

1. GENERAL.

The Electrical Power System consists of two redundant system sides (L and R). The system is normally powered from two 3 phase variable frequency AC main generators, one on each propeller gear box. Each main generator normally supplies power to its own side of the system. The APU is equipped with an identical generator. This generator may replace an inoperative main generator. When only one of the three generators is working it supplies power to both left and right side systems. The system can also be powered from a Ground Power Unit (GPU).

Each system side includes a DC system with a Transformer Rectifier Unit (TRU) and a battery. A third center TRU is connected to the two center batteries mainly used for APU start and ground services. This CTR TRU will replace a faulty L or R TRU. When only one of the three TRUs is working, the L and R DC busses are tied together and powered from that TRU. A failure within the power system initiates automatic load reduction to keep the total load within remaining capacity of the system.

AC Electrical Power System.

The system provides 3—phase 115/200 V alternating current of variable frequency. On the AC system schematic all the three phases are represented with one line. When deenergized, each generator relay connects its generator's bus to the next generator. If one main generator is inoperative, that bus is connected to the APU generator, and if the APU is inoperative that bus is tied to the bus and main generator on the other side. The AC bus interconnect circuit is provided with an overcurrent protection.

DC Electrical Power System.

The system is designed for 28 VDC and consists of two redundant system sides (L and R). Each side includes a Transformer Rectifier Unit (TRU) and a battery. Each TRU is powered from the L/R REAR AC GEN BUS. A center TRU is connected to the two center batteries mainly used for APU start and ground services. This CTR TRU replaces a faulty L or R TRU. When only one of the three TRUs is working, L and R busses are tied together and powered from that TRU.

The connections of the busses are controlled by the DC bus tie circuit. The DC bus tie overcurrent protection fuse separates the different sides should current over bus the tie exceed 200 amperes.

The CTR TRU is powered from L or R side AC bus.

The DC busses are separated into L and R busses. The busses can be supplied from the batteries or from the TRUs. When one or more TRUs fail certain busses are disconnected automatically (see DC schematic).

The four batteries are located in the wing fairings. The TRUs are also in the fairings, aft of the batteries.

Each TRU has its own fault monitoring system. In case of L or R TRU failure, the CTR TRU will automatically replace the faulty TRU. A two TRU failure will automatically result in DC bus tie and disconnection of certain busses to avoid overload of the operating TRU; see DC schematic.

On ground, only the CTR BAT's are used for ground services. L and R BAT relays remain open. They close when the TRUs supplies the busses, and remain closed throughout the flight (TRUs supplied by generator power). During APU battery start on ground all four batteries are connected in parallel to power the APU starter motor. When AC supply is available and all three TRUs operate, the APU starter motor is powered by CTR TRU and CTR BAT. During flight the APU starter motor is only powered by the left CTR BAT.

NOTE

If APU is used on ground for longer periods at high outside temperature (above +35°C), the battery temperature may get too high. In order to prevent this, select the CTR BAT switch at the overhead panel to OFF. The switch shall be turned ON after engine start.

CTR BAT is discharged during ground operation on batteries and charged by CTR TRU when AC supply becomes available (generator supply). L and R BAT relays are normally closed when AC power is available and the TRUs are working. TRU average voltage

output is higher than battery open voltage. L and R BAT are therefore normally only discharged during high current transient, e.g. APU start. They are kept charged by L and R TRUs.

Generators.

The two propeller gear box driven main generators are rated at 45 kVA each, and normally operate at frequencies of 404–577 Hz. A generator is disconnected by its relay if frequency is below 380 Hz.

The APU generator is identical to the main generators but operates on 400 Hz. When a main generator is inoperative, that side of the electric power system is supplied from the APU generator when available.

The main generators are oil cooled. The APU and its generator share the same oil.

Ground Supply Connector.

The connector is located in the fuselage on the right hand side behind the flight compartment. When the aircraft is supplied by GPU power, all four batteries are disconnected to prevent battery overcharge.

The GPU will automatically be disconnected when;

- The APU generator becomes operative.
- Both main generators become operative (if start is performed with the APU OFF).

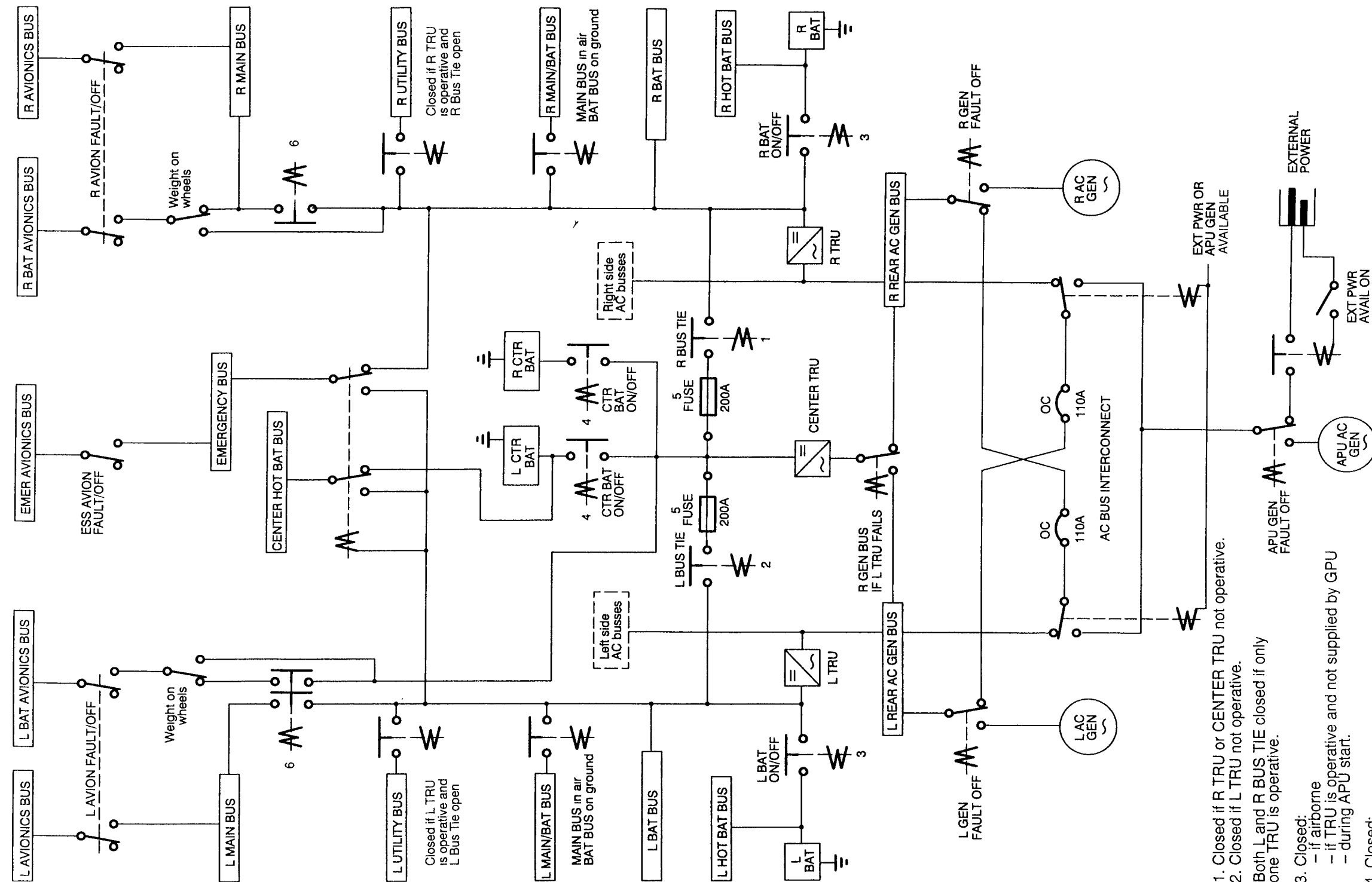
Rectifiers.

Each TRU is rated at 200 A continuously. The TRUs provide fault signals to the DC bus system for load reduction (disconnection of busses) and to close bus tie relays. If only two TRUs are working, some DC busses are disconnected and with only one TRU further DC busses are disconnected (see AC and DC schematic).

Inverters.

Two static inverters supply regulated 115 V/400 Hz single phase AC power. The L and R INVERTER busses are supplied from one inverter at a time and with the other inverter in standby. Should the power-supplying inverter fail the other inverter in standby must be selected manually.

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1. Closed if R TRU or CENTER TRU not operative.
 2. Closed if L TRU not operative.
- Both L and R BUS TIE closed if only one TRU is operative.
3. Closed:
 - if airborne
 - if TRU is operative and not supplied by GPU
 - during APU start.
 4. Closed:
 - if airborne
 - when center TRU is operative and not supplied by GPU
 - during APU start on ground
 - when no TRU is inoperative

Open when A/C supplied by GPU.
 5. Maintenance access only
 6. A/C 10-19; Open if no TRU operative.
A/C 20-up; closed when 2 or 3 TRU's operative.
- OC= Overcurrent protection.

FIG. 1. Electrical system -- DC busses (system shown de-energized).

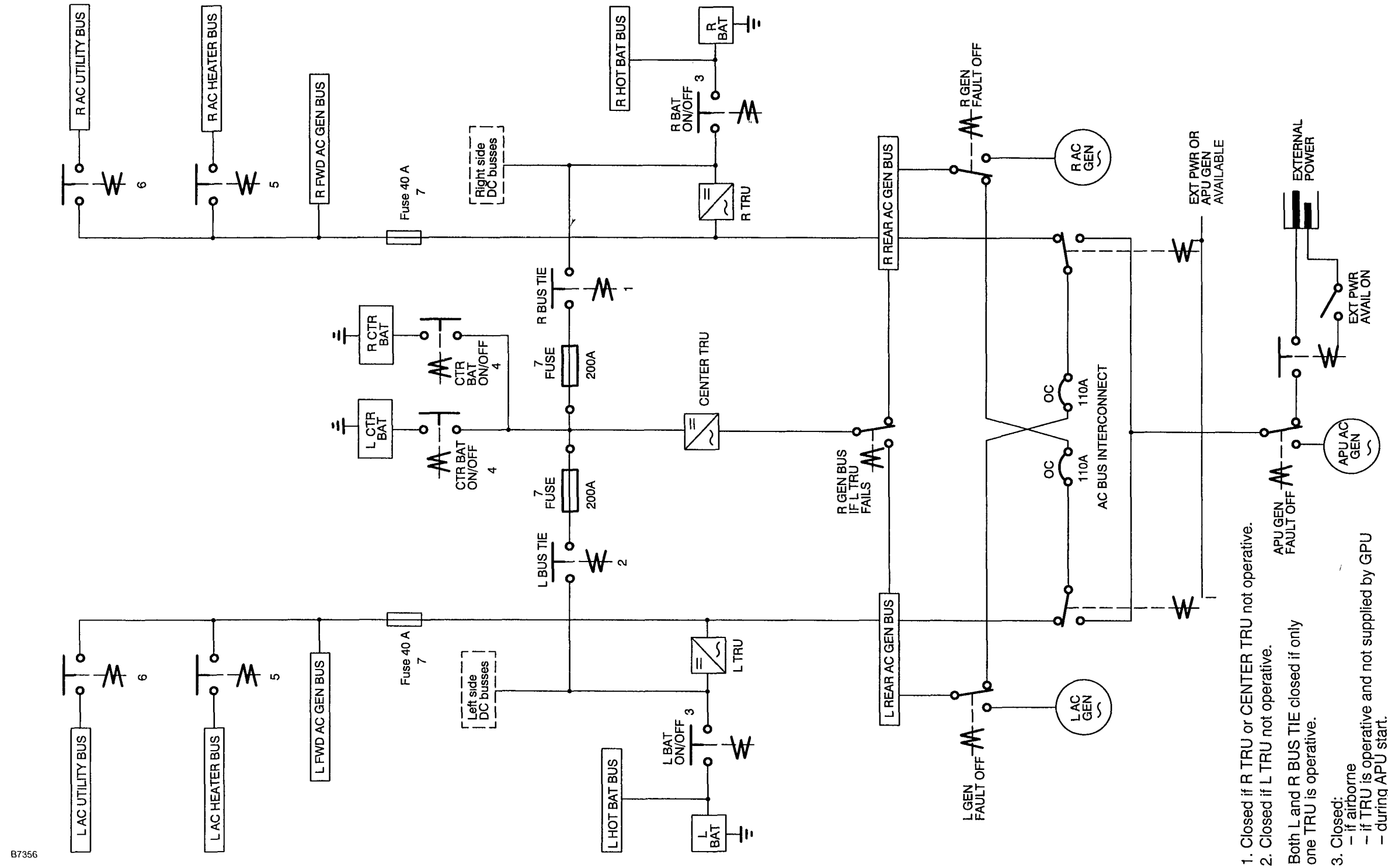


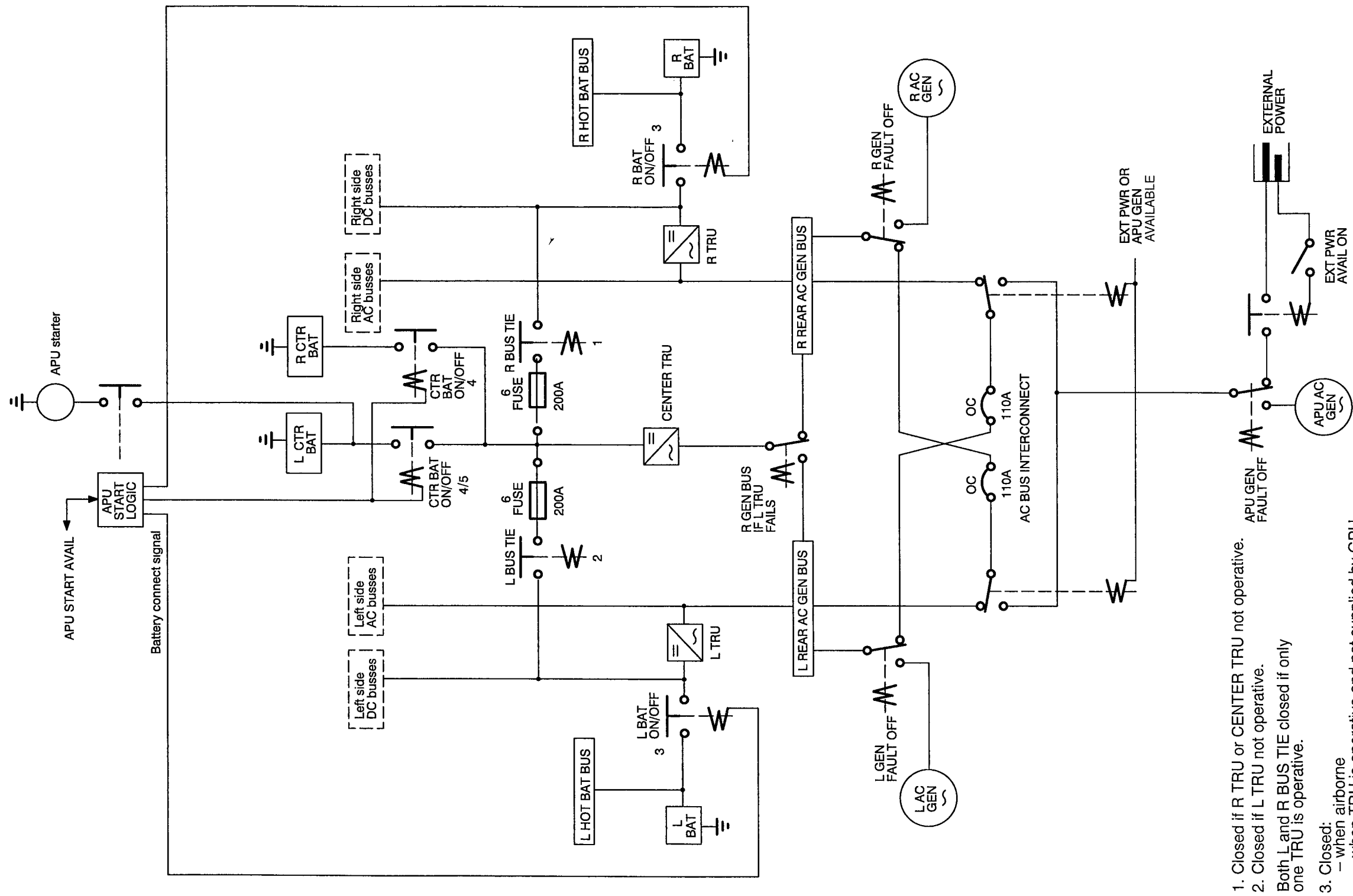
FIG.2. Electrical system – AC busses
(system shown de-energized).

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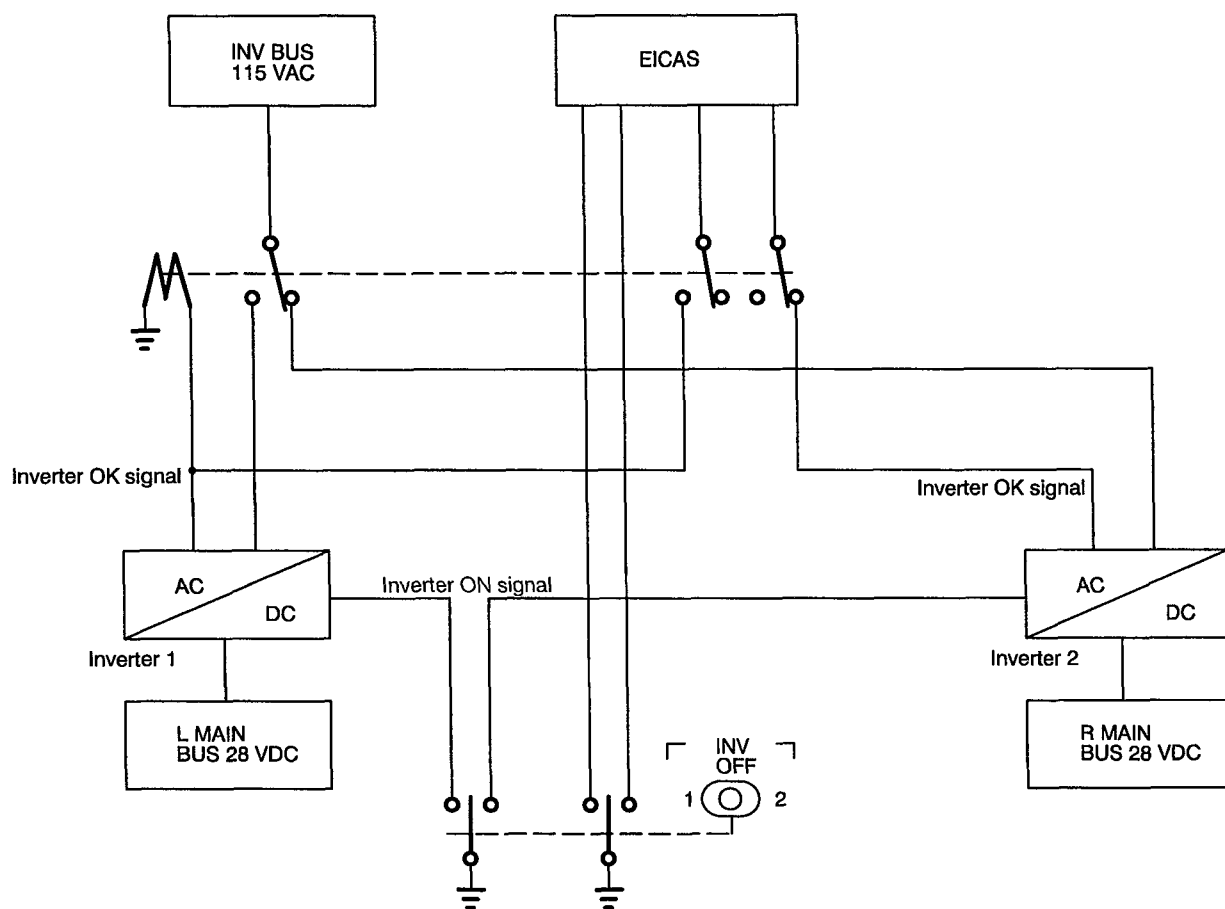
1. Closed if R TRU or CENTER TRU not operative.
2. Closed if L TRU not operative.
- Both L and R BUS TIE closed if only one TRU is operative.
3. Closed:
– if airborne
– if TRU is operative and not supplied by GPU
– during APU start.
4. Closed:
– if airborne
– when center TRU is operative and not supplied by GPU
– during APU start on ground
– when no TRU is operative.
5. Closed on ground provided L or R AC GEN on line. Always closed in air.
6. Closed if two AC GEN on line or APU on line or EXT PWR on line.
7. Maintenance access only.
- OC= Overcurrent protection.
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- The diagram shows a switch labeled "APU GEN FAULT OFF" with a double-throw mechanism. The switch is currently in the "OFF" position, indicated by a horizontal line connecting the top terminal to the common terminal. The "ON" position is indicated by a diagonal line connecting the bottom terminal to the common terminal. The switch is connected to a circular symbol representing the "APU AC GEN", which contains a sine wave symbol.

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1. Closed if R TRU or CENTER TRU not operative.
 2. Closed if L TRU not operative.
Both L and R BUS TIE closed if only one TRU is operative.
 3. Closed:
 - when airborne
 - when TRU is operative and not supplied by GPU
 - during APU start.
 4. Closed:
 - if airborne
 - when center TRU is operative and not supplied by GPU
 - during APU start on ground
 - when no TRU is operative.
 5. Open during APU start in the air.
 6. Maintenance access only.
- OC= Overcurrent protection.

FIG.3. Electrical system – Start of APU (system shown de-energized).



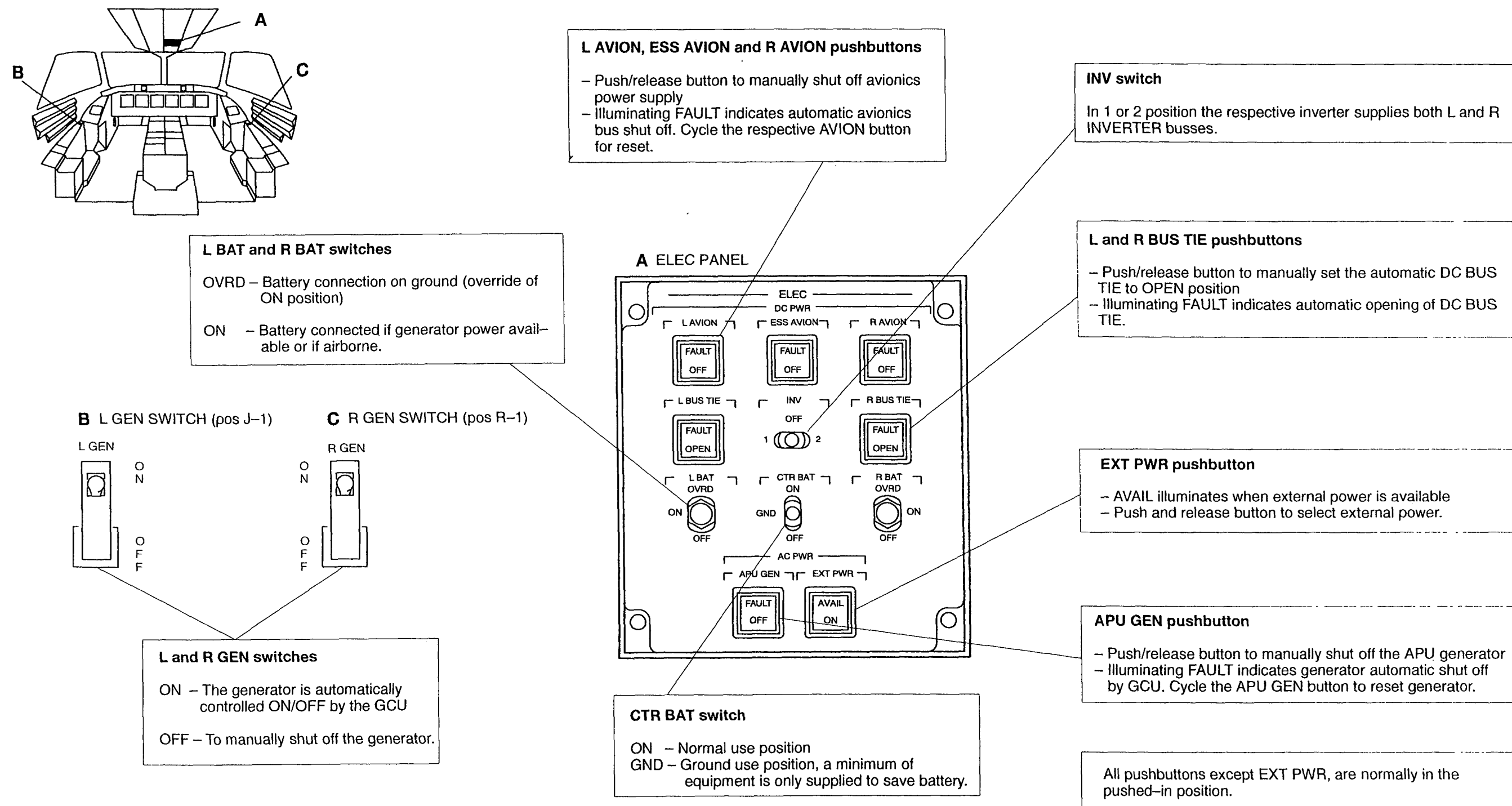
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FIG.4. Dual main inverter system.

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2. CONTROLS AND INDICATORS.



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FIG.5. Electrical system control – DC, AC and Inverters.

**3. ELECTRICAL POWER DISTRIBUTION,
DC BUSSES.****LH HOT BATTERY BUS**

- Fire Extinguishing L Eng shot 2
R Eng shot 2
- L Hydraulic Fire shut off valve
- Fire Extinguisher Cargo
- APU Fire Extinguishing
- Cargo & Service Comp Lighting
- Clock 1
- ELT Transmit Indicator
- EICAS L DCU standby power
- Potable Water control and indication

RH HOT BATTERY BUS

- Fire Extinguishing L Eng shot 1
R Eng shot 1
- R Hydraulic Fire shut off valve
- External Power control
- Clock 2
- EICAS R DCU standby power
- ACARS
- Emergency Pitch trim
- Fuel Panel / Fueling only

CENTER HOT BATTERY BUS

- Flight Deck dome Lights
- APU start motor power
- Stair Light
- Cabin Lights

LH BATTERY BUS	RH BATTERY BUS
<ul style="list-style-type: none">– L Engine Starting– L/R Engine Power Control FADEC A– L/R Engine Power Management FADEC A– L Overheat Detection, Tailpipes– L Overheat detection Bleed Air– L Fuel Fire Valves– Fuel Valve, CONNECT valve– L Fuel Measuring System– L Propeller Control– Trim Control System, Stby pitch/roll main Power– Pitch/Roll Disconnect System– L Stall Warning– R Pneumatic Distribution stby power– L AC Heater Bus + AC Utility Bus control– L AC Generator xfeed control– Wing De-Icing L lower, R lower, lower stab– L Audio Integrating– Ldg Gear Emergency Extension L + R back up– GPWS Flap override– EICAS 1, L DCU, L CRT as PED in norm or R CRT as PED in rev mode. All left lamps– Cabin Press. Control, Emergency– Nose Wheel Steering control– Smoke Detection avionics rack– Flap Control System + indication– Passenger Address– APU Control System– L Windshield Wiper– Oxygen Indication– Passenger Oxygen system– L Oil Press/Temp Indication– Antiskid Inboard– PA handset (option)– L Elevator control 1– L Elevator control 2 Back up– TAWS terrain display and flap override	<ul style="list-style-type: none">– R Engine Starting– L/R Engine Power Control FADEC B– L/R Engine Power Management FADEC B– R Engine fire detection & APU/SAU fire detection– R Overheat Detection, Tailpipes– R Overheat Detection Bleed Air– R Fuel Fire Valves– Fuel Valve, XFEED valve– R Fuel Measuring System– R Propeller Control– Trim Control System, Main roll/pitch, yaw. Stby pitch/roll trim backup power– Pitch and Roll Disconnect– Rudder Control System, RCU 2– R Stall Warning and Stick pusher– L Pneumatic Distribution stby pwr Bleed X valve– R AC Heater Bus control– R AC Generator xfeed control– Wing De-Icing L upper, R upper, upper stab fin + control back up– R Audio Integrating– Ldg Gear Emergency Extension R + L back up– L (R Navigation Lights, first pair)– R WOW– Flight Compartment Lighting L/R map light– Stby Pitot Tube Heating– EICAS SED power– Smoke Detection– Cockpit Voice Recorder– Hydraulic Central/Right AC Pump control– Passenger Oxygen system– R Oil Press/Temp Indication– Antiskid Outboard– Ldg gear (normal) extension– R Elevator control 2

LH MAIN/BAT BUS <ul style="list-style-type: none">– AHRS 1, power supply on gnd (if installed)– IRS 1, power supply on gnd (if installed)– Beacon Light lower fuselage– Flight Compartment L/R reading lights, flood lights– Rudder Control System, RCU 1– L Fuel Pump, support pump (in collector tank)	RH MAIN/BAT BUS <ul style="list-style-type: none">– AHRS 2, power supply on gnd (if installed)– IRS 2, power supply on gnd (if installed)– Beacon Light fin– Pneumatic Instruments– Fuel Measuring system/Fuel panel– Cabin Signs– Cabin Lighting– R Fuel Pump, support pump (in collector tank)
LH MAIN BUS <ul style="list-style-type: none">– L Center Battery Ventilation– L Battery Ventilation– L Ventilating Nacelle– Ventilating Avionic Rack 1 ctl– L Engine Anti-Icing– L Propeller De-Icing– L Pneumatic Distribution main power– Wing De-Icing Main control, L Bleed– Windshield Heating, L Front + R Side– L Footwarmer Control– 115 V/400 Hz Inverter 1– Flight Comp Temp Control– L Strobe Lights– Recirc Fan cockpit + Air valve– Engine Data Acquisition system, L NIU– Cabin Temp control– Emergency Lights control– Potable Water control and indication– ELT indicator	RH MAIN BUS <ul style="list-style-type: none">– R Center Battery Ventilation– R Battery Ventilation– R Ventilating Nacelle– Ventilating Avionic Rack 2 ctl– R Engine Anti-Icing– R Propeller De-Icing– R Pneumatic Distribution main power– Wing De-Icing, ON indication EICAS + R Bleed– Windshield Heating, R Front + L Side– R Footwarmer Control– 115 V/400 Hz Inverter 2– Cabin Temperature Control– R Strobe Lights– Recirc Fan cabin– EICAS 2, R DCU, R CRT as SED in norm. All right lamps– Cabin pressurization Control auto– Engine Data Acquisition system, R NIU– Flight Deck Temp control– Panel and Instrument Lighting– Hydraulic standby AC Pump Valves– R Windshield Wiper (A/C 20-up)
LH BAT AVIONIC BUS <ul style="list-style-type: none">– AHRS 1, main power– EFIS 1 PFD– Air Data System 1	RH BAT AVIONIC BUS <ul style="list-style-type: none">– AHRS 2, main power– EFIS 2 PFD– Air Data System 2– VHF COM 2 R RTU with Mod No 5735

LH AVIONIC BUS <ul style="list-style-type: none">– Integrated Avionics Processor– Flight Control System FD/AP channel 1– EFIS 1 L ND– EFIS 1 L DCP– RALT 1– ADF 1– DME 1– Flight Recorder– Weather Radar– HF COM 1– FMS– TAWS power	RH AVIONIC BUS <ul style="list-style-type: none">– Integrated Avionics Processor– Flight Control System FD/AP channel 2– EFIS 2 R ND– EFIS 1 R DCP– RALT 2– ADF 2– ATC 2– DME 2– NAV 2– VHF COM 2 R RTU without Mod No 5735– TCAS– VHF COM 3 for ACARS– Boarding music– Stby compass comp. coil– HF COM 2 (A/C 17 and 20–up)
LH UTILITY BUS <ul style="list-style-type: none">– Taxi Lights– L/R Navigation Lights, second pair– L fwd Stowage unit– L Pilot Seat Heater (with Mod. No. 6094)	RH UTILITY BUS <ul style="list-style-type: none">– Wing Inspection Lights– L fwd Galley– Lavatory– R Windshield Wiper (up to A/C19)– Floor Heaters– HF COM 2 (up to A/C19 not A/C 17)– ANC– Boarding Music– R Pilot Seat Heater (with Mod. No. 6094)
EMERGENCY AVIONIC BUS (ESS AVION BUS) <ul style="list-style-type: none">– VHF COM 1 + L RTU– NAV 1– ATC 1– Standby Horizon Indicator– Cockpit Voice Recorder– Standby Altimeter Indicator	
EMERGENCY BUS <ul style="list-style-type: none">– Instrument Lighting, stby instruments– Passenger Oxygen System– Fire Detection Engine/APU– Ldg Extension & Retraction + L WOW– R Elevator control 1– L Elevator control 2	

**4. ELECTRICAL POWER DISTRIBUTION,
AC BUSES.**

LH REAR AC GEN BUS Ø A <ul style="list-style-type: none">– L TRU + C TRU main supply– L Propeller De-Icing– Hydraulic Backup pump pwr– Potable Water Tank Anti-freeze	RH REAR AC GEN BUS Ø A <ul style="list-style-type: none">– R TRU + C TRU standby supply– R Propeller De-Icing– L fwd Stowage unit
LH REAR AC GEN BUS Ø B <ul style="list-style-type: none">– L TRU + C TRU main supply– L Propeller De-Icing– Hydraulic Backup pump pwr	RH REAR AC GEN BUS Ø B <ul style="list-style-type: none">– R TRU + C TRU standby supply– R Propeller De-Icing– L fwd Stowage unit
LH REAR AC GEN BUS Ø C <ul style="list-style-type: none">– L TRU + C TRU main supply– L Propeller De-Icing– Hydraulic Central/Right AC pump pwr– Potable Water Tank Anti-freeze	RH REAR AC GEN BUS Ø C <ul style="list-style-type: none">– R TRU + C TRU standby supply– R Propeller De-Icing– L fwd Stowage unit
LH FWD AC GEN BUS Ø A <ul style="list-style-type: none">– Windshield Heating, L Front– Ventilating Avionic Rack # 1– Recirc Fan cockpit– L Footwarmer– Instrument, ctr ped, side panel lighting	RH FWD AC GEN BUS Ø A <ul style="list-style-type: none">– Windshield Heating, L Side– Ventilating Avionic Rack # 2– Recirc Fan cabin– R Footwarmer– Logo lights– Cabin Lighting
LH FWD AC GEN BUS Ø B <ul style="list-style-type: none">– Windshield Heating, L Front– Ventilating Avionic Rack # 1– Recirc Fan cockpit– L Footwarmer– L Battery, Center Battery Ventilation– L Landing light	RH FWD AC GEN BUS Ø B <ul style="list-style-type: none">– Windshield Heating, R Front– Ventilating Avionic Rack # 2– Recirc Fan cabin– R Footwarmer– Overhead panel lighting– R Landing light

LH FWD AC GEN Ø C <ul style="list-style-type: none">– Windshield Heating, R Side– Ventilating Avionic Rack # 1– Recirc Fan cockpit– L Battery, L Center Battery heating– L Landing light	RH FWD AC GEN Ø C <ul style="list-style-type: none">– Windshield Heating, R Front– Ventilating Avionic Rack # 2– Recirc Fan cabin– R Battery, R Center Battery heating– R Landing light– Potable Water Heater
LH AC HEATER BUS Ø A <ul style="list-style-type: none">– L AOA sensor heating	RH AC HEATER BUS Ø A <ul style="list-style-type: none">– OAT probe heating– R Pitot tube heating
LH AC HEATER BUS Ø B <ul style="list-style-type: none">– De-Icing valve heating, Lower stab	RH AC HEATER BUS Ø B <ul style="list-style-type: none">– De-Icing valve heating, Upper stab + fin
LH AC HEATER BUS Ø C <ul style="list-style-type: none">– L Pitot tube heating	RH AC HEATER BUS Ø C <ul style="list-style-type: none">– R AOA sensor heating– Ice Detection
LH AC UTILITY BUS Ø A <p>Not used</p>	RH AC UTILITY BUS Ø A <ul style="list-style-type: none">– Cabin Overhead Bin compartment Lights– Galley
LH AC UTILITY BUS Ø B <p>Not used</p>	RH AC UTILITY BUS Ø B <ul style="list-style-type: none">– Passenger Reading Lights– Galley
LH AC UTILITY BUS Ø C <p>Not used</p>	RH AC UTILITY BUS Ø C <ul style="list-style-type: none">– Lavatory Water Tank Heater– Galley

**5. ELECTRICAL POWER DISTRIBUTION,
INVERTER BUSSES.**

LH INVERTER BUS	RH INVERTER BUS
<ul style="list-style-type: none">– GPWS– Flight Recorder	<ul style="list-style-type: none">– ACARS

6. AC AND DC ELECTRICAL SYST CB's.

Left side electrical

Left battery heat J - 7
Left Center battery heat J - 8
Left and L Center bat vent J - 9
TRU volt J - 10

Left side DC busses

DC Bus Tie K - 5
L Utility Bus K - 6
Essential Avionics Bus K - 7
L Main Bus K - 8
L Avionics Power K - 9
L Avionics Control K - 10
Emergency Bus normal pwr K - 11
Center Hot Bat Bus K - 12

Left side AC busses

L Heater Bus J - 3
L Utility Bus J - 4
Indication L Heater Bus J - 5
Indication L Utility Bus J - 6

Left side TRU

L TRU control K - 2
Center TRU control K - 3
Center TRU indication K - 4

Left side miscellaneous

L AC Bus interconnect J - 2

— ELEC —

L BAT HEAT
L CTR BAT HEAT
L BAT VENT
TRU VOLT

— ELEC DC BUSES —

DC BUS TIES
L UTIL
ESS AVION CTL
L MAIN
L AVION PWR
L AVION CTL
EMER BUS NORM
CTR HOT BAT

— AC BUS —

L HEAT
UTIL
IND L HEAT
IND L UTIL

— TRU —

L CTL
CTR CTL
CTR IND

L AC BUS TIE CTL

Right side electrical

Right battery heat R - 6
Right Center battery heat R - 7
Right and R Center battery vent R - 8

— ELEC —

R BAT HEAT
R CTR BAT HEAT
R BAT VENT

Right side DC busses

R Utility Bus S - 3
R Main Bus S - 4
R Avionics Power S - 5
R Avionics Control S - 6
R Bat Avionics Bus S - 7
Emergency Bus standby pwr S - 8

— ELEC DC BUSSES —

R UTIL
R MAIN
R AVION PWR
R AVION CTL
R BAT AVION
EMER BUS STBY

Right side AC busses

R Heater Bus R - 3
Indication R Heater Bus R - 4
Indication R Utility Bus R - 5

— AC BUS —

R HEAT
IND R HEAT
IND R UTIL

Right side TRU

R TRU control S - 2

— TRU —

TRU R CTL

Right side miscellaneous

R AC Bus interconnect R - 2
External Power control S - 9

R AC BUS TIE CTL
EXT PWR