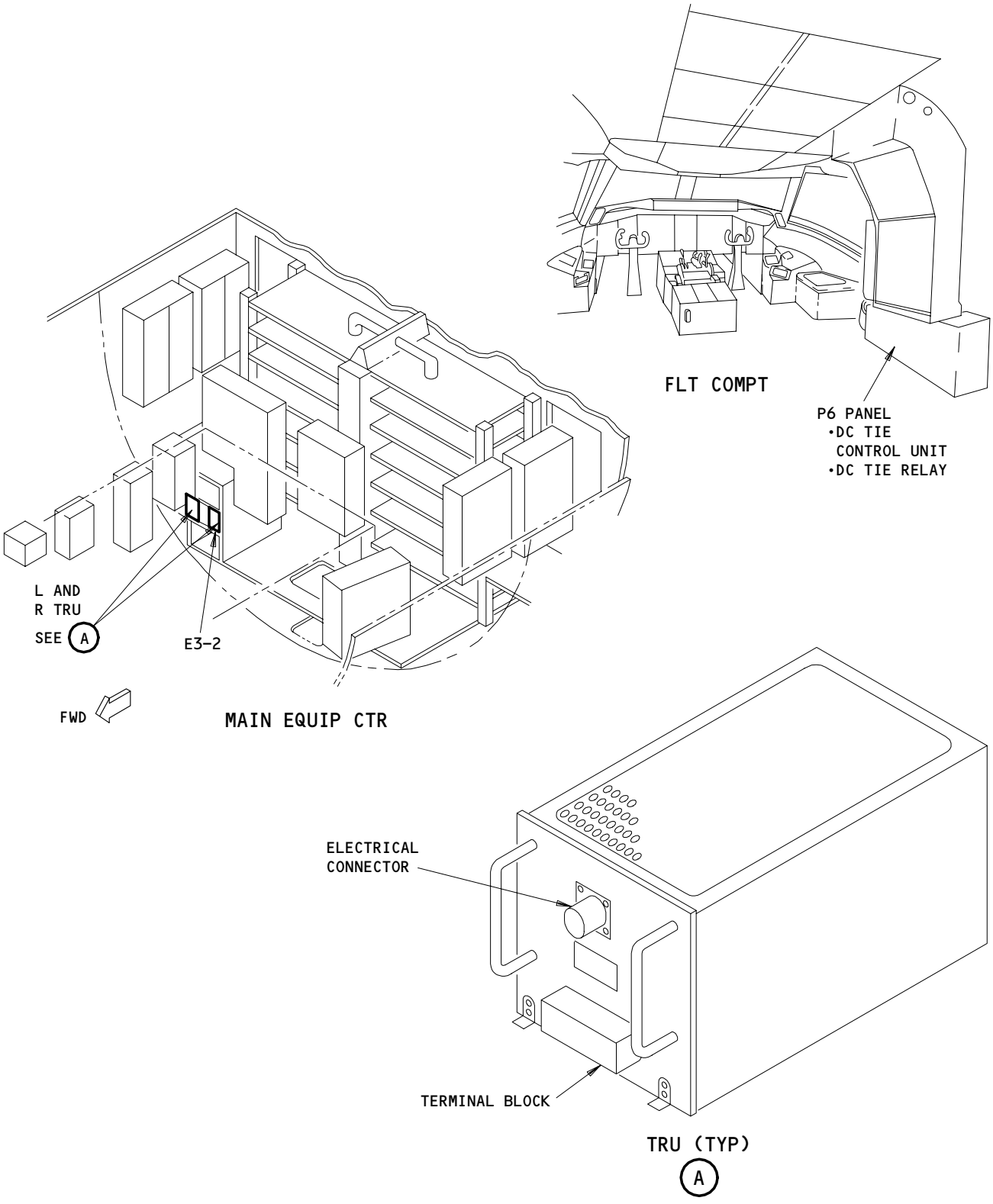
3) After the DC-V value decreases to 28 ±2 make sure the DC-A value is 0 ±5.

S 864-013

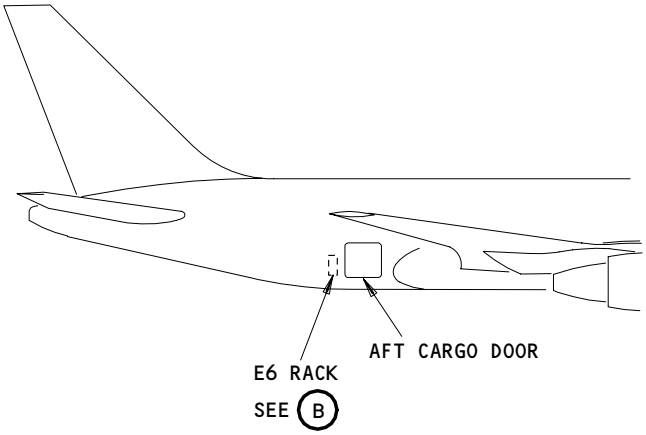
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

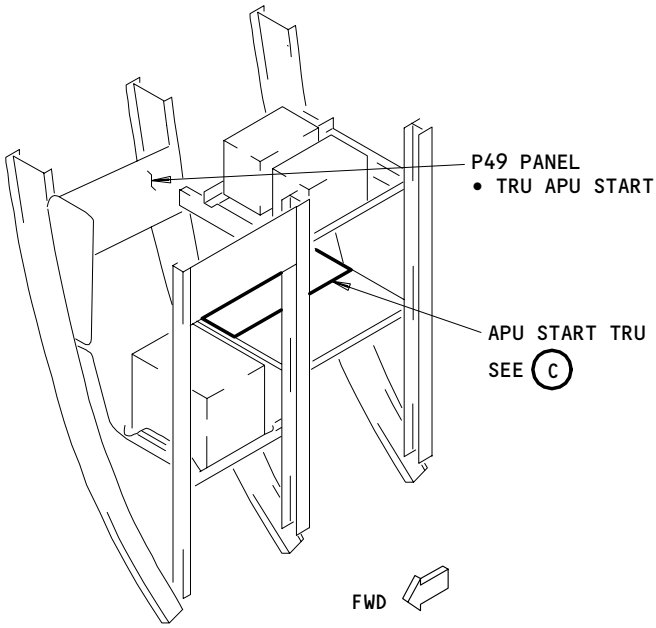
TRANSFORMER RECTIFIER - DESCRIPTION AND OPERATION

1. General
   A. The transformer - rectifier system supplies primary DC power by converting main AC power. System components include transformer - rectifier units (TRU's), a DC tie control unit, and a DC tie relay.
   B. ALL MTH AIRPLANES;
      the APU start TRU provides primary DC power to start the APU. Components include the APU start TRU and the TRU APU start relay.
2. Component Details (Fig. 1)
   A. Transformer - Rectifier Units
      (1) Two identical TRU's convert nominal 115 volt, 3 phase AC power into unregulated 28v dc power. Each TRU is capable of providing 120 amps continuous power with forced air cooling, or 60 amps for 30 minutes when cooled by natural convection. An internal meter shunt allows measurement of TRU output current by the EICAS computers. Both TRU's are located on shelf 2 of main equipment center rack E3 (E3-2).
      (2) ALL MTH AIRPLANES;
      the APU start TRU converts 115v, 3 phase ac power into unregulated 28v dc power for starting the APU. The TRU contains a cooling fan that comes on at 125°F (52°C), and overheat switches that close at 250°F (121°C). The TRU is located in aft equipment center rack E6.
   B. DC Tie Control Unit
      (1) The DC tie control unit controls the operation of the DC tie relay when the airplane is not in the autoland mode. The control unit will latch the DC tie relay closed under either of the following conditions:
         (a) Voltage on one bus drops below 19.5 volts for more than 11.5 seconds.
         (b) Buses are not powered up within 5.5 seconds of each other.
      (2) The DC tie control unit will reset (open) the DC tie relay under either of the following conditions:
         (a) Voltage on both buses remains below 19.5 volts for more than 11.5 seconds.
         (b) Control unit loses power for more than 3 seconds.
      (3) The control unit will remain reset if both main dc buses fall below 19 volts within 5 seconds of each other.
      (4) The DC tie control unit is located in main power distribution panel P6.
   C. DC Tie Relay
      (1) The DC tie relay is located in the P6 panel. The relay will tie the left and right main DC buses together if one loses power.
      (2) When the airplane is not in the autoland mode, the dc tie relay is actuated by the dc tie control unit.
      (3) When the airplane is in the autoland mode, the dc tie relay is actuated by the captain's or first officer's instrument bus voltage sensing unit (IBVSU).



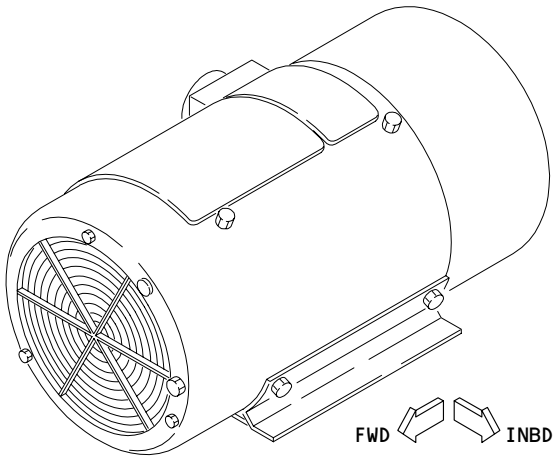
TRU Component Location
Figure 1 (Sheet 1)





AFT EQUIPMENT CENTER RACK E6

(B)



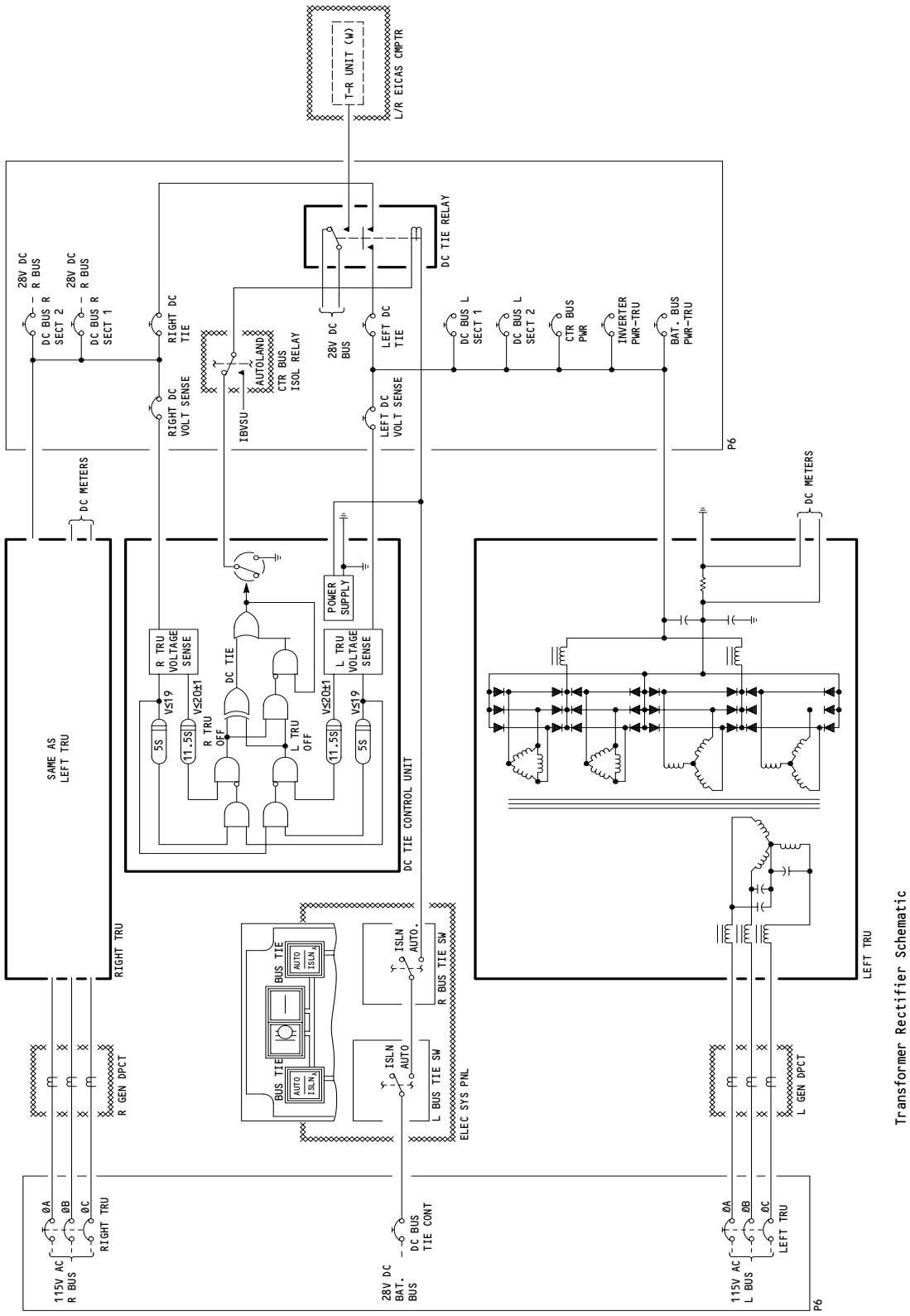
APU START TRU

(C)

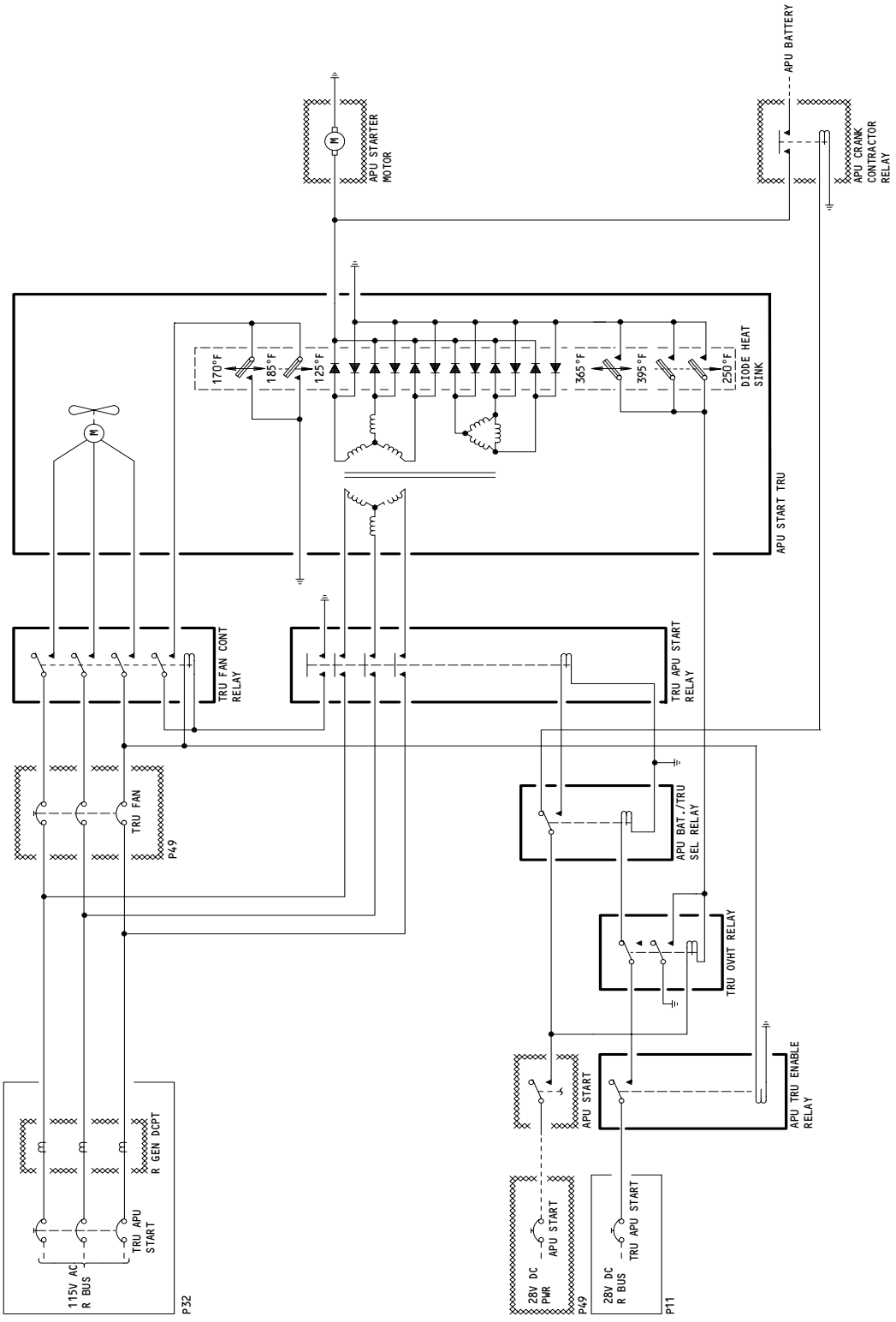
TRU Component Location
Figure 1 (Sheet 2)

D. MTH AIPRLANES ONLY;
TRU APU Start Relay
(1) The TRU APU start relay connects 115v, 3 phase ac power to the APU start TRU. The relay also supplies a ground to the TRU fan control relay. This ensures that the cooling fan in the TRU will be running during an APU start. The relay is located in aft equipment center rack E6.

3. Operation (Fig. 2 and 3)
A. Functional Description
(1) Main TRU's
(a) In normal operation the left and right TRUs provide 28v dc power to the left and right main dc buses respectively.
(b) Should the voltage on either main DC bus fall below 19.5 volts for more than 11.5 seconds, the DC tie control unit will energize the DC tie relay. The relay parallels the left and right main DC buses. The EICAS computer will show a T-R UNIT status/maintenance message on the lower display.
(c) If normal TRU voltage is restored, the left and right dc buses will remain paralleled until dc tie control unit power is removed for more than 3 seconds. This reset (power removal) can be accomplished by selecting the left or right BUS TIE switch (P5) to ISLN for at least 3 seconds.
(d) If an autoland signal is present, the center bus isolate relay energizes, preventing the DC tie relay from closing. The autoland signal has no effect if the buses are already tied together.
(e) When the airplane is in the autoland mode, the IBVSU's monitor power on the main ac buses. When the IBVSU's sense a loss of power on either main ac bus, a ground signal is applied through the center bus isolation relay to energize the dc tie relay. This ties the dc buses together and restores the dc power.
(f) EICAS computers monitor the output voltage and current of each TRU, EICAS will display the status/maintenance message TR UNIT when the dc buses are tied (dc tie relay energized).
(2) MTH AIRPLANES ONLY;
APU Start TRU
(a) When an APU start signal is received (Ref 49-41-00), the TRU APU start relay energizes, applying power to the APU start TRU. The relay also turns on the internal cooling fan for the TRU. The cooling fan stays on until TRU temperature drops below 125°F (52°C).
(b) If TRU temperature exceeds 250°F (121°C), TRU overheat relay energizes. When TRU OVHT relay energizes, APU BAT/TRU select relay de-energizes, connecting the APU start signal to the crank contactor. The crank contactor connects the APU battery to the APU starter motor.



Transformer Rectifier Schematic
Figure 2



APU Start Transformer Rectifier Schematic
Figure 3

(c) In event of the APU start TRU malfunction, the APU may be started by the APU battery by opening the TRU APU START CONT circuit breaker located on the overhead circuit breaker panel. This will de-energize the TRU OVHT and APU BAT/TRU SEL relays, apply 28 volt dc from the APU START circuit breaker through the APU BAT/TRU SEL relay to energize the APU crank contactor. The APU crank contactor thus connects the APU battery to the APU start motor.

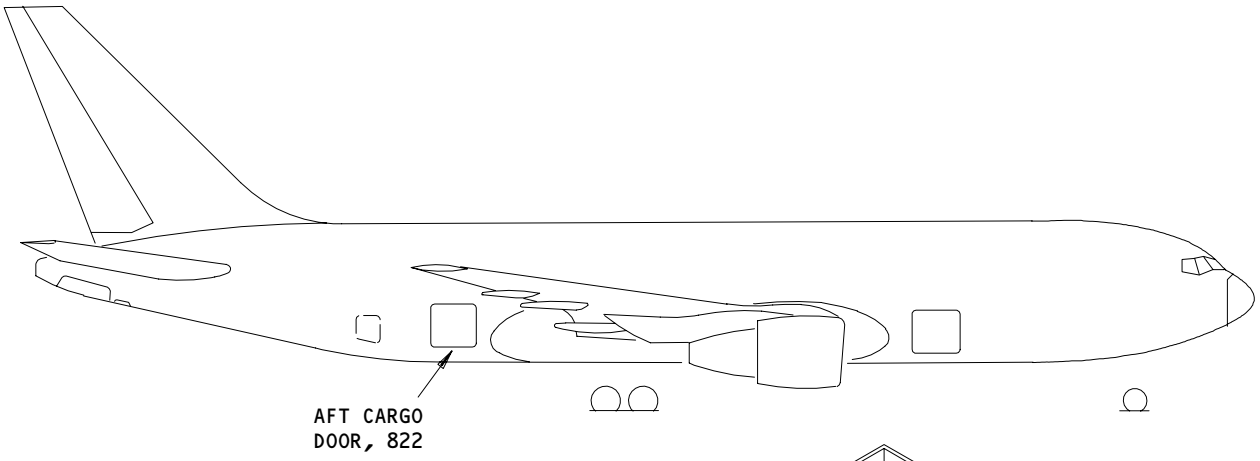
TRANSFORMER-RECTIFIER

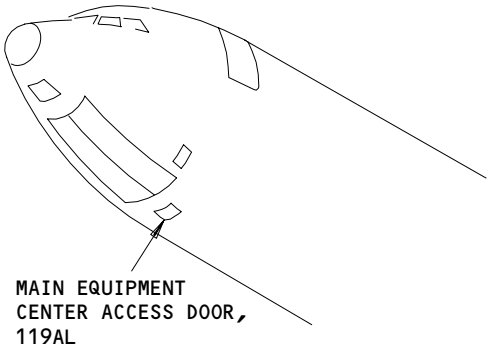
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	--		FLT COMPT, P6	
BAT BUS PWR TRU, C886		1	6D12	*
C BUS PWR, C884		1	6C10	*
DC BUS TIE CONT, C879		1	6A6	*
INV PWR TRU, C885		1	6D11	*
L DC VOLT SENSE, C801		1	6C12	*
L TRU, C312		1	6C18	*
R DC VOLT SENSE, C802		1	6G11	*
R TRU, C318		1	6C24	*
SEC 1, C882		1	6D9	*
SEC 1, C891		1	6G9	*
SEC 2, C883		1	6D8	*
SEC 2, C890		1	6G8	*
TIE L, C881		1	6D10	*
TIE R, C889		1	6G10	*
CIRCUIT BREAKER	--		FLT COMPT, P11	
TRU APU START, C865 1		1	11T35	*
CIRCUIT BREAKER	--		822, AFT EQUIP CTR RACK E6	
APU START, C20 1		1		*
TRU FAN, C89 1		1		*
CIRCUIT BREAKER	--		119AL, MAIN EQUIP CTR, P32	
APU START TRU, C303 1		1		*
PANEL - (REF 24-22-00, FIG. 101)				
ELECTRICAL SYSTEM CONTROL, M10063				
RELAY - (REF 31-01-06, FIG. 101)				
CENTER BUS ISOL, K123				
DC TIE, K108				24-32-02
RELAY - (REF 31-01-49, FIG. 101) 1				
APU BAT/TRU SELECT, K617				
APU START, K197				
APU TRU ENABLE, K615				
TRU APU START, K618				24-32-05
TRU FAN CONT, K619				24-32-06
TRU OVHT, K616				
TRANSFORMER - (REF 24-23-00, FIG. 101)				
LEFT GENERATOR DIFFERENTIAL CURRENT PROTECTION, T106				
RIGHT GENERATOR DIFFERENTIAL CURRENT PROTECTION, T108,T107 1				
UNIT - TRANSFORMER RECTIFIER, T101,T102	--	2	119AL, MAIN EQUIP CTR, E3-2	24-32-01
UNIT - TRANSFORMER RECTIFIER APU START, T189 1	2	1	822, AFT EQUIP CTR RACK E6	24-32-04
UNIT - (REF 31-01-06, FIG. 101)				
DC TIE CONTROL, M10213				24-32-03

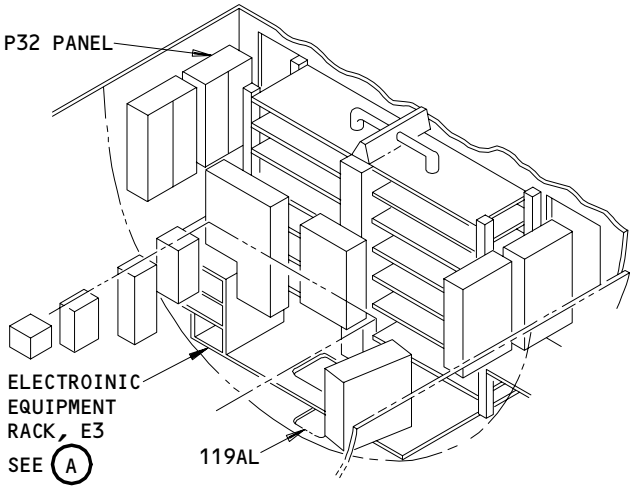
* SEE THE WDM EQUIPMENT LIST

1 ALL MTH AIRPLANES

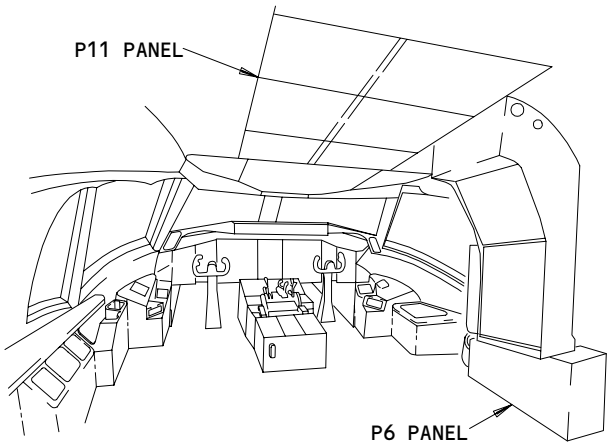
Transformer-Rectifier - Component Index
Figure 101



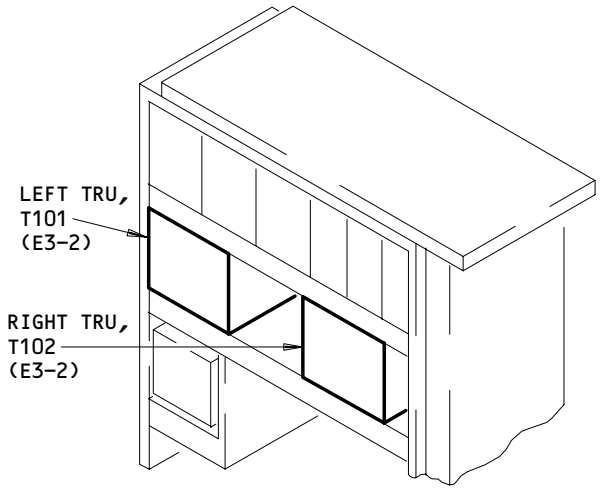




MAIN EQUIPMENT CENTER



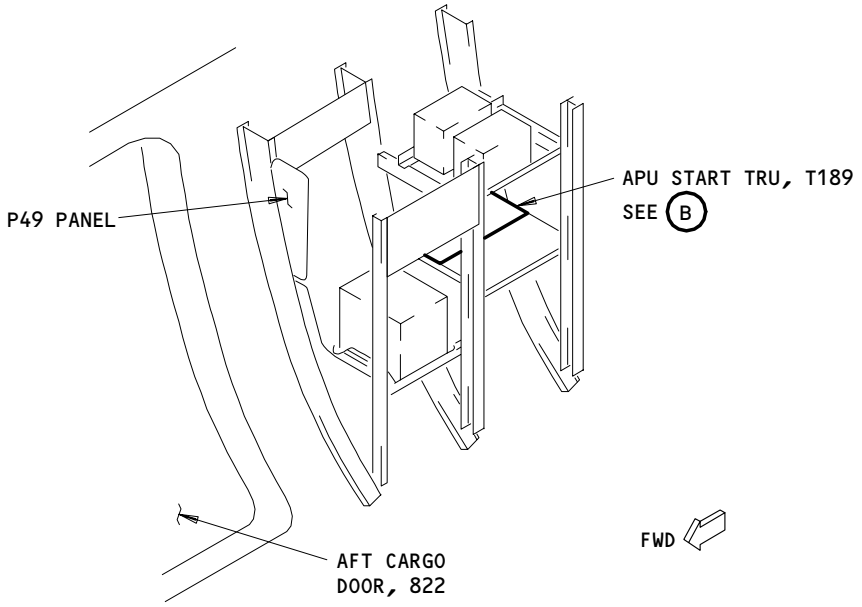
FLIGHT COMPARTMENT



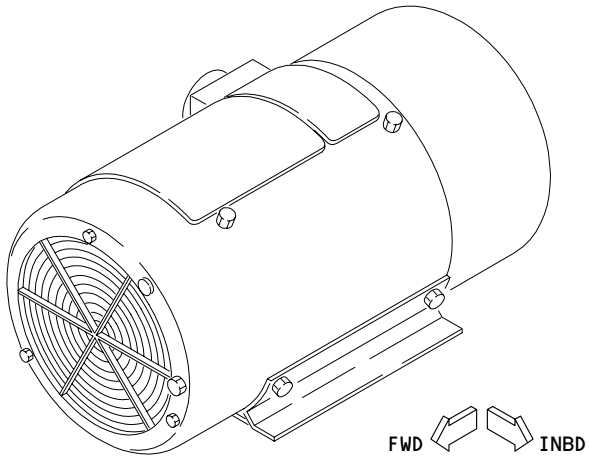
ELECTRONIC EQUIPMENT RACK, E3

(A)

Transformer-Rectifier - Component Location
Figure 102 (Sheet 1)



AFT EQUIPMENT CENTER RACK, E6



APU START TRU, T189
(B)

Transformer-Rectifier - Component Location
Figure 102 (Sheet 2)

TRANSFORMER RECTIFIER UNIT - REMOVAL/INSTALLATION

1. General
   A. The left and right transformer rectifier units (referred to as TRUs) are on shelf 2 of the main equipment center rack E3. The removal and installation procedures are the same for both units.

TASK 24-32-01-004-001

2. Remove the Transformer Rectifier Unit
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main equipment center

      (2) Access Panels
          119BL Main equipment center access

   C. Prepare for Removal

      S 044-024

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES IF HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, AND SPOILERS ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR IF HYDRAULIC POWER IS AVAILABLE TO THESE SURFACES.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-023
      (2) Open these circuit breakers on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
          (a) 6A6, DC BUS TIE CONT
          (b) 6C18, L TRU (as applicable)
          (c) 6C24, R TRU (as applicable)
          (d) 6D2, BAT XFER CONT

S 034-003
(3) Do these steps to disconnect the transformer rectifier unit:
(a) Open the cover on the E3 equipment rack.
(b) Remove the electrical connector from the TRU.
(c) Remove the cover from the terminal block on the TRU.
(d) Identify the wires on the terminal block for installation.
(e) Remove the wires from the terminal block.

S 024-004
(4) Remove the TRU (AMM 20-10-01/401).

TASK 24-32-01-404-005
3. Install Transformer Rectifier Unit
A. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
B. Access
(1) Location Zones
119/120 Main equipment center
211/212 Flight Compartment

(2) Access Panels
119BL Main equipment center access

C. Install the transformer rectifier unit.

S 424-004
(1) Install the TRU (AMM 20-10-01/401).

S 434-007
(2) Do these steps to connect the transformer rectifier unit:

WARNING: MAKE SURE YOU CONNECT THE POSITIVE AND NEGATIVE POWER CABLES TO THE CORRECT TERMINALS. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR IF THE POWER CABLES ARE CROSS CONNECTED.

(a) Install the wire, washer, lockwasher and nut on the positive terminal of the TRU.

(b) Tighten the nut on the positive terminal of the TRU to 170-190 inch-pounds (19.2-21.5 Newton meters).
(c) Install the wire, washer, lockwasher and nut on the negative terminal of the TRU.
(d) Tighten the nut on the negative terminal of the TRU to 135-145 inch-pounds (15.3-16.4 Newton meters).
(e) Install the cover on the terminal block.
(f) Connect the electrical connector to the TRU.
(g) Close the cover on the E3 equipment rack.

S 864-008
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6A6, DC BUS TIE CONT
(b) 6C18, L TRU (as applicable)
(c) 6C24, R TRU (as applicable)
(d) 6D2, BAT XFER CONT

D. Do a test of the transformer rectifier unit

S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 864-010
(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-012
(3) Do a test of the TRU, as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(b) Make sure this value is below L and R on the bottom EICAS display:

DC-V	28 ±4

S 864-013
(4) Do the activation procedure for the spoilers (AMM 27-61-00/201) if you did the deactivation procedure.

S 864-014
(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

DC TIE RELAY - REMOVAL/INSTALLATION

1. General
   A. The DC tie relay, K108, is in the main power distribution panel, P6.

TASK 24-32-02-024-014

2. Remove the DC Tie Relay (Fig 401)
   A. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zone
          211/212 Flight compartment

   C. Prepare for Removal

S 864-002

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES IF HYDRAULIC POWER IS SUPPLIED. THE AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS AND SPOILERS ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR IF HYDRAULIC POWER IS AVAILABLE TO THESE SURFACES.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

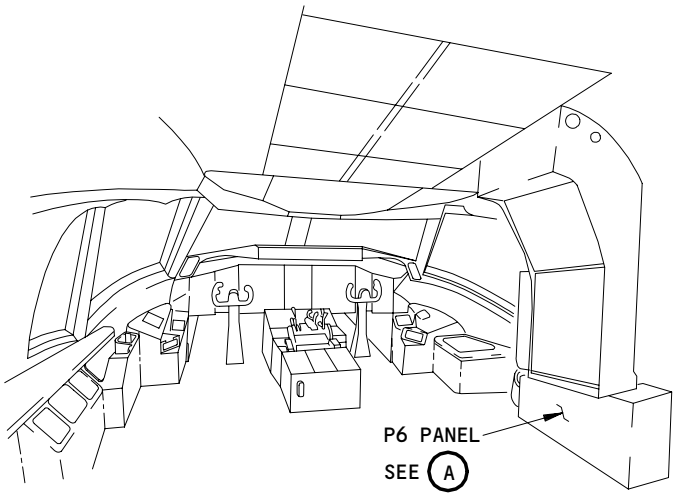
S 864-022

(2) Remove electrical power from the airplane.

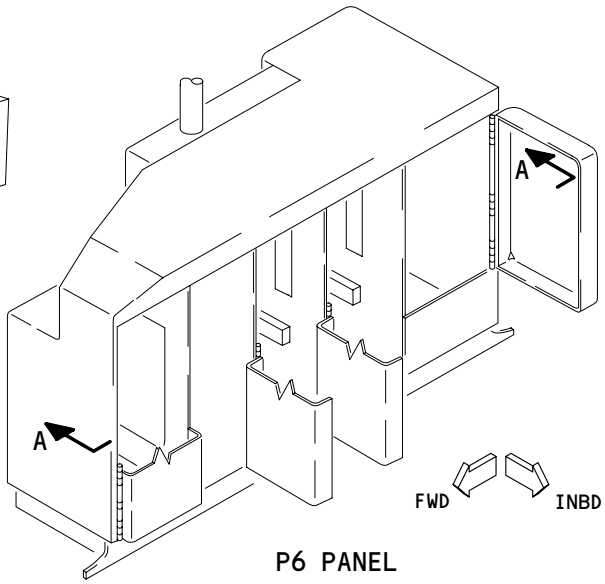
S 024-003

WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU WORK IN THE MAIN POWER DISTRIBUTION PANEL, P6. VOLTAGE LEVELS IN THE PANEL CAN CAUSE INJURY TO PERSONS.

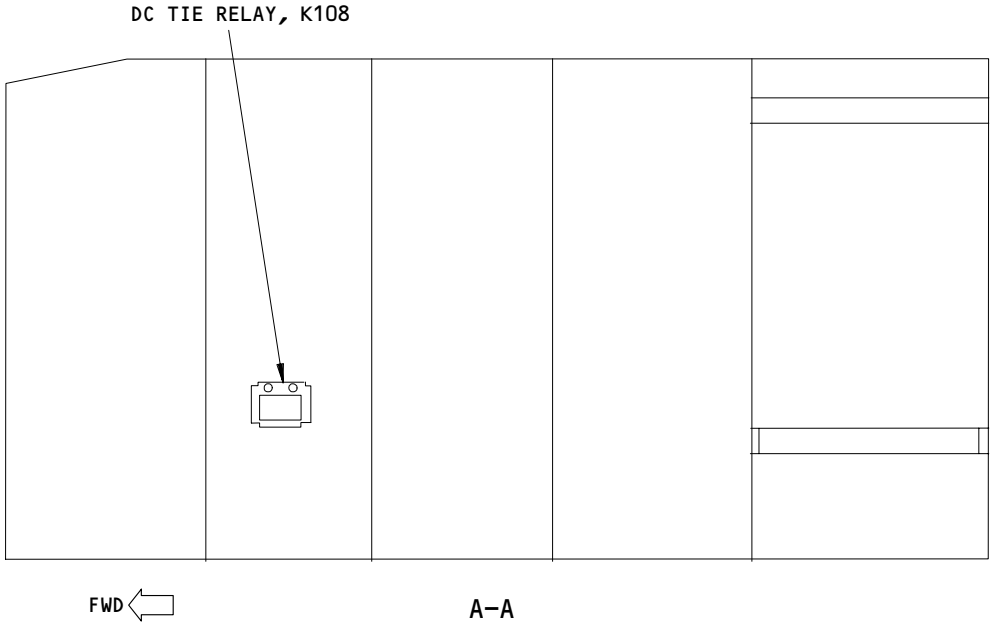
(3) Do these steps to remove the DC tie relay:
   (a) Open the P6 panel.
   (b) Identify the leads on the DC tie relay for installation.
   (c) Remove the leads from the DC tie relay.



FLIGHT COMPARTMENT



P6 PANEL
(A)



A–A

DC Tie Relay Installation
Figure 401

(d) Remove the screws that hold the DC tie relay.
(e) Remove the DC tie relay.

TASK 24-32-02-404-004

3. Install DC Tie Relay (Fig 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zone
211/212 Flight compartment

C. Install the DC Tie Relay

S 424-005
(1) Do these steps to install the DC tie relay:
(a) Put the DC tie relay in position and install the screws that hold the relay.

CAUTION: MAKE SURE THE LEADS ARE INSTALLED CORRECTLY. SERIOUS DAMAGE TO AIRPLANE CIRCUITS CAN OCCUR IF THE LEADS ARE NOT INSTALLED CORRECTLY.

(b) Connect the leads to the DC tie relay.
(c) Close the P6 panel.

D. Do a test of the DC tie relay.

S 864-006
(1) Supply electrical power (AMM 24-22-00/201).

S 864-007
(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 864-009
(3) Make sure these circuit breakers on the P6 panel are closed:
(a) 6A6, DC BUS TIE CONT
(b) 6C12, L DC VOLT SENSE
(c) 6C18, L TRU
(d) 6C24, R TRU
(e) 6D10, TIE L
(f) 6G10, TIE R
(g) 6G11, R DC VOLT SENSE

S 714-010
(4) Do a test of the DC tie relay, as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel.
(b) Make sure this value is below L and R on the bottom EICAS display:

DC-V	28 ±4

(c) Open this circuit breaker on the P6 panel and make sure the DC-V value below R falls to 0 ±0.5 on the lower EICAS display. Make sure the DC-A value below R falls to 0 ±2.5.
1) 6C24, R TRU

(d) Twelve seconds after the circuit breaker is opened, make sure these steps occur:
1) The DC-V values below L and R are the same on the bottom EICAS display.
2) The DC-A value below R stays at 0 ±2.5 on the bottom EICAS display.

(e) Close this P6 panel circuit breaker:
1) 6C24, R TRU

S 864-011

(5) Do the activation procedure for the spoilers (AMM 27-61-00/201) if you did the deactivation procedure.

S 864-012

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

DC TIE CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The DC tie control unit, M10213, (referred to as the control unit) is in the main power distribution panel, P6.

TASK 24-32-03-024-017

2. Remove the DC Tie Control Unit (Fig. 401)
   A. References
      (1) AMM 20-41-01/201, Electrostatic Sensitive Devices
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zone
          211/212 Flight Compartment

   C. Prepare for Removal

      S 864-001

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from all spoilers.

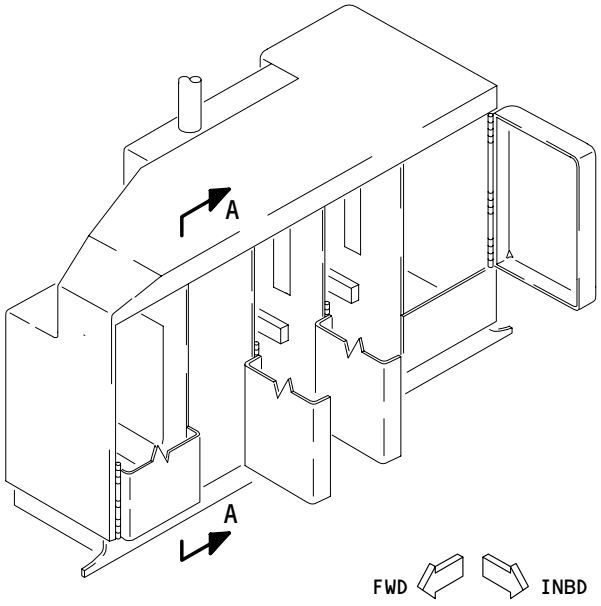
      S 864-002
      (2) Remove electrical power from the airplane (AMM 24-22-00/201).

      S 014-014

      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU OPEN THE MAIN POWER DISTRIBUTION PANEL, P6. VOLTAGE LEVELS IN THE PANEL CAN CAUSE INJURY TO PERSONS.

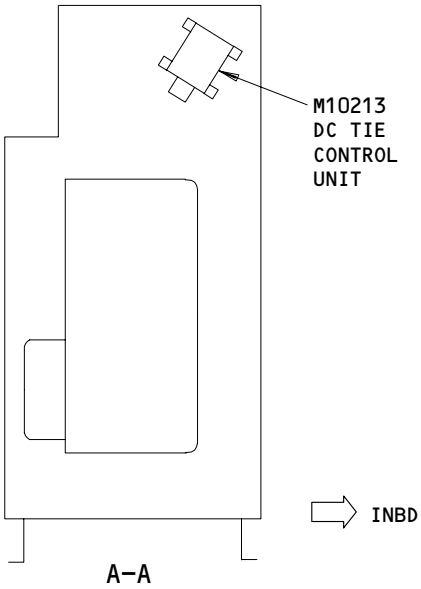
      (3) Open the main power distribution panel, P6.

FLT COMPT



P6 PANEL

A



A-A

DC Tie Control Unit Installation
Figure 401

D. Remove the DC Tie Control Unit

S 024-003

(1) Do these steps to remove the control unit:
(a) Remove the electrical connector from the control unit.

S 914-004

CAUTION: DO NOT TOUCH THE CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE . ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL UNIT.

(2) Do the procedure for devices that sensitive to electrostatic discharge (AMM 20-41-01/201).
(a) Remove the four fasteners that hold the control unit.
(b) Remove the control unit.

TASK 24-32-03-404-005

3. Install the DC Tie Control Unit (Fig. 401)

A. References
(1) AMM 20-41-01/201, Electrostatic Discharge Sensitive Devices
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zone
211/212 Flight Compartment

C. Install the DC Tie Control Unit

S 914-006

CAUTION: DO NOT TOUCH THE CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL UNIT.

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

S 424-015

(2) Do these steps to install the control unit:
(a) Put the control unit in position.
(b) Install the four screws that hold the control unit.
(c) Connect the electrical connector to the control unit.

S 414-016

(3) Close the main power distribution panel, P6.

D. Do a Test of the DC Tie Control Unit Installation.

S 864-007

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

S 714-011

(2) Do a test of the control unit, as follows:

(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(b) Make sure this value is below L and R on the bottom EICAS display:

DC-V	28 ±4

(c) Open this circuit breaker on the main power distribution panel, P6, and make sure the DC-V value below R falls to 0 ±0.5 on the bottom EICAS display. Make sure the DC-A value below R falls to 0 ±2.5.

1) 6C24, R TRU

(d) Twelve seconds after you open the circuit breaker, make sure these steps occur:

1) The DC-V values below L and R are the same on the bottom EICAS display.
2) The DC-A value below R stays at 0 ±2.5 on the bottom EICAS display.
3) The T R UNIT Message is displayed on the status page.

(e) Close this circuit breaker on the main power distribution panel, P6:

1) 6C24, R TRU

(f) Reset T R UNIT status message.

1) Press and release the DC Bus Tie Switch located on the Electrical Control Panel (P5).

NOTE: The Switch will change state from AUTO to ISLN.

2) Wait at least 3 seconds.
3) Press and release the DC Bus Tie Switch located on the Electrical Control Panel (P5).

NOTE: The Switch will change state from ISLN to AUTO.

S 864-012

(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-013

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

APU START TRU - REMOVAL/INSTALLATION

1. General
   A. The APU start transformer rectifier unit, T189, (referred to as the TRU) is in the aft equipment center rack, E6.

TASK 24-32-04-004-012

2. Remove the APU Start TRU (Fig. 401)
   A. Access
      (1) Location Zone
          154 Aft Cargo Compartment

      (2) Access Panel
          822 Aft Cargo Compartment Door

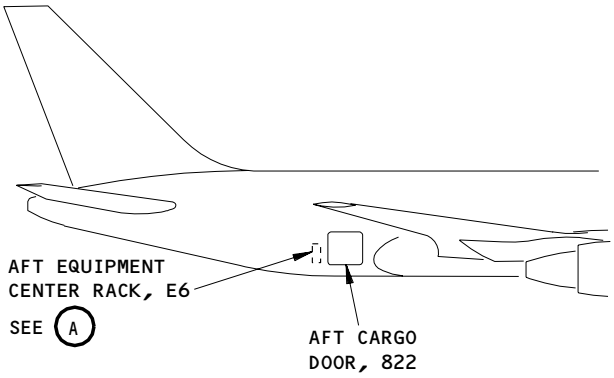
   B. Prepare for Removal

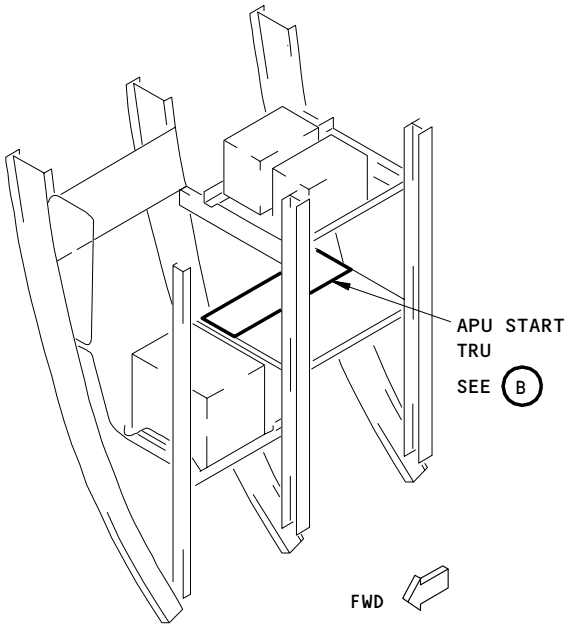
      S 864-001
      (1) Open this circuit breaker on the right generator power panel, P32, and attach a DO-NOT-CLOSE tag:
          (a) APU START TRU

      S 024-002
      (2) Do these steps to remove the TRU:
          (a) Open the access cover on the forward side of the E6 equipment rack.
          (b) Remove the electrical connector form the TRU.
          (c) Identify the leads on the TRU for installation.
          (d) Remove the leads from the TRU.
          (e) Remove the four bolts that hold the TRU.
          (f) Remove the TRU.

TASK 24-32-04-404-003

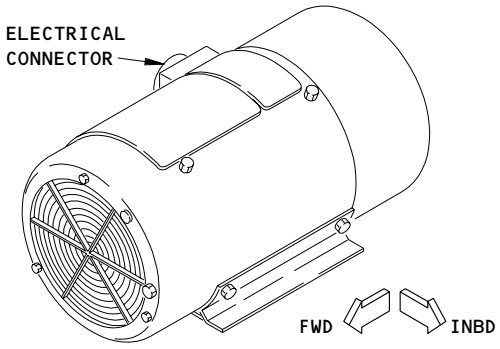
3. Install the APU Start TRU (Fig. 401)
   A. Equipment
      (1) Bonding meter - Model T-477W, Avtron Manufacturing, Inc., Cleveland, Ohio
   B. References
      (1) (SWPM 20-20-00), D6-54446.
      (2) 24-22-00/201, Electrical Power - Control
      (3) 49-11-00/201, Auxilary Power Unit





AFT EQUIPMENT CENTER RACK, E6

A



APU START TRU

B

APU Start TRU Installation
Figure 401

C. Access

(1) Location Zones

154	Aft Cargo Compartment
211/212	Flight Compartment

(2) Access Panel

822	Aft Cargo Compartment Door

D. Install the APU Start TRU

S 424-004

(1) Do these steps to install the TRU:
   (a) Put the TRU in position in the aft equipment center.
   (b) Install the four bolts that hold the TRU.
   (c) Connect the electrical connector to the TRU.
   (d) Install the wire, washer, lockwasher and nut on the positive terminal of the TRU.
   (e) Install the wire, washer, lockwasher and nut on the negative terminal of the TRU.
   (f) AIRPLANES WITH APU TRU P/N 28VS200Y-4B OR 28VS200Y-4B-1; Tighten the terminal nuts to 103-113 pound-inches (11.6-12.8 N.m).
   (g) AIRPLANES WITH APU TRU P/N 28VS200Y-4B-2; Tighten the terminal nuts to 185-195 pound-inches (20.9-22.0 N.m).

S 864-005

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the right generator power panel, P32,
   (a) APU START TRU

E. Do these steps to check the APU TRU ground stud:

S 214-018

(1) If the terminal lug, ground strap or stud is damaged, deformed, discolored or annealed, do these steps:
   (a) Repair or replace the terminal lug, ground strap or stud (SWPM 20-30-00).

NOTE: The terminal lug can become annealed (soft) because it is heated and cooled again and again. If the terminal lug is annealed, replace it with a high temperature lug (SWPM 20-30-11).

CAUTION: DO NOT PULL ON THE GROUND WIRE AFTER THE GROUND STUD IS TIGHTENED. DAMAGE TO EQUIPMENT OR AIRPLANE STRUCTURE MAY OCCUR.

(b) Make sure each APU TRU ground stud nut is torqued from 180 to 200 pound-inch (SWPM 20-30-00).
(c) Make sure the electrical bonding of the APU TRU ground studs are 0.0001 ohms (SWPM 20-20-00).

S 214-019
(2) If the terminal lug, ground strap or stud is not damaged, deformed, discolored or annealed but the electrical bonding of the ground stud is in question, do the following steps:

CAUTION: DO NOT PULL ON THE GROUND WIRE AFTER THE GROUND STUD IS TIGHTENED. DAMAGE TO EQUIPMENT OR AIRPLANE STRUCTURE MAY OCCUR.

(a) Make sure each APU TRU ground stud nut is torqued from 180 to 200 pound-inch (SWPM 20-30-00).
(b) Make sure the electrical bonding of the APU TRU battery ground is 0.0001 ohms (SWPM 20-20-00).

S 164-017
(3) Clean the fuselage area next to the APU TRU ground studs. Make sure the APU TRU ground stud area is free of dust and dirt (AMM 51-24-13/701).

F. Do a test of the APU start TRU installation.

S 864-006
(1) Supply electrical power (Ref 24-22-00).

S 864-007
(2) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
(a) 11T35, TRU APU START CONT

S 864-008
(3) Make sure this circuit breaker on the aft equipment center rack, E6, is closed:
(a) TRU FAN

S 714-009
(4) Motor the APU (Ref 49-11-00).
(a) While the APU is motored, make sure the fan in the APU start TRU operates.

S 864-010
(5) Shut down the APU (Ref 49-11-00).

S 414-011
(6) Close the access cover on the forward side of the E6 equipment rack.

S 864-012

(7) Remove electrical power if it is not necessary (Ref 24-22-00).

TRU APU START RELAY - REMOVAL/INSTALLATION

1. General
   A. The TRU APU start relay, K618, (referred to as the relay) is on the APU auxiliary panel, P49, in the aft equipment center.

TASK 24-32-05-004-001

2. Remove the APU TRU Start Relay (Fig. 401)
   A. Access
      (1) Location Zone
          154 Aft Cargo Compartment (Right)

      (2) Access Panel
          822 Aft Cargo Door

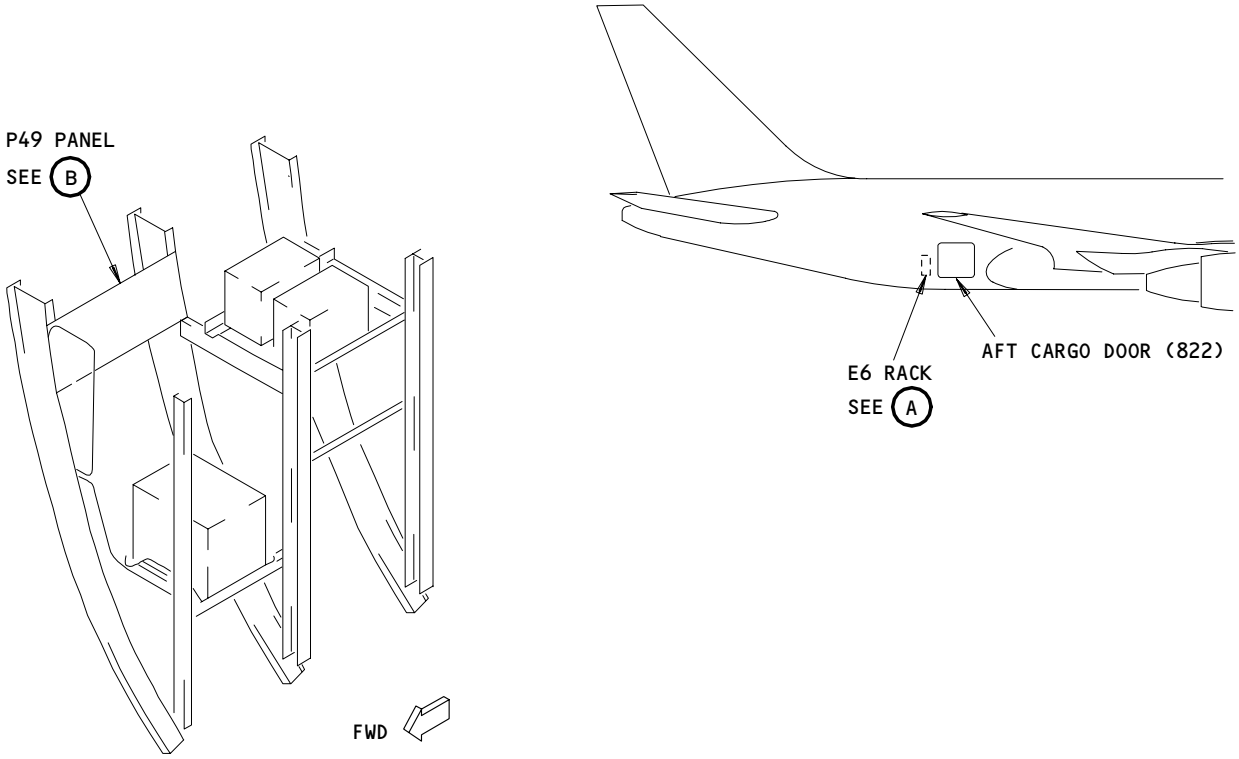
   B. Prepare for Removal

      S 864-002
      (1) Open this circuit breaker on the right generator power panel, P32, and attach a DO-NOT-CLOSE tag:
          (a) APU START TRU

      S 024-003
      (2) Do these steps to remove the APU TRU start relay:
          (a) Open the access cover on the forward side of the E6 equipment rack.
          (b) Identify the leads on the relay for installation.
          (c) Remove the leads from the relay.
          (d) Remove the four fasteners that hold the relay.
          (e) Remove the relay.

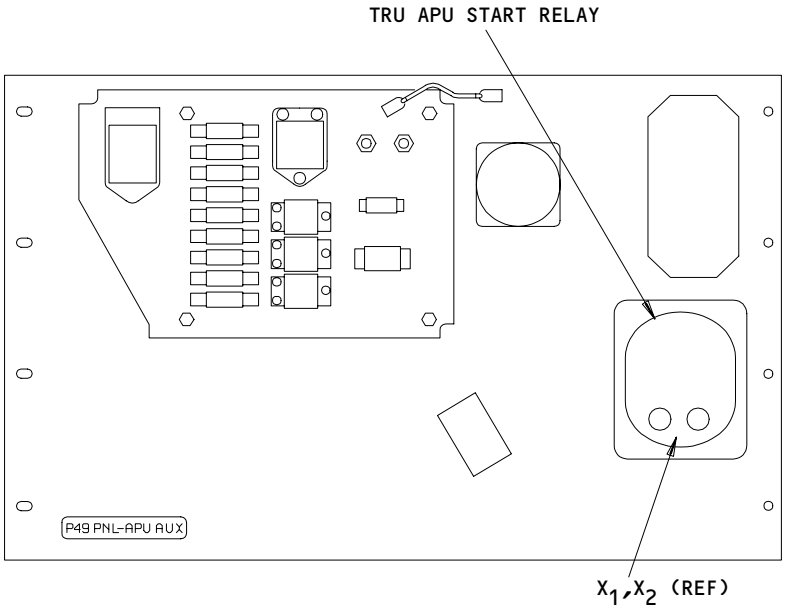
TASK 24-32-05-404-004

3. Install the TRU APU Start Relay (Fig. 401)
   A. References
      (1) 24-22-00/201, Electrical Power - Control



AFT EQUIPMENT CENTER RACK E6

A



P49 PANEL

B

TRU APU Start Relay Installation
Figure 401

664234

(2) 49-11-00/201, Auxilary Power Unit

B. Access

(1) Location Zones

154 Aft Cargo Compartment (Right)
211/212 Flight Compartment

(2) Access Panel

822 Aft Cargo Compartment Door

C. Install the APU TRU Start Relay

S 424-005

(1) Do these steps to install the relay:

(a) Put the relay in position so that the X1 and X2 terminals are down.

(b) Install the four screws that hold the relay.

CAUTION: MAKE SURE THE LEADS ARE INSTALLED CORRECTLY. THE APU TRU START SYSTEM WILL NOT OPERATE PROPERLY, AND DAMAGE TO EQUIPMENT CAN OCCUR, IF THE LEADS ARE NOT INSTALLED CORRECTLY.

(c) Connect the leads to the relay.

S 864-006

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the right generator power panel, P32:

(a) APU START TRU

D. Do a Test of the APU TRU Start Relay

S 864-008

(1) Supply electrical power (Ref 24-22-00).

S 864-009

(2) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:

(a) 11T35, TRU APU START

S 864-010
(3) Make sure this circuit breaker on the aft equipment center rack, E6, closed:
(a) TRU FAN

S 714-011
(4) Motor the APU (Ref 49-11-00).
(a) While the APU is motored, make sure the fan in the APU start TRU operates.

S 864-013
(5) Shutdown the APU (Ref 49-11-00).

S 414-012
(6) Close the access door on the forward side of the E6 equipment rack.

S 864-012
(7) Remove electrical power if it is not necessary (Ref 24-22-00).

APU START TRU FAN CONTROL RELAY - REMOVAL/INSTALLATION

1. General
   A. The APU start TRU fan control relay, K619, (referred to as the control relay) is on the APU auxilary panel, P49, in the aft equipment center.

TASK 24-32-06-004-001

2. Remove the APU Start TRU Fan Control Relay (Fig. 401)
   A. Access
      (1) Location Zone
          154 Aft Cargo Compartment (Right)

      (2) Access Panel
          822 Aft Cargo Compartment Door

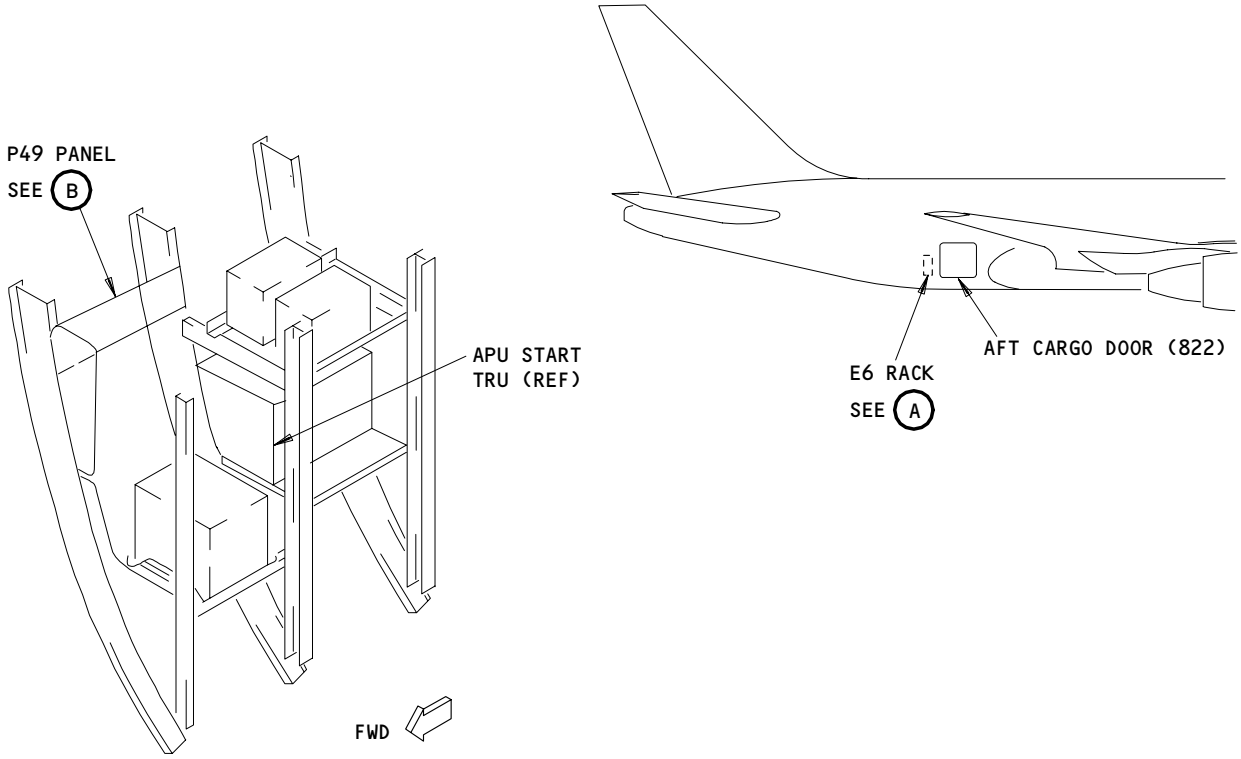
   B. Prepare for Removal

      S 864-002
      (1) Open this circuit breaker on the aft equipment center rack, E6, and attach a DO-NOT-CLOSE tag:
          (a) TRU FAN

      S 024-014
      (2) Do these steps to remove the control relay:
          (a) Open the access cover on the forward side of the E6 equipment rack.
          (b) Remove the control relay.

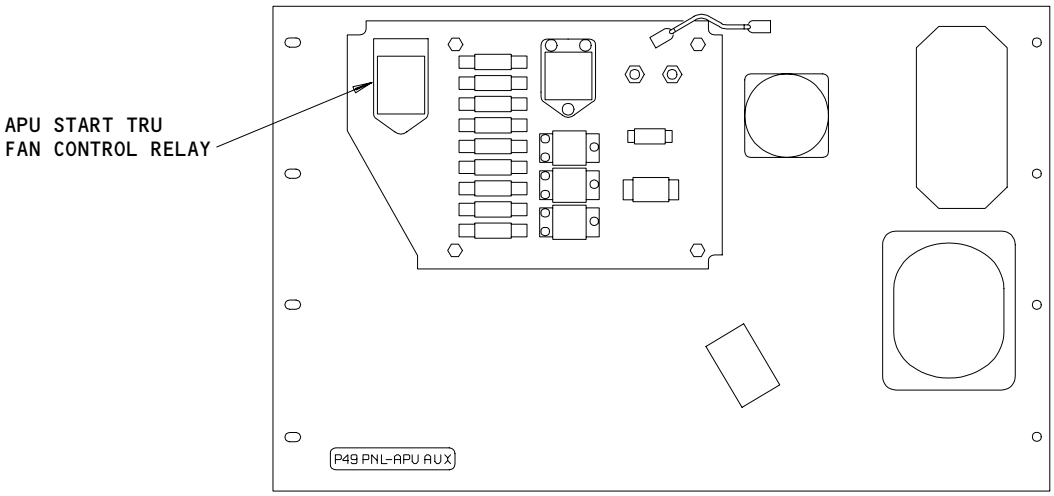
TASK 24-32-06-404-003

3. Install the APU Start TRU Fan Control Relay (Fig. 401)
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 49-11-00/201, Auxilary Power Unit
   B. Access
      (1) Location Zone
          154 Aft Cargo Compartment (Right)
          211/212 Flight Compartment



AFT EQUIPMENT CENTER RACK E6

A



P49 PANEL

B

APU Start TRU Fan Control Relay Installation
Figure 401

(2) Access Panel
822 Aft Cargo Compartment Door

C. Install the APU Start TRU Fan Control Relay

S 424-004
(1) Install the control relay.

S 864-005
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the aft equipment center rack, E6:
(a) TRU FAN

D. Do a Test of the APU Start TRU Fan Control Relay Installation

S 864-006
(1) Supply electrical power (Ref 24-22-00).

S 864-007
(2) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
(a) 11T35, TRU APU START

S 864-008
(3) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) APU START TRU

S 714-010
(4) Motor the APU (Ref 49-11-00).
(a) While the APU is motored, make sure the fan in the APU start TRU operates.

S 864-011
(5) Shutdown the APU (Ref 49-11-00).

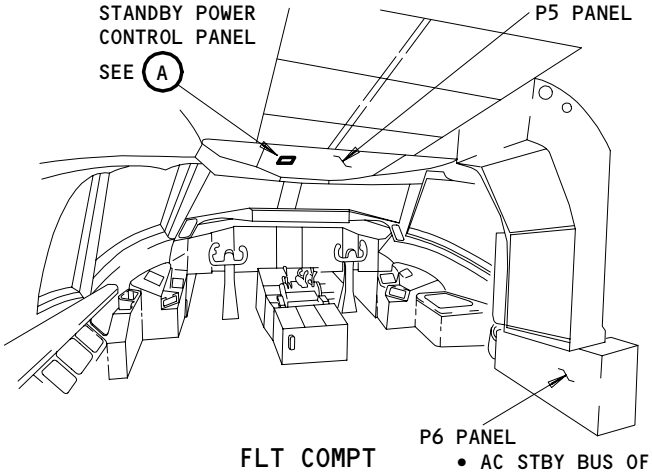
S 414-013
(6) Close the access cover on the forward side of the E6 equipment rack.

S 864-012

(7) Remove electrical power if it is not necessary (Ref 24-22-00).

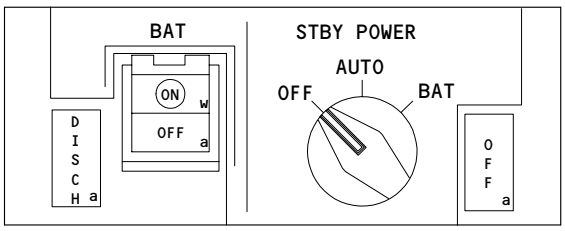
STANDBY POWER - DESCRIPTION AND OPERATION

1. General
   A. The standby power system supplies power to critical flight loads if main power is lost. System components include static inverter, standby power control panel, AC standby transfer relay, standby power relay, and standby bus off relays.
2. Component Details (Fig. 1)
   A. Static Inverter
      (1) The static inverter converts 28-volt DC power to nominal 115 volt, single phase, 400 Hz AC power. The inverter can supply rated power of 1 KVA continuously when forced air cooled. The inverter is located on shelf 2 of main equipment center rack E3 (E3-2).
   B. Standby Power Control Panel
      (1) The standby power control panel, M10062 is located on the pilots' overhead panel P5. The M10062 panel has switches to control the source of standby bus power. Lights on the M10062 panel monitor power on the standby buses and main battery charge status. The STBY POWER switch must be pushed in before the switch can be moved to OFF.
   C. AC Standby Power Relay
      (1) The AC standby power relay selects either the static inverter or the left main bus to power the AC standby bus. The relay is located in the main power distribution panel P6. The relay will automatically switch static inverter power to the AC standby bus when main bus voltage drops below 104 volts ac.
   D. Standby Power Relay
      (1) The standby power relay controls AC and DC power to the AC and DC standby buses. The standby power relay is in P6 panel.
   E. Main Battery Relay
      (1) The main battery relay, when energized, connects the main battery to the battery bus, standby bus and static inverter. The relay will be energized under any of the following conditions:
         (a) Left main DC bus voltage drops below 21.5 volts.
         (b) Airplane is in autoland mode.
         (c) STBY POWER switch is set to BAT position.

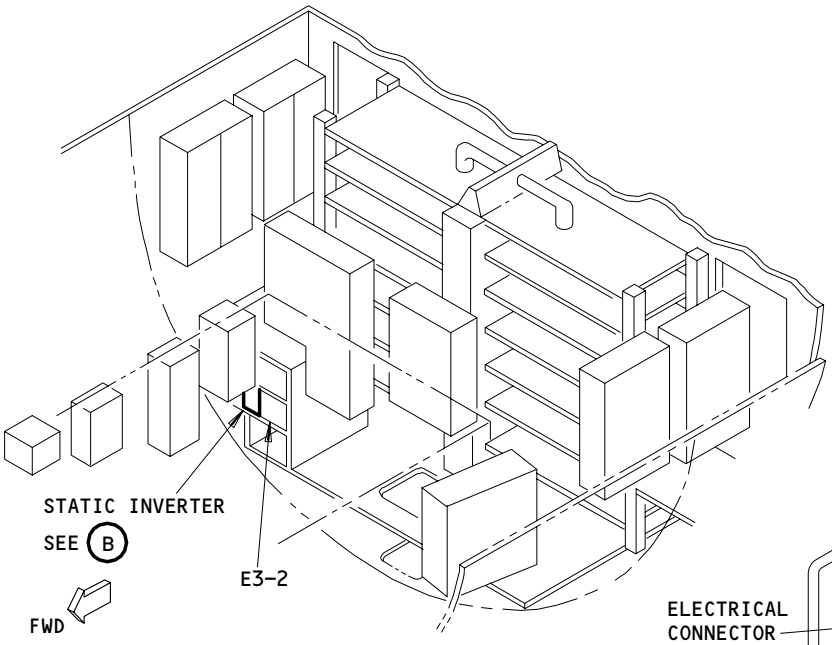


FLT COMPT

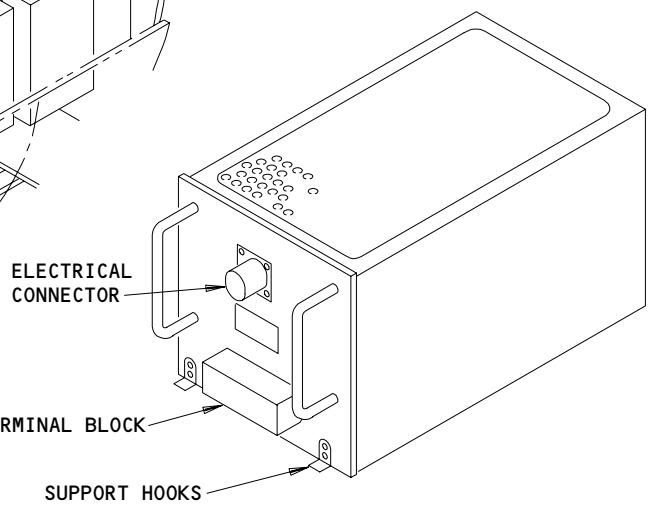
- AC STBY BUS OFF RELAY
- AC STBY POWER RELAY
- DC STBY BUS OFF RELAY
- MAIN BATTERY RELAY
- MAIN BATTERY XFER RELAY
- STBY POWER RELAY



STANDBY POWER CONTROL PANEL
A



MAIN EQUIP CTR



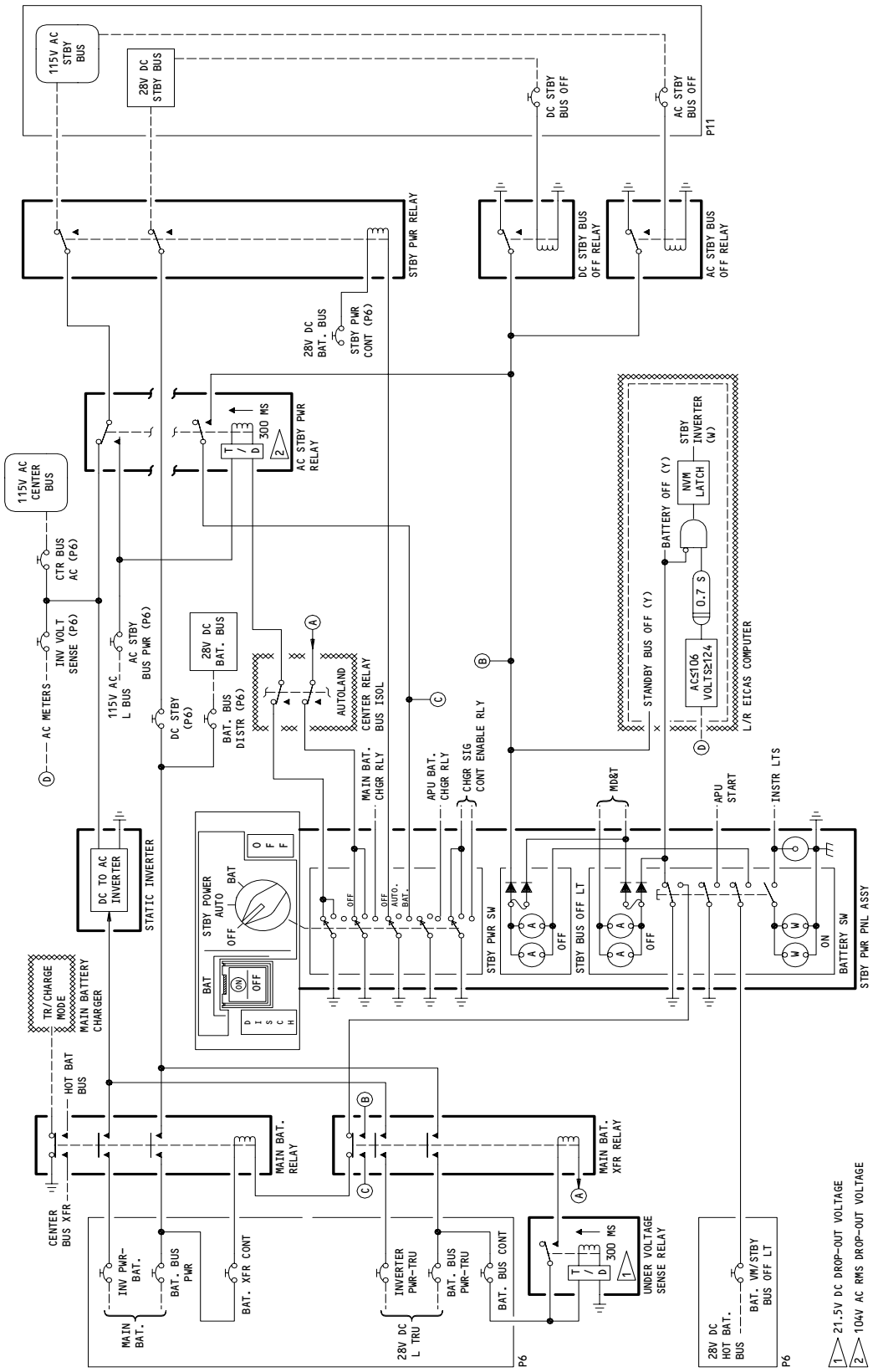
STATIC INVERTER
B

Standby Power Component Location
Figure 1

F. Main Battery Transfer Relay
(1) The main battery transfer relay, when energized, connects the left main DC bus to the battery bus, standby bus and static inverter. The relay is normally energized providing standby bus power from the main DC buses. The relay will de-energize under any of the following conditions:
(a) Left main DC bus voltage drops below 21.5 volts.
(b) Airplane is in autoland mode.
(c) STBY POWER switch is set to BAT position.

G. AC and DC Standby Bus Off Relays
(1) The AC and DC standby bus off relays provide an unlatched grounded output if bus power is lost. The relays are located in main power distribution panel P6.

3. Operation (Fig. 2)
A. Functional Description
(1) Normal operation occurs when the STBY POWER switch is set to AUTO at the standby power control panel. With the switch in this position, the standby power relay will be deenergized. Power for the standby buses comes from the left main AC and DC buses. The AC standby power relay is energized, sending power from the left AC bus through the standby power relay to the AC standby bus. The main battery transfer relay is energized, sending power from the left DC bus through the standby power relay to the DC standby bus. Power at the standby buses will energize the standby bus off relays. The energized bus off relays inhibit the standby bus off warnings on EICAS and the standby power control panel. The static inverter receives power from the left DC bus through the main battery transfer relay, but supplies no load.
(2) If the left main AC bus loses power or an autoland signal is received, the main battery transfer relay de-energizes. The main battery relay energizes, connecting the hot battery bus to the DC standby bus, through the standby power relay. The AC standby power relay is de-energized, connecting the static inverter to the AC standby bus.
(3) If only the left main DC bus loses power, the main battery transfer relay de-energizes. The main battery relay closes, supplying the DC standby bus from the hot battery bus. The AC standby bus is powered as normal.



Standby Power Schematic
Figure 2

(4) Turning the STBY POWER switch to BAT position causes the system to operate as would occur if the left main AC bus lost power. The charger signal control enable relay energizes, energizing the charger signal control relay. Contacts of the charger signal control relay latch closed, and ties the CHGR INOP message pin of EICAS to ground. This prevents a charger failure message from being displayed (AMM 24-31-00). Turning the switch to OFF or AUTO will de-energize the charger signal control enable relay, breaking the ground connection for the charger failure message. The message will be displayed unless the battery begins to charge. When the battery is charging, the battery charging signal detection relay will energize, unlatching the charger signal control relay. Contacts of the charger signal control relay will reconnect the main battery charger failure output pin to the CHGR INOP message pin.

(5) Turning the STBY POWER switch to OFF position removes power from the standby bus. The amber OFF light on the standby power control panel comes on. The EICAS computers show a STANDBY BUS OFF advisory message on the upper EICAS display.

(6) The standby buses will be off if the BAT switch on the standby power control panel is OFF and the main buses loses power. The standby buses will also be off if the BAT switch is OFF and an autoland signal is received.

(7) The standby bus OFF light will be on and the STANDBY BUS OFF message will be displayed under either of the following conditions:
   (a) Either standby bus is unpowered (regardless of STBY POWER switch setting).
   (b) Main battery transfer relay or AC standby power relay fails to switch when STBY POWER switch is set to BAT position.

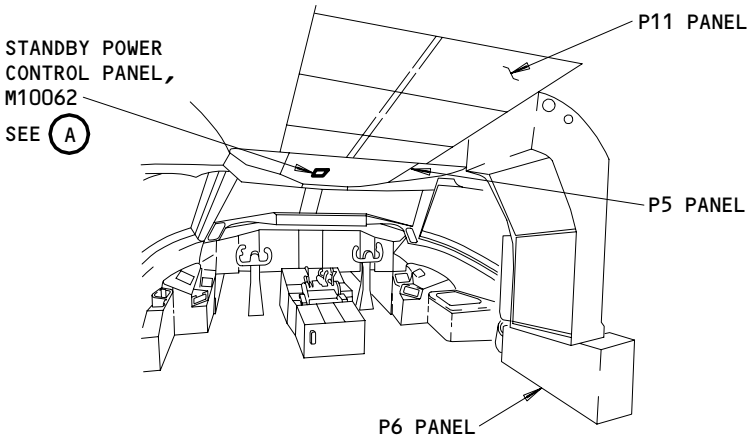
(8) EICAS computers monitor inverter output voltage and standby bus status.

STANDBY POWER

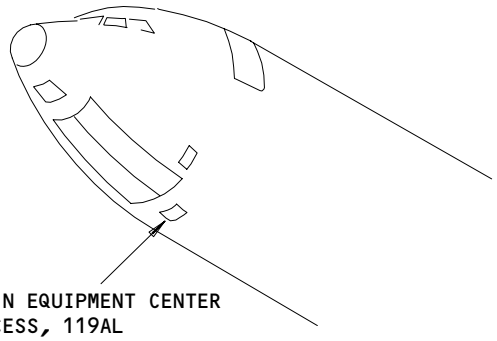
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKERS			FLIGHT COMPARTMENT, P6	
AC STBY BUS PWR, C874		1	6J17	*
BAT BUS CONT, C887		1	6C11	*
BAT BUS DISTR, C829		1	6A1	*
BAT BUS PWR, C898		1	6J11	*
BAT BUS PWR TRU, C886		1	6D12	*
BAT XFR CONT, C814		1	6D2	*
DC STBY, C872		1	6A2	*
INV PWR BAT, C813		1	6J12	*
INV PWR TRU, C885		1	6D11	*
INVERTER CENTER BUS AC, C875		1	6L15	*
INVERTER VOLT SENSE, C817		1	6L16	*
STBY PWR CONT, C828		1	6A5	*
STBY BUS OFF LT/BAT VM, C4217		1	6G6	*
CIRCUIT BREAKERS			FLIGHT COMPARTMENT, P11	
STANDBY BUS AC, C892		1	11D1	*
STANDBY BUS DC, C811		1	11D2	*
INVERTER - STATIC, M217		1	119AL, MAIN EQUIP CTR, E3-2	24-33-03
PANEL - STANDBY POWER CONTROL, M10062		1	FLIGHT COMPARTMENT, P5	24-33-04
RELAY - (FIM 31-01-06/101)				
AC STANDBY BUS OFF, K138				
AC STANDBY POWER, K105				24-33-01
CENTER BUS ISOL, K123				
DC STANDBY BUS OFF, K110				
MAIN BATTERY, K104				24-33-02
MAIN BATTERY TRANSFER, K106				24-33-02
STANDBY POWER, K109				24-33-01
UNDER VOLTAGE SENSE, K113				

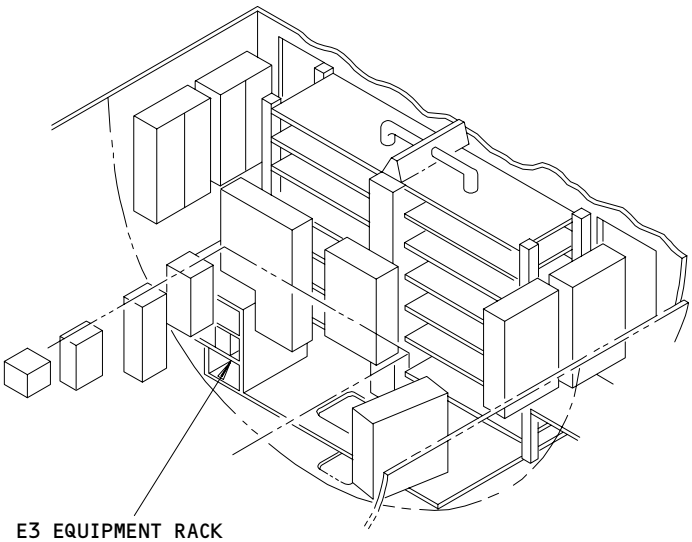
* SEE THE WDM EQUIPMENT LIST

Standby Power - Component Index
Figure 101

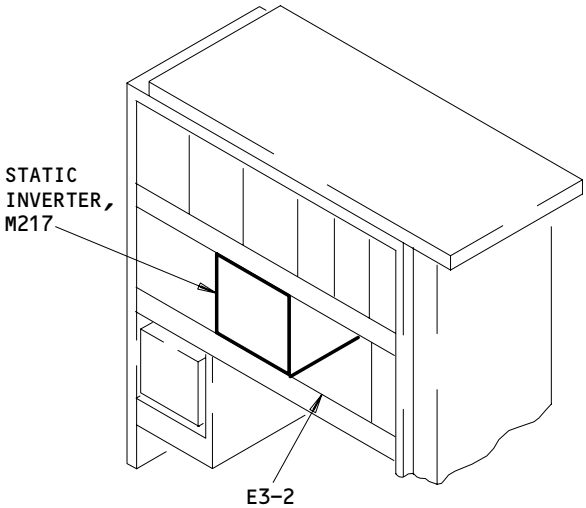


FLIGHT COMPARTMENT



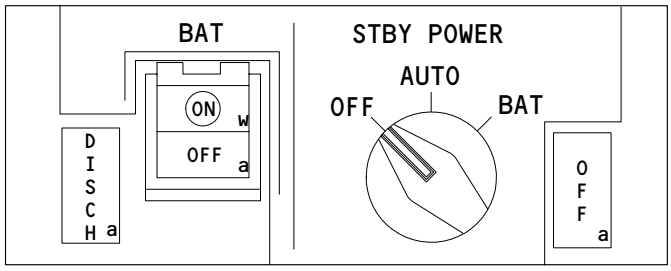


MAIN EQUIPMENT CENTER



E3 EQUIPMENT RACK

B



STANDBY POWER CONTROL PANEL, M10062

A

Standby Power - Component Location
Figure 102

STANDBY POWER - INSPECTION/CHECK

1. General
   A. This procedure contains three tasks. The first task is the Daily Standby Power Operational Test. The test makes sure that the system supplies 115 volt ac power to the ac standby bus from the static inverter.
   B. The second task is the operational test of the 115 volt AC standby power generation system. The test makes sure that the system supplies 115 volt ac power to the ac standby bus from both the left ac bus and the static inverter.
   C. The third task is the functional test to make sure that all components in the system operate correctly. The test includes a check of these components:
      (1) Main Static Inverter
      (2) Main Battery
      (3) AC Standby Power Relay
      (4) Standby Power Switch
      (5) All other related components

TASK 24-33-00-206-244

2. Daily Standby Power Operational Test (Short Test)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Procedure

      S 866-260
      (1) Supply electrical power (AMM 24-22-00/201).

      S 866-245
      (2) Make sure the BAT switch on the electrical power control panel (P5) is in the ON position.

      S 866-246
      (3) Make sure the STANDBY PWR switch on the electrical power control panel (P5) is in the AUTO position.

S 866-247
(4) Turn the STBY POWER switch on the P5 panel to the BAT position.

S 716-248
(5) Make sure the yellow DISCH light on the standby power control panel (P5) comes on.

S 866-252
(6) Make sure the yellow STBY BUS OFF light next to the STBY POWER switch (P5) is off.

S 866-259
(7) Turn the STBY POWER switch (P5) to the AUTO position.

S 716-254
(8) Make sure the yellow DISCH light on the standby power control panel (P5) goes off.

S 716-258
(9) Make sure the yellow STBY BUS OFF light next to the STBY POWER switch (P5) is off.

TASK 24-33-00-206-001

3. Operational Test - 115 volt AC Standby Power Generation (Long Test)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 31-41-00/201, EICAS - Maintenance Practices

B. Access
(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 866-016
(1) Supply electrical power (AMM 24-22-00/201).

S 866-017
(2) Make sure the BAT switch on the electrical power control panel is in the ON position.

S 866-018
(3) Make sure the STANDBY PWR switch on the electrical power control panel is in the AUTO position.

S 866-019
(4) Open INV PWR TRU (D11) circuit breaker on the main power distribution panel, P6.

S 716-173
(5) Make sure the yellow STBY BUS OFF light next to the STBY POWER switch is off.

S 716-021
(6) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.

S 716-050
(7) Make sure the EICAS message, STBY INVERTER, appears on the bottom EICAS display.

S 866-022
(8) Close the INV PWR TRU (D11) circuit breaker on the main power distribution panel, P6.

S 866-051
(9) Do the EICAS message erase procedure (AMM 31-41-00/201).

S 866-169
(10) Open the AC STBY BUS PWR (J17) circuit breaker on the main power distribution panel, P6.

S 716-170
(11) Make sure the yellow STBY BUS OFF light next to the STBY POWER switch is off.

S 716-171
(12) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.

S 866-172
(13) Close the AC STBY BUS PWR (J17) circuit breaker on the main power distribution panel, P6.

S 866-023
(14) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

S 716-024
(15) Make sure these values show below STBY/BAT on the bottom EICAS display:

AC-V	115 ±5
FREQ	400 ±5
DC-V	28 ±2

S 866-025
(16) Turn the STBY POWER switch to the BAT position.

S 716-026
(17) Make sure the yellow DISCH light on the standby power control panel comes on.

S 716-027

(18) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	25 ±2

S 866-028

(19) Turn the STBY POWER switch to the AUTO position.

S 716-029

(20) Make sure these values show below STBY/BAT on the bottom EICAS display:

NOTE: These values show that the main battery is in a charge cycle. A charge cycle of one to five minutes is usual, however, a fully discharged battery requires 75 minutes to charge.

DC-A DC-A	38 ±5 (BA06) 45 ±10 (BA35)
DC-V	33 ±4

S 716-030

(21) When the battery charge cycle is completed, make sure the DC-A value below STBY/BAT decreases suddenly (1-2 seconds) from 38 ±5 (BA06) or 45 ±10 (BA35) to 0 ±5.

NOTE: If the DC-A value decreases slowly, there is a failure in the main battery charger or its external circuit.

S 716-031

(22) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	28 ±2

S 866-032
(23) Push the STATUS switch on the EICAS display select panel on the forward electronics panel, P9.

S 716-033
(24) Make sure the EICAS message, MAIN BAT CHRG, does not show on the bottom display.

S 866-052
(25) Do the EICAS Maintenance Message Erase Procedure to erase any latched messages (AMM 31-41-00/201).

S 866-034
(26) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-33-00-706-035

4. Functional Test - 115 volt AC Standby Power Generation

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zones
211/212 Flight compartment

C. Procedure

S 866-003
(1) Supply electrical power (AMM 24-22-00/201).

S 866-004

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(2) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 866-005

(3) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
   (a) 6A1, BAT BUS DISTR
   (b) 6A2, DC STBY
   (c) 6A4, BAT CUR MON PWR
   (d) 6A5, STBY PWR CONT
   (e) 6C11, BAT BUS CONT
   (f) 6C18, L TRU
   (g) 6C24, R TRU
   (h) 6D1, BAT OVHT PROT
   (i) 6D2, BAT XFER CONT
   (j) 6D11, INV PWR TRU
   (k) 6D12, BAT BUS PWR TRU
   (l) 6G6, STBY BUS OFF LT/BAT VM
   (m) 6J9, MAIN BAT CHGR
   (n) 6J10, HOT BAT BUS
   (o) 6J11, BAT BUS PWR
   (p) 6J12, INV PWR BAT
   (q) 6J17, AC STBY BUS PWR
   (r) 6L16, INVERTER VOLT SENSE

S 866-006

(4) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 866-008

(5) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
   (a) 11D1, STANDBY BUS AC
   (b) 11D2, STANDBY BUS DC

S 866-009

(6) Make sure these circuit breakers on the forward miscellaneous electrical equipment panel, P33, are closed:
   (a) 33E2, BATTERY CHARGER MAIN

(b) 33E5, BATTERY CHARGER APU

S 866-010

(7) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

S 866-011

(8) Make sure these circuit breakers on the aft equipment center rack, E6, are closed:
(a) APU BAT OVHT PROT
(b) APU BAT DC VOLTS
(c) APU BAT CHGR
(d) APU BAT BUS

S 216-012

(9) Do a check of the standby power system as follows:
(a) Make sure the BAT switch on the P5 panel is in the ON position.
(b) Make sure the STBY POWER switch on the P5 panel is in the AUTO position.
(c) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(d) Make sure these values show below the STBY/BAT on the bottom EICAS display:

AC-V	115 ±5
FREQ	400 ±5
DC-V	28 ±2

(e) Make sure the yellow STBY BUS OFF light, next to the STBY POWER switch, is off.
(f) Turn the STBY POWER switch to the OFF position on the electrical power control panel.

(g) Make sure the yellow STANDBY BUS OFF light, next to the STBY POWER switch, comes on.
(h) Make sure the EICAS message, STANDBY BUS OFF, shows on the top EICAS display.
(i) Turn the STBY POWER switch to the AUTO position.
(j) Make sure the yellow OFF light, next to the STBY POWER switch, goes off.
(k) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.
(l) Open the AC STBY BUS PWR (J17) circuit breaker on the main power distribution panel, P6.
(m) Make sure the yellow STBY BUS OFF light, next to the STBY POWER switch, is off.
(n) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.
(o) Open the INV PWR TRU (D11) circuit breaker on the main power distribution panel, P6.
(p) Make sure the yellow STBY BUS OFF light, next to the STBY POWER switch, comes on.
(q) Make sure the EICAS message, STANDBY BUS OFF, shows on the top EICAS display.
(r) Turn the STBY POWER switch to the BAT position.
(s) Make sure the yellow STANDBY BUS OFF light, next to the STBY POWER switch, goes off.
(t) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.
(u) Open the INV PWR BAT (J12) circuit breaker on the main power distribution panel, P6.
(v) Make sure the yellow STANDBY BUS OFF light, next to the STBY POWER switch, comes on.
(w) Make sure the EICAS message, STANDBY BUS OFF, shows on the top EICAS display.
(x) Turn the STBY POWER switch to the AUTO position.
(y) Close the AC STBY BUS PWR (J17) circuit breaker on the main power distribution panel, P6.

(z) Make sure the yellow STANDBY BUS OFF light, next to the STBY POWER switch, goes off.
(aa) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.
(ab) Close the INV PWR TRU (D11) and INV PWR BAT (J12) circuit breakers on the main power distribution panel, P6.
(ac) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(ad) Make sure these values show below STBY/BAT on the bottom EICAS display:

AC-V	115 ±5
FREQ	400 ±5
DC-V	28 ±2

(ae) Make sure this value shows below APU/BAT on the bottom EICAS display:

DC-V	28 ±2

(af) Turn the STBY POWER switch to the BAT position.
(ag) Make sure the yellow DISCH light on the standby power control panel comes on.
(ah) Make sure the EICAS message, MAIN BAT DISCH, shows on the top display.
(ai) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	25 ±2

(aj) Turn the STBY POWER switch to the AUTO position.
(ak) Make sure the DISCH light goes off.
(al) Make sure these values show below STBY/BAT on the bottom EICAS display:

NOTE: These values show that the main battery is in a charge cycle. A charge cycle of one to five minutes is usual however, a fully discharged battery requires 75 minutes to charge.

DC-A DC-A	38 ±5 (BA06) 45 ±10 (BA35)
DC-V	33 ±4

(am) When the battery charge cycle is complete, make sure the DC-A value below STBY/BAT decreases suddenly (1-2 seconds) from 38 ±5 (BA06) or 45 ±10 (BA35) to 0 ±5.

NOTE: If the DC-A value decreases slowly, there is a failure in the main battery charger or its external circuit.

(an) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	28 ±2

(ao) Push the STATUS switch on the EICAS display select panel on the forward electronics panel, P9.
(ap) Make sure the EICAS message, MAIN BAT CHGR, does not show on the bottom display.

S 866-429
(10) Do the EICAS Maintenance Message Erase Procedure to erase any latched messages (AMM 31-41-00/201).

S 866-014
(11) Do the activation procedure for the spoilers (AMM 27-61-00/201) if you did the deactivation procedure.

S 866-013

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

STANDBY POWER RELAYS - REMOVAL/INSTALLATION

1. General
   A. The standby power relay, K109, and the ac standby power relay, K105, are in the main power distribution panel, P6.

TASK 24-33-01-004-004

2. Remove the Standby Power Relay (Fig. 401)
   A. References
      (1) 24-22-00/201, Electrical Power - Control
      (2) 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Prepare for the Removal

      S 044-001

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

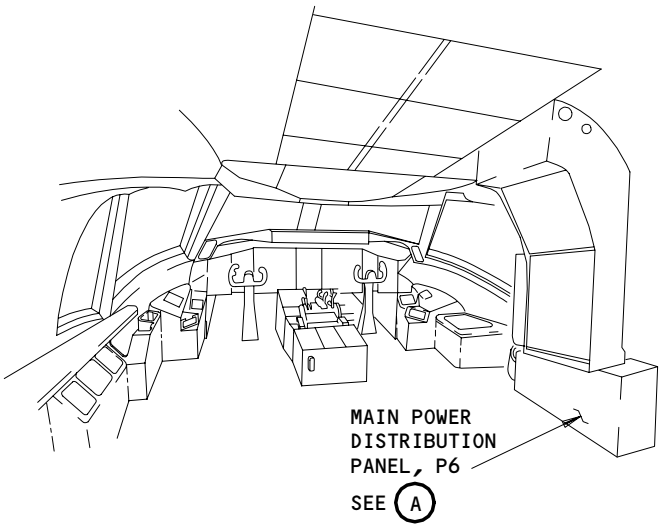
      (1) Do the deactivation procedure for the spoilers (Ref 27-61-00) or move all persons and equipment away from the spoilers.

      S 864-011

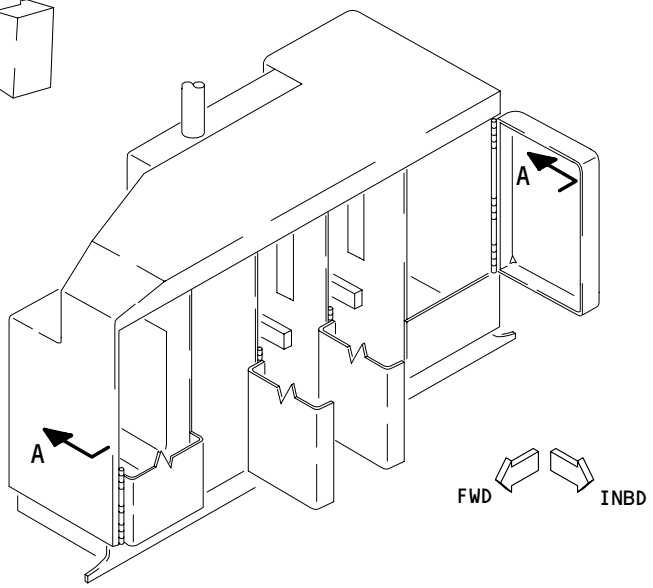
      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU DO WORK IN THE MAIN POWER DISTRIBUTION PANEL, P6. VOLTAGE LEVELS IN THE PANEL CAN CAUSE INJURY TO PERSONS.

      (2) Remove electrical power from the airplane (Ref 24-22-00).
   D. Remove the Standby Power Relays

      S 024-003
      (1) Do these steps to remove the standby power relay:
          (a) Open the main power distribution panel, P6.
          (b) Do these steps for the ac standby power relay:
              1) Remove the electrical connector from the ac standby power relay.

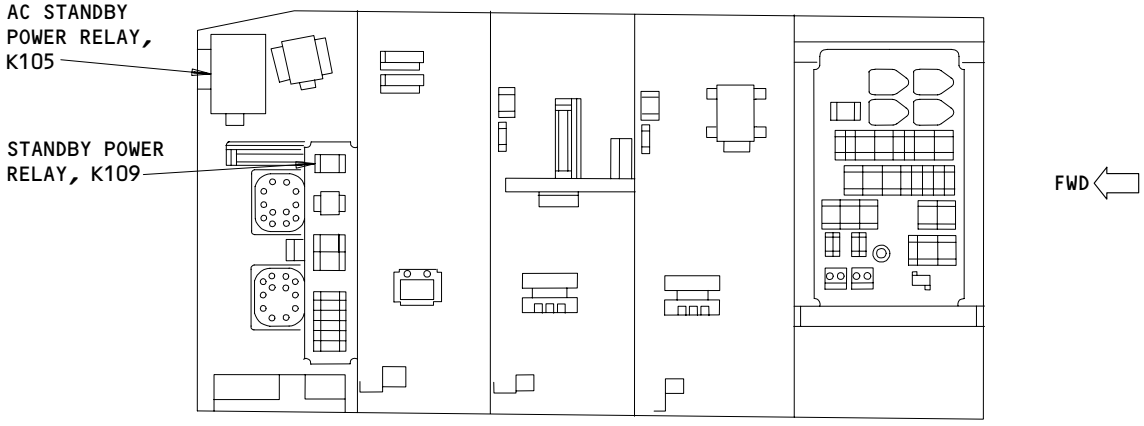


FLIGHT COMPARTMENT



MAIN POWER DISTRIBUTION PANEL, P6

(A)



A-A

Standby Power Relays Installation
Figure 401

2) Remove the screws that hold the ac standby power relay.

(c) Remove the applicable standby power relay.

TASK 24-33-01-404-005

3. Install the Standby Power Relay (Fig. 401)

A. References

(1) 24-22-00/201, Electrical Power - Control

(2) 27-61-00/201, Spoiler/Speedbrake Control System

B. Access

(1) Location Zones

211/212 Flight Compartment

C. Install the Standby Power Relay

S 424-006

(1) Do these steps to install the standby power relay:

(a) Install the applicable standby power relay.

(b) Do these steps for the ac standby power relay:

1) Install the screws that hold the ac standby power relay.

2) Connect the electrical connector to the relay.

(c) Close the main power distribution panel, P6.

D. Do a Test of the Standby Power Relay Installation

S 864-007

(1) Supply electrical power (Ref 24-22-00).

S 714-008

(2) Do a test of the standby power relay, as follows:

(a) Turn the STBY POWER switch, on the pilots' overhead panel P5, to the AUTO position.

(b) Make sure the OFF light that is adjacent to the STBY POWER switch is off.

(c) Turn the STBY POWER switch to the BAT position.

(d) Make sure the OFF light that is adjacent to the STBY POWER switch stays off.

(e) Turn the STBY POWER switch to the OFF position.
(f) Make sure the OFF light that is adjacent to the STBY POWER switch comes on.

S 444-009
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00).

S 864-010
(4) Remove electrical power if it is not necessary (Ref 24-22-00).

BATTERY AND BATTERY TRANSFER RELAYS - REMOVAL/INSTALLATION

1. General
   A. The main battery relay, K104, and the main battery transfer relay, K106, are in the main power distribution panel, P6.

TASK 24-33-02-004-001

2. Remove the Main Battery Relay or the Main Battery Transfer Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control.
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Prepare for the Removal

      S 044-002

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

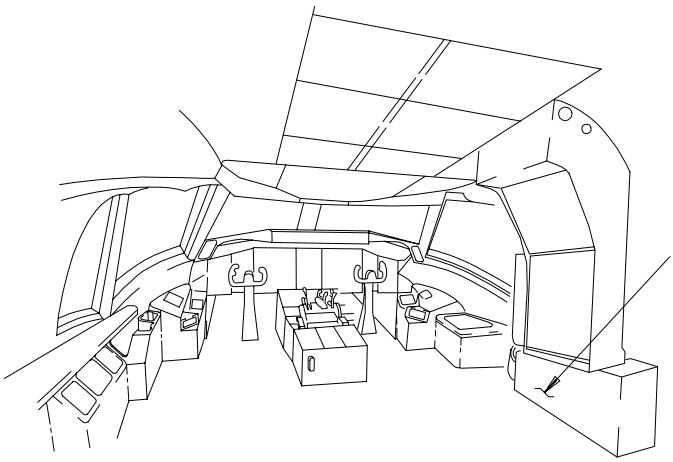
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-014

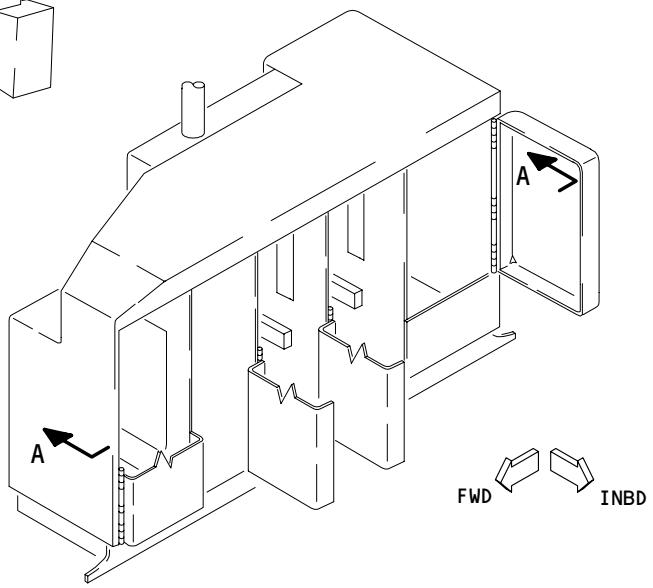
      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU DO WORK IN THE MAIN POWER DISTRIBUTION PANEL, P6. VOLTAGE LEVELS IN THE PANEL CAN CAUSE INJURY TO PERSONS.

      (2) Remove electrical power from the airplane (AMM 24-22-00/201).
   D. Remove the Relay

      S 864-008
      (1) Open these circuit breakers on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6J11, BAT BUS PWR
          (b) 6J12, INV PWR BAT

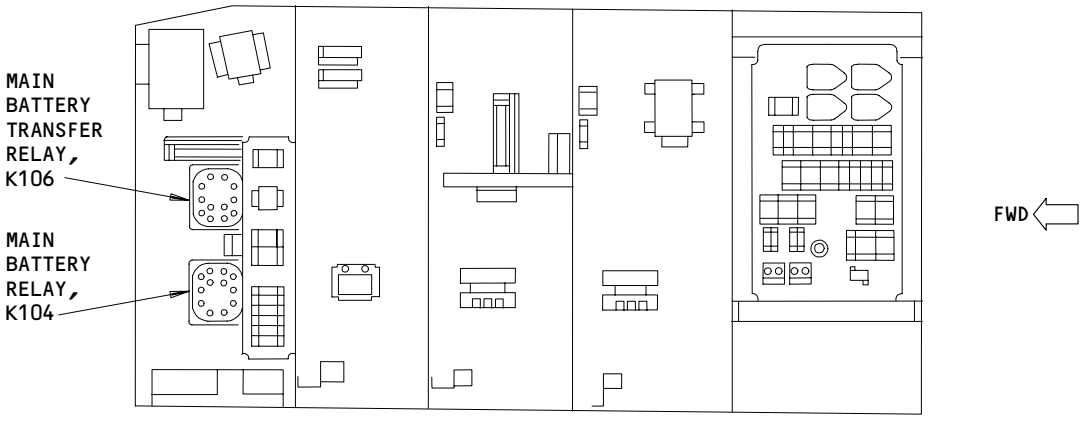


FLIGHT COMPARTMENT



MAIN POWER DISTRIBUTION PANEL, P6

(A)



A-A

Main Battery and Main Battery Transfer Relay Installation
Figure 401

(c) 6GO7, C BUS CONT

S 024-003

(2) Do these steps to remove the main battery relay or the main battery transfer relay:
(a) Open the main power distribution panel, P6.
(b) Identify the wires on the applicable relay for the installation.
(c) Remove the wires from the applicable relay.
(d) Remove the screws that hold the relay.
(e) Remove the relay.

TASK 24-33-02-404-005

3. Install the Main Battery Relay or the Main Battery Transfer Relay (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zones
211/212 Flight Compartment

C. Install the Relay

S 424-006

(1) Do these steps to install the relay:
(a) Put the relay in position in the main power distribution panel, P6.
(b) Install the screws that hold the relay.

CAUTION: MAKE SURE YOU CONNECT THE WIRES TO THE CORRECT TERMINALS ON THE RELAY. DAMAGE TO EQUIPMENT CAN OCCUR IF YOU DO NOT CONNECT THE WIRES CORRECTLY.

(c) Connect the wires to the relay.
(d) Close the main power distribution panel, P6.

S 864-007

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the main power distribution panel, P6:
(a) 6J11, BAT BUS PWR
(b) 6J12, INV PWR BAT
(c) 6GO7, C BUS CONT

D. Do a Test of the Relay Installation

S 864-009

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

S 714-010

(2) Do these steps at the standby power control panel on the pilots' overhead panel, P5:
   (a) Turn the STBY POWER switch to the AUTO position.
   (b) Make sure the OFF light that is adjacent to the STBY POWER switch is off.
   (c) Turn the STBY POWER switch to the BAT position.
   (d) Make sure the OFF light that is adjacent STBY POWER switch is off.
   (e) Turn the STBY POWER switch to the OFF position.
   (f) Make sure the OFF light that is adjacent to the STBY POWER switch comes on.

S 444-012

(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-013

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

STATIC INVERTER - REMOVAL/INSTALLATION

1. General
   A. The static inverter, M217 (referred to as the inverter) is on shelf 2 of the main equipment center rack, E3.

TASK 24-33-03-004-001

2. Remove the Static Inverter
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Sensitive Devices.
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center

      (2) Access Panels
          119AL Main Equipment Center Access

   C. Prepare for the Removal

      S 864-002
      (1) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
          (a) 6D11, INV PWR TRU
          (b) 6J12, INV PWR BAT
   D. Remove the Static Inverter

      S 034-003
      (1) Do these steps to disconnect the inverter:
          (a) Open the access cover on the E3 equipment rack.
          (b) Remove the electrical connector from the inverter.
          (c) Remove the terminal cover from the inverter.
          (d) Identify the wires on the terminals for the installation.
          (e) Remove the wires from the terminals.

      S 024-004

      CAUTION: DO NOT TOUCH THE STATIC INVERTER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STATIC INVERTER.

      (2) Remove the inverter (AMM 20-10-01/401).

TASK 24-33-03-404-005

3. Install the Static Inverter
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components

(2) AMM 20-41-01/201, Electrostatic Sensitive Devices
(3) AMM 24-22-00/201, Electrical Power - Control

B. Access

(1) Location Zones

119/120	Main Equipment Center
211/212	Flight Compartmnet

(2) Access Panel

119AL	Main Equipment Center Access

C. Install the Static Inverter

S 424-006

CAUTION: DO NOT TOUCH THE STATIC INVERTER BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE STATIC INVERTER.

(1) Install the inverter (AMM 20-10-01/401).

S 434-007

(2) Do these steps to connect the inverter:
(a) Connect the wires to the terminals.
(b) Install the plain washer to the terminal.
(c) If you use the plain nut, you must use a lock washer under the plain nut.
1) Install the plain nut and lock washer to the terminal.
(d) If you use the self-locking nut, install the self-locking nut to the terminal.
(e) Tighten the nut on the + (positive) terminal of the static inverter to 140 +/- 5 inch-pounds.
(f) Tighten the nut on the - (negative) terminal of the static inverter to 70 +/- 5 inch-pounds.
(g) Install the terminal cover on the terminals.
(h) Connect the electrical connector to the inverter.
(i) Close the access cover on the E3 equipment rack.

S 864-008

(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the main power distribution panel, P6:
(a) 6D11, INV PWR TRU

(b) 6J12, INV PWR BAT

D. Do a Test of the Inverter Installation

S 864-009

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

S 864-010

(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-012

(3) Do a test of the inverter, as follows:

(a) Push the BAT switch on the pilots' overhead panel, P5, to the ON position.

(b) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the BAT position.

(c) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(d) Make sure these values show below STBY/BAT on the bottom EICAS display:

AC-V	115 ±5
FREQ	400 ±5

(e) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the AUTO position.

(f) Push the BAT switch on the pilots' overhead panel, P5, to the OFF position.

S 864-013

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

STANDBY POWER CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. The standby power control panel, M10062 (referred to as the control panel) is on the pilots' overhead panel, P5.

TASK 24-33-04-004-001

2. Remove the Standby Power Control Panel
   A. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment

   C. Remove the Standby Power Control Panel

S 864-002

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 864-003

(2) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
   (a) 6A5, STBY PWR CONT
   (b) 6C11, BAT BUS CONT
   (c) 6D1, BAT OVHT PROT
   (d) 6D2, BAT XFER CONT
   (e) 6G6, STBY BUS OFF LT/BAT VM
   (f) 6J17, AC STBY BUS PWR

S 864-004

(3) Open this circuit breaker on the aft equipment center rack, E6, and attach a DO-NOT-CLOSE tag:
   (a) APU BAT OVHT PROT

S 024-005

(4) Remove the control panel.

TASK 24-33-04-404-006

3. Install the Standby Power Control Panel
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access

(1) Location Zones

211/212 Flight Compartment

C. Install the Standby Power Control Panel

S 424-007

(1) Install the control panel.

S 864-008

(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the main power distribution panel, P6:
(a) 6A5, STBY PWR CONT
(b) 6C11, BAT BUS CONT
(c) 6D1, BAT OVHT PROT
(d) 6D2, BAT XFER CONT
(e) 6G6, STBY BUS OFF LT BAT VM
(f) 6J17, AC STBY BUS PWR

S 864-009

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the aft equipment center rack, E6:
(a) APU BAT OVHT PROT

D. Do a Test of the Control Panel Installation

S 864-010

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

S 864-012

(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11A33, IND LIGHTS 1
(b) 11P3, INSTRUMENT & PANEL OVHD

S 714-013

(3) Do a test of the control panel, as follows:
(a) Push the BAT switch on the pilots' overhead panel, P5, to the ON position.
(b) Make sure the white ON light in the BAT switch comes on.
(c) Push the BAT switch to the OFF position.
(d) Make sure the yellow OFF light in the BAT switch comes on.

S 864-014

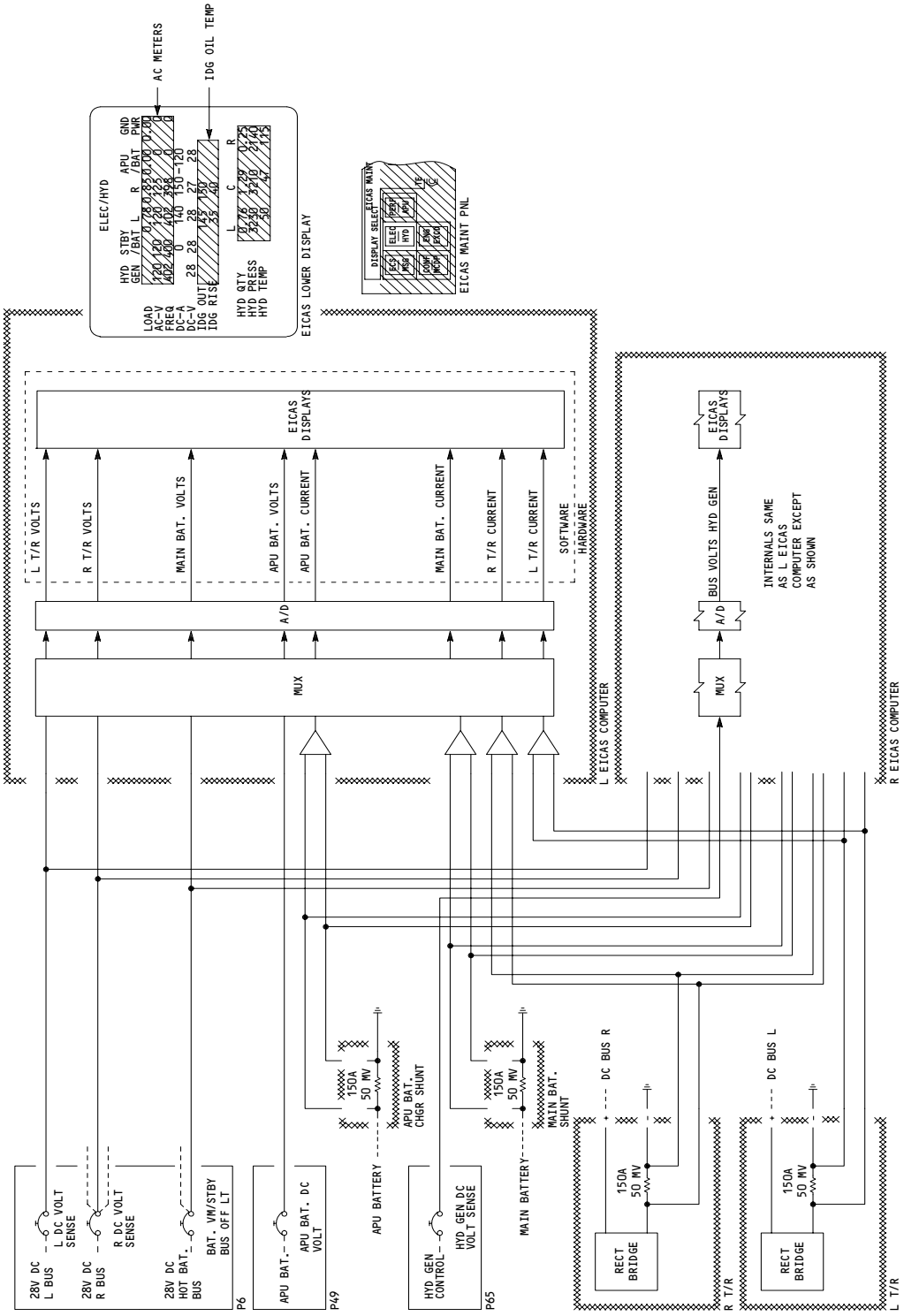
(4) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-015

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

DC METERS - DESCRIPTION AND OPERATION

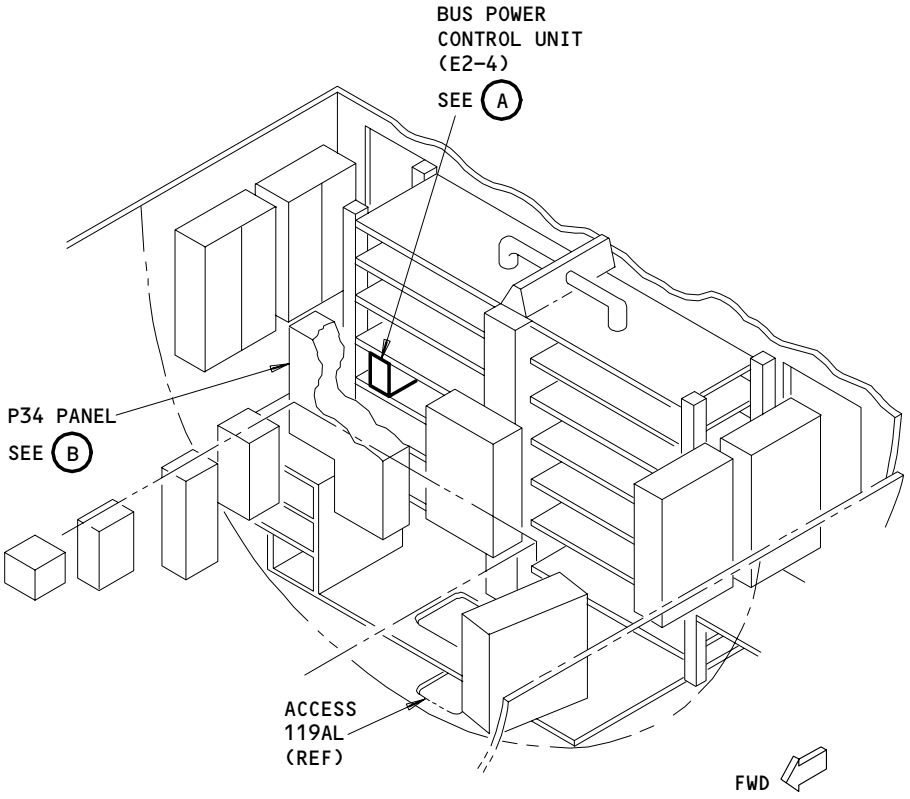
1. General
   A. EICAS computers measure the current and voltage levels on the DC buses (Ref 31-41-00). These measurements are shown on the ELEC/HYD page on the lower EICAS display.
2. Operation (Fig. 1)
   A. Functional Description
      (1) EICAS computers measure the output voltages of the main and APU batteries, and the left and right transformer - rectifier units (TRU's).
      (2) The main battery has an external shunt installed in the ground lead. A voltage proportional to main battery current is measured by the EICAS computers.
      (3) The APU battery charger has an external shunt installed in the output ground lead. A voltage proportional to APU battery charging current is measured by the EICAS computers.
      (4) Each TRU has an internal shunt installed in the output ground lead. A voltage proportional to TRU current is measured by the EICAS computers.
      (5) DC output voltage of the hydraulic motor driven generator is measured at the HYD GEN DC VOLT SENSE circuit breaker on the hydraulic generator power panel P65.



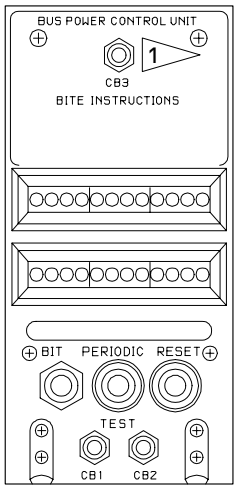
DC Meters Schematic
Figure 1

AC EXTERNAL POWER - DESCRIPTION AND OPERATION

1. General
   A. AC external power can be used on the ground to supply the main AC buses, the ground handling bus, and ground service bus. System components include bus power control unit, external power panel, external power receptacle, external power contactor, and ground power current transformer.
2. Component Details (Fig. 1)
   A. Bus Power Control Unit
      (1) The bus power control unit (BPCU) monitors the external power system. Protection circuits in the BPCU isolate faults and disconnect poor quality power from the airplanes electrical buses. The BPCU shares status information with the generator control units. The BPCU controls all electrical buses, and controls load shedding. The BPCU is located on shelf 4 of main equipment center rack E2 (E2-4).
   B. External Power Panel
      (1) The external power panel P30 is located on the lower right side of the fuselage, aft of the nose gear wheel well. The panel contains the external power receptacle, a white CONNECTED light, and a white NOT IN USE light.
   C. External Power Receptacle
      (1) The external power receptacle (EPR) connects 115-volt, 3-phase, 400-Hz AC power to the airplane's electrical system. The receptacle has six pins. Four pins are used to transfer the AC power, and two complete a DC interlock with the BPCU. The external power receptacle is located in the P30 panel.
   D. External Power Contactor
      (1) The external power contactor (EPC) is an electrically held, 115-volt, 3-phase, 400-Hz unit. When energized, the EPC connects external power to the AC tie bus. The EPC is energized by the BPCU, from a flight compartment switch command. Twenty-eight volts DC energize the contactor. The EPC is rated to operate continuously with a current of 275 amps/phase. Protective functions in the BPCU can de-energize the EPC automatically.
      (2) Six terminal studs connect external power to the EPC. Control is provided by a separate electrical connector. The EPC is in APU/external power panel P34.
   E. Ground Power Current Transformer
      (1) The ground power current transformer (GPCT) senses current flow in each of the external power feeders. The external power current is monitored by the BPCU. The GPCT is located in P34 panel.



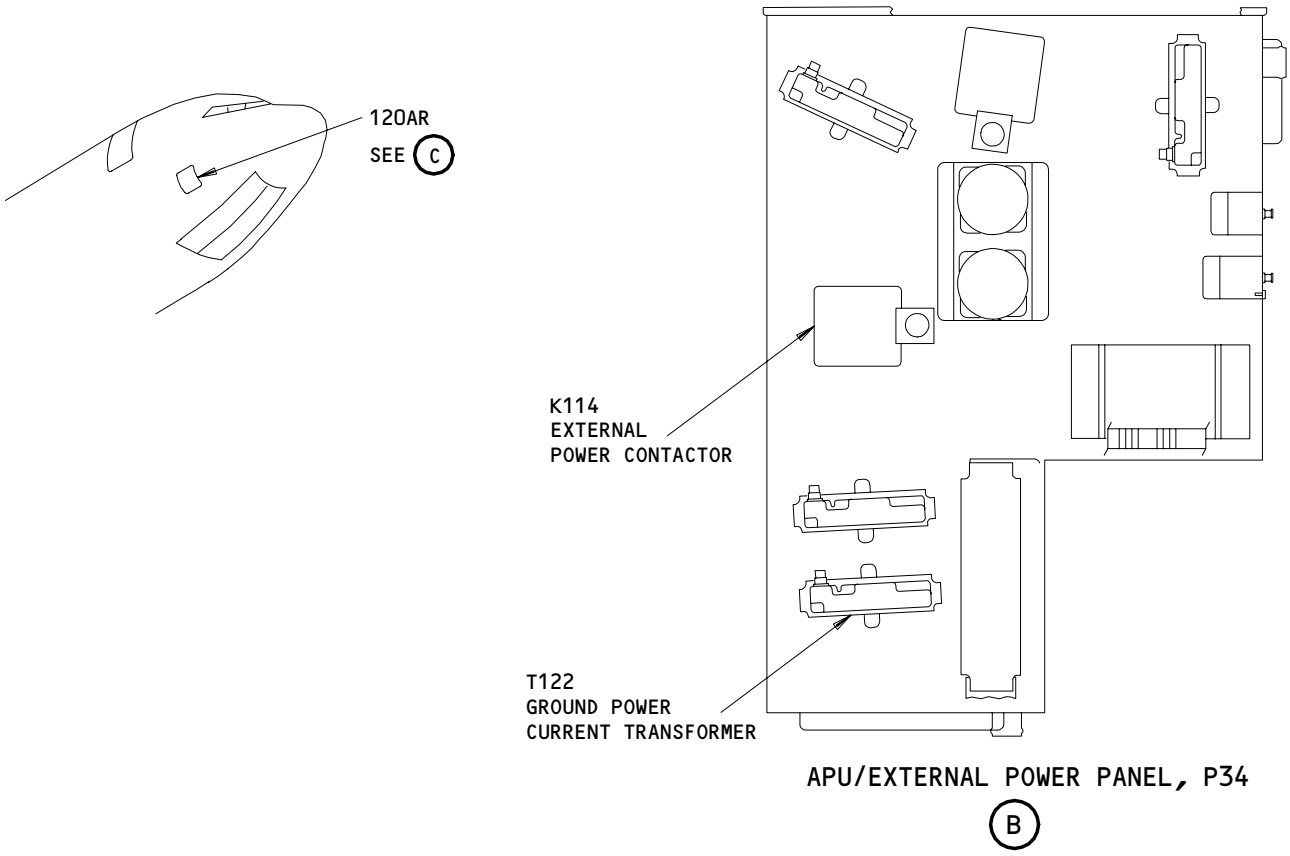
MAIN EQUIPMENT CENTER



BUS POWER CONTROL UNIT
A

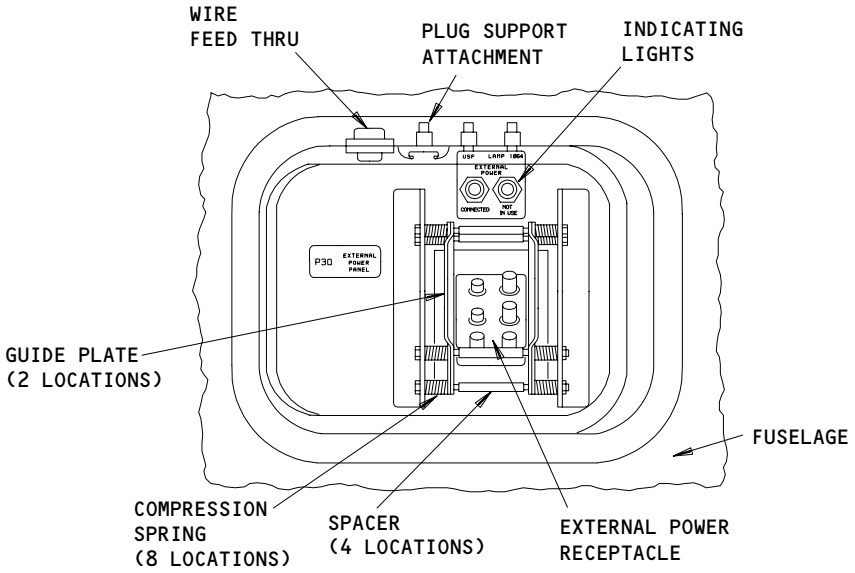
1 AIRPLANES WITH S281T001-40 TO S281T001-99 BPCU

AC External Power - Component Location
Figure 1 (Sheet 1)



APU/EXTERNAL POWER PANEL, P34

B

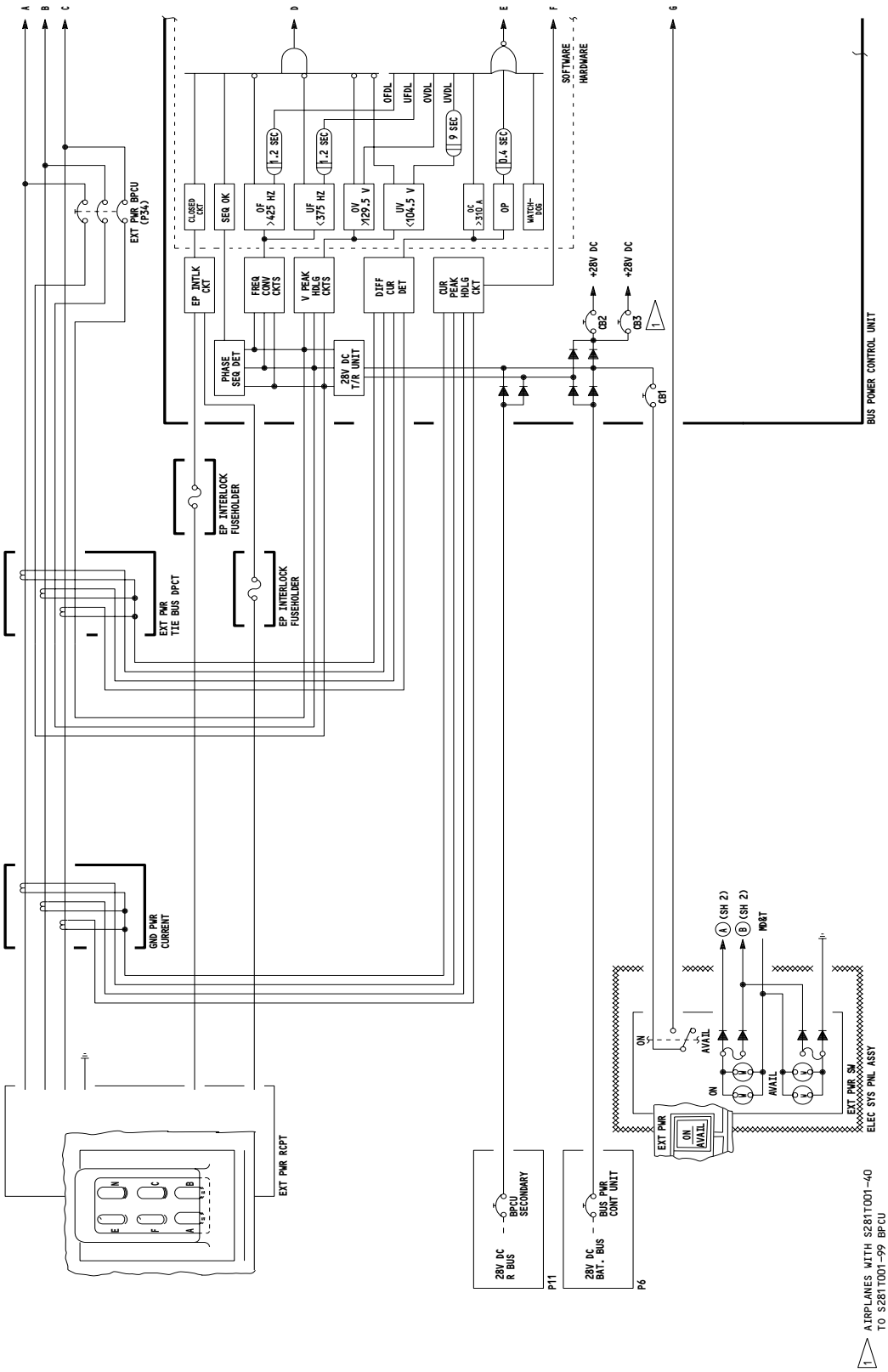


EXTERNAL POWER PANEL, P30

C

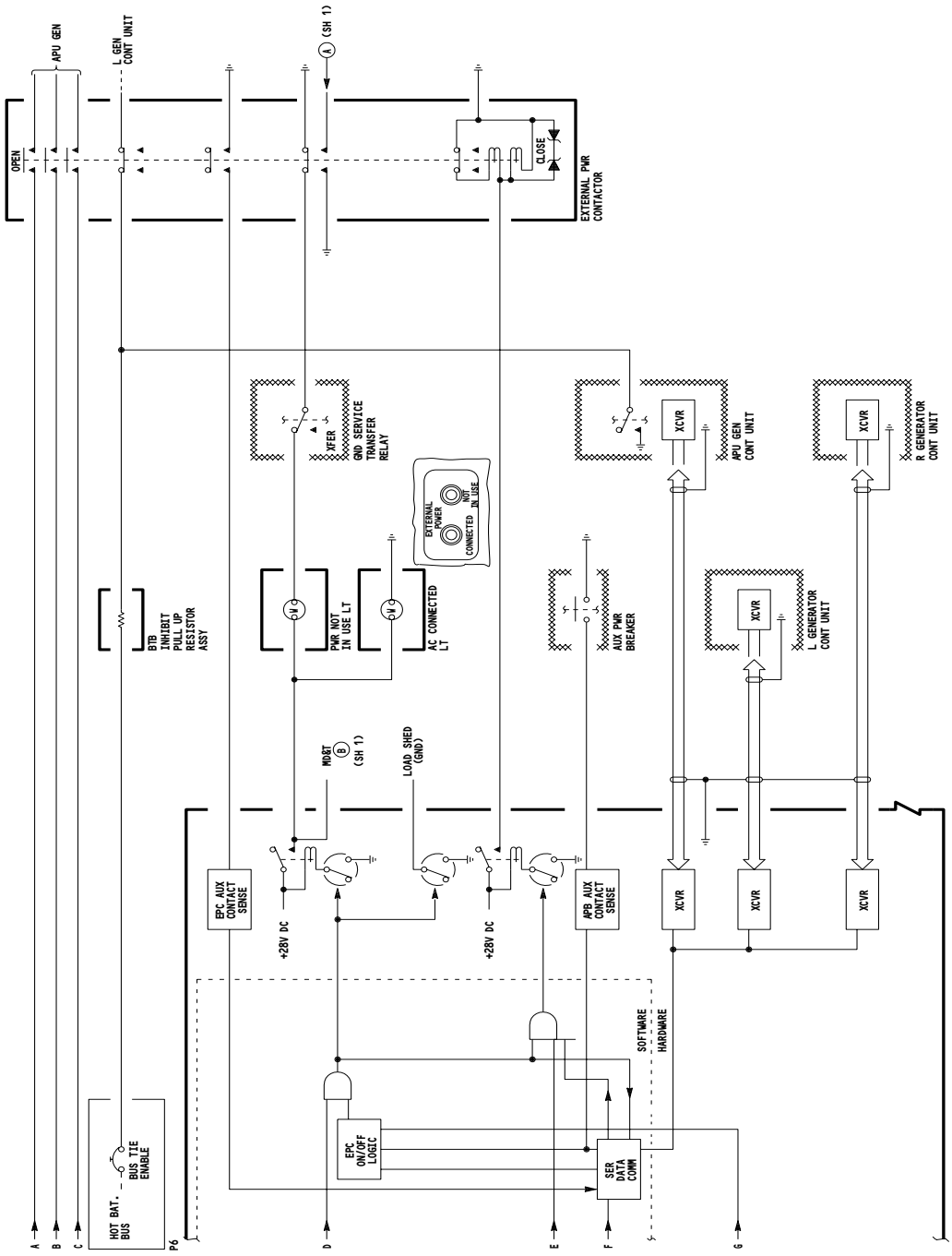
AC External Power - Component Location
Figure 1 (Sheet 2)

3. Operation (Fig. 2)
   A. Functional Description
      (1) When external power is connected to the EPR the red EXT PWR HOT BUS warning light (P34) comes on. The DC interlock circuit to the BPCU is completed, and the BPCU checks external power quality. If external power voltage, frequency and phase sequence are correct, the white CONNECTED light (P30) will come on. The white EXT PWR AVAIL light on the electrical system control panel will also come on. If external power is not selected, the white NOT IN USE light (P30) will be on.
      (2) The AC external power system is controlled by the momentary action EXT PWR switch on the electrical system control panel. Pressing the switch once turns on the system. The BPCU causes the auxiliary power breaker and generator circuit breakers to open, if previously closed. The BPCU energizes the EPC. The EXT PWR AVAIL and ON lights on the electrical system control panel will be on. The CONNECTED light (P30) will be on. The NOT IN USE light (P30) will be off. Pressing the EXT PWR switch again removes external power.
      (3) If the engines are started, the EPC will open when engine speed is sufficient to produce correct quality power. The generator circuit breakers close, providing power from the main generators. Pressing the EXT PWR switch will switch external power to the buses.
      (4) If external power current exceeds 330 ±70 amps/phase, the BPCU will disconnect external power.



External Power Schematic
Figure 2 (Sheet 1)

63224



External Power Schematic
Figure 2 (Sheet 2)

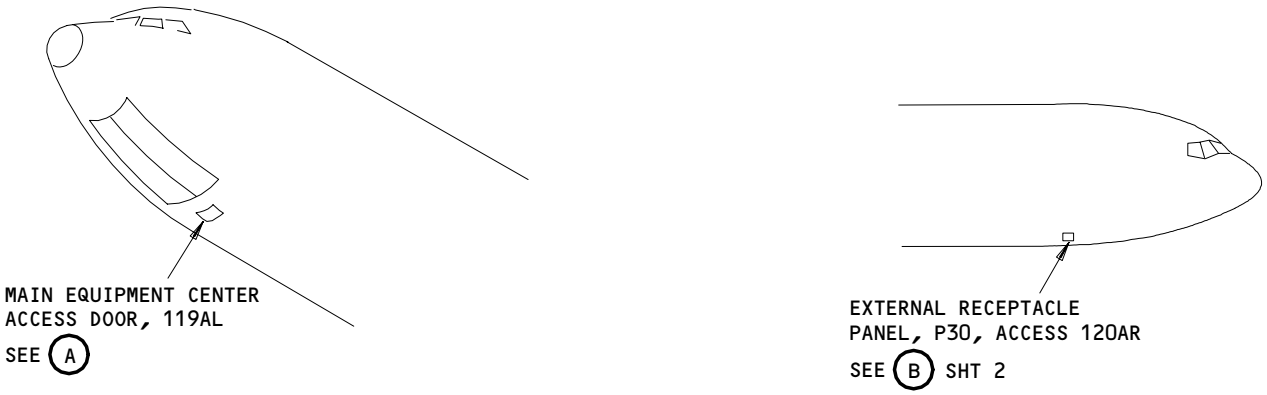
10A356

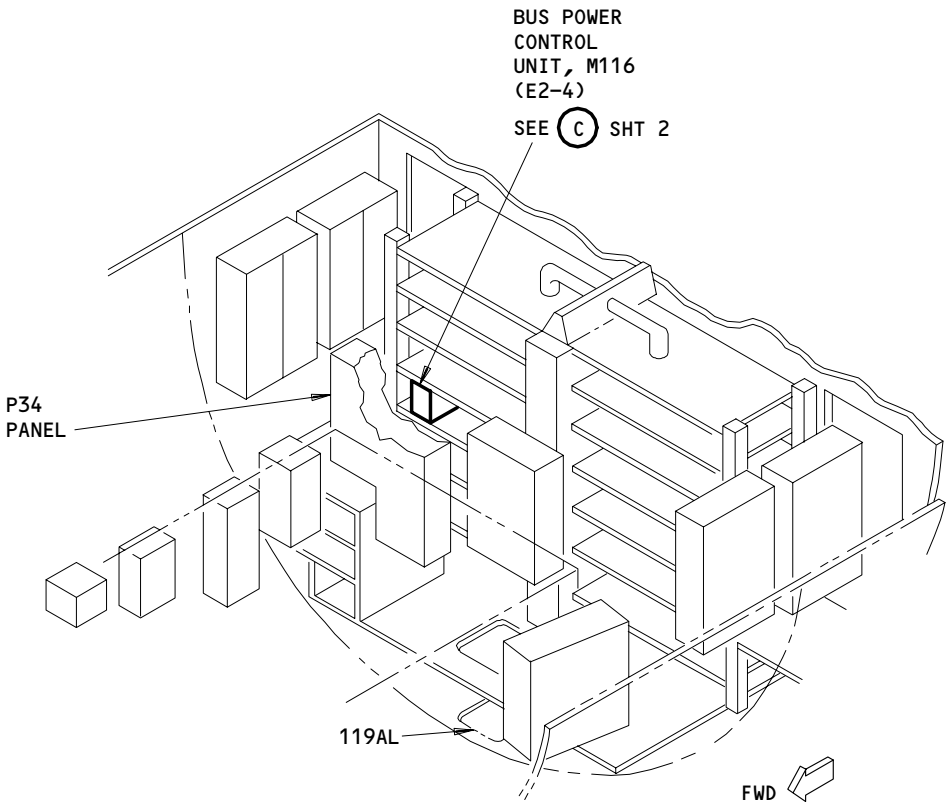
EXTERNAL POWER

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
BREAKER - (REF 31-01-34, FIG. 101)				
AUXILIARY POWER, C905				
CIRCUIT BREAKERS			FLT COMPT, P6	
BUS PWR CONT UNIT, C809		1	6B4	*
BUS TIE ENABLE, C800		1	6C4	*
CIRCUIT BREAKER			FLT COMPT, P11	
MISC BPCU SEC, C803		1	11T32	*
CIRCUIT BREAKER			119AL, MAIN EQUIP CTR, P34	
EXT PWR BPCU, C320		1	34M6	*
CONTACTOR - (REF 31-01-34, FIG. 101)				24-41-01
EXTERNAL POWER, K114				
LIGHT - CONNECTED, L82	2	1	120AR, P30	*
LIGHT - EXTERNAL POWER HOT BUS, L81		1	119AL, P34	*
LIGHT - NOT IN USE, L83	2	1	120AR, P30	*
PANEL - (REF 24-22-00, FIG. 101)				
ELECTRICAL SYSTEM CONTROL, M10063				
RECEPTACLE - EXTERNAL POWER, D372	2	1	120AR, P30	24-41-02
RELAY - (REF 31-01-32, FIG. 101)				
GROUND SERVICE TRANSFER, K102				
TRANSFORMER - (REF 24-23-00, FIG. 101)				
DIFFERENTIAL PROTECTION CURRENT EXT PWR				
TIE BUS, T116				
TRANSFORMER - (REF 31-01-34, FIG. 101)				
GROUND POWER CURRENT, T122				
UNIT, BUS POWER CONTROL, M116	2	1	119AL, MAIN EQUIP CTR, E2-4	24-41-03
UNIT - (REF 24-22-00, FIG. 101)				
APU GENERATOR CONTROL, M143				

* SEE THE WDM EQUIPMENT LIST

External Power - Component Index
Figure 101

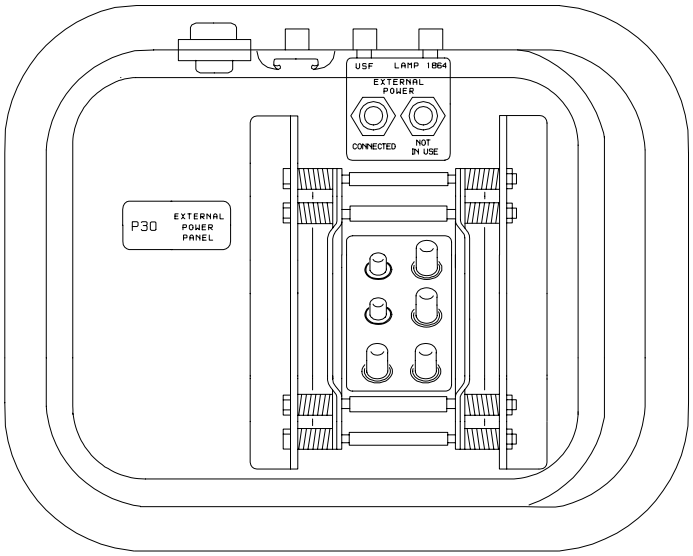




MAIN EQUIPMENT CENTER

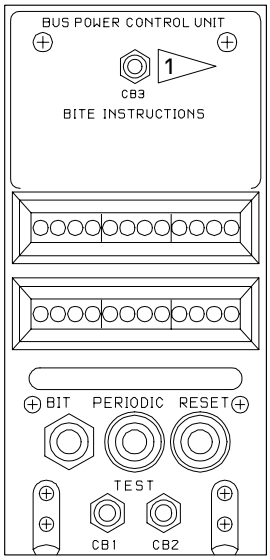
(A)

External Power - Component Location
Figure 102 (Sheet 1)



EXTERNAL RECEPTACLE PANEL, P30

B



BUS POWER CONTROL UNIT, M116

C

1 AIRPLANES WITH S281T001-40 TO S281T001-99 BPCU

External Power - Component Location (Details from Sht 1)
Figure 102 (Sheet 2)

EXTERNAL POWER - ADJUSTMENT/TEST

1. General
   A. This procedure is an operational test of the external power system. This test uses the indicator lights for the external power system and EICAS.

TASK 24-41-00-705-010

2. Operational Test - External Power System
   A. Equipment
      (1) Cart, Ground Power - 115/200 ±5 volts AC, 400 ±20 Hz, 3-phase, ABC rotation, 90 KVA power capability.
      (2) A24007-1, Support - Cable, Electrical Ground Power.
   B. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   C. Access
      (1) Loaction Zones

124	Area Below Forward Cargo Compartment (Right)
211/212	Flight Compartment

   D. Prepare for the Opreational Test

S 045-001

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

S 865-002

(2) Make sure these circuit breakers on the main power distribution panel, P6, are closed:
   (a) 6B4, BUS PWR CONT UNIT
   (b) 6C4, BUS TIE ENABLE

S 865-003

(3) Make sure this circuit breaker on the overhead circuit breaker panel, P11, is closed:
   (a) 11T32, BPCU SEC

S 865-006
(4) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 865-004
(5) Make sure this circuit breaker on the right generator power panel, P32, is closed:
(a) R GEN GND SVCE BUS

S 865-005
(6) Make sure this circuit breaker on the APU/external power panel, P34, is closed:
(a) 34M6, EXT PWR BPCU

E. Do an Operational Test of the External Power System

S 865-015
(1) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the AUTO position.

S 865-008
(2) Push the BAT switch on the pilots' overhead panel, P5, to the ON position.

S 715-011
(3) Do these steps to do an operational test of the external power system:
(a) Open the access cover for the external power panel, P30.

WARNING: REMOVE ELECTRICAL POWER FROM THE POWER CABLE BEFORE YOU CONNECT THE CABLE TO THE AIRPLANE. AN ELECTRICAL ARC CAN OCCUR WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(b) Connect the power cable to the external power receptacle.

(c) Hold the power cable with the cable support, A24007-1.
(d) Supply electrical power to the external power cable.
(e) Make sure the CONNECTED and NOT IN USE lights on the external power panel, P30, come on.
(f) Do these steps at the electrical system control panel on the pilots' overhead panel, P5:
    1) Make sure the AVAIL light in the EXT PWR switch is on.
    2) Push the EXT PWR switch.
    3) Make sure the AVAIL and ON lights in the EXT PWR switch are on.
(g) Make sure the NOT IN USE light on the external power panel, P30, is off.
(h) Make sure the CONNECTED light on the external power panel, P30, is on.
(i) Push the two BUS TIE switches on the electrical system control panel to the AUTO position.
(j) Make sure the AUTO light in each BUS TIE switch comes on.
(k) Make sure the left and right BUS OFF lights on the electrical system control panel are off.
(l) Make sure these HOT BUS WARNING lights are on:
    1) The AC TIE BUS and L 115 AC lights on the left generator power panel, P31.
    2) The AC TIE BUS and R 115 AC lights on the right generator power panel, P32.
    3) The 115 V GND SVCE BUS light on the forward miscellaneous electrical equipment panel, P33.
    4) The AC TIE BUS and EXT PWR lights on the APU/external power panel, P34.
(m) Push the right BUS TIE switch on the electrical system control panel to the ISLN position.
    1) Make sure the yellow ISLN light in the switch comes on.
    2) Make sure the right BUS OFF light comes on.
    3) Make sure the EICAS messages, R AC BUS OFF and R BUS ISOLATED, show on the top EICAS display.
(n) Push the right BUS TIE switch on the electrical system control panel to the AUTO position.
(o) Push the left BUS TIE switch on the electrical system control panel to the ISLN position.
    1) Make sure the yellow ISLN light in the switch comes on.
    2) Make sure the left BUS OFF light comes on.
    3) Make sure the EICAS messages, L AC BUS OFF and L BUS ISOLATED, show on the bottom display.
(p) Push the left BUS TIE switch to the AUTO position.
(q) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(r) Make sure these values show below GND PWR on the bottom EICAS display:

AC-V	115 ±5

FREQ	400 ±20

F. Put the Airplane Back to Its Usual Condition

S 865-012

(1) Push the EXT PWR switch on the electrical system control panel.
   (a) Make sure the white ON light in the switch goes off.

S 865-013

WARNING: REMOVE ELECTRICAL POWER FROM THE POWER CABLE BEFORE YOU REMOVE THE CABLE FROM THE AIRPLANE. AN ELECTRICAL ARC CAN OCCUR WHICH CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Remove electrical power from the external power cable.
   (a) Remove the power cable from the airplane.
   (b) Close the access door for the external power panel, P30.

S 865-014

(3) Push the BAT switch on the pilots' overhead panel, P5, to the OFF position.
   (a) Make sure the OFF light in the switch comes on.

S 445-017

(4) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

EXTERNAL POWER CONTACTOR - REMOVAL/INSTALLATION

1. General
   A. The external power contactor, K114 (referred to as the contactor) is in the APU/external power panel, P34.

TASK 24-41-01-004-001

2. Remove the External Power Contactor (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipmnet Center

      (2) Access Panel
          119AL Main Equipment Center Access

   C. Prepare for the Removal

      S 044-002

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

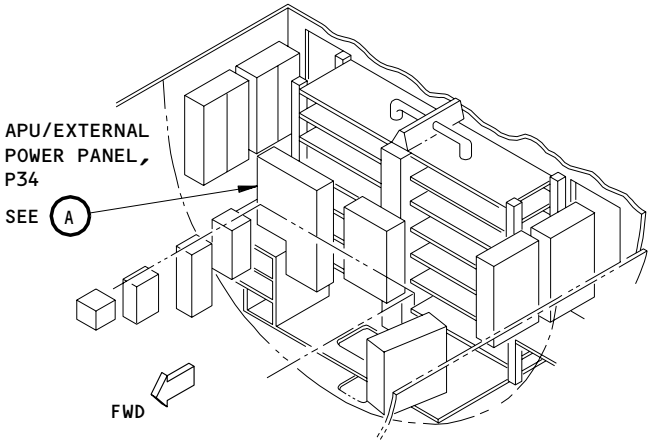
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-011

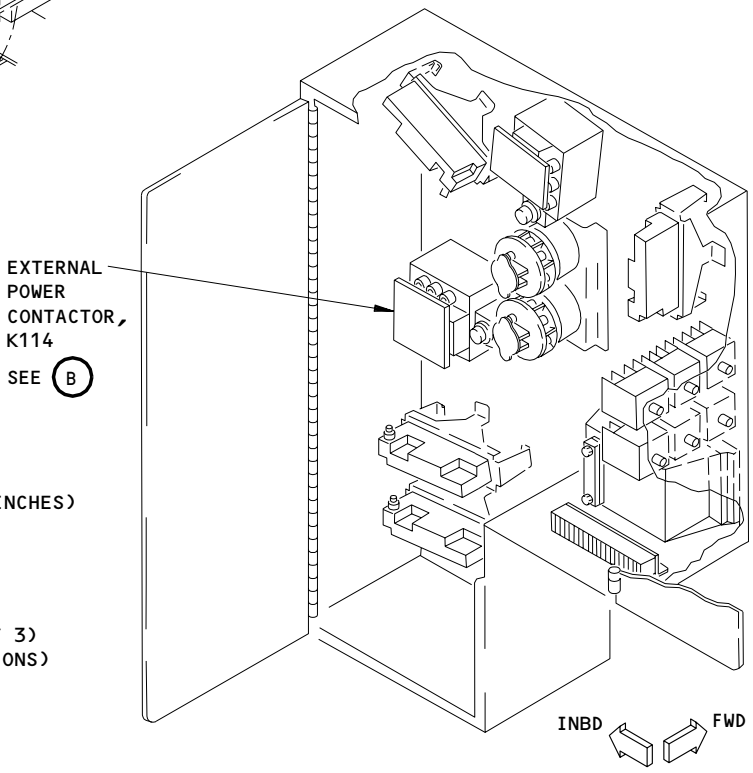
      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU DO WORK IN THE APU/EXTERNAL POWER PANEL, P34. VOLTAGE LEVELS IN THE PANEL CAN CAUSE INJURY TO PERSONS.

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

      S 024-004
      (3) Do these steps to remove the contactor:
          (a) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
              1) 6B4, BUS PWR CONT UNIT

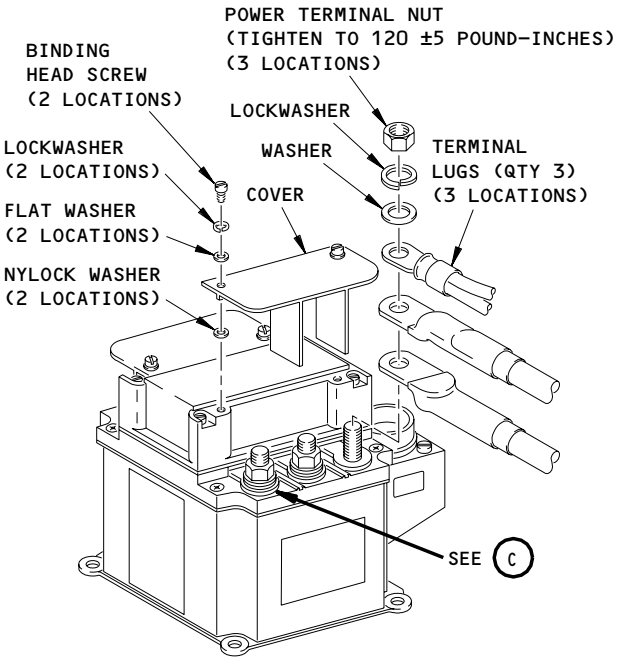


MAIN EQUIPMENT CENTER



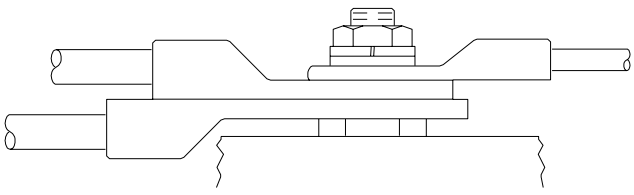
APU/EXTERNAL POWER PANEL, P34

A



EXTERNAL POWER CONTACTOR, K114

B



(TYPICAL BACK-TO-BACK INSTALLATION)

C

External Power Contactor Installation
Figure 401

(b) Open the APU/external power panel, P34.
(c) Remove the electrical connector from the contactor.
(d) Identify the phase leads on the contactor for the installation.
(e) Remove the phase leads from the contactor.
(f) Remove the four screws that hold the contactor.
(g) Remove the contactor.

TASK 24-41-01-404-010

3. Install the External Power Contactor (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access
(1) Location Zones
119/120 Main Equipment Center

(2) Access Panels
119AL Main Equipment Center Access

C. Install the External Power Contactor

S 424-005
(1) Do these steps to install the contactor:
(a) Put the contactor in position in the APU/external power panel, P34.
(b) Install the four screws that hold the contactor.

CAUTION: MAKE SURE YOU CONNECT THE PHASE LEADS TO THE CONTACTOR CORRECTLY. A SYSTEM MALFUNCTION AND EQUIPMENT DAMAGE CAN OCCUR IF YOU DO NOT CONNECT THE PHASE LEADS CORRECTLY.

(c) Connect the terminal lugs, washer and lockwasher to the studs on the contactor.

NOTE: If there are more than one terminal lugs on the same stud, put the power feeder lug on the base of the stud and the terminal lugs might be installed back-to-back.

(d) Tighten the terminal nuts to 120 +/- 5 pound-inches.
(e) Connect the electrical connector to the contactor.
(f) Close the APU/external power panel, P34.
(g) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
1) 6B4, BUS PWR CONT UNIT

D. Do a Test of the External Power Contactor Installation

S 864-006
(1) Supply electrical power (AMM 24-22-00/201).

S 714-007
(2) Do a test of the contactor, as follows:
(a) Push the BAT switch on the pilots' overhead panel (referred to as the P5 panel) to the ON position.
(b) Push the two BUS TIE switches on the P5 panel to the ISLN position.
(c) Make sure the ISLN light in each BUS TIE switch is on.
(d) Push the EXT PWR switch on the P5 panel to the ON position.
(e) Make sure the NOT IN USE light on the external power panel, P30, is off.
(f) Do these steps at the electrical systems control panel on the P5 panel:
1) Push the right BUS TIE switch to the AUTO position.
2) Make sure the right BUS OFF light is off.
3) Push the right BUS TIE switch to the ISLN position.
4) Make sure the ISLN light in the right BUS TIE switch comes on.
5) Make sure the right BUS OFF light comes on.
6) Push the EXT PWR switch to the AVAIL position.
7) Make sure the ON light in the EXT PWR switch goes off.
(g) Push the BAT switch on the P5 panel to the OFF position.

S 444-008
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-009
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

EXTERNAL POWER RECEPTACLE - MAINTENANCE PRACTICES

1. General
   A. The external power receptacle, D372 (referred to as the receptacle) is on the bottom right side of the airplane, aft of the nose wheel well. The receptacle is on the external power panel, P30.
   B. This procedure has four tasks:
      (1) External Power Receptacle - Inspection/Check
      (2) External Power Receptacle - Neutral Pin to Nose Gear Grounding Stud Continuity Check.
      (3) Remove the External Power Receptacle
      (4) Install the External Power Receptacle

TASK 24-41-02-202-004

2. External Power Receptacle - Inspection/Check
   A. General
      (1) This procedure uses wear gages to do a test of the pins on the receptacle. The wear gages are used to make sure the pins are in tolerance.
   B. Equipment
      (1) F70284-1, Wear Gage Set, External Power Plug and Receptacle
   C. Access
      (1) Location Zone
          124 Area Below Forward Cargo Compartment

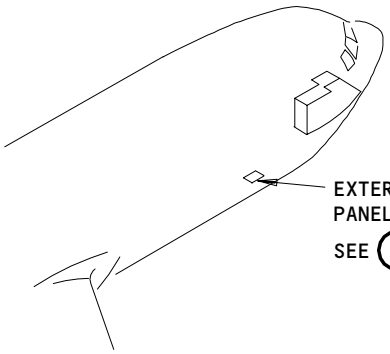
   D. Do an Inspection/Check of the External Power Receptacle

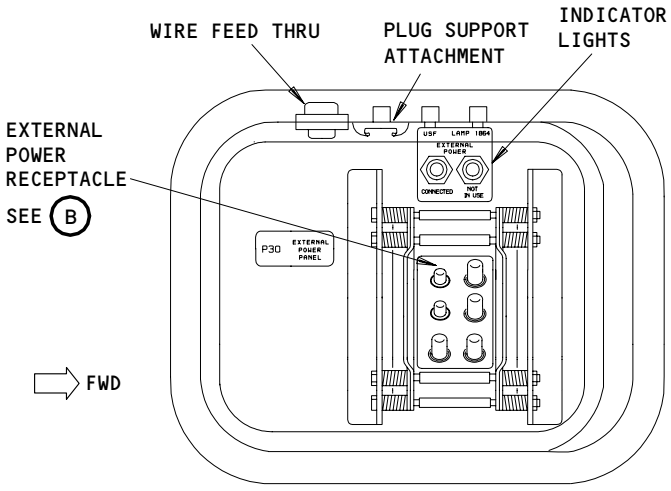
      S 212-005
      (1) Do these steps to examine the receptacles from the outer side of the airplane:
          (a) Look for pins that are loose, bent, or have a crack.
          (b) Look for damage or cracks on the base insulation.
          (c) Look for discolored, burned, or pitted pins.

              NOTE: Discoloration of the pins is due to excessive heat, which is caused by excessive corrosion and poor contact between the pin and socket.

      S 222-007
      (2) Try to move wear gage F70284-2 across pins A, B, C, and N.
          (a) If a pins accepts the "No-Go" gage or is damaged, replace the receptacle.

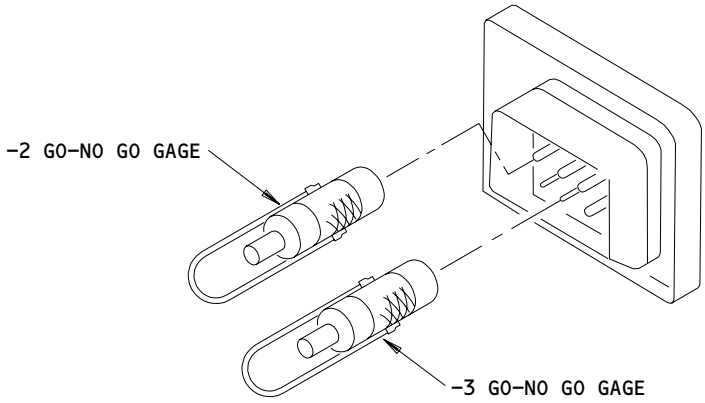
      S 222-008
      (3) Try to move wear gage F70284-3 across pins E and F.
          (a) If a pins accepts the "No-Go" gage or is damaged, replace the receptacle.





EXTERNAL POWER PANEL, P30

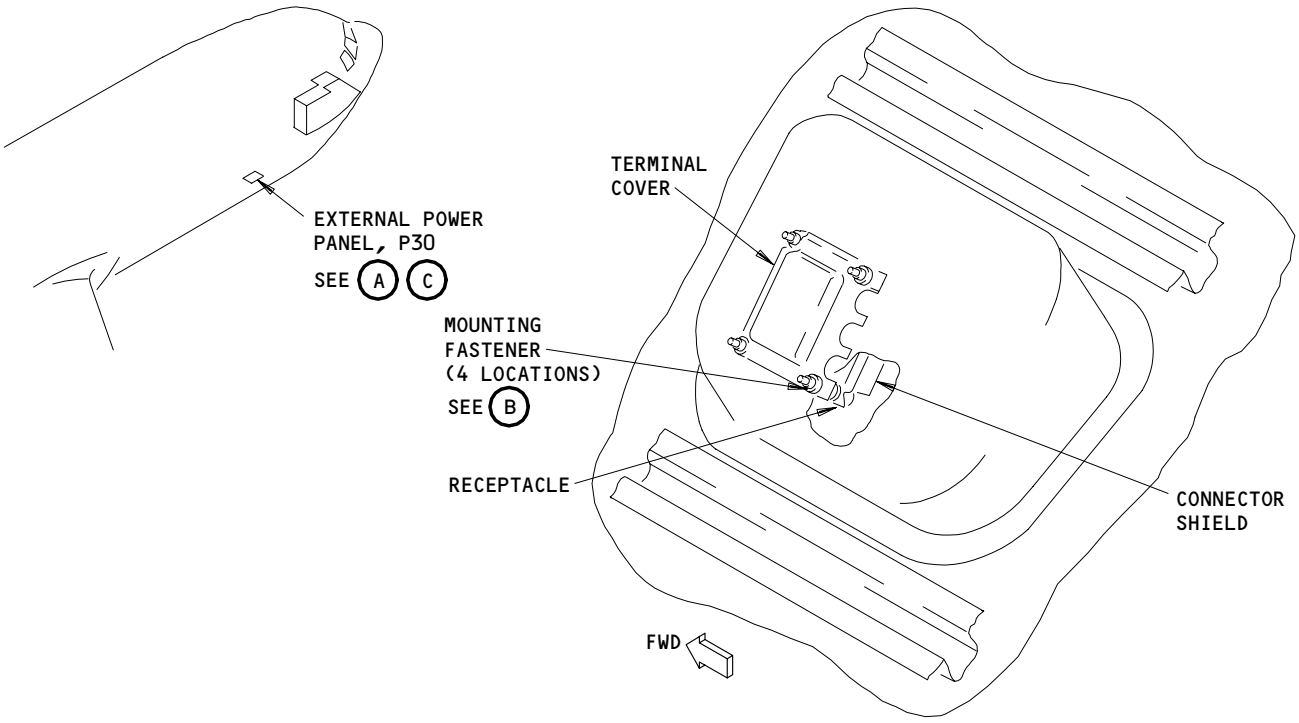
A



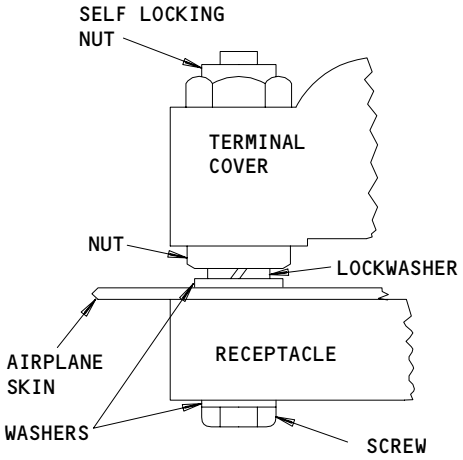
EXTERNAL POWER RECEPTACLE

B

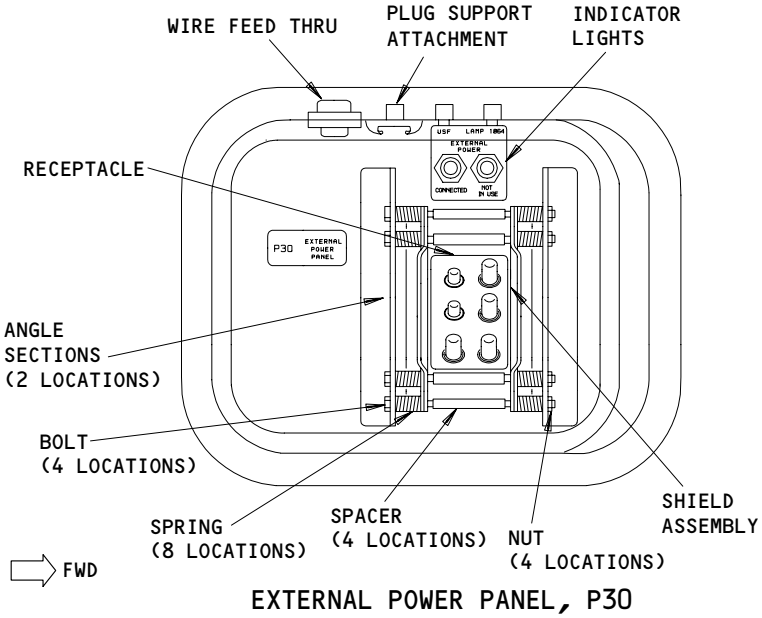
External Power Receptacle Inspection
Figure 201



EXTERNAL POWER PANEL, P30
(REAR VIEW)
A



MOUNTING FASTENER
B



EXTERNAL POWER PANEL, P30
C

External Power Receptacle Installation
Figure 202

S 202-030
(4) Do a check of tension of plug guides on both sides of the external power panel, P30.
(a) If the guides are loose, tighten the nuts to 18-22 inch-pounds.

S 202-031
(5) Do a check of retention of the ground power plugs.

TASK 24-41-02-702-019

3. External Power Receptacle Neutral Pin to Nose Gear Grounding Stud Continuity Check

A. Special Tools and Equipment
(1) Multimeter with minimum resistance reading of 0.1 ohm or less - commercially available.
B. References
(1) AMM 24-22-00/201, Manual Control
C. Access
(1) Location Zone
(a) 120 Main equipment center (RH side)
(2) Access Panel
(a) P30 External power panel
D. Prepare to check continuity between the receptacle neutral pins and the grounding stud.

S 862-020
(1) Remove electrical power from the airplane (AMM 24-22-00/201).

S 862-021
(2) Make sure the airplane static ground cable is not connected.

S 862-022
(3) Open the P30 panel for the external power receptacle.
E. Check the continuity between the receptacle neutral pins and the grounding stud.

S 712-023
(1) Make sure the resistance does not exceed 0.1 ohm.

S 862-028
(2) If the resistance exceeds 0.1 ohm, do this task:
(a) External Power Receptacle - Inspection/Check (AMM 24-41-02/201)

S 862-026
(3) If the problem continues, examine and repair the wiring between the external power receptacle neutral pins and the associated ground stud.

S 862-027
(4) Return the airplane to serviceable condition. Connect the airplane static ground cable if required.

TASK 24-41-02-002-009

4. Remove the External Power Receptacle (Fig. 202)

A. References

(1) 24-22-00/201, Electrical Power - Control

(2) 27-61-00/201, Spoiler/Speedbrake Control System

B. Access

(1) Location Zones

119/120 Main Equipment Center

124 Area Below Forward Cargo Compartment (Right)

(2) Access Panel

119AL Main Equipment Center Access

C. Remove the External Power Receptacle (Fig. 202)

S 042-002

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Do the deactivation procedure for the spoilers (Ref 27-61-00) or move all persons and equipment away from the spoilers.

S 862-010

(2) Remove electrical power (Ref 24-22-00).

S 022-018

WARNING: REMOVE ELECTRICAL POWER FROM AIRPLANE BEFORE YOU GET ACCESS TO THE EXTERNAL POWER RECEPTACLE. VOLTAGE LEVELS AT THE RECEPTACLE CAN CAUSE INJURY TO PERSONS.

(3) Do these steps to remove the receptacle:

(a) Open the floor panels on the forward right side of the E2 equipment rack in the main equipment center.

(b) Remove the four nuts that hold the terminal cover.

(c) Remove the terminal cover.

(d) Identify the wires on the receptacle for the installation.

(e) Remove the wires from the receptacle.

(f) Remove the nuts, bolts, springs and spacers that hold the shield assembly to the angle section.

(g) Remove the shield assembly.

(h) Remove the nuts that hold the receptacle to the pan.

(i) Remove the receptacle.

TASK 24-41-02-422-014

5. Install the External Power Receptacle (Fig. 202)

A. Consumable Materials

(1) B00192, Solvent - TT-N-95
(2) A00247, Compound - Sealing - BMS 5-95, Class B
(3) A00776, Compound - Potting, Dow Corning No. 738
(4) A00777, Compound - Potting, Dow Corning No. 3145
(5) A00778, Compound - Potting, GE-738

B. References

(1) 24-22-00/201, Electrical Power - Control
(2) 27-61-00/201, Spoiler/Speedbrake Control System

C. Access

(1) Location Zones

119/120 Main Equipment Center
124 Area Below Forward Cargo Compartment (Right)

(2) Access Panel

119AL Main Equipment Center Access

D. Install the External Power Receptacle

S 422-015

(1) Do these steps to install the receptacle:
(a) Use BMS 5-95, class B sealant to make a seal at the mating surface between the pan and the receptacle. Apply the sealant at a 0.25-inch radius around each of 4 fastener locations.
(b) Apply a layer of the sealant to each fastener with BMS 5-95, class B sealant.
(c) Install the receptacle from the outer side of the airplane.
(d) Install the bolts, washers, lockwashers and nuts that hold the receptacle to the pan.

NOTE: This step is easier with two persons, one outside the airplane to hold the receptacle and install the bolts, and one inside the airplane to install the nuts.

(e) Install the shield assembly.
(f) Install the bolts, springs, spacers and nuts that hold the shield assembly to the angle section.

WARNING: DO NOT BREATH THE FUMES FROM THE SOLVENT. DO NOT LET THE SOLVENT TOUCH THE SKIN FOR LONG OR FREQUENT TIMES. KEEP THE SOLVENT AWAY FROM SPARKS, HEAT AND FLAME. INJURY TO PERSONS CAN OCCUR IF YOU ARE NOT CAREFUL.

(g) Use the BMS 3-2 solvent to clean the terminals on the wires and the studs on the receptacle.

CAUTION: MAKE SURE YOU CONNECT THE WIRES TO THE RECEPTACLE CORRECTLY. DAMAGE CAN OCCUR IF YOU DO NOT CONNECT THE WIRES CORRECTLY.

(h) Install the six leads on the receptacle studs of the external power receptacle.
1) Install the nuts and the washers on the receptacle studs A, B, C, and N.
2) Tighten the nuts to 120-125 pound-inches.
3) Install the nuts and washers on the receptacle studs E and F.
4) Tighten the nuts to 20-22 pound-inches.
(i) Apply a layer of potting compound to the terminals and wires.
(j) Put the terminal cover in position on the terminals.
(k) Install the four nuts that hold the terminal cover.

S 202-032
(2) Do a check of tension of the plug guides on both sides of the external power panel, P30.
(a) If the guides are loose, tighten the nuts to 18-22 inch-pounds.

S 202-033
(3) Do a check of retention of the ground power plugs.

E. Do a Test of the External Power Receptacle Installation

S 862-011
(1) Supply electrical power to the AC ground handling bus (Ref 24-22-00).

S 712-016
(2) Do these steps at the pilots overhead panel, P5, to do a test of the receptacle.
(a) Push the BAT switch to the ON position.
(b) Make sure the two BUS TIE switches are in the ISLN position.
(c) Make sure the white AVAIL light in the EXT PWR switch is on.
(d) Push the EXT PWR switch.
(e) Make sure the white ON light in the EXT PWR switch comes on.
(f) Push the EXT PWR switch.
(g) Make sure the white ON light in the EXT PWR switch goes off.
(h) Push the BAT switch to the OFF position.

S 862-012
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00).

S 862-013
(4) Remove electrical power if it is not necessary (Ref 24-22-00).

BUS POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The bus power control unit, M116 (referred to as the control unit) is on shelf 4 of the E2 equipment rack in the main equipment center.

TASK 24-41-03-004-001

2. Remove the Bus Power Control Unit
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 20-41-01/201, Electrostatic Sensitive Devices
      (3) AMM 24-22-00/201, Electrical Power - Control
      (4) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center

      (2) Access Panels
          119AL Main Equipment Center Access

   C. Prepare for the Removal

      S 044-002

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-003
      (2) Remove electrical power from the airplane (AMM 24-22-00/201).
   D. Remove the Bus Power Control Unit

      S 864-004
      (1) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6B4, BUS PWR CONT UNIT

      S 864-005
      (2) Open this circuit breaker on the APU/external power panel, P34, and attach a DO-NOT-CLOSE tag:
          (a) 34M6, EXT PWR BPCU

S 914-006

CAUTION: DO NOT TOUCH THE CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL UNIT.

(3) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-007

(4) Remove the control unit (AMM 20-10-01/401).

TASK 24-41-03-404-008

3. Install the Bus Power Control Unit

A. References

(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 20-41-01/201, Electrostatic Sensitive Devices
(3) AMM 24-22-00/201, Electrical Power - Control
(4) AMM 27-61-00/201, Spoiler/Speedbrake Control System

B. Access

(1) Location Zones

119/120 Main Equipment Center
211/212 Flight Compartment

(2) Access Panels

119AL Main Equipment Center Access

C. Install the Bus Power Control Unit

S 914-009

CAUTION: DO NOT TOUCH THE CONTROL UNIT BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE CONTROL UNIT.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-010

(2) Install the control unit (AMM 20-10-01/401).

S 864-011

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the APU/external power panel, P34:
(a) 34M6, EXT PWR BPCU

S 864-012

(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
(a) 6B4, BUS PWR CONT UNIT

D. Do a Test of the Bus Power Control Unit Installation

S 864-013

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

S 714-014

(2) Do a test of the control unit, as follows:
   (a) Push the BAT switch on the pilots' overhead panel, P5, to the ON position.
   (b) Push the GROUND SERVICE BUS switch on the forward attendant panel, P21.
   (c) Make sure the light in the GROUND SERVICE BUS switch comes on.
   (d) Make sure the NOT IN USE light on the external power panel, P30, is off.
   (e) Push the GROUND SERVICE BUS switch on the forward attendant panel, P21.
   (f) Make sure the light in the GROUND SERVICE BUS switch goes off.
   (g) Make sure the white NOT IN USE light on the external power panel, P30, is on.
   (h) Push the RESET switch on the bus power control unit and make sure these messages show on the display:
      1) EXTERNAL POWER SYSTEM
      2) LEFT GEN POWER SYSTEM
      3) RIGHT GEN POWER SYSTEM
      4) APU GEN POWER SYSTEM
   (i) Push the BAT switch on the pilots' overhead panel, P5, to the OFF position.

S 444-015

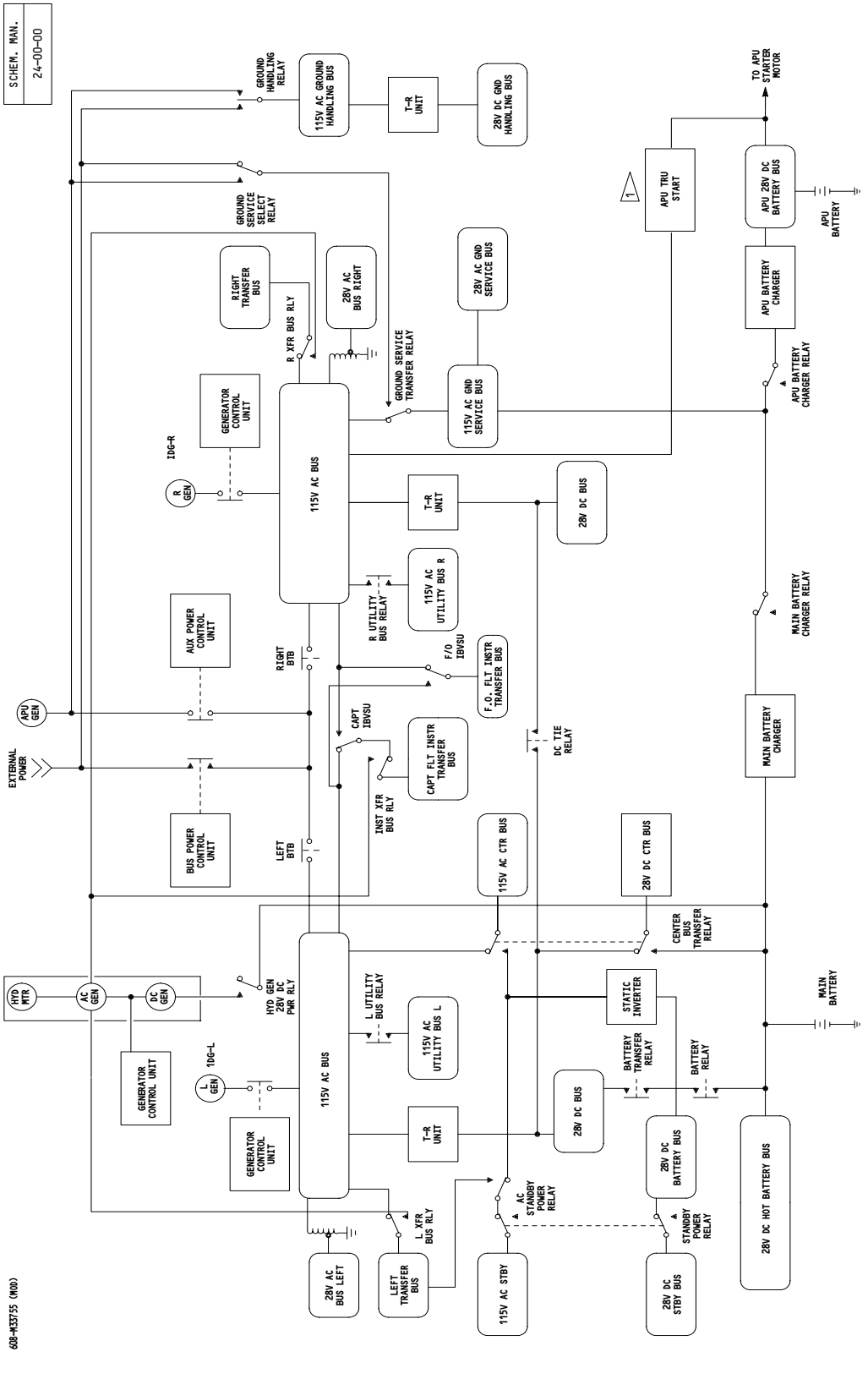
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-016

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

ELECTRICAL LOAD DISTRIBUTION - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. Electrical load distribution consists of 115-volt ac buses, 28-volt ac buses, and 28-volt dc buses.
   B. The main generators supply 115-volt, 3 phase, 400 Hz AC power to the left and right main AC buses. These buses can also be supplied by the APU generator or external power. The main buses feed the following buses: Utility buses, galley buses, captain and first officers flight instrument transfer buses, left and right transfer buses, AC standby bus, left and right 28V AC buses, AC center bus, AC ground service bus, and AC ground handling bus (AMM 24-51-00).
   C. The left and right 28-volt AC buses are supplied with power by autotransformers tied to the main AC buses (AMM 24-53-00).
   D. The two main 28-volt DC buses receive power from transformer-rectifier units, which convert main AC bus power. The main DC buses supply power to the DC center bus, DC standby bus and battery bus (AMM 24-54-00).
   E. The ground service system consists of a 115-volt AC bus and a 28-volt AC bus. These buses supply power to loads used on the ground and inflight (AMM 24-51-00).
   F. The ground handling system consists of a 115-volt AC bus and a 28-volt DC bus. These buses supply power to ground handling equipment (AMM 24-51-00).
   G. If power loss occurs at both main AC buses during flight, the hydraulic motor-driven generator is activated automatically, providing ac power to the R and L transfer buses, AC standby bus and dc power to the hot battery bus and battery bus. The buses in turn supply selected flight essential loads.



Electrical Power Block Diagram
Figure 1

ELECTRICAL LOAD DISTRIBUTION - ADJUSTMENT/TEST

1. General
   A. This procedure contains the following tasks:
      (1) Operational Test
      (2) System Test
      (3) Instrument Bus Voltage Sensing Unit Test

   TASK 24-50-00-715-001
2. Operational Test - Electrical Power Distribution
   A. General
      (1) This procedure uses indicator lights and EICAS to do an operational test of these units:
         (a) The ground service select relay.
         (b) The ground service transfer relay
         (c) The left and right utility bus relays
         (d) The instrument bus voltage sensing units
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   C. Access
      (1) Location Zones
         119/120 Main Equipment Center
         211/212 Flight Compartment

      (2) Access Panel
         119AL Main Equipment Center Access

   D. Prepare for Test

      S 045-003

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

E. Test

S 715-088

(1) Do these steps to do a test of the instrument bus voltage sensing units:
   (a) Supply electrical power (AMM 24-22-00/201).
   (b) Push the STATUS switch on the EICAS DISPLAY select panel.
   (c) Make sure the EICAS messages, CAPT INSTR XFER and F/O INSTR XFR, do not show on the bottom display.
   (d) Open this circuit breaker on the main power distribution panel, P6:
      1) 6J14, CAPT PRIM INST BUS ϕA
   (e) Make sure the EICAS message, CAPT INSTR XFER, shows on the bottom display.
   (f) Close this circuit breaker on the main power distribution panel, P6:
      1) 6J14, CAPT PRIM INST BUS ϕA
   (g) Make sure the EICAS message, CAPT INSTR XFER, does not show on the bottom display.
   (h) Open this circuit breaker on the main power distribution panel, P6:
      1) 6L20, F/O PRIM INST BUS ϕA
   (i) Make sure the EICAS message, F/O INSTR XFER, shows on the bottom display.
   (j) Close this circuit breaker on the main power distribution panel, P6:
      1) 6L20, F/O PRIM INST BUS ϕA
   (k) Make sure the EICAS message, F/O INSTR XFER, does not show on the bottom display.
   (l) Remove electrical power if it is not required (AMM 24-22-00/201).

S 715-045

(2) Do these steps to do a test of the left and right utility bus relays:
   (a) Supply electrical power (AMM 24-22-00/201).

(b) Push the left and right UTILITY BUS switches on the pilots' overhead panel, P5, to the ON position.
(c) Make sure the ON light in each UTILITY BUS switch comes on.
(d) Make sure L UTIL BUS HOT BUS WARNING light on the left miscellaneous electrical equipment panel, P36, is on.
(e) Make sure the R UTIL BUS HOT BUS WARNING light on the right miscellaneous electrical equipment panel, P37, is on.
(f) Push the left and right UTILITY BUS switches to the OFF position.
(g) Make sure the OFF light in each UTILITY BUS switch comes on.
(h) Make sure the EICAS messages, L UTIL BUS OFF and R UTIL BUS OFF, show on the top EICAS display.
(i) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 715-046
(3) Do these steps to do a test of the ground service transfer relay:
(a) Supply external power to the ground service bus (AMM 24-22-00/201).
(b) Make sure the 115 GND SVCE HOT BUS WARNING light on the forward miscellaneous electrical equipment panel, P33, is on.
(c) Remove external power if it is not necessary (AMM 24-22-00/201).

S 715-047
(4) Do these steps to do a test of the ground service select relay:
(a) Supply APU power to the ground service bus (AMM 24-22-00/201).
(b) Make sure 115 GND SVCE HOT BUS WARNING light on the forward miscellaneous electrical equipment panel, P33, is on.
(c) Remove APU power if it is not necessary (AMM 24-22-00/201).

F. Put the Airplane Back to Its Usual Condition

S 445-048
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

TASK 24-50-00-735-060

3. System Test - Electrical Power Distribution

A. General

(1) This procedure does a system test of these units:

(a) The center bus transfer relay

(b) The ground handling relay

(c) The right and left 28V AC BUS stepdown transformer.

(d) The 28V AC GROUND SERVICE BUS stepdown transformer.

(e) The ground power transformer - rectifier unit.

B. Equipment

(1) Multimeter, ±5% accuracy, used to measure 115 volts AC, 28 volts AC, and 28 volts DC.

C. Access

(1) Location Zones

119/120 Main Equipment Center
211/212 Flight Compartment

(2) Access Panel

119AL Main Equipment Center Access

D. References

(1) AMM 24-22-00/201, Electrical Power - Control

(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System

E. Prepare for Test

S 045-061

WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZER ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

(1) Do the deactivation procedure for the spoiler (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

F. Test

S 715-052

(1) Do the procedure, Operational Test - Electrical Power Distribution.

S 735-156

WARNING: BE CAREFUL WHEN YOU DO WORK IN THE POWER PANELS. VOLTAGE LEVELS IN THE POWER PANELS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) AIRPLANES WITH CB C899 (6J13), CENTER BUS DC, INSTALLED (PRR B1200/SB 24-64 NOT INCORPORATED);
Do these steps to do a test of the center bus transfer relay:
(a) Ground pin G45 of TB127 on the E1-4 shelf in the main equipment center.
(b) Set the multimeter to measure 28 volts DC.
(c) Open the main power distribution panel, P6.
(d) Connect the multimeter from pin FA8 on TB14 to ground in the main power distribution panel, P6.
(e) Supply electrical power (AMM 24-22-00/201).
(f) Make sure the multimeter shows 28 ±4 volts DC.
(g) Open this circuit breaker on the main power distribution panel, P6:
1) 6J13, CENTER BUS DC
(h) Make sure the multimeter shows zero volts DC.
(i) Close this circuit breaker on the main power distribution panel, P6:
1) 6J13, CENTER BUS DC
(j) Remove electrical power if it is not necessary (AMM 24-22-00/201).
(k) Remove the multimeter.
(l) Close the main power distribution panel, P6.
(m) Remove the ground from pin G45 of TB127 on the E1-4 shelf in the main equipment center.

S 735-157

(3) AIRPLANES WITHOUT CB C899 (6J13), CENTER BUS DC, INSTALLED (PRR B1200/SB 24-64 NOT INCORPORATED);
Do these steps to do a test of the center bus transfer relay:
(a) Set the multimeter to measure 28 volts DC.
(b) Open the main power distribution panel, P6.
(c) Connect the multimeter from pin FA8 on TB14 to ground in the main power distribution panel, P6.
(d) Supply electrical power (AMM 24-22-00/201).
(e) Make sure the multimeter shows 28 ±4 volts DC.
(f) Open this circuit breaker on the main power distribution panel, P6:
1) 6C10, CTR BUS POWER
(g) Make sure the multimeter shows zero volts DC.
(h) Ground pin G45 of TB127 on the E1-4 shelf in the main equipment center.
(i) Make sure the multimeter shows 28 ±4 volts DC.
(j) Close this circuit breaker on the main power distribution panel, P6:
1) 6C10, CTR BUS POWER
(k) Remove electrical power if it is not necessary (AMM 24-22-00/201).
(l) Remove the multimeter.
(m) Close the main power distribution panel, P6.
(n) Remove the ground from pin G45 of TB127 on the E1-4 shelf in the main equipment center.

S 735-055

(4) Do these steps to do a test of the ground handling relay:
(a) Set the multimeter to measure 115 volts AC.
(b) Open the APU/external power panel, P34.
(c) Connect the multimeter from lug A1 of circuit breaker C309 to ground in the APU/external power panel, P34.
(d) Supply external power to the ground handling bus (AMM 24-22-00/201).
(e) Make sure the multimeter shows 115 ±5 volts AC.
(f) Remove external power if it is not necessary (AMM 24-22-00/201).
(g) Remove the multimeter.
(h) Close the APU/external power panel, P34.

S 735-056

(5) Do these steps to do a test of the ground power transformer-rectifier unit:
   (a) Set the multimeter to measure 28 volts DC.
   (b) Open the APU/external power panel, P34.
   (c) Connect the multimeter to the output terminals of T103 in the P34 panel.
   (d) Supply external power to the ground handling bus (AMM 24-22-00/201).
   (e) Make sure the multimeter shows 28 ±4 volts DC.
   (f) Remove external power if it is not necessary (AMM 24-22-00/201).
   (g) Remove the multimeter.
   (h) Close the APU/external power panel, P34.

S 735-063

(6) Do these steps to do a test of the left and right 28V AC transformers:
   (a) Set the multimeter to measure 28 volts AC.
   (b) Open the main power distribution panel, P6.
   (c) Connect the multimeter from the LV terminal of T123 to ground in the main power distribution panel, P6.
   (d) Supply electrical power (AMM 24-22-00/201).
   (e) Make sure the multimeter shows 28 ±4 volts AC.
   (f) Push the EXT PWR switch on the pilot's overhead panel, P5.
   (g) Make sure the white ON light in the EXT PWR switch is off.
   (h) Connect the multimeter from the LV terminal of T124 to ground in the main power distribution panel, P6.
   (i) Do these steps on the pilots' overhead panel, P5:
      1) Push the right BUS TIE switch to the AUTO position.
      2) Push the left BUS TIE switch to the ISLN position.
      3) Push the EXT PWR switch.
   (j) Make sure the white ON light in the EXT PWR switch comes on.
   (k) Make sure the multimeter shows 28 ±4 volts AC.
   (l) Do these steps on the pilots' overhead panel, P5:
      1) Push EXT PWR switch.
      2) Make sure the white ON light in EXT PWR switch is off.
      3) Push the left BUS TIE switch to the AUTO position.
   (m) Remove electrical power if it is not necessary (AMM 24-22-00/201).
   (n) Remove the multimeter.
   (o) Close the main power distribution panel, P6.

S 735-057

(7) Do these steps to do a test of the ground service 28V AC transformer:
   (a) Set the multimeter to measure 28 volts AC.
   (b) Open the forward miscellaneous electrical equipment panel, P33.
   (c) Connect the multimeter from the LV terminal on T126 to ground in the forward miscellaneous electrical equipment panel, P33.

(d) Supply electrical power (AMM 24-22-00/201).
(e) Make sure the multimeter shows 28 ±4 volts AC.
(f) Remove electrical power if it is not necessary (AMM 24-22-00/201).
(g) Remove the multimeter.
(h) Close the forward miscellaneous electrical equipment panel, P33.

G. Put the Airplane Back to Its Usual Condition

S 445-065
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

TASK 24-50-00-715-064

4. Instrument Bus Voltage Sensing Unit Test

NOTE: This is a scheduled maintenance task.

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

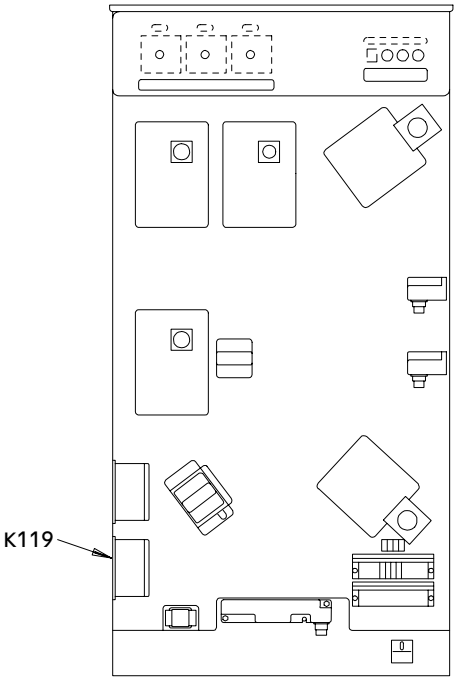
B. Test.

S 715-149
(1) Do these steps to do a test of the instrument bus voltage sensing units:
(a) Supply electrical power (AMM 24-22-00/201).
(b) Push the STATUS switch on the EICAS DISPLAY select panel.
(c) Make sure the EICAS messages, CAPT INSTR XFER and F/O INSTR XFR, do not show on the bottom display.
(d) Open this circuit breaker on the main power distribution panel, P6:
1) 6J14, CAPT PRIM INST BUS ϕA
(e) Make sure the EICAS message, CAPT INSTR XFER, shows on the bottom EICAS display unit.

(f) Close this circuit breaker on the main power distribution panel, P6:
1) 6J14, CAPT PRIM INST BUS ϕA
(g) Make sure the EICAS message, CAPT INSTR XFER, does not show on the bottom display.
(h) Open this circuit breaker on the main power distribution panel, P6:
1) 6L20, F/O PRIM INST BUS ϕA
(i) Make sure the EICAS message, F/O INSTR XFER, shows on the bottom display.
(j) Close this circuit breaker on the main power distribution panel, P6:
1) 6L20, F/O PRIM INST BUS ϕA
(k) Make sure the EICAS message, F/O INSTR XFER, does not show on the bottom display.
(l) Remove electrical power if it is not necessary (AMM 24-22-00/201).

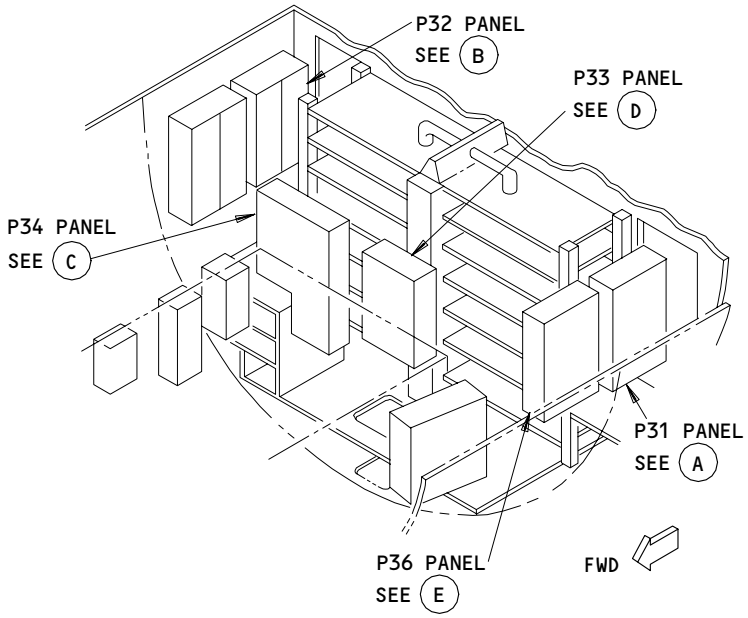
115-VOLT AC POWER DISTRIBUTION - DESCRIPTION AND OPERATION

1. General
   A. The left main ac bus supplies power to the ac center bus, ac standby bus, flight instrument transfer bus, and left utility bus. The right main ac bus supplies power to the ac ground service bus and right utility bus. The main buses also provide galley power (Ref 25-31-00).
2. Component Details (Fig. 1)
   A. Utility Bus Relays
      (1) Utility bus relays connect the main AC bus and the utility bus loads. The relays are controlled by the bus power control unit (BPCU), and can be shed if load reduction is necessary. The left utility bus relay is in left generator power panel P31. The right utility bus relay is in right generator power panel P32.
   B. Center Bus Transfer Relay
      (1) The center bus transfer relay selects the power source for the center bus. When de-energized, the relay selects left main AC and DC bus power. Energized, the relay selects standby power sources. The relay is in main power distribution panel P6.
   C. Ground Service Transfer Relay
      (1) The ground service transfer relay selects the power source for the ground service bus. When de-energized, the relay selects power from the right main AC bus. Energized, the relay selects power from the ground service select relay. The relay is in P32 panel.
   D. Ground Service Select Relay
      (1) The ground service select relay selects either APU or external power to pass on to the ground service transfer relay. The relay is normally in the external power position. External power has priority if both are available. The relay is located in P34 APU/external power panel.
   E. Ground Handling Relay
      (1) The ground handling relay selects either external or APU power for the ground handling bus. The relay is a dual position type, with a center off position. The BPCU controls both coils in the relay. The relay is in APU/external power panel P34.
   F. Instrument Bus Voltage Sensing Unit
      (1) The instrument bus voltage sensing units (IBVSUs) monitor the voltage of the respective main AC bus. If voltage is unacceptable, the IBVSU switches the captain's or first officer's instrument transfer bus to the alternate main AC bus. The IBVSUs are in main power distribution panel P6.
3. Operation
   A. Functional Description
      (1) Left and Right Main AC Buses (Fig. 2 and 3)

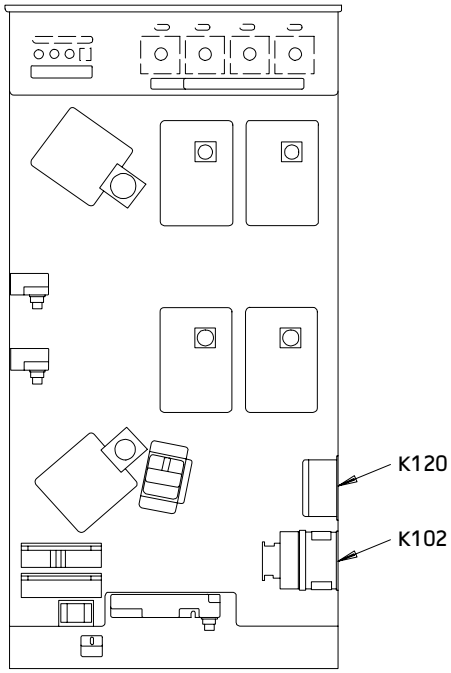


LEFT GENERATOR POWER PANEL P31

A

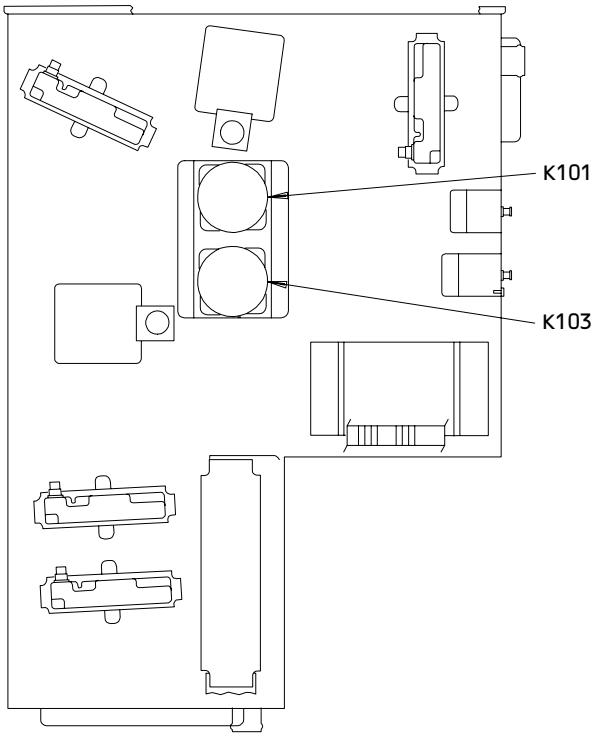


MAIN E/E EQUIPMENT CENTER



R GENERATOR POWER PANEL P32

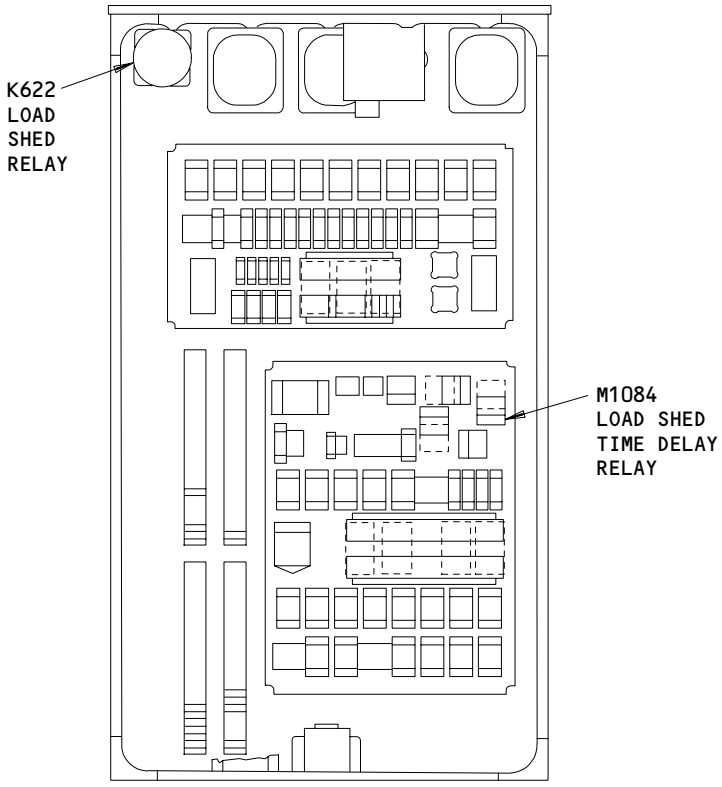
B



APU/EXT POWER PANEL P34

C

115 Volt AC Power Distribution Component Location
Figure 1 (Sheet 1)

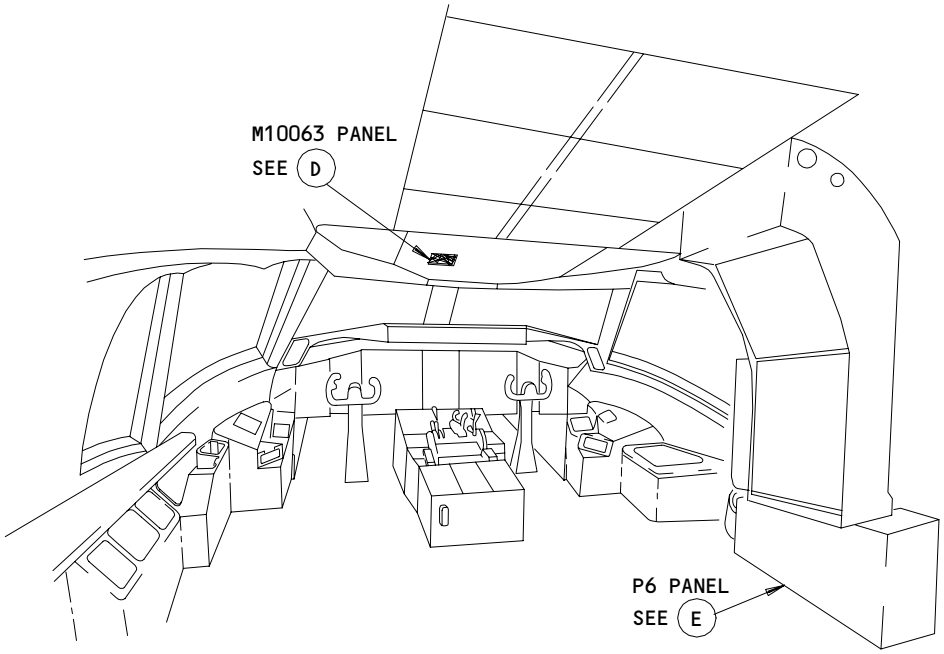


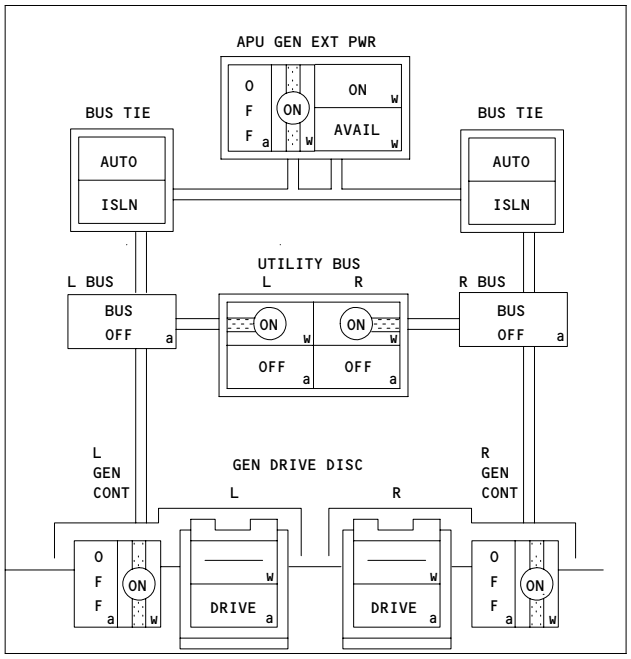
FWD MISC ELEC EQUIP PANEL P33

D

115 Volt AC Power Distribution Component Location
Figure 1 (Sheet 2)

159040

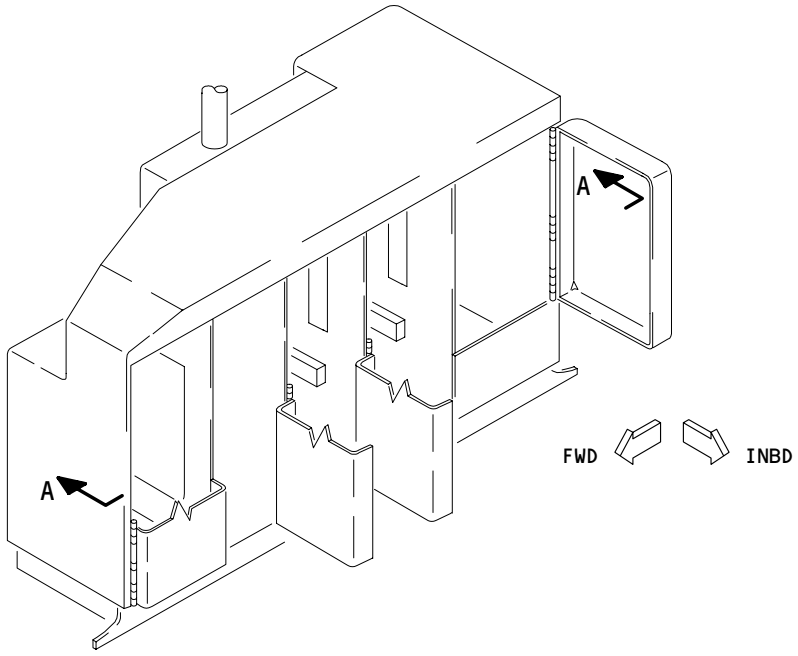




M10063 – ELECTRICAL SYSTEM CONTROL PANEL

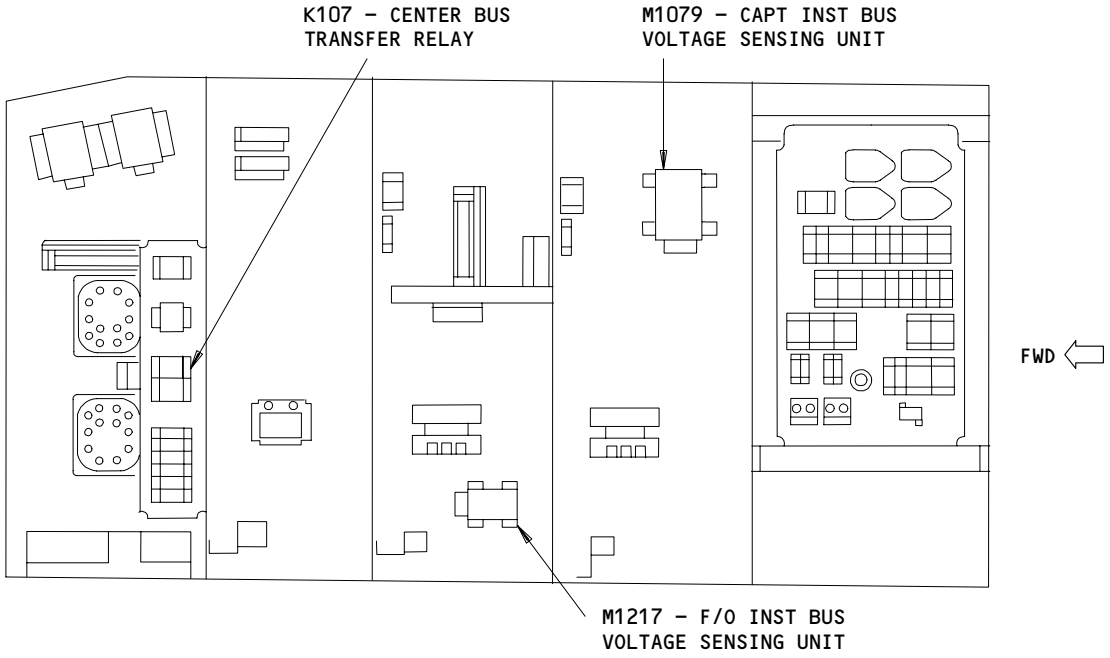
D

115 Volt AC Power Distribution Component Location
Figure 1 (Sheet 3)



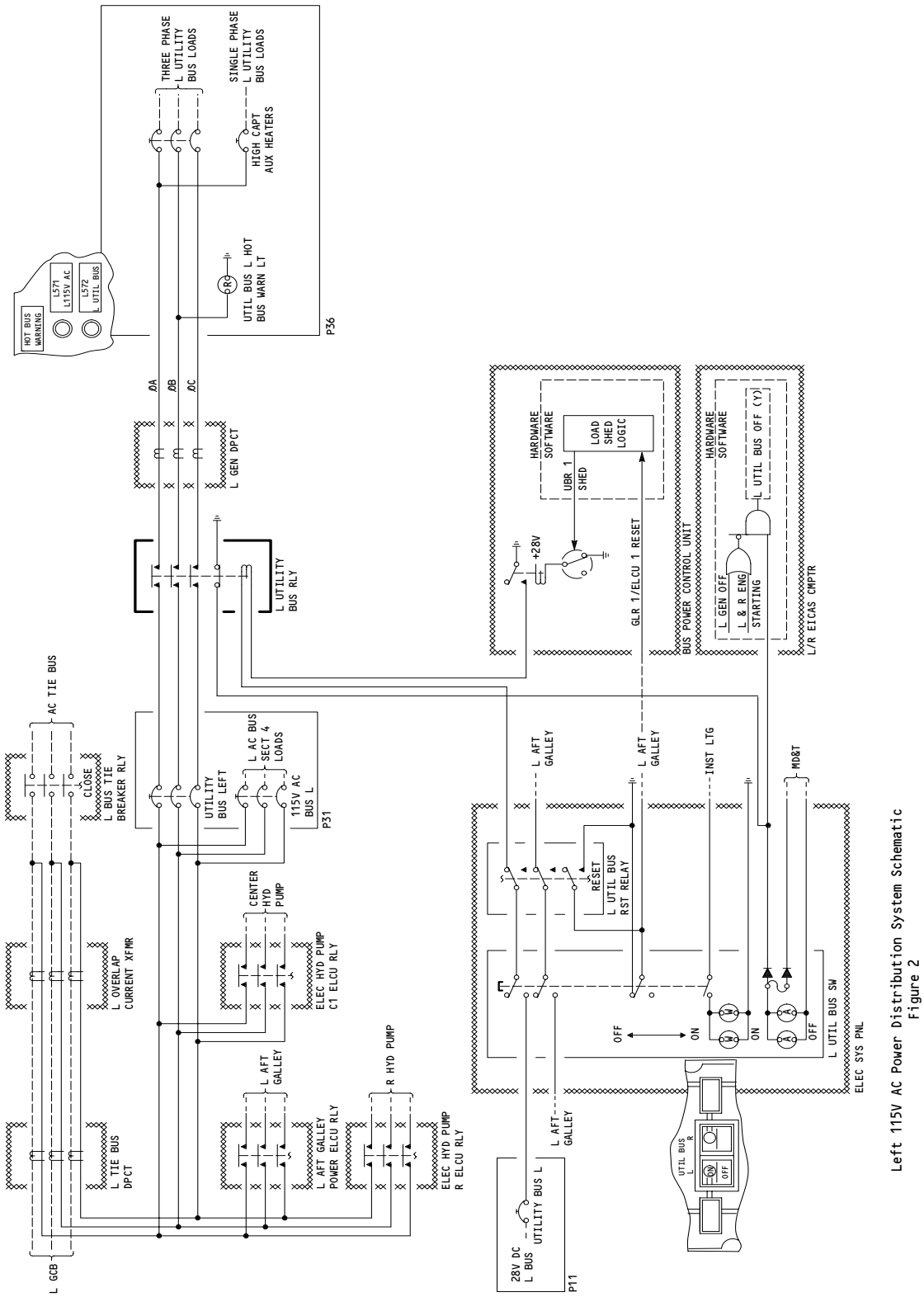
P6 – MAIN POWER DISTRIBUTION PANEL

E

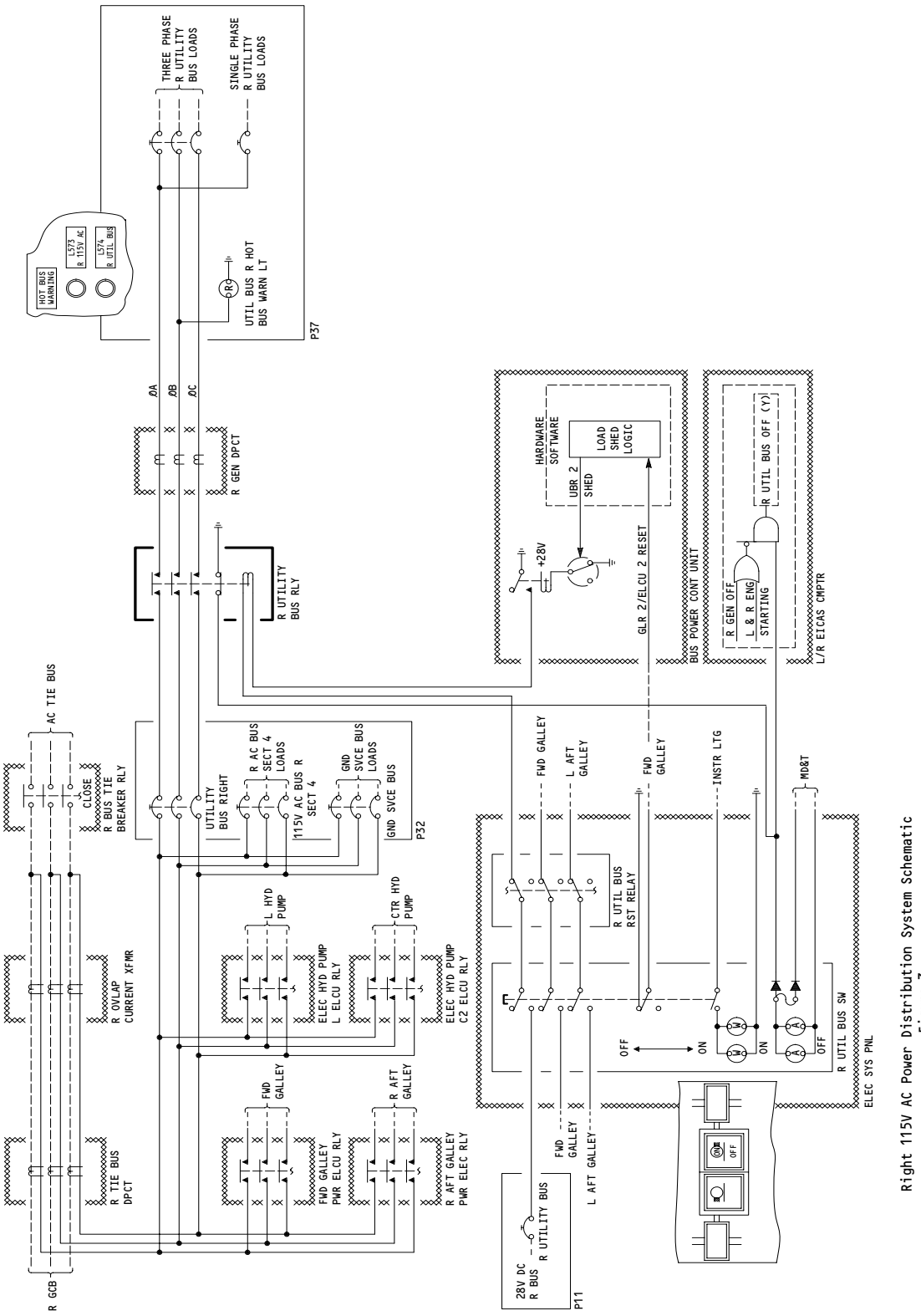


A–A

115 – Volt AC Power Distribution Component Location
Figure 1 (Sheet 4)



Left 115V AC Power Distribution System Schematic
Figure 2



Right 115V AC Power Distribution System Schematic
Figure 3

(a) The left and right main buses are normally powered by their respective generators through the respective generator circuit breaker (GCB). If normal generator power is not available, bus tie breakers (BTB's) will close to power the bus from other sources. Other available sources are external power, APU power, or the opposite generator. Bus power priority is 1) associated generator, 2) external power, 3) APU power, 4) opposite generator.

(b) Each main ac bus is divided into four sections to distribute power. Each section is supplied through a three-phase thermal circuit breaker. If a fault occurs, the breaker isolates the faulted section from the other sections.

(c) The first two sections of both main ac buses are in overhead circuit breaker panel P11. The third section is in main power distribution panel P6. The fourth section of the left main bus is in left miscellaneous electrical equipment panel P36. The fourth section of the right main bus is in right miscellaneous electrical equipment panel P37.

(d) Hot bus warning lights are located on P31, P32, P33, P34, P36, and P37 panels. The warning lights warn personnel of harzardous voltages inside each panel.

(e) EICAS computers monitor AC bus power status.

(2) Utility Buses (Fig. 2 and 3)

(a) The left and right utility buses supply 115-volt, single-phase and three-phase, ac power to nonessential loads. Power to these buses is removed if load reduction is needed. The left utility bus is in left miscellaneous electrical equipment panel P36. The right utility bus is in right miscellaneous electrical equipment panel P37.

(b) Two utility bus relays (UBR's) control utility bus power. The left UBR is in left generator power panel P31. The right UBR is in right generator power panel P32. The utility bus is powered when its UBR is energized.

(c) Two push on/push off UTILITY BUS switches, on pilot's overhead panel P5, provide manual control of the UBRs. Each UBR has its own switch. With the switch in the out position, the UBR is de-energized and the utility bus has no power. An amber OFF light in the switch will be on. When the switch is latched in, the UBR energizes. (The UBR is energized by the bus power control unit (BPCU).) An ON indicator in the switch is then visible. When the left UBR is energized, the red L UTIL BUS warning light on P36 is on. When the right UBR is energized, the red R UTIL BUS warning light on P37 is on. The UBR remains energized unless an overload condition exists. The BPCU then supplies a shed signal, de-energizing the UBR. The OFF light in the switch comes on.

(d) AIRPLANES WITH VIDEO ENTERTAINMENT SYSTEMS;
The UTILITY BUS switch provides manual control of the IFE 28 VDC Control relay (K10601, K10602 or K10611). With the switch in the out position, the IFE relay is de-energized and the power to the video entertainment systems is removed.

(e) Utility bus shedding occurs during the following conditions:
1) Loss of one or more generators in flight (both utility buses shed).
2) One source overloaded with two sources operating either in flight or on the ground (respective utility bus shed).
3) Overload with one source supplying both buses on the ground (both utility buses shed).

(f) Utility buses are automatically reset when returning to two generator operation in flight. Utility buses lost due to overload conditions must be manually reset by cycling the appropriate UTILITY BUS switches.

(g) Utility bus power is temporarily removed when starting an engine with APU pneumatics and APU electrical power. Only the utility bus being supplied by APU power will be interrupted. The utility bus will be automatically reset when the engine generator comes on line.

(h) EICAS computers monitor utility bus power status.

(3) Galley Buses (Fig. 2 and 3)

(a) Galley buses are powered from the main AC buses through electrical load control units (ELCUs) and galley load relays (GLRs) (Ref 25-31-00). The ELCU controls all galley power, and the GLR controls part of the galley's power.

(b) Galley power is temporarily removed under the following conditions:
1) Airplane on ground powered by APU or external power with a hydraulic pump on and load greater than 90 KVA (both galley buses shed).
2) During engine start with APU pneumatics and APU electrical power (galleys powered by APU generator shed).

(c) The galley buses are automatically reset from the above conditions when the engine generators come on line. In addition the galley buses are automatically reset when returning to two generator operation in flight.

(d) Loss of galley power due to source overload must be reset by manually cycling the UTILITY BUS switches.

(e) Galley bus shedding occurs under the following conditions:
1) Loss of one or more generators in flight (both galley buses shed).
2) One source overloaded with two sources operating either in flight or on the ground (respective galley bus shed).
3) Overload with one source supplying both buses on the ground (both galley buses shed).

(4) Ground Service Bus Distribution (Fig. 4)

(a) The ground service bus supplies 115-volt, 400-Hz, single-phase and three-phase ac power to loads used on the ground and in flight. The bus is powered by the right main ac bus, APU generator, or external power. When the ground service bus has power, the red 115V GND SVCE warning light on miscellaneous electrical equipment panel P33 is on. The ground service bus and its circuit breakers are in P33, main power distribution panel P6, and overhead circuit breaker panel P11.

(b) The bus power control unit (BPCU) works with the GND SERVICE switch to control two main relays: the ground service select relay, and the ground service transfer relay. These relays connect power to the ac ground service bus. The momentary action GND SERVICE switch is on left forward attendant's panel P21. Pushing the switch once turns it on, pushing it again turns it off.

(c) With the right main ac bus de-energized, external or APU power can supply the ac ground service bus. If only external power with good quality is available, pushing the GND SERVICE switch sends the command to the BPCU. The BPCU energizes the ground service transfer relay. The ground service select relay remains de-energized. External power supplies ground service bus power. The white light in the GND SERVICE switch is on. Pushing the switch again, or removing external power de-energizes all ground service relays. This also occurs if external power quality becomes poor. External power is disconnected from the ac ground service bus. The GND SERVICE switchlight goes off.

(d) If only APU power is available, pushing the GND SERVICE switch sends the command to the BPCU. The BPCU energizes the ground service select and ground service transfer relays. The APU supplies ground service power. The GND SERVICE switchlight comes on. Pressing the switch again, or removing APU power de-energizes all ground service relays. Ground service power is removed. The switchlight goes off.

(e) If both APU and external power are available, external power has priority.

(f) When the right main ac bus is energized, this source automatically supplies ground service power. All ground service relays de-energize. The GND SERVICE switch has no effect. The switchlight remains off.

(g) Some loads on the ground service bus are sheddable. When either engine N2 speed is less than 50%, the respective N2 speed card energizes its N2 relay. Load shedding will then occur after a 0.3 second time delay only if the airplane is in flight and the right utility bus is off. Testing of the engine speed card will not cause load shedding.

(h) The ground service bus will trip under the following external power conditions (Ref 24-23-00):
1) over voltage
2) under voltage
3) over frequency
4) under frequency
5) over current
6) open phase

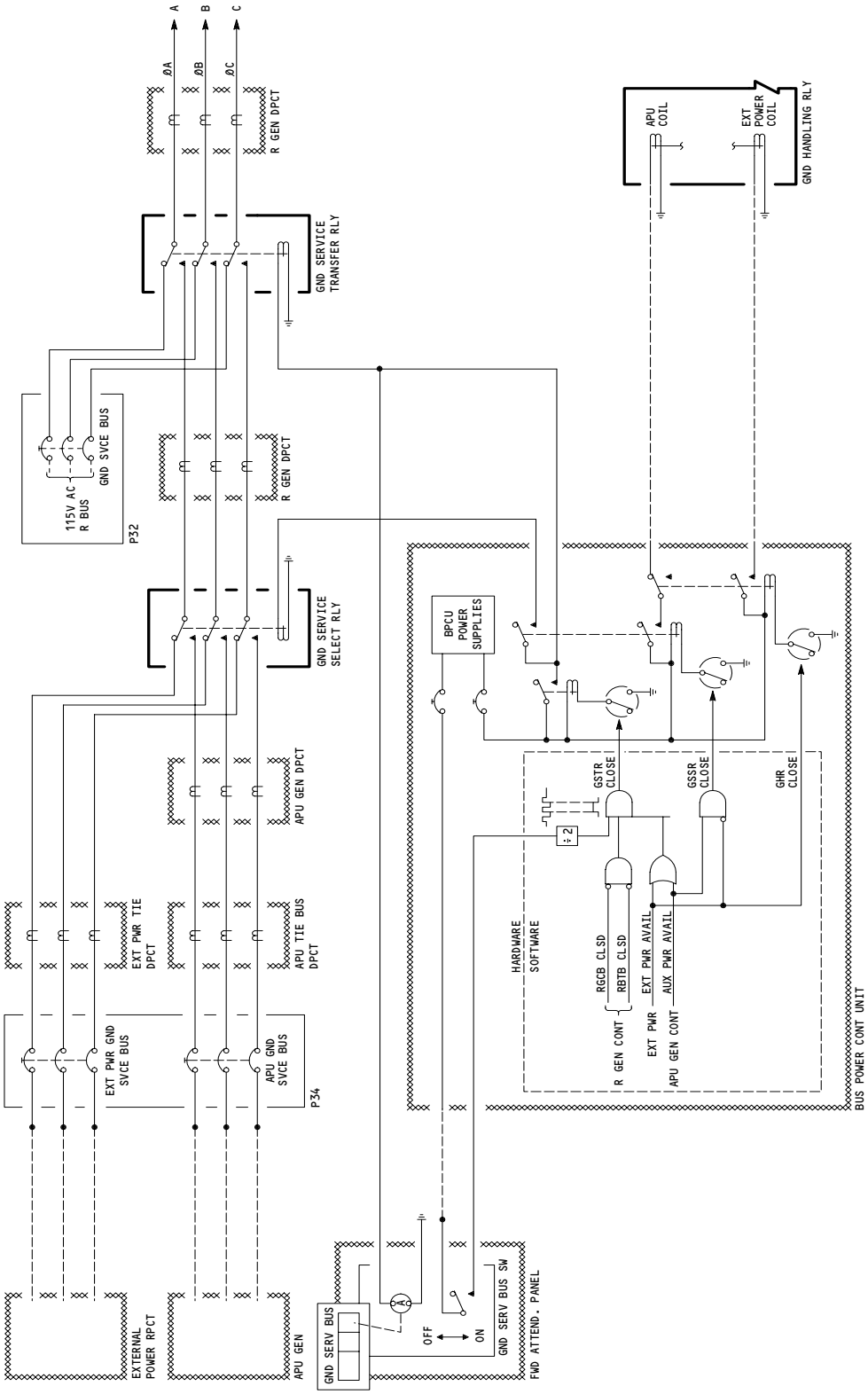
(i) To reset the ground service bus after a protective trip, cycle the GND SERVICE switch on P21 panel.

(5) Ground Handling Bus Distribution (Fig. 5)

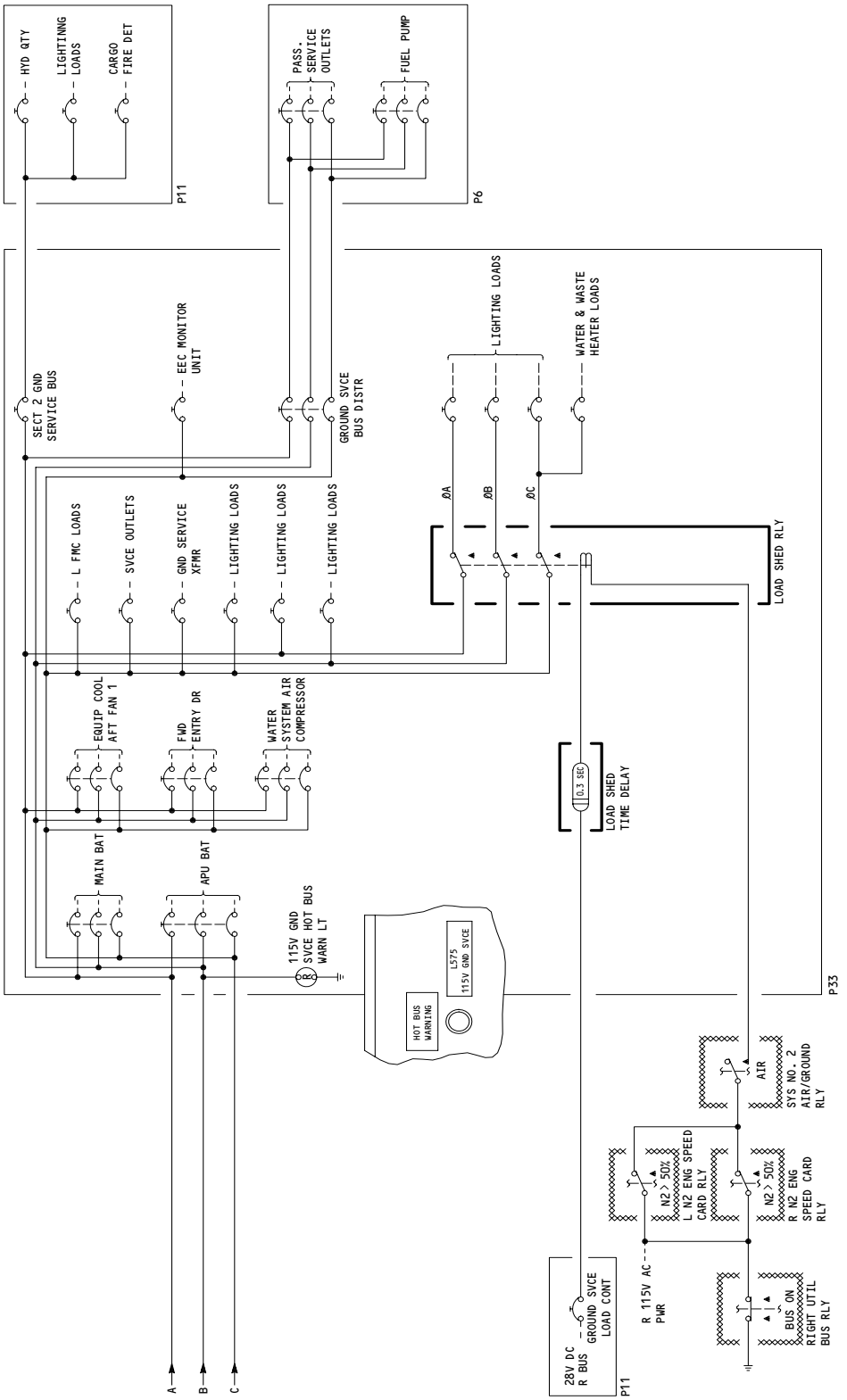
(a) The ground handling bus supplies 115-volt, 400-Hz, single-phase and three-phase, ac power to loads used only on the ground. The bus is powered from either the APU or external power. The three-position ground handling relay, in APU/external power panel P34, connects power to the bus. The bus power control unit (BPCU) controls the relay. The ground handling bus and its circuit breakers are in P34.

(b) The ground handling bus is not powered when the ground handling relay is de-energized. The relay is de-energized inflight.

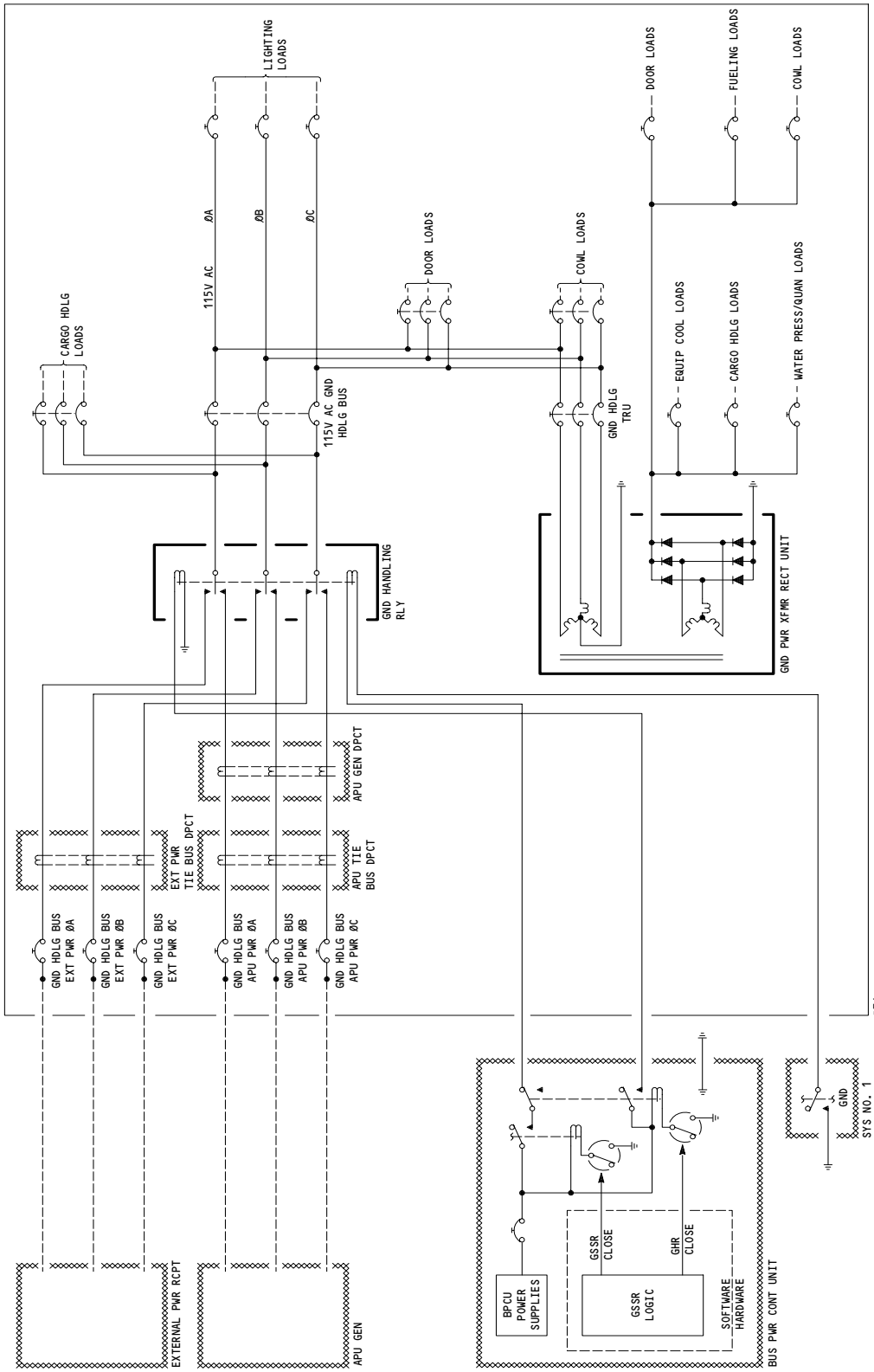
(c) If only APU power is available on the ground, the BPCU energizes the ground handling relay to supply APU power to the ground handling bus.



Ground Service Bus Schematic
Figure 4 (Sheet 1)



Ground Service Bus Schematic
Figure 4 (Sheet 2)



Ground Handling Bus Distribution Schematic
Figure 5

(d) If only external power is available on the ground, the BPCU energizes the ground handling relay to supply external power to the ground handling bus.

(e) If both APU and external power are available, external power has priority.

(f) The ground handling bus will trip under the following external power conditions (Ref 24-23-00):

1) over voltage
2) under voltage
3) over frequency
4) under frequency
5) over current
6) open phase

(g) To reset the ground handling bus after a protective trip, do the reset of the GHR lock out (AMM 24-22-00/201).

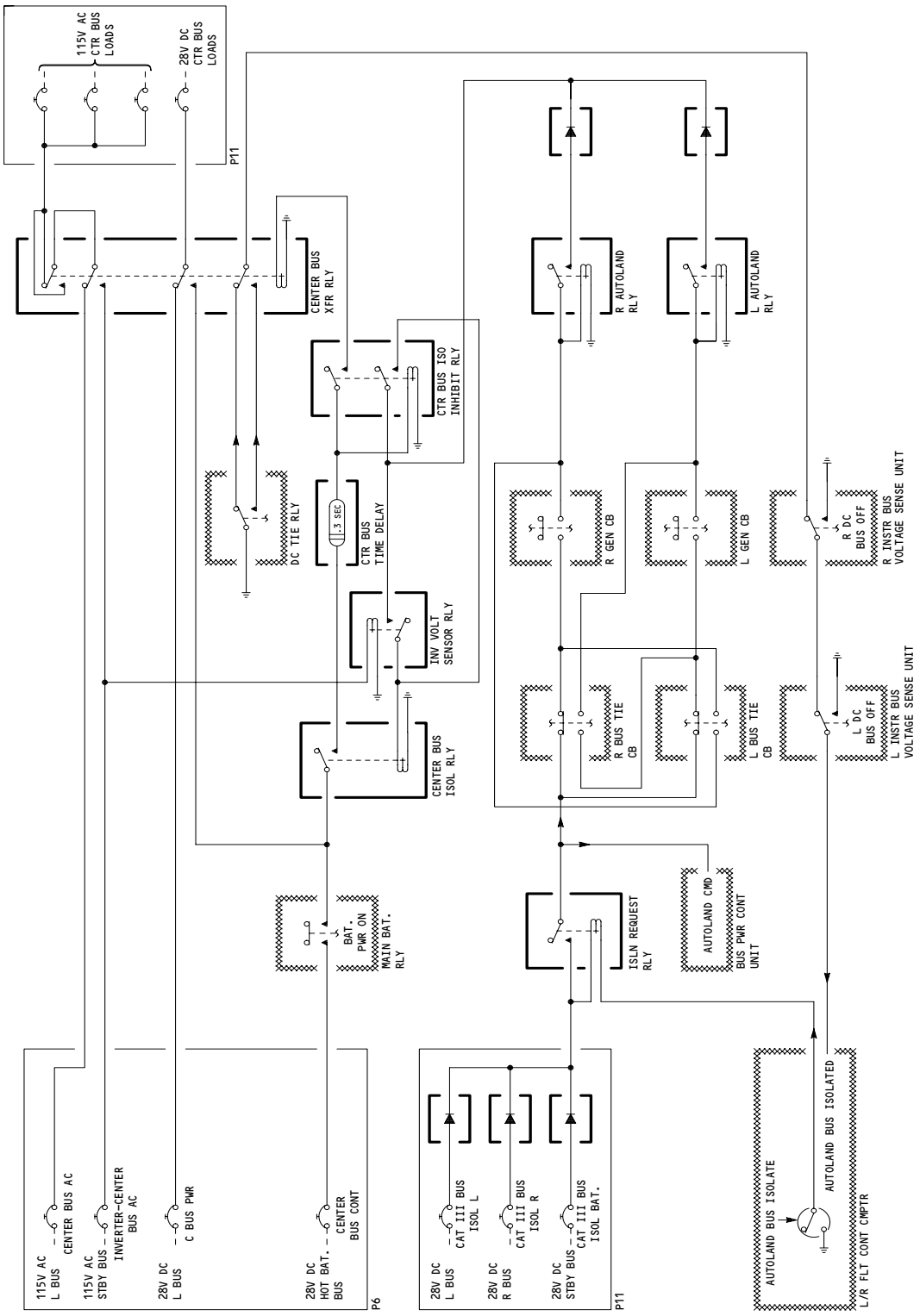
(6) AC Center Bus (Fig. 6)

(a) The ac center bus supplies 115-volt, 400-Hz, single-phase ac power to center bus loads. The bus gets power from either the left main ac bus or the static inverter. The center bus transfer relay, in main power distribution panel P6, connects power to the ac center bus. The bus power control unit (BPCU) controls the relay. The ac center bus and its circuit breakers are in overhead circuit breaker panel P11.

(b) The static inverter source of power is selected only during CAT IIIb autoland, but if it fails to supply suitable power, the center bus transfer relay will remain on the left main bus and CAT IIIb autoland is aborted.

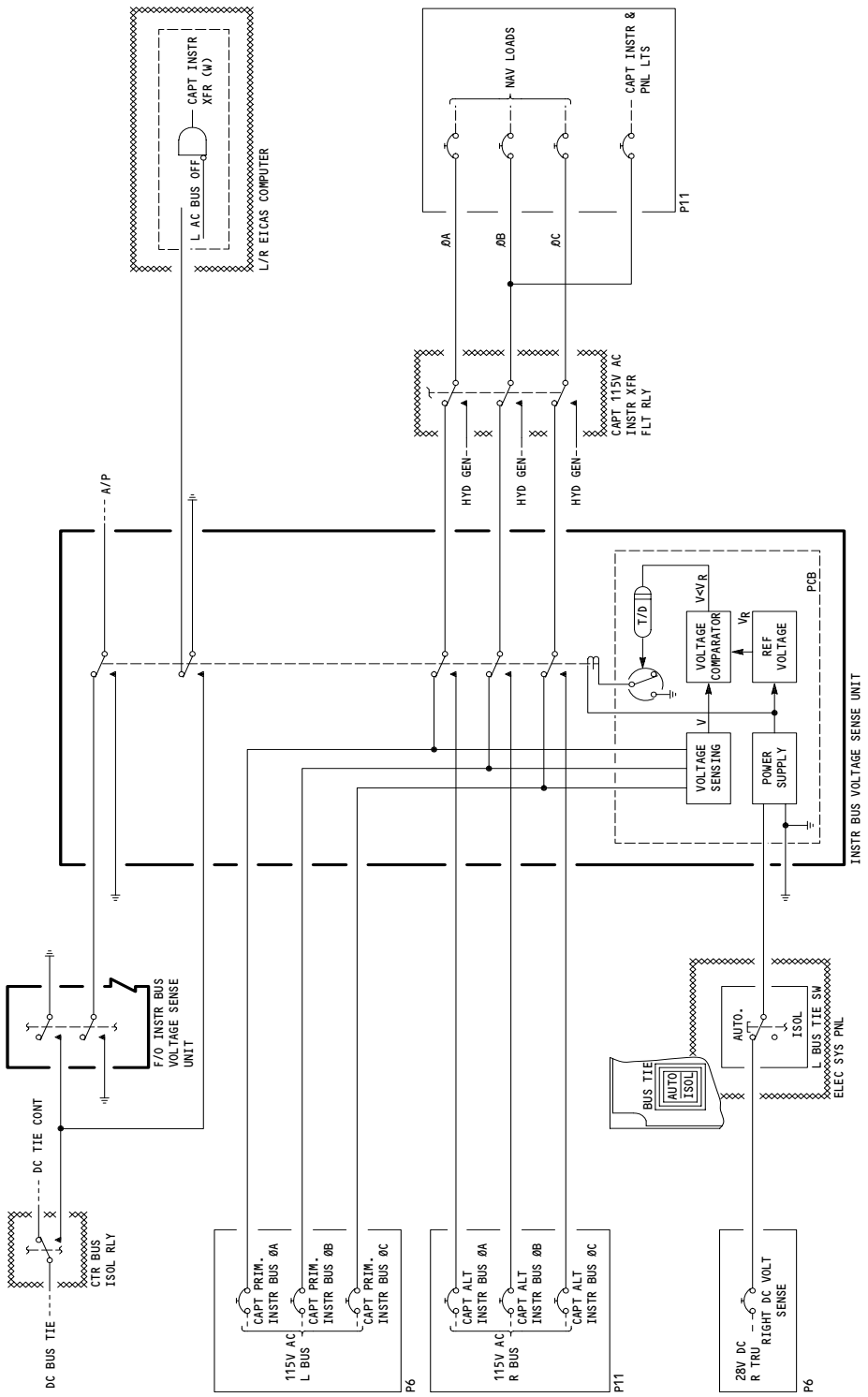
(7) Flight Instrument Transfer Bus (Fig. 7)

(a) The flight instrument transfer buses allow switching of the captain's or first officer's instruments to the alternate main AC bus if the respective main AC bus loses power. The normal power source for the captain's flight instrument transfer bus is the left main ac bus. The normal power source for the first officer's flight instrument transfer bus is the right main ac bus. The instrument bus voltage sensing units also switch to the alternate bus if main bus power is of poor quality. The alternate main ac bus voltage must be of proper quality for switching to occur. The BUS TIE switches on M10063 electrical system control panel must be in the AUTO position (latched in) for automatic bus switching capability. The flight instrument transfer buses are located in P6 and P11 panels.



Center Bus Schematic
Figure 6

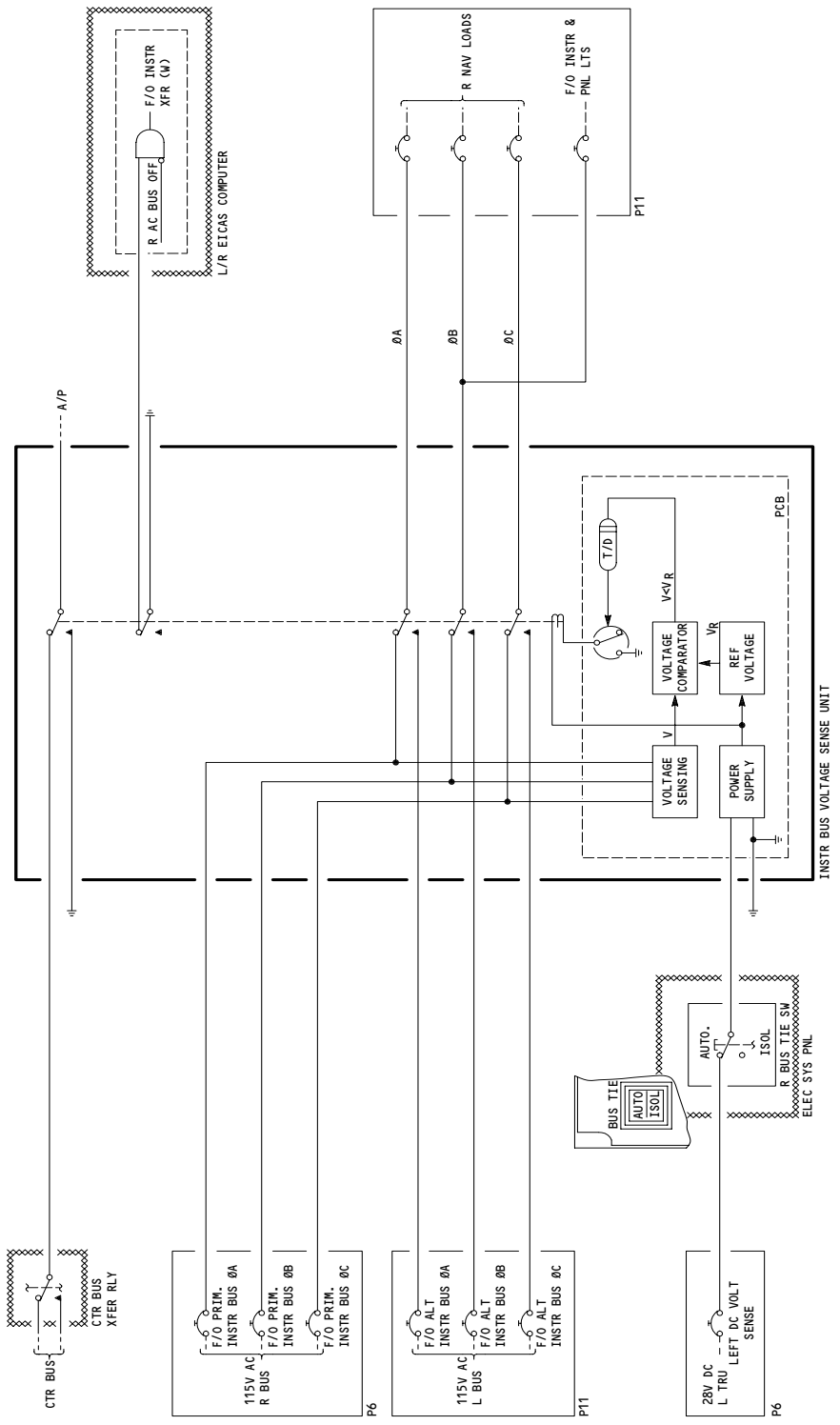
848416



CAPTAIN

Flight Instrument Transfer Bus Schematic
Figure 7 (Sheet 1)

159366



FIRST OFFICER

Flight Instrument Transfer Bus Schematic
Figure 7 (Sheet 2)

(b) The EICAS message CAPT INSTR XFER appears if the captain's instrument transfer bus switches to its alternate power source while its main source (left main ac bus) still has power.

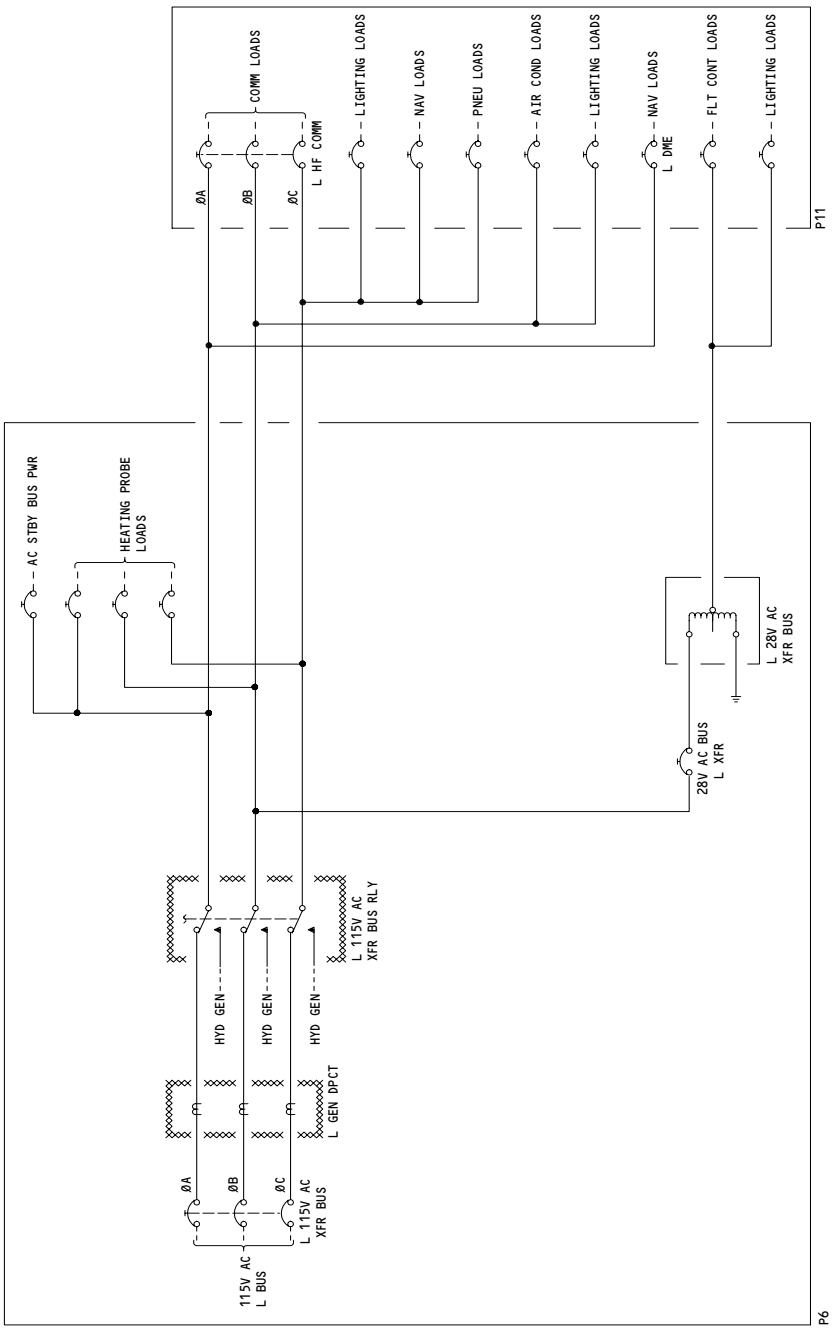
(c) The EICAS message F/O INSTR XFER appears if the first officer's instrument transfer bus switches to its alternate power source while its main source (right main ac bus) still has power.

(8) Left AC Transfer Bus (Fig. 8)

(a) The Left AC Transfer Bus is powered by the Hydraulic Motor Generator (HMG) through the left ac transfer bus relay if both main generators are inoperative during flight.

(9) Right AC Transfer Bus (Fig. 9)

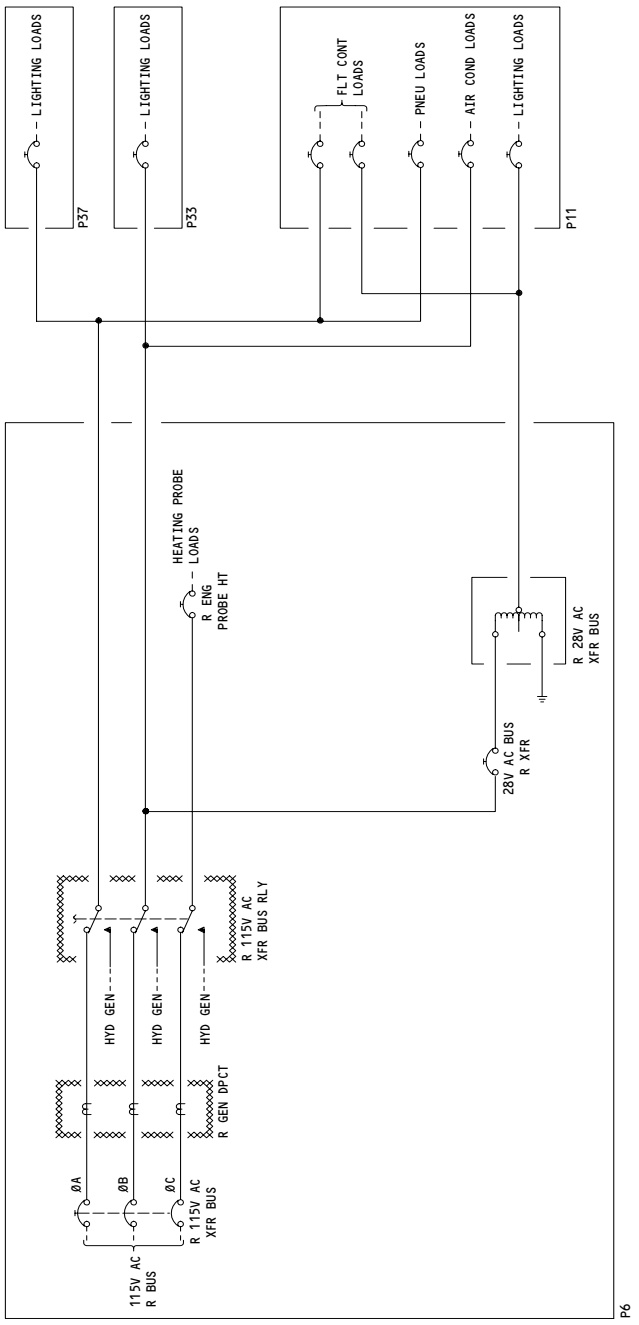
(a) The Right AC Transfer Bus is powered by the Hydraulic Motor Generator (HMG) through the right ac transfer bus relay if both main generators are inoperative during flight.



L AC TRANSFER BUS

Left AC Transfer Bus Schematic
Figure 8

159579



R AC TRANSFER BUS

Right AC Transfer Bus Schematic
Figure 9

115 VOLT AC POWER DISTRIBUTION

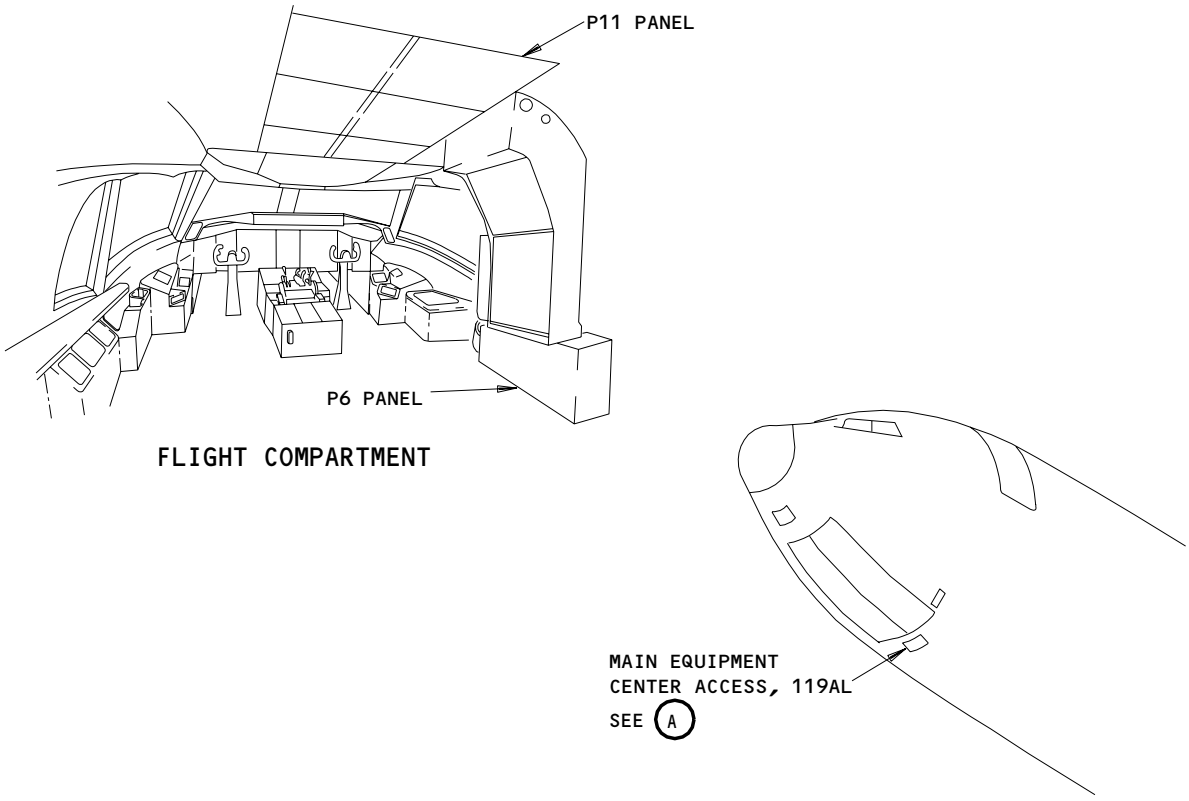
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	--		FLT COMPT, P6	
CAPT PRIM INSTR BUS - ϕA, C4264		1	6J14	*
CAPT PRIM INSTR BUS - ϕB, C4265		1	6J15	*
CAPT PRIM INSTR BUS - ϕC, C4266		1	6J16	*
CENTER BUS DC, C899		1	6J13	*
CENTER BUS AC INVERTER, C875		1	6L15	*
CENTER BUS AC, C876		1	6J18	*
F/O PRIM INSTR BUS - ϕA, C4267		1	6L20	*
F/O PRIM INSTR BUS - ϕB, C4268		1	6L21	*
F/O PRIM INSTR BUS - ϕC, C4269		1	6L22	*
115V AC BUS L SEC 1, C313		1	6C15	*
115V AC BUS L SEC 2, C308		1	6A18	*
115V AC BUS L SEC 3, C328		1	6A15	*
115V AC BUS R SEC 1, C319		1	6C21	*
115V AC BUS R SEC 2, C307		1	6A24	*
115V AC BUS R SEC 3, C329		1	6A21	*
CIRCUIT BREAKERS	--		FLT COMPT, P11	
CAT III BUS ISOL BAT, C826		1	11D6	*
CAT III BUS ISOL L, C824		1	11T3	*
CAT III BUS ISOL R, C825		1	11T30	*
UTILITY BUS L, C822		1	11T4	*
UTILITY BUS R, C823		1	11T31	*
CIRCUIT BREAKERS	--		119AL, MAIN EQUIP CTR, P31	
UTIL BUS-L, C311		1	119AL, MAIN EQUIP CTR, P31	*
115V AC BUS L SECT 4, C310		1	119AL, MAIN EQUIP CTR, P31	*
CIRCUIT BREAKERS	--		119AL, MAIN EQUIP CTR, P32	
R GEN GND SVCE BUS, C316		1	119AL, MAIN EQUIP CTR, P32	*
UTIL BUS RIGHT, C315		1	119AL, MAIN EQUIP CTR, P32	*
115V AC BUS R SECT 4, C317		1	119AL, MAIN EQUIP CTR, P32	*
CIRCUIT BREAKERS	--		119AL, MAIN EQUIP CTR, P33	
GND SVCE BUS DISTR P-6, C321		1	33B7	*
GND SERVICE XFMR, C871		1	33D2	*
CIRCUIT BREAKERS	--		119AL, MAIN EQUIP CTR, P34	
APU PWR GND HDLG BUS ϕC, C836		1	34B14	*
APU PWR GND SVCE BUS, C322		1	34B16	*
GND HDLG BUS-EXT PWR ϕC, C833		1	34D11	*
GND SVCE BUS-EXT PWR, C306		1	34C10	*
115V AC GND HDLG BUS, C309		1	34B19	*

* SEE THE WDM EQUIPMENT LIST

115 Volt AC Power Distribution - Component Index
Figure 101 (Sheet 1)

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
RELAY - (REF 31-01-06, FIG. 101)				
CENTER BUS ISOLATION, K123				
CENTER BUS TRANSFER, K107				
ISOLATION REQUEST, K122				
RELAY - (REF 31-01-31, FIG. 101)				
LEFT UTILITY BUS, K119				24-51-05
RELAY - (REF 31-01-32, FIG. 101)				
GROUND SERVICE TRANSFER, K102				24-51-03
RIGHT UTILITY BUS, K120				24-51-05
RELAY - (REF 31-01-33, FIG. 101)				
LOAD SHED, K622				
RELAY - (REF 31-01-34, FIG. 101)				
GROUND HANDLING, K101				24-51-01
GROUND SERVICE SELECT, K103				24-51-01
RELAY - (REF 31-01-36, FIG. 101)				
GALLEY GROUND LOAD SHED, K10136				
GALLEY GROUND LOAD SHED CONT, K10391				
UTILITY/GALLEY PWR FLT RESET, K10109				
MODULE - (REF 31-01-06, FIG. 101)				
CENTER BUS TIME DELAY, M540				
MODULE - (REF 31-01-33, FIG. 101)				
LOAD SHED TIME DELAY, M1084				
UNIT - (REF 31-01-06, FIG. 101)				
INSTRUMENT BUS VOLTAGE SENSING, M1079				
F/O INSTRUMENT BUS VOLTAGE SENSING, M1217				

115 Volt AC Power Distribution - Component Index
Figure 101 (Sheet 2)



115 Volt AC Power Distribution – Component Location
Figure 102

GROUND HANDLING RELAY - REMOVAL/INSTALLATION

1. General
   A. The ground handling relay, K101, is installed in the APU/external power panel, P34.
   B. This procedure contains two tasks. The first task removes the ground handling relay. The second task installs the ground handling relay and does a test of the installation.

TASK 24-51-01-004-001

2. Remove the Ground Handling Relay (Fig. 401)
   A. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Flight Compartment

      (2) Access Panel
          119AL Main Equipment Center

   C. Remove the Ground Handling Relay

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

      S 864-003

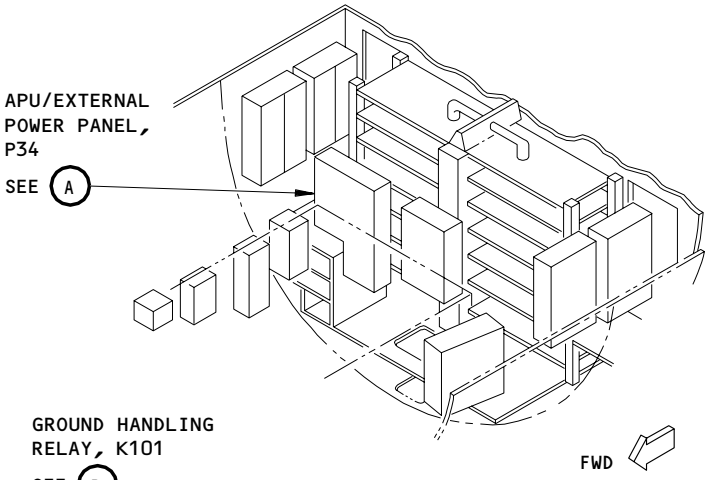
      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS INSTALLED IN THE MAIN POWER CENTERS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

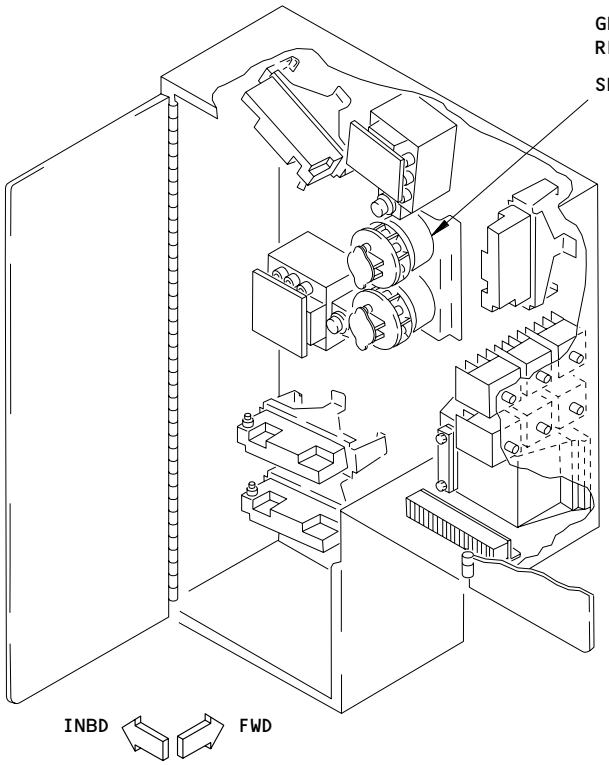
      S 864-004
      (3) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6B4, BUS PWR CONT UNIT

      S 014-005
      (4) Open the P34 panel.

      S 014-006
      (5) Remove the terminal cover on the ground handling relay.

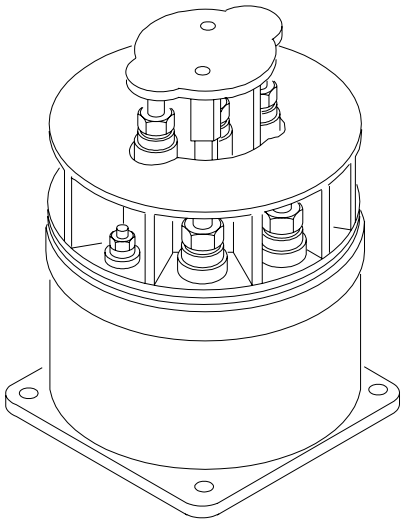


MAIN EQUIPMENT CENTER



APU/EXTERNAL POWER PANEL, P34

A



GROUND HANDLING RELAY
(TYPICAL)

B

Ground Handling Relay Installation
Figure 401

S 864-008
(6) Identify the wires that are necessary for installation.

S 034-007
(7) Remove the wires from the ground handling relay.

S 034-009
(8) Remove the screws that attach the ground handling relay to the P34 panel.

S 024-010
(9) Remove the ground handling relay.

TASK 24-51-01-404-011

3. Install the Ground Handling Relay (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones

119/120	Main Equipment Center
211/212	Flight Compartment
822	Aft Cargo Compartment

(2) Access Panel

119AL	Main Equipment Center
822	Aft Cargo Compartment

C. Install the Ground Handling Relay

S 434-012
(1) Put the relay in its position on the P34 panel.

S 434-013
(2) Install the four screws that attach the relay to the panel.

S 434-033

(3) Tighten the four screws.

S 434-035

(4) Connect the lower electrical wires to the relay:
   (a) Remove the screws that attach the lower terminal covers to the relay.
   (b) Remove the lower terminal cover.
   (c) Remove the nuts and washers from the terminal studs on the relay.

   CAUTION: MAKE SURE THE WIRES ARE CONNECTED TO THE RELAY CORRECTLY. INCORRECT INSTALLATION OF THE WIRES CAN CAUSE DAMAGE TO EQUIPMENT.

   (d) Connect the lower terminal wires to the lower terminal studs on the relay.

   CAUTION: INSTALL THE WASHERS ABOVE THE ELECTRICAL WIRES. AN INCORRECT INSTALLATION CAN CAUSE HEAT. THE HEAT CAN CAUSE DAMAGE TO THE RELAY.

   (e) Install the washers and the nuts that attach the wires to the relay.
   (f) Tighten the large nuts to 53-60 pound-inches.
   (g) Tighten the small nuts to 7-8 pound-inches.
   (h) Remove the identification labels from the wires.
   (i) Put the lower terminal cover in its position on the relay.
   (j) Install the screws that attach the lower terminal cover to the relay.
   (k) Tighten the screws to 7-8 pound-inches.

S 434-034

(5) Connect the top electrical wires to the relay:
   (a) Remove the screws that attach the top terminal covers to the relay.
   (b) Remove the top terminal cover.
   (c) Remove the nuts and washers from the terminal studs on the relay.

   CAUTION: MAKE SURE THE WIRES ARE CONNECTED TO THE RELAY CORRECTLY. INCORRECT INSTALLATION OF THE WIRES CAN CAUSE DAMAGE TO EQUIPMENT.

   (d) Connect the top terminal wires to the top terminal studs on the relay.

CAUTION: INSTALL THE WASHERS ABOVE THE ELECTRICAL WIRES. AN INCORRECT INSTALLATION CAN CAUSE HEAT. THE HEAT CAN CAUSE DAMAGE TO THE RELAY.

(e) Install the washers and nuts that attach the top terminal wires to the relay.
(f) Tighten the nuts to 46-51 pound-inches.
(g) Remove the identification labels from the wires.
(h) Put the top terminal cover in its position on the relay.
(i) Install the screws that attach the top terminal cover to the relay.
(j) Tighten the screws to 7-8 pound-inches.

S 864-016
(6) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6B4, BUS PWR CONT UNIT

S 414-017
(7) Close the P34 panel.

D. Test of the Ground Handling Relay

S 864-018
(1) Supply external power to the ac ground handling bus (AMM 24-22-00/201).

S 014-019
(2) Open the aft cargo door.

S 864-020
(3) Set the EXT AFT CAR COMPT LIGHTS switch to the ON position on the external aft cargo door control panel, P44.

S 714-021
(4) Make sure the aft cargo lights come on.

S 864-022
(5) Set the EXT AFT CAR COMPT LIGHTS switch to the OFF position.

S 414-023
(6) Close the aft cargo door.

S 864-024
(7) Remove the external power if it is not necessary (AMM 24-22-00/201).

GROUND SERVICE SELECT RELAY - REMOVAL/INSTALLATION

1. General
   A. The ground service select relay, K103, (referred to as the select relay) is installed in the APU/auxiliary power panel, P34.
   B. This procedure contains two tasks. The first task removes the select relay. The second task installs the select relay and does a test of the installation.

TASK 24-51-02-004-001

2. Remove the Ground Service Select Relay (Fig. 401)
   A. References
      (1) 27-61-00/201, Spoiler/Speedbrake Control System
      (2) AMM 24-22-00/201, Electrical Power-Control
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center
          211/212 Flight Compartment

      (2) Access Panel
          119AL Main Equipment Center

   C. Remove the Ground Service Select Relay

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (Ref 27-61-00).

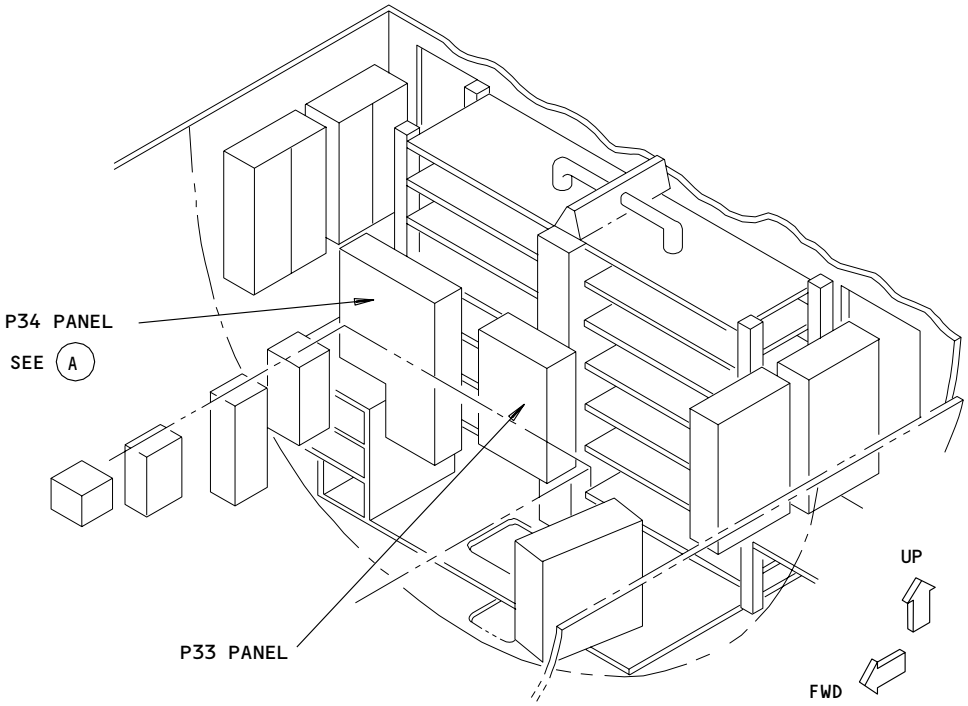
      S 864-003

      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL THE COMPONENTS INSTALLED IN THE MAIN POWER CENTERS. THE HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

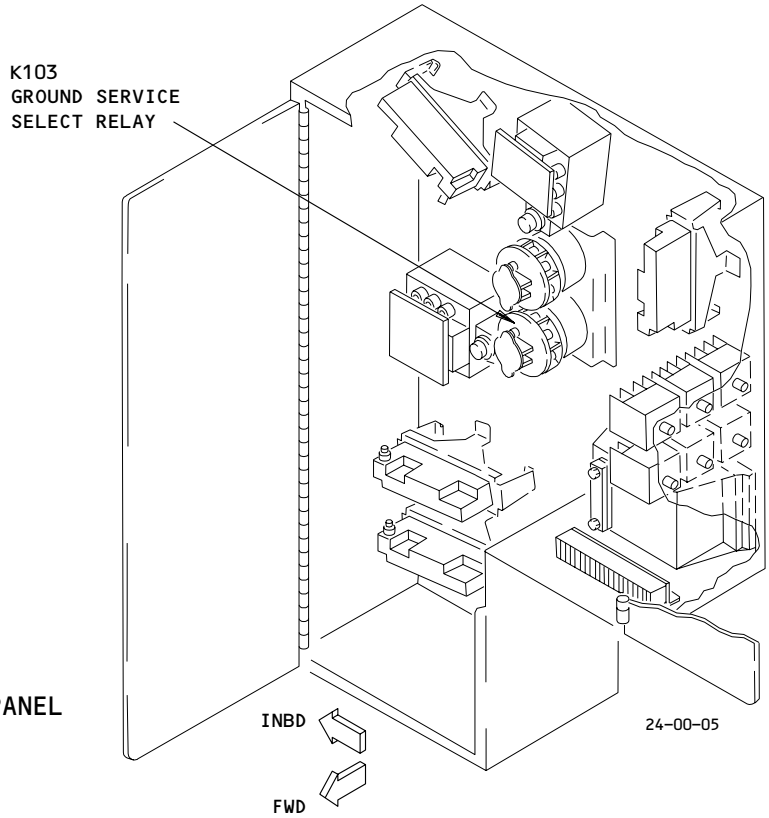
      (2) Remove electrical power (AMM 24-22-00).

      S 864-004
      (3) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
      (a) 6B4, BUS PWR CONT UNIT

      S 014-005
      (4) Open the P34 panel.



MAIN E/E EQUIPMENT CENTER



P34–APU/AUXILIARY POWER PANEL

(A)

Ground Service Select Relay Installation
Figure 401

S 014-006
(5) Remove the terminal cover on the select relay.

S 864-008
(6) Identify the wires that are necessary for installation.

S 034-007
(7) Remove the wires from the select relay.

S 034-009
(8) Remove the screws that attach the select relay to the P34 panel.

S 024-010
(9) Remove the select relay.

S 864-025
(10) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

TASK 24-51-02-404-011

3. Install the Ground Service Select Relay (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
119/120 Main Equipment Center
211/212 Flight Compartment

(2) Access Panel
119AL Main Equipment Center

C. Install the Ground Service Select Relay

S 424-012
(1) Install the select relay.

S 434-013
(2) Attach the select relay to the P34 panel with the screws.

S 434-014

CAUTION: MAKE SURE YOU CONNECT THE WIRES TO THE SELECT RELAY CORRECTLY. INCORRECT INSTALLATION OF THE WIRES CAN CAUSE DAMAGE TO EQUIPMENT.

(3) Connect the wires to the select relay.

S 424-028
(4) Tighten the large nuts to 53-60 pound-inches.

S 424-029
(5) Tighten the small nuts to 7-8 pound-inches.

S 434-015
(6) Install the terminal cover on the select relay.

S 414-016
(7) Close the P34 panel.

S 864-017
(8) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6B4, BUS PWR CONT UNIT

D. Test of the ground service select relay

S 864-018
(1) Supply external power to the ground service bus (AMM 24-22-00/201).

S 714-019
(2) Make sure the 115V GND SVCE HOT BUS WARNING light on the forward miscellaneous electrical equipment panel, P33, comes on.

S 864-020
(3) Remove external power (AMM 24-22-00/201).

S 864-021
(4) Supply APU power to the ground service bus (AMM 24-22-00/201).

S 714-022
(5) Make sure the 115V GND SVCE HOT BUS WARNING light on the P33 panel comes on.

S 864-023
(6) Remove APU power if it is not necessary (AMM 24-22-00/201).

GROUND SERVICE TRANSFER RELAY - REMOVAL/INSTALLATION

1. General
   A. Ground service transfer relay K102 is located in right generator power panel P32.

TASK 24-51-03-024-001

2. Remove the Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          120 Main Equipment Center (RH side)

      (2) Access Panels
          P32 Right Generator Power Panel
          P6 Main Power Distribution Panel

   C. Procedure

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

      S 864-027

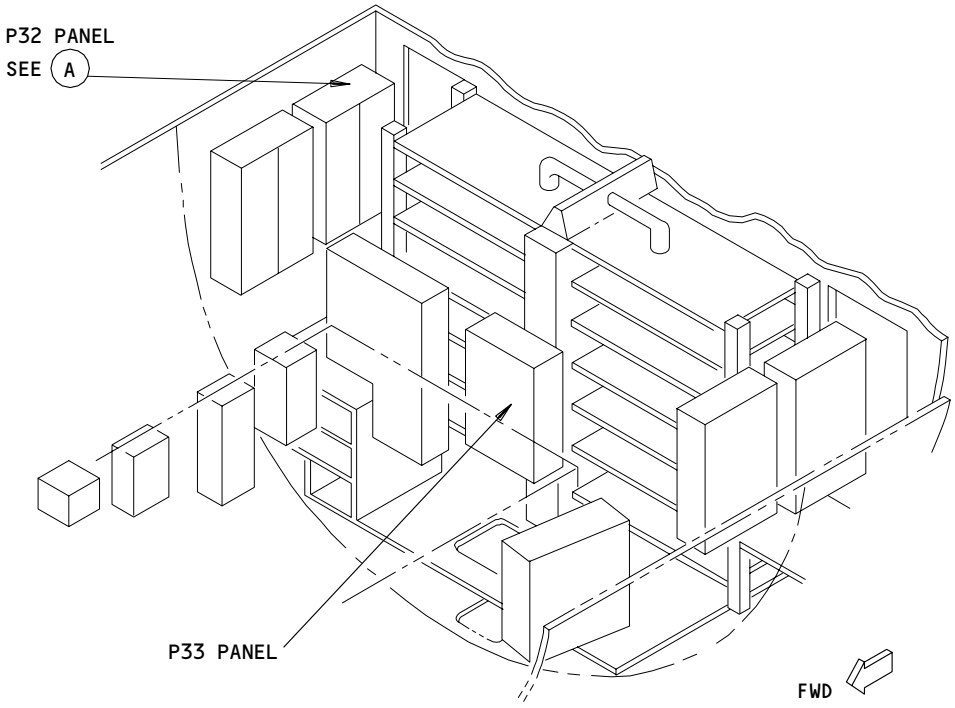
      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR EQUIPMENT AWAY FROM THE SPOILERS. THE HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

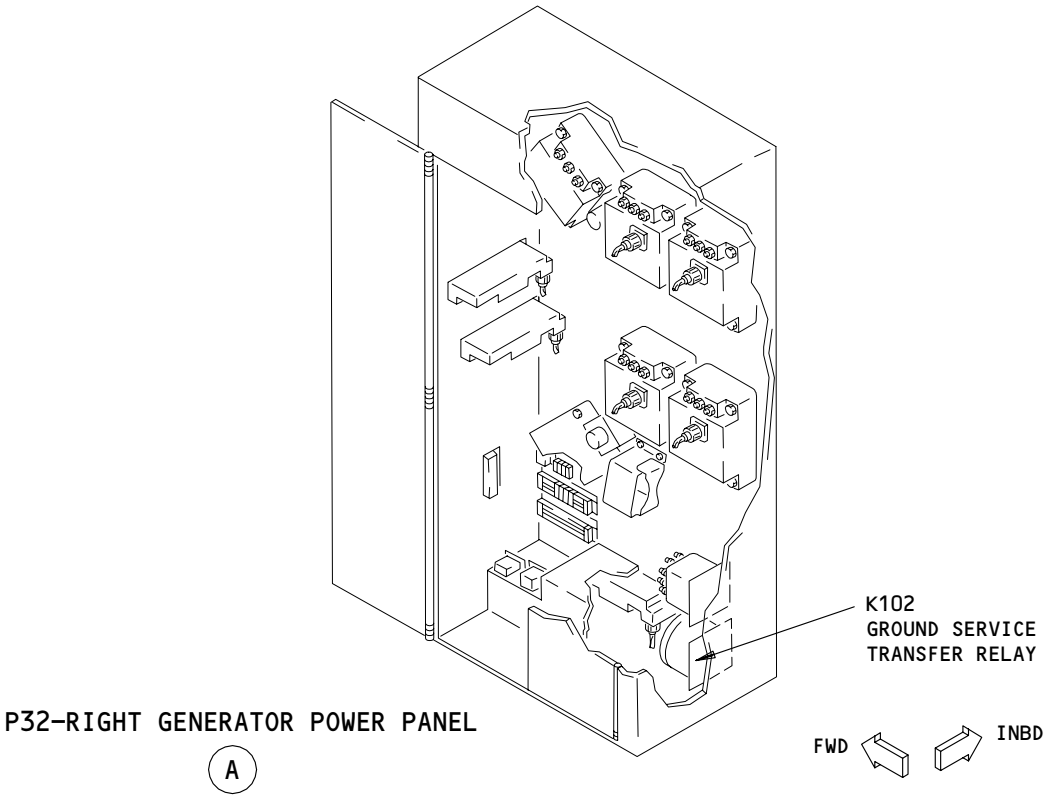
      S 864-003
      (3) Open the following main power distribution panel P6 circuit breaker and attach DO-NOT-CLOSE identifier.
          (a) 6B4, BUS PWR CONT UNIT

      S 014-004
      (4) Open P32 panel to access relay.

      S 024-005
      (5) Remove terminal cover on relay.



MAIN E/E EQUIPMENT CENTER



P32–RIGHT GENERATOR POWER PANEL
A

Ground Service Transfer Relay Installation
Figure 401

S 024-006
(6) Remove leads from relay and identify for reinstallation.

S 024-007
(7) Remove securing screws and remove relay.

TASK 24-51-03-424-008
3. Install Relay (Fig. 401)
A. References
(1) AMM 24-22-00/201, Electrical Power Control
(2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
B. Access
(1) Location Zones
120 Main Equipment Center (RH side)

(2) Access Panels
P32 Right Generator Power Panel
P6 Main Power Distribution Panel

C. Procedure

S 424-020
(1) Hold relay in position and install attaching screws.

S 754-009

CAUTION: CHECK ALL CONNECTIONS TO RELAY FOR CORRECT INSTALLATION. INCORRECT INSTALLATION OF LEADS CAN CAUSE SERIOUS CIRCUIT MALFUNCTIONS.

(2) Connect leads to relay.

S 424-030
(3) Tighten the large nuts to 53-60 pound-inches.

S 424-031
(4) Tighten the small nuts to 7-8 pound-inches.

S 424-010
(5) Install terminal cover on relay.

S 414-011
(6) Close P32 panel.

S 864-012
(7) Remove DO-NOT-CLOSE identifier and close the following P6 circuit breaker panel:
(a) 6B4, BUS PWR CONT UNIT

S 864-028
(8) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

D. Test ground service transfer relay installation.

S 864-013
(1) Provide external power to the ground service bus (AMM 24-22-00/201).

S 864-014
(2) Check that 115V GND SVCE HOT BUS WARNING light on P33 panel is on.

S 864-015
(3) Remove external power from ground service bus.

S 864-016
(4) Provide external power to right main AC bus (AMM 24-22-00/201).

S 754-017
(5) Check that 115V GND SVCE HOT BUS WARNING light on P33 panel is on.

S 864-018
(6) Remove external power if no longer required.

INSTRUMENT BUS VOLTAGE SENSING UNIT (IBVSU) - REMOVAL/INSTALLATION

1. General
   A. The Captain's instrument bus voltage sensing unit (referred to as the Captain's IBVSU), M1079, and the F/O's IBVSU, M1217, are installed in the main power distribution panel, P6.
   B. This procedure contains two tasks. The first task removes the IBVSU. The second task installs the IBVSU and does a test of the installation.

TASK 24-51-04-004-001

2. Remove the Instrument Bus Voltage Sensing Unit (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake
   B. Access
      (1) Location Zone
          211/212 Flight Compartment

   C. Prepare for Removal

      S 864-002

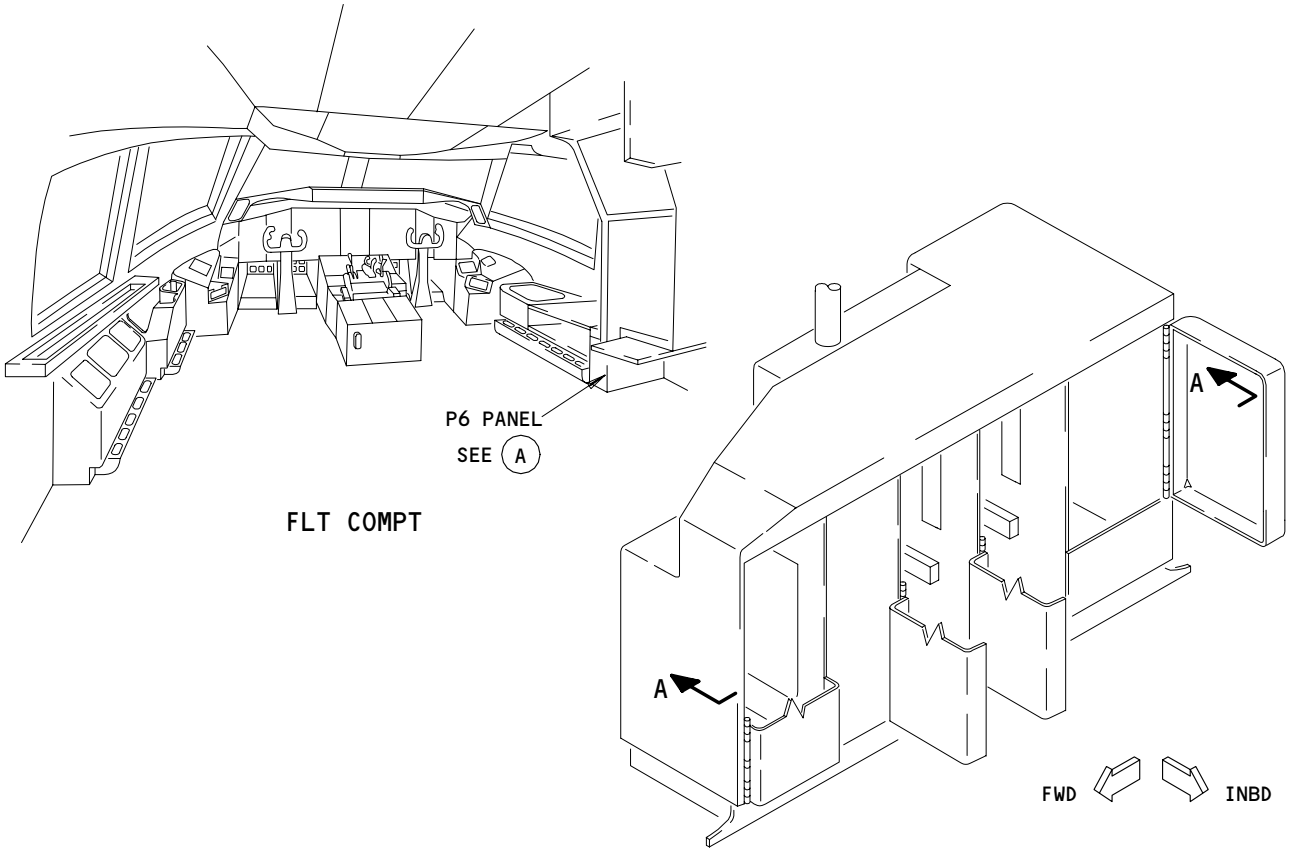
      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

      S 864-003

      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS INSTALLED IN THE MAIN POWER CENTERS. THE HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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



Instrument Bus Voltage Sensor Unit Installation
Figure 401

D. Removal

S 024-024

(1) Remove the Insturment Bus Voltage Sensing Unit (IBVSU) per the steps that follow:
(a) Open the main power distribution panel, P6.
(b) Remove the electrical connector from the IBVSU.
(c) Remove the four screws that attach the IBVSU to the panel.
(d) Remove the IBVSU.

TASK 24-51-04-404-009

3. Install the Instrument Bus Voltage Sensing Unit (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power Control
(2) AMM 31-41-00/201, Engine Indicating Crew Alerting System

B. Access
(1) Location Zone
211/212 Flight Compartment

C. Installation

S 424-010

(1) Install the IBVSU per the steps that follow:
(a) Hold the IBVSU in position and attach the IBVSU to the panel with the four screws.
(b) Install the electrical connector on the IBVSU.
(c) Close the P6 panel.

S 864-029

(2) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

D. Installation Test

S 864-014

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

S 714-025

(2) Do a test of the IBVSU per the steps that follow:
(a) Make sure the EICAS system is operational (AMM 31-41-00/201).
(b) Open the applicable P6 panel circuit breaker:
1) 6J14 CAPT PRIM INSTR BUS
2) 6L20 F/O PRIM INSTR BUS
(c) Make sure the applicable EICAS status message, F/O INST XFER, CAPT INST XFER is shown on the display.

(d) Close the applicable P6 panel circuit breaker.
1) 6J14 CAPT PRIM INSTR BUS
2) 6L20 F/O PRIM INSTR BUS
(e) Make sure the applicable EICAS status message is not shown on the display.

S 864-020
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

UTILITY BUS RELAY - REMOVAL/INSTALLATION

1. General
   A. There are two utility bus relays that are the same. The right utility bus relay, K120, is in the right generator power panel, P32. The left utility bus relay, K119, is in the left generator power panel, P31.
   B. This procedure contains two tasks. The first task removes the utility bus relays. The second task installs the utility bus relays and does a test of the installation.

TASK 24-51-05-004-001

2. Remove the Utility Bus Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zone
          119/120 Main Equipment Center

      (2) Access Panel
          119AL Main Equipment Center

   C. Prepare for Removal

      S 864-002

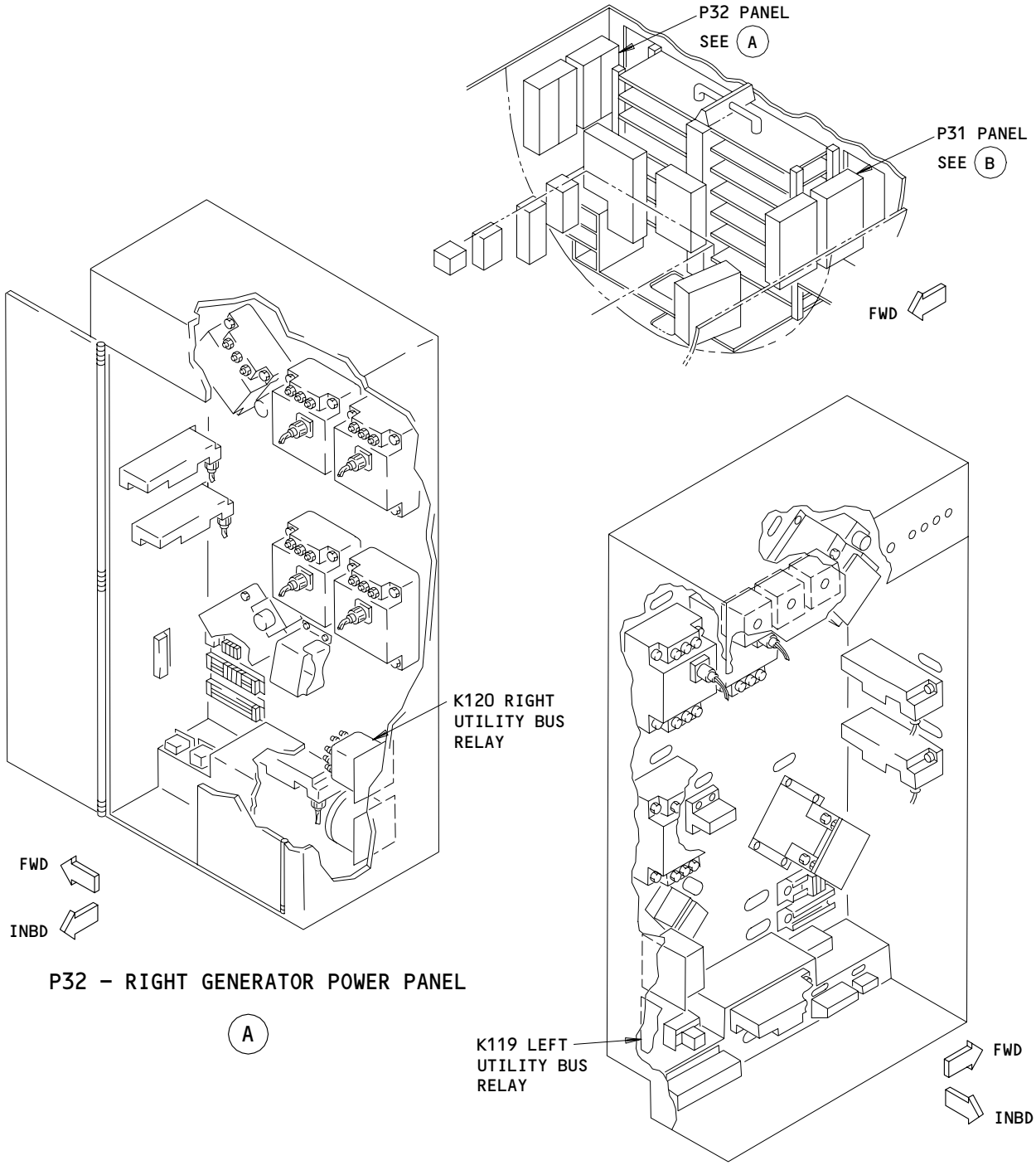
      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (AMM 27-61-00/201).

      S 864-003

      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL THE COMPONENTS INSTALLED IN THE MAIN POWER CENTERS. THE HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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



Utility Bus Relay Installation
Figure 401

D. Removal

S 024-028

(1) Remove the applicable utility bus relay per the steps that follow:
(a) Open the P32 panel to get to the right utility bus relay or the P31 panel to get to the left utility bus relay.
(b) Install identification tags on the wires for installation.
(c) Remove the wires from the relay.
(d) Remove the screws that attach the relay to the panel.
(e) Remove the relay.

TASK 24-51-05-404-009

3. Install the Utility Bus Relay (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones

119/120	Main Equipment Center
211/212	Flight Compartment

(2) Access Panel

119AL	Main Equipment Center

C. Installation

S 424-010

(1) Install the applicable utility bus relay per the steps that follow:
(a) Hold the relay in position and install the screws.

CAUTION: MAKE SURE YOU CONNECT THE WIRES ON THE UTILITY BUS RELAY CORRECTLY. INCORRECT INSTALLATION OF THE WIRES CAN CAUSE DAMAGE TO EQUIPMENT.

(b) Connect the wires to the relay.
(c) Close the applicable panel.

S 864-030
(2) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

D. Installation Test

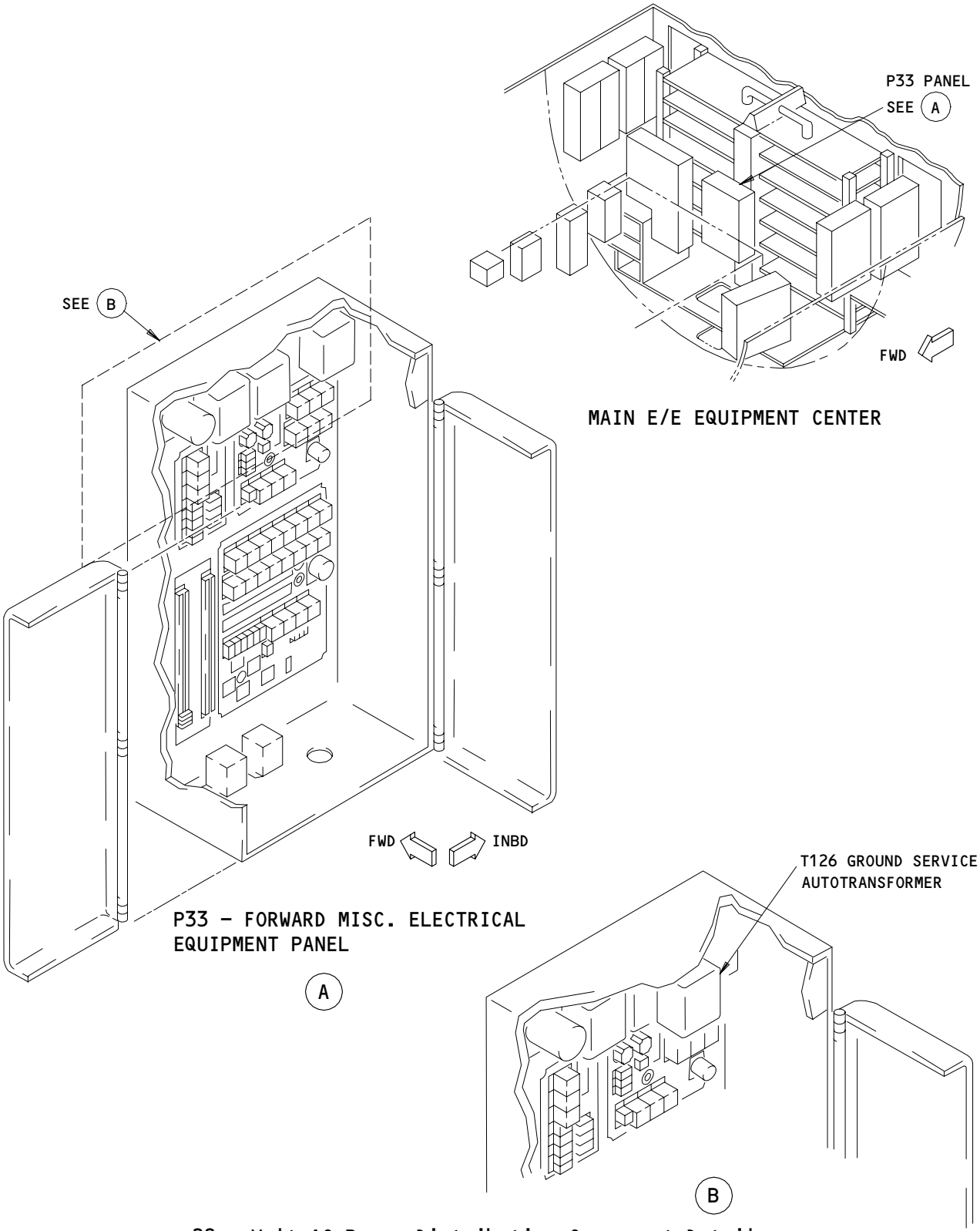
S 864-014
(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 714-029
(2) Do a check of the utility bus relays per the steps that follow:
(a) Make sure the right UTILITY BUS switch is in the off position (the switch is in the out position), on the pilot's overhead panel, P5.
(b) Make sure the left UTILITY BUS switch is in the off position (the switch is in the out position), on the P5 panel.
(c) Make sure the amber OFF light in each switch is on.
(d) Push the right UTILITY BUS switch to the ON position (the switch is in the in position).
(e) Push the left UTILITY BUS switch to the ON position (the switch is in the in position).
(f) Make sure the OFF light in each switch goes off.
(g) Push the right UTILITY BUS switch to the off position (the switch is in the out position).
(h) Push the left UTILITY BUS switch to the off position (the switch is in the out position).
(i) Make sure the amber OFF light in each switch comes on.

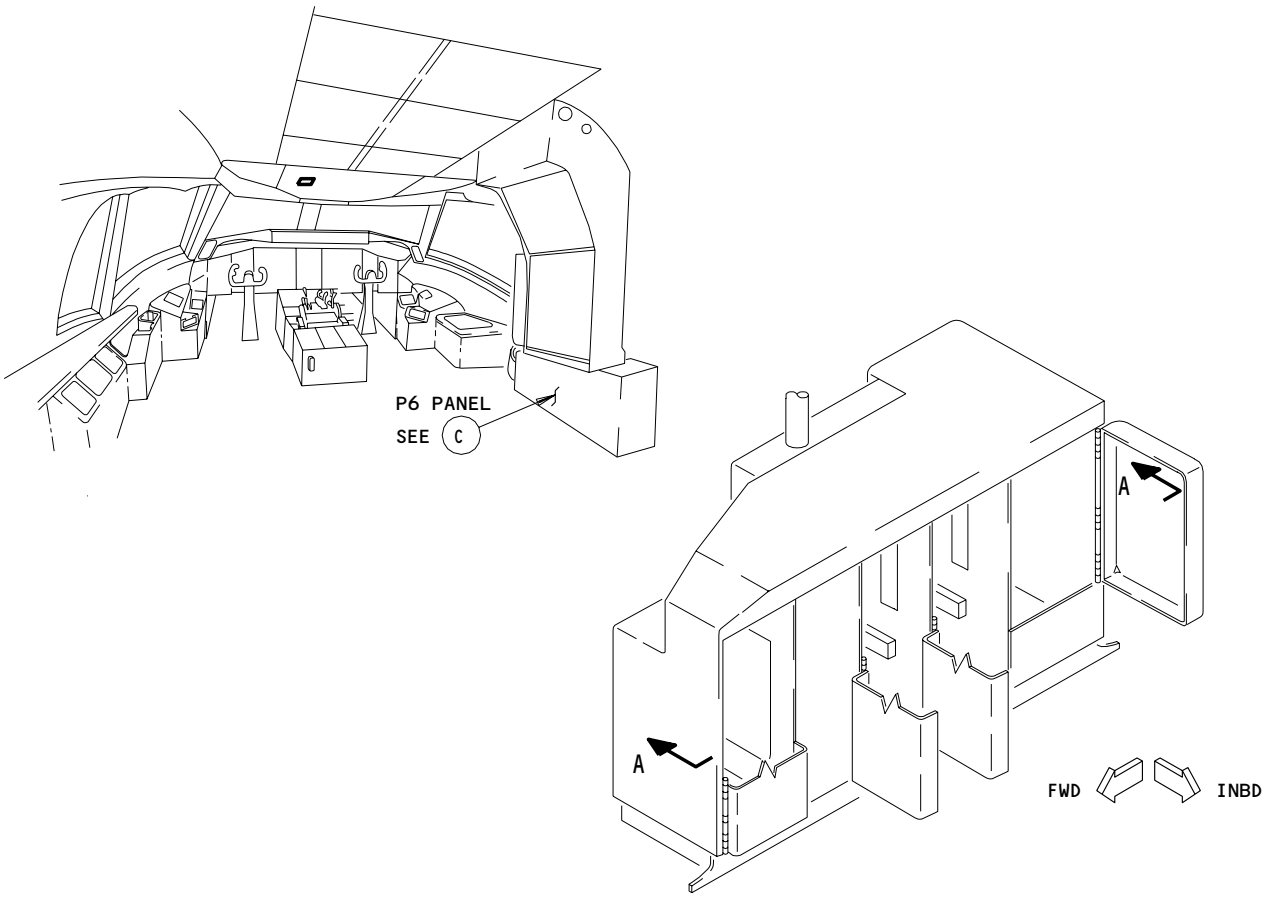
S 864-022
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

28-VOLT AC POWER DISTRIBUTION - DESCRIPTION AND OPERATION

1. General
   A. The 28-volt AC system consists of three buses. These are: left 28-volt AC bus, right 28-volt AC bus, and the 28-volt AC ground service bus. System components are autotransformers.
2. Component Details (Fig. 1)
   A. Autotransformers
      (1) Autotransformers step down 115-volt single-phase AC power to 28-volt AC power. The left and right autotransformers are in main power distribution panel P6. Circuit breakers are located in P6 panel and in P11 overhead circuit breaker panel.
      (2) The ground service autotransformer is in fwd. misc. electrical equipment panel P33. Circuit breakers are in P33 panel.
3. Operation (Fig. 2)
   A. Functional Description
      (1) Autotransformers receive input power from a single phase of the respective bus. A thermal circuit breaker in the primary of each autotransformer protects the autotransfomer and wiring from excessive current.
      (2) Autotransformers for the left and right 28-volt AC buses are rated at 350-VA of power. The ground service autotransformer is rated at 2.5 KVA of power.

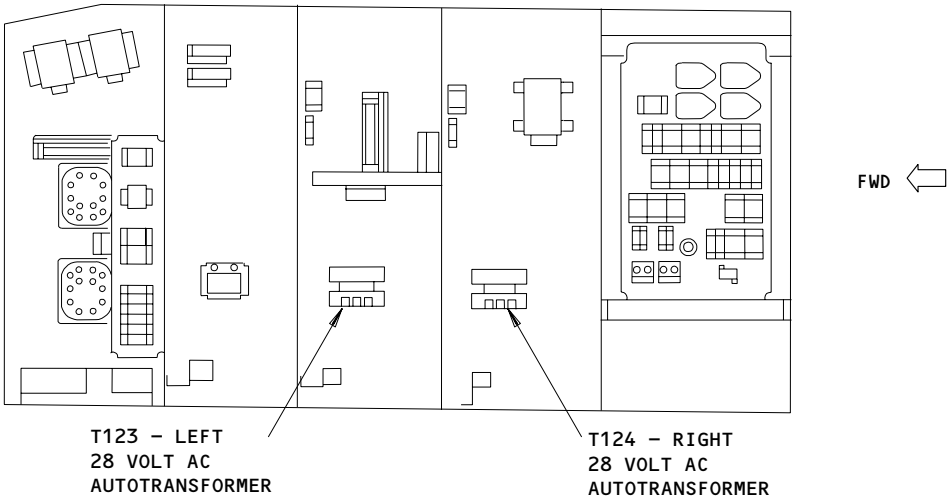


28 – Volt AC Power Distribution Component Details
Figure 1 (Sheet 1)



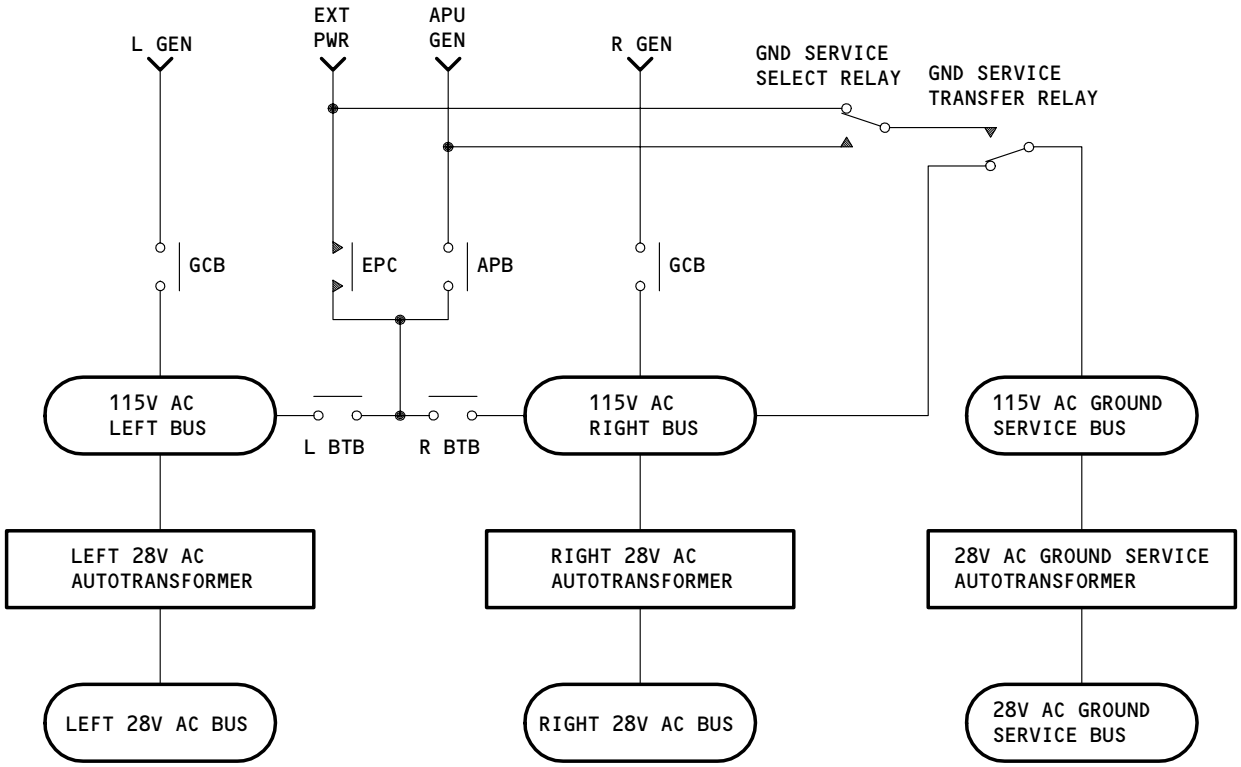
P6 – MAIN POWER DISTRIBUTION PANEL

C



A–A

28 – Volt AC Power Distribution Component Details
Figure 1 (Sheet 2)



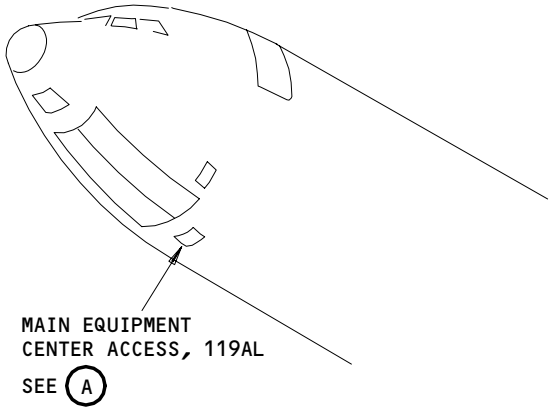
28-Volt AC Power Distribution Block Diagram
Figure 2

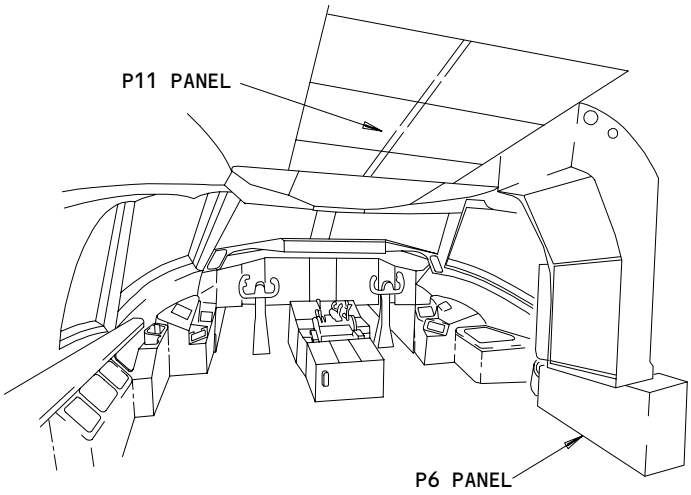
28 VOLT AC POWER DISTRIBUTION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
AUTOTRANSFORMER - (REF 31-01-06, FIG. 101)				
LEFT 28 VOLT AC BUS, T123				
RIGHT 28 VOLT AC BUS, T124				
AUTOTRANSFORMER - (REF 31-01-33, FIG. 101)				
GROUND SERVICE BUS, T126				
CIRCUIT BREAKERS	--		FLT COMPT, P6	
LEFT AC BUS 28V AC BUS L, C877		1	6J19	*
RIGHT AC BUS 28V AC BUS R, C878		1	6J25	*
CIRCUIT BREAKER	--		119AL, MAIN EQUIP CTR, P33	
ELECTRICAL POWER GROUND SERVICE TRANSFORMER, C871		1	33D2	*

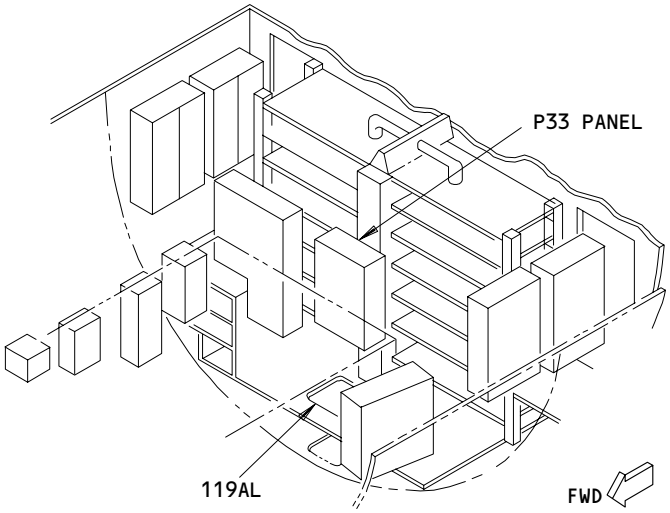
* SEE THE WDM EQUIPMENT LIST

28 Volt AC Power Distribution - Component Index
Figure 101





FLIGHT COMPARTMENT



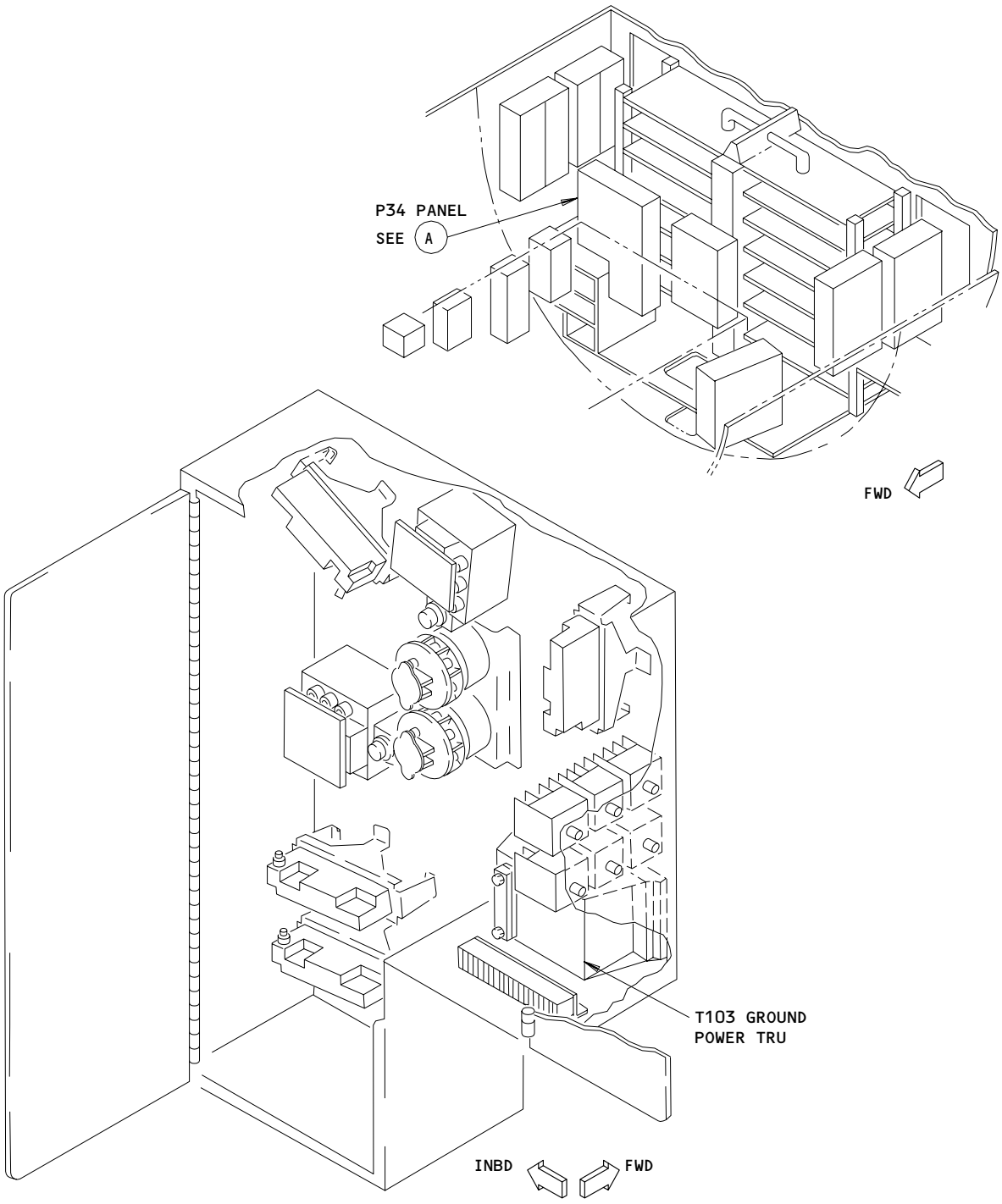
MAIN EQUIPMENT CENTER

A

28 Volt AC Power Distribution - Component Location
Figure 102

28-VOLT DC POWER DISTRIBUTION - DESCRIPTION AND OPERATION

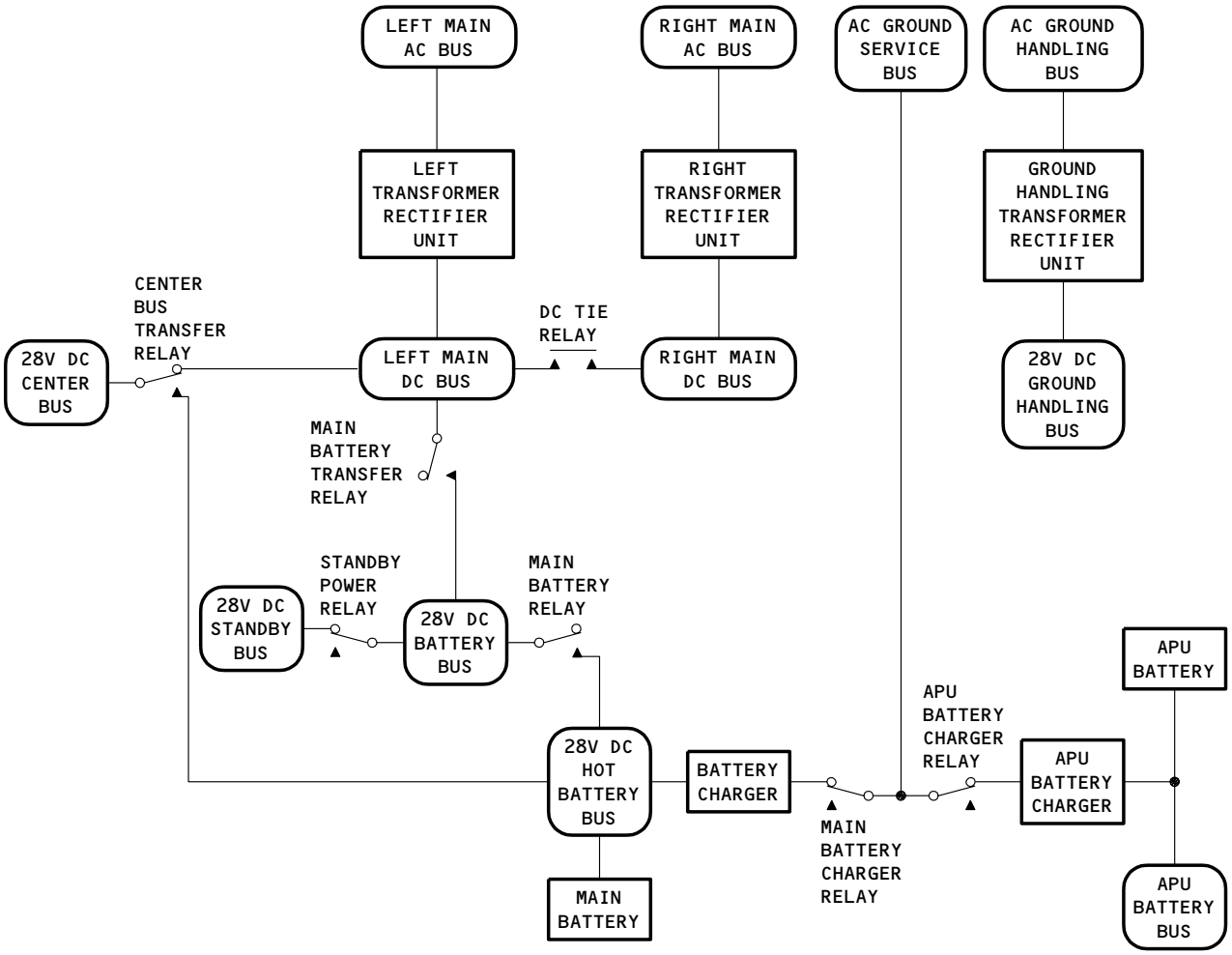
1. General
   A. Twenty-eight volt DC power distribution includes five buses. These are: left and right main DC buses, the 28-volt DC center and standby buses, and 28-volt DC ground handling bus. The main system component is the ground power transformer-rectifier unit.
2. Component Details (Fig. 1)
   A. Ground Power Transformer-Rectifier Unit (TRU)
      (1) The ground power TRU converts 115 volt, 3-phase AC power from the ground handling bus to unregulated 28-volt DC power. The TRU can provide output currents up to 20 amps continuous. The TRU is cooled by natural convection. The TRU is in APU/external power panel P34.
3. Operation (Fig. 2)
   A. Functional Description
      (1) Main DC Buses
         (a) The left and right main DC buses are powered by 120-amp transformer-rectifier units connected to the main AC buses. The buses will be joined by a DC tie relay if one loses power (Ref 24-32-00).
      (2) 28-Volt DC Center Bus
         (a) The 28-volt DC center bus provides a third, independent DC power source during autoland conditions. The center bus is normally powered by the left main DC bus. During autoland, the ground service bus powers the battery charger which is paralleled with the battery to power center bus loads. If the battery charger loses power, the center bus will be powered from the battery only.
      (3) 28-Volt DC Standby Bus
         (a) The 28-volt DC standby bus provides power to essential DC flight loads. The standby bus is normally powered from the left main DC bus. The main battery provides backup power if the left main bus loses power (Ref 24-33-00).
      (4) 28-Volt DC Ground Handling Bus
         (a) The 28-volt DC ground handling bus provides power for airplane ground servicing and maintenance. DC power for the bus is obtained through a 20-amp transformer-rectifier unit connected to the 115-volt AC ground handling bus. The DC ground handling bus and circuit breakers are located in P34 panel.



P34 – APU/EXTERNAL POWER PANEL

A

28 – Volt DC Power Distribution Component Details
Figure 1



28 Volt DC Power Distribution Block Diagram
Figure 2

37229

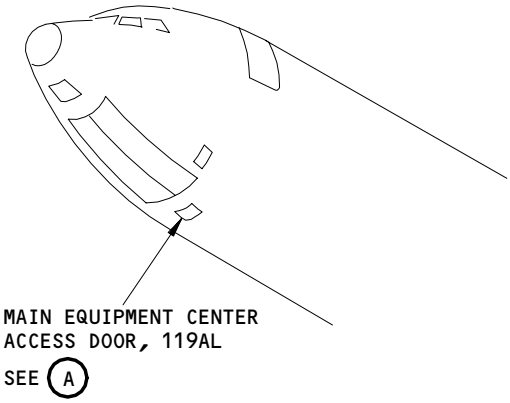
28 VOLT DC POWER DISTRIBUTION

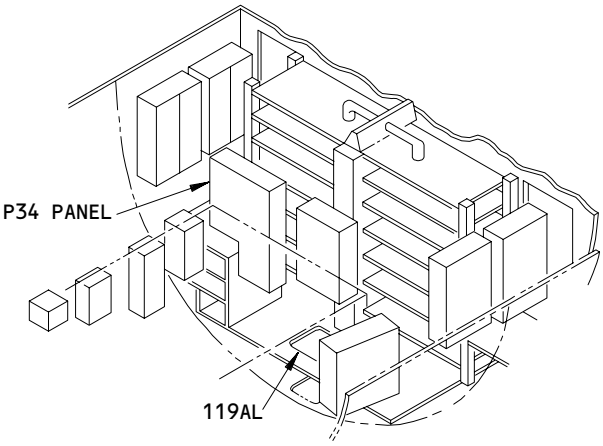
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –			FLT COMPT, P6	
BAT BUS DISTR, C829		1	6A1	*
CENTER BUS DC, C899		1	6J13	*
HOT BAT BUS, C897		1	6J10	*
LEFT DC BUS SEC 1, C882		1	6D9	*
LEFT DC BUS SEC 2, C883		1	6D8	*
RIGHT DC BUS SEC 1, C891		1	6G9	*
RIGHT DC BUS SEC 2, C890		1	6G8	*
CIRCUIT BREAKER –		1	119AL, MAIN EQUIP CTR, P34	
GND HDLG TRU, C304			34M3	*
TRANSFORMER RECTIFIER UNIT – (FIM 31-01-34/101)				24-54-01
GROUND POWER, T103				

* SEE THE WDM EQUIPMENT LIST

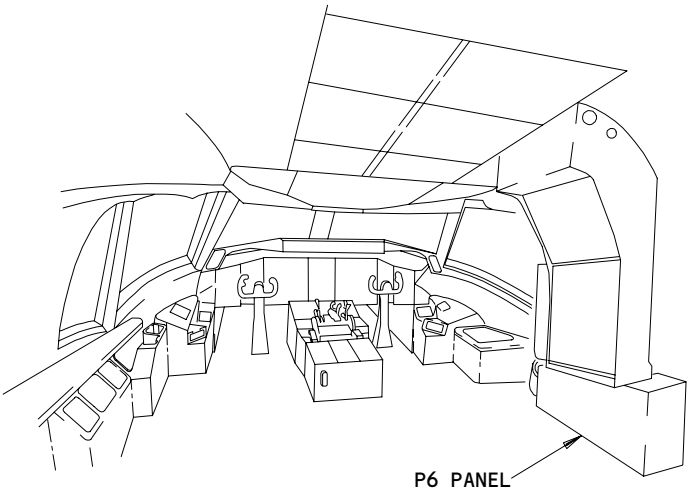
28 Volt DC Power Distribution – Component Index
Figure 101

E69421





MAIN EQUIPMENT CENTER
(A)



FLIGHT COMPARTMENT

28 Volt DC Power Distribution - Component Location
Figure 102

GROUND POWER TRANSFORMER RECTIFIER UNIT - REMOVAL/INSTALLATION

1. General
   A. The ground power transformer rectifier unit (referred to as the ground power TRU),T103, is installed on the APU/external power panel, P34.
   B. This procedure contains two tasks. The first task removes the ground power TRU. The second task installs the ground power TRU and does a test of the installation.

TASK 24-54-01-004-001

2. Remove the Ground Power TRU (Fig. 401)
   A. References
      (1) 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zone
          119/120 Main Equipment Center

      (2) Access Panel
          119AL Main Equipment Center

   C. Remove the Ground Power TRU

      S 864-002

      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

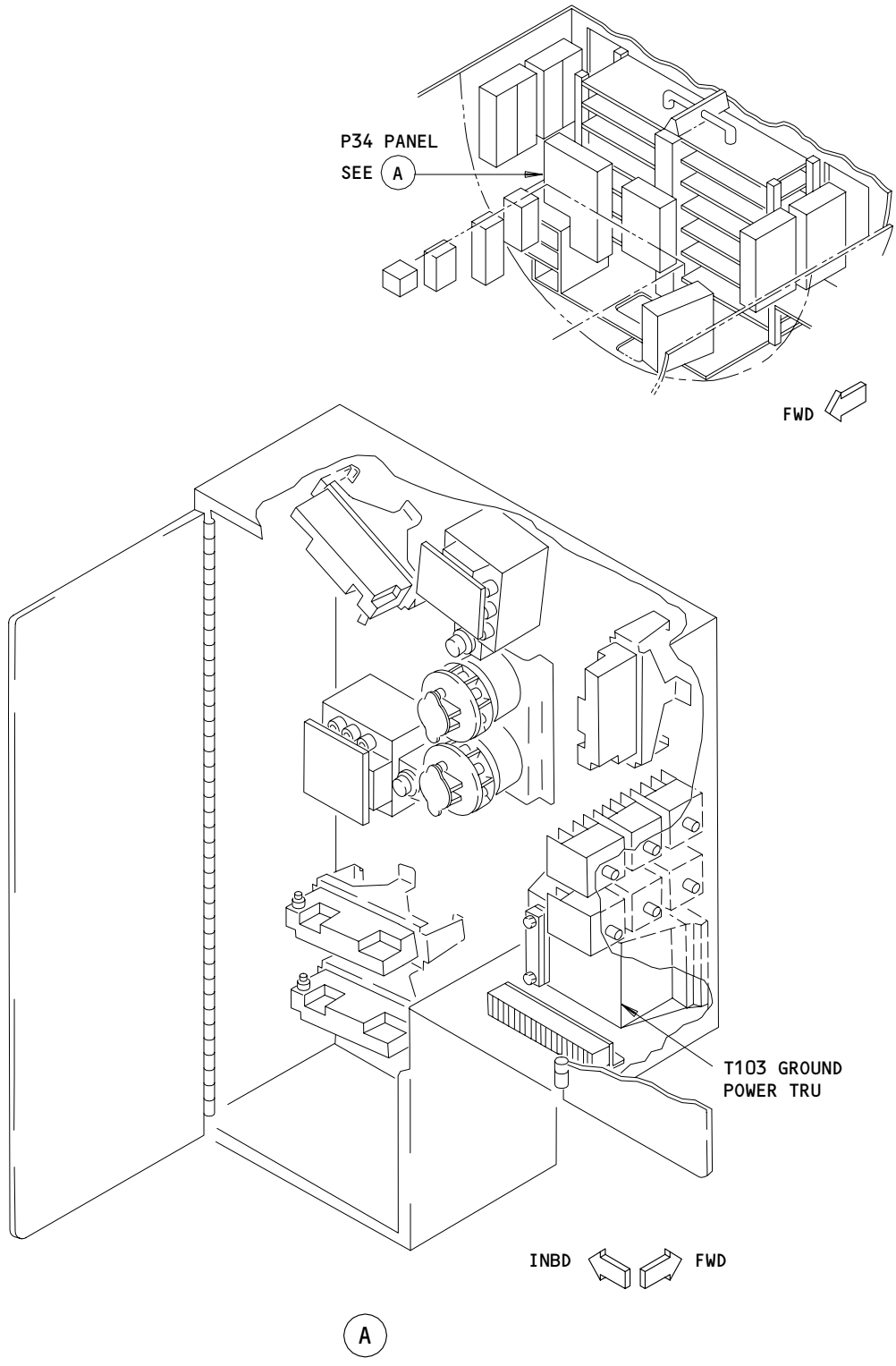
      (1) Do the deactivation procedure for the spoilers or move all persons and equipment away from the spoilers (Ref 27-61-00).

      S 864-003

      WARNING: REMOVE ELECTRICAL POWER BEFORE YOU REMOVE OR INSTALL THE COMPONENTS INSTALLED IN THE MAIN POWER CENTERS. THE HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Remove electrical power (Ref 24-22-00).

      S 014-004
      (3) Open the P34 panel.



Ground Power Transformer Rectifier Unit Installation
Figure 401

S 864-005
(4) Identify the wires on the ground power TRU that are necessary for installation.

S 034-006
(5) Disconnect the wires from the ground power TRU.

S 024-007
(6) Remove the ground power TRU.

TASK 24-54-01-404-008

3. Install the Ground Power TRU (Fig. 401)

A. References
(1) 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones

119/120	Main Equipment Center
822	Aft Cargo Compartment

(2) Access Panels

119AL	Main Equipment Center
822	Aft Cargo Door

C. Install the Ground Power TRU

S 424-009
(1) Install the ground power TRU.

S 434-010
(2) Connect the wires to the ground power TRU.

S 414-011
(3) Close the P34 panel.

D. Test of the Ground Power TRU

S 864-012
(1) Supply electrical power to the ground handling bus (Ref 24-22-00).

S 864-013

(2) Make sure this circuit breaker on the P34 panel is closed:
(a) 34J4, CARGO DOOR CONT

S 714-014

(3) At the External Forward Cargo Door Control Panel, P43, verify that the forward cargo DOOR CLOSED light comes on if the Forward Cargo Door is closed, or the forward cargo DOOR OPEN light comes on if the Forward Cargo Door is open.

S 864-015

(4) Remove electrical power if it is not necessary (Ref 24-22-00).

MEDICAL OUTLETS INVERTER - REMOVAL/INSTALLATION

1. General
   A. Provisions for the installation of a medical inverter are on rack E5-3 in the mid equipment center. Two different inverters can be used. One inverter supplies 115v/60 Hz power. The other inverter supplies 220v/50 Hz. The output from the inverter is connected to the two medical power outlets in the passenger compartment.
   B. This procedure contains two tasks. The first task removes the medical inverter. The second task installs the medical inverter.

TASK 24-54-02-004-001

2. Remove the Medical Inverter (Fig. 401)
   A. References
      (1) 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zones

119/120	Main Equipment Center
821	Forward Cargo Compartment

      (2) Access Panel

119AL	Main Equipment Center
821	Forward Cargo Door

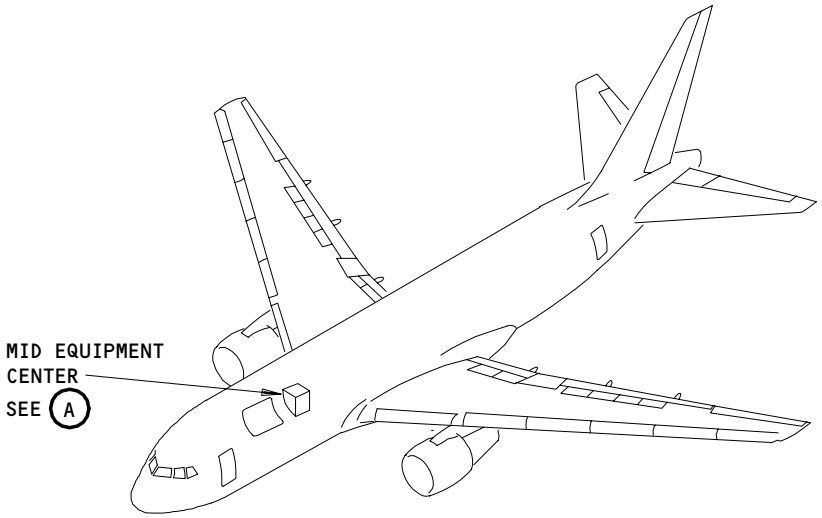
   C. Install the Medical Inverter

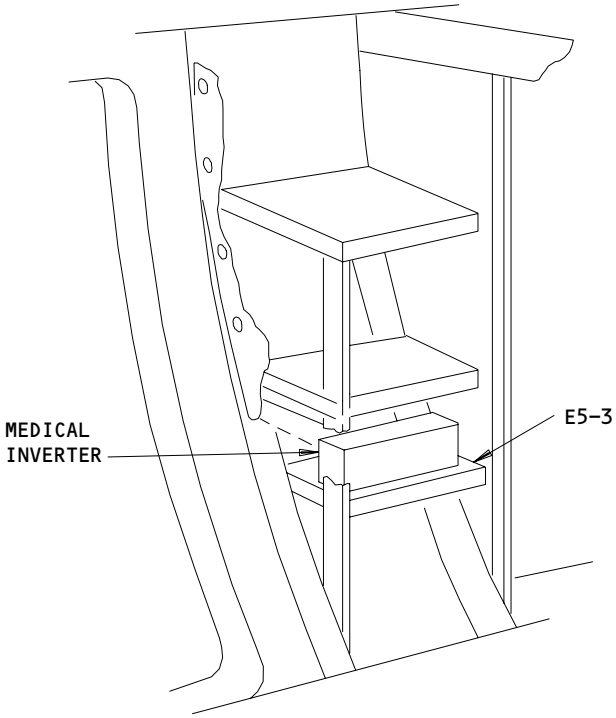
      S 864-002
      (1) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
         (a) 6G13, MEDICAL OUTLET

      S 024-003
      (2) Remove the medical inverter (Ref 20-10-01).

TASK 24-54-02-404-004

3. Install the Medical Inverter (Fig. 401)
   A. Equipment
      (1) Multimeter, for measuring 115 or 220v ac - commercially available





MID EQUIPMENT CENTER E5

A

Medical Inverter Installation
Figure 401

B. References
(1) 20-10-01/401, E/E Rack Mounted Components
(2) 24-22-00/201, Electrical Power - Control

C. Access
(1) Location Zones

119/120	Main Equipment Center
821	Forward Cargo Compartment

(2) Access Panel

119AL	Main Equipment Center
821	Forward Cargo Door

D. Install the Medical Inverter

S 864-005
(1) Make sure this circuit breaker on the P6 panel is open:
(a) 6G13, MEDICAL OUTLET

S 424-010
(2) Install the medical inverter (Ref 20-10-01).

E. Test of the Medical Inverter

S 864-006
(1) Supply electrical power (Ref 24-22-00).

S 864-007
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6G13, MEDICAL OUTLET

S 714-008
(3) Make sure the correct voltage is at the medical power outlets in passenger compartment.

S 864-009
(4) Remove electrical power if it is not necessary (Ref 24-22-00).