

"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 17s; 1607, July, 1948, £61 19s. 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 capacitance 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.),

pedance 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 P.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 **C23,**

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**.

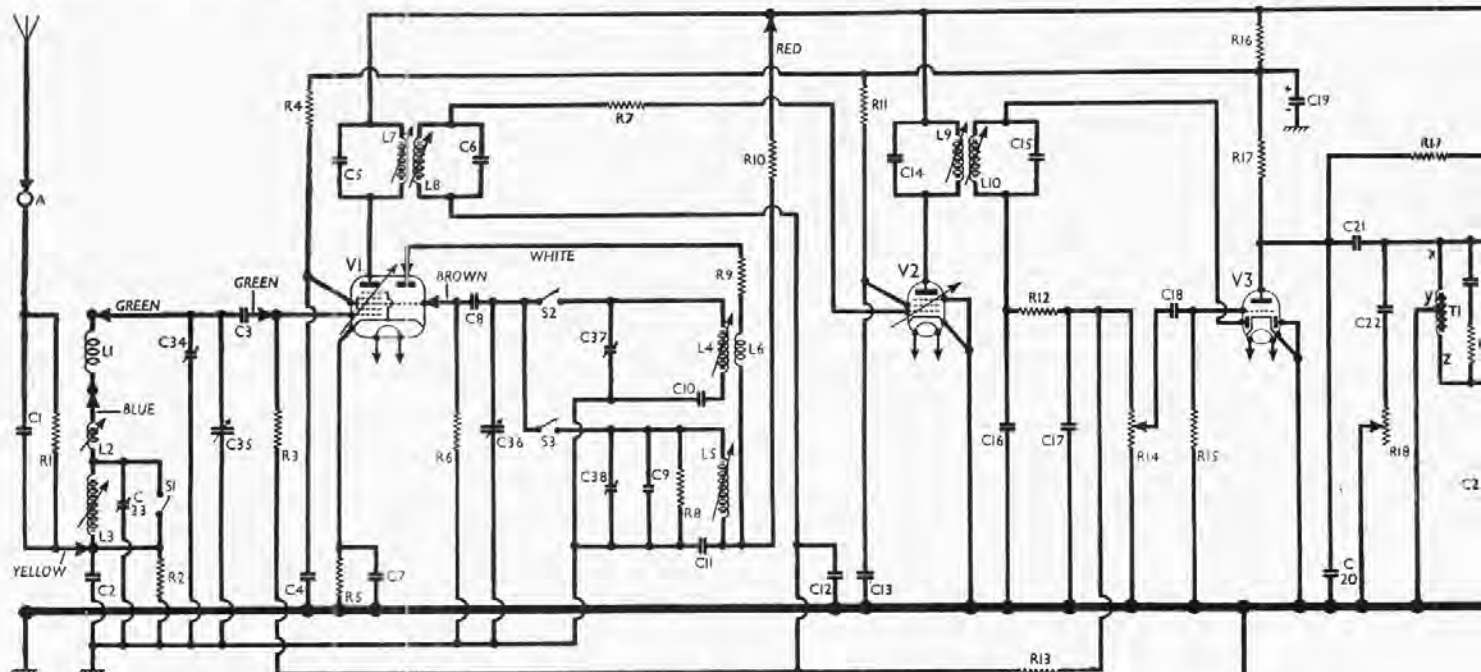
When the receiver is operated from A.C. mains H.T. current is supplied by I.H.C. half-wave rectifying valve (**V6, Marconi U145**), which with D.C. mains behaves as a low resistance. Smoothing by iron-cored choke **L12** and electrolytic capacitors **C28, C29**.

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

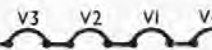
The cabinet is fitted with a detachable bottom cover, upon removal of which (three round-head wood screws) access may be gained to most of the under-chassis components.

Removing Chassis.—Pull off the four control



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 capacitive on L.W., due to the common in-

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 oper-

Valve	Type	Anode		Screen		Cath
		V	mA	V	mA	
V1	X145	180 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

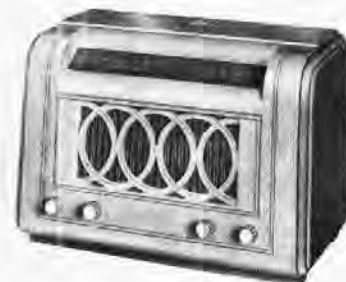
† A.C.

ating 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.

COMPONENTS AND VALUES

CAPACITORS		Values (μF)	Locations
C1	Aerial coupling ...	0.001	A4
C2		0.0033	M5
C3	V1 hept. C.G. ...	0.0001	L6
C4	V1 S.G. decoup. ...	0.1	M7
C5	1st I.F. transformer ...	0.0001	B3
C6		tuning ...	0.047
C7	V1 cath. by-pass ...	0.0001	M5
C8	V1 osc. C.G. ...	0.000082	A2
C9	Osc. L.W. trim ...	0.00039	L6
C10	Osc. M.W. tracker ...	0.00018	M6
C11	Osc. L.W. tracker ...	0.047	L7
C12	A.G.C. decoupling ...	0.1	L7
C13	V2S.G. decoup. ...	0.0001	C2
C14	2nd I.F. transformer ...	0.0001	C2
C15		mer tuning ...	0.0001
C16	I.F. by-passes ...	0.0001	L7
C17	A.F. coupling ...	0.01	K7
C18	H.T. feed decoup. ...	8.0	K6
C19*	I.F. by-pass ...	0.00018	K6
C20	A.F. coupling ...	0.1	J6
C21	Part tone control ...	0.022	J5
C22	Part tone corrector ...	0.0022	J5
C23	V5 cath. by-pass ...	20.0	H7
C24*	V4 cath. by-pass ...	20.0	E7
C25*	Tone correctors ...	0.01	J7
C26		0.01	H7
C27		24.0	G6
C28*	H.T. smoothing ...	32.0	H6
C29*			0.0022
C30	V6 R.F. by-pass ...	0.05	G7
C31	Mains R.F. by-pass ...	0.0022	L7
C32	Aerial L.W. trim ...	0.00003	M6
C33†	Aerial M.W. trim ...	—	B2
C34†	Aerial tuning ...	—	B2
C35†	Oscillator tuning ...	0.00003	N6
C36†	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		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		130	F2
R27	Heater circuit ballast resistors ...	250	F2
R28		200	F2
R29		200	F3
R30	Scale lamp shunt resistors ...	35	F3
R31		35	F3
R32		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		6.7	A2
L6	Osc. react. coil ...	3.5	A2
L7	1st I.F. trans ...	10.0	B3
L8		10.0	B3
L9	2nd I.F. trans ...	10.0	C3
L10		10.0	C2
L11	Speech coil ...	3.0	—
L12	Smoothing choke ...	190.0	D2
T1	Intervalve trans ...	294.0	J5
T2		294.0	J5
S1-S3	Output trans (Pri., total) ...	252.0	E2
	trans (Sec., total) ...	0.2	—
S4, S5	W/and switches	—	N5
	Mains sw. g'd R14	—	H5

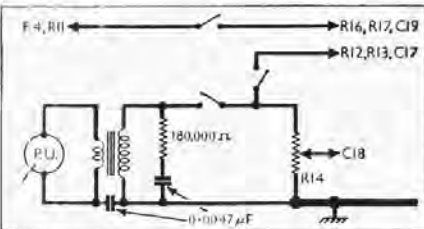
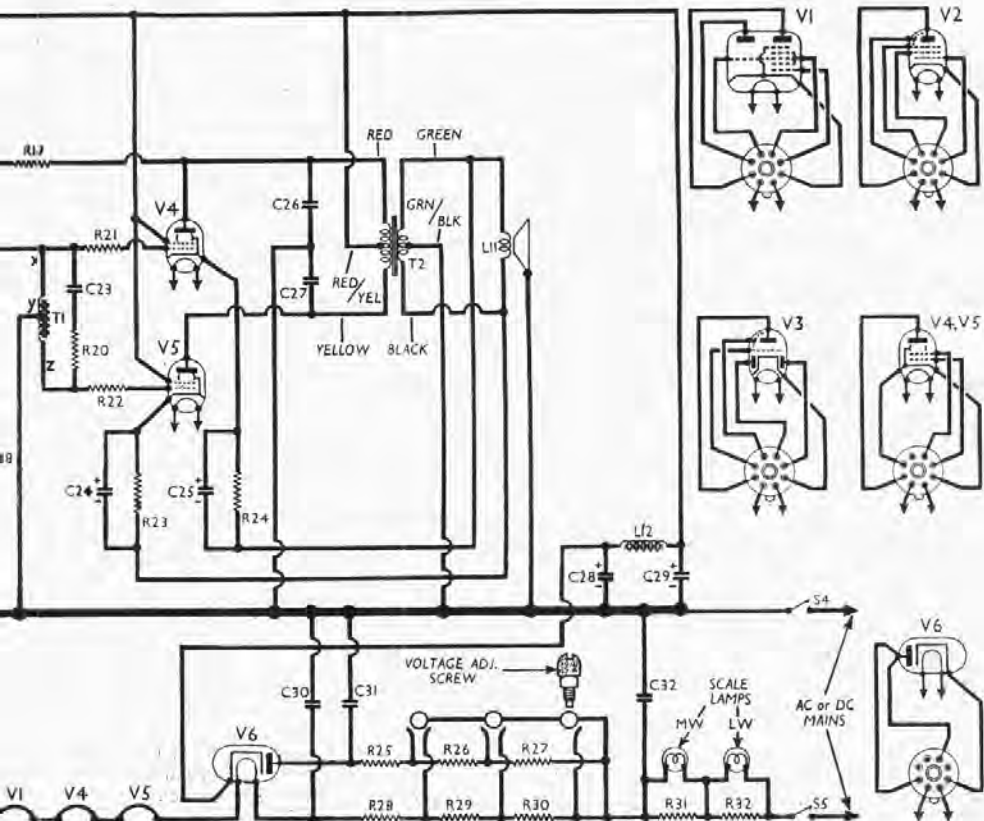
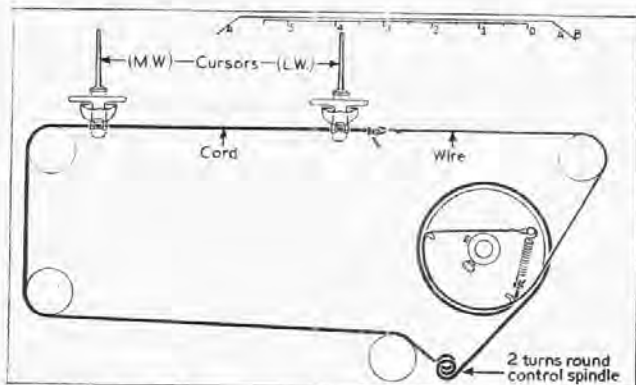


Diagram showing the circuit additions in the 1607 autoradiogram.



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 1/4 in diameter in each end, the overall length being 13 1/2 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.

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.

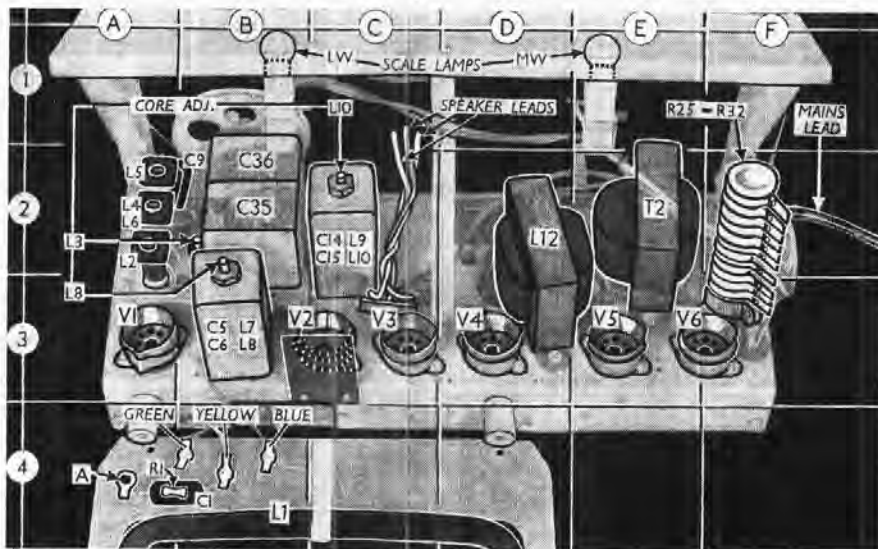
Chassis Divergencies.—In some chassis, R18 may be 20,000 Ω instead of 500,000 Ω, and C22 is then 0.047 μF instead of 0.022 μF. In early versions, C27 was omitted, and C26 was then connected directly between the anodes of the two output valves. C9 may be found in location reference N5 (beneath the chassis) 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 10 in 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.



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.

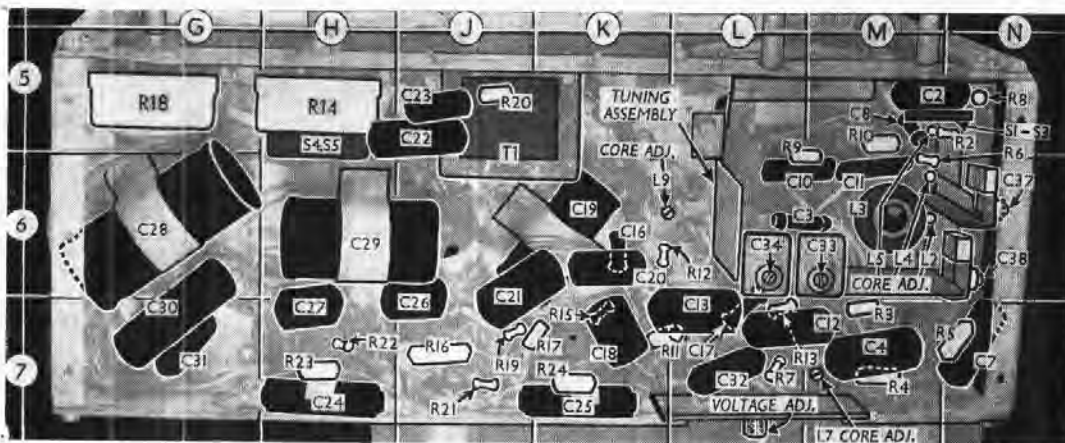
Small changes occur in the circuit. C26 and C27 become 0.0022 μF each, C23 is 0.001 μF, and the high-potential side of C32 goes to the junction of R32 and S5; that is, it goes to the opposite of R31, R32 to that shown in our diagram. In early models, as in the 1356, R18 may be 500,000 Ω, and C27 may 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 1.5 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 3/8 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 3 1/2 in on scale, feed in a 510 m (688 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 1/2 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 1/2 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.

SERVICE INSTRUMENT REVIEW

Marconi Instruments Receiver Tester

EXCEPT for the omission of a wobulator and an oscilloscope, the TP888 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 500kc/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. output; 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.

