

H.M.V. 650 FIVE-BAND TEN VALVE



The H.M.V. 650 is a 10-valve "All-World" five-band receiver. The same chassis is also used in the 655 Armchair receiver.

CIRCUIT.—The aerial coupling to V1, an H.F. pentode pre-amplifier, is via a set of transformer aerial coils. It will be noted that arrangements are made for either an ordinary single wire aerial or an aerial of the all-wave type using a transmission line.

V1 is tuned primary H.F. transformer coupled to V2, a heptode first detector and mixer. V3 is the separate oscillator of the frequency changing arrangements, and is an H.F. pentode working in a Dow circuit. An additional reaction coil ensures stable oscillation on the shortest wavelengths.

The signal, converted to the I.F., passes by an I.F. transformer of the controlled band width type to V4, an H.F. pentode, the first I.F. amplifier. Coupling to the second I.F. amplifier, V5, also an H.F. pentode, is via a similar transformer.

V5 feeds the double diode valve, V6, by a transformer of fixed band width. A

tapping on the secondary of the transformer is connected to the demodulating diode. The other diode of V6 provides a D.C. potential for A.V.C.

Coupling arrangements to the grid of V7, an H.F. pentode connected to operate as a triode L.F. amplifier, include a manual volume control. The visual tuning indicator is fed by the same impulses that operate V7.

V7 is resistance-capacity transformer coupled to the grids of V8 and V9, the push-pull amplifying valves. A bass tone

control and a bass reduction circuit for S.W.2 and S.W.3 wave bands are connected across the primary of the intervalve coupling transformer. Across the secondary is connected a tone control circuit consisting of a variable resistance and condenser.

A "degeneration" feed-back circuit that minimises harmonic distortion is formed by C47, R47, C48 and R42. A push-pull output transformer couples the output valves to the speaker, the secondary being terminated in sockets to which wander plugs from the internal speaker are connected. Cathode bias is obtained from the voltage drop across R18 and R19.

Mains equipment consists of a mains transformer, a full-wave rectifying valve V10, electrolytic smoothing condensers and smoothing chokes.

Chassis Removal (Radio Chassis).—The

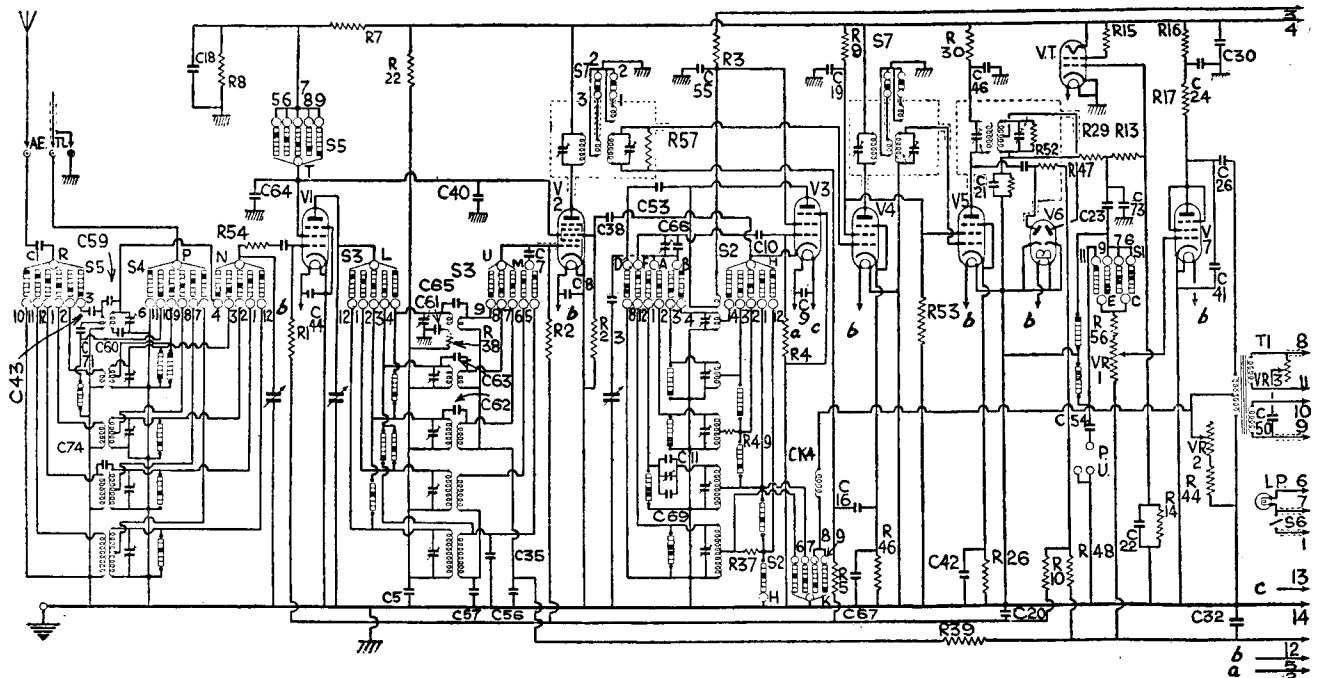
VALVE READINGS

No signal. Volume maximum. M.W. band.
225 volts A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
1	All Marconi. W63	Anode ..	220	3
		Screen ..	150	2
2	X64 ..	Anode ..	230	2.5
		Screen ..	150	1
3	Z63 ..	Anode ..	245	11
		Screen ..	245	
4	W63..	Anode ..	230	.7
		Screen ..	80	.2
5	W63..	Anode ..	220	3.
		Screen ..	80	.7
6	D63 ..	Diodes only	—	—
7	Z63 ..	Anode ..	145	1.5
		Screen ..	—	—
8	KT63 ..	Anode ..	260	31
		Screen ..	275	5
9	KT63 ..	Anode ..	260	31
		Screen ..	275	5
10	U50 ..	Filament	290	—

WINDINGS

Winding.	Ohms.	Winding.	Ohm.
L1 ..	210	L25 ..	6
L2 ..	22	L27 ..	6
L3 ..	22	L28 ..	6
L4 ..	.4	L29 ..	6
L6 ..	68	L30 ..	6
L7 ..	5.5	L33 ..	3
L8 ..	2.8	L34 ..	5
L10 ..	22	L35 ..	5
L11 ..	140	L36 ..	5
L12 ..	.4	L37 ..	5
L13 ..	30	CK1 ..	1,200
L15 ..	5.5	CK2 ..	257
L16 ..	75	T1—half prim.	300
L18 ..	2	T1—half sec.	3,470
L19 ..	8	T2—half prim.	320
L20 ..	.2	T3—prim.	8.8
L21 ..	.5	HT sec. half	86
L23 ..	.3		



cabinet has a false bottom that enables the underside of the chassis to be inspected.

Remove the back of the cabinet and the four control knobs (grub screws) and the two combined tuning knobs. The smaller of these is fixed by a grub screw and removal of this enables the larger to be pulled away.

Take the four fixing bolts and washers from the base and the two connection plugs from the rear of the output chassis deck. The chassis can then be removed.

(Output Chassis).—Completely remove the four fixing bolts and washers from the

underside of the shelf. Remove the two yellow speaker-connecting wander-plugs from the front of the chassis deck and also the two connection plugs from the rear of the chassis deck (if the radio chassis is still in position). The output chassis can then be removed.

Special Notes.—Sockets at the rear of the output chassis provide for external speakers. The receiver will operate up to four providing the impedances are not lower than 5 ohms. The switch on the rear of the output chassis enables the external speakers to be operated either separately or in conjunction with the internal speaker.

A single 1-amp. fuse of the cartridge type, located at the rear of the output chassis, is connected in the main H.T. lead.

A mains aerial socket at the rear of the output chassis is connected by a flex lead

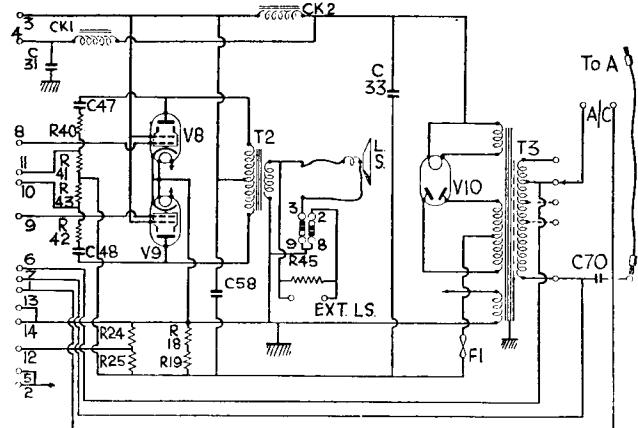
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CONDENSERS (Radio Chassis)

C.	Purpose.	Mfds.
1	Series aerial00005
4	V1 grid isolating0001
5	V1 anode decoupling . . . . .	.1
7	V2 M.W. and L.W. grid isolating . . . . .	.0001
8	V2 heater bypass . . . . .	.0023
9	V3 heater bypass . . . . .	.0023
10	Oscillator grid . . . . .	.0005
11	M.W. fixed trimmer . . . . .	.0005
13	Oscillator tracking control . . . . .	.0035
16	V4 A.V.C. decoupling . . . . .	.023
18	V1 screen decoupling . . . . .	.1
19	V4 and V5 screen decoupling . . . . .	.023
20	A.V.C. line decoupling . . . . .	.0001
21	H.F. bypass . . . . .	.01
22	T.L. grid decoupling . . . . .	.01
23	L.F. coupling . . . . .	.01
24	V7 anode decoupling . . . . .	.1
26	L.F. coupling . . . . .	.023
30	H.T. line bypass . . . . .	.1
32	V7 cathode bias shunt . . . . .	.25
35	L.W. grid shunt . . . . .	.0001
38	Osc. injection coupling . . . . .	.0001
40	V1 and V2 screen decoupling . . . . .	.0023
41	H.F. bypass . . . . .	.0005
42	V5 cathode bias shunt . . . . .	.1
43	S.W.3 aerial coupling . . . . .	.000035
44	V1 heater bypass . . . . .	.0023
46	V5 anode decoupling . . . . .	.1
50	Tone control . . . . .	.001
53	Anode coupling . . . . .	.0023
54	Pick up coupling . . . . .	.05
55	Screen decoupling . . . . .	.0023
56	V2 bias decoupling . . . . .	.1
57	V2 L.W. grid circuit decoupling . . . . .	.1
59	S.W.3 top aerial coupling . . . . .	.00001
60	S.W.3 aerial padder . . . . .	.0023
62	S.W.1 top coupling . . . . .	.000005
63	S.W.2 top coupling . . . . .	.000035
64	V1 screen decoupling S.W. . . . .	.0023
65	S.W.3 top coupling . . . . .	.00001
66	L.W. fixed padder . . . . .	.00015
67	V4 cathode bias shunt . . . . .	.1
68	A.V.C. diode coupling . . . . .	.000035
69	M.W. fixed padder . . . . .	.000023
71	S.W.3 aerial . . . . .	.00005
73	H.F. bypass . . . . .	.0001
74	M.W. top aerial coupling . . . . .	.00001

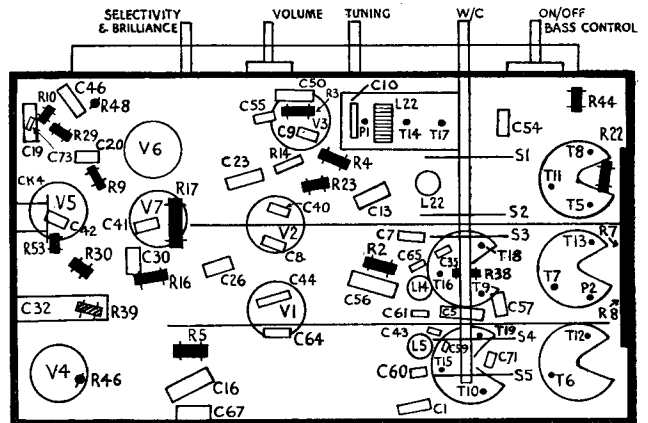
RESISTANCES (Radio Chassis)

R.	Purpose.	Ohms.
1	V1 A.V.C. decoupling	1 meg.
2	V2 A.V.C. feed	2.3 meg.
3	V3 Screen decoupling	2,300
4	V3 grid leak	50,000
5	V4 A.V.C. decoupling	100,000
6	Leak	100,000
7	V1, V2 screen potr. (part)	3,200
8	V1, V2 screen potr. (part)	6,000
9	V4 and V5 screen potr. (part)	35,000
10	A.V.C. line decoupling	750,000
11	A.V.C. line decoupling	50,000
12	Demod. diode load	350,000
13	V2 grid potr. (part)	2.3 meg.
14	V2 grid potr. (part)	2.3 meg.
15	V1 anode feed	1 meg.
16	V7 anode decoupling	10,000
17	V7 anode load	50,000
22	V1 anode decoupling	2,300
23	Mixing valve grid leak	50,000
26	V5 cathode bias	500
29	H.F. stopper	230,000
30	V5 anode decoupling	2,300
37	L.W. regeneration modifier	1,500
38	S.W.3 anode decoupling	1,000
39	S.W.1 bias decoupling	23,000
44	Tone control	1,000
46	V4 cathode bias	5,000
47	A.V.C. diode load (part)	23,000
48	A.V.C. diode load (part)	500,000
49	S.W.1 regeneration modifier	150
52	L.F. T.3 secondary shunt	100,000
53	V4 and V5 screen potr. (part)	23,000
54	H.F. stabiliser	6
56	URI series	5,000
57	L.F. T.1 secondary shunt	150,000
VR1	Volume control	1 meg.
VR2	Bass tone control	50,000
VR3	Tone control . . . . .	.1 meg.



The 650 is built in two chassis and the circuit is shown in corresponding sections. The underside diagram of the main chassis is shown right.

Other layout diagrams are on page 7.



H.M.V. 650 on Test

MODEL 650.—Standard model for A.C. mains operation, 195-255 volts, 50-100 cycles. Price, 24 gns.

DESCRIPTION.—Five-band, ten-valve, including rectifier, table superhet.

FEATURES.—Full-vision scale marked in metres and station names. Two control knobs for tuning with "micro-scale" for accurate calibration. Knobs for combined bass control and master switch, volume, combined tone and "high fidelity" switch, and wave selection.

Sockets for external speaker and pick-up. Provision for all-wave aerial. Control switch for speakers, Visual tuning indicator.

LOADING.—120 watts.

Sensitivity and Selectivity

ULTRA SHORT WAVES (4.85-12 metres).—Television sound received at room volume with an ordinary aerial.

SHORT WAVES (11.3-34 and 34-107 metres).—Very good all-round performance, with excellent selectivity and well-maintained sensitivity on both bands. Easy handling and no noticeable drift.

MEDIUM WAVES (195-575 metres).—Local stations spread on adjacent channels only. Excellent selectivity and high sensitivity.

LONG WAVES (725-2,000 metres).—Only slight side splash on Deutschlandsender. Good, clean background.

Acoustic Output

In the high-fidelity position, very well balanced reproduction is obtained. Crisp, clean top and good attack. Excellent low-note radiation and substantially no colouration whatever on speech. Volume ample for a very large room.

Replacement Condensers

EXACT replacement condensers for the 650 and 655 are available from A. H. Hunt, Ltd., of Garratt Lane, Wandsworth, London, S.W.18. These are: for either C31 or C58, unit 3058, price 9s. 6d.; for C33, unit 3056, 7s. 6d.; for the block containing C18 and C24, 3857, 7s. 6d.; and for C32, 1807, 2s. 3d.

H.M.V. 650 Five-band Ten Valve

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to the ordinary aerial socket when in use. Sockets are provided at the rear of the radio chassis for connecting a high-resistance pick-up.

The single dial light of the receiver is rated at 230 volts 15 watts and is fitted with a bayonet base.

Certain models may be found to incorporate, in place of the two 100-ohm resistances in series (R18 and R19), two 500-ohm resistances in parallel for bias purposes. R55 may be omitted and R9 increased to 150,000 ohms.

The following components are inside the various coil screens. R57 is inside IFT1; R12, R47, R52, C21 and C68 in IFT3; R37 and R49 in O2; C65 in H1; C69, C11 and C62 in H2; and C74 in A1. R15 is across the T.I. valveholder.

Fixed condensers are connected across the heaters of V1, V2 and V3.

Alignment Notes

I.F. Circuits.—Connect an output meter to the external L.S. sockets or across the primary of the speaker transformer if an A.C. voltmeter is used. Switch set to M.W., gang halfway and short grid of V3 to chassis. Set volume control to maximum, bass control fully anti-clockwise and tone control as far anti-clockwise as possible without switching to high fidelity.

Connect a service oscillator between top grid cap of V5 (leaving set connection made) and chassis. Only feed sufficient input from the service oscillator to obtain definite peaks in the output meter so as to render the A.V.C. inoperative.

Tune oscillator to 465 kc. and adjust T3A and T4A for maximum.

Connect oscillator between top grid cap of V2 (leaving set connection made) and chassis

and adjust T1, T2, T3 and T4 in that order for maximum.

Signal Circuits.—The scale pointer should be horizontal at both maximum and minimum of the gang and should line up with the marks on the scale. Connect the service oscillator to aerial and earth sockets. Only feed sufficient input from the service oscillator to obtain definite peaks in the output meter so as to render the A.V.C. inoperative.

Long Waves.—Set gang to minimum, tune oscillator to 725 metres (413.8 kc.) and adjust T5, T6 and T7 in that order for maximum.

Tune set and oscillator to 1,900 metres (157.9 kc.) and adjust P1 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement is noticed.

Medium Waves.—Set gang to minimum, tune oscillator to 195 metres (1,538 kc.) and adjust T8, T9 and T10 in that order for maximum.

Tune set and oscillator to 530 metres (566 kc.) and adjust P2 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement is noticed.

Short Waves.—(S.W.1.)—Tune set and oscillator to 35.2 metres (8,511 kc.)—this is marked with a spot on the dial—and adjust T11, T12

and T13 in that order for maximum. If noise signal ratio is excessive, turn down the volume control of the receiver and increase input from oscillator.

(S.W.2.)—Set gang to minimum, tune oscillator to 11.3 metres (26.5 mc.) and adjust T14 for maximum.

Tune set and oscillator to 30 metres (10 mc.) and adjust the spacing of the end turns of L22 for maximum.

Set gang to minimum, tune oscillator to 11.3 metres and adjust T15 and T16 for maximum.

Repeat operations until no further improvement is noticed.

(S.W.3.)—Tune set and oscillator to 5.5 metres (54.5 mc.) and adjust T17, T18 and T19 in that order for maximum, using the peak obtained with T17 in the greater capacity. If the noise to signal ratio is excessive, turn down volume control and increase input from oscillator.

Set oscillator to 9 metres (33.3 mc.) and tune in on set. If scale calibration is more than .25 metres out, then trim L24 by altering the point at which the crossed soldered leads connect and resolder. (This operation is only necessary when L24 is replaced or repaired.) Adjust L5 and L14 for maximum.

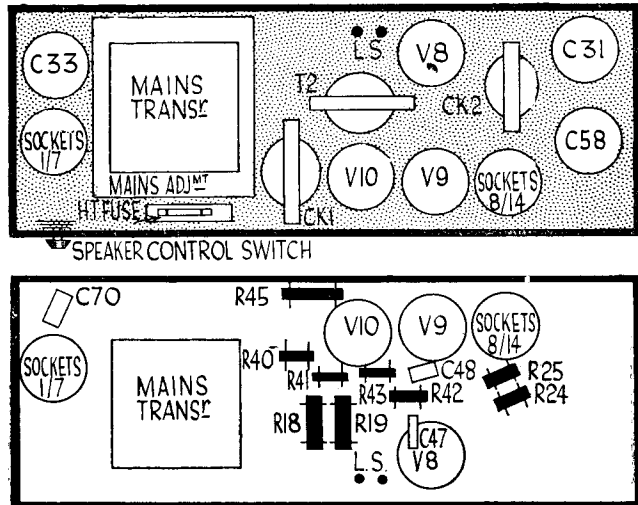
Repeat both operations until no further improvement is noticed.

CONDENSERS (Output Chassis)

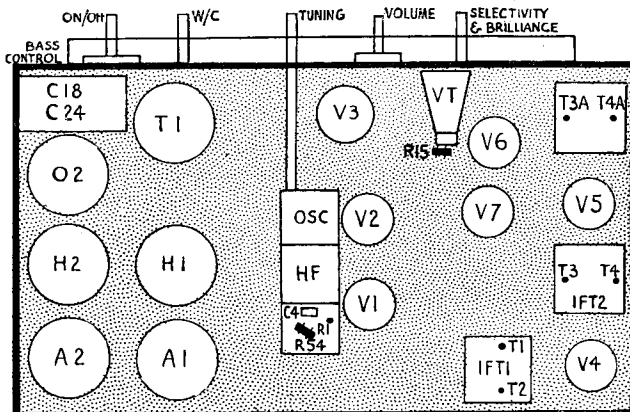
C.	Purpose.	Mfdts.
31	H.T. line smoothing (second)	32
33	H.T. smoothing	16
47	Negative feed back .. ..	.0005
48	Negative feed back .. ..	.0005
58	Main H.T. line smoothing ..	32
70	Mains aerial .. ..	.00035

RESISTANCES (Output Chassis)

R.	Purpose.	Ohms.
18	Bias series resistors	100
19	Bias series resistors	100
24	V7 bias pot. (part)	50,000
25	V7 bias pot. (part)	230,000
40	Negative feed back	150,000
41	Feed back injection resistance	10,000
42	Negative feed back	10,000
43	Feed back injection resistance.	150,000
45	External L.S. shunt	50



Left, are the top deck and underneath layout diagrams of the 650 output chassis. Below is the top appearance of the radio chassis.



G.E.C. UNIVERSAL 6

(Continued from page 21)

1,000 metres (300 kc.) and adjust T11, T12 and T13 in that order for maximum.

Connect external variable condenser as before, tune oscillator to 1,818 metres (165 kc.) and adjust receiver tuning control and external variable condenser simultaneously to give maximum.

Reconnect oscillator section of gang and, without altering receiver tuning control, adjust P2 for maximum.

Repeat alignment operation at 1,000 metres. If appreciable adjustment is necessary, repeat alignment at 1,818 metres and recheck at 1,000 metres.

The top "deck" chassis diagram of the G.E.C. Universal Super Six receiver. The under-side diagram, showing most of the parts, is given on page 21 close to the circuit and component tables.

