Supplement t[o]
Electrical Tra[der]

"TRADER" SERVICE SHEET

917

H.M.V. 1356

Covering also 1607 Autoradiogram

PROVIDED with a small frame aerial winding for occasional use, the H.M.V. 1356 is a 5-valve (plus rectifier) 2-band table superhet with a push-pull output stage. It is designed to operate from A.C. or D.C. mains of 195-255 V, 40-60 c/s. The waveband ranges are 192-567 m and 900-2,000 m.

The H.M.V. 1607 autoradiogram employs a modified 1356 chassis. The 1607 is covered in this *Service Sheet*, the differences being described under "Radiogram 1607" overleaf, but the *Sheet* was prepared from a 1356.

Release dates and original prices: 1356, *October*, 1948; £17 17*s*; 1607, *July*, 1948, £61 19*s*. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1, L2, C35** (M.W.), with the addition of loading coil **L3** on L.W., precedes a triode-heptode valve **(V1, Marconi X145)** operating as frequency changer with internal coupling. Provision is made for the connection of an external aerial, which is "bottom" coupled by the capacitative potential divider **C1, C2** to the aerial tuning circuit. Resistors **R1, R2** provide a D.C. path to prevent modulation hum.

Triode oscillator grid coils **L4** (M.W.), **L5** (L.W.) are tuned by **C36**, with parallel trimming by **C37** (M.W.), **C9, C38** (L.W.), and series tracking by **C10** (M.W.), **C11** (L.W.). Reaction coupling from anode is inductive on M.W., due to **L6**, and capacitative on L.W., due to the common impedance of **C11** in grid and anode circuits.

Second valve **(V2, Marconi W145)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-transformer couplings **C5, L7, L8, C6** and **C14, L9, L10, C15** in which the tuning capacitors are fixed and alignment is effected by varying the positions of the iron-dust cores.

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Marconi DL145)** the second diode of which is unused and wired to cathode. Audio frequency component in rectified output is developed across manual volume control **R14**, which is the diode load resistor, and passed via **C18, R15** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C16, R12, C17** and **C20** in diode and triode anode circuits respectively.

The D.C. potential developed across **R14** is tapped off and fed back, through a decoupling network **R13, C12**, as G.B. to F.C. and I.F. valves, giving automatic gain control.

Parallel-fed auto-transformer coupling by **R17, C21** and **T1**, via C.G. stoppers **R21, R22**, between **V3** triode and push-pull output stage **(V4, V5, Marconi N145's)**. Variable tone control by **C22, R18**; and fixed tone correction by **C23, R20**, and **C26, C27**. Voltage negative feed-back between **V4** and **V3** anodes is provided by **R19**, and current negative feed-back is introduced by including appropriate halves of **T2** secondary winding in the cathode circuits of **V4, V5.**

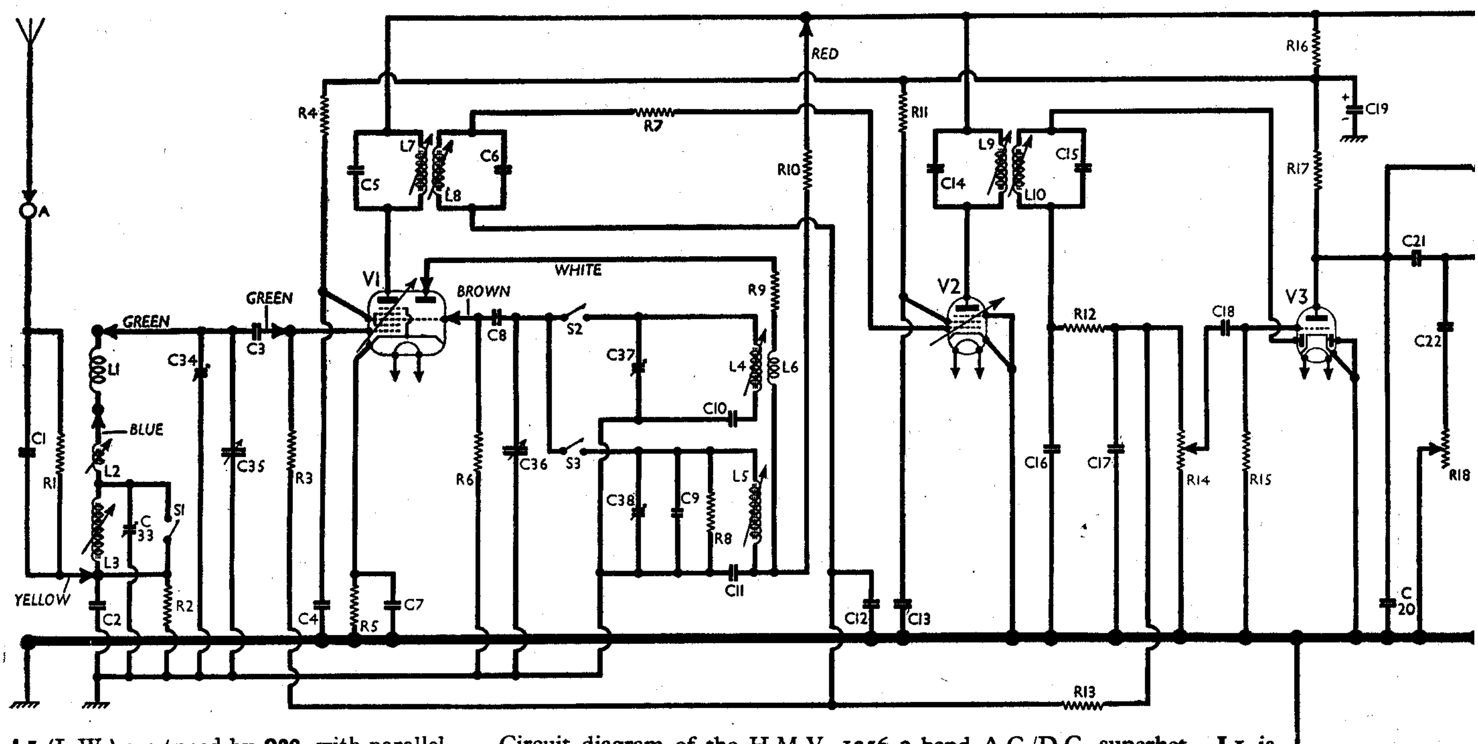
When the receiver is operated from A.C. mains H.T. current is supplied by I.H.C. half-wave rectifying valve **(V6, Marconi U145)**, which with D.C. mains behaves as a low resistance. Smoothing by iron-cored choke **L12** and electrolytic capacitors **C28, C29.**

Valve heaters, together with scale lamps (shunted by **R31, R32**) and ballast resistors **R28, R29, R30** are connected in series across mains input, and the anode of **V6** is fed from the mains via **R25, R26, R27** in series. The voltage adjustment screw short-circuits appropriate sections of the two resistor networks simultaneously when inserted in the two lower mains voltage settings. R.F. filtering in heater and mains input circuits by **C30, C31** and **C32.**

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 most of the under-chassis components.

Removing Chassis.—Pull off the four control



Circuit diagram of the H.M.V. 1356 2-band A.C./D.C. superhet. L1 is the frame aerial winding. Colours at various points round the aerial and oscillator tuning circuits identify the leads between the tuning assembly and the main chassis. The differences in the 1607 ARG are explained overleaf, but a diagram of the pick-up circuit appears on the right of this diagram in col. 6.

knobs, slacken the fixing screws of the plastic caps which cover the rear chassis retaining screws, swivel the caps aside, and withdraw the two cheese-head screws (with one spring, one plain and one paxolin washer, and a spacing sleeve, each) which are exposed;

remove the remaining two long wax-covered chassis retaining screws located in recesses near the front edge of the cabinet, lift the speaker leads from their cleat inside the cabinet, 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 three speaker leads.

When replacing, resolder the green and grey leads to the speaker connecting tags, and the black lead to an earthing tag beneath the top left-hand speaker retaining screw. Do not omit to cover the heads of the long chassis retaining screws with wax.

Removing Speaker.—Remove chassis as previously described, and withdraw the four cheese-head screws (with metal washers) securing the speaker to the sub-baffle.

When replacing, the connecting tags should be at the top, and the earthing tag should be fitted beneath the head of the top left-hand retaining screw. The leads should be resoldered as previously described.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers, whose receiver was switched to M.W. and operating from A.C. mains of 220 V. Voltages were measured with a 500 ohms-per-volt meter, chassis being the negative connection, and the total H.T. current is given as 80 mA.

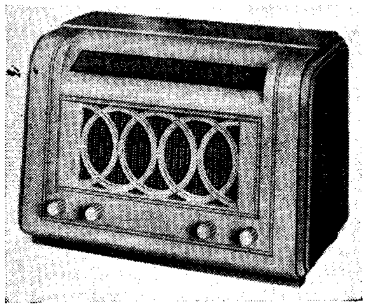
Valve		Anode		Screen		Cath
		V	mA	V	mA	V
V1	X145	180 / Oscillator 80	2.0 / 5.0	80	5.0	1.5
V2	W145	180	8.2	80	2.5	—
V3	DL145	50	2.5	—	—	—
V4	N145	175	22.0	180	5.0	8.2
V5	N145	175	22.0	180	5.0	8.2
V6	U145	195†	—	—	—	195

† A.C.

COMPONENTS AND VALUES

	CAPACITORS	Values (μF)	Locations
C1	Aerial coupling ...	0·001	A4
C2	Aerial coupling ...	0·0033	M5
C3	V1 hept. C.G. ...	0·0001	L6
C4	V1 S.G. decoup.	0·1	M7
C5	1st I.F. transformer tuning ...	0·0001	B3
C6	1st I.F. transformer tuning ...	0·0001	B3
C7	V1 cath. by-pass ...	0·047	N7
C8	V1 osc. C.G. ...	0·0001	M5
C9	Osc. L.W. trim. ...	0·000082	A2
C10	Osc. M.W. tracker	0·00039	L6
C11	Osc. L.W. tracker	0·00018	M6
C12	A.G.C. decoupling	0·047	L7
C13	V2S.G. decoup. ...	0·1	L7
C14	2nd I.F. transformer tuning ...	0·0001	C2
C15	2nd I.F. transformer tuning ...	0·0001	C2
C16	I.F. by-passes ...	0·0001	K6
C17	I.F. by-passes ...	0·0001	L7
C18	A.F. coupling ...	0·01	K7
C19*	H.T. feed decoup.	8·0	K6
C20	I.F. by-pass ...	0·00018	K6
C21	A.F. coupling ...	0·1	J6
C22	Part tone control...	0·022	J5
C23	Part tone corrector	0·0022	J5
C24*	V5 cath. by-pass ...	20·0	H7
C25*	V4 cath. by-pass ...	20·0	K7
C26	Tone correctors ...	0·01	J7
C27	Tone correctors ...	0·01	H7
C28*	H.T. smoothing ...	24·0	G6
C29*	H.T. smoothing ...	32·0§	H6
C30	Heater R.F. by-pass	0·0022	G7
C31	V6 R.F. by-pass ...	0·05	G7
C32	Mains R.F. by-pass	0·0022	L7
C33‡	Aerial L.W. trim....	0·00003	M6
C34‡	Aerial M.W. trim.	0·00003	L6
C35†	Aerial tuning ...	—	B2
C36†	Oscillator tuning ...	—	B2
C37‡	Osc. M.W. trim. ...	0·00003	N6
C38‡	Osc. L.W. trim. ...	0·00003	N6

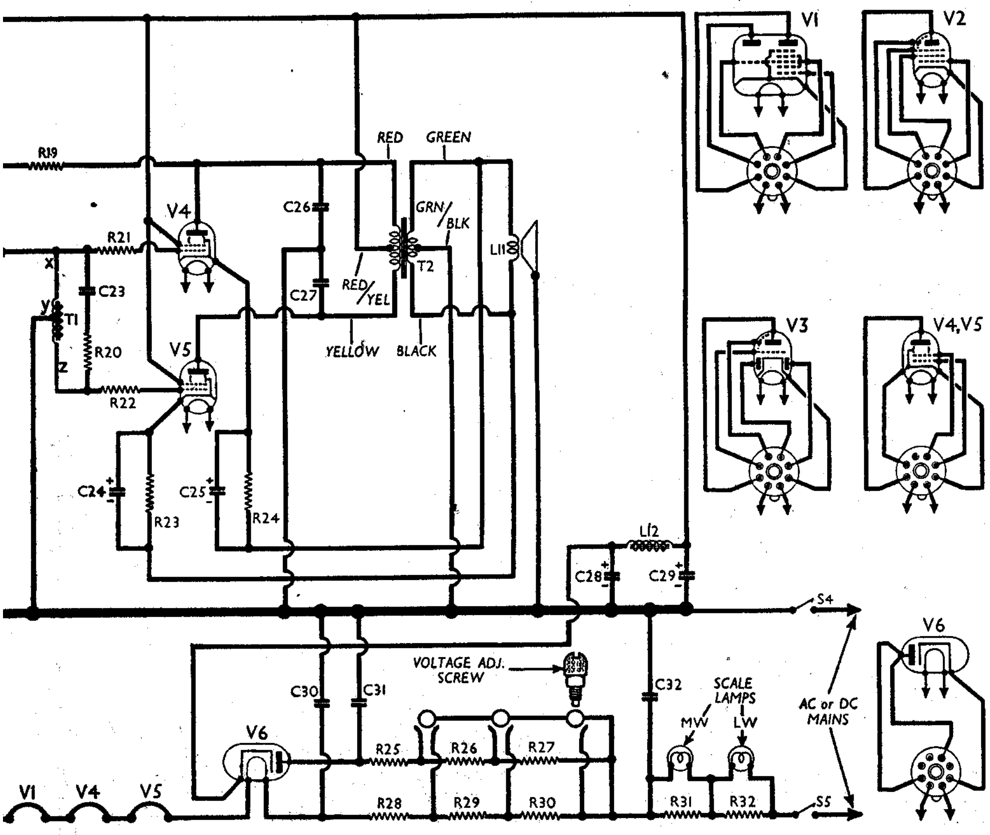
* Electrolytic † Variable ‡ Pre-set.
§ Two 16μF units in parallel.



The H.M.V. 1356 table model.

	RESISTORS	Values (ohms)	Locations
R1	Aerial coupling ...	1,000,000	A4
R2	Aerial coupling ...	22,000	N5
R3	V1 hept. C.G. ...	470,000	M7
R4	V1 S.G. H.T. feed	15,000	M7
R5	V1 fixed G.B. ...	150	N7
R6	V1 osc. C.G. ...	47,000	N5
R7	V2 C.G. stabilizer	10,000	L7
R8	Osc. L.W. shunt ...	47,000	N5
R9	Osc. stabilizer ...	3,900	L5
R10	Osc. anode load ...	22,000	M5
R11	V2 S.G. H.T. feed	33,000	L7
R12	I.F. stopper ...	100,000	K6
R13	A.G.C. decoup. ...	1,500,000	L7
R14	Volume control ...	500,000	H5
R15	V3 C.G. resistor ...	3,300,000	K7
R16	H.T. feed decoup.	2,200	J7
R17	V3 triode load ...	47,000	K7
R18	Tone control ...	500,000	G5
R19	F.-B. coupling ...	330,000	J7
R20	Part tone corrector	12,000	J5
R21	V4 C.G. stopper ...	10,000	J7
R22	V5 C.G. stopper ...	10,000	H7
R23	V5 G.B. resistor	330	H7
R24	V4 G.B. resistor	330	K7
R25	V6 surge limiting resistors ...	85	F2
R26	V6 surge limiting resistors ...	85	F2
R27	V6 surge limiting resistors ...	130	F2
R28	Heater circuit ballast resistors...	250	F2
R29	Heater circuit ballast resistors...	200	F2
R30	Heater circuit ballast resistors...	200	F3
R31	Scale lamp shunt resistors ...	35	F3
R32	Scale lamp shunt resistors ...	35	F3

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerial ...	1.4	B4
L2	M.W. loading coil	1.7	A2
L3	L.W. loading coil	14.5	M6
L4	Oscillator tuning coils ...	4.0	A2
L5	Oscillator tuning coils ...	6.7	A2
L6	Osc. react. coil	3.5	A2
L7	1st I.F. trans Pri. ...	10.0	B3
L8	1st I.F. trans Sec. ...	10.0	B3
L9	2nd I.F. trans Pri. ...	10.0	C3
L10	2nd I.F. trans Sec. ...	10.0	C2
L11	Speech coil ...	3.0	—
L12	Smoothing choke...	190.0	D2
T1	Intervalve trans x-y	294.0	J5
	Intervalve trans y-z	294.0	
T2	Output trans Pri., total	252.0	E2
	Output trans Sec., total	0.2	
S1-S3	W/band switches	—	N5
S4, S5	Mains sw. g'd R14	—	H5



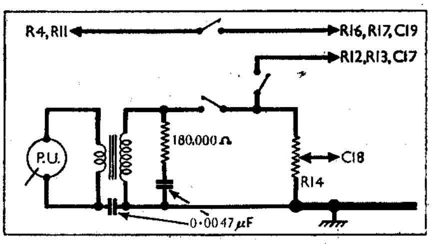
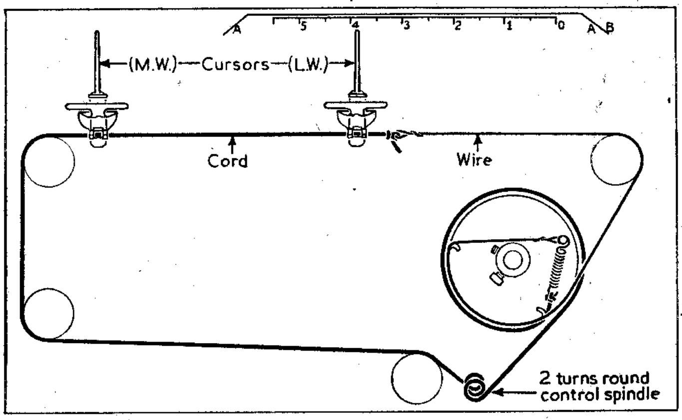


Diagram showing the circuit additions in the 1607 autoradiogram.



Sketch showing the tuning drive cord system, drawn as seen from the front of the chassis with the gang at minimum. When the gang is at maximum, the cursors should cover the nought- and five-inch marks on the alignment scale.

DRIVE CORD REPLACEMENT

The drive cord consists partly of cord and partly of wire, as indicated in our sketch in which the tuning drive system is shown as seen from the front of the set, neglecting such obstructions as obscure it from time to time, with the gang at minimum.

Supplies of suitable material can be obtained from E.M.I. Sales & Service, Ltd., Sheraton Works, Wadsworth Road, Greenford, Middlesex, and the makers emphasize that only the correct type of wire (S2447) and high-grade flax fishing line (S515) should be used. 36 inches of cord and 15 inches of wire provide ample length.

First make up the wire by making a loop about ⅛in diameter in each end, the overall length being 13¾ inches. Solder is the best method of tying off the ends.

Tie one end of the cord to the loop at one end of the wire, using a dab of shellac to hold the knot firm. Pass the other end of the wire through the appropriate hole in the gang drum groove and slip its loop over the anchor pin as shown in our sketch. Then run the wire anticlockwise for half a turn round the drum, pulling against the gang stop, and run the cord as shown in the sketch, finally tying off to the tension spring so as to open it to about one and a half times its length when hooked to the anchor pin, again dabbing the knot with shellac.

Finally, turn the gang to maximum, slide the two cursors along to register with the calibration markings of 0 and 5 respectively on the alignment scale, slip the cord into the clamps beneath the cursors and tighten up the screws.

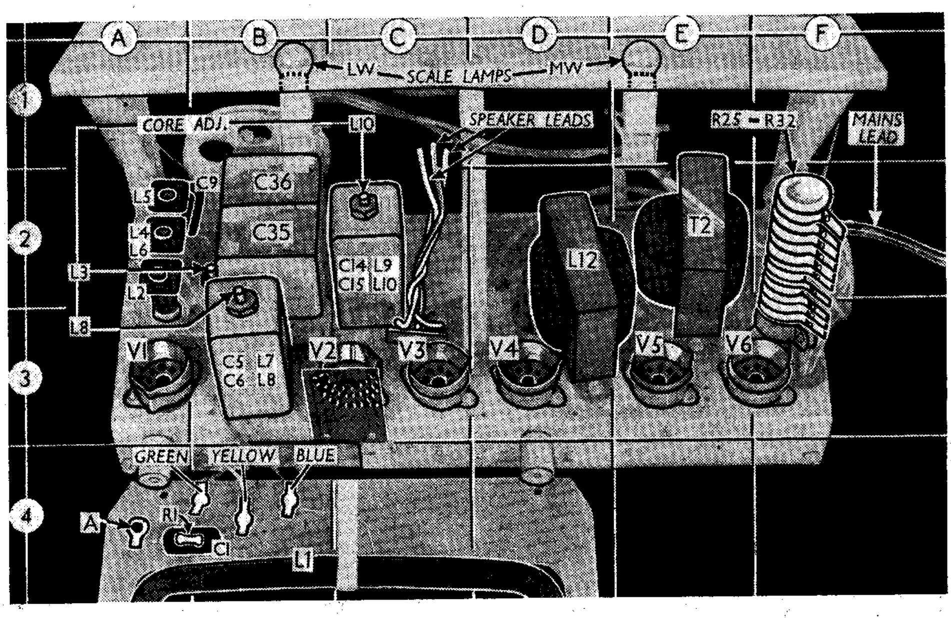
GENERAL NOTES

Switches.—S1-S3 are the waveband switches, in a small two-position unit beneath the chassis, where it is actually mounted on the tuning assembly. **S1** and **S2** close on M.W. (control knob anticlockwise), and **S3** closes on L.W.

S4, S5 are the Q.M.B. mains switches, ganged with the volume control **R14.**

Tuning Assembly.—All the R.F. and oscillator tuning coils, trimmers, trackers, switches and the gang unit form an assembly mounted in an opening in the chassis deck. This assembly can be removed as a single unit if the coloured leads indicated in the circuit diagram overleaf are first unsoldered.

Scale Lamps.—The two scale lamps are rated at 5.2 V, 0.15 A. They have large clear spherical bulbs and M.E.S. bases.



Three-quarter plan view of the chassis, with the frame aerial panel lying behind it and the interconnecting tags identified. Details of the ballast resistor unit R25-R32 are given at the foot of col. 4.

Resistors R25-R32.—These eight resistors are in fact eight sections of the wire-wound mains voltage adjustment ballast resistor. **R25, R26, R27** are surge limiting resistors in the rectifier anode lead, and **R28, R29, R30** are the heater ballast sections. **R31, R32** shunt the scale lamps.

Connections between this unit and the voltage adjustment panel are shown in the sketches in col. 4, where the lead colours are indicated. The inside face of the panel is shown : that is, as seen from the front of an inverted chassis.

Chassis Divergencies.—In some chassis, **R18** may be 20,000 Ω instead of 500,000 Ω, and **C22** is then 0.047 μF instead of 0.022 μF. In early versions, **C27** was omitted, and **C26** was then connected directly between the anodes of the two output valves. **C9** may be found in location reference N5 (beneath the chassis) instead of A2 as in our case; and **R6** may be found in M7 instead of N5.

RADIOGRAM 1607

In the radiogram model 1607 a modified version of the 1356 chassis is employed. The front of the chassis is bolted to the underside of the horizontal control panel, and the scale is between the two. The frame aerial is suspended vertically below the chassis.

The mains voltage adjustment panel and the associated ballast resistor **R25-R32** are removed from the chassis and mounted on the floor of the cabinet, while the speaker, which is a 10½in elliptical model with a permanent magnet, is mounted on the front of the cabinet.

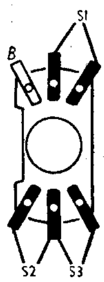


Diagram of the waveband switch unit, drawn as seen from the rear of an inverted chassis.

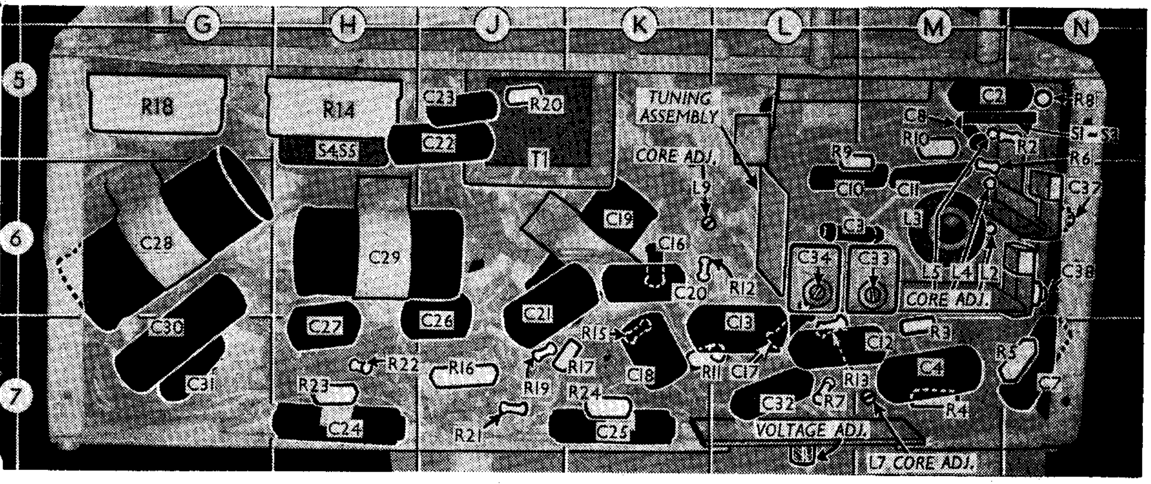
Small changes occur in the circuit. **C26** and **C27** become 0.0022 μF each, **C23** is 0.001 μF, and the high-potential side of **C32** goes to the junction of **R32** and **S5**; that is, it goes to the opposite of **R31, R32** to that shown in our diagram. In early models, as in the 1356, **R18** may be 500,000 Ω, and **C27** may be omitted, but **C22** remains at 0.047 μF.

The pick-up circuit is inserted across **R14,** with a special matching unit and a radio/gram change-over switch. The complete pick-up circuit is shown in the diagram in col. 6 overleaf, with its connections to points in our 1356 circuit diagram indicated.

The matching unit is mounted on the side of the cabinet, near the base, and above it, under the motorboard, are the change-over switch unit and pick-up connecting panel. The pick-up is a type No. 13, with a D.C. resistance of 1.3 Ω.

The auto-changer motor in models bearing a serial number below C/11 14901 was of the hysteresis type, but from then on, a No. 2 rim drive type is used. The auto-changer is type 35000T. An aerial/earth panel at the rear of the cabinet carries the earthing wire from the metalwork on the motorboard only. No earth connection is used from the receiver.

Under-chassis view. The removable tuning assembly is indicated on the right. A diagram of the voltage adjustment panel, as seen when this illustration is inverted appears at the foot of col. 4.



CIRCUIT ALIGNMENT

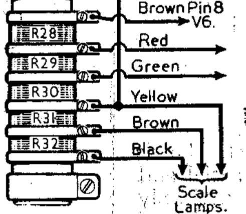
I.F. Stages.—Switch set to M.W., turn volume control to maximum and gang to minimum capacitance, and connect signal generator (via an 0.1 μF capacitor in each lead) to control grid (pin 6) of **V1** and chassis. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L10, L9, L8, L7** (location references C2, L6, B2, M7) for maximum output. Repeat these operations until no improvement results.

R.F. and Oscillator Stages.—Since the calibrated glass scale is mounted in the cabinet and alignment adjustments are carried out with the chassis on the bench, a substitute scale, divided into inches and sixteenths of an inch, is fixed to the front of the scale backing plate. Linear measurements on this scale correspond to frequencies given in the alignment adjustments, readings being made against the right-hand (L.W.) cursor.

With the gang at maximum capacitance the right-hand cursor should coincide with 0 in, and the left-hand cursor (M.W.) with 5in, on the scale. The cursors may be adjusted in position by sliding their carriages along the drive cord, after slackening their clamping screws. Transfer "live" signal generator lead and isolating capacitor, via a suitable dummy aerial, to **A** socket.

M.W.—With set still switched to M.W., tune to $3\frac{3}{32}$in on scale, feed in a 210 m (1,429 kc/s) signal, and adjust **C37** (N6) and **C34** (L6) for maximum output. Tune to $\frac{19}{32}$in on scale, feed in a 510 m (588 kc/s) signal, and adjust the cores of **L4** (N6) and **L2** (N6) for maximum output. Repeat these operations until no improvement results.

L.W.—Switch set to L.W., tune to $2\frac{7}{8}$in on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C38** (N6) and **C33** (M6) for maximum output. Tune to $\frac{17}{32}$in on scale, feed in a 1,850 m (162 kc/s) signal, and adjust the cores of **L5** (N5) and **L3** (B2) for maximum output. Repeat these operations until no improvement results.



Sketches showing details of the ballast resistor unit (left) and the voltage adjustment panel (below).

SERVICE INSTRUMENT REVIEW

Marconi Instruments Receiver Tester

EXCEPT for the omission of a wobbulator and an oscilloscope, the TF888 Portable Receiver Tester carries within itself all the instrumental facilities needed in normal radio service work beyond those provided by a multi-range meter.

It consists essentially of a good quality signal generator with a self-contained receiver output meter for alignment work. The meter, however, can be used instead to monitor the R.F. output, when, in conjunction with the attenuator, it gives a direct reading. As a receiver output meter, it has its own impedance and load matching circuits. The same meter monitors the 1,000 c/s A.F. output from the instrument, when that is required alone, and checks that the H.T. and L.T. supplies are correct.

The radio frequency range of the signal generator itself is 70 kc/s to 70 Mc/s in eight steps, using a rotating coil turret. Provision is made for the use of two reference crystals at 500 kc/s and 5 Mc/s. Although the actual crystals are an optional extra, their oscillator and switching are standard. Power supplies can be from mains or self-contained batteries, a plug-connected unit which fits into a cavity in the back of the case being available for either.

With nine control knobs on the front of the case, this instrument looks somewhat formidable at first sight, but familiarity comes quickly after a few practice runs with the comprehensive instruction manual that accompanies it. Five of the controls are the waveband selector, the tuning knob, the attenuator and two adjustments associated with the meter settings.

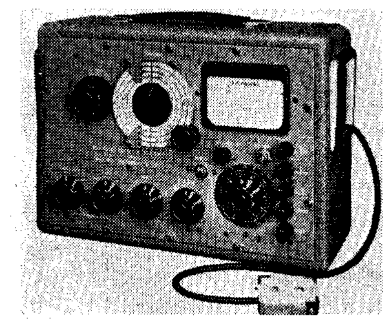
Directly Calibrated

The attenuator is calibrated in eight 10 db steps, from 1 μV to 10mV, side by side with the actual voltage readings on the same scale, and is used in conjunction with the meter which monitors the output. There is also a special position for a 500 mV output. The tuning scale, which is very open, has a 180 deg. movement and is calibrated directly in frequency. Its outer diameter is 4 ins.

The next control in importance is that controlling the meter, with seven positions: L.T. check; H.T. check; set zero; unmodulated R.F. output; modulated R.F. ouput; A.F. power (receiver output, modulated); noise power (receiver output, unmodulated, for noise level tests). Two of the remaining controls set the impedance range to match the receiver output (3Ω to 600Ω) and the output meter range (10 mW, 100 mW and 1 W full scale), while the last knob controls the crystal oscillator circuit, which is normally switched off.

We found the crystal frequency check very useful indeed, especially as the accuracy of the instrument is claimed only to be ±2%. Our sample was 0.5 Mc/s out, for instance, at 41.5 Mc/s (about 1%) which, although well within the stipulated tolerance, was not close enough for television receiver alignment. With a check from the 5 Mc/s crystal, however, at 40 Mc/s, very accurate setting was achieved. Drift checked against the crystals over a period of two hours was negligible.

Unfortunately the discrepancy was not linear over the scale, and as certain adjustments and



connections are necessary before a check can be made, one feels that a scale calibrated 0-180 deg., with a chart for each range plotted with the aid of the crystals, which give numerous reference points on each range, would provide frequency settings of such high accuracy as to be preferable to a directly calibrated scale, despite the indisputable convenience of the latter. Possibly angular divisions could be added on the periphery of the existing scale, with chart blanks provided for those who preferred to use them.

This instrument will appeal strongly to the dealer who is willing to spend a little more money than is strictly essential in order to acquire service equipment that is above the average standard of quality. It is very well made throughout and has the right kind of appearance to impress the customer. Controls are positive and smooth. Handle recesses at the sides provide convenient storage space for the leads.

The standard instrument, which we understand is now in full production, is priced at £60 net with either the mains or battery power unit, or £62 10s with both power units. The reference crystals are £3 each extra. The sole distributors to the radio trade are Simpson, Baker & Co., Ltd. The manufacturers are Marconi Instruments, Ltd., Longacres, St. Albans, Herts.

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