Group 3.C

AIR PRESSURE OPERATED FLIGHT INSTRUMENTS
(Including Mod.1382 and Mod.1415)

◀ Completely revised ▶

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

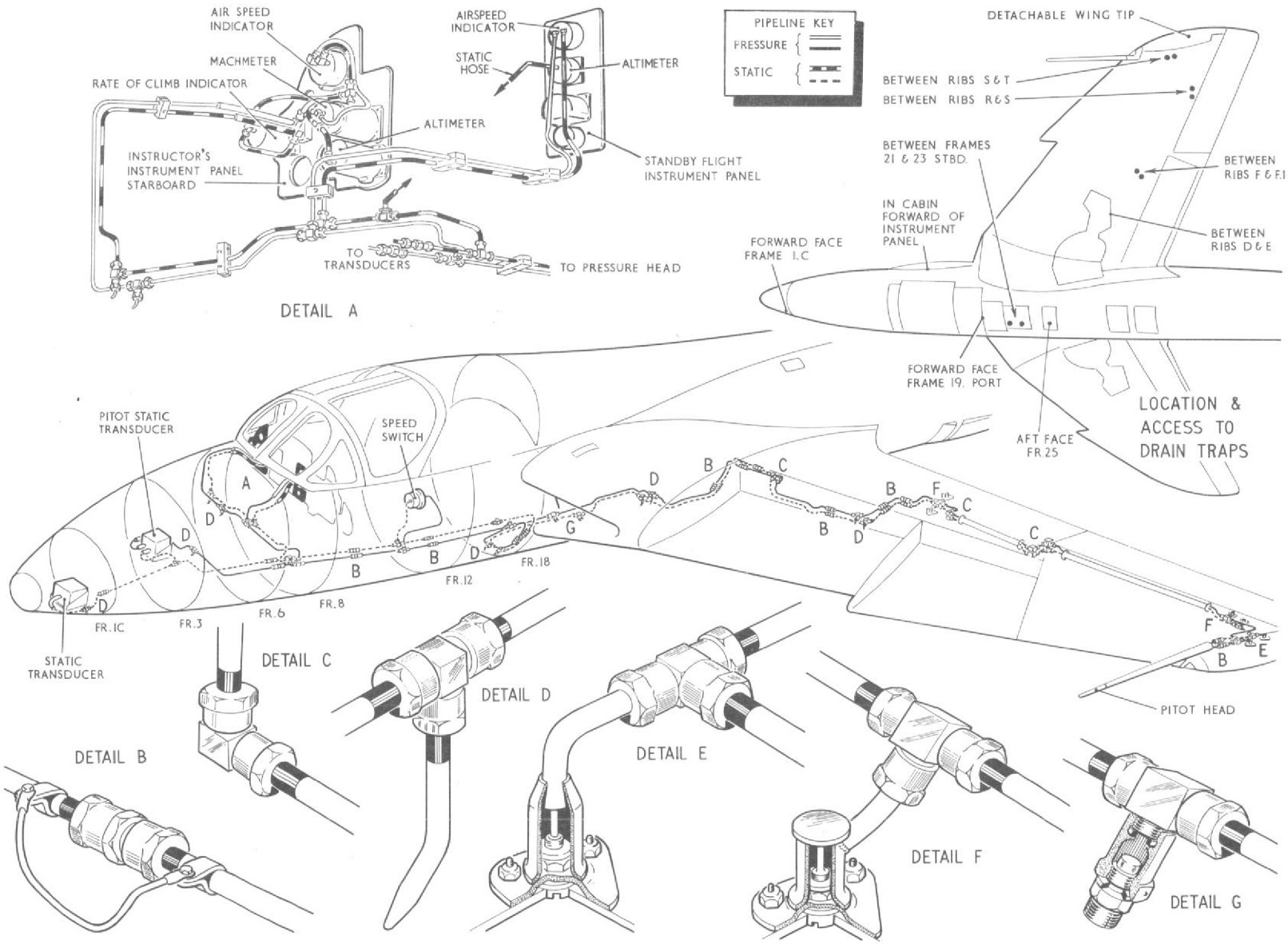

Fig.1. Pressure head installation

Fig. 1 Pressure head installation
◀ Mod.1382 and 1415 added ▶

Introduction

1. This Group contains a description of the air pressure operated flight instruments installed in this aircraft, all but one of which are operated by the pressure head installation. A general description of the instrument installation as a whole, is given in Group 1.A and the location and access to all the instruments and their associated equipment in Group 1.C. Detailed information on the standard components used will be found in the relevant Air Publications listed in Table 1.

DESCRIPTION

Pressure head installation

2. The installation *(fig.1)* Provides pitot and static air pressure to operate the instruments listed in Table 1, *(with the exception of the cabin altimeter)* and the transducers of the Air Data System *(Group 3.A)*. The installation consists of an electrically heated pressure head projecting forward from the port wing tip which provides pitot air pressure from an orifice in the forward end and static air pressure from vents in the periphery of the head. The air pressures are carried by pipe-line to the user equipment. The heater provides anti-icing protection, moisture drain traps are connected into the pipe lines as shown in details D, E, F and G on fig.1.

Pressure head heater

3. The electric heater element in the pressure head is controlled by a single-pole ON/OFF switch located on the leg panel. A routeing and theoretical diagram of the electrical heater circuit, the operation of which will be obvious, is given in fig.2.

Note . . .

When the aircraft is on the ground, the pressure head heater must not be switched on before removal of the pressure head cover, or damage to the cover will result. It is also important to ensure that the heater is not left switched on for long periods of time as the heater constitutes a danger to personnel should it be touched by accident.

Air speed indicator

4. The air speed indicator for the instructor's use is located on the starboard instrument panel. It is a capsule type instrument operated by air pressure drawn from the pressure head installation *(para.2)*.

Machmeter

5. A machmeter for the use of the instructor is mounted on the starboard flying instrument panel. It is provided to give a continuous indication of the ratio of true air speed to the speed of sound. The instrument is operated by the differential air pressure between the pressure and static pipe-lines of the pressure head installation *(para.2)*.

Altimeters

6. A Mk.30B altimeter *(Mod.1382)* is located on the starboard instrument panel and provides a pressure corrected altitude display for the instructor and transmits encoded altitude data to the IFF/SSR installation *(Sect.6, Chap.2,)* for automatic altitude reporting. The instrument mechanism is housed in a square flanged case which is connected to the static air pressure system. Electrical connections *(fig.3)* are completed through a 30 ins. flying lead which terminates in 41 pole plug. The mechanism consists of an aneroid capsule assembly which converts static pressure changes to a mechanical movement. This movement is magnified and coupled through a servo to the display and to the altitude data encoder. Should a malfunction occur an indicating flag extends to obscure part of the display. A setting knob and drum indicator provides adjustment of the display relative to a selected barometric pressure.

7. A standby altimeter *(without a height encoding facility)* is located on the standby

TABLE 1

Equipment type and Air Publication reference

Equipment Type	Air publication
Pressure head, Mk.9F, or Mk.10B *(Mod.1317)*	A.P.112G–0102–1
Air speed indicator, Mk.12A	A.P.112G–0927–1
Standby air speed indicator, Mk.18	A.P.112G–0939–1
Machmeter, Mk.3A	A.P.112G–0923–1
Altimeter, Mk.30B *(Mod.1382)*	A.P.112G–1031–1
Standby altimeter, Mk.29	A.P.112G–1028–1
Cabin altimeter, Mk.21	A.P.112G–1022–1
Rate of climb indicator, Mk.3A *(P)*, 3 *(P)* or 3 *(Q)*	A.P.112G–1007–1

instrument panel. The instrument is capsule operated by static pressure, with manual adjustment of the display relative to a selected barometric pressure. Indication of the selected barometric pressure is displayed on a cut-out in the dial.

Cabin altimeter

8. A cabin altimeter which functions on the aneroid principle is located at the forward end of the cabin starboard shelf at frame 9. It is not connected to the pressure head installation but indicates cabin pressure in terms of altitude so that the aircrew can regulate their oxygen requirements accordingly.

Rate of climb indicator

9. The rate of climb indicator is installed on the starboard side of the instructor's flying instrument panel adjacent to the artificial horizon. It is a sensitive differential pressure gauge giving the rate of change of the atmospheric pressure in terms of rate of climb or descent, whenever the aircraft departs from level flight. The instrument is connected to the static pressure pipe-line of the pressure head installation *(para.2)*.

Pitot pressure and static transducers

10. The pitot pressure and static transducers of the air data computor are mounted on frames 3 and 1C respectively, and convert the pressures exerted on them into electrical information. This information is processed and fed to various instruments of the integrated display *(Group 3A)* in the form of electrical signals representing altitude, mach, rate of climb and indicating airspeed.

SERVICING

General

11. Standard testing and servicing procedures for the instruments described in this group are given in the appropriate Air Publications given in Table 1. In-situ testing of the Mk.30B altimeter and the associated height encoding facility is given in para.14.

Pressure head drain traps

12. In order to keep pressure head system as free of moisture as possible, the drain traps *(fig.1)* should be removed periodically, proceeding as follows:-

(1) Each drain trap of the type shown *(detail D, fig.1)* should be removed by unscrewing

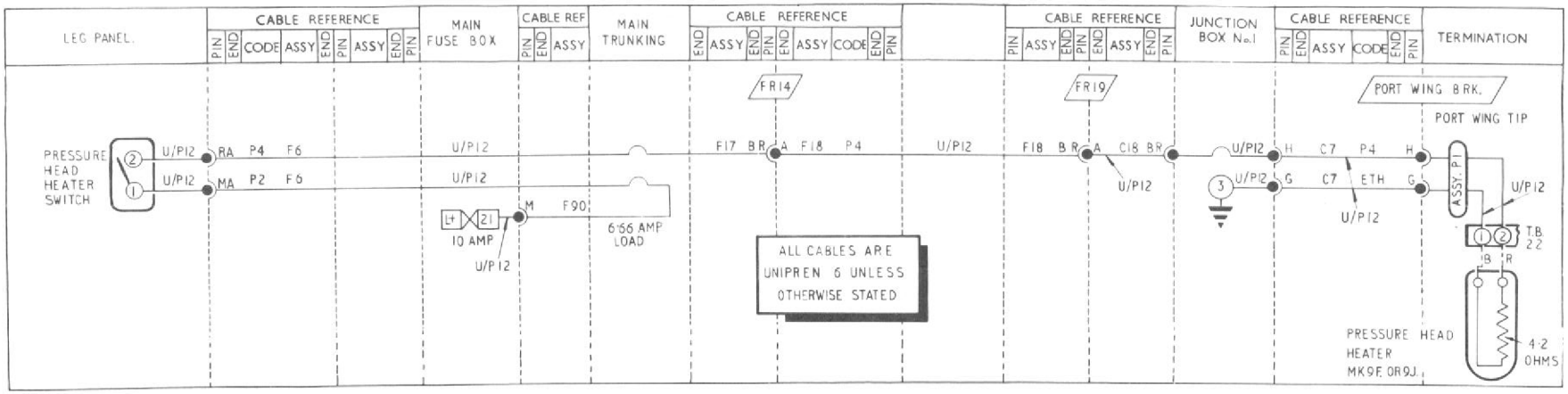

Fig.2. Pressure head heater (routeing and theoretical)

T.P.(E)24779

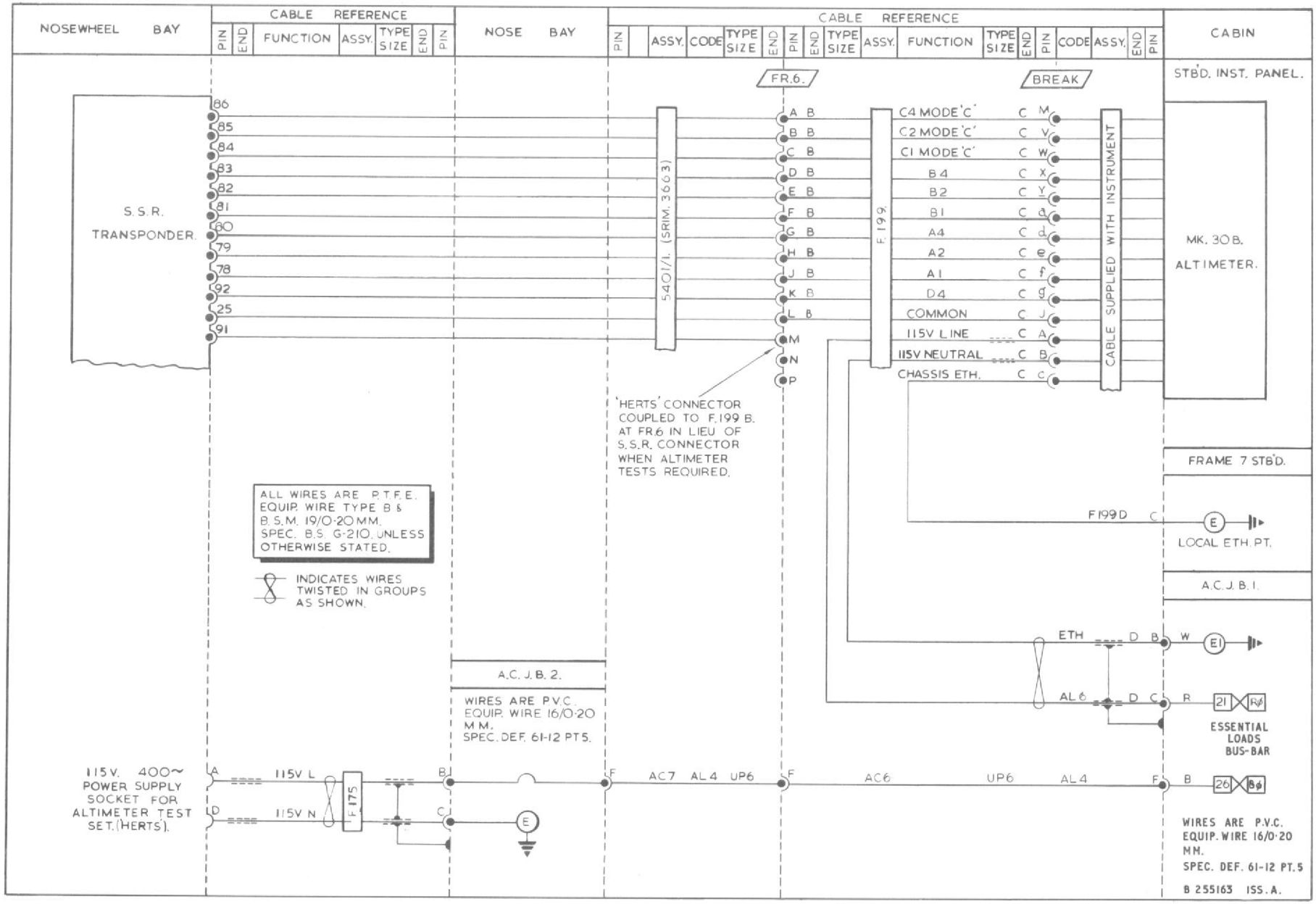

Fig.3. Height encoding altimeter (routing)

T.P.(E)24781

the union nut from the tee-piece. After removing all moisture etc., a new rubber sealing ring should be inserted in the union nut. When refixing, it is important to ensure that no unpainted portion of drain pipe is visible between the painted band and the union nut when this is fully tightened.

(2) The drain traps illustrated in detail E and F of fig.1 should be opened by unscrewing the slotted plugs in the wing skin until any moisture in the traps drains away.

(3) The drain traps illustrated in detail G of fig.1 should be opened by inserting a suitable length and diameter of hose into each drain in turn after removing the small access doors. Insertion of the hose pushes open the valve and allows any moisture to escape down the hose.

Pressure head leak tests

13. The pressure and static systems are as leak-tight as possible, every care must be taken to maintain them in this condition since even a moderate leak may develop sufficiently to cause instrument failure. To ensure that the leakage rate is within the required tolerances, the system must be tested in accordance with the instructions given in A.P.1275B, Vol.2, Part 1, Leaflet A.8 whenever the system is suspect or its pipeline joints and connections to instruments are disturbed.

Altimeter Mk.30B

14. The following test must be carried out at times prescribed in current servicing instructions or whenever the serviceability of the equipment is suspect. Reference should also be made to Sect.6, Chap.2, App.1.

Test equipment

15. Pitot-static test set.

IFF/SSR transponder test set, CRM 544.

Insulation tester 500V.

Voltmeter, calibrated to 115V 400Hz, a.c.

Test Lamp, 28V d.c.

Preliminary test procedures

16. Carry out a pitot-static system leak test as described in para.13; ensure that the test set is connected to the aircraft installation and used in such a manner that no damage to other instruments can ensue.

17. Check the integrity of the system wiring:–

(1) Check that the Battery and Engine Master Switches are selected OFF.

(2) Refer to Fig.3 and disconnect the following cable assemblies.

F199 end C at the altimeter break.

F199 end D at the A.C. J.B.1.

F199 end B to IFF/SSR cable 540/1 at Frame 6.

(3) Remove Fuse 26 at A.C. J.B.1.

(4) Carry out continuity and insulation checks on the altimeter installation wiring.

(5) Re-instate connectors un-coupled for these tests and re-fit Fuse 26 to A.C. J.B.1.

CAUTION

Do not carry out on insulation check on the altimeter.

18. Check the primary power supplies:–

(1) Connect an external power supply to the aircraft

(2) Check that the type 100A inverter switch on the centre console is at ST.BY.

(3) Switch ON the external supply and then the Engine Master Switch. Check that the type 100A inverter runs up and supplies the port artificial horizon and the directional gyro. Both main inverter indicators should show ST.BY.

19. Check the a.c. power supplies to the altimeter circuit:–

(1) Check that the Mk.30B altimeter power failure flag retracts.

(2) Check for 115V a.c. at pins A and D at the altimeter test socket.

CAUTION

Pin A is at 115V a.c. with respect to the airframe.

(3) Check that the altimeter power failure flag remains retracted when the a.c. supplies circuit is functioned *(Sect.5, Chap.1, Group E.1)* to bring the main inverters on line and that the a.c. supplied equipments are not affected by the additional load imposed by the altimeter.

Encoder-Transponder system tests

20. Carry out the following tests on the height encoding facility:–

(1) Ensure that the IFF/SSR is functioning correctly, and that the CRM 544 test set is correctly connected, to the test set power socket and functions correctly, *(S.R.I.M. 3663).*

(2) Adjust the ground pressure setting on the Mk.30B altimeter to 1,013 mb.

(3) Operate the pitot-static system test set to obtain the altimeter readings given in Table 2. The information transmitted by the IFF/SSR transponder and indicated on the CRM 544 test set shall be as listed.

Note . . .
Local ambient pressure conditions may prelude checks at zero feet.

Altimeter power failure test

21. Test the operation of the altimeter power failure flag:–

(1) Adjust the pitot-static test set to give a reading of 10 000 ft on the Mk.30B altimeter.

(2) Select the Engine Master Switch to OFF, the altimeter power failure flag must appear.

(3) Adjust the pitot-static test set to ambient atmospheric pressure.

(4) Select the Engine Master Switch to ON and note that the altimeter power failure flag retracts and that the instrument aligns to the ambient pressure altitude.

(5) Select the Engine Master Switch to OFF. Disconnect and remove the IFF/SSR test set and the external power supply. Fit protective caps to the a.c. and d.c. test sockets.

REMOVAL AND ASSEMBLY

General

22. The removal of the flight instrument panels is fully described in Group 1.B and the pressure head is covered in Book 1, Sect.3, Chap.2. Once access has been obtained, the removal of the remaining items of equipment should present no difficulties.

TABLE 2

Altimeter output codes

ALTITUDE	OUTPUT CODE				CRM 544 SETTING			
(ft.)	D	A	B	C	A	B	C	D
0	00	000	011	010	0	6	2	0
1,600	00	000	111	011	0	7	6	0
2,700	00	000	100	001	0	1	4	0
5,300	00	001	011	100	4	6	1	0
10,000	00	011	101	010	6	5	2	0
25,000	00	101	110	010	5	3	2	0
31,000	01	100	000	010	1	0	2	4