CHAPTER 5

ELECTRICAL SYSTEM

LIST OF CONTENTS

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CHAPTER 5 ELECTRICS

LIST OF EFFECTIVE PAGES

CHAPTER 5

ELECTRICAL SYSTEM

General

The aircraft electrical power system is predominantly dc, with ac used only for the avionics and instruments. The internal dc electrical power is supplied by two engine-driven starter/generators and two batteries. A Ground Power Unit (GPU) can be used to supply the aircraft with dc power whilst it is stationary on the ground. AC power is supplied at a set frequency by two static inverters powered from the dc system. Power distribution is through a busbar system which groups the loads as crash, emergency, essential and non-essential. Crash loads are connected directly to the battery busbars.

Control of the electrical power supply is through switches installed in the DC and AC CONTROL panels in the flight deck roof panel. Normal, abnormal and emergency operation, and failure indications are shown on the Central Annunciator Panel (CAP) and flight deck roof panel.

The aircraft electrical bay is located in the ventral pod aft of the hydraulic bay.

1. DC Electrical System

A. Battery System

Two 24 Volt nickel-cadmium (nicad) batteries are installed in the electrical bay of the aircraft. The batteries have sufficient capacity to supply all emergency loads for 30 minutes, IMC and 30 minutes VMC, following a failure of all generated power.

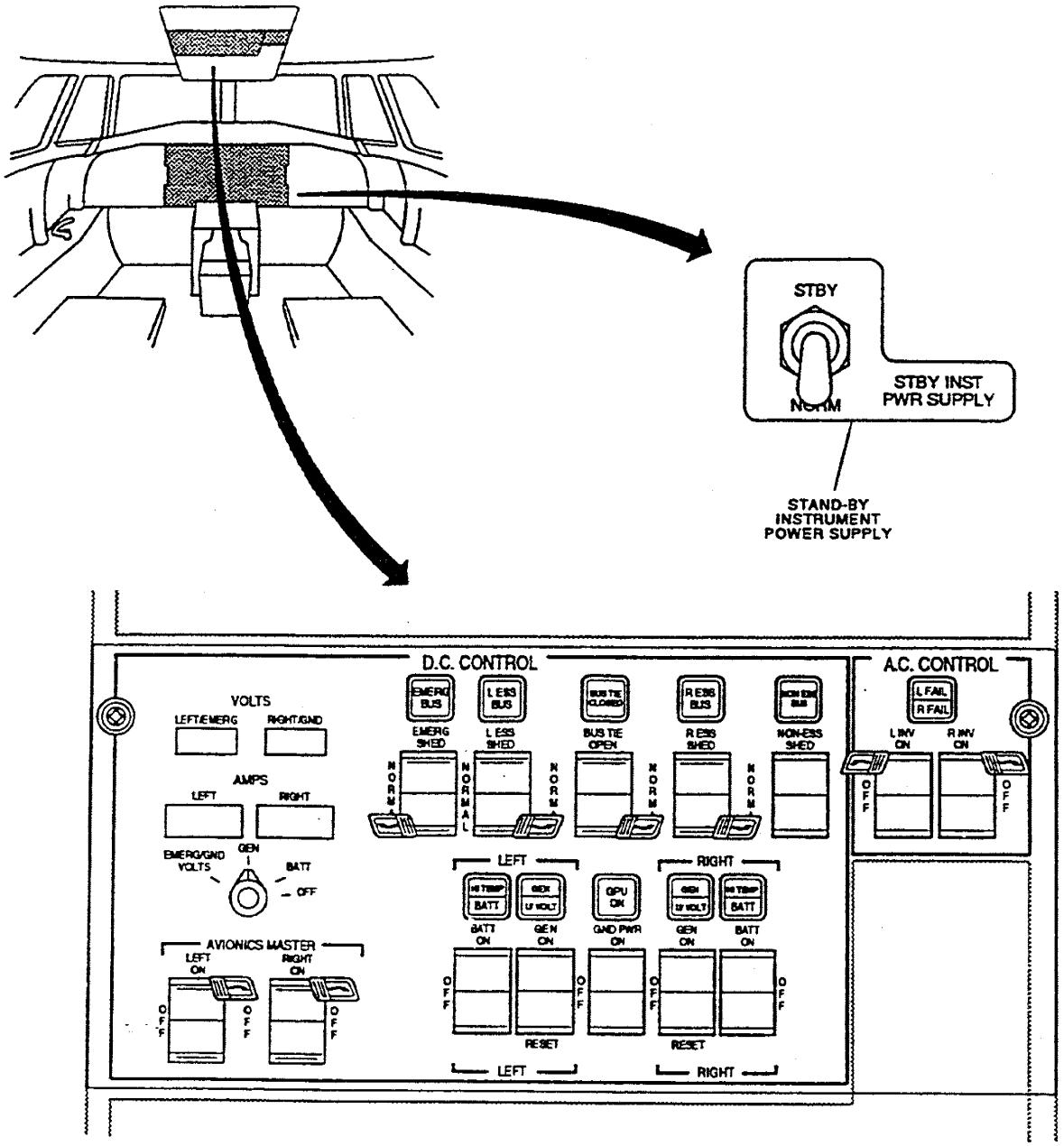
(1) Battery Contactors

Each battery is connected to its battery busbar through a Remote Control Circuit Breaker (RCCB). A battery contactor connects each battery to the relevant dc distribution system. The RCCB and battery contactor are installed in a Power Distribution Unit (PDU).

Each battery has a related BATT ON/OFF switch and [BATT] (amber) caption. The switches and captions are installed in the roof panel and are labelled LEFT and RIGHT.

If the battery system is serviceable and there is no GPU connected, the battery contactors close when the BATT switches are set to ON.

When a GPU is connected and set to ON the battery contactors are opened automatically. This disconnects the batteries from the system and the [BATT] (amber) captions in the roof panel come on regardless of the BATT switches position.



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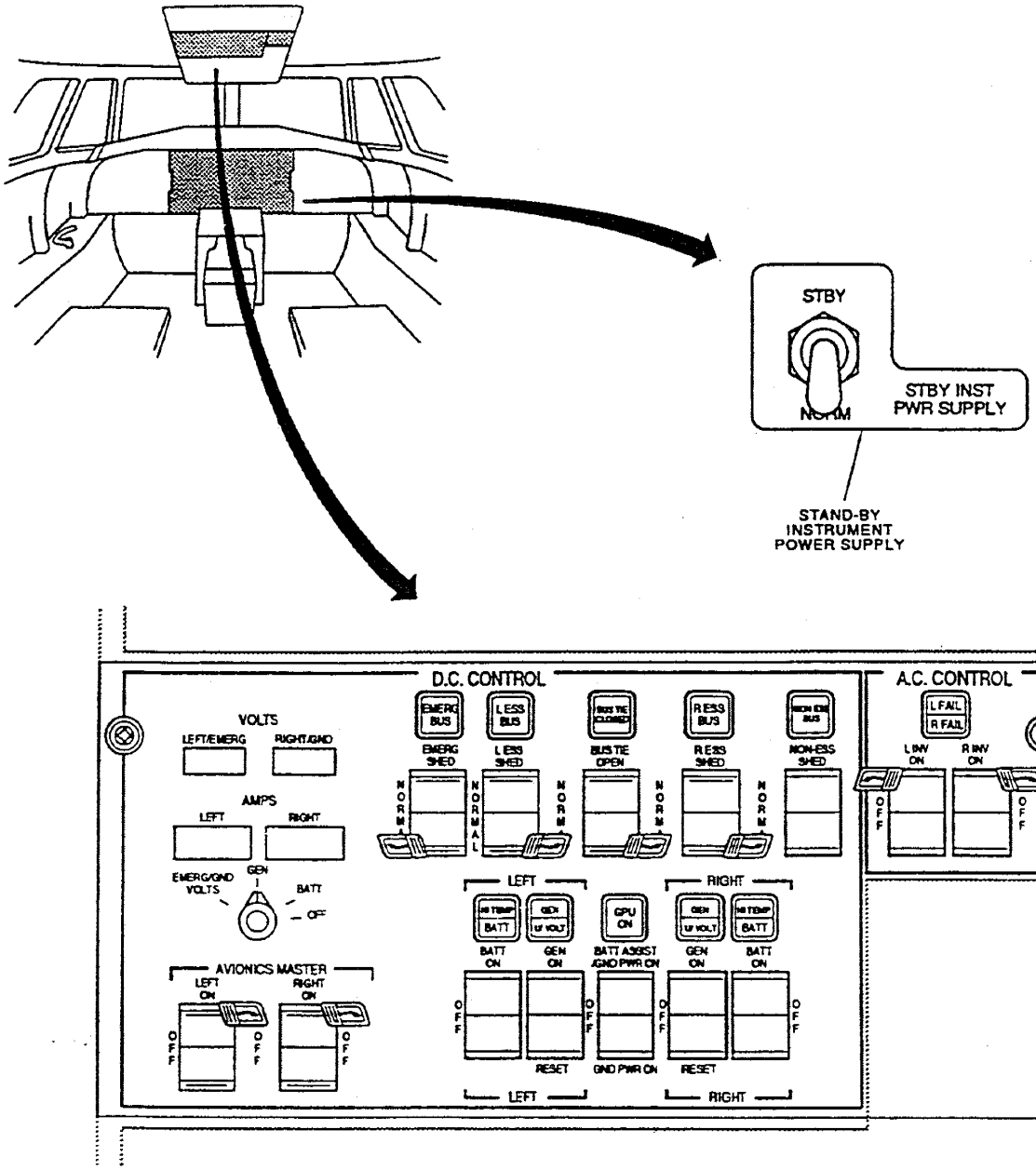
DC Electrical System - Control Switches (Sheet 1)



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DC Electrical System - Control Switches (Sheet 2)

(2) Battery Overheat

Installed in each battery are two thermal sensors. These sensors control the battery overtemperature warning and automatic disconnect function.

The overtemperature warning circuit causes a [HI TEMP] (amber) caption in the roof panel to come on if the battery temperature reaches 60° C. If corrective action is not taken and the battery temperature reaches 71° C the battery contactor is opened automatically. This disconnects the battery and the related [BATT] (amber) caption in the roof panel comes on.

If a [HI TEMP] (amber) caption comes on, set the applicable BATT switch in the roof panel to OFF. The caption will go off when the battery temperature decreases to less than 49° C.

Do not set the battery back to ON unless it is necessary for flight safety following a total failure of all generated power.

(3) Battery Charging

The batteries are charged from the engine-driven generators, they cannot be charged from a GPU. The on-line generators charge the batteries when the BATT switches are ON and the [BATT] (amber) captions are off. The battery charging current, controlled by the Generator Control Unit (GCU), is shown as part of the generator load.

(4) Battery Voltage and Current

To check the battery voltage and current; set the four position rotary switch in the roof panel to BATT. The voltage and current are shown digitally on the meters above the switch. Do not use the battery for internal power starts if the battery voltage is less than 24.0V dc.

When the current is displayed on the meter a:

- + (plus) before the digits indicates the batteries are being charged
- - (minus) before the digits indicates the batteries are being discharged: i.e. supplying an electrical load.

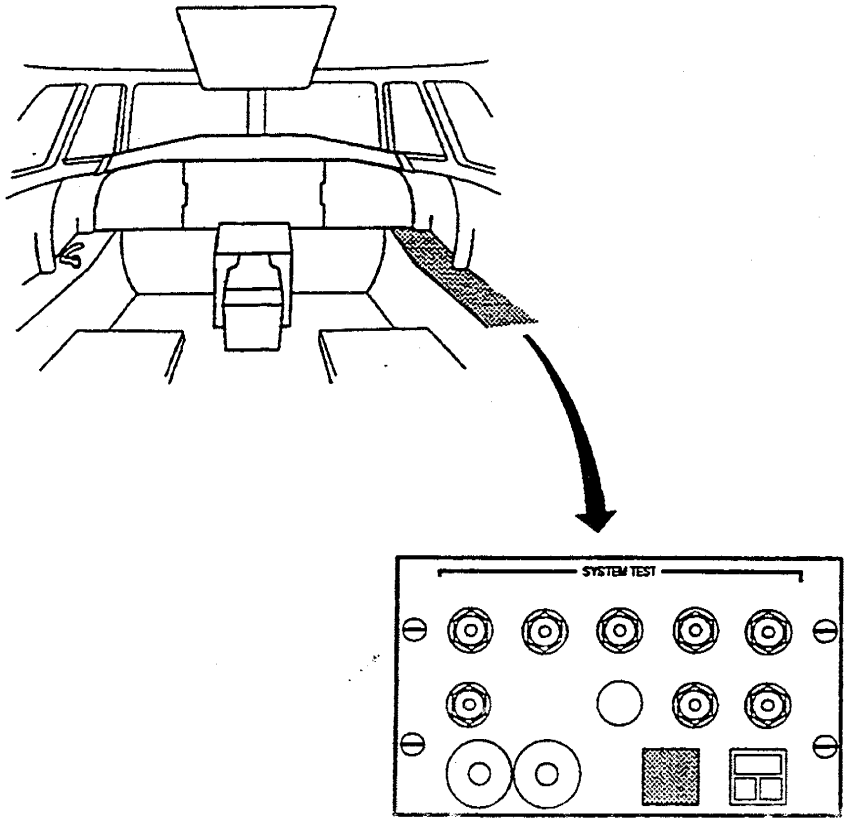
B. Standby DC Power Supply

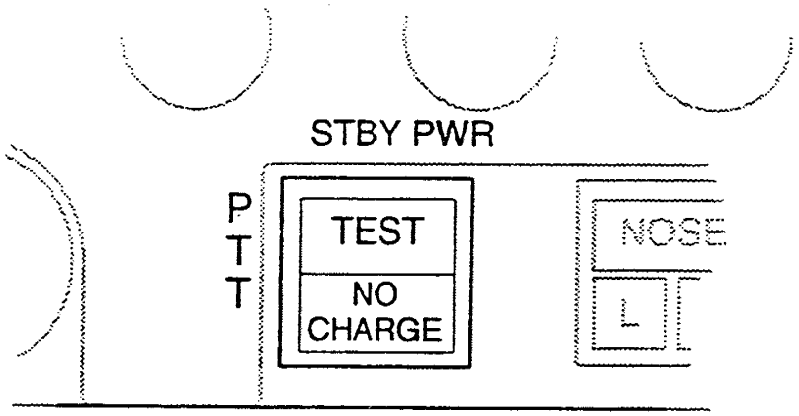
A standby dc power supply is provided by a nicad battery to maintain the AHRS (see Avionics Chapter 11) supply voltage above 18V dc during an internal battery engine start. It is also used to maintain the energisation of some PDU contactor coils during certain fault conditions. The standby dc power supply is installed under the flight deck floor.

A STBY INST PWR SUPPLY switch is located on the centre instrument panel. When the switch is set to NORM, power for the standby instruments is supplied by the 28V dc emergency avionic busbar. When the switch is set to STBY, 24V dc is enabled from the standby battery busbar to the standby instruments.

A standby dc power supply (STBY PWR) PTT indicator/switch is provided on the SYSTEM TEST panel (right side console). When the switch is pressed, an indication of the output voltage of the standby dc power supply internal battery is given. The TEST indicator (white) will come on when the output voltage is 24V dc or more. The NO CHARGE indicator (amber) will come on when the battery output voltage is at 0V dc. if less than 24 V. *

I used for 2 things
a. 10 minutes of Stby PWR
b. maintain AHRS (Stby pwr source)
c. [illegible] of contact coils





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System Test Panel

C. External Power System

A standard three pin external power socket is installed on the right side of the aircraft in the wing to fuselage aft fairing.

(1) External Power Contactor

The external power contactor connects the GPU output to the electrical power distribution system. The contactor is installed in the left PDU and is operated by the GND PWR ON/OFF switch in the roof panel.

Undervoltage and overvoltage detection relays are situated in the left PDU. The relays disconnect the GPU if an undervoltage or overvoltage condition is detected.

When a GPU is connected and set to ON the external power contactor is closed and the [GPU ON] (green) caption in the roof panel comes on.

The GPU output is then supplied to the distribution system through the cross-tie busbar and the busbar-tie contactors. The cross-tie busbar is normally isolated in-flight by the open bus-tie contactors. Whenever the bus-tie contactors are closed a [BUS TIE CLOSED] (green) caption in the roof panel comes on.

While the GPU is ON the battery contactors are open, the batteries are isolated and the [BATT] (amber) captions in the roof panel are on.

(2) GPU Voltage

To check the GPU output voltage, set the four position rotary switch in the roof panel to EMERG/GND VOLTS. The voltage shown digitally on the applicable meter above the rotary switch must not be less than 28.0V dc.

Note: This check should be carried out before the GND PWR switch is selected ON.

A GPU with a minimum current rating of 550 Amperes continuous, 1500 Amperes intermittently and current limited in the range of 1500-2000 Amperes should be used for engine starting.

D. Generator System

Two engine-driven starter/generators supply the generated dc power. Each starter/generator has a related GCU and an engine-start Generator Line Contactor (GLC).

(1) Starter Generator

A 28V dc starter/generator is installed on each engine. Each generator is rated at 550 Amperes continuous output, and 760 amps for five minutes. During the engine start cycle the starter turns the engine from 0% to 60% engine speed.

In the event of a single generator failure the remaining generator will supply all the aircrafts emergency and essential electrical loads.

(2) Generator Control Unit

A GCU is provided for each starter/generator to control and monitor the output of the generator. The functions monitored include load and voltage. If a fault in the generator is indicated the GCU causes the appropriate GLC to open.

An undervoltage detection circuit is installed in the GCU This circuit detects a generator undervoltage condition (not charging or discharging the batteries). When an undervoltage condition occurs a [UVOLT] (amber) caption in the roof panel comes on.

(3) Engine Starter/Generator Line Contactor

A Generator Line Contactor (GLC) is provided for each starter/generator. Each GLC is installed in a related PDU and has two functions:

- To connect internal or external power to the starter to turn the engine during a ground start
- To connect the generator to the distribution system when the voltage is more than the busbar load minus 0.5 Vdc.

Each GLC is controlled through the related GCU from the flight deck by a switch installed in the roof panel. The switch, one for each generator, is labelled GEN ON/OFF/RESET.

When either GLC is open the following captions come on:

- A CAP [ELECT] (amber) caption
- A [GEN] (amber) caption in the roof panel.

This occurs before engine start, or as a result of a generator or engine failure.

If a double generator failure occurs the CAP [ELECT] (red) caption comes on. This is to show that the aircraft is supplied with electrical power only from the batteries.

(4) Generator Voltage and Current

To check the generator voltage and current, set the four position rotary switch in the roof panel to GEN. The voltage (nominally 28.5V dc) and the current are shown digitally on the applicable meters above the switch.

2. DC Distribution System

A split two-channel dc system is provided. This gives mechanical and electrical isolation of the two generator systems. Mechanical and electrical isolation of the two systems ensures that no single active fault combined with a single dormant fault results in a failure of the two generator systems.

A. Busbar System

Distribution of dc power is through twelve busbars as follows:

(1) Left Essential Busbar

The left essential busbar is supplied from the left generator through the left GLC, or from a GPU through the cross-tie busbar. If a left generator failure occurs, the busbar is supplied from the right generator through the cross-tie busbar.

(2) Right Essential Busbar

The right essential busbar is supplied from the right generator through the right GLC, or from a GPU through the cross-tie busbar. If a right generator failure occurs, the busbar is supplied from the left generator through the cross-tie busbar.

(3) Non-Essential Busbar

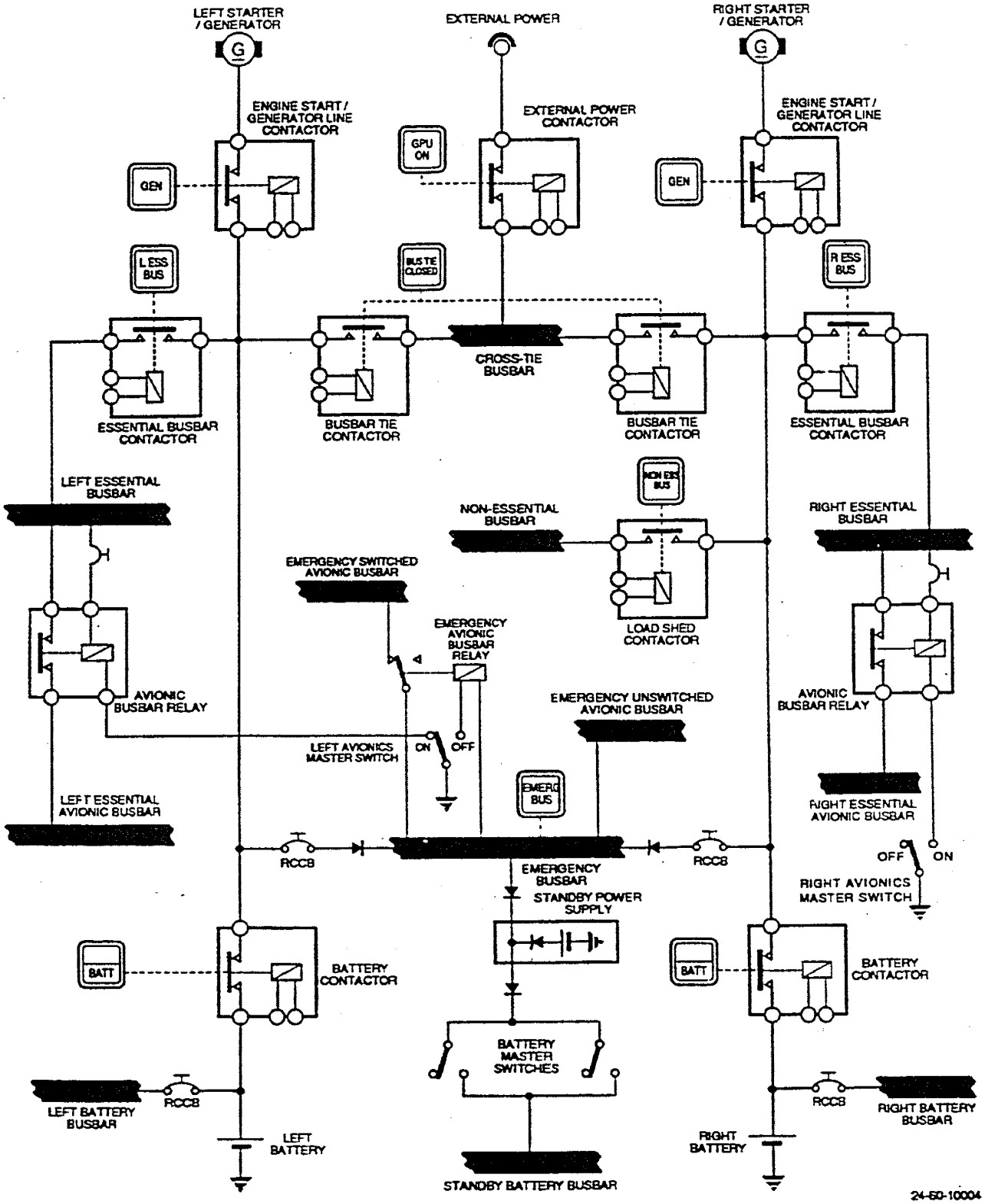
When the two generators are on-line the non-essential busbar is supplied from the right generator. The non-essential busbar is also supplied through the cross-tie busbar from a GPU. If a generator failure occurs the non-essential busbar is shed automatically.

(4) Emergency Busbar

The emergency busbar is supplied from:

- Left generator through the left GLC
- Right generator through the right GLC
- Left battery through the left battery contactor
- Right battery through the right battery contactor.

If a double generator failure occurs the essential bus contactors are opened automatically to disconnect the essential busbars. The emergency busbar will then supply the electrical loads, sufficient for safe flight and landing, from battery power.



DC Distribution System

(5) Left Battery Busbar

The left battery busbar is connected to the left battery through a Remote Control Circuit Breaker (RCCB). Crash loads related to the left engine (eg fire extinguishers) are supplied with power from this busbar.

(6) Right Battery Busbar

The right battery busbar is connected to the right battery through a RCCB. Crash loads related to the right engine are supplied with power from this busbar.

With batteries installed and the RCCBs closed the battery busbars are always live.

(7) Standby Battery Busbar

The standby battery busbar is connected to the standby power supply by either of the battery master switches. This busbar supplies power to the AHRS during internal battery engine starts.

(8) Cross-Tie Busbar

The cross-tie busbar is used to connect the output from a GPU to the distribution system. It is also used to parallel the two batteries or the two batteries and one generator for internal power starts. During the start cycle the cross-tie busbar supplies power through the bus-tie contactors to the GLCs.

In normal flight conditions the cross-tie busbar is isolated by the open bus-tie contactors. In the event of a single generator failure the bus-tie contactors are closed automatically. This connects the remaining generator to the opposite essential busbar through the closed bus-tie contactors and the cross-tie busbar.

(9) 28V dc Avionic Essential Busbars (Left and Right)

The two essential avionic busbars are supplied with power from the left and right essential busbars respectively. The power supplies to these busbars are controlled by switches in the roof panel labelled AVIONICS MASTER ON/OFF LEFT/ RIGHT.

The left essential avionic busbar supplies the number 1 avionics system components and the right supplies the number 2 avionics system components.

(10) 28V dc Emergency Switched Avionic Busbar

The emergency switched avionic busbar is supplied with power from the emergency busbar through the emergency avionics bus relay. The relay is made when the emergency busbar is powered and the LEFT AVIONICS MASTER switch set to ON.

Supplies from this busbar are, primarily, to the number 1 navigation system and standby instruments.

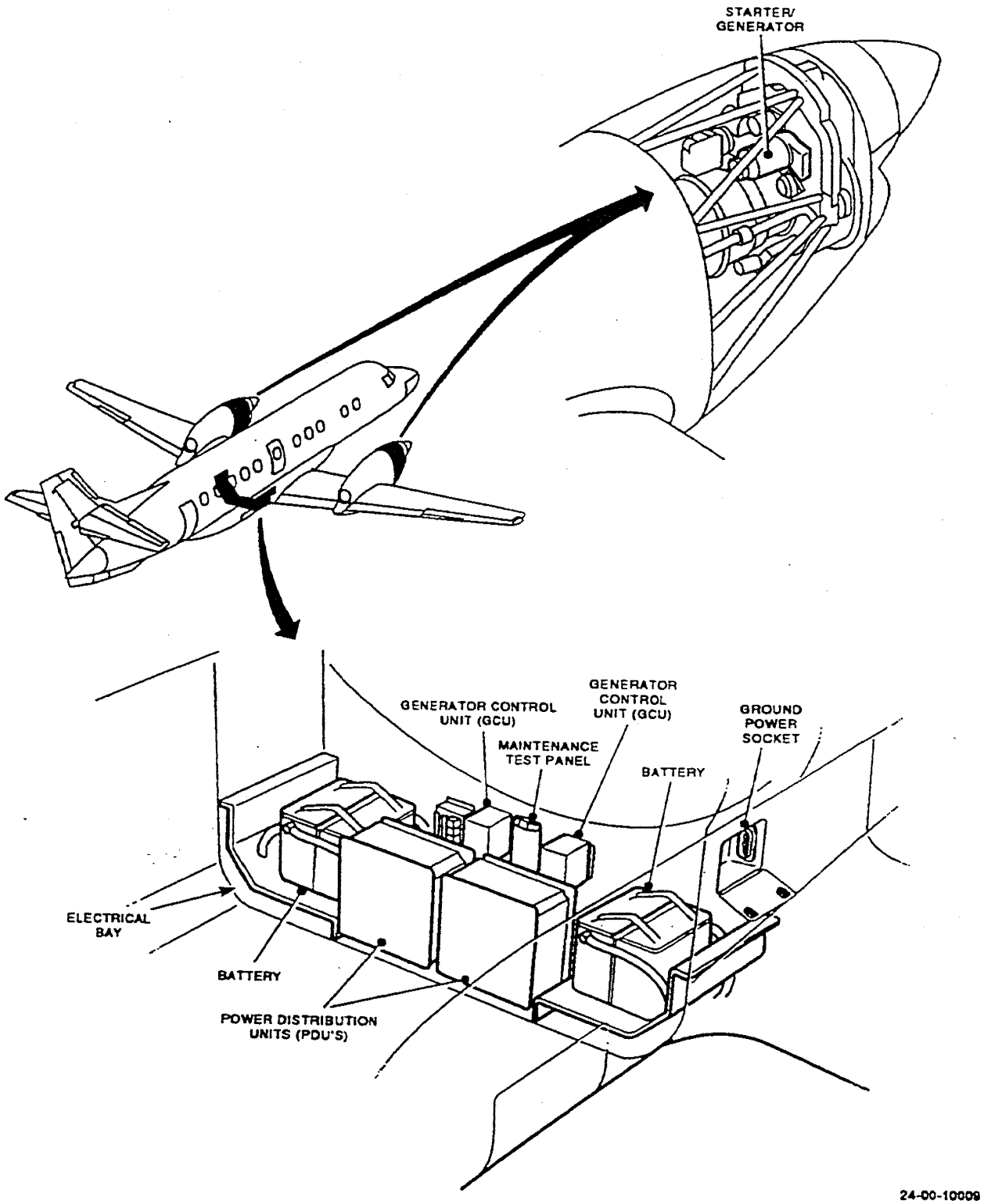
(11) 28V dc Emergency Unswitched Avionic Busbar

The emergency unswitched avionic busbar is connected direct to the emergency busbar. It is energised whenever the emergency busbar is energised.

This busbar supplies emergency services in the number 1 radio system.

3. Power Distribution Unit (PDU)

Two independently installed PDUs contain all the contactors and RCCBs which interconnect the busbars. The PDUs provide mechanical and electrical isolation of the left and right systems of the dc distribution system



Electrical Component Location - Sheet 1

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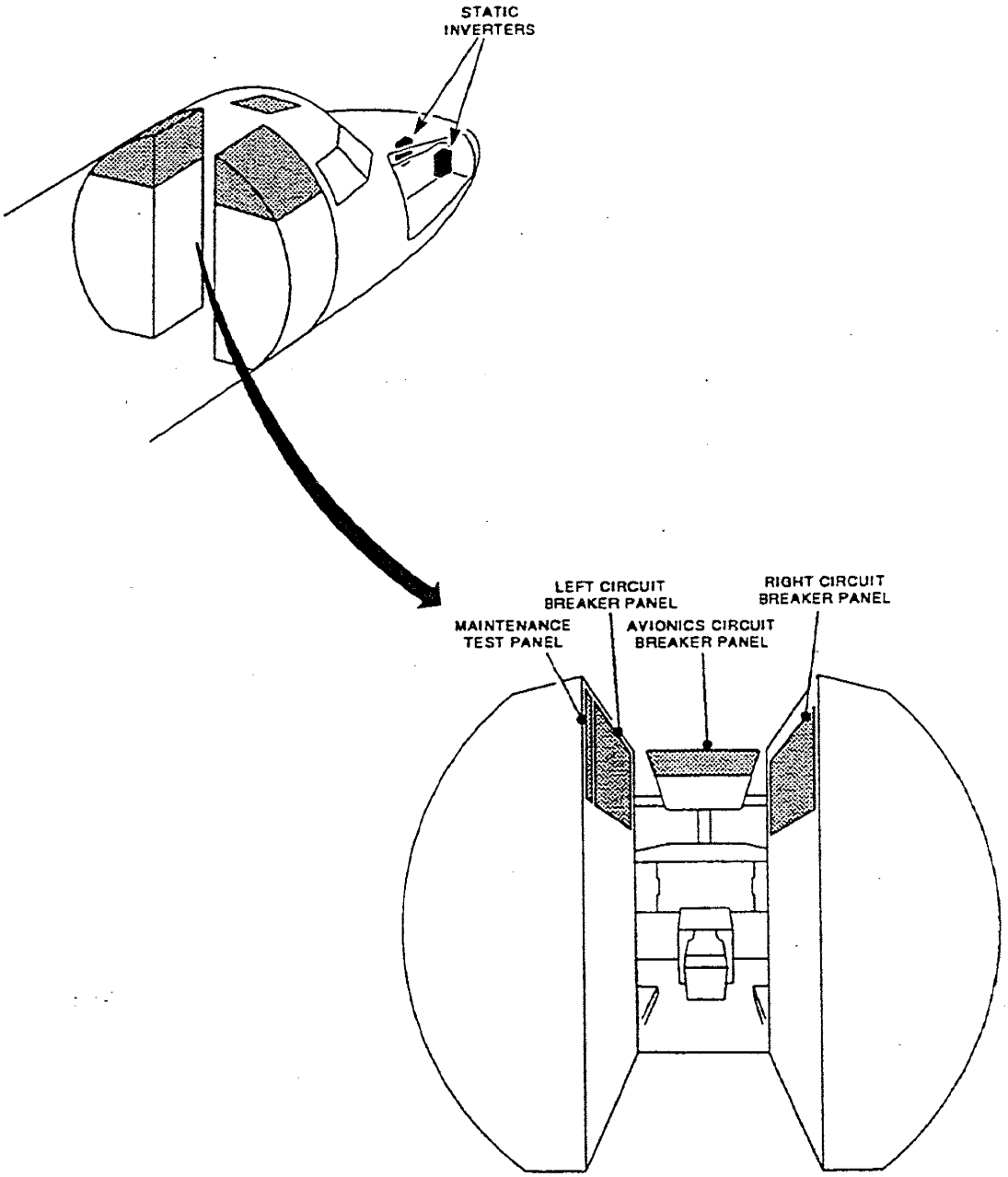

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Electrical Component Location - Sheet 2

4. Distribution Control

Contactors, RCCBs and switches control the distribution of dc electrical power.

A. Contactors

The distribution control contactors are as follows:

(1) Generator Line Contactors

The GLC function is given in para. 1. D. (3) of this chapter.

(2) Load-shed (Non-Essential) Contactor

The load-shed contactor connects the right PDU internal busbar to the non-essential busbar. The contactor is closed automatically when the two generators or a GPU come on-line. If a generator failure occurs the contactor is opened automatically to shed the non-essential busbar. The contactor can also be opened manually by selecting the roof panel switch labelled NON-ESS SHED/NORMAL to SHED. When the load-shed contactor is open the non-essential busbar is shed and the NON ESS BUS (amber) caption above the switch comes on.

(3) Busbar Tie Contactors

The busbar tie contactors connect the left and right PDU internal busbars to the cross-tie busbar. In the normal operating condition the busbar tie contactors are open.

The contactors are closed automatically when a GPU is connected and the GND PWR switch is set to ON. The GPU output is then supplied through the closed busbar tie contactors to the emergency, essential and non-essential busbars.

If a generator failure occurs during flight the busbar tie contactors are automatically closed to couple the essential busbars through the cross-tie busbar. The BUS TIE CLOSED (green) caption in the roof panel comes on to show the busbar tie contactors are closed.

(4) Battery Contactors

The battery contactors connect the batteries to their common bus points. The contactors are opened automatically when a GPU is set to ON.

Whenever a battery contactor is open a [BATT] (amber) caption in the roof panel comes on.

(5) External Power Contactor

The external power contactor connects the output from a GPU to the cross-tie busbar. With the two generators off-line the contactor is closed when the GND PWR switch is set to ON. The GPU output is then supplied to the emergency, essential and non-essential busbars through the cross-tie busbar and busbar tie contactors. If a generator is on-line, the external power contactor is open and the GND PWR switch cannot be set to ON.

When the GND PWR switch is set to ON, the external power contactor is closed and the battery contactors open. In this condition the batteries cannot be brought on-line.

To prevent damage to the aircraft electrical system the external power contactor is opened by an undervoltage, overvoltage or reverse polarity check failure when the GPU is connected.

(6) Essential Busbar Contactors

The essential busbar contactors connect the essential busbars to the PDU internal busbar. The contactors are closed automatically when a GPU is connected and the GND PWR switch is set to ON.

During normal flight operation the essential contactors remain closed. Guarded L ESS and R ESS SHED/NORMAL switches in the roof panel allow the essential busbars to be shed in-flight. When a switch is set to SHED the related essential busbar contactor is opened. This will shed the applicable essential busbar and the [L ESS BUS] or [R ESS BUS] (amber) caption above the switch will come on.

B. Remote Control Circuit Breakers (RCCBs)

The RCCBs are as follows:

(1) Emergency RCCBs

Two emergency RCCBs connect a generator and a battery to the emergency busbar by separate routes. In the event of a double generator failure the essential contactors are opened automatically to shed the essential busbars. The emergency busbar remains energized, supplied only by the batteries.

(2) Battery RCCBs

The battery RCCBs connect the batteries to their related busbars to supply the crash loads.

C. Switches

The control switches are as follows:

(1) Busbar Shedding Switches

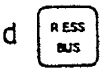
It is possible to shed individual busbars (eg for smoke drill purposes).

The emergency busbar is shed by setting the guarded switch in the roof panel labelled EMERG to SHED.

The 

(amber) caption above the switch comes on to show the busbar is isolated.

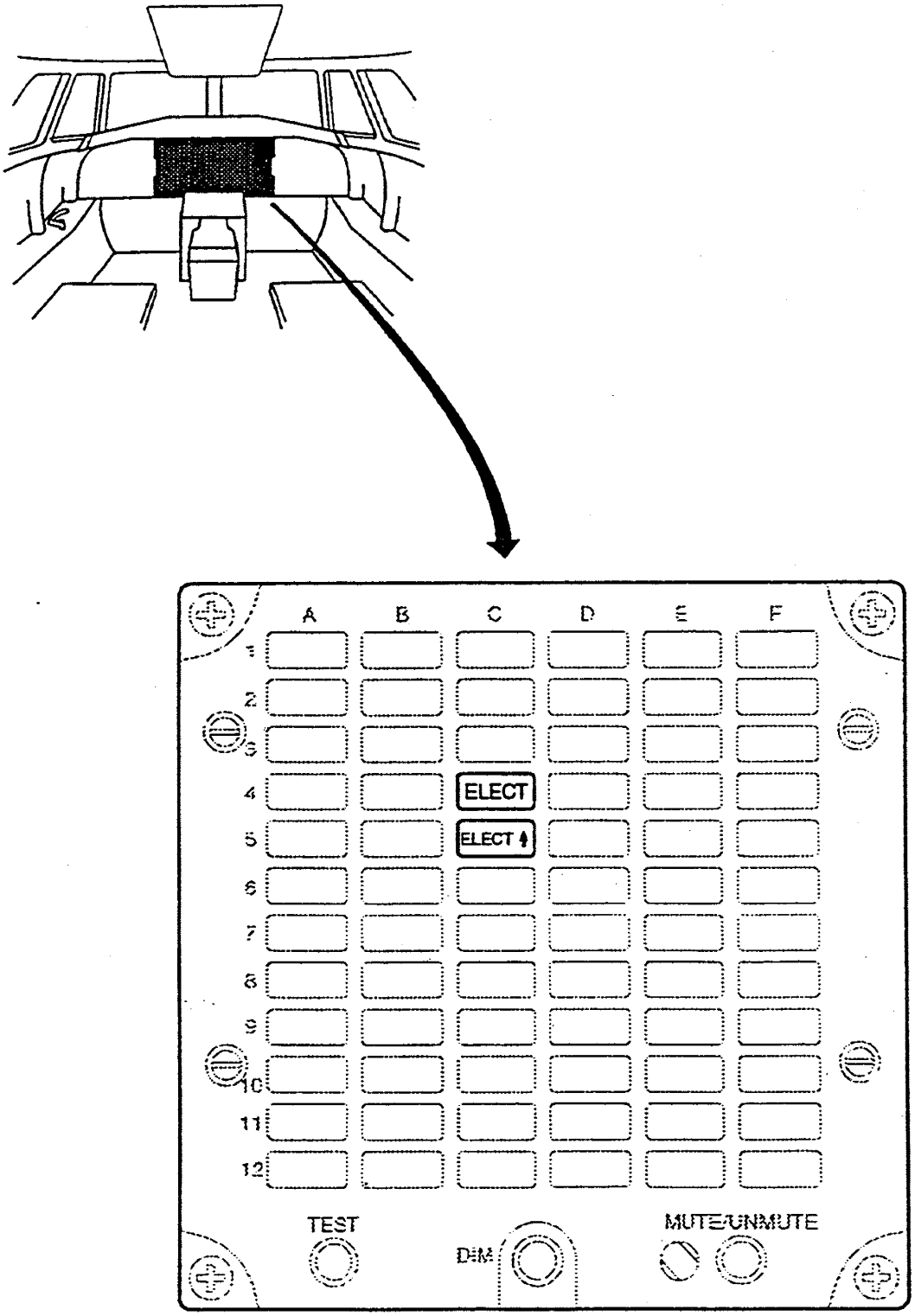
The essential busbars are shed by setting the guarded switches in the roof panel labelled L ESS and R ESS SHED/NORMAL to SHED. When the essential contactors are open the captions above the switches. 

and 

(amber) come on.

The non-essential busbar is shed by setting the switch in the roof panel labelled NON-ESS SHED/NORMAL to SHED. The caption above the switch 

(amber) comes on to show the load-shed contactor is open.



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Electrical System Warning-CAP

(2) Busbar Tie Contactors

In the event of a single generator failure the busbar tie contactors close automatically to couple the essential busbars through the cross-tie busbar. If there is a fault on one essential busbar, the busbar tie contactors must be opened to isolate the fault from the serviceable essential busbar. To open the busbar tie contactors the guarded BUS TIE OPEN/NORMAL switch in the roof panel is set to OPEN.

The [BUS TIE CLOSED] (green) caption in the roof panel comes on when the busbar tie contactors are closed.

(3) Avionics Master Switches

LEFT AVIONICS MASTER Switch:

- This switch is used to control the supply of power to the left essential avionic busbar and emergency switched avionic busbar.

RIGHT AVIONICS MASTER Switch:

- This switch is used to control the supply of power to the right essential avionic busbar.

D. Warnings

In addition to the discrete captions described for power source and busbar failure/set to OFF, generator U/VOLTage and the GND PWR switch set to ON, the CAP [ELECT] (amber) caption comes on when any warning or failure caption in the DC CONTROL panel comes on.

In the event of a double generator failure the CAP [ELECT] (red) caption will come on.

5. DC System Operation

A. Normal

In normal operation the DC system operates as two independent systems (left and right) as follows:

Left generator	Right generator
Left battery	Right battery
Left essential busbar	Right essential busbar
Left battery busbar	Right battery busbar
Auxilliary non-essential busbar	Non-essential busbar

In normal operation the busbar tie contactors are open and the cross-tie busbar isolated. The Remote Control Circuit Breakers (RCCBs) are normally closed to supply power to the emergency busbar and the left and right battery busbars.

B. External Power

External power is available to the busbars when:

- A serviceable GPU is connected and set to ON
- Both GLCs are open.

Setting the GND PWR switch to ON closes the external power contactor, the busbar tie contactors, the essential busbar contactors and the load shed contactor. The battery contactors are opened.

C. Internal Battery Power

Internal battery power is available when the external power contactor is open.

When the BATT switches are set to ON and the battery is within temperature limits, the battery contactors close and the BATT (amber) captions go off. Battery power is now available to the emergency busbar. The battery busbars are energised when the batteries are installed and the RCCBs closed.

D. Generator Power

With the two engines running at 60% RPM or more, setting one of the two GEN switches to ON opens the external power contactor and isolates the GPU supply. The GLC, busbar tie contactors and essential busbar contactors close. Generated power is supplied to all essential and emergency systems. Setting the second GEN switch to ON opens the busbar tie contactors and closes the non-essential contactor. Generated power is now supplied to all aircraft systems.

E. Abnormal Operation (Single Generator Failure)

If a single generator fails, the related GCU de-energizes the PDU logic to automatically close the busbar tie contactors. The [BUS TIE CLOSED] (green) caption in the roof panel comes on.

The remaining generator then supplies power to the left and right essential busbars.

The load-shed contactor is opened automatically and the non-essential loads shed. The following captions come on:

- A CAP [ELECT] (amber) caption
- A [NON ESS BUS] (amber) and a [GEN] (amber) caption (on the roof panel) for the failed generator.

All essential and emergency services are now supplied from the remaining generator.

F. Abnormal Operation (Double Generator Failure)

If a double generator failure occurs, the GCUs de-energize the PDU logic to automatically open the essential busbar contactors. This isolates the essential busbars and the following captions come on:

- The [L ESS BUS] and [R ESS BUS] (amber) captions in the roof panel.

The load-shed contactor is opened automatically and the non-essential loads shed. The following captions come on:

- The [NON ESS BUS] (amber) caption on the roof panel
- The CAP [ELECT] (red) caption
- The CAP [ELECT] (amber) caption
- And the two [GEN] (amber) captions come on.

The emergency busbar is now supplied from the batteries only, and only emergency and crash services are available.

G. Generator Reset

If a generator failure occurs, and the GLC opens, an attempt to put the generator back on-line can be made with the GEN ON/OFF/RESET switch in the roof panel. When the switch is set to RESET any fault logic which has operated in the GCU is momentarily reset. This permits reselection of ON to re-energize the GLC. If the faults are no longer present the generator comes back on-line and the CAP [ELECT] (amber) and [GEN] (amber) captions go off.

H. Busbar ~~Earth Faults~~ Short Circuits

An earth fault on the non-essential busbar will cause the non-essential busbar fuse to blow. This will isolate the busbar and the [NON ESS BUS] (amber) caption in the roof panel will come on.

An earth fault on an essential busbar will cause the related PDU to automatically open the contactor of the affected busbar. The relevant [L ESS BUS] or [R ESS BUS] (amber) caption in the roof panel will come on. Power supply in this condition is to the left or right essential loads, and all emergency and crash loads. A fault on either essential busbar will have no effect on the non-essential loads.

An earth fault on the emergency busbar will cause the RCCBs to open. This will isolate the busbar and the [EMERG BUS] (amber) caption in the roof panel will come on.

This fault has no effect on the power supplies to the essential, non-essential or battery busbars.

An earth fault that causes an amber failure caption in the roof panel to come on also causes the CAP [ELECT] (amber) caption to come on.

6. Protection Systems

A. Generation

The GCU provides protection against a malfunction of a generator.

A voltage protection circuit limits the generator output to 31.5V dc. A separate voltage protection circuit opens the GLC if the generator output voltage exceeds 40.0V dc.

Current limiters limit the generator output to approximately 150% of its rated output current during generator assisted starts.

If the GCU detects an out-of-limit voltage or current condition, or other faults are present, the GLC will not close. If the GLC is closed, during a detected out-of-limit condition or other fault, it will open. The related [GEN] (amber) caption in the roof panel will come on.

An undervoltage detection circuit is incorporated to detect a generator undervoltage condition. When an undervoltage condition occurs a [UVOLT] (amber) caption in the roof panel comes on.

B. Busbars

Overcurrent sensors protect the essential busbars. These sensors isolate the essential busbars if an earth fault occurs. RCCBs protect the emergency and battery busbars, and the non-essential busbar is protected by a fuse.

The applicable amber captions in the roof panel come on to show busbar failures.

C. Battery

The batteries have overtemperature and overcurrent protection circuits. The protection circuits will cause the battery contactor to open. Either a [BATT] (amber) caption or [BATT] and [HI TEMP] (amber) captions will come on if an out-of-limit battery condition occurs.

The battery busbars stay connected to their related batteries to supply crash loads unless the battery RCCB is opened.

D. External Power Supply

The aircraft systems are protected from faults on the GPU. GPU power is monitored for overvoltage, undervoltage and earth faults. If a fault condition is found, the GPU power is isolated from the main aircraft systems. When the fault has been corrected, GPU power can be re-connected by setting the GND PWR switch to OFF, then to ON.

The [GPU ON] (green) caption in the roof panel comes on when the external power contactor is closed.

If an engine start contactor welds during an interrupt to the external power supply, the appropriate engine start light will remain illuminated. This indication is to alert the flight crew not to reconnect the GPU. If the GPU is reconnected, uncommanded propeller rotation could occur.

7. DC Services

Circuit breakers and fuses protect the loads and services supplied from the busbars. Written above each circuit breaker is the load or service it supplies. The circuit breakers identified with white collars are for use in emergency drills.

Services connected to the battery busbars and identified as crash services are:

- Baggage bay light (left battery busbar)
- LP fuel cock-left (left battery busbar)
- LP hydraulic cock-left (left battery busbar)
- Battery contactor-left (left battery busbar)
- Fire extinguisher-shot 1 (left battery busbar)
- Cockpit flood light (left battery busbar)
- V/A meters (left battery busbar)
- Vestibule lights (right battery busbar)
- LP fuel cock-right (right battery busbar)
- LP hydraulic cock-right (right battery busbar)
- Battery contactor-right (right battery busbar)
- Refuel (right battery busbar)
- V/A meters (right battery busbar)
- Fire extinguisher-shot 2 (right battery busbar).

The above services are always energised when the batteries are installed and the RCCBs closed. Care must be taken not to cause inadvertant operation of the fire extinguisher switches. Make sure that the flood and emergency lights are not left selected ON when no other power source is connected to the aircraft.

8. Procedures

The procedures for the dc distribution system are as follows:

A. On the Ground - Energizing Busbars

(1) Selection of the LEFT and RIGHT BATT switches to ON energizes the emergency busbar, standby battery busbar and the emergency unswitched avionics busbar.

(2) Connection of a ground power unit and selection of the GND PWR switch to ON energizes the cross-tie, essential, non-essential and emergency busbars.

(3) Selection of the LEFT AVIONICS MASTER switch to ON energizes the left essential avionic busbar and the emergency switched avionics busbar.

Note: The LEFT AVIONICS MASTER switch operates:

- a normally open, left essential avionic busbar contactor, from the ON position
- a normally closed, emergency avionics busbar contactor, from the OFF position.

(4) Selection of the RIGHT AVIONICS MASTER switch to ON energizes the right essential avionic busbar.

Note: The RIGHT AVIONICS MASTER switch operates a normally open, right essential avionic busbar contactor from the ON position

B. Ground Engine Starting - External Power

(1) Selection of the GND PWR switch, with a ground power unit connected, to ON energizes the essential, emergency and non-essential busbars via the cross-tie busbar.

(2) Selection of the LEFT and RIGHT BATT switches to ON energizes the standby battery busbar. It will also bring the batteries on-line automatically in the event of a failure of the external power input or its control system.

Note: The standby battery provides an additional power supply to the existing emergency busbar supply to the start contactor. This is to support the start contactor coil voltage during ground power starting.

(3) Selection of the START MASTER switch (on the engine start panel) to the engine to be started and subsequent operation of the appropriate switch enables the start/generator line contactor.

(4) Selection of the associated GEN switch to ON brings the generator on-line automatically at 60% engine speed. The ground power unit is immediately isolated and the non-essential busbar de-energized.

(5) Starting the second engine and selecting its (or both) GEN switch(es) to ON brings the associated generator(s) on-line, isolates the cross-tie busbar and energizes the non-essential busbar.

C. Ground Engine Starting - Internal Power

(1) Selection of both LEFT and RIGHT BATT switches to ON energises the emergency busbar and standby battery busbar.

(2) Selection of the START MASTER switch to the appropriate engine energises the cross-tie busbar. Subsquent operation of the appropriate START switch enables the associated start/generator line contactor.

(3) Selection of the associated GEN switch to ON prior to engine start, brings the generator on-line automatically at 60% engine speed and couples the essential busbar for a generator assisted start of the other engine.

(4) Starting the second engine and selecting its GEN switch to ON brings the associated generator on-line, isolates the cross-tie busbar and energizes the non-essential busbar.

D. Emergency Procedures

In the event of a failure condition, (eg electrical fire), any one or combination of busbars may be isolated by the following methods:

(1) Non-essential Busbar

The non-essential busbar may be isolated by selection of the NON-ESS rocker switch in the DC CONTROL panel to SHED. This causes the NON ESS BUS (amber) caption above the switch to come on.

(2) Essential Busbar(s)

The left and/or right essential busbar(s) may be isolated by selection of the associated guarded L ESS and/or R ESS rocker switches in the DC CONTROL panel to SHED.

This causes the associated L ESS BUS and/or R ESS BUS (amber) caption(s) above the switch(es) to come on.

(3) Emergency Busbar

The emergency busbar may be isolated by selection of the guarded EMERG rocker switch in the DC CONTROL panel to SHED.

This causes the EMERG BUS (amber) caption above the switch to come on.

(4) Avionic Busbars

The left and right essential and the switched emergency avionic busbars may be isolated by the LEFT and RIGHT AVIONICS MASTER switches as follows:

- Selection of the LEFT AVIONICS MASTER switch to OFF isolates the left essential and the emergency switched avionic busbars
- Selection of the RIGHT AVIONICS MASTER switch to OFF isolates the right essential-avionic busbar.

9. AC Power

A. Inverters

Two independent inverters supply 26V ac and 115V ac 400 HZ. The 26V ac is supplied to the avionic and instrument systems and the 115V ac is supplied to the Flight Data Recorder (FDR).

B. AC Distribution System

The left inverter is supplied with power from the dc emergency busbar. The right inverter is supplied from the right dc essential busbar. Each inverter supplies two busbars as follows:

- Left inverter	left 26V ac avionic busbar left 115V ac busbar
- Right inverter	right 26V ac avionic busbar right 115V ac busbar.

The left and right 26V ac avionic busbars supply the left and right avionic and instrument systems respectively. The left and right 115V ac busbars supply the FDR.

C. Control

Two switches labelled L INV ON/OFF and R INV ON/OFF control the supply of dc power to the inverters. The switches are installed in the AC CONTROL panel on the flight deck roof panel.

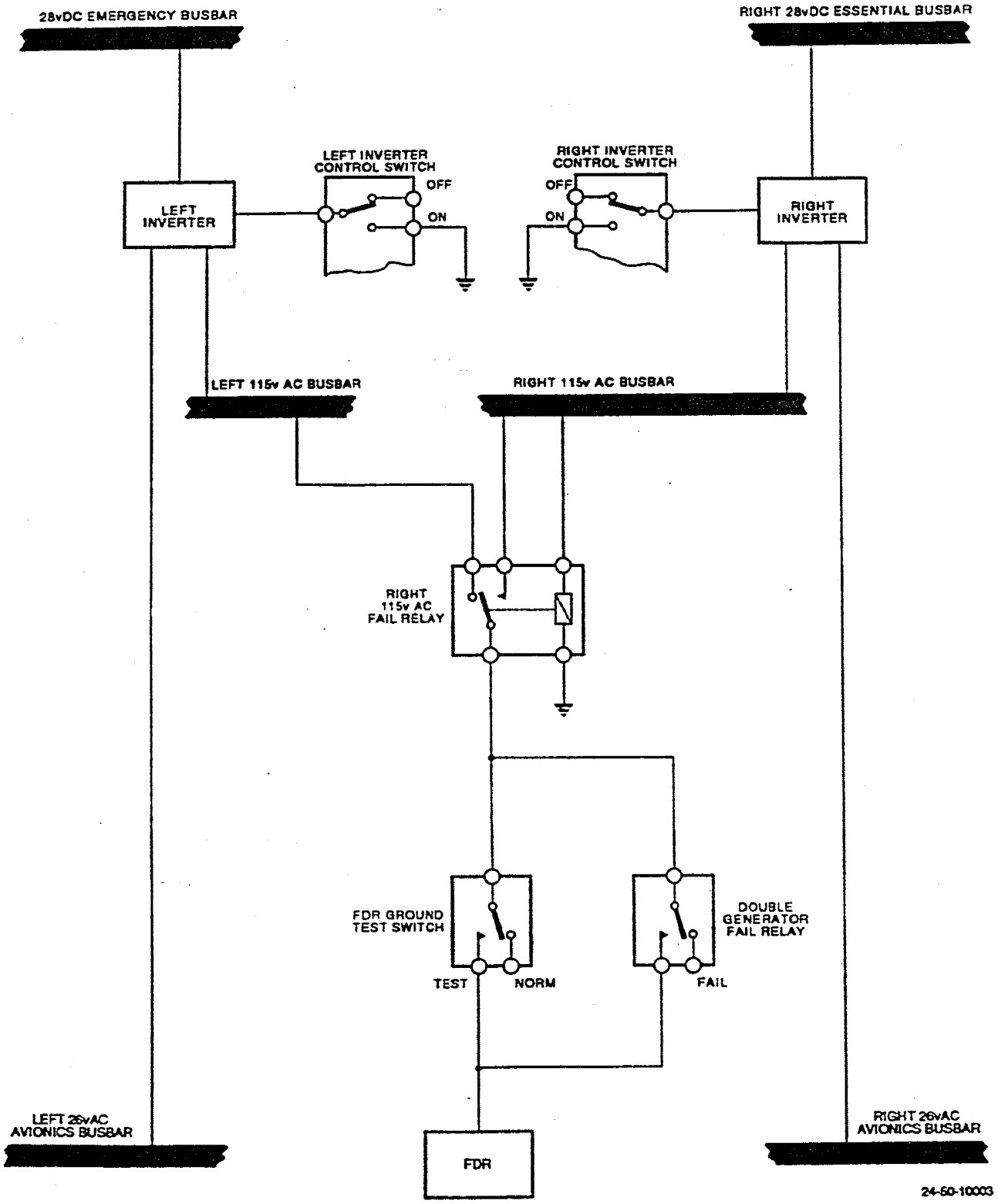
The dc power for the inverters is provided by separate routes from the two generators. This ensures that no single failure affects both pilots instruments.

D. Protection and Fault Warning

Each inverter contains internal over/under voltage and over/under frequency protection. If the limits are exceeded or any other failure or fault is apparent in the inverter it shuts down.

If an inverter shuts down, the applicable L FAIL or R FAIL (amber) caption in the AC CONTROL panel comes on. The CAP ELECT (amber) caption also comes on.

The FDR is normally supplied by the right 115V ac busbar. If a failure of the right 115V ac busbar occurs the FDR is automatically supplied from the left 115V ac busbar.



AC Power Distribution System

10. 115V A.C. Ground Services Connectors

Two 115V A.C. 3-pin ground service connectors are provided to allow the use of domestic type ground equipment, for example, a domestic vacuum cleaner, portable cabin heaters, etc..

One socket (for power input) is located adjacent to the aircraft ground power socket and one socket (output) is located below the seat level on the left side of the mid passenger cabin area.

The circuit is protected with a 30A circuit breaker which is located adjacent to the power input socket.

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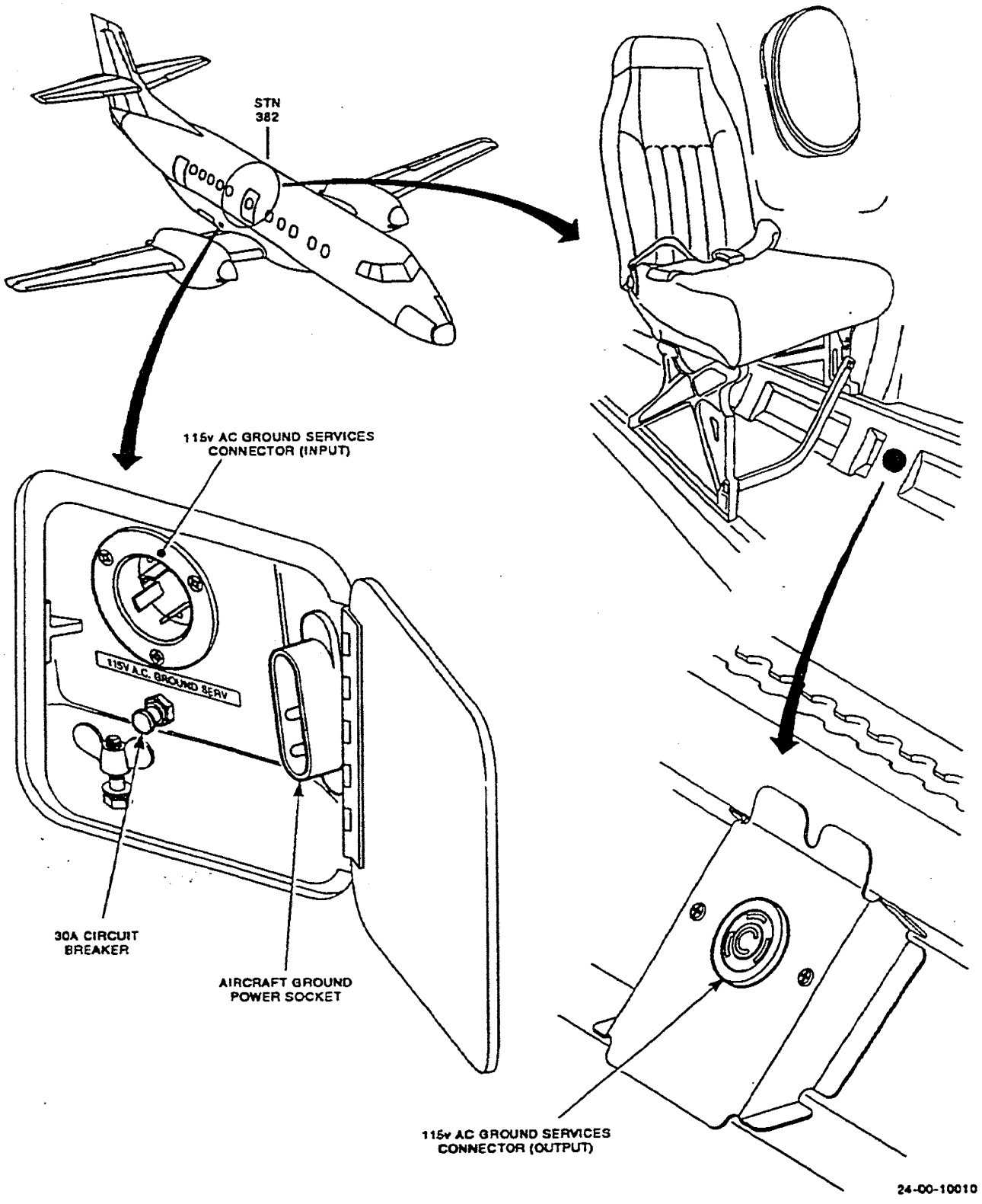

115V A.C. Ground Services Connectors

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