22 SEP 1944

WIRELESS SETS Nos. 68 P R AND T

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, through the usual channels, to the War Office (M.E.10).

MECHANICAL REPLACEMENTS AND ADJUSTMENTS

Receiver unit

1. In order to remove the gang condensers C14A and C14B first remove the calibrated dial and the locking mechanism. Then remove the four fixing screws, and unsolder the connections before lifting out the condensers.

Beat oscillator and receiver output transformer unit L7A and T1A

2. Remove the panel support stay, unsolder connections, undo the fixing nuts from the underside of the chassis, and remove the unit. The connections are shown in Fig. 1, Tels. F 553.

Sender unit

3. *M.O. coil (L19A-B for 68T and R sets, L11A-B for 68P set).* Remove the M.O. screening box. The connections are then accessible for disconnection. The connections to the coil and netting switch are shown in Fig. 1005, Tels. F 553.

4. *M.O. tuning condenser C21A.* Remove the calibrated dial; then the M.O. screening box and M.O. coil. The condenser may then be removed.

TEST AND ALIGNMENT PROCEDURE

5. The tests and alignment details are based on the manufacturers' specification. When making a repair it will not be necessary to carry out all the tests; only those applicable to the job in hand should be carried out. Do not readjust any circuit unless it fails to pass the tests, or if it has been repaired.

Test gear required

6. (*a*) Signal generator, No. 1 (Marconi type TF114).
(*b*) Meter, output (capable of reading 1mW with an input impedance 150 Ω, *i.e.*, Meter, output power, No. 2, Mk. I or No. 3).
(*c*) Calibrator, crystal (Calibrator, crystal, No. 1, 2 or 3).
(*d*) Wavementer, class C or D.
(*e*) Oscillator, beat frequency (Oscillator, beat frequency, No. 1).
(*f*) Voltmeters, valve, 15OV, No. 1 or No. 2.
(*g*) Universal Avometer (Avometer, universal, 46 range).
(*h*) Dummy aerials (see para. 7 (*e*)).

Test data

7. The following conditions will apply unless otherwise stated:
(*a*) All measurements to be taken with the set in the R/T condition.
(*b*) Signal generator modulation—30% at 400 c/s.
(*c*) Output meter impedance—150 Ω (measurement to be made with the headphones disconnected).
(*d*) Output level—1mW.
(*e*) Dummy aerials:—
Sender. 50*p*F + 10 Ω (valve voltmeter connected across the 10 Ω).
Receiver: R.F.—60*p*F.
I.F.—0·01μF + 470k Ω.
A.F.—0·1μF.
(*f*) Normal grid connection removed.
(*g*) Battery voltages on load—150V + 12V + 3V.
(*h*) Baseplates to be in position during all tests.

Filament voltages

8. Adjust filament rheostats R (R21A) and S (R21B) as follows:—
(*a*) Switch H.T. CURRENT switch to HIGH. Plug in microphone, press pressel switch, and measure voltage between pins 1 and 8 of valve V3A (ATP4) with Avometer. Adjust control S (R21B) until a reading of 2·2V is obtained. If, with the meter switch to L.T.S., the calibration figure on the plate is found incorrect, the correct calibration will be scribed, and the plate recoated with cellulose varnish.
(*b*) Switch to receive, and with the Avometer connected across pins 1 and 8 of valve V2A (AR8), adjust R (R21A) to give a reading of 2·2V. The same reading as obtained in (*a*) should be obtained on the test meter with the meter switched to L.T.R.

Control settings

9. (*a*) H.T. CURRENT—HIGH.
(*b*) L.T. GAIN —Adjusted for maximum output with beat oscillator inoperative.
(*c*) Æ SWITCH, Æ TUNING —Adjusted for maximum receiver output on aerial current.

SENDER UNIT

Preliminary drive adjustment (para. 31)

10. Connect the Avometer (100mA range) in the H.T. lead to the battery. This can be conveniently performed by obtaining a Connector, 5 pt., No. 10, Mk. II (ZA.10638), breaking into the H.T.+ lead, and connecting this connector between the battle battery and sender input plug, or between the static battery connector and the sender input plug. Disconnect the P.A. anode top cap and insert an open jack plug in the key jack socket, thus effectively cutting off the H.T. supply to the anode and screen of the P.A. valve (V3A). Note the reading of the Avometer, which indicates the master oscillator (V2B) H.T. current. This should lie within the limits given in para. 31. Reconnect the anode top cap of P.A. circuit and withdraw jack plug. Note readings of Avometer, and adjust the DRIVE condenser (C15C) until the readings given in para. 31 are obtained.

Neutralizing adjustment (para. 30)

11. (*a*) *Connections.* The receiver should be plugged in and the station be in receive condition (*i.e.*, pressel switch released). Connect a valve voltmeter between the aerial spring and the chassis.

(*b*) *Adjustment.* Press NET button and tune the Æ SWITCH and Æ TUNING condenser (C20A) to give the maximum reading on the valve voltmeter. Adjust the neutralizing condenser (C15D) for minimum deflection. Repeat the procedure until final adjustment of the neutralizing condenser is reached. This will be when no change for the reduction in the minimum reading can be obtained.

(*c*) *Limits.* The final meter reading must not be greater than that given in para. 30.

Final drive adjustment (para. 31)

12. Recheck DRIVE as described in para. 10. Rotate master oscillator tuning condenser over the whole band, and note whether the variations in meter readings exceed the limits shown in para. 31.

NOTE. Drive and neutralizing adjustments are interdependent, and consequently any adjustment of one will require a readjustment of the other. The specific readjustment will, therefore, be repeated as necessary.

Calibration (para. 32)

13. Couple the crystal calibrator loosely to sender dummy aerial. Set the master oscillator tuning dial to 5 M/cs (68R and T sets) or to 2·9 M/cs (68P set). Adjust the trimmer C15C for zero beat in the crystal calibrator phones. Check calibration over the whole band. Should any error occur in the calibration, the dial should be adjusted, and the trimmer C15C readjusted at 5 M/cs (68R and T sets) or at 2·9 M/cs (68P set). This process should be repeated until the best compromise is obtained. The calibration limits are given in para. 32.

Netting compensation (para. 33)

14. Couple crystal calibrator loosely to the master oscillator, and tune the sender for zero beat at 5 M/cs (68R and T sets) or at 2·9 M/cs (68P set). Switch to receive, and press NET button. Adjust the NETTING compensator (C15D) for zero. Repeat at several points over the band and readjust C15D to obtain the best compromise. The limits are given in para. 33.

Measurement of aerial output (para. 29)

15. (*a*) *Connections.* Check the aerial current, using the sender dummy aerial (50μF + 10 Ω) with the valve voltmeter connected across the resistor.

(*b*) *Check.* For R/T operation—press the pressel switch and adjust the aerial tapping switch and aerial tuning condenser for maximum output. Plug in the C.W. key and repeat. Note the results on both C.W. and R/T at the following frequencies: 5·0, 4·0, 3·5 and 3·0 M/cs (68R and T sets) or 2·9, 2·5, 2·0 and 1·75 M/cs (68P set). The minimum figures are given in para. 29.

(*c*) *Modulation.* Speak into microphone, and note if the meter kicks upwards.

RECEIVER

A.F. amplifier (para. 34)

16. (*a*) *Connections.* Output from beat oscillator through 0·1μF condenser connected to top cap grid of V2A with grid lead connected. The cold output lead connected to chassis. The output from telephone jack, with headphones removed, connected to output meter.

(*b*) *Sensitivity.* Check sensitivity with an input of 1V at 400c/s. Repeat this test at 1kc/s and 3kc/s.

(*c*) The limits are given in para. 34.

I.F. amplifier (para. 35)

17. (*a*) *Connections.* The output from the signal generator is connected between the grid of the frequency changer valve V1B and the chassis, with the normal lead removed. A 0·01μF condenser shunted by an 0·47M Ω resistor should be inserted in the grid lead. The receiver should be set at 3·0 M/cs (68R and T sets) or at 1·75 M/cs (68P set). The output meter connections are as given in para. 16 (*a*).

(*b*) *Frequency.* Check the resonant frequency, *i.e.*, that at which maximum output occurs. This should be within $\pm$ 2kc/s of 465kc/s.

(*c*) *Sensitivity.* Check the sensitivity.

(*d*) *Bandwidth.* Increase the input by 6db. Detune the signal generator first to one side and then to the other of the peak frequency until the output falls to 1 mW in both cases. Note the two frequencies at which this occurs. The difference between them gives the bandwidth. The mean of these two frequencies must not differ from the resonant frequency by more than the specified limits (symmetry test). Make similar test measurements for bandwidth with an increased input of 20 db. and 60 db., but omit checking symmetry.

(*e*) *Alignment.* If the set fails to pass any test described in 17 (*b*)-(*d*), tune the four I.F. circuits for maximum output at the resonant frequency. Start with the secondary of the second I.F. transformer and work back to the primary of the first I.F. transformer. Repeat this procedure. The response curve should be single peaked and reasonably symmetrical. The primaries of the I.F. transformers are nearest to the chassis. When alignment has been carried out repeat tests 17 (*c*) and (*d*).

(*f*) The limits are given in para. 35.

Beat oscillator (para. 36)

18. (*a*) *Connections.* As for I.F. amplifier check, para. 17 (*a*), but with headphones plugged in.

(*b*) With the signal generator tuned to the mid-I.F. (see para. 17 (*b*)), switch off the modulation, and with the L.F. GAIN control at MAX, adjust L.A. for zero beat.

(*c*) The limits are given in para. 36.

Calibration and R.F. alignment (para. 37)

19. (*a*) *Connections.* The signal generator output is connected between the aerial contact spring on the sender unit and the chassis, with a 60μF condenser in series with the aerial connection. The output meter connections are as in para. 17 (*a*).

(*b*) *Calibration.* A small bakelite insert is included in the baseplate to protect the oscillator coil. If the calibration check is performed with the receiver removed from the case, compensation of the calibration will be necessary when the receiver is fitted in its case to allow for the capacity affect between the coil and the case. Check the calibration at 5·0, 4·0, 3·5 and 3·0 M/cs (68R and T sets) or at 2·9, 2·5, 2·0, 1·75 (68P set). If the calibration is outside the limits, set the receiver dial to 5·0M/cs

(68R and T sets) or to 2·9 M/cs (68P set) and adjust the oscillator trimmer (C15B). Adjust the dial setting and/or index bracket at 3·0 M/cs (68R and T sets) or at 1·75 M/cs (68P set) if necessary. Repeat this check until the calibration is within the limits at each point. The limits are shown in para. 37.

(*c*) *Alignment.* Tune in a modulated signal at 5·0 M/cs (68R and T sets) or at 2·9 M/cs (68P set) and adjust the R.F. trimmer C15B for maximum output. Check the tracking at 3·0 M/cs (68R and T sets) or at 1·75 M/cs (68P set), and if it is incorrect adjust the turns of L16A (68R and T sets) or L8A (68P set). Repeat this test and then check the sensitivity.

Sensitivity (para. 38)

20. Tune in signal, using L.F. GAIN control in its maximum position. Rotate the L.F. GAIN control anticlockwise until oscillation has just ceased and check the sensitivity at 5·0, 4·0, 3·5, and 3·0 M/cs (68R and T sets) or at 2·9, 2·5, 2·0 and 1·75 M/cs (68P set). The limits are given in para. 38.

A.V.C. characteristic (para. 39)

21. Apply a 10μV signal to the aerial and tune for zero beat with the set in the C.W. condition. Increase the signal to 0·1V. Adjust the L.F. GAIN control to give an output of 1mW. Reduce the input voltage to 10μV and check the drop in output. The limits are given in para. 39.

Audio output (para. 40)

22. Apply an unmodulated signal from the signal generator. Adjust FREQUENCY control of set with the beat oscillator operative so that a beat note of 1kc/s is obtained. Adjust the signal generator input to give an output of 1mW. Reduce the GAIN control until the beat oscillator is inoperative, and again measure the output. The decrease in output should not be outside the limits given in para. 40.

Second channel ratio (para. 41)

23. With an input from the signal generator of 15μV and the receiver tuned to resonance, adjust the L.F. GAIN control to give an output of 1mW. Accurately adjust the signal generator to the second channel frequency with the receiver controls unaltered. Increase the input voltage until 1mW is again observed and note by what amount the input voltage has to be increased. Carry out this check at 3·0, 3·5, 4·0 and 5·0 M/cs (68R and T sets) or at 1·75, 2·0, 2·5 and 2·9 M/cs (68P set). The limits are given in para. 41.

Acoustic responses (para. 42)

24. Modulate the signal generator externally from a B.F.O., connect the signal generator to the aerial clip via a 60*p*F dummy aerial. Adjust the input to 10μV at 5·0M/cs with 30% modulation. With a modulation frequency of 400 c/s adjust the L.F. GAIN control to give an output of 1mW. Increase the modulation frequency to 1kc/s and 3kc/s maintaining a constant 30% modulation. The outputs must not exceed the figures given in para. 42.

Netting check (para. 33)

25. Couple the crystal calibrator to the aerial. With the L.F. GAIN control at MAX tune in receiver at 5 M/cs (68R and T sets) or at 2·9 M/cs (68P set) to give zero beat. Press NET button and adjust the master oscillator tuning for zero beat. Press pressel switch and adjust the aerial coil and aerial switch for maximum output. Check frequency of the beat note with headphones plugged into the crystal calibrator. The test should be repeated at 4 and 3 M/cs (68R and T sets) or at 2·5 and 1·9 M/cs (68P set). The limits are given in para. 33.

Crystal operation

26. Plug in crystal. Adjust the master oscillator tuning dial as accurately as possible to the crystal frequency and tune aerial with dummy load. The results should be approximately the same as those quoted in paras. 10-15, and 25.

Functional test

27. The complete station should be given a working test. Special attention should be given to the operation of the meter which should be checked on all positions.

PERFORMANCE FIGURES

28. This information should be read in conjunction with that on TEST AND ALIGNMENT PROCEDURE. It does not give a complete specification of the performance of the set, but it includes all the measurements necessary to ensure that the set is up to standard.

SENDER UNIT

Aerial output (para. 15)

29. Dummy aerial: 50*p*F and 10 Ω.

Modulation frequency: 1kc/s.

Voltage at microphone for 95% modulation: 0·5 V.

No R/T modulation figures are given for the 68P set because on certain sets difficulty may be experienced in obtaining upward modulation. The P.A. anode receiver taps on aerial coil should be adjusted to attain the best modulation condition without producing any blocking of the receiver.

Frequency	*Thermo-ammeter*		*Valve voltmeter*		*C.W.*		*Aerial tap*
	R/T unmod.	*R/T mod.*	*R/T unmod.*	*R/T mod.*	*Thermo-ammeter*	*Valve voltmeter*	
68R and T sets							
5·0 M/cs.	110 mA	146 mA	1·15 V	2·15 V	200 mA	2·5 V	4
4·5 „	103 „	142 „	1·13 „	2·13 „	200 „	2·5 „	3
4·0 „	100 „	140 „	1·05 „	2·0 „	200 „	2·35 „	3
3·5 „	95 „	135 „	1·00 „	1·95 „	200 „	2·3 „	2
3·0 „	90 „	125 „	0·92 „	1·72 „	200 „	2·2 „	1
68P set							
2·9 „	60 „		0·7 „		75 „	1·3 „	7
2·5 „	78 „		0·76 „		100 „	1·0 „	5
2·0 „	85 „		0·87 „		125 „	1·25 „	2
1·75 „	75 „		6·85 „		107 „	1·17 „	1

Table 1—Aerial output

Neutralizing (Para. 11)

30. The maximum voltage at the aerial must not exceed 0·5V but it is important that the lowest possible figure be obtained.

Drive and H.T. current (paras. 10 and 12)

31. Standing H.T. current without drive (V3A inoperative) 3·5-4·5 mA.
L.T. current (filament volts adjusted to 2·0 V) 0·35 A.

68 R and T sets	*68 P set*	*R/T*	*C.W.*
5·0 Mc/s	2·9 Mc/s	12·5 mA	35 mA
3·0 Mc/s	1·75 Mc/s	21·0 mA	40 mA

Table 2—H.T. current limits

Calibration error of M.O. circuit (para. 13)

32. Calibration error at any frequency ± 25kc/s.

Netting error (paras. 14 and 25)

33. The netting error at any frequency with the battery in good condition ± 1kc/s.

RECEIVER UNIT

A.F. amplifier (para. 16)

34. Sensitivity: Input of 1V at 400 c/s, output of 4-5 mW.
Fidelity: 1kc/s + 3 db.—9 mW.
3kc/s −3 db.—2·25 mW.

I.F. amplifier (para. 17)

35. Sensitivity: Input not greater than 600μV. for an output of 1mW.
Bandwidth: Input + 6 db. not greater than 6-7kc/s.
Input + 20 db. „ „ „ 22kc/s.
Input + 40 db. „ „ „ 40kc/s.
Symmetry test limit: ± 1kc/s.
Frequency at resonance: (ensure that set conforms to the above limits without retrimming) 465kc/s ± 2kc/s.

Beat oscillator (para. 18)

36. The following check is to be made on all sets which do not otherwise require retrimming at I.F.—The frequency of the beat oscillator is not to differ from the mid-I.F. by more than 0·25kc/s.

Frequency calibration (para. 19)

37. Maximum error at all frequencies ± 25kc/s.

R.F. sensitivity (para. 20)

38.

Frequency	*Max. input for 1MW*
68R and T sets	
5·0 Mc/s	4·0μV
4·0 „	6·0 „
3·5 „	8·0 „
3·0 „	10·0 „
68P set	
2·9 Mc/s	4·0μV
2·5 „	6·0 „
2·0 „	8·0 „
1·75 „	12·0 „

Table 3—R.F. sensitivity

A.V.C. characteristic (para. 21)

39. Max. drop in output 10db., *i.e.*, 0·1mW.

Audio output on C.W. (para. 22)

40. Output on C.W. should not be less than three times that of a modulated signal.

Second channel ratio (para. 23)

41.

Frequency	*Minimum input*	*Second channel ratio*
68R and T sets		
3·0 Mc/s	4,000μV	53 db.
3·5 „	8,000 „	58 „
4·0 „	10,000 „	60 „
5·0 „	18,000 „	65 „
68P set		
1·75 „	8,000 „	58 „
2·0 „	6,500 „	56 „
2·5 „	4,500 „	53 „
2·9 „	2,800 „	49 „

Table 4—Second channel ratio

Acoustic response

42.

Modulation frequency	*Output*	*Attenuation*
400 c/s	1·0 mW	0 db.
1,000 „	1·5 „	+2 „
3,000 „	0·25 „	−6 „

Table 5—Acoustic response

H.T. and L.T. current on receive

43. With filament volts adjusted to 2·0 V:—
Approximate H.T. current: 14mA.
„ L.T. current: 0·2A.

WINDING SPECIFICATIONS

44. The following information is intended for the use of workshops equipped with suitable coil winding machines to enable them to rewind damaged coils when no spares are available. In the case of coils used in tuned circuits the specification should be followed as closely as possible. In the case of a wave-wound coil (I.F. transformers) a small degree of latitude is permissible. Details of coil formers, position of windings and connections, etc., are not given. It is assumed that these measurements can be obtained by measuring an old coil. The finish on the coils should be reproduced where possible, and where coil dope is required British Celanese No. 202 (or its equivalent) will be used. Waxed coils are impregnated with S.W.M. 68 wax (or its equivalent) at 100°-110° C. after the coil dope is dry.

68 P, R AND T SETS

L5A 1st I.F. transformer

45. Each coil 170 + 170 turns of 6/45 Litz wire, wave-wound. Each section $\frac{3}{16}$in. wide. Stick the coils to the bakelite plate with Durofix. The spacing between the centres of the coils will be $1\frac{1}{4}$in., and they will be waxed after assembly. The coils can be adjusted by stripping off the turns until they tune at 465kc/s, with the cores set at about three turns from maximum.
Flash test. 1,000 V between windings, and between windings and can.

L6A 2nd I.F. transformer

46. Each coil 150 + 150 turns of 6/45 Litz wire. Specification otherwise as for L5A.

L7A Beat oscillator coil unit

47. Windings 190 + 190 turns of 6/45 Litz wire. After winding fix them to the bakelite plate with Durofix and then dip them in wax.
Test them at 465kc/s, limits ± 1% of frequency. The test will be made with a transformer clamp riveted to the bakelite plate.

T1A Headphones transformer

48. Secondary: 185 turns of 36 S.W.G. enamelled copper wire.
D.C. resistance 5 Ω ± 10%.
Primary: 1,850 turns of 42 S.W.G. enamelled copper wire.
Inductance not less than 6H at 1kc/s.
D.C. resistance 260 Ω ± 10%.
Leads out to be of 14/36 flexible tinned copper wire in sleeving. Windings interleaved with 0·00075 paper and one layer of 0·003 clarifoil placed between the two windings. The whole winding is bound with ½in. wide unbleached white cotton tape and the laminations then fitted.
The whole transformer is impregnated in bitumen and after cooling, dipped in wax to form a sealing cover.

T2A Microphone transformer

49. Secondary: 2,000 turns of 44 S.W.G. enamelled copper wire.
Inductance 7-10 H at 1 kc/s.
D.C. resistance 400 Ω ± 10%.
Primary: 100 turns of 24 S.W.G. enamelled copper wire.
D.C. resistance 0·61 Ω ± 10%.

Output leads to be of 14/36 flexible tinned copper wire in sleeving. The windings are interleaved with 0·00075 paper and one layer of 0·003 clarifoil is inserted between the two windings. The completed winding is bound with ½in. white unbleached cotton tape and the laminations put on.
The completed transformer is then impregnated with bitumen and, after cooling, dipped in wax to form a sealing cover.

68 P SET

L8A Anode coil

50. The winding consists of 68 turns of 28 S.W.G. enamelled copper wire, wound at 59 turns per in. After the winding, dope it with 202 coil dope and impregnate with wax.
Inductance 53·8μH ± 0·5%.

L9A—C Receiver oscillator coil

51. A and B: 4 + 4 turns of 34 S.W.G. enamelled S.S.G. copper wire, close-wound over C.
D.C. resistance 0·1 Ω each.
C: 44 turns of 6/45 D.S.C. Litz wire, wound at 86 turns per in.
Inductance 40·5μH ± 0·5%.
D.C. resistance 1·33 Ω ± 10%.
Two layers of 0·003 clarifoil between coils C and A B. Impregnate with wax.

L10A and B Aerial tank coil

52. A: 73·5/6 turns of 24 S.W.G. enamelled copper wire. The start and finish of the winding is anchored through holes in the former. The winding is tapped at the following points from the bottom of the coil—9 11/12 turns, 16 11/12 turns, 24 11/12 turns, 31 11/12 turns, 38 11/12 turns, 45 11/12 turns and 59 11/12 turns.
B: 5 5/16 turns of 24 S.W.G. enamelled copper wire. The start and finish of the winding is anchored through holes in the former. A small piece of $\frac{1}{16}$in. bakelite is fixed under the taps on coil A, and 3½in. length of 24 S.W.G. tinned copper wire are soldered to them.
The whole coil is wound in grooves at 28 turns per in. The depth of the groove is 0·01in.
Inductance 75μH ± 1%.
Insulation resistances between windings not less than 100m Ω at 2kV.

L11A and B Master oscillator coil

53. A: 63 turns of 38 S.W.G. enamelled copper wire, wound at 50 turns per in. and tapped at 53 turns. The tap is made through a hole in the former $1\frac{11}{16}$in. from the starting end of the former.
Inductance 42·3μH ± 10%.
B: 25 turns of 46 S.W.G. D.S.C. Eureka wire, close-wound. Coil B is wound over coil A on 5 layers of 0·007 Domolac in the reverse direction to coil A. Each winding is doped with 202 coil dope.
D.C. resistance 335 Ω ± 10%.

68 P AND T SETS

L16A Anode coil

54. 36 turns of 24 S.W.G. enamelled copper wire, wound at 36 turns per in. The start of the winding goes through the hole in the former, and the end direct to the tag. The complete coil is dipped in wax.
Inductance 18·3μH ± 0·5%.

L17A—C Receiver oscillator coil

55. A and B: 5 + 5 turns of 34 S.W.G. D.S.C. copper wire, close-wound.
Coils A and B are wound over coil C on two layers of 0·003 clarifoil in the centre of the winding. After the winding the coils are dipped in wax.
D.C. resistance 0·127 Ω each, ± 10%.
C: 48 turns of 26 S.W.G. enamelled copper wire, wound at 50 turns per in.
Inductance 12·8μH ± 0·5%.

L18A and B Aerial tank coil

56. A: 30·5/6 turns of 22 S.W.G. enamelled copper wire. The start and finish of the coil is anchored through holes in the former. Starting from the bottom, the coil is tapped at the following points:—2 11/12 turns, 4 11/12 turns, 8 1/12 turns, 9 11/12 turns, 15 11/12 turns, 20 11/12 turns and 26 11/12 turns. A piece of $\frac{1}{32}$in. bakelite which has previously been immersed in wax is slipped under these taps. To these taps are soldered 3½in. lengths of 22 S.W.G. tinned copper wire.
Inductance 21·8μH ± 1%.
B: 3 5/6 turns of 22 S.W.G. enamelled copper wire fixed at each end through holes in the former. The former is grooved at 20 turns per in. Depth of grooves 0·0015in.
Insulation resistance between windings not less than 100 M Ω at 2kV.

L19A and B Master oscillator coil

57. A: 31 turns of 24 S.W.G. enamelled copper wire, wound at 40 turns per in. and tapped at 4 turns. The tap is made by slotting the former, cleaning the wire at the point to be tapped and allowing it to fall into the slot.

The coil is then doped except for the last two turns,—to allow for test adjustment.
Inductance: 15·2μH $\pm$ 0·5%.
B: 16 turns of 46 S.W.G. D.S.C. copper wire, close-wound in the reverse direction to coil A.
Two layers of 0·007 Domolac between coils A and B.
The finished coil to be doped with 202 coil dope.
Inductance 12·7μH $\pm$ 2%.
D.C. resistance 7·85 Ω $\pm$ 10%.

ENGINEERING HINTS FOR CURING FAULTS

58. The following paragraphs explain, and give suggestions for curing some of the more difficult faults of an electrical nature which may occur in the Wireless set No. 68. They are based on the experience of the manufacturers producing these sets, and should help to save time in repairing troublesome sets. They should be used after the more obvious remedies, such as the checking of valves and other likely components, have been tried.

Standing aerial current indication on meter

59. With the aerial untuned, the set in a send condition (pressel switch pressed) and the meter switch in the Æ position, the meter gives a small indication of aerial current at all frequencies, when in actual fact there is no aerial current flowing. This is due to positive voltage on the rectifiers.

Excessive H.T. current on send

60. Excessive H.T. current is generally due to either the M.O. stage not functioning or, which is more likely, the auto-bias of the P.A. circuit being inoperative. In the case of the M.O. not functioning, examine L19B (68 T and R sets) or L11B (68 P set) the reaction winding for open circuit. Also try C28L (68 T set) or C1L (68 P and R sets) for open circuit. See that the netting switch contacts are making.

61. If the limiter is inoperative check C13A and R5E for open circuit. Other causes can be due to the secondary of T3A, R6C or R5D being open circuit. The same trouble can be caused by C28K (68 T set) or C1K (P and R sets) and C7C being short-circuited or leaking.

High neutralizing voltage

62. The normal voltage at the aerial on the neutralizing test condition is about 0·2 V but should a fault arise in the circuit it usually becomes much higher than that specified in para. 30. First try a new valve V3A. Should this fail try the components listed below in the order given:—

(*a*) C28J (68 T set) or C11A (P and R sets) for open circuit.
(*b*) R14A and C13B for open circuit.
(*c*) R14A shorting to chassis.
(*d*) R2C high resistance.

Unstable C.W. reception

49. Make sure that the I.F. cans are firmly bolted to the chassis and are making good contact. If there is any doubt about it, clean the chassis at the position of contact with the can. Check the earthing points on the beat oscillator unit. If it is still unstable, change C25A.

Low I.F. sensitivity

50. First examine the I.F. transformer connections to the windings and ensure that no strands of the Litz wire are broken. Trace through the I.F. circuit, paying particular attention to R6A, C5A and C7A. Check the insulation between the winding of the I.F. transformers, as leaks can occur across the bakelite plate at the tag end, due to moisture. Check C28C and C28H (68T set) or C1C and C1H (68P and R sets) for open circuit.

Low R.F. sensitivity

51. Check C28A (68T set) and C1A (68P and R sets) for open circuit, and C6A for open circuit or a break in the interconnecting lead. Examine aerial switch S1A for no contact or bad contact.

END