

**MURPHY
SERVICE
INSTRUCTIONS**

**ISSUED BY
MURPHY RADIO LTD, WELWYN GARDEN CITY
TELEPHONE: WELWYN GARDEN 800**

Circuit Analysis

THE tuned circuits of the P80 and RA80 units are extremely simple, as will be seen from the circuit diagram overleaf. This shows how the R.F. and oscillator circuits of the P80 and RA80 units connect into an A72 receiver. The receiver switches and tuned circuits are not shown as they would only make the drawing unnecessarily complicated.

It will be seen that the R.F. circuit consists of a coil and condenser in series, which are tuned by two further condensers.

The aerial is matched to the tuned circuit by connecting it to the junction of the coil and condenser (7), and by this method of connection the complication of providing separate aerial coupling coils in the push-button circuits is avoided.

In the oscillator stage also the inclusion of a second coil is avoided by the use of a "Colpitts" circuit.

The condensers in the R.F. and oscillator circuits are common for all the push-buttons, and C6 and C9 are of the preset type to allow an initial tracking adjustment to be made. If they are subsequently re-adjusted, and this should not be done unless it becomes necessary to replace any of the condensers, the instructions on page 3 should be followed.

On long waves the capacities are supplemented by the two extra condensers (C8 and C11).

Tuning on each push-button is done by varying the inductances. These are mounted in pairs and the inductances are varied by moving the iron-dust cores up or down within the former. The two cores are critically adjusted in the factory so that a frequency difference between the two tuned circuits of 465 Kc/s is obtained. When the spacing adjustment is completed the adjusting nut is sealed with paint, and it should not on any account be tampered with by servicemen.

MOTOR SWITCHING

The motor circuit, which switches in the appropriate tuned circuits on the RA80 unit when a push-button is depressed, is quite simple in arrangement. The switches S7a, b, c and d are ganged to the motor so that the arms rotate when the motor is energized. The twenty-four volt supply from the receiver for operating the motor is connected between sockets number five and nine on the chassis. The circuit diagram shows the position in which the switches will come to rest when the first medium-wave push-button is depressed. Tracing the A.C. circuit from the chassis line (5) through the switch S7a it will be seen that the circuit is broken at S1, and the motor is at rest. If the arm of S7a had been in contact with any of the other switch contacts, the motor circuit would have been completed through the switches S2 to S6 to the common switch line 31; through S1 to the motor line 29; through the motor to the socket 9. The motor would consequently have been energized, and as it rotated the circuit would have been completed through the various contacts of S7a until the contact arm reached the first M.W. contact (38), when the circuit would have been broken as explained previously.

MUTING

To prevent unwanted stations being heard as the switch arms pass over the contacts for the other push-button circuits, a switch (S8) short circuits the receiver speech coil. This switch is mounted on the motor assembly and the motor armature is pulled forward magnetically to close the contacts immediately the energizing voltage is applied; it drops back again, allowing the contacts to open immediately the circuit is broken. There is a small point about this mechanism which must be watched. The weight of the motor armature is sufficient to make it drop and

close the muting contacts, if the cable drum end of the unit is downwards. It is, therefore, necessary when testing the unit to have it either in a horizontal position or with the cable drum end upwards.

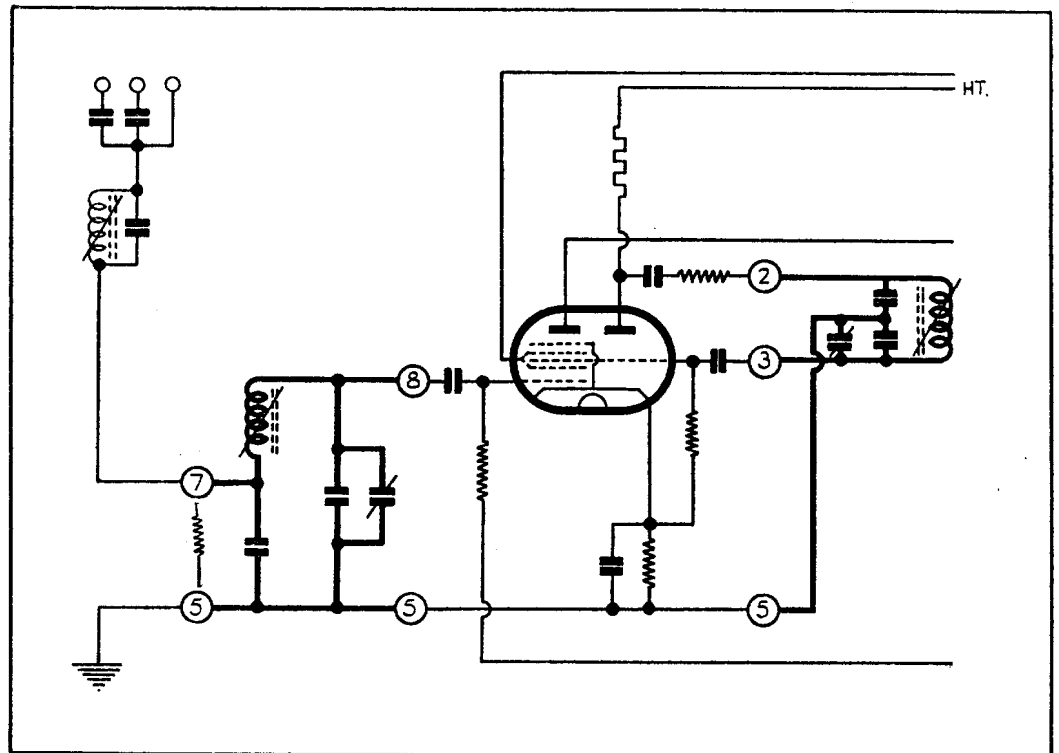
REMOTE VOLUME CONTROL

The remote volume control in the RA80 varies the bias applied to the low frequency valve of the receiver. This is a triode valve of the variable-mu type and the stage gain can consequently be varied over quite a wide range by this method. As D.C. is passing through this control a large condenser (C7) is connected across it to reduce to a minimum any noise when it is being adjusted.

It will be noted on referring to the "70" and "72" circuits, that in the "72" receivers the bias voltage is obtained from the voltage drop across the resistances in the cathode circuit of the L.F. valve, which also provide a delay for the A.V.C. circuit, whereas in the "70" receiver the

L.F. valve cathode is taken directly to chassis and bias is obtained from the voltage drop across two resistances in the common H.T. negative line.

The remote volume control is switched out when the control box is returned to the main unit, because the bias resistor is shorted by connecting one of the locating pins of the control box to the tapping on the volume control (4) and the corresponding socket on the main unit to the bottom of the volume control circuit (6).



The press button tuned circuit. The components shown in heavy lines are in the unit itself.

Mechanical Details

THE procedure for fitting the P80 and RA80 units to the various receivers is quite simple, and is fully covered in a leaflet which is issued with each unit, but the following notes are included to assist servicemen in re-fitting the units after service, when the leaflet may not be available.

Both units are secured to the receivers by four fixing screws, and in the case of the RA80, the cable drum and the cover plate of the coil, switch and motor assembly must be removed to make the screw holes accessible.

The position of the connecting plug on the main chassis of the unit may be adjusted to

allow the screw holes to register with those on the receiver cabinet, but in addition to this adjustment, it may in some cases be necessary to adjust the position of the receiver chassis in the cabinet. The unit must always be removed before the receiver chassis is taken out, and it must also be removed before a set is packed for dispatch.

TUNING

The push-button circuits are tuned by turning the appropriate adjusting screw at the back of the unit. Instructions for doing this are given in the receiver operating instruction books. It should be remembered when following these instructions that the units are dispatched from the factory with the adjusting screws set to the shortest wavelength of the wave-band they are to cover, and tuning in a station for the first time therefore entails *unscrewing* the adjusting screw. The adjustment of one push-button circuit will affect the others to some extent because the cores of the coils are fairly close together, and it is therefore advisable to check the others when one push-button has been re-adjusted.

SERVICING

Fault finding in the units should present no difficulty, as faults in the condensers will affect the operation of a group of the push-button circuits, whereas faults in the coils will only affect the circuit in which the faulty coil is located. Apart from these components there are only the switches, and in the RA80, the motor to consider, and these can be very simply checked by mechanical inspection and continuity tests.

Extension leads should not be used for servicing the units as they will cause instability; it should also be noted that if the cover plates of the units are removed it will affect tuning to some extent. The warning given earlier in this book should also be remembered—if the RA80 unit is stood on end with the cable drum down-

wards, the motor armature may drop, closing the muting switch contacts.

THE CABLE DRUM

It is not recommended that dealers should attempt to replace the cable or the main spring in a cable drum if they become faulty. The drum assembly should be returned to the factory for repair, and in urgent cases a service replacement can be supplied.

If the spring becomes too weak to re-wind the complete cable, the locking strap across the bottom of the assembly can be raised and the bush in the centre given an extra turn with a large screw driver to increase the tension. Hold the bush firmly with the screw driver as the strap is raised to prevent the spring unwinding. Ease the screw driver round one turn when the strap is raised and hold the bush in this position while the strap is replaced. The spring tension should be just sufficient to re-wind the cable completely. If it is greater than this the re-winding action will be too drastic when the cable is fully extended.

There is a V spring on the locking device to retain it in the "locked" position. If this becomes weak or broken the locking mechanism will be unreliable. It is quite a simple operation to slip a new spring into position.

THE PRESET CONDENSERS

The two preset condensers (C6 and C9) are adjusted in the factory to give correct tracking over the wave-bands, and they should remain quite constant in use.

If re-adjustment does become necessary due to the replacement of any of the condensers, the following procedure should be adopted:—

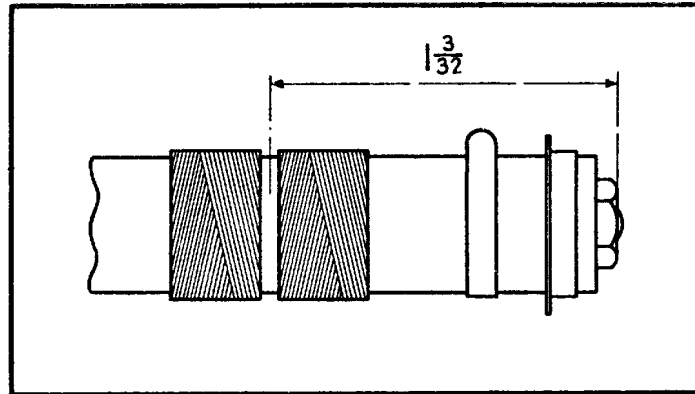
1. Remove the cover plate of the unit and screw up one of the long-wave push-button adjusting screws until the securing nut for the iron core is visible at the end of the coil former. Adjust it so that the distance from the top of the nut to the centre of the coil is exactly $1 \frac{3}{32}$

inches (as in the sketch). This measurement is quite critical and it is most easily measured with the aid of a pair of dividers.

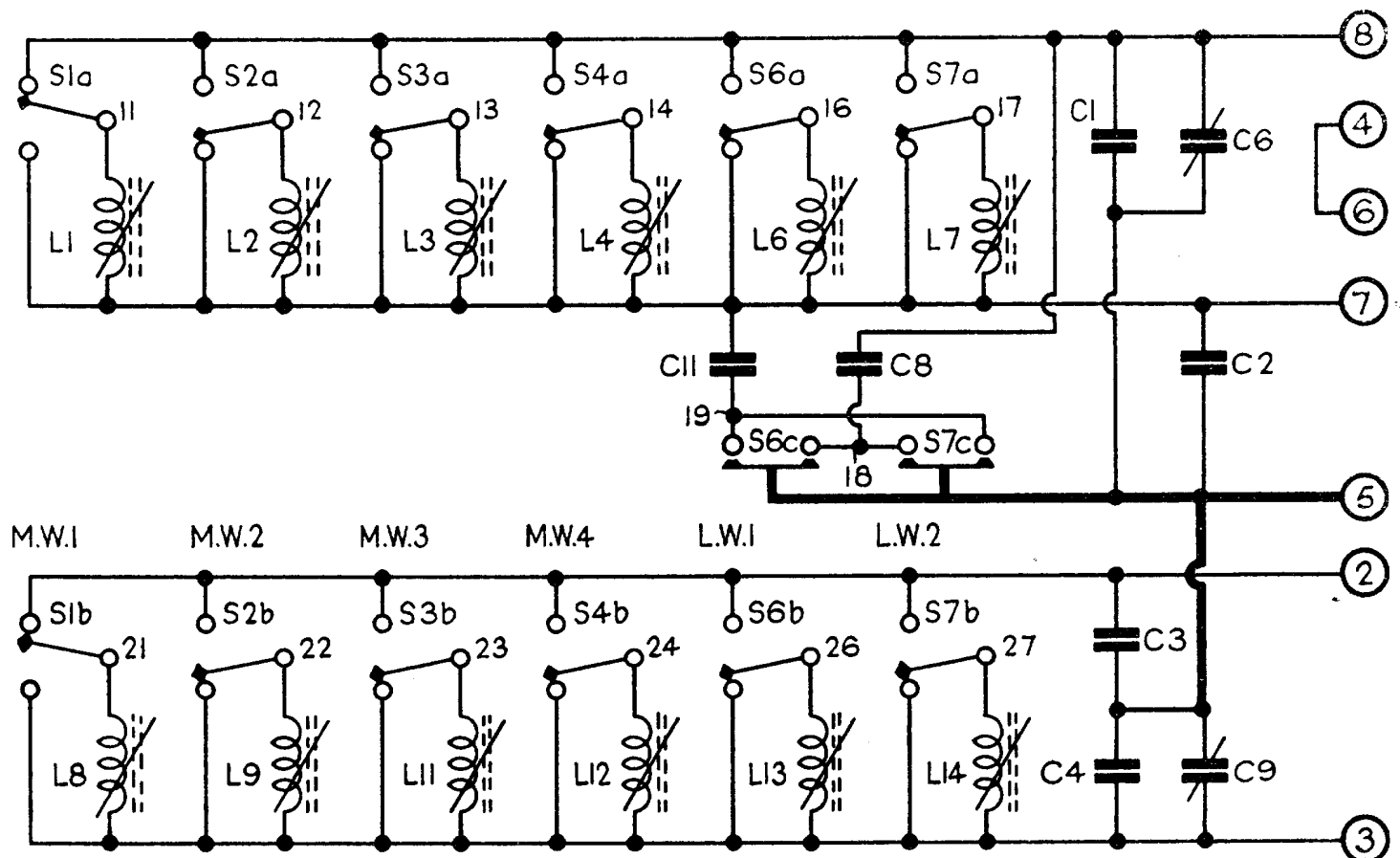
2. Replace the cover, and plug the unit into a mains operated receiver. (The battery models have a different internal capacity and must not therefore be used.) Depress the appropriate long

wave push-button. Feed in a signal of 232.5 Kc/s, and adjust the push-button oscillator trimmer (C9) for maximum output.

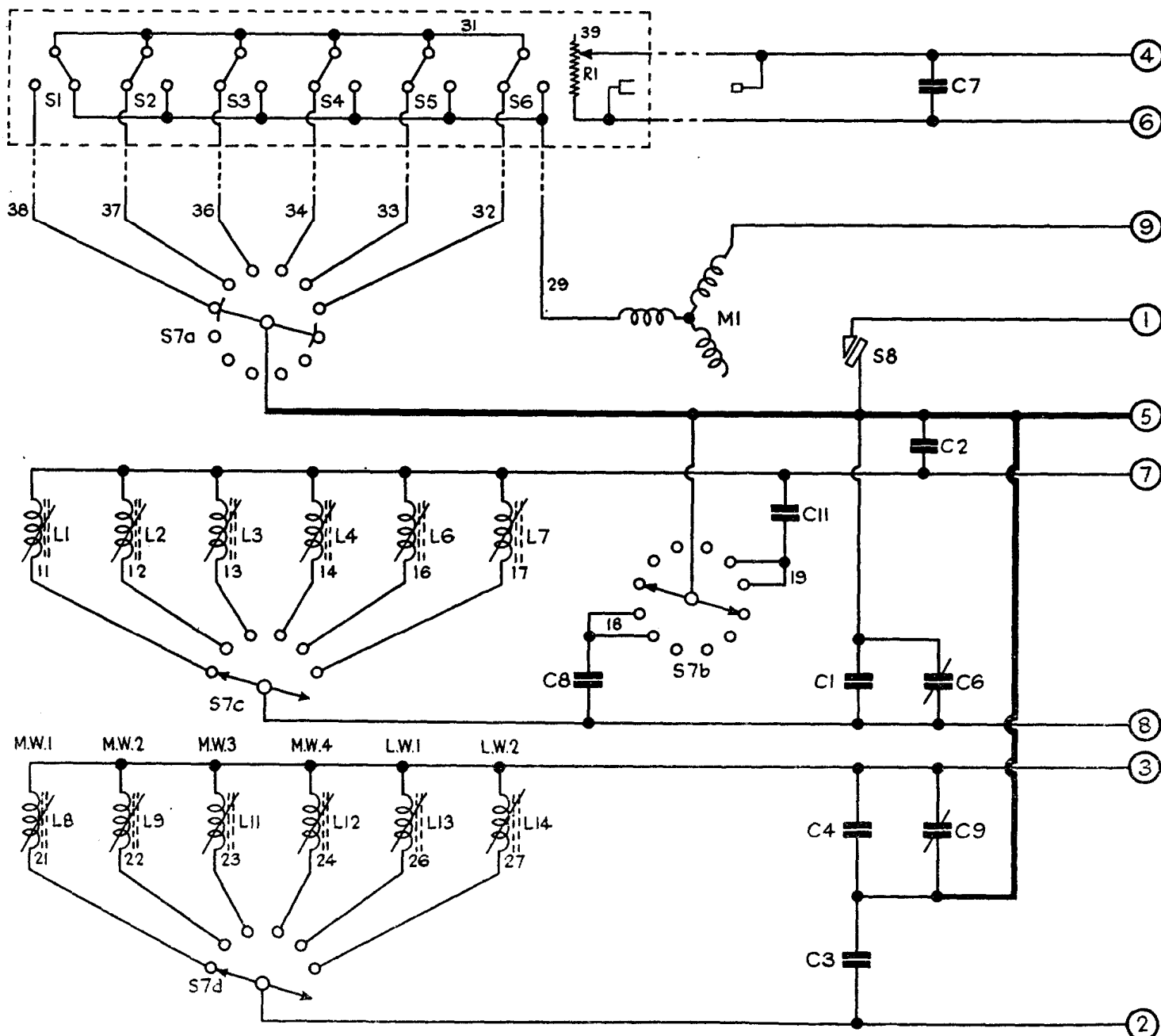
3. Tune in a signal from the service oscillator at about 220 metres on a medium-wave push-button, and adjust the aerial push-button trimmer (C6) for maximum output.



The P80 Circuit



The RA80 Circuit



P80 & RA80 TABLE OF COMPONENTS

Code	Value P80	Value RA80	Test Points		Code	Value	Test Points	
C1	35 p.f.	50 p.f.	8	5	L1	8	11	7
C2	260 p.f.	260 p.f.	7	5	L2	8	12	7
C3	175 p.f.	175 p.f.	2	5	L3	11	13	7
C4	150 p.f.	160 p.f.	3	5	L4	12	14	7
C6	Trimmer	Trimmer	8	5	L6	27	16	7
C7	—	2	6	4	L7	27	17	7
C8	350 p.f.	375 p.f.	18	8	L8	5	21	3
C9	Trimmer	Trimmer	5	3	L9	5	22	3
C11	600 p.f.	600 p.f.	19	7	L11	7	23	3
R1	—	100,000	39	6	L12	7	24	3
					L13	15	26	3
					L14	15	27	3

The P80 Press Button Unit

THIS drawing shows the unit as it would appear looking at it from the push-button end with the two sides "flattened" into one plane, so that the top half represents the unit as it would appear looking from the preset condenser side, and the bottom half as it would appear from the connecting plug side.

The plug itself has been turned to show the "tag" side as this will be more useful when checking wiring.

The switches on this unit and on the remote control unit are shown as they will be when the first medium-wave push-button is depressed. The circuit diagrams also show them in this position.

The numbers at the junction points, apart from those which go to the connecting plug (1 to 9), have no relation to the numbers used in any of the receiver circuit diagrams.

NOTE THESE ARE THE COIL TAGS. THE EARTHING TAGS FOR THE SPINDLES ARE NOT SHOWN

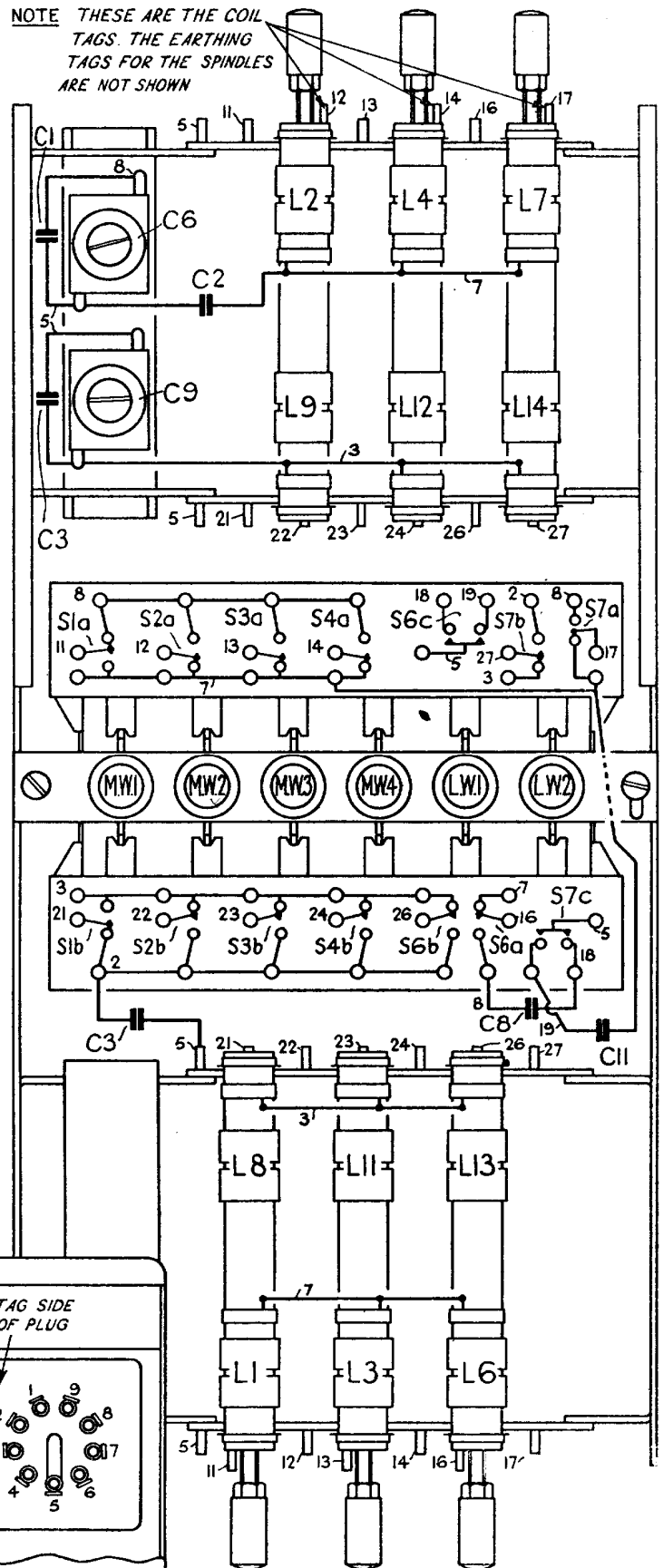
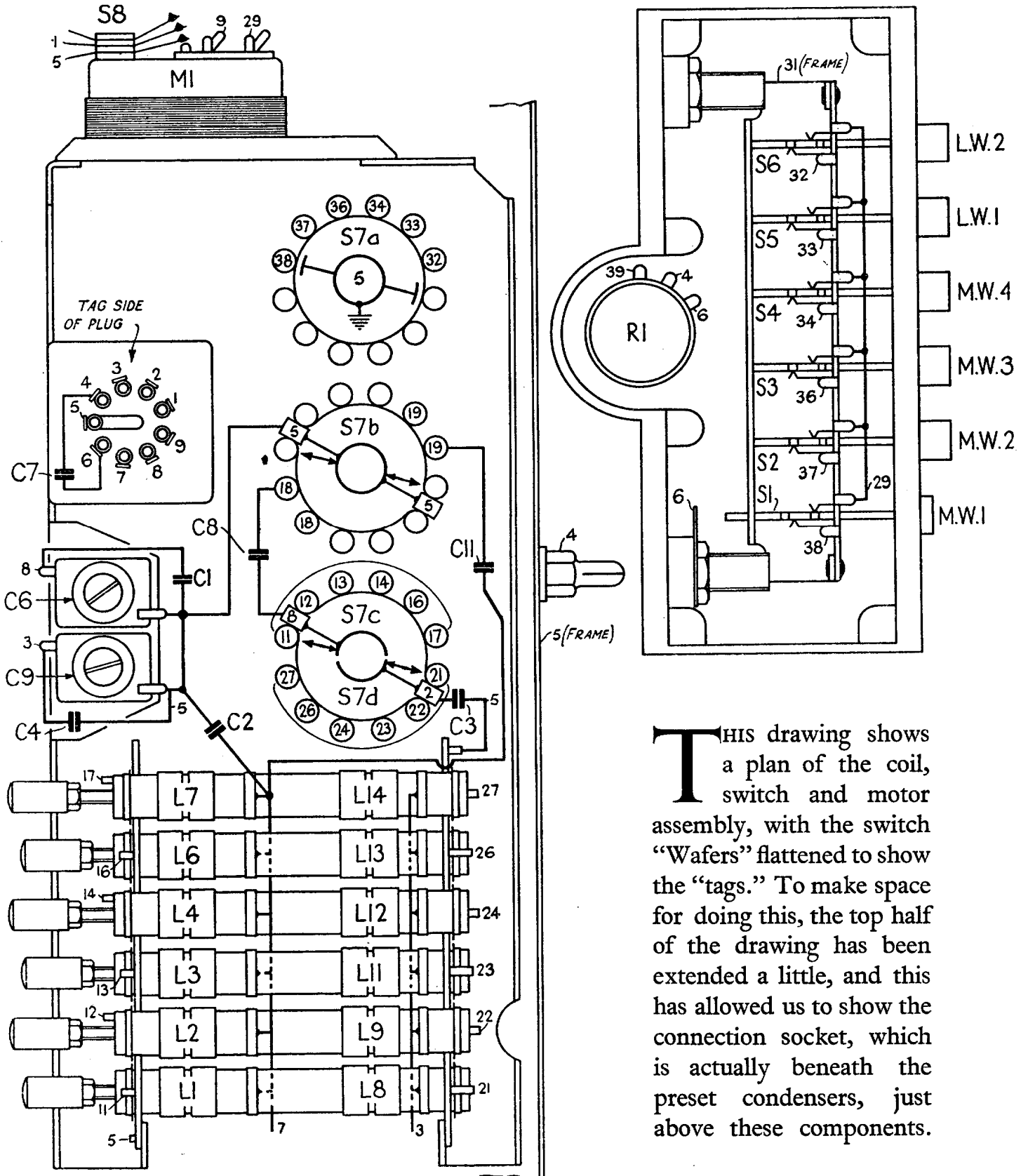


TABLE OF COMPONENTS

Code	Value P80	Value RA80	Test Points	
C1	35 p.f.	50 p.f.	8	5
C2	260 p.f.	260 p.f.	7	5
C3	175 p.f.	175 p.f.	2	5
C4	150 p.f.	160 p.f.	3	5
C6	Trimmer	Trimmer	8	5
C7	—	2	6	4
C8	350 p.f.	375 p.f.	18	8
C9	Trimmer	Trimmer	5	3
C11	600 p.f.	600 p.f.	19	7
RI	—	100,000	39	6
L1	8	8	11	7
L2	8	8	12	7
L3	11	11	13	7
L4	12	12	14	7
L6	27	27	16	7
L7	27	27	17	7
L8	5	5	21	3
L9	5	5	22	3
L11	7	7	23	3
L12	7	7	24	3
L13	15	15	26	3
L14	15	15	27	3

The RA80 Remote Control Unit



THIS drawing shows a plan of the coil, switch and motor assembly, with the switch "Wafers" flattened to show the "tags." To make space for doing this, the top half of the drawing has been extended a little, and this has allowed us to show the connection socket, which is actually beneath the preset condensers, just above these components.

Modifications

THE circuit used in units with serial numbers below RA80 129436 and P80 168965 was a little different from the one published in this book. In some localities it may be found that with these early units whistles are received on certain long wave stations, and in these cases the following modifications are recommended.

THE RA80 REMOTE CONTROL UNIT

1. Disconnect the common lead for the grid coils (L1 to L7) from the chassis tag.

2. Disconnect the white tracer wire from the common tag of S7b and connect it to the common lead to the grid coils (L1 to L7). This line will now be connected by the white tracer wire to tag 7 on the connector plug, instead of being connected to chassis as it was originally.

3. Remove C2 and connect a link of wire in its place. This will connect the common tag of S7b and one side of C1 and C6 to chassis (5).

4. Reconnect C2 (100 p.f.) between the common grid coil line (7) and the chassis tag (5) on C6.

5. Disconnect C11 from chassis (5) and connect it to the common grid coil line (7).

6. Replace C1 by a 60 p.f. condenser.

7. Replace C8 by a 420 p.f. condenser.

THE P80 PRESS BUTTON UNIT

1. Disconnect the common lead for the grid coils (L1 to L7) from the chassis tag (5).

2. Disconnect the yellow tracer wire from the end tag of S7c, shorten it, and connect it to the common grid coil lead. This lead is thus connected to tag 7 on the connecting plug instead of to chassis (5) as previously.

3. Disconnect the wires connecting S7a and S6a to chassis (5) and join them together. Actually the systoflex covered lead from S6a should reach to the top tag on S7a, and the short bare wire from S7a can be cut away.

4. Disconnect C11 from chassis (5) and connect it to the common grid coil lead (7).

5. Connect a yellow tracer wire from the common grid coil line (7) to the top tag on S6a.

6. Connect a wire between the chassis tag (5) on the "adjustment" end of the coil assembly, to the junction of C2 and C6.

7. Replace C1 with a 60 p.f. condenser.

8. Replace C8 with a 360 p.f. condenser.

It will be noticed that in this modification the condenser values are different from those used in the later production units. This is because certain adjustments were made to the coils at the same time as the general modification was introduced.

When used with the B71 receiver it may be found that these units will not tune to stations at the low end of the long-wave band. In such cases the units should be returned to the factory for adjustment.

Production Changes

AFFECTING THE TWO "80s" AND THE "70" & "72"

IN the article at the beginning of this issue dealer questions at the recent series of meetings are given, along with appropriate answers to them. As will be seen, in certain cases modifications were mentioned which are being introduced to overcome some specific difficulties. The following is a brief account of these simple modifications which dealers can easily carry out on any models they may have in stock.

The R80 Remote Control Unit. The drawing on the next page shows a plan of the modified RA80 coil, switch, and motor assembly, with the switches "flattened," and one or two components moved slightly to show the connecting tags. To make an early type unit to conform to this arrangement the following modifications are needed.

1. Disconnect the common lead for the grid coils (L1 to L7) from the chassis tag.

2. Disconnect the white tracer wire from the common tag of S7b and connect it to the common lead for the grid coils (L1 to L7). This line will now be connected by the white tracer wire to tag 7 on the connector plug, instead of being connected to chassis as it was originally.

3. Remove C2 and connect a link of wire in its place. This will connect the common tag of S7b and one side of C1 and C6 to chassis (5).

4. Connect a 60 p.f. condenser (to replace C2) between the common grid coil line (7) and the chassis tag (5) on C6.

5. Replace C11 with a condenser of 420 p.f. and connect it between the switch and the common lead for the grid coils (7) instead of between the switch and chassis as it was originally.

The P80 Press Button Unit. The drawing of the P80 shows the unit looking from the press button end with the two sides "flat-

tened" into one plane, so that the top half of the drawing shows the unit as it would appear looking at it from the preset condenser side and the bottom half shows the unit as it would appear looking at it from the connecting plug side. The plug itself has been turned to show the tag side to assist servicemen in checking the wiring.

As in the case of the RA80, the modified unit has been drawn and the modifications necessary to make an early type unit conform to this are as follows:

1. Disconnect the common lead for the grid coils (L1 to L7) from the chassis tag (5).

2. Disconnect the yellow tracer wire from the end tag of S7C, shorten it, and connect it to the common grid coil lead. This lead is thus connected to tag 7 on the connecting plug instead of to chassis (5) as previously.

3. Disconnect the wires connecting S7a and S6a to chassis (5) and join them together. Actually the systoflex covered lead from S6a should reach to the top tag on S7a, and the short bare wire from S7a can be cut away.

4. Replace C11 with a condenser of 360 p.f. and connect it between S7C (1a) and the common lead for the grid coils (7) instead of between S7C and the chassis, as it was originally.

5. Connect a yellow tracer wire from the common grid coil line (7) to the top tag on S6a.

6. Connect a wire between the chassis tag (5) on the "adjustment" end of the coil assembly, to the junction of C2 and C6.

7. Replace C2 with a 60 p.f. condenser.

This completes the modification. The circuit diagrams for both the "80" units will be published in the Service Instruction books which will be issued in about a fortnight.

In both the units the aerial pre-set con-

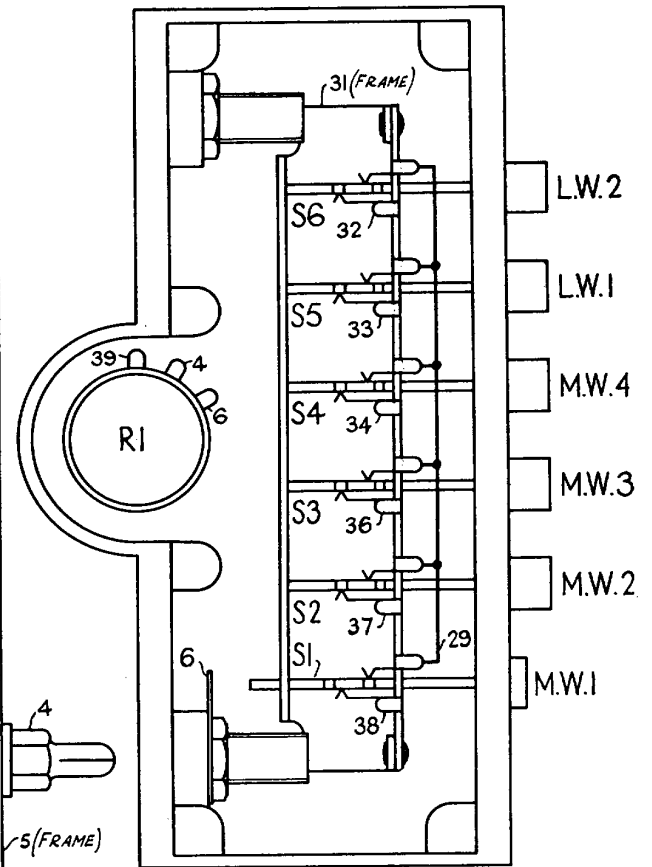
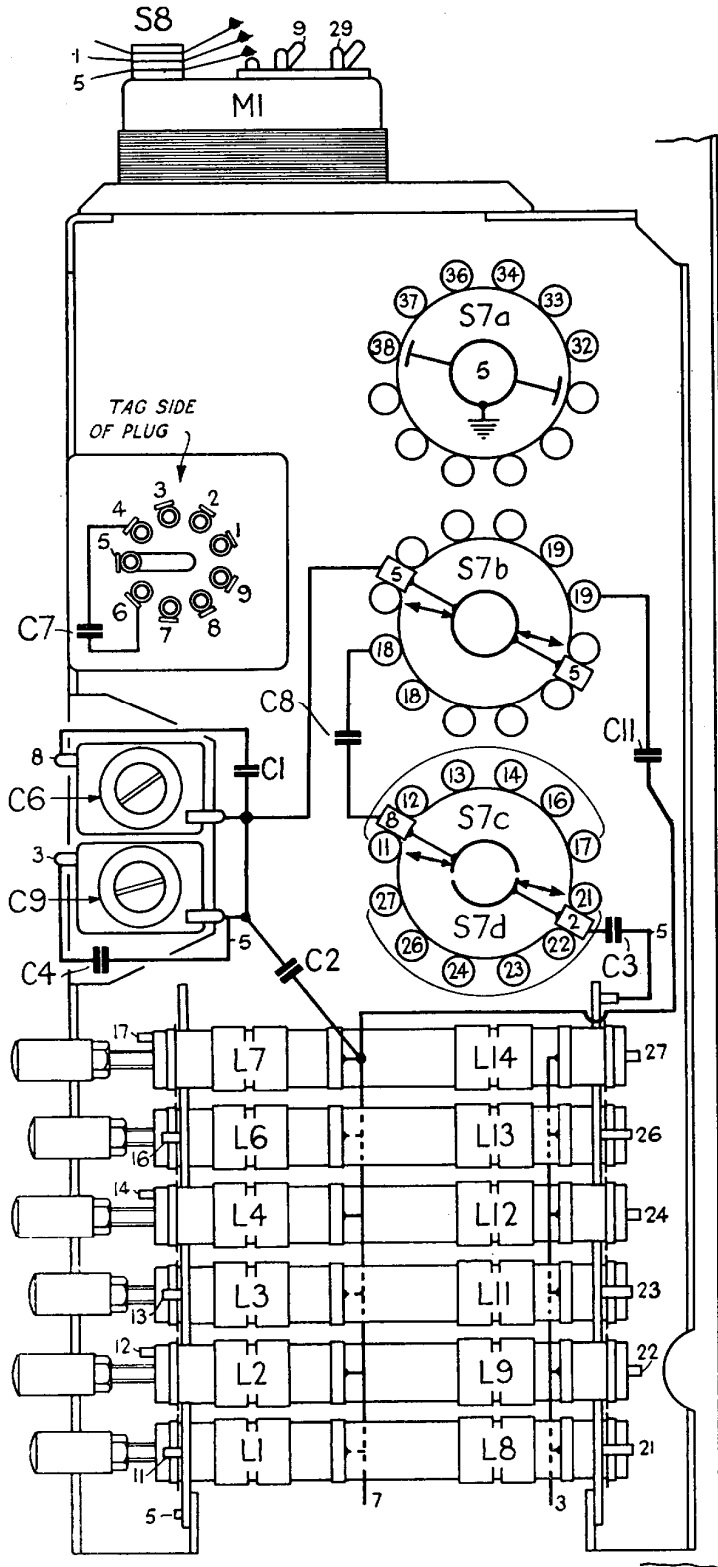
Production Changes

denser (C6) may require readjustment. If the oscillator pre-set condenser is not touched a sufficiently accurate adjustment can be made by tuning-in a M.W. station on press-buttons, and adjusting the condenser C6 for maximum output. This must be done with

the case and cover plate of the unit refitted.

The "70" and "72" Receivers. The instructions for modifying the "70" and "72" receivers should be used in conjunction with the underside views of the chassis in the "72" Service Instruction Books.

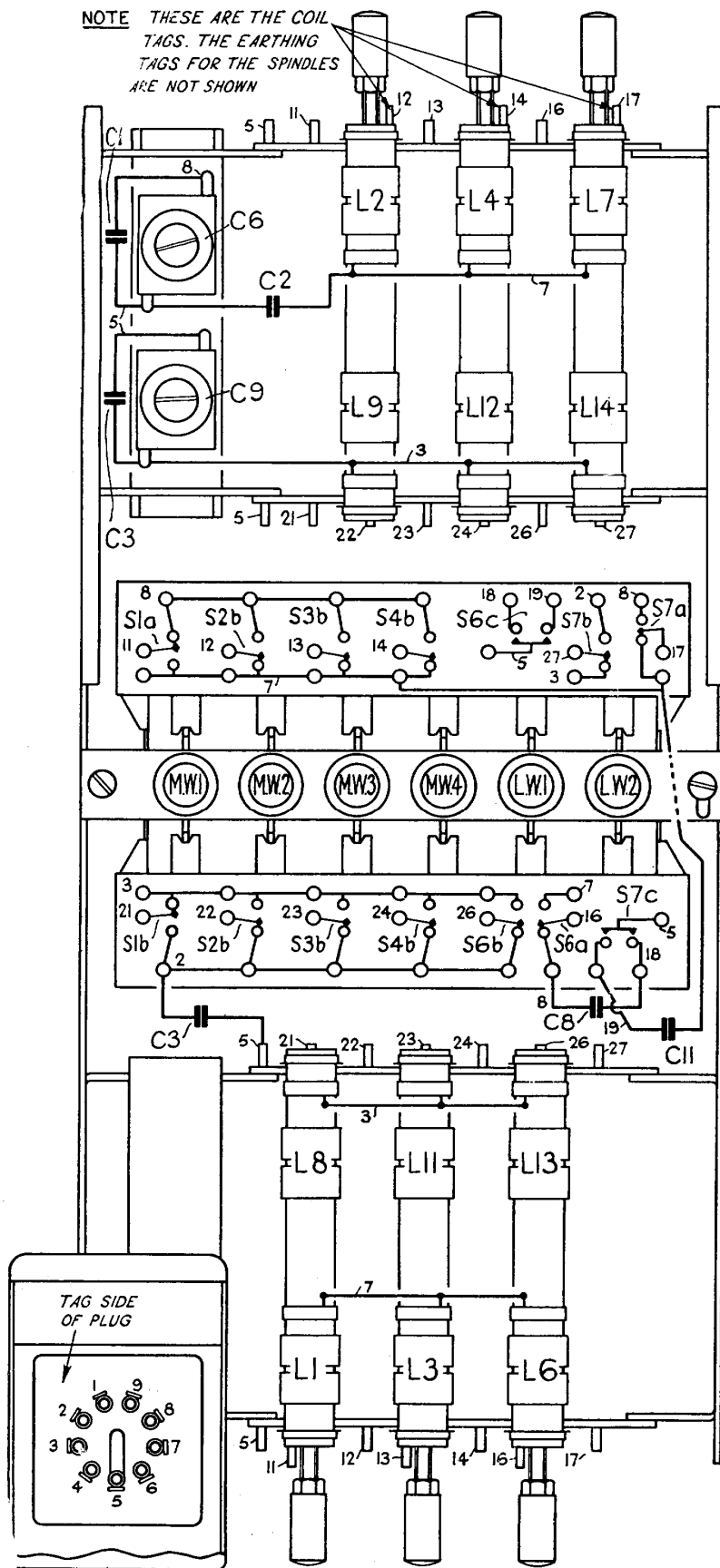
The alterations to the "72" diode load



LEFT: THE RA80

RIGHT: THE P80

NOTE THESE ARE THE COIL TAGS. THE EARTHING TAGS FOR THE SPINDLES ARE NOT SHOWN



circuit suggested below are a little different from those which are actually being made in sets which are at present going through production. This is because of the fact that in production we are replacing two resistances with a new one of the combined value, and modifying the wiring so that the wiring capacities in the circuit are altered, whereas in sets that are already completed, the modification can be made very simply without changing any components.

Looking at the underside of the chassis of the "72" it will be seen that a blue tracer wire connects the end tag of S1h (67) to the junction of R19 and R21 (67) (square 22 F). Remove this wire and connect all the contacts (including the "common") together. This completes the modification to the diode load circuit.

The modification to the aerial circuit which applies to the "70" and "72" is also very simple. In the A.C. receivers all that is necessary is to connect a 50,000 ohms resistance between tag 7 on the press-button connector socket, and chassis. In the D72 and D70 the resistance is replaced by a choke, and a condenser is placed in the aerial circuit to break the D.C. path between aerial and chassis.

In production, the choke will be mounted on the bar which holds the press-button connector socket, but to save dealers the trouble of drilling this bar when modifying existing receivers it may be mounted on the screw which projects at the end of the switch assembly. Care should be taken to see that there is sufficient clearance between the mounting bracket and the switch contacts.

The condenser (.002 mfd) should be connected in place of the short wire that runs from tag 7 on the press-button connector socket and tag 7 on the wave-range switch (square 29F in the underside view of the "72" receiver).

The choke should be connected between tag 7 on the press button connector socket, and chassis.

The components for modifying stock "70" and "72" receivers will be supplied by our Service Department, free on request.

Full particulars of the production modification will be given in a later issue of THE NEWS.