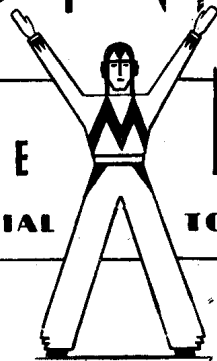


# MARCONI PHONE

## SERVICE MANUAL

PRIVATE AND CONFIDENTIAL TO THE TRADE ONLY



### MODELS 534 and 537

### 7-VALVE ALL-WAVE RECEIVER FOR A.C. MAINS

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Reprinted May 1947

SEPT.

1 9 3 6  
1937 SERIES  
NUMBER TWO  
PART NO. 24475

## TECHNICAL SPECIFICATION

### VOLTAGE RANGE.

95 to 260 volts.  
50 to 100 cycles.

### CONSUMPTION.

85 watts.

### FUSES.

It is recommended that this instrument is connected only to supply points protected with 2 ampere fuses.

### SPEECH OUTPUT.

Approximately 3 watts undistorted. Anode dissipation of type N42 output valve, 6.5 watts.

### WAVELENGTH RANGE.

S.W.	...	...	...	...	16.7 to 54 metres (18.0-5.55 mc.).
M.W.	...	...	...	...	195 to 580 metres (1,540-517 k.c.).
L.W.	...	...	...	...	725 to 1,950 metres (414-154 kc.).

### DIMENSIONS

Height.  
15 $\frac{3}{4}$  inches.

Width.  
18 $\frac{1}{8}$  inches.

Depth.  
12 $\frac{1}{4}$  inches.

### WEIGHT.

48 lb. net.  
60 lb. gross.

### LOUDSPEAKER.

No. 21970AJ.

This loudspeaker incorporates the output transformer T1, correction condenser C23, and the high capacity electrolytic condensers C16 and C18 which, together with the loudspeaker field winding CK1, smooth the high-tension current for the valves.

D.C. resistance of speech coil, 4 ohms.

Impedance at 800 cycles, 5 ohms.

D.C. resistance of field, 1,100 ohms.

### VALVES.

V1	type W42	...	...	...	H.F. amplifier.
V2	" X42	...	...	...	Frequency changer.
V3	" W42	...	...	...	I.F. amplifier.
V4	" D41	...	...	...	Diode detector and A.V.C. rectifier.
V5	" H42	...	...	...	L.F. amplifier.
V6	" N42	...	...	...	Output pentode.
V7	" U14	...	...	...	H.T. rectifier.
VT	" 6E5	...	...	...	Visual tuning indicator.

### CIRCUIT DESCRIPTION.

The aerial circuit of this receiver has been specially designed for use with a doublet aerial to give improved reception of short waves. The circuit is arranged so that the aerial operates as a "T" type on medium and long waves without alteration or switching. The first tuned circuit feeds the H.F. amplifier, an A.V.C. controlled variable mu H.F. pentode (W42).

Tuned anode, capacity coupling is employed between the H.F. amplifier and the hexode frequency changer (X42), which is also A.V.C. controlled. The inductance L19 operates as a frequency stabilizer and is extremely effective in preventing "oscillator drift," which often gives trouble on short waves. Each oscillator grid tuning coil is individually trimmed to maintain correct tracking, and the short-wave anode coil is fed through R19 and C16, which ensure stability and constant oscillation.

The first I.F. transformer feeds the I.F. amplifier type (W42), an H.F. pentode which is controlled by A.V.C. bias. The intermediate frequency is 465 kc. and the second transformer feeds the diode D41. This valve rectifies the signal and supplies the A.V.C. bias voltage for V1, 2 and 3.

The L.F. signal is amplified by the triode H42, which is resistance capacity coupled to the pentode output valve N42. All H.T. current is supplied by the full-wave rectifier U14, and is smoothed by the loudspeaker field in conjunction with electrolytic condensers C15, C18.

### WAVE-BAND SWITCHING.

The coils for the three ranges are connected in series across the variable condenser, and the wave-band switches short out the coils not in use. This means that for medium waves the short and medium wave coils form the total inductance, and for long waves all three coils are used.

### A.V.C. AND VISUAL TUNER.

The rectified I.F. signal appears across the load resistance R9 of the strapped diodes. The D.C. voltage is utilized to supply controlling bias to V1, via R7 and R1, and to V2, V3, via R7 and R5, respectively. This D.C. voltage is also fed via R25 to the grid of the visual tuner valve 6E5. This valve is a voltage indicator of a special type. It incorporates a triode and, in the end of the bulb, a cathode ray target coated with fluorescent material, which is connected directly to the H.T. supply. The anode of the triode (which acts as a D.C. amplifier) has a load resistance R23 and is internally connected to a ray-controlling electrode in the cathode ray path. The variations of grid voltage produced by the A.V.C. vary the anode current taken, and therefore the voltage across R23, bringing the potential of the ray-controlling electrode nearer and nearer to that of the target as a station is tuned in. This potential governs the "shadow" pattern on the target and consequently gives visual indication of correct resonance point when tuning.

### TONÉ CONTROL.

The six-point control gives variation of both bass and treble frequencies. The bass is controlled by varying the coupling condenser by adding C17 in parallel. Treble response is varied by switching C24 and C25 across the primary of the output transformer.

### THE RADIO-GRAM SWITCH.

The double-pole switch S2 connects the pick-up sockets to the volume control VRI, at the same time disconnecting the radio output and removing the voltage from the oscillator anode of V2.

## DISMANTLING

### REMOVAL OF CHASSIS.

1. Remove back and knobs.
2. Pull valve holder off the tuning indicator 6E5.
3. Disconnect leads from terminals B, C, and chassis on mains transformer panel, and from loudspeaker panel. Unclip pilot lamp flex from top of cabinet. The loudspeaker leads, if uncleaned, are long enough to allow the chassis to be withdrawn for inspection without disconnecting the loudspeaker.
4. Remove two fixing bolts from underside of cabinet. The chassis is now free.

### REMOVAL OF LOUDSPEAKER.

1. Disconnect wires to speaker panel.
2. Remove two screws holding speaker support bar and withdraw speaker.

### WIRE CONNEXIONS TO L.S. PANEL.

Tag No.	Wire Colour.
6	Red.
7	Red/Black.
8	Red/Yellow.
Chassis	Yellow/Black.

### IMPORTANT.

It is extremely important when servicing to make sure that all four leads are connected to the loudspeaker terminal panel and that the electrolytic condensers mounted on the speaker chassis are in a vertical position before the receiver is switched on. Otherwise serious damage may be done to these condensers or other components in the receiver.

## THE ALL-WAVE STATIC-FREE AERIAL

The Marconiphone All-wave Static-Free aerial is recommended as the ideal solution to the problem of obtaining good reception on all wave-bands with immunity from interference. Apart from the anti-static properties of this aerial it has been designed to resonate in such a way that its efficiency at the wavelengths utilized for short wave broadcasting is higher than a normal aerial. Three lengths of stranded copper wire 60, 39 and 5 feet form the aerial. They are matched into a fully screened weather-proof transmission line by a neat matching unit contained in an insulator. At the receiver end another

unit makes provision for correct matching into the input circuits of the receiver on all wave bands. The receiver unit is fitted with a three-position switch, which adjusts the conditions correctly for medium and long waves, 30 to 200 metres, and 7 to 30 metres. Full particulars for fixing the aerial are supplied with the equipment.

Where there is no serious man-made static an improved signal to noise ratio can be obtained with a doublet aerial, for connexion of which provision has been made in this receiver.

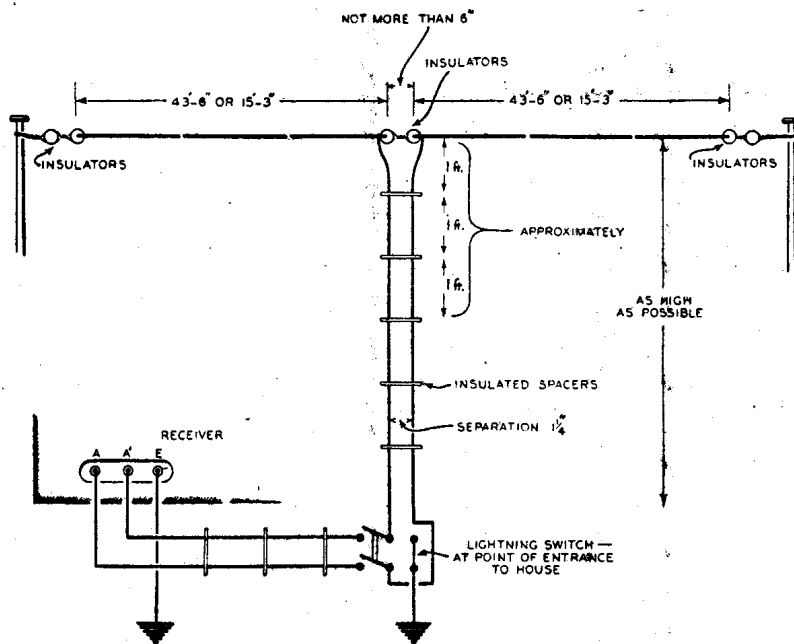
When best reception of the shorter wavelengths, i.e., 16, 19 and 25 metres, is required each half of the doublet should measure exactly 15 feet 3 inches. For the longer wavelengths—25, 31 and 49 metres—each half should be exactly 43 feet 6 inches long.

A doublet aerial should ideally be erected at right angles to the direction from which the best short-wave reception is required. The aerial should be, as nearly as possible, level, but where uneven height is unavoidable the low end should be mainly in the direction of desired reception.

Insulated or bare wire may be used, but care should be taken that the total electric length of each wire is exactly as specified above. The measurements should be made between the ends of the loops round the insulators. There should not be more than 6 inches between the feeder ends of the aerial wires. The feeders may be of bare soft copper wire or 3 or 5-amp. single flex.

The distance between the feeders should be as nearly as possible  $1\frac{1}{4}$  inches. They should be kept this distance apart by spacers, at intervals of approximately 1 foot. The spacers may be of light wood, boiled in paraffin wax (after the holes have been made) to render it impervious to weather conditions, but spacers of ebonite or porcelain are to be preferred if available.

An adequate lightning switch of low capacity should be fitted and the feeders should be taken through proper lead-in tubes and not jammed in the window frame. The illustration shows the construction of the aerial and connexions of the lightning switch.



### CONDENSER DRIVE

The replacement of the scale is very simple. In the event of the slow motion drive becoming faulty, the following instructions should be carried out when replacing :—

1. Remove vernier scale and glass scale.
2. Dismantle pointer cord.
3. Remove slow motion drive, which is fixed by two screws to the front plate of the gang condenser.
4. Place new slow motion drive in position and insert the fixing screws a short way.
5. Tension the split gear segment with which the small pinion on the drive engages by twisting one-half of the segment against the spring, one on two teeth, and then engaging with the pinion.
6. Tighten the screws fixing the drive, being sure not to let the tensioned gear segment slip.
7. Replace scales, pointers, &c.

If the slow-motion mechanism has any tendency to slip this may be overcome as follows :—

1. Remove the slow motion drive as detailed above.
2. Tighten each of the four screws in the drive a *fraction of a turn only* until the slip is taken up.
3. Seal the ends of the screws with a touch of shellac and re-assemble the drive.

### CORD DRIVES

Use only a superior flax fishing line having a breaking strain of approximately 42 lb.  
Approximate length of cord for indicator and tuning drives, 90 inches.

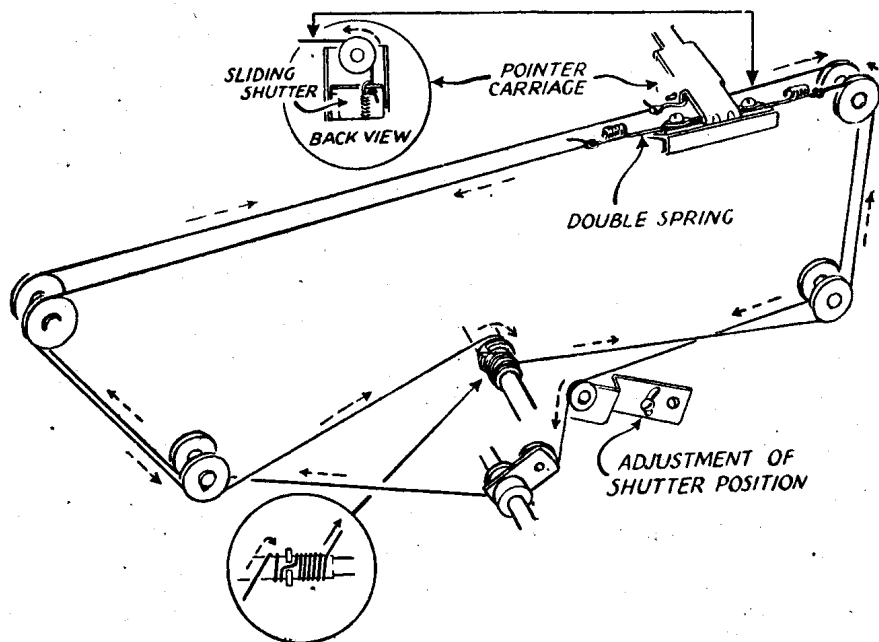
**NOTE.**—Before assuming that the cords need adjustment or replacement be sure that they are passing over all the pulleys in the correct manner as shown in the illustration.

#### Pointer Drive Cord.

1. Remove scale and vernier disc.
2. Take 48 inches of cord and securely tie one end to the left-hand end of the double spring.
3. Turn the tuning spindle until the condenser vanes are fully engaged, and push the pointer carriage as far as it will go to the right.
4. Holding the carriage in this position, wind the cord as shown in the illustration and tie the end on to the right-hand end of the double spring so that the coils of the spring are slightly opened.
5. Reassemble vernier and glass scales, and connect receiver up for operation.
6. Tune in a station of known wavelength, preferably at about the centre of the medium wave scale, and position pointer to read this wavelength correctly by slackening the two screws securing the double spring to the pointer carriage and adjusting.

#### Indicator Cord.

1. Remove two screws fixing double spring to pointer carriage, and remove the pointer light box by removing the four P.K. screws.
2. Attach one end of 41 inches of cord to the anchor point of the spring on the sliding shutter (see illustration), and over the pulley at the top of the light box.
3. Replace the light box and re-assemble the carriage.
4. Take the cord round the pulleys as shown in the illustration, and tie on the hook so that when it is assembled on the pointer carriage the shutter is in the correct position for the wave band.
5. Further correction to the shutter position can be obtained by adjusting the jockey pulley.
6. Check calibration as in No. 6 above.



## PRELIMINARY TESTS

### 1. H.T. Voltage.

Nearer electrolytic condenser to chassis of receiver, 360–400 volts, 12,000 ohms.

If the voltage is low try replacing V7 (U14), check mains voltage and transformer adjustment ; proceed to test 2.

### 2. H.T. Voltage.

Further electrolytic condenser to receiver chassis, 260–290 volts, 10,800 ohms.

No voltage indicates a faulty loudspeaker field coil. If voltage is low do test 3.

### 3. Initial Bias on V1, V2 and V3.

Between chassis of loudspeaker and receiver chassis, 2·2 volts.

This value should, when receiver is tuned to a powerful station, decrease to approximately 0·9, due to the lower current taken by the controlled valves.

### 4. Pentode Test.

Between tags 7 and 8 on L.S. panel, 13 volts.

Low or high voltage suggest replacement of V6 (N42) or examination of bias resistance R13, R14.

### 5. L.F. Test.

Switch receiver to "Gram.," and having removed the earth lead and turned volume control fully up, touch the right-hand pick-up socket with the finger. A loud hum denotes that the L.F. side of the receiver is O.K., and valves V1, V2, V3 or V4 may need replacement. If no hum is heard the fault is probably between V5 and the output stage.

### 6. H.F. Test.

Contact the aerial on to the top grid of V1, and then V2. Results should be obtained on medium waves, under both test conditions, but with loss of sensitivity and lack of stability. These tests eliminate the aerial, coupling circuit and the entire H.F. stage respectively, and may help to locate any fault which lies in that portion of the receiver.

## H.F. TESTS AND ADJUSTMENTS

Instability, insensitivity, or poor selectivity indicate that the alignment of the tuned circuits is not correct. If a coil or other component associated with the H.F. or I.F. side of the receiver has been replaced or repaired, or if wiring has been disarranged, all circuits must be realigned.

To do this the following apparatus is required. An oscillator or signal generator capable of tuning from 16·7 to 1,700 metres and to 465 kc. (653 metres) suitably screened and with an attenuator, and an output meter. Alternatively a 0 to 2 A.C. voltmeter may be used as an output meter. The E.M.I. Service apparatus is eminently suitable.

I.F. ganging should always precede H.F. alignment, and even if only one coil or range of coils has been serviced the whole of the re-alignment should be done in the order given, *i.e.*, L.W. range, M.W. range, S.W. range.

In carrying out the following operations it is important that the input to the receiver from the oscillator should be kept low, and progressively reduced as the circuits are brought into line, so that the reading on the output meter does not exceed approximately 0·5 volt. The E.M.I. Service output meter should be connected to tags 8 and chassis on the L.S. The 0–2 A.C. voltmeter must only be connected across the extra L.S. sockets.

### I.F. GANGING.

Set tone control to maximum bass and minimum top, volume control to maximum, waveband switch to L.W., and fully engage the vanes of the ganged condenser. See that the radiogram switch is in the radio position. Connect the oscillator output leads to grid V2 (via a 0·1 mfd. condenser) and chassis.

1. Tune oscillator to exactly 465 kc.
2. Adjust trimmers TC10, TC11, TC12 and TC13, in that order, for maximum deflection on the output meter.
3. Check carefully over the adjustments, still in the same order, to ascertain if the correct resonance point has been obtained on all trimmers.
4. Do H.F. ganging as described below.

## H.F. GANGING.

It is important first to check the setting of the tuning pointer in relation to the gang condenser before attempting H.F. ganging. Proceed as follows :—

1. Fully disengage vanes of tuning condenser, and adjust the vernier scale to read zero.
2. The main tuning pointer must now point to just below 200 metres. To adjust slacken screws holding double-ended spring and slide until the correct reading is obtained, then re-tighten screws.

## Long Waves.

Set tone and volume controls as for I.F. ganging and connect oscillator output leads to aerial and earth sockets via a 0.0002 mfd. condenser.

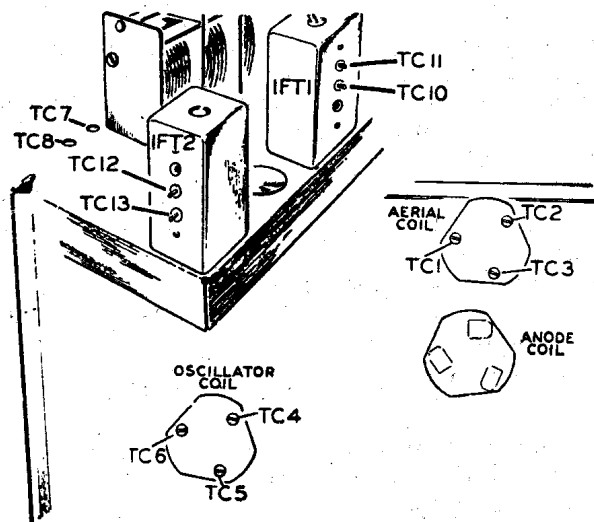
1. Set condenser vanes to minimum and then turn on to 6 degrees by the vernier scale.
2. Set oscillator to 725 metres and adjust TC6 and TC3 in that order for maximum.
3. Set oscillator to 1,900 metres and tune-in on receiver.
4. Adjust TC8 for maximum at the same time rocking gang condenser.
5. Repeat operations 1 to 4 to check correctness of trimmer setting.

## Medium Waves.

1. Set the receiver condenser to minimum and oscillator to 197 metres.
2. Adjust TC5 for maximum.
3. Set oscillator to 240 metres and tune-in on receiver.
4. Adjust TC2 for maximum.
5. Set oscillator to 550 metres and tune-in on receiver.
6. Adjust TC7 for maximum, at the same time rocking the gang condenser.
7. Return to long waves, and setting oscillator to 725 metres, tune-in and adjust TC6 for maximum output.
8. Return to 197 metres and finally adjust TC5 very carefully.

## Short Waves.

1. Connect oscillator output leads to top grid of VI (via a 0.1 mfd. condenser) and chassis, tune oscillator to 16.8 metres, and tune-in on receiver (at a point near condenser minimum).
2. Adjust TC4 for maximum, at the same time rocking the gang condenser. If two maximum points are found leave the trimmer set to that entailing the lower capacity (screw further anti-clockwise).
3. Connect oscillator to aerial and earth sockets via a 400-ohm resistance.
4. With the oscillator still tuned to 16.8 metres, adjust TC1 for maximum, whilst rocking the gang condenser.
5. Repeat operations 1 to 4 to check the correctness of the trimmer settings.



## VALVE TABLE

Valves.*	V1 (W42)	V2 (X42)	V3 (W42)	V4 (D41)	V5 (H42)	V6 (N42)	V7 (U14)	VT (6E5)	
ANODE/FRAME VOLTS ... ..	240	265 Mix.	170* Osc.	265	—	135	250	—	25†
SCREEN/FRAME VOLTS ... ..	SW 110 M& LW 25	75	110	—	—	245	—	—	(Target) 280
BIAS ... ..	2·2†	2·2†	2·2†	—	1·5	17·0	380	—	
	Chassis to H.T. —	Chassis to H.T. —	Chassis to H.T. —	—	Cathode to H.T. —	Cathode to H.T. —	Cathode to H.T. —	—	

\* Signals unobtainable whilst taking this reading.

† These values will vary when a strong station is tuned in. The bias values will reduce and the anode voltage 6E5 increase.

Total H.T. current measured at tag 6 L.S. panel ... .. 77 mA.

Pentode (N42) anode current measured at tag 8 L.S. panel ... .. 28 mA.

Anode and screen current V1, V2, V3, V5 measured at tag 7 L.S. panel ... .. 48 mA.

NOTE.—The loudspeaker chassis is connected to H.T. —.

### WIRE COLOUR CODE.

H.T. positive (+) ... ..	Red.
Anodes of valves when not direct to H.T. + ...	Red/Yellow.
Screening grids when not direct to H.T. + , ...	Red/Black.
Grid circuits ... ..	Green.
Mains... ..	Orange.
Heaters, filaments and cathodes ... ..	Brown.
Earth ... ..	Black.
General purpose colour ... ..	Yellow.

Yellow will be used for leads not falling in the general code, and when stocks of any colour are temporarily exhausted in the factory.

### RESISTANCE COLOUR CODE.

BODY AND END Colours. (1st and 2nd figures.)	SPOT Colours. (Additional 0's)
0 Black.	0 Black.
1 Brown.	0· Brown.
2 Red.	00· Red.
3 Orange.	000· Orange.
4 Yellow.	0,000· Yellow.
5 Green.	00,000· Green.
6 Blue.	
7 Violet.	
8 Grey.	
9 White.	



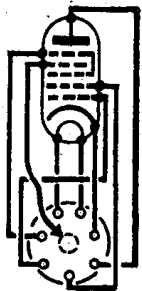
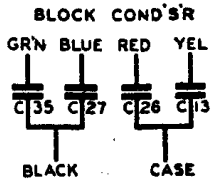
## CONTINUITY CHECKS

Remove valves and pilot lamps. Readings  $\pm 20$  per cent.

Components.	Measured.	Switch.	Resistance.	
L1, L2 ... ..	Aerial and earth sockets ... ..	—	10·0 ohms.	
L3, L4, L5 ... ..	Top grid V1 and contact 3. S1 ... ..	S.W. M.W. L.W.	(L3) 0·1 ohm. (L3 + L4) 9·5 ohms. (L3, L4, L5) 23·5 ohms.	
L6, L7, L8, R21 ... ..	Anode V1 (W42) and contact 13. S1 ... ..	S.W. M.W. L.W.	(L6) 0·1 ohm. (L6 + L7) 9·0 ohms. (L6, L7, L8) 23·0 ohms.	
L9 ... ..	Across ends ... ..	—	0·1 ohm.	
L10 ... ..	Across ends ... ..	—	5·7 ohms.	
L11 ... ..	Across ends ... ..	—	5·0 ohms.	
L12, L13, L14 ... ..	Anode V2 (X42) and contact 5. S2 ... ..	—	7·2 ohms.	
L15 ... ..	Across ends ... ..	—	5·0 ohms.	
L16, R5... ..	Top grid V3 (W42) and yellow/black wire from I.F.T. 1 ... ..	—	100,000 ohms. (L16 5·0 ohms.)	
L17 ... ..	Across ends ... ..	—	5·0 ohms.	
L18, R9... ..	Diodes and Cathode V4 (D41) ... ..	—	0·5 megohm. (L18, 5·0 ohms.)	
L19 ... ..	Cathode V2 (X42) and chassis ... ..	—	0·1 ohm.	
L20, L18 ... ..	Diodes V4 (D41) and contact 3. S2 ... ..	—	75 ohms.	
R1, R3, L3 ... ..	Grid V1 (W42) and mixer grid V2 (X42) ... ..	S.W.	0·6 megohm.	
R7, R25, L8 ... ..	Grid VT (6E5) and diodes V4 (D41) ... ..	—	2·9 megohm.	
R13 ... ..	Grid V6 (N42) and L.S. chassis ... ..	—	0·5 megohm.	
VRI ... ..	Top grid V5 (H42) and L.S. chassis ... ..	—	5·0 ohms to 0·5 megohm.	
CK1 (L.S. Field) ... ..	Tags 6 and 7. L.S. Panel ... ..	—	1,100 ohms.	
L.S. Speech coil ... ..	Across ends (disconnect T1 primary) ... ..	—	4 ohms.	
T1 Primary ... ..	Tags 2 and 3 (disconnect speech coil) ... ..	—	0·6 ohm.	
Secondary ... ..	Tags 7 and 8... ..	—	570 ohms.	
T2 ... ..	Terminals 1-2 ... ..	—	0·5 ohm.	
	"    2-3 ... ..	—	0·5 "	
	"    3-4 ... ..	—	0·5 "	
	"    4-5 ... ..	—	3·0 ohms.	
	"    5-6 ... ..	—	0·4 ohm.	
	"    6-7 ... ..	—	5·6 ohms.	
	"    1-7 ... ..	—	10·5 "	
	Secondaries ... ..	Tags 9-10 ... ..	—	150 "
		"    10-11 ... ..	—	150 "
		"    12-13 ... ..	—	0·1 ohm.
	"    14-15 ... ..	—	0·2 "	

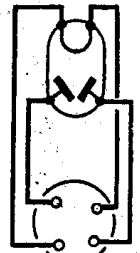
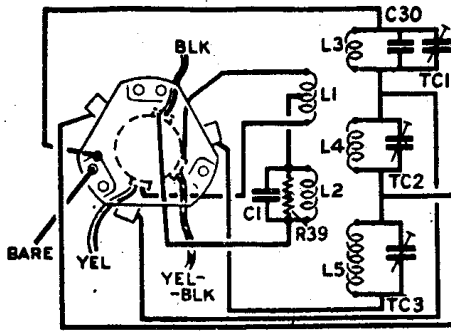


VI & V3-W42

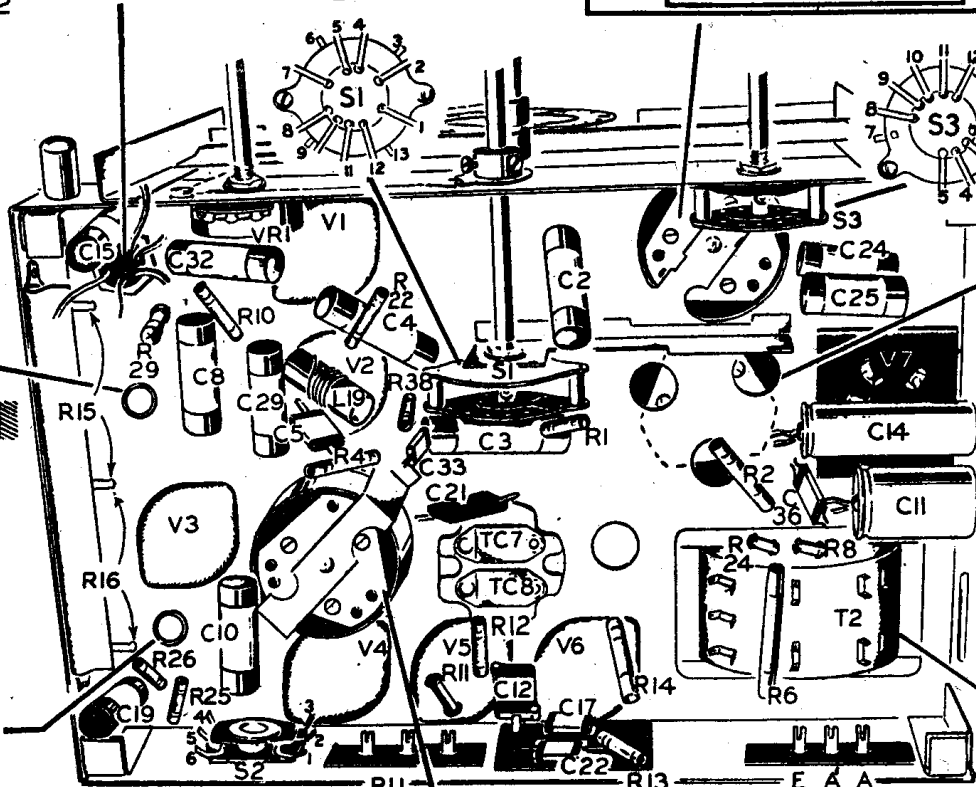


V2-X42

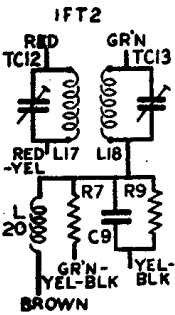
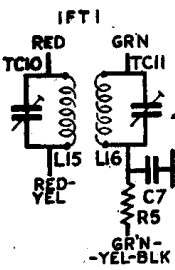
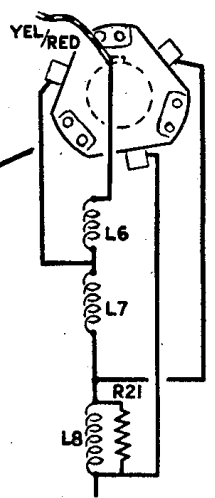
AERIAL COIL



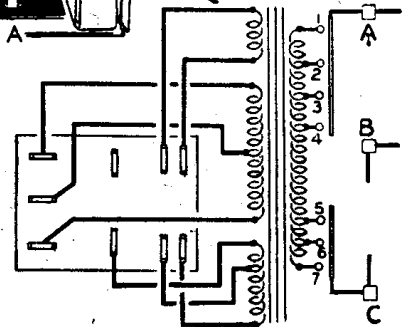
V7-U14



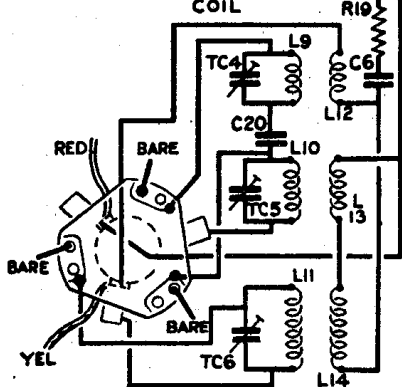
ANODE COIL



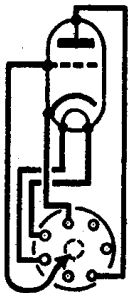
MAINS TRANSFORMER



OSCILLATOR COIL



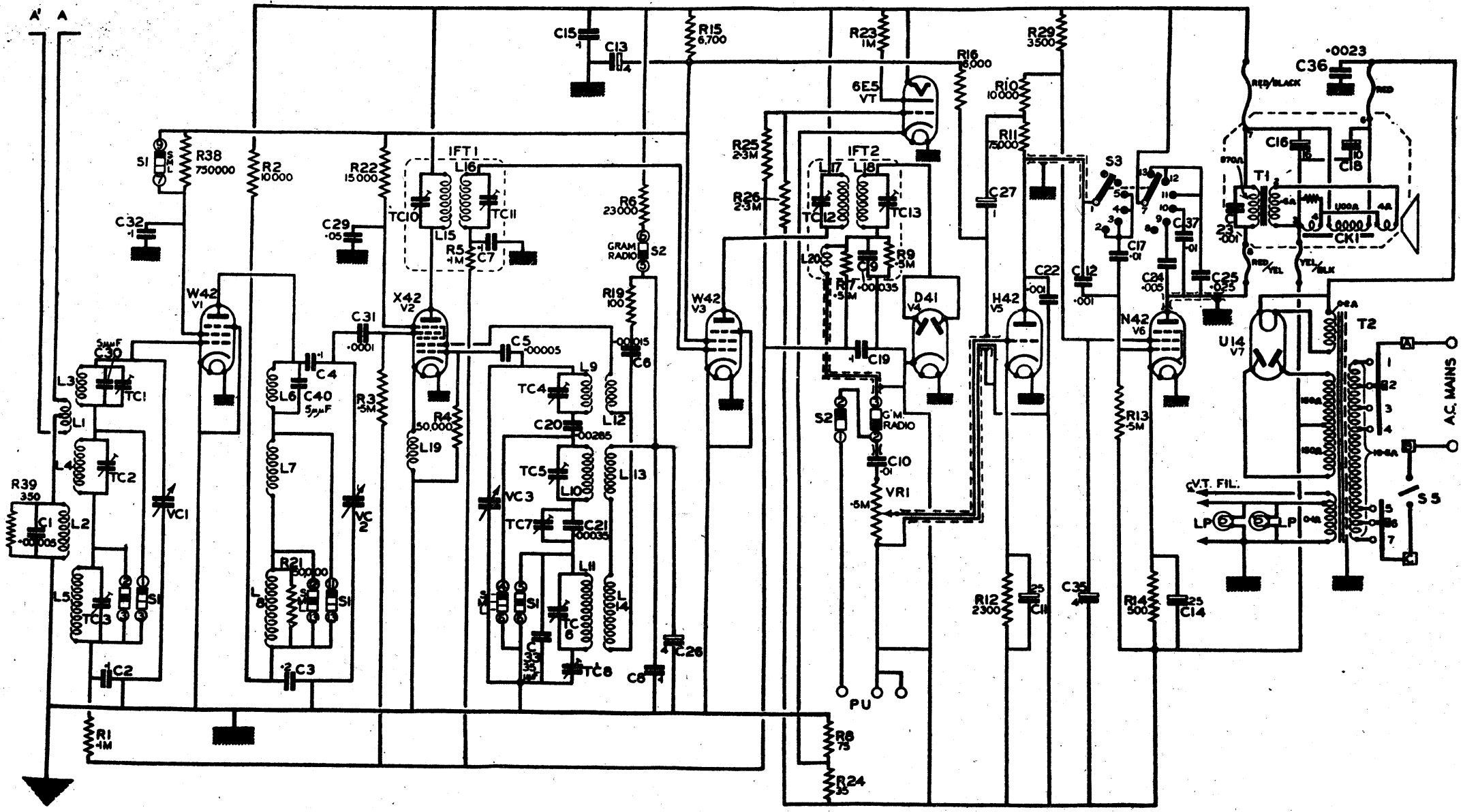
V4-D41

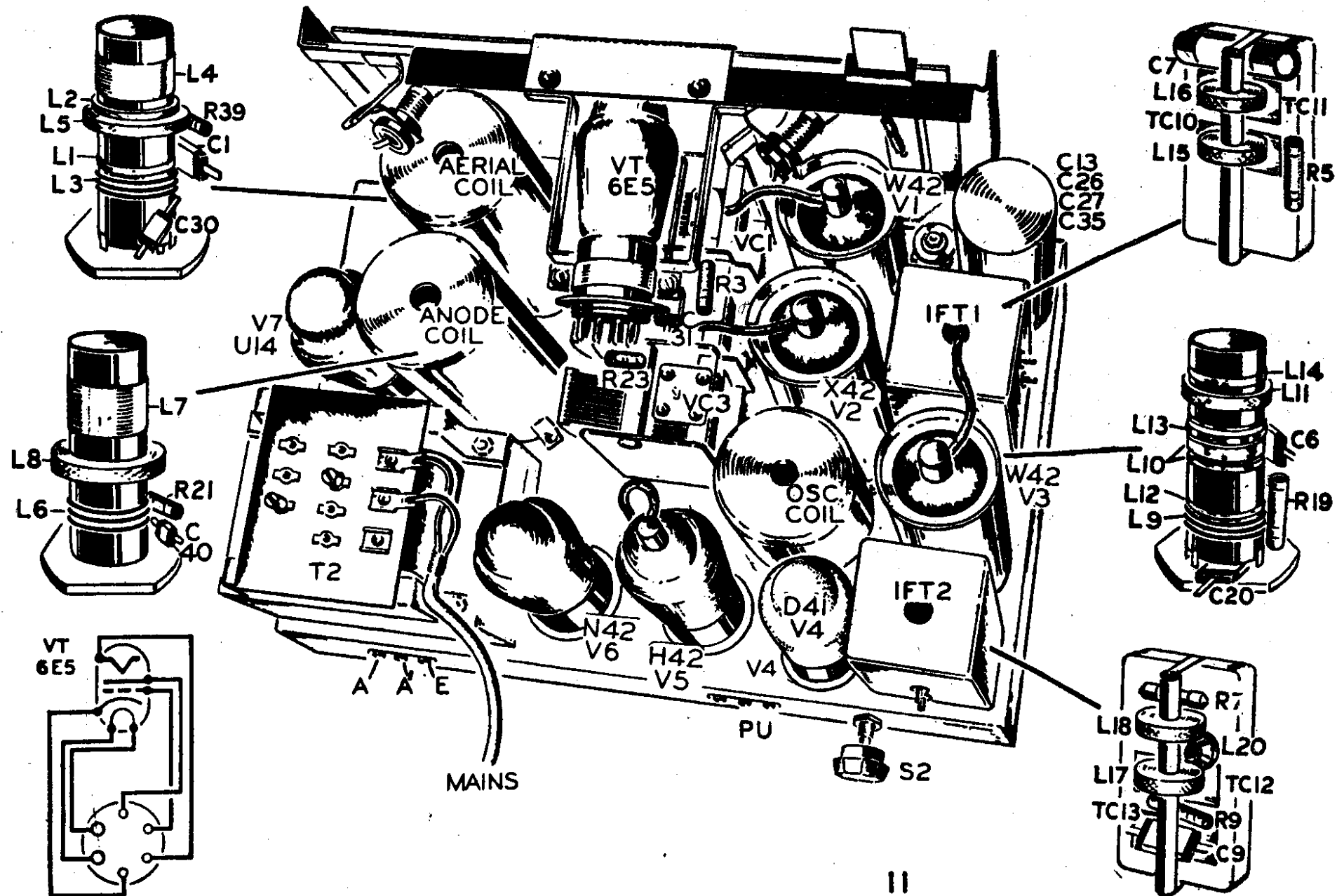


V5-H42



V6-N42





## SPARE PART LIST

Part No.	Description	Parts per Inst.	Finish.	Retail List Price.	Per
80868	<b>Instructions.</b> Warning and valve position label... .. . . .	1	—		Doz.
24992	Instruction Card ... .. . . .	1	—		Each.
17577	Voltage adjustment label ... .. . . .	1	—		"
22291	Station list ... .. . . .	1	—		"
<b>CABINET PARTS AND FITTINGS</b>					
—	<b>Cabinet</b> ... .. . . .	1	Pol		Each.
8195	Rubber Feet ... .. . . .	4	—		Doz.
24800	Wire mesh ... .. . . .	1	—		Each.
80154	Felt for wire mesh, top and bottom ... .. . . .	4	—		"
80155	Felt for wire mesh, sides ... .. . . .	4	—		Doz.
80444	Loudspeaker location block ... .. . . .	4	Black		Each.
9547	Screw, securing location blocks ... .. . . .	8	—		Doz.
12775	Insert nut, for speaker fixing ... .. . . .	2	CB		Each.
24974	Window, for trade mark ... .. . . .	1	—		Doz.
24865	Escutcheon, for trade mark and visual tuner ... .. . . .	2	—		Each.
24873	Bracket, for cabinet back ... .. . . .	4	CdP		"
8602	Screw, securing brackets ... .. . . .	8	—		Doz.
24858D	Cabinet back (printed) ... .. . . .	1	—		Each.
19896	Screw } securing cabinet back ... .. . . .	4	ParB		"
19895	Spring washer } ... .. . . .	4	ParB		Doz.
19214E	S5—Mains On/Off switch ... .. . . .	1	BzPLocal		Each.
14697	Nut ... .. . . .	1	WN		Doz.
21238	Switch plate ... .. . . .	1	CdP		Each.
19875	Switch escutcheon ... .. . . .	1	BzSpLocal		"
24852	Tuning escutcheon ... .. . . .	1	—		"
24844	Tuning escutcheon packing ... .. . . .	4	—		Doz.
24864	Tuning escutcheon window ... .. . . .	1	—		"
24977	Clamp } securing window to tuning escutcheon ... .. . . .	2	CdP		"
25157	Rubber } ... .. . . .	2	—		"
11318	Screw } ... .. . . .	2	WN		"
24851	Plate } ... .. . . .	2	CdP		Each.
8602	Screw } securing tuning escutcheon ... .. . . .	2	WN		Doz.
3820	Washer } ... .. . . .	2	WN		"
24546	Bracket, for visual tuner ... .. . . .	2	CdP		Each.
8651	Screw, securing brackets to cabinet ... .. . . .	8	WN		Doz.
24369	Clamp, top ... .. . . .	1	CdP		Each.
24820	Clamp, bottom ... .. . . .	1	CdP		"
8777	Screw, P.K., securing clamp bottom, to brackets ... .. . . .	2	—		Doz.
14791	Screw } securing clamp, top, to clamp, bottom... .. . . .	2	WN		"
3166	Washer, S.P. } ... .. . . .	2	—		"
24972	Reflector ... .. . . .	1	WMCI EnLocal		Each.
8692	Screw, securing reflector ... .. . . .	2	WN		Doz.
21406C	Bracket, with two sockets for Ex. L.S. ... .. . . .	1	—		Each.
8651	Screw, securing bracket ... .. . . .	2	WN		Doz.
<b>LEADS, PLUGS AND CLEATS</b>					
19063C	Mains lead, with two tags ... .. . . .	1	—		Each.
11802	Tag ... .. . . .	2	—		Doz.
24397A	Switch lead, with three tags ... .. . . .	1	—		Each.
11802	Tag ... .. . . .	3	—		Doz.
16289J	Plug, yellow ... .. . . .	6	—		Each.
16289B	Plug, black ... .. . . .	2	—		"
18889A	Carton, for mains lead and plugs ... .. . . .	1	—		"
7155	Cleat, for mains lead ... .. . . .	1	WN		"
8602	Screw, securing cleat ... .. . . .	1	WN		Doz.
550	Cleat, for lamp wiring ... .. . . .	1	—		Each.
17306	Screw, securing cleat ... .. . . .	1	WN		Doz.

**SPARE PART LIST—continued**

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per
<b>CONTROLS</b>					
24854	Knob—Tuning (large) ... ..	1	—		Each.
24855A	Knob—"Tuner" ... ..	1	ChF		"
11773	Grub screw, securing "Tuner" knob ... ..	1	WN		Doz.
21281K	Knob—"Volume" ... ..	1	ChF		Each.
21281X	Knob—"Wave-band" ... ..	1	ChF		"
21281W	Knob—"Tone" ... ..	1	ChF		"
21281AL	Knob—"Pick-up" ... ..	1	ChF		"
11805	Screw, P.K., securing knobs ... ..	4	—		Doz.
24848	Extension spindle ... ..	3	WN		Each.
8777	Screw, P.K., securing extension spindles ... ..	3	—		Doz.
NOTE.—Extension spindles are part of radio unit.					
<b>LOUDSPEAKER</b>					
21970AJ	Loudspeaker, complete with T1, C16, C18 and C23 ... ..	1	—		Each.
24355C	T1—Output transformer ... ..	1	—		"
10606	Screw, P.K., securing T1 ... ..	2	—		Doz.
22675C	C16—16 mfd. condenser ... ..	1	—		Each.
22675B	C18—10 mfd. condenser ... ..	1	—		"
22005Q	C23—0.001 mfd. condenser ... ..	1	—		"
11543N	CK1—Field coil ... ..	1	—		"
12947	Washer, felt ... ..	1	—		Each.
21456	Washer, presspahn ... ..	2	—		Doz.
21966C	Terminal panel, with 8 tags and hum coil ... ..	1	—		Each.
21968	Top plate ... ..	1	CdP		"
21967	Stud, securing top plate ... ..	4	WN		"
21965D	Cone chassis, with two studs and bracket for T1 ... ..	1	CdP		"
11627	Nut, securing cone chassis to magnet assembly ... ..	4	WN		Doz.
21256A	Speech coil and cone ... ..	1	BME Local		Each.
19585	Card washer ... ..	2	—		Doz.
17476	"D" washer } securing spider of cone to studs on cone chassis ... ..	2	CdP		"
1092	Washer } ... ..	2	—		"
19687	Nut } ... ..	2	—		"
19456	Cone mounting ring ... ..	2	—		"
19457	Felt ring ... ..	1	—		Each.
16754	Insulating bush (for speech coil leads) ... ..	2	—		"
24056	Bracket for C16 and C18 ... ..	1	CdP		"
11211	Screw, securing bracket to magnet ... ..	3	WN		Doz.
7229	Earthing tag ... ..	1	—		"
25013	Stop ... ..	1	CB		Each.
25022	Sleeve } securing stop to magnet core ... ..	1	WN		Doz.
25023	Screw } ... ..	1	HeadCB		"
24863A	Loudspeaker support strap ... ..	1	CdP		Each.
22759	Bolt } securing loudspeaker to support strap ... ..	1	WN		"
21890	Washer } ... ..	1	WN		Doz.
11205	Screw } securing support strap to insert nuts in cabinet ... ..	2	WN		"
1038	Washer } ... ..	2	WN		"
<b>VALVES</b>					
—	V1—W42				
—	V2—X42				
—	V3—W42				
—	V4—D41, met.				
—	V5—H42				
—	V6—N42				
—	V7—U14				
<b>RADIO UNIT</b>					
24000N	Radio unit ... ..	1	—		Each.
24857	Rubber bush, supporting front of radio unit ... ..	2	—		"
11207	Screw, O.BA by 1½-in. rd. hd. } securing radio unit ... ..	2	WN		Doz.
21328	Washer } ... ..	2	WN		"
21235	Rubber bush } ... ..	4	—		"
21284	Distance piece ... ..	2	WN		Each.

SPARE PART LIST—continued

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per
<b>INDUCTANCES</b>					
23921A	L 1—S.W. coupling coil L 2—M.W. and L.W. coil L 3—S.W. grid coil L 4—M.W. grid coil L 5—L.W. grid coil } aerial coil assembly ... ..	1	—		Each.
23921B	L 6—S.W. anode coil L 7—M.W. anode coil L 8—L.W. anode coil } anode coil assembly ... ..	1	—		"
23921C	L 9—S.W. oscillator coil L10—M.W. oscillator coil L11—L.W. oscillator coil L12—S.W. reaction coil L13—M.W. reaction coil L14—L.W. reaction coil } oscillator coil assembly ... ..	1	—		"
24013	Coil spacer ... ..	3	—		Doz.
24030A	L15—1st I.F. primary ... ..	1	—		Each.
24030A	L16—1st I.F. secondary ... ..	1	—		"
24030A	L17—2nd I.F. primary ... ..	1	—		"
24030A	L18—2nd I.F. secondary ... ..	1	—		"
24096B	L19—Frequency stabiliser ... ..	1	—		"
16664C	L20—Choke ... ..	1	—		"
24030B	IFT1—1st I.F. transformer, complete with L15, L16, R5, C7, TC10 & TC11	1	—		"
24036	Clip, supporting coil former ... ..	2	SP		Doz.
11248	Screw ... ..	2	WN		"
3165	Washer, S.P. } securing clips ... ..	2	—		"
24037B	Screen, with insulating bush ... ..	1	—		Each.
16756	Insulating bush ... ..	1	—		"
24030C	IFT2—2nd I.F. transformer, complete with L17, L18, L20, R7, R9, C9, TC12 and TC13	1	—		"
24036	Clip, supporting coil former ... ..	2	SP		Doz.
11248	Screw ... ..	2	WN		"
3165	Washer, S.P. } securing clips ... ..	2	—		"
24037A	Screen ... ..	1	—		Each.
3166	Washer, S.P. } securing I.F. transformers ... ..	4	—		Doz.
11628	Nut ... ..	4	WN		"
11543N	CK1—Field coil, 1,100 ohms (on loudspeaker)	1	—		Each.
24355C	T1—Output transformer (on Loudspeaker)	1	—		"
21586R	T2—Mains transformer ... ..	1	—		"
21240A	Terminal panel ... ..	1	—		Each.
8777	Screw, P.K., securing terminal panel ... ..	4	—		Doz.
11228	Terminal screw ... ..	3	WN		"
12179	Voltage adjustment screw ... ..	2	WN		Each.
3167	Washer, S.P. } securing T2 ... ..	4	—		Doz.
11627	Nut ... ..	4	WN		"
<b>RÉSISTANCES</b>					
19202L	R1 —100,000 ohms ... ..	1	—		Each.
17541B	R2 — 10,000 ohms ... ..	1	—		"
19202N	R3 —500,000 ohms ... ..	1	—		"
19202J	R4 — 50,000 ohms ... ..	1	—		"
19202L	R5 —100,000 ohms ... ..	1	—		"
5786P	R6 — 23,000 ohms ... ..	1	—		"
24115N	R7 —500,000 ohms ... ..	1	—		"
24150Y	R8 — 75 ohms ... ..	1	—		"
19202N	R9 —500,000 ohms ... ..	1	—		"
24115F	R10— 10,000 ohms ... ..	1	—		"
19202K	R11— 75,000 ohms ... ..	1	—		"
19202C	R12— 2,300 ohms ... ..	1	—		"
24115N	R13—500,000 ohms ... ..	1	—		"
5786AF	R14— 500 ohms ... ..	1	—		"
24047A	R15— 6,700 ohms ... ..	1	—		"
12619	R16— 6,000 ohms ... ..	1	—		"
	Screw, P.K., securing resistance ... ..	2	—		Doz.

**SPARE PART LIST—continued**

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per.
<b>RESISTANCES—continued.</b>					
19202AA	R19— 100 ohms ...	1	—		Each.
19202J	R21— 50,000 ohms ...	1	—		"
17541AG	R22— 15,000 ohms ...	1	—		"
19202P	R23— 1 megohm ...	1	—		"
24150W	R24— 35 ohms ...	1	—		"
19202AM	R25— 2.3 megohms ...	1	—		"
19202AM	R26— 2.3 megohms ...	1	—		"
17541BK	R29— 3,500 ohms ...	1	—		"
19202AL	R38—750,000 ohms ...	1	—		"
19202AD	R39— 350 ohms ...	1	—		"
18300CK	VR1—500,000 ohms volume control complete with fixing nut and shake-proof washer ...	1	—		"
<b>CONDENSERS</b>					
22001A	C1 —0.00005 mfd....	1	—		Each.
21766D	C2 —0.1 mfd. ...	1	—		"
21766E	C3 —0.3 mfd. ...	1	—		"
21766D	C4 —0.1 mfd. ...	1	—		"
22170A	C5 —0.00005 mfd....	1	—		"
22001AC	C6 —0.00015 mfd....	1	—		"
21766D	C7 —0.1 mfd. ...	1	—		"
21766D	C8 —0.1 mfd. ...	1	—		"
22001AE	C9—0.00035 mfd. ...	1	—		"
21766A	C10—0.01 mfd. ...	1	—		"
24089A	C11—25 mfd. (electrolytic), 12-volt ...	1	—		"
22001F	C12—0.001 mfd. ...	1	—		"
24019A	C13—4 mfd. (electrolytic), with C26, C27 and C35 ...	1	—		"
24089B	C14—25 mfd. (electrolytic), 25-volt ...	1	—		"
21766D	C15—0.1 mfd. ...	1	—		"
22675C	C16—16 mfd. (electrolytic) on loudspeaker ...	1	—		"
22005B	C17—0.01 mfd. ...	1	—		"
22675B	C18—10 mfd. (electrolytic) on loudspeaker ...	1	—		"
21766D	C19—0.1 mfd. ...	1	—		"
22330CA	C20—0.00285 mfd. V.S.L. ...	1	—		"
22330AL	C21—0.00035 mfd. S.L. ...	1	—		"
22001F	C22—0.001 mfd. ...	1	—		"
22005Q	C23—0.001 mfd. on loudspeaker ...	1	—		"
22676G	C24—0.005 mfd. ...	1	—		"
22676F	C25—0.025 mfd. ...	1	—		"
	C26—4 mfd. (electrolytic), with C13.				
	C27—1 mfd. (electrolytic), with C13.				
21766C	C29—0.05 mfd. ...	1	—		"
22164A	C30—5 m/mfd. ...	1	—		"
22001B	C31—0.0001 mfd. ...	1	—		"
21766D	C32—0.1 mfd. ...	1	—		"
22164F	C33—35 m/mfd. ...	1	—		"
	C35—4 mfd. (electrolytic) with C13.				
22005K	C36—0.0023 mfd. ...	1	—		"
21766A	C37—0.01 mfd. ...	1	—		"
22164A	C40—5 m/mfd. ...	1	—		"
23922D	TC1, TC2 and TC3—Triple pre-set condensers ...	1	—		"
23922B	TC4, TC5 and TC6—Triple pre-set condensers ...	1	—		"
24027	Adjusting screw ...	6	—		Doz.
3165	Washer, S.P. } securing triple pre-set condensers ...	2	—		"
19050	Screw } ...	2	—		"
24001	Bracket, supporting TC4, TC5 and TC6 ...	1	CdP		Each.
8777	Screw, P.K., securing bracket ...	2	—		Doz.
12640G	TC7 and TC8—Twin pre-set condenser ...	1	—		Each.
11743	Adjusting screw ...	2	—		Doz.
11701	Spacer } ...	2	WN		Each.
11225	Screw } ...	2	WN		"
1088	Washer } securing twin pre-set condensers ...	2	WN		Doz.
3166	Washer, S.P. } ...	2	—		"
11628	Nut } ...	2	WN		"



SPARE PART LIST—continued

Part No.	Description	Parts per Inst.	Finish.	Retail List Price.	Per
<b>CONDENSERS—continued.</b>					
22530C	TC10 and TC11—Twin pre-set condenser (in I.F.T. 1) ... ..	1	—		Each.
22530D	TC12 and TC13—Twin pre-set condenser (in I.F.T. 2) ... ..	1	—		Doz.
25083	Adjusting screw ... ..	4	WN		Doz.
24040B	VC1, VC2 and VC3—three-gang condenser ... ..	1	—		Each.
22159	Tag (upper) ... ..	2	SP		Doz.
22157	Tag long (lower) ... ..	2	SP		"
22331	Screw, securing tags and fixed plate ... ..	8	WN		"
22386	Tag (upper), oscillator section ... ..	1	SP		Each.
22385	Tag (lower) oscillator section ... ..	1	SP		"
22484	Insulator, oscillator section ... ..	2	—		"
21454	Washer, under insulator ... ..	4	—		Doz.
21452	Screw ... ..	8	WN		"
3166	Washer, S.P. } securing insulators, tags and fixed plates (oscillator) }	8	—		"
17359	Earth spring ... ..	5	SP		"
16234	Rivet, securing earth springs ... ..	3	—		"
398/20639	Metal braid ... ..	—	—		Yard.
24984	Bracket ... ..	1	CdP		Each.
24562	Stop bracket ... ..	1	CdP		"
11219	Screw ... ..	2	WN		Doz.
3166	Washer, S.P. } securing brackets ... .. }	2	—		"
21236	Rubber bush ... ..	3	—		Each.
6305	Washer ... ..	3	WN		Doz.
3167	Washer, S.P. } securing three-gang condenser ... .. }	3	—		"
11627	Nut ... ..	3	WN		"
<b>CONDENSER DRIVE AND TUNING DETAILS</b>					
24833B	Drive mechanism ... ..	1	—		Each.
24833A	Base casting ... ..	1	—		"
24830	Spindle ... ..	1	AcD		"
24831A	Sleeve and pinion ... ..	1	CP		"
3658	Ball ... ..	3	—		Doz.
24832	Friction ring ... ..	2	—		Each.
24834	Ring ... ..	1	WN		Doz.
11328	Screw ... ..	4	WN		"
11321	Screw ... ..	2	WN		"
3166	Washer, S.P. } securing drive mechanism to three-gang condenser ... }	2	—		"
24862	Nut plate ... ..	1	CdP		Each.
24804C	Scale frame assembly ... ..	1	LBnEn Local WMEEn Local		"
8777	Screw, P.K., securing scale frame assembly to chassis ... ..	4	—		Doz.
24813	Cursor guide ... ..	1	CdP		Each.
24845	Spacer ... ..	2	WN		Doz.
11805	Screw, P.K. } securing cursor guide to top of scale frame ... }	2	—		"
24814B	Cursor box assembly ... ..	1	—		Each.
24816A	Shutter, with coloured windows ... ..	1	—		"
24843	Spring ... ..	1	—		"
5515	Cord, operating shutter ... ..	—	—		Yard.
24368	Hook, for cord ... ..	1	—		Doz.
12619	Screw, P.K., securing cursor box to lamp bracket ... ..	4	—		"
24819	Lamp bracket ... ..	1	WN matt WLocal		Each.
24811	Cursor ... ..	1	—		"
14791	Screw ... ..	2	WN		Doz.
24868	Washer ... ..	2	AcD		"
24842	Nut plate ... ..	1	WN		"
24856	Spring, for cord ... ..	1	—		Each.
5515	Cord ... ..	—	—		Yard.
22238A	Lampholder ... ..	3	—		Each.
22704A	Lamp ... ..	3	—		"
24822B	Arm and pulley ... ..	1	—		"

**SPARE PART LIST—continued**

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price.	Per.
<b>CONDENSER DRIVE AND TUNING DETAILS—continued.</b>					
13246	Screw, securing arm to switch spindle ...	2	WN		Doz.
24824	Pulley ...	1	AcD		"
12457	Collar, positioning pulley on switch spindle ...	1	WN		Each.
14446	Screw, securing collar on switch spindle ...	1	WN		Doz.
24827A	Plate and pulley ...	1			Each.
8777	Screw, P.K., securing plate and pulley to chassis ...	2			Doz.
24839E	Tuning scale (glass) ...	1			Each.
24844	Rubber packing ...	2			Doz.
24828	Clamp ...	4	LBnEn		Each.
24829	Rubber packing } securing tuning scale ...	4			Doz.
8777	Screw, P.K. ...	4			
24836B	Fine tuning disc ...	1			Each.
11219	Screw, securing disc to tuning spindle ...	1	WN		Doz.
24850A	Lamp wiring ...	1			Each.
24380C	Socket for visual tuner, with lead and R23 ...	1			"
24380A	Socket ...	1			"
24861A	Lead ...	1			"
24195A	Visual tuner, 6E5 ...	1			
<b>SWITCHES</b>					
21491B	S1—Wave change switch ...	1			Each.
24003	Bracket ...	1	CdP		"
8777	Screw, P.K., securing bracket ...	3			Doz.
24092A	S2—Gram-Radio switch ...	1			Each.
5673	Washer, S.P. } securing S2 ...	1	WN		Doz.
24015	Nut ...	1	WN		"
21491F	S3—Tone switch ...	1			Each.
19214E	S5—Mains On/Off switch (on cabinet) ...	1			"
<b>VALVE HOLDERS, SCREENS, PANELS, ETC.</b>					
18180	Valve panel, 5-pin ...	2			Each.
24979	Valve panel cover, 5-pin ...	2			"
18182	Valve panel 7-pin ...	5			"
24980	Valve panel cover, 7-pin ...	5			"
17503	Valve leg clip ...	45			"
16357	Rivet, securing four valve holders ...	8			Doz.
16356	Rivet, securing three valve holders and valve screen base ...	6			"
24981	Valve screen base ...	3	CdP		Each.
24982B	Valve screen base ...	3			"
19897	Valve top clip ...	4			"
21337A	Coil screen ...	2			"
24029A	Coil screen (for oscillator coil) ...	1			Doz.
12619	Screw, securing screens ...	6			Each.
23922C	Base and tag assembly (for anode coil) ...	1			Doz.
19050	Screw } securing base ...	1	WN		Doz.
3166	Washer, S.P. ...	1			"
11531G	A. and E. panel with three sockets and tags ...	1			Each.
11531J	P.U. panel with three sockets and tags ...	1			"
13803	Rivet, securing panels ...	4			Doz.
22536A	Condenser and resistance panel, with 4 tags ...	1			Each.
22539	Insulation ...	1			"
13810	Rivet, securing panel ...	2			Doz.
24017A	Tag panel, with five tags ...	2			Each.
24020A	Tag panel, with three tags ...	3			"
12619	Screw, P.K., securing tag panels ...	5			Doz.
24091A	Loudspeaker lead ...	1			Each.
24565A	Volume control lead ...	1			"
16757	Insulating bush ...	5			"
12613	Cleat ...	1			"
8777	Screw P.K., securing cleat ...	1			Doz.
7155	Cleat, ...	2	WN		Each.
12619	Screw, P.K., securing one cleat ...	1			Doz.

**"FINISH" CODE**

AcD .. ..	Acid Dip	CP .. ..	Copper Plate
BMEEn .. ..	Black Matt Enamel	LBnEn .. ..	Light Brown Enamel
BzP .. ..	Bronze Polish	Pol .. ..	Polished
BzSp .. ..	Bronze Spray	ParB .. ..	Parkerised Black
CB .. ..	Camera Black	SP .. ..	Silver Plate
CdP .. ..	Cadmin Plate	WMCIEEn .. ..	White Matt Cellulose Enamel
ChF .. ..	Chrome Filled	WN .. ..	White Nickel

In order to expedite delivery of spare part orders, please quote :—

1. Model number and serial number.
2. Spare part number, description, and " finish " as given in the above list.
3. Quantity required.

Unless full particulars are quoted, delay in the execution of orders must inevitably result.

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