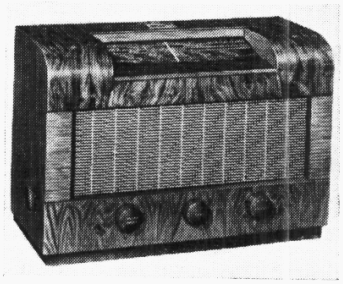
"TRADER" SERVICE SHEET
923

H.M.V. 1120

A.C. Superhet with Band-spread S.W. Tuning



TWO of the three short-wave bands in the H.M.V. 1120 receiver employ electrical band-spreading circuits. The receiver is a 4-valve (plus rectifier) 5-band superhet designed to operate from A.C. mains of 195-255 V, 50-100 c/s. The waveband ranges are 15.5-20.5 m (S.W.3), 20.5-33 m (S.W.2), 33-100 m (S.W.1.), 190-570 m (M.W.) and 720-2,000 m (L.W.). Note that S.W.3 is the lowest wavelength band.

Release date and original price: March 1949; *£22 1s. plus purchase tax.*

CIRCUIT DESCRIPTION

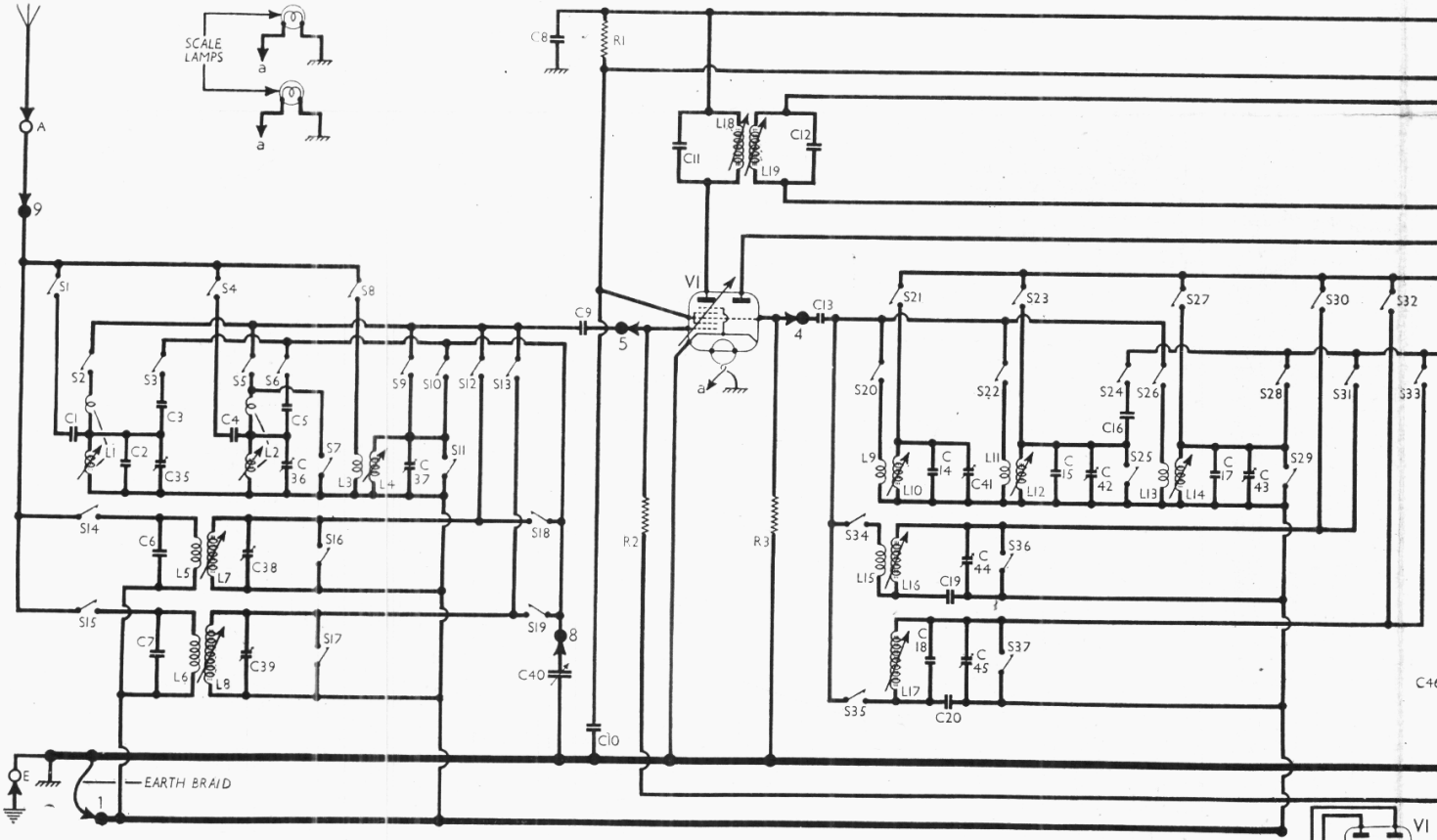
Input from the aerial is capacitatively coupled by **C1** (S.W.3) or **C4** (S.W.2), to the tappings on single-tuned circuits **L1, C3, C40** (S.W.3) or **L2, C5, C40** (S.W.2), or inductively coupled by **L3** (S.W.1), **L5** (M.W.), **L6** (L.W.) to single-tuned circuits **L4, C40** (S.W.1), **L7, C40** (M.W.), **L8, C40** (L.W.). Aerial circuit electrical band-spread tuning on the S.W.3 and S.W.2 ranges is achieved by connecting the gang capacitor to tappings on the appropriate coils via series capacitors **C3** (S.W.3) or **C5** (S.W.2).

First valve **(V1, Marconi X148** or **X81)** is a variable-mu triode heptode or triode-hexode operating as frequency changer with internal coupling. Band-spread tuning of the triode oscillator anode coils **L10** (S.W.3), or **L12** (S.W.2) is obtained by the use of capacitors **C22** (S.W.3), or **C16, C22** in parallel (S.W.2), in series with the gang capacitor **C46.**

On the remaining ranges, oscillator anode coils **L14** (S.W.1), **L16** (M.W.), **L17** (L.W.) are tuned directly by **C46,** with parallel trimming by **C17, C43** (S.W.1), **C44** (M.W.), **C18, C45** (L.W.), and series tracking by **C19** (M.W.), **C20** (L.W.). Reaction coupling is inductive on the three S.W. bands, due to **L9** (S.W.3), **L11** (S.W.2), and **L13** (S.W.1). On M.W. mixed inductive and capacitative coupling is provided by **L15** and the common impedance of **C19** in grid and anode circuits, and on L.W. the coupling is capacitative only, by **C20.**

Second valve **(V2, Marconi metal W81)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-transformer couplings **C11, L18, L19, C12** and **C24, L20, L21, C25.**

Intermediate frequency 465 kc/s.



Circuit diagram of the H.M.V. 1120 5-band A.C. superhet. The S.W. bands, reading from left to right in both aerial and oscillator circuits, are S.W.3, S.W.2 and S.W.1, the lowest wavelengths being in the S.W.3 range. Electrical band-spreading is effected on S.W.3 and S.W.2 in the aerial circuit by coil tappings and series capacitors **C3** and **C5**; and in the oscillator circuit by **C22** (S.W.3) and **C16** (S.W.2). The numbers 1 to 9 around the aerial and oscillator circuits indicate the points of inter-connection between the tuning assembly and the rest of the chassis.

Diode second detector is part of double diode triode valve **(V3, Marconi DH81).** Audio frequency component in rectified output is developed across manual volume control **R7,** which is the load resistor, and passed via **C27, R8** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C26, R5** in diode circuit and **C29** in triode anode circuit.

Second diode of **V3,** fed from **V2** anode via **C28** provides D.C. potential, which is developed across load resistor **R10** and fed back through a decoupling circuit **R6, C23** as G.B. to F.C. and I.F. valves, giving automatic gain control.

Resistance-capacitance coupling by **R9, C30, R11,** via C.G. stopper **R12,** between **V3** triode and beam tetrode output valve **(V4, Marconi KT81).** Fixed tone correction by **C31,** and variable tone control by **C32, R14** in tetrode anode circuit.

H.T. current is supplied by full-wave rectifying valve **(V5, Marconi U84).** Smoothing by speaker field coil **L24** and electrolytic capacitors **C33, C34.** H.T. circuit R.F. filtering by **C8.**

VALVE ANALYSIS

Valve voltages and currents in the table (next col.) are those quoted by the manufacturers, whose receiver was switched to M.W. and operating under "no signal" conditions from mains of 220V. Voltages were measured with a 500 ohms-per-volt meter, chassis being the negative connection, and the total H.T. current is given as 56mA.

Valve		Anode		Screen		Cath.
		V	mA	V	mA	V
V1	X148	270 oscillator 100	0·6 4·8	50	1·6	—
V2	W81	270	8·25	50	2·5	—
V3	DH81	58	0·5	—	—	—
V4	KT81	255	32·5	270	5·5	4·0
V5	U84	334†	—	—	—	340·0

† Each anode, A.C.

COMPONENTS AND VALUES

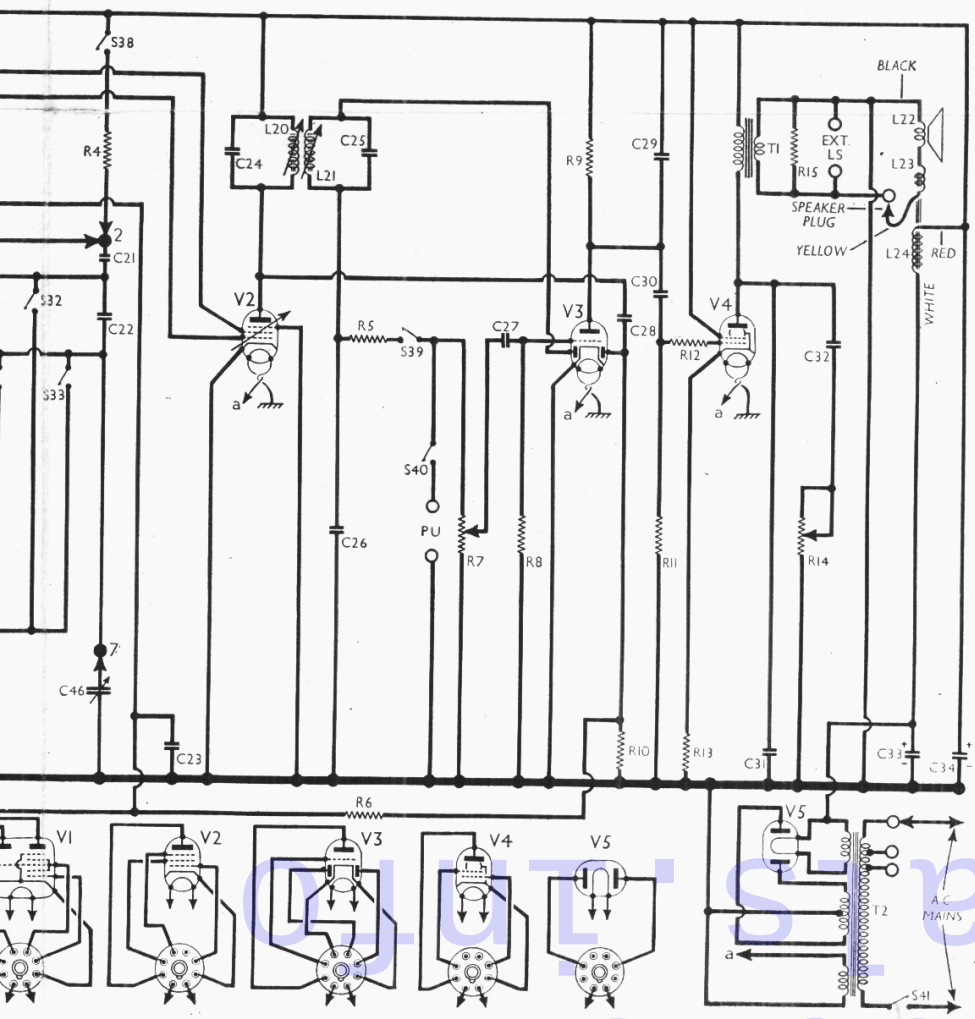
RESISTORS		Values (ohms)	Locations
R1	S.G's H.T. feed ...	51,000	F5
R2	V1 hept. C.G. ...	470,000	G4
R3	V1 osc. C.G.	47,000	G4
R4	Osc. anode load ...	33,000	G4
R5	I.F. stopper ...	47,000	F5
R6	A.G.C. decoup. ...	1,000,000	F5
R7	Volume control ...	500,000	D3
R8	V3 C.G. resistor ...	10,000,000	E5
R9	V3 triode load ...	470,000	E5
R10	A.G.C. diode load ...	470,000	E5
R11	V4 C.G. resistor ...	220,000	E5
R12	V4 C.G. stopper ...	47,000	E5
R13	V4 G.B. resistor ...	100	E5
R14	Tone control ...	20,000	C3
R15	Speaker shunt ...	22	D5

CAPACITORS		Values (μF)	Locations
C1	S.W.3 aerial coup.	0·0000047	M7
C2	S.W.3 aerial trim.	0·00001	M7
C3	S.W.3 aerial track.	0·00012	M7
C4	S.W.2 aerial coup.	0·0000047	M7
C5	S.W.2 aerial track	0·00018	M7
C6	Aerial M.W. shunt	0·00047	L7
C7	Aerial L.W. shunt	0·00022	L7
C8	H.T. R.F. by-pass	0·22	G5
C9	V1 hept. C.G. ...	0·00022	M7
C10	S.G.'s decoupling ...	0·047	G5
C11	1st I.F. trans- former tuning ...	0·0002 0·0002	A1 A1
C12			
C13	V1 osc. C.G. ...	0·000047	M6
C14	S.W.3 osc. trim. ...	0·000047	M6
C15	S.W.2 osc. trim. ...	0·00001	L6
C16	S.W.2 osc. track ...	0·000047	M6
C17	S.W.1 osc. trim. ...	0·000015	L6
C18	Osc. L.W. trim. ...	0·000033	L6
C19	Osc. M.W. tracker	0·00051	L6
C20	Osc. L.W. tracker	0·00015	L6
C21	Osc. anode coup. ...	0·000068	M6
C22	S.W.1. osc. track. ...	0·00012	M6
C23	A.G.C. decoup. ...	0·047	G3
C24	2nd I.F. trans- former tuning ...	0·0002 0·0002	A2 A2
C25			
C26	I.F. by-pass ...	0·0001	G5
C27	A.F. coupling ...	0·047	F5
C28	A.G.C. coupling ...	0·000047	F5
C29	I.F. by-pass ...	0·00022	E5
C30	A.F. coupling ...	0·022	E5
C31	Tone corrector ...	0·01	E5
C32	Part tone control ...	0·05	D4
C33*	H.T. smoothing	16·0	A2
C34*		8·0	A2
C35‡	S.W.3 aerial trim.	—	M7
C36‡	S.W.2 aerial trim.	—	M7
C37‡	S.W.1 aerial trim.	—	L7
C38‡	Aerial M.W. trim.	—	L7
C39‡	Aerial L.W. trim. ...	—	K5
C40†	Aerial tuning ...	—	A1
C41‡	S.W.3 osc. trim. ...	—	M6
C42‡	S.W.2 osc. trim. ...	—	L6
C43‡	S.W.1. osc. trim. ...	—	L6
C44‡	Osc. M.W. trim. ...	—	L6
C45‡	Osc. L.W. trim. ...	—	L6
C46†	Oscillator tuning ...	—	A1

* Electrolytic † Variable ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	S.W.3 aerial tune	0·1	M7
L2	S.W.2 aerial tune	0·1	M7
L3	S.W.1 aerial coup.	1·5	L7
L4	S.W.1 aerial tune	0·1	L7
L5	Aerial M.W. coup.	26·0	L7
L6	Aerial L.W. coup.	65·0	L7
L7	Aerial M.W. tune	3·0	L7
L8	Aerial L.W. tune	30·0	L7
L9	S.W.3 react. coil ...	0·1	M6
L10	S.W.3 osc. tune ...	0·1	M6
L11	S.W.2 react. coil ...	0·1	L6
L12	S.W.2 osc. tune ...	0·1	L6
L13	S.W.1 react. coil ...	0·1	L6
L14	S.W.1 osc. tune ...	0·4	L6
L15	Osc. M. W. react.	2·07	L6
L16	Osc. M.W. tune ...	2·59	L6
L17	Osc. L.W. tune ...	11·5	L6
L18	1st I.F. trans. Pri.	5·0	A1
L19	Sec. ...	5·0	A1
L20	2nd I.F. trans. Pri.	5·0	A2
L21	Sec. ...	5·0	A2
L22	Speech coil ...	2·9	—
L23	Hum neut. coil ...	0·1	—
L24	Field coil	970·0	—
T1	Output trans. Pri.	390·0	E4
	Sec. ...	0·5	
T2	Mains trans. Pri., total	33.5	
	Heat. sec., Rect. heat. sec. ...	0·1	B2
	H.T. sec., total ...	550·0	
S1-S37	W/band switches	—	M6
S38-S40	Radio/gram switches	—	E5
S41	Mains sw., g'd R7...	—	D3

If the component numbers given in the foregoing tables are used when ordering replacements, dealers should mention the fact in the orders, as these numbers may differ from those used in the manufacturers' diagram.



DISMANTLING THE SET

The cabinet is fitted with a detachable bottom cover, upon removal of which (three round-head wood screws) access may be gained to the majority of the under-chassis components.

Removing Chassis.—Remove the three front panel control knobs, taking care not to lose their grub screws, and pull-off the side control knob;

free the speaker leads from their cleat in the top of the cabinet, and the drive cord from its clip on the cursor carriage;

unclip the scale lamps and park them on the projections provided directly behind the two drive cord idler wheels;

from the underside of the cabinet remove the four chassis retaining screws (with one spring

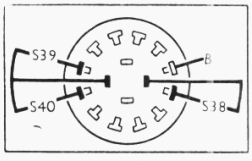


Diagram of the radio/gram change-over switch as seen from the front of an inverted chassis.

and one claw washer each) and slide out the chassis to the extent of the speaker leads, which is sufficient for most purposes.

To free the chassis entirely unsolder the four speaker leads at tags on the field coil assembly.

When replacing, the white and red speaker leads should be resoldered to the upper and lower left-hand tags, and the yellow and black leads to the centre and lower right-hand tags, respectively, on the field coil assembly.

The upper right-hand tag has no external connection.

Transit Bolts.—Four transit bolts, which hold the chassis firmly to the bottom of the cabinet for transport purposes, should be loosened when the receiver is put into service, to allow the chassis to float freely on its rubber mountings.

These bolts may be identified by their heads which are painted red and are visible from beneath the cabinet. The bolts should be kept with the receiver, and should be tightened up whenever it is transported by road or rail.

Removing Speaker.—Remove chassis as previously described, and then withdraw the four cheese-head screws securing the speaker to the sub-baffle.

When replacing, the side of the field coil assembly having three connecting tags should be on the right, and the leads must be reconnected as described above.

Removing Tuning Assembly.—Unsolder from the tag strip on the assembly all the leads connecting it to the chassis; also, the orange and green leads to the gang capacitor, and the yellow lead to the **A** socket;

withdraw the four self-threading screws securing the assembly to the front and rear chassis members, and lift out the assembly, taking care not to strain its connecting leads.

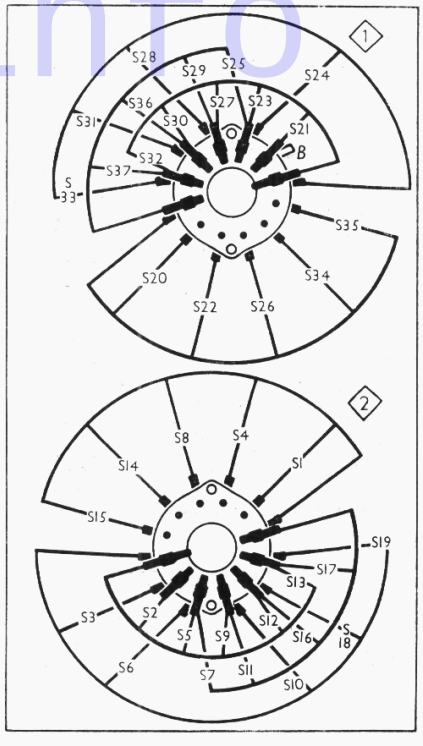
When replacing, the connecting tags are numbered in our illustrations of the chassis and circuit diagram, and the leads to them should be resoldered as follows:

1, metal braid lead from **V1** holder;
2, red lead from pin 3 on **V1** and lead from **R4**;
3, no external connection;
4, no connection;
5, green lead from pin 6 on **V1** holder;
6, no external connection.

The long orange lead from the assembly goes to the fixed vanes connecting tag (7) on the front section **(C46)** of the gang capacitor, the green lead to a similar tag (8) on the rear section **(C40)**, and the yellow lead to the **A** socket (9).

Waveband Switch Table and Diagrams

Switch	S.W.3	S.W.2	S.W.1	M.W.	L.W.
S1	C	—	—	—	—
S2	C	—	—	—	—
S3	C	—	—	—	—
S4	—	C	—	—	—
S5	—	C	—	—	—
S6	—	C	—	—	—
S7	C	—	—	—	—
S8	—	—	C	—	—
S9	—	—	C	—	—
S10	—	—	C	—	—
S11	C	C	—	—	—
S12	—	—	—	C	—
S13	—	—	—	—	C
S14	—	—	—	C	—
S15	—	—	—	—	C
S16	C	C	C	—	—
S17	C	C	C	C	—
S18	—	—	—	C	—
S19	—	—	—	—	C
S20	C	—	—	—	—
S21	C	—	—	—	—
S22	—	C	—	—	—
S23	—	C	—	—	—
S24	—	C	—	—	—
S25	C	—	—	—	—
S26	—	—	C	—	—
S27	—	—	C	—	—
S28	—	—	C	—	—
S29	C	C	—	—	—
S30	—	—	—	C	—
S31	—	—	—	C	—
S32	—	—	—	—	C
S33	—	—	—	—	C
S34	—	—	—	C	—
S35	—	—	—	—	C
S36	C	C	C	—	—
S37	C	C	C	C	—



Diagrams of the waveband switch units (right) drawn as seen when viewed in the direction of the arrows (numbered 1 and 2 in diamonds) in the photograph of the tuning assembly in col. 4. Some tags form part of two separate banks of switches, while others not connected with them at all belong to banks on the opposite sides of the wafers. The associated table is on the left.

GENERAL NOTES

Switches.—**S1-S37** are the waveband switches, ganged in two rotary units in the tuning assembly, beneath the chassis. These units are indicated in our illustration of the tuning assembly, which must be removed before access can be gained to the units. They are shown in detail in the diagrams above, where they are drawn as seen when viewed in the direction of the arrows in our photograph of the assembly.

The table above gives the switch positions for the five control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S38-S40 are the radio/gram change-over switches, ganged in a small rotary unit mounted on the rear member of the chassis. On radio (knob anti-clockwise) **S38** and **S39** are closed, and **S40** is open. When **S40** closes on gram, **S38** and **S39** open to mute radio.

S41 is the Q.M.B. mains switch, ganged with the manual volume control **R7.**

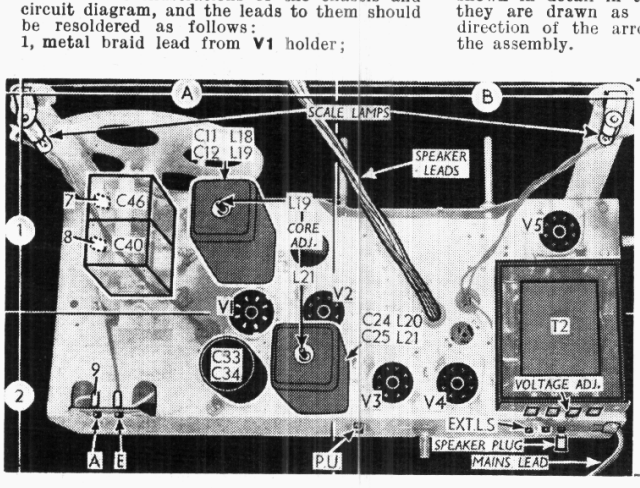
Tuning Assembly.—All the coils, switches, trimmers, trackers and several allied components associated with the R.F. and oscillator tuning circuits are mounted in a removable assembly beneath the chassis, while the tuning gang itself is mounted on the chassis deck, directly above the assembly.

The position of the assembly is indicated in our under-chassis view, where the underside of the assembly is seen. All the R.F. and oscillator alignment adjustments, amounting to twenty, are indicated here.

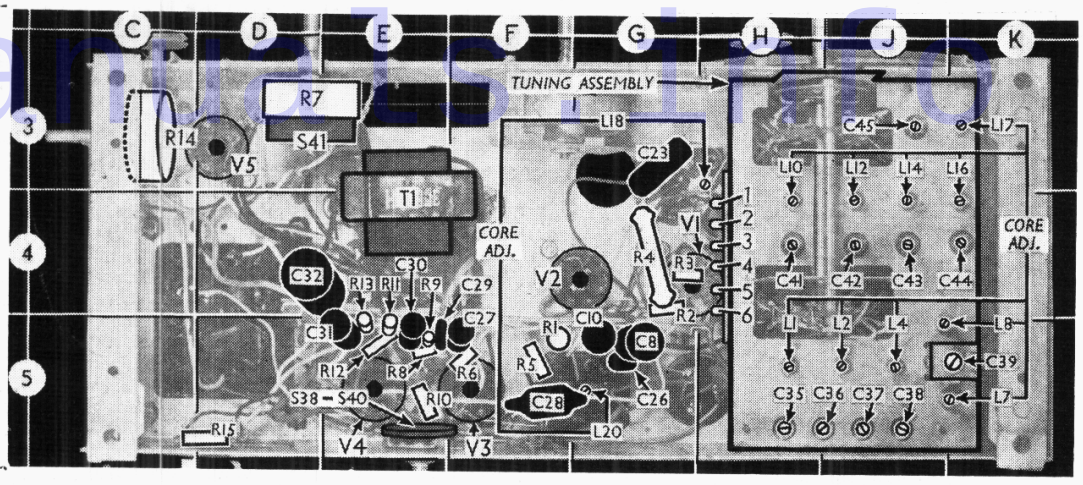
The upper side of the assembly, as seen after removal, is shown in the photograph in col. 4, where all the components are identified. Instructions for the removal and replacement of the unit are given under "Dismantling The Set."

Scale Lamps.—These are two "Vitality" lamps, with M.E.S. bases and small clear tubular bulbs, rated at 6.8 V, 0.3 A. "Parking" lugs are provided for them, for use when the chassis is out of the cabinet, where they are protected from accidental knocks.

External Speaker.—The 6½-in internal speaker speech coil has a rated D.C. resistance of 2.9 Ω and an impedance of 3.5 Ω at 1,000 c/s. Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 5 Ω) external speaker. A plug on a flexible lead normally inserted in a third socket on the same panel may be withdrawn to mute the internal speaker. This plug should not be withdrawn unless another speaker is actually connected, but as a safety measure **R15** is shunted across the output transformer secondary to provide sufficient loading to prevent damage.



Plan view of the chassis. Connecting points 7, 8 and 9 for the tuning assembly are indicated here. 7 and 8 are actually tags at the base of the gang. The scale lamps are seen on their "parking" lugs.



Under-chassis view. Tags **1-6** of the tuning assembly are seen on the left of the unit, and all the twenty alignment adjustments on the unit are identified here, while the primary adjustments of the two I.F. transformers are seen near the unit.

CIRCUIT ALIGNMENT

These operations may be carried out with the chassis in the cabinet, but since a calibrated scale is printed on the rear of the gang drive drum they are more conveniently performed with the chassis on the bench. In the following instructions both the wavelength on the glass scale to which the cursor should be set, and the corresponding position of the drive drum in inches and sixteenths of an inch, measured against the red line on a bracket above the drum, are quoted.

A 4BA non-metallic hollow box spanner, together with a small non-metallic screwdriver inserted through the spanner, should be used for adjusting the coil cores, and a special box spanner (Stock No. Q/D 5021) is required for adjusting the oscillator trimming capacitors. It is available from E.M.I. Sales and Service, Ltd., Dealers' Service Development Division, 100 Blyth Road, Hayes, Middlesex.

I.F. Stages.—Switch set to M.W., turn volume control to maximum and gang to minimum capacitance, connect signal generator (via an 0.05 μF capacitor in the "live" lead) to control grid (pin 6) of **V2** and the **E** socket. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L21** (location reference A2) and **L20** (G5) for maximum output. Transfer "live" signal generator lead to control grid (pin 6) of **V1**, feed in a 465 kc/s signal, and adjust the cores of **L19** (A1) and **L18** (H3) for maximum output.

R.F. and Oscillator Stages.—With the gang at maximum capacitance the cursor should coincide with the high wavelength ends of the scales, and the red line on the bracket should indicate 9 ins on the subsidiary scale. Small adjustments of the cursor may be made by moving it along its clamp plate on the drive cord, after slackening the clamping screw, but larger adjustments would have to be made either by turning the gang drum on its spindle or by shifting the clamp plate along the drive cord. The drum pointer bracket may be moved sideways for adjustment.

For S.W. alignment a crystal controlled signal generator is desirable, and the receiver calibration should be finally checked against S.W. broadcast stations of known wavelength, the cursor being adjusted to give the best compromise for all wave-bands if necessary. Transfer "live" signal generator lead to **A** socket, via a suitable dummy aerial.

S.W.3.—Switch set to S.W.3, tune to 20.68 m (7 11/16 ins) on scale, feed in a 20.68 m (14.5 Mc/s) signal, and adjust the core of **L10** (H4) for maximum output. Then adjust the core of **L1** (H5), while rocking the gang, for maximum output, and repeat the **L10** adjustment.

Tune to 16.21 m (1⅛ ins.) on scale, feed in a 16.21 m (18.5 Mc/s) signal, and adjust **C41** (H4) for maximum output. Then adjust **C35** (H5), while rocking the gang, for maximum output, and repeat the **C41** adjustment. Finally, repeat all these adjustments.

S.W.2.—Switch set to S.W.2, tune to 31.9 m (7⅛ ins.) on scale, feed in a 31.9 m (9.4 Mc/s) signal, and adjust the core of **L12** (J4) for maximum output. Then adjust the core of **L2** (J5), while rocking the gang, for maximum output, and repeat the **L12** adjustment.

Tune to 22.2 m (1⅛ ins.) on scale, feed in a 22.2 m (13.5 Mc/s) signal, and adjust **C42** (J4) for maximum output. Then adjust **C36** (J5), while rocking the gang, for maximum output, and repeat the **C42** adjustment. Finally, repeat all these adjustments.

S.W.1.—Switch set to S.W.1, tune to 85.66 m (7 5/16 ins.) on scale, feed in an 85.66 m (3.5 Mc/s) signal, and adjust the core of **L14** (J4) for maximum output. Then adjust the core of **L4** (J5) while rocking the gang, for maximum output, and repeat the **L14** adjustment.

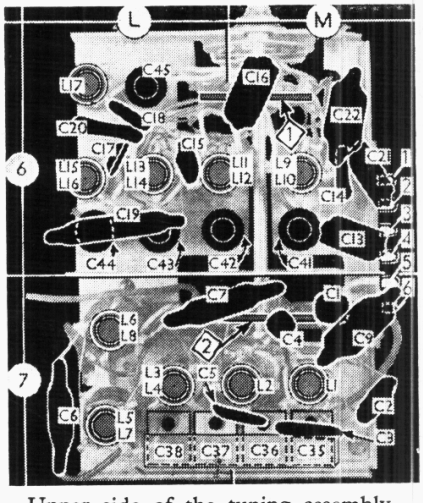
Tune to 36.12 m (1⅛ ins.) on scale, feed in a 36.12 m (8.31 Mc/s) signal, and adjust **C43** (J4) for maximum output. Then adjust **C37** (J5), while rocking the gang, for maximum output, and repeat the **C43** adjustment. Finally, repeat all these adjustments.

M.W.—Switch set to M.W., tune to 510 m (7⅜ ins.) on scale, feed in a 510 m (588 kc/s) signal, and adjust the core of **L16** (K4) for maximum output. Then adjust the core of **L7** (K5), while rocking the gang, for maximum output, and repeat the **L16** adjustment.

Tune to 210 m (1 25/32 ins.) on scale, feed in a 210 m (1,429 kc/s) signal, and adjust **C44** (K4) for maximum output. Then adjust **C38** (J5), while rocking the gang, for maximum output, and repeat the **C44** adjustment. Finally, repeat all these adjustments.

L.W.—Switch set to L.W., tune to 1,850 m (7½ ins.) on scale, feed in a 1,850 m (162 kc/s) signal, and adjust the core of **L17** (K3) for maximum output. Then adjust the core of **L8** (K4), while rocking the gang, for maximum output, and repeat the **L17** adjustment.

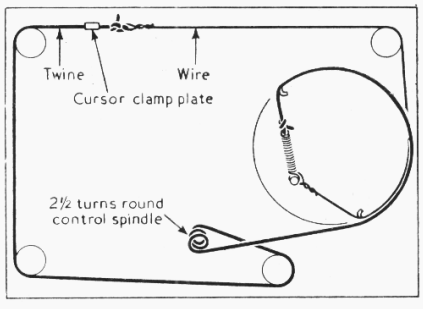
Tune to 850 m (1½ ins.) on scale, feed in an 850 m (353 kc/s) signal, and adjust **C45** (J3) for maximum output. Then adjust **C39** (K5), while rocking the gang, for maximum output, and repeat the **C45** adjustment. Finally, repeat all these adjustments.



Upper side of the tuning assembly, which faces the underside of the chassis deck and is visible only when removed from the chassis. Tags **1-6** are indicated.

DRIVE CORD REPLACEMENT

The drive cord consists of two sections, one section being of wire and the other of high-grade fishing line, and it is important that only the correct materials should be used for replacements. Supplies of the correct wire (type S2447) and twine (type S515) may be obtained from E.M.I. Sales and Service, Ltd., Sheraton Works, Wadsworth Road, Greenford, Middlesex.



Sketch showing the tuning drive assembly. The system is drawn here as seen from the front of the receiver when the gang is at minimum.

Make up the wire section with a loop of about ⅛-inch diameter at each end so that it measures 20¾ inches overall. Take about five feet of the twine and tie one end of it with a non-slip knot to one end of the wire. The wire joints can easily be sealed by a touch of solder, and it is advisable to apply a dab of cellulose or some sealing compound to the twine knot.

Turn the gang to minimum, when the drum should take up the position shown in our sketch above, where the complete drive system is viewed from the front. Hook the loop at the free end of the wire to the anchor post, first threading it into the drum through the slot in the drum groove.

Run the wire anti-clockwise round the drum for about a quarter of a turn, then off round the pulleys as shown in the sketch, making 2½ turns round the control spindle, anti-clockwise and winding outwards. Make about three-quarters of a turn anti-clockwise round the drum to enter it by the second slot, tying off to the tension spring so that it is opened to about half its length again when hooked on to the anchor post. Cut off surplus cord.

The small brass cleat which clamps on to the twine to take the cursor carriage should be fixed ½ inch from the junction of the two sections of the cord. Calibration is adjusted as explained under "Circuit Alignment."

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