

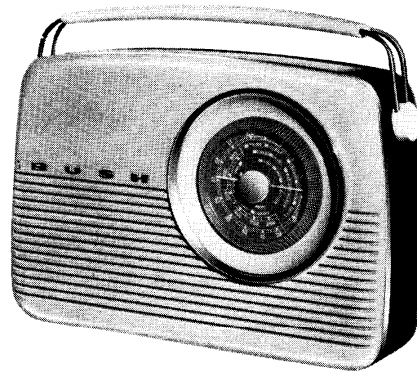
# BUSH RADIO

## Service Instructions

### MODEL MB.60

MAINS/BATTERY

### PORTABLE RADIO



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#### SPECIFICATION

##### CIRCUIT

The MB.60 is a 5-valve mains/battery superheterodyne portable receiver using Mullard valves in the following sequence :—

Mixer/oscillator DK96 (V1), 1st I.F. Amplifier DF96 (V2), 2nd I.F. Amplifier DF96 (V3), Detector/AGC/Audio Amplifier DAF96 (V4), Output DL96 (V5).

Metal rectifiers are used for mains operation.

##### BATTERIES

A combined dry battery is used for h.t. (90V.) and l.t. (1.5V.) supplies. A recommended battery is the Ever-Ready type B147, but of course any equivalent type may be used.

##### MAINS OPERATION

The receiver is automatically switched to mains operation when the mains plug is inserted to battery operation when the mains plug is withdrawn. Thus particular care must be taken by the customer to switch off the set by the On/Off switch and not merely by removing the mains plug.

##### CONSUMPTION

Battery Operation : H.T. 10mA at 90V.  
L.T. 150 mA at 1.5V.  
Mains Operation : 5 watts.

##### WAVERANGES

M.W. 187-570 metres (1,605 to 525 kc/s).  
L.W. 1,070-1,900 metres (280 to 158 kc/s).

##### INTERMEDIATE FREQUENCY

470 kc/s.

##### AERIAL

An internal ferrite rod aerial is provided for use on both bands and there is also provision for connecting a car aerial.

##### AUDIO OUTPUT

100 milliwatts.

##### CONTROLS

On top of case from left to right viewed from front :—  
Rim operated volume control.  
Two push key waveband switch.  
Rim operated combined tone control and On/Off switch.

##### WEIGHT

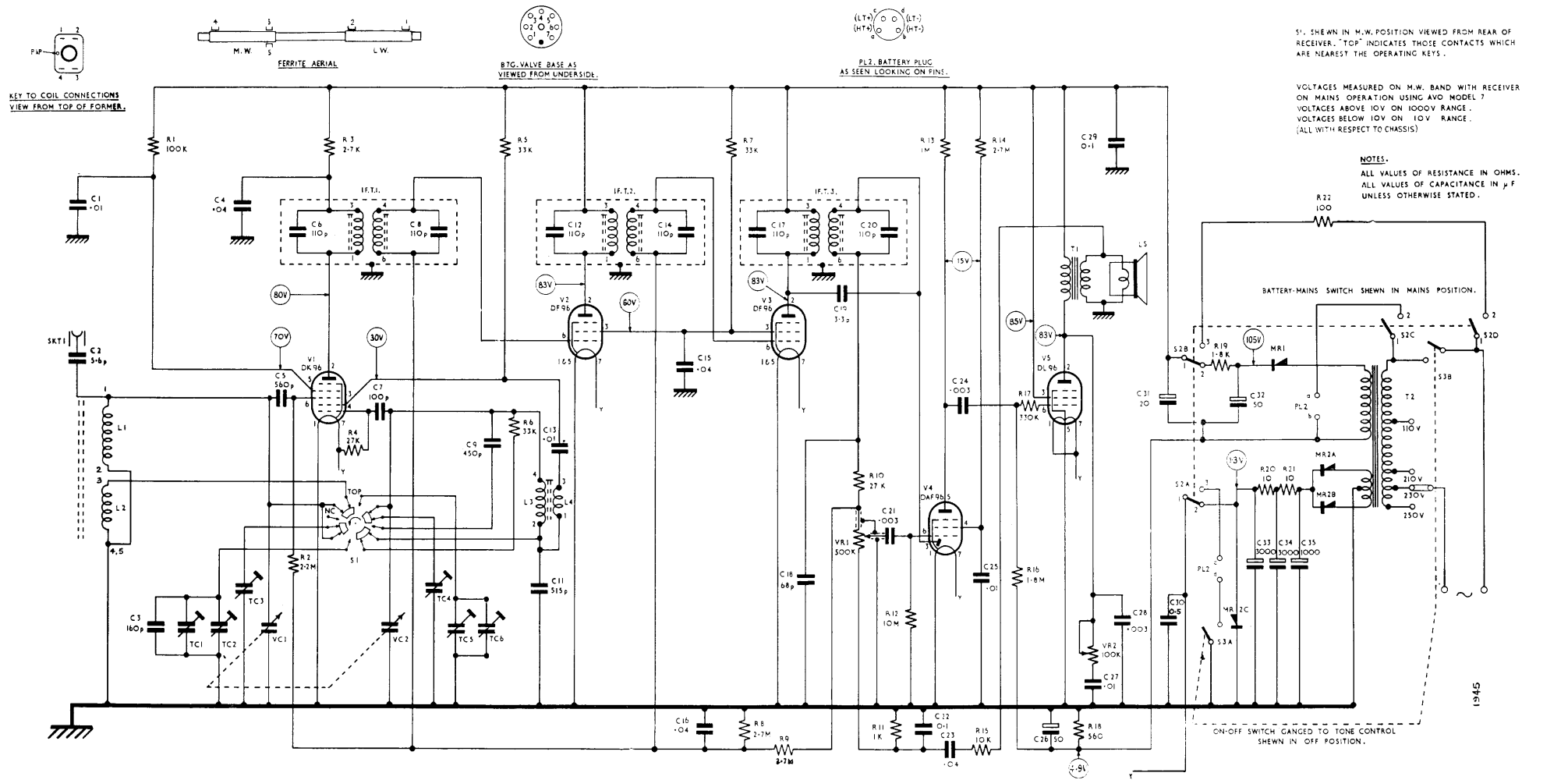
7 lbs.

##### DIMENSIONS

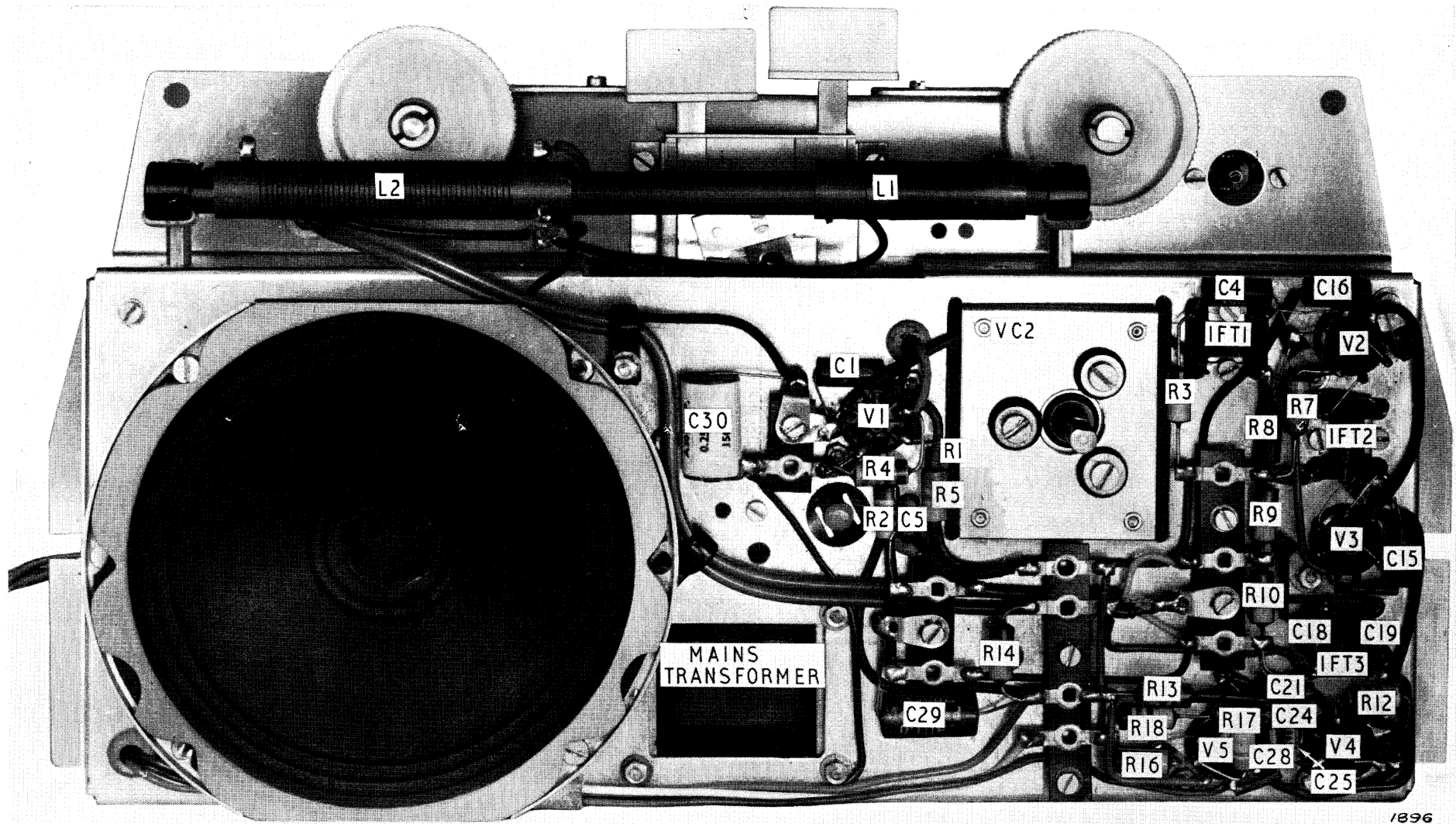
Height\* 10 $\frac{1}{4}$ ". Width 13 $\frac{1}{2}$ ". Depth 3 $\frac{3}{4}$ ".

\* Including projecting handles.

CAPACITORS	1	3	4	5	6	7	8	9	10	11	13	14	16	17	18	19	20	22	23	24	25	26	27	29	31	32	33	34	35	CAPACITORS
RESISTORS		1		2	3	4			5	6			7	8	9		10	11	12	13	14	15	16	17	18	19	20	21	22	RESISTORS
MISCELLANEOUS	SKT1	L1 L2	TC1 TC2 TC3	VC1	VI	SI	IFT1 VC2	TC4 TC5 TC6	L3 L4	V2	IFT2		V3	IFT3 VR1	V4		V5 VR2	L5	S1B S2A S3A	PL1 MR1C MR1	MR2A MR2B	T1	MR3A MR3B	T2	S1C S3B	S1D S3D			MISCELLANEOUS	



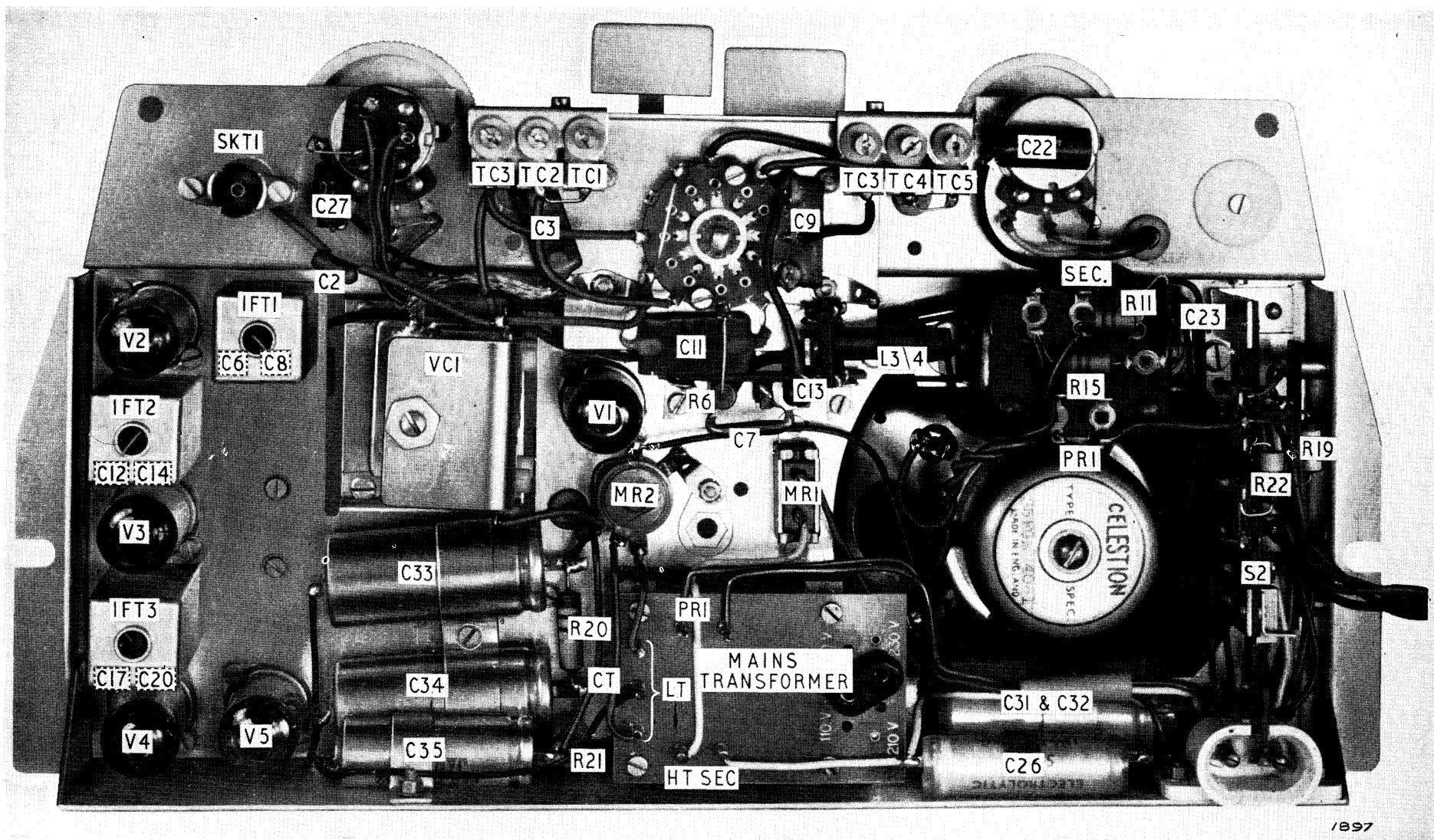
1345



1896

Front View

MB.60



1897

Rear View

**REMOVING CHASSIS FROM CABINET**

R.F. and oscillator adjustment may be carried out without withdrawing the chassis from the cabinet.

For I.F. alignment and alignment of the ferrite rod aerial it is necessary to remove the chassis after withdrawing the four retaining screws and the tuning knob and pointer.

When the chassis is replaced in the cabinet, care must be taken to replace the flexible connection to the foil screen.

**ALIGNMENT PROCEDURE**

**TEST EQUIPMENT REQUIRED**

1. Signal generator with a frequency range of 150 kc/s to 2 Mc/s. Modulation 400 C/s at 30 per cent.
2. Output wattmeter 50 to 1,000 milliwatts.

**PRELIMINARY**

1. For R.F. alignment the generator should be coupled to the receiver by means of a single loop of insulated wire placed about 3 feet from the receiver and with its plane at right angles to that of the ferrite aerial.
2. The receiver and signal generator should be switched on ten minutes before commencing alignment.
3. Set the receiver volume control to maximum and the tone control to maximum top and use the lowest input from the signal generator consistent with a reasonable output from the receiver.

4. Check that when the plates of the tuning condenser are fully meshed the engraved line on the tuning knob coincides with the scale datum line.

**I.F. ALIGNMENT**

Switch the receiver to M.W. and adjust the tuning pointer to approximately 300 metres. Connect the signal generator via a 0.1 $\mu$ F capacitor to pin 6, V2 and tune the secondary and primary of I.F.T.3 for maximum output. Then tune the secondary and primary of I.F.T.2 for maximum output. Transfer the signal to pin 6, V1 and tune the secondary and primary of I.F.T.1 for maximum output. Decrease the signal generator output as the circuit approaches resonance.

**R.F. ALIGNMENT**

Operation	Waveband	Signal Generator Frequency	Receiver Tuned to	Adjustment
1	M.W.	600 kc/s	500 metres	Core of L3/4. Trimmer TC4 (oscillator) and TC3 (Aerial).
2	M.W.	1,500 kc/s	200 metres	
3	Repeat operations 1 and 2.		1,400 metres	Trimmer TC5 and TC6 (oscillator) and TC1 and TC2 (Aerial).
4	L.W.	214 kc/s		
5	Check calibration.			

The ferrite rod aerial L.W. coil has been sealed after alignment at the factory and should not be moved. It is also unlikely that alignment will be required on M.W. If it is necessary the ferrite aerial coil L2 may be adjusted on the rod for maximum output with the signal generator tuned to 600kc/s.

**COILS AND TRANSFORMERS**

Reference	Resistance (ohms)	Part Number	Description
L1	Less than 0.5	AS60505	Ferrite Aerial Coil.
L2	0.5		
L3	4		
L4	2	BS60495	M.W. Oscillator Coil.
T1	Pri. 460 $\Omega$ Sec. 0.2 $\Omega$	BS60494	Output Transformer.
T2	Pri. 770 $\Omega$ Total H.T. 420 $\Omega$ L.T. 1.6 $\Omega$ Total	DS60492	Mains Transformer.
I.F.T.1	Pri. 16 Sec. 16	AS24304	1st I.F. Transformer.
I.F.T.2	Pri. 16 Sec. 16	AS24304	2nd I.F. Transformer.
I.F.T.3	Pri. 16 Sec. 16	AS24304	3rd I.F. Transformer.

RESISTORS

Reference	Value (ohms)	Rating (watts)	Tolerance ± %	Part No.
R1	100K	1	10	P6869
R2	2.2M	1	20	P7199
R3	2.7K	1	20	P13897
R4	27K	1	10	P6719
R5	33K	1	10	P6743
R6	33K	1	10	P6743
R7	33K	1	10	P6743
R8	2.7M	1	20	P14437
R9	2.7M	1	20	P14437
R10	27K	1	20	P14077
R11	1K	1	10	P6365
R12	10M	1	20	P7365
R13	1M	1	20	P7115
R14	2.7M	1	20	P14437
R15	10K	1	10	P6617
R16	1.8M	1	20	P14407
R17	330K	1	20	P6989
R18	560	1	5	P6305
R19	1.8K	1	10	P6425
R20	10	1	5	P5866
R21	10	1	5	P5866
R22	100	1	20	P6107
VR1	500K	—	—	BP60410
VR2	100K	—	—	BP60308

CAPACITORS

Reference	Value		Type	D.C. Working Voltage	Tolerance ± %	Part No.
	mfd.	pf.				
C1	0.01	—	M.P.	400	20	AP21909
C2	—	5.6	S.C.	750	.5pF	AP24628
C3	—	160	S.M.	350	2	AP60305
C4	0.04	—	M.P.	200	20	AP24028
C5	—	560	S.C.	350	20	AP23405
C6	—	110	S.M.	350	2	AP25808
C7	—	100	S.M.	350	10	AP18803
C8	—	110	S.M.	350	2	AP25808
C9	—	450	S.M.	350	1	AP25616
C11	—	515	S.M.	350	1	AP17175
C12	—	110	S.M.	350	2	AP25808
C13	0.01	—	M.P.	400	20	AP21909
C14	—	110	S.M.	350	2	AP25808
C15	0.04	—	M.P.	200	20	AP24028
C16	0.04	—	M.P.	200	20	AP24028
C17	—	110	S.M.	350	2	AP25808
C18	—	68	S.C.	750	20	AP18161
C19	—	3.3	S.C.	750	±.5p	AP60609
C20	—	110	S.M.	350	2	AP25808
C21	0.003	—	M.P.	400	20	AP22249
C22	0.1	—	M.P.	150	25	AP24115
C23	0.04	—	M.P.	200	20	AP21245
C24	0.003	—	M.P.	400	20	AP24028
C25	0.01	—	M.P.	400	20	AP22249
C26	50	—	Elect.	12	+50 -20	AP24115
C27	0.01	—	M.P.	400	20	AP21909
C28	0.003	—	M.P.	400	20	AP22249
C29	0.1	—	M.P.	150	25	AP24115
C30	0.5	—	M.P.	150	20	AP21245
C31	20	—	Elect.	150	+50 -20	AP60249
C32	50	—	Elect.	150	+50 -20	AP60307
C33	3000	—	Elect.	6	+50 -20	AP60306
C34	3000	—	Elect.	6	+50 -20	AP60306
C35	1000	—	Elect.	6	+50 -20	AP60252
TC1	—	3—30	—	—	—	—
TC2	—	3—30	—	—	—	—
TC3	—	3—30	—	—	—	—
TC4	—	3—30	—	—	—	—
TC5	—	3—30	—	—	—	—
TC6	—	3—30	—	—	—	—
VC1	—	523	—	—	—	—
VC2	—	523	—	—	—	—

Elect. — Electrolytic. M.P. — Metallized Paper. S.C. — Silver Ceramic. S.M. — Silver Mica.

MISCELLANEOUS PART NUMBERS

<i>Description</i>	<i>Part No.</i>	<i>Description</i>	<i>Part No.</i>
Aerial Ferrite .. .. .	DS60544	Plug 4-pin .. .. .	AP16338
Cabinet—Body .. .. .	EP60205	Rectifier, contact (H.T.) .. .. .	AP60412
Cabinet—Front .. .. .	EP60206	Rectifier, Stabilizer (L.T.) .. .. .	AP60413
Cabinet—Back .. .. .	EP60207	Scale Tuning .. .. .	DP60514
Handle .. .. .	DP60208	Speaker 5" .. .. .	CP60416
Knob (Long) .. .. .	CP60214	*Socket, Co-axial Type CRS200 .. .. .	AP60448
Knob (Medium) .. .. .	CP60215	Switch, Waveband .. .. .	DS60502
Knob (Tuning) .. .. .	CP60216	Valveholder B7G .. .. .	AP19187
Knob (Volume or Tone) .. .. .	CP60204		

\*Early production receivers used a socket type TVS/1

MODIFICATIONS

On Chassis No. 1-2000:—

C10 was 35pF, S.M., 350V, wkg.,  $\pm 5\text{pF}$  tol., Part Number AP24433. This is no longer used.

C30 was 0.25 $\mu\text{F}$ , M.P., 150V, wkg.,  $\pm 25\%$  tol., Part Number AP21244

# BUSH RADIO

## Supplementary Service Instructions (FOR USE IN CONJUNCTION WITH TP1109)

### MODEL MB. 60 MAINS/BATTERY PORTABLE RADIO SERIAL NO. 12001 ONWARDS

The circuit is basically the same as on the earlier model. Different batteries are used and this has necessitated a change in the component layout.

#### SPECIFICATION

As for earlier models except:

#### BATTERIES

Separate dry batteries are used for h.t. (90 V) and l.t. (1.5 V) supplies. Recommended batteries are, for h.t. an Ever Ready B131 and l.t. two U.2 cells. Connection of the B131 to the set is by means of press studs. The two U.2 cells are held by a retaining clip. Any equivalent types of battery may of course be used.

#### CIRCUIT MODIFICATION

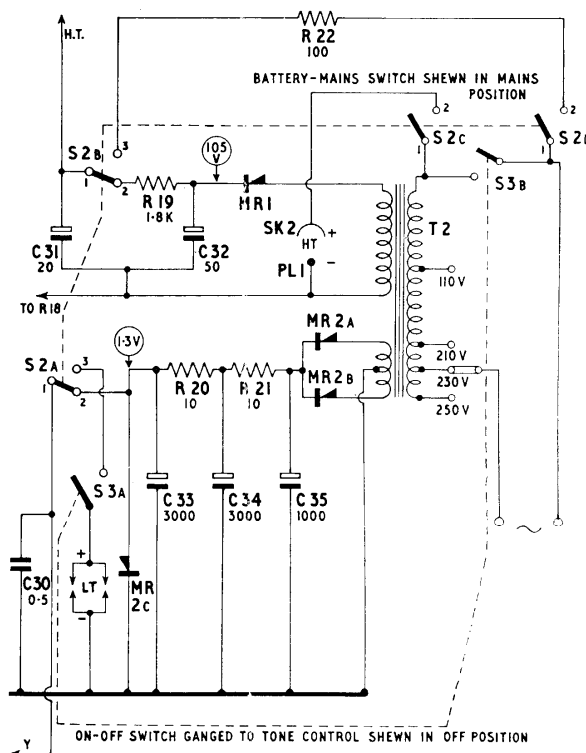


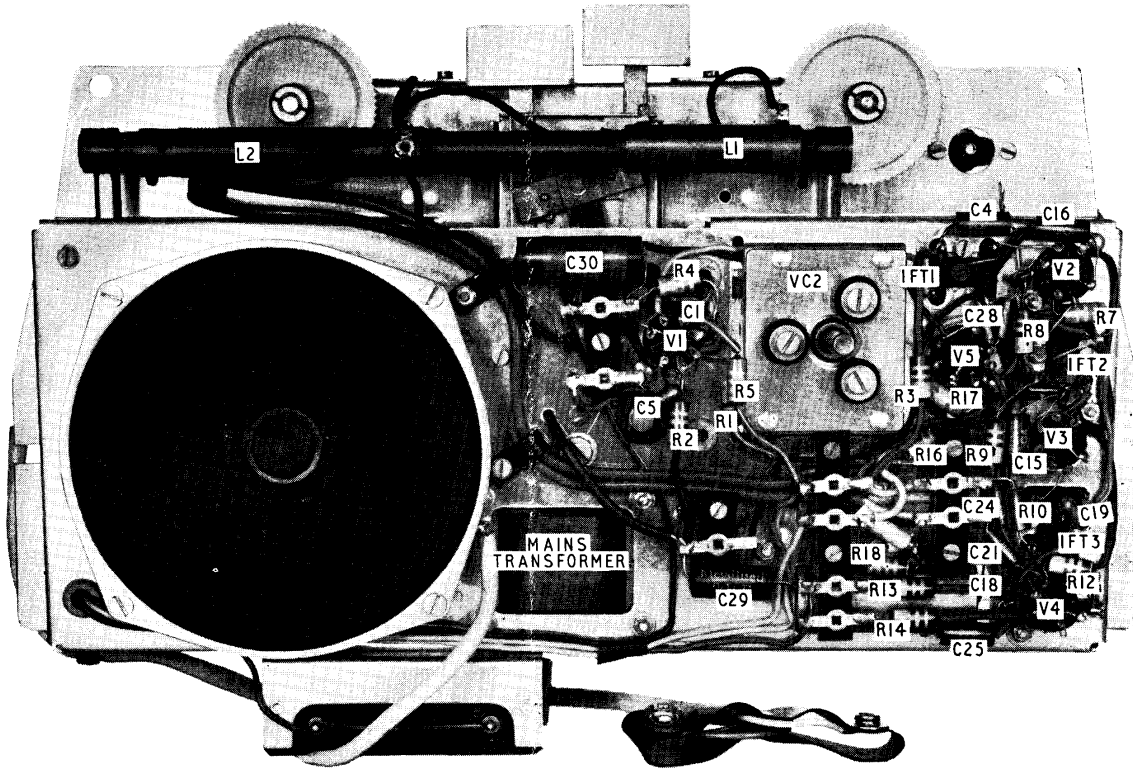
Fig. 1. Part of circuit redrawn to show modified battery connections.



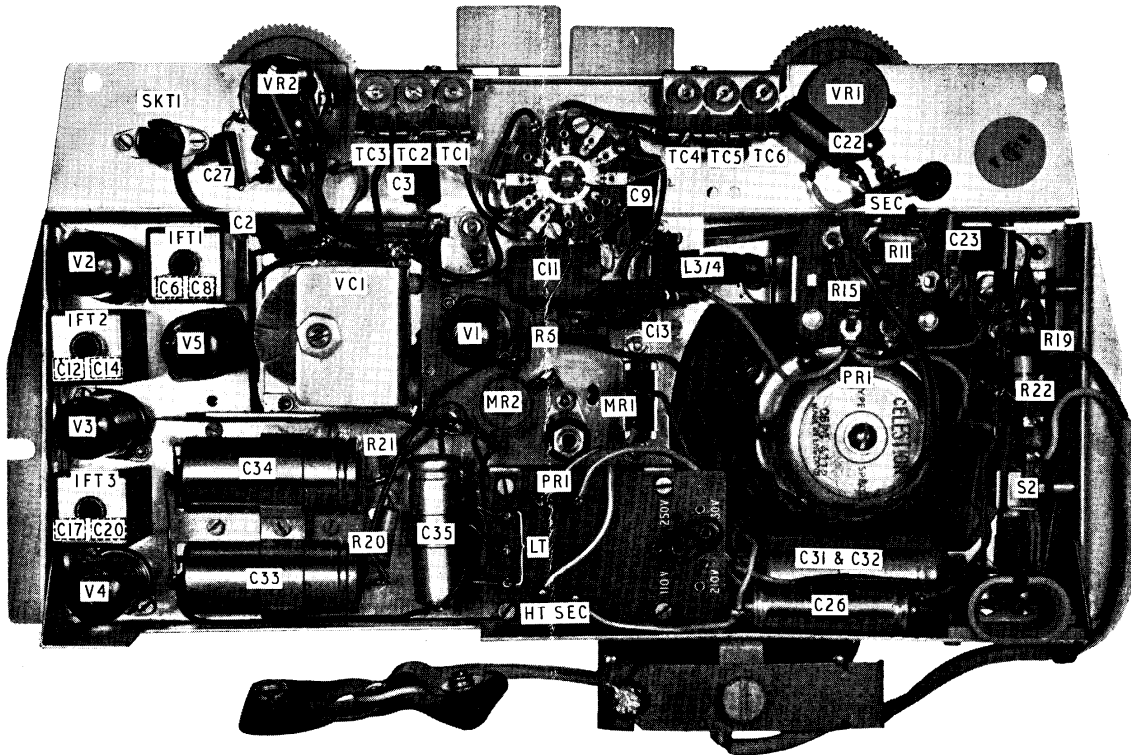
## SUPPLEMENTARY PARTS LIST

Battery lead	AP60794	†Socket coaxial type CRS200	AP60896
*Socket coaxial type TVS/1	AP60448	‡ „ „ „ „ CRS300	AP61162
		*Early production only.	
		†Not used after serial No. 12000.	
		‡Serial No. 12001 onwards.	

## MODIFIED COMPONENT LAYOUTS



*Fig. 2. Front View.*



*Fig. 3. Rear View.*

NOTE: On sets from serial No. 15001 onwards C2 is 1800pF, 3000V flash +50% -20% ceramic and is on the front of the chassis connected between the centre conductor of the aerial socket and a tag secured near this. A connection is taken from this tag to the winding L5 (see Fig. 5) on the ferrite rod aerial.

# FERRITE ROD AERIAL

(SETS FROM SERIAL No. 15001 ONWARDS)

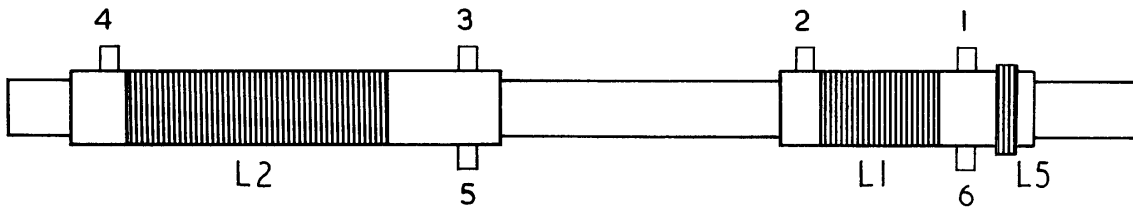


Fig. 4. Ferrite Rod Aerial.

To obtain more effective coupling of the car aerial when used, a new winding, L5, is now added on the ferrite rod aerial. Its d.c. resistance is  $\frac{3}{4}$  ohm.

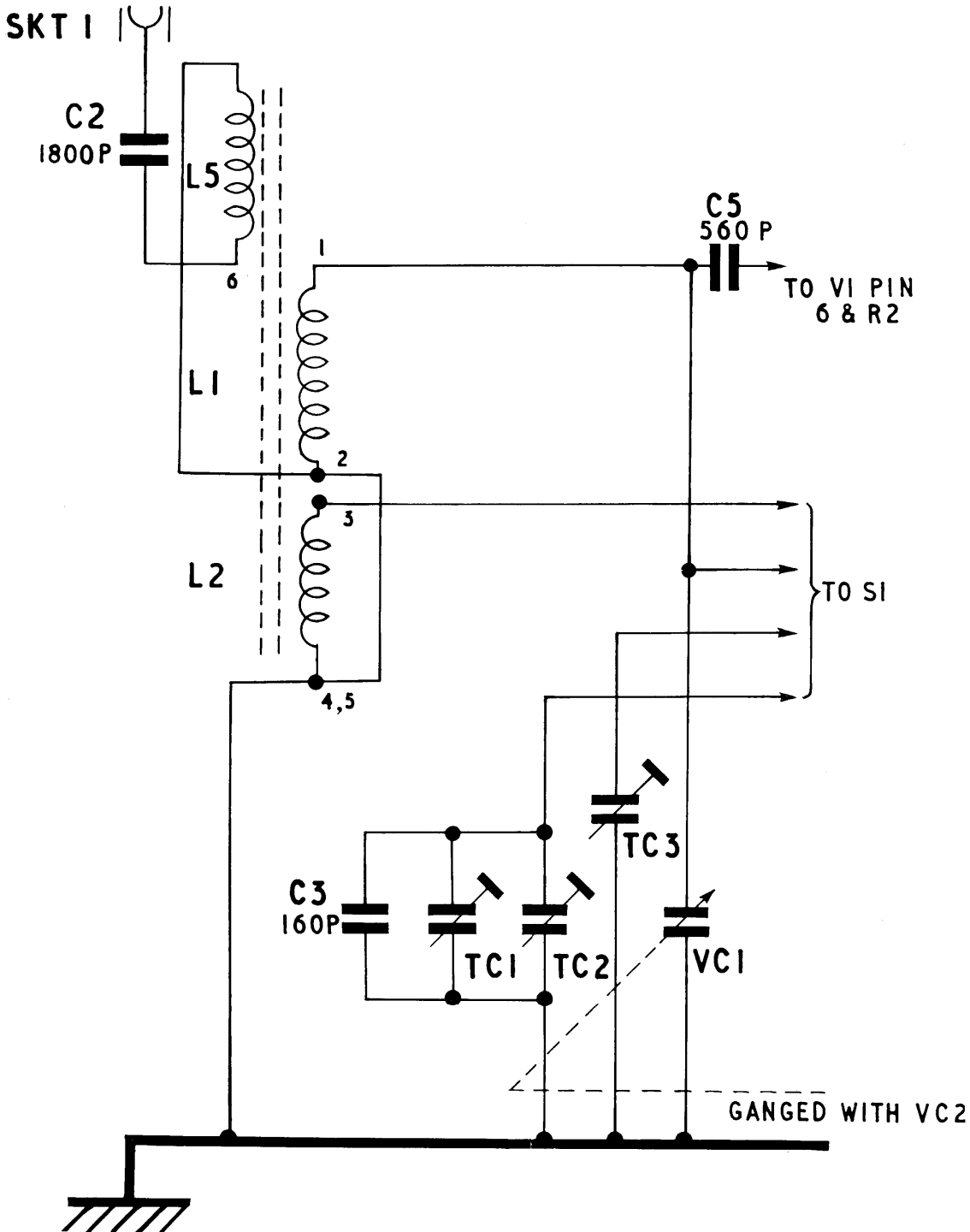


Fig. 5. Part of circuit showing the ferrite rod aerial.