48

MURPHY SERVICE INSTRUCTIONS

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

SPECIFICATION

A48 A48RG D48 D48RG

BASIC DESIGN:		4 valve (+ rectifier) superhet with special form of inverse feedback.
INTERMEDIATE FREQUENCY:		465 Kc/s.
WAVE RANGES:		16.7 to 50 metres. 200 to 550 „ 950 to 2000 „
MAINS SUPPLY:	A48:	200-250 volts 50-100 cycles A.C. 100-125 „ 50-100 „ „ (Radio gramophone 50-60 cycles only)
	D48:	200-250 volts D.C. or A.C. (25-100 cycles). (Radio gramophone 25-60 cycles only, on A.C.)
VALVES:	A48:	AC/TH1, AC/VP2, AC/HLDD (or octal, HL41DD) AC/5Pen, UU4.
	D48:	TH2320, VP1322, HLDD1320, PenDD4021, or TH2321, VP133, HL133DD, Pen3820, U4020.
PILOT LAMPS:	A48:	6.2 v. 0.3 amp Tubular Frosted.
	D48:	3.5 v. 0.15 amp Globular Frosted.
SPEECH COIL IMPEDANCE:		2 ohms.
TOTAL WEIGHT:		Table 35 lbs. Radiogramophone 100 lbs.
OVERALL DIMENSIONS:		Table $12\frac{1}{2}'' \times 18\frac{1}{2}'' \times 19\frac{1}{2}''$ Radiogramophone $32'' \times 18'' \times 37''$

Circuit Analysis

IN the "48" receiver the signals from the aerial are fed through an aerial coupling coil (L2 or L3) to an inductively coupled band-pass unit (L6, 7, 8, and 9) for medium and long waves but on the short wave band the aerial coil (L1) is directly coupled to the single tuned grid coil (L4). The three sets of coils are connected to a common low potential point and the high potential ends are taken to the contacts of the wave range switch (S1b and S1c) which connects the coils selected to the tuning condensers (C1a and C1b).

The long wave coils have fixed parallel trimmers (C3 and 4). The medium wave aerial circuit trimmer (C6) is mounted on the variable condenser frame, and the medium wave grid coil trimmer (C2) is on the chassis. The trimmer (C7) mounted on the second section of the variable condenser (C1b) aligns the short wave tuning coil (L4).

The trimmers are all identified on the chassis plan view.

The tuned R.F. signals are fed into a triode hexode valve (V1) where they are mixed with the signals from the local oscillator circuit.

The oscillator circuit also employs a parallel coil arrangement, each coil having a separate trimmer. All have a common low potential connection, and the high potential ends are taken to a third section of the wave range switch (S1e). In this case, however, another section of the switch (S1f) is used to short circuit the long wave coil (L16) during medium wave reception, to prevent energy absorption by the coil and its associated padder (C18). On medium waves there is a series padder (C22) only, but on long waves there are both series (C23) and parallel (C18) padding condensers.

The circuit arrangement adopted allows the oscillator trimmer of any wave-band to be adjusted without affecting the trimming of the other two bands.

The oscillator circuit is tuned to 465 Kc/s above the signal frequency on the medium and long wave bands, but on short waves it is tuned to 465 Kc/s *below* the signal frequency and any "image signals" on this wave-band will therefore be received at a wavelength below that of the station itself.

The two I.F. transformers (L17, 18, and L19, 21) have coils wound on iron dust cores and the capacities tuning the transformers are made up of fixed condensers with a small trimmer in parallel. The fixed condensers, which are of a particularly constant type, form the greater part of the capacity, and the effect of any drift which may occur in the trimmer is therefore reduced to a minimum.

The signals, amplified by the I.F. valve (V2) are fed on to the signal diode of the valve (V3) and the rectified signal is developed across the load resistances (R12 and 13).

The rectified carrier voltage, smoothed by the resistance and condenser (R11 and C8) is fed to the first two valves to give automatic volume control.

A filter for I.F. is provided by the resistance and condenser (R12, C39) and the L.F. voltage is passed through C37 (and the radiogram switch or the pickup jack) to the volume control. In the radiogram the filter condenser (C39) is omitted as the screened lead to the switch for the pickup is of sufficiently high capacity to make the condenser unnecessary.

Pickup jacks are only fitted to the A.C. models as the difficulty of overcoming hum and risk of electric shock make these fittings undesirable on A.C./D.C. receivers.

On the radio-gramophones the pickup is connected across the volume control (through a transformer in the D.C. model) by the gramophone switch (S3b). Another section of this switch (S3a) breaks the H.T. supply to V1 triode on gramophone to prevent this valve oscillating

and so to prevent break-through of radio signals, while section S3d cuts out the negative feed back circuit and section S3c introduces the additional tone correcting resistance (R20). In the D48RG there is a potentiometer (R10) across the pick-up to eliminate hum when the receiver is working on positive earthed D.C. mains. It is adjusted in the factory, but in cases where hum is abnormal on gramophone it must be readjusted while the set is working on the customer's mains.

The L.F. signals amplified by the valve (V3) are passed through the condenser (C43) and the "grid stopper" resistance (R22) to the output valve; a beam tetrode capable of giving 5 watts output at 5 per cent total harmonic.

There is a small correction circuit formed by C45 and R25 to prevent instability in the output stage and the tone control circuit is returned to R26 because of the negative feed back circuit connections.

NEGATIVE FEED BACK

Negative feed back is introduced on medium and long waves, which not only reduces gain to a suitable level for these bands, but also greatly improves the frequency characteristic. Although the I.F. transformers are arranged to give a fairly flat resonance curve, a certain amount of attenuation of the higher audio frequencies is inevitable, in order to provide adequate selectivity. The negative feed back is arranged to compensate for this and give a practically flat response curve with a sharp cut off at 5000 cycles.

The system employed is to feed the signal from the secondary of the output transformer into the cathode circuit of the L.F. valve (V3) through a coil (L23) which is tuned by a condenser (C41) and which is coupled to another coil (L22) in V3 cathode circuit. The values of the condenser and inductances are so arranged that minimum voltage in R26 and L22 occurs at approximately 4500 cycles (the resonant frequency of the tuned circuit (L23, C41), and as the L.F. gain is inversely proportional to the amount of negative feed back, the gain will be highest at 4500 cycles, thus compensating for the cut-off in the I.F. circuits. Immediately above the resonance the phase of the voltage induced in L22 changes sign, a large voltage is fed back, and the gain drops very rapidly. The feed back circuit is cut out on short waves by the switch (S1h) as the highest possible gain is required on this band.

On the A.C./D.C. models an extra winding is included in the output transformer to give the feed back voltage. This is because the normal secondary winding is connected to actual earth to make it safe for extension loud-speaker connections.

The circuit gives voltage feed-back which reduces the impedance of the output valve and so damps the loudspeaker and cabinet resonances giving better quality reproduction.

MAINS AND H.T. CIRCUITS

The mains and H.T. circuits are quite orthodox in arrangement except that, in the A.C./D.C. receivers, a thermal delay switch is arranged to short circuit the pilot lamps when the receiver is switched on to prevent the initial current surge through the cold valve heaters passing through them. As soon as the valves have warmed up the switch operates and removes the short circuit and the pilot lamps light up. There is a small screw on this switch which is adjusted to give a delay of between 10 and 30 seconds; further adjustment should not be necessary. In checking the operation of the switch, care should be taken to allow the set to cool down completely before switching on again. The valves take about five minutes to become cold.

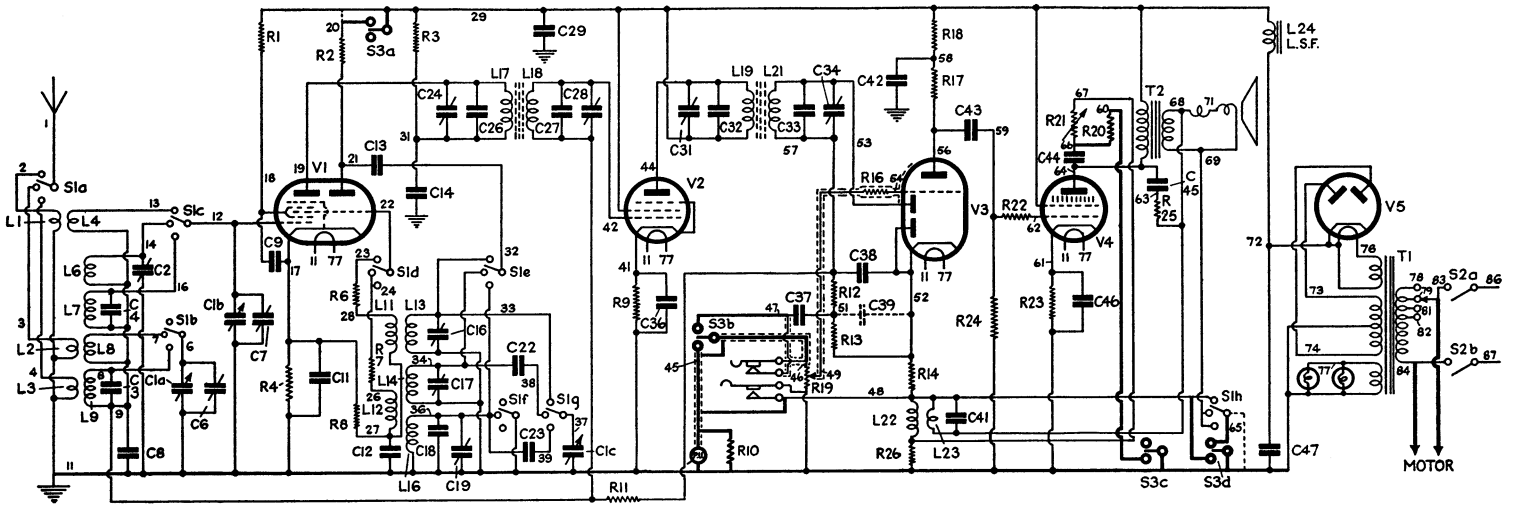


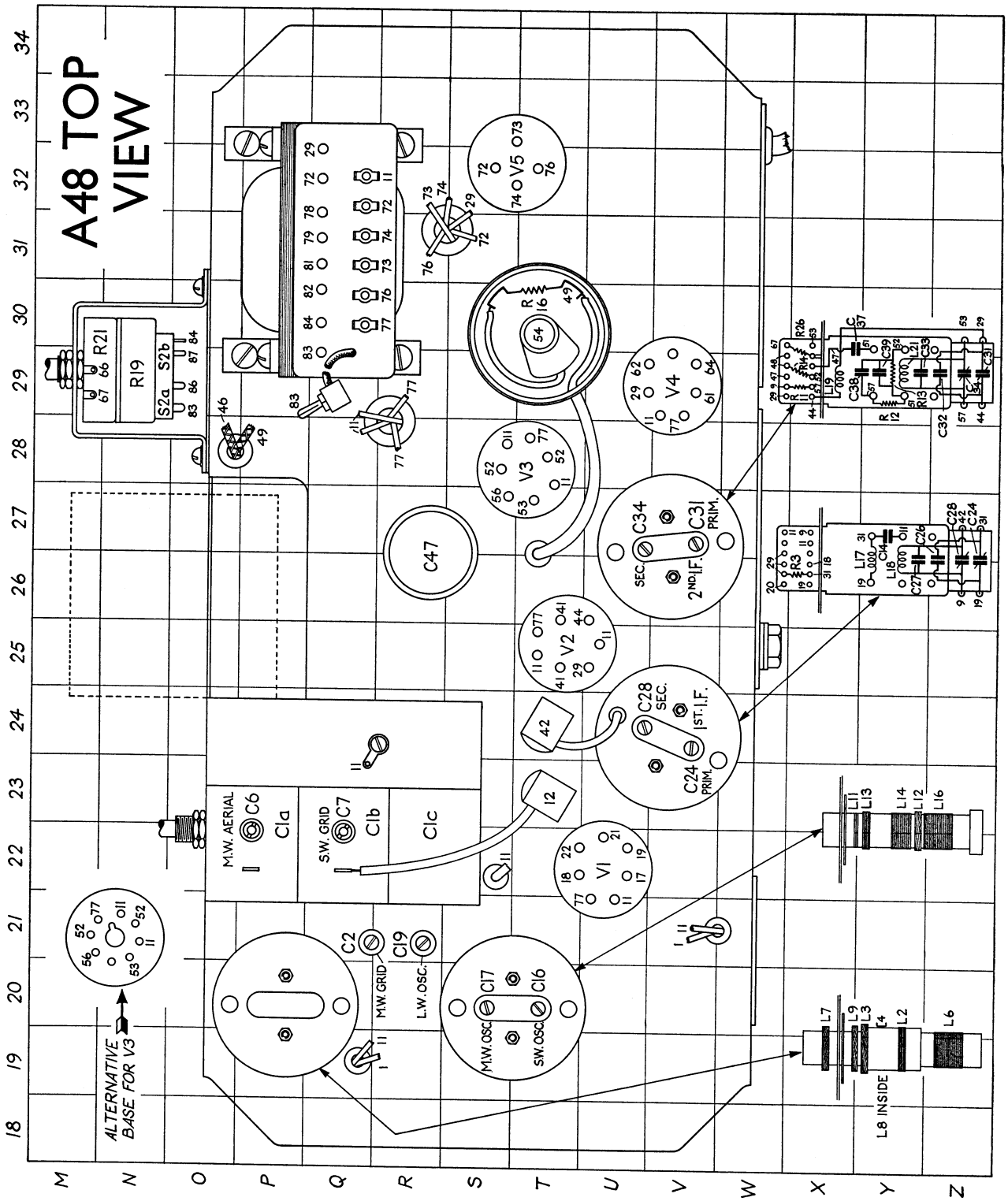
TABLE OF VOLTAGES

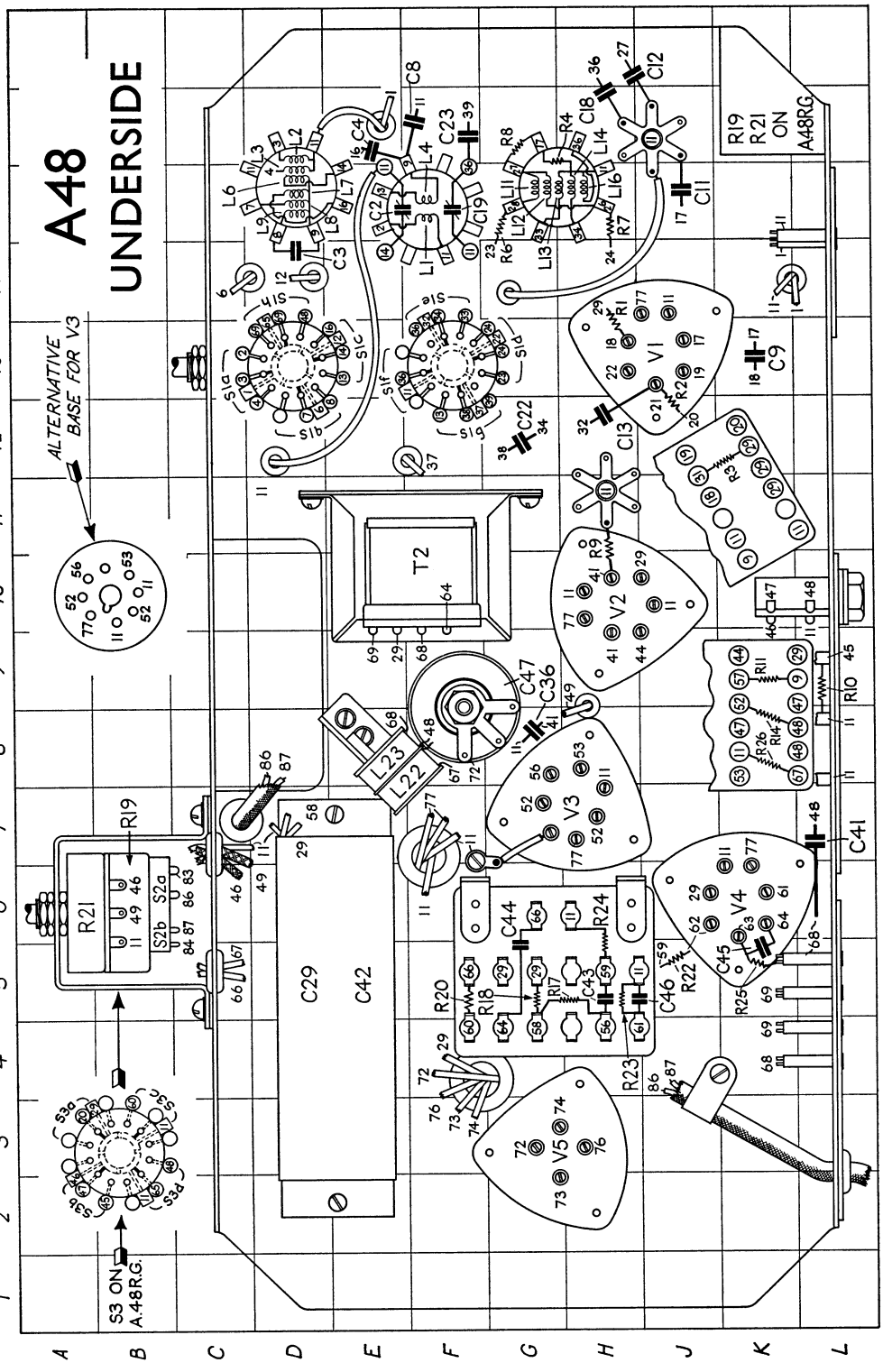
A48

VALVE	TYPE	ELECTRODE	TEST POINT	SQUARE	VOLTAGE
V1	Mazda AC/TH1	Hexode Anode	19	13 J	195
		Hexode Screen	18	13 H	95
		Triode Anode	21	13 J	S.W. 70 M.W. 75 L.W. 80
		Cathode	17	13 J	4
V2	Mazda AC/VP2	Anode	44	9 J	215
		Screen	29	10 J	215
		Cathode	41	10 H	4
V3	Mazda AC/HLDD or HL.41.DD	Anode	56	8 G	90
		Cathode	52	7 H	1
V4	Mazda AC/5 Pen	Anode	64	6 K	210
		Screen	29	6 J	215
		Cathode	61	6 K	7·5
V5	Mazda UU4	Cathode	72	3 G	310
L.S. Field			29·72	32 Q	95

TABLE OF COMPONENTS A48

CODE	VALUE	SQUARE	TEST From	TEST To
C1a	Variable	23 P	6	11
C1b	„	23 Q	11	12
C1c	„	23 R	11	37
C2	Trimmer	21 Q	11	14
C3	50 mmf.	14 D	8	9
C4	62 „	16 E	9	16
C6	Trimmer	22 P	6	11
C7	„	22 Q	11	12
C8	0·1	16 F	9	11
C9	·025	13 K	17	18
C11	·05	15 J	11	17
C12	200 mmf.	17 J	11	27
C13	100 „	12 H	21	32
C14	·025	27 V	11	31
C16	Trimmer	20 T	11	33
C17	„	20 S	11	34
C18	245 mmf.	16 H	11	36
C19	Trimmer	21 R	11	36
C22	703 mmf.	12 G	34	38
C23	386 mmf.	16 F	36	39
C24	Trimmer	24 V	19	31
C26	125 mmf.	27 Z	19	31
C27	134 „	27 Y	9	42
C28	Trimmer	24 U	9	42
C29	8	5 D	11	29
C31	Trimmer	27 V	29	44
C32	125 mmf.	29 Z	29	44
C33	125 „	29 Y	53	57
C34	Trimmer	27 U	53	57
C36	·025	8 G	11	41
C37	·002	30 X	47	51
C38	100 mmf.	29 Y	52	57
C39	100 „	29 Y	51	52
C41	0·1	7 L	48	68
C42	4 (300v)	5 E	11	58
C43	·025	5 H	56	59
C44	·04	5 G	64	66
C45	500 mmf.	5 K	63	64
C46	50 (12v)	5 H	11	61
C47	8 (A48) 16 (A48RG)	9 F	11	72
R1	25,000	13 H	18	29
R2	33,000	12 J	20	21
R3	5,000	12 K	29	31
R4	300	16 H	11	17
R6	100	15 G	23	28
R7	1,000	15 H	24	26
R8	20,000	16 G	17	27
R9	450	11 H	11	41
R10	100,000	9 L	11	45
R11	2MΩ	9 K	9	57
R12	100,000	29 Y	51	57
R13	500,000	29 Y	51	52
R14	500	8 K	48	52
R16	50,000	30 T	49	54
R17	50,000	5 H	56	58
R18	15,000	5 G	29	58
R19	1MΩ	6 B	11	46
R20	5,000	5 F	60	66
R21	25,000	29 M	66	67
R22	50,000	5 J	59	62
R23	180	5 H	11	61
R24	500,000	6 H	11	59
R25	5,000	5 K	63	68
R26	75	8 K	11	67
L1	—	15 F	2	11
L2	1·25	16 D	3	11
L3	10	15 D	4	11
L4	—	15 F	9	13
L6	4	15 D	9	14
L7	12	15 D	9	16
L8	4	15 D	7	9
L9	12	15 D	8	9
L11	—	15 G	27	28
L12	1·5	15 G	26	27
L13	—	15 H	11	33
L14	2·5	15 H	11	34
L16	4	15 H	11	36
L17	6	27 Y	19	31
L18	6	27 Y	9	42
L19	6	29 X	29	44
L21	6	29 Y	53	57
L22	44	8 F	48	67
L23	68	8 E	48	68
L24	1400	L.S. Field	29	72
T1 Prim				
200-213v	26	30 Q	82	84
214-228v	28	31 Q	81	84
229-244v	31	31 Q	79	84
245-260v	33	32 Q	78	84
H.T. Sec	230	31 Q	11	73
	+210	31 Q	11	74
T2 Prim	140	10 F	29	64
Sec.		10 F	68	69
L.S.				
Sp. Coil	2		69	71
Hum-bucking Coil	—		68	71





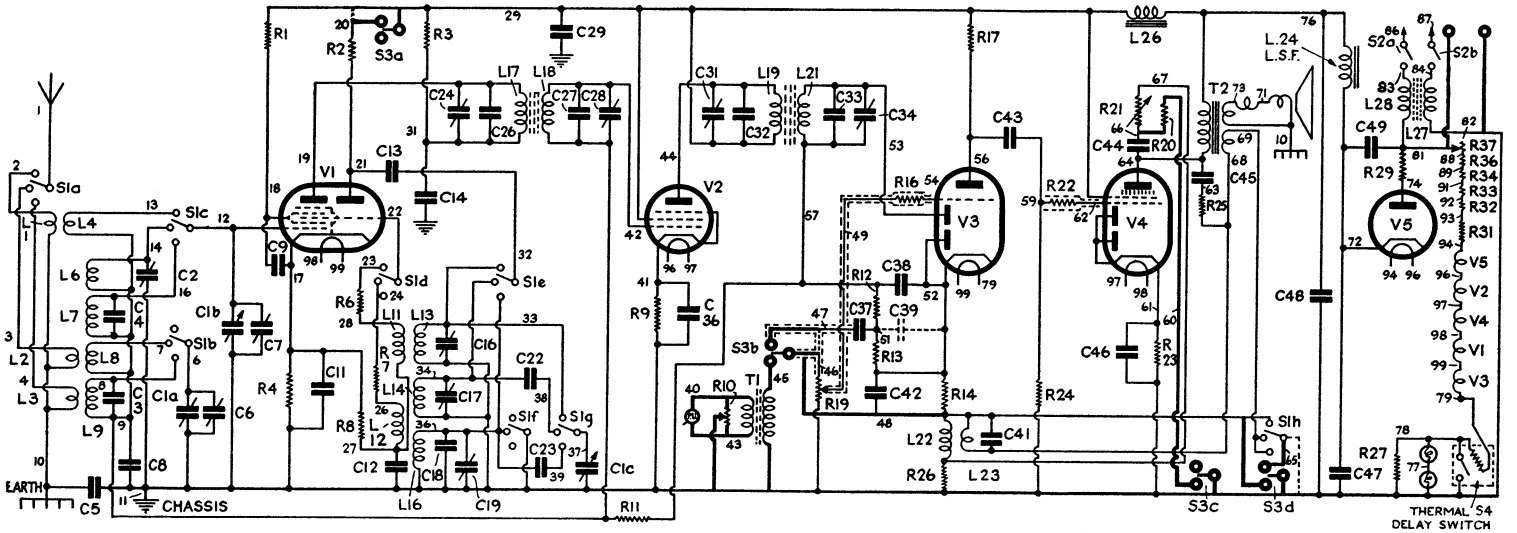


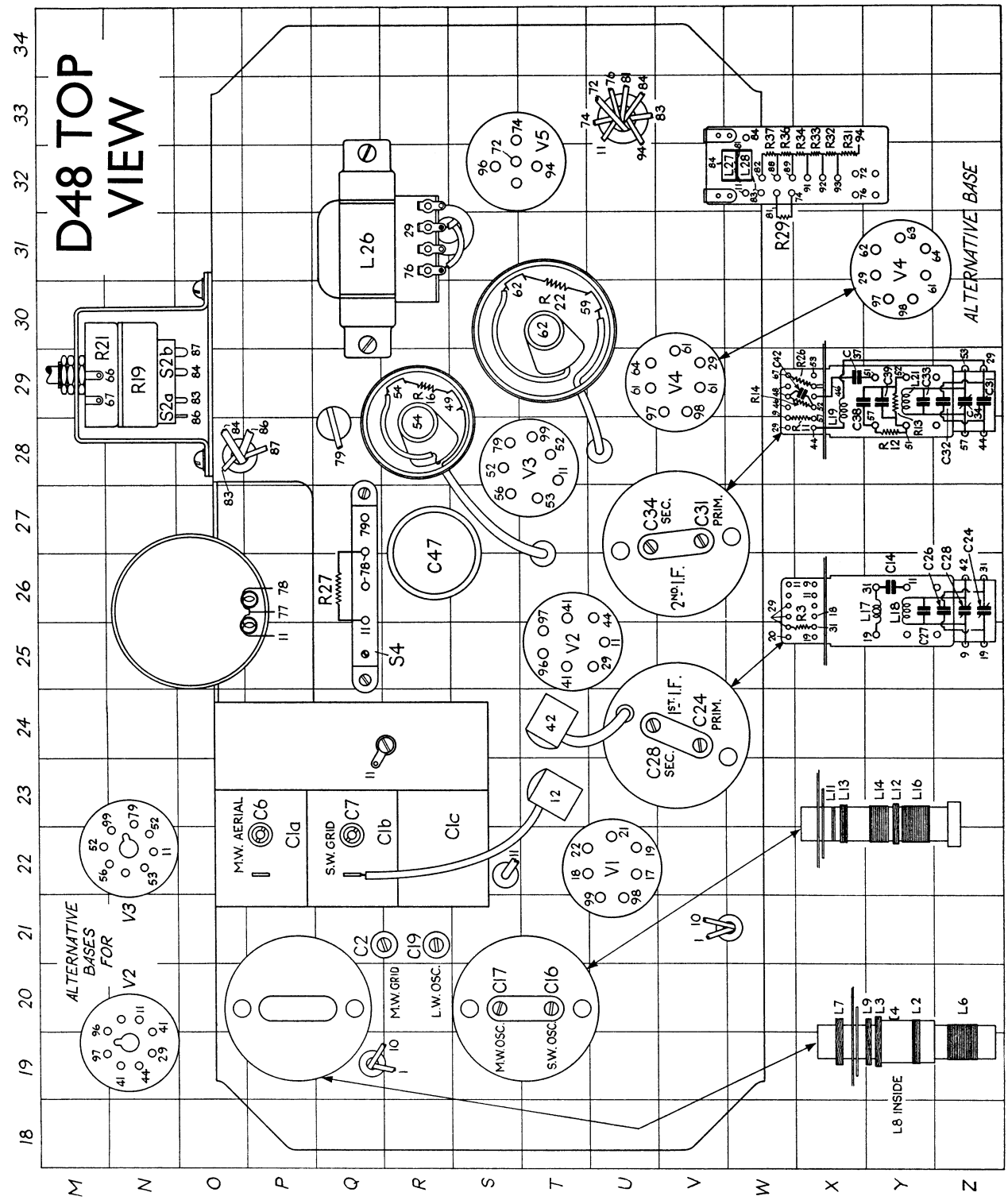
TABLE OF VOLTAGES

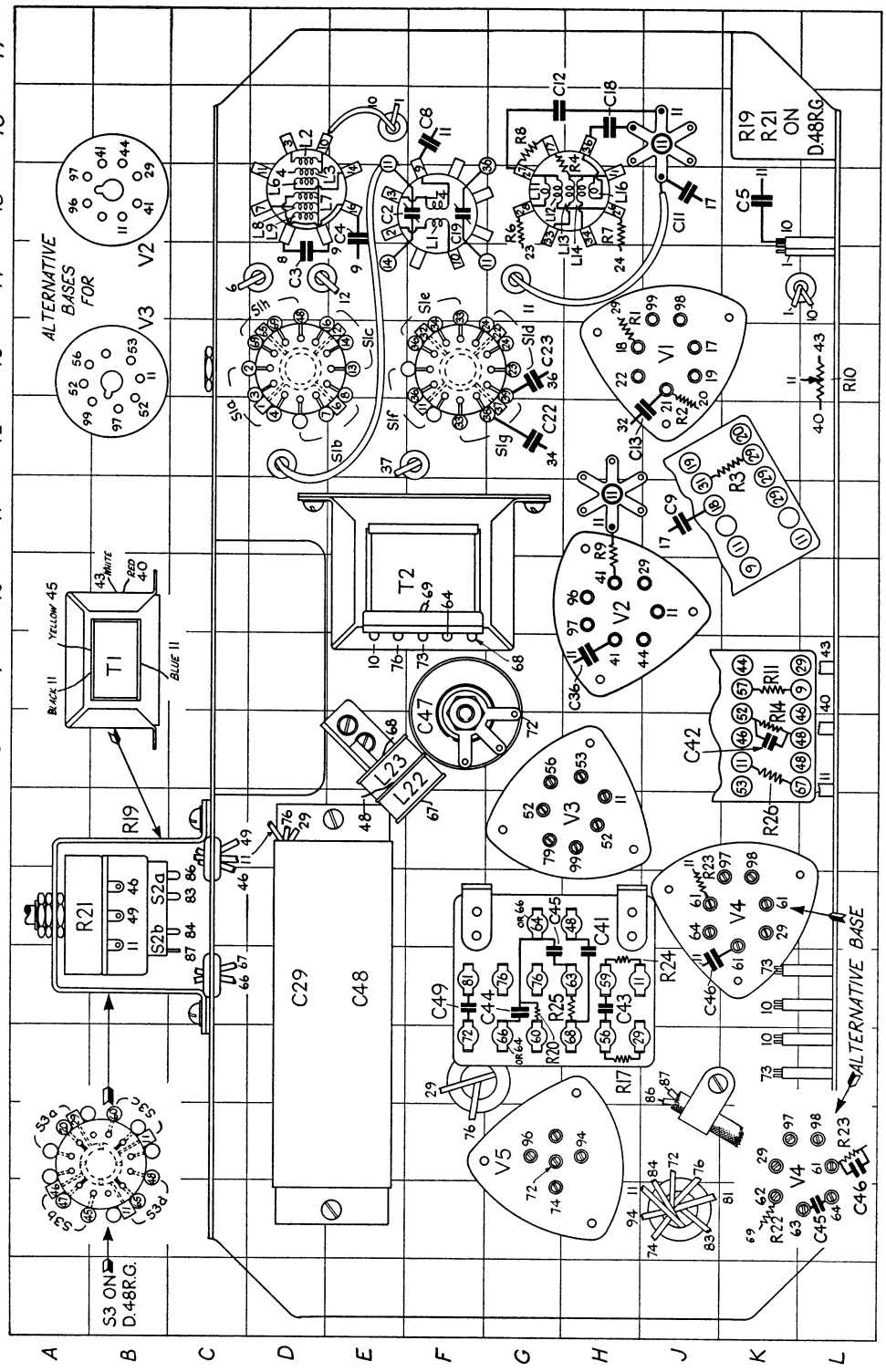
D48

VALVE	TYPE	ELECTRODE	TEST POINT	SQUARE	VOLTAGE
V1	Mazda TH2320 or TH2321	Hexode Anode	19	13 J	115
		Hexode Screen	18	13 H	100
		Triode Anode	21	13 J	S.W. 45 M.W. 55 L.W. 60
		Cathode	17	13 J	4
V2	Mazda VP1322 or VP133	Anode	44	9 J	140
		Screen	29	10 J	140
		Cathode	41	10 H	2
V3	Mazda HL/DD1320 or HL.133.DD	Anode	56	8 G	80
		Cathode	52	7 H	1·5
V4	Mazda PenDD4021 or Pen3820	Anode	64	6 J	150
		Screen	29	6 K	140
		Cathode	61	6 K	6
V5	Mazda U4020	Cathode	72	3 G	230
L.S. Field			72·76	32 X	90

TABLE OF COMPONENTS D48

CODE	VALUE	SQUARE	TEST From	TEST To
C1a	Variable	22 P	6	11
C1b	„	22 Q	11	12
C1c	„	22 S	11	37
C2	Trimmer	21 Q	11	14
C3	50 mmf.	14 D	8	9
C4	62 „	15 E	9	16
C5	·01	15 K	10	11
C6	Trimmer	22 P	6	11
C7	„	22 Q	11	12
C8	0·1	16 F	9	11
C9	·025	11 J	17	18
C11	·05	15 J	11	17
C12	200 mmf.	16 G	11	27
C13	100 „	12 J	21	32
C14	·025	26 Y	11	31
C16	Trimmer	20 T	11	33
C17	„	20 S	11	34
C18	245 mmf.	16 H	11	36
C19	Trimmer	21 R	11	36
C22	703 mmf.	12 G	34	38
C23	386 „	13 G	36	39
C24	Trimmer	24 V	19	31
C26	125 mmf.	26 Z	19	31
C27	134 „	26 Y	9	42
C28	Trimmer	24 U	9	42
C29	16 (400v.)	5 D	11	29
C31	Trimmer	27 V	29	44
C32	125 mmf.	29 Z	29	44
C33	125 „	29 Y	53	57
C34	Trimmer	27 U	53	57
C36	·025	9 H	11	41
C37	·01	29 X	47	51
C38	100 mmf.	29 Y	52	57
C39	100 „	29 Y	51	52
C41	0·1	7 H	48	68
C42	25 (12v)	8 K	48	52
C43	·025	5 H	56	59
C44	·04	5 G	64	66
C45	500 mmf.	2 L	63	64
C46	50 (12v.)	5 J	11	61
C47	16 (400v.)	8 F	11	72
C48	16 (400v.)	5 E	11	76
C49	·04	5 F	72	81
R1	10,000	13 H	18	29
R2	20,000	13 J	20	32
R3	5,000	12 K	29	31
R4	300	16 H	11	17
R6	100	15 G	23	28
R7	1,000	15 H	24	26
R8	20,000	16 G	17	27
R9	400	11 H	11	41
R10	400	13 L	40	43
R11	2 MΩ	9 K	9	57
R12	100,000	28 Y	51	57
R13	500,000	29 Y	51	52
R14	1,500	8 K	48	52
R16	50,000	29 R	49	54
R17	50,000	4 H	29	56
R19	1 MΩ	6 B	11	46
R20	2,000	5 G	60	66
R21	25,000	29 M	66	67
R22	50,000	30 T	59	62
R23	140	6 J	11	61
R24	500,000	5 H	11	59
R25	5,000	5 H	63	68
R26	75	8 K	11	67
R27	51	26 Q	11	78
R29	50	31 W	74	81
R31	314	32 X	93	94
R32	50	32 X	92	93
R33	50	32 X	91	92
R34	50	32 X	89	91
R36	50	32 W	88	89
R37	50	32 W	82	88
L1	—	15 F	2	10
L2	1·25	16 D	3	10
L3	10	15 D	4	10
L4	—	15 F	9	13
L6	4	15 D	9	14
L7	12	15 D	9	16
L8	4	15 D	7	9
L9	12	15 D	8	9
L11	—	15 G	27	28
L12	1·5	15 G	26	27
L13	—	15 H	11	33
L14	2·5	15 H	11	34
L16	4	15 H	11	36
L17	6	26 Y	19	31
L18	6	26 Y	9	42
L19	6	29 X	29	44
L21	6	29 Y	53	57
L22	44	8 F	48	67
L23	68	8 E	48	68
L24	900	L.S.F.	72	76
L26	500	31 R	29	76
L27	3	32 W	11	84
L28	3	32 W	81	83
T1 prim	56	9 B	40	43
T1 sec	1500	9 B	11	45
T2 prim	170	10 F	64	76
T2 sec 1	—	10 F	10	73
T2 sec 2	1·5	10 F	68	69
L.S. Sp. coil	2		10	71
Hum-bucking coil	—		71	73





D48 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. It is also important to ensure that the service oscillator is accurately calibrated and it is advisable to check this regularly by the method described on page 10 of the Service Manual for the "28" series.

THE SERVICE OSCILLATOR

Checking points for the higher I.F. range were 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.

All the trimmers are on top of the chassis and they should be adjusted with an insulated screwdriver having a blade approximately 3/16" wide.

The correct sequence for completely retrimming is I.F.'s (465 Kc/s) S.W., M.W., and L.W., but 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 any of 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 which are marked on the diagram sheets.

I.F. TRIMMING

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.

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 V3 (square 8H, test point 53).

3. Tune the receiver to the top end of the long wave scale.

4. Connect the service oscillator between the control grid of V2 (square 24T, test point 42) 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 C31 (square 27V) for maximum

reading on the output meter.

7. Remove the damping unit from V3 diode anode and clip it to anode of V2 (square 9J, test point 44). Adjust C34 (square 27U).

8. Connect the service oscillator between the control grid of V1 (square 23T, test point 12) and chassis via the dummy aerial, switch the receiver to medium waves.

9. Remove the damping from V2 anode and apply it to V2 control grid (square 24T, test point 42). Adjust C24 (square 24V).

10. Remove the damping from V2 grid and apply to V1 hexode anode (square 13J test point 19). Adjust C28 (square 24U).

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 C16 (square 20T). 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 trimmer on the centre section of the gang condenser C7 (square 22Q) 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.

3. Adjust the oscillator trimmer C17 (square 20S), the grid trimmer C2 (square 21Q), and the aerial trimmer C6 (square 22P) 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 1000 metres.

3. Adjust the oscillator trimmer C19 (square 21R).

Mechanical Details

THE chassis is held in position by four bolts, and when these and the control knobs are removed it can be taken away without removing the loud-speaker. In the table model the flexible lead to the pilot lamps is cleated to the top of the cabinet and must be slipped out before the chassis is lifted out.

When replacing the chassis see that each fixing bolt has a square washer on it.

The loud-speaker is also held in by bolts and

if this is removed, care should be taken to see that the front of it is pressing firmly against the cabinet when it is replaced. The field leads on the table model are taken over the front of the chassis. To make the R.G. chassis more convenient for transporting or for standing on the bench, one screw can be removed from the volume control bracket to allow it to be swivelled round into a horizontal position. The screw can then be placed in the alternative hole provided, to secure the bracket.

COIL CANS

The coil cans are secured by nuts, and if they fail to tighten up properly it is usually because the top of the can has become dented. If the dent is pushed out the nuts should tighten the can quite rigidly against the receiver chassis.

EARTHING

Although in the circuit diagram many of the components are shown as earthed to chassis, it does not follow that they can be earthed at the nearest convenient point. It will be noticed that on the chassis, several of the earth connections, particularly for the S.W. components, are earthed in rather unexpected places. This is to prevent unwanted couplings between the circuits and it is therefore most important that the original wiring layout is adhered to if any components are replaced. It will also be noticed that the left-hand front screw securing the tuning assembly is insulated from the tuning frame by a bakelite washer. If this screw short circuits to the frame, second channel interference on short waves will be increased.

THE PILOT LAMPS

The pilot lamps can be replaced by pulling the bracket away from the tuning drum and 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 the two short circuit, one of the pilot lamps will be short circuited.

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. The short lead above the chassis should be disconnected by unscrewing the earth tag. There are three earthing points, one above and two below the chassis. 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. The leads 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 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 CONDENSER DRIVE

The slow motion device on the condenser drive should give no trouble if it is properly assembled, but if it is strained at all it will run unevenly. Rubber washers are placed behind the mounting to allow a little latitude in the fixing.

If the drive is uneven the fixing screws should be slackened or tightened slightly until the drive runs evenly.

THE CORD DRIVE

To fit a new cord drive take a piece of cord $25\frac{1}{4}$ inches long and thread it through the two holes near the top edge of the drum, pulling it through until the ends come together. Refit the drum in

its frame. Pass the two ends of the cord around the drum, through the holes provided in the frame and thence over the pulleys and round the rim of the condenser drive pulley bringing them together at the small hole in the rim. Pass the ends through this hole and make fast through the smaller loop of the tension spring. The cord must be fastened so that the spring is tightly stretched when it is hooked on to the pulley or there will be backlash in the movement of the tuning drum.

THE TUNING DRUM

To remove the tuning drum, first remove 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.

THE CURSOR THREAD

The cursor thread is sprung at both ends and should normally be very durable, but if a breakage does occur, it is quite a simple matter to fit a new thread.

Remove the framing plate from the front of the tuning assembly and then remove the two brackets which hold the thread at either end. Unhook the small helical springs from these ready to attach to the new thread. The thread should have a small loop at either end and should have a total length of between $7\frac{3}{4}$" and $7\frac{7}{8}$" including the loops. The length is rather critical and the easiest way of making it correct is to drive two brads into a piece ofwood eight inches apart.

Make a small loop at one end of the thread and place it over one of the brads. Place the other end around the other brad to form a loop, then slip it off the brad, holding it securely. Tie a single knot in the loop thus formed to make the second permanent loop. The amount of thread taken up by the knot will be just sufficient to give the correct overall length to the thread.

Hook a spring on to each loop and then attach the other end of each spring to the fixing brackets.

Replacing the brackets should then hold the thread under tension in front of the tuning drum. The holes in the brackets are slotted and they should be so adjusted that the thread is covering the end markings on the drum (just above 550m. and 50m.) when the condenser is set at maximum.

Using The Diagram Sheets

THE diagrams on pages 4 to 11 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 the sheets.

Each sheet contains the circuit diagram, the top and underside views of the chassis, the key to values of components, and the voltage table, for one particular model.

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 A48 receiver, we suspect the A.V.C. decoupling resistance; we refer to the circuit diagram and find that its number is R11. By referring to the tabulated list of values, we find that it is 2MΩ and is located in "square 9K." By referring to the square at the junction of column "9" vertically, and column "K" horizontally, on the underside view of the chassis, we find that the condenser is mounted on the 2nd IF assembly. The numbers inside the circles representing the tags show (from the circuit diagram) which end is connected to R12 (57) and which to the band pass coils (9) 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.

The panels are represented as being laid flat against the chassis with the tags uppermost and the components on the underside. Components are drawn in full lines for clarity although, being underneath, they should normally be shown dotted.

To enable the panels to be shown flat without covering other components, it has been necessary to draw one or two components out of the correct positions but where any considerable alteration has been made in this respect, an arrow indicates the direction of the correct placing.

In the underside and top views a table model is shown, but with the radio-gramophone components added. The radio-gramophone components must therefore be ignored when considering a table model, and allowance must be made for the re-arrangement of one or two components in the case of the radio-gramophones.

A composite circuit diagram is used for the table and radio-gramophone models. For the A48 and D48 table models, the heavy lines should be ignored and the dotted lines treated as full. For the radio-gramophones, ignore the dotted lines (and the gramophone jack in the case of the A48) 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 with a 0-50v. and 0-500v. 1000 ohms-per-volt meter, with the receivers working on 230 volts A.C.