ELECTRICAL AND MECHANICAL
ENGINEERING REGULATIONS
(By Command of the Army Council)

TELECOMMUNICATIONS
H 444
Part 1

STATION, RADIO, C42

TECHNICAL HANDBOOK - FIELD REPAIRS

Errata

Note: These Pages 0 and 01, Issue 1, will be filed immediately in front of Page 1, Issue 3, dated 5 Apr 63.

1. The following amendments will be made to the regulation.

2. Page 13, Table 2,

add the following detail after the last item, under 'Preferred instrument - Designation'

Wavemeter, Wattmeter, No 4 (any mark)'

3. Page 22,

(a) Para 70(a), line 3,

Delete: '4.9kc/s'
Insert: '4.5kc/s'

(b) Para 72(a), line 2,

Delete: '60μW'
Insert: '80μW'

EME8c/1046

STATION, RADIO, C42, NO 1

TECHNICAL HANDBOOK - FIELD REPAIRS

Errata

Note: These Pages 02 and 03, Issue 1, will be filed immediately in front of Page 1, Issue 3, dated 5 Apr 63.

The following amendments will be made to the regulation.

4. Page 15

(a) Para 42

Delete all detail
Insert: 'These have been divided into two classes, A and B. Those in Class A are considered essential to prove the serviceability of an equipment and should be carried out each time an equipment is inspected or after repairs. Class B tests are those which need not be carried out on all occasions, but are included to assist in proving the correct operation of an equipment or fault tracing.'

(b) Para 43

Delete all detail
Insert: 'TRC42, No 1 will be associated with specific S.U.V. No 12, Mk 2 or P.S.T. No 1, this combination will be used together and will be sent to workshops together when either/both need workshop attention, finally certain tests enumerated later will be carried out on the combined TRC42 and p.s.t./s.u.v.'

(c) Para 46

Delete all detail
Insert: 'Tests will be carried out using a Supply Unit, vibratory, No 12, Mk 2, 24V or Supply unit, transistorized, No 1. The input voltage shall be varied (with VCR switch on the test box at LOW) until the HT2 voltage is 175 ± 2V, this may need adjustment between receive and transmit conditions. When this voltage has been set the following conditions shall apply:-

(a) The input voltage shall not exceed 24V.

(b) The HT1 voltage (on transmit) shall not be less than 345V.

If these conditions are not met, the supply unit should be thoroughly specification tested and if necessary, a replacement vibrator fitted, relay contacts cleaned etc.'

5. Page 20, para 68(c)

Add new sub-para

'(iv) After (i) to (iii) and any adjustments have been carried out, the link between pin 21 and earth will be removed. With its own power unit, the transmitter power output will be checked at 36,38,46,54 and 60Mc/s, the set being tuned up in the normal manner, at any of the frequencies the power output must exceed 15W except at 36Mc/s where it must exceed 13W. The requirements of para 46 will apply.'

6. Page 22, para 72(b)(ii), after VEHICLE-S.

Add: 'Reduce the BFO output to zero.'

7. Page 38, Table 12, Preparation

(a) Item (d), after 1mA
Insert: 'd.c.'

(b) Item (e)
Delete all detail
Insert: 'Set neutralizing capacitor C39 plates 5/32 in. apart.'

(c) Item (f)
Delete: '*Switch test box to AV08-WANDER.'

(d) Item (g)
Delete entire entry

EME8c/1046

ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS
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TELECOMMUNICATIONS
H 444
Part 1

STATION, RADIO, C42, NO 1

TECHNICAL HANDBOOK - FIELD REPAIRS

Erratum

Note: This Page 04, Issue 1, is to be filed immediately in front of Page 1, Issue 3, dated 5 Apr 63.

The following amendment is to be made to the regulation.

8. Page 20, para 68(a)(i)

Delete all detail

Insert: 'The power delivered into a 70Ω resistive load connected to the aerial plug shall not be less than 15W at any frequency above 38Mc/s and not less than 13W at 36 Mc/s.'

EME8c/1046

Distribution - Class 334. Code No 6

ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS
(By Command of the Defence Council)

TELECOMMUNICATIONS
H 444
Part 1

Erratum

Note: This Page 05, Issue 1, must be filed immediately in front of Page 1, Issue 3, dated 5 Apr 63.

The following amendment must be made to the regulation.

9. Page 11, para 39(f)

Add: 'Replace Key at this point. Disengage film and allow spool to go free. Wind spool B for four complete turns (clockwise viewed from the direction of arrow AA). Insert shaped end of film into spool. Remove Key and check as before.'

T/8c/1046/2MAG

Errata

Note: This Page 06 is to be filed immediately in front of Page 1, Issue 4, dated Jun 74.

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

10. Page 60, para 195:

After (CT 531) delete full stop and add:

'and c.r.o. output of TRE to X2 input'.

T/8c/1046/Tels

STATION, RADIO C42

TECHNICAL HANDBOOK - FIELD REPAIRS

Note: These Pages 1-4a, Issue 4 supersede Pages 1-4, Issue 3 dated 5 Apr 63. The index has been revised throughout.

This EMER must be read in conjunction with Tels H 442 Part 2 which contains figures and tables to which reference is made.

CONTENTS

FIGURES

TABLES

TABLES (Cont)

INTRODUCTION

1. It is recommended that the repair of the radio set shall be carried out in two stages:

a. Diagnose the fault to a sub-unit and replace the faulty unit by a serviceable one. The fault finding chart, Table 4001, will assist in the rapid diagnosis of a fault to a sub-unit.

b. The unserviceable sub-unit should be repaired using the Test kit, sub-units, vehicle radio sets (Tels M 170-179).

2. Sub-units may, however, be tested and repaired/aligned by substitution into a known set of satisfactory performance.

3. In addition, if it is necessary to work on a sub-unit and the required component is not accessible through the cut outs in the tray, the unit may be removed and connections made by means of extension leads.

INSTRUCTIONS FOR DRYING AND SEALING

4. The set should be opened and repaired in the driest possible conditions.

5. On receipt for repair the set should be pressurised to 10 lbf/in^2 above atmosphere pressure using the Apparatus, seal testing, and a dip test carried out in a water tank to check the need for the replacement of any leaky spindle seals, gaskets, etc, or pin holes in the castings. As the leak specification for this set is 27 cm^3/h, this inspection should be carried out thoroughly with the set immersed for at least five minutes. The addition of a small quantity of wetting agent to the water is recommended.

6. The set should be opened and all obvious mechanical repairs, component replacements and mechanical adjustments carried out.

7. The set (removed from case) shall then be placed in the Oven, Drying, Tels and dried for at least 1 hour at 50°C with the dry air from the pump unit passing through the oven (Tels M 602 gives full details of Oven, Drying Tels).

8. After cooling, the set should be electrically tested and any necessary realignment or repairs carried out.

9. As soon as possible after alignment, the set should be fitted with a silica gel (green canister) desiccator and resealed into its case. (The desiccator should be reactivated by drying in an oven at 140°C for two hours before fitting). The gasket should be smeared with Silicone grease (H1/6850-99-942-3548).

10. Dry air from the Oven, Drying, Tels shall now be passed through the set for 15 minutes.

11. The set should now be disconnected from the Oven, Drying, Tels and one hole fitted with a blanking plug, the other hole should be used for connecting the Apparatus, seal testing.

12. The set should be pressurised to 10 lbf/in^2 using the Apparatus, seal testing, dry air from the Oven, drying, being used to pressurise the set.

13. After a period of 33 hours, the pressure shall not have reduced to less than 4 lb. (after carrying out temperature correction as laid down in Tels M 631). That is, the set has a time constant of 150 hours.

14. Finally, fit the other seal plug and check operation of the set.

MECHANICAL REPAIRS AND REPLACEMENTS

General precautions

15. Do not interfere with the setting of the 100kc/s crystal trimmer C22.

16. Do not remove the 100kc/s crystal unless it is suspected of being faulty. The replacement and readjustment of the 100kc/s crystal and C22 can only be carried out in workshops having a Calibrator, crystal, set; Wavemeter standard No 2; or instrument of similar accuracy (1 part in 10^6).

17. Do not separate the 1st local oscillator unit from film scale drive unit, or loosen the coupling between these two units, unless it is absolutely necessary.

18. Before opening the tray containing the r.f. unit, turn RF dial to DATUM and unplug the c.r.o. lead from SKT5. Similarly, before closing this tray, re-insert PL5 in SKT5 and ensure that the dial and law corrector fork are in their correct positions.

19. The position of the wiring on the r.f. sub-unit is critical, it should therefore not be interfered with and similar gauge and routing must be used if any leads or components are replaced.

To remove heavy duty collet type knob (Fig 4001)

20. (a) Unscrew cap (4) and washer (15).

(b) Remove knob (11).

(c) Unscrew nut (6).

(d) Gently tap collet (1) towards panel, until loose on component spindle.

(e) Remove collet (1), washer (3) and body (2).

(f) Unscrew securing nut (7) or (10) according to size.

(g) The component may now be removed.

To remove film scale unit from front panel

21. (a) Remove three handles, LOCK, CHANNEL and CURSOR ADJUSTER. Details of the collet type handles are given in para 20.

(b) Undo the two No 2BA Nylock nuts at the upper end of the unit.

(c) Remove the three nuts which secure the spindle bosses to the front panel.

(d) Carefully withdraw unit, having first swung both trays out.

(e) Note that if the 1st local oscillator unit is still attached remove SKT6 and PL5.

To remove r.f. drive unit from front panel

22. (a) Remove two handles RF and LOCK.

(b) Rotate RF drive to DATUM and engage catch in fork, swing RF tray clear.

(c) Undo two No 2BA Nylock nuts at upper end of unit.

(d) Remove the two spindle boss securing nuts.

(e) Carefully remove unit.

To remove 1st local oscillator unit

23. The 1st local oscillator unit should not be detached from the film scale unit unless absolutely necessary. If it should prove necessary, proceed as follows:-

(a) Remove SKT6 and PL5.

(b) Turn film scale to 60Mc/s mark.

(c) Remove three securing screws and carefully withdraw unit. Note position of fork arm, do NOT rotate spindle unless absolutely necessary.

(d) If the inductuner is rotated or is replaced, an approximate resetting can be obtained as follows:-

(i) Rotate inductuner clockwise until the ball bearing click is heard.

(ii) Rotate inductuner approximately 1.1/2 turns anticlockwise.

(e) Final resetting of inductuner to film scale is described under Electrical adjustments, para 122.

To remove sub-units from wiring trays

24. The appropriate wiring tray should be swung out from its hinge; to do this loosen the four No 2BA securing screws at the sides of the tray, noting precautions in para 18.

25. Connections between sub-units are made via soldering links as shown in Fig 1. To remove any sub-unit from the wiring tray, proceed as follows:-

(a) Heat the soldered joint A, Fig 1.

(b) Withdraw the link B by moving in direction of arrow.

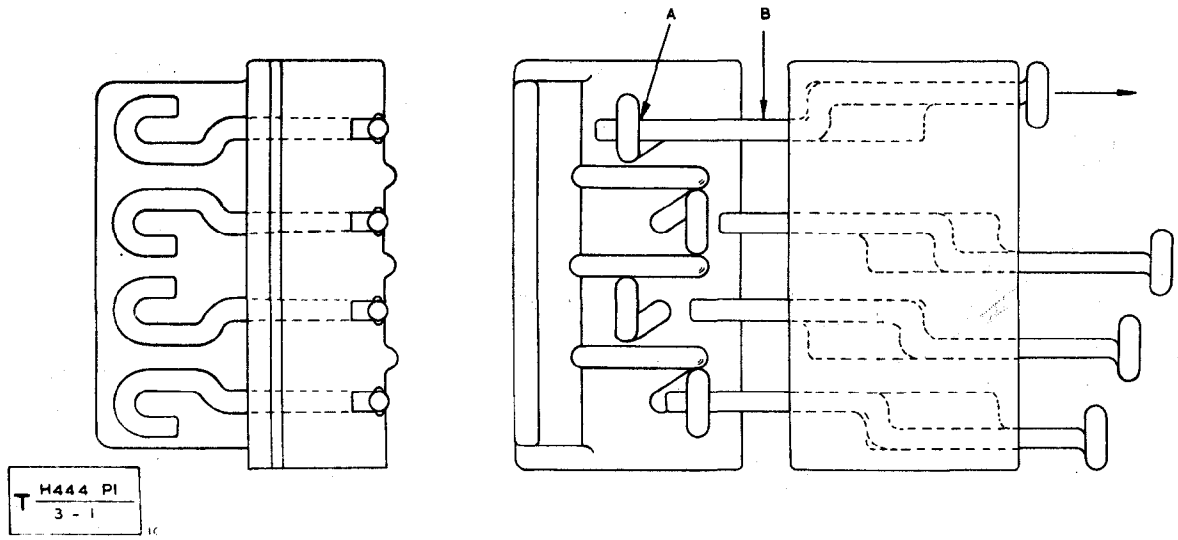


Fig 1 - Sub-unit connectors

(c) Carry out any special tasks detailed in Table 1.

(d) After all links enumerated in Table 1 have been unsoldered and withdrawn, unscrew the unit securing screws and carefully withdraw the sub-unit. The unit securing screws are those with polished chromium No 4BA cheeseheads.

Sub-unit	Soldering links	No of securing screws	Special tasks
R.F.	A1-8, B9-16	6	Remove SKT7 from PL7 Turn RF drive to DATUM
1st I.F.	E1-8, F9-11	3	Remove SKT4 from PL4
2nd I.F.	H1-4, J5-7	4	Remove SKT3 from PL3
A.F.	L1-8, M9-16	4	-
Squelch	N1-6, P7-12	4	-
A.M.C.	S1-4, T5-8	4	-
I.C.	Q1-6, G7-9	2	-

Table 1 - Sub-unit removal detail

To replace riveted-in components

26. Eyelets have been used to fix certain components, notably valveholders in the set. If these components have to be replaced, it will be necessary to drill out the existing rivets.

27. The new components may be replaced using 'pop' rivets and the 'Pop' riveting tool (Cat No F1/FA 18320, Tools, pop riveting, Tucker type AML 8995/10).

28. The correct rivets to use are:-

(a) P.A. valveholder - G1/5320-99-941-7229, Rivets, blind, steel, monel metal, domed head, 5/32 in. dia., 0.19 in. long.

(b) All other positions - G1/5320-99-941-7224, Rivets, blind, steel, monel metal, domed head, 1/8 in. dia., 0.19 in. long.

To remove front panel

29. (a) Unsolder connections to A bracket terminal strips.

(b) Release cable cleats on A brackets.

(c) Unsolder coaxial lead to aerial plug PL8.

(d) Remove four tamperproof covers from No OBA Allen screws on front panel.

(e) Unscrew four No OBA Allen screws and remove front panel.

Repairs to ventilator

30. These should be carried out in conformity with Tels J 234.

Repainting

31. Any repainting should be done in conformity with Tels A 760.

32. Care should be taken if chemical depainters are used, as the case and front panel are made of aluminium alloy, which is liable to attack by certain depainting agents.

33. In addition, the case and front panel are either varnished or impregnated to render them non-porous.

To open i.f. cans (Fig 2)

34. (a) Unsolder wires from spills.

(b) Remove securing screws.

(c) Carefully bend can lugs back level with sides of can.

(d) Remove coil former.

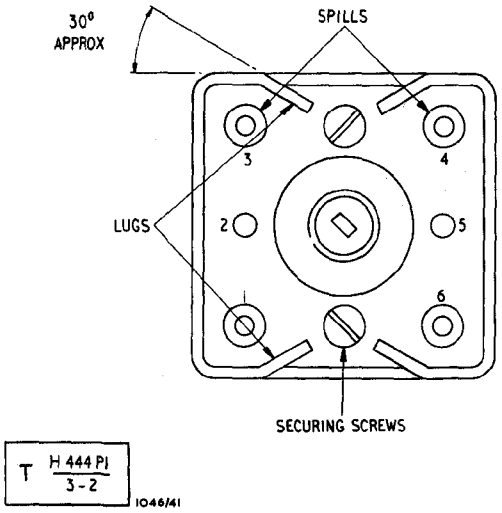


Fig 2 - I.F. can base

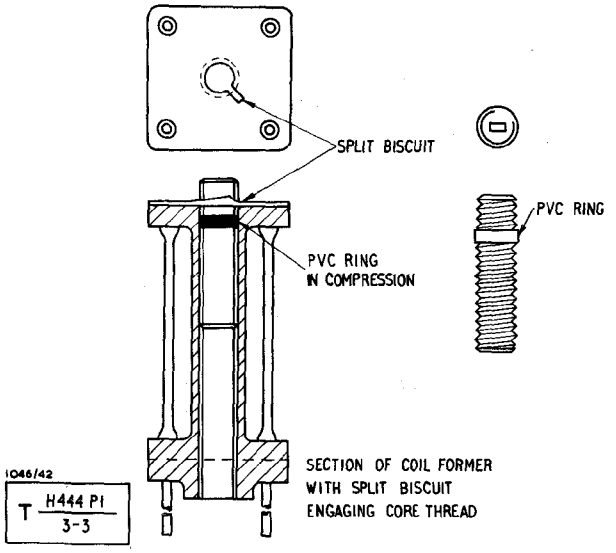


Fig 3 - Coil slug fixing

To open discriminator cans

35. (a) Proceed as described in para 34(a) to (d).

(b) Details of diode wiring are given in Tels H 442 Part 2.

Fixing of coil slugs (Fig 3)

36. The slugs in the i.f. and discriminator coils are secured by:-

(a) A split 'biscuit' on top of coil former.

(b) A P.V.C. ring fitted in groove of slug.

37. No other form of fixing is necessary and on no account should locking paints, pastes, varnishes, etc. be used on any of the slugs or trimmers in the set with the exception of C22, the 100kc/s crystal trimmer, which should be secured with locking paint.

Repairs to Mk 4B plug and socket

38. Details of these are given in Tels A 462.

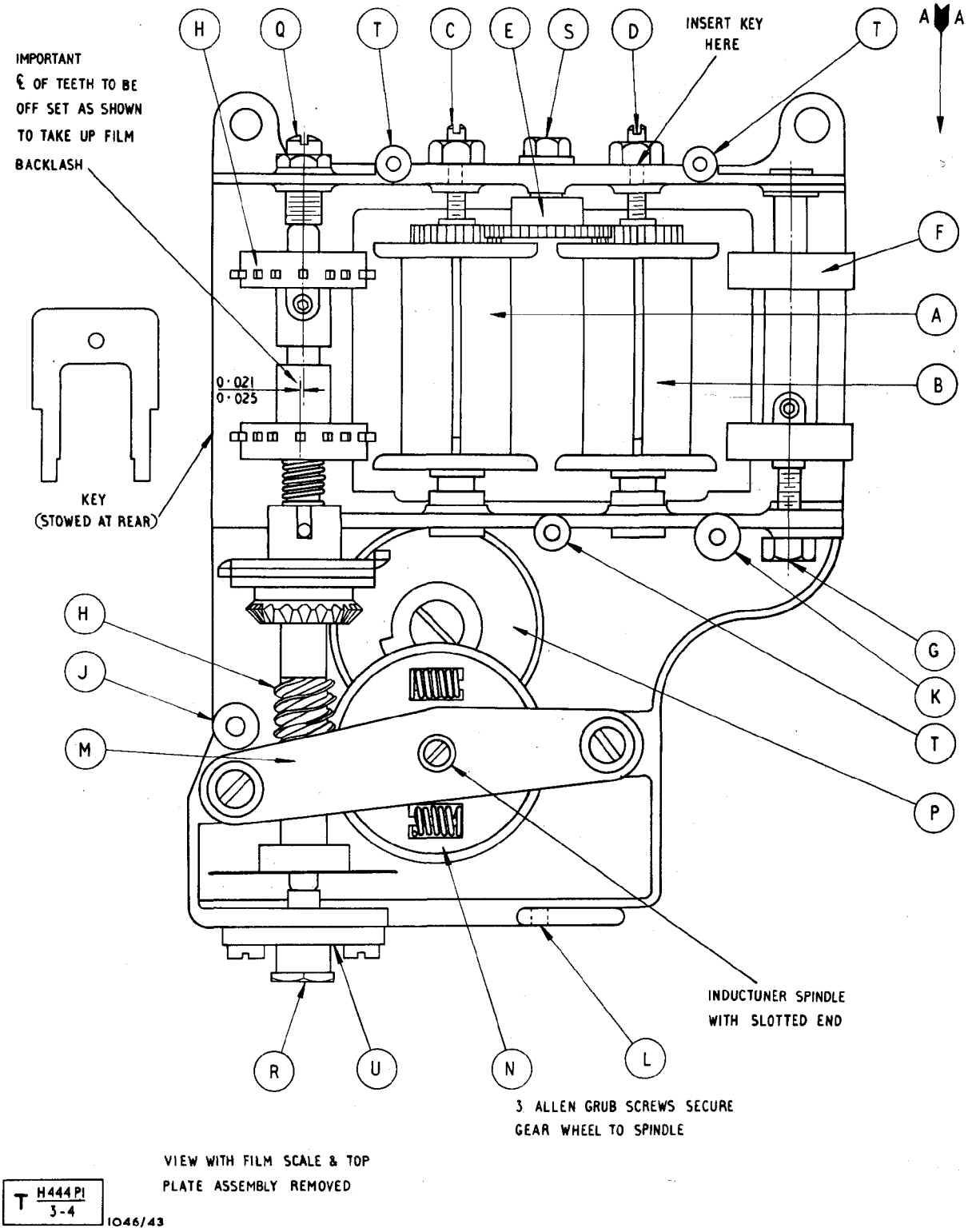


Fig 4 - Film scale assembly

Method of fitting a film scale (Fig 4)

39. (a) Roll the film to be inserted such that the higher frequency end is on the outside.

(b) Rotate tuning spindle in a clockwise direction until set against stop.

(c) Turn unit face downwards, enter film between idler sprocket F and frame with calibration uppermost, fit shaped end of film into spool B. Wind film completely on to the spool, rotating the spool by hand in an anticlockwise direction viewed in direction of arrow AA.

(d) Insert key through frame into gear of spool B. Thread film over the idler sprocket F, between the scale plate and pointer, round driving sprocket H, between sprocket H and frame until end calibration mark is central in scale plate. Fold end back and secure to frame by means of a Bulldog or large crocodile clip.

(e) Wind spool A for four complete turns (anticlockwise viewed from direction of arrow AA). Release clip and insert shaped end of film into spool A, release spool A carefully and film will wind itself on, check that film is fitting correctly on sprockets.

(f) Remove key and check that the film does not become detached from spool B when tuning spindle is turned fully anticlockwise to the end stop.

(g) Check cal 'Replace Key at this point. Disengage film and allow spool to go free. Wind spool B for four complete turns (clockwise viewed from the direction of arrow AA). Insert shaped end of film into spool. Remove Key and check as before.'

Method of dismantli

40. (a) Remove film by winding the film on to spool B and release shaped end from spool A, do not let spool A unwind violently. Remove film from spool B by unwinding.

(b) Remove top plate assembly by undoing the three No 4BA cheesehead screws in positions J, K and L.

(c) Remove wormwheel bearing plate M by undoing the two No 4BA cheesehead screws, remove wormwheel N by loosening the three Allen-headed grub screws.

(d) Remove stop gear P by undoing the No 2BA nut at rear of casting.

(e) Remove driving sprocket and worm assembly HH by slackening the end bearings QR. Remove idler sprocket by slackening bearing G.

(f) Remove scale plate by undoing the three No 6BA screws at positions TTT.

(g) Remove idler gear E by undoing the No 2BA nut S.

(h) Remove spools A and B by slackening bearings CD respectively.

Method of assembling the film scale unit

41. (a) Assemble spools A and B, adjust bearings C and D to run freely with minimum end play.

(b) Assemble idler gear E, adjust to run freely with minimum backlash.

(c) Assemble idler sprocket and shaft F, adjust bearing G to run freely with minimum end play. Loosen grub screws in sprocket, align sprocket with spools A and B, tighten grub screws.

(d) Assemble driving sprocket and worm assembly HH, leave bearings QR loose (adjust later).

(e) Assemble lock adjust screw, locking bar, spring locking spindle, tuning spindle, pointer, cursor assembly, and cursor drive spindle to top plate.

(f) Assemble top plate to frame by screws J, K and L. Adjust wormshaft HH longitudinally by bearings QR so that the bevel gears run freely with minimum backlash.

(g) Remove top plate assembly. Fit stop gear P, wormsheel N and bearing plate M. Sprag the loose gear of wormsheel N two teeth before meshing with worm. Adjust wormshaft HH laterally so that worm and wormwheel run freely (by adjustment of bearing plate U). Check that stop is working in both directions of rotation and that travel of wormshaft is 30.1/2 turns.

(h) Refit top plate assembly and align the split driving sprocket H with spool A by means of grub screws in the sprocket. (It should be noted that the teeth on the upper and lower halves of the driving sprocket are offset by 0.021-0.025 in., this ensures that the backlash in the film is taken up.)

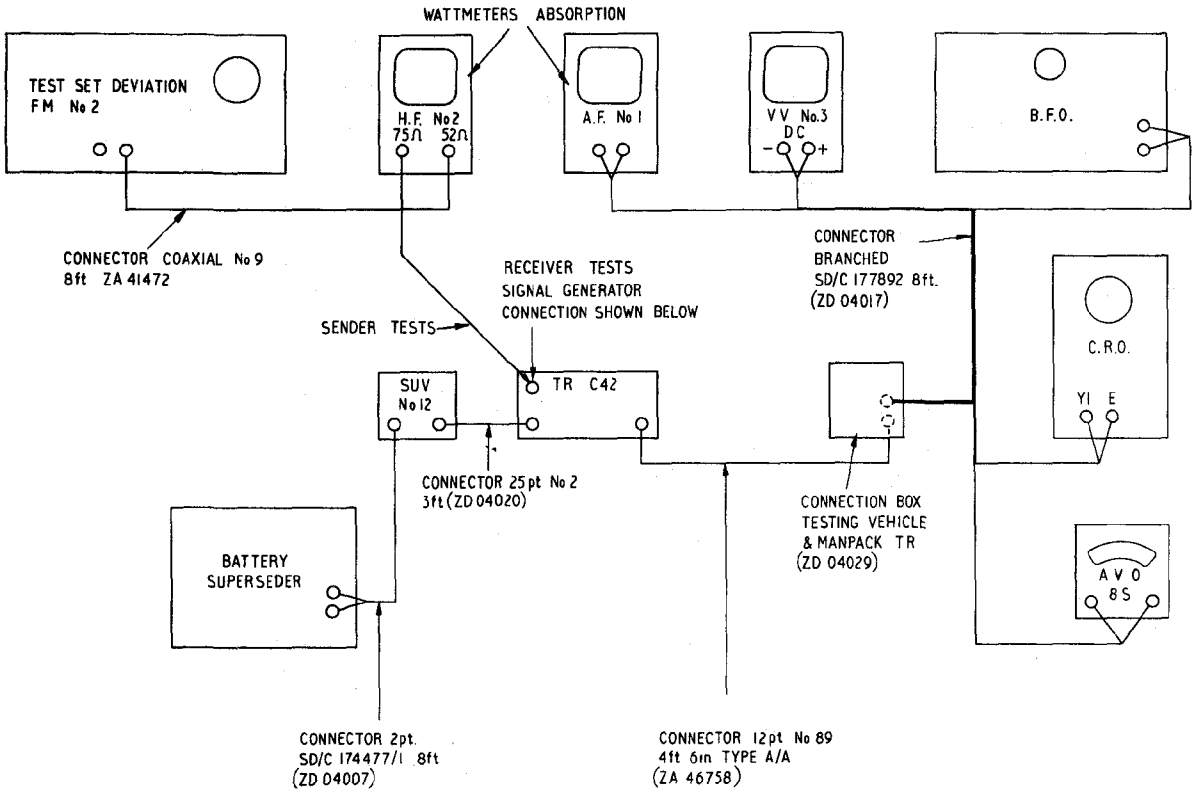
(j) Adjust locking screw for efficient locking action.

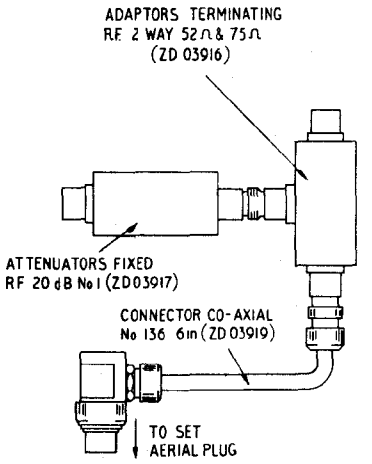
(k) Refit film scale as described in para 39.

Table 2 – Test equipment schedule

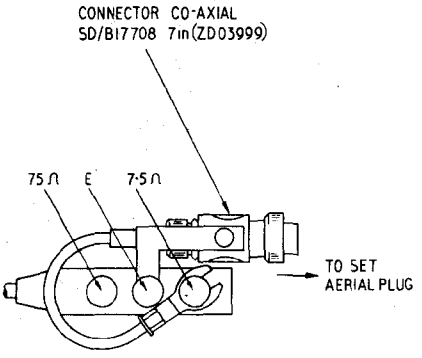
Preferred instrument		Suitable alternative	
Part No	Designation	Part No	Designation
	WAVEMETER NO 4 (ANY MARK)		
ZD 02674	Signal generator No 12	ZD 00391	Signal generator No 1, Mk 3
ZD 04302	Signal generator No 18	WD 3941	Signal generator No 13
NIV	Multi-range testmeter (20,000Ω/V)	ZD 00252	Instrument, testing, Avometer, 8S, 28-range
Z4/6625-99-913-8618	Oscilloscope CT436	Z4/10S/831	Oscilloscope type 13A
ZD 00661	Wattmeter, absorption, a.f., No 1	ZD 0063	Meter, output power, No 3, Mk 2
Z4/6625-99-949-0593	Calibrator, crystal, set	WY 0241	Wavemeter, standard, No 2
	*Test set, type AM913		-
	*Test set, type AM330		-
ZD 00747	Wattmeter, absorption, h.f., No 2		-
ZD 00657	Voltmeter, valve, No 3	ZD 00617	Instrument, testing, electronic, multi-range, No 1
ZD 00198	Oscillator, b.f., No 8	WY 2562	Oscillator, b.f., No 5
ZD 00193	Test set, deviation, f.m., No 2		-
NIV	Frequency meter, r.f., portable (under development) XT437	ZC 1411	Frequency meter SCR 211
Z4/6625-99-942-4825	Ovens, drying, Tels, 240V, a.c.		-
ZD 02172	Tester, valve, CT160	ZD 00286	Tester, valve, Avo, No 3 or No 1, Mk 2
WC 53340	Apparatus, seal testing		-
NIV	Multi-range testmeter (1,000Ω/V)	ZD 00207	Instrument, testing, Avometer, universal, 50-range, No 2
ZD 03985	Kits, testing, vehicle and manpack radio sets		-

*Used in conjunction with Wavemeter, standard, No 2 in base workshops for crystal testing





SIGNAL
GENERATOR No 18



SIGNAL
GENERATOR No 13

T H444 PI 3-5 1046/44

Fig 5 - Test equipment connections

SPECIFICATION TF

'These have been divided into two classes, A and B. Those in Class A are considered essential to prove the serviceability of an equipment and should be carried out each time an equipment is inspected or after repairs. Class B tests are those which need not be carried out on all occasions, but are included to assist in proving the correct operation of

General

42. These have considered essen carried out each

f 'TRC42, No 1 will be associated with specific S.U.V. No 12, Mk 2 or P.S.T. No 1, this combination will be used together and will be sent to workshops together when either/both need workshop attention, finally certain tests enumerated later will be carried out on the combined TRC42 and p.s.t./s.u.v.'

43. Class B tests included to assist

44. It is necessary to use a test box to connect set. A box designed for this purpose is included in 'Kits, testing, vehicle and manpack radio sets'. This box, designated 'Connection boxes, testing, vehicle and manpack radio sets' (ZD 04029), is described in Tels M 152.

45. The testing and alignment instructions included in this handbook are written on the assemption that the Connection box, testing vehicle and manpack radio sets (ZD 04029) is being used; this box will be referred to hereafter in the text as 'test box'.

Test conditions

'Tests will be carried out using a Supply unit, vibratory, No 12, Mk 2, 24V or Supply unit, transistorized, No 1. The input voltage shall be varied (with VCR switch on the test box at LOW) until the HT2 voltage is 175 ± 2V, this may need adjustment between receive and transmit conditions. When this voltage has been set the following conditions shall apply:-

(a) The input voltage shall not exceed 24V.

(b) The HT1 voltage (on transmit) shall not be less than 345V.

If these conditions are not met, the supply unit should be thoroughly specification tested and if necessary, a replacement vibrator fitted, relay contacts cleaned etc.'

46. Tests shall be values unless otherw should be 23V (or 1 p.s.u. shall be ope the test box to VCR

47. The radio set internal crystal ca receiver frequency.

48. The trimmer C22 on the 100kc/s crystal oscillator circuit shall be adjusted such that the frequency of the crystal is within 2c/s of nominal at a temperature of 20°C (see para 126).

49. The r.f. signals shall be obtained from a Signal generator No 18 or 13. The connections to the aerial plug of the set shall be made as shown in Fig 5.

50. The standard test frequencies shall be 38, 46 and 58Mc/s and a carrier level of 4μV shall be used except where otherwise stated.

51. Note that all r.f. input voltages are quoted in terms of the open circuit voltage at the terminating unit, ie panel reading ÷10.

52. The signal generator shall be tuned to the radio set by tuning for minimum noise on the output meter (signal generator at c.w., ie unmodulated).

53. The standard modulation shall be a deviation of 5kc/s and a modulating frequency of 300c/s except where otherwise stated.

54. All i.f. signals shall be obtained from a Signal generator No 12 or No 1 Mk 3. Where necessary, a series resistor to bring the source impedance up to 75Ω shall be used.

55. The receiver shall be operated into a Wattmeter, absorption, a.f. No 1 or Meter, output power No 3 with the impedance set to 50Ω unless otherwise stated. A c.r.o. type CT436 or 13A shall be connected across the output meter/wattmeter so that the waveform can be observed.

56. The receiver internal preset gain control RV1 shall be set, so that when a 46Mc/s modulated r.f. signal 4μV, 15kc/s deviation, 1600c/s modulating frequency is applied to the aerial plug, the output power is 150mW (see para 65).

57. The squelch preset control RV2 shall be set as follows. The radio set shall be tuned to 46Mc/s. The front panel SQUELCH control RV4 shall be set two-thirds of the way round towards its fully clockwise position. The internal preset control RV2 shall then be adjusted slowly until the SIGNAL lamp ILP2 just lights.

58. A Wattmeter, absorption, h.f. No 2 switched to its 70Ω 25W range shall be used as the dummy load when the sender is operated. For measuring the power output on low power, a Voltmeter, valve No 3 or No 2 shall be connected across the wattmeter.

59. For deviation measurements a Test set, deviation, No 2 shall be used. It will be found convenient to connect this to the 50Ω 1W plug of the Wattmeter, h.f. No 2, the stray coupling within the wattmeter providing an adequate input for the deviation meter.

60. The a.m.c. preset control RV3 shall be set up with the sender tuned to 46Mc/s, so that a deviation of 4.5kc/s is obtained when the input to the microphone terminals from a 300Ω source at a frequency of 1000c/s is 10mV. (See para 113-117). This figure and all other microphone input voltages quoted elsewhere is the open circuit voltage obtained from a 300Ω source.

61. The sender shall be operated on high power for all tests except where otherwise stated.

62. The input of the intercomm amplifier shall be obtained from a 300Ω source (para 74). The output shall be measured on a Meter, output power No 3, set to 30Ω. If a Wattmeter, absorption, a.f. No 1 is used, it shall be set on 50Ω with a headset connected in parallel. A c.r.o. type CT436 or 13A shall be connected across the output for waveform observations.

Receiver tests - Class A

Quieting

63. (a) Specification: An input signal of 1.25μV shall produce a reduction in the noise output from the set of at least 10dB.

(b) Method: (i) Connect Signal generator (s.g.) to set (para 49).

(ii) Tune set to 38Mc/s, tune s.g. to set (para 52).

(iii) Connect output meter (50Ω) to set via test box (para 55).

(iv) Switch test box SA to VEHICLE-R.

(v) Switch s.g. to C.W., CARRIER-OFF, and attenuator to 1.25μV x 10μV and note the reading of the output meter (reading 1).

(vi) Switch s.g. to CARRIER-ON and note the reading on the output meter, this should be at least 10dB less than reading 1.

(vii) Repeat (i) to (vi) at 46 and 58Mc/s.

Bandwidth and symmetry

64. (a) Specification: The bandwidth shall be as follows:-

3dB: 58-72kc/s, the difference between the frequencies at which the 3dB points occur either side of nominal shall not exceed 4kc/s.

60dB: 250kc/s max.

(b) Method A (using Signal generator No 13):

(i) Tune set to 38Mc/s, tune s.g. to set, inject signal of 1μV.

(ii) Switch test box SE to AVO SET; switch the Avometer 8 to 50μA range. Note reading of AVO 8.

(iii) Couple frequency meter to 2nd i.f., a convenient point is the -ve lead to the AVO 8. Adjust frequency meter to read 2nd i.f. frequency (approximately 2.4Mc/s). Note this frequency (fo).

(iv) Increase s.g. signal to 1.4μV.

(v) Detune s.g. to a lower frequency until the AVO 8 again reads as in (ii). Adjust frequency meter to read i.f. frequency (2.4 - 33kc/s, approximately). Note this frequency (f_1).

(vi) Repeat (v) at a higher frequency (2.4 + 33kc/s approximately), note this frequency (f_2).

(vii) The 3dB bandwidth is given by $f_2 - f_1$ and should be between 58-72kc/s, the difference between the frequencies (2.4 - f_1) and (f_2 - 2.4) should not exceed 4kc/s.

(viii) Repeat (iii) to (vii) using an input of 1mV, the difference between f_2 and f_1 shall not exceed 250kc/s.

(c) Method B (using Signal generator No 18):

(i) Tune set to 38Mc/s. Tune s.g. to set ensuring that incremental dial is set at zero, inject signal of 1μV.

(ii) Switch test box SE to AVO-SET; switch the Avometer 8 to the 50μA range, note the reading on the Avometer.

(iii) Increase s.g. signal to 1.4μV.

(iv) Rotate the incremental dial to the lower side and note the frequency (f_1) at which the Avometer again reads as in (ii).

(v) Rotate the incremental dial to the higher side and note the frequency (f_2) at which the Avometer again reads as in (ii).

(vi) The 3dB bandwidth is given by $f_1 + f_2$ and should be between 58-72kc/s, the difference between f_1 and f_2 shall not exceed 4kc/s.

(vii) Repeat (iii) to (vi) using an input signal of 1mV, the sum of f_1 and f_2 shall not exceed 250kc/s.

(viii) It may be necessary to check the incremental dial calibration of the signal generator against a frequency meter at regular intervals (weekly).

A.F. output and distortion

65. (a) Specification: A modulated signal shall be applied to the set, the output shall be 150mW ±25mW, with no apparent distortion, (para 56).

(b) Method:

(i) Tune set to 46Mc/s, tune s.g. to set, inject signal of 4μV, 15kc/s deviation and 1600c/s modulating frequency.

(ii) Switch test box SA to VEHICLE-R and SB to HANDSETS-OFF, ensuring output meter/wattmeter is set to 50Ω impedance.

(iii) Output on meter should be 150mW ±25mW.

(iv) There should be no visible distortion on the c.r.o.

Hum and microphony

66. (a) Specification: When an unmodulated signal with a level exceeding 10μV is applied to the radio set, the hum and noise output shall not exceed 20μW.

(b) Method:

(i) Tune set to 46Mc/s.

(ii) Switch set control switch to CHANNEL ADJ (the 100kc/s crystal will conveniently provide the input signal).

(iii) Switch test box SA to VEHICLE-R and SB to HANDSETS-OFF, ensuring output meter/wattmeter is set to 150Ω impedance.

(iv) The meter should read less than 20μW. Give the set a sharp blow with the hand, the meter shall quickly restore to less than 20μW.

Squelch

67. (a) Specification: Signal/noise ratio to operate SIGNAL lamp:-

(i) RV4 at cut-out point - 5dB.

(ii) RV4 fully anticlockwise - 10dB.

(b) Method:

(i) Put NOISE switch to ON.

(ii) Adjust set to 46Mc/s, tune s.g. to set.

(iii) Switch test box SA to VEHICLE-R, SB to HANDSETS-OFF.

(iv) Switch s.g. to CARRIER-OFF, attenuator to minimum.

(v) Adjust SQUELCH control RV4 so that the SIGNAL lamp ILP2 is just extinguished.

(vi) Note noise output on output meter (dBs).

(vii) Switch s.g. to CARRIER-ON, S.W. and slowly increase signal level until the SIGNAL lamp lights.

(viii) Note output meter reading, this shall not decrease more than 5dB from reading (vi).

(ix) Turn RV4 fully anticlockwise.

(x) Repeat (vii) and (viii), the output shall now be more than 10dB below reading (vi).

Sender tests - Class A

High power output

68. (a) Specification: (i) 'The power delivered into a 70Ω re
the aerial plug shall not be less
above 38Mc/s and not less than 1

(ii) When the p.a. output is 15W the current taken by the p.a. stage from the 350V supply shall not exceed 130mA; when the power output is 22W the current shall not exceed 150mA. For power outputs other than these two values. See Table 3 for permissible currents.

(b) Method A (set sealed in case): (i) Connect Wattmeter, h.f. No 2, switched to 70Ω 25W range, to aerial plug of set.

(ii) Tune set to 38Mc/s, switched to HIGH POWER.

(iii) Switch test box SA to VEHICLE-S. The 350V current can be measured by connecting a Connection box, testing, p.s.u. (ZD 04025) between the set and p.s.u. and switch SD (p.s.u. test box) to HT1. The voltage now read on an Avo connected to the p.s.u. test box AVO terminals will now indicate the 350V line current (A) x 10.

(iv) Note the r.f. power output and the voltage on the p.s.u. test box AVO. The power should exceed 15W and the voltage should be less than that quoted in Table 3.

(v) Repeat (ii) to (iv) at 46 and 58Mc/s.

(c) Method B (set removed from case): (i) Connect Wattmeter, h.f. No 2, switched to 70Ω 25W range, to aerial plug of set.

(ii) Switch test box SA to VEHICLE-S. Connect a shorting link between A bracket terminal 21 and chassis, this removes the a.f.c. from the modulator valve V5.

(iii) Tune r.f. scale slowly from 36 to 60Mc/s noting r.f. output and 350V line current. The output should exceed 15W at all frequencies and the current should conform to Table 3.

'(iv) After (i) to (iii) and any adjustments have been carried out, the link between pin 21 and earth will be removed. With its own power unit, the transmitter power output will be checked at 36,38,46,54 and 60Mc/s, the set being tuned up in the normal manner, at any of the frequencies the power output must exceed 15W except at 36Mc/s where it must exeeed 13W. The requirements of para 46 will apply.'

R.F. power (W)	Maximum 350V line current mA	Voltage measured on p.s.u. test box Avo
15	130	1.30
15.5	131.5	1.31
16	133	1.33
16.5	134.5	1.34
17	135.5	1.35
17.5	137	1.37
18	138.5	1.38
18.5	140	1.40
19	141.5	1.42
19.5	143	1.43
20	144.5	1.45
20.5	145.5	1.46
21	147	1.47
21.5	148.5	1.49
22	150	1.50
22.5	151.5	1.52
23	153	1.53
23.5	154.5	1.55
24	155.5	1.56
24.5	157	1.57
25	158.5	1.59
25.5	160	1.60

Table 3 - High power outputs

Low power output

69. (a) Specification: The voltage across a 70Ω resistive load connected to the aerial plug at any frequency shall be between 4 and 7.2V when the sender is on low power.

(b) Method A or B:

(i) Proceed as detailed for high power except:-

(1) Switch set to low power.

(2) Ignore 350V line current.

(3) Connect Wattmeter, h.f. No 2 1W 50Ω plug to aerial plug of set. Switch wattmeter to 1W range.

(ii) Note reading on wattmeter, this should be approximately in the range 0.2-0.8W.

(iii) At conclusion of test, remove shorting link from terminal 21.

Deviation

70. (a) Specification: With the sender tuned to 46Mc/s, the deviation obtained with an input of 10mV to the microphone terminals at a frequency of 1000c/s should be 4.5kc/s ±0.5kc/s.

(b) Method:

(i) Tune set to 46Mc/s, with no input to microphone circuit, set up deviation meter (para 59 and Tels Z 831).

(ii) Set BFO output to 10V, frequency 1000c/s and test box SD to ÷1000 and SA to VEHICLE-S.

(iii) Measure deviation frequency, this should be 4.5kc/s ±0.5kc/s.

A.M.C. check

71. (a) Specification: After deviation test, increase the input voltage to 200mV, the deviation shall not increase to more than 6kc/s.

(b) Method:

(i) Proceed as in para 70(b)(i) to (iii) but set BFO to 20V and test box SD to ÷100.

(ii) The deviation frequency shall not exceed 6kc/s.

Hum and microphony

72. (a) Specification: The output from the receiver (sidetone) shall not exceed 60µW when the sender is operating with no a.f. input.

(b) Method:

(i) Tune set to 46Mc/s on high power.

(ii) Switch test box SD to WANDER and SA to VEHICLE-S. Reduce the B.F.O. output to zero.

(iii) Set output meter/wattmeter to 150Ω.

(iv) Note output recorded on output meter, this should be less than 60µW.

(v) Note that all sub-unit and tray fastening bolts must be well tightened when carrying out this test.

A.F.C. check

73. (a) Specification: The capture range shall be at least 400kc/s at 58Mc/s and 250kc/s at 38Mc/s. The m.o. frequency shall be corrected to less than 10kc/s at 58Mc/s and 7kc/s at 38Mc/s.

(b) Method:

(i) Set test box SA to VEHICLE-S.

(ii) Tune the radio set to 58Mc/s, couple a frequency meter loosely to the 2nd i.f. (see para 64 (iii)),

and note the frequency (f_1). Lock the RF tuning knob.

(iii) Retune the CHANNEL tuning knob to 58.4Mc/s.

(iv) Set test box SA to VEHICLE-R and then back to VEHICLE-S.

(v) Measure 2nd i.f. frequency on frequency meter (f_2), this frequency shall be less than f_1, by not more than 10kc/s.

(vi) Repeat (iii) to (v) at 57.6Mc/s, the i.f. frequency shall not exceed f_1 by more than 10kc/s.

(vii) Repeat (i) to (vi) with set tuned to 38Mc/s and with CHANNEL retuned to 38.25 and 37.75Mc/s, the i.f. shall not change by more than ±7kc/s respectively.

Intercomm amplifier tests - Class A

Gain and output

74. (a) Specification: The input voltage at 1000c/s which is required in order to produce an output power of 250mW shall be between 40 and 100mV.

(b) Method:

(i) Switch test box SD to ÷100, and SA to VEHICLE-IC. Set output meter/wattmeter to 50Ω impedance (para 62). Switch test box SB to HEADSETS VEHICLE PH and ensure a handset is connected. Switch p.s.u. to I.C. ON. This produces an impedance of approximately 30Ω.

(ii) Set BFO to 1000c/s and adjust output voltage to produce an output reading of 175mW on the output meter/wattmeter. The BFO output voltage should be between 4-10V. This takes into account the power dissipated in the earpiece.

Intercomm call

75. (a) Specification: The input and output of the amplifier shall be coupled together via a 0.5μF capacitor. There shall be an a.f. output from the amplifier of at least 200mW into a 30Ω load at a frequency of between 500c/s and 2000c/s.

(b) Method:

(i) Connect test harness and output meter/wattmeter as in para 74.

(ii) Operate test box SG to CALL, the output meter should show an output of at least 150mW and the note heard in the handset should be checked aurally to be within 500-2000c/s.

Functional check - Class A

76. (a) Specification: To ensure that NOISE ON/OFF switch, SEND/RECEIVE relay contacts RLC1 and RLC4, squelch relay contact RLD1 and homing sockets SK2E and SK2L are functioning correctly.

(b) Method:

(i) Tune set to 46Mc/s, with test box SA switched to VEHICLE-R. Increase squelch control until signal lamp lights, NOISE switch to OFF.

(ii) Under these conditions the BATTERY lamp ILP1, the HT lamp ILP2 and the REBRO lamp ILP3 on the test box should light.

(iii) The carrying out of any ONE of the following operations shall cause ILP3 to extinguish:-

(1) Rotate squelch control anticlockwise until signal lamp extinguishes.

(2) Operate NOISE switch to ON.

(3) Switch test box from VEHICLE-R to VEHICLE-S, this should also cause the HT lamp ILP2 and the BATTERY lamp ILP1 to go out.

Receiver tests - Class B

Second local oscillator harmonics

77. The 5th, 6th and 7th harmonics of the 8.4Mc/s crystal oscillator V13b occur at 42, 50.4 and 58.8Mc/s respectively, and when the receiver is tuned to these frequencies it may be found that its performance is slightly degraded.

78. When a modulated signal (para 53) is applied to the radio set at any of these frequencies, the input required for a 10dB signal/noise ratio shall not exceed by more than 2dB that required when the radio set and s.g. are retuned to the channel frequency 100kc/s above. Modification H 447 No 9 must be carried out before this test can be carried out.

Second channel rejection

79. With the radio set tuned to 58Mc/s, the limiter grid current produced by a 1μV unmodulated signal from a s.g. tuned to the radio set shall be noted. The s.g. shall then be retuned to a frequency of 70Mc/s and the input level increased until the same value of limiter grid current is obtained. This input level should not be less than 3.16mV.

I.F. rejection

80. With the radio set tuned to 58Mc/s, the limiter grid current produced by a 1μV unmodulated signal from a s.g. tuned to the radio set shall be noted (reading 1).

81. A s.g. tuned to 6Mc/s shall now be used to inject an unmodulated signal to the set, the input level required to produce a limiter grid current equal to reading 1 shall be not less than 10mV.

82. The test in para 81 shall be repeated at a frequency of 2.4Mc/s. The input signal shall be not less than 10mV.

Limiting

83. A 46Mc/s modulated signal (para 53) shall be applied to the set tuned to 46Mc/s and the carrier level varied between 2μV and 100mV. The a.f. power output shall not vary by more than ±1dB.

Audio frequency response

84. With radio set and s.g. tuned to 46Mc/s, a 4μV signal, modulated at 5kc/s deviation and frequencies shown below shall be applied to the aerial plug. The a.f. output power shall be within ±2dB of the figures quoted in Table 4 relative to the power output at 300c/s.

f	300c/s	100c/s	600c/s	1kc/s	2kc/s	4kc/s
level	0dB (ref. level)	-2dB	-2dB	-5dB	-10dB	-14dB

Table 4 - A.F. frequency response

Audio frequency linearity

85. With radio set and s.g. tuned to 46Mc/s, a 4μV signal modulated 1600c/s shall be applied to the radio set and the deviation varied as in Table 5 below. The a.f. output power relative to that at 8kc/s deviation shall be within the limits stated.

Deviation f	4kc/s	8kc/s	16kc/s
A.F. output	-6dB ±2dB	0dB	+6dB ±2dB

Table 5 - A.F. linearity

Audio frequency output regulation

86. With radio set and s.g. tuned to 46Mc/s, a modulated signal with 15kc/s deviation and 1600c/s modulating frequency should be applied to the set. The a.f. output power should be adjusted to 150mW (para 56). The impedance of the output meter/wattmeter should now be altered from 50Ω to 150Ω and the output should now be less than 90mW.

Muting

87. Put panel SQUELCH control RV4 fully anticlockwise. Apply a modulated signal (para 53) and adjust the signal level until the signal lamp ILP2 is extinguished. The a.f. output from the set with the NOISE switch SC at OFF shall be at least 40dB less than the output with SC at ON.

Frequency stability of first local oscillator with change of supply volts

88. With the set tuned to 58Mc/s, a change of input volts to the p.s.u. of ±10% shall not cause the oscillator V31 to change by more than 7kc/s.

Accuracy of calibration of film scale

89. The accuracy of the scale shall be such that when the receiver local oscillator has been tuned in accurately to any of the harmonics of the 1 or 2Mc/s crystal calibrator within the tuning range, it shall be possible to adjust the position of the cursor to make the scale read correctly.

90. When the scale has been corrected by cursor adjustment at a frequency (f_o) which is an exact multiple of 1 or 2Mc/s, then at any point within the frequency range f_o ±1Mc/s the scale shall be correct to within ±30kc/s.

Sender tests - Class B

A.F. frequency response

91. Remove V28 to disable the a.m.c. circuit. When the sender is tuned to 46Mc/s, the a.f. input required relative to that at 1kc/s to produce a deviation of 15kc/s at the modulation frequencies in Table 6 below shall be as stated.

100c/s	300c/s	600c/s	1kc/s	2kc/s	4kc/s	10kc/s
Not less than 28dB	17 ±3dB	7 ±3dB	0dB (ref. level)	-9 ±3dB	-14 ±4dB	Not less than 6.5dB relative to level at 4kc/s

Table 6 - Sender a.f. response

Deviation, variation with carrier frequency

92. When the sender is tuned to 58Mc/s the deviation produced by an input of 10mV at a frequency of 2000c/s shall exceed the deviation produced by the same input with the sender tuned to 38Mc/s by not more than 1kc/s.

Frequency stability of sender oscillator with change of supply voltage

93. For this test, the a.f.c. circuit shall be inoperative, do this by switching to the TUNE RF position of SA on the set. The change is oscillator (V6) frequency resulting from a change of ±10% in the input voltage to the p.s.u. shall not exceed 150kc/s.

Accuracy of calibration of r.f. scale

94. The accuracy of this scale shall be such that at any point in the tuning range the frequency of the sender oscillator shall be within ±1Mc/s of the frequency indicated on the scale.

Intercomm amplifier tests - Class B

Frequency response

95. The a.f. input required to produce an output of 100mW at frequencies shown in Table 7 shall be as stated.

100c/s	300c/s	600c/s	1kc/s	2kc/s	4kc/s	10kc/s	20kc/s
Greater than +1dB	-2 to 0dB	-2 to 0dB	0dB (ref. level)	+2 to +4dB	+6 to +8dB	Greater than +15dB	Greater than +25dB

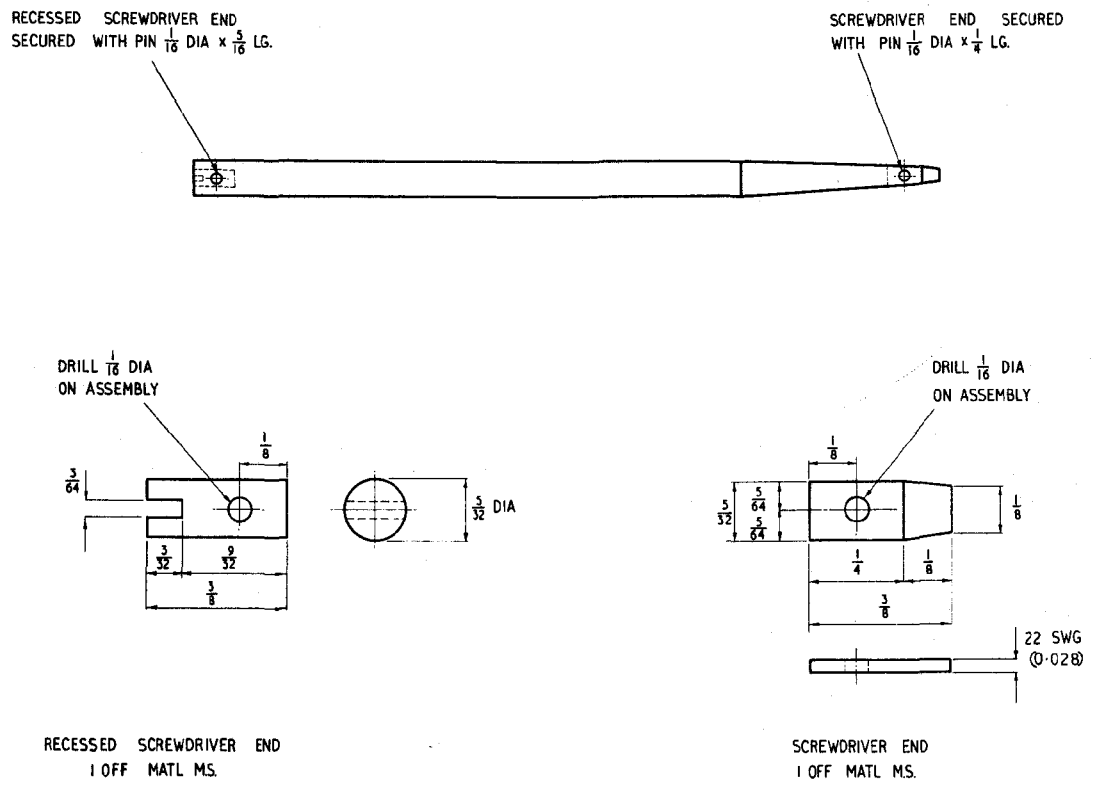
Table 7 - Intercomm amplifier frequency response

Distortion of output

96. An input at 400c/s shall be applied to the amplifier and the input level adjusted to give an output of 250mW. The total harmonic distortion shall be measured and shall be less than 10%.

Output regulation

97. The input voltage at 1000c/s shall be adjusted so that an output power of 250mW into a 30Ω output meter is obtained (see para 74). The impedance of the output meter shall be changed to 150Ω and the headset switched off. The output power shall now be less than 90mW.



TRIMMING TOOL

TEST WAND

T H 444 PI 3-6 1046/45

Fig 6 - Trimming tools

ELECTRICAL ADJUSTMENTS AND ALIGNMENT

General

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

(a) 1st i.f.

(b) 2nd i.f.

(c) A.F. discriminator

(d) A.F.C. discriminator

(e) Sender r.f.

(f) Receiver r.f.

(g) A.F. unit

(h) A.M.C. unit

(j) Squelch unit

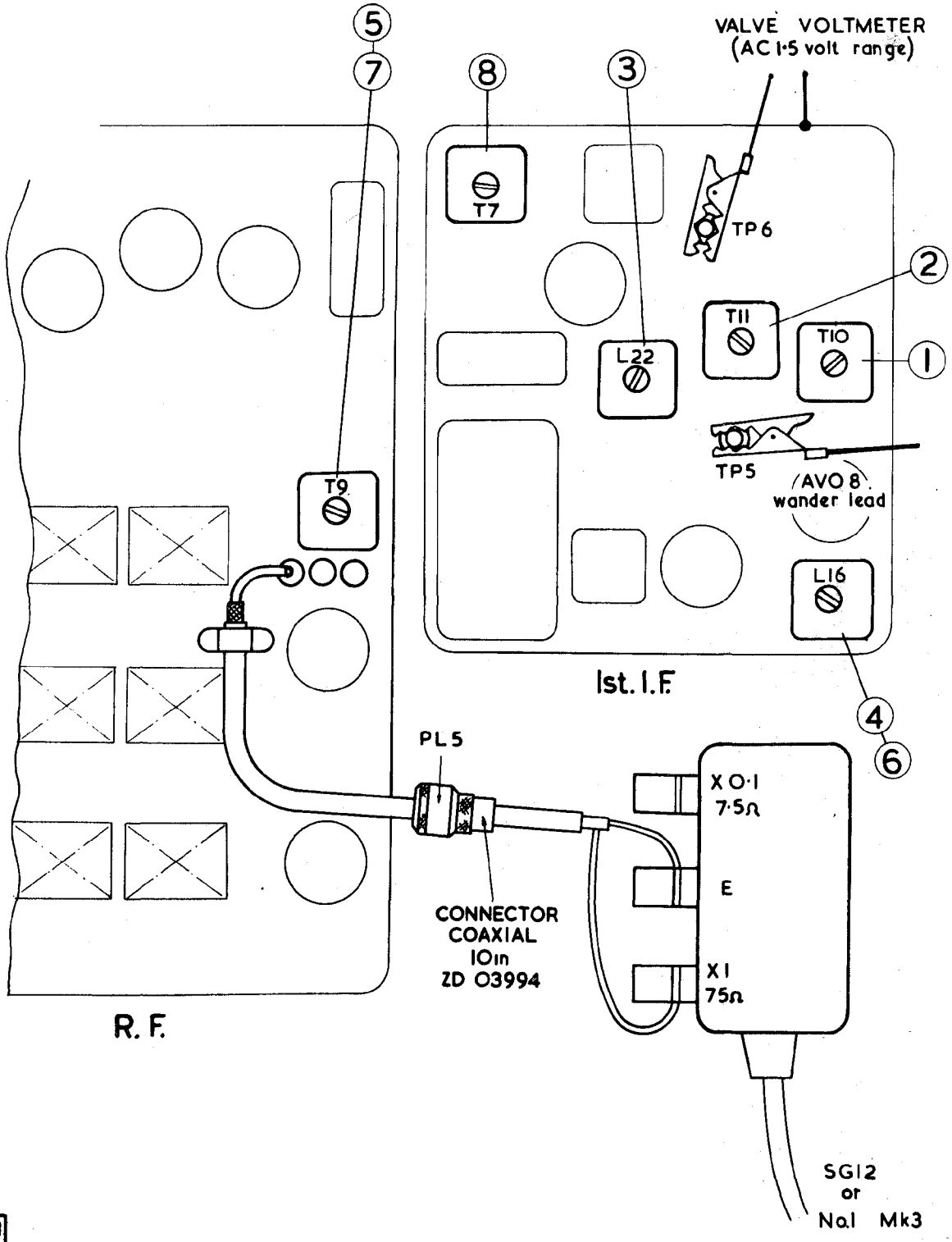
99. As the i.f. strips contain a number of overcoupled pairs, it is essential that the alignment be carried out as described in the schedules.

100. Details of necessary trimming tools will be found in Fig 6. These are to be provided in the Holdalls, tool, telecommunications repair and alignment.

101. When carrying out i.f. alignment it is important to check the setting of the 6.0Mc/s point of the s.g. against a crystal reference (in-built calibrator in Signal generator No 12) each time that the s.g. is reset to 6.0Mc/s.

102. No securing pastes, varnishes or paints should be used on the cores or trimmers (para 37). The crystal trimmer C22 should be secured with Compound sealing, nitro-cellulose (Y3/WB 3621).

103. Trimming should be carried out very carefully as there appears to be a slight time lag between movement of the trimmer/slug and the Avometer 8 reaching its final position, hence it is easy to slightly 'overshoot' the correct trimming point.



T H444P1 3-7 1046/46

Fig 7 - Trimming diagram, 1st i.f.

Table 8 - Alignment schedule, 1st i.f.

Preparation

(a) Connect Signal generator as shown in Fig 7.
(b) Connect AVO 8 wander lead to TP5.
(c) Switch test box SA to VEHICLE-R, WANDER.
(d) Switch AVO 8 to 50μA range.
(e) Connect valve voltmeter to TP6 and chassis (Operation 8 only)

Operation No	Trimming point	Signal generator f Mc/s	Signal generator Output	Action
	T10 T11 L22 L16 T9			Screw slug IN until flush with can Screw slug OUT for 3/4 of length Screw slug OUT for 3/4 of length Screw slug OUT for 3/4 of length Screw slug IN until flush with can
		6.00		Increase level until AVO 8 reads 15-25μA. Check that s.g. signal is producing Ig by switching s.g. carrier off and noting that Ig reduces
1	T10	6.00	*	Trim for MAX current. Do these operations carefully and ONCE only. Do not repeat
2	T11	6.00	*	Trim for MIN current
3	L22	6.00	*	Trim for MAX current
4	L16	6.10	*	Trim for MAX current
5	T9	5.90	*	Trim for MAX current
6	L16	6.10	*	Trim for MAX current
7	T9	5.90	*	Trim for MAX current
		6.00	about 40-60mV	Adjust s.g. level to give 25μA
	3dB bandwidth check			Increase s.g. input level by 3dB and note frequencies on either side of 6.00Mc/s at which AVO 8 reads 25μA. Ensure that the two humps are reasonably symmetrical in both displacement from 6.00Mc/s and amplitude. The bandwidth should be of the order of 290-320kc/s.
8	T7	Not required		Trim for MAX on valve voltmeter and then screw slug 2.1/2 turns further in

*Adjust s.g. level to maintain a reading of approximately 25μA on the AVO 8

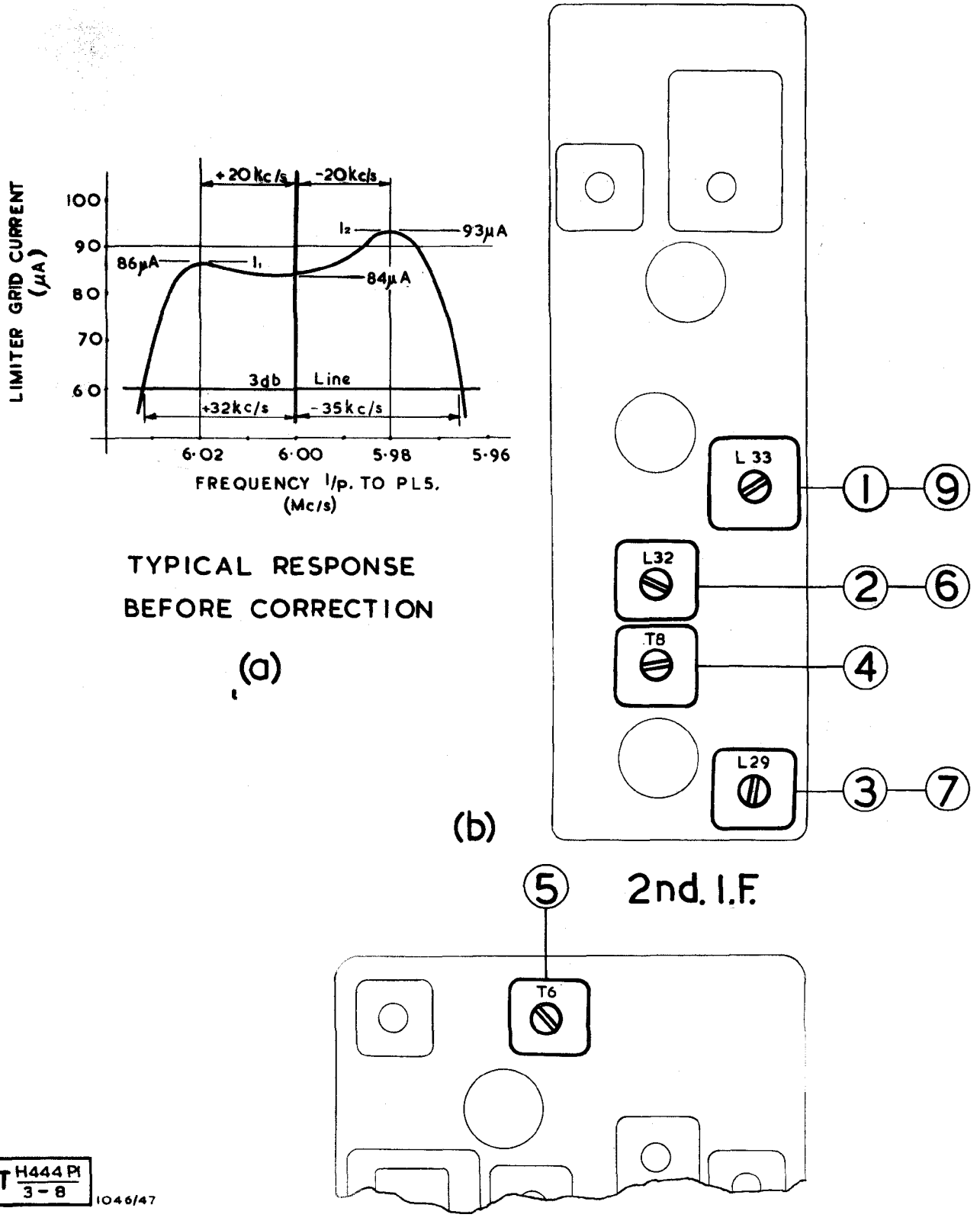
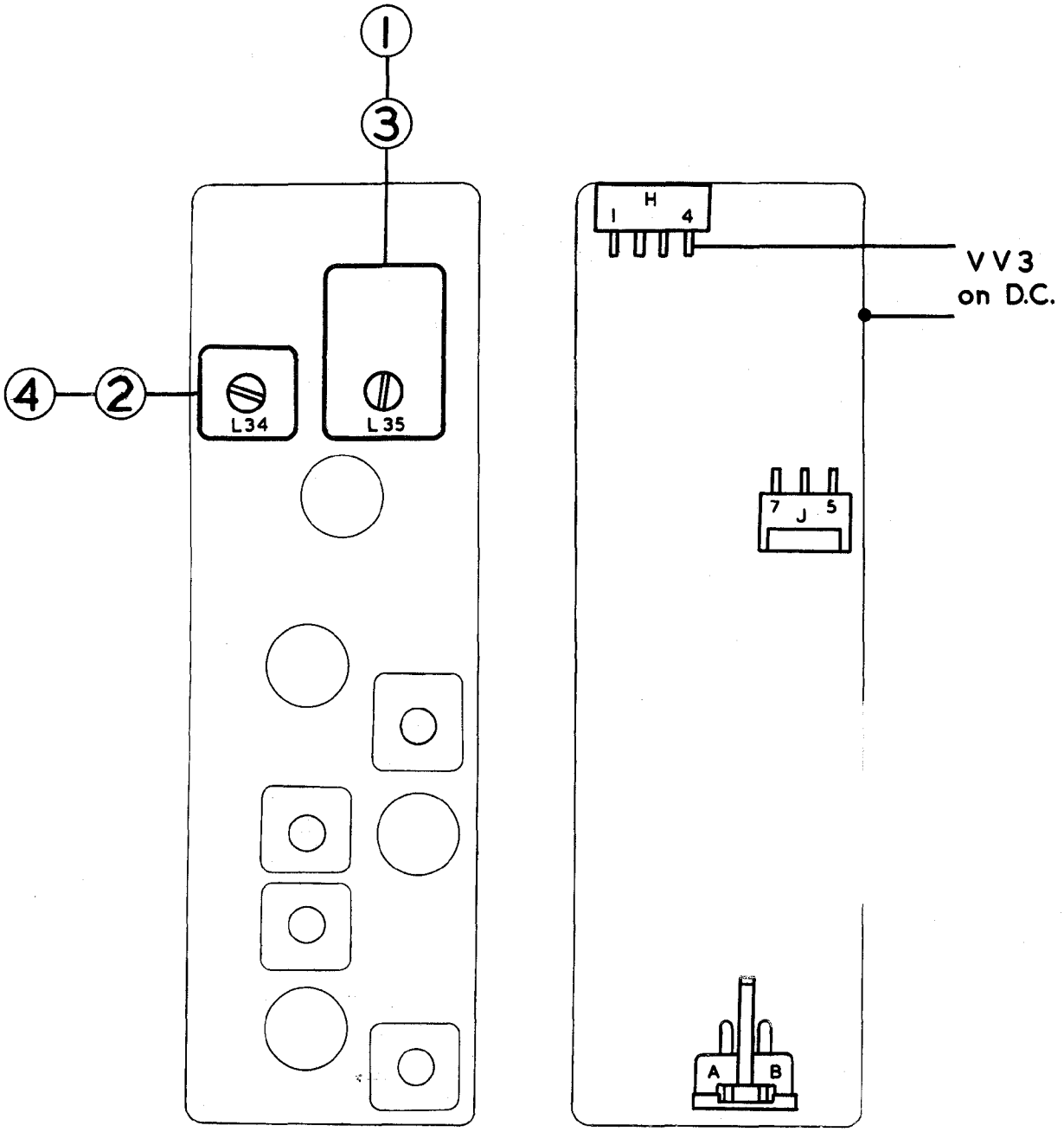


Fig 8 - Trimming diagram, 2nd i.f.

Table 9 - Alignment schedule, 2nd i.f.

Preparation	(a) S.G. connected as for 1st i.f. (b) Switch test box SE to AVO-SET. (c) Set AVO 8 to 50μA range.			
Operation No	Trimming point	Signal generator f Mc/s	Signal generator Output	Action
	T6 L29 T8 L32 L33			Screw all slugs OUT to 3/4 of length
1	L33	6.0	1V	Trim for MAX current
2	L32	6.025	*	Trim for MAX current
3	L29	6.025	*	Trim for MAX current
4	T8	5.975	*	Trim for MAX current
5	T6	5.975	*	Trim for MAX current
6	L32	6.025	*	Trim for MAX current
7	L29	6.025	*	Trim for MAX current
				*Maintain s.g. level to produce approximately 25μA limiter grid current
8		6.0	50μV app.	Adjust s.g. level to give 60μA grid current. Increase level by 3dB. Tune s.g. over band 6.0Mc/s ±40kc/s noting the frequencies and amplitudes of the two humps. Call these f_1 and f_2. Fig 8(a) shows a typical curve.
9	L33			Tune the s.g. to the hump with the lower amplitude and trim L33 until the hump increases in amplitude by approximately 1/2 $(I_2 - I_1)$
				Repeat 8 and 9 until the response curve is reasonably symmetrical
10	3dB bandwidth check	6.0		Adjust s.g. level to give 60μA grid current. Increase s.g. level by 3dB. Note frequencies at which 60μA is again read on AVO 8. Call these f_1 and f_2. The difference between f_1 and f_2 should be between 58-72kc/s, and the difference between (6.0Mc/s - f_1) and (f_2 - 6.0Mc/s) should not exceed 4kc/s
11	60dB bandwidth check	6.0		Repeat 10 at 60dB, $f_1 - f_2$ should not exceed 250kc/s



T H444 PI 3-9 1046/48

Fig 9 - Trimming diagram, a.f. discriminator

Table 10 - Alignment schedule, a.f. discriminator

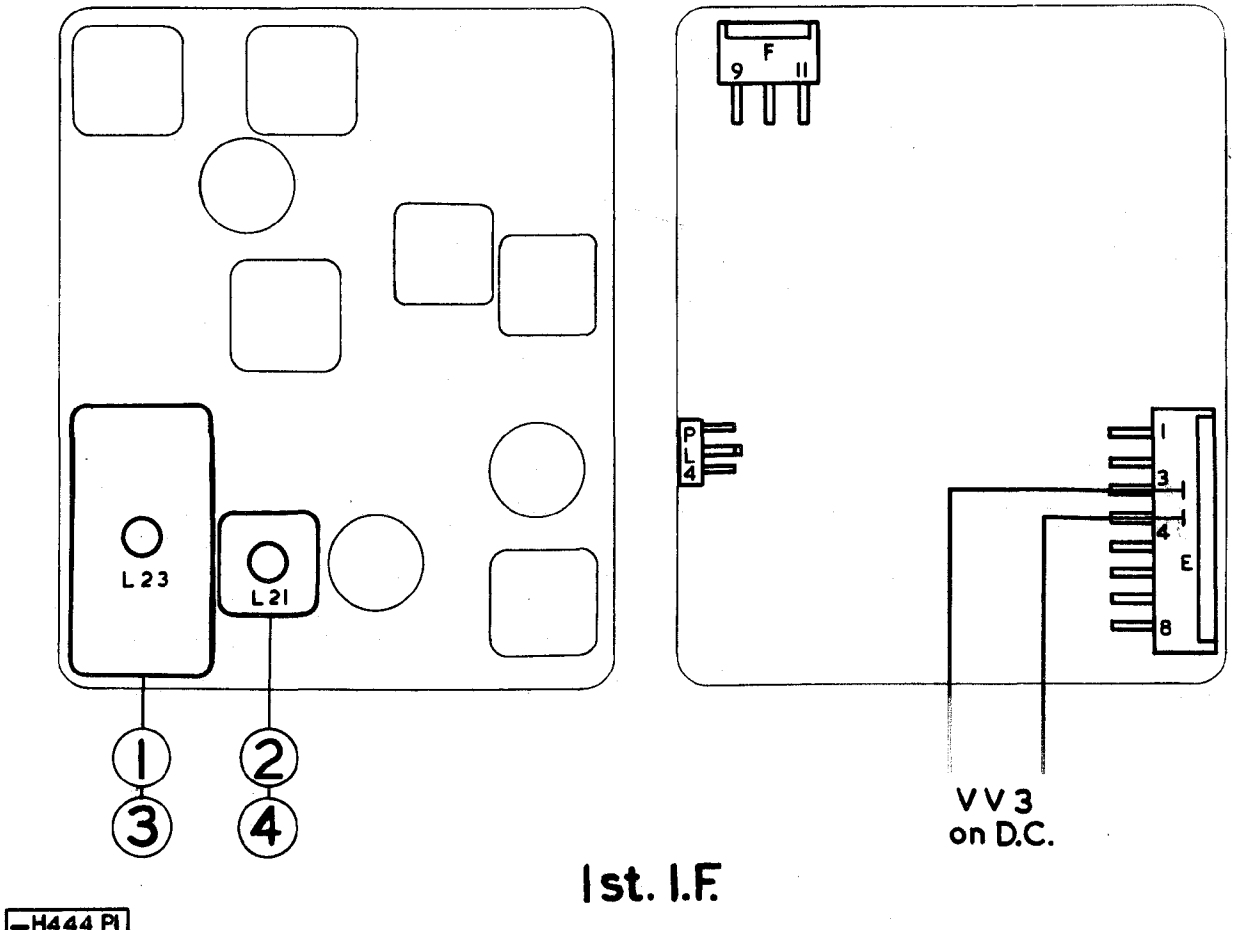
Preparation

(a) Connect s.g. as for 1st i.f. alignment.
(b) Connect Voltmeter, valve No 3 (V.V.3) between terminal block H4 and chassis.
(c) Switch V.V.3 to d.c., 30V range.

Operation No	Trimming point	Signal generator		Action	Remarks
		f Mc/s	Output		
1	L35	6.0	25μV	Trim for ZERO on V.V.3	Several zeros may be found. The correct one is that when a 1/8 turn produces a deflection of about 10V
2	L34	6.080	5mV	Trim for MAX on V.V.3	A peak of about 25-30V is to be expected
3	L35	6.0	25μV	Trim for ZERO on V.V.3	Repeat until no further adjustments necessary
4	L34	6.080	5mV	Trim for MAX on V.V.3	
5		6.015	25μV	Tune s.g. to 6.015Mc/s and note V.V.3 reading (V1)	V1 will probably be about 8-10V
		6.030	25μV	Tune s.g. to 6.030Mc/s and note V.V.3 reading (V2)	V2 should be at least 1.95 times as great as V1
6		5.985 5.970		Repeat 5 at 15 and 30kc/s below 6.0Mc/s	Results should be similar to those in 5 but of opposite sign

Table 11 - Alignment schedule, a.f.c. discriminator

Preparation	(a) Connect s.g. as for 1st i.f. alignment. (b) Disconnect terminal links E3 and E4. (c) Connect V.V.3 to terminals E3 and E4 (on 1st i.f. unit). (d) Switch set to RF TUNE, this connects 175+ to a.f.c. limiter V10				
Operation No	Trimming point	Signal generator		Action	Remarks
		f Mc/s	Output		
1	L23	6.0	1V	Trim for ZERO on V.V.3	
2	L21	6.38	1V	Trim for MAX on V.V.3	A reading of 35-40V is usual
3	L23	6.0	1V	Trim for ZERO on V.V.3	
4	L21	6.250 5.750	1V	Adjust for symmetry of output at 6.25 and 5.75Mc/s	Deflection about 35-40V



T H444 PI 3-10 1046/49

Fig 10 - Trimming diagram, a.f.c. discriminator

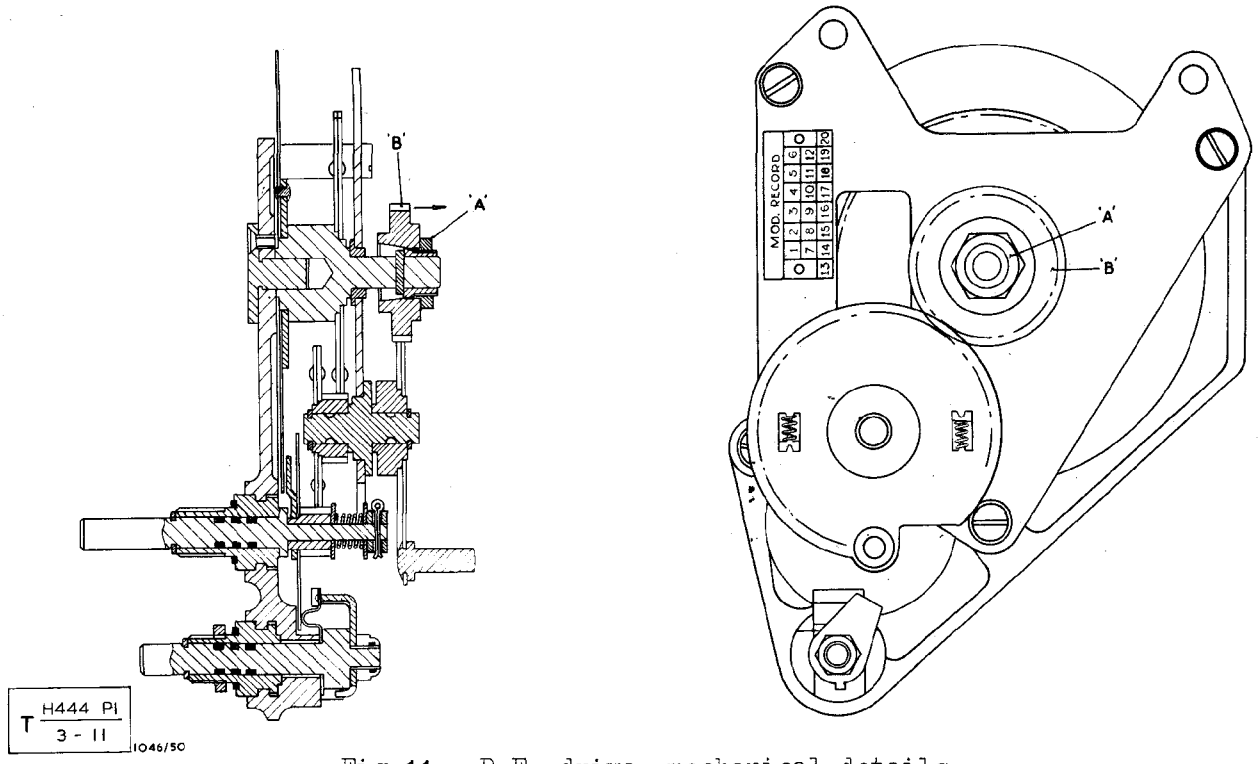


Fig 11 - R.F. drive, mechanical details

Mechanical setting up of r.f. drive and gang capacitor C3 (Fig 11)

104. The gang capacitor should be set up such that 3° rotation from the fully meshed position (0°) corresponds to 36Mc/s and 165° rotation to 60Mc/s, using the Scales, setting provided in the Kits, testing vehicle and manpack sets.

105. Set r.f. dial to 36Mc/s, inspect the capacitor vanes, these shall be 3° unmeshed, this is approximately 1/3 of the split end section of the vane.

106. Rotate gang to 60Mc/s, this should be 165° round from the fully meshed position.

107. If the 36Mc/s position needs resetting, proceed as follows:-

(a) Loosen nut A two turns.

(b) Move pinion B in direction of arrow, this will now 'idle'. Take care that split gears to not disengage.

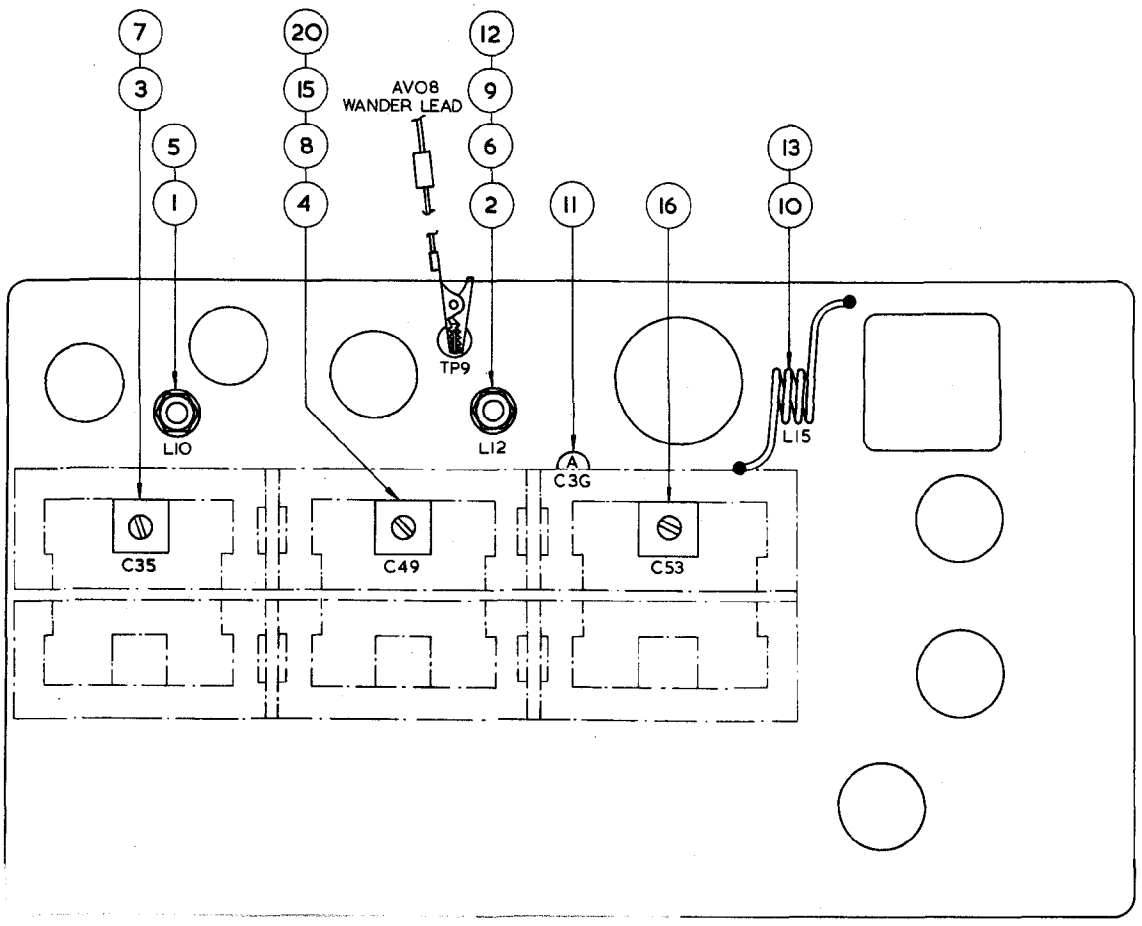
(c) Set r.f. drive to 36Mc/s and gang to 3° rotation point.

(d) Tighten nut A.

108. If the 60Mc/s position needs resetting, proceed as follows:-

(a) Set r.f. drive to 60Mc/s and lock.

(b) Adjust No 6BA nut on law corrector of fork until capacitor is correctly rotated (165°).



RF SENDER

T H444 PI 3-12 1046/51

Fig 12 - Trimming diagram, sender r.f.

Table 12 - Alignment schedule, sender r.f.

Preparation

(a) Ensure that r.f. dial and gang are in correct relationship (para 104-108). Set switch to HIGH POWER.
(b) Connect Wattmeter, absorption, h.f. No 2 to aerial plug.
(c) Switch wattmeter to 70Ω, 25W range.
(d) Switch test box SE to AV08-SET and SA to VEHICLE-S; AV08 to 1mA DC range.
(e) ~~Set C3G neutralising capacitor 3 turns from fully closed position.~~ Set neutralising capacitor C3G plates 5/32 in apart.
(f) Connect AVO 8 wander lead to TP9. ~~*Switch test box to AV08-WANDER.~~
(g) ~~Connect A bracket terminals 20 and 21 together~~

Note: These pages 39 and 40, Issue 4, supersede Pages 39 and 40, Issue 3, dated 5 Apr 63. Table 12 has been amended

Table 12 - (cont)

Operation No	R.F. scale	Set system switch	Action	Trimming point	Remarks
	36	CURSOR ADJ	Tune CHANNEL to 36mc/s		
1	36	TUNE RF	Trim for MAX on AVO 8	L10	Meter will read about 700μA
			Switch SE on test box to AVO-WANDER and set Avometer to 10mA range		
2	36	TUNE RF	Trim for MAX on AVO 8	L12	Meter Will read 3-5mA. return SE to AVO-SET
	60	CURSOR ADJ	Tune CHANNEL to 60mc/s		
3	60	TUNE RF	Trim for MAX on AVO 8	C34	Meter will read about 700μA
			Return SE to AVO-WANDER and Avometer to 1mA range		
4	60	TUNE RF	Trim for MAX on AVO 8	C49	Meter will read 3-5mA
5-8			Repeat 1 and 3 until alignment is approximately correct		
			Connect 'A' bracket terminal 21 to earth (a.f.c. disabled)		
9	36	OPERATE	Trim for MAX power output	L12	
10	36	OPERATE	Test with 'wand' and adjust for MAX power output	L15	Close or open winding turns
11	60	OPERATE	Trim for MAX power output	C49	
12	60	OPERATE	Trim for MAX power output	C53	
13			Repeat 9-12 until no further improvement is effected		
14			Tune slowly through the band and note point of minimum power output (F MIN)		
15	F MIN	OPERATE	Trim until power output is within limits over the band and as near constant as possible	(C49) (L12)	The adjustment of C49 or L12 will depend upon whether F MIN is nearer the low or high frequency end of band
			Remove link from 'A' frame terminal 21 and earth		
16	36	OPERATE			Power must exceed 13W
17	38	OPERATE	Tune CHANNEL and RF scales in normal manner and carry out RF power tests		The power must exceed 15W
18	46	OPERATE			
19	54	OPERATE			
20	60	OPERATE			

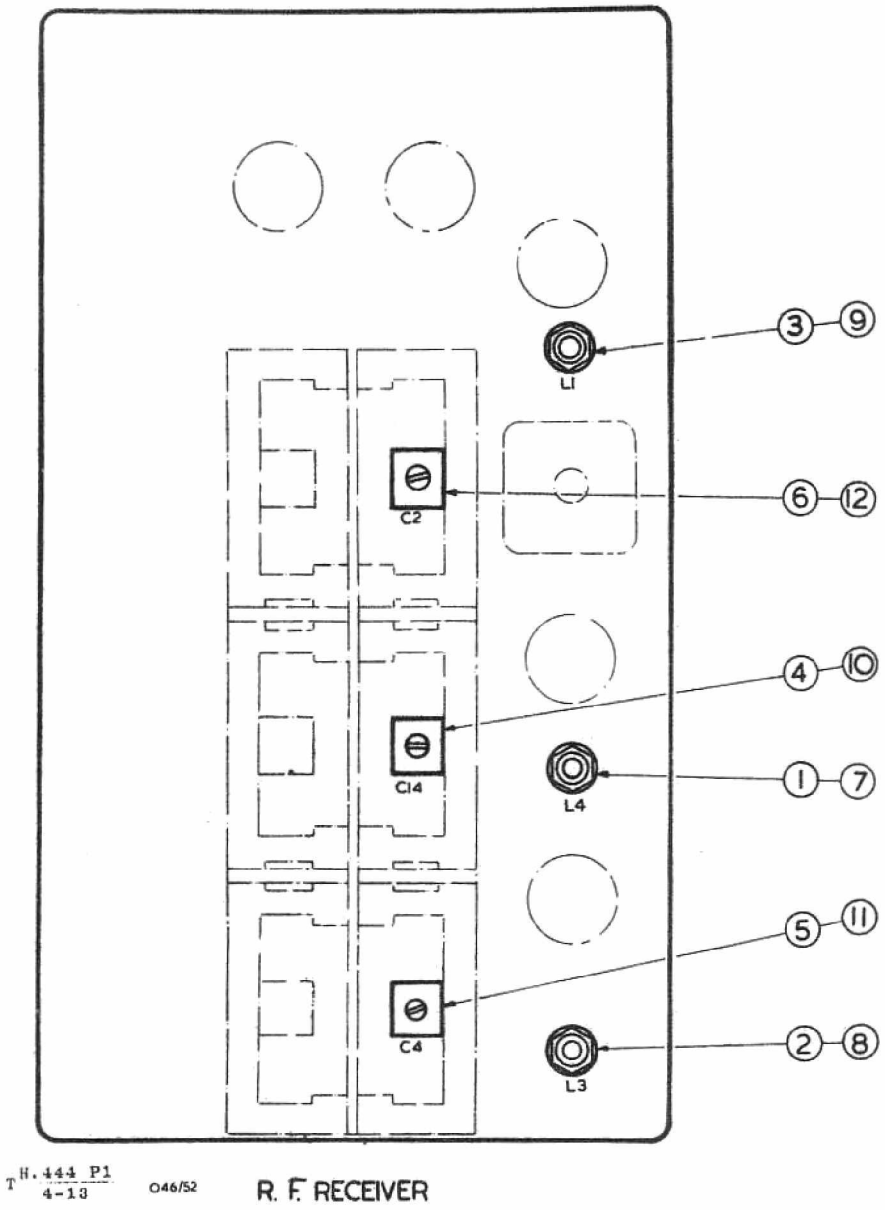


Fig 13 - Trimming diagram, receiver r.f.

Table 13 - Alignment schedule, receiver r.f.

Preparation

(a) Connect Signal generator No 13 or 18 to aerial plug (para 49). S.G. switched to CW.
(b) Switch test box SA to VEHICLE-R and SE to AVO-SET.
(c) Tune set to 36Mc/s and 60Mc/s using CURSOR ADJ and TUNE RF positions of set control switch.
(d) Carry out trimming with set switched to OPERATE.

Operation No	Trimming point	Signal generator		Action	Remarks
		f Mc/s	Output		
1	L4	36	16μV	Trim for MIN on output meter	If, due to noise, the output meter is unsteady, the trimming should be carried out for a maximum limiter grid current
2	L3	36	16μV	Trim for MIN on output meter	
3	L1	36	16μV	Trim for MIN on output meter	
4	C14	60	16μV	Trim for MIN on output meter	
5	C4	60	16μV	Trim for MIN on output meter	
6	C2	60	16μV	Trim for MIN on output meter	
7-12				Repeat 1-6 until no further improvement is obtained	
		38 46 58	1.25 MAX	Carry out quieting tests at 38, 46 and 58Mc/s	See para 63 for details

Adjustments to a.f. unit

109. After all alignment to the r.f. and i.f. units is completed, the preset gain control RV1 should be adjusted. The test box SA shall be switched to VEHICLE-R.

110. The set shall be tuned in the normal manner to 46Mc/s and a Signal generator No 13 or 18 shall be connected to the set aerial plug. The s.g. shall then be tuned to the set.

111. A signal of 4μV modulated 15kc/s deviation 1600c/s shall then be injected into the set.

112. Adjust RV1 until the output meter/wattmeter reads 150mW, the switch SB on the test box must be at OFF.

Adjustments to a.m.c. unit

113. After alignment of the sender r.f. circuits, the a.m.c. preset control RV3 should be set up. This test should be carried out with all sub-unit securing screws and tray bolts securely fastened, otherwise hum may give false results.

114. With set tuned to 46Mc/s, connect Wattmeter, absorption, h.f. No 2 to set aerial plug. Switch wattmeter to 70Ω 25W range.

115. Switch test box SA to VEHICLE-S and SD to ÷1000.

116. Adjust BFO to give a signal of 10V, 1000c/s to the test box.

117. Adjust RV3 until the deviation meter reads 4.5kc/s (para 60).

Adjustments to squelch unit

118. Tune set to 46Mc/s.

119. Adjust front panel squelch control RV4 two-thirds of way round towards its fully clockwise position (approximately 180° rotation from fully anticlockwise stop).

120. Adjust RV2 until SIGNAL lamp ILP2 just lights.

Adjustments to receiver, 1st local oscillator

121. If the film scale has been replaced, but neither the inductuner L40 and trimmer C161 have been interfered with, nor the inductuner unit separated from film scale drive proceed as follows:-

(a) Couple a Wavemeter No 4 loosely to the output of the oscillator unit. SKT5 is a suitable point to do this.

(b) Tune the wavemeter accurately to 66Mc/s, and with the set switched to OPERATE, tune the CHANNEL scale until the wavemeter indicates a maximum. This should occur when the film scale reads 60Mc/s at approximately mid scale. Set the cursor to read exactly 60Mc/s.

(c) Tune CHANNEL down to 36Mc/s and reset wavemeter to 42Mc/s. Note the film scale frequency at which the wavemeter reads a maximum. This should be 36Mc/s. If satisfactory, the calibration should be checked using the internal 2Mc/s crystal, at 2Mc/s points throughout the band. It should be possible to adjust the cursor at all points so that the scale reads correctly.

(d) If calibration in (b) or (c) is unsatisfactory, the unit requires realignment. Proceed as detailed in para 122.

122. If the inductuner unit has been worked on, or separated from the film scale drive unit proceed as follows:-

(a) Set the Wavemeter No 4 to exactly 66Mc/s. Switch set to OPERATE. Remove the film scale unit with the local oscillator unit attached from the set, but connect by SKT6 to h.t. and l.t. supplies. Couple the oscillator unit output loosely to the wavemeter from SKT5.

(b) Set film scale to 60Mc/s, with the cursor in mid position.

(c) Release the three No 6BA Allen headed grub screws securing the driving pinion to the inductuner spindle (Fig 4).

(d) Adjust inductuner until wavemeter indicates a maximum. The inductuner spindle has a slotted end, and may be turned by a screwdriver inserted through the hole in the scale plate (see Fig 4).

(e) Tighten one of the Allen headed grub screws.

(f) Set film scale to 36Mc/s, and wavemeter to 42Mc/s. Adjust C161 for a maximum on the wavemeter. Note that C161 is at h.t. potential and an insulated trimming tool must be used.

(g) Repeat (a) to (f) until no further adjustment is required.

(h) Finally, tighten all grub screws.

(j) Reassemble unit into set, using reverse procedure to that described in para 23.

(k) Switch set to CURSOR ADJUST and check that 2Mc/s calibration points are accurate throughout the band as described in para 121(c).

(l) Note that the output of the oscillator unit rises to a peak between film scale readings of 50-55Mc/s. If the wavemeter is coupled too tightly to the oscillator, a reading will be indicated on the wavemeter when it is set to 66 or 42Mc/s, and the oscillator is tuned through the region 50-55Mc/s. This reading should be ignored, as it is not a true peak.

Adjustments to T12, output transformer of 1st local oscillator

123. (a) Connect a Voltmeter, valve, No 3 to the junction of R11 and R12 at the end of the coaxial cable from PL5.

(b) Adjust slug in output transformer until the r.f. output at 42Mc/s (36Mc/s on scale), equals output at 66Mc/s (60Mc/s on scale).

(c) Tune the unit through its whole range, and check that the output at any point is not less than the output at 42 and 66Mc/s (36 and 60Mc/s on scale).

To check and set up crystal calibrator

124. The accuracy of the crystal oscillators shall be determined by using a Calibrator, crystal set (Tels Z 650-9), or a Wavemeter, standard, No 2 (Tels Z 211), or a similar instrument having an accuracy of 1 in 10^6.

125. The 2Mc/s crystal should have an accuracy of .02% at 20°C.

126. The 100kc/s crystal should be checked and C22 adjusted until the accuracy is 100kc/s ±2c/s at 20°C.

Relay adjustments

127. Details of relay adjusting are given in the Tels A 400 series.

128. Relays RLA and RLB should be adjusted as follows:-

(a)	Test operate current:	17mA
(b)	Coil d.c. resistance:	700Ω
(c)	Contact clearance:	10 mils
(d)	Spring tensions:-	
	Make contacts:	10-15 grams
	Break contacts:	20 grams minimum
	Lever contacts:	10-15 grams
(e)	Buffer spring lift:	2 mils

129. Relays RLC and RLD should be adjusted as follows:-

(a)	Test operate current:	RLC 24mA RLD 6.5mA
(b)	Coil d.c. resistance:	RLC 670Ω RLD 7600Ω
(c)	Armature tension:	15-25 grams
(d)	Contact clearance:	10 mils
(e)	Lever:-	
	Break:	15-21 grams
	Make:	9-16 grams
(f)	Make contacts:	15-21 grams
(g)	Block lift:	4-10 mils

FAULT FINDING DATA

General

130. The figures quoted are those measured on six early production sets and are included to assist in fault tracing only. They are not in any way intended to be specification tests.

Input point	Input volts			Output
	300c/s	1000c/s	4000c/s	
Terminal L4	0.7-0.9	0.5-0.6	0.45-0.6	) For an output of 150mW
Across RV1	0.2-0.3	0.1-0.15	0.1-0.15	) into a 50Ω wattmeter/
Grid V21	2.5-3.0	1.6-1.8	1.4-1.7	) output meter connected to SKT2 pins G & M

Table 14 - A.F. sensitivity figures

A.F. discriminator

Conditions

131. (a) S.G. connected to PL3A, signal 2.4Mc/s, 1mV unmodulated.

(b) V.V.3 connected between H4 and earth.

(c) Tune s.g. for zero output volts, call s.g. frequency f_o.

S.G. frequency relative to f_o, kc/s	-30	-20	-10	+10	+20	+30
Volts	16-20	10-12	5-6	5-6	10-12	16-20

Table 15 - A.F. discriminator slope

2nd i.f. gain

Conditions

132. (a) S.G. input at 2.4Mc/s from 75Ω terminating unit.

(b) Output from TP8 and chassis, 25μA on AVO 8S.

(c) PL3A disconnected except for V13a and TP6 tests.

(d) Remove XL3 when making V13a and TP6 tests.

Input point Grid V15	L32 spills 1 and 3	Grid V14	PL3	TP6	V13a pin 2
Input volts 50-56mV	10-15mV	1.4-1.6mV	350-400μV	0.7-1.2mV	60-100μV

Table 16 - 2nd i.f. gain

1st i.f. gain

Conditions

133. (a) S.G. input at 6.0Mc/s from 75Ω terminating unit.

(b) Limiter grid current at TP8 to chassis, 25μA.

(c) SKT4 disconnected.

Input point	V13a pin 2	Spills 1 and 6 of L22	Spills 1 and 3 of TR11	Grid V9	PL4
Input μV	200-250	120-200	180-200	25-40	10-16

Table 17 - 1st i.f. gain

8.4Mc/s crystal oscillator

Conditions

134. (a) PL4 disconnected.

(b) V.V.3 connected between V13 pin 7 and chassis, the output voltage will be in the region of 12-15V r.f.

1st local oscillator

Conditions

135. (a) PL5 disconnected.

(b) V.V.3 connected to SKT5, the output voltage will be as follows:-

38Mc/s	-	1.3-2.0V)	Frequencies quoted are scale
46Mc/s	-	3.0-4.5V)	reading, ie actual oscillator
58Mc/s	-	0.7-1.0V)	frequency will be 6Mc/s
42-43Mc/s	-	12.0-16.0V)	higher.

Receiver r.f.

Conditions

136. (a) S.G. connected via 75Ω termination, 46Mc/s unmodulated signal.

(b) Set tuned to 46Mc/s.

(c) All leads short and screened.

(d) Voltages quoted in Table 19 are for 10dB quieting at output terminals SKT2 pins G & M.

Input point	C3C	C3B	C3A	Aerial
Input μV	3-5	0.6-2	6-10	0.8-1.0

Table 18 - Receiver r.f. gains

A.M.C. unit

Conditions

137. (a) Input to SKT2 terminals A and B, 1V 10000c/s from b.f.o. via test box, SD to ÷100 (Col 1).

(b) Set tuned to 46Mc/s, HP SEND.

(c) RV3 set to a maximum.

(d) As (a) but input 2V ÷10 (Col 2).

Output point	Across RV3 V28 in	S4 to chassis V28 in	Across RV3 V28 out	S4 to chassis V28 in	Across R151	Across R144 d.c. volts
Output volts Col 1	0.07-0.1	1.9-2.4	0.07-0.1	2.0-3.2	0.08-0.12	1.0-1.2
Output volts Col 2	0.1-0.12	2.7-2.8			0.1-0.12	2.8-3.4

Table 19 - A.M.C. test figures

Sender r.f.

Conditions

138. (a) Sent on HP SEND, wattmeter connected to aerial plug.

(b) Set unmodulated.

(c) All voltages measured with Voltmeter, valve No 2.

Test point	38Mc/s	46Mc/s	58Mc/s
Output watts		18-20	
TP3 r.f. volts		1.5-2.5	
V6 pin 7 r.f. volts	17-20	20-27	20-30
TP9 to chassis d.c. volts	-3 to -4	-3 to -4	-3.5 to -4.2

Table 20 - Sender r.f. test figures.

A.F.C.

Conditions

139. (a) Disconnect terminals E3 and E4.

(b) Disconnect PL4 from SKT4.

(c) Connect s.g. to PL4.

(d) Connect V.V.3 across E3 and E4 on 1st i.f. unit.

(e) Connect AVO 8 between TP5 and chassis.

(f) Inject signal of 6Mc/s 40μV, unmodulated.

S.G. frequency Mc/s	D.C. volts at E3 and E4	Current at TP5 μA
6.0	0	18-35
5.9	13-20	
6.1	13-20	

Table 21 - A.F.C. readings

Intercomm amplifier

Conditions

140. (a) Switch output meter to 30Ω (para 62).

(b) B.F.O. input 1000c/s adjusted to give 250mW output.

(c) A.F. voltages measured with Voltmeter, valve No 3.

Input volts	0.07-0.09
A.F. volts V26 grid	2.4-2.8
A.F. volts V26 anode	80-90

Table 22 - Intercomm amplifier gain

D.C. currents and voltages

141. A table showing the currents and voltages is given in Tels H 442 Part 2.

Reactor

Conditions

142. (a) Disconnect B14.

(b) Set switched to HP SEND, tuned 46Mc/s.

(c) Deviation meter connected as para 59.

(d) A.F. signal obtained from test box. Applying 1000c/s a.f. signal between B14 and chassis produced deviations in Table 23.

A.F. input voltage	7.5 ÷ 100	20 ÷ 100	28 ÷ 100
Deviation kc/s	4	10	15

Table 23 - Deviation frequencies for a.f. input signal to reactor

143. (a) Conditions as in para 142(a) and (b).

(b) D.C. voltage from battery connected between B14 and chassis. Applying a d.c. voltage between B14 and chassis caused m.o. frequency to vary as in Table 24.

Applied voltage d.c.	-5	-10	+5	+10
M.O. frequency variation kc/s	-600	-700	+700	+1200

Table 24 - Frequency variation with d.c. voltage applied to reactor grid

Reactor tests

144. Primary d.c. resistance at 20°C: 297-402Ω
Primary dincutance: 1.0H min at 1000c/s, 1V.

Hum and microphony

145. The tests detailed in para 66 and 72 will be carried out with the wiring trays securely screwed to the A brackets. In faulty sets the following may effect a cure:-

(a) Change V31 - receiver and/or sender faulty.

(b) Change V27 - if sender alone is faulty.

(c) Change ventilator.

Note: ~~The next page is Page 1001~~

Note: These Pages 50-73, Issue 3 are to be filed immediately after Page 49, Issue 3 dated 5 Apr 63. They contain additional information. Delete 'Note: The next page is Page 1001' from the bottom of Page 49.

SPECIFICATION TESTS TEST RIG, ELECTRONIC EQUIPMENT, TEST CONTROLLER METHOD

General

146. The tests described in this regulation use the Test Rig, Electronic Equipment, Test Controller No 1 or No 2. The operating instructions and technical description of this equipment are given in Tels M 382.

147. The tests detailed in this regulation are those that are essential to prove the serviceability of an equipment and should be carried out each time an equipment is inspected or repaired.

148. No attempt will b e made to reconcile this regulation with previous issues as it has been considerably amended in the light of experience and the use of modern test equipment.

149. Fig 4003 shows the layout of the controls, sockets etc on the Test Controller. Reference to these items in the text is made by using the abbreviation for the relevant unit followed by the code number of the required control etc, eg CTC14 indicates Control Test Conditions unit, control code number 14.

150. The Test Controller shall be fitted with an Interface Larkspur (IF(L)) in the Interface, equipment under test position.

Test conditions

151. The power supply for the radio set shall be a P.S.T. No 1 or an S.U.V. No 12 Mk 2.

152. Tests will be carried out with the input supply voltage to the radio set p.s.u. within the limits 23.8 to 24.2V unless otherwise stated. The slave relay RLD/4 in the p.s.u. shall be operated (v.c.r. low), this is done by depressing IF(L)6.

153. The radio set shall be tuned in the normal manner, ie CHANNEL adjusted to the internal crystal calibrator frequency and the sender oscillator (RF) adjusted to the receiver frequency.

154. The trimmer C22 on the 100kHz crystal oscillator shall be adjusted such that the crystal oscillator frequency is within 2Hz of nominal at a temperature of 20°C.

155. The receiver internal preset gain control RV1 shall be set, so that when a 46MHz modulated r.f. signal, 109dB (4μV), 15kHz deviation and 1.6kHz modulating frequency is applied to the antenna plug, the a.f. power output is 150mW (see para 176).

156. The squelch preset control RV2 shall be set as follows. Tune the radio set to 46MHz. Set the front panel SQUELCH control RV4 to two thirds of the way round towards its fully clockwise position. Adjust the internal preset control RV2 slowly until the SIGNAL lamp just lights. There shall be no antenna signal input.

157. The a.m.c. preset control RV3 shall be set up with the sender tuned to 46MHz, so that a deviation of between 4.0 and 5.0kHz is obtained when the input to the microphone terminals from a 300Ω source at a frequency of 1kHz is 10mV (see para 180). This figure and all other microphone input voltages quoted in this handbook are e.m.f. from a 300Ω source, ie as indicated on the a.f. generator.

158. The standard a.f. load shall be 50Ω unless otherwise stated.

159. The standard modulation shall be a deviation of 5kHz and a modulating frequency of 300Hz unless otherwsie stated.

160. The standard test frequencies are to be 38, 46 and 58MHz and a carrier level of 109dB (4μV) is to be used except where otherwise stated. All levels are quoted as attenuator settings with the signal generator output level maintained at 1V.

161. The Test Rig Electronic (t.r.e.) will be fitted with one of two signal generators. They are the Signal generator CT562, or the Schlumberger FSD120S. On equipments fitted with the signal generator CT562 care must be taken to ensure that the 6dB attenuator (part of the s.g. CES) is fitted to the output socket of the signal generator.

162. The signal generator shall be set to the nominal test frequency. No attempt shall be made to tune the signal generator to the equipment under test (e.u.t.).

163. To match the 75Ω impedance of the radio set antenna to the 50Ω impedance of the t.r.e., the antenna of the e.u.t. shall be connected to the t.r.e. via a 50/75Ω matching transformer type 6803. The use of this transformer causes the input level at the receiver to be 1dB higher than the signal generator output. Therefore all signal generator attenuator settings detailed in this regulation will be 1dB higher than the theoretical values, ie if an input of 1μV (120dB) is required at the e.u.t. antenna, the signal generator attenuator will be set to 121dB. The insertion loss on transmitter tests caused by the use of this transformer is less than 0.25dB and can be disregarded.

164. All r.f. and a.f. power measurements shall be made directly on the digital voltmeter in the t.r.e. All powers will be quoted in the tests detailed in this regulation as voltages with the corresponding power in brackets, eg r.f. power 3.8V (15W), a.f. power 700mV (10mW).

165. The law for r.f. power measurements is:

$W = E^2$ Where E is the d.v.m. reading.

166. The law for a.f. power measurements is:

$W = \frac{E^2}{R}$ Where E is the d.v.m. reading and R is the a.f. load resistance

167. The sender shall be operated on HIGH power unless otherwise stated.

168. All tests can be carried out with the radio set sealed in its case.

169. For all tests the radio set shall be connected to the t.r.e. using items from the Cable Assembly Kit (issued with the t.r.e.) as follows:

a. CS7 to p.s.t. or s.u.v. using item 13 (Cable assy 6625-99-621-8735).

b. IF(L)16 to SKT2 on radio set using item 22 (Cable assy 6625-99-621-8744).

c. E.U.T. antenna plug to CTC20 via 75/50Ω matching transformer type 6803 and item 7 (Cable assy 6625-99-621-8729).

170. CTC26 shall be set to INT for all tests.

171. IF(L)5 shall not be depressed while the radio section of the e.u.t. is being tested.

172. IF(L)6 shall be depressed (v.c.r. low) and IF(L)7 shall be switched to C42 for all tests.

173. IF(L)13 must not be depressed while IF(L)7 is switched to C42.

Receiver tests

Quieting

174. Specification

A signal input of 1.25μV shall produce a reduction in the noise output from the radio set of at least 10dB.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC7	Depressed
CS2	VEH V	CTC14	Signal
CTC1	RX CW	CTC15	31 (10dB)
CTC2	Quieting	IF(L)6	Depressed (v.c.r. low)
		D.V.M.	18V range (3 s filter in if necessary for steadier reading)

b. Set signal generator to 38MHz, attenuator for 119dB and tune e.u.t. to 38MHz. Note d.v.m. reading.

c. Set CTC14 to CARRIER OFF, the d.v.m. reading shall now exceed that at b.

d. Repeat b. and c. at 46 and 58MHz.

e. Set t.r.e. controls:

CS1	VEH 14 - 33	CTC5	Depressed	d.v.m.	180V range

f. Adjust CS4 for a reading of between 20.8 and 21.2V on the d.v.m. Depress CTC7 and set d.v.m. to 18V range.

g. Set CTC15 to 45 (7dB) and repeat b. to d.

h. Set CS1 to VEH 24.

Bandwidth

175. Specification

a. Field repair: The bandwidth shall be:

3dB: 58-72kHz; 60dB: 250kHz maximum

b. Base repair: The bandwidth shall be:

3dB: 58-72kHz, assymmetry shall not exceed 4kHz; 60 db: 250kHz maximum

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC14	Signal
CS2	VEH V	IF(L)2	Depressed
CTC1	RX CW	IF(L)6	Depressed (v.c.r. low)
CTC6	Depressed	D.V.M.	18V range (40dB filter in will give a steadier reading)

b. Tune e.u.t. to 38.5MHz, set signal generator to 38.5MHz, attenuator to 121dB. Note the reading on the d.v.m.

c. Set the attenuator to 118dB and reduce signal generator frequency (using the 10kHz and 1kHz controls) until the d.v.m. reads as in b. Note this frequency (f1).

d. Set s.g. to 38.5MHz and repeat c. increasing the s.g. frequency. Note this frequency (f2).

e. Field repair: The 3dB bandwidth is given by f2-f1 and shall be between 58 and 72kHz.

f. Base repair: The 3dB bandwidth is given by f2-f1 and shall be between 58 and 72kHz. The assymmetry is given by the difference between (f2-38.5MHz) and (38.5MHz-f1) and must not exceed 4kHz.

g. Repeat b. to d. with the attenuator set at 61dB. The difference between f2 and f1 shall not exceed 250kHz.

A.F. output and distortion

176. Specification

A modulated signal shall be applied to the radio set. The output shall be between 125 and 175mW with no apparent distortion.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC7	Depressed
CS2	VEH V	CTC13	AF
CTC1	RX FM	CTC26	INT
CTC2	AF LOAD 50	IF(L)6	Depressed (v.c.r. low)
		D.V.M.	18V range

b. Tune e.u.t. to 46MHz. Set signal generator 46MHz, attenuator 109dB, 15kHz deviation, 1,600Hz modulating frequency.

Note: 15kHz deviation is given by 150mV a.f. output setting of the modulator.

c. The d.v.m. shall read between 2.5V (125mW) and 2.95V (175mW). The c.r.o. will display the a.f. waveform, there should be no apparent distortion.

Hum and microphony

177. Specification

When an unmodulated signal with a level exceeding 10μV is applied to the radio set, the hum and noise output shall not exceed 20μW.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC13	AF
CS2	VEH V	CTC14	SIGNAL
CTC1	RX CW	IF(L)6	Depressed (v.c.r. low)
CTC2	AF LOAD 150	D.V.M.	180mV range
CTC7	Depressed		

b. Tune e.u.t. to 46MHz and switch set control switch to CHANNEL ADJ (the 100kHz crystal will conveniently provide the input signal).

c. The d.v.m. shall read less than 55mV (20μW). Give the set a sharp blow with the hand, the d.v.m. indication shall quickly restore to less than 55mV (20μW).

Squelch

178. Specification

Signal/noise ratio to operate SIGNAL lamp:

a. RV4 at cut-out point -5dB.

b. RV4 fully anti-clockwise -10dB.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC14	CARRIER OFF
CS2	VEH V	CTC15	56 (5dB)
CTC1	RX CW	IF(L)6	Depressed (v.c.r. low)
CTC2	QUIETING		
CTC7	Depressed	D.V.M.	18V range

b. Tune e.u.t. to 46MHz; NOISE switch to NOISE ON; set signal generator to 46MHz; attenuator 119dB. Note d.v.m. reading.

c. Set CTC14 to SIGNAL ON and adjust attenuator (using the carrier level control as a fine adjustment) until d.v.m. reads as in b.

d. Adjust SQUELCH control RV4 so that the SIGNAL lamp ILP2 just lights. Put NOISE switch to NOISE OFF.

e. Set CTC14 to CARRIER OFF, the SIGNAL LAMP ILP2 should be extinguished and the set muted.

f. Turn RV4 fully anti-clockwise; NOISE switch to NOISE ON; CTC14 to CARRIER OFF: CTC15 to 31 (10dB). Note the reading on the d.v.m.

g. Repeat c. until the d.v.m. reads as in f. Put NOISE switch to NOISE OFF. The SIGNAL lamp ILP2 should be extinguished and the set muted.

h. Switch CTC14 to SIGNAL ON, ILP2 should remain extinguished and the set muted.

Sender tests

R.F. power output

179. Specification

The power output into a 75Ω resistive load shall be:

a. High power: Not less than 13W between 36 and 38MHz.

b. High power: Not less than 15W between 38 and 60MHz.

c. Low power: Between 0.2 and 0.7W at any frequency.

d. High power (low voltages): Not less than 9W at any frequency.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC7	Depressed
CS2	VEH V	CTC14	SIGNAL
CTC1	CW	IF(L)6	Depressed (v.c.r. low)
CTC2	AF LOAD 50	D.V.M.	18V range (this is important)

b. Tune e.u.t. to 36MHz and put power switch to HIGH. Depress CTC11, the d.v.m. reading shall be not less than 3.6V (13W).

c. Repeat b. at 38, 46 and 58MHz, the d.v.m. shall read not less than 3.9V (15W).

d. Repeat b. and c. with power switch at LOW. The d.v.m. shall read between 0.44-0.8V (0.2-0.7W).

e. Set t.r.e. controls:

CS1 VEH 14-33 CTC5 Depressed D.V.M. 180V range

f. Adjust CS4 for a reading of between 20.8 and 21.2V on the d.v.m. Depress CTC7 and set d.v.m. to 18V range.

g. Repeat b. and c. with power switch at HIGH. The d.v.m. shall read not less than 3.0V (9W).

h. Set CS1 to VEH 24.

Deviation and a.m.c. check

180. Specification

With the sender tuned to 46MHz, the deviation obtained with an input of 10mV to the microphone terminals at a frequency of 1000Hz shall be within the limits 4.0 to 5.0kHz. When the input to the microphone terminals is increased to 200mV the deviation shall not exceed 6kHz.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC13	AF
CS2	VEH V	CTC14	SIGNAL
CTC1	MOD S.T.	IF(L)6	Depressed
CTC2	AF LOAD 50	A.F. GEN	1000Hz, 10mV
CTC7	Depressed		

b. Tune e.u.t. to 46MHz and put power switch to HIGH. Depress CTC11 and tune deviation meter.

c. The deviation meter shall read between 4.0 and 5.0kHz. The demodulated a.f. from the modulation meter can be viewed on the c.r.o.

d. Increase a.f. gen level to 200mV and depress CTC11. The deviation meter reading shall not exceed 6.0kHz.

Hum and microphony

181. Specification

The output from the receiver (sidetone) shall not exceed 80µW when the sender is operating with no a.f. input.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC7	Depressed
CS2	VEH V	IF(L)6	Depressed (v.c.r. low)
CTC1	MOD S.T.	D.V.M.	18V range
CTC2	AF LOAD 150	A.F. gen	0mV

b. Tune e.u.t. to 46MHz and put power switch to HIGH.

c. Depress CTC11, the d.v.m. reading shall not exceed 110mV (80µW).

Note: If high readings result check that connections between set and p.s.u. are tight and that connections between t.r.e. and set are tight.

A.F.C. check

182. Specification

The capture range and m.o. correction shall be:

a. At 58MHz: 400kHz and 10kHz respectively.

b. At 38MHz: 250kHz and 7kHz respectively.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC12	RF
CS2	VEH V	IF(L)6	Depressed (v.c.r. low)
CTC1	CW		

b. Tune e.u.t. to 58MHz, depress CTC11 and note frequency (f1) displayed on counter. Release CTC11.

c. Returne the set to 58.4MHz, lock the RF tuning dial.

d. Switch set to CURSOR ADJ and retune CHANNEL tuning dial to 58MHz.

e. Switch set to OPERATE and depress CTC11. Note the frequency (f2) displayed on the counter. The difference between f1 and f2 shall be less than 10kHz.

f. Repeat b. to e. with the RF dial locked at 57.6MHz.

g. Repeat b. to f. at 38MHz using RF tuning dial frequencies of 38.250 and 37.750MHz. The difference between f1 and f2 shall not exceed 7kHz.

Intercomm amplifier tests

Gain and output

183. Specification

The input voltage at 1000Hz which is required in order to produce an output power of 250mW shall be between 40 and 100mV.

Method

a. Set t.r.e. controls:

CS1	VEH 24	CTC13	AF
CS2	VEH V	IF(L)5	Depressed
CTC1	RX CW	IF(L)6	Depressed (v.c.r.low)
CTC2	AF LOAD OC	A.F. gen	1000Hz, 40mV
CTC12	AF	D.V.M.	18V range

b. Switch IC switch on p.s.u. to ON.

c. Note the d.v.m. reading, it shall be less than 2.7V (250mW).

d. Increase the a.f. gen level to 100mV. The d.v.m. reading shall be greater than 2.7V (250mW).

Intercomm call

184. Specification

The input and output of the amplifier shall be coupled together via a 0.5μF capacitor. There shall be an a.f. output from the amplifier of at least 200mW into a 30Ω load at a frequency of 500 to 2000Hz.

Method

a. Conditions as for test in para 183.

b. Depress IF(L)4. The d.v.m. shall read not less than 2.45V (200mW) and the frequency displayed on the counter shall be between 500 and 2000Hz.

c. Switch off IC on p.s.u. and release IF(L)5.

Functional check

185. Specification

To ensure that NOISE ON/OFF switch, SEND/RECEIVE relay contacts RLC1 and RLC4, squelch relay contact RLD1 and homing sockets SK2E and SK2L are functioning properly.

Method

a. Set t.r.e. controls:

CS1	VEH 24	IF(L)3	Depressed
CS2	VEH V	IF(L)6	Depressed (v.c.r. low)
CTC1	CW		
CTC6	Depressed	D.V.M.	180V range

b. Tune e.u.t. to 46MHz. Turn SQUELCH control RV4 fully anti-clockwise. With NOISE switch ON/OFF the d.v.m. shall read approximately 23V.

c. Turn SQUELCH control RV4 until the SIGNAL lamp just lights and turn NOISE switch to OFF. The d.v.m. shall read OV.

d. Put NOISE switch to ON, the d.v.m. shall read 23V. Depress CTC11, the d.v.m. shall read OV.

ELECTRICAL ADJUSTMENTS AND ALIGNMENT, T.R.E. METHOD

General

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

a. 1st i.f.
b. 2nd i.f.
c. A.F. discriminator
d. A.F.C. discriminator
e. Sender r.f.
f. Receiver r.f.
g. A.F. unit
h. A.M.C. unit
j. Squelch unit

187. As the i.f. strips contain a number of over-coupled pairs it is essential that the alignment be carried out as detailed in this regulation.

188. Details of the necessary trimming tools will b e found in Fig 6. These are provided in the holdalls, tool, telecommunications repair and alignment.

189. No securing pastes, varnishes or paints should be used on the cores of the trimmers (para 37). The crystal trimmer C22 should be secured with Compound sealing, nitro-cellulose (Y3/WB 3631) applied sparingly.

190. The t.r.e. will be connected to the e.u.t. as follows, unless otherwise stated:

a. CS7 to p.s.t. or s.u.v. using item 13.

b. IF(L)16 to SKT2 on radio set using item 22.

191. The t.r.e. controls shall be set as follows unless otherwise stated:

CS1	VEH 24	IF(L)6	Depressed (v.c.r. low)
CS2	VEH V	IF(L)7	C42

192. To obtain a steadier reading on the d.v.m. the 40dB filter may be switched in. Trimming should then be carried out carefully as there will be a time lag between movement of the trimmer/slug and the d.v.m. reaching its peak reading. Hence it is very easy to 'over-shoot' the correct trimming point.

To check and set up the 100kHz crystal oscillator XL1

193. Connect CTC22 to a coupling clip on XL1 (a 3/4 in. terry clip slipped over the crystal envelope makes a convenient coupling) using item 12.

194. Set CTC13 to ACCESS and control switch SA on the radio set to CHANNEL ADJ.

195. Connect the 1MHz standard from the counter to X1 input on the c.r.o. (CT531), and cro. output of TRE to X2 input.

196. Set the CT531 c.r.o. controls as follows:

CHANNEL MODE	ALT	CH 2 sensitivity	0.1V
TRIGGER SELECTOR	CH 1	TRIGGER MODE	AUTO
CH 1 sensitivity	0.2V	'A' TIME/CM	2μs

197. The c.r.o. will display the 1MHz trace stationary (locked) and the 100kHz trace drifting left or right. Movement left indicates frequency high, right frequency low.

198. Adjust C22 until the 100kHz trace is stationary (or as near as possible). Clockwise movement of the trimmer reduces frequency, anti-clockwise movement raises frequency.

199. Transfer the lead from CTC22 to CTC21 and set CTC12 to ACCESS. Take a 10 s count on the counter, it shall be within the limits 99,997.9-100,002.1Hz (100kHz ±2Hz ±1 count).

200. Remove clip from XL1 and replace can.

To check 2MHz crystal XL2

201. Wind a loop of insulated wire round the rear pin of XL2 and connect via a 2pF capacitor and item 12 to CTC21. Set CTC12 to ACCESS and SA to CURSOR ADJUST.

202. Set counter to 1 s and 0.01V input. The counter should read 2MHz ±400Hz. If outside these limits replace crystal XL2.

Table 25 - Alignment schedule, 1st i.f., t.r.e. method

Preparation: a. Connect CTC20 to the junction of PL5 and R11 and chassis using item 12 (Cable assy 6625-99-621-8734). Set CTC1 to RX CW. Disconnect PL5 from SKT5.

b. Connect CTC16-17 to TP5 and chassis using the d.v.m. extension leads. Depress CTC3.

c. Set s.g. and attenuator as detailed in the table.

d. Set SA to OPERATE.

e. Refer to Fig 7 for location of trimmers/slugs.

Operation No	Trimming point	Signal generator		Action
		f MHz	Attenuator	
	T10 T11 L22 L16 T9			Screw slug IN 2 turns Screw slug OUT 2 turns Screw slug OUT 2 turns Screw slug OUT 2 turns Screw slug IN 2 turns
		6.0		Adjust attenuator level until the d.v.m. reads 100mV. Maintain this level while trimming. Check that the s.g. voltage is producing the d.v.m. reading by switching CTC14 to CARRIER OFF and noting that the reading reduces.
1	T10	6.0		Trim for MAX on d.v.m. Do these
2	T11	6.0		Trim for MIN on d.v.m. operations
3	L22	6.0		Trim for MAX on d.v.m. carefully
4	L16	6.10		Trim for MAX on d.v.m. and ONCE
5	T9	5.90		Trim for MAX on d.v.m. only. Do
6	L16	6.10		Trim for MAX on d.v.m. not repeat
7	T9	5.90		Trim for MAX on d.v.m.
		6.0	25-28dB approx	Adjust s.g. level to give a reading of 100mV on the d.v.m. (1)
		3dB bandwidth check		Increase s.g. level by 3dB. Tune s.g. either side of 6.0MHz and note the frequencies f1-f2 at which the d.v.m. reads (1). These frequencies should be reasonably symmetrical in displacement from 6.0MHz. The bandwidth should be of the order of 290-320kHz.
				Remove extension leads from CTC16-17 and TP5. Connect Hewlett Packard probe (11096) between CTC16-17 and TP6. Depress CTC3.
8	T7	Not required		Trim for MAX on d.v.m. and then screw slug IN a further 2.1/2 turns

Table 26 - Alignment schedule, 2nd i.f., t.r.e. method

Preparation: a. Connect s.g. as for 1st i.f. alignment. Set CTC1 to RX CW.
b. Depress CTC6 and IF(L)2.
c. Set s.g. and attenuator as detailed in the table.
d. Switch SA to OPERATE.
e. Refer to Fig 8 for location of trimmers/slugs.

Operation No	Trimming point	Signal generator		Action	
		f MHz	Attenuator		
	T6 L29 T8 L32 L33			Screw slugs OUT 2 turns	
1	L33	6.0	0dB	Trim for MAX on d.v.m.	*Maintain s.g. level to give a reading of 300mV on the d.v.m. while trimming
2	L32	6.025	*	Trim for MAX on d.v.m.	
3	L29	6.025	*	Trim for MAX on d.v.m.	
4	T8	5.975	*	Trim for MAX on d.v.m.	
5	T6	5.975	*	Trim for MAX on d.v.m.	
6	L32	6.025	*	Trim for MAX on d.v.m.	
7	L29	6.025	*	Trim for MAX on d.v.m.	
8	L33	5.975 6.025 6.025 5.975	87dB approx	Note d.v.m. reading (1) Note d.v.m. reading (2) Trim until d.v.m. reads the mean of (1) and (2). Call this reading (3). Note the d.v.m. reading, it should be approx equal to (3). Trim L33 as necessary until (3) is equal at 5.975 and 6.025MHz	
9		3dB bandwidth check		Adjust s.g. level at 6.0MHz until the d.v.m. reads 300mV (1). Increase s.g. level by 3dB. Tune s.g. either side of 6.0MHz noting the frequencies f1 and f2 at which the d.v.m. reads (1). The difference between f1 and f2 should be between 58 and 72kHz and the difference between (f2-6.0MHz) and (6.0MHz-f1) shall not exceed 4kHz.	
10		60dB bandwidth check		Repeat 9 at 60dB, f2-f1 should not exceed 250kHz	

Table 27 - Alignment schedule, a.f. discriminator, t.r.e. method

Preparation: a. Connect s.g. as for 1st i.f. alignment. Set CTC1 to RX CW.

b. Connect CTC16-17 between terminal block H4 and chassis using the d.v.m. extension leads. Depress CTC3.

c. Set s.g. and attenuator as detailed in table.

d. Refer to Fig 9 for location of trimmers/slugs.

Operation No	Trimming point	Signal generator		Action	
		f MHz	Attenuator		
1	L35	6.0	93dB	Trim for ZERO on d.v.m. Several zeros may be found. The correct one is that when a 1/2 turn produces a reading of about 10V on the d.v.m.	
2	L34	6.080	46dB	Trim for MAX on d.v.m. A reading of about 25-30V on the d.v.m. is to be expected.	
3	L35	6.0	93dB	Trim for ZERO on d.v.m.	
4	L34	6.080	46dB	Trim for MAX on d.v.m.	
5				Repeat 3 and 4 until no further adjustments are required	
6		6.015	93dB	Tune s.g. to 6.015 MHz and note d.v.m. reading (1)	(1) will be about 10-12V
		6.030	93dB	Tune s.g. to 6.030 MHz and note d.v.m. reading (2)	(2) should be at least 1.95 times that of (1)
7		5.985		Repeat operation 6 at 15 and 30kHz below 6.0MHz	Results should be similar to those in 6 but of opposite sign

Table 28 - Alignment schedule, a.f.c. discriminator, t.r.e. method

Preparation:
a. Connect s.g. as for 1st i.f. alignment. Set CTC1 to RX CW.
b. Disconnect terminals E3 and E4.
c. Connect CTC16-17 to terminals E3 and E4 (on 1st i.f. unit) using the d.v.m. extension lead. Depress CTC3.
d. Switch SA to TUNE RF.
e. Refer to Fig 10 for location of trimmers/slugs.

Operation No	Trimming point	Signal generator		Action	Remarks
		f MHz	Attenuator		
1	L23	6.0	0dB	Trim for ZERO on d.v.m.	
2	L21	6.38	0dB	Trim for MAX on d.v.m.	A reading of about 35-40V is usual
3	L23	6.0	0dB	Trim for ZERO on d.v.m.	
4	L21	6.250 5.750	0dB	Adjust for symmetry of output at 6.25 and 5.75MHz	About 35-40V

Table 29 - Alignment schedule, sender r.f., t.r.e. method

Preparation:
a. Ensure that the r.f. dial and gange are in correct relationship (para 104-108).
b. Set C3G neutralising capacitor 3 turns from fully closed position.
c. Connect 'a' frame terminals 20-21 together.
d. Connect CTC21 loosely to C50 (PA trimmer) or L15 using item 12 and a short piece of insulated wire looped round C50 or L15 to provide the necessary coupling. Set CTC21 to ACCESS.
e. Set counter to 0.01 s 0.01V input.
f. Connect CTC20 via item 7 and 50/75Ω matching transformer to e.u.t. antenna plug. Set CTC20 to CW TX.
g. Refer to Fig 12 for the location of trimmers/slugs.

Table 29 (Cont)

No	Trimming point	R.F. scale	Set control switch	Action
1		36	CURSOR ADJ	Tune CHANNEL to 36MHz Remove a.f.c. link while tuning
2	L10	36	TUNE RF	Trim until counter reads 36MHz ±4kHz
3		60	CURSOR ADJ	Tune CHANNEL to 60MHz Remove a.f.c. link while tuning
4	C35	60	TUNE RF	Trim until counter reads 60MHz ±6kHz
5				Repeat 1-4 until no improvement is obtained
6			TUNE RF	Check with r.f. dial at 50 and 40MHz that the counter reads within ±1MHz of indicated frequency
7				Set CTC1 to CW TX; depress CTC7; d.v.m. set to 18V range; switch SB to HIGH POWER
8	L12	36	OPERATE	Trim for MAX on d.v.m.
9	L15	36	OPERATE	Test with 'wand' and adjust for MAX on d.v.m. This should be at least 3.9V (15W)
10	C49	60	OPERATE	Trim for MAX on d.v.m.
11	C53	60	OPERATE	Trim for MAX on d.v.m. This should be at least 3.9V (15W)
12				Repeat 8-11 until no further improvement is obtained
13				Rotate gang over the band and ensure that at no point from 36-60MHz does the d.v.m. reading fall below 3.9V (15W). Note point of minimum reading ('f min').
14	(C49) (L12)	'f min'	OPERATE	Trim until power output is within limits over the band and as near constant as possible. The adjustment of C49 or L12 will depend upon whether f min is nearer the low or high frequency end of band.
Remove link from 'a' frame terminals 20-21				
15			OPERATE	Tune CHANNEL and RF scales in normal manner and carry out RF power tests para 179.

Table 30 - Alignment schedule, receiver r.f., t.r.e. method

Preparation: a. Connect CTC20 to antenna plug of e.u.t. via item 7 and 50/75Ω matching transformer. Set CTC1 to RX CW.

b. Depress CTC6 and IF(L)2.

c. Tune set to 36MHz and 60MHz using CURSOR ADJ and TUNE RF position of set control switch.

d. Carry out trimming with set switched to OPERATE.

e. Refer to Fig 13 for the location of trimmers/slugs.

Operation No	Trimming point	Signal generator		Action
		f MHz	Attenuator	
1	L4	36	96dB	Trim for MAX on d.v.m.
2	L3	36	96dB	Trim for MAX on d.v.m.
3	L1	36	96dB	Trim for MAX on d.v.m.
4	C14	60	96dB	Trim for MAX on d.v.m.
5	C4	60	96dB	Trim for MAX on d.v.m.
6	C2	60	96dB	Trim for MAX on d.v.m.
7				Repeat 1-6 until no further improvement is obtained
		38 46 58	119dB max	Carry out quieting tests at 38, 46 and 58MHz (para 174)

Adjustments to a.f. unit

203. Carry out detail in para 176 and adjust RV1 until the d.v.m. reads 2.73V (150mW). Observe the waveform on the c.r.o., there should be no visible distortion.

Adjustments to a.m.c. unit

204. After alignment of the sender r.f. circuits the a.m.c. preset control RV3 should be set up. This adjustment must be carried out with all sub-unit securing screws and tray bolts securely fastened, otherwise hum may give false results.

205. Carry out the detail in para 180.a., b., c. and adjust RV3 until the deviation meter reads 4.5kHz (para 180.a.).

Adjustments to squelch unit

206. Carry out the detail described in para 156.

Adjustments to receiver, 1st local oscillator

207. If the film scale has been replaced, but neither the inductuner L40 and trimmer C161 has been interferred with, nor the inductuner separated from the film scale drive proceed as follows:

a. Connect CTC21 to SKT5 via a 200pF capacitor and item 12. Set CTC12 to ACCESS.

b. Set counter to 1 s and 0.01V input.

c. Switch SA to OPERATE and tune the CHANNEL dial until the counter reads 66MHz ±1kHz. This should occur when the film scale reads 60MHz at approx mid-scale. Set the cursor to read exactly 60MHz.

d. Tune CHANNEL until the counter reads 42MHz ±1kHz. This should occur when the film scale reads 36MHz within ±1/8 in. of the cursor. If satisfactory, the calibration should be checked using the internal 2MHz crystal, at 2MHz points throughout the band. It should be possible to adjust the cursor at all points so that the scale reads correctly.

e. If calibration in c. or d. is unsatisfactory, the unit requires realignment. Proceed as detailed in para 208.

208. If the inductuner unit has been worked on, or separated from the film scale drive unit proceed as follows:

a. Switch SA to OPERATE. Remove the film scale unit with the local oscillator unit attached from the set, but connect by SKT6 to h.t. and l.t. supplies. Couple the oscillator output from SKT5 as in para 207.a. Set CTC12 to ACCESS.

b. Set the film scale to 60MHz, with the cursor in mid-position.

c. Release the three No 6 BA Allen headed screws securing the driving pinion to the inductuner spindle (Fig 4).

d. Adjust inductuner until counter reads 66MHz ±1kHz. The inductuner spindle has a slotted end and may be turned by a screw-driver inserted through the hole in the scale plate (Fig 4).

e. Tighten one of the Allen headed grub screws.

f. Set film scale to 36MHz. Adjust C161 until counter reads 42MHz ±1kHz.
Note: C161 is at h.t. potential and an insulated trimming tool must be used.

g. Repeat b. to f. until no further adjustment is required.

h. Finally tighten all grub screws and reassemble unit in set, using reverse procedure to that described in para 23.

j. Switch set to CURSOR ADJ and check that 2MHz calibration points are accurate throughout the band as described in para 207.d.

Adjustments to T12, output transformer of 1st local oscillator

209. a. Connect CTC16-17 to the junction of R11 and R12 at the end of the co-axial cable from PL5 using the Hewlett Packard probe (11096). Depress CTC3.

b. Adjust slug in T12 until the r.f. output at 42MHz (36MHz on scale) equals the output at 66MHz (60MHz on scale).

c. Tune the unit through its whole range, and check that the output at any point is not less than the output at 42 and 66MHz (36 and 60MHz on scale).

FAULT FINDING DATA, T.R.E. METHOD

General

210. The figures quoted are included to assist in fault finding only. They are in no way intended to be specification tests.

A.F. sensitivity

Conditions

211. a. Set t.r.e. controls:

CTC2	AF LOAD 50	IF(L)6	Depressed
CTC7	Depressed	IF(L)7	C42
CTC8	Depressed	D.V.M.	18V range

b. CTC23 via item 12 to input as detailed in Table 31.

Table 31 - A.F. sensitivity figures, t.r.e. method

Input point	Input volts			Output
	300Hz	1000Hz	4000Hz	
Terminal H4	700-900mV	500-600mV	450-600mV	2.73V (150mW) on d.v.m.
Across RV1	200-300mV	100-130mV	100-150mV	
Grid V21	2.5-3.5V	1.6-1.8V	1.4-1.7V	

A.F. discriminator

Conditions

212. a. CTC20 connected to PL3A using item 12. Set CTC1 to RX CW.

b. Signal generator 2.4MHz; attenuator 60dB.

c. CTC16-17 to H4 and chassis using d.v.m. extension leads.

d. Depress CTC3, set d.v.m. to 180V range.

e. Tune s.g. for zero reading on the d.v.m. Note this frequency (fo).

Table 32 - A.F. discriminator slope, t.r.e. method

S.G. frequency relative to fo,(kHz)	-30	-20	-10	+10	+20	+30
D.V.M. reading (V)	16-20	10-12	5-6	5-6	10-12	16-20

2nd i.f. gain

Conditions

213. a. CTC20 to input as detailed in Table 33 using item 12. CTC1 set to RX CW.

b. Signal generator 2.4MHz. Attenuator set as detailed in Table 33 for a reading of 300mV on the d.v.m.

c. Depress CTC6 and IF(L)2. Set IF(L)7 to C42.

d. PL3A disconnected except for V13a and TP6 tests.

e. Remove XL3 when making V13a and TP6 tests.

Table 33 - 2nd i.f. gain, t.r.e. method

Input point	Grid V15	L32 spills 1 and 3	Grid V14	PL3	TP6	V13a pin 2
Attenuator(dB)	25-26	37-40	56-58	68-69	58-63	80-84

1st i.f. gain

Conditions

214. a. CTC20 to input as detailed in Table 34 using item 12. CTC1 set to RX CW.

b. Depress CTC6 and IF(L)2. Set IF(L)7 to C42.

c. Signal generator 6.0MHz. Attenuator set as detailed in Table 34, for a reading of 300mV on the d.v.m.

d. SKT4 disconnected.

Table 34 - 1st i.f. gain, t.r.e. method

Input point	V13a pin 2	Spills 1 and 6 of L22	Spills 1 and 3 of T11	Grid V9	PL4
Attenuator(dB)	74-75	74-78	74-75	88-92	96-100

8.4MHz crystal oscillator

Conditions

215. a. PL4 disconnected.

b. CTC16-17 to V13 pin 7 using the Hewlett Packard probe (11096). CTC3 depressed.

c. The reading on the d.v m. will be between 12 and 15V.

1st local oscillator

Conditions

216. a. PL5 disconnected.

b. CTC16-17 to SKT5 using the Hewlett Packard probe (11096). CTC3 depressed.

c. The readings on the d.v.m. will be as follows:

38MHz - 1.3-2.0V)
46MHz - 3.0-4.5V)
58MHz - 0.7-1.0V)
42-43MHz -12.0-16.0V)

Frequencies quoted are scale reading ie actual oscillator frequency will be 6.0MHz higher

Receiver r.f.

Conditions

217. a. Carry out quieting test para 174 at 46MHz. The attenuator settings for 10dB quieting should be between 122 and 119dB.

b. CTC20 connected via a 75Ω termination to the input point detailed in Table 35. The attenuator settings for 10dB quieting should be as shown.

Table 35 - Receiver r.f. gains, t.r.e. method

Input point	C3C	C3B	C3A
Attenuator(dB)	111-107	123-114	105-100

A.M.C. unit

Conditions

218. a. Set up e.u.t. and t.r.e. as detailed in para 180.

b. Connect d.v.m. extension leads to CTC16-17 and output points as detailed in Table 36. Depress CTC3.

c. Set RV3 to maximum.

d. Set a.f. generator 1000Hz; 10mV (Col 1, Table 36).

e. As a. but input 200mV (Col 2, Table 36).

Table 36 - A.M.C. test figures, t.r.e. method

Output points	Across RV3 V28 in	S4 to Chassis V28 in	Across RV3 V28 out	S4 to Chassis V28 out	Across R151	Across R144 d.c. volts
Output volts Col 1	0.07–0.1	1.9–2.4	0.07–0.1	2.0–2.2	0.08–0.12	1.0–1.2
Output volts Col 2	0.1–0.12	2.7–2.8	-	-	0.1–0.12	2.8–3.4

Sender r.f.

Conditions

219. a. Set up e.u.t. and t.r.e. as detailed in para 179.

b. Carry out HIGH POWER output test at 38, 46 and 58MHz. The d.v.m. should read between 3.9 and 4.4V (15–20W).

c. Connect Hewlett Packard probe (11096) to CTC16–17 and TP3. Depress CTC3. With conditions as in b. the d.v.m. should read between 1.5 and 2.5V.

d. Connect CTC16–17 to TP9 and chassis using the d.v.m. extension leads. Carry out HIGH POWER output test at 38, 46 and 58MHz. Depress CTC3, the d.v.m. should read between -3 and -4V at 38 and 46MHz and -3.5 to -4.2V at 58MHz.

A.F.C.

Conditions

220. a. Disconnect terminals E3 and E4.

b. Disconnect PL4 from SKT4.

c. Connect CTC20 to PL4. Set CTC1 to RX CW.

d. Connect d.v.m. extension leads to CTC16–17 and E3 and E4. Depress CTC3.

e. Set signal generator 6.0MHz; attenuator 28dB.

f. Connect multimeter CT498 between TP5 and chassis.

Table 37 - A.F.C. readings, t.r.e. method

Signal generator frequency (MHz)	D.C. volts across E3 and E4	Current at TP5 (μA)
6.0	0	18-33
5.9	13-20	-
6.1	13-20	-

Intercomm amplifier

Conditions

221. a. Carry out the detail in para 183.a. and b.

b. A.F. generator set to 1000Hz, adjust the a.f. generator output until the d.v.m. reads 2.7V (250mW).

c. The input from the a.f. generator should be between 70-90mV.

D.C. currents and voltages

222. See Table 2513 EMER Tels H 442 Part 2.

Reactor

Conditions

223. a. Disconnect B14.

b. Set switched to HP SEND, tuned to 46MHz.

c. Carry out detail in para 180.a.

d. Connect CTC23 to B14 and chassis using item 12. Depress CTC 8.

e. Applying a 1000Hz a.f. signal should produce the deviations shown in Table 38.

Table 38-Deviation frequencies for a.f. input signal to reactor, t.r.e. method

A.F. input (mV)	7.5	200	280
Deviation(kHz)	4	10	15

224. a. Conditions as in para 221.a. and b.

b. D.C. voltage from a battery connected between B14 and chassis. Apply a d.c. voltage between B14 and chassis, this should cause m.o. frequency to vary as in Table 39.

Table 39 - Frequency variation with d.c. voltage applied to reactor grid, t.r.e. method

Applied d.c. (V)	-5	-10	+5	+10
MO frequency variation(kHz)	-600	-700	+700	+1200

Reactor tests

225. Primary d.c. resistance at 20°C: 297-402Ω

Primary inductance: 1.0H at 1000Hz, 1V

Hum and microphony

226. The tests detailed in para 177 and 181 will be carried out with the wiring trays securely screwed to the 'A' brackets. In faulty sets the following may effect a cure:

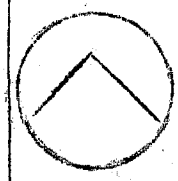
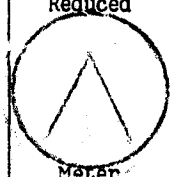
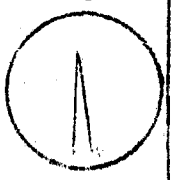
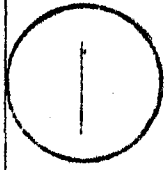
a. Change V31 - receiver and/or sender faulty.

b. Change V27 - if sender only is faulty.

c. Change ventilator.

Note: the next page is Page 1001

Table 4001 - Fau

CURSOR ADJUST		CHANNEL ADJUST		TUNE R.F.		OPERATE	S
Tune meter indication	Lim grid μA	Tune meter indication	Lim grid μA	Tune meter indication	Lim grid μA	Lim grid μA	Op
Normal	600-900	Normal	500-800	Normal	600-900	30-70	
 Meter swing				None	20-50	30-70	N
		None	20-50	Normal	600-900	30-70	N
	10-20	None	2-5	Very slight or none	20-70 Tune for max	2-5	N
Reduced  Meter swing	100-500	None	20-40	Normal	600-900	20-40	N
Slight  Meter swing	50-150	None	10-20	None	300-600 Tune for max	10-15	N
	2-5	None	2-5	Normal	2-5	2-5	
None 	600-900	None	500-800	None	600-900	30-70	N
				Normal	600-900	30-70	
	40-70	Normal	500-800	Normal	600-900	30-70	N
	20-40	None	2-10	None	10-30 Tune for max	2-8	N
	Less than 20	None	2-5	Normal	2-5	2-5	
	No reading	None	No reading	Normal	No reading	No reading	

01 - Fault finding chart

TE d µA	SQUELCH Operation	Headset		Probable fault	Action
		Phones	Microphone		
0	Normal	Normal	Normal	No fault, set operating correctly	-
			S/T very loud	A.M.C. not working	Change V28 or a.m.c. sub-unit
			No S/T	Mic amp or mod not working	Check a.f.c. If in order change V27 or V30
		No noise	No S/T	A.F. amplifier not working	Change V20 or V21 or a.f. sub-unit
	None	Normal	Normal S/T	Squelch unit faulty	Change squelch sub-unit
0	Normal	Normal	No S/T, noise	M.O. not working	Change V6, V7 or r.f. sub-unit
0	Normal	Normal	Normal S/T	100kc/s cal not working	Change r.f. sub-unit
	Normal	Normal	Noise or possibly S/T	1st amplifier not working	Change V9 or 1st i.f. chassis
0	Normal	Normal	Normal S/T	R.F. stage not working	Change V1 or r.f. unit
5	Normal	Normal	Noise	Local oscillator not working	Change V31
	None	Low noise or hum	Possibly S/T	2nd i.f. amplifier not working	Change V14, V15 or 2nd i.f. chassis
0	Normal	Normal	Normal	Meter faulty	
0	None	Hum	Hum no S/T	2nd limiter not working	Change V17 or 2nd i.f. sub-unit
0	Normal	Normal	Normal S/T	2Mc3s cal not working	Change V4 or XL2 or r.f. sub-unit
	Normal	Normal	Noise	Mixer not working	Change V2 or r.f. sub-unit
	None	Low noise	No S/T	2nd mixer or 8.4Mc/s osc not working	Change V13 or 1st i.f. sub-unit
ing	None	Hum	Hum no S/T	1st limiter (V16) o/c heater	Change V16

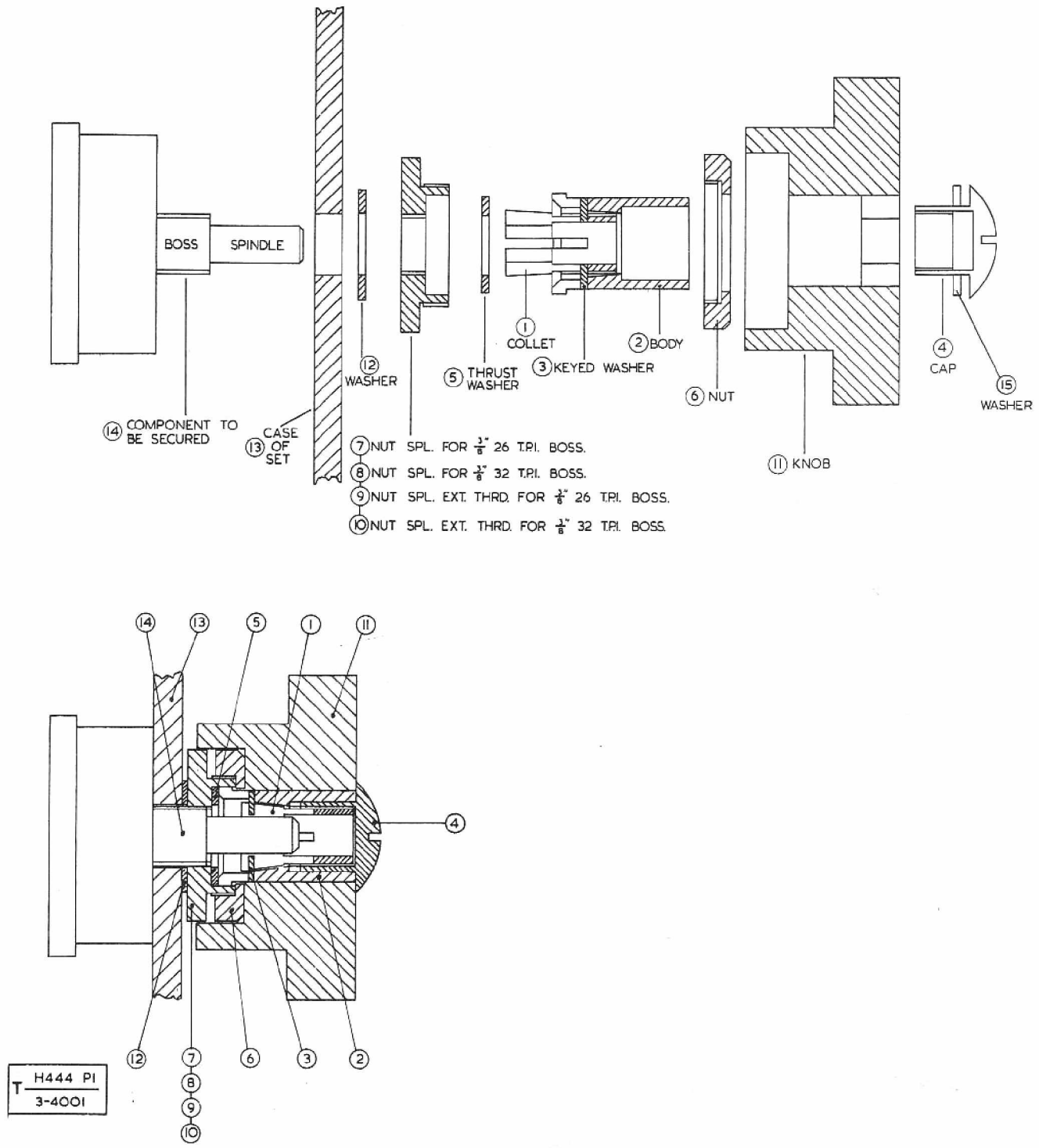
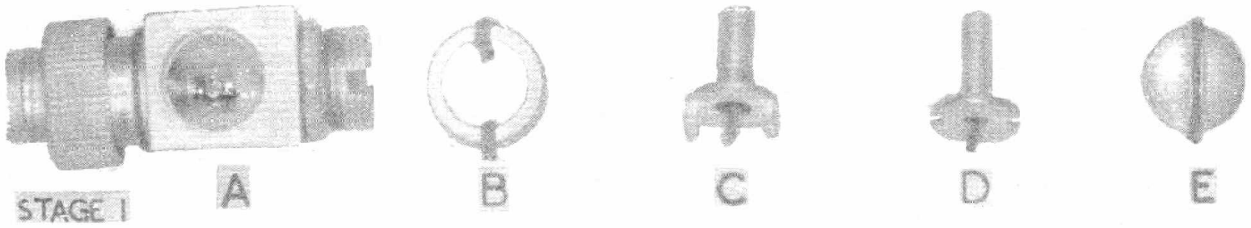
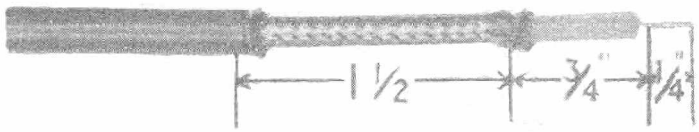


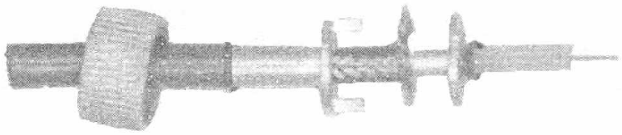
Fig 4001 - Collet type knob



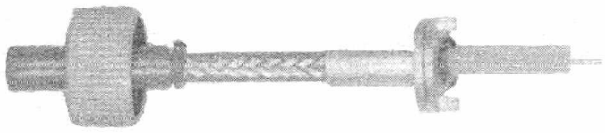
STAGE 1



STAGE 2

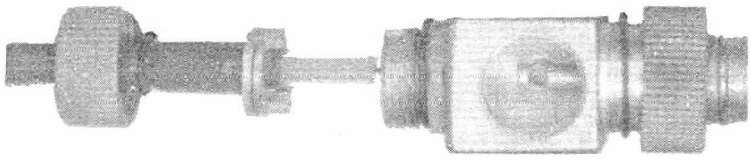


STAGE 3

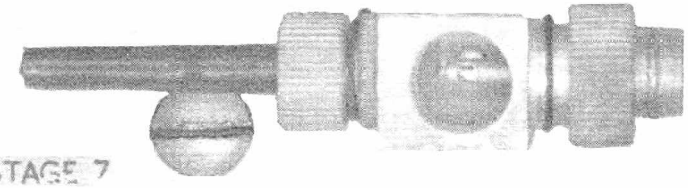


STAGE 4

STAGE 5



STAGE 6



STAGE 7

Stage 1 - Disassemble socket as shown.

Stage 2 - Prepare Uniradio 57. Cut off outer covering, then slip remainder of covering back 1.1/2 in.

Stage 3 - Assemble items B, C and D on cable. Comb out braiding for 1/4 in.

Stage 4 - Clamp braiding between C and D, sliding D between braid and polythene. Trim braiding if it projects beyond C and D.

Stage 5 - Slide outer covering over item D.

Stage 6 - Mate cable to socket. Solder cable end to socket.

Stage 7 - Complete assembly by screwing B to A, fit cover screw E.

T H 444-1
3-4002

Fig 4002 - Details of repairing aerial connectors

Note: This Page 1004, Issue 3 is to be filed immediately after Page 1003, Issue 3 dated 5 Apr 63. This information

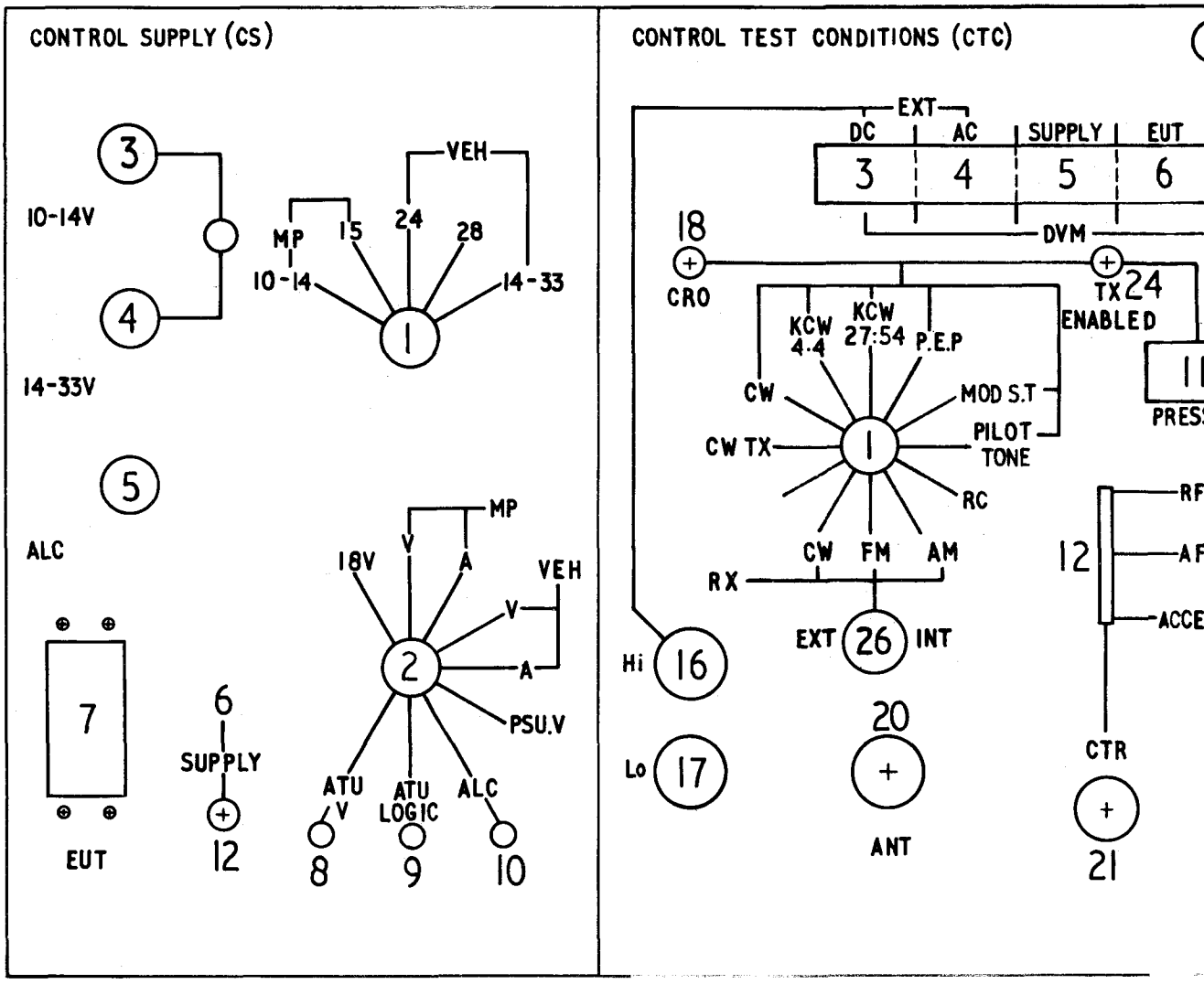
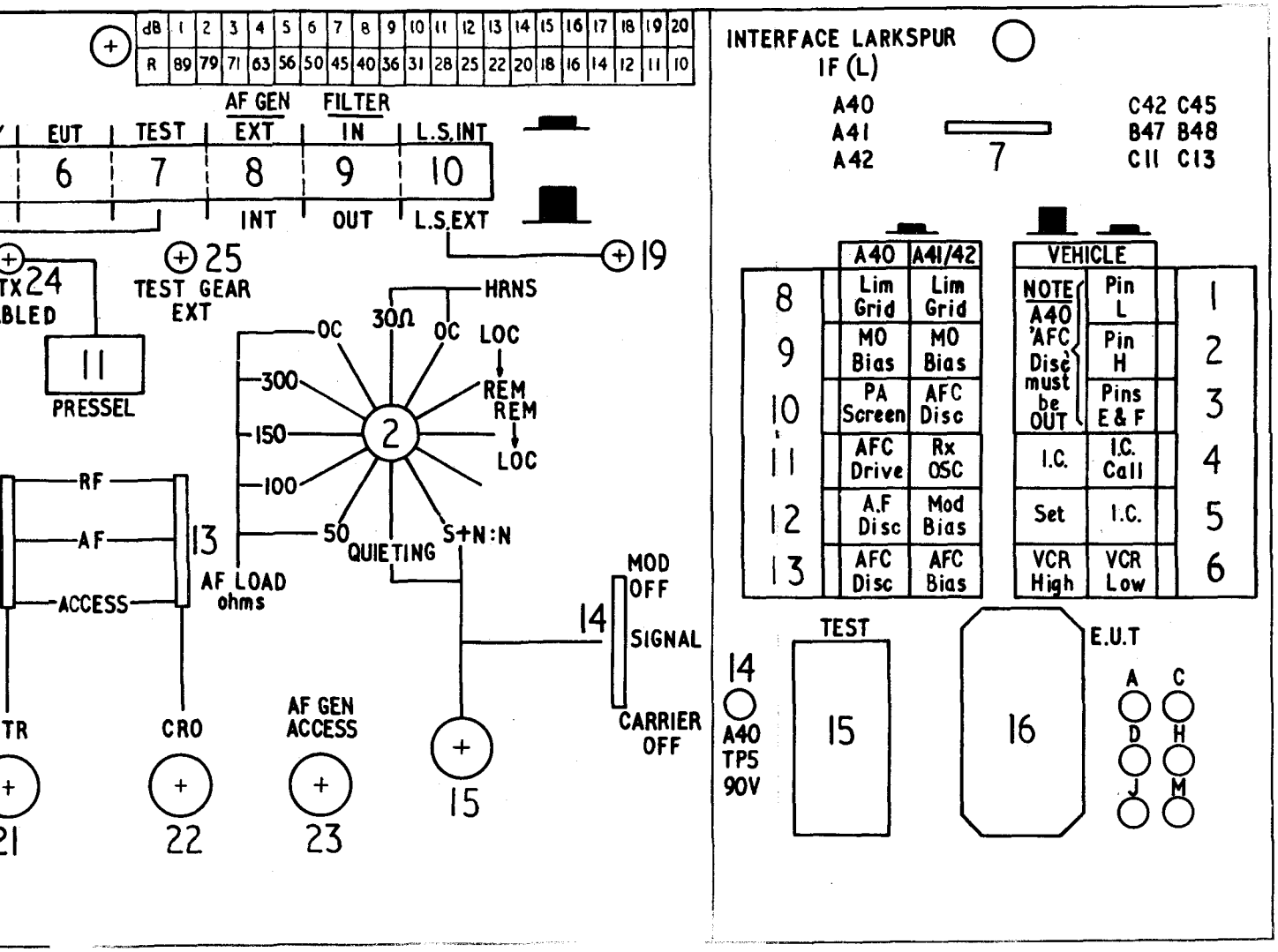


Fig 4003 - Front panel layout, Test Contr

EME8b/4052/Tels

END of

formation is additional. Delete 'END OF PART 1' from the bottom of Page 1003.



st Controller, fitted with Interface Larkspur

END of Part 1

Table 4001 – Fault finding chart

CURSOR ADJUST		CHANNEL ADJUST		TUNE R.F.		OPERATE Lim grid μA	SQUELCH Operation	Headset		Probable fault	Action
Tune meter indication	Lim grid μA	Tune meter indication	Lim grid μA	Tune meter indication	Lim grid μA			Phones	Microphone		
Normal	600-900	Normal	500-800	Normal	600-900	30-70	Normal	Normal	Normal	No fault, set operating correctly	-
									S/T very loud	A.M.C. not working	Change V28 or a.m.c. sub-unit
									No S/T	Mic amp or mod not working	Check a.f.c. If in order change V27 or V30
								No noise	No S/T	A.F. amplifier not working	Change V20 or V21 or a.f. sub-unit
							None	Normal	Normal S/T	Squelch unit faulty	Change squelch sub-unit
Meter swing				None	20-50	30-70	Normal	Normal	No S/T, noise	M.O. not working	Change V6, V7 or r.f. sub-unit
		None	20-50	Normal	600-900	30-70	Normal	Normal	Normal S/T	100kc/s cal not working	Change r.f. sub-unit
	10-20	None	2-5	Very slight or none	20-70 Tune for max	2-5	Normal	Normal	Noise or possibly S/T	1st amplifier not working	Change V9 or 1st i.f. chassis
Reduced	100-500	None	20-40	Normal	600-900	20-40	Normal	Normal	Normal S/T	R.F. stage not working	Change V1 or r.f. unit
Meter swing											
Slight	50-150	None	10-20	None	300-600 Tune for max	10-15	Normal	Normal	Noise	Local oscillator not working	Change V31
	2-5	None	2-5	Normal	2-5	2-5	None	Low noise or hum	Possibly S/T	2nd i.f. amplifier not working	Change V14, V15 or 2nd i.f. chassis
Meter swing											
None	600-900	None	500-800	None	600-900	30-70	Normal	Normal	Normal	Meter faulty	
				Normal	600-900	30-70	None	Hum	Hum no S/T	2nd limiter not working	Change V17 or 2nd i.f. sub-unit
	40-70	Normal	500-800	Normal	600-900	30-70	Normal	Normal	Normal S/T	2Mc3s cal not working	Change V4 or XL2 or r.f. sub-unit
	20-40	None	2-10	None	10-30 Tune for max	2-8	Normal	Normal	Noise	Mixer not working	Change V2 or r.f. sub-unit
	Less than 20	None	2-5	Normal	2-5	2-5	None	Low noise	No S/T	2nd mixer or 8.4Mc/s osc not working	Change V13 or 1st i.f. sub-unit
	No reading	None	No reading	Normal	No reading	No reading	None	Hum	Hum no S/T	1st limiter (V16) o/c heater	Change V16

Note: This Page 1004, Issue 3 is to be filed immediately after Page 1003, Issue 3 dated 5 Apr 63. This information is additional. Delete 'END OF PART 1' from the bottom of Page 1003.

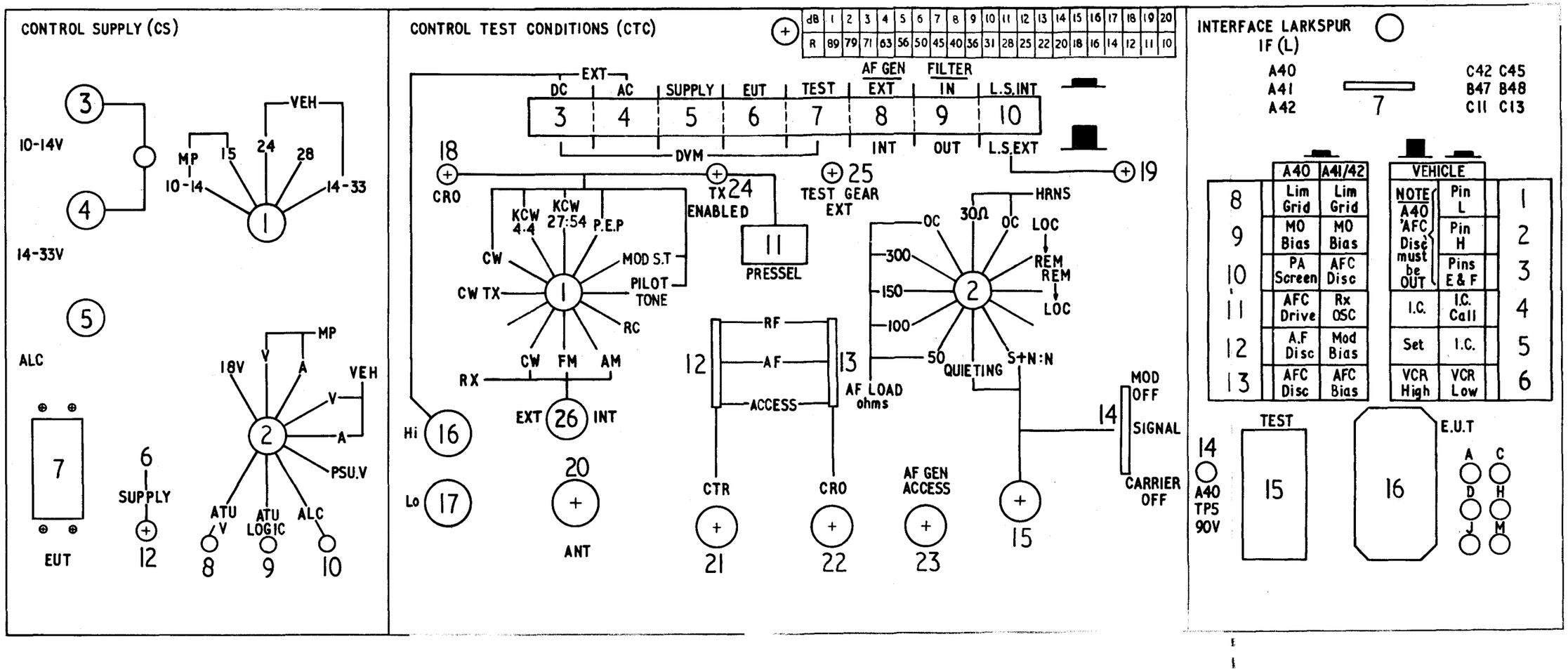


Fig 4003 - Front panel layout, Test Controller, fitted with Interface Larkspur

EME8b/4052/Tels

END of Part 1