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I put a lot of time into producing these files which is why you are met with this page when you open the file.

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It is my hope that you find the file of use to you personally – I know that I would have liked to have found some of these files years ago – they would have saved me a lot of time !

Colin Hinson

In the village of Blunham, Bedfordshire.

AIR PUBLICATION

**2883G**

VOLUME 5

# RECEIVING EQUIPMENT TYPE R.1475

## BASIC SERVICING SCHEDULES

Prepared by direction of  
the Minister of Supply

A handwritten signature in black ink, appearing to read "R. Munro".

Promulgated by Command of  
the Air Council

A handwritten signature in black ink, appearing to read "H. J. Dean".

AIR MINISTRY

## GENERAL NOTES AND PRECAUTIONS

1. Re-alignment should not be attempted until it has been definitely established that circuits are out of alignment. It must only be done by competent personnel to whom the correct test equipment is available.

2. Do not earth the HT -ve line of the receiver or power unit as this line is used to provide a negative bias of 55V for the receiver.

3. No attempt should be made to remove any sub-unit from the receiver chassis unless the appropriate switch bar has been withdrawn. The sub-units and the switch bars controlling them are as follows :—

A, B and C .....Range switch bar.

D, E, G, J and K.....System switch bar.

Before removing a sub-unit, the switches should be set as follows :—

Range switch : Set to 11·3–20 Mc/s range.

System switch : Set to ' Narrow-band CW '.

When removing the sub-units C and D, it will be necessary to unsolder the connection between these two sub-units. When replacing a sub-unit, take care that the inter-connecting plugs are connected in accordance with the colour code.

4. Take care when removing valve top cap connectors that the connectors or valve caps are not damaged. It should be noted that it is difficult to grip valves by their bases due to the screening can mountings, therefore ensure that the valve base to envelope joints do not become loosened when valves are removed. Ensure that the valve top cap connectors are correctly connected at both ends when valves are replaced or renewed, a diagram of these connections appears in the receiver case.

FIRST LINE SERVICING SCHEDULES

**LIST OF SECTIONS**

**I Daily Servicing Schedule**

## SECOND LINE SERVICING SCHEDULES

### **LIST OF SECTIONS**

- 1 Weekly Servicing Schedules**  
*(Application to be decided later)*
- 2 Fortnightly Servicing Schedules**  
*(Application to be decided later)*
- 3 Monthly Servicing Schedules**
- 4 Three Monthly Servicing Schedules**  
*(Application to be decided later)*
- 5 Six Monthly Servicing Schedules**

## **LIST OF APPENDICES**

- A**    **Setting up instructions**
- B1**   **A.F. and I.F. sensitivity tests**
- B2**   **Alignment of I.F. circuits**
- B3**   **Alignment of R.F. circuits**
- B4**   **Receiver calibration**
- B5**   **Adjustment of tuning drive mechanism**
- B6**   **Alignment of guard channel tuning unit**
- C1**   **Tools, test equipment and materials**
- C2**   **Fuses, valves and lamps**
- C3**   **Special test equipment**
- C4**   **Use of test equipment** AL2
- D**    **Fault location chart**
- E1**   **General physical serviceability**
- E2**   **Removal of sub-units**
- F**    **Typical valve electrode voltages**

**RECEIVING EQUIPMENT TYPE R.1475  
BASIC SERVICING SCHEDULES**

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**HANDWRITTEN AMENDMENTS**

When making the following handwritten amendments *write* “ (A.L. 4) ” in the margin against each amendment.

**APPENDIX B3**

To precede para. 5 *insert* a side heading “ Alignment ”.

**APPENDIX B6**

Para. 1; below “ Telephone headset ” *insert* “ Wattmeter absorption CT44 10AF/98 ”.

**REMOVAL AND INSERTION OF LEAVES**

**2nd LINE, SECTION 5**

*Remove* para. 10 to 27 (three leaves) and *substitute* the new para. 10 to 27 (three leaves) attached.

**APPENDIX B3**

*Remove* para. 12 to 15 (one leaf) and *substitute* the new para. 12 to 22 (two leaves) attached.

**APPENDIX B6**

*Remove* para. 13 to 31 and Appendix C1 (one leaf) and *substitute* the new para. 13 to 33 and Appendix C1 (two leaves) attached.

**AMENDMENT RECORD SHEET**

*Record* the incorporation of this amendment list and *destroy* this instruction sheet.

**SIGNALS**

- (k) Refit the relay unit in its octal base.
- (l) Tighten the two retaining screws.
- (m) Replace the relay cover.
- (n) Tighten the relay cover and retaining screw.

**10. Power unit cleaning**

Remove the power unit dust cover and clean the unit as follows :—

- (a) Remove the vibrator unit from its socket.
- (b) Remove all dust from the interior of the power unit with a soft brush and an air blower.
- (c) Clean the contact pins of the vibrator unit and refit it to the power unit.
- (d) Clean the front panel of the power unit.
- (e) Clean the interior and exterior of the power unit dust cover.

**11. Power unit wiring**

Examine the power unit wiring for signs of overheating or deterioration. Renew any faulty or suspect wiring.

**12. Power unit AC main switch**

Examine the main switch and if necessary use a soft brush and air blower to clean the switch. The brush may be moistened where necessary with a little white spirit. Dry the switch.

**13. Power unit dust cover**

Refit the dust cover to the power unit.

**14. Power unit fuses**

Remove the LT and AC fuses. Check that the fuses are of the correct rating (LT — 20A Type 143 10H/18207. AC — 2A Type 28 10H/180). Clean the fuses with a dry cloth. Refit the fuses in the appropriate fuse holders.

**Note . . .**

*The pilot lamp also serves as the HT fuse.*

**15. Power unit pilot lamp**

Remove the pilot lamp cover and the pilot lamp. Clean both cover and lamp. Check that the lamp is of the correct rating (6V, 1.8W 5L/9951204). Refit the pilot lamp and cover.

**WARNING**

*Do not earth the HT —ve line of the receiver or power unit as this line is used to provide negative bias of 55V for the receiver.*

**16. Power unit to receiver connection**

Ensure that the main switch on the power unit is set to OFF. Connect the receiver to the power unit by means of the appropriate connector.

**17. Power unit voltage test**

Connect the power unit to the mains supply and set the main switch to AC. Check that the voltage readings at the output socket of the power unit are as follows :—

- (a) Pin 16 (+) to pin 15 (—)      260V DC.
- (b) Pin 14 to pin 13 (earth)      12V AC.



**18. Receiver sensitivity test (R/T)**

Perform a sensitivity test as follows :—

- (a) Arrange for the signal generator to present an impedance of 45 ohms to the receiver (*App. C4*).
- (b) Connect the signal generator output to the co-axial aerial socket of the receiver.

- (c) Set the controls on the wattmeter (output meter) as follows :—

IMPEDANCE .... Set to 600 ohms  
POWER RANGE .... Set to 60 mW.

Connect the output meter to the 600 OHMS HIGH LEVEL output terminal of the receiver (pin 14 of SK 1) and earth.

- (d) Set the controls on the receiver as follows :—

SYSTEM switch .... Set to R/T  
LF GAIN control .... Set fully clockwise  
NOISE LIMITER switch Set to OFF  
AGC switch .... Set to OFF  
GUARD switch .... Set to OFF

- (e) Inject 30 per cent modulated signals (400 c/s or 1,000 c/s) from the signal generator at each of the frequencies and levels listed below. At each frequency perform a scale check, adjust the tuning control of the receiver for maximum output and check that an output of 50mW can be obtained within the limits of the HF GAIN control. Also at each frequency, set the HF GAIN control for 50mW receiver output, switch off the modulation and check that the output meter does not read more than 0.5mW (1,000 c/s modulation) or 0.9mW (400 c/s modulation).

- (i) 20.0 Mc/s  $4\mu\text{V}$  Receiver range 1
- (ii) 15.0 Mc/s  $5\mu\text{V}$  Receiver range 1
- (iii) 11.3 Mc/s  $7\mu\text{V}$  Receiver range 1
- (iv) 11.3 Mc/s  $4.5\mu\text{V}$  Receiver range 2
- (v) 6.4 Mc/s  $4.5\mu\text{V}$  Receiver range 2
- (vi) 6.4 Mc/s  $4\mu\text{V}$  Receiver range 3
- (vii) 3.6 Mc/s  $5\mu\text{V}$  Receiver range 3
- (viii) 3.6 Mc/s  $4\mu\text{V}$  Receiver range 4
- (ix) 2.0 Mc/s  $4\mu\text{V}$  Receiver range 4

- (f) If the receiver does not meet the specification detailed in (e) refer to appendix B1.

**19. Receiver sensitivity test (CW)**

Perform a sensitivity test as follows :—

- (a) Set the controls on the receiver as follows :—

◀ SYSTEM switch .... Set to ' wide-band ' CW ▶  
LF GAIN control .... Set fully clockwise  
NOISE LIMITER switch Set to OFF  
AGC switch .... Set to OFF  
GUARD switch.... Set to OFF

- (b) Inject unmodulated signals at each of the frequencies and levels listed below. Perform a

scale check, tune the receiver for maximum output at each of the frequencies and check that an output of 50mW can be obtained within the limits of the HF GAIN control:—

- ◀ (i) 11.3 Mc/s    1.5 $\mu$ V    Receiver range 1
- (ii) 6.4 Mc/s    1.0 $\mu$ V    Receiver range 2
- (iii) 3.6 Mc/s    1.0 $\mu$ V    Receiver range 3
- (iv) 2.0 Mc/s    1.0 $\mu$ V    Receiver range 4 ▶
- (c) Switch off the input signal and check that the output meter does not read more than 0.5mW.
- (d) If the receiver does not meet the specification detailed in (b) and (c) refer to Appendix B1.

## 20. AVC test

Perform a test of the AVC circuits as follows :—

- (a) Set the controls on the receiver as follows :—
  - SYSTEM switch        .... Set to R/T
  - Range switch        .... Set to range 1
  - TUNING control        .... Set to 11.3 Mc/s
  - HF GAIN control        .... Set to 10
  - NOISE LIMITER switch    Set to OFF
  - AVC switch        ....        Set to FAST
- (b) Inject a 30 per cent modulated signal of 11.3 Mc/s at a level of 100mV from the signal generator.
- (c) Tune the receiver for maximum output and adjust the LF GAIN control for a reading of 50mW in the output meter.
- (d) Reduce the level of the input signal to 3 $\mu$ V and check that the level indicated by the output meter does not drop by more than 8 dB.

## 21. Scale trimmer test

Perform a test of the SCALE TRIMMER as follows :—

- (a) Insert a telephone headset in the telephone jack.
- (b) Set the controls on the receiver as follows :—
  - ◀ SYSTEM switch        .... Set to 'wide-band' cw ▶
  - HF GAIN control        .... Set to 9
  - AVC switch        ....        Set to SLOW
  - NOISE LIMITER switch    Set to OFF
- (c) Set the scale trimmer to -5.
- (d) Inject an unmodulated signal of 20 Mc/s at a level of 50 $\mu$ V from the signal generator and tune the receiver for "zero beat" note.
- (e) Set the SCALE TRIMMER to +5.
- (f) Adjust the signal generator frequency control for a "zero beat" note and check that the injected signal frequency difference is at least 115 kc/s.
- (g) Repeat operations (c) to (f) for the frequencies listed below and check that the injected signal frequency difference is at least that shown against the frequency concerned :—
  - (i) 6.4 Mc/s (Range 2)    45 kc/s
  - (ii) 3.6 Mc/s (Range 3)    25 kc/s
  - (iii) 2.0 Mc/s (Range 4)    12 kc/s

## 22. Keying relay attenuation

### **Note . . .**

*The test detailed in this paragraph need not be done if the normal operation of the receiver does not involve the use of the keying relay.*

Check the keying relay attenuation as follows :—

- (a) Set the controls on the receiver as detailed in para. 18(d).
- (b) Inject a 30 per cent modulated signal (any frequency between 2 and 20 Mc/s) at a level of  $2\mu\text{V}$ .
- (c) Tune the receiver for maximum output, then adjust the HF GAIN control for a receiver output of 50mW.
- (d) Remove the relay unit dust cover and operate the relay armature to the attenuated position.
- (e) Increase the signal generator output to  $200\mu\text{V}$  and check that the receiver output does not exceed 50mW.
- (f) Release the relay armature and replace the relay dust cover.

## 23. Tuning scale calibration

Perform a test of the tuning scale calibration as follows :—

### **Note . . .**

- (1) *The receiver must be "scale checked" before tuning to each of the selected frequencies.*
  - (2) *It is imperative that the signal generator used for this test be accurately calibrated. Alternatively, use an SCR211 frequency meter or make use of standard frequency transmissions.*
- (a) Select convenient frequencies in the lower, centre and upper portions of each frequency range of the receiver.
  - (b) Inject unmodulated signals at a level of approximately  $2\mu\text{V}$  at each of the frequencies selected at (a) and accurately tune the receiver to each frequency, checking that the difference between the receiver tuning scale reading and the injected signal frequency does not exceed 2 kc/s on the 2 - 11.3 Mc/s ranges or 4 kc/s on the 11.3 - 20 Mc/s range.

## 24. Guard channel signal to noise ratio

Perform a test of the guard channel signal to noise ratio as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch	....	Set to R/T
LF GAIN control	....	Set fully clockwise
GUARD switch....	....	Set to GUARD ONLY
AVC switch	....	Set to OFF.
NOISE LIMITER switch		Set to OFF.
- (b) Insert a crystal in the guard unit of appropriate frequency for the guard unit under test (600 kc/s from the operating frequency, Appendix B6).
- (c) Inject a 30 per cent modulated signal at a level

of  $30\mu V$  and frequency determined by the choice of crystal at (b).

- (d) Adjust the guard unit FREQUENCY control for maximum receiver output.

**Note . . .**

*A false maximum will be obtained if the 2nd RF trimmer is tuned through the oscillator frequency. The correct maximum is much larger.*

- (e) Adjust the two pre-set RF trimmers on the guard unit for maximum receiver output.
- (f) Set the GUARD RF GAIN control for a receiver output of 50mW.
- (g) Switch off the modulation on the signal generator.
- (h) Check that the noise level indicated on the output meter does not exceed 0.5mW.



**25. Restoration**

Switch off the external power supply to the power unit. Disconnect the signal generator and output meter from the receiver. Remove the connector between the receiver and power unit. Replace the receiver dust cover.

**26. Unserviceabilities**

Ensure that any fault discovered during servicing has been rectified.

**27. Servicing records**

Complete the servicing records for the receiver.



- (c) Adjust trimmer L1 (sub-unit A) for a peak reading in the wattmeter.
- (d) Adjust the receiver TUNING control for a peak reading in the wattmeter.
- (e) Repeat operations (a) to (c).

**12.** Repeat the operations detailed in para. 6 to 11 until maximum receiver output is obtained at 19.13 and 11.73 Mc/s without further adjustment to the trimmers.

**13.** Repeat the operations detailed in para. 5 to 12, setting the signal generator and receiver to the frequencies listed in Table 1 and adjust the appropriate trimmers in the order shown for maximum receiver output.

◀ **Tests after alignment**

*Receiver sensitivity (R/T)*

**14.** Perform a sensitivity test as follows :—

- (a) Set the controls on the receiver as follows :—

- SYSTEM switch .... Set to R/T
- LF GAIN control .... Set fully clockwise
- NOISE LIMITER switch Set to OFF
- AGC switch .... Set to OFF
- GUARD switch .... Set to OFF

- (b) Inject 30 per cent modulated signals (400 c/s or 1,000 c/s) from the signal generator at each of the frequencies and levels listed below. At each frequency, perform a scale check and then adjust the tuning control of the receiver for maximum output. Check that an output of 50mW can be obtained within the limits of the HF GAIN control. Also at each frequency, set the HF GAIN control for 50mW receiver output, switch off the modulation and check that the output meter does not read

more than 0.5mW (1000 c/s modulation) or 0.9mW (400 c/s modulation).

- (i) 20.0 Mc/s 4μV Receiver range 1
- (ii) 15.0 Mc/s 5μV Receiver range 1
- (iii) 11.3 Mc/s 7μV Receiver range 1
- (iv) 11.3 Mc/s 4.5μV Receiver range 2
- (v) 6.4 Mc/s 4.5μV Receiver range 2
- (vi) 6.4 Mc/s 4μV Receiver range 3
- (vii) 3.6 Mc/s 5μV Receiver range 3
- (viii) 3.6 Mc/s 4μV Receiver range 4
- (ix) 2.0 Mc/s 4μV Receiver range 4

*Image rejection*

**15.** Perform an image rejection test as follows :—

- SYSTEM switch .... Set to R/T
- HF GAIN control .... Set to 10
- LF GAIN control .... Set fully clockwise
- NOISE LIMITER switch Set to OFF
- AGC switch .... Set to OFF
- GUARD switch .... Set to OFF

- (b) Perform a scale check and tune the receiver to each of the frequencies listed below. At each frequency inject 30 per cent modulated signals from the signal generator at a level to produce exactly 50mW receiver output. Increase the frequency of the signal generator to the image frequency (signal frequency + 1.2 Mc/s) and increase the signal generator output by the amount shown against the signal frequency. The receiver output should not then exceed 50mW.

- (i) 20 Mc/s 30dB Receiver range 1
- (ii) 15 Mc/s 50dB Receiver range 1
- (iii) 11.3 Mc/s 60dB Receiver range 1
- (iv) 11.3 Mc/s 50dB Receiver range 2

**TABLE I**

Receiver range Mc/s	Frequency gang point Mc/s	Adjust trimmers		
		1 (sub-unit B)	2 (sub-unit B)	3 (sub-unit A)
6.4—11.3	10.81	C21	C17	C7
	6.65	L10	L6	L2
3.6— 6.4	6.12	C22	C18	C8
	3.74	L11	L7	L3
2 — 3.6	3.47	C23	C19	C9
	2.08	L12	L8	L4

- (v) 6.4 Mc/s 75dB Receiver range 2
- (vi) 6.4 Mc/s 65dB Receiver range 3
- (vii) 3.6 Mc/s 85dB Receiver range 3
- (viii) 3.6 Mc/s 80dB Receiver range 4
- (ix) 2.0 Mc/s 94dB Receiver range 4

**Receiver sensitivity (CW)**

**16.** Perform a sensitivity test as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch .... Set to ' wide-band ' cw  
 LF GAIN control .... Set fully clockwise  
 NOISE LIMITER switch Set to OFF  
 AGC switch .... Set to OFF  
 GUARD switch .... Set to OFF

- (b) Inject unmodulated signals at each of the frequencies listed below. Perform a scale check and then tune the receiver for maximum output at each of the frequencies. Check that an output of 50mW can be obtained within the limits of the HF GAIN control :—

- (i) 11.3 Mc/s 1.5 $\mu$ V Receiver range 1
- (ii) 6.4 Mc/s 1.0 $\mu$ V Receiver range 2
- (iii) 3.6 Mc/s 1.0 $\mu$ V Receiver range 3
- (iv) 2.0 Mc/s 1.0 $\mu$ V Receiver range 4

- (c) Switch off the input signal and check that the output meter does not read more than 0.5mW.

**A.V.C.**

**17.** Perform a test of the AVC circuits as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch .... Set to R/T  
 Range switch .... Set to range 1  
 TUNING control .... Set to 11.3 Mc/s  
 HF GAIN control .... Set to 10  
 NOISE LIMITER switch Set to OFF  
 AVC switch .... Set to FAST

- (b) Inject a 30 per cent modulated signal of 11.3 Mc/s at a level of 100mV from the signal generator.
- (c) Tune the receiver for maximum output and adjust the LF GAIN control for a reading of 50mW in the output meter.
- (d) Reduce the level of the input signal to 3 $\mu$ V and check that the level indicated by the output meter does not drop by more than 8dB.

**Scale trimmer**

**18.** Perform a test of the SCALE TRIMMER as follows :—

- (a) Insert a telephone headset in the telephone jack.

- (b) Set the controls on the receiver as follows :—

SYSTEM switch .... Set to ' wide-band ' cw  
 HF GAIN control .... Set to 9  
 AVC switch .... Set to SLOW  
 NOISE LIMITER switch Set to OFF

- (c) Set the SCALE TRIMMER to -5
- (d) Inject an unmodulated signal of 20 Mc/s at a level of 50 $\mu$ V from the signal generator and tune the receiver for " zero beat " note.
- (e) Set the SCALE TRIMMER to +5.
- (f) Adjust the signal generator frequency control for a " zero beat " note and check that the injected signal frequency difference is at least 115 kc/s.
- (g) Repeat operations (c) to (f) for the frequencies listed below and check that the injected signal frequency difference is at least that shown against the frequency concerned:—
- (i) 6.4 Mc/s (Range 2) 45 kc/s
  - (ii) 3.6 Mc/s (Range 3) 25 kc/s
  - (iii) 2.0 Mc/s (Range 4) 12 kc/s

**IF rejection**

**19.** Perform an IF rejection test as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch .... Set to R/T  
 LF GAIN control .... Set fully clockwise  
 NOISE LIMITER switch Set to OFF  
 AGC switch .... Set to OFF  
 GUARD switch .... Set to OFF

- (b) Scale check and tune the receiver to 2.0 Mc/s and inject a 2.0 Mc/s signal, at 2 $\mu$ V, modulated 30 per cent, from the signal generator. Adjust the HF GAIN control for a receiver output of 50mW, increasing the signal generator output if necessary.
- (c) Decrease the signal generator frequency to 601.3 kc/s and increase its output to 100mV. The receiver output should not then exceed 50mW.

*Keying relay attenuation*

**20.** Check the keying relay attenuation as follows:—

- (a) Set the controls on the receiver as detailed in para. 18(d).
- (b) Inject a 30 per cent modulated signal (any frequency between 2 and 20 Mc/s) at a level of  $2\mu\text{V}$ .
- (c) Tune the receiver for maximum output, then adjust the HF GAIN control for a receiver output of 50mW.
- (d) Remove the relay unit dust cover and operate the relay armature to the attenuated position.
- (e) Increase the signal generator output to  $200\mu\text{V}$  and check that the receiver output does not exceed 50mW.
- (f) Release the relay armature and replace the relay dust cover.

*Tuning scale calibration*

**21.** Perform a test of the tuning scale calibration as follows:—

**Note . . .**

- (1) *The receiver must be "scale checked" before tuning to each of the selected frequencies.*
- (2) *It is imperative that the signal generator used for this test be accurately calibrated. Alternatively, use an SCR211 frequency meter or make use of standard frequency transmissions.*
  - (a) Select convenient frequencies in the lower, centre and upper portions of each frequency range of the receiver.
  - (b) Inject unmodulated signals at a level of approximately  $2\mu\text{V}$  at each of the frequencies selected at (a) and accurately tune the receiver to each frequency, checking that the difference between the receiver tuning scale reading and the injected signal frequency does not exceed 2 kc/s on the 2—11.3 Mc/s ranges or 4 kc/s on the 11.3-20 Mc/s range. ►

**22.** If no further tests are to be carried out, switch off the receiver and disconnect the signal generator and wattmeter.



## Appendix B4

### RECEIVER CALIBRATION

#### Note . . .

- (1) Calibration should be done only if the tests detailed in the 2nd Line Servicing, Section 5 show it to be necessary or if components in the oscillator section have been renewed and calibration cannot be corrected by re-alignment.
- (2) Mis-alignment of the tuning mechanism will also result in apparent faulty calibration but this condition should be rectified in accordance with the instructions detailed in Appendix B5 and not by re-calibration.
- (3) It is imperative that the signal generator and frequency meter used in the calibration be themselves accurately calibrated.

#### Tools and test equipment

1. The following will be required for calibrating the receiver :—

Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Telephone headset	As supplied
Frequency meter SCR211	110T/16

#### Receiver preparation

2. Draw a horizontal straight line across the centre of the escutcheon window with removable ink or a grease pencil.

#### Connection of test equipment

3. Connect the test equipment and receiver as follows :—

- (a) Connect the signal generator to the top cap of V3 in the receiver.
- (b) Connect the signal generator earth terminal to the receiver chassis.
- (c) Connect the receiver to its power unit using the appropriate connector.
- (d) Connect the receiver power unit, signal generator and frequency meter to the mains supply.
- (e) Connect the telephone headset to the appropriate jack on the receiver.

#### Equipment control settings

4. Set the controls on the signal generator for a CW output of  $3\mu\text{V}$  at 11.73 Mc/s.
5. Set the controls on the receiver as follows :—
  - (a) RANGE switch Set to range 1 (11.3 to 20 Mc/s).
  - (b) TUNING control Set to 11.73 Mc/s on the straight line scale (para. 2).
  - (c) HF GAIN control Set to 10.
  - (d) GUARD switch Set to GUARD OFF
  - (e) NOISE LIMITER switch Set to OFF.
  - (f) AVC switch Set to FAST
  - (g) LF GAIN control Set to mid-travel
  - (h) SYSTEM switch Set to 'wide-band' CW.
  - (j) SCALE TRIMMER Set to 0.
  - (k) Supply switch Set to AC.  
(Power unit Type 360B)

#### Establishment of scale datum points

6. Adjust trimmer L13 (sub-unit C) for a beat note in the telephone headset. Adjust the LF GAIN control for a comfortable level in the telephones.
7. Set the signal generator frequency to 12.93 Mc/s and check that a beat note is heard in the telephones. This confirms that the oscillator is tracking correctly.
8. Set the receiver TUNING control to 19.1 Mc/s on the straight line scale.
9. Set the controls on the signal generator for a CW output of  $3\mu\text{V}$  at 19.1 Mc/s.
10. On the receiver, adjust trimmer C27 (sub-unit C) for a beat note in the telephone headset.
11. Set the signal generator frequency to 20.3 Mc/s and check that a beat note is heard in the telephones. This check confirms that the oscillator is tracking correctly.



**Note . . .**

*Some confusion may arise in trimming the RF circuits as a false maximum appears as the 2nd RF trimmer is tuned through the oscillator frequency. The true maximum is more pronounced and identification presents no difficulty when this point is appreciated.*

13. Adjust the guard tuning unit 1st and 2nd RF trimmers in turn for maximum deflection in the tuning indicator or loudest note in the telephones.
14. Withdraw the guard tuning unit from the receiver.
15. Remove the 3.6 Mc/s crystal from the guard tuning unit.
16. Insert a 2.6 Mc/s crystal in the guard tuning unit and replace the unit in the receiver.
17. Set the signal generator frequency to 2.0 Mc/s.
18. Adjust the guard tuning unit osc trimmer for a note in the telephones and check that the frequency of the note varies when the guard frequency trimmer is varied.
19. Withdraw the guard tuning unit from the receiver.
20. Remove the 2.6 Mc/s crystal from the guard tuning unit and insert the crystal normally used in the unit.
21. Select the 4.1 to 7.5 Mc/s guard tuning unit (Tuning unit Type 132).
22. Insert a 6.9 Mc/s crystal in the guard tuning unit and fit the unit in the receiver.
23. Set the signal generator frequency to 7.5 Mc/s.
24. Repeat operations detailed in para. 10 to 13.
25. Withdraw the guard tuning unit from the receiver.
26. Remove the 6.9 Mc/s crystal from the guard tuning unit.
27. Insert a 4.7 Mc/s crystal in the guard

tuning unit and replace the unit in the receiver.

28. Set the signal generator frequency to 4.1 Mc/s.

29. Adjust the guard unit osc trimmer for a note in the telephones and check that the frequency of the note varies when the guard frequency trimmer is varied.

### ◀ Tests after alignment

#### Signal to noise ratio

30. Perform a test of the signal to noise ratio at the highest and lowest frequency of the unit under the test as follows:—

- (a) Connect the INPUT terminals of the wattmeter to pins 14 and 15 of socket SK1 on the receiver (600 ohms high level output).
- (b) Set the wattmeter IMPEDANCE switch to 600 ohms and POWER range switch to 60mW.
- (c) Set the controls on the receiver as follows:—
 

SYSTEM switch	....	Set to R/T
LF GAIN control	....	Set fully clockwise
GUARD switch	....	Set to GUARD ONLY
AVC switch	....	Set to OFF
NOISE LIMITER switch		Set to OFF
- (d) Insert a crystal in the guard unit of approximate frequency for the guard unit under test.
- (e) Inject a 30 per cent modulated signal at a level of  $30\mu\text{V}$  and frequency determined by the choice of crystal at (d).
- (f) Adjust the guard unit FREQUENCY control for maximum receiver output.
- (g) Adjust the two pre-set RF trimmers on the guard unit for maximum receiver output.
- (h) Set the GUARD RF GAIN control for a receiver output of 50mW.
- (j) Switch off the modulation of the signal generator.
- (k) Check that the noise level indicated on the output meter does not exceed 0.5mW.

*Image rejection*

**31.** Perform image rejection tests at the highest and lowest frequency of the unit under test as follows :—

- (a) Perform the functions detailed in para. 30 (a) to (f).
- (b) Increase the frequency of the signal generator to the image frequency (+ 1.2 Mc/s) and then increase its

output by 36dB. The output from the receiver must not then exceed 50mW. ►

**32.** Remove the guard tuning unit from the receiver.

**33.** Remove the 4.7 Mc/s crystal from the guard tuning unit and insert the crystal normally used in the unit.

## Appendix C1

### TOOLS, TEST EQUIPMENT AND MATERIALS

Item	Stores Ref. No.	Daily	Monthly	Six Monthly
Blowers air portable	5A/4124		X	X
Wattmeter absorption CT44	10AF/98			
or				
Output power meter Type 2	10S/11934			X
or				
Multimeter electronic CT38	10S/16308			
Signal generator Type 56	10S/647			
or				
Signal generator CT218	10S/16780			X
or				
Signal generator Type 70	10S/16392			
Multimeter Type 1	10S/16411			
or				
Testmeter Type F	10S/1		X	X
Cloth mutton	32B/1062	X	X	X
White spirit	34D/246			X
Grease XG-271	34D/9100511		X	X
Oil OM-13	34D/9100570		X	X
Additional items required for unscheduled servicing :—				
Testers insulation Type A	5G/1621			
Vices pin, Qty. 4	1C/2621			
Test oscillator Type 2	10S/838			
or				
Oscillator unit Type 25	10V/11940			
Frequency meter SCR211	110T/16			
Power unit Type 7262	10K/19450			
Crystal quartz 2.6 Mc/s	10X/2600			
Crystal quartz 3.6 Mc/s	10X/3600			
Crystal quartz 4.7 Mc/s	10X/4700			

Item				Stores Ref. No.	Daily	Monthly	Six Monthly
Crystal quartz 6·9 Mc/s	....	....	....	10X/6900			
Tester valve Type 4A	....	....	....	10S/639			
or							
Tester valve CT80	....	....	....	10S/16381			

AIR MINISTRY

November, 1958

Amendment List No.3  
to  
A.P.2883G, Vol.5

RECEIVING EQUIPMENT TYPE R.1475  
BASIC SERVICING SCHEDULES

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HANDWRITTEN AMENDMENTS

When making the following handwritten amendment  
write "(A.L.3)" in the margin against the amendment.

APPENDIX C4

Para.2; between lines 7 and 8 insert "source is  
therefore light and the P.D."

AMENDMENT RECORD SHEET

Record the incorporation of this amendment list and  
destroy this instruction sheet.

SIGNALS

**RECEIVING EQUIPMENT TYPE R.1475  
BASIC SERVICING SCHEDULES**

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**HANDWRITTEN AMENDMENTS**

When making the following handwritten amendments *write* “(A.L.2)” in the margin against each amendment.

**2nd LINE, SECTION 5**

Para. 10, line 1; *insert* “ and ” between “ cover ” and “ clean ”

**APPENDICES MARKER CARD**

Appendix C4; *delete* “ (to be issued later) ”.

**APPENDIX B5**

Para. 1, sub-para. (c), line 3; *amend* “ centte ” to read “ centre ”.

**REMOVAL AND INSERTION OF LEAVES**

**2nd LINE, SECTION 3**

*Remove* the leaf bearing Section 3 and *insert* the new leaf attached.

**APPENDICES**

To follow the Appendix C3, *insert* the new Appendix C4 (one leaf) attached.

**AMENDMENT RECORD SHEET**

- *Record* the incorporation of this amendment list and *destroy* this instruction sheet.

**SIGNALS**

### Section 3

## MONTHLY SERVICING

### DETAIL

	<i>Para.</i>		<i>Para.</i>
<i>Clean the exterior of the receiver and power unit</i> ....	2		
<i>Clean the tuning scale drums</i> ....	3	<i>Check the calibration</i> ....	5
<i>Check the external connections, switch on power supplies. Check the dial indicator lamps, the reception on all ranges, the guard circuit, gain controls, noise limiter and the operation of the AVC system</i> ....	4	<i>Report unserviceabilities</i> ....	6
		<i>Complete servicing records</i> ....	7

### SCHEDULE

- |  |  |
|--|--|
| <p><b>1.</b> Tools, test equipment and materials</p> <p><b>2.</b> External cleaning</p> <p><b>3.</b> Tuning scale drum cleaning</p> <p><b>4.</b> Daily servicing</p> <p><b>5.</b> Calibration check</p> <p><b>6.</b> Unserviceabilities</p> <p><b>7.</b> Servicing records</p> | <p>The following will be required:—</p> <p>Telephone headset                   As supplied</p> <p>Cloth, mutton                        32B/1062</p> <p>Clean the exterior of the receiver and power unit as necessary with a clean, slightly moist cloth.</p> <p>◀ Examine the scale drums and if necessary clean them as follows:—</p> <p>(a) Remove the protective grille and visor from the front of the receiver.</p> <p>(b) Clean the scale drums with a slightly moist soapy cloth.</p> <p>(c) Dry the drums.</p> <p>(d) Refit the visor and protective grille.▶</p> <p>Do the daily servicing detailed in the first line servicing, section 1, para. 3 to 11.</p> <p>Check the calibration of the receiver as follows:—</p> <p>(a) Set the range switch to the 2 to 3·6 Mc/s frequency range.</p> <p>(b) Set the SYSTEM switch to SCALE CHECK.</p> <p>(c) Adjust the tuning control to each of the scale check points in turn and check that the calibration can be corrected by adjustment of the SCALE TRIMMER</p> <p>(d) Set the range switch to the other frequency ranges in turn and repeat operation (c) for each range.</p> <p>(e) If it is not possible to correct the calibration on any particular range, return the receiver for higher servicing.</p> <p>Report any apparent fault or loss of efficiency to the N.C.O. i/c so that remedial action may be taken.</p> <p>Make the appropriate entries in the servicing log book for the installation.</p> |
|--|--|



## Appendix C 4

### USE OF TEST EQUIPMENT

#### Signal voltages

1. When testing a receiver, the source of aerial input signal should simulate a suitable aerial and have an internal impedance equal to that of the aerial. The voltage quoted is that which would be developed in an aerial and is therefore the source E.M.F., not the P.D. at the aerial socket.

2. When applying a signal to a receiver at a point other than the aerial, the voltage quoted is the P.D. required at that point. The impedance of the receiver between the connection and earth should be high in comparison with the internal impedance of the source. The loading on the signal source is therefore light and the P.D. is, for all practical purposes, equal to the source E.M.F.

3. Signal voltages specified in this publication are therefore those actually set on the output voltage and multiplier controls of the signal generator.

#### Connection to aerial socket

4. For connecting a signal generator to the aerial socket, the effective impedance of its output can be raised by the inclusion of a suitable resistor in series with the output lead or lowered by the addition of a resistor in parallel with the output.

5. The signal generators listed in these

schedules should be set at their lowest output impedances. These are such that the inclusion of a 33-ohm resistor in series with the output lead will raise the effective impedance to the 45 ohms required for the aerial input of the R.1475. Suitable resistors are 10W/0219017, 10W/0215061, 10W/0221047 and 10W/0221049. The resistor should be screened.

#### Connections other than to aerial socket

6. When connecting a signal generator to a point in a receiver other than the aerial socket, the lowest output impedance should be selected. The connection should be direct without additional resistors.

#### Signal generator Type 56

7. The output impedance of the signal generator Type 56 should be set at 10 ohms (low output ranges). Information on this generator is contained in A.P.2879D.

#### Signal generator CT218

8. The output impedance of the signal generator CT218 should be set at 7.5 ohms. Information on this generator is contained in A.P.2563 CF.

#### Signal generator Type 70

9. The controls on the output unit of the signal generator Type 70 should be set to e/1, 13 OHM SOURCE and DUMMY AERIAL OUT.

AL3



**RECEIVING EQUIPMENT TYPE R1475 BASIC SERVICING  
SCHEDULES**

---

**INSERTION OF LEAVES**

**FIRST LINE SERVICING**

*Insert* the attached Section 1 (one leaf) to follow the first line servicing divider card.

**SECOND LINE SERVICING**

*Insert* the attached Sections 3 and 5 (five leaves) to follow the second line servicing divider card

**APPENDICES**

*Insert* the attached Appendices A to F (sixteen leaves) to follow the Appendices divider card.

**AMENDMENT RECORD SHEET**

*Record* the incorporation of this amendment list and *destroy* this instruction sheet.

**SIGNALS**

## Section 1

### DAILY SERVICING

#### DETAIL

	Para.		Para.
Clean the exterior of the receiver and power unit....	2	Check the guard circuit and gain controls	9
Check the aerial connection	3	Check the noise limiter	10
Check the external connections	4	Check the operation of the AVC system	11
Switch on the power supplies	5	Check the scale calibration	12
Set the SYSTEM switch to 'wide-band' CW	6	Report unserviceabilities	13
Check the dial indicator lamps	7	Complete servicing records	14
Check reception on all ranges	8		

#### SCHEDULE

1. Tools, test equipment and materials  
The following will be required :—  
Telephone headset                      As supplied  
Cloth mutton                              32B/1062
2. External cleaning  
Clean the exterior of the receiver and power unit as necessary with a clean slightly moist cloth.
3. Aerial connection  
Ensure that the receiver is connected to the correct aerial for the frequency in use.
4. External connections  
Examine all connections to the receiver and power unit for security and good contact. Plug the telephone headset into the jack on the receiver.
5. Power supplies  
Switch on the external power supply and set the power unit supply switch to AC or 12V DC as appropriate.
6. SYSTEM switch  
Set the SYSTEM switch to 'wide-band' cw.
7. Indicator lamps  
Operate the range switch and check that the indicator lamps light on the appropriate tuning scale. Note any unserviceable lamp (5L/9951142) for renewal at the first available opportunity.
8. Reception  
Set the range switch to each range in turn and check that signals can be received at each position.
9. Guard switch and gain controls  
Check the operation of the guard switch and gain controls as follows :—  
(a) Set the guard switch to GUARD OFF.  
(b) Set the LF GAIN control to 10.  
(c) Operate the HF GAIN control and check that the receiver output is controlled smoothly and without extraneous noises.  
(d) Set the HF GAIN control to 9.  
(e) Operate the LF GAIN control and check that the receiver output is controlled smoothly and without extraneous noises.

**Note . . .**

*Operations (f) to (h) are applicable only if the guard unit is normally in use.*

- (f) Set the guard switch to GUARD ONLY.
- (g) Set the LF GAIN control to 10.
- (h) Vary the GUARD RF GAIN control and check that the signals or background noise from the guard unit can be controlled.

**10. Noise limiter**

Check the efficiency of the noise limiter as follows :—

- (a) Set the NOISE LIMITER to OFF and note the noise level.
- (b) Set the NOISE LIMITER to ON and check that the receiver output level is slightly reduced and that there is less background noise. If this is not so, renew V10 (CV1054).
- (c) Set the NOISE LIMITER to OFF.

**11. AVC**

Check the operation of the AVC system as follows :—

- (a) Set the AVC switch to OFF.
- (b) Tune the receiver to a strong signal and check that the tuning indicator fully closes.
- (c) Adjust the HF GAIN control until the tuning indicator just starts to open.
- (d) Set the AVC switch to FAST and check that the tuning indicator opens slightly and remains constant.
- (e) Set the AVC switch to OFF.

**12. Scale calibration**

Check the scale calibration as follows :—

- (a) Adjust the tuning scale to the nearest check point for the frequency in use.
- (b) Set the SYSTEM switch to SCALE CHECK.
- (c) Set the HF GAIN to 9 and the LF GAIN to give a convenient level in the telephones.
- (d) Adjust the SCALE TRIMMER for 'zero beat' in the telephones.
- (e) Set the SYSTEM switch for the service required.
- (f) Adjust the tuning control until the required frequency on the tuning scale is cut by the cursor line and set all other controls to the optimum positions for the reception of the required signal.

**13. Unserviceabilities**

Report any apparent fault or loss of efficiency to the N.C.O. i/c so that remedial action may be taken.

**14. Servicing records**

Make the appropriate entries in the servicing log book for the installation.

## Section 3

### MONTHLY SERVICING

#### DETAIL

	Para.		Para.
Clean the exterior of the receiver and power unit	2	Check the calibration	5
Clean the tuning scale drums	3	Report unserviceabilities	6
Check the external connections, switch on power supplies. Check the dial indicator lamps, the reception on all ranges, the guard circuit, gain controls, noise limiter and the operation of the AVC system	4	Complete servicing records	7

#### SCHEDULE

1. Tools, test equipment and materials  
The following will be required :—  
Telephone headset                      As supplied  
Cloth mutton                              32B/1062
2. External cleaning  
Clean the exterior of the receiver and power unit as necessary with a clean, slightly moist cloth.
3. Tuning scale drum cleaning  
Remove the protective grille and visor from the front of the receiver. Clean the scale drums with a slightly moist soapy cloth. Dry the drums, replace the visor and protective grille.
4. Daily servicing  
Do the daily servicing detailed in the first line servicing, section 1, para. 3 to 11.
5. Calibration check  
Check the calibration of the receiver as follows :—  
(a) Set the range switch to the 2 - 3.6 Mc/s frequency range.  
(b) Set the SYSTEM switch to SCALE CHECK.  
(c) Adjust the tuning control to each of the scale check points in turn and check that the calibration can be corrected by adjustment of the SCALE TRIMMER.  
(d) Set the range switch to the other frequency ranges in turn and repeat operation (c) for each range.  
(e) If it is not possible to correct the calibration on any particular range, return the receiver for higher servicing.
6. Unserviceabilities  
Report any apparent fault or loss of efficiency to the N.C.O. i/c so that remedial action may be taken.
7. Servicing records  
Make the appropriate entries in the servicing log book for the installation.

## Section 5

### SIX MONTHLY SERVICING

#### DETAIL

	Para.		Para.
Clean the receiver unit	2	Connect the external supply and check the power unit voltages	17
Clean and refit the valves	3	Measure the receiver sensitivity on R/T	18
Test the indicator lamps	4	Measure the receiver sensitivity on CW	19
Examine and lubricate the tuning mechanism	5	Check the receiver AVC system	20
Examine and clean the switches	6	Check the action of the scale trimmer	21
Clean the guard unit	7	Check the attenuation effect of the keying relay (where used)	22
Clean the guard unit mounting	8	Check the tuning scale calibration	23
Clean and check the action of the relay unit	9	Measure the guard channel sensitivity	24
Clean the power unit	10	Disconnect the test equipment and power unit and refit the dust cover	25
Examine the power unit wiring	11	Rectify unserviceabilities	26
Examine and clean the power unit main switch	12	Complete servicing records	27
Refit the power unit dust cover	13		
Clean and examine the power unit fuses	14		
Test the power unit pilot lamp (HT fuse)	15		
Connect the receiver to the power unit	16		

#### SCHEDULE

#### 1. Tools, test equipment and materials

The following will be required :—

Blower air portable Type D	5A/4124
Telephone headset	As supplied
Wattmeter absorption CT44	10AF/98
or	
Output power meter Type 2	10S/11934
Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Multimeter Type 1	10S/16411
or	
Testmeter Type F	10S/1
Cloth mutton	32B/1062
White spirit	34D/246
Grease XG-271	34D/9100511
Oil OM-13	34D/9100570

#### 2. Receiver unit cleaning

Remove the dust cover from the receiver. Clean the receiver as follows :—

- (a) Remove the valves, tuning indicator and indicating lamps.
- (b) Thoroughly clean the equipment with a soft brush and an air blower.
- (c) Clean the tuning scale vizer with a soft moist soapy cloth. Dry the tuning scale vizer.
- (d) Clean the front panel of the equipment with a soft moist cloth. Dry the front panel.
- (e) Clean the tuning scale drums with a moist soapy cloth.



3. Valves Clean and refit the valves and tuning indicator into their original holders.
4. Indicator lamps Clean the indicator lamps and test them for continuity. Renew any unserviceable lamp (12V 1W 5L/9951142). Refit the lamps.
5. Tuning drive mechanism Check that the action of the tuning drive mechanism is smooth and that the brake action is positive. Lubricate the drive mechanism sparingly with a light grease.
- Note . . .**  
*Do not clean the wafer type switches unless visual examination or reported faulty action makes it necessary.*  
 Examine all switches that are visible without removing sub-units. If necessary, clean them with a camel hair brush and white spirit. Lubricate all switch linkage systems sparingly with a light oil.
6. Switches
7. Guard unit Remove the guard unit and service it as follows :--  
 (a) Remove the guard unit screening cover. Clean the interior of the guard unit with a soft brush and an air blower.  
 (b) Clean the interior and exterior of the screening cover and refit the cover to the guard unit.  
 (c) Clean the guard unit contacts with a cloth moistened in white spirit. Dry the contacts.
- Note . . .**  
*Take care not to distort the contacts of the guard unit during the following operation.*  
 Use a cloth moistened with white spirit to clean the contacts of the guard unit mounting. Dry the contacts and refit the guard unit to the receiver.
8. Guard unit mounting
- Note . . .**  
*Do not service the relay unit unless its action is suspect.*  
 If necessary, service the relay unit as follows :--  
 (a) Loosen the relay cover retaining screw.  
 (b) Remove the relay cover.  
 (c) Loosen the two relay retaining screws.  
 (d) Withdraw the relay from its octal base taking care not to damage the spring contacts in the process.  
 (e) Remove any dust with a soft brush.  
 (f) Clean the contacts with a contact burnisher.  
 (g) Check that the contact pivot arm is not stiff.  
 (h) Depress the armature to the operated position and check that the fixed blades are seen to flex a little as contact is made.  
 (j) Check that similar action occurs on the back contacts when the armature is released.
9. Relay unit
- Note . . .**  
*If resetting of the contact blades is necessary refer to A.P.2487, Vol. 1, Chap. 2 for information.*

- (k) Refit the relay unit in its octal base.
- (l) Tighten the two retaining screws.
- (m) Replace the relay cover.
- (n) Tighten the relay cover and retaining screw.

**10. Power unit cleaning**

Remove the power unit dust cover clean the unit as follows :—

- (a) Remove the vibrator unit from its socket.
- (b) Remove all dust from the interior of the power unit with a soft brush and an air blower.
- (c) Clean the contact pins of the vibrator unit and refit it to the power unit.
- (d) Clean the front panel of the power unit.
- (e) Clean the interior and exterior of the power unit dust cover.

**11. Power unit wiring**

Examine the power unit wiring for signs of overheating or deterioration. Renew any faulty or suspect wiring.

**12. Power unit AC main switch**

Examine the main switch and if necessary use a soft brush and air blower to clean the switch. The brush may be moistened where necessary with a little white spirit. Dry the switch.

**13. Power unit dust cover**

Refit the dust cover to the power unit.

**14. Power unit fuses**

Remove the LT and AC fuses. Check that the fuses are of the correct rating (LT — 20A Type 143 10H/18207. AC — 2A Type 28 10H/180). Clean the fuses with a dry cloth. Refit the fuses in the appropriate fuse holders.

**Note . . .**

*The pilot lamp also serves as the HT fuse.*

**15. Power unit pilot lamp**

Remove the pilot lamp cover and the pilot lamp. Clean both cover and lamp. Check that the lamp is of the correct rating (6V, 1.8W 5L/9951204). Refit the pilot lamp and cover.

**WARNING**

*Do not earth the HT —ve line of the receiver or power unit as this line is used to provide negative bias of 55V for the receiver.*

**16. Power unit to receiver connection**

Ensure that the main switch on the power unit is set to OFF. Connect the receiver to the power unit by means of the appropriate connector.

**17. Power unit voltage test**

Connect the power unit to the mains supply and set the main switch to AC. Check that the voltage readings at the output socket of the power unit are as follows :—

- (a) Pin 16 (+) to pin 15 (—)      260V DC.
- (b) Pin 14 to pin 13 (earth)      12V AC.

**18. Receiver sensitivity test (R/T)**

Perform a sensitivity test as follows :—

- (a) Arrange for the signal generator to present an impedance of 45 ohms to the receiver (*App. C4*).
- (b) Connect the signal generator output to the co-axial aerial socket of the receiver.
- (c) Set the controls on the wattmeter (output meter) as follows :—

IMPEDANCE      ....      Set to 600 ohms

POWER RANGE      ....      Set to 60 mW.

Connect the output meter to the 600 OHMS HIGH LEVEL output terminal of the receiver (pin 14 of SK 1) and earth.

- (d) Set the controls on the receiver as follows :—

SYSTEM switch      ....      Set to R/T

LF GAIN control      ....      Set fully clockwise

NOISE LIMITER switch      Set to OFF

AGC switch      ....      Set to OFF

GUARD switch      ....      Set to OFF

SCALE TRIMMER      ....      Set to 0

- (e) Inject 30 per cent modulated signals (400 c/s or 1,000 c/s) from the signal generator at each of the frequencies and levels listed below. At each frequency, adjust the tuning control of the receiver for maximum output and check that an output of 50 mW can be obtained within the limits of the HF GAIN control. Also at each frequency, set the HF GAIN control for 50mW receiver output, switch off the modulation and check that the output meter does not read more than 0.5mW (1,000 c/s modulation) or 0.9mW (400 c/s modulation).

(i) 20.0 Mc/s 4 $\mu$ V Receiver range 1

(ii) 15.0 Mc/s 5 $\mu$ V Receiver range 1

(iii) 11.3 Mc/s 7 $\mu$ V Receiver range 1

(iv) 11.3 Mc/s 4.5 $\mu$ V Receiver range 2

(v) 6.4 Mc/s 4.5  $\mu$ V Receiver range 2

(vi) 6.4 Mc/s 4  $\mu$ V Receiver range 3

(vii) 3.6 Mc/s 5  $\mu$ V Receiver range 3

(viii) 3.6 Mc/s 4  $\mu$ V Receiver range 4

(ix) 2.0 Mc/s 4  $\mu$ V Receiver range 4

- (f) If the receiver does not meet the specification detailed in (e) refer to appendix B1.

**19. Receiver sensitivity test (CW)**

Perform a sensitivity test as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch      ....      Set to CW (1.2 kc/s)

LF GAIN control      ....      Set fully clockwise

NOISE LIMITER switch      Set to OFF

AGC switch      ...      Set to OFF

GUARD switch....      Set to OFF

SCALE TRIMMER      ....      Set to 0

- (b) Inject unmodulated signals (level 1 $\mu$ V) at each of the frequencies listed below. Tune the



receiver for maximum output at each of the frequencies and check that an output of 50mW can be obtained within the limits of the HF GAIN control :—

- (i) 11·3 Mc/s .... Receiver range 1
  - (ii) 6·4 Mc/s .... Receiver range 2
  - (iii) 3·6 Mc/s .... Receiver range 3
  - (iv) 2·0 Mc/s .... Receiver range 4
- (c) Switch off the input signal and check that the output meter does not read more than 0·5mW.
- (d) If the receiver does not meet the specification detailed in (b) and (c) refer to Appendix B1.

## 20. AVC test

Perform a test of the AVC circuits as follows :—

- (a) Set the controls on the receiver as follows :—
- SYSTEM switch .... Set to R/T
  - Range switch .... Set to range 1
  - TUNING control .... Set to 11·3 Mc/s
  - HF GAIN control .... Set to 9
  - NOISE LIMITER switch Set to OFF
  - AVC switch .... Set to FAST
- (b) Inject a 30 per cent modulated signal of 11·3 Mc/s at a level of 100mV from the signal generator.
- (c) Tune the receiver for maximum output and adjust the LF GAIN control for a reading of 50mW in the output meter.
- (d) Reduce the level of the input signal to  $3\mu\text{V}$  and check that the level indicated by the output meter does not drop by more than 8 dB.

## 21. Scale trimmer test

Perform a test of the SCALE TRIMMER as follows :—

- (a) Insert a telephone headset in the telephone jack.
- (b) Set the controls on the receiver as follows :—
- SYSTEM switch .... Set to CW (5 kc/s)
  - HF GAIN control .... Set to 9
  - AVC switch .... Set to SLOW
  - NOISE LIMITER switch Set to OFF
- (c) Set the scale trimmer to  $-5$ .
- (d) Inject an unmodulated signal of 20 Mc/s at a level of  $50\mu\text{V}$  from the signal generator and tune the receiver for "zero beat" note.
- (e) Set the SCALE TRIMMER to  $+5$ .
- (f) Adjust the signal generator frequency control for a "zero beat" note and check that the injected signal frequency difference is at least 115 kc/s.
- (g) Repeat operations (c) to (f) for the frequencies listed below and check that the injected signal frequency difference is at least that shown against the frequency concerned :—
- (i) 6·4 Mc/s (Range 2) 45 kc/s
  - (ii) 3·6 Mc/s (Range 3) 25 kc/s
  - (iii) 2·0 Mc/s (Range 4) 12 kc/s

## 22. Keying relay attenuation

### **Note . . .**

*The test detailed in this paragraph need not be done if the normal operation of the receiver does not involve the use of the keying relay.*

Check the keying relay attenuation as follows :—

- (a) Set the controls on the receiver as detailed in para. 18(d).
- (b) Inject a 30 per cent modulated signal (any frequency between 2 and 20 Mc/s) at a level of  $2\mu\text{V}$ .
- (c) Tune the receiver for maximum output, then adjust the HF GAIN control for a receiver output of 50mW.
- (d) Remove the relay unit dust cover and operate the relay armature to the attenuated position.
- (e) Increase the signal generator output to  $200\mu\text{V}$  and check that the receiver output does not exceed 50mW.
- (f) Release the relay armature and replace the relay dust cover.

## 23. Tuning scale calibration

Perform a test of the tuning scale calibration as follows :—

### **Note . . .**

- (1) *The receiver must be "scale checked" before tuning to each of the selected frequencies.*
  - (2) *It is imperative that the signal generator used for this test be accurately calibrated. Alternatively, use an SCR211 frequency meter or make use of standard frequency transmissions.*
- (a) Select convenient frequencies in the lower, centre and upper portions of each frequency range of the receiver.
  - (b) Inject unmodulated signals at a level of approximately  $2\mu\text{V}$  at each of the frequencies selected at (a) and accurately tune the receiver to each frequency, checking that the difference between the receiver tuning scale reading and the injected signal frequency does not exceed 2 kc/s on the 2 - 11.3 Mc/s range or 4 kc/s on the 11.3 - 20 Mc/s range.

## 24. Guard channel sensitivity

Perform a test of the guard channel sensitivity as follows :—

- (a) Set the controls on the receiver as follows :—

SYSTEM switch	....	Set to R/T (5 kc/s)
LF GAIN control	....	Set fully clockwise
GUARD switch....	....	Set to GUARD ONLY
AVC switch	....	Set to OFF.
NOISE LIMITER switch		Set to OFF.
- (b) Insert a crystal in the guard unit of appropriate frequency for the guard unit under test (600 kc/s from the operating frequency, Appendix) B6.
- (c) Inject a 30 per cent modulated signal at a level

of  $30\mu\text{V}$  and frequency determined by the choice of crystal at (b).

- (d) Adjust the guard unit FREQUENCY control for maximum receiver output.

**Note . . .**

*A false maximum will be obtained if the 2nd RF trimmer is tuned through the oscillator frequency. The correct maximum is much larger.*

- (e) Adjust the two pre-set RF trimmers on the guard unit for maximum receiver output.
- (f) Set the GUARD RF GAIN control for a receiver output of 50mW.
- (g) Switch off the modulation on the signal generator.
- (h) Check that the noise level indicated on the output meter does not exceed 20 dB below 50mW.
- (j) Switch on the signal generator modulation, decrease the signal input level to  $5\mu\text{V}$  and check that a receiver output of 50mW can be obtained within the limits of the GUARD RF GAIN control.

**25. Restoration**

Switch off the external power supply to the power unit. Disconnect the signal generator and output meter from the receiver. Remove the connector between the receiver and power unit. Replace the receiver dust cover.

**26. Unserviceabilities**

Ensure that any fault discovered during servicing has been rectified.

**27. Servicing records**

Complete the servicing records for the receiver.

## Appendix A

### SETTING UP INSTRUCTIONS

#### Note . . .

*The tuning control is not to be operated when the brake is ON or the brake fibre will become worn and the brake rendered inoperative.*

#### Test equipment

1. The following will be required :—  
Telephone headset      As supplied

#### Preliminary adjustments

2. Ensure that all external connections are secure and making good contact.
3. On the power unit, set the switch to AC.
4. On the receiver, set the range switch to the required frequency range and check that the appropriate scale indicator lamp lights.
5. Plug the telephone headset into the phone jack.

#### Scale check

##### Note . . .

*The scale check points are the black circles on the tuning scale.*

6. Rotate the fast tuning control until the scale pointer indicates the 'whole megacycle' portion of the required frequency at the bottom of the dial.
7. Rotate the tuning control until the cursor line intersects the approximate frequency required.
8. Identify the nearest scale check point to the required frequency and set the tuning control so that the cursor line intersects the check point.
9. Set the controls on the receiver as follows :—
  - (a) HF GAIN control      Set to 9
  - (b) LF GAIN control      Set fully clockwise
  - (c) SYSTEM switch      Set to SCALE CHECK
  - (d) GUARD switch      Set to GUARD OFF.
10. Rotate the SCALE TRIMMER until a note is heard in the telephones and set the SCALE TRIMMER for 'dead-space' in the telephones.

#### Final tuning

##### Note . . .

*The smallest divisions on the tuning scale are 10 kc/s steps. Adjustment of the tuning control for frequencies within each step must be made by visual interpolation.*

11. Rotate the slow tuning control until the exact frequency tune point on the scale is intersected by the cursor line.

#### CW reception

##### Note . . .

*AVC may be switched on to counteract fading signals. In which case, the HF GAIN control is set to 10 and the output level from the receiver controlled solely by the LF GAIN control.*

12. Set the controls on the receiver as follows :—
  - (a) SYSTEM switch      Set to 'wideband' CW.
  - (b) NOISE LIMITER switch      Set to OFF.
  - (c) AVC switch      Set to OFF.
  - (d) LF GAIN control      Set fully clockwise.
  - (e) HF GAIN control      Adjust for the best signal to noise ratio in the telephones.
  - (f) Tuning control      Adjust the slow control for a suitable note in the telephones.

13. If the required signal is subject to adjacent channel interference, set the SYSTEM switch to either or the two 'narrow band' cw positions and reset the slow tuning control for improved reception.

14. If the received signal is subject to impulsive noises such as car ignition or static, set the NOISE LIMITER to 1 or 2 for improved reception.

15. If the received signal is subject to fading, as proceed follows :—
  - (a) Set the AVC switch to SLOW or FAST depending upon the speed of fade.
  - (b) Set the HF GAIN to 9.
  - (c) Adjust the LF GAIN control for convenient signal level in the telephones.



### R/T reception

**16.** Set the controls on the receiver as follows :—

- (a) SYSTEM switch      Set to R/T.
- (b) NOISE LIMITER switch      Set to OFF
- (c) AVC switch      Set to FAST.
- (d) HF GAIN control      Set to 9.
- (e) LF GAIN control      Adjust for convenient signal level in the telephones.

### Guard channel

#### Note . . .

*Guard channel reception is provided by two plug-in units which cover a frequency range of 2 - 7.5 Mc/s. These units are crystal controlled. The correct crystal is one which differs in frequency from the required frequency by 600 kc/s and falls within the range of the tuning unit. At the lower end of the tuning unit frequency range add 600 kc/s to the required frequency and at the upper end, subtract 600 kc/s to determine the crystal frequency.*

**17.** Select the tuning unit appropriate to the required guard channel frequency.

**18.** Fit the correct crystal to the tuning unit and insert the unit in its socket on the receiver chassis.

**19.** Set the controls on the receiver as follows :—

- (a) HF GAIN control      Set to 9.
- (b) LF GAIN control      Set to 10.
- (c) SYSTEM switch      Set to 'wide-band' CW.
- (d) GUARD switch      Set to GUARD ONLY.
- (e) AVC switch      Set to OFF.
- (f) NOISE LIMITER switch      Set to OFF.
- (g) GUARD RF GAIN      Set to 10.
- (h) GUARD FREQUENCY      Set to 5.

**20.** When the guard channel signals are being received, adjust the GUARD FREQUENCY control for a convenient note in the telephones. If no note can be obtained and the guard channel signal is known to be available, align the tuning unit as detailed in Appendix B6.

**21.** Set the GUARD switch to NORMAL.

## Appendix B1

### AF AND IF SENSITIVITY TESTS

#### Note . . .

- (1) *The purpose of these tests is to determine which section of the receiver is at fault should the overall performance of the receiver not be satisfactory.*
- (2) *The AF test must be performed first. Any defects revealed must be rectified before proceeding with the IF test.*
- (3) *Should the AF and IF sections of the receiver give the correct performance figures, the RF section is suspect and should be investigated.*

#### Test equipment

1. The following will be required :—

Wattmeter absorption CT 44	10AF/98
Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Test oscillator Type 2	10S/838
or	
Oscillator unit Type 25	10V/11940
Multimeter Type 1	10S/16411
or	
Testmeter Type F	10S/1
Telephone headset	As supplied

#### AF sensitivity test

2. Remove the receiver dust cover and connect the receiver to its power unit.
3. Connect the test equipment as follows:—
  - (a) Wattmeter input terminals to pins 14 and 15 of SK1 on the receiver (600 ohms unbalanced output).
  - (b) Testmeter terminals to the output terminals of the test oscillator.
  - (c) Test oscillator output terminals through a screened lead to the top cap of V11. Connect the screening of this lead to chassis.
4. Set the wattmeter controls for an impedance of 600 ohms and a power range of 60mW.
5. Set the testmeter controls to the lowest AC range.

6. Switch on the mains supply to the test oscillator and allow it to warm up for at least five minutes.

7. Set the receiver LF GAIN control to 10 and the HF GAIN to 0. Switch on the mains supply to the receiver power unit and allow the receiver to warm up for about three minutes.

8. Check the calibration of the test oscillator against the mains and then adjust the controls for an output of 400 c/s at a level of 0.13V.

9. Check that the receiver output measured by the wattmeter is at least 50mW.

10. If the receiver output reaches the required level, disconnect the test oscillator from V11 in the receiver and proceed with the IF test.

#### IF sensitivity test

11. Connect the test equipment as follows :—

- (a) Signal generator output to the top cap of V3 in the receiver.
- (b) Signal generator earth terminal to the receiver chassis.
- (c) Wattmeter input terminals to pins 14 and 15 of SK1 on the receiver (600 ohms unbalanced output).
- (d) Telephone headset to the appropriate jack.

12. Set the wattmeter controls for an impedance of 600 ohms and a power range of 60mW.

13. Switch on the mains supply to the signal generator and allow it to warm up for at least fifteen minutes at minimum output.

14. Set the receiver controls as follows :—

- (a) Range switch           Set to range 4 (2 - 3.6 Mc/s).
- (b) TUNING control       Set to 3.6 Mc/s.
- (c) HF GAIN control       Set to 9.
- (d) GUARD switch         Set to GUARD OFF.

- (e) NOISE LIMITER switch      Set to OFF.
- (f) AVC switch              Set to OFF.
- (g) LF GAIN control      Set to 10.
- (h) SYSTEM switch      See note.

**Note . . .**

*The IF frequency of the receiver is 601.3 kc/s. If the signal generator has previously been accurately calibrated at this frequency, set the SYSTEM switch to 'wide-band' CW and omit the operations detailed in para. 15. If the signal generator has not been calibrated at 601.3 kc/s, set the system switch to 'narrow-band' CW (300 c/s) and proceed as detailed in para. 15.*

**15.** Set the signal generator controls for a CW output of approximately 595 kc/s at a level of  $50\mu\text{V}$ . Slowly increase the fre-

quency of the signal generator until a beat note is heard in the telephone headset. Continue to increase the frequency of the signal generator keeping the reading on the wattmeter under observation. The reading should rise to a maximum as the frequency approaches 598.7 kc/s, fall as it approaches 600 kc/s (zero beat) and rise to a second maximum at 601.3 kc/s. Set the signal generator frequency control accurately for a peak reading on the wattmeter on the second maximum. Set the receiver SYSTEM switch to 'wide-band' CW.

**16.** Set the signal generator for an output of 601.3 kc/s at a level of  $50\mu\text{V}$ .

**17.** Remove the telephone headset and check that the output of the receiver is at least 50mW. If the output is low, investigate the IF circuits and re-align if necessary (*App. B2*).

## Appendix B2

### ALIGNMENT OF IF CIRCUITS

#### Note . . .

*This alignment is to be done only when the receiver is shown by the tests detailed in the 2nd Line Servicing, Section 5 to be mis-aligned.*

#### Tools and test equipment

1. The following will be required for aligning the IF circuits :—

Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Wattmeter absorption	
CT44	10AF/98
Telephone headset	As supplied

#### Inter-connection of test equipment

2. Connect the test equipment as follows:—

- Connect the signal generator output to the top cap (control grid) of V3 in the receiver.
- Connect the signal generator earth terminal to the receiver chassis.
- Connect the INPUT terminals of the watt meter to pins 14 and 15 of socket SK1 on the receiver (600 ohms high level output).
- Connect the receiver to its power unit with the appropriate connector.
- Connect the signal generator and receiver power unit to the mains supply.
- Connect the telephone headset to the appropriate jack on the receiver.

#### Equipment control settings

3. Set the controls on the wattmeter as follows :—

- IMPEDANCE Set to 600 ohms.
- POWER RANGE Set to 60mW.

4. Set the controls on the receiver as follows :—

- Range switch Set to range 4 (2 - 3.6 Mc/s).
- TUNING control Set to 3.6 Mc/s.
- HF GAIN control Set to 9
- GUARD switch Set to GUARD OFF
- NOISE LIMITER switch Set to OFF

- AVC control Set to OFF.
- LF GAIN control Set to approximately mid-travel.
- SYSTEM switch Set to 'narrow band' CW (300 c/s).
- Supply switch (power unit Type 360 B) Set to AC.

5. Set the controls on the signal generator to give a CW output of 30 $\mu$ V at 595 kc/s.

#### Setting the signal generator frequency

6. The frequency required for alignment of the IF circuits is 601.3 kc/s which can be obtained accurately as follows :—

- Adjust the receiver LF GAIN control, if necessary, to reduce the reading on the wattmeter to less than 10mW.

#### Note . . .

- During the following operation, ensure that the receiver output does not exceed 30mW by adjustment, where necessary, of the signal generator output level controls.*
  - Once the frequency of the signal generator is accurately set, do not alter the frequency until IF alignment is completed.*
- (b) Slowly increase the setting of the signal generator FREQUENCY control until a beat note is heard in the telephone headset. Continue to raise the frequency of the signal generator keeping the reading on the wattmeter under observation. The reading should rise to a maximum as the signal generator frequency reaches 598.7 kc/s, fall as the frequency approaches 600 kc/s (zero beat) and rise to a second maximum at 601.3 kc/s. Set the signal generator FREQUENCY control accurately for a peak reading in the wattmeter on the second maximum.

#### Receiver preparation

##### Note . . .

*To correctly align the IF circuits, it is necessary to set these circuits to narrow band selectivity and note filter to broad band (5 kc/s R/T).*



7. Prepare the receiver as follows:—
  - (a) Ensure that the SYSTEM switch is set to 'narrow band' cw.
  - (b) Remove the screw securing the SYSTEM switch bar.
  - (c) Withdraw the switchbar approximately 5 inches so that only the last two sub-units are engaged.
  - (d) Hold the switchbar in this position and set the SYSTEM switch to R/T.
  - (e) Remove the SYSTEM switchbar completely from the receiver.

#### Alignment of the IF circuits

8. Set the signal generator for 30 per cent modulation (internal).
9. Slowly turn the receiver LF GAIN control to the fully clockwise position, reducing the signal generator output in step, to maintain a reading of approximately 10mW on the wattmeter.
10. Set the POWER RANGE switch on the wattmeter to 20mW.

#### WARNING

*Take great care when adjusting trimming controls since it is possible to screw the cores in too far and thus damage the coil assemblies.*

11. Adjust trimmer L24 (sub-unit J) for a peak reading on the wattmeter. If necessary, adjust the output voltage of the signal generator to maintain a reading of approximately 10mW on the wattmeter.
  12. Repeat the operation detailed in para. 11 for trimmers L23 and L22 (sub-unit G), L21 and L20 (sub-unit E), L19 (sub-unit F), L18 and L17 (sub-unit D) in that order. Repeat the trimming adjustments until it is certain that each circuit is correctly aligned.
- #### IF amplifier performance check
13. Set the wattmeter POWER RANGE switch to 60mW.
  14. Set the signal generator output voltage to  $25\mu\text{V}$ .
  15. Refit the SYSTEM switchbar so that the last two sub-units (J and K) only are engaged. Hold the switchbar in this position

and set the SYSTEM switch to 'narrow band' cw. Carefully slide the SYSTEM switchbar into position. Replace and tighten the securing screw.

16. Set the receiver SYSTEM switch to R/T.
  17. Adjust the signal generator FREQUENCY control for a peak reading in the wattmeter. Note the reading on the dB scale.
  18. Adjust the signal generator FREQUENCY control until the reading on the wattmeter is 6 dB less than that noted at para. 17. Note the signal generator frequency.
  19. Adjust the signal generator FREQUENCY control in the opposite direction through the peak reading until the reading on the wattmeter is 6 dB less than that noted at para. 17. Note the signal generator frequency.
  20. Calculate the bandwidth by subtracting the lower signal generator frequency reading from the higher (*para. 18 and 19*). The bandwidth must not be less than 5 kc/s.
  21. Calculate the mid-band frequency by adding the two signal generator frequency readings (*para. 18 and 19*) together and dividing by 2. The mid-band frequency must be between 601.2 and 601.4 kc/s.
- Note . . .**  
*The mid-band frequency determined at para. 21 is to be considered as a datum figure and all subsequent frequency readings will be relative to that figure.*
22. Set the signal generator FREQUENCY control for a peak reading on the wattmeter. Note the reading on the wattmeter.
  23. Set the signal generator output voltage to 250mV (an increase of 60 dB) then adjust the signal generator frequency control to ascertain the two frequencies at which the reading on the wattmeter is the same as that noted at para. 22.
  24. Calculate the bandwidth by subtracting the lower frequency from the higher (*para. 23*) and check that the two frequencies are evenly spaced either side of datum (*para. 21*). The bandwidth must not be greater than 20 kc/s.

**25.** Set the signal generator output voltage to  $25\mu\text{V}$ .

**26.** On the receiver, set the SYSTEM switch bar to CW middle bandwidth (1.2 kc/s).

**27.** Remove the screw securing the SYSTEM switchbar and withdraw the switchbar approximately 5 inches so that the last two sub-units only are engaged. Hold the switchbar in this position and set the SYSTEM switch to R/T. Remove the switchbar completely from the receiver.

**28.** Repeat the operations detailed in para. 17 to 21; the required bandwidth being not less than 2.4 kc/s.

**29.** Repeat the operations detailed in

para. 22 to 24; the required bandwidth being not greater than 16 kc/s.

**30.** Refit the SYSTEM switchbar so that the last two-sub-units only are engaged. Hold the switchbar in this position and set the SYSTEM switch to CW middle bandwidth (1.2 kc/s). Carefully slide the switchbar into position. Replace and tighten the securing screw.

**31.** Disconnect the signal generator from the grid of V3 and earth. Replace the top cap connection to V3.

**32.** If no further tests are to be carried out, switch off the power unit Type 360B and disconnect the wattmeter from the receiver.

## Appendix B3

### ALIGNMENT OF RF CIRCUITS

#### Note . . .

*This alignment is to be done only when the receiver is shown by the tests detailed in the 2nd line Servicing, Section 5 to be mis-aligned.*

#### Tools and test equipment

1. The following will be required for aligning the RF circuits.

Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Wattmeter absorption CT44	10AF/98

#### Arrangement of test equipment

2. Arrange that the signal generator presents an impedance of 45 ohms to the receiver (*App. C4*).

3. Connect the test equipment and receiver as follows :—

- Connect the signal generator output (45 ohms) to the co-axial aerial socket of the receiver.
- Connect the INPUT terminals of the wattmeter to pins 14 and 15 of socket SK1 on the receiver (600 ohms high level output).
- Connect the receiver to the power unit by means of the appropriate connector.
- Connect the receiver power unit and signal generator to the external mains supply.

4. Set the controls on the wattmeter as follows :—

- IMPEDANCE Set to 600 ohms.
- POWER RANGE Set to 60mW

AL4

#### Alignment

5. Set the controls on the receiver as follows :—

- Range switch Set to range 1 (11.3 to 20 Mc/s).
- TUNING control Set to 19.13 Mc/s.
- HF GAIN control Set to 9.
- GUARD switch Set to GUARD OFF.

- NOISE LIMITER switch Set to OFF
- AVC switch Set to OFF.
- LF GAIN control Set to approximately mid-travel.
- SYSTEM switch Set to R/T.
- Supply switch Set to AC (Power unit Type 360B)

6. Set the controls on the signal generator for a 30 per cent modulated output of  $4\mu\text{V}$  at 19.13 Mc/s.

7. Adjust the receiver TUNING control for a peak reading in the wattmeter in step with successive adjustments to the LF GAIN control to maintain a receiver output level not exceeding 40mW.

8. Tune the RF circuits to 19.13 Mc/s as follows :—

- Adjust trimmer C20 (sub-unit B) for a peak reading in the wattmeter.
- Adjust trimmer C16 (sub-unit B) for a peak reading in the wattmeter.
- Adjust trimmer C6 (sub-unit A) for a peak reading in the wattmeter.
- Adjust the receiver TUNING control for a peak reading in the wattmeter.
- Repeat operations (a) to (c).

9. Set the controls on the signal generator for a 30 per cent modulated output of  $4\mu\text{V}$  at 11.73 Mc/s.

10. Set the receiver TUNING control to 11.73 Mc/s and adjust this control for a peak reading in the wattmeter. If necessary, adjust the LF GAIN control to maintain a receiver output level not exceeding 40mW.

11. Tune the RF circuits at 11.73 Mc/s as follows :—

- Adjust trimmer L9 (sub-unit B) for a peak reading in the wattmeter.
- Adjust trimmer L5 (sub-unit B) for a peak reading in the wattmeter.

- (c) Adjust trimmer L1 (sub-unit A) for a peak reading in the wattmeter.  
 (d) Adjust the receiver TUNING control for a peak reading in the wattmeter.  
 (e) Repeat operations (a) to (c).

**12.** Repeat the operations detailed in para. 6 to 11 until maximum receiver output is obtained at 19.13 and 11.73 Mc/s without further adjustment to the trimmers.

**13.** Repeat the operations detailed in para.

5 to 12, setting the signal generator and receiver to the frequencies listed in Table 1 and adjust the appropriate trimmers in the order shown for maximum receiver output.

**14.** Do an overall sensitivity test and record the figures obtained for future reference.

**15.** If no further tests are to be carried out, switch off the receiver and disconnect the signal generator and wattmeter.

**TABLE I**

Receiver range Mc/s	Frequency gang point Mc/s	Adjust trimmers		
		1 (sub-unit B)	2 (sub-unit B)	3 (sub-unit A)
6.4—11.3	10.81	C21	C17	C7
	6.65	L10	L6	L2
3.6— 6.4	6.12	C22	C18	C8
	3.74	L11	L7	L3
2 — 3.6	3.47	C23	C19	C9
	2.08	L12	L8	L4



## Appendix B4

### RECEIVER CALIBRATION

#### Note . . .

- (1) Calibration should be done only if the tests detailed in the 2nd Line Servicing, Section 5 show it to be necessary or if components in the oscillator section have been renewed and calibration cannot be corrected by re-alignment.
- (2) Mis-alignment of the tuning mechanism will also result in apparent faulty calibration but this condition should be rectified in accordance with the instructions detailed in Appendix B5 and not by re-calibration.
- (3) It is imperative that the signal generator and frequency meter used in the calibration be themselves accurately calibrated.

#### Tools and test equipment

1. The following will be required for calibrating the receiver :—

Signal generator Type 56	10S/647
or	
Signal generator CT218	10S/16780
or	
Signal generator Type 70	10S/16392
Telephone headset	As supplied
Frequency meter SCR211	110T/16

#### Receiver preparation

2. Draw a horizontal straight line across the centre of the escutcheon window with removable ink or a grease pencil.

#### Connection of test equipment

3. Connect the test equipment and receiver as follows :—

- (a) Connect the signal generator to the top cap of V3 in the receiver.
- (b) Connect the signal generator earth terminal to the receiver chassis.
- (c) Connect the receiver to its power unit using the appropriate connector.
- (d) Connect the receiver power unit, signal generator and frequency meter to the mains supply.
- (e) Connect the telephone headset to the appropriate jack on the receiver.

#### Equipment control settings

4. Set the controls on the signal generator for a CW output of  $3\mu\text{V}$  at 11.73 Mc/s.

5. Set the controls on the receiver as follows :—

- (a) RANGE switch Set to range 1 (11.3 to 20 Mc/s).
- (b) TUNING control Set to 11.73 Mc/s on the straight line scale (para. 2).
- (c) HF GAIN control Set to 10.
- (d) GUARD switch Set to GUARD OFF
- (e) NOISE LIMITER switch Set to OFF.
- (f) AVC switch Set to FAST
- (g) LF GAIN control Set to mid-travel
- (h) SYSTEM switch Set to 'wide-band' CW.
- (j) SCALE TRIMMER Set to 0.
- (k) Supply switch Set to AC.  
(Power unit Type 360B)

#### Establishment of scale datum points

6. Adjust trimmer L13 (sub-unit C) for a beat not in the telephone headset. Adjust the LF GAIN control for a comfortable level in the telephones.

7. Set the signal generator frequency to 12.93 Mc/s and check that a beat note is heard in the telephones. This confirms that the oscillator is tracking correctly.

8. Set the receiver TUNING control to 19.1 Mc/s on the straight line scale.

9. Set the controls on the signal generator for a CW output of  $3\mu\text{V}$  at 19.1 Mc/s.

10. On the receiver, adjust trimmer C27 (sub-unit C) for a beat note in the telephone headset.

11. Set the signal generator frequency to 20.3 Mc/s and check that a beat note is heard in the telephones. This check confirms that the oscillator is tracking correctly.



TABLE 1

Receiver range Mc/s	Signal generator and receiver tuning frequency Mc/s	Adjust trimmer	Tracking check frequency Mc/s
6.4—11.3	6.65	L14	7.85
	10.80	C28	12.00
3.6— 6.4	3.74	L15	4.94
	6.12	C29	7.32
2 — 3.6	2.08	L16	3.28
	3.47	C30	4.67

**12.** Repeat the operations detailed in para. 4 to 11 for the other frequency ranges of the receiver; the appropriate signal generator, receiver tuning and tracking check points are listed in Table 1.

#### Calibration

**13.** Disconnect the signal generator from the receiver.

**14.** Connect the antenna terminal of the frequency meter (SCR 211) to the top cap (control grid) of V3 in the receiver.

**15.** Set the frequency meter to 11.5 Mc/s by means of the built-in calibration tables.

**16.** Set the receiver TUNING control to 11.5 Mc/s using the straight line scale.

**17.** Adjust the trimmer L13 until a low frequency beat note is heard in the telephones.

#### Note . . .

*The adjustment to L13 should only be slight.*

**18.** Set the frequency meter and receiver TUNING to 19.5 Mc/s, using on the receiver, the straight line scale.

**19.** Adjust trimmer C27 until a beat note of approximately the same pitch as that

obtained at para. 17 is heard in the telephones.

**20.** Set the frequency meter and receiver to 11.5 Mc/s and check that the low pitch beat note is still heard. If this is not so, repeat the operations detailed in para. 17 to 19 until the correct conditions are obtained. Replace the receiver cover.

**21.** Set the frequency meter to 20 Mc/s and tune the receiver to exact zero beat note. Mark the outside of the escutcheon window opposite the 20 mc/s calibration point taking care to avoid parallax errors.

**22.** Repeat the operations detailed in para. 21 at 0.5 Mc/s intervals throughout range 1 of the receiver.

**23.** Repeat the operations detailed in para. 15 to 22 for the other three ranges of the receiver; the appropriate check frequencies, trimmers and calibration intervals are listed in Table 2.

**24.** Remove the receiver escutcheon window and erase any existing calibration curves from the inside surface of the window.

**25.** Draw a smooth curve with marking ink (or substitute) on the inside of the window through the calibration points

TABLE 2

Receiver range Mc/s	Lower check frequency Mc/s	Lower frequency trimmer	Higher Check frequency Mc/s	Higher frequency trimmer	Calibration interval
6.4—11.3	6.5	L14	11.0	C28	0.5 Mc/s
3.6— 6.4	4.0	L15	6.0	C29	200 kc/s
2.0— 3.6	2.0	L16	3.5	C30	100 kc/s

previously marked on the outside of the window.

**26.** Erase the calibration points and straight line drawn on the outside of the window.

**27.** Replace the escutcheon window on the receiver.

**28.** Switch off the receiver power unit and frequency meter. Remove the connection between the frequency meter and the top cap of V3 in the receiver.

## Appendix B5

### ADJUSTMENT OF TUNING DRIVE MECHANISM

#### WARNING

The gear wheels of the tuning drive are of the split type, each half being under tension with respect to the other. Do not attempt to adjust the mechanism without first clamping the two halves of each gear wheel with pin vices.

#### Note . . .

- (1) Valves V9 to V12 must be removed before adjusting the tuning drive mechanism.
- (2) There are calibration lines on the tuning scale drums at the HF end of range 3 and the LF end of range 2. There is also an engraved line on the centre gear wheel of the countershaft left-hand gear assembly. Calibration is approximately correct when, with the main tuning control at the LF end of its travel, the two scale drum calibration lines co-incide  $\frac{1}{2}$  in. below the upper frame of the escutcheon aperture, the engraved line on the centre gear wheel is vertical and the tuning capacitor is fully in mesh.

#### Scale drum removal.

1. Remove the scale drum as follows :—
  - (a) Disconnect the receiver from the power supplies and aerial.
  - (b) Slide the receiver out of its case and remove the escutcheon window.
  - (c) Set the tuning control on the receiver to the LF end of its travel so that the engraved line on the centre gear wheel on the countershaft is vertical and the two lines at the ends of range 2 and 3 drums are co-incidental. Remove the scale pointers.
  - (d) Use pin vices to clamp both halves of each of the three gear wheels at the left-hand end of the countershaft and the tuning capacitor gear wheel.
  - (e) Remove the four domed hexagonal nuts and then the double ended bolts which secure the front panel to the main chassis.
  - (f) Slacken the locknut and end bearing at the left-hand end of the countershaft.
  - (g) Ease the left-hand countershaft gear-wheel assembly back and out of mesh with the tuning drum shaft gearing.

- (h) Slacken the locknuts and end bearings at both ends of the tuning drum shaft.
- (j) Carefully ease the front panel of the receiver away from the main chassis taking care not to apply undue strain to the attached wiring, until there is sufficient gap between the front panel and the indicator lamp shields to enable the scale drums to be removed.
- (k) Lift out the scale drum assembly complete.

#### Scale drum refitting

2. Refit the scale drum assembly as follows :—
  - (a) Lower the scale drum assembly into position between the end bearings.
  - (b) Tighten the end bearings of the tuning drum shaft until the drums revolve easily without play in the bearings. Tighten the locknuts.
  - (c) Ease the front panel up to the main chassis and secure by means of the double ended bolts and hexagonal nuts.
  - (d) Set the line at the HF end of range 3 tuning drum to coincide with the line at the LF end of range 2 tuning drum. Align the drums so that the two co-incidental lines are approximately  $\frac{1}{2}$  in. from the upper frame of the receiver chassis and ensure that the line on the centre gear wheel is vertical.
  - (e) Hold the two drums and ease the countershaft gearing into mesh with the tuning drum shaft gearing.
  - (f) Tighten the end bearing and locknut at the left-hand end of the countershaft. Refit the scale pointers at the LF end of each scale drum.
  - (g) Unclamp the pin vices.
  - (h) Run the tuning control from end to end and check that the mechanism and drums run freely throughout their travel. If free running is interrupted at any point, reclamp the gear wheels, disengage the countershaft, advance or retard the gearing by one tooth as appropriate, engage the gearing, unclamp and test for free running.

### Tuning drive mechanism adjustments

#### Note . . .

- (1) *It is assumed that due to mishandling or maladjustment, the tuning drive mechanism is incorrectly aligned, it is also assumed that the amount of error is not known.*
- (2) *The instructions contained in para. 3 detail the method whereby the mechanism may be adjusted to an approximate datum point from which accurate setting up may be achieved.*

### 3. Adjust the tuning drive mechanism as follows :—

- (a) Set the tuning control as near the LF end of the scale as possible.
- (b) Clamp the two halves of each of the three countershaft split gear wheels with pin vices.
- (c) Slacken the locknut and end bearing at the left-hand end of the countershaft.
- (d) Ease the left-hand countershaft gear wheel assembly back and out of mesh with the tuning drum shaft gearing.
- (e) Rotate the tuning drums as required to make the two lines at the ends of range 2 and 3 scale drums co-incide. Align the drums so that the two coincidental lines are approximately  $\frac{1}{2}$  in. from the upper frame of the escutcheon aperture.

#### Note . . .

*If the countershaft is very much out of adjustment, it will be necessary to use an additional pin vice to clamp each gear wheel in turn as the originally fixed pin vice will foul the receiver chassis on rotation of the countershaft.*

- (f) Check the position of the engraved line on the centre gear wheel at the left-hand end of the countershaft. This should be vertical. If not, rotate the countershaft until it is correctly positioned.
- (g) Hold the scale drums and carefully ease the countershaft gear assembly into mesh with the tuning drum gearing. Ensure that when the gearing is completely meshed, the two lines on the tuning drums are still correctly positioned and co-incidental ; also that the engraved line on the centre gear wheel of the countershaft is vertical.

- (h) Remove the pin vices.
- (i) Tighten the end bearing of the countershaft and check that the tuning control moves freely throughout its travel.
- (k) Tighten the countershaft end bearing locknut.

### Tuning drive mechanism alignment check

#### Note . . .

*It is assumed that the receiver oscillator circuit is correctly aligned.*

### 4. Check the alignment of the tuning drive mechanism as follows :—

- (a) Refit valves V9 to V12 and the cursor window.
- (b) Connect the receiver to the power supplies.
- (c) Connect a telephone headset to the appropriate jack on the receiver.
- (d) Connect the receiver power unit to the mains supply.
- (e) Do a scale check at 19.8 Mc/s.
- (f) Check that the SCALE TRIMMER control at zero beat is within  $\pm 1$  division of 0. If this is not so, switch off the mains supply and proceed as detailed in (g) to (r).
- (g) Set the SCALE TRIMMER to 0 and zero beat the receiver with the main tuning control.
- (h) Clamp the three gear wheels at the left-hand end of the countershaft and the tuning capacitor gear wheel with the pin vices.
- (j) Mark the tuning capacitor gear wheel so that the exact position may be retained.
- (k) Slacken the right-hand bearing of the countershaft by loosening the two screws securing the bearing to the framework. These screws may be reached with a long bladed screwdriver inserted through the slot in the right-hand side of the chassis.
- (l) Slacken the countershaft left-hand bearing locknut then slightly slacken the left-hand bearing, ensuring that the left-hand end gearing does not come out of mesh with the tuning drum gearing.
- (m) Ease the countershaft right-hand bearing forward until the right-hand gear is disengaged from the tuning capacitor drive.



- (n) Adjust the tuning drum to bring the 19·8 Mc/s check point central with the cursor line, taking care to ensure that the tuning drum and countershaft gearing remain in mesh.
- (o) Ensuring that the tuning capacitor gear wheel is maintained in its original position (j), ease the right hand bearing of the countershaft back and into mesh with the tuning capacitor gear. Lightly tighten the bearing securing screws.
- (p) Tighten the countershaft left-hand end bearing and locknut.
- (q) Tighten the countershaft right-hand end bearing securing screws and remove the pin vices.
- (r) Do a calibration check as detailed in (b) to (f).
- (s) Do a calibration check at the upper, centre and lower ends of each range of the receiver. Should the calibration appear consistently out in one direction, disengage the tuning capacitor gearing as detailed in (h) to (m), move the tuning capacitor gear wheel one tooth in the appropriate direction to correct and remesh. Tuning capacity is increased by counter clockwise rotation of the tuning capacitor gear wheel when viewed from the left of the receiver.



## Appendix B6

### ALIGNMENT OF GUARD CHANNEL TUNING UNITS

#### Note . . .

- (1) *Guard channel facility is provided on the receiving equipment Type R1475 by two plug-in tuning units. Tuning Unit Type 131 (10D/2001) covers the frequency range 2 to 4.2 Mc/s. Tuning Unit Type 132 (10D/2002) covers the frequency range 4.1 to 7.5.*
- (2) *When using the guard facility, it is essential to select the correct crystal for the frequency concerned. The correct crystal is one whose frequency differs from the required frequency by 600 kc/s and yet lies within the range of the appropriate tuning unit. For example, at the lower end of the tuning unit frequency range add 600 kc/s to the required frequency. At the upper end of the tuning unit frequency range, subtract 600 kc/s from the required frequency. For alignment purposes however, the tuning units are set up at two frequencies within the tuning range.*

#### Test equipment

1. The following will be required :—

Signal Generator Type 56	10S/647
or	
Signal Generator CT 218	10S/16780
or	
Signal Generator Type 70	10S/16392
Crystals quartz 2.6 Mc/s	10X/2600
Crystals quartz 3.6 Mc/s	10X/3600
Crystals quartz 4.7 Mc/s	10X/4700
Crystals quartz 6.9 Mc/s	10X/6900
Telephone headset	As supplied
AL4 Wattmeter, Absorbtion CT44	10AF/98

#### Preliminary adjustments

2. On the power unit, set the switch to AC.
3. Select the tuning unit Type 131, (2 to 4.2 Mc/s frequency range).
4. Set the controls on the receiver as follows :—
  - (a) LF GAIN control Set fully clockwise
  - (b) HF GAIN control Set to 10
  - (c) SYSTEM switch Set to 'wide-band' CW

- (d) GUARD switch Set to GUARD ONLY
- (e) AVC switch Set to OFF.
- (f) NOISE LIMITER switch Set to OFF
- (g) GUARD RF GAIN Set fully clockwise

5. Set the controls on the signal generator to give a CW output of  $30\mu\text{V}$  at 4.2 Mc/s. The output of the signal generator may be varied later to give a convenient level in the telephones.

6. Connect the signal generator output to to the aerial socket of the receiver and the telephones to the receiver phone jack.

7. Insert a 3.6 Mc/s crystal in the guard tuning unit.

8. Fit the guard tuning unit to the receiver.

#### Alignment

9. Set the guard tuning unit frequency control to 5 (fully clockwise).

10. Unlock the guard tuning unit trimmers.

11. Adjust the guard tuning unit osc trimmer for a note in the telephones. If a note is not obtained, proceed as follows :—

- (a) Remove the guard tuning unit from the receiver.
- (b) Locate the core of the oscillator inductor ; this is accessible through the round hole in the base of the tuning unit in line with the frequency control.
- (c) Make a small adjustment to the core of the oscillator inductor.
- (d) Fit the guard tuning unit to the receiver.
- (e) Adjust the guard unit osc trimmer for a note in the telephones.
- (f) Repeat the operations (a) to (e) until a note is heard in the telephones.

12. Turn the guard tuning unit frequency control to 0 and check that the note varies in frequency.

**Note . . .**

*Some confusion may arise in trimming the RF circuits as a false maximum appears as the 2nd RF trimmer is tuned through the oscillator frequency. The true maximum is more pronounced and identification presents no difficulty when this point is appreciated.*

13. Adjust the guard tuning unit 1st and 2nd RF trimmers in turn for maximum deflection in the tuning indicator or loudest note in the telephones.
14. Withdraw the guard tuning unit from the receiver.
15. Remove the 3.6 Mc/s crystal from the guard tuning unit.
16. Insert a 2.6 Mc/s crystal in the guard tuning unit and replace the unit in the receiver.
17. Set the signal generator frequency to 2.0 Mc/s.
18. Adjust the guard tuning unit osc trimmer for a note in the telephones and check that the frequency of the note varies when the guard frequency trimmer is varied.
19. Withdraw the guard tuning unit from the receiver.
20. Remove the 2.6 Mc/s crystal from the guard tuning unit and insert the crystal normally used in the unit.
21. Select the 4.1 to 7.5 Mc/s guard tuning unit (Tuning unit Type 132).
22. Insert a 6.9 Mc/s crystal in the guard tuning unit and fit the unit in the receiver.
23. Set the signal generator frequency to 7.5 Mc/s.
24. Repeat operations detailed in para. 10 to 14.
25. Withdraw the guard tuning unit from the receiver.
26. Remove the 6.9 Mc/s crystal from the guard tuning unit.
27. Insert a 4.7 Mc/s crystal in the guard tuning unit and replace the unit in the receiver.
28. Set the signal generator frequency to 4.1 Mc/s.
29. Adjust the guard unit osc trimmer for a note in the telephones and check that the frequency of the note varies when the guard frequency trimmer is varied.
30. Remove the guard tuning unit from the receiver.
31. Remove the 4.7 Mc/s crystal from the guard tuning unit and insert the crystal normally used in the unit.

## Appendix C1

### TOOLS, TEST EQUIPMENT AND MATERIALS

Item	Stores Ref. No.	Daily	Monthly	Six Monthly
Blowers air portable	5A/4124		X	X
Wattmeter absorption CT44 or Output power meter Type 2 or Multimeter electronic CT38	10AF/98 10S/11934 10S/16308			
Signal generator Type 56 or Signal generator CT218 or Signal generator Type 70	10S/647 10S/16780 10S/16392			X
Multimeter Type 1 or Testmeter Type F	10S/16411 10S/1		X	X
Cloth mutton	32B/1062	X	X	X
White spirit	34D/246			X
Grease XG-271	34D/9100511		X	X
Oil OM-13	34D/9100570		X	X
Additional items required for unscheduled servicing :—				
Testers insulation Type A	5G/1621			
Vices pin, Qty. 4	1C/2621			
Test oscillator Type 2 or Oscillator unit Type 25	10S/838 10V/11940			
Frequency meter SCR211	110T/16			
Power unit Type 7262	10K/19450			
Crystal quartz 2·6 Mc/s	10X/2600			
Crystal quartz 3·6 Mc/s	10X/3600			
Crystal quartz 4·7 Mc/s	10X/4700			
Crystal quartz 6·9 Mc/s	10X/6900			
Tester valve Type 4A or Tester valve CT80	10S/639 10S/16381			

## Appendix C2

### FUSES, VALVES AND LAMPS

**TABLE 1**  
**Fuses**

Fuse No.	Rating	Type	Ref. No.
Power unit Type 360B			
AC Fuse	2A	28	10H/180
HT Fuse	6V, 1·8W	Fuse lamp	5L/9951204
LT Fuse	20A	143	10H/18207

**TABLE 2**  
**Valves**

Valve No.	Type	Function	Sub-unit location
Receiver unit Type 88			
V1	CV1053	RF amplifier	B
V2	CV1932	RF oscillator	C
V3	CV1347	Frequency changer (main)	D
V4	CV1347	Frequency changer (guard)	D
V5	CV1053	1st IF amplifier	E
V6	CV216	Voltage stabilizer	E
V7	CV1053	2nd If amplifier	G
V8	CV587	AVC rectifier, RF delay	G
V9	CV587	Detector and BFO	J
V10	CV1054	Noise limiter and AVC IF delay	J
V11	CV587	AF Amplifier	K
V12	CV1932	Output	K
V13	CV1103	Tuning indicator	

**TABLE 3**  
**Lamps**

Location	Rating	Ref. No.
Power unit Type 360B		
HT fuse	6V, 1·8W	5L/9951204
Receiver unit Type 88		
Scale indicators LP 1-4	12V, 1·0W	5L/9951142

## Appendix C3

### SPECIAL TEST EQUIPMENT

#### Valve electrode test adaptor

##### Note . . .

*Due to the construction of the receiver, it is impracticable to measure valve electrode voltages at the valve base without a form of adaptor.*

1. The adaptor, shown in complete form on fig. 1 is to be manufactured locally and used when it is necessary to measure valve electrode voltages under working conditions.

2. The following equipment will be required :—

Valve holder			
Type 319	Qty. 1	10H/18251	
Valve socket	Qty. 1	110H/648	
Cablelectric 12A	Qty. 1 foot	5E/9100030	

A base from any small diameter international octal based valve which has all eight pins fitted.

3. Prepare the valve base as follows :—

- Remove the glass envelope from the valve base.
- Scrape away the sealing cement from the neck of the valve base.
- Unsolder the pinch wires from the valve pins and clean out surplus solder.
- Cut a slot  $\frac{1}{2}$  in. deep and  $\frac{1}{4}$  in. wide in the side of the valve base between pins 1 and 8 (fig. 2).

4. Prepare the 'clip-in' type valve holder as follows :—

- Use a file to reduce the diameter of the tag side of the valve holder until the valve base prepared in para. 3 will accept the valve holder as a good fit.
- Strip back one end of the multi-core

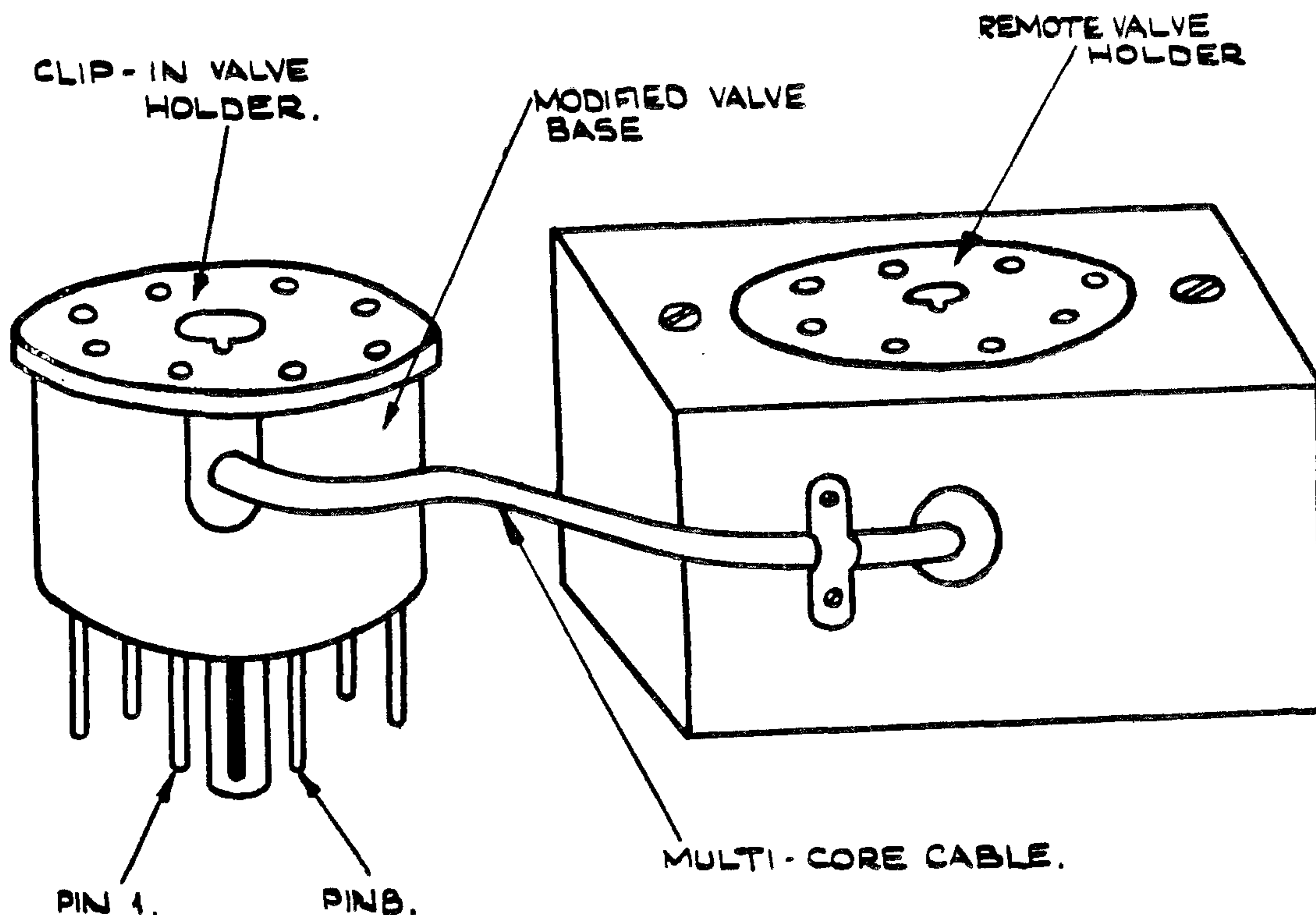


Fig. 1. Complete valve electrode voltage test adaptor



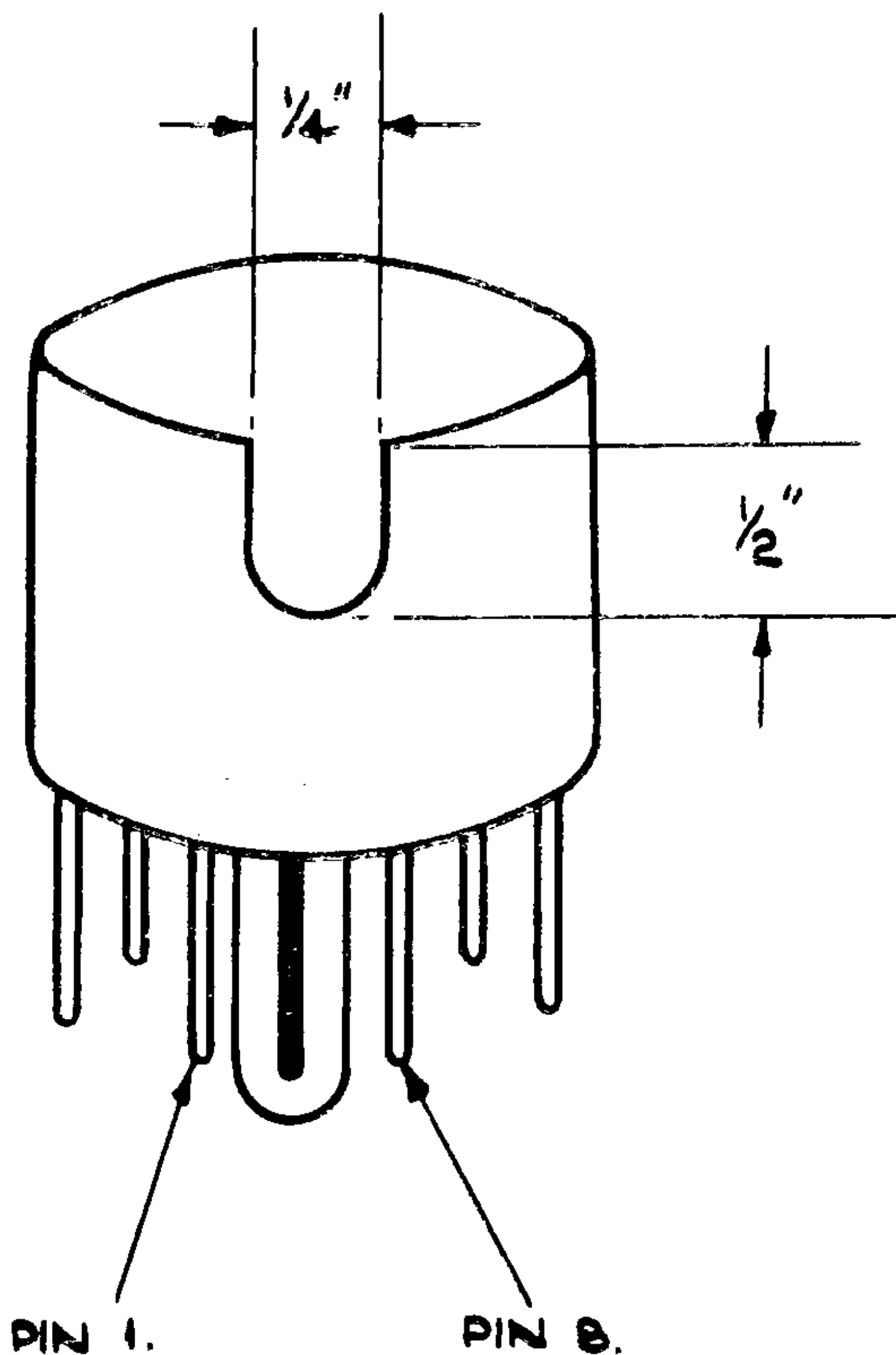


Fig. 2. Prepared valve base

cable for approximately  $1\frac{1}{2}$  in. Bare each core for approximately  $\frac{3}{16}$  in.

- (c) Connect one core of the multi-core cable to each of tags 1, 3, 4, 5, 6 and 8 of the valve holder, making the connection at the inner hole of each tag.
- (d) Connect two cores of the multi-core cable to each of tags 2 and 7 of the valve holder, making the connection at the inner hole of each tag.
- (e) Make a note of the cable colour connected to each tag and cut off the unused cores.
- (f) Solder a  $1\frac{1}{2}$  in. length of tinned copper wire to each tag of the valve holder, making the connection to the outer hole of each tag.
- (g) Apply sealing cement to the inside of the neck of the valve base. Align the valve holder over the valve base, keyways in line then fit the two items together, passing the multi-core cable into the slot cut in the side of the valve base. Ensure that the tinned copper wire extensions protrude through the holes in the valve pins. Allow the cement to set.

- (h) Solder the tinned copper wire to each valve pin, clip off any surplus wire and clean up each joint.

5. Construct a small box to house the batten mounting type valve holder. This may be made of any convenient material but should be enclosed at the bottom to prevent accidental short circuits. Cut a hole  $\frac{1}{4}$  in. in diameter in the side of the box to permit the entry of the multi-core cable.

6. Connect each tag of the batten type valve holder to the appropriate core of the multi-core cable having regard to the colour identification.

7. Fit the valve holder to the box and clamp the cable securely so that undue strain is not applied to the soldered joints.

8. The adaptor should be used as follows:—

- (a) Remove the valve under test.
- (b) Insert the valve base end of the adaptor to the valve holder just vacated.
- (c) Fit the valve to the clip-in type valve holder.
- (d) Measure the valve electrode voltages at the appropriate test point on the remote valve holder.

#### Sub-unit extension adaptor

##### Note . . .

*Due to the construction of the receiver, it is difficult to gain access to components in the sub-units while the equipment is in a working condition and fault finding is in progress. The adaptor described in para. 9 to 12 which should be made up locally, will assist in overcoming this difficulty by permitting any of the main sub-units to be removed from the main chassis yet maintaining the receiver in a working condition. The screening cover of the particular sub-unit under examination may be removed giving access to components mounted within the items. This adaptor must not be used when aligning the receiver.*

9. The following equipment will be required:—

Plugs Type 672	Qty 1	10H/18577
Plugs Type 687	Qty 1	10H/18774
Sockets Type 627	Qty. 1	10H/18578
Caps, valve Type B	Qty. 1	10A/13025
Clips crocodile	Qty. 2	5K/9400856

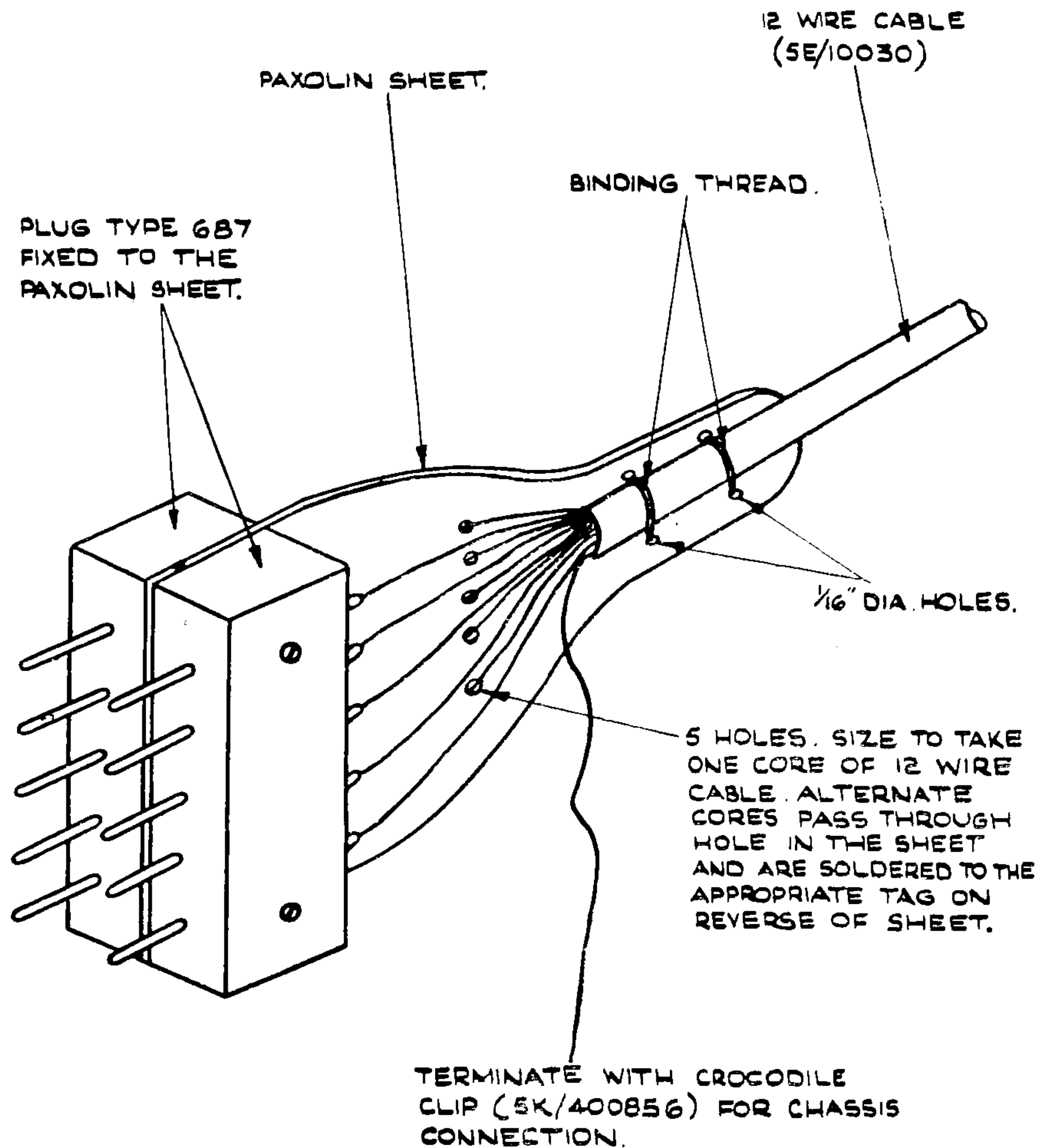


Fig. 3. Sub-unit extension adaptor (plug)

Cable electric 12A Qty. 1 foot 5E/9100030  
 Paxolin sheet  $\frac{5}{8}$  in. thick approximately  
 3in.  $\times$  6 in.

A suitable mounting bracket such as an  
 old IF can or a square cocoa tin.

**10.** Prepare, assemble and connect the  
 plug, paxolin sheet and multi-core cable as  
 shown in fig. 3. Note the colour of the core  
 connected to each pin of the plug.

**11.** Connect the other end of the multi-core  
 cable to the socket, ensuring that the colour

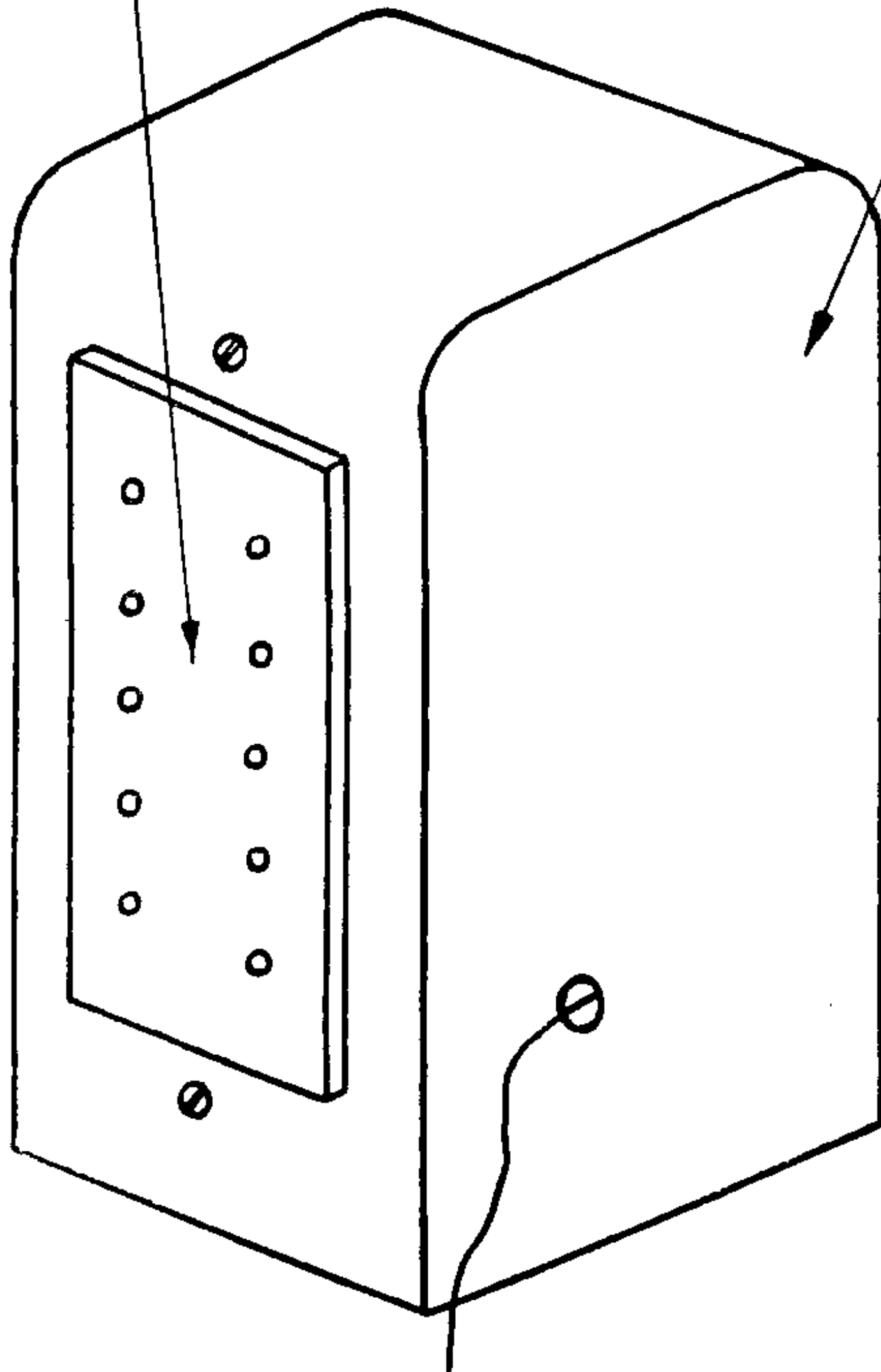
of each connection corresponds to that  
 noted at para. 10.

**12.** Mount the socket in the can mounting  
 as shown in fig. 4.

**13.** Prepare a valve top cap extension  
 lead by cutting a 12 in. length of screened  
 cable such as Uniradio 32, terminating one  
 end in a plug Type 672 and the other in a  
 top cap connector. This lead is then used  
 when top cap connected valves are mounted  
 on the sub-unit under test.

SOCKET TYPE G72,  
CONNECTED TO 12  
WIRE CABLE BEFORE  
BEING BOLTED TO  
CAN.

SUITABLE CAN MOUNT  
WITH SLOT CUT AT  
FRONT TO TAKE SOCKET  
TYPE G72, AND HOLE AT  
REAR TO TAKE 12 WIRE  
CABLE.



12 WIRE CABLE  
LED IN THROUGH  
HOLE AT REAR  
OF CAN. EACH  
CORE CONNECTED  
TO APPROPRIATE  
TAG, THEN SECURELY  
CLAMPED.

TERMINATE WITH CROCODILE  
CLIP FOR CHASSIS CONNECTION.

Fig. 4. Sub-unit extension adaptor (Socket)

## Appendix D

### FAULT LOCATION CHART

**Note . . .**

- (1) Where the term "3rd line" is given in the Action column of this appendix and the Station concerned is not established and equipped to do themselves what is normally 3rd line servicing, the receiver is to be returned for higher servicing.
- (2) At 3rd line, should it be necessary to remove a sub-unit from the receiver chassis refer to Appendix E2 for details of how to remove the sub-units.

Symptom	Probable fault	Action
1. No output from main or guard channel, tuning indicator and dial lights not lit.	(a) Connector between power unit and receiver disconnected or open circuit.	(a) Examine connector and renew if necessary.
	(b) Connector between power unit and mains source open circuit, disconnected or wrongly connected.	(b) Examine connector and renew if necessary.
	(c) AC fuse in power unit faulty	(c) Renew fuse (10H/180). If fuse fails again, refer to NCO i/c for investigation.
	(d) External mains source fuse faulty.	(d) Refer to NCO i/c for investigation.
	(e) Mains voltage selector screw in power unit loose.	(e) Tighten screw.
2. No output from main or guard channel, tuning indicator not lit, scale lamps normal.	HT fuse in power unit faulty.	Renew fuse lamp 5L/9951204).
3. Low output from main or guard channel. Tuning indicator glows but in-operative, scale check normal.	(a) Aerial disconnected or feeder open circuit.	(a) Examine and repair if necessary.
	(b) Relay RL 1 in sub-unit A faulty.	(b) Clean relay contacts or renew relay (10F/16663) 3rd line.
	(c) Plugs Type 672 on A or B sub-units disconnected.	(c) Examine connections and renew if necessary.
	(d) Aerial sub-unit A faulty.	(d) Check by replacement using Tuning unit Type 145 (10D/2337), 3rd line.
4. Low output from main channel, guard channel normal, tuning indicator normal on guard channel, scale check normal.	(a) V1 faulty.	(a) Renew valve (CV1053).
	(b) RF unit B faulty.	(b) Check by replacement using Tuning unit Type 146 (10D/2338) 3rd line.



Symptom	Probable fault	Action
5. No reception between 2 to 6.4 Mc/s, weak signals or flat tune 6.4 to 11.3 Mc/s on main channel, guard channel and tuning indicator normal, scale check not working.	V2 faulty.	Renew valve (CV1932).
6. Main channel normal, no output from guard channel, tuning indicator and scale check normal.	(a) Guard tuning unit crystal faulty.	(a) Renew crystal.
	(b) Guard tuning unit faulty.	(b) Check by replacement.
	(c) V4 faulty.	(c) Renew valve (CV1347).
	(d) Mixer unit D faulty.	(d) Check by replacement using Mixer Unit Type 11 (10A/19140), 3rd line.
7. No reception on main channel, guard channel and tuning indicator normal, no scale check.	(a) V3 faulty.	(a) Renew valve (CV1347).
	(b) Oscillator unit C faulty.	(b) Check by replacement using Oscillator unit Type 171 (10V/592), 3rd line.
	(c) Mixer unit D faulty.	(c) Check by replacement using Mixer unit Type 11 (10A/19140), 3rd line.
8. No reception on main or guard channels, tuning indicator glows but inoperative, no scale check.	(a) V5 faulty.	(a) Renew valve (CV1053).
	(b) V7 faulty.	(b) Renew valve (CV1053).
	(c) Mixer unit D faulty.	(c) Check by replacement using Mixer unit Type 11 (10A/19140), 3rd line.
	(d) IF unit E faulty.	(d) Check by replacement using IF unit Type 37 (10D/2340), 3rd line.
	(e) IF unit G faulty.	(e) Check by replacement using IF unit Type 38 (10D/2341), 3rd line.
	(f) LC unit F faulty.	(f) Check by replacement using Inductor Capacitor unit Type 88 (10C/14730) 3rd line.
9. Main and guard channels normal with AVC off, no output with AVC on, tuning indicator permanently closed, scale check normal.	V8 faulty.	Renew valve (CV587).
10. No output from main or guard channel on CW; weak and distorted on R/T, tuning indicator normal, scale check indecisive.	(a) V9 faulty.	(a) Renew valve (CV587).
	(b) Unit J faulty.	(b) Check by replacement using Oscillator unit Type 170 (10V/591), 3rd line.



Symptom	Probable fault	Action
11. Main and guard channels normal, tuning indicator and scale check normal, noise limiter inoperative and causing no reduction in signal strength when switched on.	V 10 faulty.	Renew valve (CV1054).
12. No output from phone jacks (low level) on main and guard channels, tuning indicator and scale check normal.	(a) Output connections faulty. (b) Output transformer matching tap loose. (c) V11 faulty. (d) V12 faulty. (e) Output unit K faulty.	(a) Check telephones. (b) Tighten screw. (c) Renew valve (CV587). (d) Renew valve (CV1932). (e) Check by replacement using Output unit Type 45 (10D/2339), 3rd line.
13. Main and guard channels normal, tuning indicator, inoperative, scale check normal.	V13 faulty.	Renew valve (CV1103).

## **Appendix E1**

### **GENERAL PHYSICAL SERVICEABILITY**

1. The continuous serviceability of a radio installation depends not only on the servicing operations specified in the schedules but also on the observance by operators, mechanics and fitters, of small defects of a physical nature which should be reported and rectified as they occur. Some of these defects which should become obvious to personnel in the normal course of their work on the installation are listed below; the experienced radio tradesman will obviously amend and extend this list to meet the requirements of a particular installation.

(a) Mechanical structures should be

securely fixed and rigid. Nuts and bolts should be tight.

(b) Major components should be securely fixed.

(c) Porcelain insulators should show no damage or signs of arcing at high voltage points.

(d) There should be no signs of leakage from oil filled components.

(e) Cables and cable forms should not be subjected to undue strain, and should show no damage.

(f) Braiding should be adequately earthed.

## Appendix E2

### REMOVAL OF SUB-UNITS

#### Note . . .

- (1) *It is difficult to grip the valves by their bases due to the screening can mountings. Care is therefore to be taken when extracting a valve that the valve base to envelope joints do not become loosened.*
- (2) *This appendix has been written on the assumption that the receiver dust cover has been removed.*

#### WARNING

*Do not attempt to remove any sub-unit until the appropriate switchbar has been removed. Sub-units A, B and C are operated by the RANGE switchbar and sub-units D, E, G, J and K by the SYSTEM switchbar.*

1. Remove the appropriate switchbar as follows :—
  - (a) Set the RANGE switch to the 11.3 - 20 Mc/s range (locating slots vertical).
  - (b) Set the SYSTEM switch to 'narrow-band' CW (locating slots horizontal).
  - (c) Remove the small screw and spring washer securing the switchbar to the operating mechanism.
  - (d) Withdraw the switchbar.
  - (e) Refit the securing screw and spring washer to the operating mechanism to prevent loss.

2. If either of sub-units C or D is to be removed, unsolder the short lead connecting these two sub-units together.

3. Extract the valve or valves from the sub-unit being removed, or on sub-unit A remove the relay unit.

4. Where appropriate, remove the leads connected to the two pin socket on the top of the sub-unit.

5. Slacken the two captive screws at the top front of the sub-unit.

6. Invert the receiver and slacken the two captive screws at the bottom front of the sub-unit.

7. Gently withdraw the sub-unit from the main chassis.

#### Note . . .

*Before attempting to refit any sub-unit, ensure that the RANGE and SYSTEM switches are set as detailed in para. 1 and that the switch on the sub-unit is in alignment with its appropriate switchbar.*

8. Refit the sub-unit by reversing the procedure detailed in para. 1 to 7.

## Appendix F

### TYPICAL VALVE ELECTRODE VOLTAGES

1. The voltage readings detailed in Table 1 are included to assist fault location. They are typical of a serviceable equipment and were taken using a testmeter Type F (10S/1) with the receiver in the operating condition, no signal input and the controls set as follows :—

- (a) RANGE switch Set to 4
- (b) TUNING control Set to 2 Mc/s.
- (c) SYSTEM switch Set to ' wide-band ' CW
- (d) GUARD switch Set to OFF
- (e) HF GAIN control Set to 10
- (f) LF GAIN control Set fully clockwise

2. With the exception of the heater voltages, all readings were measured relative to the receiver chassis. The heater voltages were measured between pins 2 and 7.

3. The HT voltage was 200V on load measured with respect to chassis at the power unit.

4. In Table 1, the figure in brackets indicates the range to which the testmeter should be set for that particular measurement. The testmeter should be set to AC when measuring heater voltages and to DC for all other measurements.

5. The valve heaters are wired in a series parallel arrangement as shown in fig. 1. Particular attention should be paid to the relative heater voltages since an apparently faulty valve may in fact be serviceable and the heater resistance of another valve may have risen to deprive the suspect valve of correct heater voltage.

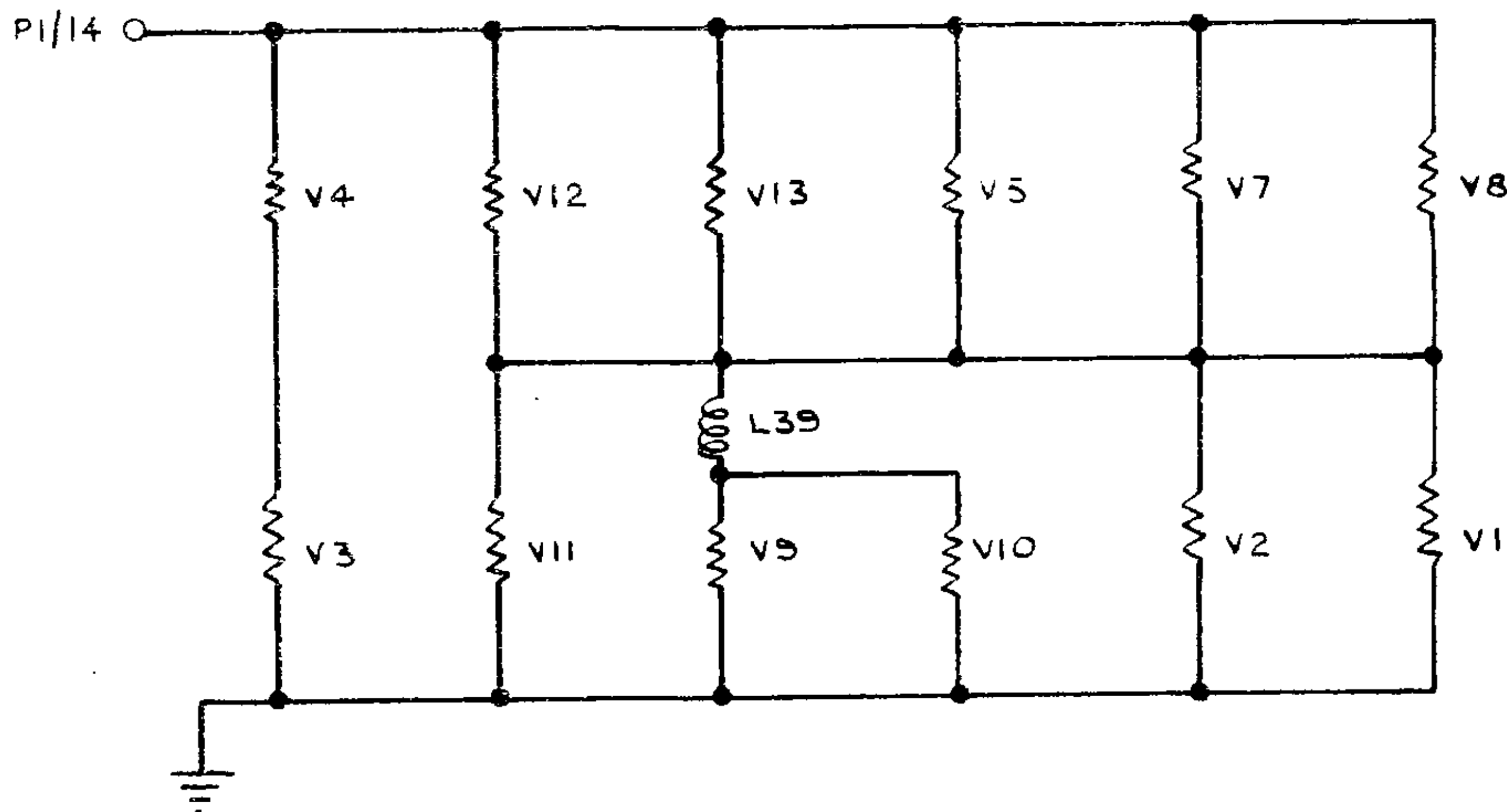


Fig. 1. Arrangement of heater

TABLE I

Valve No.	Pin No.						Remarks
	2/7	3	4	5	6	8	
V1	6·1 (10)	185 (400)	75 (400)				
V2	6·1 (10)	85 (400)		—30 (400)		—40 (400)	
V3	6·25 (10)	185 (400)	70 (400)	—0·2 (10)		2·8 (10)	
V4	6·0 (10)	175 (400)	38 (400)		120 (400)	1·2 (10)	Guard channel switched on for this test.
V5	6·48 (10)	180 (400)	76 (400)				
V6	—50 (400)			92 (400)			Stabilizer
V7	6·5 (10)	175 (400)	87 (400)				
V8	6·2 (10)	175 (400)				32 (400)	
V9	6·1 (10)	158 (400)					
V10	6·1 (10)		15 (400)	—2 (400)		2 (400)	
V11	6·2 (10)	143 (400)	0·3 (10)	0·3 (10)		0·9 (10)	
V12	6·4 (10)	180 (400)		—35 (400)		—50 (400)	
V13	6·2 (10)		200 (400)				Tuning indicator