72

MURPHY SERVICE INSTRUCTIONS

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

SPECIFICATION

A72 D72
A72RG

BASIC DESIGN:		4 valve (+ rectifier and tuning indicator) super-het with variable selectivity and tuned inverse feedback. Provision for use with separate Push-Button Unit, and in the A.C. models provision for use with Remote Control Unit.
INTERMEDIATE FREQUENCY:		465 Kc/s.
WAVE RANGES:		16·7 to 50 metres 200 to 550 „ 950 to 2000 „
MAINS SUPPLY:	A72:	200–250 volts 50–100 cycles A.C. 100–125 „ 50–100 „ „
	D72:	200–250 „ D.C. or A.C. (25–100 cycles)
VALVES:	A72:	Mazda, TH41, VP41, HL42DD, ME41, PEN45, UU6.
	D72:	Mazda TH233, VP133, HL133DD, ME91, PEN383, U403.
PILOT LAMPS:	A72:	6·2v. 0·3 amp Globular Frosted.
	D72:	3·5v. 0·15 amp Globular Frosted.
SPEECH COIL IMPEDANCE:		Table 3 ohms R.G. 4 ohms
TOTAL WEIGHT:		Table 36 lb. R.G. 115 lb.
OVERALL DIMENSIONS:		Table 18″×22″×10″ R.G. 37″×36¾″×18″
CONSUMPTION:		70 watts approximately.

Circuit Analysis

ALTHOUGH the "72" receiver is, in general, quite straightforward in design, this short description of some of the special features should be helpful to servicemen in following the circuit diagrams in the centre pages of this book.

Both the A.C. and D.C. models have been designed for use in conjunction with the P80 Push-button Unit and the A.C. models can also be used with the RA80 Remote Control Push-button Unit. A full description of the circuits used in these units is not given here as they are dealt with in the "80" Service Instructions. To show function of certain of the "72" components, however, it will be necessary to describe the features which have been included to enable the units to be used. The most obvious of these is that a fourth position is provided on the wave-range switch for connecting the units.

THE R.F. AND OSCILLATOR STAGES

The tuning coils in the "72" are of the variable iron-dust core type, which can be accurately adjusted after they have been assembled in the chassis, and this helps considerably in maintaining correct ganging at the top end of the waveband, thus simplifying the initial adjustment of the receiver in the factory. Very little subsequent adjustment of the coils should be necessary.

To allow for widely varying reception conditions, three serial tappings are provided so that the aerial can be coupled directly to the tuned circuits in favourable localities, but in places close to a powerful transmitter, or where a customer is using an exceptionally long aerial it can be coupled through one of the small condensers (C1 and C2).

To obtain the highest possible performance on short waves, when the aerial is connected through the smaller condenser, a second condenser (C5) is included directly between the socket and the short-wave coupling coil.

The filter (L1 and C3) in the serial circuit is tuned to the intermediate frequency of the set (465 Kc/s.) and is included to prevent signals from stations working in the region of 465 Kc/s. reaching the frequency changer valve (V1).

The condenser (C12) in the grid circuit of the frequency changer is included so that the tuned circuit can be returned to chassis instead of to the A.V.C. line, as this arrangement simplifies the connections to the push-button units.

The oscillator circuit is quite orthodox in arrangement, apart from the switch (S1g) which, it will be noticed, has a *shorting* contact following the usual arm contact.

The function of this extra contact, and of similar ones in two other sections of the switch (S1f and S1g) is connected with the cathode circuit of the A.F. amplifier valve (V3) and will be dealt with when this part of the circuit is described.

Before passing on to the I.F. and A.F. circuits, there is one feature in the R.F. and Oscillator stages which should be noted. The trimming condensers are of a spiral type instead of the compression type which were used in early models. As the plates of these condensers are not under compression or tension they should be very constant over a period of time.

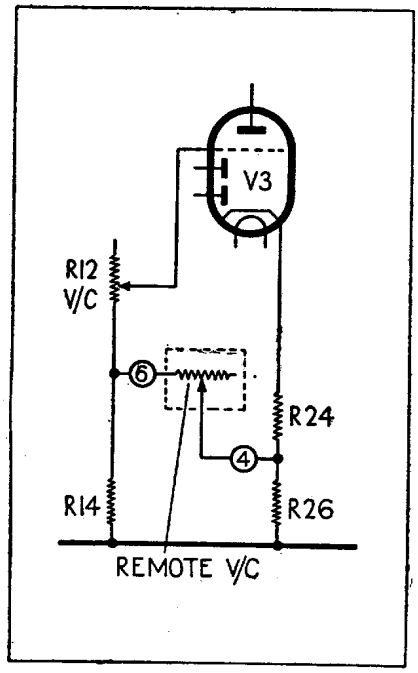
THE I.F. STAGE

The I.F. transformers are tuned by fixed condensers, and the final trimming (to 465 Kc/s.) is done by altering the position of the dust-core within the coil formers to vary the inductance. Here again, the constancy over a period of time should be good, as there are no parts under compression; also, the effects of humidity are reduced to a minimum by using silvered mica condensers.

Variable selectivity is provided in the first I.F. transformer by the addition of the coil (L19) which increases the coupling between

primary and secondary. The coil, which forms part of the secondary and is wound over the primary, has only a very small inductance and no correction to the tuning is therefore required when it is in circuit.

THE A.F. STAGE



A variable-mu valve is used for the A.F. amplifier so that, in the remote control unit, volume can be controlled by varying the bias applied to this valve.

The drawing shows the A.F. valve bias circuit when the remote control unit is connected.

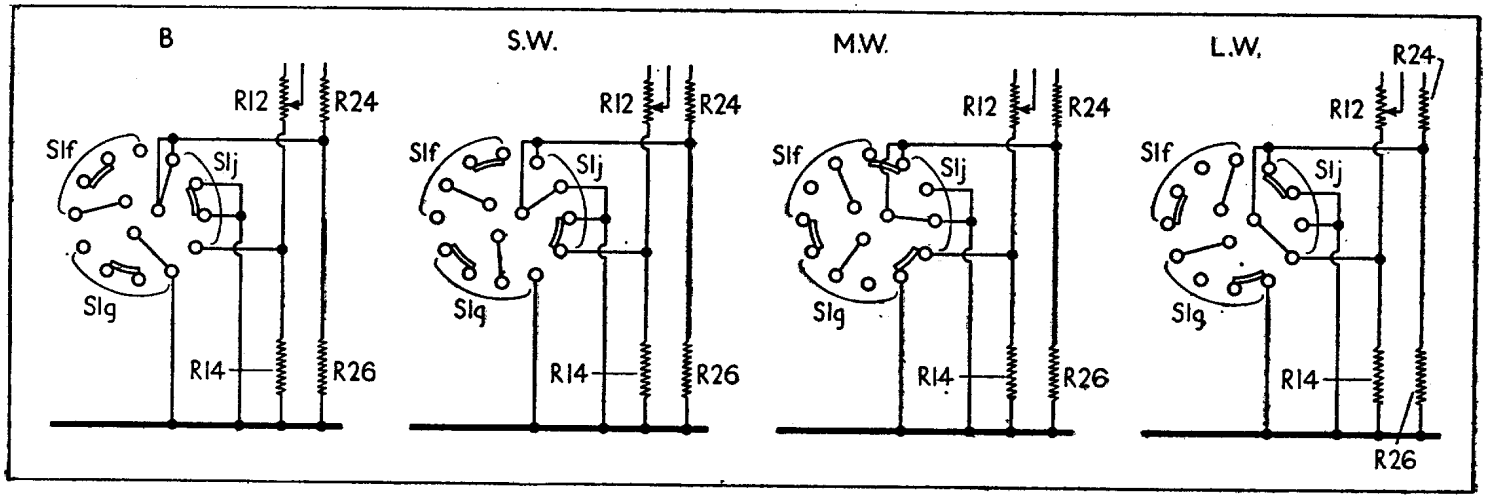
The voltage drop across the cathode resistances (R24 and R26) is approximately 19 volts and of this about 1.4 volts (across R24) are applied as initial bias.

The remote volume control and the resistance (R14) form a potentiometer across the second cathode resistance (R26), allowing the bias, and consequently the gain of the valve, to be varied over fairly wide limits. The inclusion of the fixed portion (R14) of this potentiometer is necessary to limit the current which is passed through the remote volume control.

The voltage drop in the cathode resistance also applies a delay to the A.V.C. circuit on push buttons. This delay is introduced because the push-button stations are normally comparatively powerful and better control is obtained under these conditions if the A.V.C. circuit is delayed. This also effectively increases the gain, however, and the A.F. signal is therefore taken from a lower point (the junction of R19 and R21) in the chain of diode load resistances when the set is working on push-buttons.

When the push-button or remote control units are not in use the resistances (R14 and R26), are short circuited, as they are not required for remote volume control and a delay is not required on the A.V.C. circuit.

The short circuit is applied by the special switches (S1f, g, and j) previously referred to. The operation of these switches is rather difficult to follow when they are drawn in different parts of the circuit, and we have therefore shown them below, arranged together, as they are in the actual chassis. The four drawings indicate the arrangement for each position of the wave-range switch, and it will be seen that, although the *shorting* contacts are shown on the main circuit diagram as each belonging to one section of the switch, they actually travel from one section to another when the set is switched from short



waves to medium waves. The resistance (R24) is thus shorted to earth through S1j on short waves and long waves and through S1g on medium waves.

The current passed by the A.F. amplifier valve will obviously vary as the bias is altered and two resistances (R16 and R27) are included in the circuit to compensate for this and so prevent large variations in the voltage applied between the anode and cathode of the valve.

THE OUTPUT STAGE

A tuned system of negative feed-back is introduced in the output stage by the inclusion of the choke and condenser (L24 and C49) and the resistance (R38) in the cathode circuit. These components are only in circuit when the set is switched to "high quality" and the values are chosen to give the greatest amount of feed-back at approximately 3000 cycles and so flatten out the peak which normally occurs at this point due to the combined effect of the loudspeaker impedance increasing with frequency and the attenuation in the tuned circuits at the higher audio-frequencies. On the other two positions of the switch, when the high note response is attenuated, the rise in response does not occur and the feed-back components are therefore short circuited to earth. The condenser and choke (C48 and L23) across the output transformers resonate at about 9000 Kc/s. and form a heterodyne filter.

GRAMOPHONE

The A.C. radio-gramophone circuit is similar to the table model, but a small amount of high note compensation has been effected on push-buttons to balance the increased bass response in the radio gramophone. As previously stated, due to the comparatively powerful signals on push-buttons the audio signal is taken from a lower tapping on the diode load (the junction of R19 and R21). High note compensation has therefore been introduced by including a small condenser (C40)—which will pass the higher audio frequencies—between the coupling condenser (C34) and the higher tapping on the diode load.

The radio-to-gramophone change-over switch connects the pick-up to the volume control in place of the radio coupling condenser (C34). Radio break through is prevented by breaking the H.T. supply to the oscillator valve and the negative feed-back circuit is shorted out by switching the bias resistance (R37) directly to earth.

A tone correction circuit is connected across the pick-up, and this is controlled by the switch (S1b) which is part of the variable selectivity-tone control.

THE D.C. MODEL

The D72 is fundamentally the same as the A.C. model apart from the mains supply arrangements which are quite orthodox for a universal model.

This receiver will operate with the P.80 Push-Button limit, but not with the RA80 Remote Control Unit. A limiting resistance for the remote volume control (R14 in the A.C. model) is not therefore required and a simple rotary switch (S1j) is used to short circuit the A.V.C. delay resistance (R26) on manual tuning.

A thermal delay switch is used in the heater circuit to prevent overloading the pilot lamps while the valves are cold. Instructions for adjusting this are given on page 18.

On medium waves, two lamps in series are used for illuminating the scale, and on short waves and long waves a series resistance (R44) is used in place of the second lamp.

The Diagrams

THE diagrams on pages 6 to 13 of this book contain most of the information required for carrying out normal service work. The following information will help you to make full use of them.

The circuit diagram is numbered at each "junction point," so that every component has a number at each terminal. These numbers are marked at the ends of the components in the underside and top views of the chassis so that the respective terminals may easily be identified with those on the circuit diagram.

The ringed numbers indicate the socket numbers in the connector for the push-button and remote control units.

The underside and top views of the chassis are divided into squares which are lettered horizontally and numbered vertically so that any section may be referred to by quoting the appropriate "square."

A composite circuit diagram is used for the table and radio gramophone models. For the table models, the heavy lines should be ignored and the dotted lines treated as full. For the radio gramophone, ignore the dotted lines and include the parts shown in heavy lines.

In the component tables, all resistances are given in ohms, and capacities in microfarads, unless otherwise stated. The D.C. resistance of coils is quoted in ohms in all cases, except where the reading would be too small to be of use, when they are omitted altogether.

The voltage tables should only be taken as a guide, as considerable variations may occur without affecting the efficiency of the receiver.

The readings were taken to chassis unless otherwise stated, using a 0-50v. and 0-500v. 1,000 ohms-per-volt meter, with the receivers working on 230 volts A.C. and switched to M.W.

Modifications

CERTAIN minor modifications have been made to the circuit in the course of production, and full particulars of these are given in the table below.

If any further modifications are announced in the *Murphy News*, they should be added in the space provided at the bottom of the table.

IST SET MODIFIED	MODIFICATION
	The H.T. circuit in the earlier models was different from the published circuit in the following details:—V1 screen was fed independently through a 27,000 ohms resistance (10,000 ohms on D72) with a ·025 mfd. condenser between screen and cathode. R9 was 100,000 ohms (27,000 on D72). C29 was ·025 mfd. L17 was fed direct from H.T. line. C25 was omitted.

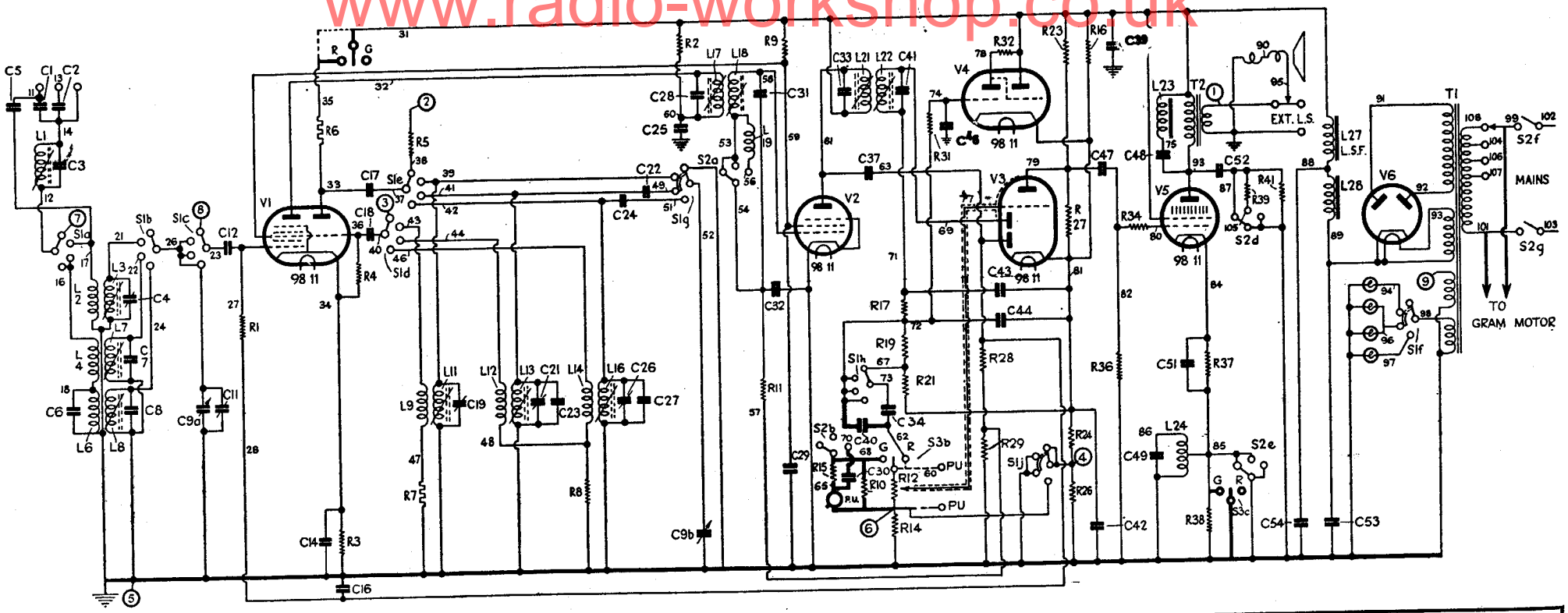


TABLE OF VOLTAGES

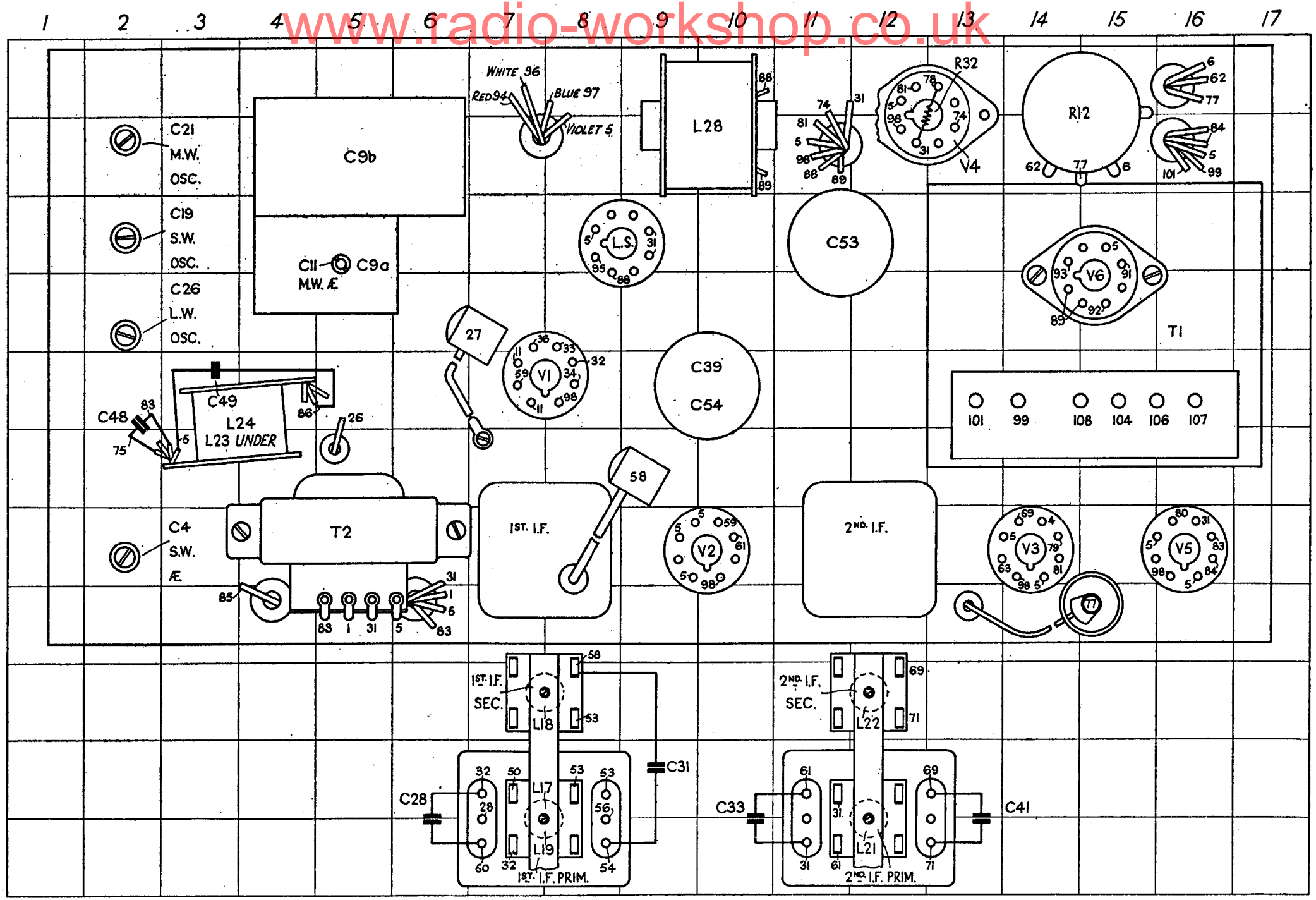
A72

Valve	Type	Electrode	Test Pt	Square	Voltage
V1	TH41	Hexode Anode	32	27 E	200
		Screen	29	28 E	87
		Triode Anode	33	27 E	75
		Cathode	34	27 E	2·5
V2	VP41	Anode	61	25 G	210
		Screen	59	25 G	87
		Cathode	5	26 G	0
V3	HL42DD	Triode Anode	79	21 G	80
		Cathode	81	21 G	1·5
		Cathode on Push Buttons			19
V4	ME41	Anode 1	31	12 B	210
		Anode 2	78	13 A	50
		Cathode	81	12 A	1·5
V5	Pen 45	Anode	83	19 G	210
		Screen	31	19 G	210
		Cathode	84	19 G	6·5
V6	UU6	Cathode	89	15 D	320

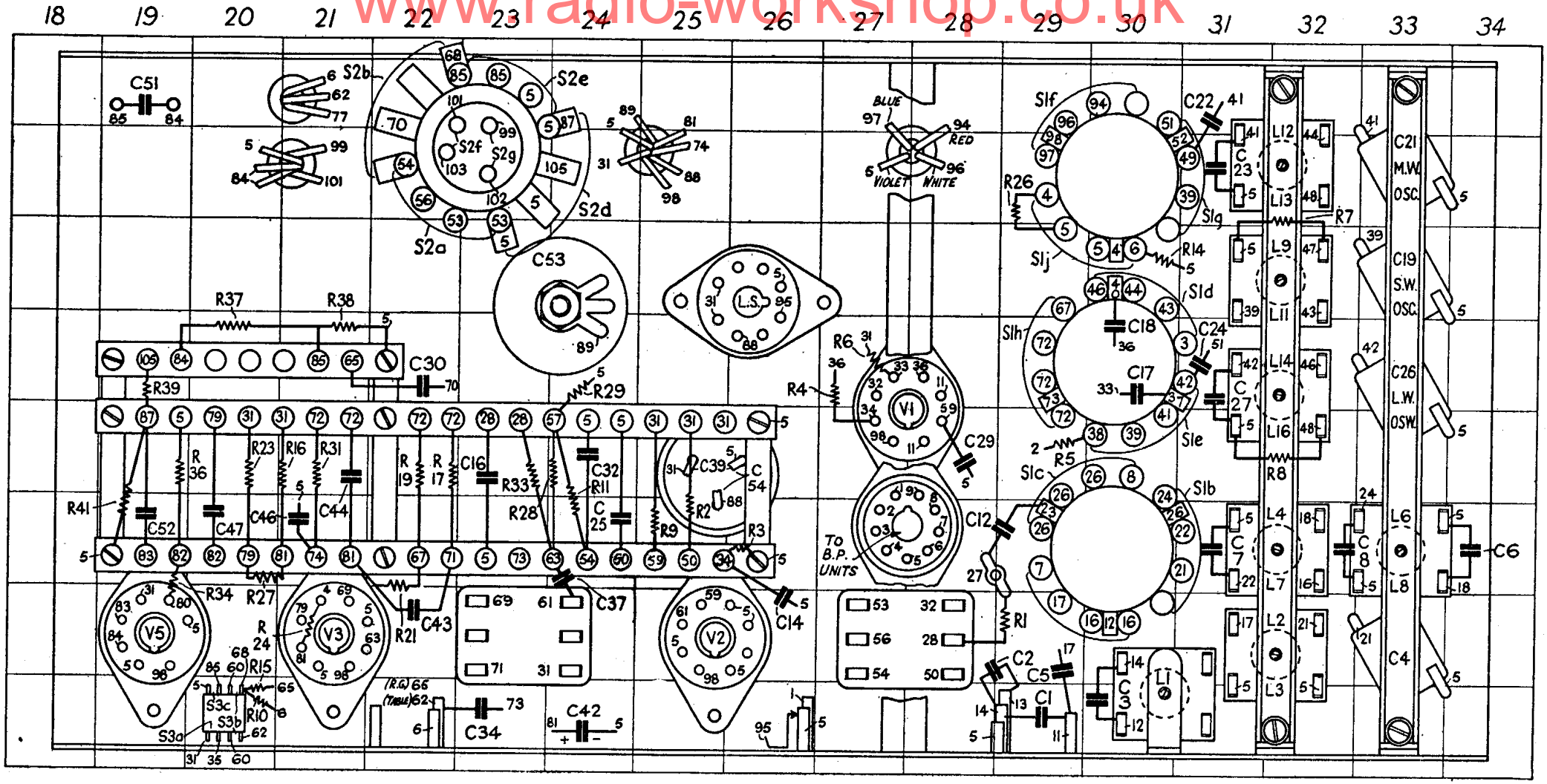
TABLE OF COMPONENTS A72

Code	Value	Test	Pts.	Square
C1	15 pf.	11	14	29 H
C2	50 pf.	13	14	29 G
C3	500 pf.	12	14	30 H
C4	Trimmer	21	5	2 G
C5	150 pf.	11	17	30 G
C6	500 pf.	18	5	34 F
C7	10 pf.	22	5	31 F
C8	85 pf.	24	5	32 F
C9a	Variable	26	5	5 C
C9b	Variable	52	5	5 B
C11	Trimmer	26	5	5 C
C12	500 pf.	23	27	28 F
C14	·05	34	5	26 G
C16	·01	28	5	23 E
C17	100 pf.	33	37	30 D
C18	200 pf.	36	40	30 D
C19	Trimmer	39	5	2 C
C21	Trimmer	41	5	2 B
C22	676 pf.	41	49	31 A
C23	20 pf.	41	5	31 B
C24	375 pf.	42	51	31 D
C25	·025	50	5	28 E
C26	Trimmer	42	5	2 D
C27	260 pf.	42	5	31 D
C28	139 pf.	32	50	6 L
C29	·08	59	5	24 F
C30	·001	65	70	22 D
C31	150 pf.	58	54	8 K
C32	·05	54	5	24 E
C33	139 pf.	61	31	10 L
C34	·01	73	62	23 H
C37	50 pf.	61	63	24 F
C39	8	31	5	25 E
C40	120 pf.	62	72	20 G
C41	150 pf.	71	69	13 L
C42	20 35v.	81	5	24 H
C43	100 pf.	71	81	22 G
C44	100 pf.	72	81	21 E
C46	·05	74	5	21 F
C47	·025	79	82	20 F
C48	850 pf.	75	83	2 E
C49	·025	5	86	3 E
C51	75	84	85	19 A
C52	·04	83	87	19 F
C53	16	89	5	24 C
C54	8	88	5	25 E
R1	470,000	27	28	29 G
R2	4,700	31	50	25 E
R3	220	34	5	26 F
R4	22,000	36	34	27 D
R5	8,200	2	38	29 E
R6	33,000 1w	33	35	26 D
R7	47	47	5	32 C
R8	470	48	5	32 E
R9	22,000 1w	31	59	25 F
R10	100,000	68	6	20 H
R11	1 MΩ	54	57	24 E
R12	1 MΩ	60	6	14 A
R14	22,000	6	5	30 C
R15	100,000	65	68	20 H
R16	47,000 1w.	31	81	21 E
R17	100,000	71	72	22 E
R19	390,000	67	72	22 E
R21	68,000	67	81	22 F
R23	47,000 ½w.	31	79	20 E
R24	180	81	4	21 G
R26	2,700 ½ w.	4	5	29 B
R27	150,000	79	81	20 F
R28	1 MΩ	63	57	24 E
R29	470,000	57	5	24 D
R31	1·5 MΩ	74	72	21 E
R32	1 MΩ	78	31	13 B
R33	2·2 MΩ	63	28	23 E
R34	47,000	82	80	19 G
R36	150,000	82	5	19 E
R37	170 1w.	84	85	20 D
R38	100	85	5	21 D
R39	27,000	87	105	19 D
R41	47,000	87	5	19 F
L1	3	14	12	30 H
L2	★	17	5	32 G
L3	★	21	5	32 G
L4	★	16	18	32 F
L6	25	18	5	33 F
L7	3	22	5	32 F
L8	15	24	5	33 F
L9	★	43	47	32 C
L11	★	39	5	32 C
L12	★	44	48	32 B
L13	1	41	5	32 B
L14	·5	46	48	32 D
L16	1·5	42	5	32 D
L17	6	50	32	7 L
L18	6	58	53	7 J
L19	★	56	53	7 L
L21	6	31	61	12 L
L22	6	71	69	12 T
L23	300	75	31	3 F
L24	380 + 15	86	5	3 F
L27	1400	31	88	L.S.F.
L28	250	89	88	10 B
T1 Prim				
200-205	18	108	101	
210-220	20	104	101	
230-240	22	106	101	
250	24	107	101	15 D
H.T. sec.	250	5	91	
	+250	5	92	
T2 prim.	320	31	83	5 G
T2 sec.	★	5	1	
L.S. Sp. Coil	3	90	95	

★ Less than 1Ω



A72 TOP VIEW



A72 UNDERSIDE

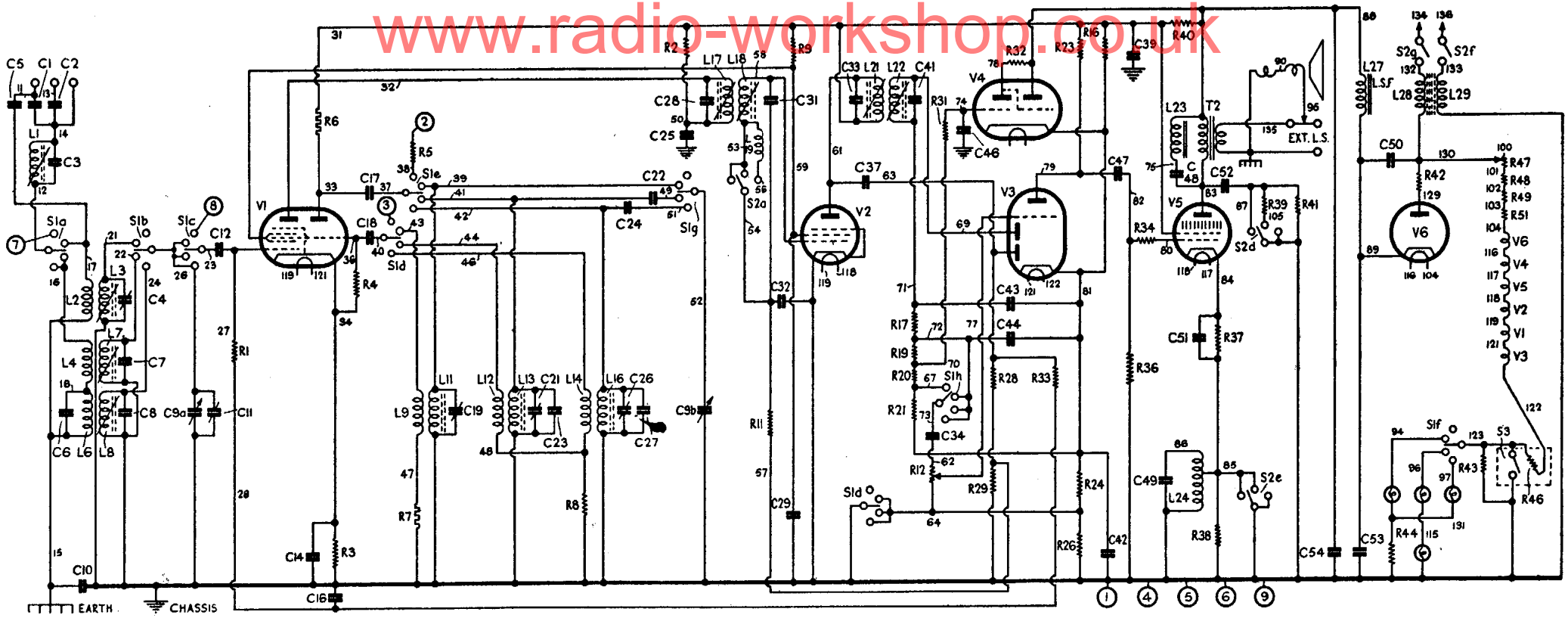


TABLE OF VOLTAGES — D72

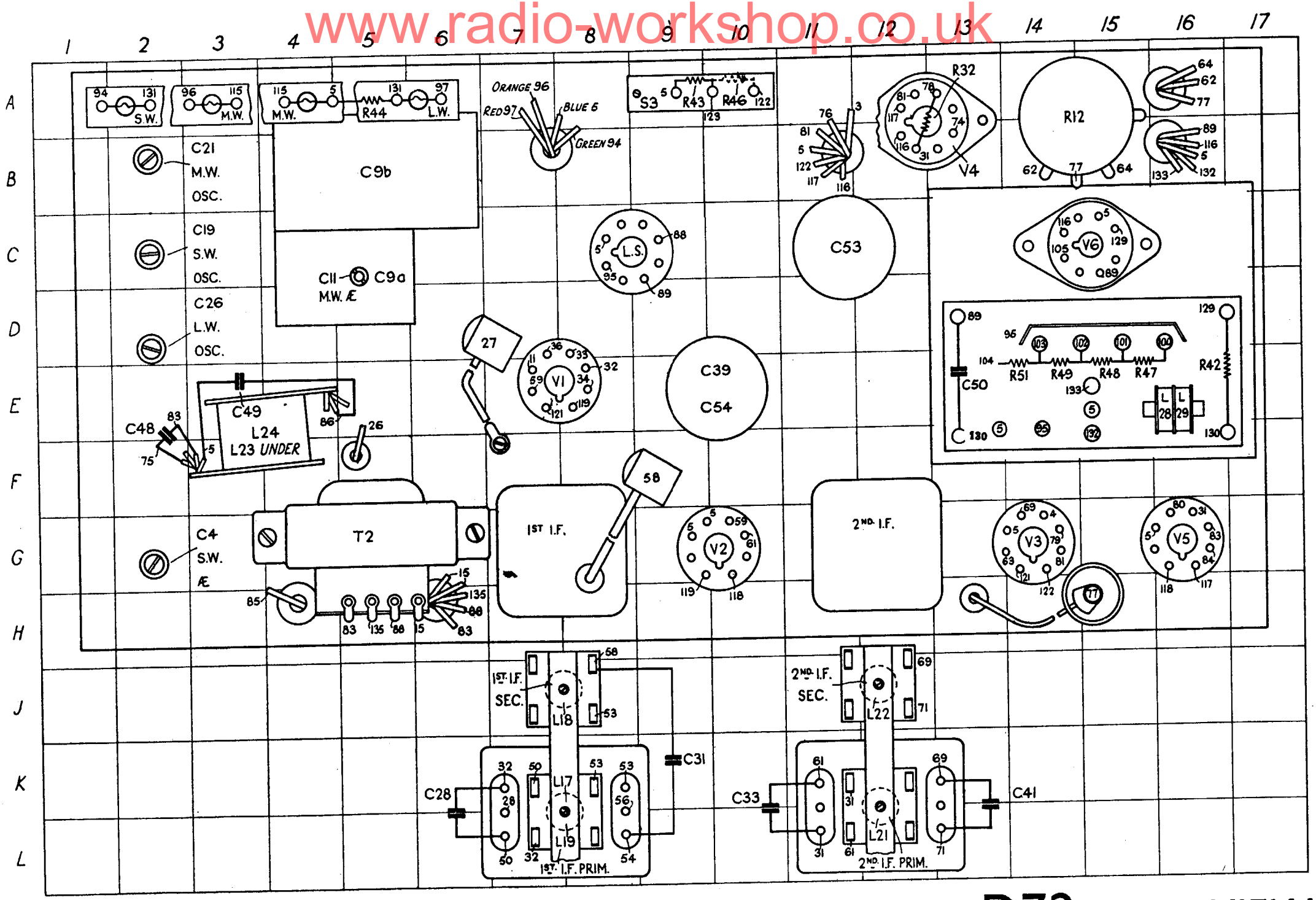
Valve	Type	Electrode	Test Pt	Square	Voltage	Valve	Type	Electrode	Test Pt	Square	Voltage
V1	TH233	Hexode Anode	32	27 E	125	V4	ME91	Anode 1	31	12 B	150
		Screen	29	28 E	80			Anode 2	78	13 A	20
		Triode Anode	33	27 E	60			Cathode	81	12 A	2
		Cathode	34	27 E	2·4						
V2	VP41	Anode	61	25 G	135	V5	Pen383	Anode	83	19 G	150
		Screen	59	25 G	80			Screen	31	19 G	130
		Cathode	5	26 G	0			Cathode	84	19 G	7
V3	HL133DD	Anode	79	21 G	77	V6	U403	Cathode	89		230
		Cathode	81	21 G	2						

TABLE OF COMPONENTS

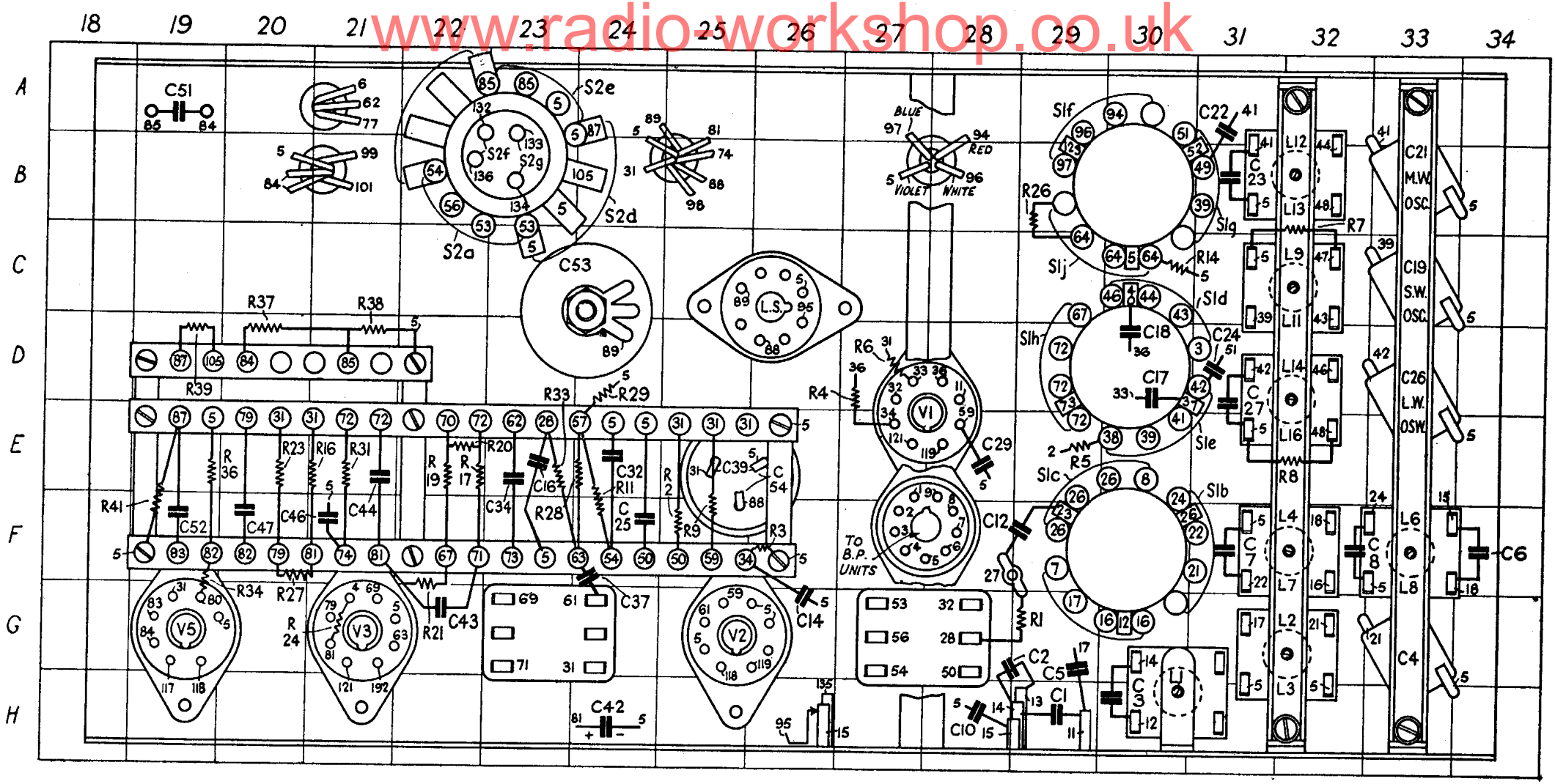
D72

Code	Value	Test	Pts	Square
C1	15 pf.	11	14	29 H
C2	50 pf.	13	14	28 G
C3	500 pf.	12	14	30 H
C4	Trimmer	21	5	2 G
C5	50 pf.	11	17	30 G
C6	500 pf.	15	18	34 F
C7	10 pf.	22	5	31 F
C8	85 pf.	24	5	32 F
C9a	Variable	26	5	5 C
C9b	Variable	52	5	5 B
C10	·01	15	5	29 G
C11	Trimmer	26	5	5 D
C12	500 pf.	23	27	29 F
C14	·05	34	5	26 G
C16	·01	28	5	23 E
C17	100 pf.	33	37	30 D
C18	200 pf.	36	40	30 D
C19	Trimmer	39	5	2 C
C21	Trimmer	41	5	2 B
C22	676 pf.	41	49	31 A
C23	20 pf.	41	5	31 B
C24	375 pf.	42	51	31 D
C25	·025	50	5	28 E
C26	Trimmer	42	5	2 D
C27	260 pf.	42	5	31 D
C28	139 pf.	32	50	6 L
C29	·08	59	5	24 F
C31	150 pf.	58	54	9 L
C32	·05	54	5	24 E
C33	139 pf.	61	31	10 L
C34	·005	73	62	23 H
C37	50 pf.	61	63	24 F
C39	16	31	5	10 E
C41	150 pf.	71	69	13 L
C42	20 35v	81	5	24 H
C43	100 pf.	71	81	22 G
C44	100 pf.	72	81	21 E
C46	·05	74	5	21 F
C47	·025	79	82	20 F
C48	850 pf.	75	83	2 F
C49	·025	5	86	4 E
C50	·04	89	95	13 E
C51	75	84	85	19 A
C52	·04	83	87	19 F
C53	16	89	5	24 C
C54	16	88	5	25 E
R1	470,000	27	28	29 G
R2	4,700	31	50	25 F
R3	220	34	5	27 D
R4	22,000	34	36	27 D
R5	8,200	2	38	29 E
R6	20,000	33	31	26 D
R7	47	47	5	32 B
R8	470	48	5	32 E
R9	6,800	31	59	25 F
R11	1 MΩ	54	57	24 F
R12	1 MΩ	62	64	14 A
R16	39,000	31	81	21 E
R17	100,000	71	72	22 E
R19	180,000	72	70	22 D
R20	260,000	67	70	22 E
R21	56,000	67	81	22 F
R23	47,000	31	79	20 E
R24	390	81	64	21 G
R26	2,200	5	64	29 B
R28	1 MΩ	63	57	24 E
R29	470,000	57	5	24 D
R31	1·5 MΩ	74	70	21 E
R32	1 MΩ	78	31	12 A
R33	2·2 MΩ	63	28	23 E
R34	47,000	82	80	19 F
R36	150,000	82	5	19 E
R37	140	84	85	20 D
R38	100	85	5	21 D
R39	10,000	87	105	19 D
R40	1,000 1w.	31	88	26 D
R41	12,000	87	5	19 F
R42	47 2w.	95	129	16 E
R43	47 2w.	123	5	9 A
R44	18	5	131	5 A
R46	18	122	123	10 A
R47	75	100	101	16 E
R48	100	101	102	15 E
R49	75	103	102	15 E
R51	281	104	103	14 E
L1	3	14	12	30 H
L2	★	17	15	32 G
L3	★	21	5	32 G
L4	★	16	18	32 F
L6	25	15	18	33 F
L7	3	22	5	32 F
L8	15	24	5	33 F
L9	★	47	43	32 C
L11	★	5	39	32 C
L12	★	44	48	32 A
L13	1	5	41	32 B
L14	★	46	48	32 D
L16	1·5	5	42	32 E
L17	6	50	32	8 G
L18	6	53	58	8 G
L19	★	53	56	8 G
L21	6	31	61	12 G
L22	6	69	71	12 G
L23	300	75	88	4 F
L24	390 + 15	5	86	4 F
L27	900	88	89	L.S.F.
L28	3	130	132	15 F
L29	3	5	133	16 F
T2 prim.	190	83	88	5 G
Sec.	★			
L.S. Sp. coil	3			

★ Less than 1Ω



D72 TOP VIEW



D72 UNDERSIDE

Trimming

TRIMMING on this receiver is very critical and must be carried out carefully as small inaccuracies may completely spoil the performance of the receiver.

THE SERVICE OSCILLATOR

It is also important to ensure that the service oscillator is accurately calibrated, and it is advisable to check this regularly by the "beat" method.

CHECKING THE TRIMMING

There are one or two points about this receiver which call for special comment as far as trimming is concerned.

Firstly, the IF circuits are tuned by varying the inductances instead of the capacities. The variation is affected by turning a small screw at the end of the coil, which moves the iron core within the coil, thereby varying the inductance. The setting of these inductances should be very constant over a period of time and IF trimming should thereby rarely be required.

Although damping is required for adjusting these circuits, they may be checked without the damping applied and consequently without removing the chassis from the cabinet, by connecting the service oscillator between the chassis and the grid of the frequency changer valve and feeding in signals between 450 Kc/s and 480 Kc/s. The set should be tuned to 550 metres and adjusted for maximum selectivity. Connect an output meter across the L.S. sockets. If the IF circuits are correctly adjusted the reading in the output meter, as the oscillator is tuned between 450 Kc/s and 480 Kc/s, should rise to a peak at 465 Kc/s, and fall steadily on either side.

Variable inductances as well as trimming condensers are used in the R.F. and oscillator circuits and the former should be adjusted at the top (wavelength) end of each band. Here again re-adjustment of the inductances should rarely be required and in most cases trimming can be carried out entirely by varying the trimmer capacities at the bottom of the wave-band and merely checking at the top end to see that the alignment is correct. In the instructions given below we assume, of course, that the inductances do require adjustment, but the procedure can be shortened accordingly if this is found unnecessary.

It is important that the tuning scale is set to the top marking on the dial when the variable condenser is adjusted to maximum before R.F. trimming is commenced and as any strain on the flexible drive may alter the calibration a little, it is advisable to do the final condenser adjustment with the chassis in the cabinet.

Another point which must be watched is that calibration errors at the top end of the waveband can be due to incorrect adjustment of the I.F. circuits, or to incorrect adjustment of the oscillator inductance. It is therefore essential to check the I.F. circuits carefully before making any adjustment to the oscillator, or R.F. inductances.

The correct sequence for completely retrimming is I.F.'s (465 Kc/s), M.W., L.W., S.W., and I.F. filter. Small errors in calibration occurring at the lower end of the bands may be corrected by adjusting the oscillator trimmers only, and on this receiver these can be adjusted without affecting the calibration of the other bands.

THE OUTPUT METER

We suggest the use of a 0 to 3 volt rectifier type voltmeter, placed across the loudspeaker sockets, for measuring the output of the receiver when trimming, as this method is both simple and straightforward.

The input from the service oscillator, when the output meter is used, should always be kept sufficiently low to keep the reading below 1 volt.

It is therefore necessary to reduce the input as each stage is brought into tune.

DAMPING

The characteristics of the I.F. transformers make it essential to damp one of each pair of coupled circuits as the other is trimmed, and a unit for this purpose should be made up with a 20,000 ohms (quarter watt) resistance and a 0.1 mfd. condenser. Attach a crocodile clip to one end of the resistance and connect the other end to the condenser. Then attach a short flexible lead terminated with a crocodile clip, to the free end of the condenser.

BIAS

The shape of the I.F. curve will be affected when a signal is received due to the bias applied to the valves from the A.V.C. line, and to simulate working conditions while the set is being trimmed about 9 volts bias should be applied to the A.V.C. line.

Certain of the trimmers will have two setting points. In all cases the "minimum" setting is the correct one, i.e. the second point when unscrewing the adjusting screw. This also applies to the inductance adjustment. In the R.F. circuits, if the inductances are adjusted to the "inner" setting, the coupling between the tuned and coupling coils will be incorrect.

I.F. TRIMMING. 465 Kc/s

1. Connect the output meter across L.S. terminals.
2. Clip the flexible lead of the damping unit to chassis and V3 signal diode anode (test point 9, square 21G).
3. Connect the positive side of a 9 volt battery to chassis, and the negative side to the A.V.C. line (test point 63, square 21G).
4. Switch the set for maximum selectivity. Tune to 500 metres and connect the service oscillator between the control grid of V2 (square 58, test point 9F) and chassis, through a fixed condenser of 0.1 mfd.
5. Tune the service oscillator to exactly 465 Kc/s and switch on the internal modulation.
6. Adjust L21 (square 12K) for maximum reading on the output meter.
7. Remove the damping unit from V3 and clip it to anode of V2 (square 25G, test point 61). Adjust L22 (square 12J).
8. Connect the service oscillator between the control grid of V1 (square 7D, test point 27) and chassis via the mfd condenser.
9. Remove the damping from V2 anode and apply it to V2 control grid (square 9F, test point 58). Adjust L17 (square 7K).
10. Remove the damping from V2 grid and apply to V1 hexode anode (square 27E test point 32). Adjust L18 (square 7J).

If the inductances are found to require only a very small adjustment, the 465 Kc/s I.F. trimming may now be regarded as complete, but if large adjustments have been made, it is advisable to repeat the whole procedure as a final adjustment.

M.W. TRIMMING

See that the tuning scale is set to the top marking on the dial (just above 550 metres) when the tuning condenser is fully in mesh.

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.
2. Tune the service oscillator and the receiver to 500 metres.
3. Adjust L13 (square 32B), and L7 (square 32G) for maximum gain.
4. Tune the receiver and oscillator to 220 metres.
5. Adjust the oscillator trimmer C21 (square 2B), and the grid trimmer 11 (square 5C).
6. Readjust at both ends of the waveband until it is correct.
7. Check calibration on a broadcast signal.

L.W. TRIMMING

See that the tuning scale is set to the top marking on the dial (just above 2050 metres) when the tuning condenser is fully in mesh.

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.
2. Tune the service oscillator and the receiver to 1900 metres.
3. Adjust the inductances L8 (square 33F), and L16 (square 32D) for maximum gain.
4. Tune receiver and oscillator to 1,000 metres.
5. Adjust the oscillator trimmer C26 (square 2D) to correct calibration.
6. Readjust at both ends of the waveband until it is correct.
7. Check calibration on a broadcast signal.

S.W. TRIMMING

See that the tuning scale is set to the top marking on the dial (just above 50 metres) when the tuning condenser is fully in mesh.

1. Connect the service oscillator between the aerial and earth sockets of the receiver and the output meter across the L.S. terminals.
2. Tune the receiver and the service oscillator to 49 metres.
3. Adjust S.W. inductances L11 (square 32C) and L3 (square 32G) for maximum gain.
4. Tune the receiver and the service oscillator to 17 metres.
5. Trim C19 (square 2C) and C4 (square 2G). Recheck at the top end of the band, and if any further adjustment of the inductances is found to be necessary, go back to the low end of the band and readjust the condensers.
6. See that the 17-metre stations come in on the 17-metre marking on the tuning scale.

I.F. FILTER (465Kc/s)

1. Connect the service oscillator to the aerial and earth terminals.
2. Tune the oscillator to 465Kc/s and the receiver to 450 metres.
3. Adjust the output from the oscillator until the signal is just audible.
4. Adjust L1 (square 30H) to give minimum output from the loudspeaker.

It is easier to judge the "minimum" setting by ear than by the use of an output meter, but to obtain an accurate adjustment the oscillator output must be so adjusted that at the "minimum" point it is almost inaudible. Inaccurate adjustment of this filter will affect the gain at the top end of the M.W. band.

Mechanical Details

THE tuning dial assembly on the "72" is quite separate from the main chassis, but as the drive is flexible, the chassis of the table model can be withdrawn and placed on end, close behind the cabinet, without disturbing the drive mechanism. With the chassis in this position it should be possible to carry out most service work, but if it is found desirable to remove the chassis further from the cabinet, the tuning drive can be removed from the variable condenser by slackening the set-screws holding the drive wheel to the condenser spindle, and removing one screw which holds the drive assembly to the condenser frame. Alternatively, the tuning scale assembly can be removed from the cabinet by taking out the four securing screws. In either case care must be taken not to twist or strain the flexible drive.

In the radio-gramophone the chassis is held by four bolts in the front of the cabinet. The loud-

speaker "silk" must be removed to reach these by taking out the four screws which secure it from inside the cabinet. The top side of the silk is rabbeted into the cabinet so that when the lower screws have been removed it may be pushed forward and lifted out.

The flexible drive on this receiver is shorter than the one on the table model, and it must be released from the tuning drum before removing the chassis. To do this turn the tuning control to "maximum," slacken the grub screw securing the drive wheel to the drum spindle, and the screw holding the drive wheel bracket. Note that there is a rubber washer between this bracket and the drum-bearing bracket.

A ledge is provided to support the chassis while the fixing bolts are being taken out or replaced.

It should be noted that the series aerial condensers on the radio gramophone are located on the aerial panel at the back of the cabinet, so that it may be necessary to put a small condenser in series with the aerial when making tests on the chassis alone, if you are using a large aerial close to a powerful station.

TRANSIT BRACKETS

To prevent the tuning drive being strained or damaged in transit a bracket is fixed between the tuning drum and cabinet before the sets are dispatched from the factory.

This bracket must be removed before any attempt is made to turn the tuning control.

If the receiver is bumped when the transit bracket is not fixed, there may be a tendency for the drive to slip causing calibration errors. It is therefore advisable for dealers to re-fit the bracket if a receiver is to be transported any distance.

THE DRIVE

The drive in this receiver should be regarded as a complete unit, and if it becomes faulty, a replacement should be obtained.

In handling the drive care must be taken not to strain it or the casing for the wire may be damaged.

The tension of the wire is adjusted in the factory and it should normally be unnecessary to make any further adjustments. If, however, the wire does become slack due to the locking nuts becoming loosened, the nipples at the top of the slow motion drive assembly can be adjusted by trial and error until the correct tension is obtained. If the tension is too great the drive will be stiff and uneven; if it is too slack, back lash will occur. Remember to tighten the locking nuts when the adjustment is completed.

FITTING THE DRIVE

The condenser end of the drive should be fitted first. Push it on to the condenser spindle, and see that the bracket rests against the condenser frame. This will avoid the possibility of strain when the screws are tightened. Turn the drive to the "maximum" stop, and set the condenser vanes fully in mesh; then screw the bracket to the condenser frame and tighten the grub screws.

Slide the small pulley over the tuning drum spindle, and turn the drum round by hand until it is tuned to the highest marking on the dial. (just above 50 metres on the short wave scale). Screw the drive wheel bracket to the tuning assembly, and tighten the grub screw.

THE TUNING SCALE ASSEMBLY

The tuning scale assembly is held to the cabinet by four screws, and it is located by dowels in the escutcheon.

In the table model the assembly must be removed before the drive can be taken off, as the securing screw for the drive bracket is not accessible when the drive assembly is mounted in the cabinet.

In the radio-gramophone the screws can be reached without taking out the whole assembly

THE SCALE

The station name scale is held to the tuning frame by cleats, and rubber channeling is placed over the edge of the glass at the points where it is secured.

In fitting a new scale, see that the station names are lined up so that the lines on the tuning drum run through the squares on the scale.

THE TUNING DRUM

The tuning drum should be removed, after the drive has been removed, by taking out the screws securing the end bracket at the drive end. The "chart" can be removed by taking off the fixing clamp at the back of the drum.

A new chart should be placed around the drum and held securely with strong elastic bands or lengths of wire. It is important that it should be held tightly against the drum, otherwise tuning errors will occur. See that the top and bottom edges of the chart are square with the ends of the frame before refitting the clamp. When the clamp is in position the bands can be removed.

To obtain the correct spacing between the drum and the scale place a piece of cartridge paper between the two before securing the end bracket.

THE THERMAL DELAY SWITCH

The thermal delay switch on the universal models is adjusted in the factory to give a delay of between five and twenty seconds. It should not require further adjustment, but if further adjustments are made it is essential that the delay should be checked when the chassis is quite cold. It takes at least 30 minutes for the valves and the delay switch to become quite cold after the set has been running. The adjustment of the switch is fairly critical. Turning the adjusting screw in a clockwise direction increases the delay, and turning it the other way has the opposite effect. It is essential that the mains tapping plug should be in the correct socket.

Fault Finding

THE table below is included to assist servicemen in recording systematically faults which develop in the "72" receiver. The faults already included should be added to by servicemen from particulars of any faults which are subsequently published in *Murphy News* and any which develop in the field.

SYMPTOMS	FAULTS
Weak Signals or No Signals	C3 s/c Trimmers s/c I.F. Filter out of adjustment (causing low gain at top end of M.W. band).
Instability	Wiring displaced: If the output transformer wires run close to the aerial socket the set will be unstable on L.W. The wiring in other parts of the circuit may also cause instability if it is seriously displaced. C4 o/c
Distortion	A.V.C. line o/c or s/c.

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 "flattened" 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.

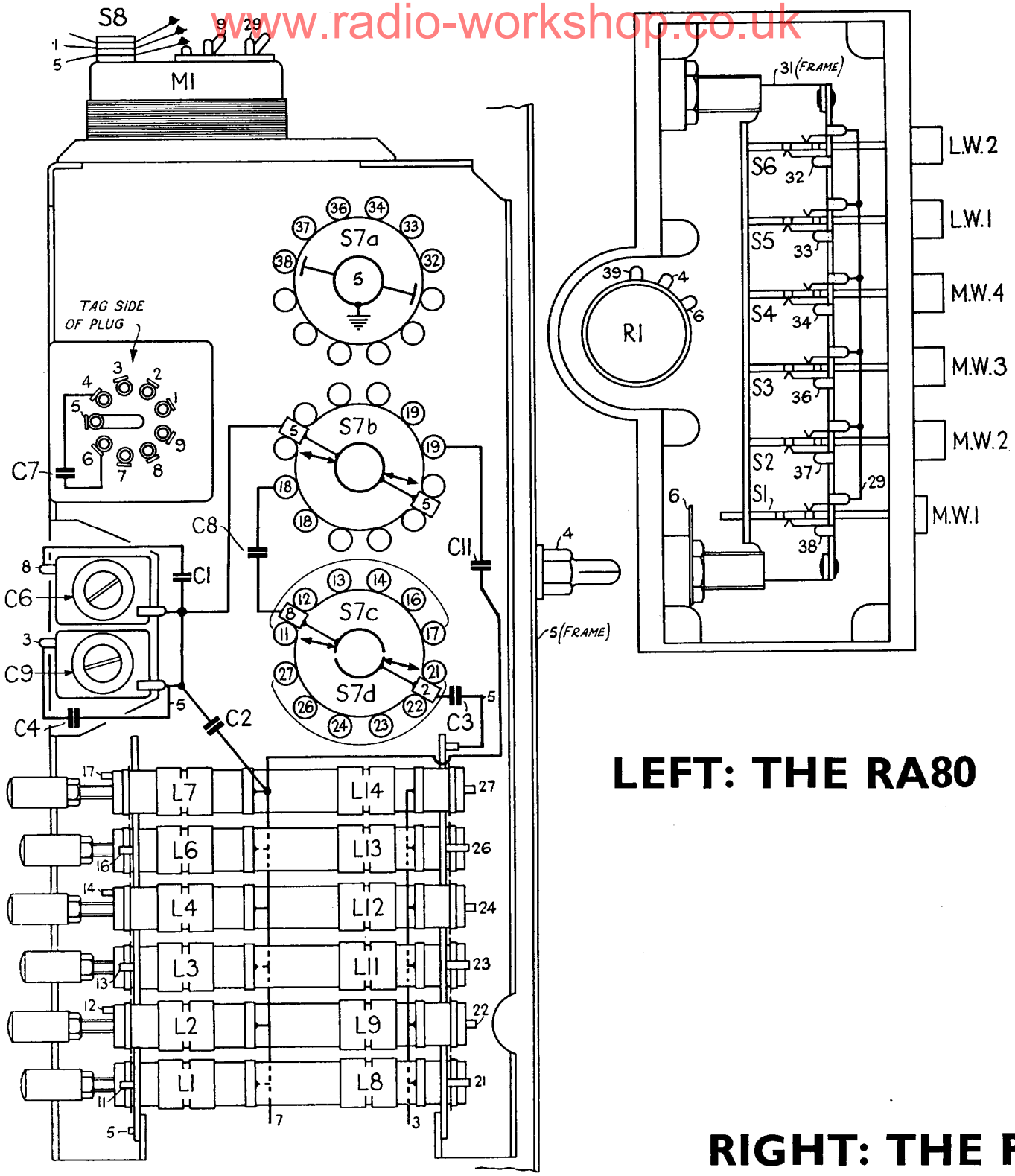
In both the units the aerial pre-set con-

Production Changes

denser (C6) may require readjustment. If the oscillator pre-set condenser is not touched a sufficiently accurately 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.

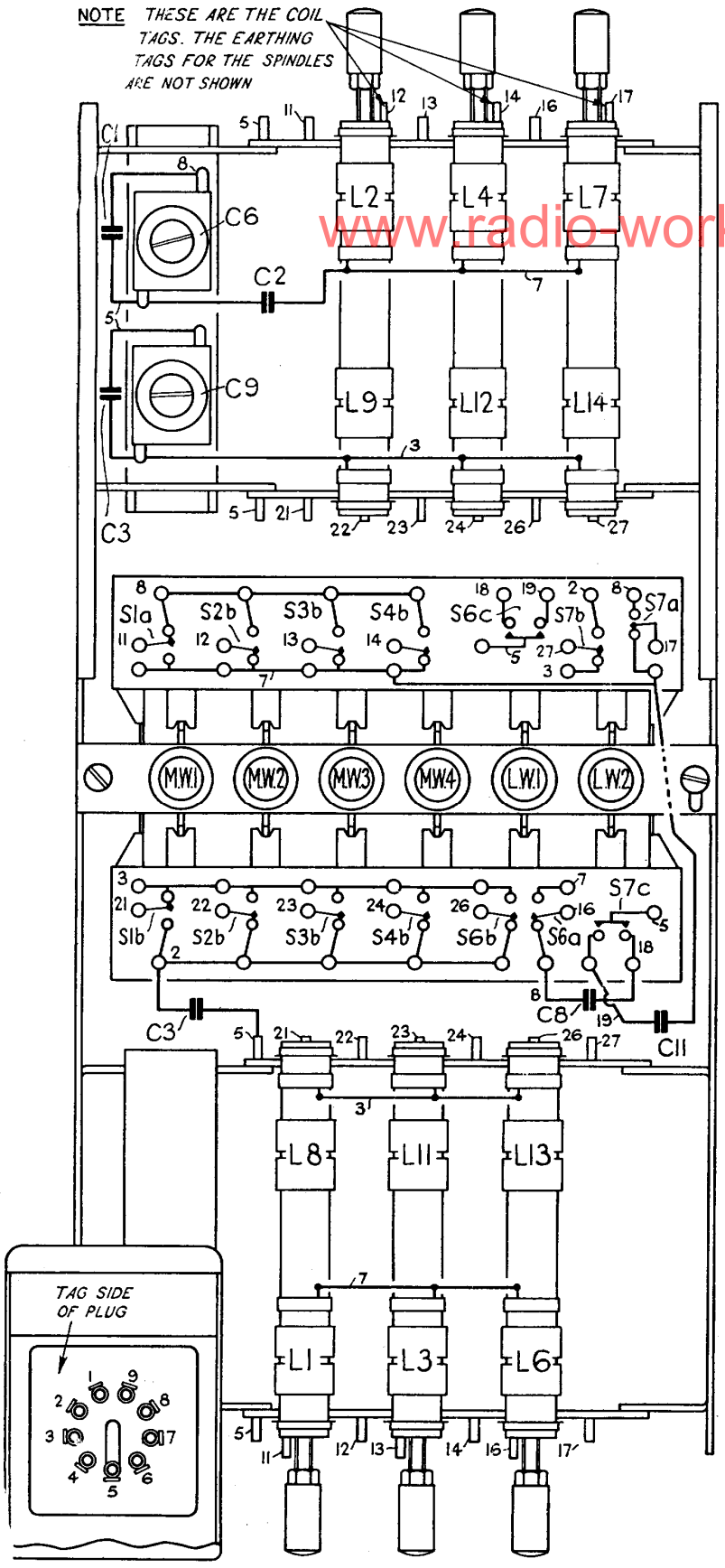
The "70" and "72" Receivers. The instructions for modifying the "70" and "72" receivers should be used in conjunction with the underside views of the chassis in the "72" Service Instruction Books.

The alterations to the "72" diode load



LEFT: THE RA80

RIGHT: THE P80



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.