Cancelled, now AP 120F-0208-1

Chapter 2

TEST EQUIPMENT, ULTRA, TYPE QE405

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LEADING PARTICULARS

Test equipment, Ultra, Type QE405	*Ref. No. 5G/3225*
Supply battery, 5·4V Mallory mercury Type SKB 536	*Ref. No. 5S/3464*
Dimensions	18 *in.* × 11 *in.* × 9 *in.*
Weigh	28 *lb*

Introduction

1. The field test equipment, Ultra, Type QE405 is designed to facilitate fault diagnosis and the quick testing of throttle control equipment, Ultra, Type B.A.P. 3 and the associated aircraft wiring. The test facilities may be summarised as follows: —

(1) Assessment of the temperature control system by injecting a voltage to simulate the aircraft thermocouple signal.

(2) Assessment of the datum lift function by injecting a voltage to stimulate the aircraft thermocouple signal and simultaneously applying an external engine speed signal.

(3) Checking, or resetting, of the c.r.p.m. governor datum settings using a variable speed signal source.

(4) Testing the aircraft wiring associated with telesyn system, normal motor, feedback generator, cold junction compensator (C.J.C.) unit, tacho-generator and relay unit.

(5) Assessment of the voltage safety, temperature safety and positioner safety circuits in terms of balance or unbalance. For B.A.P. 3 equipment embodying MOD. No. B181 reference in this manual to the assessment of voltage safety is not applicable.

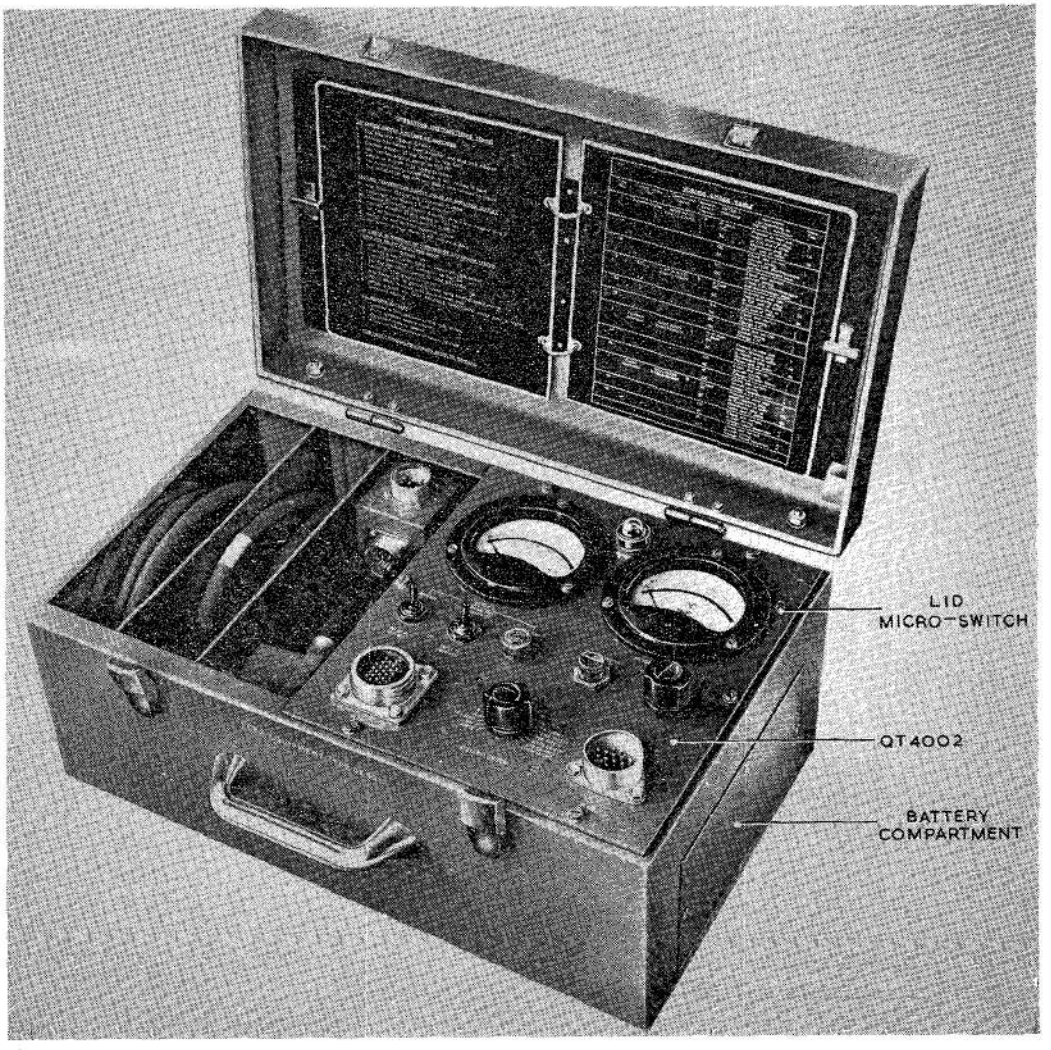

Fig. 1. Test equipment, Ultra, Type QE405

(6) Indication that the supply voltages to the amplifier and transmitter units are within specified limits. A neon lamp is used to observe continuity of supplies.

DESCRIPTION

General

2. The test equipment, Ultra, Type QE405 (*fig.* 1) consists of the following units and ancillaries: —

(1) QT4002—Test set.

(2) QY4051—Amplifier adaptor unit (with 25-way connector lead) between aircraft amplifier connectors and test set PLUG 1.

(3) QY4052—Connector (12-way contact bar at one end) between amplifier test panel 3 and test set PLUG 2.

(4) QY4053—Connector between transmitter test socket T3 and test set PLUG 2.

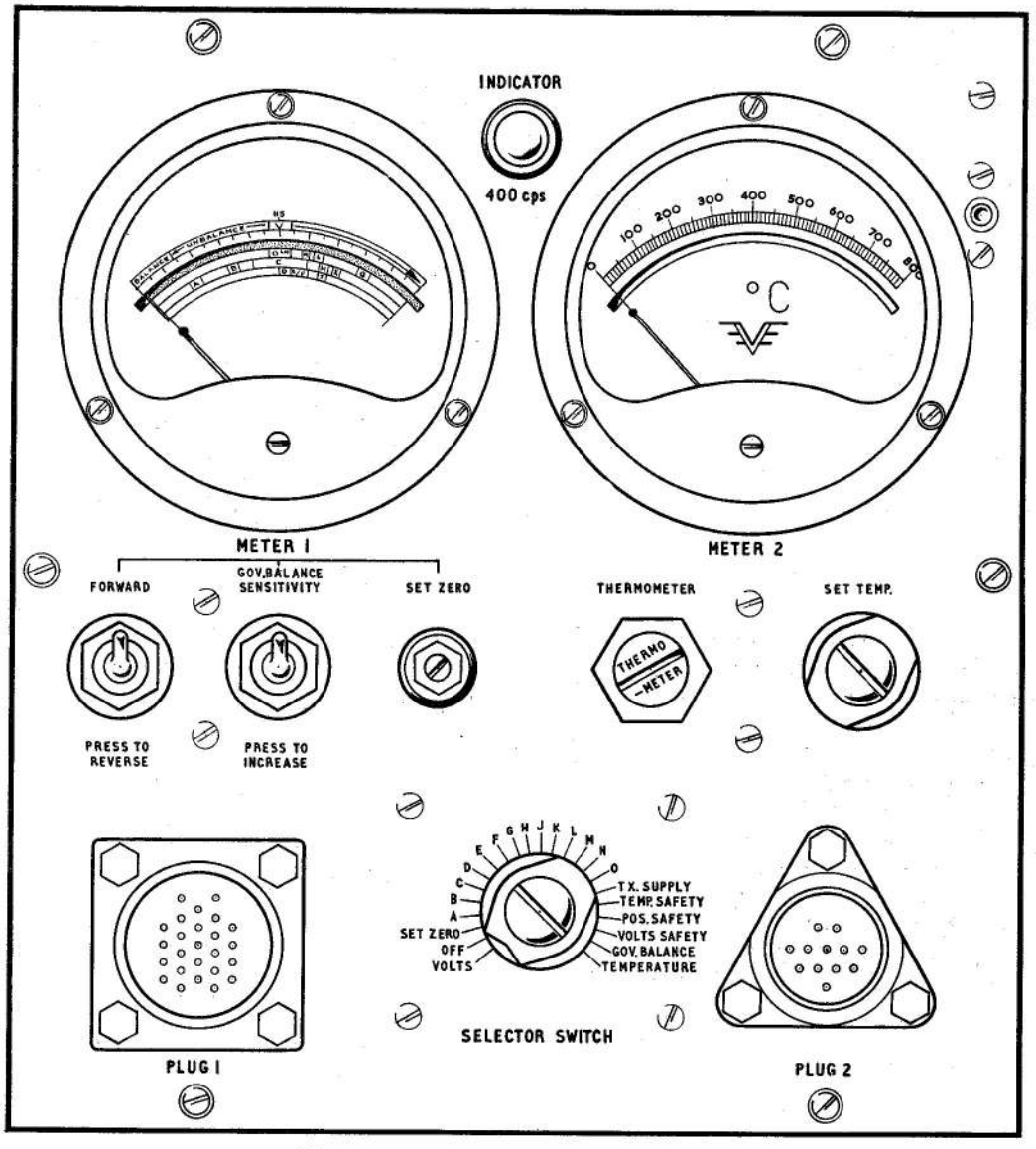

Fig. 2. Test set QT4002—front panel

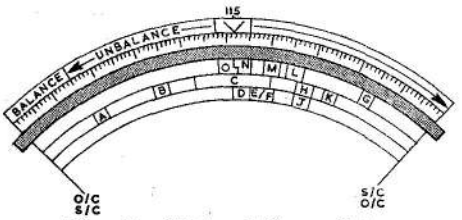

Fig. 3. Meter 1 face plate

(5) QY4054—Connector between amplifier unit plug A2 and adaptor unit QY4051.

(6) QY4055—Connector (approximately 15 ft. long) between C.J.C. unit and test set PLUG 2.

(7) QY4006—Shorting unit.

(8) Metal carrying case and instruction plates.

Test set, Ultra, Type QT4002

3. The test set QT4002 is contained in a portable aluminium case with cable connectors and the other ancillaries housed in separate compartments. Metal instruction plates are mounted inside the hinged lid. The power supply battery is also contained in a separate compartment, the battery case and fuse holder being mounted to a panel secured by four quick release fasteners. This side-panel can be seen in fig. 1. A lid operated microswitch ensures that the battery supply is disconnected when the test set lid is closed. A 2-way connector facilities removal of the battery, battery holder and fuse as a complete unit.

4. On the left-hand side of the front panel is a multi-range instrument METER 1. The scale (*fig.* 3) is calibrated in lettered zones which correspond to the engraved marking of the various SELECTOR SWITCH positions. Associated with METER 1 are a SET ZERO control and two spring loaded toggle switches, the functions of which are described in para. 10.

5. On the right-hand side of the front panel is METER 2, calibrated in degrees Centigrade. This meter indicates the simulated temperature signal applied to the C.J.C. unit thermocouple terminals. The signal is adjusted by the SET TEMP. control. A thermometer supplied for the purpose of correcting METER 2 readings is also mounted on the front panel and labelled (THERMOMETER). A neon INDICATOR on the panel is used to observe continuity of supplies.

CIRCUIT DESCRIPTION

6. The circuit (*fig.* 6) contains five wafers (SW1A to SW1E) of the SELECTOR SWITCH (SW1). The switch wafers select the required interconnections between PLUG 1 (PL1) and PLUG 2 (PL2) (connected to the external circuit under test), METER 1 (M1), METER 2 (M2), and the 5·4V battery. The rectifier circuits of MR1 and MR2 convert the 115V and 30V a.c. supplies, respectively, to the appropriate d.c. voltage for METER 1.

7. METER 1 indicates acceptable or non-acceptable resistance readings corresponding to SW1 positions 4 to 17 (A to O on front panel). An acceptable reading brings the pointer within the zone having a letter mark corresponding to that engraved on the panel for the switch position. The voltage for these resistance measurements is derived from the 5·4V battery. The circuit under test is connected in series, or in parallel, with a resistance network consisting of R3, R4 and R5 with RV4 (SET ZERO) compensating for changes in battery voltage and metering circuit.

8. The 5.4V battery is also used to provide the variable simulated temperature signal. The signal is fed to the aircraft C.J.C. circuit via the resistor network R10, R9 and RV3 (SET TEMP) and poles J and K of PL2. R10 is included to avoid tripping the aircraft temperature safety circuit. The temperature signal is monitored by METER 2.

9. The resistors R12 to R15, associated with PL2, reduce the safety circuit governor balance currents to values suitable for display on METER 1.

Test set controls

10. The test set controls are illustrated in fig. 2 and 6 and are as follows :—

(1) Switches (*fig.* 2) :

(a) Circuit SELECTOR SWITCH (SW1).

(b) FORWARD/PRESS TO REVERSE (METER 1) spring bias toggle switch (SW2). The reversal of METER 1 indication may be necessary during balance tests, when the conditions may result in either polarity.

(c) GOV. BALANCE SENSITIVITY/PRESS TO INCREASE (METER 1) spring bias toggle switch (SW3).

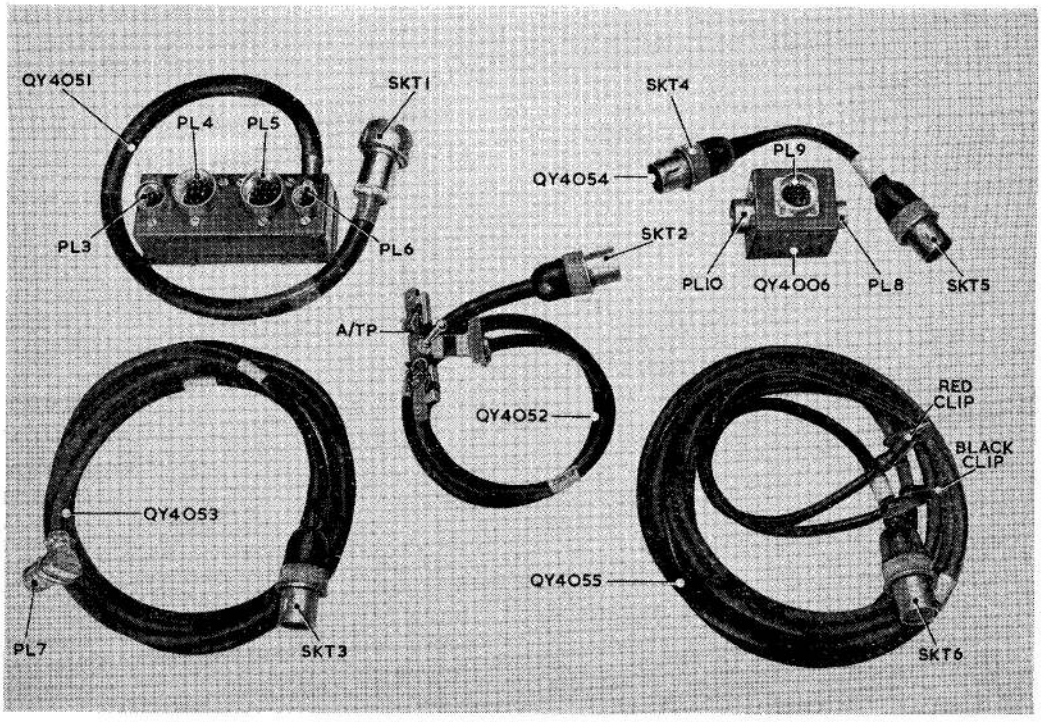

Fig. 4. Cable connectors and ancillary components

(d) Lid safety switch (SW4). Micro-switch disconnecting the battery supply when lid is closed.

(2) External potentiometer controls (*fig.* 2):

(a) SET TEMP control (RV3)—sets the amplitude of the simulated temperature signal.

(b) SET ZERO control (RV4)—METER 1 (resistance bands).

(3) Internal preset potentiometers (*fig.* 6) :

(a) RV1 calibrates the amplifier V band (115V).

(b) RV2 calibrates the temperature reading of METER 2.

(c) RV5 calibrates the transmitter V band (30V).

Note . . .

The three internal preset potentiometers are included for calibration purposes only. They are set up during manufacture and should not be disturbed unless the instrument needs recalibration. The calibration of the temperature reading on METER 2 depends on the length of the connector Type QY4055. If the length of this connector is altered the meter must be re-calibrated. The procedure for calibration is given in para. 38.

Selector switch positions

11. For a particular selector switch position, either a voltage or a resistance measurement is made across a supply or component or test point of the B.A.P. 3 equipment, so that two plug-pole connections are involved in each measurement. Table 1 lists the test plug-pole connections together with corresponding B.A.P. 3 unit connections and aircraft wiring identifications (where applicable). All readings apply to METER 1 unless stated otherwise. Approximate resistance values are given here for reference purposes only, since they are displayed as being acceptable or non-acceptable by METER 1.

TABLE 1

Selector switch positions

SELECTOR SWITCH SW1 position	Engraving	Supply or component	Approx. values	Test set con-nections	B.A.P.3 unit con-nections	Aircraft wire identi-fications
1	VOLTS	Amplifier supply	115V	PL1.A PL1.O	A.4.A A.4.B	
2	OFF	—	—	—	—	
3	SET ZERO	—	—	—	—	
4	A	C.J.C.	4 ohms	PL1.B PL1.P	A.1.B A.1.D	KHcI12 KHcI10
5	B	C.J.C.	11·5 ohms	PL1.C PL1.P	A.1.A A.1.D	KHcI14 KHcI10
6	C	Feedback generator	20 ohms*	PL1.D PL1.Q	A.3.C A.3.D	KHIa22 KHIa24
7	D	Tacho-generator	26 ohms	PL1.E PL1.R	A.3.L A.3.M	KHBIa2 KHBIb1
8	E	Normal motor	30 ohms or 36 ohms	PL1.F PL1.S	A.3.A A.3.B	KHIa20 KHIa30
9	F	Normal motor	30 ohms or 36 ohms	PL1.D PL1.S	A.3.C A.3.B	KHIa22 KHIa30
10	G	Safety warning relay	90 ohms	PL1.G PL1.T	A.2.L A.2.M	KHIa50 KHIa52
11	H	Reset stator (R-Y)	50 ohms	PL1.H PL1.U	A.3.E A.3.G	KHIa8A KHIa10A
12	J	Reset stator (R-B)	50 ohms	PL1.H PL1.V	A.3.E A.3.F	KHIa8A KHIa6A
13	K	Transmit rotor	73 ohms	PL1.J PL1.W	A.2.C A.2.D	KHIa34 KHIa36
14	L	C.J.C.	270 ohms	PL1.C PL1.X	A.1.A A.1.C	KHcI14 KHcI16
15	M	Transmit stator (Y-B)	360 ohms	PL1.K PL1.W	A.2.A A.2.D	KHIa8 KHIa36
16	N	Reset rotor	470 ohms	PL1.L PL1.Y	A.3.H A.3.J	KHIa12 KHIa14
17	O	Transmit stator (R-B)	540 ohms	PL1.M PL1.W	A.2.B A.2.D	KHIa10 KHIa36
18	TX SUPPLY	TX supply	30V	PL1.N PL1.Z	A.2.F A.2.G	KHIa40 KHIa42
19	TEMP. SAFETY	Balance volts	0·15V	PL2.E PL2.F	A.TP3.1 A.TP3.3	
20	POS. SAFETY	Balance volts	0·06V	PL2.C PL2.D	T.3.3 T.3.4	
21	VOLTS SAFETY	Balance volts	0·25V	PL2.G PL2.H	A.TP3.4 A.TP3.5	
22	GOV. BALANCE	Balance volts	0·15V	PL2.A PL2.B	T.3.1 T.3.2	
23	TEMPER-ATURE	Simulated temperature signal	Variable (METER 2)	PL2.J PL2.K	C.J.C.— C.J.C.+	

* Resistance reading may be considerably greater than 20 ohms for a used generator due to variable brush contact, but the generator should not be rejected for this reason.

OPERATING INSTRUCTIONS

Procedure

12. The procedure for the various test facilities is given in the following paragraphs. These instructions are also given, in summarised form, on metal instruction plates housed inside the lid of the test set. The details on the plates are reproduced in Table 2.

Aircraft wiring test

13. The free sockets A.1, A.2 and A.3 linking the aircraft wiring to the amplifier unit are disconnected and reconnected to the adapter box of QY4501. The 25-way socket of the adapter lead is connected to PLUG 1 of the test set. The selector switch is turned to interrogate the various circuits listed in the wiring check table (Table 3). This Table is also engraved on the metal instruction plates inside the lid of the test set. Abnormally high or low resistance readings will cause the pointer to indicate outside the designated band on METER 1. In this event, the component at the remote end of the wiring is disconnected and a shorting unit QY 4006 is then substituted in order to determine whether the aircraft wiring or the remote unit is at fault. The potentiometer SET ZERO mounted on the front panel enables a zero adjustment of METER 1 to be made before each set of readings, thus compensating for any variation of battery voltage. The pointer should be set to the zero at the right hand end of the scale, i.e., the high ohms zero. When it is no longer possible to zero the meter, the battery should be renewed.

Temperature safety balance or voltage safety balance

14. Remove the amplifier test point 3 cover (six screws) and fit the 12-way terminal connecting bar of QY4052 to the test point. The free socket at the remote end of the connecting bar cable is fitted to PLUG 2 of the test set. The TEMP. SAFETY or VOLTS SAFETY circuits can be assessed in terms of BALANCE or UNBALANCE by selecting the appropriate switch position and switching on the 115V supply to the system.

Note . . .

During balance tests (para. 14, 15, 22 .and 23) it may be found necessary to reverse the reading on METER 1 by means of the toggle switch PRESS TO REVERSE (para. 10).

Positioner safety balance

15. Connect the transmitter test socket T3 to the test set PLUG 2 using connector QY4053. Select POS. SAFETY and switch on the 115V supply to the system. METER 1 indicates BALANCE or UNBALANCE.

Temperature channel tests

16. A variable input simulating the jet pipe temperature signal is applied across the aircraft C.J.C. thermocouple terminals. At least 30 minutes should have elapsed after an engine run to allow the jet-pipes to cool and thermocouples to return to ambient temperatures. A second operator is required to observe the throttle motor unit.

17. The test set is connected to the aircraft C.J.C. thermocouple terminals via connector QY4055 from the test set PLUG 2. The red lead must be connected to the positive terminal and the black lead to the negative terminal of the C.J.C. With METER 2 correctly zeroed using meter set screw, select TEMPERATURE on the test set, switch on the aircraft supplies and move the throttle lever fully forward. The temperature signal, simulated by the test set, is then slowly increased by rotating the SET TEMP. control in a clockwise direction until the second operator observes that the throttle motor starts up and commences to close the throttle. At this point the temperature signal, recorded on METER 2, should be 580°C $\pm$ 10°C.

18. In high ambient temperatures it may be necessary to correct the readings on METER 2. The reference datum level temperature is 556°C$-$0·15T, where T is the ambient temperature, and the throttle motor should start to close at approximately 25°C above this point. A thermometer is supplied to record the ambient temperature. The signal required to cause the throttle motor to close is therefore 580°C $\pm$ 10°$-$0·15T.

Note . . .

The above test is only a 'function or non-function' check. The compressed meter scale is not suitable for accurate setting-up of the temperature control function.

19. The datum lift function can be tested by using the test procedure, as in para. 16 to 18, and by injecting an external speed signal which simulates the engine c.r.p.m. signal.

The temperature datum is 556°C at all speeds when the tacho is steady running, but when the tacho speed is increasing at speeds above 9,500 c.r.p.m. (approx.) the temperature datum may rise to a maximum of 620°C (approx.) depending on the rate of acceleration. If the tacho speed is increased from the speed equivalent to 10,000 c.r.p.m. up to the speed equivalent to 12,000 c.r.p.m. in approximately 10 seconds, the temperature datum rises to the maximum of approximately 620°C. To test this function, set the c.r.p.m. source to 10,000 c.r.p.m. and inject a temperature signal equivalent to 610°C. Push the throttle lever forward. The throttle should be closed. Increase c.r.p.m. from 10,000-12,000 in approximately 10 seconds. The throttle motor should open the throttle while c.r.p.m. are increasing.

Amplifier supply voltage

20. The two-pole supply socket A4 is disconnected from the amplifier unit and the supply lead connected to the adapter box QY4051. The adapter 25-way socket is linked to the test set PLUG 1. Select the VOLTS position on the selector switch and switch on the aircraft 115V supply. METER 1 should read within the V band (107V to 123V). A neon 400 c/s indicator on the front panel is used to observe continuity of supplies.

Transmitter supply voltage

21. The transmitter supply voltage can also be measured at the amplifier unit. Disconnect the free socket A2 at the amplifier and connect the adapter lead QY4054 between amplifier plug A2 and adapter box QY4051. Connect adapter 25-way socket to the test set. Turn selector switch to TX SUPPLY and switch on aircraft 115V supply. METER 1 to read within the V band.

Governor balance

22. The governor channel balance may be checked using connector QY4053 between transmitting test socket T3 and test set PL2. With no tacho signal, switch to GOV. BALANCE. Depress GOV. BALANCE SENSITIVITY switch. METER 1 should indicate in the BALANCE band.

Note . . .

During balance tests (*para.* 14, 15, 22 *and* 23) *it may be found necessary to reverse the reading on METER* 1 *by means of the toggle switch PRESS TO REVERSE* (para. 10).

Governor datum check

23. With test conditions as in para. 22, connect an external speed source and run tacho at governing speed. Switch on datum selector and select appropriate datum. Centralize pilot's trimmer and METER 1 should read in the BALANCE band. If it is necessary to adjust the governor datum the governor sensitivity switch provides increased sensitivity for more accurate setting.

Removal of battery

24. To remove the battery, unscrew the four quick-release fasteners at the right hand side of the case. Partly withdraw the battery retainer and disconnect the battery leads. Complete withdrawal of the battery retainer is then possible.

25. The summarised OPERATING INSTRUCTIONS and the associated WIRING CHECK TABLE as engraved on the metal instruction plates are given in Table 2 and Table 3.

TABLE 2

Operating instructions

Wiring Check

1. Use Amplifier Adapter QY4051
2. Disconnect free sockets 1, 2 and 3 from Amplifier
3. Connect free sockets 1, 2 and 3 to Adapter QY4051
4. Connect Adapter 25-way socket to Test Set
5. Set Test Set selector switch to SET ZERO
6. Check that Meter 1 reads SC (if not, adjust control SET ZERO for SC reading ; if unable to obtain SC reading change battery)
7. Proceed as directed in WIRING CHECK TABLE

TABLE 2—(contd.)

Temperature Safety and Voltage Safety Balance Test

1. Use Connector QY4052
2. Remove test point cover from Amplifier
3. Connect terminal strip of Connector to Amplifier test pin bracket
4. Plug free socket of Connector into Test Set
5. Set Test Set selector switch to TEMP. SAFETY or VOLTS SAFETY, as required
6. Switch on Aircraft 115V supply to system
7. Meter 1 will indicate BALANCE or UNBALANCE of circuit under test

Positioner and Frequency Safety Balance Test

1. Use Connector QY4053
2. Connect 6-way Cannon plug to Transmitter test socket
3. Plug free socket of Connector into Test Set
4. Set Test Set selector switch to POS SAFETY
5. Switch on Aircraft 115V supply to system
6. Meter 1 will indicate BALANCE or UNBALANCE of circuit

To Test Temperature Control

1. Use Connector QY4055
2. Connect red sleeved clip to positive stud of C.J.C.
3. Connect black sleeved clip to Negative stud of C.J.C.
4. Set Test Set selector switch to TEMPERATURE
5. Switch on Aircraft 115V supply to system
6. Open throttle with Normal system
7. Turn SET TEMP. control clockwise, to increase temp. signal, until throttle starts to close
8. Record reading of Meter 2

Note . . .

Decrease Temp. Signal as soon as possible to prevent excessive use of slipping clutch in throttle motor.

To Check Supply Voltage at Amplifier

1. Use Amplifier Adapter QY4051
2. Remove free socket 4 from Amplifier, and plug into Adapter
3. Connect Adapter 25-way socket to Test Set
4. Set Test Set selector switch to VOLTS
5. Switch on Aircraft 115V supply to system
6. For correct supply voltage Meter 1 will indicate V band
7. The INDICATOR 400 CPS will detect interruptions to supply

Testing Transmitter Supply Volts at Amplifier Outlet

1. Use Adapter QY4051 and Connector QY4054
2. Disconnect free socket 2 from Amplifier
3. Connect Connector between Amplifier plug 2 and Adapter plug 2
4. Connect adapter 25-way socket to Test Set
5. Set Test Set selector switch to TX SUPPLY
6. Swith on Aircraft 115V supply to system
7. For correct voltage Meter 1 will indicate V band

To Check Alignment of Compressor Governor System
(Using Test Set and Engine Speed Source)

1. Use Connector QY4053
2. Connect 6-way Cannon plug to Transmitter test socket
3. Connect free socket of Connector to Test Set

TABLE 2—(contd.)

To Check Alignment of Compressor Governor System—(contd.)

4. Set Test Set selector switch to GOV. BALANCE
5. Switch on 115V supply to system
6. Run Tacho-gen at governing speed using external speed source
7. Adust Pilots Trimmer until Meter 1 reads zero
8. When pressed, the GOV. BALANCE SENSITIVITY switch gives a higher sensitivity reading

To Remove Battery

1. Unscrew 4 fasteners at side of case
2. Partly withdraw battery retainer
3. Disconnect leads to battery
4. Complete the withdrawal of battery retainer

TABLE 3

Wiring Check Table

Test No.	Circuit under Test	Connections Tested	Sel. Sw. Posn.	METER 1 indication	Instruction corresponding to METER 1 indication	Next Test
1	Thermo-couples	A/1/B-A/1/D KHcI12-KHcI10	A	A band	Proceed to next test	2
				OC	Insert shorting plug at C.J.C. end of cable	1A
				SC	Disconnect plug at C.J.C. end of cable	1B
1A				OC	Check and correct aircraft wiring	1
				SC	Check C.J.C. thermo-couples and thermo-couples leads	1
1B				SC	Check and correct aircraft wiring	1
				OC	Check C.J.C. thermo-couples and thermo-couples leads	1
2	C.J.C.	A/1/A-A/1/D KHcI14-KHcI10	B	B band	Proceed to next test	3
				OC	Insert shorting plug at C.J.C. end of cable	2A
				SC	Disconnect plug at C.J.C. end of cable	2B
2A				OC	Check and correct aircraft wiring	2
				SC	Change C.J.C.	2
2B				SC	Check and correct aircraft wiring	2
				OC	Change C.J.C.	2

TABLE 3—(contd.)

Test No.	Circuit under Test	Connections Tested	Sel. Sw. Posn.	METER 1 indication	Instruction corresponding to METER 1 indication	Next Test
3	Feedback Generator	A/3/C-A/3/D KHIa22-KHIa24	C	In or near C band	Proceed to next test	4
				OC	Insert shorting plug at Motor end of cable	3A
				SC	Disconnect plug at Motor end of cable	3B
3A				OC	Check and correct aircraft wiring	3
				SC	Change Throttle Motor	3
3B				SC	Check and correct aircraft wiring	3
				OC	Change Throttle Motor	3
4	Tacho-Generator	A/3/L-A/3/M KHBIa2-KHBIb1	D	D band	Proceed to next test	5
				OC	Insert shorting plug at Tacho end of cable	4A
				SC	Disconnect plug at Tacho end of cable	4B
4A				OC	Check and correct aircraft wiring	4
				SC	Change Tacho-generator	4
4B				SC	Check and correct aircraft wiring	4
				OC	Change Tacho-generator	4
5	Normal Motor	A/3/A-A/3/B KHIa20-KHIa30	E	E band or near E band on OC side	Proceed to next test	6
				OC	Insert shorting plug at Motor end of cable	5A
				SC	Disconnect plug at Motor end of cable	5B
5A				OC	Check and correct aircraft wiring	5
				SC	Change Motor	5
5B				SC	Check and correct aircraft wiring	5
				OC	Change Motor	5

TABLE 3—(contd.)

Test No.	Circuit under Test	Connections Tested	Sel. Sw. Posn.	METER 1 indication	Instruction corresponding to METER 1 indication	Next Test
6	Normal Motor	A/3/C-A/3/B KHIa22-KHIa30	F	F band or near F band on		
				OC side	Proceed to next test	7
				OC	Insert shorting plug at Motor end of cable	6A
				SC	Disconnect plug at Motor end of cable	6B
6A				OC	Check and correct aircraft wiring	6
				SC	Change Motor	6
6B				SC	Check and correct aircraft wiring	6
				OC	Change Motor	6
7	Relay Unit	A/2/L-A/2/M KHIa50-KHIa52	G	G band	Proceed to next test	8
				OC	Insert shorting link across appropriate relay channels as follows: No. 1 B-C, No. 2 F-G, No. 3 K-L, No. 4 P-Q	7A
				SC	Disconnect appropriate leads as above	7B
7A				OC	Check and correct aircraft wiring	7
				SC	Renew relay unit (Remove link)	7
7B				SC	Check and correct aircraft wiring	7
				OC	Renew relay unit	7
8	Reset Telesyn Stator	A/3/E-A/3/G KHIa8A-KHIa10A	H	H band	Proceed to next test	9
				OC	Insert shorting plug at Motor end of cable	8A
				SC	Disconnect plug at Motor end of cable	8B
8A				OC	Check and correct aircraft wiring	8
				SC	Change Motor	8
8B				SC	Check and correct aircraft wiring	8
				OC	Change Motor	8

TABLE 3—(contd.)

Test No.	Circuit under Test	Connections Tested	Sel. Sw. Posn.	METER 1 indication	Instruction corresponding to METER 1 indication	Next Test
9	Reset Telesyn Stator	A/3/E-A/3/F KHIa8A-KHIa6A	J	J band	Proceed to next test	10
				OC	Insert shorting plug at Motor end of cable	9A
				SC	Disconnect plug at Motor end of cable	9B
9A				OC	Check and correct aircraft wiring	9
				SC	Change Motor	9
9B				SC	Check and correct aircraft wiring	9
				OC	Change Motor	9
10	Transmit Telesyn Rotor	A/2/C-A/2/D KHIa34-KHIa36	K	K band	Proceed to next test	11
				OC	Insert shorting plug at Transmitter end of cable	10A
				SC	Disconnect plug at Transmitter end of cable	10B
10A				OC	Check and correct aircraft wiring	10
				SC	Change Transmitter	10
10B				SC	Check and correct aircraft wiring	10
				OC	Change Transmitter	10
11	C.J.C.	A/1/A-A/1/C KHcI14-KHcI16	L	L band	Proceed to next test	12
				OC	Insert shorting plug at C.J.C. end of cable	11A
				SC	Disconnect plug at C.J.C. end of cable	11B
11A				OC	Check and correct aircraft wiring	11
				SC	Change C.J.C.	11
11B				SC	Check and correct aircraft wiring	11
				OC	Change C.J.C.	11
12	Transmit Telesyn Stator	A/2/A-A/2/D KHIa8-KHIa36	M	M band	Proceed to next test	13
				OC	Insert shorting plug at Transmitter end of cable	12A
				SC	Disconnect plug at Transmitter end of cable	12B

TABLE 3—(contd.)

Test No.	Circuit under Test	Connections Tested	Sel. Sw. Posn.	METER 1 indication	Instruction corresponding to METER 1 indication	Next Test
12A				OC	Check and correct aircraft wiring	12
				SC	Change Transmitter	12
12B				SC	Check and correct aircraft wiring	12
				OC	Change Transmitter	12
13	Reset Rotor	A/3/H-A/3/J KHIa12-KHIa14	N	N band	Proceed to next test	14
				OC	Insert shorting plug at Motor end of cable	13A
				SC	Disconnect plug at Motor end of cable	13B
13A				OC	Check and correct aircraft wiring	13
				SC	Change Motor	13
13B				SC	Check and correct aircraft wiring	13
				OC	Change Motor	13
14	Transmit Telesyn Stator	A/2/B-A/2/D KHIa10-KHIa36	O	O band	Wiring Check complete	
				OC	Insert shorting plug at Transmitter end of cable	14A
				SC	Disconnect plug at Transmitter end of cable	14B
14A				OC	Check and correct aircraft wiring	14
				SC	Change Transmitter	14
14B				SC	Check and correct aircraft wiring	14
				OC	Change Transmitter	14

Notes on fault finding chart

26. The following notes amplify the abbreviated instructions given in numbered blocks of the fault finding chart (*fig.* 5).

(1) Disconnect socket A4 from amplifier unit and connect free socket to adapter box. Select VOLTS and switch on the supply. METER 1 to read within V band. If neon indicates interrupted supply, test the relevant switches, fuses and soldered joints.

(2) Fit 12-way connecting bar of QY4052 to amplifier unit test panel 3. Connect 12-way lead to test set. Select VOLTS SAFETY and switch on the supply. METER 1 indicates BALANCE or UNBALANCE.

(3) Connections as in (2). Select TEMP. SAFETY and switch on the supply. METER 1 indicates BALANCE or UNBALANCE.

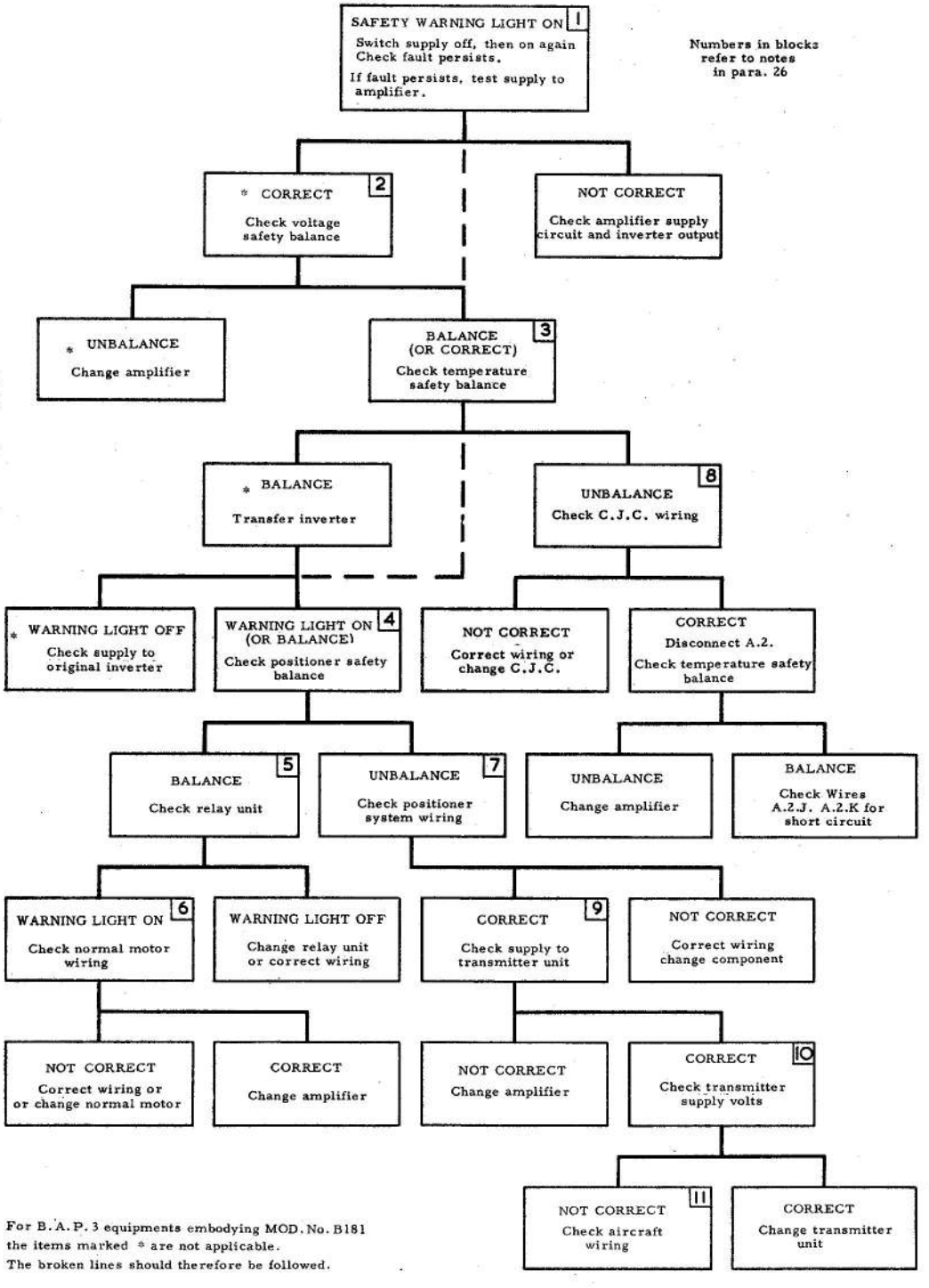

Fig. 5. Fault finding chart

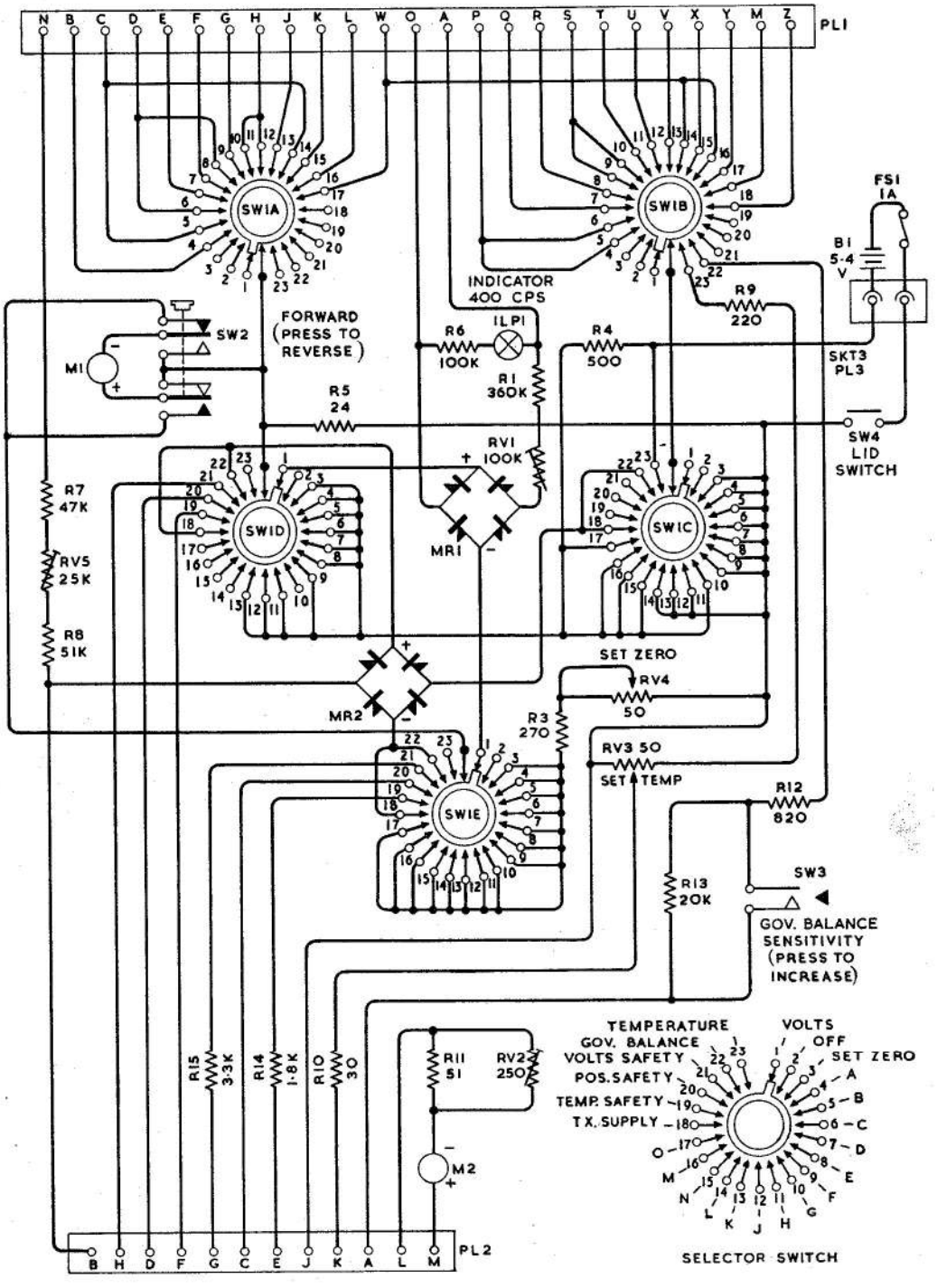

Fig. 6. Circuit diagram

(4) Connect 6-way plug of connector QY4053 to transmitter unit test socket T3. Connect cable to test set. Select POS. SAFETY and switch on the supply. METER 1 indicates BALANCE or UNBALANCE.

(5) Transfer relay unit connections to an adjacent engine channel. The relay unit terminal board connections are as follows : —

Engine channel 1	A. B, C and D
Engine channel 2	E. F. G and H
Engine channel 3	J, K, L and M
Engine channel 4	N, P, Q and R

Switch on the supply and observe relevant safety warning light.

(6) Disconnect socket A3 from amplifier unit and connect free socket to adapter box. Connect 25-way adapter box lead to test set and perform wiring tests 5 and 6. If these tests give correct results, remove socket A2 from amplifier and connect free socket to adapter box. Perform wiring test 7.

(7) Remove sockets A2 and A3 from amplifier unit and connect free sockets to adapter box. Connect 25-way adapter box lead to test set and perform wiring tests 8, 9, 10, 12, 13 and 14.

(8) Disconnect socket A1 from amplifier unit and connect free socket to adapter box. Connect 25-way adapter box lead to test set and perform wiring tests 1, 2 and 11.

(9) Disconnect socket A1 from amplifier unit and connect free socket to adapter box. Connect 25-way lead to test set and select TX. SUPPLY. M1 to read within V band.

(10) Disconnect socket T1 from transmitter unit. The voltage between poles 6 and 7 of the free socket should be approx. 30V.

(11) Check continuity of transmitter supply leads : —

T.1.6 — A.2.F — KHIa40
T.1.7 — A.2.G — KHIa42

SERVICING

27. The following test should be performed at the prescribed periods or when the accuracy of the test set is suspect. To perform the tests the following items are required : —

(1) Decade resistance box (Ref. No. 5G/3217).

(2) D.C. potentiometer (accuracy ±0·3% or Cambridge type).

(3) Multimeter, Type 1 (Ref. No. 10S/16411) or similar.

(4) A resistor, approximately 1·5 kilohms.

(5) A resistor, approximately 3 ohms.

(6) A d.c. voltage, variable between 0V and 0·5V. A suitable source consists of a 1·5V cell with a 25 ohms potentiometer connected between the terminals. A variable voltage is then available between the slider and either side of the potentiometer.

(7) A 115V, 400 c/s variable voltage source.

Resistance tests

28. Connect the free socket of the amplifier adapter Type QY4051 to PLUG 1 on the test set front panel. Rotate the selector switch to the SET ZERO position and adjust the SET ZERO control until the needle of METER 1 indicates full-scale deflection at the right-hand end (i.e. black O/C line). If it is not possible to obtain full-scale deflection of the meter needle, replace the internal battery.

29. Connect the terminals of the decade box to poles A and D on the adapter 5-way plug PL3. Rotate the selector switch to the B position and adjust the controls of the decade box until the meter needle indicates the left-hand limit of the B band. The resistance of the decade box must be 10 ohms ± 0·3 ohms.

30. Connect the terminals of the decade box to poles E and G on the adapter 12-way plug PL5. Rotate the selector switch to the H position and adjust the controls of the decade box until the meter needle indicates the left-hand limit of the H band. The resistance of the decade box must be 46 ohms ± 1·5 ohms.

31. Connect the terminals of the decade box to poles A and D on the adapter 14-way plug PL4. Rotate the selector switch to the M position and adjust the controls of the decade box until the meter needle indicates the left-hand limit of the M band. The resistance of the decade box must be 384 ohms ± 8 ohms.

Safety circuit balance points

Temperature safety

32. Connect the socket of connector Type QY4052 to PLUG 2 on the test set front panel. Connect the variable d.c. source and the Multimeter (0—2·5V d.c. range) between poles 1 and 3 of the connector Type QY4052. Rotate the selector switch to the TEMP. SAFETY position. Increase the voltage applied to the poles 1 and 3 until the needle of METER 1 indicates the point between the BALANCE and UNBALANCE bands. The meter needle indication of the Multimeter must be 0·15V ± 0·03V.

Volts safety

33. Connect the socket of connector Type QY4052 to PLUG 2 on the test set front panel. Connect the variable d.c. source and the Multimeter (0—2·5V d.c. range) between poles 4 and 5 of the connector Type QY4052. Rotate the selector switch to the VOLTS SAFETY position. Increase the voltage applied to the poles 4 and 5 until the needle of METER 1 indicates the point between the BALANCE and UNBALANCE bands. The multimeter indication must be 0·25V ± 0·04V.

Positioner safety

34. METER 1 is calibrated for the POS. SAFETY position of the selector switch, using a complete set of B.A.P.3 equipment, before despatch from the manufacturer. However, an approximate check of the POS. SAFETY position may be made, using the following procedure : —

35. Connect the appropriate socket of connector Type QY4053 to PLUG 2 on the test set front panel. Rotate the selector switch to the POS. SAFETY position. Connect the Multimeter (0—2·5V d.c. range) across the variable d.c. source. Connect the output from the d.c. source to poles 3 and 4 of the free socket of connector Type QY4053, via the 1·5 kilohm resistor. Increase the output from the d.c. source until the needle of METER 1 indicates the junction of the BALANCE and UNBALANCE bands. The Multimeter indication must be approximately 0·15V d.c.

Supply voltage

36. Connect the free socket of the amplifier adapter Type QY4051 to PLUG 1 on the test set front panel. Rotate the selector switch to the VOLTS position. Connect the variable a.c. voltage to the 2-way socket on the amplifier adapter Type QY4051. Adjust the variable a.c. voltage until the needle of METER 1 indicates the left-hand limit line of the V band. The Multimeter indication must be 107V ± 3V. Adjust the variable a.c. voltage until the needle of METER 1 indicates the right-hand limit line of the V band. The Multimeter indication must be 123V ± 3V. If an a.c. variable voltage is not available, an approximate check can be performed by connecting the test set to a serviceable amplifier channel in an aircraft. The meter reading can then be compared with the aircraft voltmeter reading.

Temperature

37. Connect the connector Type QY4055 to PLUG 2 on the test set front panel. Adjust the mechanical zero control on METER 2 until the needle indicates 0°C. Connect the 3 ohm resistor between the terminals of d.c. potentiometer. Connect the clips of connector Type QY4055 to the terminals of the d.c. potentiometer, ensuring correct polarity. Rotate the test set selector switch to the TEMPERATURE position. Adjust the SET TEMP. control until the needle of METER 2 indicates 600°C. Measure the voltage across the 3 ohm resistor using the d.c. potentiometer. The measured voltage must be between 24·7mV and 25·12mV (600°C ± 5°C).

Recalibration of METER 2

38. If the length of the connector Type QY4055 is altered, METER 2 must be recalibrated as follows : —

(1) Connect the test set to the associated equipment as described in para. 37.

(2) Adjust the SET TEMP. control until the output, measured with the d.c. potentiometer, is 24·91mV.

(3) Adjust RV2 (inside the test set) until METER 2 indicates 600°C.

TABLE 4

Inter-unit cable connections

Connector Type QY4051

SKT1 :— 25-way socket connected to PL1 on test set
PL3 :— 5-way Plessey plug connected to socket A1 on aircraft wiring
PL4 :— 14-way Plessey plug connected to socket A2 on aircraft wiring
PL5 :— 12-way Plessey plug connected to socket A3 on aircraft wiring
PL6 :— 2-way Plessey plug connected to socket A4 on aircraft wiring

SKT1/A — PL6/A	SKT1/J — PL4/C	SKT1/R — PL5/M
SKT1/B — PL3/B	SKT1/K — PL4/A	SKT1/S — PL5/B
SKT1/C — PL3/A	SKT1/L — PL5/H	SKT1/T — PL4/M
SKT1/D — PL5/C	SKT1/M — PL4/B	SKT1/U — PL5/G
SKT1/E — PL5/L	SKT1/N — PL4/F	SKT1/V — PL5/F
SKT1/F — PL5/A	SKT1/O — PL6/B	SKT1/W — PL4/D
SKT1/G — PL4/L	SKT1/P — PL3/D	SKT1/X — PL3/C
SKT1/H — PL5/E	SKT1/Q — PL5/D	SKT1/Y — PL5/J
		SKT1/Z — PL4/G

Connector Type QY4052

SKT2 :— 12-way socket connected to PL2 on test set
A/TP :— 12-way 'T' piece and terminal block assembly connected to amplifier test point 3

SKT2/A — A/TP/9	SKT2/E — A/TP/3	SKT2/G — A/TP/4
SKT2/D — A/TP/10	SKT2/F — A/TP/1	SKT2/H — A/TP/5

Connector Type QY4053

SKT3 :— 12-way socket connected to PL2 on test set
PL7 :— 6-way plug free Cannon connected to transmitter test socket T3

SKT3/A — PL7/1	SKT3/C — PL7/3
SKT3/B — PL7/2	SKT3/D — PL7/4

Connector Type QY4054

SKT4 :— 14-way socket connected to PL4 on QY4051
SKT5 :— 14-way socket connected to amplifier plug A2

SKT4/F — SKT5/F	SKT4/G — SKT5/G

Connector Type QY4055

SKT6 :— 12-way socket connected to PL2 on test set
Red Clip :— clip connects to C.J.C. +ve
Black Clip :— clip connects to C.J.C. −ve

SKT6/J — Black Clip	SKT6/L — Red Clip
SKT6/K — Red Clip	SKT6/M — Black Clip

Connector Type QY4006 Shorting Unit

PL 8 :— 5-way Plessey plug. Poles A to E linked
PL 9 :— 16-way Cannon plug. Poles 1 to 16 linked
PL10 :— 9-way Plessey plug. Poles 1 to 9 linked

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