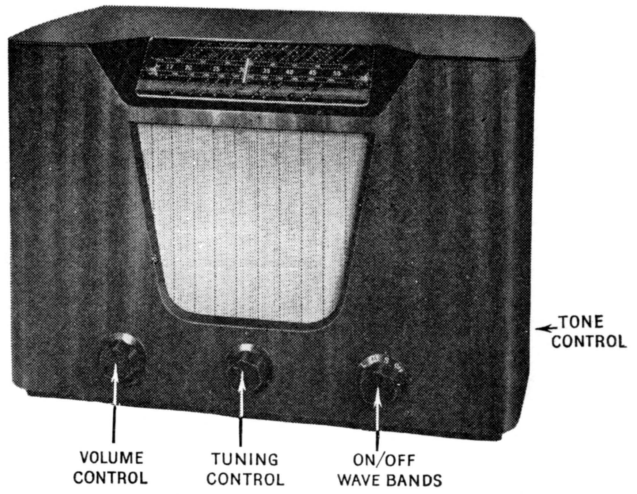
MURPHY SERVICE INSTRUCTIONS

MURPHY RADIO LTD
WELWYN GARDEN CITY · HERTS
PHONE: WELWYN GARDEN 800

B141

BATTERY RECEIVER

MURPHY RADIO LIMITED
WELWYN GARDEN CITY · HERTFORDSHIRE
Telephone: Welwyn Garden 800



BATTERY SUPPLY:	111 V. + 9 V. h.t. plus g.b. battery 2 volt accumulator
WAVE RANGES:	Long: 1000 to 2050 metres Medium: 190 to 555 metres Short: 17 to 52 metres
INTERMEDIATE FREQUENCY:	465 Kc/s
VALVES:	Mazda: TP25, VP23, HL23DD, QP25
SPEECH COIL IMPEDANCE:	3 Ohms
EXTENSION LOUDSPEAKER:	3 to 7 Ohms
CABINET DIMENSIONS:	13¼ in. high, 19 in. wide, 13 in. deep
WEIGHT:	19 lb.
CONSUMPTION:	h.t. 9·5 mA. l.t. 0·5 Amp.
RELEASE DATE:	January, 1949

ELECTRICAL NOTES

The Circuit. This is a four-valve superheterodyne receiver with a 465 Kc/s i.f. amplifier. Full a.g.c. is used, and the control voltage is obtained from the signal diode load. The quiescent push-pull output stage is driven by an auto-transformer having a 1 : 2 step-up ratio to each valve grid.

The receiver was designed for use with fixed grid bias and although this may appear at first to be a retrograde step, it is necessary to enable the q.p.p. stage to deliver its full output without introducing an undue amount of distortion. The anode current of the output valve is a function of the screen voltage and the grid bias. As the grid bias is limited (by the battery) to a maximum of nine volts, it was found necessary to reduce the screen voltage to 99 so that the anode current of "high current limit" QP25 valves can be kept to an economical level.

The h.t. battery. A combined 111 V. + 9 V. battery is recommended, and the connections are given in the following table which shows the original plug and lead colouring.

The h.t. + 1 voltage should never exceed 99 V.

Plug Coding	*Plug Colour*	*Lead Colour*	*Battery Voltage*
GB –	Green	Green	– 9 V.
HT –	Black	Black	0
HT + 1	Red	Red	99 V.
HT + 2	Mauve	White	111 V.

If it is impossible to obtain a combined h.t. + g.b. battery, a standard 120 volt battery may be used. In this case, the g.b. – plug is connected to the battery negative socket and the h.t. – plug is not connected (it should be well insulated). The h.t. + 1 plug is tapped in at 108 V. and the h.t. + 2 plug is connected to the 120 V. socket.

With this method the circuit operates under auto-bias conditions and the h.t. voltages are substantially the same as with the recommended battery, but it should be understood that the maximum undistorted output will be considerably less. This will be apparent as obvious distortion if an attempt is made to operate the set at high levels of output.

H.T. current consumption. When measuring the total h.t. current consumption, the sum of the currents in the h.t. + 1 and h.t. + 2 leads must be taken and, under "no signal" conditions, should be greater than 8·5 mA but should not exceed 10·5 mA. Before taking this measurement it is advisable to check for leakage across the h.t. line by removing the valves, inserting a current meter in series with the h.t. + 2 lead, and switching the set "ON". **Warning.** A heavy current surge will take place as the capacitor, C31, charges.

The total current can be brought within the limits quoted above by adjusting the V4 grid bias tap as described below.

Grid bias adjustment. To allow for variations between QP25 valves, the grid bias can be adjusted to keep the anode current within the limits specified in the preceding paragraphs. Before making this adjustment, check the h.t. line for leakage current, and then with all the valves replaced, read the h.t. + 2 current with the h.t. + 1 lead disconnected. With an average production model this current was 5·35 mA (under "no signal" conditions) and any wide difference should be investigated.

With the h.t. + 1 lead replaced, the bias should be adjusted by moving the **connector** (15817) from one to another of the three vertical wires located behind the VP23 (V2).

If two taps give total currents that lie between 8·5 mA and 10·5 mA, in the interests of quality of reproduction, the tap giving the higher current should be used.

The i.f. filter. This is set in the works and cannot readily be re-adjusted. It should produce a drop in gain between the top of L4 and the aerial socket of about 25 : 1, at 465 Kc/s when the receiver is tuned to 555 metres.

The short wave coils. These coils are not set to close limits during manufacture. The adjustment is carried out in the receiver, as part of the alignment process, by moving the unsealed spiral turn on each coil. When replacing the short wave coils, proceed as in the alignment table, and adjust the spiral turns at 41·4 metres (7·25 Mc/s). Repeat the whole process until no further improvement can be made. Finally, seal the turns.

MECHANICAL NOTES

Transit. The chassis is mounted on four rubber grommets which are enclosed in cup washers, one on either side of each grommet. For transit, the chassis bolts are tightened so that the grommets are compressed sufficiently to allow the cup washers to grip the chassis.

To reduce its movement during transit, the gang capacitor is "tied" to the aerial filter bracket with 18-gauge copper wire.

Before installing the receiver, the chassis bolts should be loosened sufficiently to allow the chassis to "float" on the rubber grommets, and the wire that holds the gang capacitor must be removed.

When packing the receiver for transit, these operations should be reversed.

Removing the chassis from the cabinet. Take off the battery-retaining bar (51273), the fibre back (51289), and the front control knobs and felt washers, and disengage the pointer carrier from the drive cord; disconnect the loudspeaker. Remove the **nuts** (260765) from the four chassis **bolts** (51525), and withdraw the bolts.

The tone control leads are sufficiently long for the chassis to be manoeuvred from the cabinet. If it is desired to separate the chassis and cabinet, the tone control may be mounted on the chassis as shown on page 5. A $\frac{1}{4}$ in. Whitworth box spanner may be used for loosening the tone control nut.

The cup **washers** (50042) are held on to the rubber **grommets** (8608) in the chassis, with "Bostick", and it is advisable to avoid dislodging them. If they do become detached, they can be placed in their correct positions when the chassis is in the cabinet.

Refitting the chassis in the cabinet. The sequence described in the previous paragraph should be reversed. It may be found necessary to use french chalk on the grommets to help the chassis bolts to pass through them.

Before attaching the pointer carrier to the drive cord, set the pointer to 2050 metres, and the gang capacitor to maximum capacitance.

The scale and pointer. The **scale** (51329) is held in position on two spacers by means of 4 BA knurled **studs** (50050). These spacers are of unequal shoulder height, and each has a tapped and slotted projection which fits inside the holes in the scale. The right-hand **spacer** (50048) has a longer projection than the left-hand **spacer** (50049). The hole in the right-hand end of the scale is in the form of a slot which allows for cabinet tolerances and variations, and the longer projection on the spacer accommodates a spring **washer** (48195) to prevent scale rattle.

The spacers are also used to secure the pointer carrier **guide** (52075) in which the holes are slotted to allow adjustment so that the **carrier** (50041) and the pointer **holder** (50045) do not foul the sides of the slot in the cabinet. Details of the **pointer** (51906), holder, and the carrier are shown in the cord drive diagram on page 6.

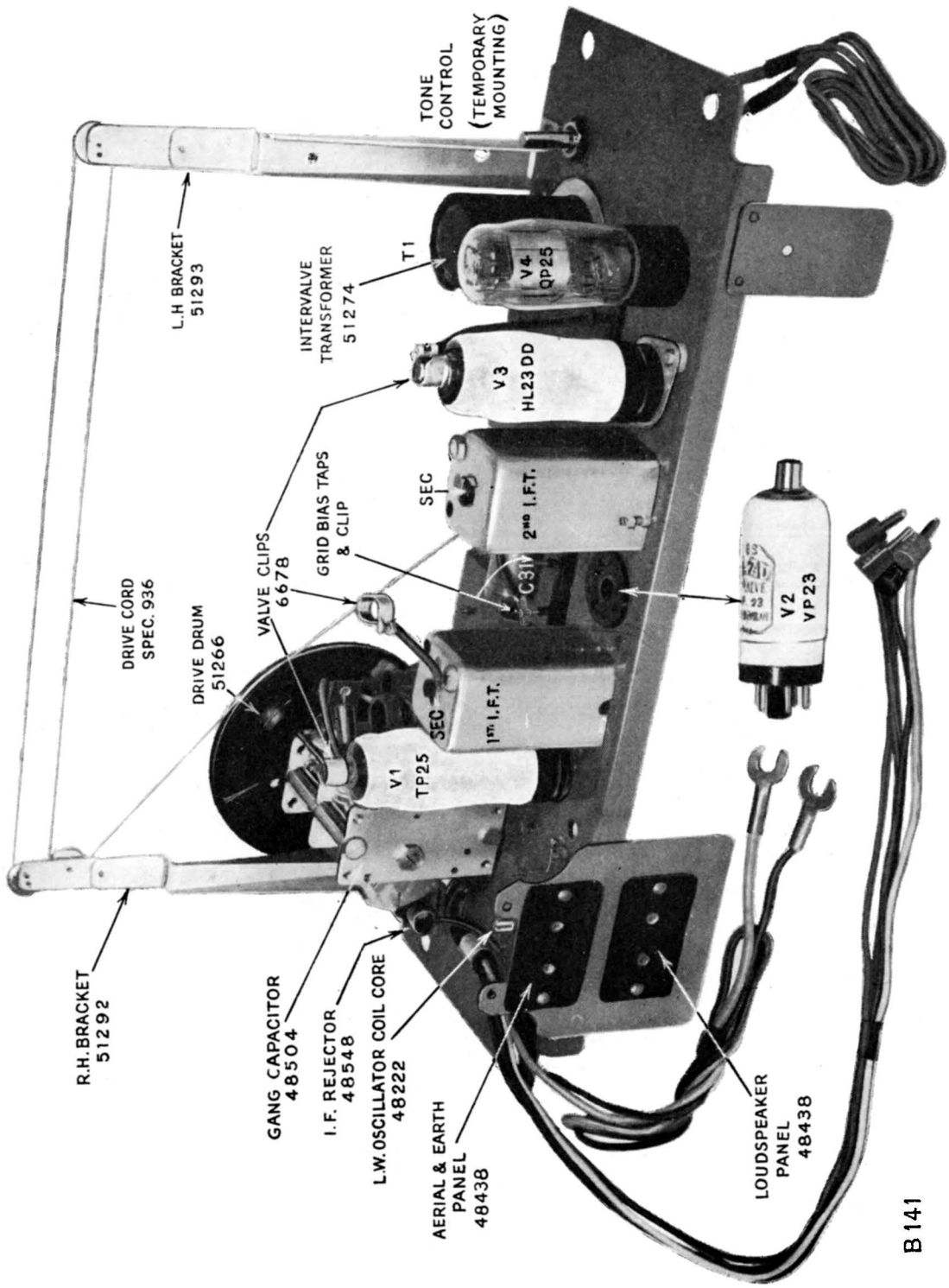
The r.f. coils. Each aerial coil is clamped so that the hole in the former fits over the "pip" punched up on the bracket.

The oscillator coils are located so that the "nick" in the former is towards the wave-change switch. Note that the ends of the long wave oscillator coil **clamps** (48193) are used as tensioners for the core **spring** (48228).

V3 valve-holder. This has an anti-microphonic mounting consisting of two grommets in the chassis in each of which is a **spacer** (37457). The valve-holder is bolted to the spacers.

The intervalve transformer mounting. This is held by a **ring clamp** (51301), and when refitting, care should be taken to see that the washers are placed beneath the clamp to prevent it buckling when the screws are tightened.

The i.f. transformers are tuned by adjustable iron dust cores. These cores are moulded with a thread on the outside and with a slot for trimming at each end. The threads engage with U-shaped pieces of bakelite which are fitted at each end of the i.f. coil formers. It is possible for the cores to be screwed in too far, and they may then drop into the centre of the coil. If this does occur, the opposite



Top view of the chassis, showing the principal components and part numbers. The corresponding diagram is on page 12.

core should be removed, and then the loose core can be re-started in its thread.

As these cores are rather fragile, care must be taken when adjusting them, and it is recommended that a non-metallic screwdriver is used.

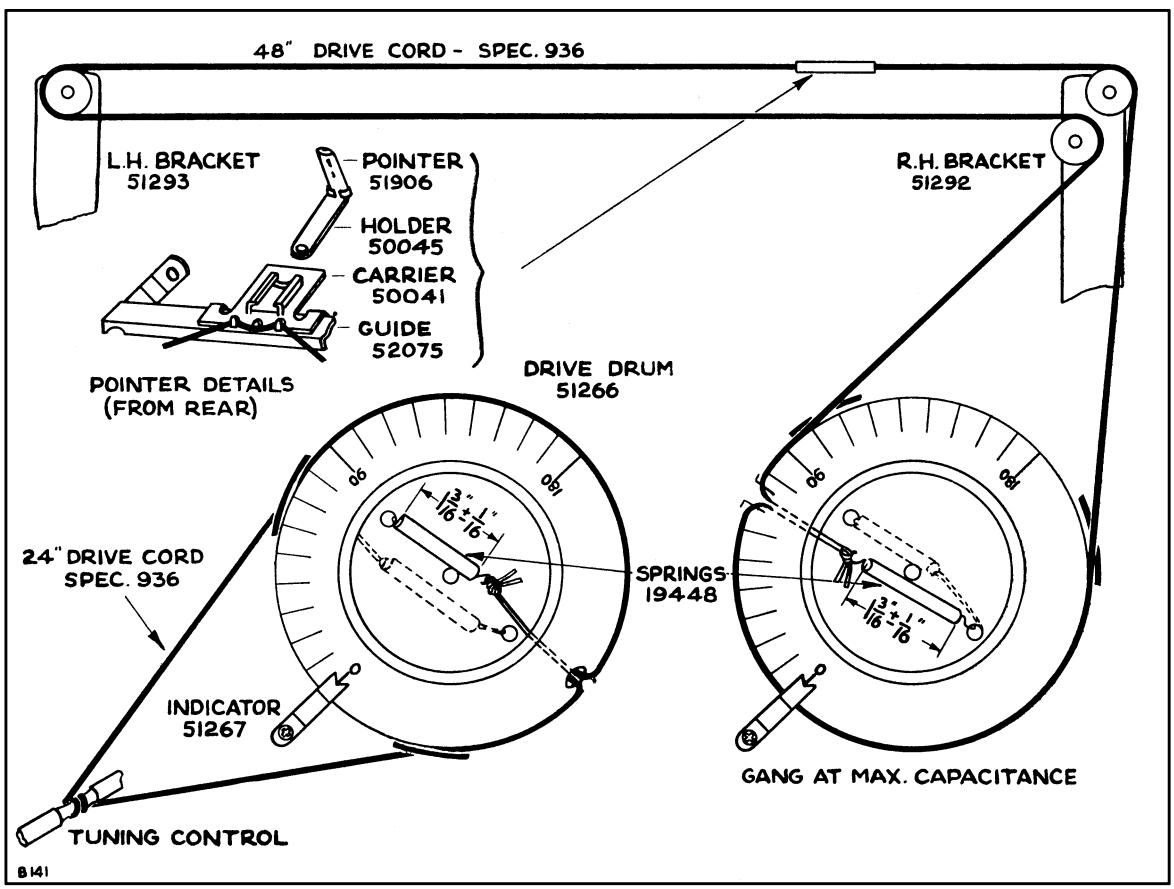
The screening can may be taken off for inspection if the securing tabs are bent back and the self-tapping screws are removed. The tabs are accessible through holes in the chassis below the assemblies. When replacing the cans, first see that the piece of insulating material is wrapped round the assembly to prevent any possibility of a short circuit.

THE CORD DRIVES

The diagram shows the general arrangement as seen from the front of the chassis when the gang capacitor is at maximum capacitance.

Before starting to fit the cords, see that the flywheel spins freely, and adjust the bracket if necessary. Also check that the "V" in the indicator registers with O on the drive drum when the gang capacitor is at maximum capacitance.

The main drive may be fitted as follows: Tie a **spring** (19448) to one end of a 24-inch length of drive cord (woven and waxed Italian hemp cord, Spec. 936), pass the end through the small holes in



the **drive drum** (51266) from the inside, and pull the spring up to the inside edge of the drum. Pass the end under the drum in a clockwise direction twice round the tuning control spindle, and round the drive drum to the start. Tie this end also to the spring, very close to the inside edge, and hook the spring into the hole as shown. If necessary, adjust the knot so that the spring is extended to 1 $\frac{3}{16}$ inches as shown in the diagram.

The pointer cord may be fitted in exactly the same manner and it should lie in front of the main drive as indicated. For accurate calibration, it is essential that the correct cord is used for this drive.

NOTE. In order that the cord drives may not stretch later, resulting in slipping or uneven operation, it is recommended that the cord is stretched for a few hours before it is fitted to the receiver. Also to prevent the knots slipping, the two ends may be tied together, after they have been knotted to the spring.

AERIAL FILTERS

In areas close to powerful medium wave transmitters, an aerial filter may be required to prevent overloading the frequency changer, causing whistles on other stations. To reduce this form of interference, suitable filters can be supplied by Murphy Radio Limited in the form of single or double units according to the station, or stations, causing trouble.

There are three standard filters, covering wavelengths as follows:

A: 200–300 metres (1500—1000 Kc/s)
B: 300–428 metres (1000–700 Kc/s)
C: 428–600 metres (700–500 Kc/s)

The double units can be supplied in any of the following combinations: AA, BB, CC, AB, AC, BC.

When ordering a filter, please state whether a single or double unit is required, quoting the letter or letters of the units, and the receiver type.

To fit the filter. The filter is mounted on to the extensions above the aerial and earth socket panel. It is secured by two 4 BA screws and is fitted so that the adjusting screws are uppermost.

The lead from the filter is then plugged into the aerial socket, and the aerial is plugged into the filter —a hole is provided in the receiver back to allow for this.

To adjust the filter. Connect a milliameter (0–15 approximately) in series with the h.t. + 2 plug. Tune the receiver to the interfering station, turn the volume control to minimum (so that the QP25 does not cause any changes in h.t. consumption) and adjust the filter for maximum current. If this point is not easily noticeable, the h.t. + 1 plug may be removed, thus putting the QP25 out of action; the total h.t. consumption will then be about 5 mA.

CIRCUIT ALIGNMENT

For complete circuit alignment, the chassis must be taken from its cabinet, but this is unnecessary if the only adjustments required are to the aerial circuit trimmers or the long wave oscillator coil core.

In removing the chassis from the cabinet, the tuning scale is separated from the remainder of the tuning mechanism, and so, an arbitrary scale, graduated from 0 to 180, is engraved upon the drive drum to enable the r.f. adjustments and calibration checks to be carried out.

IMPORTANT: Before attempting any adjustments, make sure that the centre of the indicator "V" registers with O on the drive drum, when the plates of the gang capacitor are fully in mesh.

To ensure the accuracy of calibration throughout

the tuning ranges, a drive cord of the correct diameter (Murphy Radio Spec. 936) must be used for the tuning pointer.

When replacing the chassis in the cabinet, set the gang capacitor to maximum capacitance and the tuning pointer to 2050 metres, before fitting the drive cord to the pointer carrier.

All adjustments are made for maximum a.f. output as indicated by an output meter connected to the l.s. sockets. The volume and tone controls should be set fully clockwise, and the signal generator attenuator should be adjusted so that the a.f. output from the receiver does not exceed 50mW (approximately 0·4 V. a.c.).

A non-metallic screwdriver should be used for adjusting the i.f. transformer cores, and as they are fragile, care must be taken to avoid damaging them. An insulated trimming tool is advisable when adjusting the s.w. trimmers. When making adjustments, unscrew the appropriate coil core or trimmer and then re-tune to the first point of maximum output.

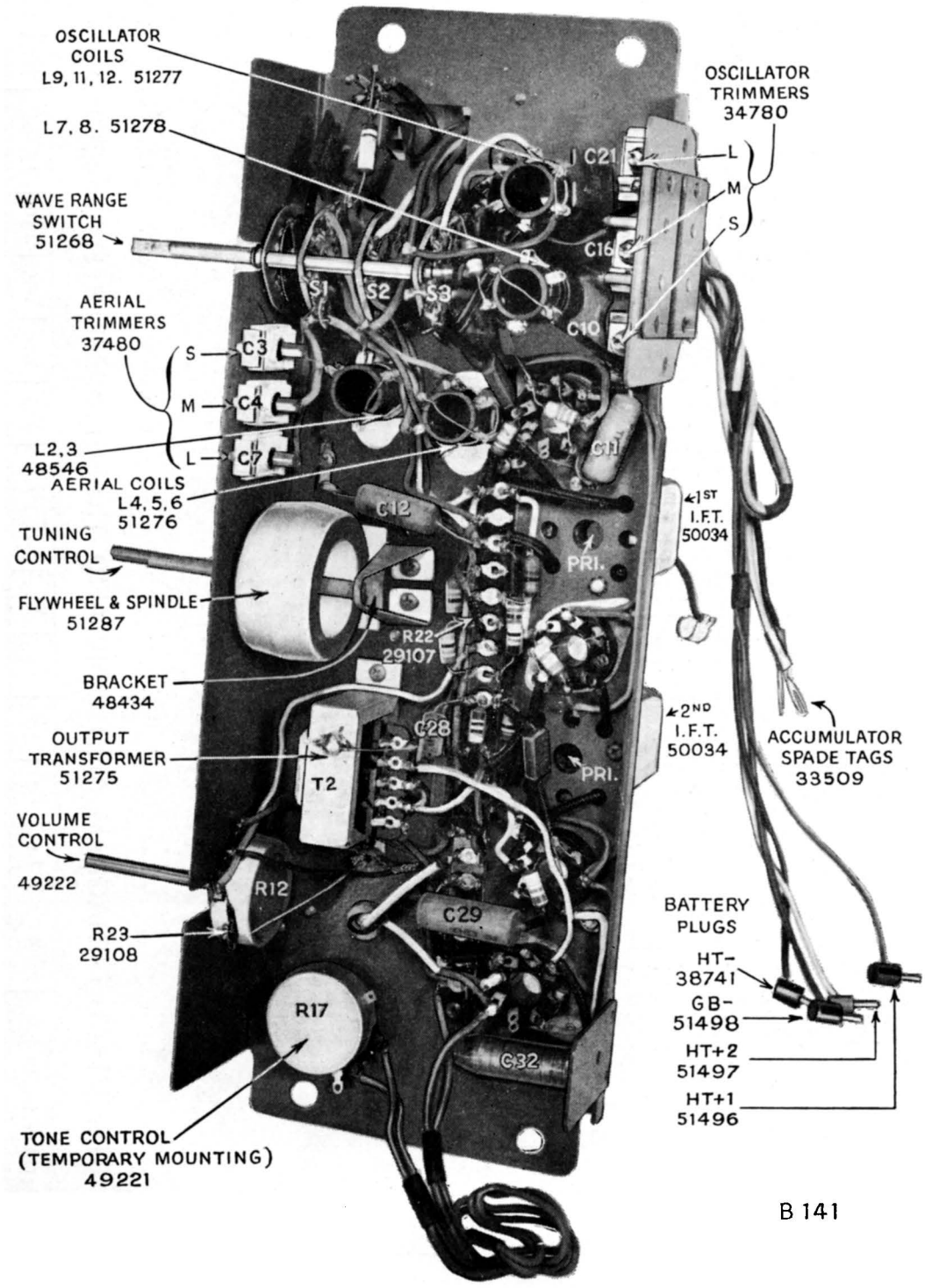
The local oscillator frequency is higher than the signal frequency on all wavebands.

To overcome the effect of oscillator "pulling" on the short waveband, the tuning control should be used to hold the signal while adjusting the aerial circuit.

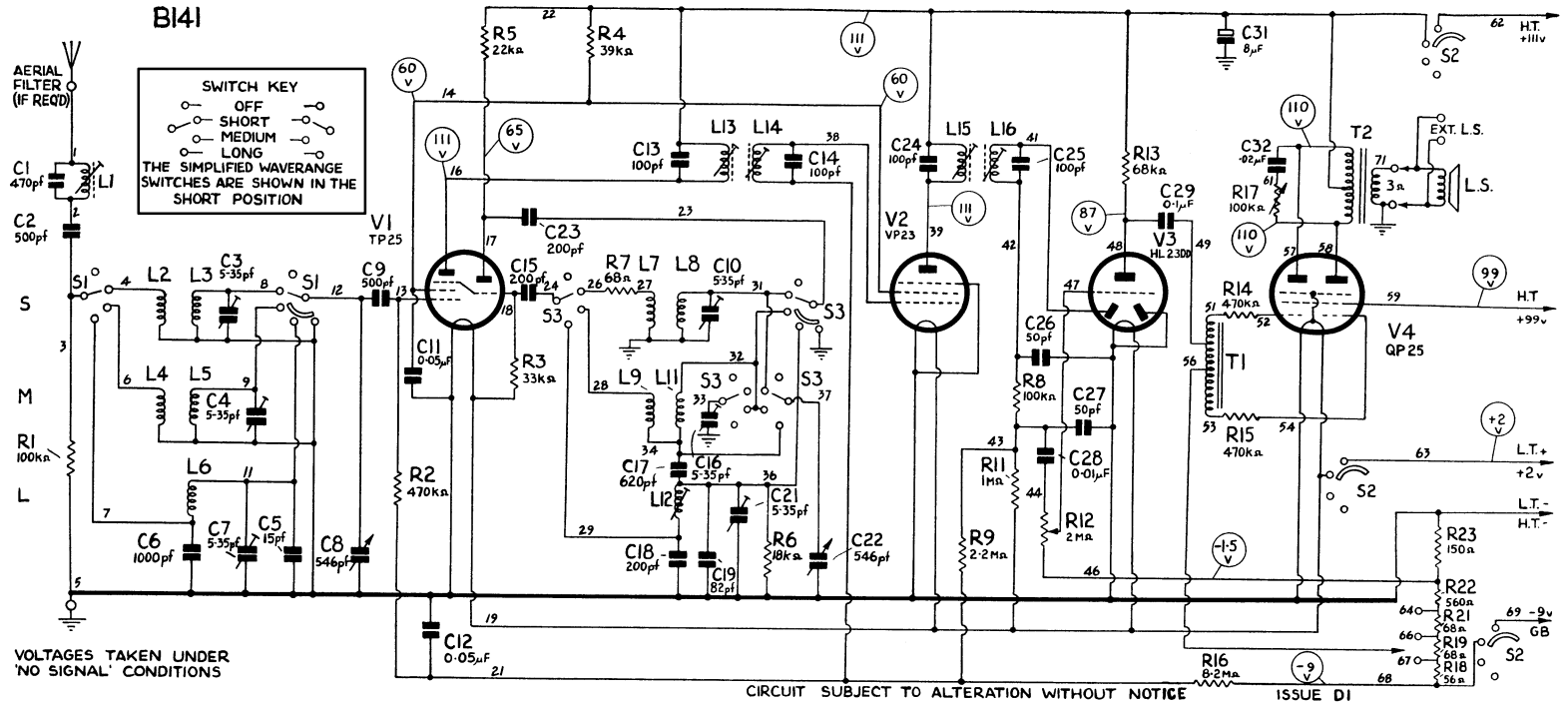
CIRCUIT ALIGNMENT TABLE

For i.f. adjustments, the signal generator is connected between the grid of V1 and chassis, via a 0·1 μF. capacitor. For all other adjustments, the signal generator is connected to the aerial and earth sockets via a dummy aerial. Further details are given on page 7 and above.

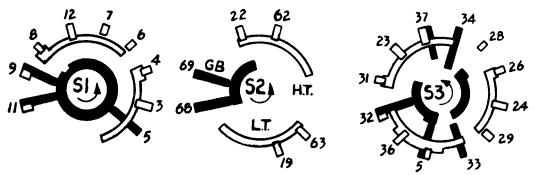
CIRCUIT	NOTES	SIG. GEN. FREQUENCY	RECEIVER SCALE SETTING	DRIVE DRUM SETTING	WAVE-RANGE	ADJUSTMENTS
2nd i.f.t.	Unscrew both cores to fullest extent	465 Kc/s	2050 m.	O	M	L15 (pri.) under chassis L16 (sec.) top of can Do not readjust
1st i.f.t.	Unscrew both cores to fullest extent	465 Kc/s	2050 m.	O	M	L13 (pri.) under chassis L14 (sec.) top of can Do not readjust
L.W.	Unscrew trimmers before adjusting. Repeat these adjustments until no further improvement	300 Kc/s (1000 m.) 158 Kc/s (1900 m.)	1000 m. 1900 m.	166·5 32·5	L L	l.w. osc. trimmer (C21) l.w. aerial trimmer (C7) l.w. osc. coil core (L12) (above chassis)
M.W.	See L.W. notes. No coil adjustment provided	1363 Kc/s (220 m.)	220 m.	155	M	m.w. osc. trimmer (C16) m.w. aer. trimmer (C4)
	Check calibration at 300 m. and 500 m.	1000 Kc/s (300 m.)	300 m.	115 ±·5	M	—
		600 Kc/s (500 m.)	500 m.	28 ± 1	M	—
S.W.	Unscrew trimmers before adjusting. Lowest capitance setting correct for osc. trimmer Check calibration at 31·25 m. and 41·4 m.	15 Mc/s (20 m.)	20 m.	153	S	s.w. osc. trimmer (C10) s.w. aer. trimmer (C3)
		9·6 Mc/s (31·25 m.)	31·25 m.	95–98	S	—
		7·25 Mc/s (41·4 m.)	41·4 m.	52–55·5	S	—



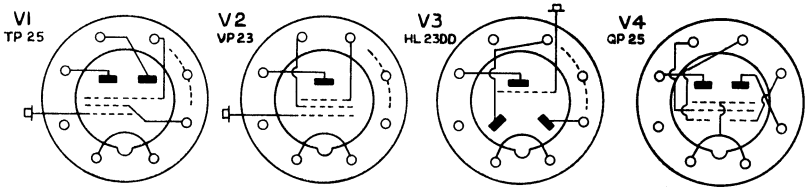
Underneath view of the chassis, showing the principal components and part numbers.
The corresponding diagram is on page 11.



SWITCH WAFERS, AS SEEN FROM REAR OF INVERTED CHASSIS (THE BLACK CONTACTS ARE AT THE REAR OF THE WAFER)



THE VALVE BASES, AS SEEN FROM BELOW THE CHASSIS

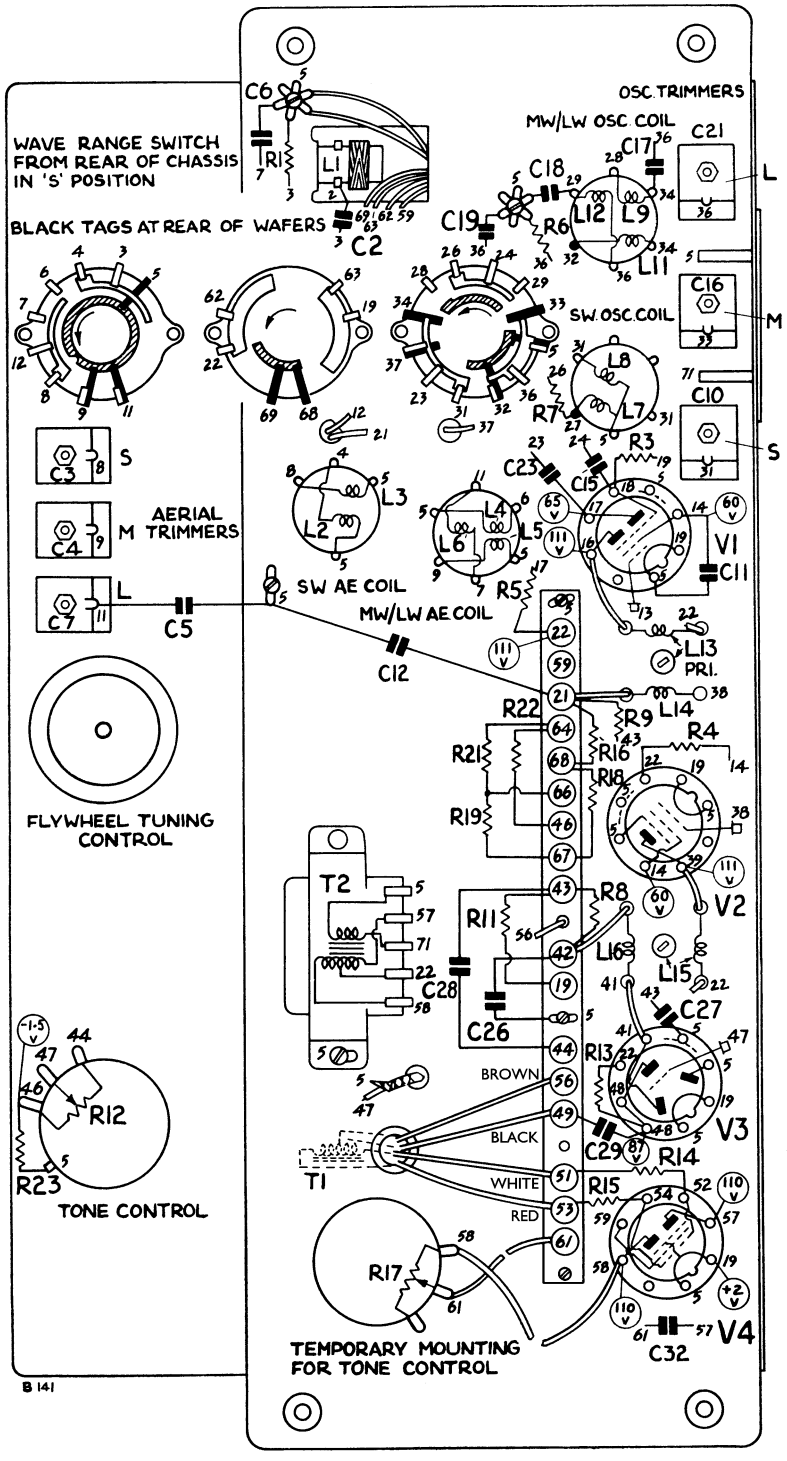


THE B141 CIRCUIT DIAGRAM AND COIL AND TRANSFORMER RESISTANCES

The voltages were measured with a 500 Ohms/Volt meter (M.W. band.)

Coil resistances which are not shown in the table are less than 1 Ohm.

Coil	L1	L4	L5	L6	L9	L11	L12	L13	L14	L15	L16	T1 total	T2 pri.
Ohms	3	1·5	4	22	1·5	2	5·5	6·5	6·5	6·5	6·5	1150	600

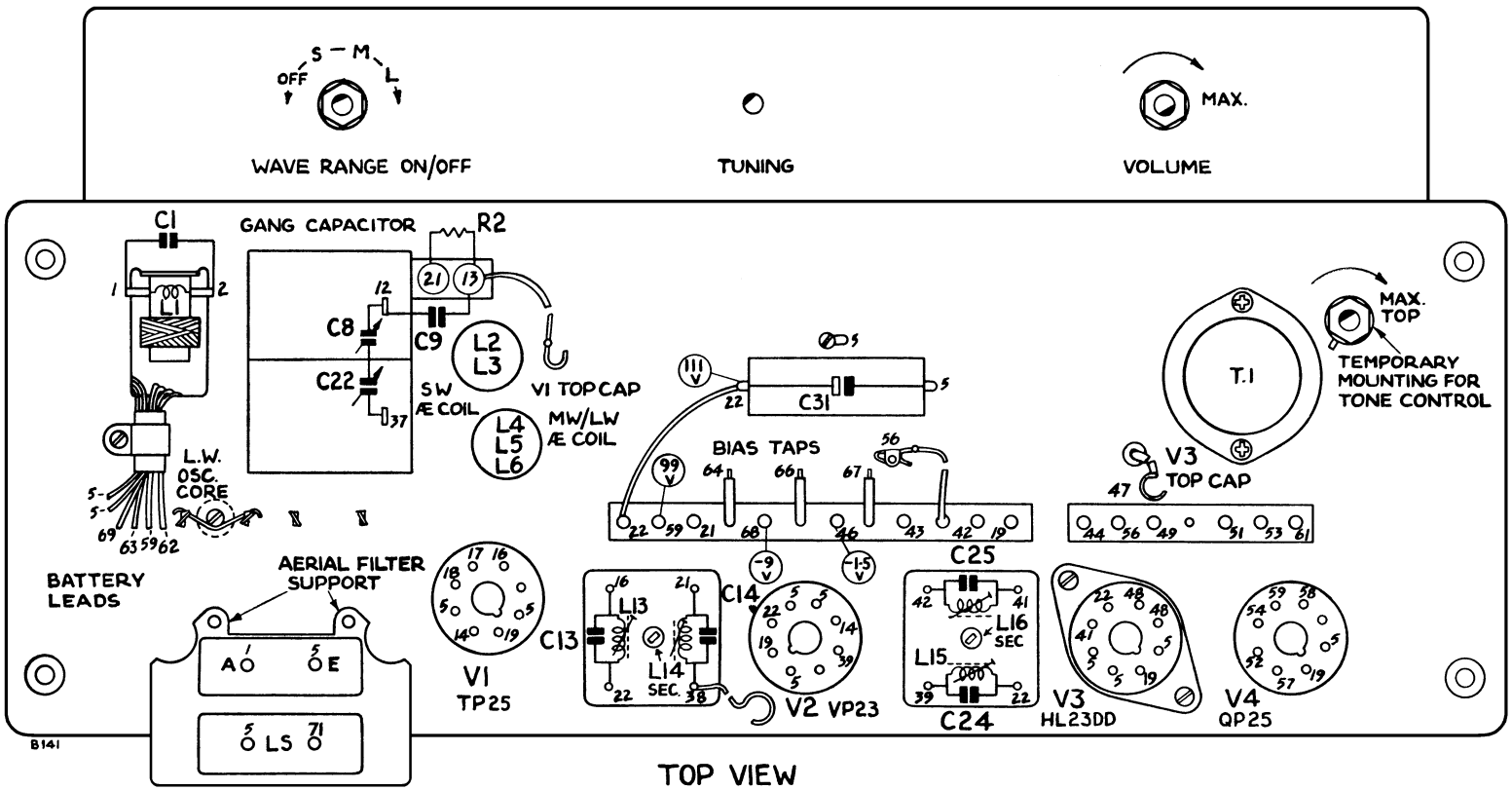


UNDERNEATH VIEW

C	L	R
6	1	1
17 21 18 2 19	12 9 11	6
16		
	8 7	7
10 3 15 23	3	3
4 11 7 5	2 6 4 5	5
12	13 14	
		22 16 9 21 4 18
		19
28	16 15	11 8
26 27		
29		12 13 23
		14 15
32		17

The voltage measurement conditions are given on page 10. The oscillator coil tags in black correspond with the locating nicks in the former.

C		1		8	22 9		13	14		31	24, 25					CAPACITORS
L		1				2,3,4,5,6	13	14			15 16					COILS
R						2										RESISTORS



TOP VIEW

The voltage measurement conditions are given on page 10.

REPLACEMENT COMPONENTS

Application for replacement components should be addressed to the Service Department, Murphy Radio Ltd, Welwyn Garden City, Herts., quoting the receiver type, description of item, and *part number*. The following parts list gives the part numbers for the majority of components which may be required for the B141 receiver. The Service Department is always ready to provide any assistance or information, etc. that may be required.

PARTS LIST

(Electrical Components)

The following abbreviations are used in the table: m.m., moulded mica; p.s.m., protected silvered mica; tub., tubular paper; elec., electroyltic; W, wattage rating. All resistors are rated at $\frac{1}{4}$ Watt unless otherwise stated.

The d.c. resistance quoted for the coil and transformer windings is an average figure and should be taken as a general guide only.

PART NO.	CIRCUIT NO.	VALUE	REMARKS
28173	C1	470 p.F	5% p.s.m.
23966	C2	500 p.F	20% m.m.
37480	C3	5–35 p.F	Trimmer
37480	C4	5–35 p.F	Trimmer
23602	C5	15 p.F	10% p.s.m.
28259	C6	1000 p.F	1% p.s.m.
37480	C7	5–35 p.F	Trimmer
48504	C8	546 p.F	Gang capacitor
23966	C9	500 p.F	20% m.m.
37480	C10	5–35 p.F	Trimmer
41403	C11	0·05 μ.F	20% tub.
41403	C12	0·05 μ.F	20% tub.
28156	C13	100 p.F	5% p.s.m.
28156	C14	100 p.F	5% p.s.m.
23900	C15	200 p.F	20% m.m.
37480	C16	5–35 p.F	Trimmer
28241	C17	620 p.F	1% p.s.m.
28258	C18	200 p.F	1% p.s.m.
23676	C19	82 p.F	10% p.s.m.
37480	C21	5–35 p.F	Trimmer
48504	C22	546 p.F	Gang capacitor
23900	C23	200 p.F	20% m.m.
28156	C24	100 p.F	5% p.s.m.
28156	C25	100 p.F	5% p.s.m.
23834	C26	50 p.F	20% m.m.
23834	C27	50 p.F	20% m.m.
41401	C28	0·01 μ.F	20% tub.
41404	C29	0·1 μ.F	20% tub.
31366	C31	8 μ.F	+50%, —20% elec., 175 Vw.
41420	C32	0·02 μ.F	20% tub., 1000 Vw.

PART NO.	CIRCUIT NO.	RESISTANCE	REMARKS
48548	L1	3Ω	i.f. rejector
48546	L2	—	s.w. aerial coil
	L3	—	
51276	L4	1·5Ω	m.w. aerial coil
	L5	4Ω	
	L6	22Ω	l.w. aerial coil
51278	L7	—	s.w. osc. coil
	L8	—	
51277	L9	1·5Ω	m.w. osc. coil
	L11	2Ω	
	L12	5·5Ω	l.w. osc. coil
50034	L13	6·5Ω	1st i.f.t. pri.
	L14	6·5Ω	1st i.f.t. sec.
50034	L15	6·5Ω	2nd i.f.t. pri.
	L16	6·5Ω	2nd i.f.t. sec.
51274	T1 total	1150Ω	i.v.t.
51275	T2 pri.	600Ω	o.t.
	T2 sec.	—	

PART NO.	CIRCUIT NO.	RESISTANCE	TOLERANCE AND REMARKS
27269	R1	100 KΩ	20%
27397	R2	470 KΩ	20%
27173	R3	33 KΩ	20%

PART NO.	CIRCUIT NO.	RESISTANCE	TOLERANCE AND REMARKS	PART NO.	CIRCUIT NO.	RESISTANCE	TOLERANCE AND REMARKS
25541	R4	39 KΩ	10%	27397	R14	470 KΩ	20%
25545	R5	22 KΩ	10%	27397	R15	470 KΩ	20%
25413	R6	18 KΩ	10%	26437	R16	8·2 MΩ	10%
24485	R7	68 Ω	10%	49221	R17	100 KΩ	Tone control
27269	R8	100 KΩ	20%	24453	R18	56 Ω	10%
27525	R9	2·2 MΩ	20%	24485	R19	68 Ω	10%
27461	R11	1 MΩ	20%	24485	R21	68 Ω	10%
49222	R12	2 MΩ	Volume control	29107	R22	560 Ω	5% high stability
27237	R13	68 KΩ	20%	29108	R23	150 Ω	5% high stability

PARTS LIST
(Mechanical Components)

This list contains only those parts which are not included in the electrical parts list; items such as self-tapping screws, bolts, and nuts, etc. may be obtained upon request from Murphy Radio Ltd, Service Department.

PART NUMBER	DESCRIPTION	REMARKS
42541	Accumulator tray	
51289	Back for cabinet	
51273	Battery retaining bar	
51525	Bolt, $\frac{1}{4}$ in. Whit. $3\frac{1}{2}$ in. long	Chassis fixing bolt
51292	Bracket with pulleys, r.h.	For cord drives
51293	Bracket with pulleys, l.h.	For cord drives
48434	Bracket	For flywheel spindle
51300	Cabinet	
50041	Carrier	For pointer
48223	Clamp	For aerial coils
48193	Clamps	For oscillator coils
15817	Connector	For grid bias taps
Spec. 936	Cord, for drives	Pointer 4 ft, main 2 ft
48222	Core, brass	For l.w. osc. coil
46911	Core, iron dust	For i.f.t.
51266	Drive drum	Engraved
34592	Felt washers	For knobs
49466	Flywheel (tuning control)	Less spindle
51287	Flywheel and spindle	Assembled
48504	Gang capacitor	
8608	Grommet	For chassis bolts
52075	Guide	For pointer and carrier
50045	Holder	For pointer
51267	Indicator	For drive drum
18504	Knob	For volume and tuning controls
49031	Knob	For tone control
51272	Knob	Engraved, for wave-range switch
51642	Loudspeaker	
260765	Nut, $\frac{1}{4}$ in. Whit.	For chassis fixing bolts

PART NO.	DESCRIPTION	REMARKS
31228	Panel and tag	On gang
48438	Panel with sockets	For A.E. and L.S. panels
38741	Plug, H.T.— (black)	Battery plugs
51496	Plug, H.T.+1 (red)	
51497	Plug, H.T.+2 (mauve)	
51498	Plug, GB— (green)	
45974	Plug, L.S.	
37974	Plug, aerial	
37975	Plug, earth	
51906	Pointer only	
52240	Pointer and holder, assembled	
51301	Ring clamp	For inter-valve transformer
51329	Scale	
50048	Spacer (right hand)	To support scale
50049	Spacer (left hand)	To support scale
37457	Spacer	For V3 valve-holder
33509	Spade tag	For accumulator leads
48228	Spring	For l.w. osc. coil core
19448	Spring	For cord drives
46761	Strip with tags	Main component panel
46906	Strap	For securing i.f. rejector
50050	Stud (knurled)	For securing scale to cabinet
51268	Switch, wave-range	Unwired
7619	Terminal, nut	For battery retaining bar
37480	Trimmer	
6678	Valve clip	For top caps of valves
3975	Valve-holders	
50042	Washer, cup	For chassis mounting
48195	Washer, spring	For scale support (on spacer 50048)

MODIFICATIONS AND NOTES

Details of any modifications should be noted in the space below. It is also suggested that information regarding elusive faults which may have been experienced should be added for future reference.