# CHAPTER 2

# ELECTRICAL INSTALLATION – DESCRIPTON

# Chapter 2

# ELECTRICAL INSTALLATION - DESCRIPTION

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## LIST OF ILLUSTRATIONS



### Introduction

**1.** The purpose of this chapter is to describe the functioning of the electrical circuits in the aircraft. The schematic diagram shows the theoretical arrangement of the circuits. The cross references underneath the various circuits refer to the routing charts issued with Chapter 1 of this section. For a detailed description of the functioning of the components, reference should be made to the appropriate volumes in the list of Air Publications given at the beginning of this book.

### POWER SUPPLY

**2.** Power is supplied by an engine-driven, shunt wound generator, Type HX2, a detailed description of which is given in A.P.1095C, Vol. 1, Sect. 5, Chap. 10. The generated voltage is controlled by a Type A voltage regulator panel which includes a Type D2 cut-out. The latter prevents the possibility of the generator field being reversed should its voltage fall below that of the accumulator. If for any reason the generator fails, or a fault develops in the main supply leads, this is indicated by a power failure warning lamp, a description of which is given in A.P.1095C, Vol. 1, Sect. 8, Chap. 1. Pre-mod. 393 aircraft are fitted with a Type KX generator and a Type F 24 voltage regulator.

### STARTING

**3.** The operation of the starting cycle is fully described in A.P.1095C, Vol. 1, Sect. 8, Chap. 2. This description conforms to that used on this aircraft, except that, an auxiliary switch is connected in series with contact 5 of the time switch and the coil of the master relay. This allows the pilot to delay the final stage of the starting cycle until such time as the impeller shaft has reached the correct number of revolutions per minute. Non-operation of the master relay prevents the starting resistance from being short-circuited; the motor cannot, therefore, run up to normal full speed. Care must be taken to ensure that the ground/flight switch is in the FLIGHT position when starting the engine. Failure to do this will prevent the positive supply being connected to the starter relay coils, the non-operation of which will prevent the starting cycle from being completed, and there is a possibility of the starting resistance being burnt out. The reason for this is, there are two external supply sockets, one for testing the electrical services, and one for starting. The coils of the relays are connected to the external

supply socket (testing) and not to the external supply socket (starting).

### UNDERCARRIAGE WARNING

**4.** When the aircraft undercarriage is down and locked, the green lamp circuit is completed via the leg-lock and door-lock micro switches. The throttle warning circuit is broken. Immediately the leg-lock is released, the green lamp circuit is broken at the leg-lock micro switch and the red lamp circuit completed. A positive supply is connected to the throttle warning circuit. The warning lamp will now glow should the pilot throttle back and the undercarriage be unlocked. This circuit is completed via the throttle micro switch. When the undercarriage is up and locked, the leg-lock micro switch returns to its normal position, and the door-lock micro switch opens its contacts. The red lamp goes out, and the green lamp circuit is broken at the door-lock micro switch. The positive feed to the throttle warning circuit is now via the leg-lock micro switch contact D and the up-lock micro switch contact D. No lamps glow.

| Undercarriage Position | Micro Switch Position | Circuit Affected |
|---|---|---|
| UP and LOCKED | DOOR-LOCK CLOSED<br>UP-LOCK CLOSED<br>LEG-LOCK NORMAL | RED and GREEN LAMPS OUT, THROTTLE WARNING POSITIVE SUPPLY CONNECTED |
| INTERMEDIATE | DOOR-LOCK OPEN<br>UP-LOCK OPEN<br>LEG-LOCK CLOSED | RED LAMPS IN, GREEN LAMPS OUT, THROTTLE WARNING POSITIVE SUPPLY CONNECTED |
| DOWN and LOCKED | DOOR-LOCK OPEN<br>UP-LOCK OPEN<br>LEG-LOCK NORMAL | RED LAMPS OUT, GREEN LAMPS IN, THROTTLE WARNING CIRCUIT BROKEN |

### UNDERCARRIAGE LEVER LOCK

**5.** This circuit consists of two micro switches connected in series with the lever lock solenoid, When the aircraft is on the ground, undercarriage UP cannot be selected as the lever is locked in the DOWN position by means of a solenoid-operated plunger, the circuit being broken at the leg micro switch and the contacts being open. When the aircraft is airborne, the leg micro switch contacts close, and there is sufficient movement in the lever to close the contacts of the lever-lock micro switch ; this completes the solenoid circuit and causes the plunger to be withdrawn. allowing the pilot to select undercarriage UP. An override switch, which short-circuits the leg micro switch, is fitted for use in case of emergency.

### FIRE EXTINGUISHER

**6.** There are two separate operations in the fire extinguisher circuit.

(1) Warning
(2) Operation of the bottles

The fire warning circuit consists of four flame switches wired in parallel, the operation of any one completing the circuit to the warning lamp. The fire extinguisher bottle is discharged by depressing a push-switch fitted in the cockpit.

### FUEL CONTENTS GAUGES AND FLAP POSITION INDICATOR

**7.** The fuel contents gauges, flap position indicator and the associated transmitters are operated on the Desynn system, a detailed description of which is given in A.P.1275A, Vol. 1, Sect. 1, Chap. 12.

### FUEL PRESSURE AND CABIN PRESSURE WARNING

**8.** The fuel pressure and cabin pressure warning systems are simple series circuits, in which the operation of a pressure switch in the fuel system and a valve in the pressure cabin close a pair of contacts which complete the circuit and cause the appropriate lamp to glow. A resistance is connected in the fuel warning circuit to reduce the current to a safe value.

### BOOSTER PUMP

**9.** The booster pump is driven by a totally enclosed compound wound, two-pole motor, and is controlled by a single-pole switch. The power supply is connected through a suppressor to prevent electrical interference with the radio equipment.

### OIL THERMOMETER

**10.** The indicator is a normal moving coil instrument, designed to show the

out-of-balance current in a Wheatstone bridge, the four arms of which are made up of three fixed resistances contained within the case, the fourth being embodied in the thermometer bulb. Any variation of temperature in the fourth arm will lead to a variation of resistance and a corresponding out-of-balance current in the indicator. The resistance change is proportional to the change of temperature; therefore, with a given supply voltage, the out-of-balance current will indicate a measure of the temperature.

### R.I. COMPASS AND GYRO GUN SIGHT SUPPLY

**11.** The power supply to these two circuits is taken through separate suppressors; the gyro gun sight supply is also connected to a voltage regulator to ensure that the supply voltage is maintained at 22 volts; any variation from this voltage will cause the sight to indicate incorrect aiming allowance. For further details see A.P.1275E.

### ENGINE SPEED INDICATOR

**12.** This circuit consists of a 3-phase generator driven through a gear train meshing with a pinion on the impeller shaft. The generated 3-phase currents drive a 3-phase self-starting synchronous motor in the indicator. A magnetic drag element co-axial with the motor moves the pointer over the dial calibrated in r.p.m. thus providing a continuous indication of the impeller shaft speed.

### PYROMETERS

**13.** These instruments are used to give the temperatures of the rear bearing and the exhaust gases. A full description of their construction and operation is given in A.P.1275A, Vol. 1, Sect. 4.

### LIGHTING

**14.** The navigation, identification, and cockpit lighting are standard installations, controlled by single-pole switches or dimmer switches with an off position.

### GUN FIRING

**15.** Before the guns can be fired the nose-wheel micro switch contacts must be closed, and the safety flap on the selective firing switch opened. The raising of the safety flap connects a supply to the coil of the master relay through the nose-wheel micro switch contacts. The function of the master relay is to connect an earth to the gun firing solenoids and to the coils of the gun firing relays. Depressing one end of the firing bar causes group 1 gun relay to operate and the closing of its contacts energizes group 1 gun firing solenoids. Depressing the other end of the firing bar causes group 2 guns to be fired, and depressing the firing bar in the centre causes both groups of guns to be fired.

### CAMERA GUN

**16.** The camera gun may be used independently when the circuit switch on J.B.1 is closed. The camera mechanism is then operated by pressing a switch on the head of the control column with the safety flap down. A double-pole relay then closes to complete the circuit. With the safety flap raised, the camera will operate when the guns are fired, by pressing the gun firing bar switch. The camera will then continue to operate until the firing switch is released. When R.P. on the Bombs/R.P. switch is selected and the camera switch (coupled mechanically with the Bombs/R.P. switch) is closed, the camera will continue to operate if the camera switch on the head of the control column is pressed at the commencement of the run up to the target. The double-pole relay will then be held closed and the camera will continue to operate until the R.P. firing switch (on the throttle lever) is pressed. This will cause a relay to be opened and the camera will immediately cease to operate. Should, however, the camera mechanism be started by pressing the switch on the control column, it will continue to operate without the firing switch being pressed. It is, therefore, essential that the coupled camera and Bombs/R.P. switches should be set to neutral. This will open a relay and the camera will cease to operate.

### BOMB RELEASE

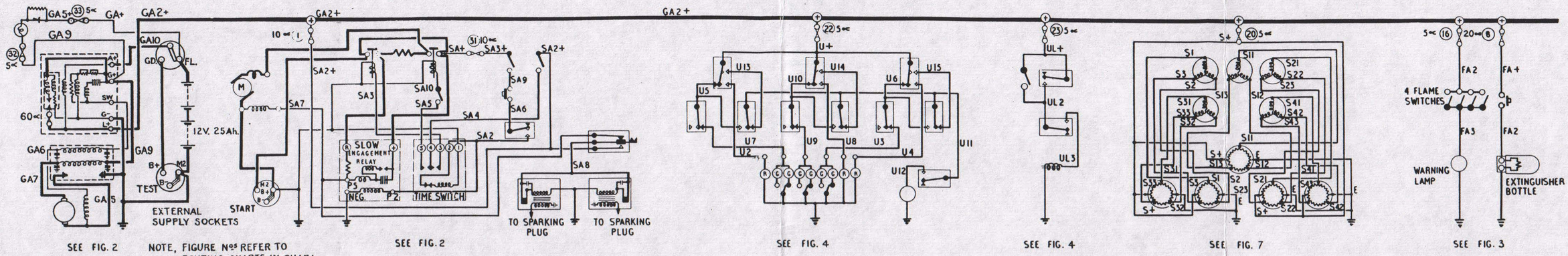
**17.** This circuit consists of a standard two-way bomb distributor, distributor switch, nose and tail fuzing switches, port and starboard selector switches, Bombs/

R.P. selector switch, and a firing push. When using the distributor there is a delay of 0·3 second in the release of the starboard bomb after the port bomb has been released. If it is desired to release the starboard bomb first, connections 5 and 6 on the distributor should be reversed.

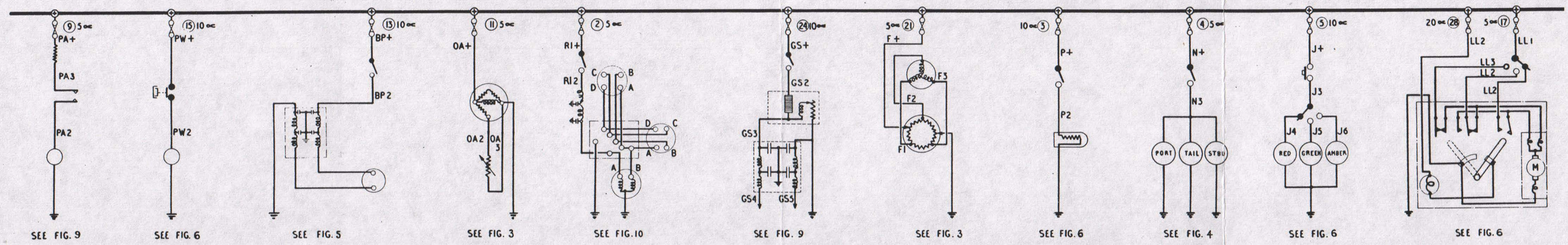
## R.P. FIRING

**18.** The R.P. circuit consists of an auto selector switch, a relay unit and resistance box. The circuit is inter-connected with the camera gun circuit, and is so designed that the camera stops at the instant the R.P.'s are fired.

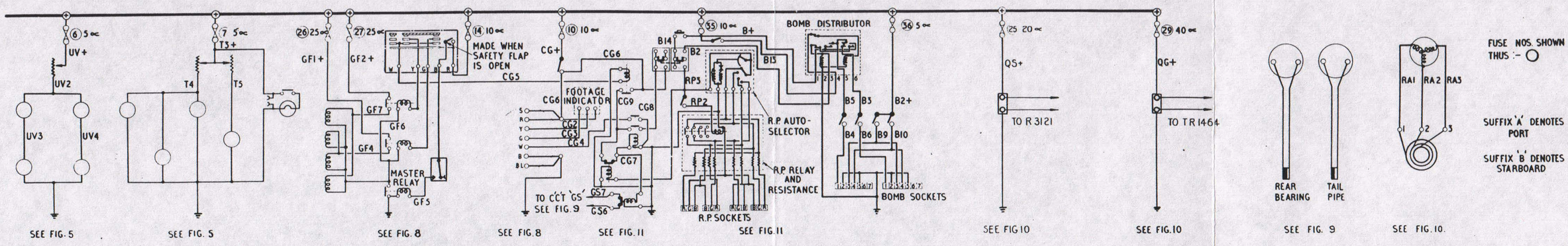
G2671 M15805 2/49 360 C.B.&S.Ltd. Gp.30




GA GENERATOR — SA STARTER AND BOOSTER COILS — U U/C INDICATOR — UL U/C LEVER LOCK — S FUEL GAUGES — FA FIRE EXTINGUISHER




PA FUEL PRESSURE WARNING LAMP — PW CABIN PRESSURE WARNING LAMP — BP BOOSTER PUMP — OA OIL THERMOMETER — RI COMPASS SUPPLY — GS GYRO GUNSIGHT SUPPLY — F FLAP INDICATOR — P HEATED PRESSURE HEAD — N NAVIGATION LAMPS — J IDENTIFICATION LAMPS — LL LANDING LAMP




UV ULTRA VIOLET LAMPS — T COCKPIT LAMPS — GF GUN FIRING — CG CAMERA GUN — RP FIRING CONTROL — B BOMB RELEASE — QS A.R.I. 5131 SUPPLY — QG A.R.I. 5229 SUPPLY — PYROMETERS — RA ENGINE SPEED INDICATOR

# FIG. I SCHEMATIC DIAGRAM OF ELECTRICAL SERVICES

G2672 M15806 2/49 360 C.B.& S.LTD. GP55.

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