

STALL WARNING - STICK SHAKER

Stall warning is achieved by the use of a stick shaker mounted on the forward side of the pilot's and co-pilot's control column. An electric motor with rotating weights induces a vibration feel to the control column. The pilot is alerted to impending stall by the vibration of the control column which occurs approximately 8% to 10% above the actual stall speed. Stick shaker activation will occur before stall buffet. The stick shaker is energized by inputs from the angle-of-attack system. The rotary test switch located on the center pedestal provides a means of checking the shaker prior to flight.

ELECTRICAL

GENERAL

Electrical power for the Excel comes primarily from DC sources originating with the starter/generators or the battery. A receptacle below the left engine pylon is provided for connection of a 28 VDC external power unit.

ALTERNATING CURRENT (AC) POWER

The Excel utilizes a single alternating current (AC) inverter to power the electroluminescent panel lighting. In addition, AC power from engine-driven alternators is used to power the electrically-heated windshield. For a complete system description, refer to Anti-Ice/Deice description in this section.

NOTE

Avionics equipment in the Excel is DC-powered, and therefore does not require the use of AC inverters.

DIRECT CURRENT (DC) POWER

The direct current (DC) power distribution system contains of two separate and independent DC power sources which supply the system. In the event these DC power sources fail, the battery system will supply emergency power to selected systems. The direct current (DC) power distribution system consists of a battery system, two 300 amp starter/generators, two Generator Control Units (GCUs), a distribution system, a battery switch, an avionics switch, two generator control switches, two ammeters and a voltmeter with a selector switch. A description of various components follows.

BATTERY SYSTEM

The battery system consists of the battery, the battery disconnect relay and associated switches. The 40-amp battery is used to provide power for engine starting, and to provide power to the emergency battery bus in the event of a dual generator failure.

The battery is located in the left hand aft fairing and has an overboard vent. A battery disconnect relay is provided for the battery. During normal operation, the relay remains in a de-energized position. During a battery overtemp condition, the battery may be disconnected by operating the BATTERY DISCONNECT switch on the pilot's circuit breaker sub-panel. The switch is also intended for ground operation in the event a starter relay becomes welded closed.

The battery condition may be continuously monitored using the cockpit temperature gauge. Battery temperatures should remain well below 63°C (145°F) during all operations. Anytime battery temperature exceeds 63°C (145°F), the red BATT O'TEMP annunciator illuminates. If temperature continues to climb and exceeds 71°C (160°F), the red BATT O'TEMP > 160° annunciator will flash and trigger the MASTER WARNING annunciator.

NOTE

The battery must be serviced per the Maintenance Manual when the battery temperature exceeds 63°C (145°F).

The three-position control switch for the battery is normally located on pilot's switch panel, and is labeled BATT, OFF and EMER. Placing the switch to the BATT position closes the battery and emergency relays and powers the battery bus, emergency bus and both main DC buses. This position also enables external power to supply the entire system.

In the OFF position, battery or external power is isolated from all but the hot battery bus.

With the battery switch in the EMER (emergency) position and both generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:-

LH AND RH Ignition
COMM 1
NAV 1
AHRS 2
LH and RH N₁ Indicator
RMU I
Flap Control
Two-Position Stabilizer

Standby Pitot and Static Heaters
Pilot's and Copilot's Audio Panels
Glareshield and Overhead Floodlights
Standby HSI
Standby Radio Control Head
Interior Entry Lights
Landing Gear Control and Indication

The standby flight display unit will continue to operate on its own emergency battery pack. This battery pack also provides 5 volt emergency instrument lighting.

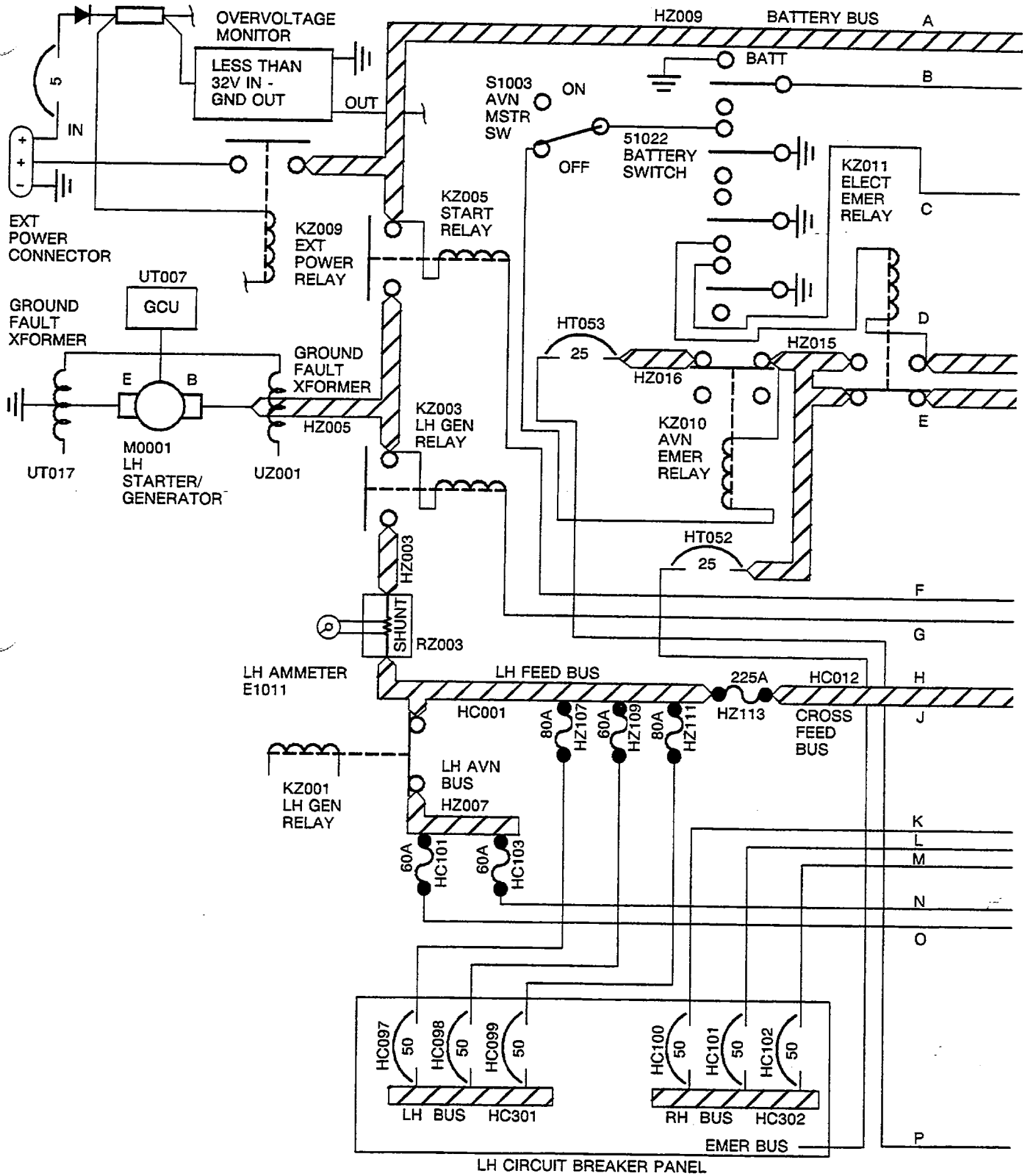
NOTE

In some cases, it may be prudent to turn OFF unneeded systems in order to conserve the airplane's battery.

STARTER/GENERATORS

A starter/generator is located on each engine and is wired directly to the power Junction Box. The starter/generator is driven by engine rotation through the accessory gear box, and is air cooled using engine bypass air. In ground operations (ground idle) each starter/generator is rated at 200 amps (which may be exceeded momentarily for start). At maximum operating altitude, each starter/generator is rated at 300 amps.

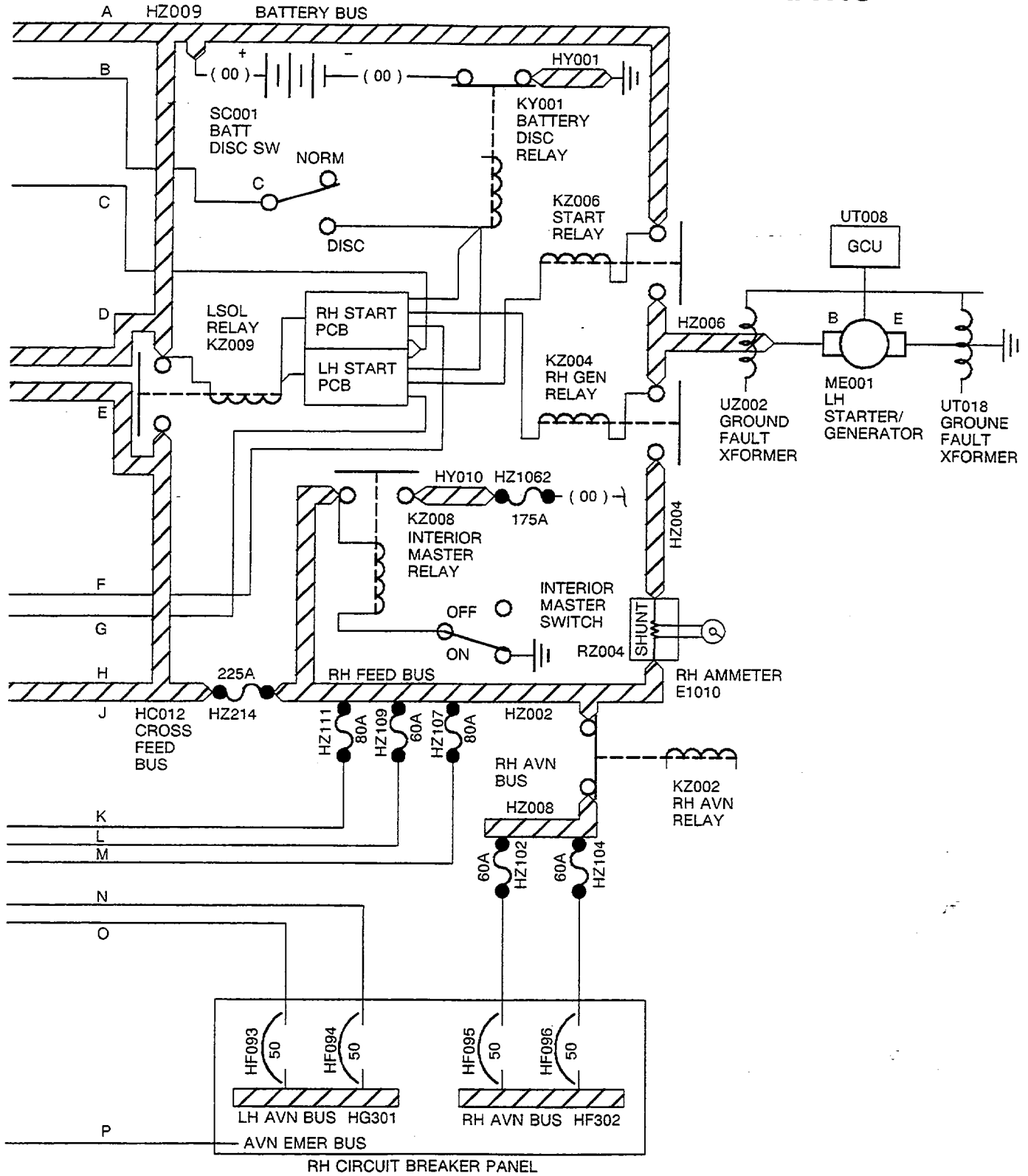
DIRECT CURRENT SIMPLIFIED SCHEMATIC



6685T2001 (L)

Figure 2-13 (Sheet 1 of 2)

DIRECT CURRENT SIMPLIFIED SCHEMATIC



6685T2001 (R)

Figure 2-13 (Sheet 2)

GENERATOR CONTROL UNIT (GCU)

Two GCUs, one for each starter/generator, are installed in the tailcone area above the aft power junction box. The GCU is used to control the operation of the starter/generator and provides the following control features:

- 1.) Voltage regulation at 28.5 VDC.
- 2.) Load sharing to within 40 amps in parallel operation.
- 3.) Overvoltage protection at 35.0 VDC.
- 4.) Reverse current control of the line contactor.
- 5.) Generator feeder ground fault protection.
- 6.) Start contactor control and field-weakening during start.
- 7.) Overspeed sensing and protection resulting from sheared starter shaft.
- 8.) Generator self-excitation and subsequent regulation without an external source of power (such as a battery).
- 9.) Generator deactivation when the firewall shut-off is activated.

EXTERNAL POWER

External direct current (DC) power can be connected to the airplane through a receptacle located on the left side of the fuselage. When external power is connected, the external power relay energizes and connects the power source to the hot battery bus. Positioning the battery switch to BATT energizes the battery and emergency relays allowing external power to be connected to the entire DC system. Ground power requirements dictate a 28-volt unit, with a nominal capability of 1000 amperes current. If an adjustable power unit is used, it should be adjusted to provide a setting of 1000 amperes. A ground power unit with a soft start capability is preferable. The battery should be disconnected if the airplane is to be on a ground power unit for a prolonged period of time.

DIRECT CURRENT (DC) POWER INDICATORS

The indicators consist of two ammeters, a voltmeter and two amber generator failure lights. The ammeters function as load meters indicating the load being carried by each generator.

The voltmeter is wired through the battery switch and will indicate the voltage of the hot battery bus any time the battery switch is in the BATT or EMER position. The voltmeter selector switch can be rotated to the LH or RH GEN positions to check generator voltage output. Since the voltmeter reads the highest voltage on the bus, an accurate check of one generator is obtained only with the opposite one off the line.

Should either generator fail, the associated power relay will open, removing the generator from the system and illuminating the appropriate L or R GEN OFF annunciator panel light. Should both generators fail, the master warning light will also illuminate. This is the only condition under which amber annunciator light illumination will trigger the master warning.

ELECTRICAL BUSESSES

EMERGENCY BUS

LH FAN SPEED
RH FAN SPEED
STANDBY HSI
STANDBY P/S HEATER
LH IGNITION
RH IGNITION
HYD CONTROL
STAB CONTROL
FLAP CONTROL
GEAR CONTROL
GEAR WARNING
FLOOD LIGHTS
AHRS 2
AUDIO 2
COMM 1
NAV 1
AUDIO 1 (only when EMER is selected, otherwise this is on the Avionics Bus)

BATTERY BUS

INTERIORS
FWD EMERG LTS
CABIN DOOR
LH START CONTROL PCB
BATTERY VOLTAGE
RH START CONTROL PCB
ELT (AVN)
AFT EMERG LTS
AFT/FWD COMP LTS

FEED BUS

LH PRECOOLER CONTROL
LH BUS SENSE
LH LANDING/RECOG LTS
OXY/SEAT BELT
RH PRECOOLER CONTROL
RH LANDING/RECOG LTS
TAIL FLOOD LTS

AVIONICS BUS

AUDIO 1
AHRS 1
XPDR 1
DME 1
ADF 1
WARN
ADC 1
IC 1
DISPLAY 1
PFD 1
TCAS
RAD ALT
HF
MFD
RADAR
AUDIO 2 (WARN)
COMM 2
MNAV 2
XPDR 2
DME 2
ADF 2
FLIGHT PHONE
ADC 2
IC 2
DISPLAY CONTRL 2
PFD 2
MFD CONTROL
RADAR CONTROL
CABIN DISPLAY
GPWS
AFIS

CROSSFEED BUS

COCKPIT WEMAC FAN
FWD EVAP FAN
AFT EVAP FAN
RH IGNITOR SOURCE
LH LANDING/RECOG LTS
LH IGNITOR SOURCE
LH LANDING LTS

GENERATOR BUS

RH START CONTROL
PCB
RH VOLTMETER
RH GENERATOR
LH START CONTROL
PCB
LH VOLTMETER
LH GENERATOR

ELECTRICAL BUS

LH PANEL LTS
STBY FLT DISPLAY
LH CLOCK
RAT
LH ENGINE ANTI-ICE
LH PITOT/STATIC
TAS HEATER
AOA HEATER
NORM PRESS
LH ITT
LH TURB SPEED
LH FUEL FLOW
LH FUEL QTY
LH OIL TEMP
LH FUEL TEMP
AUTO TEMP
FUEL CONTROL
LH START
RH ENG COMP
ENGINE VIB MON
WARNING LTS
PITCH TRIM
SPEED BRAKES
CVR
CABIN DOOR MONITOR
LH W/S ANT-ICE
RH F/W SHUTOFF
RH FIR DETECT
RH BOOST PUMP
LH THRUST REVERSER

ELECTRICAL BUS

(continued)

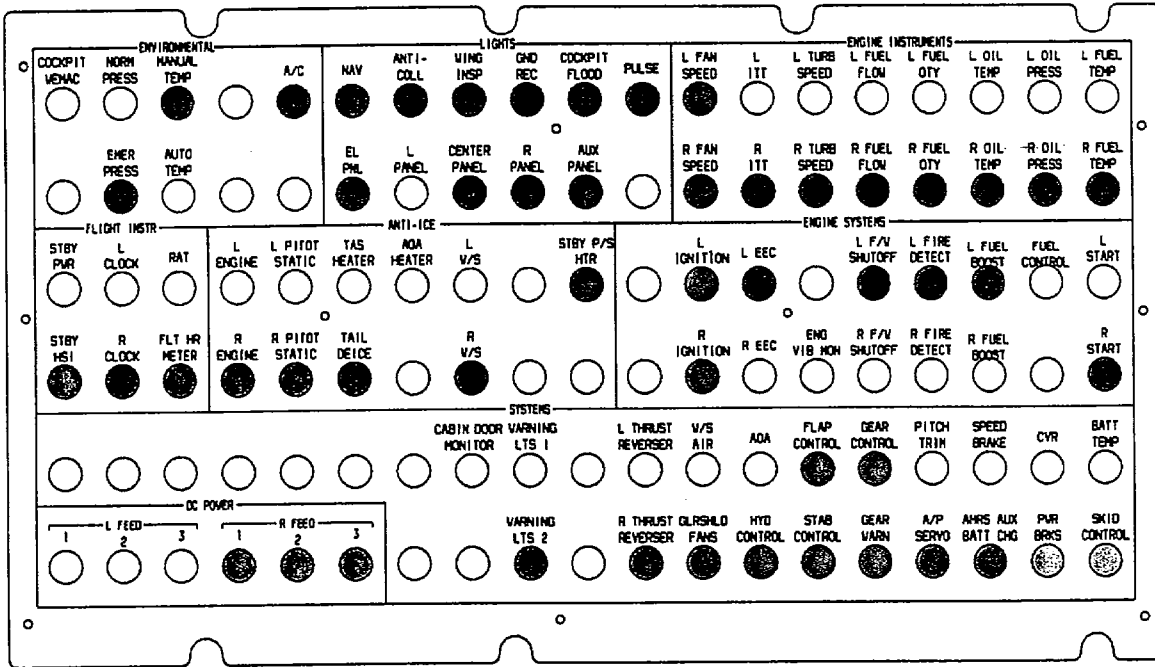
W/S AIR
AOA
BATT EMP
SKID CONTROL
PWR BRAKES
PH PANEL LTS & MAP
LTS
NAV
ANTI-COLLISION LTS
GND RECOG LIGHT
RH ENGINE ANTI-ICE
RH PITOT/STATIC
EL PNL/PNL FLD
FREON AC
CABIN ALT SWITCH
RH ITT
RH TURB SPEED
RH FUEL FLOW
RH OIL TEMP
RH OIL PRESS
RH FUEL TEMP
MANUAL TEMP
WING INSPECTION LT
CENTER PNL LTS
LH ENG COMP
EMERG PRESS
LH F/W SHUTOFF
LH BOOST
RH CLOCK
FLT HOUR METER
TAIL DEICE
RH W/S ANTI-ICE
RH START
WARNING LTS 2
RH THRUST
REVERSER
GLARESHIELD FANS
A/P SERVO
AHRS AUX BATT



Figure 2-13A

LEFT CIRCUIT BREAKER PANEL

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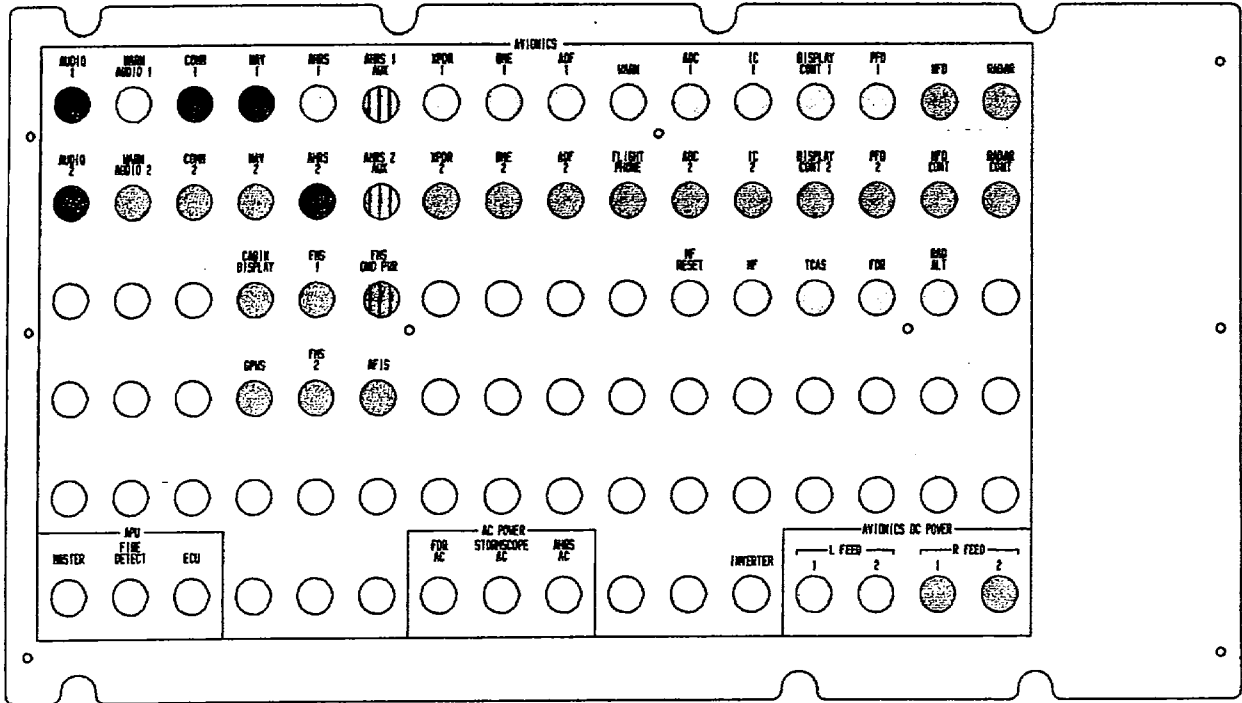
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DC POWER







- LH BUS
- RH BUS
- EMER BUS
- LH SUB BUS

Figure 2-14 (Sheet 1 of 2)

RIGHT CIRCUIT BREAKER PANEL



DC POWER

-  AHS AUX PWR BUS (HF304)
-  LH AVN BUS (HF301)
-  RH AVN BUS (HF302)
-  AVN EMER BUS (HF303)
-  LH AVN BUS (HF301) SWITCHES TO AVN EMER BUS (HF003) WHEN BATT IS SWITCHED TO EMER
-  SWITCHES BETWEEN AHS AUX PWR BUS (HF304) AND LH AVN BUS (HF301) BASED ON BATT SWITCH AND AVIONICS SWITCH POSITION

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Figure 2-14 (Sheet 2)