SECTION 7

ELECTRICAL

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LIST OF ILLUSTRATIONS

SECTION 7

ELECTRICAL

1. SUPPLY

A. General

The electrical power system consists of generating and static conversion systems, and secondary and external power systems.

(1) Power Generating Systems

There are three power generating systems:

- Primary ac power is provided by two integrated drive generators, GEN 1 and GEN 2. Both generators provide 115/200 volts ac, 400 Hz, 3 phase, with a maximum power rating of 30 kVA.
- Auxiliary ac power is provided by the auxiliary power unit (APU). The generator output is 115/200 volts ac, 400 Hz, 3 phase, with a maximum power rating of 30 kVA.
- Emergency ac power is provided by an air-driven generator (ADG). The generator provides 115/200 volts, 400 Hz, 3 phase, with a maximum power rating of 15 kVA at 160 knots.

(2) DC Static Conversion System

The primary and essential ac supplies are fed to three transformer rectifier units (TRU) which produce unregulated 28-volt dc supplies.

(3) Secondary DC Power System

A nickel-cadmium battery provides secondary and emergency dc power.

(4) External Power System

The aircraft can be supplied from an external source through ac and dc receptacles on the lower fuselage.

B. AC Power (Figures 1, 2, 3 and 4)

(1) No. 1 and No. 2 Generators

Each generator normally supplies its own distribution system. GEN 1 supplies power to the ac main bus No. 1 which feeds the ac essential bus, TRU 1 and the ac utility bus No. 1. The AC essential bus supplies the essential loads and TRU 3.

GEN 2 supplies ac main bus No. 2 which feeds the main No. 2 loads, TRU 2, ac utility bus No. 2 and the battery charger.

(2) Transfer and Bus Tie (Figures 1, 2, 5 and 6)

If either primary generator fails, the associated bus is transferred automatically to the other generator and both ac utility busses are isolated. The GEN OFF light comes on but the MAIN BUS OFF light remains out to indicate that the bus is tied to another supply. To restore the services of the ac utility busses, the APU generator must be brought on line.

Under bus tie conditions, if an overload occurs in the bus tie, the generator control circuit de-energizes the transfer contactors and the FAIL and MAIN BUS OFF lights come on. When the AUTO OFF/FAIL switch/light is pressed, the automatic transfer circuit is inhibited, the AUTO OFF light comes on and the FAIL light goes out.

If power is lost from ac main bus No. 1, the essential transfer contactor automatically transfers the ac essential bus to ac main bus No. 2.

If all ac power is lost, the ADG is deployed automatically. If automatic deployment fails, the ADG can be deployed manually by operating the manual deploy handle located on the centre pedestal. When the ADG comes on line, the ADG ac emergency transfer contactor transfers the ac essential bus to the ADG bus and also connects the dc essential bus to the battery bus.

(3) APU and External Power (Figures 1, 2 and 7)

The APU and external ac power can supply any ac bus through the AP/EP contactor and line and transfer contactors.

When external power is connected to the aircraft the AVAIL light comes on. When the GPWR switch is set to on, the external contactor energizes. The AVAIL light goes out, the IN USE light comes on and the external power is connected to the ac main busses. When the APU is running and on line, it overrides the external supply and supplies power to the main busses.

(4) AC Metering (Figure 8)

All sources of ac power are monitored on the metering section of the power management panel.

C. DC Power

(1) Internal DC Power

When ac power is available from the ac busses, the transformer rectifier units supply dc power to dc bus No. 1, dc bus No. 2, and the dc essential bus. Two other busses, dc utility bus No. 1 and dc utility bus No. 2, are supplied by dc bus No. 1 and dc bus No. 2 respectively under normal operating conditions. Power to the battery bus from the battery direct bus is fed via a battery contactor controlled by a battery bus power sensing relay. Normally this relay is energized and the battery bus is isolated except when a bus tie operation is carried out. Each bus, except the utilities, has an associated light which is out when the bus has power.

If either dc bus No. 1 or No. 2 loses power, it can be supplied from the other bus by pressing the appropriate BUS TIE CLOSED switch/light on the power management panel. When the bus is tied, the BUS TIE CLOSED light comes on. If the dc essential bus loses power because of TRU 3 failure, it can be supplied from either dc bus No. 1 or No. 2 by pressing the appropriate BUS TIE CLOSED switch/light. For any of the described tie conditions, the battery bus receives power.

If a complete power failure occurs, an emergency transfer takes place and power is fed from the battery direct bus via the battery contactor. The contactor is energized via the BATTERY MASTER switch and de-energized battery bus power sensing relay. The dc essential bus receives power from the battery bus via an emergency dc transfer contactor. The BATT BUS OFF light goes out and the CHARGE light comes on, indicating that the battery is on load.

The battery direct bus supplies refuel/defuel facilities, passenger doors, control circuits for the battery, boarding lights and service lights.

(2) External DC Power

External dc power is connected to the aircraft through an external receptacle located adjacent to the battery compartment. It energizes an external dc contactor and supplies the battery direct bus.

(3) DC Metering

A rotary switch on the power management panel permits all sources of dc power to be monitored on the metering section.

2. DISTRIBUTION

Primary ac power from the integrated drive generators (GEN 1 and GEN 2) or from the APU generator and external ac power are supplied to ac main bus No. 1 and ac main bus No. 2 through the main electrical distribution panel. The ac essential bus is normally supplied from ac main bus No. 1 but transfer facilities permit the ac essential bus to be fed from ac main bus No. 2 or, in an emergency, from the ADG bus.

Primary dc power to dc bus No. 1 and dc bus No. 2 is obtained from primary ac power by transformer rectifier units (TRUs). The dc essential bus is supplied from the essential TRU. Battery and external dc power are fed to the battery bus through the aft electrical distribution box and the battery direct bus.

The electrical power is distributed through the following circuit breaker panels:

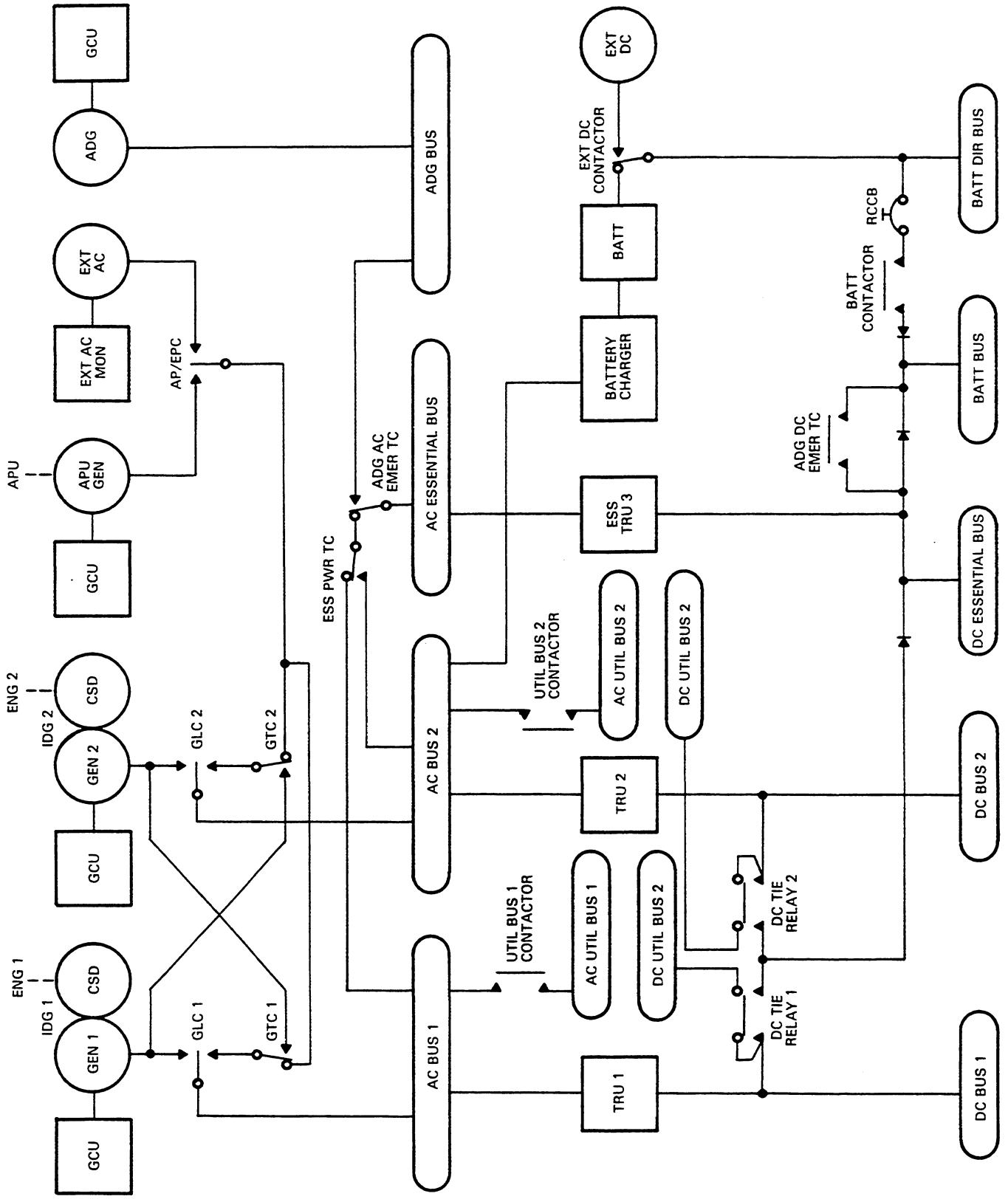
- CBP-A is located on the forward bulkhead behind the pilot's position and is divided into two sections. One section contains ac main bus No. 1, dc bus No. 1, and dc utility bus No. 1 circuit breakers. The other section contains battery bus circuit breakers (refer to Figures 9 and 10).

- CBP-B is located on the forward bulkhead behind the copilot's position and divided into two sections. One section contains ac main bus No. 2, dc bus No. 2, dc utility bus No. 2 and ac utility bus No. 2 circuit breakers. The other section contains battery bus circuit breakers (refer to Figures 11 and 12).

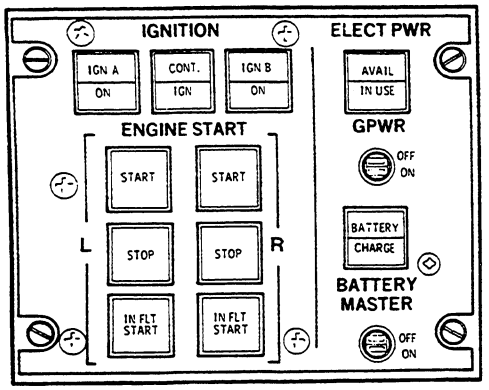
- CBP-C is located in the flight compartment on the pilot's left console and contains the ac essential bus and ADG bus circuit breakers (refer to Figure 13).

- CBP-D is located in the flight compartment on the copilot's right console and contains the dc essential bus circuit breakers (refer to Figure 14).

The aft electrical distribution box is located in the battery compartment and contains the battery direct bus circuit breakers (refer to Figure 15).

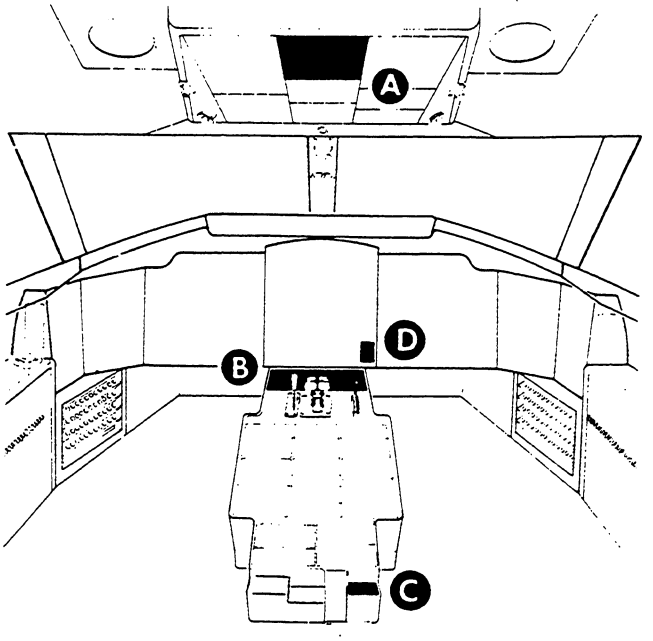


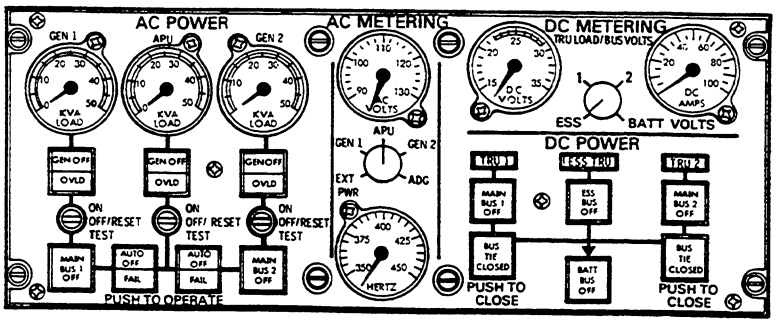
Electrical System - Basic Configuration
Figure 1



ENGINE START AND
ELECTRICAL CONTROL PANEL

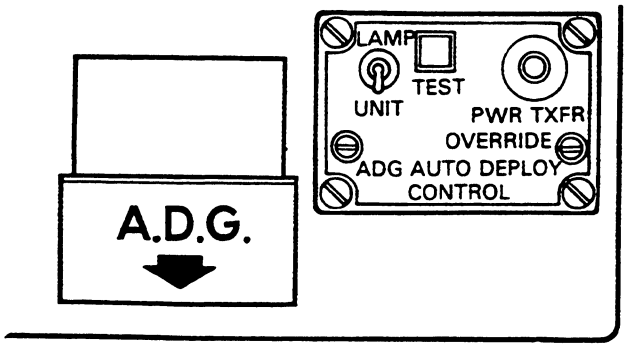
A





POWER MANAGEMENT PANEL

B

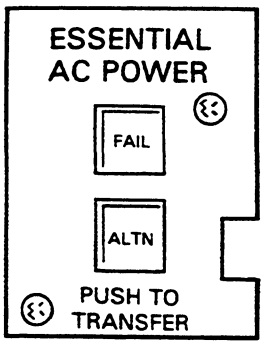


MANUAL DEPLOY HANDLE

C

AUTO DEPLOY PANEL

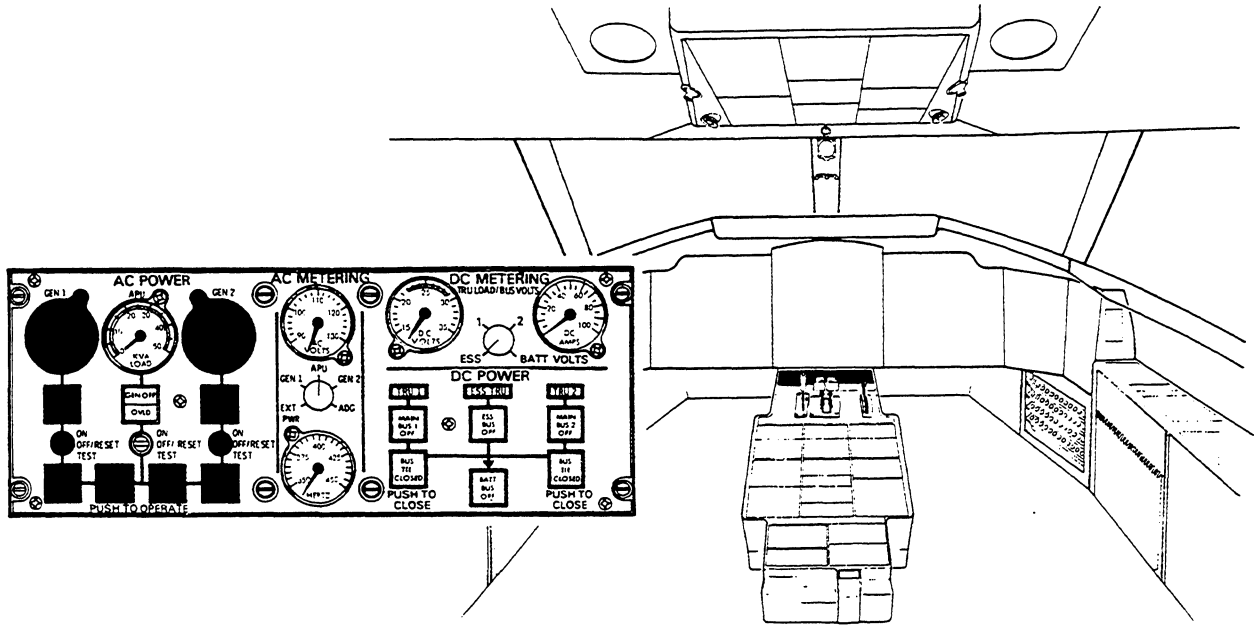
D

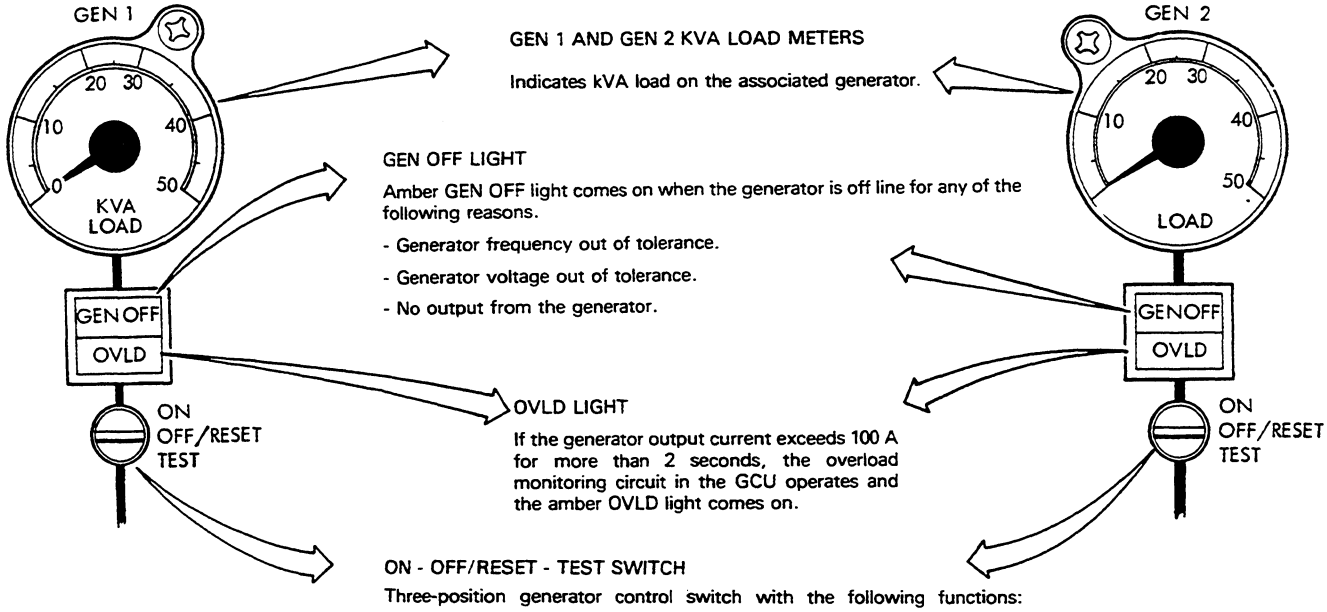


ESSENTIAL AC POWER
TRANSFER PANEL

E

Electrical System Control Panels
Figure 2





GEN 1 AND GEN 2 KVA LOAD METERS

Indicates kVA load on the associated generator.

GEN OFF LIGHT

Amber GEN OFF light comes on when the generator is off line for any of the following reasons.

- Generator frequency out of tolerance.
- Generator voltage out of tolerance.
- No output from the generator.

OVLD LIGHT

If the generator output current exceeds 100 A for more than 2 seconds, the overload monitoring circuit in the GCU operates and the amber OVLD light comes on.

ON - OFF/RESET - TEST SWITCH

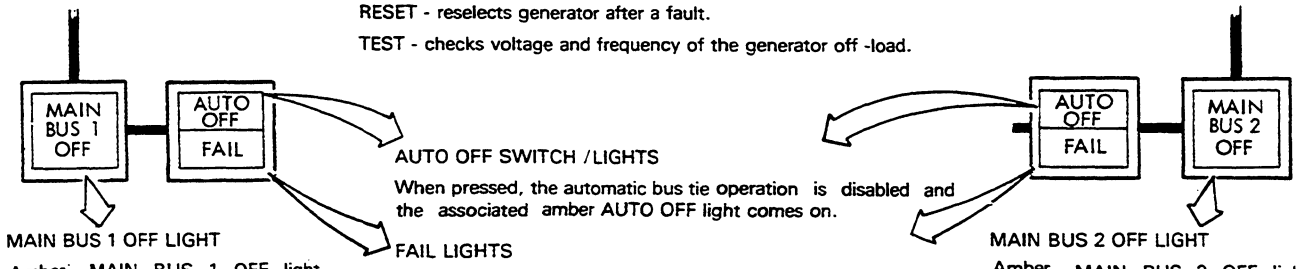
Three-position generator control switch with the following functions:

ON - supplies power to ac busses.

OFF - removes auxiliary power from the ac busses.

RESET - reselects generator after a fault.

TEST - checks voltage and frequency of the generator off -load.



AUTO OFF SWITCH /LIGHTS

When pressed, the automatic bus tie operation is disabled and the associated amber AUTO OFF light comes on.

FAIL LIGHTS

Associated amber FAIL light comes on if a bus tie overcurrent or generator overcurrent condition exists.

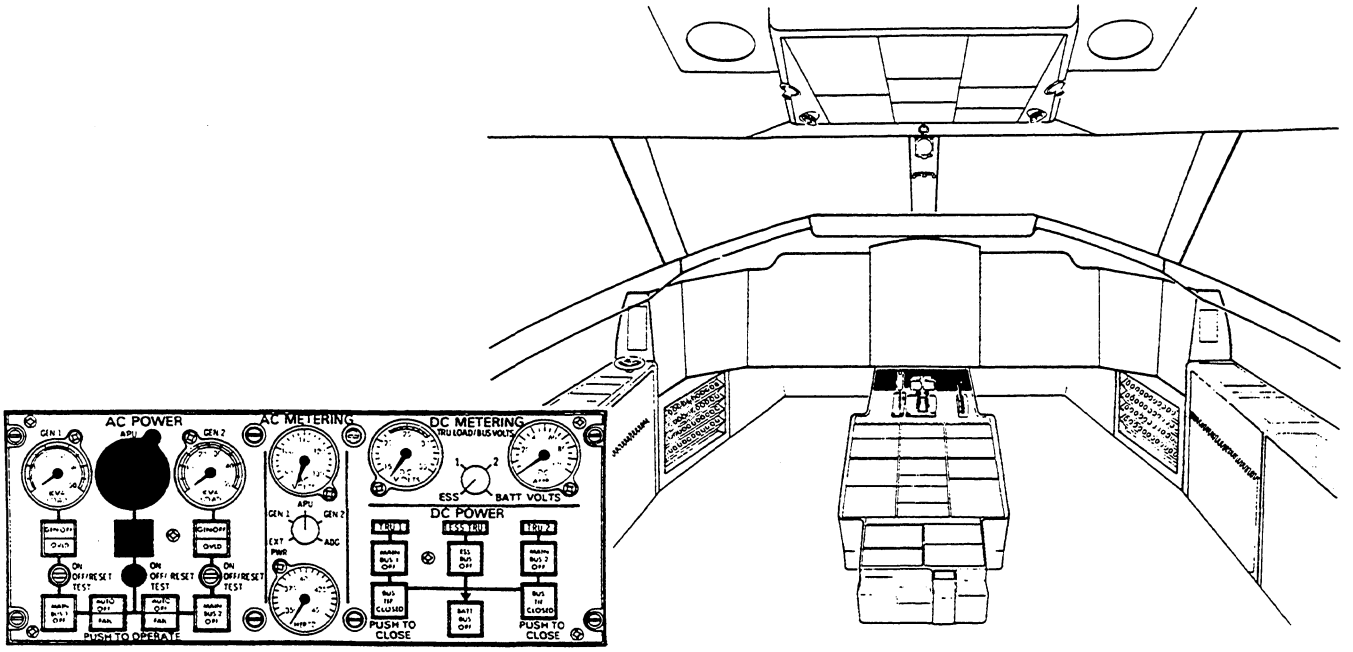
MAIN BUS 1 OFF LIGHT

Amber MAIN BUS 1 OFF light comes on when main bus No.1 is not connected to any generator.

MAIN BUS 2 OFF LIGHT

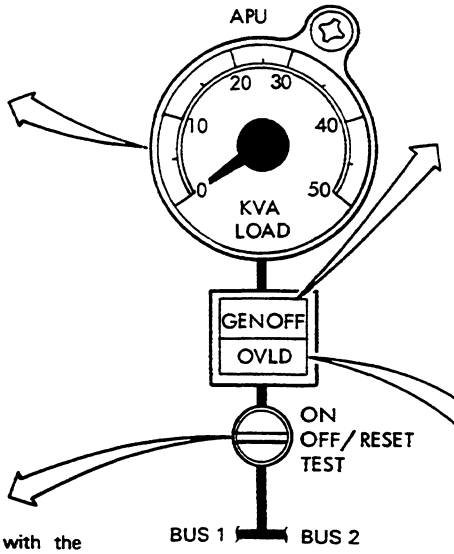
Amber MAIN BUS 2 OFF light comes on when main bus No. 2 is not connected to any generator.

Primary AC Control
Figure 3



APU KVA LOAD METER

Indicates kVA load on the APU generator.



GEN LIGHT OFF

Amber GEN OFF light comes on when the generator is off line for any of the following reasons:

- Generator frequency out of tolerance.
- Generator voltage out of tolerance.
- No output from the generator.

If APU is shut down, the APU GEN OFF light goes out.

ON – OFF/RESET – TEST SWITCH

Three-position generator control switch with the following functions:

ON – supplies power to ac busses.

OFF – removes auxiliary power from the ac busses.

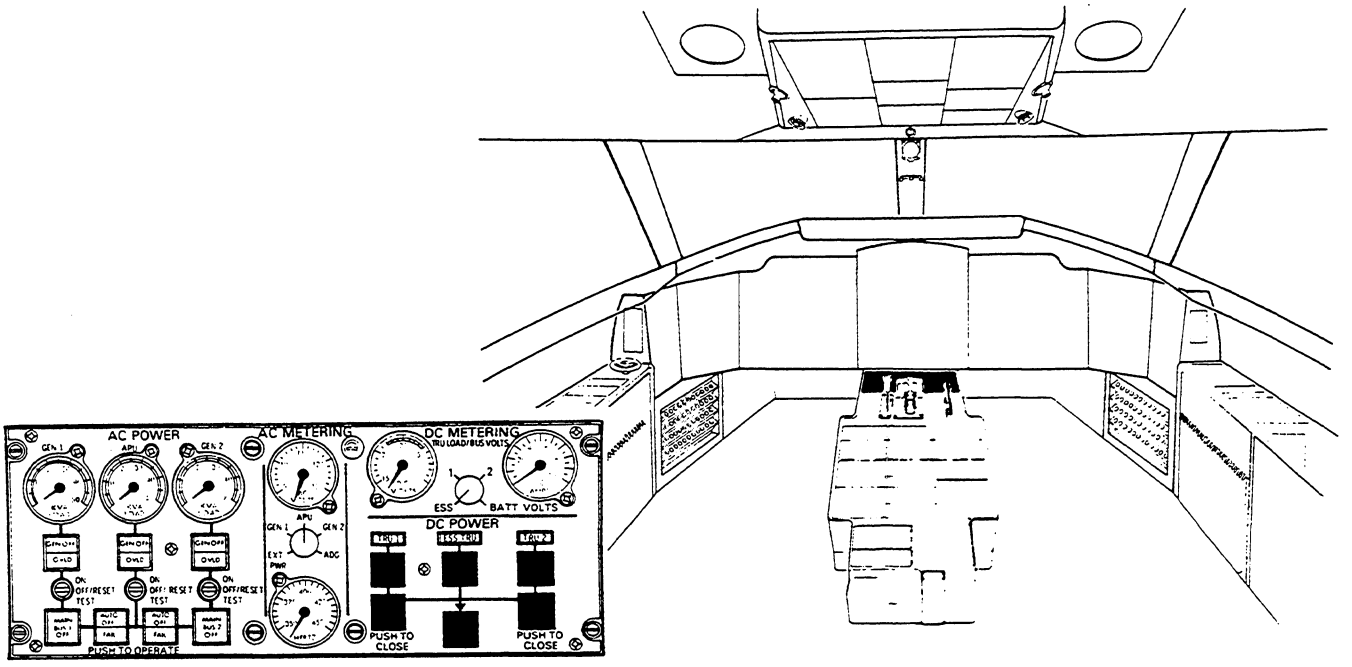
RESET – reselects generator after a fault.

TEST – checks voltage and frequency of the generator off-load.

OVLD LIGHT

If the generator output current exceeds 100 A for more than 2 seconds, the overload monitoring circuit in the GCU operates and the amber OVLD light comes on.

Auxiliary AC Control
Figure 4



ESS BUS OFF LIGHT

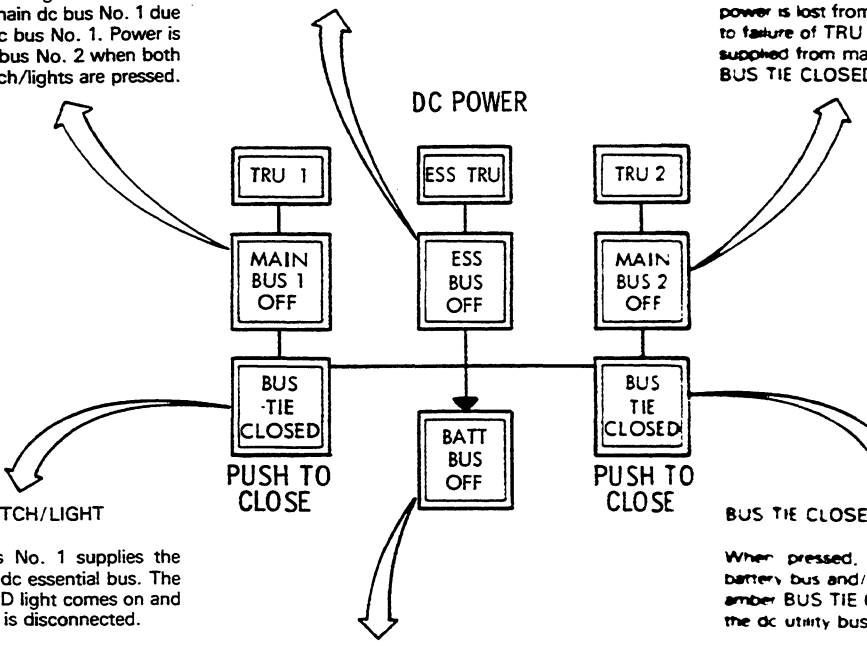
Amber ESS BUS OFF light comes on if power is lost from the dc essential bus due to the failure of TRU 3 or ac essential bus. Power is restored to the dc essential bus by pressing either BUS TIE CLOSED switch/light or, in emergency conditions, by deploying ADG.

MAIN BUS 1 OFF LIGHT

Amber MAIN BUS 1 OFF light comes on if power is lost from the main dc bus No. 1 due to failure of TRU 1 or ac bus No. 1. Power is supplied from main dc bus No. 2 when both BUS TIE CLOSED switch/lights are pressed.

MAIN BUS 2 OFF LIGHT

Amber MAIN BUS 2 OFF light comes on if power is lost from the main dc bus No. 2 due to failure of TRU 2 or ac bus No. 2. Power is supplied from main dc bus No. 1 when both BUS TIE CLOSED switch/lights are pressed.



BUS TIE CLOSED SWITCH/LIGHT

When pressed, dc bus No. 1 supplies the battery bus and/or the dc essential bus. The amber BUS TIE CLOSED light comes on and the dc utility bus No. 1 is disconnected.

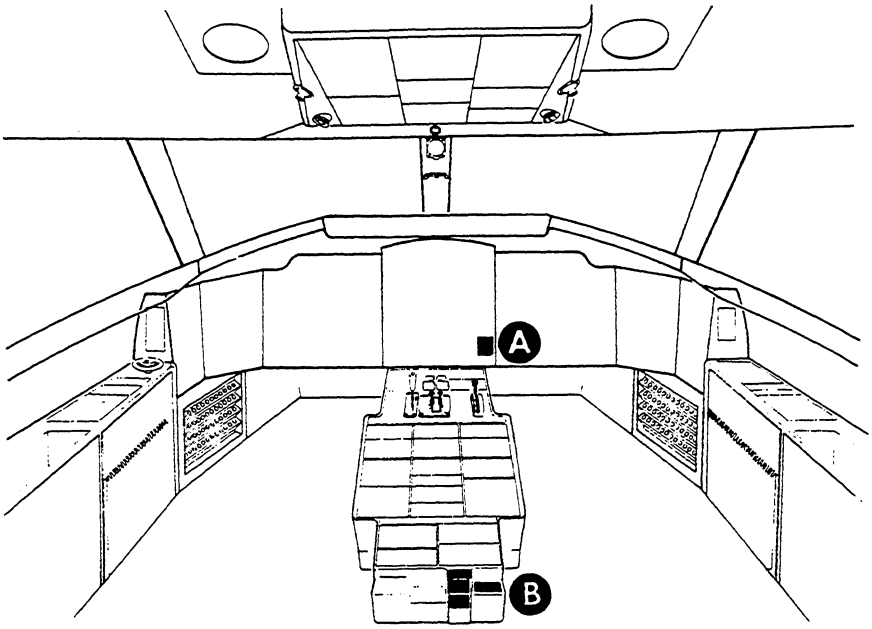
BUS TIE CLOSED SWITCH/LIGHT

When pressed, dc bus No.2 supplies the battery bus and/or the dc essential bus. The amber BUS TIE CLOSED light comes on and the dc utility bus No. 2 is disconnected.

BATT BUS OFF LIGHT

Amber BATT BUS OFF light comes on if power is lost from the battery bus. Power is restored to the battery bus by pressing either BUS TIE CLOSED switch/light.

Main DC Control
Figure 5

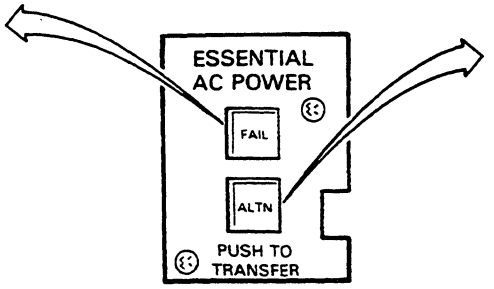


FAIL LIGHT

Amber FAIL light comes on when ac essential voltage is less than 90 volts on any phase.

ALTN SWITCH/LIGHT

When pressed, green ALTN light comes on and ac essential bus transfers from ac bus No. 1 to ac bus No. 2. Light comes on automatically if access to ac bus No. 1 is lost.



ADG LAMP — UNIT TEST SWITCH

Two-position switch checks the following:

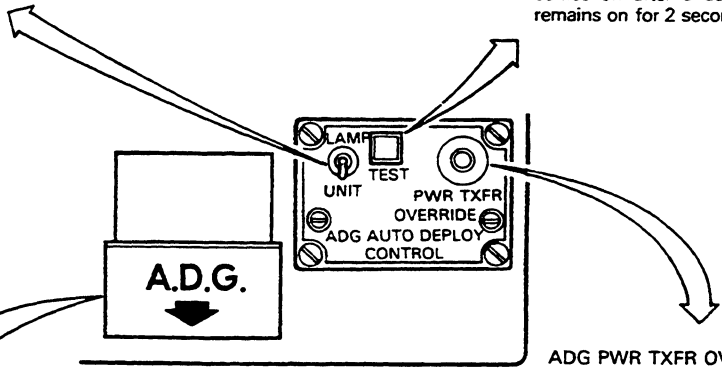
UNIT - Continuity of the uplock squib circuit
- Continuity of the three transfer contactors.
- Logic circuits

LAMP - TEST light
- Weight-on-wheels circuit.

ADG AUTO DEPLOY TEST LIGHT

Green light comes on when tests performed with LAMP-UNIT test switch in UNIT position are correct. On the ground, light comes on immediately for 2 seconds. In the air, light comes on after a delay of 5 seconds and remains on for 2 seconds.

A



A.D.G. MANUAL DEPLOY HANDLE

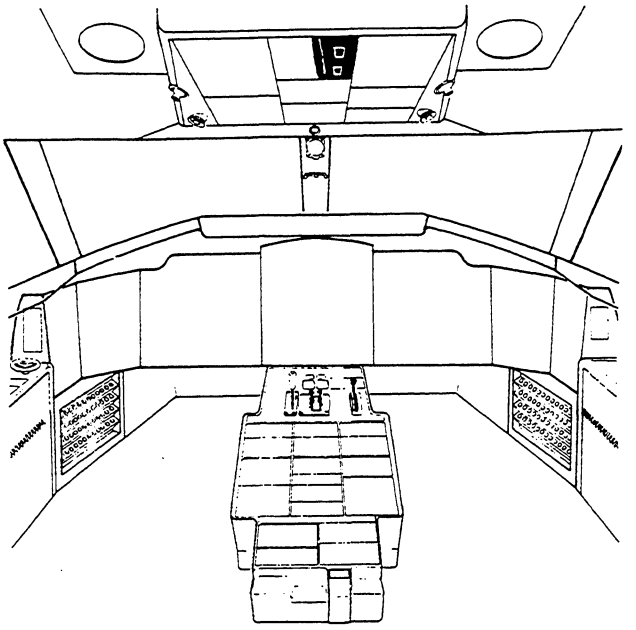
Manually deploys the ADG and energizes the three transfer contactors.

ADG PWR TXFR OVERRIDE SWITCH

When pressed, de-energizes ac emergency, dc emergency and 3B hydraulic contactors if power has been restored to the main ac bus.

B

Essential AC Power and ADG Control
Figure 6



ELECT PWR AVAIL LIGHT

When external power is connected to the aircraft, the external power monitor checks for:

—Correct phase sequence.

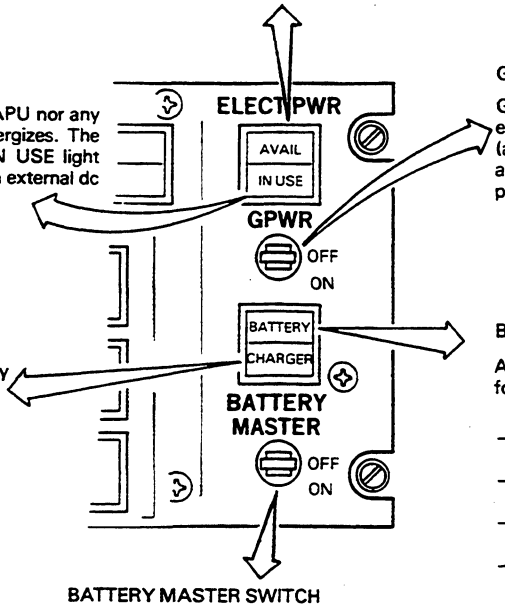
—Voltage between 106 and 124 volts ac.

—Frequency between 370 and 430 Hz.

The green AVAIL light comes on if these parameters are met.

ELECT PWR IN USE LIGHT

When the G PWR switch is on and neither the APU nor any generator is on line, the external contactor energizes. The green AVAIL light goes out and the amber IN USE light comes on. The IN USE light also comes on when external dc power is connected.



G PWR CONTROL SWITCH

Ground power control switch energizes the external power contacts of the AP/EPC (auxiliary power/external power contactor) and if no other generator is on line, ground power supplies the busses.

CHARGER LIGHT

The amber CHARGER light comes on if any of the following conditions exist:

—Battery charger fail.

—Overtemperature of battery.

—Loss of TRU 3 feed to battery bus.

—Charger circuit breaker tripped.

—ADG deployed

BATTERY LIGHT

Amber BATTERY light comes on if any of the following conditions exist:

—BATTERY MASTER switch set to off.

—Loss of power to the battery direct bus.

—Faulty battery direct sensing relay.

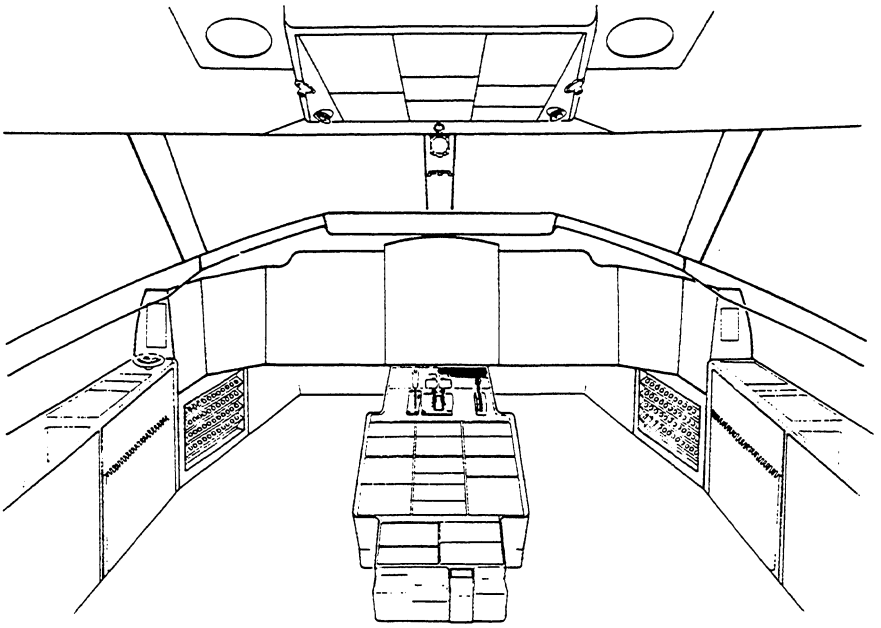
—Battery control circuit breaker tripped.

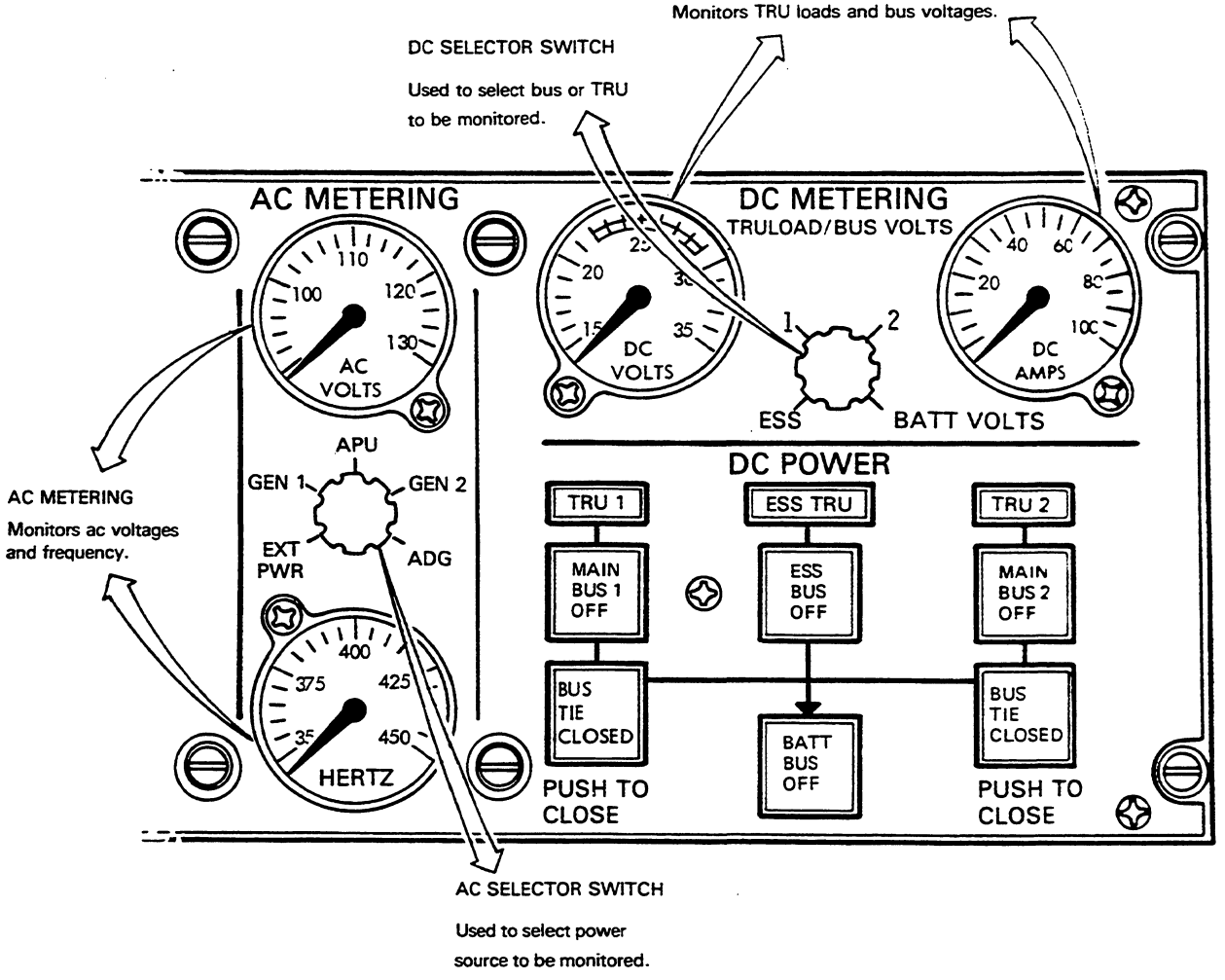
BATTERY MASTER SWITCH

ON—Connects the battery to the battery bus when no external power is connected.

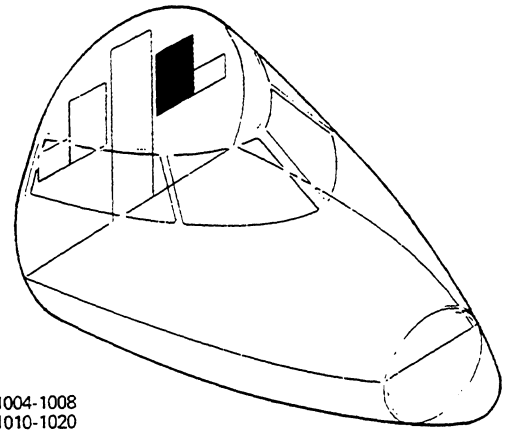
The battery is automatically connected to the battery bus if TRU 3 fails.

External Power and Battery Control
Figure 7

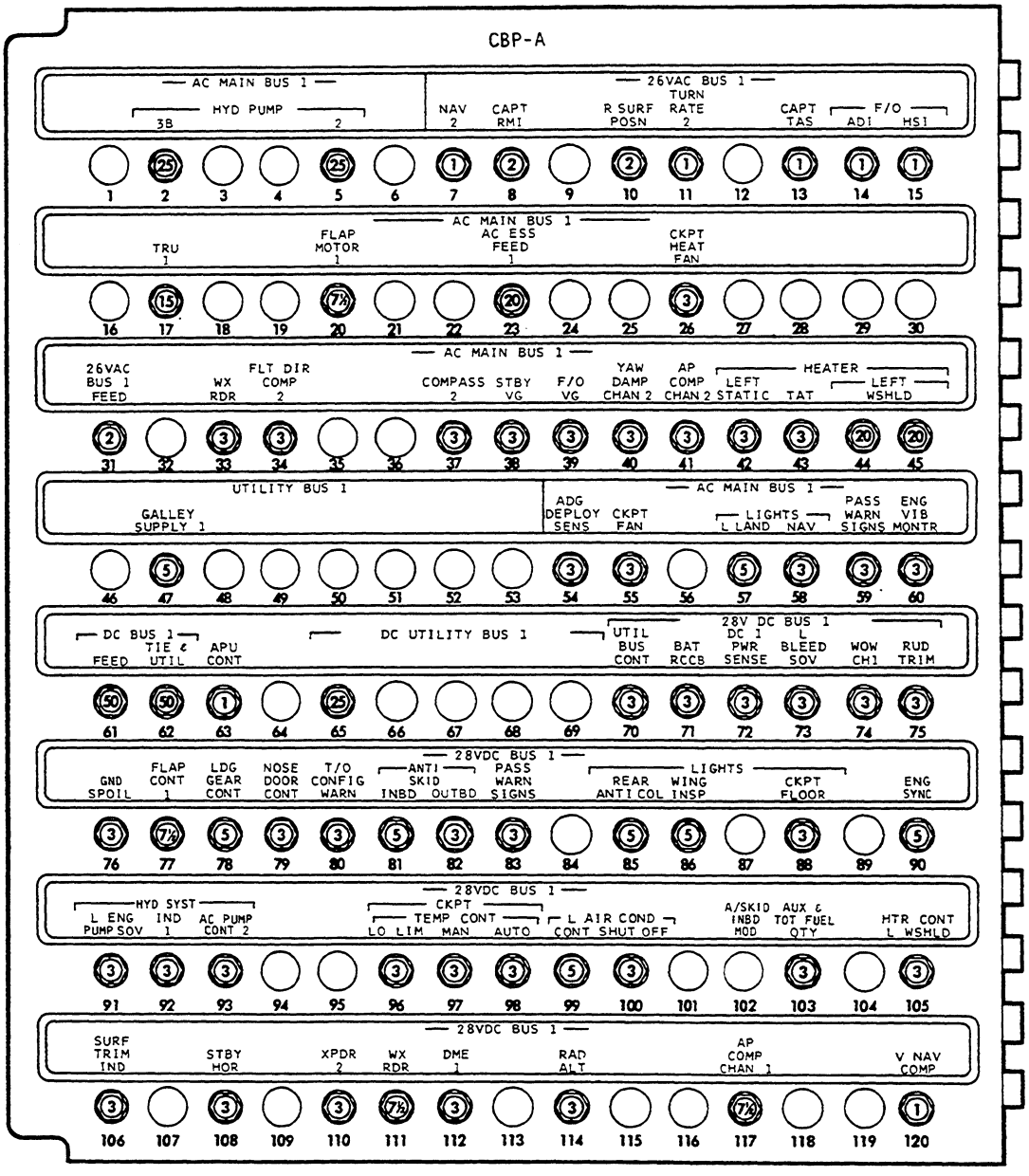




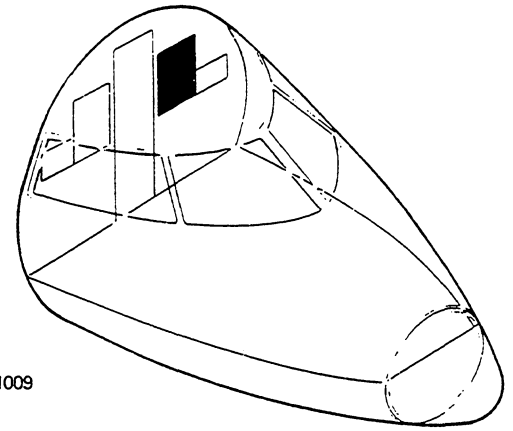
AC and DC Metering
Figure 8



EFFECTIVITY: A/C 1004-1008
1010-1020



Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 1)



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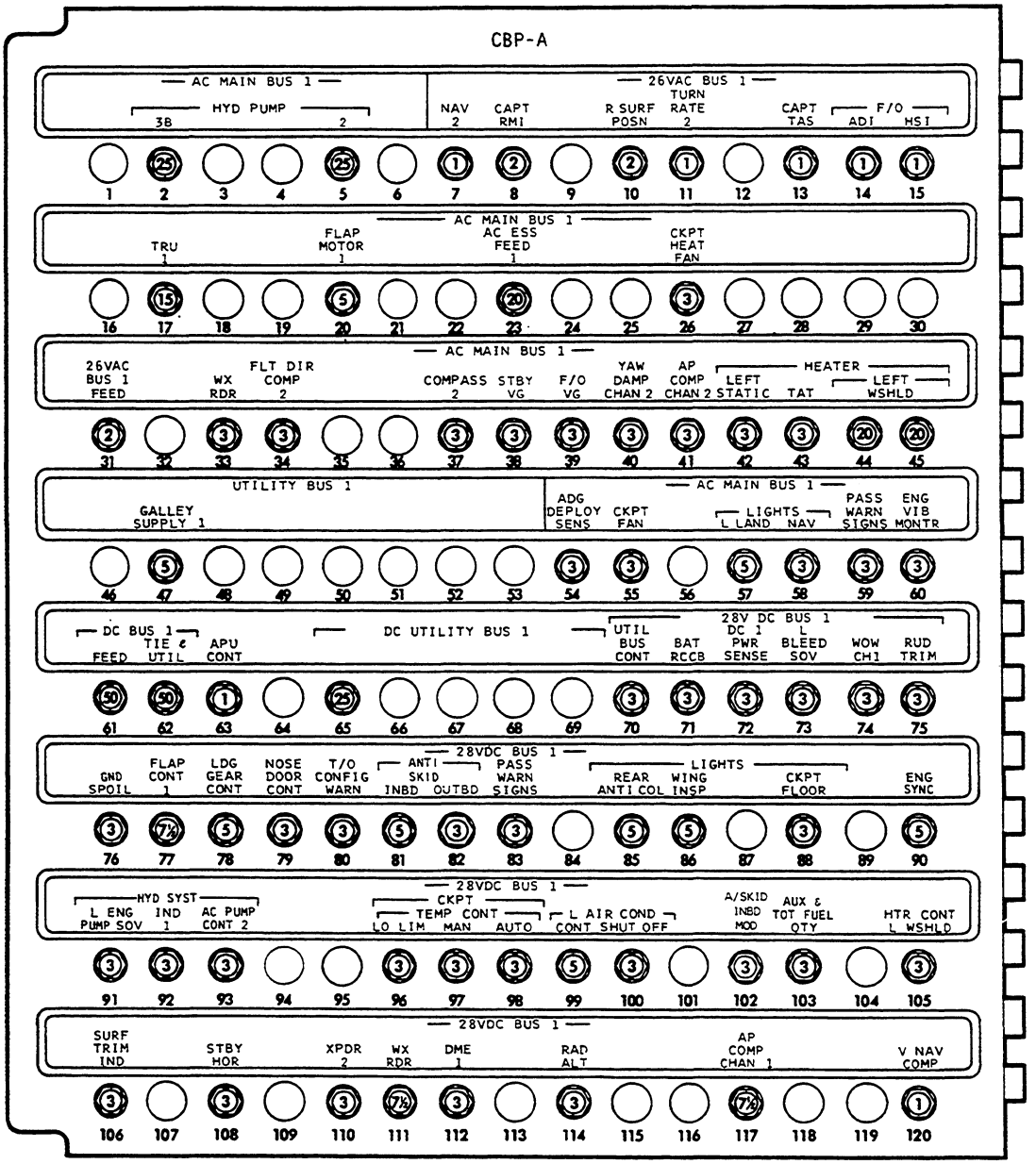
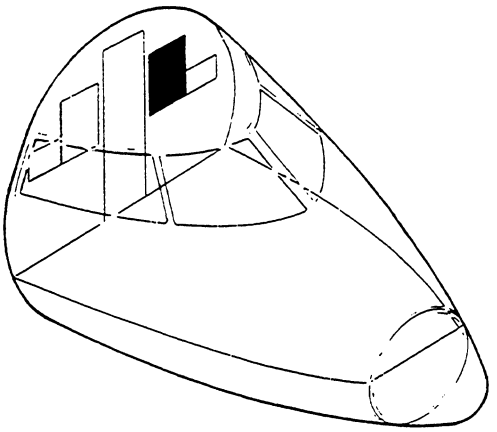
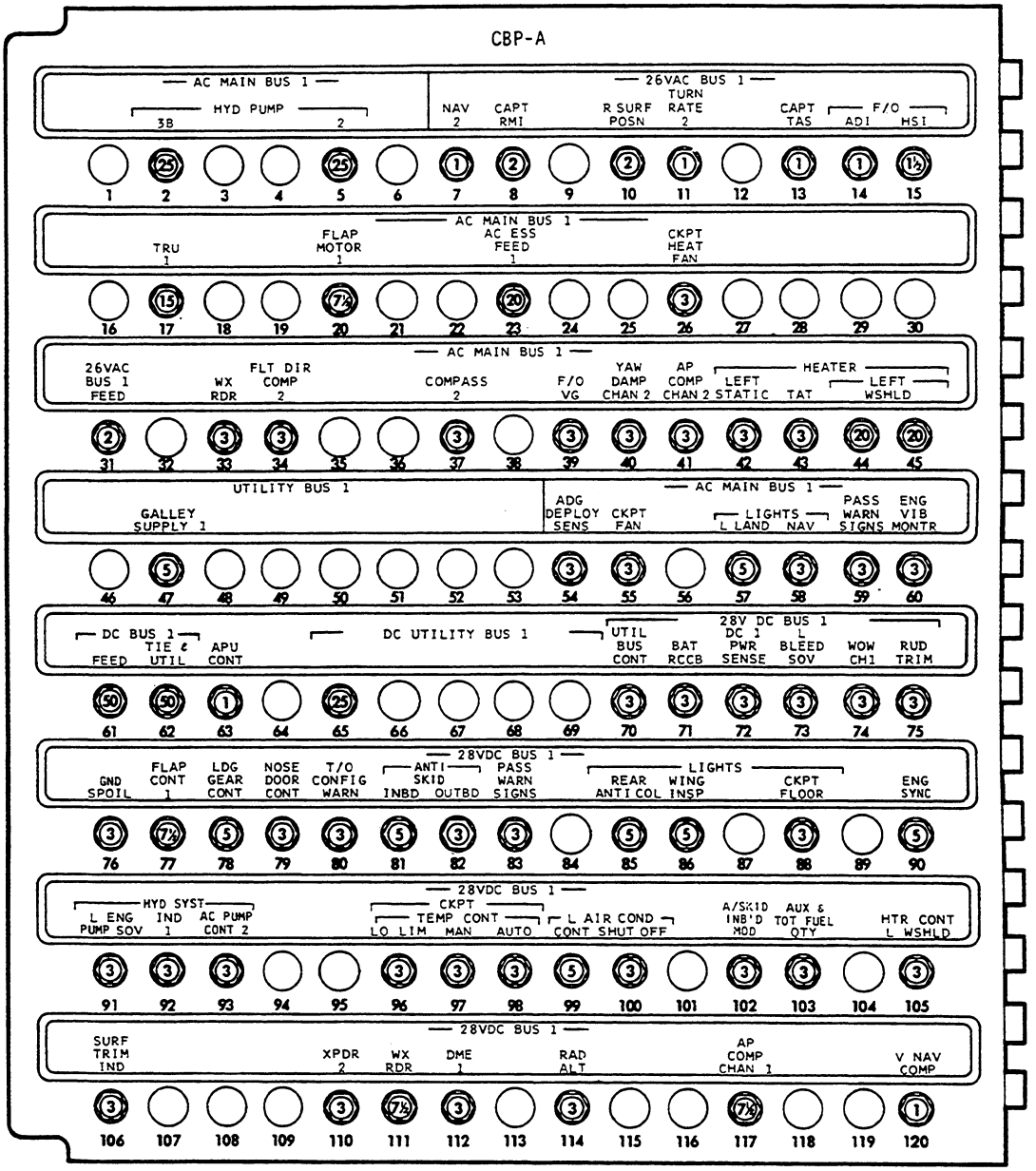


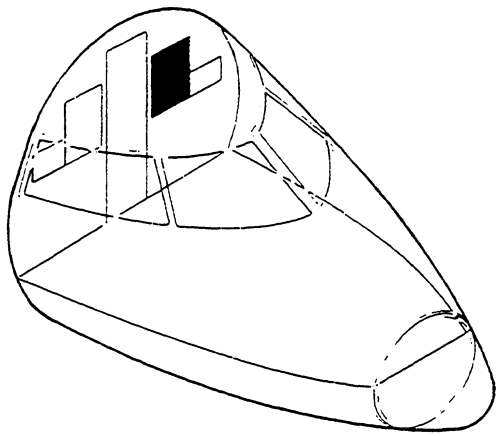
Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 2)



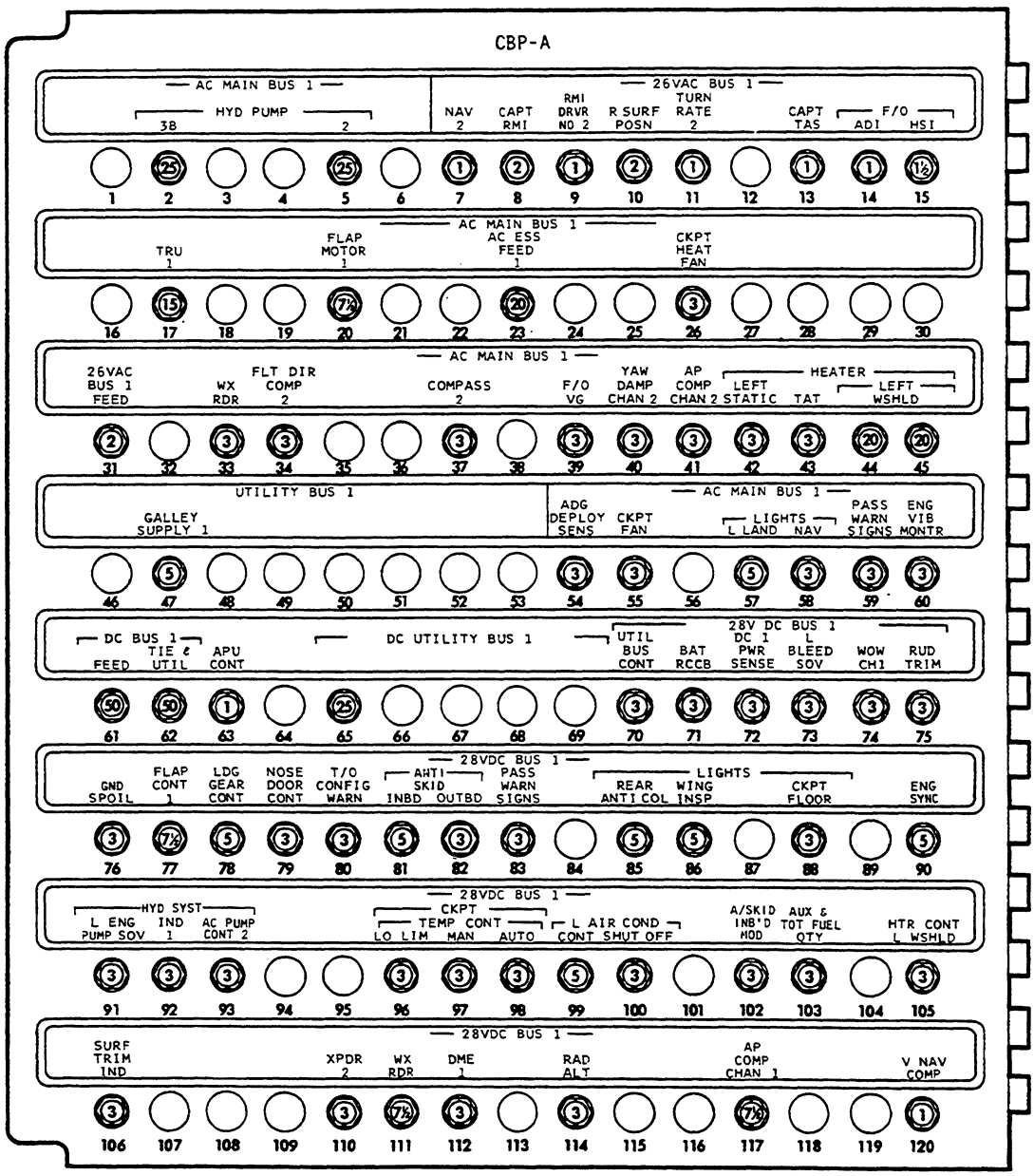
EFFECTIVITY: A/C 1021 TO 1028



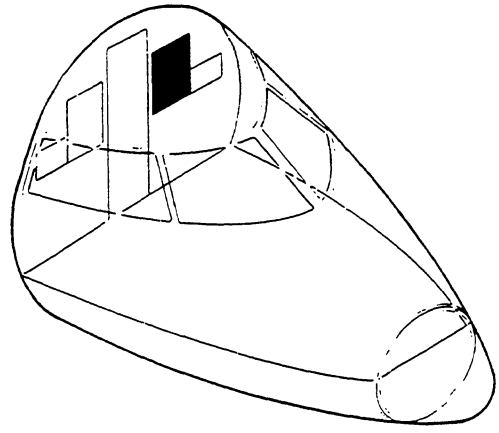
Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 3)



EFFECTIVITY: A/C 1029 TO 1050



Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 4)



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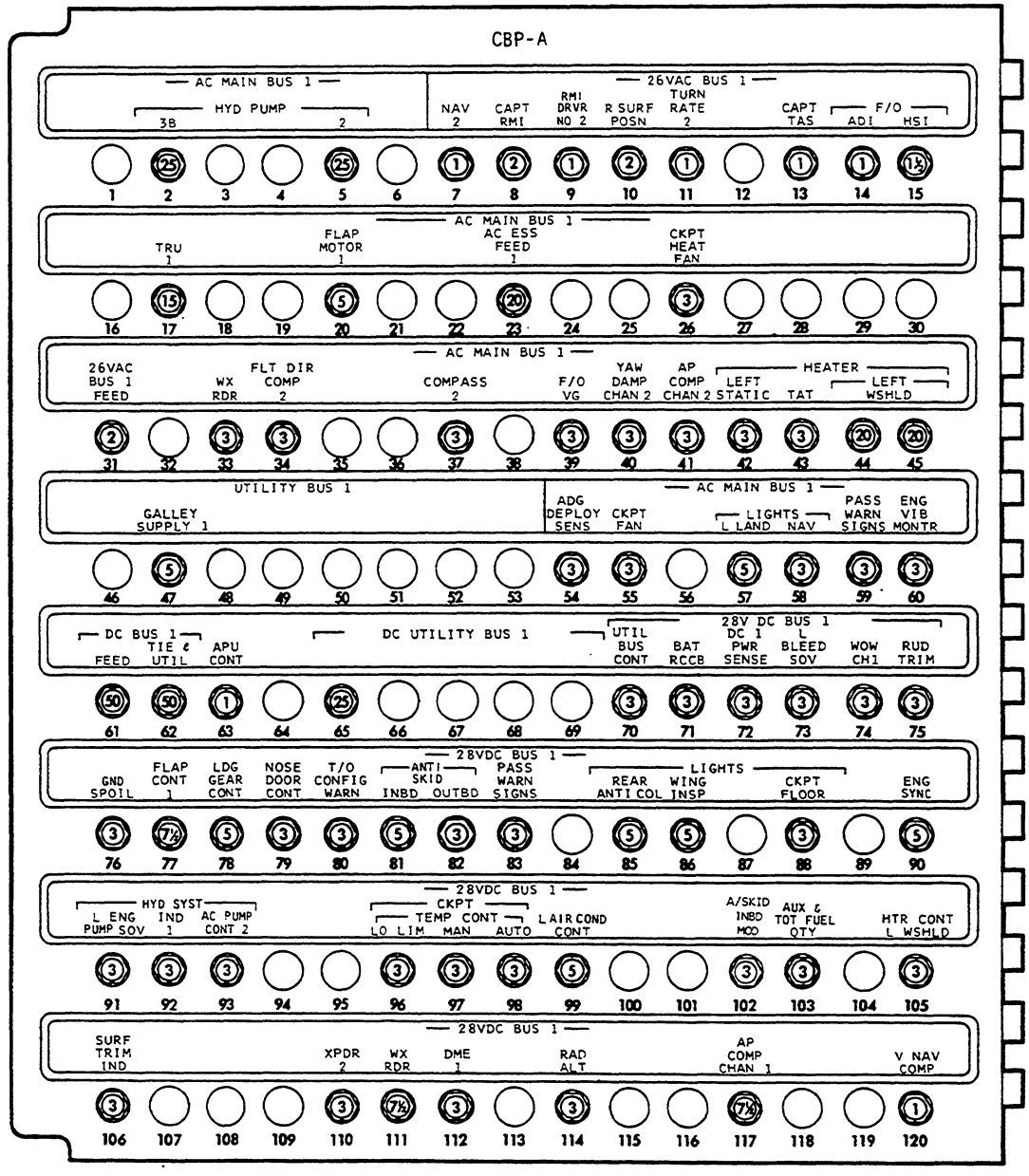
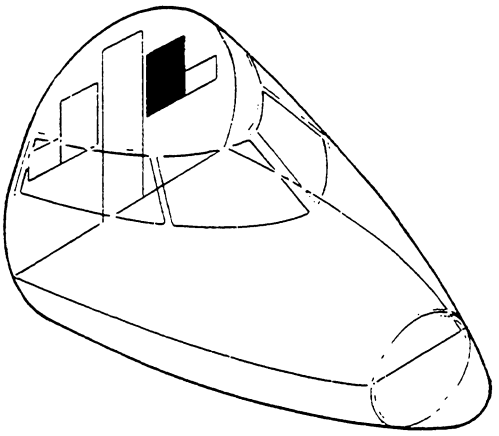
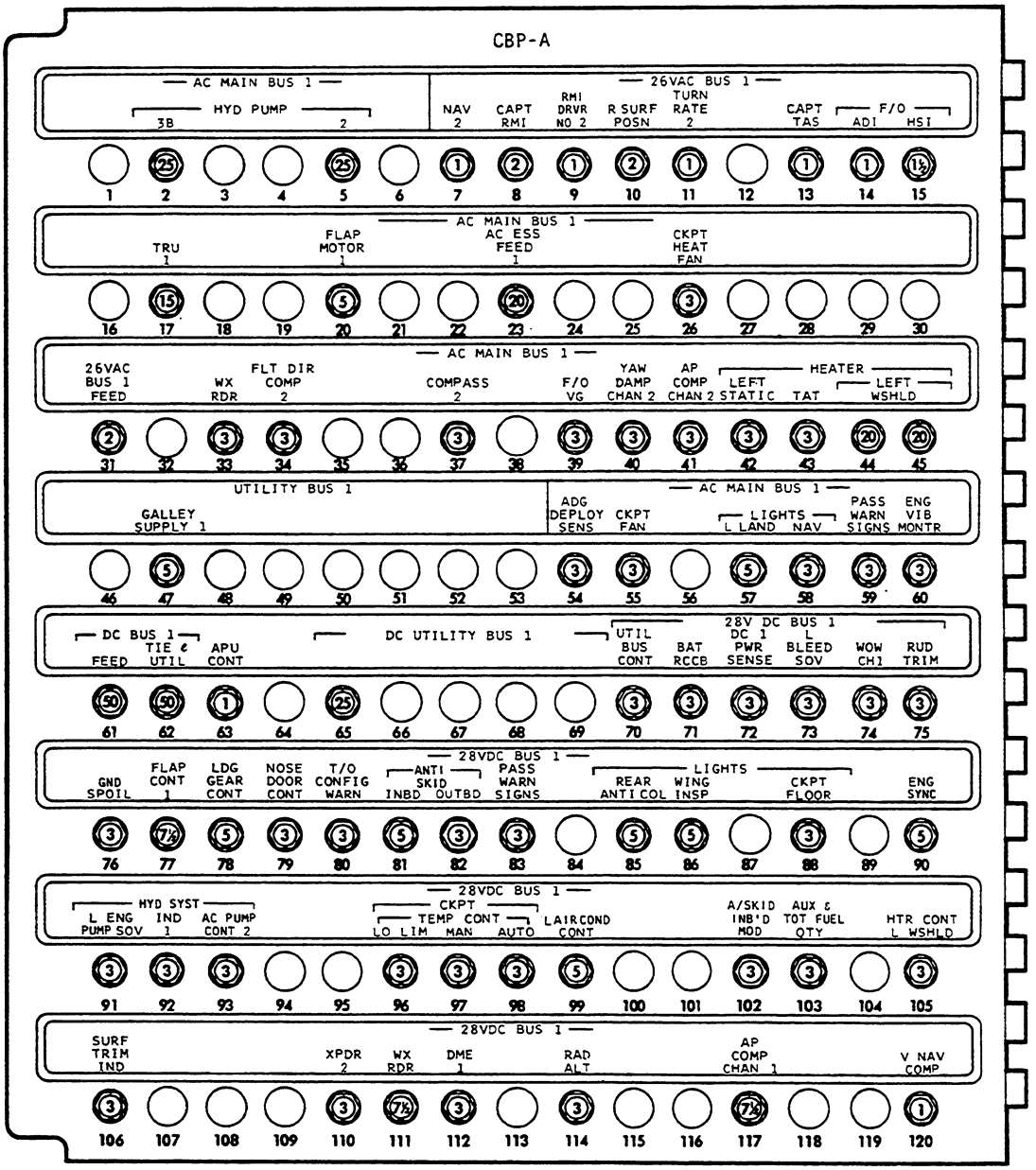


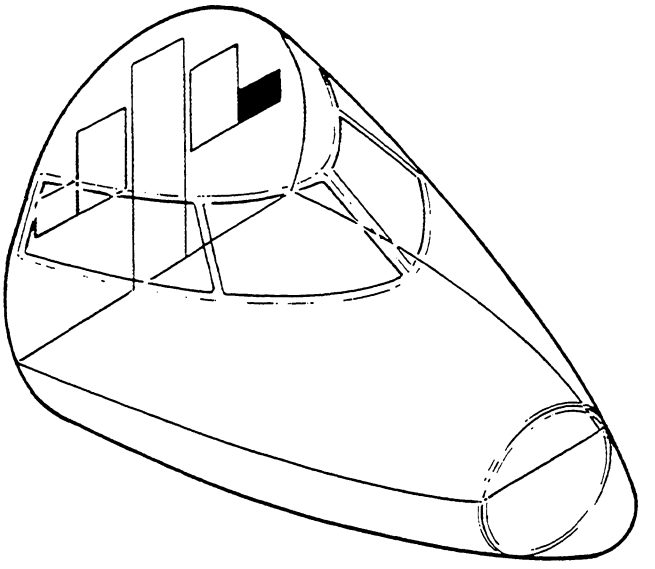
Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 5)



EFFECTIVITY: A/C 1076 TO 1999



Main AC No. 1 and DC No. 1 Circuit Breaker Panel
Figure 9 (Sheet 6)



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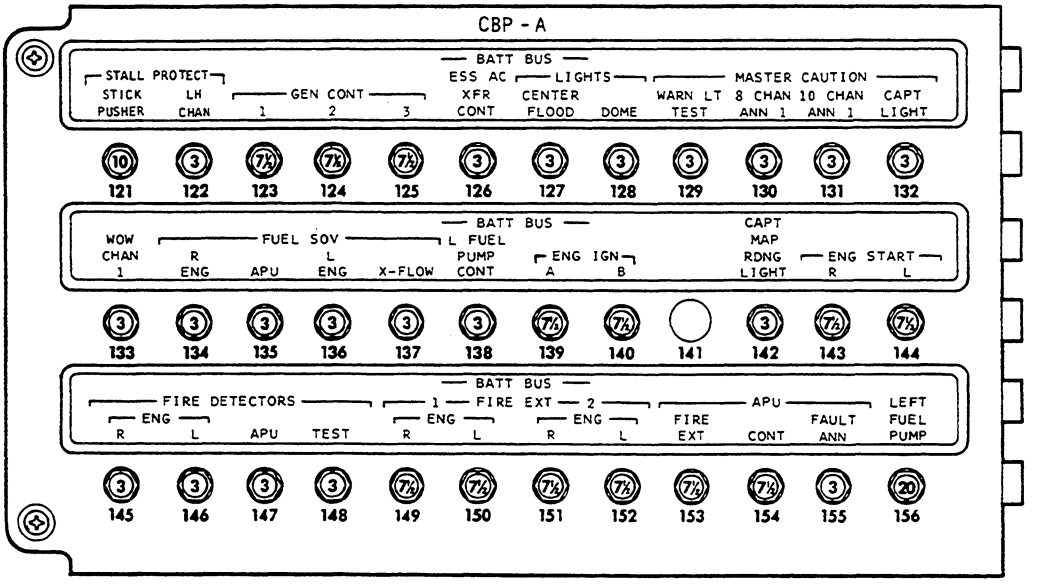
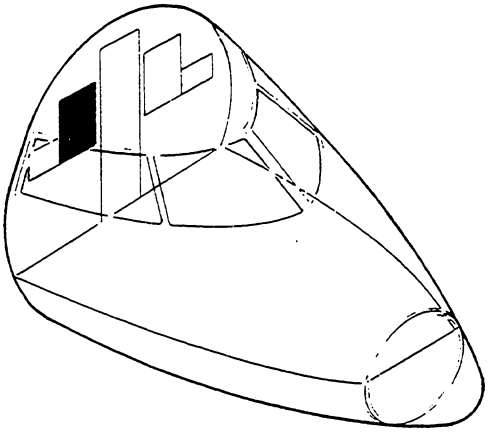
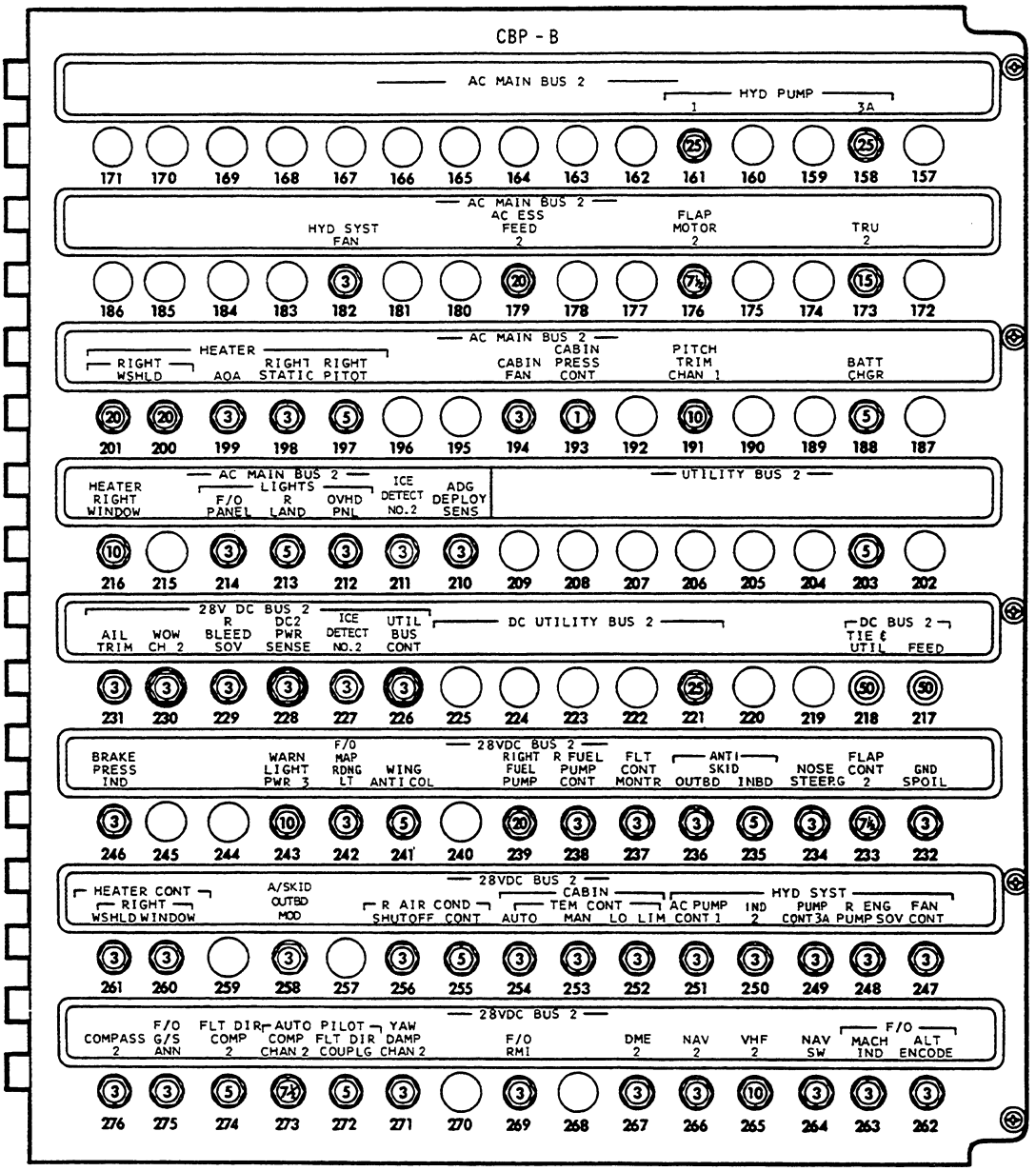


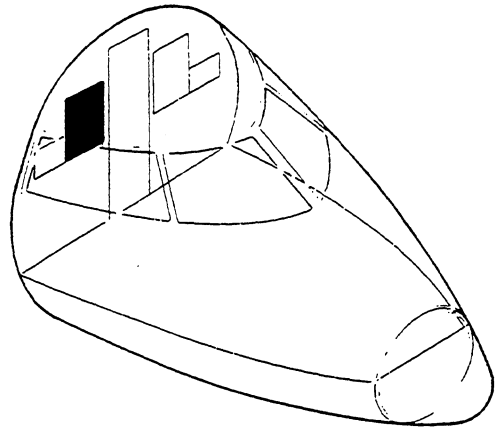
Battery Bus Left Circuit Breaker Panel
Figure 10

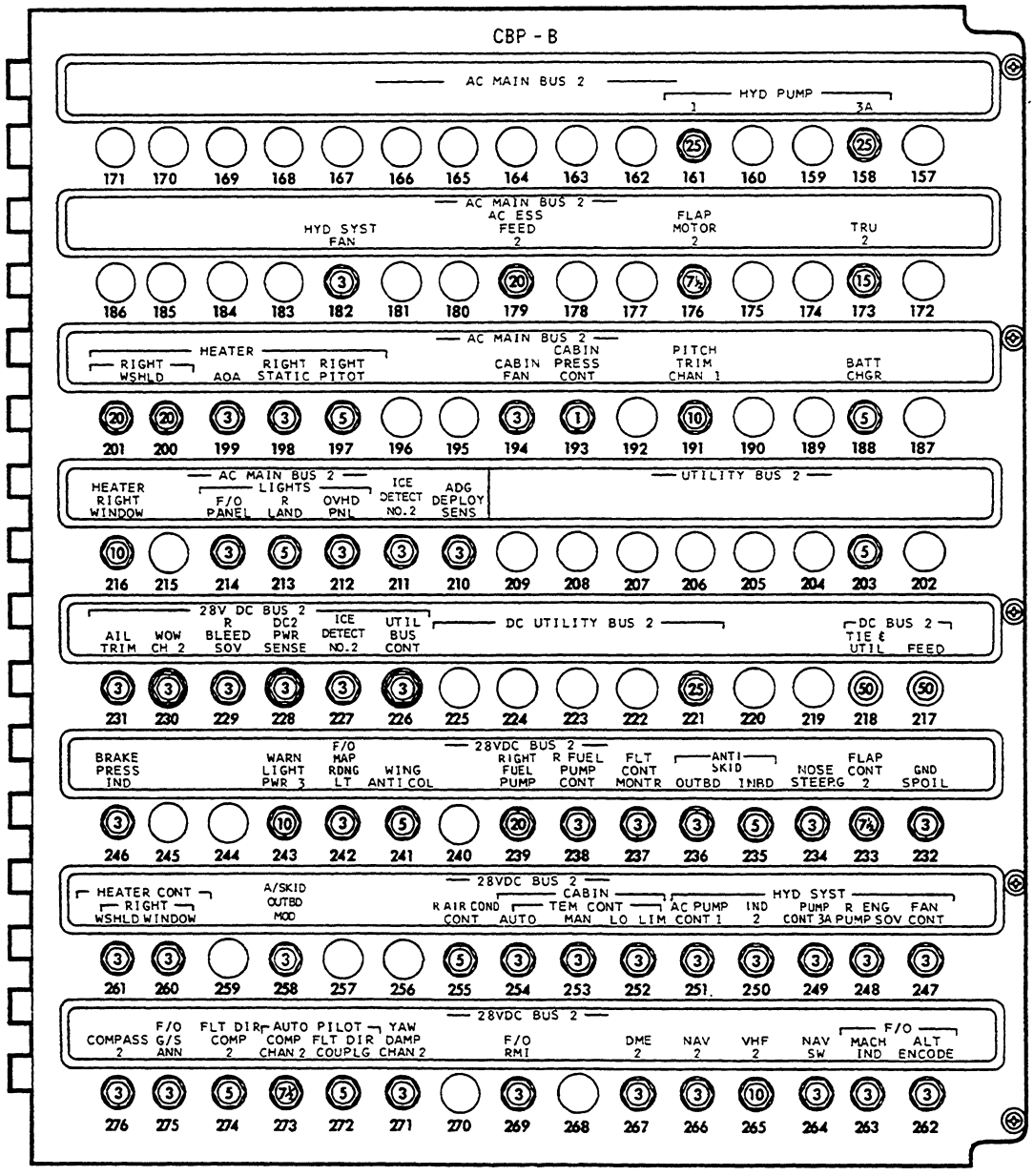




EFFECTIVITY: A/C 1004 TO 1050

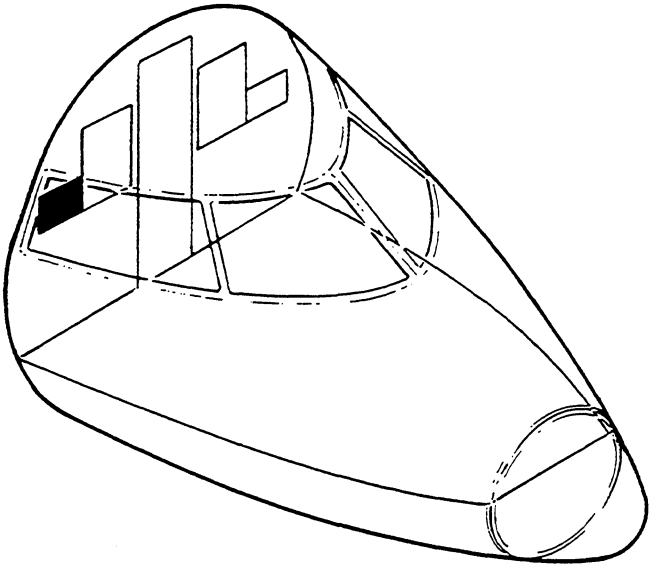
Main AC No. 2 and DC No. 2 Circuit Breaker Panel
Figure 11 (Sheet 1)

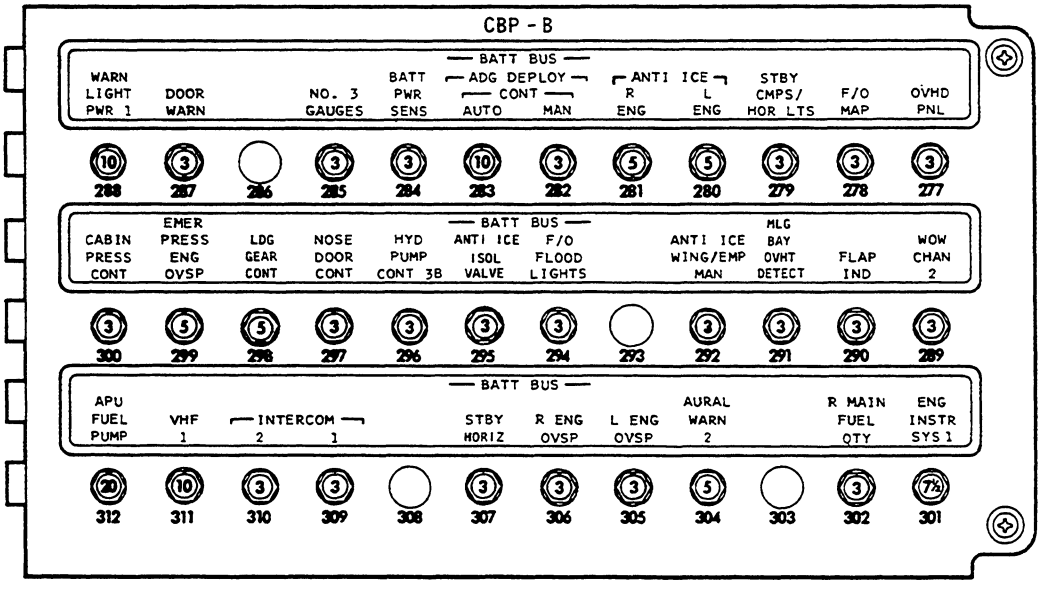




EFFECTIVITY: A/C 1051 TO 1999

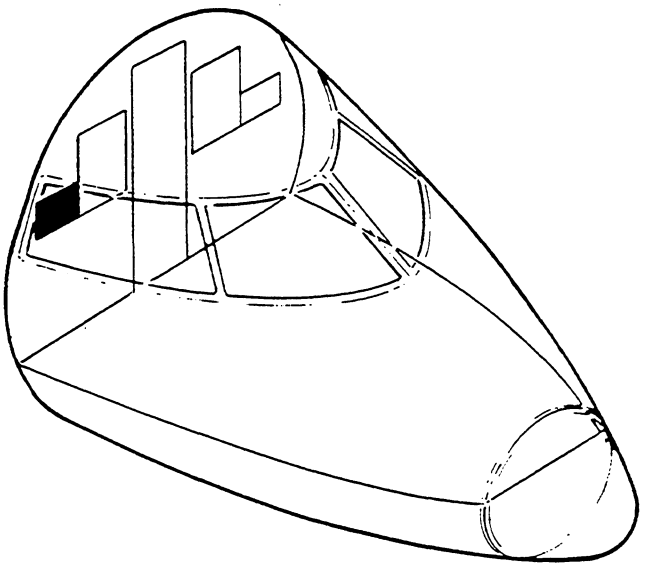
Main AC No. 2 and DC No. 2 Circuit Breaker Panel
Figure 11 (Sheet 2)

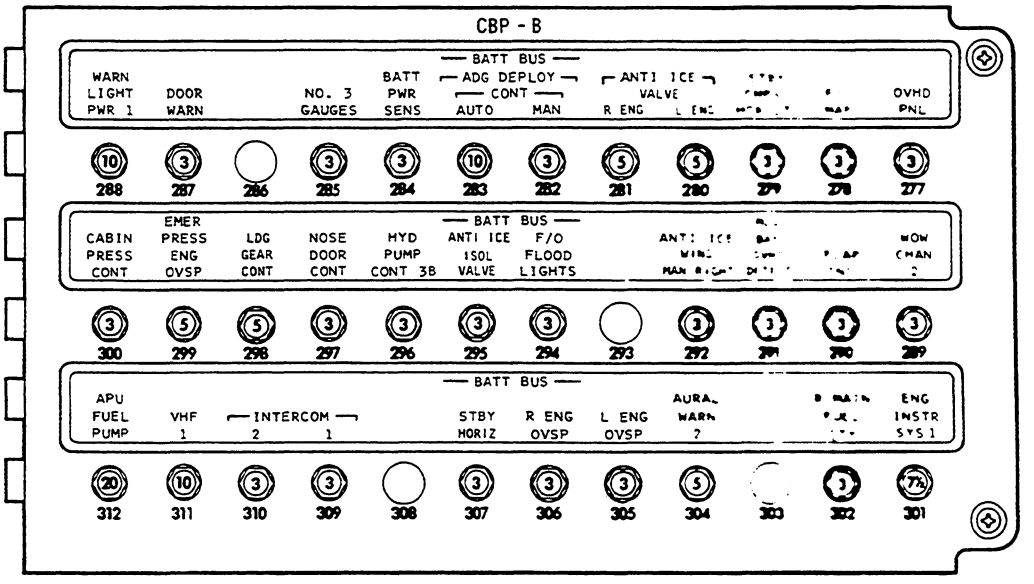




EFFECTIVITY: A/C 1004 TO 1050

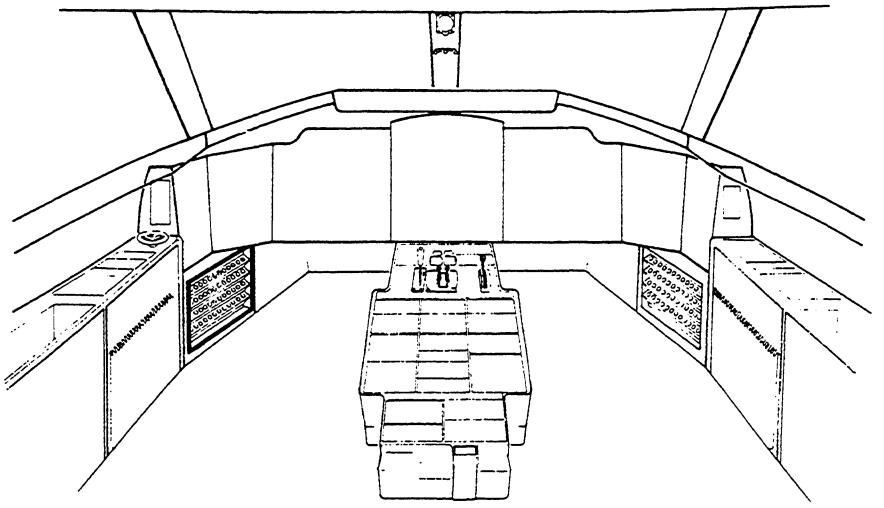
Battery Bus Right Circuit Breaker Panel
Figure 12 (Sheet 1)

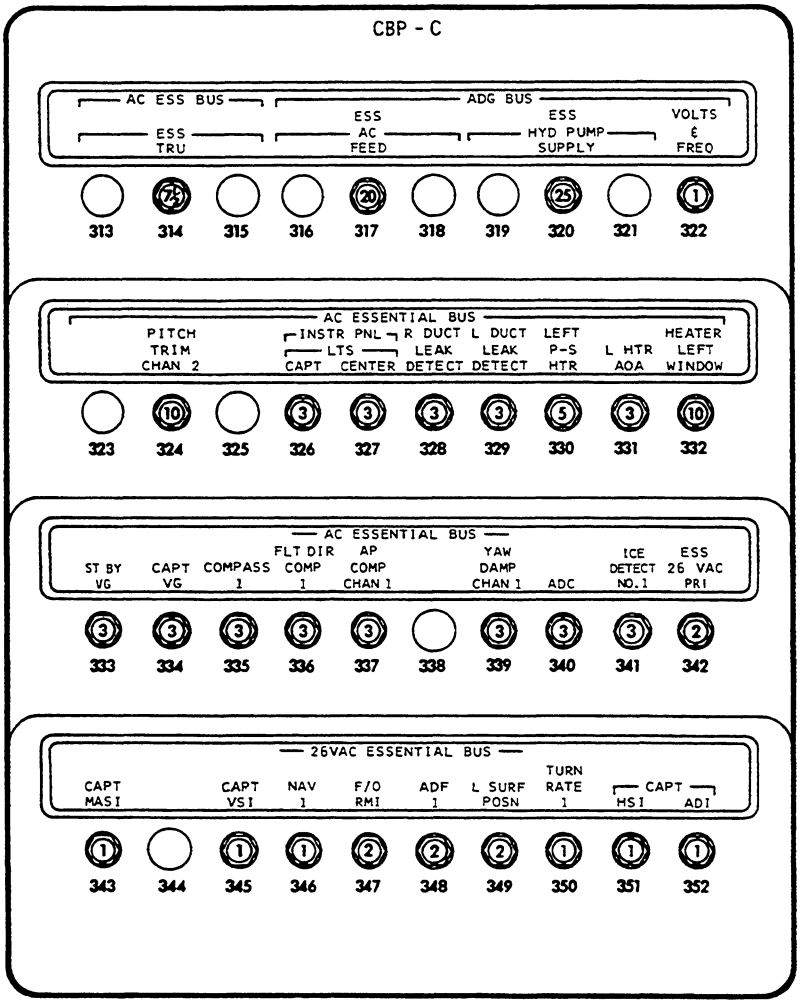




EFFECTIVITY: A/C 1051 TO 1999

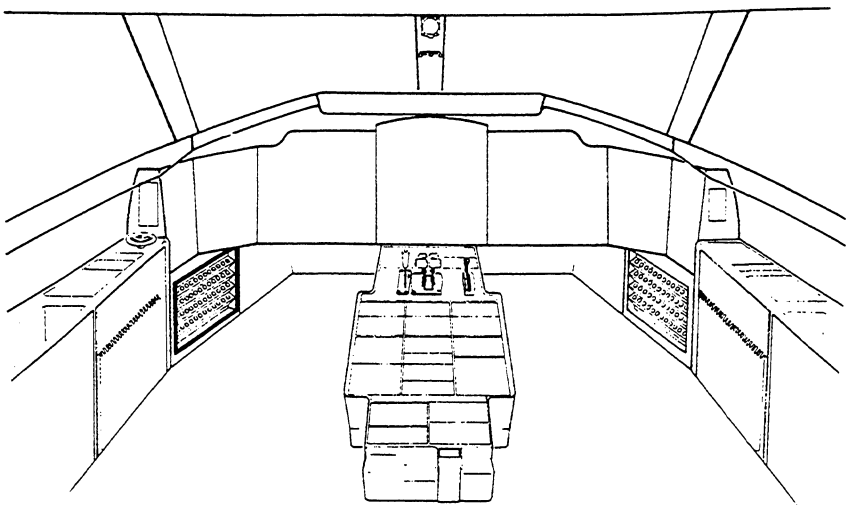
Battery Bus Right Circuit Breaker Panel
Figure 12 (Sheet 2)

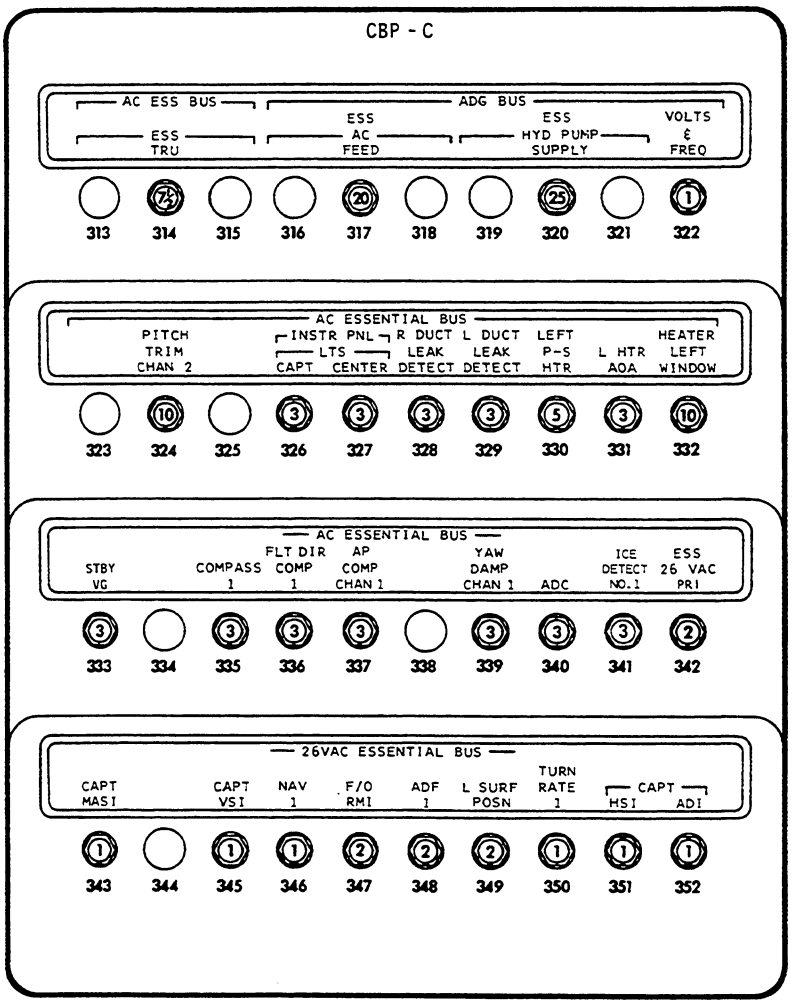




EFFECTIVITY: A/C 1004 TO 1020

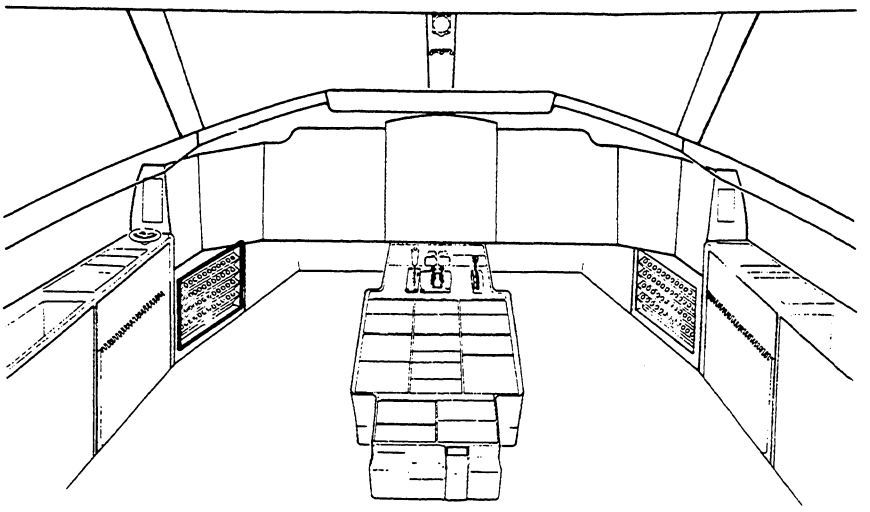
AC Essential Bus Circuit Breaker Panel
Figure 13 (Sheet 1)

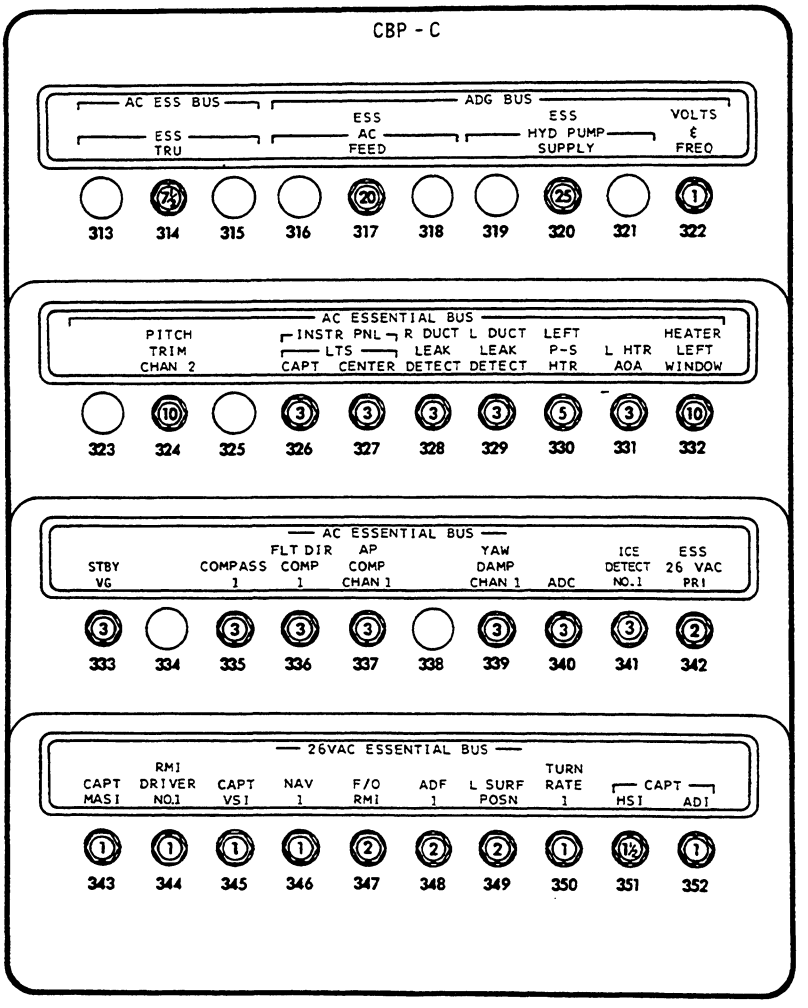




EFFECTIVITY: A/C 1021 TO 1028

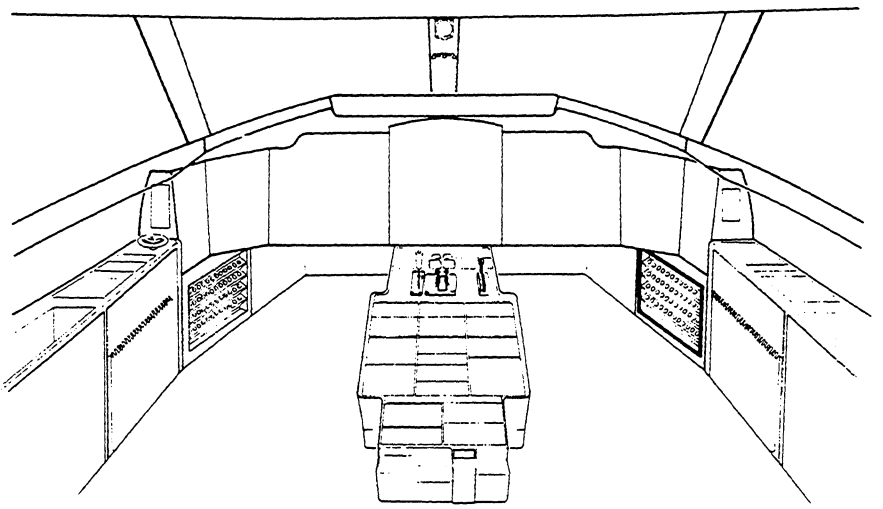
AC Essential Bus Circuit Breaker Panel
Figure 13 (Sheet 2)

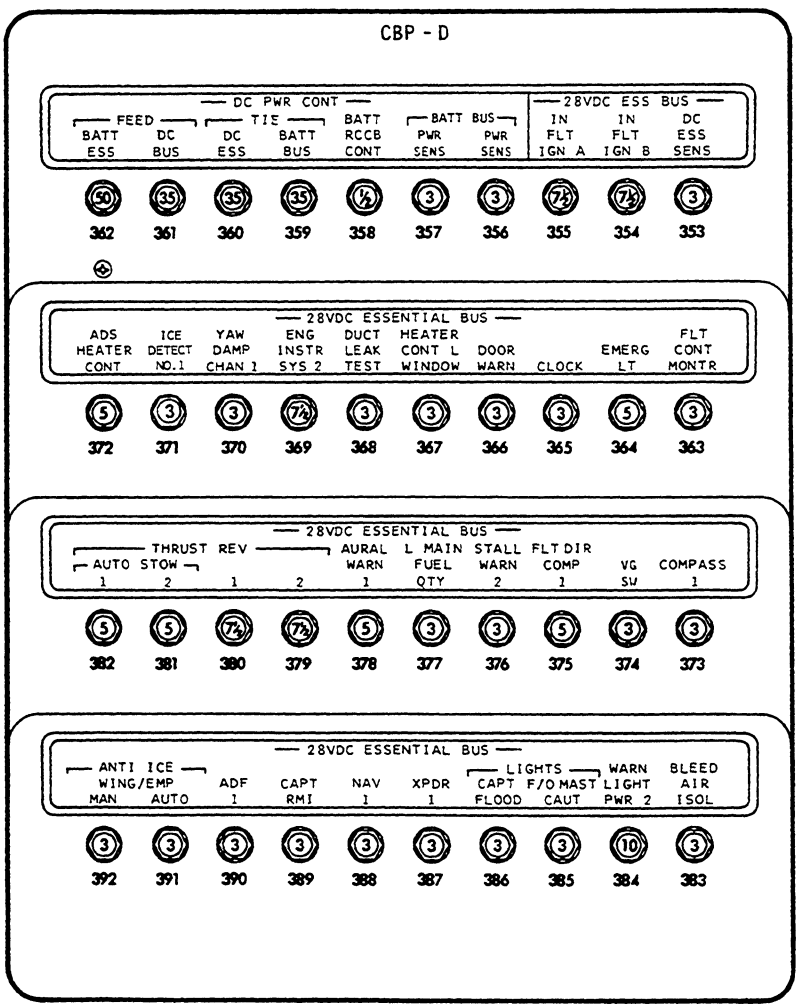




EFFECTIVITY: A/C 1029 TO 1999

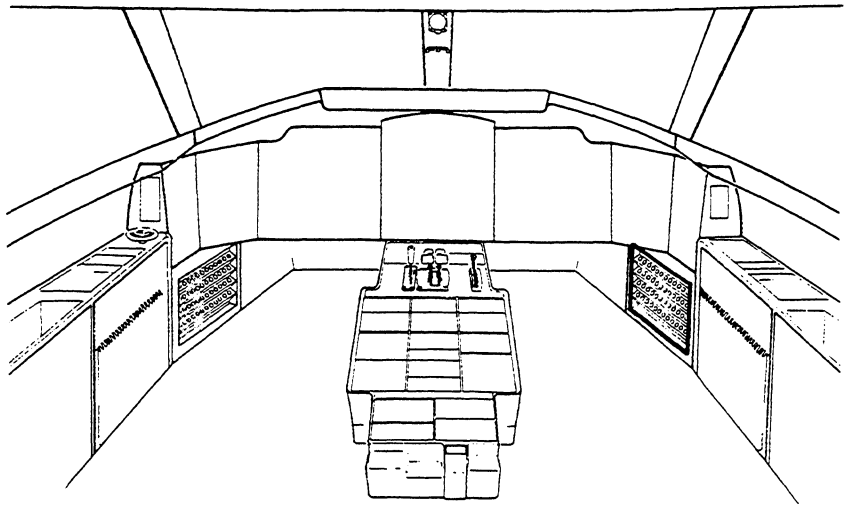
AC Essential Bus Circuit Breaker Panel
Figure 13 (Sheet 3)

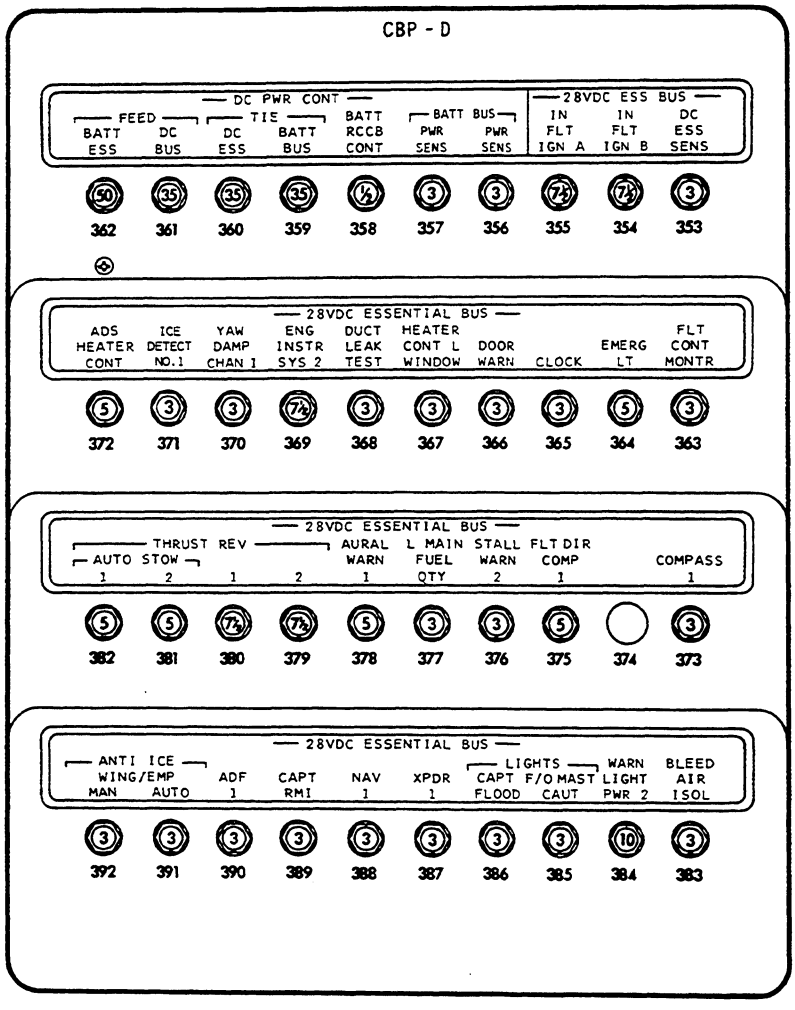




EFFECTIVITY: A/C 1004 TO 1020

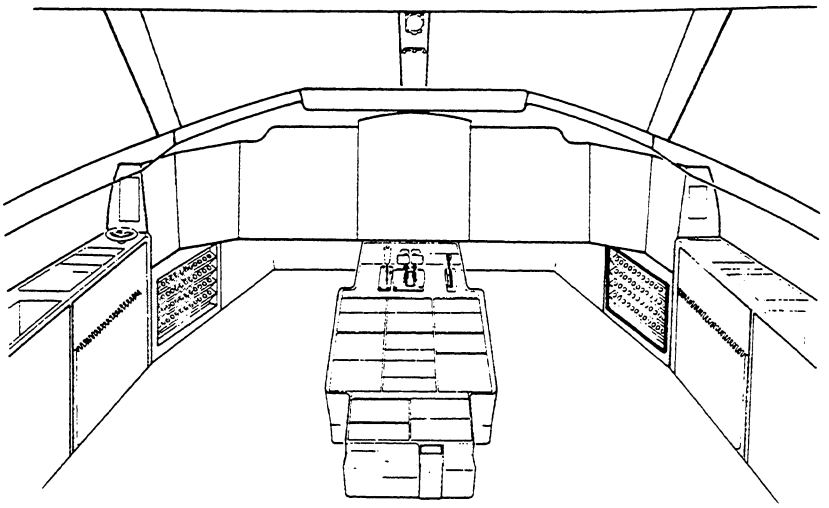
DC Essential Bus Circuit Breaker Panel
Figure 14 (Sheet 1)

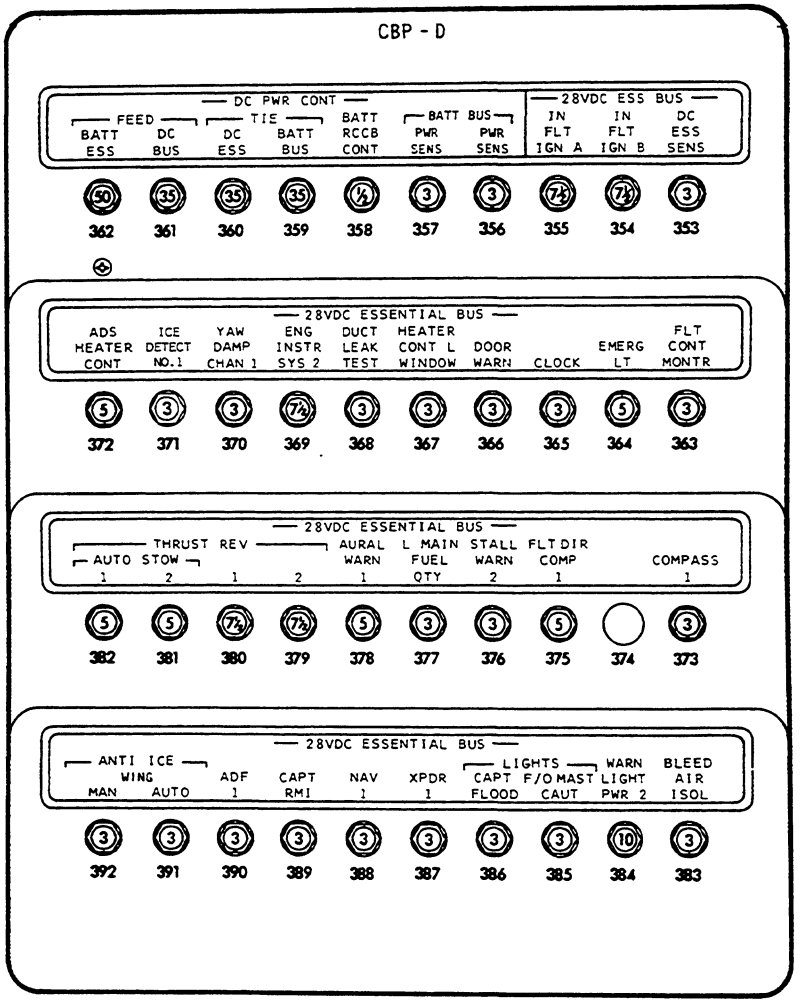




EFFECTIVITY: A/C 1021 TO 1050

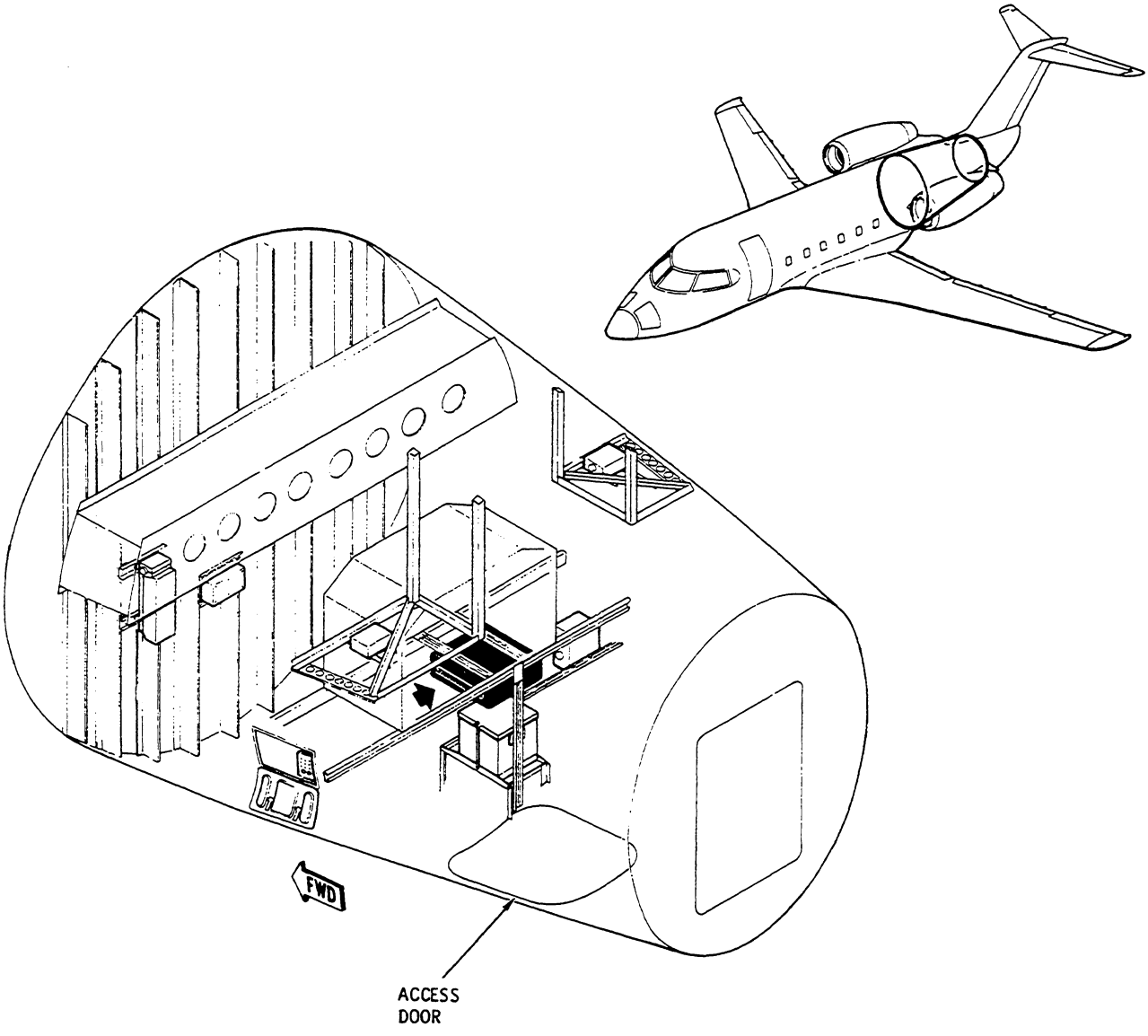
DC Essential Bus Circuit Breaker Panel
Figure 14 (Sheet 2)



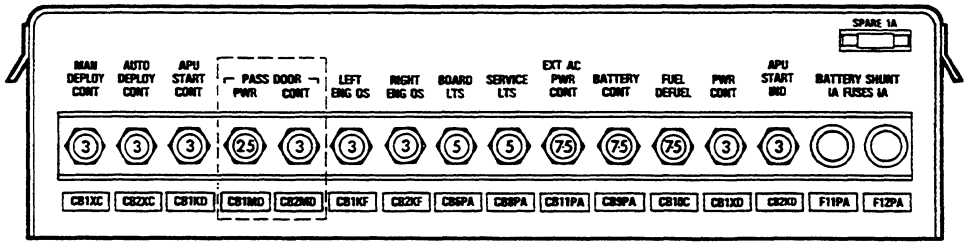


EFFECTIVITY: A/C 1051 TO 1999

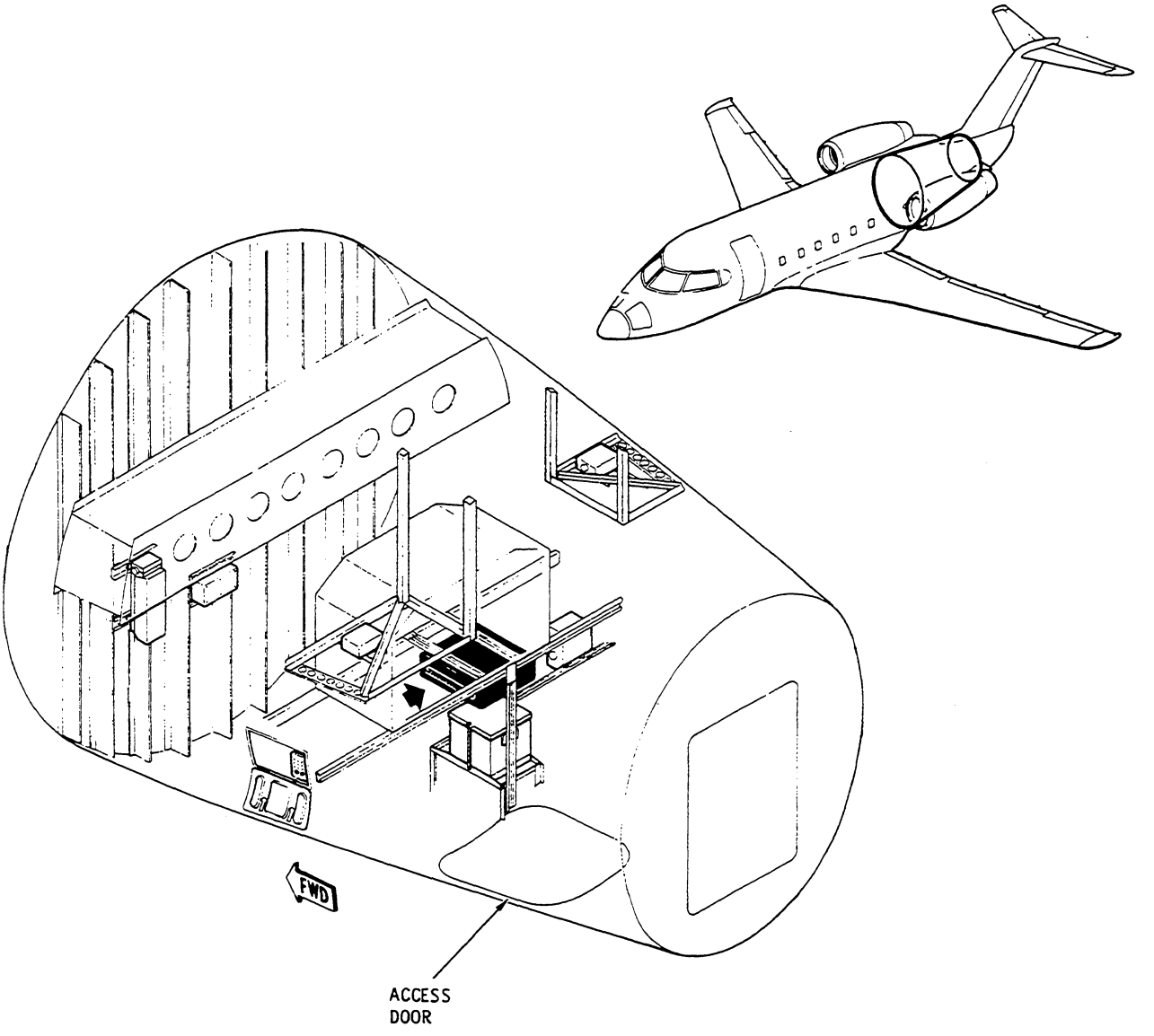
DC Essential Bus Circuit Breaker Panel
Figure 14 (Sheet 3)



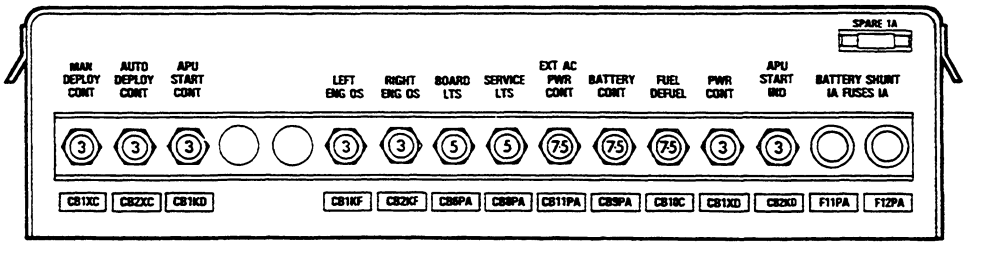
EFFECTIVITY: 1004 TO 1023



Aft Electrical Distrubution Box Circuit Breaker Panel
Figure 15 (Sheet 1)



EFFECTIVITY 1024 TO 1999



Aft Electrical Distribution Box Circuit Breaker Panel
Figure 15 (Sheet 2)