Cancelled, now AP 113F-0502-1

Chapter 3

AIR SPEED DATUM AND RELAY BOX, Ref. No. 26FY/18964

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF APPENDICES

Introduction

1. The air speed datum and relay box (fig. 1) is used in the Sea Vixen Auto-throttle system. Its function is to provide an air speed signal of approximately 130 knots and to provide a correct switching sequence for the a.c. and d.c. supplies and safety circuits. A pitch angle signal is also routed through the unit to the actuator amplifier. The unit is located in the pilot's cockpit, and is mounted upside down beside the actuator amplifier.

General construction (fig. 2)

2. The air speed datum and relay box consists of three miniature relays, E, F and G, a transformer, Type 3C 532 and an air speed sensing unit. The relays and the transformer are mounted on a chassis assembly. The air speed sensing unit is passed through a large hole in the chassis onto a mounting plate assembly below. Mounted to the chassis by three 6 B.A. $\frac{5}{16}$ in. roundhead screws is a tagboard assembly which is used to route via the U.K.A.N. socket, the a.c.

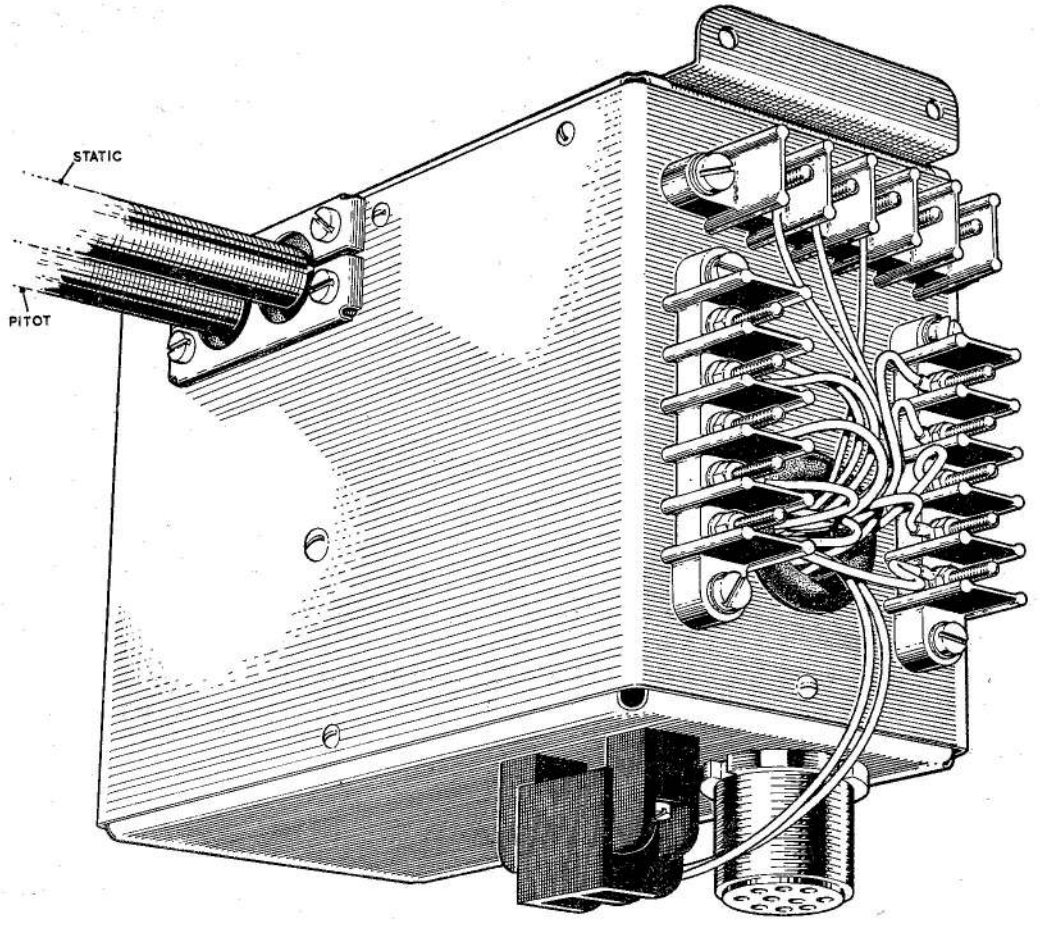

Fig. 1. General view of unit

and d.c. supplies, air speed and pitch signal to the amplifier.

3. The complete chassis assembly is contained in a 'Alclad' case and secured to the inside of the case by six 4 B.A. roundhead screws. Cable connections are completed by three 5 way terminals situated on the front panel and a clamp assembly, mounted on the side of the case, is used to carry the pitot and static hoses to the air speed sensing unit. An aluminium alloy top plate is secured to the top of the case by six 6 B.A. roundhead screws and supports two brackets mounting the unit in the pilots cockpit. An aluminium alloy bottom plate is secured to the bottom of the case by four 6 B.A. roundhead screws and supports an a.c. supply input two way terminal, and a U.K.A.N. socket connecting the unit to the actuator amplifier.

DESCRIPTION

Relays

4. The three relays E, F and G are Type SM5D-N73 each having four contacts. In operation, relay E is energized when the complete system is engaged. Relay F is the "Lock-on" relay and is energized, when the mid-stroke micro-switch in the actuator is correctly centralized, to provide 28V d.c. to the magnetic indicator and the magnetic clutch. Relay G is energized when the auto-throttle master switch is selected to provide 28V d.c. and 115V a.c. supplies to the system.

Transformer H, Type 3C 532

5. The transformer H has six secondary windings only two of which are used. The secondary windings H G F E are linked together to provide the 11V excitation supply

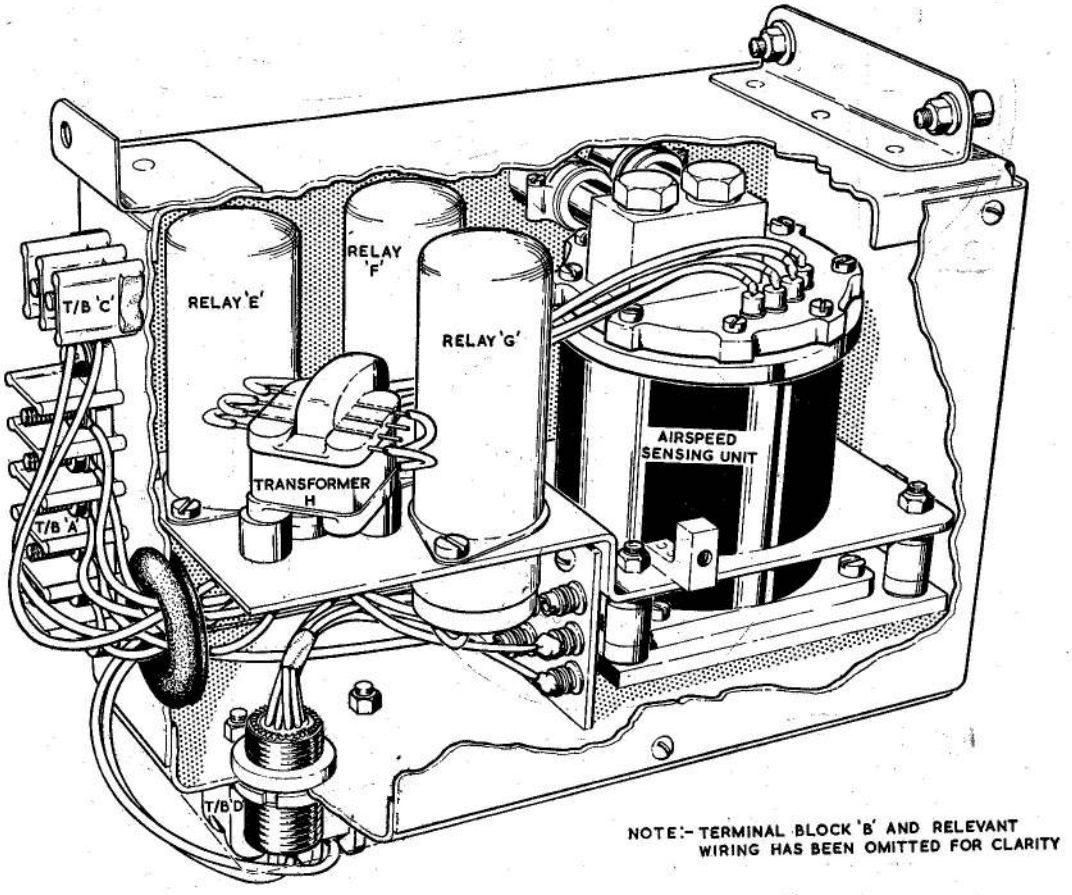

Fig. 2. Air speed datum and relay box — cutaway view

for air speed sensing unit pick-off. The transformer is connected to the 115V 400 c/s supply via pins 1 and 2 of TBD and master relay G.

Air speed sensing unit (fig. 3)

6. This unit consists of a single air speed aneroid capsule which operates, via a conventional lay-shaft mechanism, and a rotary a.c. pick-off. Pitot pressure is applied to the interior and static pressure to the exterior of the capsule, such that any changes in air speed will cause the capsule to expand or contract and rotate the rotor of the a.c. pick-off. The pick-off output voltage varies linearly with air speed over the range 100-160 knots I.A.S. and this signal is used with the speed gearing potentiometer, in the actuator amplifier, to define the air speed datum of the auto-throttle system.

7. The mechanism is temperature compensated and fixed to a brass top-plate which carries electrical terminals and the pitot-static connections. The complete assembly is gasket-sealed in a cylindrical case.

OPERATION

8. When the auto-throttle master is selected, 28V d.c. is applied to the aircraft's relay ACJ-A which operates, via pins 3 and 6. to arm the appropriate circuits of the auto-throttle system; simultaneously 28V d.c. is applied to pin L of the test point (AUU-5) via the DISENGAGE buttons X and Y and

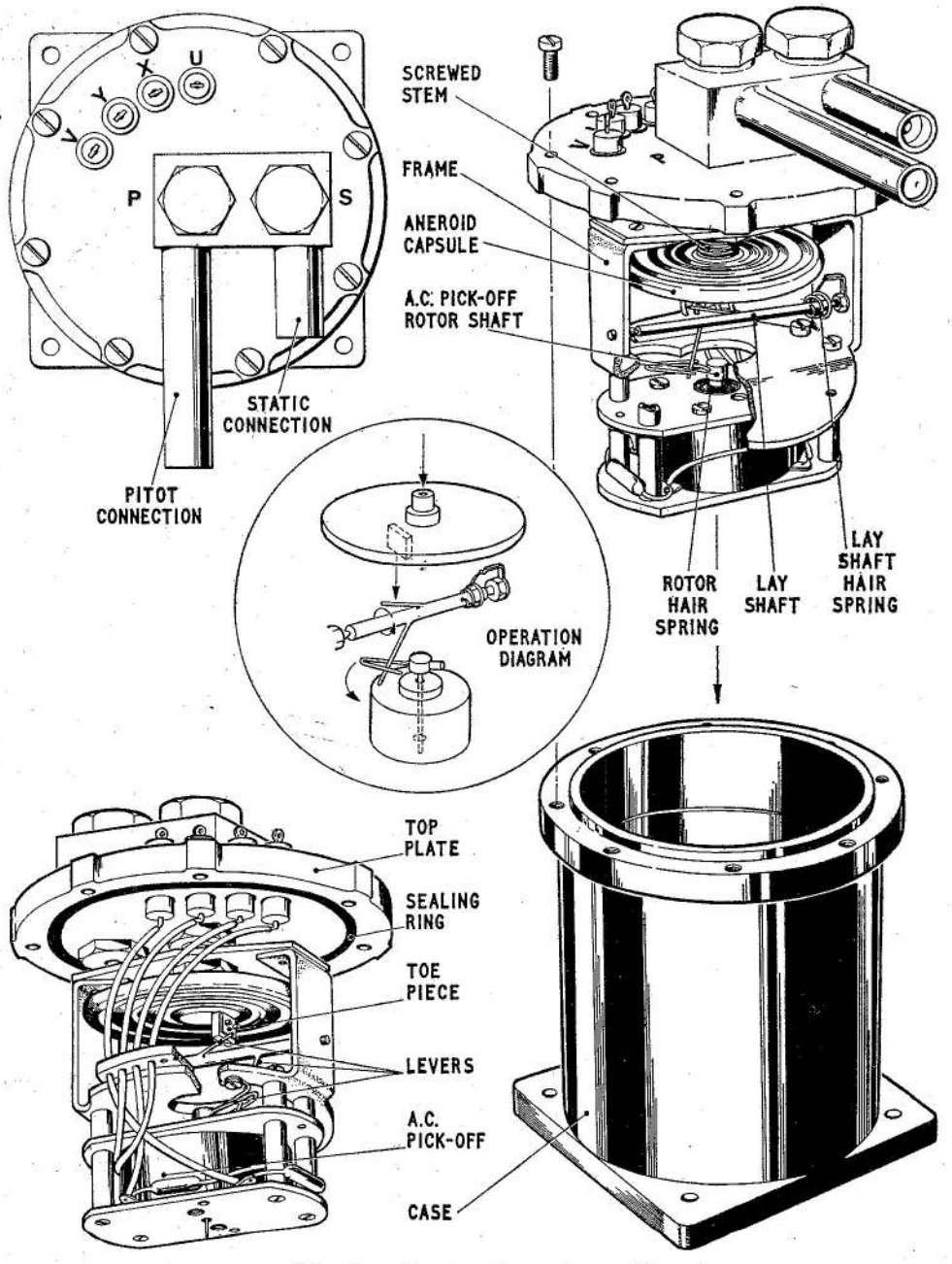

Fig. 3. Air speed sensing unit

to terminal 3 of TBA on the air speed datum and relay box (fig. 4).

9. 28V d.c. also energizes the master relay 'G' in the air speed datum and relay box via terminal 5 of TBA. Thus with the master relay energized, the 28V d.c. is supplied to the speed trim switch, the pitch signal potentiometer in the artificial horizon and to one side of the engage button via terminal 3 of the arming relay. The d.c. negative paths are completed, via pins 9 and 8 of the master relay 'G' to the pitch signal potentiometer and the speed trim switch.

10. The a.c. supplies to the transformer,

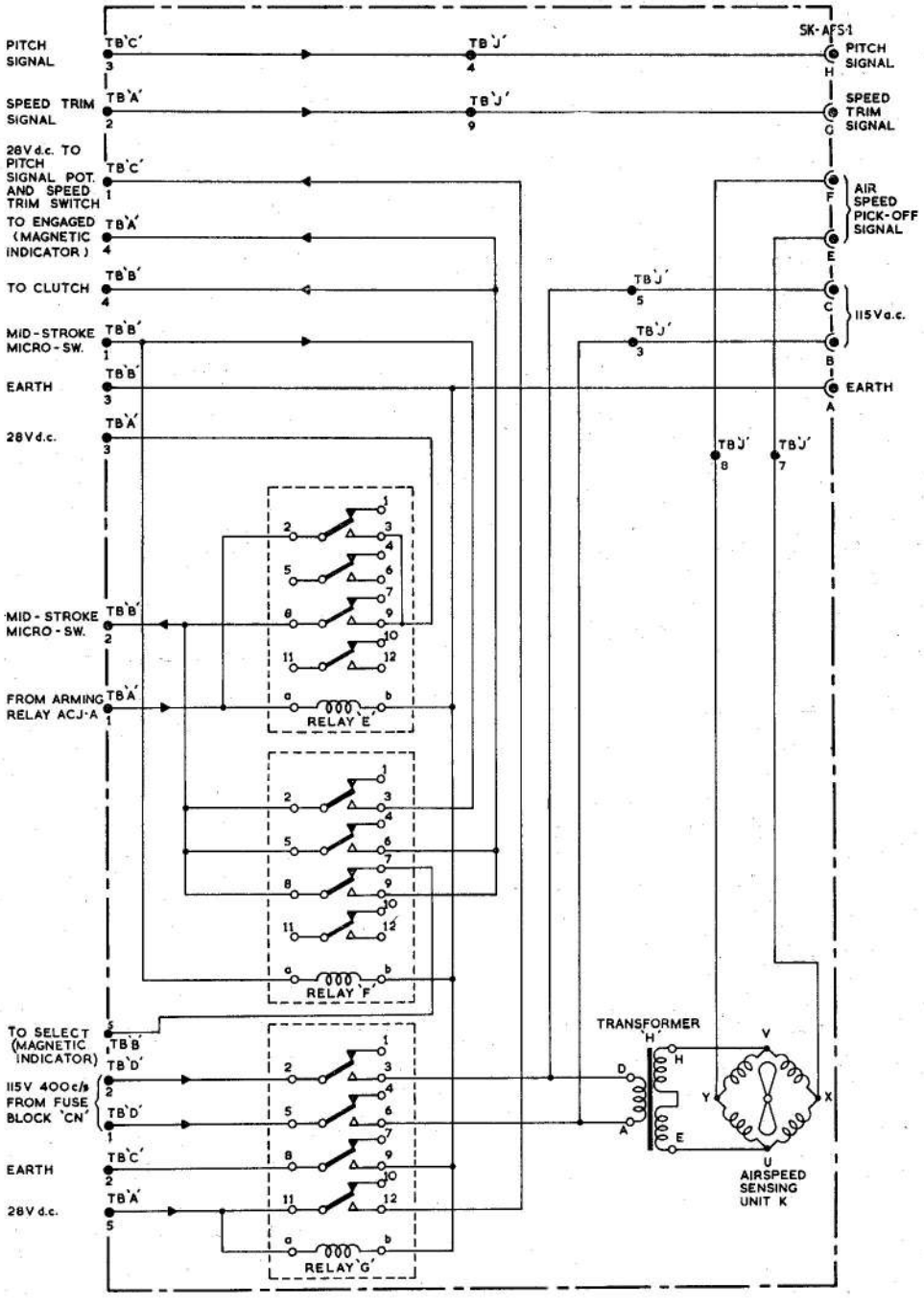

Fig. 4. Circuit diagram

Type 3C 532 and the air speed sensing unit pick-off are completed via pins 3 and 6 of the master relay 'G'. In. addition, this supply is fed to the four transformers of the actuator amplifier via the tagboard and the U.K.A.N. connector.

Engagement

11. When the 'ENGAGE' button on the control column is depressed, the Engage relay 'E' is energized. via the Arming relay ACJ-A contacts, and makes its own retaining circuit via pins 2 and 3.

12. 28V d.c. will energize the 'select' portion of the dual magnetic indicator in the pilot's cockpit via pins 8-7 of the 'lock-on' relay 'F' in the de-energized condition and pin 5 of TBB.

13. With the mid-stroke actuator micro-switch made, the lock-on relay 'F' will energize, making its own retaining circuit via pins 2-3, and completing circuits via pins 8-9 to energize the 'Engaged' section of the magnetic indicator via pin 4 of TBA. Simultaneously 28V d.c. energizes the magnetic clutch via pins 5-6 of the lock-on relay F and pin 4 of TBB.

Disengagement

14. The air speed datum and relay box can be disengaged by pressing the disengage buttons (X and Y) and setting the auto-throttle master switch to the off position.

SERVICING

General

15. The test procedures normally carried out at specified periods, or at any time when the correct functioning of the air speed datum and relay box is suspect, are described in Appendix A of this chapter.

Preliminary examination

16. Remove the top and bottom covers by removing the ten securing screws around the top and bottom of the main cover assembly. The components of the unit are now accessible for servicing.

17. A brief visual examination of the unit should be made for:—

(a) Faulty insulation
(b) Broken wiring
(c) Wiring not placed in position
(d) Cleanliness

and signs of:—

(e) Overheating
(f) Corrosion
(g) Cracking

18. Subject the unit to the standard serviceability test Appendix A.

RENEWAL OF COMPONENTS

Relays E, F and G

19. Each relay is secured to the chassis by means of two 4 B.A. $\frac{5}{16}$in. cheesehead screws. To renew any of the relays proceed as follows:—

(1) Unsolder the cableform connections from the terminals of the relay, noting the terminal pins, lead colours and the shorting links.

(2) Remove the two 4 B.A. securing screws and stiff nuts and lift the relay from the chassis.

(3) Position the new relay and replace the two 4 B.A. securing screws and stiff nuts.

(4) Resolder the cableform wires and the shorting links to the appropriate terminal pins of the new relay.

Replacement of transformer 'H', Type 3C 532

20. Transformer Type 3C 532 is secured to the chassis by two 6 B.A. $\frac{9}{16}$ in. cheesehead screws and two spacers. To renew the transformer proceed as follows:—

(1) Unsolder the cableform connections from the terminal pins of the transformer, noting the terminal pins and lead colours. Remove also the shorting link between pins F and G.

(2) Remove the two 6 B.A. securing screws and spacers and lift the transformer form the chassis.

(3) Position the new transformer with spacer on the chassis and replaces the two 6 B.A. securing screws.

(4) Resolder the shorting link between terminal pins F and G.

(5) Resolder the cableform wires to the appropriate terminal pins of the new transformer.

Replacement of air speed sensing unit

21. The air speed sensing unit is secured to the chasssis by four 6 B.A. $\frac{1}{2}$ in cheesehead screws and four 6 B.A. stiffnuts. To renew the air speed sensing unit proceed as follows:—

(1) Remove the two hoses from the pitot and static connections.

(2) Unsolder the four cableform wires from the terminal pins on the top of the sensing unit, noting the terminal pins and lead colours.

(3) Remove the four 6 B.A. stiffnuts and securing screws and lift the sensing unit from the chassis.

(4) Position the new sensing unit and replace the four 6 B.A. securing screws and stiffnuts.

(5) Resolder the cableform wires to the appropriate terminal pins of the new sensing unit.

(6) Replace the pitot and static hoses.

Appendix A

STANDARD SERVICEABILITY TEST for AIR SPEED DATUM AND RELAY BOX 26FY/18964

LIST OF CONTENTS

Introduction

1. The tests laid down in this appendix are to be carried out on the air speed datum and relay box before it is fitted to an aircraft, or at any time when its serviceability is suspect.

TEST EQUIPMENT

2. The following test equipment is required :

(1) 2nd line test set, Type 3D2262-A-1.
(2) Valve voltmeter, C.T.471, (Ref. No. 0557/6625-99-972-0247).
(3) Pitot static test set, Mk. 3.
(4) 500V insulation tester, Type A (Ref. No. 5G/1621).

POWER SUPPLIES

3. The following power supplies are required :

(1) 115V ± 0·5V 400 c/s a.c. single phase.
(2) 28V ± 0·5V d.c.

TEST PROCEDURE

Preparation

4. Remove the covers and examine the interior of the unit for signs of moisture ingress, corrosion, damage to components, chafing of cables, and security of components and electrical connections. Replace cover.

5. Ensure that all test set switches are set to the off position. Connect the 115V a.c. and 28V d.c. supplies to PL1 of the test set.

6. Swich on external power supplies and check supplies on the test set as follows :—

(1) S16 to A.C.
(2) S18 to ON.
(3) The a.c. supply indicated on meter M1 should be 115V ± 0·5V.
(4) S16 to D.C.
(5) S17 to ON.
(6) The d.c. supply indicated on meter M1 should be 28V ± 0·5V d.c.

7. Set switch S6 to RLG. Press to test, lamps 2 to 7 inclusive. Renew any lamp found to be defective. Set switches S6, S17 and S18 to OFF.

8. Connect a valve voltmeter to socket SK4 using cable harness No. 4 (3C/3022) and set it to the 2·4 A.C. range. Set switch S12 to position 3 (ASU. PO) and switch S15 to position 4 (ASU O/P).

Leak test

9. Connect the pitot-static test set to the pitot connection and apply a pressure of 750 knots. Shut off pressure and verify that there is no leak. If this test is satisfactory proceed with the following tests.

Relay functioning test

10. Carry out the following operations:

(1) Connect the air speed datum and relay box to socket SK2 on the test set, using cable harness No. 2 (3C2865).

(2) Set switches S17 and S18 to ON.

(3) Set switch S6 to RLG and note that lamps LP1 to LP5 inclusive light.

(4) Press and release switch S5 and note lamps LP1 to LP5 inclusive light.

(5) Press and release switch S7 and note that lamp LP1 to LP4 inclusive and lamps LP6 and LP7 light; lamp LP5 remaining off.

(6) Set switch S6 to OFF and note that lamps LP1 to LP7 inclusive are off.

Air speed pick off test

11. Set switch S6 to RLG, apply 120 knots to the pitot connection and note that the valve voltmeter reading is 667mV ± 90mV.

12. Increase the pitot reading to 130 knots and note that the valve voltmeter reading is 0 ± 59mV.

13. Increase the pitot reading to 140 knots and note that the valve voltmeter reading is 667mV ± 90mV.

14. Increase the pitot reading to 160 knots.

15. Decrease the pitot reading to 140 knots and note that the valve voltmeter reading is 667mV + 90mV.

16. Decrease the pitot reading to 139 knots and note that the valve voltmeter reading is 0±59mV.

17. Decrease the pitot reading to 120 knots and note that the valve voltmeter reading is 667mV ± 90mV.

18. Reduce the pitot pressure to zero and set switch S6 to OFF.

Insulation test

19. Set all test set switches to off and disconnect cable harness No. 2 from the test set.

20. Using a 500V insulation tester measure the insulation resistance between each pin of the 25 way test harness connector and the frame of the unit; the resistance should be not less than 2 megohms.

21. Disconnect the cable harness No. 2 from the unit.

Southampton No. 17[illegible]