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

TELECOMMUNICATIONS
E 774

RECEPTION SETS AR88D AND AR88LF

TECHNICAL HANDBOOK - FIELD AND BASE REPAIRS

SUBJECT INDEX

INDEX TO TABLES

Distribution - Class 910. Code No. 4

INDEX TO TABLES (contd)

INDEX TO FIGURES

INTRODUCTION

1. Since the two receivers covered by this regulation are basically similar only one will be referred to in the text. Differences between the two models will be specified as they occur.

MECHANICAL ADJUSTMENTS AND REPLACEMENTS

Removal of R.F. unit

2. The R.F. unit contains the R.F. mixer and oscillator valves, ganged tuning capacitors, RANGE switch and all the R.F. and oscillator coils with their associated trimmers. It is mounted on a separate sub-chassis which is bolted to the main chassis. To remove the R.F. unit proceed as follows:-

(a) Remove the large cover from the top of the R.F. unit and remove the small cover from the ganged tuning capacitors.

(b) Unclip the dial lamp sockets from the vernier drive assembly. Remove the TUNING CONTROL knob and the RANGE switch knob.

(c) Loosen the screws in the ANT ADJ extension shaft coupling and withdraw the extension shaft from the front of the set.

(d) Unsolder the following eight leads which connect the R.F. unit to the remainder of the receiver.

(i) Blue lead to terminal A of TB1.
(ii) Black lead to centre terminal of TB1.
(iii) Brown lead to pin 7 of V11.
(iv) Yellow lead to terminal E of TR4.
(v) Red lead to terminal E of TR3.
(vi) Blue lead to terminal F of TR3.
(vii) Green lead to pin 6 of V6.
(viii) Brown lead to pin 7 of V6.

(e) Disconnect C121 from its earthing point on the R.F. unit.

(f) Loosen the screws in the coupling between the vernier drive assembly and the ganged tuning capacitors.

(g) Remove the four screws securing the vernier drive assembly to the ganged tuning capacitors.

(h) Remove the four nuts securing the vernier drive assembly to the R.F. unit sub-chassis.

(j) Remove the 11 screws which secure the R.F. unit to the main chassis (eight screws on top of the unit, three screws underneath).

(k) Invert the receiver, lift up the rear of the R.F. unit and slide it back out of the opening in the main chassis.

3. To replace the R.F. unit, reverse the procedure detailed in para 2.

Removal of RANGE switch wafers

4. (a) Turn the RANGE switch to position 1.

(b) Remove the R.F. unit from the main chassis as detailed in para 2.

(c) Remove the bottom coverplates from the oscillator and R.F. sections of the R.F. unit.

(d) Remove the nut securing the click plate to the oscillator section screen.

(e) Remove the oscillator section screen by removing the 12 screws securing it to the R.F. unit sub-chassis.

(f) Remove the two nuts securing the switch stator support shafts at the rear of the R.F. unit.

(g) Carefully draw the click plate and the stator support shafts to the front and remove the spacers between each switch wafer.

(h) Unsolder the leads to the defective switch wafer and remove the wafer.

5. To replace the RANGE switch wafer reverse the procedure detailed in para 4 ensuring that:-

(a) The flat sides of the central holes in each switch rotor are vertical, with the grooved side to the left in the case of the AR88D, and to the right in the case of the AR88LF as viewed from the front.

(b) The wafer is replaced in the correct way round.

(c) The three shaft guides and earthing springs are in position.

Removal of SELECTIVITY switch wafers

6. To remove the rear wafer, switch to position 1 and proceed as follows:-

(a) Unsolder the leads to the wafer.

(b) Remove the two nuts securing the wafer to the support shafts.

(c) Withdraw the wafer to the rear, slightly bending the copper shield if necessary.

7. To remove the front wafer proceed as follows:-

(a) Remove the rear wafer as detailed above.

(b) Unsolder the leads to the switch wafer.

(c) Remove the SELECTIVITY switch knob.

(d) Undo the nut securing the switch click plate to the chassis.

(e) Remove the two nuts securing the shield which lies between the two switch wafers.

(f) Raise the rear end of the switch assembly until the shield securing screws clear the chassis and withdraw the switch assembly to the rear.

(g) Remove the spacers and the shield; the wafer can now be removed.

8. To replace the SELECTIVITY switch wafers reverse the procedures detailed ensuring that:-

(a) The flat sides of the central hole in each switch rotor are vertical with the grooved side to the left as viewed from the front when the switch is in position 1.

(b) The wafer is replaced the correct way round.

(c) The shaft guide and the earthing spring are in position.

Removal of front panel

9. (a) Remove all control knobs.

(b) Remove the phone jack.

(c) Remove the two screws securing the dial lamp bracket over the nameplate on the front panel.

(d) Remove the eight nuts securing the front panel to the main chassis.

(e) Draw forward the front panel.

10. To replace the front panel reverse the procedure detailed in para 9.

Removal of vernier drive assembly

11. (a) Remove the front panel as detailed in para 9.

(b) Unclip the dial lamp holders.

(c) Remove the flywheel bracket.

(d) Loosen the two grubscrews in the coupling between the drive assembly and the ganged capacitor assembly.

(e) Remove the four screws securing the drive assembly to the ganged capacitor assembly.

(f) Remove the four nuts securing the drive assembly to the main chassis.

(g) The vernier drive assembly may now be removed by drawing it forward.

12. To replace the vernier drive assembly reverse the procedure detailed in para 11.

Adjustment of dial drive mechanism

13. The tuning dials and the couplings to the ganged capacitor assembly must be adjusted before the alignment of the R.F. and oscillator circuits. Proceed as follows:-

(a) Remove the covers from the R.F. unit and the ganged capacitor assembly.

(b) Loosen the grubscrews in the coupling between the vernier drive assembly and the ganged capacitor assembly.

(c) Rotate the ganged capacitor assembly shaft until the capacitor plates are fully meshed. Check that both front and rear portions of the capacitor assembly are fully meshed.

(d) Rotate the TUNING CONTROL fully counter-clockwise until the dial stop engages.

(e) Tighten the grubscrews in the coupling between the vernier drive assembly and the ganged capacitor assembly.

(f) Loosen the grubscrews securing the main tuning dial to its shaft.

(g) Rotate the main tuning dial until the zero line on the bottom scale is directly behind the cursor.

(h) Tighten the grubscrews.

(j) Loosen the two grubscrews securing the vernier tuning dial to its shaft.

(k) Rotate the vernier dial until its zero line is directly behind its cursor.

(l) Tighten the grubscrews.

ALIGNMENT AND SPECIFICATION TESTING

General

14. It is essential that all receiver tests and alignments be carried out in a completely screened compartment. Failure to do this is likely to result in false readings being obtained due to stray pick up.

B.F.O. attenuator

15. The output meter of Oscillators, beat frequency No. 5, 7 or 8 on the 10Ω range is scaled up to 5V. To permit voltages of the order of 0 - 0.5V to be measured, a simple attenuator is used between the output of the B.F.O. and the circuits under test. Suitable values for an attenuator giving an attenuation of 10 : 1 are given in Fig 1. The reading on the B.F.O. meter is then divided by 10.

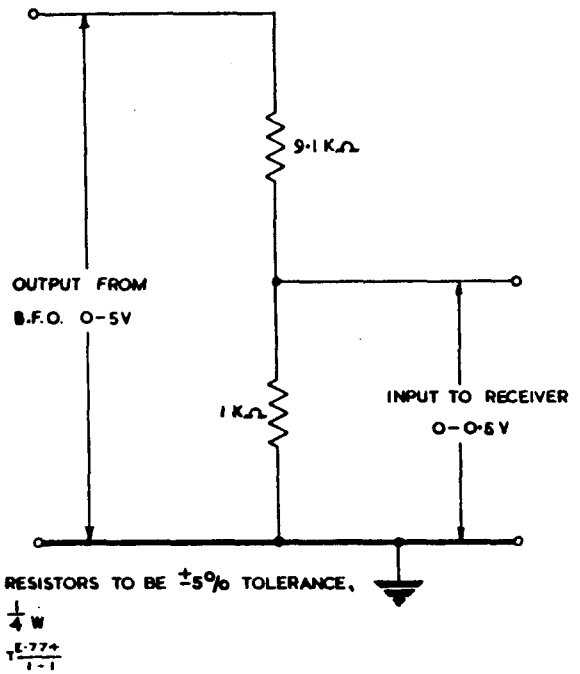

Fig 1 - B.F.O. attenuator circuit

Adjustments to tuned circuits

16. When making adjustments to the trimming capacitors and iron-dust cored coils the trimming tools provided with the set must be used. These trimming tools are carried in clips on the sides of the ganged capacitors' cover. Great care should be taken when making adjustments to the local oscillator trimming capacitors and coils as their settings are very critical. When the alignment of any particular section is completed, the iron-dust core adjusting screws should be sealed with a drop of Compound, sealing, nitro-cellulose (WB 3621). To free adjusting screws which have been sealed, dissolve the sealing compound with Acetone, commercial (HA 0001) applied with a brush.

Test equipment

17. The following test equipment is required for alignment and specification testing:-

Wattmeter, absorption, A.F., No. 1
Oscillator, beat frequency, No. 5, 7 or 8.
B.F.O. attenuator (see para 15).
Signal generator No. 1, Mk 2 or
Signal generator No. 12
Oscillograph, C.R., No. 1 or
Oscillograph type 13A.
Oscillator, ganging, No. 2, Mk 1 or Mk 2 (see note). — Cossor 343
Signal generator No. 2, Mk 1/2, Mk 3 or Mk 4, or
Signal generator No. 15
Frequency meter SCR-211. — BC 221

Note: The Oscillator, ganging, No. 2 is obsolescent, but should be used wherever available for the I.F. channel alignment procedure given in paras 26 to 35. A new method of I.F. channel alignment, which does not involve the use of a ganging oscillator, is now being developed for receivers employing over-coupled I.F. coils. Instructions detailing this method will be issued in due course as additional pages to this regulation.

General test conditions

18. (a) Set to be switched on for a period of at least 15 minutes before any circuit adjustment is made.

(b) The wattmeter on the 2.5Ω impedance range to be connected across the speaker terminals on all tests unless otherwise specified.

(c) Receiver at REC MOD unless otherwise stated.

(d) When aligning or testing the I.F. circuits, modulate the signal generator output at 150c/s to a depth of 30% using external modulation.

(e) When aligning or testing the R.F. circuits, modulate the signal generator output at 400c/s to a depth of 30%.

A.F. stages

19. Set the receiver controls as follows:-

A.F. GAIN - fully clockwise.
H.F. TONE - fully clockwise.

Connect the output of the B.F.O. across RV2 (A.F.GAIN) via the B.F.O. attenuator. With a constant input of 0.15V, the A.F. output should not be less than 500mW at any frequency between 150c/s and 3,000c/s. At 3,000c/s adjust RV2 to give 500mW. Turn RV4 (H.F. TONE) fully anti-clockwise; the output should fall to below 25mW.

20. Return RV4 to fully clockwise and switch to TRANS. Remove the wattmeter from the 2.5Ω output and connect it on the appropriate impedance range across the line output. For the AR88LF connect a 10Ω $\frac{1}{4}$W resistor in series with the wattmeter on the 10Ω impedance range and multiply the scale reading by two. Switch to REC MOD; the A.F. output should be as in Table 1. Similarly check the output of the headphone circuit, ensuring in the case of the AR88D that the headphone plug is pushed fully home.

Output circuit	AR88D		AR88LF	
	Impedance	Output	Impedance	Output
Speaker	2.5Ω	500mW	2.5Ω	500mW
Line	600Ω	>400mW	20Ω	>400mW
Headphone	20kΩ	>6mW	20Ω	>250mW

Table 1 - Line and headphone circuit outputs

I.F. channel performance

21. As a crystal filter is employed in positions 3, 4 and 5 of the SELECTIVITY switch on both receivers it is essential that the I.F. channel be aligned at the crystal frequency (this may differ slightly from the nominal intermediate frequency). Alignment of the I.F. channel is exceedingly difficult to perform and must not be attempted unless the performance is outside the limits specified in the following paragraphs.

22. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise.
R.F. GAIN	:	fully clockwise.
A.F. GAIN	:	fully clockwise.
NOISE LIMITER	:	fully anti-clockwise.
SELECTIVITY	:	position 4.
A.V.C./N.L. switch	:	MAN
RANGE switch and TUNING CONTROL	:	AR88D to 535kc/s. AR88LF to 550kc/s.

Remove the local oscillator valve V3. Set up the Signal generator No. 1 to give a 1mV modulated signal at the nominal I.F. Apply the output via a 0.1μF, 350V D.C. paper capacitor to the grid (pin 8) of V4.

23. Adjust the frequency of the signal generator, with the incremental dial set to zero, for maximum response as indicated on the wattmeter. The signal generator is now set to the crystal frequency. Note the input required to give 500mW A.F. output. This must be within the limit specified in column 2 of Table 2. Increase the input by 6db and detune the signal generator, using the incremental dial only, either side of resonance until the A.F. output again falls to 500mW. Note the two frequencies at which this occurs and calculate their mean and their difference. The mean frequency must not differ from the crystal frequency by more than the amount given in column 3 of Table 2. The frequency difference is the band-width at -6db and must be within the limits specified in column 5.

24. Repeat the procedure of para 23 for each of the other four selectivity positions. In each case (except position 1) the frequency of maximum response must not differ from the crystal frequency by more than the amount given in column 6 of Table 2.

SELECTIVITY position	Max input for 500mW output	Max deviation of mean from Xtal frequency	Nominal band-width at -6db	Acceptable limits of band-width	Max deviation of peak from Xtal frequency
		AR88D	I.F. = 455kc/s		
1	2.5mV	2kc/s	13kc/s	11.5-14.5kc/s	-
2	1.0mV	1kc/s	7kc/s	6 - 8kc/s	1kc/s
3	1.5mV	500c/s	3kc/s	2.5- 3.5kc/s	500c/s
4	1.9mV	350c/s	1.5kc/s	1.2- 1.8kc/s	Xtal freq
5	4.0mV	200c/s	400c/s	250- 550c/s	200c/s
		AR88LF	I.F. = 735kc/s		
1	600μV	2kc/s	16kc/s	14.5-17.5kc/s	-
2	400μV	1kc/s	8kc/s	7 - 9kc/s	1kc/s
3	850μV	500c/s	4kc/s	3.5- 4.5kc/s	500c/s
4	950μV	350c/s	2kc/s	1.7- 2.3kc/s	Xtal freq
5	1.6mV	200c/s	550c/s	400- 700c/s	200c/s

Table 2 - I.F. channel response

25. If the I.F. channel response in any SELECTIVITY position is outside the specified limits, the I.F. channel must be re-aligned.

I.F. channel alignment, using Oscillator, ganging, No. 2

26. With the SELECTIVITY switch at position 2 and other conditions as in para 22, adjust the frequency of the signal generator to the nominal I.F. using the frequency meter. Adjust the cores of all the I.F. transformers for maximum response as indicated on the wattmeter, reducing the input to maintain the A.F. output around 500mW.

27. Set the phasing capacitor C75 to half-capacity by inspection of the vanes and fully screw in the core of TR4, the crystal load. Switch to SELECTIVITY position 4 and adjust the frequency of the signal generator for maximum reading on the wattmeter. Next, adjust the core of TR4 for maximum response. Readjust the signal frequency and TR4 until no further increase in output can be obtained. The signal generator is now set to the crystal frequency.

28. Switch to SELECTIVITY position 2 and adjust the cores of all the I.F. transformers for maximum reading on the wattmeter, reducing the input to maintain the output around 500mW. Remove the signal generator input and set A.F. GAIN to minimum.

29. Connect up the oscilloscope and the ganging oscillator using a 25c/s sweep. The output of the ganging oscillator is fed to the grid of V4. Connect the DIVERSITY terminal to the A1 terminal on the oscilloscope and set the A1 amplifier to maximum gain. Adjust the length of the oscilloscope trace to exactly 6 cm and set the output of the ganging oscillator to 30kc/s deviation. Switch to SELECTIVITY position 4 and adjust the oscillator frequency until the peak of the response curve lies in the exact centre of the oscilloscope trace. Check this adjustment frequently.

30. Switch to SELECTIVITY position 2 and check that the peak of the response curve in this position lies in the centre of the trace. If it is displaced to one side, carefully bring it to the centre by making slight adjustments to all the transformer cores. Take care not to reduce the sensitivity of the I.F. channel or to destroy the symmetry of the curve.

31. Compare the I.F. response curves in SELECTIVITY positions 1, 2 and 3 with those illustrated in Fig 2 or 3. These are idealized response curves which would be obtained from a perfectly aligned I.F. channel. The respective heights of the response curves indicate the relative responses of the I.F. channel in the different SELECTIVITY positions. These curves however are very difficult to reproduce exactly and approximations within the limits specified in Table 2 are sufficient for all purposes.

32. The procedure for obtaining the desired curves consists of making small adjustments to the following:- the bottom cores only of TR5, TR6, TR7 and TR8, C75 and TR4. First adjust the bottom cores of TR5 to TR8 in SELECTIVITY positions 1 and 2 observing the effects on the oscilloscope until the correct curves are obtained. Switch to position 3 and adjust C75 and TR4 for the best symmetrical curve. The correct setting of C75 is very close to its half-capacity position. It must never be set to either maximum or minimum capacity. Note that the symmetry of the curves in positions 1 and 2 is affected by C75, therefore check these after each adjustment.

Note: It may save time to align position 3 after only partially aligning positions 1 and 2.

33. It may not be possible to obtain the correct response in position 3 by means of TR4 and C75 alone. In this case an adjustment to one or more of the bottom cores of TR5 to TR8 will be necessary. Note the effect of such an adjustment on the response in positions 1 and 2 and correct for it by adjusting the remaining bottom cores of TR5 to TR8.

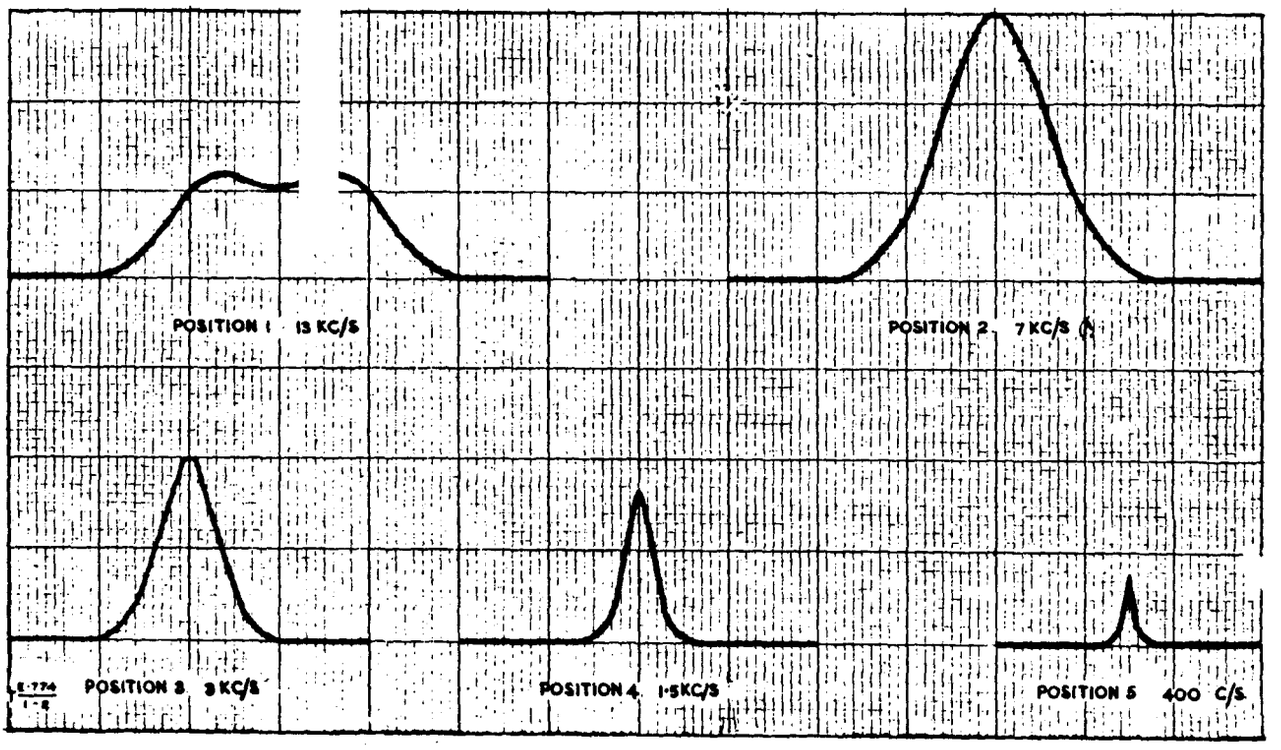

Fig 2 - I.F. response curves, AR88D

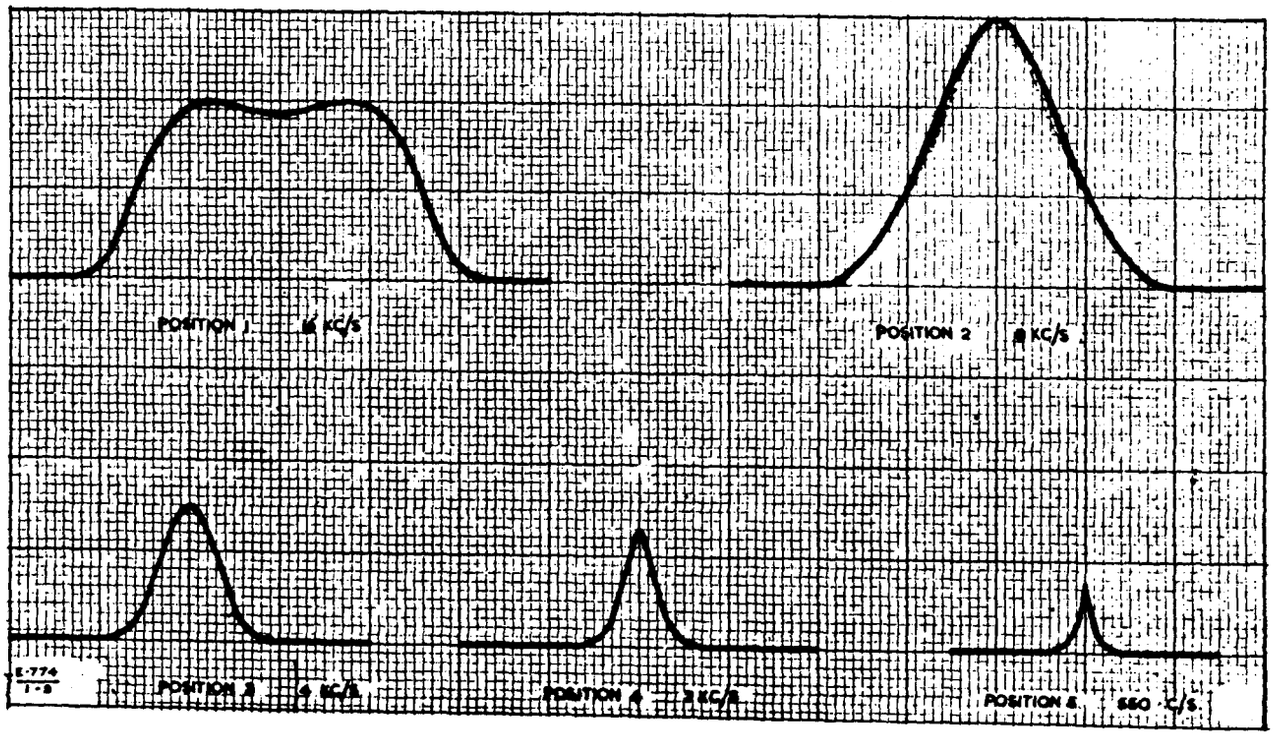

Fig 3 - I.F. response curves, AR88LF

34. After SELECTIVITY positions 1, 2 and 3 have been satisfactorily aligned obtain the best response curves for positions 4 and 5 by adjusting C81 and C80 respectively.

35. On completion of the I.F. channel alignment check the performance as detailed in paras 22 to 25.

B.F.O. adjustment

36. Set the receiver controls as given in para 22 and apply a modulated signal at the intermediate frequency. Adjust the frequency for maximum A.F. output and set the input to give 100mW on the wattmeter. Switch off the modulation and plug in the headphones; reduce A.F. GAIN. Switch to REC C.W. and set the B.F.O. ADJ capacitor, C86, so that at half-capacity the control knob points vertically upwards. Adjust the core of TR10 for zero beat in the headphones.

37. By rotating B.F.O. ADJ check that it is possible to vary the beat note to 3,000c/s, judged aurally, either side of zero beat.

B.F.O. efficiency

38. With an input applied as in para 36 set B.F.O. ADJ to give a beat note of approximately 1,000c/s. Remove the headphones and increase A.F. GAIN to maximum. The A.F. output should be greater than 500mW as indicated on the wattmeter.

Wave-trap adjustment

39. Remove the signal input from the grid of V4 and plug in V3. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise
R.F. GAIN	:	fully clockwise
A.F. GAIN	:	mid - position
NOISE LIMITER	:	fully anticlockwise
SELECTIVITY	:	position 2
A.V.C./N.L. switch	:	MAN
RANGE switch	:	(AR88D to range 1 (AR88LF to range 3

Set the signal generator to give 100mV signal modulated 30% at 400c/s at the intermediate frequency. Apply the signal input between terminals A and G of TB1 via the appropriate dummy aerial (200pF capacitor for AR88D; 200Ω resistor for AR88LF, see para 41). Check that the centre terminal of TB1 is shorted to G. Adjust the frequency for maximum A.F. output, setting this to about 500mW with the A.F. GAIN control. Adjust L57 for minimum receiver response. This adjustment is not critical and L57 need not be sealed.

R.F. and local oscillator alignment

40. Before attempting this alignment check that the dial drive mechanism is correctly adjusted as detailed in para 13.

41. Set the receiver controls as in para 39 with the RANGE switch set to range 1. The alignment procedure is given in Table 3 (AR88D) or Table 4 (AR88LF). Set the signal generator to give a 10μV modulated signal and apply it in series with the dummy aerial (value given in Tables 3 and 4) across terminals A and G of TB1. The centre terminal must be shorted to G. The dummy aerial capacitor should be a high grade ceramic type; the resistor should be ±5% tolerance $\frac{1}{4}$W, non-inductive.

Table 3 - R.F. and oscillator alignment, AR88D

Operation	Range switch position	Position of dial	Generator frequency	Dummy Aerial	Position of C2, ANT ADJ	Trimmer adjustments
1	1	Extreme low end	535kc/s	200pF	-	L51
2	1	Extreme high end	1,600kc/s	200pF	-	C16
3	Repeat 1 and 2 until end frequencies are as indicated					
4	1	1,500kc/s	1,500kc/s	200pF	Max output	C37, C59
5	1	600kc/s	600kc/s	200pF	Untouched	L2, L14, L24
6	Repeat 4 and 5 until circuits remain in alignment over the band					
7	2	Extreme low end	1,570kc/s	200Ω	-	L52
8	2	Extreme high end	4,550kc/s	200Ω	-	C19
9	Repeat 7 and 8 until end frequencies are indicated					
10	2	4,300kc/s	4,300kc/s	200Ω	Max output	C38, C60
11	2	1,700kc/s	1,700kc/s	200Ω	Untouched	L4, L16, L26
12	Repeat 10 and 11 until circuits remain in alignment over the band					
13	3	Extreme low end	4,450kc/s	200Ω	-	L53
14	3	Extreme high end	12,150kc/s	200Ω	-	C22
15	Repeat 13 and 14 until end frequencies are as indicated					
16	3	11,500kc/s	11,500kc/s	200Ω	Max output	C39, C62
17	3	4,600kc/s	4,600kc/s	200Ω	Untouched	L6, L18, L28
18	Repeat 16 and 17 until circuits remain in alignment over the band					
19	4	Extreme low end	11,900kc/s	200Ω	-	L54
20	4	Extreme high end	16,600kc/s	200Ω	-	C25
21	Repeat 19 and 20 until end frequencies are as indicated					
22	4	16,400kc/s	16,400kc/s	200Ω	Max output	C41, C64
23	4	12,100kc/s	12,100kc/s	200Ω	Untouched	L8, L19, L29
24	Repeat 22 and 23 until circuits remain in alignment over the band					

Table 3 - contd

Operation	Range switch position	Position of dial	Generator frequency	Dummy aerial	Position of C2 ANT ADJ	Trimmer adjustments
25	5	Extreme low end	16,100kc/s	200Ω	-	L55
26	5	Extreme high end	22,700kc/s	200Ω	-	C27
27	Repeat 25 and 26 until end frequencies are as indicated					
28	5	22,500kc/s	22,500kc/s	200Ω	Max output	C43, C66
29	5	16,400kc/s	16,400kc/s	200Ω	Untouched	L10, L20, L30
30	Repeat 28 and 29 until circuits remain in alignment over the band					
31	6	Extreme low end	22,000kc/s	200Ω	-	L56
32	6	Extreme high end	32,000kc/s	200Ω	-	C32
33	Repeat 31 and 32 until end frequencies are as indicated					
34	6	31,500kc/s	31,500kc/s	200Ω	Max output	C45, C68
35	6	22,500kc/s	22,500kc/s	200Ω	Untouched	L12, L21, L31
36	Repeat 34 and 35 until circuits remain in alignment over the band					

Table 4 - R.F. and oscillator alignment, AR88LF

Operation	Range switch position	Position of dial and Generator frequency	Dummy aerial	Position of C2, ANT ADJ	Trimmer adjustments
1	1	85kc/s	700pF	-	L51
2	1	200kc/s	700pF	-	C16
3	Repeat 1 and 2 until end frequencies are as indicated				
4	1	195kc/s	700pF	Max output	C37, C59
5	1	85kc/s	700pF	Untouched	L2, L14, L24
6	Repeat 4 and 5 until circuits remain in alignment over the band				
7	2	200kc/s	700pF	-	L52
8	2	545kc/s	700pF	-	C19
9	Repeat 7 and 8 until end frequencies are as indicated				
10	2	500kc/s	700pF	Max output	C38, C60

Table 4 - contd

Operation	Range switch position	Position of dial and Generator frequency	Dummy aerial	Position of C2 ANT ADJ	Trimmer adjustments
11	2	205kc/s	700pF	Untouched	L4, L16, L26
12	Repeat 10 and 11 until circuits remain in alignment over the band				
13	3	1,500kc/s	200Ω	-	L53
14	3	4,350kc/s	200Ω	-	C22
15	Repeat 13 and 14 until end frequencies are as indicated				
16	3	4,250kc/s	200Ω	Max output	C41, C64
17	3	1,600kc/s	200Ω	Untouched	L6, L19, L29
18	Repeat 16 and 17 until circuits remain in alignment over the band				
19	4	4,300kc/s	200Ω	-	L54
20	4	12,100kc/s	200Ω	-	C25
21	Repeat 19 and 20 until end frequencies are as indicated				
22	4	11,900kc/s	200Ω	Max outout	C39, C62
23	4	4,400kc/s	200Ω	Untouched	L8, L18, L28
24	Repeat 22 and 23 until circuits remain in alignment over the band				
25	5	12,000kc/s	200Ω	-	L55
26	5	19,400kc/s	200Ω	-	C27
27	Repeat 25 and 26 until end frequencies are as indicated				
28	5	19,000kc/s	200Ω	Max output	C43, C66
29	5	12,150kc/s	200Ω	Untouched	L10, L20, L30
30	Repeat 28 and 29 until circuits remain in alignment over the band				
31	6	19,100kc/s	200Ω	-	L56
32	6	30,400kc/s	200Ω	-	C32
33	Repeat 31 and 32 until end frequencies are as indicated				

Table 4 - contd

Operation	Range switch position	Position of dial and Generator frequency	Dummy aerial	Position of C2 ANT ADJ	Trimmer adjustments
34	6	30,000kc/s	200Ω	Max output	C45, C68
35	6	19,500kc/s	200Ω	Untouched	L12, L21, L31
36	Repeat 34 and 35 until circuits remain in alignment over the band				

42. Set the frequency of the signal generator at each step using the Frequency meter SCR-211. For 85kc/s in the case of the AR88LF, use the second harmonic of the signal and adjust for zero beat against a 170kc/s setting of the frequency meter. Adjust each trimmer for maximum reading on the wattmeter, setting the A.F. GAIN to give approximately 500mW output. If the R.F. circuits are considerably out of alignment a higher R.F. input will be necessary. If more than one peak is obtainable when adjusting the oscillator circuits, use the higher frequency peak. The oscillator should track at a higher frequency than the signal frequency on all bands.

43. Note that on all coils, except L54, L55 and L56 on the AR88D and L55 and L56 on the AR88LF, turning the core clockwise increases the inductance. On the above-mentioned coils the reverse applies.

Over-all receiver performance

44. Tables 5 and 6 give performance data for both receivers. The figures given have been taken from sample receivers and are for reference only. The performance limits for each receiver are given in the following paragraphs.

Table 5 - Receiver performance data

Range	Frequency in kc/s		Input in μV for 20db signal-to-noise ratio		I.F. rejection ratio	
	AR88D	AR88LF	AR88D	AR88LF	AR88D	AR88LF
1	600	85	5.0	8.0	31,000	>100,000
	1,000	140	9.0	7.0	>100,000	>100,000
	1,500	195	11.5	8.0	>100,000	>100,000
2	1,700	205	4.0	5.0	>100,000	>100,000
	3,000	375	4.0	6.0	>100,000	>100,000
	4,300	500	4.0	7.0	>100,000	37,000
	4,600	1,600	6.0	6.0	>100,000	>100,000
3	8,000	3,000	3.5	5.0	>100,000	>100,000
	11,500	4,250	3.5	5.0	>100,000	>100,000

Table 5 - contd

Range	Frequency in kc/s		Input in μV for 20db signal-to-noise ratio		I.F. rejection ratio	
	AR88D	AR88LF	AR88D	AR88LF	AR88D	AR88LF
	12,100	4,400	4.0	8.0	>100,000	>100,000
4	14,300	7,500	2.5	5.0	>100,000	>100,000
	16,400	11,900	3.0	4.0	>100,000	>100,000
	16,400	12,100	3.0	4.0	>100,000	>100,000
5	19,500	15,500	2.5	3.0	>100,000	>100,000
	22,500	19,000	3.0	2.5	>100,000	>100,000
	22,500	19,500	6.0	2.5	>100,000	>100,000
6	27,000	27,500	5.0	3.0	>100,000	>100,000
	31,500	30,000	3.0	2.0	>100,000	>100,000

Range	Signal frequency in kc/s		2nd channel frequency in kc/s		2nd channel ratio	
	AR88D	AR88LF	AR88D	AR88LF	AR88D	AR88LF
1	1,500	195	2,410	1,665	>100,000	>100,000
2	4,300	500	5,210	1,970	6,800	>100,000
3	11,500	4,250	12,410	5,720	5,800	28,000
4	12,100	4,400	13,010	5,870	2,200	>100,000
	16,400	11,900	17,310	13,370	1,200	1,850
5	16,400	12,100	17,310	13,570	6,000	2,500
	22,500	19,000	23,410	20,470	320	800
6	22,500	19,500	23,410	20,970	800	1,600
	27,000	27,500	27,910	28,970	210	220
	31,500	30,000	32,410	31,470	220	280

Table 6 - Second-channel ratios

Dial calibration

45. Set the receiver controls as in para 39. Using the frequency meter, set the frequency of the signal generator in turn to each of the frequencies given in Table 5. Set the generator to give a 10μV modulated signal and apply it via the appropriate dummy aerial between terminals A and G of TB1. Tune the receiver to resonance reducing A.F. GAIN to give approximately 500mW A.F. output. The setting of the tuning dial should be within ±0.5% of the signal frequency.

Signal-to-noise ratio

46. With the receiver adjusted as in para 45, set the A.F. GAIN to give exactly 500mW A.F. output. Switch off the signal modulation; the resultant A.F. output due to noise should be less than 5mW. For test frequencies below 1.5Mc/s the modulated input may be increased to 15μV.

I.F. rejection ratio

47. Set the signal generator to give a 10μV signal modulated 30% at 400c/s at the following frequency:- AR88D, 600kc/s; AR88LF, 500kc/s. Tune the receiver to resonance and adjust A.F. GAIN to give 500mW A.F. output.

48. Without altering the receiver controls change the signal frequency to the receiver intermediate frequency. Increase the input and adjust the signal generator frequency for maximum receiver response. The input required for 500mW A.F. output must exceed 150mV (AR88D) or 200mV (AR88LF); ie at the test frequencies the I.F. rejection ratio must exceed 15,000 (AR88D) or 20,000 (AR88LF).

49. At any other frequency the I.F. rejection ratio of each receiver must exceed 100,000.

Second-channel ratio

50. Adjust the signal generator to give a 10μV modulated signal and set it in turn to each of the signal frequencies given in Table 6. Tune the receiver to resonance and adjust A.F. GAIN to give 500mW A.F. output. Without altering the receiver controls, change the signal frequency to the second-channel frequency given in Table 6. Adjust the signal generator frequency for maximum receiver response and note the input required to give 500mW A.F. output. At frequencies below 1.5Mc/s the ratio of the inputs at the signal and second-channel frequencies should exceed 100,000. At frequencies above 1.5Mc/s the ratio should exceed 200.

Automatic volume-control

51. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise
R.F. GAIN	:	fully clockwise
A.F. GAIN	:	mid-position
SELECTIVITY	:	position 2
A.V.C./N.L.	:	A.V.C.
NOISE LIMITER	:	fully anti-clockwise

Set the signal generator to give a 10μV modulated signal at 3Mc/s. Tune the receiver to resonance. Increase the input to 100mV and set the A.F. GAIN to give 500mW A.F. output. Slowly reduce the input to 10μV. The output should fall smoothly, and at 10μV input it should exceed 15mW.

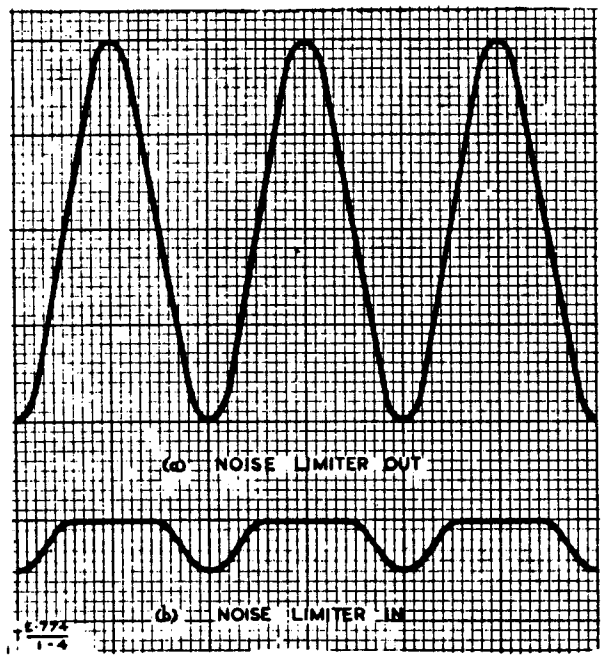

Fig 4 - Action of noise limiter

Noise-limiter control

52. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise
R.F. GAIN	:	fully clockwise
A.F. GAIN	:	mid-position
SELECTIVITY	:	position 2
A.V.C./N.L.	:	MAN. N.L.
NOISE LIMITER	:	fully clockwise

Set the signal generator to give a 10μV modulated signal at 3Mc/s. Tune the receiver to resonance and adjust A.F. GAIN to give 500mW. Connect the live terminal of the speaker output to the A1 amplifier of the oscilloscope. Adjust the oscilloscope controls to give a stationary waveform as illustrated in Fig 4(a). Rotate the NOISE LIMITER control to the fully anti-clockwise position; the waveform should gradually assume the shape illustrated in Fig 4(b).

Para	Spec figure	Fig obtained	Pass
19	Greater than 500mW Less than 25mW		
20	Line - greater than 400mW Headphone - greater than 6mW (AR88D) Headphone - greater than 250mW (AR88LF)		
23) 24)	As in Table 2		
37	To 3,000c/s either side		
38	Greater than 500mW		
45	±0.5%		
46	Less than 5mW		
48	AR88D - greater than 15,000 AR88LF - greater than 20,000		
49	Greater than 100,000		
50	Below 1.5Mc/s - greater than 100,000 Above 1.5Mc/s - greater than 200		
51	Greater than 15mW		
52	As in Fig 4		

Tests recorded correspond with those detailed in Tels E 774 against the para Nos shown

Result of Test

Signature

Table 7 - Extract from A.F. G3504, Specification tests

FAULT FINDING

I.F. stages

53. Table 8 gives stage-by-stage sensitivity figures of the I.F. channel with each I.F. transformer peaked for maximum response at the crystal frequency (see paras 26 - 28). The test conditions are given in para 54.

54. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise
R.F. GAIN	:	fully clockwise
A.F. GAIN	:	fully clockwise
NOISE LIMITER	:	fully anti-clockwise
SELECTIVITY	:	position 2
A.V.C./N.L.	:	MAN
RANGE switch and TUNING CONTROL	:	AR88D to 535kc/s AR88LF to 550kc/s

Remove the local oscillator V3. Set the signal generator to give a signal modulated 30% at 150c/s at the nominal intermediate frequency. Apply the signal to the grid of each stage in turn and adjust the signal generator frequency for maximum response. The inputs required for 500mW A.F. output should be of the order of those given in Table 8, which have been taken from a sample receiver.

Receiver	Input for 500mW A.F. output			
	Pin 8, V4	Pin 4, V5	Pin 4, V6	Pin 4, V7
AR88D	270µV	320µV	3.4mV	20mV
AR88LF	75µV	190µV	3.1mV	19mV

Table 8 - I.F. channel peak sensitivity figures

R.F. stages

55. Table 9 gives sensitivity figures for the R.F. stage (V2) and mixer (V4). The sensitivity figure of the R.F. stage (V1) is comparable with the noise level at this stage and cannot readily be measured. The test conditions are given in para 56.

56. Set the receiver controls as follows:-

H.F. TONE	:	fully clockwise
R.F. GAIN	:	fully clockwise
A.F. GAIN	:	fully clockwise
NOISE LIMITER	:	fully anti-clockwise
SELECTIVITY	:	position 2
A.V.C./N.L.	:	MAN
RANGE switch and TUNING CONTROL	:	3Mc/s

Set the signal generator to give a 3Mc/s signal modulated 30% at 400c/s. Apply the signal to the grid of each stage in turn and tune the receiver for maximum response. The inputs required for 500mW A.F. output should be of the order of those given in Table 9, which have been taken from a sample receiver. This test is made with the I.F. channel fully aligned as detailed in paras 26 - 35.

Receiver	Input for 500mW A.F. output	
	Pin 4, V2	Pin 8, V4
AR88D	42μV	900μV
AR88LF	10μV	200μV

Table 9 - R.F. sensitivity figures

7/Maint/4017

END

Check for :-

3 - way block caps. - test insulation (esp. a AGC line, grid bias return etc)
C 119 - insulation - if this goes s/c, normally takes o/p trans primary with it!
use hi-voltage type to replace, or omit altogether.

Hi-value screen resistors on V1 & V2. replace with hi-stab types. if originals are well out of tolerance limits

Anode, screen & bias resistors around V10 - these sometimes go o/c for no apparent reason

4700 pF (& 5000 pF) decouplers are sometimes Micanold paper types (sim to BC348 type) e.g. C1 C63 in front-end - check insulation & replace as nec. Grey or pink lozenge-shaped variety is usually OK.