PRIVATE AND CONFIDENTIAL

TO THE TRADE ONLY

Service
Manual for

"His Master's Voice"

7-valve All-Wave Superhet Model 482 472

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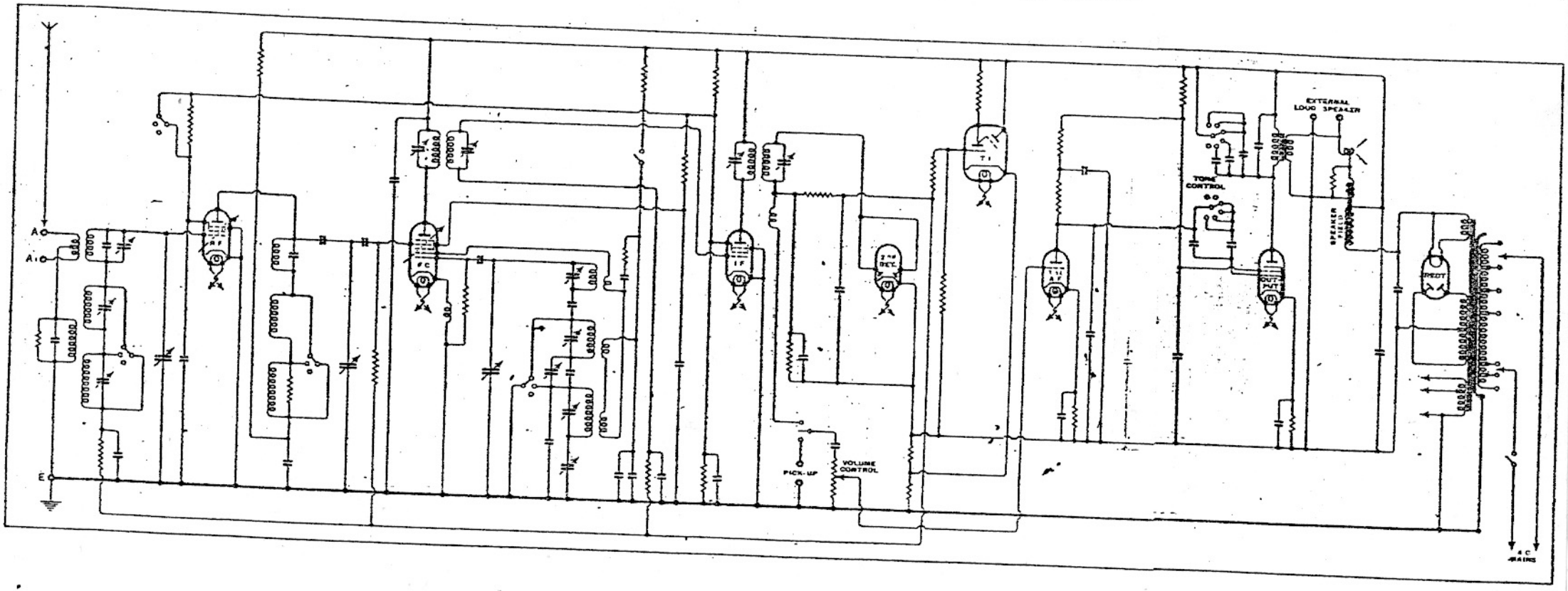
Part No. 24471

August, 1936

HMV Model 482 (1937) English Valves

HMV Model 472 American Valves



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 42 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 kc.).
L.W.—725 to 2,000 metres (414–150 kc.).

DIMENSIONS.

Height.	Width.	Depth.
18¼ inches.	19 inches.	10¾ inches.
46·5 cm.	48·25 cm.	27·5 cm.

WEIGHT.

45 lb.	20·5 kg. net.
55 lb.	24·7 kg. gross.—Carton packed.
72 lb.	32·4 kg. gross.—Case packed (for Overseas).

LOUDSPEAKER.

No. 21970T.
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 6K7	..	H.F. amplifier.
V2 „ 6A8	..	Frequency changer.
V3 „ 6K7	..	I.F. amplifier.
V4 „ 6H6	..	Diode detector and A.V.C. rectifier.
V5 „ 6F5	..	L.F. amplifier.
V6 „ 42	..	Output pentode.
V7 „ 80	..	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 (6K7).

Tuned anode, capacity coupling is employed between the H.F. amplifier and the hexode frequency changer (6A8), 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 6K7) 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 6H6. 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 6F5, which is resistance capacity coupled to the pentode output valve 42. All H.T. current is supplied by the full-wave rectifier 80, 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.

TONE 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 VR1, at the same time disconnecting the radio output and removing the voltage from the screens of V1, V2 and V3.

THE DOUBLET AERIAL

This instrument has been designed to take special advantage of a doublet aerial. This type of aerial gives a great improvement in signal strength on short waves, and at the same time does not require switching or modification for good medium and long-wave reception. The increase in strength on any particular wavelength is directly dependent on the length of each half of the aerial.

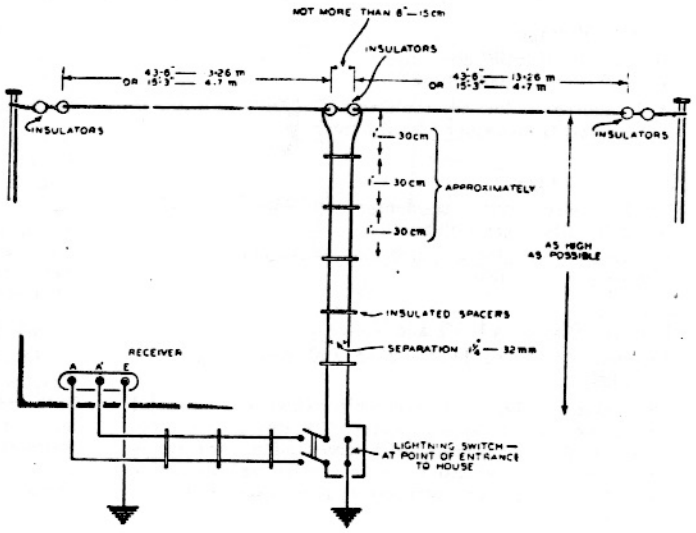
When best reception of the shorter wavelengths, *i.e.*, 16, 19 and 25 metres, is required each half of the doublet should measure exactly 15 feet 3 inches (4·7 metres). For the longer wavelengths—25, 31 and 49 metres—each half should be exactly 43 feet 6 inches (13·26 metres) long.

An ideal doublet aerial should 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 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 (15 cm.) 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 1¼ inches (32 mm.). They should be kept this distance apart by spacers, at intervals of approximately 1 foot (30 cm.). 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 between the window frame. The illustration shows the construction of the aerial and connexions of the lightning switch.



DISMANTLING

REMOVAL OF CHASSIS.

1. Remove back, turn wave-band switch to long waves, and remove knobs.
2. Disconnect leads from terminals B, C, and chassis on mains transformer panel, and from loudspeaker panel. The loudspeaker leads, if uncleated, are long enough to allow the chassis to be withdrawn for inspection without disconnecting the loudspeaker.
3. Remove four 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.

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 pointers, vernier scale, and glass scale.
2. Remove scale frame.
3. Remove slow motion drive which is fixed by two P.K. 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 or 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.

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 (80), 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. On short waves the value should be 2·6 volts due to the extra current taken by V1 when the resistance R38 is shorted out.

4. Pentode Test.

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

Low or high voltage suggest replacement of V6 (42) 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 re-aligned.

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. An output meter, such as an 0 to 2 A.C. voltmeter.

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.*, S.W. range, M.W. range, L.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 output meter should be connected to tags 2 and 3 on the L.S. panel.

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. Turn the tuner slowly until 30 degrees is registered on the vernier scale.

3. The main tuning pointer must now point accurately to 725 metres. Be sure in examining this reading that the eye is exactly above the pointer. To adjust do not bend pointer, slacken screw holding collar and slide round the condenser spindle until the correct reading is obtained, then re-tighten screw.

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.

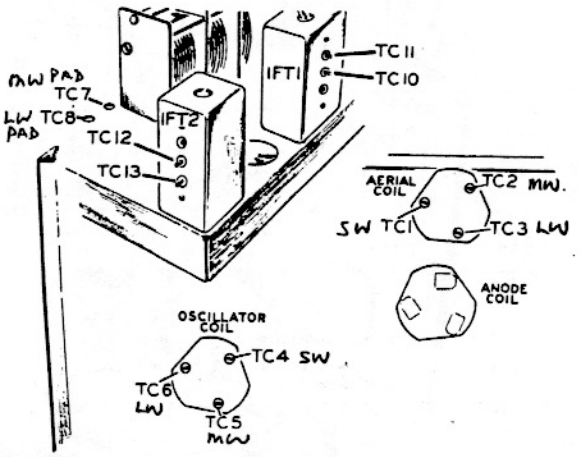
1. Set receiver to 725 metres by the tuning scale.
2. Set oscillator to 725 metres and adjust TC6 and TC3 in that order for maximum.
3. Set oscillator to 1,900 metres and tune-in on receiver.
4. Adjust TC8 for maximum at the same time rocking gang condenser.
5. Repeat operations 1 to 4 to check correctness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

Medium Waves.

1. Set the receiver and oscillator to 197 metres. There is no calibration mark on the scale at 197 metres but the correct setting is obtained when the vernier reads 24 degrees and the wavelength pointer is just below 200 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 and receiver to 725 metres adjust TC6 for maximum output.

Short Waves.

1. Connect oscillator output leads to top grid of V1 (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 (6K7)	V2 (6A8)		V3 (6K7)	V4 (6H6)	V5 (6F5)	V6 (42)	V7 (80)	VT (6E5)
ANODE/FRAME VOLTS..	200	265 Mix.	170* Osc.	265	—	160	255	—	25†
SCREEN/FRAME VOLTS	100	75		105	—	—	250	—	(Target) 370
BIAS	2·2†	2·2†		2·2†	—	1·5	17·0	370	—
	Chassis to H.T. —	Chassis to H.T. —		Chassis to H.T. —	—	Cathode to H.T. —	Cathode to H.T. —	Cathode to H.T. —	—
FILAMENT VOLTAGE ..	6·3	6·3		6·3	6·3	6·3	6·3	5·0	6·3

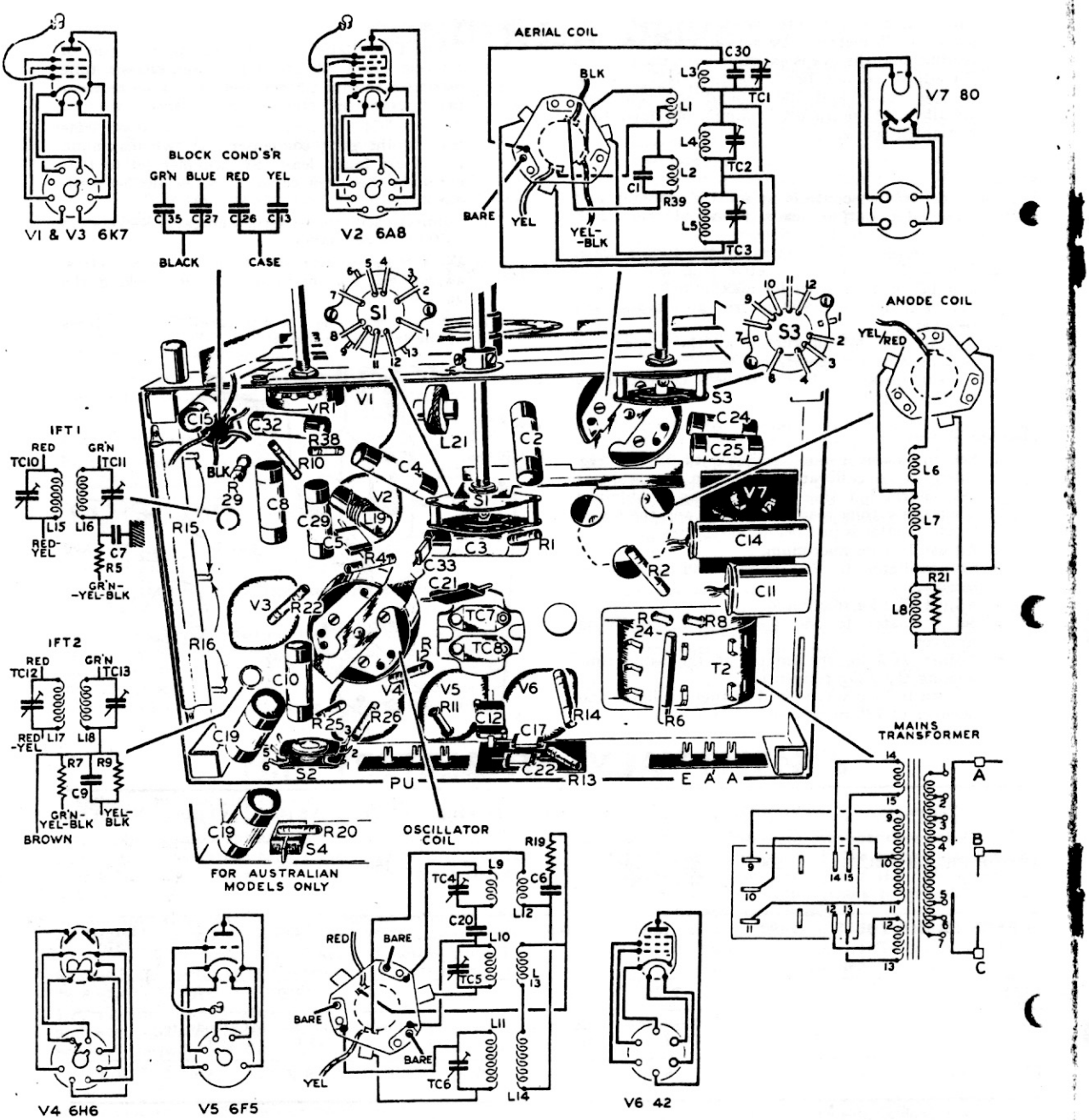
* Signals unobtainable whilst taking this reading.

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

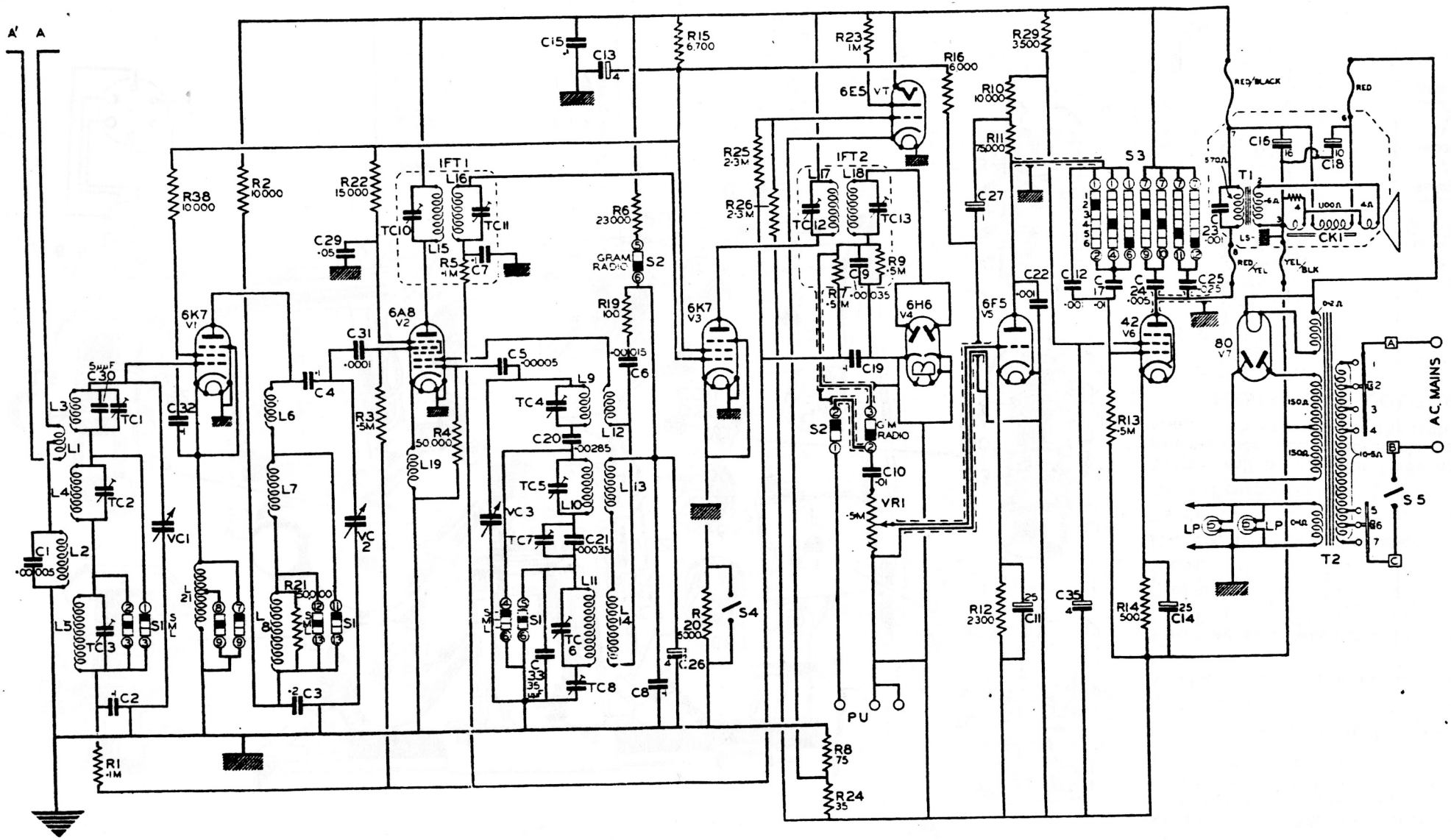
Total H.T. current measured at tag 6 L.S. panel .. .. 75 mA.
Pentode (42) anode current measured at tag 8 L.S. panel .. .. .. 26 mA.
Anode and screen current V1, V2, V3, V5 measured at tag 7 L.S. panel .. 49 mA.

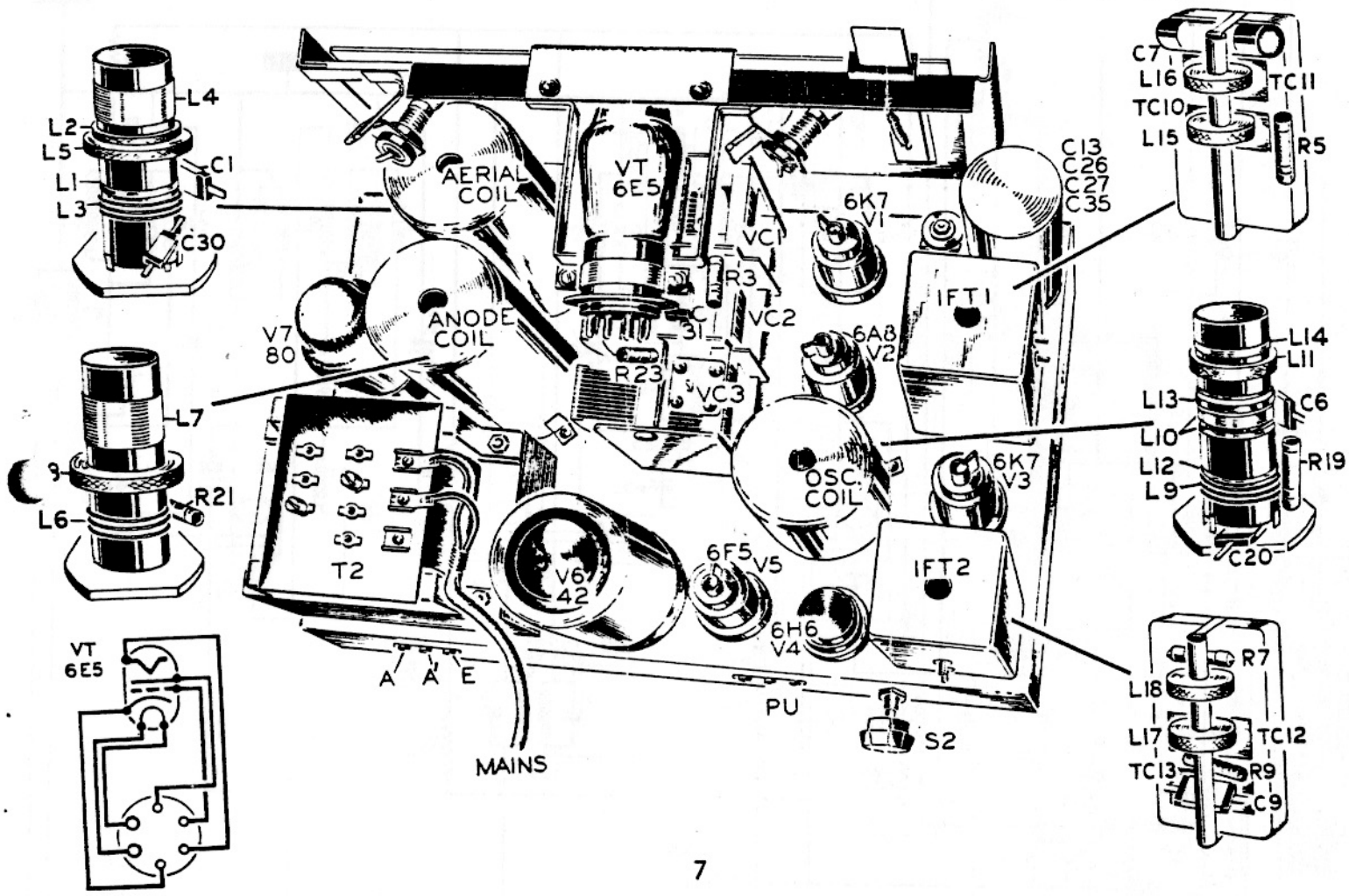
In the case of Australian models the above values should obtain with the local distant switch in the " distant " position.

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


V1 & V3 6K7
BLOCK COND'S'R
GR'N BLUE RED YEL
C35 C27 C26 C13
BLACK
CASE
V2 6A8
AERIAL COIL
BLK
BARE
YEL
YEL-BLK
C30
L3
TC1
L1
L4
TC2
C1
L2
R39
L5
TC3
V7 80
ANODE COIL
YEL/RED
L6
L7
R21
L8
IFT1
RED
GR'N
TC10
TC11
L15
L16
RED-YEL
C7
R5
GR'N-YEL-BLK
IFT2
TC12
TC13
L17
L18
R7
R9
C9
GR'N-YEL-BLK
YEL-BLK
BROWN
S1
S2
S3
S4
VR1
V1
V2
V3
V4
V5
V6
V7
C15
C32
R38
R10
R29
C8
C29
C5
L19
L21
C2
C4
C3
R1
R4
C33
C21
R22
R15
R16
C10
C19
R25
R26
R11
C12
C17
R14
R24
R8
R6
T2
C14
C11
R2
C24
C25
TC7
TC8
PU
R13
E A A
C22
R20
FOR AUSTRALIAN MODELS ONLY
OSCILLATOR COIL
R19
L9
TC4
C6
L12
C20
L10
TC5
L13
L11
TC6
L14
RED
BARE
YEL
MAINS TRANSFORMER
A
B
C
V4 6H6
V5 6F5
V6 42

HMV
Model 472





NOTE : The bias resistance (R20) and local-distant switch (S4) are incorporated in Australian models only. In all other models the cathode of V3 is connected to chassis.

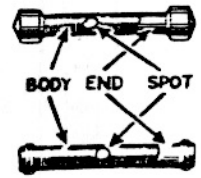
WIRE COLOUR CODE.

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.	00,000· Yellow.
5 Green.	00,000· Green.
6 Blue.	
7 Violet.	
8 Grey.	
9 White.	



CONTINUITY CHECKS

Remove valves and pilot lamps. Readings ± 20 per cent.

Components.	Measured.	Switch.	Resistance.
L1, L2, R39	Aerial and earth sockets	—	10·0 ohms.
L3, L4, L5	Top grid VI and contact 3. S1	S.W. M.W. L.W.	(L3) 0·1 ohms. (L3 + L4) 9·5 ohms. (L3, L4, L5) 23·5 ohms.
L6, L7, L8, R28	Anode VI (6K7) and contact 13. S1	S.W. M.W. L.W.	(L6) 0·1 ohms. (L6 + L7) 9·0 ohms. (L6, L7, L8) 23·0 ohms.
L9	Across ends	—	0·1 ohms.
L10	Across ends	—	5·7 ohms.
L11	Across ends	—	5·0 ohms.
L12, L13, L14	Anode V2 (6A8) and end of R6	—	7·2 ohms.
L15	Across ends	—	5·0 ohms.
L16, R5	Top grid V3 (6K7) and yellow/black wire from IFT 1	—	100,000 ohms. (L16 5·0 ohms.)
L17	Across ends	—	5·0 ohms.
L18, R9	Diodes and Cathode V4 (6H6)	—	0·5 megohm. (L18, 5·0 ohms.)
L19	Cathode V2 (6A8) and chassis	—	0·1 ohms.
L21	Cathode V1 (6K7) and chassis	S.W. M.W. L.W.	"Short" 6 ohms. 15 ,,
R1, R3, L3	Grid VI (6K7) and mixer grid V2 (6A8)	S.W.	0·6 megohm.
R7, R25, L8	Grid VT (6E5) and diodes V4 (6H6)	—	2·8 megohm.
R13	Grid V6 (42) and L.S. chassis	—	0·5 megohm.
VR1	Top grid V5 (6F5) 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 Secondary	Tags 2 and 3 (disconnect speech coil) Tags 7 and 8	— —	0·6 ohms. 570 ,,
T2 Primary	Terminals 1–2	—	0·5 ohms.
	,, 2–3	—	0·5 ,,
	,, 3–4	—	0·5 ,,
	,, 4–5	—	3·0 ,,
	,, 5–6	—	0·4 ,,
	,, 6–7	—	5·6 ,,
	,, 1–7	—	10·5 ,,
Secondaries	Tags 9–10	—	150 ,,
	,, 10–11	—	150 ,,
	,, 12–13	—	0·1 ,,
	,, 14–15	—	0·2 ,,

SPARE PART LIST

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price. £ s. d.	Per
	Instructions.				
80050	Cabinet label	1	—	0 0 1	Each.
24393	Instruction card	1	—	0 0 6	,,
17577	Voltage adjustment label	1	—	0 0 1½	,,
24394	Knob card	1	—	0 0 6	,,
24395	Short wave guide	1	—	0 0 6	,,
	CABINET PARTS AND FITTINGS				
Z1194	Cabinet	1	Pol	4 5 0	Each.
8195	Rubber feet	4	—	0 0 8	Doz.
80086A	Baffle board	1	Std	0 2 3	Each.
15831	Screw (No. 8 × 1 in.) securing baffle board	2	—	0 0 2	Doz.
9530	Screw (No. 8 × 1½ in.) securing baffle board	6	—	0 0 2½	,,
24192	Wire mesh	1	BzP	0 3 0	Each.
9772	Screw, securing wire mesh to baffle board	4	—	0 0 2	Doz.
80053	Felt for wire mesh, top and bottom (¼ in.)	2	—	0 0 1½	Each.
80051	Felt for wire mesh, top and bottom (⅛ in.)	2	—	0 0 6	Doz.
80054	Felt for wire mesh, sides (¼ in.)	2	—	0 0 1	Each.
80052	Felt for wire mesh, sides (⅛ in.)	2	—	0 0 4½	Doz.
80444	Loudspeaker locating block	4	Std	0 0 2	Each.
9547	Screw, securing locating blocks to baffle	8	—	0 0 2	Doz.
24193	Bracket, for speaker support blocks	2	WN	0 0 1	Each.
2418	Screw, securing brackets	8	—	0 0 3	Doz.
12775	Insert nut, for speaker fixing	2	CB	0 0 1	Each.
24873	Bracket, for cabinet back	4	CdP	0 0 1	,,
2418	Screw, securing brackets	8	—	0 0 3	Doz.
24398C	Cabinet back (printed)	1	—	0 2 0	Each.
19896	Screw securing cabinet back to brackets	4	ParB.	0 0 1	,,
19895	Spring washer securing cabinet back to brackets	4	ParB	0 0 4	Doz.
19214E	S5 mains on/off switch	1	BzP	0 1 9	Each.
14697	Switch nut	1	WN	0 0 11	Doz.
21238	Switch plate	1	CdP	0 0 1	Each.
19875	Switch escutcheon	1	BzSp	0 0 6	,,
24375	Tuning escutcheon	1	—	0 1 0	,,
24377	Tuning window	1	—	0 0 3	,,
24378	Rubber packing (8½ in.)	2	—	0 0 6	Doz.
24379	Rubber packing (3 in.)	2	—	0 0 3	,,
24376A	Clip, with rubber securing tuning escutcheon and window	4	BzSp	0 0 1	Each.
9545	Screw securing tuning escutcheon and window	4	WN	0 0 3	Doz.
	LEADS, PLUGS AND CLEATS				
24397A	Switch lead with three tags	1	—	0 0 9	Each.
19063C	Mains lead with two tags	1	—	0 1 6	,,
11802	Tag, for above leads	5	—	0 0 3	Doz.
16289B	Plug, black	2	—	0 0 2	Each.
16289J	Plug, yellow	3	—	0 0 2	,,
16289K	Plug, brown	1	—	0 0 2	,,
18889A	Carton, for mains lead and plugs	1	—	0 0 1	,,
7155	Cleat, for mains lead	1	WN	0 0 1	,,
16578	Cleat, for loudspeaker lead	1	—	0 0 6	Doz.
8602	Screw, securing cleats	2	WN	0 0 2	,,
	CONTROLS				
24371	Knob—tuning (large)	1	—	0 0 7	Each.
24372	Knob—" tuner "	1	ChF	0 0 7	,,
10674	Grub screw for " Tuner " knob	1	WN	0 0 4	Doz.
21281K	Knob—" Volume "	1	ChF	0 0 7	Each.
21281X	Knob—" Wave-band "	1	ChF	0 0 7	,,
21281W	Knob—" Tone "	1	ChF	0 0 7	,,
21281AL	Knob—P.U. Switch	1	ChF	0 0 7	,,
11805	Screw, P.K., securing knobs	4	—	0 0 6	Doz.

SPARE PART LIST—*continued.*

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price. £ s. d.	Per
	LOUDSPEAKER				
21970T	**Loudspeaker,** complete with T1, C16, C18 and C23	1	—	2 0 0	Each.
12040AA	T1—Output transformer	1	—	0 7 6	,,
10606	Screw, P.K., securing T1	2	—	0 0 7	Doz.
22675C	C16—16 mfd. electrolytic condenser	1	—	0 7 0	Each.
22675B	C18—10 mfd. electrolytic condenser	1	—	0 6 6	,,
22005Q	C23—0·001 mfd. condenser	1	—	0 1 6	,,
11543F	CK1—Field coil	1	—	0 5 9	,,
21455A	Hum coil	1	—	0 0 6	,,
21966A	Terminal panel, with six tags	1	—	0 1 0	,,
21456	Washer (presspahn) } at ends of field coil	1	—	0 0 4	Doz.
12947	Washer (felt) } at ends of field coil	1	—	0 0 2	Each.
17422	Washer (millboard) } at ends of field coil	2	—	0 0 3	Doz.
21968	Top plate	1	CdP	0 1 0	Each.
21967	Stud, securing top plate	4	WN	0 0 1½	,,
21965D	Cone chassis, with two studs and bracket for T2	1	CdP	0 2 6	,,
11627	Nut, securing cone chassis studs (21967)	4	WN	0 0 6	Doz.
21256A	Speech coil and cone	1	BMEn	0 3 0	Each.
19585	Card washer } securing spider of cone to studs on cone chassis	2	local —	0 0 1	Doz.
17476	"D" washer } securing spider of cone to studs on cone chassis	2	CdP	0 0 1	,,
1092	Washer } securing spider of cone to studs on cone chassis	2	—	0 0 2	,,
19687	Nut } securing spider of cone to studs on cone chassis	2	—	0 0 2	,,
19456	Cone mounting ring	2	—	0 0 3	,,
19457	Felt ring	1	—	0 0 1	Each.
16576	Insulating bush	1	—	0 0 3	Doz.
25013	Stop, for speech coil	1	CB	0 0 1	Each.
25022	Sleeve } securing stop to magnet core	1	WN	0 0 6	Doz.
25023	Screw } securing stop to magnet core	1	CB	0 0 6	,,
24056	Bracket, for electrolytic condensers	1	CdP	0 0 6	Each.
11211	Screw, securing bracket	3	WN	0 0 8	Doz.
7229	Earthing tag	1	SP	0 0 4	,,
22759	Bolt } securing loudspeaker to support strap	1	WN	0 0 1½	Each.
21890	Washer } securing loudspeaker to support strap	1	WN	0 0 1½	Doz.
24373A	Loudspeaker support strap	1	CdP	0 1 9	Each.
11205	Screw } securing support strap to insert nuts in support blocks	2	WN	0 0 2	Doz.
1038	Washer } securing support strap to insert nuts in support blocks	2	WN	0 0 6	,,
	VALVES				
—	V1—6K7	—	—	—	—
—	V2—6A8	—	—	—	—
—	V3—6K7	—	—	—	—
—	V4—6H6	—	—	—	—
—	V5—6F5	—	—	—	—
—	V6—42	—	—	—	—
—	V7—80	—	—	—	—
	RADIO UNIT				
24000C	**Radio unit**	1	—	9 10 0	Each.
11206	Screw } securing radio unit	4	WN	0 0 2	Doz.
3531	Washer } securing radio unit	4	WN	0 0 2	,,
10173	Spring washer } securing radio unit	4	—	0 0 2	,,
	INDUCTANCES				
23921A	L1 —S.W. coupling coil L2 —M.W. and L.W. coupling coil L3 —S.W. grid coil L4 —M.W. grid coil L5 —L.W. grid coil } aerial coil assembly	1	—	0 3 6	Each
23921B	L6 —S.W. anode coil L7—M.W. anode coil L8 —L.W. anode coil } anode coil assembly	1	—	0 2 6	,,

SPARE PART LIST—*continued.*

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price. £ s. d.	Per
23921C	L9 —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	—	0 3 6	Each.
24013	Coil spacer	3	—	0 0 3	Doz.
24030A	L15—1st I.F. primary .. .. }	1	—	0 2 6	Each.
24030A	L16—1st I.F. secondary .. .. }	1	—	0 2 6	,,
24096A	L17—2nd I.F. primary .. .. }	1	—	0 0 3	,,
24096C	L18—2nd I.F. secondary .. .. }	1	—	0 2 0	,,
24030B	L19—Frequency stabiliser	1	—	0 7 0	,,
	L21—Choke coil	2	SP	0 0 9	Doz.
24036	I.F.T. 1—1st I.F. transformer, complete with L15, L16, R5, C7, TC10 and TC11	2	WN	0 0 7	,,
11248	Clip supporting coil former	2	—	0 0 2	,,
3165	Screw } securing clips	1	—	0 1 4½	Each.
24037B	Washer, S.P. } securing clips	1	—	0 0 1	,,
16756	Screen with insulating bush				
	Insulating bush				
24030C	I.F.T. 2—2nd I.F. transformer, complete with L17, L18, R7, R9, C19, TC12 and TC13	1	—	0 7 9	,,
24036	Clip supporting coil former	2	SP	0 0 9	Doz.
11248	Screw } securing clips	2	WN	0 0 7	,,
3165	Washer, S.P. } securing clips	2	—	0 0 2	,,
24037A	Screen	1	—	0 1 3	Each.
3166	Washer, S.P. } securing I.F. transformers	4	—	0 0 2	Doz.
11628	Nut } securing I.F. transformers	4	WN	0 0 4	,,
11543F	CK1—Field coil, 1,100 ohms (on loudspeaker)	1	—	0 5 9	Each.
12040AA	T1—Output transformer (on loudspeaker)	1	—	0 7 6	,,
21586J	T2—Mains transformer	1	—	1 10 0	,,
21240A	Terminal panel	1	—	0 1 3	,,
8777	Screw, P.K., securing terminal panel	4	—	0 0 6	Doz.
11228	Terminal screw	3	WN	0 0 4	,,
12179	Voltage adjustment screw	2	WN	0 0 1	Each.
3167	Washer, S.P. } securing T2	4	—	0 0 2	Doz.
11627	Nut } securing T2	4	WN	0 0 6	,,
	RESISTANCES				
19202L	R1 —100,000 ohms	1	—	0 0 9	Each.
17541B	R2 — 10,000 ohms	1	—	0 0 9	,,
19202N	R3 — 500,000 ohms	1	—	0 0 9	,,
19202J	R4 — 50,000 ohms	1	—	0 0 9	,,
19202L	R5 —100,000 ohms	1	—	0 1 1	,,
5786P	R6 — 23,000 ohms	1	—	0 0 9	,,
24115N	R7 — 500,000 ohms	1	—	0 0 9	,,
24150Y	R8 — 75 ohms	1	—	0 0 9	,,
19202N	R9 —500,000 ohms	1	—	0 0 9	,,
24115F	R10— 10,000 ohms	1	—	0 0 9	,,
19202K	R11— 75,000 ohms	1	—	0 0 9	,,
19202C	R12— 2,300 ohms	1	—	0 0 9	,,
24115N	R13—500,000 ohms	1	—	0 1 1	,,
5786AF	R14— 500 ohms	1	—	0 2 6	,,
24047A	R15— 6,700 ohms }	2	—	0 0 6	Doz.
12619	R16— 6,000 ohms }	1	—	0 0 9	Each.
19202AA	Screw, P.K., securing resistance	1	—	0 0 9	,,
19202J	R19— 100 ohms	1	—	0 0 9	,,
17541AG	R21— 50,000 ohms	1	—	0 0 9	,,
19202P	R22— 15,000 ohms	1	—	0 0 9	,,
24150W	R23— 1 megohm	1	—	0 0 9	,,
19202AM	R24— 35 ohms	1	—	0 0 9	,,
19202AM	R25— 2·3 megohms	1	—	0 0 9	,,
	R26— 2·3 megohms				

SPARE PART LIST—*continued.*

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price. £ s. d.	Per
17541BK	R29— 3,500 ohms	1	—	0 0 9	Each.
19202F	R38—10,000 ohms	1	—	0 0 9	,,
18300CK	VR1—500,000 ohms volume control, complete with fixing nut and shakeproof washer	1	—	0 5 0	,,
	CONDENSERS				
22001A	C1 —0·00005 mfd.	1	—	0 0 9	Each.
21766D	C2 —0·1 mfd.	1	—	0 1 4	,,
21766E	C3 —0·3 mfd.	1	—	0 1 6	,,
21766D	C4 —0·1 mfd.	1	—	0 1 4	,,
22170A	C5 —0·00005 mfd.	1	—	0 0 9	,,
22001AC	C6 —0·00015 mfd.	1	—	0 0 9	,,
21766D	C7 —0·1 mfd.	1	—	0 1 4	,,
21766D	C8 —0·1 mfd.	1	—	0 1 4	,,
22001AE	C9 —0·00035 mfd.	1	—	0 0 9	,,
21766A	C10—0·01 mfd.	1	—	0 1 0	,,
24089A	C11—25 mfd. (electrolytic), 12 volt	1	—	0 2 6	,,
22001F	C12— 0·001 mfd.	1	—	0 0 9	,,
24019A	C13— 4 mfd. (electrolytic), with C26, C27 and C35	1	—	0 6 6	,,
24089B	C14—25 mfd. (electrolytic), 25 volt	1	—	0 2 9	,,
21766D	C15— 0·1 mfd.	1	—	0 1 4	,,
22675C	C16—16 mfd. (electrolytic) on loudspeaker	1	—	0 7 0	,,
22005B	C17— 0·01 mfd.	1	—	0 2 0	,,
22675B	C18—10 mfd. (electrolytic) on loudspeaker	1	—	0 6 6	,,
21766D	C19— 0·1 mfd.	1	—	0 1 4	,,
22330CA	C20— 0·00285 mfd. V.S.L.	1	—	0 2 6	,,
22330AL	C21— 0·00035 mfd. S.L.	1	—	0 2 6	,,
22001F	C22— 0·001 mfd.	1	—	0 0 9	,,
22005Q	C23— 0·001 mfd. on loudspeaker	1	—	0 1 6	,,
22676G	C24— 0·005 mfd.	1	—	0 1 0	,,
22676F	C25— 0·025 mfd.	1	—	0 1 3	,,
	C26— 4 mfd. (electrolytic), with C13.				
	C27— 1 mfd. (electrolytic), with C13.				
21766C	C29— 0·05 mfd.	1	—	0 1 3	,,
22164A	C30— 5 mmfd.	1	—	0 0 9	,,
22001B	C31— 0·0001 mfd.	1	—	0 0 9	,,
21766D	C32— 0·1 mfd.	1	—	0 1 4	,,
22164F	C33—35 mmfd.	1	—	0 0 9	,,
	C35— 4 mfd. (electrolytic), with C13.				
23922D	TC1, TC2 and TC3—Triple pre-set condensers	1	—	0 2 0	,,
23922B	TC4, TC5 and TC6—Triple pre-set condensers	1	—	0 2 6	,,
24027	Adjusting screw	6	—	0 0 3	Doz.
3165	Washer, S.P. } securing triple pre-set condensers	2	—	0 0 2	,,
19050	Screw }	2	—	0 0 3	,,
24001	Bracket, supporting TC4, TC5 and TC6	1	CdP	0 0 2	Each.
8777	Screw, P.K., securing bracket	2	—	0 0 6	Doz.
12640G	TC7 and TC8—Twin pre-set condenser	1	—	0 2 0	Each.
11743	Adjusting screw	2	—	0 0 8	Doz.
17071	Spacer	2	WN	0 0 1	Each.
11225	Screw	2	WN	0 0 1	,,
1088	Washer } securing twin pre-set condensers	2	WN	0 0 3	Doz.
3166	Washer, S.P.	2	—	0 0 2	,,
11628	Nut	2	WN	0 0 4	,,
22530C	TC10 and TC11—Twin pre-set condenser (in IFT 1)	1	—	0 1 6	Each.
22530D	TC12 and TC13—Twin pre-set condenser (in IFT 2)	1	—	0 1 6	,,
21657	Adjusting screw	4	WN	0 0 2	Doz.
24040B	VC1, VC2 and VC3—three-gang condenser	1	—	0 12 6	Each.
22159	Tag (upper)	2	SP	0 0 6	Doz.
22157	Tag, long (lower)	2	SP	0 0 6	,,
22331	Screw, securing tags and fixed plates	8	WN	0 0 2	,,
22386	Tag (upper) oscillator section	1	SP	0 0 1	Each.
22385	Tag (lower) oscillator section	1	—	0 0 1	,,
22484	Insulator oscillator section	2	—	0 0 1	,,

SPARE PART LIST—*continued.*

Part No.	Description.	Parts per Inst.	Finish.	Retail List Price. £ s. d.	Per
		4	—	0 0 1	Doz.
21454	Washer, under insulator .. .. securing insulators, tags, and fixed plates	8	WN	0 0 1½	,,
21452	Screw	8	—	0 0 2	,,
3166	Washer, S.P. (oscillator)	5	SP	0 0 6	,,
17359	Earth spring	3	—	0 0 1	,,
16234	Rivet, securing earth springs	—	—	0 0 6	Per Yd.
398/20639	Metal braid	1	CdP	0 0 3	Each.
24049	Bracket	1	CdP	0 0 1	,,
24562	Stop bracket	2	WN	0 0 3	Doz.
11219	Screw securing brackets	2	—	0 0 2	,,
3166	Washer, S.P. securing brackets	3	—	0 0 1	Each.
21236	Rubber bush securing brackets	3	WN	0 0 1	Doz.
6305	Washer securing three-gang condenser	3	—	0 0 2	,,
3167	Washer, S.P. securing three-gang condenser	3	WN	0 0 6	,,
11627	Nut securing three-gang condenser				
	CONDENSER DRIVE AND TUNING DETAILS				
		1	—	0 2 0	Each.
24050A	Drive mechanism	1	—	0 0 4	,,
24050	Spindle	1	CPBzSp	0 0 9	,,
24051A	Sleeve and pinion		local		
		1	—	0 0 3	,,
24053A	Barrel and flange	3	—	0 0 1	Doz.
3522	Ball	7	—	0 0 1	,,
3540	Ball (small)	1	CP	0 0 1	,,
24057	Washer	1	—	0 0 1	Each.
24055	Spring	1	WN	0 0 6	Doz.
5183	Circlip	2	—	0 0 6	,,
8777	Screw, P.K., securing drive mechanism to three-gang condenser ..	1	BzSplocal	0 1 6	Each.
24064A	Scale frame	4	—	0 0 6	Doz.
8777	Screw, P.K., securing scale frame to chassis	1	BzSplocal	0 1 9	Each.
24060A	Scale plate	4	BzP	0 0 4½	Doz.
19050	Screw securing scale plate to scale frame ..	4	BzP	0 0 2	,,
22511	Washer securing scale plate to scale frame ..	4	—	0 0 2	,,
3166	Washer, S.P. securing scale plate to scale frame ..	1	CBlocal	0 0 4½	Each.
24365A	Wave band indicator	1	—	0 0 1½	,,
24367	Spring	1	—	0 2 6	,,
24071A	Scale glass, printed	1	—	0 0 9	Doz.
24073	Black paper mask	1	—	0 1 0	Each.
24074	Felt backing	1	BzSP	0 0 3	,,
24075A	Scale clamp, with rubber packing	2	WN	0 0 3	Doz.
11219	Screw securing scale clamp	2	—	0 0 2	,,
3166	Washer, S.P. securing scale clamp	1	CdP	0 0 3	Each.
24363A	Indicator operating lever	2	WN	0 0 3	Doz.
13387	Screw, securing lever to switch spindle	1	BzSplocal	0 0 6	Each.
24361B	Fine tuning indicator disc	1	WN	0 0 3	Doz.
11326	Screw, securing disc to drive mechanism	1	BzSp	0 0 2	Each.
24077A	Pointer for disc		Wlocal		
		1	WN	0 0 7	Doz.
11248	Screw securing pointer to scale plate	1	—	0 0 2	,,
3165	Washer, S.P. securing pointer to scale plate	1	BzSp	0 0 6	Each.
24079A	Tuning pointer		Wlocal		
		1	WN	0 0 3	Doz.
11326	Screw securing pointer to spindle of three-gang condenser	1	—	0 0 2	,,
3165	Washer, S.P. securing pointer to spindle of three-gang condenser	2	—	0 0 9	Each.
22238A	Lampholder	2	—	0 0 9	,,
22704H	Lamp	1	—	0 0 6	,,
24534A	Wiring for lamps	1	CdP	0 0 1	,,
24369	Clamp (upper) for visual tuner	1	CdP	0 0 2	,,
24370	Clamp (lower) for visual tuner	4	WN	0 0 4	Doz.
14791	Screw securing clamps	4	—	0 0 2	,,
3166	Washer, S.P. securing clamps	1	—	0 2 0	Each.
24380B	Socket for visual tuner, complete with lead and R23	1	—	0 0 6	,,
24380A	Socket	1	—	0 1 0	,,
24387A	Lead	—	—	—	—
—	Visual tuner—6E5				