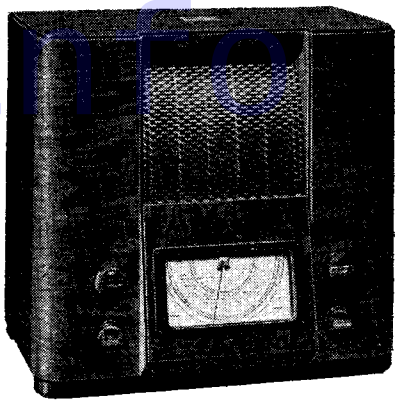
H.M.V. 653 ALL-WAVE FOUR



An inclined scale with a vernier indicator is a feature of the H. M. V. model 653 four-valve plus rectifier three-band superhet.

CIRCUIT.—The aerial coupling to the grid of V1, a heptode frequency changer, is *via* a set of iron-cored H.F. transformer aerial coils. A whistle filter is included on the long waveband. On medium waves the filter coil is utilised to complete the MW primary inductance and the filter condenser is cut out of circuit. On the short waves the input is *via* a coupling condenser to a single tuned circuit feeding the grid of V1.

In the oscillator circuit the H.T. feed passes through the reaction coil on short waves, while on medium and long waves a load resistance and coupling condenser arrangement is used.

The output of V1 passes *via* an iron-cored I.F. transformer, tuned to 465 kc., to the grid of V2, an H.F. tetrode operating as the I.F. amplifier. When wander-plugs connected to a pick-up are inserted into the appropriate sockets the grid of V2 is shorted to chassis *via* a fixed condenser, thereby cutting off the radio input. This is ingeniously effected by means of a split socket that is bridged by one of the pick-up wander-plugs.

V2 is coupled to the demodulating diode of V3, a double diode triode, *via* a further I.F. transformer also of iron core construction. The other diode of V3 is fed by a coupling condenser and provides a D.C. potential that is fed back by means of a potentiometer network to the grids of V1 and V2 to give A.V.C.

A manual volume control is included in the coupling arrangements to the grid of the triode section of V3. V3 is resistance capacity coupled to V4, an output tetrode in the anode circuit of which is connected the speaker matching transformer.

VALVE READINGS

No signal. Volume maximum. MW min. cap. 200 volt A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
	All Marconi.			
1	X63 ..	Anode ..	232	2.5
		Screen ..	75	2
		Osc. anode	170	4
2	KTW63 ..	Anode ..	232	6
		Screen ..	75	1.3
3	DH63 ..	Anode ..	120	1.4
4	KT63 ..	Anode ..	220	32
		Screen ..	232	6
5	U50 ..	Heater ..	330	—

WINDINGS (D.C. Resistances)

Inductances.	Ohms.	R'nge	Measured between.
L1	9.3	Any	A socket and 7.
L2+L5	34	LW	7 and chassis.
L3	below .1	SW	3 and mid point R10, R11.
L4	.4	MW	7 and chassis.
L5	34.2	LW	7 and chassis.
L6	1.7	MW	3 mid point R10 and R11.
L7	8.9	LW	3 mid point R10 and R11.
L8	below .1	SW	15 and C10 side of C1.
L9	2.9	MW	15 and 10.
L10	3.6	LW	15 and 12.
L11	1	SW	Osc. anode.
L12	4.4	—	IF trans. pins.
L13	6.4	—	IF trans. pins.
L14	4.4	—	IF trans. pins.
L15	4.4	—	IF trans. pins.
L16	1710	—	Tags 6 and 7 speaker panel.
O.T. prim.	277	—	Anode V4 and H.T. line.
M.T. prim.	26	—	Mains plug pins.
Total H.T.	sec. 626	—	V5 anode pins.

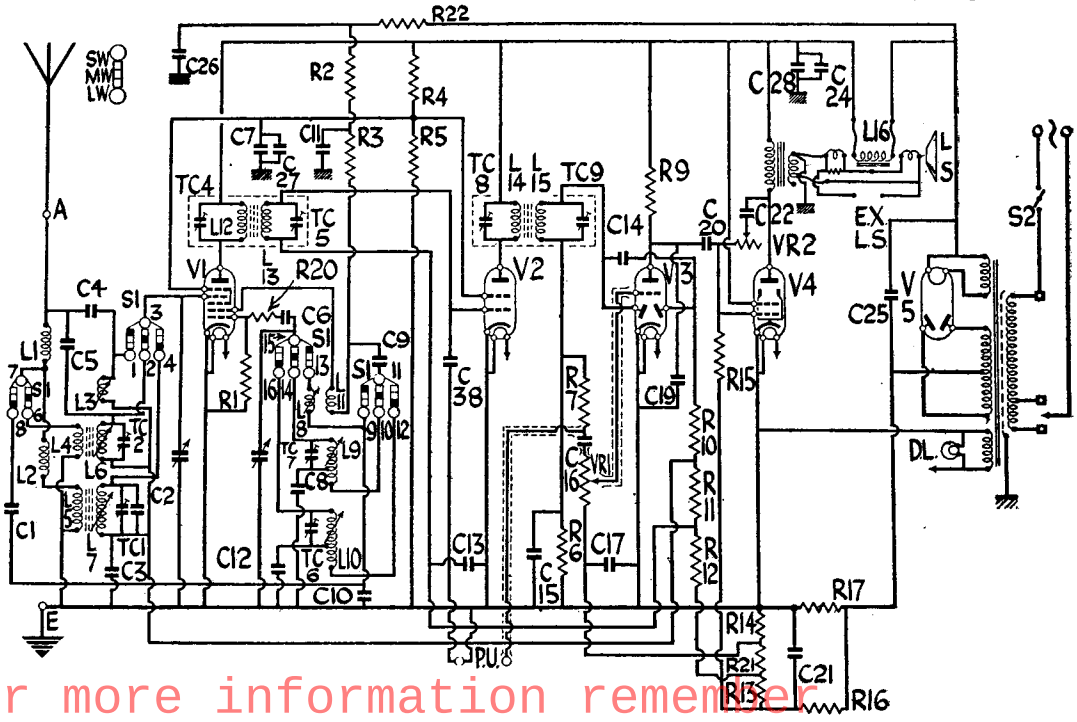
A condenser C22 and variable resistance VR2 provide tone control in the form of negative feed back, the operation of VR2 curtailing the high-note response of the valve.

A bias potentiometer provides grid bias for V3 and V4, as well as supplying an A.V.C. delay voltage.

Mains equipment consists of a mains transformer, a full-wave rectifying valve V5, electrolytic smoothing condensers, and a smoothing choke (the speaker field coil).

Chassis Removal.—Undo the back and remove the four grub-screw fixed control knobs. After the four chassis-securing bolts have been removed the chassis can be taken out far enough for service purposes.

The speaker (secured by three nuts) may be removed if desired, or, alternatively, the speaker cable unsoldered from the speaker panel. The tags on the panel are numbered. When replacing leads con-



Efficient design gives the simple circuit of the 653 a good performance. Methods of aligning the variably tuned circuits, which have iron-core coils, are rather unusual (see alignment notes).

nect the black to No. 1, yellow to No. 3, red to No. 6, and red with black spot to No. 7.

The tuning pack is enclosed by a screen removed by detaching three screws. The tuning coils, trimmers and wave-change switch can be completely removed from the chassis by unsoldering seven wires and removing two screws and one switch locator unit securing nut.

The leads are : blue from aerial to gang to contact 3; yellow from osc. gang and C6 to contact 15; red-yellow from osc. anode to S.W. osc. coil; H.T. lead (red) to tag of S.W. osc. coil and C9; yellow to aerial socket; green-black to mid point R10 and R11; earthing lead to lug on chassis.

Special Notes.—Sockets at the rear of the chassis enable a high resistance (above 1,000 ohms) pick-up to be connected. To revert to radio the pick-up plugs must be removed.

Two tags on a small insulating panel above the main speaker panel enable an extension speaker to be connected. The extension speaker should be of the permanent-magnet type with an impedance of about 3.75 ohms.

A single dial light mounted in a screw-in holder behind the wavelength scale is rated at 6.3 volts .25 amp.

Circuit Alignment Notes

I.F. Circuits.—Switch receiver to L.W., set gang to maximum, volume to maximum and tone to maximum top (fully anti-clockwise).

Tune oscillator to 465 kc. (645.2 metres) and connect output leads to fixed vane tag of the aerial section of the gang (*via* a .1-mfd. condenser) leaving grid lead connected to V1 and the cap in place.

Adjust TC4, TC5, TC8 and TC9, in that order, for maximum output.

Reduce the input from the oscillator as the circuits come into line so that the set output remains low and the A.V.C. does not operate.

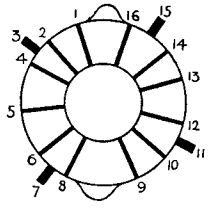
(*Continued on page* 7)

CONDENSERS

C.	Purpose.	Mfds.
1	I.F. filter fixed padder	.00005
2	L.W. aerial fixed trimmer	.00005
3	V1 A.V.C. decoupling	.05
4	S.W. aerial coupling	.000015
5	M.W. top aerial coupling	2.3 mmfds
6	Osc. grid	.00005
7	V1 and V2 screen decoupling (part)	4
8	M.W. osc. fixed padder	.00055
9	Osc. anode coupling M.W. and L.W.	.005
10	S.W. osc. fixed padder	.005
11	Osc. anode decoupling	4
12	L.W. osc. fixed padder	.0003
13	V2 A.V.C. decoupling	.05
14	A.V.C. diode coupling	.000075
15	H.F. by-pass	.0001
16	L.F. coupling	.005
17	V3 cathode bias shunt	50
19	V3 anode shunt	.00035
20	L.F. coupling	.035
21	Bias potentiometer shunt	.23
22	Negative feed back	.001
24	H.T. line by-pass	.1
25	H.T. smoothing	16
26	Osc. anode extra decoupling	4
27	V1 and V2 screen decoupling (part)	.05
28	H.T. smoothing	8
38	Radio shorting condenser	.0001

RESISTANCES

R.	Purpose.	Ohms.
1	Osc. grid leak	50,000
2	Osc. anode decoupling	15,000
3	Osc. anode load	15,000
4	V1 and V2 screen potr. (part)	23,000
5	V1 and V2 screen potr. (part)	23,000
6	Demod. diode load	500,000
7	H.F. stopper	230,000
9	V3 anode load	75,000
10	A.V.C. diode load (part)	1 meg.
11	A.V.C. diode load (part)	500,000
12	A.V.C. diode load (part)	23 meg.
13	Bias potr. (part)	1 meg.
14	Bias potr. (part)	100,000
15	V5 grid leak	230,000
16	Bias decoupling	100,000
17	Series bias resistor	270
20	Regeneration modifier	75
21	Bias potentiometer (part)	100,000
22	Osc. anode extra decoupling	5,000
VR1	Volume control	2 meg.
VR2	Feed back control	2 meg.



The switch bank with contacts numbered to correspond with the circuit diagram.

H.M.V. 653 on Test

MODEL 653.—Standard model for A.C. mains, 195-255 volts, 50-100 cycles. Price 10½ gns.

DESCRIPTION. — Four-valve, plus rectifier, table superhet covering three bands.

FEATURES.—Full-vision scale, calibrated in metres and station names. Separate vernier scale for accurate calibration. Controls for tuning, wave selection, tone control, combined volume and master switch. Negative feed-back circuit. Tuning coils, trimmers and wave-change switch removed by unsoldering only seven wires and removing two screws and one nut. Sockets for pick-up and provision for extension L.S.

LOADING.—64 watts.

Sensitivity and Selectivity

SHORT WAVES (13.5-50 metres).—Excellent gain and very easy handling. Sensitivity well maintained. No drift.

MEDIUM WAVES (195-580 metres).—Very good gain and selectivity, with good background and freedom from whistles. Local stations spread on adjacent channels only.

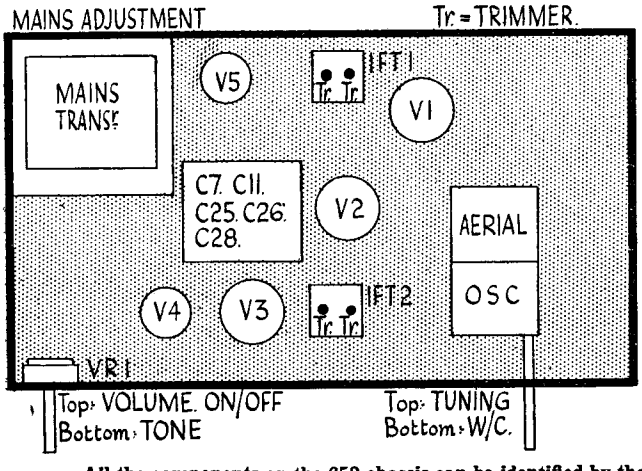
LONG WAVES (900-2,000 metres).—Similar performance to medium band. Deutschlandsender received with some interference, which is very good for a two-circuit tuner.

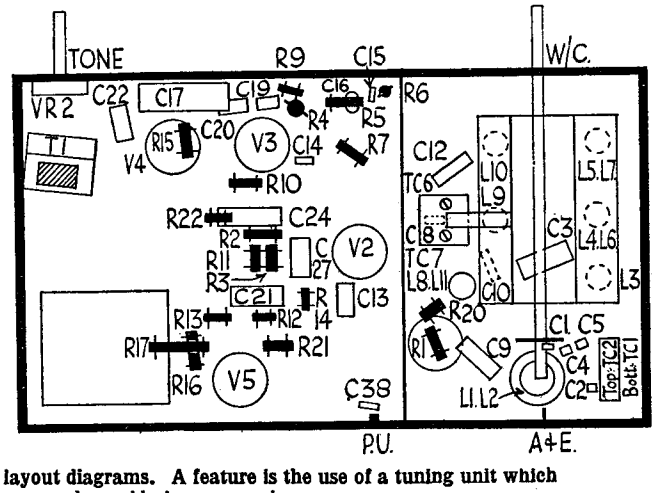
Acoustic Output

Ample volume for an ordinary room, with crisp, clean tone and good attack. Tone control working on the negative feed-back principle is vigorous in action and introduces appreciable top cutting in the maximum position. General tone is pleasing and the balance is very satisfactory.

EXACT replacement condensers for the model 653 are available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18.

For the block containing Cs 25, 28, 7, 11 and 26 there is unit list number 4084, 11s 6d., and for C17 there is unit 2915, 1s. 9d.





All the components on the 653 chassis can be identified by these layout diagrams. A feature is the use of a tuning unit which can be removed by undoing two screws and unsoldering seven wires.

Circuit Alignment Notes

Take out the two wood screws from the right-hand side of the cabinet that secure the metal name-plate. Two holes will be found in the space revealed, whereby access to the two trimmers can be obtained.

Connect the leads from a service oscillator to a coupling coil and bring the coil near the receiver. Tune the oscillator to 214 metres (1,400 kc.), and set the receiver wavelength pointer to read 214 metres.

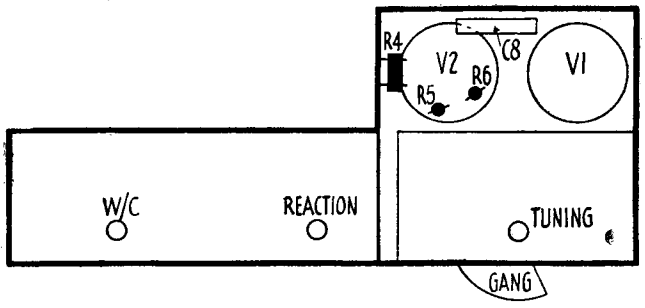
Adjust the lower trimmer to bring in the signal at maximum volume, and then adjust the top trimmer for maximum.

The reaction condenser (marked volume on the dial) should be adjusted almost to the point of oscillation while the trimmers are being set. Move the coupling coil away from the receiver if the volume becomes too great for accurate ganging and leave the reaction control advanced.

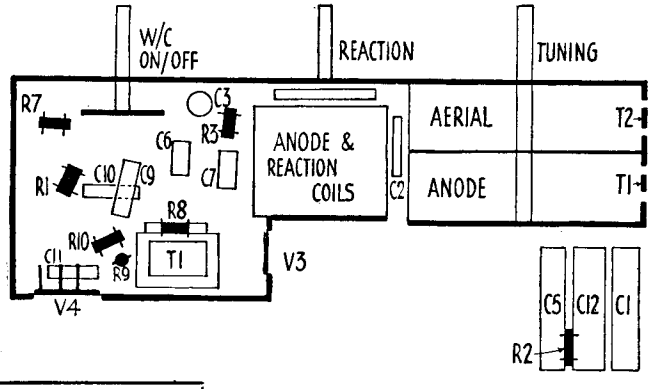
Replacement Condensers

Exact replacement condensers for the P202 are available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18.

These are: For C1, unit number 2996, price 2s.; for either C3 or C5, unit 3479, 1s 9d.; for C12, 2918, 1s. 9d.



Left, a diagram giving a top view of the Beethoven P202 chassis. A rather unusual form of construction is necessitated by the compact nature of the set.



Right, a side view of the set which shows the positions of the rest of the components and how the two other valves are arranged.

Beethoven P202 on Test

MODEL Baby P202.—For battery operation, requiring a Sterling 80-volt H.T. battery, type 2002, and an Ever Ready 2-volt jelly-acid accumulator, type J155. Price, 7 gns. complete.

DESCRIPTION. — Four-valve, "straight" battery portable covering two wavebands and with self-contained aerial.

FEATURES. — Contained in a leatherette case measuring only 9 by 8½ by 5 in. Carrying strap. Rectangular scale calibrated in metres and station names. Controls for combined wave selection and master switch, reaction and tuning. Pilot light on speaker grill can be switched off to economise L.T. current.

LOADING.—H.T., 6.5 ma.; L.T., .5 amp. or .8 amp, with dial light.

Sensitivity and Selectivity

MEDIUM WAVES (200-550 metres).—Good gain for valve combination and frame aerial employed. In daylight the main stations are easily received. A very good number is obtainable after dark.

LONG WAVES (900-2,000 metres).—Good gain and adequate selectivity. Luxembourg, Radio Paris, Droitwich, and Hilversum are very easily received without any interference. Careful handling of the directional frame and reaction control enables less powerful stations to be obtained.

GENERAL NOTES.—The reaction control is very smooth and free from overlap and apart from a little stiffness in the tuning knob, the set handles excellently on both bands.

Acoustic Output

Clean, crisp tone with sufficient volume for a small room without distortion. Balance is well adjusted and the general reproduction is pleasing.

RESISTANCES

R.	Purpose.	Ohms.
1	V1 screen and anode decoupling	4,000
2	V2 anode decoupling	6,000
3	V2 anode load	30,000
4	V2 anode H.F. filter	6,000
5	V2 grid potr. (part)	4 meg.
6	V2 grid potr. (part)	4 meg.
7	V4 grid bias resistor	300
8	V3 grid leak	500,000
9	V3 anode load	20,000
10	V4 grid stopper	250,000

CONDENSERS

C.	Purpose.	Mfds.
1	H.T. reservoir	4
2	V2 grid	.00015
3	V1 screen and anode decoupling	2
5	V2 anode decoupling	2
6	H.F. filter	.004
7	L.F. coupling	.0025
8	H.F. filter	.00005
9	L.F. coupling	.05
10	V3 anode shunt	.001
11	Pentode compensator	.004
12	V4 bias resistor shunt	25

H.M.V. 653 Three-band Four

(*Continued from page* 5)

Medium Waves.—First turn gang to maximum and see that the pointer coincides with the small black spot in the top right-hand corner of the scale.

Set receiver to M.W., volume and tone to maximum and connect oscillator to aerial and earth sockets.

For adjusting the coil cores a special tool must be obtained from E.M.I. Service, Ltd.

Set the receiver (by spot on scale) and oscillator to 225 metres (1,333 kc.). Adjust TC7 for maximum.

Set receiver (by spot on scale) and oscillator to 530 metres (566 kc.). Adjust spade trimmer of L9 for maximum.

Tune set and oscillator to 225 metres and adjust TC2 for maximum.

Tune set and oscillator to 530 metres. Rotate upper core of L6 for maximum by means of special tool.

Readjust at 225 metres.

Long Waves.—Set receiver and oscillator to 1,100 metres (272.72 kc.) and adjust TC6 for maximum.

Set receiver and oscillator to 1,900 metres (158 kc.) and adjust L10 for maximum.

Repeat all operations with a final check at 1,100 metres. Adjust TC1 for maximum (at 1,100 metres).

Set receiver and oscillator to 1,900 metres and adjust hexagonal headed screw core of L7 for maximum.

Set receiver and oscillator to 1,400 metres (214.3 kc.) and readjust TC1.

Short Waves.—Preferably the oscillator output should terminate in a 100-ohm non-inductive parallel resistance and a 400-ohm non-inductive resistance in series with the "hot" lead.

Set receiver and oscillator to 50 metres (6 megacycles) and adjust the loop in L8 for maximum. A strip of insulating material should be used for this.

Adjust the loop in L3 through hole in top of chassis for maximum.