STATION RADIO, A13

SECTION 7 - STABILIZER VOLTAGE, TRANSISTOR TYPE (SV)

Errata

Note: This Page 0, Issue 2 supersedes Page 0, Issue 1, dated Nov 71, and must be filed immediately in front of Page 1, Issue 2 dated 4/71. Item 2 has been amended; item 3 is additional.

1. The following amendment must be made to the regulation.

2. At end of paras 300 and 304

   Add new sentence:

   'If Mod Instr No 36 has been carried out, this test does NOT apply'.

3. Page 82, Table 21.

   a. Column 1, adjacent to nos '3' and '7' mark '*'.

   b. At foot of table add:

   '*If Mod Instr No 36 has been carried out, these tests do NOT apply'.

Errata

Note: This Issue 2 supersedes Issue 1 Page 01 dated May 72 and must be filed in front of Page 1 Issue 2 dated Apr 71. Items 5 to 14 are additional.

(The following amendments are to be made to the regulation)

4. Page 21, para 67 line 4

   Add new sentence: 'Refer to EMER Tels F 149 Misc Instr No 5'

5. Page 22, para 69.a. line 1

   Delete: 1000Hz
   Insert: 1700Hz

6. Page 22, para 69.b.(2) line 1

   Delete: 1000Hz
   Insert: 1700Hz

7. Page 23, para 70.a. line 3

   Delete: 70µW
   Insert: 100µW

8. Page 23, para 70.b.(3) line 2

   Delete: 105mV
   Insert: 120mV

9. Page 31, para 86.b.(6) line 3

   Delete: 7dB
   Insert: 2dB

10. Page 32, para 91, sub para a. line 2

    Delete: '10'
    Insert: '10.5'

11. Page 33, para 91, sub para b.(2) line 1

    Delete: '9.9'
    Insert: '10.4'

12. Page 33, para 91, sub para b.(2) line 1

    Delete: '10.1'
    Insert: '10.6'

13. Page 33, para 91, sub para b.(2) line 3

Delete: '9.9'
Insert: '10.4'

14. Page 33, para 91, sub para b.(2) line 3

Delete: '10.1'
Insert: '10.6'

T/8c/3697/Tels

ERRATA

Note: This Page 03, Issue 1, must be filed immediately in front of Page 1, Issue 2 dated Apr 72.

(The following amendments are to be made to the regulation)

15. Page 36, para 104.u. lines 5 and 6

Delete: '725mA'

Insert: '765mA'

Errata

Note: This Page 04, Issue 1 is to be filed immediately in front of Page 1, Issue 2 dated 4/71.

(The following amendments must be made to the regulation)

16. Page 22, para 69.a., line 1

Delete: 1700Hz
Insert: 1000Hz

17. Page 22, para 69.b.(2), line 1

Delete: 1700Hz
Insert: 1000Hz

18. Page 92, para 347.b., line 6

Delete: 1700Hz
Insert: 1000Hz

19. Page 93, para 348.b., line 6

Delete: 1700Hz
Insert: 1000Hz

T/8/2185

Errata

Note: This Page 05, Issue 1, must be filed immediately in front of Page 1, Issue 2 dated 4/71.

(The following amendments must be made to the regulation).

20. Page 98, para 365, line 2:

Delete: 14.2

Insert: 14.1

2185/Tels

Errata

Note: This Page 06 is to be filed immediately in front of Page 1, Issue 2, dated Apr 71.

(The following amendments must be made to the regulation).

21. Page 95, para 354b, after 'deviated 400Hz at 1000Hz'

Insert: '(as measured using the modulation meter)'.

2185/Tels

Errata

Note: This Page 07 is to be filed immediately in front of Page 1, Issue 2, dated April 71.

(The following amendments must be made to the regulation).

22. Page 44, para 135

Delete: TS65
Insert: TSG5

2185/Tels

STATION, RADIO, A13

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

Note: This Issue 2 supersedes all issues (including Errata pages) issued prior to the date of this publication. The regulation has been revised throughout.

This EMER must be read in conjunction with Tels F 142 Part 2 which contains figures and tables to which reference is made.

CONTENTS

CONTENTS (cont)

CONTENTS - (cont)

CONTENTS - (cont)

Note: These Pages 5-6, Issue 4 supersede Pages 5-6, Issue 3 dated Jul 74. Section 11 detail is additional.

CONTENTS - (cont)

SECTION 8 - HARNESS ADAPTOR MK 2 (H.A.U.)

SECTION 9 - ANCILLARIES

SECTION 10 - STATION RADIO A13, SPECIFICATION TESTS, TEST RIG ELECTRONIC TEST CONTROLLER METHOD

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (cont)

INTRODUCTION

General

1. This regulation is divided into eleven separate sections dealing with the following major components of the station:-

Section 1 - Transmitter-receiver, radio, A13 (TRA13)
Section 2 - Amplifier, r.f., No 12 Mk 1 (RFA 12/1)
Section 3 - Amplifier, r.f., No 12 Mk 2 (RFA 12/2)
Section 4 - Tuner, r.f., antennae (T.R.F.)
Section 5 - Generator, d.c. (HG)
Section 6 - Control, T/R, remote (R.C.U.)
Section 7 - Stabilizer, voltage (SV)
Section 8 - Harness adaptor (H.A.U.)
Section 9 - Ancillaries
Section 10 - Specification testing - Test Rig Electronic, Test Controller Method
Section 11 - Electrical adjustments, Test Rig Electronic, Test Controller Method

2. All testing, other than that detailed in Section 10, is based on the use of the Test kit, radio, SRA13, the test kit being separately described in Tels M 180-189. Table 1 details the test equipment required for field and base repairs.

3. The station units contain numbers of semi-conductors which can be permanently damaged by the connection of supplies that are excessive or of reversed polarity. The test kit and equipments have been designed to obviate any damage should a mistake be made, but the greatest care must be exercised at all times. Since transistors are damaged instantaneously, there are no warning symptoms. Before commencing to service a transistorized equipment, read Tels A 412 and note that the improper use of an ohmmeter such as the multimeter can have disasterous consequences.

Lubricants and sealing compounds

4. The following items will require lubrication and/or sealing:-

a. All spindle seals and mechanical bearings should be lightly smeared with Grease XG329 (4 oz tubes, H1/9150-99-220-1152).

b. Rubber sleeves such as are used on headsets etc or insulating sleeves should be lightly smeared with Silicone compound, Releasil 7 (2 oz tubes, H1/6850-99-943-3472). This may also be applied sparingly to cords which have to be threaded through rubber sleeves, grommets etc.

c. Screws, nuts etc should be lightly coated with Dulex red, varnish-insulating, anti-tracking, air-drying, (1/2 pt tins, H1/8010-99-942-8917).

d. The sleeves of pygmy plugs and sockets require the use of a sealing compound (see Fig 2594). The correct compound is Loctite A sealing compound (10 cc and 50 cc containers, H1/8030-99-220-2387 and H1/8030-99-220-2874 respectively).

e. Where power type transistors are mounted on heat sinks or chassis, using mica or anodised insulating spacers, the spacers should be coated on both sides with a thin film of Grease, silicone compound XG250 (2 oz tubes H1/6850-99-220-2421). This gives an improved heat-transfer path.

f. The main sealing gaskets between front panels and cases should be lubricated as detailed in the drying and sealing instructions for each unit. The use of the correct lubricant (Lanolin, anhydrous technical - 203 tubes - H1/9160-99-220-1843) is important as it prevents corrosion when dissimilar metals are present.

Table 1 - Test equipment

Cat No (Section Z4)	Designation	Required for use with							
		TRA 13	RFA 12/1	RFA 12/2	T.R.F.	HG	R.C.U.	SV	H.A.U.
5820-99-103-4697	Test kit, radio, SRA13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ZD C0198	Oscillator, beat frequency, No 8	Yes	No	No	No	No	Yes	No	Yes
6625-99-933-1822	Counter, electronic frequency, (TF1417/2)	Yes	No	No	No	No	No	No	No
6625-99-104-5121	Converter frequency electronic	Yes	No	No	No	No	No	No	No
6625-99-105-7049	Multimeter, set, CT498A	Yes	Yes	Yes	No	Yes	Yes	No	Yes
6625-99-199-2562	Oscilloscope, set, CT531/3	Yes	No	No	No	No	No	No	Yes
W3/4440-99-201-3049	Dehumidifier, desiccant, electric	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6625-99-105-9563	No 2 Mk 1 Power supply and circuit breaker, electronic	No	No	No	No	No	No	Yes	Yes
6625-99-106-3438	Power supply set, Solatron, AS1412/M	Yes	Yes	Yes	No	No	Yes	Yes	No
6625-99-102-8077	Signal generator No 12/2) OR)	Yes	No	Yes	Yes	No	No	No	No
6625-99-108-9800	Signal generator set CT572/2)								
6625-99-199-3370	Test set, modulation (Airmec 409)	Yes	No	No	No	No	No	No	No
6625-99-106-1341	Voltmeter, electronic (TF2600S)	Yes	No	Yes	Yes	No	Yes	No	Yes
6625-99-949-0470	Voltmeter valve No 3 CT208 equipment	Yes	No	Yes	Yes	No	Yes	No	Yes
6625-99-200-2271	Leak locator (CT509)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6625-99-943-5568	Wattmeter, absorption, CT419 equipment	No	Yes	Yes	No	No	No	No	No
6625-99-106-8159	Test set, special purpose, amplifier, r.f., No 12 Mk 1 and 2	No	Yes	Yes	No	No	No	No	No

Note: Additional specialized test equipment is required to test and repair printed boards and similar sub-assemblies. (EMER Tels M 300 refers).

Repair policy

5. The repair policy for this equipment is as follows:

a. Unit repairs will be confined to those parts which do not involve the opening of the sealed set. Those items which are provided for replacement at unit level are listed in Tels F 143.

b. Field and Intermediate repairs will normally be confined to:

(1) The exchange of faulty printed boards or assemblies.

(2) The exchange of film scales or components which are not mounted on printed boards except the gear drives, shafts, ganged capacitors, cableforms and system switch which will only be replaced during base repairs.

(3) The items which are authorized to be exchanged at Field level are given in Table 2504, 2506, 2507, 2510, 2512, 2514, 2516, 2518 and 2519.

(4) The alignment and specification testing of the set and ancillaries using the test equipment listed in Table 1.

c. Major items and sub-assemblies which are considered to be economically repairable at base, within the terms of DCI (Army) 280/1966, are to be sentenced BLR and backloaded through RAOC channels, clearly labelled "REPAIRABLE". Cracked boards and those having badly damaged printed wiring are to be sentenced BER and discarded at field level.

d. Base repairs will consist of:

(1) The repair of sets arising for Base repair/overhaul in the normal manner.

(2) All sets which need the replacement of mechanical drives, ganged capacitors, cableforms or system switches.

(3) The repair, test and alignment of printed boards or assemblies. This will only be carried out in those workshops which have been specially designated to carry out such repairs and which are in possession of the special factory-type test gear and detail spares.

Colour coding

6. In general, all leads are colour-coded using the standard resistor colour code. Transistors, where necessary, have their leads colour-coded as follows:

Emitter	-	red
Base	-	green
Collector	-	white

SECTION 1 - TRANSMITTER RECEIVER A13 (SRA13)

General

7. The information contained in this sections deals with the repair, adjustment and testing of TRA13 as an entity. Details of the repair and testing of the assemblies or printed boards will be issued separately to those workshops which are issued with the special-to-type module test equipment.

INSTRUCTIONS FOR DRYING AND SEALING

8. The set must be opened and repaired in the driest possible conditions.

9. On receipt for repair the set is to be pressurized to 10 lb/sq in. and a dip test carried out in a water tank. This should reveal any leaky spindle seals, casting-pin holes etc. This inspection should be carried out thoroughly with the set immersed for at least five minutes. The addition of a small amount of wetting agent to the water is recommended.

10. The set should be opened and all necessary mechanical repairs and adjustments carried out.

11. The set, removed from its case, must now be placed in the dehumidifier, desiccant and dried for 30 minutes at 50°C with the dry air from the pump unit passing through the oven (see Tels M 602).

12. After cooling, the set should be electrically tested and aligned if necessary.

13. As soon as possible after testing, the set should be re-sealed into its case, the rubber faces of the Hyclad gasket should be smeared with Lanolin anhydrous technical (2 oz tubes - H1/9160-99-220-1843).

14. The set should now have its desiccator plug removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator fitted.

15. The set is now pressurized to 10 lb/sq in. using the leak locator, dry air from the drying oven being used to pressurize the unit.

16. After a period of 12 hours the pressure should not have reduced below 9 lb/sq in. (after applying temperature/pressure correction as detailed in Tels M 631). The set has a time constant of 150 hours.

17. Finally remove the sealing adaptor and fit the desiccator plug with a reactivated 1.1/4 in. silica gel desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring with XG329 grease and screw the plug firmly into the case.

MECHANICAL REPAIRS AND REPLACEMENTS

General precautions

18. Do not interfere with the settings of any of the trimmers or coil slugs.

19. Do not slacken the clamps of the couplings which secure the gear drives to the ganged capacitors, otherwise the relative positions of mechanical drives and films and r.f. drum to the ganged capacitors will be disturbed and a lengthy re-alignment procedure will be required.

20. When releasing the tension on the springs in the film spools try and release it gradually, otherwise the springs may become disengaged from the spool or pinion.

21. Do not slacken the film sprockets on the spindle; if it is essential to do so for any reason then they must be repositioned as shown in Fig 1. This ensures that there is a minimum of backlash in the film transport.

To remove set from case

22. Remove the two anti-tamper caps if fitted.

23. Using a 3/32 in. AF wrench, slacken to their full extent the eight socket-headed screws round the periphery of the case. These screws are captive.

24. Turn the set over on to its face and carefully lift the case off the front panel. Carefully lift the Hyclad gasket off the front panel and store it on a flat surface, taking great care not to distort the gasket.

To separate front panel from film scale unit

25. Remove set from case (para 22 to 24 inclusive).

26. Using a 1/16 in. AF wrench slacken the set screws and remove the following knobs:- RANGE MHz, LOCK, CURSOR ADJ and TUNE.

27. Using a 1/4 in. Whit tubular spanner, remove the nuts exposed by the removal of the knobs.

28. Turn the equipment on to its face and using screwdriver, Philips head No 2, remove the four recessed-head screws at the corners of the film scale casting. Remove the CW TONE capacitor plugs from their sockets.

29. Carefully separate the casting from the front panel by lifting it directly upwards. SKA and PLA are separated during this operation.

30. To replace carry out the above procedure in the reverse order.

To remove MHz film blind
(Fig 1(1))

31. Remove front panel (para 25-29).

a. Slacken the three grub screws in the MHz drums (2 and 3) using a .050 in. hexagon wrench.

b. Remove the blind by unwinding off the spools and removing the end tails from the slits in the drums.

To remove kHz film
(Fig 1(4))

32. a. Remove MHz film blind (1) (para 31).

b. Remove MHz film guide plate (16) by unscrewing the two cross headed screws (5) and sliding the plate off the locating pins (6).

c. Remove printed wiring board No 6.

d. Remove the Terylene cord from the pulleys (7 and 8) by compressing the end springs until they disengage from the locating holes in the pulley cheeks.

e. Remove MHz spool (2) by drawing the pulley (7) and its spindle in direction A.

f. Engage the winders (9 and 10) by depressing.

g. Release the idler wheel (11) by slackening screws (12) and moving idler plate in direction shown.

h. It should now be possible to wind the film off the spools but it may be necessary to release the tension from the springs in the film spools (see para 20).

j. Remove kHz film guide plate.

To replace kHz film
(Fig 1(4))

33. a. With INPUT 'B' in the CHANNEL FREE position wind the three-ganged capacitor to its mechanical end stop.

b. Wind film so that the high frequency end is on the outside. If it is a new film it will be necessary to fold the two ends back about 1.1/2 in.

c. Pass end of film under sprockets 13 and engage end of film in the slit in spool 14. By rotating winder 10 in direction shown, wind film on until, with the film wound round the sprocket, the STOP line on the film is in the position shown.

d. Pass the film round spool 15 and engage low frequency end of film in slit. Using winder 9, rotate in direction shown until all film is wound on.

e. Finally rotate both winders a further 16 turns to tension spool springs.

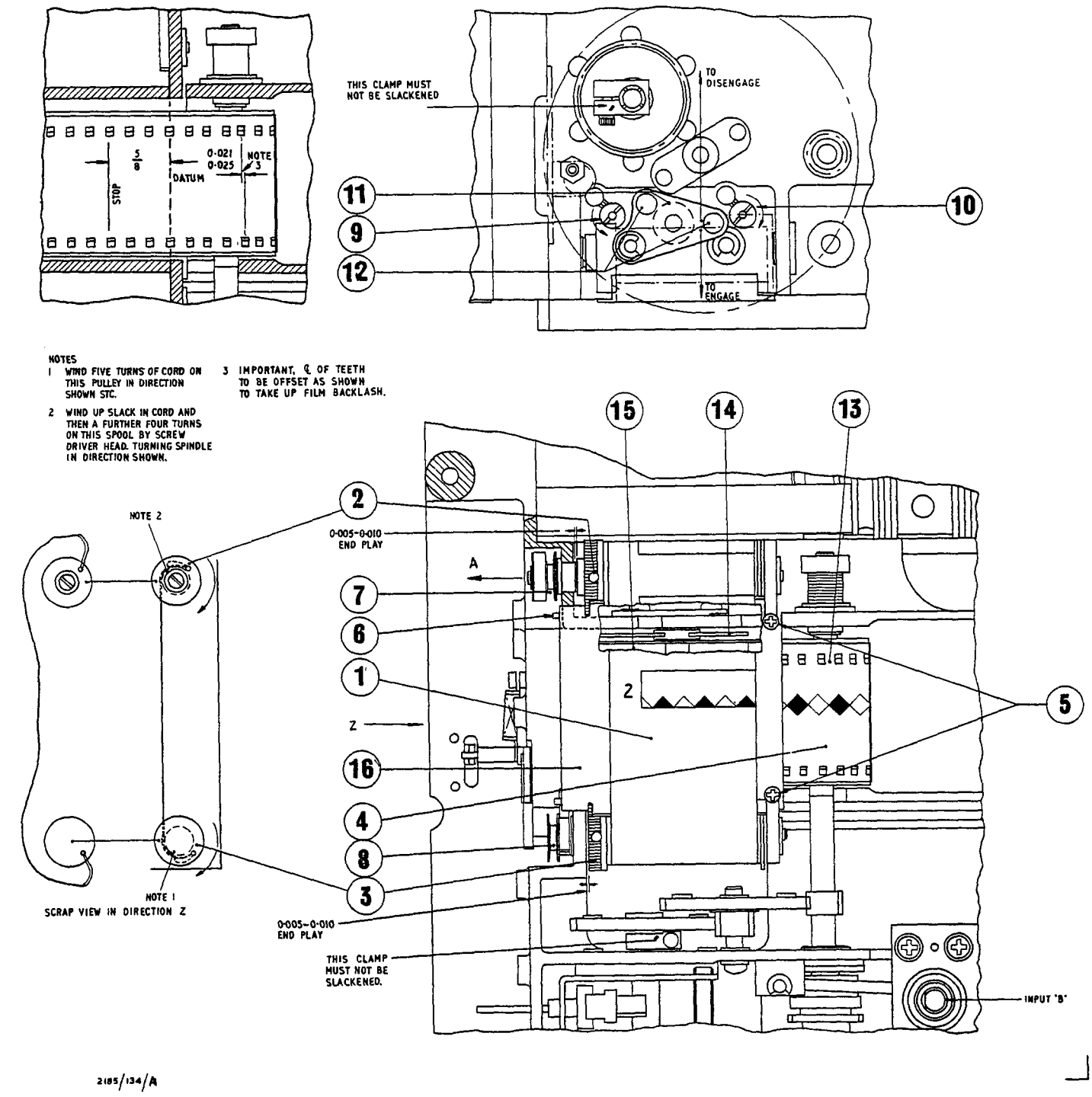


Fig 1 - TRA13, film scale assembly, detail

f. Engage idler gear by moving its plate in direction shown, ensure that it is engaged by moving plate and simultaneously slightly rotating the winders. The gears will be felt to engage as this is done. Tighten the screws 12 and disengage the winders by lifting upwards.

g. Replace the kHz film guide plate and wind the film through from end to end ensuring that it runs smoothly, incorrect tensioning will be shown by either tight running (excessive tension) or a tendency for the film to lift off the sprockets (insufficient tension).

h. Replace MHz spool 2 by inserting pulley 7 and its spindle through spool.

To replace MHz film blind
(Fig 1(1))

34. a. Turn MHz switch fully anticlockwise ie, 2-2.5MHz position.

b. Insert ends of film in the slits in spools 2 and 3.

c. Wind film on to spool 3 by rotating the knurled cheek until the film takes up the position shown in Fig 1. Tighten one of the grub screws in spool 3, it helps to identify this screw by making a mark on the spool adjacent to it.

d. Wind remainder of film on to spool 2.

e. Fit wire end of terylene cord (Fig 1) into the pulley of spool 3. Wind 5 turns of cord round the pulley in the direction shown.

f. Fit other wire end into the pulley of spool 2 then using the screwdriver slotted end of pulley 2, wind its spring up about 3 turns, at the same time holding the film wound as tightly as possible. Finally tighten one of the grub screws in spool 2 and mark it.

g. Refit MHz film guide plate, securing with screws (5).

h. Rotate the MHz blind through its entire movement and observe that it runs smoothly, shows no tendency to ride up, and that it exposes the correct portion of the kHz film. To adjust its position relative to the kHz film, slacken the drums (2, 3) and rotate them as required. When the positioning and running are satisfactory tighten up the remaining grub screws in the pulleys (2 and 3).

j. In carrying out g. the pulleys should be so positioned on their spindles that some end play (say .005 in. - .010 in.) is left in the spindle, ie, do not tighten up with the pulley face rubbing on the casting.

To remove printed boards

35. F 142 Part 2 Fig 2510-2520 shows the interconnections between the printed boards and the terminal strips. The majority of these interconnections are made by short 26 s.w.g. tinned copper wire links. It is recommended that these be cut through when removing a printed board and the resultant stubs removed separately and new links fitted to a board on replacement. Otherwise the iron may be left unduly long on the pins with possible damage to the printed board, or the cableform end may become detached from the pin on the underside of the terminal strip. The screws which secure the boards to the casting are ringed with green.

36. Certain boards, notably 1 and 19, have connections within the board area to gang capacitor stubs etc, these connections are shown on the relevant printed board layout diagram.

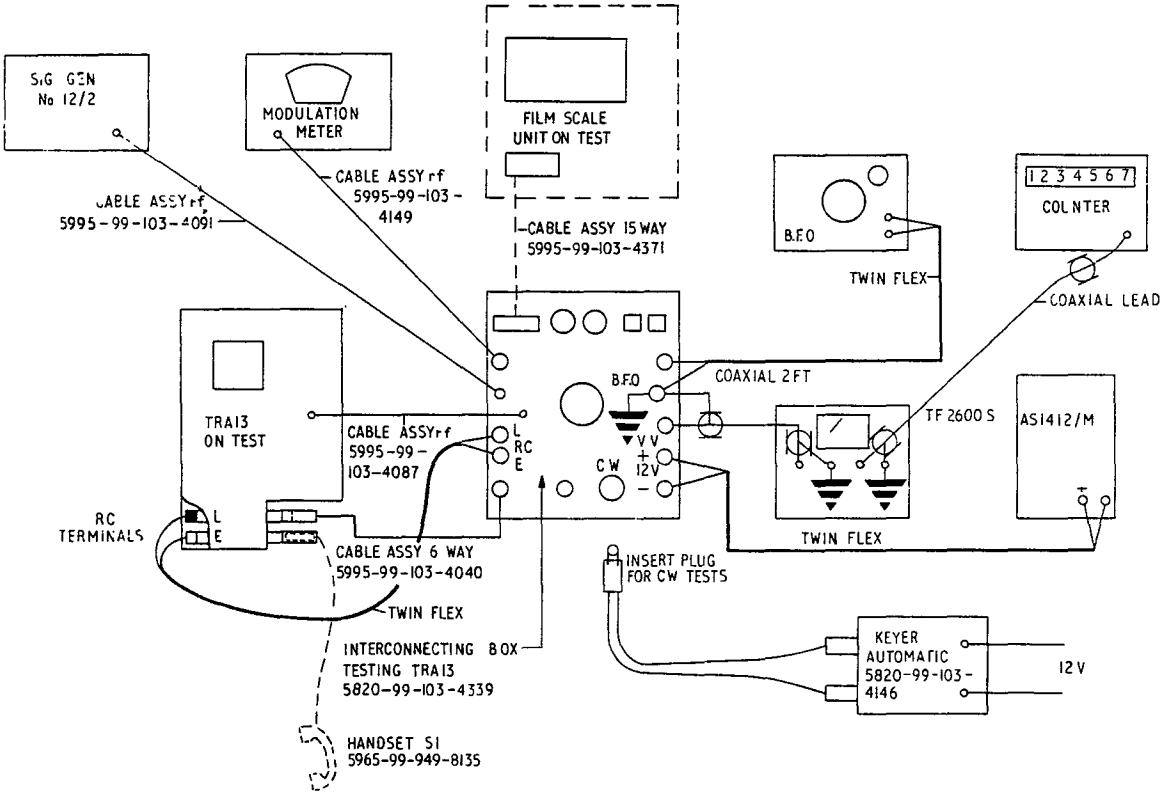


Fig 2 - TRA13, test gear arrangement

SPECIFICATION TESTS

37. The tests shown in this regulation are those which are necessary to prove the serviceability of an equipment. They should be carried out each time an equipment is inspected and/or repaired. It will be noted that some tests are only carried out after Intermediate or Base repairs.

38. The specifications and methods of carrying out the tests are listed in para 66-93. These are also summarized in Table 2502 and 2503 and are arranged in the order which involves the minimum of retuning etc.

39. All testing and alignment instructions are based on the use of the Test kit, radio, SRA13 together with the peripheral test equipment shown in Fig 2 and listed in Table 1.

40. The Test kit, radio, SRA13 is separately described in Tels M 180-189.

Test conditions

41. Tests are to be carried out with supply voltages to the set at NORMAL unless otherwise stated. The voltages to be used are:

NORMAL	12V d.c.
LOW	10V d.c.
HIGH	13V d.c.

42. The supply voltages are to be obtained from an approved stabilized transistor supply unit or in an emergency from a 12V secondary cell. The battery superseder must not be used as the transient spikes which it produces may damage the transistors.

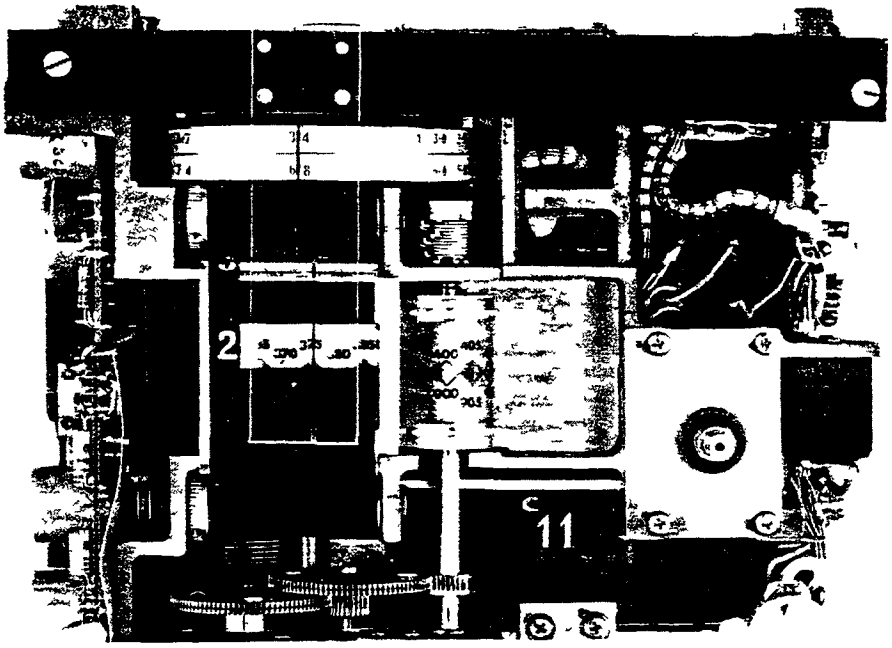
43. All tests are carried out with the set tuned up in the normal manner. This is described in para 55-62 inclusive.

44. All tests are based on a room temperature of 20°C but where the test parameters may be affected by ambient temperature additional figures for -32°C or +55°C are shown.

45. For receiver measurements the signal generator must be provided with a suitable matching pad such that an impedance of 50Ω is presented to the set antenna connection. This matching pad is inbuilt into the Interconnecting box, testing, TRA13 (test box). If the signal generator CT572/2 is used then a modification must be made to the Interconnecting box of the SRA13 Test kit. R6 should be shorted out and R7 removed (See EMER Tels M 182 Fig 2002).

46. The voltages quoted in this regulation are the open circuit voltages which are to be connected to the receiver, ie those shown on the panel of the signal generator No 12/2. If the signal generator CT572/2 is used then its associated 6dB pad must be used also.

47. The transmitter antenna load must be 50Ω and this is included in the test box.



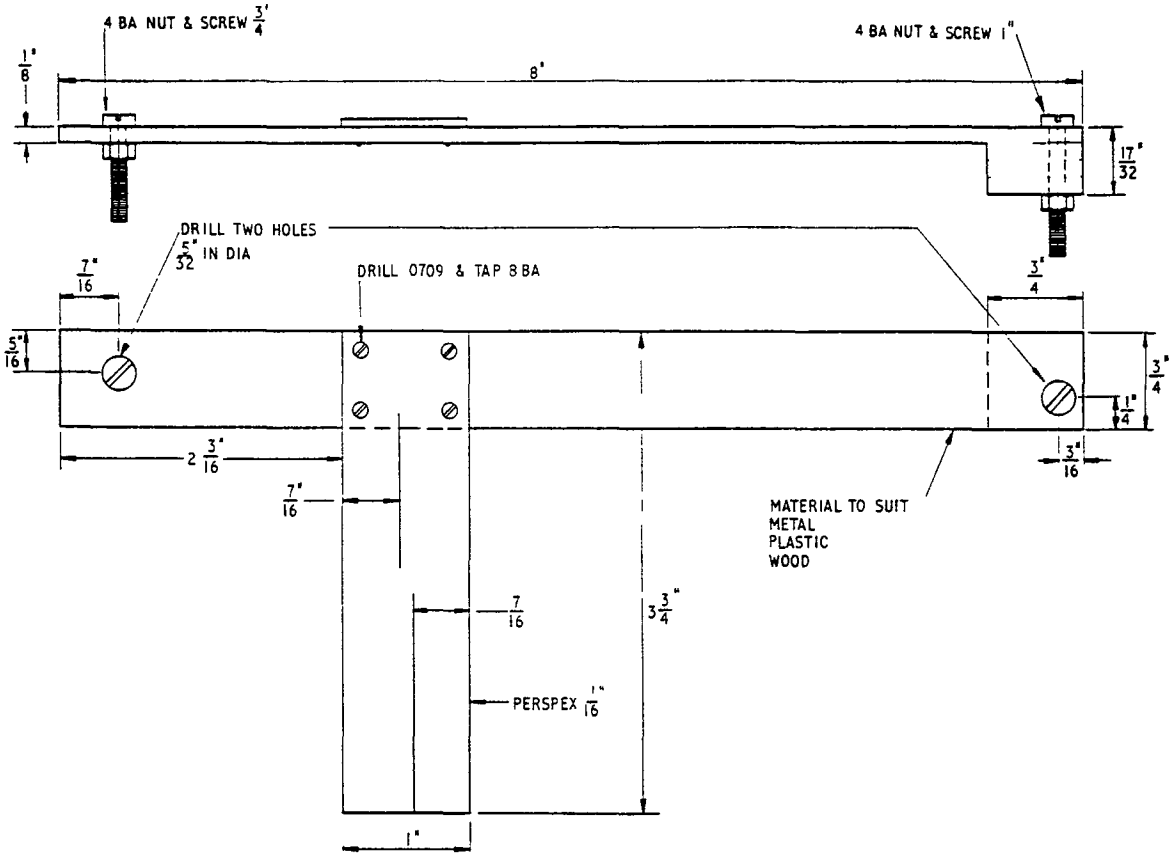


Fig 3 - TRA13 cursor jig, details of manufacture and fitting

48. The microphone input must be obtained from a 300Ω source. All voltages quoted are open circuit. These voltages are of the correct value and source impedance if the test box is used and the output from the b.f.o. is maintained at 1V.

49. When measurements of modulation are made using the Airmec 409 modulation meter, the phase deviation measurements are to be made on both FM PEAK+ and FM PEAK-, the mean of these will be regarded as the test result. Similarly a.m. measurements are made on AM PEAK and AM TROUGH, the mean being the test result.

receiver and sidetone a.f. outputs are measured into a 150Ω load, provided by the test box.

ess specifically stated a handset should not be connected to the eadset socket of the TRA13.

TRA13 GAIN control must be at maximum ie fully clockwise unless e stated. The CW TONE control is to be at 'pinch zero', ie the tongue ontrol shall be in line with the projection on the case.

53. Unless otherwise stated the signal generator is to be tuned to the set. The method of doing this depends upon whether the set is sealed or open. If the set is sealed the signal generator should be tuned for maximum a.f. output. If the set is open the generator is to be tuned to produce a second i.f. equal to filter centre frequency (para 54). The filter centre frequency is referred to in all testing and alignment instructions as fM. The signal generator fan must be switched OFF when signal/noise tests are carried out.

54. To determine filter centre frequency (fM) proceed as follows:

a. Disconnect link between TSF5 and pin 7 of board 6.

b. Connect a signal generator to TSF5 and inject a signal of 455kHz 100mV.

c. Connect the sensitive valve voltmeter/frequency counter combination of TSG2 and chassis.

d. Vary the signal generator frequency to produce a maximum reading on the valve voltmeter.

e. Adjust 7C3 and 7C4, where applicable, for a maximum and note the valve voltmeter reading.

f. Detune the signal generator to a level 6dB below that in e. and at a lower frequency than 455kHz, note this frequency fL.

g. Repeat at a frequency above 455kHz call this fH.

h. The filter centre frequency fM = $\frac{fH + fL}{2}$, which should be 455 ±2kHz.

Tuning procedure for TRA13

55. Set the system switch to the CURSOR ADJ position. Set the range switch to the required range. Set the lock lever to RF FREE and adjust the RF scale to display the required channel frequency in the centre of the window, using the tuning control.

56. Set the lock lever to CHANNEL FREE and, by rotation of the tuning control, set the 100kHz check point nearest to the required channel frequency to the centre of the window. Adjust the channel scale accurately to the position that produces centre zero on the meter, ensuring that when approaching the centre zero point the direction of movement of the channel scale and the meter needle are the same.

57. Set the channel scale cursor to the crystal point on the channel scale by adjustment of the CURSOR control.

58. Set the system switch to the CHAN ADJ position. Set the 10kHz check point nearest to the required channel frequency under the cursor. Adjust the channel scale accurately to the position that produces centre zero on the meter, ensuring that when approaching the centre zero point the direction of movement of the channel scale and meter needle are the same.

59. If the required channel frequency is a crystal check point omit the next paragraph.

60. If the required channel frequency is not a crystal check point, set the cursor accurately to the check point. Now set the channel scale to the required frequency, normally a multiple of 2.5 or 5kHz.

61. Move the lock lever to the RF FREE position. Set the system switch to the TUNE RF position. Adjust the RF scale, using the tuning control, to produce centre zero indication on the meter. Ensure that when approaching centre zero the direction of movement of the RF scale and meter needle are the same. Move the lock lever to the LOCK position.

62. Set the system switch to the mode of operation required, the set is then ready to operate.

General

63. If a set has received a considerable repair, particularly any rewiring of the system switch, cableforms etc, it is considered advisable to carry out the preliminary continuity and supply checks as listed in Table 2 - 4 before proceeding to test and alignment.

64. If the set is being tested/aligned with the front panel removed, it will be necessary to fit a jig to simulate the cursor. Details of a suitable jig and method of fitting are shown in Fig 3.

65. It must be noted that the battery plugs are live when the set is connected to the power supply via the 6-way connector. It is recommended that they be insulated with rubber sleeves whilst fault finding and testing is being carried out.

Table 2 - TRA13, preliminary continuity check

Test No (a)	From AVO + (b)	To AVO - (c)	OHMS (d)	Remarks (e)
1	SKC A	SKB A	S/C	) S2 at OFF.
2	SKC B	SKB B	S/C	) These tests need only be
3	SKC C	SKB C	S/C	) performed if rewiring or
4	SKC D	SKB D	S/C	) replacement of these
5	SKC E	SKB E	S/C	) components has been
6	SKC F	SKB F	S/C	) carried out.
7	SKC D	BATT -	S/C	S2 at OFF
8	SKC D	SKE -	S/C	S2 at OFF
9	SKC D	CHASSIS	S/C	S2 at OFF
10	SKC E	BATT +	S/C	S2 at OFF
11	PLA +	SKE +	1000 max	S2 at OFF) Protection diode
12	SKE +	PLA +	5M	S2 at OFF) test
13	SKA D	SKA E	O/C	S2 at OFF
14	SKA D	SKA E	200-300	S2 at ON, S3 at CURSOR ADJ
15	SKA D	SKA E	200-300	S2 at ON, S3 at CHAN ADJ
16	SKA D	SKA E	100-200	S2 at ON, S3 at TUNE RF
17	SKA D	SKA E	450-650	S2 at ON, S3 at Ph.M
18	SKA D	SKA E	550-750	S2 at ON, S3 at AM
19	SKA D	SKA E	450-540	S2 at ON, S3 at CW
20	CHASSIS	TPA	500	S2 at ON
21	CHASSIS	Bd 25 Pin 4	600	S2 at ON

If the above are satisfactory proceed to Table 3.

Notes: 1. Use Multimeter CT498A. The -ve terminal of the instrument is +ve polarity on continuity tests. Use the OHMS x 1 or x 100 ranges only. The ÷100 range must not be used.

2. If tests 14-19 are out of limits proceed to Table 3 and note whether the supply currents/voltages indicate the source of trouble. Take care that the current limiter on the supply unit is set within the rated limit.

3. S/C = short circuit
O/C = open circuit

Table 3 - TRA13, preliminary current consumption check

Preparation:

a. Carry out preliminary continuity check, Table 2.

b. Connect to test box. Set supply unit to zero volts and current limiter to figure shown in column (d).

c. Switch S2 to ON and S3 to position shown in column (b).

d. Connect handset to SKA or SKB.

e. Connect a 50Ω load to antenna socket.

f. Increase supply voltage slowly to 12V ensuring that current does not exceed that shown in column (c). Return supply voltage to zero after each test.

Test No (a)	S3 position (b)	Supply current max MA (c)	Current limiter (d)	Set dial lamps (e)	Remarks (f)
1	CURSOR ADJ	450	0.5A	Lit	
2	CHAN ADJ	450	0.5A	Lit	
3	TUNE RF	850	1.0A	Lit	
4	Ph.M	200	250mA	Not lit	Pressel not operated
5	AM	200	250mA	Not lit	Pressel not operated
6	CW	200	250mA	Not lit	Pressel not operated
7	Ph.M	600-800	1.0A	Not lit	Pressel operated
8	AM	650-850	1.0A	Not lit	Pressel operated
9	CW	600-800	1.0A	Not lit	Pressel operated, c.w. sidetone heard
10	CW	-	1.0A	-	Note 2. Check that reduction of supply to 10V causes meter to reduce to L mark
11	AM	Note 1	1.0A		Pressel operated, speak into microphone and check that sidetone is present and that operating S2 increases/decreases volume

Carry out tests in Table 4

Notes: 1. If speech is loud it may be necessary to switch supply unit to 2A.

2. If with an input of 10V the meter does not read to the L mark adjust potentiometer 21RV1.

Table 4 - TRA13, tag strip supply voltage check

Preparation:

a. Switch supply unit to 12V, current limiter to 1.0A.

b. Using a Multimeter CT498A connect -ve lead to chassis and measure voltages at pins indicated with system switch in position indicated with and without pressel of handset operated, ie Tx and Rx conditions.

Tag strip and terminal	System switch and Tx/Rx condition								
	CURSOR ADJ	CHAN ADJ	TUNE RF	Ph.M		AM		CW	
				Rx	Tx	Rx	Tx	Rx	Tx
TSB-3	-	-	12	-	12	-	12	-	12
TSB-6	12	12	-	12	-	12	-	12	-
TSC-4	8	8	8	8	8	8	8	8	8
TSC-5	12	12	12	12	12	12	12	12	12
TSD-1	-	-	-	-	-	-	-	8	-
TSE-2	8	8	8	8	8	8	8	8	8
TSE-6	12	12	12	12	12	12	12	12	12
TSF-2	8	8	8	8	8	8	8	8	8
TSG-11	12	12	12	12	12	12	12	12	12
TSH-5	12	12	12	12	12	-	12	-	12
TSH-7	8	8	8	8	8	8	8	8	8
TSJ-5	-	-	-	-	-	-	-	-	12
TSK-1	-	-	-	-	12	-	12	-	-
TSK-4	12	12	12	12	12	12	12	12	12
TSL-6	8	8	8	8	8	8	8	8	8
TSM-8	-	-	-	-	12	-	12	-	-
TSN-4	-	-	12	-	12	-	12	-	12
TSO-10	-	-	-	-	-	-	12	-	-
TSP-7	12	12	-	-	-	-	-	-	-
TPA	8	8	8	8	8	8	8	8	8
TPD	12	12	12	12	12	12	12	12	12
TPE	-	-	12	-	12	-	12	-	12
25TR4-E	-	-	8	-	8	-	8	-	8

Note: The voltages shown as 8 above are stabilized and their actual value will be in the range 7-8V approximately.

Current consumption

66. The current consumption measured at 3.1MHz and 6.1MHz with an input of 12V shall not exceed the values shown in Table 5. The input currents can be conveniently measured by reference to the ammeter fitted on the supply unit. Note the current drawn by the test box before switching the set on (160mA approximately); this must be deducted from the subsequent currents.

Table 5 - TRA13, current consumption

TRA13 system switch (a)	TRA13 test box (b)	Max input current mA (c)	Remarks (d)
CURSOR ADJ	S/N MOD ON	400	
CHAN ADJ	S/N MOD ON	400	
TUNE RF	S/N MOD ON	850	
Ph.M	S/N MOD ON	185	
AM	S/N MOD ON	165	
CW	S/N MOD ON	185	
Ph.M	POWER OUT	725	
AM	10mV MOD	900	Adjust b.f.o. level for 30% modulation
Ph.M	CW	725	

Transmitter tests

R.F. power output

67. With the test box switched to POWER OUT measure the r.f. power output of the set at the frequencies, input voltages and system switch positions shown in Table 6. The power indicated in volts by the valve voltmeter (10V range) shall exceed the figures shown in the table.

Table 6 - TRA13, r.f. power output

Frequency (MHz) (a)	TRA13 system switch			Input voltage (e)
	Ph.M (b)	AM (c)	CW (d)	
2.0	8.5	6.0	8.5	12
3.1	8.5	6.0	8.5	12
4.0 LOW range	8.5	6.0	8.5	12
4.0 HIGH range	8.5	6.0	8.5	12
6.1	8.5	6.0	8.5	12
8.0	8.5	6.0	8.5	12
8.0	7.0	5.0	7.0	10

Note: These voltages represent approximately the following powers:

8.5 = 1.5W; 7.0 = 1.0W; 6.0 = 0.75W; 5.0 = 0.5W

Modulation sensitivity and a.m.c.

68. a. Specification: With a modulation input of 1000Hz, the deviation on Ph.M and the modulation depth on a.m. shall vary with input level as follows:

A.F. input	Phase mod deviation (Hz)	A.M. mod depth
10mV	greater than 600	greater than 60%
20mV	greater than 800	
100mV	between 800 and 1600	between 60 and 100%

b. Method:

(1) Tune set to 2.3MHz and switch to Ph.M.

(2) Check that supply voltage is 12.0V.

(3) Set test box to 10mV MOD, set b.f.o. to 1000Hz at 1V and tune in the deviation meter.

(4) The deviation meter shall indicate a deviation between the limits 600-1600Hz.

(5) Repeat (3) and (4) with the test box at 20mV MOD and 100mV MOD, the deviation meter shall read between 800 and 1600Hz.

(6) Switch set to AM and set up modulation meter to read a.m. percentage modulation.

(7) With the test box in the 10mV MOD and 100mV MOD positions the modulation meter should read within the limits 60 and 100%.

(8) Repeat (1) to (7) at 3.0MHz on the 3.0 to 3.5MHz range and 7.0MHz on the 7.0 to 7.5MHz range.

Sidetone, phase and amplitude modulation

69. a. Specification: With the transmitter modulated with a 1000Hz tone at a level that gives 800Hz deviation on phase modulation or 85% modulation on a.m. the sidetone output shall be within the limits 400-1500 µW on AM and 250-1000 µW on Ph.M.

b. Method:

(1) Tune set to 3.1MHz and set system switch to Ph.M.

(2) Set test box to 20mV MOD and b.f.o. to 1000Hz, tune in modulation meter to measure deviation (3kHz range).

(3) Adjust b.f.o. level until the modulation meter indicates a deviation of 800Hz.

(4) The valve voltmeter (1V range) should indicate a reading of 0.2-0.4V (0.25-1.0mW).

(5) Set system switch to AM and set modulation meter to read percentage modulation (a.m.).

(6) Adjust b.f.o. level until the modulation reads 85%.

(7) The valve voltmeter should read between 0.25V and 0.5V.

Sidetone, c.w.

70. a. Specification: With the set switched to c.w. operation and the key operated, the sidetone output shall be between 500 and 2000Hz at a level of 30-70 μW.

b. Method:

(1) Tune set to 3.1MHz and set system switch to CW.

(2) Set test box to CW.

(3) The valve voltmeter (300mV) shall read between 65 and 105mV and the frequency shall be audibly judged to be between 500 and 2000Hz.

A.F.C. operation

71. a. Specification: When the a.f.c. is disabled and the transmitter detuned from the receiver (±10kHz in the 2-4MHz band or ±20kHz in the 4.8MHz band) restoration of the a.f.c. shall return the transmitter frequency to within 200Hz of the receiver frequency.

b. Method: (set open)

(1) Tune the set to 2.01MHz, leave lock lever at RF FREE. Set system switch to Ph.M.

(2) Set test box to POWER OUT and measure the transmitter frequency on the frequency counter. Call this fC.

(3) Connect a shorting link between TSH3 and TSH6 and note the transmitter frequency (fT).

(4) Retune the RF scale until the frequency counter records a frequency of fT+10kHz.

(5) Remove the link from TSH3 and TSH6 and record the transmitter frequency (fH).

(6) The difference between fC and fH shall be less than 200Hz.

(7) Repeat (3) to (6) with fT at fT-10kHz.

(8) Repeat (1) to (7) at a frequency of 3.99MHz.

c. Method: (set sealed)

(1) Tune the set to 2.01MHz. Set system switch to Ph.M. Connect handset to the audio socket on the set. Switch test box to POWER OUT.

(2) Check that sidetone is present when speaking into the microphone.

(3) Set the system switch to CHAN ADJ, retune the channel scale by +10kHz as indicated by the calibration signals. Return system switch to Ph.M.

(4) Recheck that sidetone is still present with no significant loss of quality.

Master oscillator frequency stability

72. Note: This test is carried out only when set is open.

a. Specification: When the equipment is operated with the a.f.c. disabled, the frequency of the master oscillator shall not change by more than 600Hz per MHz when the supply voltage is changed from Normal to Low or High.

b. Method:

(1) Tune the set to 2.9MHz. Set test box to POWER OUT. Set system switch to Ph.M.

(2) Connect a shorting link between TSH3 and TSH6. Record transmitter frequency fA.

(3) Reduce the supply voltage to 10V and record the transmitter frequency (fB).

(4) Increase the supply voltage to 13V, record transmitter frequency (fC).

(5) Ensure that the difference frequency fA-fB and fA-fC do not exceed ±1740Hz.

(6) Remove the link between TSH3 and TSH6 and return supply voltage to 12V.

Remote control Ph.M and a.m.

73. a. Specification: A 270Ω resistor shall be connected across the remote control terminals and an input of 35mV at 1000Hz applied across the resistor. This shall produce a deviation of between 900 and 1600Hz on phase modulation or a modulation depth of between 70% and 100% on amplitude modulation.

b. Method:

(1) Tune the set to 4.0MHz (Low band). Set the system switch to Ph.M.

(2) Set test box to RC 35mV MOD and b.f.o. to 1000Hz 1V. Tune modulation meter to 4.0MHz phase modulation (3kHz range).

(3) The deviation indicated on the meter shall be between 900 and 1600Hz.

(4) Set system switch to AM and tune modulation meter to read modulation depth (a.m.).

(5) The modulation depth shall be between 70 and 100%.

Remote control, c.w.

74. a. Specification: A 1200Ω resistor shall be connected across the remote control terminals. The morse key in series with a 270Ω resistor shall be connected in parallel with the 1200Ω resistor. It must be possible to form clear morse characters when transmitting on c.w. at a speed of 25 w.p.m.

b. Method: (1) Tune the set to 4.0MHz (Low band). Set the system switch to CW.

(2) Set the test box to RC CW. Connect a c.r.o. to the valve voltmeter terminals on the test box. Plug the automatic key into the test box.

(3) With the automatic key running at 25 w.p.m. the r.f. waveform envelope shall be sensibly square.

A.M. switching check

75. a. Specification: When the set is switched to amplitude modulation and the pressel is operated, a 12V supply is to be present at pin B of sockets B and C.

b. Method: (1) Set tuned to any frequency, system switch at AM.

(2) Set the test box to POWER OUT.

(3) The lamp marked RFA on the test box should light. When the system switch is moved to either the Ph.M or CW positions the lamp should go out.

(4) Set the test box to SN MOD ON. In the Ph.M, AM and CW positions of the system switch the lamp should remain unlit.

Receiver tests

Signal-to-noise ratio, Ph.M

76. a. Specification: With an input of 4.0 μV, the ratio of the receiver a.f. output with modulation (400Hz deviation at 1000Hz) to the output with no modulation shall not be less than 16dB at 20°C. This figure may be reduced to 14dB at -32°C and +55°C.

b. Method: (1) Tune set to 2.1MHz and set system switch to Ph.M.

(2) Set test box to S/N MOD ON and valve voltmeter to the 100mV range.

(3) Set signal generator to 2.1MHz with 400Hz deviation at 1000Hz and output level of 4 μV.

(4) Tune the signal generator to the set (para 53).

(5) Observe the valve-voltmeter reading in dB.

(6) Switch the signal generator modulation off, (do this by setting the DEVIATION kHz - RANGE switch to OFF, not by switching the MODULATION SELECTOR from FM to CW). Switch the test box to S/N MOD OFF.

(7) Observe the valve-voltmeter dB reading; it shall not be greater than reading (5) dB. If it is required to establish the actual signal/noise ratio this is given by:

Signal/noise ratio dB = 16+
Reading (5) dB - Reading (7) dB

(8) Repeat (1) to (7) at 2.9, 3.9, 4.1, 5.9 and 7.9MHz.

Signal-to-noise ratio, a.m.

77. a. Specification: With an input of 6.3 µV, the ratio of the receiver a.f. output with modulation (30% at 1000Hz) to the output with no modulation shall not be less than 16dB at 20°C. This figure may be reduced to 14dB at -32°C and +55°C.

b. Method: (1) Tune set to 2.9MHz and set system switch to AM.

(2) Set test box to S/N MOD ON and valve voltmeter to the 100mV range.

(3) Set signal generator to 2.9MHz with 30% modulation at 1000Hz and output level of 6.3 µV.

(4) Tune the signal generator to the set.

(5) Observe the valve-voltmeter reading in dB.

(6) Switch the modulation off by moving the MODULATION SELECTOR from AM to CW. Switch the test box to S/N MOD OFF.

(7) Observe the valve-voltmeter reading, it shall not be more than reading (5) dB. If it is required to know the actual signal/noise ratio, it is given by:

Signal/noise ratio dB = 16+
Reading (5) dB - Reading (7) dB

(8) For Intermediate and Base repairs repeat (1) to (7) at 5.9MHz.

Signal-to-noise ratio, c.w.

78. a. **Specification:** With an input of 2.0 µV, the ratio of receiver output (with the CW TONE control and the gain control adjusted for maximum) to the output (with the CW TONE control only readjusted for a minimum) shall not be less than 16dB at 20°C. This figure may be reduced to 14dB at -32°C and +55°C.

b. **Method:** (1) Carry out procedure detailed in para 77.b.(1) to (4).

(2) Switch signal generator and set from AM to CW.

(3) Reduce signal generator output level to 2.0 µV and valve voltmeter range to 30mV.

(4) Adjust the CW TONE control on the set to produce a maximum a.f. output as indicated on the valve voltmeter; note this level in dB.

(5) Adjust the CW TONE control to produce a minimum reading on the voltmeter, switch test box to S/N MOD OFF and retune CW TONE control for an absolute minimum. Note this reading; it must not be greater than the reading in (4). The absolute signal/noise ratio is given by:

Signal/noise ratio dB = 16+
Reading (4) dB - Reading (5) dB

(6) For Intermediate and Base repairs repeat (1) to (5) at 5.9MHz.

C.W. tone control

79. a. **Specification:** An unmodulated signal shall be applied to the set (levels 2 µV to 100mV) the following shall apply:

(1) With the CW TONE control set to its centre (pinch) position, the resulting a.f. output shall not exceed 300Hz at 20°C or 1000Hz at -32°C or +55°C. The note shall not change by more than 100Hz when the supply voltage is changed either to 10V or to 13V.

(2) At 20°C when the CW TONE control is turned in either direction away from central zero, a smooth increase in a.f. up to a frequency of 2.5-3.5kHz shall result.

b. **Method:** (1) Carry out the procedure of para 78.b.(1) and (2).

(2) Reduce signal generator to 2 µV.

Field test (3) By a listening test estimate that the 'pinch zero' note is not more than 300Hz and that the maximum frequencies obtained by movement of the CW TONE control in either direction are within the limits 2.5-3.5kHz.

(4) Repeat with a signal input of 100mV.

Intermediate and Base (5) Carry out (3) and (4) using a counter to determine the frequencies.

(6) Repeat (5) with a 10 and a 13V supply, the pinch zero note shall not change by more than 100Hz from the frequency at 12V supply.

Audio frequency output, Ph.M.

80. a. Specification: The output level for a 10 µV phase-modulated signal (1000Hz deviation at 1000Hz) shall be within the limits 5.0mW to 10mW with the gain control at maximum.

b. Method: (1) Tune the set to 4.6MHz and set system switch to Ph.M.

(2) Set test box to AF OUTPUT and valve-voltmeter to 3V range.

(3) Set signal generator to 4.6MHz with 1000Hz deviation at 1000Hz, and output level of 10 µV.

(4) Tune the signal generator to the set.

(5) Observe the valve-voltmeter reading, this should be within the limits 0.85 to 1.2V.

A.F. gain control

81. a. Specification: By operation of the GAIN control it shall be possible to reduce the receiver a.f. output level on Ph.M and a.m. by between 21 and 27dB.

b. Method: (1) Carry out the procedure of para 80.b.(1) to (4).

(2) Reduce the gain control to its minimum position.

(3) Note the voltmeter level as AdB.

(4) Switch test box to GAIN CONTROL MIN and then return set GAIN control to maximum.

(5) Note the voltmeter level; this shall be within the limits AdB ±3dB.

Remote control, a.f. output

82. a. Specification: A 1200Ω resistor shall be connected across the remote control terminals and a 150Ω resistor across pins D and F of either of the headphone sockets. On phase modulation the a.f. voltage developed across this resistor shall be between 0.15 and 0.30V r.m.s. when a signal of 10 µV, deviation 1000Hz at 100Hz is applied to the antenna terminal.

b. Method: (1) Carry out the procedure of para 80.b.(1) to (4).

(2) Switch the test box to RC AF OP and valve voltmeter to the 1V range.

(3) The valve-voltmeter shall read between 0.15 and 0.3V.

Audio frequency output, a.m.

83. a. Specification: The output level for a 10 µV amplitude modulation signal (80% at 1000Hz) with the gain control at maximum shall be within the limits 4.0-10mW.

b. Method: (1) Tune the set to 4.6MHz and set system switch to AM.

(2) Set test box to AF OUTPUT and valve voltmeter to 3V range.

(3) Set signal generator to 4.6MHz with 80% modulation at 1000Hz.

(4) Tune the signal generator to the set.

(5) Observe the valve-voltmeter reading; this should be within the limits 0.75-1.2V.

Audio frequency output, c.w.

84. a. Specification: The output for a 10 µV unmodulated signal with the CW TONE control and GAIN control adjusted for maximum output shall be greater than 2mW.

b. Method: (1) Follow the procedure described in para 83.b.(1) to (4).

(2) Switch set and signal generator to c.w.

(3) Vary the CW TONE control for maximum a.f. output as recorded on the valve-voltmeter (1V range), this should be greater than 0.55V.

Audio frequency response

(Intermediate and Base only)

85. a. Specification: When the modulating frequency is varied, keeping the deviation on phase modulation constant at one radian or the modulation depth on amplitude modulation constant at 80%, the output shall be within the following limits:

300Hz +1 to -5dB)
2000Hz +2 to -5dB) relative to level at 1000Hz on phase modulation
3000Hz -4 to -12dB)

300Hz +1 to -5dB)
2000Hz +1 to -5dB) relative to level at 1000Hz on amplitude modulation
3000Hz -4 to -14dB)

b. Method: (1) Phase modulation; follow procedure outlined in para 80.b.(1) to (5). Note the voltmeter reading as AdB.

(2) Change the signal generator modulation to 300Hz deviation at 300Hz.

(3) The voltmeter reading shall be between the limits AdB +1 or AdB -3dB.

(4) Modulate the signal generator at 3000Hz with 3000Hz deviation.

(5) The voltmeter reading shall be within the limits AdB -4dB to AdB -8dB.

Limiting

86. a. Specification: When a phase-modulated signal (400Hz deviation at 1000Hz) is applied to the set and the input level varied from 3.1 µV to 100mV the a.f. output should not vary by more than 2dB.

b. Method: (1) Tune the set to 4.6MHz and set system switch to Ph.M.

(2) Set test box to AF OUTPUT and valve voltmeter to 300mV range.

(3) Set signal generator to 4.6MHz with 400Hz deviation at 1000Hz and output level of 3.1 µV.

(4) Tune the signal generator to the set.

(5) Note the voltmeter reading in dB.

(6) Increase the signal generator level to 100mV; the voltmeter reading should not vary by more than 7dB from the reading (5).

A.G.C.

87. a. Specification: When a modulated signal (85% at 1000Hz) is applied and the input level varied from 6.3 µV to 100mV the a.f. output shall not vary by more than 7dB.

b. Method:

(1) Tune the set to 4.6MHz and set system switch to AM.

(2) Set test box to AF OUTPUT and valve-voltmeter to 1V range.

(3) Set signal generator to 4.6MHz with 85% modulation at 1000Hz and output level 6.3 µV.

(4) Tune signal generator to set.

(5) Note the voltmeter level in dB.

(6) Increase the signal generator level to 100mV, the voltmeter reading should not vary by more than 7dB from the reading (5).

Second local oscillator stability

(Intermediate and Base only)

88. a. Specification: A change of supply volts from Normal to High or Low shall not produce a frequency change of more than 150Hz.

b. Method:

(1) Connect the frequency counter to TS5-8, note this frequency fB.

(2) Reduce the supply volts to 10V, the counter frequency shall be within the limits fB ±150Hz.

(3) Increase the supply volts to 13V; the counter frequency shall be within the limits fB ±150Hz. Return supply volts to 12V.

Channel scale backlash test

(Intermediate and Base only)

89. a. Specification: The change in frequency of the second local oscillator due to backlash in the tuning mechanism shall not exceed 1000Hz.

b. Method:

(1) Set the Channel scale to the 465kHz tracking point approaching from the high frequency end of the scale.

(2) Connect the frequency counter to TS5-8 and note the frequency of second local oscillator, call this fA.

(3) Reset the Channel scale to the 465kHz tracking point but approaching from the lower frequency end of the scale. Note the counter frequency, this shall be fA ±1000Hz.

(4) Repeat (1) and note counter reading, this shall be fA ±1000Hz.

(5) Repeat (1) to (4) at the 35 and 250kHz tracking points.

Miscellaneous tests

Netting error

90. a. Specification: At 20°C the difference between the receiver frequency (ie the signal frequency which produces a second i.f. midway between the 6dB points) and the transmitter frequency shall not exceed 300Hz.

b. Method: (Set open)

(1) Tune set accurately to 7.4MHz.

(2) Connect a frequency counter to TSG-12.

(3) Switch the test box to AF OUTPUT and set signal generator to 7.4MHz, 10 µV c.w.

(4) Tune the signal generator until the counter reads filter centre frequency fM (para 54).

(5) Change the counter to measure the signal generator frequency, call this fR.

(6) Connect the counter to the valve-voltmeter output and switch the test box to POWER OUT, measure the transmitter frequency, call this fT.

(7) The difference between fR and fT shall be less than 300Hz; fT shall be 7.4MHz ±200Hz.

Battery volts indicator

91. a. Specification: On the Ph.M, AM and CW positions of the system switch, with a supply voltage of 10 ±0.1V the meter shall read on the L mark, indicating the end of life of the battery.

b. Method: (1) Switch set to Ph.M.

(2) Set supply voltage to 9.9 and 10.1V, ensure that the meter pointer reads either side of the L mark when changing from 9.9 to 10.1V. If not re-adjust 21RV1 (para 111).

(3) Switch the set to a.m. and c.w. and ensure that the meter has the same deflection as in (2).

Film scale accuracy

92. a. Specification: The channel scale calibration accuracy shall be such that in the CURSOR ADJ position it is possible to identify the required 100kHz harmonic without ambiguity.

b. Method: (1) Tune the set to 7.0MHz on the 7.0-7.5MHz range.

(2) Switch set to CURSOR ADJ, align the cursor on the zero frequency mark of the Channel scale.

(3) Set the LOCK knob to CHANNEL FREE and rotate the channel dial to tune to the 100kHz calibration point, measure the difference as indicated by the scale between the 100kHz mark and the cursor, it should be within ±3kHz.

(4) Now adjust the cursor to line up with the 100kHz point and then tune to the 200kHz point, the difference between the 200kHz mark and cursor shall be within ±3kHz.

(5) Repeat (4) at the 300, 400 and 500kHz points, at any adjacent 100kHz points the differences shall be within ±3kHz.

Calibrator sensitivity

93. a. Specification: When the r.f. drum has been adjusted so that the required frequency is centred in the window, the output of the crystal calibrator at any of the 100 or 10kHz points shall be such as to produce full scale deflection of the tuning meter.

b. Method: (1) Set the system switch to CHAN ADJ.

(2) Tune the set to the calibration point at 7.95MHz, the tuning meter should be deflected to full scale when the dial is moved either side of this tuning point.

(3) Repeat at 7.96, 7.97, 7.98 and 7.99MHz.

ELECTRICAL ADJUSTMENTS AND ALIGNMENT

General

94. The electrical alignment and adjustments should be carried out in the following order:

a. Calibrator setting.

b. Transmitter.

c. 2nd i.f. filter, measurement of filter centre frequency and discriminator adjustment.

d. B.F.O.

e. 2nd local oscillator.

f. 1st i.f. amplifier.

g. Receiver r.f. stages.

h. A.G.C. threshold setting.

j. Meter battery voltage setting.

k. A.M.C. level setting.

95. Details of the necessary trimming tools are given in Fig 5(b).

96. Securing pastes, varnishes or paints must not be used on the cores or trimmers.

97. All alignment will be carried out with a supply voltage of 12V unless otherwise stated.

98. The GAIN control will be at maximum unless otherwise stated.

99. When tuning, the film or drum will always be finally set by approaching the final setting from a higher frequency.

100. The cursor will be set to its mid position and will remain so during all alignment.

101. The CW TONE control will normally be set at pinch zero.

102. If any major repairs connected with the mechanical drives etc are made, or if difficulty is experienced with tracking, check that the mechanical end stops of the r.f. drum and the kHz film drive coincide with maximum engagement of the ganged capacitors. Both the rotor and stators of the capacitors are V-notched and are said to be in full engagement when a knife edge laid along the 'V's just touches both rotor and stator. This will not need to be adjusted unless the clamps which lock the capacitors to the gear drives have been released and the mechanical alignment has been lost. To examine these points the front panel must be removed.

Calibrator adjustment

103. a. Set the system switch to CURSOR ADJ.

b. Open the calibrator tray and connect the counter to the 1MHz output test point.

c. Note the crystal frequency, it should be 1MHz ±10Hz, if necessary re-adjust 22C2 bringing the frequency to within 1MHz ±2Hz.

Transmitter

104. a. Set r.f. drum to low-frequency mechanical end stop.

b. Fix a temporary cursor over the STOP line on drum (front panel on) or fit cursor jig (film scale unit only (Fig 3)). A temporary cursor can be made of a piece of transparent adhesive tape with a line marked on it.

c. Connect test gear (Fig 2). Set valve voltmeter to its 10V range.

d. Set range switch S1 to 2-2.5MHz position, set r.f. drum to 2.0MHz.

e. Short circuit a.f.c. line by a jumper between TS18-1 and earth.

f. Switch on supplies. Set system switch to Ph.M, test box to POWER OUT.

g. Adjust 18T1 to produce a counter reading of 1.98MHz ±1kHz.

h. Switch off supplies and remove jumper, sub-para e.

j. Connect a jumper between TSH-3 and TSH-6, switch on supply.

k. Adjust 24RV1 to produce an output frequency of 2MHz, lock 24RV1.

l. Set r.f. drum to 2.133MHz alignment mark, adjust 18T1 to produce an output frequency of 2.133MHz ±2kHz.

m. Set r.f. drum to the 3.867MHz ±5kHz alignment mark, adjust 18C5 to produce an output frequency of 3.867MHz ±5kHz.

n. Repeat l. and m. until the correct frequency is obtained at each alignment point.

o. Set r.f. drum to 2MHz adjust 19T3 for maximum reading on valve voltmeter (approximately 8V).

p. Set range switch S1 to 4-4.5MHz position, set r.f. drum to 8MHz.

q. Adjust 19C10 for maximum reading on valve voltmeter.

r. Set range switch S1 to 3.5-4.9MHz. Set r.f. drum to 4MHz on low band.

s. Adjust 19C8 for maximum power output.

t. Repeat o. to s. until no improvement is possible.

u. Set range switch S1 to 4-4.5MHz, RF drum to 8MHz. Turn 19RV1 slowly clockwise until valve voltmeter reads 9.3V. If the power output maximum is less than 9.3V it may be possible to increase the power by reversing the links to TS19-7 and TS19-8. The supply current should be less than 725mA. If the current exceeds 725mA reduce 19RV1 until current reads 725mA, the valve voltmeter should read at least 8.5V.

v. Switch off supplies and remove shorting link from TSH3 and TSH6.

2nd i.f. filter and discriminator

105. a. Set S3 to CHAN ADJ.

b. Set test box to S/N MOD ON.

c. Disconnect link from TSF5 to 2nd mixer board 6, pin 7.

d. Connect signal generator to TSF5 with an input of 100mV, 455kHz, connect counter to signal generator.

e. Disconnect link from TSG8 (a.g.c.).

f. Connect sensitive valve voltmeter on 30mV range to TSG2 and chassis.

g. Tune signal generator for maximum reading on valve voltmeter

h. Adjust 7C3 and 7C4 for maximum reading on the valve voltmeter. Note this level.

j. Detune the signal generator to obtain a level 6dB below that in h. and at a lower frequency than 455kHz, note this frequency fL.

k. Repeat j. at a frequency higher than 455kHz, note this frequency fH.

l. Calculate the filter mid frequency ie $\frac{fH + fL}{2}$ = fM. This mid frequency shall be 455 ±2kHz.

m. Disconnect the valve voltmeter from TSG2 and reconnect to TSG12, change range to 1V.

n. Set signal generator to mid-frequency (fM) at 1mV level, c.w.

o. Tune 8L1 for maximum.

p. Disconnect valve voltmeter from TSG12.

q. Adjust 11L2 to produce a zero output as noted on front-panel tuning meter.

r. Switch off supply, disconnect signal generator from TSF5.

s. Reconnect link from TSF 5 to 2nd mixer board 6, pin 7.

NB: Capacitors 7C3 and 7C4 are omitted if the Kohusai filter is used. Step h. above should therefore be omitted in this case.

B.F.O.

106. a. Set system switch to CW.

b. Set CW TONE control to 'pinch zero'.

c. Connect counter to TSG12 via 1000Ω resistor.

d. Adjust 9L1 until the counter frequency is mid-frequency ±300Hz.

e. Switch off supply, disconnect counter from TSG12 and reconnect link to TSG8.

2nd local oscillator and channel scale backlash test

107. a. Connect counter to TS5-8.

b. Set range switch to 2-2.5MHz. System switch to AM.

c. Set channel scale to 2.035MHz (tracking point).

d. Adjust 5C6 to give a counter reading of 1.870MHz ±2kHz.

e. Set channel scale to 2.465MHz (tracking point).

f. Adjust 5L2 to give counter reading of 1.440MHz ±2kHz.

g. Repeat c. to f. until no further improvement is possible.

h. Set channel scale to the 2.465MHz tracking point approaching from a higher frequency, record 2nd local frequency as fA. Repeat approaching from a lower frequency note frequency at tracking point fB, the difference between fA and fB should not exceed 200Hz.

j. Repeat h. at 2.035 and 2.250MHz.

k. Switch off supply and disconnect counter from the unit.

First i.f. amplifier

108. a. Connect the signal generator No 12/2 via a 560Ω resistor to TSE-4.

b. Connect a Multimeter CT498A set to its 3V d.c. range between test socket C and earth.

c. Set the signal generator to 1.415MHz, 100mV level.

d. Set the channel scale to the 2.035MHz tracking point.

e. Adjust 5C16 and 5C24 for maximum a.g.c. volts reducing the signal generator level as required, to keep the Multimeter reading below f.s.d.

f. Set the channel scale to 2.465MHz tracking point, and signal generator to 0.985MHz.

g. Adjust 5L6 and 5L7 for maximum a.g.c. volts.

h. Repeat d. to g. until no improvement is possible.

j. Switch off supplies and disconnect the signal generator and Multimeter.

Receiver r.1.

109. a. Connect signal generator to the signal generator co-axial socket on the test box.

b. Connect a valve voltmeter (30mV range) to TSB-7.

c. Turn 12RV1 fully anticlockwise.

d. Switch RANGE switch to the 2-2.5MHz position and tune set to the 3.865MHz tracking point.

e. Set signal generator to 3.865MHz, 20mV c.w. and tune to set.

f. Stop the local oscillators by removing the link from TSL6 to board 21 (RX stabilized supply).

g. Trim the capacitors or inductors as indicated in Table 7 for a maximum reading on the valve voltmeter.

Table 7 - TRA13, receiver r.f. circuits alignment chart

Operation No	Range switch (MHz)	R.F. tracking point (MHz)	Signal generator (MHz)	Trim for maximum on valve voltmeter
1	2-2.5	3.865	3.865	1C25, 1C21, 1C23
2	2-2.5	2.135	2.135	1L1, 1T2, 1T4
3	Repeat 1 and 2 until no improvement is discerned			
4	4-4.5	7.730	7.730	1C20, 1C24, 1C22
5	4-4.5	4.270	4.270	1L2, 1T1, 1T3
6	Repeat 4 and 5 until no improvement is discerned			
7	Disconnect valve voltmeter			

A.G.C. threshold

110. a. Using normal tuning procedure, set up TRA13 to 4.8MHz. Set system switch to Ph.M.

b. Connect valve voltmeter between TSG12 and earth.

c. Inject a signal via the test box from signal generator, level 50 µV at 4.8MHz, c.w.

d. Adjust 12RV1 until valve voltmeter reads 0.8V. Lock 12RV1 and disconnect voltmeter.

Meter, battery voltage

111. a. Set supply unit to 10.0V. Ensure that system switch is at Ph.M.

b. - Adjust 21RV1 until the front panel meter reads opposite the L mark.

c. Lock 21RV1 and return supply volts to 12V.

Meter sense

112. a. With the range switch at 2.5-3.0MHz tune the set to 3.0MHz using the calibrator.

b. Note that the meter needle is moving in the same direction as the channel and r.f. dials when tuning on to a crystal calibrating point.

A.M.C., Ph.M and a.m.

113. a. With set tuned to 3MHz on the 2.5-3MHz range, set system switch to Ph.M.

b. Set the b.f.o. to give 1V output at 1000Hz. Switch test box to 100mV MOD.

c. Tune the modulation meter to the set (3MHz), adjust 21RV2 until the modulation meter indicates a deviation of 1500Hz. Lock 21RV2.

d. Set supply volts to 13.0V. Set system switch to AM.

e. Set modulation meter to read a.m.; first turn 28RV1 fully clockwise then re-adjust 28RV1 until the meter indicates a modulation of between 90 and 95%. Lock 28RV1.

f. Reduce supply volts to 12.0V and switch test box to S/N MOD ON.

FAULT FINDING NOTES

General

114. It is not possible to lay down a precise fault-finding routine but the following paragraphs and tables should assist in locating the fault to a board or module.

115. The routine is based on the normal tuning procedure and (dependent upon whether a corrrect or incorrect indication is obtained) the next sub-routine is indicated in the tables.

116. A number of the tests, particularly those associated with the receiver, are based on using the set calibrator as a single source; the routine establishes whether the calibrator itself is functioning correctly at an early stage.

117. On the right of each table will be found a column of supply voltages which should be present at various terminals (for the relevant position of the system switch); these are the individual supplies to the boards.

118. The fault-finding chart particularly in the receiver stages employs the combination of a sensitive valve-voltmeter (TF2600S) and an electronic counter (together with its range extension unit used as a video amplifier). By these means measurements can be made at input and output points of stages, with levels and frequencies measured simultaneously. The counter normally needs a drive of some 100-200mV, but with the additional amplification available from the valve-voltmeter and the converter, measurements down to about 500 µV are possible. When complex waveforms are involved, eg mixer outputs, the frequency indicated will often be a sum frequency, but oscilloscope investigation will help to interpret results.

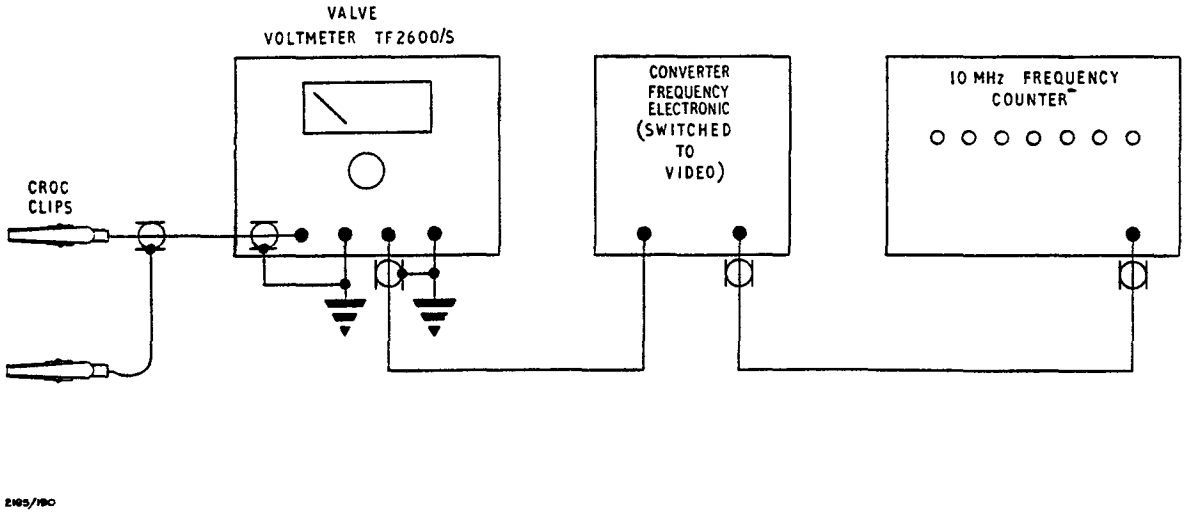


Fig 4 - TRA13, arrangement of test gear for fault tracing

119. Where the term 'meter indication' is used this means the deflection obtained when the tuning knob is rocked over a range of about 10kHz either side of the nominal frequency.

120. The figures quoted for levels should be regarded as typical only.

121. If a fault is associated only with certain of the 12 range positions check:

a. If all the bands 2.00-4.00MHz or 4.00-8.00MHz are faulty, it is probable that the fault is associated with the range-change switch on boards 1 and/or 19, or with the tuning components unique to the faulty band. If the fault is only on receive then board 1 should be examined and if necessary exchanged. If the fault is peculiar to transmit then board 19 should be examined and/or exchanged.

b. If only one or odd bands are not operating correctly, the assembly 2, 3, 4, 17 should be examined and the crystal output levels and frequencies checked at the test socket TPF; these should be:

MHz switch position	Crystal frequency kHz	Level
2-2.5	3450	)
2.5-3.0	3950	)
3.0-3.5	4450	)
3.5-4.0	4950	)
4.0-4.5	5450	)
4.5-5.0	5950	)
5.0-5.5	6450	) 0.15-0.45V
5.5-6.0	6950	)
6.0-6.5	7450	)
6.5-7.0	7950	)
7.0-7.5	8450	)
7.5-8.0	8950	)

122. The absence of 7.8V at TPA usually indicates a faulty 21TR4, which is particularly vulnerable to voltage/current surges. This component has therefore been provisioned as a 'Field' spare. (See EMER TELS F 142 Part 2 page 1078). A new 21TR4 must not be fitted until the possibility of a contributary fault on Boards 3, 5, 6 and 21 has been investigated.

123. The transmit stabilized supply (8V) can be readily measured at 25TR4 emitter.

124. Where it is not possible to tune the set using the meter, the dials should be set with the nominal frequency in the middle of the scale.

A.G.C. level for various r.f. inputs

125. Set tuned to 4.8MHz Ph.M, signal generator input via test box.

Sig gen level (c.w.) input	Valve-voltmeter G12-GND	Test point C Multimeter on 3V range
1 µV	100-160mV	-
10 µV	600-760mV	-
100 µV	780-800mV	0.75
1mV	800-820mV	1.35
10mV	800-830mV	2.2
100mV	800-850mV	5.2

2nd local oscillator output

126. Set on a.m., valve-voltmeter connected between TS5-8 and earth. Set on 2-2.5 band.

Tuned	Frequency	Volts
2.000	1905	0.9-1.2
2.035	1870	1.0-1.2
2.100	1805	1.05-1.25
2.200	1705	1.1-1.3
2.300	1605	1.2-1.5
2.400	1505	1.4-1.6
2.465	1440	1.4-1.7
2.500	1405	1.5-1.7

Receiver r.f. stage

127. Inject signal from signal generator at the antenna; stage gain measured at TSB7 with valve-voltmeter. Oscillators stopped by disconnecting the receiver stabilized volts at TSL6. The gain measured was approximately 35dB at input levels of 10 µV-100mV. The specification of the board calls for 40dB ±2.

Discriminator

128. a. Inject 2MHz, 10 µV signal at antenna.

b. Connect a Multimeter CT498A (3 and 10V range as required) between TPB and ground.

c. Signal frequency varied to give mid-frequency
fM +2kHz; voltmeter reads approx +9V
fM -2kHz; voltmeter reads approx +0.8V

Ph.M, receiver a.f. tests

129. a. Signal in at antenna: 2MHz, 10 µV 1000Hz tone 1000Hz deviation.

b. Outputs:

Across 150Ω load in test box		0.9V
	TPJ4 and ground	8mV
	TPK10 and ground	4V

Typical injection signals and levels

130. All inputs from 75Ω terminal of signal generator No 12/2 (or CT572/2 and 6dB pad), with 560Ω resistor in series. Output at 2nd i.f. amplifier TSG12 0.5V.

Input point	Input signal		Set tuned to: (MHz)						Signal generator
	Frequency	Level	2.09	3.09	L4.000	H4.000	6.000	7.900	
TSG2	455	150µV							
TSF5	455	500µV							
TS5-7			1360	1360	950	1450	1450	1050	Frequency kHz
			500	550	630	550	500	550	Level µV
TSE4			1360	1360	950	1450	1450	1050	Frequency kHz
			100	125	220	100	100	160	Level µV
TSB7			2.09	3.09	4.000	4.000	6.000	7.900	Frequency kHz
			300	310	350	420	360	500	Level µV
Antenna (75Ω)			4	5	5.5	4.5	4.0	5.0	Level µV

A.M., receiver a.f. tests

131. a. Signal in at antenna: 2MHz 10 µV, 85% mod at 1000Hz tone.

b. Outputs:

Across 150Ω load		1.0V
TPJ4	and ground	10mV
TPG9	and ground	10mV
TPK10	and ground	4.5V

C.W. receive

132. a.

Gain control posn	Max	8	7	6	5	4	3	2	Min
Volts d.c. at TSB10 and ground	0	0.25	0.6	1.0	1.35	1.58	2.4	3.3	6.4

b. B.F.O. output level measured at TSD3: 100mV at 455kHz

Master oscillator

133. Set tuned to 2.1MHz and valve-voltmeter/counter combination connected between:

TS18.9 and earth - 2.0V at 2.100MHz
TS18.7 and earth - 2.0V at 2.100MHz

Power amplifier

134. TSB1 - 0.4V approximately at sender frequency, this is the a.f.c. feed to receiver.

Amplitude modulation

135.

Input	Valve voltmeter (a.c.)					Multimeter d.c.	
	TSM3	TSM6	TS65	TS04	TS05	TSM5	TS03
10mV	5.0mV	0.25V	4.0V	2V	5.0V	1.65V	9V
100mV	40mV	0.30V	4.1V	2.3V	6.0V	1.9V	8.5V
No input							11V

A.M. transistor 28TR1

136.

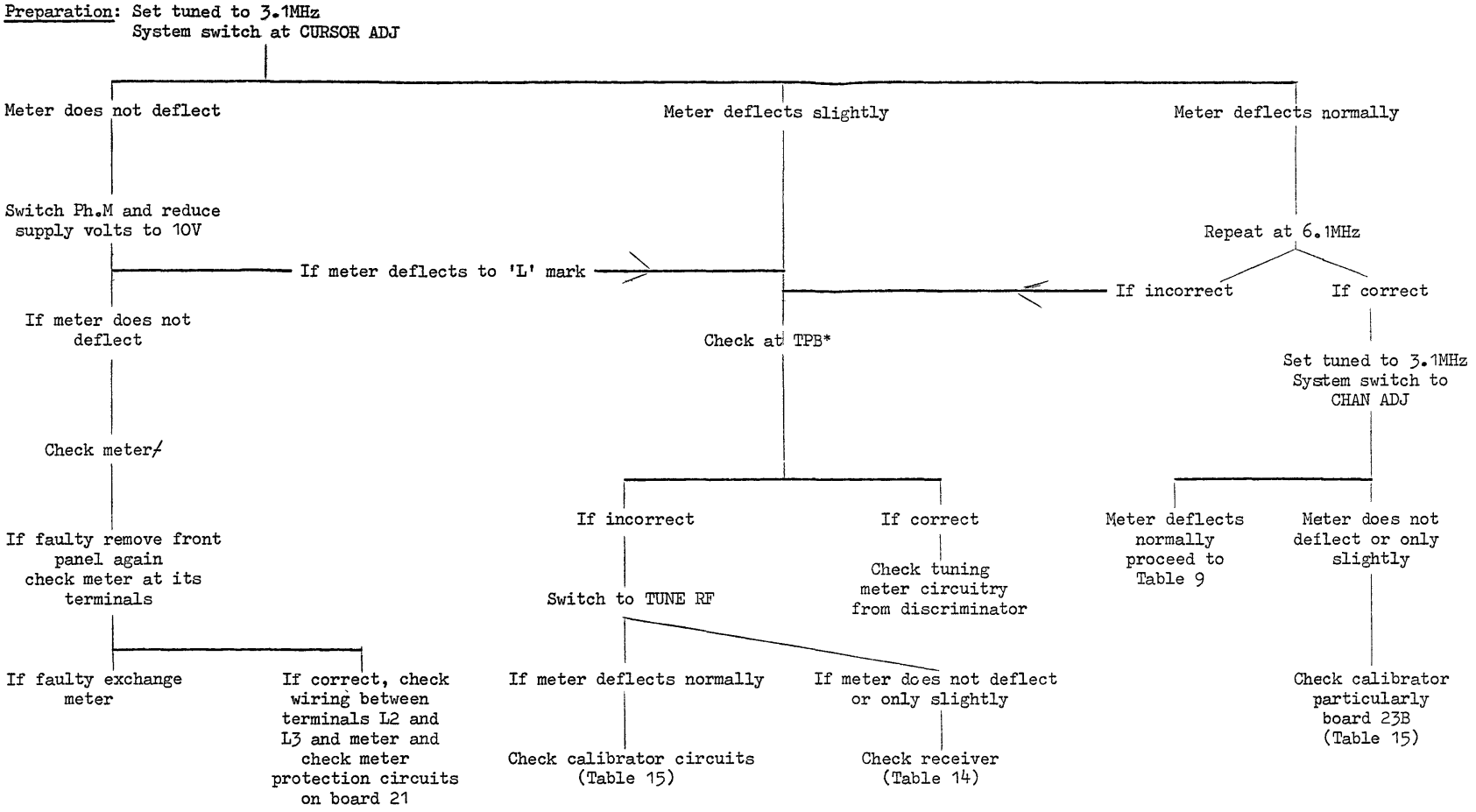
A.F. input	Multimeter CT498A d.c.		
	Base (TS07)	Emitter (TS08)	Collector (TSG5)
10mV	9.0V	9.2V	0.5V)
20mV	8.7V	9.0V	0.6V) 3V range
100mV	8.5V	8.7V	0.65V)

Phase modulation

137. The following are approximate figures and may vary with the loop gain and the setting of RV1:

Input	Valve voltmeter (a.c.)							Multimeter d.c.
10mV	3.0mV	11.0mV	550mV	1.55V	14.0mV	490mV	1.55V	1.25V
100mV	27mV	15.3mV	790mV	2.2V	14.3mV	690mV	2.2V	1.95V

Table 8 - TRA13, fault finding, step 1

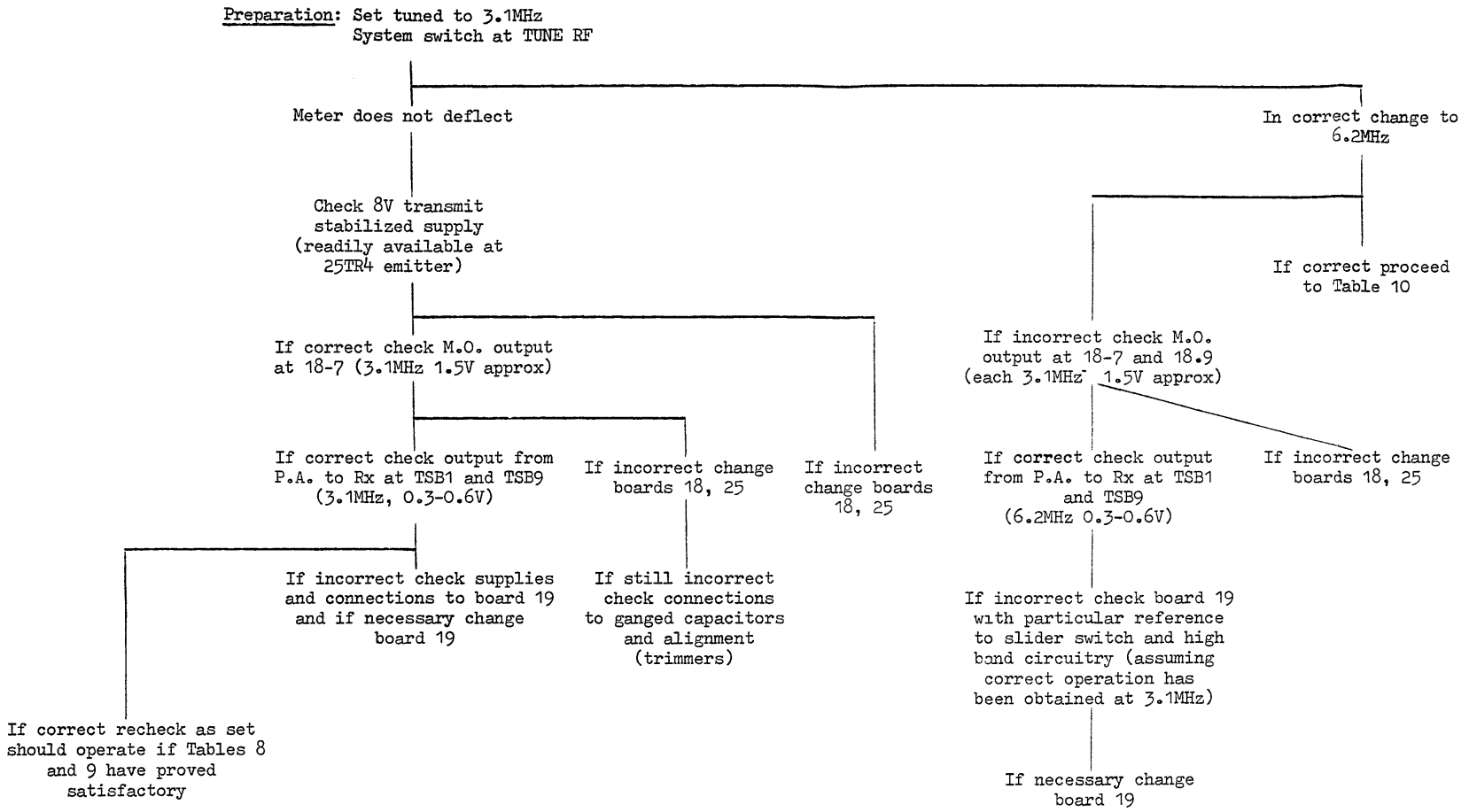


Voltage checks	
Point	Volts
TSB-6	12
TSC-4	8
TSC-5	12
TSE-2	8
TSE-4	12
TSF-2	8
TSG-11	12
TSH-5	12
TSH-7	8
TSK-3	12
TSL-6	8
TSP-7	12
TPA	8
TPD	12
TPC	2.5
TPB*	0.15
	0.65
	1.15

*These voltages correspond with f.s.d. right, centre zero and f.s.d. left of the tune meter when the tuning dial is rocked, ie the discriminator output.

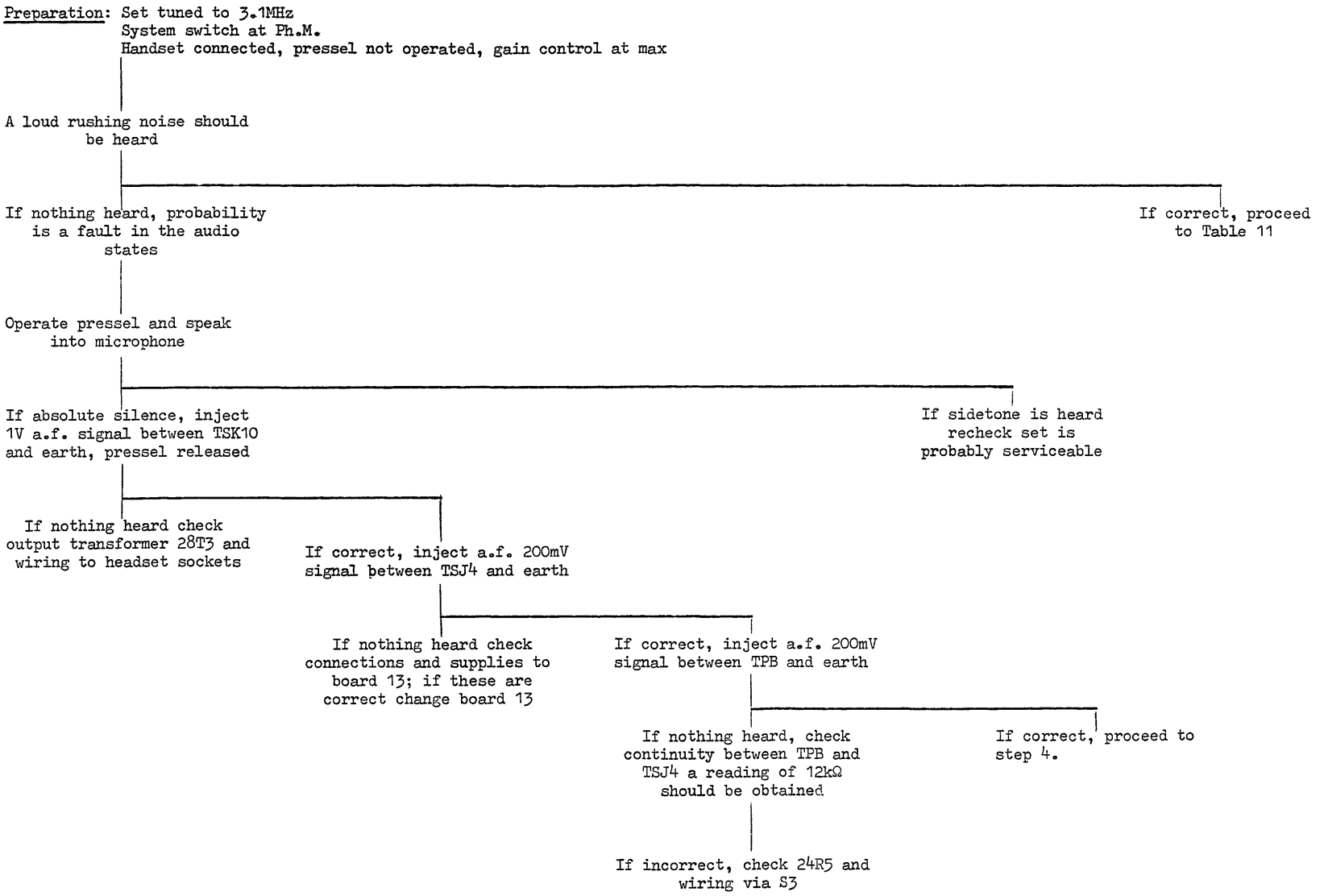
/ To check the meter for continuity and movement, connect a Multimeter CT498A on the OHMS x 100 range to terminals TS L2 and L3 the meter should deflect to approximately 1/2 scale left and right, reversing the prods will produce the two movements.

Table 9 - TRA13, fault finding, step 2



Voltage checks	
Point	Volts
TSB-3	12
TSC-4	8
TSC-5	12
TSE-2	8
TSE-4	12
TSF-2	8
TSG-11	12
TSH-5	12
TSH-7	8
TSK-3	12
TSL-6	8
TSN-4	12
TPA	8
TPD	12
TPE	12
25TR4-E	8

Table 10 - TRA13, fault finding, step 3



Voltage checks	
Point	Volts
TSB-6	12
TSC-4	8
TSC-5	12
TSE-2	8
TSE-4	12
TSF-2	8
TSG-11	12
TSH-5	12
TSH-7	8
TSK-3	12
TSL-6	8
TPA	8
TPD	12

Table 11 - TRA13, fault finding, step 4

Preparation: Set tuned to 3.1MHz
System switch at Ph.M.
Handset connected, pressel operated, gain control at max

Speak into microphone

If sidetone is not heard (assuming step 3 has been proved correct) two faults are probable, ie microphone fault or transmitter off frequency

Check transmitter frequency

Check P.A. output to receiver at TSB1 (3.1MHz 0.3V-0.6V) on counter and V.V.

If frequency off by a significant amount ie several kilo hertz an a.f.c. fault is indicated. The transmitter frequency with disabled a.f.c. has already been proved correct if the TUNE RF step has been carried out satisfactorily

Check a.f.c. loop TSH-4-TSN-3

If this is correct

Switch to AM

Check continuity between TSH6 and TS18-2 a reading of 2.2kΩ should be read

If correct

Change boards 18-25

Switch to Ph.M. and speak into microphone. If sidetone is still not heard a more elaborate investigation will be required ie inject a.f. into microphone input and using a valve-voltmeter and/or oscilloscope, trace the a.f. signal through (para 135 indicates expected levels) and if this is satisfactory check with a deviation meter that the master oscillator is being deviated

If sidetone is heard it can be assumed that both the receiver and transmitter are operating satisfactorily on Ph.M on the low band

Check at 6.2MHz and if correct proceed to Table 12

If sidetone is not heard check microphone input circuits to boards 15 and 16

If correct, check output of boards 15 and 16, if necessary replace boards 15 and 16 (see para 135)

Voltage checks	
Point	Volts
TSB-3	12
TSC-4	8
TSC-5	12
TSE-2	8
TSE-4	12
TSF-2	8
TSH-11	12
TSH-5	12
TSH-7	8
TSK-1	12
TSK-3	12
TSL-6	8
TSM-8	12
TSN-4	12
TPA	8
TPD	12
TPE	12
25TR4-E	8

Table 12 - TRA13, fault finding, step 5

Preparation: Set tuned to 3.1MHz
System switch at A.M.
Handset connected, pressel not operated

A rushing sound should be heard in 'phones if a few feet of wire are connected to the antenna this sound should increase or a signal may be heard

If correct receiver is probably satisfactory

If the sound heard is very quiet or not heard, inject an a.m. signal to the antenna from a signal generator

If tone is not heard

Check that i.f. is present at TSG-12 (para 130)

If correct check if a.f. is present at TSG-9 (5mV a.f. for 10 µV 30% signal)

If not change board 12

If correct check for a.f. at TSJ-4

If not check continuity between TSG9 and TSJ-4

The supply current approx 0.9A with no speech should rise up to about 1.5A with loud speech

If the supply current is low ie 0.4-0.5A

Check voltages at following points
TSO11 - 12V
TSO10 - 10V
TSO9 - 12V-9V (reduces with speech)
TSO5 - 8.5V
TSB3 - 8.5V

If supply current is about 0.9A but does not increase with speech

Inject a.f. 10mV 1000Hz at microphone socket

Check a.f. at:
TSM6 - 250mV
TSG4 - 250mV
TSG5 - 3.5V

D.C. voltages
TSG5 (28TR1C) 0.1-0.6V (with loud speech)
TSO7 (28TR1B) 11-9V (loud speech)
TSO8 (28TR1E) 11-9V (loud speech)

Operate pressel speak into microphone

Sidetone should be heard

If no sidetone is heard check continuity between TSM6 and TSJ3 (set switched OFF) if correct ie short-circuit, test continuity to TSJ4. A reading of 120kΩ should be obtained; if open-circuit change board 13

Voltage checks	
Point	Volts
TSB3	12ø
TSB6	12/
TSC4	8
TSC5	12
TSE2	8
TSE4	12
TSF2	8
TSG11	12
TSH5	12ø
TSH7	8
TSK1	12ø
TSK3	12
TSL6	8
TSM8	12ø
TSN4	12ø
TSO10	12ø
TPA	8
TPD	12
TPE	12ø
25TR4-E	8ø

/Receive only
øTransmit only

Table 13 - TRA13, fault finding, step 6

Preparation: Set tuned to 3.1MHz
System switch at C.W.
Handset connected pressel not operated

Inject an unmodulated 3.1MHz signal at the antenna, or tune in to a station

A whistle, variable by the C.W. TONE control should be heard

If no tone is heard check that TSD1 has an 8V supply

If correct disconnect link between TSD3 and TS9-3. Check at TS9/3 that a frequency (variable between 452 and 458kHz approx and level 0.5-1.0V) is obtainable when the C.W. TONE control is operated

If correct

Operate pressel, note that supply current rises to about 700mA and that a sidetone 'howl' is heard. Check with an r.f. power meter that there is about 1.5W present at antenna

Check that when the pressel is 'keyed' the sidetone follows the 'keying' but ensure that the supply current remains at 0.7A for a period of about 2 seconds after the 'key' or pressel is released

If the supply current follows the key ie no delay change board 13 after checking connections to TSK11 and TSK12

If there is no sidetone 'howl' check that 12V is present at TSJ5

If correct check that TSJ6 is earthed when the pressel is operated

If correct check that an a.f. signal (1000Hz nominal) 0.2-0.6V) is present at TSK10 and ground

If incorrect change board 13

If there is no r.f. power and the set has proved satisfactory on Ph.M and A.M. send, check at TS19-1 with a voltmeter. This should give a reading of zero volts with pressel unoperated and about 6V with pressel operated. Check that there is a 12V supply to TSB3

Check RLB1 contacts and if necessary change RLB

Voltage checks	
Point	Volts
TSB3	12ø
TSB6	12/
TSC4	8
TSC5	12
TSD1	8/
TSE2	8
TSE4	12
TSF2	8
TSG11	12
TSH5	12ø
TSH7	8
TSJ5	12ø
TSK3	12
TSL6	8
TSN4	12ø
TPA	8
TPD	12
TPE	12ø
25TR4-E	8ø

øTransmit only
/Receive only

Table 14 - TRA13, fault finding, receiver check

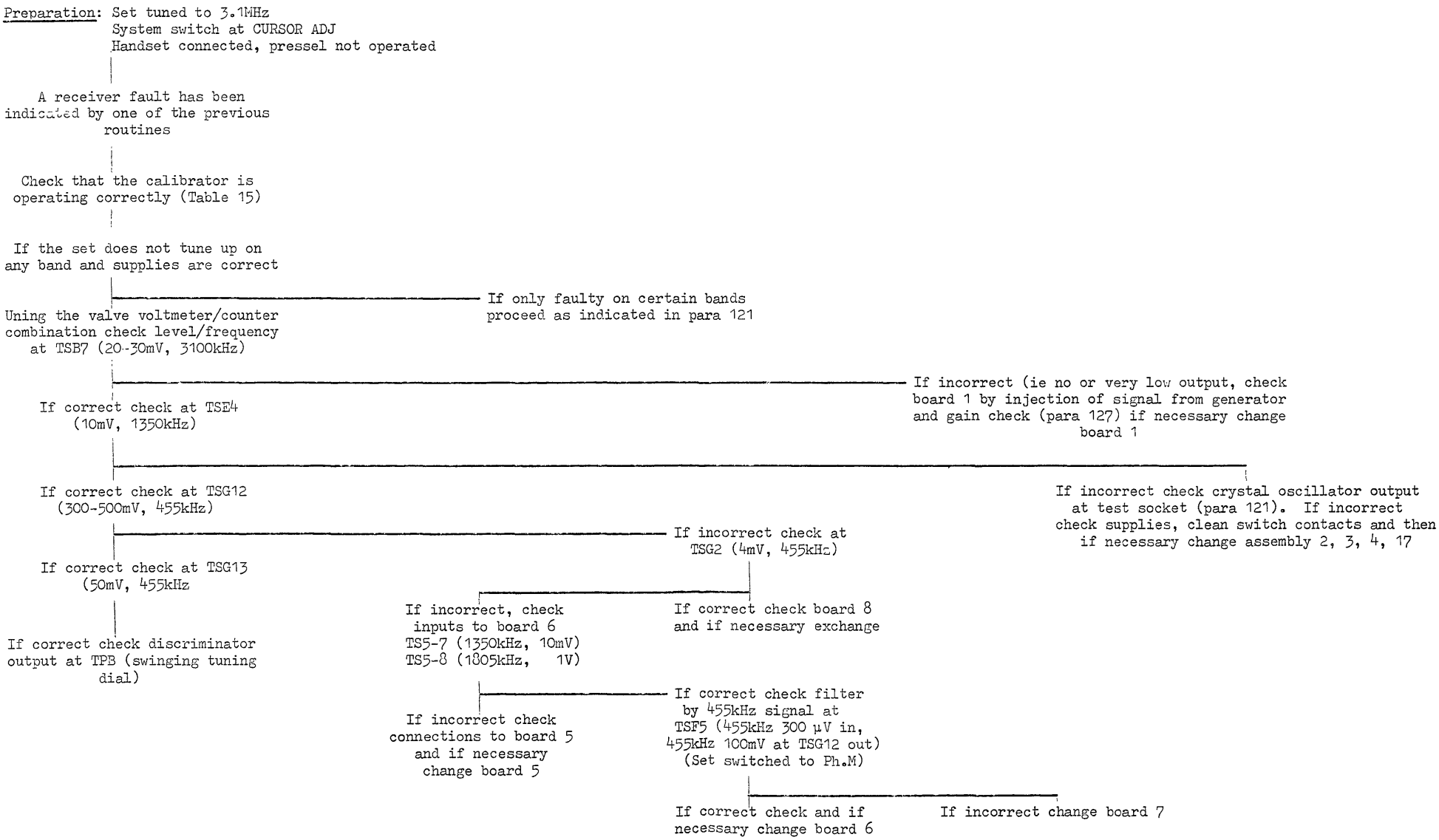


Table 15 - TRA13, fault finding, calibrator check

Preparation:

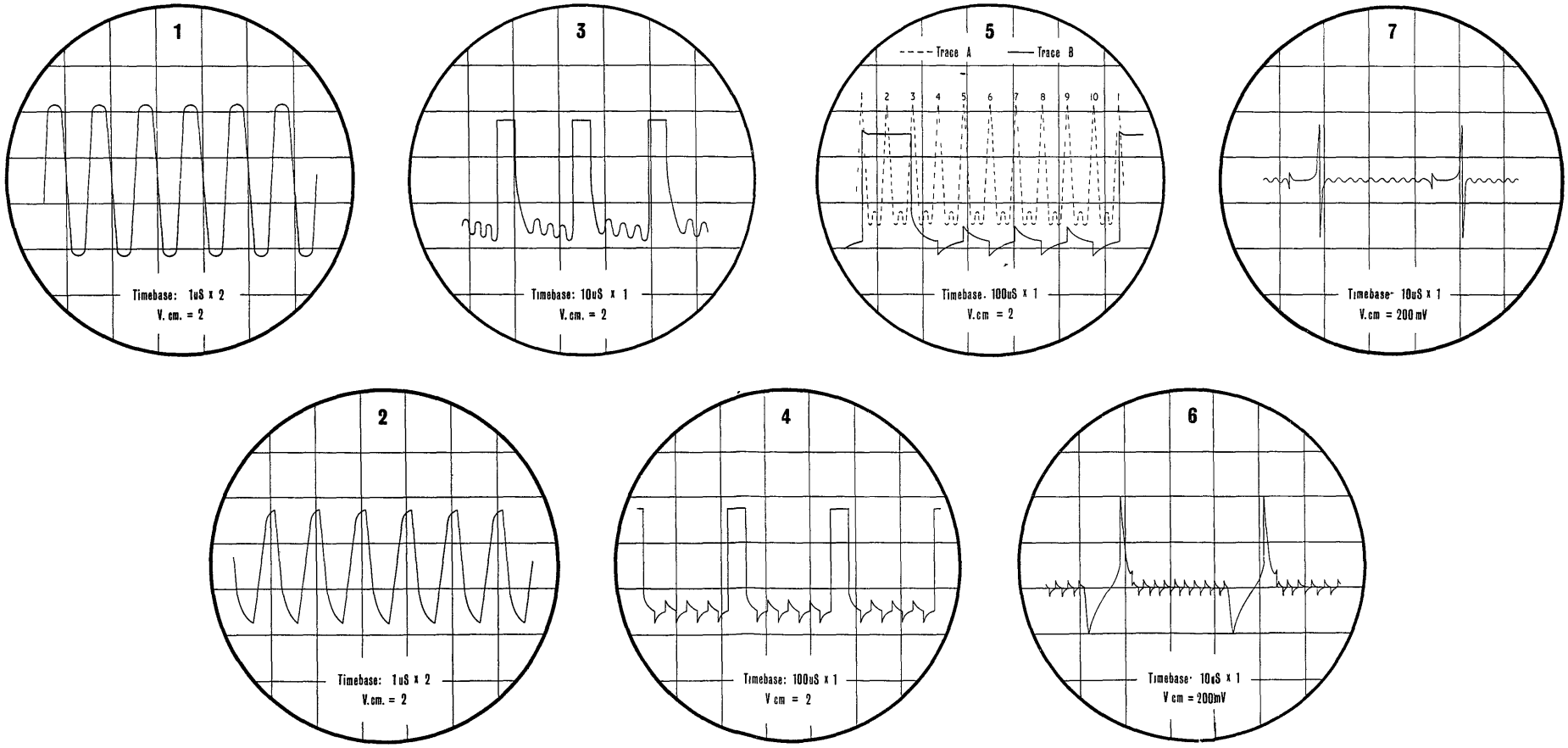
1. System switch at CHANNEL ADJ, supply volts 12V.
2. Check 12V positive supply at TSP7.
3. Check 1MHz test point (crystal pin) with valve-voltmeter/counter combination, approximately 1V, 1000kHz ±10Hz.
4. Check remainder of calibrator by reference to traces 1-7.

Traces:

1. 1MHz test point.
2. TS 22/6, 1MHz output to 100kHz divider.
3. TS 23A/1, output from 100kHz divider to input 10kHz divider.
4. TS 23B/1.
5. Composite of traces 3 and 4 using Y1 and Y2 amplifiers.
6. TS 22/4, input to calibrator amplifier.
7. TS P6, output of calibrator amplifier.

Final check:

With set switched to CURSOR ADJ check that set tunes up at 100kHz intervals and at CHAN ADJ that there are nine tuning points between adjacent 100kHz markers.



4165/179/A

SECTION 2 - AMPLIFIER R.F. NO 12 MK 1 (RFA12/1)

INSTRUCTIONS FOR DRYING AND SEALING

138. The amplifier should be opened and repaired in the driest possible conditions.

139. On receipt for repair the amplifier should be pressurized to 10 lb/sq in. and a dip test carried out in a water tank. This should reveal any faulty spindle seals, pin holes etc. This inspection should be carried out thoroughly with the set immersed for at least five minutes. The addition of a small amount of wetting agent to the water is recommended.

140. The amplifier should now be opened and any necessary mechanical repairs and adjustments carried out.

141. The amplifier is now to be resealed into its case the rubber faces of the Hyclad gasket being lightly smeared with Lanolin anhydrous technical (2 oz tubes - H1/9160-99-220-1843). Anti-tamper caps are to be fitted to two diagonally-opposite screws.

142. The desiccator plug is now removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator fitted.

143. The amplifier is now pressurized to 10 lb/sq in. using the leak locator, dry air from the dehumidifier being used.

144. After a period of 12 hours the pressure should not have reduced below 9 lb/sq in. after temperature/pressure correction has been applied (Tels M631).

145. Finally remove the adaptor, fit a reactivated 1.1/4 in. desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring with XG329 grease and screw the plug tightly into the case.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove amplifier from case

146. Remove the two anti-tamper caps.

147. Using a 3/32 in. AF wrench, slacken to their full extent the eight socket-headed screws round the periphery of the case. These screws are captive.

148. Turn the set over on to its face and carefully lift the case off the front panel. Carefully lift the Hyclad gasket off the front panel and store it on a flat surface, great care must be taken not to distort the gasket.

To remove the d.c. converter

149. Slacken the four cross-headed screws (captive) and lift the unit directly upwards when it will unplug from the remainder of the amplifier.

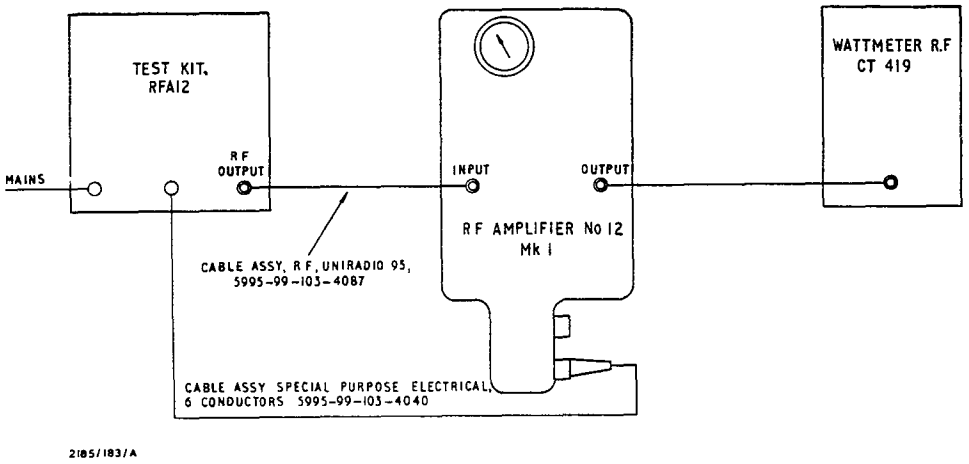


Fig 6 - RFA12/1, test arrangement

SPECIFICATION TESTS

General

150. The tests given in this regulation are those necessary to prove the serviceability of an equipment. They should be carried out each time an amplifier is inspected and/or repaired.

151. The test equipment should be arranged as shown in Fig 6.

Test conditions

152. The amplifier will need to be driven from an r.f. source having a frequency range of 2-8MHz, an output impedance of 50Ω and a power output variable from 0.7W-1.5W. This will be provided by the Test kit, Radio, Amplifier r.f. Mk 1 and 2 or if this is not available a TRA13 can be used.

153. Tests are to be carried out with supply voltages to the amplifier at NORMAL unless otherwise stated. The voltages to be used are:

NORMAL	12V d.c.
LOW	10V d.c.

154. The supply voltages are to be obtained from an approved stabilized transistor supply unit (AS1412/M) or in an emergency from a 12V secondary cell. The superseder must not be used as the transients which it produces may damage the transistors.

155. All tests are carried out with the amplifier tuned up in the normal manner. All necessary pressel switching is contained in the test kit, RFA12. If the test kit is not available, a handset must be connected to the amplifier headset socket and a TRA13 be used as the drive source.

Power consumption

156. a. Specification: Under the conditions shown the current consumption shall not exceed:

Condition	Current (A)		
	Ph.M	A.M.	C.W.
Off	0	0	0
Receive	0	0	0
Transmit 30% mod	4.6	4.6	4.6

b. Method:

(1) Switch off R.F.A. No 12/1.

(2) Set drive unit to Ph.M 3.0MHz and output 1.5W.

(3) Switch R.F.A./1 to range 2.5-3.5 and TUNE PA. Switch ON and tune R.F.A./1 for maximum deflection on the tuning meter.

(4) Switch R.F.A./1 to OPERATE and retune the R.F.A./1 to obtain maximum output.

(5) The power output should be not less than 15W and the input current should be less than 4.6A.

(6) Switch drive unit to AM and adjust power output to 1W. Repeat (3) and (4).

(7) The power output should be not less than 6W and the input current should be less than 4.6A.

Power output

157. a. Specification: At normal (20°C) temperature and normal supply volts; input drive powers of 1.5 and 0.75W shall produce minimum output powers of 15 and 6W respectively.

b. Method:

(1) Set the drive unit to 2.0MHz, output 1.5W and Ph.M and supply voltage to NORMAL.

(2) Switch the R.F.A./1 to range 2.0-2.5 and TUNE PA. Tune the amplifier to obtain maximum meter deflection.

(3) Switch the R.F.A./1 to OPERATE, and retune for maximum power output, this is to be not less than 15W.

(4) Repeat (1) to (3) at all frequencies and conditions as shown in Table 16.

Table 16 - RFA12/1, power output

Drive unit			R.F.A.	Supply voltage	Output power not less than (W)
'f' MHz	Power (W)	Condition	Range		
2.0	1.5	Ph.M	2.0-2.5	NORMAL	15
2.25	1.5	Ph.M	2.0-2.5	NORMAL	15
2.5	1.5	Ph.M	2.0-2.5	NORMAL	15
2.5	1.5	Ph.M	2.5-3.5	NORMAL	15
3.0	1.5	Ph.M	2.5-3.5	NORMAL	15
3.5	1.5	Ph.M	2.5-3.5	NORMAL	15
3.5	1.5	Ph.M	3.5-5.0	NORMAL	15
4.0	1.5	Ph.M	3.5-5.0	NORMAL	15
5.0	1.5	Ph.M	3.5-5.0	NORMAL	15
5.0	1.5	Ph.M	5.0-8.0	NORMAL	15
7.0	1.5	Ph.M	5.0-8.0	NORMAL	15
8.0	1.5	Ph.M	5.0-8.0	NORMAL	15
8.0	1.0	Ph.M	5.0-8.0	LOW	9
f LOW*	1.0	A.M.		NORMAL	6
f LOW	0.7	A.M.		LOW	3

*Note: Whilst carrying out the Phase modulation tests note the frequency and R.F.A. range setting at which the lowest power output was obtained, carry out the A.M. tests at this frequency and range setting.

Delay circuit

158. a. Specification: The delay circuit is to maintain the d.c. converter running for between 5 and 13 seconds after the pressel is released.

b. Method: (1) Set supply voltage to NORMAL.

(2) Release pressel, the input current to the amplifier shall reduce to zero 5 to 13 seconds after the pressel is released.

Socket continuity

159. Using a Multimeter CT498A ensure that there is continuity between the corresponding pins of sockets 4 and 5.

ALIGNMENT

160. Connect the amplifier into the test arrangement shown in Fig 6.

161. Connect a Multimeter CT498A on its 10V d.c. range to the test points across R17. Set the drive unit to 8MHz 1.5W input and the supply volts at NORMAL.

162. Switch the R.F.A./1 to range 2.0-2.5 and TUNE PA, switch drive unit to transmit.

163. Tune L1 to give a maximum deflection on the Multimeter, decrease the drive unit frequency until the Multimeter reads a minimum (normally a dip occurs at approximately 6.5MHz).

164. Retune L1 at this frequency for a maximum on the Multimeter, note this reading (A). Reset the drive unit to 8MHz, the Multimeter should not read less than reading (A).

SECTION 3 - AMPLIFIER, RF, NO 12, MK 2 (RFA12/2)

INSTRUCTIONS FOR DRYING AND SEALING

165. The amplifier should be opened and repaired in the driest possible conditions.

166. When received for repair, the amplifier should be pressurized to 10 lb/sq in. and a dip test carried out. Any faulty spindles, pin holes etc, should now show up. This test should be carried out with the set immersed for at least five minutes. The addition of a small amount of wetting agent to the water is recommended.

167. The amplifier should now be opened and any necessary repairs and adjustments carried out.

168. The amplifier is now to be placed in the dehumidifier, desiccant (Tels M 602) for 30 minutes at 50°C with dry air from the pump unit flowing through the dehumidifier.

169. After cooling, the amplifier should be tested and any final adjustments should be made.

170. The amplifier is now to be resealed into its case, the rubber faces of the Hyclad gasket being lightly smeared with Lanolin anyhydrous technical (2 oz tubes H1b/9160-99-220-1843). Anti-tamper caps are to be fitted to two diagonally opposite screws.

171. Remove the desiccator plug and fit the 3/4 in. 20 t.p.i. adaptor from the leak locator (CT509).

172. Pressurize the amplifier to 10 lb/sq in. using the leak locator and dry air from the dehumidifier.

173. After a period of 12 hours the pressure should not have fallen below 9 lb/sq in. after the temperature/pressure correction has been applied (see Tels M.631).

174. Finally remove the adaptor and fit a reactivated 1.1/4 in. desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring the XG329 grease and screw the plug tightly into the case.

MECHANICAL REPAIRS AND REPLACEMENTS

To remove amplifier from case

175. Remove the two anti-tamper caps.

176. Using a 3/32 in. AF wrench, slacken to their full extent the eight socket-headed captive screws round the periphery of the case.

177. Turn the set over on to its face and carefully lift the case off the front panel. Carefully lift the Hyclad gasket off the front panel and store it on a flat surface, great care being taken not to distort the gasket.

To remove top tray

178. Unscrew the four Philips captive screws, ringed in green.

179. Lift off the tray containing the d.c. supplies and delay circuit.

To remove the relay and equaliser sub-unit

180. Unsolder wires numbered 50, 51 and 52 from RLC.

181. Unsolder wire from RLD to T1, at RLD.

182. Unsolder wire from T1 to earth pin on equaliser board, at earth pin.

183. Remove the cable loop from the clamp on the side of the relay bracket.

184. Remove the four Philips screws, ringed green, securing the relay bracket to the front panel.

185. Lift off the relay and equaliser sub-assembly.

To remove the RF amplifier sub-unit

186. Unsolder the wire from T1 to RLD, at T1.

187. Unsolder wire numbered 35 from RLA and disengage from cleats on side of heat sink.

188. Unsolder wires from T2 to filter unit, at filter unit.

189. Unsolder wire numbered 53 from earth point ET3.

190. Remove the four Philips screws, ringed green, securing the amplifier sub-unit to the front panel.

191. Lift off the amplifier assembly taking care not to damage the cableforms.

Note: Due to the presence of silicon between the heat sink and the front panel, a slight resistance will be felt during the operation in para 191.

To remove the filter unit

192. Unsolder wires to T2 at the filter unit.

193. Unsolder wires numbered 50 and 53 from the filter unit.

194. Remove the frequency band switch knob assembly from the front panel.

195. Remove the four Philips screws, ringed green, securing the filter unit to the front panel.

196. Lift off the filter unit.

Re-assembly

197. The sub-units are re-assembled to the front panel in the reverse order to that described in para 178 to 196 inclusive.

SPECIFICATION TESTS

General

198. The tests given in this regulation are those necessary to prove the serviceability of an equipment. They should be carried out each time an amplifier is inspected and/or repaired.

199. The test equipment should be arranged as shown in Fig 7.

200. Details of the test equipment ancillaries are also shown in Table 17.

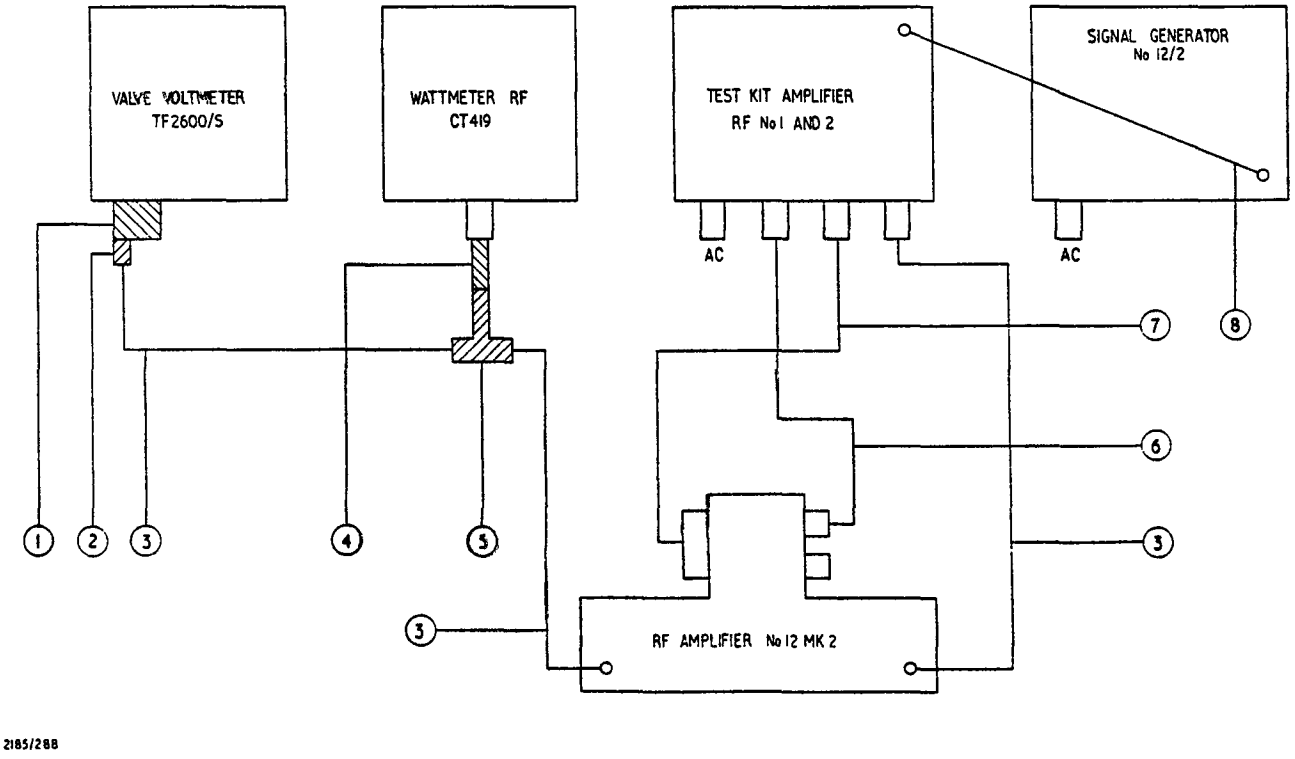


Fig 7 - Test equipment, arrangement

Test conditions

201. The amplifier will need to be driven from a test kit, radio, amplifier, RF, No 12, Mk 1 and 2 (test kit RFA12).

202. Tests are to be carried out with the supply voltages from the test kit RFA12 to the amplifier at NORMAL unless otherwise stated.

Table 17 - Ancillary equipment details

Item No	Part No	Designation	Qty	Remarks
1	Z4/5935-99-105-1561	Screened adaptor	1	TF2600 CES
2	Z4/5935-99-193-3635	Modified adaptor BNC male to VMP female, transradio type ABS11/5	1	Test kit RFA12 CES
3	Z4/5995-99-103-4087	Cable assy, R.F., uniradio 95, 3 ft lg	3	Test kit RFA12 CES
4	Z4/5935-99-193-3633	Modified adaptor VMP female to N male, transradio type ABS51/5	1	Test kit RFA12 CES
5	Z4/5935-99-193-3634	Modified 'T' adaptor VMP male to two VMP female, transradio type VMP/4	1	Test kit RFA12 CES
6	Z4/5994-99-103-4040	Cable assy, special purpose electrical, 6 conductor, 3 ft lg	1	Test kit RFA12 CES
7	Z4/6625-99-193-3636	Cable assy, special purpose electrical, 2 conductor, 3 ft lg	1	Test kit RFA12 CES
8	NIV	Cable R.F., special burndept male to BNC male, 3 ft lg	1	Local manufacture

Amplifier gain adjustment

203. a. The aim of the gain adjustment is to ensure that the output present is never less than 8W on A.M. or less than 15W on Ph.M/C.W. at any point in the range 2-8MHz, ie, R17 must be at its lowest setting consistent with these requirements. This is to ensure that the power transistors are not over-run.

b. With an input of 1.5W for the Ph.M/C.W. mode, check output power at 1MHz intervals throughout the band 2-8MHz.

c. Select the frequency at which output power is a maximum and adjust R17 to give between 15 and 18W.

d. Select the frequency at which output power was minimum and recheck that the output power is not less than 15W.

e. With an input of 1.0W for the AM mode, check output power at intervals throughout the band 2-8MHz.

f. The output power should be not less than 8W throughout the band.

Power consumption

204. Specification: Under the conditions given in para 203 the current consumption shall not exceed:

Condition	Current (A)		
	Ph.M	A.M.	C.W.
Off	0	0	0
Receive	0	0	0
Transmit	1.7	1.7	1.7

Power output

205. a. Specification: At normal temperature (20°C) and normal supply volts; conditions given in Table 18 shall produce the minimum output powers given in Table 18.

b. Method:

(1) Set the test kit RFA12 to 2.00MHz, DRIVE LEVEL to 1.5W and SYSTEM SWITCH to Ph.M/C.W.

(2) Switch RFA12/2 to RANGE 2-3MHz and switch on. Power output should be not less than 15W.

(3) Repeat (1) and (2) above for the different settings of FREQUENCY, RANGE, MODE and DRIVE LEVELS as given in Table 18. Check that the power outputs are not less than the figures indicated.

Table 18 - Power output, RFA12/2

RFA12/2 Frequency range	TEST KIT RFA12			Power output to be not less than: (W)
	Frequency (MHz)	Mode	Drive level (W)	
2-3MHz	2.00	Ph.M/C.W.	1.5	15.0
	2.25	Ph.M/C.W.	1.5	15.0
	2.50	Ph.M/C.W.	1.5	15.0
	3.00	Ph.M/C.W.	1.5	15.0
	2.00	A.M.	1.0	8.0
	2.25	A.M.	1.0	8.0
	2.50	A.M.	1.0	8.0
	3.00	A.M.	1.0	8.0

Table 18 - (cont)

RFA12/2 Frequency range	TEST KIT RFA12			Power output to be not less than: (W)
	Frequency (MHz)	Mode	Drive level (W)	
3-5MHz	3.00	Ph.M/C.W.	1.5	15.0
	3.50	Ph.M/C.W.	1.5	15.0
	4.00	Ph.M/C.W.	1.5	15.0
	5.00	Ph.M/C.W.	1.5	15.0
	3.00	A.M.	1.0	8.0
	3.50	A.M.	1.0	8.0
	4.00	A.M.	1.0	8.0
	5.00	A.M.	1.0	8.0
5-8MHz	5.00	Ph.M/C.W.	1.5	15.0
	6.00	Ph.M/C.W.	1.5	15.0
	7.00	Ph.M/C.W.	1.5	15.0
	8.00	Ph.M/C.W.	1.5	15.0
	5.00	A.M.	1.0	8.0
	6.00	A.M.	1.0	8.0
	7.00	A.M.	1.0	8.0
	8.00	A.M.	1.0	8.0

Delay circuit

206. a. Specification: The delay circuit holds RLB in the operated condition during periods of keying or similar short breaks in transmission for a period of between 5 and 10 sec.

b. Method:

(1) Connect a multimeter set CT498A with the positive lead connected to the negative battery pin of the amplifier and the negative lead connected to earth on the front panel of the RFA12/2.

(2) Set CT498A to read 100V DC.

(3) Switch test kit RFA12 to TRANSMIT and note that CT498A is reading 12V.

(4) Switch test kit RFA12 to DRIVE LEVEL and note that the time taken for the CT498A to read zero is between 5 and 10 sec.

Socket continuity

207. Using a CT498A ensure that there is continuity between the corresponding pins of sockets 5 and 6.

ALIGNMENT

General

208. A special trimming tool, to be used in alignment, is included in the CES of the test kit RFA12.

209. Access to the core of L4, L5 or L6 is obtained by passing the thin end of the trimming tool through the core of L7, L8 or L9 respectively. Care must be taken not to upset the setting of L7, L8 or L9 when adjusting L4, L5 and L6.

210. Securing pastes, varnishes or paints are NOT to be applied to the cores.

211. Connect the amplifier into the test arrangement shown in Fig 7.

Filter A (range 2-3MHz)

212. a. Select the 2-3MHz range on the RFA12/2.

b. Set the external frequency from the signal generator No 12/2 to 4.13MHz.

c. Switch test kit RFA12 to TRANSMIT, Ph.M/C.W. and EXT RF.

d. Slowly increase the drive level until the amplifier current (d.c.) is between 0.5 and 0.8A. DO NOT EXCEED THIS VALUE.

e. Adjust L7 for a minimum reading on the TF2600/S.

f. Reduce the drive level to zero.

g. Set the signal generator to 6.0MHz.

h. Repeat para d.

j. Adjust L4 for a minimum reading on the TF2600/S.

k. Repeat para a. to j. until readings will not reduce further.

l. Set the signal generator to 2.9MHz.

m. Slowly increase the drive level until the amplifier current (d.c.) is 1A.

n. Adjust L4 for a maximum reading on TF2600/S.

o. Reduce the drive to zero.

p. Switch test kit RFA12 to DRIVE LEVEL, 3.00MHz and adjust r.f. level to 1.5W.

q. Switch test kit RFA12 to TRANSMIT.

r. Check that the power output is not less than 15W and that the fall-off is not excessive.

s. Switch test kit RFA12 to DRIVE LEVEL.

Filter B (range 3-5MHz)

213. a. Select the 3-5MHz range on the RFA12/2.

b. Set the signal generator to 6.44MHz.

c. Switch test kit RFA12 to TRANSMIT.

d. Slowly increase the drive level until the amplifier current (d.c.) is between 0.5 to 0.8A. DO NOT EXCEED THIS VALUE.

e. Adjust L8 for a minimum reading on the TF2600/S.

f. Reduce the drive to zero.

g. Set the signal generator to 9.16MHz.

h. Repeat para d.

j. Adjust L5 for a minimum reading on the TF2600/S.

k. Repeat para a. to j. until readings will not reduce further.

l. Set the signal generator to 4.85MHz.

m. Slowly increase the drive level until the amplifier current (d.c.) is 1A.

n. Adjust L5 for a maximum reading on the TF2600/S.

o. Reduce the drive to zero.

p. Switch test kit RFA12 to DRIVE LEVEL, 5MHz and adjust r.f. level to 1.5W.

q. Switch test kit RFA12 to TRANSMIT.

r. Check that the power output is not less than 15W.

s. Switch test kit RFA12 to DRIVE LEVEL.

Filter C (range 5-8MHz)

214. a. Select the 5-8MHz range on the RFA12/2.

b. Set the signal generator to 10.3MHz.

c. Switch test kit RFA12 to TRANSMIT.

d. Slowly increase the drive level until the amplifier current (d.c.) is between 0.5 to 0.8A. DO NOT EXCEED THIS VALUE.

e. Adjust L9 for a minimum reading on the TF2600/S.

f. Reduce the drive to zero.

g. Set the signal generator to 14.65MHz.

h. Repeat para d.

j. Adjust L6 for a minimum reading on the TF2600/S.

k. Repeat para a. to j. until readings will not reduce further.

l. Set the signal generator to 7.8MHz.

m. Slowly increase the drive level until the amplifier current (d.c.) is 1A.

n. Adjust L6 for a maximum reading on the TF2600/S.

o. Reduce the drive to zero.

p. Switch test kit RFA12 to DRIVE LEVEL, 8MHz and adjust level to 1.5W.

q. Switch test kit RFA12 to TRANSMIT.

r. Check that the power output is not less than 15W.

s. Switch test kit RFA12 to DRIVE LEVEL.

SECTION 4 - TUNER, R.F., ANTENNAE (T.R.F.)

INSTRUCTIONS FOR DRYING AND SEALING

215. The tuner should be opened and repaired in the driest possible conditions.

216. On receipt for repair the tuner should be pressurized to 10 lb/sq in. and a dip test carried out in a water tank. This should reveal any faulty spindle seals, pin holes etc. This inspection should be carried out thoroughly with the set immersed for at least five minutes. The addition of a small amount of wetting agent to the water is recommended.

217. The tuner should now be opened and any necessary mechanical repairs and adjustments carried out.

218. The tuner is now to be placed in the Dehumidifier, desiccant and dried for 30 minutes at 50°C with dry air from the pump unit flowing through the dehumidifier (Tels M 602).

219. After cooling, the tuner is tested.

220. The tuner is now to be resealed into its case, the rubber faces of the Hyclad gasket being lightly smeared with Lanolin anhydrous technical (2 oz tubes - H1/9160-99-220-1843). Anti-tamper caps are to be fitted to two diagonally-opposite screws.

221. The desiccator plug is now removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator (CT509) fitted.

222. The tuner is now pressurized to 10 lb/sq in. using the leak locator dry air from the dehumidifier being used.

223. After a period of 10 hours the pressure should not have reduced below 9 lb/sq in. after temperature/pressure correction has been applied (Tels 631).

224. Finally remove the adaptor, fit a reactivated 1.1/4 in. desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring with XG329 grease and screw the plug tightly into the case.

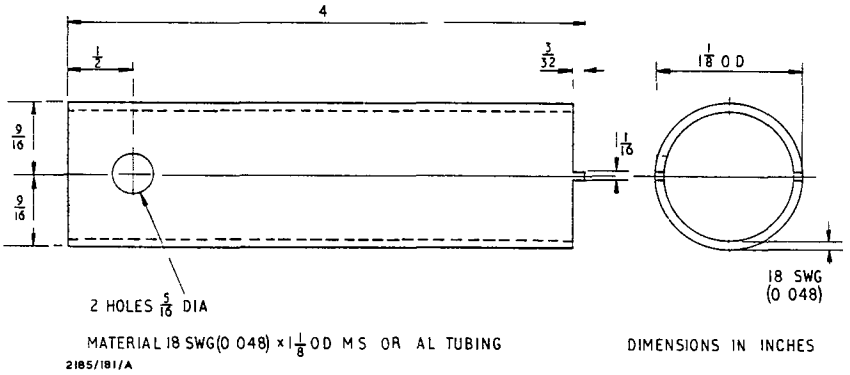


Fig 8 - Detail of meter spanner

MECHANICAL REPAIRS AND REPLACEMENTS

To remove unit from case

225. Remove the two anti-tamper caps.

226. Using a 3/32 in. AF wrench, slacken to their full extent the eight socket headed screws round the periphery of the case. These screws are captive.

227. Lift the unit out of the case, take care not to distort the Hyclad gasket.

To remove the coil unit

228. Remove the TUNE and LOCK knobs using a 1/16 in. AF wrench.

229. Remove the nuts securing the TUNE and LOCK spindles.

230. Remove the leads from the front panel assembly to the coil unit (Fig 2576 gives wiring details).

231. Remove the four cross-headed screws securing the coil deck to the front panel.

232. Draw the coil assembly clear of the front panel.

To remove the meter

233. Remove the coil unit (para 228).

234. Remove the leads from the meter.

235. Remove the meter using the special spanner (Fig 8).

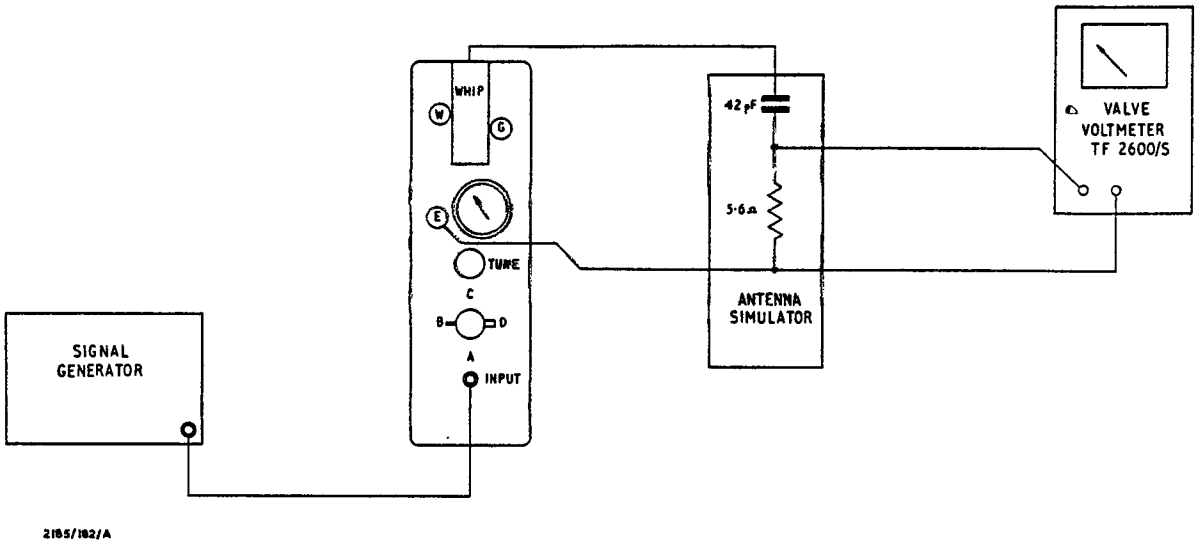


Fig 9 - Tuner r.f., test arrangement

SPECIFICATION TESTS

General

236. These tests are those required at Field, Intermediate and Base level. A number of the tests cannot be carried out at Field level because suitable test equipment is not provided, where possible a suggested alternative check is given.

Insulation
(Intermediate and Base only)

237. a. Set the RANGE switch between A and B, that is a point between the switch positions.

b. Connect an insulation tester between the WHIP antenna socket (+ve) and the earth terminal (-ve). Slowly raise the test voltage to 5kV, there is to be no breakdown.

c. Reduce test voltage to zero and remove the positive lead.

d. Connect the positive lead to the wire antenna terminal and connect the whip antenna socket to earth.

e. Increase the test voltage to 4kV, no breakdown should occur.

f. Reduce the test voltage to zero, change the positive lead over to the ground antenna terminal.

g. Increase the test voltage to 4kV, no breakdown should occur.

h. Reduce the test voltage to zero and remove all connections.

Frequency coverage
(Field, Intermediate and Base)

238. a. Connect the test equipment as shown in Fig 9. The antenna simulator should be made up of locally-obtained components.

b. Set the signal generator to produce a signal of 2MHz at 50mV.

c. Set the tuner to RANGE A and TUNE control fully clockwise.

d. Vary the signal generator frequency until the valve voltmeter indicates a maximum, the frequency is to be less than 2MHz.

e. Set the TUNE control fully anticlockwise and vary the signal generator frequency for a maximum on the valve voltmeter. The frequency will be approximately 2.8MHz, call this F1.

f. Change the RANGE switch to position B but without altering the signal generator or TUNE controls.

g. Tune the signal generator for a maximum, the frequency at which this occurs is to be less than F1.

h. Set the TUNE control fully clockwise, tune signal generator for a maximum. The frequency will be about 4.4MHz, call this F2.

j. Set the RANGE switch to C, retune the signal generator for a maximum, the frequency is to be less than F2.

k. Set the TUNE control fully anticlockwise, tune signal generator for a maximum. The frequency will be about 7.1MHz, call this F3.

l. Set the RANGE switch to D, retune the signal generator for a maximum, the frequency is to be less than F3.

m. Set the TUNE control fully clockwise, tune signal generator for a maximum, the frequency is not to be less than 8.0MHz.

Meter sensitivity
(Base)

239. a. Connect the RF power generator to the tuner input; connect the antenna simulator No 2 between the rod antenna socket and earth.

b. Inject a signal 8MHz at 2.0W from the generator.

c. With the RANGE selector at D adjust the TUNE control for a maximum on the tuning meter, the deflection obtained is to be more than 1/3rd but less than full scale.

d. Increase the input signal to 20.0W, tune for a maximum deflection of the tuning meter, the deflection obtained is to be more than 1/3rd but less than full scale.

e. Switch off the generator and remove the simulator.

f. Connect antenna simulator No 4 between the ground antenna terminal and earth.

g. Repeat tests b. to d. inclusive. The results should be as previously recorded.

h. Switch off the generator and remove the simulator.

Meter sensitivity
(Intermediate and Field)

240. The meter test will be a purely functional one using any locally-available source of r.f. power, ie TRA13, TRC13 etc. A suitable wire or rod antenna should be connected to the antenna socket for this test. The antenna simulator should not be used.

SECTION 5 - GENERATOR, d.c. (HG)

INSTRUCTIONS FOR DRYING AND SEALING

241. The generator should be opened and repaired in the driest possible conditions.

242. On receipt for repair the generator should be pressurized to 10 lb/sq in. and a dip test carried out. Any faulty spindle seals, pin holes etc will be indicated by a stream of bubbles.

243. Any necessary mechanical or electrical repairs should now be carried out.

244. After specification testing the generator should be resealed into its case the rubber faces of the Hyclad gasket being lightly smeared with grease (Lanolin, anydrous technical, 2 oz tubes - H1/9160-99-220-1843).

245. The desiccator plug is now removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator (CT509) fitted.

246. The generator is now pressurized to 10 lb/sq in. using the leak locator.

247. After a period of 12 hours the pressure should not have reduced below 9 lb/sq in. after temperature/pressure correction has been applied (Tels M 631).

248. Finally remove the adaptor, fit a reactivated 1.1/4 in. desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring with XG329 grease and screw the plug tightly into the case.

MECHANICAL REPAIRS AND REPLACEMENTS

To open the generator

249. Using a 3/32 in. hexagon wrench, unscrew the eight socket-headed screws which secure the alternator housing to the control housing. Bronze fairleads are forced over the screw threads which make the screws captive. When the screws are removed the alternator housing can be lifted away from the control housing, the movement must be directly in line as a plug and socket have to be split and a splined shaft removed from the alternator gear drive, also the two case halves are positioned by means of dowels.

To remove the control unit

250. After splitting the unit (para 249) it is first necessary to unsolder four leads:

a. Leads No 25 and 26 to the indicating lamp.

b. Leads No 30 and 31 to the output socket.

251. It is necessary to provide a Philips-headed screwdriver No 1 size with a shaft six inches long, this can be made by using the normal one provided (3 in. shaft) and brazing an extension piece of 3/16 in. steel rod on. Unscrew the nine cross-headed screws which secure the control assembly to the casting. Eight of these are captive, the one at the front being free. The assembly can now be removed.

252. The control assembly will open out for accessibility if lead 09 is unsoldered from terminal 21 and the eight cross-headed screws which hold the assembly together are removed. If a jumper wire is now connected between lead 09 and terminal 21 the assembly is electrically operational and fault finding etc can proceed.

Lubrication

253. In normal use the bearings will require repacking at five-year intervals. If the generators are, however, subjected to prolonged storage the bearings should be cleaned and repacked with grease XG329 at three-yearly intervals. The gears should be lightly greased with grease XG329 whenever the generator is opened for repairs etc, care must be taken however to keep the amount of grease to a minimum.

SPECIFICATION TESTS

General

254. The full testing of the generator d.c. requires a mechanical means of rotating the handle at speeds varying between 60 and 150 rev/min. This is provided (by those workshops in possession) by the Test stand, automotive generator and starter. Workshops not in possession of a test stand must arrange to turn the handle manually or by any locally-provided ad hoc arrangement. It may be found impossible to apply certain tests manually, notably the overwinding full load test (para 258.c.).

255. The full load tests must only be applied whilst the electronic regulator unit is screwed into the casting, otherwise the power transistors will overheat. The maximum load resistance which must be applied with the control unit removed from the casting is 30Ω.

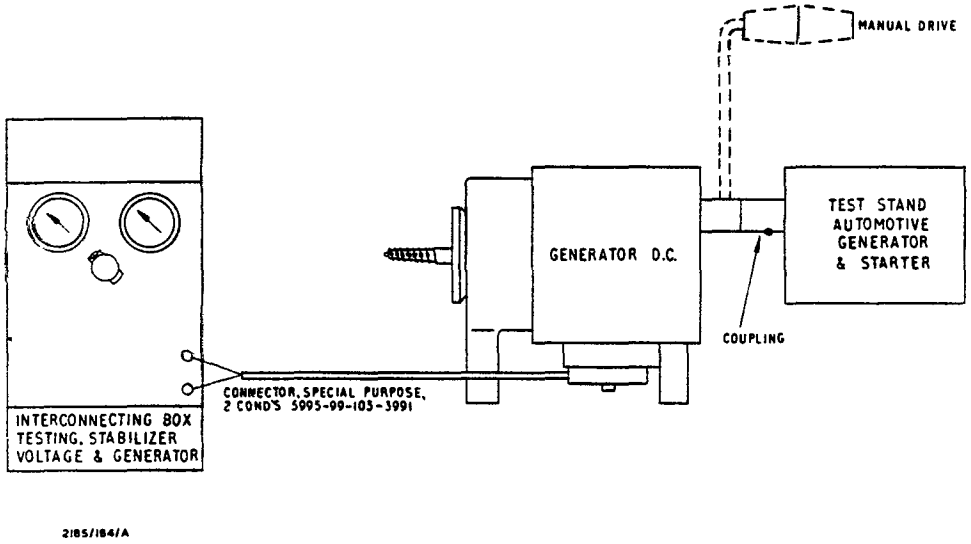


Fig 10 - Generator d.c., test arrangement

Output voltage

256. a. Specification: When the handle is turned at any speed which causes the indicator lamp to light and with a load resistance of between 7-1500Ω the output voltage is to be between the limits 14.2-14.6V.

b. Method:

(1) Connect up as shown in Fig 10, switch the test box to position 3.

(2) Turn the handle at between 60 and 75 rev/min.

(3) The lamp is to be lit and the output voltage shown on METER 2 is to indicate between calibration marks 2(14.2V) and 6(14.6V).

(4) Operate the LOAD switch, the output voltage is to remain between 14.2V and 14.6V and the load current (METER 1) will read approximately 2A.

(5) Under the conditions of (4) the output voltage and lamp illumination are to be steady at 75 rev/min.

Overload

257. a. Specification: When the handle is turned at 65 rev/min and a load resistor of any value between 0 and 7Ω is applied the output voltage shall not exceed 14.6V. When a short-circuit is applied the short-circuit current is not to exceed 4.0A.

b. Method:

(1) Connect up as shown in Fig 10, switch the test box to position 8.

(2) Turn the handle at 65 rev/min.

(3) Operate the LOAD switch, the output voltage is not to exceed 14.6V and the load current is to be less than 3.0A. The test must not be continued for more than 1 minute.

Overwinding

258. a. Specification: At 20°C when the generator is operated at 150 rev/min into a 7Ω load the overvoltage protector shall operate causing the indicator lamp to go out and the output voltage to drop to less than 2V.

b. Method: (Open circuit load).

(1) Connect up as shown in Fig 10, switch the test box to position 3.

(2) Turn the handle at a speed rising from 75 towards 124 rev/min.

(3) The operation of the overwind protection circuit will be seen by the lamp going out and a sudden reduction of the output voltage, this is to occur at a speed of between 80 and 120 rev/min.

c. Method: (Full load)

(1) Connect up as shown in Fig 10, switch the test box to position 3 and operate the LOAD switch.

(2) Turn the handle at 100 rev/min.

(3) The output voltage is to be between 14.2V and 14.6V. This test must not be maintained for a period longer than one minute.

FAULT FINDING AND SETTING UP

Alternator

259. A rudimentary check of the alternator can be made by spinning the gears with the fingers; the voltage measured across sockets 1-2, 1-3 and 2-3 using a Multimeter CT498A on its 10V a.c. range will be about 3-5V dependent upon the speed.

260. The d.c. resistance measured across the same pin combinations will be approximately 3Ω each winding.

Control unit - setting up

261. Remove the control unit from the casting (para 250).

262. Connect up into the circuit shown in Fig 11.

263. With an input voltage of 30V and with S1 open, ie no load, adjust RV1 until METER 2 on the test box reads 14.5V (5 mark).

264. Reduce the input voltage to 20V and with S1 closed the output voltage is to be within the limits 14.2-14.6V, note this value (Voltage A).

265. Turn RV2 fully clockwise, close S1 and reduce the input voltage to 10V. Increase the input voltage until METER 2 indicates a reading equal to Voltage A. Now turn RV2 slowly anticlockwise until the lamp lights and just becomes steady.

Table 19 - Generator d.c., test point voltages

Multimeter CT498A		Voltage measured (V)	Range (V)
+ve	-ve		
TP12	TP8	4.1	10
TP13	TP8	4.8	10
TP14	TP8	14.0	30
TP24	TP17	10.5	30
TP24	TP18	15.0	30
TP24	TP19	5.5	30
TP24	TP22	5.8	30
TP24	TP23	5.8	30
TP24	TP55	15.0	30
TP24	TP56	6.0	30
TP24	TP57	7.0	30

Note: Input voltage 30V. Output voltage 14.5V. Test conditions as Fig 11; S1 closed. Figures taken on early production models.

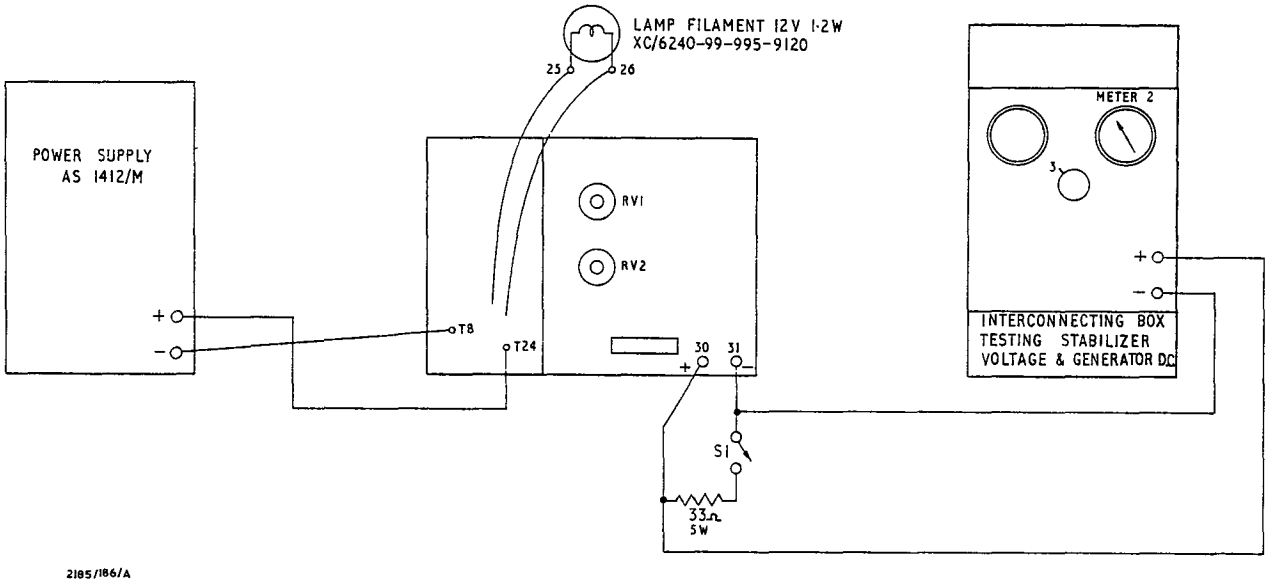


Fig 11 - Generator d.c., control unit, test arrangement

SECTION 6 - CONTROL, TRANSMITTER-RECEIVER, REMOTE (R.C.U.)

INSTRUCTIONS FOR DRYING AND SEALING

266. The unit should be opened in the driest possible conditions and all the necessary repairs and testing carried out. The baseplate can be removed by unscrewing the ten 6 UNC x 3/8 in. long socket-headed screws using a 3/32 in. AF wrench.

267. The unit should then be placed in the Dehumidifier, desiccant for thirty minutes at 50°C with the dry air from the pump unit passing through the oven (Tels M 602 gives full details).

268. The unit shall then have its baseplate replaced, no grease must be used on the rubber facing of the plate.

269. When replacing the baseplate tighten up the screws gradually, tightening diagonally opposite screws in turn. Where possible a torque driver set to 45 ±5 oz in. should be used.

270. The unit shall now have its desiccator plug removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator fitted in its place.

271. The unit is now pressurized to 10 lb/sq in. using the leak locator, dry air from the dehumidifier, being used to pressurize the unit.

272. After a period of 2.5 hours the pressure should not have reduced below 9 lb/sq in. (after applying temperature/pressure correction as explained in Tels M 631). The unit has a time constant of 30 hours.

273. Finally remove the sealing adaptor and fit the desiccator plug with a reactivated 1.1/4 in. silica gel desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring the XG329 grease and screw the plug firmly into the case.

SPECIFICATION TESTS

General

274. The tests shown are those necessary to prove the serviceability of an equipment.

275. The tests are based on the use of an Interconnecting box, testing, control remote, TRA13, which is part of Test kit, radio, SRA13.

276. Para-279 to 285 list the tests and show the method of carrying them out. These are summarized in a recommended sequence in Table 18.

Test conditions

277. All tests are carried out with 12V d.c. supply voltage connected to the test box. This supply should be derived from a transistorized supply unit of approved type or from a 12V secondary cell. The superseder should not be used. If a transistorized supply unit fitted with a current-limiting device is used the limiter should be set at about 50mA.

278. The test equipment should be arranged as shown in Fig 12.

Receiver tests

A.F. sensitivity

279. a. Specification: An input of 0.9-1.5V a.f. at 1000Hz from a 300Ω source should produce an a.f. output of 5mW into a 150Ω load.

b. Method:

(1) Set valve voltmeter to 1.0V range and the switch on R.C.U. to RT.

(2) Set switch box to position 1 and the b.f.o. to 1000Hz on the 10Ω range.

(3) Adjust the b.f.o. level until the valve voltmeter reads 0.85V (this approximates to 5mW).

(4) Set valve voltmeter to its 3.0V range.

(5) Change switch box to position 2, the valve voltmeter should read between 0.9 and 1.5V. Note this reading on the dB scale of the voltmeter and call it AdB.

A.F. frequency response

280. a. Specification: The a.f. output at 300 and 3000Hz shall be within ±2dB of the level at 1000Hz.

b. Method: Repeat para 279.b.(5) at 300 and 3000Hz, the valve voltmeter readings shall be within ±2dB of AdB.

Load current

281. a. Specification: The load current shall be between 5 and 8mA.

b. Method: With test box switched to position 2, connect a Multimeter on its 10V d.c. range to the INPUT CURRENT sockets. The meter should read between 1.1 and 1.75V.

Transmitter tests

Microphone sensitivity and frequency response

282. a. Specification: A microphone input of 100mV at 1000Hz shall produce an a.f. output at the live terminals of 35-55mV. At 300 and 3000Hz the output shall be within ±2dB of that at 1000Hz.

b. Method: (1) Set b.f.o. to 1000Hz at 1V.

(2) Set test box to position 3 and then change valve voltmeter to 100mV range.

(3) The valve voltmeter shall read between 25 and 45mV. Note this reading as BdB.

(4) Repeat (1) to (3) at 300 and 3000Hz, the valve voltmeter should read within the limits BdB ±2dB.

R.T. sidetone

283. a. Specification: A microphone input of 100mV at 1000Hz shall produce a sidetone a.f. output of 0.5 - 1.5mW. The output at 300 and 3000Hz shall be within ±2dB of that at 1000Hz.

b. Method: (1) Set valve voltmeter to its 1V range.

(2) Set b.f.o. to 1000Hz at 1V.

(3) Change switch box to position 4, the valve voltmeter should read between 250 and 500mV. Note this reading CdB.

(4) Repeat (3) at 300 and 3000Hz, the voltmeter should read within the limits CdB ±2dB.

C.W. sidetone

284. a. Specification: With the key closed there shall be a sidetone output of 30-100 µW at a frequency of between 500 and 2000Hz.

b. Method:

(1) Switch R.C.U. to C.W.

(2) Reduce b.f.o. output to zero.

(3) Change valve voltmeter to its 300mV range, the meter shall read between 70 and 105mV.

(4) Connect a handset to the other socket on the R.C.U. and plug a key into the key jack on the test box.

(5) The note heard should be between 500 and 2000Hz and when the key is operated the tone should be started and stopped clearly with no objectionable chirps or clicks.

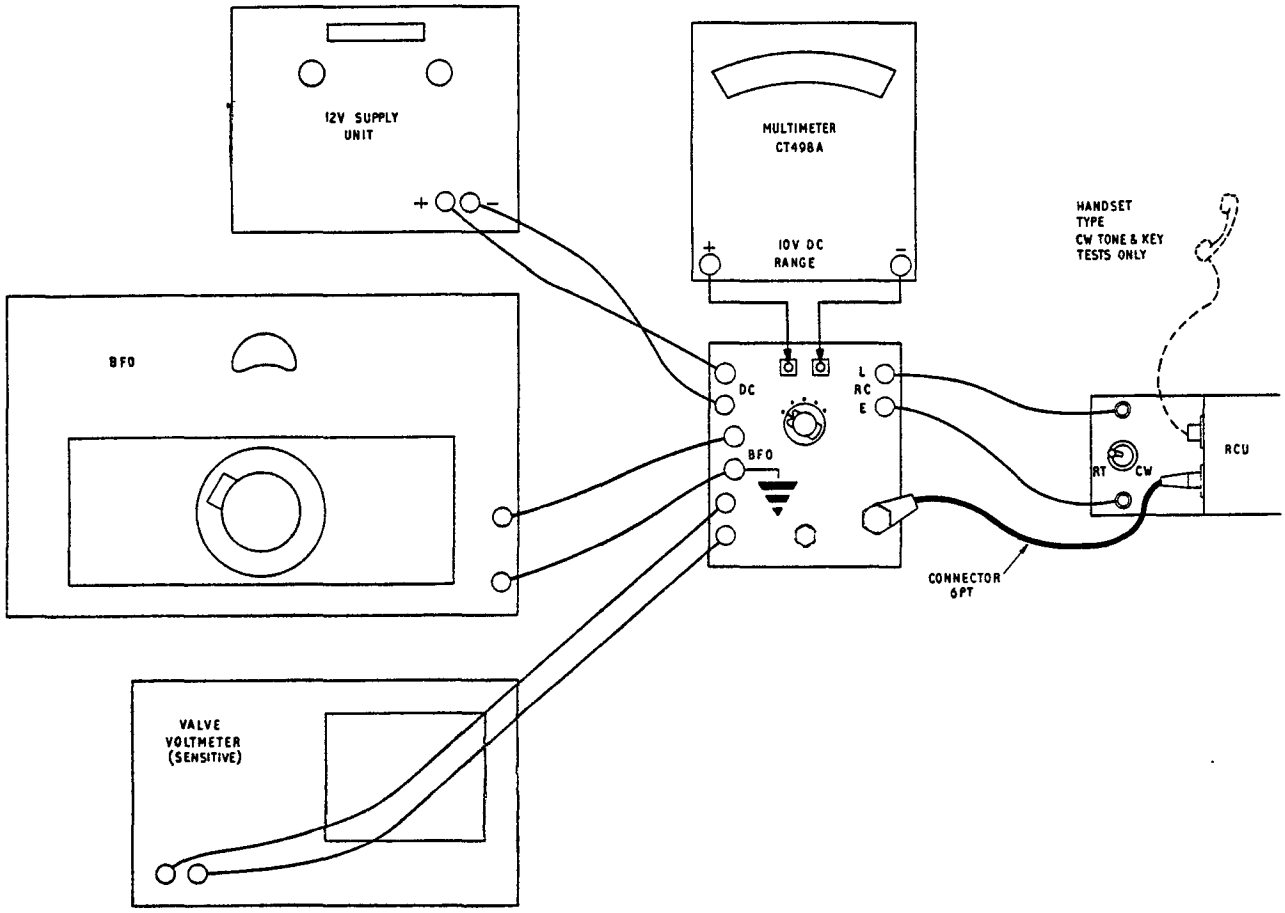


Fig 12 - R.C.U., test arrangement

Supply current

285. a. Specification: The input current should be between the limits 18-24mA on either R.T. or C.W.

b. Method: (1) Connect a Multimeter on its 10V d.c. range to the INPUT CURRENT sockets.

(2) With the test box in position 5 and the R.C.U. switch at R.T. and C.W. respectively, the Multimeter should read between 4.0 and 5.25V.

Table 20 - R.C.U., summary of tests

Test No	Test box switch position	B.F.O.		V.V. reading	Multimeter reading
		f(Hz)	level		
1*	1	1000	Adjust to give 0.85V on V.V.	0.85V	-
2*	2	1000	As test 1	0.9-1.5V	1.75-2.25V
3*	2	300	As test 1	±2dB of test 2 reading	-
4*	2	3000	As test 1	±2dB of test 2 reading	-
5*	3	1000	1V	25-45mV	4.0-5.0V
6*	3	300	1V	±2dB of test 5 reading	-
7*	3	3000	1V	±2dB of test 5 reading	
8*	4	1000	1V	250-500mV	
9*	4	300	1V	±2dB of test 8 reading	
10*	4	3000	1V	±2dB of test 8 reading	
11/	5	0	0	70-105mV	
12/	5	0	0	Tone heard to be between 500-2000Hz. No clicks or chirps	

Notes: *Switch on R.C.U. at R.T.
/Switch on R.C.U. at C.W.
All tests at 12V input

SECTION 7 - STABILIZER VOLTAGE, TRANSISTOR TYPE (SV)

INSTRUCTIONS FOR DRYING AND SEALING

286. The unit should be opened in the driest possible conditions and all the necessary repairs and testing carried out. The baseplate can be removed by unscrewing the ten 6 UNC x 3/8 in. long socket-headed screws using a 3/32 in. AF wrench.

287. The unit should then be placed in the Dehumidifier, desiccant for thirty minutes at 50°C with the dry air from the pump unit passing through the oven. (Tels M 602 gives full details).

288. The unit shall then have its baseplate replaced, no grease must be used on the rubber facing of the plate.

289. When replacing the baseplate tighten up the screws gradually, tightening diagonally opposite screws in turn. Where possible a torque driver set to 45 ±5 oz in. should be used. Anti-tamper caps should be fitted to two diagonally-opposite corner screws.

290. The unit shall now have its desiccator plug removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator testing fitted in its place.

291. The unit is now pressurized to 10 lb/sq in. using the leak locator dry air from the dehumidifier, being used to pressurize the unit.

292. After a period of five hours the pressure should not have reduced below 9 lb/sq in. (after applying temperature/pressure correction as explained in Tels M 631). The unit has a time constant of 50 hours.

293. Finally remove the sealing adaptor and fit the desiccator plug with a reactivated 1.1/4 in. silica gel desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring with XG329 grease and screw the plug firmly into the case.

SPECIFICATION TESTS

General

294. The tests shown are those necessary to prove the serviceability of an equipment.

295. The tests are based on the use of an Interconnecting box, testing, stabilizer voltage and generator d.c. (Z1/5820-99-103-3947) which is part of Test kit, radio, SRA13. Tels M 182 describes the test box.

296. Para 299 to 306 list the tests and show the method of carrying them out. These are summarized in a recommended sequence in Table 19.

Test conditions

297. All tests are carried out using supply voltages of 31.6 or 20.6V. This supply can be derived from a superseder; to obtain the higher voltage it may be necessary to add an additional 4 or 6V cell in series with the superseder.

298. Figure 13 shows the arrangement of the test gear.

Tests and adjustments

Setting up the voltage stabilizer

299. With the test box switched to position 1 adjust the input voltage until the voltmeter reads 6 (this is preset to equal an input voltage of 31.6V).

Output volts at 31.6V input

300. Switch to position 3 and operate the LOAD switch; the voltmeter shall read between 2 and 6 (ie 14.2 and 14.6V). The ammeter will read about 2A.

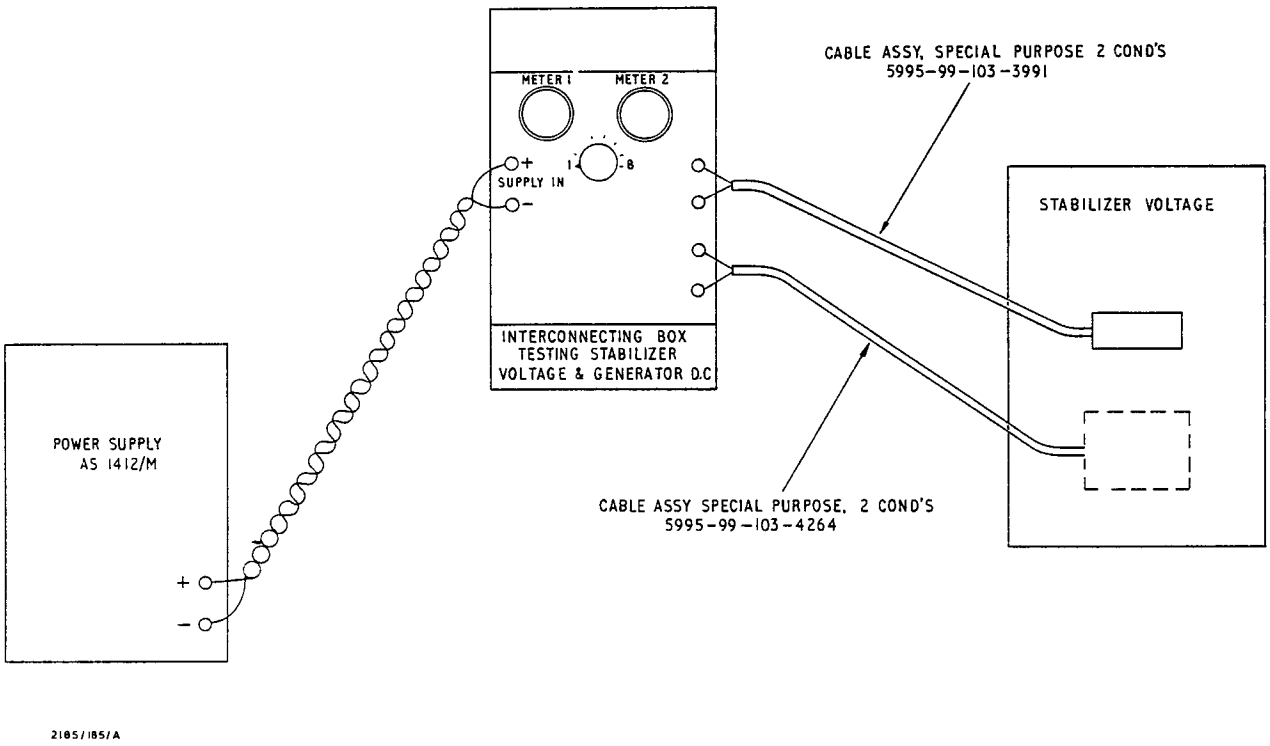


Fig 13 - SV test arrangement

Reverse input voltage

301. Switch to position 4; the voltmeter (now used as a microammeter) reading shall not exceed 2 (100 µA).

Output volts at 20.6V input

302. Switch to position 1. Reduce input volts until meter reads between 2 and 3. Switch to position 5 and adjust volts until meter reads 6 (20.6V) exactly.

303. Switch to position 6; the voltmeter should read between 2 (14.2) and 6 (14.6V). This is the output voltage on no load.

304. Switch to position 7 and operate the LOAD switch; the voltmeter should read between 2 (14.2) and 6 (14.6V) and the ammeter should read approximately 2A.

305. In the event of any of the foregoing tests failing to meet the required specification figures, switch to position 2 and adjust RV1 on the stabilizer until the voltmeter reads 6 (this is preset to equal 14.6V).

Current limiting

306. Switch to position 8 and operate the LOAD switch; the ammeter reading should be less than 4.0A.

Table 21 - SV, summary of tests

Switch position	Voltmeter reading	Ammeter reading	Test
1	6 (31.6V)		Adjust input volts to 31.6V
2	5 (14.5V)		Adjust RV1 for an output voltage of 14.5
3	2 (14.2V) 6 (14.6V)	2A approx	Output volts at full load, 31.6V input
4	less than 2 (100 µA)		Reverse current. 31.6V input
5	6 (20.6V)		Adjust input volts to 20.6V
6	2 (14.2V) to 6 (14.6)		Output volts, no load. 20.6V input
7	2 (14.2V) to 6 (14.6V)	2A approx	Output volts, full load. 20.6V input
8		4A max	Current limiting, short circuit, 20.6V input

SECTION 8 - HARNESS ADAPTOR UNIT MK 2 (H.A.U.)

INSTRUCTIONS FOR DRYING AND SEALING

307. The unit should be opened in the driest possible conditions and all the necessary repairs and testing carried out.

308. The unit should then be placed in the Dehumidifier, desiccant for thirty minutes at 50°C with the dry air from the pump unit passing through the oven (Tels M 602 gives full details).

309. If either of the cover plates have been removed the gaskets should be lightly smeared with XG329 grease before replacement. The fixing screws should be tightened evenly using the technique in para 289.

310. The unit shall now have its desiccator plug removed and the 3/4 in. 20 t.p.i. adaptor from the leak locator fitted in its place.

311. The unit is now pressurized to 10 lb/sq in. using the leak locator, dry air from the dehumidifier being used to pressurize the unit. After a period of 15 hours the pressure should not have reduced below 9 lb/sq in.

312. Finally remove the sealing adaptor and fit the desiccator plug with a reactivated 1.1/4 in. silica gel desiccator (Z1/4440-99-942-2061). Lightly smear the sealing ring the XG329 grease and screw the plug firmly into the case.

SPECIFICATION TESTS

General

313. The tests shown are those necessary to prove the serviceability of an equipment.

314. The tests are based on the use of an Interconnecting box testing, harness adaptor, TRA13 (Z1/5820-99-103-3946) which is part of the Test kit, radio, SRA13. This box will be referred to hereafter as 'Test box'.

Test conditions

315. The supply voltages shall be between 20.6V and 31.6V. This supply can be obtained from the battery superseder, it may be necessary to connect an additional 2-4V from a secondary battery in series with the superseder to obtain the upper voltage.

316. For the headphone amplifier tests the input volts quoted are open-circuit from a 150Ω source and the output load shall be 50Ω.

317. For the microphone attenuator tests the input voltages are the open-circuit volts from a 300Ω source and the output voltages are measured across a 300Ω terminating resistor.

Voltage regulator

Output voltage

318. a. Specification: With the load resistor having any value between 1500Ω and 2.2Ω the output voltage shall be between 12.0 and 13.0V.

b. Method:

(1) Adjust the input voltage to 31.6V

(2) Operate the LOAD switch; the output voltmeter shall read between 0 (12.0V) and 10 (13.0V) and the input current shall be less than 6.5A.

(3) Repeat (2) with an input voltage of 20.6V.

(4) With an input voltage of 20.6V and the LOAD switch released the input current should be less than 0.5A and the output voltage between 0 (12.0V) and 10 (13.0V).

(5) In the event of any of the foregoing tests failing to meet the required specification figures, adjust RV1 in the harness adaptor until the output voltmeter reads on the 7 mark (12.7V). The input current meter shall read less than 0.5A.

Current limiting

319. a. Specification: When the unit is operated with a short-circuit across the output the current shall not exceed 10A.

b. Method:

(1) Adjust the input voltage to 20.6V.

(2) Set the SHORT switch to ON, the output current shall be less than 10A. This test must not be applied for a longer period than one minute.

Reverse-voltage protection

320. a. Specification: With reversed polarity applied to the input of the unit no damage shall occur to the unit and no reversed output voltage shall be present.

b. Method: (1) Adjust the input voltage to 31.6V and set NORMAL/REVERSE switch to the REVERSE position.

(2) The output voltage and input current shall be zero.

Headphone amplifier

Gain

321. a. Specification: The input level at 1000Hz required to produce an a.f. output of 150mW shall be between 2.0 and 3.0V.

b. Method: (1) Set supply voltage to 24V.

(2) Switch to OUTPUT 50Ω.

(3) Set valve voltmeter to its 3V range and b.f.o. to 1000Hz, 600Ω output.

(4) Increase the b.f.o. level until the valve voltmeter reads 2.75V (150mW).

(5) Switch to INPUT 50Ω, the valve voltmeter should read between 2.0 and 3.0V.

Regulation

322. a. Specification: When the input level is adjusted to give an output of 150mW into 50Ω and is then altered to 150Ω the output power shall fall to less than 70mW.

b. Method: (1) Proceed as para 321 (1) to (4), switch valve voltmeter to 10V.

(2) Switch to REG, the valve voltmeter should read less than 3.24V.

Microphone attenuator

323. a. Specification: When an input of 300mV at 1000Hz is applied the output level shall be between 13 and 16dB below the input level.

b. Method: (1) Reduce b.f.o. output to zero and set to 1000Hz 10Ω output.

(2) Switch to ATTENUATION TESTS INPUT and set valve voltmeter to 300mV range.

(3) Increase b.f.o. output level until the valve voltmeter reads 300mV.

(4) Switch to ATTENUATION TESTS OUTPUT and switch valve voltmeter to 100mV range.

(5) The valve voltmeter should read between 23 and 34 millivolts.

Regulation

324. a. Specification: When a load resistor of 6Ω 60W is connected across pins A and B of SK4, the output across the resistor shall be not less than 18V with a supply voltage of 20.6V.

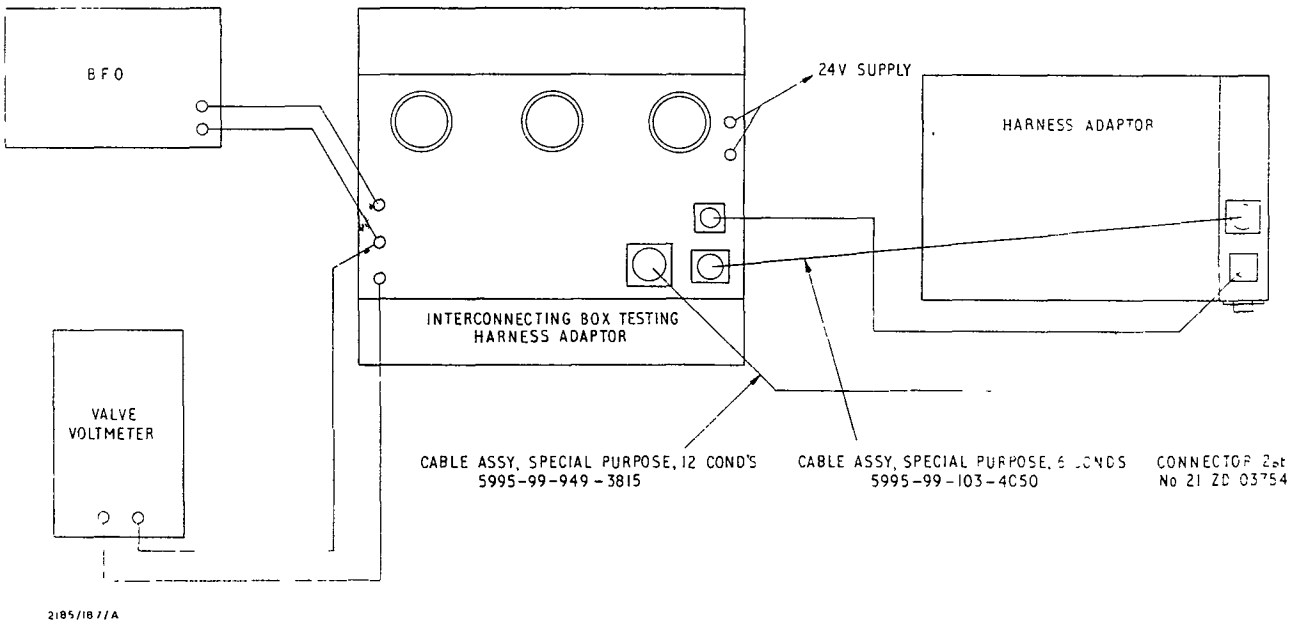


Fig 14 - H.A.U., test arrangement

Note: This Page 86, Issue 3 supersedes Page 86, Issue 2 dated 4/71. Para marked • have been amended.

SECTION 9 - ANCILLARIES

Battery, secondary, alkaline, 12V 2AH

325. These batteries (Z1/6140-99-949-6145) are of the nickel-cadmium type and cannot be repaired other than the replacement of the connection sockets (Clip, spring tension, Z1/5340-99-104-0901).

• 326. The batteries must always be charged from a constant voltage source of 14.4 ±0.2V and must be charged for six hours from a starting p.d. of 10V to ensure that they become fully charged.

• 327. The following test should be applied to a battery to determine its serviceability state. The battery shall be charged from a starting p.d. of 10V for six hours at 14.4 ±0.2V. At the end of this period it shall be discharged through a 30Ω 5W resistor for a period of five hours; the on-load potential shall then be at least 10V. Any battery which does not satisfy this requirement is to be returned to REME workshops for examination. A suitable discharge resistor is included in the Interconnecting box, testing, harness adaptor TRA13.

EME 8c/2185

END