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INTRODUCTION

The F900EX uses DC power for control, operation and indication of the various systems installed in the airplane.

The electrical power supply system consists of a 28 V_{DC} on board generation system designed to minimize electrical fluctuation and power interruption. It supplies, controls and distributes DC power to the onboard electrical equipment through two main buses (LH and RH buses).

Most of the avionics equipment are master switched on these buses: MINILOAD and LH AV MASTER on the LH bus and RH AV MASTER on the RH bus.

The system is powered in flight by three engine driven generators and two batteries.

On ground, it can also be supplied by an Auxiliary Power Unit (APU) driven generator or by an external DC Ground Power Unit (GPU).

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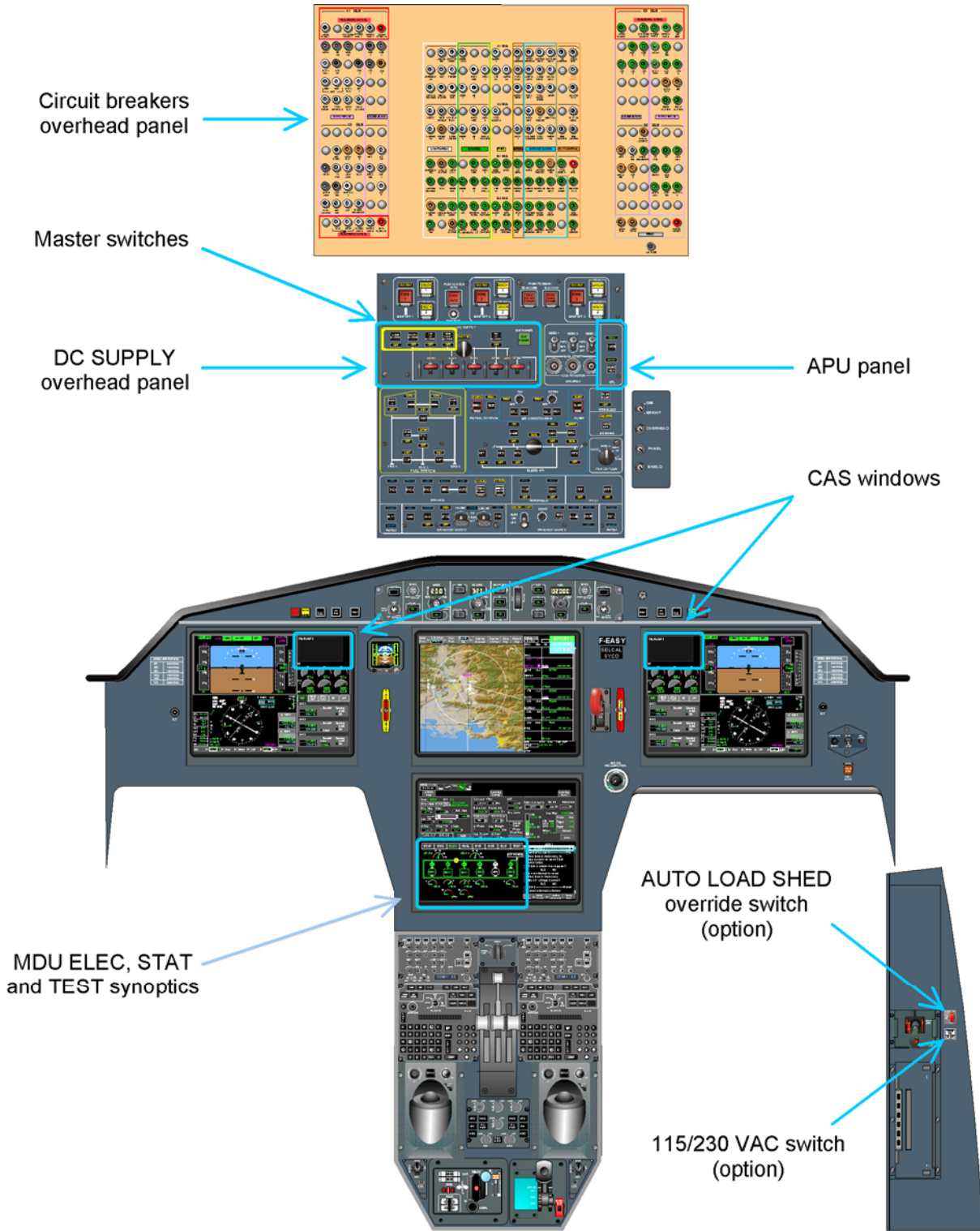


FIGURE 02-24-05-00 FLIGHT DECK OVERVIEW

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SOURCES

	DC SOURCES	AC SOURCES
INTERNAL	<ul style="list-style-type: none"> - two 36 Ah Ni-Cad batteries - three 9 kW (300 A) engine-driven starter generators - one 9 kW (300 A) APU-driven starter generator (ground operation only) - 1 Secondary Flight Display (SFD) battery: HORIZ BAT - 1 auxiliary battery: AUX BAT (option) - 3 batteries for the emergency lighting system - 4 buffer batteries for LH DU, UP DU, MAU1 and MAU2 - 4 NIC batteries, one battery per NIC/PROC module of each MAU 	<ul style="list-style-type: none"> - equipment requiring alternating current are equipped with built-in inverters - passenger convenience items can be powered by inverters on a dedicated network
EXTERNAL	<ul style="list-style-type: none"> - Ground Power Unit (GPU) 	

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EQUIPMENT LOCATION

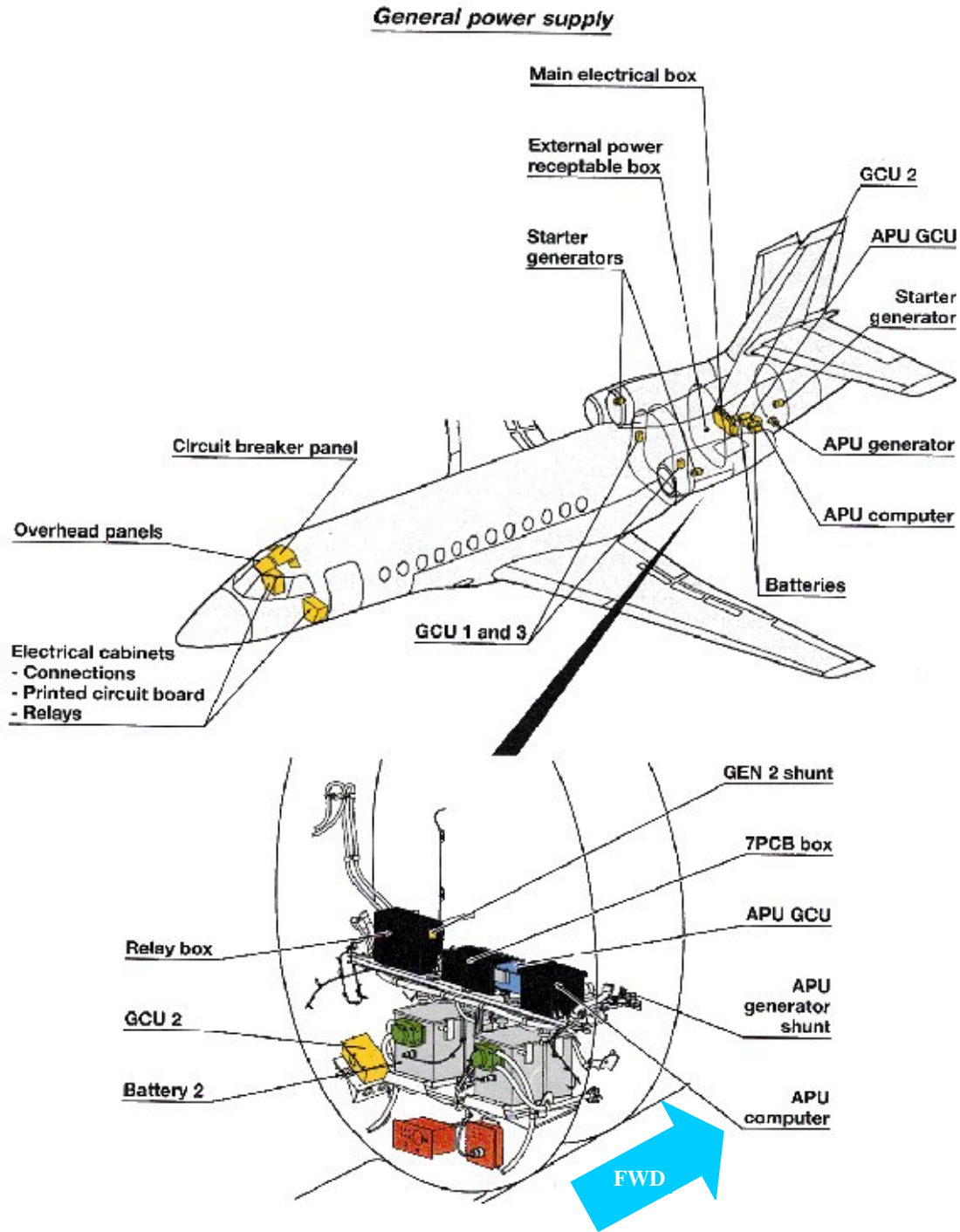


FIGURE 02-24-05-01 EQUIPMENT LOCATION

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GENERATION

MAIN BATTERIES

On ground, prior to APU starting, the two 24 V (36 Ah) Ni-Cad batteries provide the primary source of DC power to the entire distribution system and they supply electrical power to start the engines.

As soon as one generator is connected, batteries are reloading and flatten generator electrical spikes.

They are also capable of an emergency in-flight source of power for a limited period if all engine-driven generators fail. In that case, battery autonomy would be around 56 min with maximum load shedding.

The batteries are located in the mechanic servicing compartment accessible through the mechanic servicing compartment door.

The batteries are ventilated, on the ground, by a battery powered blower and by aerodynamic air flow in flight. During ground operation, the battery blower is operational when the BAT 2 switch is on.

NOTE

The two batteries are necessary for engine starting. Very weak batteries cannot be connected to the main buses, as their contactors need at least 18 V_{DC} to close.

OTHER BATTERIES

Three batteries supply emergency lights.

One HORIZ BAT battery supplies Secondary Flight Display (SFD), for approximately 2 h 40 min, in case of total electric failure.

One AUX BAT battery, when installed, supplies dedicated equipment during electrical failure.

Four MAU-DU BAT buffer batteries supply prevent the LH display, UP display, MAU1 and MAU2 so as to prevent them from diming when the APU or engines starts due to voltage drop. One of these batteries supplies the Centralized Maintenance Computer (CMC) during shutdown.

Four NIC batteries supply NIC/PROC module of each MAU chanel.

Except for the emergency lights batteries and NIC batteries, all batteries voltages are monitored and indicated in the TEST synoptic page.

The emergency lights batteries can be checked by a three-position OFF-ON-ARM EMERG LIGHTS switch located on the overhead panel.

ENGINE DRIVEN GENERATORS

Engine-driven starter-generators are driven by the accessory gear box of each engine. A shear shaft in the generator prevents damages to the accessory gearbox in case of generator seizure. A damper in the generator shaft prevents from vibrations.

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They are rated at 9 kW and regulated at 28.5 V_{DC} by their associated Generator Control Unit (GCU).

APU GENERATOR

The Auxiliary Power Unit (APU) is equipped with the same starter-generator as the engines. While the airplane is on the ground, it is capable of power the entire DC electrical system, in addition to charge batteries and providing engine start assistance.

GCU

The four Generator Control Units (GCU) provide current and voltage regulation and protection for their associated generator:

- Regulation: the GCU regulates the voltage at 28.5 V_{DC} and monitors the output current to 300 A, with a maximum of 350 A for one minute. It also provides generator output regulation in order to balance the current between several generators, when connected in parallel on the same bus.
- Protection: the GCU automatically disconnects its associated generator in case of over voltage or electrical load limit overtaking.

They also control engine start sequence.

CAUTION

**Limit output current at 225A on ground.
Limit output current at 300 A below 43,000 ft.
Limit output current at 260 A above 43,000 ft.**

GPU

An approved 28 V_{DC} Ground Power Unit (GPU) may be used for prolonged periods to power the DC system in order to facilitate maintenance and servicing.

The GPU may also be used for engine starting, but it cannot be used to charge the batteries, unless a GPU airplane battery charging system is installed. Recommended instantaneous power for engine start is 1,000 A maximum.

When the GPU is connected and operating, generators and batteries are automatically disconnected from the LH and RH buses.

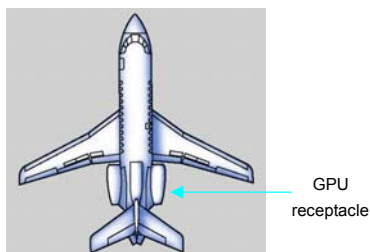


FIGURE 02-24-10-00 GPU RECEPTACLE LOCATION

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DISTRIBUTION

DC power distribution is separated into two independent buses, allowing redundantly powered systems to continue to safely operate if one bus fails.

The distribution system consists of 8 distinct buses:

- battery bus,
- starting bus,
- LH bus,
- RH bus,
- bus A1,
- bus A2,
- bus B1,
- bus B2.

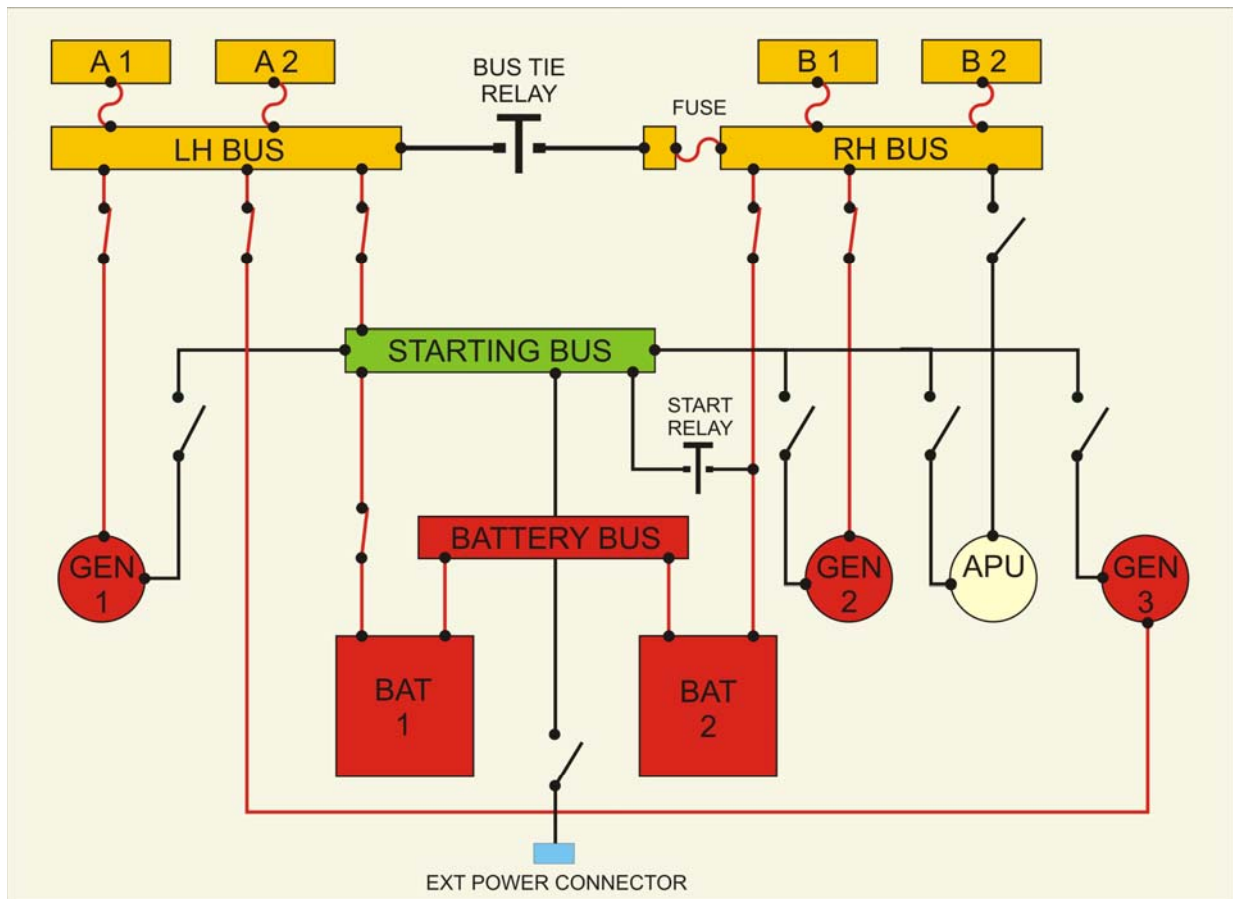


FIGURE 02-24-10-01 ELECTRICAL SYSTEM DIAGRAM

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The battery bus is powered as soon as one of the batteries is installed and plugged in. Regardless of battery switch position, the battery bus provides electrical directly to:

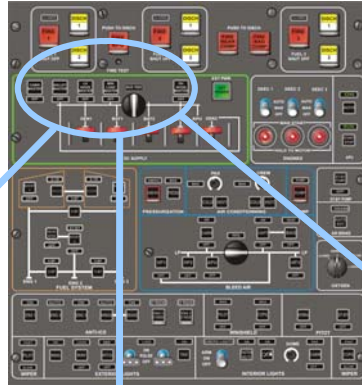
- the single point refueling panel,
- the emergency outboard slats control circuit,
- the 3 generators excitation circuits,
- Servicing lights (exterior and interior).

Most of the avionics equipment are connected to the main buses through master-switches located on the overhead panel.



FIGURE 02-24-10-02 OVERHEAD PANEL

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LH BUS		RH BUS
LH AV MASTER	MINI LOAD MASTER	RH AV MASTER
AUDIO Panel 3 AFCS channel B AT servomotors Data loader LSS MAU 1 Channel A RAD ALT 1 TCAS Weather Radar	ADF 1 ADM 1 ATC 1 CCD LH (one channel) CCD RH (one channel) DME 1 GP LH LH DU MAU 2 channel B MKB LH UP DU VOR 1	ADF 2 ADM 2 AFCS channel A AP servomotors ATC 2 CCD LH (one channel) CCD RH (one channel) DME 2 GP RH LW DU MAU 1 channel B MAU 2 channel A MKB RH RAD ALT 2 RH DU VHF 3 (optional) VOR 2 Yaw Damper

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	LH BUS	
	A1	A2
Air conditioning / Oxygen	CABIN PRESS COND'G CREW STBY BLEED MONIT LH O2 BOX	CAB TEMP CONTROL
Flight controls	A/B CONTROL LH AUTO SLAT (Normal power) PITCH FEEL STAB EMERG	AT SVO (AT servo-actuator) FLAP A/B INDIC TRIM AILERON TRIM RUDDER
Hydraulic	HYDR 1 INDIC ST BY PUMP	
Ice and rain protection	AIR FR LH AOA HEAT LH PITOT HEAT LH STATIC HEAT TEMP PROBE WSHLD FRONT LH	DRAINS HEAT DV WINDOW STBY PITOT WIPER LH
Landing Gear	L/G CONTROL	BSCU 1 (Braking system No 1)
Lights	ANTICOL FIN CKPT LH READING EXT WRN LIGHTS A (Emergency lighting) LH SLATS LIGHT LIGHT WARN A-B NAV OVERHEAD LH STROBE	BELTS / NO SMOKING CAB LIGHT MASTER CABIN CEILLING LANDING LH LSS (Lightening Sensor System) SHIELD TEST WARN A-B

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			LH BUS	
			A1	A2
Navigation / communication			ADF 1 ATC 1 DME 1 IRS 1 VOR 1	AFCS CH B HF 1 ICS 3 ICS LH IRS 3 VHF 1
Avionics			ADM 1 CCD LH CMPTR LH GP LH HUD-HGS/HCP HUD-CHU LH AV MASTER LH DU LH DU BAT MAU 1 BAT MAU1 CH A MKB LH STBY INSTR BAT	CCD RH DATA LOADER MAU 2 CH B MRC1 NIM R/T WR RAD ALT 1 REV PANEL TCAS UP DU UP DU BAT

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LH BUS		
	A1	A2
Engine / fuel	BOOST 1 DEEC 1 DETECT ENG 1 (Fire detection) ENG 1 HP 1 (HP valve) ENG 1 VIBR (Vibration) EXTING ENG 1 (Extinguisher) IGNIT AUTO (Automatic ignition, all engines) IGNTR 1 (Igniton of ENG 1) OIL 1 X-BP 2-3 (Cross BP valve)	BOOSTSTRAP DEEC 3 DETECT ENG 3 ENG 3 HP 3 ENG 3 VIBR EXTING ENG 3 FUEL 2 SHUT-OFF IGNTR 3 OIL 3 STBY BOOST 2
Miscellaneous	115V _{AC} MASTER (Transfo) AUDIO WARN A	BAG COMP (Fire detection) FLIGHT RECORDER REAR COMP (Fire detection)

- A3: Pilot Front Windshield
- A4: Galley 1 Bar
- A5: Standby Hydraulic Pump
- A6: Galley 2 Bar

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RH BUS		
	B1	B2
Air conditioning / Oxygen	BLEED CTL HP 2 COND'G CABIN CPCS MONIT RH O2 BOX	BAG PRESS BLEED MONIT CKPT TEMP CTRL
Flight controls	AIL FEEL RH AUTO SLAT STAB NORMAL	AFCS CH A AP SVO FLAP CONTROL ROLL EMERG YD (Yaw Damper)
Hydraulic	HYDR 2 INDIC	
Ice and rain protection	AFT SIDE WINDOW RH AOA HEAT WIPER RH	RH PITOT HEAT RH STATIC HEAT WSHLD FRONT RH
Landing Gear	L/G INDIC	BSCU 2 LANDING RH NOSE WHL
Lights	CAB/LAV MASTER CKPT RH READING EXT WARN LIGHTS B (Emergency lighting) TAXI	ANTICOL BELLY EMERG LIGHTS LANDING RH RH SLATS LIGHT (Leading edge ice detection)

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RH BUS		
	B1	B2
Navigation / communication	ADF 2 ATC 2 DME 2 IRS 2 VHF 3 VOR 2	AFCS CH A HF 2 ICS RH MRC 2 NIM SELCAL VHF 2 VOICE RECORDER
Avionics	ADM 2 CCD LH CMPTR RH CREW CALL GP RH LW DU MAU 1 CH B MAU 2 BAT OVERHEAD RH RH AV MASTER	CCD RH INSTR RH MAU 2 CH A MKB RH RAD ALT 2 RH DU

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RH BUS		
	B1	B2
Engine / fuel	DEEC 2 DETECT ENG 2 ENG 2 VIBR ENG 2 VIBR EXTING ENG 2 IGNITR 2 NORM BOOST 2 OIL 2 STBY DEEC 1 X-BP 1-3	BOOST 3 FUEL 1 SHUT-OFF FUEL 3 SHUT-OFF FUEL TRANS 2 PRESSURE FUELING REVERSE DEPLOY REVERSE STOW REVERSE WARN X-BP 1-2
APU	APU FIRE	APU
Miscellaneous	AUDIO WARN B LEVEL	CREW SEATS GALLEY MASTER NOSE FAN

B3: Copilot Front Windshield

B4: spare

BATTERY BUS	
Miscellaneous	BAG COMP DOOR (baggage compartment door exterior lighting) EXCIT GEN 1 EXCIT GEN 2 EXCIT GEN 3 LIGHT 1 (passenger door airstairs and aisle lighting, mechanic servicing compartment lighting, refueling connector lighting and refueling panel) LIGHT 2 (dome, nose cone and baggage compartment lighting) SLATS (emergency outboard slats)

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CONTROL

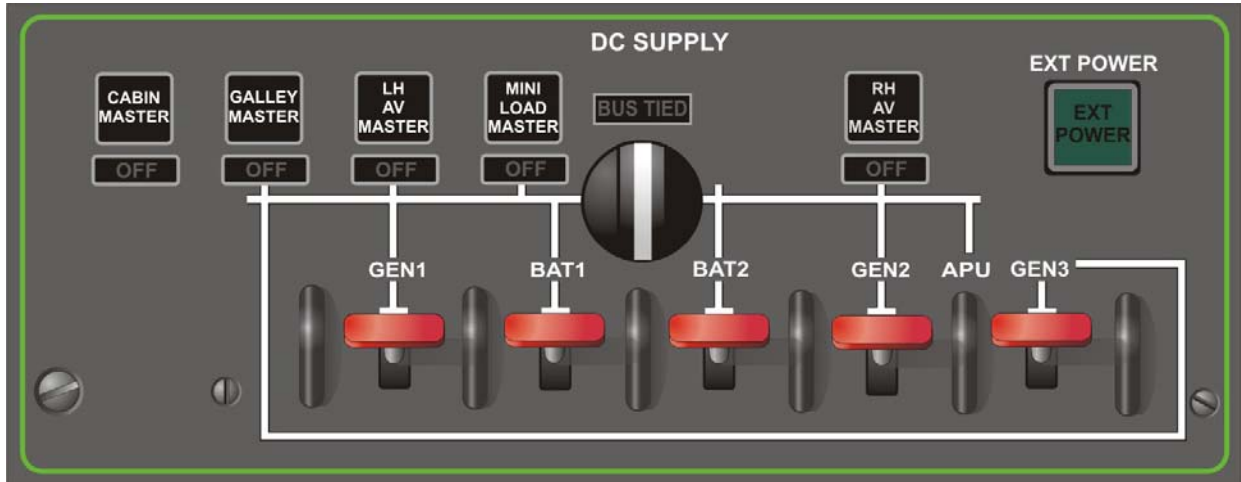











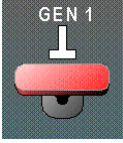

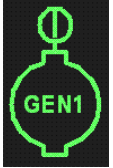




FIGURE 02-24-15-00 OVERHEAD PANEL DURING NORMAL FLIGHT OPERATION

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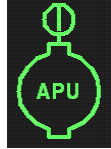







SYNTHETIC TABLE

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE		SYNOPTIC
 two positions trip magnetic switch  two positions trip magnetic switch	<ul style="list-style-type: none"> - BAT 1 connects battery 1, through the starting bus, to the LH bus - BAT 2 connects battery 2 to the RH bus <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;">NOTE</p> <p>Each battery supplies directly the battery bus whatever battery switch position</p> </div> <ul style="list-style-type: none"> - trip automatically to down position when system detects an anomaly (too high reverse current) - act as reset switches when the fault is cleared (only one reset attempt is allowed) 	 Connected	 Disconnected	<p>On: Contactor is closed and GPU is off</p>  <p>Off: Contactor is open and {GPU is ON or APU/ENG start in progress}</p>  <p>Abnormal situation: overheating</p>  <p>Abnormal situation: contactor is closed and GPU is on</p>  <p>Abnormal situation: contactor is open and GPU is Off and no APU/ENG start is in progress</p> 








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CONTROL	FUNCTION	TO ACTIVATE	SYNOPTIC
		TO DEACTIVATE	
 two positions trip magnetic switch	<ul style="list-style-type: none"> - GEN 1 and GEN 3 connect generators 1 and 3 to the LH bus - GEN 2 connects generator 2 to the RH bus - trip automatically to down position when the GCU detects an over-voltage - act as reset switches when the fault is cleared (only one reset attempt is allowed) 	 Connected	On: contactor is closed and GPU is Off 
 two positions trip magnetic switch		Off: contactor is open and {engine is not running or GPU is On} 	
 two positions trip magnetic switch		Abnormal situation: contactor is open and engine is running and GPU is Off 	






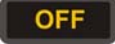













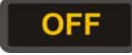




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CONTROL	FUNCTION	TO ACTIVATE	SYNOPTIC
		TO DEACTIVATE	
	<ul style="list-style-type: none"> - connects the APU generator to the LH bus - trips automatically to down position when the GCU detects an over-voltage, - acts as a reset switch when the fault is cleared (only one reset attempt is allowed) <p>➤ <i>For more information, refer to Chapter 02 / ATA 49</i></p>	<p>➤ <i>refer to Chapter 02 / ATA 49</i></p>	<p>On: contactor is closed and GPU is Off</p>  <p>Off: contactor is open (APU N1 < 95% or GPU is On)</p>  <p>Abnormal situation: contactor is open and APU N1 > 95% and GPU is Off</p> 
 <p>light pushbutton</p>	<p>ON GROUND ONLY:</p> <ul style="list-style-type: none"> - disconnects the batteries from their respective buses, independently from BAT magnetic switch position - ties up LH and RH buses whatever BUS TIED selector position - allows GPU to supply all buses 	 <p>Push On (on ground)</p>  <p>Push Off (on ground)</p>	<p>On: airplane powered by GPU</p>  <p>Off: airplane not powered by GPU</p> 














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CONTROL	FUNCTION	TO ACTIVATE	SYNOPTIC
		TO DEACTIVATE	
 BUS TIED rotary switch	- ties up LH and RH buses	 Turn horizontally (TIED)	Normally tied  Abnormally untied (rotary switch horizontal or EXT POWER pushed on) 
		 Turn vertically (UNTIED)	Normally untied  Abnormally tied (rotary switch vertical with no GPU) 

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CONTROL	FUNCTION	TO ACTIVATE	SYNOPTIC
		TO DEACTIVATE	
pushbutton   status light	- sheds cabin optional equipment load from the LH bus	Push on (connected)   Push off (shed)  	No specific indication on the ELEC synoptic
pushbutton   status light	- sheds galley optional equipment load from LH bus	Push on (connected)   Push off (shed)  	No specific indication on the ELEC synoptic
pushbutton   status light	- supplies power to LH AV equipment	Push on (connected)   Push off (shed)  	No specific indication on the ELEC synoptic
pushbutton   status light	- supplies power to MINI LOAD equipment	Push on (connected)   Push off (shed)  	No specific indication on the ELEC synoptic

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CONTROL	FUNCTION	TO ACTIVATE	SYNOPTIC
		TO DEACTIVATE	
Pushbutton   status light	<ul style="list-style-type: none"> - supplies power to RH AV equipment 	Push on (connected)   Push off (shed)  	No specific indication on the ELEC synoptic
 Two positions guarded switch	<ul style="list-style-type: none"> - in the OVERRIDE position, reconnects all the systems, previously shedde after failure of one generator 	OVERRIDE  NORMAL 	No specific indication on the ELEC synoptic
status light  Three positions switch	<ul style="list-style-type: none"> - ARM: activates the standby mode of the three EMERG batteries - ON: illuminates EMERG lights and check their three batteries charge 	ARM (normal in-flight position)  ON (test position)  OFF 	No specific indication on the ELEC synoptic

INDICATION

Electrical system indications are displayed on two pages on the MDU:

- ELEC synoptic,
- STAT synoptic.

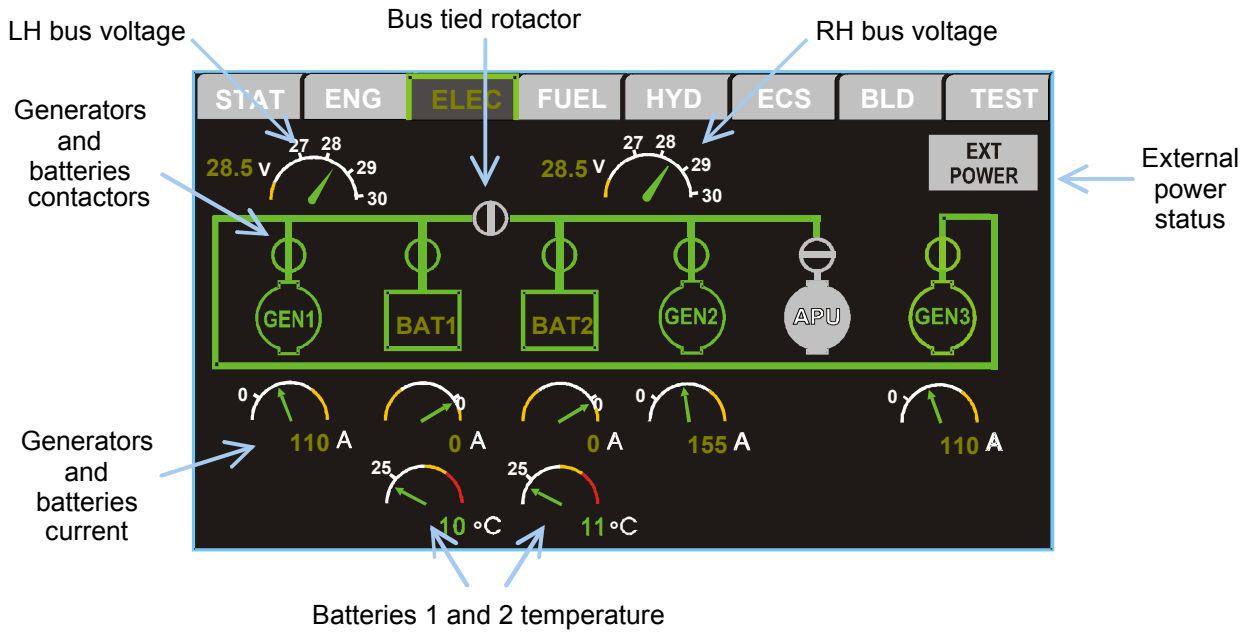


FIGURE 02-24-15-01 ELEC SYNOPTIC

EXAMPLES OF BATTERY TEMPERATURE INDICATION

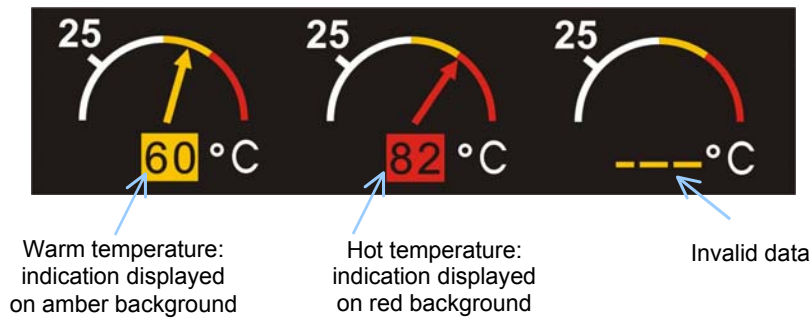


FIGURE 02-24-15-02 BATTERY TEMPERATURE INDICATION

For each battery, temperature indication is given by the pointer position on an analog scale and by digital readout.

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When the airplane is not equipped with temperature control (lead acid batteries), none of the above symbols and indication are displayed (option).

The scale is colored in white below 49°C, in amber between 49°C and 71°C and in red above 71°C.

EXAMPLES OF BATTERY AMMETER

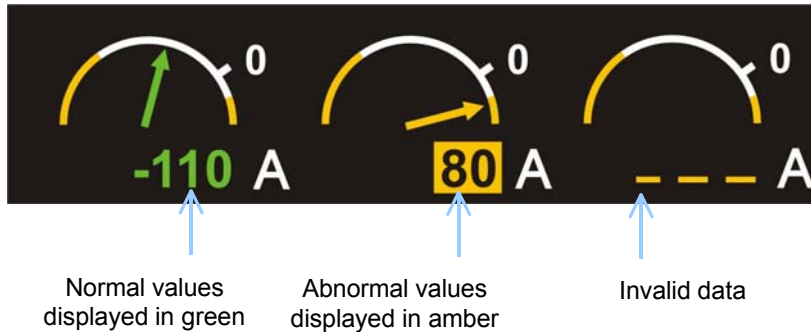


FIGURE 02-24-15-03 BATTERY AMMETER

For each of the two batteries, current indication is given by the pointer position on an analog scale and by digital readout.

The scale is colored in amber below - 300 and above + 45 A and in white between - 300 A and + 45 A.

NOTE

A negative current designates a battery charging current.

EXAMPLES OF DC GENERATOR AMMETER

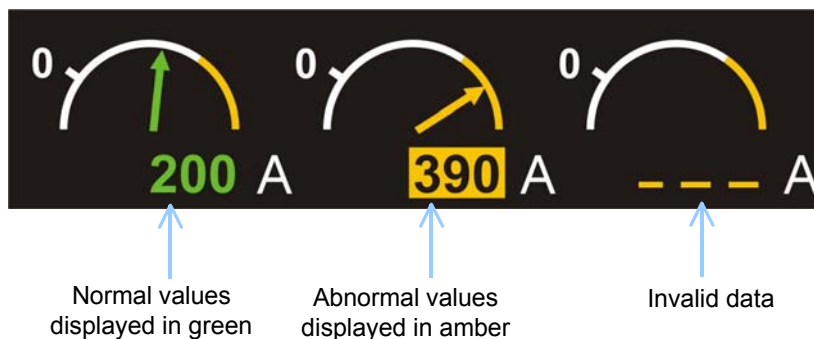


FIGURE 02-24-15-04 DC GENERATOR AMMETER

For each of the three engine-driven generators, current indication is permanently displayed by the pointer position on an analog scale and by digital readout.

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In flight, the scale and the indication are colored in amber when current is greater then 300 A below an altitude of 43,000ft. The threshold is 260 A for altitudes above 43,000 ft. On ground the threshold is 225 A.

For the APU generator, the analog ammeter and digital readout are only displayed when the airplane is on the ground and the APU running. The scale and the indication are amber range when current overtakes 300 A.

**NOTE
ERRONEOUS INDICATION FOR AIRPLANE WITHOUT M3706**

For any generator or battery, 0 A is displayed on synoptic ammeters when real current is between -30 A and +30 A.

STARTING PHASE

White **START** is placed under the generator ammeter which is in starting mode.

NOTE

Amber **START** is used to indicate a generator that stays in starter mode when N 2 > 45%. Generator that assists has a white **ASSIST** annunciation.

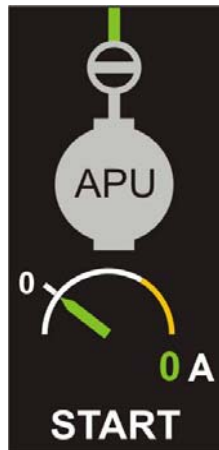


FIGURE 02-24-15-05 STARTING PHASE

White **START** is placed under the APU ammeter while the APU N1 is below 50%.

During engine starting phase, APU and BAT 1+2 symbols may be temporarily displayed in gray color.

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EXAMPLES OF BUSES VOLTMETER

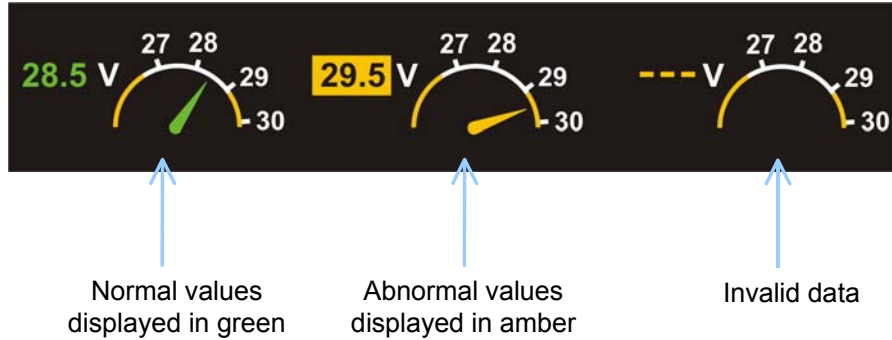


FIGURE 02-24-15-06 BUSES VOLTMETER

LH and RH buses are permanently monitored through two voltmeters displayed in the ELEC synoptic.

When a generator supplies the bus, the analog scale is colored in amber below 25 V and above 30 V. This range is different depending on the airplane electrical configuration (bus supplied by batteries only, APU starting, ...).

NOTE

Electrical information is also available on the STAT synoptic.

STATUS SYNOPTIC

LH and RH voltage buses, BAT and GEN current indications

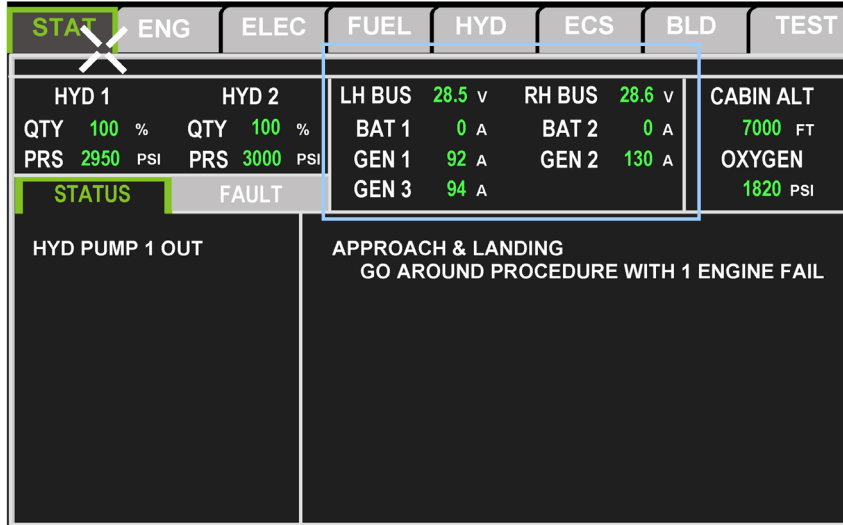
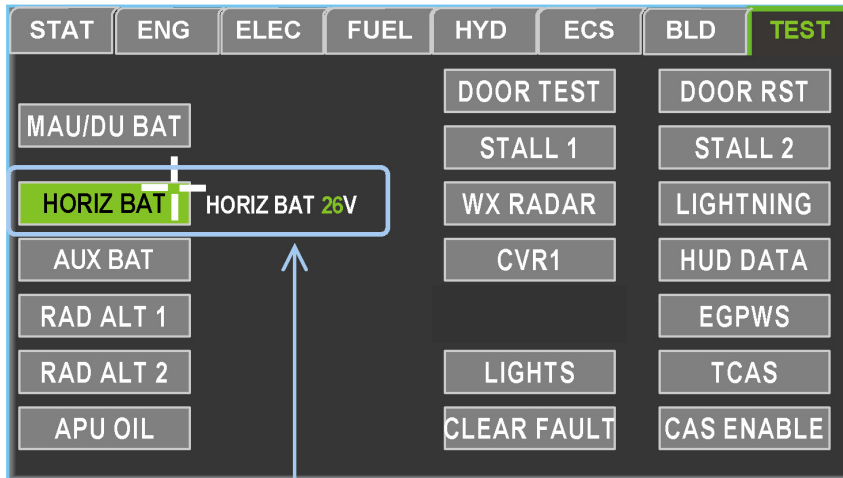


FIGURE 02-24-15-07 STATUS SYNOPTIC

TEST SYNOPTIC



HORIZ BAT battery voltage

FIGURE 02-24-15-08 TEST SYNOPTIC

To check MAU / DU BAT, AUX BAT or HORIZ BAT, place the CCD cursor on the respective soft key and keep the <ENTER> button pressed to activate the test and to have indications displayed.

Normal values appear in green while too low or too high values appear in amber.

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INTRODUCTION

Feeder cables are protected by current fuses located inside the electrical box.

Circuit protection is provided by conventional trip-free circuit breakers located on the circuit breakers panel.

The circuit breakers panel is divided into different sections. Each section, delimited by different colored frames, corresponds to airplane major systems.

In case of failure of any of the three engine-driven generators, certain items, non essential for the flight, such as galley, lavatory and cabin entertainment systems are automatically load-shed.

After proper electrical load analysis by the crew, an AUTO LOAD SHED switch located on the right side ledge may be set to the OVERRIDE position to re-energize the load-shed systems.

In the case of a second generator failure, the electrical system is auto load shed a second time with no possibility for the crew to re-energize the load-shed items.

The auto-load shed system is disabled when the airplane is on the ground, allowing normal operation of all cabin facilities.

The BUS TIED rotary switch normal position is vertical, isolating the LH and RH buses from each other. In case of overvoltage or short-circuit on one side, the other side is not affected.

The LH and RH buses must be temporary tied for APU and engine starting or on the ground, when the airplane is powered by the GPU only.

When LH and RH buses are tied, a 225 A fuse offers protection between them in case of overload in one bus.

BATTERIES

The batteries are protected against excessive load by a trip magnetic switch, which opens and disconnects the battery when the charging (reverse) current exceeds 400 A during more than 1 sec.

The BAT magnetic switch trips off and **BAT ..** CAS message appears.

NOTE

Only one reset attempt is permitted.

Batteries are ventilated on ground and in flight to protect them (hydrogen accumulation, heating).

On ground, the ventilation is provided by an electrical blower. It operates when the BAT 2 trip magnetic switch is on and the EXT POWER pushbutton is on off position.

In flight, ventilation is provided by the effect of dynamic air flowing through a venting duct and blowing on the batteries.

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GENERATORS AND APU

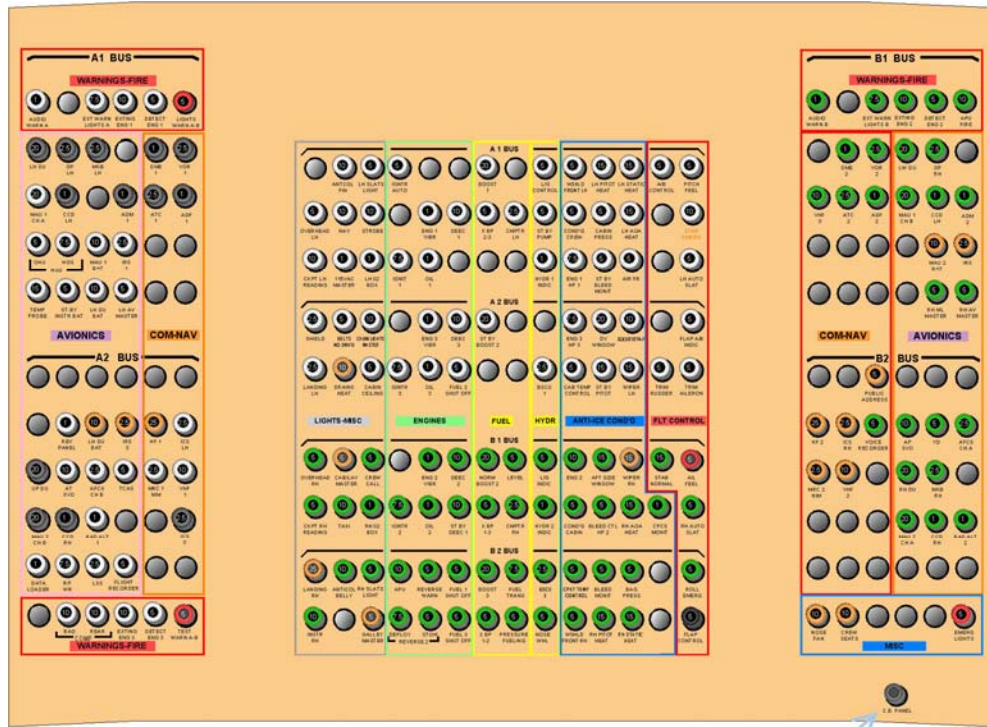
The engine-driven generators and the APU are each monitored by a GCU. Each GCU provides:

- Voltage regulation: 28.5 V_{DC}
- Main protections are:
 - o overvoltage protection (> 32 V_{DC}),
 - o current output limitations (350 A max).

When the protection is activated, the corresponding magnetic switch trips off, isolating the generator. In this case, the **GEN ..** CAS message appears.

CAUTION
Do not attempt to reset more than one time.

CIRCUIT BREAKERS








Circuit breaker panel light

FIGURE 02-24-20-00 CIRCUIT BREAKERS PANEL

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CIRCUIT BREAKER COLOR CODE

-  Mini load
-  A1 and A2 BUS
-  B1 and B2 BUS
-  EMERG LIGHTS
AIL FEEL
LIGHTS WARNING A / B
TEST WARN A / B
-  To be pulled if all generators fail

NOTE

Red breakers are back-up powered by the LH bus or by the RH bus if LH bus is not available.

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INTRODUCTION

In the following, typical ground and in-flight situations have been selected to help the crew to understand the symbols provided in the various panels and displays.

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GROUND OPERATION WITH GPU PLUGGED (MINI LOAD MASTER ON)

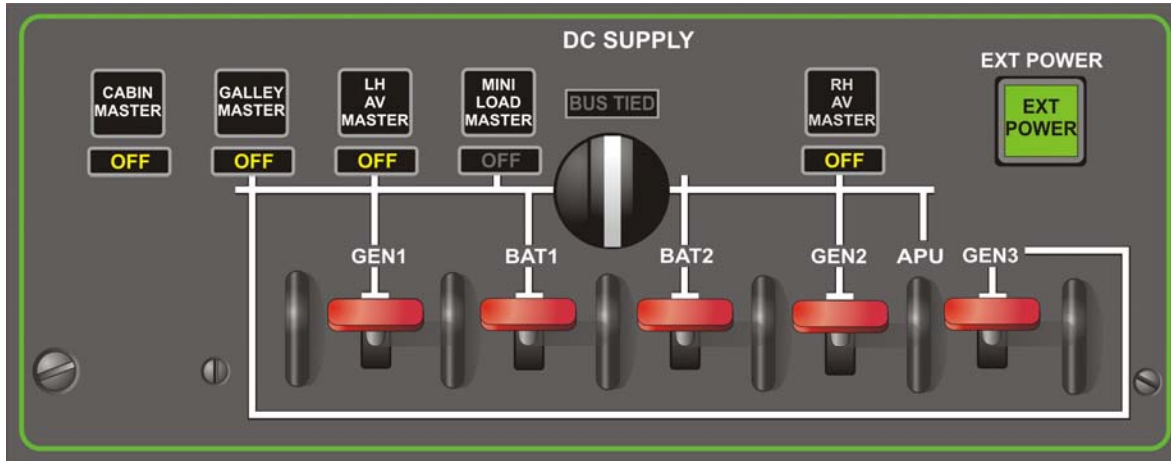


FIGURE 02-24-25-00 OVERHEAD PANEL

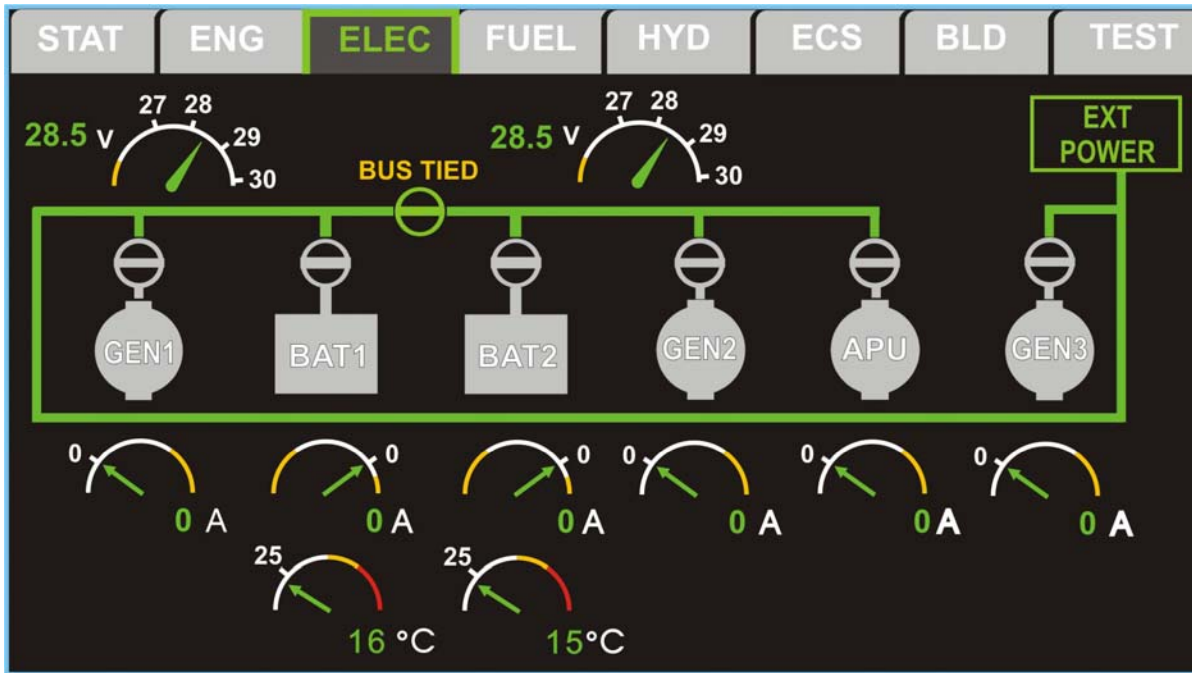



FIGURE 02-24-25-01 ELEC SYNOPTIC

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ACTION	RESULT
Plug in the GPU which is not running.	No result
Turn on GPU (at 28 V _{DC})	No result
Push on EXT PWR light pushbutton	Overhead panel: Green light on ALL MASTER: OFF lights on
Push on MINI LOAD MASTER	MINI LOAD MASTER: OFF light off After time delay of many seconds: GPU ON: BUS TIED CAS message Synoptic:  symbol all GEN and BAT isolated (gray synoptic symbols) BUS TIED amber indication LH and RH buses voltage indications

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**GROUND OPERATION WITH APU OPERATING
(LH AV, RH AV AND MINI LOAD MASTER ON)**

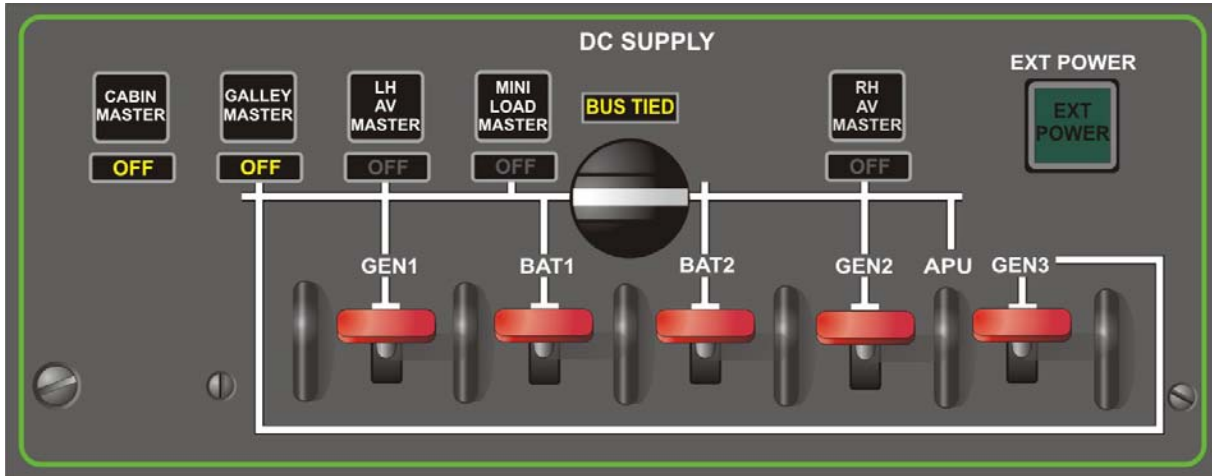


FIGURE 02-24-25-02 OVERHEAD PANEL

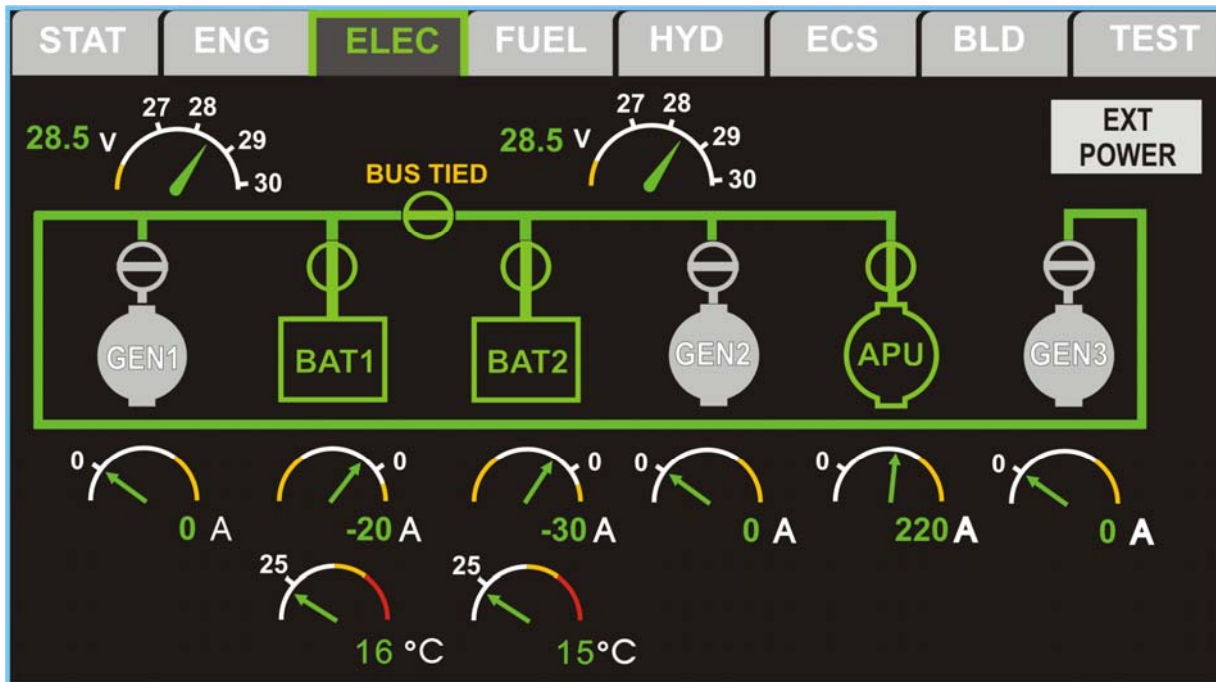


FIGURE 02-24-25-03 ELEC SYNOPTIC

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ACTION	RESULT
BAT1 and BAT2 overhead panel trip magnetic switches Up position	No result
MINI LOAD MASTER overhead panel pushbutton pushed on	BAT 1,2 symbols in green LH and RH buses voltage indications GEN 1,2,3 in stand-by + symbol in gray
BUS TIED rotary switch in horizontal position	BUS TIED symbol in green BUS TIED amber indication on the ELEC synoptic
EXT POWER overhead panel pushbutton Off	EXT POWER symbol in gray
APU MASTER pushbutton depressed (ON) APU START STOP pushbutton depressed (START)	After starting: - APU symbol in green (generator connected) - BAT1 and BAT2 charging (negative current)
LH and RH AV MASTER overhead panel pushbuttons pushed on	LH and RH AV MASTER : OFF lights off

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NORMAL FLIGHT OPERATION



FIGURE 02-24-25-04 OVERHEAD PANEL

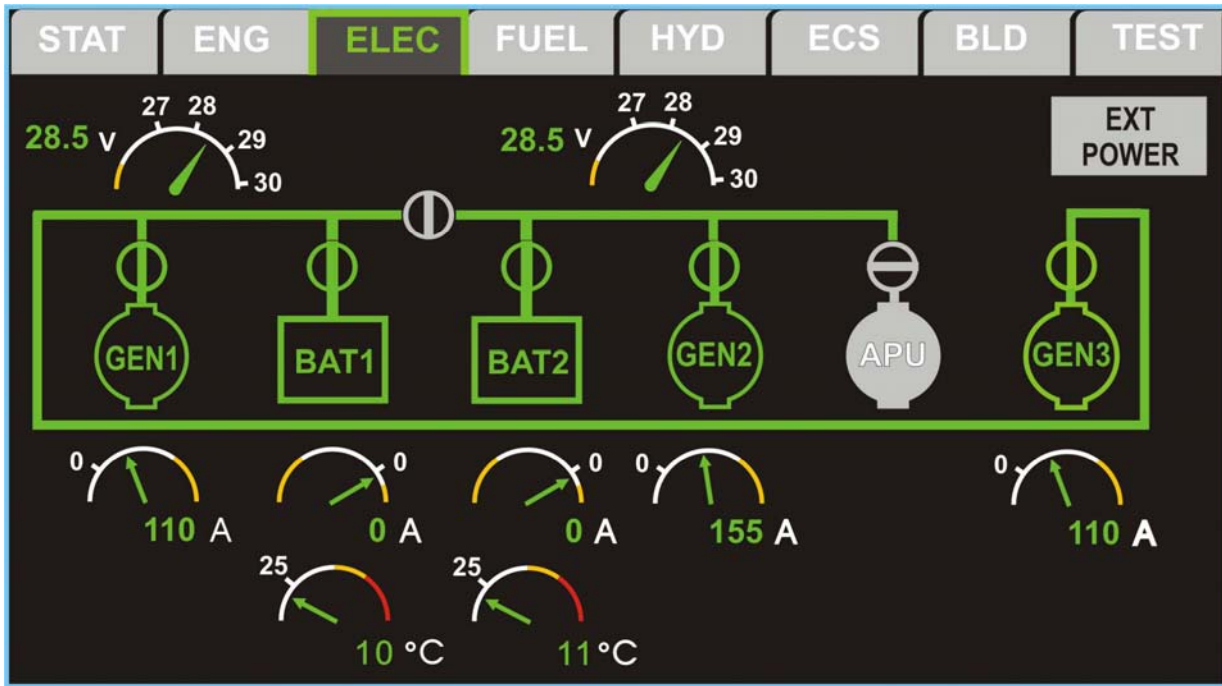


FIGURE 02-24-25-05 ELECTRICAL SYNOPTIC

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ACTION	RESULT
All overhead panel pushbuttons depressed	Unlighted
All overhead panel trip magnetic switches on Up position	GEN 1,2,3 and BAT 1,2 symbols in green + respective current indication (and temperature for batteries) indications LH and RH buses voltage indications
BUS TIED rotary switch on vertical position (In-flight normal position)	BUS TIED symbol in gray
EXT POWER switch Off	EXT POWER symbol in gray
APU MASTER pushbutton Off	APU symbol in gray

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INTRODUCTION

In the following, abnormal situations have been selected to help the crew to understand the symbols provided in the various panels and displays.

BATTERY 1 OVERHEAT

ABNORMAL STATUS

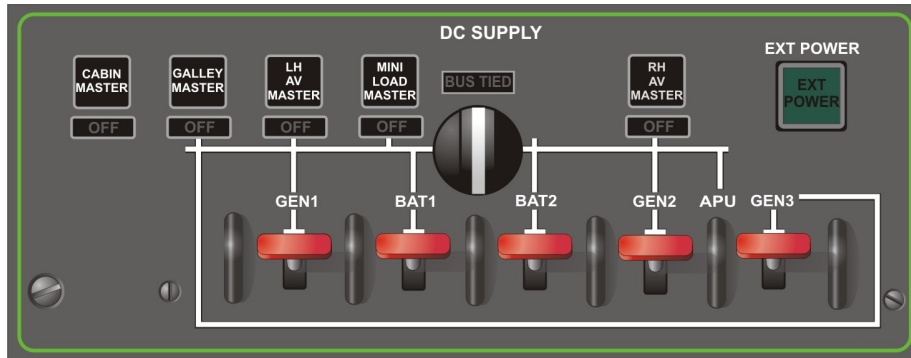


FIGURE 02-24-30-00 OVERHEAD PANEL

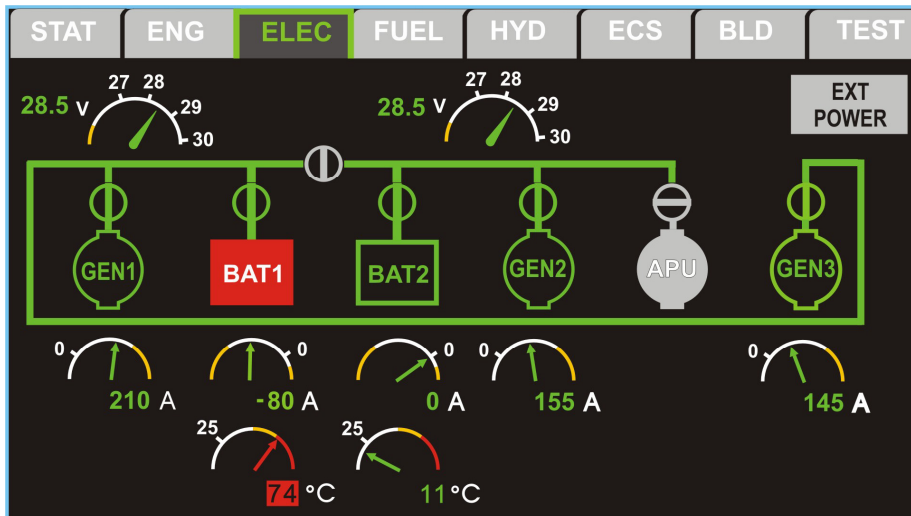



FIGURE 02-24-30-01 ELEC SYNOPSIS

CONTEXT	RESULT
Battery 1 overheat	<ul style="list-style-type: none"> + HOT BAT 1 CAS message Battery temperature > 71.1°C (160°F) +  MASTER WARNING light on BAT 1 symbol in red + BAT 1 temperature indication in red

AFTER PROCEDURE COMPLETE

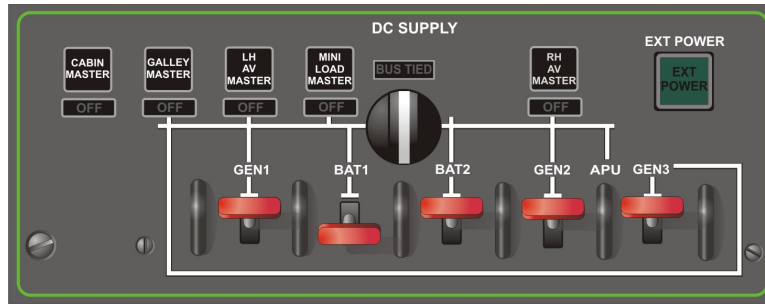


FIGURE 02-24-30-02 OVERHEAD PANEL

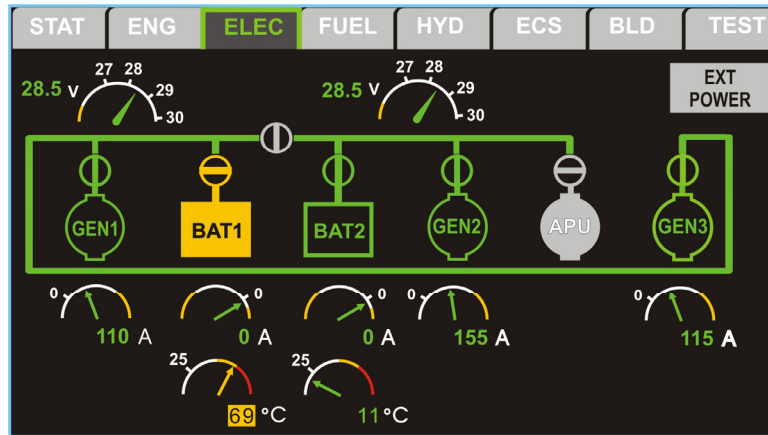


FIGURE 02-24-30-03 ELEC SYNOPSIS

ACTION	RESULT
<p>BAT 1 overhead panel trip magnetic switch set to down position</p>	<p>BAT 1 isolated:</p> <ul style="list-style-type: none"> - BAT 1 CAS message appears <p>Wait until:</p> <ul style="list-style-type: none"> - HOT BAT 1 CAS message disappears (battery temperature < 71°C) - WARM BAT 1 CAS message appears <p>When HOT BAT 1 disappears:</p> <ul style="list-style-type: none"> - BAT 1 symbol in amber + BAT 1 temperature indication in amber, decreasing

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GEN 2 FAILURE

ABNORMAL STATUS

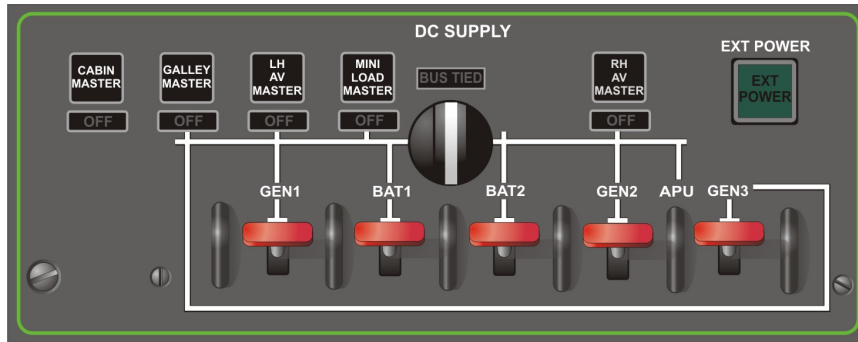


FIGURE 02-24-30-04 OVERHEAD PANEL

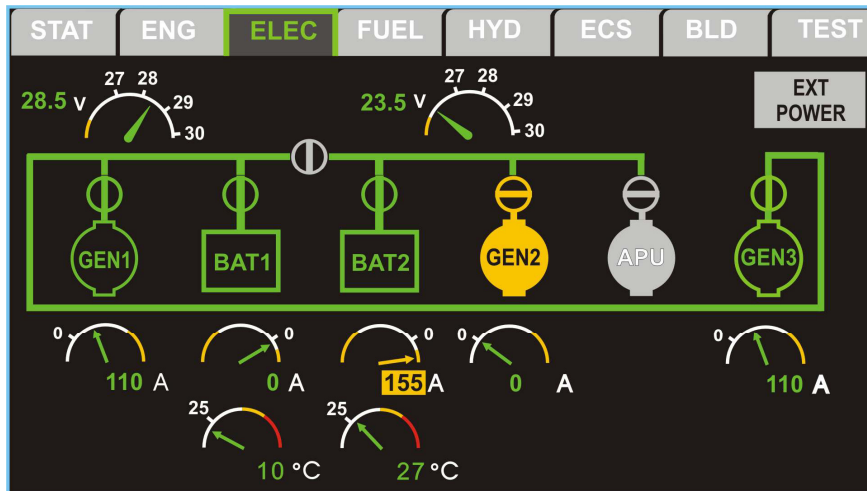




FIGURE 02-24-30-05 ELEC SYNOPTIC

CONTEXT	RESULT
- GEN 2 failure detected	<p>GEN 2 overhead panel trip magnetic switch automatically set to down position (isolated) and GEN 2 symbol in amber on ELEC synoptic</p> <p>+ BAT2 voltage on RH bus</p> <p>GEN 2 CAS message</p> <p>+   light on</p>

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AFTER PROCEDURE COMPLETE

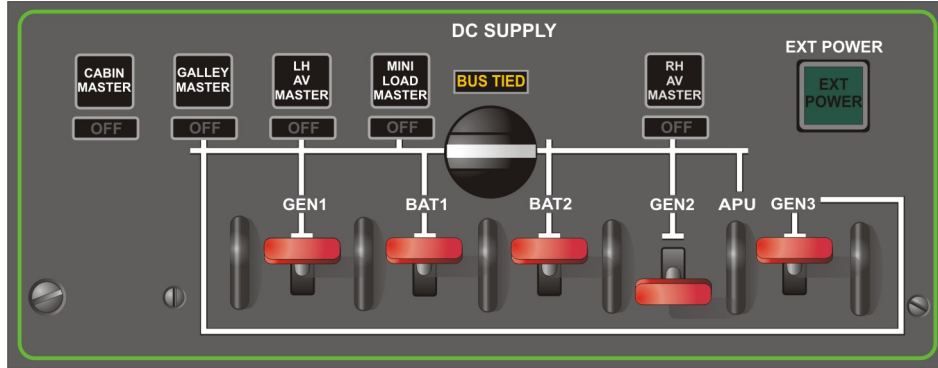


FIGURE 02-24-30-06 OVERHEAD PANEL

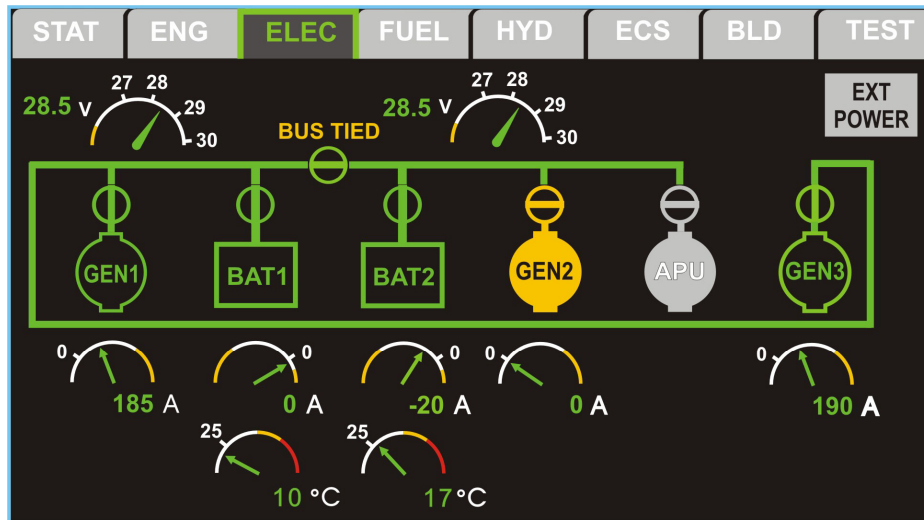



FIGURE 02-24-30-07 ELEC SYNOPSIS

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ACTION	RESULT
<p>- BUS TIED rotary switch set to tied position (horizontal position)</p>	<p>+  contactor symbol and</p> <p>+ BUS TIED indication on ELEC synoptic</p> <p>+ BUS TIED CAS message</p>

NOTE

In GEN 1+2 off configuration bus untied, LH bus is supplied by GEN 3 and RH bus is supplied by BAT 2.

When buses are supplied only by batteries (case of bus untied), green voltage scale is downshifted ($22\text{ V} \leq \text{gren scale} \leq 29\text{ V}$).

NO PROTECTED GEN 1 OVERVOLTAGE (>32 V_{DC})

ABNORMAL STATUS

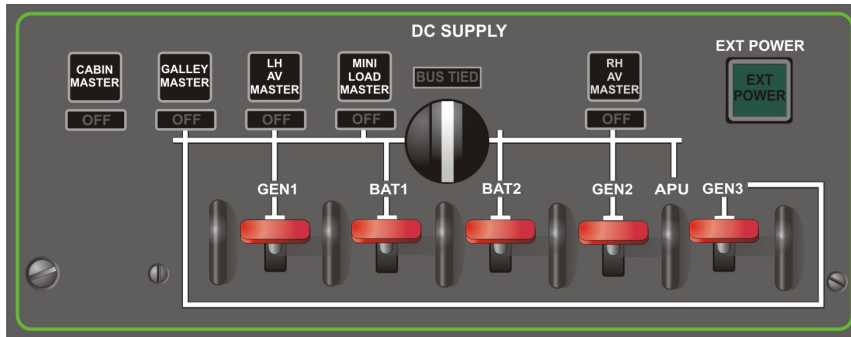


FIGURE 02-24-30-08 OVERHEAD PANEL

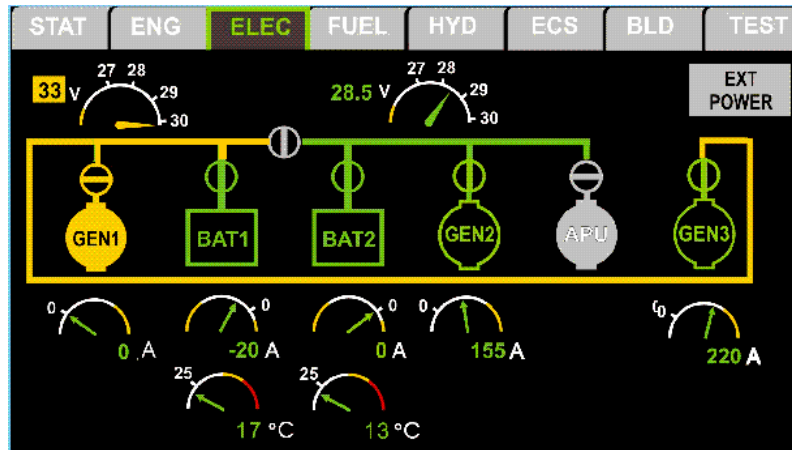




FIGURE 02-24-30-09 ELEC SYNOPTIC

CONTEXT	RESULT
High voltage detected on LH bus (33 V _{DC})	<p>the faulty generator, GEN 1, remains on line</p> <p>+ BUS LH OVERVOLTAGE CAS message</p> <p>+   light on</p>

AFTER PROCEDURE COMPLETE

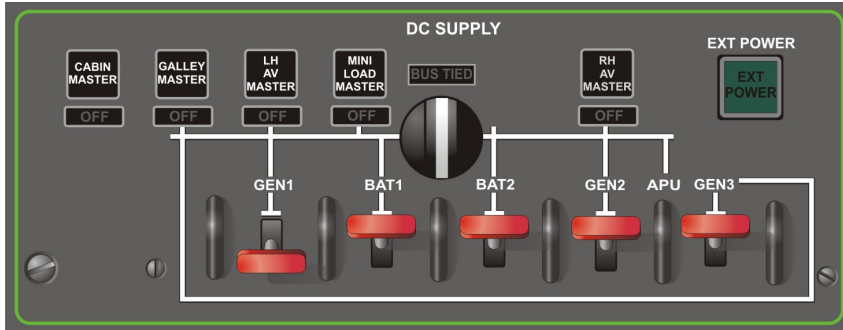


FIGURE 02-24-30-10 OVERHEAD PANEL

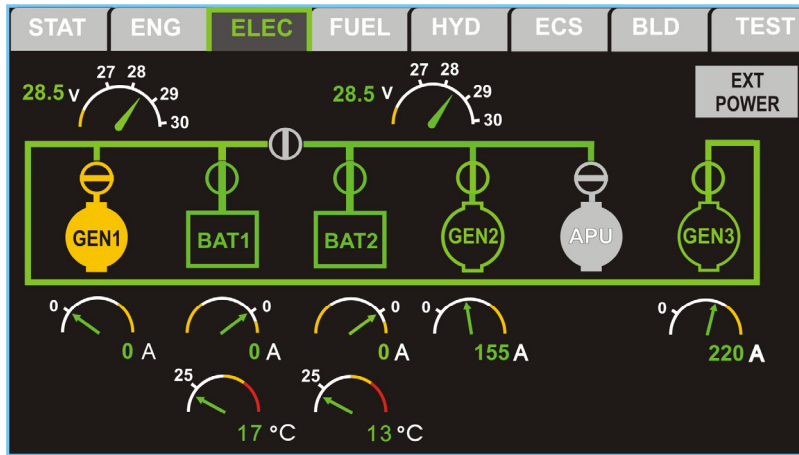




FIGURE 02-24-30-11 ELEC SYNOPTIC

ACTION	RESULT
GEN 1 overhead panel trip magnetic switch set to down position	<ul style="list-style-type: none"> - GEN 1 isolated and GEN 1 symbol in amber on ELEC synoptic + GEN 1 CAS message +   light on

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CAS MESSAGES

CAS MESSAGE	DEFINITION
3 GEN'S FAIL	All generators (1, 2 and 3) disconnected and all engines running (N2 above 45%)
HOT BAT ..	Battery (1/2) temperature at or above 71.1°C (160°F)
BAT ..	Battery (1/2) not connected and no GPU power supply
BAT .. TEMP INOP	On ground, battery (1/2) temperature sensor failure
BUS TIED	Indication of untimely bus tied
BUS XX LOW VOLTAGE	(LH/RH) bus voltage lower than 24 V. with one generator connected
BUS XX OVERVOLTAGE	(LH/RH) bus voltage over 32 V.
GEN ..	Generator (1,2 or 3) failed to connect and corresponding engine running (N2 above 45%)
OVHD BACKUP PWR XX FAIL	On ground, overhead panel channel is operating on backup power supply (LH/RH)
WARM BAT ..	Battery (1/2) temperature at or above 48.9°C (120°F)
BAT .. COLD	Battery (1/2) temperatue < 4 °F (-30 °C)
BAT .. TEMP INOP	In-flight, battery (1/2) temperature sensor failure
BUS TIED	Indication of bus tied
GEN .. FAIL	On ground, indication of generator (1,2 or 3) failure (corresponding engine shut-down)
GPU ON: BUS TIED	Airplane powered by GPU: LH and RH buses tied, independently of rotary switch position
OVHD BACKUP PWR .. FAIL	In-flight, indication of failure of backup power supply for overhead panel

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