

# PART 1

## Chapter 3 — ELECTRICAL SYSTEM

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### Description

#### 1 DC supplies

(a) Two 6000-watt engine-driven generators supply the entire electrical system and charge two 24-volt batteries connected in parallel. Minimum RPM to keep the batteries fully charged are 3700 with both generators running, or 4000 if one generator has failed.

(b) An external ground supply socket is accessible via the radio bay door and is for use when a ground battery is necessary for servicing purposes.

## 2 Standby DC supplies

- (a) A pair of series-connected 12-volt batteries, in the radio bay, provide standby supplies for the turn and slip indicator, the cockpit emergency lamps and the E2B compass illumination.
- (b) A 24-volt battery, also in the radio bay, provides an emergency supply for the standby UHF set.

## 3 AC supplies

- (a) AC supply is from four type 100A inverters divided into two groups. No 1 group comprises No 1 (main) and No 4 (standby) inverters which supply the G4FT compass, the cockpit temperature amplifier and top temperature controller. In addition, No 4 inverter acts as a control to the radar ranging type 206 inverter, provided that No 1 inverter is in circuit. If No 1 inverter fails, radar ranging is impossible since No 4 inverter takes over the other supplies. No 2 group comprises No 2 (main) and No 3 (standby) inverters which supply the artificial horizons, Mk 22F altimeter, the vibrator for the Mk 19 altimeter and the oil pressure gauge.
- (b) When the engine master switch is set to ON, both standby inverters start up. When the engine is started and the generators are on line the two main inverters take over the supply.
- (c) Post Mod 1321, a type 108 inverter provides AC supply for Tacan. The inverter starts up when the aircraft becomes airborne and micro-switches are operated by the raising of the landing gear. A ground test switch is provided on the generator control panel for servicing purposes only.
- (d) Post Mod 1356, the type 108 inverter also supplies AC power for the IFF/SSR; a type E182 static inverter provides standby AC power for the IFF/SSR. Changeover is automatic if the type 108 inverter fails.
- (e) Post Mod 1357, AC power for the IFF/SSR is provided by a type E182 static inverter which is controlled by the master switch on the IFF/SSR control unit. There is no standby AC power supply for the IFF/SSR.

## 4 Inertia switches

In the event of a crash landing, the generators and batteries are automatically isolated by the operation of four inertia switches. Each

generator is isolated by its own inertia switch so that only one generator is lost in the event of accidental operation of a switch. The remaining two switches are connected in series and when operated isolate the batteries and automatically discharge the fire extinguisher bottle.

## Controls and Indicators

### 5 Generator controls and indicators

(a) The generators each have a separate control panel in the radio bay. No pilot-operated controls are fitted.

(b) A warning light for each generator, below the port instrument panel, comes on when its associated generator is not supplying power.

### 6 Main battery control

The battery master switch below the port instrument panel, when set to OFF, isolates the aircraft main batteries from all electrical services except the engine fire extinguisher inertia switch circuit, the canopy switch circuit, the refuelling circuits, and the telebriefing facilities.

### 7 Standby battery controls

(a) The supply to the turn and slip indicator is controlled by the TURN & SLIP-NORMAL/EMERGENCY switch below the instrument. When set to EMERGENCY the instrument is powered by the 12-volt series-connected standby batteries.

(b) The supply to the two cockpit emergency lamps from the standby batteries is controlled by the EMERGENCY LIGHTS—ON/OFF switch on the centre instrument panel.

(c) Selecting STBY EMERG BATT on the three-position MAIN/STBY/STBY EMERG BATT switch on the cockpit port wall connects the standby UHF to its 24-volt standby battery.

### 8 AC supply — controls and indicators

(a) The engine master switch normally controls the circuit to the inverters, but No 1 and No 2 inverters do not come into circuit until the engine is started and the generators are on line. Two indicators on

the centre pedestal, one for each group, give the following indications:

OFF (red) ... .. No inverter running

STANDBY (amber) ... Standby inverter running, main inverter not running

MAIN (green) ... Main inverter running, standby inverter not running

Adjacent to the pupil's artificial horizon is a STANDBY INVERTER ON magnetic indicator which shows black when No 2 inverter is supplying power and white if it is not.

(b) On the centre console are two NORMAL/STANDBY switches, one for each group. They may be used to test either standby inverter on the ground when the engine is running, or in flight. They may also be used to attempt to reset a main inverter (see para 11).

(c) Post Mod 1321, on the centre panel is a TACAN POWER SPLYS — FAILURE indicator which shows black when the type 108 inverter is running and white when there is a power failure. An adjacent RESET button may be used to attempt to re-start the inverter in flight or to cut out the inverter after landing.

## 9 Warning indicators

<i>Service</i>	<i>Indication</i>	<i>Function</i>
Fire warning	1 red light	Gives warning when temperature in engine bay exceeds a pre-determined level
Fuel pressure warning	1 red light	Indicates fuel pressure below 3 to 3½ PSI at engine inlet
Fuel transfer warning	2 white magnetic indicators	Indicate failure of transfer system
Fuel outboard tanks	2 white magnetic indicators	Indicate transfer from outboard drop tanks complete
Booster pumps warning	2 amber lights	Indicate failure of associated pump or pumps switched off
HP pump isolation	1 red light	Indicates isolation in use

<i>Service</i>	<i>Indication</i>	<i>Function</i>
Engine anti-icing	1 window	Indicates: OPEN — Red SHUT — Green De-energised — Yellow
Generator failure warning	2 red lights	Indicate generator(s) not on line
Radar ranging warning	1 white magnetic indicator	Indicates radar ranging in use
Oxygen	3 striped magnetic indicators	Indicate respective pilot inhaling (2 indicators for the instructor)
Inverters	1 magnetic indicator	Black — No 2 on line White — No 3 on line or both failed
	2 windows	Indicate state of inverters OFF — Red STBY — Amber MAIN — Green
Tacan power supplies	1 white magnetic indicator	Indicates AC or DC failure
Braking parachute	Red STREAM caption panel	Indicates parachute streamed
Hydraulic failure warning	1 red light (plus audio warning)	Indicates hydraulic pressure below 600 PSI
Landing gear position	3 red or green lights	Indicate position of each landing gear unit separately No light — unit locked up Red light — unit between locks Green light — unit locked down

<i>Service</i>	<i>Indication</i>	<i>Function</i>
Landing gear warning	1 red light	Indicates when throttle less than $\frac{1}{3}$ open and landing gear not locked down
Powered controls	2 pairs of white magnetic indicators	Indicate separately disengagement of aileron or elevator power or electrical fault
Airbrake position	1 white magnetic indicator	Indicates airbrake not fully in
Cockpit pressure warning	1 red light	Indicates drop of $\frac{1}{2}$ PSI in cabin pressure differential
Telebriefing	1 amber light	Indicates telebriefing in use
Canopy	1 green light	Indicates canopy locked closed with landing gear down
Arrester hook	1 green light	Indicates when hook is released

## Normal use of the System

### 10 Pre-flight procedures

(a) Before starting the engine, switch on the battery master switch and check the functioning of all DC operated instruments and indicators.

(b) When the engine master switch is on, check that the No 3 and No 4 inverters start up (indicators STBY), that the STANDBY INVERTER indicator shows white and that the instruments are functioning.

(c) After start up, check generator warning lights out, main inverters start up (indicators MAIN) and STANDBY INVERTER indicator black. Then select STANDBY on each inverter changeover switch checking that the associated inverter indicator shows STBY. Also check that the STANDBY INVERTER indicator shows white when the No 2 group changeover switch is at STANDBY. Re-select each

changeover switch to **NORMAL** and check that the inverter indicators are at **MAIN** and that the **STANDBY INVERTER** indicator is black.

**NOTE:** The changeover check may be carried out in the air. There is a distinct noise change when inverter changeover takes place.

## Malfunctioning of the System

### 11 Inverter failure

If either main inverter fails, the standby inverter takes over the load automatically. An attempt may be made, either on the ground or in the air, to reset a main inverter by setting the appropriate **NORMAL/STANDBY** changeover switch to **STANDBY** and then returning it to **NORMAL**. If the associated indicator then shows **MAIN**, and in the case of the No 2 group, the **STANDBY INVERTER** magnetic indicator reverts to black, resetting has been accomplished. If the indicators show that the standby inverter is in operation, resetting is not possible.

### 12 Single generator failure

If one generator fails, the other provides sufficient output for all electrical services provided engine RPM are kept above 5000. To avoid overloading the remaining generator, however, the radar ranging and tail-plane interconnection should be switched off. Except for operational reasons, a return to base should be made as soon as possible in case the remaining generator fails.

### 13 Double generator failure

(a) If both generators fail, all electrical services are supplied by the batteries. These normally should be fully charged about 20 minutes after take-off and then should maintain the following output before they are discharged:

Output — amps	180	150	125	100	75	50
Time — Minutes	5	7	10	15	20	30

(b) Failure to relight may involve gliding back to base, during which time all electrical loads should be reduced to a minimum to conserve enough power to operate the fire-extinguisher and brake parachute.

The turn and slip indicator should be operated from the emergency battery for greater reliability in the final stages and the E2B compass used as far as possible because of the unreliability of the G4FT compass with dropping battery voltage. Engine windmilling RPM provide little or no generation.

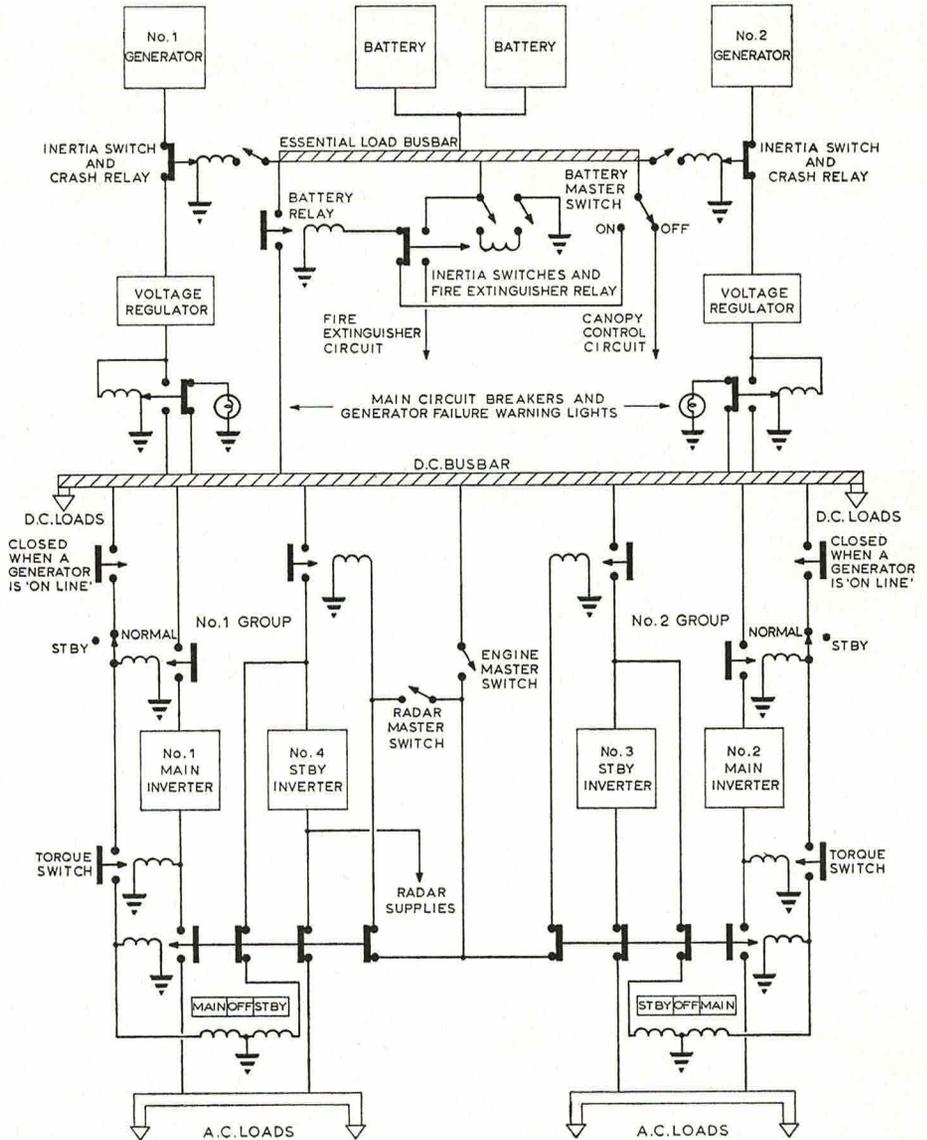
(c) To assist the pilot in deciding which loads should be shed, if generator failure occurs, the following table lists the major services and the current they require.

<i>Service</i>	<i>Load (amps)</i>
Radar ranging ... ..	46
*Type 108 inverter (Tacan) ... ..	35
Booster pumps ... ..	30
*Type 100A inverters (each) ... ..	7.5
UHF ... ..	17
Tailplane actuator ... ..	12
Gun firing ... ..	10
DME ... ..	7
IFF/SSR ... ..	6
Pressure head heater ... ..	6
RP firing ... ..	5
Engine relighting ... ..	5

\*The type 108 inverter cannot be switched off in flight. The minimum number of type 100A inverters operating is two; these cannot be switched off in flight.

#### **14 Double generator and battery failure**

Once the batteries are discharged, no electrical services can be operated, eg trim tab actuators, tailplane motors, electro-hydraulic selectors, etc. In addition the fuel gauges and electrically-operated flight instruments become inoperative. The fuel booster pumps cease operation which may entail reduction in altitude and engine RPM to ensure satisfactory engine running (see Part 1, Chapter 1, para 16). No relight or fire extinguisher facilities are available when the batteries are fully discharged.



Hunter T7 Electrical Supply System (simplified)





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