MURPHY SERVICE INSTRUCTIONS

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

SPECIFICATION

A50 A50C — D50 D50C

BASIC DESIGN		5 valve (+ rectifier and tuning indicator) superhet with variable selectivity and a special form of inverse feedback.
INTERMEDIATE FREQUENCY		465 Kc/s.
WAVE RANGES:		7 metres sound 16·7 to 50 metres 200 to 550 „ 950 to 2000 „
MAINS SUPPLY:	A50:	200–250 volts 50–100 cycles A.C. 100–125 „ 50–100 „ „
	D50:	200–250 volts D.C. or A.C. (25–100 cycles)
VALVES:	A50:	AC/VP2, AC/TH1, AC/VP2, HL41DD, AC/4Pen, UU4.
	D50:	VP133, TH2321, VP133, HL133DD, Pen3820, U4020.
PILOT LAMPS:	A50:	6·2v. 0·3 amp Tubular Frosted.
	D50:	3·5v. 0·15 amp Globular Frosted.
SPEECH COIL IMPEDANCE:		Table 5 ohms Console 2 ohms
TOTAL WEIGHT:		Table 50 lbs. Console 74 lbs.
OVERALL DIMENSIONS:		Table $12'' \times 17\frac{3}{8}'' \times 23''$ Console $26\frac{1}{2}'' \times 13\frac{1}{2}'' \times 27''$
CONSUMPTION		85 watts approximately.

077/10/38

Circuit Analysis

The tuning system in the "50" receiver is complicated by the switching which is arranged to remove the R.F. amplifying stage from the circuit on medium and long waves when the receiver is working close to a powerful transmitter.

THE INSTALLATION SWITCH

The switch which puts the R.F. valve in or out of circuit is referred to in the operating instructions as the "installation switch" and it is shown on the circuit diagram immediately to the right of the R.F. valve (S3a and b).

R.F. VALVE IN CIRCUIT

With the switch in the left-hand position (knob toward front on chassis), the R.F. valve is in circuit. We will consider briefly the circuit for each position of the wave-range switch under these conditions.

SEVEN METRE SOUND

With the wave-range switch in the most anti-clockwise position, the set is adjusted for seven metre (television) sound. The signal from the aerial is fed through the condenser C12 directly to the frequency changer valve (V2). The inductance of the coil (L10) in the grid circuit is variable for trimming purposes, and the variation is achieved by screwing a brass rod into the coil, thereby altering the inductance. A point to notice here is that the trimmer (C22) across the second section of the variable condenser (C1b) which is used for aligning the short wave circuit, will also affect the tuning of the 7-metre coil. The short wave circuits must therefore be aligned *before* the coil (L10) is adjusted. The oscillator circuit on this band is trimmed by the condenser (C31), and to make tuning less critical a series condenser (C37) is included in the circuit. This condenser must not be confused with the usual series padding condenser which is included in oscillator circuits to maintain alignment over the waveband, because in this case we are concerned with tuning to one wavelength only, and not with tuning over a whole waveband. Automatic volume control is not desirable on the frequency changer for this band and the A.V.C. circuit is shorted back to earth through the switch (S1k) and the short wave oscillator coil (L22). The part of the delay voltage for the A.V.C. circuit which is developed across the resistance (R46) is also shorted by the switch (S1m) thus reducing the delay by approximately 9 volts.

SHORT WAVES

The short wave coils are in circuit when the switch is in the second position. To obtain the highest signal to noise ratio on this band, the tuned aerial coil (L4) is returned to earth so that no A.V.C. is applied to the first valve. One of the delay voltage resistances (R46) is also short-circuited by the switch (S1m) as in the case of the ultra short waves.

The short wave circuits are aligned in each case by the trimmers (C7, 22, and 36) mounted on the main variable condenser.

Although the coil (L16) is not in circuit on short waves, it could cause unwanted couplings, and it is therefore short circuited through the switch (S1k).

A series padding condenser is unnecessary on this band and the oscillator coil is therefore connected direct to the tuning condenser by the switch (S1j). The oscillator stage is tuned to 465 Kc/s *below* the signal frequency on this band, and any "image" signals will therefore be received at a wavelength shorter than that of the station being received.

Maximum L.F. gain is required on short waves and on the 7 metre band and the L.F. feed to the volume control is in both cases therefore taken through the switch (S1l) from the top of the signal diode load resistances (R24 and R26).

MEDIUM WAVES

On medium waves the tuned aerial coil is connected to the A.V.C. line so that the first valve is controlled and the tuned circuit is completed through the condenser (C11).

The long wave coil is short circuited by the switch (S1c) for medium wave reception, to prevent losses through the long wave circuit.

To equalize the sensitivity over the waveband, the coupling coil (L9) is tuned by the condenser (C14) to resonate just above the top end of the waveband.

The long wave tuned coil is also shorted out in this circuit by connecting the top end of the coil back to earth through the condenser (C15) the switch (S1c) and thence through the condensers (C16 and C8).

The condenser (C15) was not included in the first few models, but it was found that some of the waverange switches could be adjusted to a position where the centre arm of section "e" connected with the medium and long wave contacts together. This, in the original circuit, allowed the H.T. supply to be applied to the grid of the frequency changer valve (through R8, L9, S1e, and S1f), causing overloading of the H.T. feed resistances and the valve. The condenser (C15) was therefore inserted to prevent the possibility of damage from this cause.

The coil (L14) which is used as a band pass coupler when the R.F. valve is out of circuit, is in series with the tuned coil (L12) while the long-wave section of this band pass unit is shorted out by the switch (S1k).

In the oscillator section a padding condenser (C38) is placed in series with the coil (L32) and variable condenser (C1c) by the switch (S1j) to maintain correct alignment over the waveband. The long wave oscillator coil (L24) is in this case short circuited by the switch (S1m).

LONG WAVES

It will be noticed that there is a resistance (R1) across the long wave aerial coil (L3). This is to prevent a resonance at the top of the medium waveband, which would cause losses on medium-wave reception. Parallel fixed condensers are placed across the long wave trimmers so that the trimmer capacity can be kept low to minimize drift. The coupling circuit (L9 and C14) which was used on medium waves is modified for long waves by including a series condenser (C16). This makes the circuit resonate towards the top of the long wave band instead of at the top end of the medium wave band as it does for medium waves. A series padding condenser (C39) is also included on this band to maintain alignment over the band.

On medium and long waves the full gain is not required in the A.F. side of the receiver, and the feed from the diode load to the A.F. amplifier valve is therefore tapped down to the junction of the two diode load resistances (R24 and R26) by the switch (S1l).

R.F. VALVE OUT OF CIRCUIT

When the installation switch (S3) is in the right-hand position (knob towards the back on the actual chassis) the R.F. valve is omitted from the circuit on medium and long waves.

The aerial tuned circuit is completed through the switch (S3a), the coils (L14 and L16), and the condenser (C21). As these components are common to the tuned circuits in the frequency changer stage, a band pass circuit is formed.

The R.F. valve (V1) is still in the aerial tuned circuit so that tuning is not affected, but instead of an amplified signal being passed through a coupling coil to the frequency changer stage, it is returned to chassis through the switches (S1a and S3b) and the condenser (C8). The coupling coil circuit is completed through the small condenser (C13) and the switches back to the valve anode to prevent it upsetting the tuning of the frequency changer stage.

The action of the other sections of the waverange switch is not affected by the operation of the installation switch.

VARIABLE SELECTIVITY AND TONE CONTROL

The switch for varying the selectivity of this receiver is coupled with tone control circuits which in three positions of the switch give the best compromise between tonal balance and selectivity for varying reception conditions. The fourth setting of the switch is arranged to cut the bass response to give improved reproduction of speech under certain circumstances.

In the table model the bass can be cut when the I.F. selectivity is lowest (to give high quality reproduction on speech reproduced above normal loudness), whereas in the Console, the bass cut is arranged to operate with the most highly selective setting of the I.F. circuits to increase intelligibility on very weak signals. The table and console models are made different in this respect largely because of the differences in the acoustic properties of the cabinets.

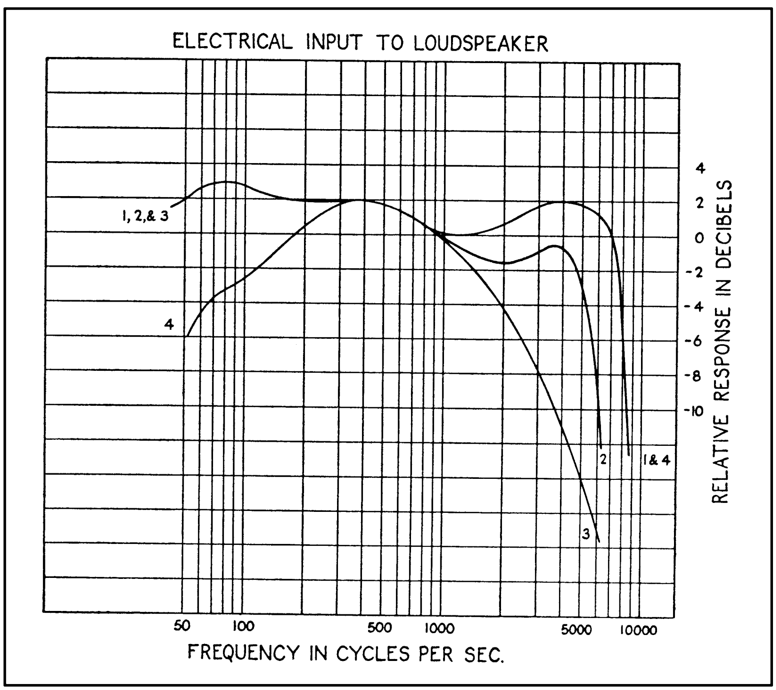
The reproduction in the high fidelity setting of the switch is of a very high order for a table model, but nevertheless a certain predominance of bass may be noticed on speech due to limitations of cabinet size. This is most noticeable on the reproduction of speech at fairly high volume levels, and the "bass cut" position on the switch is therefore provided to compensate for this limitation.

In the case of the console cabinet there is more volume, and the resonances are less noticeable. The "bass cut" for speech on the low selective setting is therefore unnecessary, but to give the customer the widest possible range of control, to suit widely varying reception conditions, a "bass cut" position has been provided to operate when the coupling of the I.F. circuits is arranged for high selectivity. This switch position is particularly useful for short wave reception when interference is bad.

The "bass cut" is arranged by passing the A.F. signal through the small condenser (C60). The condenser is short circuited on the other three positions by the switch (S2c).

From the foregoing remarks, the reason for the "open" position of the switch being at opposite ends for the table and console switch respectively, will be obvious.

The different switch arrangements for the table and console models in the I.F. coupling circuits, will also be noted. In following the diagram, the dotted lines or the heavy lines must be completely ignored, according to which circuit is being considered.



TONE CORRECTION

Tone correction in conjunction with the variable selectivity circuits is provided by means of feed-back from the output transformer secondary into the cathode circuit of the A.F. amplifier valve (V5). The amount of feed-back is variable in four degrees, and is controlled by two sections of the variable selectivity and tone control switch (S2e and S2f).

The feed-back circuit is tuned in a similar way to that adopted in the "48" receiver to give frequency compensation with a sharp cut-off. The electrical frequency responses obtained from the various combinations of inverse feed-back and I.F. coupling in the table model, are indicated in the diagram opposite. The feed-back circuit is modified in the console to suit different acoustic conditions resulting from the larger cabinet and loudspeaker.

NOISE SUPPRESSION

The noise suppression circuit is of a type which does not introduce distortion, and is the same as that employed in the "34" series.

When the noise suppression switch (S4) is closed to the left (knob in the "up" position on the actual chassis), the signal diode anode is at the same potential as the cathode, and it consequently rectifies on all signals.

When it is closed to the right (N.S. on) a circuit from the cathode of the I.F. amplifier valve (V3) is made through the suppression grid of the valve itself, and the resistances (R22, R24, and R26) to the cathode of the A.F. amplifier valve (V5). As the cathode of V5 is at a higher potential than the cathode of V3 (see voltage table) a current will pass between the suppressor grid and cathode of V3. This will cause a voltage drop across the resistances (R24, R26, and R22), and the anode of the signal diode, which is connected through the I.F. coil (L29) to the junction of the resistances (R24 and R22), will consequently be negative to the cathode. It will not, therefore, rectify any signals which have peaks of less value than this voltage difference between the electrodes, but if a stronger signal is received, rectification will commence, and as the voltage drop across the resistances will thus have been neutralized by the signal voltage, the current flow between the suppressor grid and cathode of V3 will cease and the signal diode will act as an unbiased diode, thus avoiding the distortion which occurs when biased diode circuits are employed.

PICKUPS

In the A.C. table model a pickup jack is provided which breaks the circuit from the signal diode to the V/C when the plug is inserted, and also modifies the feed-back circuit to make it suitable for gramophone reproduction. On the console model this is replaced by a double pole switch and plug arrangement, so that pickup leads need not be disconnected when not in use.

Provision for the use of pickups is not made on the universal models because of the difficulty in avoiding hum and the risk of electric shock to the user.

THE UNIVERSAL MODELS

The two "D50" circuits are fundamentally the same as the A.C. models apart from differences necessitated by the use of universal valves and the usual alterations which are necessary in receivers which are not isolated from the mains by a transformer.

A mains filter (L41 and L42) is included to prevent mains interference, and the filtered supply is then fed into the heater and pilot lamp circuits and to the anode of the rectifier valve (V7). The mains voltage is dropped through the resistances (R61 to R67) to supply the heaters, and because current in this circuit is higher than normal until the valves warm up, a thermal delay switch (S4) is included to short circuit the pilot lamps during this period. The current reaches a safe value after about seven seconds, and the switch is therefore adjusted in the factory to give from 7 to 30 seconds delay. Further adjustment will not normally be required, but should it be found necessary, it is most important to let the switch become quite cold before each attempt to adjust it, otherwise the adjustment will not be suitable when the set is switched on from cold.

To prevent the rectifier valve being overloaded at the higher mains voltages, limiting resistances (R58 and R59) are included. A resistance (R69) is also placed in series with the reservoir condenser (C71) to limit the surge current when the set is working from A.C. mains.

As the loudspeaker speech coil is connected to true earth instead of to chassis, to provide for external L.S. connections, an additional winding is included in the output transformer for the feedback circuit.

The Diagrams

THE diagrams on pages 10 to 17 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 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."

The use of the scheme is best shown by giving a practical example.

Suppose, in tracing a fault in an A50 receiver, we suspect the A.V.C. decoupling condenser; we refer to the circuit diagram and find that its number is C29. By referring to the tabulated list of values, we find that it is .01mfd. and is located in "square 5F." By referring to the square at the junction of column "5" vertically, and column "F" horizontally, on the underside view of the chassis, we find that the condenser is mounted between panel 4 and the 2nd IF assembly. The numbers inside the circles representing the tags show (from the circuit diagram) which end is connected to R19 (96) and which to the chassis (11) without the necessity of checking wiring. Reversing the process, any tag or terminal on the receiver can be identified on the circuit diagram by referring to its number.

In the underside and top views a table model is shown, but a small diagram is included indicating the variable selectivity switch contacts for the console model.

A composite circuit diagram is used for the table and console models. For the A50 and D50 table models, the heavy lines should be ignored and the dotted lines treated as full. For the console, 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.

Signals which are sufficiently powerful to operate the A.V.C. circuit will cause a variation in the voltage at points where A.V.C. is applied.

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. This method is fully described in the operating instructions supplied with our All-Wave Service Oscillator Type M1. It is also described in the "28" Service Manual on page 10.

Checking points for the higher I.F. range are not given in these instructions, but the stations listed below can be used, and as they will beat with the second harmonic of the service oscillator in each case, it should be quite easy to adjust the two inputs to give the required beat.

STATION	FREQUENCY	SERVICE OSCILLATOR FREQUENCY
	Kc/s	Kc/s
Milan	814	407
Berlin	841	420.5
London Regional	877	438.5
Hamburg	904	452
Radio Toulouse	913	456.5
Brussels, No. 2	932	466
Breslau	950	475
Post Parisien	959	479.5
NorthIrelandReg.	977	488.5
Hilversum, No. 2	995	497.5

THE OUTPUT METER

We suggest the use of a 0 to 3 volt rectifier type voltmeter, placed across the loud-speaker 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.

The correct sequence for completely retrimming is I.F.'s (465 Kc/s) S.W., M.W., L.W., and 7-metre sound. 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 trimmer positions are marked on the chassis plan view, and may also be located by the square numbers in brackets.

The selectivity switch (S2) should be adjusted for maximum selectivity before trimming is commenced.

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.

I.F. TRIMMING

1. Connect the output meter across L.S. terminals.

2. Clip the flexible lead of the damping unit to chassis and the resistance end to the signal diode anode of V5 (square 4J, test point 80).

3. Tune the receiver to the top end of the long wave scale and switch (S2) to maximum selectivity.

4. Connect the service oscillator between the control grid of V3 (square 31T, test point 68) 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 C51 (square 34R) for maximum reading on the output meter.

7. Remove the damping unit from V5 diode anode, and clip it to anode of V3 (square 6J, test point 67). Adjust C54 (square 33R).

8. Connect the service oscillator between the control grid of V2 (square 29Q, test point 33) and chassis via the dummy aerial. Switch the receiver to medium waves.

9. Remove the damping from V5 anode and apply it to V3 control grid (square 31T, test point 68). Adjust C42 (square 30T).

10. Remove the damping from V3 grid and apply to V2 hexode anode (square 10H test point 36). Adjust C46 (square 30T).

If the trimmers are 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 adjustment.

It is always advisable to check the R.F. circuits after I.F. adjustments.

The accuracy of long wave calibration depends upon the accuracy of the I.F. trimming.

S.W. TRIMMING

Connect the service oscillator between the aerial and earth sockets of the receiver and the output meter across the L.S. terminals. Tune both the oscillator and the receiver to 21 metres. Adjust C36 (square 30P). It will be found that the signal can be received at two settings of this condenser. The correct adjustment is the one with the higher capacity, that is, the second point when screwing in the trimmer screw. The other is the "image."

When the oscillator trimmer has been adjusted, set the other short wave trimmers C22 (square 30O) and C7 (square 30M) to give maximum gain. A fairly accurate adjustment of the short wave trimmers can be made by tuning to a known station on about twenty metres and trimming for the best results judged by ear, but care should be taken to tune to the highest capacity setting on the oscillator trimmer.

After adjustment, check that the 16-metre band still registers correctly at the bottom of the scale, as too much trimmer capacity may throw it out.

M.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.

2. Tune the receiver and oscillator to 220 metres, and switch in the R.F. stage by pushing the installation switch knob towards the front of the chassis.

3. Adjust the oscillator trimmer C32 (square 31S), the grid trimmer C17 (square 27P), and the aerial trimmer C3 (square 27M) in that order. Repeat for final adjustment.

4. If possible, check the calibration on the local broadcast station.

L.W. TRIMMING

1. Connect the service oscillator to the aerial and earth terminals, and the output meter to the L.S. terminals.

2. Tune receiver and oscillator to 1,000 metres and switch the R.F. stage into circuit.

3. Adjust the oscillator trimmer C33 (square 31R) to correct calibration, and the trimmers C18 (square 27Q), and C4 (square 27M) for maximum gain.

7-METRE SOUND

When the 7-metre oscillator trimmer (C31) is adjusted, great care must be taken to tune to the correct frequency, and not to the "image" frequency.

When the set is correctly trimmed an image signal will be heard *below* the correct setting on the dial.

If the trimmers are only slightly out of adjustment, set the dial to the correct trimming point and adjust the oscillator trimmer (square 32P) to give the maximum signal. The adjustment is very critical and it is quite easy to tune past the correct point without realizing it. The adjustment must therefore be made very carefully.

When the oscillator trimmer has been adjusted, release the lock nut on the coil trimmer L10 (square 28O) and adjust the screw until maximum gain is obtained. Adjust both trimmers again to obtain greater accuracy, and finally check to see that the image signal is tunable below the correct setting.

If the trimming is completely out of adjustment, tune the receiver until the station is heard, then tune back to the correct point by small stages, readjusting both trimmers at each stage. This procedure is recommended because the sensitivity on this band is very low unless the two circuits are aligned, and if attempts are made to find the correct setting of the oscillator trimmer without simultaneously adjusting the other trimmer no signal will be received and adjustment will therefore be impossible.

Fault Finding

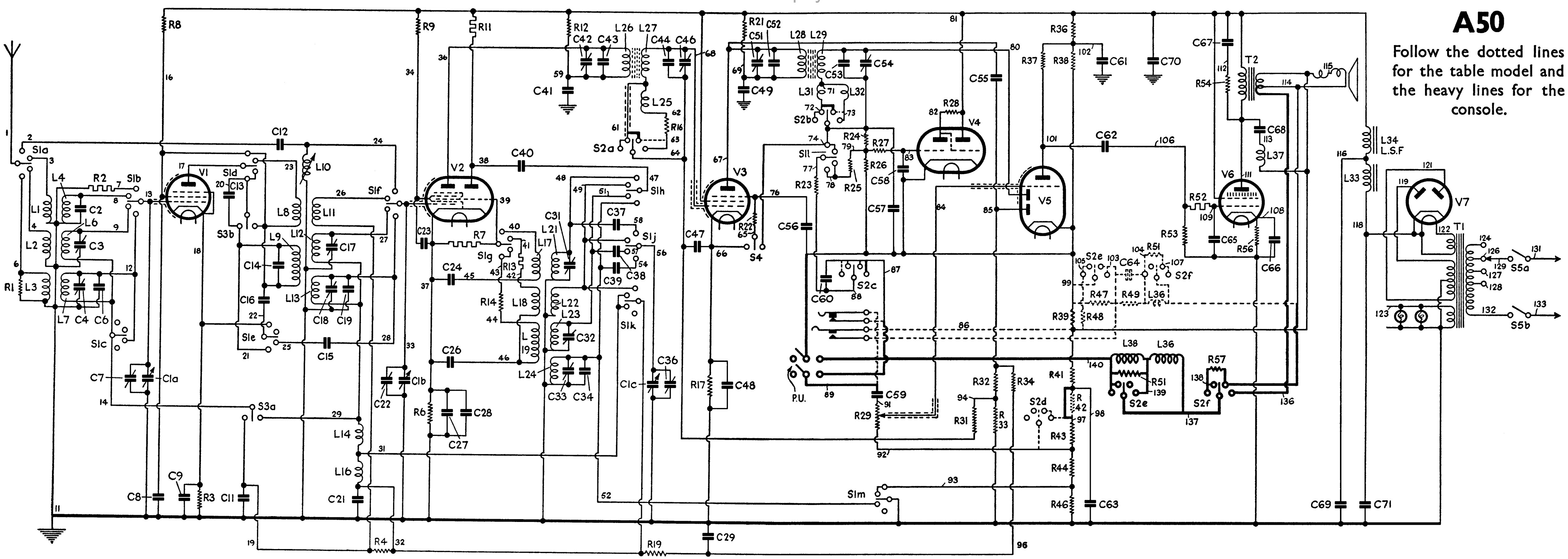
The table below is included to assist service men in recording systematically, faults which develop in the "50" receivers.

Some known faults have been included to start the table, and these should be added to by the serviceman from information published in the Murphy News and from faults which develop in the field.

Symptoms	Cause
No signals or weak signals	Speech coil o/c. I.F. transformers s/c turns
Instability	C16, C11, C29, s/c or o/c
Distortion	T2 s/c turns A.V.C. voltage s/c to earth
Hum	V6 Heater leak to cathode

A50

Follow the dotted lines for the table model and the heavy lines for the console.



CODE	VALUE	TEST PTS.		SQUARE
C1a	Variable	11	13	29 M
C1b	”	11	33	29 N
C1c	”	11	56	29 P
C2	10 pf	8	11	12 A
C3	Trimmer	9	11	27 M
C4	”	11	12	27 M
C6	30 pf	11	12	22 V
C7	Trimmer	11	13	30 M
C8	·1	11	16	15 E
C9	·025	11	18	16 D
C11	·1	11	19	15 E
C12	20 pf	2	24	10 C
C13	20 pf	21	20	13 F
C14	30 pf	21	16	12 F
C15	·002	25	28	9 C
C16	·001	16	22	9 D
C17	Trimmer	11	27	27 P
C18	”	11	28	27 Q
C19	20 pf	11	28	25 V
C21	·1	11	32	15 F
C22	Trimmer	11	33	30 O
C23	·025	34	37	12 H
C24	50 pf	37	45	8 H
C26	200 pf	37	46	7 H
C27	·05	11	37	12 J
C28	·01	11	37	10 H
C29	·01	11	96	5 F

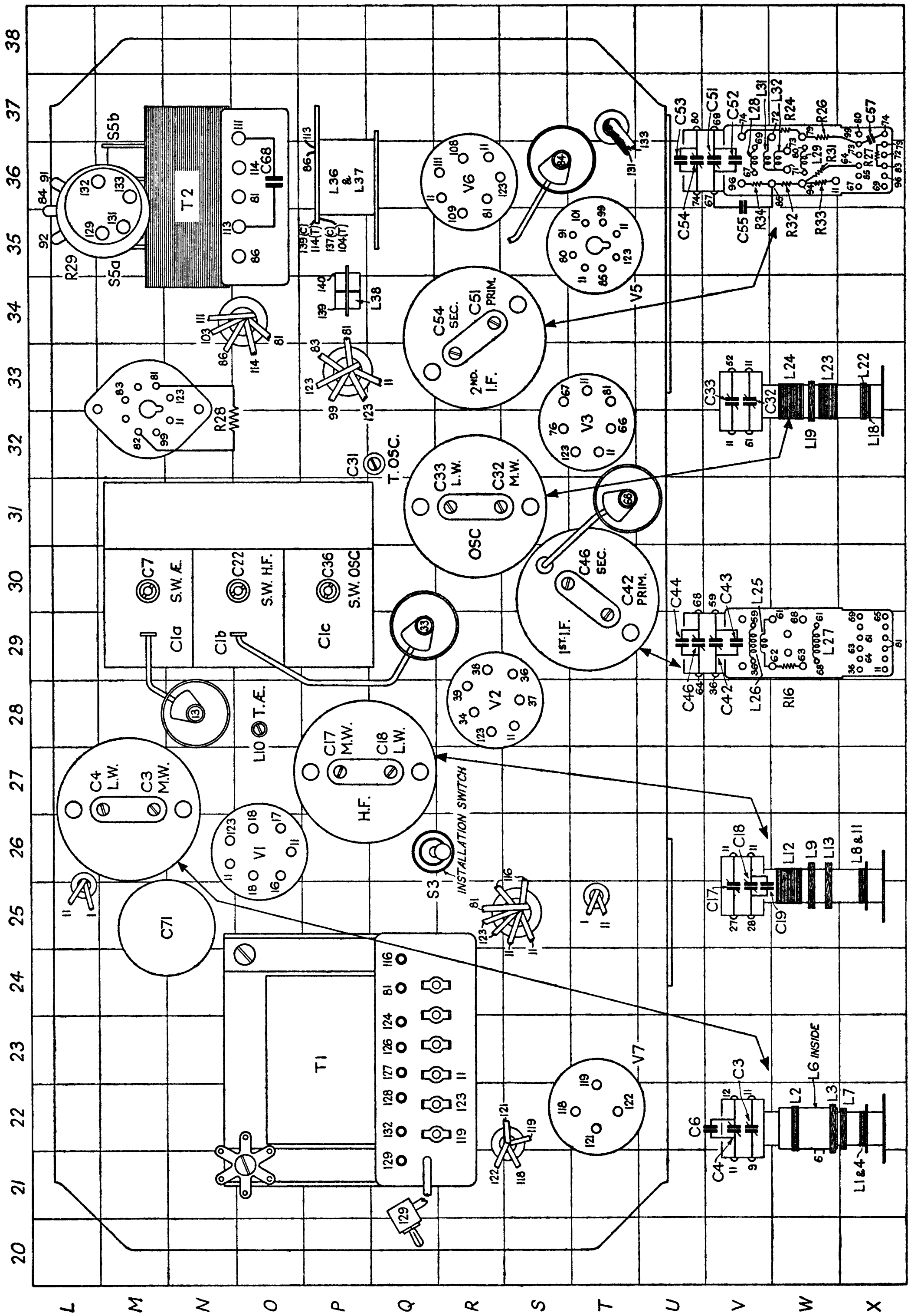
CODE	VALUE	TEST PTS.		SQUARE
C31	Trimmer	11	48	32 Q
C32	Trimmer	11	51	31 S
C33	”	11	52	31 R
C34	220 pf	11	52	8 G
C36	Trimmer	11	56	30 P
C37	30 pf	48	58	9 D
C38	703 pf	51	57	9 E
C39	386 pf	52	54	9 F
C40	100 pf	38	47	10 G
C41	·025	11	59	12 H
C42	Trimmer	36	59	29 T
C43	125 pf	36	59	29 V
C44	125 pf	64	68	29 U
C46	Trimmer	64	68	30 S
C47	·05	64	66	9 J
C48	·025	11	66	7 J
C49	·1	11	69	6 E
C51	Trimmer	67	69	34 R
C52	100 pf	67	69	36 V
C53	125 pf	74	80	36 U
C54	Trimmer	74	80	33 R
C55	50 pf	67	85	35 V
C56	·05	76	99	5 H
C57	100 pf	74	99	5 G
C58	·05	83	99	6 F
C59	·003	89	91	3 J
C60	T 500 pf	87	88	4 C

CODE	VALUE	TEST PTS.		SQUARE
C60	C·001	87	88	
C61	8	102	11	17 F
C62	·2	101	106	4 E
C63	20 35v	11	98	7 B
C64	·6	103	104	7 D
C65	200 pf	11	109	3 H
C66	75 12v	11	108	3 E
C67	·04	112	81	2 E
C68	·002	111	113	36 O
C69	8	11	116	17 F
C70	16	11	81	17 G
C71	8	11	118	14 C
R1	20,000	6	11	9 A
R2	50	7	11	8 B
R3	200	18	11	13 D
R4	25,000	19	32	16 F
R6	200	11	37	12 J
R7	20,000	37	39	11 G
R8	5,000 ½w	16	81	15 E
R9	25,000 1w	34	81	13 J
R11	33,000 ½w	38	81	10 H
R12	5,000	59	81	13 J
R13	100	41	42	9 F
R14	1,000	43	44	9 G
R16	28	62	63	29 W
R17	300	66	11	7 J
R19	25,000	32	96	15 G

CODE	VALUE	TEST PTS.		SQUARE
R21	2,000	69	81	6 E
R22	1MΩ	76	65	8 J
R23	100,000	77	88	5 C
R24	300,000	74	79	36 W
R25*	1 MΩ	78	79	7 F
R26	300,000	79	99	36 W
R27	1·5 MΩ	79	83	5 G
R28	1 MΩ	81	82	32 N
R29	1 MΩ	91	92	35 L
R31	1 MΩ	94	64	36 W
R32	800,000	85	94	36 W
R33	800,000	11	94	36 W
R34	2 MΩ	85	96	36 V
R36	2,500	81	102	5 E
R37	50,000	102	101	4 E
R38	40,000 1w	99	102	4 E
R39	100	99	86	6 B
R41	25	86	98	6 B
R42	100	98	97	6 C
R43	{ T 35	92	97	6 C
	{ C 150	92	97	
R44	500	92	93	7 C
R46	1,300	11	93	10 F
R47	150	103	99	6 A
R48	83	86	105	5 B
R49	250	104	103	7 B
	* Delete on Console			

CODE	VALUE	TEST PTS.		SQUARE
R51	{ T 500	104	107	3 A
	{ C5,000	139	140	
R52	50,000	106	109	4 G
R53	100,000	11	106	4 F
R54	4,000 1w	111	112	2 E
R56	114 1w	11	108	2 G
R57	60	114	138	
L1	——	3	11	12 B
L2	1·5	4	11	13 B
L3	10	6	11	12 B
L4	——	8	11	12 B
L6	4	9	14	12 B
L7	12	12	14	12 B
L8	——	16	23	12 E
L9	16	16	21	12 F
L10	——	24	11	11 D
L11	——	26	19	12 E
L12	4	27	29	12 E
L13	12	28	29	12 F
L14	·2	29	31	15 A
L16	3	31	32	15 A
L17	——	40	45	8 H
L18	——	42	46	7 H
L19	2	44	46	7 H
L21	——	48	11	8 G
L22	——	49	11	7 G

CODE	VALUE	TEST PTS.		SQUARE
L23	2·5	51	11	7 G
L24	4	52	11	7 G
L25	——	61	62	29 V
L26	5	36	59	29 V
L27	5	61	68	29 W
L28	5	67	69	36 V
L29	5	80	71	36 W
L31	——	72	71	36 V
L32	——	71	73	36 W
L33	122	116	118	17 B
L 34	{ T 630	81	116	L.S.F.
	{ C 900	81	116	L.S.F.
L36	{ T 250	104	114	36 P
	{ C 250	139	137	36 P
L37	250	113	86	36 P
L38	C 10	140	139	34 P
T1 Prim				
200–213v	18	132	128	} 23 P
214–228v	20	132	127	} 23 P
229–244v	22	132	126	} 23 P
245–260v	24	132	124	} 23 P
H.T. Sec.	125	11	119	} 23 P
	+135	11	121	} 23 P
T2 Prim	130	81	111	36 N
L.S.	T 5 }	114	86	
Sp. Coil	C 2 }			


T1
T2
V1
V2
V3
V5
V6
V7
C71
H.F.
OSC
2ND. I.F.
1ST. I.F.
INSTALLATION SWITCH
S3
C1a
C1b
C1c
S.W. Æ.
S.W. H.F.
S.W. OSC
T. Æ.
T. OSC.
L6 INSIDE
L36 & L37
L38
R28
R29
S5a
S5b
C68
L1&4
L8&11
L27
R16

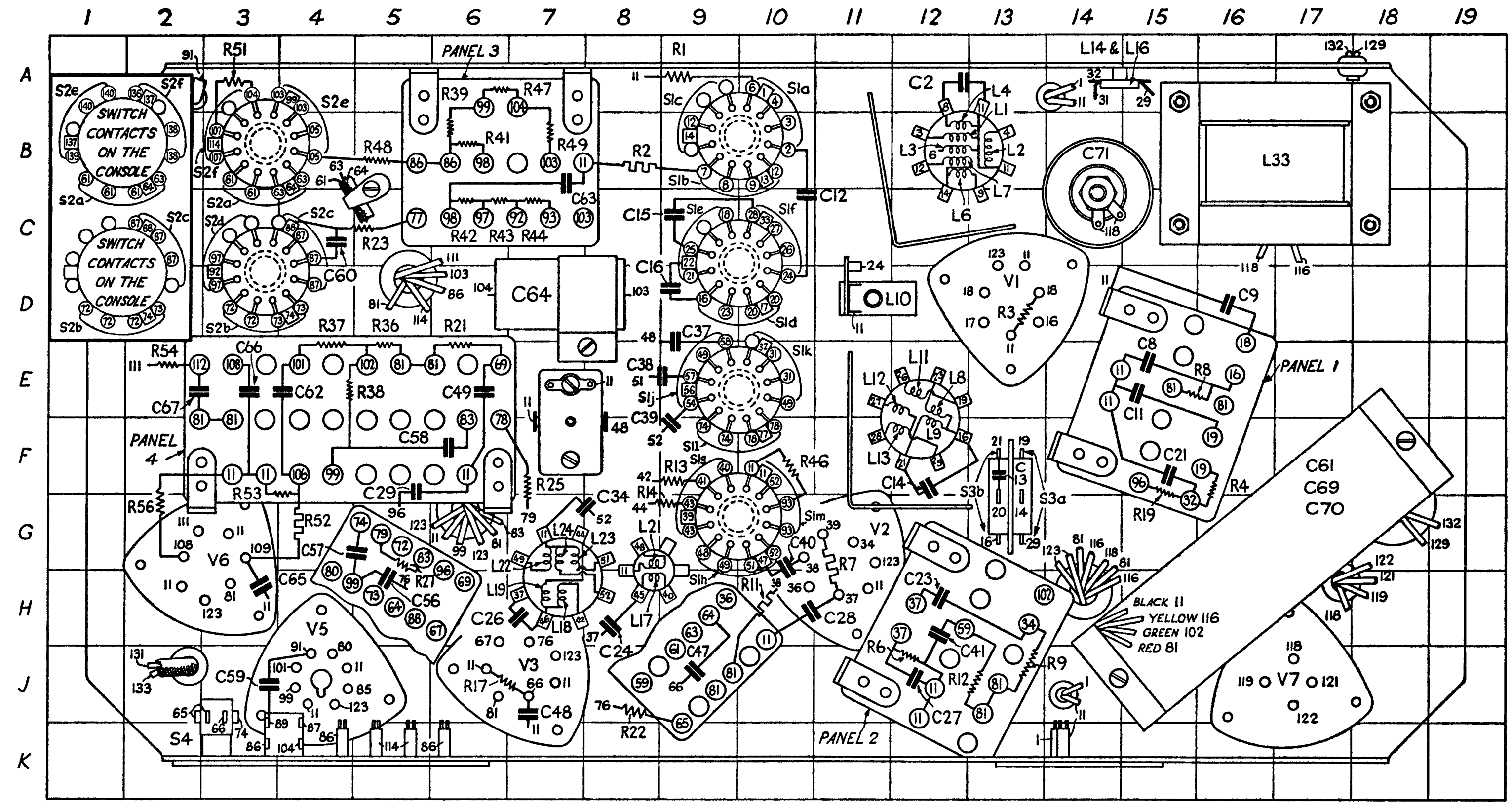
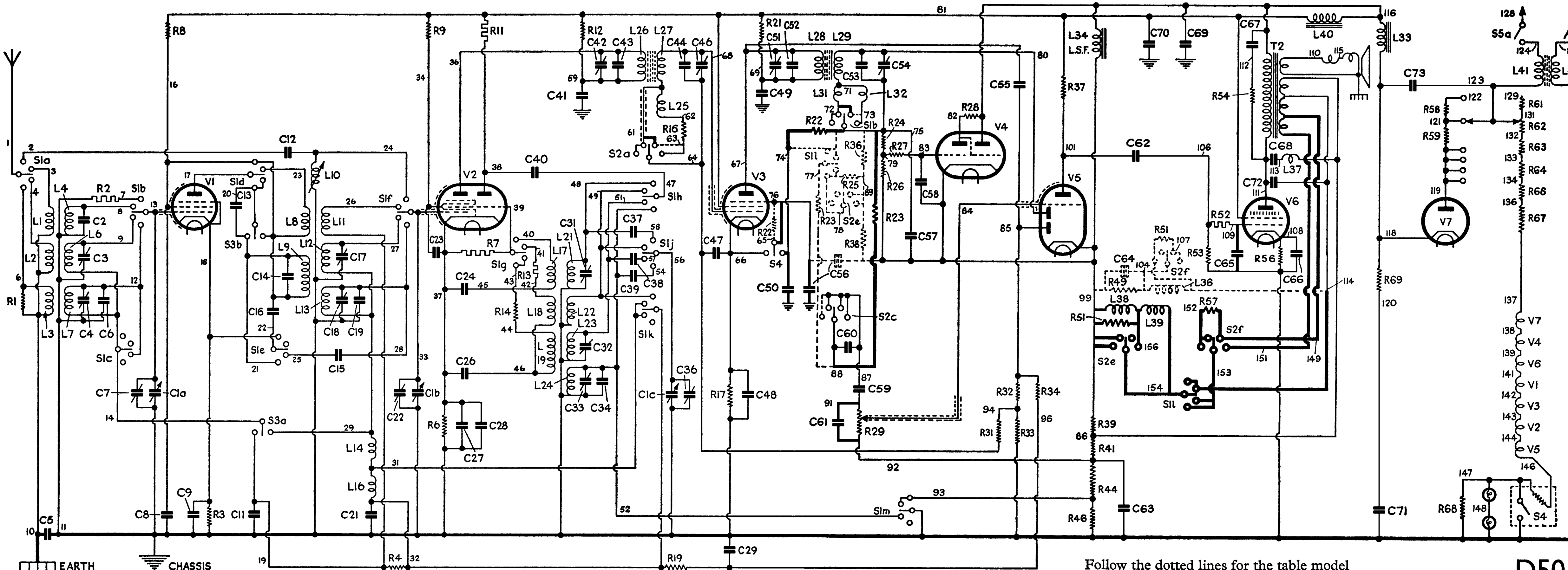


TABLE OF VOLTAGES A50

	V1		V2 HEX		V2 TRIODE		V3		V4 TRIODE		V4 C.R.		V5		V6		V7	
	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts
ANODE	17 13D	170	36 10H	200	38 10G	60	67 6J	200	82 32 M	20	81 33M	220	101 3J	95	111 3G	210		
SCREEN	16 13D	170	34 11G	85			81 6J	220							81 3H	220		
CATHODE	18 13D	1·6	37 11H	2·1	37 11H	2·1	66 7J	3	99 32M	14	99 32M	14	99 3J	14	108 2G	7	118 17J	300



Follow the dotted lines for the table model and the heavy lines for the console.

D50

CODE	VALUE	TEST PTS.		SQUARE
C1a	Variable	11	13	29 M
C1b	„	11	33	29 O
C1c	„	11	56	29 P
C2	10 pf	8	11	12 A
C3	Trimmer	9	11	27 M
C4	„	11	12	27 M
C5	·1	10	11	14 K
C6	30 pf	11	12	21 V
C7	Trimmer	11	13	30 M
C8	·1	11	16	15 E
C9	·025	11	18	15 C
C11	·1	11	19	15 E
C12	20 pf	2	24	10 B
C13	20 pf	21	20	13 F
C14	30 pf	21	16	12 F
C15	·002	25	28	9 C
C16	·001	16	22	9 D
C17	Trimmer	11	27	27 P
C18	„	11	28	27 Q
C19	20 pf	11	28	27 V
C21	·1	11	32	14 E
C22	Trimmer	11	33	30 O
C23	·025	34	37	12 H
C24	50 pf	37	45	10 H
C26	200 pf	37	46	7 H
C27	·05	11	37	12 J
C28	·01	11	37	10 J
C29	·01	11	96	5 H
C31	Trimmer	11	48	32 Q

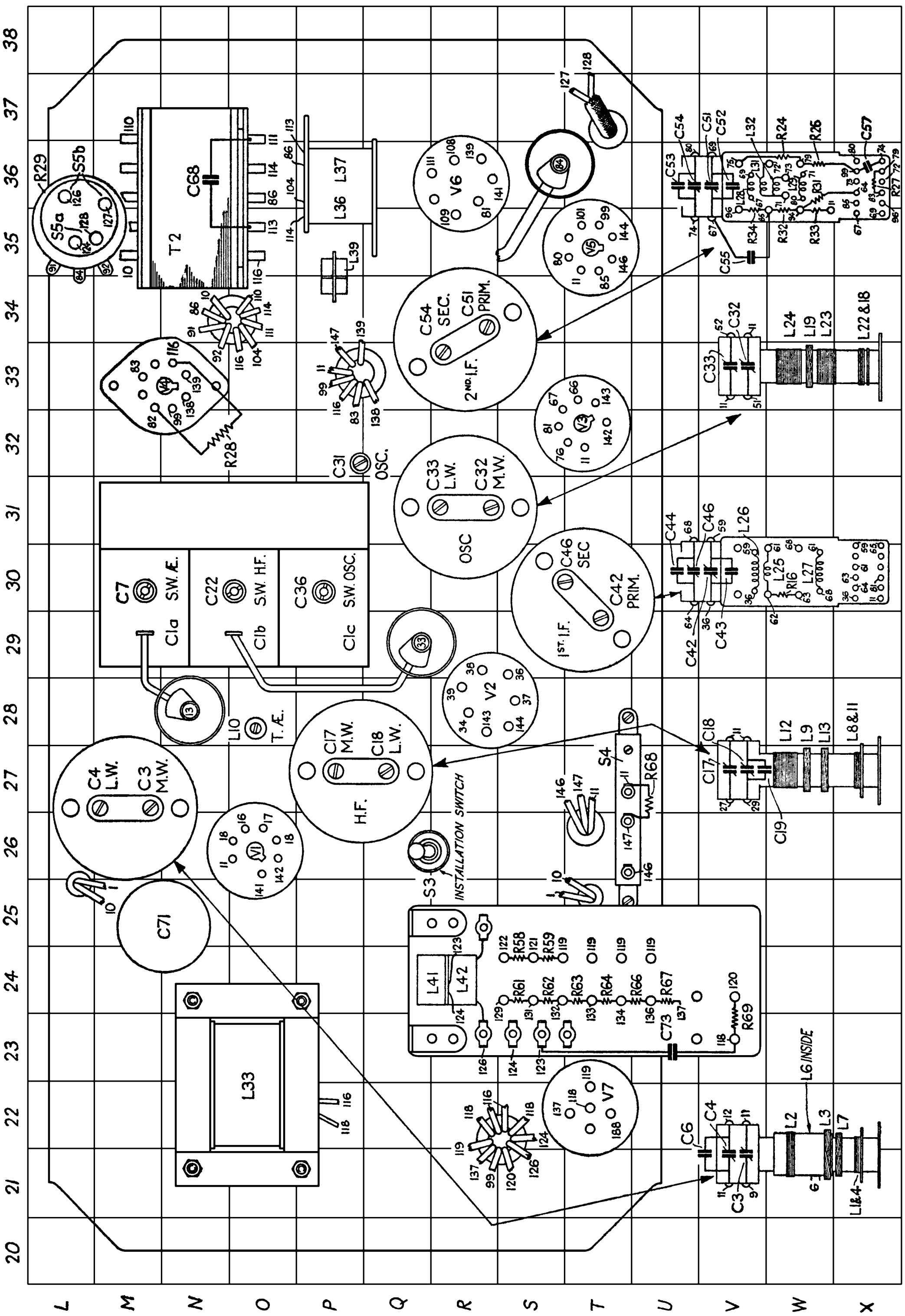
CODE	VALUE	TEST PTS.		SQUARE
C32	Trimmer	11	51	31 R
C33	„	11	52	31 R
C34	220 pf	11	52	8 G
C36	Trimmer	11	56	30 P
C37	30 pf	48	58	9 D
C38	703 pf	51	57	8 E
C39	386 pf	52	54	8 F
C40	100 pf	38	47	10 H
C41	·025	11	59	12 J
C42	Trimmer	36	59	29 T
C43	125 pf	36	59	29 V
C44	125 pf	64	68	31 U
C46	Trimmer	64	68	30 S
C47	·05	64	66	9 H
C48	·025	11	66	6 J
C49	·1	11	69	6 F
C50	·025	11	74	
C51	Trimmer	69	67	34 R
C52	100 pf	67	69	36 V
C53	125 pf	75	80	36 U
C54	Trimmer	75	80	33 R
C55	50 pf	67	85	35 V
C56	T ·05	76	99	4 H
	C ·025	76	11	
C57	100 pf	75	99	4 G
C58	·05	83	99	5 F
C59	·003	87	91	7 D
C60	T 500 pf	87	88	4 C
	C ·001	87	88	

CODE	VALUE	TEST PTS.		SQUARE
C61	50 pf	91	92	17 F
C62	·2	101	106	4 E
C63	25 25v.	11	92	7 B
C64	·6	99	104	7 D
C65	200 pf	11	109	3 H
C66	75 12v	11	108	3 E
C67	·04	112	116	2 E
C68	·002	111	113	36 N
C69	32	11	116	17 C
C70	16	11	81	17 C
C71	16	11	120	14 C
C72	·001	111	114	
C73	·04	118	123	23 U
R1	20,000	6	10	15 A
R2	50	7	11	9 B
R3	200	18	11	13 C
R4	25,000	19	32	16 F
R6	200	11	37	12 J
R7	20,000	37	39	11 G
R8	5,000 ½w	16	81	15 E
R9	10,000 ½w	34	81	13 H
R11	20,000 ½w	38	81	9 J
R12	5,000	59	81	13 H
R13	100	41	42	9 F
R14	1,000	43	44	9 G
R16	28	62	63	30 W
R17	200	66	11	6 J
R19	25,000	32	96	15 F

CODE	VALUE	TEST PTS.		SQUARE
R21	2,000	69	81	6 E
R22	1 MΩ	76	65	8 J
R23	T 100,000	77	88	5 C
	C 100,000	75	88	
R24	300,000	75	79	36 W
R25	650,000	78	89	5 B
R26	300,000	79	99	36 W
R27	1·5 MΩ	79	83	5 G
R28	1 MΩ	116	82	32 N
R29	1 MΩ	91	92	35 L
R31	1 MΩ	94	64	36 W
R32	800,000	85	94	36 W
R33	800,000	11	94	36 W
R34	2 MΩ	85	96	36 V
R36	500,000	89	75	6 C
R37	50,000	81	101	4 E
R38	800,000	99	89	6 B
R39	100	99	86	6 A
R41	25	86	92	6 B
R44	83	92	93	7 C
R46	600	11	93	7 B
R49	250	104	99	7 C
R51	T 1,500	114	107	3 A
	C 5,000	99	156	2 B
R52	T 5,000	106	109	4 G
	C 50,000	106	109	
R53	100,000	11	106	4 F
R54	2,000 1w	111	112	2 E
R56	130 1w	11	108	2 G

CODE	VALUE	TEST PTS.		SQUARE
R57	60	152	149	1 A
R58	120 2w	121	122	24 S
R59	25 ½w	119	121	24 S
R61	50	129	131	24 S
R62	50	131	132	24 S
R63	50	132	133	24 T
R64	50	133	134	24 T
R66	50	134	136	24 U
R67	203·5	136	137	24 U
R68	51	11	147	27 U
R69	50 2w	118	120	23 V
L1	—	3	10	12 B
L2	1·5	4	10	13 B
L3	10	6	10	12 B
L4	—	8	11	12 B
L6	4	9	14	12 B
L7	12	12	14	12 B
L8	—	16	23	12 E
L9	16	16	21	12 F
L10	—	24	11	11 D
L11	—	26	19	12 E
L12	4	27	29	12 E
L13	12	28	29	12 F
L14	·2	29	31	14 A
L16	3	31	32	15 A
L17	—	40	45	8 H
L18	—	42	46	7 H
L19	2	44	46	7 H

CODE	VALUE	TEST PTS.		SQUARE
L21	—	48	11	8 G
L22	—	49	11	7 G
L23	2·5	51	11	7 G
L24	4	52	11	7 G
L25	—	61	62	30 w
L26	6	36	59	30 V
L27	6	61	68	30 W
L28	6	67	69	36 V
L29	6	80	71	36 W
L31	—	72	71	36 V
L32	—	71	73	36 W
L33	122	116	118	22 O
L34	5,000	99	116	L.S.F.
L36	T 250	104	114	36 P
L37	250	113	86	36 P
L38	C 250	99	156	34 P
L40	700	116	81	15 H
L41	2·5	123	124	24 R
L42	2·5	11	126	24 R
T2 Prim	130	116	111	36 N
L.S.	T 5	10	115	
	C 2			


T2
L33
C71
C68
L36 L37
L39
V1
V2
V3
V4
V5
V6
V7
C7 S.W. Æ.
C22 S.W. H.F.
C36 S.W. OSC.
C1a
C1b
C1c
C4 L.W.
C3 M.W.
C17 M.W.
C18 L.W.
H.F.
C33 L.W.
C32 M.W.
OSC
C46 SEC
C42 PRIM.
1ST. I.F.
C54 SEC.
C51 PRIM.
2ND. I.F.
INSTALLATION SWITCH
S3
S4
R68
L10 T. Æ.
C31 OSC.
R28
R29
S5a
S5b
L41
L42
C73
R69
L6 INSIDE
L1&4
L8&11
L22 & 18
L12
L9
L13
L24
L19
L23
C19
C55
L26
L25
L27
R16
L32
R24
R26
C57
R27
R31
R32
R33
R34
C53
C54
C51
C52
C44
C46
C42
C43
C6
C4
C3
C2
C17
C18
C33
C32
L2
L3
L7
R58
R59
R61
R62
R63
R64
R66
R67
L M N O P Q R S T U V W X
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

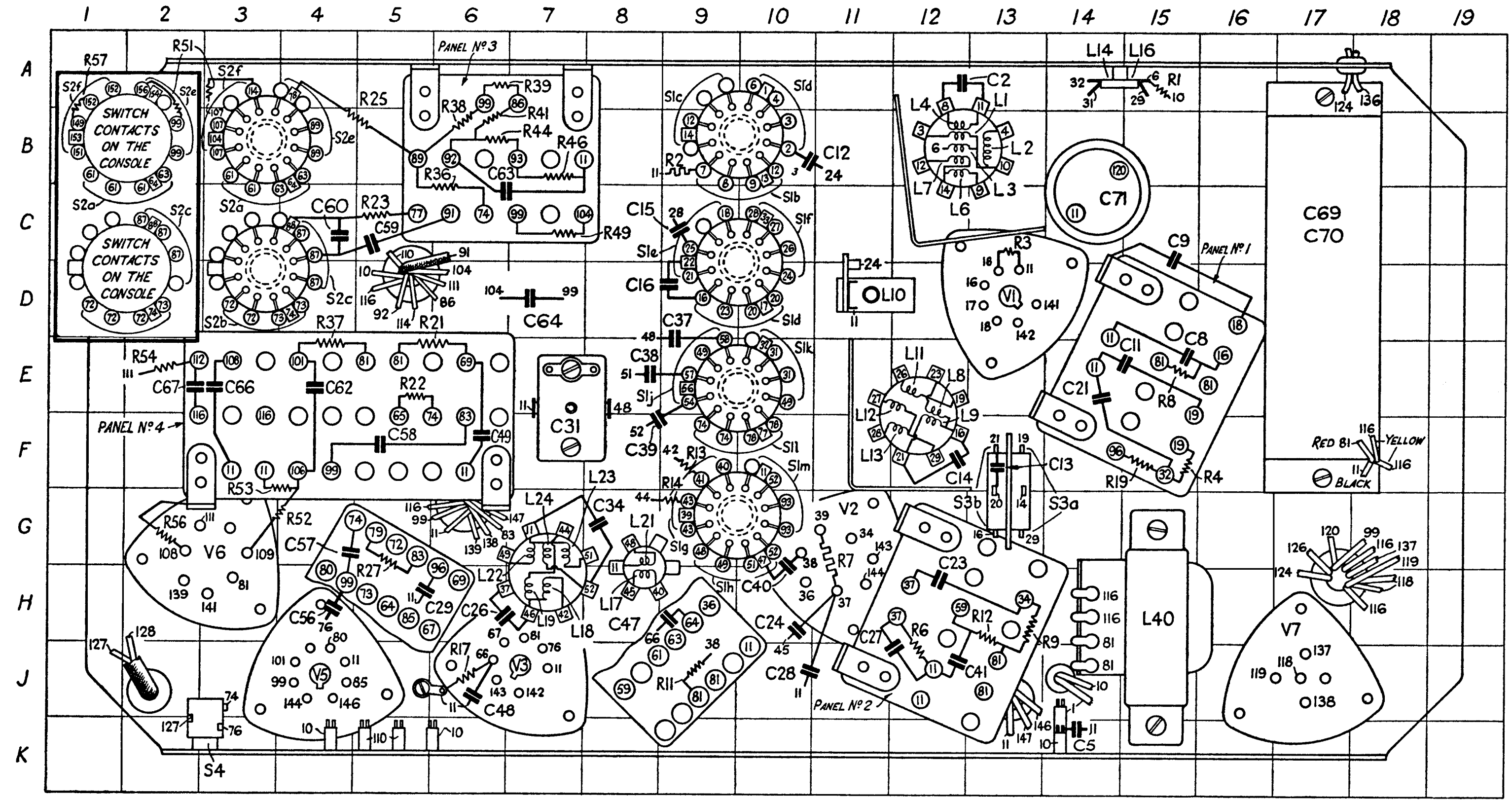


TABLE OF VOLTAGES

D50

	V1		V2 HEX		V2 TRIODE		V3		V4 TRIODE		V4 C.R.		V5		V6		V7	
	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts	Located	Volts
ANODE	17 13D	100	36 10H	125	38 10G	50	67 6J	120	82 33M	30	116 33N	160	101 4J	100	111 3G	160	119 16J	
SCREEN	16 13D	100	34 11G	80			81 7H	140							81 3H	140		
CATHODE	18 13D	1·4	37 11H	2·4	37 11H	2·4	66 6J	2·2	99 33N	21	99 33N	21	99 4J	21	108 2G	6.5	118 17J	180

Mechanical Details

The chassis can be removed from the cabinet very easily if the correct procedure is adopted, but if attempts are made to force them considerable difficulty will be experienced. We have therefore tabulated the instructions for each model so that they can be followed stage by stage.

TABLE MODEL

1. Remove the control knobs, the back of the receiver, and the loudspeaker plugs.

2. Remove the four fixing bolts. In some cases it will be necessary to remove the wooden strip under the right hand end of the cabinet looking from the back. This strip is held by five wood screws.

3. Slacken the bolt which holds the back left hand fixing bracket to the chassis and push the bracket round to allow the chassis to be withdrawn without fouling the cabinet.

THE CONSOLE

1. Remove the control knobs, the back of the receiver, and the loudspeaker plugs.

2. Remove the screw securing the top of the tuning frame.

3. Slacken the fixing bolts to allow the chassis to drop sufficiently to make the small bracket on the top of the tuning frame accessible.

4. Remove the bracket by taking out the two screws.

5. Remove the fixing bolts and withdraw the chassis.

WIRING

It is most important, when components are changed to replace the wiring in original positions. This applies particularly to earthing wire, where it will be noticed that in several instances components are not earthed to the nearest earthing tags, but to the ones where they will not cause unwanted couplings between the circuits.

THE TUNING CONDENSER

To remove the tuning condenser, the leads should be unsoldered from the wave range switch and earth tags, as the tags of the tuning condenser itself are not accessible. There are three earthing points, one above, and two below the chassis. The short lead above the chassis should be disconnected by unscrewing the earth tag, and the two below the chassis should be unsoldered.

Remove the three fixing screws and drive pulley. The condenser can then be lifted out.

To fit a new condenser, first solder the leads to it. They must be kept as short as possible and it is particularly important that no loops of leads are left between the condenser tags and the top of chassis. These loops would add to the stray capacities, alter the short wave inductances, and give feed back between the circuits.

The earth leads must be connected to the correct points, otherwise gain and image suppression will be reduced.

THE PILOT LAMPS

The pilot lamps can be replaced by pulling the bracket away from the tuning drum and carefully pulling the flexible lead through the retaining clip until the lamps are accessible.

When the bracket is replaced be careful that it is pushed right home, and that the soldering tags are pushed flat, otherwise there is a risk of short circuit to the tuning frame when the drum is rotated. On the A.C./D.C. model the drum frame is insulated from the main tuning frame and if they touch one another, one of the pilot lamps will be short circuited.

THE TUNING DRUM

To remove the tuning drum, first take the drive cord tension spring from its hook on the condenser drive pulley and detach the cord. Withdraw the pilot lamp carrier from the back of the drum (by giving it a sharp pull) and remove the top pivot screw. The drum can now be tilted back and lifted out.

THE CHART

The chart may be removed by taking off the clamping plate at the back of the drum. A new chart should be placed around the drum and held securely at each end with strong elastic bands or lengths of wire. It is important that it should be held tight against the drum, otherwise calibration errors will occur. See that the holes through which the drive cord is threaded are not covered by the chart and that the top and bottom edges of the chart are square with the ends of the frame.

When the chart is securely held the clamping plate can be replaced and the rubber bands removed.

To prevent the charts becoming soiled it is a good plan to rub french chalk over the fingers before handling the tuning drum assembly.

THE CONDENSER DRIVE PULLEY

The condenser drive pulley should be adjusted on the condenser spindle to reach the "stop" in a clockwise direction when the condenser vanes are fully in mesh.

THE CORD DRIVE

To fit a new cord drive the station name panel and the tuning drum must first be removed.

Thread the cord through the two holes near the bottom edge of the tuning drum, pulling it through from the outside until the two ends come together. Refit the drum in the bearings. Pass the two ends around the drum in opposite directions and through the hole at the bottom of the tuning frame.

Pass the cord from the front of the drum round the back of the horizontal guide pulley and round the condenser drive pulley, pushing the end through the small hole in the rim.

The cord from the back of the drum must be passed around the vertical guide pulley, between the condenser drive pulley and the condenser drive mechanism and finally through the hole in the rim of the condenser drive pulley.

Thread the tension spring over the two ends of the cord and hook the other end on to the lug on the condenser drive pulley.

Pull the ends of the cord to keep the drive under tension and rotate the condenser drive pulley in a clockwise direction until it reaches the stop. The end of the scale on the drum (just above 550 metres) should now register with the index line on the station name panel. If it does not register, adjust it by pulling one end of the drive cord further through the spring, allowing the other end to run back a little to keep the tension constant.

When the drum has been made to register correctly clamp the cord close to the spring, keeping it under tension until it has been secured, and then cut off any spare cord.

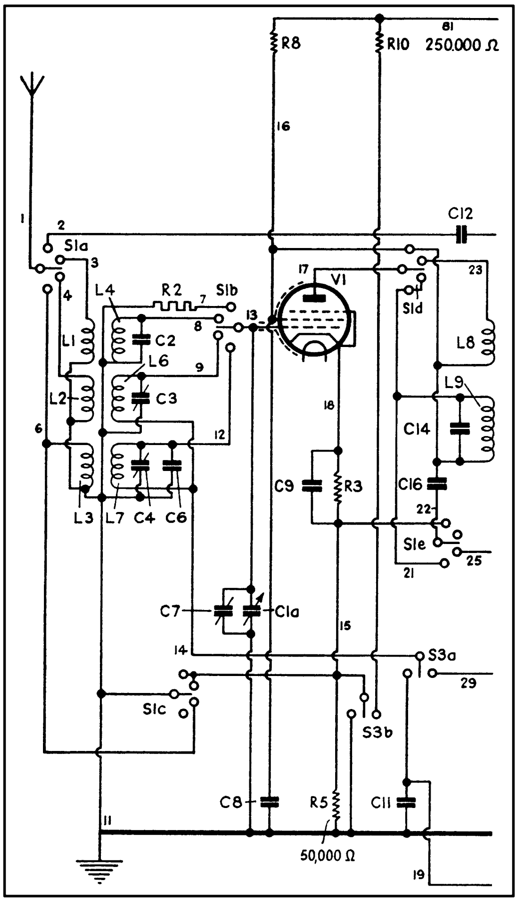
THE STATION NAME PANEL

The station name panel can be removed by undoing the securing screws.

Four screws hold the escutcheon assembly to the tuning frame, four more hold the panel frame to the escutcheon, and eight hold the panel to the panel frame. When replacing the name panel it should be assembled so that the vertical angle brackets are *behind* the scale frame, otherwise the drum will rub the scale. Bakelite spacing washers were used between the escutcheon and the tuning frame in the earlier models, but these were replaced with rubber ones to give greater clearance between the drum and the scale. When replacing the escutcheon see that the names register correctly with the markings on the drum.

Modifications

The R.F. circuit in the "50" has been modified to apply a large bias to the R.F. valve when it is cut out of the circuit (by pulling the installation switch towards the back of the chassis). This is achieved by the circuit shown below.



The modification is incorporated in all receivers above the following serial numbers:

A50	148802	A50C	161069
D50	157540	D50C	164150

It has been introduced to prevent grid current flowing in the first valve when the receiver is working within two or three miles of a powerful transmitter. It should therefore be unnecessary for dealers to modify the earlier type of circuit.

If, however, the set is to be operated very close to a powerful transmitter, and it is found that, with the installation switch towards the back of the chassis (H.F. stage out) reception from the local station is distorted and there is an excessive number of whistles on the medium wave-band, the modification should be carried out in the following order.

1. Remove R3 from V1 valve holder and mount it between tag 18 and the adjacent blank tag on panel 1.
2. Transfer the earthed end of C9 to this point and fit a 50,000 ohms resistor between here and chassis.
3. Remove the green tracer wire from tag 16 on S3 and tag 16 on the adjacent coil assembly.
4. Connect a 250,000 ohms resistor between tag 81, panel 1 and the tag on S3 to which the green tracer was previously connected.
5. Remove C15 from S3. Disconnect the blue tracer wire from the centre tag and connect it to point 21 on the coil assembly.
6. Remove the bare wire from this tag and connect it to chassis, thus connecting one side of S3 to chassis.
7. From the centre tag of S3 take a yellow tracer wire to the junction to R3 and the new 50,000 ohms resistance and thence to the two blank tags on S1c.
8. Remove the green wire from between tag 14 on S1c and the coil assembly, and connect this switch tag to chassis.
9. Remove R.1. and disconnect the link wire from S1b test point 12 and connect it to S1a test point 6, so that point 12 on S1c and point 6 on S1b become linked. **In the D.C. models this link must be replaced by a .002 mfd. tubular condenser, to prevent a D.C. circuit being made between chassis an actual earth.**