RECEPTION SET R206, MK. 2 AND POWER SUPPLY UNIT NO. 33

SECOND TO FOURTH ECHELON WORK

Note : This information is provisional and is supplied for guidance pending the issue of more complete instructions. All errors of a technical nature should be notified in accordance with Tels. A 009.

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MECHANICAL REPLACEMENTS AND ADJUSTMENTS

To remove the turret and range scale

1. Slacken off the two 4 B.A. nuts securing the hook which holds the spring at the left-hand end of the turret and release the spring. Undo the two nuts on the loose link of the chain driving the range scale, loosen the screw and remove the chain. Undo the four 2 B.A. screws fixing the end bearings of the turret and lift the turret assembly out, carefully noting the number of spacers under each screw. Care must be taken to avoid damage to the spring contacts and to the rows of contact blocks on the turret. The range scale is removed by undoing the two 2 B.A. nuts at the side of the R.F. assembly. When replacing the chain, ensure that the figure shown in the range window is that of the compartment in contact with the R.F. spring contacts.

To remove a coil compartment from the turret

2. The corners of the coil compartments are screwed to the turret by the 6 B.A. screws bolting down the earthing con-

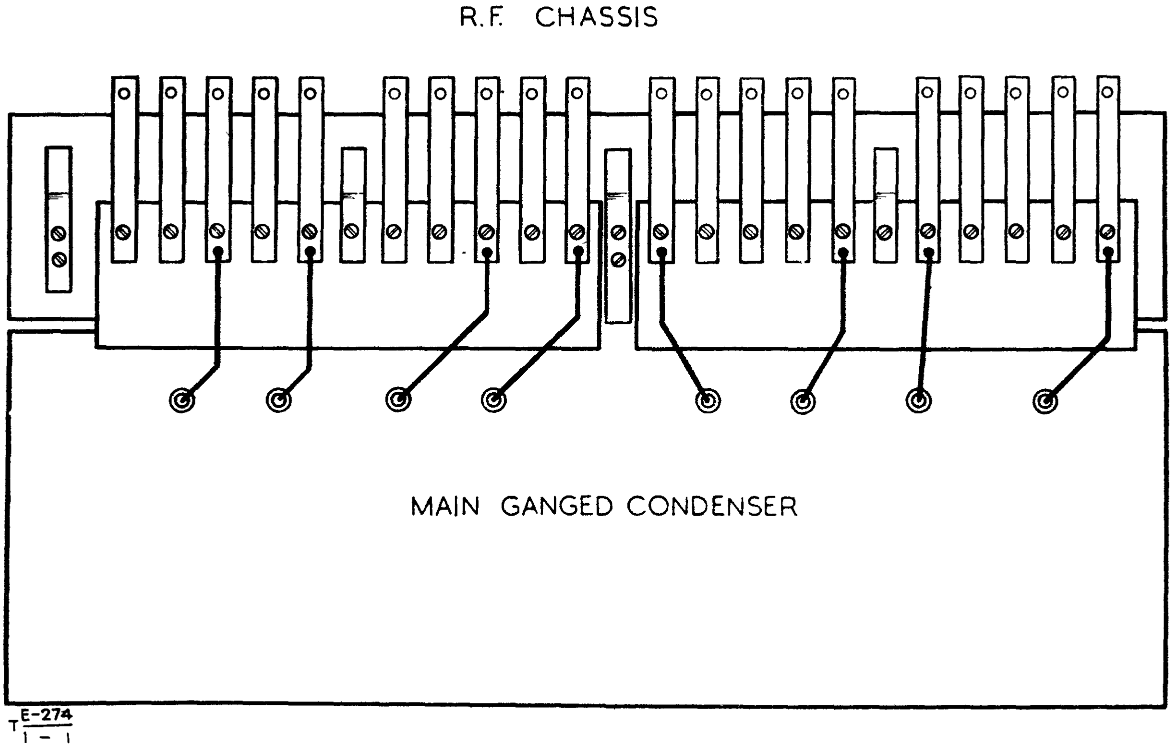

Fig. 1—Wiring of spring contacts to main ganged condenser

tacts. Hence, to remove a coil compartment take out three of the screws of the four earthing contacts at the corners of the compartment, including the one fixing the compartment, and swivel the earth contacts about the fourth screw until the compartment can be removed. With compartments at the end of the turret, the outside ends are fixed by two 6 B.A. screws which must be removed. The compartment cover is fixed by the two screws at each side of the box. To remove the contact strip, unsolder the leads from the inside ends of the fixing screws, and unscrew the 6 B.A. fixing bolt on the inside. This frees the individual contact blocks, all of which must be taken out to remove the moulded boards. When removing a coil, unsolder the leads at the end remote from the coil to prevent damaging the coil or its protective coating with the soldering iron.

To remove the R.F. chassis

3. (*a*) Remove the supplies plug from the socket on top of the B.F.O. unit, and the plug of the coupling lead from the socket on the first I.F. unit. Note that the knurled ring securing this plug has a normal right-handed thread when viewed from the I.F./A.F. side.
   (*b*) Unsolder the three leads from the AE. INPUT socket, noting carefully the point from which each wire is unsoldered. Unsolder the wires connecting the main gang condenser to the spring contacts. Undo the four 4 B.A. screws from the flange at the base of the R.F. chassis, and carefully remove the chassis. When replacing, see Fig. 1 for details of the wiring of the ganged condensers to the spring contacts.

4. When removing a valveholder from the chassis, at least one of the screens below the chassis will have to be taken out. To do this unsolder all connecting wires to components mounted on the screen and remove the four 8 B.A. fixing bolts. The wiring layout must not be altered more than necessary, as this will have serious effects on the alignment. When any operation is performed on the R.F. chassis, the set must of course be re-aligned.

To remove the R.F. assembly

5. (*a*) Unsolder the three leads from the AE. INPUT socket.
   (*b*) Remove the oscillator vernier knob and scale, the range handle, the aerial trimmer knob and both the main tuning knobs (Tels. E 273, para. 7). Remove the main tuning dial by undoing its three setscrews. Put TUNING SPEED CONTROL to FAST.
   (*c*) Remove the supply plug and the plug to the first I.F. can.
   (*d*) Loosen the eight 0 B.A. screws round the base of the assembly and remove the assembly to the rear, taking care not to damage the valves on the R.F. chassis.

6. When replacing the aerial trimmer knob, turn the spindle until the mark on it is to the top; the condenser is then in its mid-position, and the knob should be set with its arrow vertical. When replacing the oscillator vernier, turn the driving spindle until the marks on the two spindles coincide at the top; the condenser is then in its mid-position and the scale should be set to read zero.

To remove the main gang and casing assembly

7. (*a*) Remove the R.F. assembly as in para. 5.
   (*b*) Remove the turret as in para. 1.
   (*c*) Remove the R.F. chassis as in para. 3.
   (*d*) Loosen the clamping collar on the main tuning drive and remove the two-speed drive assembly.

(*e*) Remove the pointer by loosening the 6 B.A. screw clamping it to its spindle.
(*f*) Remove the scale and its supporting plate by undoing the five 6 B.A. screws.
(*g*) Remove the cover from the pointer drive by undoing the four 4 B.A. screws.
(*h*) Remove the large spring-loaded gear from the main drive shaft.
(*j*) Remove the collar from the aerial trimmer spindle, and the two-speed drive from the oscillator vernier spindle.
(*k*) Remove the baseplate of the main gang and casing assembly secured by the twelve 4 B.A. screws.

The main gang and casing assembly can now be removed by undoing the six 2 B.A. screws securing it at the top and the eight 4 B.A. screws at the front; two of the latter are situated below the second large spring-loaded gear, but access may be had to them through the holes in the gear (one is countersunk-headed).

8. To remove the main gang from its case, undo the four 4 B.A. countersunk-headed fixing screws on the top of the case. Unsolder the wires to the oscillator vernier and aerial trimmers, noting the connections, and withdraw the main gang. The position of the connecting leads to the R.F. chassis from the main gang must be noted for replacement purposes. Do not attempt to adjust the main gang, but in the event of a fault replace complete.

Notes for replacing the main gang

9. On replacing the main gang turn the condenser to the stop at the maximum capacity end and adjust the pointer to read zero on the logging scale; check that the pointer will read 10 on the logging scale, before the condenser stop comes into operation at the minimum capacity end.

10. The pointer drive is by means of two sets of spring-loaded gears from the gang condenser shaft, and the gears are set up to a tension of two teeth each.

11. The two setscrews securing the main tuning dial to the spindle bed into small holes drilled into the spindle. When originally assembled, the pointer was set to zero on the logging scale, the main tuning dial set to read exactly zero and the two setscrews tightened up; the dial was removed and holes drilled where the setscrews bedded on the spindle so that there should be no slip between it and the dial. If the clamping collar located between the set front panel and the front of the R.F. assembly has been loosened, tighten the setscrews in their original holes, set the pointer and dial to read zero, and tighten the clamping collar.

12. The backlash between the condenser and the main tuning drive, measured at the 100 division interpolating scale, must not exceed 0·3 of a division. This is measured electrically by feeding in a C.W. signal from a signal generator, and tuning the set in on C.W. A.V.C. ON for zero beat, first from one side of the tuning point and then from the other. The difference in the scale readings gives the backlash. This must apply over the whole tuning swing, using range 5 as a criterion. Excessive backlash may be due to mechanical strain of the condenser gearbox due to over or uneven tightening of screws on the R.F. assembly.

13. The slow-motion ball bearing drives must not be dismantled, and in the event of a fault, should be replaced complete.

To remove the I.F./A.F. assembly

14. (*a*) Remove the following control knobs—R.F. GAIN, A.F. GAIN, BANDWIDTH, R.T./C.W. switch and B.F.O. knob and scale.
(*b*) Remove the supplies plug from the B.F.O. unit and the plug from the first I.F. transformer. Unclip the two scale lamps, and release the leads to them from the two clamps at the top of the rear of the front panel.
(*c*) Undo the six 4 B.A. cheese-headed fixing bolts on the front panel and the four beneath the chassis. The I.F./A.F. assembly may now be removed.
(*d*) Each side panel, and one of the end panels of the I.F./A.F. assembly may be detached by removing five 4 B.A. cheese-headed bolts.

15. When replacing the B.F.O. dial, remove the cover from the B.F.O. unit and set the condenser to its mid-position. Secure the dial so that it reads zero and replace the cover on the B.F.O. unit.

To remove a wafer of the BANDWIDTH switch

16. (*a*) Remove the I.F./A.F. assembly as in para. 14 and remove the back end panel.
(*b*) Slacken the two screws securing the flexible coupling to the switch shaft and remove the shaft.
(*c*) If one of the front wafers is to be removed, undo the two 6 B.A. nuts at the front end of the switch supporting rods and withdraw the rods as far as the wafer in question, noting the positions of the spacers. If one of the rear wafers is to be removed, undo the two 6 B.A. nuts at the rear end of the rods and withdraw the rods towards the front.
(*d*) Lift out the wafer as far as is possible without straining the leads and unsolder the leads, noting to which tags they are connected. In the case of the rear wafers it is simpler to remove the leads and tags from the crystal filter sockets.

To remove the R.T./C.W. switch

17. Unscrew the two countersunk screws holding the R.T./C.W. switch assembly to the front of the I.F. assembly.

I.F. cans and A.F. filter

18. These may be removed by taking out the two holding bolts beneath the chassis and unsoldering the leads to the tags. Access to the cans can, however, be obtained by undoing the four 6 B.A. bolts at the side of the can, and removing the side plate.

I.F. coils

19. Coil formers are held to the can by means of spring-retaining Spire type nuts on the outside of the can, which grip the end of the former protruding through the can. To remove a coil, unsolder the leads and twist the Spire nut loose. When replacing the Spire nut, it should be pushed up tight against the can with a 2 B.A. box spanner.

Cylindrical tag-boards

20. These are supported by internally threaded brass pillars. To remove, undo the two 4 B.A. bolts on the underside of the chassis.

B.F.O. unit

21. Access may be obtained to the unit by undoing the three 6 B.A. bolts at the top of the unit and removing the cover. To remove the unit, see para. 21 of Tels. E 273.

TEST AND ALIGNMENT PROCEDURE

Test equipment required

22. Signal generator No. 1
 " " " 2 Mk. 1**
Meters, output, power No. 1 and No. 3
Voltmeter, valve 150V No. 1
Oscillator B.F.
Calibrator, crystal No. 7
Oscillator, alignment, crystal filter No. 1.

Setting up

23. It is essential that the I.F. stages are aligned at the peak frequency of the narrow band crystal filter (approximately 465kc/s). The procedure for tuning the signal generator is given in para. 26. The standard modulation for testing on this set is 400c/s at 30% depth and this must be used unless otherwise stated (140c/s is used for I.F. alignment and testing).

24. The normal switch positions of the set are as follows:—
R.T./C.W. switch to R.T. A.V.C. OFF.
BAND-WIDTH switch to NARROW.
A.F. FILTER and LIMITER switches to OUT.
R.F. GAIN to 10 (i.e., maximum).
A.F. GAIN to 10 (i.e., minimum).
L.S. switch to OFF.
Any variations from these positions are detailed in the appropriate text.

25. Connect a B.F.O. to the external modulation terminals of the signal generator and set to give 140c/s at 30% depth of modulation. Connect the generator directly to the grid (top cap) of the mixer valve V3A after removing the grid lead. Plug an output meter into the 150Ω output jack and switch to the 50mW range 600Ω impedance. It is essential to use 600Ω impedance as the PHONES 150Ω and LINE 600Ω jacks are in parallel; the advantage of having an output impedance to line of 600Ω balanced to earth outweighs the loss due to the mismatch of the 'phones.

26. Tune the receiver to 06·Mc/s and allow to warm up. Then carefully tune the signal generator about 465kc/s for maximum audio output. It is now set to the peak frequency of the narrow band crystal filter which is the reference frequency, and during subsequent testing it should be frequently checked.

27. Switch off the generator modulation and put the R.T./C.W. switch to C.W. A.V.C. OFF. Set the B.F.O. control to its mid-position and adjust C69 for zero beat.

I.F. alignment

28. Connect the signal generator directly to the grid (top cap) of V3A after removing the grid lead. To avoid possible damage to the crystal due to overload, the input from the generator should be kept low and should be set to give an audio output of about 10mW. Remove the securing plate from above the crystal filters, and undo the two 6 B.A. screws holding the lids of each of the crystal filters. Replace the lids with drilled lids (see para. 67). For all I.F. tests the local oscillator should be prevented from working by inserting a sheet of Paxolin between the oscillator turret studs and the contact springs.

29. Vary the signal generator tuning carefully either side of 465kc/s and set the tuning to give peak output. With a non-metallic tool adjust for maximum output trimmers C53, C49, C43, and C39. Adjust C131 and C134 on the narrow crystal filter for maximum output (see Fig. 2). On no account must C130 be touched after alignment of the filter.

30. Put the BANDWIDTH switch to MEDIUM and adjust C137 and C140 on the medium crystal filter for maximum output.

31. Put the BANDWIDTH switch to WIDE and adjust C31 and C23 for maximum output.

32. Repeat the operations described in paras. 29 to 31.

I.F. amplifier sensitivity

33. Set the output of the signal generator to 50μV and the BANDWIDTH switch to NARROW. Vary the frequency of the generator for maximum receiver audio output, and adjust the output of the generator to give an audio output of 10mW. The output of the generator should not be greater than 35μV (100μV for Serial Nos. 601 to 801).

34. Repeat para. 33 with the BANDWIDTH switch at MEDIUM and WIDE, but leaving the generator frequency unaltered; the output required from the generator should not be greater than 20μV and 30μV respectively (50μV in each case for Serial Nos. 601 to 801).

Adjacent channel selectivity

35. With the switch positions as in para. 24 and the signal generator connected to the grid of V3A, set the receiver tuning to 1·0 Mc/s on range 6. Adjust the generator output to 100μV, modulated at 140 c/s 30% depth, and accurately tune it to the reference frequency.

36. Switch off the generator modulation and put the R.T./C.W. switch to C.W. A.V.C. OFF and check that the adjustment of C69 carried out in para. 27 gives zero beat. Return the R.T./C.W. switch to R.T. A.V.C. OFF and switch on the signal generator modulation. Adjust the A.F. GAIN for an output of 10mW.

37. Detune the signal generator by reducing its frequency by

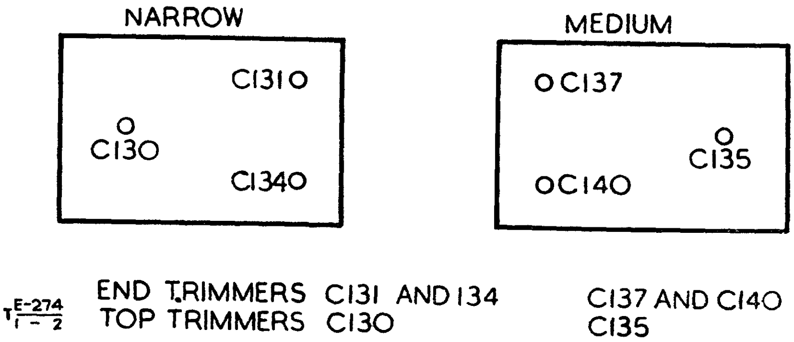

Fig. 2—Positions of trimmers on crystal filters

about 20 kc/s and increase its output to 200μV. Slowly increase the frequency until an output of 10mW is again obtained. Put the R.T./C.W. switch to C.W. A.V.C. OFF and increase the frequency of the generator modulation until it beats with the receiver B.F.O. note and then finally adjust the modulation frequency for zero beat. Note this modulation frequency. Reset the modulation to 140 c/s and repeat on the high side of the reference frequency.

38. The sum of the two modulation frequencies thus obtained gives the band-width at 6db. down. Repeat with a generator output of 1 mV and 100 mV (i.e., at 20db. and 60db. down) taking care not to overload the crystal filter (i.e., reduce the signal generator output to 100μV or less when passing through peak frequency). The band-width obtained should conform to the figures given in Table 1.

39. Repeat with the BANDWIDTH switch at MEDIUM. If the figures obtained for either position of the switch are outside the limits, it may indicate that one or other of the crystal filters is out of alignment. The procedure for re-alignment is given in paras. 66-76. This should be carried out only if it is quite certain that a filter is at fault.

40. Reset the signal generator to the reference frequency. Put the BANDWIDTH switch to WIDE and measure the band-width at 6, 20 and 60db. down. For the 60db. measurement the double beat method, using the second harmonic of the B.F.O., should be used.

Input in μV	*Increase in db.*	*Band-width kc/s*		
		Narrow	*Medium*	*Wide*
200	6	0·8-1·1	2·0-3·0	7·0-9·
1,000	20	2·3 max.	4·0 max.	12·5 max.
100,000	60	6·3 max.	8·0 max.	26·0 max.
Cut-off slope between 20 and 60 db. in db. per kc/s		20 min.	20 min.	5·5 min.

NOTE: On wide band, the slope may be 5·5 between 6 and 60 db. or between 20 and 60 db.

Table 1—I.F. band-widths

A.F. response

41. Connect the signal generator directly to the grid of V2C with the grid lead removed. Put the R.T./C.W. switch to R.T. A.V.C. ON, and the BANDWIDTH to WIDE. Modulate the signal generator at 500c/s 30% depth with an output of 1V. Tune the generator about 465kc/s for maximum audio output. Set the A.F. GAIN to give an output of 200mW. Maintain the modulation depth at 30%, and vary the frequency between 300c/s and 3,000c/s. The variation in receiver audio output should be within the limits of + 2db. and −6db. with respect to the level at 500c/s.

A.F. filter performance

42. With the same set-up as in para. 41 put the FILTER switch to IN and swing the modulation frequency about 900c/s until maximum audio output is obtained. This is the centre of the pass-band and should be 900c/s ± 80c/s. Set the modulation frequency to this peak and adjust the L.F. GAIN for an output of 100mW.

43. Set the FILTER switch to OUT. The audio output now observed should be within the limits 50mW to 200mW, i.e., the filter insertion efficiency should not be more than ± 3db.

44. Set the FILTER switch to IN. Adjust the modulation frequency to points above and below the peak so that the output falls to 25mW (i.e., a reduction of audio output of 6db.). The difference between these two frequencies gives the band-width at 6db. down which should be between 160c/s and 300c/s.

45. Repeat at frequencies to give an output of 2·5mW (i.e., 16db. down). From the band-widths obtained at 6db. and 16db. down determine the filter cut-off slope. On the lower frequency side it should not be less than 8db./100c/s and on the higher frequency side not less than 4db./100c/s.

R.F. alignment

46. All R.F. trimmers are secured by locking collars, and these must be slackened before any adjustments are attempted. The cores of the coils are secured by springs tightened by a 6 B.A. screw. These locking collars and screws must be retightened before the signal-to-noise ratios are measured.

47. The signal generator is connected to the aerial input of the receiver by a non-inductive 80Ω resistor in series with the output terminal of the generator. The frequency should be accurately set up by means of a crystal calibrator.

Ranges 3—6

48. The R.F. circuits are lined up independently of the rest of the set. Remove the grid lead of V3A (earthing the grid to prevent damage to the valve) and connect a valve voltmeter set to its lowest range, between the grid lead and earth. Connect the signal generator to the aerial terminals of the set as above. Prevent the local oscillator from working by inserting a sheet of Paxolin between the oscillator turret studs and contact springs. Set the R.F. GAIN to maximum and the R.T./C.W. switch to R.T. A.V.C. OFF.

49. Set the receiver tuning to 1·05 Mc/s on range 6 and the signal generator also to 1·05 Mc/s with an output, unmodulated, of 100mV. Put the AE. TRIMMER to approximately mid-position and adjust C110 for maximum output. Reset the generator and receiver to 0·6 Mc/s and adjust L40. Repeat this procedure as the capacity and inductance trimmers have an effect on each other.

50. Repeat at 1·05 Mc/s and 0·6 Mc/s, adjusting the 1st. R.F. circuit trimmers C109 and L38, and for the aerial circuit C108 and L36. Reduce the generator output as the circuits are aligned.

51. Carry out a similar procedure on range 5 (at 2·15 and 1·2 Mc/s), range 4 (4·5 and 2·5 Mc/s) and range 3 (9·5 and 5·1 Mc/s), adjusting the condenser trimmers at the upper frequency and the inductance cores at the lower frequency.

52. When the trimming is completed, the tracking is carried out. Set the local oscillator working by removing the Paxolin strip and replace the lead on the mixer grid. Plug an output meter (600Ω impedance) into the 150Ω output jack (see para. 25) and externally modulate the signal generator at 140c/s and 30% depth, feeding to the aerial terminal as before. Put the receiver switches to the positions given in para. 24 and set the OSC. VERNIER to zero.

53. With the signal generator accurately set to the frequencies used for trimming and the receiver dial set also to these points, adjust the oscillator condenser trimmers and inductance cores at the upper and lower frequencies respectively of each range. After adjusting the condenser and inductance it will be necessary to repeat, due to the effects of the trimmers on each other, until the calibration is correct. The tolerance is ± ½% and should be checked throughout the range.

54. When the tracking is satisfactory adjust the mixer grid circuit trimmers (e.g., C110 and L40 for range 6) to compensate for the difference in capacity of the valve voltmeter and mixer grid input. The other trimmers may also be touched to ensure perfect lining-up ; on all ranges this should be done on noise alone, either by ear or by careful use of an output meter.

Ranges 1—2

55. The R.F. circuits should be lined up as in paras. 48-51 above with the oscillator prevented from working, the frequencies used being 19 and 11 Mc/s for range 2, and 29 and 21 Mc/s for range 1.

56. As pulling of the local oscillator by the R.F. circuits becomes important on these ranges, particularly range 1, a slightly different procedure must be adopted for tracking. When the lining-up is satisfactory, connect the signal generator directly to the mixer grid and, using an input of 1,000μV, track the oscillator in the normal way. Calibration accuracy should be within ± ½%.

57. The final trimming of the R.F. circuits is done by using the signal generator with very small coupling. Connect the earth side of the generator lead to the earth on the set and hang the live side near the aerial terminal and use only sufficient output to hear the modulation note, trimming being done by ear, or by careful use of an output meter.

Signal-to-noise ratio

58. Signal-to-noise tests must be made in a double-screened room with the receiver operated from a 12V accumulator. No mains leads must be brought into the cage and a signal generator or any other measuring equipment in the screened room must be battery-driven. If it is not found possible to exclude mains leads from the cage, the performance required in para. 59 will probably not be reached by 6db.

59. Put the controls to the positions given in para. 24, except the BANDWIDTH which must be at MEDIUM. At each frequency in Table 2 in turn, set the signal generator output modulated to a value not greater than that shown. Carefully tune the receiver, including the aerial trimmer, for maximum audio output. Adjust the A.F. GAIN control for an output of 50mW. Switch off the modulation. The residual noise read on the output meter should not exceed 0·5mW at any frequency (i.e., 20db. signal-to-noise ratio).

Second channel ratio

60. Put controls to positions as in para. 24, except BANDWIDTH which must be at WIDE. Set the signal generator to the frequencies of Table 3 with a modulated output of not more than 10μV. Tune the receiver, including the AE. TRIMMER, and adjust the A.F. GAIN for 10mW output. Tune the signal generator approximately to the second channel frequency shown in Table 3 and increase its output so that it can be accurately tuned to the second channel frequency. Adjust the generator output for an audio output of 10mW. This must require a ratio not less than that given in Table 3.

Range	*Frequency in Mc/s*	*S.G. output in μV*
1	29 25 21	2·0 2·0 2·5
2	19 15 11	2·0 2·0 2·5
3	9·5 7·2 5·1	2·0 2·0 2·0
4	4·5 3·5 2·5	2·0 2·0 2·0
5	2·15 1·5 1·2	2·0 2·0 2·0
6	1·05 0·8 0·6	2·0 2·0 2·0

Table 2—Inputs for signal-to-noise ratio measurements

Range	*Frequency in Mc/s to which receiver is tuned*	*2nd. channel frequency in Mc/s.*	*Minimum permissible ratio in db.*
1	29 25 21	28·07 24·07 20·07	20 32 46
2	19 11	19·93 11·93	40 66
3	9·5 5·1	10·43 6·03	46 66
4	4·5	5·43	72
5	2·15	3·08	80
6	1·05	1·98	100

Table 3—Second channel ratios

A.V.C. adjustment and efficiency and limiter functioning

61. Put the controls to positions as in para. 24, except R.T./C.W. switch to R.T. A.V.C. ON. Set the signal generator, modulated at 140c/s to a depth of 30%, to give an output of 10μV at 1·5 Mc/s. Tune the receiver, including the A.E. TRIMMER. With the BANDWIDTH switch at WIDE and the modulation frequency increased to 400 c/s, increase

the generator output to 10mV and adjust C73 for minimum output.

62. Adjust the A.F. GAIN for an audio output of 10mW and vary the signal generator output from 10mV to 10μV. The change in the audio output should lie within the limits of +6 and −8db. referred to 10mW, but the total change should not be greater than 8db.

63. Set the A.F. GAIN for an audio output of 10mW and switch the LIMITER to IN. The output should now lie between 3mW and 6mW.

C.W. heterodyne efficiency

64. Put the controls to positions as in para. 24 except BANDWIDTH to WIDE and B.F.O. control set to zero. With a valve voltmeter connected between the anode of the B.F.O. valve V2D and earth, measure the output of the B.F.O. This should be not less than 12V R.M.S.

A.F. hum level

65. With switch positions as in para. 24, except BANDWIDTH to WIDE and R.F. and A.F. GAIN to 0 (i.e., minimum), the output of A.F. hum and residual noise should not be greater than 50μW.

CRYSTAL FILTER ALIGNMENT

66. Remove the crystal filter from the receiver and place it in the jig on the amplifier portion of the Oscillator, alignment, crystal filter, No. 1. Unlock the three trimmers on the filter.

67. During all adjustments to the crystal filter, a lid with three holes drilled above the three trimmers must be used in place of the normal lid.

68. Set the oscillator frequency to 465kc/s with an output of about 25μV. Adjust the end trimmers on the filter (see Fig. 2) for maximum meter reading, using a non-metallic tool. It will be necessary to adjust each condenser in turn several times until no further increase in meter reading can be obtained. During subsequent alignment the output of the oscillator must at no time exceed 230μV when the frequency is passing through 465kc/s or the crystal will be damaged (e.g., when changing the frequency from the upper to the lower rejection point).

69. Set the oscillator frequency to 468·3kc/s (470kc/s for the medium), the approximate upper rejection point (see Fig. 3), and increase the output of the oscillator by about 50db. to give a suitable reading on the meter. Adjust the top trimmer (see Fig. 2) for minimum readings. Set the oscillator frequency to about 461·7kc/s (460kc/s for the medium) and rock the frequency slightly to check the lower rejection point, which should be approximately 461·7kc/s; only an approximate setting of the top trimmer is required during this preliminary setting-up.

70. With the oscillator set to 465kc/s adjust the attenuator to give a convenient meter reading. Note this reading and the attenuator reading. Increase the oscillator output by 6db. and note the frequencies for which the meter reading noted above is obtained. The mean of these two frequencies is the mid-band frequency (m.b.f.) of the filter, and should be within ± 200c/s of 465kc/s.

71. Repeat para. 68 with the oscillator set to the m.b.f.

72. Adjust the centre trimmer so that the upper and lower rejection points are set symmetrically about the m.b.f. These rejection points should be 3·0 to 3·6kc/s from the m.b.f. for the narrow filter (4·5 to 5·5kc/s for the medium) and the asymmetry of the upper and lower points about the m.b.f. should not be more than 300c/s.

73. Set the oscillator to the m.b.f. and measure the band-width at 6db. down, using the method described in para. 70. This should be within the range 0·65 to 1·1kc/s for the narrow filter (2·4 to 3·1kc/s for the medium).

74. Set the oscillator to the m.b.f. with an output to give a convenient meter reading. Tune the oscillator to the rejection points, and note the increase of oscillator output required to restore the meter reading. The rejection points should be as stated in para. 72, and at these points the response must be at least 55db. below the response at the m.b.f. for the narrow filter (45db. for the medium), but symmetry of response is not necessary.

75. The return lobes must be at least 46db. below the response at the m.b.f. for the narrow filter (40db. for the medium).

76. The dependence of the response curve on individual components and their adjustment is as follows, references being to the narrow filter although similar remarks apply to the medium :—

(*a*) Band-width at 6db. down—termination of filter and internal losses.

(*b*) Level of return lobes—Q of L60 and L61.

(*c*) Level of rejection points—R80.

(*d*) Symmetry of rejection points—setting of C130.

(*e*) Displacement of rejection points from m.b.f.—mutual inductance of L60 and L61. This is controlled by the spacing of the inductance cores by means of shims. An alteration in spacing of 0·005 in. alters the distance between the rejection points by approximately 100c/s.

(*f*) Mid-band frequency—XI.

WINDING DETAILS

77. This information is given for guidance in emergency only. The coils should either be matched with a manufacturer's sample taken from spares or a set, or adjusted finally in the set. The figures give a general idea of the coil winding, with the necessary dimensions; they do not depict any particular coil, but should be used for guidance with the text.

Receiver

R.F. coils

78. Except for range 1 aerial coil (Fig. 4b) all formers have the same dimensions as those in Fig. 4a, but all the tags and spills are not required for each coil.

79. Coil formers for ranges 1, 2 and 3 are threaded for the main winding at 6½, 12 and 30 T.P.I. respectively, the start of the threading being $\frac{5}{16}$ in., ¼ in. and ¼ in. respectively from the top of the base, as given by dimension X in Fig. 4a. The distance between the spills and the base, dimension Y, is given in the particulars for individual coils.

80. The coupling windings on ranges 1 and 2 are wound between the turns of the main winding. On range 3 the coupling windings are wound over the lower part of the main winding, i.e., nearer the base.

81. The main windings on range 4 are close-wound on the former, starting at a distance $X = \frac{5}{16}$ in. The coupling windings are wound over in a similar manner to range 3.

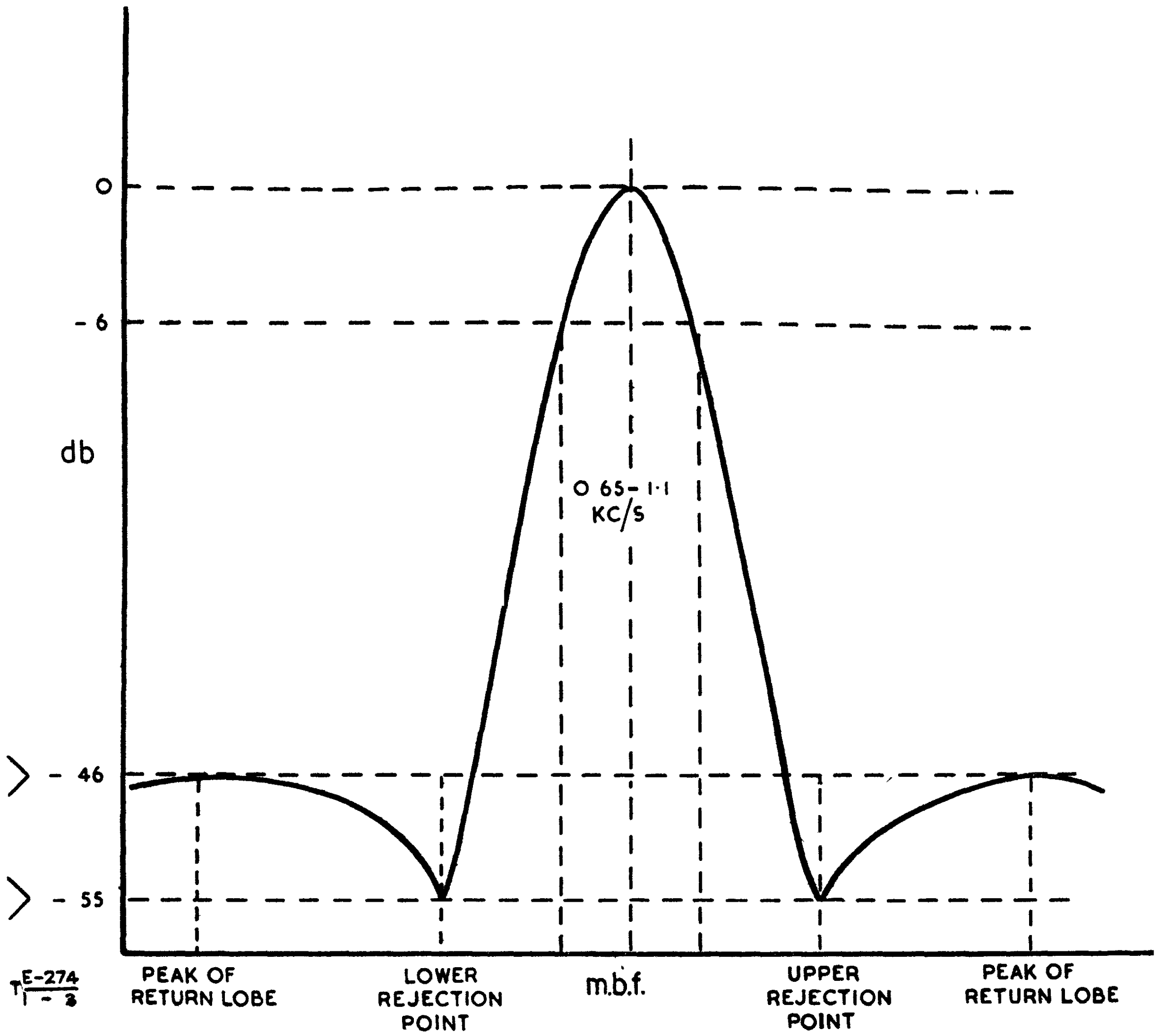

Fig. 3—Response curve for narrow filter

82. The main windings on ranges 5 and 6 are wave-wound to the dimensions given in Figs. 4c and 4d respectively; the coupling windings are close-wound in positions as given for the individual coils.

83. After winding, all coils are dipped in LPRM—3 tropical wax (Claude Campbell).

84. In the column headed wire in Table 4 20 S. Cu. indicates 20 S.W.G. silvered copper ; 27/47 indicates 27/27 S.W.G. enamelled copper straight-laid D.R.C.C. wire ; the remaining numbers indicate the S.W.G. of D.R.C.C. wire.

Compound	*Function*	*Turns*	*Wire*	*Start*	*Finish*	*Y*	*Remarks*
Range 1							
L1	Aerial	5½	20 S.Cu	1	—	—	Tapped ½ turn from end, left free 1 in. End left free 1½ in.
L2	H.F. 1 main	4	18 S.Cu	3	6	1 in.	
L3	H.F. 1 coupling	4	36	1	4	,,	Wound centrally between turns of main winding
L4	H.F. 2 main	4	18 S.Cu	3	6	,,	
L5	H.F. 2 coupling	4	36	1	4	,,	Wound centrally between turns of main winding
L6	Oscillator	4½	18 S.Cu	3	9	,,	Tapped one turn from start with 1 in. of 20 S.Cu.

Table 4—Winding details—R.F. coils

Table 4—Winding details, R.F. coils—*continued*

Compound	*Function*	*Turns*	*Wire*	*Start*	*Finish*	*Y*	*Remarks*
Range 2							
L7	Aerial main	$6\frac{1}{2}$	18 S.Cu	1	7	$\frac{7}{8}$ in.	
L8	Aerial coupling	1	22	3	2	”	Between first and second turns of main winding. Insulated from main winding by Domolac strip at cross-over
L9	H.F. 1 main	$6\frac{1}{2}$	18 S.Cu	1	7	”	
L10	H.F. 1 coupling	3	36	2	3	”	Between first three turns of main winding
L11	H.F. 2 main	$6\frac{1}{2}$	18 S.Cu	1	7	”	
L12	H.F. 2 coupling	4	36	2	3	”	Between first four turns of main winding
L13	Oscillator	$6\frac{1}{2}$	18 S.Cu	1	7	”	Tappings at two and three turns from start. Ends 1 in. long
Range 3							
L14	Aerial main	$14\frac{1}{2}$	24	1	7	$\frac{13}{16}$ in.	
L15	Aerial coupling	3	24	3	2	”	Wound over lower end of main winding and separated by Domolac sheet
L16	H.F. 1 main	$14\frac{1}{2}$	24	1	7	”	
L17	H.F. 1 coupling	3	36	3	2	”	As for L15
L18	H.F. 2 main	14	24	1	4	”	
L19	H.F. 2 coupling	7	36	3	2	”	As for L15
L20	Oscillator	$13\frac{5}{8}$	24	3	8	”	Tapping five turns from start, formed by leaving loop, twisting together and soldering to Tag 2
Range 4							
L21	Aerial main	30	27/47	1	4	$\frac{13}{16}$ in.	
L22	Aerial coupling	5	24	2	3	”	Wound over lower end of main winding and separated by Domolac sheet
L23	H.F. 1 main	30	27/47	1	4	”	Tapping ten turns from start, formed by leaving loop and twisting together for 1 in. long
L24	H.F. 1 coupling	10	36	2	3	”	As for L22
L25	H.F. 2 main	30	27/47	1	4	”	As for L23
L26	H.F. 2 coupling	4	36	2	3	”	As for L22
L27	Oscillator	27	27/47	1	4	”	Tapping 12 turns from start, formed by leaving loop, twisting together and soldering to tag 2
Range 5							
L28	Aerial main	2 piles, 30 and 31	27/47	1	4	1 in.	Wave-wound
L29	Aerial coupling	8	28	3	2	”	Wound as close as possible under lower pile of main winding
L30	H.F. 1 main	2 piles, 29 and 32	27/47	1	4	”	Wave-wound with tapping formed by leaving loop between piles and twisting together
L31	H.F. 1 coupling	14	36	3	2	”	Wound between the two piles of main winding
L32	H.F. 2 main	2 piles, 29 and 31	27/47	1	4	”	As for L30
L33	H.F. 2 coupling	2	36	3	2	”	As for L29
L34	Oscillator	2 piles, 24 and 25	27/47	2	5	”	Wave-wound with tapping formed by leaving a loop between piles, twisting together, and soldering to Tag 1
Range 6							
L35	Aerial main	3 piles, 39, 41 and 41	27/47	1	4	$\frac{13}{32}$ in.	Wave-wound
L36	Aerial coupling	9	28	3	2	”	Wound as closely as possible under lower pile of main winding
L37	H.F. 1 main	3 piles, 40, 42 and 43	27/47	1	4	”	Wave-wound, with tapping formed by leaving loop between first and second piles and twisting together

Table 4—Winding details, R.F. coils—*continued*

Compound	*Function*	*Turns*	*Wire*	*Start*	*Finish*	*Y*	*Remarks*
Range 6 (cont'd)							
L38	H.F. 1 coupling	15	36	3	2	$\frac{13}{32}$ in.	Wound between first and second piles of mains winding
L39	H.F. 2 main	3 piles, 40, 42 and 43	27/47	1	4	"	As for L37
L40	H.F. 2 coupling	7	36	3	2	"	As for L36
L41	Oscillator	3 piles, 27, 27 and 21	27/47	3	6	"	As for L37 but solder tap to Tag 2

H.F. chokes L52, L53

85. Ten turns of No. 30 S.W.G. enamelled copper wire.

I.F. coil L42

86. On Distrene former as in Fig. 4e.
Two sections of 60 turns each 9/46 enamelled and D.R.C.C. wire straight lay. The coil is secured with Distrene varnish and the whole assembly is sealed with tropical wax.

I.F. coil L43

87. Dimensions as in Fig. 9.
220 turns of 27/47 enamelled and S.R.C.C. wire, close-wave-wound. Start—tag 1. Finish—tag 2.
The coil is thinly coated with Distrene varnish and impregnated with tropical wax.

I.F. coils L44—L47

88. Dimensions as in Fig. 4g.
95 turns of 27/47 enamelled and S.R.C.C. wire, close-wave-wound. Start—tag 1. Finish—tag 2.
The coil is thinly coated with Distrene varnish and impregnated with tropical wax.

A.V.C. coil L51

89. 250 turns of 5/46 enamelled and D.R.C.C. wire, wave-wound, a sliding fit on $\frac{1}{4}$ in. diameter former. The winding is secured with Distrene varnish and the complete assembly is impregnated with tropical wax.

B.F.O. coil L50

90. Dimensions as in Fig. 4h.
102 turns 27/47 enamelled and S.R.C.C., tapped at 53 turns from start, close-wave-wound. Start—tag 1. 53 turns tap—tag 4. Finish—tag 2.
The finished winding is thinly coated with Distrene varnish and impregnated with tropical wax.

R.F. choke L54

91. Dimensions as in Fig. 4j.
1,000 turns of 40 S.W.G. D.R.C.C. copper wire, wave-wound. Start—connected to tags 1 and 2. Finish—connected to tags 3 and 4.
The finished winding is thinly coated with Distrene varnish and impregnated with tropical wax.

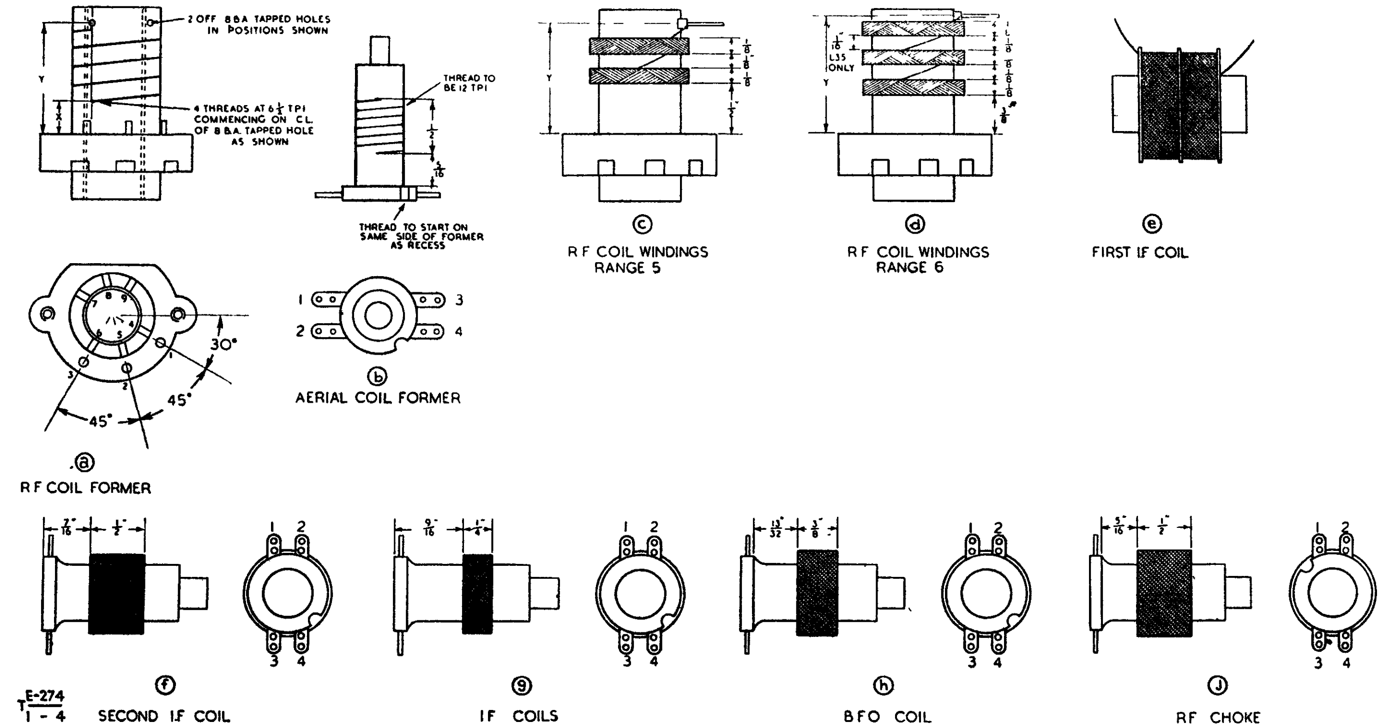

Fig. 4—1 Coil winding details

A.F. filter coils L48—L49

92. 800 turns of No. 28 S.W.G. enamelled copper wire. Bound with tropical tape. The inductance is adjusted by varying the gap between E and I laminations. Inductance, 0·265H. After adjustment, preheated for 2 hours and impregnated with tropical wax.

L.F, inter-stage transformer T1

93. Primary, 1,800 turns of 44 S.W.G. enamelled and R.C.C. wire and covered with two layers of regenerated cellulose tape. Secondary, 7,200 turns of 44 S.W.G. enamelled and R.C.C. wire and covered with grey Egyptian cotton tape. The transformer is vacuum-impregnated with H.D. Symonds compound S.475.

Output transformer T2

94. The windings and interleaving are put on in the order given.
First half of secondary 1, 65 turns of No. 28 S.W.G. enamelled copper. Start connected to tag 1, finish to start of second half of secondary 1. Covered with six layers of interleaving tissue.
Secondary 2, 500 turns of No. 38 S.W.G. enamelled copper. Start to tag 3, finish to tag 4. Covered with ten layers of interleaving tissue.
Primary, 4,000 turns of No. 40 S.W.G. enamelled copper, fully interleaved. Start to tag 6, finish to tag 7. Covered with ten layers of interleaving tissue.
Secondary 3, 500 turns of No. 38 S.W.G. enamelled copper. Start to tag 4, finish to tag 5. Covered with six layers of interleaving tissue.
Second half of secondary 1, 65 turns of No. 28 S.W.G. enamelled copper. Start to finish of first half of secondary 1, finish to tag 2. Bound over all with tropical tape. The can is inverted and filled with bitumen before the baseplate is secured.

Valve heater dropping resistor R66

95. 58 turns of 38 S.W.G. Eureka enamelled wire on former 7/32 in. diameter. Resistance, 30Ω ± 1%.

Power supply unit

R.F. chokes L3, 4 and 5

96. 36 turns of No. 18 S.W.G. enamelled copper wire, close-wound on $\frac{5}{16}$ in. diameter mandrel. One loop of Macramé twine is passed through the choke round one side and tied before impregnation with tropical wax.

Choke L2

97. 250 turns of No. 28 S.W.G. D.C.C. copper wire, wave-wound $\frac{1}{2}$ in. wide. Inductance, 0·6mH, D.C. resistance, 1·75Ω. The vacuum is varnish-impregnated and dipped in tropical wax.

R.F. chokes L1 and L10

98. 20 turns of No. 16 S.W.G. enamelled copper wire, close-wound on $\frac{1}{2}$ in. diameter mandrel, tied and impregnated as for L3—5.

Choke L6

99. Inner winding, 57½ turns of 18 S.W.G. enamelled copper wire, followed with two layers of grey Egyptian tape (50% lap) and one layer of flexible bakelite, kept in place by one layer of tape (50% lap).
Outer winding, 54½ turns of 18 S.W.G. enamelled copper wire wound in the same direction as the inner winding. The complete winding bound with grey Egyptian tape, vacuum-impregnated with tropical varnish and dipped in tropical wax. Inductance of each winding, 0·06mH (0mA). D.C. resistance, 0·16Ω.

Choke L13

100. Four piles, each of 225 turns of No. 34 S.W.G. D.R.C. copper wire, wave-wound. Each pile 7/32 in. wide and spaced 3/32 in., vacuum-impregnated with varnish and dipped in tropical wax. Inductance, 2·2mH.

Choke L9

101. 180 turns of No. 16 S.W.G. D.C.C. copper wire. Wrapped with grey Egyptian tape. The completed coil is vacuum-impregnated in tropical varnish and dipped in tropical wax. D.C. resistance, 0·16Ω. Inductance, 250μH (1,000c/s).

Choke L11

102. 200 turns of No. 20 S.W.G. D.C.C. copper wire. The winding is bound with grey Egyptian tape and the complete coil is vacuum-impregnated in tropical varnish and dipped in tropical wax. Inductance, 400μH at 1,000c/s. D.C. resistance, 0·322.

L.F. choke L7

103. 131 turns of No. 16 S.W.G. enamelled copper wire, interleaved with 0·002 in. paper. The complete winding is bound with Egyptian tape and vacuum-impregnated with tropical varnish.

L.F. chokes L8, L12

104. 4,400 turns of No. 32 S.W.G. enamelled copper wire, interleaved with 0·002 in. paper. The complete winding is bound with Egyptian tape and vacuum-impregnated with tropical varnish. Inductance, 10H (100mA). D.C. resistance, 220Ω ± 10%.

Mains transformer T1

105. Primary, 1,020 turns of No. 28 S.W.G. enamelled copper wire, tapped at 0, 40, 80, 490, 695, 900 and 1,020 turns (20, 10, 0, 100, 150, 200 and 230V points), layer-wound approximately 130 turns per layer in six layers, each layer separated by one layer of Kraft paper. The whole winding is covered by two layers of Empire tape bound in place with Egyptian tape, followed by a copper screen bound in place with Egyptian tape. The whole is covered with two layers of Empire tape.
Secondary, 1,800 turns of No. 34 S.W.G. enamelled copper wire, centre-tapped, layer-wound approximately 212 turns per layer in nine layers, each layer separated by one layer of Kraft paper. The whole winding is covered with two layers of Empire tape bound in place with Egyptian tape.
Vibrator winding, 78 turns of No. 18 S.W.G. enamelled copper wire, centre-tapped, layer-wound, approximately 40 turns per layer, in two layers in a similar manner to the secondary.
Heater winding, 54 turns of No. 18 S.W.G. enamelled copper wire, centre-tapped, layer-wound in two layers in a similar manner to the secondary. The winding is impregnated with tropical varnish. Kingsnorth compound is run into the transformer box when assembled.

END