# GROUP B — ENGINE SERVICES

## LIST OF CONTENTS



## LIST OF ILLUSTRATIONS



*Introduction*

**1.** The information in this group covers the electrical starting of the engine besides the associated circuits affecting its satisfactory functioning. The specialist Air Publication references for the components used are listed below.

| Equipment | Air Publication |
|---|---|
| Starter motor, Type C3804/1 | 4343D, Vol. 1, Sect. 1, Chap. 14 |
| Time switch, Type D8403 | 4343C, Vol. 1, Sect. 3 at a later date |
| Slow-engagement relay, Type U0704 | 4343, Vol. 1, Sect. 13, Chap. 2 |
| Heavy-duty relay, Type U | 4343C, Vol. 1, Sect. 3 at a later date |
| Relay, Type Q1 | 4343C, Vol. 1, Sect. 3, Chap. 5 |
| High energy igniter unit, Type C10TS/1 | 1374G, Vol. 1, Sect. 4, Chap. 2 |
| Booster coil, Type C2TS | 1374E, Vol. 1, Sect. 1 at a later date |
| Re-light push-switch | 4343C, Vol. 1, Sect. 1 at a later date |
| Fuel booster pump, Type BP1, Mk. 4 | 4343D, Vol. 1, Sect. 7, Chap. 15 |
| Suppressor, Type B.5 | 4343C, Vol. 1, Book 3, Sect. 5 |
| Pressure switch, Mk. 1E* | 1275A, Vol. 1, Sect 24, Chap. 17 |
| Resistor | 1275A, Vol. 1, Sect 24, Chap. 17 |
| Lucas pump, GC.221/19N (single pump engine) | 4282A, Vol. 1 |
| Lucas pump, GC.237/11J (dual pump engine) | 4282A, Vol. 1 |

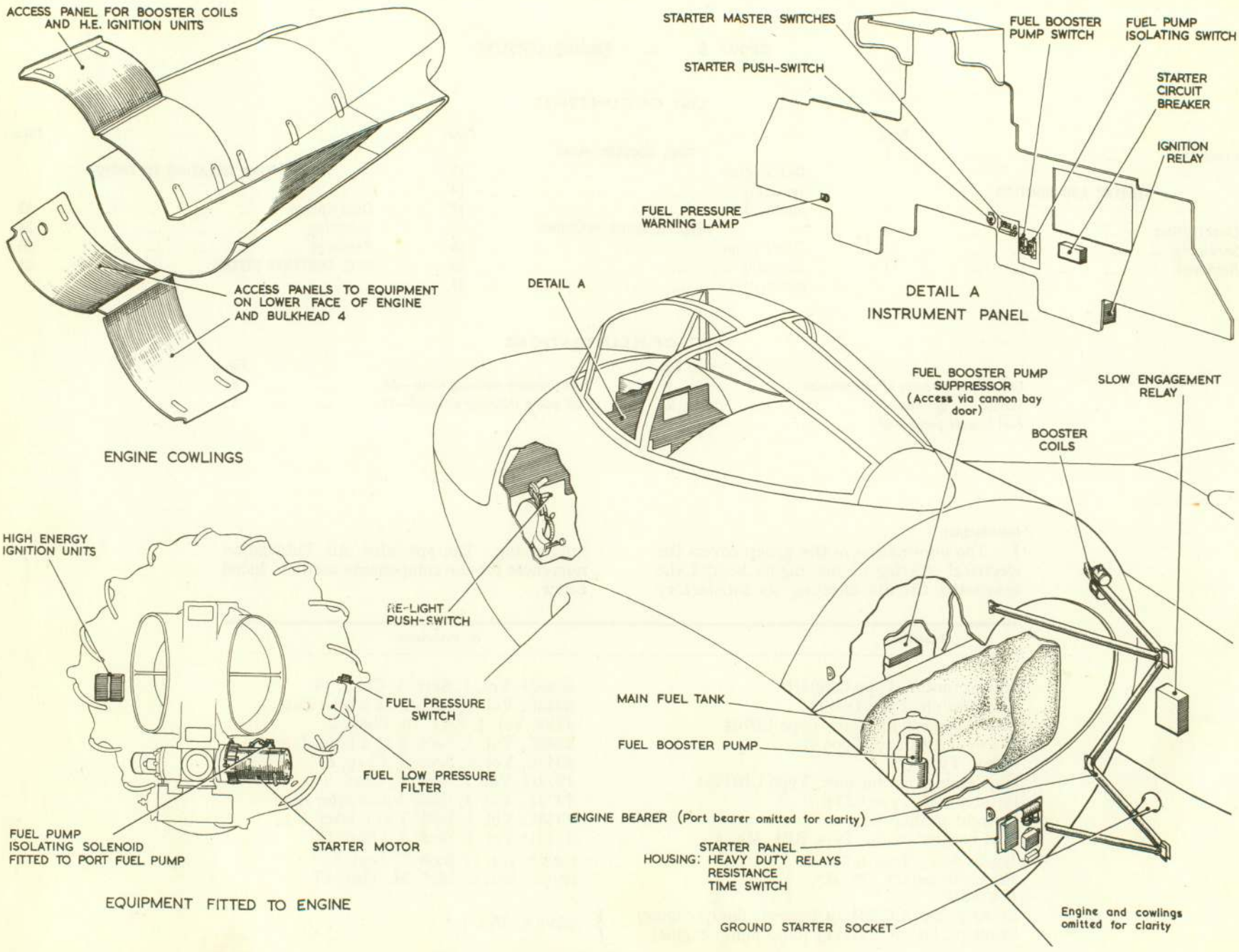


Fig.1. Location and access of components

## STARTER AND IGNITION

**Description**

**2.** An electric starter motor is used, the motor being geared to the engine impeller shaft via the engine lower accessories gearbox. A separate external supply socket is fitted to the starboard side of the engine bay beneath the starboard wing root to allow an external 24-volt d.c. supply to be utilized for turning the starter motor.

**3.** The motor is allowed to turn at three separate speeds, these speed variations being obtained by connecting resistors in series with the motor. Two such resistors are used and both are connected in circuit when the starting cycle is begun, as shown in fig. 2.

**4.** With the 10 amp. circuit breaker and the starter master switch set to ON, pressure on the starter push-switch actuates a time switch and a slow-engagement relay. The push-switch may now be released as the time switch automatically controls the starting cycle for its 30 seconds duration.

**5.** At this stage the starter motor will turn slowly, being excited via two resistors (one in the slow-engagement relay, the other a separate starting resistance) and a Type Q1 relay which supplies the booster coils, or high energy igniters, if fitted, will be energised, and ignition commence.

**6.** As the time switch unwinds contacts 3 and 4 close, thereby operating one of the heavy-duty relays and short-circuiting the starting resistor in the slow-engagement relay. The starter motor will therefore speed up.

**7.** As the time switch further unwinds, contacts 4 and 5 close, short-circuiting the starter resistor between the two heavy-duty relays and supplying the starter motor direct from the external 24-volt d.c. supply, and thereby increasing its speed to a maximum.

**8.** Thirty seconds after the push-switch has been originally depressed, the time switch becomes fully unwound, opening all contacts and thereby de-energising the starter circuit. By this time, combustion should have occurred and the engine be running.

**Note . . .**

*It is important that the starting cycle is completed BEFORE removing the external supply plug from the external supply socket of the aircraft.*

**9.** The engine may be re-lit in flight by depressing the engine re-light push-switch, fitted in the H.P. fuel cock lever of the port throttle quadrant. This completes the circuit to energise the Type Q1 relay feeding the ignition system without operating the engine starting timing sequence.

**WARNING . . .**

*The discharge of the capacitors of the high energy igniter units through the human body can cause serious or FATAL injuries. Before servicing the high energy igniter system, the L.T. plugs to both units are to be DISCONNECTED FOR AT LEAST ONE MINUTE. This will allow the stored capacitor energy to dissipate, and obviate inadvertant discharge.*

**Servicing**

**10.** The servicing instructions for the starting system components will be found in the specialist Air Publications listed in para. 1.

**Removal**

**11.** The starter motor is secured to the engine lower accessories gearbox by eight bolts, the electrical connections being secured by terminal nuts. Removal and refitting is straightforward, and should be carried out in conjunction with an engine tradesman.

**12.** The time switch, starter resistor and both heavy duty relays are fitted to a mounting panel, the panel being secured to the aft, lower face of bulkhead 4 by five 2 B.A. bolts and aerotight nuts. Both heavy-duty relays are covered by a waterproofed Kalanoide sheath. The method of panel removal and component removal is obvious on examination.

## FUEL BOOSTER PUMP

**Description**

**13.** A fuel booster pump is fitted in the base plate of the main fuselage tank. The pump motor is controlled by a single-pole toggle switch, which has a spring-loaded guard, and is fitted to the instrument panel, whilst a suppressor is connected in series with the pump motor to eliminate any radio interference set up by operation of the motor. The suppressor is fitted to the cannon bay roof.

**Servicing**

**14.** Instructions for servicing the fuel booster pump circuit components are to be found in the specialist Air Publications listed in para. 1.

**Note . . .**

*Ensure that the pump is immersed in fuel BEFORE operating.*

**15.** The efficiency of the pump may be checked by viewing the fuel pressure warning lamp. With the low pressure fuel cock ON and the high pressure fuel cock OFF, switch on the pump motor and check that the fuel pressure warning lamp goes out almost immediately due to the pump delivering at the correct pressure.

**16.** The normal current consumption for this particular fuel pump is 7 amp. It is essential that the vent gauze at the base of the pump should be kept clean to aid ventilation.

**Removal**

**17.** The fuel pump must be removed and refitted in conjunction with the engine tradesman, as the pump is sealed to the fuel tank.

## FUEL PRESSURE WARNING

**Description**

**18.** Should the pressure delivery from the immersed fuel booster pump fall below 1·5 p.s.i., a pressure switch, fitted to the outlet of the fuel low pressure filter in the engine

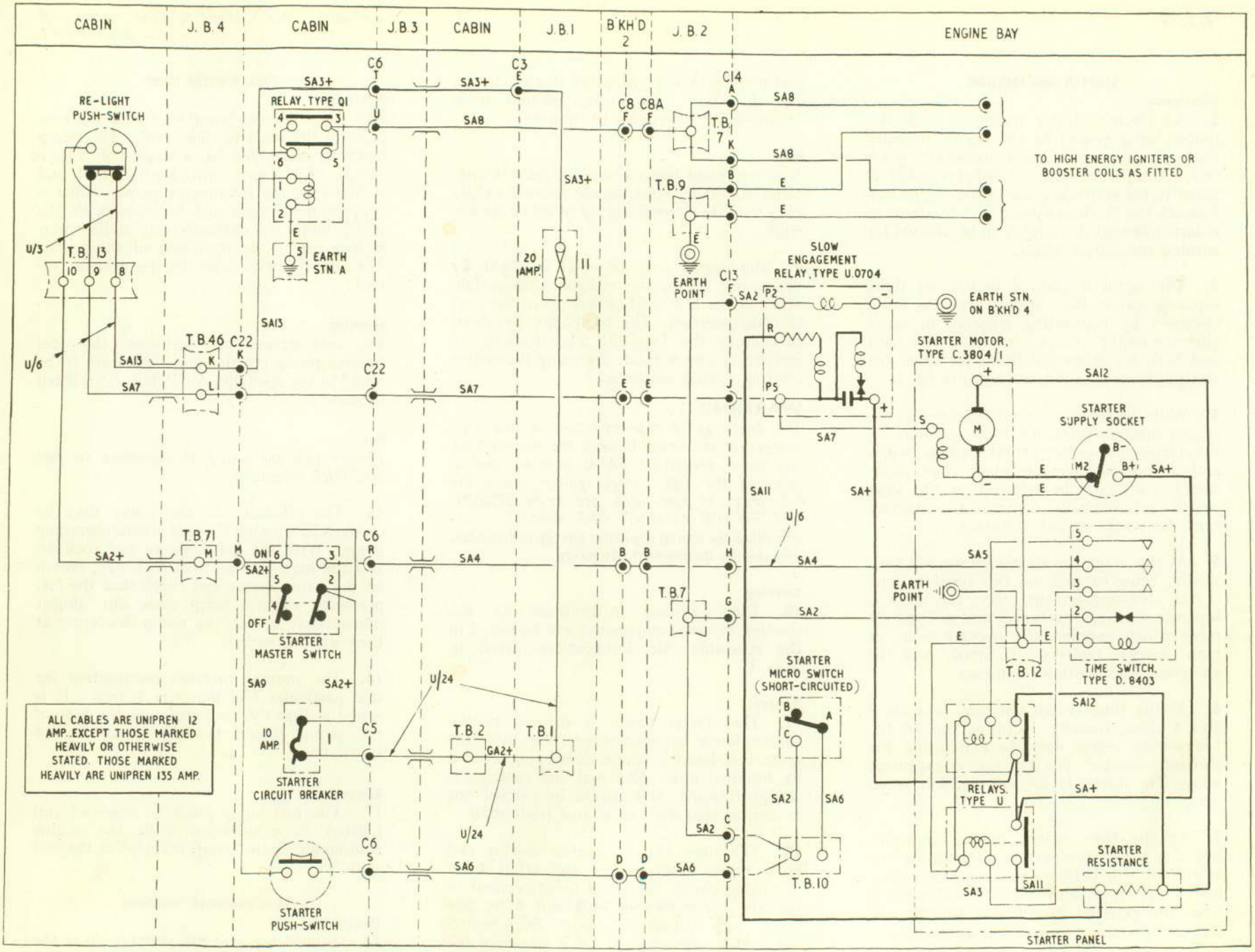


Fig. 2. Starter and ignition—SA

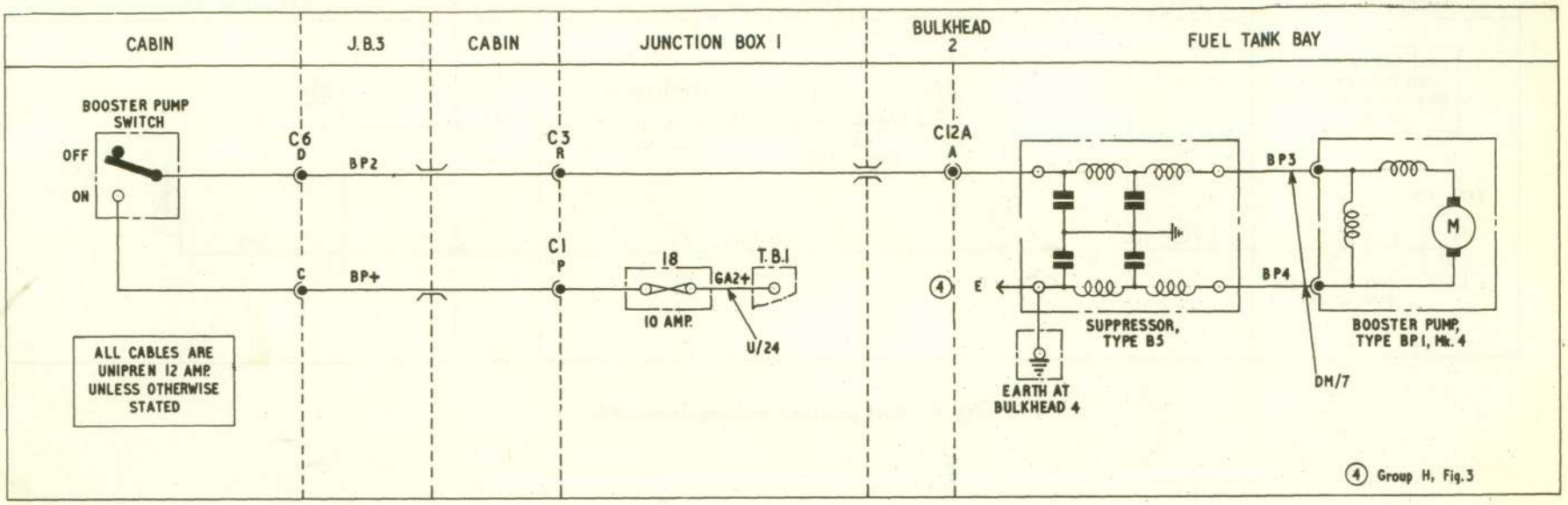


**Fig. 3. Fuel booster pump—BP**

bay, will close and cause a lamp mounted on the instrument panel to light.

**19.** The lamp is supplied with d.c. via a resistor fitted inside J.B.1, and the pressure switch, the resistor being incorporated to limit the current through the switch contacts. A 6-volt filament lamp is used in the circuit.

**Servicing**

**20.** Servicing instructions for the pressure switch, and a description of both switch and resistor, are contained in the specialist Air Publication listed in para. 1.

**Removal**

**21.** The pressure switch is the responsibility of the engine tradesman. The resistor is secured inside J.B.1 by two 4 B.A. screws and stiffnuts.

### FUEL PUMP ISOLATING SOLENOID

**Description**

**22.** The engine may have either one or two engine-driven fuel pumps. In both instances, however, an isolating solenoid is fitted to obviate the danger of a fuel cut to the engine due to the failure of the barometric pressure control of the fuel system (Sect. 4, Chap. 2).

**23.** The solenoid is controlled by a single-pole toggle switch, which has a spring-loaded guard, fitted to the instrument panel. In the dual pump installation, the solenoid is an integral part of the engine-driven fuel pump fitted to the lower starboard side of the engine wheel case, but in the single pump installation, the solenoid is an integral part of the engine-driven fuel pump fitted to the lower port side of the engine wheel case.

**Servicing**

**24.** The solenoid, being an integral part of the pump, is described in the specialist Air Publication dealing with the pump, as listed in para. 1.

**Removal**

**25.** The solenoid cannot be removed from the pump; therefore, if the solenoid develops a fault, the pump must be changed, this being the responsibility of the engine tradesman.

### FUEL CONTENTS SYSTEM

**26.** The power unit of the fuel contents system installation is supplied with d.c., the system itself being described in Chapter 2, Appendix 1, Group D of this Section.

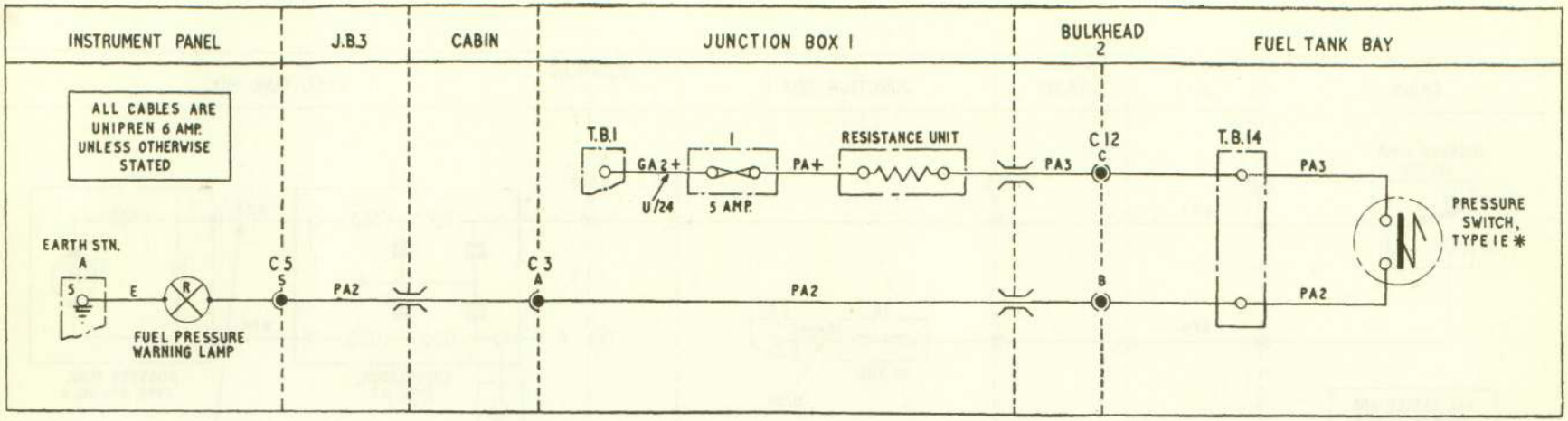


Fig. 4. Fuel pressure warning lamp—PA

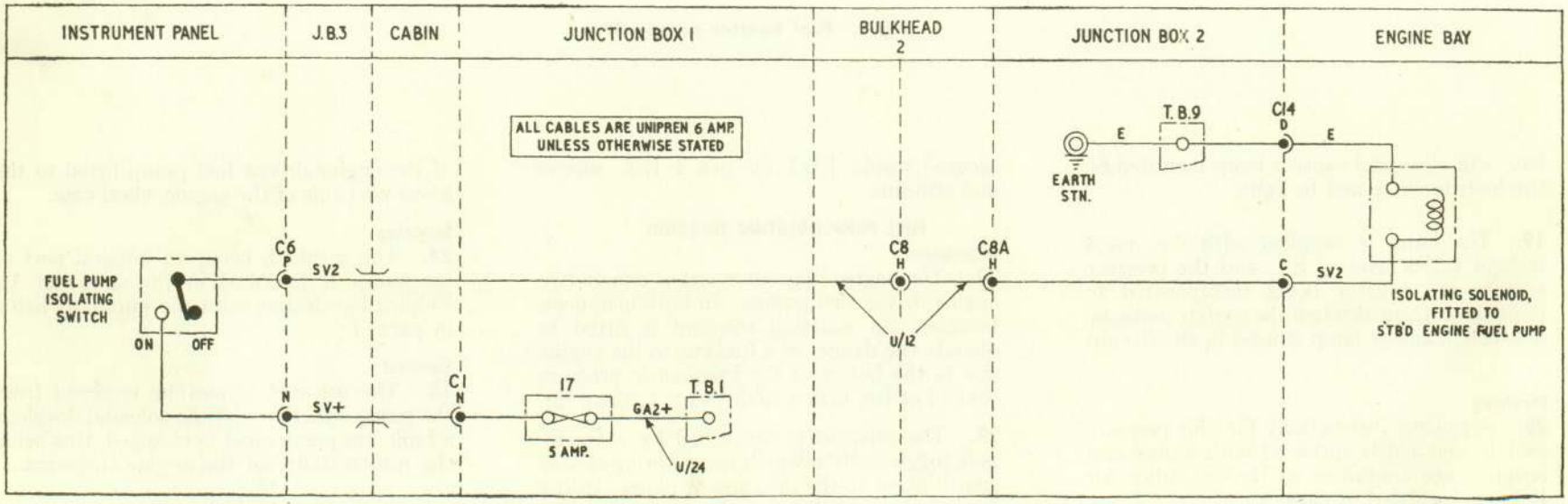


Fig. 5. Fuel pump isolating solenoid—SV