# Group G WING FOLDING

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INTRODUCTION

1. This group contains information concerning the wing-fold warning circuit. A description of the wing-fold mechanism is given in Sect. 3, Chap. 2. Details of individual items of equipment will be found in the appropriate specialist Air Publications, listed below.

| Equipment | Air Publication |
|---|---|
| Micro switches, Type 1a | A.P.4343C, Vol.1, Sect. 1 |
| Instrument lamp, Type C (Stores Ref. 5CX/2282) | A.P.4343E, Vol.1, Sect. 7 |
| Magnetic indicators | A.P.4343E, Vol.1, Sect. 18 |

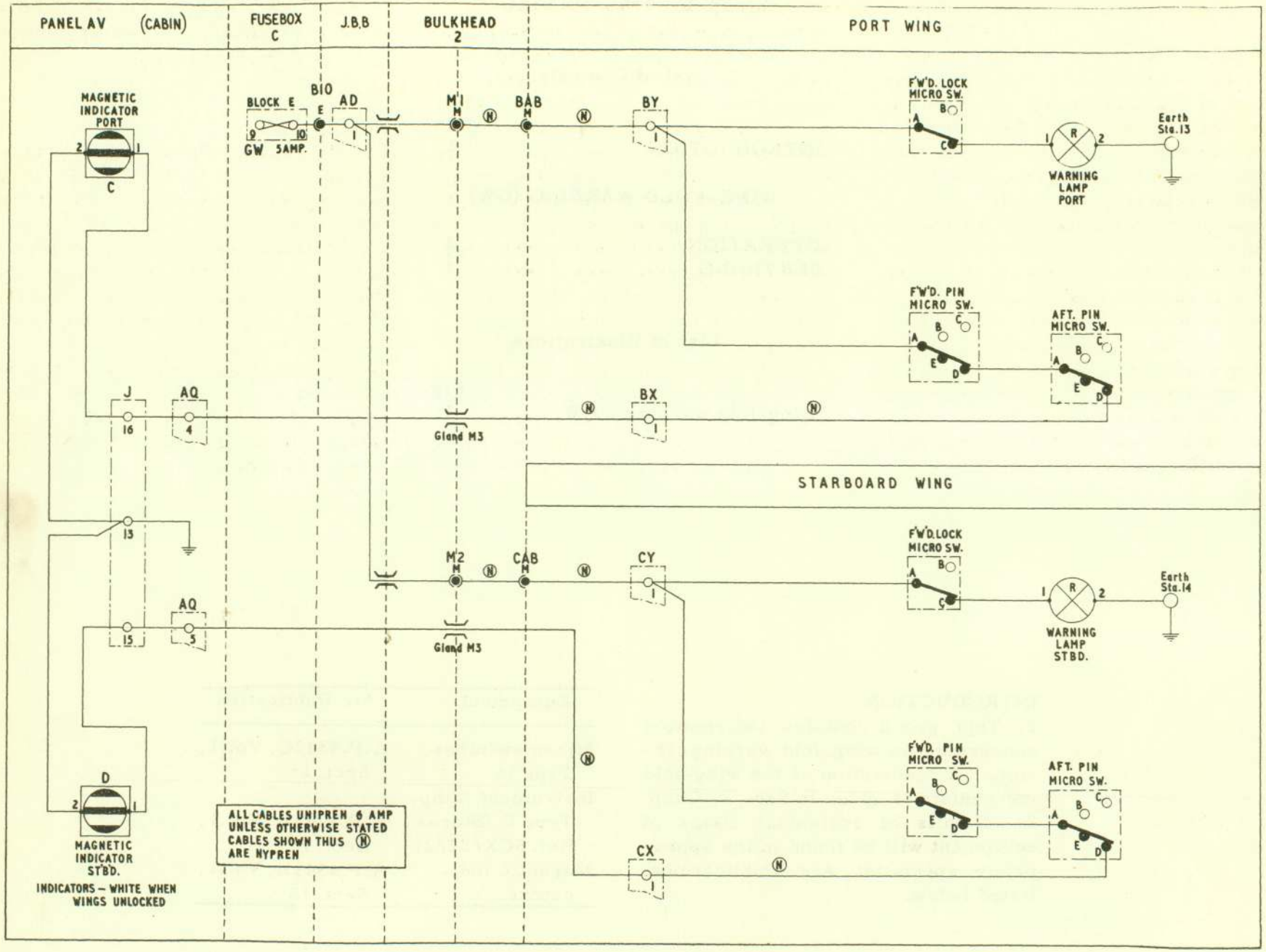


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Fig.I. Wing fold warning–GW

## WING-FOLD WARNING (GW)

### OPERATION

2. There are two separate indicators used in conjunction with the wing-fold locking mechanism. Two magnetic indicators, positioned on the port panel G, give warning when the wing-fold locking is in an unsafe condition. In addition, there are two instrument lamps, housed in a cylindrical container which has a red filter cover. These instruments lamps, Type C (Stores Ref. 5CX/2282) emerge from slots in the port and starboard upper wing surfaces, respectively, inboard of the wing-fold joints. While both sets of indicators are directly connected with wing-fold warning, they give different indications of wing-fold lock movement. The external lamps indicate when the safety locking pins are withdrawn from the forward main locking bolts, while the magnetic indicators in the cabin show white when the main locking bolts are withdrawn. Both sets of indicators are operated by micro switches actuated by wing-fold lock movement. A single micro switch controls the supply to each wing indicator lamp warning device, while the supply to each magnetic indicator is controlled through two micro switches connected in series; one is actuated by the forward main locking bolt withdrawal, the second by the aft main locking bolt withdrawal. Normally, all locking-bolt movement will occur instantaneously whenever the wing-fold selector lever is operated. The mechanical details of the wing-fold assembly are shown in Sect. 3, Chap. 2, fig. 5.

### SERVICING

3. The micro switches and cable connections should be maintained in a secure, clean condition free from dirt, moisture and corrosion. Periodically examine the indicator lamps in the wings for damage and alignment in the wing slots. Adjustment of micro switches must be carried out in conjunction with an airframe specialist tradesman. Access to the micro switches and the filaments of the indicator lamps in the wings can be gained only when the wings are folded.

# Group J & K ENGINE CONTROL AND R.A.T.O.

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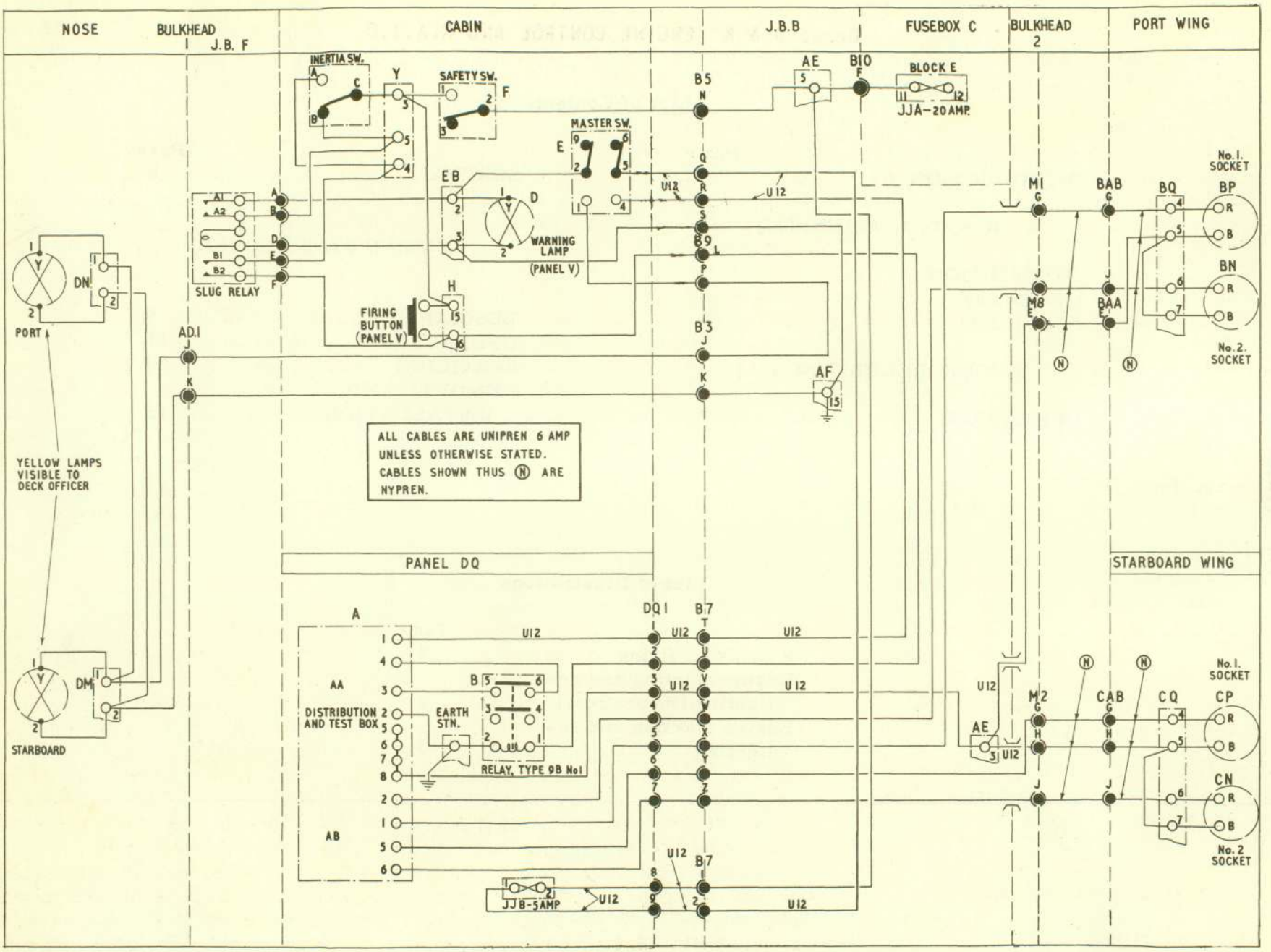


Fig.1. R.A.T.O. firing–JJ

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INTRODUCTION

1. This group contains information relating to the R.A.T.O. circuit and engine starting and relighting circuits. Details of the individual items of equipment will be found in the appropriate specialist Air Publications listed below.

| Equipment | Air Publication |
|---|---|
| Distribution box (R.A.T.O.) Type A (Stores Ref. 5CZ/2848) | |
| Inertia switch (R.A.T.O.) Type 5CW/5098 | A.P.4343C, Vol.1, Sect. 3 (at a later date). |
| Relay, Type 9B No.1 | A.P.4343C, Vol.1, Sect. 3. |
| High-energy igniter units Type C10TS/1 | A.P.1374G, Vol.1, Sect. 4. |
| Relay, Type S1 | A.P.4343C, Vol.1, Sect. 3. |
| Starter selector switch Type FJB/A/4 | A.P.4343C, Vol.1, Sect. 1. |
| Time delay switch Type FHM/A/25 | A.P.4343C, Vol.1, Sect. 3. |

## R.A.T.O. FIRING (JJ)

DESCRIPTION

2. Provision is made for mounting four rockets arranged in pairs on the outboard side of the port and starboard booms. The rockets are electrically fired, the firing being controlled either by the pilot, or automatically under catapult take-off conditions. In the latter case, the circuit is completed through the contacts of an inertia switch which close when the aircraft is catapulted from a stationary position. An amber indicator lamp, positioned on panel V, informs the pilot when the circuit is selected and ready for firing; an external pair of amber indicator lamps give a similar indication to the deck control officer. These lamps are mounted one in each side of the fuselage nose.

OPERATION

3. A special cover plate, positioned across the safety switch and master switch, permits these switches to be operated only in the correct sequence. The safety switch and master switch are located on panel V in the cabin. With the master switch closed, a supply is made to the pilot's firing push-switch on the side of the throttle-box, and through the inertia switch, contacts B-C (in the cocked position), to energize the slug relay. Contacts A1-A2 of this relay complete the circuit to the amber lamp in the cockpit. When the safety switch is closed, circuits are made to the two external lamps and to the distribution panel DQ. The circuit is now ready for firing.

4. Under take-off conditions where R.A.T.O. is required, operation of the pilot's push-switch energizes the firing relay, placing a supply through the distribution and test box to the port and starboard rockets.

5. During a catapult take-off, it is necessary that the rockets fire immediately the catapult fires. The supply through the inertia switch contacts A and C (in the tripped position) passes through contacts B1 and B2 of the slug relay to energize the firing relay, Type 9B No.1. These contacts B1-B2 remain closed for 300 milliseconds after the supply has been removed from the coil of the slug relay. This allows the firing relay to be energized for a brief period, sufficient for a supply to be fed to the rocket units.

SERVICING

6. The test procedure for this circuit is fully described in A.P.(N)1023 (7) and should be carefully adhered to. Test switches, test lamp and links are incorporated in the distribution box. The rocket mountings are described in Sect.7, Chap.2, together with details of the mechanism for jettisoning the mountings after take-off. All cable and cable connections should be maintained in clean condition, free from corrosion, particularly the external plug and socket pull-away connectors to the rockets.

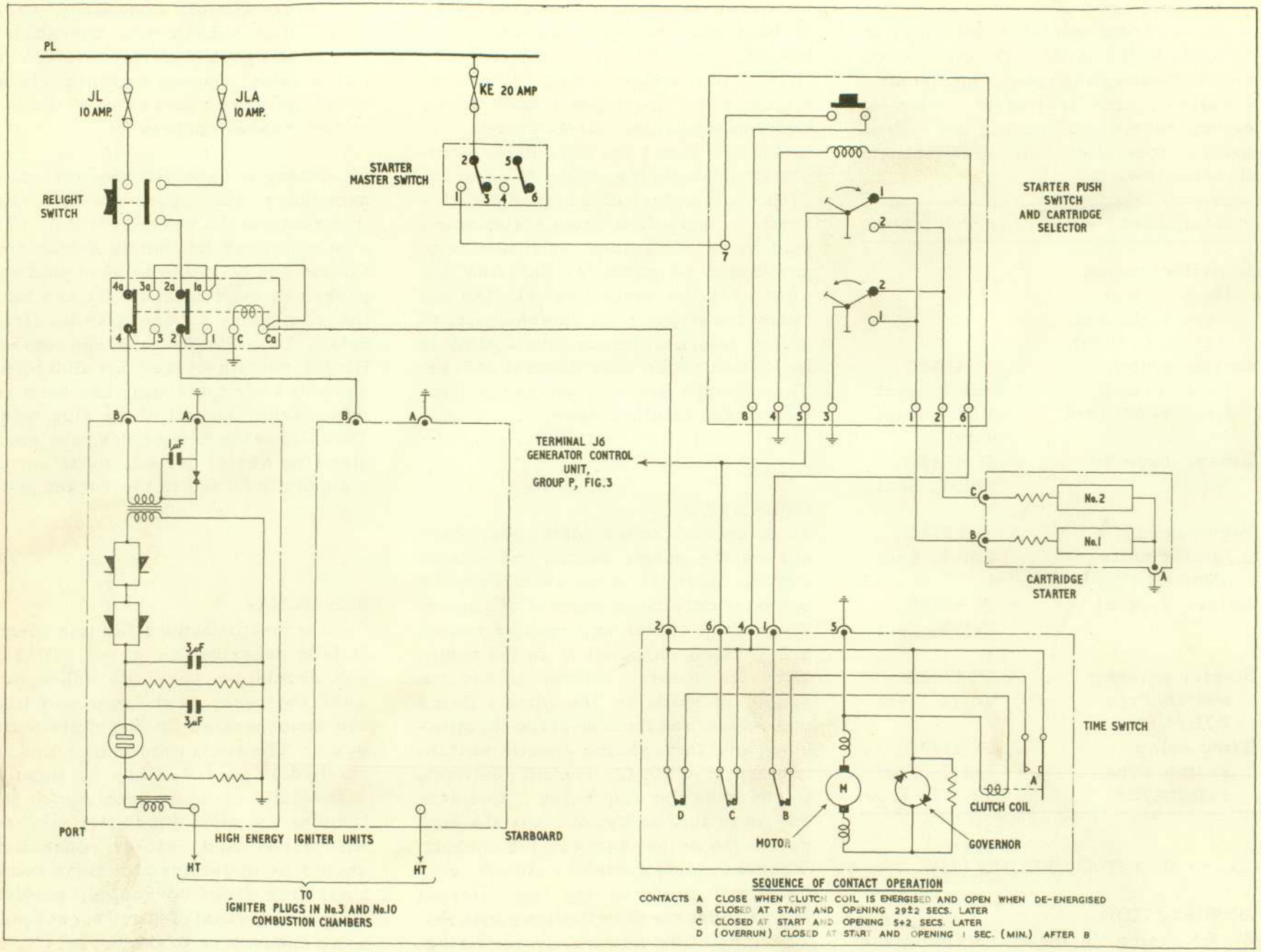


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Fig. 2. Engine starting and relighting (theoretical)

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## ENGINE RELIGHTING (JL)

### OPERATION

7. The engine relighting circuit is controlled from a double-pole push switch in the end of the H.P. cock lever on the throttle box. It is used only during flight and is normally depressed for 15 to 20 seconds. The circuit to each high energy igniter unit is via a separate fuse through the double-pole push-switch and the normally closed contacts of relay H, direct to the igniter units.

### SERVICING

8. As this circuit is used only during flight particular attention should be given to the cables and connections throughout the circuit.

## ENGINE STARTING (KE)

### DESCRIPTION

9. Equipment for engine starting comprises a turbo-starter, Type CT.0104 (A.P.1181, Vol.1 and 6, Sect.4, Chap.2), and a high-energy igniter system controlled from a combined starter and selector switch on the lower instrument panel. The starter/selector switch incorporates a spring-loaded plunger which trips a rotary barrel switch. One cartridge at a time is selected and, on depressing the starter push-button, the spring-loaded plunger is held down for a period of 30 seconds by means of a latch mechanism which is controlled by the time switch. Cartridge selection (No.1 or No.2) is made by turning the starter selector switch in a clockwise direction.

10. The electrical connections to the turbo-starter twin breech assembly is via a four-pole plug and socket located adjacent to the safety switch inspection plates. The safety switches on the top of each breech casting complete the firing circuit only when both breech caps are fully screwed home and correctly locked. As a safety measure, the electrical circuits are arranged so that the switch in No.1 breech completes the circuit to No.2 and vice-versa. In the head of each breech cap is a spring-loaded contact assembly projecting so as to make contact with the base of the cartridge. A contact strip connects this contact spring assembly with the slipper block on the outside of the cap.

### OPERATION

11. The starter master switch on the lower instrument panel must be ON, and the STARTER/SELECTOR switch set so that No.1 cartridge is selected to fire. Depressing the starter push-button will place a supply from fuse KE through the master switch and starter push, to terminal 4 of the time switch. The current goes through contacts D of the time switch to energize the clutch coil, operate the motor, and close contacts A.

12. A supply is also fed through contacts A and B to energize the hold-in of the selector switch latch, and a supply is also fed from terminal 2 of the time switch, to energize the relight control relay. Contacts C in the time switch, closed at the start of the cycle and open after 5 seconds, pass current through the starter selector, switch contacts to No.1 breech of the turbo starter, firing the No.1 cartridge.

13. The high-energy igniter units are only operative during the starting cycle period of approximately 30 seconds. The H.T. spark is applied to the surface discharge plugs mounted in No.3 and No.10 combustion chambers.

WARNING...

> The discharge of the capacitors of the high-energy igniter units through the human body can be fatal. Before servicing the ignition system the L.T. plugs to both units must be disconnected and a period of 1 minute allowed to elapse. This permits dissipation of the capacitor. The high-energy igniter unit must not be operated with the H.T. lead disconnected.

### SERVICING

14. The cables connecting the units of the starter system should be examined to ensure that there is no possibility of short-circuiting which would cause both cartridges in the turbo starter to be fired simultane-

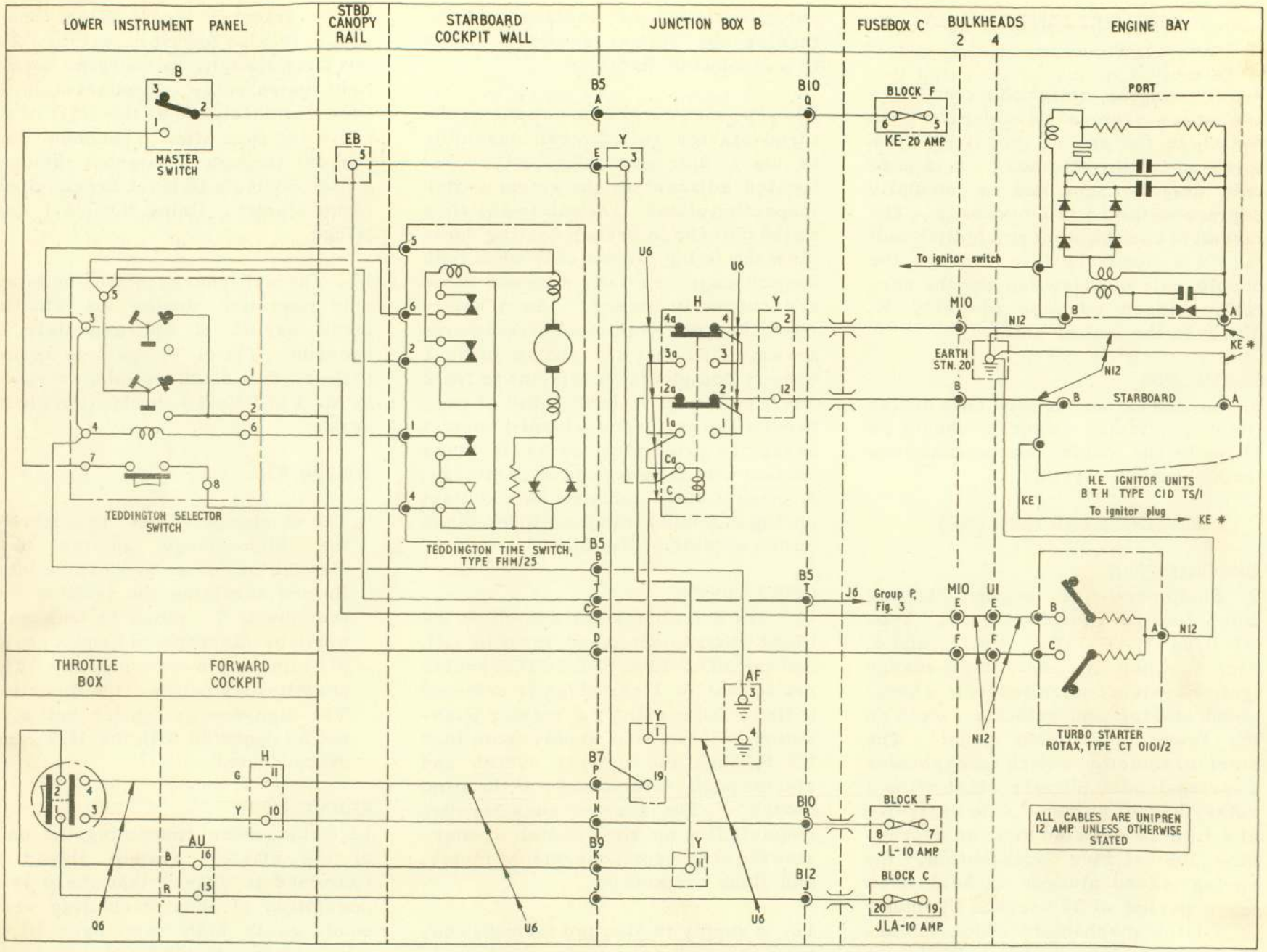



Fig. 3 Engine starting and relighting

ously. The operation of the high-energy igniter units and of the igniter plugs can be tested by pressing the relight button on the H.P. cock lever and observing the functioning of the two igniter plugs. If the plugs are operating correctly, the discharge at each plug will be clearly audible. Further details of the engine starter system are given in A.P.4320B, Vol. 1, and in A.P.1181, Vol.1 and 6.

WARNING...

In the interests of safety it should be the practice to take special precautions before carrying out any work on the starter electrical system. Render the aircraft electrically safe by switching OFF the battery isolation switch and the starter master switch. ENSURE THAT THERE ARE NO LIVE CARTRIDGES IN EITHER OF THE TURBO STARTER BREECHES.

REMOVAL AND INSTALLATION

15. Reference should be made to the diagrams for location of equipment. No difficulties should be experienced in changing any of the components.

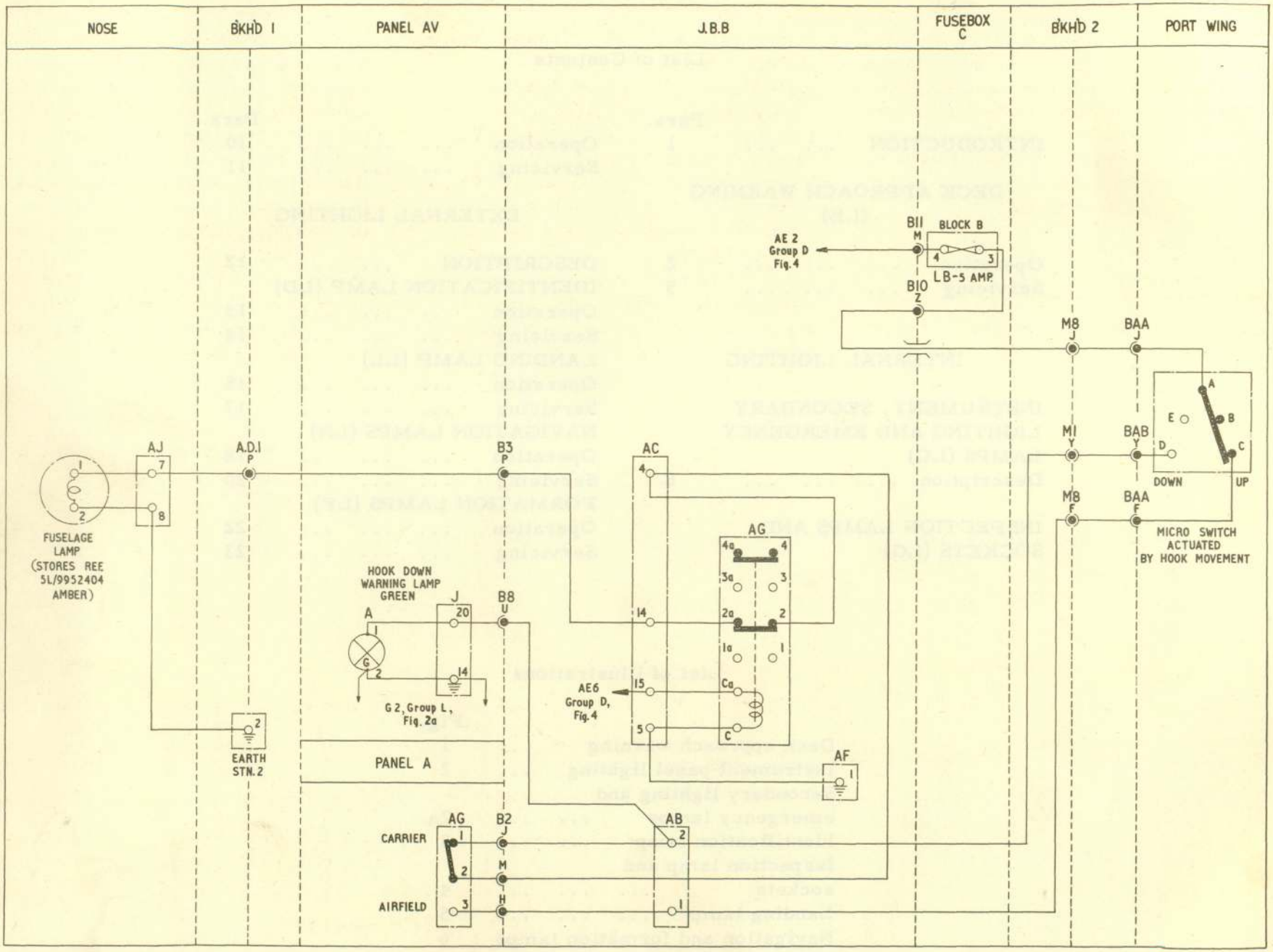



Fig. I. Deck approach warning

## DECK APPROACH WARNING (LB)

### INTRODUCTION

1. This group contains information relating to all lighting circuits on the aircraft, and the deck approach warning circuit. Details of the individual items of equipment will be found in the appropriate specialist Air Publication listed below.

| Equipment | Air Publication |
|---|---|
| Relay, Type S | A.P.4343C, Vol. 1, Sect. 3 |
| Identification lamp, Type C | A.P.4343E, Vol. 1, Sect. 7 |
| Inspection lamp, Mk. 1a | A.P.4343E, Vol. 1, Sect. 7 |
| Landing lamp, Type J | A.P.4343E, Vol. 1, Sect. 7 |
| Flasher unit, Type A | A.P.4343C, Vol. 1, Sect. 3 |

### OPERATION

2. A system of warning lamps used during deck approach fulfils two separate purposes. Firstly, a green hook-down lamp, on panel AV in the cabin informs the pilot that the arrester hook is extended. Secondly, the fact that the hook is extended and the alighting gear locked down is made apparent to the deck landing control officer by use of an amber lamp mounted on the noseleg fairing, shining forward. This lamp will light only when BOTH the arrester hook and the alighting gear are extended. The supply to both circuits is via a micro switch which is closed when the arrester hook is down. This switch, the hook micro switch, is fitted in the port wing root and is accessible through a panel at the trailing edge of the wing.

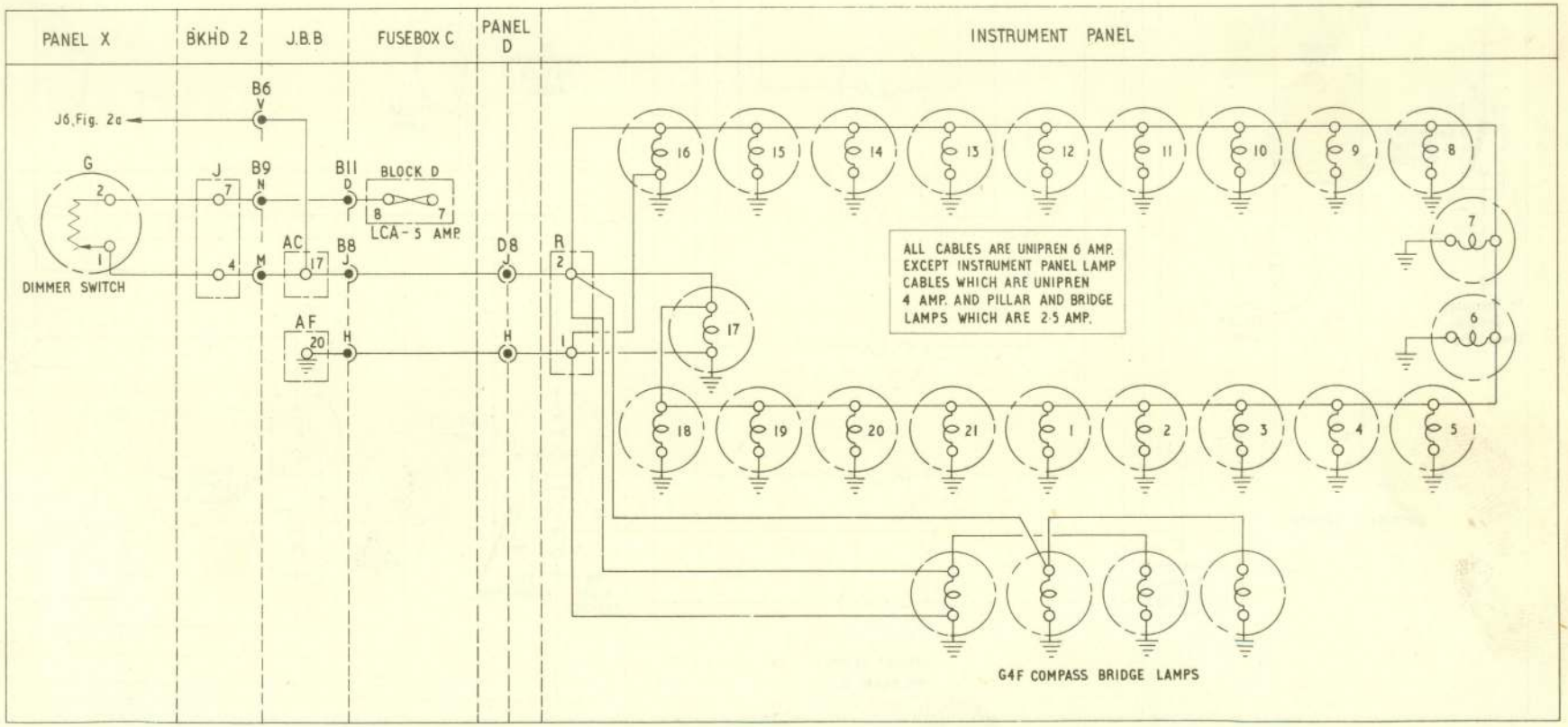



Fig. 2 Instrument panel lighting

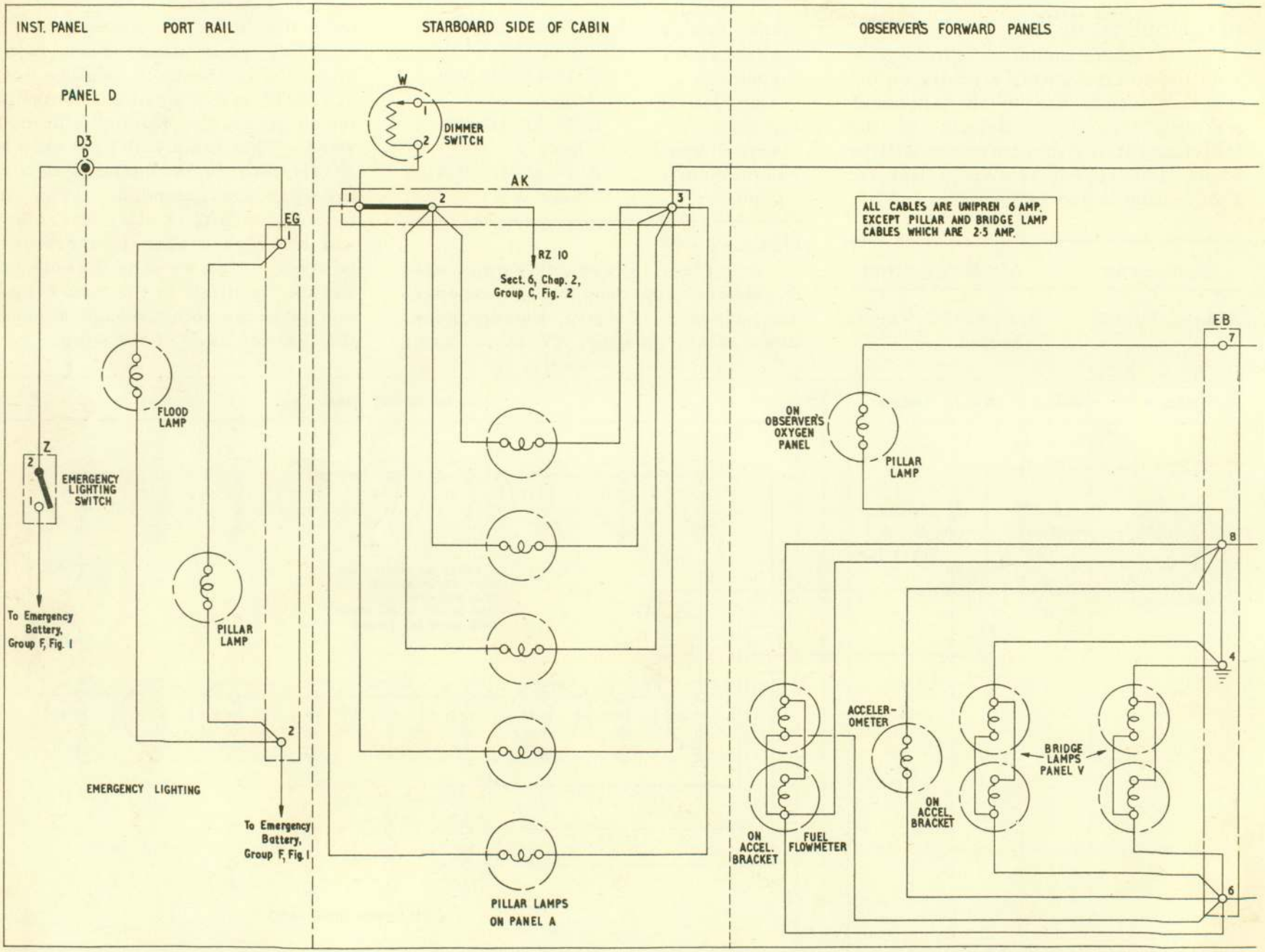
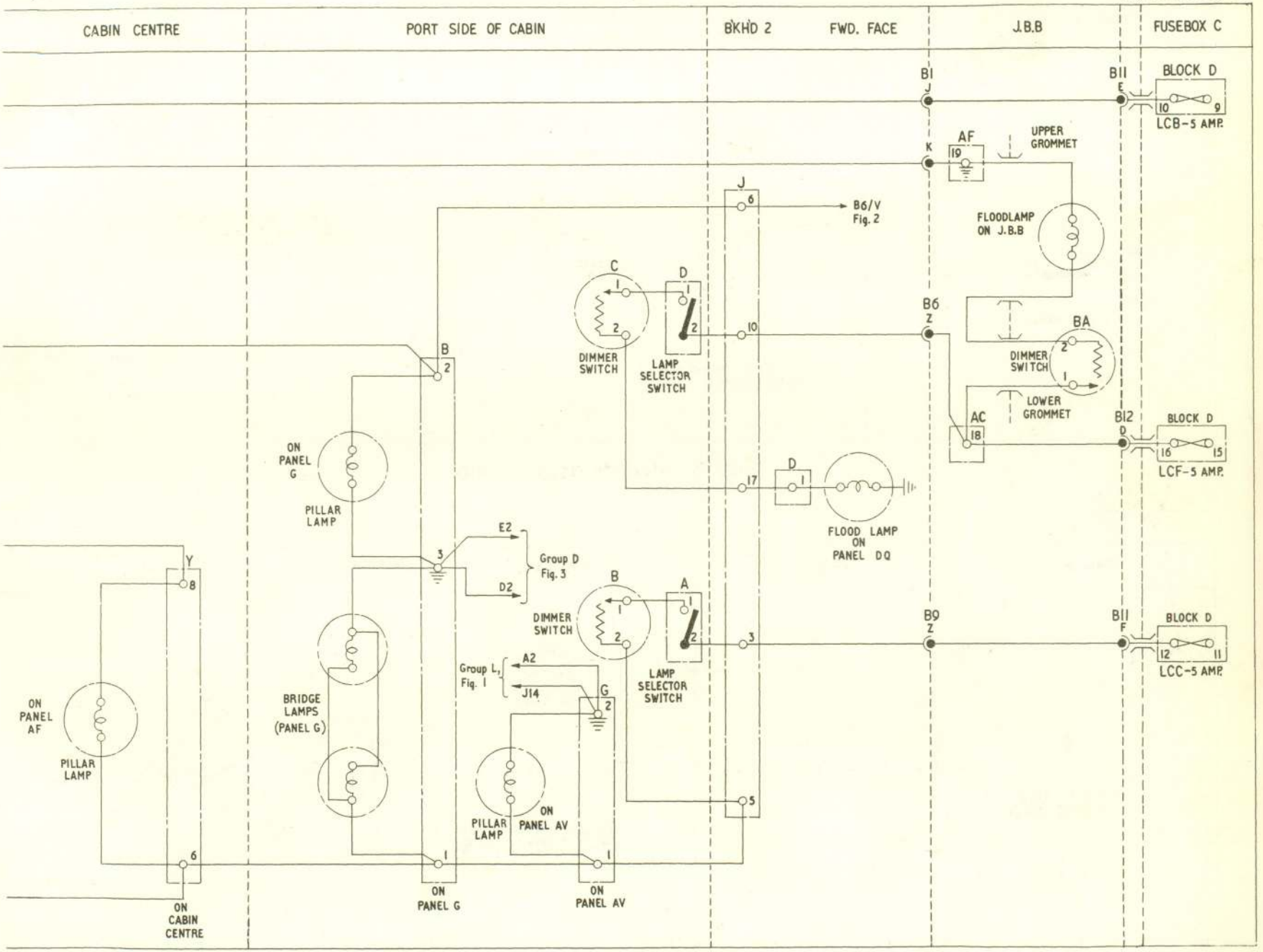



Fig. 2a Secondary lighting

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and emergency lamps

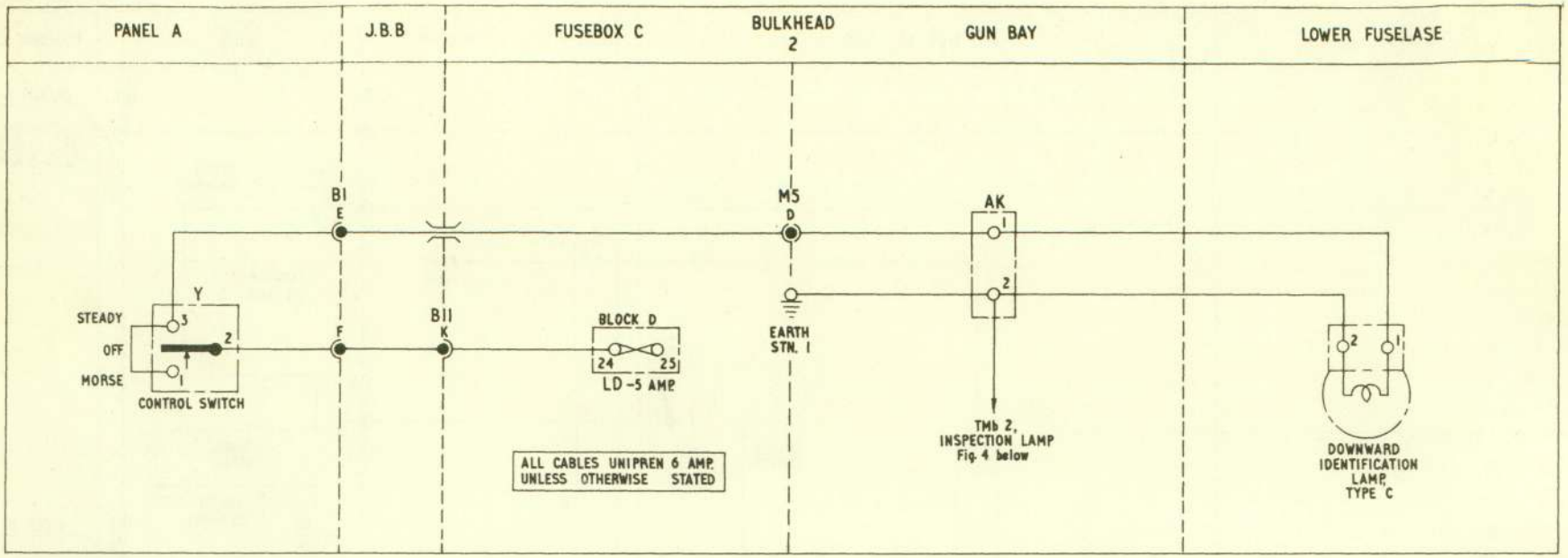


Fig. 3 Identification lamp

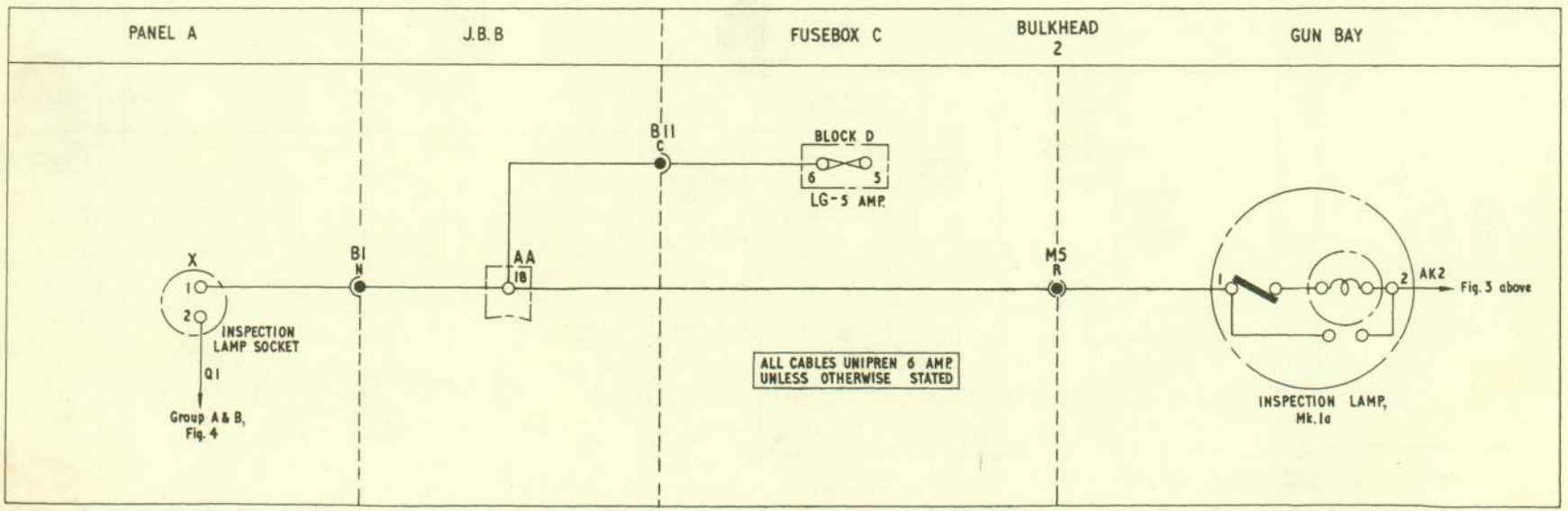


Fig. 4 Inspection lamp and sockets

3. The control relay in the circuit is energised whenever any undercarriage unit is NOT locked down. Operation of this relay breaks the supply to the amber lamp in the noseleg fairing. An AIRFIELD/CARRIER switch positioned on the starboard console panel A allows dummy deck landings to be made at an airfield, where hook-down selections would be undesirable. With the switch at AIRFIELD the hook-down GREEN warning lamp is inoperative. Whenever the alighting gear is locked down under these conditions, the DECK APPROACH lamp operates. The switch is fitted with a guard which retains the switch in the CARRIER position; there is also provision for wire locking the switch to this position when the aircraft is permanently carrier-based.

4. For carrier landings the switch will be at its normal position, i.e., selected to CARRIER. The circuit will function normally; the hook-down GREEN warning lamp will be ON when the hook is extended fully down, while the external amber lamp will be on only when both the hook and the alighting gear are fully down.

SERVICING

Note...

N.A.M.O./VENOM/L2 gives instructions on re-fixing of the deck approach warning lamps, as it was found that sometimes the glass was shattered during gun firing. A check should be made to ensure that this has been complied with.

5. Cable connections to the micro switch in the port wing root, and to the amber lamp mounted on the noseleg fairing should be checked for security and cleanliness.

INTERNAL LIGHTING

INSTRUMENT SECONDARY LIGHTING AND EMERGENCY LAMPS (LC)

Description

6. The instrument panel is fitted with the transilluminated type lighting. This is in the form of an acrylic plastic sheet faced on the upper and lower surfaces by a thin sheet of translucent white plastic. Over this is laid a second thin sheet of black opaque plastic and the whole is then bonded together to form a homogeneous panel. Engravings made through the black outer layer without piercing the white layer show clearly against the matt black surface of the panel in daylight. For night illumination 21 small indicator lamp-holders (Type A No.1) are built into the panel at selected positions. These holders incorporate a special red filter and the red light is transmitted through the acrylic sheet to back-illuminate the white engraving.

7. Instrument faces are illuminated by facets cut and angled in the plastic panels surrounding the dial. The lampholders project above the face of the panel and are provided with soft rubber sealing washers under the cap to prevent the escape of light from the front of the panel. The filaments (Ref. No. 5L/9959118), 28 volts 0.04 amp. are inserted with the cap uppermost. A supply is fed to each lamp from a terminal block at the base of the instrument panel.

8. Secondary lighting is in the form of bridge and pillar lamps arranged to illuminate the panels and instruments on which they are mounted. This method of illumination provides lighting similar to that described in paragraph 7.

9. Emergency lighting, is provided by a flood lamp and a single pillar lamp, and is operated from a 24-volt emergency battery of 0.4 amp/hr. capacity which also provides the turn and slip indicator with an emergency supply. A switch on the main instrument panel controls the emergency lighting circuit which is entirely separate from the aircraft main system. The switch toggle is luminous.

INSPECTION LAMPS AND SOCKETS (LG)

Operation

10. A fixed inspection lamp is fitted

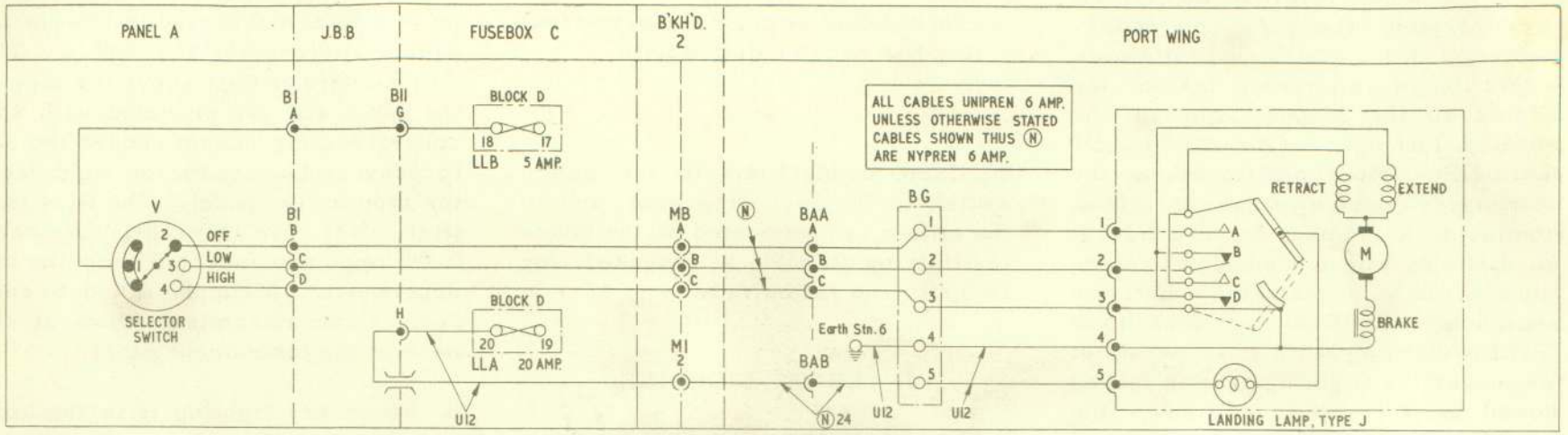


Fig.5 Landing lamp

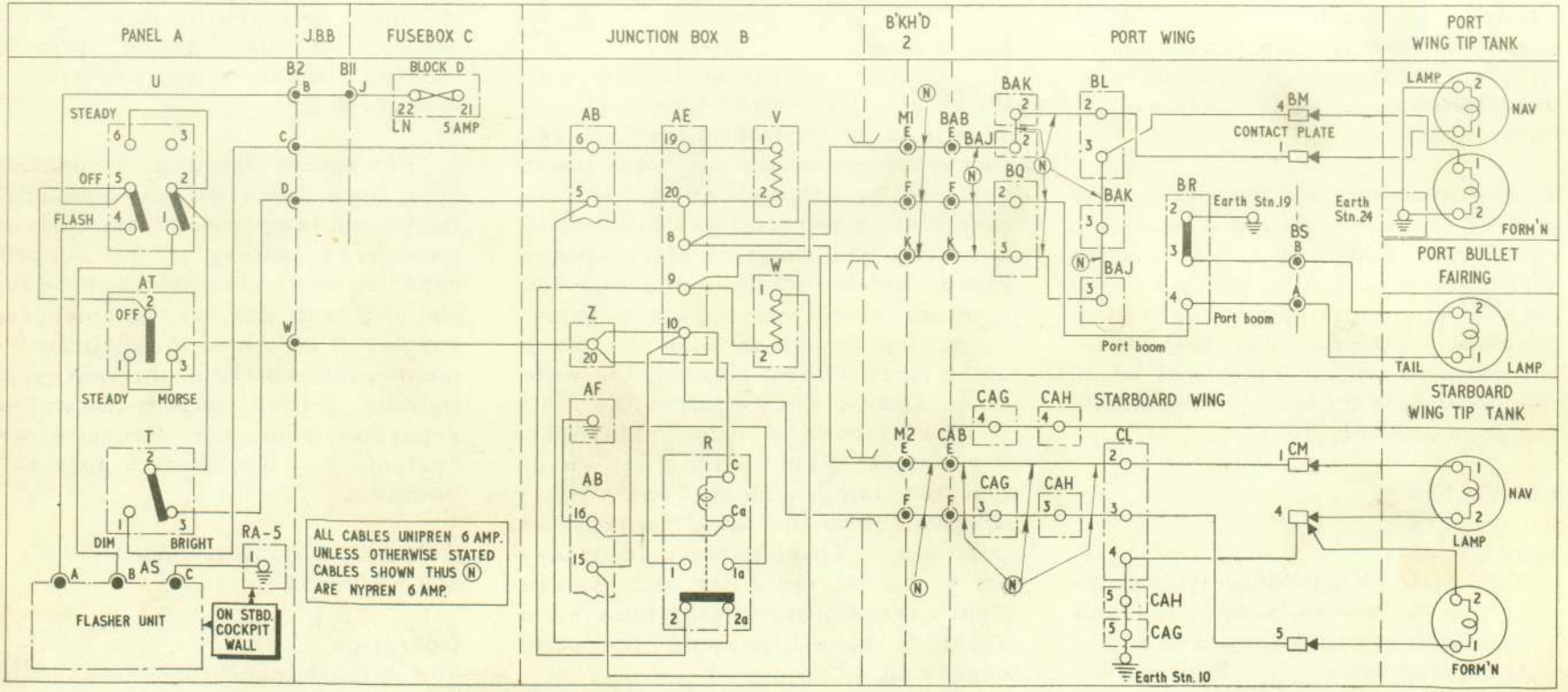


Fig.6 Navigation and formation lamps

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in the gun bay of the aircraft to give adequate illumination during servicing. The lamp has its own control switch integral with the unit. A two-pole socket for an inspection lamp is positioned on the starboard console panel A, permitting a wander lamp to be used in the cabin area. The socket is permanently live and is supplied from fuse L.G. in J.B.B.

Servicing

11. Inspection lamp sockets and the inspection lamp switch contacts should be kept free from dirt and corrosion.



## EXTERNAL LIGHTING

Description

12. The supply to all external lighting is fed through a circuit breaker G positioned on the starboard console panel A. This circuit breaker is shown in the wiring diagram fig.4, Main distribution, Group P.

## IDENTIFICATION LAMP (LD)

Operation

13. A downward identification lamp is mounted on the lower fuselage, and controlled by a two-way switch positioned on the starboard console panel A. The switch has a centre-off position and is spring-loaded from the MORSE position. The supply to the control switch is fed from fuse LD in J.B.B.

Servicing

14. There is no special servicing to the downward identification lamp, but care should be taken to keep cables and connections clean.

## LANDING LAMP (LL)

Operation

15. The landing lamp is positioned under the port wing between ribs 9 and 10, and is controlled by a selector switch on the starboard console panel A. The switch positions allow selection of a high or low position of the landing lamp. The lamp switch gear and motor are housed within the lamp assembly, connections being made through a five-pole plug and socket.

16. The supply to the landing lamp motor is taken through fuse LLB direct from the main bus-bar. The landing lamp filament supply through fuse LLA is fed through circuit breaker G on the starboard console panel A.

Servicing

17. To gain access to the landing lamp switch gear and motor, the lamp assembly should be removed from the aircraft wing by disconnecting the cable and unscrewing the flange plate securing screws. Support the lamp, which can be lowered on its flange plate. Cover plates on the lamp assembly, when removed, give access to the filament contact wiper arm and motor gears.

## NAVIGATION LAMPS (LN)

Operation

18. The navigation lamp circuit comprises three lamps, one fitted in the nose of each wing-tip tank and connected by contact plates at the wing-tips, and a tail lamp fitted in the port bullet fairing. The circuit is controlled from a STEADY/FLASH selector switch on the starboard console panel A. Selection to the FLASH position introduces a flasher unit into the circuit. Connections to the unit are made via a three pole plug and socket, pin G being earthed.

19. A separate BRIGHT/DIM selector switch is positioned on the starboard console panel A. In the DIM position a resistance is connected in series with the lamps supply.

Servicing

20. The flasher unit Type A is mounted on the starboard cabin wall forward of the upper starboard console panel A and comprises a condenser/resistance network. For servicing refer to A.P.4343C, Vol.1, Book 2, Sect.3, Chap.86.

21. Access to the wing-tip contact plates is via a panel on the underside of the wing. The cable connections and contact plates should be kept free from dirt and corrosion.

## FORMATION LAMPS (LF)

### Operation

22. The formation lamp circuit comprises three lamps, one being fitted to the rear of each wing-tip tank and the navigation tail lamp fitted in the port bullet fairing, is fed through a resistance to form part of this circuit. The lamps are controlled by a STEADY/MORSE selector switch mounted on the starboard console panel A.

### Servicing

23. No special servicing is required for the formation lamp circuit, but the cables and connections should be kept free from dirt and corrosion.