The VMARS Archive

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Any other problems?

Please get in touch with me at archivist@vmarsmanuals.co.uk.

Richard Hankins, VMARS Archivist, Summer 2004

WIRELESS SET NO. 62

SECOND TO FOURTH ECHELON WORK

Note: This issue supersedes Issue I which has been revised throughout.

CONTENTS

TABLE

Distribution - Class 870. Code No.6

FIGURES

MECHANICAL REPLACEMENTS AND ADJUSTMENTS

Frequency range switch S1A

1. To dismantle the switch S1A, remove the knob by removing the centre screw and loosening the grubscrew. Take off the knob and prise off the metal cap and Neoprene seal, and then detach the escutcheon by removing the fixing screws. Turn the set upside down and unscrew the two screws holding the click plate to its mounting frame. By rotating the click plate and pulling the shaft forward, the shaft and click plate can be detached. This will allow the wafers to be removed separately as required.

Services switch S4A

2. To dismantle the services switch, remove the knob and sealing as in para.1, and unscrew the two screws holding the switch to the front panel. To remove the switch it will be necessary to unsolder the shorter leads to it before it can be withdrawn.

R.F. coils

3. To remove an R.F. coil, unsolder the connections to the coil and remove the nut and shakeproof washer, on the top of the chassis, which holds the coil in place. The coil, complete with dust core and trimmer, can now be removed.

Resistor R6D

4. The grid leak, R6D, of the sender buffer amplifier, V5A, is mounted in a screened box which partly covers the valveholder of this valve. To reach this resistor, or the pins screened by the box, remove the lid of the screened box by unsoldering it at the three soldering tags.

4-Gang condenser C9A-D and flick mechanism (Fig.1)

Preliminary

5. (a) Remove the dial assembly, slow-motion and flick knobs and clamping nuts.
   (b) Remove the three screws holding the main gang to the side plate of the flick mechanism.
   (c) Slacken all holding screws on the front panel and remove the crystal holder completely. This allows the front panel to be eased away from the chassis.

6. To remove the condenser:-
   (a) Unsolder the leads connecting C4A and C4B to the gang.
   (b) Unsolder the earth connection to the junction of R6A and R7B on the TC1 tag panel on the top of the gang.
   (c) Unsolder the two earth leads at the gang frame.
   (d) Unsolder the lead connecting C1A to L1A.
   (e) Unsolder the leads connecting S1A/1, S1A/4, S1A/5 and S1A/6.
   (f) Ease the 4-gang condenser out sideways.

7. To remove the flick mechanism:-
   (a) Remove the three nuts and bolts holding the flick assembly to the chassis.
   (b) Undo the nut holding R26A to the flick mechanism frame and leave the resistor suspended in the wiring.
   (c) Ease the front panel forward from the chassis so that it clears the flick indicators.
   (d) Then carefully ease the flick assembly straight up from the chassis so as to clear the trimmers.

8. To replace the gang and flick mechanism, reverse the procedure.

Flick springs

9. To replace the flick indicator springs with the flick mechanism in position on the chassis, use the tool shown in Fig.2. Thread the spring through the eye provided and then by careful manipulation the spring can be removed and replaced as required.

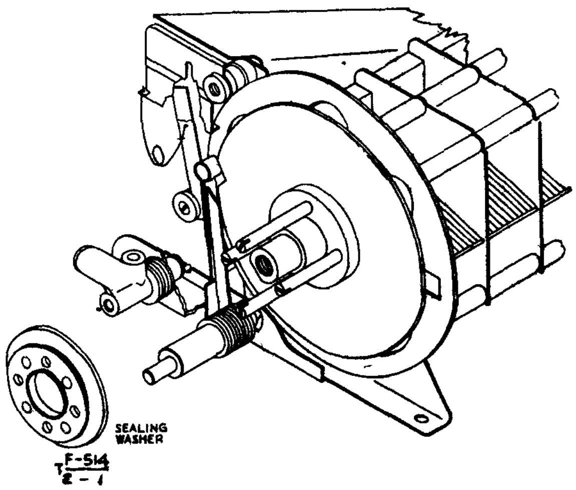


Fig.1 - Flick mechanism

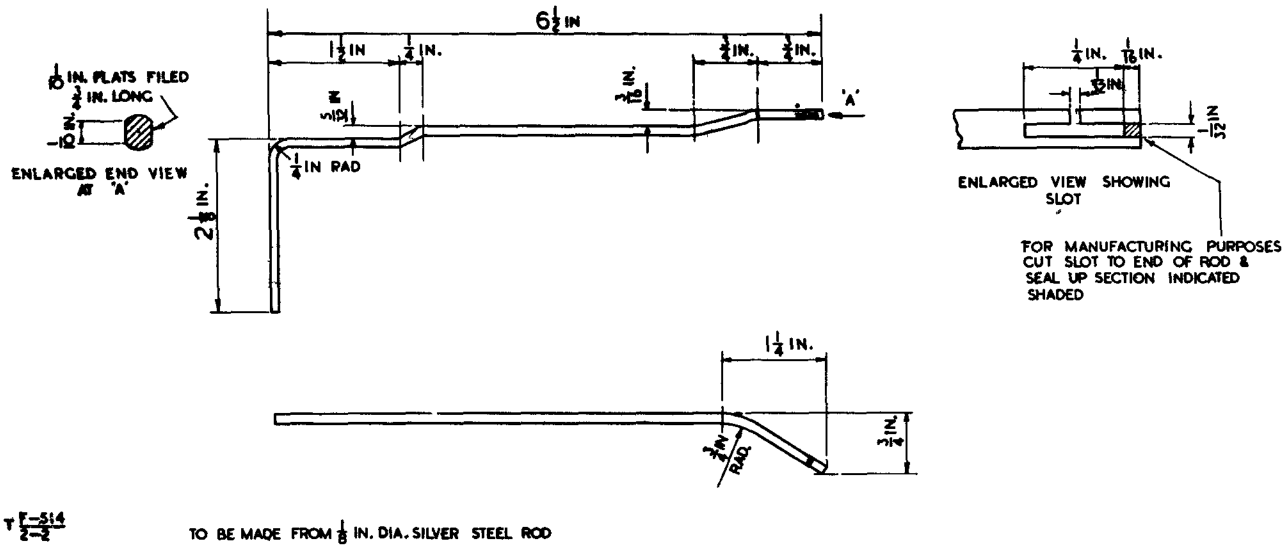


Fig.2 - Flick spring tool

TEST AND ALIGNMENT PROCEDURE

Test equipment required

10. Oscillator, beat frequency, No.1
Meter, output power, No.3 (150Ω impedance)
Dummy aerials, receiver, 0.1μF + 0.5MΩ
60pF (± 2%)
Dummy aerials, sender, 60pF (± 2%) air dielectric in series with 10Ω (± 5%) noninductive, 5W.
Generator, signal, standard, No.1.
Crystal calibrator or Wavemeter SCR-211.
Voltmeter, valve, 150V, No.1.
R.F. ammeter, 0-500mA.

Trimming tool

11. Fig.3 shows details of a suitable trimming tool which should be made out of 1/4 in. Tuffnol rod or similar material.

Table 1

12. This gives the alignment and test procedure in two columns, the left-hand column detailing the method of alignment, while the right-hand column gives relevant extracts from the R.E.M.E. Specification (Tels. A 820), giving performance to be achieved.

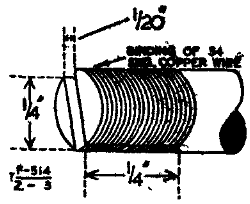


Fig.3 - Trimming tool

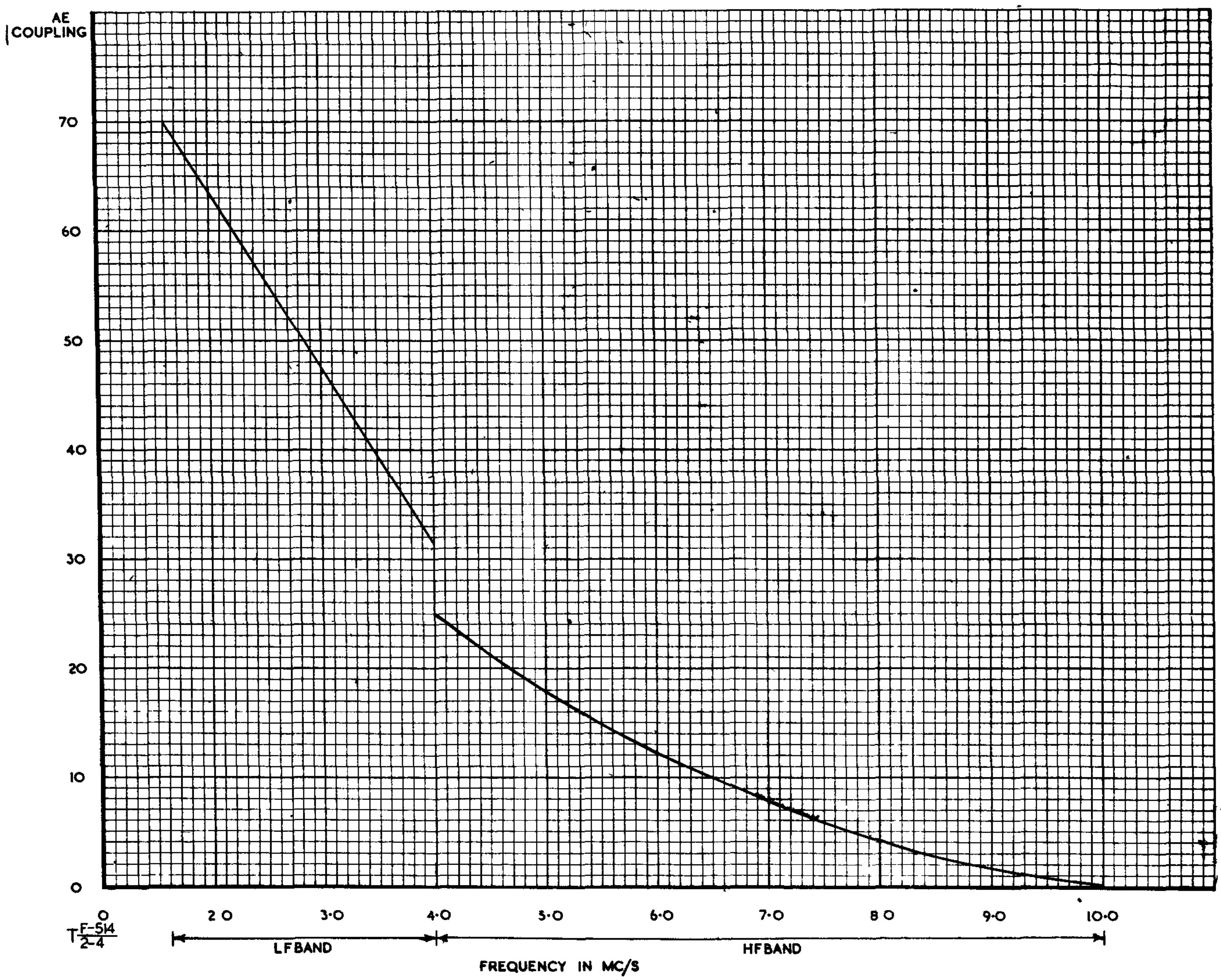


Fig.4 - Aerial coupling settings

Table 1 - Alignment and test procedure.

RECEIVER	General conditions:	OFF/REC ON/ALL ON switch to REC ON except when set switched to NET or when checking beat oscillator Output meter of 150Ω impedance: headset disconnected when measurements are made L.T. input at 12V, measured at set input socket

Item	Method of alignment or testing	Test R.E.M.E. Spec.
A.F. amplifier	Connect a B.F.O. between junction of C5C and S4A/8 and chassis. Switch to R.T. GAIN control to max.	1. <u>Output</u> Audio output not less than 200mW at 1kc/s
Beat oscillator	Set a signal generator to 460 kc/s exactly by beating it with a crystal calibrator. Connect the signal generator, unmodulated, to the grid of V1B through 0.1µF with 0.5MΩ to earth. Switch to NET and ALL ON. Allow the set to warm up and adjust L10A for zero beat.	2. <u>Het tone range</u>. At NET, and with an unmodulated input at the aerial socket of 20µV at any frequency within the coverage of the set, the tuning control will be adjusted for zero beat. Switch to C.W. With the HET TONE control at either end of its travel, the beat note should lie between 2 and 5 kc/s 3. <u>Pulling</u> With input increased to 10mV and the GAIN control set appropriately, it should be possible to tune through zero beat with no evidence of pulling Smoothness of variation of the beat frequency by the HET TONE con-

Table 1 (contd.)

		trol should be satisfactory
I.F.amplifier	The signal generator is used, set at exactly 460kc/s, modulated at 400c/s to 30% fading through 0.1μF to the valve top cap, with 0.5MΩ to chassis and grid lead disconnected. With input to V1E, adjust diode (top) and anode (bottom) coils of T3A for maximum output.	With the frequency dial of the set at 1.6Mc/s and with a 100μV modulated signal at approximately 460 kc/s applied to V1B top cap through 0.1μF, with 0.5MΩ connected between top cap and chassis, and normal grid lead disconnected, tune the signal generator for maximum output
	With input to V1D, adjust grid (top) and anode (bottom) coils of T2A for maximum output	4. <u>Sensitivity.</u> The input required at this peak frequency for an output of 50mW must not exceed 120μV
	With input to V1B and damping circuit of 0.1μF and 20kΩ in series connected between grid V1D and chassis, adjust grid and anode coils of T1A for maximum output. Remove damping circuit	5. <u>Adjacent channel selectivity.</u> With signal generator output at 100μV, set VOLUME control for output of 10mW. Increase signal generator output to 200μV and note frequencies on either side of resonance for 10mW output. The difference between these two frequencies will be the band-width at 6db. down. The mean of these two frequencies should lie between 458 and 462kc/s and within 1kc/s of the peak Repeat with an input of 100mV to find the band-width at 60db. down.

Table 1 (contd.)

			The band-width at 6db. down should be between 5 and 8kc/s and the average slope between 6 and 60db. should not be less than 4.7db./kc/s The specification also quotes maximum band-widths as follows:- 20db. 13.5kc/s max. 40db. 19.0kc/s max. 60db. 28.0kc/s max.
Local oscillator	Replace baseplate Switch to 4-10mc/s RANGE and to NET. Set tuning to 9Mc/s and inject an accurate 9Mc/s signal (from crystal calibrator) to grid of V1B. Adjust C12B for zero beat. Tune to 4Mc/s and adjust L6A for zero beat. Check the error at Mc/s points on the dial and repeat till satisfactory. Seal core and trimmer and recheck. Switch to 1.6-4Mc/s RANGE. Tune to 4Mc/s and adjust C12A for zero beat. Tune to 2Mc/s and adjust L5A for zero beat. Check at 3 and 4Mc/s and repeat until satisfactory. Seal core and trimmer and recheck If it is impossible to align the set, slacken the dial stops, at the top and bottom of the front plate of the main tuning condenser, and turn condenser to maximum capacity. Adjust the cursors to take up the average errors on L.F. and H.F. bands. Fix the dial stops so that the condenser is prevented from fully opening or closing, but covers the frequency band	6. 7.	Calibration. The calibration error of the tuning dial at any salient point must not exceed ½% between 1.6 and 8Mc/s, or 1% between 8 and 10Mc/s Coverage. The frequency coverage should be from 1.6 to 10Mc/s with an overlap of not less than 2% between the two bands

Table 1 (contd.)

RF amplifier	(Aerial coupling condenser set to reading in Fig.4 and aerial tuning inductance adjusted for maximum sensitivity) Switch to 4-10Mc/s RANGE and to NET. Inject a signal at 9Mc/s to the aerial and tune for zero beat Modulate signal 30% at 400 c/s and adjust C10A for maximum output. Inject a 4Mc/s signal, tune receiver to it and adjust L2A for maximum output. Repeat until satisfactory. Seal core and trimmer Switch to 1.6-4Mc/s RANGE. Inject 4Mc/s signal. Tune receiver to it and adjust C11A for maximum output. Inject a signal of 2Mc/s, tune receiver to it and adjust L3A for maximum output. Repeat until satisfactory. Seal core and trimmer	8. 9. 10.	R.F. Sensitivity. With an input of 5µV at 1.7, 2.5 and 4.0Mc/s on the L.F. band, it should be possible to obtain an output of at least 50mW With an input of 8µV at 4, 6 and 9Mc/s on the H.F. band, it should be possible to obtain an output of at least 50mW Signal-to-noise ratio. With an input of 3µV, the signal-to-noise ratio should be greater than 20db. at any frequency within the coverage of the set. For this test the GAIN control should be adjusted to give an audio output of 10mW; the modulation is then switched off and the noise output measured Second channel selectivity. With an input of 10µV from the signal generator, the receiver should be tuned to resonance and the GAIN control adjusted to give an output of 10mW. The signal generator will then be adjusted to the second channel frequency and, with the receiver controls unaltered, the signal generator tuned for maximum receiver audio output of 10mW. The various inputs from the signal generator should be noted and the second channel ratios obtained.

Table 1 (contd.)

		These ratios should not be less than the figures below Signal frequency Mc/s. / Second channel frequency. Mc/s / Second channel ratio. db. 1.6 / 2.52 / 67 2.5 / 3.42 / 57 4.0 / 4.92 / 47 4.0 / 4.92 / 52 6.0 / 6.92 / 42 9.0 / 9.92 / 25 11. <u>I.F. Breakthrough.</u> At any frequency within the coverage the sensitivity to the intermediate frequency should be at least 80 db. below the sensitivity to the signal
Over-all		12. <u>Over-all audio response.</u> Inject a 10μV signal at 1.6Mc/s, externally modulated at 1kc/s to 30%. Tune the receiver and set the GAIN control to give an output of 10mW. The modulation frequency will then be varied, keeping the modulation level constant, and the output noted at the frequencies below. The output should be between the limits given.

Signal frequency Mc/s.	Second channel frequency. Mc/s	Second channel ratio. db.
1.6	2.52	67
2.5	3.42	57
4.0	4.92	47
4.0	4.92	52
6.0	6.92	42
9.0	9.92	25

Table 1 (contd.

Modulation frequency	Output mW	Output db.
400c/s	6.3 to 15.8	± 2
750c/s	8.0 to 12.5	± 1
1kc/s	10.0	0
2kc/s	1.6 to 2.5	-6 to -8
3kc/s	0.2 to 0.5	-13 to -17

		13. <u>L.F. Hum.</u> With no signal input, the reading of an output meter due to L.F. hum should not exceed 10μW
Crystal operation		14. <u>Sensitivity.</u> Switch XTAL/MO switch to XTAL, tune set and insert appropriate crystal (signal + I.F.) in holder. Set meter switch to DRIVE, system switch to C.W. and depress pressel switch on microphone. Tune FREQUENCY dial near frequency to obtain maximum deflection on meter, approaching from L.F. end of the band. Switch to receive and check sensitivity Over the L.F. band, an output of at least 50mW should be obtained with a modulated input of 4μV. Over the H.F. band, an output of at least 50mW should be obtained with a modulated input of 7.5μV
C.W. operation		15. <u>Amplitude.</u> Switch to R.T. and MO. Inject a small signal at 4Mc/s, modulated 30% at 400c/s, to the aerial through 60μμF Tune set on the L.F. band, and, with GAIN control at maximum, adjust signal input

Table 1 (contd.)

		for 20mW output from receiver. Switch off modulation, switch to C.W. and adjust HET. TONE for maximum beat note output at a frequency not greater than 1kc/s. The output so obtained should be not less than 60mW With the signal increased to 1mV, and GAIN and HET.TONE adjusted for maximum output at a frequency not greater than 1kc/s, the output should be not less than 200mW
	If the output is low, tune the set accurately with an input giving 20mW output, switch off modulation and to C.W. adjust HET.TONE and then adjust the twisted wires joining C29A for maximum output (about 100mW) Reseal	
A.V.C.		16. <u>A.V.C. characteristic</u>. Switch to R.T. With a modulated input of 2µV at 4Mc/s, the receiver should be tuned. Increase input to 100mV with the GAIN control adjusted to give 50mW output. With the signal reduced to 50µV, the output must not fall below 2.0mW

Table 1 (contd.)

Meter calibration A.V.C.		17. With no signal applied to the set, the meter reading should lie between 3 and $6\frac{1}{2}$V on the low-voltage scale. When tuned to a signal of 20µV at 4Mc/s, this reading should increase by not less than 3/4V and should show a progressive increase with input signals up to 0.1V with only a single tuning peak. At C.W., with GAIN control fully anti-clockwise, the meter should read not less than 9V
SENDER	General conditions:	The dummy aerial should consist of a 60pF (± 2%) air-dielectric condenser in series with a 10Ω (± 5%) non-inductive resistor capable of dissipating 5W. The resistor should be in the earthy side The valve voltmeter should be connected across the 10Ω resistor If an R.F. ammeter is used, the sum of the dummy aerial resistance and the meter resistance should be 10Ω ± 5%, and the meter should be inserted between the resistor and the set earth terminal To tune the set to any frequency, adjust the AERIAL COUPLING condenser to the setting in Fig.4 and tune the AERIAL TUNING inductance for maximum output (This setting of the AERIAL COUPLING condenser will not be the same as that for maximum signal on receive)
Sender amplifier	Switch to NET and tune set to 9Mc/s. Switch meter to AE and set to R.T. Press pressel switch and adjust drive trimmer C28B as near to maximum capacity, but so that aerial current rises on modulating. Switch meter to DRIVE and adjust C10B and C10C for maximum drive. If three peaks are obtained, choose the centre one	18. <u>Drive</u>. The drive voltage should be consistent with meeting the sender output and modulation requirements 19. <u>Drive meter calibration</u>. The reading should be satisfactory from an operator's point of view

Table 1 (contd.)

<table>
<tr>
<td></td>
<td>Release pressel switch, switch to NET and tune to 4Mc/s
Press pressel switch, switch to R.T. and adjust L2B and L2C for maximum drive. Repeat until satisfactory tracking is obtained. Seal cores and trimmers
Switch to 1.6-4Mc/s RANGE and repeat above, adjusting drive trimmer C28A, and then adjusting C11B and C11C at 4Mc/s and L3B and L3C at 2Mc/s
Repeat adjustments until sender circuits track and drive is reasonably constant</td>
<td>20. <u>Pulling.</u> With the set tuned to any frequency within the coverage, the change in emitted frequency as the sender PA circuit is tuned fully through resonance should not exceed 100c/s

21. <u>Power output.</u> With the dummy aerial specified, the AERIAL COUPLING condenser set as in Fig.4 and the AERIAL TUNING INDUCTOR tuned for maximum, the following figures should be obtained
<table>
<tr><th>Frequency Mc/s.</th><th colspan="2">R.M.S. Voltage across 10Ω resistor</th><th colspan="2">Dummy aerial current in mA</th></tr>
<tr><th></th><th>R.T. (no mod.)</th><th>C.W.</th><th>R.T. (no mod.)</th><th>C.W.</th></tr>
<tr><td>1.7</td><td>2.3</td><td>2.7</td><td>230</td><td>270</td></tr>
<tr><td>2.5</td><td>2.6</td><td>3.1</td><td>260</td><td>310</td></tr>
<tr><td>4.0</td><td>2.5</td><td>3.0</td><td>250</td><td>300</td></tr>
<tr><td>4.0</td><td>2.4</td><td>3.0</td><td>240</td><td>300</td></tr>
<tr><td>6.0</td><td>2.4</td><td>3.1</td><td>240</td><td>310</td></tr>
<tr><td>9.0</td><td>1.9</td><td>2.5</td><td>190</td><td>25[illegible]</td></tr>
</table>
</td>
</tr>
<tr>
<td>Aerial current metering</td>
<td>Adjust by R26A for required results. If they cannot be obtained, the spacing of turns on T7A will have to be adjusted</td>
<td>22. <u>Meter reading.</u> With a current in the primary of T7A of 350mA at 8Mc/s, the meter should read 10 ± 1V on the low-voltage scale
With the same current at 3Mc/s, the meter should read 12 ± 1V</td>
</tr>
</table>

Table 1 (contd.)

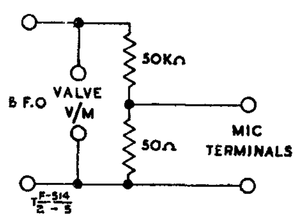
Crystal operation		23. Power Output. For output frequencies below 6Mc/s, the output with crystal control should be not less than 90% of the output with MO control, and for frequencies between 6 and 8Mc/s it should be not less than 75% of the output with MO control 24. Tuning. When using crystal control, correct adjustment of the tuning condenser should be indicated by a distinct peak in the drive reading
Modulation and sidetone	 Fig.5 - Attenuator	An attenuator as shown in Fig.5 will be connected across the output of a B.F.O., monitored by a valve voltmeter, and the voltage across the 50Ω fed to the microphone terminals of the snatch plug. The modulation should be examined on an oscilloscope connected to produce a trapezium pattern 25. Stability. With the B.F.O. frequency at 1kc/s, the pattern should show no trace of instability as the modulation depth is varied from 0 to 100%. As there is normally some flattening of the output modulation peaks at high modulation depth, 100% modulation is considered to occur when the apex of the triangle is formed

Table 1 (contd.)

		26. Modulation voltage. The B.F.O. output at 1kc/s, to give 100% modulation, should lie between 25 and 50V 27. Sidetone. The sidetone should lie between 3 and 20mW with the sender modulated 100% 28. Audio response. The B.F.O. input voltages required for 50% modulation should be within the following limits

Modulation frequency c/s.	Input limits for 50% Modulation db.
400	0 to +6
750	0 to +2
1,000	0
2,000	0 to -3
3,000	0 to -3

29. Modulation distortion. The set will be modulated by speech, using a Microphone and receiver headgear assembly No.10. A trapezium trace of approved shape should be obtained with no deterioration of the trapezium into a cotton-reel shape

30. Hum modulation. When fully tuned with the dummy aerial, the hum modulation on the carrier should not exceed 5%

Table 1 (contd.)

Keying		31. Keying. A listening test should determine that keying chirp is negligible. The keying relay, must be capable of operating at 30 w.p.m. A mechanical sender should replace the key and the output of the sender should be viewed on a C.R.O. The mechanical sender will be arranged to send groups of five dots, the dot length being approximately 50mS. Under these conditions, five dots should be observed on the screen of the C.R.O., the shape of the keyed wave-form should be sensibly square and free from spurious spaces due to bouncing of the relay contacts, the spaces being approximately equal in length to the marks 32. Spacing wave. No spacing wave should be observed on the fundamental output frequency by any method of test, including using a remote receiver for C.W. reception 33. Break-in working. When keying the sender at any speed up to 30 w.p.m. with the receiver at any sensitivity, there should be no aurally noticeable receiver recovery time, and during keying there should be no spurious oscillations such as to cause a howl in the headphones

Note: These Pages 19 and 20, Issue 3, supersede Pages 19 and 20, Issue 2, dated 30 Mar 47. Additional information has been added to Test Spec No 38.

Table 1 - (cont)

Netting		34. Netting error. At any frequency within the range 1.6 to 10Mc/s inclusive, a test signal should be injected from the signal generator, using the dummy antenna. The netting error, defined as the difference in frequency between the applied test signal and the emitted frequency of the sender immediately after the conclusion of the netting procedure, should not exceed 1kc/s at any input signal level between 3µV and 10mV, and at any l.t. voltage between 10.8 and 13.2V. 35. Netting tone. Under these conditions, it should always be possible to adjust the beat note continuously through zero beat, ie no receiver saturation may occur. The beat note should always be of reasonable intensity, and there should be no spurious responses
GENERAL		
Flick controls		36. Flick resetting accuracy. Engage one of the flicks. With the flick lever at SET, unlock the setscrews and tune to zero beat a steady 8Mc/s c.w. signal. Tighten the setscrews and set the lever to FLICK. Turn the dial in alternate clockwise and anti-clockwise directions and retune to the set value ten times in all, each time on coming

Table 1-(cont)

		to the set value, setting the flick lever to SET and measuring the beat note frequency. The frequency should not exceed 3kc/s. Repeat with the other flick
Calibration of set meter: L.T.	Adjust input to set to exactly 12V. Read set meter to nearest 1/4V and mark in appropriate place on front panel	
Calibration of set meter: H.T.R and H.T.S		37. The h.t. voltage recorded should be accurate to within ±20%
Power consumption		38. <u>Current consumption.</u> The current consumptions should not exceed the following values:- (a) Sets fitted with rotary transformer p.s.u. REC ON, GAIN at max, no signal input 3.0A ALL ON, GAIN at max, no signal input 3.7A SEND, tuned with dummy antenna, R.T., no modulation 4.6A SEND, tuned with dummy antenna C.W., no modulation 5.0A (b) Sets fitted with Power supply, transisterized, No 36 REC ON, GAIN at max, no signal input 0.9A ALL ON, GAIN at max, no signal input 1.5A SEND, tuned with dummy antenna, R.T., no modulation 2.5A SEND, tuned with dummy antenna, C.W., 2.7A These figures are typical and may vary with individual equipments

Note: These Pages 21 and 22, Issue 3, supersede Pages 21 and 22, Issue 2, dated 30 Mar 47. Information on the P.S.T. No 36 has been added to Table 1.

Table 1 - (cont)

H.V. and L.V. operation		39. The operation of the set should be satisfactory and it should be possible to obtain satisfactory operation of all controls with any supply voltage between 10.8 and 14V, measured at the set input socket
Suppression		40. Noise e.m.f. in battery leads For this test the l.t. batteries should be connected to the set by Connector, twin, No 274. Using the dummy antenna tune the receiver to any frequency within the coverage of the set. Switch to C.W. and with no signal input, note the residual noise on an output meter. Disconnect the chassis side of the dummy antenna and join it directly to the negative terminal of the battery. Again note the maximum residual noise on the output meter, retuning the a.t.i. if necessary. The two readings should not differ by more than 1dB
Power supply, transistorized, No 36		
Insulation resistance		The insulation resistance between the output terminations and chassis shall not be less than 10MΩ when measured with a 500V megger
Supply protection	Apply 12V ±2% d.c. to the input terminals in the reverse direction	The current taken from the supply shall not be greater than 1mA d.c.
Voltage regulation and efficiency	Apply 12V ±2% d.c. to the input connections	The open circuit output voltage shall not exceed 600V

Table 1 - (cont)

	Apply 12V ±2°/o d.c. to input connections	With a load of 30mA ±4°/o the output voltage shall be 350V ±5°/o
	Apply 11.5V ±2°/o d.c. to the input connections	With a load of 60mA ±4°/o the output voltage shall be 300V ±5°/o. The overall efficiency under these conditions shall not be less than 67°/o.
Ripple voltage	Apply 11.5V ±2°/o d.c. to the input connections and connect a multimeter type 9SX in series with a 4μF paper capacitor to the output connections	With a load of 60mA ±4°/o the ripple voltage measured shall not exceed 12V

WINDING DETAILS

Note: All coils should be adjusted for optimum operation of the set. The standards referred to in the following paragraphs should be obtained by using spare coils removed from the sets.

L1

13. Winding to consist of 230 turns, of S.S.C. enamelled copper wire, wave-wound in one section, 3/16 in. wide. Coat with coil dope and check inductance, which should be 470μH ±5%. Resistance should be 17.3Ω ±10%.

L2

14. Winding to consist of 14.1/2 turns of 30/48 D.S.C. S.W.G. enamelled copper wire, solenoid-wound over 0.25 in., end of winding 0.75 in. from fixing end of former, ie end nearer chassis when assembled. Anchor start and finish with small pieces of shellac. Coat whole coil with coil dope. Check inductance without brass insert or core and adjust to standard (2.89μH ±2%). Resistance should be 0.3Ω approximately. Bake for 1 hour in a well-ventilated oven at 100°C. Remove from oven and immediately immerse in container holding Hymeg varnish No 2. Place container in vacuum chamber and reduce pressure to less than 1 cm. Maintain pressure until all bubbles leave the left coil. Remove and drain for 30 minutes. Insert fixing bushes complete with crosswire and bake for 3 hours at 132°C. When cool, fit core and trimmer. Check coil and adjust core to standard (3.5μH ±1%).

L3

15. Winding to consist of 47.1/2 turns of 30/48 S.W.G. D.S.C. Litz enamelled copper wire, solenoid-wound over 0.81 in., end of winding 3/8 in. from fixing end. Anchor and coat as for L2. Check inductance as for L2 and adjust to 14μH ±2%. Resistance, 0.95Ω approximately. Finish coil as for L2 and adjust core to standard (17.7μH ±1%).

Note: This Page 22A, Issue 3, is to be filed immediately after Page 22, Issue 3, dated 15 Dec 65. It contains information previously on Page 22, Issue 2, dated 30 Mar 47.

L4

16. Coil to consist of 150 turns of 36 S.W.G. S.S.C. enamelled copper wire, wave-wound in one section, 3/16 in. wide. Check inductance to standard (210µH ±5%). Resistance, 3.0Ω approximately. Finish coil as for L2 and recheck to standard.

L5

17. Winding to consist of 47.2/3 turns of 30/48 S.W.G. D.S.C. Litz copper wire, solenoid-wound over 0.75 in.; a tap to be made at 14.1/4 turns; end of winding 5/8 in. from fixing end. Anchor and coat as for L2. Check inductance as for L2 and adjust to standard (11.75µH ±2%). Resistance should be 0.78Ω ±10%. Finish coil as for L2 and adjust core to standard (14.25µH ±1%). Tap should be made as follows: Wind to tap, double wire for 3 in. and thread through hole in former. Pull through former, solder to tag and continue winding.

L6

18. Winding to consist of 16.1/3 turns of 26 S.W.G. enamelled copper wire, solenoid-wound over 7/16 in; a tap is made at 5.2/3 turns. Top of coil to be 11/16 in. from fixing end. Tap made as in L5. Second winding is 3.1/4 in. turns of 42 S.W.G. S.S.C. enamelled copper wire, wound over two layers of 0.003 in. interleaving tissue. The first turn of this winding to be directly over the second turn of the first winding. Anchor and coat as for L2. Check inductance as for L2 and adjust to standard (2.58µH ±2%). Resistance of first winding should be 0.1Ω approximately, for second winding, 0.3Ω approximately. Finish coil as for L2 and adjust to standard (3.09µH ±1/2%).

L8

19. Coil to consist of 20 S.W.G., wound in three layers of 19 + 18 + 17 turns; ends to be pulled through holes in former. Check inductance to standard (12µH ±10%). Resistance should be 0.07Ω approximately. Finish as for L2 and test to standard.

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L9

20. Coil to consist of 20 turns of 36 S.W.G. S.S.C. enamelled copper wire, solenoid close-wound. Fix and coat as for L2. Check inductance to standard (3.0μH, ± 2%). Resistance should be 0.32Ω approximately. Finish as for L2 and test to standard.

L10

21. (a) Coil A. 4 turns of 30 S.W.G. S.S.C. enamelled copper wire, wound over a length of 5/16 in. Top of coil 1 1/8 in. from bottom of former. Wind two layers of 0.003 in. interleaving tissue.

(b) Coils B and C.
Coil B: 130 turns of 6/45 S.W.G. D.S.C. Litz copper wire, wave-wound, 5/16 in. wide.
Coil C: 50 turns of 42 S.W.G. S.S.C. enamelled copper wire, wave-wound with the first 50 turns of coil B, using the same feed. Thinly coat with coil dope.

Check inductance of coil B which should be 90μH, ± 2%. Assemble plates and supporting wires, solder connections to correct wires, helixing to prevent breakage. Check resistance of coils B and C (both 3.2Ω approximately). Bake in well-ventilated oven for 1 hour at 100°C. Remove from oven and immerse in container containing Hymeg varnish No.2. Place container in vacuum chamber and reduce pressure to less than 1 cm., until all bubbles have left coil. Drain for 30 minutes and bake for three hours at 132°C. When cool, insert core and bush, smearing the serrated edge of the bush with a thin layer of varnish. Connect condensers, etc., and check in the set that it is possible to align beat oscillator to 460 kc/s.

L11

22. Consists of 4,500 turns of 47 S.W.G. enamelled copper wire on bobbin. The start and finish to be terminated with 19/45 D.S.C. copper lead-out wires, the 47 S.W.G. wire being doubled back twice to provide adequate strength. Insulate with oiled silk and check D.C. resistance, which should be 1.350Ω approximately. Assemble laminations (interleaved) and fit tag plate assembly. Bake in oven for 1 hour at 100°C. and impregnate with bitumen. Check that inductance at 2V A.C., 1 kc/s, is not less than 15H. Check D.C. resistance and flash-test 500V A.C. between winding and core.

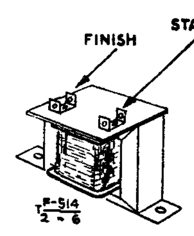

Fig.6 - L11

L12

23. Winding to consist of two wave-wound sections, each of 300 turns of 40 S.W.G. S.S.C. copper wire, 1/4 in. dia., spaced 1/16 in. Coat with dope, and check inductance which should be 1.55mH, ± 5%. Resistance, 27Ω approximately. Impregnate as for L2 and repeat tests.

Relay coil

24. Coil to consist of 4,500 turns of 36 S.W.G. enamelled copper wire. Resistance should be 100Ω approximately. Flash-test at 500V A.C. between tags and frame.

T1

25. (a) Primary winding to consist of 130 + 130 turns of 6/45 S.W.G. D.S.C. Litz copper wire, wave-wound in two sections 5/16 in. wide and with a space of 1/16 in. between sections. Start of winding to be 0.8 in. from bottom of former. Edge of winding to be 0.76 in. from end of former.
(b) Secondary to consist of 119 + 119 turns of 6/45 S.W.G. D.S.C. Litz copper wire in two sections, each 5/16 in. wide and with a space of 1/16 in. between sections. Edge of windings to be 0.22 in. from finish of primary.
(c) Assemble as for L10, and check primary inductance which should be 171μH, ± 1%. Secondary inductance should be 153μH, ± 1%. Impregnate as for L10, and check resonant frequency with condensers in place. Should tune to 460 kc/s with cores not closer than 4 turns to maximum or minimum.

T2

26. Wound as for T1 with following alterations:-
(a) Primary. 116 + 116 turns. Start to be 0.71 in. and edge 0.66 in. from edge of former. Inductance, 144μH.
(b) Secondary. 118 + 118 turns. Edge 0.43 in. from primary. Inductance, 150μH.

T3

27. Wound as for T1 with the following alterations:-
(a) Primary, 93 + 93 turns. Start to be 0.68 in. and edge 0.63 in. from end of former. Inductance, 87μH.
(b) Secondary, 93 + 93 turns. Edge 0.48 in. from primary. Inductance, 87μH.

T4, microphone transformer

28. (a) Secondary, 14,000 turns of 47 S.W.G. enamelled copper wire, one layer of oiled silk wound half-lap.
(b) Screen, One layer of 47 S.W.G. enamelled copper wire.
(c) Primary, 140 turns of 28 S.W.G. enamelled copper wire, one layer of oiled silk wound half-lap.

(d) The ends of the secondary and screen are to be joined to 19/45 flexible D.S.C. tinned copper wire. Double back twice. All leads to be brought out to 14/36 tinned copper wire insulated with $1\frac{1}{2}$ mm ... sleeving. All joints to be insulated with interleaving tissue. Check resistance of primary which should be 1.4Ω and that of secondary which should be 4.7kΩ ± 10%. Bake and impregnate as for L11.

(e) Assemble in can and bend wires to coincide with tagboard. Heat assembly to 100°C. and fill can with bitumen. Allow to cool and assemble tagboard.

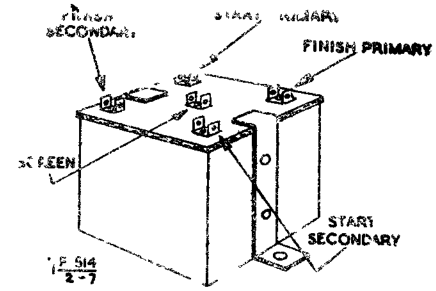

Fig.7 - T4, Microphone transformer

(f) Check resistance and inductance (primary not less than 3mH at 5V, 1 kc/s). Flash-test at 250V.A.C., 50 c/s between windings, and windings and core (screen connected to core).

T5, output transformer

29. (a) Secondary, wound on former, 200 turns of 34 S.W.G. enamelled copper wire, layer-wound with 0.001 in. paper interleaving. Cover with two layers of 0.003 in. Clarifoil.

(b) Primary, 2,800 turns of 44 S.W.G. enamelled copper wire, layer-wound with 0.001 in. paper interleaving.

(c) Cover with 4 layers of 0.003 in. Clarifoil and seal with acetone. Ends of windings to be 14/36 flexible tinned copper wire with sleeving. Check secondary resistance which should be 5.8Ω, and that of primary which should be 840Ω approximately. Assemble, check and seal edges with acetone. Bake and impregnate with bitumen as for L11.

(d) Check primary impedance at 10V A.C., 50 c/s with 5mA D.C. flowing, which should be not less than 2.4kΩ. Flash-test 1 kV.A.C., 50 c/s between windings and between windings and core.

(e) Check insulation resistance at 500V D.C. between windings and between windings and core; it should not be less than 1,000MΩ.

T6, rotary transformer

30. Field coil NP. Wound from 32 S.W.G. enamelled H.G. copper wire. Wound on former, 1.046 in. x 0.765 in., with 3/32 radius corners. Winding, 390 turns, 5/16 in. thick, brought out to wire ends 4 in. long; coded start, yellow sleeving finish, black sleeving. Bind with oiled silk tape. Secure lead-out wires with S-bend, as shown in Fig.9, with $1\frac{1}{2}$ turns adhesive tape. Form to an outside radius of 59/64 in. Paint coil with one coat of shellac varnish and allow to dry.

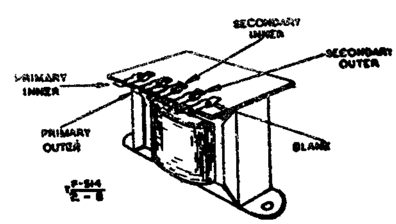

Fig.8 - T5, Output transformer

31. Field coil SP. Wind in reverse direction to that for NP coil but to same specification. Code, start yellow and finish red. After binding with oiled silk secure lead-out wires and U-bend as shown in Fig.10. Form coil to outside radius of 59/64 in. and finish as for field coil NP.

32. On assembly of coils ensure that the pole-pieces are replaced in their original positions according to markings. Pole fixing screws are to be locked by staking, and the leads then given one coat of enamel. The two yellow leads of the coils should be soldered together, the joint being covered with sleeving fixed in place with varnish.

33. It is impossible to rewind the armature. Either the armature or the whole rotary transformer should be replaced complete.

T7

34. Two types of core are used in this transformer:-
- (a) Tight stack of 45 laminations
- (b) Tape core.

Insulate inside ring with interleaving tissue strip. Place a paper washer on each side of stack, inner and outer edges being folded towards the centre of the stack. Tightly compress assembly, hold in position with one layer of ½ in. white glass-backed tape bound on the outer edge of the ring, the edges being folded inwards; leave the outer end of the tape extended for ½ in. If the core (a) is used, 8 turns of 36 S.W.G. S.S.C. enamelled copper wire should be evenly distributed on ring and the ends secured with ends of tape. If core (b) is used, 6 turns are required. Dip for 3 minutes in bakelite varnish and bake for 2 hours at 120°C.

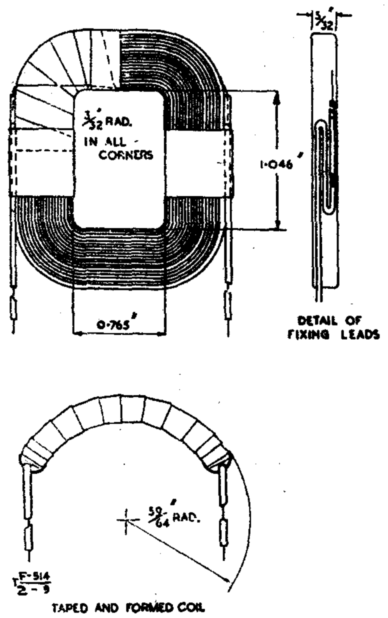

Fig.9 - T6, Field coil NP

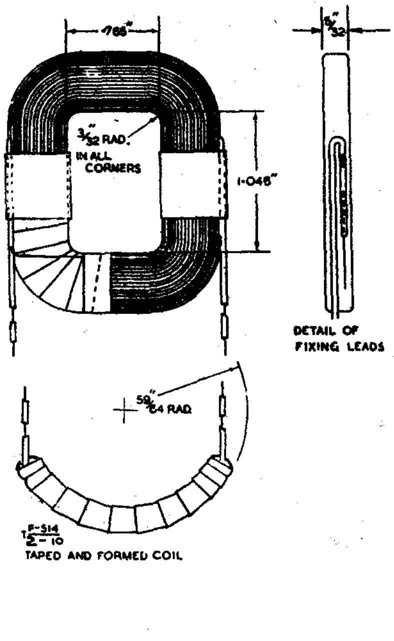

Fig.10 - T6, Field coil SP.

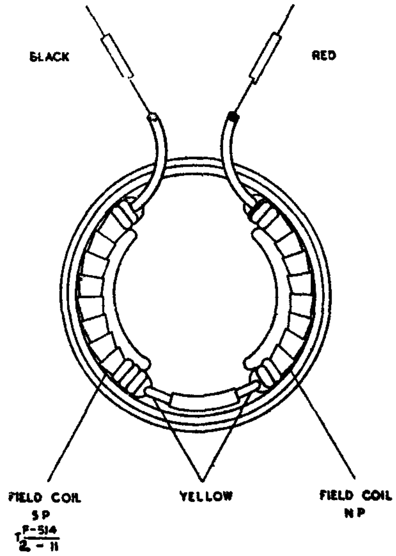

Fig.11 - T6, Field coil assembly

END