Group 3.B

ELECTRICALLY OPERATED INSTRUMENTS

(Completely revised)

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LIST OF ILLUSTRATIONS

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Introduction

1. This group contains a description of the electrically-operated flying instruments installed in this aircraft, including the necessary routeing and theoretical diagrams of these installations. For a general description of the instrument installation, reference should be made to Group 1.A. The location and access to all the instruments and associated equipment is given in Group 1.C. Detailed information on the standard components used will be found in the appropriate Air Publications listed in Table 1.

DESCRIPTION

Gyro compass (Code C)

2. The gyro unit of the Type GM4F gyro compass installation is situated on the centre-line of the centre instrument panel just below the artificial horizon. The

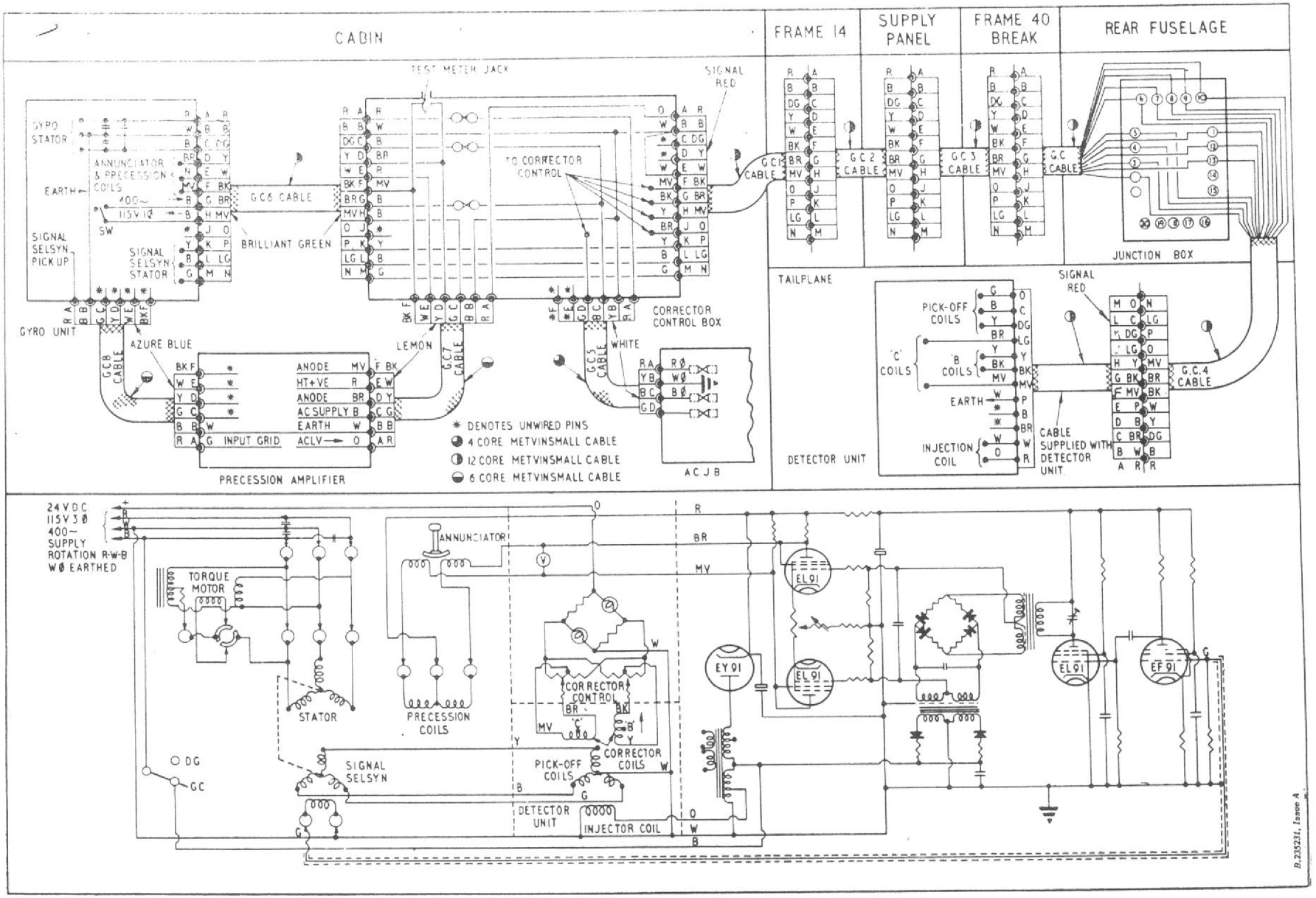

Fig. 1. Gyro compass

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gyro unit is an electrically-operated directional gyro, which is orientated in the the earth's magnetic field by a remote detector unit located in the port side of the tail plane. The instrument gives a continuous indication of the aircraft's magnetic heading at all times throughout flight. The installation, which also incorporates a precession amplifier and a corrector control box, is supplied with d.c. for compass correction and three-phase a.c. from the a.c. supplies circuit described in Group E.1 of Sect.5, Chap.1. The precession amplifier and corrector control box are both located on the starboard side of the cabin. A routeing and theoretical diagram of the installation is given in fig. 1, but for a full description of the compass and the principles of operation, reference should be made to the appropriate Air Publications listed in Table 1.

Artificial horizon (Code H)

3. The artificial horizon is located on the centre instrument panel just above the gyro compass and provides a continuous indication of the aircraft's attitude in roll and pitch in relation to the natural horizon. The instrument is an electrically-operated gyroscope, the gyro unit being basically a three-phase induction motor, which is supplied with three-phase a.c. from the a.c. supplies circuit described in Group E.1 of Sect.5, Chap.1.

4. Fast erection of the gyro may be attained by the use of the fast erection push switch located on the centre instrument panel adjacent to the artificial horizon. This switch allows the pilot to re-erect the gyro should it topple, due to a sharp manoeuvre of the aircraft, and should not be used until the aircraft is once again in level flight. The switch must not be held pressed for longer than 1 minute, otherwise the torque motors may be damaged.

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air Publication
Gyro compass Gyro unit, Type A or B Detector unit, Type A Corrector control box Precession amplifier, Type A	A.P.1275B, Vol.1, Sect.11
Artificial horizon, Mk.4 *(Pre Mod.654)* Artificial horizon, Mk.4A *(Post Mod.654)* Levelling controller, 6A/5084 *(Post Mod.654)* Turn and slip indicator, Mk.2	A.P.1275A, Vol.1, Sect.13
Tail plane position indicator, Type MF.858FL Tail plane position transmitter, Type 227FL Rudder and aileron trim indicator, Type 501FL Rudder tab position transmitter, Type 470FL Aileron tab position transmitter, Type 553FL or 568FL Flap position indicator, Type 473FL Flap position transmitter, Type C	A.P.1275A, Vol.1, Sect.16

Operation

Pre-Mod.654

5. The artificial horizon is fed with three phase a.c. from the a.c. supplies circuit, described in Group E.1, Sect.5, Chap.1. The routeing and theoretical diagram *(fig.2)* is self explanatory.

Post Mod.654

6. The artificial horizon is fed with a three phase a.c. supply from the a.c. junction box in the a.c. supplies circuit. This supply feeds the instrument via a Levelling Control unit employed to give automatic fast erection to the gyro, on the initial starting of the instrument. The control unit is situated beneath the forward portion of the starboard cabin shelf and con-

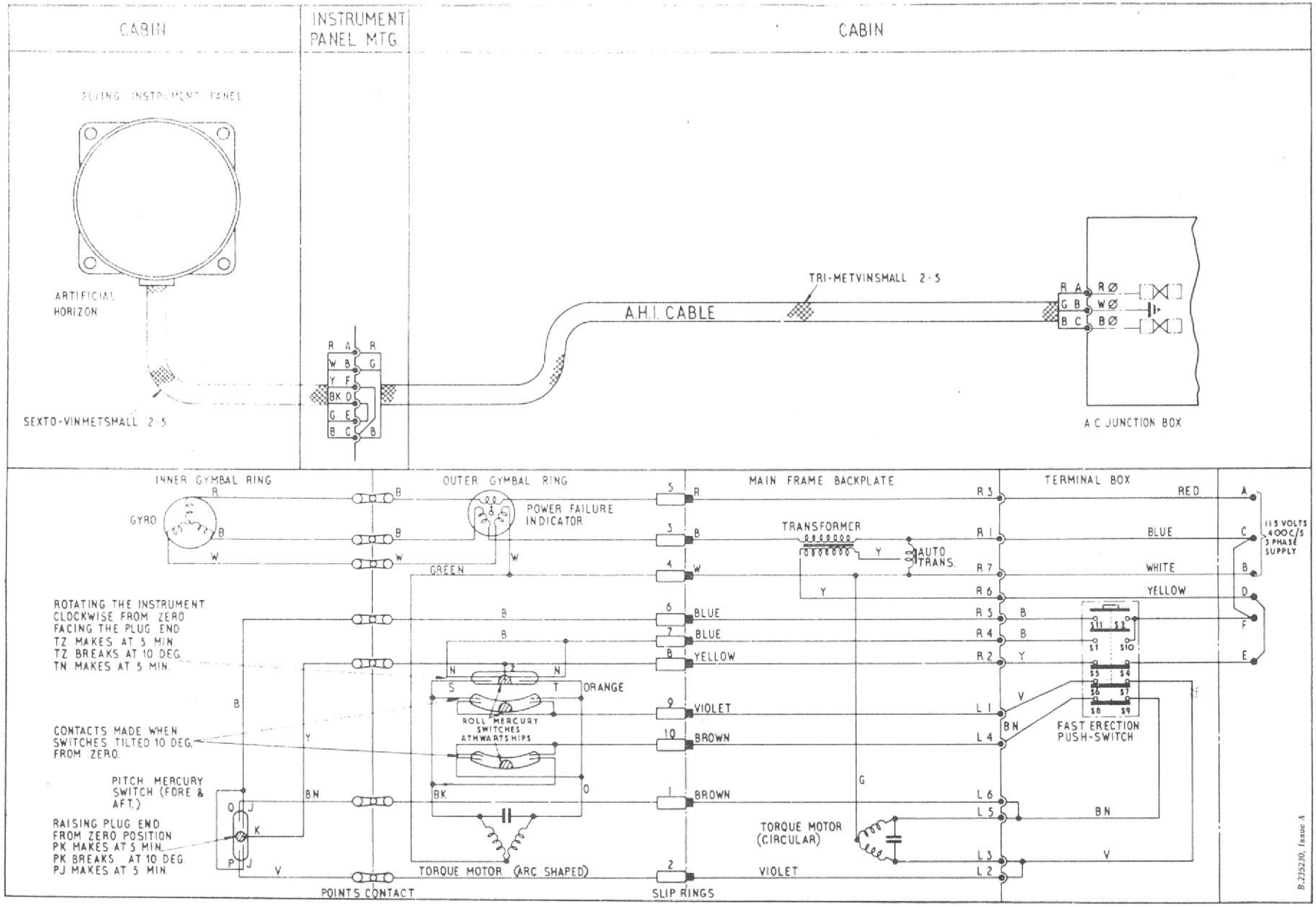

Fig. 2. Artificial horizon (Pre-Mod. 654)

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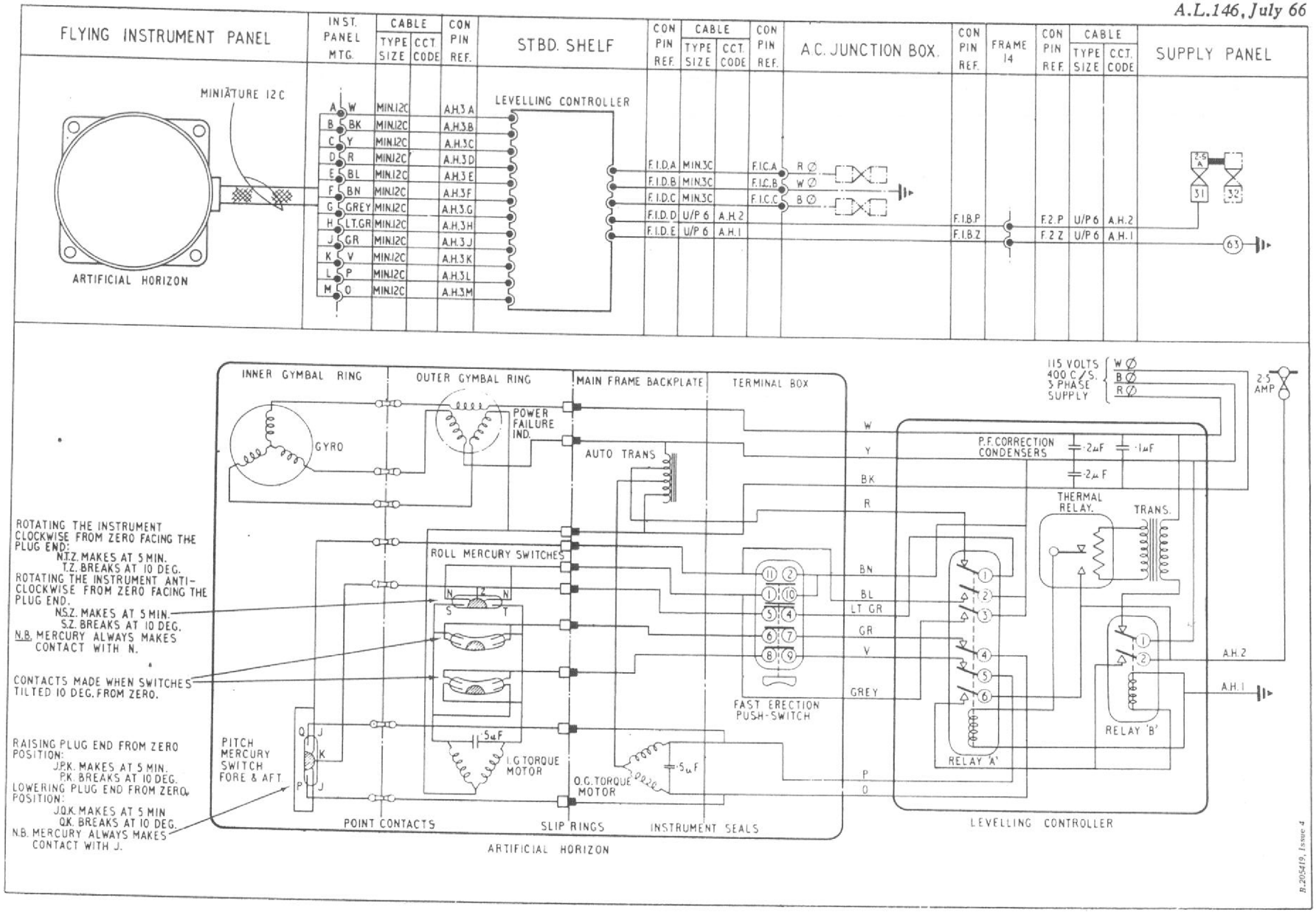

Fig.3. Artificial horizon (Post Mod.654)

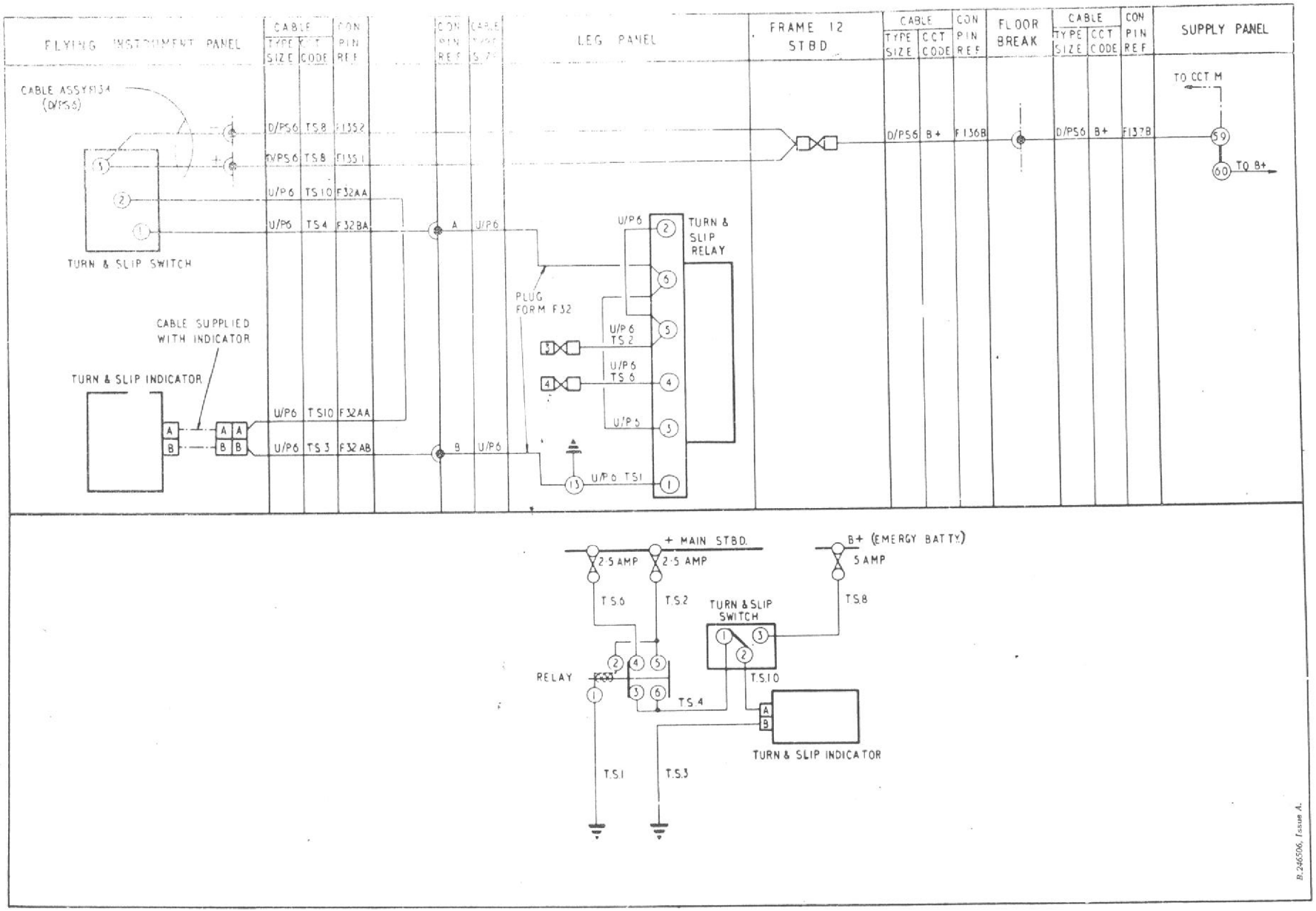

Fig.4 Turn and slip indicator (routeing and theoretical)

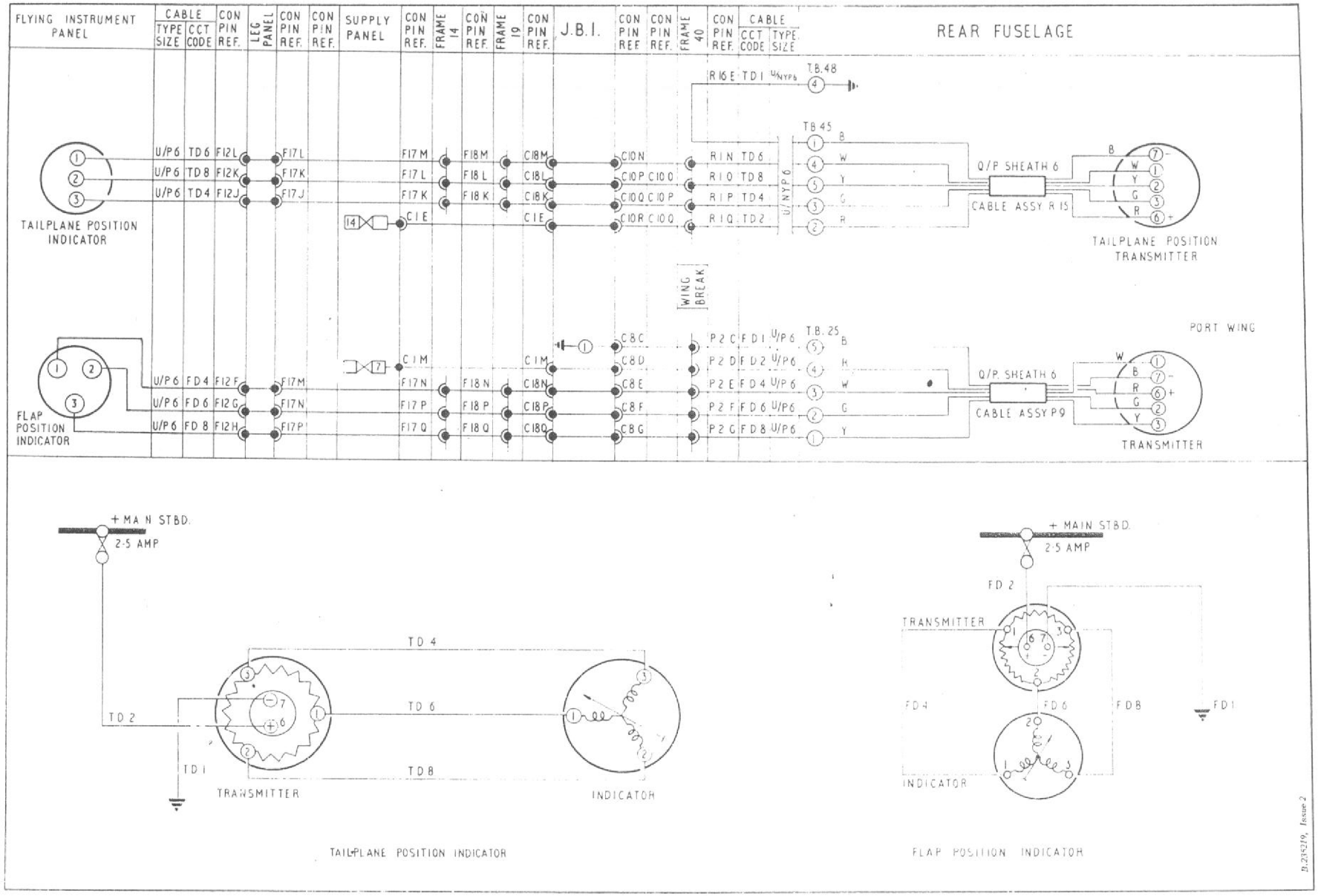

Fig.5. Tail plane and Flap position indicator

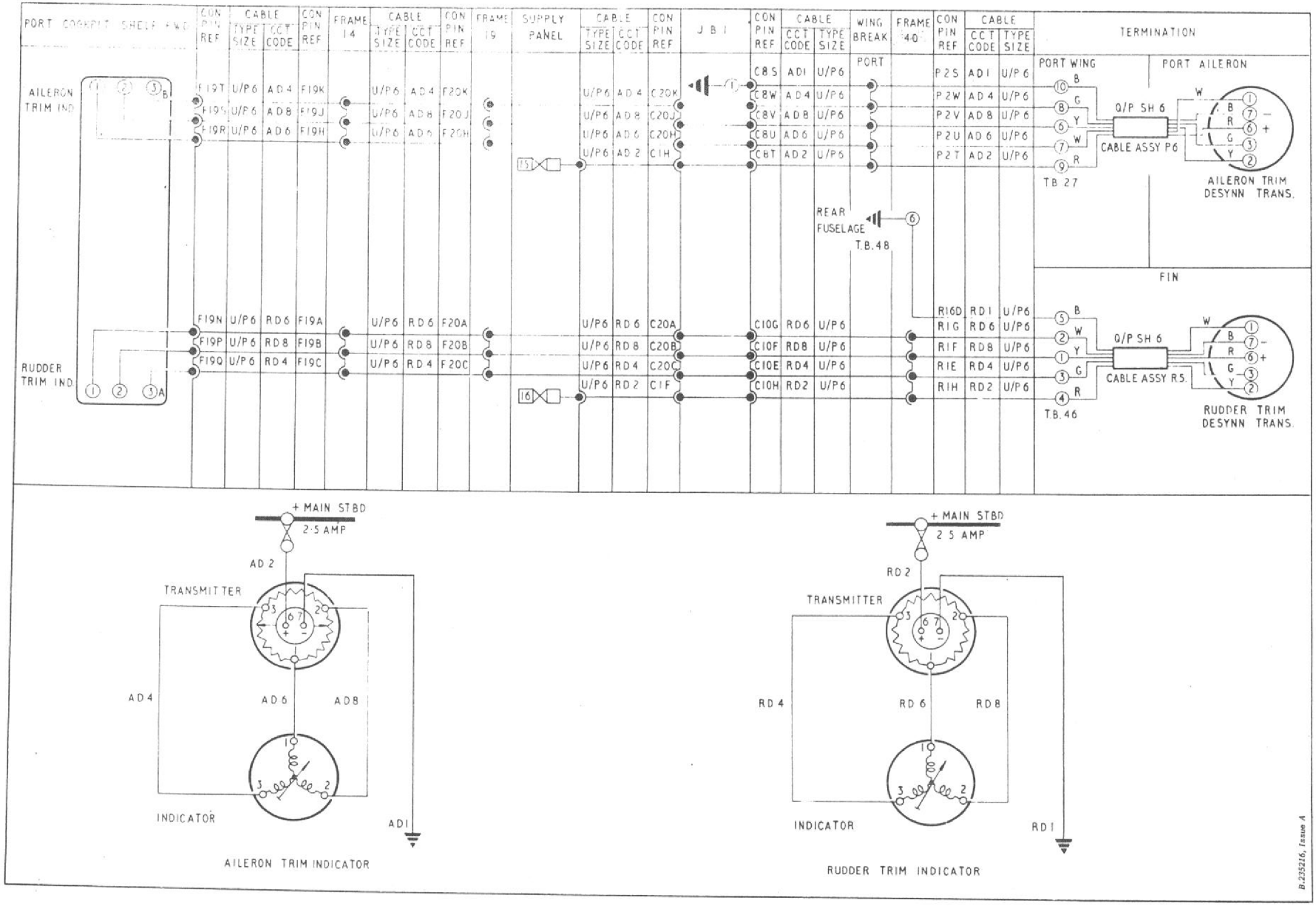

Fig.6 Rudder and aileron tab position indicators

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tains a transformer, a thermal relay, two normal relays and power factor correction condensers. A routeing and theoretical diagram of this installation is given in fig.3.

7. Once the a.c. supplies circuit is in operation and a supply is fed to the gyro, via the levelling control unit, the gyro commences to rotate. At the same time the transformer in the control unit supplies the thermal relay, the feed passing through the made contacts 1 of the de-energized relay B. When the contacts of the thermal relay make, a d.c. supply from a fuse in the supply panel is fed to energize relay A. With relay A energized a supply of 115 volts a.c. is fed to the two torque motors in the artificial horizon through contacts 2-3 of the relay, the slip rings and mercury switches in the instrument. At the same time a supply is fed to energize relay B, via contacts 6 of relay A.

8. With relay B energized the d.c. supply passes through the made contacts 2 and forms a hold-on circuit for the relay, while the a.c. supply to the transformer passing through contacts 1 is broken and the thermal relay is in turn de-energized. When the contacts of the thermal relay break, relay A is de-energized, the 115 volts a.c. supply fed directly to the torque motors is broken and the auto transformers is brought into circuit again, via the closing of contacts 1 of the relay, to feed the torque motors with their normal 20 volt a.c. supply.

Turn and slip indicator (Code TS)

General

9. This indicator is fitted on the starboard side of the centre instrument panel just below the rate of climb indicator. It is provided to indicate the aircraft's lateral attitude in relation to level flight and to indicate skid, side slip or correct bank during a turn. The indicator is an electrically-operated instrument which is normally-supplied from the aircraft's 28 volt d.c. supply or, should this supply fail, from the standby batteries *(Sect.5, Chap.1, Group B.1)*.

Normal supply

10. The normal supply, which is operating immediately the battery master switch is placed in the ON position, is provided with duplicated fuses located in the leg panel. The supply from the fuses to the instrument is controlled by a relay also located in the leg panel.

Emergency supply

11. Should the normal d.c. supply fail, the standby batteries may be brought into use by placing the NORMAL/EMERGENCY turn and slip switch to the EMERGENCY position. This switch is located adjacent to the turn and slip indicator.

Operation

Normal supply

12. The operation of the normal supply circuit is such that when the battery master switch is placed in the ON position, the turn and slip relay is energized, via the normal circuit fuse. Contacts of this relay, which are made while the relay is energized, feed the supply from the normal fuse and through the turn and slip switch to operate the indicator. If the normal fuse fails, the relay will immediately be de-energized, thus making the other set of contacts, which are fed from the standby fuse and also connected, via. the turn and slip switch, to the indicator. The indicator is now supplied from the standby fuse and remains in operation with no apparent indication of fuse failure.

Note . . .

Due to the fuse change-over facility of this circuit, it is important to check that the normal and standby fuses are both serviceable before each flight.

Emergency supply

13. The emergency supply is provided as a standby in the event of an electrical fault developing in the normal d.c. supply to the indicator. A separate 24 volt supply (B+) from the standby batteries passes through a fuse to contact 3 of the turn and slip supply switch. Placing the switch in the EMERGENCY position makes contacts 3-2 and breaks contacts 1-2 of the switch, thus isolating the normal supply and connecting the emergency supply to the indicator. A circuit diagram of the turn and slip indicator installation is given in fig.4.

Tail plane position indicator (Code TD)

14. The incidence of the tail plane is

shown on an indicator situated on the port side of the centre instrument panel just above the machmeter. The indicator is operated by a Desynn transmitter located in the dorsal fin just above the tail plane actuator and linked to the actuator by a short operating rod. A routeing and theoretical diagram of the electrical circuit is given in fig.5. Details of the Desynn system will be found in the Air Publications listed in Table 1.

Rudder and aileron tab position indicators (Code RD and AD)

15. The settings of the rudder and aileron trim tabs are shown on a trim indicator located just forward of the trim switch on the cabin port shelf. The rudder portion of the indicator is operated by a Desynn transmitter, which is bolted to nose rib F in the leading edge of the fin and the aileron portion of the indicator is actuated by another Desynn transmitter located adjacent to the tab actuator in the aileron structure. Both transmitters are actuated by cables connected to levers on the tab actuators. Routeing and theoretical diagrams of the electrical circuits of the indicators are given in fig.6.

Flap position indicator (Code FD)

16. This indicator is located on the port side of the centre instrument panel just below the machmeter and is operated by a Desynn transmitter located in the port wheel bay. This transmitter is linked to the flap drum switch and interconnecting levers by a Bowden cable. A routeing and theoretical diagram of the electrical circuit is given in fig.5.

SERVICING

General

17. The necessary servicing to maintain the electrically-operated flying instruments in an efficient condition and the standard serviceability tests, which should be applied is contained in the appropriate Air Publications listed in Table 1. The method of adjusting the linkages to the various Desynn transmitters will be found in Sect.3, Chap.4. Before servicing or removing any of the electrically-operated instruments, the aircraft must be rendered electrically safe, as described in Group A.1 of Sect.5, Chap.1.

REMOVAL AND ASSEMBLY

General

18. The removal of the instrument panels carrying the electrically-operated flying instruments is described in Group 1.B. Once access has been obtained, the removal of the instruments from the panels should present no difficulties. Access to the rudder tab Desynn Transmitter may be gained by removing a door from the port side of the upper fin structure and access to the aileron tab transmitter is obtained by removing an access door from the upper surface of the aileron nosing, after the removal of the aileron.