

 A330 <small>SIMULATOR</small> FLIGHT CREW OPERATING MANUAL	ELECTRICAL	1.24.00	P 1
	CONTENTS	SEQ 001	REV 04

24.00 CONTENTS

24.10 DESCRIPTION

- GENERAL 1
- GENERATION OF ELECTRICAL POWER 3
- OPERATIONS 6

24.20 CONTROLS AND INDICATORS

- OVERHEAD PANEL 1
- FORWARD CABIN 8
- R - EXTERNAL POWER PANEL 9
- ECAM ELEC AC PAGE 10
- ECAM ELEC DC PAGE 17
- C/B ECAM PAGE 21
- WARNINGS AND CAUTIONS 23
- MEMO DISPLAY 24

AIRBUS TRAINING  A330 SIMULATOR FLIGHT CREW OPERATING MANUAL	ELECTRICAL DESCRIPTION	1.24.10 SEQ 001	P 1 REV 04
--	--------------------------------------	------------------------	-------------------

GENERAL

The electrical power system consists of a three phase 115 / 200 volt 400 hertz constant frequency AC system and a 28 volt DC system.

Electrical transients are acceptable for equipment.

Commercial supply has secondary priority.

Normally, the system produces alternating current, some of which then transform into direct current for certain applications.

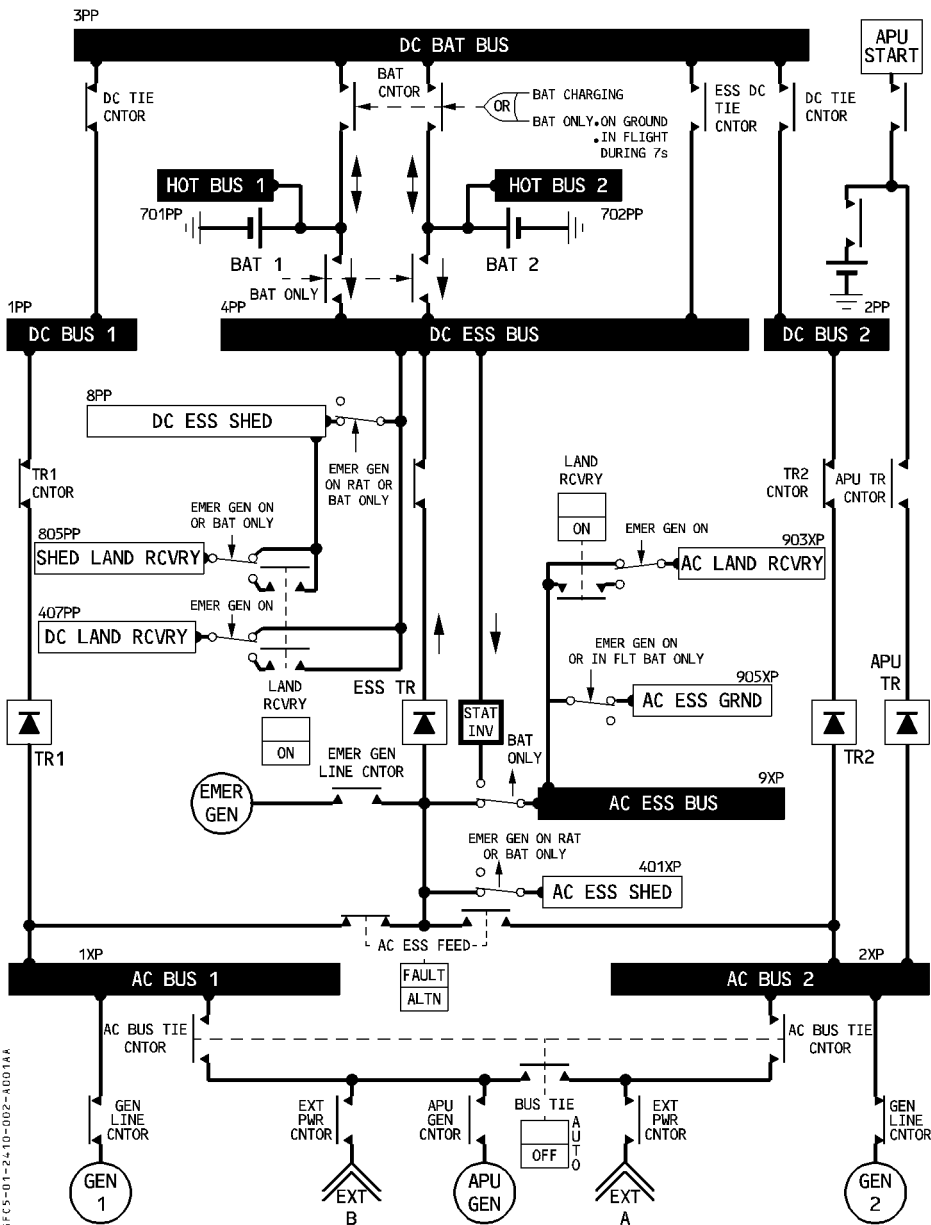
Each of the aircraft's three generators can supply the whole network.

If all normal AC generation is lost, an emergency generator can supply AC power.

If all AC generation is lost, the system can transform DC power from the batteries into AC power.

FOR INFO

R



6FC5-01-24.10-002-4001AA

AIRBUS TRAINING  A330 SIMULATOR FLIGHT CREW OPERATING MANUAL	ELECTRICAL	1.24.10	P 3
	DESCRIPTION	SEQ 001	REV 04

GENERATION OF ELECTRICAL POWER

AC GENERATION

MAIN GENERATORS

Two three-phase AC generators (GEN 1, GEN 2), one driven by each main engine through an integrated drive, supply aircraft electrical power. Each generator can supply up to 115 KVA of three phase 115/200 volt 400 hertz power.

A third generator (APU GEN), driven directly by the APU and producing the same output as each main engine generator, can replace either or both main engine generators at any time.

A generator control unit (GCU) controls the output of each generator. The main functions of each GCU are :

- Control the frequency and voltage of the generator output.
- Protect the network by controlling the associated generator line contactor (GLC).

EXTERNAL POWER

Two ground power connector near the nose wheel allow ground power to be supplied to all bus bars (with some galleys shed in case of overload). The aircraft can be supplied by two ground power units (90 kVA max each).

A Ground Power Control Unit (GPCU) protects the network by controlling the External Power Contactor, and generates a reference frequency used by GCU for synchronisation before No Break Power Transfer (NBPT).

EMERGENCY GENERATOR

R The green hydraulic circuit drives an emergency generator that automatically supplies emergency AC power to the aircraft electrical system if all three main generators fail. This generator supplies 8.6 KVA of three-phase 115/200-volt 400-hertz power, except when the ram air turbine powers the green hydraulic circuit and the aircraft speed is below 260 knots. In this case it delivers only 3.5 kVA, leading to some shedding.

A generator control unit (GCU) :

- keeps the emergency generator at a constant speed
- controls the generator's output voltage
- protects the network by controlling the emergency generator line contactor
- controls the emergency generator start-up

STATIC INVERTER

A static inverter transforms DC power from the DC essential bus into 2.5 KVA of single-phase 115-volt 400-hertz AC power, which is then supplied to part of the AC essential bus. In flight, the inverter is activated automatically if nothing but the batteries is supplying electrical power to the aircraft, regardless of the positions of the BAT1 and BAT2 pushbutton switches.

On the ground, the inverter is activated if nothing but the batteries is supplying electrical power to the aircraft and the BAT1 and BAT2 pushbutton switches are both on.

DC GENERATION**TRANSFORMER RECTIFIERS (TRS)**

Two main Transformer Rectifiers, TR1 and TR2 (200 A) and one essential TR (100 A), supply the aircraft electrical system with DC current.

A fourth TR (100 A) is dedicated to APU start or APU battery charging.

Each TR controls its contactor by internal logic.

BATTERIES

Two main batteries, each with a normal capacity 37 ampere-hours, are permanently connected to the two hot buses.

A third battery (37 Ah) is dedicated to APU start.

Each battery has an associated Battery Charge Limiter (BCL).

The BCL monitors battery charging and controls its battery contactor.

CONTACTORS

Two identical electrical Contactor Management Units (ECMUs) provide :

- AC and DC contactors control (excepted TR contactors which are controlled by the TR itself).
- galley shedding control.
- No Break Power Transfer control (NBPT).
- monitoring and indicating.

 A330 <small>SIMULATOR</small> FLIGHT CREW OPERATING MANUAL	ELECTRICAL	1.24.10	P 5
	DESCRIPTION	SEQ 001	REV 03

For this purpose, each ECMU receives following information:

- Voltage of all normal busbars
- position of all AC and DC contactors
- availability of all generators or power source (from GCU or GPCU)
- position of all galleys contactors
- TR status
- pushbutton position (BUS TIE, GALLEY SHED and COMMERCIAL)
- flight/ground signal from associated LGCIU.

AC AND DC CONTACTOR CONTROL

- ECMU 1 controls :
- The Generator Line Contactor (GLC) 1.
 - The AC Bus Tie Contactor (BTC) 1.
 - The APU Generator Contactor.
 - Both DC Tie Contactors.
 - The BUS TIE contactor
 - The External Power Contactor B
- ECMU 2 controls :
- The Generator Line Contactor (GLC) 2.
 - The AC Bus Tie Contactor (BTC) 2.
 - The External Power Contactor A.
 - Both DC tie Contactors.

NO BREAK POWER TRANSFER

This function avoids busbar power interruption during supply source transfer on ground in normal configuration. It is inhibited in flight.

ECMU controls simultaneous connection of the two sources for a short time. To achieve this, both sources are synchronized on a frequency reference signal sent by the GPCU.

Synchronization may take up to 15 seconds for APU GEN with GPU, and some milliseconds in all other cases.

If synchronization is not achieved within allowed time transfer is performed anyway (without simultaneous connection of two sources). This function has a back-up in the GCU.

MONITORING AND INDICATING

Each ECMU sends the following information to the ECAM:

- Bus bars supplied or not
- contactor status
- galley supply status, and galley switch position

**CIRCUIT BREAKERS**

All circuit breakers are in the electronic equipment bay.

A Circuit Breaker Monitoring Unit (CBMU) monitors the circuit breakers status. It sends this information to the ECAM system.

OPERATIONS**GENERAL**

Each AC BUS is supplied in priority order by :

- the corresponding engine generator.
- the APU generator or the external power A (if both are connected, the APU generator has priority for the left side bars, and the external power has priority for the right side bars).
- the external power B (if both external power are connected, B has priority for the left side bars and A has priority for the right side bars).
- the other side engine generator.

The APU generator or the external power may supply all the network.

One generator can supply all the network (with galley shedding in case of overload detection).

The generators cannot be connected in parallel (except on ground during No Break Power Transfers).

NORMAL CONFIGURATION

IN FLIGHT

Each engine-driven generator supplies its associated AC BUS (1 and 2) via its Generator Line Contactor (GLC 1 and GLC 2).

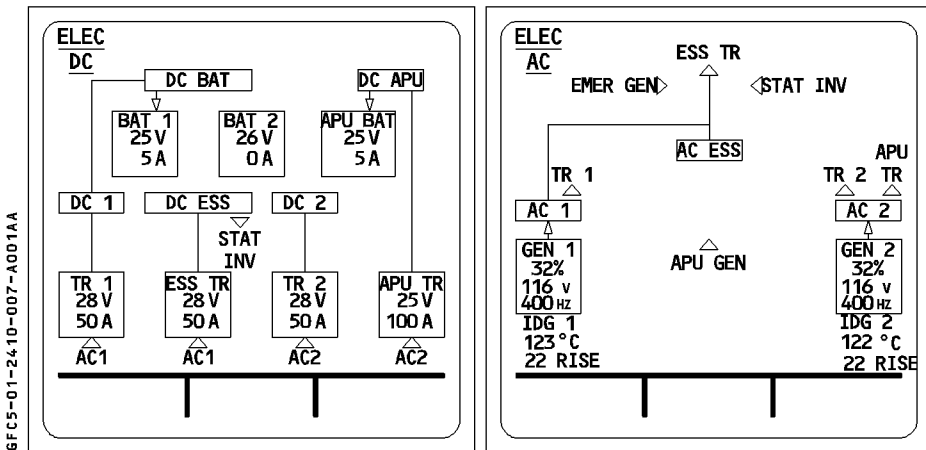
AC BUS 1 normally supplies the AC ESS BUS via a contactor.

AC BUS 1 supplies TR 1 which normally supplies DC BUS 1, DC BAT BUS.

AC BUS 2 supplies TR 2 which normally supplies DC BUS 2.

AC BUS 1 supplies ESS TR which normally supplies DC ESS BUS.

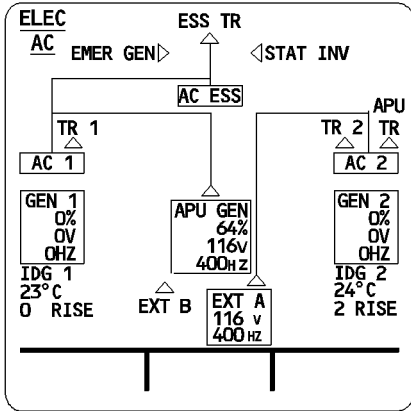
The two batteries are connected to the DC BAT BUS if they need charging. When they are fully charged the Battery Charge Limiter disconnects them.



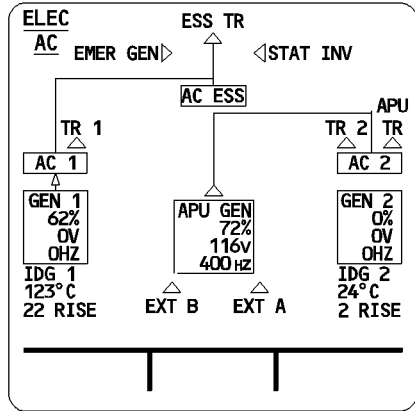
6FC5-01-24.10-007-A001A

ON GROUND

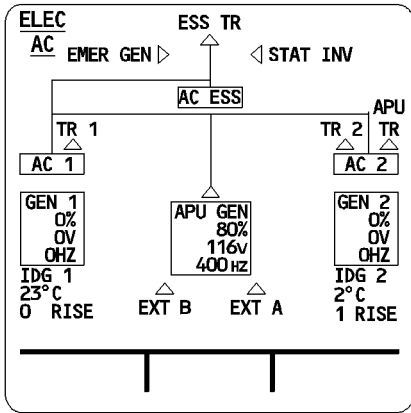
Either the APU generator or external power may supply the complete system (with some galley shedding in case of overload).



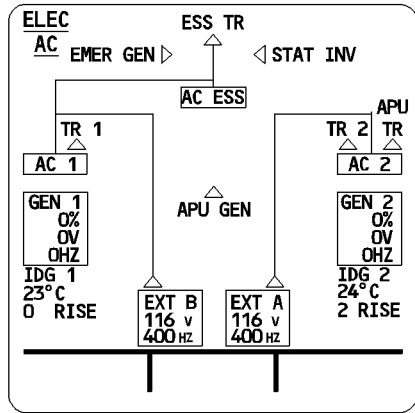
APU GEN + EXTERNAL POWER



APU GEN + GEN 1



APU GEN ONLY



EXTERNAL POWER ONLY

GFC5-01-24.10-008-A001AC

If external power A and external power B plus APU supply the complete system, the APU has priority over external power B.

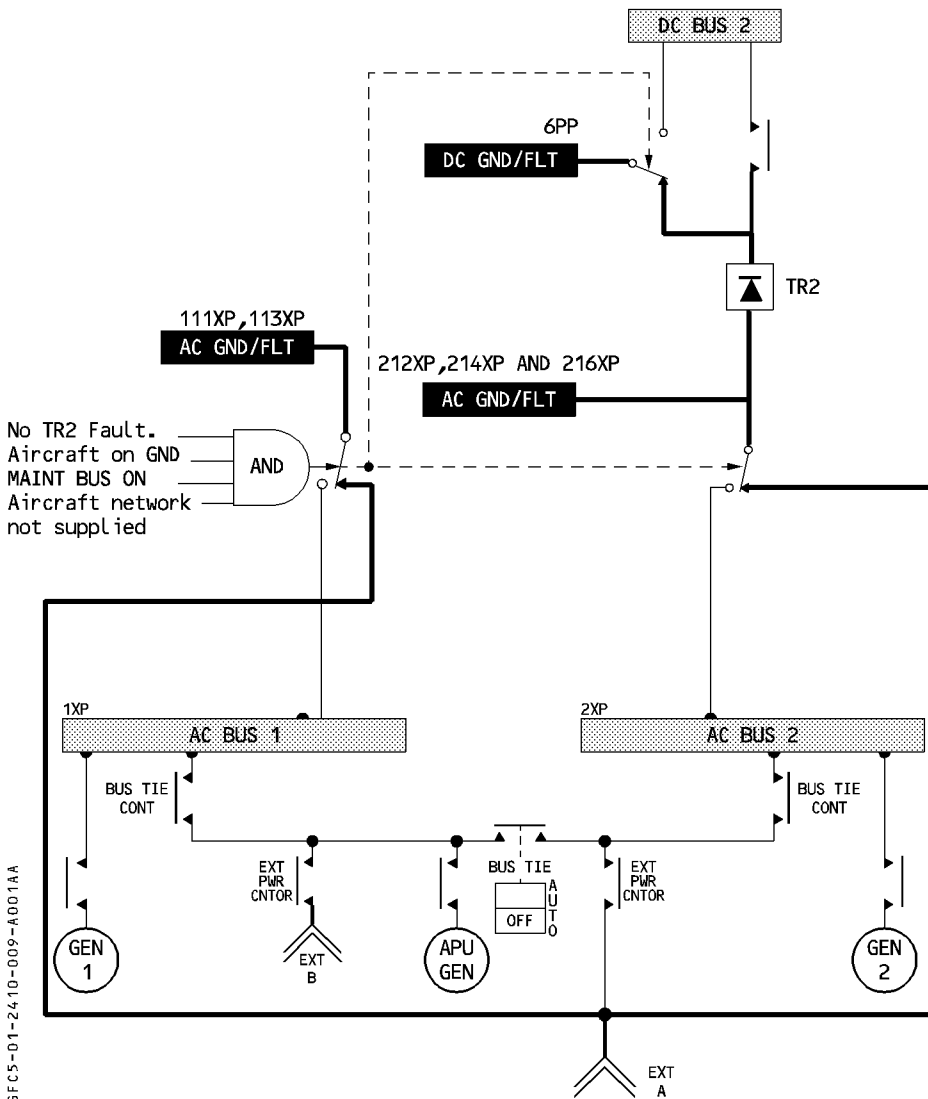
Situation then will be as displayed for case APU plus external power

On ground, when only ground services are required, external power can supply the AC and DC GRND/FLT buses directly, without supplying the aircraft's entire network.

R This configuration is selected via the MAINT BUS switch located in the forward entrance area.

FOR INFO

R



GFC5-01-2410-009-A001AA

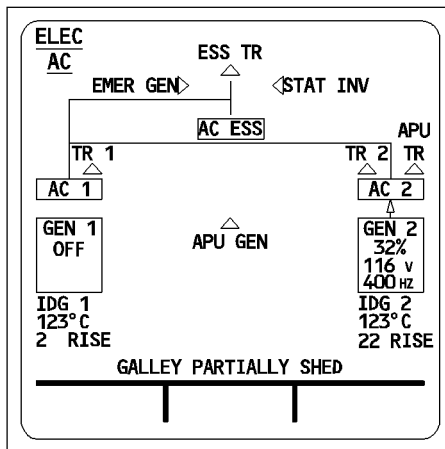
ABNORMAL CONFIGURATIONS**FAILURE OF ONE ENGINE GENERATOR**

ECMU provides automatic reconfiguration.
 Complete network remains supplied.

Note : If a generator is lost due to overcurrent detection, reconfiguration does not occur and the related AC BUS is lost.

The system automatically replaces the failed generator with :

- The APU generator if available or,
- The other engine generator (automatically shedding part of the galley load).

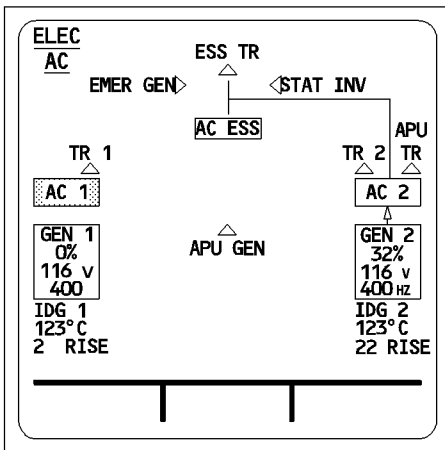


6FC5-01-24-10-010-A001AA

FAILURE OF THE AC BUS 1

The AC BUS 2 supplies the AC ESS BUS and the ESS TR automatically.

6FC5-01-24.10-011-A001AA



TR FAILURES

The contactor of each TR opens automatically in case of:

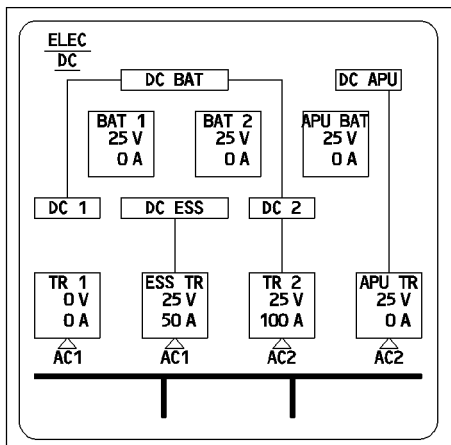
- overheat
- minimum current
- overcurrent
- open or short circuit

ECMU provides automatic reconfiguration (except for APU TR)

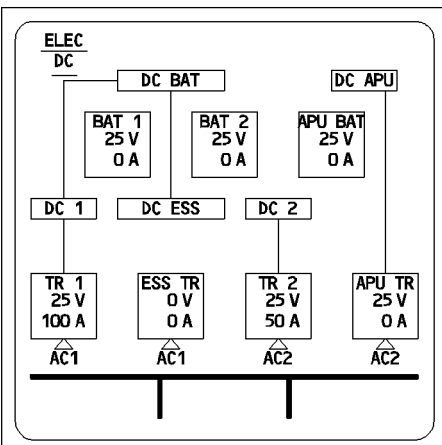
Note : If a TR is lost due to overcurrent detection, reconfiguration does not occur and the related DC BUS is lost.

Failure of one TR

- TR 1 or 2 lost : the available TR replaces the faulty one.
- ESS TR lost : the TR 1 replaces the ESS TR.



TR1 FAULT



ESS TR FAULT

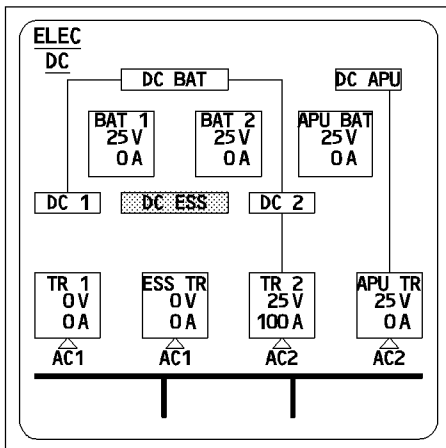
6FC5-01-24.10-012-A001AA



Failure of ESS TR and TR 1 (or TR 2)

The remaining TR supplies the two DC norm busses and the DC BAT bus.

The DC ESS bus is lost.



6FC5-01-2410-013-A001AA

EMERGENCY GENERATION AFTER LOSS OF ALL MAIN GENERATORS

If both AC BUS 1 and 2 are lost, and if both engines are lost, the Ram Air Turbine (RAT) automatically extends.

If only powered by the RAT, the EMER GEN is inhibited when the slats are extended.

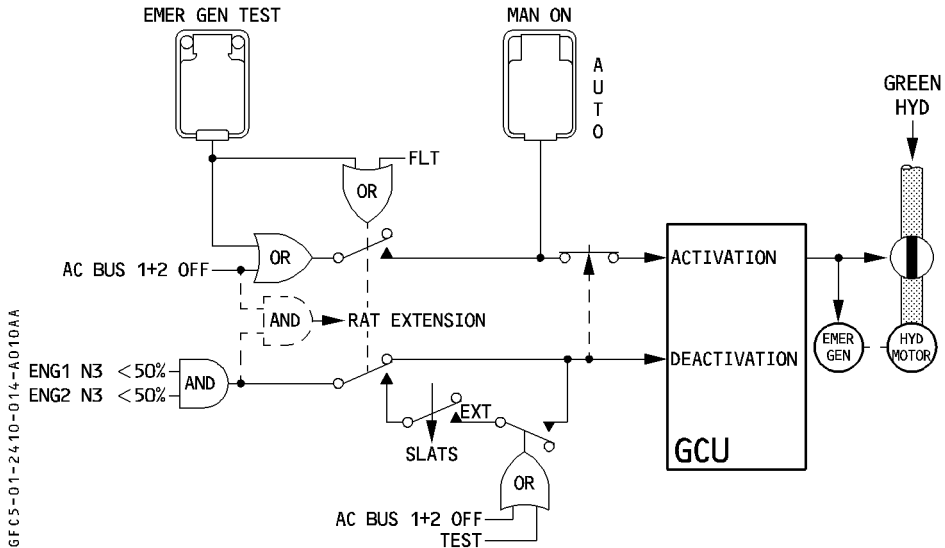
The emergency generator can be manually activated via the MAN ON pushbutton.

Emergency generator deactivation only occurs automatically :

- In flight : At slats extension ; if only powered by the RAT (both engines are lost), it can be reactivated after slats retraction via the MAN ON pushbutton.
- On ground : After both engines are shut down.

The EMER GEN TEST pushbutton enables the activation of the emergency generator, and its connection to the essential network. This test is inhibited when the slats are extended.

FOR INFO



GFC5-01-24-10-014-A010AA

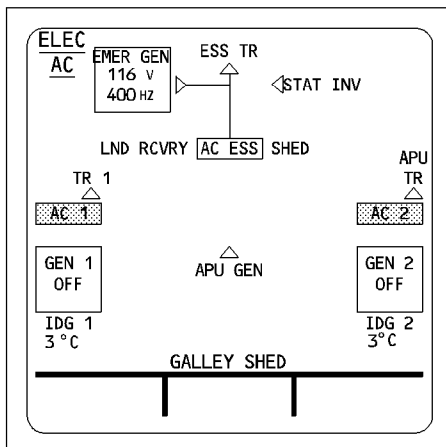
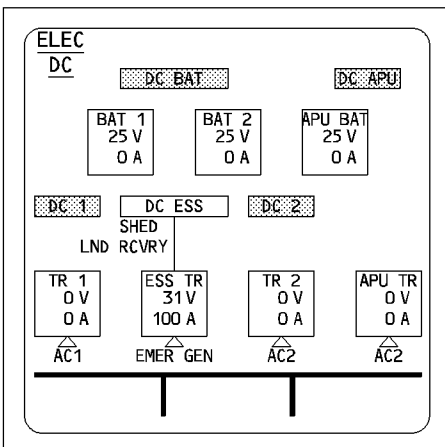
- If the green hydraulic system, which actuates the emergency generator, is powered by an engine-driven pump, the emergency generator supplies the :
 - AC ESS BUS,
 - AC ESS SHED.
 And, through the ESS TR, the :
 - DC ESS BUS, and
 - DC ESS SHED.
- If the green hydraulic system is powered by the Ram Air Turbine, the emergency generator supplies the :
 - AC ESS BUS, and
 - DC ESS BUS, through the ESS TR.

All LAND RECOVERY AC and DC BUS bars are shed. They are recovered when the LAND RECOVERY pushbutton is ON.

The AC ESS GND is lost.

R

6FC5-01-24.10-015-R001AA



FLIGHT WITH BATTERIES ONLY

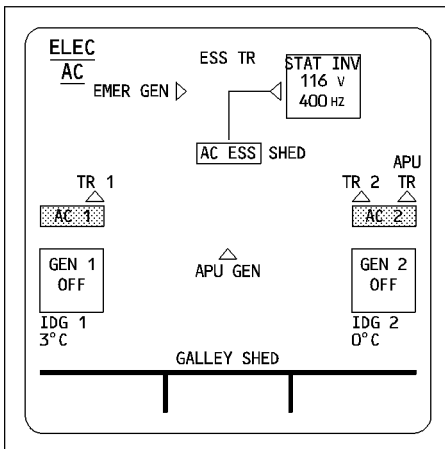
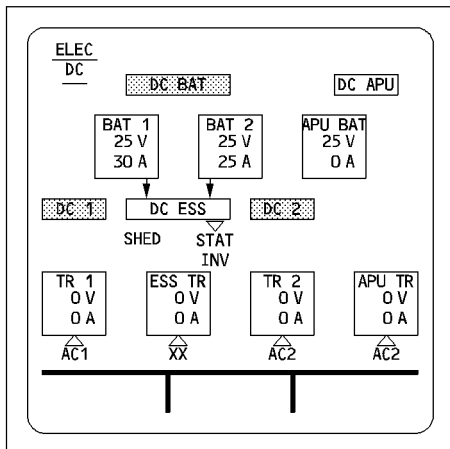
When emergency generator is not available, the batteries supply :

- the DC ESS BUS
 - the DC LAND RECOVERY (whatever the LAND RECOVERY pushbutton position is) and through the STAT INV :
 - the AC ESS BUS
 - the AC LAND RECOVERY (whatever the LAND RECOVERY pushbutton position is)
- The AC ESS SHED, the DC ESS SHED and the SHED LAND RECOVERY are not supplied.
The AC ESS GND is lost.

Example : flight with batteries only.

R

GFC5-01-24.10-016-A001AA





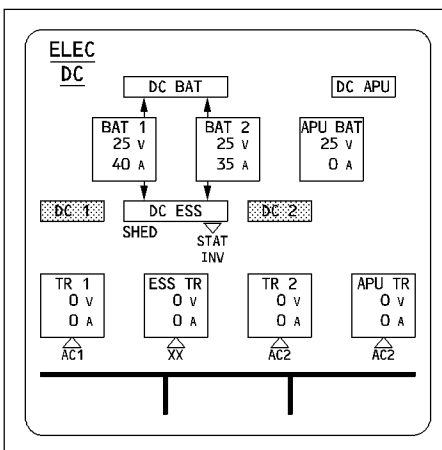
ON GROUND, BATTERIES ONLY

Provided they are both selected AUTO, the batteries supply:

- the DC ESS BUS
- the DC BAT BUS
- the DC LAND RECOVERY (whatever the LAND RECOVERY pushbutton position is) and through the static inverter:
- the AC ESS BUS
- the AC ESS GND
- the AC LAND RECOVERY (whatever the LAND RECOVERY pushbutton position is)

The AC ESS SHED, the DC ESS SHED and the SHED LAND RECOVERY are not supplied.

GFC5-01-2410-017-A001AA



Note : ELEC AC ECAM page is identical to flight with batteries only case.



DISTRIBUTION TABLE

	AC BUS 1	AC BUS 2	AC ESS BUS	AC ESS GND	AC ESS SHED	DC BUS 1	DC BUS 2	DC BAT BUS	DC ESS BUS	DC ESS SHED
NORM CONFIG	GEN 1	GEN 2	GEN 1	GEN 1	GEN 1	TR 1 GEN 1	TR 2 GEN 2	TR 1 GEN 1	ESS TR GEN 1	ESS TR GEN 1
GEN 1 INOP	GEN 2 (3)	GEN 2	GEN 2 (3)	GEN 2 (3)	GEN 2 (3)	TR 1 GEN 2 (3)	TR 2 GEN 2	TR 1 GEN 2 (3)	ESS TR GEN 2 (3)	ESS TR GEN 2 (3)
GEN 2 INOP	GEN 1	GEN 1 (3)	GEN 1	GEN 1	GEN 1	TR 1 GEN 1	TR 2 GEN 1 (3)	TR 1 GEN 1	ESS TR GEN 1	ESS TR GEN 1
AC BUS 1 Lost	-	GEN 2	GEN 2	GEN 2	GEN 2	TR 2 GEN 2	TR 2 GEN 2	TR 2 GEN 2	ESS TR GEN 2	ESS TR GEN 2
AC BUS 2 Lost	GEN 1	-	GEN 1	GEN 1	GEN 1	TR 1 GEN 1	TR 1 GEN 1	TR 1 GEN 1	ESS TR GEN 1	ESS TR GEN 1
TR 1 FAULT	NOT AFFECTED					TR 2 GEN 2 (2)	TR 2 GEN 2	TR 2 GEN 2 (2)	ESS TR GEN 1	ESS TR GEN 1
TR 2 FAULT						TR 1 GEN 1	TR 1 GEN 1 (2)	TR 1 GEN 1	ESS TR GEN 1	ESS TR GEN 1
TR 1 + 2 FAULT						-	-	-	ESS TR GEN 1	ESS TR GEN 1
ESS TR						TR 1 GEN 1	TR 2 GEN 2	TR 1 GEN 1	TR 1 GEN 1 (2)	TR 1 GEN 1 (2)
TR 1 FAULT and ESS TR FAULT						TR 2 GEN 2 (2)	TR 2 GEN 2	TR 2 GEN 2 (2)	-	-
TR 2 FAULT and ESS TR FAULT						TR 1 GEN 1	TR 1 GEN 1 (2)	TR 1 GEN 1	-	-

6FC5-01-24.10-018-A001AA

White compartments : same supply as in normal configuration

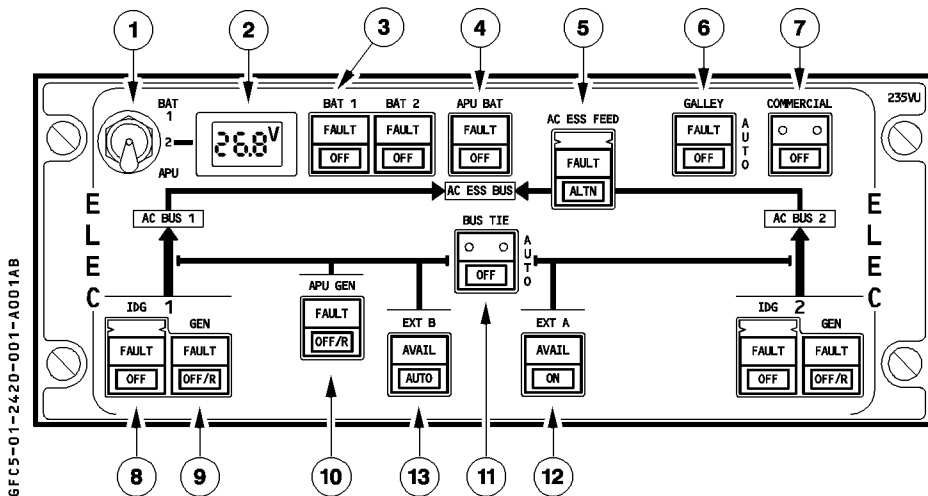
Shaded compartments : back up supply

**DISTRIBUTION TABLE (cont'd)**

EMER CONFIG	AC BUS 1	AC BUS 2	AC ESS BUS	AC ESS GND	AC ESS SHED	AC LAND REC	DC BUS 1	DC BUS 2	DC BAT BUS	DC ESS BUS	DC ESS SHED	DC LAND REC	SHED LAND REC
• BATTERIES ONLY (in flight)	–	–	STAT INV BAT 1-2	–	–	STAT INV BAT 1-2	–	–	(4)	BAT 1-2	–	BAT 1-2	–
• EMER GEN SUPPLIED BY ENGINE DRIVEN PUMP	–	–	EMER GEN	–	EMER GEN	EMER GEN (1)	–	–	–	ESS TR EMER GEN	ESS TR EMER GEN	ESS TR EMER GEN (1)	ESS TR EMER GEN (1)
• EMER GEN SUPPLIED BY RAT	–	–	EMER GEN	–	–	EMER GEN (1)	–	–	–	ESS TR EMER GEN	–	ESS TR EMER GEN (1)	–

ON GROUND	AC BUS 1	AC BUS 2	AC ESS BUS	AC ESS GND	AC ESS SHED	AC LAND REC	DC BUS 1	DC BUS 2	DC BAT BUS	DC ESS BUS	DC ESS SHED	DC LAND REC	SHED LAND REC
BAT only, V > 50 Kt	–	–	STAT INV BAT 1-2	–	–	STAT INV BAT 1-2	–	–	–	BAT 1-2	–	BAT 1-2	–
BAT only, V < 50 Kt	–	–	STAT INV BAT 1-2	STAT INV BAT 1-2	–	STAT INV BAT 1-2	–	–	BAT 1-2	BAT 1-2	–	BAT 1-2	–

- (1) supplied when LAND RECOVERY pushbutton is at ON
- (2) lost in case of overcurrent on the faulty TR.
- (3) In case of differential protection failure
 - the affected generator is not replaced
 - the associated TR is switched off.
- (4) Lost after 7 seconds.

OVERHEAD PANEL① BAT 1 (2 or APU) sel

Selects the battery for voltage indication.

② BAT 1 (2 or APU) voltage indication

Selected battery voltage.

③ BAT 1 (2) pb sw

Controls the operation of the corresponding battery charge limiter.

- Auto** : The battery charge limiter controls automatically the connection and the disconnection of the corresponding battery to the DC BAT BUS by closing and opening of the battery line contactor.
- The batteries are connected to the DC BAT BUS in the following cases :
 - Battery voltage below 26.5 volt (battery charge). The charging cycle ends when battery charge current goes below 4 Amperes (for 10 seconds on ground, 30 minutes in flight).
 - On the ground (with speed below 50 knots), when batteries only are supplying the aircraft.
 - In flight DC generation lost (limited to 7 seconds).
 - The batteries are connected to the DC ESS BUS when batteries only are supplying :
 - in flight
 - on the ground (speed below 50 knots) provided they are both selected auto.

Note : 1. In normal configuration the batteries are disconnected most of the time.

2. A battery automatic cut off logic prevents batteries from discharging completely when the aircraft is on the ground (parking).

Automatic battery contactors open when :

- the aircraft is on the ground
- the main power supply (external power plus all generators) is cut off.
- the battery voltage is lower than 23 volt for more than 16 seconds.

The flight crew can reset the contactors by switching the BAT pushbutton switch to OFF then to AUTO.


OFF : The battery charge limiter is not operating, the DC ESS BUS is not connected to the battery (except in flight in emergency configuration).

OFF comes on white if the DC BAT BUS is powered.

Hot buses remain supplied.

FAULT It : Comes on amber, accompanied by an ECAM caution, when the charging current for corresponding battery is outside limits.

In this case the battery contactor opens.

	ELECTRICAL	1.24.20	P 3
	CONTROLS AND INDICATORS	SEQ 001	REV 04

④ APU BAT pb sw

Controls the operation of the APU battery charge limiter.

Auto : The APU battery charge limiter controls automatically the closing and opening of the line APU BAT contactor.

The battery is connected in the following cases :

- To ensure battery charge (as for BAT 1 or 2)
- When the APU start sequence is initiated.

Note : *Automatic cut-off, as for BAT 1 or 2, is provided.*

OFF : The battery charge limiter is not operating, the battery line contactor is open. OFF light comes on.

FAULT It : Comes on amber, associated to ECAM caution as for BAT 1 or 2. In this case the battery contactor opens.

⑤ AC ESS FEED pb sw

NORMAL : The AC ESS BUS is normally supplied from AC BUS 1.

It is automatically supplied by the AC BUS 2 when the AC BUS 1 is lost.

ALTN : The AC ESS BUS is supplied from AC BUS 2.

FAULT It : Comes on amber, and ECAM caution comes on when the AC ESS BUS is not electrically supplied.

Note : *In case of total loss of main generators, the AC ESS BUS is automatically supplied by the emergency generator or by the static inverter if the emergency generator is not available.*

⑥ GALLEY pb sw

AUTO : The galleys are normally supplied. The ECMU automatically sheds one or more galleys in case of generator(s) failure or in case of overload detection. On the ground when APU generator or the external power supplies, all galleys are supplied provided no overload is detected.

OFF : All galleys are shed and water/waste (drain mast) ice protections is lost.

FAULT It : Comes on amber and ECAM caution comes on, when an overload is detected, and if the automatic shedding is not performed.

Note : *Switching OFF then AUTO resets the galleys which have been automatically shed by the ECMU due to an overload detection. Galleys which have been shed due to the loss of generator(s) are not reset.*

7 COMMERCIAL pb

OFF : The following equipment is shed :

- galleys
- passenger entertainment system (music and video)
- cargo loading system
- electrical service
- escape slide lock mechanism ice protection
- water/waste (drain mast) ice protection
- lavatory and cabin lights
- water heater
- in-seat power supply ◀

R

8 IDG 1(2) (Integrated Drive Generator) pb**CAUTION**

1. Holding in this pushbutton for more than about three seconds may damage the disconnection mechanism.
2. IDG disconnection is inhibited when engine N3 is below the low speed threshold.

IDG switches are normally spring loaded out.

Pressing this switch disconnects the IDG from its drive shaft. Only maintenance personnel can reconnect it.

FAULT It : Lights up amber and ECAM caution comes on if :

- IDG oil outlet overheat (above 185° C), or
 - IDG oil pressure low. Inhibited at low engine speed (N3 below 52 %).
- It extinguishes when the IDG is disconnected.


9 GEN 1(2) pb

ON : The generator field is energized and the line contactor closes, if electrical parameters are normal.

OFF/R : The generator field is de-energized and the line contactor opens.
The fault circuit is reset.

FAULT It : Lights up amber and ECAM caution comes on, if the associated Generator Control Unit (GCU) trips it.
The line contactor opens.

Note : If a differential fault trips the protection, reset action has no effect after two attempts.

 AIRBUS TRAINING A330 SIMULATOR FLIGHT CREW OPERATING MANUAL	ELECTRICAL		1.24.20	P 5
	CONTROLS AND INDICATORS		SEQ 001	REV 04

⑩ APU GEN pb sw

- ON** : The APU generator field is energized and the line contactor closes if parameters are normal.
Each bus tie contactor 1 and (or) 2 closes automatically if its associated generator is not operating.
- OFF/R** : The generator field is de-energized and the line contactor opens. The fault circuit is reset.
- FAULT It** : Same as GEN FAULT.
The APU GEN FAULT light is inhibited when APU speed is too low.

⑪ BUS TIE pb sw

- AUTO** : The three BUS TIE contactors open or close automatically according to the priority logic in order to maintain power supply to all AC busses.
The three contactors close when :
– only one engine generator supplies the aircraft, or
– only the APU generator or single ground power unit supplies the aircraft.
- OFF** : The three BUS TIE contactors open.

⑫ EXT A pb : (momentary action)

- AVAIL It** : Comes on green if external power parameters are normal.
- Pressed momentarily** : – If the AVAIL light was on :
· The external power line contactor closes
· The AVAIL light goes off
· The ON light comes on blue
– If the ON light was on :
· The external power line contactor opens
· The ON light goes off
· The AVAIL light comes on.

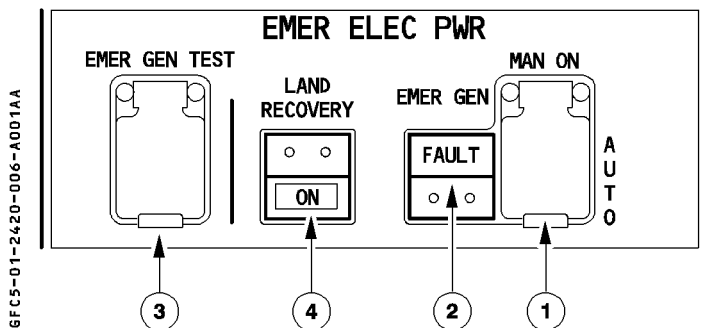
13 EXT B pb : (momentary action)

- AVAIL** : Comes on green if external power parameters are normal.
- Pressed momentarily** : – If the AVAIL light was on :
- Provided the APU is off the external power line contactor closes
 - The AVAIL light goes off
 - The AUTO light comes on.
- If the AUTO light was on :
- The external power line contactor opens
 - The AUTO light goes off
 - The AVAIL light comes on.

Note : 1. The APU generator has priority over external power (A and B) for AC BUS 1.
 The external power A has priority over the APU generator for AC BUS 2.
 The engine generators have priority over the external power.
 The APU generator has priority over external power B for AC BUS 2.
 The external power B has priority over external power A for AC BUS 1.

2. When external power B is selected AUTO, AUTO light remains illuminated even when the APU generator has taken over.


R

**1** MAN ON pb (guarded)

- AUTO** : In flight, in case of normal AC supply loss, the emergency generator is automatically started.
- Pressed** : The emergency generator runs and is connected to the aircraft network.

2 EMER GEN FAULT It

The light comes on red if the emergency generator is not supplying power and normal AC supply is lost in flight.

 AIRBUS TRAINING A330 SIMULATOR FLIGHT CREW OPERATING MANUAL	ELECTRICAL		1.24.20	P 7
	CONTROLS AND INDICATORS		SEQ 100	REV 12

③ TEST pb (guarded)

Pressed and held : The emergency generator runs (provided the green hydraulic system is pressurized) and supplies the DC ESS BUS and the AC ESS BUS.

④ LAND RECOVERY pb

ON : When pressed in emergency generator configuration, the AC LAND RECOVERY and the DC LAND RECOVERY buses are recovered and the following equipment is restored :

- LGCIU 1
- SFCC 1 (flap channel is not recovered, if the emergency generator is powered by the RAT or batteries).
- BSCU channel 1 (not recovered, if the emergency generator is powered by the RAT or batteries)
- LH windshield anti-ice (not recovered, if the emergency generator is powered by the RAT or batteries)
- LH landing light (not recovered, if the emergency generator is powered by the RAT or batteries)

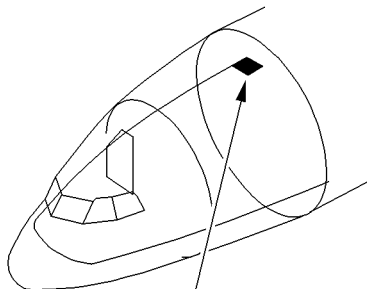
The remaining fuel pump (if any) is lost.

Note : The remaining fuel pump will be shed at 260 knots, if the emergency generator is powered by the RAT, or upon LAND RECOVERY selection, whichever occurs first.

The following equipment is shed :

- HF 1, ADR 3 and, consequently, AP 1.
- Weather radar 1.

Note : The AC LAND RECOVERY and the DC LAND RECOVERY buses are supplied on batteries only, whatever the position of the LAND RECOVERY pushbutton.

FORWARD CABIN**MAINT BUS switch**

MAINT BUS SWITCH

GFC5-01-2420-008-A001A

This switch enables maintenance and ground service personnel to energize electrical circuits for ground servicing, without energizing the aircraft's entire electrical system.

ON : The selector latches magnetically, if external power is connected and normal (AVAIL light is on). The AC and DC GRND/FLT busbars are supplied, and the following services can be energized :

- Passenger compartment lighting
- Galley lighting
- Entrance area lights
- Lavatory lighting and service
- Vacuum cleaner sockets
- Flight compartment service outlets
- Flight compartment flood lighting
- Cargo door hydraulic pump
- Fuel quantity indications
- Refueling
- Lower deck cargo compartment lighting and power outlets
- Main and nose landing gear compartment lighting
- Hydraulic compartment lighting
- Landing Gear Compartment service outlets
- Ground call
- Equipment compartment lights and service outlets
- Navigation lights
- Parking brake
- Escape slide locking mechanism ice protection

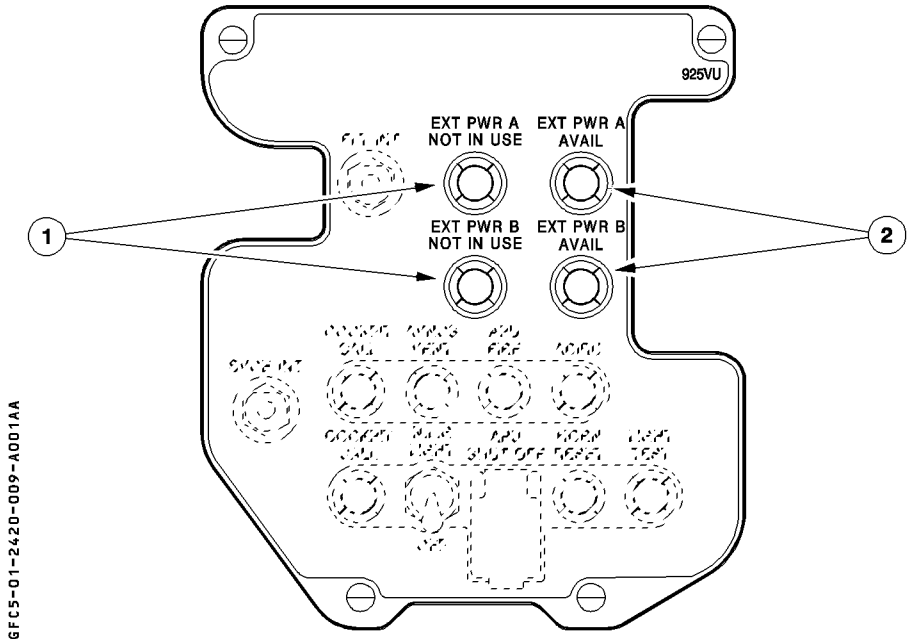
The switch trips, when the external source is removed.

OFF : The AC and DC GRND/FLT busbars are connected to AC BUS 2 and DC BUS 2.



EXTERNAL POWER PANEL

(This panel is located closed to the external power connector)



6FC5-01-2420-009-A001AA

① EXT PWR A (B) NOT IN USE

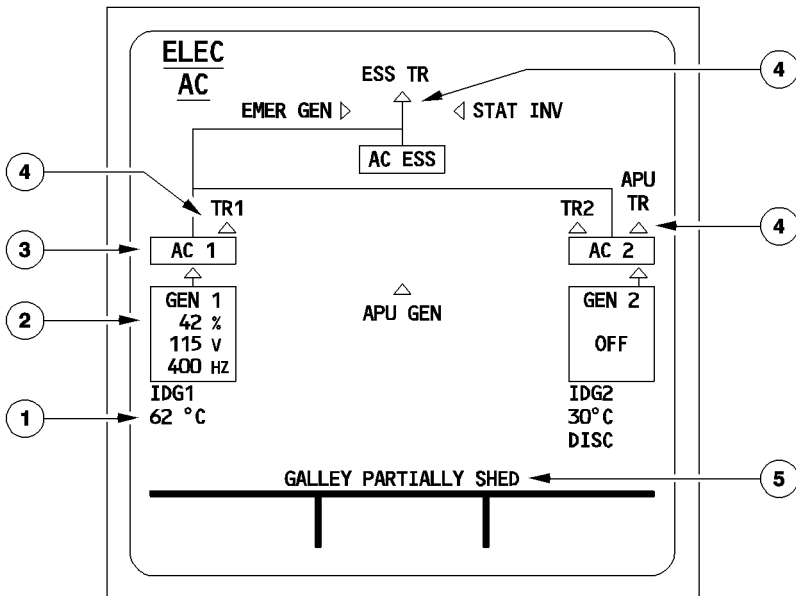
This white light comes on to inform ground personnel that the ground power unit is not supplying the aircraft network and can be removed. It goes off when EXT A (B) is in use.

② EXT PWR A (B) AVAIL

This amber light comes on to indicate that external power is available and the voltage is correct.

ECAM ELEC AC PAGE

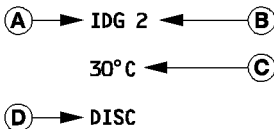
FLIGHT CONFIGURATION



6FC5-01-2420-010-A001AA

6FC5-01-2420-010-B001AA

1 IDG indications



(A) IDG legend :

- The "IDG" legend, normally white, becomes amber if :
- Oil outlet temperature > 185° C.
 - Oil pressure gets too low.
 - IDG becomes disconnected.

(B) IDG number :

The "IDG" number is white if associated engine is running, becomes amber if stopped.



- Ⓒ Oil outlet temperature :
This legend is normally in green, and appears in amber if $T > 185^{\circ} \text{C}$.
It flashes, if $142^{\circ} \text{C} < T < 185^{\circ} \text{C}$ (advisory).

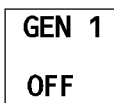
- Ⓓ DISC/LO PR indication :
This legend appears in amber, when the IDG is disconnected.
"LO PR" appears in amber, when IDG low pressure is detected.
It is inhibited at low engine speed (N2 below 14 %).

R

② GEN 1 (or 2) indications

- GEN pushbutton is OFF :

6FC5-01-2420-011-A001AA



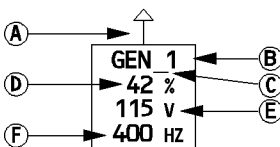
"GEN" is amber.

"OFF" indication is white.

"1" or "2" indication is in white, if the associated engine is running ; it is in amber, if it is not.

- GEN pushbutton is ON :

6FC5-01-2420-011-B001AA



- Ⓐ Arrow indication :
Appears green, when the generator line contactor is in line.



- R
- R
- Ⓑ The GEN number is white, if the associated engine is running. It becomes amber, when the associated engine stops.
 - Ⓒ The GEN indication is normally white. It becomes amber, when the generator fails, or when the associated engine stops.
 - Ⓓ The GEN load is normally green. It becomes amber, if the load is greater than 108 %, for more than 10 seconds.
 - Ⓔ The GEN voltage is normally green. It becomes amber below 110 V or, above 120 V.
 - Ⓕ The GEN frequency is normally green. It becomes amber below 390 Hz, or above 410 Hz.

③ Bus indication

The bus indication is normally green. It becomes amber, when the corresponding bus is off.

④ TR indication

The TR indication is normally white. It becomes amber, when the TR fails or in case of abnormal current.

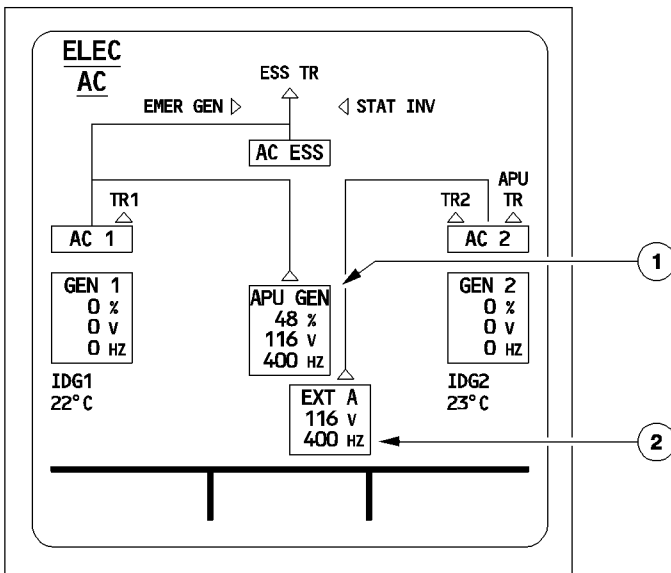
⑤ Galley indication

The following legend appears in white, when applicable, depending on the order of priority :

(1 = highest priority) :

1. COMMERCIAL OFF
2. GALLEY SHED
3. GALLEY PARTIALLY SHED

GROUND CONFIGURATION

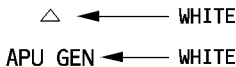


6FC5-01-2420-013-A001AA

① APU Generator

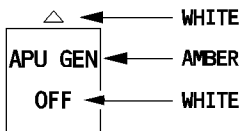
– When APU MASTER SW pushbutton is off :

R



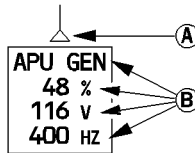
6FC5-01-2420-013-B001AA

– When APU MASTER SW pushbutton is ON and APU GEN pushbutton is OFF :



6FC5-01-2420-013-C001AA

– When APU MASTER SW pushbutton is ON and APU GEN pushbutton is on :

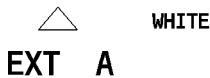


- Ⓐ – green when APU generator supplies one or more AC bus bar
– white otherwise
- Ⓑ same logic as engine generator

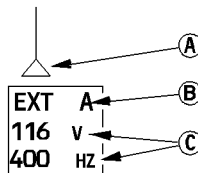
R ② External power A (External power B symbol appears beside with the same principle) :

(only displayed when aircraft is on ground)

– When external power is not available

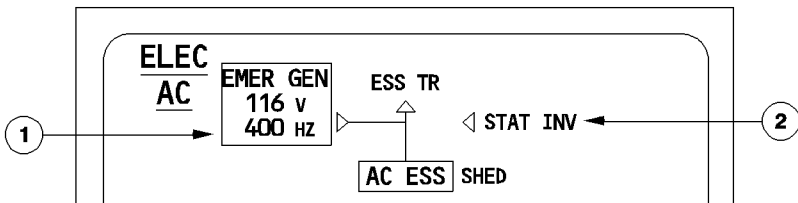


– When external power is available

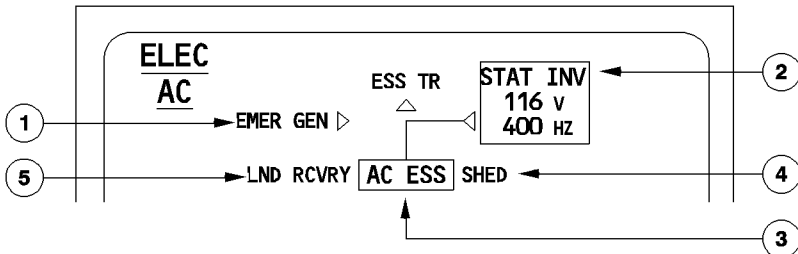


- Ⓐ – green when external power supplies one or more bus bar
– white otherwise
- Ⓑ white
- Ⓒ same as engine generator

EMER CONFIGURATION



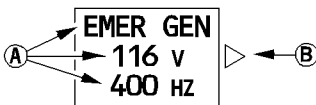
6FC5-01-2420-015-A001AA



① Emergency generator

- When the emergency generator contactor is closed :

6FC5-01-2420-015-B001AA



Ⓐ same logic as engine generator

Ⓑ green

- When the emergency generator contactor is open :

EMER GEN ▷ : white

EMER GEN ◁ : becomes amber when faulty

② Static inverter

Same logic as emergency generator

**③** AC ESS BUS

This legend, normally green, becomes amber when the bus is not supplied.

④ SHED indication

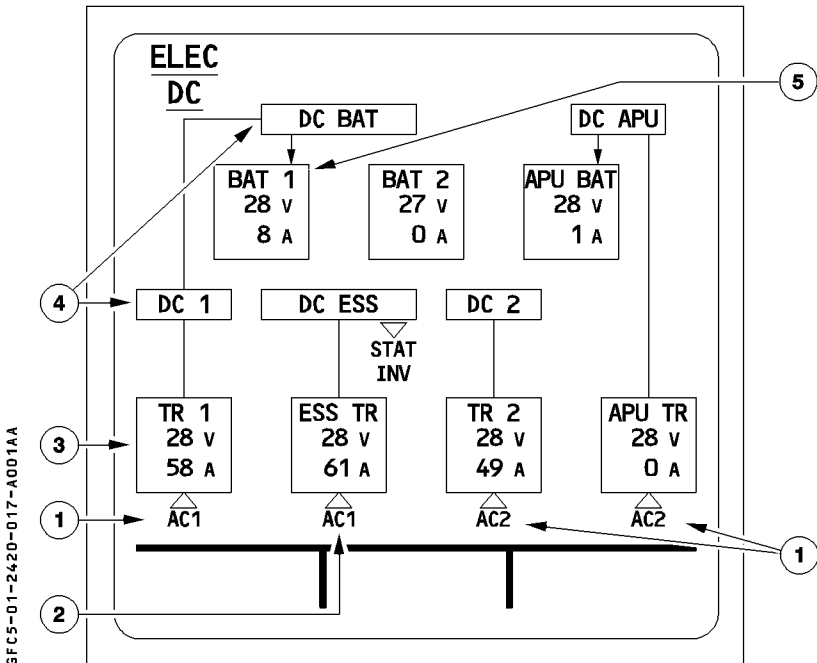
This label comes on amber when AC ESS SHED BUS is not supplied.

⑤ LND RCVRY indication

This label comes on green when LAND RECOVERY pushbutton is pressed.

ELEC DC ECAM PAGE

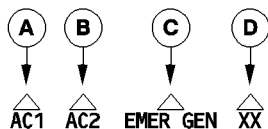
NORMAL CONFIGURATION



① TR 1 (or TR 2 or APU TR) power supply

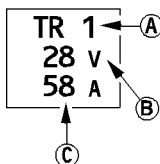
This legend is normally white but becomes amber when the bus bar is not powered.

② ESS TR power supply



- Ⓐ Appears in white, when the AC 1 busbar supplies the TR.
- Ⓑ Appears in white, when the AC 2 busbar supplies the TR.
- Ⓒ Appears in white, when the emergency generator is not failed, and supplies the TR. Appears in amber, when the emergency generator is failed, and is connected to the TR.
- Ⓓ Appears amber in all other cases (ESS TR not supplied, or information not available).

③ Transformer Rectifier (1, 2, APU, and ESS)



- Ⓐ TR indication :
 - Appears in white
 - Appears in amber, when the voltage or the current value is abnormal, or when the TR is failed (overheat, minimum current, overcurrent, or open or short circuit).
- Ⓑ Voltage :
 - Appears in green
 - Appears in amber, when the voltage is less than 25V, or greater than 31V.

Note : For APU TR, the voltage indication remains green, even if abnormal during APU start.

- Ⓒ Current :
 - Appears in green
 - Appears in amber, when the TR is failed or the current is less than 2A.

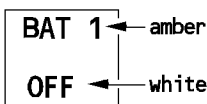


④ DC BUS bars

- normally green
- amber if no voltage on the bar

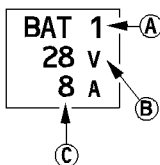
⑤ Batteries

- if BAT pushbutton is selected OFF



GFC5-01-2420-019-1001AA

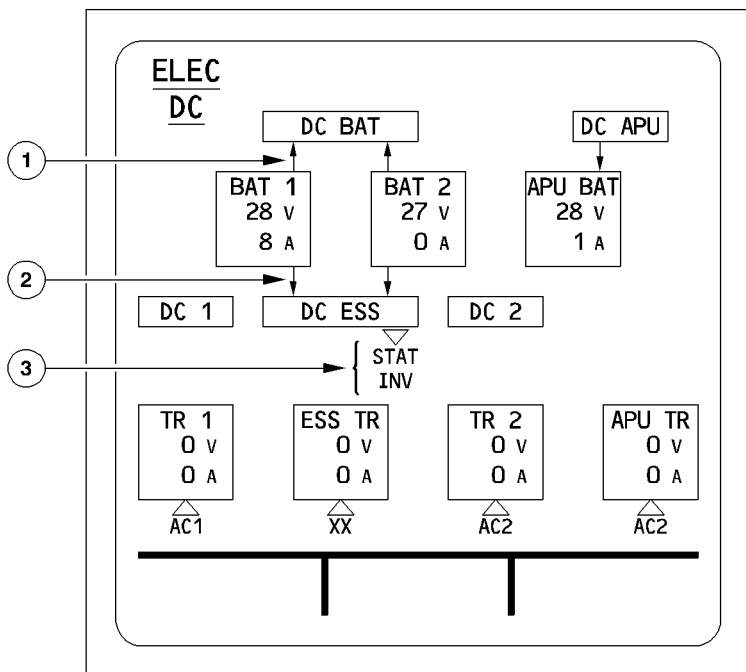
- if BAT pushbutton is selected AUTO



GFC5-01-2420-019-B001AA

- ① BAT indication
 - normally white
 - amber if the battery is faulty
- ② Voltage
 - normally green
 - amber below 25V or above 31V
- ③ Current (charge or discharge)
 - normally green
 - amber if discharge current is above 5A.

Note : For APU battery, even if voltage or current is abnormal, the values remain green during APU start.

EMERGENCY CONFIGURATION

6FC5-01-2420-020-A001A

① DC BAT – BAT connection

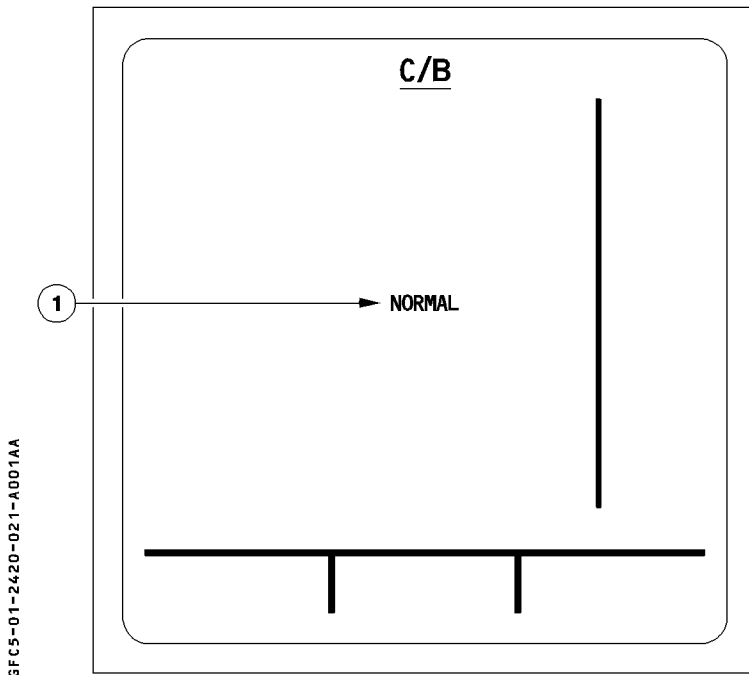
- Battery Line Contactor open :
nothing displayed
- Battery Line Contactor closed :
↓ green : battery charge
↑ amber : battery discharge

② DC ESS – BAT connection

- ↓ amber : appears when the contactor is closed. (Battery supplying DC ESS bus)

③ Static inverter

- normally white
- amber when the static inverter is faulty.

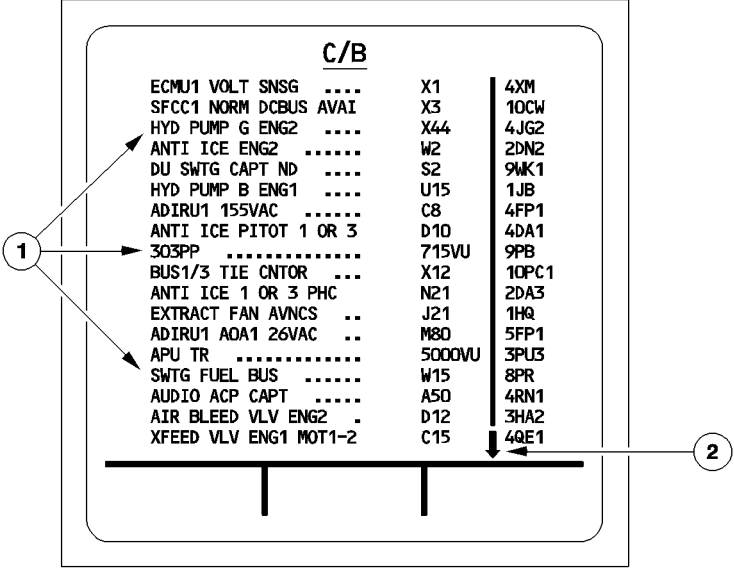
**C / B ECAM PAGE****NO C / B PULLED**

6FC5-01-2420-021-A001AA

① NORMAL

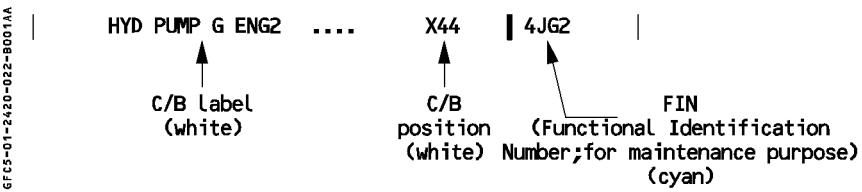
Displayed in green when no circuit breaker is pulled.

C / B PULLED



GFC5-01-2420-022-A001AA

① Open circuit breaker identification



GFC5-01-2420-022-B001AA

The last tripped Circuit Breaker is displayed on the top of the screen.
 All Circuit Breaker are monitored except commercial Circuit Breaker.

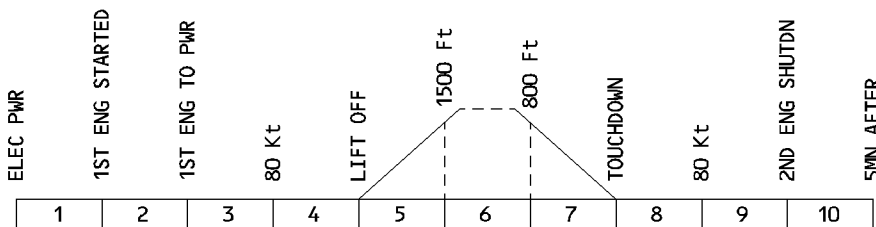
② C / B page overflow symbol

Displayed in green when pulled Circuit Breaker list is not closed.

- Note : 1. To display the next page, press again Circuit Breaker pushbutton or CLEAR pushbutton on the ECAM control panel.
 2. A maximum of three pages is available.

WARNINGS AND CAUTIONS

6FC5-01-2420-023-A001AA



R

E / WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
EMER CONFIG Loss of main generators. Both AC BUS are lost.	CRC	MASTER WARN	NIL *	EMER GEN FAULT It	
AC BUS 1 FAULT AC BUS 2 FAULT Busbar(s) is (are) no longer supplied.	SINGLE CHIME	MASTER CAUT	ELEC AC	NIL	4, 8
AC ESS BUS FAULT Busbar is no longer supplied.				AC ESS FEED FAULT It	
AC ESS BUS SHED Busbar is no longer supplied.				NIL	
GEN 1(2) FAULT . Protection trip initiated by associated GCU, or . Opening of line contractor with GEN pb at ON				GEN 1(2) FAULT It	1, 3, 4, 5, 7, 8, 10
GEN 1(2) OFF GEN 1(2) pb at OFF with no FAULT					
APU GEN FAULT . Protection trip initiated by associated GCU, or . Opening of line contractor with APU GEN pb at ON.				APU GEN FAULT It	3, 4, 5, 7, 8
GEN 1(2) or APU GEN OVERLOAD Load of one generator is above 100 % of rated output				GALLEY FAULT It	3 to 8
EXT PWR A (B) OVERLOAD Load of external power is above 100 % of rated output					
IDG 1(2) OIL LO PR IDG oil pressure low. Inhibited if N2 < 14 %.				IDG 1(2) FAULT It	1, 4, 5, 7, 8, 10
IDG 1(2) OIL OVHT IDG outlet oil temp. above 185°C					
IDG 1(2) DISCONNECTED on ground				IDG OFF It	3 to 10
ECMU 1(2) FAULT				NIL	3, 4, 5, 7, 8

* ELEC page shall be called on upper ECAM by pressing and holding the ELEC pushbutton on the ECAM control panel.

R

E / WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB		
C / B TRIPPED One C / B tripped	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8		
BAT 1(2) FAULT charging current increases at an abnormal rate			ELEC DC	BAT 1(2) FAULT It			
APU BAT FAULT charging current increases at an abnormal rate				APU BAT FAULT It			
DC BUS 1 FAULT DC BUS 2 FAULT DC BUS 1 + 2 FAULT DC ESS BUS FAULT Busbar(s) is (are) no longer supplied			SINGLE CHIME	MASTER CAUT	ELEC DC	NIL	4, 8
DC ESS BUS SHED Busbar is no longer supplied							
DC BAT BUS FAULT busbar is no longer supplied							
BUS TIE OFF The BUS TIE pb sw is abnormally OFF							
AC ESS BUS ALTN AC ESS BUS is abnormally supplied by AC 2 bus			SINGLE CHIME	MASTER CAUT	ELEC DC	NIL	3, 4, 5, 7, 8, 9
BAT 1(2) or APU BAT OFF BAT pb sw at OFF without fault							
TR 1 (2), APU TR or ESS TR FAULT			SINGLE CHIME	MASTER CAUT	ELEC DC	NIL	3, 4, 5, 7, 8, 9, 10
BCL 1 (2) or APU BCL FAULT							
STATIC INV FAULT	SINGLE CHIME	MASTER CAUT	ELEC DC	NIL	3, 4, 5, 7, 8		
C/B MONITOR FAULT Loss of CBMU							
IDG 1 (2) MINOR FAULT							

MEMO DISPLAY

- EMER GEN is displayed in green when emergency generator is running.
- ELEC EXT PWR is displayed in green if external power is available. This message becomes amber if both engines are running.