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MURPHY SERVICE INSTRUCTIONS

ISSUED BY
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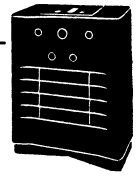
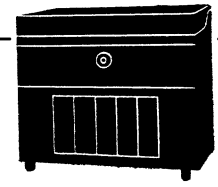


A40C



A40RG

BASIC DESIGN:	12 valve (+2 rectifiers and tuning indicator) superhet with variable selectivity, noise-suppression, automatic tuning correction, double frequency changer on short waves, push-pull output stage.
INTERMEDIATE FREQUENCY:	119 Kc/s.
WAVE RANGES:	13·9 to 50 metres. 200 to 550 metres. 900 to 2,000 metres.
MAINS SUPPLY:	200—260 volts 50—100 cycles.
VALVES:	1 Mazda AC/TP — 2 Mazda AC/SP1 3 Mazda AC/VP2 — 2 Mazda AC/4 Pen 1 Mazda AC/ME — 1 Mazda AC/TH1 3 Mazda V914 — 2 Mazda UU4
PILOT LAMPS:	6·2v. ·3 amps globular clear.
SPEECH COIL IMPEDANCE:	Console 3 ohms. R.G. 3+3 ohms.
TOTAL WEIGHT	Console 122·5 lb. R.G. 274 lb.
OVERALL DIMENSIONS:	Console 31×25×12 in. R.G. 40×41×18 in.
CONSUMPTION:	200 watts approx.

Trimming

THE trimming of this receiver is critical, and to get the best results, it should be carried out very carefully.

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

An output meter will be required, and it is suggested that an 0—3 volt rectifier type A.C. meter is used, connected across the external L.S. sockets. A milliameter is also required for checking the discriminator circuits, and this should preferably have a range of 0—10 M/a, although a meter with a slightly higher range will be suitable.

Unless an oscilloscope is used, it is 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.

It is also necessary to use an insulated screwdriver for adjusting the trimming condensers because a number of these are connected directly to the H.T. line.

For the adjustment of the A.T.C. control valve (V8) a second Service Oscillator is required. If this is unobtainable a "straight" receiver with reaction can be used instead.

Small calibration errors can be corrected by adjusting the oscillator and R.F. trimmers only but for completely re-trimming the A40, adjustments should be made in the following sequence:

1. Discriminator circuits (117·5 and 120·5 Kc/s).
2. I.F. circuits (119 Kc/s).
3. Preliminary adjustment of calibration, by means of the M.W. and L.W. oscillator trimmers.
4. R38 in A.T.C. circuit.
5. Final adjustment to oscillator and R.F. circuits including short waves.

In the following instructions the test point numbers apply to both Console and Radiogramophone models, whereas in giving the square numbers, the Console number is given first, followed by the R.G. number, e.g., Test point O, Square 18 X, R.G. 20Y, where 18X is the Console number and 20Y is the R.G. number.

THE DISCRIMINATOR CIRCUIT

1. Disconnect the wires from C51 (Tag C on W2500 condenser bank) leaving the wires connected together. This will reduce the time constant of the control circuits making the adjustment easier.
2. Disconnect the link between L13, test point 129, and H.T. line; and insert the 0—10 milliameter. (Square 18J, R.G. 18M.)
3. Switch the set to maximum selectivity.
4. Press the noise suppression A.T.C. switch down.
5. Connect the Service Oscillator across V2 control grid and chassis (test point 42, Square 33G, R.G. 36L) through an 0·1 condenser.
6. Tune the Service Oscillator to 117·5 Kc/s. Modulation switched off.
7. Adjust C55 (square 5E, R.G. 4D) for **maximum** reading on the milliameter.
8. Tune the Service Oscillator to 120·5 Kc/s.
9. Adjust C54 (Square 2D, R.G. 5D) to give a **minimum** reading on the milliameter.
10. Check both previous adjustments. Tune the Service Oscillator to 119 kc/s and note the meter reading.
11. Disconnect the Service Oscillator. If the adjustments have been correctly carried out the meter reading should be identical to that given when the Service Oscillator was connected. If a discrepancy of more than about 0·2 M/a between the two readings occurs, then it will be necessary to repeat the whole procedure.

THE I.F. CIRCUIT

1. Re-connect C51 (Tag C on W2500 bank).
2. Remove the milliameter and re-solder the link to L13 (Test point 129), (Square 18J, R.G. 18M.)
3. Switch the set to maximum selectivity.
4. Press the noise suppression A.T.C. switch up.
5. Leave the Service Oscillator connected to V2 control grid, but tune to 119 Kc/s. Switch modulation *on*.
6. Tune the set to 2000 metres.
7. Connect the output meter to the external L.S. sockets.
8. Connect the damping unit between the signal diode anode (Test point 51, Square 14K, R.G. 8M) and chassis. Adjust C18 for maximum reading on the output meter.
9. Connect the damping unit between V2 anode (Test point 46, Square 13H, R.G. 5L) and chassis. Adjust C17 (Square 10H, R.G. 8J) for maximum reading on output meter.
10. Check the adjustments.
11. Connect the Service Oscillator across V1 signal grid and chassis (Test point 12, Square 31J, R.G. 32G).
12. Connect the damping unit between V1 pentode anode (Test point 18, Square 17K, R.G. 14K) and chassis. Adjust C16 for maximum reading on output meter.
13. Connect the damping unit across V2 grid (Test point 42, Square 36G, R.G. 36L) and chassis. Adjust C15 (Square 16K, R.G. 6G) for maximum reading on output meter.

If the trimmers were found to require only a very small adjustment, the 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 check. Finally, disconnect the damping unit.

OSCILLATOR AND R38

1. Connect an aerial and an earth to the receiver and tune in a known signal at the bottom end of the Medium Wave band (200 metre end).
2. Correct any calibration error by means of C6 (Square 19J, R.G. 15J).
3. Tune the receiver to 520 metres.
4. Leave the Service Oscillator connected to V2 control grid, but switch off modulation and tune to 119 kc/s.
5. Press the noise-suppression A.T.C. switch up.
6. Short circuit the control grid of V8 (test point 107, Square 21K, R.G. 18K) to chassis.
7. Connect a second Service Oscillator to the aerial and earth sockets of the receiver and tune it to 520 metres, with modulation off, setting it finally to give zero beat with the 119 kc signal already being fed in at V2 control grid. As previously mentioned, as an alternative to a second Service Oscillator, the reaction coil of an oscillating "straight" receiver may be coupled to the aerial and earth sockets, adjusting the oscillator stage to zero beat as described.
8. Tune the receiver to 530 metres; this will cause the signal to rise in pitch above audibility.
9. Remove the short circuit from the grid of V8.
10. Adjust the pre-set resistance R38 (Square 20L, R.G. 16K) to bring the signal back to zero beat.

THE OSCILLATOR AND R.F. CIRCUITS

1. Tune the receiver to 200 metres.
2. Adjust for maximum selectivity and press the noise-suppression A.T.C. switch up.
3. Connect the Service Oscillator to the aerial and earth sockets and tune it to 200 metres, with modulation on.
4. Adjust C6 (Square 19J, R.G. 15J), C4 (Square 17E, R.G. 15G) and C2 (Square 18B, R.G. 15C) in that order, to give maximum reading on the output meter.
5. Repeat the above adjustments, to make sure that the receiver gain is at maximum.
6. Switch the receiver to L.W. and tune to 1000 metres.

7. Tune the Service Oscillator to 1000 metres.

8. Adjust C7 (Square 19H, R.G. 15H), C5 (Square 17E, R.G. 15F), and C3 (Square 17B, R.G. 14C) in that order, for maximum reading in output meter.

9. Repeat the above adjustments, to make sure that the receiver gain is at maximum.

10. Disconnect the Service Oscillator, and connect up with aerial and earth. Check the receiver calibration on both M.W. and L.W. bands against stations of known reliability.

THE S.W. CIRCUIT

1. Switch the receiver to the S.W. band and adjust the tuning control until the cursor line registers with "5" on the S.W. scale.

2. Set the S.W. band selector to the 16-metre band.

3. Connect the Service Oscillator to the aerial and earth sockets of the receiver, and adjust it to 17·7 Mc/s (16·94 metres).

4. Adjust C68, C67, and C66 (all on S.W. gang condenser) in that order for the maximum output meter reading.

5. Check the calibration of the receiver over the whole of the S.W. range with the main tuning control set at 5 on S.W. scale. The check frequencies are given below:

Waveband	Frequency	Wavelength
13	21·5 M/cs	13·95 metres
16	17·7 „	16·94 „
19	15·25 „	19·67 „
21	14·2 „	21·13 „
25	11·9 „	25·22 „
31	9·5 „	31·58 „
42	7·15 „	41·96 „
49	6·1 „	49·18 „

If a progressive calibration error occurs towards the top of the range, or if the tracking of the three circuits goes out it will be necessary to adjust the inductance of the coils concerned. This is done by moving the last turn on the coil. L36 (Square 21G, R.G. 18G) should be adjusted for a calibration error, and L32 and L34 (Squares 18C and E, R.G. 15C and E) for tracking errors.

TABLE OF VOLTAGES A40

Valve	Type	Electrode	Test Point	Square Console	Square R.G.	Voltage
V1	Mazda AC/TP	Pentode Anode	18	16 K	14 K	**165**
		Pentode Screen	17	17 K	14 K	**165**
		Triode Anode	21	18 L	15 K	**60**
		Cathode	22	17 L	15 K	**4**
V2	Mazda AC/VP2	Anode	46	13 H	5 L	**236**
		Screen	24	14 J	4 L	**206**
		Cathode	47	14 H	4 M	**3·4**
V3	Mazda AC/ME	Anode	58	38 E	36 C	**30**
		Target	129	37 E	35 C	**236**
		Cathode	11	37 E	36 B	**0**

TABLE OF VOLTAGES (Continued) A40

Valve	Type	Electrode	Test Point	Square Console	Square R.G.	Voltage
V5	Mazda AC/SP1	Anode Screen Cathode	71 69 73	37 L 8 K 8 L	33 K 10 K 10 K	**120** **203** **20**
V6	Mazda AC/4 Pen	Anode Screen Cathode	96 129 97	6 K 6 K 6 K	12 M 12 M 12 M	**250** **236** **8**
V7	Mazda AC/4 Pen	Anode Screen Cathode	99 129 98	2 K 2 K 2 K	16 M 17 M 16 M	**250** **236** **8**
V8	Mazda AC/SP1	Anode Screen Cathode	37 129 108	28 L 22 K 21 K	25 H 18 K 18 J	**236** **236** **6**
V10	Mazda AC/VP2	Anode Screen Cathode	123 69 122	7 G 6 H 7 H	5 K 5 K 5 K	**206** **206** **4**
V11	Mazda V914	Cathode	73	5 H	3 M	**20**
V12	Mazda AC/VP2	Anode Screen Cathode	158 157 159	22 D 23 D 23 D	19 E 20 E 20 D	**115** **210** **2·7**
V13	Mazda AC/TH1	Hexode Anode Hexode Screen Triode Anode Cathode	166 162 167 164	23 F 22 F 22 F 23 F	20 G 19 G 20 G 20 F	**210** **100** **70** **2·5**
V14	Mazda UU4	Cathode	133	49 D	49 D	**360**
V15	Mazda UU4	Cathode	133	51 D	51 D	**360**
Total voltage across L.S. Fields						**80**

Voltages measured with 1000 ohms-per-volt meter. Receiver switched to maximum selectivity.—N.S. off—No signals.

Dismantling

THE chassis of the console model is secured by four bolts, and when these and the control knobs have been removed, the supporting shelf should be pulled back an inch or two before the chassis is removed.

This will cause the shelf to drop sufficiently to allow the chassis to be withdrawn without fouling the cabinet.

In replacing the chassis, care should be taken to see that it is pushed far enough into the cabinet to allow the spring, on the tuning scale assembly, to clear the rail along the back of the cabinet, before the shelf is raised and pushed back into place.

The radio gramophone chassis is removed through the top of the cabinet and as this is a little more difficult than in the case of the console model, the correct procedure is tabulated below:

1. Remove the control knobs.
2. Lift off the glass control panel.
3. Slacken the screws securing the small circular glass panel in the front of the cabinet.
4. Remove the four fixing bolts beneath the chassis. The front left-hand one is obscured by a wooden panel inside the cabinet. This panel can be removed by taking out the four wood screws securing it, or the fixing bolt may be removed by reaching behind the board with a box spanner, or strong screw-driver.
5. Remove the 10-way power plug from its socket.
6. Release the operating arm from the noise suppression switch.
7. Remove the P.U.C. leads from the panel on the side of the chassis and the aerial, earth, and loudspeaker plugs from the panel on the output transformer.
8. Push the chassis back until the volume control spindle clears the front of the cabinet: then take hold of the short bars on the front edge, and lift it out, tilting it so that the gang condenser assembly clears the lid of the cabinet.

In replacing the R.G. chassis, the following points should be borne in mind:

1. The securing screws for the front glass panel should not be tightened until the chassis is bolted in position.
2. When centring the red spot on the front glass panel, it is suggested that the receiver should be connected and switched on, as the correct point is more easily determined when the red spot is illuminated.
3. All fixing bolts and securing screws should be tightened, the wooden panel replaced (if it has been removed), top glass panel put in place, knobs put on and secured, and P.U.C. L.S. aerial, earth, and power leads replaced. The back can then be fixed in position.

It should be noted that it is unnecessary to remove the loudspeaker plugs from the panel at the bottom of the cabinet when removing the chassis.

If for any reason they have to be removed from their sockets, care should be taken on replacing them that the loudspeakers are connected in correct phase, as otherwise serious lack of bass will result.

No trouble should be experienced in the removal and replacing of the power pack chassis, since the fixing arrangements are quite straightforward.

Fault Finding Table

SYMPTOMS	CAUSE AND CURE
Low gain all bands Gram normal	Low gain on 2nd I.F.T. due to losses introduced by a chemical action which takes place when a rubber lead is in contact with the silk covering of the winding, and this is easily identified by discoloration of the silk. Replace coil assembly, and also the lead, by pull-back wire, or cover the rubber wire with systoflex. Finally re-trim.
Distortion on strong signals. ME overlapping.	Possibly due to one section of L28 being O/C or S/C turns. Replace and re-trim.
Instability	R49 low resistance L6 O/C C6 O/C C13 O/C or low capacity } Replace and retrim if necessary. Other decoupling components wrong value or O/C
A.T.C. pulling off tune	L26 or L27 O/C R41 or R42, high resistance } Replace and re-trim
No signals. ME closed	R17 O/C — Replace
Lack of bass in A40RG	Speakers out of phase — Reverse one set of LS leads

NOTE: Other faults should be added to this table as they are experienced by service men.

TABLE OF COMPONENTS A40

Code	Value	Test Pts.	Square Console	Square R.G.	Code	Value	Test Pts	Square Console	Square R.G.
C0	·0095	6 11	17 D	14 E	C54	Trimmer	114 116	2 D	5 D
C1a	Variable	7 11	34 C	33 C	C55	,,	11 118	5 E	3 D
C1b	,,	11 12	34 D	33 D	C56	·002	114 117	45 D	37 D
C1c	,,	11 37	34 E	33 E	C57	·002	11 117	41 F	39 E
C2	Trimmer	7 11	17 B	15 C	C58	·5	11 114	4 C	3 E
C3	,,	8 11	17 B	14 C	C59	100 pf	124 128	39 F	39 H
C4	,,	11 12	17 E	14 G	C60	·01	11 127	17 H	9 G
C5	,,	11 13	17 E	15 F	C61	8	11 129	22 J	2 M
C6	,,	11 37	19 J	15 J	C62	16	11 131	5 C	2 M
C7	,,	39 41	19 H	15 H	C63	16	11 132	53 A	53 A
C8	·1	11 16	14 D	10 E	C64	8	11 133	52 C	52 C
C9	500 pf	22 23	21 J	17 K	C65a	Variable	11 156	28 C	26 C
C10	·1	40 23	14 E	11 E	C65b	,,	11 163	28 D	26 D
C11	·1	40 41	14 B	10 B	C65c	,,	11 173	28 E	26 E
C12	·001	41 44	19 K	17 P	C66	Trimmer	11 156	27 C	26 C
C13	8	11 24	22 J	20 H	C67	,,	11 163	27 D	26 D
C14	·01	17 19	31 H	32 H	C68	,,	11 173	27 E	26 E
C15	Trimmer	17 18	16 K	6 G	C69	·025	11 157	21 C	19 C
C16	,,	42 43	15 K	6 H	C70	·025	11 159	20 B	19 B
C17	,,	46 129	10 H	8 J	C71	·001	11 161	19 E	16 E
C18	,,	49 59	36 H	7 J	C72	·025	162 164	21 D	18 D
C19	·005	26 27	19 H	10 F	C73	·01	11 164	23 E	21 F
C20	·002	21 37	19 K	17 J	C74	50 pf	171 172	21 H	18 H
C21	·1	43 47	14 B	10 B	C75	100 pf	167 173	21 F	19 F
C22	·1	11 47	14 B	10 B	C76	100 pf	11 166	20 B	18 C
C23	100 pf	48 121	41 J	38 L	C77	·005	166 174	19 B	18 B
C24	·0015	53 54	10 J	7 L	C78	8	11 69	5 C	20 H
C25	·025	11 57	3 G	4 L	C79	800 pf	55 60	—	2 K
C26	Trimmer	59 61	37 H	35 K	C80	·005	65 70	—	3 K
C27	200 pf	59 62	37 H	36 J	C81	·01	11 134	49 D	49 D
C28	·0001	11 59	37 G	35 J	C82	·01	11 136	51 D	51 D
C29	·05	63 66	10 K	6 M	C83	50 pf	59 61	10 G	—
C30	·2	71 79	7 C	3 C	C84	·002	11 70	—	3 K
C31	50 pf	72 73	10 L	5 L					
C32	25	11 73	14 L	8 P					
C33	·025	73 74	4 E	3 F	R1	5,000	16 127	16 J	9 F
C34	·025	73 76	4 E	3 G	R2	50,000	22 23	21 J	17 K
C35	·005	73 119	3 D	3 F	R3	500	40 23	14 D	10 D
C36	200 pf	73 79	7 B	3 B	R4	5,000	17 24	31 H	33 H
C37	·002	73 81	7 B	4 B	R5	100,000	26 27	15 H	11 F
C38	·005	73 82	7 B	3 B	R6	1,000	27 28	15 J	10 F
C39	·002	73 83	7 C	3 B	R7	500	29 31	16 J	10 F
C40	·005	73 86	7 C	3 B	R8	170	32 33	15 H	10 G
C41	·00125	84 88	10 B	8 B	R9	160,000	21 37	19 K	16 H
C42	300 pf	79 87	8 C	C 3	R10	3,000	24 129	16 K	9 F
C43	200 pf	73 89	7 A	4 B	R11	400	11 47	14 B	10 C
C44	75	11 97	4 K	14 L	R12	5,000	53 54	10 J	7 L
C45	75	11 98	3 K	15 L	R13	1,000	54 56	10 J	7 L
C46	·025	99 101	3 F	19 L	R14	2 MΩ	57 59	10 F	7 D
C47	310 pf	104 107	24 K	24 J	R15	1 MΩ	58 129	17 J	9 F
C48	45 pf	107 109	25 K	23 J	R16	250,000	59 63	37 H	35 K
C49	·002	106 107	21 J	17 K	R17	25,000	11 63	37 H	35 J
C50	·5	11 108	14 B	10 A	R18	50,000	64 66	9 K	6 L
C51	4	11 111	14 C	10 D	R19	100,000	66 67	10 K	6 L
C52	4·5 pf	116 123	44 D	37 E	R20	2,000	69 129	4 D	20 L
C53	4·5 pf	118 123	41 E	39 E	R21	20,000	69 71	7 C	2 B

TABLE OF COMPONENTS A40

Code	Value	Test	Pts	Square Console	Square R.G.
R22	100,000	68	72	9 L	5 L
R23	250,000	67	68	10 K	6 M
R24	375	67	73	10 L	5 M
R25	2,000	11	67	10 K	6 M
R26	1 MΩ	74	76	5 E	4 F
R27	2 MΩ	73	78	3 E	3 J
R29	50,000	11	89	41 B	1 H
R30	50,000	91	92	6 K	12 L
R31	50,000	93	94	3 J	16 L
R32	118	11	97	5 K	14 L
R33	118	11	98	4 J	15 L
R34	10,000	96	101	3 F	18 L
R35	10,000	96	101	20 K	19 L
R36	90,000	37	106	21 K	17 J
R37	300	108	109	21 K	20 L
R38	500	11	109	20 L	16 K
R39	5,000	111	112	4 C	3 E
R40	500,000	112	114	3 C	2 E
R41	1 MΩ	114	117	45 C	37 D
R42	1 MΩ	11	117	41 F	40 E
R43	1 MΩ	117	119	4 D	4 F
R44	500,000	11	121	41 H	38 K
R45	600	11	122	7 H	5 K
R46	50,000	69	123	40 F	39 J
R47	500,000	126	128	39 F	39 H
R48	1 MΩ	11	126	39 F	40 H
R49	1 MΩ	43	126	39 F	39 H
R50	1 MΩ	127	128	40 F	40 H
R51	2,000	129	157	20 D	17 D
R52	15,000	157	161	19 D	17 D
R53	300	11	159	21 B	19 B
R54	25,000	129	162	21 D	18 E
R55	5,000	129	166	20 E	17 E
R56	30,000	167	169	21 F	19 G
R58	200	11	64	21 C	18 D
R58	20,000	164	171	21 G	18 G
R59	25	11	172	21 H	18 H
R60	20,000	11	40	—	10 C
R61	1 MΩ	55	60	—	3 J
R62*	150,000	60	70	—	3 K
R63	50,000	11	70	—	3 J

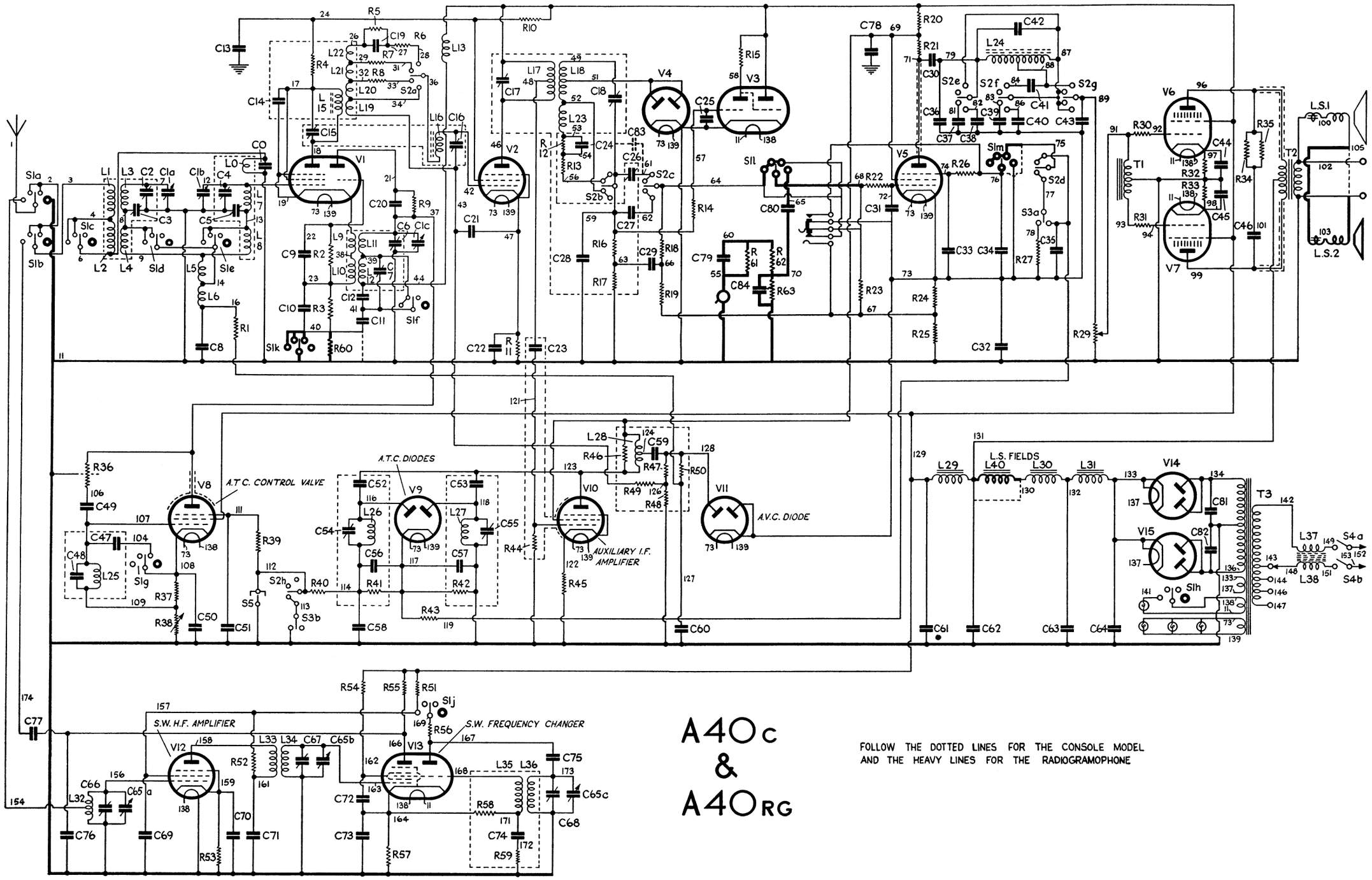
*A 500,000 resistance is placed in parallel with this when a "red spot" pick-up is used.

L0	*	6	11	30 E	29 E
L1	1·4	3	4	30 C	29 C
L2	9	4	6	30 C	29 C
L3	4	7	8	31 C	29 C
L4	12	8	9	31 C	29 C
L5	2·7	9	14	19 G	15 G
L6	*	14	16	18 G	15 G
L7	4	12	13	31 E	30 E
L8	12	9	13	31 E	29 E
L9 }	2·5	19	38	28 H	28 H
L10 }		23	38	28 H	28 J

Code	Value	Test	Pts	Square Console	Square R.G.
L11	3·5	37	39	28 H	28 J
L12	9	39	44	28 H	28 H
L13	50	44	129	18 J	18 M
L15	23	17	18	31 H	33 H
L16	24	36	42	32 K	36 G
L17	5+35	46	129	37 G	34 J
L18	16+24	49	52	37 J	36 K
L19	1	34	43	31 G	33 H
L20	1·5	32	34	31 G	33 H
L21	2	29	32	31 G	33 H
L22	2	26	29	31 G	34 H
L23	10	52	53	36 G	36 J
L24	57	79	87	44 A	39 B
L25	6	107	109	25 K	23 J
L26	18	114	116	44 D	37 D
L27	18	11	118	42 E	39 D
L28	80	69	123	39 F	39 H
L29	300	129	131	55 D	55 D
L30	400	130	132	L.S.F.	L.S.F.
L30	200	130	132	—	L.S.F.
L31	70	132	133	55 D	55 D
L32	*	11	156	18 D	15 C
L33	*	158	161	18 E	15 E
L34	*	11	163	18 E	15 E
L35	*	168	171	21 G	18 G
L36	*	11	173	4 B	18 G
L37	*	142	149	4 B	1 F
L38	*	148	151	4 B	2 F
L40	200	130	131	—	L.S.F.

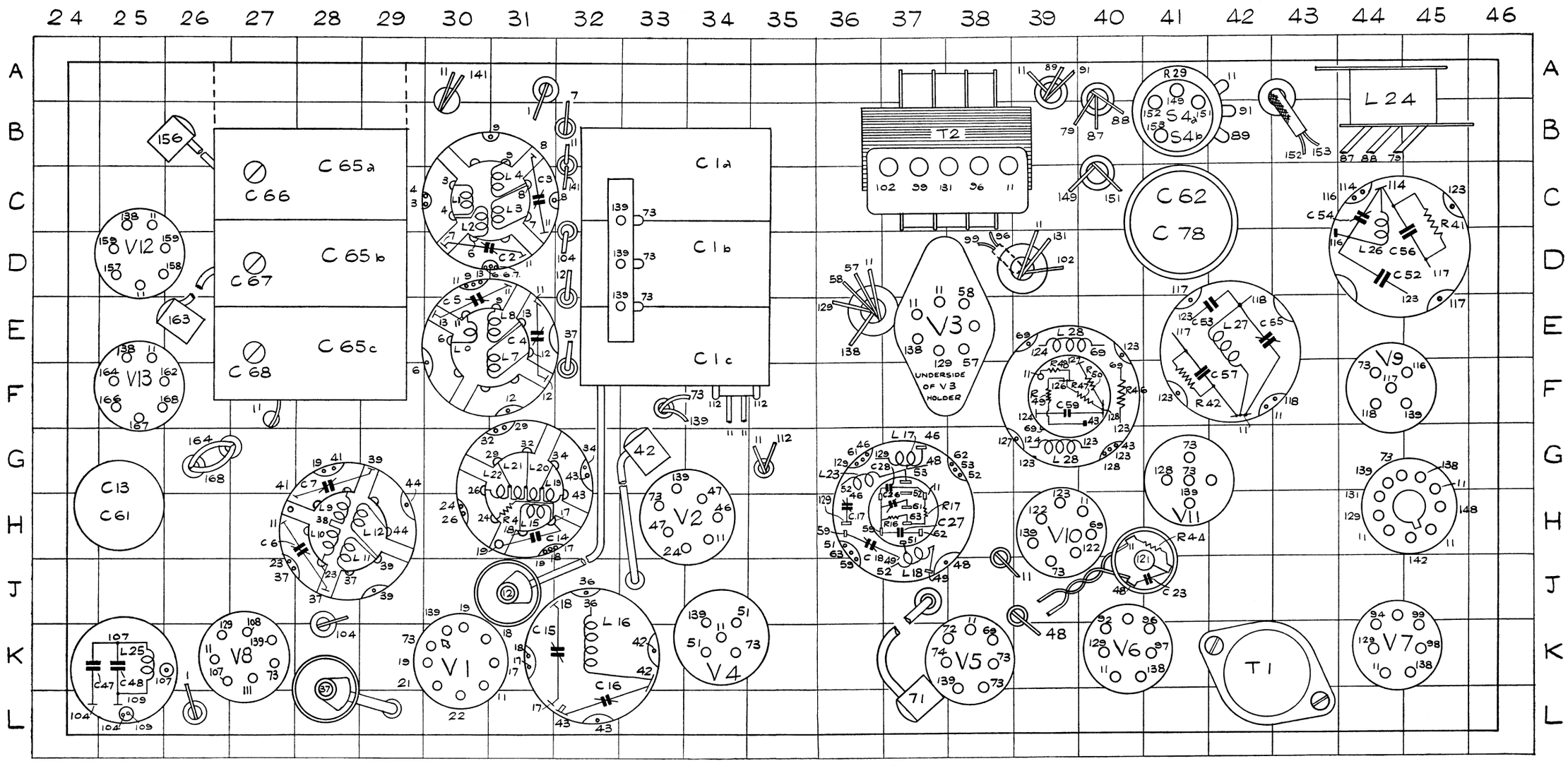
T1	360	11	91	42 K	28 K
	+530	11	93		
T2	130	96	131	37 B	23 L
Prim	+190	99	131		
Sec.	*	11	102		
T3	5·5	142	143	57 B	57 B
Prim	5·75	142	144		
	6	142	146		
	6·5	142	147		
H.T.	45	11	134		
Sec.	+45	11	136		

All values marked * less than 1 ohm

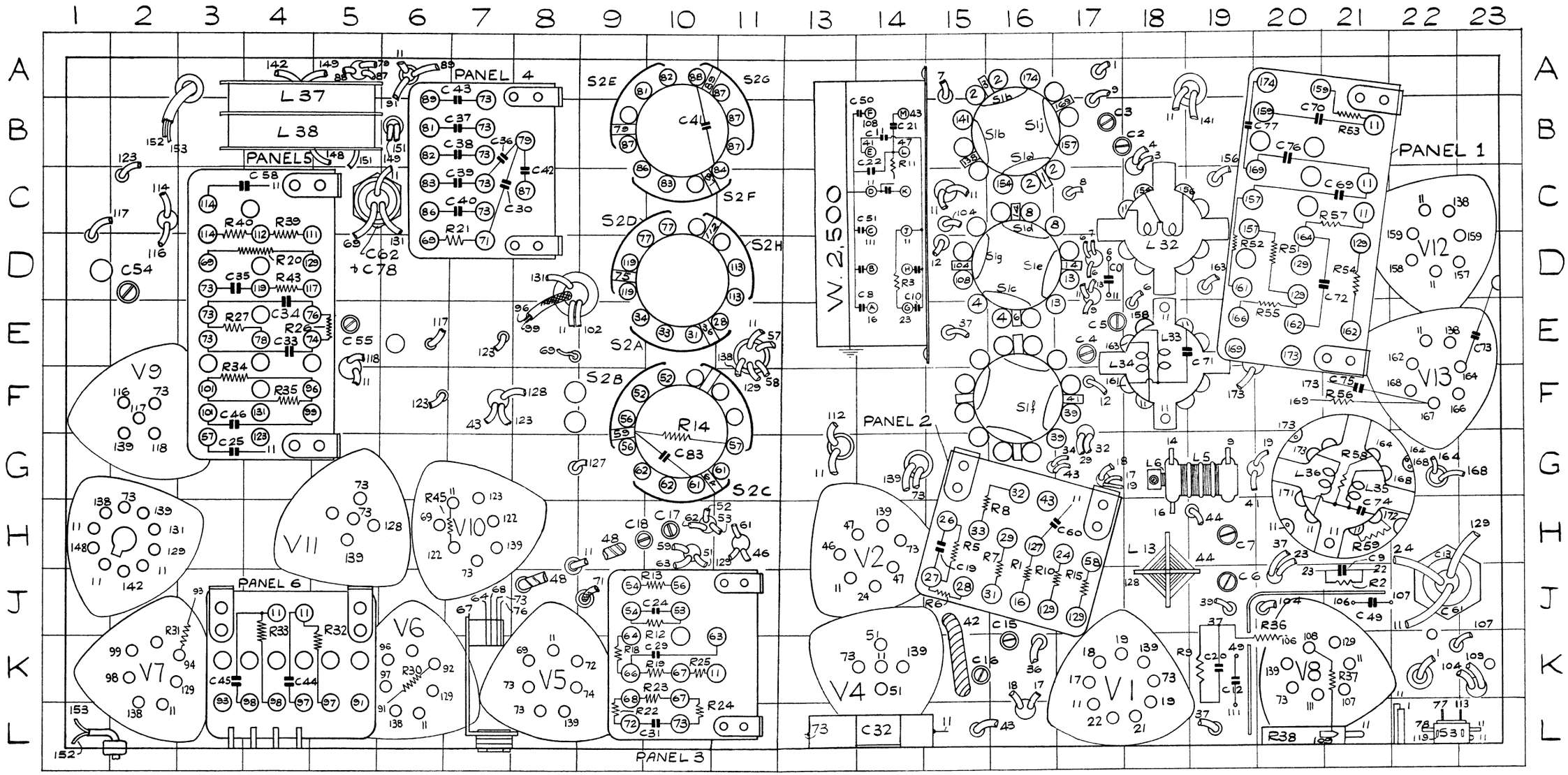


A40C & A40RG

FOLLOW THE DOTTED LINES FOR THE CONSOLE MODEL AND THE HEAVY LINES FOR THE RADIOGRAMOPHONE



A40 CONSOLE TOP VIEW



A40 CONSOLE UNDERSIDE