BOEING 757

AIRCRAFT MAINTENANCE MANUAL

CHAPTER 24 - ELECTRICAL POWER

THOMSON AIRWAYS CUSTOMISATIONS

AIR 2000

757-2Y0

MAINTENANCE MANUAL

CHAPTER 24 - ELECTRICAL POWER

WARNING: *AIRCRAFT G-OOOX (NB329) IS FITTED WITH VICKERS HYDRAULIC MOTOR-DRIVEN GENERATOR. THIS MEANS THAT TEST PROCEDURE FOR THE HMG RESET SIGNAL, PARAGRAPH "3", SUB-PARAGRAPH "F", SUB-SUB-PARAGRAPH "1", LETTERS (a) Thru (q) WILL NOT APPLY TO THIS AIRCRAFT.*

EFFECTIVITY

G-OOOX.

BOEING TELEX M-7272-93-2367.

B757 MANUAL SUPPLEMENT - ATP 3510
SECTION 1 CHAPTER 24
CONTROL PAGE - ISSUE 3

A. File the attached Temporary Revision/Alerts in the Manual Supplement in ATA Chapter/Section/Subject/Page sequence

B. File this Control Page in front of the Chapter TRs/Alerts.

C. The following list shows active TRs/Alerts together with TRs/Alerts added by this control page.

Chapter Section Subject	Page	TR/Alert No.
24-00-00	1	Alert 24-527
24-00-00	1	Alert 24-528
24-11-00	501	24-535
24-11-00	501	24-536
24-11-01	201	24-537
24-31-02	404	24-526
24-31-04	403	24-525
24-33-00	501	24-501
24-51-01	403	* 24-548
24-51-03	403	* 24-549
24-51-04	403	* 24-555

D. Remove and Destroy the following TRs/Alerts:

* Indicates TRs/Alerts issued with this control page

ATP ALERT

BRITISH AIRWAYS

B757 (NB322)

MAINTENANCE MANUAL

ALERT No. 24-527

16 September, 1997

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA) AND COMPLIES WITH BCAR'S CHAPTER A5-3, B5-3 AND/OR TSS No. 0-2 AS REQUIRED. CAA DESIGN APPROVAL No. DAI/8566/78.

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-00-00 Page 1

REASON FOR REVISION

Safety and Technical Strategy Board requirement.

ACTION

An incident has occurred where an aircraft took off with a number of circuit breakers still tripped, following hangar maintenance. Also an additional C.B had been tripped during the same check and, although reset, due to internal failure it would not pass current.

STANDARD PRACTICE

1. Whilst aircraft are in the hangar if it is necessary to manually trip Circuit Breakers for maintenance purposes, it must have suitable C.B. clips fitted to clearly identify they have been tripped.
   The preferred type is Part No. PM81128
   and is a standard C.B clip with a 6" red flag attached.
   A suitable but less obvious alternative is Part No. 4 BA 15859, which has an orange ident plate attached to the clip.
   Suitable equivalents may be used.
   Only C.B.'s that are tripped and left unattended require this precautionary action.

2. After resetting a circuit breaker, always ensure that the power is available to at least one system fed from that circuit breaker.

ALERT No. 24-528

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA) AND COMPLIES WITH BCAR'S CHAPTER A5-3, B5-3 AND/OR TSS No. 0-2 AS REQUIRED. CAA DESIGN APPROVAL No. DAI/8566/78.

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-00-00 Page 1

REASON FOR REVISION

Safety and Technical Strategy Board requirement.

ACTION

Following a serious incident where chafed wiring arced on a main hydraulic pressure pipe resulting in burn holes, a hydraulic leak and a potential fire hazard, the following "Inspection Standard for Electrical Wiring Installations" has been issued.

Inspection Standard for Electrical Wiring Installations

1. Ensure that all wiring/wire bundles are adequately routed, clipped, supported and protected where necessary.

2. Where possible a minimum of one inch clearance shall exist between all electrical wiring and adjacent pipework.

   Where by design, it is impossible to achieve one inch clearance, then an absolute minimum of half an inch will suffice, provided clipping and routing is such that movement of the wiring is unlikely to occur. Appropriate account should be taken of exposure to the dynamic conditions experienced in flight.

3. Although the above requirement applies to clearance with respect to pipework, it is equally important to maintain adequate clearance between electrical wiring and adjacent components/structure. The same minimum clearance as in 2 above should be maintained if at all possible. However it is accepted that the detail design of most aircraft types makes ½" clearance with respect to components and structure, very difficult to achieve in certain localised areas. Where this is the case, the minimum clearance between electrical wiring and adjacent components or structure may be reduced to ¼". At this reduced clearance, it is even more important that clipping and routing is adequate to ensure that movement of the wiring is unlikely to occur. Appropriate account should be taken of exposure to the dynamic conditions experienced in flight.

Rectification

It is accepted that minor changes to routing, clipping and clip stand-off lengths may be required. No two aircraft are identical in these minor respects. Additional localised wiring/wire bundle protection by sleeving may be required in some cases but sleeving is not normally regarded as an adequate permanent substitute for separation.

NOTE:

1) It is self evident from the above clearance requirements that electrical wiring should never be tied or clipped directly to pipework. Where, by design, the pipework has been used as an anchor point for wiring or wire bundles, then appropriate clip types/standoffs must be used that result in the required clearance between the pipe and wiring.

2) During aircraft maintenance, component changes etc., care should be taken to ensure that above wiring clearances are not reduced by inadvertent movement/distortion of either wiring, clipping or adjacent components.

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TEMPORARY REVISION No. 24-535

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For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-11-00 Page 501

REASON FOR REVISION

To introduce exercising of the DRIVE DISC switch, add a NOTE highlighting that one operation of the switch should effect IDG disconnect and emphasise the 'CAUTION' for extended switch operation.

ACTION

Amend task 24-11-00-715-002 para 3G to read as follows:

G. The Disconnect Test and the Connect Test

SUBTASK 715-038

(1) Do the disconnect test and the connect test:

(a) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; Make sure the FIELD OFF light in the switch for the left generator field (P61) is off.

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

(c) Push and hold the L GEN DRIVE DISC switch (P5) for maximum of 3 seconds.
NOTE: the disconnect function must operate on the first switch actuation. Failure to do so indicates a defect with the disconnect system. If no defects are present within the circuit to/including the IDG, switch replacement is required.
1) Make sure these lights come on:
a) The yellow DRIVE light in the L GEN DRIVE DISC switch (P5).
b) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The white FIELD OFF light in the switch for the left generator field (P61).

2) Make sure these indications for the left power channel show on the lower EICAS display:
a) AC-V = 0 ±5
b) FREQ = 0 ±5

TEMPORARY REVISION No. 24-535 (Cont'd)

3) Make sure these indications show on EICAS:
   a) L GEN OFF - (level B)
   b) L GEN DRIVE - (level C)

(d) Stop the left engine (Ref 71-00-00).

(e) Exercise the DRIVE DISC switch by depressing/releasing the switchlight 5 times. The switch must be smooth in operation without evidence of binding/malfunction.

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

(f) Push the AUTO EVENT READ switch on the EICAS maintenance panel (P61).

(g) Push and hold the ERASE button on the EICAS maintenance panel (P61) for 3 seconds.
   1) Make sure the AUTO EVENT on the EICAS erases.

(h) Open the fan cowl panels of the left engine (Ref 71-11-04).

(i) 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 must be felt when you pull the ring to the outer limit.

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

(k) 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.

(l) Permit the ring to slowly go back to the maximum inner position.
   1) If the IDG does not correctly set, replace the IDG (Ref 24-11-01).

(m) Do the disconnect inhibit test
   1) Momentarily push the L GEN DRIVE DISC switch (P5).
   2) Slowly pull the disconnect connect ring to the outer travel limit, and monitor the force necessary.
      a) The force must be less than when you pulled the ring the first time.
      b) There must be no click.
      c) Permit the disconnect connect ring to slowly go back to the maximum inward position.

NOTE:The IDG disconnect function is inhibited when the engine is stopped.

SUBTASK 415-019

(2) Close the fan cowl panels (Ref 71-11-04).

TEMPORARY REVISION No. 24-535 (Cont'd)

SUBTASK 745-020

(3) Push the RESET switch on the front of the BPCU (E5-3).
  (a) Make sure these indications show on the BPCU:
    1) EXTERNAL POWER SYSTEM
    2) LEFT GEN POWER SYSTEM
    3) RIGHT GEN POWER SYSTEM
    4) APU GEN POWER SYSTEM

SUBTASK 395-029

(4) Seal the guard wire for the IDG Disconnect Switch. Refer to AMM 24-11-00 page 201.

SUBTASK 845-015

(5) Put the Airplane Back to its Usual Condition
  (a) Remove electrical power if it is not necessary (Ref 24-22-00).
  (b) Put the BAT switch (P5) to the OFF position.

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TEMPORARY REVISION No. 24-536

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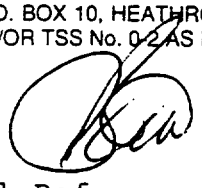

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-11-00 Page 501

REASON FOR REVISION

To introduce exercising of the DRIVE DISC switch, add a NOTE highlighting that one operation of the switch should effect IDG disconnect and emphasise the 'CAUTION' for extended switch operation.

ACTION

Amend task 24-11-00-715-003 para 4G to read as follows:

G. The Disconnect Test and the Connect Test

SUBTASK 715-045

(1) Do the disconnect test and the connect test:

(a) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; Make sure the FIELD OFF light in the switch for the right generator field (P61) is off.

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

(c) Push and hold the R GEN DRIVE DISC switch (P5) for a maximum of 3 seconds.
NOTE: the disconnect function must operate on the first switch actuation. Failure to do so indicates a defect with the disconnect system. If no defects are present within the circuit to/including the IDG, the switch must be replaced.
1) Make sure these lights come on:
a) The yellow DRIVE light in the R GEN DRIVE DISC switch (P5).
b) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The white FIELD OFF light in the switch for the right generator field (P61).

2) Make sure these indications for the right power channel show on the lower EICAS display:
a) AC-V = 0 ±5
b) FREQ = 0 ±5

3) Make sure these indications show on EICAS:
a) R GEN OFF - (level B)

TEMPORARY REVISION No. 24-536 (Cont'd)

b) R GEN DRIVE - (level C)

(d) Stop the right engine (Ref 71-00-00).

(e) Exercise the DRIVE DISC switch by depressing/releasing the switchlight 5 times. The switch must be smooth in operation without evidence of binding/malfunction.

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

(f) Push the AUTO EVENT READ switch on the EICAS maintenance panel (P61).

(g) Push and hold the ERASE button on the EICAS maintenance panel (P61) for 3 seconds.
1) Make sure the AUTO EVENT on the EICAS erases.

(h) Open the fan cowl panels of the right engine (Ref 71-11-04).

(i) 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 must be felt when you pull the ring to the outer limit.

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

(k) 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.

(l) Permit the ring to slowly go back to the maximum inner position.
1) If the IDG does not correctly set, replace the IDG (Ref 24-11-01).

(m) Do the disconnect inhibit test
1) Momentarily push the R GEN DRIVE DISC switch (P5).
2) Slowly pull the disconnect connect ring to the outer travel limit, and monitor the force necessary.
a) The force must be less than when you pulled the ring the first time.
b) There must be no click.
c) Permit the disconnect connect ring to slowly go back to the maximum inward position.

NOTE:The IDG disconnect function is inhibited when the engine is stopped.

SUBTASK 415-016

(2) Close the fan cowl panels (Ref 71-11-04).

TEMPORARY REVISION No. 24-536 (Cont'd)

SUBTASK 745-017

(3) Push the RESET switch on the front of the BPCU (E5-3).
  (a) Make sure these indications show on the BPCU:
    1) EXTERNAL POWER SYSTEM
    2) LEFT GEN POWER SYSTEM
    3) RIGHT GEN POWER SYSTEM
    4) APU GEN POWER SYSTEM

SUBTASK 395-030

(4) Seal the guard wire for the IDG Disconnect Switch. Refer to AMM 24-11-00 page 201.

SUBTASK 845-018

(5) Put the Airplane Back to its Usual Condition
  (a) Remove electrical power if it is not necessary (Ref 24-22-00).
(b) Put the BAT switch (P5) to the OFF position.

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For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-11-01 Page 201

REASON FOR REVISION

To introduce exercising of the DRIVE DISC switch, add a NOTE highlighting that one operation of the switch should effect IDG disconnect and emphasise the 'CAUTION' for extended switch operation.

ACTION

Amend task 24-11-01-206-001 Para 2 to read as follows:

2. Check the IDG Disconnect Function
   A. References
      (1) AMM 24-22-00/201, Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 77-12-01/201, Engine Run Simulation

   B. Access
      (1) Location Zones
          211 /
          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)

   C. Prepare for Check

      SUBTASK 216-003
      (1) Make sure that the engines are not running.

      SUBTASK 016-007
      (2) Open the fan cowl panels (AMM 71-11-04/201).

      SUBTASK 866-004
      (3) Supply ground electrical power (AMM 24-22-00/201).

TEMPORARY REVISION No. 24-537 (Cont'd)

SUBTASK 866-005

(4) 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

D. Procedure

SUBTASK 866-006

(1) Do the check as follows:

(a) Push the BAT switch on the pilots' overhead panel P5 to ON (latched-in-position).
(b) Make sure that the amber DRIVE lights in the L and R GEN DRIVE DISC switches on P5 are on.
(c) Do the disconnect inhibit test

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

1) Push the GEN DRIVE DISC switch on P5.

NOTE: Put a person near the IDG listening for no click. There should be no click at IDG when the GEN DRIVE DISC switch is pushed.

2) Make sure that the amber DRIVE light in the switch remains on.

3) Slowly pull the disconnect reset ring to the outward travel limit. Make a note of the amount of hand force required.

4) Make sure that the force required is light.

5) Make sure that no "click" is felt when pulling the disconnect ring.

NOTE: The IDG disconnect is inhibited when the engine is not running.

(d) Make a check of the IDG disconnect function.
1) Simulate the Engine Running (AMM 77-12-01/201) for engines with the inhibit function.

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

TEMPORARY REVISION No. 24-537 (Cont'd)

(e) Push the GEN DRIVE DISC switch on P5. Make sure that the amber DRIVE light in the switch remains on.

NOTE: (I) Put a person near the IDG listening for a click. There should be a click at IDG when the GEN DRIVE DISC switch is pushed.
(ii) the disconnect function must operate on the first switch actuation. Failure to do so indicates a defect with the disconnect system. If no defects are present within the circuit to/including the IDG, switch replacement is required.

(f) Exercise the DRIVE DISC switch by depressing/releasing the switchlight 5 times. The switch must be smooth in operation without evidence of binding/malfunction.

CAUTION: THE IDG INPUT SHAFT MUST BE RECONNECTED TO THE GEARBOX SHAFT PRIOR TO ENGINE START. WHEN THE IDG IS DISCONNECTED WITH THE ENGINE BELOW IDLE SPEED OR WITH THE ENGINE SHUT DOWN, THERE WILL NOT BE COMPLETE SEPARATION OF THE DISCONNECT DOG TEETH. IF YOU DO NOT RESET THE DISCONNECT BEFORE YOU START THE ENGINE DAMAGE TO THE IDG CAN OCCUR.

(g) Push the BAT switch on P5 to OFF (OUT) position.

(h) Seal the guard wire for the IDG Disconnect Switch. Refer to AMM 24-11-00 page 201.

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MAINTENANCE MANUAL

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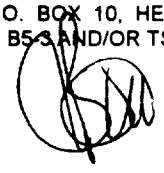

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-31-02 Page 404

REASON FOR REVISION

To add a cleaning procedure for the battery charger

ACTION

A new para 4. is added as detailed below.

4. Main Battery Charger - Cleaning.

1) Remove the Battery Charger as per task 24-31-02-004-001.

2) Place Battery Charger on a clean bench.

3) Remove the top and bottom covers (8 off screws each).

4) Clean covers and unit interior using an air source and/or brush to ensure free cooling airflow.

CAUTION: DO NOT USE CHEMICAL CLEANING AGENTS.

5) Refit the top and bottom covers.

6) Refit the Battery Charger as per task 24-31-02-404-006.

Originator: GARY KERR
Reference: 757-W-MCR-GK-97-838
Workbook: CV 34-225

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ATP TEMPORARY REVISION

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MAINTENANCE MANUAL

TEMPORARY REVISION No. 24-525

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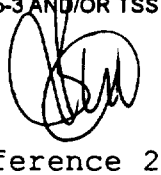

For CHIEF ENGINEER QUALITY AND TRAINING

Manual Reference 24-31-04 Page 403

REASON FOR REVISION

To add a cleaning procedure for the battery charger

ACTION

A new para 4. is added as detailed below.

4. APU Battery Charger - Cleaning.

   1) Remove the Battery Charger as per task 24-31-04-004-003.

   2) Place Battery Charger on a clean bench.

   3) Remove the top and bottom covers (8 off screws each).

   4) Clean covers and unit interior using an air source and/or brush to ensure free cooling airflow.

      CAUTION: DO NOT USE CHEMICAL CLEANING AGENTS.

   5) Refit the top and bottom covers.

   6) Refit the Battery Charger as per task 24-31-04-404-005.

Originator: GARY KERR
Reference: 757-W-MCR-GK-97-838
Workbook: CV 34-225

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ATP TEMPORARY REVISION

BRITISH AIRWAYS (NB322) B757

MAINTENANCE MANUAL

13 May, 1997

TEMPORARY REVISION No. 24-501

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For CHIEF ENGINEER QUALITY AND TECHNICAL SERVICES.

Manual Reference 24-33-00 Page 501. **THIS IS AN AMS CHECK**

REASON FOR REVISION

The BA AMS calls call for the confidence check of the standby power systems. This check is an additional task to that listed in the existing manuals.

ACTION

TASK 24-33-00-765-001

Standby Power Confidence Check

A. Procedure

S 865-002

(1) With electrical power on aircraft, place battery switch to "ON" and stby power switch to "AUTO". Check that "STBY BUS OFF LIGHT" is extinguished.

S 865-003

(2) Switch off electrical power to aircraft. Check that:

(a) "STBY BUS OFF LIGHT" is extinguished.

(b) Standby artificial horizon is powered.

(c) Integral lights on standby instruments on P1-3 panel are illuminated.

S 865-004

(3) Place stby power switch to "BATT". Check that:

(a) "STBY BUS OFF LIGHT" is extinguished.

(b) Standby artificial horizon is powered.

(c) Integral lights on standby instruments on P1-3 panel are illuminated.

S 865-005

(4) Restore electrical power to the aircraft and place stby power switch to "AUTO".
Check that "STBY BUS OFF LIGHT" is extinguished.

S 865-006

(5) Place stby power switch to "OFF".
Check that "STBY BUS OFF LIGHT" is illuminated.

S 865-007

(6) Place stby power switch to "AUTO".
Check that "STBY BUS OFF LIGHT" is extinguished.

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TEMPORARY REVISION No. 24-548

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CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 24-51-01 Page 403

REASON FOR REVISION

To add torque loading figures for main terminals, to prevent excessive torque of terminal nuts.

ACTION

Amend task 24-51-01-424-005 para 3 as follows:-

Task 24-51-01-424-005

3. Install the Ground Handling Relay Fig. 401

A. Procedure

Subtask 424-006

(1) Install the relay as follows:

(a) Attach the relay to the P34 panel with the installation screws.
(b) Connect the wires to the relay and torque the main terminals nuts to 65-75 inch pounds.
(c) Install the terminal cover on the relay.
(d) Close the P34 panel.

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MAINTENANCE MANUAL

TEMPORARY REVISION No. 24-549

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CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 24-51-03 Page 403

REASON FOR REVISION

To add torque loading figures for main terminals, to prevent excessive torque of terminal nuts.

ACTION

Amend task 24-51-03-024-002 para 3 as follows:-

C. Procedure

Subtask 424-003

(1) Install the relay as follows:

(a) Attach the relay to the panel with the installation screws.
(b) Connect the wires to the relay and torque the main terminals nuts to 65-75 inch pounds.
(c) Install the terminal cover on the relay.
(d) Close the applicable P34 panel or the P37 panel.

←

MAINTENANCE MANUAL

TEMPORARY REVISION No. 24-555

THIS TEMPORARY REVISION IS ISSUED BY BRITISH AIRWAYS ENGINEERING (TECHNICAL INFORMATION SERVICES, G2, TBA, S401, P. O. BOX 10, HEATHROW AIRPORT, HOUNSLOW, MIDDLESEX TW6 2JA).
CAA DESIGN APPROVAL No. DAI/8566/78.

Manual Reference 24-51-04 Page 403

REASON FOR REVISION

To add torque loading figures for main terminals, to prevent excessive torque of terminal nuts.

ACTION

Amend task 24-51-04-424-002 para 3 as follows:-

c. Procedure

Subtask 424-003

(1) Install the relay as follows:

(a) Attach the relay to the P34 panel with the installation screws.
(b) Connect the wires to the relay and torque the main terminals nuts to 65-75 inch pounds.
(c) Install the terminal cover on the relay.
(d) Close the P34 panel.

←

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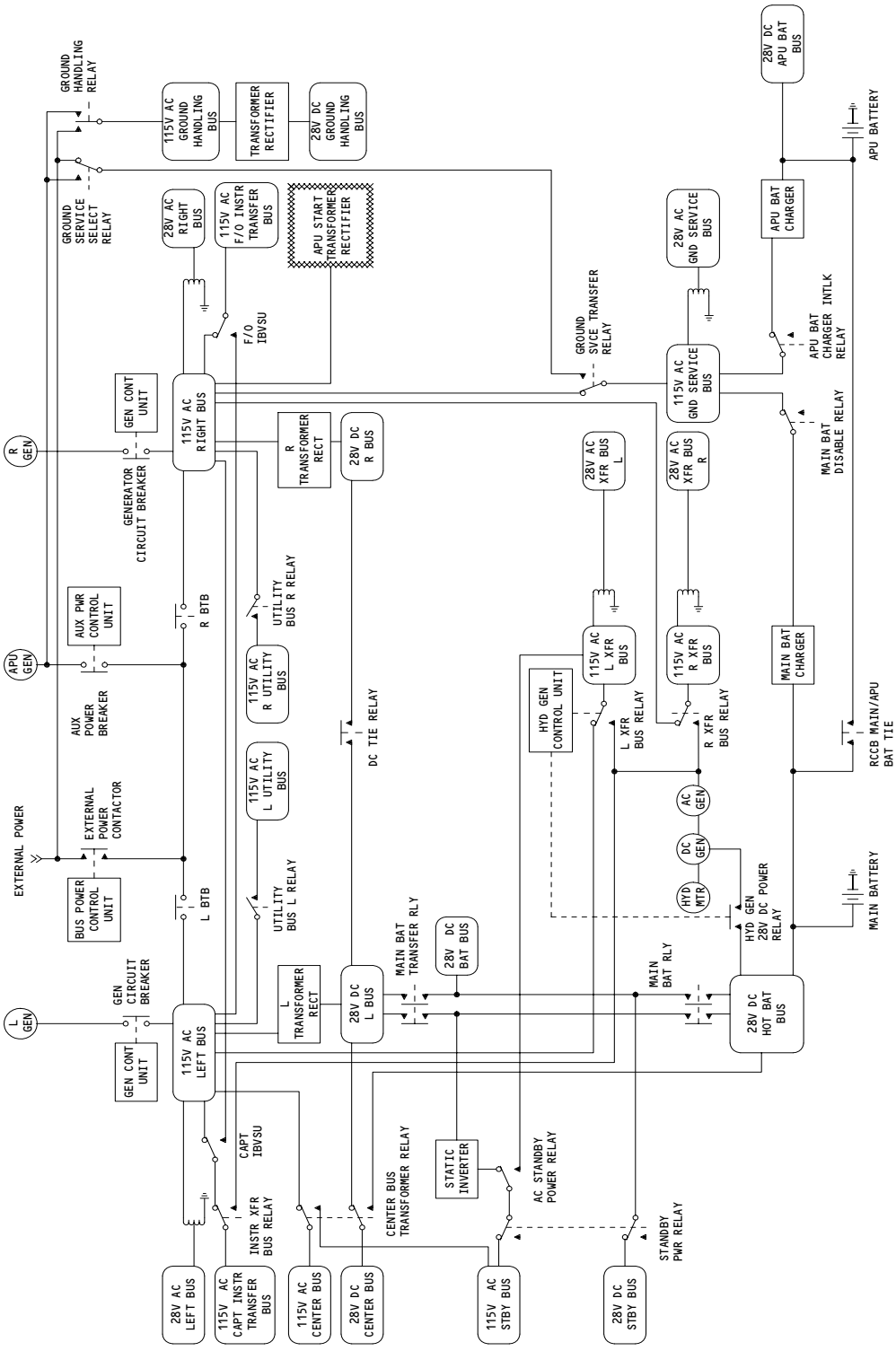
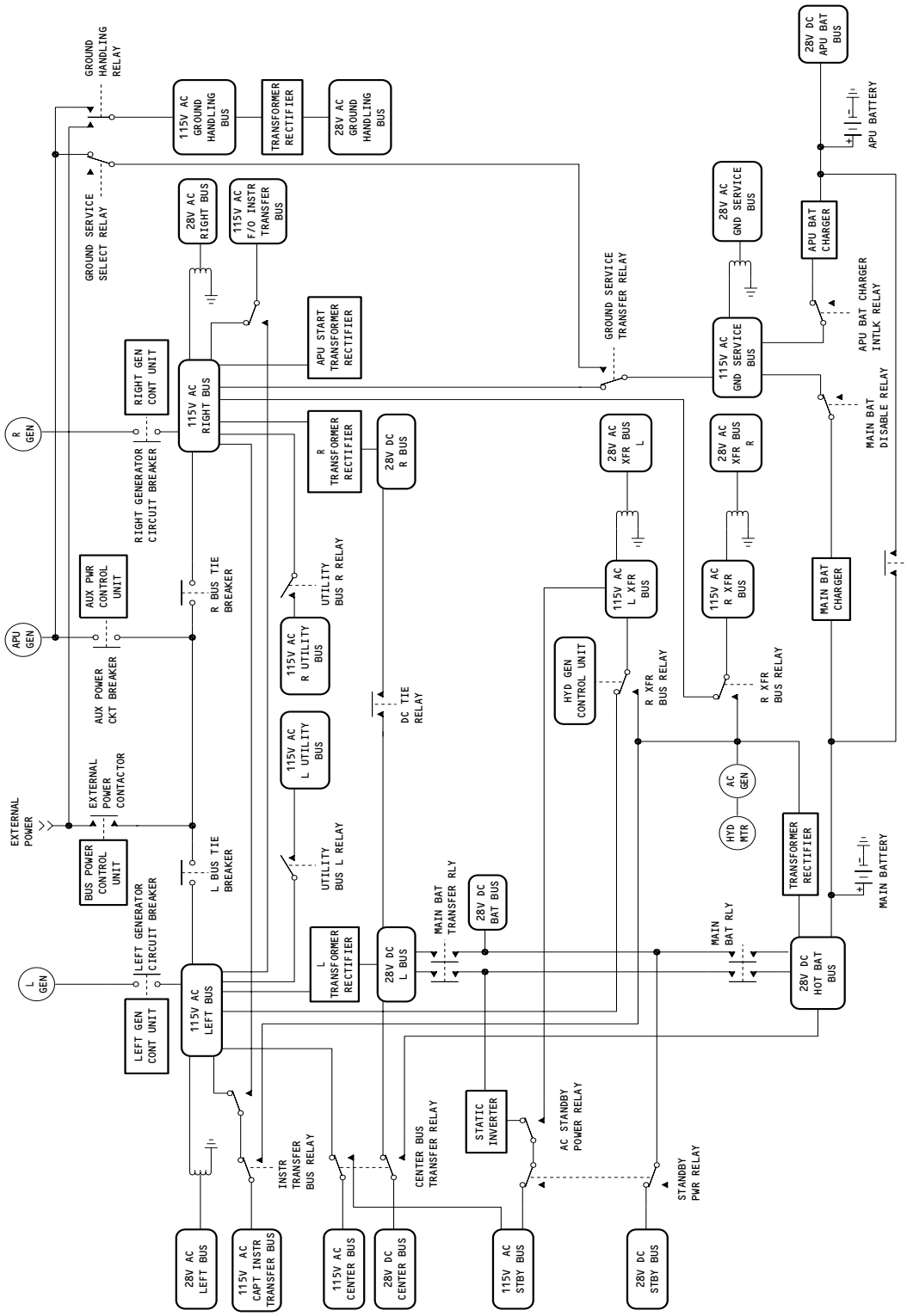
ELECTRICAL POWER - GENERAL - DESCRIPTION AND OPERATION

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 (Ref 24-11-00). An auxiliary power unit driven generator provides inflight backup to the IDGs (Ref 24-21-00). System control is by three generator control units (Ref 24-22-00), and one bus power control unit (Ref 24-41-00).
      (2) The system normally provides two, non-parallelable ac 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 (Ref 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 main 115-volt ac power (Ref 24-32-00).
      (2) The main battery and its charger provide a backup source for the standby power system (Ref 24-33-00). During a category III autoland, the main battery and its charger provide a third independent dc power channel (Ref 24-33-00).
      (3) The main and APU batteries are paralleled if power is lost at the left 28 volt dc bus. This provides a 90 minute standby power source.
   D. GUI 001-002, 115;
      an independent non-time-limited standby power system is installed on extended range airplanes. 115-volt ac and 28-volt dc power is provided by a hydraulic motor-driven generator which is activated automatically when power is lost at both main ac buses.
   E. GUI 003-114, 116-999;
      an independent non-time-limited standby power system is installed on the extended range airplanes. 115-volt ac power is supplied by a hydraulic motor generator which is activated automatically when power is lost at both main ac buses. A part of the ac power is transformed and rectified by a transformer/rectifier unit to supply dc power for the dc essential loads.



Electrical Power Block Diagram
Figure 1 (Sheet 1)

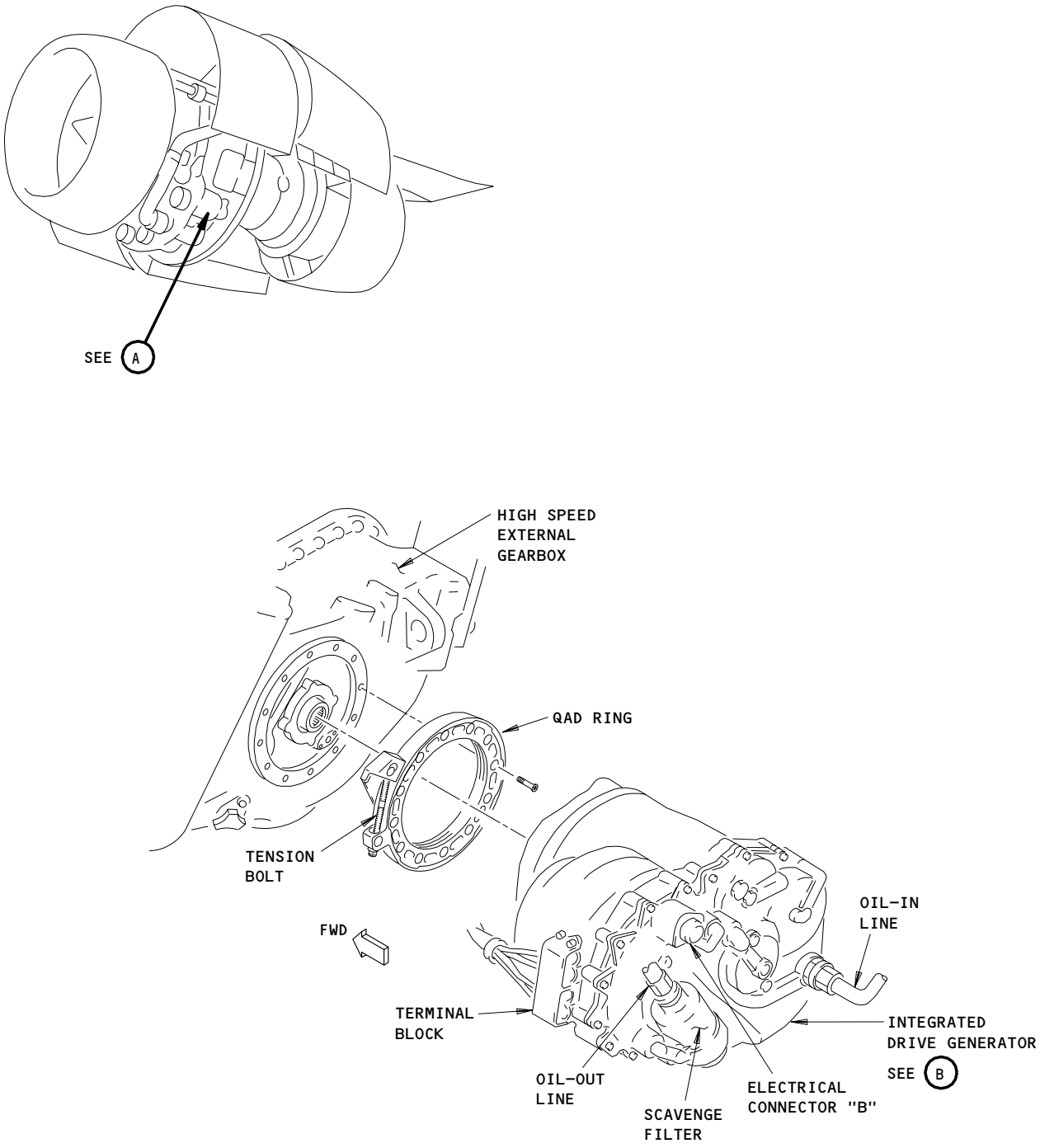


Electrical Power Block Diagram
Figure 1 (Sheet 2)

A744467

GENERATOR DRIVE SYSTEM - DESCRIPTION AND OPERATION

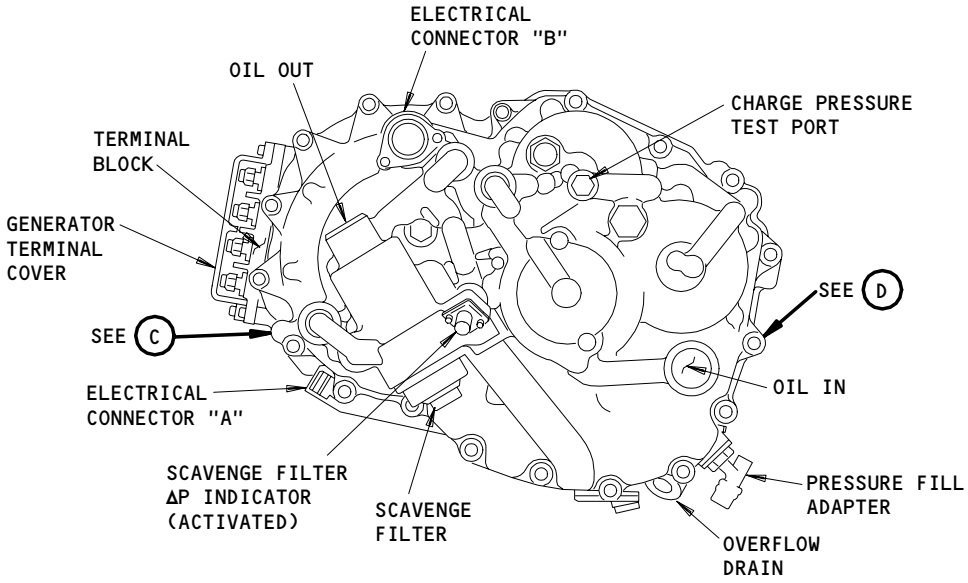
1. General
   A. The purpose of the generator drive system is to convert mechanical power into electrical power. The major components are two integrated drive generators (IDGs), one mounted to each engine. Each IDG has a corresponding air/oil heat exchanger.
2. Component Details (Fig. 1)
   A. Integrated 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 air/oil heat exchanger. 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 located on the lower left side of each engine, just above each IDG. The heat exchanger comprises an air inlet duct, cooler element, pressure relief valve, cooler outlet, and oil transfer tubes.
      (2) ENGINES POST-RR-SB 24-9280;
      Two vanes are installed in the heat exchanger duct on each side of the duct central stiffener. The vanes are connected to a drive shaft which is connected by a lever and control rod to a pneumatic ram. The ram uses HP3 air from the engine to close the vanes and limit the air flow. The ram is attached to a bracket on the engine at the side of the heat exchanger. A thermal switch is installed in the oil exit tube from the heat exchanger. The switch gives a signal to operate a solenoid valve which controls the HP3 air to the ram. The solenoid valve is installed on a bracket at the front flange of the rear LP compressor case.
      (3) The inlet duct of the heat exchanger collects air from the low pressure compressor. This air goes through the cooling element of the heat exchanger. (The cooling element is made up of a number of corrugated fins). IDG oil is carried through this cooling element by oil transfer tubes. Heat from the oil is then transferred to air flowing through the cooling element. After passing through the heat exchanger cooling element, air passes out through the outlet duct. This air is vented out through a cutaway in the engine firewall.
      (4) Oil flow pressure through the cooler is controlled by the pressure relief valve. If the oil inlet pressure exceeds 60-70 psi., the valve operates and progressively opens. This allows oil to bypass the cooler element and therefore protect the element.



INTEGRATED DRIVE GENERATOR INSTALLATION

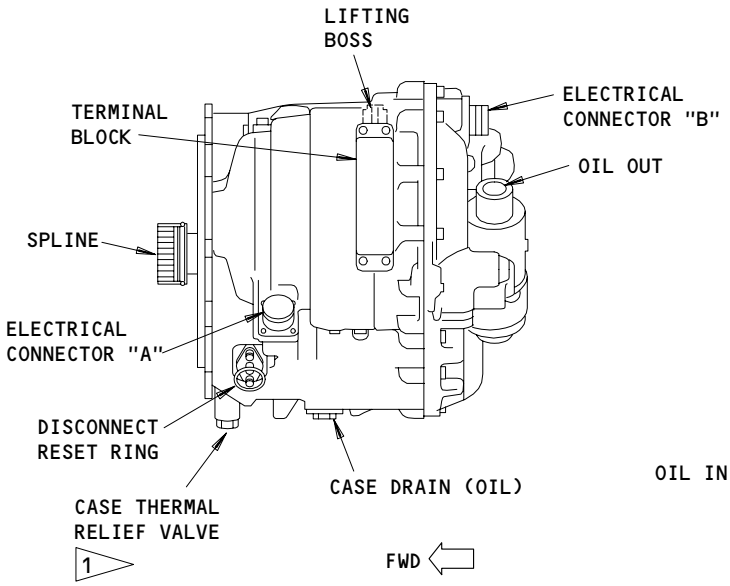
A

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



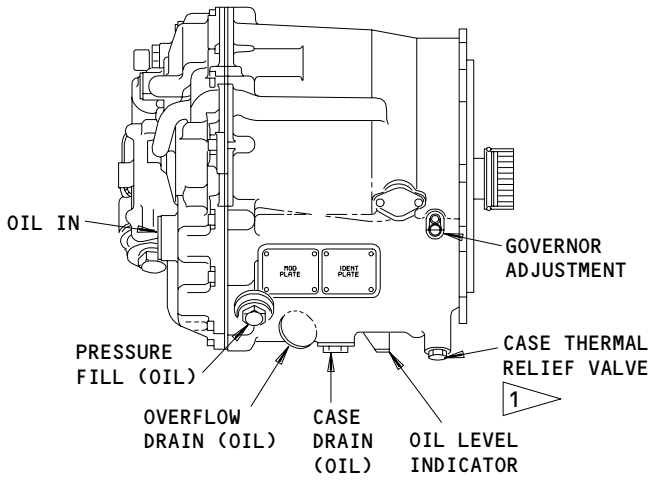
INTEGRATED DRIVE GENERATOR
REAR VIEW

B



LEFT SIDE

C

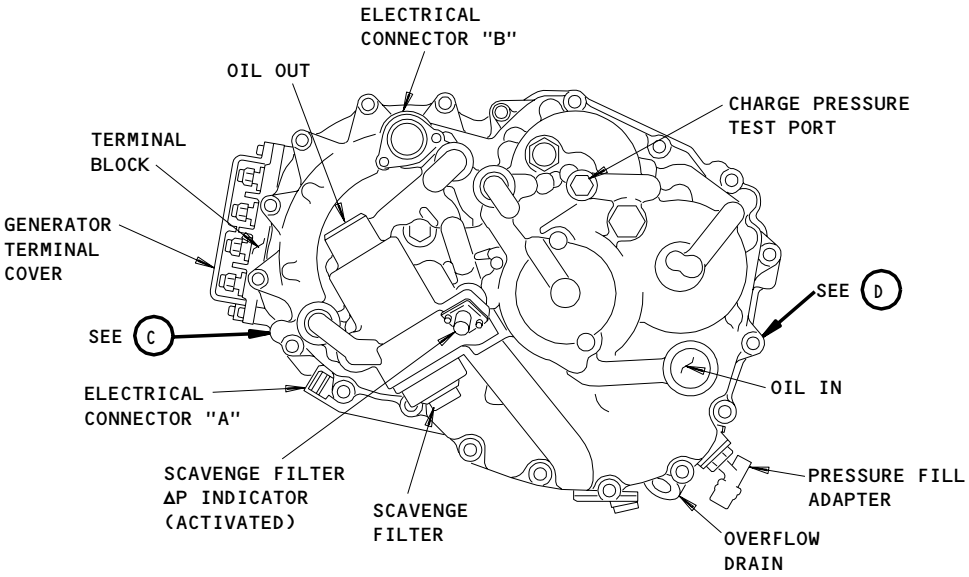


RIGHT SIDE

D

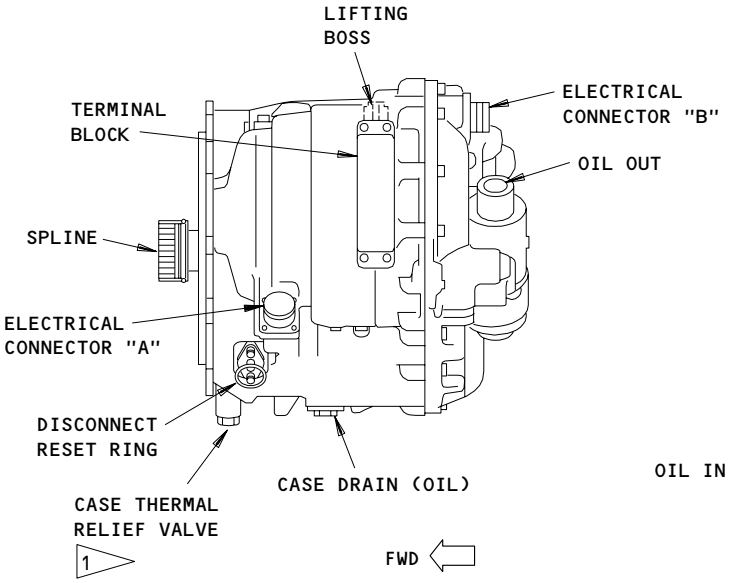
1 SEAL DRAIN LINE CONNECTS TO CASE THERMAL RELIEF VALVE

Generator Drive System Component Location
Figure 1 (Sheet 2)



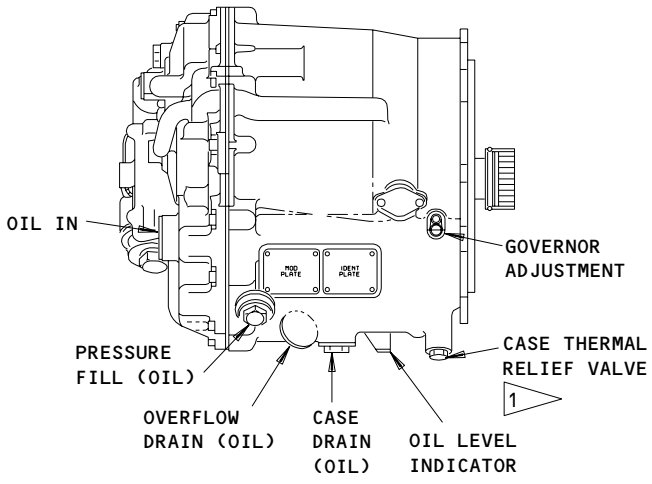
INTEGRATED DRIVE GENERATOR WITH VACUUM PRESSURE VALVE
(REAR VIEW)

B



LEFT SIDE

C

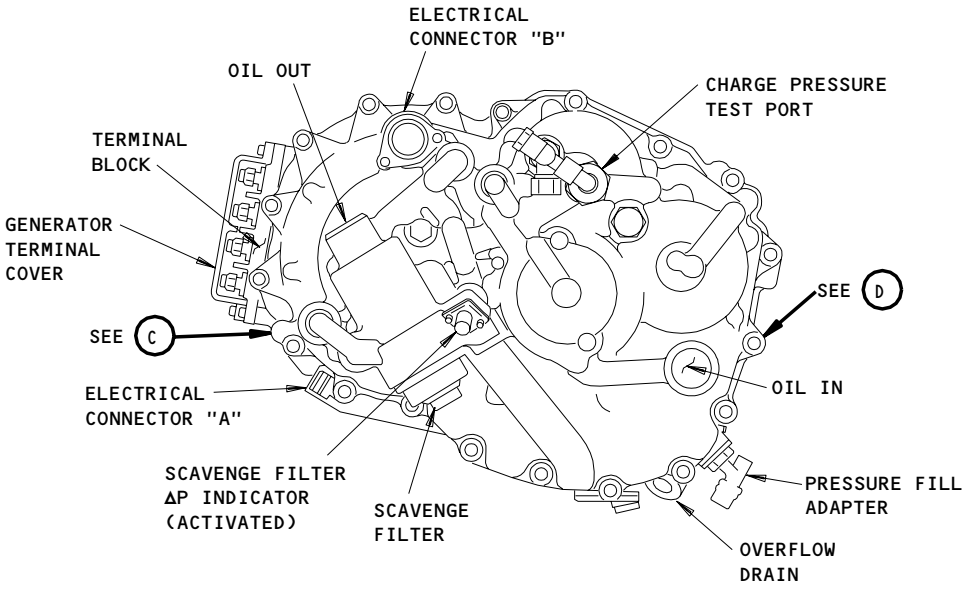


RIGHT SIDE

D

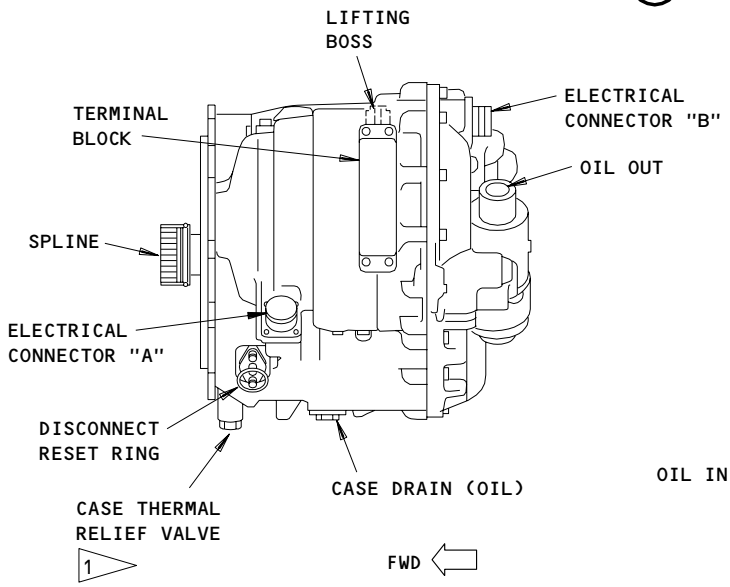
1 SEAL DRAIN LINE CONNECTS TO CASE THERMAL RELIEF VALVE

Generator Drive System Component Location
Figure 1 (Sheet 3)



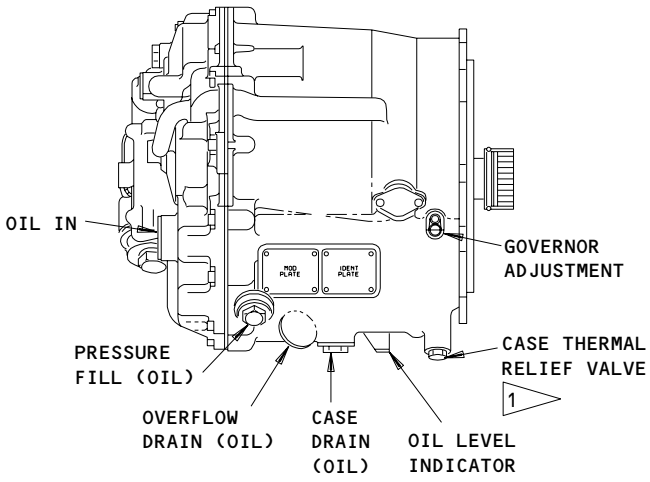
INTEGRATED DRIVE GENERATOR WITH EXTERNAL ASPIRATOR CASE VENT SYSTEM
(REAR VIEW)

B



LEFT SIDE

C



RIGHT SIDE

D

1 SEAL DRAIN LINE CONNECTS TO CASE THERMAL RELIEF VALVE

Generator Drive System Component Location
Figure 1 (Sheet 4)

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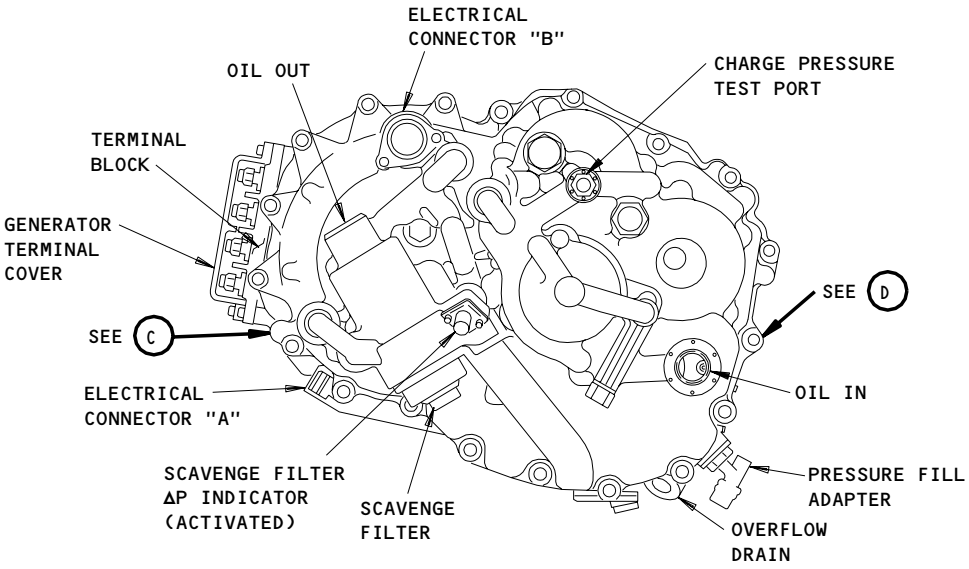
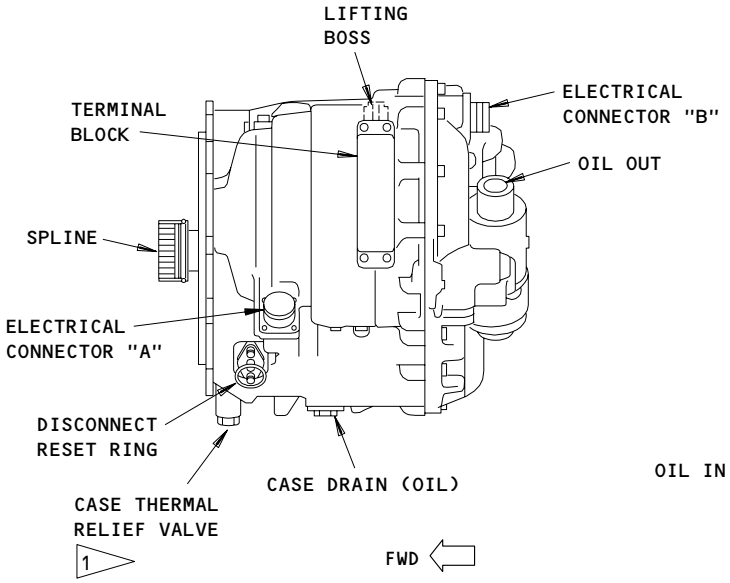


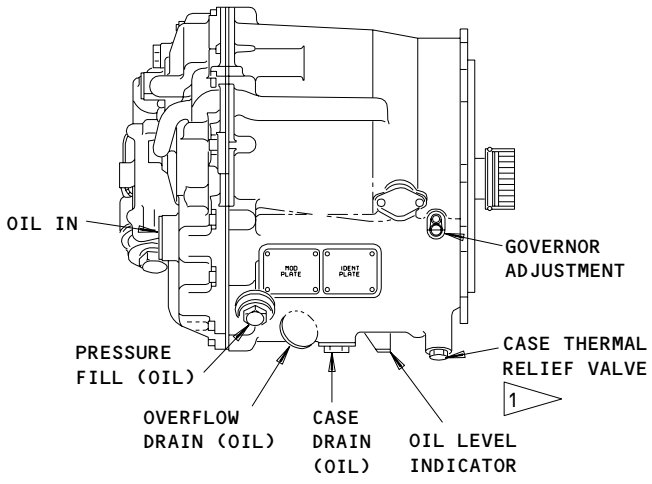
INTEGRATED DRIVE GENERATOR WITH INTERNAL ASPIRATOR CASE VENT SYSTEM
(REAR VIEW)

B



LEFT SIDE

C

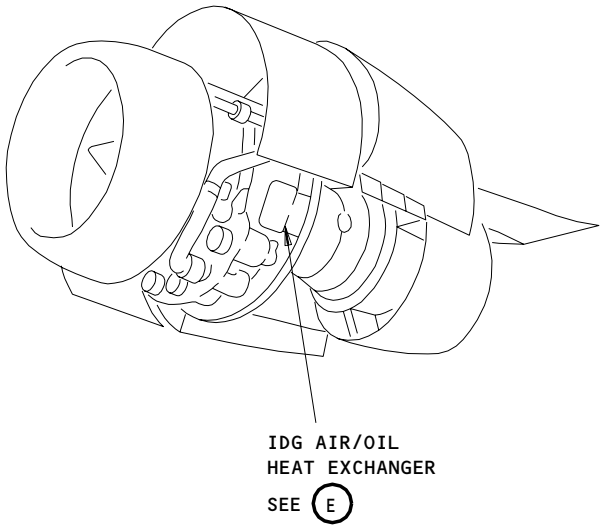


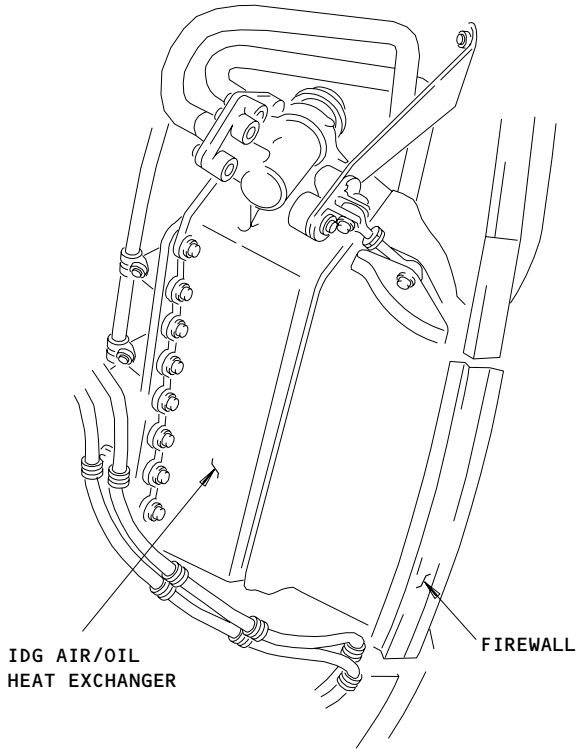
RIGHT SIDE

D

1 SEAL DRAIN LINE CONNECTS TO CASE THERMAL RELIEF VALVE

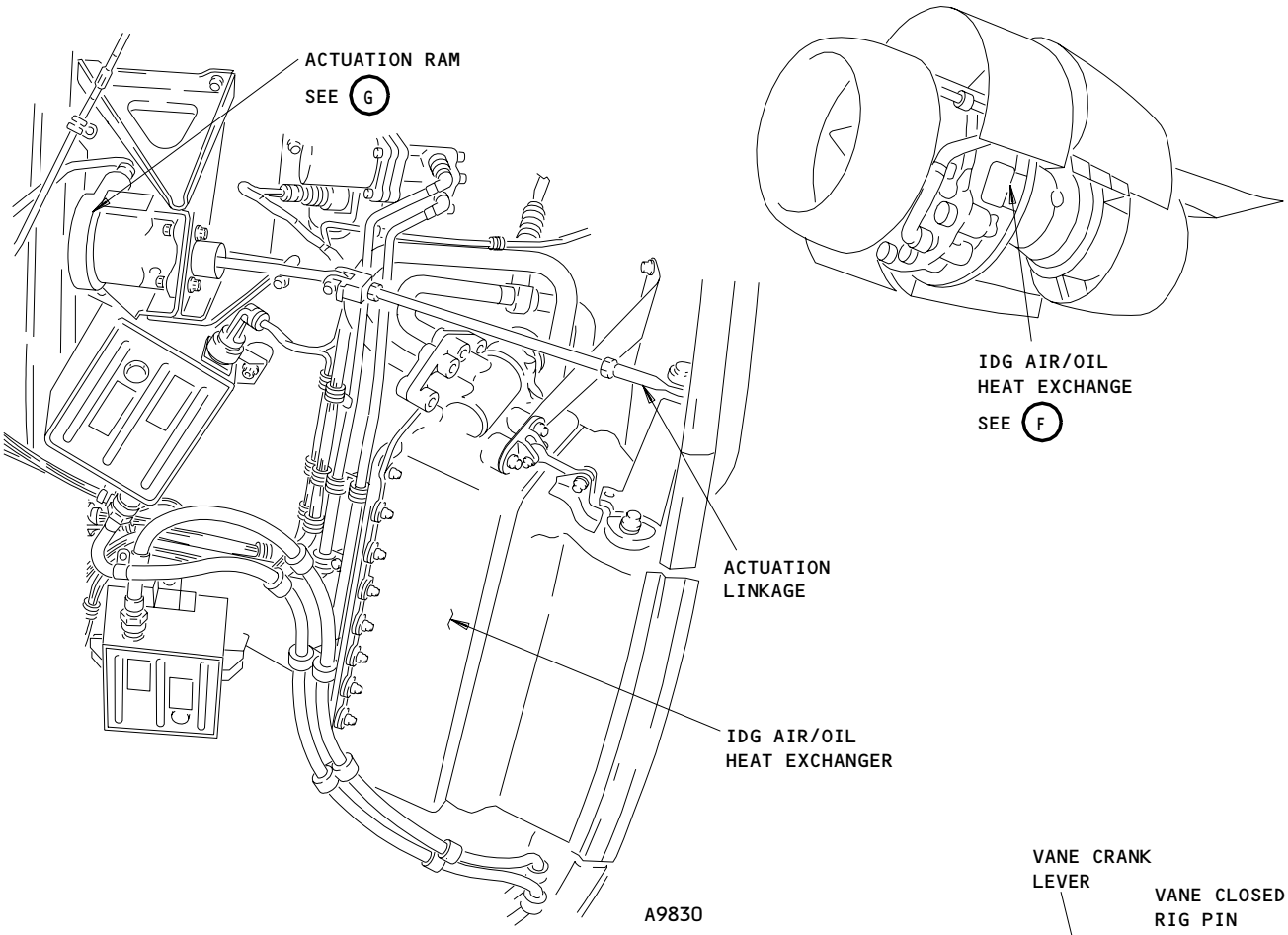
Generator Drive System Component Location
Figure 1 (Sheet 5)





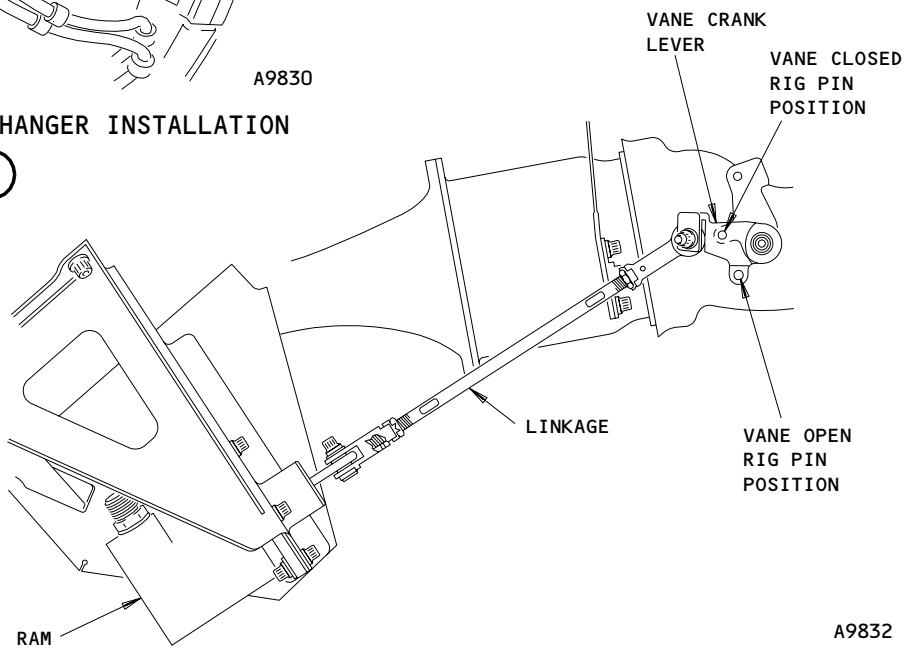
IDG AIR/OIL HEAT EXCHANGER
(E)

Generator Drive System – Component Location
Figure 1 (Sheet 6)



IDG AIR/OIL HEAT EXCHANGER INSTALLATION

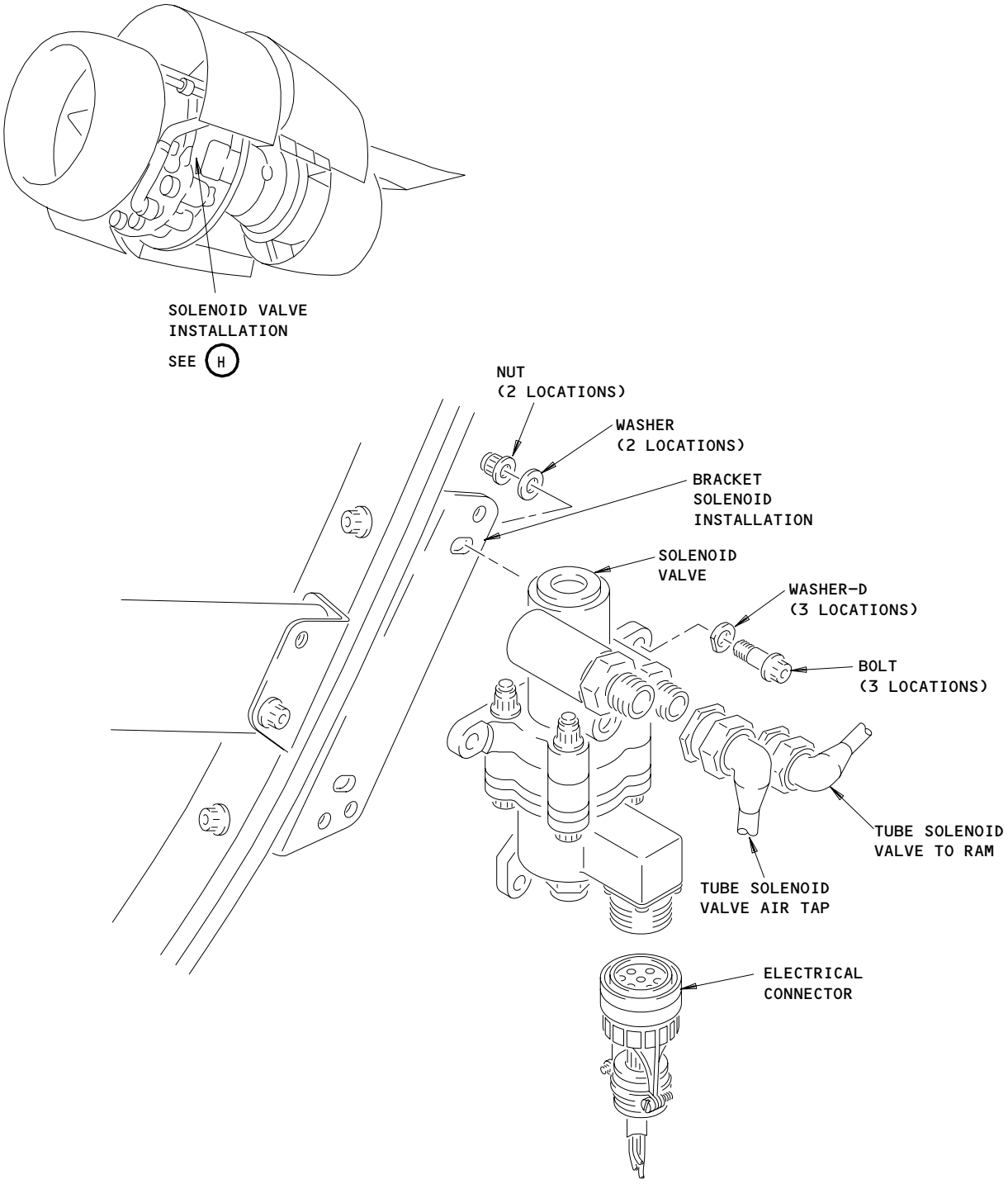
F



ACTUATION RAM INSTALLATION

G

Generator Drive System – Component Location
Figure 1 (Sheet 7)



SOLENOID VALVE INSTALLATION

(H)

C2389

Generator Drive System - Component Location
Figure 1 (Sheet 8)

D. 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.

3. Operation

A. Functional Description (Fig. 2, Fig. 3)

(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.

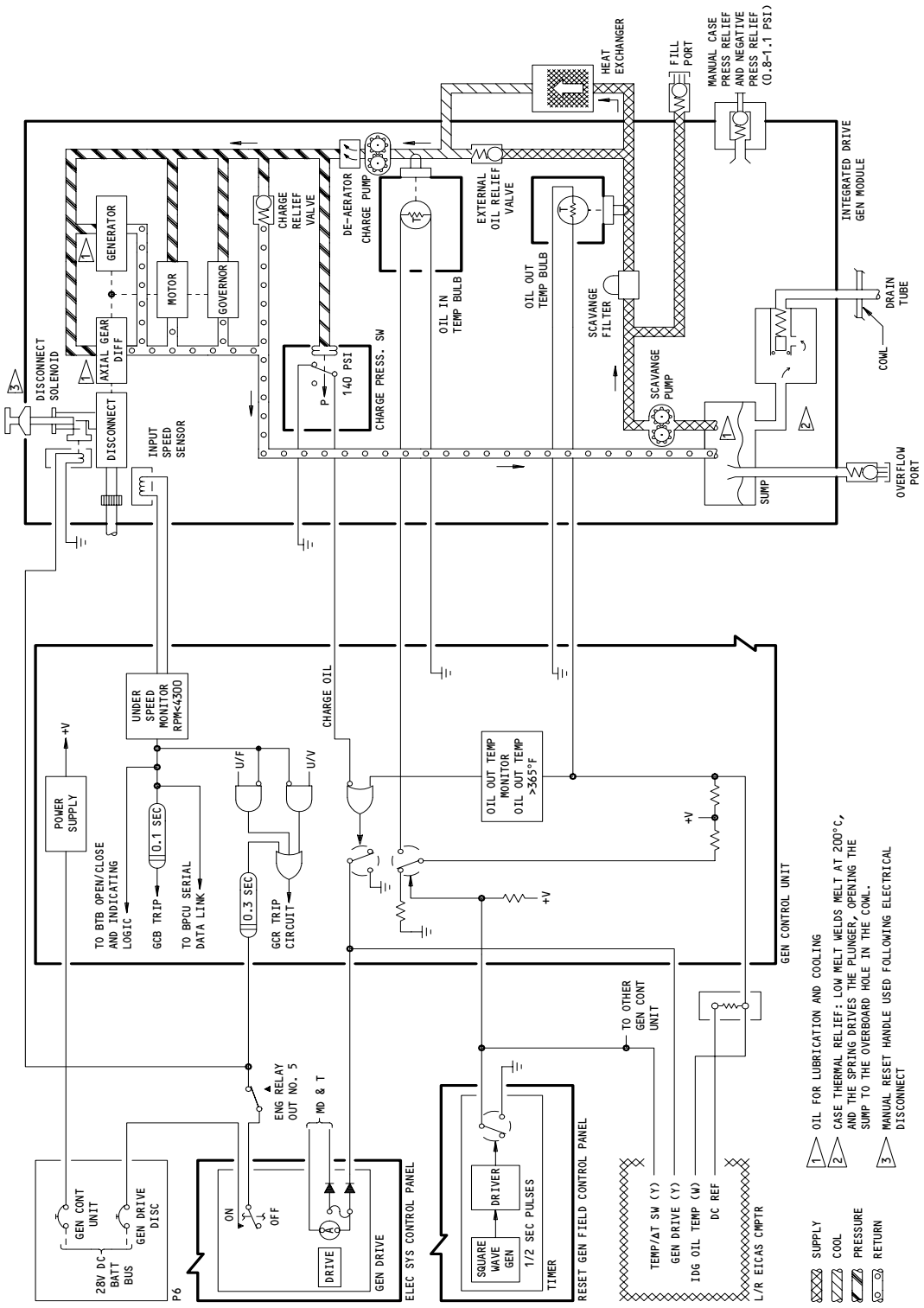
(2) The axial gear differential/hydraulic speed control section in the IDG converts a varying engine input speed of 4,500-9,075 rpm, to a constant output speed of 12,000±150 rpm. The constant output speed allows the generator section of the IDG to produce ac power with a frequency of 400 ±5-Hz.

(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±4-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 ± 1 - volt ac, line-to-neutral, at 400 ±4 - Hz, for loads up to 90 - Kva (Voltage is regulated within 115 ± 1.5 - volts 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.



Integrated Drive Generator Schematic (Typical)
Figure 2

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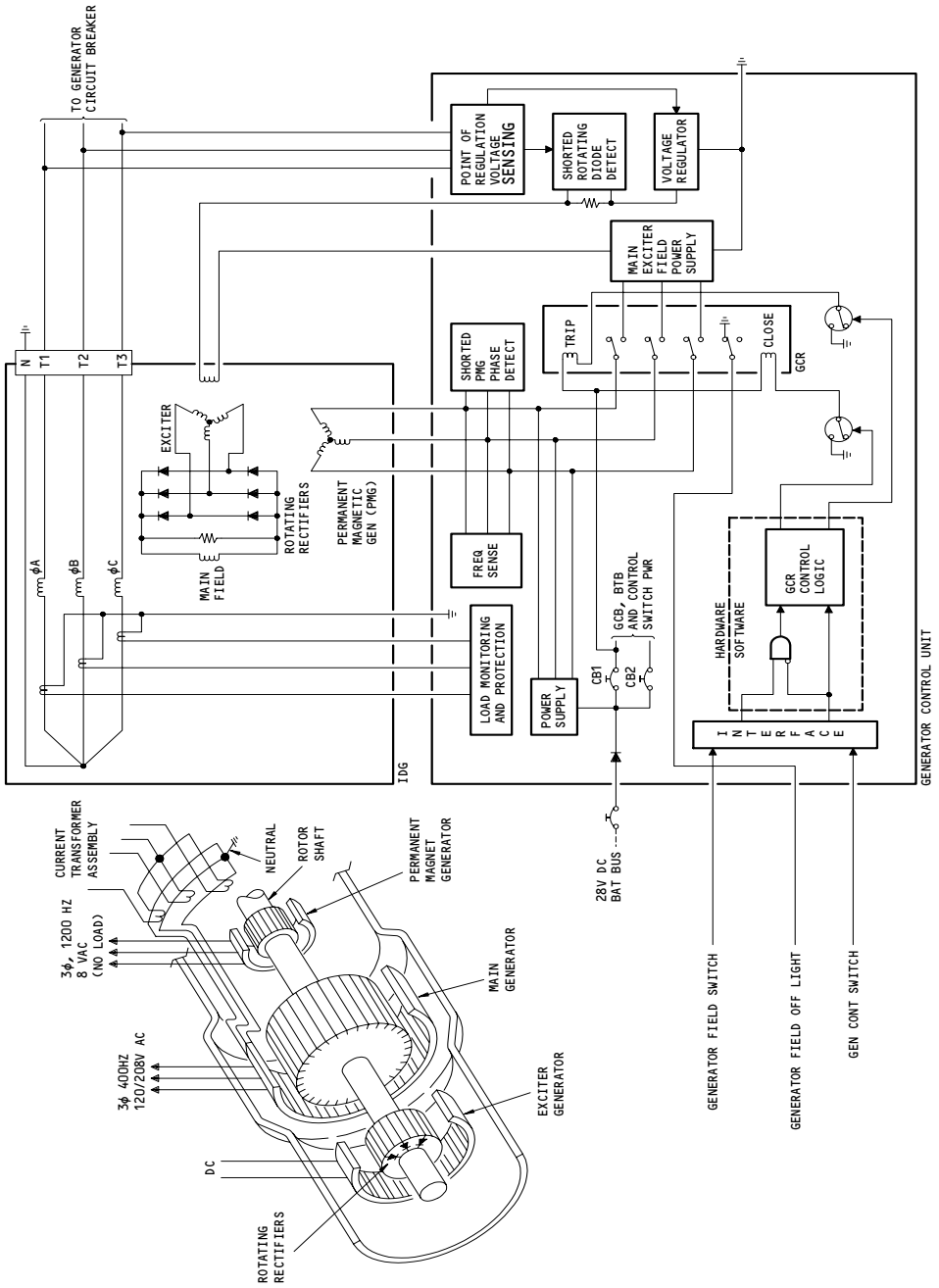


IDG Power Generation Block Diagram
Figure 3

(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 ±20 psi, a ground circuit in the IDG closes. A signal is sent to the generator control unit, causing the approriate 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.

(8) 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. 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).

(9) An inhibit IDG disconnect circuit is provided, using the engine running relay to avoid nuisance disconnects when the engine is not running.

(10) 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.

(11) 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.

(12) 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.

(13) Oil exiting the IDG flows through the IDG scavenge filter. The oil then goes through the air/oil heat exchanger. 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).

(14) 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 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.

(15) 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.

(16) ENGINES POST-RR-SB 24-9280;
For the IDG to operate satisfactorily the exit oil temperature from the heat exchanger must be below 100 degrees centigrade. A thermal switch is installed in the oil exit tube of the heat exchanger. The thermal switch monitors the temperature of the exit oil and gives a signal to open or close the solenoid valve. As the solenoid valve opens (low IDG oil temperature) HP3 air is supplied to a ram. The ram extends to close two vanes in the heat exchanger duct and limit the air flow through the heat exchanger. As the oil temperature increases the thermal switch gives a signal to close the solenoid valve. The solenoid closes to stop the supply of HP3 air to the ram. The ram retracts to open the two vanes in the heat exchanger duct and allow air to flow throgh the heat exchanger and lower the IDG oil temperature.

(17) AIRPLANES WITH VENT VALVE ON THE IDG;
The vent valve is a spring-actuated valve located on the IDG end housing to maintain internal pressure in the housing. The vent valve closes by use of a biasing spring acting on a piston. This action permits air pressure to build up in the IDG case. Before servicing the IDG, the valve should be pushed to vent this build-up pressure. The manual vent valve has been replaced by a case vent system on the new IDGs.

(18) AIRPLANES WITH CASE VENT ON THE IDG;
The case vent system consists on an aspirator mounted on the end housing and an aneroid valve installed in the input shaft. The purpose of the case vent system is to interchange the air inside the IDG with ambient air. Air enters the IDG through the aspirator and escapes through the aneroid valve. The continuous interchange of air extends the oil and filter change interval by removing entrained water absorbed by the ester-based oil. The entrained water forms an acid that corrodes internal metal parts, and plugs the filter with the corrosion products. The case vent system is not used with vent valve.

(19) 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 overboard through the seal drain line.

(20) Oil exiting the IDG goes through the IDG air/oil heat exchanger. The heat exchanger provides continuous oil cooling by low pressure compressor air. After exiting the air/oil heat exchanger, oil returns to the IDG.

(21) A valve in the IDG limits the pressure seen across the air/oil heat exchanger. 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.

(22) If IDG oil-out temperature remains above 284°F (140°C) for 5 minutes, an EICAS message appears on the maintenance page: 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). 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) If a difference exceeding 10°C occurs between the left and right IDG oil temperatures, an EICAS message IDG OUT TEMP will display on the maintenance page.

(24) If an oil temperature sensor failure occurs, a L (or R) IDG TEMP SENS EICAS message is displayed on the maintenance page. The L (or R) IDG TEMP SENS EICAS message will inhibit the L (or R) IDG OIL TEMP and the IDG RISE TEMP EICAS messages so a faulty oil temperature sensor will not cause nuisance IDG oil temperature EICAS messages.

(25) 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). If the difference between the two IDG rise temperatures is greater than 10°F (6°C), for more than 5 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.)

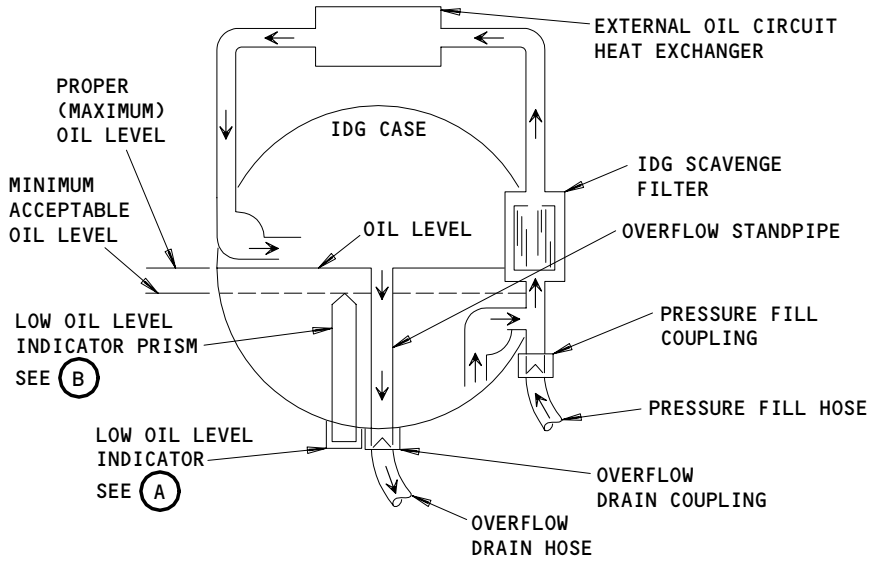
(26) IDG Servicing Features (Fig. 4).

(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. Therefore, when there is no silver spot in the viewing area, 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.

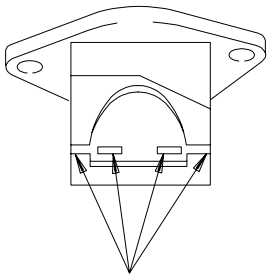
(b) The low oil level indicator can operate on low levels of light. Light sufficient to see the white alignment marker is all the light that is needed to view the indicator. Shining a flashlight (or other light source) directly into or onto the viewing face can induce too much light and cause reflections 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.

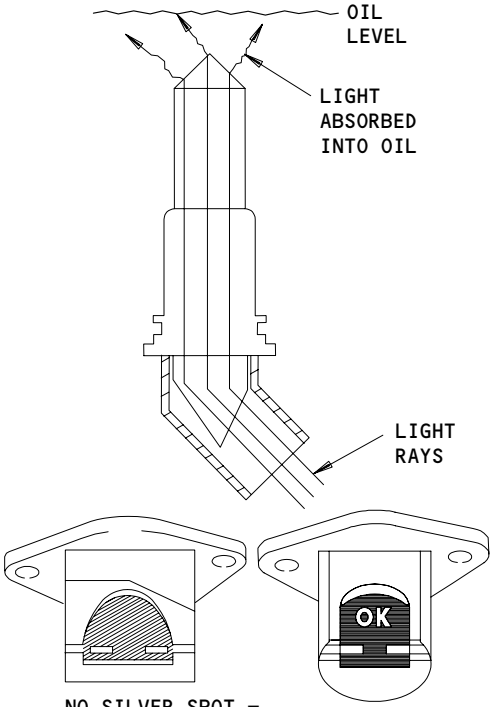


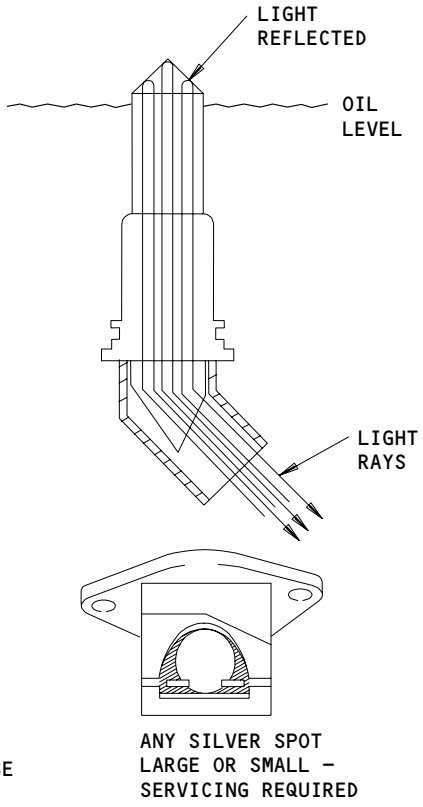
IDG SERVICING DIAGRAM



LOW OIL LEVEL INDICATOR

A





NOTE: BOTH TYPES OF PRISMS ARE PRESENTLY IN USE

LOW OIL LEVEL INDICATOR PRISM

B

A54536

IDG Servicing Features
Figure 4

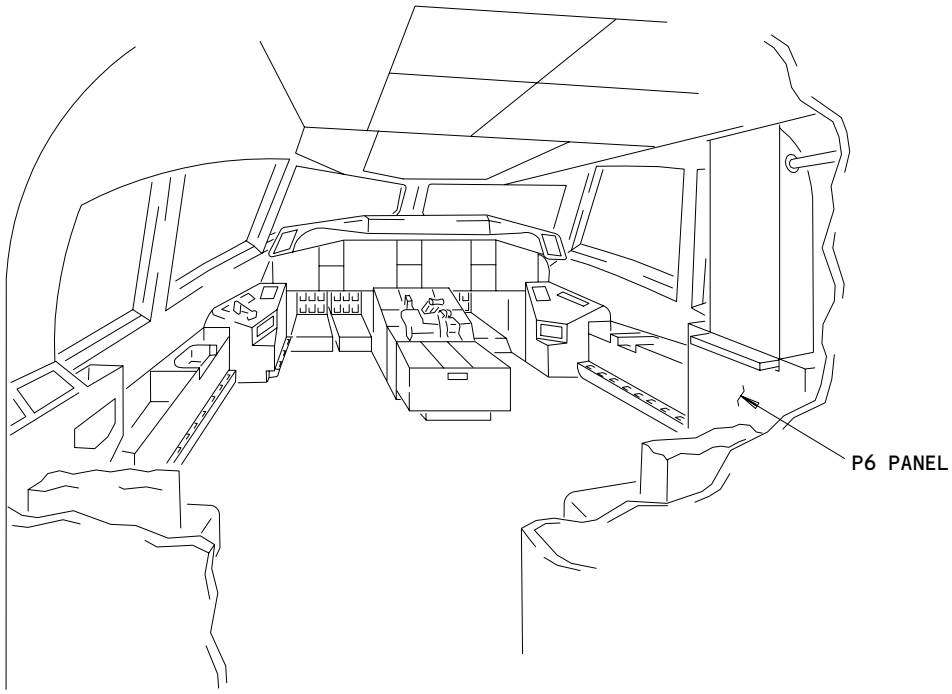
(e) The overflow drain establishes the proper fill level for the IDG oil system. The IDG oil level is correct when oil overflows from the overflow drain and then slows to drops. The overflow standpipe establishes the maximum oil level in the IDG case.

GENERATOR DRIVE SYSTEM

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS	1		FLIGHT COMPARTMENT, P6	
GEN CONT UNIT L, C804		1	6B1	*
GEN CONT UNIT R, C805		1	6B2	*
GEN DRIVE DISC L, C807		1	6B5	*
GEN DRIVE DISC R, C808		1	6B6	*
COUPLING - QUICK ATTACH/DETACH	2	2	413AL, 423AL FAN COWL PANELS ACCESSORY GEARBOX	24-11-03
EXCHANGER - IDG AIR/OIL HEAT	2	2	413AL, 423AL FAN COWL PANELS	24-11-04
GENERATOR - INTEGRATED DRIVE, M10538	2	2	413AL, 423AL FAN COWL PANELS ACCESSORY GEARBOX	24-11-01

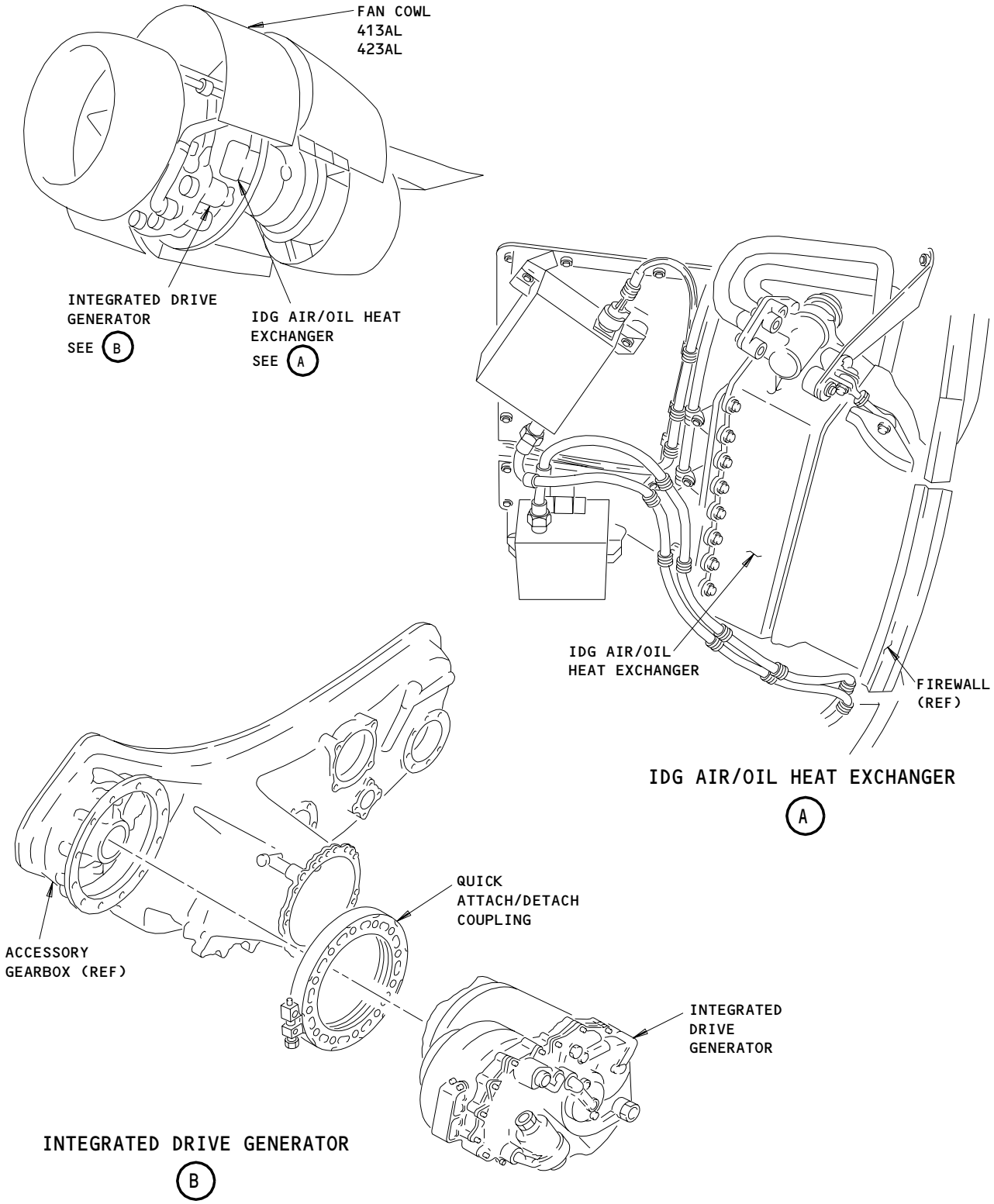
* SEE THE WDM EQUIPMENT LIST

Generator Drive System - Component Index
Figure 101



FLIGHT COMPARTMENT

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



Component Location
Figure 102 (Sheet 2)

GENERATOR DRIVE SYSTEM - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks:
      (1) The BITE and 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. If the spoilers are extended, and electrical power is removed, the spoilers will retract in less than one second.

TASK 24-11-00-745-001

2. The BITE and RESET Test
   A. General
      (1) This procedure does a check of the RESET operation and a 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
122	Forward Cargo Compartment

      (2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door Access Panel

   D. Prepare for the Test

      S 865-047
      (1) Supply electrical power to the 115V ac buses (AMM 24-22-00/201).

      NOTE: The BPCU BITE procedure can be run with battery power.

   E. Procedure

      S 015-048
      (1) Open the forward cargo door, 821.

S 015-049
(2) Remove the forward cargo compartment bulkhead panel.

S 745-005
(3) Do the RESET check:
  (a) Momentarily push the RESET switch on the front of the BPCU (E5-3).
  (b) Make sure these indications show on the BPCU:
    1) EXTERNAL POWER SYSTEM
    2) LEFT GEN POWER SYSTEM
    3) RIGHT GEN POWER SYSTEM
    4) APU GEN POWER SYSTEM

S 745-006
(4) Do the BITE Test:
  (a) Momentarily push the BIT switch on the front of the BPCU.
  (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 00 END OF DATA
    10) FOR PREVIOUS FLT PUSH NOW

      NOTE: The above sequence is shown when the power system has no fault. If a fault is found, the applicable fault message 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, momentarily push the PERIODIC TEST switch.

S 415-050
(5) Install the forward cargo compartment bulkhead panel.

S 415-051
(6) Close the forward cargo door, 821.

TASK 24-11-00-715-002

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 24-22-00/201, Electrical Power - Control
(2) AMM 71-00-00/201, Power Plant (Operating Procedures)
(3) AMM 71-00-00/501, Power Plant
(4) AMM 71-11-04/201, Fan Cowl Panels

C. Access

(1) Location Zones

212	Flight Compartment (RH Side)
119/120	Main Equipment Center
122	Forward Cargo Compartment
410	Power Plant Nacelle (Left)
420	Power Plant Necelle (Right)

(2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door Access Panel

D. Prepare for the Test

S 745-035
(1) Do the BITE test (AMM 24-11-00/501).

S 865-032
(2) Supply external or APU power to the 115V ac buses (AMM 24-22-00/201).

S 045-026

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.

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

E. The Operation Test

S 715-036
(1) Do the operation test:
(a) Set the L GEN CONT switch on the P5 panel to the OFF position.

(b) 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).
(c) Set the selection switch for the EICAS computer on the P9 panel to the AUTO position.
(d) Push the selection switch for the ELECT/HYD display on the right side panel P61.
(e) Make sure these indications for the left power channel show on the lower EICAS display:
    1) AC-V = 0 ±5
    2) FREQ = 0 ±5
    3) Make sure no L GEN OFF or L GEN DRIVE show on the EICAS display.
(f) Operate the left engine (AMM 71-00-00/201).

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.

(g) After 30 seconds, make sure the DRIVE light in the L GEN DRIVE DISC switch (P5) is off.

    CAUTION: DO NOT DISCONNECT THE IDG UNLESS THE ENGINE SPEED IS AT, OR GREATER THAN, IDLE SPEED.
    THE IDG WILL NOT DISCONNECT FULLY AND DAMAGE TO THE IDG DRIVE GEAR TEETH COULD OCCUR.

    1) If the DRIVE light in the L GEN DRIVE DISC switch (P5) comes on, push the L GEN DRIVE DISC switch.
    2) Stop the engine (AMM 71-00-00/201).
    3) Isolate the problem which caused the DRIVE light to come on.
(h) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
(i) Push the L GEN CONT switch (P5) to the ON position.
(j) 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).
(k) Make sure these indications for the left power channel show on the lower EICAS display:
    1) AC-V = 115 ±5
    2) FREQ = 400 ±5
        a) If the frequency is out of the tolerance, adjust the IDG.
    3) IDG OUT = 80 ±50
    4) IDG RISE = 20 ±17

(l) If the white ON light in the EXT PWR switch (P5) is on, push and release the EXT PWR switch to open the external power contactor.
1) Make sure the white ON light in the EXT PWR switch (P5) is off.
(m) Push the R GEN CONT switch (P5) to the OFF position.
(n) Push the APU GEN CONT switch (P5) to the OFF position.
(o) Make sure the left and right BUS OFF lights are off.
(p) Push the left BUS TIE switch (P5) to the ISLN (out) position.
(q) Make sure the right BUS OFF light (P5) is on.
(r) Push the left BUS TIE switch (P5) to the AUTO (in) position.
(s) Make sure the right BUS OFF light (P5) is off.

S 745-033
(2) Do the BITE test (AMM 24-11-00/501).

F. The Load Test

S 715-037
(1) Do the load test:
(a) Do these steps until the EICAS display shows the LOAD value of not less than 0.50.

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

(b) 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
(c) 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

(d) Put These switches on the air conditioning control module (P5) to the ON position.
1) L RECIRC FAN
2) R RECIRC FAN

(e) 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

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

(g) Push the EXT PWR switch (P5).
1) Make sure the white ON light in the switch comes on.
2) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
3) Make sure the two BUS OFF lights (P5) are off.

S 745-034

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

G. The Disconnect Test and the Connect Test

S 715-038

(1) Do the disconnect test and the connect test:

(a) AIRPLANES WITH GEN FIELD CONT SWITCHES ON P61 MAINTENANCE PANEL (WDM 24-22-11);
Make sure the FIELD OFF light in the switch for the left generator field (P61) is off.

(b) Make sure these indications for the left power channel show on the lower EICAS display:
1) AC-V = 115 ±5
2) FREQ = 400 ±5

(c) Momentarily push the L GEN DRIVE DISC switch (P5).
1) Make sure these lights come on:
a) The yellow DRIVE light in the L GEN DRIVE DISC switch (P5).

b) AIRPLANES WITH GEN FIELD CONT SWITCHES ON P61 MAINTENANCE PANEL (WDM 24-22-11);
The white FIELD OFF light in the switch for the left generator field (P61).

2) Make sure these indications for the left power channel show on the lower EICAS display:
a) AC-V = 0 ±5
b) FREQ = 0 ±5

3) Make sure these indications show on EICAS:
a) L GEN OFF
b) L GEN DRIVE

(d) Stop the left engine (Ref 71-00-00).

(e) Push the AUTO EVENT READ switch on the EICAS maintenance panel (P61).

(f) Push and hold the ERASE switch on the EICAS maintenance panel (P61) for 3 seconds.

1) Make sure the AUTO EVENT on the EICAS erases.

(g) Open the fan cowl panels of the left engine (Ref 71-11-04).

(h) Slowly pull the disconnect reset 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.

(i) Permit the disconnect reset ring to go back slowly to the maximum inner position.

1) The operation of the ring must be smooth and must move freely.

(j) 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.

(k) 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 415-019
(2) Close the fan cowl panels (AMM 71-11-04/201).

S 745-020
(3) Push the RESET switch on the front of the BPCU (E5-3).
(a) Make sure these indications show on the BPCU:
1) EXTERNAL POWER SYSTEM
2) LEFT GEN POWER SYSTEM
3) RIGHT GEN POWER SYSTEM
4) APU GEN POWER SYSTEM

S 845-015
(4) Put the Airplane Back to its Usual Condition
(a) Remove electrical power if it is not necessary (AMM 24-22-00/201).
(b) Put the BAT switch (P5) in the OFF position.

TASK 24-11-00-715-003

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 71-00-00/201, Power Plant (Operating Procedures)
(3) AMM 71-00-00/501, Power Plant
(4) AMM 71-11-04/201, Fan Cowl Panels

C. Access
(1) Location Zones

212	Flight Compartment (RH Side)
119/120	Main Equipment Center
122	Forward Cargo Compartment
410	Power Plant Nacelle (Left)
420	Power Plant Necelle (Right)

(2) Access Panels
122AZ Forward Cargo Compartment Bulkhead Panel
821 Forward Cargo Door Access Panel

D. Prepare for the Test

S 745-039
(1) Do the BITE test (AMM 24-11-00/501).

S 865-040
(2) Supply external or APU power to the 115V ac buses (AMM 24-22-00/201).

S 045-025

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.

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

E. The Operation Test

S 715-041
(1) Do the operation test:
(a) Set the R GEN CONT switch on the P5 panel to the OFF position.
(b) 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).
(c) Set the selection switch for the EICAS computer on the P9 panel to the AUTO position.
(d) Push the selection switch for the ELECT/HYD display on the right side panel P61.
(e) Make sure these indications for the right power channel show on the lower EICAS display:
1) AC-V = 0 ±5

2) FREQ = 0 ±5
3) Make sure no R GEN OFF or R GEN DRIVE show on the EICAS display.

(f) Operate the right engine (AMM 71-00-00/201).

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.

(g) After 30 seconds, make sure the DRIVE light in the R GEN DRIVE DISC switch (P5) is off.

CAUTION: DO NOT DISCONNECT THE IDG UNLESS THE ENGINE SPEED IS AT, OR OR GREATER THAN IDLE SPEED. THE IDG WILL NOT DISCONNECT FULLY AND DAMAGE TO THE IDG DRIVE GEAR TEETH COULD OCCUR.

1) If the DRIVE light in the R GEN DRIVE DISC switch (P5) comes on, push the R GEN DRIVE DISC switch.
2) Stop the engine (AMM 71-00-00/201).
3) Isolate the problem which caused the DRIVE light to come on.

(h) Make sure the yellow OFF light in the R GEN CONT switch (P5) is on.
(i) Push the R GEN CONT switch (P5) to the ON position.
(j) 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).
(k) Make sure these indications for the right power channel show on the lower EICAS display:
1) AC-V = 115 ±5
2) FREQ = 400 ±5
a) If the frequency is out of the tolerance, adjust the IDG.
3) IDG OUT = 80 ±50
4) IDG RISE = 20 ±17

(l) If the white ON light in the EXT PWR switch (P5) is on, push and release the EXT PWR switch to open the external power contactor.
1) Make sure the white ON light in the EXT PWR switch (P5) is off.
(m) Push the L GEN CONT switch (P5) to the OFF position.
(n) Push the APU GEN CONT switch (P5) to the OFF position.
(o) Make sure the left and right BUS OFF lights (P5) are off.
(p) Push the right BUS TIE switch (P5) to the ISLN (out) position.
(q) Make sure the left BUS OFF light (P5) is on.
(r) Push the right BUS TIE switch (P5) to the AUTO (in) position.
(s) Make sure the left BUS OFF light (P5) is off.

S 745-042
(2) Do the BITE test (AMM 24-11-00/501).

F. The Load Test

S 715-043
(1) Do the load test:
(a) Do these steps until the EICAS display shows the LOAD value of a minimum of 0.50.

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

(b) 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
(c) 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
(d) Put These switches on the air conditioning control module (P5) to the ON position.
1) L RECIRC FAN
2) R RECIRC FAN
(e) 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
(f) Put to the OFF position all the switches put to the ON position in the test.

(g) Push the EXT PWR switch (P5).
1) Make sure the white ON light in the switch comes on.
2) Make sure the yellow OFF light in the R GEN CONT switch (P5) is on.
3) Make sure the two BUS OFF lights (P5) are off.

S 745-044

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

G. The Disconnect Test and the Connect Test

S 715-045

(1) Do the disconnect test and the connect test:
(a) AIRPLANES WITH GEN FIELD CONT SWITCHES ON P61 MAINTENANCE PANEL (WDM 24-22-11);
Make sure the FIELD OFF light in the switch for the right generator field (P61) is off.
(b) Make sure these indications for the right power channel show on the lower EICAS display:
1) AC-V = 115 ±5
2) FREQ = 400 ±5
(c) Momentarily push the R GEN DRIVE DISC switch (P5).
1) Make sure these lights come on:
a) The yellow DRIVE light in the R GEN DRIVE DISC switch (P5).
b) AIRPLANES WITH GEN FIELD CONT SWITCHES ON P61 MAINTENANCE PANEL (WDM 24-22-11);
The white FIELD OFF light in the switch for the right generator field (P61).
2) Make sure these indications for the right power channel show on the lower EICAS display:
a) AC-V = 0 ±5
b) FREQ = 0 ±5
3) Make sure these indications show on EICAS:
a) R GEN OFF
b) R GEN DRIVE
(d) Stop the right engine (Ref 71-00-00).
(e) Push the AUTO EVENT READ switch on the EICAS maintenance panel (P61).
(f) Push and hold the ERASE button on the EICAS maintenance panel (P61) for 3 seconds.
1) Make sure the AUTO EVENT on the EICAS erases.
(g) Open the fan cowl panels of the right engine (Ref 71-11-04).
(h) Slowly pull the disconnect reset 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 must be felt when you pull the ring to the outer limit.

(i) Permit the disconnect reset ring to go back slowly to the maximum inner position.
1) The operation of the ring must be smooth and must move freely.
(j) 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.
(k) Permit the ring to slowly go back to the maximum inner position.
1) If the IDG does not correctly set, replace the IDG (Ref 24-11-01).

S 415-016
(2) Close the fan cowl panels (AMM 71-11-04/201).

S 745-017
(3) Push the RESET switch on the front of the BPCU (E5-3).
(a) Make sure these indications show on the BPCU:
1) EXTERNAL POWER SYSTEM
2) LEFT GEN POWER SYSTEM
3) RIGHT GEN POWER SYSTEM
4) APU GEN POWER SYSTEM

S 845-018
(4) Put the Airplane Back to its Usual Condition
(a) Remove electrical power if it is not necessary (AMM 24-22-00/201).
(b) Put the BAT switch (P5) to the OFF position.

TASK 24-11-00-825-004

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 not within 400 + 5 Hz, but is within 400 ±20 Hz, 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 71-00-00/201, Power Plant (Operating Procedures)
(2) AMM 71-11-04/201, Fan Cowl Panels

C. Prepare for the Adjustment

S 715-021
(1) Stop the engine (AMM 71-00-00/201).

S 015-027
(2) Open the fan cowl panels (AMM 71-11-04/201).

D. Procedure

S 825-022
(1) Adjust the system
(a) Remove the lockwire from the governor adjustment screw.
(b) Turn the adjustment screw clockwise to decrease the IDG frequency.
(c) Turn the adjustment screw counterclockwise to increase 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.
(d) Lock the adjustment screw with a wire.

S 845-023
(2) Put the Airplane back to its Usual Condition
(a) Close the fan cowl panels (AMM 71-11-04/201).
(b) After the adjustment of the IDG, continue with the operational test.

GENERATOR DRIVE SYSTEM - INSPECTION/CHECK

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

TASK 24-11-00-866-001

2. IDG Oil System Pressure Release (Fig. 601)
   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 - High Speed External Gearbox Aft Face 5 o'clock
422	Engine 2 - High Speed External Gearbox Aft Face 5 o'clock

      (2) Access Panel

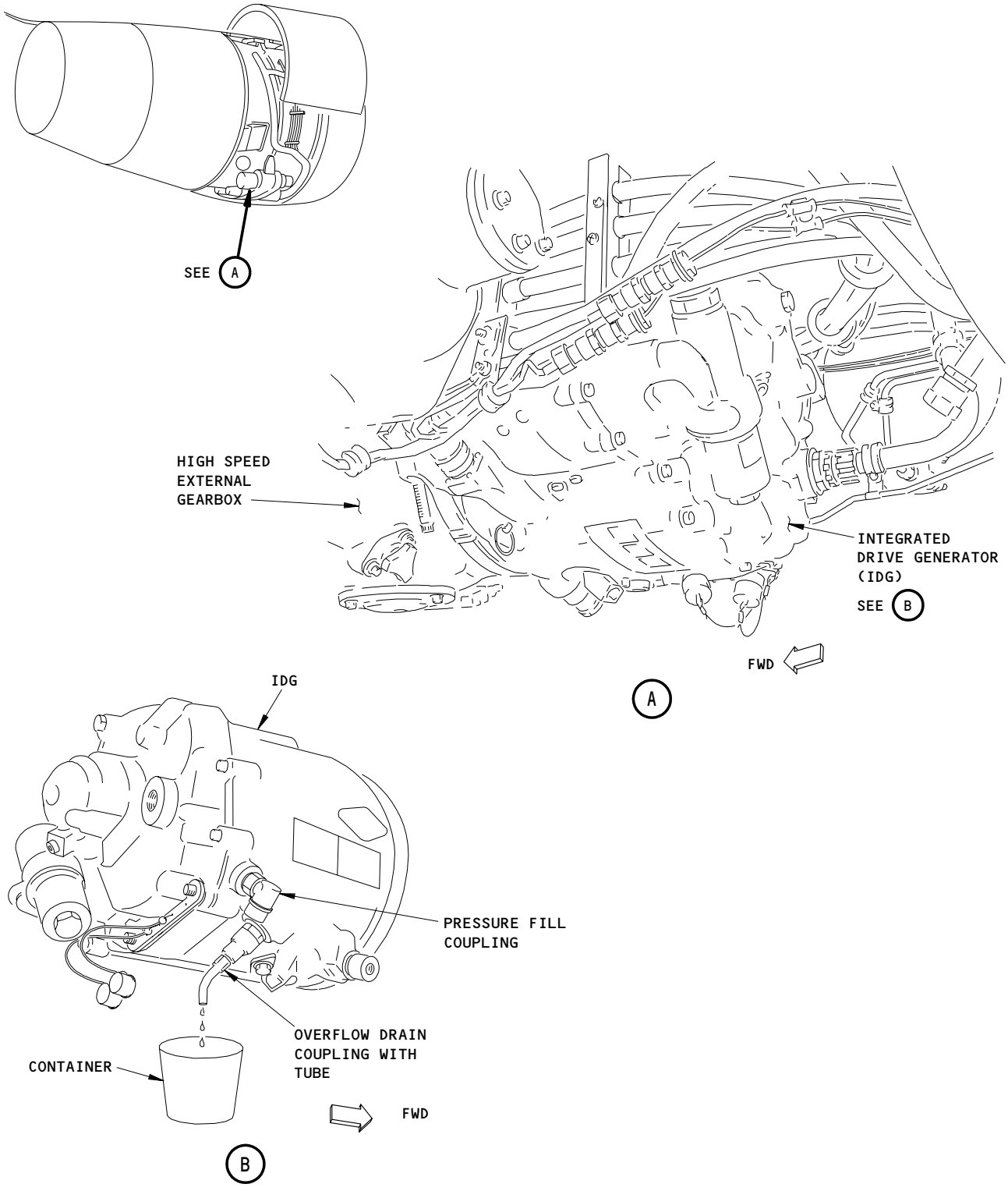
414BB	IDG Oil Fill Access Door
424BB	IDG Oil Fill Access Door

   D. Procedure

      S 016-006
      (1) Open the service access door, for the IDG, on the right hinged cowl.

      S 036-007
      (2) Remove the cover from the overflow drain coupling on the IDG.

      S 866-008
      (3) Put the free end of the outlet hose into a container.



Integrated Drive Generator Depressurization
Figure 601

S 866-009

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

S 096-010

(5) Disconnect the adapter and the outlet hose from the overflow drain coupling.

S 436-011

(6) Install the cover on the overflow drain coupling.

S 866-012

(7) Put the Airplane in Its Usual Condition

S 416-017

(8) Close the service access door, for the IDG, on the right hinged cowl.

TASK 24-11-00-796-018

3. IDG Oil System Static Leak Check (Fig. 602)

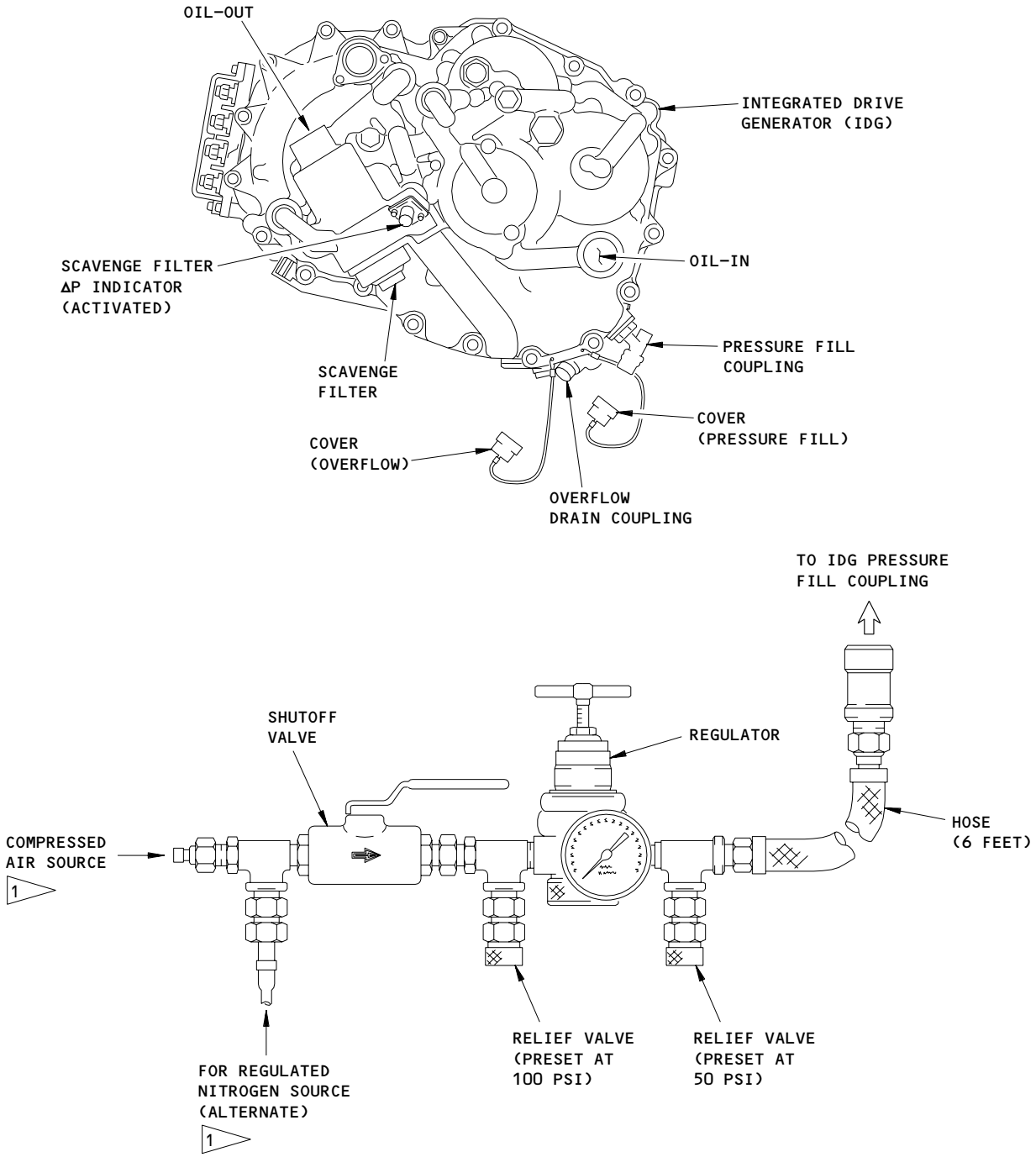
A. General

(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.



IDG Oil System Static Leak Test
Figure 602

(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) D00193 Lubricant-Oil - 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 -	High Speed External Gearbox Aft Face 5 o'clock
422	Engine 2 -	High Speed External Gearbox Aft Face 5 o'clock

(2) Access Panel

414BB	IDG Oil Fill Access Door
424BB	IDG Oil Fill Access Door

F. Procedure

S 016-020
(1) Open the right hinged cowl (AMM 71-11-02/201).

S 866-021
(2) Do this task: IDG Oil System Pressure Release (AMM 24-11-00/201).

S 866-022
(3) Assemble the leak test equipment (Fig. 602).

S 866-023
(4) Set the shutoff valve on the leak test equipment to OFF.

S 866-024
(5) Turn off the regulator valve on the leak test equipment to prevent over pressurization of the IDG case.

S 036-025
(6) Remove the cover from the pressure fill coupling.

S 486-026
(7) Connect the hose adapter of the leak test equipment to the pressure fill fitting.

S 486-027
(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 866-028

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 866-029
(10) Turn the shutoff valve to OFF.

S 866-030
(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 216-031
(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 24-11-00/601).
(d) Repair the leaks you found and do the leak check again.

S 866-032
(13) Do this task: IDG Oil System Pressure Release (AMM 24-11-00/601).

S 086-033
(14) Disconnect the test equipment.

S 616-034
(15) Add oil to the IDG, if it is necessary (AMM 12-13-03/301).

S 436-035
(16) Install the cover on the pressure fill coupling.

G. Put the Airplane in Its Usual Condition

S 416-037
(1) Close the right hinged cowl (AMM 71-11-02/201).

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.

TASK 24-11-01-212-005

2. IDG Oil Lines Flushing (Scavenge Filter is damaged)
   A. References
      (1) AMM 24-11-01/401, Integrated Drive Generator
      (2) AMM 24-11-04/401, IDG Air/Oil Heat Exchanger
   B. Equipment
      (1) Container - 2 gallon capacity
   C. Consumable Materials
      (1) Nitrogen - gas (minimum of 249 cubic feet bottle) and regulator from 20 to 250 psig
   D. 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)
   E. Procedure

      S 022-034
      (1) Remove the IDG (AMM 24-11-01/401).

      S 022-035
      (2) Remove the air/oil cooler (AMM 24-11-04/401).
          (a) Attach a nitrogen bottle to the IDG oil line.

              NOTE: Begin the task with a full bottle of dry nitrogen.

          (b) Apply 250 psi to the IDG oil line until the nitrogen gas bottle is empty.

(c) Remove the IDG oil line from the nitrogen gas bottle.
(d) Clean the moisture on the IDG oil line.

S 432-045
(3) Install the IDG oil lines.

S 422-025
(4) Replace the IDG Air/Oil Heat Exchanger (AMM 24-11-04/401)

S 422-033
(5) Replace the IDG (AMM 24-11-01/401)

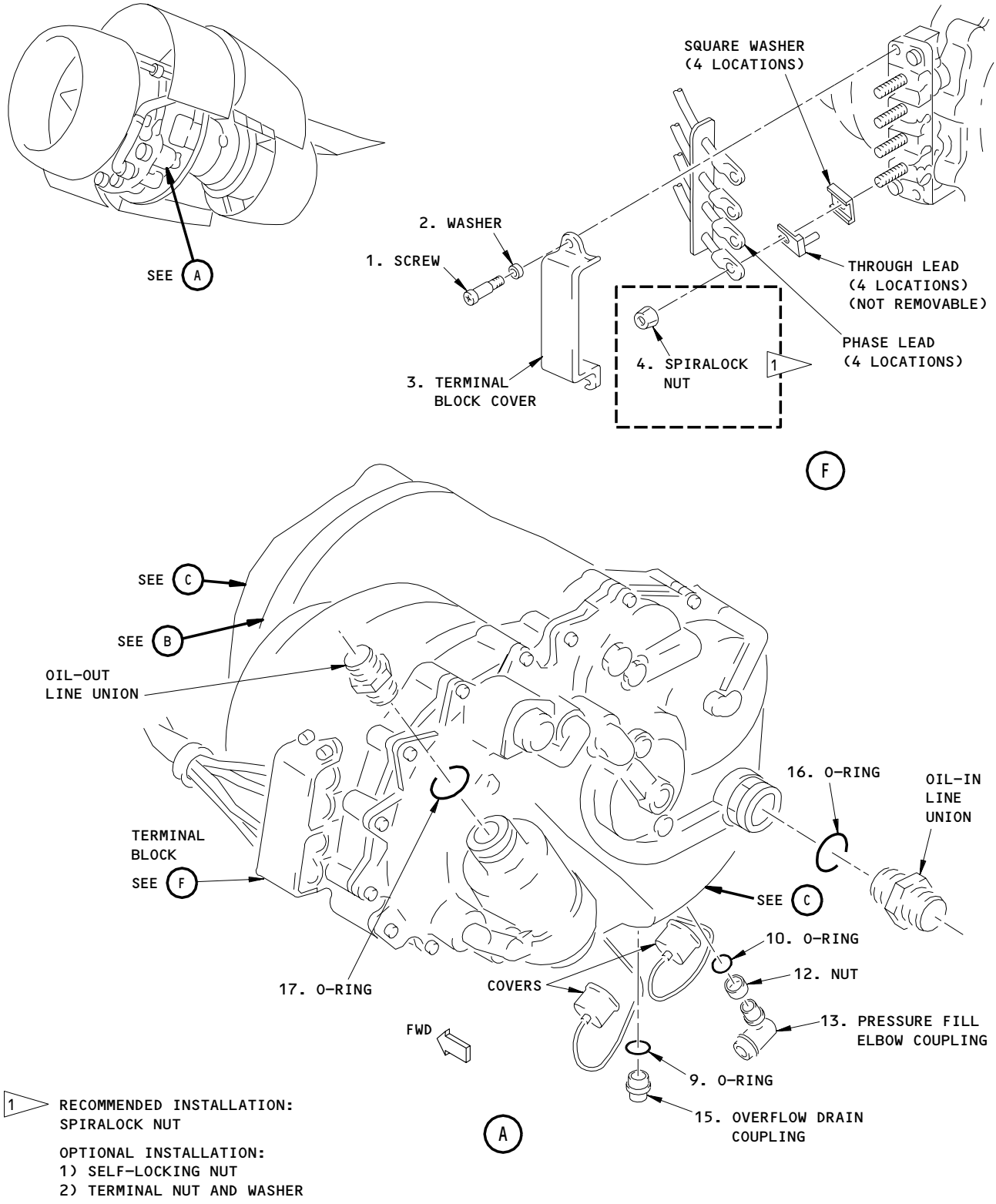
INTEGRATED DRIVE GENERATOR - REMOVAL/INSTALLATION

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.

   TASK 24-11-01-024-001

2. Remove the Integrated Drive Generator (Fig. 401)
   A. Equipment
      (1) IDG Hoist Adapter
         (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: Lift Fixture A71015-87
         (b) Option 2: Hein Werner Model 62 Jack with Spacer Assy A71013-19
         (c) Option 3: Lincoln Automotive W93720 Jack with Spacer Assy A71013-19
      (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
   C. 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)
   D. Prepare for Removal

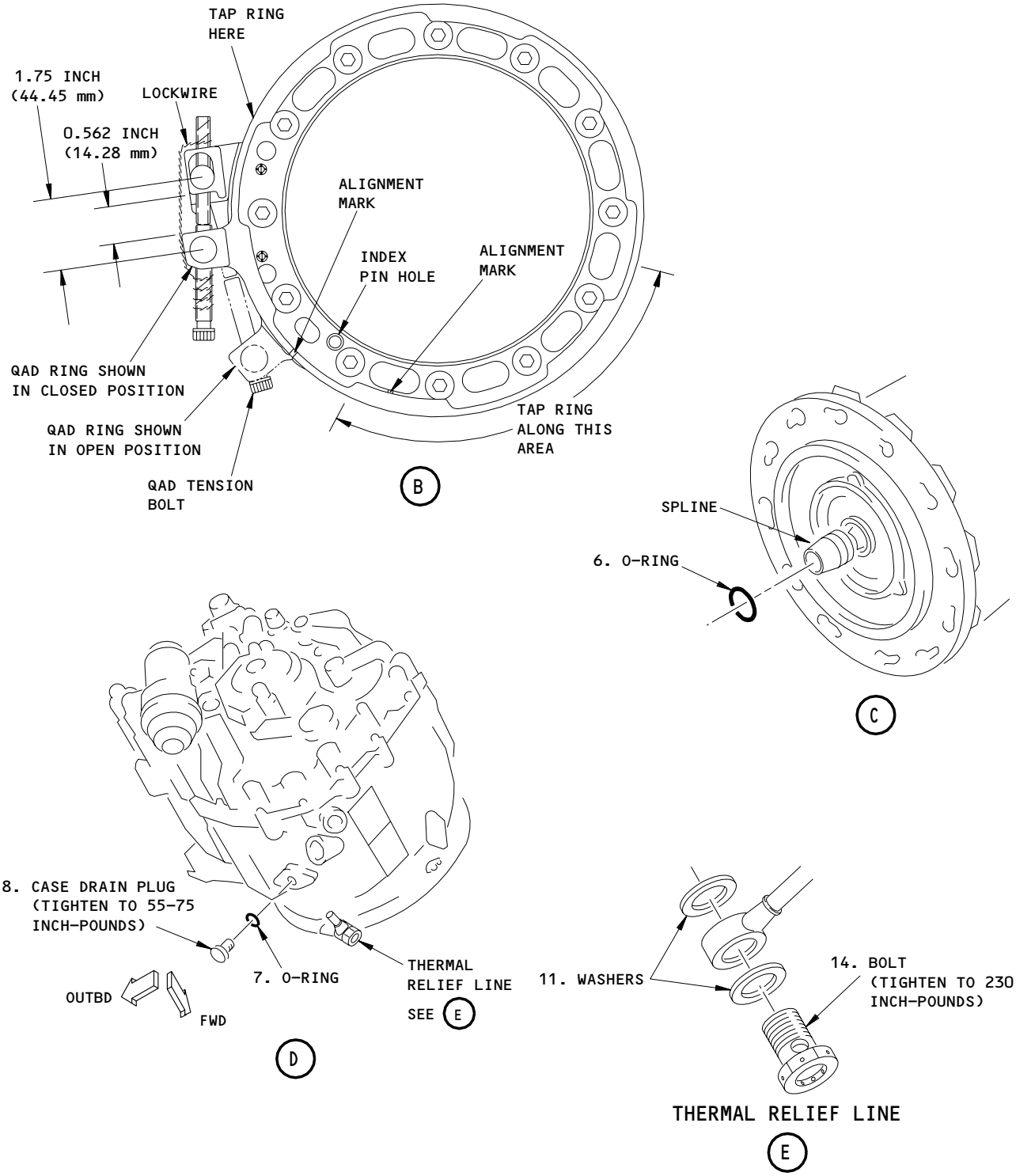
      S 864-008
      (1) Open these circuit breakers on the main power distribution panel P6 and attach DO-NOT-CLOSE tags:
         (a) 6B5, L GEN DRIVE DISC



1 RECOMMENDED INSTALLATION:
SPIRALOCK NUT

OPTIONAL INSTALLATION:
1) SELF-LOCKING NUT
2) TERMINAL NUT AND WASHER

Integrated Drive Generator Installation
Figure 401 (Sheet 1)



Integrated Drive Generator Installation
Figure 401 (Sheet 2)

(b) 6B6, R GEN DRIVE DISC

S 014-009

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

E. Procedure

S 864-010

(1) Remove the pressure from the IDG cooling system as follows:
  (a) If the IDG has a Push-To-Vent button, push the button to release pressure in the IDG.
  (b) Put the container under the IDG to catch oil.
  (c) Remove the cover from the overflow drain coupling.
  (d) 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. HOT OIL CAN CAUSE SERIOUS INJURY.

  (e) Connect the overflow drain hose to the overflow drain coupling. Allow the surplus oil to flow into the container.
  (f) Remove the overflow drain hose.

S 684-011

(2) Drain the IDG cooling oil as follows:
  (a) Put the container under the IDG to catch oil.
  (b) Remove the wire which locks the case drain plug.

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

  (c) Remove the case drain plug (8) and the O-ring (7).
  (d) Allow the oil to flow from the IDG into the container.
  (e) Discard the O-ring (7).
  (f) Lubricate and install a new O-ring (7) on the case drain plug (8).
  (g) Install the case drain plug (8). Tighten to 55-75 pound-inches (6.21-8.47 Newton-meters).
  (h) Install a lockwire on the case drain plug (8) if you plan to re-install this IDG.

S 034-012

(3) Remove the electrical connectors as follows:
  (a) Remove the two IDG electrical connectors.
  (b) Install protective caps on the IDG and ship side electrical connectors.

S 034-013

(4) Remove the phase leads from the IDG as follows:
  (a) Remove the two screws (1) and the two washers (2) which attach the terminal block cover (3) to the IDG.
  (b) Remove the terminal block cover (3) from the IDG.
  (c) Remove the spiralock nuts (4), the self-locking nuts, or the terminal nuts and washers which are installed on the terminal studs.
  (d) Remove the four phase leads and identify the leads for subsequent installation.
  (e) Install the spiralock nuts (4), the self-locking nuts, or the washers and terminal nuts on the terminal studs (tighten by hand).
  (f) Install the terminal block cover (3) with the washers (2) and the screws (1). Tighten the screws by hand.

S 014-014

(5) Remove the thermal relief drain line from the IDG as follows:

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

  (a) Disconnect the thermal relief drain line from the IDG. Allow any oil from the line to drain into the container.
  (b) Remove the screw and the nut which attaches the thermal relief drain line to the bracket near the bottom of the IDG.
  (c) Remove the thermal relief drain line.
  (d) Install a plug to the thermal relief valve port.

S 014-015

(6) Remove the oil-in and the 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.

CAUTION: USE TWO WRENCHES TO LOOSEN THE OIL-IN AND OIL-OUT LINES. IF YOU DO NOT USE THE TWO WRENCHES PROCEDURE, TO MUCH TORQUE CAN BE TRANSFERRED TO THE GENERATOR FITINGS. THIS CAN CAUSE DAMAGE TO THE GENERATOR FITTINGS.

(a) Disconnect the oil-in and the oil-out lines from the IDG. Allow the oil from the lines to drain into the container.
(b) Cap the oil-in and the oil-out lines.
(c) Remove the IDG oil-in line from the hose which goes to the heat exchanger.
(d) Cap the open end of the oil-in line. Keep the line for installation.
(e) Remove the oil-in and the oil-out fittings. Keep for installation. Discard the O-rings.
(f) Install plugs in the oil-in and oil-out bosses on the IDG.

S 034-017
(7) Remove and inspect the scavenge filter (AMM 24-11-02/201).

S 034-016
(8) Remove the pressure fill and overflow drain couplings as follows:
(a) Remove the covers from the overflow drain coupling and the pressure fill elbow coupling. Keep the covers for installation.
(b) Remove the wire which locks the pressure fill elbow coupling.
(c) Remove the overflow drain coupling and pressure fill elbow coupling.
(d) Remove and discard the O-ring (9) on the overflow drain coupling.
(e) Remove the drilled jamnut (12) from the pressure fill boss. Keep the nut for installation. Discard the O-ring (10).
(f) Install plugs in the pressure fill boss and overflow drain boss on the IDG.

S 024-025
(9) Remove the IDG as follows:
(a) Move the lift fixture under the IDG. Lift the hoist adapter to touch the IDG.

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

(b) Attach the hoist to the IDG. Lift the adapter to take some of the IDG weight.

(c) Remove the wire which locks the QAD tension bolt.
(d) Loosen the QAD tension bolt to allow movement of the IDG.
(e) Adjust the hoist adapter to hold the weight of the IDG, and remove weight from the QAD and the IDG input shaft.
(f) Loosen the QAD tension bolt until the alignment marks on the QAD ring and the IDG housing align. The QAD kit is in the open position and the clamping lugs will be disengaged when the alignment marks align.

NOTE: If the QAD ring moves 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.

CAUTION: DO NOT USE IDG INPUT SHAFT FOR LIFTING THE IDG. THIS WILL DAMAGE SHAFT. GUIDE THE IDG OUT IN A STRAIGHT LINE. BINDING OF INPUT SHAFT CAN DAMAGE IDG INPUT SEAL.

(g) Pull the hoist adapter straight out to remove the IDG from the engine accessory gearbox.
(h) Remove and discard the O-ring (6) from the IDG input spline.

TASK 24-11-01-424-002

3. Install the Integrated Drive Generator (Fig. 401)
   A. Equipment
      (1) IDG Hoist Adapter
         (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: Lift Fixture A71015-87
         (b) Option 2: Hein Werner Model 62 Jack with Spacer Assy A71013-19
         (c) Option 3: Lincoln Automotive W93720 Jack with Spacer Assy A71013-19
   B. Consumable Materials
      (1) Oil - Lubricating, MIL-L-7808 or MIL-L-23699 (AMM 20-30-04/201)
      (2) Grease - Dow Corning No. 4 (AMM 20-30-04/201)
   C. Parts
      (1) Refer to IPC for part numbers and effectivities of items in the following table:

AMM		NOMENCLATURE	AIPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	6	Packing (O-ring)	24-11-01	05	305
	7	Packing (O-ring)			25
	9	Packing (O-ring)			15
	10	Packing (O-ring)			115
	9	Packing (O-ring)		08	25
	10	Packing (O-ring)			30
	16	Packing (O-ring)		01	40
	17	Packing (O-ring)			35
	16	Packing (O-ring)		01A	40
	17	Packing (O-ring)			35

D. References
(1) AMM 12-13-03/301, Integrated Drive Generator
(2) AMM 20-10-23/401, Lockwires
(3) AMM 20-30-04/201, Lubricants
(4) AMM 24-11-00/501, Generator Drive System
(5) AMM 24-11-03/401, Quick Attach Detach (QAD) Coupling
(6) AMM 24-11-03/601, Quick Attach/Detach (QAD) Coupling
(7) AMM 71-11-04/201, Fan Cowl Panels

E. Access
(1) Location Zones
212 Flight Compartment
(2) Access Panels
413/423 Fan Cowl Panels (Left)
414/424 Fan Cowl Panels (Right)

F. Prepare for Installation

S 214-003
(1) Inspect the QAD ring for damage (AMM 24-11-03/601).

NOTE: To prevent foreign material from entering the IDG, leave the plugs in the ports and protective caps on the connectors until the fittings and electrical connectors are installed.

S 644-004
(2) Lubricate a new O-ring (6) with engine oil and install the O-ring on the IDG input spline.

S 644-005
(3) Apply a thin coat of engine oil on the IDG surface which will be mated with the QAD surface.

S 644-048

(4) Apply a thin coat of engine oil to the threads of the QAD coupling tension bolt.

G. Procedure

S 424-006

(1) Install the IDG as follows:

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

(a) Use the hoist adapter and lift fixture to put the IDG to the mounting pad.
(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) Align the IDG with the gearbox mount pad. Hold the IDG so that no weight is put on the input shaft.
(d) Position the IDG to allow the lugs on the IDG input flange go into the QAD ring openings. Align the alignment mark on the QAD and the align mark on the IDG.
(e) Make sure that the index pin on the IDG goes into the index pin hole on the QAD adapter.
(f) Tighten the QAD tension bolt so the QAD ring lugs fully engage the input flange lugs of the IDG. Make sure that the ring moves freely and does not catch.
(g) Tighten the QAD tension bolt as follows:
    1) Torque the QAD tension bolt to 240-264 pound-inches (27-30 Newton-meters).
    2) Use a brass drift to lightly hit the edge of the QAD coupling to prevent the incorrect values. Hit the ring as shown in Fig. 401.
    3) Do a check of the torque value of the tension bolt.
    4) If the torque is less than 180 pound inches (20 Newton-meters), tighten the tension bolt to 240-264 pound-inches (27-30 Newton-meters).
    5) If the torque is greater than 180 pound-inches (20 Newton-meters), lightly hit the edge of the QAD coupling again.
(h) Do the steps to tighten the QAD tension bolt again until the torque does not drop below 180 pound-inches (20 Newton-meters) after you hit the QAD coupling.
(i) Torque the QAD tension bolt to 240-264 pound-inches (27-30 Newton-meters).
(j) Remove the hoist adapter from the IDG.

(k) Measure the distance between the ring lug and the bracket on the QAD ring. If the distance is less than 0.562 inch (14.28 mm), replace the QAD coupling (AMM 24-11-03/401).

NOTE: You can measure the distance between the centers of the nuts in the QAD coupling tension bolt assembly. If the distance is less than 1.750 inches (44.45 mm), replace the QAD coupling.

S 434-007

(2) Lock the QAD tension bolt with wire.

S 434-018

(3) Install the oil-in and the oil-out tubing as follows:
(a) Remove the plugs from the oil-in and the oil-out bosses on the IDG.
(b) Remove caps from oil-in and oil-out line.
(c) Connect the IDG oil-in tubing to the hose which is connected to the heat exchanger.
(d) Lubricate a new O-ring (16) with engine oil and install the O-ring on the oil-in coupling.
(e) Install the oil-in coupling in the IDG oil-in boss and tighten the coupling to a torque of 130-175 pound-inches (14.6-19.7 Newton-meters).
(f) Lubricate a new O-ring (17) with engine oil and install the O-ring on the oil-out coupling.
(g) Install the oil-out coupling in the IDG oil-out boss and tighten the coupling to a torque of 110-150 pound-inches (12.4-16.9 Newton-meters).

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

(h) Connect the oil-in line.
(i) Connect the oil-out line.

S 434-019

(4) Install the pressure fill and overflow drain couplings as follows:
(a) Remove plugs in the pressure fill boss and overflow drain boss on the IDG.
(b) Get a new or shop-tested pressure fill elbow coupling (13) and install the drilled jamnut (12) on the pressure fill elbow coupling.
(c) Lubricate a new O-ring (10) with engine-oil and install the O-ring on the pressure fill elbow coupling (13). The O-ring should be between the IDG and jamnut.

(d) Install the pressure fill elbow coupling (13) with the O-ring and the drilled jamnut (12). Turn the assembly as a unit until the O-ring is seated against the pressure fill boss. Tighten the drilled jamnut (12) to 110-150 pound-inches (12.43-16.95 Newton-meters).
(e) Lock the drilled jamnut (12) with wire.
(f) Get a new or shop-tested overflow drain coupling (15).
(g) Lubricate a new O-ring (9) with engine-oil and install the O-ring on the overflow drain coupling (15).
(h) Install the overflow drain coupling (15). Tighten the coupling to 110-150 pound-inches (12.43-16.95 Newton-meters).

S 434-020

(5) Install the thermal relief drain line as follows:
(a) Remove the plug from the thermal relief valve port.
(b) Install the screw and the nut which attach the thermal relief line to the bracket near the bottom of the IDG.
(c) AIRPLANES WITH RB211 ENGINES;
Install two washers (11) on the thermal relief line.
(d) AIRPLANES WITH RB211 ENGINES;
Install the thermal relief line and tighten the bolt to 230 pound-inches (25.99 Newton-meters).

S 434-021

(6) Install the electrical connectors as follows:
(a) Remove the caps from the two IDG electrical connectors.
(b) Connect the wiring harness to the two IDG electrical connectors.

S 434-022

(7) Install the phase leads on the IDG as follows:
(a) Remove the screws (1) and washers (2) that attach the terminal block cover (3) to the IDG.
(b) Remove the spiralock nuts (4), the self-locking nuts, or the terminal nuts and washers which are installed on the terminal studs.
(c) Visually inspect the power terminal studs for any damage.
(d) Make sure the square washers are under the through leads.
(e) If the phase color sleeves on the power feeder cables are damaged or missing, replace the sleeves (SWPM 20-10-14).
(f) If the fanning strip is damaged or loose, replace the fanning strip.

CAUTION: MAKE SURE THAT YOU CONNECT THE PHASE LEADS TO THE CORRECT TERMINAL STUDS ON THE IDG. AN INCORRECT INSTALLATION CAN CAUSE CIRCUIT MALFUNCTION.

(g) Attach the four phase leads to IDG power terminal studs.

(h) Do these steps if you install the spiralock nuts (4):
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: DO NOT INSTALL ANY WASHER UNDER THE PHASE LEADS. THE PHASE LEADS MUST BE IN DIRECT CONTACT WITH THE THROUGH LEADS. IF YOU INSTALL WASHER UNDER THE PHASE LEADS, LOCALIZED RESISTANCE HEATING CAN OCCUR WHICH COULD CAUSE THE TERMINAL BLOCK TO BURN.

(i) Install the spiralock nuts (4), the self-locking nuts, or the washers and terminal nuts on the terminal studs.

NOTE: If you install the spiralock nuts or the self-locking nuts, do not install the terminal washers.

CAUTION: MAKE SURE THAT YOU TIGHTEN THE NUTS TO THE SPECIFIED TORQUE VALUE. A LOW TORQUE ON TERMINAL NUTS 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.

(j) Tighten the terminal nuts to 144-168 pound-inches (16-19 Newton-meters).
1) Make sure the terminal studs do not rotate when the terminal nuts are tighten. If the terminal studs rotate when the nuts are tighten, replace the terminal block (AMM 24-11-20/401).
(k) Install the terminal block cover (3). Tighten the screws (1) to 20-22 pound-inches (2.3-2.5 Newton-meters).
(l) Remove labels on the phase leads if they are installed.

S 434-046
(8) If the IDG is not connected, connect the IDG Input Shaft (AMM 24-11-01/601).

S 614-023
(9) Replenish the IDG oil (AMM 12-13-03/301).

S 864-028
(10) 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 714-033
(11) Do this task: "Idle Leak Test for the Oil and Fuel Systems" (AMM 71-00-00/501).

S 794-034
(12) Stop the engine.

S 214-044
(13) Do a check for oil leaks at the IDG and external oil cooling system. Repair any leaks you find.

S 614-035
(14) Do this task: "IDG Oil Level Check" (AMM 12-13-03/301).

S 724-036
(15) If the oil level is low, do this task: "IDG Oil Servicing" (AMM 12-13-03/301).

S 414-024
(16) Close the fan cowl panel (AMM 71-11-04/201).

S 714-027
(17) Do the IDG Adjustment/Test (AMM 24-11-00/501).

INTEGRATED DRIVE GENERATOR - 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 cap.

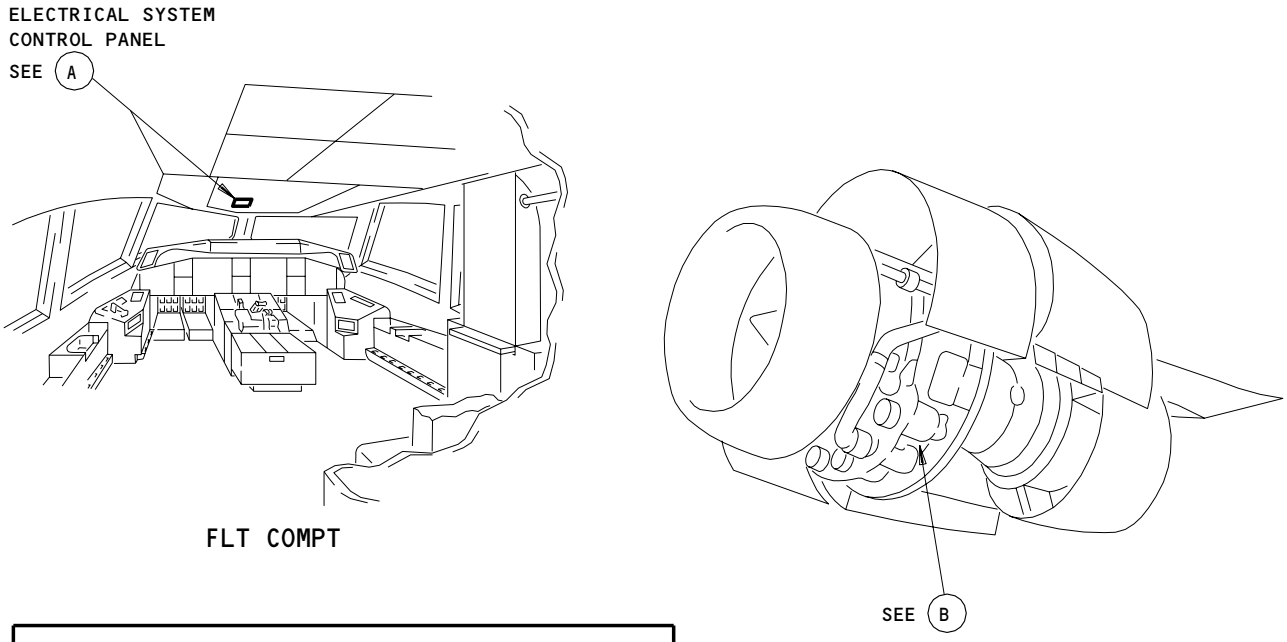
   TASK 24-11-01-206-001
2. Check the IDG Disconnect Function
   A. General
      (1) This task has these checks:
         (a) IDG Disconnect Inhibit Function Check
         (b) IDG Disconnect Check
   B. References
      (1) AMM 24-22-00/201, Control
      (2) AMM 71-11-04/201, Fan Cowl Panels
      (3) AMM 77-12-01/201, Engine Run Simulation
   C. Access
      (1) Location Zones
            211/212 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)
   D. Prepare for Check

      S 216-003
      (1) Make sure that the engines are not running.

      S 016-007
      (2) Open the fan cowl panels (AMM 71-11-04/201).

      S 866-004
      (3) Supply ground electrical power (AMM 24-22-00/201).

      S 866-005
      (4) 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



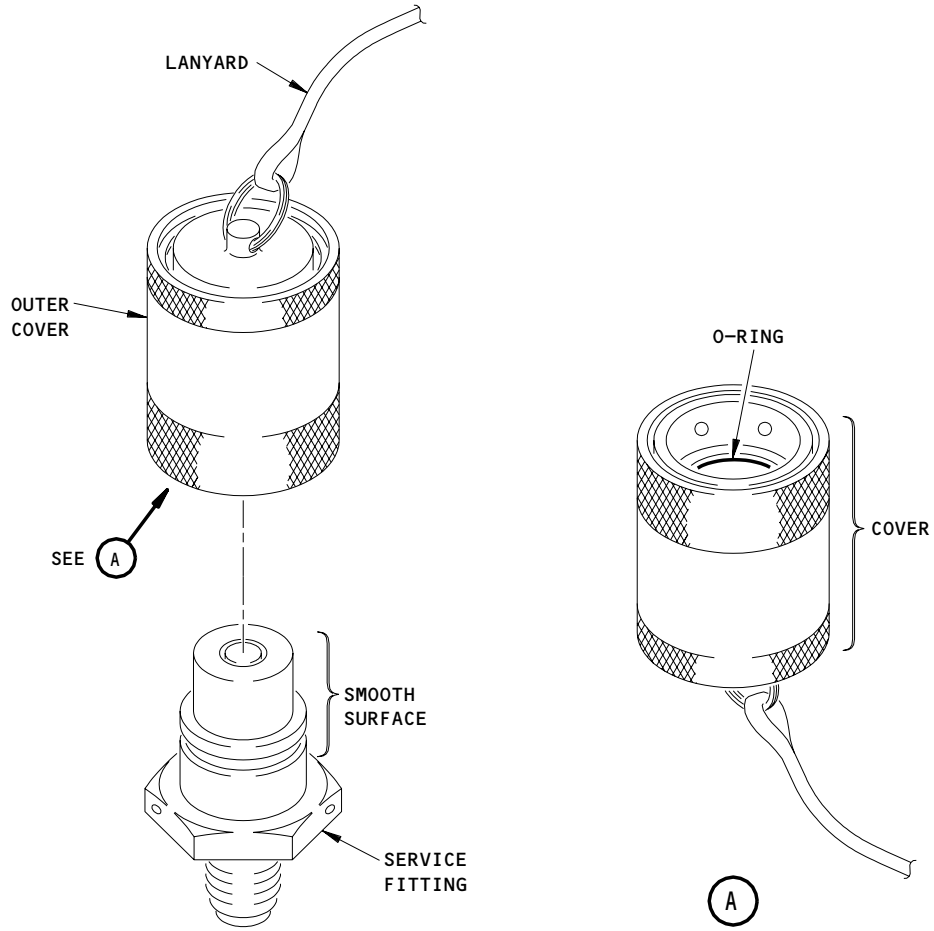
M10063–ELECTRICAL SYSTEM CONTROL PANEL

A

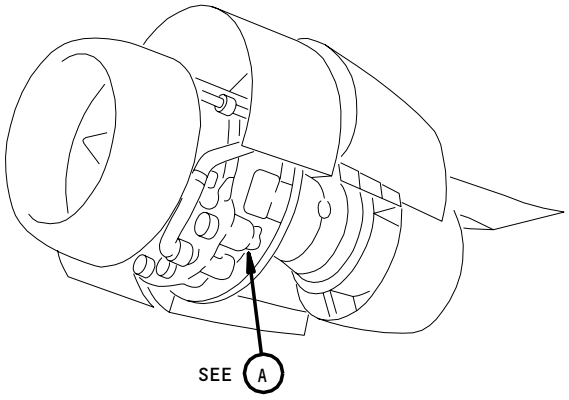
LEFT SIDE VIEW

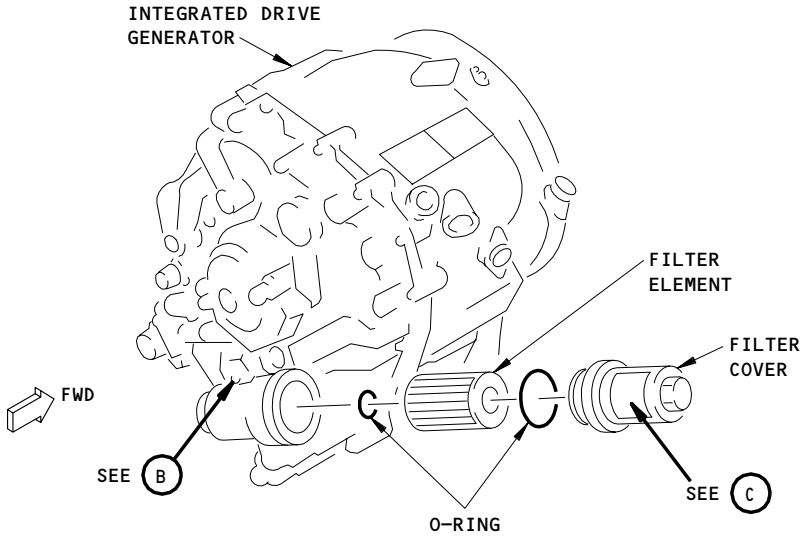
B

IDG Disconnect Drive System
Figure 601



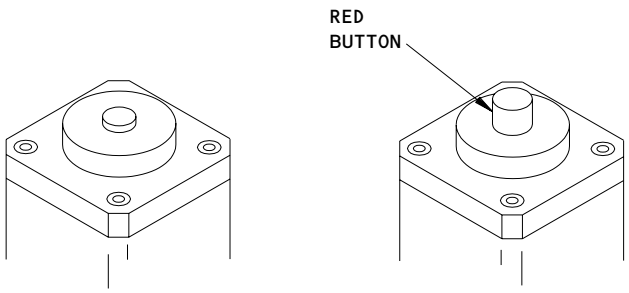
IDG Service Fitting and Pressure Cap Inspection
Figure 602





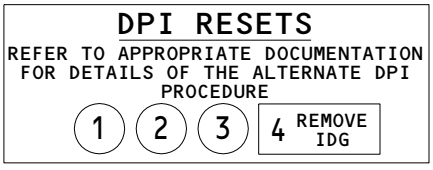
(BOTTOM VIEW)

A



PRESSURE DIFFERENTIAL INDICATOR

B



DPI RESETS DECAL

C

DPI Reset Procedure
Figure 603

E. Procedure

S 866-006

(1) AIRPLANES WITH IDG DISCONNECT INHIBIT (POST-SB 24-59);
Do the IDG Disconnect Inhibit Function Check as follows:

NOTE: These airplanes use pins 1 and 13 on K10446 or K10556 in the P36 panel (WDM 24-11-11).

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

(a) Momentarily push the GEN DRIVE DISC switch on the P5 panel for the applicable IDG.
(b) Slowly pull the disconnect reset ring to the outward travel limit.
1) Make sure there is no "click" sound when you pull the disconnect reset ring.
(c) Permit the ring to slowly go back to the maximum inner position.

S 716-088

(2) Do the IDG Disconnect Function check as follows:
(a) Open the applicable ENGINE SPEED CARD circuit breaker, 11B31 or 11B32, for the applicable IDG.

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

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

(c) Close the applicable ENGINE SPEED CARD circuit breaker, 11B31 or 11B32, for the applicable IDG.
(d) Cycle the Generator Control Switch to reset the field relay.
(e) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-11-01-436-002

3. Connect the IDG Input Shaft

A. References
(1) AMM 24-11-01/401, Integrated Drive Generator
(2) AMM 71-11-04/201, Fan Cowl Panels

B. Access
(1) Location Zones
211/212 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)

C. Prepare for check

S 016-008
(1) Open the fan cowl panels of the engine which contains the IDG to be connected if they are not already open (AMM 71-11-04/201).

D. Procedure

S 436-009
(1) Do the IDG connect procedure as follows:
(a) Slowly pull the disconnect reset ring on the IDG to the outward limit of travel. Note the amount of hand force required.
(b) Make sure that the "click" can be felt in the disconnect reset ring as it gets near the outward limit of travel.

NOTE: Operation of the reset ring should be smooth with moderate force required and no indication of binding.

(c) Allow the disconnect reset ring to slowly return to the maximum inward position.

NOTE: Operation of the reset ring should be smooth with no indication of binding.

(d) Slowly pull the disconnect reset ring to the outward travel limit. Note the amount of hand force required.
(e) Make sure that the force required should be less than that required in the previous step.

(f) Make sure that there was no "click" due to the second pull of the disconnect ring.

NOTE: If the hand force does not decrease, or a "click" is produced during the second pulling of disconnect reset ring, replace IDG (AMM 24-11-01/401).

(g) Allow the disconnect reset ring to slowly return to the maximum inward position.

S 416-010

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

TASK 24-11-01-286-075

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 the IDG oil condition are not satisfactory, or the DPI Resets decal shows it is the 4th extension, the IDG must be replaced.

(3) If the scavenge filter and the IDG oil condition are satisfactory, and the DPI Resets decal shows it is not the 4th extension, the DPI can be reset.

B. References

(1) AMM 12-13-03/301, IDG - Servicing
(2) AMM 24-11-02/201, Scavenge Filter
(3) AMM 24-11-00/501, Generator Drive System
(4) AMM 71-11-04/201, Fan Cowl Panels

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.

D. Access

(1) Location Zones
(a) 212 Flight Compartment
(b) 410 Left Power Plant Nacelle
(c) 420 Right Power Plant Nacelle

(2) Access Panels
(a) 413/423 Fan Cowl Panels (Left)
(b) 414/424 Fan Cowl Panels (Right)

E. Prepare for Examination

S 866-082

(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 016-080

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

F. Procedure

S 286-073

(1) Do these steps to examine the Pressure Differential Indicator (DPI).

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

(a) 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 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).
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is not breached. (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).

DPI EXTENSION		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is not breached. (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).
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is breached. (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 the IDG air/oil cooler (AMM 24-11-04/401). 3. Replace the IDG oil cooler lines. 4. Install a new IDG. (AMM 24-11-01/401).
*[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.		

1) If the IDG was replaced, no more work is necessary.

2) If the IDG was not replaced, check the DPI Resets 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 3 times.

a) If the DPI Resets decal shows it is the fourth (4th) DPI extension, replace the IDG (AMM 24-11-01/401).
b) If the DPI Resets decal shows it is not the fourth (4th) DPI extension, use a blunt tool to rub out the next number on the DPI Resets decal and use finger to push the DPI red button down.

(b) If the button 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 those tasks.

S 866-083

(2) 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 416-086

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

TASK 24-11-01-286-014

5. Examine The Oil In The IDG.

A. General

(1) The Visual Oil Check will visually examine the oil for contamination, the oil color, signs of overheating or chemical contamination.

(2) The Specific Gravity Oil Check 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 IDG oil.

NOTE: Fuel smell is everywhere on the flight line. Do the specific gravity check to check for fuel in the oil

(3) The Water in Oil Check 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 71-11-04/201, Fan Cowl Panels

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. Access
   (1) Location Zones
      (a) 410 Left Power Plant Nacelle
      (b) 420 Right Power Plant Nacelle
   (2) Access Panels
      (a) 413/423 Fan Cowls Left
      (b) 414/424 Fan Cowls Right

E. Prepare for Examination

S 866-084

   (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 016-017

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

F. Visual Oil Check

S 916-024

CAUTION: DO NOT PUT A TOOL INSIDE THE PRESSURE OILER (SERVICE FITTING) TO REMOVE IDG INTERNAL PRESSURE. DAMAGE TO THE PRESSURE OILER (SERVICE FITTING) 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 216-025

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

S 026-026

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

(a) If the pressure oiler is leaking, do the Pressure Oiler (service fitting) and Pressure Cap check (AMM 24-11-01/601).

NOTE: If the pressure oiler (service fittings) or service adapters are leaking because they do not mate properly, replace the pressure oiler or service adapters. The pressure oilers are not repairable.

S 426-027

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

S 426-028

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.

NOTE: If the pressure oiler to adapter connection is leaking, replace the pressure oiler and/or the adapter. The pressure oiler and service adapters are not repairable.

S 216-029

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

(a) If the oil is contaminated, discolored or overheated, do the Scavenge Filter and Oil Condition Check.

(b) If 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.

NOTE: Some types of IDG oils are colored 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 IDG oil. Hydraulic fluid will lose its color over a short time. Old hydraulic fluid is clear in color.

S 216-030

(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.

NOTE: When it is difficult to smell fuel in the IDG oil, do the Specific Gravity Oil Check. It is better to do the Specific Gravity Oil Check on the flight line because fuel smell is everywhere on the flight line.

(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.

(c) If the oil removed from the IDG is less than 1 pint (1/2 liter), check the low oil level indicator.

1) Make sure the low oil level indicator shows a silver circle.

G. Specific Gravity Oil Check

S 686-031

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

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

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

NOTE: The specific gravity of new IDG oil is from 0.89 to 0.99.

(c) Get a sample of used IDG oil.
(d) Examine the specific gravity of used IDG oil.
(e) Compare the specific gravity readings.
(f) If the specific gravity reading of the used IDG oil is lower than 0.89, fuel may be in the IDG oil. Do the Scavenge Filter and Oil Condition Check.
(g) If the specific gravity reading of the used IDG oil is above 0.99, hydraulic fluid or water may be in the IDG oil. Do the Scavenge Filter and Oil Condition Check.

H. Water In The Oil Check

S 686-032

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

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

S 756-033

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 916-034

(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 756-035
(4) Shake the mixture of IDG oil and methyl alcohol for one minute.

S 756-036
(5) Wait one (1) minute and check the mixture.
(a) If the mixture is cloudy, water is in the IDG oil. Do the Scavenge Filter and Oil Condition Check.

I. Scavenge Filter and Oil Condition Check

S 286-087
(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).
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is not breached. (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).

SCAVENGE FILTER AND OIL CONDITION CHECK		
SCAVENGE FILTER CONDITION	IDG OIL CONDITION	ACTION
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is not breached. (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).
Visible magnetic or non-metallic particles in the scavenge filter and the scavenge filter is breached. (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 the IDG air/oil cooler (AMM 24-11-04/401). 3. Replace the IDG oil cooler lines. 4. Install a new IDG. (AMM 24-11-01/401).
*[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 866-085
(2) 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 416-039
(3) Close the fan cowl panels (AMM 71-11-04/201).

TASK 24-11-01-216-049

6. Check the IDG Pressure Oiler (Service Fitting) and Pressure Cap (Fig. 602)
A. General
(1) This is a check for pressure oiler (service fittings) and pressure cap oil leakage.
B. References
(1) AMM 24-11-02/201, Scavenge Filter
(2) AMM 71-11-04/201, Fan Cowl Panels
C. Equipment
(1) Container - 2 U.S. gallon (8 liter) capacity, suitable to collect oil drainage from the IDG
D. Access
(1) Location Zones
(a) 410 Left Power Plant Nacelle
(b) 420 Right Power Plant Nacelle
(2) Access Panels
(a) 413/423 Fan Cowls Left
(b) 414/424 Fan Cowls Right
E. Procedure

S 016-052
(1) Open the fan cowl panels (AMM 71-11-04/201).

S 286-059
(2) Do these steps to examine the pressure cap:
(a) Make sure the pressure cap has no oil leaking from the cap.

NOTE: If the pressure cap has oil leaking from the cap, the pressure oiler must be replaced.

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

(b) Pull on the outer cover of the pressure cap and remove the pressure cap.
(c) Examine the pressure cap 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 cap and the bore of the cap for cuts, nicks gouges or missing bearings.
1) If damage to the pressure cap bore is found, replace the cap.
(e) Clean the oil from the inside of the cap with Isporopyl alcohol. Dry the cap with dry compressed air or nitrogen.

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

S 286-060
(3) Do these steps to examine the pressure oiler (service fitting):

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 (service fitting) 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 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.

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 PSI to the pressure oiler. Do not apply more than 500 PSI 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 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.

S 416-063

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

SCAVENGE FILTER - MAINTENANCE PRACTICES

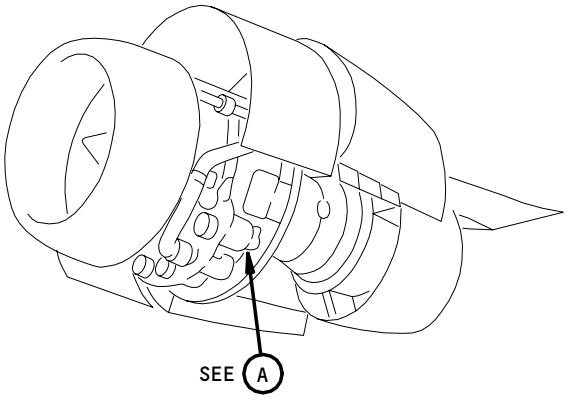
1. General
   A. This procedure has three tasks:
      (1) The first task removes the integrated drive generator (IDG) scavenge filter from the airplane.
      (2) The second task does an inspection/check of the scavenge filter.
      (3) The third task installs the scavenge filter on the airplane.
   B. If the IDG is to be replaced for any reason, the IDG Scavenge Filter and filter element must be reinstalled into the faulty IDG and sent to the repair shop for analysis.
   C. A removed filter element should not be used again, even if the filter element looks normal. Install a new filter element.

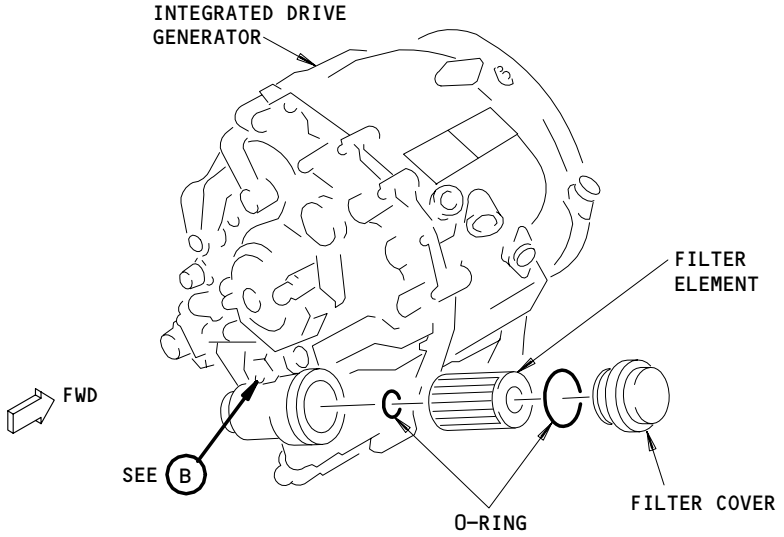
TASK 24-11-02-022-007

2. Scavenge Filter Removal (Fig. 201)
   A. Equipment
      (1) IDG oil overflow drain hose with outlet adapter Ozone OMP2505-3
      (2) Container - 1 gallon capacity
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   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)
   D. Prepare for the Removal

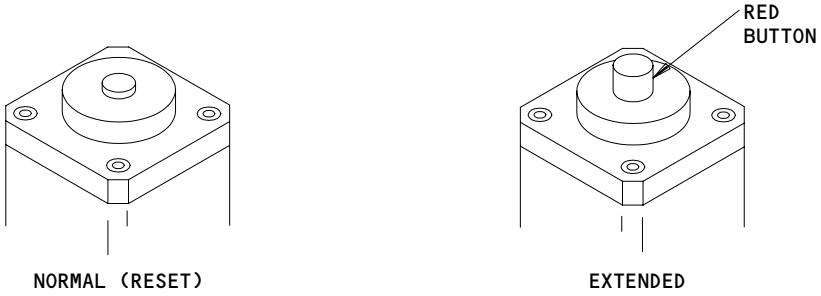
      S 012-008
      (1) Open the fan cowl panels (AMM 71-11-04/201).

      S 862-009
      (2) Remove pressure from the IDG cooling system as follows:
          (a) If the IDG has a PUSH-TO-VENT button, push the button to release the internal IDG pressure.
          (b) Put the container under the IDG to catch the oil.





BOTTOM VIEW
A



PRESSURE DIFFERENTIAL INDICATOR
B

Scavenge Filter Installation
Figure 201

(c) Remove the cover from the overflow drain coupling on the IDG.
(d) 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.

(e) Connect the oil-drain hose to the overflow drain coupling on the IDG. Allow the surplus oil to drain into the container.
(f) Remove the oil-drain hose.
(g) Install cover on overflow drain coupling.

E. Procedure

S 022-010

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

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.

(c) Remove the filter cover. Discard the O-ring. Allow the oil to flow out of the filter into the container.

NOTE: Inspect oil in filter cover for particles before dumping.

(d) Remove the filter element. Discard the O-ring.

TASK 24-11-02-212-002

3. Scavenge Filter Inspection/Check (Fig. 201)

A. General
(1) When the Pressure Differential Indicator (DPI) on the IDG is extended, the scavenge filter and the IDG oil must be examined to see if more work is necessary.

B. References
(1) AMM 24-11-01/601, Integrated Drive Generator
(2) AMM 24-11-04/401 IDG Air/Oil Heat Exchanger

C. Procedure

S 212-011

(1) Do a check for the conditions that follow:
(a) Is there contamination on the scavenge filter element, in the filter , or in the oil drained from the filter?
(b) Is there a condition that would allow contaminated oil to bypass the filter and enter the external oil cooling circuit?

(c) 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.

(d) Fuel, hydraulic fluid or water in IDG oil is liquid contamination.

(e) The condition that would allow oil to bypass the scavenge filter are damaged O-rings or a damaged filter.

S 422-017

(2) If the Pressure Differential 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 in the filter or in the IDG oil, do the "Examine The Oil In The IDG" (AMM 24-11-01/601).

S 422-014

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

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

TASK 24-11-02-422-003

4. Scavenge Filter Installation (Fig. 201)

A. 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

B. Procedure

S 422-004

(1) Install the scavenge filter as follows:
  (a) Lubricate and install a new O-ring on the filter element.
  (b) Lubricate and install a new O-ring on the filter cover.
  (c) Install the filter element into the IDG.

WARNING: INSTALL THE FILTER COMPONENTS CORRECTLY BEFORE YOU INSTALL THE COVER ON THE FILTER. DO NOT USE THE COVER TO PUSH THE FILTER COMPONENTS INTO THE HOUSING. YOU CAN CAUSE DAMAGE TO THE COMPONENTS.

  (d) Turn the filter cover to install it.
    1) Tighten it to 156-180 pound-inches.
  (e) Lock the filter cover with wire.

S 612-005

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

S 412-006

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

S 792-015

(4) Dry motor the engine (AMM 71-00-00/201) and check for any leaks.

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

1. General
   A. This procedure has two tasks. The first task removes the quick attach/detach (QAD) coupling from the airplane. The second task installs the QAD coupling on the airplane.

TASK 24-11-03-024-001

2. Remove the Quick Attach/Detach Coupling (Fig. 401)
   A. References
      (1) AMM 24-11-01/401, Integrated Drive Generator
   B. Prepare to Remove the QAD coupling

      S 024-003
      (1) Remove the IDG (AMM 24-11-01/201).
   C. Procedure

      S 024-004
      (1) Remove the QAD coupling as follows:
         (a) Remove the bolts which attach the QAD coupling to the gearbox.
         (b) Remove the QAD coupling and gasket from the engine accessory gearbox.

TASK 24-11-03-424-002

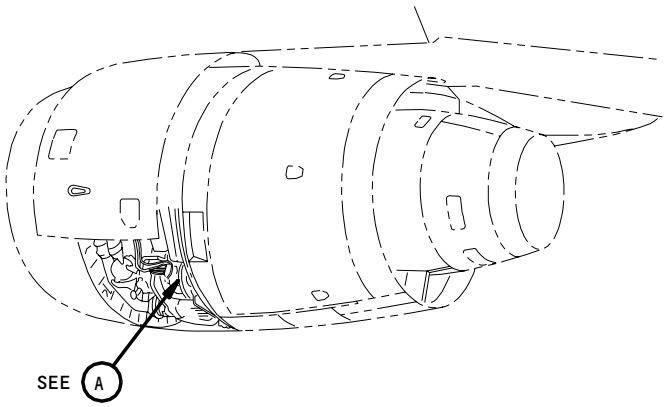
3. Install the Quick Attach/Detach Coupling (Fig. 401)
   A. Consumable Materials
      (1) Oil - MIL-L-23699 (AMM 20-30-04/201).
   B. References
      (1) AMM 20-30-04/201, Lubricants
      (2) AMM 24-11-01/401, Integrated Drive Generator
      (3) AMM 24-11-03/601, Quick Attach/Detach (QAD) Coupling
   C. Prepare to Install the QAD Coupling

      S 214-008
      (1) Do a visual check of the QAD coupling and the gearbox mounting pad mating surfaces.Make sure the surfaces are clean and smooth.

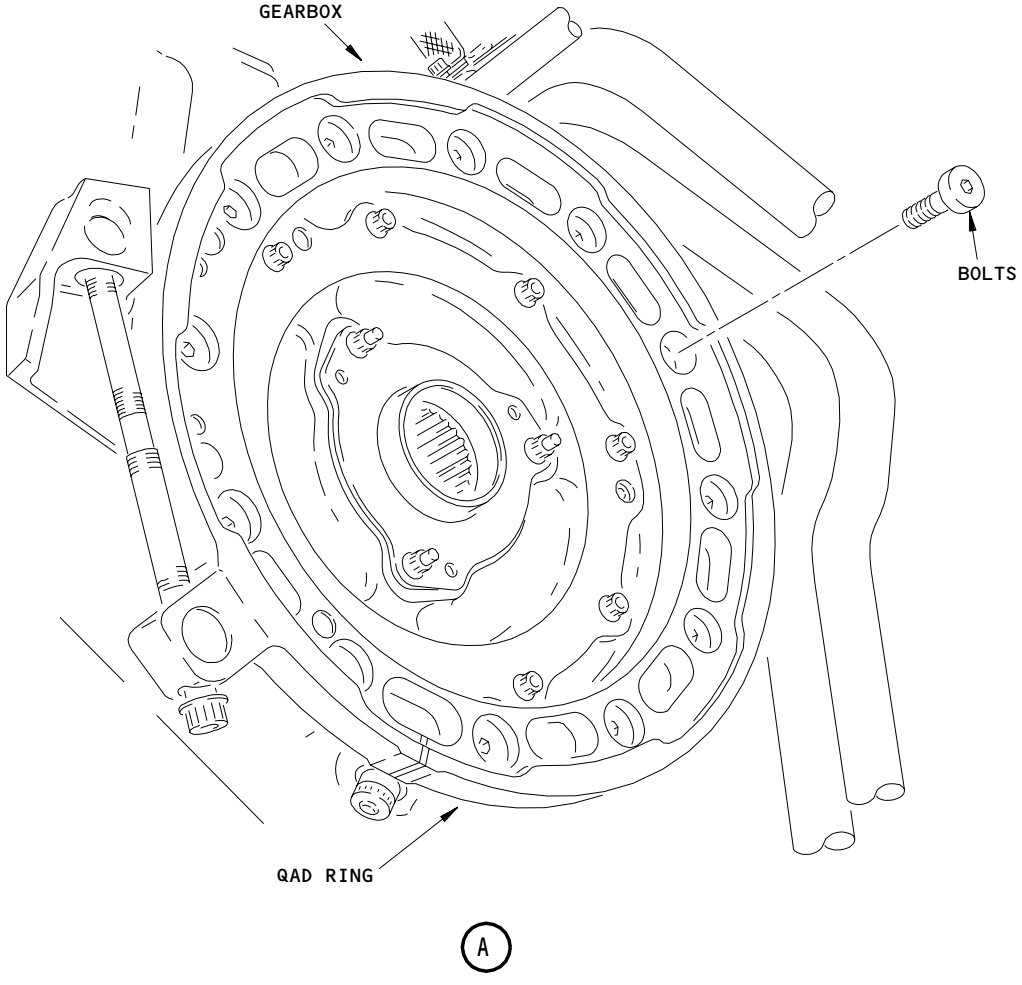
      S 644-009

      CAUTION: DO NOT PUT GREASE IN THE DOWEL PIN HOLES OR THE BOLT HOLES. DAMAGE MAY OCCUR TO THE GEARBOX DUE TO PRESSURE INCREASE WHEN THE BOLTS ARE INSTALLED.

      (2) Apply a thin layer of oil (AMM 20-30-04/201) to these parts:
         (a) Around the gearbox holes where the mounting bolts enter.
         (b) The gasket side of the QAD coupling, between the mounting holes and the inner edge.
         (c) The QAD coupling tension bolt threads.



(EXAMPLE OF QAD RING LOCATION)



Quick-Attach/Detach Coupling Installation
Figure 401

S 644-011
(3) Apply a thin coat of anti-seize to the threads and under the head of the mounting bolts.

D. Procedure

S 424-005
(1) Install the QAD coupling as follows:
(a) Install the gasket on the side of the QAD coupling that mates the gearbox mounting pad.

NOTE: A thin film of oil on the gasket will hold it in place. Be sure the hole patterns in the gasket and the QAD coupling are aligned.

(b) Put the QAD coupling on the gearbox. The word TOP should be at the top of the QAD coupling when looking toward the gearbox.
(c) Attach the QAD coupling to the gearbox with 12 mounting bolts. Tighten the bolts to 276-300 Pound Inches.
(d) Use a clean dry cloth to clean the excess anti-seize on the QAD.

S 424-006
(2) Check the QAD coupling (AMM 24-11-03/601).

S 424-007
(3) Install the IDG (AMM 24-11-01/201).

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

1. General
   A. This procedure has two tasks:
      (1) The first task makes an inspection of the quick attach/detach (QAD) coupling.
      (2) The second task does a torque check of the QAD coupling tension bolt.

TASK 24-11-03-206-001

2. QAD Coupling Inspection (Fig. 601)
   A. Equipment
      (1) 900-24999 - Fixture, Simulated IDG Input Flange Inspection Plate, Hamilton Sundstrand, 4747 Harrison Avenue, P.O Box 7002, Rockford, IL 61125
   B. Procedure

      S 216-003

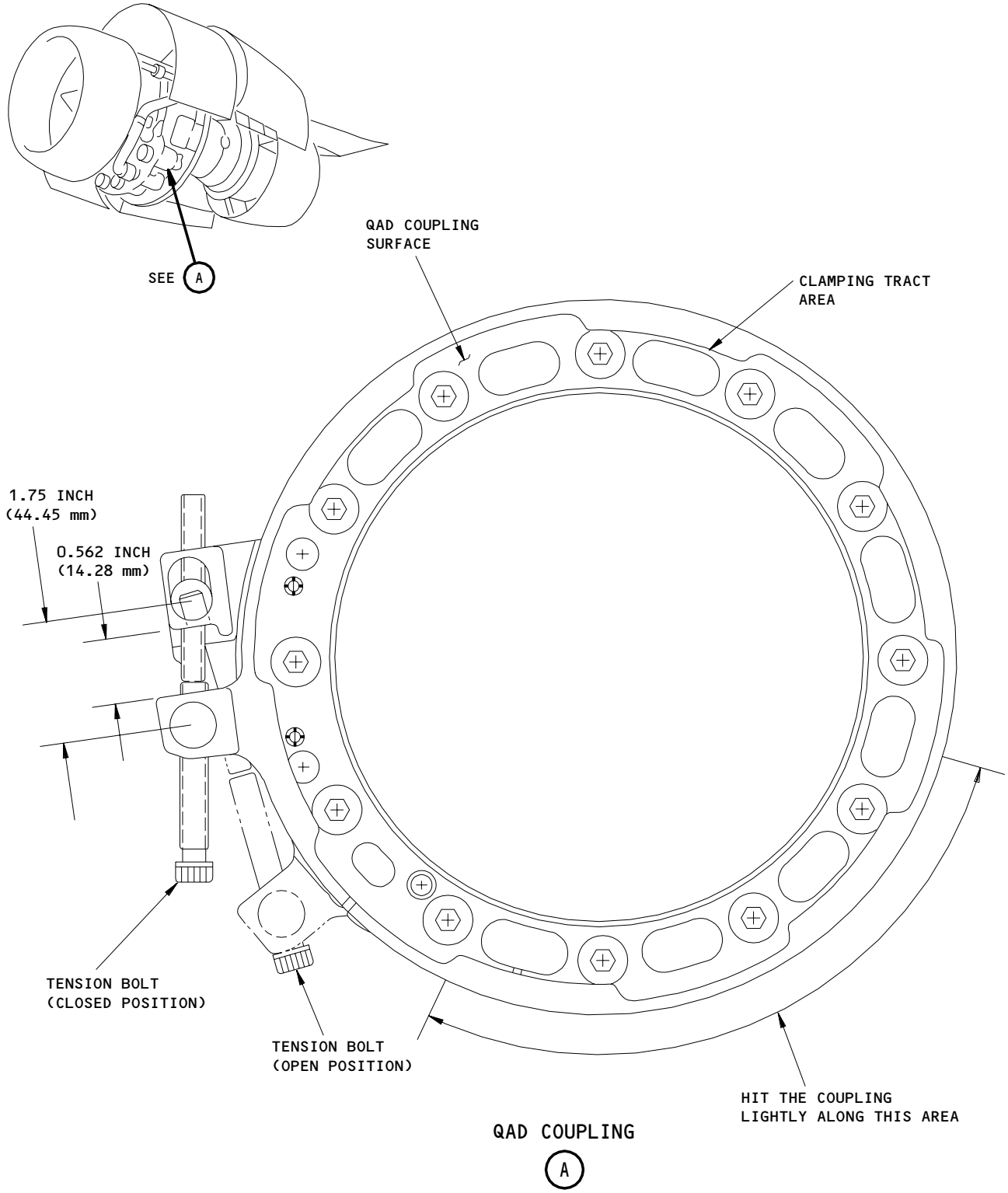
      (1) Inspect the QAD coupling as follows:
         (a) Visually examine the QAD coupling mating surface for damage.
         (b) Visually examine the QAD coupling tension bolt nuts, and the tension bolt for damage.
         (c) Visually examine the inner surfaces of the QAD coupling clamp. Replace the QAD coupling if the wear is uneven.
         (d) Install the simulated IDG input flange inspection plate or the IDG in the QAD coupling.
         (e) Tighten the QAD tension bolt to 240-264 pound-inches (27.1-29.8 N.m).
         (f) Measure the distance between the ring lug and the bracket on the QAD ring. If the distance is less than 0.562 inch (14.28 mm), replace the QAD coupling (AMM 24-11-03/401).

            NOTE: You can measure the distance between the centers of the nuts in the QAD coupling tension bolt assembly. If the distance is less than 1.750 inches (44.45 mm), replace the QAD coupling.

         (g) Remove the simulated IDG input flange inspection plate if it is installed.

TASK 24-11-03-206-002

3. Check the QAD Coupling Torque (Fig. 601)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels



Quick-Attach/Detach Coupling
Figure 601

B. Access
(1) Location Zones
410/420 Power Plant Nacelles
(2) Access Panels
413/423 Fan Cowls (Left)
414/424 Fan Cowls (Right)

C. Prepare to check the QAD coupling torque.

S 016-004
(1) Open the fan cowl panels (AMM 71-11-04/201).

D. Procedure

S 216-005
(1) Do a check of the torque value as follows:
(a) Remove the lockwire 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.

(b) 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 position.

(c) Measure the torque on the tension bolt.
1) If the torque is more than 180 pound-inches (20.3 N.m), do these steps:
a) Tighten the tension bolt to a torque of 240-264 pound-inches (27.1-29.8 N.m).
b) Secure the tension bolt with lockwire.
2) If the torque is less than 180 pound-inches (20.3 N.m), do these steps:
a) Tighten the tension bolt to a torque of 240-264 pound-inches (27.1-29.8 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 (20.3 N.m) again, tighten the bolt to the torque of 240-264 pound-inches (27.1-29.8 N.m) and tap the ring. Do this step again until the torque does not drop below 180 pound-inches (20.3 N.m) after you tap the QAD ring.
d) Tighten the tension bolt to a torque of 240-264 pound-inches (27.1-29.8 N.m).
e) Secure the tension bolt with lockwire.

S 216-012
(2) Do a check of the torque value as follows:
(a) Measure the distance between the ring lug and the bracket on the QAD ring. If the distance is less than 0.562 inch (14.28 mm), replace the QAD ring (AMM 24-11-03/401).

NOTE: You can measure the distance between the centers of the nuts in QAD coupling tension bolt assembly. If the distance is less than 1.750 inches (44.45 mm), replace the QAD coupling.

S 416-006
(3) Close the fan cowl panels (AMM 71-11-04/201).

IDG AIR/OIL HEAT EXCHANGER - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the air/oil heat exchanger, for the integrated drive generator (IDG), from the airplane. The second task installs the heat exchanger on the airplane.
   B. This procedure refers to the IDG air/oil heat exchanger as the heat exchanger.

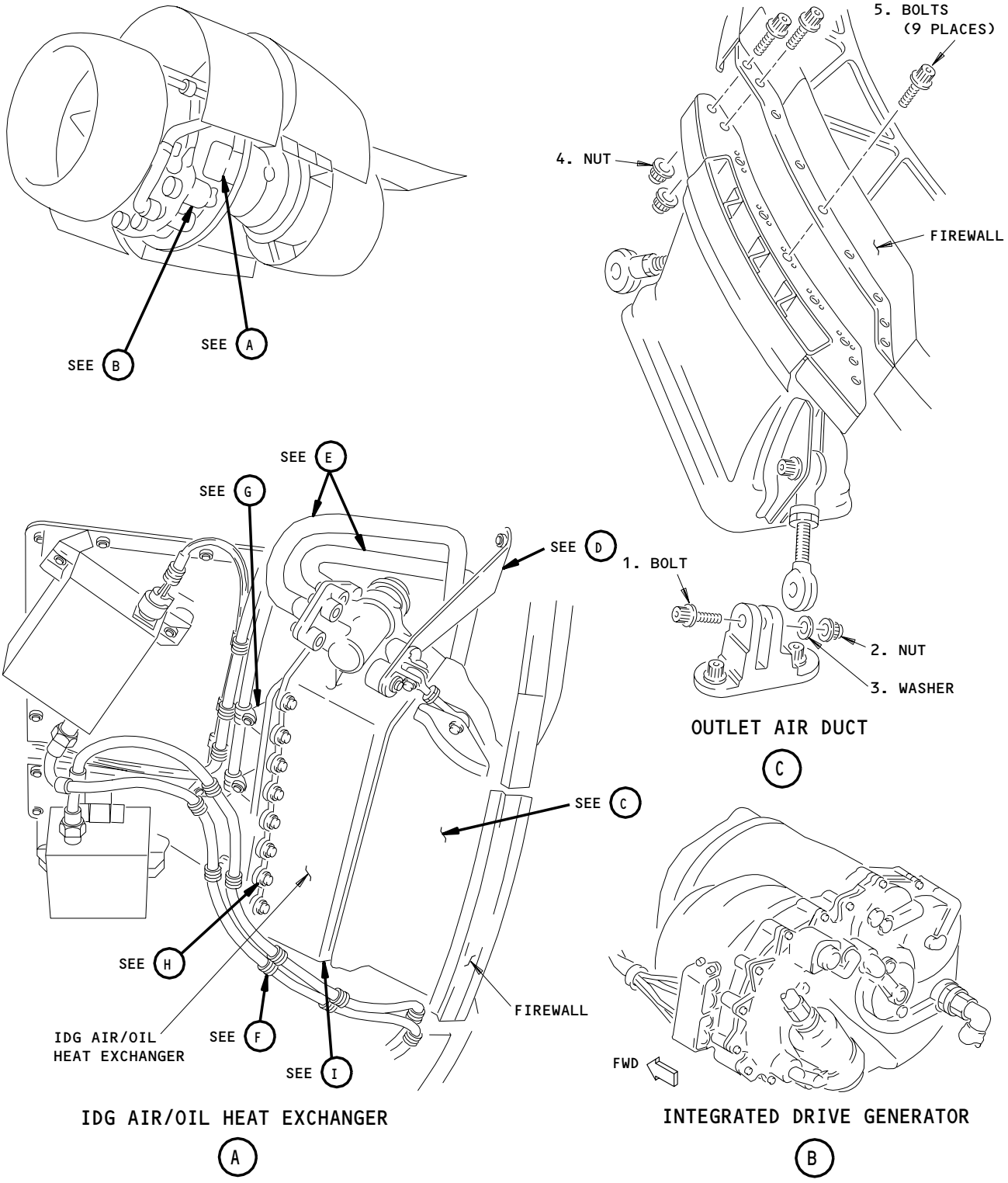
TASK 24-11-04-004-001

2. Remove the IDG Air/Oil Heat Exchanger (Fig. 401)
   A. Equipment
      (1) Overflow drain hose with an adapter
          Ozone OMP2505-3
      (2) Container - 3 gallon capacity
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
      (2) AMM 71-00-00/501, Power Plant
      (3) 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)
   D. Prepare for the Removal

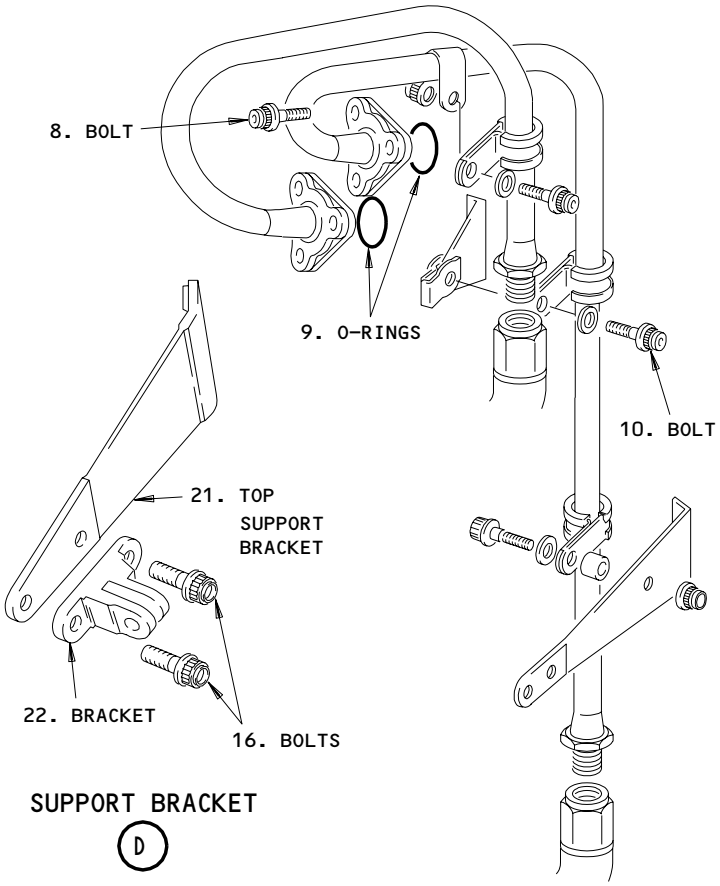
      S 044-005

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

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

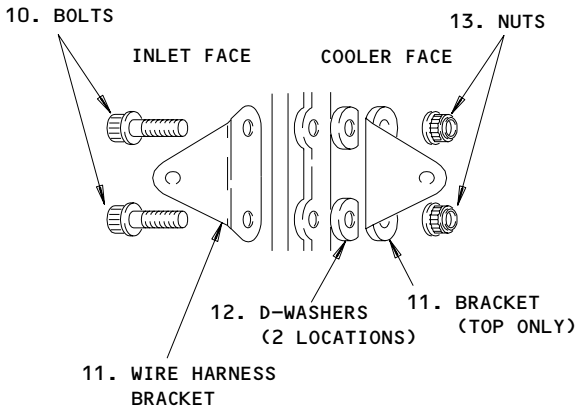


IDG Air/Oil Heat Exchanger Installation
Figure 401 (Sheet 1)



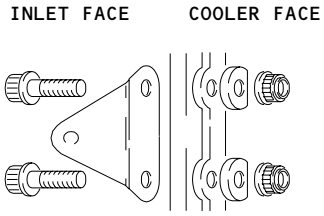
SUPPORT BRACKET

D



DOUBLE BRACKET POSITION

F

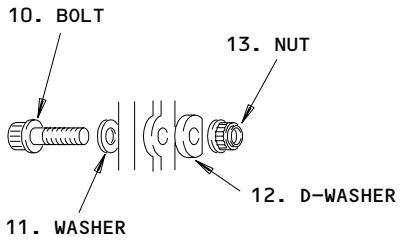


SINGLE BRACKET POSITION

G

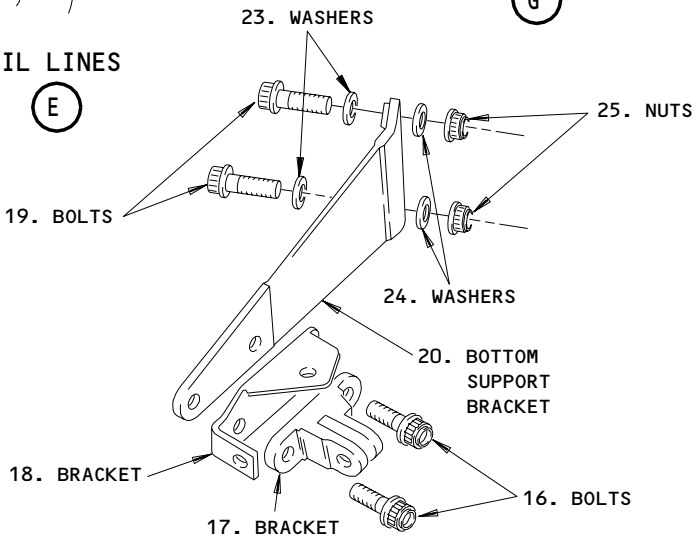
OIL LINES

E



NON BRACKET POSITION

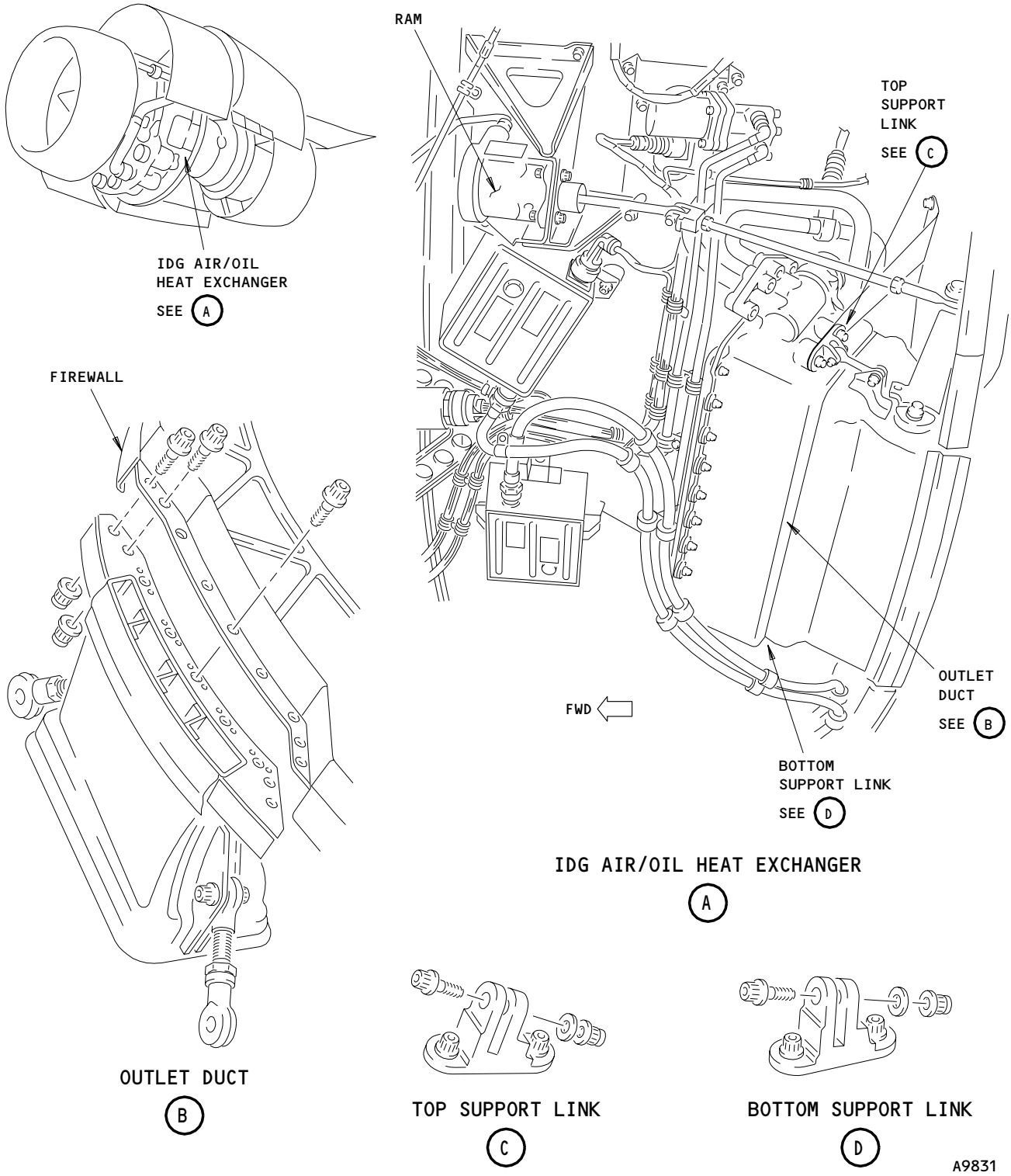
H



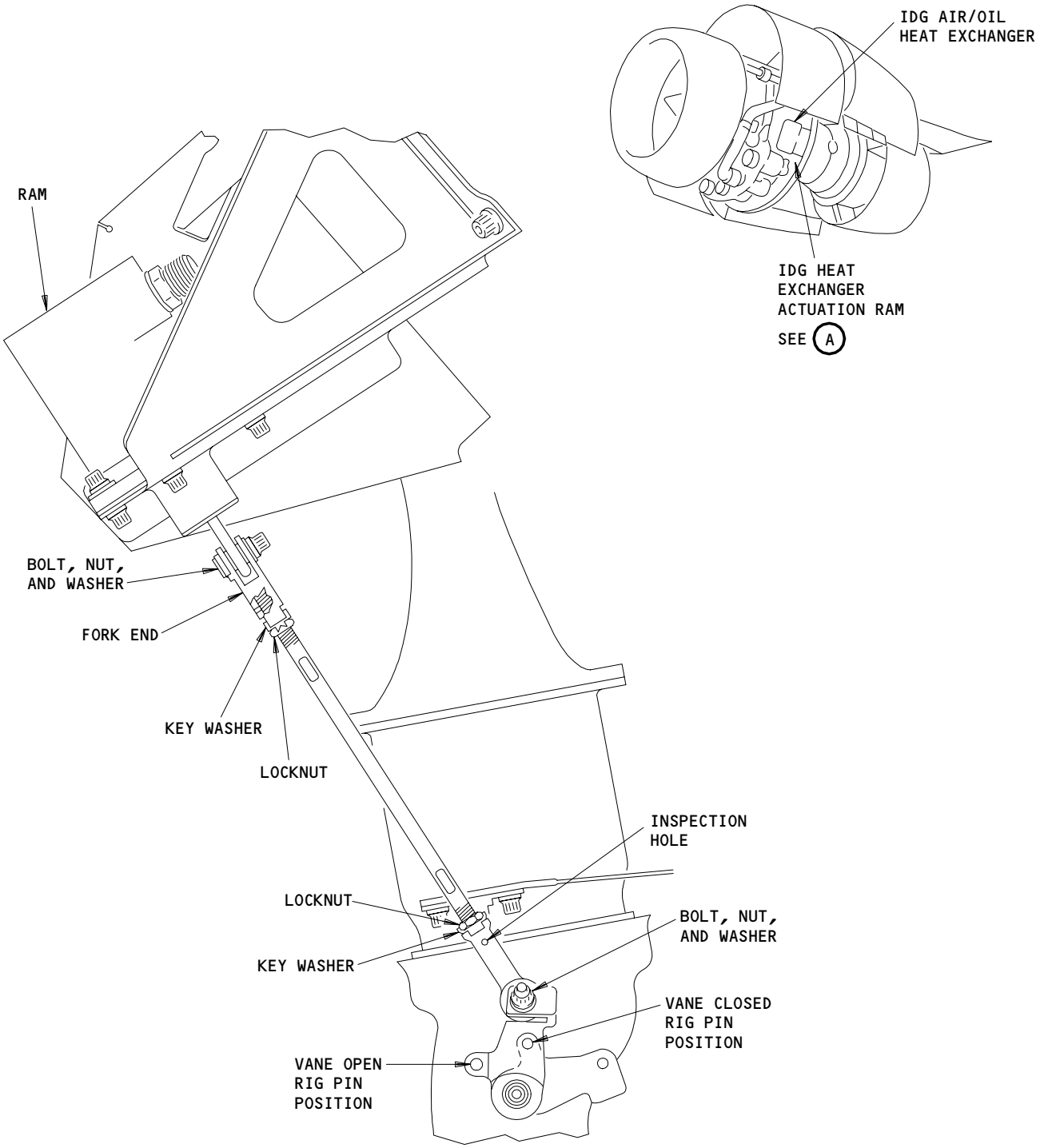
SUPPORT BRACKET

I

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



IDG Air/Oil Heat Exchanger Outlet Duct Support Points
Figure 402



IDG HEAT EXCHANGER ACTUATION RAM

(A)

A9832

IDG Air/Oil Heat Exchanger Actuator Ram Adjustments
Figure 403

S 014-006

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 014-004

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

S 864-008

(4) Remove the pressure, from the oil cooling system of the IDG:
  (a) Remove the cover, from the overflow drain coupling of the IDG.
  (b) Put the container below the IDG to catch the oil.
  (c) Put the end of the overflow drain hose into the container.

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

  (d) Connect the overflow drain hose, to the overflow drain coupling on the IDG.
    1) Let the oil flow into the container.
  (e) Remove the overflow drain hose.
  (f) Install the cover, on the overflow drain coupling of the IDG.

S 684-007

(5) Drain the oil from the IDG:

  WARNING: BE CAREFUL WHEN YOU DRAIN THE IDG OIL. WEAR THE PROTECTION GEAR. HOT OIL CAN CAUSE INJURY.

  (a) Remove the case drain plug and the O-ring from the IDG.
    1) Let the oil flow from the IDG into the container.
    2) Discard the used O-ring.

(b) Lubricate a new O-ring with Acyloid.
(c) Install the new O-ring on the case drain plug.
(d) Install the case drain plug.
(e) Tighten the case drain plug to 55-75 pound-inches.
(f) Lock the case drain plug with a wire.

S 014-009
(6) Remove the outlet air duct:
(a) Remove the bolt (1), the nut (2), and the washer (3) which attach the top duct support to the heat exchanger.
1) Keep the bolt (1), the nut (2), and the washer (3) for the installation.
(b) Remove the bolt (1), the nut (2), and the washer (3) which attach the bottom duct support to the heat exchanger.
1) Keep the bolt (1), the nut (2), and the washer (3) for the installation.
(c) AIRPLANES WITH RB211 ENGINES (POST-RR-SB 24-9280);
Remove the bolt, nut, and the washer that attach the link assembly to the vane crank.
(d) Remove the 9 bolts (5), and the 4 nuts (4) which hold the outlet air duct to the firewall.
1) Keep the bolts (5) and the nuts (4) for the installation.
(e) Remove the outlet air duct from the engine.

E. Procedure

S 024-010
(1) Remove the heat exchanger:
(a) Remove the bolt (10), which holds the clip, that attaches the oil tubes to the tube support .
1) Keep the bolt (10) for the installation.

WARNING: BE CAREFUL WHEN YOU DISCONNECT THE OIL TUBES. WEAR THE PROTECTION GEAR. HOT OIL CAN CAUSE INJURY.

(b) Disconnect the oil-out line from the IDG.
1) Let the oil from the oil-out line flow into the container.

WARNING: BE CAREFUL WHEN YOU DISCONNECT THE OIL TUBES. WEAR THE PROTECTION GEAR. HOT OIL CAN CAUSE INJURY.

(c) Disconnect the oil-in line from the IDG.
1) Let the oil from the oil-in line flow into the container.
(d) Put the container below the heat exchanger to catch the oil from the disconnected tubes.

(e) Disconnect the bolts (8) which attach the oil-in line to the heat exchanger.
  1) Remove the oil-in line.
  2) Discard the used O-ring (9).
  3) Keep the bolts (8) and the oil-in line for the installation.
(f) Put a plug in the two ends of the oil-in line.
(g) Put a plug in the oil-in opening of the IDG.
(h) Disconnect the bolts (8) which attach the oil-out line to the heat exchanger.
  1) Remove the oil-out line.
  2) Discard the used O-ring (9).
  3) Keep the bolts (8) and the oil-out line for the installation.
(i) Put a plug in the two ends of the oil-out line.
(j) Put a plug in the oil-out opening of the IDG.
(k) Remove the wire harness brackets (11) at the bottom of the heat exchanger:
  1) Remove the two bolts (10), the washers (12) and the nuts (13).
  2) Keep the bolts (10), the washers (12), the nuts (13), and the brackets (11) for the installation.
(l) Remove the wire harness bracket (11) at the top of the heat exchanger:
  1) Remove the two bolts (10), the washers (12) and the nuts (13).
  2) Keep the bolts (10), the washer (12), the nut (13) and the bracket (11) for the installation.
(m) Remove the inlet air duct of the heat exchanger:
  1) Remove the bolts (10), the nuts (13), and the washers (14,12).
  2) Keep the bolts (10), the nuts (13), the washers (14,12) for the installation.
(n) Disconnect the bottom support bracket (20) of the heat exchanger at the fan case:
  1) Remove the 2 bolts (19), the 4 washers (23, 24) and the 2 nuts (25).
  2) Keep the 2 bolts (19), the 4 washers (23, 24) and the 2 nuts (25) for the installation.
  3) Keep the bracket (20) attached to the heat exchanger.

WARNING: PUT ON THE PROTECTION GEAR WHEN YOU REMOVE THE HEAT EXCHANGER HOT OIL CAN FLOW FROM THE HEAT EXCHANGER, AND CAUSE INJURY TO PERSONS.

(o) Hold the heat exchanger, and remove the top support bracket of the heat exchanger, at the fan case:
  1) Remove the 2 bolts (19), the 4 washers (23, 24), and the 2 nuts (25).

2) Keep the 2 bolts (19), the 4 washers (23, 24), and the 2 nuts (25) for the installation.
3) Keep the bracket (21) attached to the heat exchanger.

(p) Remove the heat exchanger from the engine.
1) Let the oil from the heat exchanger flow into the container.

(q) Remove the 2 bolts (16) which attach the bottom support bracket to the heat exchanger.
1) Keep the bolts (16), and the 3 brackets (17)(18)(20) for the installation.

(r) AIRPLANES WITH RB211 ENGINES (POST-RR SB 24-6439);
Keep the two spacers (15) for the installation.

(s) Remove the 2 bolts (16) which attach the top support bracket to the heat exchanger.
1) Keep the bolts (16), and the 2 brackets (19)(22) for the installation.
2) AIRPLANES WITH RB211 ENGINES (POST-RR-SB 24-6439);
Keep the two spacers (15) for installation.

TASK 24-11-04-404-002

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

A. Equipment
(1) Brush - clean with rigid bristles

B. Consumable Materials
(1) Jointing Compound
British Spec - DTD 900/4586
OMat No. - 4/46
(2) Jointing Compound
American Spec - Hylomar PL32
(3) Degreasing Fluid (Inhibited and stabilized 1.1.1 Trichloroethane)
British Spec - BS 4487 1969
American Spec - M.I.T. 81533
OMat No. - 1/21
(4) Lockwire
British Spec - DTD 189A 22 S.W.G.
American Spec - 21 A.W.G.
OMat No. 238
(5) Lubricating Oil - MIL-L-7808, or MIL-L-23699

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

MM		NOMENCLATURE	IPC		
FIG	ITEM		SUBJECT	FIG	ITEM
401	9	Seal	24-11-05	01	50

D. References
(1) AMM 12-13-03/301, Integrated Drive Generator Servicing
(2) AMM 70-51-00/201, Torque Tightening Technique
(3) AMM 71-11-04/201, Fan Cowl Panels
(4) AMM 71-00-00/501, Power Plant
(5) 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, 426 Thrust Reverser Panels (Right)

F. Procedure

S 424-011
(1) Install the heat exchanger.
(a) Install the top support bracket (21), and the bracket (22) to the heat exchanger. Safety (Ref 70-51-00) with the two bolts (16).
(b) Install the bottom support bracket (20), and the 2 brackets (17) (18). Safety (AMM 70-51-00) with the two bolts (16).

WARNING: WHEN YOU USE THE DEGREASING FLUID, DO NOT BREATHE THE GAS OR PERMIT THE FLUID TO TOUCH YOUR SKIN. FLUID CAN CAUSE IRRITATION TO THE SKIN, AND BE DANGEROUS TO YOUR HEALTH IF YOU BREATHE THE GAS.

(c) Remove the used jointing compound from the surfaces where the inlet air duct connects with the heat exchanger.
   1) Use the degreasing fluid.
(d) Apply a thin layer of jointing compound, with a rigid bristled brush.
   1) Apply to the surfaces where the inlet air duct connects with the heat exchanger.
   2) Permit the compound to dry for a minimum of 10 minutes.
(e) Put the heat exchanger on the inlet air duct on the engine.
(f) Install the inlet air duct, at the heat exchanger.
   1) Install the bolts (10) the washers (12,14) and the nuts (13).
(g) Install the wire harness bracket (11) at the top of the heat exchanger.
   1) Install the two bolts (10) the washers (12) and the nuts(18).
(h) Install the wiring harness bracket (11) at the bottom of heat exchanger.
   1) Install the two bolts (10), the washers (12), and the nuts (13).
(i) Install the bottom support bracket (20) for the heat exchanger, to the fan case.
   1) Install the 2 bolts (19), the 4 washers (23, 24) and the 2 nuts (25).
(j) Install the top support bracket (21) for the heat exchanger, to the fan case.
   1) Use the 2 bolts (19), the 4 washers (23, 24) and the 2 nuts (25).
(k) Remove the plug from the oil-out opening of the IDG.

(l) Remove the plugs from the two ends of the oil-out line of the IDG.
(m) Lubricate a new O-ring (9) with Acryloid.
(n) Install the new O-ring (9), on the heat exchanger end of the oil-out line of the IDG.
(o) Connect the oil-out line from the IDG, to the oil-in opening of the heat exchanger, with the bolts (8).

CAUTION: USE TWO WRENCHES TO HOLD FITTINGS WHEN YOU TORQUE THE OIL-OUT LINE. ONE WRENCH CAN APPLY TOO MUCH TORQUE, AND DAMAGE THE IDG FITTINGS.

(p) Connect the oil-out line, to the oil-out opening of the IDG.
(q) Remove the plug from the oil-in opening of the IDG.
(r) Remove the plugs from the two ends of the oil-in line of the IDG.
(s) Lubricate a new O-ring (9) with Acryloid.
(t) Install the new O-ring (9) on the heat exchanger end of the oil-in line of the IDG.
(u) Connect the oil-in line for the IDG, to the heat exchanger oil-out opening, with the bolts (8).

CAUTION: USE TWO WRENCHES TO HOLD FITTINGS WHEN YOU TORQUE THE OIL-IN LINE. ONE WRENCH CAN APPLY EXCESS TORQUE AND DAMAGE THE IDG FITTINGS.

(v) Connect the oil-in line to the oil-in opening of the IDG.
(w) Install the bolt (10) which holds the clip, that attaches the oil tubes to the tube support.
(x) Put the outlet air duct on the engine.
(y) Install the 9 bolts (5) and 4 nuts (4) to attach the outlet air duct to the firewall.
(z) Install the duct link support at the top of the heat exchanger.
    1) Use the bolt (1), the nut (2), and the washer (3).
(aa) Install the duct link support at the bottom of the heat exchanger.
    1) Use the bolt (1), the nut (2), and the washer (3).

S 984-021

(2) AIRPLANES WITH RB211 ENGINES (POST-RR-SB 24-9280);
Set the outlet duct linkage.
(a) With the link disconnected from the vane crank lever, set the vane crank lever to the closed position.Install the rig pin.
(b) Disconnect the HP3 air tube from the ram.
(c) Apply air from an external source of 15 psi to the ram to compress the spring.
(d) Connect the link to the vane crank lever.
(e) Remove the rig pin.
(f) Disconnect the external air supply from the ram.
(g) Disconnect one end of the link assembly by removing the bolt, the nut and the washer.
(h) Increase the length of the link assembly. To do this, loosen the end of the link assembly that has been disconnected by 1.5 turns.
(i) Connect the end of the link assembly that was removed. Use the bolt, the nut and the washer to do this.
(j) Adjust the link assembly if necessary.
1) To adjust the link, disconnect the link and turn the link to increase or decrease its length.
(k) Make sure the threads are engaged at the inspection holes in the fork end.
(l) Tighten the locknuts (AMM 70-51-00).
(m) Apply air from an external source of 15 psi to the ram.
(n) Make sure the link assembly moves freely.
(o) Disconnect the external air supply and connect the HP3 air tube to the ram.
(p) Engage the keywasher to lock the nuts.

S 614-012

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

S 414-017

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 444-018
(5) Do the activation procedure for the thrust reverser (AMM 78-31-00/201).

S 414-013
(6) Close the fan cowl panels (AMM 71-11-04/201).

S 714-014
(7) Do a test on the engine. Refer to the Power Plant Test Reference Table (AMM 71-00-00/201).

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

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

TASK 24-11-05-004-020

2. Remove the IDG Air/Oil Heat Exchanger Solenoid Valve (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   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)

   C. Procedure

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

      S 034-021
      (2) Disconnect the electrical connector from the IDG air/oil heat exchanger solenoid valve.

      S 034-005
      (3) Disconnect the two pneumatic tubes from the IDG air/oil heat exchanger solenoid valve.

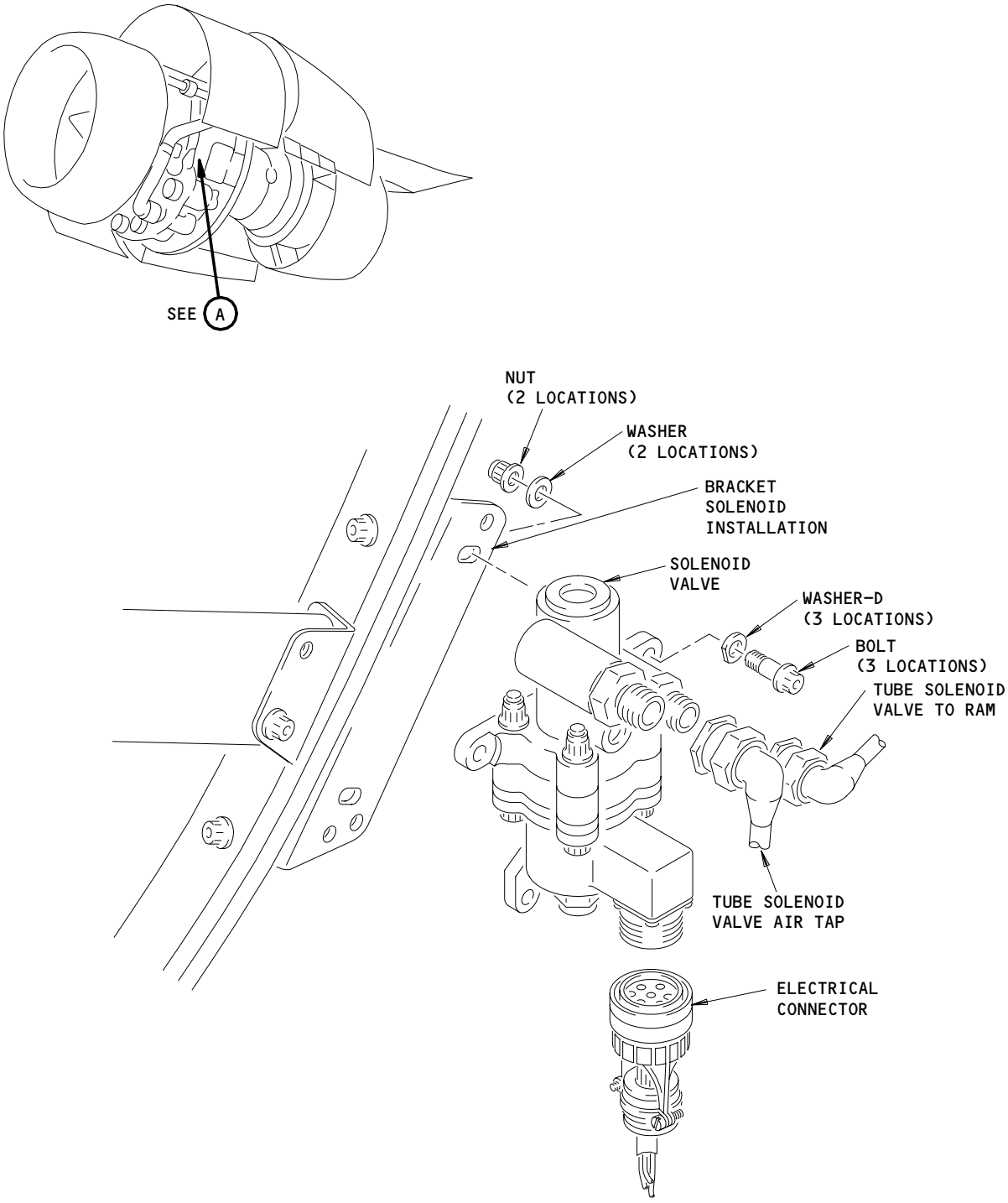
      S 034-006
      (4) Remove the three bolts that attach the IDG air/oil heat exchanger solenoid valve to the engine.

      S 024-007
      (5) Remove the IDG air/oil heat exchanger solenoid valve.

      S 034-008
      (6) Install the covers for protection of the openings and the connectors.

TASK 24-11-05-404-009

3. Install the IDG Air/Oil Heat Exchanger Solenoid Valve (Fig. 401)
   A. References
      (1) AMM 71-11-04/201, Fan Cowl Panels



IDG Air/Oil Heat Exchanger Solenoid Valve Installation
Figure 401

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)

C. Procedure

S 434-010

(1) Remove the covers from all the openings and connections related to the IDG air/oil heat exchanger solenoid valve.

S 424-011

(2) Install the IDG air/oil heat exchanger solenoid valve to the engine-mounting bracket.

S 434-012

(3) Install the three bolts that attach the IDG air/oil heat exchanger solenoid valve to the mounting bracket.

S 434-013

(4) Tighten the three bolts.

S 434-014

(5) Connect the pneumatic tubes to the IDG air/oil heat exchanger solenoid valve.

S 434-015

(6) Tighten the tube connectors.

S 434-016

(7) Safety the pneumatic tubes with lockwire.

S 434-022

(8) Connect the electrical connector to the IDG air/oil heat exchanger solenoid valve.

S 414-019

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

IDG AIR/OIL HEAT EXCHANGER THERMAL SWITCH - REMOVAL/INSTALLATION

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

TASK 24-11-06-004-001

2. Remove the IDG Air/Oil Heat Exchanger Thermal Switch
   A. Equipment
      (1) Container - 1/2 U.S. gallon (2-liter) capacity, suitable to collect oil drainage from the thermal switch port
   B. References
      (1) AMM 71-11-04/201, Fan Cowl Panels
   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)
   D. Procedure

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

      S 864-004
      (2) Release the pressure from the IDG oil system as follows:
          (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.

          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.

          (d) Connect the overflow drain hose to the overflow drain coupling on the IDG. Allow the surplus oil to flow into the container.
          (e) Remove the overflow drain hose.
          (f) Install the cover on the overflow drain coupling.

S 034-005

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS NOT DIRTY BEFORE IT IS DISCONNECTED. CONTAMINATION OF THE ELECTRICAL CONNECTOR CAN CAUSE DAMAGE TO EQUIPMENT.

(3) Disconnect the electrical connector from the IDG air/oil heat exchanger thermal switch.

S 494-006

(4) Put a clean container near the switch housing to catch the oil.

S 024-007

WARNING: DO NOT LET SYNTHETIC OIL GET ON YOUR SKIN. THIS OIL CAN CAUSE SKIN IRRITATION.

BE CAREFUL WHEN YOU WORK NEAR THE OIL SYSTEM COMPONENTS AFTER ENGINE SHUTDOWN. THE OIL STAYS HOT FOR A LONG TIME AFTER THE ENGINE STOPS AND CAN CAUSE INJURY.

CAUTION: REMOVE FALLEN OIL IMMEDIATELY. IT CAN CAUSE DAMAGE TO CLOTHING, PAINT, AND RUBBER.

USE ONLY CLEAN CONTAINERS AND EQUIPMENT. CONTAMINATION (SUCH AS FROM SOME ALKALINE CLEANING FLUIDS) CAN CAUSE A FAILURE OF THE OIL.

DO NOT PUT THE DRAINED OIL BACK INTO THE SYSTEM. USED OIL CAN CONTAIN CONTAMINATION WHICH WILL DAMAGE THE SYSTEM COMPONENTS.

(5) Remove the IDG air/oil heat exchanger thermal switch from the housing.

S 434-008

(6) Remove and discard the seal.

S 034-009

(7) Install the covers for protection of the openings and the connectors.

TASK 24-11-06-404-010

3. Install the Air/Oil Heat Exchanger Thermal Switch

A. References

(1) AMM 12-13-03/301, IDG - Servicing

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

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)

C. Procedure

S 434-011

(1) Remove the covers from all the openings and connectors related to the IDG air/oil heat exchanger thermal switch.

S 434-012

(2) Install a new seal, lubricated with engine oil, to the air/oil heat exchanger thermal switch.

S 424-013

(3) Install the IDG air/oil heat exchanger thermal switch to the housing.

S 434-014

(4) Tighten the IDG air/oil heat exchanger thermal switch to 320 pound-inches.

S 434-015

(5) Safety the IDG air/oil heat exchanger thermal switch with lockwire.

S 434-016

CAUTION: MAKE SURE THE ELECTRICAL CONNECTOR IS NOT DIRTY OR OILY BEFORE IT IS CONNECTED. A DIRTY OR OILY ELECTRICAL CONNECTOR CAN CAUSE DAMAGE TO SYSTEM COMPONENTS.

(6) Connect the electrical connector to the IDG air/oil heat exchanger thermal switch.

S 614-017
(7) Fill the IDG oil system (AMM 12-13-03/301).

S 414-019
(8) Close the fan cowl panels (AMM 71-11-04/201).

IDG TERMINAL BLOCK ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. This procedure contains two tasks:
      (1) The removal of the terminal block assembly from the integrated drive generator (IDG).
      (2) The installation of the terminal block assembly on the integrated drive generator (IDG).
   B. Use this procedure to replace the terminal block cover, screws, washers, nuts, and terminal block.

TASK 24-11-20-004-001

2. Removal of the IDG Terminal Block Assembly (Fig. 401)
   A. References
      (1) AMM 78-31-00/201, Thrust Reverser System
      (2) AMM 71-11-04/201, Fan Cowl Panels
   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)

   C. Prepare for Removal

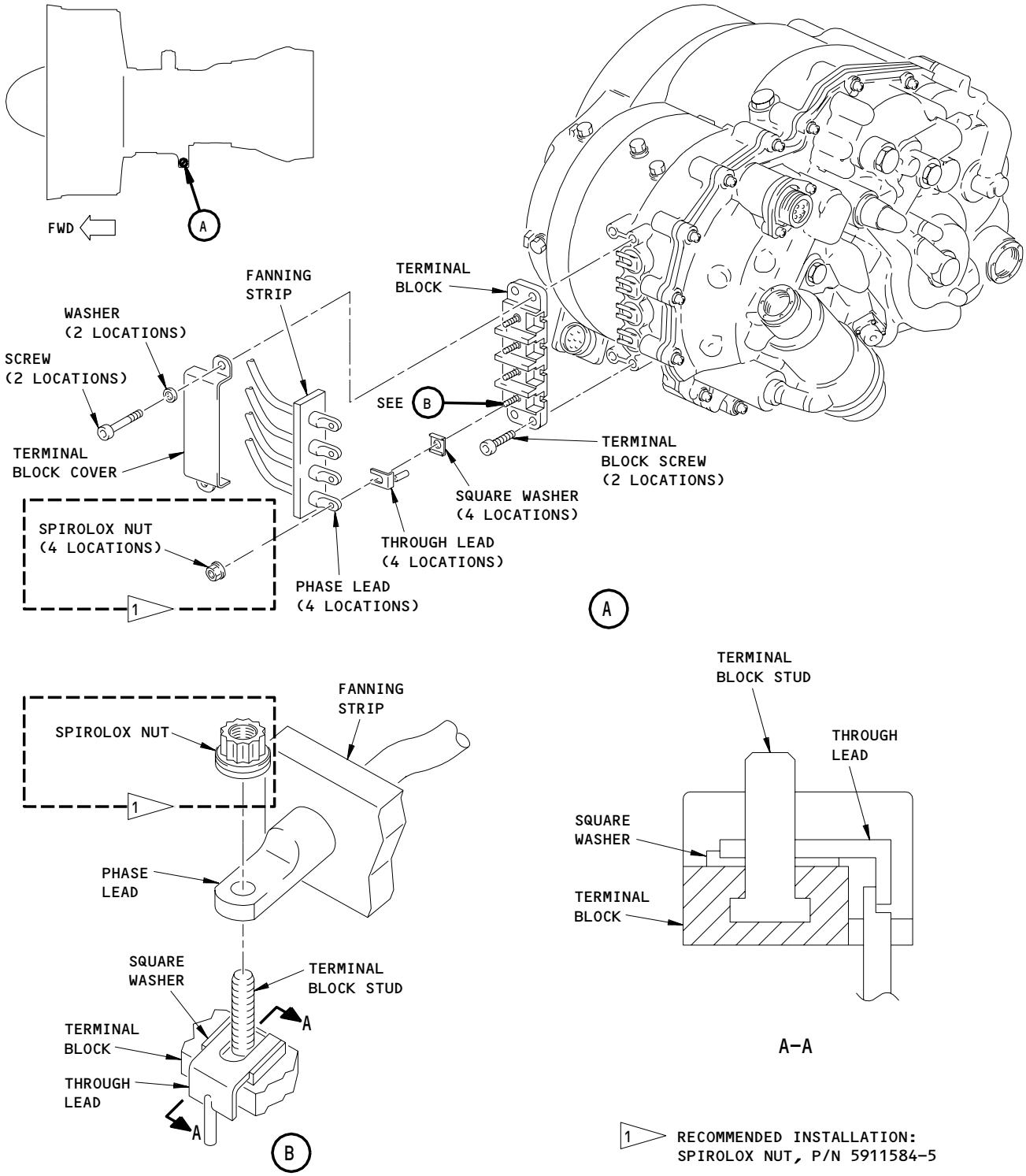
      S 864-002
      (1) Open these circuit breakers on the main power distribution panel, P6, and attach DO-NOT-CLOSE tags:
          (a) 6B5, L GEN DRIVE DISC
          (b) 6B6, R GEN DRIVE DISC

      S 014-003

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

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

      S 034-005
      (1) Remove the screws, washers, and terminal block cover.



IDG Terminal Block Assembly
Figure 401

S 034-006
(2) Remove the spirolox nuts, the self-locking nuts, or the terminal nuts and washers which are installed on the terminal studs.

S 034-008
(3) Remove the phase leads.

S 034-009
(4) Remove the terminal block screws.

S 024-010
(5) Remove the terminal block.
(a) Move the terminal block to the input end of the IDG to remove it from the through-leads.

S 034-011
(6) Remove the square washers from the terminal block.

TASK 24-11-20-404-012

3. Installation of the Terminal Block Assembly (Fig. 401)

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

C. Procedure

S 434-013
(1) Install the square washers on the terminal block.

S 424-014
(2) Install the terminal block.

CAUTION: PUT THE SQUARE WASHERS BELOW THE THROUGH-LEAD STRAPS. IF YOU INSTALL THE WASHERS INCORRECTLY, THE IDG WILL BECOME TOO HOT.

(a) Put the square washers below the through-lead straps.

S 434-015

(3) Install the terminal block screws.
(a) Torque the screws to 20-22 pound inches.

S 434-016

(4) Install the phase leads to the terminal block.

S 434-017

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

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.

(a) Make sure the circular washers are between the terminal nuts and the phase leads.
(b) Torque the terminal nuts to 12-14 pound feet.

S 434-019

(6) Install the terminal block cover and connect with washers and screws.
(a) Torque the screws to 20-22 pound inches.

S 414-020

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

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

S 864-022

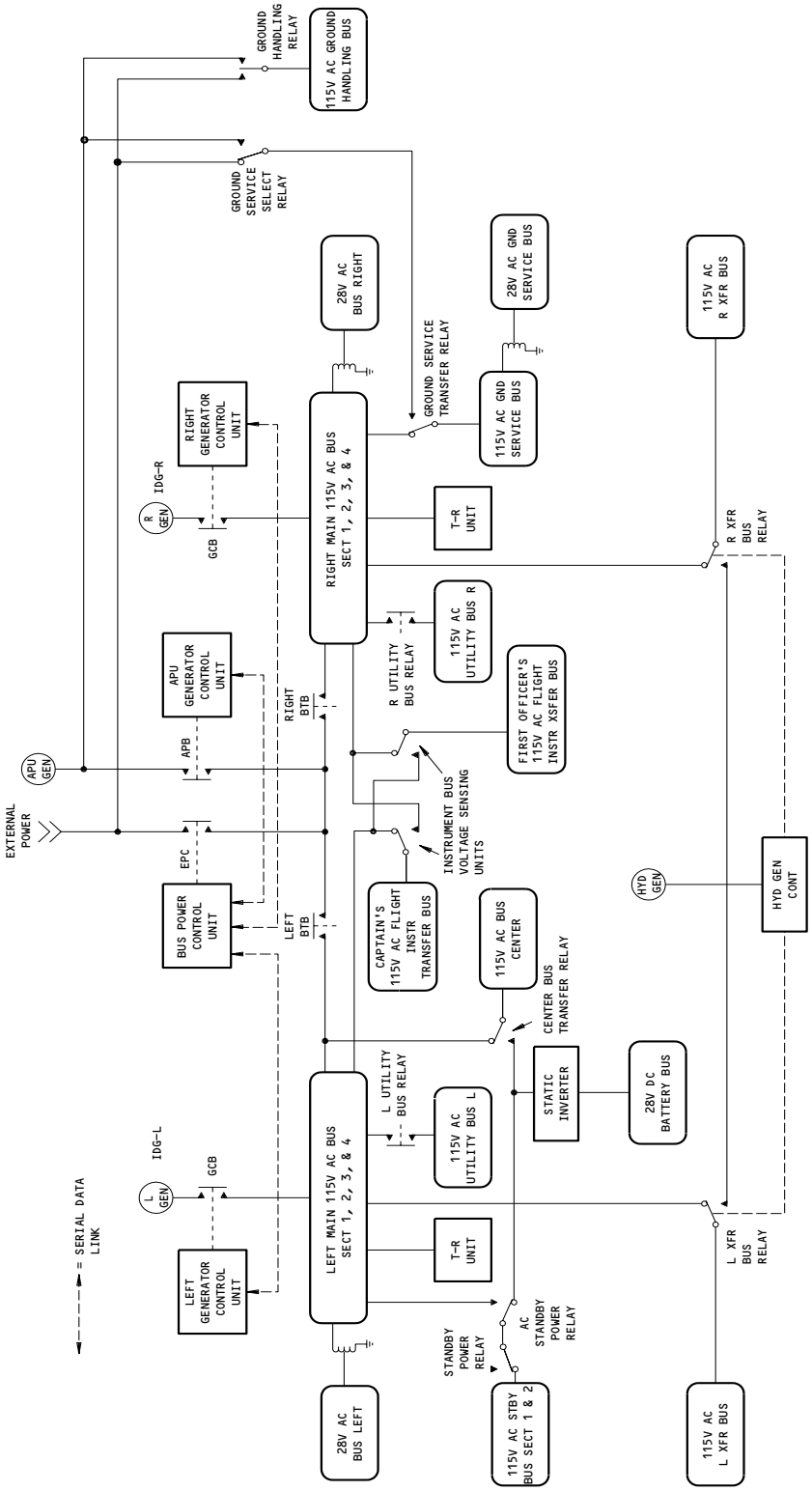
(8) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P6 panel:
(a) 6B5, L GEN DRIVE DISC
(b) 6B6, R GEN DRIVE DISC

S 724-023

(9) 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)
   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. 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 (Ref 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 (Ref 24-21-00).
   D. External power may be connected to supply ground service, ground handling, and/or main power. (Ref 24-41-00).
   E. The power system includes three generator control units (GCUs). One GCU controls 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 (Ref 24-22-00).
   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 (Ref 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 (Ref 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 (Ref 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 inflight.
   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

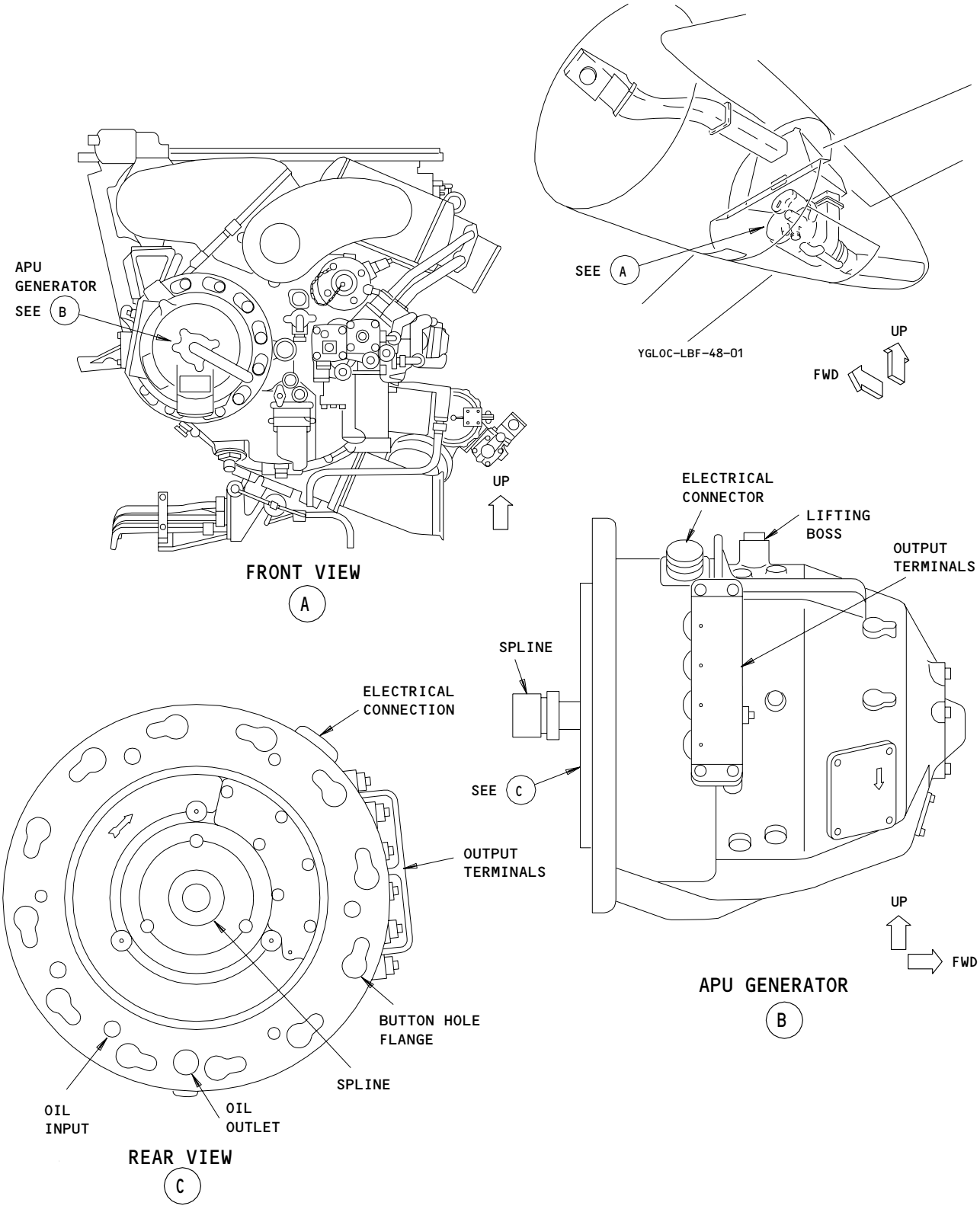
237490

J. AIRPLANES WITH 5KVA HYDRAULIC MOTOR GENERATOR;
A hydraulic motor 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 buses. The system is rated to supply 115/200 volt, 3-phase 5 kva ac power continuously.

K. AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
A hydraulic motor 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 buses. The system is rated to supply 115/200 volt, 3-phase 10 kva ac power continuously.

POWER AND REGULATION - DESCRIPTION AND OPERATION

1. General
   A. The auxiliary power unit (APU) generator supplies electrical power on the ground when: 1) External power is not available, and 2) the integrated drive generators are not operating.
   B. The APU generator can supply electrical power inflight after an integrated drive generator failure.
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. (Full output power is available at altitudes up to 40,000 ft.). 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 3 of equipment center rack E5.
      (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.

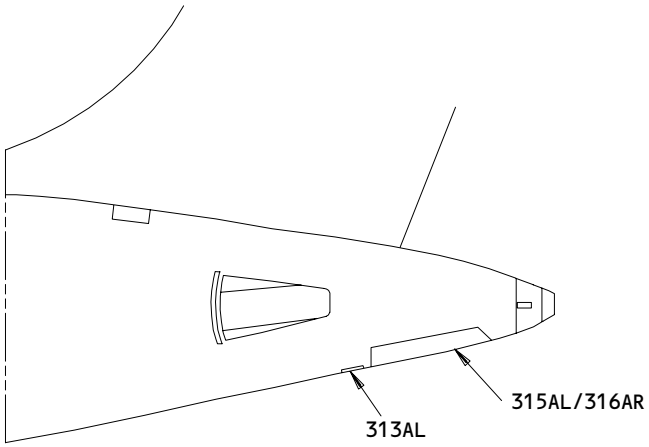


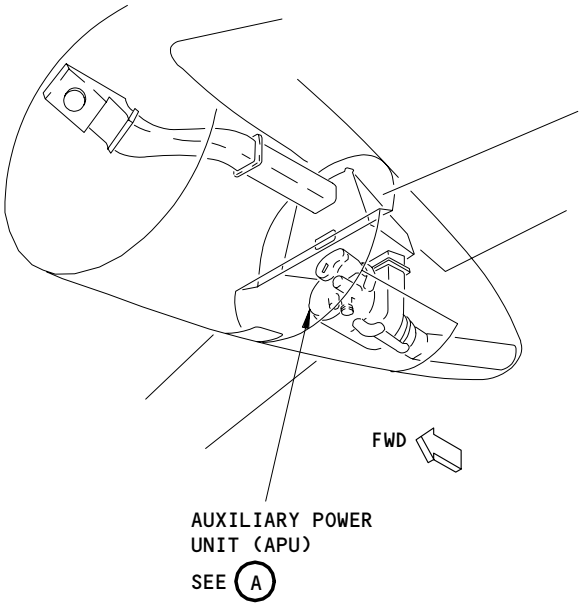
APU Generator Component Location
Figure 1

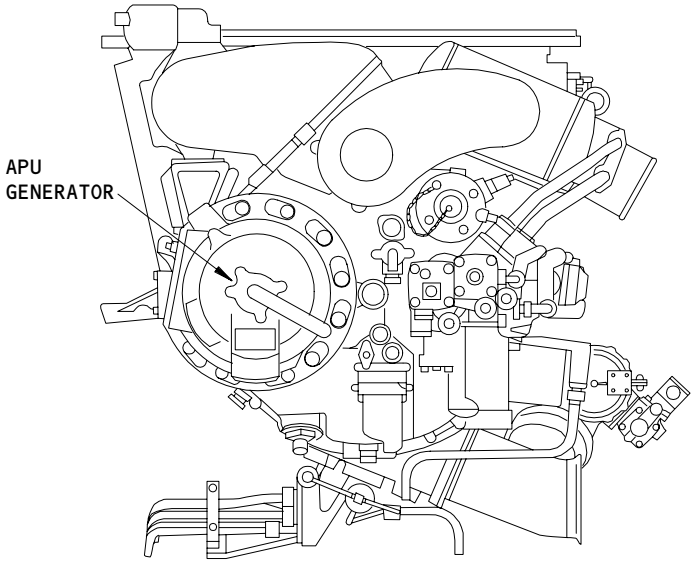
POWER AND REGULATION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
GENERATOR - APU	--	1	APU, 315AL, 316AR	24-21-01

Power and Regulation - Component Index
Figure 101







AUXILIARY POWER UNIT (APU)
(VIEW IN THE AFT DIRECTION)

(A)

Power and Regulation - Component Location
Figure 102

POWER AND REGULATION - ADJUSTMENT/TEST

1. General
   A. This procedure has two tasks. The first task does an operational test of the APU generator system. The second task does a system test of the APU generator system.

TASK 24-21-00-715-001

2. Operational Test - APU Generator
   A. General
      (1) The operational test does these tests:
          (a) The BITE (Built-in-Test Equipment) Test
          (b) The APU Generator Test
      (2) If the spoilers are extended, and electrical power is removed, the spoilers will retract in less than one second.
   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
122	Forward Cargo Compartment

      (2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door Access Panel

   D. Prepare for the Test

S 045-027

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 865-003

(2) Supply external power to the 115V ac buses (AMM 24-22-00/201).

S 015-020
(3) Open the forward cargo door, 821.

S 015-021
(4) Remove the forward cargo compartment bulkhead panel.

E. The BITE Test

S 745-004
(1) Do the BITE test:
(a) Make sure the BAT switch (P5) is in the ON position.
(b) Momentarily push the BIT switch on the BPCU (E5-3).
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 OO END OF DATA
j) FOR PREVIOUS FLT PUSH NOW

NOTE: The above sequence is shown when the power system has no fault. If there is a fault, the applicable fault message will be displayed in place of the OK message.

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

F. The APU Generator Test

S 715-005
(1) Do the APU generator test:
(a) Set the APU GEN switch (P5) to the OFF position.
(b) Make sure this light is on:
1) The yellow OFF light in the APU GEN (P5).
(c) Start the APU (AMM 49-11-00/201).
1) Make sure these lights are on:
a) The yellow OFF light in the APU GEN switch (P5).
b) The white ON light in the EXT PWR switch (P5).

2) Make sure the APU PWR HOT BUS WARN light on the P34 panel is off.
3) Set the switch for the EICAS computer (P9) to the AUTO position.
4) Push the switch for the ECS/MSG display (P61).
   a) Make sure the APU GEN OFF (level C-message) shows on the EICAS display.
5) Push the switch for the ELEC/HYD display (P61).
   a) Make sure these indications of the APU power channel show on the EICAS display:
   b) AC-V = 0
   c) FREQ = 0
6) Push the APU GEN switch (P5) to the ON position.
   a) Make sure the OFF light in the switch goes off.
   b) Make sure these lights are on:
   c) The white ON light in the EXT PWR switch (P5).
   d) The red APU PWR HOT BUS WARN light (P34).
   e) Make sure these lights are off:
   f) The two BUS OFF lights (P5).
   g) Make sure these indications on the APU power channel show on the EICAS display:
   h) AC-V = 115 ± 5
   i) FREQ = 400 ± 5
7) Push the switch for the ECS/MSG display (P61).
   a) Make sure APU GEN OFF does not show on the EICAS display.
8) Push the EXT PWR switch (P5).
   a) Make sure the ON light in the switch goes off.
   b) Make sure these lights are off:
   c) The OFF light in the APU GEN CONT switch (P5).
   d) The two BUS OFF lights (P5).
   e) Make sure these red lights are on:
   f) The APU PWR HOT BUS WARN (P34).
   g) The TIE BUS HOT BUS WARN (P34).
   h) The AC TIE BUS HOT BUS WARN (P31).
   i) The AC TIE BUS HOT BUS WARN (P32).
9) Push the APU GEN switch (P5) to the OFF position.
   a) Make sure these lights are on:
   b) The yellow OFF light in the APU GEN switch (P5).
   c) The two yellow BUS OFF lights (P5).

(d) Stop the APU (AMM 49-11-00/201).
1) Make sure the two yellow BUS OFF lights (P5) are on.
   a) Make sure these lights are off:
   b) The OFF light in the APU GEN switch (P5).
   c) The APU PWR HOT BUS WARN (P34).
   d) The TIE BUS HOT BUS WARN (P34).
   e) The AC TIE BUS HOT BUS WARN (P31).

f) The AC TIE BUS HOT BUS WARN (P32).

S 745-006

(2) Do the BITE test.

S 845-018

(3) Put the airplane to its usual condition.
(a) Install the forward cargo compartment bulkhead panel.
(b) Close the forward cargo door, 821.
(c) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).
(d) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-21-00-735-002

3. System Test - APU Generator

A. General

(1) The system test does these tests:
(a) The BITE (Built-in-Test Equipment) test.
(b) The Ground Handling and Ground Service Test.
(c) The Air Mode Test.
(d) The Load Test.

(2) If the spoilers are extended, and electrical power is removed, the spoilers will retract in less than one second.

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
122	Forward Cargo Compartment

(2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door Access Panel

D. Prepare for the Test

S 045-026

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 865-008

(2) Supply external power to the 115V ac buses (AMM 24-22-00/201).

S 015-022

(3) Open the forward cargo door, 821.

S 015-023

(4) Remove the forward cargo compartment bulkhead panel.

E. The BITE Test

S 745-009

(1) Do the BITE test:
   (a) Make sure the BAT switch (P5) is in the ON position.
   (b) Momentarily push the BIT switch on the BPCU (E5-3).
      1) Make sure the 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 OO 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.

F. The Ground Handling and Ground Service Test

S 725-010

(1) Do the ground handling and ground service test:
  (a) Supply APU generator power to the 115V ac buses (AMM 24-22-00/201).
  (b) Push the right BUS TIE switch (P5) to the ISLN position.
    1) Make sure these yellow lights on the P5 panel are on:
      a) The ISLN light in the right BUS TIE switch.
      b) The right BUS OFF light.
  (c) Set the NLG W/W INSP LT SWITCH, S324 (P63) to the ON position.
    1) Make sure the inspection lights for the nose wheel well are on.
  (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 inspection lights for the nose wheel well are on.
    3) Make sure the red 115V GND SVCE HOT BUS WARNING light on the P33 panel is on.
  (e) Push the GRND SERV BUS switch on the P21 panel.
    1) Make sure the white light in the switch goes off.
    2) Make sure the 115V GND SVCE HOT BUS WARNING light on P33 is off.
  (f) Push the GRND SERV BUS switch on the P21 panel.
    1) Make sure the white ON light in the switch is on.
  (g) Push the right BUS TIE switch (P5) to the AUTO position.
    1) Make sure the yellow ISLN light in the switch is off.
    2) Make sure the ON light in the GRND SERV BUS switch is off.
  (h) Push the GRND SERV BUS switch on the P21 panel.
    1) Make sure the ON light in the switch stays off.
    2) Make sure the inspection lights for the nose wheel well are on.

G. The Air Mode Test

S 725-011

(1) Do the air mode test:
  (a) Make sure the NLG W/W INSP LT SWITCH S324 on the P63 panel is in the ON position.
    1) Make sure the inspection lights for the nose wheel well are on.
  (b) Supply APU generator power to the 115V ac buses (AMM 24-22-00/201).
    1) Make sure the two BUS TIE switches (P5) are in the AUTO position.
    2) Make sure these lights on P5 are off:
      a) The ISLN lights in the two BUS TIE switches.
      b) The two BUS OFF lights.

c) Make sure the ON light in the GRND SERV BUS switch on the P21 panel is off.

(c) Push the GRND SERV BUS switch (P21).
1) Make sure the ON light in the switch stays off.

(d) Put the airplane in the air mode (AMM 32-09-02/201).
1) Make sure the inspection lights for the nose wheel well are off.

(e) Push the GRND SERV BUS switch on the P21 panel.
1) Make sure the ON light in the switch stays off.

(f) Open this circuit breaker on the P32 panel:
1) 32A8, R GEN GND SVCE BUS
2) Make sure these lights are off:
a) The ON light in the GRND SERV BUS switch.
b) The 115V GND SVC HOT BUS WARNING light on the P33 panel.

(g) Push the GRND SERV BUS switch on the P21 panel.
1) Make sure these lights are off:
a) The ON light in the GRND SERV BUS switch.
b) The 115V GND SVCE HOT BUS WARNING light on the P33 panel.

(h) Close this circuit breaker on the P32 panel:
1) 32A8, R GEN GND SVCE BUS
2) Make sure the red 115V GND SVCE HOT BUS WARNING light on the P33 panel is on.
3) Make sure the ON light in the GRND SERV BUS switch is off.

S 845-012

(2) Put the airplane in the ground mode (AMM 32-09-02/201).
(a) Make sure the inspection lights for the nose wheel well are on.
(b) Put the NLG W/W INSP LT SWITCH, (S324) (P63) to the OFF position.
1) Make sure the inspection lights for the nose wheel well go off.
(c) Stop the APU (AMM 49-11-00/201).

H. The Load Test

S 725-013

(1) Do the load test:
(a) Make sure these lights are off:
1) The OFF light in the APU GEN switch (P5).

2) The two yellow BUS OFF lights (P5).

(b) Put the EICAS computer switch (P9) to the AUTO position.

(c) Push the ELEC/HYD display switch on the EICAS maintenance panel (P61).
1) Make sure these indications for the APU show on the EICAS display:
a) AC-V = 110 to 123
b) FREQ = 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 the steps below.
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) Push these switches on 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) Push 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 of the APU channel show on the EICAS display:
1) AC-V = 115 ±5
2) FREQ = 400 ±5
3) LOAD = 0.50 minimum

(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 745-014

(2) Do the BITE test.

S 845-015

(3) Put the Airplane Back to its Usual Condition

(a) Install the forward cargo compartment bulkhead panel.

(b) Close the forward cargo door, 821.

(c) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

(d) Make sure the NLG W/W INSP LT SWITCH (S324) is in the OFF position (P63).

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

(f) Push the BAT switch on the P5 panel to the off position.

APU GENERATOR - REMOVAL/INSTALLATION

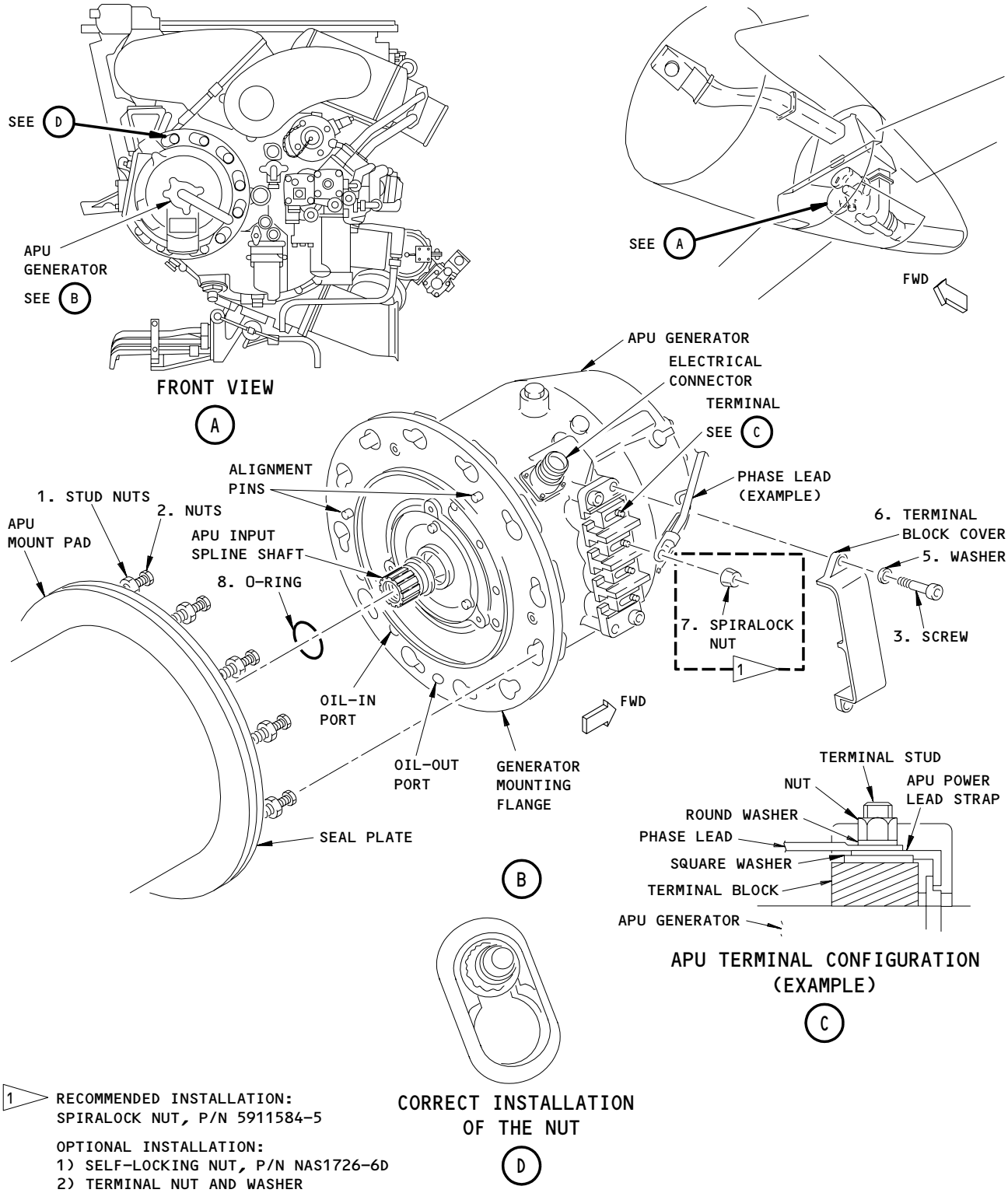
1. General
   A. This procedure has two tasks. The first task removes the APU generator from the airplane. The second task installs the APU generator on the airplane.

   TASK 24-21-01-024-001

2. Remove the APU Generator (Fig. 401)
   A. Equipment
      (1) Container - 0.5 gallon capacity
      (2) Fishpole hoist. (Commercial source)
      (3) Eyebolt - A49002-1 or A49002-2
      (4) APU Generator Input Shipping Cover - (Sundstrand P/N 733740)
   B. Consumable Materials
      (1) Lubricant - MIL-L-23699 or MIL-L-7808
   C. References
      (1) AMM 49-27-03/201, APU Filters
      (2) AMM 49-27-06/201, APU Generator Seal Plate
   D. Access
      (1) Location Zones
          315/316 APU Compartment
      (2) Access Panels
          315AL/316AR APU Compartment
   E. Prepare for the Removal

      S 864-004
      (1) Make sure the APU control switch is in the OFF position. Attach a DO-NOT-OPERATE tag.

      S 864-003
      (2) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11B34, APU ALTN CONT or APU MN BAT CONT



APU Generator Installation
Figure 401

S 864-005
(3) Open this circuit breaker on the E6 rack in the aft equipment center, and attach a DO-NOT-CLOSE tag.
(a) APU PRIME CONT

S 014-006
(4) Open the APU access doors, and lock in the open position with the door rods.

F. Remove the APU Generator

S 864-007
(1) Remove the electrical connection as follows:
(a) Remove the wire harness from the generator electrical connector.
(b) Install a cap on the electrical connector.
(c) Remove the terminal block cover (6) from the generator.
(d) Remove the spiralock nuts (7), the self-locking nuts, or the terminal nuts and washers which are installed on the terminal studs.
(e) Remove the four phase leads.
(f) Install the spiralock nuts (7), the self-locking nuts, or the washers and terminal nuts on the terminal studs (tighten by hand).
(g) Install the terminal block cover (6) with the washers (5) and the screws (3).

S 024-008
(2) Remove the generator as follows:

CAUTION: USE CORRECT EYEBOLT FOR THE APU GENERATOR. INCORRECT EYEBOLT CAN CAUSE DAMAGE TO THE LIFT BOSS.

(a) AIRPLANES WITH APU GENERATOR PART NUMBER 727810A OR 727810B; Install the eyebolt A49002-1 into the lift boss.

(b) AIRPLANES WITH APU GENERATOR PART NUMBER 727810C;
Install the eyebolt A49002-2 into the lift boss.
(c) Use the eyebolt and the fishpole hoist, to hold the generator and keep the weight off the input shaft.
(d) Loosen the nuts (1) which attach the generator to the seal plate. Make a minimum of 7 full turns of each nut, but do not remove the nuts (1) from the studs.
(e) Put the container below the APU generator.

WARNING: BE CAREFUL WHEN YOU REMOVE THE GENERATOR. THE HOT OIL FROM THE GENERATOR CAN CAUSE INJURY TO PERSONS.

CAUTION: DO NOT ALLOW THE GENERATOR TO HANG ON TO THE INPUT SHAFT DURING REMOVAL. FAILURE TO HOLD THE GENERATOR PROPERLY, CAN DAMAGE THE SHAFT.

(f) Pull the generator from the seal plate.
(g) Turn the generator 7 degrees clockwise to align the stud nuts on the seal plate with the holes in the generator.

CAUTION: PULL THE INPUT SHAFT IN A STRAIGHT LINE WHEN YOU REMOVE THE GENERATOR. AXIAL MOVEMENT OF THE INPUT SHAFT CAN CAUSE DAMAGE TO THE INPUT SHAFT SEAL.

(h) Pull the generator from the studs on the APU.
(i) Remove the generator.
(j) Remove the eyebolt from the lift boss.

S 034-009
(3) Remove and examine the generator scavenge filter (AMM 49-27-03/201).

S 034-010
(4) Install the generator shipping cover.

S 214-011
(5) Examine the APU seal plate for mechanical damage.

S 644-031
(6) Apply lubricant MIL-L-23699 or MIL-L-7808 to the seal on the near side of the plate (AMM 49-27-06/201).

TASK 24-21-01-424-002

3. Install the APU Generator (Fig. 401)
A. Equipment
(1) Fishpole hoist. (Commercial source)
(2) Eyebolt - A49002-1 or A49002-2
B. Consumable Materials
(1) Lubricant - MIL-L-23699 or MIL-L-7808
(2) Lubricant - Aeroshell Grease 16

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

AMM			AIPC		
FIG	ITEM	NOMENCLATURE	SUBJECT	FIG	ITEM
401	8	Packing	24-22-03	01	43

D. References
(1) AMM 12-13-04/301, Auxiliary Power Plant
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/501, Engine Indicating and Crew Alerting System
(4) AMM 49-27-03/201, APU Filters
(5) AMM 49-27-06/201, APU Generator Seal Plate
(6) AMM 49-11-00/501, Auxiliary Power Unit

E. Access
(1) Location Zones
315/316 APU Compartment
(2) Access Panels
315AL/316AR APU Compartment

F. Prepare for the Installation

S 034-033
(1) Remove the input shipping cover from the generator input face.

S 434-012
(2) Lubricate and install a new O-ring (8) on the input spline.
Lubricate with MIL-L-23699 or MIL-L-7808.

S 434-013
(3) Install the large nuts on the studs of the APU mount pad. Keep a minimum of 1 inch between the nuts and the seal plate.

S 644-014
(4) AIRPLANES WITH APU P/N S351T020-1, -3, -7, -9, -11 PRE-GARRETT-SB 331-49-5493;
Lightly coat the APU input spline shaft with Aeroshell Grease 16.

S 144-015
(5) AIRPLANES WITH APU POST-GARRETT-SB 331-49-5493;
Clean the grease from the APU generator input spline before installing the APU generator.

S 434-016

CAUTION: REMOVE THE PLUGS FROM THE OIL-IN AND THE OIL-OUT OPENINGS OF THE GENERATOR. THE PLUGS WILL PREVENT FLOW OF OIL AND CAUSE DAMAGE TO THE GENERATOR.

(6) Remove the plugs from the oil-in and the oil-out openings of the APU generator.

G. Procedure

S 424-017

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

(1) Install the generator as follows:

CAUTION: USE CORRECT EYEBOLT FOR THE APU GENERATOR. INCORRECT EYEBOLT CAN CAUSE DAMAGE TO THE LIFT BOSS.

(a) AIRPLANES WITH APU GENERATOR PART NUMBER 727810A OR 727810B; Install the eyebolt A49002-1 into the lift boss.
(b) AIRPLANES WITH APU GENERATOR PART NUMBER 727810C; Install the eyebolt A49002-2 into the lift boss.
(c) Use the eyebolt and the fishpole hoist to hold the generator to the APU.
(d) Align the oil-in and oil-out openings of the generator, with the mating openings of the APU.
(e) Put the studs of the APU mount pad through the holes of the generator.
(f) Turn the generator counterclockwise 7 degrees. The pins on the flange must align with the slots in the seal plate, and the holes in the APU gearbox.
(g) Make sure the generator spline and the APU gearbox spline align.
(h) If adjustment of the APU gearbox spline is necessary, continue as follows:
    1) Remove the sheet metal cap from the APU starter.
    2) Turn the shaft of the APU starter to align with the gearbox spline of the APU.
    3) Install the sheet metal cap on the APU starter.
(i) Tighten the stud nuts (1) to 175-200 pound-inches (19.8 - 22.6 Newton-meters).

(j) Make sure that the nuts are installed correctly (See Fig. 401).
(k) Make sure that there is no visible gap between the generator flange and the seal plate.
(l) Remove the eyebolt from the lift boss.

S 434-018
(2) Connect the electrical connection as follows:

CAUTION: MAKE SURE THE WIRES ARE INSTALLED CORRECTLY. INCORRECT INSTALLATION OF THE WIRES CAN CAUSE CIRCUIT MALFUNCTION AND/OR DAMAGE TO EQUIPMENT.

CAUTION: INSTALL CIRCULAR WASHERS BETWEEN THE TERMINAL NUT AND THE PHASE WIRE. DO NOT INSTALL WASHERS BELOW THE PHASE WIRES. TO DO SO CAN CAUSE HEATING WHICH CAN CAUSE THE TERMINAL BLOCK TO BURN.

(a) Attach the four phase leads to the generator terminal studs.
(b) Install the spiralock nuts (7), the self-locking nuts, or the washers and terminal nuts on the terminal studs.
(c) Tighten the terminal nuts (7) to 144-168 pound-inches (16-19 Newton-meters).
(d) Install the terminal block cover (6). Tighten the screws (3) to 20-22 pound-inches (2.3 - 2.5 Newton-meters).

CAUTION: ALIGN THE ELECTRICAL CONNECTOR PINS BEFORE INSTALLATION. IF THE PINS DO NOT ALIGN DAMAGE TO THE CONNECTORS CAN OCCUR.

(e) Install the APU wire harness to the generator electrical connector.

S 614-019
(3) Fill the APU with oil (AMM 12-13-04/301).

S 414-020
(4) Close the APU access doors.

S 864-021
(5) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the E6 rack in the aft equipment center.
(a) APU PRIME CONT

S 864-022
(6) Remove the DO-NOT-CLOSE tags, and close these P11 panel circuit breakers:
(a) 11B34, APU ALTN CONT or APU MN BAT CONT

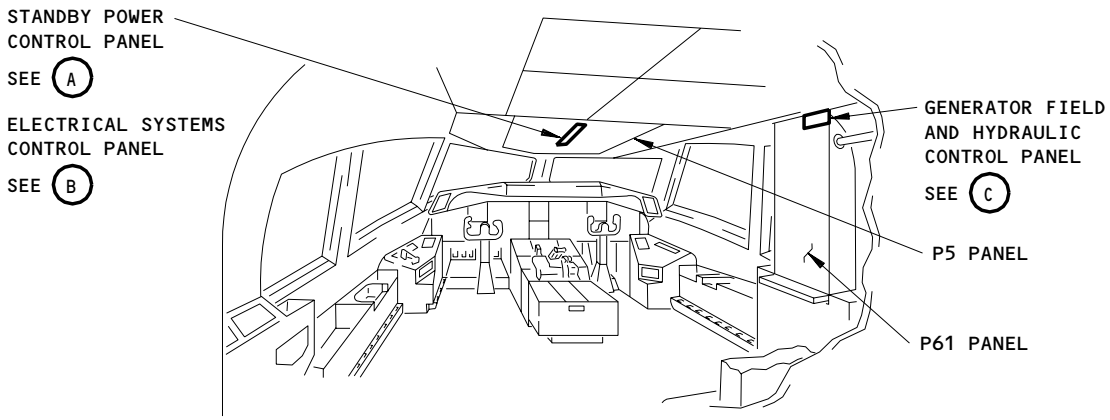
H. Do the Generator Installation test

S 734-038
(1) Do this task: APU Generator Operation Test (AMM 24-21-00/501).

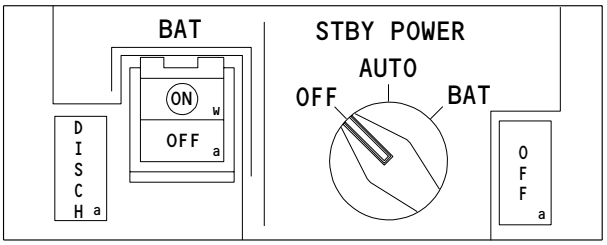
S 864-030
(2) Remove external power if it is not necessary (AMM 24-22-00/201).

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).
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 BITE 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 one 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) in its IDG. 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 disconnect drive functions. This power is from the battery bus through circuit breakers on P6.
      (4) The left GCU is on shelf 1 of equipment center rack E5. The right GCU is on shelf 2 of E5. The APU GCU is on shelf 3 of E5. 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 continuity to the auxiliary contacts and power to the trip and close coils.



FLIGHT COMPARTMENT



STANDBY POWER CONTROL PANEL, M10062 (P5)

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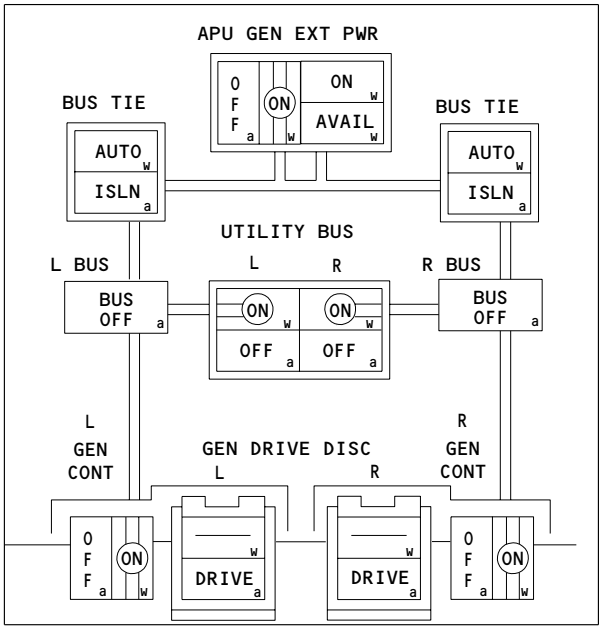
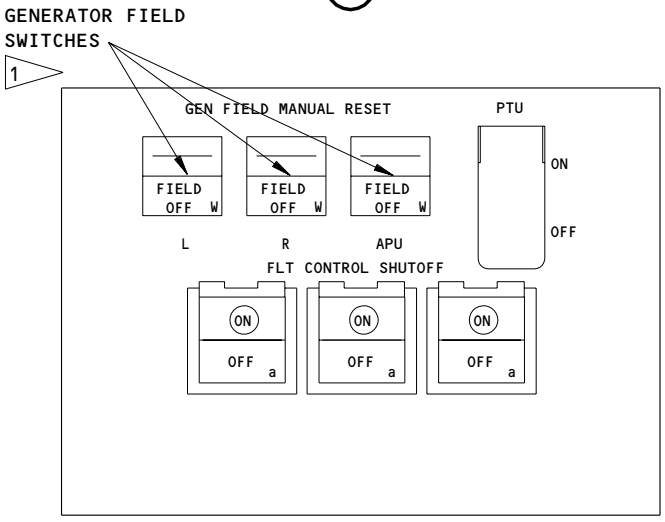


ELECTRICAL SYSTEMS CONTROL PANEL, M10063 (P5)

B

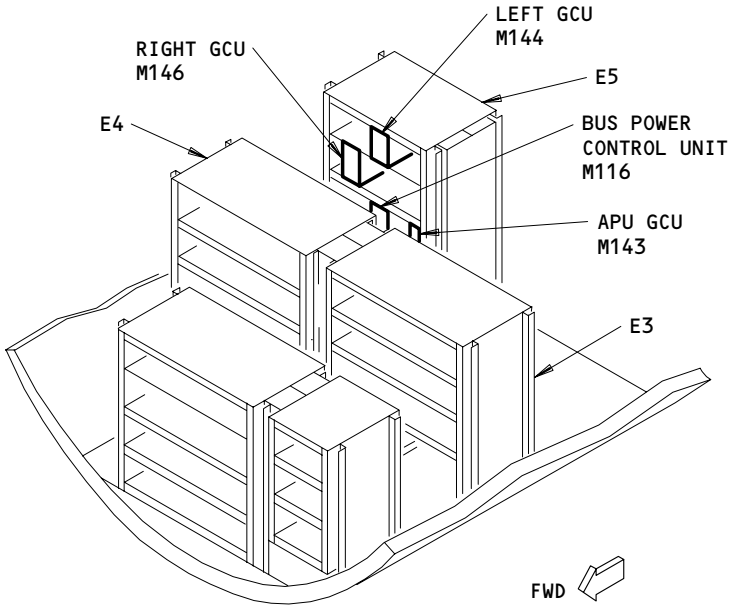


GENERATOR FIELD AND HYDRAULIC CONTROL PANEL, M10191 (P61)

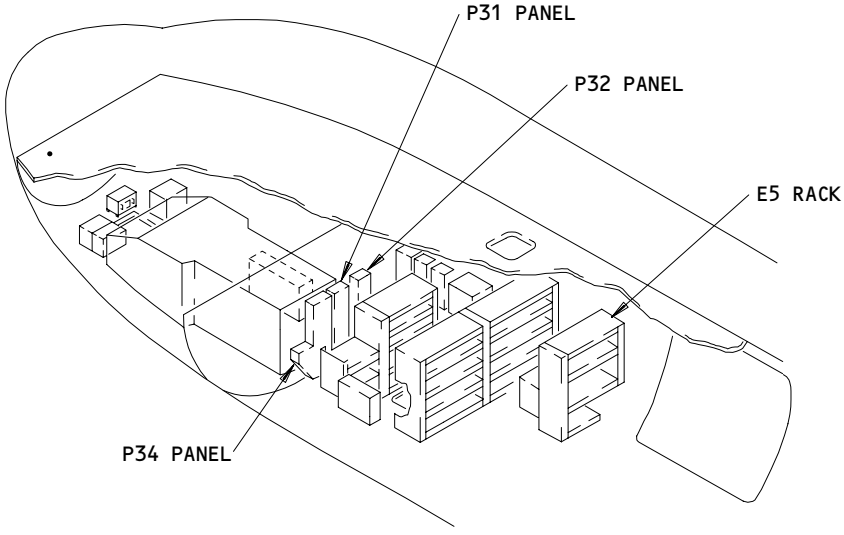
C

1 IF INSTALLED

Electrical Control – Component Location
Figure 1 (Sheet 1)



MAIN EQUIPMENT CENTER



Electrical Control Component Location
Figure 1 (Sheet 2)

(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 main ac bus status.

D. AIRPLANES WITH GENERATOR FIELD SWITCHES;
Generator Field and Hydraulic Control Panel

(1) Generator field and hydraulic control panel M10191 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.

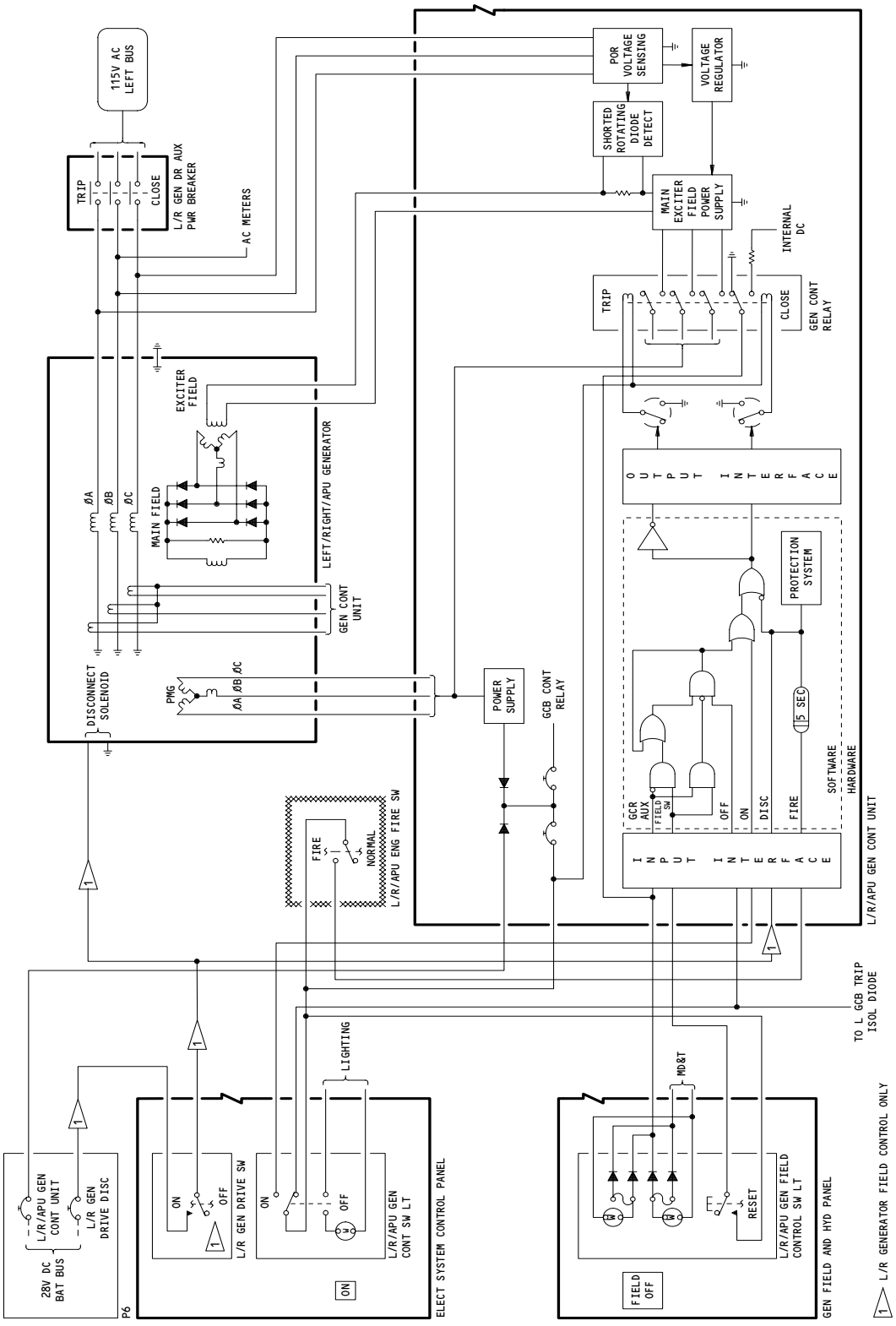
3. Operation

A. Functional Description

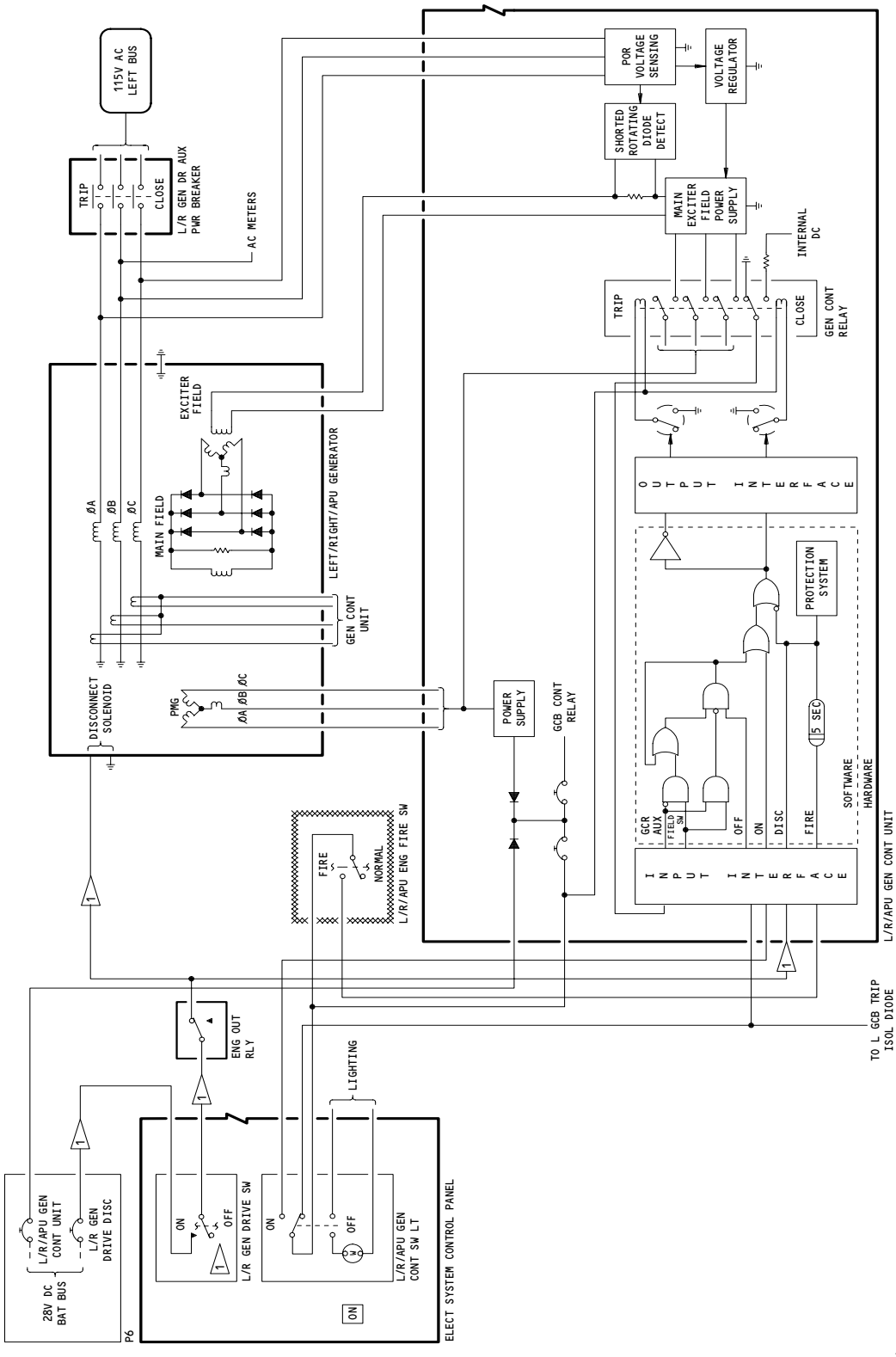
(1) Generator Field Control Relay (GCR) Control (Fig. 2)

(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) AIRPLANES WITH GENERATOR FIELD SWITCHES;
The GCUs work with the GEN CONT switches on the M10063 panel and the field switches on the M10191 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.



Left/Right/APU Generator Field Control Schematic
Figure 2 (Sheet 1)



Left/Right/APU Generator Field Control Schematic
Figure 2 (Sheet 2)

(c) AIRPLANES WITHOUT GENERATOR FIELD SWITCHES;
The GCUs work with the GEN CONT switches on the M10063 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.

(d) 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.

(e) Four conditions can trip (open) a generator GCR and GCB: 1) Pressing the GEN CONT switch off (out); 2) pressing the appropriate guarded GEN DRIVE DISC switch on M10063; 3) pulling the engine fire switch on aft pilots' control stand P8; or 4) a protective trip by the GCU (Ref 24-23-00). 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.

(f) AIRPLANES WITH GENERATOR FIELD SWITCHES;
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: 1) Pressing the appropriate guarded GEN DRIVE DISC switch; 2) pulling the engine fire switch on aft pilots' control stand P8; or 3) a protective trip by the GCU. When a GCR is open, the white FIELD OFF light in its field switch is on.

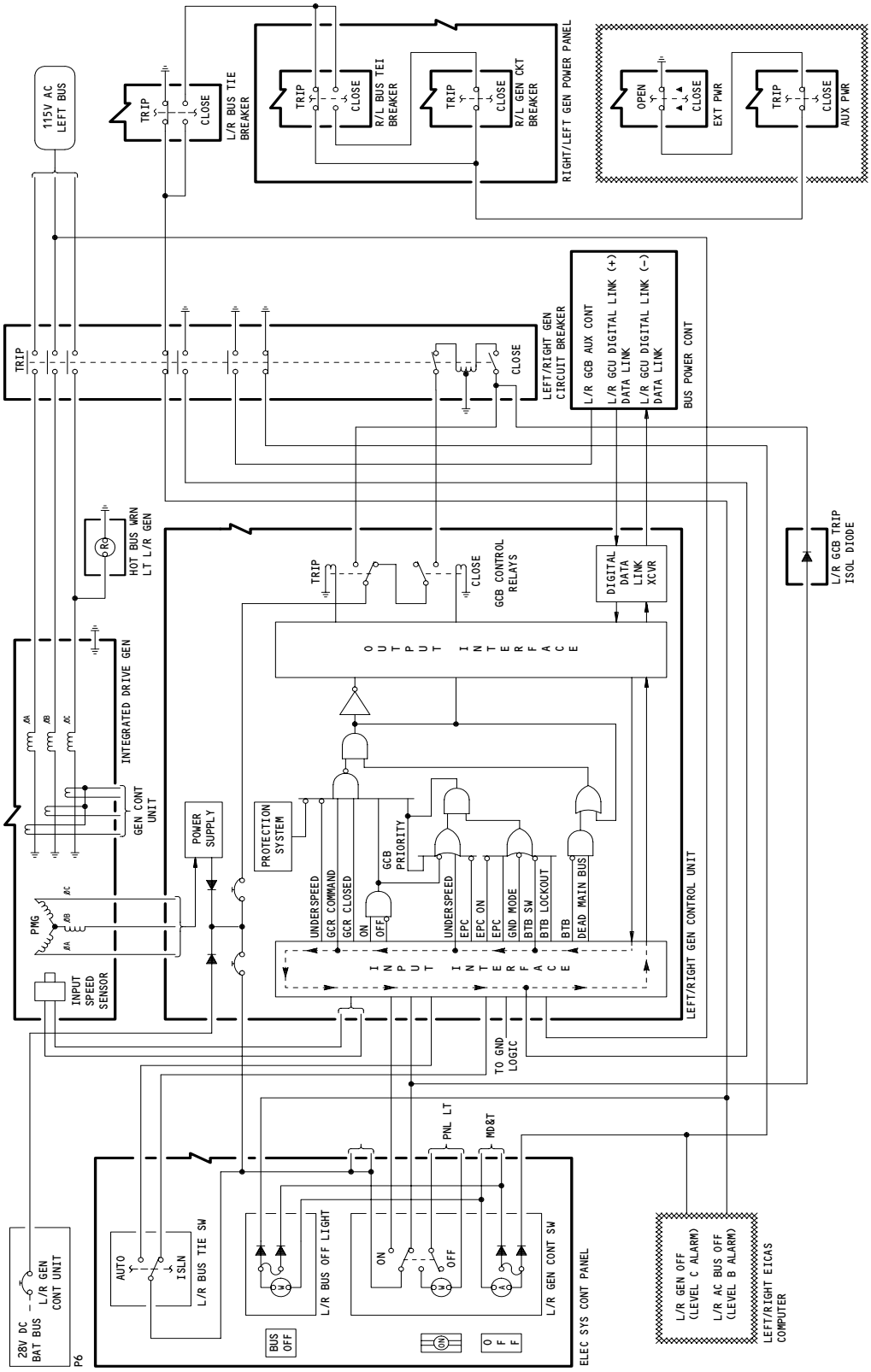
(g) AIRPLANES WITH GENERATOR FIELD SWITCHES;

The APU field control switch is also located on generator field and hydraulic control panel M10191 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: 1) Pushing the field switch off; 2) pulling the APU fire switch on P8; or 3) a protective trip by the APU GCU. When the APU GCR is open, the white FIELD OFF light in the switch is on.

(2) Generator Circuit Breaker (GCB) Control (Fig. 3)

(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 level C EICAS message when the corresponding GCB is open, and the corresponding engine is on. 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: 1) Pressing the GEN CONT switch off (out); 2) pressing the appropriate guarded GEN DRIVE DISC switch on M10063; 3) pulling the engine fire switch on aft pilots' control stand P8; 4) a protective trip by the GCU (Ref 24-23-00); or 5) an engine shutdown. If external power is available, pushing the EXT PWR switch on M10063, also trips the GCBs. External power then supplies main ac bus power (Ref 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.



Left/Right Generator Circuit Breaker Control Schematic
Figure 3

(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 (Figs. 4 and 5)

(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.)

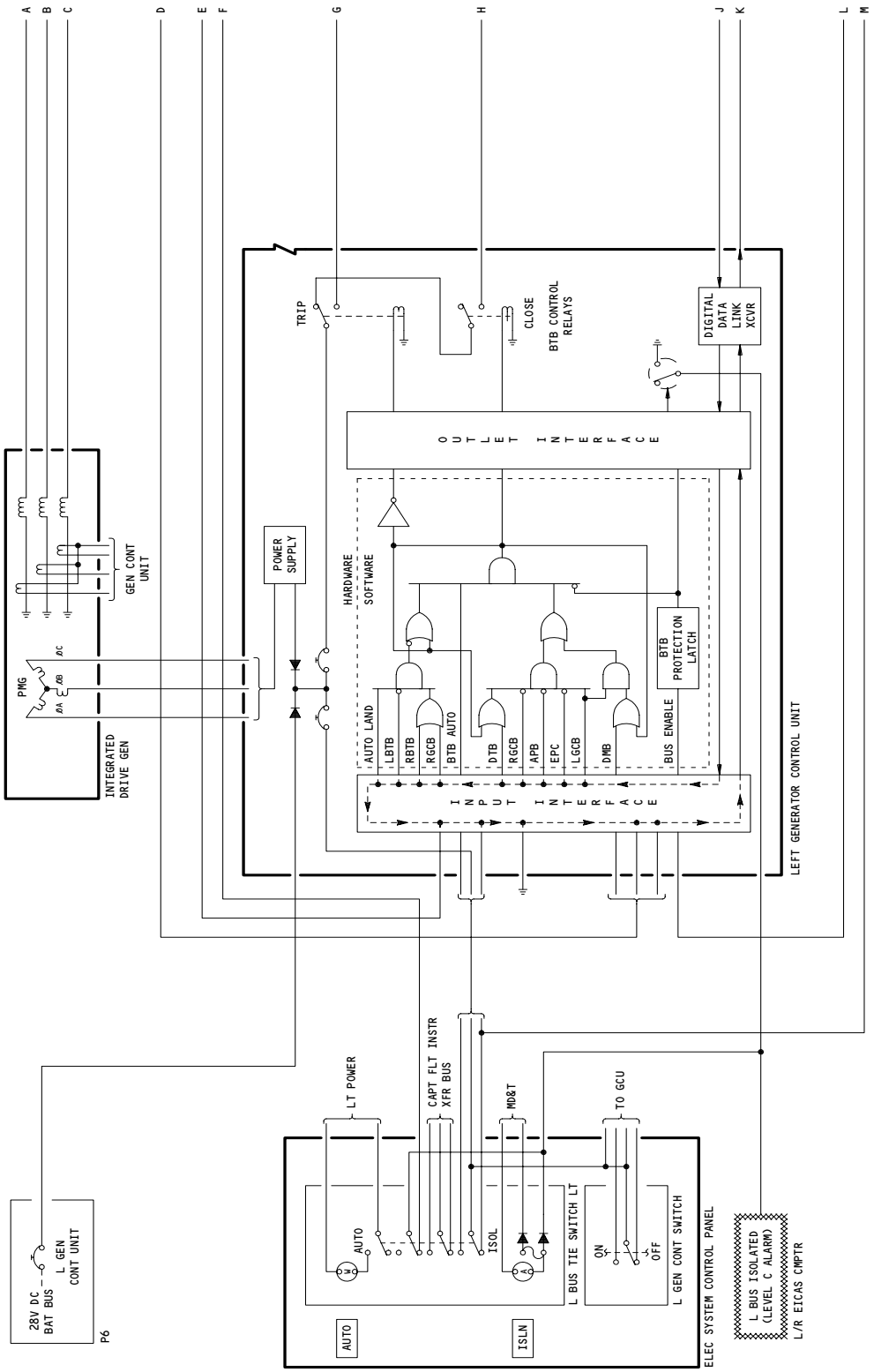
(f) Both BTBs close if one generator circuit breaker (GCB) opens, and no auxiliary or external power is available. (The auxiliary power breaker (APB), and the external power contactor (EPC), are open.) The one operating generator supplies both main ac buses. Both BTBs also close if both GCBs open. Any 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. The BTB actually opens before its GCB closes, to prevent parallel source operation. 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 are to close, the BTB is opened first. Power sources cannot be paralleled.

(h) When a BUS TIE switch is isolated (ISLN), its BTB cannot close. The amber ISLN light in the switch is on. Also, the EICAS display provides the L (or R) BUS ISOLATED level C EICAS message when the corresponding BUS TIE switch is set to ISLN. The main ac bus will remain isolated from the other power sources even if the bus loses power.

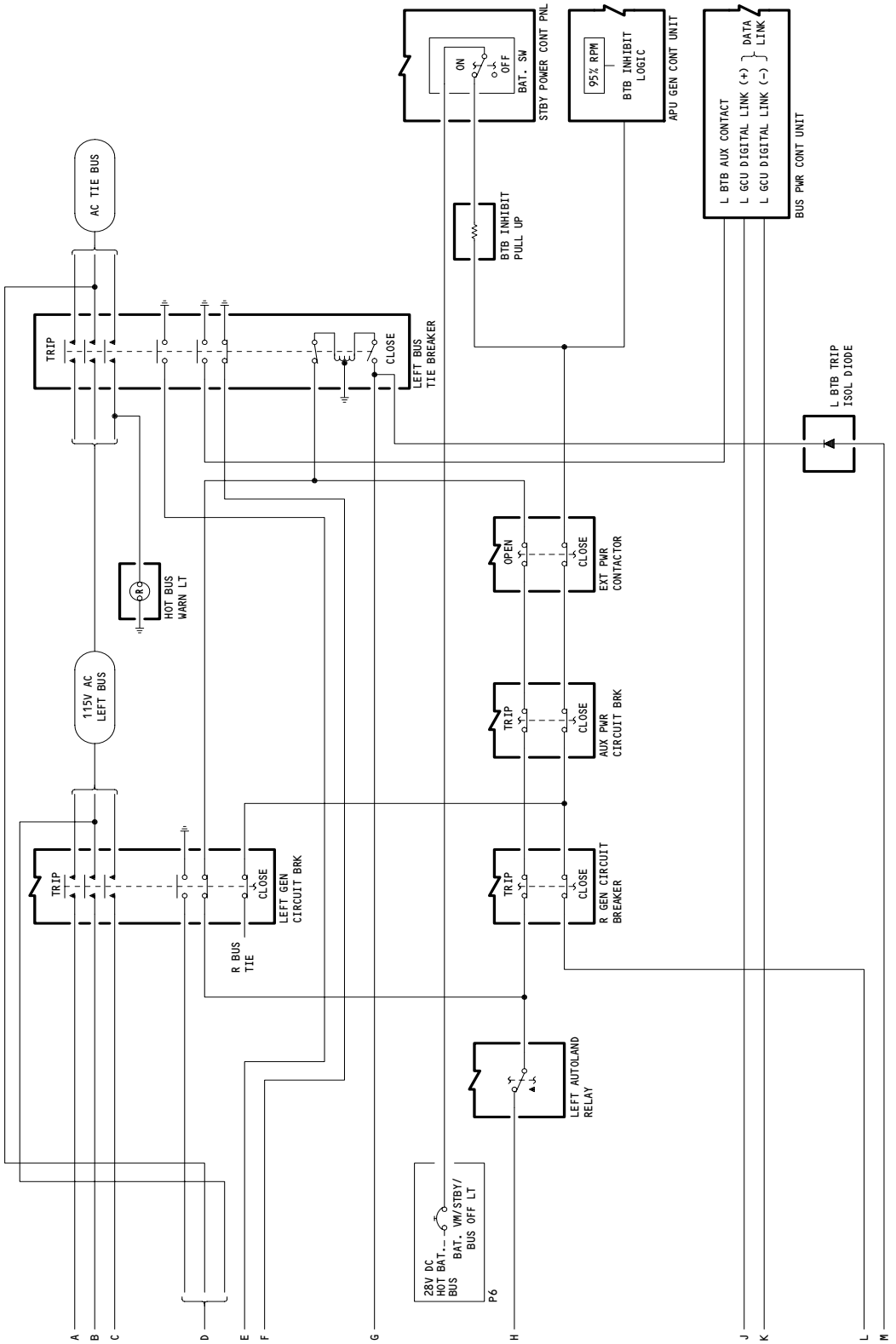
(i) The left and right BUS TIE switches control the automatic switching of power to the captain's and first officer's flight instrument transfer buses (Ref 24-51-00). This switching maintains power on the buses if their primary source fails. For automatic control of power to the captain's flight instrument 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, a CAPT INSTR XFER EICAS message 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, a F/O INSTR XFER EICAS message 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 (Ref 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.

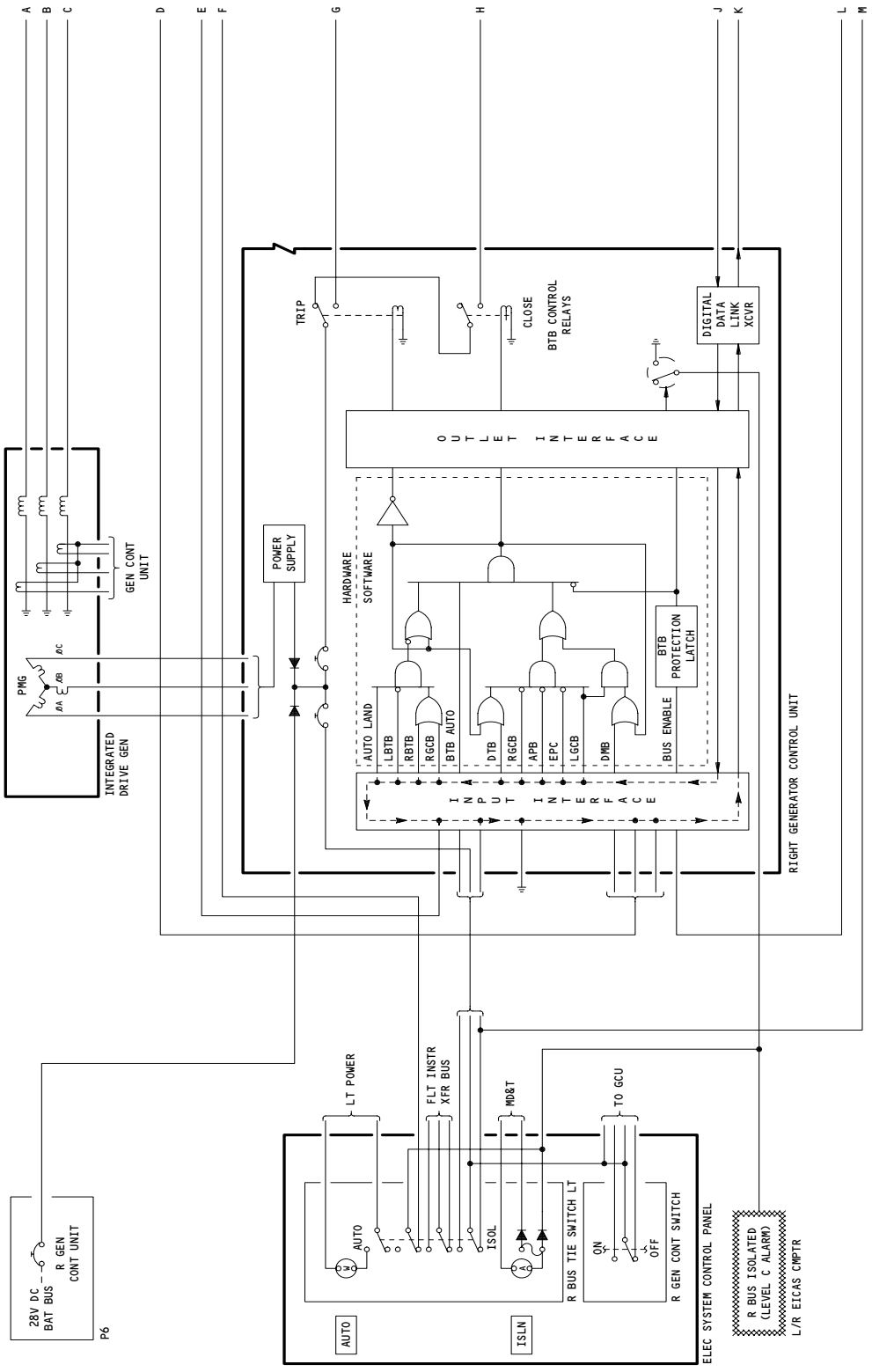


Left Bus Tie Breaker Control Schematic
Figure 4 (Sheet 1)

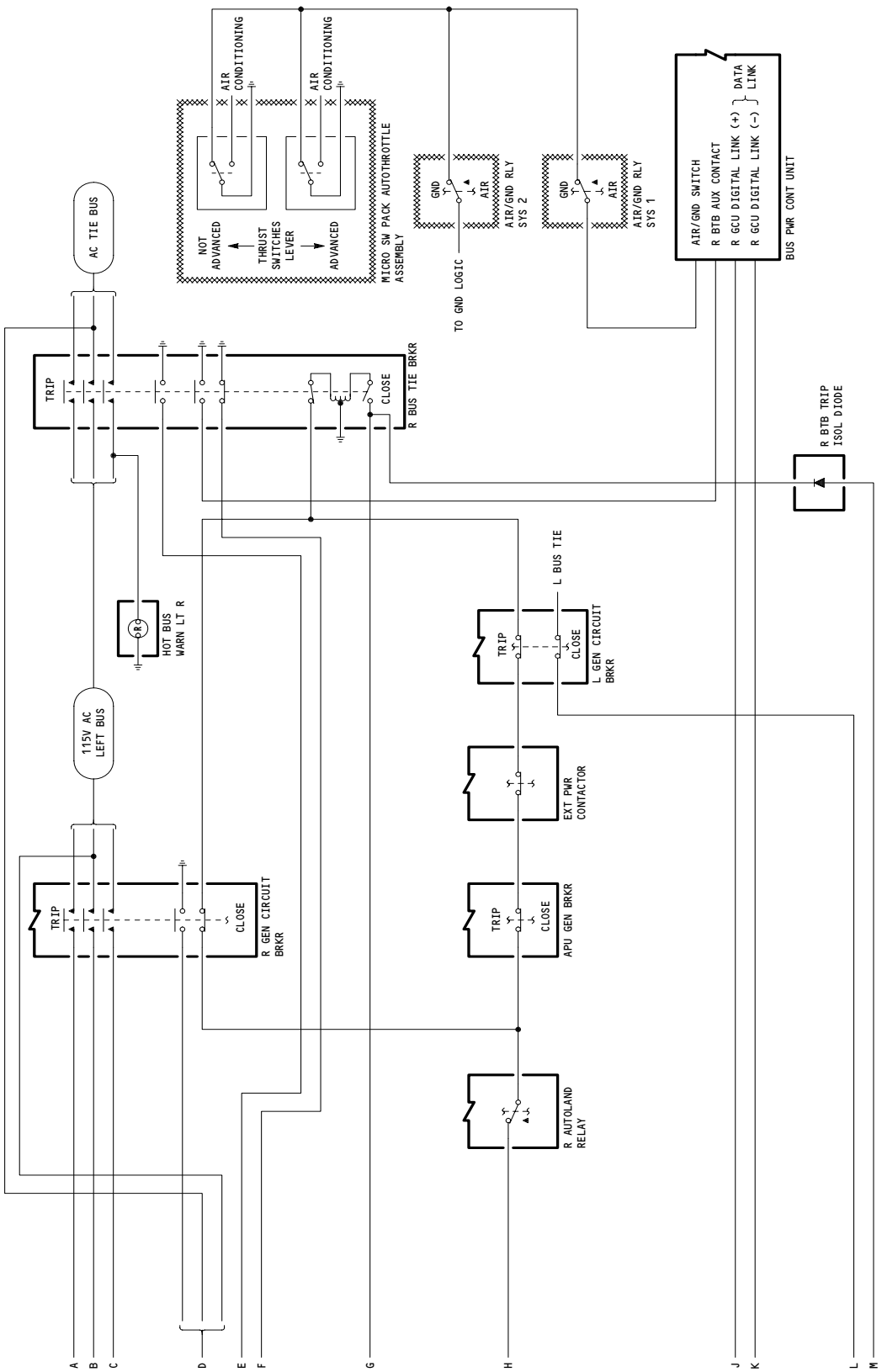
88797



Left Bus Tie Breaker Control Schematic
Figure 4 (Sheet 2)



Right Bus Tie Breaker Control Schematic
Figure 5 (Sheet 1)



Right Bus Tie Breaker Control Schematic
Figure 5 (Sheet 2)

888806

(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 (Ref 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 signal 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 messages 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.

(4) During catagory III autoland, the dc tie relay is actuated by the captain's or first officer's instrument bus voltage sensing unit (IBVSU). When the IBVSU's 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 TR UNIT EICAS message appears on the status and maintenance pages.

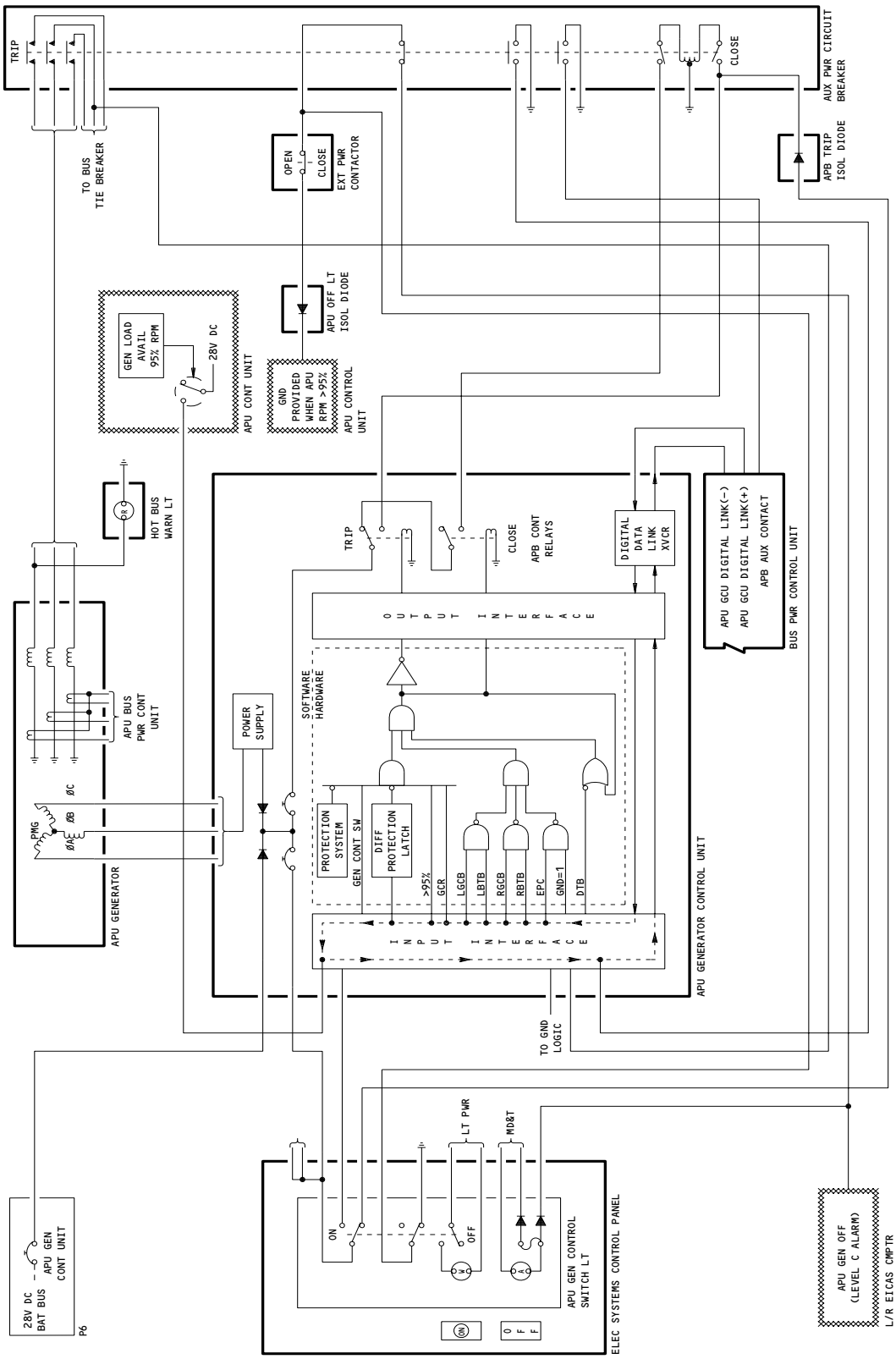
(5) Auxiliary Power Breaker (APB) Control (Fig. 6)

(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. The amber OFF light in the switch is on when the APB is open and:

1) The APU GEN switch is OFF (out position); or
2) The external power contractor (EPC) is open, and the APU is operating above 95 percent full speed.

(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 level C EICAS message to appear.

(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.



Auxiliary Power Breaker Control Schematic
Figure 6

88808

(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 (Ref 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 switch should not come on as long as the APU GEN 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 (Ref 24-23-00).

(g) The APB trips (opens) due to: 1) Pressing the APU GEN switch off (out); 2) pressing the EXT PWR switch on M10063 with external power available; 3) the APU generator input shaft falling below 95 per cent full speed; 4) pulling the APU fire switch on aft pilots' control stand P8; or 5) a protective trip by the APU GCU (Ref 24-23-00).

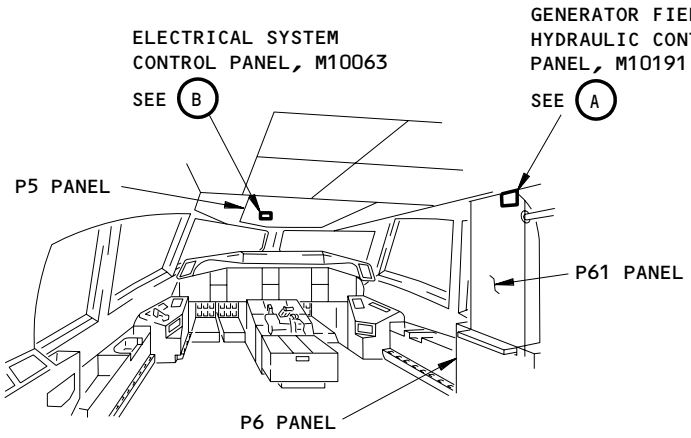
CONTROL

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
CIRCUIT BREAKER –			FLIGHT COMPARTMENT, P6	
GEN CONT UNIT APU, C806		1	6B3	
CIRCUIT BREAKER – (FIM 31-01-31/101)				
LEFT BUS TIE, C902				24-22-03
LEFT GENERATOR, C901				24-22-03
CIRCUIT BREAKER – (FIM 31-01-32/101)				
RIGHT BUS TIE, C904				24-22-03
RIGHT GENERATOR, C903				24-22-03
CIRCUIT BREAKER – (FIM 31-01-34/101)				
AUX POWER, C905				24-22-03
PANEL – GENERATOR FIELD AND HYDRAULIC CONTROL, M10191 [1]	1	1	FLIGHT COMPARTMENT, P61	24-22-04
PANEL – ELECTRICAL SYSTEM CONTROL, M10063	1	1	FLIGHT COMPARTMENT, P5	24-22-01
UNIT – APU GENERATOR CONTROL, M143	2	1	821, MAIN EQUIPMENT CENTER, E5-3 [2]	24-22-02
UNIT – LEFT GENERATOR CONTROL, M144	2	1	821, MAIN EQUIPMENT CENTER, E5-1 [2]	24-22-02
UNIT – RIGHT GENERATOR CONTROL, M146	2	1	821, MAIN EQUIPMENT CENTER, E5-2 [2]	24-22-02

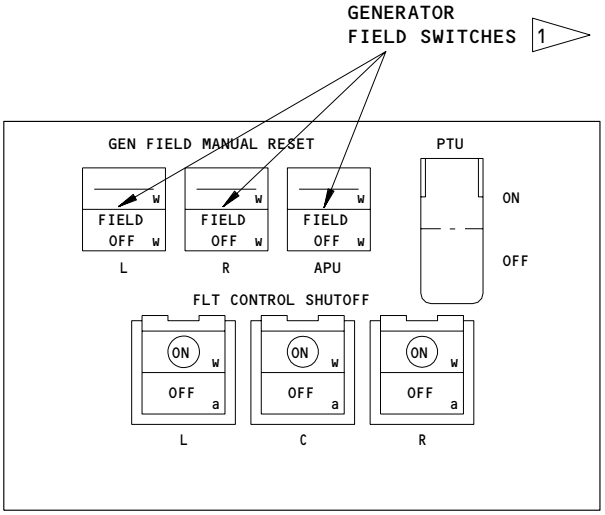
[1] IF INSTALLED

[2] ACCESS TO GCU THROUGH THE FOLLOWING PANEL AT THE FORWARD END OF THE FORWARD CARGO COMPARTMENT:
757-200
122AZ
757-300
122CZ

Control – Component Index
Figure 101

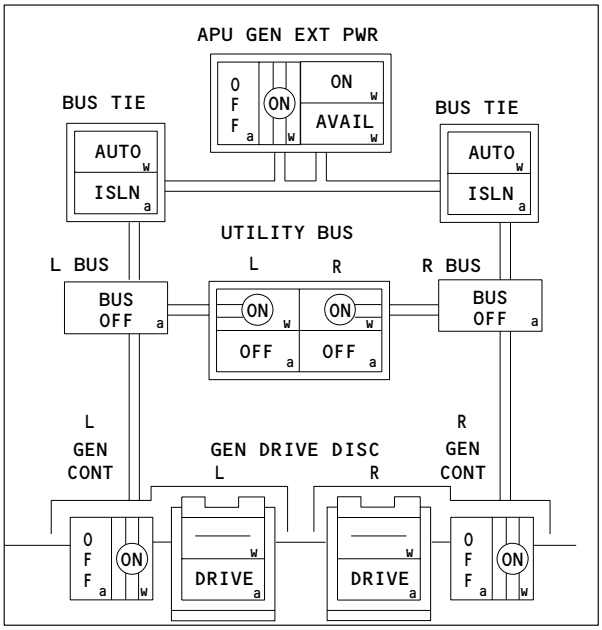


FLIGHT COMPARTMENT



GENERATOR FIELD AND HYDRAULIC
CONTROL PANEL, M10191 (P61)

A

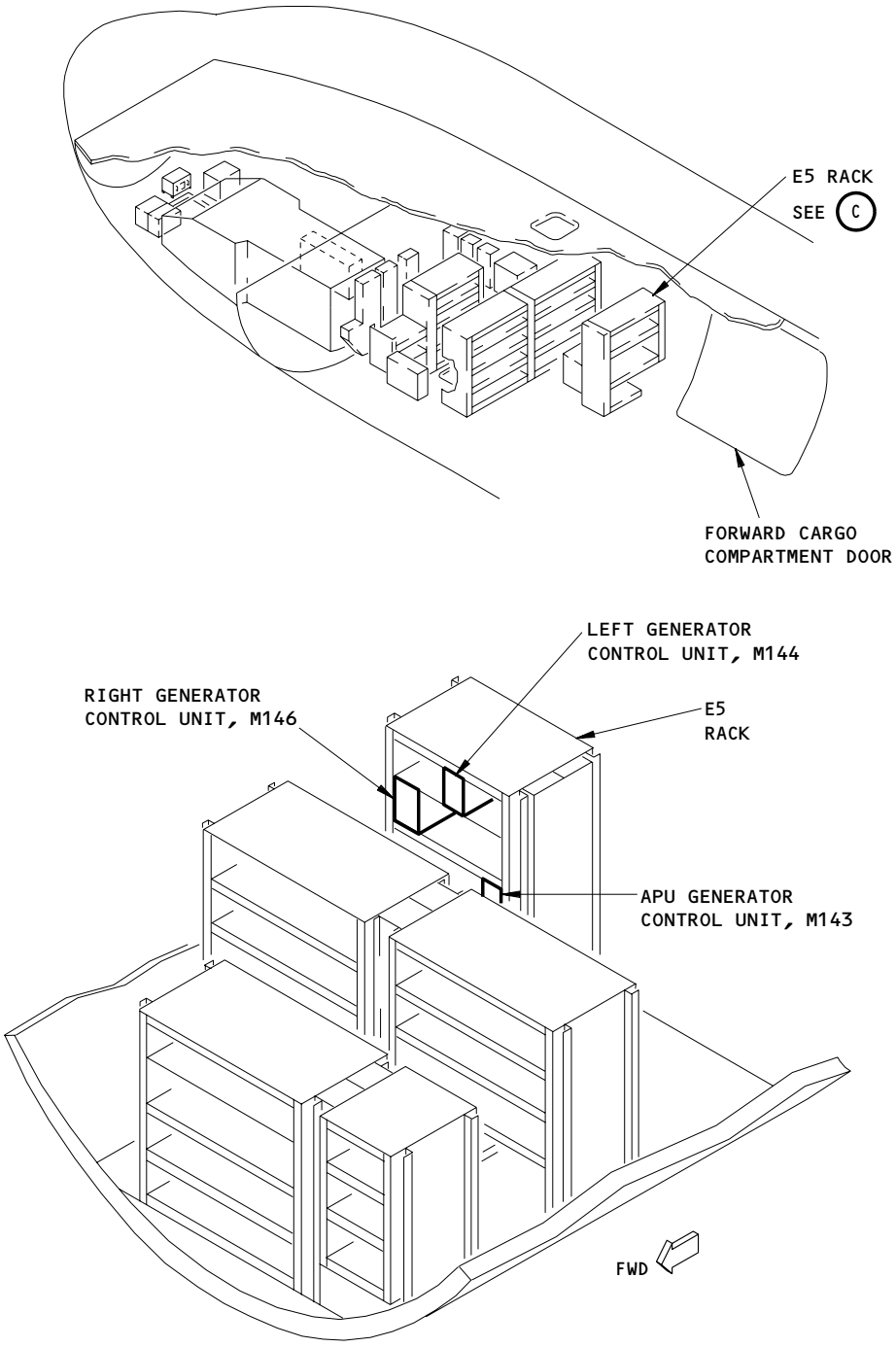


ELECTRICAL SYSTEM CONTROL
PANEL, M10063 (P5)

B

1 IF INSTALLED

Control - Component Location
Figure 102 (Sheet 1)



MAIN EQUIPMENT CENTER

C

Control - Component Location
Figure 102 (Sheet 2)

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 Integrated Drive Generator Power.

   TASK 24-22-00-862-028
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
   C. Equipment
      (1) External power supply - 115/200-volt ac, 3-phase, 400-Hz, 90-Kva
   D. Access
      (1) Location Zones
         212 Flight Compartment
      (2) Access Panel
         120AR External Power Panel

E. Prepare for the Test

S 042-030

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 862-031

(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 12OAR 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.

d) Use a cargo tie down to support the cable.
e) 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) Set the BAT switch (P5) to 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 862-032

(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 IN 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 24-41-01/401).

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.
(d) Use a cargo tie down to support the cable.
(e) Energize the power cable.

(f) Make sure these white lights on the P30 panel are on:
1) The CONNECTED light.
2) The NOT IN USE Light.

S 862-033

(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 862-034

(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 IN 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 24-41-01/401).

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.
(d) Use a cargo tie down to support the cable.
(e) Energize the power cable.

(f) Make sure these white lights on the P30 panel are on:
1) The CONNECTED light.
2) The NOT IN USE light.
(g) 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.
(h) Make sure the NOT IN USE light on the P30 panel is off.

S 862-035
(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 862-036
(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 24-41-01/401).

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.
(d) Use a cargo tie down to support the cable.
(e) Energize the power cable.
(f) Make sure these white lights on the P30 panel are on:
    1) The CONNECTED light.
    2) The NOT IN USE light.
(g) Push the BAT switch on the pilots' overhead panel P5 to the ON 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 862-040

(7) Do these steps to remove the External Power from the 115v ac buses:
(a) Push the EXT PWR switch on 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) Push the BAT switch on P5 to the off position.
(e) Make sure the white NOT IN USE light on P30 is on.
(f) Remove the power from the external power cable.
(g) 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.

(h) Remove the external power cable.
(i) 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.
(2) When the APU generator power quality is acceptable, the generator is automatically connected to the ac ground handling bus. Flight compartment switches allow manual control of APU generator power to the ac ground service, and/or main ac buses. Power to the ac ground service bus can also be applied by a switch on the forward attendant's panel P21.

B. References
(1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(2) AMM 49-11-00/501, Auxiliary Power Unit

C. Access
(1) Location Zones
212 Flight Compartment

D. Procedure

S 862-011

(1) Do these steps to supply the APU generator power to the ground handling bus:

NOTE: If both external and APU generator power are available, external power is automatically chosen to supply the ac ground handling bus. External power must be removed to allow the APU generator to supply the ac ground handling bus.

(a) Push the BAT switch on the P5 panel to the ON position.
(b) Set the STBY POWER switch to the AUTO position.
(c) Make sure the APU GEN switch on the P5 panel is in the OFF position.
(d) Make sure the two BUS TIE switches on the P5 panel are in the ISLN position.
1) Make sure the yellow ISLN light in each switch is on.
(e) Start the APU (AMM 49-11-00/201).

S 862-039

(2) Do these steps to remove the APU Generator Power from the AC Ground Handling Bus:
(a) Shut down the APU (AMM 49-11-00/201).
(b) Set the STBY POWER switch to the OFF position.
(c) Push the BAT switch on the P5 panel to the OFF position.

S 862-013

(3) Do these steps to supply the APU Generator Power to the AC Ground Service Bus:

NOTE: If the airplane is on the ground, the ground handling bus is automatically energized when the APU generator power quality is satisfactory. If the right main ac bus is energized, the ac ground service bus is automatically energized from the right main ac bus.

(a) Push the BAT switch on the P5 panel to the ON position.
(b) Set the STBY POWER switch to the AUTO position.
(c) Make sure the APU GEN CONT switch on the P5 panel is in the OFF position.
(d) Make sure the two BUS TIE switches on the P5 panel are in the ISLN position.
1) Make sure the yellow ISLN light in each switch is on.
(e) Start the APU (AMM 49-11-00/201).
(f) Press the GND SERVICE switch on the left forward attendant's panel P21.
1) Make sure the light in the switch comes on.

S 862-038

(4) Do these steps to remove the APU Generator Power from the AC Ground Service Bus:
   (a) Shut down the APU (AMM 49-11-00/201).
   (b) Set the STBY POWER switch to the OFF position.
   (c) Push the BAT switch on the P5 panel to the OFF position.

S 862-015

(5) Do these steps to supply APU generator power to the main AC buses:

   NOTE: If the airplane is on the ground, the ac ground handling bus is automatically energized when the APU generator power is satisfactory. The AC ground service bus is automatically energized when the right main ac bus is energized.

   (a) Push the BAT switch on the P5 panel to the ON position.
   (b) Set the STBY POWER switch to the AUTO position.
   (c) Make sure the APU GEN switch on the P5 panel is in the OFF position.
   (d) Make sure the two BUS TIE switches on the P5 panel are set to ISLN position.
      1) Make sure the yellow ISLN light in each switch is on.
   (e) Make sure the two yellow BUS OFF lights on the P5 panel are on.
   (f) Start the APU (AMM 49-11-00/201).
   (g) Push the APU GEN switch (P5) to the ON position.
   (h) Make sure the yellow OFF light in the APU GEN switch on the P5 panel is off.
   (i) Push the left BUS TIE switch on the P5 panel to the AUTO position to energize the left 115V ac bus.
      1) Make sure the (L BUS) BUS OFF light on P5 is off.
   (j) Push the right BUS TIE switch on the P5 panel to AUTO position to energize the right 115v ac bus.

      NOTE: The AC ground service bus is automatically energized by the right main ac bus.

      1) Make sure the (R BUS) BUS OFF light on P5 is off.
   (k) 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 is off.

S 862-017

(6) Do these steps to remove the APU generator power from the main AC buses:
   (a) Push the two BUS TIE switches on the P5 panel to the ISLN position.
      1) Make sure the yellow ISLN light in each switch comes on.
   (b) Make sure the two yellow BUS OFF lights on the P5 panel are on.
   (c) Push APU GEN switch on P5 panel to the OFF position.

(d) Shutdown the APU (AMM 49-11-00/201).
(e) Set the STBY POWER switch to the OFF position.
(f) Push the BAT switch on the P5 panel to the off position.

TASK 24-22-00-862-003

4. Supply and Remove Integrated Drive Generator 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.
(2) The integrated drive generator (IDG) is used to energizes the main ac buses and the ground service bus. The IDG cannot be used to energize the ac ground handling bus.
(3) Normally each engine IDG supplies power to one main ac bus of the electrical system. One engine IDG can, however, supply electrical power to both main 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. Procedure

S 862-018
(1) Do these steps to supply the IDG Power to the main AC buses:
(a) Push the BAT switch on the P5 panel to the ON position.
(b) Set the STBY POWER switch to the AUTO position.
(c) Make sure the two yellow BUS OFF light on the P5 panel are on.
(d) Do these steps to energize the left 115V ac bus with the left generator power:
1) Make sure the yellow DRIVE light in L GEN DRIVE DISC switch on the P5 panel is on.
2) Operate the left engine (AMM 71-00-00/201).

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 71-00-00/201).

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 the P5 panel to ON position.
   a) Make sure the yellow OFF light in the GEN CONT switch is off.
5) Make sure the left (L BUS) BUS OFF light on the P5 panel is off.

(e) Do these steps to energize the right 115V ac bus with the left generator power:

NOTE: The right main ac bus must not be energized by external power, the APU generator, or the right generator. The APU GEN CONT and EXT PWR switches on P5 must be off. The right engine must be off, or the R GEN CONT switch (P5) must be OFF.

1) Energize the left main ac bus with the left generator power (AMM 24-22-00/201).
2) Push the two BUS TIE switches on the P5 panel to AUTO position.
   a) Make sure the ISLN light in each switch goes off.
3) Make sure the two BUS OFF lights on the P5 panel are off.

(f) 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 the P5 panel is on.
2) Operate the right engine (AMM 71-00-00/201).

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 on the P5 panel 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 71-00-00/201).
   b) Isolate the failure which caused the DRIVE light to come on (FIM 24-20-00/101).
4) Push the R GEN CONT switch on the P5 panel to the ON position.
   a) Make sure the yellow OFF light in the R GEN CONT switch is off.
5) Make sure the right (R BUS) BUS OFF light on the P5 panel is off.

(g) Do these steps to energize the left 115V ac bus with the right generator power:

NOTE: The left main ac bus must not be energized by external power, the APU generator, or the left generator. The APU GEN CONT 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 main ac bus with right generator power (AMM 24-22-00/201).
2) Push the two BUS TIE switches on the P5 panel to AUTO position.
   a) Make sure the ISLN light in each switch goes off.
3) Make sure the two BUS OFF lights on the P5 panel are off.

(h) Do these steps to supply power to the utility/galley bus:
1) Energize the main ac bus which supplies the applicable utility/galley bus (AMM 24-22-00/201).
2) Push the applicable (L or R) UTILITY BUS switch on the P5 panel to ON position.
   a) Make sure the yellow OFF light in the switch goes off.

(i) Do these steps to 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 both throttle levers to the idle detent position.
   b) Stop for a minimum of 10 seconds.
   c) Cycle the applicable utility bus switch off and on.
   d) Make sure the yellow OFF light in each switch is off.

S 862-020

(2) Do these steps to remove the IDG power from the main AC buses:
(a) Shut down the engine(s) (AMM 71-00-00/201).
(b) Make sure the yellow DRIVE lights in the L and R GEN DRIVE DISC switches on the P5 panel 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) Set the STBY POWER switch to OFF.
(f) Push the BAT switch on the P5 panel to off position.

E. Put the Airplane Back to Its Usual Condition

S 862-042
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

CONTROL - ADJUSTMENT/TEST

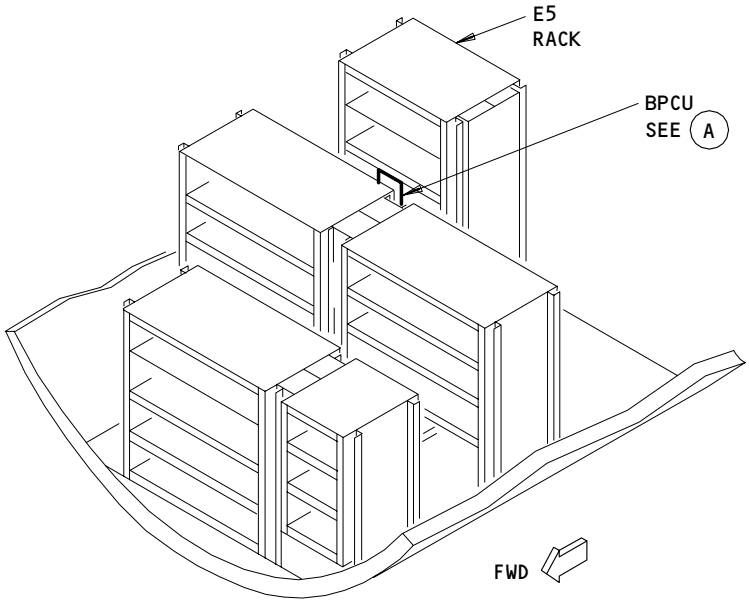
1. General
   A. This procedure has three tasks. The first task does an operational test of the AC power system. The second task does a system test of the AC power system. The third task does a BITE/PERIODIC test of the BPCU.
      (1) The operational test does a fast system check. It uses the EICAS displays to monitor the system. No tools are necessary.
      (2) The system test gives more full checks of parts of the system.
   B. It is necessary to operate the engines in the operational test, and the system test.

TASK 24-22-00-715-001

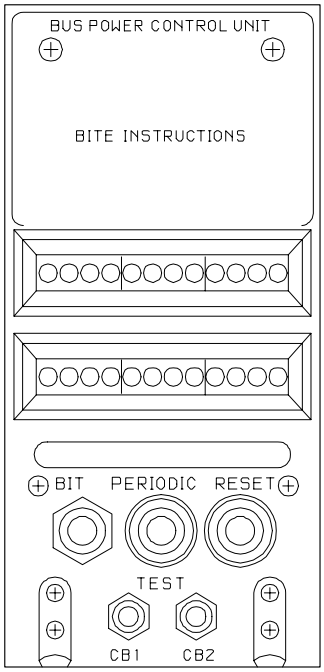
2. Operational Test - AC Power System
   A. General
      (1) The operational test does these tests:
         (a) BPCU BITE/PERIODIC TEST.
         (b) Engine Start with External Power, and Switch Check
         (c) Field Control Relay, for the L (R) IDG
         (d) Bus Tie Breakers, and Generator Circuit 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) 24-22-00/201, Electrical Power - Control
      (2) 49-11-00/501, Auxiliary Power Unit (APU)
      (3) 71-00-00/501, Power Plant
   C. Access
      (1) Location Zones

212	Flight Compartment (RH Side)
119	Main Equipment Center
122	Forward Cargo Compartment



MAIN EQUIP CTR



BUS POWER CONTROL UNIT, M116

A

Component Location
Figure 501

(2) Access Panels
122AZ Forward Cargo Compartment Bulkhead Panel
821 Forward Cargo Door Access Panel

D. Prepare for the Test

S 865-063
(1) Set the BAT switch to the ON position.

E. BPCU BITE/PERIODIC TEST

S 745-060
(1) Do the task BPCU BITE/PERIODIC TEST at the end of this procedure.

NOTE: Use battery power to supply power to the BPCU. Do not use the IDGs, External Power or APU generator to supply power to the BPCU when you do the test.

S 865-064
(2) Set the BAT switch to the OFF position.

F. Engine Start with External Power, and Switch Check

S 865-005
(1) Supply external power to the main ac buses (Ref 24-22-00).

S 715-006
(2) Do a check of the EICAS displays:
(a) Push the DISPLAY SELECT switch for the ELEC/HYD display on the EICAS maintenance page (P61).
(b) Set the selection switch, on the EICAS computer panel (P9), to the AUTO position.
1) Make sure these EICAS indications show:
a) For the left power channel,
AC-V = 0
FREQ = 0.
b) For the right power channel,
AC-V = 0
FREQ = 0.
c) For the ground power,
AC-V = 115 ±5
FREQ = 400 ±5

S 715-007

(3) Do a check of the L (R) GEN CONT switches:

(a) Set the L (R) GEN CONT switches, on the P5 panel, to the OFF position.

1) Make sure the yellow OFF light in each switch stays on.

2) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Make sure the white FIELD OFF light, in the generator field switches (P61), are on.

(b) Set the L (R) GEN CONT switches (P5) to the ON position.

1) Make sure these lights are on:

a) The yellow OFF light in L (R) GEN CONT switches (P5).

b) The white ON light in the EXT PWR switch (P5).

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

3) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Make sure the L (R) FIELD OFF lights (P61), are off.

(c) Make sure the yellow DRIVE light, in the L (R) GEN DRIVE DISC switches (P5), are on.

S 715-008

(4) Operate the left engine (Ref 71-00-00).

S 715-009

(5) After 30 seconds, 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 BUS OFF lights (P5).

4) AIRPLANES WITH FIELD OFF SWITCHES ON THE GENERATOR FIELD AND HYDRAULIC CONTROL PANEL, P61;
The L FIELD OFF light.

NOTE: If you pushed the switch for the GEN DRIVE DISC because the yellow DRIVE light came on, do the engine shutdown procedure (Ref 71-00-00). Isolate the problem which caused the DRIVE light to come.

(b) 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 ON light in the EXT PWR switch (P5).

S 715-010
(6) Make sure these EICAS indications show:
(a) For the left power channel,
AC-V = 115 ± 5
FREQ = 400 ± 5.
(b) For the right power channel,
AC-V = 0
FREQ = 0.

S 715-011
(7) Push the EXT PWR switch (P5).
(a) Make sure these lights are off:
1) The ON light, in the EXT PWR switch (P5).
2) The OFF light, in the L GEN CONT switch (P5).
3) The two BUS OFF lights (P5).
4) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L FIELD OFF light (P61).

S 715-012
(8) Push the EXT PWR switch (P5) again.
(a) Make sure these lights are on:
1) The yellow OFF light in the L (R) GEN CONT switches (P5).
2) The white ON light in the EXT PWR switch (P5).
(b) Make sure these lights are off:
1) The two BUS OFF lights (P5).
2) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L FIELD OFF light (P61).
(c) Make sure the yellow DRIVE light, in the R GEN DRIVE DISC switch (P5), is on.

S 715-013
(9) Operate the right engine (Ref 71-00-00).

S 715-014
(10) After 30 seconds, make sure these lights are off:
(a) The DRIVE light in the R GEN DRIVE DISC switch (P5).
(b) The OFF light in the R GEN CONT switch (P5).
(c) The BUS OFF lights (P5).
(d) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The R FIELD OFF light (P61).

NOTE: If you pushed the switch for the GEN DRIVE DISC because the yellow DRIVE light came on, do the engine shutdown procedure (Ref 71-00-00). Isolate the problem which caused the DRIVE light to come on.

S 715-015
(11) 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 715-016
(12) Make sure these indications show on the lower EICAS display:
(a) For the left power channel,
AC-V = 115 ± 5
FREQ = 400 ± 5.
(b) For the right power channel,
AC-V = 115 ± 5
FREQ = 400 ± 5.

S 715-017
(13) Push the EXT PWR switch (P5).

S 715-018
(14) Make sure these lights are off:
(a) The ON light, in the EXT PWR switch (P5).
(b) The OFF light, in the L (R) GEN CONT switches (P5).
(c) The BUS OFF lights (P5).

(d) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L (R) FIELD OFF lights (P61).

S 715-019
(15) Push the EXT PWR switch (P5), again.

S 715-020
(16) Make sure these lights are on:
(a) The yellow OFF light, in the L (R) GEN CONT switches (P5).
(b) The white ON light, in the EXT PWR switch (P5).

S 715-021
(17) Make sure these lights are off:
(a) The BUS OFF lights (P5).
(b) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L (R) FIELD OFF lights (P61).

S 715-022
(18) Push the L GEN CONT switch (P5),two times (OFF-ON).
(a) Make sure the switch is in the ON position.

S 715-023
(19) Make sure these lights are off:
(a) The OFF light in the L GEN CONT switch (P5).
(b) The BUS OFF lights (P5).
(c) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L FIELD OFF light (P61).

S 715-024
(20) Push the R GEN CONT switch (P5) two times.(OFF-ON).
(a) Make sure the switch is in the ON position.

S 715-025
(21) Make sure these lights are off:
(a) The OFF light in the L (R) GEN CONT switches (P5).
(b) The BUS OFF lights (P5).
(c) The ON light in the EXT PWR switch (P5).
(d) AIRPLANES WITH FIELD OFF SWITCHES INSTALED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The L (R) FIELD OFF lights (P61).

S 715-026
(22) Push the EXT PWR switch (P5).

S 715-027
(23) Make sure these lights are on:
(a) The white ON light in the EXT PWR switch (P5).
(b) The yellow OFF light in the L (R) GEN CONT switches (P5).

S 715-028

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

G. AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Field Control Relay, for the L(R) IDG

S 715-029

(1) Do a check of the field control relay for the L(R) IDG:
  (a) Push the L GEN CONT switch (P5) to the OFF position.
    1) Make sure the yellow OFF light in the switch, stays 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 stays on.
    2) Make sure the white R FIELD OFF light (P61) is on.
  (c) Make sure the ELEC/HYD page shows on the bottom EICAS display.
  (d) Make sure these indications show on the lower EICAS display:

    1) For the left power channel,
      AC-V = 0
      FREQ = 0.
    2) For the right power channel,
      AC-V = 0
      FREQ = 0.
  (e) Push the L GEN FIELD switch (P61).
    1) Make sure the L FIELD OFF light in the switch goes off.
  (f) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
  (g) Make sure these indications show on the lower EICAS display:

    1) For the left power channel,
      AC-V = 115 ± 5
      FREQ = 400 ± 5.
    2) For the right power channel,
      AC-V = 0
      FREQ = 0.

(h) Push the R GEN FIELD switch (P61).
    1) Make sure the OFF light, in the switch, goes off.
(i) Make sure the yellow OFF light, in the R GEN CONT switch (P5), is on.
(j) Make sure these indications show on the lower EICAS display:

    1) For the left power channel,
       AC-V = 115 ± 5
       FREQ = 400 ± 5.
    2) For the right power channel,
       AC-V = 115 ± 5
       FREQ = 400. ± 5
(k) Push the L GEN FIELD switch (P61).
    1) Make sure the white FIELD OFF light, in the switch, comes on.
(l) Make sure the yellow OFF light, in the L GEN CONT switch (P5), stays on.
(m) Make sure these indications show on the lower EICAS display:

    1) For the left power channel,
       AC-V = 0
       FREQ = 0.
    2) For the right power channel,
       AC-V = 115 ± 5
       FREQ = 400 ± 5.
(n) Push the R GEN FIELD switch (P61).
    1) Make sure the white FIELD OFF light, in the switch, comes on.
(o) Make sure the yellow OFF light, in the R GEN CONT switch (P5), stays on.
(p) Make sure these indications show on the lower EICAS display:

    1) For the left power channel,
       AC-V = 0
       FREQ = 0,
    2) For the right power channel,
       AC-V = 0
       FREQ = 0.
(q) 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.
(r) Push the R GEN FIELD switch (P61), two times.
    1) Make sure the FIELD OFF light, stays off, after each time the switch is pushed.
(s) Push the R GEN CONT switch (P5), to the OFF position.
    1) Make sure the yellow OFF light, in the switch, comes on.
(t) Push the L GEN CONT switch (P5), to the ON position.
    1) Make sure the OFF light, in the switch, goes off.
(u) Make sure the L FIELD OFF light (P61), is off.

(v) Push the L GEN FIELD switch (P61),two times.
1) Make sure the FIELD OFF light stays off, each time the switch is pushed.
(w) Push the L GEN CONT switch (P5), to the OFF position.
1) Make sure the yellow OFF light, in the switch, comes on.

H. AIRPLANES WITH NO FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Field Control Relay, for the L(R) IDG

S 715-067
(1) Do a check of the field control relay for the L(R) IDG:
(a) Push the L GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch, stays on.
(b) Push the R GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch stays on.
(c) Make sure the ELEC/HYD page shows on the bottom EICAS display.
(d) Make sure these indications show on the lower EICAS display:

1) For the left power channel,
AC-V = 0
FREQ = 0.
2) For the right power channel,
AC-V = 0
FREQ = 0.
(e) Push the L GEN CONT switch (P5), to the ON position.
1) Make sure the OFF light, in the switch, goes off.
(f) Make sure these indications show on the lower EICAS display:

1) For the left power channel,
AC-V = 115 ± 5
FREQ = 400 ± 5.
2) For the right power channel,
AC-V = 0
FREQ = 0.
(g) Push the R GEN CONT switch (P5), to the ON position.
1) Make sure the OFF light, in the switch, goes off.
(h) Make sure these indications show on the lower EICAS display:

1) For the left power channel,
AC-V = 115 ± 5
FREQ = 400 ± 5.
2) For the right power channel,
AC-V = 115 ± 5
FREQ = 400. ± 5
(i) Push the L GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.
(j) Push the R GEN CONT switch (P5) to the OFF position.
1) Make sure the yellow OFF light in the switch comes on.

(k) Make sure these indications show on the lower EICAS display:

1) For the left power channel,
AC-V = 0
FREQ = 0.
2) For the right power channel,
AC-V = 0
FREQ = 0.

I. Bus Tie Breakers, and Generator Circuit Breakers

S 715-030

(1) Do a check on the field control relay, for the L (R) IDG:
(a) Push the R GEN CONT switch (P5), to the OFF position.
1) Make sure the yellow OFF light, in the switch, stays on.
(b) Push the L GEN CONT switch (P5), to the OFF position.
1) Make sure the yellow OFF light in the switch stays on.
2) Make sure these indications show on the EICAS display:
a) L GEN OFF - (level C message)
b) R GEN OFF - (level C message)
(c) Push the right BUS TIE switch (P5), to the ISLN position.
1) Make sure these lights are on:
a) The yellow ISLN light, in the right BUS TIE switch (P5).
b) The yellow right BUS OFF light (P5).
c) The yellow OFF light, in the R GEN CONT switch (P5).
2) Make sure these indications show on the EICAS display:
a) R AC BUS OFF - (level B message)
(d) Push the R GEN CONT switch (P5), to the ON position.
1) Make sure these lights are off:
a) The OFF light, in the R GEN CONT switch (P5).
b) The right BUS OFF light (P5).
2) Make sure the yellow ISLN light, in the right BUS TIE switch (P5), stays on.
3) Make sure the R GEN OFF, or the R AC BUS OFF indication does not show on the EICAS display.
4) Make sure the R BUS ISOLATED indication shows on the EICAS display.
(e) Push the right BUS TIE switch (P5), to the AUTO position.
1) Make sure the ISLN light, in the switch, goes off.
2) Make sure the R BUS ISOLATED indication does not show on the EICAS display.
(f) Push the left BUS TIE switch (P5), to the ISLN position.
1) Make sure these lights are on:
a) The yellow ISLN light, in the left BUS TIE switch (P5).
b) The left BUS OFF light (P5).
c) The yellow OFF Light, in the L GEN CONT switch (P5).
2) Make sure these indications show on the EICAS display:
a) L AC BUS OFF - (level B message)
b) L BUS ISOLATED - (level C message)

c) L GEN OFF - (level C message)

(g) Push the L GEN CONT switch (P5), to the ON position.
1) Make sure these lights are off:
a) The OFF light, in the L GEN CONT switch (P5).
b) The left BUS OFF light (P5).
c) The ON light, in the EXT PWR switch (P5).
2) Make sure the yellow ISLN light, in the left BUS TIE switch stays on.
3) Make sure the L GEN OFF, or the L AC BUS OFF message does not show on the EICAS display.
4) Make sure L BUS ISOLATED shows on the EICAS display.
(h) Push the left BUS TIE switch (P5), to the AUTO position.
1) Make sure the ISLN light, in the switch goes off.
2) Make sure L BUS ISOLATED does not show on the EICAS display.

J. Engine Shutdown

S 715-031
(1) Prepare to do the engine shutdown procedure:
(a) Push the L GEN CONT switch (P5), to the ON position.
1) Make sure the OFF light, in the switch, is off.
(b) Push the R GEN CONT switch (P5), to the ON position.
1) Make sure the OFF light, in the switch, is off.
(c) Make sure the ON light, in the EXT PWR switch (P5), is off.

S 715-032
(2) Stop the left engine (Ref 71-00-00).
(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 the left BUS OFF light, stays off.
(e) Make sure the L AC BUS OFF, the L GEN OFF, or the L GEN DRIVE indication does not show on the EICAS display.

S 715-033
(3) Stop the right engine (Ref 71-00-00).
(a) Make sure the yellow DRIVE light, in the L (R) GEN DRIVE DISC switches (P5), are on.
(b) Make sure these lights are on:
1) The yellow OFF light, in the L (R) GEN CONT switches (P5).
2) The yellow BUS OFF lights (P5).

K. Switch Check with External Power and APU Generator

S 715-034
(1) Do a check with the external power, and the APU generator:
(a) Shutdown the APU if it is running (AMM 49-11-00/201).
(b) Supply external power to the main ac buses (Ref 24-22-00).

(c) Push the APU GEN switch (P5), to the OFF position.
  1) Make sure the yellow OFF light, in the switch, is on.
  2) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
     Make sure the white APU FIELD OFF light (P61), is on.

(d) Set the selection switch, on the EICAS select panel (P9), to the AUTO position.
  1) Make sure the APU GEN OFF message shows on the EICAS display.

(e) Push the APU GEN switch (P5), to the ON position.
  1) Make sure the OFF light, in the APU GEN switch (P5), is off.
  2) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
     Make sure the white APU FIELD OFF light (P61), is off.
  3) Make sure APU GEN OFF does not show on the EICAS display.

(f) Start the APU (Ref 49-11-00).
  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) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
        The APU FIELD OFF light (P61).
  2) Make sure the ON light, in the EXT PWR switch (P5), is on.

(g) 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) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
        The white APU FIELD OFF light (P61).
  2) Make sure APU GEN OFF (level C message) shows on the EICAS display after 5 seconds.

(h) Push the APU GEN switch (P5), to the ON position.
  1) Make sure the OFF light in the APU GEN switch (P5) is off.
  2) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
     Make sure the APU FIELD OFF light (P61), is off.
  3) Make sure the white ON Light, in the EXT PWR switch (P5), is on.
  4) Make sure APU GEN OFF does not show on the EICAS display.

(i) Push the EXT PWR switch (P5).
  1) Make sure these lights are off:
     a) The ON light, in the EXT PWR switch (P5).
     b) The OFF light, in the APU GEN switch (P5).
     c) The two BUS OFF lights (P5).

(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 yellow BUS OFF lights (P5).

c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The white APU FIELD OFF light (P61).

2) Make sure the ON light, in the EXT PWR switch, is off.

(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 ON light, in the EXT PWR switch (P5).
d) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The APU FIELD OFF light (P61).

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

1) Make sure the white ON light, in the switch, comes on.
2) Make sure the OFF light in the APU GEN switch (P5) does not come on.
3) Make sure these lights are off:
a) The two BUS OFF lights (P5).
b) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The APU FIELD OFF light (P61).

L. Field Control Relay, for the APU Generator

S 715-035

(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) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
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, after 5 seconds.

(b) Push the selection switch for the ELEC/HYD indication on (P61).

(c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Push the for 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 APU GEN OFF shows on the EICAS display.
4) Make sure the indications for the APU power channel shows on the lower EICAS display:
a) AC-V = 110 to 123
FREQ = 400 ± 5

(d) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
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 indications for the APU power channel show on the lower EICAS display:
a) AC-V = 0
FREQ = 0

(e) 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) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
The APU FIELD OFF light (P61).
2) Make sure the indications for the APU power channel show on the lower EICAS display:
a) AC-V = 110 to 123
FREQ = 400 ± 5
3) Make sure APU GEN OFF does not show on the EICAS display.

(f) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Push the APU GEN FIELD switch (P61) two times.
1) Make sure the FIELD OFF light stays off, after each push.

M. Engine Start with APU Power and Switch Check

S 715-036

(1) Do a check of the switches during the engine start with the APU power:
(a) Push the APU GEN switch (P5), to 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.
2) Make sure the two BUS OFF lights (P5), are off.
(c) Push the L (R) UTILITY BUS switches (P5), to the OFF position.
1) Make sure the yellow OFF light in each switch comes on.
(d) 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)
(e) Push the L (R) UTILITY BUS switches (P5), to the ON position.
1) Make sure the yellow OFF light, in each switch, goes off.
2) Make sure L UTIL BUS OFF, or R UTIL BUS OFF are not shown.
(f) Set the COUNTER LIGHT switch on the forward galley switch panel, to ON.
1) Make sure the counter light on the forward galley, is on.
(g) Set the COUNTER LIGHT switch at aft galley switch panel, to ON.
1) Make sure the counter light on the aft galley, is on.

(h) Make sure the L (R) GEN CONT switches (P5), are ON.
    1) Make sure the yellow OFF light, in each switch, is on.
(i) Make sure the yellow DRIVE lights in the L (R) GEN DRIVE DISC switches (P5), are on.
(j) Start the left engine with the APU (Ref 71-00-00).
    1) Make sure these results occur for approximately 30 seconds during the left engine start:
        a) The yellow OFF light in the L (R) UTILITY BUS switches (P5), come on.
        b) the counter lights at the forward and the aft galleys, are off.
        c) The two BUS OFF lights (P5), are off.
(k) 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 L GEN CONT switch (P5), is off.
    3) The two BUS OFF lights (P5), are off.
    4) The OFF light in APU GEN switch (P5), is off.
    5) The OFF light, in the L (R) UTILITY BUS switches (P5), are off.
    6) The counter lights at the forward and the aft galleys are on.
(l) Push the APU GEN switch (P5), to the OFF position.
    1) Make sure the yellow OFF light in the switch, comes on.
    2) Make sure these lights are off:
        a) The OFF light, in L GEN CONT switch (P5).
        b) The two BUS OFF lights (P5).
        c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
           The left FIELD OFF light (P61).
    3) Make sure the yellow OFF light, in the R GEN CONT switch (P5), stays on.
(m) Push the APU GEN switch (P5), to the ON position.
    1) Make sure the OFF light in the switch, goes off.
    2) Make sure these lights are off:
        a) The OFF light in L GEN CONT switch (P5).
        b) The two BUS OFF lights (P5).

c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; The L (R), and APU FIELD OFF lights (P61).

3) Make sure the yellow OFF light, in the R GEN CONT switch (P5), stays on.

4) Make sure the yellow DRIVE light, in the R GEN DRIVE DISC switch (P5), is on.

(n) Start the right engine with the APU (Ref 71-00-00).

1) Make sure these results occur for approximately 30 seconds during the right engine start:

a) The yellow OFF light in the R UTILITY BUS switch (P5), comes on.

b) The OFF light in the L UTILITY BUS switch (P5), stays off.

c) The counter light at the aft galley is on.

d) The counter light at the forward galley is off.

e) The two BUS OFF lights (P5), stay off.

(o) One minute after the right engine start, make sure these results occur:

1) The DRIVE light, in the L (R) GEN DRIVE DISC switches (P5), are off.

2) The OFF light, in the L (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 light, in the L (R) UTILITY BUS switches (P5) are off.

6) The counter lights at the forward and aft galleys are on.

(p) Push the APU GEN switch (P5), to the OFF position.

1) Make sure the yellow OFF light in the switch comes on.

2) Make sure these lights are off:

a) The OFF light, in the L (R) GEN CONT switches (P5).

b) The two BUS OFF lights (P5).

c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; The left and the right FIELD OFF lights (P61).

(q) Push the APU GEN switch (P5), to the ON position.

1) Make sure the OFF light in the switch goes off.

2) Make sure these lights are off:

a) The OFF light, in the L (R) GEN CONT switches (P5).

b) The two BUS OFF Lights (P5).

c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; The L (R) and APU FIELD OFF lights (P61).

N. Engine Shutdown with APU Generator

S 715-041

(1) Do the engine shutdown with the APU generator procedure:

(a) Stop the left engine (Ref 71-00-00).

1) Make sure the yellow DRIVE light, in the L GEN DRIVE DISC switch (P5), is on.

2) Make sure the DRIVE light, in the R GEN DRIVE DISC switch (P5), is off.
3) Make sure the yellow OFF light, in the L GEN CONT switch (P5), is on.
4) Make sure these lights are off:
a) The OFF light, in the APU and R GEN CONT switches (P5).
b) The two BUS OFF lights (P5).

(b) Stop the right engine (Ref 71-00-00).
1) Make sure the yellow DRIVE light, in the L (R) GEN DRIVE DISC switches (P5), are on.
2) Make sure the yellow OFF light, in the L (R) GEN CONT switches (P5), are on.
3) Make sure these lights are off:
a) The OFF light, in the APU GEN switch (P5).
b) The two BUS OFF lights (P5).
c) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL; The white APU FIELD OFF light (P61).
4) Push the EXT PWR switch (P5).
a) Make sure the ON light, in the switch, is on.

(c) Shutdown the APU (Ref 49-11-00).
1) Make sure these lights are off:
a) The OFF light in the APU GEN switch (P5).
b) The two BUS OFF lights (P5).

O. Restore Airplane to Normal

S 865-042
(1) Remove electrical power, if it is not necessary (Ref 24-22-00).
(a) Put the BAT switch (P5), to the OFF position.

TASK 24-22-00-735-057

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) 24-22-00/201, Electrical Power - Control
(2) 27-61-00/201, Spoiler/Speedbrake Control System
(3) 31-41-00/501, Engine Indicating and Crew Alerting System (EICAS)
(4) 32-09-02/201, Air/Ground Relays
(5) 49-11-00/501, Auxiliary Power Unit (APU)
(6) 71-00-00/501, Power Plant

C. Access
(1) Location Zones
212 Flight Compartment (RH Side)

D. Equipment
(1) Adapter - A24004-2.

(2) Multimeter - 0-1000 VDC, 0-750 VAC, 0-2 amps, 0-20 megohms

E. Air Mode Test

S 845-061

WARNING: REFER TO AMM 32-09-02/201 FOR FLIGHT MODE SIMULATION. IF YOU DO NOT FOLLOW THE INSTRUCTIONS, INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(1) Put the system number 1 and 2 air/ground relays in the flight mode (AMM 32-09-02/201).

S 015-044

(2) Open the access cover on the external power panel P30.

S 865-045

(3) Install the power cable, in the external power receptacle.
  (a) Use a cargo tie down for cable support.
  (b) Energize the power cable.

S 865-046

(4) Supply integrated drive generator power to the main ac buses (AMM 24-22-00/201).

S 725-047

(5) 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) Set the two BUS TIE switches (P5) to the AUTO position.
    1) Make sure the ISLN light, in each switch, is off.
  (c) Push the R GEN CONT switch on the P5 to the OFF position.
    1) Make sure the yellow OFF light, in the switch, comes on.
    2) Make sure these lights are off:
      a) The OFF light in the L GEN CONT switch (P5).
      b) The two BUS OFF lights (P5).
      c) The ON light in the EXT PWR switch (P5).
  (d) Push the EXT PWR switch (P5).
    1) Make sure these lights on the P5 panel are off:
      a) The ON light in the EXT PWR switch.
      b) The OFF light in the L GEN CONT switch.
      c) The two BUS OFF lights.
  (e) 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 two yellow BUS OFF lights (P5) come on.
    3) Make sure the ON light in the EXT PWR switch (P5) is off.
  (f) Push the R GEN CONT switch (P5) to the ON position.
    1) Make sure these lights are off:
      a) The OFF light in the R GEN CONT switch (P5).
      b) The two BUS OFF lights (P5).

(g) Push the EXT PWR switch (P5).
    1) Make sure these lights stay off:
        a) The ON light in the EXT PWR switch (P5).
        b) The two BUS OFF lights (P5).
        c) The OFF light in the R GEN CONT switch.
(h) Push the L GEN CONT switch (P5) to the ON position.
    1) Make sure these lights are off:
        a) The OFF light in the L and R GEN CONT switch (P5).
        b) The two BUS OFF lights (P5).
        c) The ON light in the EXT PWR switch.
(i) Push the EXT PWR switch (P5).
    1) Make sure these lights are off:
        a) The OFF light in the L and R GEN CONT switch (P5).
        b) The two BUS OFF lights (P5).
        c) The ON light in the EXT PWR switch.
(j) Push the GRND SERV BUS switch on the forward attendant's panel P21.
    1) Make sure the light in the switch stays off.
(k) Push the L GEN CONT switch (P5) to the OFF position.
    1) Make sure the yellow OFF light in the switch comes on.
(l) Push the R GEN CONT switch (P5) to the OFF position.
    1) Make sure the yellow OFF light in the switch comes on.
    2) Make sure the two yellow BUS OFF lights are on.
(m) Push the GRND SERV BUS switch on the forward attendant's panel P21.
    1) Make sure the light in the switch stays off.
(n) Start the APU (AMM 49-11-00/201).
(o) Make sure the yellow OFF light in the APU GEN switch (P5) stays on.
(p) Push the APU GEN switch (P5) to the ON position.
    1) Make sure these lights are off:
        a) The two BUS OFF lights (P5).
    2) The OFF light in the APU GEN switch (P5).
    3) Make sure the yellow OFF lights in the L and R GEN CONT switches (P5) stay on.
(q) Push the L GEN CONT switch (P5) to the ON position.
    1) Make sure these lights are off:
        a) The OFF lights in the L GEN CONT and APU GEN switches.
        b) The two BUS OFF Lights (P5).
    2) Make sure the yellow OFF light in the R GEN CONT switch (P5) stays on.
(r) Push the GRND SERV BUS switch (P21).
    1) Make sure that the light in the switch stays off.
(s) Push the R GEN CONT switch (P5) to ON.
    1) Make sure these lights are off:
        a) The OFF lights on the L, R and APU GEN switches (P5).
        b) The two BUS OFF lights (P5).

(t) Shutdown the left engine (AMM 71-00-00/201).
1) Make sure the yellow DRIVE light in the L GEN DRIVE DISC switch (P5) comes on.
2) Make sure the yellow OFF light in the L GEN CONT switch (P5) is on.
3) Make sure these lights are off:
a) The OFF lights in the R and APU GEN switches (P5).
b) The two BUS OFF lights (P5).
(u) Shutdown the right engine (AMM 71-00-00/201).
1) Make sure the yellow DRIVE light in the R GEN DRIVE DISC switch (P5) comes on.
2) Make sure the yellow OFF lights in the L and R GEN CONT switches (P5) are on.
3) Make sure these lights are off:
a) The OFF light in the APU GEN switch (P5).
b) The two BUS OFF lights (P5).
(v) Remove the APU generator power from the main ac buses.
(w) Remove the power from the external power cable.

S 845-049
(6) Put the airplane in the ground mode (AMM 32-09-02/201).

F. Autoland Mode Test

S 725-050
(1) Do a check of the autoland mode:
(a) Remove the electrical power from the main ac buses (AMM 24-22-00/201).
(b) Open these circuit breakers in the P11 panel and attach the DO-NOT-CLOSE tag:
1) 11D6, CAT III BUS ISOL BAT
2) 11R3, CAT III BUS ISOL LEFT
3) 11R30, CAT III BUS ISOL RIGHT

WARNING: DO NOT OPEN THE MAIN POWER DISTRIBUTION PANEL P6 WHEN THE ELECTRICAL POWER IS ON THE AIRPLANE. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(c) Open the main power distribution panel P6.

(d) Remove the ISOLATION REQUEST RELAY, K122, in the P6.
    1) Keep the ISOLATION REQUEST RELAY for the installation.
(e) Install the adapter in the location of the ISOLATION REQUEST RELAY, K122, in the P6 panel.
    1) Set the switch on the relay adapter to the ON position.
(f) Close the P6 panel.
(g) Supply integrated drive generator power to the main ac buses (AMM 24-22-00/201).
(h) Make sure the Left and Right BUS TIE switches on the P5 panel are in the AUTO position.
    1) Make sure the ISLN light in each BUS TIE switch is off.
(i) Make sure the L and R main AC BUS OFF lights (P5) are off.

WARNING: BE CAREFULL WHEN YOU WORK IN THE P11 PANEL.
HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY TO PERSONS.

(j) Open the P11 panel to get access to the circuit breaker terminals.
    1) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21 or 11E20) on P11.
    2) Measure 115 +/- 5 volts AC at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20 or 11E19) on P11 .
(k) Open the CENTER BUS AC circuit breaker (6K17 or 31EG3).
(l) Open the CENTER BUS PWR circuit breaker (6C09) on the P6 panel.
(m) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21 or 11E20) on P11.
(n) Measure 0 +/- 5 volts AC at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20 or 11E19) 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 P11 panel, CAT III BUS ISOL L (11R3).
(t) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21 or 11E20) on P11.
(u) Measure 115 +/- 5 volts AC at terminal 1 of the FLT CONT CMPTR PWR C circuit breaker (11E20 or 11E19) on P11 .
(v) Open this circuit breaker on the P6 panel, CENTER BUS CONT (6GO6).

(w) Measure 0 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21 or 11E20) on P11.
(x) Close the CENTER BUS CONT circuit breaker (6G6) on the P6 panel.
(y) Open the CAT III BUS ISOL L circuit breaker (11R3) 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 (11R30) on the P11 panel.
(ag) Measure 28 ±3 volts dc at terminal 1 of the FLT CONT CMPTR SERVO C circuit breaker (11E21 or 11E20) on P11.
(ah) Open the CAT III BUS ISOL R circuit breaker (11R30) 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 or 11E20) 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 or 11E20) 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 or 11E20) on P11.
(av) Open the CAT III BUS ISOL BAT (11D6) breaker.

(aw) Set the switch on the adapter for the Isolation Request relay to the OFF position.
(ax) Remove the integrated drive generator power from the main ac buses (AMM 24-22-00/201).

WARNING: DO NOT OPEN THE MAIN POWER DISTRIBUTION PANEL P6 WHEN ELECTRICAL POWER IS ON THE AIRPLANE. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(ay) Open the P6 panel.
(az) Remove the adapter for the ISOLATION REQUES RELAY, K122, from the P6 panel.
(ba) Install the ISOLATION REQUEST RELAY, K122, in the P6 panel.
(bb) Close the P6 panel.
(bc) Remove the DO-NOT-CLOSE tags and close these P11 panel circuit breakers:
1) 11D6, CAT III BUS ISOL BAT
2) 11R3, CAT III BUS ISOL LEFT
3) 11R30, CAT III BUS ISOL RIGHT
(bd) Close the CENTER BUS AC circuit breaker (6K17 or 31EG3).
(be) Close the CENTER BUS PWR circuit breaker (6C09) on the P6 panel.

G. Test Autoland DC Tie

S 725-052

(1) Do a check of the autoland dc tie:
(a) Remove the electrical power from the main ac buses.
(b) Push the BAT switch on the P5 panel, to the OFF position.
(c) Attach a DO-NOT-OPERATE tag on the BAT switch (P5).

WARNING: DO NOT OPEN THE MAIN POWER DISTRIBUTION PANEL (P6) WITH POWER ON THE AIRPLANE. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(d) Open the main power distribution panel P6.
(e) Remove the isolation request relay, K122 from the P6 panel.
1) Keep the isolation request relay for the installation.
(f) Install the adapter, for the isolation request relay, in the K122 location in the P6 panel.
1) Set the switch on the relay adapter to the ON position.

(g) Close the P6 panel.
(h) Remove the DO-NOT-OPERATE tag from the BAT switch (P5).
(i) Make sure these circuit breakers on the P11 panel are closed:
1) 11D6, CAT III BUS ISOL BAT
2) 11Q6, F/O INST TRANSFER CONT
3) 11Q7, F/O INST TRANSFER ALTN BUS ϕA
4) 11Q8, F/O INST TRANSFER ALTN BUS ϕB
5) 11Q9, F/O INST TRANSFER ALTN BUS ϕC
6) 11Q33, CAPT INST TRANSFER CONT
7) 11Q34, CAPT INST TRANSFER ALTN BUS ϕA
8) 11Q35, CAPT INST TRANSFER ALTN BUS ϕB
9) 11Q36, CAPT INST TRANSFER ALTN BUS ϕC
10) 11R3, CAT III BUS ISOL LEFT
11) 11R30, CAT III BUS ISOL RIGHT
(j) Make sure these circuit breakers on the P6 panel are closed:
1) 6M16, CAPT PRIM INST BUS ϕA
2) 6M17, CAPT PRIM INST BUS ϕB
3) 6M18, CAPT PRIM INST BUS ϕC
4) 6M22, F/O PRIM INST BUS ϕA
5) 6M23, F/O PRIM INST BUS ϕB
6) 6M24, F/O PRIM INST BUS ϕC
(k) Make sure these circuit breakers are closed:
1) 6A17 or 31EC02, 115V AC BUS LEFT SEC 2
2) 6A23 or 32EB02, 115V AC BUS RIGHT SEC 2

S 865-053
(2) Supply external power to the left main ac bus (Ref 24-22-00).

S 865-054
(3) Supply IDG power to the right main ac bus (Ref 24-22-00).

S 725-055
(4) Do these steps:

CAUTION: MAKE SURE THE YELLOW DRIVE LIGHT IN THE GEN DRIVE DISC SWITCH STAYS OFF WHILE THE ENGINE OPERATES. IF THE DRIVE LIGHT COMES ON WHILE THE ENGINE OPERATES, PUSH THE GEN DRIVE DISC SWITCH (P5). IF YOU OPERATE THE GENERATOR WITH THE LIGHT ON, THE GENERATOR CAN BE DAMAGED.

(a) Make sure the DRIVE light in the R GEN DRIVE DISC switch (P5) is off, when the engine operates.
1) Push the GEN DRIVE DISC switch if the yellow DRIVE light comes on.
2) Stop the engine (Ref 71-00-00).
3) Isolate the problem which caused the DRIVE light to come on.

(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) Make sure the EICAS system operates (Ref 31-41-00).
(d) Push the STATUS switch on the EICAS select panel located on the forward control stand P9.
(e) Make sure the TR UNIT, CAPT INSTR XFER, and F/O INSTR XFER messages are not displayed on the lower EICAS display unit.
(f) Open this circuit breaker:
1) 6M16, CAPT PRIM INSTR BUS ϕA
(g) Push the STATUS switch on the EICAS select panel.
(h) Make sure the CAPT INSTR XFER, and the TR UNIT messages show on the lower EICAS display unit.
(i) Close this circuit breaker:
1) 6M16 CAPT PRIM INSTR BUS ϕA
(j) Make sure CAPT INSTR XFER and TR UNIT do not show on the lower EICAS display unit.
(k) Open this circuit breaker:
1) 6M16 F/O PRIM INSTR BUS ϕA
(l) Push the STATUS switch on the EICAS select panel.
(m) Make sure F/O INSTR XFER and TR UNIT show on the lower EICAS display unit.
(n) Close this circuit breaker:
1) 6M22 F/O PRIM INSTR BUS ϕA
(o) Make sure F/O INSTR XFER and TR UNIT do not show on the lower EICAS display unit.

S 845-056
(5) Restore airplane to normal.
(a) Remove the IDG power from the right main ac buses.
(b) Remove the external power from the left main ac bus.
(c) Make sure the BAT switch (P5) is set to the OFF position.
(d) Attach a DO-NOT-OPERATE tag on the BAT switch (P5).

WARNING: DO NOT OPEN THE MAIN POWER DISTRIBUTION PANEL P6 WITH POWER ON THE AIRPLANE. HIGH VOLTAGE IN THE PANEL CAN CAUSE INJURY.

(e) Open the P6 panel.
(f) Set the switch on the adapter for the isolation request relay (installed on the P6) to the OFF position.
(g) Remove the adapter for the isolation request relay from the P6 panel.
(h) Install the isolation request relay, K122 in the P6 panel.
(i) Close the P6 panel.
(j) Remove the DO-NOT-OPERATE tag from the BAT switch (P5).

TASK 24-22-00-745-058

4. BPCU BITE/Periodic Test

NOTE: This is a scheduled maintenance task.

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Prepare for the Test

S 865-065
(1) Supply electrical power to the 115V ac buses (AMM 24-22-00/201).

NOTE: The BPCU BITE procedure can be run with battery power.

C. Procedure

S 015-072
(1) Open the forward cargo door, 821.

S 015-073
(2) Remove the forward cargo compartment bulkhead panel.

S 745-059
(3) Do the PERIODIC TEST:
(a) Momentarily push the PERIODIC TEST switch on the BPCU (E5-3).
1) Make sure these indications show 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

NOTE: The above sequence is shown when the power system has no fault. If a fault is found, the applicable fault message will be displayed in place of the OK message.

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

(b) Push the RESET switch on the front of the BPCU.
1) Make sure the indication sequence shows on the BPCU:
a) EXTERNAL POWER SYSTEM
b) LEFT GEN POWER SYSTEM
c) RIGHT GEN POWER SYSTEM
d) APU GEN POWER SYSTEM

S 415-074

(4) Install the forward cargo compartment bulkhead panel.

S 415-075

(5) Close the forward cargo door, 821.

S 865-066

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

ELECTRICAL SYSTEM CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the electrical system control panel from the airplane. The second task installs the electrical system control panel on the airplane.

TASK 24-22-01-024-001

2. Remove 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. Remove the control panel as follows:

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

          S 864-004
      (3) Make sure the BAT switch on the P5 panel is off and attach a DO NOT OPERATE tag.

          S 024-005
      (4) Remove the control panel.

TASK 24-22-01-424-006

3. Install the Electrical System Control Panel
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zones
211/212 Flight Compartment

C. Install the control panel as follows:

S 424-007
(1) Install the electrical system control panel.

S 864-008
(2) Remove the DO NOT OPERATE tag from the BAT switch on the P5 panel and make sure the BAT switch is in the on postion.

D. Do a test of the Control Panel Installation.

S 864-009
(1) Supply external ac power to the ground handling bus (AMM 24-22-00/201).

S 714-010
(2) Make sure the APU GEN switch on the P5 panel is off.

S 864-011
(3) Make sure the two BUS TIE switches on the P5 panel are off.

S 714-012
(4) Make sure the lights on P5 panel that follow 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 right and the left GEN CONT switches,
(e) The white AVAIL light in the EXT PWR switch.

S 864-013
(5) 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. The APU generator control unit (GCU) is installed on shelf 3 of the mid equipment center rack E5. The right GCU is installed on shelf 2 of the E5 rack. The left GCU is installed on shelf 1 of the E5 rack. The removal/installation procedures are the same for all units.
   B. This procedure has two tasks. The first task removes the generator control units from the airplane. The second task installs the generator control units on the airplanes.

TASK 24-22-02-004-002

2. Remove the Generator Control Units
   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
      (4) AMM 27-61-00/201, Spoiler/Speedbrake Control System
      (5) AMM 49-11-00/201, Auxiliary Power Unit
   B. Access
      (1) Location Zones

122	Forward Cargo Compartment
119/120	Main Equipment Center
211/212	Flight Compartment

      (2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door Access Panel

   C. Remove the Generator Control Units

S 024-003

      (1) Do these steps to remove the Generator Control Units.

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 INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

         (a) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.
         (b) Make sure the engines and APU are not in operation (AMM 49-11-00/201).
         (c) Open this circuit breaker and attach the DO-NOT-CLOSE tag:
            1) On the main power distribution panel P6:
               a) 6A1, BAT BUS DISTR

(d) Open the forward cargo door, 821.
(e) Remove the forward cargo compartment bulkhead panel.

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.

(f) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

WARNING: DO NOT REMOVE OR INSTALL THE GENERATOR CONTROL UNITS WHEN THE ENGINES OR APU ARE IN OPERATION. HIGH VOLTAGE AT THE CONNECTOR CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(g) Remove the generator control unit (AMM 20-10-01/401).

TASK 24-22-02-404-004

3. Install the Generator Control Units

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
(4) AMM 27-61-00/201, Spoiler/Speedbrake Control System
(5) AMM 49-11-00/201, Auxiliary Power Unit

B. Access
(1) Location Zones
119/120 Main Equipment Center
122 Forward Cargo Compartment
211/212 Flight Compartment
(2) Access Panels
122AZ Forward Cargo Compartment Bulkhead Panel
821 Forward Cargo Door Access Panel

C. Install the Generator Control Units

S 424-005
(1) Do these steps to install the generator control units.

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 INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(a) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.
(b) Make sure this circuit breaker is open:
1) On the main power distribution panel P6:
a) 6A1, BAT BUS DISTR

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.

(c) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

WARNING: DO NOT REMOVE OR INSTALL THE GENERATOR CONTROL UNITS WHEN THE ENGINES OR APU ARE IN OPERATION. HIGH VOLTAGE AT THE CONNECTOR CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(d) Install the generator control units (AMM 20-10-01/401).
(e) Remove the DO-NOT-CLOSE tags and close this circuit breaker:
1) On the main power distribution panel P6:
a) 6A1, BAT BUS DISTR

S 714-007
(2) Do the steps that follow to do a test of the left generator control unit:
(a) Supply external power to the ac ground handling bus (AMM 24-22-00/201).
(b) Push the BAT switch on the pilot's overhead panel, P5, to the ON position (latched-in position).
(c) Make sure the left BUS TIE switch on the P5 panel is off (out position).
1) Make sure the yellow ISLN light in the switch is on.
(d) Push the EXT PWR switch on the P5 panel.
1) Make sure the white ON light in the switch comes on.
(e) Push the left BUS TIE switch to the AUTO position (latched-in position).
1) Make use the yellow left BUS OFF light on the P5 panel goes off.
(f) Push the left BUS TIE switch to off (out position).
1) Make sure the amber ISLN light in the switch is on.

(g) Push the RESET button on the bus power control unit (BPCU). (The BPCU is on shelf 3 of the mid equipment center rack E5.)
1) Make sure these messages show on the BPCU, in the sequence that follows:
a) EXTERNAL POWER SYSTEM
b) LEFT GEN POWER SYSTEM
c) RIGHT GEN POWER SYSTEM
d) APU GEN POWER SYSTEM.

(h) Install the forward cargo compartment bulkhead panel.

(i) Close the forward cargo door, 821.

(j) Remove electrical power if it is not necessary.

S 714-008

(3) Do the steps that follow to do a test of the right generator control unit:

(a) Supply external power to the ac ground handling bus (AMM 24-22-00/201).

(b) Push the BAT switch on the pilot's overhead panel, P5, to the ON position (latched-in position).

(c) Make sure the right BUS TIE switch on the P5 panel is off (out position).
1) Make sure the yellow ISLN Light in switch is on.

(d) Push the EXT PWR switch on the P5 panel.
1) Make sure the white ON light in the switch comes on.

(e) Push the BUS TIE switch to the AUTO position (latched-in position).
1) Make sure the yellow right BUS OFF light on the P5 panel goes off.

(f) Push the right BUS TIE switch to off (out position).
1) Make sure the yellow ISLN light in the switch is on.

(g) Push the RESET button on the bus power control unit (BPCU). (The BPCU is on shelf 3 of the mid equipment center rack E5.)
1) Make sure these messages show on the BPCU, in the sequence that follows:
a) EXTERNAL POWER SYSTEM
b) LEFT GEN POWER SYSTEM
c) RIGHT GEN POWER SYSTEM
d) APU GEN POWER SYSTEM.

(h) Install the forward cargo compartment bulkhead panel.
(i) Close the forward cargo door, 821.
(j) Remove electrical power if it is not necessary.

S 714-009
(4) Do the steps that follow to do a test of the APU generator control unit:
(a) Push the BAT switch on the P5 panel to the ON position (latched-in position).
(b) Make sure the two BUS TIE switches on the P5 panel are off (out position).
1) Make sure the yellow ISLN light in each switch is on.
(c) Push the APU GEN switch on the P5 panel to the ON position (latched-in position).
(d) Start the APU (AMM 49-11-00/201).
1) Make sure the OFF light in the APU GEN switch on the P5 panel stays off.
(e) Push the APU GEN switch to off (out position).
1) Make sure the yellow OFF light in the APU GEN switch is on.
(f) Stop the APU (AMM 49-11-00/201).
(g) Push the RESET button on the bus power control unit (BPCU). (The BPCU is on shelf 3 of the mid equipment center rack E5.)
1) Make sure these messages show on the BPCU, in the sequence that follows:
a) EXTERNAL POWER SYSTEM
b) LEFT GEN POWER SYSTEM
c) RIGHT GEN POWER SYSTEM
d) APU GEN POWER SYSTEM.
(h) Install the forward cargo compartment bulkhead panel.
(i) Close the forward cargo door, 821.
(j) Push the BAT switch on the P5 panel to off (out position).
(k) Remove electrical power if it is not necessary.

GENERATOR, BUS TIE, AND AUXILIARY POWER BREAKERS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks.
      (1) The first task removes the generator circuit breaker (GCB),the bus tie breaker (BTB),and the auxiliary power breaker (APB), from the airplane.
      (2) The second task installs the GCB, the BTB, and the APB, on the airplane.
         (a) These circuit breakers are the same, and this procedure is applicable for all the, GCB, BTB, and APB circuit breakers.

TASK 24-22-03-024-002

2. Remove the GCB, BTB, or APB, Circuit Breakers (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Prepare for Removal

      S 864-003

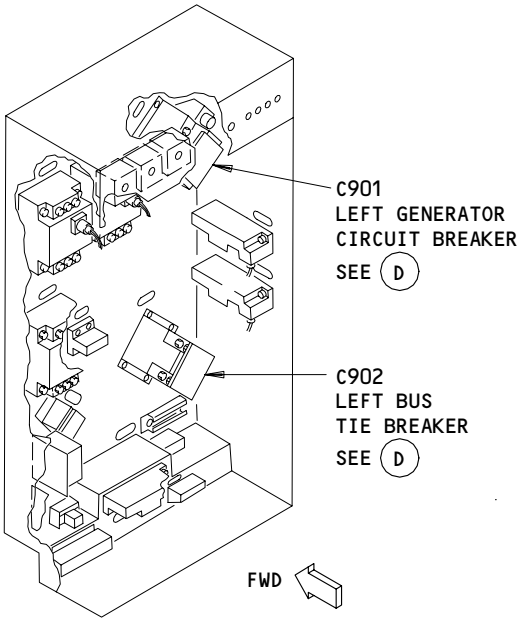
      WARNING: REMOVE ELECTRICAL POWER BEFORE REMOVING OR INSTALLING COMPONENTS LOCATED IN MAIN POWER CENTERS. HIGH VOLTAGES PRESENT CAN BE FATAL.
      REFER TO AMM 27-61-00/201 FOR APPROPRIATE SPOILER/SPEEDBRAKE DEACTIVATION PROCEDURE. INADVERTENT SPOILER MOVEMENT RESULTING FROM NEXT STEP COULD CAUSE SERIOUS INJURY TO PERSONNEL.

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

      S 864-004
      (2) Open this circuit breaker on the main distribution panel P6 and attach DO-NOT-CLOSE tag.
         (a) 6A1, BAT BUS DISTR
   C. Procedure

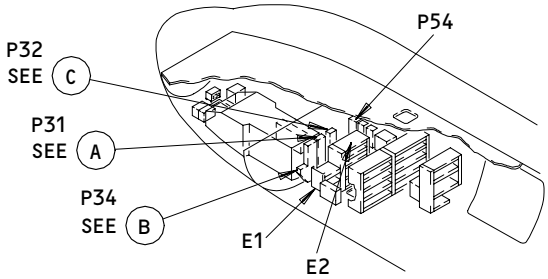
      S 024-005
      (1) Remove the circuit breaker as follows:
         (a) Open the panel to gain access to the circuit breaker that is to be removed. The circuit breakers are located as follows:##

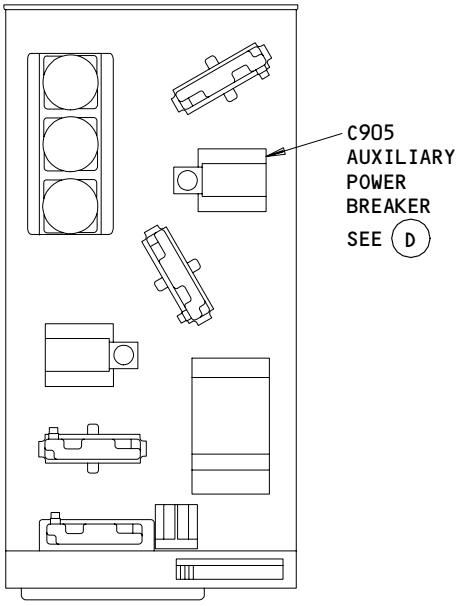
Circuit Breaker			Location
Right	GCB	C903	P32
Right	BTB	C904	P32
	APB	C905	P34
Left	GCB	C901	P31
Left	BTB	C902	P31



LEFT GENERATOR POWER PANEL P31

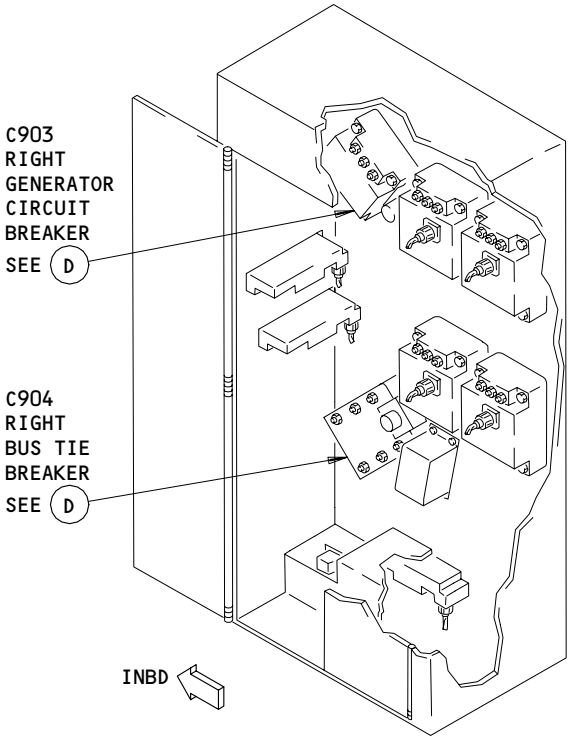
A





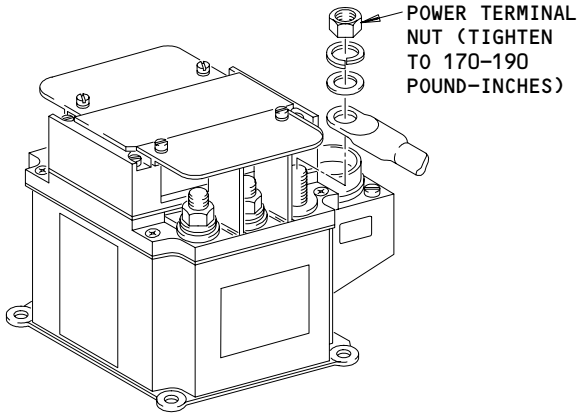
APU/EXTERNAL POWER PANEL P34

B



RIGHT GENERATOR POWER PANEL P32

C



CIRCUIT BREAKER

D

Generator, Bus Tie, and Auxiliary Power Breaker Installations
Figure 401

CAUTION: DO NOT DISTURB THE INSTALLATION OF THE TIE BUS WIRES. DISTURBING THE TIE BUS WIRES CAN CAUSE DAMAGE TO THE AIRPLANE ELECTRICAL SYSTEM.

(b) Remove auxiliary contact connector from breaker.
(c) Remove the terminal cover.
(d) Disconnect the leads and identify for installation.
(e) Remove the circuit breaker.

TASK 24-22-03-424-006

3. Install the GCB, BTB, or the APB Circuit Breakers (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Procedure

S 424-007

(1) Do these steps to install the breaker:

CAUTION: DO NOT DISTURB THE INSTALLATION OF THE TIE BUS WIRES. DISTURBING THE TIE BUS WIRES CAN CAUSE DAMAGE TO THE AIRPLANE ELECTRICAL SYSTEM.

CAUTION: CONNECT THE LEADS CORRECTLY AND SECURELY TO THE BREAKER. THE ELECTRICAL SYSTEM WILL NOT OPERATE CORRECTLY IF THE LEADS ARE NOT PROPERLY CONNECTED, AND EQUIPMENT DAMAGE CAN OCCUR.

(a) Connect the leads to the breaker.
1) Tighten the power terminal nuts to the value shown in Fig. 401.
(b) Install the terminal cover.
(c) Install the auxiliary contact connector into the breaker.

S 414-008

(2) Close the panel.

S 864-009

(3) Remove the DO-NOT-CLOSE tag and close this P6 panel circuit breaker:
(a) 6A1, BAT BUS DISTR

S 714-010

(4) Do a test of the generator, bus tie, and/or auxiliary power breaker installation:
(a) Supply electrical power (AMM 24-22-00/201).
(b) Push the BAT switch on the pilots' overhead panel P5 to ON (latched-in position).
(c) Set the L, R, and APU GEN CONT switches (P5) to OFF (out position).
1) Make sure the amber OFF light in each switch is on.

(d) Make sure the two BUS TIE switches (P5) are set to the ISLN (out position).
1) Make sure the amber ISLN light in each switch is on.
(e) Make sure the amber L and R BUS OFF lights (P5) are on.
(f) Push the two BUS TIE switches (P5) to the AUTO (latched-in) position.
1) Make sure the ISLN light in each BUS TIE switch is off.
(g) Make sure the amber OFF lights in the L, R, and APU GEN CONT switches (P5) are on.
(h) Make sure the amber L and R BUS OFF lights (P5) are off.
(i) Push the BAT switch (P5) to off (out position).

S 864-011
(5) Remove electrical power (AMM 24-22-00/201) if it is not necessary.

GENERATOR FIELD AND HYDRAULIC CONTROL PANEL - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the generator field and hydraulic control panel from the airplane. The second task installs the panel on the airplane.

TASK 24-22-04-024-001

2. Remove the Generator Field and Hydraulic Control Panel
   A. Access
      (1) Location Zones
          211/212 Flight Compartment
   B. Prepare for removal

      S 864-010
      (1) Make sure that the engines and the APU are not running.

      S 864-002
      (2) Open this circuit breaker on the main power panel, P6, and attach DO-NOT-CLOSE tag:
          (a) 6A1, BAT BUS DISTR

      S 864-003
      (3) Open these circuit breakers on the overhead circuit breaker panel, P11, and attach DO-NOT-CLOSE tags:
          (a) 11H17, FLT CONT SHUTOFF TAIL LEFT
          (b) 11H18, FLT CONT SHUTOFF TAIL CENTER
          (c) 11H28, FLT CONT SHUTOFF TAIL RIGHT
   C. Procedure

      S 024-004
      (1) Remove the generator field and hydraulic control panel.

TASK 24-22-04-424-005

3. Install the Generator Field and Hydraulic Control Panel
   A. Procedure

      S 424-007
      (1) Install the generator field and hydraulic control panel.

      S 864-006
      (2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the P11 panel:
          (a) 11H17, FLT CONT SHUTOFF TAIL LEFT
          (b) 11H18, FLT CONT SHUTOFF TAIL CENTER
          (c) 11H28, FLT CONT SHUTOFF TAIL RIGHT

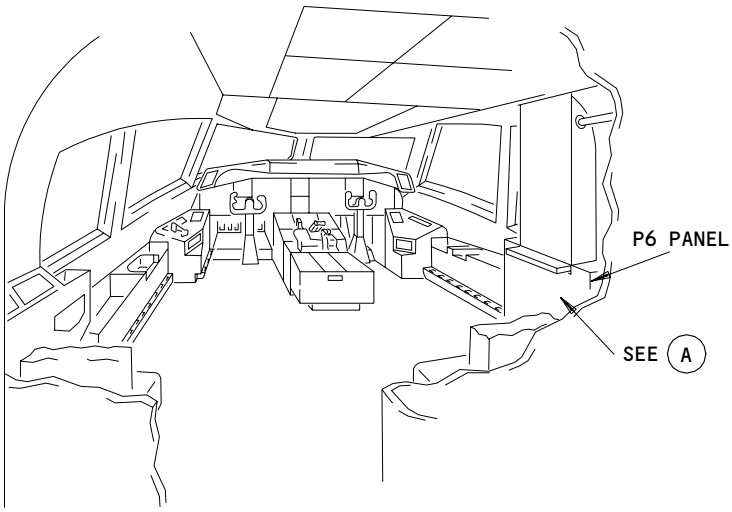
      S 864-009
      (3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel.
          (a) 6A1, BAT BUS DISTR

S 714-011

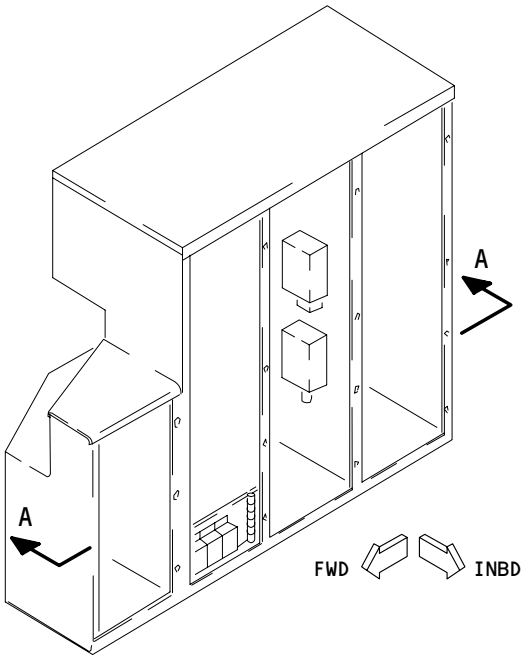
(4) AIRPLANES WITH FIELD OFF SWITCHES INSTALLED ON GENERATOR FIELD AND HYDRAULIC CONTROL PANEL;
Test the generator field and hydraulic control panel installation as follows:
(a) Make sure that the two GEN CONT switches on the P5 panel are off (out position).
(b) Make sure that the APU GEN CONT switch on the P5 panel is off (out position).
(c) Push the BAT switch on the pilots' overhead panel P5 to ON (latched-in position).
(d) The white left and right FIELD OFF lights on the generator field and hydraulic control panel must come on.
(e) The white APU FIELD OFF light on the generator field and hydraulic control panel must come on.
(f) Push the BAT switch on P5 panel to off (out position).

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 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 in the main ac, ac tie, APU generator, and external power feeder and distribution system. 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.

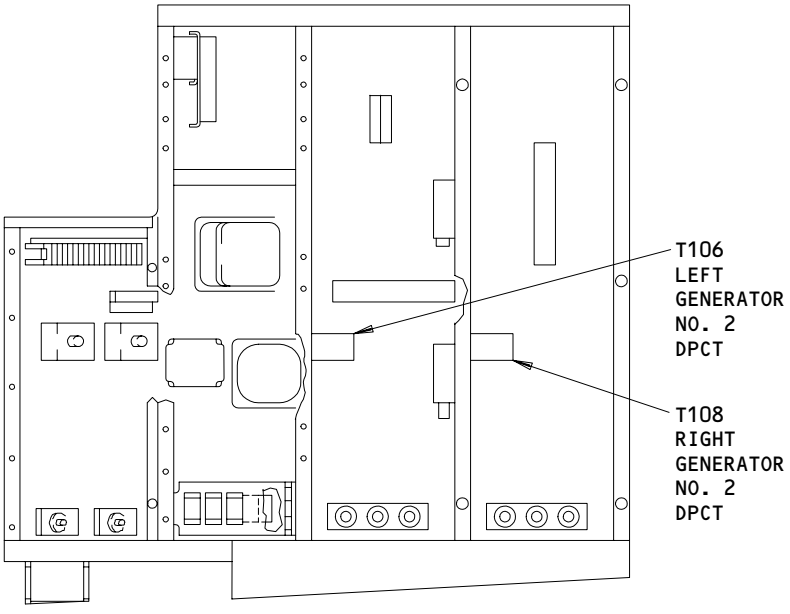


FLIGHT DECK



MAIN POWER DISTRIBUTION PANEL P6

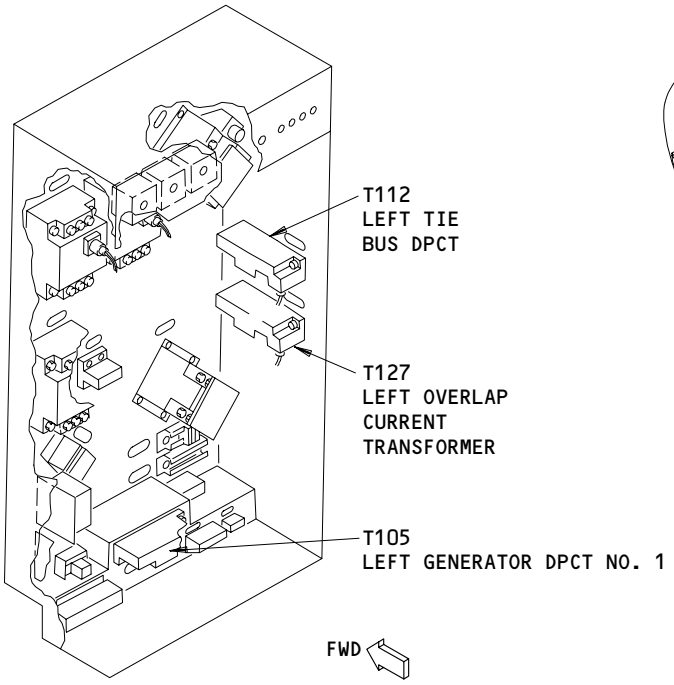
A



P6

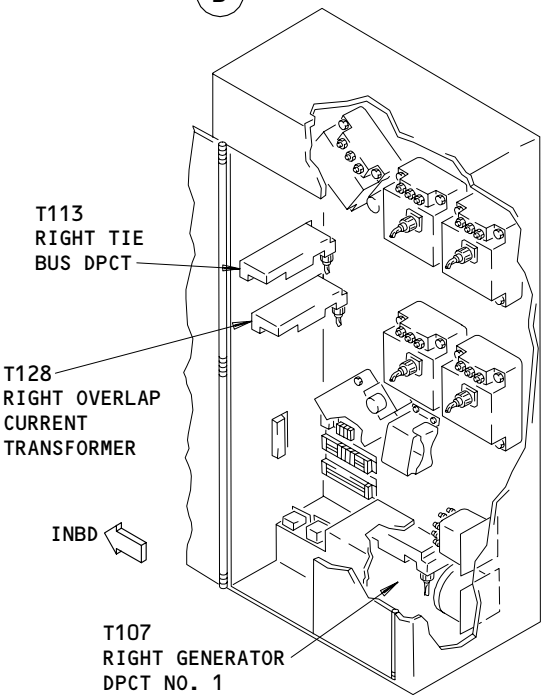
A-A

Current Transformers Component Locations
Figure 1 (Sheet 1)



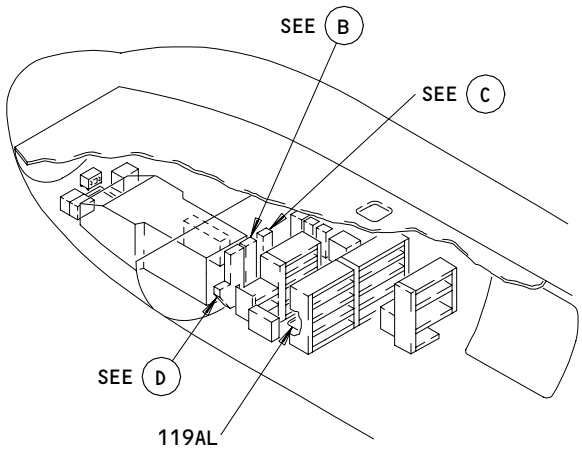
LEFT GENERATOR POWER PANEL P31

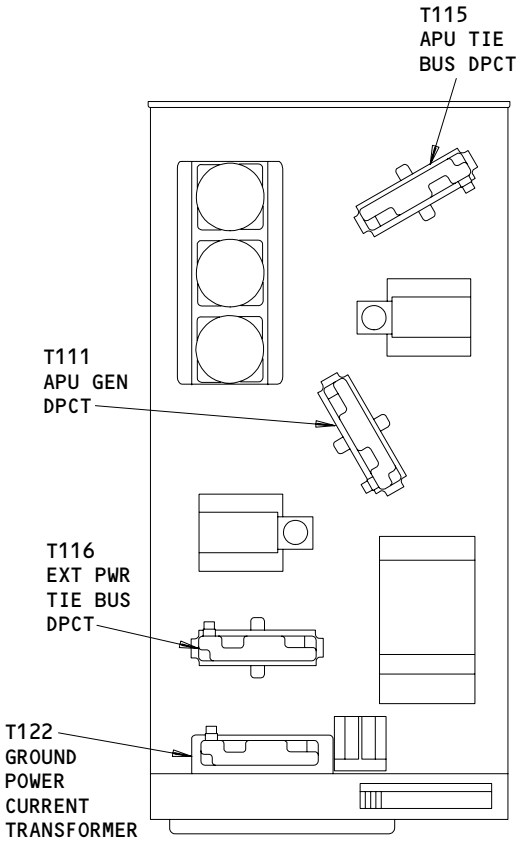
B



RIGHT GENERATOR POWER PANEL P32

C





APU/EXTERNAL POWER PANEL P34

D

Current Transformers Component Locations
Figure 1 (Sheet 2)

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, integrated drive generator (IDG) underspeed, shorted rotating diode, shorted permanent magnet generator, failed generator circuit breaker (GCB), and BTB lockout. (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. This is the point of regulation. An overvoltage condition occurs if any phase voltage is greater than 130-volts 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 ±1.5-volts 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 undervoltage protection. Underfrequency protection is prevented from operating by underspeed activation. Underfrequency activation locks out underspeed protection.

(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. (This indicates that a phase current has exceeded the overload threshold of 12.5-Kva for 8.0 to 8.5 seconds).

(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 .05 ±.02-seconds. (The GCB should open in .02-seconds following a GCR trip.)

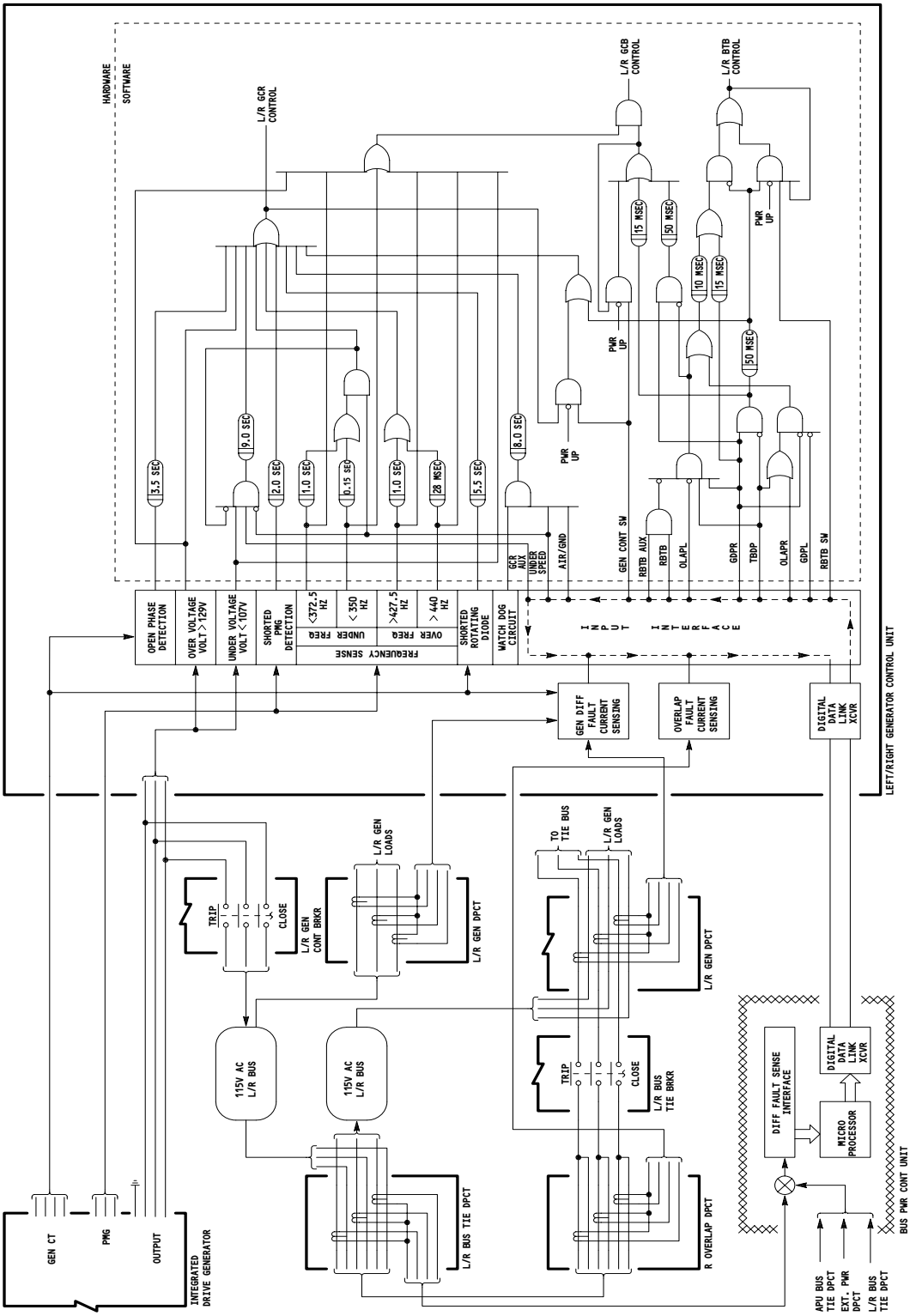
(n) Each GCU contains a watchdog circuit. If a GCU has an internal failure, the circuit opens the GCB and GCR. (The watchdog circuit in the APU opens the APU GCR and APB.)

(2) Differential Fault Sensing (Fig. 2, and 3)

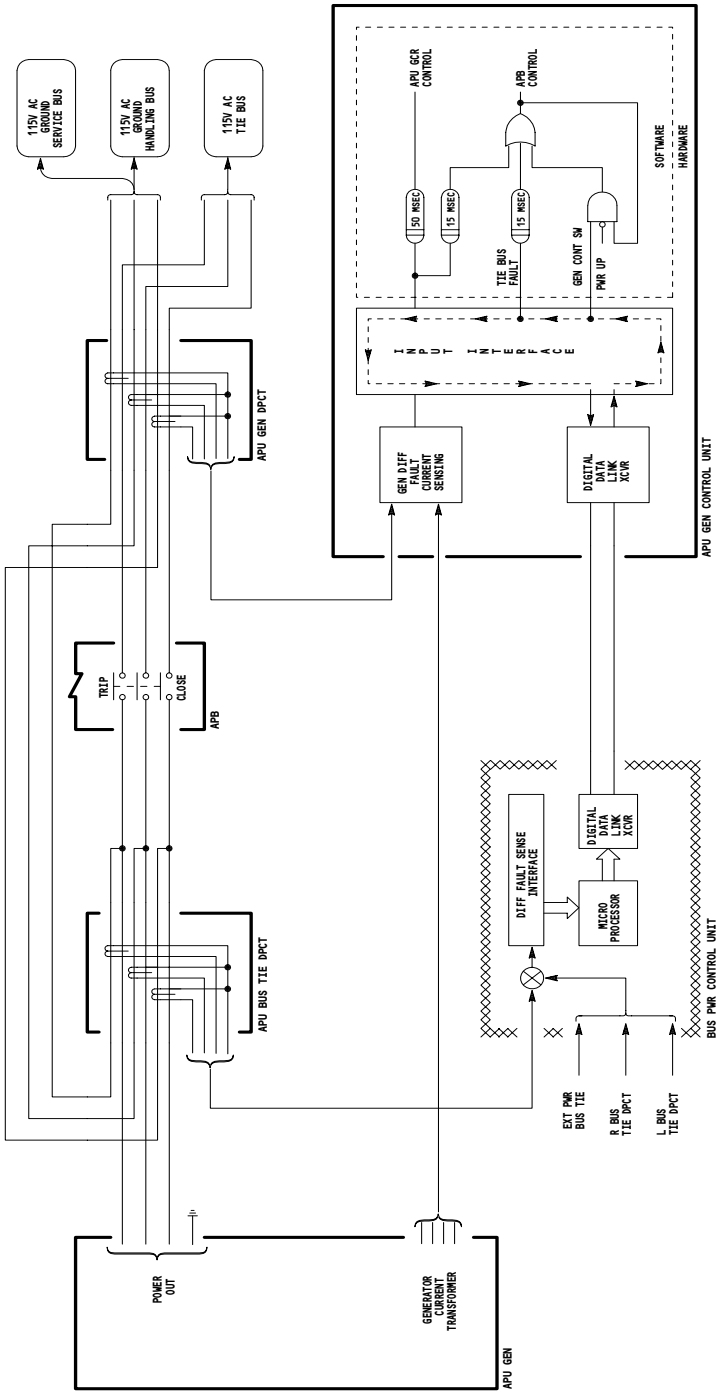
(a) The differential protection current transformers (DPCT's) provide current signals to the generator control units (GCU's), and the bus power control unit (BPCU). The BPCU, by means of four DPCT assemblies, monitors the tie bus. (This is the area between the two bus tie breakers (BTB's), the auxiliary 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 comes on. (The GEN CONT switch is on pilots' overhead panel P5.) There will also be a level C message on the EICAS display: L (or R, or APU) GEN OFF. If a BTB trips, the amber ISLN light in the corresponding BUS TIE switch (P5) comes on. There will be a level C message on the EICAS display: L (or R) BUS ISOLATED. Tripping of the EPC causes the ON light in the EXT PWR switch (P5) to go off.



Left/Right Generator Differential Protection Schematic
Figure 2



APU Differential Protector Schematic
Figure 3

(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

(a) To reduce generator loads, the utility bus relays (UBRs) and electrical load control units (ELCUs) are de-energized. This removes power from 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) A bus fault with auto isolation will isolate the left and right buses. This condition will cause the faulted buses to shed their loads. All loads on the buses that are not faulted are not shed.

(c) The UTILITY BUS switches are on electrical systems control panel M10063. (This panel is on pilot's 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 shedding conditions remain, the contactors are again de-energized. (The amber OFF light in the switch again comes on.)

(d) 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.)

(e) 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.

(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) electrical 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.

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 right miscellaneous electrical equipment panel P37.

(b) The galley buses remain off until all hydraulic switches are off, or until an IDG comes on line (GCB closes). When an IDG comes on line, at least one bus tie breaker (BTB) opens. (To prevent parallel source operation.) This causes the R and L UTILITY BUS RESET relays (one shot relays) to reset the galley shed circuit. Manual reset, if desired, can be accomplished by cycling the ENG START LD SHED RESET circuit breaker (11R2) on P11. (If APU or external power load remains above the 90-Kva level, the galley buses will again be shed when the circuit breaker is closed.)

(c) 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 28-volt 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 bleed air valve control relay K23 is closed), and
3) the auxiliary power breaker (APB) is closed. (APU generator supplying electrical power.)

Since the IDG associated with an "off" engine is not operating, that 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 28-volt dc to energize the UTIL BUS RESET relay of an "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.

(c) 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 28-volt dc power from the UTIL BUS RESET relay(s). This once again closes the path that energizes the UBRs and ELCUs. Power is restored to the utility and galley buses.

(d) 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
b) above 112.5 kva for 4 seconds.

(b) 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 ELCUs and UBRs.

(c) If one source is supplying both main ac buses at the time of the overload, both utility buses and all galley buses will be shed. If a separate source is supplying each main ac bus, only the utility and galley buses supplied by the overloaded source are affected by shedding. During normal two generator operation, source loading will not exceed 90 kva.

(d) If one IDG is supplying power to both main ac buses, GCU protection circuits act to prevent loss of this remaining IDG due to a passive failure. (An example of a passive IDG failure is the presence of open diodes in the IDG rotor circuits.) Detection of a passive failure of the remaining IDG causes the corresponding bus tie breaker (BTB) to trip open. Therefore, all load transferred to the one operating IDG is dropped. The load is reduced to a value equal to or less than that carried before the failure of the other IDG. This prevents the combination of 1) a passive IDG failure, and 2) a high load, from depressing system voltage and tripping the remaining IDG off line.

(e) 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 takoff 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
3) 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 come on, and the L and R UTIL BUS OFF messages appear on the EICAS display. (These are level C EICAS messages.) The BPCU does not allow the utility or 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 28 volt dc to the UTILITY/GLY PWR FLT RESET relay. This one shot relay energizes the L and R UTIL BUS RESET relays for 1.5 seocnds. This relay action has the same effect as manually cycling the UTILITY BUS switches. Power to the utility and galley buses is restored.

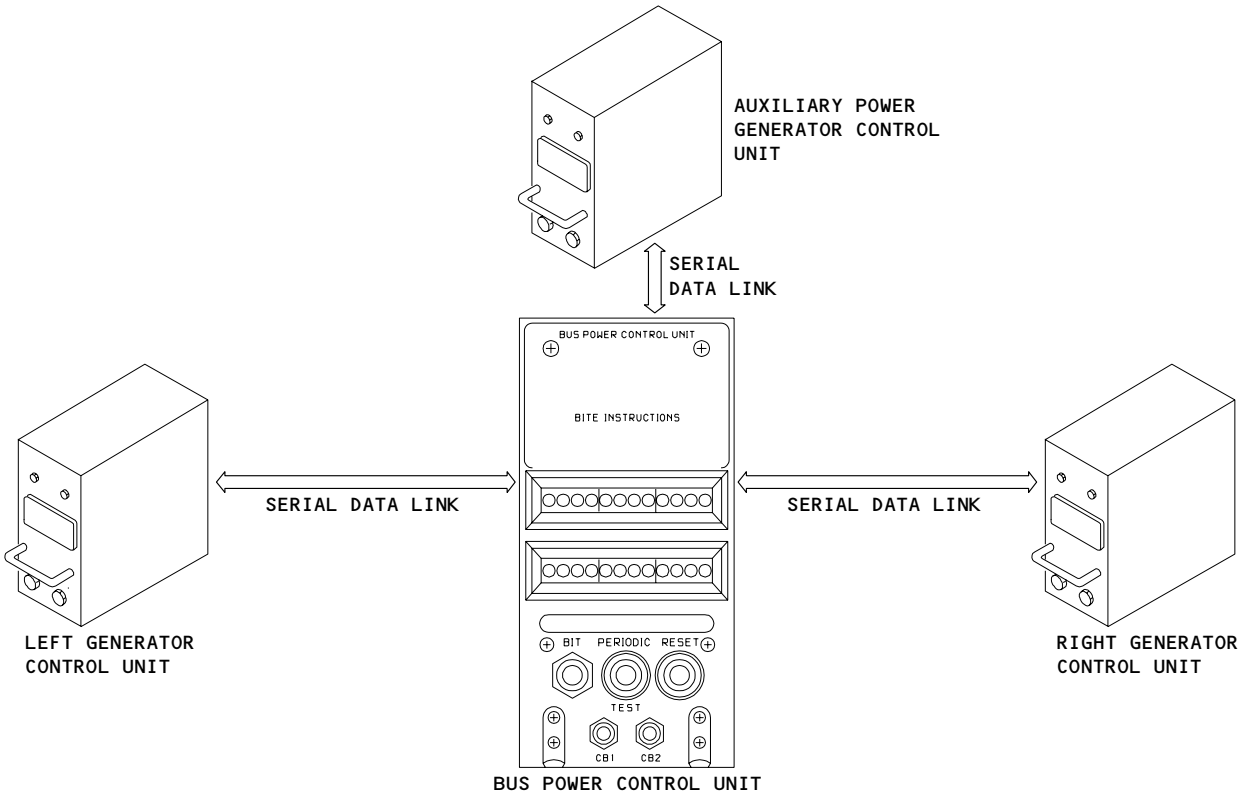
(e) The utility and galley buses can be manually reset if the airplane is on the ground and at least one thrust lever is not advanced. When these 2 conditions are met, the BPCU receives a "ground mode" signal. After a 10 second time delay the utility and galley buses are reset by cycling the UTILITY BUS switches.

B. BITE (Fig. 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 alpha-numeric 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.



AC Generation Built-In-Test (BIT)
Figure 4

(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 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
OVERVOLT TRIP	15
GCU FAILED CODE 34 *[1]	15
APU GEN POWER SYSTEM	2
OK	2
LAST FLT ( ) END OF DATA *[2]	15
FOR PREVIOUS FLT PUSH NOW *[3]	15

*[1] The error code refer to the failure in the GCU, causing the trip.
*[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).
*[3] 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 sequence to the next message. In this way, the display sequence can be speeded up.

(7) The current flight cycle plus seven previous flight cycles are saved in eight memory locations. 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 an ground-air-ground cycle. The cycle continues after both engines are shut down. A new cycle starts with the next engine start.

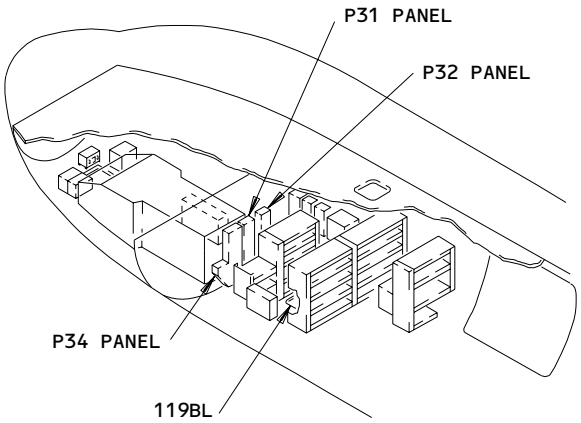
(9) When BIT or PERIODIC TEST is pushed on the BPCU, all BITE information stored for the latest flight cycle appears on the BPCU display. If two identical messages are stored in BITE memory, the same BITE message will be displayed twice. BITE does not disregard a message, even if it was already displayed 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).

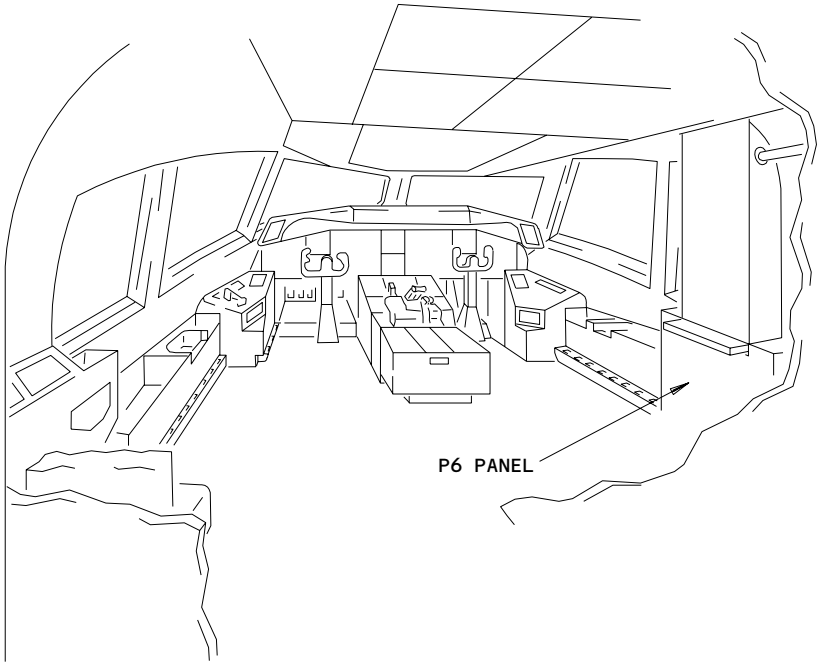
AC POWER FAULT SENSING

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS - (REF 24-22-00, FIG. 101)				
AUX POWER, C905				
LEFT BUS TIE, C902				
LEFT GENERATOR, C901				
RIGHT BUS TIE, C904				
RIGHT GENERATOR, C903				
GENERATOR - (REF 24-11-00, FIG. 101)				
INTEGRATED DRIVE, M10160				
GENERATOR - (REF 24-21-00, FIG. 101)				
AUXILIARY POWER UNIT, M281				
TRANSFORMER - (REF 31-01-34, FIG. 101)				24-23-01
CURRENT DIFFERENTIAL PROTECTION APU GENERATOR, T111				
CURRENT DIFFERENTIAL PROTECTION APU TIE BUS, T115				24-33-01
CURRENT DIFFERENTIAL PROTECTION EXTERNAL POWER TIE BUS, T116				24-23-01
CURRENT GROUND POWER, T122				24-23-01
TRANSFORMER - (REF 31-01-32, FIG. 101)				
CURRENT DIFFERENTIAL PROTECTION RIGHT GENERATOR #1, T107				24-23-01
CURRENT DIFFERENTIAL PROTECTION RIGHT TIE BUS, T113				24-23-01
CURRENT RIGHT OVERLAP, T128				24-23-01
TRANSFORMER - (REF 31-01-31, FIG. 101)				
CURRENT DIFFERENTIAL TRANSFORMER LEFT GENERATOR #1, T105				24-23-01
CURRENT DIFFERENTIAL PROTECTION LEFT TIE BUS, T112				24-23-01
CURRENT LEFT OVERLAP, T127				24-23-01
TRANSFORMER - (REF 31-01-06, FIG. 101)				
CURRENT DIFFERENTIAL PROTECTION LEFT GENERATOR #2, T106				24-23-01
CURRENT DIFFERENTIAL PROTECTION RIGHT GENERATOR #2, T108				24-23-01
UNIT - (REF 24-22-00, FIG. 101)				
APU GENERATOR CONTROL, M143				
LEFT GENERATOR CONTROL, M144				
RIGHT GENERATOR CONTROL, M146				
UNIT - (REF 24-41-00, FIG. 101)				
BUS POWER CONTROL, M116				

AC Power Fault Sensing - Component Index
Figure 101



MAIN EQUIPMENT CENTER



FLIGHT COMPARTMENT

AC Power Fault Sensing - Component Location
Figure 102

CURRENT TRANSFORMER ASSEMBLY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the current transformer assembly from the airplane. The second task installs the current transformer assembly on the airplane.

   TASK 24-23-01-024-001

2. Remove Current Transformer Assembly
   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 Removal

      S 864-004

      WARNING: REMOVE ELECTRICAL POWER BEFORE REMOVING OR INSTALLING COMPONENTS LOCATED IN MAIN POWER CENTERS. HIGH VOLTAGES PRESENT CAN BE FATAL.

      WARNING: REFER TO AMM 27-61-00/201 FOR APPROPRIATE SPOILER/SPEEDBRAKE DEACTIVATION PROCEDURE. INADVERTENT SPOILER MOVEMENT RESULTING FROM NEXT STEP COULD CAUSE SERIOUS INJURY TO PERSONNEL.

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

      S 014-002
      (2) To access the applicable current transformer assembly, open the panel referred to in the table that follows:

Transformer Equip No.	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

*[1] - Not installed on all airplanes

D. Procedure

S 024-006

(1) Remove the current transformer assembly as follows:
   (a) Remove the wire which locks the electrical connector to the current transformer.
   (b) Remove the electrical connector from the current transformer.
   (c) Tag and remove each wire which goes through the current transformer. Make a note of the direction which each wire goes through the current transformer. Make a note of the position of the L and T symbols on the current transformer. Mark each wire tag as follows:
      1) The unit from which the wire was removed (name and equipment number).
      2) The terminal on the unit from which the wire was removed.
      3) The hole in the current transformer through which the wire goes (left right, or center).The side of the current transformer (L or T) through which the wire goes. If the wire goes through a second current transformer, add the equipment number of the second current transformer and hole through which the wire goes.
   (d) Remove the wire which locks the bolts that attach the current transformer.
   (e) Remove the two bolts.
   (f) Remove the current transformer.

TASK 24-23-01-424-005

3. Install Current Transformer Assembly

A. References
   (1) AMM 24-22-00/201, Electrical Power - Control

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 424-007

(1) Install the current transformer as follows:
  (a) Install the current transformer with two bolts.
  (b) Lock with wire the two bolts which attach the current transformer.

CAUTION: CHECK THAT THE POWER LEADS GO THROUGH THE CORRECT HOLES IN THE CURRENT TRANSFORMER ASSEMBLY. INCORRECT INSTALLATION WILL RESULT IN CIRCUIT MALFUNCTION.

  (c) Install the power wires through the correct holes in the current transformer assembly.
  (d) Connect the electrical connector to the current transformer.
  (e) Lock with wire the electrical connector.
  (f) Close the panel.

D. If current transformer T107 was replaced, do a test as follows:

S 864-008

(1) Supply right IDG power to both main ac buses (AMM 24-22-00/201).

S 714-009

(2) Make sure that the lights on P5 panel that follow are off:
  (a) The Two BUS OFF lights.
  (b) The ISLN lights in the two BUS TIE switches.
  (c) The OFF light in the R GEN CONT switch.

S 864-010

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

E. If current transformer T105 was replaced do a test as follows:

S 864-011

(1) Supply left IDG power to both main ac buses (AMM 24-22-00/201).

S 714-012

(2) Make sure that the lights on P5 panel that follow are off:
  (a) The two BUS OFF lights.
  (b) The ISLN lights in two BUS TIE switches.
  (c) The OFF light in L GEN CONT switch.

S 864-013

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

F. If current transformer T106, T108, T112, T113, T116, T122, T127, or T128 was replaced do a test as follows:

S 864-014

(1) Supply external power to main ac buses (AMM 24-22-00/201).

S 714-015
(2) Make a check as follows:
(a) Make sure that the lights on P5 panel that follow are off:
1) The two BUS OFF lights.
2) The ISLN lights in the two BUS TIE switches.
(b) Make sure that the ON light in the EXT PWR switch (P5) is on.
(c) Push the R BUS TIE switch (P5) to the ISLN (out position).
(d) Make sure that the lights on P5 panel that follow are on:
1) The amber right BUS OFF light.
2) The amber ISLN light in the right BUS TIE switch.
(e) Push the GROUND SERVICE switch on the cargo door control panel P81.
1) Make sure that the white light in the GROUND SERVICE switch stays on.

S 864-016
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

G. If current transformer T111, or T115 was replaced do a test as follows:

S 864-017
(1) Supply APU generator power to the left main ac bus (AMM 24-22-00/201).

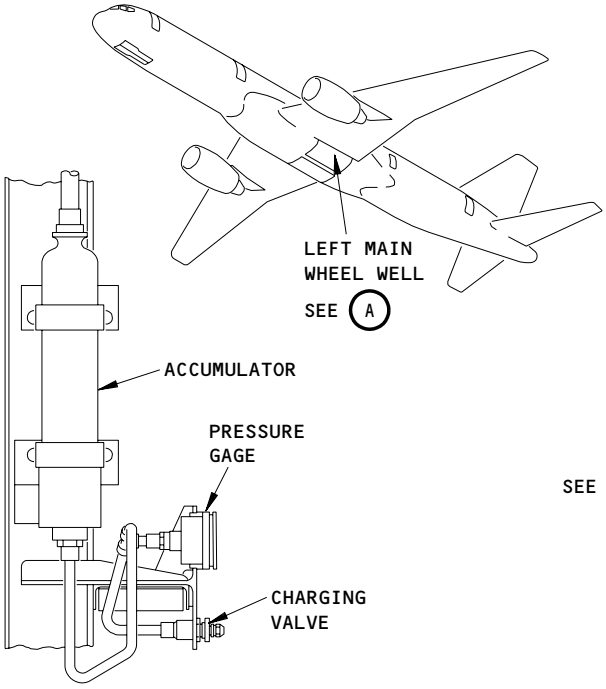
S 864-020
(2) Make sure that the lights on P5 panel that follow are off:
(a) The OFF light in the APU GEN switch.
(b) The ISLN light in the L BUS TIE switch.
(c) The L BUS OFF light.

S 864-021
(3) Push the GROUND SERVICE switch on the cargo door control panel P81.
(a) Make sure that the white light in the GROUND SERVICE switch stays on.

S 864-019
(4) Remove electrical power if it is no longer required (AMM 24-22-00/201).

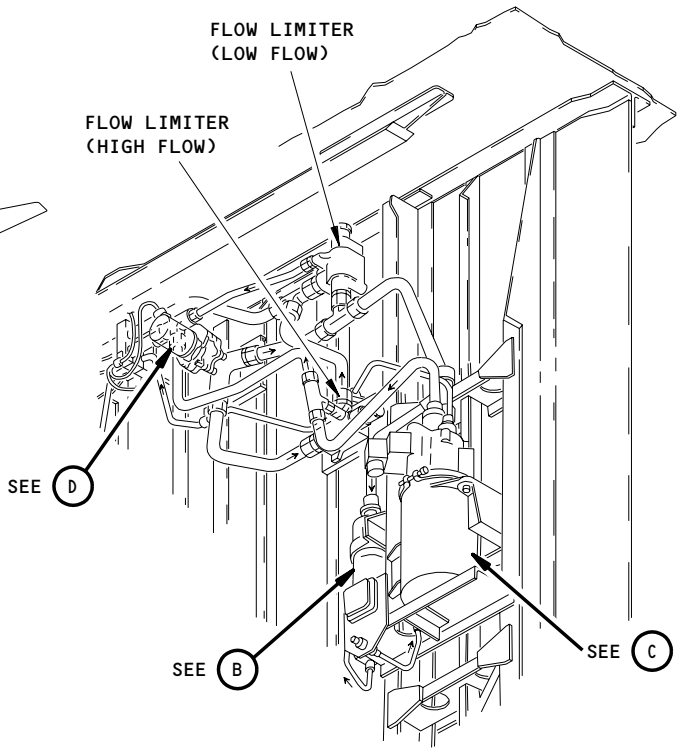
HYDRAULIC MOTOR GENERATOR SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The hydraulic motor generator (HMG) system is an independant, non-time-limited, standby electrical power supply. It is activated automatically in flight when power loss occurs at both main AC buses.
   B. System components are a hydraulic motor generator, generator control unit, relays, test switch, hydraulic shutoff valve, hydraulic flow limiters, and a hydraulic accumulator with charging valve and pressure gage.
   C. ETOPS PARTIAL PROVISIONS;
      Provisions do not include the Hydraulic Motor Generator (HMG) and accumulator, the pressure sensor, the Generator Control Unit (GCU), and the Transformer/Rectifier Unit (TRU).
   D. EICAS displays status and maintenance messages for the system.
   E. The system is driven by the left hydraulic system.
   F. 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. The buses in turn supply selected flight essential loads.
   G. AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
      It uses a TR unit to transform AC power to DC power before it is supplied to the hot battery bus.
2. Component Details (Fig. 1)
   A. AIRPLANES WITH 5 KVA HYDRAULIC MOTOR GENERATOR;
      Hydraulic Motor Generator (5kva)
      (1) The hydraulic motor generator is on the inboard bulkhead of the left wheel well.
          (a) Generator
              1) The generator is oil-cooled, and brushless.
              2) 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.
              3) A permanent magnet generator section provides 3-phase 800 Hz power to the generator control unit for control and protection functions.



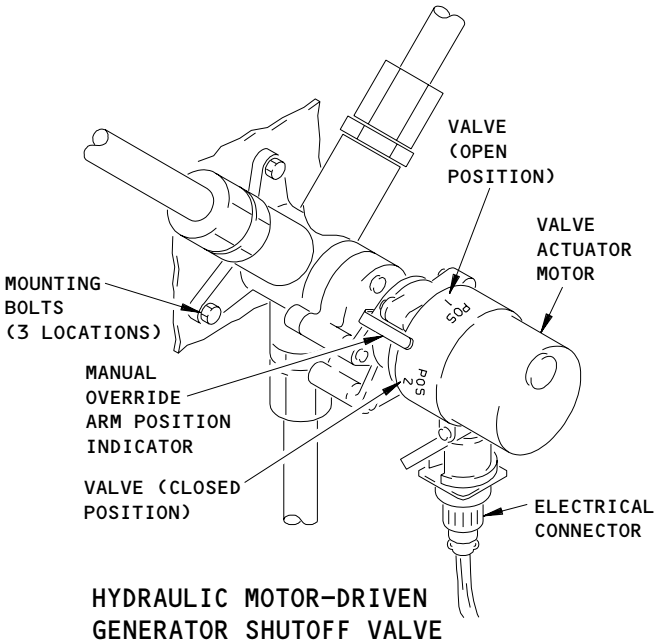
HYDRAULIC ACCUMULATOR

B



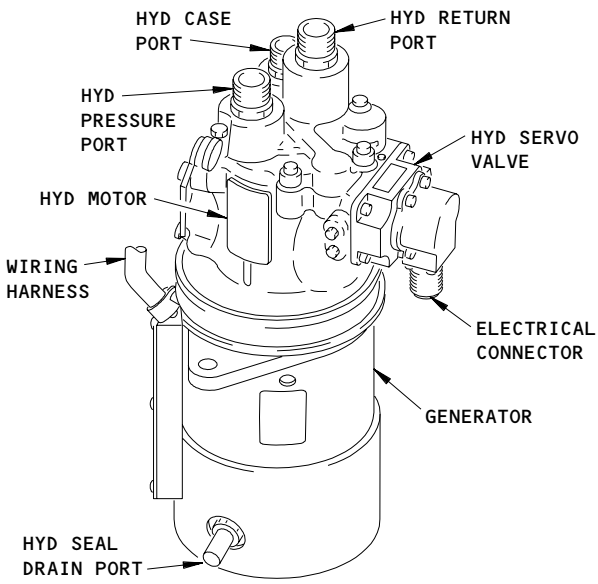
LEFT MAIN WHEEL WELL

A



HYDRAULIC MOTOR-DRIVEN
GENERATOR SHUTOFF VALVE

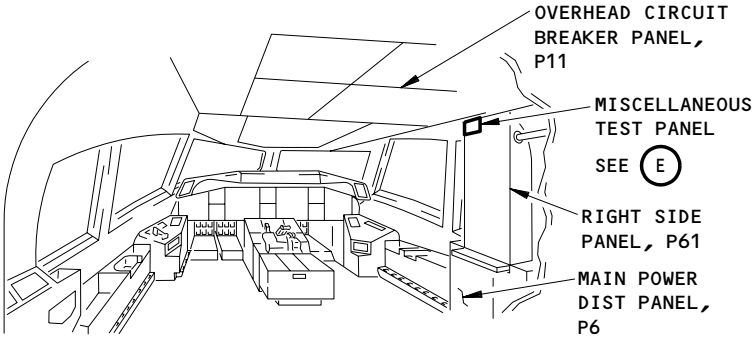
D



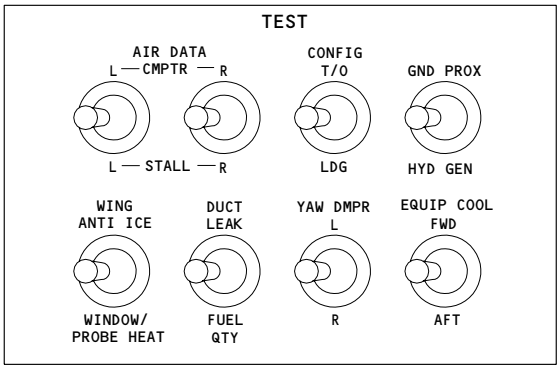
HYDRAULIC MOTOR-DRIVEN GENERATOR

C

Hydraulic Motor-Driven Generator System - Component Location
Figure 1 (Sheet 1)

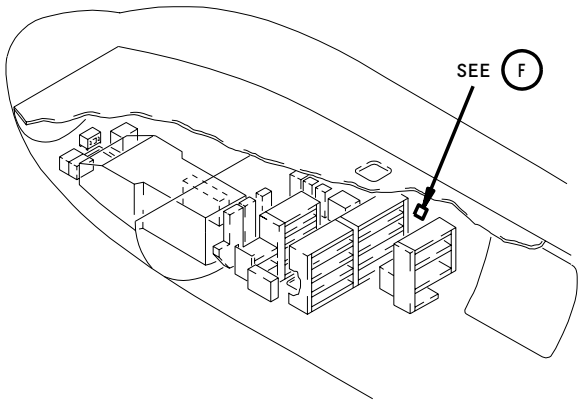


FLIGHT COMPARTMENT

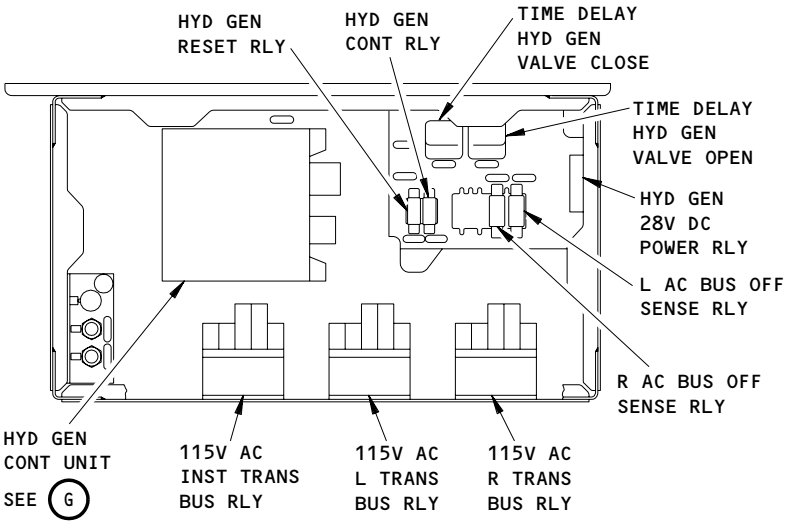


MISCELLANEOUS TEST PANEL

E

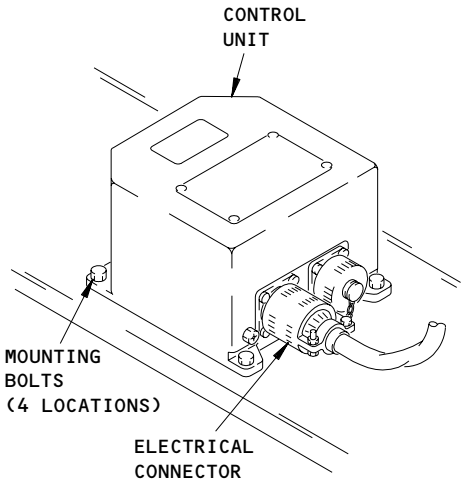


MAIN EQUIPMENT CENTER



HYD GEN POWER PANEL, P71

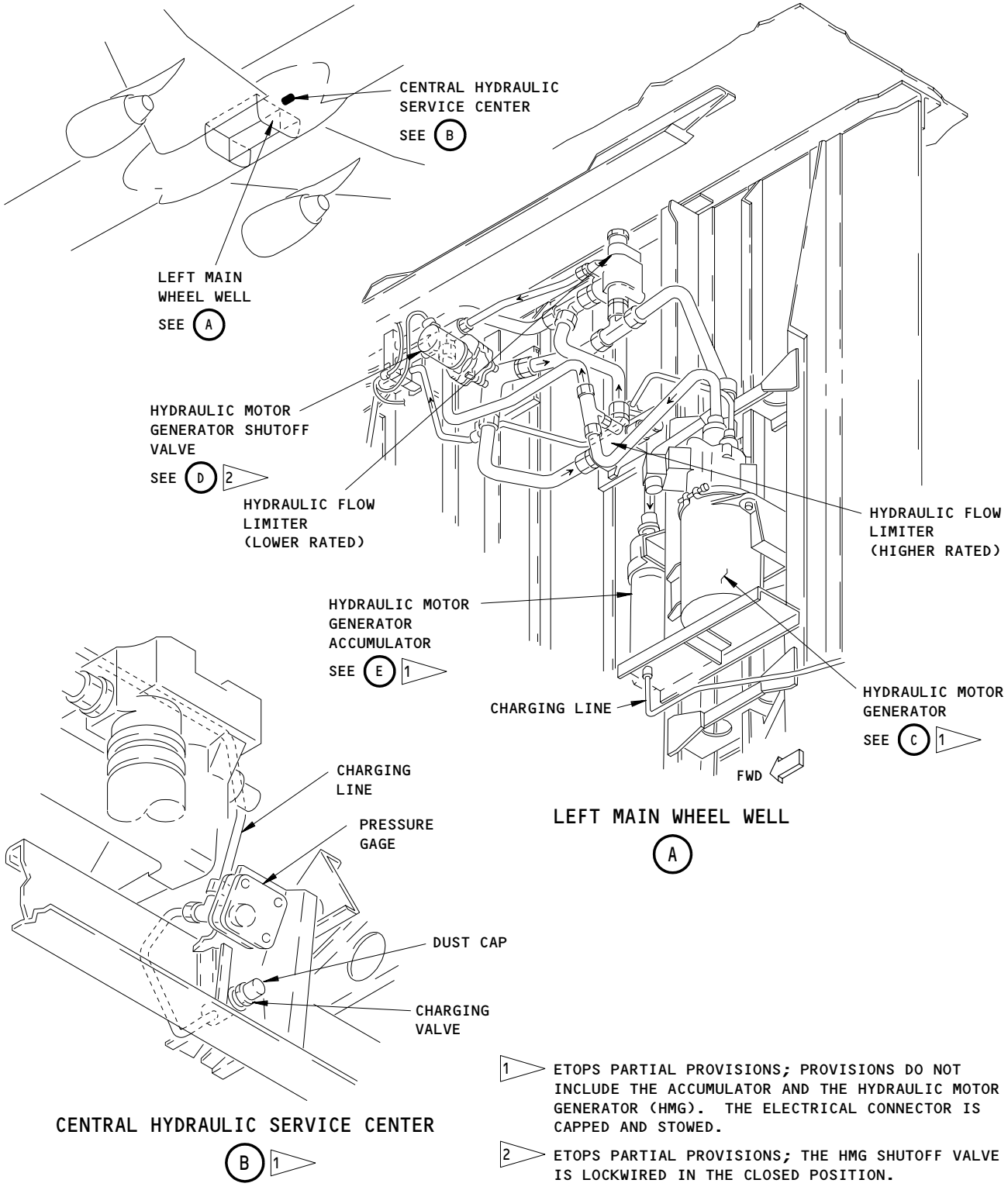
F



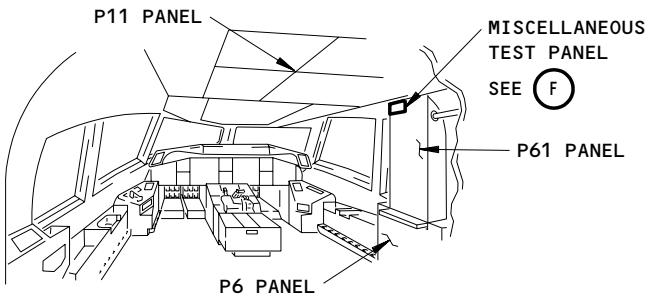
HYDRAULIC MOTOR–DRIVEN GENERATOR CONTROL UNIT

G

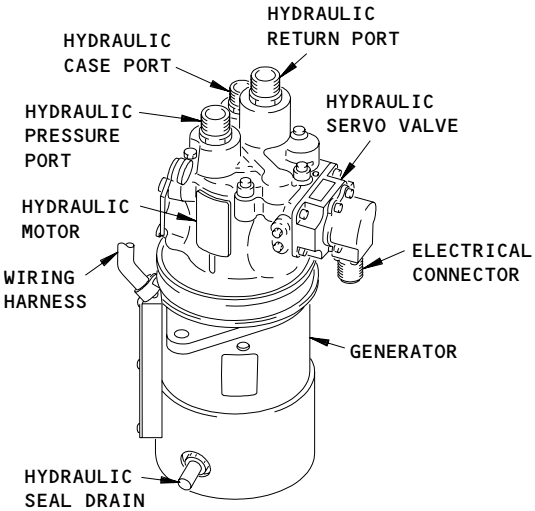
Hydraulic Motor–Driven Generator System – Component Location
Figure 1 (Sheet 2)



Hydraulic Motor Generator System – Component Location
Figure 1A (Sheet 1)

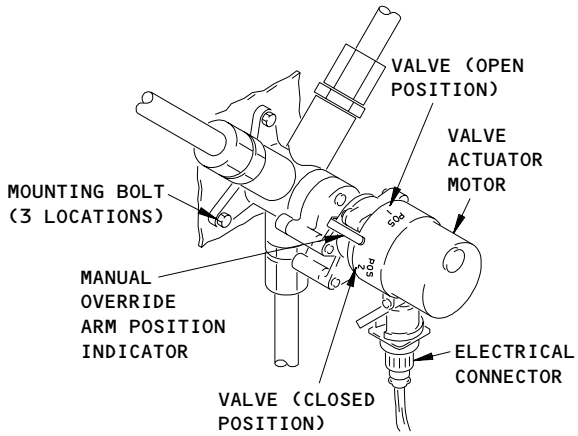


FLIGHT COMPARTMENT



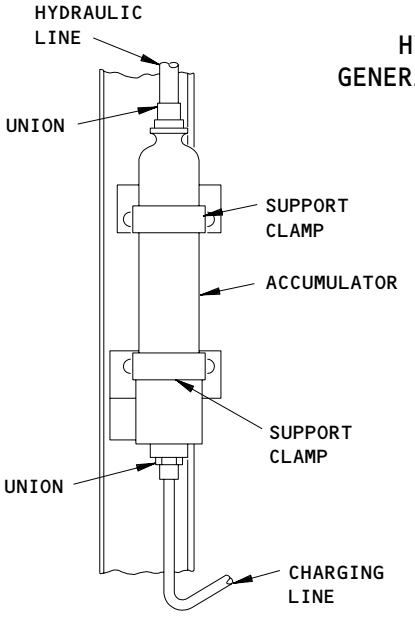
HYDRAULIC MOTOR GENERATOR

C 1



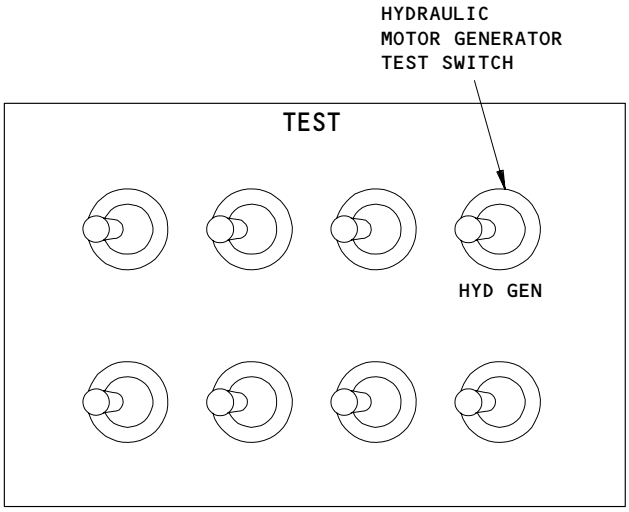
HYDRAULIC MOTOR GENERATOR SHUTOFF VALVE

D 2



HYDRAULIC MOTOR GENERATOR ACCUMULATOR

E 1

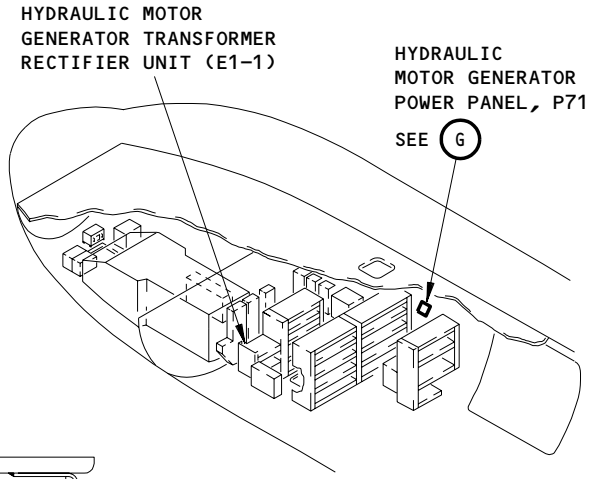


MISCELLANEOUS TEST PANEL

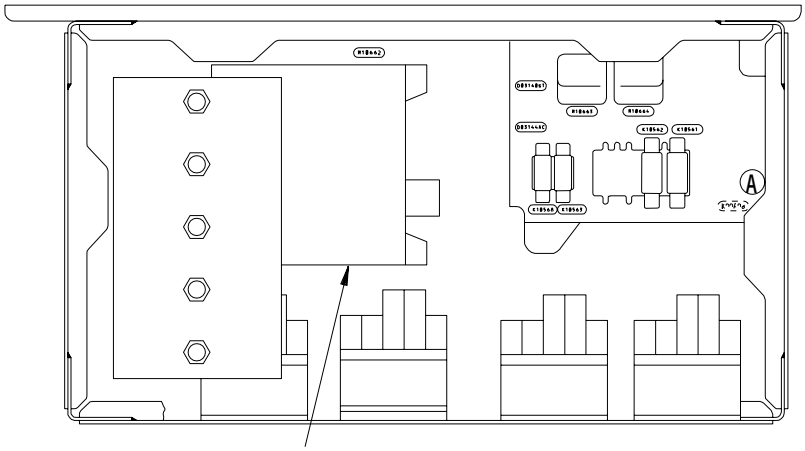
F

Hydraulic Motor Generator System – Component Location
Figure 1A (Sheet 2)

A51136

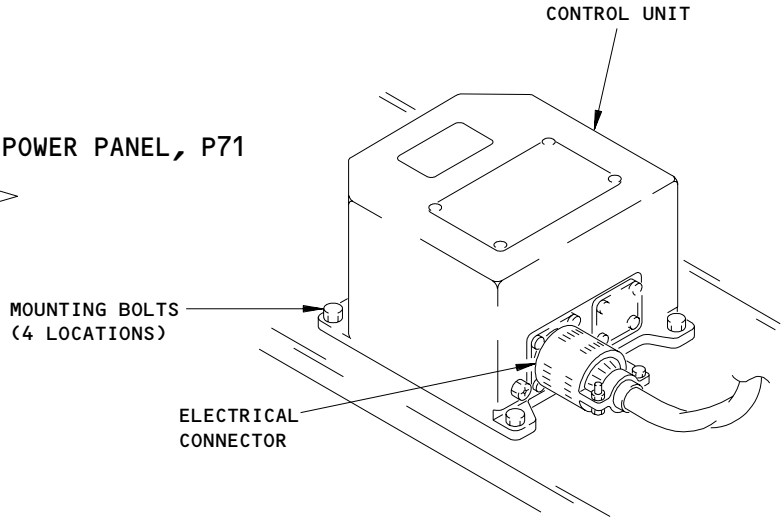


MAIN EQUIPMENT CENTER



HYDRAULIC MOTOR GENERATOR POWER PANEL, P71

G 3



HYDRAULIC MOTOR GENERATOR CONTROL UNIT

H 3

3 ETOPS PARTIAL PROVISIONS; PROVISIONS DO NOT INCLUDE THE HYDRAULIC MOTOR GENERATOR (HMG) CONTROL UNIT. THE ELECTRICAL CONNECTOR IS CAPPED AND STOWED.

Hydraulic Motor Generator System - Component Location
Figure 1A (Sheet 3)

4) A permanent magnet generator section supples 3-phase output to a full-wave rectifier bridge for main field excitation. Excitation is controlled by the generator control unit to maintain a nominal 118v rms line to neutral at the end of the ac feeders in the P71 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 17 gpm.

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. AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
Hydraulic Motor Generator (10kva)

(1) ETOPS PARTIAL PROVISIONS;
The Hydraulic Motor Generator (HMG) is not installed. The electrical connector is capped and stowed and the HMG shutoff valve is lockwired in the closed position.

(2) The hydraulic motor 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 8000 rpm and develops an ac output. The ac output is 3-phase, 4-wire, wye connected, rated at 120/208 volts rms, 400 Hz, 10.0 KVA at 0.75 to unity power factor.

2) A permanent magnet generator section provides 3-phase power to the generator control unit for excition, control, and protection functions.

3) A exciter generator section supplies a 3-phase output to a full-wave rotating rectifier bridge for main field excitation. Excitation is controlled by the generator control unit to maintain a nominal 115v rms line to neutral at the end of the ac feeders in the P71 panel.

(b) Motor

1) The hydraulic motor is a servo-controlled, 8000 rpm constant speed variable displacement unit designed for operation in a 3000-psi hydraulic system.

2) An electrohydraulic servo-valve is attached to the motor for speed control. The valve is controlled by feedback signals from the generator output to maintain frequency at 400 ±2 Hz under steady state conditions. The speed control circuits are in the generator control uit.

C. Generator Control Unit

(1) ETOPS PARTIAL PROVISIONS;
The Generator Control Unit (GCU) is not installed. The electrical connector is capped and stowed.

(2) The generator control unit is located in the hydraulic generator power panel P71 which is mounted on the right sidewall aft of E4 rack. It is convection-cooled, solid-state unit which provides dc control power, and voltage regulation. It also provides undervoltage and underfrequency protection; power ready, voltage/frequency control, and speed control functions for the extended range operations system.

(3) AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
The generator control unit has two modes: monitor and operation. In the monitor mode the GCU receives its power from the battery bus and monitors the two main 115-volt ac buses. In the operational mode the GCU receives its power from the HMG permanent magnet generator in the HMG.

D. Hydraulic Shutoff Valve

(1) ETOPS PARTIAL PROVISIONS;
The hydraulic shutoff valve is lockwired in the closed position.

(2) The hydraulic motor generator shutoff valve is located on the inboard bulkhead of the left wheel well. It controls the left hydraulic system pressure 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.

E. AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
Transformer Rectifier Unit

(1) ETOPS PARTIAL PROVISIONS;
The Transformer Rectifier Unit (TRU) is not installed. The electrical connector is capped and stowed.

(2) The transformer rectifier unit (TRU) converts power from a nominal 115 volt, 400 Hz, three phase source to an unregulated 28 volt dc output. The TRU has a continuous rating of 50 amperes with convection cooling or 60 amperes with active cooling. No active cooling is provided to the TRU during HMG operation.

(3) The TRU consists of a core type transformer with a three phase, four wire primary and a secondary with multi-phase windings. The secondry windings are connected in series to reactors and series rectifiers to maintain dc output.

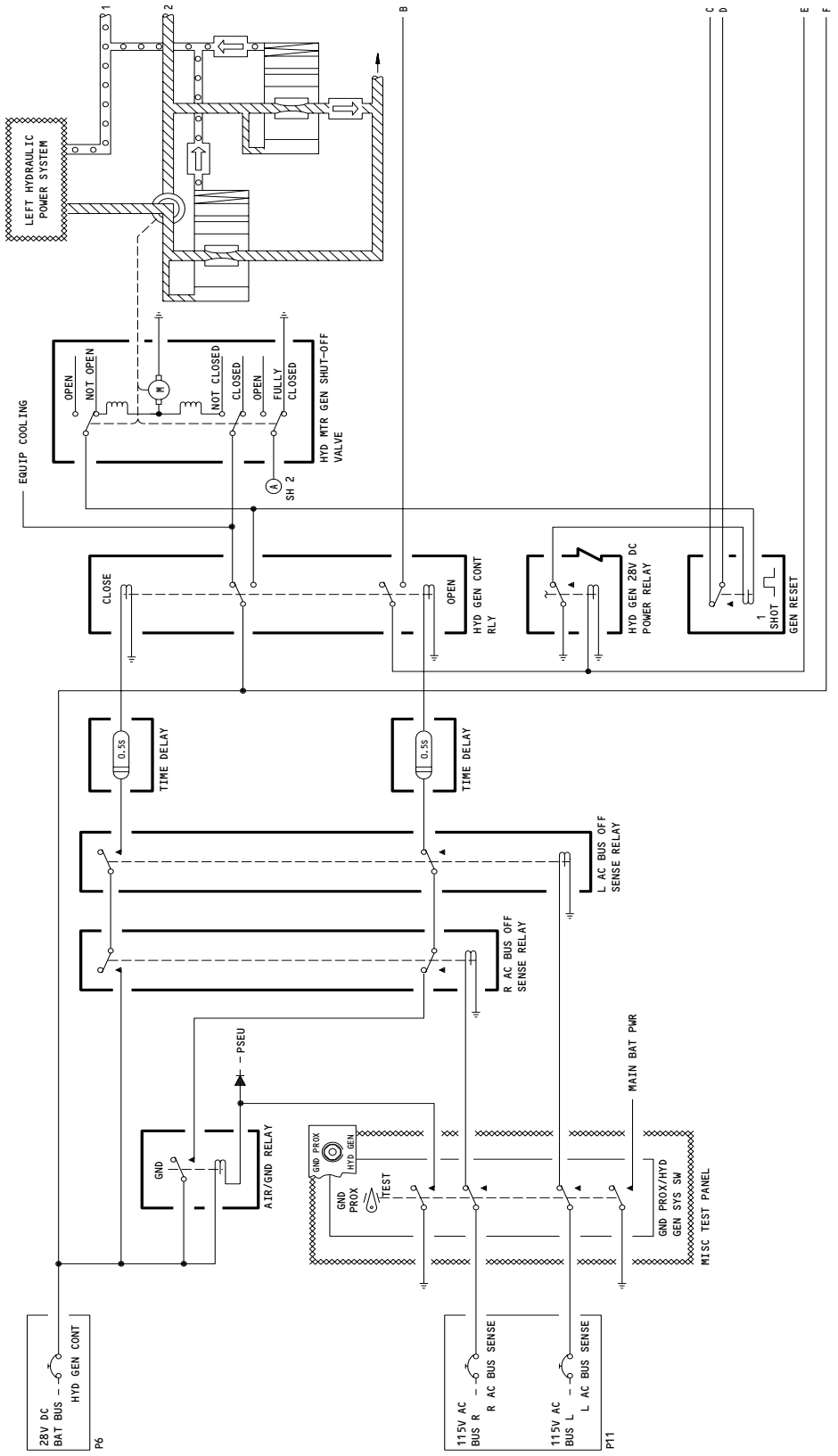
F. Hydraulic Generator Power Control Panel P71
   (1) P71 mounts on the right sidewall aft of E4 rack. It contains all the relays, generator control unit, and control circuitry for the extended range operations system.
   (2) AIRPLANES WITH 5 KVA HYDRAULIC MOTOR GENERATOR;
   The time delays are installed in the P71 panel.

G. Hydraulic Accumulator
   (1) ETOPS PARTIAL PROVISIONS;
   The hydraulic accumulator is not installed.
   (2) The hydraulic motor generator hydraulic accumulator is located on the inboard bulkhead of the left wheel well. It stabilizes the hydraulic system pressure to the generator hydraulic motor.
   (3) One side of the accumulator is continually pressurized by the left hydraulic system. The opposite side of the accumulator is pressurized by nitrogen gas through the ground charging valve. The charging valve and pressure gage are installed at the same location as the accumulator (5 kva HMG) or in the central hydraulic service center (10 kva HMG).
   (4) AIRPLANES WITH 5 KVA HYDRAULIC MOTOR GENERATOR;
   Accumulator nitrogen pre-charge pressure is 1550 to 2050 psi, depending on ambient temperature.
   (5) AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;
   The nominal pre-charge pressure of the accumulator is 1500 psi.

H. Hydraulic Flow Limiters
   (1) The hydraulic motor generator hydraulic system shutoff valve selects one of two hydraulic flow limiters to service the TE flaps/LE slats depressurizations module. When the generator is not operating, the shutoff valve is closed to allow the higher-rated flow limiter to service the depressurization module. When the generator is operating, the shutoff valve opens to allow the lower-rated flow limiter to service the depressurization module, and conserve hydraulic pressure and flow for the hydraulic motor generator system.

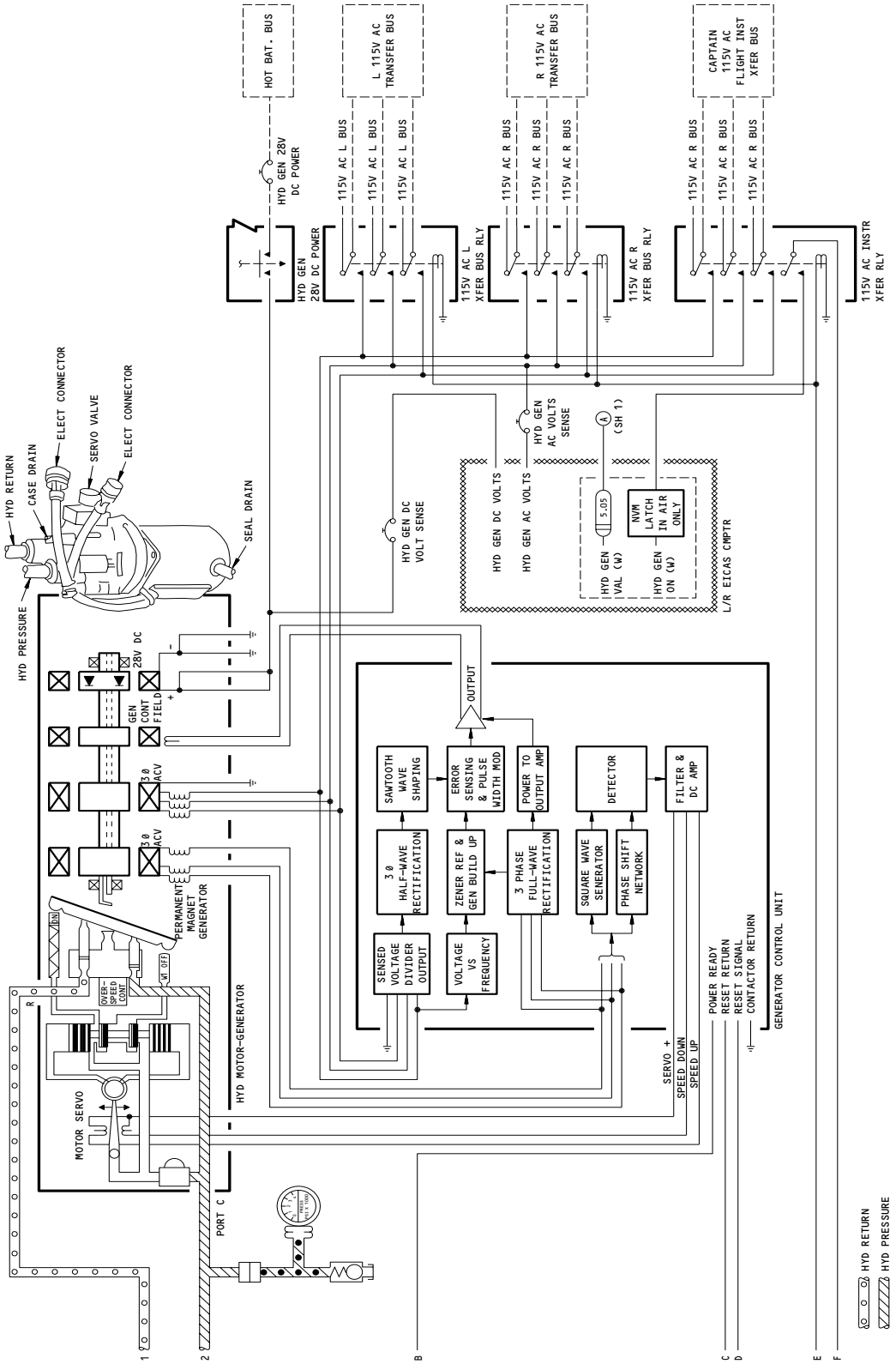
I. Test Switch
   (1) ETOPS PARTIAL PROVISIONS;
   The test switch is inoperative.
   (2) A momentary on manual toggle switch (GND PROX/HYD GEN) is provided for system checkout. It is located on the right side panel P61 in the flight deck.

3. Operation (Fig. 2)



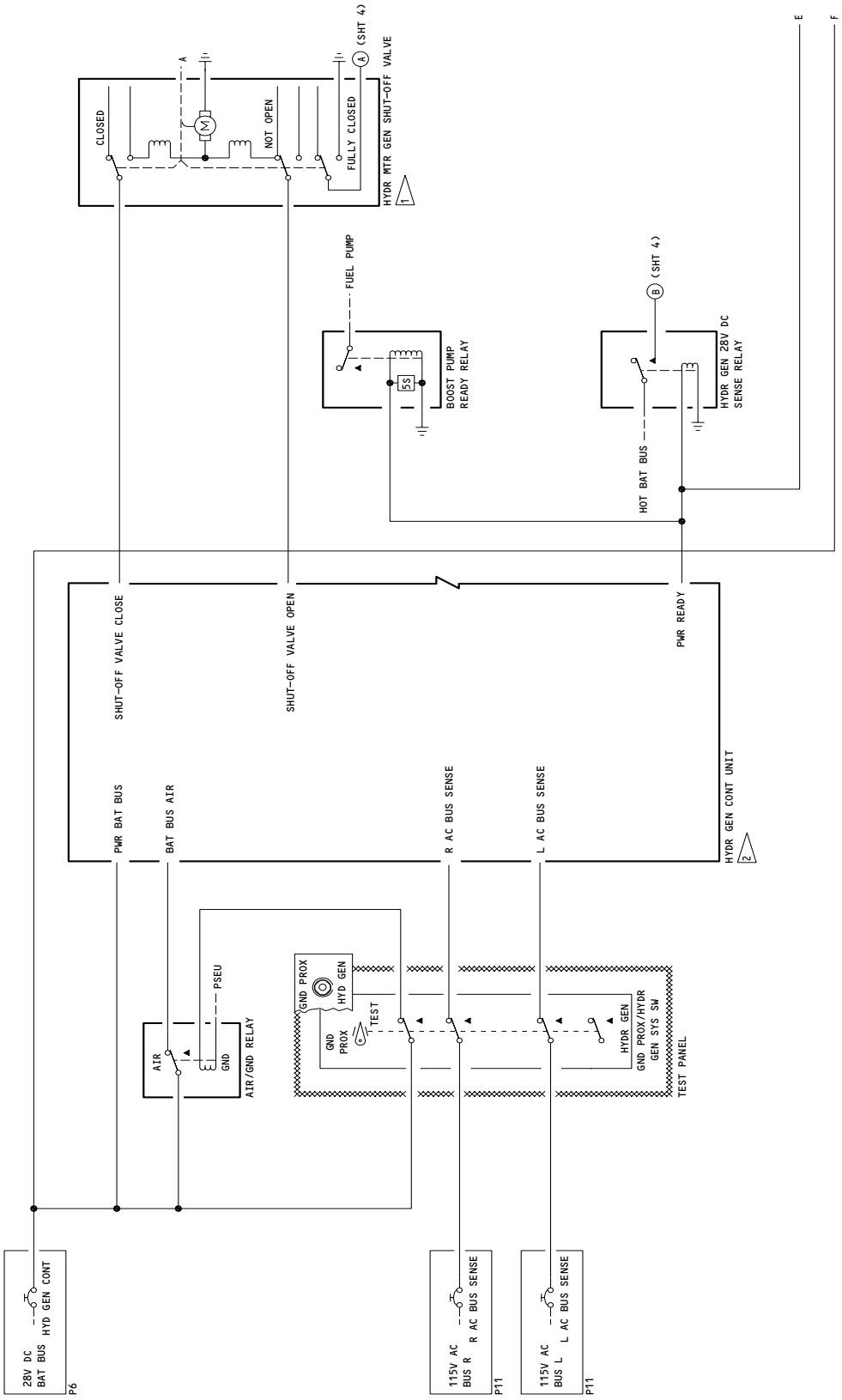
Hydraulic Generator Control Schematic
Figure 2 (Sheet 1)

215716



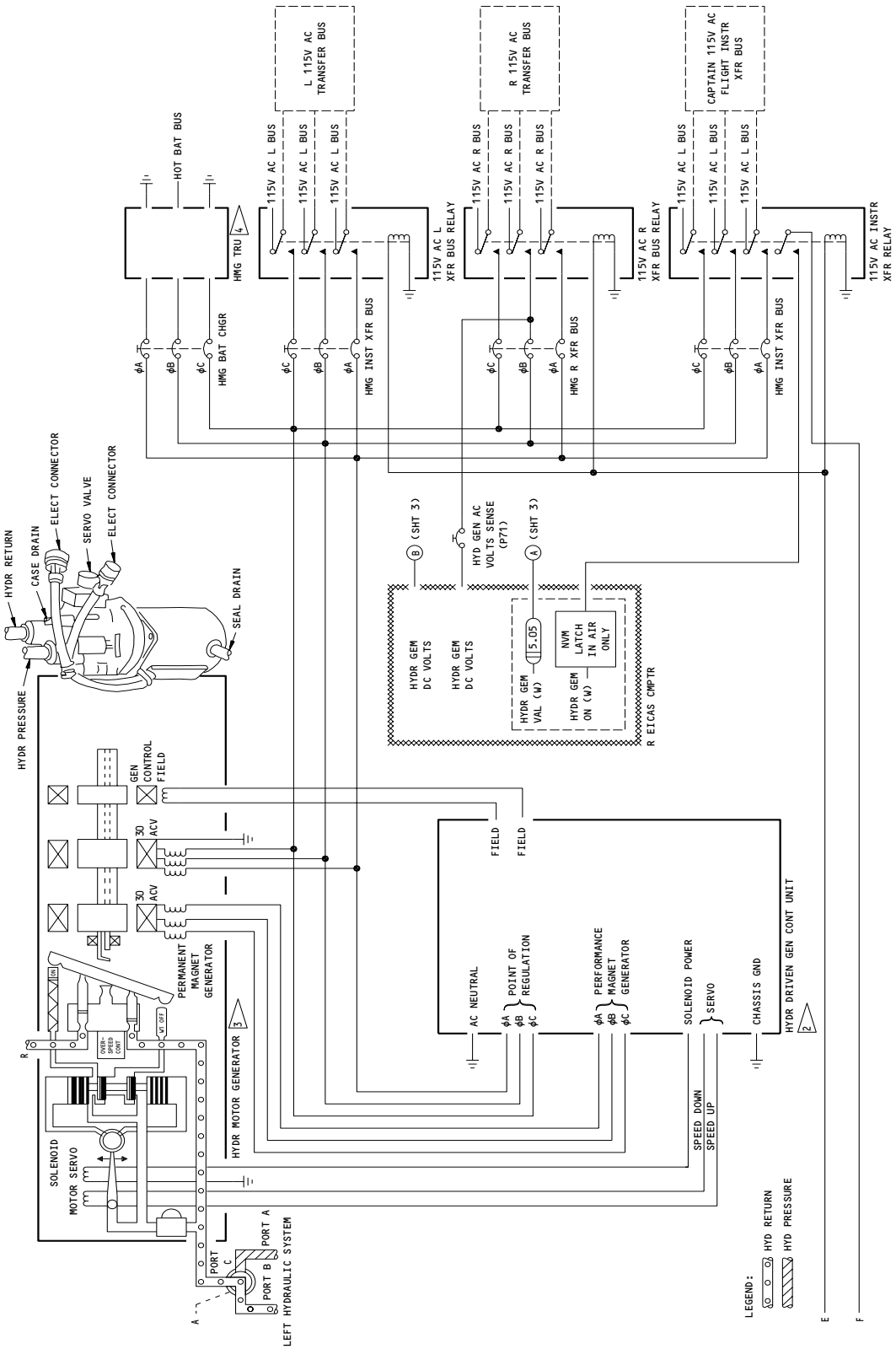
Hydraulic Generator Control Schematic
Figure 2 (Sheet 2)

215619



Hydraulic Generator Control Schematic
Figure 2 (Sheet 3)

AS1138



Hydraulic Generator Control Schematic
Figure 2 (Sheet 4)

A51148

A. Functional Description

(1) ETOPS PARTIAL PROVISIONS;
The Hydraulic Motor Generator (HMG) system is inoperative.

(2) When loss of power at both main ac buses is sensed during flight, the standby power system automatically takes over. After a 0.5-second time delay, 28v dc from the battery bus drives the hydraulic motor-driven generator shutoff valve to the open position. Left hydraulic pressure is then applied to the hydraulic motor-driven generator via the shutoff valve and the generator begins to operate.

(3) The open shutoff valve also selects the lower-rated flow limiter of the two flow limiters which service the flap/slat depressurization module. This conserves hydraulic pressure and fluid for the hydraulic motor-driven generator system.

(4) 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.

(5) The dc output is connected to the hot battery bus through the HYD GEN 28v dc power relay to parallel with the standby battery. The ac output is connected to the captains instrument transfer bus through the 115v ac instrument transfer bus relay. The ac output also feeds the left and right transfer buses through the 115v ac L transfer bus relay and the 115v ac R transfer bus relay respectively.

(6) 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.

(7) The hydraulic generator dc output normally exceeds battery terminal voltage, so the battery will not discharge. The battery will be available for transient demands encountered during approach and landing.

(8) If normal power is recovered during flight both main ac buses are energized. 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.

(9) If an undervoltage or underfrequency occurs during hydraulic generator operation, the bus transfer relays will trip but the generator will remain excited. On the 5 kva HMG GCU, 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. If the fault has cleared, the bus transfer relays will energize and supply the loads. If a trip occurs a second time within 30 seconds, the generator will continue to recycle until the fault is cleared.

(10) AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;

The 10kva HMG GCU provides a power ready signal if the generator is providing power of acceptable quality. In the event of an under/over voltage, under/over frequency, or over speed condition of the generator, the GCU will remove the power ready signal, within a minimum of 1.5 seconds. If the power quality is re-established within 11.5 seconds, the power ready signal will also be re-established. If the power quality is not re-established within 11.5 seconds, the GCU will cause an HMG shutdown. The GCU will also shutdown the HMG if two protective trips occur within 60 seconds.

(11) The momentary on toggle switch GND PROX/HYD GEN provided on the right side panel (P61) in the flight deck allows system checkout.

(12) Checkout is accomplished with the main buses energized, EICAS operating, and the left hydraulic system pressurized.

(13) 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 standby battery charger.

(14) 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.

(15) If the hydraulic shutoff valve is not fully closed a status message HYD GEN VAL appears after a 5 second delay on EICAS.

(16) The EICAS maintenance page displays the ac and dc voltages, and ac frequency during checkout.

HYDRAULIC MOTOR GENERATOR SYSTEM

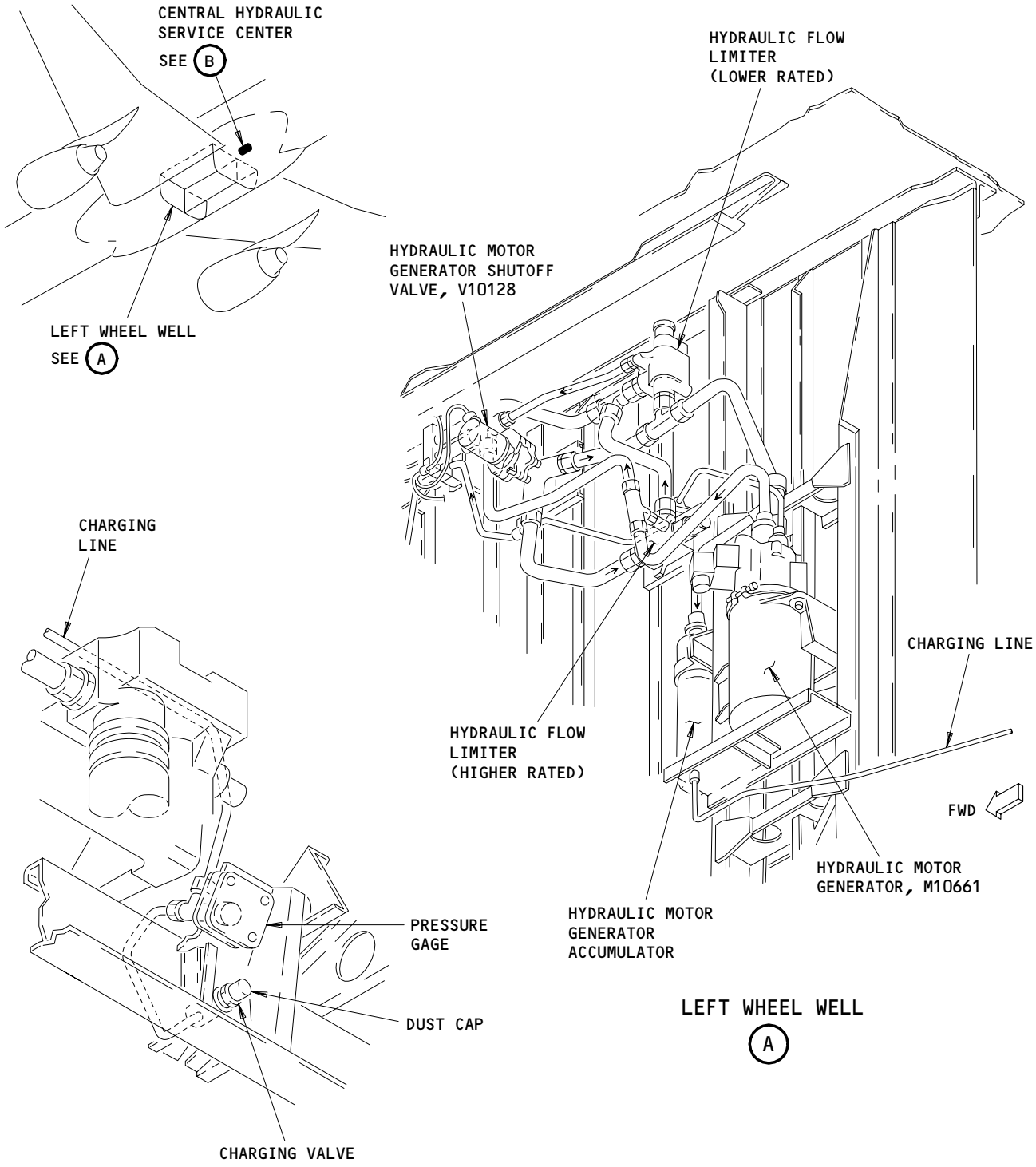
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
ACCUMULATOR - HYDRAULIC	1	1	LEFT WHEEL WELL	24-25-04
CIRCUIT BREAKERS -	2		FLIGHT COMPARTMENT, P11	
AC BUS SENSE LEFT, C4356		1	11R6	*
AC BUS SENSE RIGHT, C4357		1	11R29	*
CIRCUIT BREAKER -	2		FLIGHT COMPARTMENT, P6	
HYD GEN CONT, C4349		1	6C3	*
CIRCUIT BREAKERS -	2		FORWARD CARGO COMPARTMENT, MAIN EQUIPMENT CENTER, P71	
HMG BAT CHGR, C3061		1	71E1	*
HMG INST XFR BUS, C3060		1	71D1	*
HMG L XFR BUS, C3058		1	71B1	*
HMG R XFR BUS, C3059		1	71C1	*
HYD GEN AC VOLT SENSE, C4351		1	71A1	*
COMPUTERS - (31-41-00/102)				
LEFT EICAS, M10182				
RIGHT EICAS, M10181				
CONTROL UNIT - GENERATOR HYDRAULIC, M10662	2	1	119BL, MAIN EQUIPMENT CENTER, P71	24-25-02
GENERATOR - HYDRAULIC MOTOR, M10661	1	1	LEFT WHEEL WELL	24-25-01
LIMITER - HYDRAULIC FLOW (HIGH RATE)	1	1	LEFT WHEEL WELL	
LIMITER - HYDRAULIC FLOW (LOW RATE)	1	1	LEFT WHEEL WELL	
PANEL - MISC TEST, M10398	2	1	FLIGHT COMPARTMENT, P61	
RELAYS - (31-01-71/101)				
BOOST PUMP READY, K10698		1		
F/O 115V AC INSTR XFR BUS RELAY, K10640				
HYD GEN 28V DC SENSE, K10690				
115V AC INST TRANS BUS, K10565				
115V AC L TRANSFER, K10566				
115V AC R TRANSFER, K10567				
SWITCH - GND PROX/HYD GEN, S4	2	1	FLIGHT COMPARTMENT, P61, M10398	*
UNIT - TRANSFORMER RECTIFIER, T10060	2	1		24-25-05
VALVE - HYD MTR GEN S/O, V10128	1	1	LEFT WHEEL WELL	24-25-03

* SEE THE WDM EQUIPMENT LIST

Hydraulic Motor Generator System - Component Index
Figure 101

EFFECTIVITY
AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;

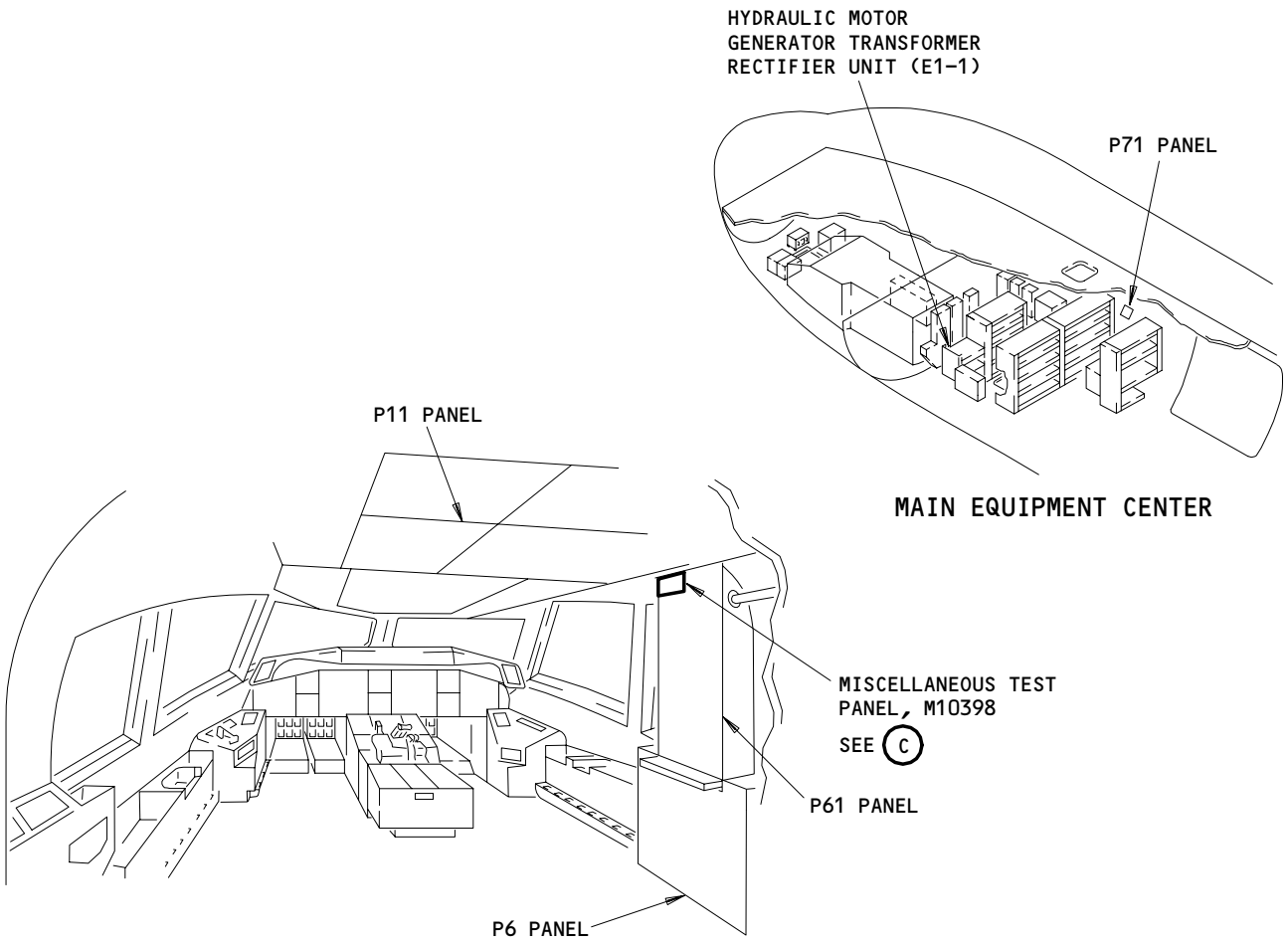
A63875



Hydraulic Motor Generator System – Component Location
Figure 102 (Sheet 1)

EFFECTIVITY
AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;

A63960



Hydraulic Motor Generator System - Component Location
Figure 102 (Sheet 2)

EFFECTIVITY
AIRPLANES WITH 10 KVA HYDRAULIC MOTOR GENERATOR;

A63963

HYDRAULIC MOTOR GENERATOR SYSTEM-
ADJUSTMENT/TEST

1. General
   A. This procedure has two tasks.
      (1) The first task does an operational test of the hydraulic motor generator (HMG) system.
      (2) The second task does a system test of the HMG system.

TASK 24-25-00-715-001

2. Operational Test - Hydraulic Motor Generator System (Fig. 501)
   A. General
      (1) The operational test does a fast system check, and uses the EICAS displays to monitor the system.
      (2) A ground service cart or the alternating current motor pumps (ACMP) can supply hydraulic power.
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 29-11-00/201, Main Hydraulic Systems
   C. Access
      (1) Location Zones
          211/212 Flight Compartment
   D. Prepare for the Test

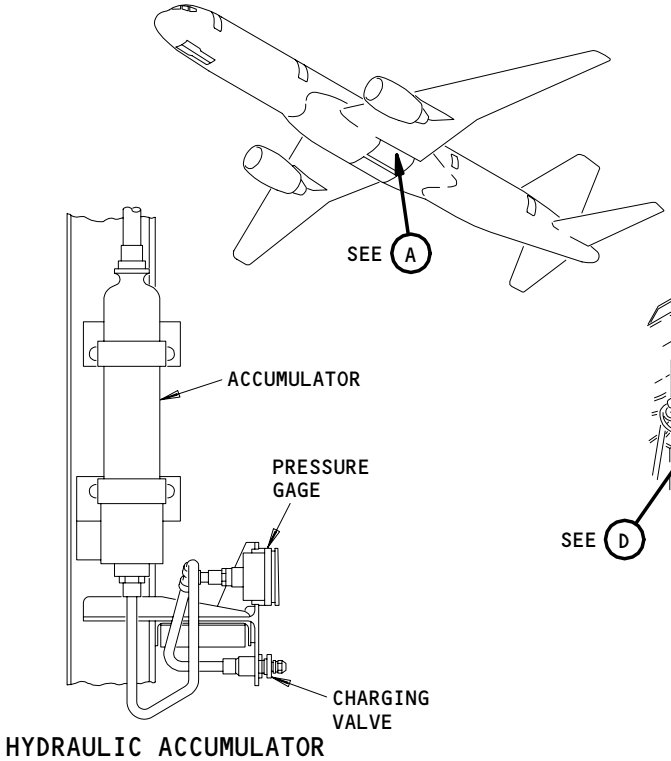
      S 865-002
      (1) Supply electrical power (AMM 24-22-00/201).

      S 865-003
      (2) Make sure the EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

      S 865-004
      (3) Make sure these circuit breakers on the P11 panel are closed:
          (a) 11R6, AC BUS SENSE LEFT
          (b) 11R29, AC BUS SENSE RIGHT

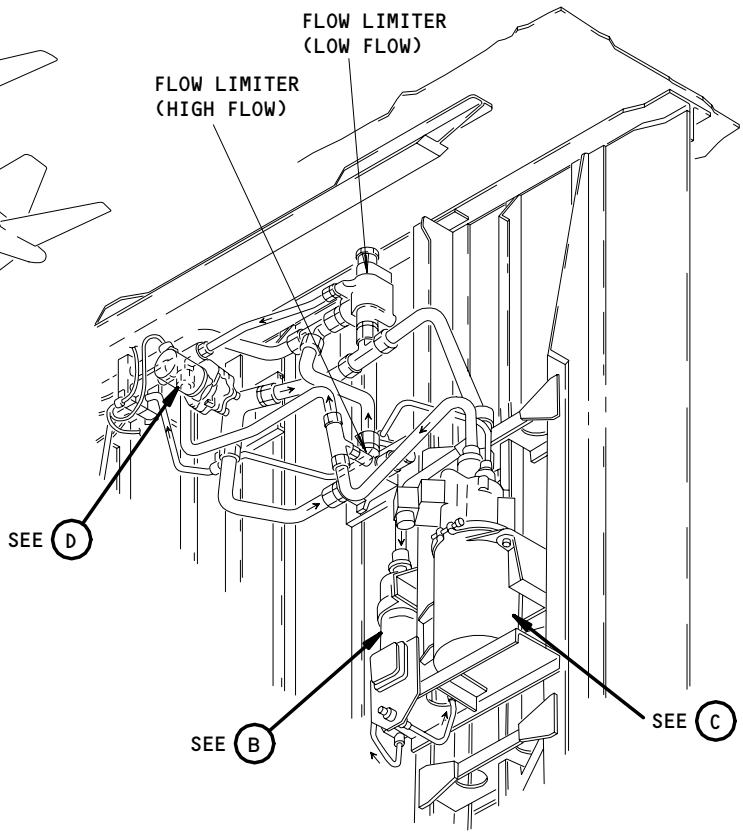
      S 865-005
      (4) Make sure this circuit breaker on the main power distribution panel, P6, is closed:
          (a) 6C3, HYD GEN CONT

      S 615-006
      (5) If you use the hydraulic service cart to pressurize the hydraulic system, do this procedure:
          (a) Pressurize the left hydraulic system with the hydraulic service cart (AMM 29-11-00).



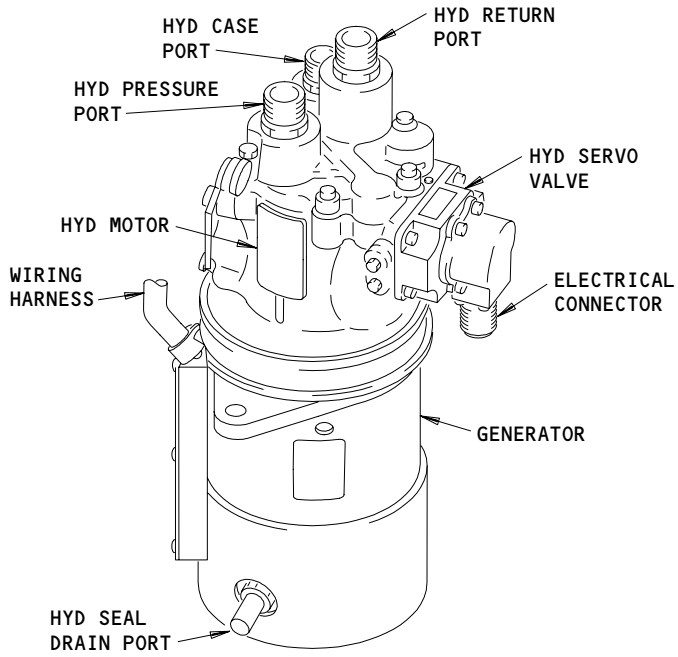
HYDRAULIC ACCUMULATOR

B



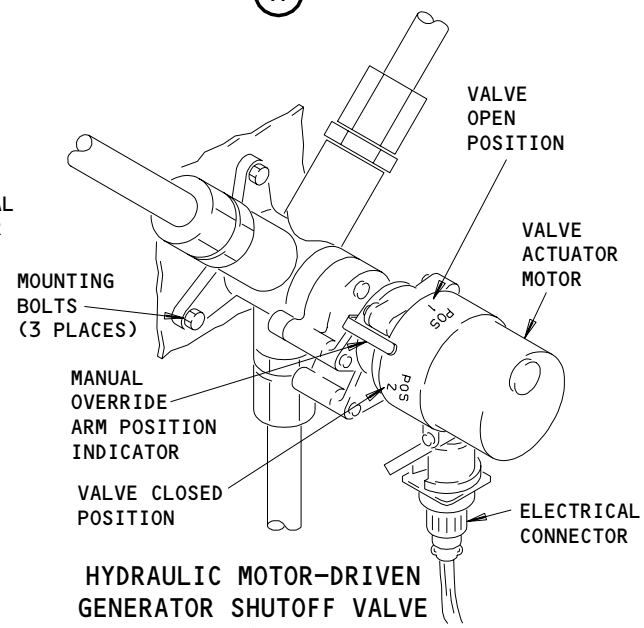
LEFT WHEEL WELL

A



HYDRAULIC MOTOR-DRIVEN GENERATOR

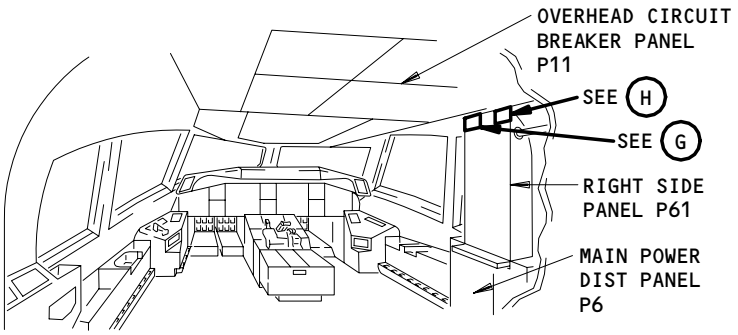
C



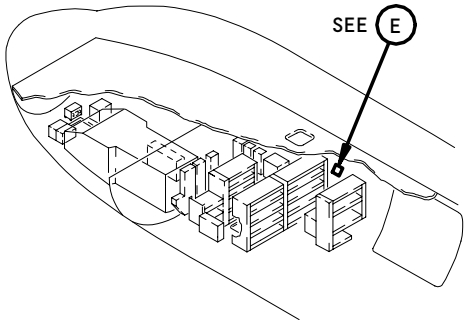
HYDRAULIC MOTOR-DRIVEN GENERATOR SHUTOFF VALVE

D

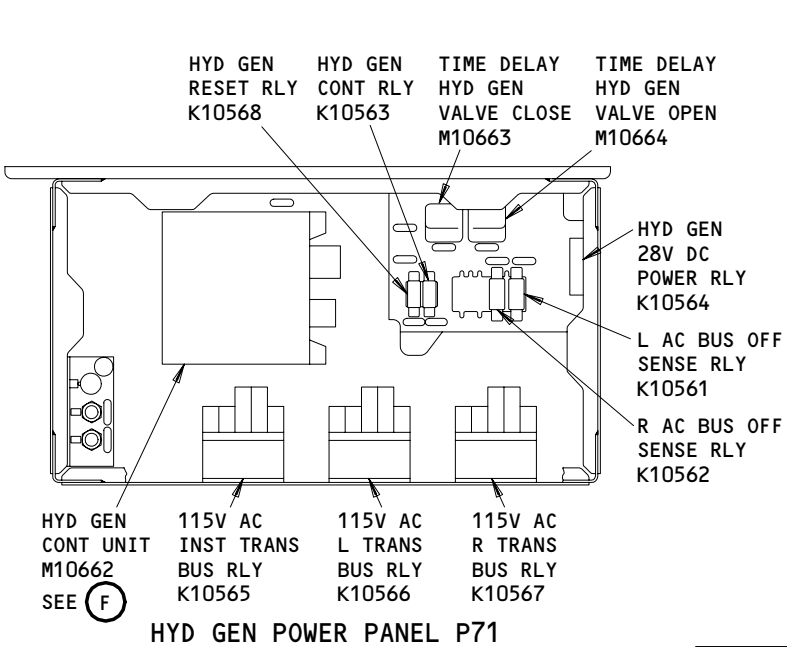
Hydraulic Motor-Driven Generator System Component Location
Figure 501 (Sheet 1)



FLIGHT COMPT

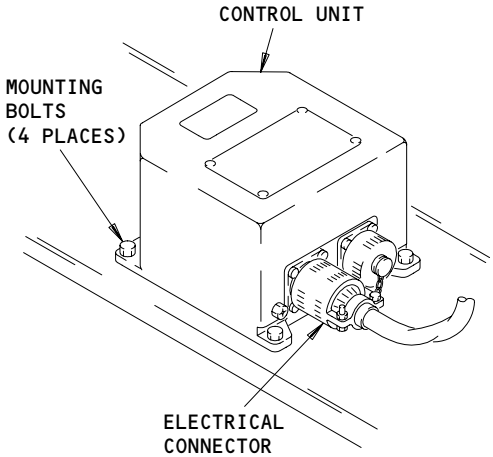


MAIN EQUIPMENT CENTER



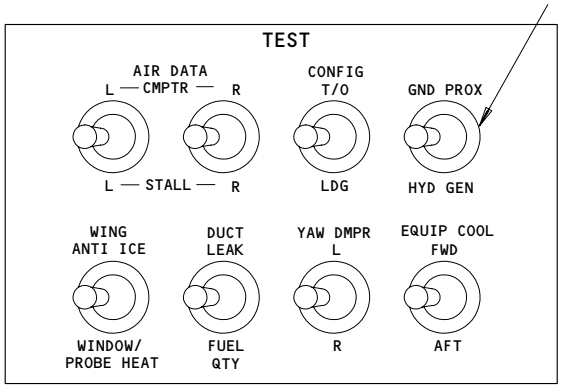
HYD GEN POWER PANEL P71

E



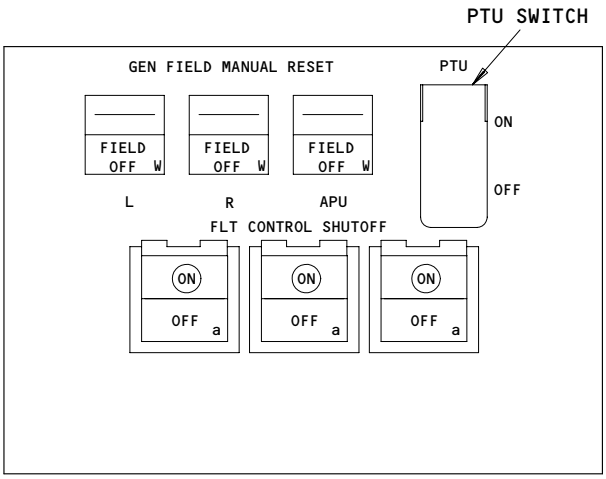
HYDRAULIC MOTOR-DRIVEN GENERATOR CONTROL UNIT

F



MISCELLANEOUS TEST PANEL, M10398

G



M10191 GENERATOR FIELD AND HYDRAULIC CONTROL PANEL (P61)

H

Hydraulic Motor-Driven Generator System Component Location
Figure 501 (Sheet 2)

S 615-007

(6) If you use the Alternating Current Motor Pump (ACMP) to pressurize the hydraulic system, do these procedures:
  (a) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (AMM 29-11-00).
  (b) Put the PTU switch on the P61 panel to the ON position.

E. Procedure

S 715-008

(1) Do a test on the HMG system (Fig. 501):
  (a) Push the DISPLAY STATUS switch on the EICAS display select panel P9.
  (b) Hold the GND PROX/HYD GEN switch on the P61 panel in the HYD GEN position.

NOTE: THE PITOT HEATER ANNUNCIATOR LIGHTS MAY FLASH WHILE PERFORMING THIS TEST.

  (c) Make sure HYD GEN ON and HYD GEN VAL show on the EICAS lower display.
  (d) On the EICAS maintenance page, make sure the ELEC/HYD display shows:
    1) HYD GEN DC-V 28 ±4
    2) HYD GEN AC-V 115 ±5
    3) HYD GEN FREQ 400 ±5

NOTE: The HYD GEN DC-V display is indication of the hot battery bus voltage (HMG TRU output is in parallel with the main battery).

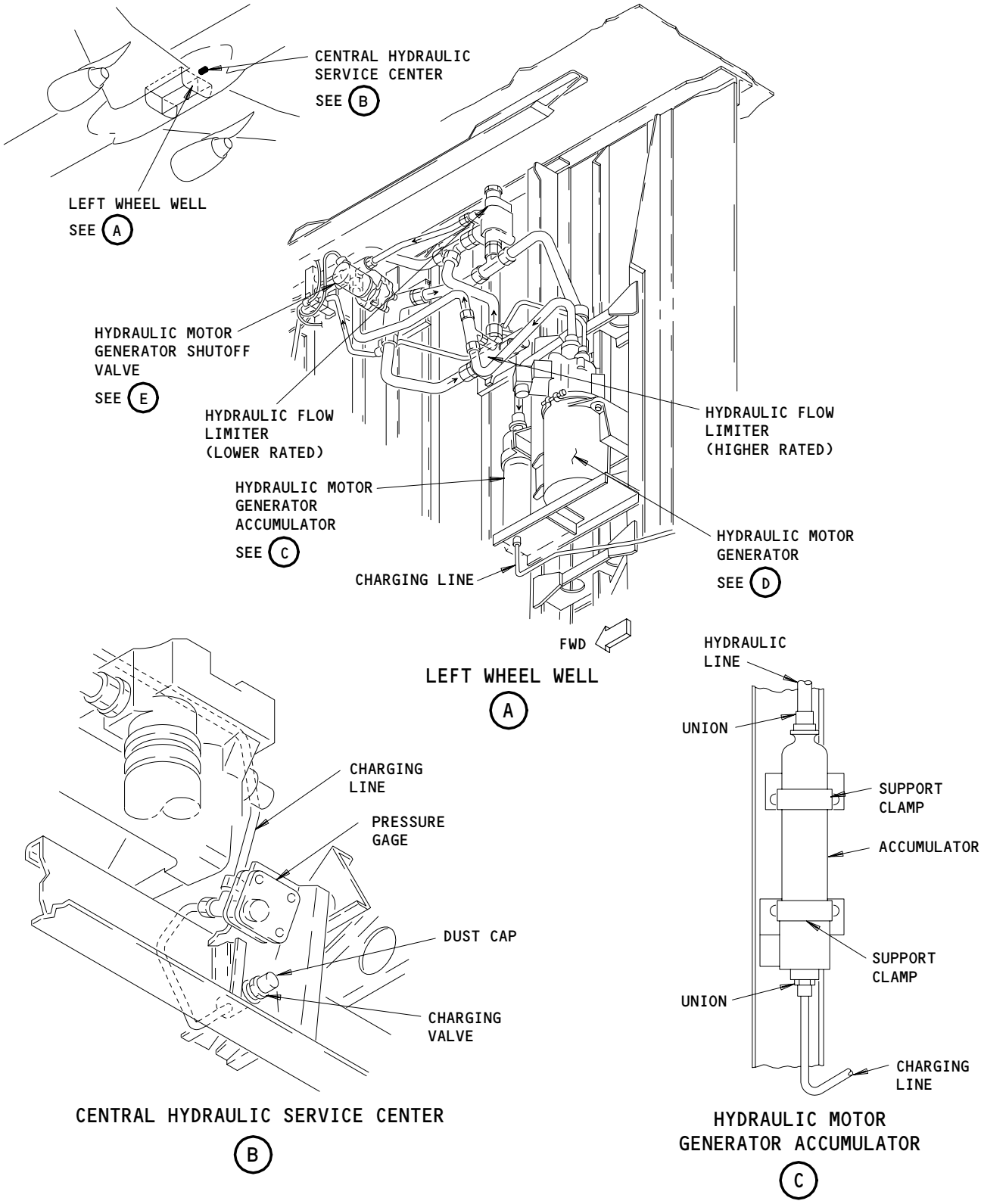
NOTE: The HYD GEN DC-V display on EICAS is a measurement of the battery bus voltage only and is not a confirmation of the HMG DC output.

NOTE: If the display does not show correct voltages or frequency, cycle the HYD GEN CONT circuit breaker (6C3) on the P6 panel and do the test again.

  (e) Release the GND PROX/HYD GEN switch (P61) and make sure these values are shown on the EICAS maintenance page:

NOTE: On airplanes with 10 KVA HMG, the HMG will continue to operate for approximately 15 seconds after the test switch is released.

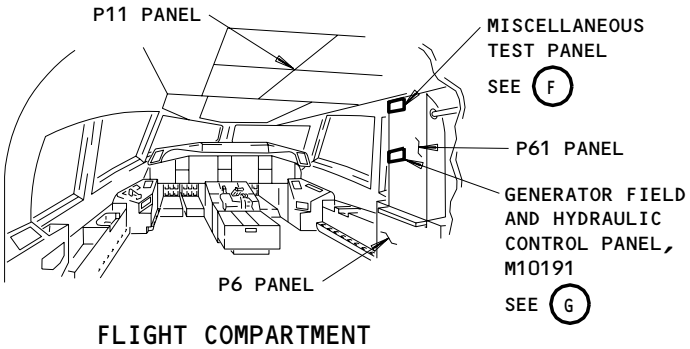
    1) HYD GEN DC-V 0 ±4
    2) HYD GEN AC-V 0 ±5
    3) HYD GEN FREQ 0 ±5
  (f) Make sure HYD GEN ON and HYD GEN VAL do not show on the EICAS lower display.



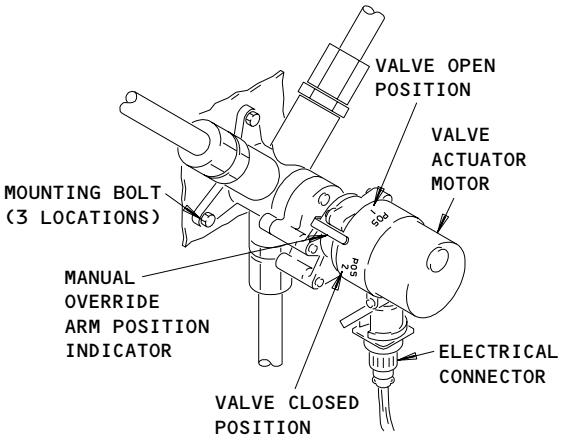
Hydraulic Motor Generator System – Component Location
Figure 501A (Sheet 1)

EFFECTIVITY
AIRPLANES WITH 10 KVA HMG

A51160

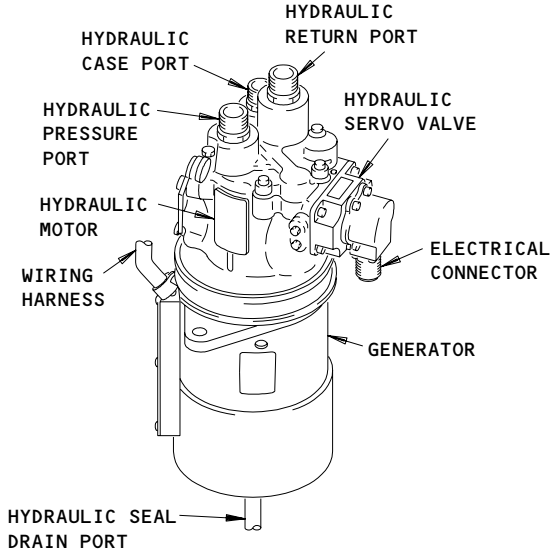


FLIGHT COMPARTMENT



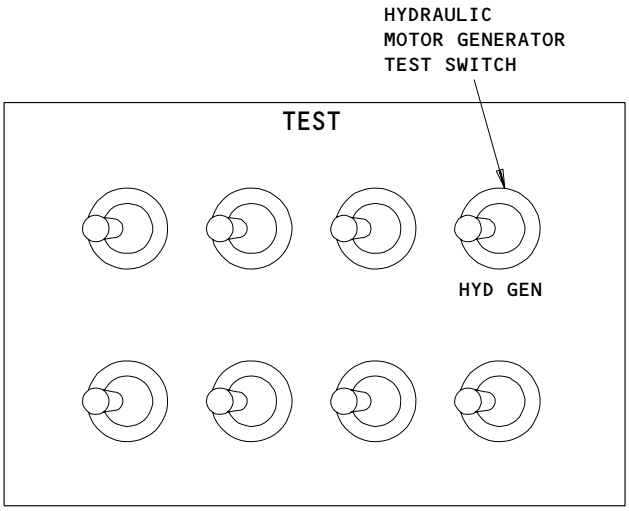
HYDRAULIC MOTOR
GENERATOR SHUTOFF VALVE

(E)



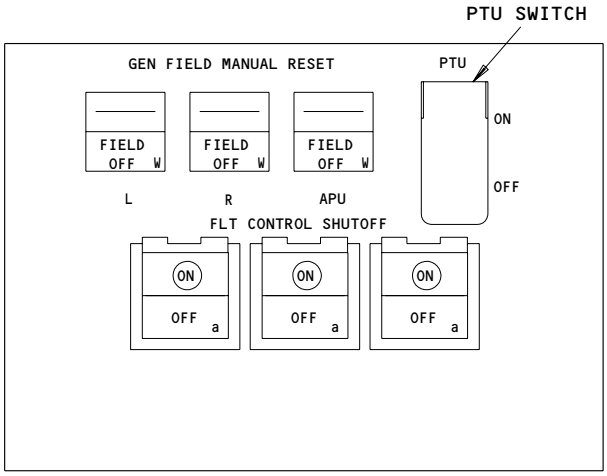
HYDRAULIC MOTOR GENERATOR

(D)



MISCELLANEOUS TEST PANEL

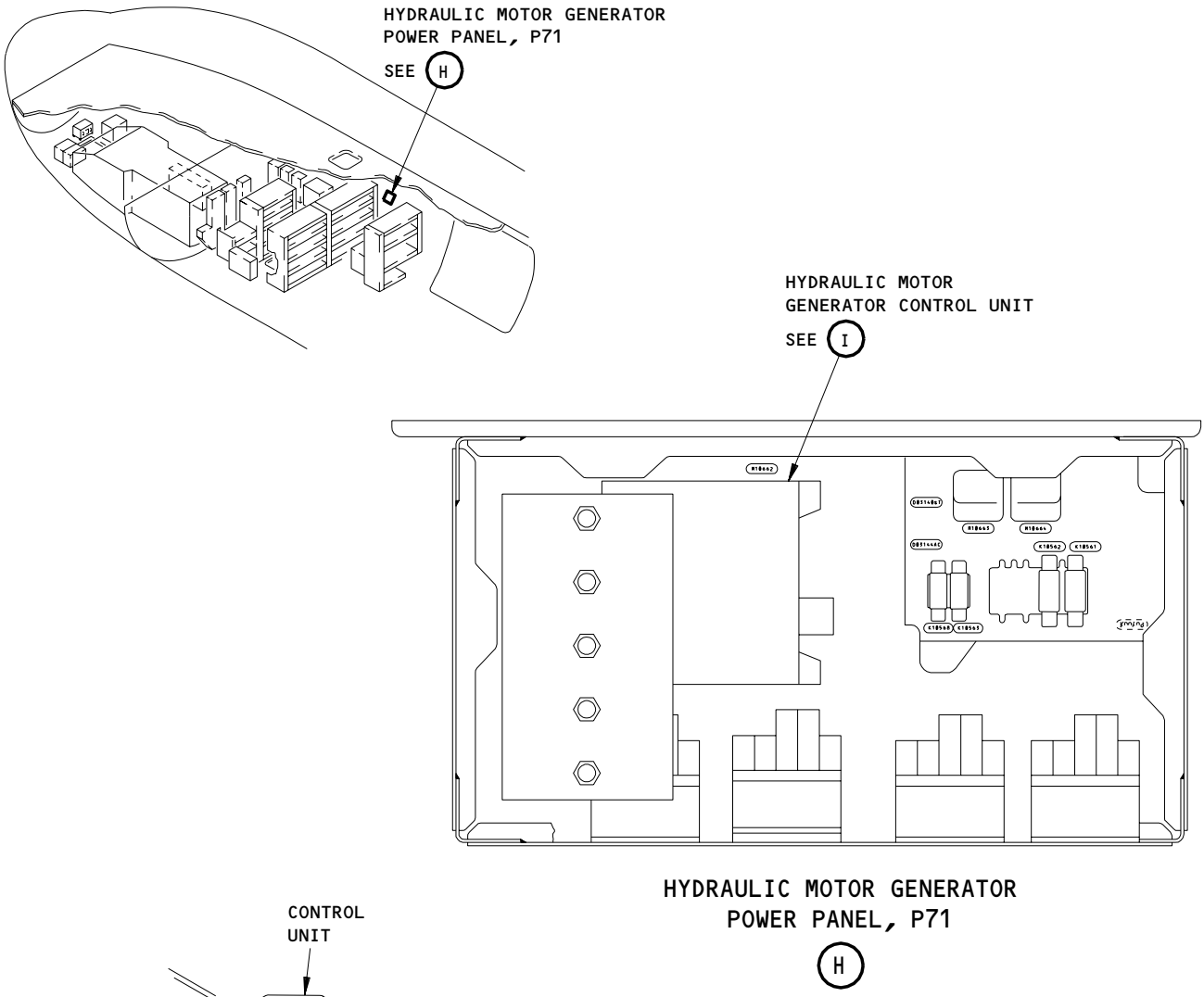
(F)



GENERATOR FIELD AND HYDRAULIC
CONTROL PANEL, M10191 (P61)

(G)

Hydraulic Motor Generator System – Component Location
Figure 501A (Sheet 2)



Hydraulic Motor Generator System – Component Location
Figure 501A (Sheet 3)

K21948

(g) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

S 845-010

(2) Put the Airplane back to its Usual Condition
(a) If you used the ACMPs:
1) Put the PTU switch to the OFF position.
(b) Remove the hydraulic power if it is not necessary (AMM 29-11-00).
(c) Remove the electrical power if it is not necessary (AMM 24-22-00).

TASK 24-25-00-725-011

3. System Test - Hydraulic Motor Generator System

A. General
(1) The system test does these checks:
(a) HMG Reset Signal (for 5 kva HMG only)
(b) Hydraulic Shutoff Valve
(c) Bus Power Transfer
(d) Thrust Reverser EROPS Transfer Relay.

B. References
(1) AMM 24-22-00/201, Electrical Power - Control
(2) AMM 27-61-00/201, Activate/Deactivate Spoilers
(3) AMM 29-11-00/201, Main Hydraulic Systems
(4) AMM 32-09-02/201, Air Ground Relays
(5) AMM 32-00-15/201, Main Gear Door Locks

C. Equipment
(1) MULTIMETER - 0-1000v dc ±1%, 0-750 ac, 0-2 amps, 0-2 meg-ohms
(2) 5kva HMG Test Box - A24008-27 (Preferred)
5kva HMG Test Box - A24008-19 (Optional)

NOTE: This test box is only for use on 5kva HMG units.

D. Access
(1) Location Zones
143/144 Main Landing Gear Body
211/212 Flight Compartment
(2) Access Panels
732/742 Main Landing Gear Body Doors

E. Prepare for the Test

S 865-012
(1) Supply electrical power (AMM 24-22-00).

S 865-013
(2) Make sure the EICAS circuit breakers on P11 are closed.

S 015-014

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 OR DAMAGE TO EQUIPMENT.

(3) Open the doors for the left landing gear and install the door locks (AMM 32-00-15).

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.

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

F. Procedure

S 725-015

CAUTION: DO NOT PERFORM THIS TEST ON 10 KVA HMG UNITS. USE TEST EQUIPMENT ONLY ON 5 KVA HMG UNITS. PERFORMING THIS TEST ON 10 KVA HMG UNITS WILL CAUSE DAMAGE TO THE TEST EQUIPMENT.

(1) AIRPLANES WITH 5 KVA HMG SYSTEM;
Do a check of the HMG Reset Signal (for 5 kva HMG only):
(a) Open this circuit breaker on the P6 panel and attach a DO-NOT-CLOSE tag:
1) 6C3, HYD GEN CONT
(b) Disconnect the electrical connector D7070 from the HMG control unit.
(c) Connect the electrical connector D7070 to the test box.
(d) Put the RELAY POWER switch and the 28vdc power switch on the test box to OFF.
(e) Connect the test box to a 115vac power source which has a frequency of 400 Hertz.
(f) Put the 28V DC POWER switch and the RELAY POWER switch on the test box to ON.
1) Make sure the RESET light on the test box comes on.
(g) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
(h) Remove the DO-NOT-CLOSE tag and close this P6 circuit breaker:
1) 6C3, HYD GEN CONT
(i) Remove the electrical connector D7074 from the HMG valve V10128.
1) Do a check for 28 +2-4v dc at pin 2 and 0v dc at pin 3 of connector D7074.

(j) Hold the GND PROX/HYD GEN switch in the HYD GEN position for a minimum of 0.5 second.
(k) Release the GND PROX/HYD GEN switch.
1) Do a check for 28v dc at pin 3, and 0v dc at pin 2 of the electrical connector D7074.
(l) Set the RELAY POWER switch on the test box to OFF.
1) Make sure the RESET light goes out and after 1.5 seconds comes on.
2) Make sure HYD GEN ON does not show on EICAS.
(m) Set the RELAY POWER switch on the test box to ON.
1) Make sure the RESET light stays on.
2) Make sure the HYD GEN ON indication shows on EICAS.
(n) Remove the DO-NOT-CLOSE tags and close these P11 circuit breakers:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
(o) Connect the electrical connector D7074 to the HMG valve V10128.
(p) Set the 28V DC POWER switch on the test box to OFF and remove the test box.
(q) Connect the electrical connector D7070 to the HMG control unit.

S 725-085
(2) AIRPLANES WITH HYDRAULIC SHUTOFF VALVE S270T010-1, -2, -3, -4, -5, -6, -7, -8, -9, OR WITH SUFFIX "R";
Hydraulic Shutoff Valve Check:
(a) Do a check of the Hydraulic Shutoff Valve:
1) Make sure the valve indicator is in position 2.
2) Hold the GND PROX/HYD GEN switch (P61) in the HYD GEN position.
3) Make sure the valve indicator moves to position 1.
4) Listen to the valve motor and make sure that the motor does not operate after the valve has moved to position 1.
5) Release the GND PROX/HYD GEN switch (P61).
6) Make sure the valve indicator moves to position 2 in approximately 2 seconds.
7) Listen to the valve motor and make sure that the motor does not operate after the valve has moved to position 2.
8) Open the HYD GEN CONT circuit breaker (6C3) on the P6 panel.
9) Manually move the valve indicator to the middle position (between position 1 and position 2).
10) Close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.
11) Make sure the valve indicator moves to position 2.
12) Listen to the valve motor and make sure that the motor does not operate after the valve has moved to position 2.
13) Hold the GND PROX/HYD GEN switch (P61) in the HYD GEN position and in approximately 2 seconds open the HYD GEN CONT circuit breaker (6C3).
14) Make sure the valve indicator moves to position 1.

15) Listen to the valve motor and make sure that the motor does not operate after the valve has moved to position 1.
16) Release the GND PROX/HYD GEN switch (P61).
17) Manually move the valve indicator to the middle position (between position 1 and position 2).
18) Hold the GND PROX/HYD GEN switch (P61) in the HYD GEN position.
19) Close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.
20) Make sure the valve indicator moves to position 1.
21) Listen to the valve motor and make sure that the motor does not operate after the valve has moved to position 1.
22) AIRPLANES WITH 10 KVA HMG;
Make sure the valve indicator moves to position 2 in approximately 15 seconds.
23) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

(b) If any step in the Hydraulic Shutoff Valve Check fails, the valve is defective. Replace the valve (AMM 24-25-03/401).

S 725-062

(3) AIRPLANES WITH 5 KVA HMG SYSTEM;
Do a check of the Hydraulic Shutoff Valve (5 kva HMG only):

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Do the Flight Mode Simulation procedure for the No. 1 air/ground system (AMM 32-09-02).
(b) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
a) Make sure the hydraulic shutoff valve moves to the open position (1) and HYD GEN VAL shows on EICAS.
(c) Remove the DO-NOT-CLOSE tags and close these P11 circuit breakers:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
a) Make sure the hydraulic shutoff valve moves to the closed position (2) and HYD GEN VAL does not show on EICAS.

(d) Open and close this circuit breaker on the P6 panel to reset the GCU:
1) 6C3, HYD GEN CONT

S 725-082
(4) AIRPLANES WITH 10 KVA HMG SYSTEM;
Do a check of the Hydraulic Shutoff Valve (10kva HMG only):

WARNING: MAKE SURE YOU DO THE FLIGHT MODE SIMULATION CORRECTLY. IF THE PROCEDURE IS NOT DONE CORRECTLY, INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Do the Flight Mode Simulation procedure for the No. 1 air/ground system (AMM 32-09-02).
(b) Open these circuit breakers on the P11 panel and attach DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
a) Make sure the hydraulic shutoff valve moves to the open position (1) and HYD GEN VAL shows on EICAS.
b) After 15 seconds approximately, make sure the hydraulic shutoff valve moves to the closed position (2) and HYD GEN VAL does not show on EICAS.
(c) Remove the DO-NOT-CLOSE tags and close these P11 circuit breakers:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
(d) Open the following circuit breaker, wait for approximately 35 seconds and then close it to reset the GCU:
1) 6C3, HYD GEN CONT

S 725-017
(5) Do a check of the Bus Power Transfer:
(a) Open these circuit breakers to remove electrical power from all buses supplied by the HMG:
1) 6C7, HYD GEN 28V DC POWER

2) 6M16, CAPT PRIMARY INSTR BUS PH A
3) 6M17, CAPT PRIMARY INSTR BUS PH B
4) 6M18, CAPT PRIMARY INSTR BUS PH C
5) 11Q34, CAPT ALT INST BUS PH A
6) 11Q35, CAPT ALT INST BUS PH B
7) 11Q36, CAPT ALT INST BUS PH C

(b) Open these circuit breakers:
1) 31EF2 or 6J17 or 6J14, 115V AC LEFT XFR BUS
2) 32EF2 or 6J23 or 6D14 or 6J20, 115V AC RIGHT XFR BUS

WARNING: MEASURE THE VOLTAGE CAREFULLY AT THESE HIGH CURRENT CIRCUIT BREAKERS. HIGH CURRENT CAN CAUSE INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT.

(c) Do a check for voltage at these circuit breakers:

BUS	CIRCUIT BREAKER	TERMINAL	VOLTAGE
115v ac L Transfer	11E9, L FMCS CMPTR C609	2	0 ±5 ac
115v ac R Transfer	11M19, R AUTO PACK C674	2	0 ±5 ac
Captains Instr	11E1, L IAS MACH C580	1	0 ±5 ac
Hot Battery	6C7, HYD GEN 28V DC C4348	1	0 ±3 dc

(d) Do a check for 28v dc ±3 at terminal 2 of the circuit breaker HYD GEN 28V DC (6C7).
(e) If you use the hydraulic service cart to pressurize the hydraulic system, do this procedure:
1) Pressurize the left hydraulic system with the hydraulic service cart (AMM 29-11-00/201).
(f) If you use the Alternating Current Motor Pump (ACMP) to pressurize the hydraulic system, do these procedures:
1) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (AMM 29-11-00/201).
2) Put the PTU switch on the P61 panel to the ON position.
(g) Close these circuit breakers:
1) 31EF2 or 6J17 or 6J14, 115V AC LEFT XFR BUS
2) 32EF2 or 6J23 or 6D14 or 6J20, 115V AC RIGHT XFR BUS

(h) Open these P11 circuit breakers and attach DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT

WARNING: MEASURE THE VOLTAGE CAREFULLY AT THESE HIGH CURRENT CIRCUIT BREAKERS. HIGH CURRENT CAN CAUSE INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT.

(i) Do a check for voltages at these circuit breakers:

BUS	CIRCUIT BREAKER	TERMINAL	VOLTAGE
115v ac L Transfer	11E9, L FMCS CMPTR C609	2	118 ±5 ac
115v ac R Transfer	11M19 R AUTO PACK PWR C674	2	118 ±5 ac
Captains Instr	11E1, L IAS MACH C580	1	118 ±5 ac
Hot Battery	6C7, HYD GEN 28V DC C4348	1	32 ±4 dc

(j) Remove the DO-NOT-CLOSE tags and close these P11 circuit breakers:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
(k) Put the airplane back to the ground mode (AMM 32-09-02).

S 725-024
(6) AIRPLANES WITHOUT SB 78-32 THRUST REVERSER SYNC LOCK INSTALLATION; Do a check of the Thrust Reverser EROPS Transfer Relay:
(a) Make sure these P11 circuit breakers are closed:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
3) 11K33 or 11B30, T/R CONT R
4) 11K32 or 11B29, T/R IND R
(b) Make sure this P6 circuit breaker is closed:
1) 6C3, HYD GEN CONT
(c) Remove these air/ground relays from the P36 panel.
1) The System 1 K177 and the K199 relays.
(d) Remove these air/ground relays from the P37 panel.
1) The System 2 K203 and the K263 relays.

(e) Make sure the GND PROX/HYD GEN switch on P61 is in the off position and do these checks:
1) Make sure that 28v dc is at pin 7 of the receptacle D1866 for the K263 relay (P37).
2) Make sure that 28v dc is at pin A2 of the receptacle D616 for the K203 relay (P37).
(f) Hold the GND PROX/HYD GEN switch on P61 in the HYD GEN position do these checks:
1) Make sure the HMG operates.
2) Make sure that 28v dc is at pin C2 of the receptacle D598 for the K199 relay (P36).
3) Make sure that 28v dc is at pin 7 of the receptacle D606 for the K177 relay (P36).
(g) Release the GND PROX/HYD GEN switch.
(h) Install the relay K177 and the relay K199 in the P36 panel.
(i) Install the relay K203 and the relay K263 in the P37 panel.
(j) Close the P36 and the P37 panels.
(k) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

S 845-019
(7) Put the Airplane back to its Usual Condition
(a) Remove electrical power if it is not necessary (AMM 24-22-00).
(b) Remove the door locks from the landing gear doors and close the doors (AMM 32-00-15).
(c) Put the airplane back to the ground mode (AMM 32-09-02).
(d) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00).

HYDRAULIC MOTOR GENERATOR REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the hydraulic motor generator (HMG) from the airplane. The second task installs the HMG on the airplane.

TASK 24-25-01-004-001

2. Remove the Hydraulic Motor Generator (Fig. 401)
   A. References
      (1) 12-25-01/301, Exterior Cleaning
      (2) 29-11-00/201, Main Hydraulic Systems
      (3) 32-00-15/201, Main Gear Door Locks
   B. Equipment
      (1) Main Gear Door Locks (Ref 32-00-15)
   C. Access
      (1) Location Zones
          143 Main Landing Gear Wheel Well (LH Side)
          211 Control Cabin - Sect 41 (LH Side)
          212 Control Cabin - Sect 41 (RH Side)

      (2) Access Panel
          732 Main Landing Gear Body Door (LH Side)

   D. Prepare for Removal

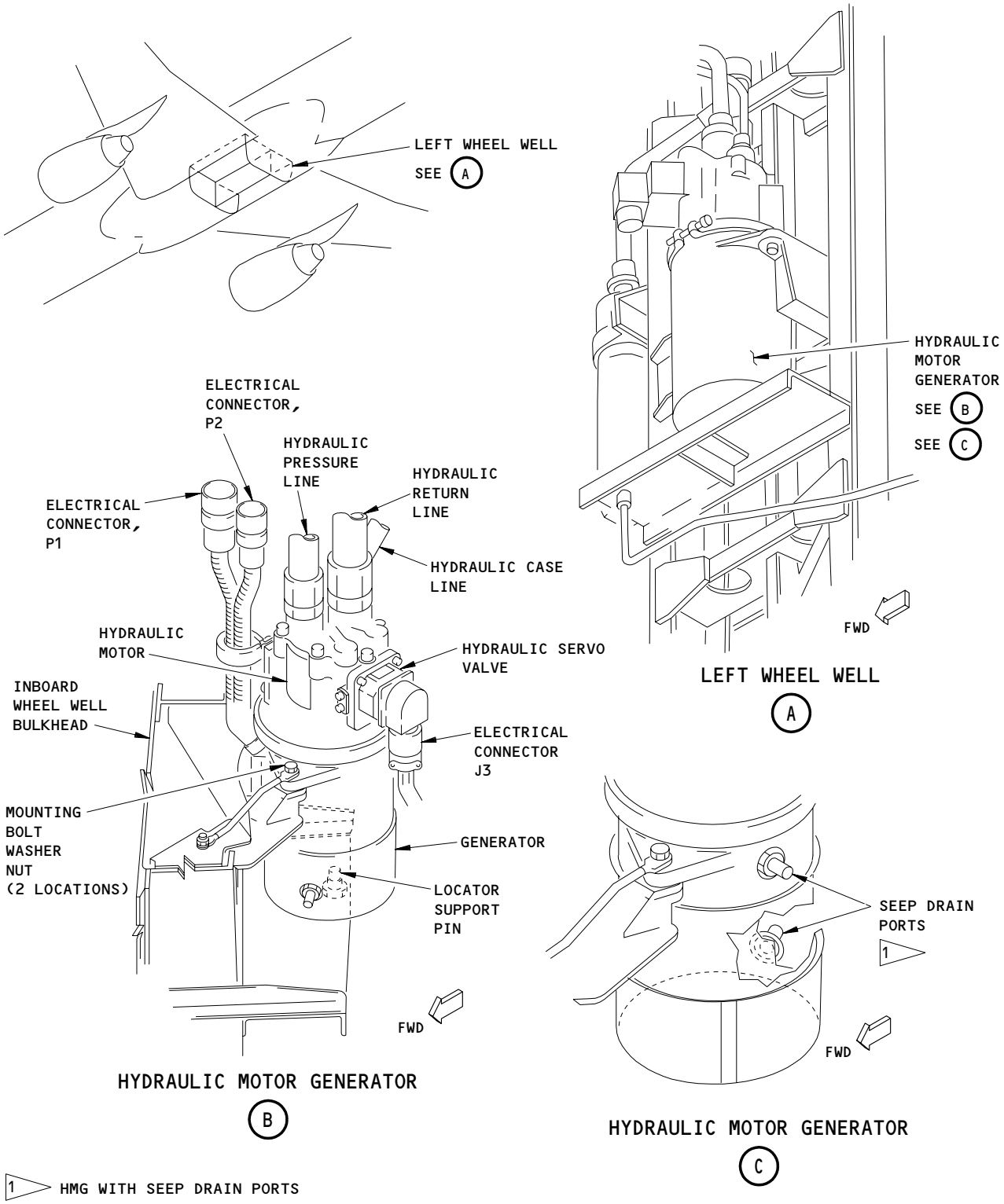
      S 014-002

      WARNING: REFER TO AMM 32-00-15/201 FOR LOCK INSTALLATION PROCEDURE. RAPID ACTION OF DOORS MAY INJURE PERSONS OR DAMAGE EQUIPMENT IF LOCKS ARE NOT INSTALLED CORRECTLY.

      (1) Open the left wheel well door and install the door lock (AMM 32-00-15/201).

      S 614-003
      (2) Remove the pressure from the hydraulic systems and left reservoir (Ref 29-11-00).

      S 864-004
      (3) Open this circuit breaker on the main power distribution panel P6 and attach DO-NOT-CLOSE tag:
      (a) 6C3, HYD GEN CONT



Hydraulic Motor Generator Installation
Figure 401

E. Procedure

S 024-005

(1) Remove the HMG as follows:

(a) Remove the electrical connector D7022 from the servo valve on the HMG.

(b) Remove the generator wiring harness connectors D7066 and D7068 to the airplane wiring.

(c) Disconnect the hydraulic pressure, return, and case lines at the HMG and install caps and plugs.

(d) Remove the two generator mounting bolts, washers and nuts.

(e) Remove the generator by lifting clear of the locator support pin.

S 144-006

CAUTION: QUICKLY CLEAN THE INSTALLATION AREA OF ALL FLUID. HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE AIRPLANE EQUIPMENT.

(2) Clean all hydraulic fluid from the installation area (Ref 12-25-01).

S 034-007

(3) Remove the three unions from the HMG and discard the O-rings.

TASK 24-25-01-424-020

3. Install the Hydraulic Motor Generator (Fig. 401)

A. References

(1) 24-22-00/201, Electrical Power Control

(2) 29-11-00/201, Main Hydraulic Systems

B. Access

(1) Location Zones

143 Main Land Gear Wheel Well (Left)

211 Control Cabin - Section 41 (Left)

212 Control Cabin - Section 41 (Right)

(2) Access Panel

732 Main Landing Gear Body Door (Left)

C. Prepare for Installation

S 644-015

(1) Install new O-rings on the unions.

(a) Apply hydraulic lubricant or hydraulic fluid to O-rings and union threads.

S 434-019

(2) Install unions in the HMG ports.

S 434-024
(3) HYDRAULIC MOTOR GENERATOR WITH THREADED SEEP DRAIN PORTS; Remove the shipping caps/plugs and discard.

NOTE: Parts should be left open, do not seal off or attach tube assembly.

D. Procedure

S 424-008
(1) Install the HMG as follows:
(a) Put the generator on the locator support pin and install:
1) two mounting bolts
2) two nuts
3) two washers
(b) Connect the hydraulic pressure, case and return lines.
(c) Install the electrical connector D7022 on the servo valve.
(d) Install the generator wiring harness connectors D7066 and D7068 to the airplane wiring.

S 864-018
(2) Remove DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
(a) 6C3, HYD GEN CONT

E. Test the HMG Installation.

S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 214-010
(2) Make sure the six EICAS circuit breakers on overhead circuit breaker panel P11 are closed.

S 614-011
(3) Pressurize the left hydraulic system (AMM 29-11-00/201).
(a) If you use the ACMPs to pressurize the left hydraulic system, do these steps:
1) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (AMM 29-11-00/201).
2) Put the PTU switch on the P61 panel to the ON position.

S 214-012
(4) Examine the HMG installation for hydraulic fluid leaks.

S 714-023
(5) Do an operational check.
(a) Hold the GND PROX/HYD GEN switch on the miscellaneous test panel P61 in HYD GEN position.
1) Make sure the HMG operates.
(b) Press the STATUS DISPLAY switch on the EICAS display select panel P9.
1) Make sure the EICAS status message HYD GEN ON is displayed.

(c) Release the GND PROX/HYD GEN switch to the off position.
1) Make sure the HMG stops and status message HYD GEN ON is not displayed.
(d) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

S 864-014
(6) Remove hydraulic power if it is not necessary (Ref 29-11-00).

S 864-017
(7) Remove electrical power if it is not necessary (Ref 24-22-00).

HYDRAULIC MOTOR GENERATOR CONTROL UNIT REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the hydraulic motor generator (HMG) control unit from the airplane. The second task installs the HMG control unit on the airplane.

TASK 24-25-02-024-001

2. Remove the HMG Control Unit (Fig. 401)
   A. Access
      (1) Location Zones
          211/212 Flight Compartment
          119/120 Main Equipment Center
      (2) Access Panels
          119BL Main Equipment Center
   B. Prepare to Remove the HMG Control Unit

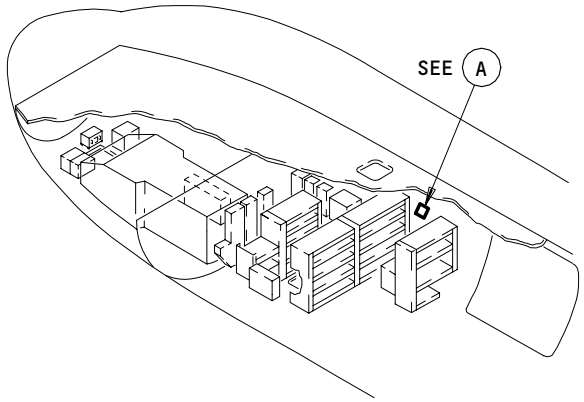
      S 864-003
      (1) Open this circuit breaker on the main power distribution panel P6 and attach DO-NOT-CLOSE tag:
          (a) 6C3, HYD GEN CONT

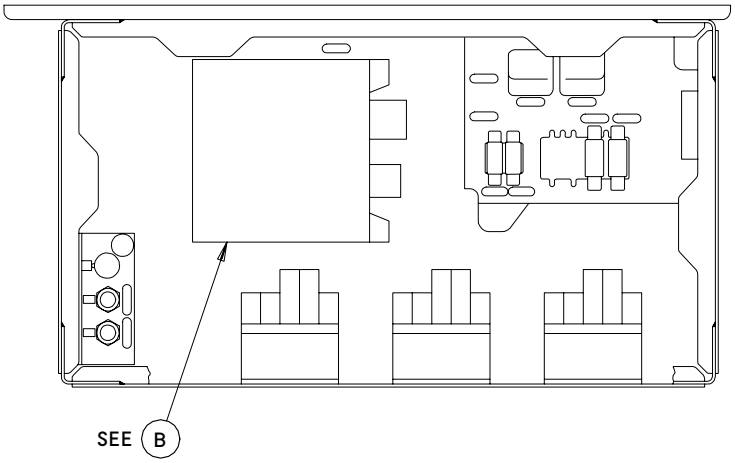
      S 014-004
      (2) Open the HYD GEN POWER PANEL P71 to access the HMG control unit.
   C. Procedure

      S 024-005
      (1) Remove the HMG Control Unit
          (a) Remove the electrical connector D7070 from the HMG control unit.
          (b) Remove the four screws which attach the HMG control unit.
          (c) Remove the HMG control unit.

TASK 24-25-02-424-002

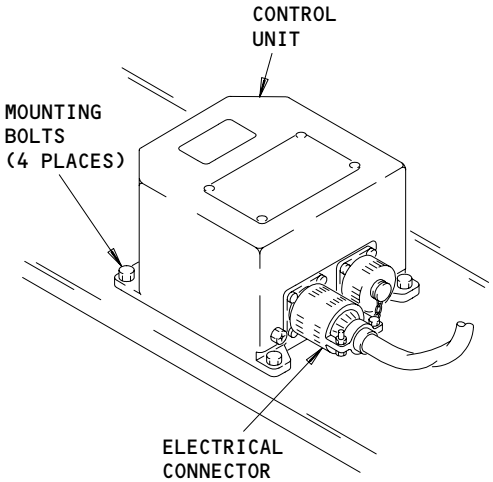
3. Install the HMG Control Unit (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control





HYD GEN POWER PANEL P71

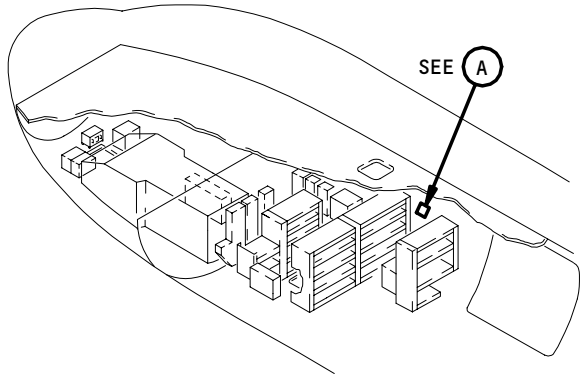
A

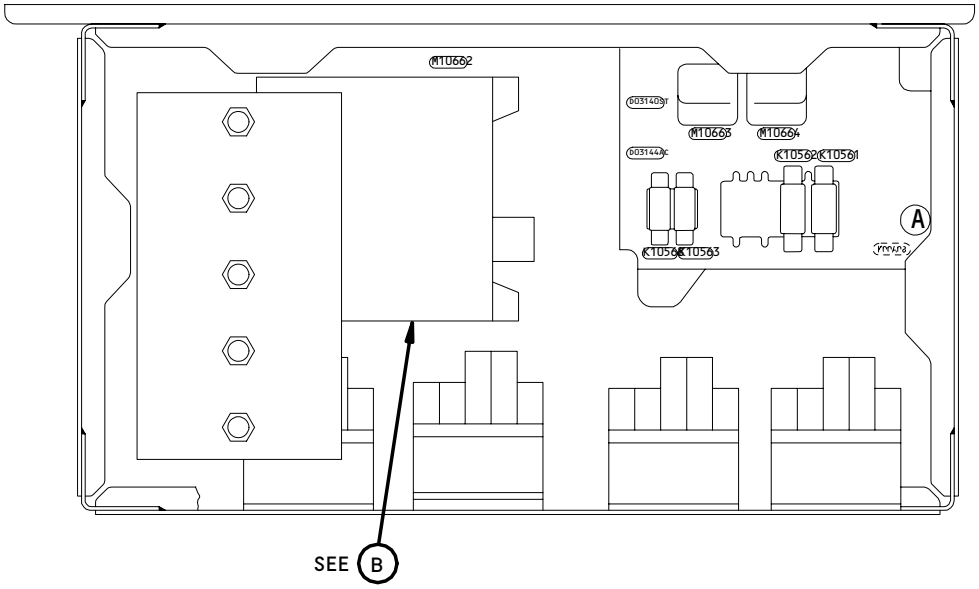


HYDRAULIC MOTOR DRIVEN
GENERATOR CONTROL UNIT

B

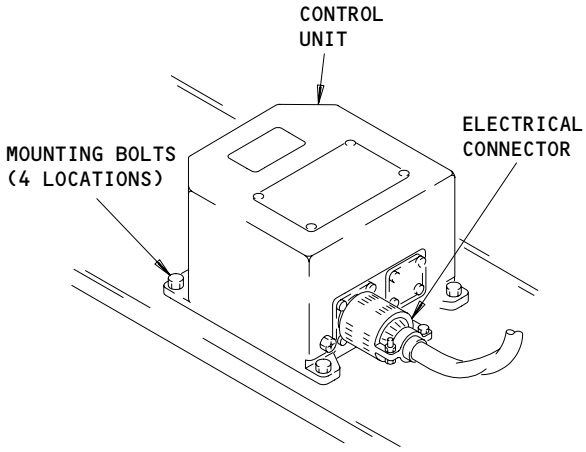
Hydraulic Motor Driven Generator Control Unit Installation
Figure 401





HYDRAULIC GENERATOR
POWER PANEL, P71

A



HYDRAULIC MOTOR
GENERATOR CONTROL UNIT

B

Hydraulic Motor Generator Control Unit Installation
Figure 401A

EFFECTIVITY
AIRPLANES WITH 10 KVA SYSTEM

A51177

(2) 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
119BL Main Equipment Center

C. Procedure

S 424-006

(1) Install the HMG Control Unit
(a) Position the HMG control unit in the P71 panel and install with four screws.
(b) Connect the electrical connector D7070 to the HMG control unit.
(c) Close the P71 panel.

S 864-007

(2) Remove the DO-NOT-CLOSE tag, and close this P6 circuit breaker:
(a) 6C3, HYD GEN CONT

D. HMG Control Unit Installation Test

S 864-008

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

S 864-009

(2) Make sure the six EICAS circuit breakers on overhead circuit breaker panel P11 are closed.

S 614-010

(3) Pressurize the left hydraulic system (AMM 29-11-00/201).
(a) If you use the ACMPs to pressurize the left hydraulic system, do these steps:
1) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (AMM 29-11-00/201).
2) Put the PTU switch on the P61 panel to the ON position.

S 714-011

(4) Do an operational check as follows:
(a) Put the GND PROX/HYD GEN switch on the miscellaneous test panel P61, in the HYD/GEN position.
(b) Push the ELEC/HYD switch on EICAS maintenance panel P61.
(c) Make sure the EICAS ELEC/HYD display reads as follows:
1) HYD GEN DC-V 28 ±4
2) HYD GEN AC-V 118 ±5
3) HYD GEN FREQ 400 ±5
(d) Put the GND PROX/HYD GEN switch to the off position.
(e) Make sure the EICAS ELEC/HYD display reads as follows:
1) HYD GEN DC-V 0
2) HYD GEN AC-V 0
3) HYD GEN FREQ 0

(f) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

S 864-012

(5) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

S 864-013

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

HYDRAULIC MOTOR GENERATOR SHUTOFF VALVE REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the hydraulic motor generator (HMG) shutoff valve from the airplane. The second task installs the HMG shutoff valve on the airplane.

TASK 24-25-03-024-001

2. Remove the HMG Shutoff Valve (Fig. 401)
   A. Equipment
      (1) Main Gear Door Locks (Ref 32-00-15)
   B. References
      (1) 12-12-01/301, Hydraulic Systems
      (2) 12-25-01/301, Exterior Cleaning
      (3) 24-22-00/201, Electrical Power - Control
      (4) 29-11-00/201, Main Hydraulic Systems
      (5) 32-00-15/201, Main Gear Door Locks
   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 Removal

S 014-002

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 614-003

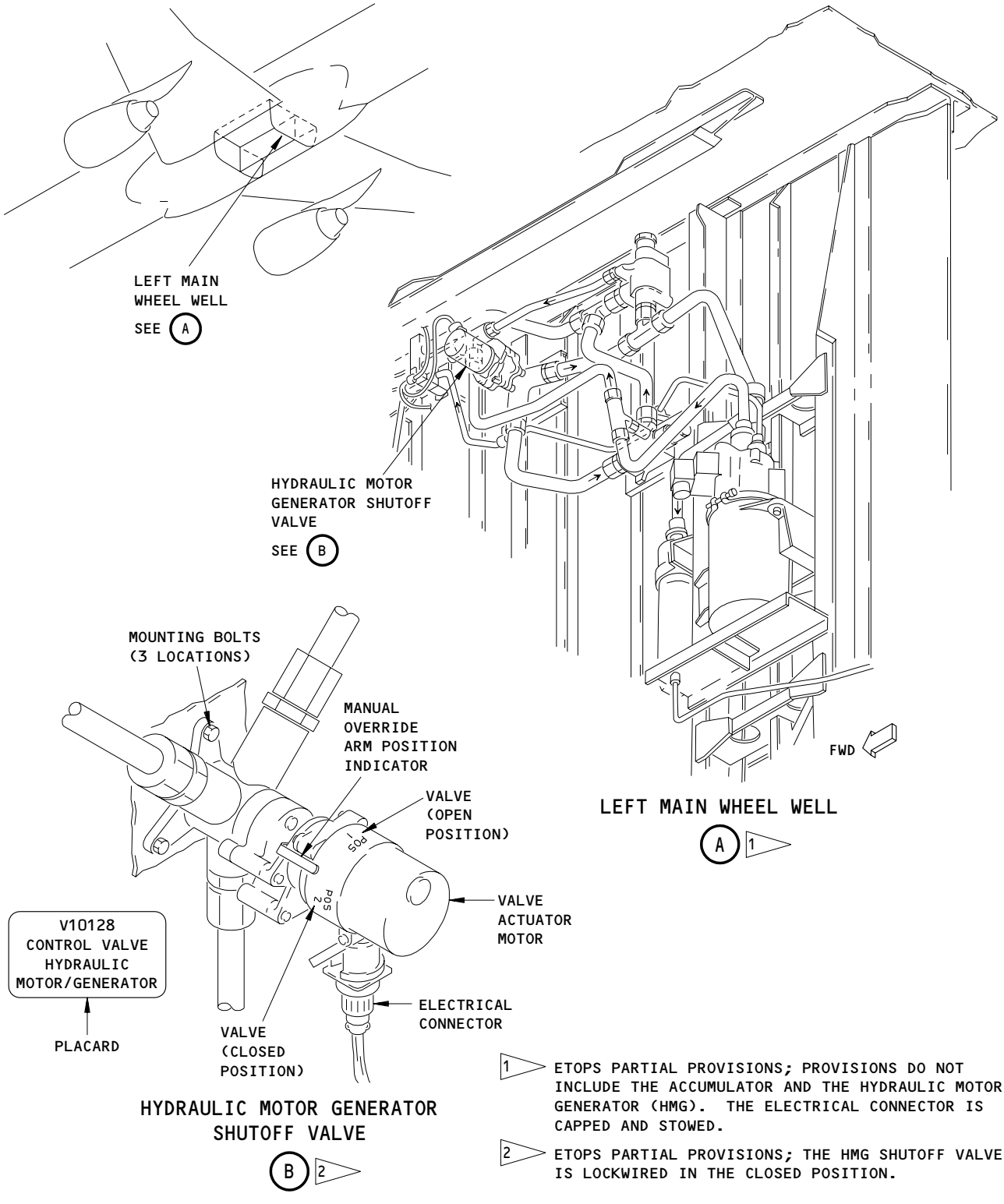
(2) Remove the pressure from hydraulic systems and the left reservoir (AMM 29-11-00/201).

S 864-004

(3) Open this circuit breaker on the main power distribation P6 and attach DO-NOT-CLOSE tag:
(a) 6C3, HYD GEN CONT

S 864-005

(4) Open these circuit breakers on the overhead circuit breaker panel P11, and attach DO-NOT-CLOSE tags:
(a) 11R6, AC BUS SENSE LEFT
(b) 11R29, AC BUS SENSE RIGHT



Hydraulic Motor Generator Shutoff Valve Installation
Figure 401

E. Procedure

S 024-006

(1) Remove the HMG shutoff valve as follows:
  (a) ETOPS PARTIAL PROVISIONS;
  Remove the lockwire (AMM 20-10-23/401).
  (b) Remove the electrical connector D7074 from the HMG shutoff valve.
  (c) Disconnect the three hydraulic lines from the HMG shutoff valve and install caps and plugs.
  (d) Remove the three mounting bolts and washers.
  (e) Remove the HMG shutoff valve.

S 164-007

CAUTION: HYDRAULIC FLUID SPILLAGE SHOULD BE PROMPTLY CLEANED AND REMOVED. HYDRAULIC FLUID CAN DAMAGE AIRPLANE EQUIPMENT.

(2) Clean any hydraulic fluid from the installation area (Ref 12-25-01).

S 034-008

(3) Remove the three unions from the HMG shutoff valve. Keep the unions for installation. Discard the O-rings.

TASK 24-25-03-424-009

3. Install the HMG Shutoff Valve (Fig. 401)

A. Equipment
(1) Main Gear Door Locks (Ref 32-00-15)

B. References
(1) 12-12-01/301, Hydraulic Systems
(2) 24-22-00/201, Electrical Power - Control
(3) 29-11-00/201, Main Hydraulic Systems
(4) 32-00-15/201, Main Gear Door Locks

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 O-rings and union threads.

S 434-011

(2) Install the unions in the HMG shutoff valve ports.

E. Procedure

S 424-012
(1) Install the HMG shutoff valve as follows:
(a) Install the HMG shutoff valve on the wheel well bulkhead with three bolts and washers.
(b) Connect the three hydraulic lines to the HMG shutoff valve.
(c) Connect the electrical connector D7074 to the HMG shutoff valve.
(d) ETOPS PARTIAL PROVISIONS;
Make sure the Hydraulic Motor Generator (HMG) shutoff valve is in the closed position.
1) Install lockwire (AMM 20-10-23/401).

S 864-013
(2) Remove the DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
(a) 6C3, HYD GEN CONT

S 864-014
(3) Remove the DO-NOT-CLOSE tags, and close these P11 panel circuit breakers:
(a) 11R6, AC BUS SENSE LEFT
(b) 11R29, AC BUS SENSE RIGHT

S 614-015
(4) Service the left hydraulic system (Ref 12-12-01).

F. Test the HMG shutoff valve installation.

S 864-016
(1) Supply electrical power (Ref 24-22-00).

S 864-017
(2) Pressurize the left hydraulic system (Ref 29-11-00).
(a) If you use the ACMPs to pressurize the left hydraulic system, do these steps:
1) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (Ref 29-11-00).
2) Put the PTU switch on the P61 panel to the ON position.

S 214-018
(3) Check the HMG shutoff valve for hydraulic fluid leaks.

S 214-019
(4) Check the HMG shutoff valve is in the closed position.

S 714-020
(5) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR INSTALLED;
Do an operational check as follows:
(a) Hold the GND PROX/HYD GEN switch on miscellaneous test panel P61, in the HYD GEN position.
(b) Make sure the HMG shutoff valve moves to the open position. The EICAS message HYD GEN VAL must also be displayed on the lower EICAS panel.
(c) Release the GND PROX/HYD GEN switch.
(d) Make sure the HMG shutoff valve returns to the closed position. The EICAS message HYD GEN VAL must not be displayed on the EICAS lower panel.
(e) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

S 864-021
(6) Remove the hydraulic power if it is not necessary (Ref 29-11-00).

S 864-022
(7) Remove the electrical power if not necessary (Ref 24-22-00).

HYDRAULIC MOTOR GENERATOR ACCUMULATOR - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the hydraulic motor generator (HMG) accumulator from the airplane. The second task installs the HMG accumulator on the airplane.

TASK 24-25-04-024-001

2. Remove the HMG Accumulator (Fig. 401)
   A. Equipment
      (1) Main Gear Door Locks (Ref 32-00-15)
   B. References
      (1) 12-15-06/301, Hydraulic Motor Generator Accumulator
      (2) 29-11-00/201, Main Hydraulic Systems
      (3) 32-00-15/201, Landing Gear Door Locks
      (4) 32-00-20/201, Landing Gear Downlocks
   C. Access
      (1) Location Zones
          143 Main Landing Gear Wheel Well (LH Side)
      (2) AIRPLANES WITH 5 KVA HMG;
          Access Panels
          732 Main Landing Body Door (LH Side)
      (3) AIRPLANES WITH 10 KVA HMG;
          Access Panels
          732 Main Landing Body Door (LH Side)
          197KL Central Hydraulic Service Center
   D. Prepare for Removal

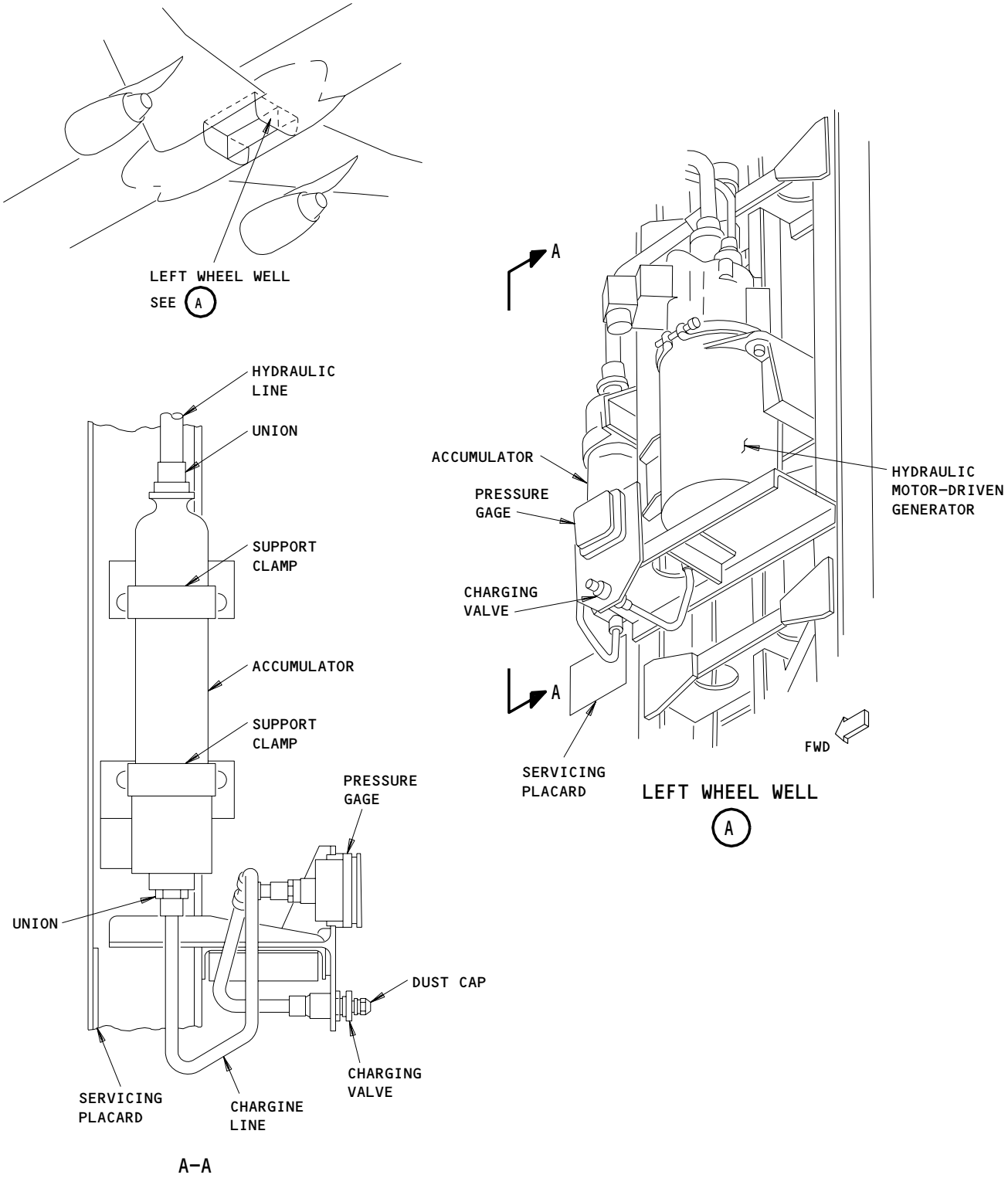
      S 214-005
      (1) Make sure the landing gear downlocks are installed (AMM 32-00-20/201).

      S 014-006

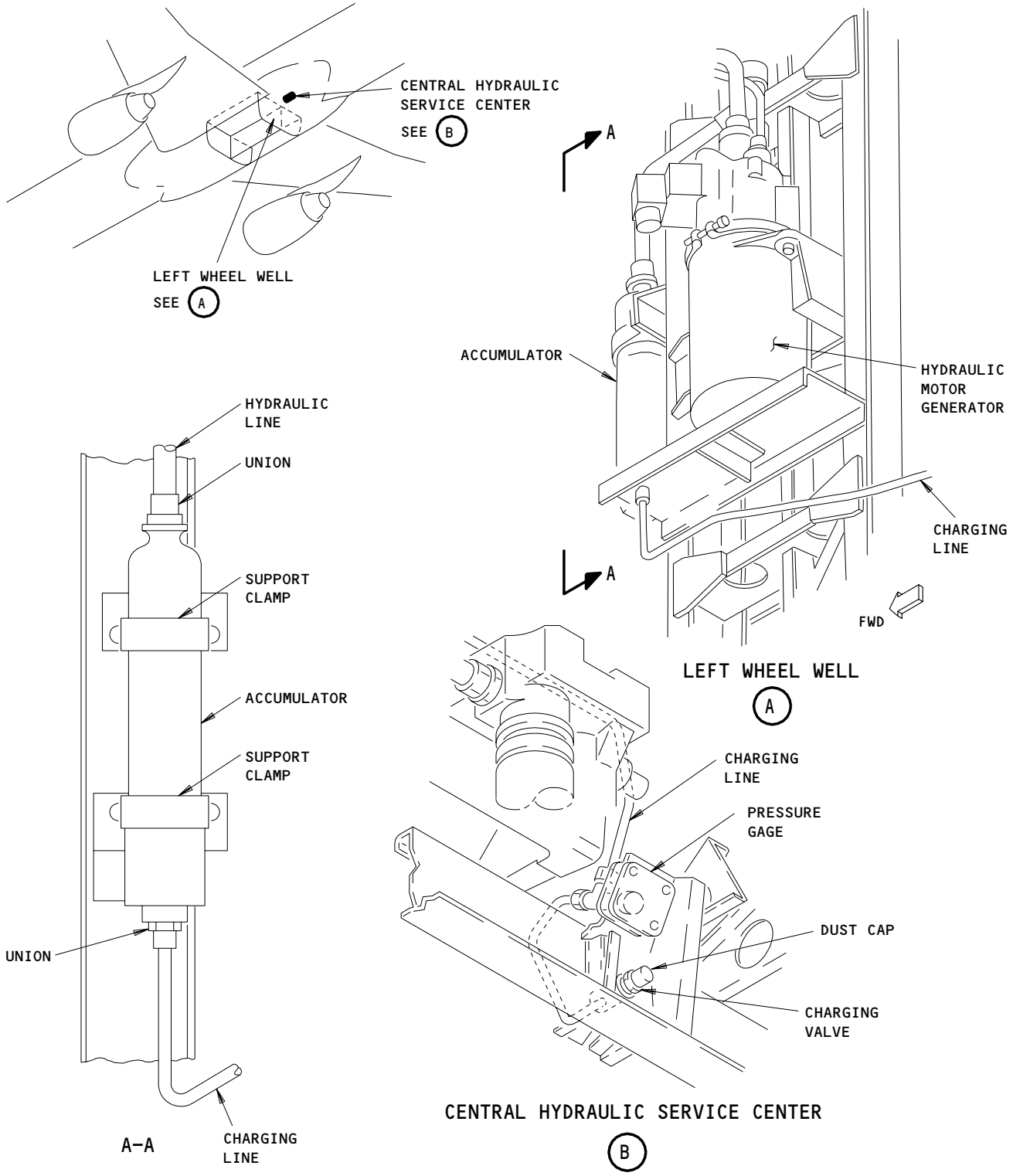
      WARNING: REFER TO AMM 32-00-15/201 FOR DOOR LOCK INSTALLATION PROCEDURE. RAPID ACTION OF DOORS MAY CAUSE INJURY OR DAMAGE IF LOCKS ARE NOT PROPERLY INSTALLED.

      (2) Open the doors for the left main landing gear and install the door locks (AMM 32-00-15/201).

      S 864-007
      (3) Remove the pressure from the left hydraulic system (AMM 29-11-00/201).



Hydraulic Motor-Driven Generator Accumulator Installation
Figure 401



Hydraulic Motor Generator Accumulator Installation
Figure 401A

S 864-012

(4) Remove the pressure from the HMG accumulator:

(a) AIRPLANES WITH 10 KVA HMG;
Open the access panel 197KL for the central hydraulic service center.

(b) Remove the dust cap from the accumulator nitrogen charging valve.

(c) Loosen the swivel nut at the charging valve, to bleed all the pressure from the accumulator (Ref 12-15-06).

E. Procedure

S 024-002

(1) Remove the HMG accumulator as follows:

(a) Disconnect the charging line from the lower end of the accumulator. Discard the O-ring on the union.

(b) Disconnect the hydraulic line from the upper end of the accumulator. Cap line and discard O-ring on union.

(c) Loosen the nuts and open the accumulator support clamps.

(d) Remove the HMG accumulator.

(e) Remove the unions from the top and bottom of the accumulator. Keep for installation.

(f) Plug the accumulator ports.

TASK 24-25-04-424-004

3. Install the HMG Accumulator (Fig. 401)

A. Consumable Materials

(1) Fluid, Hydraulic - BMS 3-11 (Ref 20-30-04)

(2) Lubricant, Hydraulic System Fittings - MCS 352B (Ref 20-30-04)

B. References

(1) 12-15-06/301, Hydraulic Motor Generator Accumulator

(2) 20-30-04/201, Lubricants

C. Access

(1) Location Zones
143 Main Landing Gear Wheel Well (LH Side)

(2) Access Panels
732 Main Landing Body Door (LH Side)

D. Prepare for Installation

S 644-008

(1) Lubricate the new O-rings with hydraulic fluid or lubricant (Ref 20-30-04).

(a) Install the O-rings on the unions.

(b) Install the unions on the accumulator.

S 214-009

(2) Visually examine the HMG accumulator support clamps. Replace the clamps if they are cracked or broken.

E. Procedure

S 424-010

(1) Install the HMG accumulator, as follows:
  (a) Put the HMG accumulator in a position so that the charging line and the hydraulic line align with the accumulator unions. Tighten the clamps.
  (b) Connect the charging line and the hydraulic line to the HMG accumulator.
  (c) Tighten the connections.

S 614-011

(2) Service the HMG accumulator with nitrogen (Ref 12-15-06).

HMG TRANSFORMER RECTIFIER UNIT - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the hydraulic motor generator (HMG) transformer rectifier unit (TRU) from the airplane. The second task installs the HMG TRU on the airplane.

TASK 24-25-05-014-013

2. Remove the HMG TRU
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zone
          119/120 Main equipment center
      (2) Access Panels
          119BL Main equipment center access
   C. Prepare for Removal

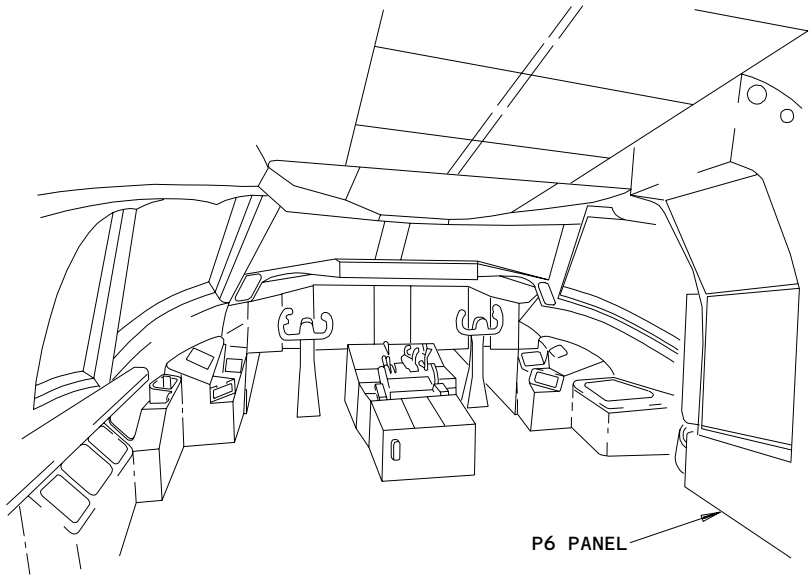
      S 864-002
      (1) Open this circuit breaker on the main power distribution panel (referred to as the P6 panel) and attach DO-NOT-CLOSE tag:
          (a) 6C7, HYD GEN 28V DC PWR

      S 864-014
      (2) Open this circuit breaker on the hydraulic generator power panel P71 and attach DO-NOT-CLOSE tag:
          (a) 71E1, HMG BAT CHGR
   D. Remove the HMG TRU

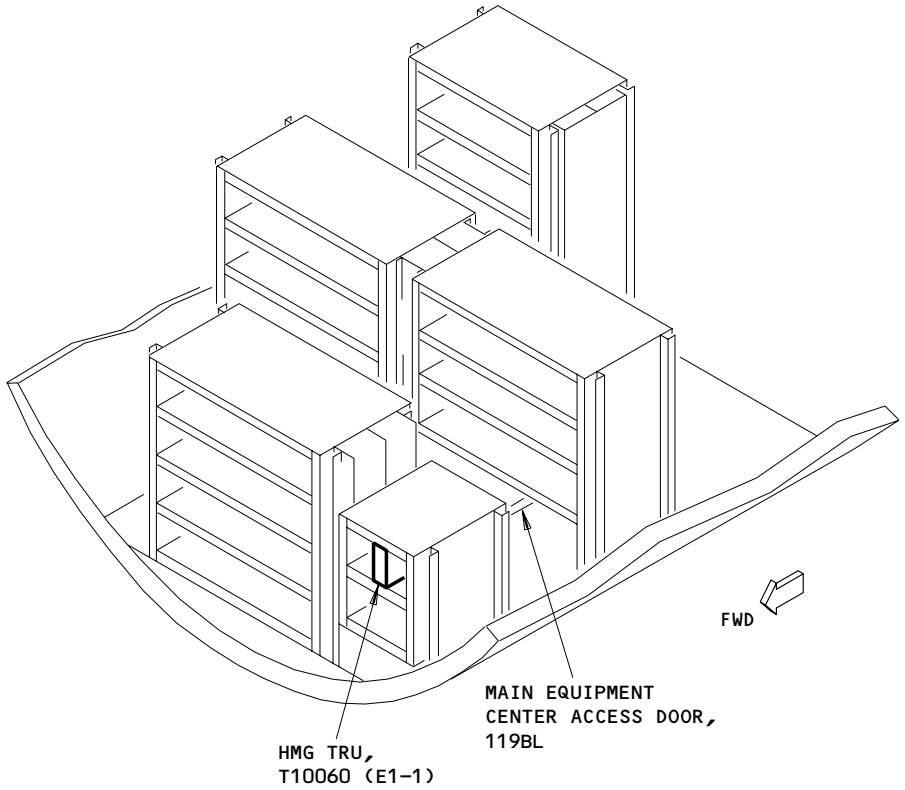
      S 024-004
      (1) Remove the TRU (AMM 20-10-01/401).

TASK 24-25-05-404-005

3. Install the HMG TRU
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 24-25-00/501, Hydraulic Motor Generator System
   B. Access
      (1) Location Zones
          119/120 Main equipment center
          211/212 Flight compartment
      (2) Access Panels
          119BL Main equipment center access



FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER

Hydraulic Motor Generator Transformer Rectifier - Installation
Figure 401

C. Install the HMG TRU

S 424-006
(1) Install the TRU (AMM 20-10-01/401).

S 864-008
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6C7, HYD GEN 28V DC PWR

S 864-015
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P71 panel:
(a) 71E1, HMG BAT CHGR

D. Do a Test of the TRU Installation

S 864-017
(1) Supply electrical power (AMM 24-22-00/201).

S 214-018
(2) Make sure the six EICAS circuit breakers on overhead circuit breaker panel P11 are closed.

S 614-019
(3) Pressurize the left hydraulic system (AMM 29-11-00/201).
(a) If you use the ACMPs to pressurize the left hydraulic system, do these steps:
1) Pressurize the left hydraulic system and the right hydraulic system with the ACMPs (AMM 29-11-00/201).
2) Put the PTU switch on the P61 panel to the ON position.

S 714-020
(4) Do an operational check as follows:
(a) Open these P11 circuit breakers and attach DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT

2) 11R29, AC BUS SENSE RIGHT
3) 6C7, HYD GEN 28V DC

(b) Push the ELEC/HYD switch on EICAS maintenance panel P61.
(c) Make sure the EICAS ELEC/HYD display reads as follows:
1) HYD GEN DC-V 28 ±4
2) HYD GEN AC-V 118 ±5
3) HYD GEN FREQ 400 ±5

WARNING: MEASURE THE VOLTAGE CAREFULLY AT THESE HIGH CURRENT CIRCUIT BREAKERS. HIGH CURRENT CAN CAUSE INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT.

(d) Do a voltage check.
1) Do a check for 28v dc ±3 at terminal 1 of the circuit breaker 6C7, HYD GEN 28V DC.
2) Do a check for 28v dc ±3 at terminal 2 of the circuit breaker 6C7, HYD GEN 28V DC.
(e) Close these P11 circuit breakers and remove DO-NOT-CLOSE tags:
1) 11R6, AC BUS SENSE LEFT
2) 11R29, AC BUS SENSE RIGHT
3) 6C7, HYD GEN 28V DC
(f) Make sure the EICAS ELEC/HYD display reads as follows:
1) HYD GEN DC-V 0
2) HYD GEN AC-V 0
3) HYD GEN FREQ 0
(g) Open and close the 6C3, HYD GEN CONT circuit breaker on the P6 panel.

S 864-021
(5) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

S 864-022
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

HYDRAULIC FLOW LIMITER - MAINTENANCE PRACTICES

1. General
   A. This procedure contains three tasks:
      (1) The removal of the hydraulic flow limiter.
      (2) The installation of the hydraulic flow limiter.
      (3) The test of the hydraulic flow limiter.

   TASK 24-25-06-002-001

2. Removal of the Flow limiter (Fig. 201)
   A. References
      (1) AMM 29-11-00/201, Main (Left, Right, and Center) Hydraulic Systems
      (2) AMM 32-00-15/201, Main Gear Door Locks
      (3) AMM 32-00-20/201, Landing Gear Downlocks
   B. Access
      (1) Location Zone
          143 Left Main Landing Gear Wheel Well

   C. Procedure

      S 492-024

      WARNING: MAKE SURE THE DOWNLOCKS ARE INSTALLED ON ALL THE LANDING GEAR (BEFORE YOU MOVE THE CONTROL LEVER). WITHOUT THE DOWNLOCKS, THE LANDING GEAR COULD RETRACT AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

      (1) Make sure the downlocks are installed on the nose and main landing gear (AMM 32-00-20/201).

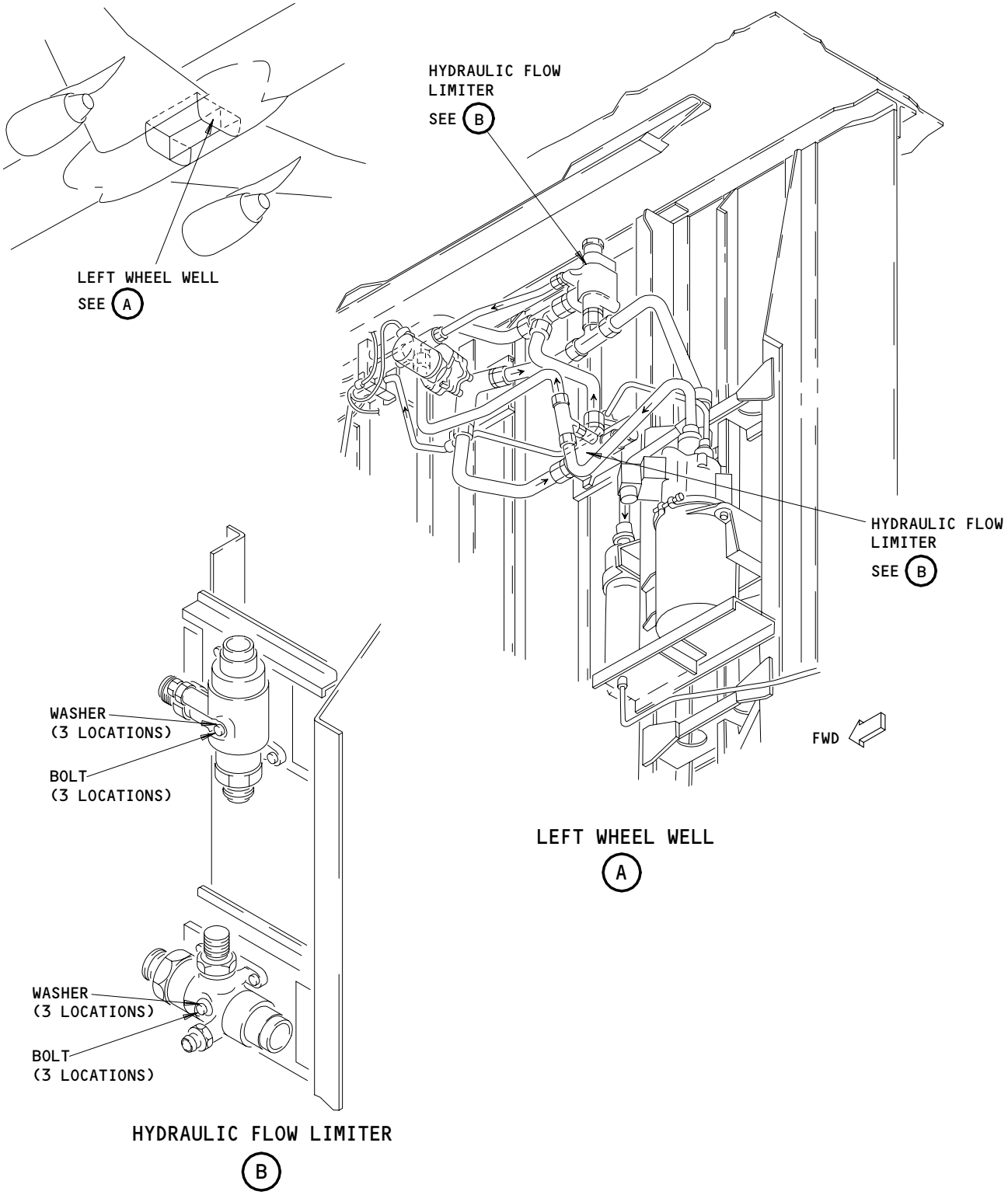
      S 492-003

      WARNING: DO 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 OR DAMAGE TO EQUIPMENT.

      (2) Open the doors for the landing gear and install the door locks (AMM 32-00-15/201).

      S 862-004
      (3) Remove the pressure from the left hydraulic system and the reservoir (AMM 29-11-00/201).

      S 032-005
      (4) Disconnect the hydraulic lines from the flow limiter.



Hydraulic Flow Limiter Removal/Installation
Figure 201

A72547

S 032-006
(5) Install caps on the hydraulic lines.

S 022-007
(6) Remove the bolts and washers which hold the flow limiter.

S 022-008
(7) Remove the flow limiter.

TASK 24-25-06-402-009

3. Installation of the Flow Limiter (Fig. 201)

A. References
(1) AMM 12-25-01/301, Exterior Cleaning
(2) AMM 29-11-00/201, Main (Left, Right, and Center) Hydraulic Systems
(3) AMM 32-00-15/201, Main Gear Door Locks

B. Access
(1) Location Zone
143 Left Main Landing Gear Wheel Well

C. Procedure

S 422-010
(1) Hold the flow limiter in its position.

S 422-011
(2) Install the bolts and the washers which hold the flow limiter.

S 432-012
(3) Remove the caps from the hydraulic lines.

S 432-013
(4) Connect the hydraulic lines to the flow limiter.

S 862-014
(5) Pressurize the left hydraulic system and the reservoir (AMM 29-11-00/201).

S 792-015
(6) Make sure there are no leaks at the flow limiter.

S 112-016

CAUTION: QUICKLY CLEAN THE INSTALLATION AREA OF ALL HYDRAULIC FLUID. HYDRAULIC FLUID CAN CAUSE DAMAGE TO THE AIRPLANE EQUIPMENT.

(7) Clean all hydraulic fluid from the installation area (AMM 12-25-01/301).

S 092-017

WARNING: OBEY THE REMOVAL PROCEDURE FOR THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY. THE MOVEMENT OF THE DOORS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(8) Remove the door locks from the landing gear doors and close the doors (AMM 32-00-15/201).

S 862-018

(9) Remove hydraulic power if it is not necessary (AMM 29-11-00/201).

TASK 24-25-06-702-019

4. The Test of the Hydraulic Flow Limiter

A. References

(1) AMM 24-22-00/201, Electrical Power Control
(2) AMM 29-11-00/201, Main (Left, Right and Center) Hydraulic Systems
(3) AMM 32-00-15/201, Main Gear Door Locks
(4) AMM 32-00-20/201, Landing Gear Downlocks

B. Access

(1) Location Zones

143 Left Main Landing Gear Wheel Well
211,212 Control Cabin

C. Prepare for the Test

S 862-023

WARNING: MAKE SURE THE DOWNLOCKS ARE INSTALLED ON ALL THE LANDING GEAR (BEFORE YOU MOVE THE CONTROL LEVER). WITHOUT THE DOWNLOCKS, THE LANDING GEAR COULD RETRACT AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Make sure the downlocks are installed on the nose and main landing gear (AMM 32-00-20/201).

S 012-021

WARNING: OBEY THE INSTALLATION PROCEDURE FOR THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY. THE MOVEMENT OF THE DOORS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

(2) Open the doors for the landing gear and install the door locks (AMM 32-00-15/201).

S 862-022

(3) Close these circuit breakers:
  (a) On the power distribution panel P6:
    1) 6C8, HYD GEN 28VDC SENSE
    2) 6C3, HYD GEN CONT
  (b) On the overhead panel P11:
    1) 11K17, HYDRAULICS SYSTEM PRESS-L
    2) 11K26, HYDRAULICS SYSTEM PRESS-R
    3) 11K20, HYDRAULICS QTY L
    4) 11K21, HYDRAULICS QTY R
    5) 11D31, HYDRAULIC PTU CONT
    6) 11R6, AC BUS SENSE L
    7) 11R29, AC BUS SENSE R
  (c) On the P71-00 panel:
    1) HMG INST XFR BUS
    2) HMG L XFR BUS
    3) HMG R XFR BUS
    4) HMG BAT CHGR
    5) HYD GEN AC VOLT SENSE

D. Procedure

S 712-020

(1) Do a test of the hydraulic flow limiter.
  (a) Make sure that the trailing edge flaps and the leading edge slats are in the fully retracted position.
  (b) Fill the HMG accumulator with dry nitrogen to a specified pressure as shown on the placard.

    NOTE: On airplanes with Vickers 10 KVA HMG, the placard is on the central hydraulics bay door which is adjacent to the accumulator charging point.

    On airplanes with Abex 5 KVA HMG, the placard is on the aft keel beam of the left wheel well.

  (c) Make sure all the hydraulic system pressures are zero psig.

(d) Make sure the EICAS Maintenance Page HYD QTY shows 0.75 or more for the left and right system reservoirs.
(e) Pressurize the right hydraulic system with the right engine-driven pump or a hydraulic ground cart (AMM 29-11-00/201).
(f) Move the PTU manual control switch S1 which is on the P5 Pilot's overhead panel (or S7 on the P61 right side panel as applicable) to the ON position.
    1) Make sure that the PTU operates.
    2) Make sure the EICAS Maintenance Page shows 2600 psig or more for the left hydraulic system.
(g) Move the GRD PROX/HYD GEN switch on the miscellaneous test panel M10398 to the HYD GEN position and hold it in its position.
    1) Make sure that the EICAS Maintenance Message HYD GEN DC-V shows between 24 and 32 volts.
    2) Make sure that the EICAS Maintenance Message HYD GEN AC-V shows between 113 and 123 volts.
    3) Make sure that the EICAS Maintenance Message HYD GEN FREQ shows between 395 and 405 Hz.
(h) Move the flap control lever on the flight deck control stand to the 5 degree position.
    1) Make sure that the left system hydraulic pressure stays between 2300 and 2825 psig during the movement of the flaps and slats.
    2) Make sure that the HMG does not stop before the flaps are extended to the 5 degree position.
(i) Move the flap control lever to the zero (flap up) position.
    1) Make sure that the left system hydraulic pressure stays between 2300 and 2825 psig during the movement of the flap.
    2) Make sure the HMG does not stop before the flaps and slats are in the fully retracted position.
(j) Release the GRD PROX/HYD GEN switch.
(k) Move the PTU manual control switch S1 on the P5 panel or S7 on the P61 panel (as applicable) to the OFF position.
(l) Release the pressure in the right hydraulic system to zero psig (AMM 29-11-00/201).

(m) Open and close the HYD GEN CONT circuit breaker (6C3) on the P6 panel.

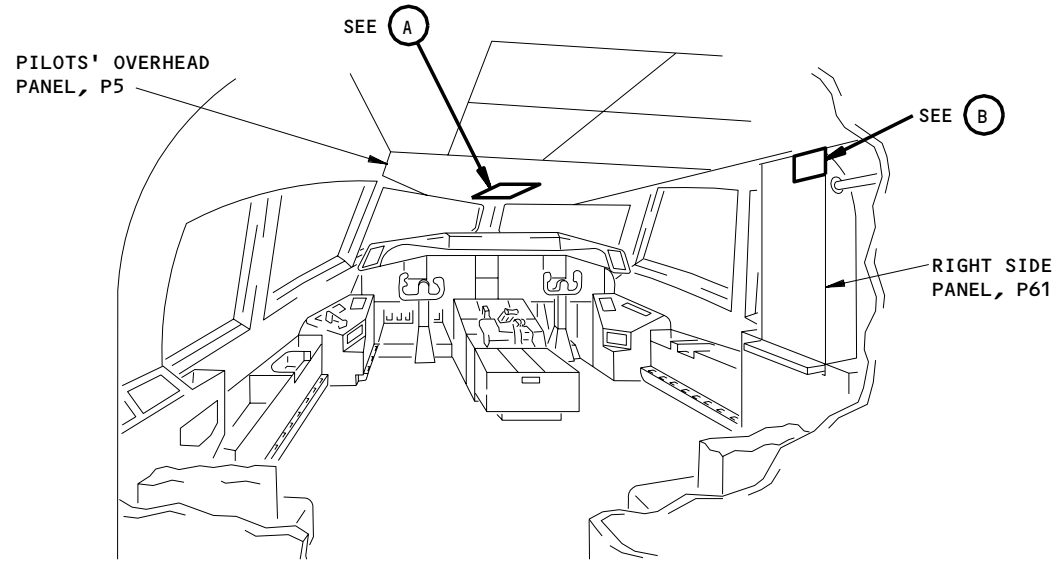
(n) Put the airplane back to its usual condition.

WARNING: OBEY THE REMOVAL PROCEDURE FOR THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY. THE MOVEMENT OF THE DOORS CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

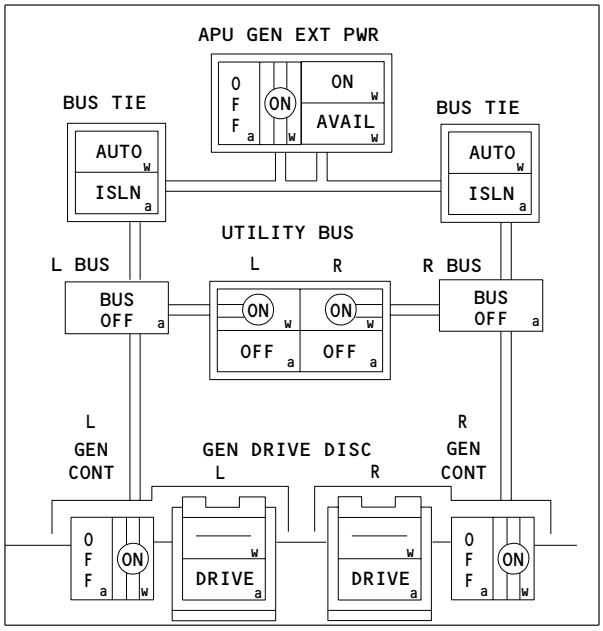
1) Remove the door locks from the landing gear doors and close the landing gear doors (AMM 32-00-15/201).

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. AIRPLANES WITH GENERATOR FIELD SWITCHES;
      Generator Field and Hydraulic Control Panel
      (1) Generator Field and Hydraulic control panel M10191 is on right side panel P61. The panel contains three (L, R, and APU) GEN FIELD MANUAL RESET switches with white FIELD OFF lights. 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 (Ref 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 (Ref 24-22-00); or 2) the GCB being opened by a generator control unit (GCU) protection function (Ref 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) AIRPLANES WITH GENERATOR FIELD SWITCHES;
      The three (L, R, and APU) GEN FIELD MANUAL RESET switches control the generator control relays (GCRs) (Ref 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 (Ref 24-11-00). Along with the DRIVE light, a (L or R) GEN DRIVE level C message appears on the EICAS display, if the corresponding engine is running. The EICAS message also causes an electric auto event in the EICAS system (Ref 31-41-00).

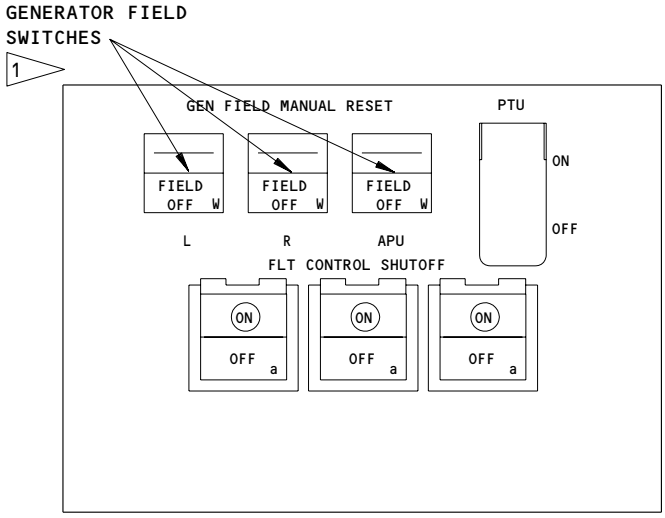


FLIGHT COMPARTMENT



ELECTRICAL SYSTEMS
CONTROL PANEL, M10063 (P5)

A



GENERATOR FIELD AND HYDRAULIC
CONTROL PANEL, M10191 (P61)

B

1 IF INSTALLED

AC Generation Annunciation – Component Location
Figure 1

(4) The BUS TIE switches control bus tie breaker operation (Ref 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 (Ref 24-23-00). Along with the ISLN light, a (L or R) BUS ISOLATED level C message appears on the EICAS display.

(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 level B message appears on the EICAS display.

(7) The APU GEN CONT switch controls operation of the auxiliary power breaker (APB) (Ref 24-22-00). The amber OFF light in the switch is on when the APB is open and:
   (a) The APU GEN CONT switch is OFF (out position); or
   (b) The external power contactor (EPC) is open, and the APU is operating above 95 percent full speed.

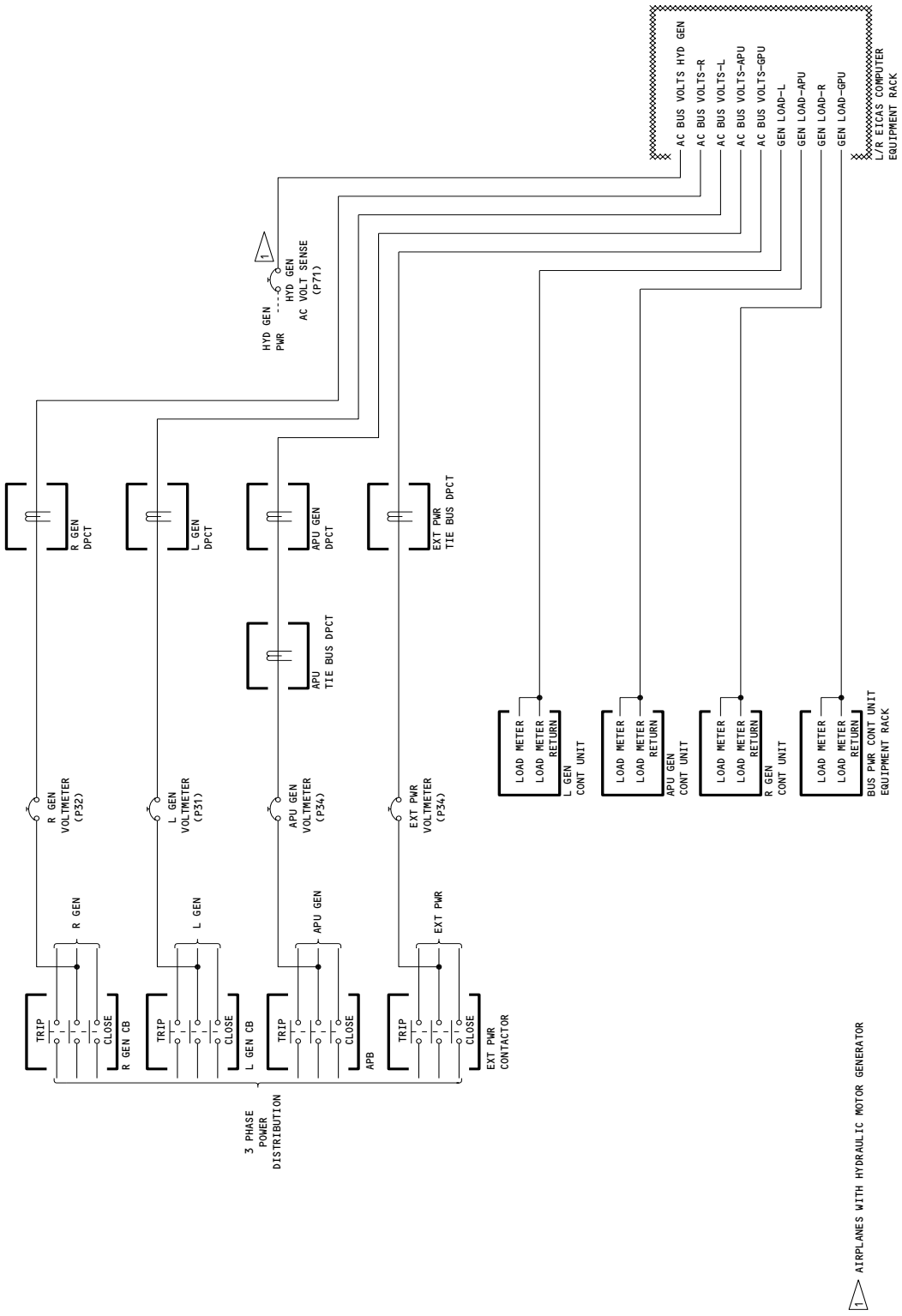
(8) Along with the amber OFF light in the APU GEN CONT switch, an APU GEN OFF message appears on the EICAS display. (The APU must be running, with the failure existing, for the EICAS message to appear.) This is a level C EICAS message.

(9) The EXT PWR switch controls the external power contactor (EPC) (Ref 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 level C message appears on the EICAS display.

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 displayed on the EICAS screen. (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 senses to the left and right EICAS computers. The values are then shown on the EICAS display. The EICAS displays the 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) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR;
      The hydraulic motor generator frequency, and ac voltage are also displayed on EICAS maintenance page.

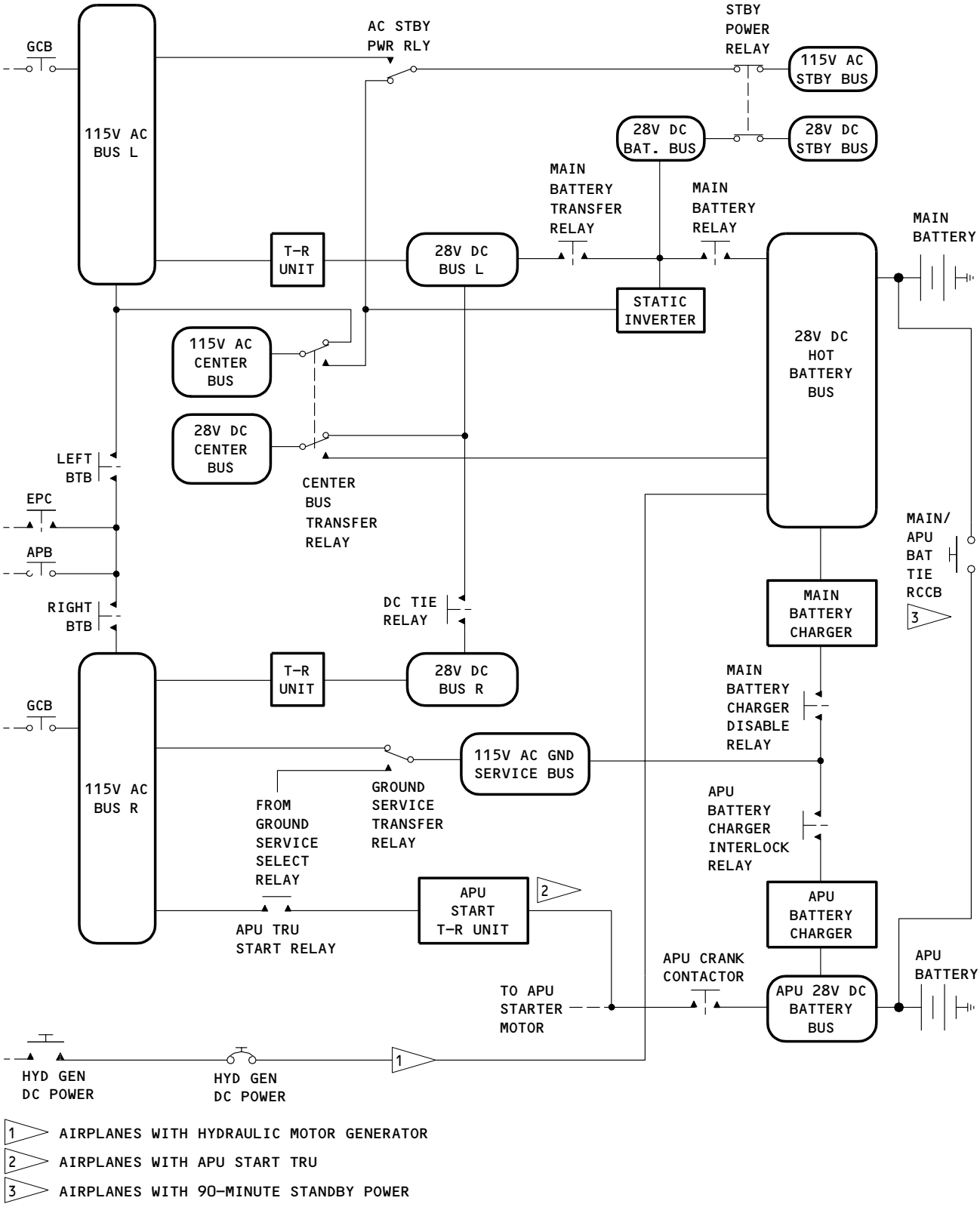


AC Meters Schematic
Figure 1

H1273G

DC GENERATION - DESCRIPTION AND OPERATION

1. General (Fig. 1)
   A. The DC generation system consists of three subsystems: primary dc system, standby system, and the battery/battery charger system.
   B. Primary DC System (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.
      (2) 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.
   C. Standby Power System (24-33-00)
      (1) The standby power system includes the main battery and static inverter. 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 ac and/or dc power. The system can supply these loads for 90 minutes. The standby system also serves as an independent power source for the autoland system center channel during a category III autoland.
      (2) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR;
      Hydraulic motor generator is an independent non-time-limited backup power source which is installed on the extended range airplanes. The hydraulic motor generator is activated automatically when power is lost at both main ac buses. The hydraulic motor generator provides both ac and dc power.
   D. Battery/Battery Charger System (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.
      (3) The main and APU batteries are paralleled when left main 28-volt dc power is lost to provide a 90-minute standby power source.



DC Generation Block Diagram
Figure 1

DC GENERATION - ADJUSTMENT/TEST

1. General
   A. This procedure has these tasks:
      (1) An Operational Test of the DC Generation System and Battery Charger Failure Detection Circuit.
      (2) An Operational Test of the Battery Charger and Current Monitor.
      (3) An Operational Test of the DC Tie Control Unit and DC Tie Relay.

TASK 24-30-00-705-048

2. Operational Test - DC Generation System and Battery Charger Failure Dectection Circuit
   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 Zones
          211 Control Cabin - section 41 (LH side)
          212 Control Cabin - section 41 (RH side)
   C. Prepare for the Operational Test

      S 045-059
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or remove all the persons and equipment from the spoiler area.

      S 865-060

      WARNING: MAKE SURE THE SPOILERS ARE DEACTIVATED OR THAT ALL PERSONS AND EQUIPMENT ARE REMOVED FROM THE SPOILER AREA. POWER SOURCES ARE CHANGED AS SWITCHES ARE PUSHED OR CIRCUIT BREAKERS ARE OPENED, WHICH CAN CAUSE THE SPOILERS TO MOVE. ACCIDENTAL MOVEMENT OF THE SPOILERS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

D. Do the Operational Test of the DC Generation System

S 865-010
(1) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

S 865-011
(2) Do these steps at the standby power control panel on the pilots' overhead panel (P5):
  (a) Make sure the STBY POWER switch is in the AUTO position.
  (b) Make sure the ON light in the BAT switch is on.
  (c) Make sure the MAIN BAT DISCH and the APU BAT DISCH lights are off.
  (d) Make sure the standby bus OFF light is off.

S 215-012
(3) Make sure these DC-V 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 215-013
(4) Make sure these DC-A values show as positive and not zero on the bottom EICAS display:
  (a) L
  (b) R

S 215-014
(5) Make sure these values show below STBY/BAT on the bottom EICAS display:
  (a) AC-V = 115 ±5
  (b) FREQ = 400 ±5

S 215-015
(6) Make sure these EICAS messages do not show on the top EICAS display:
  (a) STANDBY BUS OFF

(b) BATTERY OFF
(c) MAIN BAT DISCH
(d) APU BAT DISCH

S 215-382
(7) Make sure the EICAS messages do not show on the lower display:
(a) STBY INVERTER
(b) MAIN BAT CHGR
(c) APU BAT CHGR
(d) APU BAT NO STBY

S 215-383
(8) Turn the STBY POWER switch on the P5 panel to the OFF position and do a check as follows:
(a) Make sure the EICAS message, STANDBY BUS OFF, shows on the upper display.
(b) Make sure the standby bus OFF light on the P5 panel is on.

S 215-384
(9) Push the BAT switch on the P5 panel to the OFF position and do a check as follows:
(a) Make sure the amber OFF light in the switch is on.
(b) Make sure the EICAS message, BATTERY OFF, shows on the upper display.

S 865-385
(10) Turn the STBY POWER switch on the P5 panel to the AUTO position.

S 215-386
(11) Push the BAT switch on the P5 panel to the ON position and do a check as follows:
(a) Make sure the amber OFF light in the switch is off.
(b) Make sure the EICAS message, BATTERY OFF, does not show on the upper display.

S 865-387
(12) Open this P6 panel circuit breaker:
(a) 6D10, INV PWR TRU

S 865-388
(13) Make sure the EICAS message, STBY INVERTER, shows on the lower display.

S 865-389
(14) Close this P6 panel circuit breaker:
(a) 6D10, INV PWR TRU

S 215-390
(15) Make sure the EICAS message, STBY INVERTER, stays shown on the lower display.

S 915-391
(16) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).

S 215-392
(17) Make sure the EICAS message, STBY INVERTER, does not show on the lower display.

E. Do the Operational Test of the Main and APU Battery Charger Failure Detection Circuits

S 715-396
(1) Do the Main and APU Battery Charger Failure Detection Circuits test as follows:
(a) Make sure the lower EICAS display is in the ECS/MSG mode. Push the ECS MSG switch on the P61 panel, if necessary.
(b) Open this P34 panel circuit breaker:
1) 34A16, MN/APU BAT CHGR DET ENABLE
(c) Open this P6 panel circuit breaker:
1) 6A4, BAT CUR MON PWR
(d) Approximately 10 seconds after the circuit breakers opened, make sure the EICAS messages, MAIN BAT CHGR and APU BAT CHGR, show on the lower display.
(e) Close this P34 panel circuit breaker:
1) 34A16, MN/APU BAT CHGR DET ENABLE
(f) Close this P6 panel circuit breaker:
1) 6A4, BAT CUR MON PWR
(g) Push the AUTO EVENT READ switch on the P61 panel and make sure the AUTO EVENT page shows on the lower display.

(h) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).
(i) Make sure the EICAS messages, MAIN BAT CHGR and APU BAT CHGR, stay shown on the lower display.

NOTE: The messages can blink when erase procedure is tried, but must remain shown.

(j) Turn the STBY POWER switch on the P5 panel to the BAT position and permit the switch to stay in this position for at least 5 seconds.
(k) Turn the STBY POWER switch on the P5 panel to the AUTO position.
(l) Do the Maintenance Message Erase procedure (AMM 31-41-00/201).
(m) Make sure the EICAS messages, MAIN BAT CHGR and APU BAT CHGR, do not show on the upper display.

F. Put the Airplane Back To Its Usual Condition

S 445-393
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-394
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-30-00-715-049

3. Operational Test - Battery Charger and Current Monitor

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

B. Prepare for the Operational Test

S 045-055
(1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or remove all the persons and equipment from the spoiler area.

S 865-056

WARNING: MAKE SURE THE SPOILERS ARE DEACTIVATED OR THAT ALL PERSONS AND EQUIPMENT ARE REMOVED FROM THE SPOILER AREA. POWER SOURCES ARE CHANGED AS SWITCHES ARE PUSHED OR CIRCUIT BREAKERS ARE OPENED, WHICH CAN CAUSE THE SPOILERS TO MOVE. ACCIDENTAL MOVEMENT OF THE SPOILERS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

C. Do the operational test

S 715-379

(1) Do the Main and APU Battery Charger and Current Monitor test as follows:
   (a) Make sure the bottom EICAS display is in the ELEC HYD mode. Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel P61 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 MAIN BAT DISCH and APU BAT DISCH lights on the P5 panel come on.
   (e) Make sure the EICAS messages, MAIN BAT DISCH and APU BAT DISCH, show on the top EICAS display.
   (f) Make sure these values show below STBY/BAT on the bottom EICAS display:
      1) DC-V = 25 ±2
      2) DC-A a number larger than 4 in quantity

         NOTE: This value will have a minus sign in front of it to show that it is a discharge current.

(g) Make sure these values show below APU/BAT on the bottom EICAS display:
1) DC-V = 25 ±2
2) DC-A = 0

(h) After one minute, turn the STBY POWER switch, on the P5 panel, to the AUTO position.

(i) Make sure the MAIN BAT DISCH and APU BAT DISCH lights on the P5 panel go off.

(j) Make sure the DC-A value is 38 ±5 below STBY/BAT and APU/BAT on the bottom EICAS display.

(k) Make sure the DC-V values below STBY/BAT and APU/BAT increase to 32 ±4 volts and then decrease to 28 ±2 volts.

NOTE: It will usually take from 1 to 5 minutes for the voltage values to increase and then decrease. However, a fully discharged battery will extend this time to 75 minutes.

(l) After the DC-V value below STBY/BAT and APU/BAT decreases to 28 ±2 volts, make sure the DC-A value below STBY/BAT and APU/BAT is 0 ±5 amps.

(m) Push the ECS MSG switch on the EICAS MAINT panel on the P61 panel.

(n) Make sure the EICAS messages, MAIN BAT CHGR and APU BAT CHGR, do not show on the top display.

D. Put the Airplane Back To Its Usual Condition

S 445-128

(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 865-129

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

TASK 24-30-00-715-061

4. Operational Test - DC Tie Control Unit and DC Tie Relay

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

B. Prepare for the Operational Test

S 045-057

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

S 865-058

WARNING: MAKE SURE THE SPOILERS ARE DEACTIVATED OR THAT ALL PERSONS AND EQUIPMENT ARE REMOVED FROM THE SPOILER AREA. POWER SOURCES ARE CHANGED AS SWITCHES ARE PUSHED OR CIRCUIT BREAKERS ARE OPENED, WHICH CAN CAUSE MOVEMENT OF THE SPOILERS. ACCIDENTAL MOVEMENT OF THE SPOILERS CAN INJURE PERSONS OR DAMAGE EQUIPMENT.

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

S 715-139

(3) Do the DC Tie Control Unit and DC Tie Relay Operational Test as follows:
(a) Make sure the two BUS TIE switches on the P5 panel are set to the AUTO (latched-in) position.

NOTE: The ISLN light in each switch should be off.

(b) Make sure the bottom EICAS display is in the ECS MSG mode. Push the ECS MSG switch on the EICAS MAINT panel on the right side panel P61, if necessary.
(c) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.
(d) Push the ELEC HYD switch on the EICAS MAINT panel.

(e) Make sure these values are below L and R on the bottom EICAS display:
    1) DC-V = 28 ±5
    2) DC-A = larger than 5
(f) Open this circuit breaker:
    1) 6C23 or 32EE2, R TRU
(g) Make sure these values are below R on the bottom EICAS display for 11 ±5 seconds:
    1) DC-V = 0 ±1
    2) DC-A = 0
(h) After 11 ±5 seconds make sure these values are below R on the bottom EICAS display:
    1) DC-V = 28 ±5
    2) DC-A = 0
(i) Push the ECS MSG switch on the P61 panel.
(j) Make sure the EICAS message, T-R UNIT, shows on the bottom display.
(k) Close this circuit breaker:
    1) 6C23 OR 32EE2, R TRU
(l) Make sure the EICAS message, T-R UNIT, still shows on the bottom display.
(m) Push the left BUS TIE switch on the P5 panel to the ISLN position (out position).
(n) Make sure the amber ISLN light in the switch comes on.
(o) After 3 seconds (minimum), push the left BUS TIE switch on the P5 panel to the AUTO position.
(p) Make sure the ISLN light in the switch goes off.
(q) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.
(r) Push the ELEC HYD switch on the EICAS MAINT panel.
(s) Open this circuit breaker:
    1) 6C17 OR 31EE2, L TRU
(t) Make sure these values are below L on the bottom EICAS display:
    1) DC-V = 0 ±1
    2) DC-A = 0

(u) After 11 ±5 seconds, make sure these values are below L on the bottom EICAS display:
1) DC-V = 28 ±5
2) DC-A = 0
(v) Push the ECS MSG switch on the EICAS MAINT panel.
(w) Make sure the EICAS message, T-R UNIT, shows on the bottom display.
(x) Close this circuit breaker:
1) 6C17 OR 31EE2, L TRU
(y) Make sure the EICAS message, T-R UNIT, still shows on the bottom display.
(z) Push the left BUS TIE switch on the P5 panel to the ISLN position (out position).
(aa) Make sure the amber ISLN light in the switch comes on.
(ab) After 3 seconds (minimum), push the left BUS TIE switch on the P5 panel to the AUTO position.
(ac) Make sure the ISLN light in the switch goes out.
(ad) Make sure the EICAS message, T-R UNIT, does not show on the bottom display.

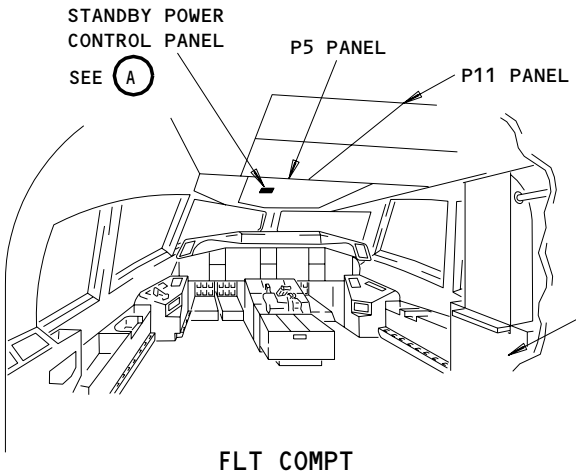
C. Put the Airplane Back To Its Usual Condition

S 445-137
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

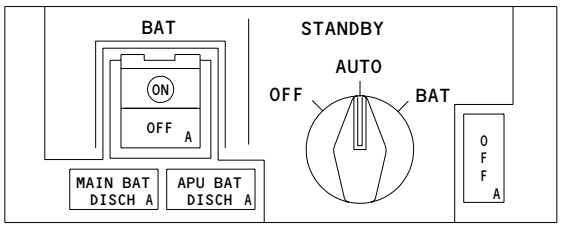
S 865-138
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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 disable relay, APU battery charger interlock relay, main battery relay, main battery transfer relay, DC under voltage sensing relay, main battery charger detection relay, and main/APU battery charger detection enable relay.
   B. The main and APU batteries are connected in parallel during the standby power operating mode (AMM 24-33-00/001).
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 in the forward equipment center. The APU battery is located in aft equipment center rack E6.
   B. Battery Chargers
      (1) The main and APU battery chargers are identical. Each charger operates from 115 volts, 3-phase, 400 Hz power supplied from the ac ground service bus. The battery chargers operate in three modes: the constant current charge mode, the constant voltage charge mode, and the T-R mode.
         (a) In the constant current charge mode, the charger provides a constant current charge of 38 amps to the battery. Battery temperature and battery voltage are sensed by the charger. As charging progresses, the battery voltage will rise. The charger measures the constant current charge time required to reach the voltage inflection point (approx. 31v dc at room temperature). When this point is reached, the charger starts an overcharge as a percentage of the base charge time.
         (b) After completion of the constant current charge and the overcharge, the charger starts the constant voltage charge. In this mode, the charger acts as a regulated power supply at 27.75 volts dc with a current limit of 38 amps. The charger will supply the hot battery bus loads thus preventing slow depletion of the battery. The charger can recharge a completely discharged battery in 75 minutes.

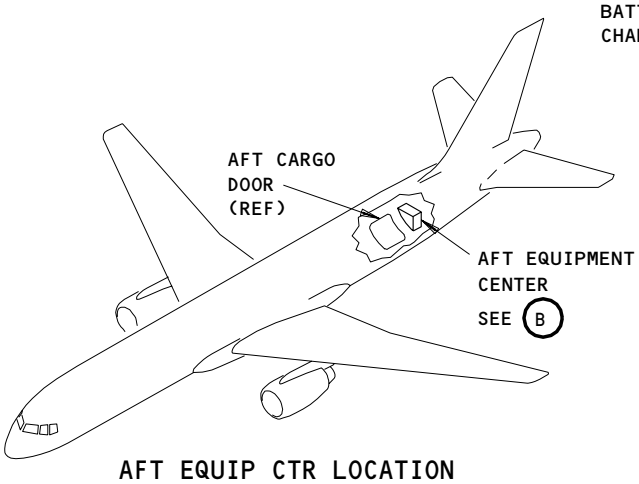


FLT COMPT

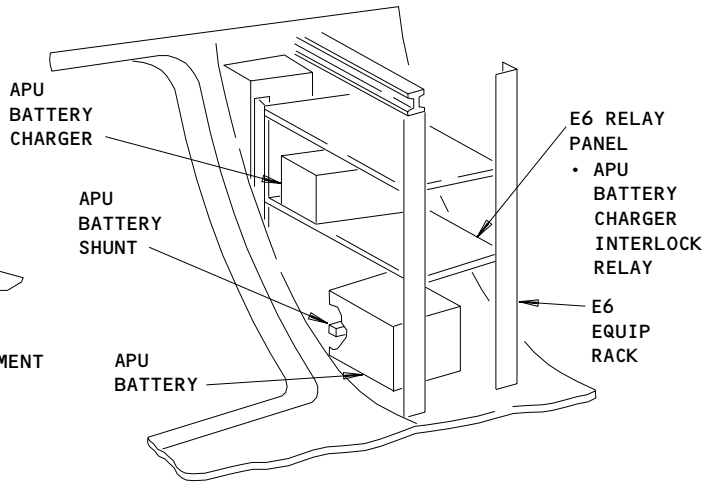


STANDBY POWER CONTROL PANEL

A



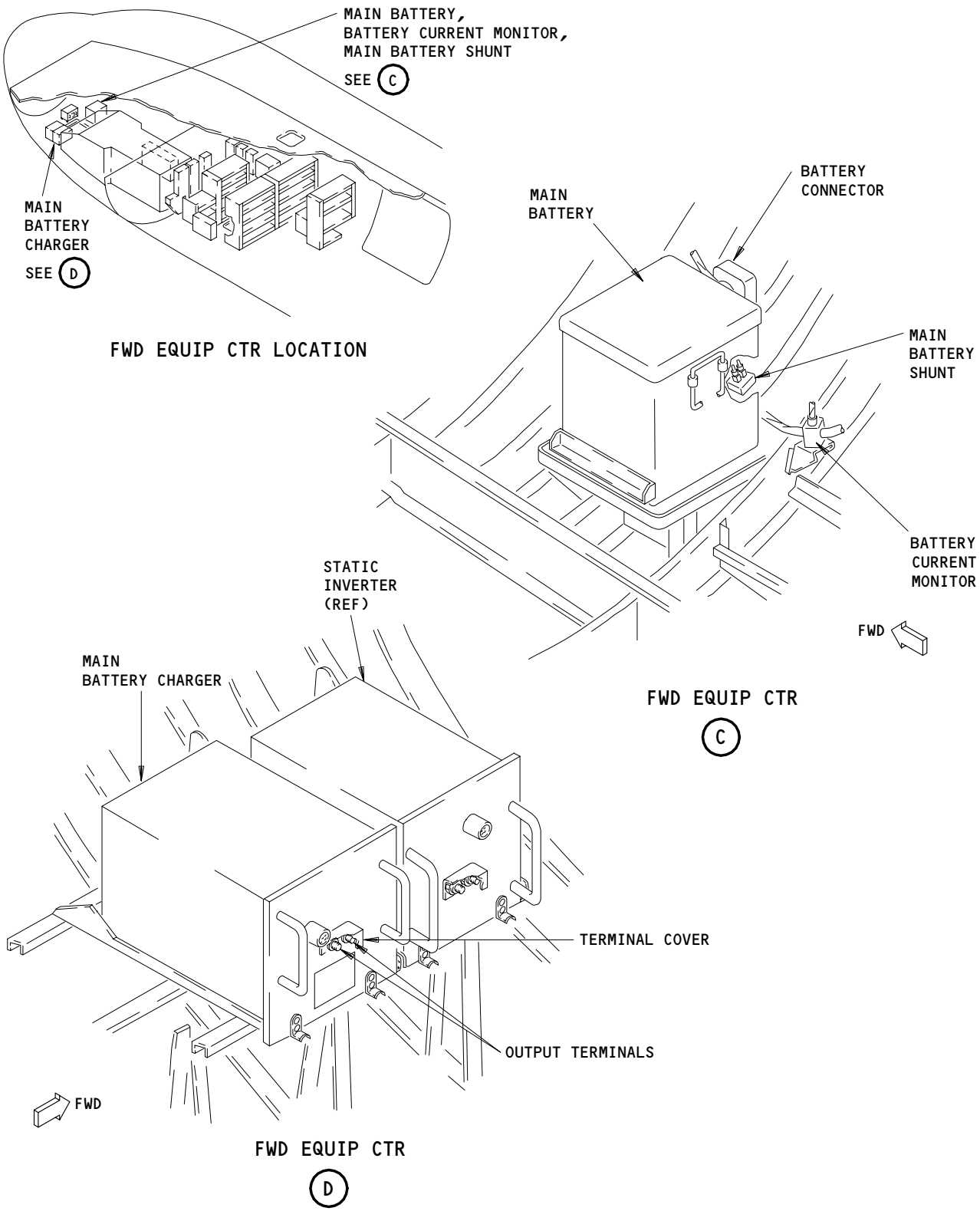
AFT EQUIP CTR LOCATION



AFT EQUIPMENT CENTER

B

Batteries Component Location
Figure 1 (Sheet 1)



Batteries Component Location
Figure 1 (Sheet 2)

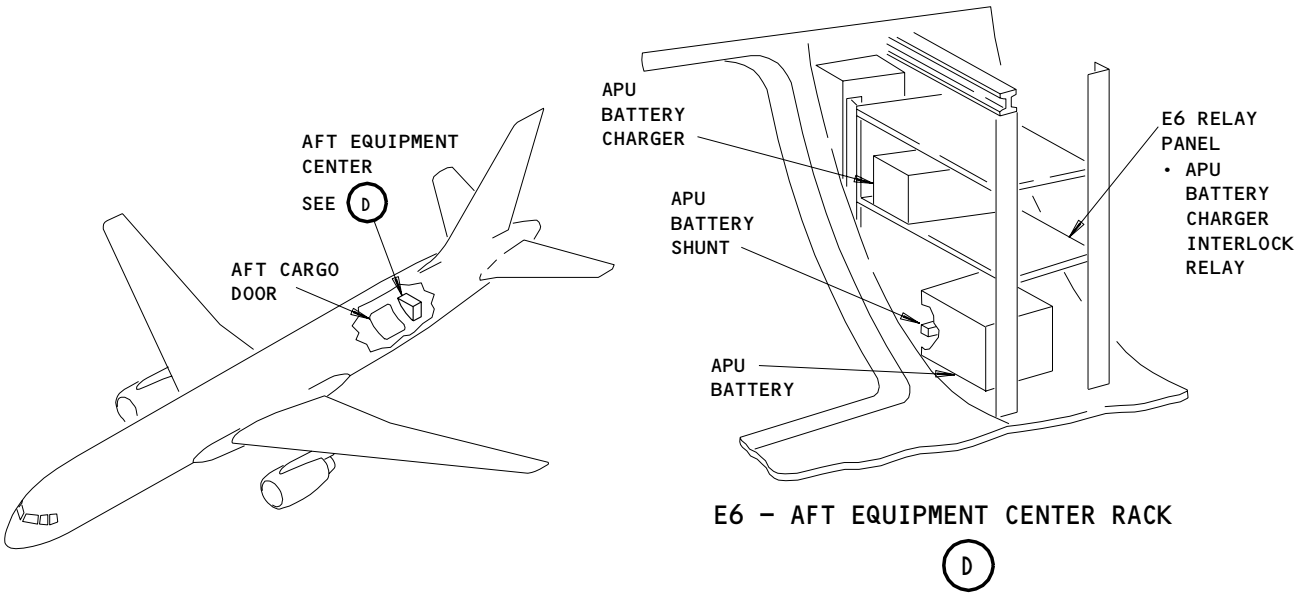
(c) In the T-R mode, the charger acts as a regulated power supply at 27.75 volts dc with a current limit of 64 amps.

(2) The following conditions will command the battery charger to start a constant current charge mode:

(a) Input voltage is initially applied or interrupted for more than 0.5 second.

(b) Battery voltage is less than 23 volts.

(c) The charger has operated more than 0.5 second in the T-R mode and is switched to the charge mode.



Batteries Component Location
Figure 1 (Sheet 3)

(3) The battery charger will shut down when any of the following conditions occur:
  (a) Input voltage less than 94 volts or greater than 134 volts.
  (b) An open in the battery interlock circuit.
  (c) Battery temperature above 145 degrees F (63 degrees C).
  (d) Loss of input power.
  (e) An internally caused overcurrent condition or inverter circuit unbalance.
  (f) A shutdown also occurs if the power connector is not connected to the battery when the charger is initially energized. The charger does not start unless the voltage sensed at the output terminals is above 4 volts.

(4) The latched status and maintenance message MAIN BAT CHGR is displayed on the bottom display if any of the following conditions occur:
  (a) The interlock circuit is open.
  (b) The battery temperature is greater than 145 degrees F.
  (c) The input power is lost.

(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 the fwd equipment center, and the APU battery charger is located in the E6 rack.

C. Battery Shunts

(1) A battery shunt is installed in the ground lead of the main battery to provide for battery current measurement. This measurement is sent to the EICAS computers.

(2) A battery shunt is installed in the ground lead of the APU battery charger to provide APU battery charging current measurement. This measurement is sent to the EICAS computers.

D. Main Battery Relay

(1) The main battery relay K104 connects the hot battery bus to the battery bus. Switching occurs if the left main DC bus loses power or an autoland signal is present. Contacts on the relay provide mode control for the main battery charger. The relay is in main power distribution panel P6.

E. Main Battery Transfer Relay

(1) The main battery transfer relay K106 connects the left main DC bus to the battery bus. The relay is in the P6 panel.

F. DC Under Voltage Sensing Relay

(1) The DC under voltage sensing relay K113 de-energizes the main battery transfer relay if left main DC bus voltage is low. The relay will open if voltage drops below 21.5 ±.5 volts DC for 200 - 400 milliseconds, or below 15 volts for 50 milliseconds. The relay will close when bus voltage exceeds 24.5 ±.5 volts DC for 100 milliseconds. The relay is in the P6 panel.

G. Battery Current Monitor
(1) The battery current monitors are installed around the ground lead of the main and APU batteries. The monitor magnetically senses the magnitude and direction of battery current. The monitor is located next to the battery.
(2) If the main or APU battery discharge current is more than the monitor's threshold current, the current monitor provides aground to the MAIN BAT DISCH light or APU BAT 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 or APU 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.

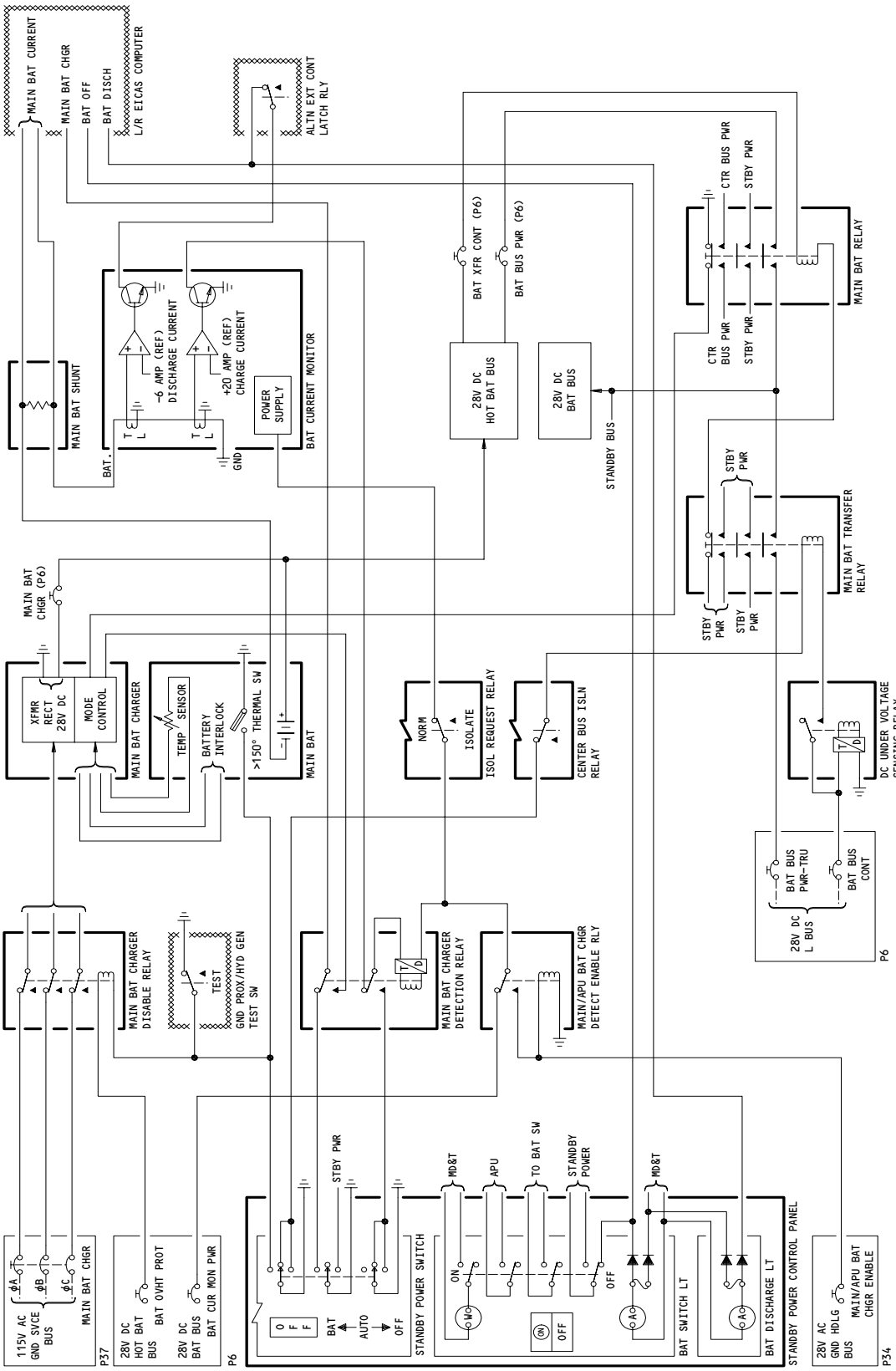
H. Main Battery Charger Disable Relay
(1) The main battery charger disable relay (MBCDR) K115 switches AC power from the ground service bus to the battery charger inputs. The MBCDR is located in main power distribution panel P6.

I. Main Battery Charger Detection Relay
(1) The main battery charger detection relay K10425 is a time delay relay and is controlled by the main battery current monitor and the main/APU battery charger detection enable relay K10424. When relay K10425 is energized, the main battery charger shutdown detection circuit is connected to EICAS. Relay K10425 has a dropout time delay of 750 milliseconds and remains latched until electrical power is removed from the airplane or until the STBY POWER switch on the standby power control panel is set to BAT. Relay K10425 is in the P6 panel.

J. APU Battery Charger Interlock Relay
(1) The APU battery charger interlock relay (ABCIR) K116 connects AC power from the ground service bus to the battery charger inputs. The ABCIR is located in the relay panel on the E6 equipment rack.

K. Main/APU Battery Charger Detection Enable Relay
(1) The main/APU battery charger detection enable relay K10424 switches electrical power to the main battery current monitor and the main battery charger detection relay K10425 from the battery bus to the ground handling bus whenever the ground handling bus is energized. Relay K10424 performs the same function for the APU battery current monitor and the APU battery charger detection relay K10418 (Ref 24-33-00, Standby Power System). This ensures that the battery charging detection circuit is powered whenever the ground service bus, which powers the battery charger, is powered. Relay K10424 is in the P6 panel.

3. Operation
A. Functional Description
(1) Main Battery System (Fig. 2)
(a) The main battery and charger are connected to the hot battery bus, and supply bus loads.



Main Battery Schematic
Figure 2

(b) In normal operation, the STBY POWER and BAT switches on M10062 standby power control panel are in AUTO and ON positions, respectively. The DC under voltage sensing relay is energized. This energizes the main battery transfer relay through the de-energized autoland bus isolation relay. The main battery relay is de-energized, grounding the mode control input of the battery charger. The charger is in the charge mode.

(c) In the charge mode, the battery charger supplies a constant current of 38 amps to the battery until the battery is fully charged. If charging current falls below 21 ±5 amps, the current trips the battery current monitor's charging output, causing the main battery charger detection relay K10245 to close. Contacts on K10425 connect the charger INOP pin on the charger to EICAS. The EICAS system will display a MAIN BAT CHGR message to indicate a failed charger. When the battery is fully charged, the charger switches to the constant voltage (28v dc) mode and charging current goes to zero.

(d) If an undervoltage condition is sensed on the left DC bus or if an autoland signal is present, the main battery transfer relay will de-energize. When this occurs the main battery relay is energized. The energized main battery relay connects the battery bus to the hot battery bus and switches the main battery charger to operate in the T-R mode.

(e) If the STBY POWER switch is set to BAT position, the charger is disconnected from the ground service bus by the MBCDR. The ground circuit for the main battery transfer relay opens, energizing the main battery relay. The hot battery bus and battery bus are connected. The battery is not charging. The contacts of K10425 are open, disconnecting the charger shutdown annunciation circuit from EICAS. The message is inhibited as it is grounded through the STBY POWER switch which is in series with the normally closed contacts of K10425.

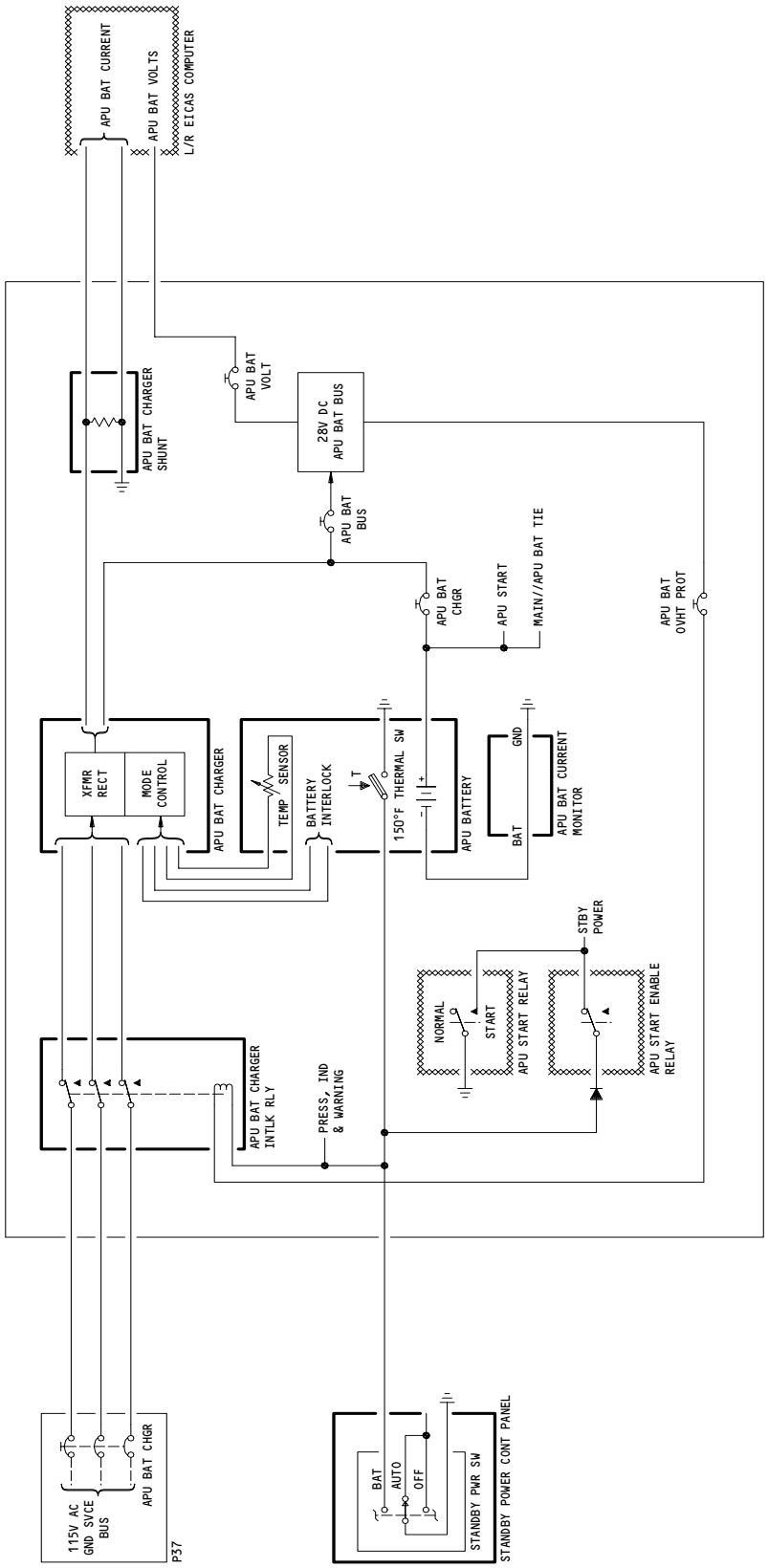
(f) A thermal switch in the battery closes when battery temperature exceeds 150°F (65°C). The switch closes a circuit to ground to energize the MBCDR. The MBCDR removes input power to the battery charger. The switch will re-open when battery temperature drops below 135°F (57°C).

(g) If the battery is discharging at a rate greater than the battery current monitor threshold current the monitor closes a circuit to ground. The amber DISCH light on the standby power control panel (P5) will come on. EICAS computers will show a battery discharging message.

(h) EICAS computers monitor battery voltage and current measurements. Other inputs include charger inoperative status and BAT switch position.

(2) APU Battery System (Fig. 3)

(a) The APU battery and charger are connected to the APU battery bus, and supply bus loads.



APU Battery Schematic
Figure 3

(b) In normal operation, the ABCIR is de-energized. The APU battery charger is connected to the ground service bus. The charger operates in the charge mode only. The APU battery current monitor latches APU battery charger detection relay K10418. Contacts on K10418 connect the charger INOP pin of the charger to EICAS. If charger shutdown occurs, the charger INOP pin goes high, turning on the message APU BAT CHGR INOP.

(c) The APU battery charger interlock relay is energized when starting the APU or when the STBY PWR switch is set to the BAT position. When energized, the relay disconnects the APU battery charger from the ground service bus. The APU BAT DISCH warning light (P5) and EICAS message are disabled during an APU start.

(d) If battery temperature exceeds 150°F (65°C), a thermal switch in the battery closes. The switch energizes the ABCIR, removing charger input power. The switch will re-open when battery temperature drops below 135°F (57°C).

(e) EICAS computers monitor APU battery voltage and charging current.

BATTERIES

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BATTERY - APU, M208	2	1	822, AFT EQUIP CTR, E6	24-31-04
BATTERY - MAIN, M223	1	1	113AL, FWD EQUIP CTR	24-31-01
CHARGER - APU BATTERY, M207	2	1	822, AFT EQUIP CTR, E6-2	24-31-05
CHARGER - MAIN BATTERY, M218	1	1	113AL, FWD EQUIP CTR	24-31-02
CIRCUIT BREAKER -	2		FLT COMPT, P6	
APU/MAIN BAT TIE, C4282		1	6L7	
BAT BUS BAT PWR, C898		1	6L10	*
BAT BUS CONT, C887		1	6C10	*
BAT BUS PWR - TRU, C886		1	6D11	*
BAT CUR MON PWR, C4097		1	6A4	*
BAT OVHT PROT, C827		1	6D1	*
BAT XFR CONT, C814		1	6D2	*
CENTER BUS DC, C899		1	6L12	*
HOT BAT BUS, C897		1	6L9	*
INV PWR BAT, C813		1	6L11	*
MAIN BAT CHGR DC, C896		1	6L8	*
CIRCUIT BREAKER -	2	1	FLT COMPT, P11	
EXT STBY BAT TIE, C4276		1	11A19	
EXT STBY CONT PWR, C4275		1	11A20	
CIRCUIT BREAKER -			822, AFT EQUIP CTR, E6	
APU BAT CHGR, C868		1	822, AFT EQUIP CTR, E6	*
APU BAT OVHT PROT, C820		1	822, AFT EQUIP CTR, E6	*
APU BAT VOLT, C821		1	822, AFT EQUIP CTR, E6	*
APU BUS, C869		1	822, AFT EQUIP CTR, E6	*
CIRCUIT BREAKER -	1		119BL, MAIN EQUIP CTR, P34	
MAIN/APU BAT CHGR ENABLE, C4241		1	34A16	*
MAIN/APU BAT TIE REMOTE CONT, C4286		1	822, AFT EQUIP CTR, E6	
CIRCUIT BREAKER -	1		119BL, MAIN EQUIP CTR, P37	
APU BAT CHGR, C302		1	37B5	*
MAIN BAT CHGR, C301		1	37B2	*

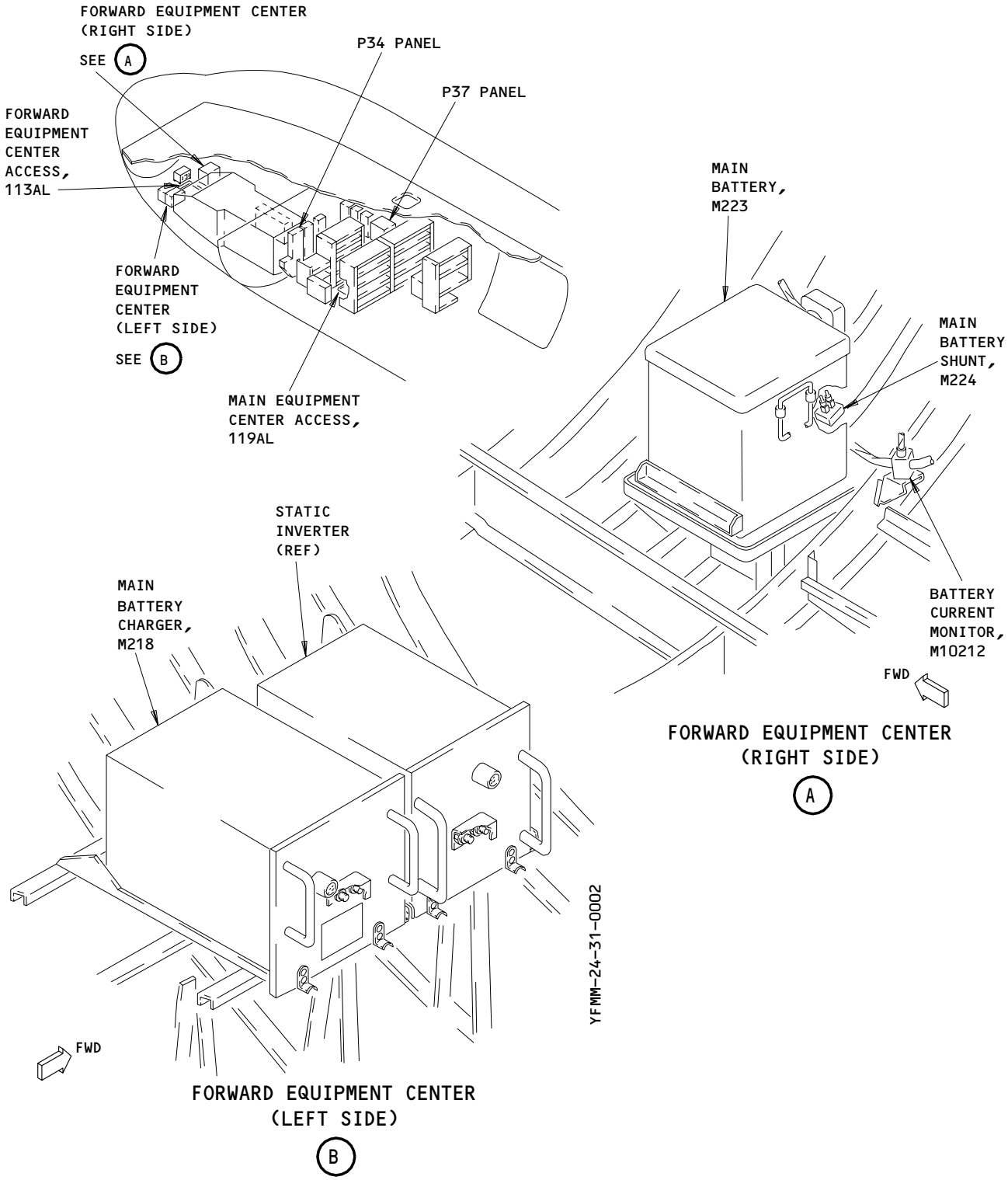
* SEE THE WDM EQUIPMENT LIST

Batteries - Component Index
Figure 101 (Sheet 1)

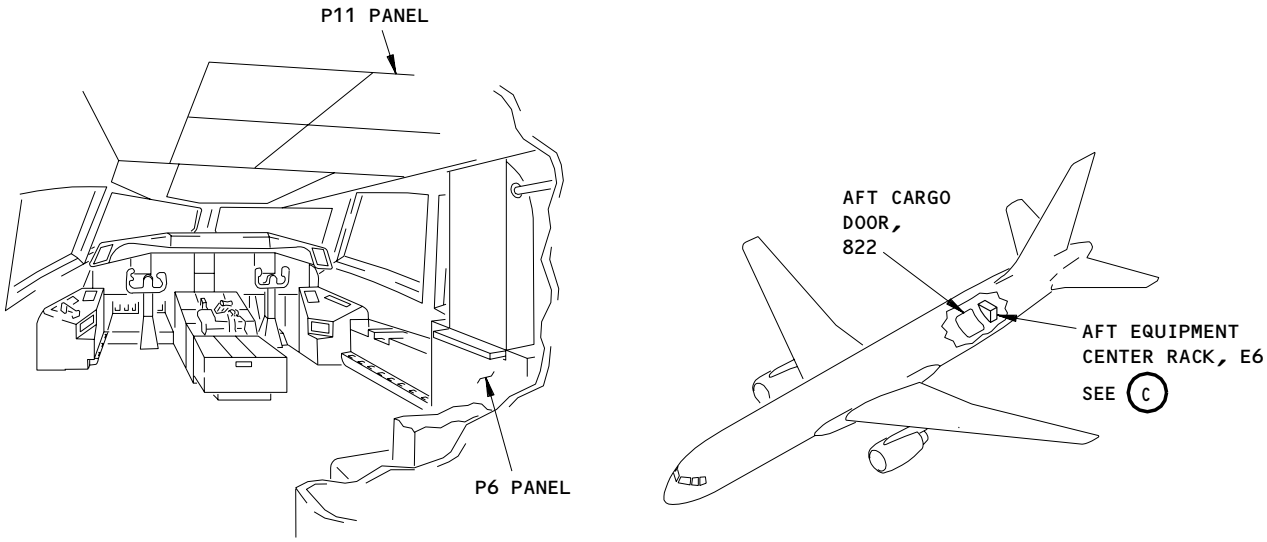
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
MONITOR - APU BATTERY CURRENT, M10495	2	1	822, AFT EQUIP CTR, E6	24-31-07
MONITOR - BATTERY CURRENT, M10212	1	1	113AL, FWD EQUIP CTR	24-31-03
RELAY - (FIM 31-01-36/101)				
ALTN EXT CONT LATCH, K10370				
RELAY - (FIM 31-01-86/101)				
APU BAT CHGR INLK, K116				
RELAY - (FIM 31-01-06/101)				
CENTER BUS ISLN, K123				
DC UNDER VOLTAGE SENSING, K113				
ISOL REQ, K122				
MAIN BAT, K104				
MAIN BAT CHGR DET, K10425				
MAIN BAT CHGR DISABLE, K115				
MAIN BAT TRANSFER, K106				
MAIN/APU BAT CHGR DET ENABLE, K10424				
SHUNT - APU BATTERY, M10251	2	1	822, AFT EQUIP CTR, E6	24-31-00
SHUNT - MAIN BATTERY, M224	1	1	113AL, FWD EQUIP AREA	24-31-00

* SEE THE WDM EQUIPMENT LIST

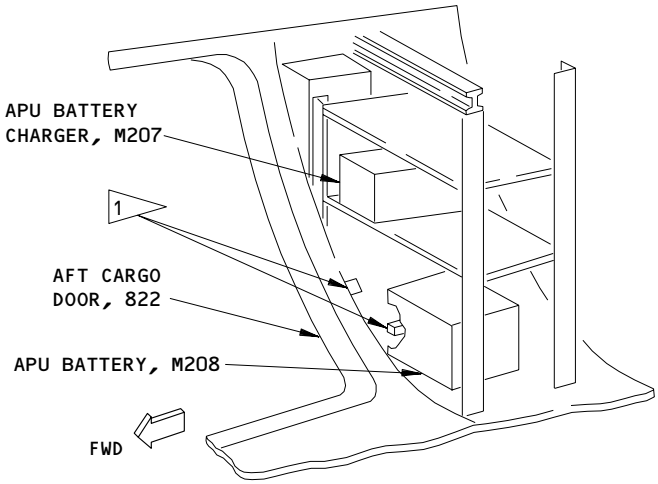
Batteries - Component Index
Figure 101 (Sheet 2)



Batteries - Component Location
Figure 102 (Sheet 1)



FLIGHT COMPARTMENT



AFT EQUIPMENT CENTER RACK, E6

C

1 APU BATTERY SHUNT, M10251,
IS AT ONE OF THESE LOCATIONS

Batteries - Component Location
Figure 102 (Sheet 2)

MAIN BATTERY - REMOVAL/INSTALLATION

1. General
   A. The main battery is on the right side of the forward equipment center.
   B. It is possible that a battery hoist is kept in the aft left area of the forward equipment center, approximately 12 inches aft of the access door.

TASK 24-31-01-004-001

2. Remove the Main Battery
   A. Equipment
      (1) Hoist - Main Battery, B24001-109 or B24001-110
   B. Access
      (1) Location Zones
         (a) 113 Area forward of NLG wheel well (LH side)
         (b) 114 Area forward of NLG wheel well (RH side)
         (c) 211 Control cabin - section 41 (LH side)
         (d) 212 Control cabin - section 41 (RH side)
      (2) Access Panels
         (a) 113AL Forward equipment center access
   C. Prepare for Removal (Fig. 401)

S 864-025

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.

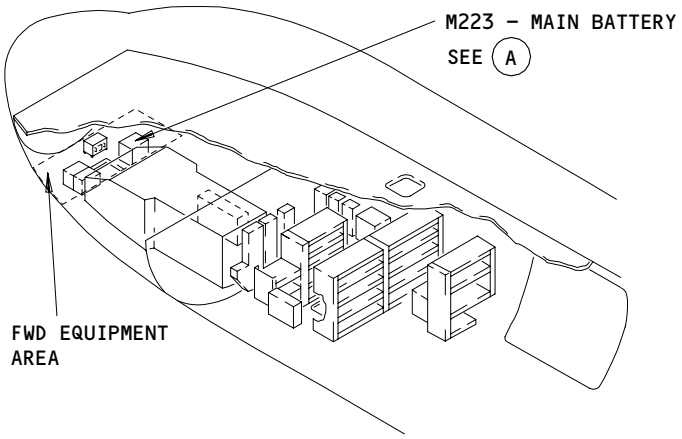
(1) If the external power is not necessary, do these steps to remove the external power:
   (a) Remove the external power (AMM 24-22-00/201).
   (b) Make sure the BAT switch (P5) is in the OFF position.

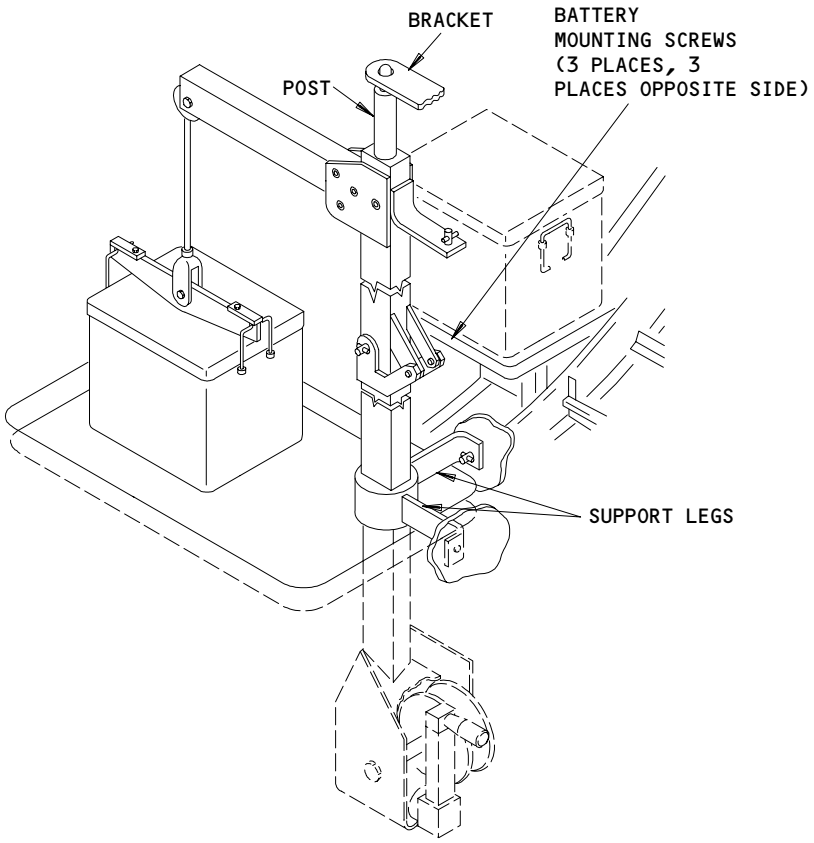
S 864-026

(2) If the external power is necessary, do these steps before you remove the battery:
   (a) Push the BAT switch (P5) to the OFF position.

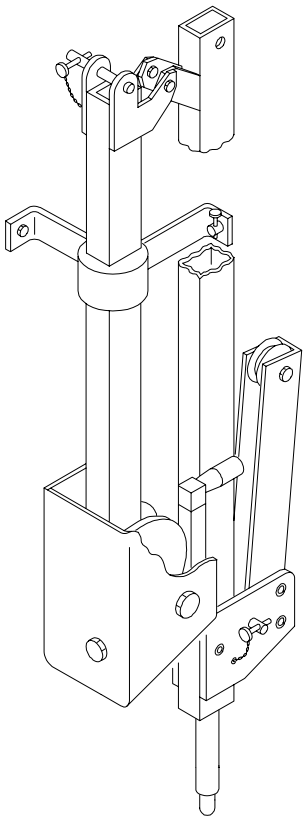
CAUTION: OPEN THE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN. IF YOU DO NOT OPEN THE CIRCUIT BREAKERS IN THIS SEQUENCE DAMAGE TO THE BATTERY CHARGER CAN OCCUR.

   (b) Open this circuit breaker on the right miscellaneous electrical equipment panel (P37) and attach a DO-NOT-CLOSE tag:
      1) 37B2, MAIN BATTERY CHARGER





(A)



BATTERY HOIST – FOLDED

(B)

Main Battery Installation
Figure 401

(c) Open these circuit breakers on the main power distribution panel (P6) and attach a DO-NOT-CLOSE tag:
1) 6D2, BAT XFR CONT
2) 6L8, MAIN BAT CHGR
3) 6L9, HOT BAT BUS
4) 6L12, CENTER BUS DC
5) 6F6, LANDING GEAR ALTN EXT MOTOR
6) 6L7, APU/MAIN BAT TIE

D. Remove the Main Battery

S 024-018

(1) Do these steps to remove the main battery:
(a) Disconnect the main battery connector from the main battery.
(b) Disconnect the thermal sensor connector from the main battery.
(c) Remove the screws that hold the main battery.
(d) Open the main battery hoist.
(e) Lock the battery hoist in the open position with the equipment that is attached.
(f) Put the post of the battery hoist into the bracket.
(g) Connect the support legs of the battery hoist to the structure with the bolts and ball lock pins.
(h) Move the arm of the battery hoist over the main battery.
(i) Attach the spreader bar to 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 BATTERY ABOVE PERSONS DURING REMOVAL. THE BATTERY WEIGHS 96 POUNDS AND FAILURE OF THE BATTERY HOIST COULD INJURE PERSONS.

(j) Remove the main battery.

TASK 24-31-01-404-012

3. Install the Main Battery

A. Equipment
(1) Hoist - Main Battery, B24001-109 or B24001-110

B. References
(1) SWPM 20-20-00, Standard Wiring Practice Manual D6-54446.
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/201, EICAS

C. Access
(1) Location Zones
(a) 113 Area forward of NLG wheel well (LH side)
(b) 114 Area forward of NLG wheel well (RH side)

(c) 211 Control Cabin - section 41 (LH side)
(d) 212 Control cabin - section 41 (RH side)

(2) Access Panels
(a) 113AL Forward equipment center access

D. Install the Main Battery

S 424-019

(1) Do these steps to install the main battery:
(a) Set the battery so that the terminals are to the right side of the airplane.
(b) Attach the spreader bar to 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 BATTERY ABOVE PERSONS DURING INSTALLATION. THE BATTERY WEIGHS 96 POUNDS AND FAILURE OF THE BATTERY HOIST COULD INJURE PERSONS.

(c) Use the battery hoist to lift the main battery into the forward equipment center.
(d) Lower the main battery into the battery tray.
(e) Remove the main battery hoist.
(f) Fold the main battery hoist and lock the hoist in this position with the equipment that is attached.
(g) Install the screws that attach the main battery.
(h) Connect the electrical connectors to the main battery.

S 864-027

(2) If you opened the circuit breakers in the Prepare for Removal step, do these steps to close those circuit breakers:

CAUTION: CLOSE THE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN. IF YOU DO NOT CLOSE THE CIRCUIT BREAKERS IN THIS SEQUENCE DAMAGE TO THE BATTERY CHARGER CAN OCCUR.

(a) Remove the DO-NOT-CLOSE tags and close these P6 panel circuit breakers:
1) 6D2, BAT XFR CONT
2) 6L8, MAIN BAT CHGR

3) 6L9, HOT BAT BUS
4) 6L12, CENTER BUS DC
5) 6F6, LANDING GEAR ALTN EXT MOTOR
6) 6L7, APU/MAIN BAT TIE

(b) Remove the DO-NOT-CLOSE tag and close this P37 panel circuit breaker:
1) 37B2, MAIN BATTERY CHARGER

E. Do these steps to check the main battery shunt:

S 214-023

(1) If there is a crack in the battery shunt body, a thread damage to the terminal posts, or corrosion on the terminal posts, do these steps to replace the battery shunt:
(a) Replace the battery shunt (AMM 24-31-09/401).

S 164-024

(2) Clean the area around the battery shunt and the ground stud nut.

F. Do a test of the main battery installation.

S 864-008

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

S 864-009

(2) Make sure the six EICAS circuit breakers on the overhead panel, P11, are closed.

S 914-010

(3) Do the Maintenance Message Erase Procedure (AMM 31-41-00/201).

S 864-011

(4) Make sure the STBY POWER switch, on the pilots' overhead panel P5, is set to the AUTO position.

S 714-020

(5) Do a test of the main battery as follows:
(a) Push the ECS MSG switch on the EICAS maintenance panel on the right side panel, P61.
(b) Make sure the EICAS message, MAIN BAT CHGR, does not show on the bottom display.
(c) Make sure the BAT switch on the P5 panel is ON.
(d) Turn the STBY POWER switch on the P5 panel to the BAT position.
(e) Push the ELEC HYD switch on the EICAS maintenance panel.

(f) Make sure this value shows below STBY/BAT on the bottom EICAS display:
1) DC-V = 24 ±4
(g) Turn the STBY POWER switch to the AUTO position
(h) Set the Captain's and First Officer's clocks to the correct time and date (AMM 31-25-00/501).

S 494-016
(6) Put the battery hoist in the airplane, or send the hoist to supply, as applicable.

S 864-017
(7) 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, (referred to as the battery charger) is on the left side of the forward equipment center.

TASK 24-31-02-004-001

2. Remove the Main Battery Charger (Fig. 401)
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zone
          113/114 Area forward of NLG wheel well

      (2) Access Panel
          113AL Forward equipment center access
   C. Prepare for Removal

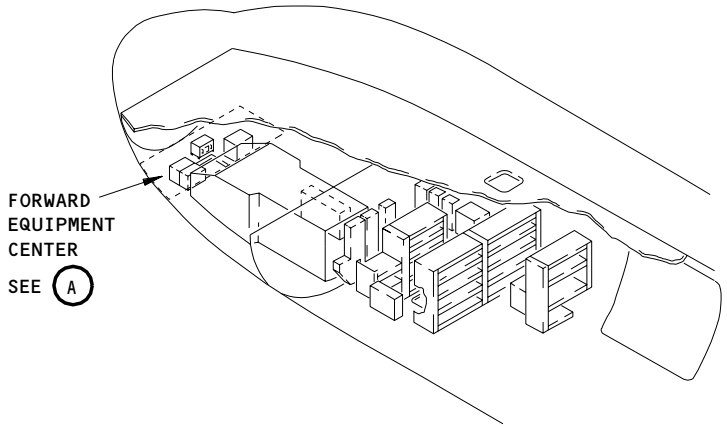
      S 864-002

      CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE MAIN BATTERY CHARGER.

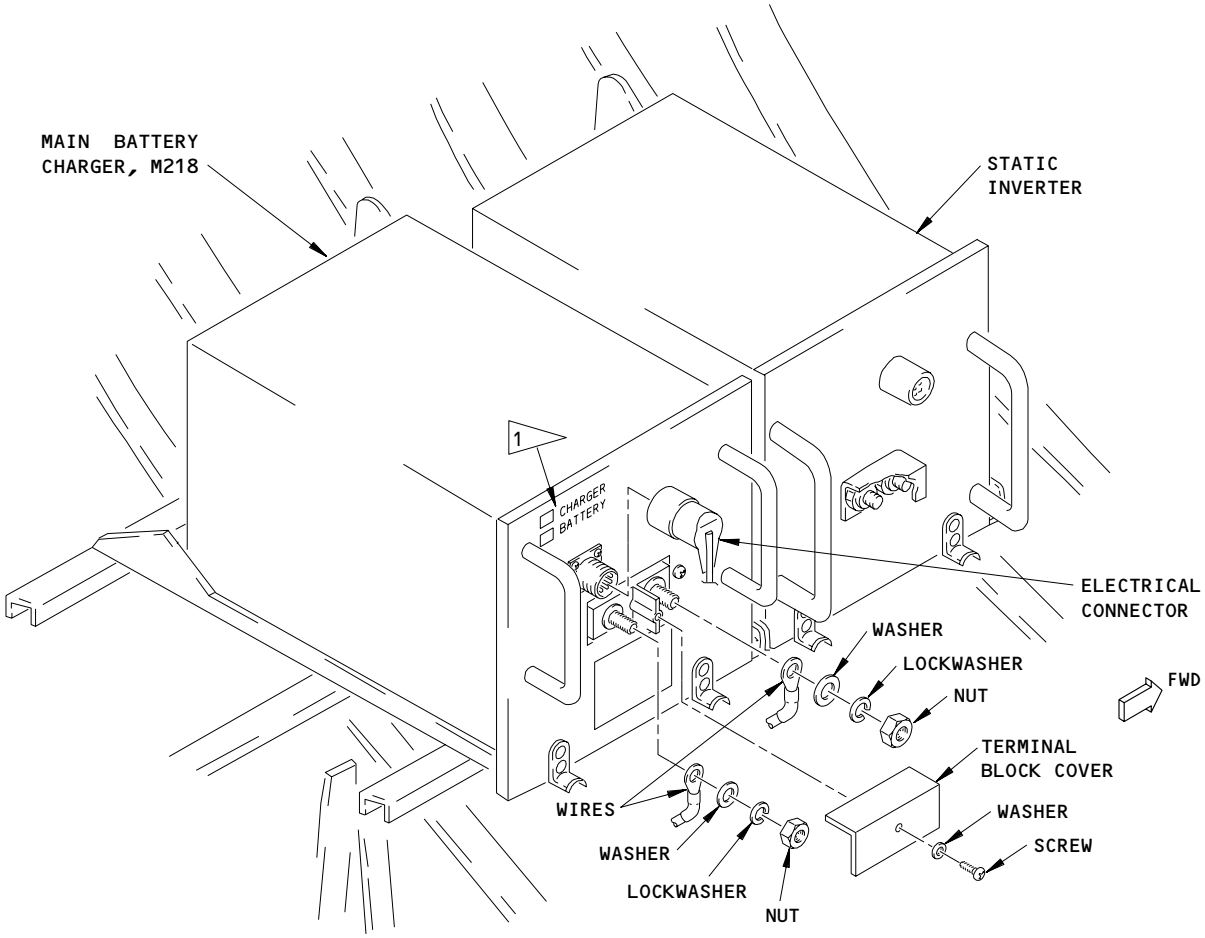
      (1) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
          (a) 37B2, MAIN BATTERY CHARGER

      S 864-003
      (2) Open this circuit breaker on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
          (a) 6L8, MAIN BAT CHGR
   D. Remove the Battery Charger

      S 034-004
      (1) Do these steps to disconnect the battery charger:
          (a) Disconnect the electrical connector from the battery charger.



FORWARD EQUIPMENT CENTER LOCATION



FORWARD EQUIPMENT CENTER

A

1 BATTERY CHARGER WITH THE CHARGER AND BATTERY LEDs

Main Battery Charger Installation
Figure 401

(b) Remove the terminal cover from the battery charger.
(c) Identify the wires on the terminals for installation.
(d) Remove the wires from the terminals.

S 024-005
(2) Remove the battery charger (AMM 20-10-01/401).

TASK 24-31-02-404-006
3. Install the Battery Charger (Fig. 401)
A. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 24-22-00/201, Electrical Power - Control
B. Access
(1) Location Zones
113/114 Area forward of NLG wheel well
211/212 Flight compartment

(2) Access Panel
113AL Forward equipment center access
C. Install the Battery Charger

S 424-007
(1) Install the battery charger (AMM 20-10-01/401).

S 434-008
(2) Do these steps to connect the 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 battery charger.

S 864-009

CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT

DAMAGE TO THE MAIN BATTERY CHARGER.

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6L8, MAIN BAT CHGR

S 864-010

(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37B2, MAIN BATTERY CHARGER

D. Do a test of the battery charger installation

S 864-011

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

S 864-012

(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-013

(3) Do a test of the 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 pilots' overhead panel, P5, to the ON position.
(c) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the BAT position for one minute.
(d) Turn the STBY POWER switch to the AUTO position and make sure these values show below STBY/BAT on the bottom EICAS display.

NOTE: These values will occur quickly. Make sure you monitor the bottom EICAS display carefully.

DC-A	38 ±5
DC-V	increases to 32 ± 4 volts dc then decreases to 28 ±2 volts dc.

(e) Make sure the DC-A value that shows below STBY/BAT on the bottom EICAS display is positive.

S 864-014

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

APU BATTERY - REMOVAL/INSTALLATION

1. General
   A. The APU battery is in the aft equipment-center-rack (refered to as the E6 rack).

TASK 24-31-03-004-001

2. Remove the APU Battery
   A. Access
      (1) Location Zones
         (a) 154 Aft cargo compartment (LH side)
         (b) 211 Control cabin - section 41 (LH side)
         (c) 212 Control cabin - section 41 (RH side)
      (2) Access Panels
         (a) 822 No. 2 cargo compartment door
   B. Prepare for Removal (Fig. 401)

S 864-002

CAUTION: OPEN THE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN. FAILURE TO OPEN THE CIRCUIT BREAKERS IN THIS SEQUENCE CAN CAUSE DAMAGE TO THE APU BATTERY CHARGER.

(1) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
(a) 37B5 or 37K2, APU BATTERY CHARGER

S 864-003

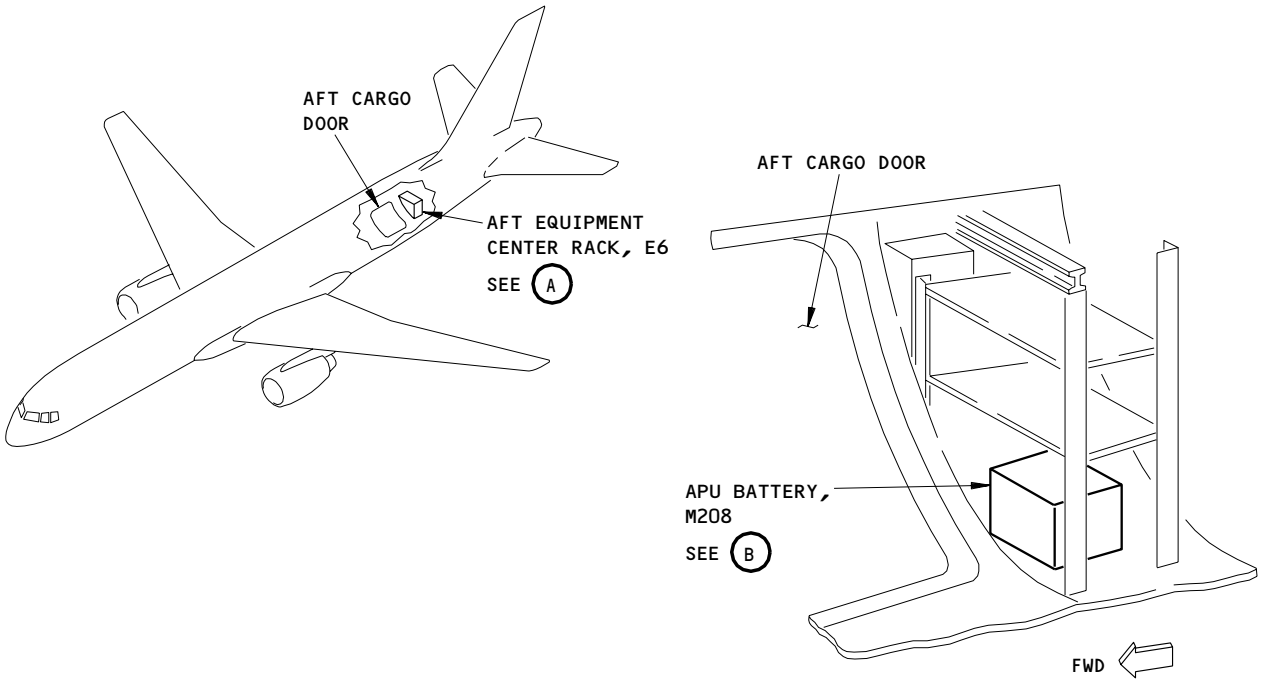
(2) Open this circuit breaker on the aft equipment center rack (referred to as the E6 rack) and attach a DO-NOT-CLOSE tag:
(a) APU BAT CHGR

S 864-004

(3) Open this circuit breaker on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
(a) 6D2, BAT XFER CONT

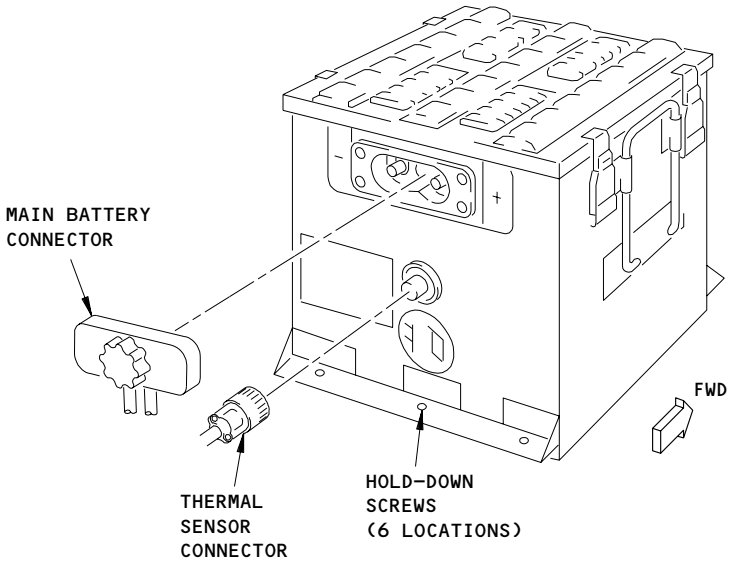
S 014-005

(4) Open the forward doors on the E6 rack.



AFT EQUIPMENT CENTER RACK, E6

A



APU BATTERY, M208

B

APU Battery Installation
Figure 401

C. Remove the APU battery

S 024-006

(1) Do these steps to remove the APU battery:
(a) Disconnect the electrical connectors from the APU battery.
(b) Release the APU battery tray.
(c) Move the APU battery tray out.
(d) Remove the screws that hold the APU battery in the tray.

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) Remove the APU battery.

TASK 24-31-03-404-007

3. Install the APU Battery (Fig. 401)
A. Equipment
(1) Bonding meter - Model T-477W
Avtron Manufacturing, Inc.,
Cleveland, Ohio
B. References
(1) SWPM 20-20-00, Standard Wiring Practice Manual D6-54446.
(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/201, EICAS
C. Access
(1) Location Zones
(a) 154 Aft cargo compartment (LH side)
(b) 211 Control cabin - section 41 (LH side)
(c) 212 Control cabin - section 41 (RH side)
(2) Access Panels
(a) 822 No. 2 cargo compartment door
D. Procedure

S 424-008

(1) Do these steps to install the APU battery:

WARNING: DO NOT INSTALL THE APU BATTERY WITHOUT AID. BATTERY WEIGHS 96 POUNDS AND INJURY CAN OCCUR IF INSTALLATION IS DONE WITHOUT AID.

(a) Install the APU battery in the tray.
(b) Install the screws that attach the APU battery to the tray.
(c) Move the APU battery tray aft into the E6 rack.
(d) Lock the APU battery tray.
(e) Connect the electrical connectors to the APU battery.

CAUTION: CLOSE THE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN. IF YOU DO NOT CLOSE THE CIRCUIT BREAKERS IN THIS SEQUENCE, DAMAGE TO THE BATTERY CHARGER CAN OCCUR.

(f) Remove the DO-NOT-CLOSE tag, and close this E6 rack circuit breaker:
1) APU BAT CHGR

(g) Remove the DO-NOT-CLOSE tag, and close this P37 panel circuit breaker:
1) 37B5 or 37K2, APU BATTERY CHARGER

(h) Remove the DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
1) 6D2, BAT XFER CONT

E. Do these steps to check the APU battery ground stud:

S 214-030

(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: If the terminal lug is annealed, replace the lug 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 ground studs are 0.0001 ohms (SWPM 20-20-00).

S 214-032

(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 these 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 ground studs are 0.0001 ohms (SWPM 20-20-00).

S 164-031

(3) Clean the fuselage area next to the APU ground studs. Make sure there is no dust on the APU ground stud area.

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 panel (referred to as the P11 panel) are closed.

S 914-013
(3) Do the Maintenance Message Erase Procedure (AMM 31-41-00/201).

S 864-014
(4) Make sure the STBY POWER switch, on the pilots' overhead panel P5, is set to the AUTO position.

S 714-011
(5) Do a test of the APU battery as follows:
(a) Push the ECS MSG switch on the EICAS maintenance panel on the right side panel (referred to as the P61 panel).
1) Make sure the EICAS message, APU BAT CHGR, does not show on the bottom display.
(b) Make sure the BAT switch, on the pilots' overhead panel P5, is ON.
(c) Turn the STBY POWER switch to the BAT position.
(d) Push the ELEC HYD switch on the EICAS maintenance panel on the P61 panel.
(e) Make sure the value that follows is below APU/BAT on the bottom EICAS display.
1) DC-V = 24 ±4
(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
2) DC-V value increases to 33 ±4 then decreases to 28 ±3

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 864-012

(6) 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, (referred to as the battery charger) is in the aft equipment center rack, E6.

TASK 24-31-04-004-003

2. Remove the APU Battery Charger
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zone
          154 Aft cargo compartment (Right)

      (2) Access Panel
          822 Aft cargo compartment door
   C. Prepare for Removal

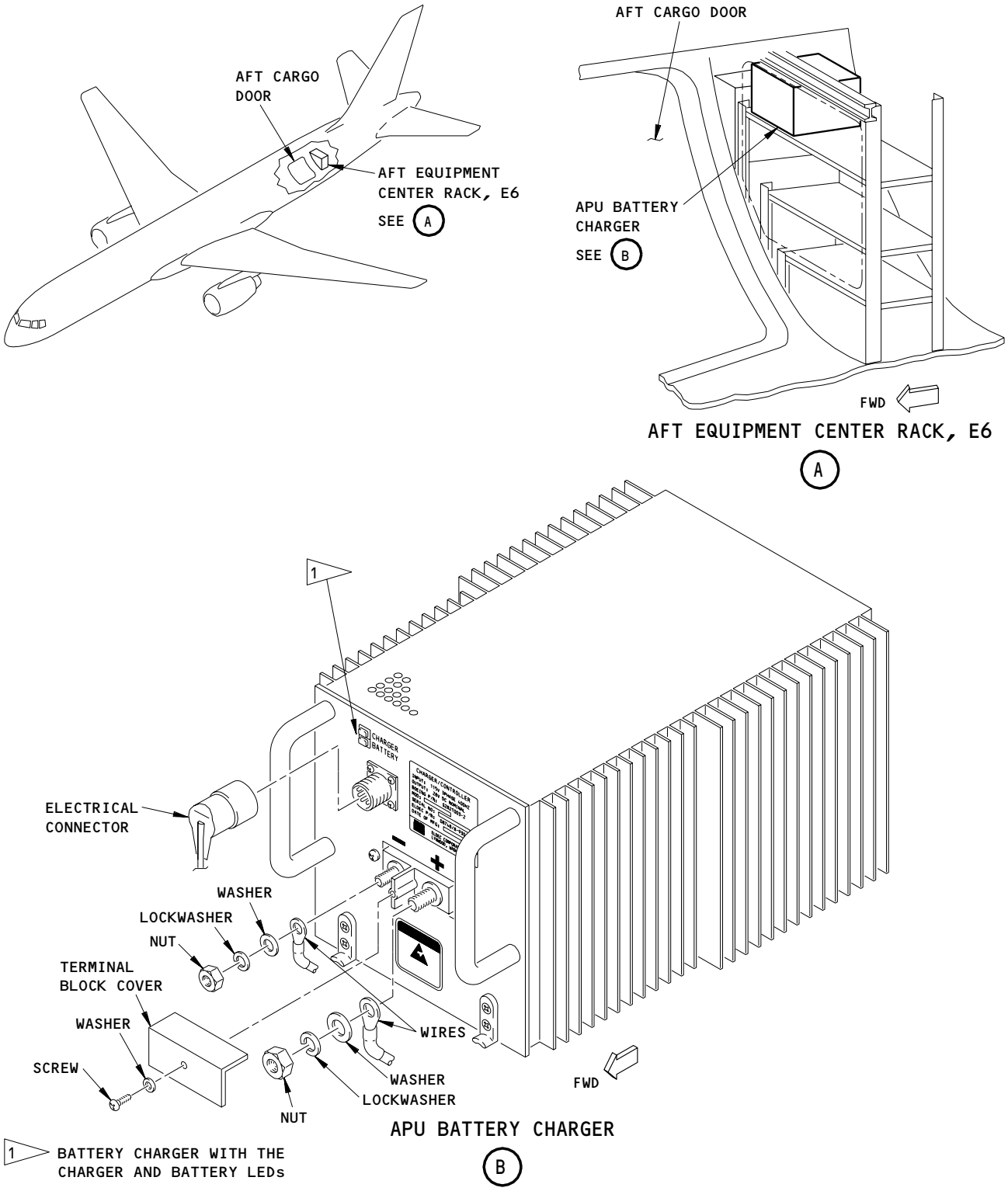
      S 864-001

      CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE APU BATTERY CHARGER.

      (1) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
          (a) 37B5 OR 37K2, BATTERY CHARGERS APU

      S 864-002
      (2) Open this circuit breaker on the aft equipment center rack (referred to as the E6 rack) and attach a DO-NOT-CLOSE tag:
          (a) APU BAT CHGR

      S 034-004
      (3) Do these steps to disconnect the APU battery charger:
          (a) Open the front cover on the E6 rack.



APU Battery Charger Installation
Figure 401

(b) Remove the electrical connector from the battery charger.
(c) Remove the terminal cover from the battery charger.
(d) Identify the wires on the terminals for installation.
(e) Remove the wires from the terminals on the battery charger.

S 024-005
(4) Remove the battery charger (AMM 20-10-01/401).

TASK 24-31-04-404-005
3. Install the APU Battery Charger
A. References
(1) AMM 20-10-01/401, E/E Rack Mounted Components
(2) AMM 24-22-00/201, Electrical Power - Control
B. Access
(1) Location Zone
154 Aft cargo compartment (Right)
211/212 Flight compartment

(2) Access Panel
822 Aft cargo compartment door
C. Install the battery charger

S 424-006
(1) Install the battery charger (AMM 20-10-01/401).

S 434-007
(2) Do these steps to connect the 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 battery charger.
(g) Close the front cover on the E6 rack.

S 864-008

CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE APU BATTERY CHARGER.

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the E6 rack:
(a) APU BAT CHGR

S 864-009
(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37B5 OR 37K2, BATTERY CHARGERS APU

D. Do a test of the battery charger installation

S 864-010
(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 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 BAT switch on the standby power panel (P5) is in the ON position.
(c) Turn the STBY POWER switch on the P5 panel to the BAT position for approximately one minute.
(d) Make sure this value is below APU/BAT on the bottom EICAS display:
1) DC-V = 24 ± 4
(e) Turn the STBY POWER switch on the P5 panel to the AUTO position.

NOTE: Watch the EICAS display closely. The values on the display will change quickly.

(f) Make sure these values show below APU/BAT on the bottom EICAS display:
1) DC-A value increases quickly to 38 ± 5
2) DC-V value increases to 32 ± 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
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

MAIN BATTERY CURRENT MONITOR - REMOVAL/INSTALLATION

1. General
   A. The main battery current monitor, M10212, (referred to as the current monitor) is outboard of the main battery in the forward equipment center.

TASK 24-31-05-004-001

2. Remove the Main Battery Current Monitor (Fig. 401)
   A. Access
      (1) Location Zone
          113/114 Area forward of NLG wheel well

      (2) Access Panel
          113AL Forward equipment center access
   B. Prepare for Removal

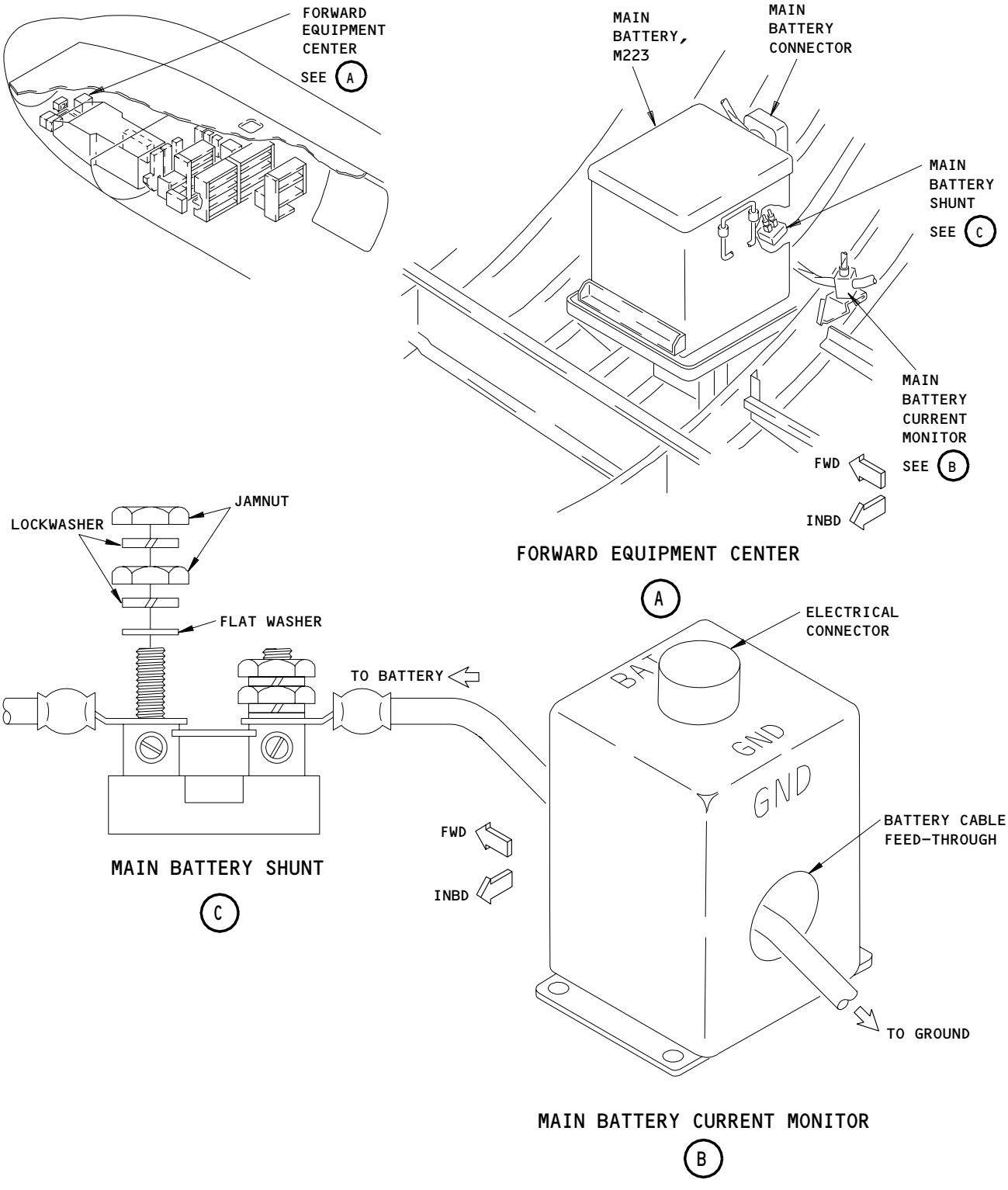
S 864-002

CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE MAIN BATTERY CHARGER.

(1) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
(a) 37B2, BATTERY CHARGERS MAIN

S 864-003

(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) 6L7, APU/MAIN BAT TIE
(b) 6L8, MAIN BAT CHGR
(c) 6L9, HOT BAT BUS
(d) 6L10, BAT BUS PWR
(e) 6L11, INV PWR BAT
(f) 6L12, CENTER BUS DC
(g) 6F6, LANDING GEAR ALTN EXT MOTOR



Main Battery Current Monitor Installation
Figure 401

C. Remove the Current Monitor

S 024-004

(1) Do these steps to remove the current monitor:
(a) Remove the battery connector from the main battery.
(b) Remove the ground lead from terminal B on the main battery shunt.
(c) Move the ground lead through the current monitor.
(d) Remove the electrical connector from the current monitor.
(e) Remove the screws that hold the current monitor.
(f) Remove the current monitor.

TASK 24-31-05-404-005

3. Install the Main Battery Current Monitor (Fig. 401)

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

B. Access
(1) Location Zone
113/114 Area forward of NLG wheel well

(2) Access Panel
113AL Forward equipment center access

C. Install the Current Monitor

S 424-011

(1) Do these steps to install the current monitor:
(a) Hold the current monitor so the BAT end of the current monitor points to the main battery.

NOTE: Make sure you align the GND and BAT sides of the current monitor as shown (Fig. 401).

(b) Move the battery ground lead through the current monitor.
(c) Put the current monitor in position.
(d) Install the four screws that hold the current monitor.
(e) Connect the electrical connector to the current monitor.
(f) Connect the battery ground lead (from the current monitor) 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 864-006

CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE BATTERY CHARGER.

(2) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the P6 panel:
(a) 6L7, APU/MAIN BAT TIE
(b) 6L8, MAIN BAT CHGR
(c) 6L9, HOT BAT BUS

(d) 6L10, BAT BUS PWR
(e) 6L11, INV PWR BAT
(f) 6L12, CENTER BUS DC
(g) 6F6, LANDING GEAR ALTN EXT MOTOR

S 864-007
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37B2, BATTERY CHARGERS MAIN

D. Do a test of the current monitor installation:

S 864-008
(1) Supply electrical power (AMM 24-22-00/201).

S 714-009
(2) Do these steps at the standby power control panel on the pilots' overhead panel, P5:
(a) Push the BAT switch to the ON position.
(b) Make sure the white light in the switch comes on.
(c) Turn the STBY POWER switch to the BAT position.
(d) Make sure the yellow MAIN BAT DISCH light comes on.
(e) Turn the STBY POWER switch to the AUTO position.
(f) Push the BAT switch to the OFF position.
(g) Make sure the yellow light in the switch comes on.

S 864-010
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

MAIN BATTERY AND MAIN 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, in the flight compartment.

TASK 24-31-06-004-002

2. Remove the Main Battery Relay or Main Battery Transfer 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 Zone
          211/212 Flight compartment

   C. Prepare for Removal

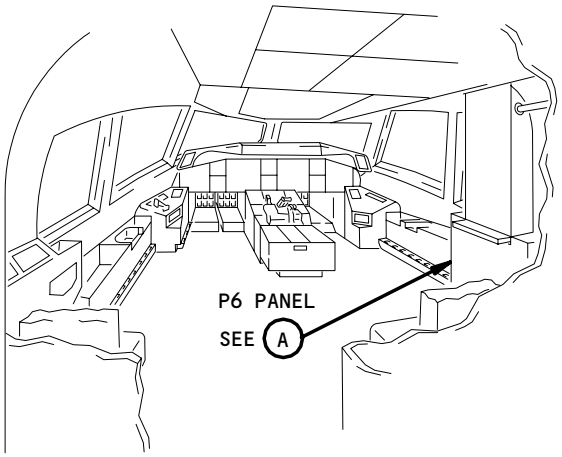
      S 864-001

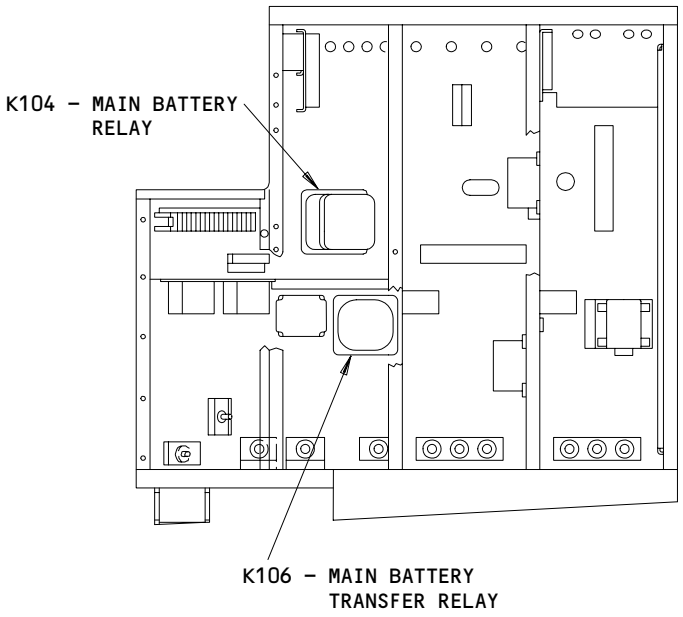
      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZERS ARE FULLY POWERED SURFACES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR WHEN HYDRAULIC POWER IS SUPPLIED.

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

      S 864-003
      (2) Remove electrical power from the airplane (Ref 24-22-00).

      S 864-004
      (3) Open these circuit breakers on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
          (a) 6L9, HOT BAT BUS
          (b) 6L10, BAT BUS PWR
          (c) 6L11, INV PWR BAT





POWER DISTRIBUTION PANEL P6

A

Main Battery and Main Battery Transfer Relay Installation
Figure 401

S 024-005

(4) Do these steps to remove the main battery relay or main battery transfer relay:

WARNING: REMOVE ALL ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU OPEN THE P6 PANEL. VOLTAGES IN THE P6 PANEL CAN CAUSE SERIOUS INJURY TO PERSONS.

(a) Open the P6 panel.
(b) Identify the wires on the applicable relay for installation.
(c) Remove the wires from the applicable relay.
(d) Remove the screws that hold the applicable relay.
(e) Remove the main battery relay or main battery transfer relay.

TASK 24-31-06-404-006

3. Install the Main Battery Relay or Main Battery Transfer 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 Zone
211/212 Flight Compartment

C. Install the Main Battery Relay or Main Battery Transfer Relay

S 424-007

(1) Do these steps to install the applicable relay:
(a) Put the applicable relay in position in the P6 panel.
(b) Install the screws that hold the relay.

CAUTION: MAKE SURE ALL WIRES ARE CORRECTLY CONNECTED TO THE RELAY. AN INCORRECT CONNECTION CAN CAUSE SERIOUS SERIOUS DAMAGE TO THE DC CIRCUIT COMPONENTS ON THE AIRPLANE.

(c) Connect the wires to the applicable relay.

(d) Close the P6 panel.

S 864-008

(2) Remove the DO-NOT-CLOSE tag and close these P6 panel circuit breakers:
(a) 6L9, HOT BAT BUS
(b) 6L10, BAT BUS PWR
(c) 6L11, INV PWR BAT

D. Do a test of the main battery relay or main battery transfer relay installation.

S 864-009

(1) Supply electrical power (Ref 24-22-00).

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 adjacent to the switch is off.
(c) Turn the STBY POWER switch to the BAT position.
(d) Make sure the OFF light adjacent to the switch is off.
(e) Turn the STBY POWER switch to the OFF position.
(f) Make sure the OFF light adjacent to the switch comes on.

S 864-011

(3) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00).

S 864-012

(4) Remove electrical power if it is not necessary (Ref 24-22-00).

APU BATTERY CURRENT MONITOR - REMOVAL/INSTALLATION

1. General
   A. The APU battery current monitor, M10495, (referred to as the current monitor) is adjacent to the APU battery in the aft equipment center rack, E6.

TASK 24-31-07-004-001

2. Remove the APU Battery Current Monitor (Fig. 401)
   A. Access
      (1) Location Zone
          153 Aft cargo compartment (Right)

      (2) Access Panel
          822 Aft cargo compartment door
   B. Prepare for Removal

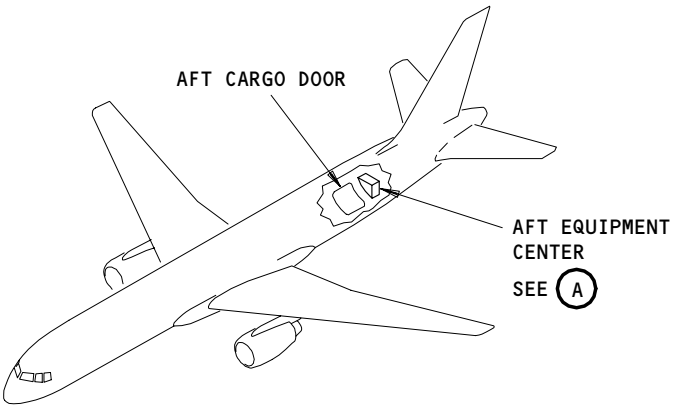
      S 864-002
      (1) Open this circuit breaker on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
          (a) 6A4, BAT CUR MON PWR

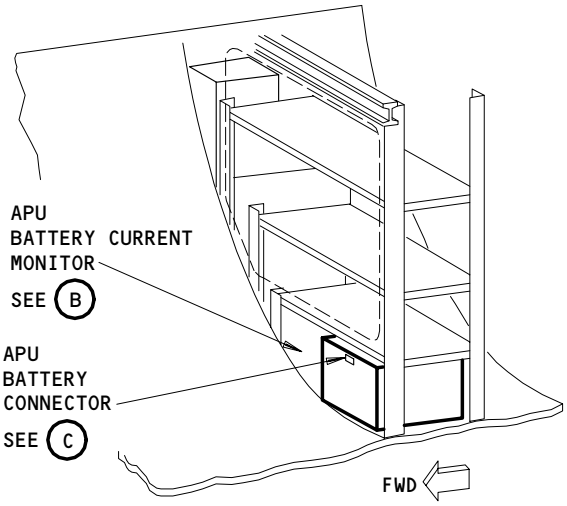
      S 864-003

      CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE APU BATTERY CHARGER.

      (2) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
          (a) 37B5 (Plate B), APU BATTERY CHARGER

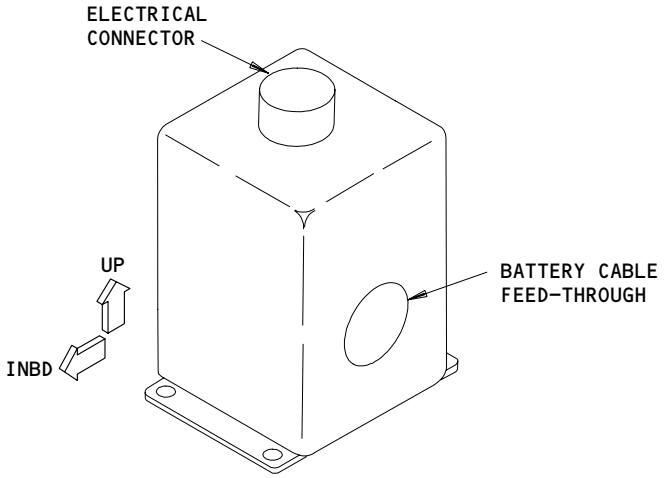
      S 864-004
      (3) Open this circuit breaker on the aft equipment center rack (referred to as the E6 rack) and attach a DO-NOT-CLOSE tag:
          (a) APU BAT CHGR





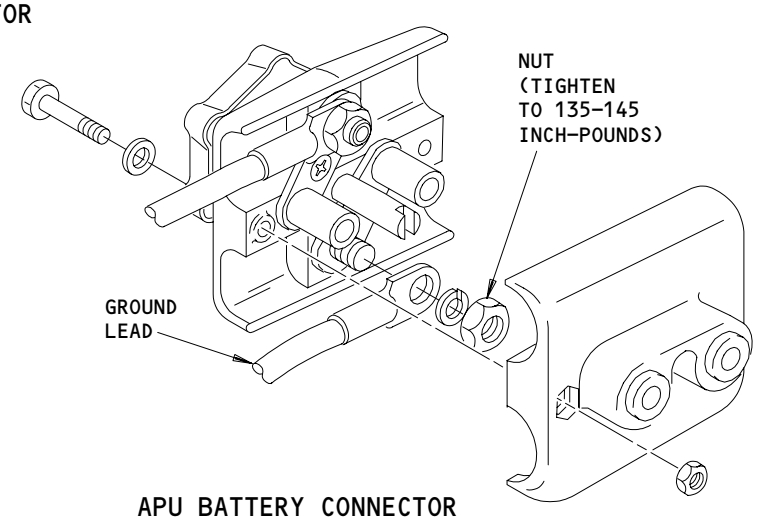
AFT EQUIPMENT CENTER RACK E6

A



APU BATTERY CURRENT MONITOR

B



APU BATTERY CONNECTOR

C

APU Battery Current Monitor Installation
Figure 401

C. Remove the Current Monitor

S 024-005

(1) Do these steps to remove the current monitor:
(a) Open the cover on the front of the E6 rack.
(b) Remove the battery connector from the APU battery.
(c) Open the battery connector.
(d) Remove the ground lead from the battery connector.
(e) Move the battery ground lead through the current monitor.
(f) Remove the electrical connector from the current monitor.
(g) Remove the screws that hold the current monitor.
(h) Remove the current monitor.

TASK 24-31-07-404-006

3. Install the APU Battery Current Monitor (Fig. 401)

A. References
(1) 24-22-00/201, Electrical Power - Control

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 Current Monitor

S 424-014

(1) Do these steps to install the current monitor:
(a) Hold the current monitor so the BAT end of the current monitor points to the APU battery.
(b) Move the battery ground lead through the current monitor.
(c) Put the current monitor in position.
(d) Install the screws that hold the current monitor.
(e) Connect the electrical connector to the current monitor.
(f) Connect the battery ground lead (from the current monitor) to the APU battery connector and tighten the nut to 135-145 inch-pounds.
(g) Close the APU battery connector.
(h) Connect the APU battery connector to the APU battery.

S 864-007

CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE APU BATTERY CHARGER.

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the E6 rack:
(a) APU BAT CHGR

S 864-008
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37B5 (Plate B), APU BATTERY CHARGER

S 864-009
(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6A4, BAT CUR MON PWR

D. Do a Test of the Current Monitor Installation.

S 864-010
(1) Supply electrical power (Ref 24-22-00).

S 864-011
(2) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11B7, LIGHTS INSTR
(b) 11N4, INSTRUMENT AND PANEL OVHD

S 714-012
(3) Do these steps on the standby power control panel on the pilots' overhead panel, P5:
(a) Push the BAT switch to the ON position.
(b) Make sure the white ON light in the BAT switch comes on.
(c) Turn the STBY POWER switch to the BAT position.
(d) Make sure the APU BAT DISCH light comes on.
(e) Turn the STBY POWER switch to the AUTO position.
(f) Make sure the APU BAT DISCH light goes off.
(g) Push the BAT switch to the OFF position.
(h) Make sure the yellow OFF light in the BAT switch comes on.

S 864-013
(4) Remove electrical power if it is not necessary (Ref 24-22-00).

MAIN BATTERY SHUNT - REMOVAL/INSTALLATION

1. General
   A. The main battery shunt, M224, is outboard of the main battery in the forward equipment center.

TASK 24-31-09-004-001

2. Remove the Main Battery Shunt (Fig. 401)
   A. Access
      (1) Location Zone
          113/114 Area forward of NLG wheel well

      (2) Access Panel
          113AL Forward equipment center access
   B. Prepare for Removal

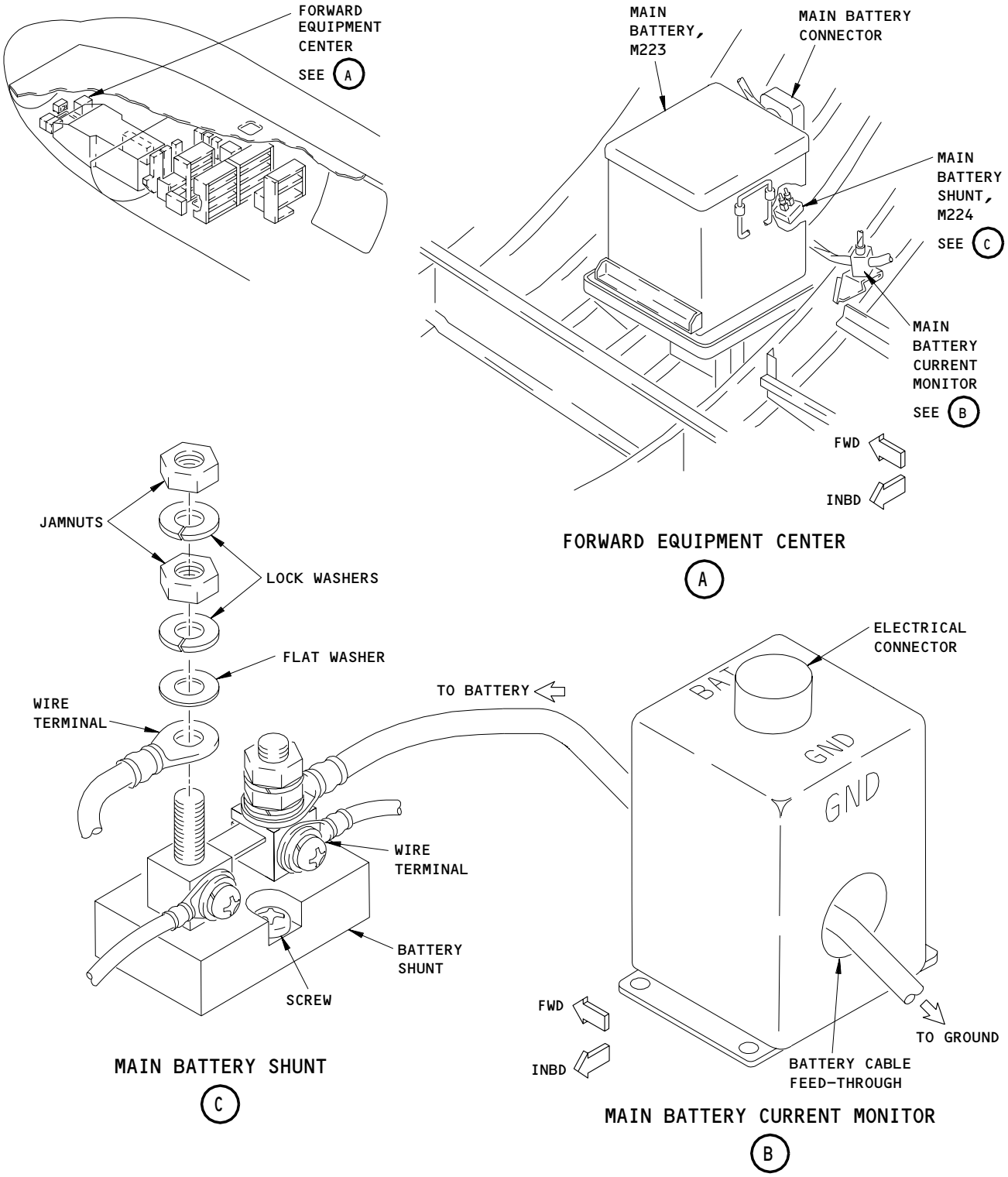
      S 864-002

      CAUTION: OPEN THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE MAIN BATTERY CHARGER.

      (1) Open this circuit breaker on the right miscellaneous electrical equipment panel (referred to as the P37 panel) and attach a DO-NOT-CLOSE tag:
          (a) 37B2, BATTERY CHARGERS MAIN

      S 864-003
      (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) 6L7, APU/MAIN BAT TIE
          (b) 6L8, MAIN BAT CHGR
          (c) 6L9, HOT BAT BUS
          (d) 6L10, BAT BUS PWR
          (e) 6L11, INV PWR BAT
          (f) 6L12, CENTER BUS DC
          (g) 6F6, LANDING GEAR ALTN EXT MOTOR
   C. Remove the Battery Shunt

      S 024-004
      (1) Do these steps to remove the battery shunt:
          (a) Remove the battery connector from the main battery.
          (b) Remove the wire terminals on the main battery shunt.
          (c) Remove the screws that hold the battery shunt.
          (d) Remove the battery shunt.



Main Battery Shunt Installation
Figure 401

TASK 24-31-09-404-005

3. Install the Main Battery Shunt (Fig. 401)
   A. Equipment
      (1) Bonding meter - Model T-477W
          Avtron Manufacturing, Inc.,
          Cleveland, Ohio
   B. References
      (1) AMM 24-22-00/201, Electrical Power - Control
   C. Access
      (1) Location Zone
          113/114 Area forward of NLG wheel well

      (2) Access Panel
          113AL Forward equipment center access
   D. Install the Battery Shunt

      S 424-006

      (1) Do these steps to install the battery shunt:
          (a) Put the battery shunt in position.
          (b) Install the two screws that hold the battery shunt.
          (c) Install the terminal lug, flat washer, lock washer and jam nut on the shunt terminal post.
          (d) Tighten the jam nut to 35 +/- 5 pound-inch.
          (e) Install the lock washer and jam nut on the terminal post.
          (f) Tighten the jam nut to 35 +/- 5 pound-inch.
          (g) Install the terminal lug, washer, lock washer and tighten the screws on the shunt (SWPM 20-30-11).
          (h) Make sure the main battery ground nut is torqued to 190 +/- 10 pound-inch (SWPM 20-20-00).
          (i) Connect the battery connector to the main battery.
          (j) Make sure the bonding resistance between the main battery ground stud and airplane structure is not more than 0.0001 ohms (SWPM 20-20-00).

      S 164-012

      (2) Clean the area around the battery shunt and the ground stud nut.

      S 864-007

      CAUTION: CLOSE THESE CIRCUIT BREAKERS IN THE SEQUENCE SHOWN TO PREVENT DAMAGE TO THE BATTERY CHARGER.

      (3) Remove the DO-NOT-CLOSE tag and close these circuit breakers on the P6 panel:
          (a) 6L7, APU/MAIN BAT TIE

(b) 6L8, MAIN BAT CHGR
(c) 6L9, HOT BAT BUS
(d) 6L10, BAT BUS PWR
(e) 6L11, INV PWR BAT
(f) 6L12, CENTER BUS DC
(g) 6F6, LANDING GEAR ALTN EXT MOTOR

S 864-008
(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P37 panel:
(a) 37B2, BATTERY CHARGERS MAIN

E. Do a test of the battery shunt installation:

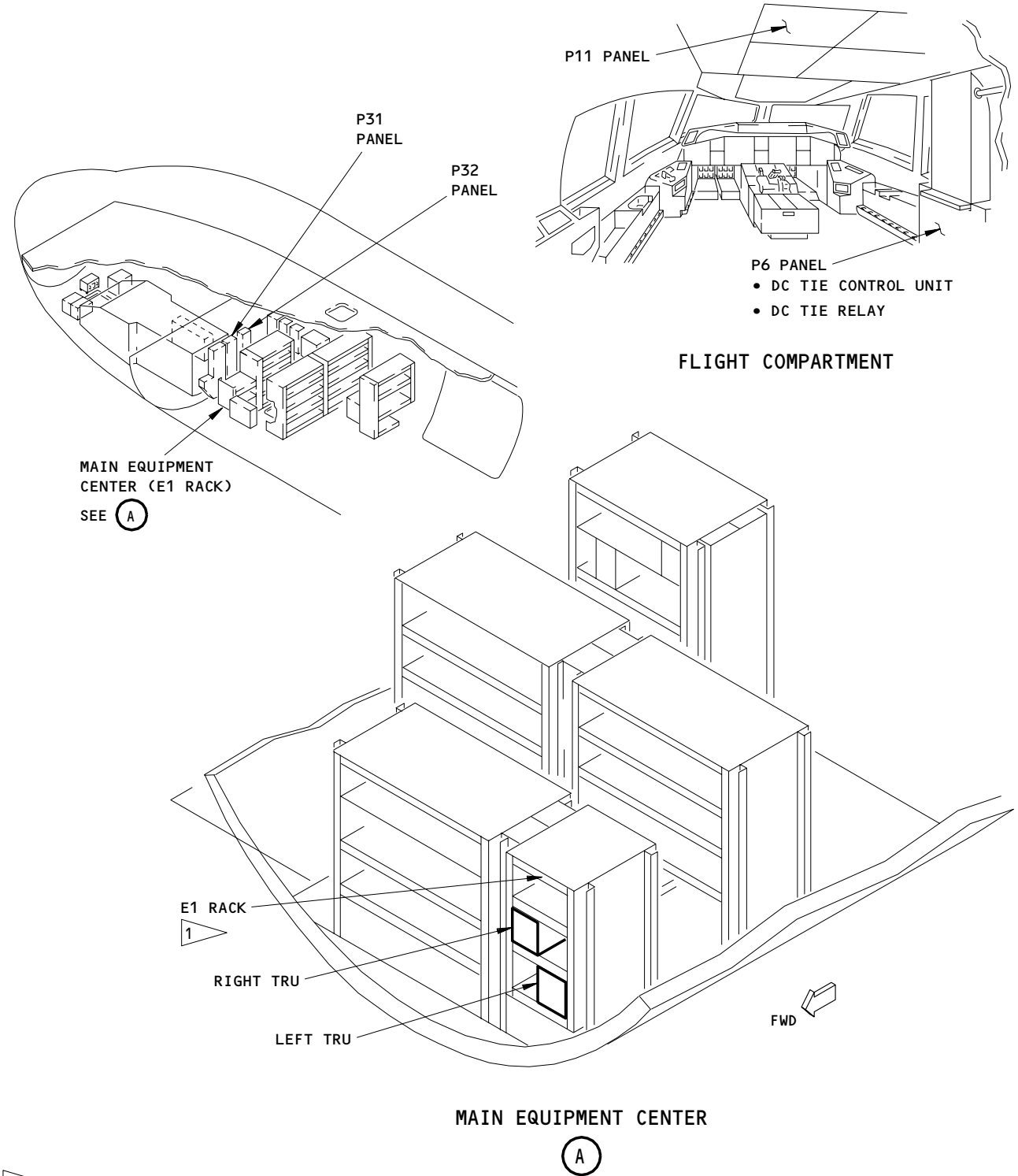
S 864-009
(1) Supply electrical power (AMM 24-22-00/201).

S 714-010
(2) Do these steps at the standby power control panel on the pilots' overhead panel, P5:
(a) Make sure the BAT switch is in the ON position.
(b) Make sure the white light in the switch comes on.
(c) Turn the STBY POWER switch to the BAT position.
(d) Make sure the yellow MAIN BAT DISCH light comes on.
(e) Turn the STBY POWER switch to the AUTO position.
(f) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(g) Make sure this DC-V value shows on the bottom EICAS display:
1) STBY/BAT 28 +/- 3

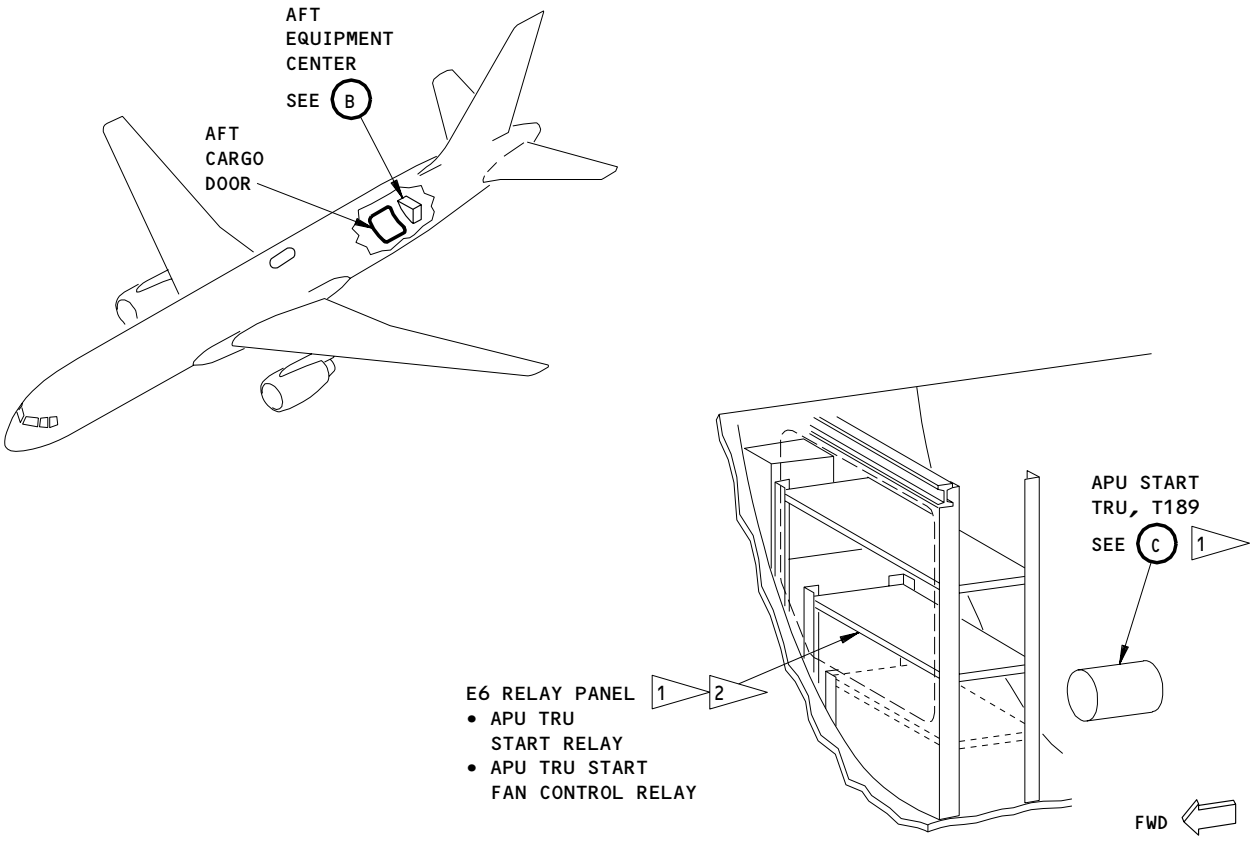
S 864-011
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TRANSFORMER-RECTIFIER - DESCRIPTION AND OPERATION

1. General
   A. The transformer-rectifier system supplies primary DC power and APU starting power by converting main AC power. System components include transformer-rectifier units (TRU's), a DC tie control unit, a DC tie relay, an APU start TRU fan control relay, and APU TRU 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 28-volt DC power. Each TRU is capable of providing 120 amps of continuous current with forced-air cooling. Internal protection circuits prevent TRU damage due to a shorted output. An internal meter shunt allows measurement of TRU output current by the EICAS computers. The main TRU's are located on shelves 1 and 2 of main equipment center rack E1 (E1-1, E1-2).
      (2) A third TRU is used for APU starting. This TRU contains an integral fan and overheat switches for thermal protection. The APU start TRU is located aft of aft equipment rack E6.
   B. DC Tie Control Unit
      (1) The DC tie control unit controls the operation of the DC tie relay when an autoland signal is not present. The control unit will latch the DC tie relay closed, under the following conditions:
         (a) Voltage on one bus drops below 19 volts for more than 11.5 seconds.
         (b) Buses are not powered up within 5.75 seconds of each other.
      (2) The control unit resets (opens) the DC tie relay under the following conditions:
         (a) Both buses lose power for more than 11.5 seconds.
         (b) Both buses lose power within 5.75 seconds of each other, provided the buses were not previously tied.
         (c) Control unit loses power for more than 3 seconds.
      (3) 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. It is used to tie the main dc buses together if one loses power. The relay receives 28 volts dc from the battery bus, and is actuated by the dc tie control unit, provided the airplane is not in the autoland mode.



Transformer-Rectifier - Component Location
Figure 1 (Sheet 1)



1 AIRPLANES WITH APU START TRU

2 CAN BE LOCATED AFT OF APU BATTERY

Transformer-Rectifier - Component Location
Figure 1 (Sheet 2)

(2) When an autoland signal is present, the dc tie relay is actuated by the captain's or first officer's instrument bus voltage sensing unit (IBVSU). When the IBVSU's sense a loss of power on either main ac bus, a ground is applied through the center bus isolation relay to actuate the dc tie relay, which restores dc power.

D. APU Start TRU Fan Control Relay

(1) The APU start TRU fan control relay turns on the fan in the TRU when starting the APU. The fan will then keep running until TRU temperature drops below the TRU fan control thermal switch closing temperature (See Fig. 3 for temperature). The relay is in the E6 panel.

E. APU TRU Start Relay

3. Operation

A. Functional Description

(1) Main TRU's (Fig. 2)

(a) In normal operation, the BUS TIE switches on the electrical system control panel (P5) are in the AUTO position. The center bus isolate and DC tie relays are de-energized, provided the airplane is not in autoland mode.

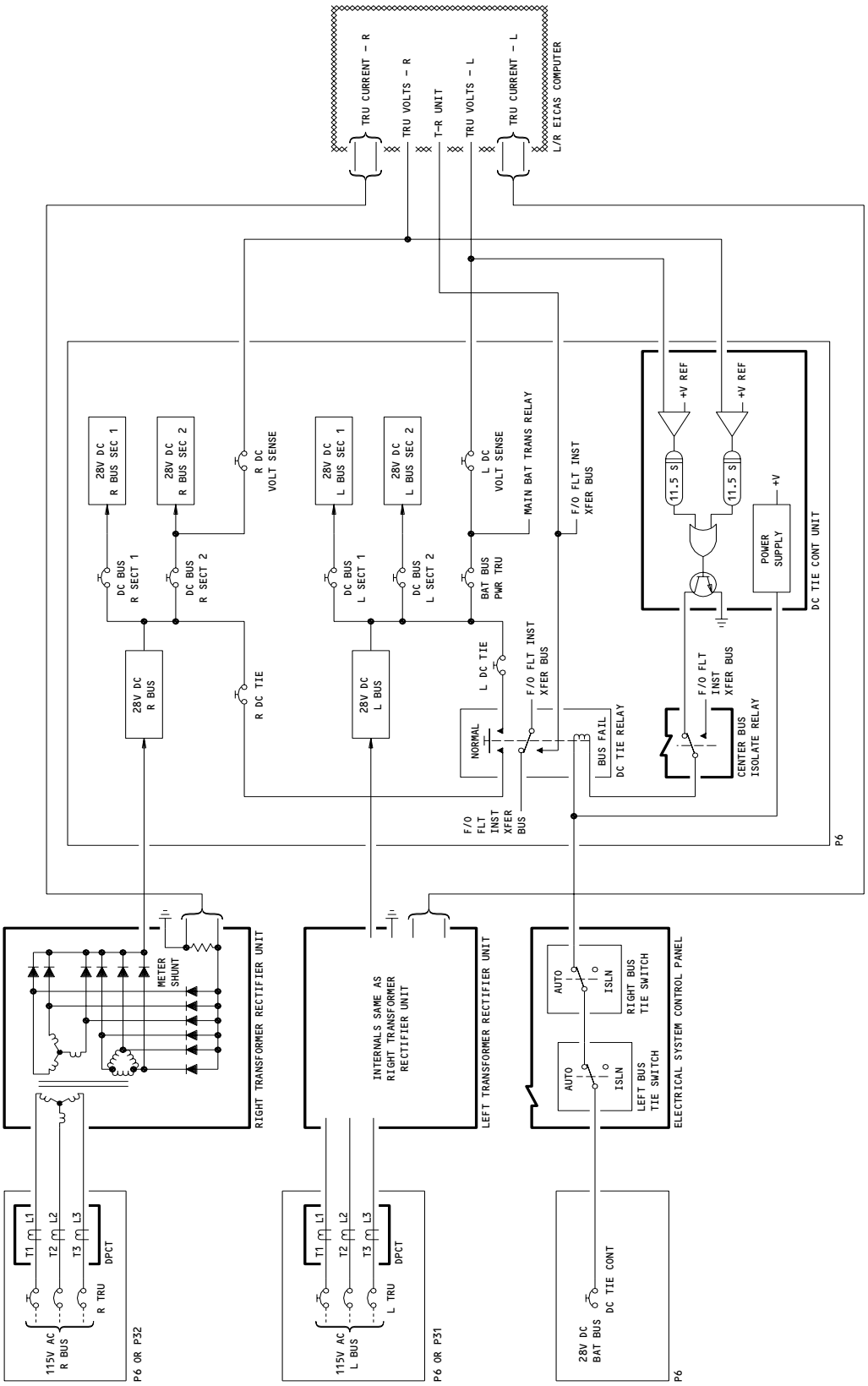
(b) If either bus loses power for longer than 11.5 seconds, the DC tie control unit provides a ground for the DC tie relay. The DC tie relay energizes, tieing the buses together. The EICAS computers display a TRU failure message.

(c) The instrument bus voltage sensing units (IBVSU's) monitor power on the main AC buses. In the autoland mode, when the IBVSU's sense a loss of power on either main AC bus, a ground is supplied through the center bus isolation relay to energize the DC tie relay. This ties the DC buses together and restores power to the dead DC bus.

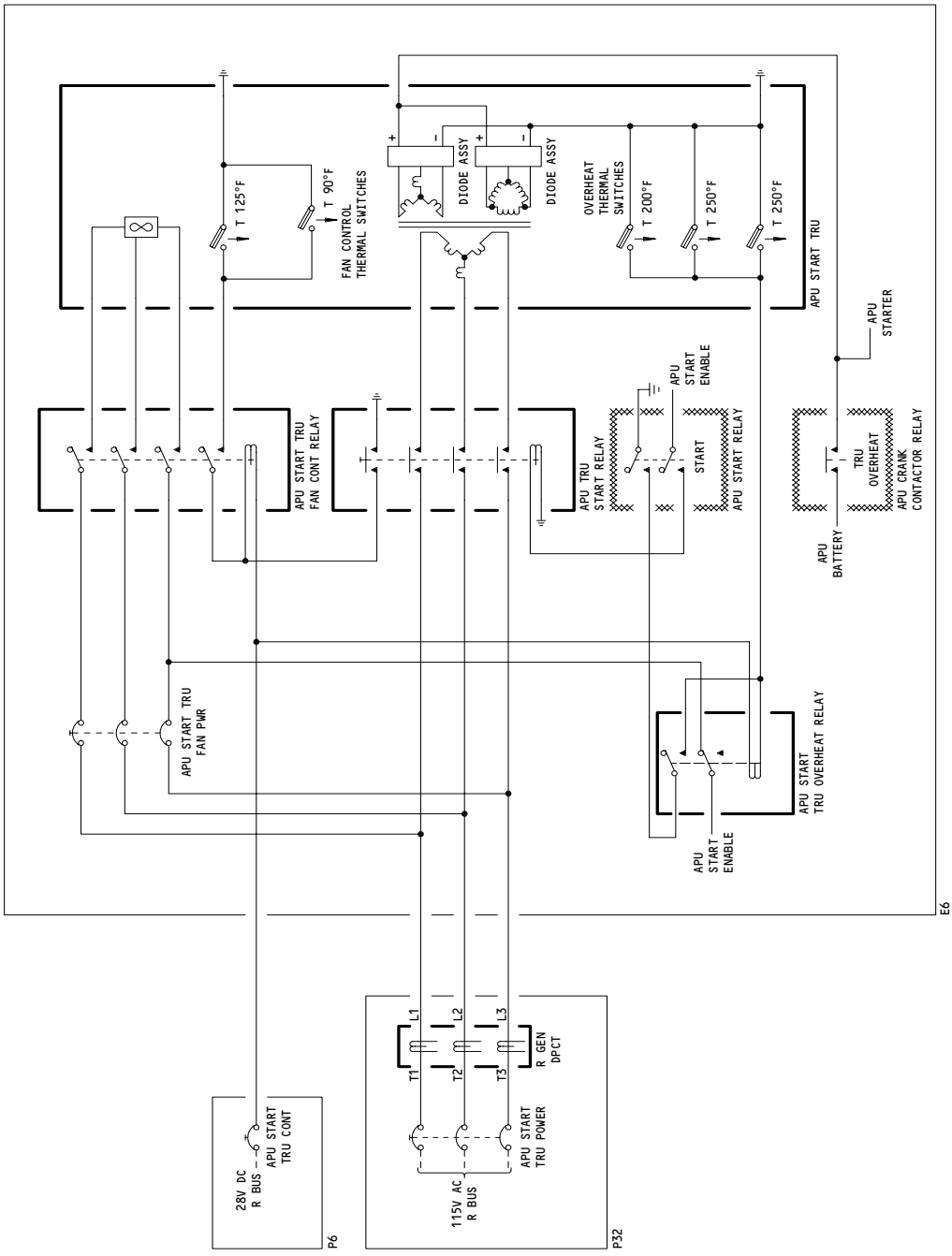
(d) EICAS computers monitor the output voltage and current of each TRU, and EICAS will display the status/maintenance message TR UNIT when the dc tie relay is energized.

(2) APU Start TRU (Fig. 3)

(a) The APU is normally started by the TRU, but may also be started by the APU battery.



Transformer Rectifier Schematic
Figure 2



Transformer Rectifier APU Schematic
Figure 3

(b) When an APU start command is given, the APU TRU start relay is energized by the APU start enable relay via the APU start relay (AMM 49-11-00). The APU TRU start relay provides AC input power to the TRU, and energizes the fan control relay. The fan will be on while the APU is being started, and until TRU temperature drops below the fan control thermal switches closing temperature (Ref Fig. 3 for temperature). The APU crank contactor is inhibited from closing provided the APU start enable relay is energized. The APU start enable relay will be de-energized if the TRU overheats, or power is not available from the right AC bus. Under these conditions the APU crank contactor will close and the APU starter motor receives power from the APU battery.

(c) Thermal switches within the TRU protect the TRU during an overheat condition (Ref Fig. 3 for overheat thermal switches closing temperatures). An overheat thermal switch closure causes the APU start TRU overheat relay to energize. This relay de-energizes the APU start enable relay. The APU start enable relay energizes the APU crank contactor via the APU start relay. The APU starter motor will now receive power from the APU battery.

(d) A latching circuit prevents the APU start TRU overheat relay from de-energizing while the APU is being started. This prevents the APU starter motor from cycling back to TRU power during a start sequence in which an overheat condition occurs.

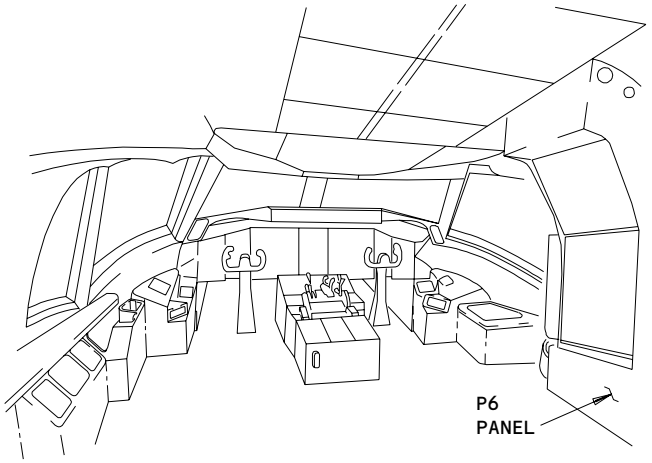
TRANSFORMER-RECTIFIER

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
BATTERY - (FIM 24-31-00/101)				
APU, M208		1		
CIRCUIT BREAKER -			FLT COMPT, P6	
APU START TRU CONT, C865 1		1	6H12	*
BAT BUS CONT, C887		1	6C10	
BAT BUS PWR TRU, C886		1	6D11	
C BUS PWR, C884		1	6C9	*
DC BUS TIE CONT, C879		1	6A6	
INV PWR TRU, C885		1	6D10	
L TRU, C312		1	6C17 OR 31EE2	*
L DC VOLT SENSE, C4142		1	6C11	
R DC VOLT SENSE, C4143		1	6H10	
R TRU, C318		1	6C23 OR 32EE2	*
SECT 1, C891, C882		1	6H8,6D8	
SECT 2, C890, C883		1	6H7,6D7	
TIE L, C881		1	6D9	*
TIE R, C889		1	6H9	*
CIRCUIT BREAKER 1			119BL, MAIN EQUIP CTR, P32	
APU START TRU POWER, C3000		1		*
CIRCUIT BREAKER 1			822, AFT EQUIP CTR, E6	
APU TRU FAN, C89		1		*
COMPUTER - (FIM 34-41-00/101)				
LEFT EICAS, M10181				
RIGHT EICAS, M10182				
CONTACTOR - (FIM 49-41-00/101)				
APU CRANK, K117				
CONTROL UNIT - (FIM 31-01-06/101)				
DC TIE, M10213				
PANEL - (FIM 24-22-00/101)				
ELECTRICAL SYSTEM CONTROL, M10063				
RELAY - (FIM 31-01-06/101)				
CENTER BUS ISOLAITON, K123				
DC TIE, K108				
RELAY - (FIM 31-01-86/101) 1				
APU START, K197				
APU START TRU FAN CONTROL, K619				*
APU START TRU OVERHEAT, K616				*
APU TRU START, K10010				*
TRANSFORMER - (FIM 31-01-06/101)				
DIFFERENTIAL PROTECTION CURRENT, T106, T108				
TRANSFORMER - (FIM 31-01-32/101)				
DIFFERENTIAL PROTECTION CURRENT, T107				
UNIT - APU START TRANSFORMER RECTIFIER, T189 1	--	1	822, AFT EQUIP CTR, E6	24-32-01
UNIT - DC TIE CONTROL, M10213		1	FLT COMPT, P6	24-32-03
UNIT - LEFT TRANSFORMER RECTIFIER, T101	--	1	119BL, MAIN EQUIP CTR, E1-2	24-32-01
UNIT - RIGHT TRANSFORMER RECTIFIER, T102	--	1	119BL, MAIN EQUIP CTR, E1-1	24-32-01

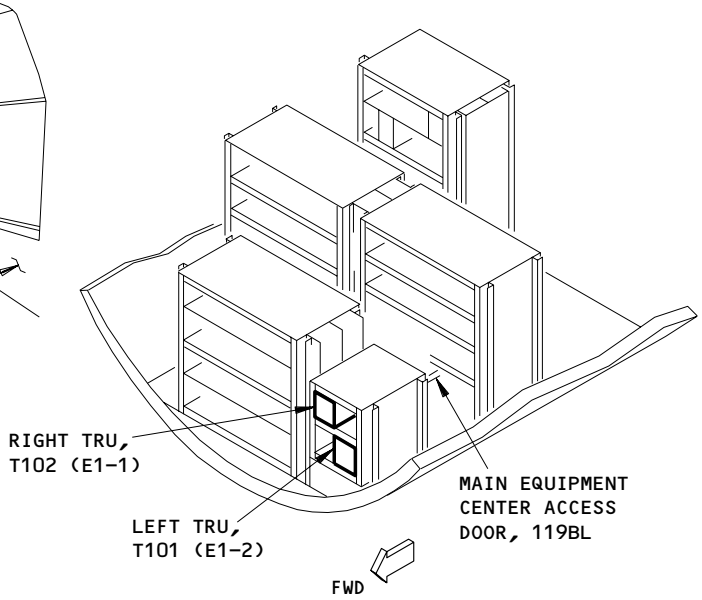
* SEE THE WDM EQUIPMENT LIST

1 AIRPLANES WITH APU START TRU

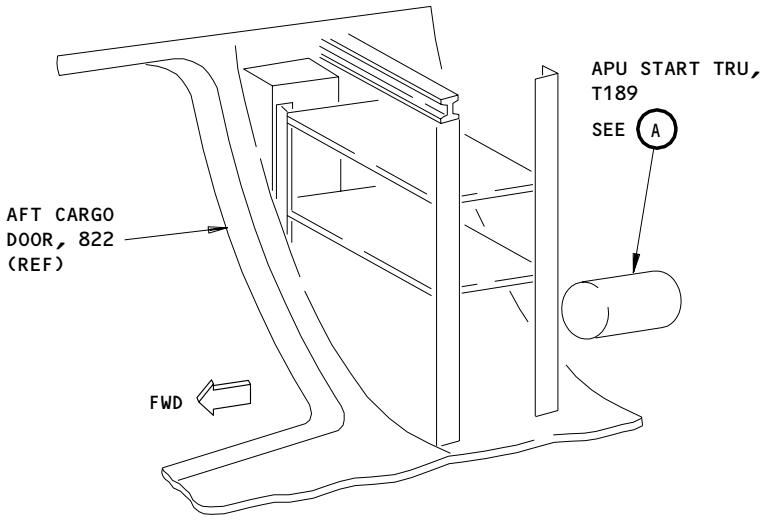
Transformer-Rectifier - Component Index
Figure 101



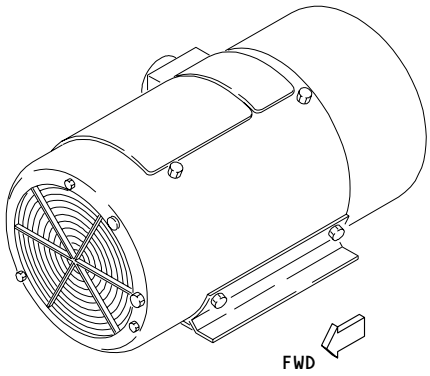
FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER



AFT EQUIPMENT CENTER RACK, E6



APU START TRANSFORMER
RECTIFIER UNIT, T189

A 1

1 AIRPLANES WITH APU START TRU

Transformer-Rectifier - Component Location
Figure 102

TRANSFORMER - RECTIFIER UNITS - REMOVAL/INSTALLATION

1. General
   A. The transformer-rectifier units (referred to as the TRU's) are located in the E1 equipment rack of the main equipment center. The left TRU, T101, is on shelf 1 and the right TRU, T102, is on shelf 2. The removal and installation procedures are the same for both TRU's.

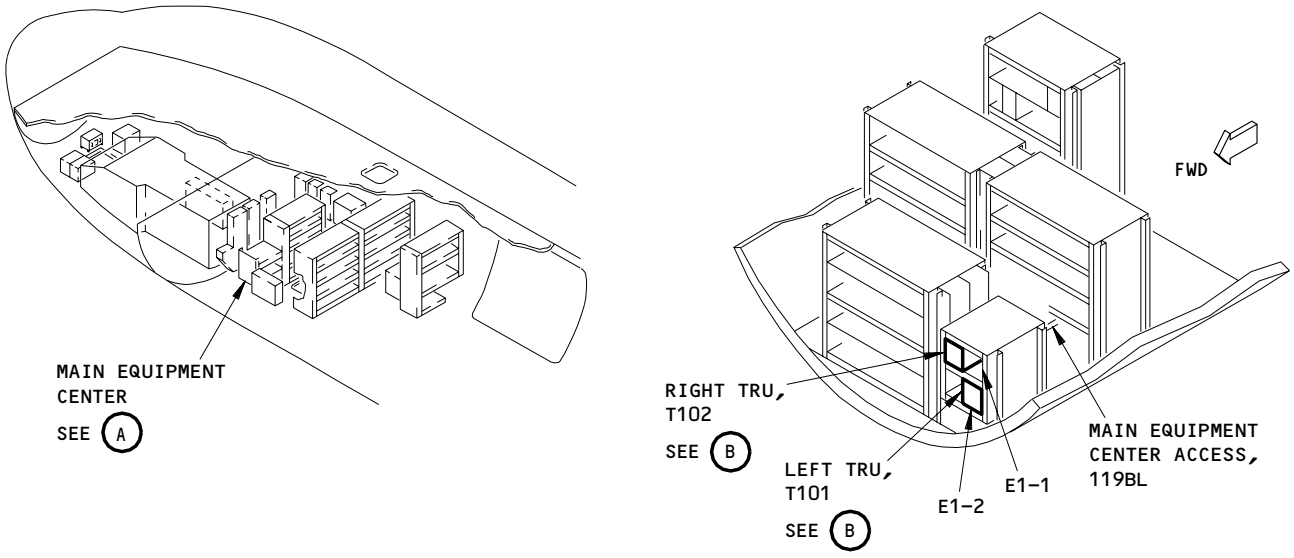
   TASK 24-32-01-024-015
2. Remove the TRU
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zone
          119/120 Main equipment center
      (2) Access Panels
          119BL Main equipment center access
   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.

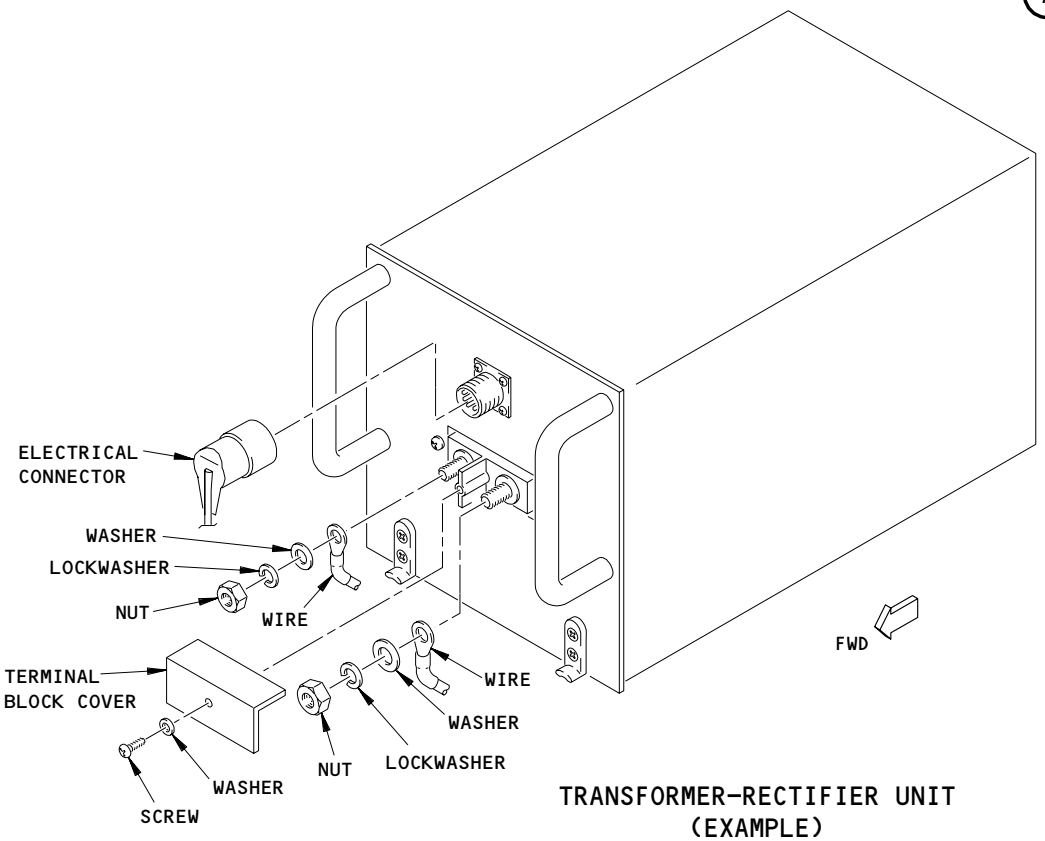
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-042
      (2) Open these circuit breakers and attach DO-NOT-CLOSE tags:
          (a) 6C17 OR 31EE2, L TRU
          (b) 6C23 OR 32EE2, R TRU
          (c) 6D9, TIE L
          (d) 6H9, TIE R



MAIN EQUIPMENT CENTER

A



TRANSFORMER-RECTIFIER UNIT (EXAMPLE)

B

Transformer-Rectifier Units
Figure 401

(e) 6L15, CAPT MAIN PITOT HEAT
(f) 6L16, L AUX PITOT HEAT
(g) 6L22, F/O MAIN PITOT HEAT
(h) 6L21, F/O AUX PITOT HEAT

D. Remove the TRU

S 034-002
(1) Do these steps to disconnect the TRU:
(a) Remove the electrical connector from the TRU.
(b) Remove the terminal cover from the TRU.
(c) Identify the leads on the terminals for installation.
(d) Remove the leads from the terminals.

S 024-004
(2) Remove the TRU (AMM 20-10-01/401).

TASK 24-32-01-424-004

3. Install the TRU

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 TRU

S 424-005
(1) Install the TRU (AMM 20-10-01/401).

S 434-006
(2) Do these steps to connect the TRU:

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 terminal cover on the TRU.
(f) Connect the electrical connector to the TRU.

S 864-043
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers:
(a) 6C17 OR 31EE2, L TRU
(b) 6C23 OR 32EE2, R TRU
(c) 6D9, TIE L
(d) 6H9, TIE R
(e) 6L15, CAPT MAIN PITOT HEAT
(f) 6L16, L AUX PITOT HEAT
(g) 6L22, F/O MAIN PITOT HEAT
(h) 6L21, F/O AUX PITOT HEAT

D. Do a Test of the TRU Installation

S 864-044
(1) Supply electrical power (AMM 24-22-00/201).

S 864-045
(2) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel (referred to as the P11 panel) are closed.

S 864-047
(3) Make sure these circuit breakers on the P6 panel are closed:
(a) 6C11, L DC VOLT SENSE
(b) 6H10, R DC VOLT SENSE

S 714-011
(4) Do a test of the TRU installation, as follows:
(a) Open this circuit breaker on the P6 panel:
1) 6A6, DC BUS TIE CONT
(b) After five seconds close this circuit breaker on the P6 panel:
1) 6A6, DC BUS TIE CONT
(c) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.

(d) Make sure the EICAS message, TR UNIT, message does not show on the bottom display.
(e) Push the ELEC HYD switch on the EICAS MAINT panel.
(f) Make sure the DC-V value under L or R (as applicable) is 28 ±4 on the bottom EICAS display.
(g) Make sure the DC-A value under L or R (as applicable) is not zero on the bottom EICAS display.

S 864-048
(5) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-046
(6) 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, in the flight compartment.

TASK 24-32-02-024-013

2. Remove the DC Tie Relay (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 864-001

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 the spoilers.

S 864-002

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

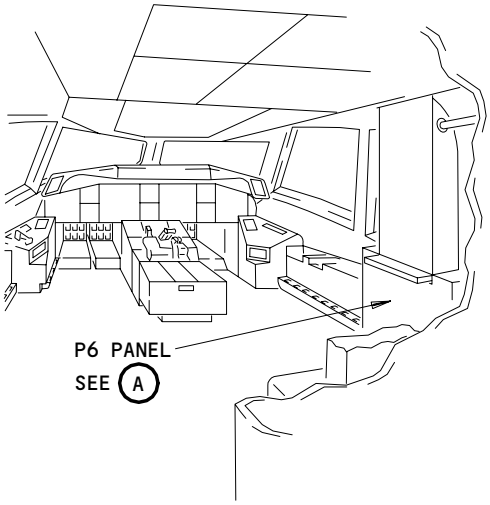
S 014-003

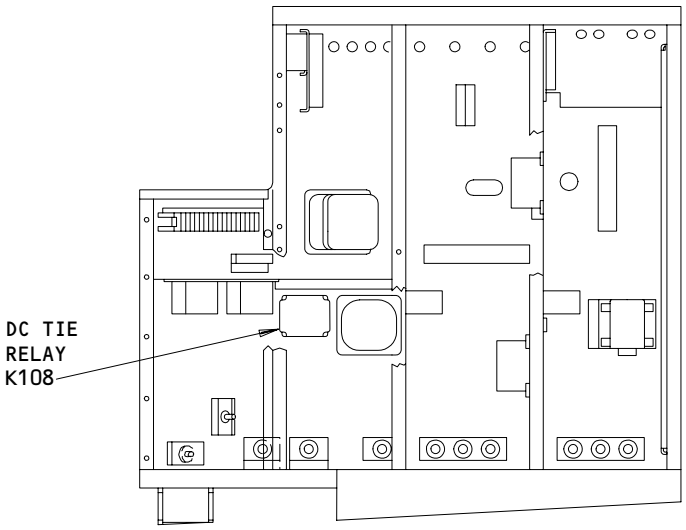
WARNING: REMOVE ALL ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU OPEN THE P6 PANEL. VOLTAGES IN THE P6 PANEL CAN CAUSE SERIOUS TO PERSONS.

(3) Open the P6 panel.

S 024-004

(4) Do these steps to remove the DC tie relay.
   (a) Identify the leads on the DC tie relay for installation.
   (b) Remove the leads from the DC tie relay.
   (c) Remove the four screws that hold the DC tie relay.





POWER DISTRIBUTION PANEL P6
A

DC Tie Relay Installation
Figure 401

(d) Remove the DC tie relay.

TASK 24-32-02-424-014

3. Install the 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 in the P6 panel.

(b) Install the four screws that hold the DC tie relay.

WARNING: MAKE SURE YOU CONNECT THE LEADS TO THE CORRECT TERMINALS ON THE DC TIE RELAY. INCORRECT CONNECTION OF THE LEADS CAN CAUSE INJURY TO PERSONS AND SERIOUS DAMAGE TO THE AIRPLANE.

(c) Connect the leads to the DC tie relay.

D. Do a Test of the DC Tie Relay Installation

S 864-006

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

S 864-008

(2) Make sure this circuit breaker on the P6 panel is closed:

(a) 6A6, DC BUS TIE CONT

S 864-009

(3) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel, P11, are closed.

S 714-007

(4) Do a test of the DC tie relay installation, as follows:

(a) Make sure the BUS TIE switches on the pilots' overhead panel, P5, are in the AUTO position.

(b) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(c) Open the R TRU circuit breaker on the P6 or the P32 panel:
1) 6C23 OR 32EE2, R TRU
(d) Make sure these values show below R on the bottom EICAS display:

DC-V 0

DC-A 0

(e) Twelve seconds after the circuit breaker is opened, make sure these values show below R on the bottom EICAS display:

DC-V 28 ±4

DC-A 0

E. Put the Airplane Back to its Usual Condition

S 864-021
(1) Close this circuit breaker on the P6 panel or the P32 panel:
(a) 6C23 or 32EE2, R TRU

S 864-015
(2) Open this circuit breaker on the P6 panel for 11 seconds and then close this circuit breaker:
(a) 6A6, DC BUS TIE CONT

S 864-011
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-012
(4) 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, is in the main power distribution panel, P6, in the flight compartment.

TASK 24-32-03-024-017

2. Remove the DC Tie Control Unit (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. 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, 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 864-002

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

S 864-003

(3) Open this circuit breaker 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

S 014-004

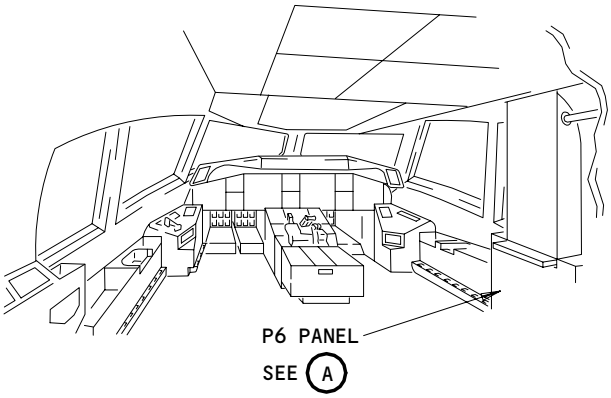
WARNING: REMOVE ALL ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU OPEN THE P6 PANEL. VOLTAGES IN THE P6 PANEL CAN CAUSE INJURIES TO PERSONNEL.

(4) Open the P6 panel.

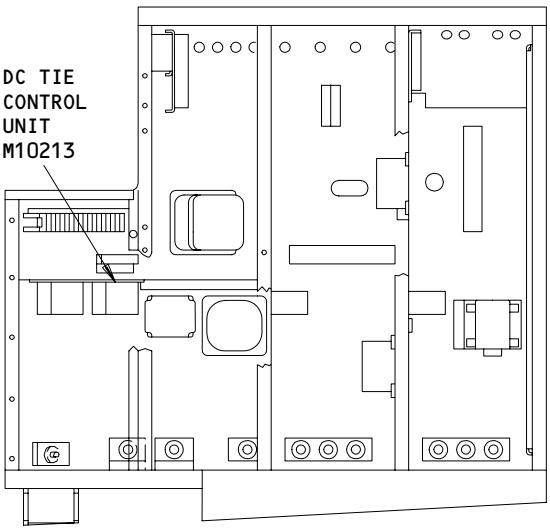
   D. Remove the DC Tie Control Unit

S 024-006

(1) Do these steps to remove the DC tie control unit:
   (a) Remove the electrical connector from the DC tie control unit.
   (b) Remove the four screws that hold the DC tie control unit.



FLT COMPT



MAIN POWER DISTRIBUTION PANEL P6

A

DC Tie Control Unit Installation
Figure 401

(c) Remove the DC tie control unit.

TASK 24-32-03-404-007

3. Install the DC Tie Control Unit (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 Control Unit

S 424-008

(1) Do these steps to install the DC tie control unit:

(a) Put the DC tie control unit in position in the P6 panel.

(b) Install the four screws that hold the DC tie control unit.

(c) Connect the electrical connector to the DC tie control unit.

S 434-009

(2) Close the P6 panel.

S 864-010

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:

(a) 6A6, DC BUS TIE CONT

D. Do a Test of the DC Tie Control Unit Installation.

S 864-011

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

S 864-012

(2) Make sure these circuit breakers on the P6 panel are closed:

(a) 6C11, L DC VOLT SENSE

(b) 6D9, TIE L

(c) 6H9, TIE R

(d) 6H10, R DC VOLT SENSE

S 864-034
(3) Make sure the L TRU circuit breaker on the P6 or P31 panel is closed:
(a) 6C17 or 31EE2, L TRU

S 864-045
(4) Make sure the R TRU circuit breaker on the P6 or P32 panel is closed:
(a) 6C23 or 32EE2, R TRU

S 864-013
(5) Make sure the six EICAS circuit breakers on the overhead circuit breaker panel (referred to as the P11 panel) are closed:

S 714-014
(6) Do a test of the DC tie control unit, as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.
(b) Open this circuit breaker:
1) 6C23 or 32EE2, R TRU

S 864-018
(7) Approximately 12 seconds after you open the circuit breaker, make sure these values show below R on the bottom EICAS display:

DC-V 28 ±4

DC-V 28 ±4

DC-A 0

(a) Close this circuit breaker:
1) 6C23 or 32EE2, R TRU
(b) Open this circuit breaker on the P6 panel:
1) 6A6, DC BUS TIE CONT
(c) After five seconds, close this circuit breaker on the P6 panel:
1) 6A6, DC BUS TIE CONT
(d) Push the ECS MSG switch on the EICAS MAINT panel on the right side panel, P61.
(e) Make sure the EICAS message, TR UNIT, does not show on the bottom display.

S 864-015
(8) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-016
(9) Remove electrical power if it is not necessary (AMM 24-22-00/201).

APU START TRU - REMOVAL/INSTALLATION

1. General
   A. The APU start TRU is aft of the aft equipment center rack, E6. You must remove the sidewall panels behind the aft equipment center rack to get access to the APU start TRU.

TASK 24-32-04-024-001

2. Remove the APU Start TRU (Fig. 401)
   A. Access
      (1) Location Zone
          154 Aft cargo compartment (Right)
      (2) Access Panel
          822 Aft cargo door
   B. Prepare for Removal

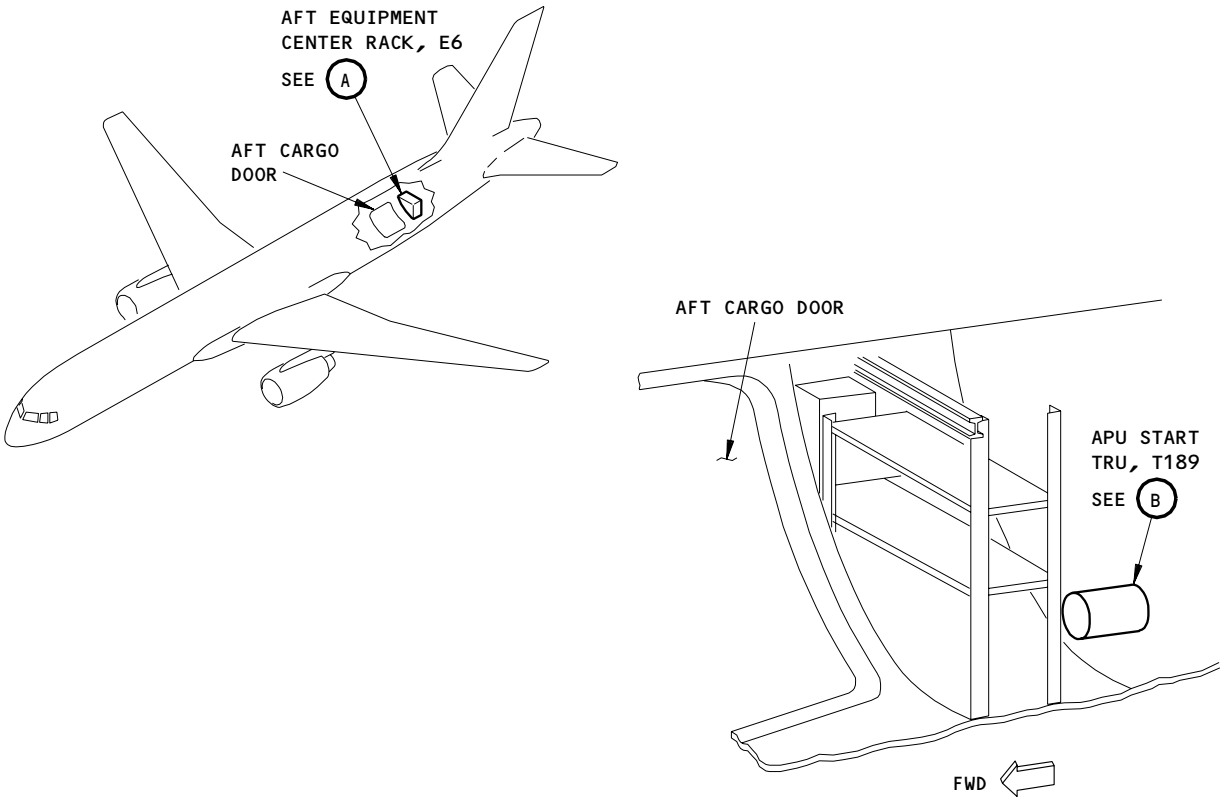
      S 864-002
      (1) Open this circuit breaker on the right generator power panel (referred to as the P32 panel) and attach a DO-NOT-CLOSE tag:
          (a) 32A6, APU START TRU POWER

      S 014-004
      (2) Open the sidewall panels behind the aft equipment center rack, E6.
   C. Remove the APU Start TRU

      S 024-006
      (1) Do these steps to remove the APU start TRU:
          (a) Remove the electrical connector from the APU start TRU.
          (b) Identify the two leads on the APU start TRU for installation.
          (c) Remove the two leads from the APU start TRU.
          (d) Remove the bolts that hold the APU start TRU.
          (e) Remove the APU start TRU.

TASK 24-32-04-424-007

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, Standard Wiring Practice Manual D6-54446.
      (2) AMM 24-22-00/201, Electrical Power - Control
      (3) AMM 49-11-00/201, Auxiliary Power Unit
   C. Access
      (1) Location Zones
          154 Aft cargo compartment (right)
          211/212 Flight compartment



APU Start TRU Installation
Figure 401

(2) Access Panel
822 Aft cargo door

D. Install the APU start TRU

S 424-008

(1) Do these steps to install the APU start TRU:
(a) Put the APU start TRU in position.
(b) Install the bolts that hold the APU start TRU.
(c) Connect the two leads to the APU start TRU.
(d) Connect the electrical connector to the TRU.

S 864-009

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P32 panel:
(a) 32A6, APU START TRU POWER

E. Do these steps to check the APU start TRU ground stud:

S 214-020

(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: If the terminal lug is annealed, replace the lug 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 TRU ground stud nut is torqued from 180 to 200 pound-inch (SWPM 20-30-00).
(c) Make sure the electrical bonding on the APU TRU ground studs are 0.0001 ohms (SWPM 20-20-00).

S 284-022

(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 these 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 ground studs are 0.0001 ohms (SWPM 20-20-00).

S 164-021
(3) Clean the fuselage area next to the APU TRU ground studs. Make sure there is no dust on the APU TRU ground stud area.

F. Do a test of the APU start TRU installation.

S 864-011
(1) Supply electrical power (AMM 24-22-00/201).

S 714-012
(2) Motor the auxiliary power unit (AMM 49-11-00/201) and make sure the fan inside of the APU start TRU comes on.

G. Put the Airplane Back to Its Usual Condition

S 864-013
(1) Shutdown the auxiliary power unit.

S 414-014
(2) Close the sidewall panels behind the aft equipment center rack, E6.

S 864-016
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

APU TRU START RELAY - REMOVAL/INSTALLATION

1. General
   A. The APU TRU start relay, K10010 (referred to as the start relay) is on the relay panel in the aft equipment center rack, E6.

TASK 24-32-05-004-001

2. Remove the APU TRU Start Relay (Fig. 401)
   A. Access
      (1) Location Zones
          154 Aft Cargo Compartment (Right)

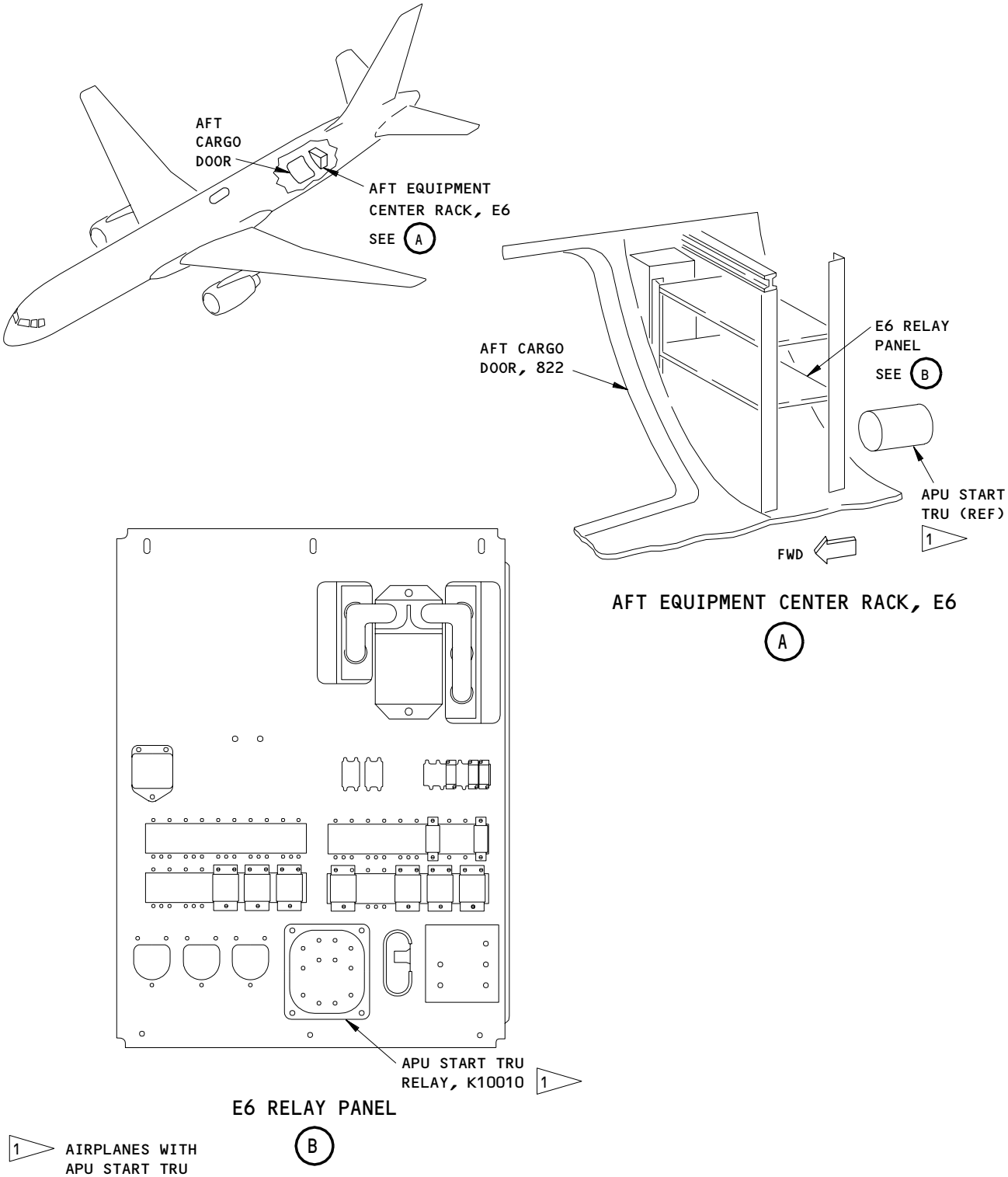
      (2) Access Panel
          822 Aft Cargo Compartment Door

   B. Prepare for the Removal

      S 864-002
      (1) Open this circuit breaker on the right generator power panel, P32, and attach a DO-NOT-CLOSE tag:
          (a) 32A6, APU START TRU PWR

      S 864-003
      (2) Open this circuit breaker on the aft equipment center rack, E6, and attach a DO-NOT-CLOSE tag:
          (a) APU START
   C. Remove the APU TRU Start Relay

      S 024-004
      (1) Do these steps to remove the start relay:
          (a) Open the access cover at the rear side of the aft equipment center rack.
          (b) Identify the wires on the start relay for the installation.
          (c) Remove the wires from the start relay.
          (d) Remove the screws that hold the start relay.



APU Start TRU Relay Installation
Figure 401

(e) Remove the start relay.

TASK 24-32-05-404-005

3. Install the APU TRU Start 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 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 424-006

(1) Do these steps to install the start relay:

(a) Put the start relay in position so that the X1 and X2 terminals are to the outboard side.

(b) Install the four screws that hold the start relay.

CAUTION: MAKE SURE YOU INSTALL THE WIRES CORRECTLY. THE APU TRU SYSTEM WILL NOT OPERATE PROPERLY AND DAMAGE TO EQUIPMENT CAN OCCUR IF YOU DO NOT INSTALL THE WIRES CORRECTLY.

(c) Connect the wires to the start relay.

(d) Close the access cover on the aft side of the aft equipment center rack, E6.

S 864-007

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the right generator power panel, P32:

(a) 32A6, APU START TRU PWR

S 864-008
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the aft equipment center rack, E6:
(a) APU START

D. Do a Test of the APU TRU Start Relay Installation

S 864-009
(1) Supply electrical power (Ref 24-22-00).

S 014-010
(2) Open the sidewall panels aft of the aft equipment center rack, E6, to get access to the APU start TRU.

S 714-011
(3) Motor the APU (Ref 49-11-00).
(a) While the APU is motored, make sure the fan in the APU start TRU operates.

S 864-012
(4) Do the shutdown procedure for the APU (Ref 49-11-00).

S 414-013
(5) Close the access panels aft of the aft equipment center rack, E6.

S 864-014
(6) 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 relay panel in the aft equipment center rack, E6.

TASK 24-32-06-004-001

2. Remove the APU Start TRU Fan Control Relay (Fig. 401)
   A. Access
      (1) Location Zones
          154 Aft Cargo Compartment (Right)

      (2) Access Panel
          822 Aft Cargo Compartment Door

   B. Prepare for the Removal

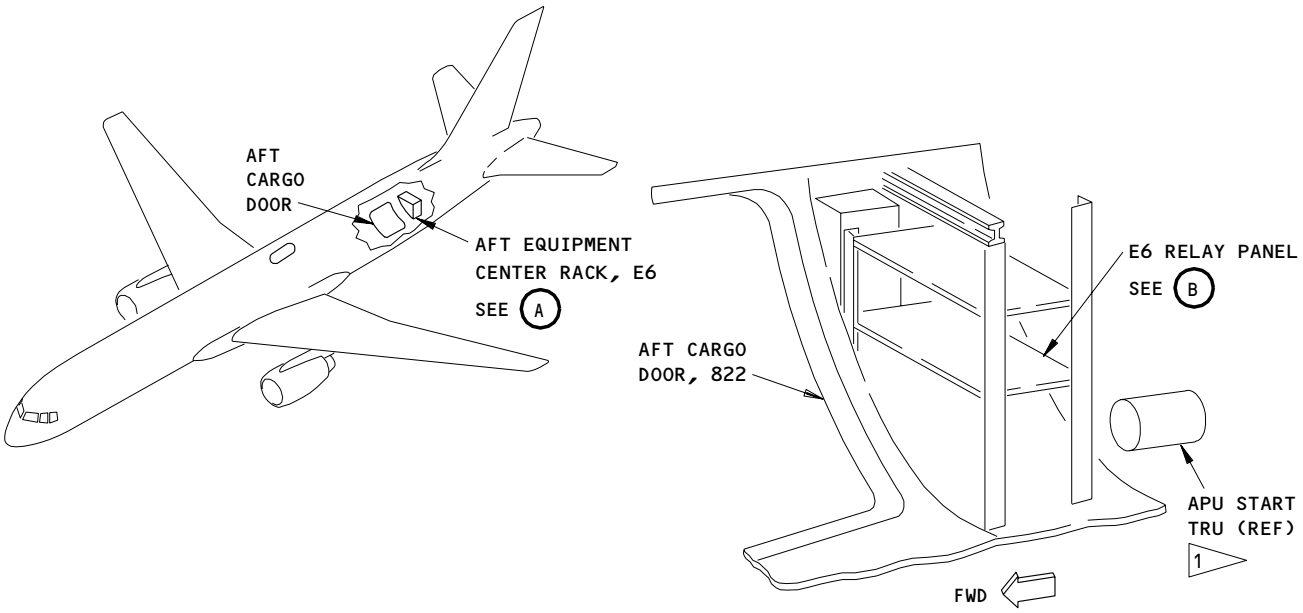
      S 864-002
      (1) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6H12, APU START TRU CONTROL

      S 864-003
      (2) Open this circuit breaker on the aft equipment center rack, E6, and attach a DO-NOT-CLOSE tag:
          (a) APU TRU FAN

      S 024-004
      (3) Do these steps to remove the control relay:
          (a) Open the access cover on the rear of the aft equipment center rack, E6.
          (b) Remove the control relay.

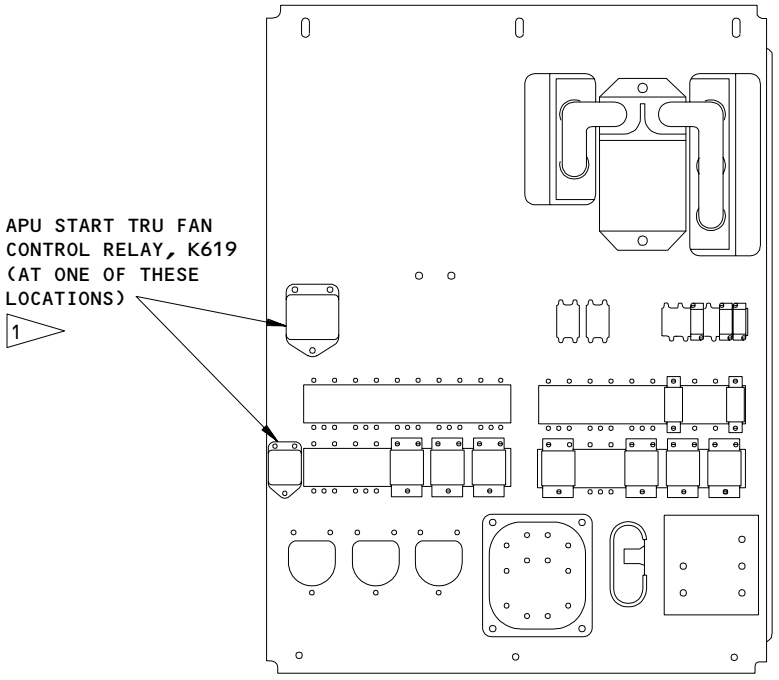
TASK 24-32-06-404-005

3. Install the APU Start TRU Fan Control Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control



AFT EQUIPMENT CENTER RACK, E6

A



E6 RELAY PANEL

B

1 AIRPLANES WITH APU START TRU

APU Start TRU Fan Control Relay Installation
Figure 401

(2) AMM 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 Start TRU Fan Control Relay

S 424-008

(1) Do these steps to install the control relay:
(a) Install the control relay.
(b) Close the access cover on the rear of the aft equipment center rack, E6.

S 864-010

(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the aft equipment center rack, E6:
(a) APU TRU FAN

S 864-009

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6
(a) 6H12, APU START TRU CONT

D. Do a Test of the APU Start TRU Fan Control Relay Installation

S 864-011

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

S 014-012

(2) Open the sidewall panels aft of the aft equipment center rack, E6 to get access to the APU start TRU.

S 714-013

(3) Motor the APU (AMM 49-11-00/201).
(a) While the APU is motored, make sure the fan in the APU start TRU operates.

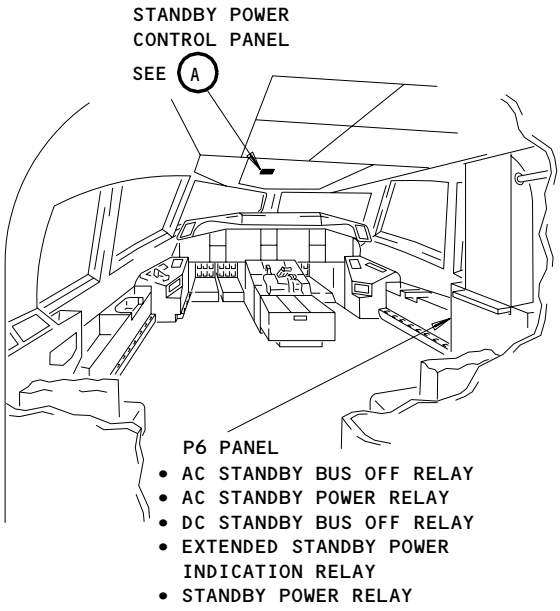
S 864-014
(4) Do the shutdown procedure for the APU (AMM 49-11-00/201).

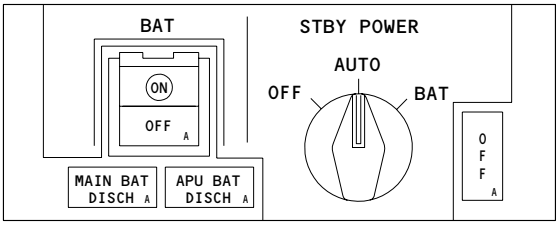
S 414-015
(5) Close the sidewall panels aft of the aft equipment center rack, E6.

S 864-016
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

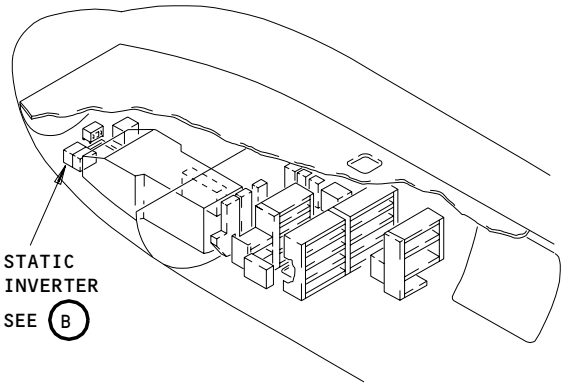
STANDBY POWER - DESCRIPTION AND OPERATION

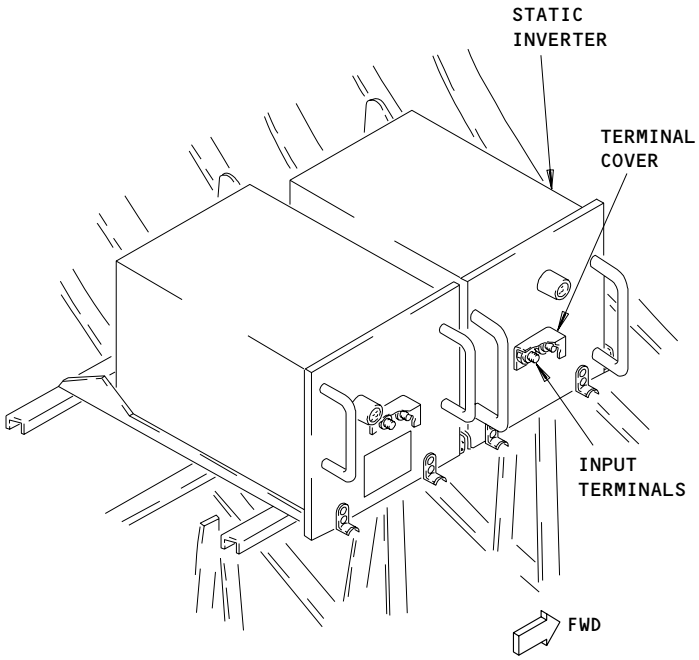
1. General
   A. The standby power system supplies power to critical flight loads if main power is lost. The standby power system is controlled from a panel in the flight compartment. The system can be set to operate manually or automatically. System components include a static inverter, a standby power control panel, an ac standby power relay, a standby power relay, ac and dc standby bus off relays, a main/APU battery tie remote control circuit breaker, an extended standby power indication relay, a battery discharge indication inhibit relay, and an APU battery charger detection relay.
   B. There are two standby buses: 115v ac and 28v dc. When the left ac and left dc buses are powered the ac standby bus receives power from the left ac bus and the dc standby bus receives power from the left dc bus.
   C. If the left ac bus loses power, the ac standby bus receives power from the static inverter. If the left dc bus loses power, the dc standby bus receives power from the hot battery bus.
2. Component Details (Fig. 1)
   A. Static Inverter
      (1) The static inverter supplies 115v ac power to the 115v ac standby bus. The static inverter will supply power to the standby bus under the following conditions:
         (a) The left ac bus loses power. In this case the static inverter will receive 28v dc power from the hot battery bus.
         (b) The AC STBY BUS PWR circuit breaker (P6) is open. In this case the static inverter will receive 28v dc power from the left DC bus.
         (c) The airplane is in an autoland mode. In this case the static inverter will receive 28v dc power from the hot battery bus.
   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 and APU battery charge status. On some airplanes, the STBY POWER switch must be pushed in before the switch can be moved to OFF.





STANDBY POWER CONTROL PANEL
A





B

Standby Power Component Location
Figure 1

(2) The standby power control panel is located on pilots' overhead panel P5. The control panel contains the following switches and indicator lights:

(a) The STBY PWR switch controls the selection of power sources for the standby buses. The switch can be set to the following positions:

1) When the switch is set to OFF all power will be removed from the standby buses. THE STBY PWR switch must be pushed in before it can be set to OFF.

2) When the switch is set to AUTO the power source for the standby buses will be selected automatically. If the left AC and DC buses are powered they will provide power to the standby buses. If the left AC and DC buses are not powered, the standby buses will be powered by the static inverter and hot battery bus.

3) When the switch is set to BAT the standby buses will receive power from the static inverter and hot battery bus. In this case, the BAT switch (next to the STBY PWR switch) must be set to ON for the standby buses to receive power.

(b) The OFF light comes on whenever the STBY PWR switch is set to OFF.

(c) The DISCH light comes on whenever a load is drawing more than 6 amps from the main battery. The DISCH light is controlled by a signal from the battery current monitor.

(d) The BAT switch controls the function of the main battery relay. When the battery switch is set to OFF, the main battery relay will be open. With the main battery relay open, the hot battery bus will be isolated from the other DC buses and the static inverter.

C. AC Standby Power Relay

(1) The AC standby power relay selects the power source for the AC standby bus. The relay will connect either the left AC bus or the static inverter to the standby bus. The AC standby power relay is controlled by the STBY POWER switch on the standby power control panel. The relay is located in the P6 panel.

D. Standby Power Relay

(1) The standby power relay applies and removes power from the AC and DC standby buses. When the relay is closed the standby buses are isolated from all power sources. The relay is controlled by the STBY POWER switch on the standby power control panel. The relay will be closed when the STBY POWER switch is to OFF. The standby power relay is located in the P6 panel.

E. AC and DC Standby Bus Off Relays

(1) The AC and DC standby bus off relays monitor the power on the standby buses. If either standby bus loses power the appropriate relay provides a ground to the EICAS system. The EICAS system will show a STANDBY BUS OFF advisory message on the upper display. The relay also provides a ground to turn on the OFF light at the standby power control panel. The AC and DC standby bus off relays are located in the P6 panel.

F. Main/APU Battery Tie Remote Control Circuit Breaker

(1) The main/APU battery tie remote control circuit breaker (RCCB) connects the main and APU batteries in parallel. The paralleled batteries supply 90 minutes of standby power. The RCCB also contains logic circuits that inhibit the paralleling function during an APU start or when the airplane is in an autoland mode.

G. Extended Standby Power Indication Relay

(1) The extended standby power indication relay functions with the RCCB to provide an EICAS message. If the RCCB does not open or close as commanded, the APU BAT NO STBY message will be shown on the lower display. The relay is located in the P6 panel.

H. Battery Discharge Indication Inhibit Relay

(1) The battery discharge indication inhibit relay energizes when the APU is started. The energized relay inhibits the APU BAT DISCH warning light (P5) and EICAS message. The relay will de-energize once the APU start is complete. The relay is located on the relay panel on aft equipment center rack E6.

I. APU Battery Charger Detection Relay

(1) The APU battery charger detection relay K10418 is controlled by the APU battery current monitor when the STBY POWER switch on standby power control panel is in the AUTO or OFF position. When relay K10418 is energized, the APU battery charger shutdown detection circuit is connected to EICAS. Relay K10418 is on a panel in the E6 rack.

(2) The main/APU battery charger detection enable relay K10424 switches electrical power to relay K10418 and the APU battery current monitor from the battery bus to the ground handling bus whenever the ground handling bus is energized. This assures that the APU battery charging detection circuit is powered whenever the ground service bus, which powers the APU battery charger, is powered.

3. Operation (Fig. 2 and 3)

A. Functional Description

(1) Normal operation of the standby power system occurs with the following:

(a) The left AC and DC buses are fully powered.

(b) The STBY POWER switch on the standby power control panel is set to AUTO. This will close the main battery transfer relay and the AC standby power relay. The standby power relay will be open.

(c) Power from the left AC bus is routed through the AC standby power relay to the standby power relay. From the standby power relay the power is sent to the AC standby bus.

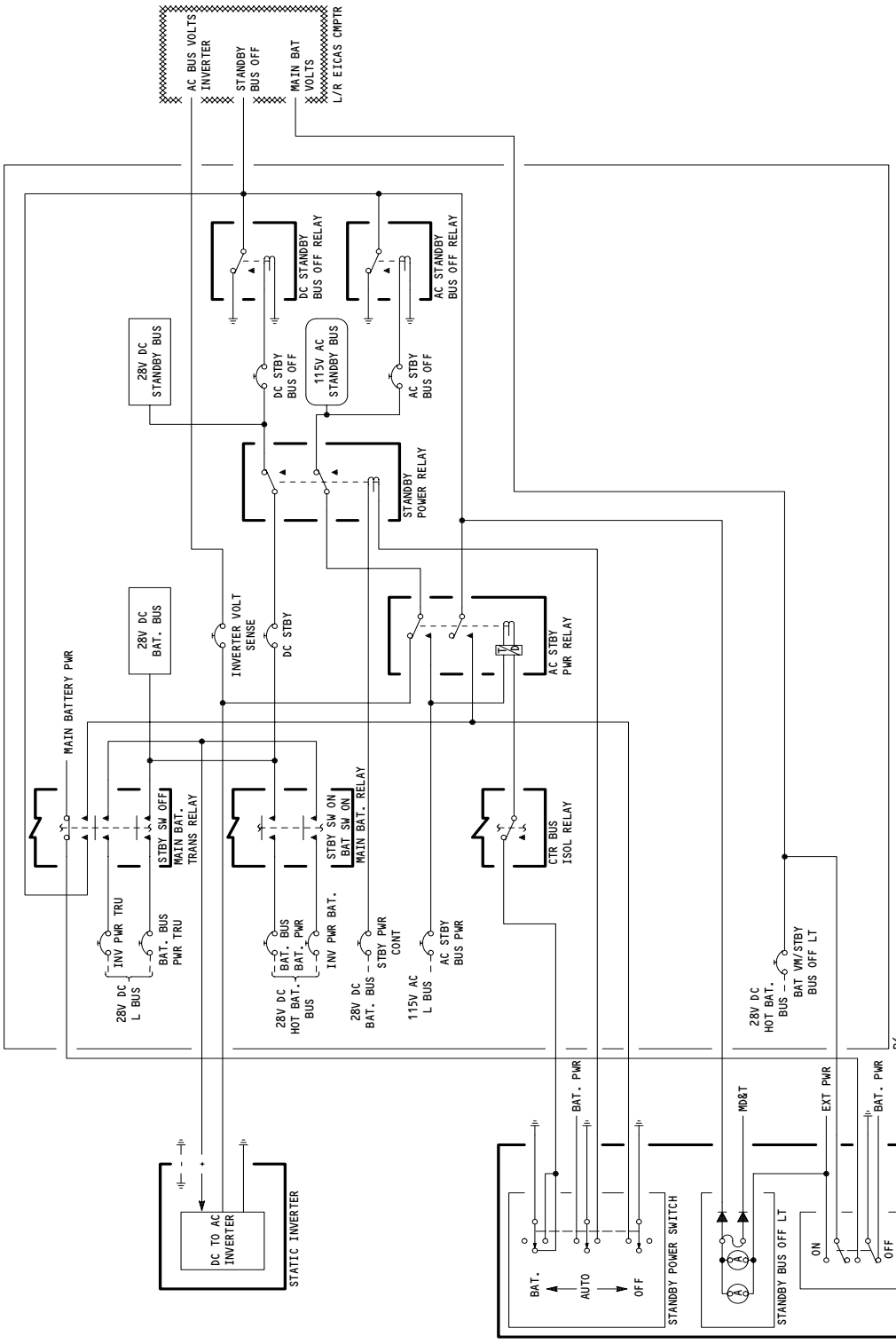
(d) Power from the left DC bus is routed through the main battery trasnfer relay to the standby power relay. From the standby power relay the power is sent to the DC standby bus.

(e) Power on the AC and DC standby buses will close the standby bus off relays. The closed relays inhibit the STANDBY BUS OFF message on EICAS. The closed relays also turn off the OFF light at the standby power control panel.

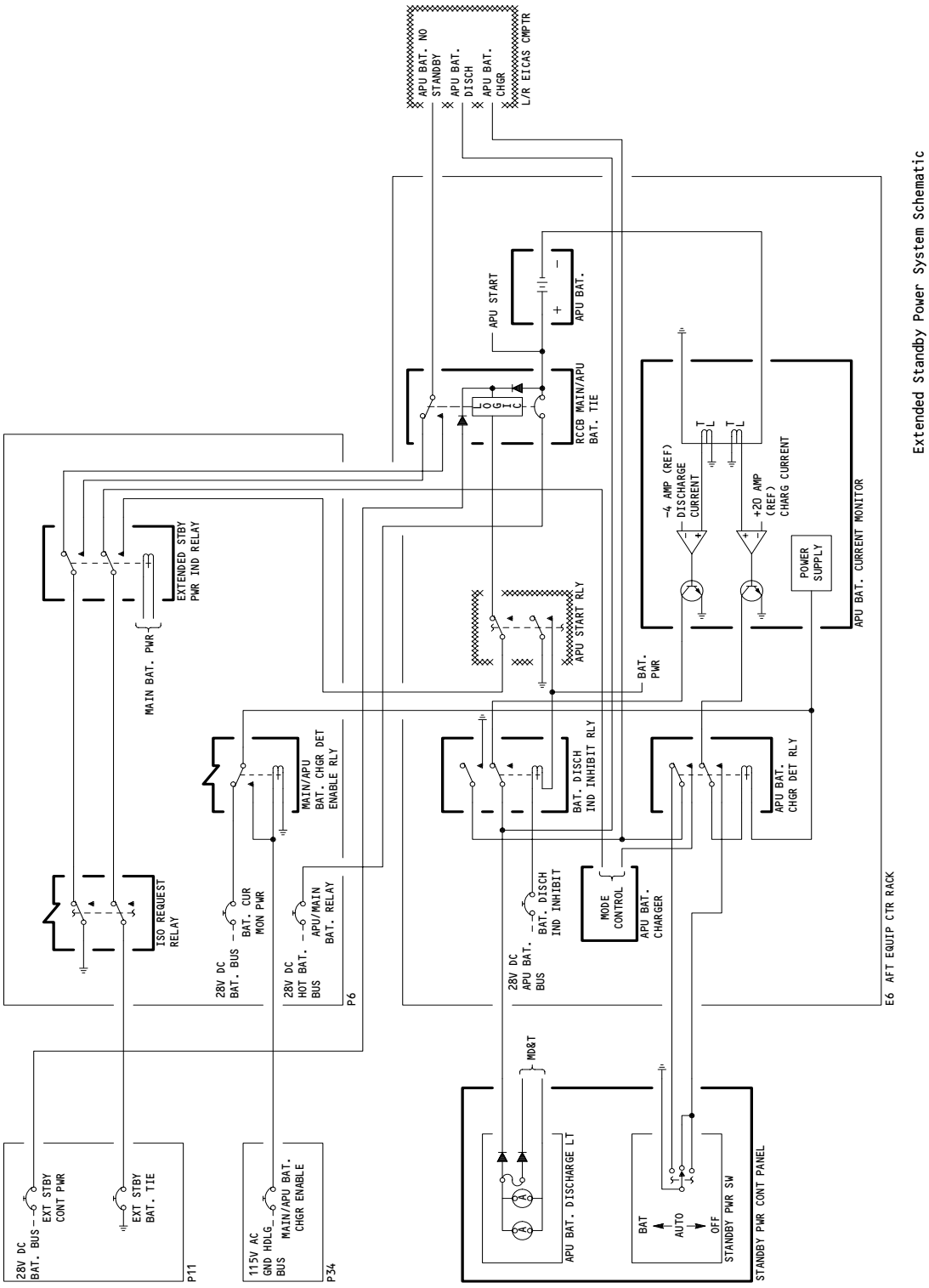
(f) The static inverter receives power from the left DC bus through the main battery transfer relay, but supplies no load.

(2) If the left AC bus loses power or the airplane is put into an autoland mode, the following will occur:

(a) The main battery transfer relay will open which will allow the main battery relay to close. The BAT switch on the standby power control panel must also be ON for the main battery relay to close. Power from the hot battery bus will be routed through the main battery relay to the standby power relay. From the standby power relay the power will be sent to the DC standby bus. Power from the hot battery bus will also be provided to the static inverter, through the main battery relay.



Standby Power System Schematic
Figure 2



Extended Standby Power System Schematic
Figure 3

(b) The AC standby power relay will open which will connect the static inverter to the AC standby bus.

(c) If only the left DC bus loses power, the main battery transfer relay will still open. The main battery relay will close which will connect the hot battery bus to the DC standby bus. The AC standby power relay will remain closed. The AC standby bus will still receive power from the left AC bus.

(3) When the STBY POWER switch is set to BAT, the standby power system will operate as it would if the left AC and DC buses lost power.

(4) When the STBY POWER switch is set to OFF a ground is applied to close the standby power relay. When the standby power relay is closed the standby buses are isolated, removing all power from the buses. When power is removed from the standby buses the standby bus off relays will open. The EICAS system will show a STANDBY BUS OFF message and the OFF light next to the STBY POWER switch will come on.

(5) The RCCB closes when the main battery relay closes. This parallels the main and APU batteries, except closure is inhibited during autoland or when starting the APU. Operation of the two batteries in parallel extends the standby power system endurance to 90 minutes. An EICAS status message APU BAT NO STBY is displayed if the RCCB does not close during the standby power mode or if it remains closed during normal operation when the batteries should be isolated.

(6) If the BAT switch is OFF, the standby buses will lose power when the left AC and DC buses lose power. If the BAT switch is set to OFF, the standby buses will also lose power when the airplane is put into an autoland mode. If the BAT switch is OFF the main battery relay can not close.

(7) EICAS monitors the APU battery and APU battery charger. If the APU battery is discharging at a rate greater than 6 amps the APU BAT DISCH advisory message will be shown on the upper display. If the APU battery charger fails the APU BAT CHGR status/maintenance message will be shown on the lower display.

(8) EICAS monitors the status of the standby buses. EICAS also monitors the output voltage level and frequency of the static inverter. If either standby bus loses power EICAS will show a STANDBY BUS OFF message on the upper display. When the lower EICAS display is in the ELEC/HYD format, the static inverter output values will be shown. Values for voltage (AC-V) and frequency (FREQ) will be shown under the STBY/BAT heading on the lower display.

(9) Static inverter output voltages above 124v ac or below 106v ac will cause EICAS to show a STBY INVERTER message. This message will be stored in EICAS non-volatile memory.

STANDBY POWER

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
BATTERY - (REF 24-31-00, FIG. 101)				
APU, M208				
CHARGER - (REF 24-31-00, FIG. 101)				
APU BATTERY, M207				
CIRCUIT BREAKERS			FLT COMPT, P6	
AC STBY BUS OFF, C892		1	6M13	*
AC STBY BUS PWR, C874		1	6K16	*
APU/MAIN BAT TIE, C4282		1	6L7	*
BAT BUS CONT, C887		1	6C10	*
BAT BUS DISTR, C829		1	6A1	*
BAT BUS PWR, C898		1	6L10	*
BAT BUS PWR TRU, C886		1	6D11	*
BAT CUR MON PWR, C4097		1	6A4	*
BAT XFR CONT, C814		1	6D2	*
DC STBY, C872		1	6A2	*
DC STBY BUS OFF, C811		1	6A3	*
INVERTER CENTER BUS AC, C875		1	6M14	*
INVERTER VOLT SENSE, C817		1	6M15	*
INV PWR BAT, C813		1	6L11	*
INV PWR TRU, C885		1	6D10	*
STBY BUS OFF LT BAT VM, C4217			6G5	*
STBY PWR CONT, C828			6A5	*
CIRCUIT BREAKERS			FLT COMPT, P11	
EXT STBY BAT, C4276		1	11A19	*
EXT STBY CONT, C4275		1	11A20	*
CIRCUIT BREAKER			822, AFT EQUIP CTR RACK, E6	
BAT DISCH IND INHIBIT, C4286		1		*
CIRCUIT BREAKER - MAIN/APU BATTERY TIE REMOTE CONTROL, M104916		1	822, AFT EQUIP CTR RACK, E6	24-33-02
COMPUTER - (REF 31-41-00, FIG. 101)				
LEFT EICAS, M10181				
RIGHT EICAS, M10182				
CONTACTOR - (REF 49-41-00, FIG. 101)				
APU CRANK, K117				

* SEE THE WDM EQUIPMENT LIST

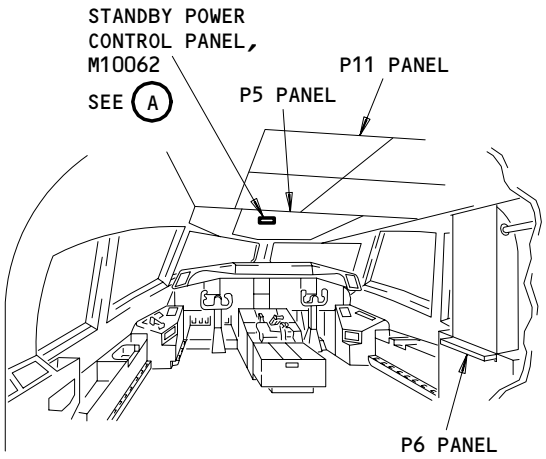
Standby Power - Component Index
Figure 101 (Sheet 1)

STANDBY POWER

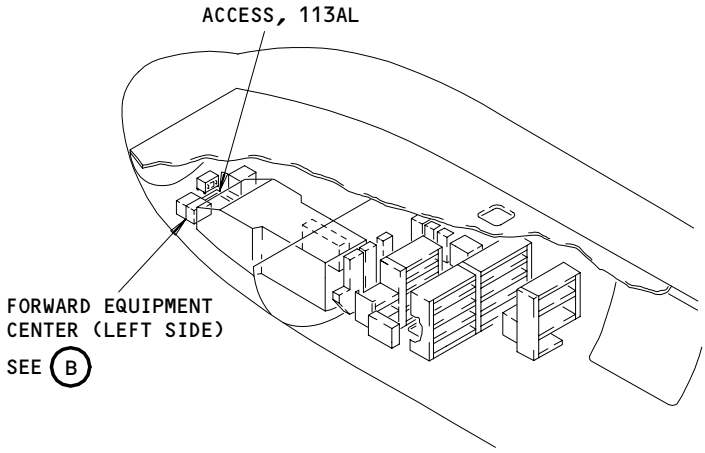
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
INVERTER – STATIC, M217		1	113AL, FWD EQUIP CTR	24-33-03
LIGHT – APU BATTERY DISCHARE, YTGL3	1	1	FLT COMPT, P5, STANDBY POWER CONTROL PANEL, M10062	*
LIGHT – MAIN BATTERY DISCHARGE, YTGL1	1	1	FLT COMPT, P5, STANDBY POWER CONTROL PANEL, M10062	*
LIGHT – STANDBY BUS OFF, YTGL2	1	1	FLT COMPT, P5, STANDBY POWER CONTROL PANEL, M10062	*
MONITOR – (REF 24-31-00, FIG. 101)				
APU BATTERY CURRENT, M10495				
PANEL – STANDBY POWER CONTROL, M10062		1	FLT COMPT, P5	24-33-04
RELAYS – (REF 31-01-06, FIG. 101)				
AC STANDBY BUS OFF, K138				
AC STANDBY POWER, K105				24-33-01
CTR BUS ISOL, K123				
DC STANDBY BUS OFF, K110				
EXT STBY PWR IND, K10416				
ISOL REQ, K122				
MAIN/APU BAT CHGR DET ENABLE, K10424				
MAIN BATTERY, K104				24-33-02
MAIN BAT CHGR DET, K10425				
MAIN BATTERY TRANSFER, K106				24-33-02
STANDBY POWER, K109				24-33-01
UNDER VOLTAGE SENSE, K113				
RELAY – (REF 31-01-86, FIG. 101)				
APU BAT CHARGER DET, K10418				
APU START, K197				
BATTERY DISCHARGE INDICATION INHIBIT, K10422				
SWITCH – BATTERY, YTGS2	1	1	FLT COMPT, P5, STANDBY POWER CONTROL PANEL, M10062	*
SWITCH – STANDBY POWER, YTGS1	1	1	FLT COMPT, P5, STANDBY POWER CONTROL PANEL, M10062	*
TRANSFORMER – (REF 31-01-06, FIG. 101)				
DIFFERENTIAL PROTECTION CURRENT, LEFT GEN, T106				

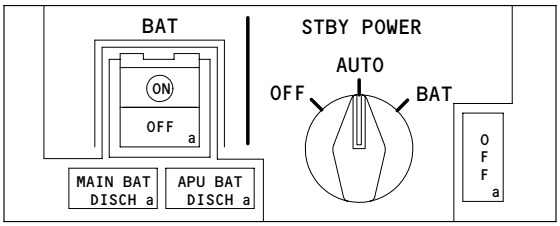
* SEE THE WDM EQUIPMENT LIST

Standby Power – Component Index
Figure 101 (Sheet 2)



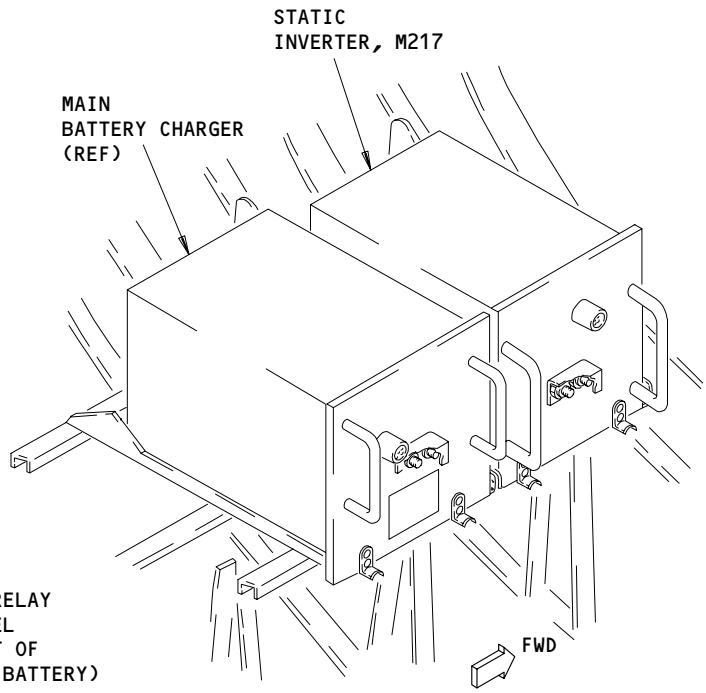
FLIGHT COMPARTMENT





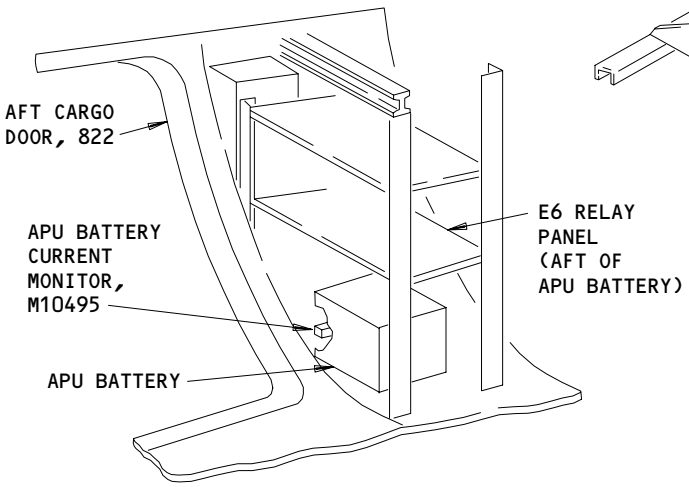
STANDBY POWER CONTROL PANEL, M10062

A



FORWARD EQUIPMENT CENTER
(LEFT SIDE)

B



AFT EQUIPMENT CENTER RACK, E6

C

Standby Power - Component Location
Figure 102

STANDBY POWER - INSPECTION/CHECK

1. General
   A. This procedure contains two tasks. The first task is an operational tests 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.
   B. The second task is a 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 24-33-00-716-016

2. Operational Test - 115 volt AC Standby Power Generation
   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
         (a) 211/212 Flight Compartment
   C. Procedure

      S 866-019
      (1) Supply electrical power (AMM 24-22-00/201).

      S 866-020
      (2) Make sure the BAT switch is in the ON position on the electrical power control panel.

      S 866-021
      (3) Make sure the STANDBY PWR switch is in the AUTO position on the electrical power control panel.

      S 866-022
      (4) Open INV PWR TRU (D10) circuit breaker on the main power distribution panel, P6.

      S 216-023
      (5) Make sure the yellow STBY BUS OFF light next to the STBY POWER switch is off.

S 216-024
(6) Make sure the EICAS message, STANDBY BUS OFF, does not show on the top EICAS display.

NOTE: The EICAS message STANDBY INVERTER will show when you open the INV PWR TRU circuit breaker. To erase this message use the EICAS Message Erase Procedure (AMM 31-41-00/201).

S 866-025
(7) Close the INV PWR TRU (D10) circuit breaker on the main power distribution panel, P6.

S 866-026
(8) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

S 866-027
(9) 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 216-028
(10) Make sure this value shows below APU/BAT on the bottom EICAS display:

DC-V	28 ±2

S 866-029
(11) Turn the STBY POWER switch to the BAT position for at least 30 seconds.

S 216-030
(12) Make sure the yellow DISCH light on the standby power control panel comes on.

NOTE: The EICAS message MAIN DISCHARGE will show while the standby power system operates under battery power.

S 216-031
(13) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	25 ±2

S 866-032
(14) Turn the STBY POWER switch to the AUTO position.

S 216-033
(15) 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	38 ±5
DC-V	32 ±4

S 216-034
(16) When the battery charge cycle is complete, make sure the DC-A value below STBY/BAT decreases suddenly (1-2 seconds) from 38 + or - 5 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 216-035
(17) Make sure this value shows below STBY/BAT on the bottom EICAS display:

DC-V	28 ±2

S 866-036
(18) Push the STATUS switch on the EICAS display select panel on the forward electronics panel, P9.

S 216-037
(19) Make sure the EICAS message, MAIN BAT CHRG, does not show on the bottom display.

S 866-018
(20) Remove electrical power if it is not necessary (AMM 24-22-00/201).

TASK 24-33-00-726-017

3. 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. Prepare for Examination

S 866-002

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

S 866-015

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 remove all persons and equipment from the spoiler area.

D. Procedure

S 216-012

(1) 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) Turn the STBY POWER switch on the P5 panel to the OFF position.
   (c) Make sure the yellow OFF light adjacent to the STBY POWER switch comes on.
   (d) Make sure the EICAS message, STANDBY BUS OFF, shows on the upper display.
   (e) Turn the STBY POWER switch on the P5 panel to the AUTO position.
   (f) Make sure the yellow OFF light adjacent to the STBY POWER switch goes off.
   (g) Push the ELEC HYD switch on the EICAS maintenance panel on the right side panel (P61).
   (h) Make sure the values that follow show on the bottom EICAS display:

STBY BAT: AC-V = 115 ±5
FREQ = 400 ±5
DC-V = 28 ±2

APU/BAT: DC-V = 28 ±2

(i) Make sure the EICAS message, STANDBY BUS OFF, does not show on the bottom display.

(j) Do the Main, APU Battery Chargers and Current Monitor test as follows:

1) Turn the STBY POWER switch on the P5 panel to the BAT position.
2) Make sure the yellow MAIN BAT DISCH and APU BAT DISCH lights on the P5 panel come on.
3) Make sure the EICAS messages, MAIN BAT DISCH and APU BAT DISCH, show on the top display.
4) Make sure the values that follow show on the bottom EICAS display:
5) STBY/BAT: DC-V = 25 ±2
6) APU/BAT: DC-V = 25 ±2
7) Turn the STBY POWER switch on the P5 panel to the AUTO position.
8) Make sure the yellow APU BAT DISCH and MAIN BAT DISCH lights on the P5 panel go off.
9) Make sure the values that follow show on the bottom EICAS display.

STBY/BAT: DC-A = 38 ±5

APU/BAT: DC-A = 38 ±5

10) Make sure the DC-V values below STBY/BAT and APU/BAT increase to 33 ±4 on the bottom EICAS display.

NOTE: The main and APU batteries are in a charge cycle. A charge cycle of one to five minutes is usual, but a fully discharged battery requires 75 minutes to charge.

11) Make sure the DC-A values below STBY/BAT and APU/BAT decrease from 38 ±5 to 0 ±5 in less than two seconds.

NOTE: If more than two seconds is required for the DC-A value to decrease to 0 ±5 there is a failure in the battery charger or its external circuit.

The DC-A values below STBY/BAT and APU/BAT do not have to decrease at the same time.

12) Make sure the DC-V values below STBY/BAT and APU/BAT are 28 ±2 on the bottom EICAS display.
13) Push the STATUS switch on the EICAS display select panel on the forward electronics panel, P9.
14) Make sure the EICAS messages, MAIN BAT CHGR, APU BAT CHGR and APU BAT NO STBY, do not show on the bottom display.

(k) Open the 6K16 AC STBY BUS PWR circuit breaker on the main power distribution panel (P6).
(l) Make sure the yellow OFF light next to the standby power switch is off.
(m) Make sure the EICAS message STANDBY BUS OFF does not show on the upper display.
(n) Open the 6D10 INV PWR TRU circuit breaker on the main power distribution panel (P6).
(o) Make sure the yellow OFF light next to the STBY PWR switch comes on.
(p) Make sure the EICAS message STANDBY BUS OFF shows on the upper display.
(q) Turn the STBY PWR switch to the BAT position.
(r) Make sure the yellow OFF light next to the STBY PWR switch goes off.
(s) Make sure the EICAS message STANDBY BUS OFF does not show on the upper display.
(t) Open the 6L11 INV PWR BAT circuit breaker on the main power distribution panel (P6).

(u) Make sure the yellow OFF light next to the STBY PWR switch comes on.
(v) Make sure the EICAS message STANDBY BUS OFF shows on the upper display.
(w) Put the STBY PWR switch to the AUTO position.
(x) Close the AC STBY PWR circuit breaker (6K16) on the main power distribution panel (P6).
(y) Make sure the yellow OFF light next to the STBY PWR switch goes off.
(z) Make sure the EICAS message STBY BUS OFF does not show on the upper display.
(aa) Close the INV PWR TRU (6D10) and INV PWR BAT (6L11) circuit breakers on the main power distribution panel (P6).
(ab) Push the ELEC HYD switch on the EICAS maintenance panel on the right side panel (P61).
(ac) Make sure the EICAS shows these values:
1) STBY BAT: AC-V = 115 ±5
FREQ = 400 ±5
DC-V = 28 ±2

APU/BAT: DC-V = 28 ±2

S 866-013
(2) Do the activation procedure for the spoilers (AMM 27-61-00/201), if deactivated.

S 866-014
(3) Remove electrical power if it is no longer needed (AMM 24-22-00/201).

STANDBY POWER RELAYS - REMOVAL/INSTALLATION

1. General
   A. The AC standby power relay, K105, and the standby power relay, K109, are in the main power distribution panel, P6.

TASK 24-33-01-004-001

2. Remove the Standby Power 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.

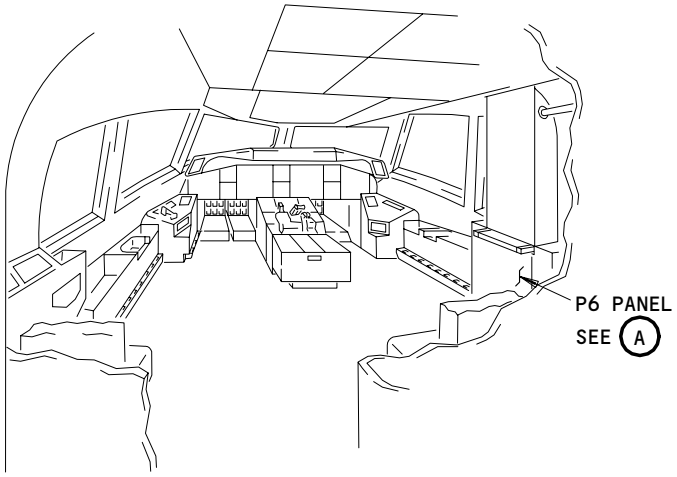
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-003
      (2) Remove electrical power from the airplane (AMM 24-22-00/201).
   D. Remove the Standby Power Relays

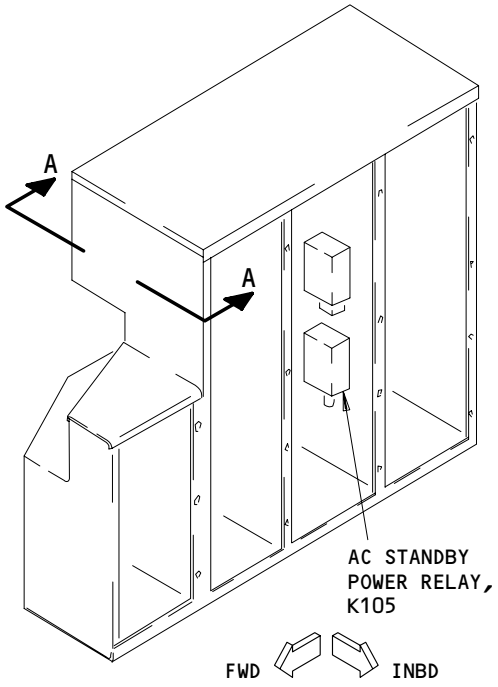
      S 024-004
      (1) Do these steps to remove the standby power relay:

      WARNING: DO NOT OPEN THE POWER DISTRIBUTION PANEL, P6 BEFORE YOU REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE. VOLTAGE LEVELS IN THE P6 PANEL CAN CAUSE INJURIES TO PERSONS.

      (a) Open the P6 panel.
      (b) Do these steps for the AC standby power relay:
          1) Remove the electrical connector from the AC standby power relay.

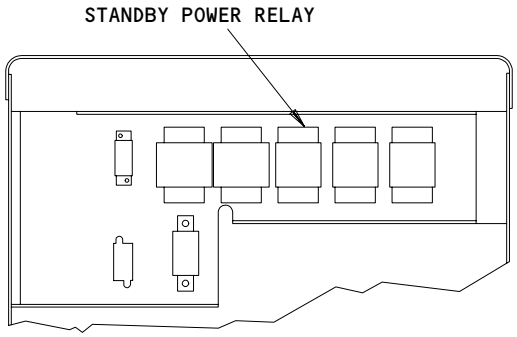


FLIGHT COMPARTMENT



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 Relays

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 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 (AMM 24-22-00/201).

S 714-008

(2) Do a test of the standby power relay, as follows:

(a) Turn the STBY POWER switch, on the pilot's 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 (AMM 27-61-00/201).

S 864-010
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

MAIN/APU BATTERY TIE REMOTE CONTROL CIRCUIT BREAKER - REMOVAL/INSTALLATION

1. General
   A. The Main-APU battery tie remote control circuit breaker (referred to as the RCCB) is outboard of the APU battery in the aft equipment center rack, E6.

TASK 24-33-02-004-001

2. Remove the Main-APU Battery Tie Remote Control Circuit Breaker
   A. Equipment
      (1) Remove - Insert Tool P/N 6500-001-0020, Matrix Science Corp.
   B. Access
      (1) Location Zones
          154 Aft Cargo Compartment (Right)

      (2) Access Panel
          822 Aft Cargo Compartment Door

   C. Remove the RCCB

      S 864-002
      (1) Open this circuit breaker on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6L7, APU/MAIN BAT TIE

      S 864-003
      (2) Open this circuit breaker on the overhead circuit breaker panel, P11, and attach a DO-NOT-CLOSE tag:
          (a) 11A20, EXT STBY CONT

      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 CHGR

      S 024-005
      (4) Do these steps to remove the RCCB:
          (a) Open the access cover on the forward side of the aft equipment center, E6.
          (b) Remove the battery connector from the APU battery.

(c) Identify the wires on the RCCB for the installation.
(d) Remove the RCCB with the remove - insert tool P/N 6500-001-0020.

TASK 24-33-02-404-006

3. Install the Main-APU Battery Tie Remote Control Circuit Breaker

A. References
(1) AMM 24-22-00/201, Electrical Power - Control

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 RCCB

S 864-007
(1) Do these steps to install the RCCB:
(a) Put the RCCB in position in the aft equipment center rack, E6.
(b) Install the screws that hold the RCCB.

CAUTION: MAKE SURE YOU INSTALL THE WIRES CORRECTLY. DANGEROUS CIRCUIT MALFUNCTIONS CAN OCCUR IF YOU DO NOT INSTALL THE WIRES CORRECTLY.
(c) Connect the wires to the RCCB with the remove - insert tool P/N 6500-001-0020.
(d) Connect the battery connector to the APU battery.
(e) Close the access cover on the forward side of the aft equipment center rack, E6.

S 864-008
(2) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the aft equipment center rack, E6:
(a) APU BAT CHGR

S 864-009
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the main power distribution panel, P6:
(a) 6L7, APU/MAIN BAT TIE

S 864-010
(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the overhead circuit breaker panel, P11:
(a) 11A20, EXT STBY CONT

D. Do a Test of the RCCB Installation

S 864-011
(1) Supply electrical power (AMM 24-22-00/201).

S 864-012
(2) Make sure this circuit breaker on the main power distribution panel, P6, is closed:
(a) 6D2, BAT XFR CONT

S 864-013
(3) Make sure these circuit breakers on the overhead circuit breaker panel, P11, are closed:
(a) 11A20, EXT STBY CONT
(b) 11N4, INSTRUMENT AND PANEL OVHD

S 714-014
(4) Do a test of the RCCB, as follows:
(a) Do these steps at the standby power control panel on the pilots' overhead panel, P5:
1) Turn the STBY POWER switch to the BAT position.
2) Push the BAT switch to the ON position.
3) Make sure the APU BAT DISCH and MAIN BAT DISCH lights come on.
4) Push the BAT switch to the OFF position.
5) Turn the STBY POWER switch to the AUTO position.
6) Make sure the APU BAT DISCH and MAIN BAT DISCH lights go off.

S 864-015
(5) 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 the left side of the forward equipment area.

TASK 24-33-03-004-001

2. Remove the Static Inverter (Fig. 401)
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components
   B. Access
      (1) Location Zone
          113 Area Forward of NLG Wheel Well (Left)

      (2) Access Panel
          113AL Forward Equipment Area Access

   C. Prepare for the Removal

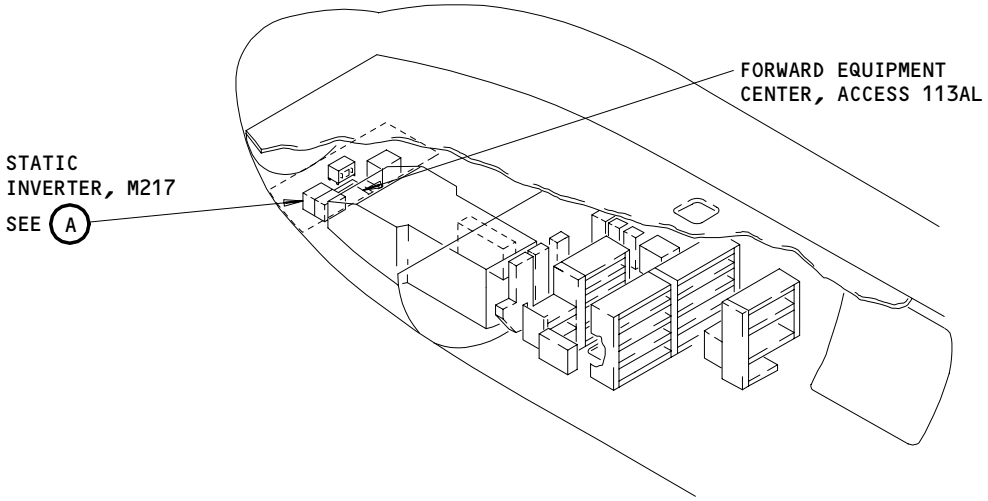
      S 864-002
      (1) Open these circuit breakers on the main power distribution panel, P6, and attach a DO-NOT-CLOSE tag:
          (a) 6D10, INV PWR TRU
          (b) 6L11, INV PWR BAT

      S 034-003
      (2) Do these steps to disconnect the inverter:
          (a) Open the access door to the forward equipment area.
          (b) Remove the electrical connector from the inverter.
          (c) Identify the wires on the terminals for the installation.
          (d) Remove the wires from the terminals.

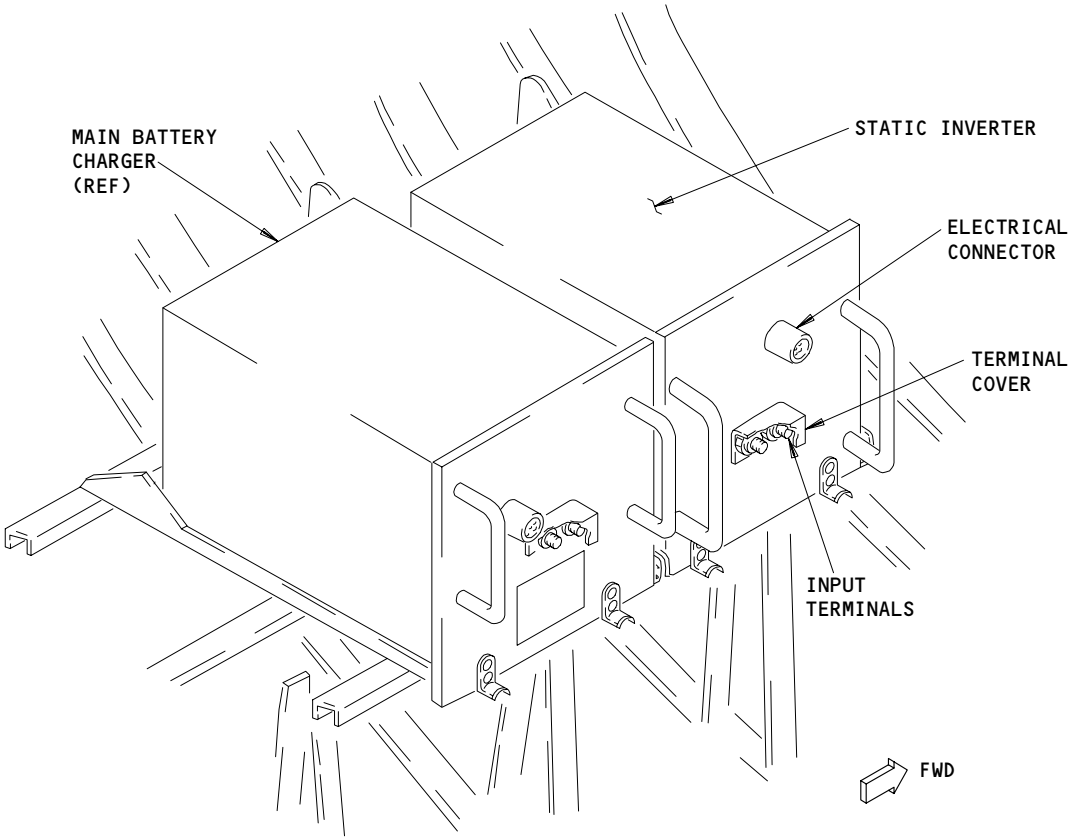
      S 024-004
      (3) Remove the inverter (AMM 20-10-01/401).

TASK 24-33-03-404-005

3. Install the Static Inverter (Fig. 401)
   A. References
      (1) AMM 20-10-01/401, E/E Rack Mounted Components



FORWARD EQUIPMENT CENTER LOCATION



FORWARD EQUIPMENT CENTER

A

Static Inverter Installation
Figure 401

(2) AMM 24-22-00/201, Electrical Power - Control
(3) AMM 31-41-00/201, EICAS - Maintenance Practices

B. Access

(1) Location Zones

113	Area Forward of NLG Wheel Well (Left)
211/212	Flight Compartment

(2) Access Panel

113AL	Forward Equipment Area Access

C. Install the Static Inverter

S 424-006
(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) Tighten the self-locking nut on the + (positive) terminal of the static inverter to 140 +/- 5 inch-pounds.
(c) Tighten the self-locking nut on the - (negative) terminal of the static inverter to 70 +/- 5 inch-pounds.
(d) Install the terminal cover on the terminals.
(e) Connect the electrical connector to the inverter.

S 864-009
(3) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the main power distribution panel, P6:
(a) 6D10, INV PWR TRU
(b) 6L11, INV PWR BAT

D. Do a Test of the Inverter Installation

S 864-008
(1) Supply electrical power (AMM 24-22-00/201).

S 714-012
(2) Do a test of the static inverter, as follows:
(a) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(b) Make sure these values show below STBY/BAT on the bottom EICAS display:

AC-V	115 ±4
FREQ	400 ±5

S 914-013

(3) Do the EICAS Maintenance Message Erase procedure (AMM 31-41-00/201).
   (a) Make sure the EICAS message, STBY INVERTER, does not show on the top display.

S 864-014

(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) 6A4, BAT CUR MON PWR
   (b) 6A5, STBY PWR CONT
   (c) 6C10, BAT BUS CONT
   (d) 6D1, BAT OVHT PROT
   (e) 6D2, BAT XFER CONT
   (f) 6G5, STBY BUS OFF LT BAT VM
   (g) 6K16, AC STBY BUS PWR

S 864-004

(3) Open this circuit breaker on the APU/external power panel, P34, and attach a DO-NOT-CLOSE tag:
   (a) 34A16, MN/APU BAT CHGR DET ENABLE

S 864-005

(4) Open this circuit breaker on the aft equipment center rack, E6, and attach a DO-NOT-CLOSE tag:
   (a) APU BAT OVHT PROT

D. Remove the Standby Power Control Panel

S 024-006
(1) Remove the control panel.

TASK 24-33-04-404-007

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 424-008
(1) Install the control panel.

S 864-009
(2) Remove the DO-NOT-CLOSE tags and close these circuit breakers on the overhead circuit breaker panel, P11:
(a) 6A4, BAT CUR MON PWR
(b) 6A5, STBY PWR CONT
(c) 6C10, BAT BUS CONT
(d) 6D1, BAT OVHT PROT
(e) 6D2, BAT XFER CONT
(f) 6G5, STBY BUS OFF LT BAT VM
(g) 6K16, AC STBY BUS PWR

S 864-010
(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the APU/external power panel, P34:
(a) 34A16, MN/APU BAT CHGR DET ENABLE

S 864-011
(4) 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 864-015
(1) Supply electrical power (AMM 24-22-00/201).

S 714-012
(2) Do a test of the control panel, as follows:
(a) Push the BAT switch on the control panel to the ON position.
(b) Make sure the white light in the switch comes on.
(c) Push the BAT switch on the control panel to the OFF position.
(d) Make sure the white light in the switch goes off.
(e) Make sure the yellow light in the switch comes on.

S 864-013
(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

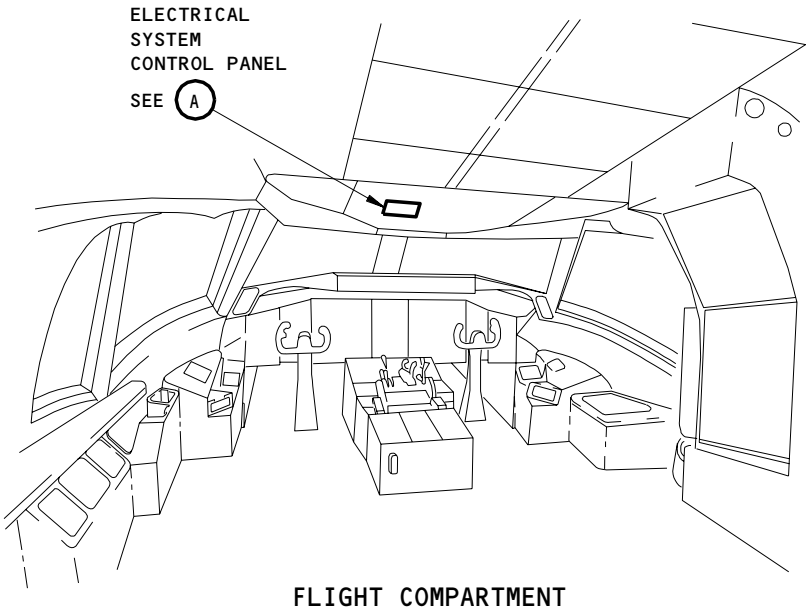
S 864-014
(4) Remove electrical power if it is not necessary (AMM 24-22-00/201).

DC METERS - DESCRIPTION AND OPERATION

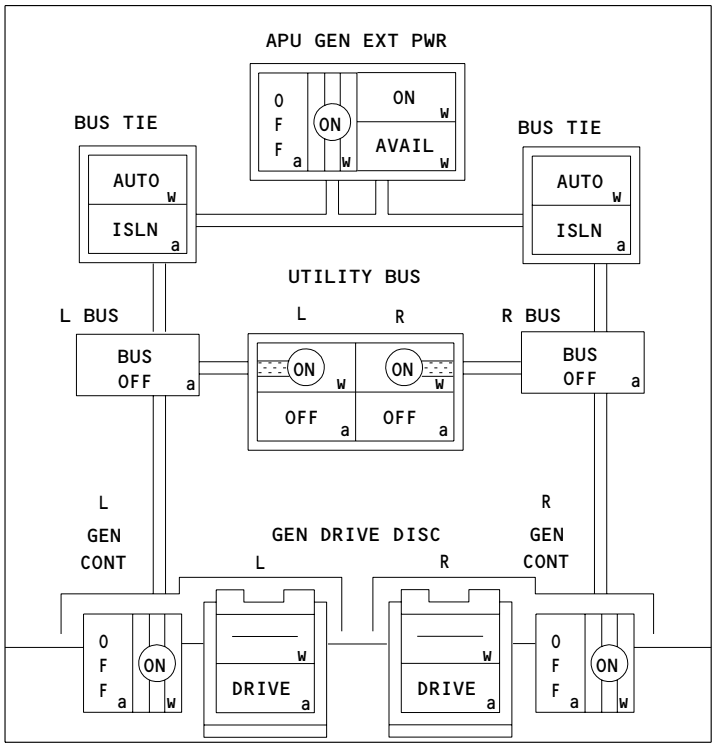
1. General
   A. EICAS computers measure the DC currents and voltages on the DC buses.
2. Operation
   A. Functional Description
      (1) EICAS computers measure the output voltages of the main and APU batteries, and the left and right transformer-rectifier units (TRU's).
      (2) The main battery has an external shunt installed in the ground lead. A voltage proportional to battery current is measured by the EICAS computers.
      (3) The APU battery charger has an external shunt installed in the ground lead. A voltage proportional to charging current is measured by the EICAS computers.
      (4) Each TRU has an internal shunt installed in the ground lead. A voltage proportional to TRU current is measured by the EICAS computers.
      (5) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR;
      the DC output voltage of the hydraulic motor-driven generator is measured at the HYD GEN DC SENSE circuit breaker on the hydraulic generator power panel P71.

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. The BPCU shares status information with the generator and auxiliary generator control units. The BPCU controls all AC electrical buses, and controls load shedding. The BPCU is located in forward equipment center rack E5.
   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 AC PWR CONNECTED light, and a clear PWR 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.



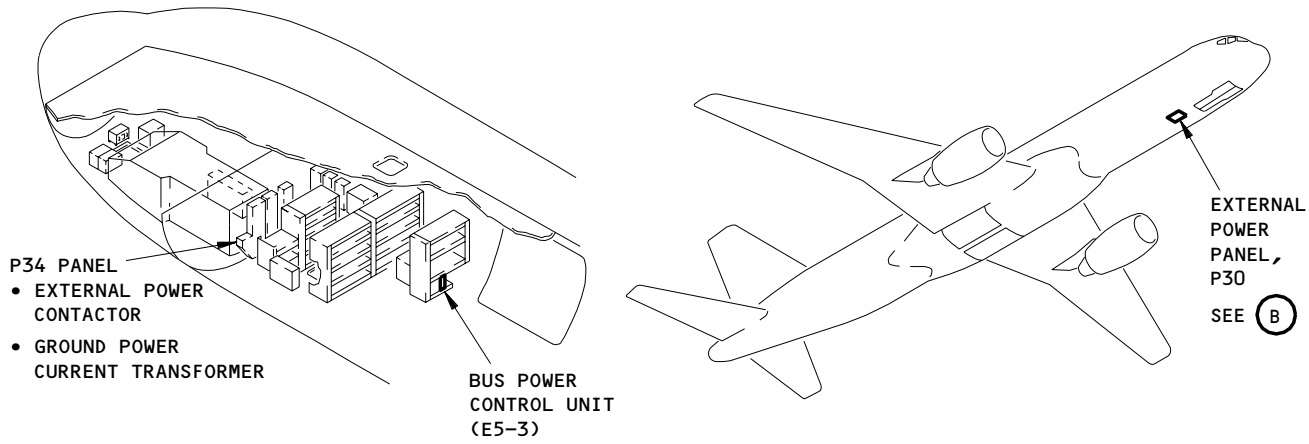
FLIGHT COMPARTMENT

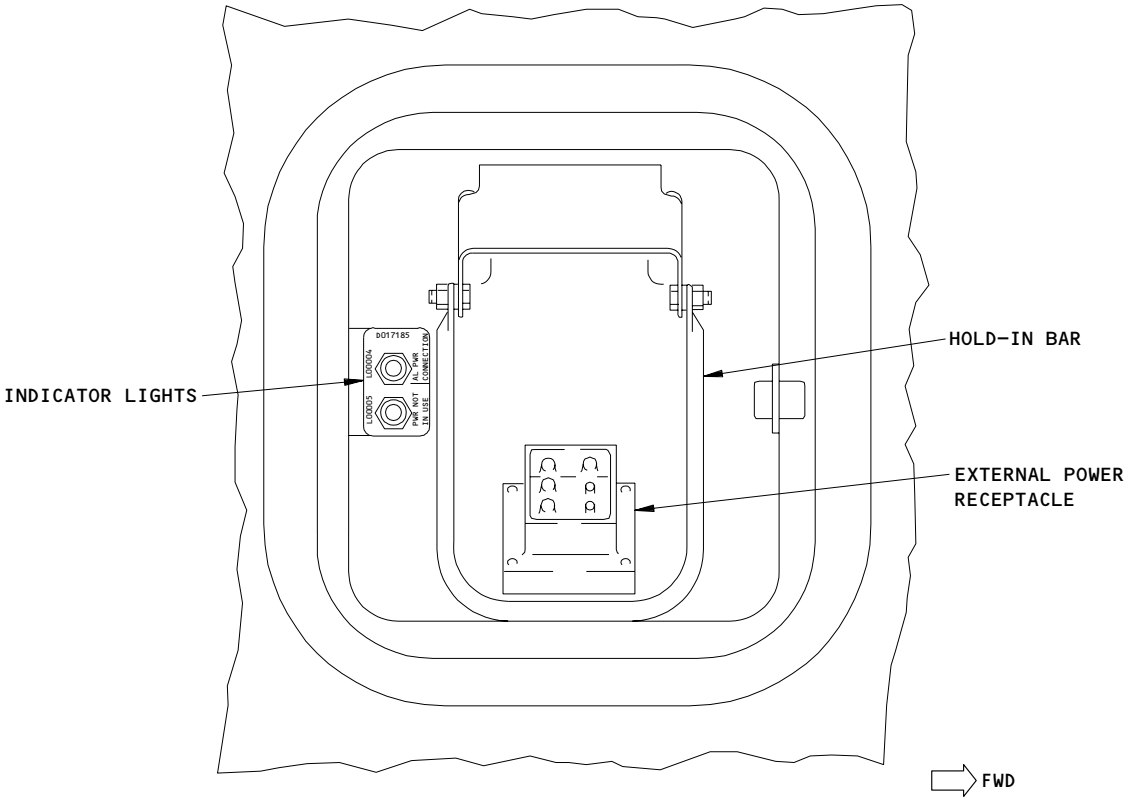


ELECTRICAL SYSTEM CONTROL PANEL

A

External Power - Component Location
Figure 1 (Sheet 1)

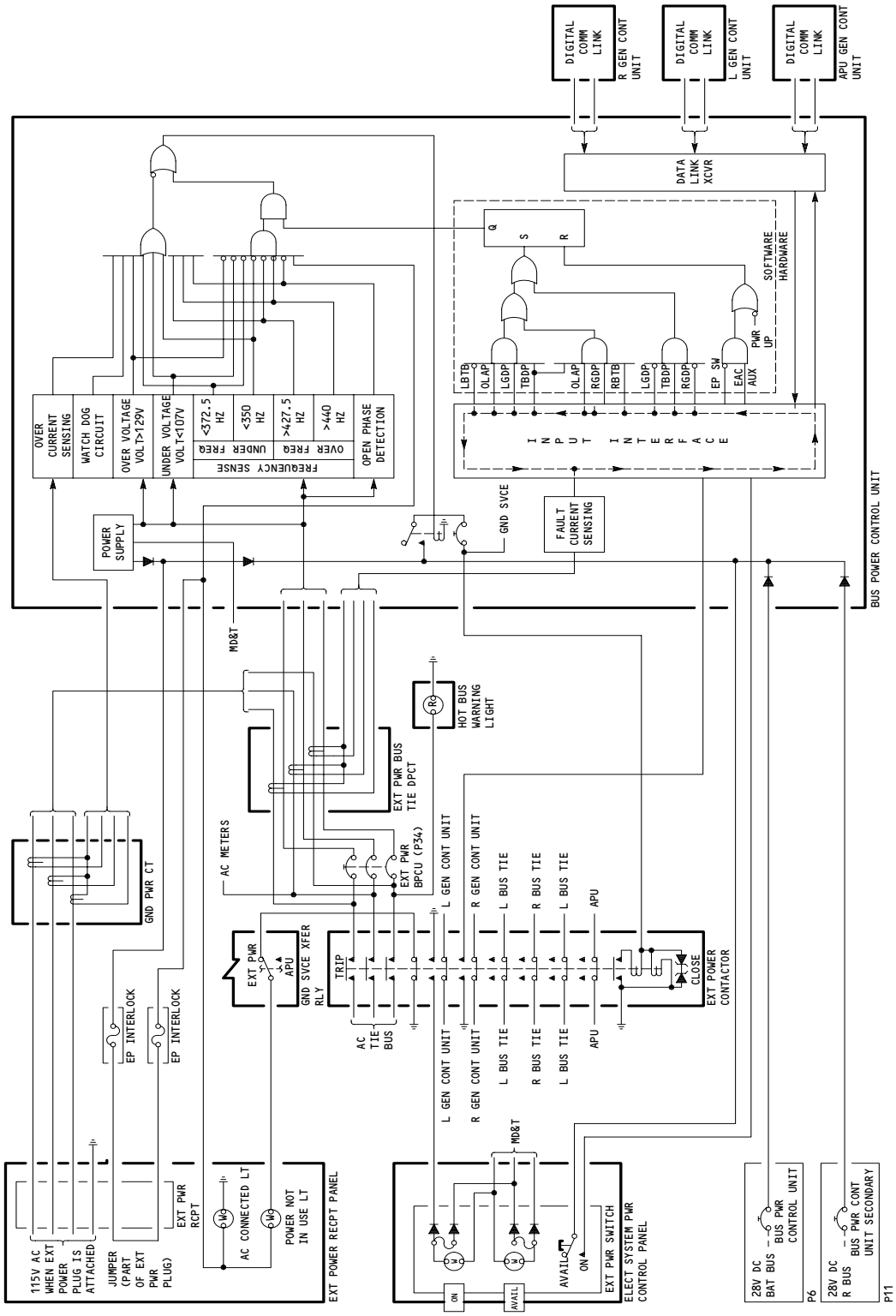




EXTERNAL POWER PANEL, P30
(B)

External Power - Component Location
Figure 1 (Sheet 2)

3. Operation (Fig. 2)
   A. Functional Description
      (1) Connecting external power to the EPR turns on the red EXT PWR HOT BUS warning light on P34 panel. 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 AC PWR CONNECTED light on P30 panel will come on. The white EXT PWR AVAIL light on M10063 electrical system control panel will be on. If external power is not selected, the clear PWR NOT IN USE light on P30 panel will be on.
      (2) The momentary action EXT PWR switch on M10063 panel controls the system. 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 M10063 panel will be on. The AC PWR CONNECTED light on P30 panel will be on. The PWR NOT IN USE light on P30 panel 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.



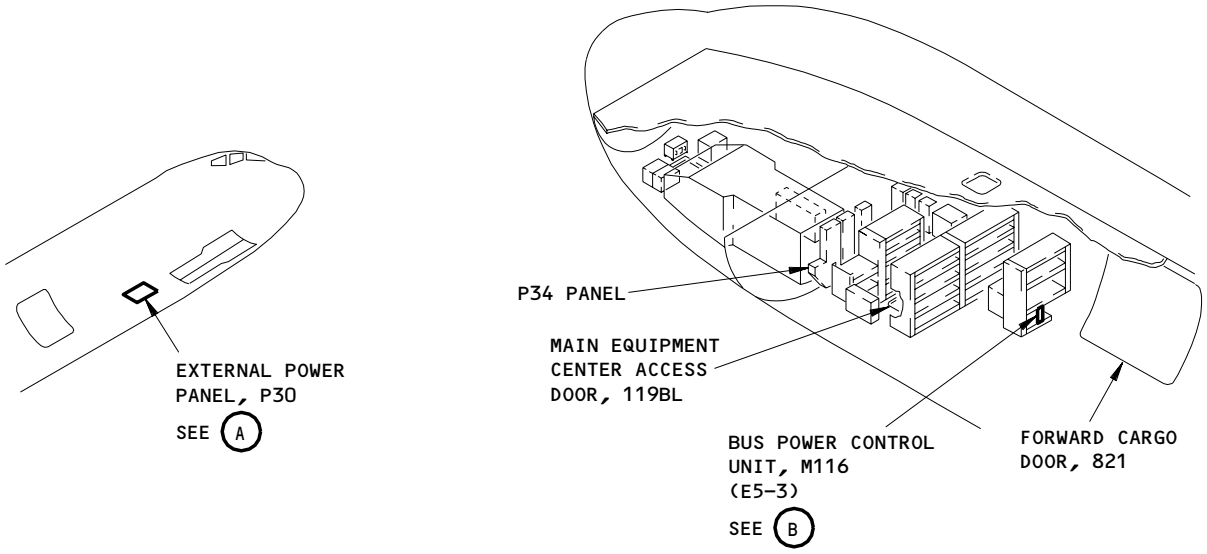
External Power Schematic
Figure 2

EXTERNAL POWER

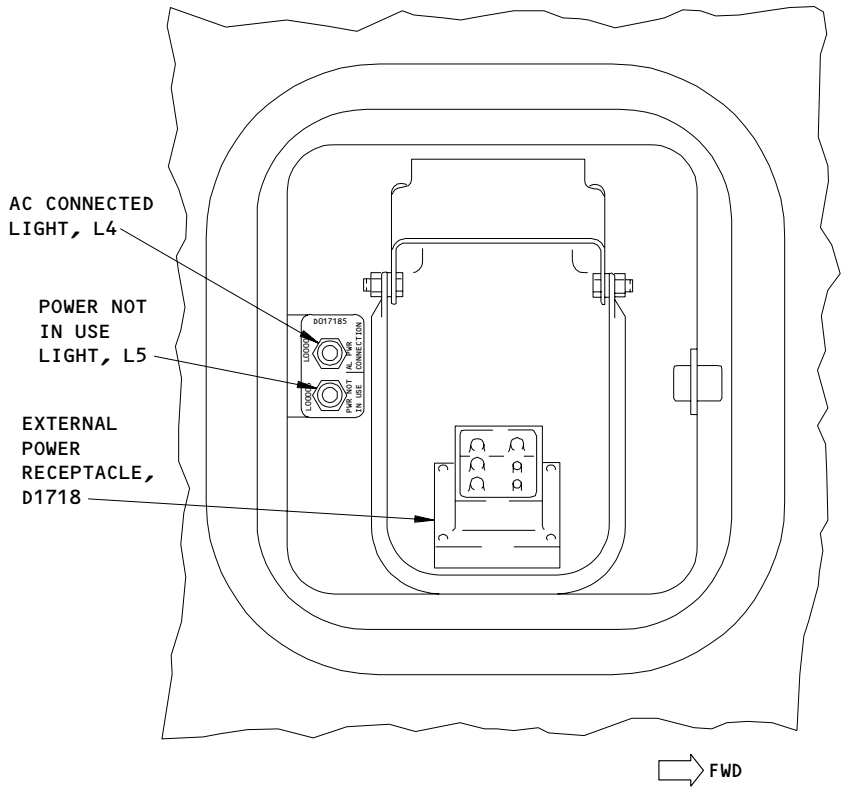
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
BREAKER - (REF 24-22-00, FIG. 101)				
AUXILIARY POWER, C905				
CIRCUIT BREAKER	--		FLT COMPT, P6	
BUS PWR CONT UNIT, C809		1	6B4	*
CIRCUIT BREAKER	--		FLT COMPT, P11	
BPCU SEC, C803		1	11R32	*
CIRCUIT BREAKER	--		119BL, MAIN EQUIP CTR, P34	
GROUND POWER BPCU, C320		1	34M6, SECT A	*
CONTACTOR - (REF 31-01-34, FIG. 101)				24-41-01
EXTERNAL POWER, K114				
LIGHT - AC CONNECTED, L4	--	1	120AR, P30	*
LIGHT - HOT BUS WARNING, L15	--	1	119BL, P34	*
LIGHT - POWER NOT IN USE, L5	--	1	120AR, P30	*
PANEL - (REF 24-22-00, FIG. 101)				
ELECTRICAL POWER SYSTEM CONTROL, M10063				
PANEL - (REF 24-33-00, FIG. 101)				
STANDBY POWER CONTROL, M10062				
RECEPTACLE - EXTERNAL POWER, D1718	--	1	120AR, P30	24-41-02
TRANSFORMER - (REF 31-01-34, FIG. 101)				
CURRENT DIFFERENTIAL PROTECTION EXTERNAL POWER TIE BUS, T116				
GRND POWER CURRENT, T122				
UNIT - BUS POWER CONTROL, M116	--	1	821, FWD CARGO COMPT, E5-3	24-41-03
UNIT - (REF 24-22-00, FIG. 101)				
APU GENERATOR CONTROL, M143				
LEFT GENERATOR CONTROL, M144				
RIGHT GENERATOR CONTROL, M146				

* SEE THE WDM EQUIPMENT LIST

External Power - Component Index
Figure 101

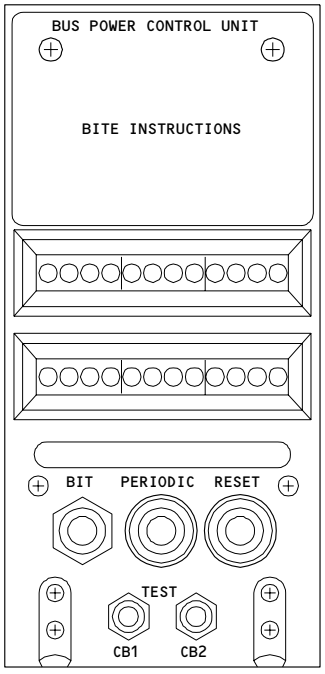


MAIN EQUIPMENT CENTER



EXTERNAL POWER PANEL, P30

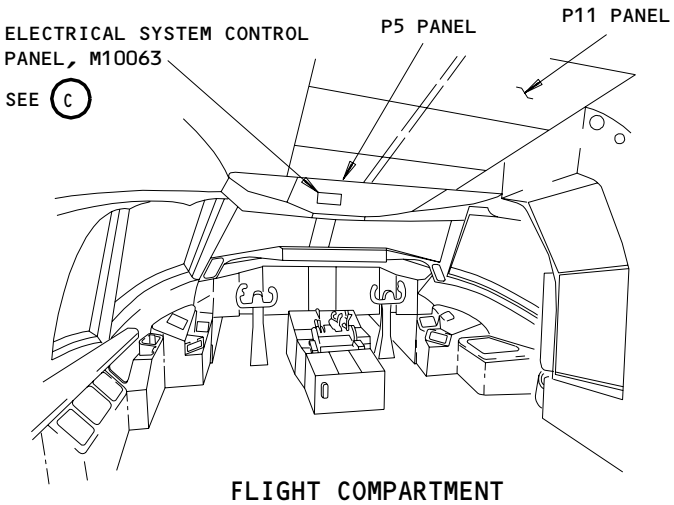
A



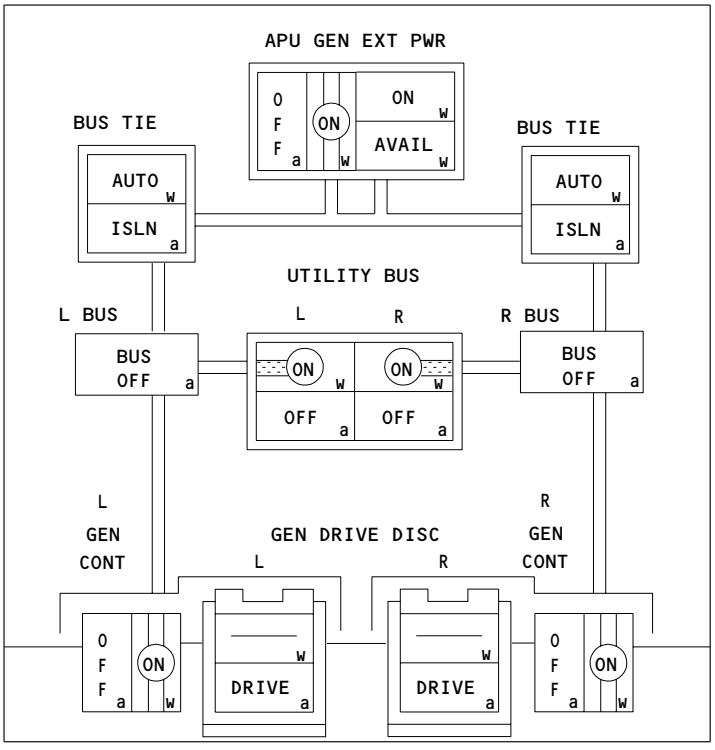
BUS POWER CONTROL UNIT, M116

B

External Power - Component Location
Figure 102 (Sheet 1)



FLIGHT COMPARTMENT



ELECTRICAL SYSTEM CONTROL PANEL, MI0063

C

External Power - Component Location
Figure 102 (Sheet 2)

AC 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 24-41-00-705-001

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
   B. References
      (1) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   C. Access
      (1) Location Zone

124	Area Below Forward Cargo Compartment (Right)
211/212	Flight Comaprtment

   D. Prepare for the Operational Test

      S 045-002

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPPLIED. 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.

   E. Do an Operational Test of the External Power System

      S 865-008
      (1) Turn the STBY POWER switch on the pilots' overhead panel, P5, to the AUTO position.

S 865-009

(2) Push the BAT switch on the pilots' overhead panel, P5, to the ON position.

S 715-010

(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) Supply electrical power to the external power cable.
(d) Make sure the CONNECTED and NOT IN USE lights on the external power panel, P30, come on.
(e) 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.
(f) Make sure the NOT IN USE light on the external power panel, P30, is off.
(g) Make sure the CONNECTED light on the external power panel, P30, is on.
(h) Push the two BUS TIE switches on the electrical system control panel to the AUTO position.
(i) Make sure the AUTO light in each BUS TIE switch is on.
(j) Make sure the left and right BUS OFF lights on the electrical system control panel are off.
(k) 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 AC TIE BUS and EXT PWR lights on the APU/external power panel, P34.
4) The 115 V AC GND SVCE BUS light on the right miscellaneous electrical equipment panel, P37.

(l) 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 RIGHT BUS ISOLATED, show on the top display.

(m) Push the right BUS TIE switch on the electrical system control panel to the AUTO position.

(n) 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 LEFT BUS ISOLATED, show on the top display.

(o) Push the left BUS TIE switch to the AUTO position.

(p) Push the ELEC HYD switch on the EICAS MAINT panel on the right side panel, P61.

(q) 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 865-011

(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 865-012

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 external power cable from the airplane.
   (b) Close the access door for the external power panel, P30.

S 865-013

(3) Push the BAT switch on the pilots' overhead panel, P5, to the OFF position.
   (a) Make sure the OFF light in the BAT switch comes on.

S 445-014

(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, in the main equipment center.

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 Equipment Center

      (2) Access Panels
          119BL Main Equipment Center Access

   C. Prepare for the Removal

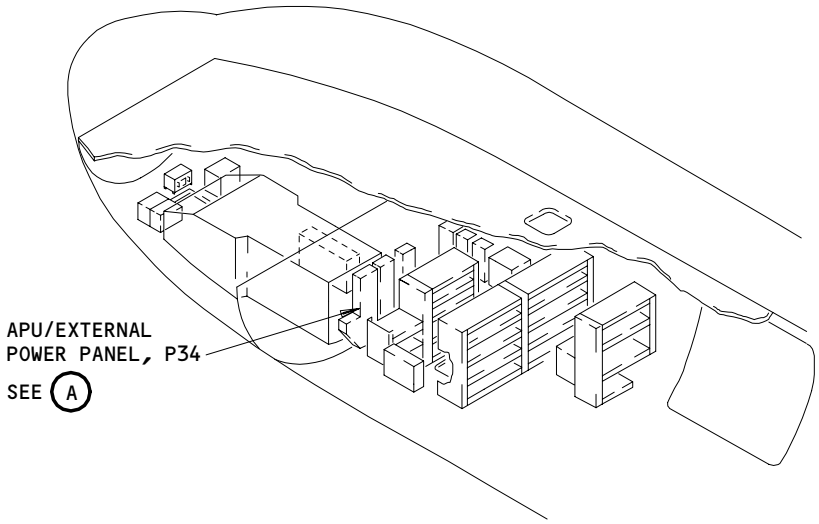
      S 044-002

      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.

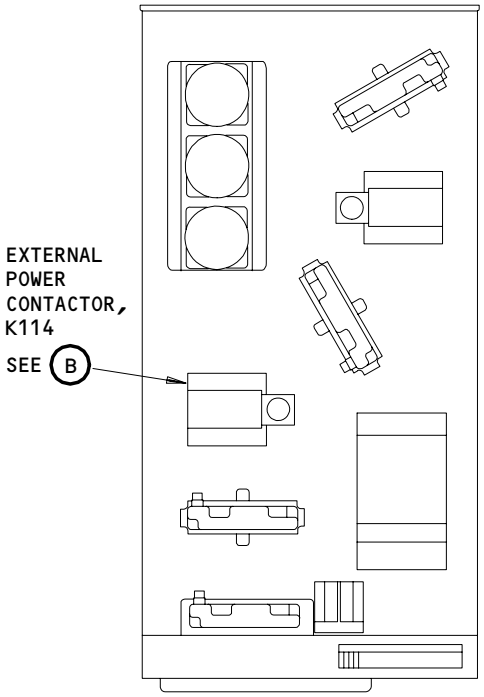
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

      S 864-003
      (2) Remove electrical power (AMM 24-22-00/201).

      S 024-005
      (3) Do these steps to remove the contactor:

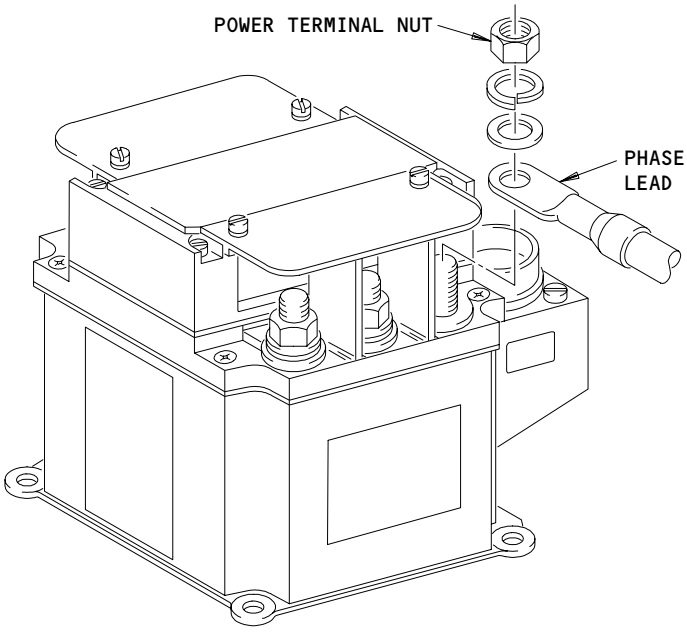


MAIN EQUIPMENT CENTER



APU/EXTERNAL POWER PANEL, P34

A



EXTERNAL POWER CONTACTOR, K114

B

External Power Contactor Installation
Figure 401

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.

(a) Open the APU/external power panel, P34.
(b) Remove the electrical connector from the contactor.
(c) Identify the phase leads on the contactor for the installation.
(d) Remove the phase leads from the contactor.
(e) Remove the four screws that hold the contactor.
(f) Remove the contactor.

TASK 24-41-01-404-006

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
211/212 Flight Compartment

(2) Access Panel
119BL Main Equipment Center Access

C. Install the External Power Contactor

S 424-007
(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 phase leads to the terminals on the contactor and tighten the nuts to 170-190 pound-inches.
(d) Connect the electrical connector to the contactor.
(e) Close the APU/external power panel, P34.

D. Do a Test of the External Power Contactor Installation

S 864-008

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

S 714-010

(2) Do these steps at the pilots' overhead panel, P5, to do a test of the contactor:
   (a) Push the BAT switch to the ON position.
   (b) Push the two BUS TIE switches to the AUTO position.
   (c) Push the EXT PWR switch to the ON position.
   (d) Make sure the two BUS OFF lights are off.
   (e) Push the EXT PWR switch.
   (f) Make sure the ON light in the EXT PWR switch goes off.
   (g) Push the BAT switch to the OFF position.

S 914-011

(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 864-012

(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, D1718 (referred to as the receptacle) is on the bottom right side of the airplane, aft of the nose wheel. The receptacle is on the external power panel, P30.
   B. This procedure has these tasks:
      (1) External Power Receptacle - Inspection/Check
      (2) Remove the External Power Receptacle
      (3) Install the External Power Receptacle

TASK 24-41-02-202-001

2. External Power Receptacle - Inspection/Check
   A. General
      (1) This procedure uses wear gages to do a test of the pins on the external power 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 Zones
          124 Area Below Forward Cargo Compartment (Right)

   D. Do an Inspection/Check of the External Power Receptacle

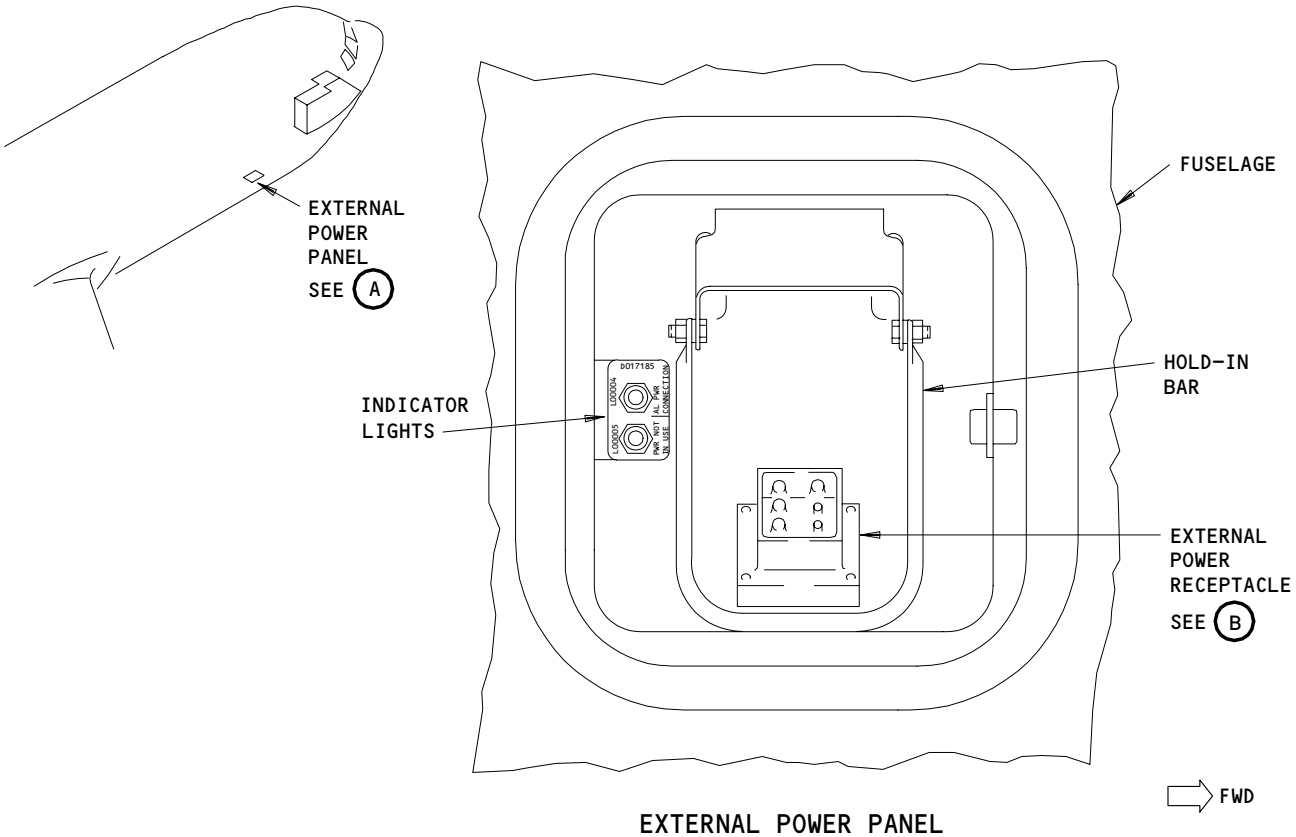
      S 212-002
      (1) Visually examine the receptacle for apparent damage.

      S 212-003
      (2) Make sure all pins on the receptacle are correctly installed on the receptacle.

      S 212-004
      (3) Make sure none of the pins show a bend.

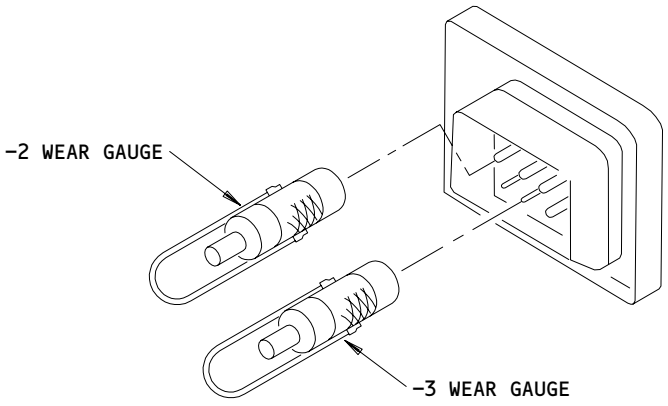
      S 222-005
      (4) Try to move the wear gage F70284-2 across pins A, B, C, and N.

      S 222-006
      (5) Try to move the wear gage F70284-3 across pins E and F.
          (a) If a pin accepts the "No-Go" gage or is damaged, replace the external power receptacle.



EXTERNAL POWER PANEL

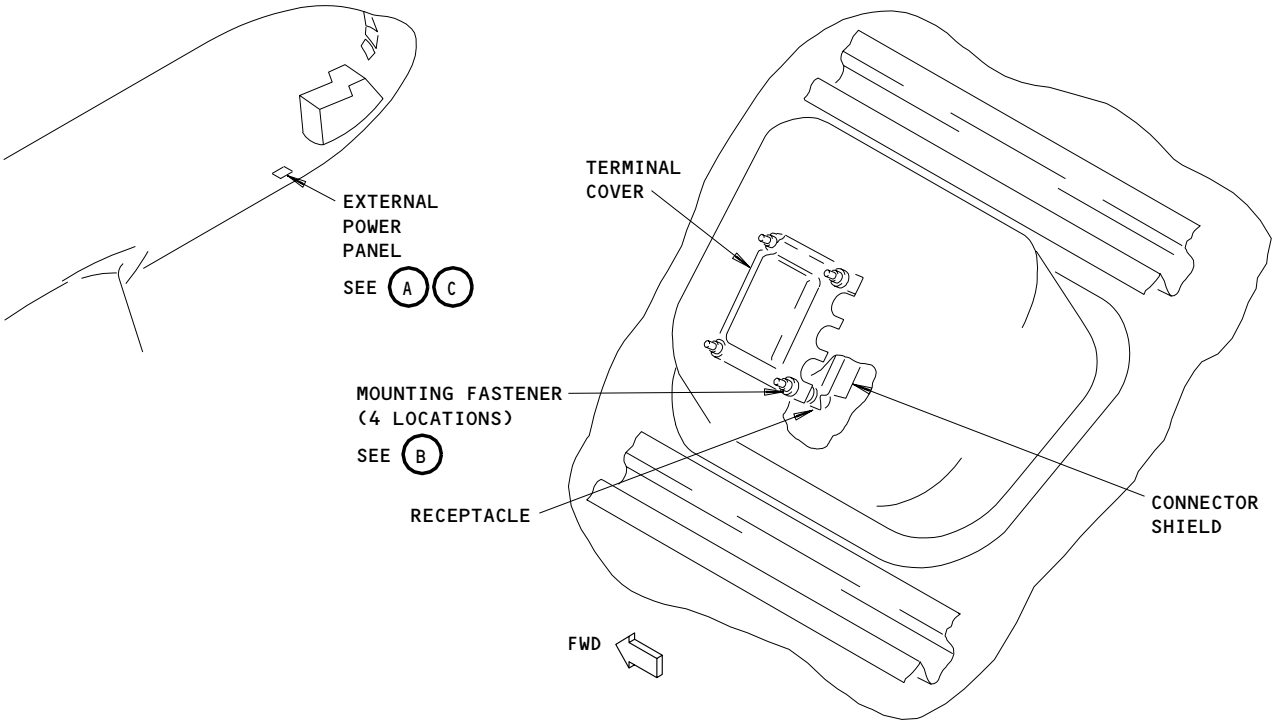
A



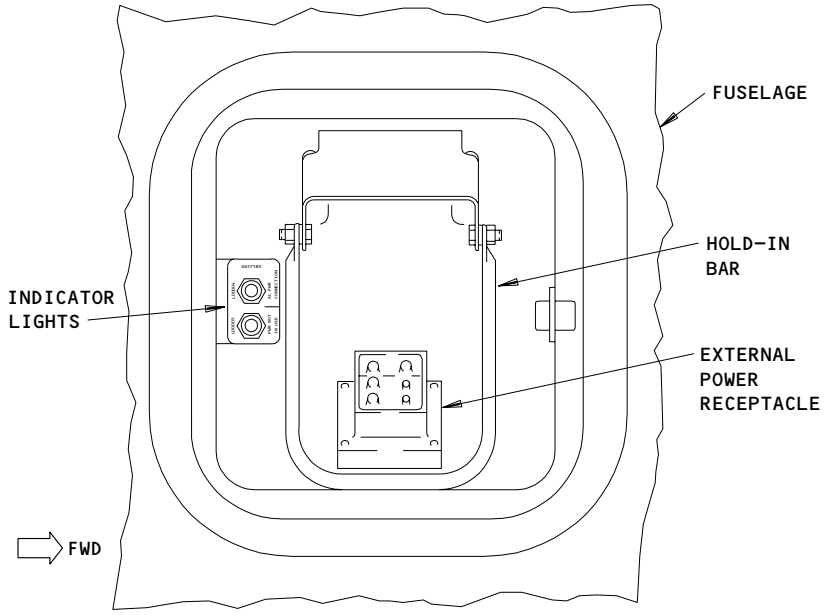
EXTERNAL POWER RECEPTACLE

B

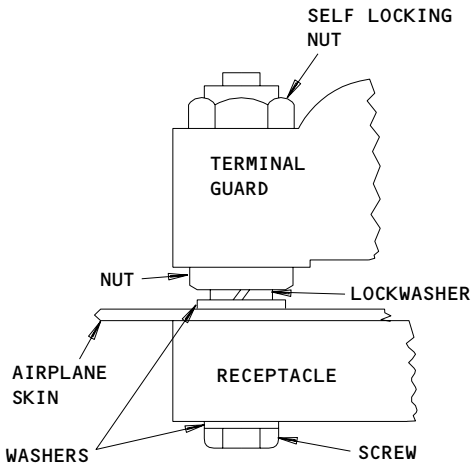
External Power Receptacle Inspection
Figure 201



EXTERNAL POWER PANEL
(REAR VIEW)
A



EXTERNAL POWER PANEL
C



MOUNTING FASTENER
B

External Power Receptacle Installation
Figure 202

TASK 24-41-02-762-023

3. External Power Receptacle Neutral Pin to Nose Gear Grounding Stud Continuity Check

A. Special Tools and Equipment
   (1) Low Resistance Ohmmeter
B. References
   (1) AMM 24-22-00/201, Manual Control
C. Access
   (1) Location Zone
      (a) 119 Main equipment center (RH side)
   (2) Access Panel
      (a) P30 External power panel
D. Prepare for continuity check.

S 862-022
   (1) Remove electrical power from the airplane and all externally powered devices (AMM 24-22-00/201).

S 212-024
   (2) Make sure the airplane static ground cable is not connected.

S 012-021
   (3) Open the P30 panel for the external power receptacle.
E. Perform continuity check.

S 762-020
   (1) Measure the resistance between the external power receptacle neutral pin and nose gear ground stud.
      (a) If the resistance exceeds 0.1 ohms, do this task:
         1) External Power Receptacle - Inspection/Check (AMM 24-41-02/201)

S 302-018
   (2) If the problem continues, examine and repair the wiring between the external power receptacle neutral pins and the associated ground stud.

S 862-025
   (3) Return the airplane to serviceable condition. Connect the airplane static ground cable if required.

TASK 24-41-02-002-007

4. Remove the External Power Receptacle

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 Main Equipment Center

(2) Access Panels
119BL Main Equipment Center Access

C. Remove the External Power Receptacle (Fig. 202)

S 042-008

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 862-009
(2) Remove electrical power (AMM 24-22-00/201).

S 422-016

WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE BEFORE YOU GET ACCESS TO THE 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 that hold the receptacle to the pan.
(g) Remove the receptacle and connector shield from the outer side of the airplane.

TASK 24-41-02-402-011
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

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	Main Equipment Center
124	Area Below Forward Cargo Compartment (Right)

(2) Access Panels

119BL	Main Equipment Center Access

D. Install the External Power Receptacle

S 422-012

(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 the 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 eight washers and four nuts and bolts that hold the receptacle.

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.

(e) Use the TT-N-95 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. A SYSTEM MALFUNCTION AND EQUIPMENT DAMAGE CAN OCCUR IF YOU DO NOT CONNECT THE WIRES CORRECTLY.

(f) Install the six leads on the receptacle terminal 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.

(g) Apply a layer of potting compound to the terminals and wires.
(h) Put the terminal cover in position on the terminals.
(i) Install the four nuts that hold the terminal cover.
(j) Close the floor panels on the forward right side of the E2 equipment rack in the main equipment center.

E. Do a Test of the External Power Receptacle Installation

S 862-013

(1) Supply external power to the ac ground handling bus (AMM 24-22-00/201).

S 712-014

(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.

S 442-015

(3) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

S 862-016

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

BUS POWER CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The bus power control unit (referred to as the BPCU) is on shelf 3 of the E5 equipment rack in the main equipment center.
   B. The bus power control unit (referred to as the BPCU) divides external power between the airplane buses. When the BPCU is removed or installed external power cannot be connected to either main ac bus, the ground service bus, or the ground handling bus (external power may remain connected at the external power receptacle). The main engine generators can supply power to their related buses. The bus tie breakers must stay in the open position. With the bus tie breakers open, the APU generator cannot supply power to either main ac bus and the main generators cannot supply power to the opposite ac bus.

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 Discharge Sensitive Devices
      (3) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Access
      (1) Location Zones
          119/120 Main Equipment Center
          122 Forward Cargo Compartment
      (2) Access Panels
          122AZ Forward Cargo Compartment Bulkhead Panel
          821 Forward Cargo Door
   C. Prepare for Removal

      S 864-005

      WARNING: KEEP PERSONS AND EQUIPMENT AWAY FROM ALL CONTROL SURFACES WHEN HYDRAULIC POWER IS SUPPLIED. AILERONS, ELEVATORS, RUDDER, FLAPS, SLATS, SPOILERS, AND STABILIZERS 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 864-002
      (2) Open this circuit breaker on the main power distribution panel (referred to as the P6 panel) and attach a DO-NOT-CLOSE tag:
          (a) 6B4, BUS PWR CONT UNIT

      S 864-003
      (3) Open this circuit breaker on the overhead circuit breaker panel (referred to as the P11 panel) and attach a DO-NOT-CLOSE tag:
          (a) 11R32, BPCU SEC

S 864-004
(4) Open this circuit breaker on the APU/external power panel (referred to as the P34 panel) and attach a DO-NOT-CLOSE tag:
(a) 34B2, GROUND POWER BPCU

D. Remove the BPCU

S 014-024
(1) Open the forward cargo door, 821.

S 014-025
(2) Remove the forward cargo compartment bulkhead panel.

S 914-018

CAUTION: DO NOT TOUCH THE BPCU BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN CAUSE DAMAGE TO THE BPCU.

(3) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 024-007
(4) Remove the BPCU (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 Discharge 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
122	Forward Cargo Compartment
211/212	Flight Compartment

(2) Access Panels

122AZ	Forward Cargo Compartment Bulkhead Panel
821	Forward Cargo Door

C. Install the BPCU

S 914-009

CAUTION: DO NOT TOUCH THE BPCU BEFORE YOU DO THE PROCEDURE FOR DEVICES THAT ARE SENSITIVE TO ELECTROSTATIC DISCHARGE. ELECTROSTATIC DISCHARGE CAN DAMAGE THE BPCU.

(1) Do the procedure for devices that are sensitive to electrostatic discharge (AMM 20-41-01/201).

S 424-010

(2) Install the BPCU (AMM 20-10-01/401).

S 864-011

(3) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P34 panel:
(a) 34B2, GROUND POWER BPCU

S 864-012

(4) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P6 panel:
(a) 6B4, BUS PWR CONT UNIT

S 864-013

(5) Remove the DO-NOT-CLOSE tag and close this circuit breaker on the P11 panel:
(a) 11R32, BPCU SEC

D. Do a test of the BPCU installation

S 864-014

(1) Supply external power to the ground handling bus (AMM 24-22-00/201).

S 714-015

(2) Do a test of the BPCU installation, as follows:
(a) Push the BAT switch to the ON position at the pilots' overhead panel, P5.
(b) Push the GROUND SERVICE switch to the on position at the forward attendant panel, P21.
(c) Make sure the white light in the GROUND SERVICE switch comes on.
(d) Make sure the NOT IN USE light on the external power panel, P30, is off.
(e) Push the GROUND SERVICE switch to the off position.
(f) Make sure the white light in the GROUND SERVICE switch goes off.
(g) Make sure the NOT IN USE light on the external power panel, P30, is on.

(h) Push the RESET switch on the BPCU and make sure this sequence of messages show on the BPCU 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 to the OFF position at the pilots' overhead panel, P5.

S 414-026

(3) Install the forward cargo compartment bulkhead panel.

S 414-027

(4) Close the forward cargo door, 821.

S 864-016

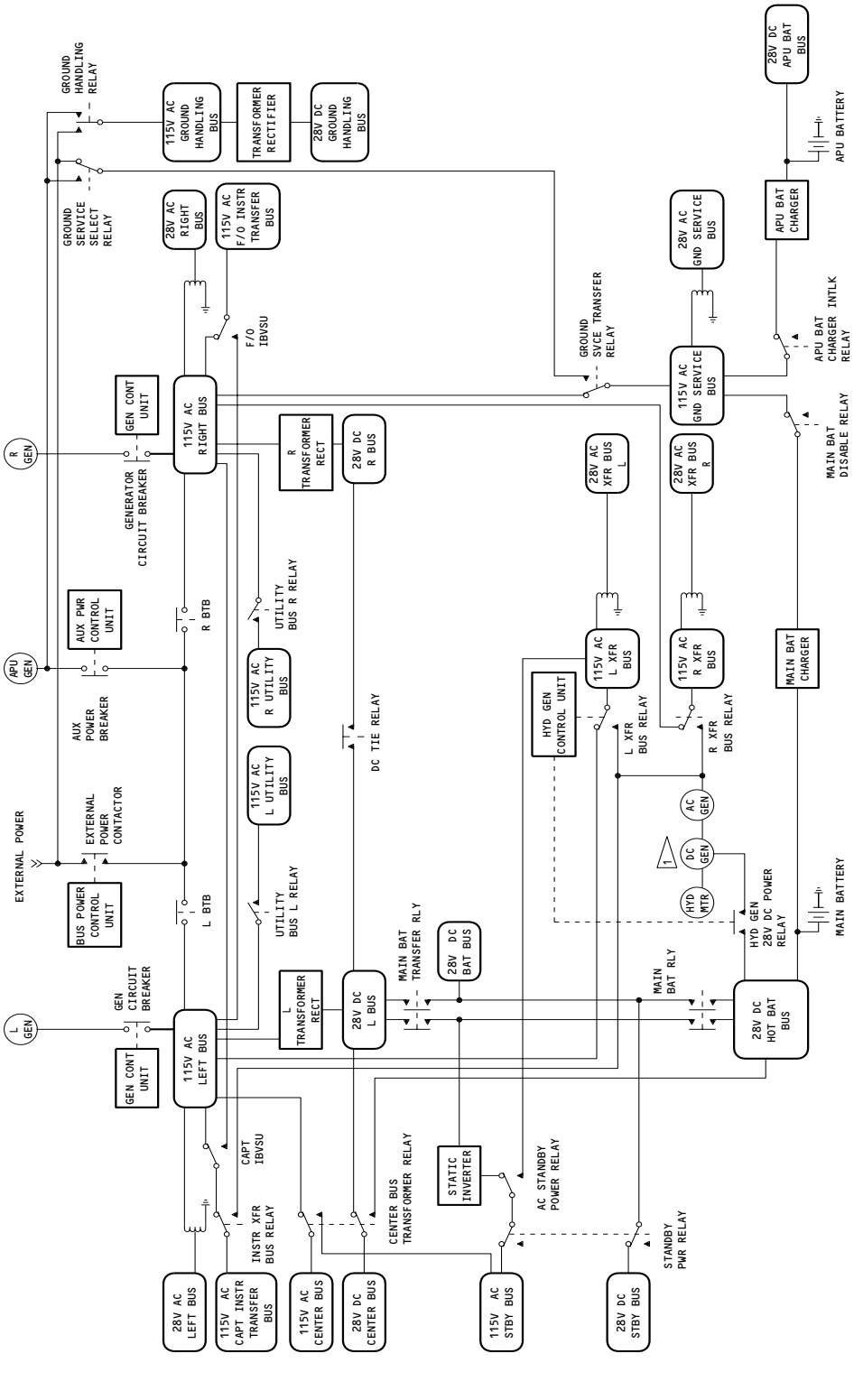
(5) Do the activation procedure for the spoilers if you did the deactivation procedure (Ref 27-61-00).

S 864-017

(6) Remove electrical power if it is not necessary (Ref 24-22-00).

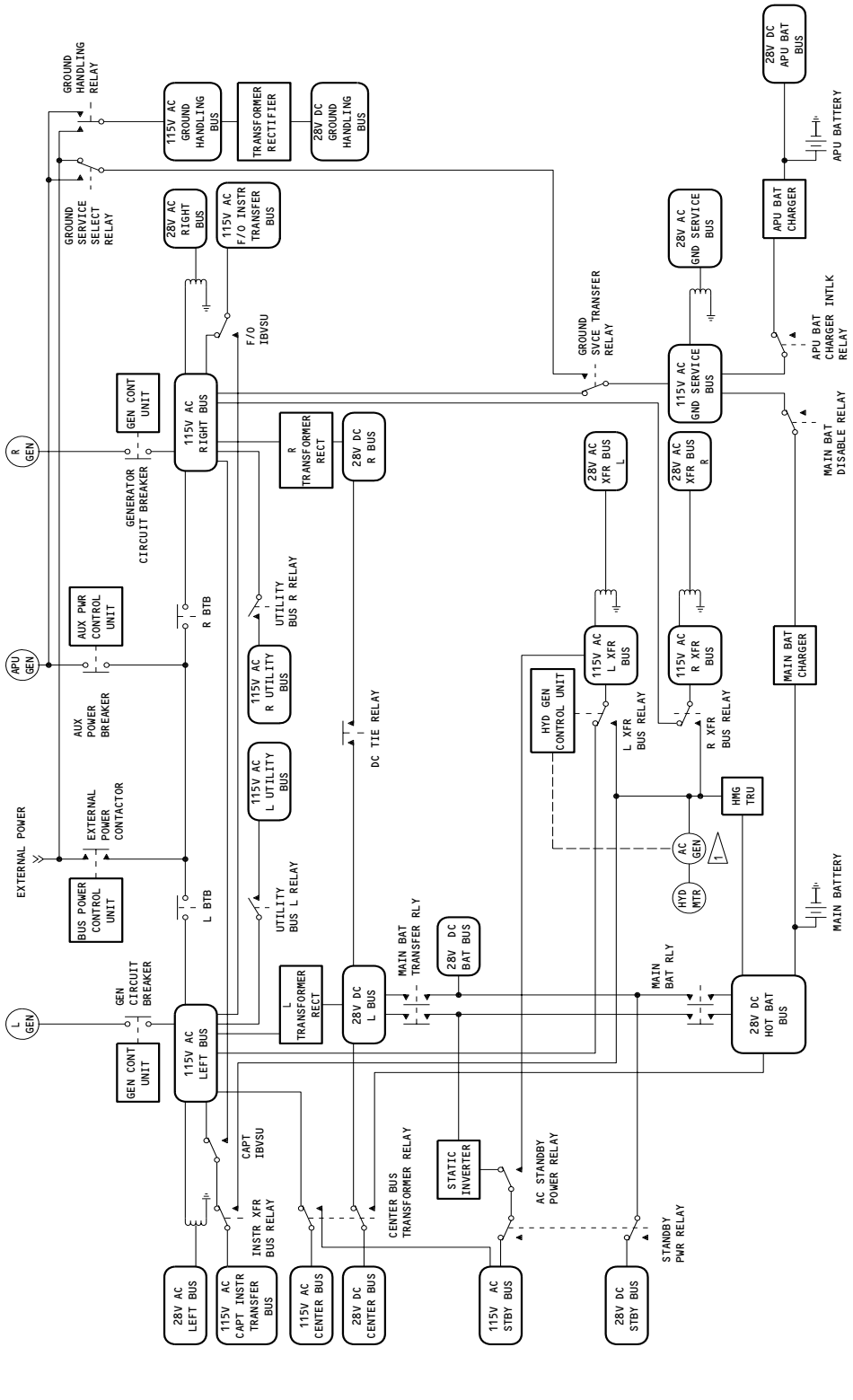
AC ELECTRICAL LOAD DISTRIBUTION - DESCRIPTION AND OPERATION

1. General
   A. Electrical load distribution consists of 115-volt AC buses, 28-volt AC buses, and 28 volt DC buses.
2. General Description (Fig. 1)
   A. 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, flight instrument transfer buses, AC center bus, AC standby bus, AC ground service bus, and AC ground handling bus (Ref 24-51-00).
   B. The left and right 28-volt AC buses are supplied with power by autotransformers tied to the main AC buses (Ref 24-53-00).
   C. 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 (Ref 24-54-00).
   D. 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 (Ref 24-51-00).
   E. 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 (Ref 24-51-00).
   F. AIRPLANES WITH 5 KVA HMG;
   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, and dc power to the hot battery bus. The buses in turn supply selected flight essential loads.
   G. AIRPLANES WITH 10 KVA HMG;
   If power loss occurs at both main AC buses during flight, the hydraulic motor generator (HMG) is activated automatically. The HMG supplies ac power to the R and L transfer buses, and the HMG transformer rectifier unit (TRU). The HMG TRU converts the ac power to dc power which is supplied to the hot battery bus. The buses in turn supply selected flight essential loads.



Electrical Load Distribution Block Diagram
Figure 1 (Sheet 1)

A73925



Electrical Load Distribution Block Diagram
Figure 1 (Sheet 2)

A73940

AC ELECTRICAL LOAD DISTRIBUTION - ADJUSTMENT/TEST

1. General
   A. This procedure has two tasks. The first task does an operational test. The second task does a system test.
   B. The operational test uses only the airplane lights and EICAS indications.
   C. The system test uses test equipment not found on the airplane

TASK 24-50-00-715-003

2. Operational Test - Electrical Power Distribution
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Spoiler/Speedbrake Control System
   B. Prepare for the Test

      S 045-057

      WARNING: DO THE DEACIVATION 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.

   C. Do a test of the Electrical Power Distribution

      S 715-056
      (1) Do a test of the instrument bus voltage sensing units as follows:
         (a) Supply external power to the main AC buses (AMM 24-22-00/201).
         (b) Push the STATUS switch on the EICAS display select panel P9.
         (c) Make sure the EICAS message, CAPT INSTR XFER, does not show on the bottom display.
         (d) Open this P6 panel circuit breaker:
            1) 6M16, CAPT PRIM INSTR BUS ϕA

(e) Make sure the EICAS message, CAPT INSTR XFER, shows on the bottom display.
(f) Close this P6 panel circuit breaker:
1) 6M16, CAPT PRIM INSTR BUS ϕA
(g) Make sure the EICAS message, F/O INSTR XFER, does not show on the bottom display.
(h) Open this P6 panel circuit breaker:
1) 6M22, F/O PRIM INSTR BUS ϕA
(i) Make sure the EICAC message, F/O INSTR XFER, shows on the bottom display.
(j) Close this P6 panel circuit breaker:
1) 6M22, F/O PRIM INSTR BUS ϕA

S 865-012
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 715-013
(3) Do a test on the relays of the left and the right utility bus as follows:
(a) Supply external power to the main AC buses (AMM 24-22-00/201).
(b) Push the switches of the left the and right UTILITY BUS to the ON position.
1) Make sure the white ON lights are on.
2) Make sure the yellow OFF lights are off.
3) Make sure the EICAS display does not show a UTIL BUS OFF indication.
(c) Push the switches of the L and (R) UTILITY BUS to the OFF position.
1) Make sure the yellow OFF lights are on.
2) Make sure the L and (R) UTIL BUS OFF indications are shown on the upper EICAS display.
(d) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 715-014
(4) Do a test on the ground service transfer relay as follows:
(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 P37 panel is on.
(c) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 715-015
(5) Do a test on the ground service select relay as follows:
(a) Supply APU power to the ground service bus (AMM 24-22-00/201).
(b) Make sure the 115 GND SVCE HOT BUS WARNING light on the P37 panel is on.

S 865-016
(6) Remove the APU electrical power if it is not necessary (AMM 24-22-00/201).

S 445-017
(7) Do the activation procedure for the spoilers (AMM 27-61-00/201) if previously deactivated.

TASK 24-50-00-725-002

3. System Test
A. Equipment
(1) Multimeter, ±5% accuracy, used to measure 115 volts AC, 28 volts AC, and 28 volts DC.
(2) Adapter relay - P/N A24004-2
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
D. Prepare for the Test

S 045-018

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.

E. System Test - Electrical Power Distribution

S 725-048

WARNING: EXERCISE CARE WHEN WORKING IN THE POWER PANELS. VOLTAGES PRESENT CAN CAUSE SERIOUS INJURY AND/OR DAMAGE TO EQUIPMENT.

(1) Do a test on the center bus transfer relay as follows:
  (a) Remove the isolation request relay from the P6 panel.
  (b) Install the relay adapter in the isolation request relay socket, and set the switch on the adapter to ON.
  (c) Set the multimeter to measure 28 volts DC. Connect the meter to terminal B of FLT CONT CMPTR DC C (11E20, C518) circuit breaker and ground.
  (d) Supply electrical power to the left main AC bus (AMM 24-22-00/201).
  (e) Measure 24 ±4 volts DC.
  (f) Open this P6 panel circuit breaker:
    1) 6L12, CENTER BUS DC
  (g) Measure zero volts DC.
  (h) Close this P6 panel circuit breaker:
    1) 6L12, CENTER BUS DC

S 865-025

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

S 865-026
(3) Set the switch on the relay adapter to OFF and remove the adapter. Install the isolation request relay and close the P6 panel.

S 865-027
(4) Remove the meter and close the P11 panel.

S 725-028
(5) Do a test of the ground handling relay as follows:
(a) Set the multimeter to measure 115 volts AC.
(b) Open the P34 panel and connect the meter to terminal A2 of the ground handling relay K101 and ground.
(c) Supply external power to the ground handling bus (AMM 24-22-00/201).
(d) Measure 115 ±5 volts AC.

S 865-029
(6) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 865-030
(7) Remove the meter and close the P34 panel.

S 725-031
(8) Do a test of the ground power transformer rectifier unit as follows:
(a) Set the multimeter to measure 28 volts DC.
(b) Open the P34 panel and connect the meter to the output terminals of the ground power TRU T103.
(c) Supply external power to the ground handling bus (AMM 24-22-00/201).
(d) Measure 28 ±4 volts DC.

S 865-032
(9) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 865-033
(10) Remove the meter and close the P34 panel.

S 725-034
(11) Do a test of the left and right 28 volt AC autotransformers, as follows:
(a) Set the multimeter to measure 28 volts AC.
(b) Open the P70 panel and connect the meter to the LV terminal of the left autotransformer T123 and ground.
(c) Supply external power to the left main AC bus (AMM 24-22-00/201).
(d) Measure 28 ±4 volts AC.
(e) Push the EXT PWR switch on the M10063 electrical system control panel. Make sure the white ON light is off.
(f) Remove the meter and close the P70 panel.
(g) Open the P33 panel.
(h) Connect the meter to the LV terminal of the right autotransformer T124 and ground.
(i) Push the right BUS TIE switch on the M10063 panel to AUTO (in) position.
(j) Push the left BUS TIE switch to the ISLN (out) position.
(k) Push the EXT PWR switch, and make sure the white ON light is on.
(l) Measure 28 ±4 volts AC.
(m) Push the EXT PWR switch, and make sure the white ON light goes off.
(n) Push the left BUS TIE switch to the AUTO (in) position.

S 865-035
(12) Remove electrical power if it is not necessary (AMM 24-22-00/201).

S 865-036
(13) Remove the meter and close the P33 panel.

S 725-037
(14) Do a test of the ground service 28 volt AC auto transformer, as follows:
(a) Set the multimeter to measure 28 volts AC.

(b) Open the P34 panel, and connect the meter to the LV terminal of the ground service autotransformer T126 and ground.
(c) Supply external power to the ground service bus (AMM 24-22-00/201).
(d) Measure 28 ±4 volts AC.

S 865-038
(15) Remove electrical power if it not necessary (AMM 24-22-00/201).

S 865-039
(16) Remove the meter and close the P34 panel.

S 445-040
(17) Do the activation procedure for the spoilers (AMM 27-61-00/201) if previously deactivated.

TASK 24-50-00-715-041

4. Operational Test - Instrument Bus Voltage Sensing Unit

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

B. Prepare for the Test

S 045-058

WARNING: DO THE DEACIVATION 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.

C. Do a Test of the Instrument Bus Voltage Sensing Unit

S 715-065
(1) Do a test of the instrument bus voltage sensing units as follows:
(a) Supply external power to the main AC buses (AMM 24-22-00/201).

(b) Push the STATUS switch on the EICAS display select panel, P9.
(c) Make sure that EICAS message, CAPT INSTR XFER, does not show on the bottom display.
(d) Open this P6 panel circuit breaker:
1) 6M16, CAPT PRIM INSTR BUS ϕA
(e) Make sure the EICAS message, CAPT INSTR XFER, shows on the bottom display.
(f) Close this P6 panel circuit breaker:
1) 6M16, CAPT PRIM INSTR BUS ϕA
(g) Make sure the EICAS message, F/O INSTR XFER, does not show on the bottom display.
(h) Open this P6 panel circuit breaker:
1) 6M22, F/O PRIM INSTR BUS ϕA
(i) Make sure the EICAS message, F/O INSTR XFER, shows on the bottom display.
(j) Close this P6 panel circuit breaker:
1) 6M22, F/O PRIM INSTR BUS ϕA

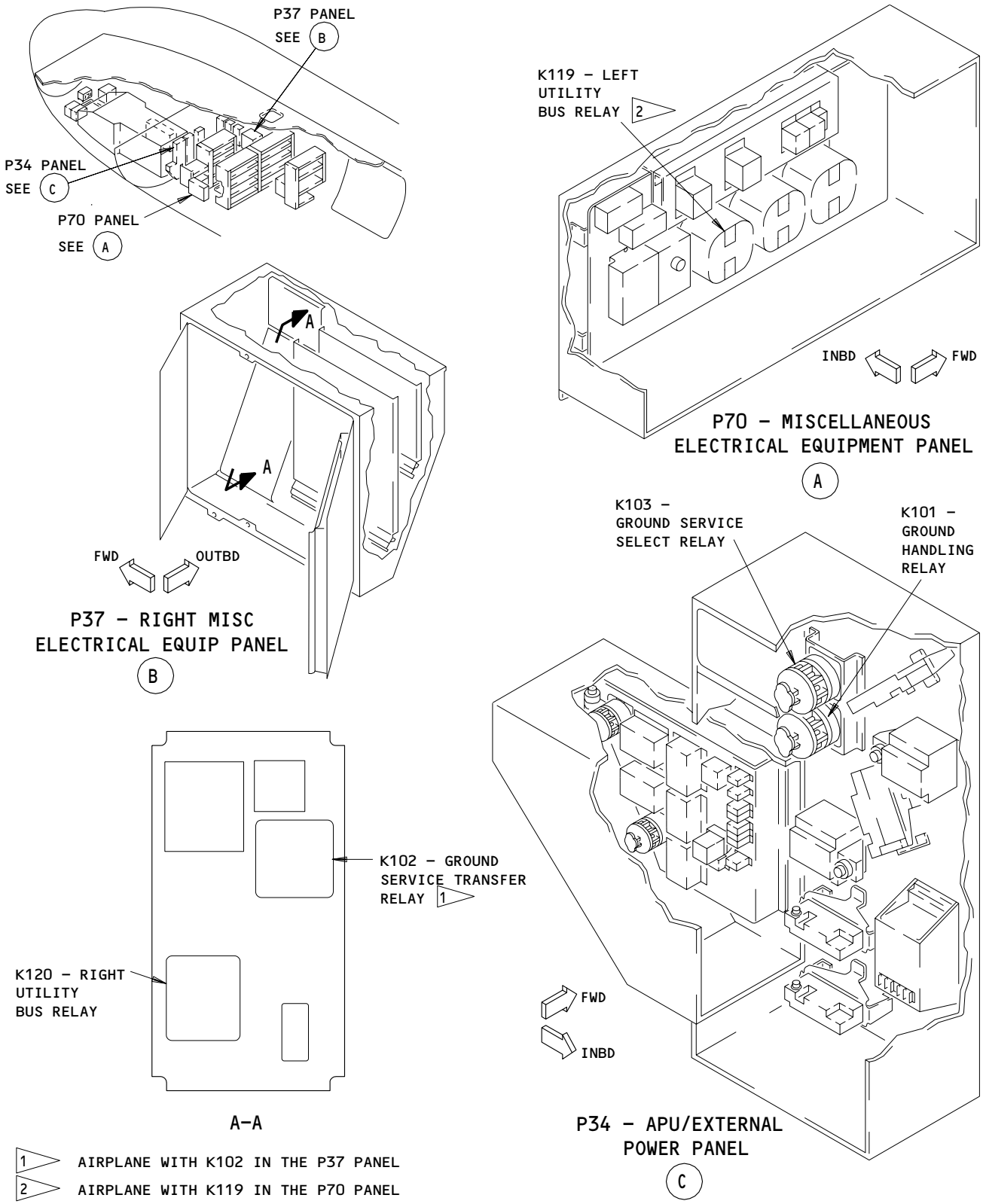
D. Put the Airplane Back to Its Usual Condition

S 445-042
(1) Do the activation procedure for the spoilers if you did the deactivation procedure (AMM 27-61-00/201).

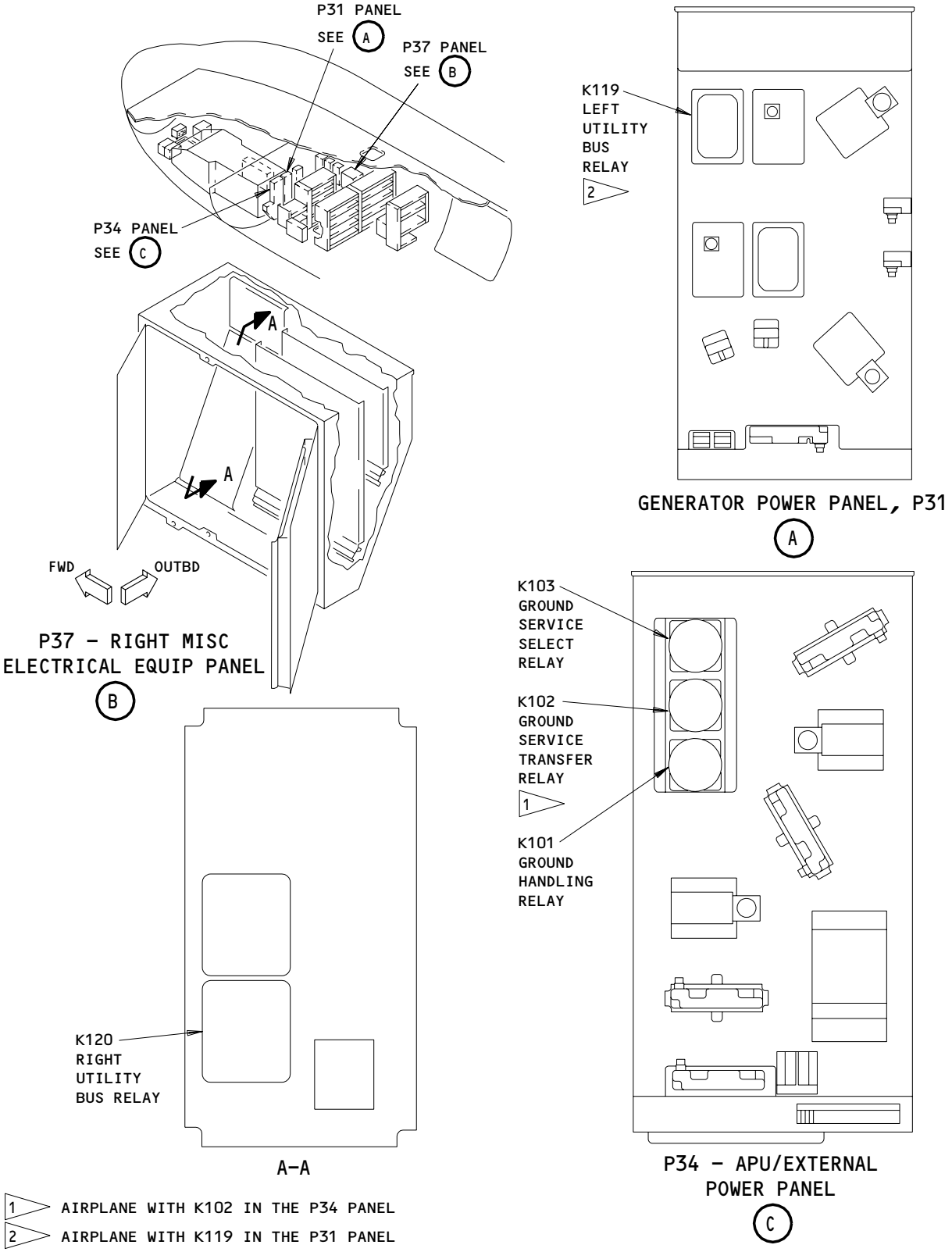
S 865-043
(2) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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, captains flight instrument transfer bus, left utility bus, and left galley buses. The right main AC bus supplies power to the ground service bus, right utility bus, first officers flight instrument transfer bus, and right galley buses. The ground handling bus is powered from external power or the APU generator. System components include: Utility bus relays, center bus transfer relay, ground service select relay, ground service transfer relay, ground handling relay, and instrument bus voltage sensing units.
2. Component Details (Fig. 1)
   A. Utility Bus Relays
      (1) Utility buses are connected to the main AC buses through utility bus relays. These relays are controlled by the bus power control unit (BPCU), and can be de-energized if load reduction is necessary. Relays are located in P7O misc. electrical equipment panel, and P37 right misc. electrical equipment panel.
   B. Center Bus Transfer Relay
      (1) The center bus transfer relay selects the input power source for the AC center bus. When de-energized, the relay selects left main AC and DC bus power. When 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 ground service bus is powered from the right main AC bus. Energized, the relay selects external power or APU generator power. The relay is located in P37 panel or P34 panel.
   D. Ground Handling Relay
      (1) The ground handling relay selects either external power or APU generator power for the ground handling bus. The relay is a dual position type, with a center off position. The relay is in APU/external power panel P34.
   E. Ground Service Select Relay
      (1) The ground service select relay selects APU or external power for the ground service transfer relay. The relay selects APU power when energized. When APU and external power are available, external power has priority. The relay is located in P34 panel.
   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.

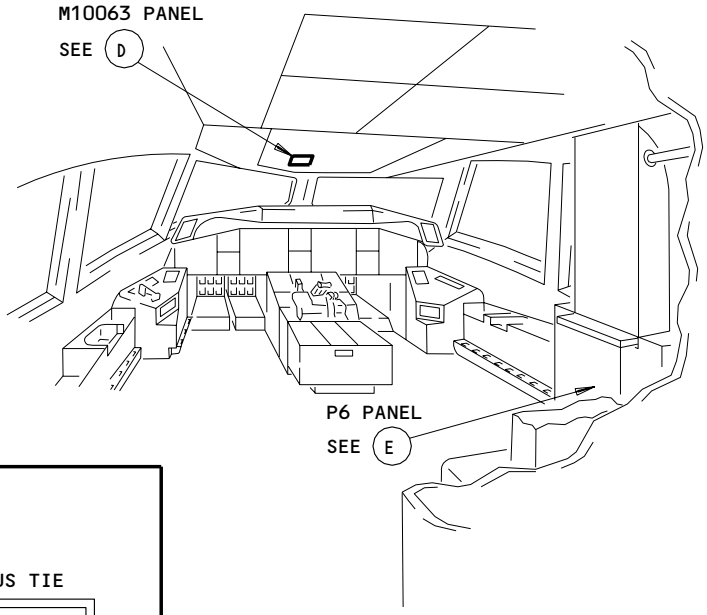


115 – Volt AC Power Distribution Component Location
Figure 1 (Sheet 1)

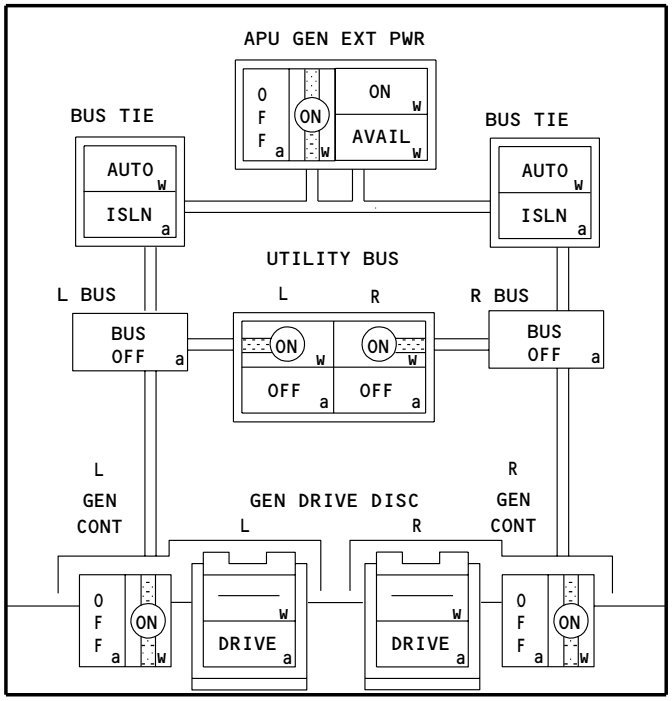


115 – Volt AC Power Distribution Component Location
Figure 1 (Sheet 2)

H74269

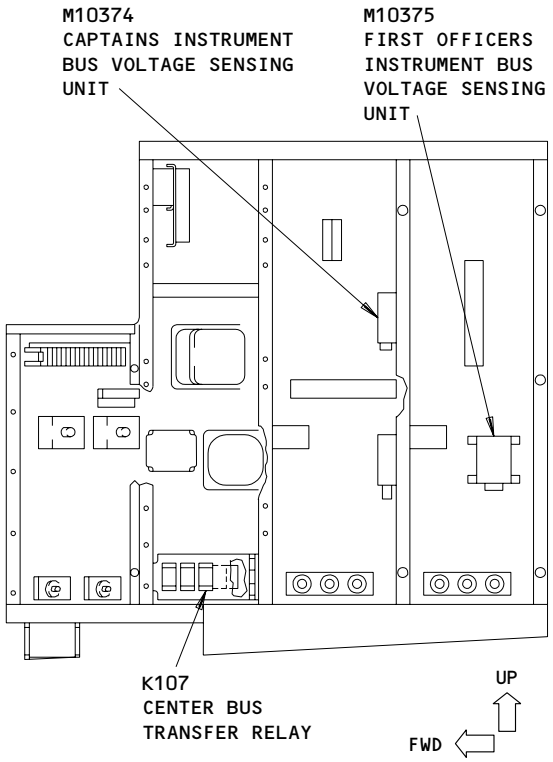


FLIGHT COMPARTMENT



M10063–ELECTRICAL SYSTEM CONTROL PANEL

D

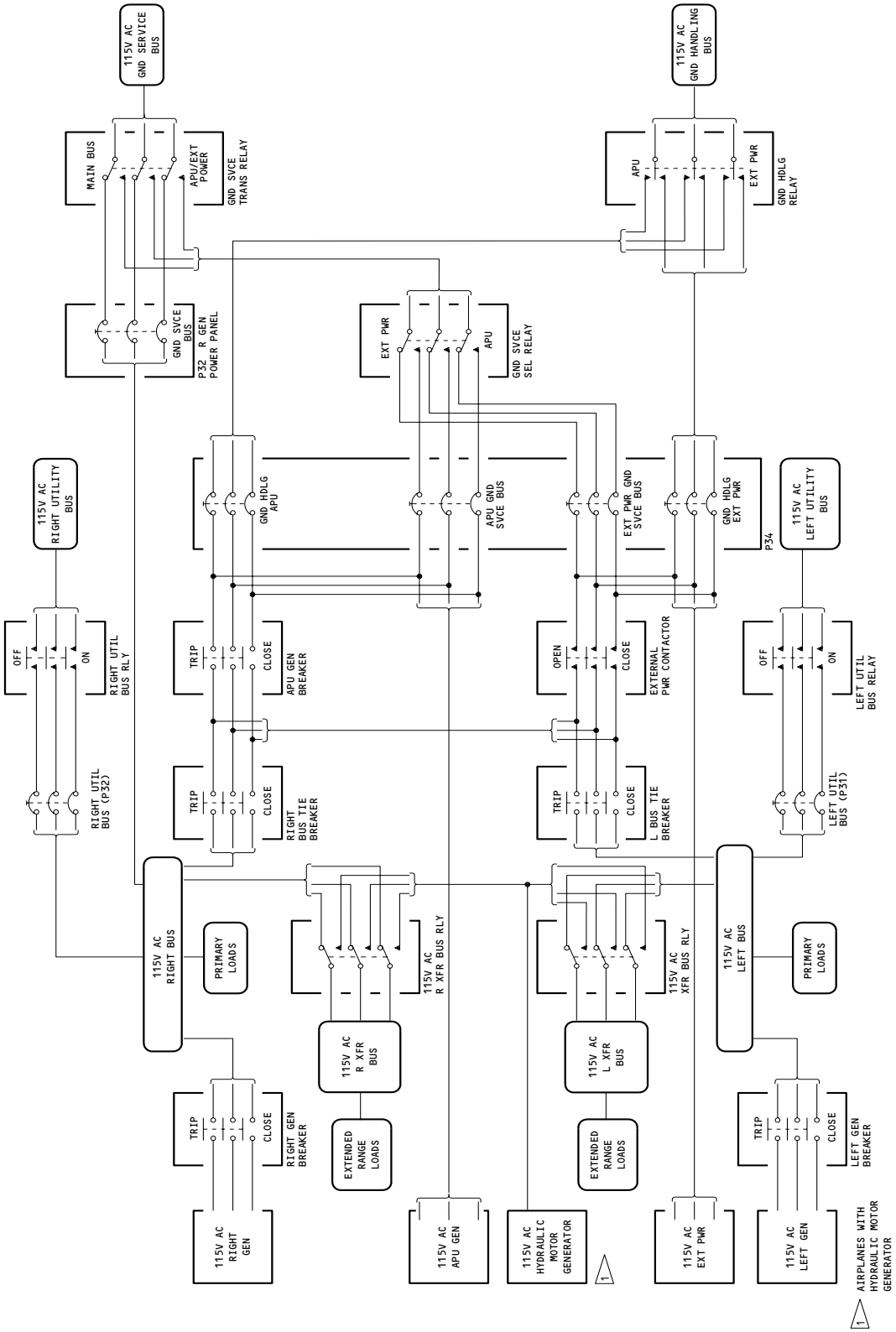


P6–MAIN POWER DISTRIBUTION PANEL

E

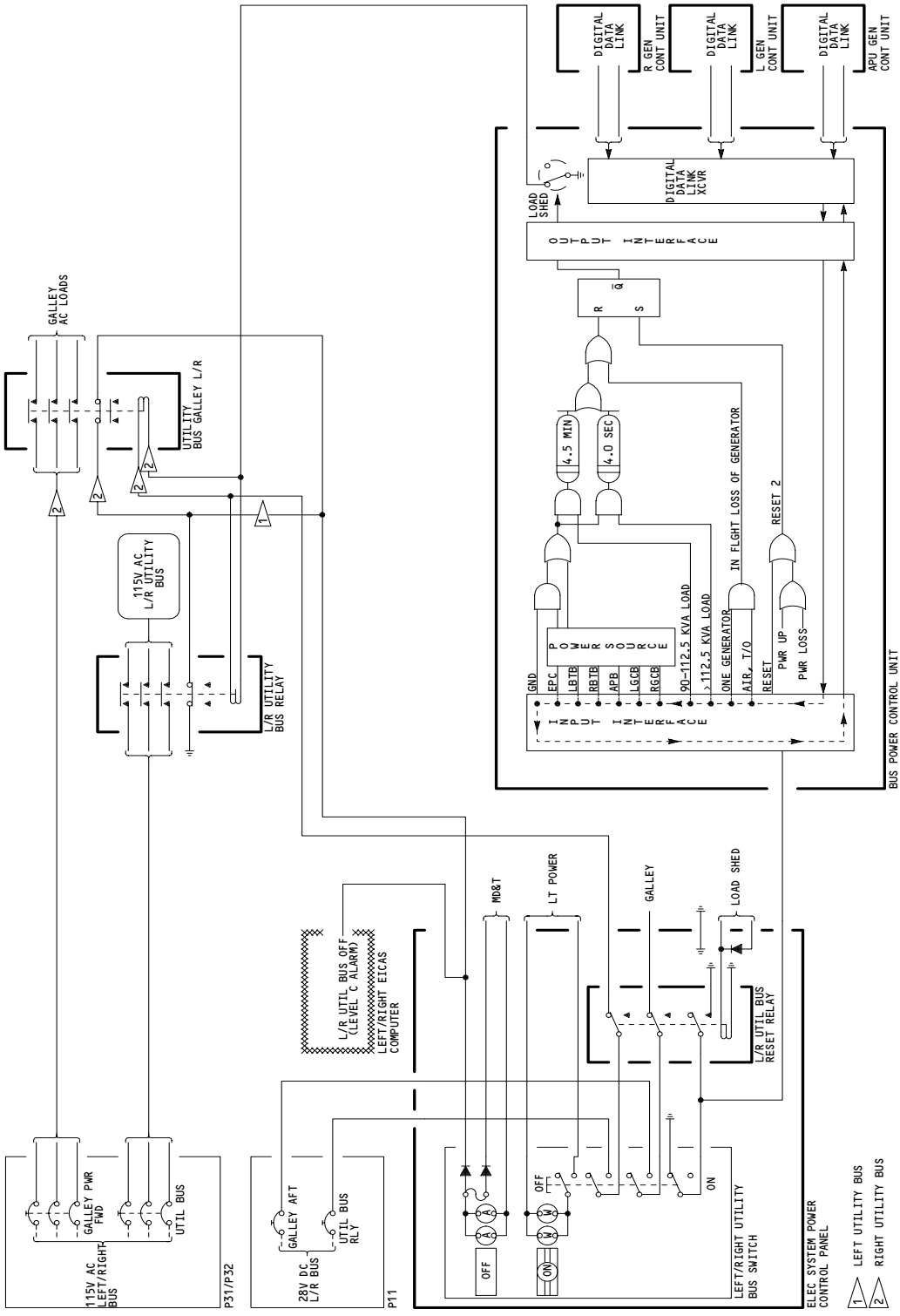
115 – Volt AC Power Distribution Component Location
Figure 1 (Sheet 3)

3. Operation
   A. Functional Description
      (1) Main AC Buses (Fig. 2)
         (a) When the left generator is operating with its generator circuit breaker (GCB) open, a red L GEN warning light on left generator power panel P31 is on. If the left GCB is closed, a red L 115 VAC warning light will also be on. The L 115 VAC warning light is on P31 panel. The right main AC bus functions similarly. The components are on right generator power panel P32.
         (b) The main AC buses can also be powered by the APU generator or external power. This power is connected through contactors to the AC tie bus. Three-phase bus tie breakers connect the power to the main AC buses. Three red warning lights will be on: EXT BUS TIE on P34 panel, LEFT TIE BUS on P32 panel, and if the APU generator is used, a red HOT BUS WARN light on P34 will also be on.
         (c) 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.
         (d) The first two sections of both main buses are in overhead cicuit breaker panel P11. The third section of both buses is divided between P6 and P11 panels. The fourth section of the left bus is in left misc. electrical equipment panel P36. The fourth section of the right bus is in right misc. electrical equipment panel P37.
         (e) EICAS computers monitor main AC bus status.
      (2) Utility Buses and Galley Buses (Figs. 3, and 4)
         (a) The left and right utility buses supply single-phase and three-phase power to non-essential loads. Power to these loads is removed if load reduction is needed. The left utility bus is located in P36 panel, and the right utility bus is located in P37 panel.
         (b) Two utility bus relays (UBR's) control utility bus power. The utility bus is powered when its UBR is energized. Two push on/push off UTIL BUS switches on M10063 electrical system control panel provide manual control of the UBR's. 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. Pressing the switch in energizes the the UBR's, and a white ON light in the switch comes on.
         (c) Galley buses are also controlled by the UTIL BUS switches. Pressing the switches in energizes the utility bus galley relays, supplying power to the galley buses. The white ON light in the switch is on. The galley buses have no power if the switches are in the out position.

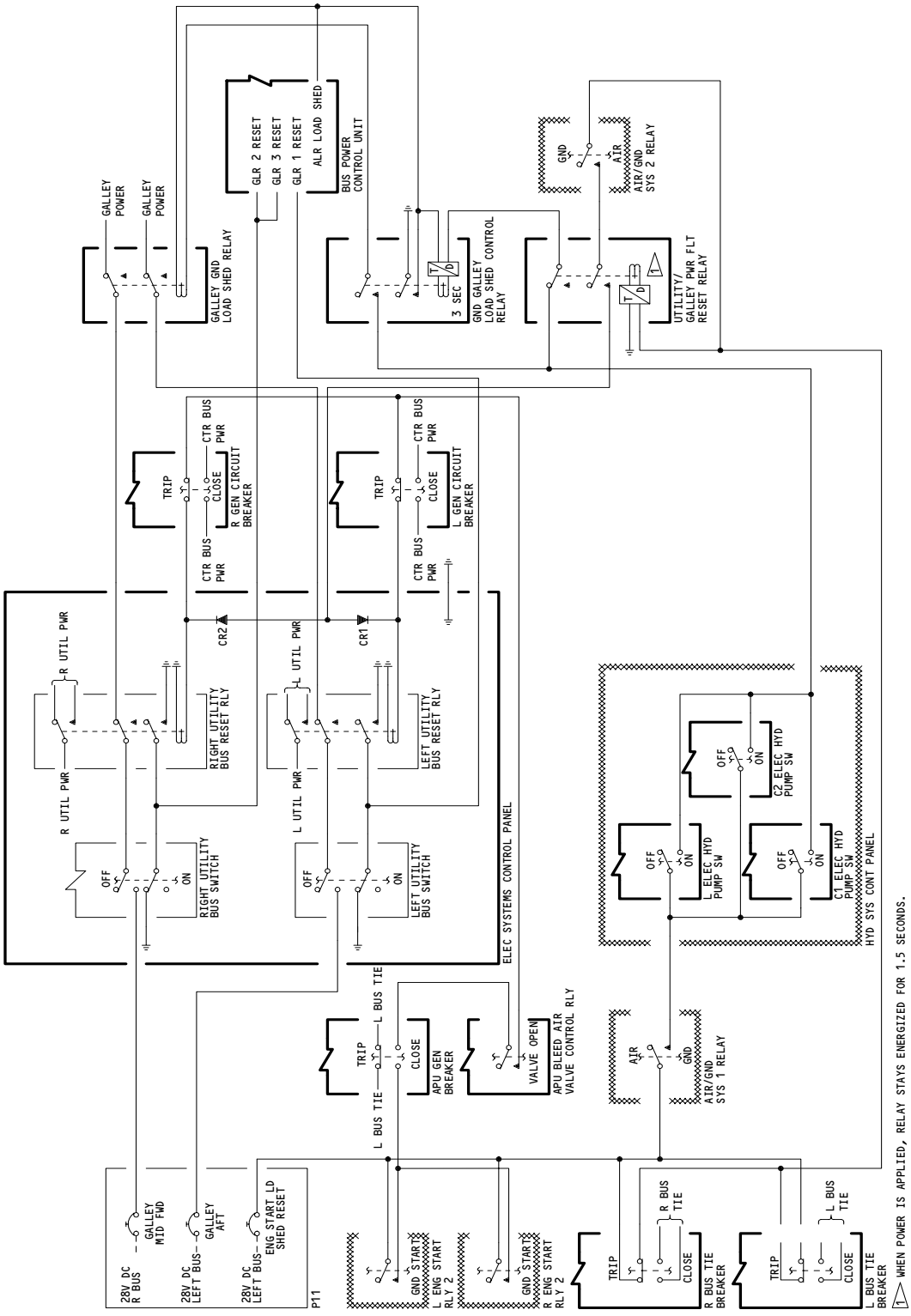


Main AC Bus Schematic
Figure 2

H12309



Left/Right Utility Bus Control Schematic
Figure 3



Load Shedding Schematic
Figure 4

(d) AIRPLANES WITH VIDEO ENTERTAINMENT SYSTEMS;
The UTIL BUS switches also provide manual control of the IFE Switching relays (K10856 or K10857). 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 and galley bus shedding occurs during the following conditions:
1) Loss of one or more generators in flight (both utility and galley buses shed).
2) One source overloaded with two sources operating either in flight or on the ground (respective utility and galley buses shed).
3) Overload with one source supplying both buses on the ground (both utility and galley buses shed).

(f) Galley buses are temporarily shed when the airplane is powered by APU or external power with a hydraulic pump on and load greater than 90 KVA. This protection is for ground mode only.

(g) Utility and galley buses are automatically reset when returning to two generator operation in flight. Utility and galley buses lost due to overload conditions must be manually reset by cycling the appropriate UTILITY BUS switches.

(h) Utility and galley bus power is temporarily removed when starting an engine with APU pneumatics and APU electrical power. Only the utility and galley buses being supplied by APU power will be interrupted. The utility and galley buses will be automatically reset when the engine generator comes on line.

(i) EICAS computers monitor utility bus status.

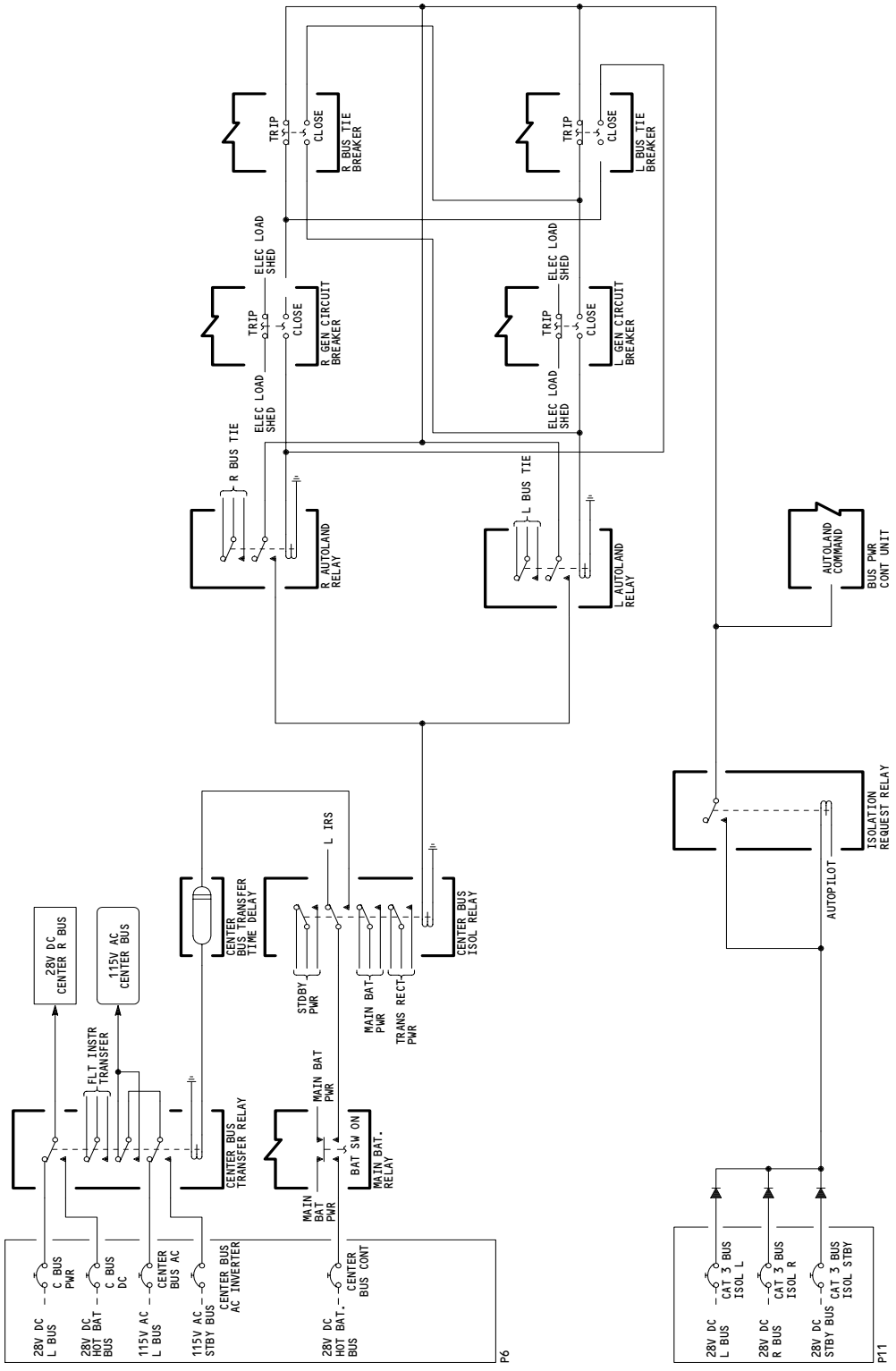
(3) AC Center Bus (Fig. 5)

(a) The AC center bus provides a third, independent power source during autoland conditions. The bus is normally powered from the left main AC bus. If an autoland signal is received, the autoland relay energizes, connecting the center bus to the standby power bus. The AC center bus is in P6 panel.

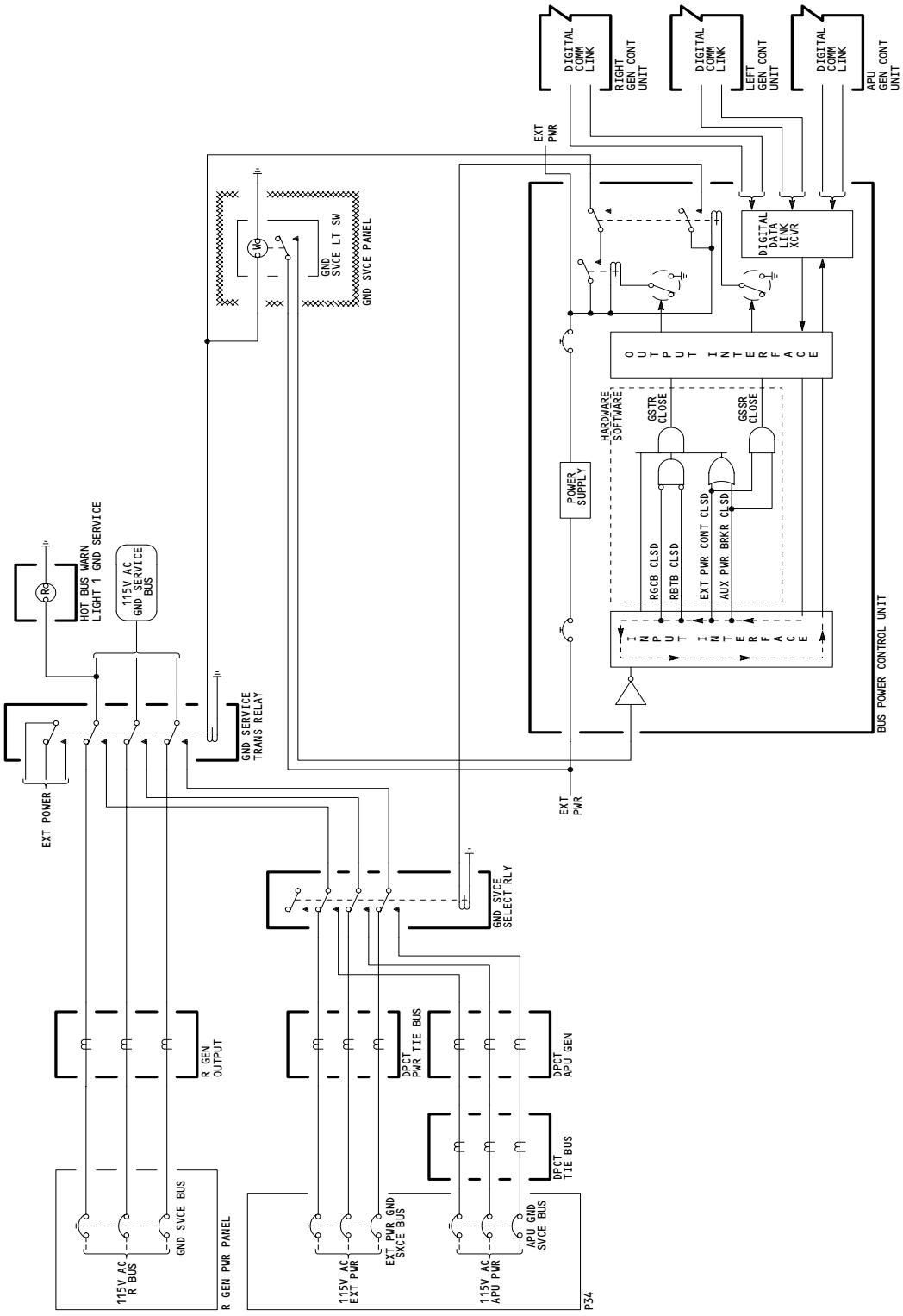
(4) Ground Service Bus (Fig. 6)

(a) The ground service bus provides power to loads used inflight and on the ground. The bus is normally powered from the right main AC bus. External power or APU generator power can also be used. A red GND SVCE warning light on right generator power panel P32 is on when the bus has power. The ground service bus and circuit breakers are in P32, P6, P37, P34, and P11 overhead circuit breaker panels.

(b) The BPCU works with a ground service switch to control two main relays: the ground service select relay, and the ground service transfer relay. The ground service select relay is in APU/external power panel P34. The ground service switch is on forward left attendant's panel P21. The switch is a momentary action type. Pushing the switch once turn on the ground service bus, pushing it again turns the bus off. A white light in the switch shows when APU or external power is used.



Center Bus Schematic
Figure 5

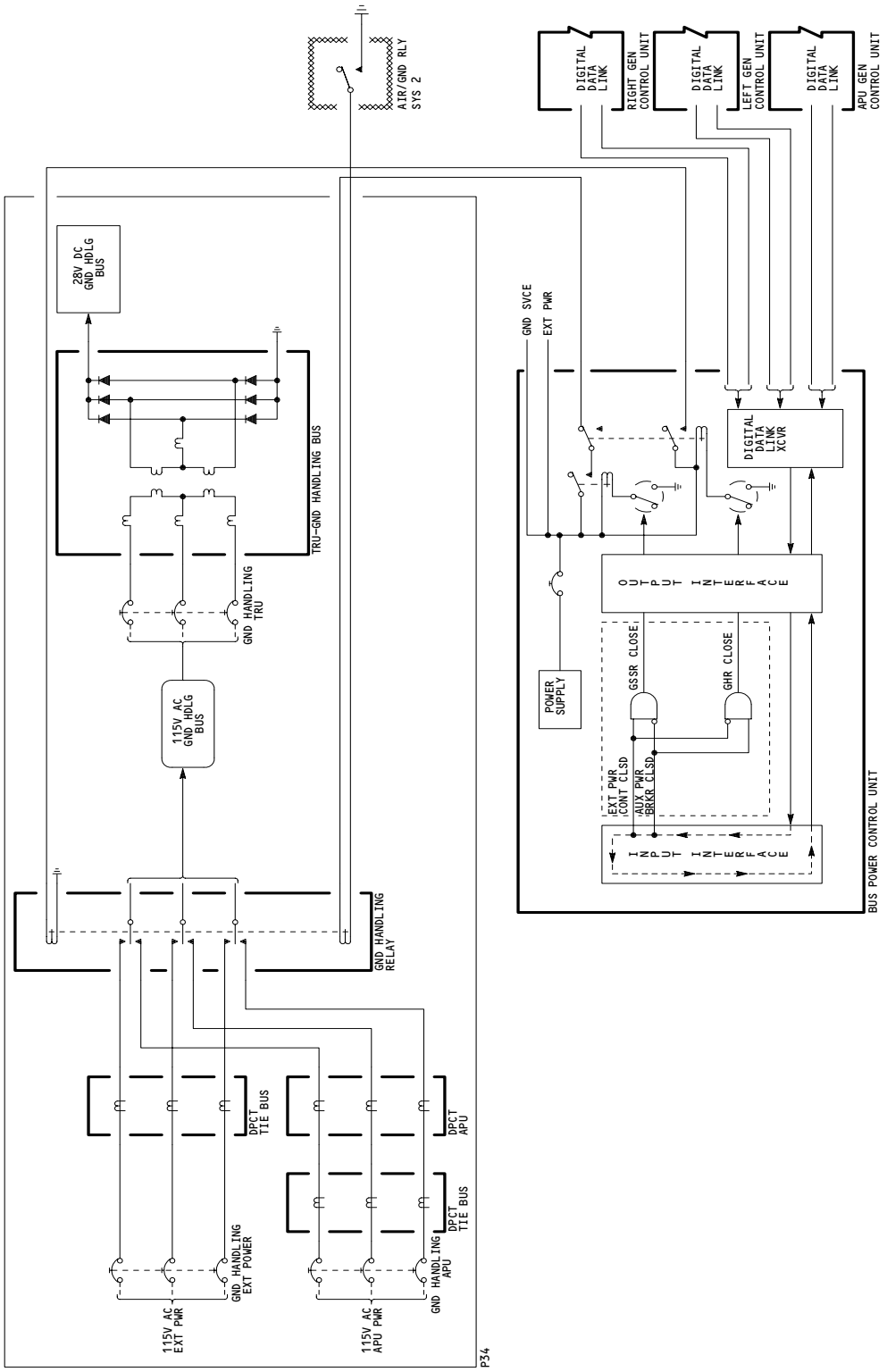


Ground Service Bus Schematic Diagram
Figure 6

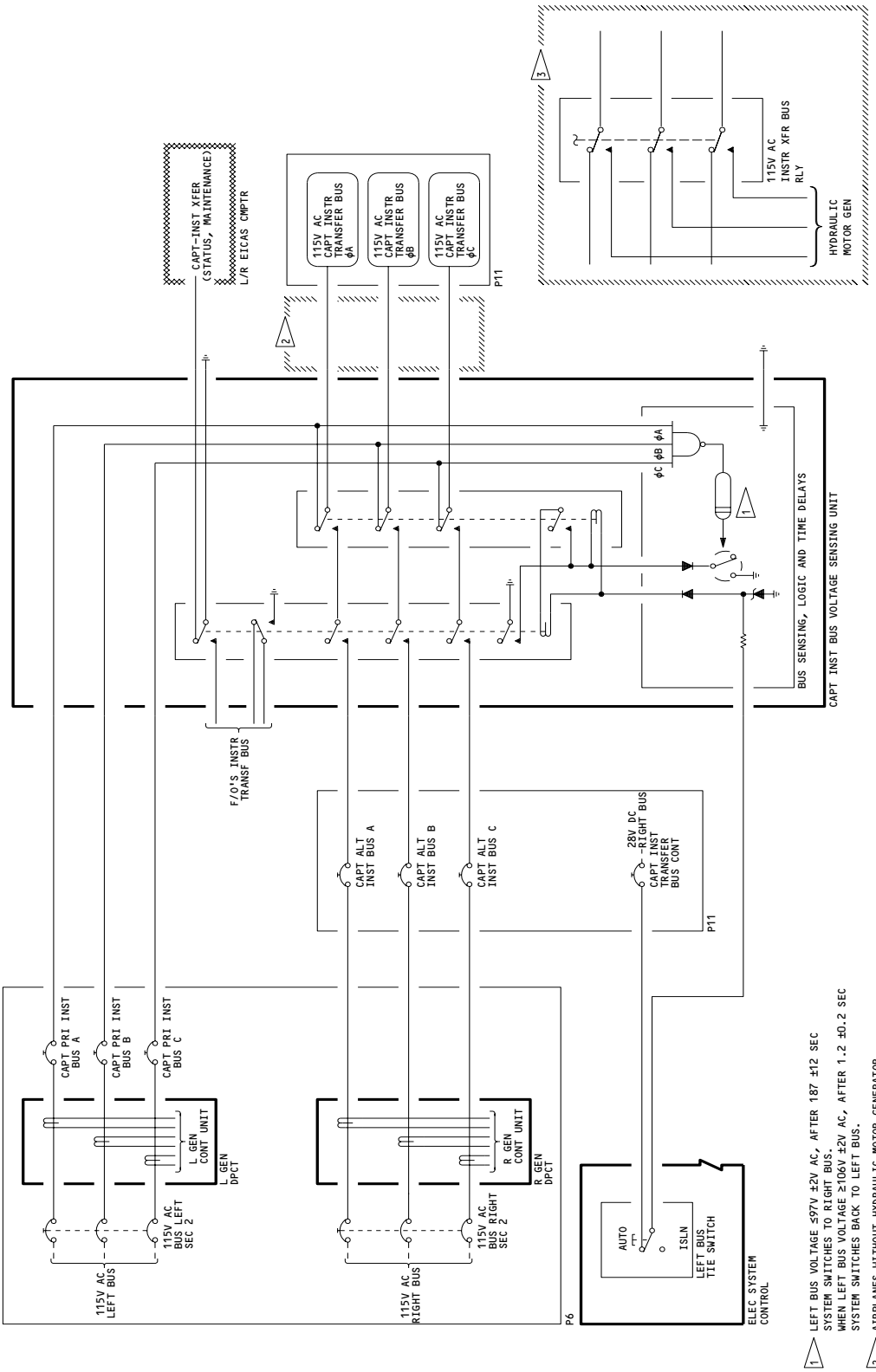
(c) The ground service bus is normally powered by the right main AC bus. The GROUND SERVICE switch has no effect. The ground service transfer relay is de-energized.
(d) If the right main AC bus is unpowered, APU or external power may be used. The BPCU activates the ground service relay to select either APU or external power (external power has priority). Pressing the GROUND SERVICE switch causes the BPCU to energize the ground service transfer relay. The ground service bus is powered. Removing APU or external power causes all relays to de-energize. The GROUND SERVICE light goes off.
(e) Re-energizing the right main AC bus automatically switches the ground service bus back to right main AC bus power. The GROUND SERVICE light goes off.
(f) The ground service bus will trip under the following 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 service bus after a protective trip, cycle the GND SERVICE switch.

(5) Ground Handling Bus (Fig. 7)
(a) The ground handling bus provides power to loads used on the ground only. The bus is powered from the APU generator or external power (external power has priority). The three position ground handling relay connects power to the bus. The bus and circuit breakers are in P34 panel.
(b) The ground handling bus is not powered inflight. The BPCU prevents the bus from energizing with APU power inflight.
(c) The ground handling bus will trip under the following conditions (Ref 24-23-00):
1) over voltage
2) under voltage
3) over frequency
4) under frequency
5) over current
6) open phase
(d) To reset the ground handling bus after a protective trip, cycle (press and release) the GROUND SERVICE switch.

(6) Flight Instrument Transfer Buses (Figs. 8 and 9)



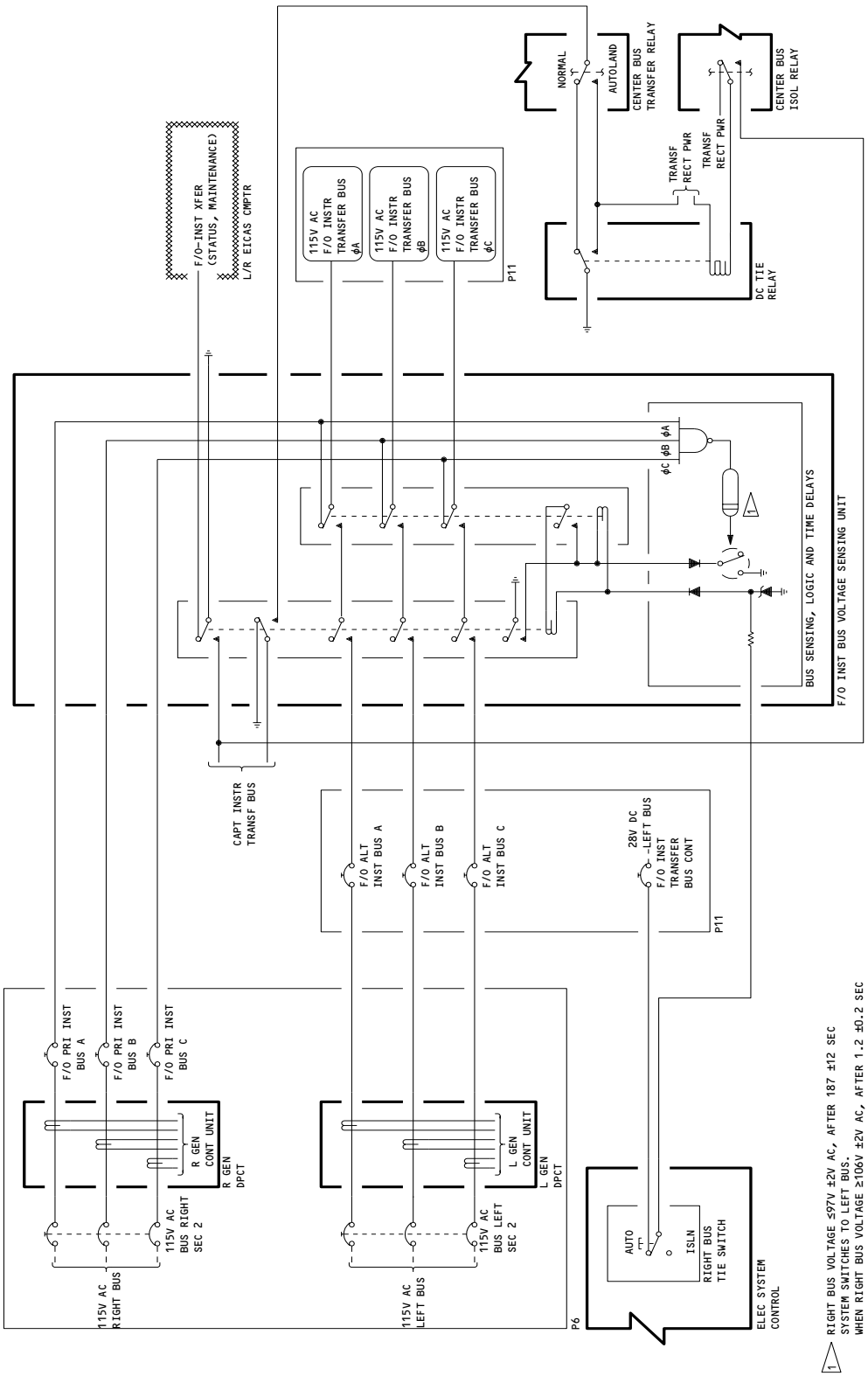
Ground Handling Bus Schematic
Figure 7



1. LEFT BUS VOLTAGE ≤97V ±2V AC, AFTER 187 ±12 SEC SYSTEM SWITCHES TO RIGHT BUS. WHEN LEFT BUS VOLTAGE ≥106V ±2V AC, AFTER 1.2 ±0.2 SEC SYSTEM SWITCHES BACK TO LEFT BUS.
2. AIRPLANES WITHOUT HYDRAULIC MOTOR GENERATOR
3. AIRPLANES WITH HYDRAULIC MOTOR GENERATOR

Captain's Flight Instrument Transfer Bus Schematic
Figure 8

H1230A



First Officer's Flight Instrument Transfer Bus Schematic
Figure 9

78780

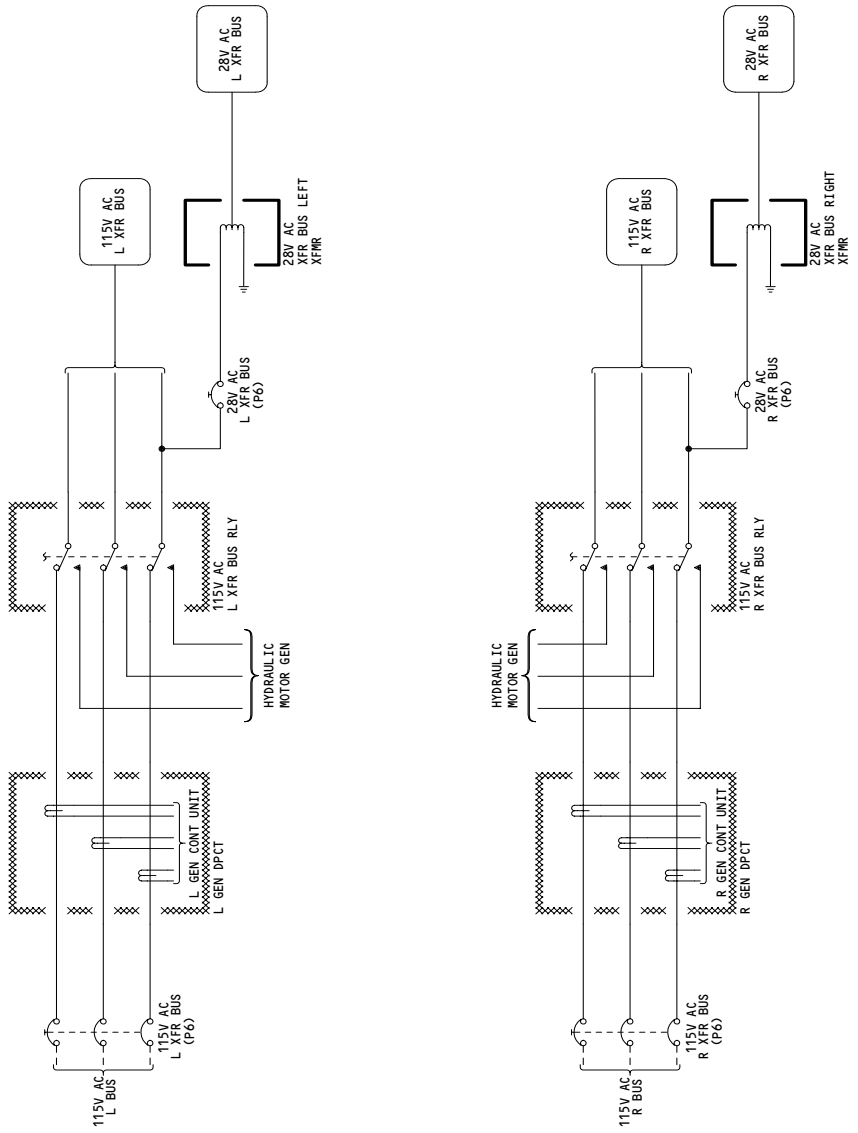
(a) The flight instrument transfer buses allow switching of the captain's or first officer's instruments to the alternate main AC bus if the respective main AC bus loses power. The normal power source for the captain's flight instrument transfer bus is the left main ac bus. The normal power source for 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.

(b) An EICAS message appears if either the captain's or first officer's transfer bus switches to its alternate power source while its main source still has power: CAPT INSTR XFER or F/O INSTR XFER.

(c) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR;
If power is lost to both main ac buses the hydraulic motor-driven generator system will supply power to the captain's instrument transfer bus via the 115v ac instrument transfer relay.

(7) AC Transfer Bus (Fig. 10)

(a) AIRPLANES WITH HYDRAULIC MOTOR GENERATOR;
The left and right AC Transfer Buses are powered by the Hydraulic Motor Generator (HMG) through the left and right ac transfer bus relays respectively if power is lost to both main ac buses during flight.



AC Transfer Buses
Figure 10

115-VOLT AC POWER DISTRIBUTION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
CIRCUIT BREAKERS			FLT COMPT, P6	
ϕA CAPT PRIM INSTR BUS, C4264		1	6M16	*
ϕB CAPT PRIM INSTR BUS, C4265		1	6M17	*
ϕC CAPT PRIM INSTR BUS, C4266		1	6M18	*
ϕA F/O PRIM INSTR BUS, C4267		1	6M22	*
ϕB F/O PRIM INSTR BUS, C4268		1	6M23	*
ϕC F/O PRIM INSTR BUS, C4269		1	6M24	*
AC STBY BUS PWR, C874		1	6K16	*
CENTER BUS AC, C876		1	6K17	*
28V AC BUS L, C877		1	6K18	*
28V AC BUS R, C878		1	6K24	*
115V AC BUS L SEC 1, C313		1	6C14	*
115V AC BUS L SEC 2, C308		1	6A17	*
115V AC BUS L SEC 3, C310		1	6A14	*
115V AC BUS R SEC 1, C319		1	6C20	*
115V AC BUS R SEC 2, C307		1	6A23	*
115V AC BUS R SEC 3, C317		1	6A20	*
CIRCUIT BREAKERS			FLT COMPT, P11	
LIGHTING CAPT INSTR ALT BUS A, C4227		1	11Q34	*
LIGHTING CAPT INSTR ALT BUS B, C4229		1	11Q35	*
LIGHTING CAPT INSTR ALT BUS C, C4231		1	11Q36	*
LIGHTING F/O INSTR ALT BUS A, C4266		1	11Q7	*
LIGHTING F/O INSTR ALT BUS B, C4228		1	11Q8	*
LIGHTING F/O INSTR ALT BUS C, C4230		1	11W9	*
LIGHTING CAPT INSTR XFR CONT, C4225		1	11Q33	*
LIGHTING F/O INST XFR CONT, C4224		1	11Q6	*
MISC SYS CAT III BUS ISOL L, C824		1	11R3	*
MISC SYS CAT III BUS ISOL R, C825		1	11R30	*
MISC SYS UTIL BUS L, C822		1	11R4	*
MISC SYS UTIL BUS R, C823		1	11R31	*
CIRCUIT BREAKER			119BL, MAIN EQUIP CTR, P31	
UTIL BUS - LEFT, C311		1	31A2	*
CIRCUIT BREAKERS			119BL, MAIN EQUIP CTR, P32	
R GEN GND SVCE BUS, C316		1	32A8	*
UTIL BUS - RIGHT, C315		1	32A7	*
CIRCUIT BREAKERS			119BL, MAIN EQUIP CTR, P34	
GND SVCE BUS APU, C322		1	34A2, SECT C	*
GND SVCE BUS EXT PWR, C306		1	34E2, SECT C	*

* SEE THE WDM EQUIPMENT LIST

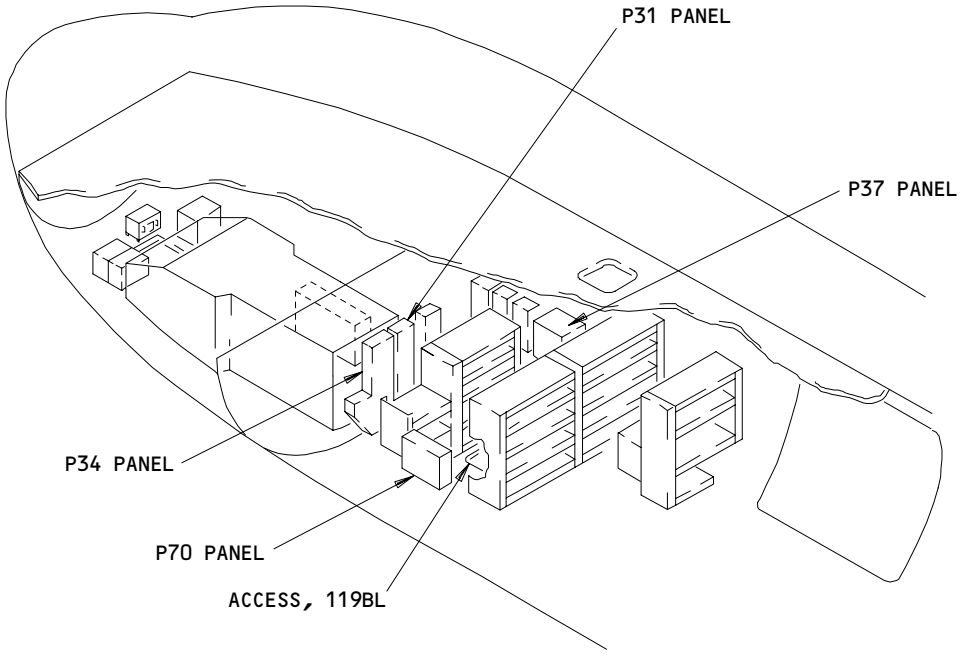
115-Volt AC Power Distribution - Component Index
Figure 101 (Sheet 1)

115-VOLT AC POWER DISTRIBUTION

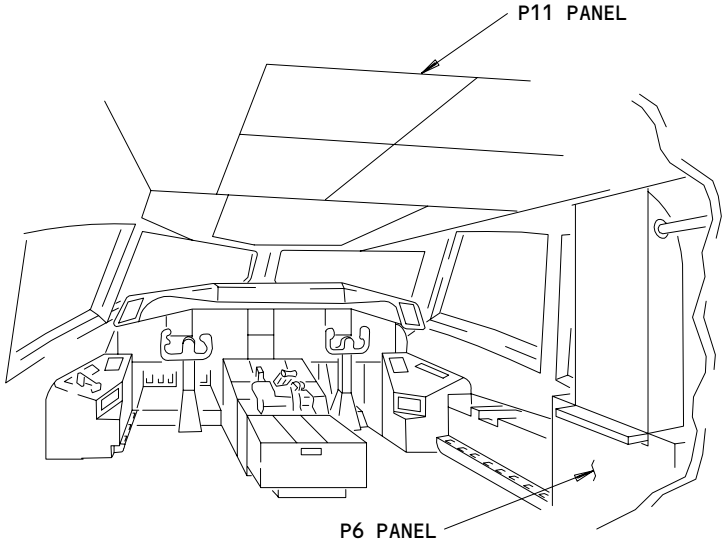
COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	REFERENCE
RELAYS - (REF 31-01-06, FIG. 101)				
CENTER BUS ISOLATION, K123				*
CENTER BUS TRANSFER, K107				*
ISOLATION REQUEST, K122				*
RELAYS (REF 31-01-34, FIG. 101)				
GROUND HANDLING, K101				24-51-01
GROUND SERVICE SELECT, K103				24-51-04
RELAYS (REF 31-01-37, FIG. 101)				
GALLEY GROUND LOAD SHED, K10136				*
GROUND GALLEY LOAD SHED CONT, K10391				*
GROUND SERVICE TRANSFER, K102				24-51-03
RIGHT UTILITY BUS, K120				24-51-02
UTILITY/GALLEY POWER FLIGHT RESET, K10109				*
UTILITY BUS GALLEYS R, K10298				*
RELAY (REF 31-01-70, FIG. 101)				
LEFT UTILITY BUS, K119				24-51-02
UNIT (REF 31-01-06, FIG. 101)				
CAPTAIN'S INSTRUMENT BUS VOLTAGE SENSING, M10374				24-51-08
FIRST OFFICER'S INSTRUMENT BUS VOLTAGE SENSING, M10375				24-51-08

* SEE THE WDM EQUIPMENT LIST

115-Volt AC Power Distribution - Component Index
Figure 101 (Sheet 2)



MAIN EQUIPMENT CENTER



FLIGHT COMPARTMENT

115 Volt AC Power Distribution - Component Location
Figure 102

GROUND HANDLING RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the ground handling relay from the airplane. The second task installs the ground handling relay on the airplane.

TASK 24-51-01-024-001

2. Remove the Ground Handling 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
          119/120 Main Equipment Center
          211/212 Flight Compartment

      (2) Access Panel
          119AL Main Equipment Center

   C. Prepare for the Removal

      S 044-002

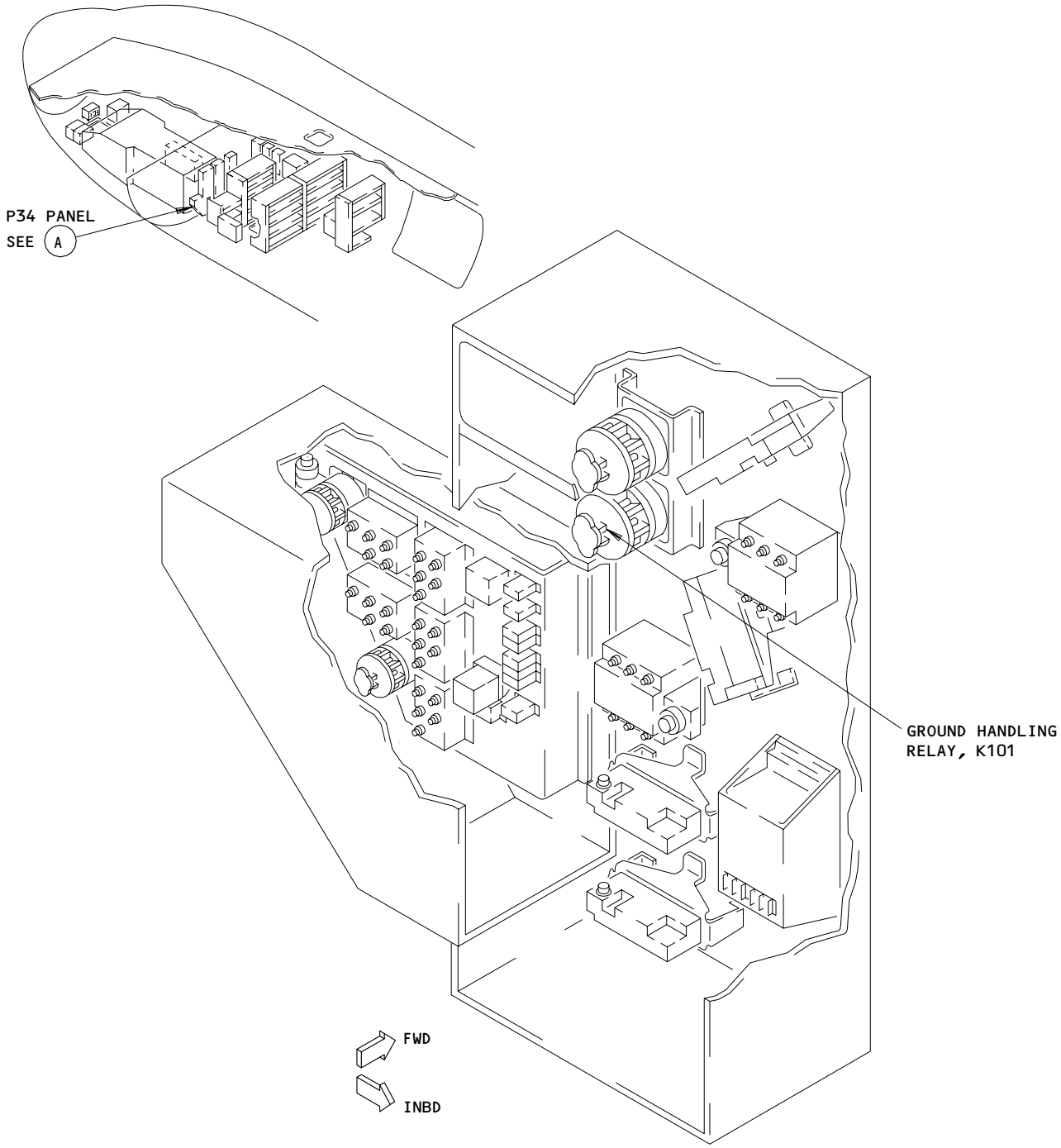
      WARNING: DO THE DEACTIVATION PROCEDURE FOR THE SPOILERS OR MOVE ALL PERSONS AND EQUIPMENT AWAY FROM THE SPOILERS. THE SPOILERS CAN RETRACT QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

      S 044-003

      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE P34 PANEL. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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



APU/EXTERNAL POWER PANEL, P34

A

Ground Handling Relay Installation
Figure 401

S 864-013
(3) Open this circuit breaker on the P6 panel:
(a) 6B4, BUS PWR CONT UNIT

D. Procedure

S 024-004
(1) Remove the relay as follows:
(a) Open the P34 panel.
(b) Remove the relay terminal cover.
(c) Remove the wires from the relay.
(d) Remove the installation screws that attach the relay to the P34 panel.
(e) Remove the relay.

TASK 24-51-01-424-005

3. Install the Ground Handling Relay (Fig. 401)

A. Procedure

S 424-016
(1) Attach the relay to the P34 panel and install the four screws.

S 424-018
(2) 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 nuts to 46-51 pound-inches.
(g) Remove the identification labels from the wires.
(h) Put the lower terminal cover in its position on the relay.
(i) Install the screws that attach the lower terminal cover to the relay.
(j) Tighten the screws to 5.5-7.5 pound-inches.

S 424-019

(3) 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 5.5-7.5 pound-inches.

S 414-017
(4) Close the P34 panel.

B. Do a Test of the Relay Installation

S 864-007
(1) Make sure this circuit breaker on the main power distribution panel P6 is closed:
(a) 6B4, BUS PWR CONT UNIT

S 864-008
(2) Supply external ac power to the ground handling bus (AMM 24-22-00/201).

S 714-011
(3) Set the inspection lights switch in the wheel well of the main landing gear to the ON position. Make sure the lights come on.

S 864-009
(4) Turn off the inspection lights in the wheel well of the main landing gear.

S 864-010
(5) Remove electrical power if it is not necessary (AMM 24-22-00/201).

UTILITY BUS RELAYS - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the utility bus relay from the airplane. The second task installs the utility bus relay on the airplane.

   TASK 24-51-02-024-001
2. Remove the Utility Bus Relays (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 Zones
          119/120 Main Equipment Center
      (2) Access Panel
          119AL Main Equipment Center
   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 EQUIPMENT.

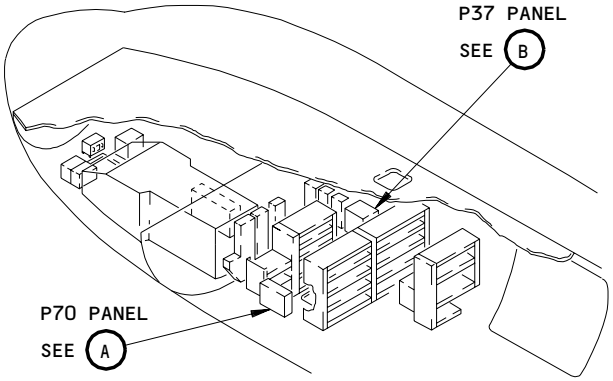
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

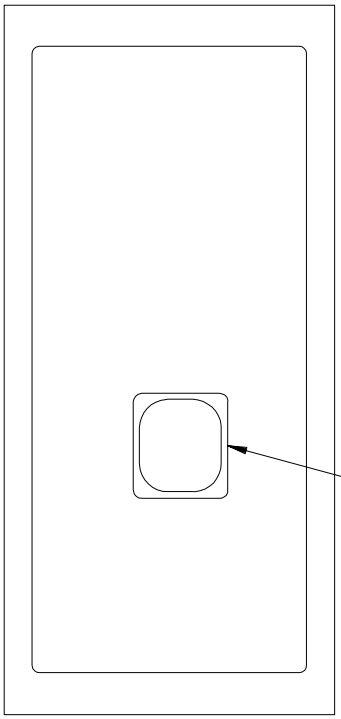
      S 864-003

      WARNING: REMOVE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE EQUIPMENT.

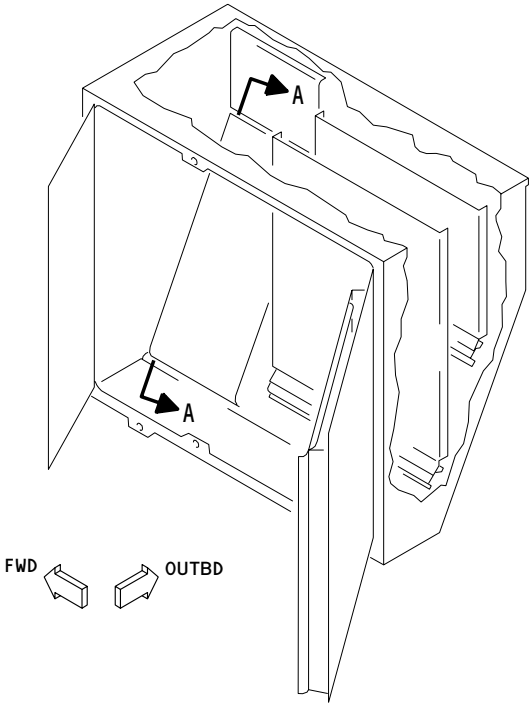
      (2) Remove electrical power (AMM 24-22-00/201).
   D. Procedure

      S 024-004
      (1) Remove the relay as follows:
          (a) Open the applicable electrical equipment panel.
          (b) Identify the wires that are necessary for the installation.

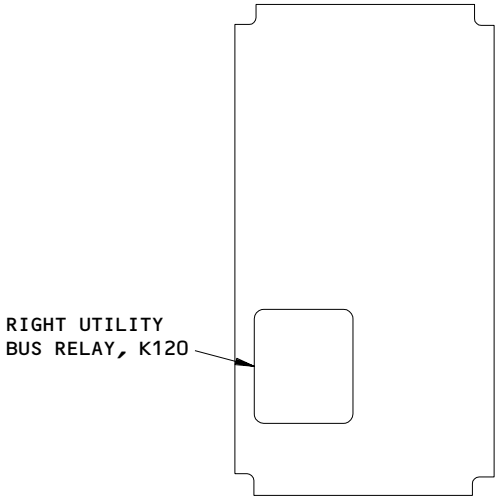




MISCELLANEOUS ELECTRICAL
EQUIPMENT PANEL, P70
A



RIGHT MISCELLANEOUS ELECTRICAL
EQUIPMENT PANEL, P37
B



A-A

Utility Bus Relays Installation
Figure 401

(c) Remove the wires from the relay.
(d) Remove the screws that attach the relay to the panel.
(e) Remove the relay.

TASK 24-51-02-404-005

3. Install 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

B. Access
(1) Location Zones
119/120 Main Equipment Center
(2) Access Panel
119AL Main Equipment Center

C. Procedure

S 424-006
(1) Install the relay as follows:
(a) Attach the relay to the panel with the installation screws.
(b) Connect the wires to the relay.
(c) Close the applicable electrical equipment panel.

D. Do a test of the relay installation

S 864-007
(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 864-008
(2) Make sure the applicable circuit breaker on the overhead circuit breaker panel P11 is closed.
(a) 11R4, UTIL BUS L or UTIL BUS LEFT
(b) 11R31, UTIL BUS R or UTIL BUS RIGHT

S 864-010
(3) Push the applicable UTILITY BUS switch on the pilots' overhead panel P5 to the ON position.

S 714-011
(4) Make sure the yellow OFF light is off.

S 864-012
(5) Push the UTILITY BUS switch to the OFF position.

S 714-013
(6) Make sure the yellow OFF light is on.

S 864-014
(7) Remove electrical power if it is not necessary (AMM 24-22-00/201).

GROUND SERVICE TRANSFER RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the ground service transfer relay (referred to as the relay) from the airplane. The second task installs the relay on the airplane.

TASK 24-51-03-024-001

2. Remove the Ground Service Transfer Relay (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 Zones
          211/212 Flight Compartment
          119/120 Main Equipment Center

      (2) Access Panel
          119AL Main Equipment Center

   C. Prepare for the Removal

      S 044-011

      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.

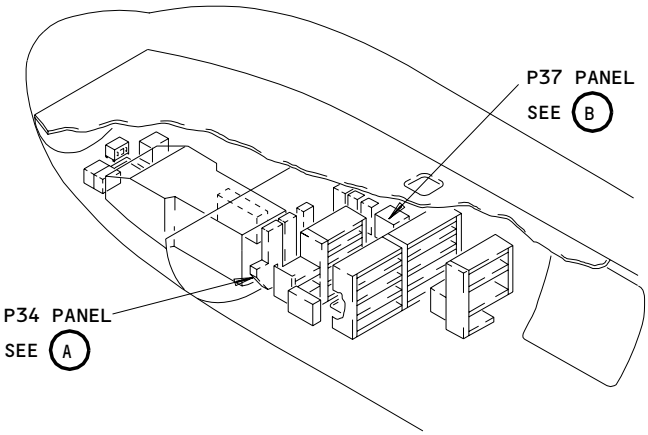
      (1) Do the deactivation procedure for the spoilers (AMM 27-61-00/201) or move all persons and equipment away from the spoilers.

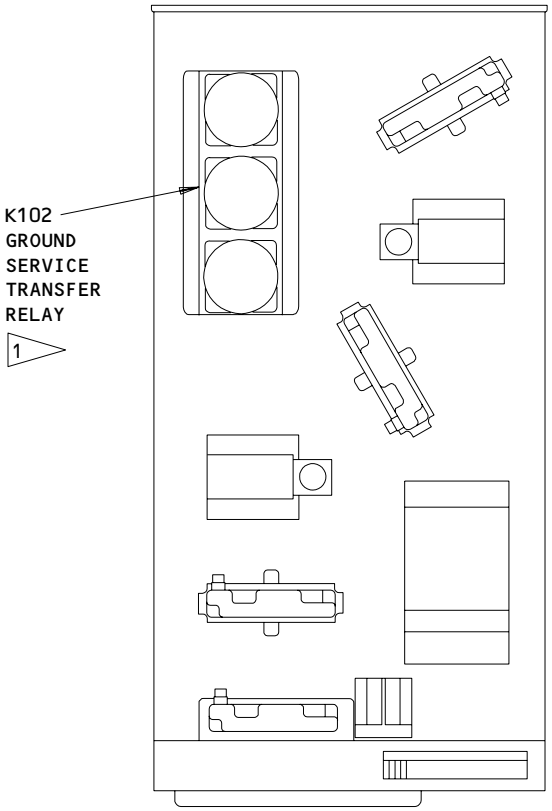
      S 044-012

      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

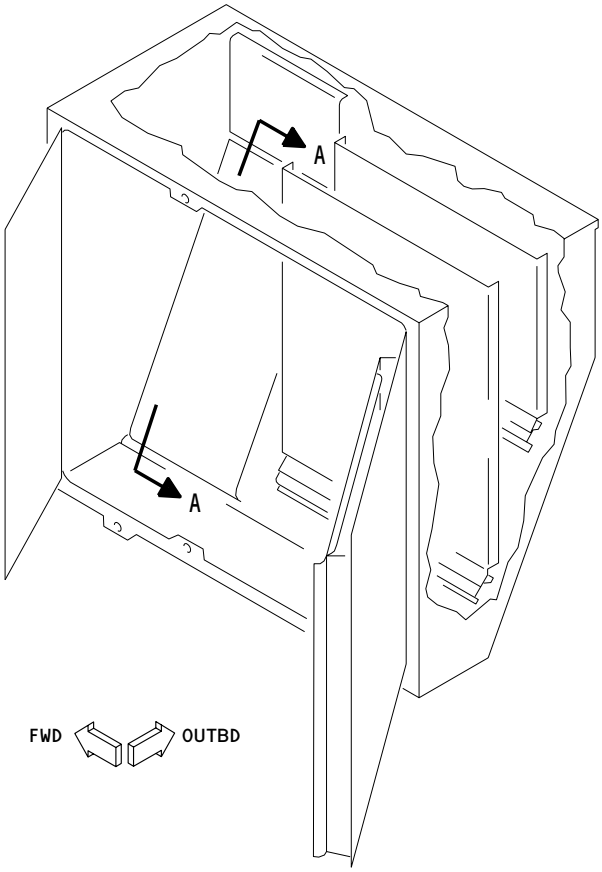
      S 864-013
      (3) Open this main power distribution panel P6 circuit breaker, and attach a DO-NOT-CLOSE tag:
          (a) 6B4, BUS PWR CONT UNIT





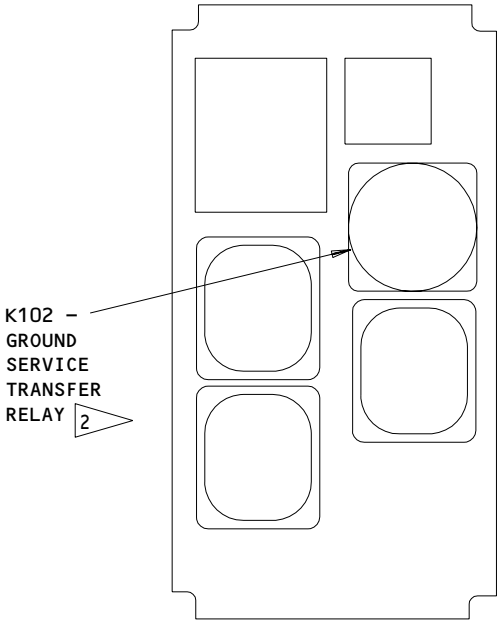
APU/EXTERNAL POWER PANEL P34

A



P37 – RIGHT MISC ELECTRICAL EQUIPMENT PANEL

B



A–A

1 AIRPLANE WITH K102 IN P34 PANEL

2 AIRPLANE WITH K102 IN P37 PANEL

Ground Service Transfer Relay Installation
Figure 401

D. Procedure

S 024-010

(1) Remove the relay as follows:
(a) Open the applicable P34 panel or the P37 panel.
(b) Remove the terminal cover on the relay.
(c) Identify the wires.
(d) Remove the wires from the relay.
(e) Remove the screws which attach the relay to the panel.
(f) Remove the relay.

TASK 24-51-03-424-002

3. Install the Ground Service Transfer Relay (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 Zones
211/212 Flight Compartment
119/120 Main Equipment Center

(2) Access Panel
119AL Main Equipment Center

C. Procedure

S 424-003

(1) Install the relay as follows:
(a) Attach the relay to the panel with the installation screws.
(b) Connect the wires to the relay.
(c) Install the terminal cover on the relay.
(d) Close the applicable P34 panel or the P37 panel.

S 864-004

(2) Remove the DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
(a) 6B4, BUS PWR CONT UNIT

D. Do a Test of the Relay Installation

S 864-005
(1) Supply external power to the ground service bus (AMM 24-22-00/201).

S 714-006
(2) Make sure the warning light 115V GND SVCE HOT BUS on the P37 panel is on.

S 864-007
(3) Push the right BUS TIE switch on the P5 panel, to the AUTO position.

S 714-008
(4) Make sure the warning light on the P37 panel 115V GND SVCE HOT BUS is on.

S 864-009
(5) Remove external power if it is not necessary (AMM 24-22-00/201).

GROUND SERVICE SELECT RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the ground service select relay (referred to as the relay) from the airplane. The second task installs the relay on the airplane.

TASK 24-51-04-024-001

2. Remove the Ground Service Select Relay (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 Zones
          119/120 Main Equipment Center
          211/212 Flight Compartment

      (2) Access Panel
          119AL Main Equipment Center

   C. Prepare for the Removal

      S 044-011

      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.

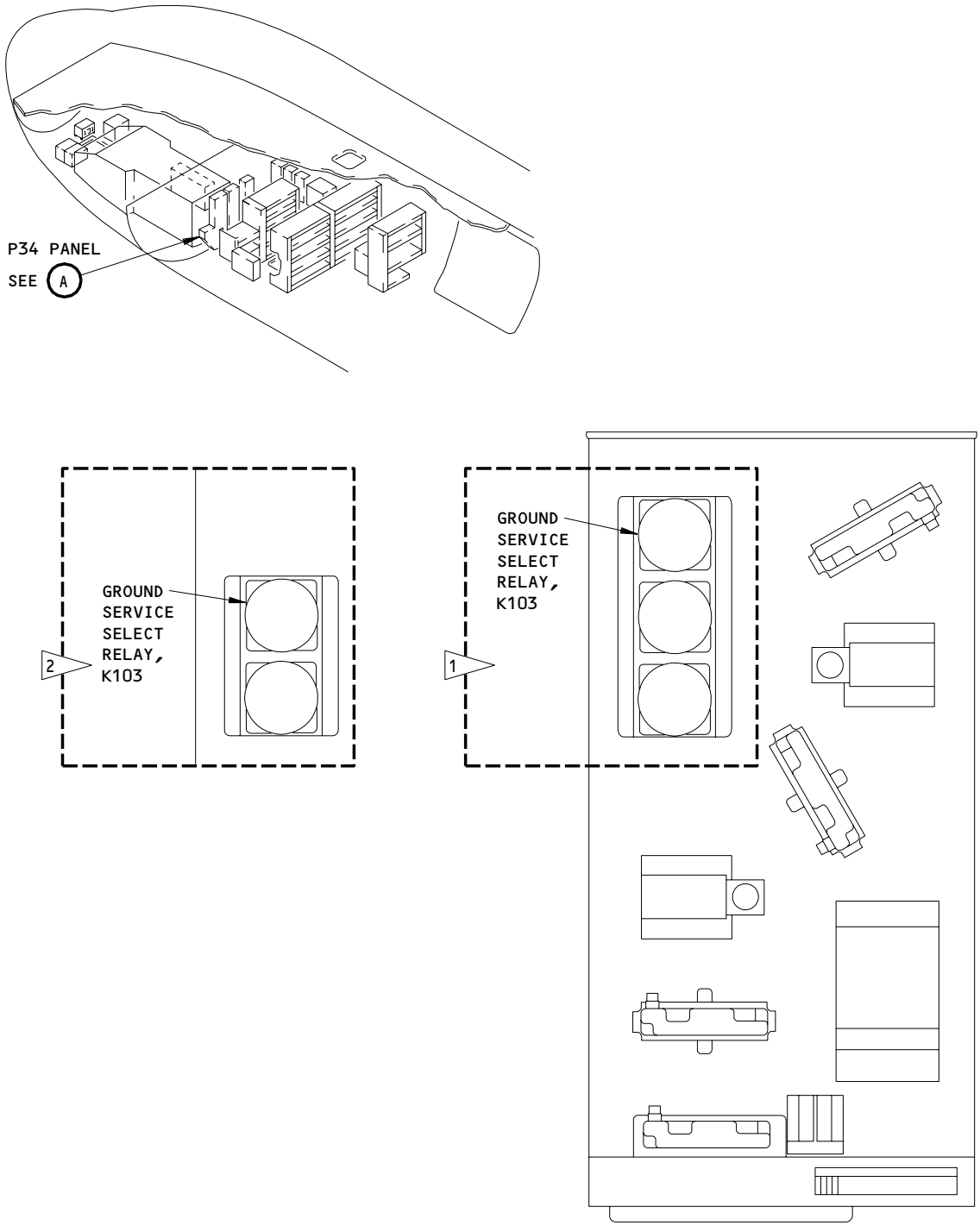
      S 044-012

      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

      S 864-013
      (3) Open this main power distribution panel P6 circuit breaker and attach a DO-NOT-CLOSE tag:
          (a) 6B4, BUS PWR CONT UNIT

      S 024-014
      (4) Remove the relay as follows:
          (a) Open the P34 panel.
          (b) Remove the terminal cover on the relay.
          (c) Remove the wires from the relay.



Ground Service Select Relay Installation
Figure 401

(d) Remove the installation screws which attach the relay to the P34 panel.
(e) Remove the relay.

TASK 24-51-04-424-002

3. Install the Ground Service Select Relay (Fig. 401)

A. Reference
(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. Procedure

S 424-003
(1) Install the relay as follows:
(a) Attach the relay to the P34 panel with the installation screws.
(b) Connect the wires to the relay.
(c) Install the terminal cover on the relay.
(d) Close the P34 panel.

S 864-004
(2) Remove the DO-NOT-CLOSE tag, and close this P6 panel circuit breaker:
(a) 6B4, BUS PWR CONT UNIT

D. Do a test on the relay installation

S 864-005
(1) Supply external power to the ground service bus (AMM 24-22-00/201).

S 714-006
(2) Make sure the warning light on the P37 panel 115V GND SVCE HOT BUS is on.

S 864-007
(3) Push the ground service switch on the P21 panel.

S 864-008
(4) Supply APU power to the ground service bus (AMM 24-22-00/201).

S 864-009
(5) Make sure the warning light on the P37 panel 115V GND SVCE HOT BUS is on.

S 864-010

(6) Remove APU power if it is not necessary (AMM 24-22-00/201).

CENTER BUS TRANSFER RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the center bus transfer relay (referred to as the relay) from the aiirplane. The second task installs the center bus transfer relay on the airplane.

TASK 24-51-05-024-001

2. Remove the Center Bus Transfer Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Speedbrake/Spoiler Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment
   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 044-003

      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

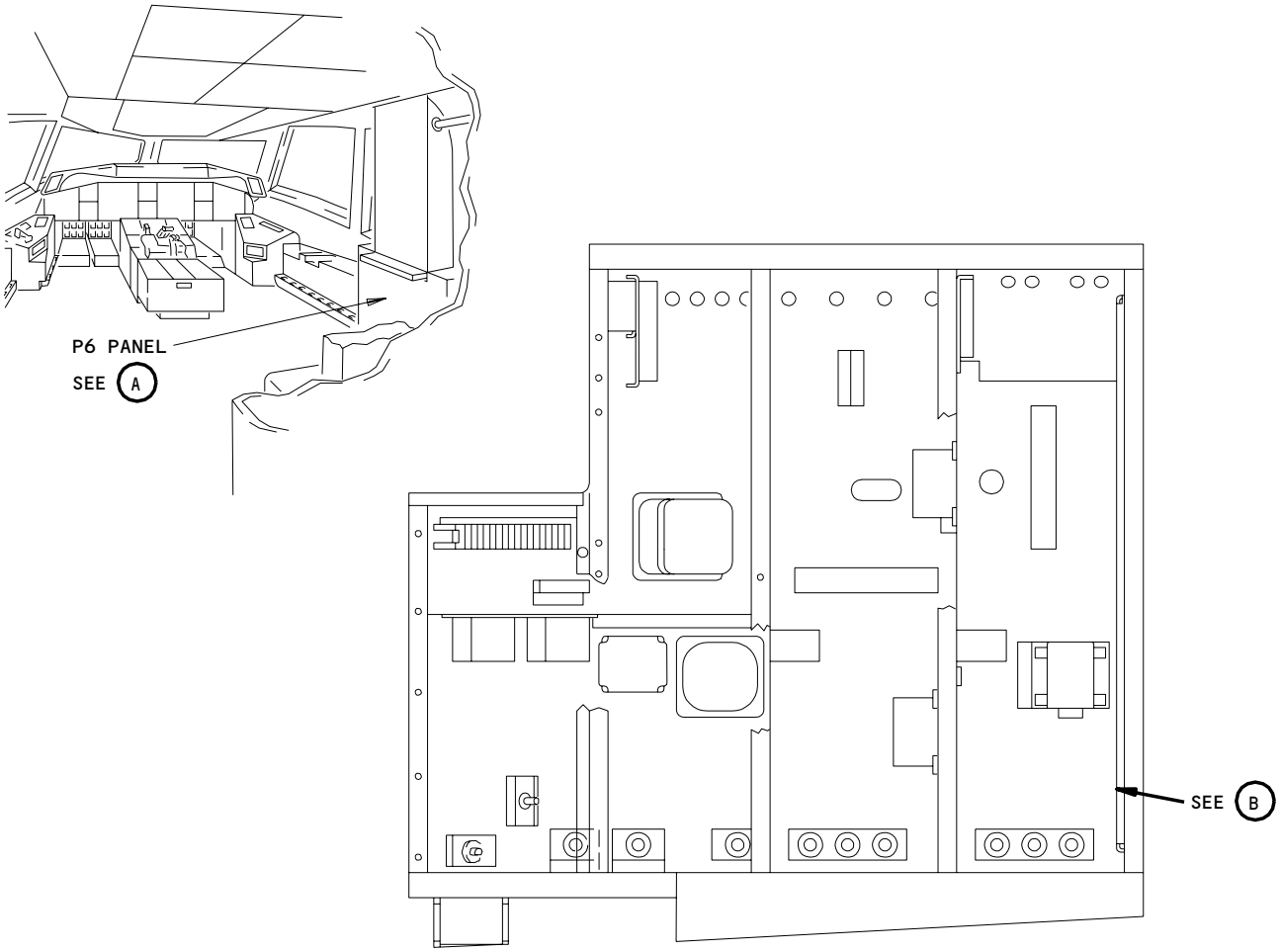
      (2) Remove electrical power (AMM 24-22-00/201).

      S 864-004
      (3) Open these main power distribution panel P6 circuit breakers and attach DO-NOT-CLOSE tags:
          (a) 6D2, BAT XFR CONT
          (b) 6L12, CENTER BUS DC
   D. Procedure

      S 024-005
      (1) Remove the relay as follows:
          (a) Open the P6 panel.
          (b) Remove the relay from the P6 panel.

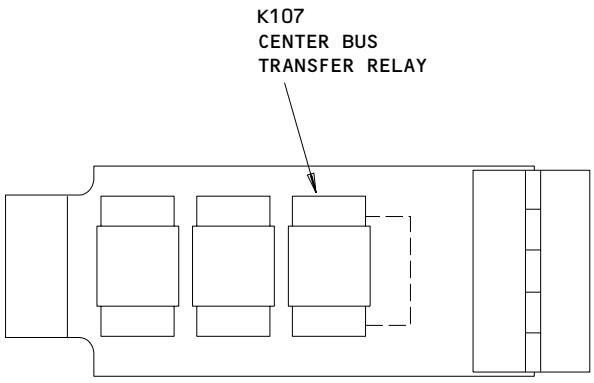
TASK 24-51-05-424-006

3. Install the Center Bus Transfer Relay (Fig. 401)
   A. References
      (1) AMM 22-41-00/501, Maintenance Monitor



POWER DISTRIBUTION PANEL P6

A



B

Center Bus Transfer Relay Installation
Figure 401

(2) AMM 24-22-00/201, Electrical Power - Control

B. Access

(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 424-007

(1) Install the relay in the P6 panel.

S 414-008

(2) Close the P6 panel.

S 864-009

(3) Remove the DO-NOT-CLOSE tags and close these P6 panel circuit breakers:
(a) 6D2, BAT XFR CONT
(b) 6L12, CENTER BUS DC

D. Do a test of the relay installation

S 864-010

(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 724-011

(2) DO the isolation test on the autoland bus within the MCDP test code 40 - Autoland System (AMM 22-41-00/501).

S 864-012

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

CENTER BUS ISOLATION RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the center bus isolation relay (referred to as the relay) from the airplane. The second task installs the relay on the airplane.

TASK 24-51-06-024-001

2. Remove the Center Bus Isolation Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Speedbrake/Spoiler Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment
   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 044-003

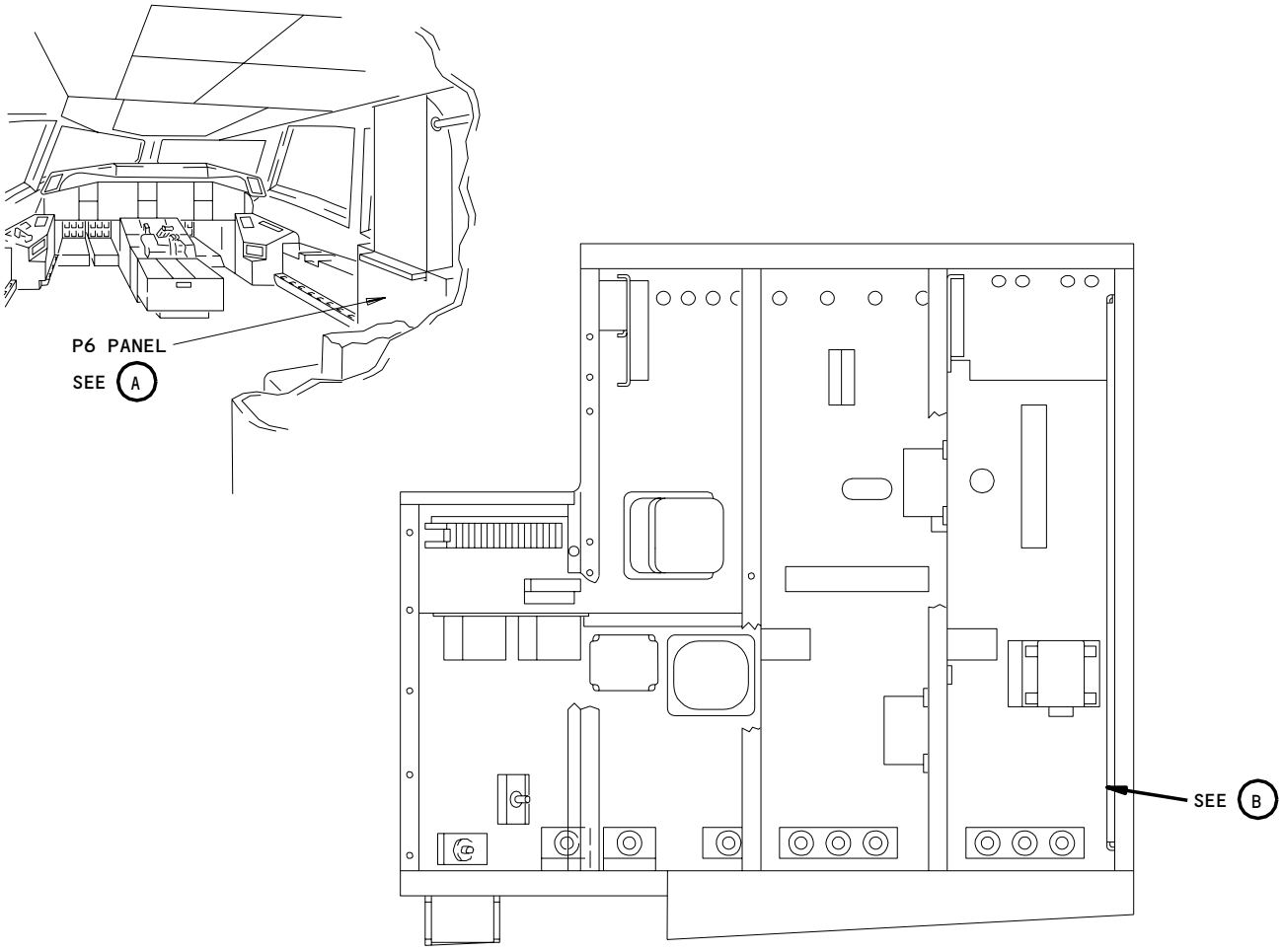
      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

      S 024-004
      (1) Remove the relay as follows:
          (a) Make sure the BAT switch on the pilot's overhead panel P5 is OFF. Attach a DO-NOT-OPERATE tag on the switch.
          (b) Open the P6 panel.
          (c) Remove the relay from the P6 panel.

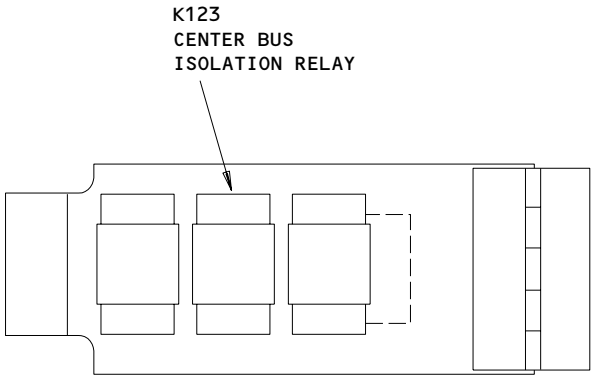
TASK 24-51-06-424-005

3. Install the Center Bus Isolation Relay (Fig. 401)
   A. References
      (1) AMM 22-41-00/501, Maintenance Monitor
      (2) AMM 24-22-00/201, Electrical Power - Control



POWER DISTRIBUTION PANEL P6

A



B

Center Bus Isolation Relay Installation
Figure 401

B. Access
(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 424-006
(1) Install the relay as follows:
(a) Install the relay in the P6 panel.
(b) Close the P6 panel.
(c) Remove the DO-NOT-OPERATE tag from the BAT switch on the P5 panel.

D. Do a test of the relay installation

S 864-007
(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 724-008
(2) Do the isolation test on the autoland bus within the MCDP test code 40 - Autoland System (AMM 22-41-00/501).

S 864-009
(3) Remove electrical power if it is not necessary (AMM 24-22-00/201).

ISOLATION REQUEST RELAY - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the isolation request relay from the airplane. The second task installs the isolation request relay on the airplane.

TASK 24-51-07-024-001

2. Remove the Isolation Request Relay (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power - Control
      (2) AMM 27-61-00/201, Speedbrake/Spoiler Control System
   B. Access
      (1) Location Zones
          211/212 Flight Compartment
   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 864-009

WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER CENTERS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

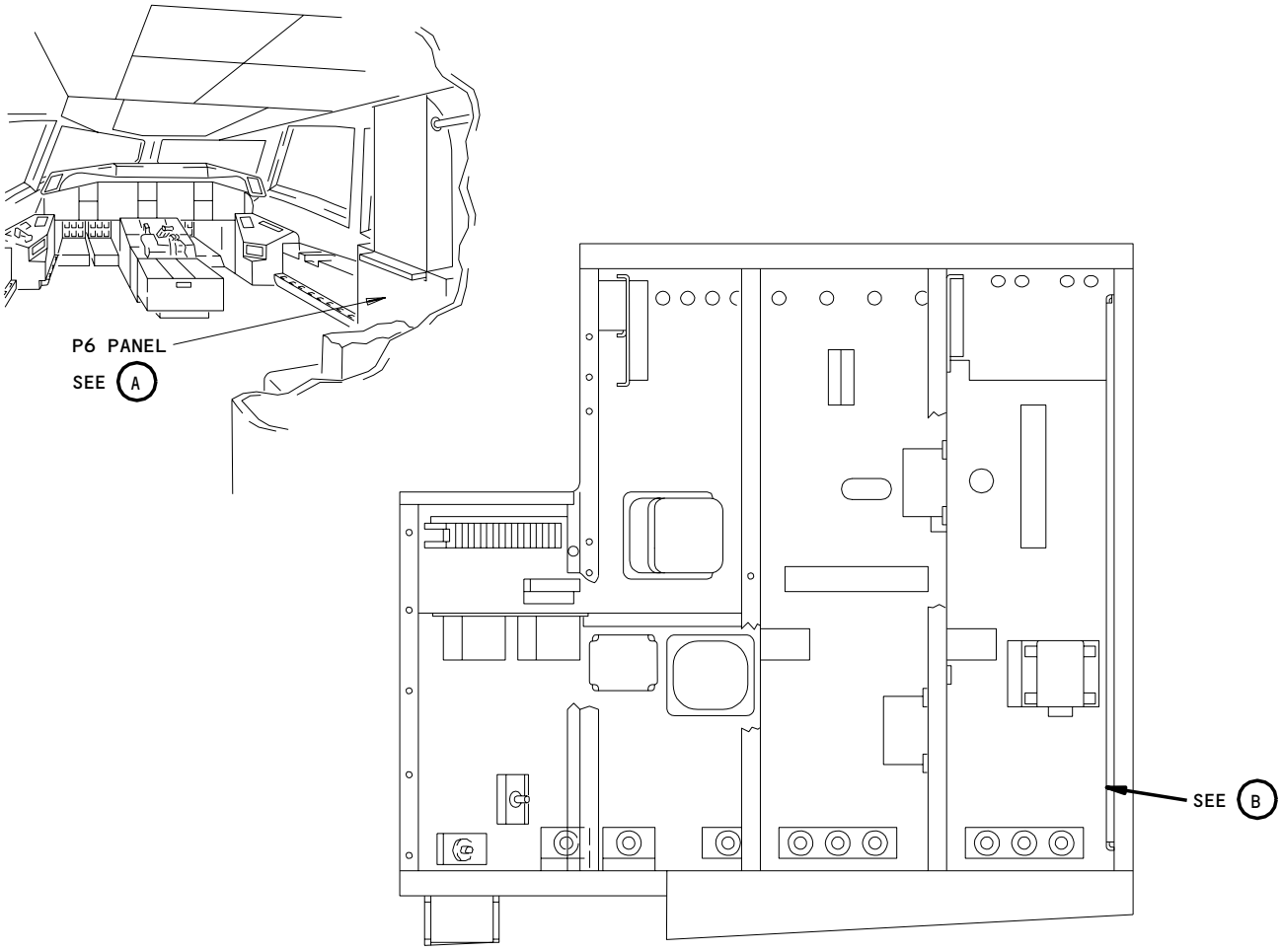
   D. Procedure

S 024-004

(1) Remove the relay as follows:
   (a) Make sure the BAT switch on the pilot's overhead panel P5 is in the OFF position. Attach a DO-NOT-OPERATE tag on the switch.
   (b) Open the P6 Panel.
   (c) Remove the relay.

TASK 24-51-07-424-003

3. Install the Isolation Request Relay (Fig. 401)
   A. References
      (1) AMM 22-41-00/501, Maintenance Monitor



Isolation Request Relay Installation
Figure 401

(2) AMM 24-22-00/201, Electrical Power - Control

B. Access

(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 424-005

(1) Install the relay as follows:
(a) Install the relay.
(b) Close the P6 panel.
(c) Remove the DO-NOT-OPERATE tag from the BAT switch on the P5 panel.

D. Do a test of the relay installation

S 864-006

(1) Supply electrical power to the main ac buses (AMM 24-22-00/201).

S 714-008

(2) Do the isolation test on the autoland bus within the MCDP test code 40 - Autoland System (AMM 22-41-00/501).

S 864-007

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

INSTRUMENT BUS VOLTAGE SENSING UNIT (IBVSU) REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the instrument bus voltage sensing unit (referred to as the unit) from the airplane. The second task installs the unit on the airplane.

TASK 24-51-08-024-001

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 Zones
          211/212 Flight Compartment
   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 044-003

WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

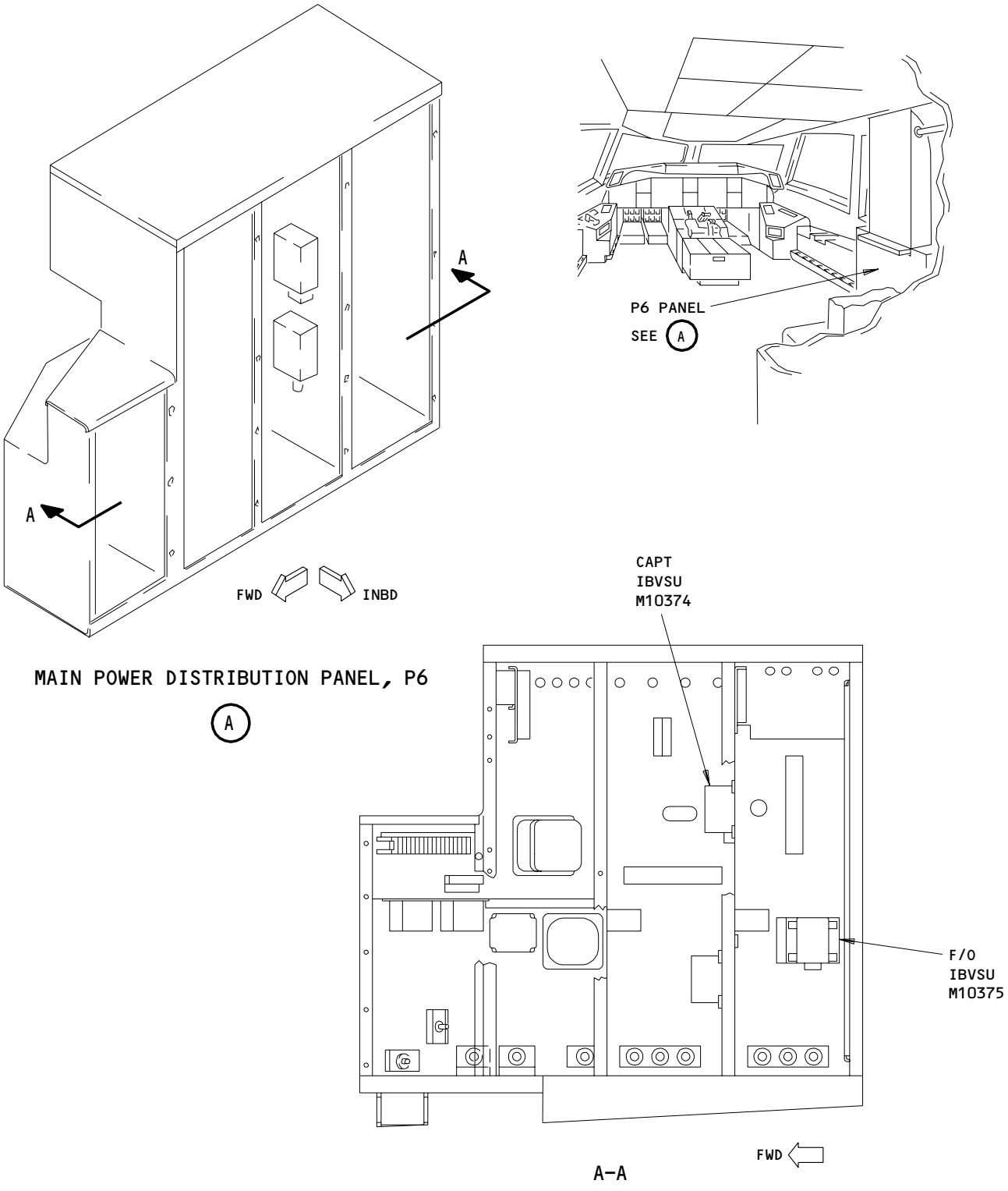
(2) Remove electrical power (AMM 24-22-00/201).

S 024-004

(3) Remove the unit as follows:
   (a) Open the P6 panel.
   (b) Remove the electrical connector from the unit.
   (c) Remove the four screws which attach the unit to the P6 panel.
   (d) Remove the unit..

TASK 24-51-08-424-005

3. Install the Instrument Bus Voltage Sensing Unit (Fig. 401)
   A. References
      (1) AMM 24-22-00/201, Electrical Power Control



MAIN POWER DISTRIBUTION PANEL, P6

A

Instrument Bus Voltage Sensor Unit Installation
Figure 401

(2) AMM 31-41-00/201, Engine Indicating Crew Alerting System

B. Access

(1) Location Zones
211/212 Flight Compartment

C. Procedure

S 424-006

(1) Install the unit as follows:
(a) Attach the unit to the P6 panel with four screws.
(b) Connect the electrical connector to the unit.
(c) Close the P6 panel.

D. Do a test of the unit installation.

S 844-013

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

S 864-014

(2) Make sure the EICAS system is operational (AMM 31-41-00/201).

S 864-015

(3) Open the applicable P6 panel circuit breaker:
(a) 6M16 CAPT PRIM INSTR BUS A
(b) 6M22 F/O PRIM INSTR BUS A

S 754-016

(4) Make sure the applicable EICAS status message, F/O INST XFER, CAPT INST XFER is shown on the display.

S 864-017

(5) Close the applicable P6 panel circuit breaker.
(a) 6M16 CAPT PRIM INSTR BUS A
(b) 6M22 F/O PRIM INSTR BUS A

S 754-018

(6) Make sure the EICAS status message is not shown on the display.

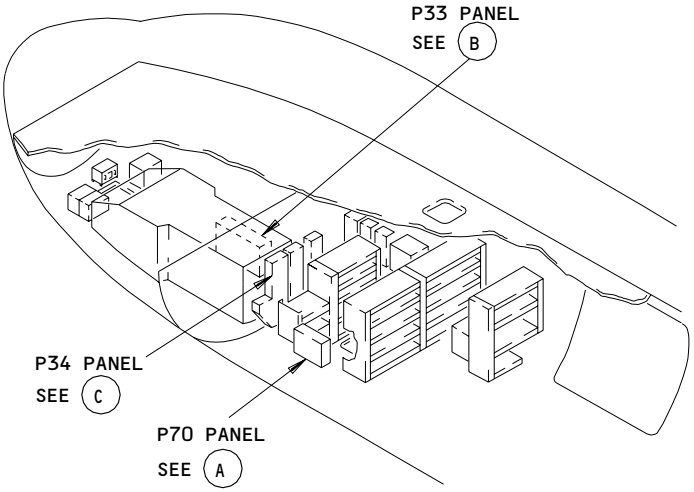
S 844-019

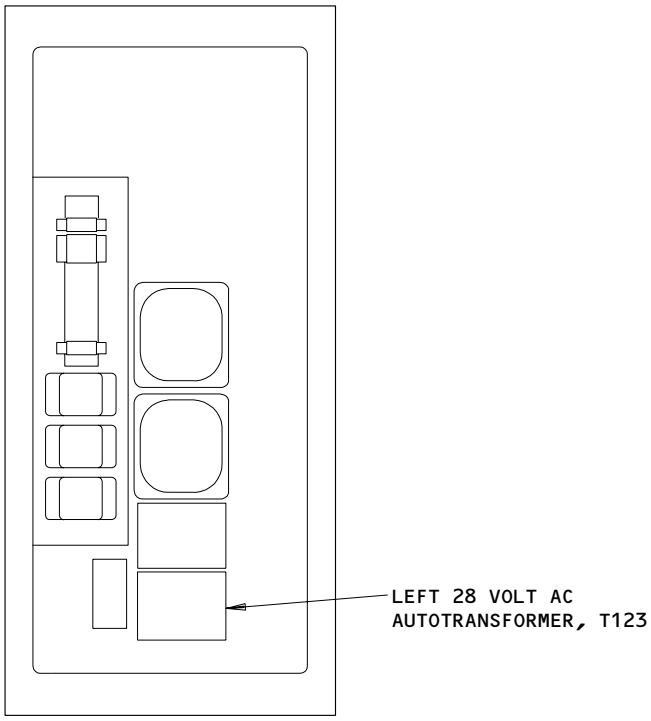
(7) Remove electrical power if it is not necessary (AMM 24-22-00/201).

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 autotransformer is in misc. electrical equipment panel P70. The right autotransformer is in misc. electrical equipment panel P33. Circuit breakers for the left and right buses are in main power distribution panel P6 and in overhead circuit panel P11. The ground service autotransformer is in P34 panel. Ground service bus circuit breakers are on APU/external power panel P34.
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 autotransformer and wiring from excessive current.
      (2) Autotransformers for the left and right 28-volt AC buses are rated at 750-VA of power. The ground service autotransformer is rated at 2.5-KVA.

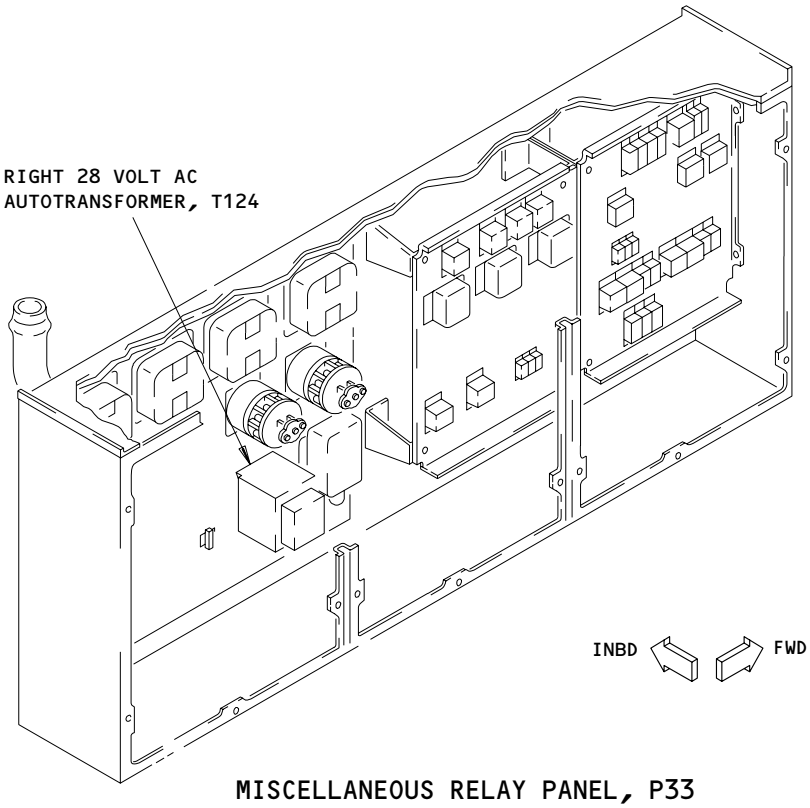




MISCELLANEOUS ELECTRICAL EQUIPMENT PANEL, P70

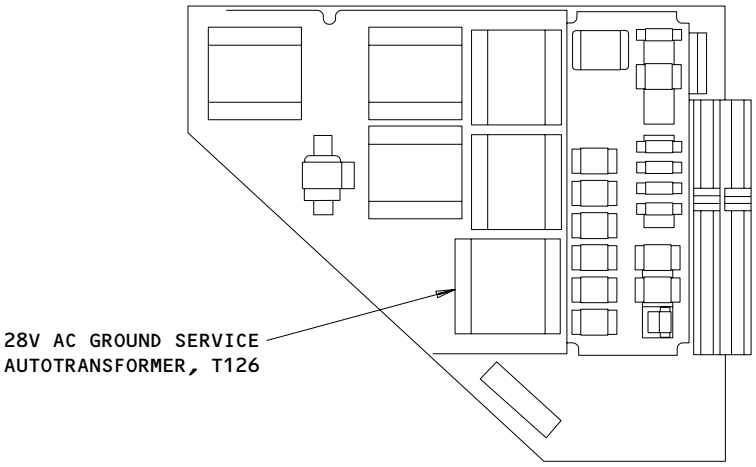
A

28 Volt AC Power Distribution Component Location
Figure 1 (Sheet 1)



MISCELLANEOUS RELAY PANEL, P33

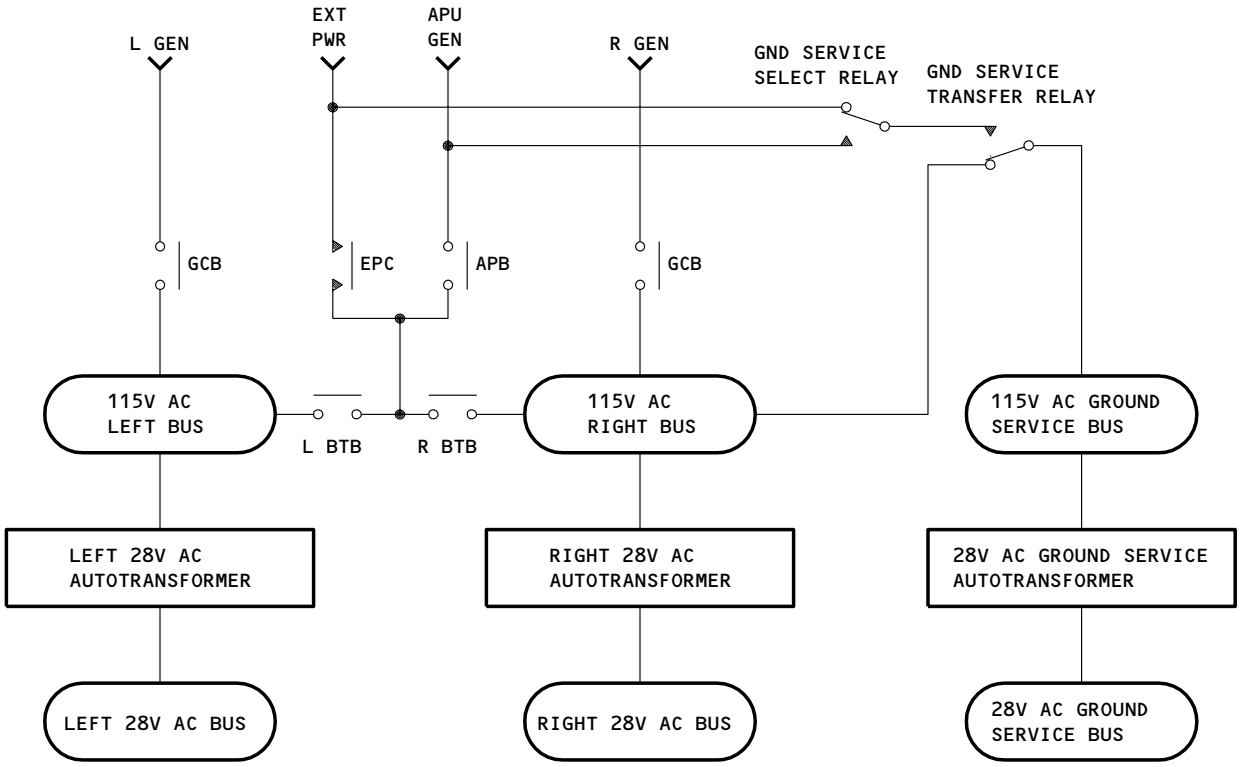
B



APU/EXT POWER PANEL, P34

C

28-Volt AC Power Distribution Component Location
Figure 1 (Sheet 2)



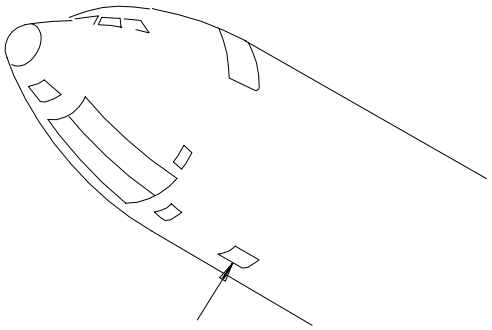
28 - Volt AC Power Distribution Block Diagram
Figure 2

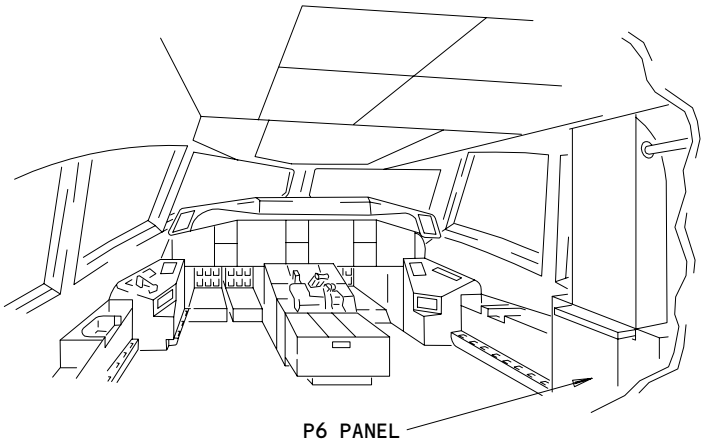
28 VOLT AC POWER DISTRIBUTION

COMPONENT	FIG. 102 SHT	QTY	ACCESS/AREA	AMM REFERENCE
AUTOTRANSFORMER - (FIM 31-01-33/101)				
RIGHT 28V AC BUS, T124				
AUTOTRANSFORMER - (FIM 31-01-37/101)				
GROUND SERVICE BUS, T126				
AUTOTRANSFORMER - (FIM 31-01-70/101)				
LEFT 28V AC BUS, T123				
CIRCUIT BREAKER -	--		FLT COMPT, P6	
28V AC BUS LEFT, C877		1	6K18	*
28V AC BUS RIGHT, C878		1	6K24	*
CIRCUIT BREAKER -	--		119BL, MAIN EQUIP CTR, P37	
GND XFMR, C871		1	37E5	*

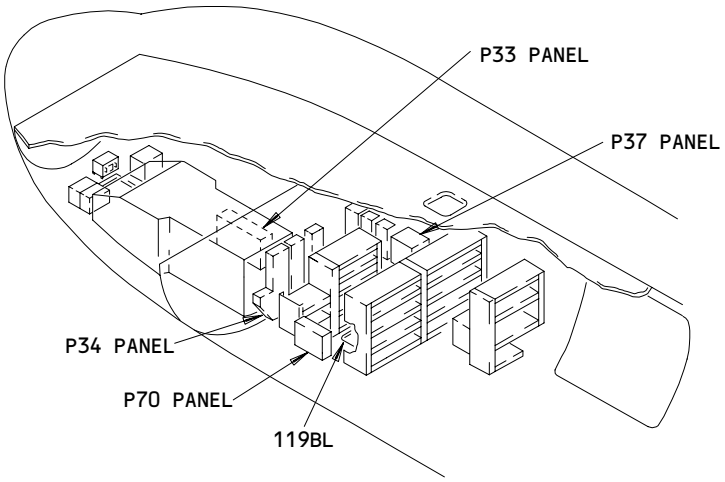
* SEE THE WDM EQUIPMENT LIST

28 Volt AC Power Distribution - Component Index
Figure 101





FLIGHT COMPARTMENT

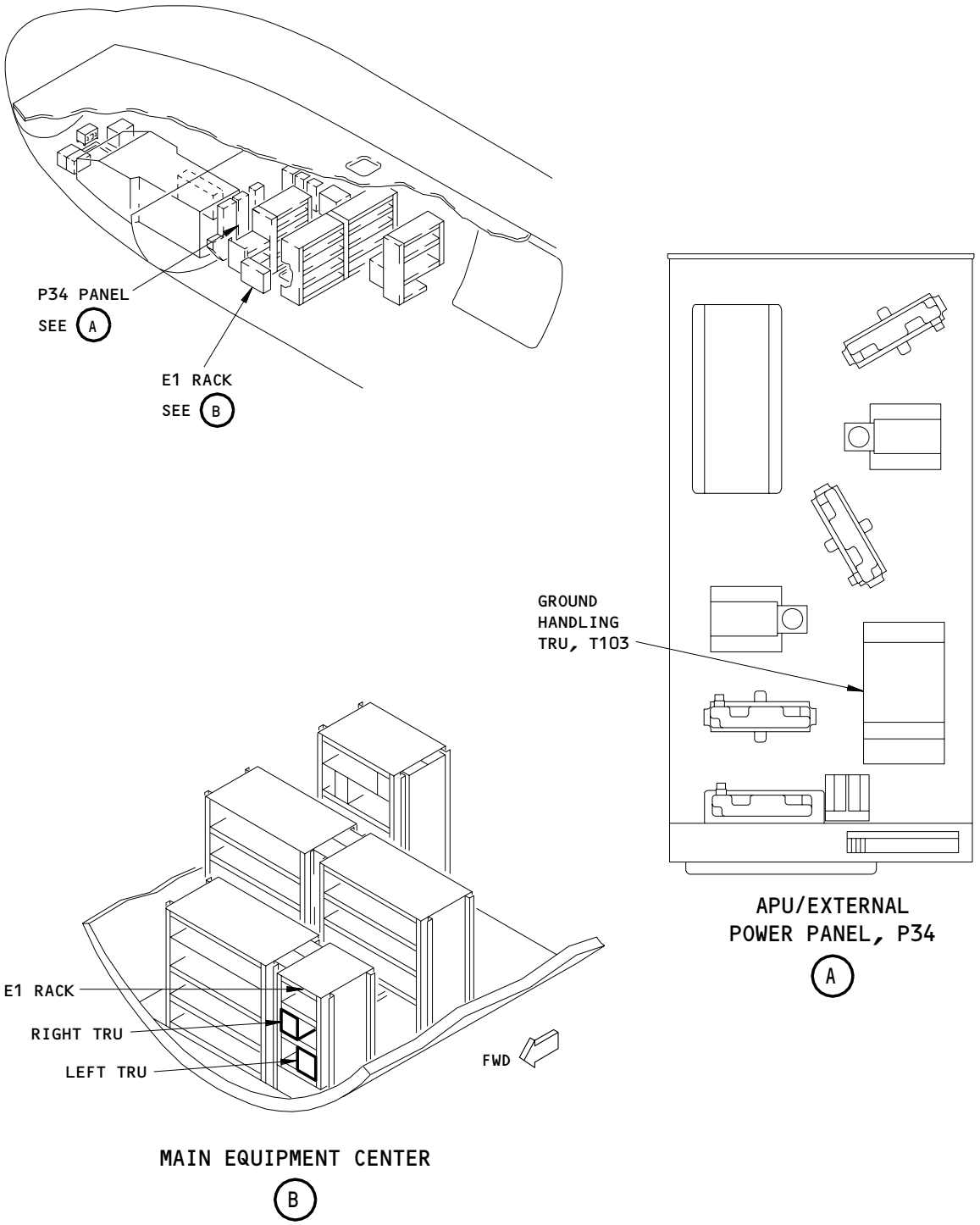


MAIN EQUIPMENT CENTER

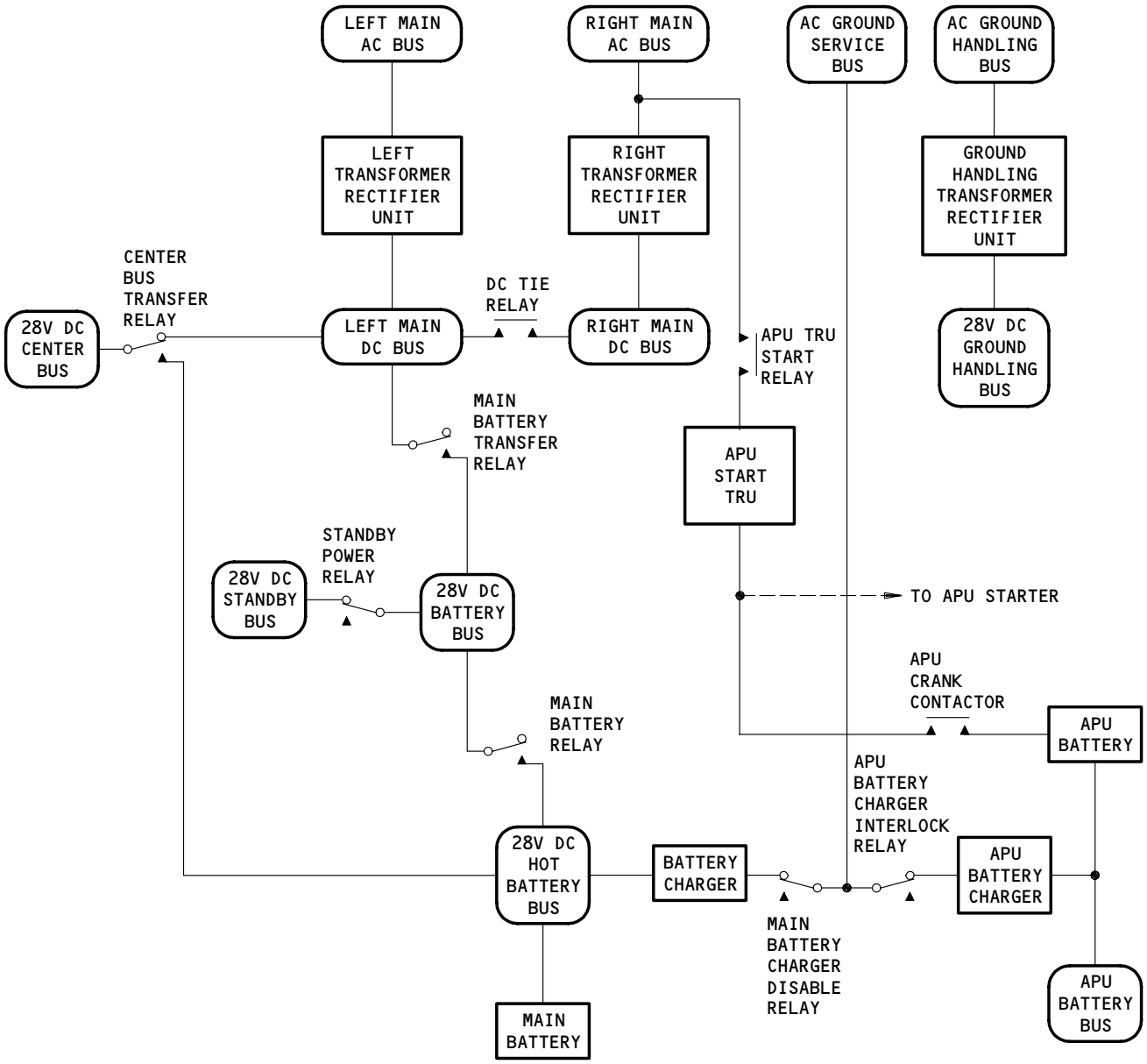
28 Volt AC Power Distribution - Component Location
Figure 102

28-VOLT DC POWER DISTRIBUTION - DESCRIPTION AND OPERATION

1. General
   A. Twenty-eight volt DC power distribution involves buses. These are: left and right main DC buses, the 28-volt DC center, standby, battery, and hot battery buses, and 28-volt DC ground handling bus. The main system components include two transformer-rectifier units for the main dc buses and one ground handling transformer-rectifier unit.
2. Component Details (Fig. 1)
   A. Transformer-Rectifier Units
      (1) Two identical TRUs convert nominal 115-volt, 3-phase AC power into unregulated 28-volt DC power. Each TRU is capable of providing 120 amps continuous current with forced-air cooling. Internal protection circuits prevent TRU damage due to a shorted output. An internal meter shunt allows measurement of TRU output current by the EICAS computers. The main TRUs are located in left forward equipment center rack E1.
   B. Ground Handling Transformer-Rectifier Unit (TRU)
      (1) The ground handling 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 transformer-rectifier units connected to the main AC buses. The buses can be joined by a DC tie relay if one bus loses power (AMM 24-32-00/001).
      (2) 28-Volt DC Hot Battery Bus
         (a) The hot battery bus supplies 28-volt DC power to the most critical flight loads. The hot battery bus is connected directly to the main battery through a thermal circuit breaker. The hot battery bus is not switched.
      (3) 28-Volt DC Battery Bus
         (a) The battery bus supplies power to critical DC flight loads. The battery bus is normally powered by the left main DC bus through the main battery transfer relay. If the left DC bus is unpowered, the main battery relay will automatically switch to hot battery bus power.
      (4) 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. If the main buses lose power, the center bus is powered from the hot battery bus.
      (5) 28V DC Standby Bus
         (a) The 28-volt DC standby bus provides power to standby equipment and instruments. The DC standby bus is powered from the battery bus. The STBY POWER switch provides manual control of the standby buses (AMM 24-33-00/001).



28 Volt DC Power Distribution Component Location
Figure 1



28 - Volt DC Power Distribution Block Diagram
Figure 2

43371

(6) 28-Volt DC Ground Handling Bus

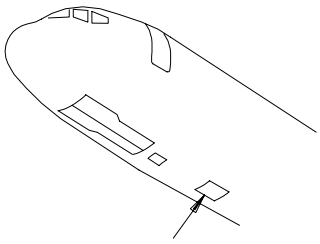
(a) The 28-volt DC ground handling bus provides power to ground support equipment. DC power for the bus is obtained through a transformer-rectifier unit connected to the 115-volt AC ground handling bus. The DC ground handling bus and circuit breakers are located in P34 panel.

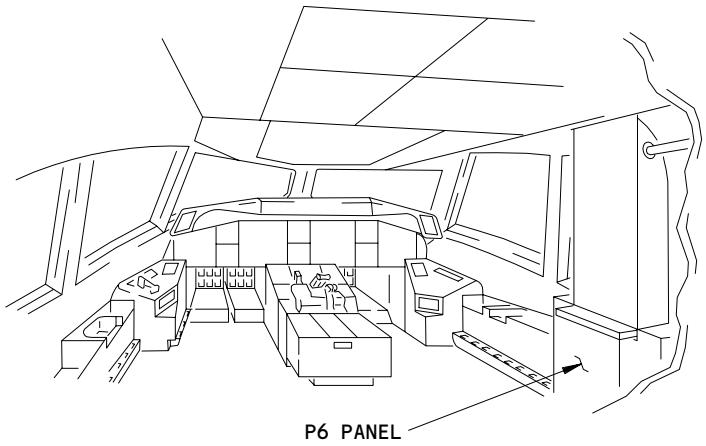
28 VOLT DC POWER DISTRIBUTION

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	6L12	*
HOT BAT BUS, C897		1	6L9	*
LEFT DC BUS SEC 1, C882		1	6D8	*
LEFT DC BUS SEC 2, C883		1	6D7	*
RIGHT DC BUS SEC 1, C891		1	6H8	*
RIGHT DC BUS SEC 2, C890		1	6H7	*
CIRCUIT BREAKER –			119BL, MAIN EQUIP CTR, P34	
GROUND HANDLING TRU, C304			34B1, SECT A	*
TR UNIT – (FIM 31-01-34/101)				24-54-01
GROUND HANDLING BUS, T103				

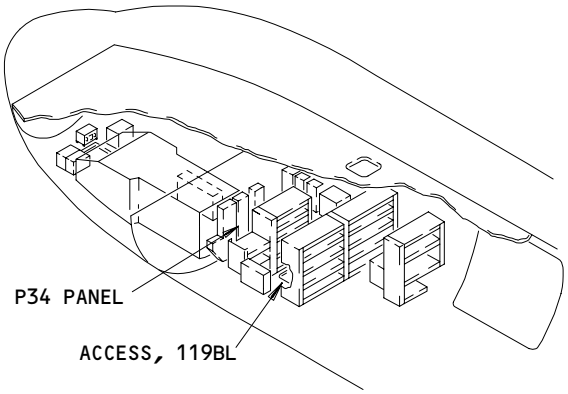
* SEE THE WDM EQUIPMENT LIST

28 Volt DC Power Distribution – Component Index
Figure 101





FLIGHT COMPARTMENT



MAIN EQUIPMENT CENTER

28 Volt DC Power Distribution - Component Location
Figure 102

GROUND POWER TRANSFORMER-RECTIFIER UNIT - REMOVAL/INSTALLATION

1. General
   A. This procedure has two tasks. The first task removes the ground power transformer rectifier unit (referred to as the unit) from the airplane. The second task installs the unit on the airplane.

   TASK 24-54-01-024-001

2. Remove the Ground Power Transformer Rectifier Unit (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
          211/212 Flight Compartment
      (2) Access Panel
          119AL Main Equipment Center
   C. Prepare for the Removal

      S 044-002

      WARNING: DO THE DEACIVATION 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.

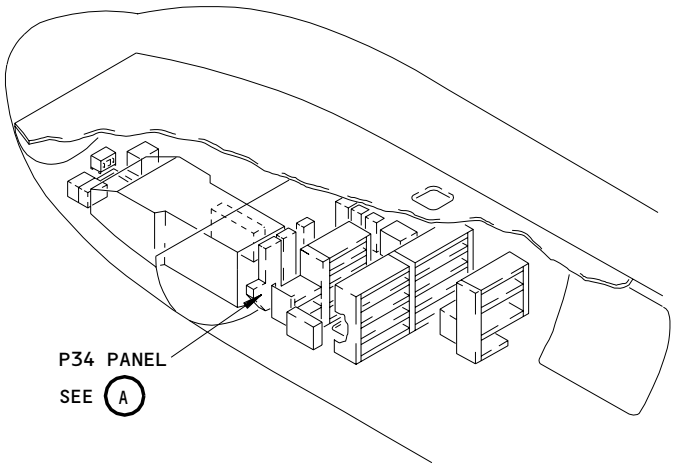
      (1) Do the deactivation procedure for the spoilers (Ref 27-61-00) or move all persons and equipment away from the spoilers.

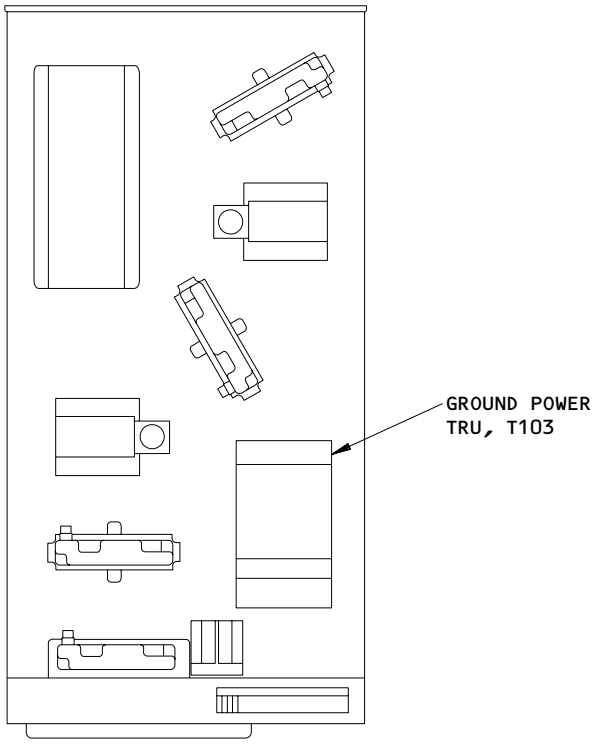
      S 044-003

      WARNING: REMOVE THE ELECTRICAL POWER FROM THE AIRPLANE WHEN YOU REMOVE OR INSTALL COMPONENTS IN THE POWER PANELS. HIGH VOLTAGES CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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

      S 024-004
      (1) Remove the unit as follows:
          (a) Open the P34 panel.
          (b) Remove the terminal cover on the unit.
          (c) Identify the wires for the installation.





APU/EXTERNAL POWER PANEL, P34

(A)

Ground Power TRU Installation
Figure 401

(d) Remove the wires from the terminals of the unit.
(e) Remove the six screws which attach the unit to the P34 panel.
(f) Remove the unit.

TASK 24-54-01-424-005

3. Install the Ground Power TRU (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. Procedure

      S 424-006
      (1) Install the unit as follows:
          (a) Attach the unit to the P34 panel with six screws.
          (b) Connect the wires to the terminals of the unit.
          (c) Install the terminal cover on the unit.
   D. Do a test of the unit installation.

      S 864-007
      (1) Supply electrical power to the ground handling bus (AMM 24-22-00/201)

      S 864-008
      (2) Put the switch of the NOSE GEAR WHEELWELL LIGHTS to ON.

      S 714-010
      (3) Make sure the NOSE GEAR WHEEL WELL Lights come on.

      S 864-011
      (4) Put the switch to the OFF position.

      S 864-012
      (5) Remove electrical power if it is no longer necessary (AMM 24-22-00/201).