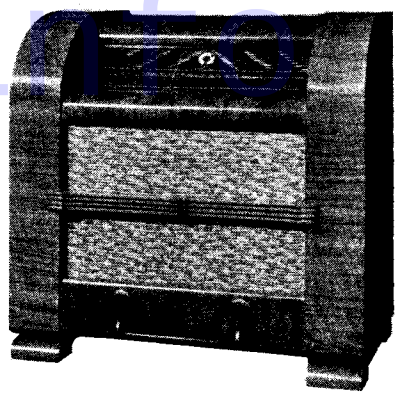
G.E.C. UNIVERSAL ALL-WAVE SUPER 6



The General Electric Company's Universal All-wave Super Six employs five-valves plus rectifier, barretter and cathode-ray tuning indicator.

CIRCUIT.—The aerial is coupled *via* a series aerial condenser and aerial coils to the grid of the H.F. amplifier V1, an H.F. pentode. V1 is tuned anode coupled to the triode hexode frequency changer V2. Here the signal is converted to the I.F.

An I.F. transformer (tuned to 456 kc.) leads to V3, an H.F. pentode, the I.F. amplifier. Another transformer feeds the demodulating diode of V.4, a double-diode-triode. The other diode provides the D.C. potential for operating the visual tuning indicator and the A.V.C. network.

Coupling arrangements to the grid of the triode section of V4 include a manual volume control and also connections for a pick-up. The pick-up connections are isolated to prevent shocks.

V4 is resistance capacity coupled to V5, the output valve. A tone control, consisting of two condensers and a variable resistance, varies the value of the L.F. coupling condenser. In one position of the slider, C26 and C36 are in parallel; at the other position C32 is directly across the anode load R23.

Mains equipment consists of a half-wave rectifying valve V6, a barretter, electrolytic smoothing condensers and a smoothing choke. H.F. filter chokes are inserted in the mains input leads.

Chassis Removal.—Remove the back of the cabinet and the controls. Take out the screws securing the bracing batten to the back of the cabinet and also the two screws which secure the dial assembly through rubber grommets to the top of the inside of the cabinet.

After removing the four chassis securing bolts and washers from the base, the chassis is free except for the speaker cable. For complete removal, either the leads to the speaker must be unsoldered or the speaker be withdrawn. As the two leads are connected to the speech coil only, they can be connected either way round.

Special Notes.—Remember that this is a universal set and the chassis is live.

A pair of sockets at the rear of the chassis enable a pick-up to be connected. A similar pair above the earthing terminal are for connecting an extension speaker. The plug provided enables the external speaker to be used in conjunction with or separately from the internal speaker according to whether the plug is pushed home or only half way in.

The external speaker should be of a permanent magnet, low impedance (2 to 4 ohms) type, a matching transformer being unnecessary.

The visual tuning indicator is mounted on a bracket behind the tuning scale and R28 is on the associated valve holder.

There are two dial lamps located in screw-in holders held by thumb nuts on each side of the dial assembly. These are Osram bulbs rated at 6.5 volts, 0.3 amp., with M.E.S. bases.

The following components have different values if an X55 is fitted in place of the X31 frequency changer. R6, R8, R13 and R14 will be 300, 99,000, 22,000 and 2,200 ohms respectively.

C8, C12 and R5 are located inside the H.F. coils can, and R11 and R29 in the can containing the oscillator coils.

VALVE READINGS

No signal. Volume maximum. M.W. band. Min. cap. 200 volt A.C. mains.

V.	Type.	Electrode.	Volts.	Ma.
	All Osram.			
1	W63 (Octal)	Anode ..	105	5.8
		Screen ..	70	1.5
2	X31 (7) ..	Anode ..	165	2.1
		Screen ..	80	3.2
		Osc. anode	85	3
3	W63 (Octal)	Anode ..	168	5.9
		Screen ..	70	2.6
4	DH63 (Octal)	Anode ..	135	.5
5	N30G or KT30 (7)	Anode ..	150	22
		Screen ..	165	4.5
6	U30 (7) ..	Cathode ..	200	—

Switch Positions. On medium waves switches A, C and E are open, B, D and F are closed. On L.W., all are open.

On the short-wave band all are closed except B, which is open.

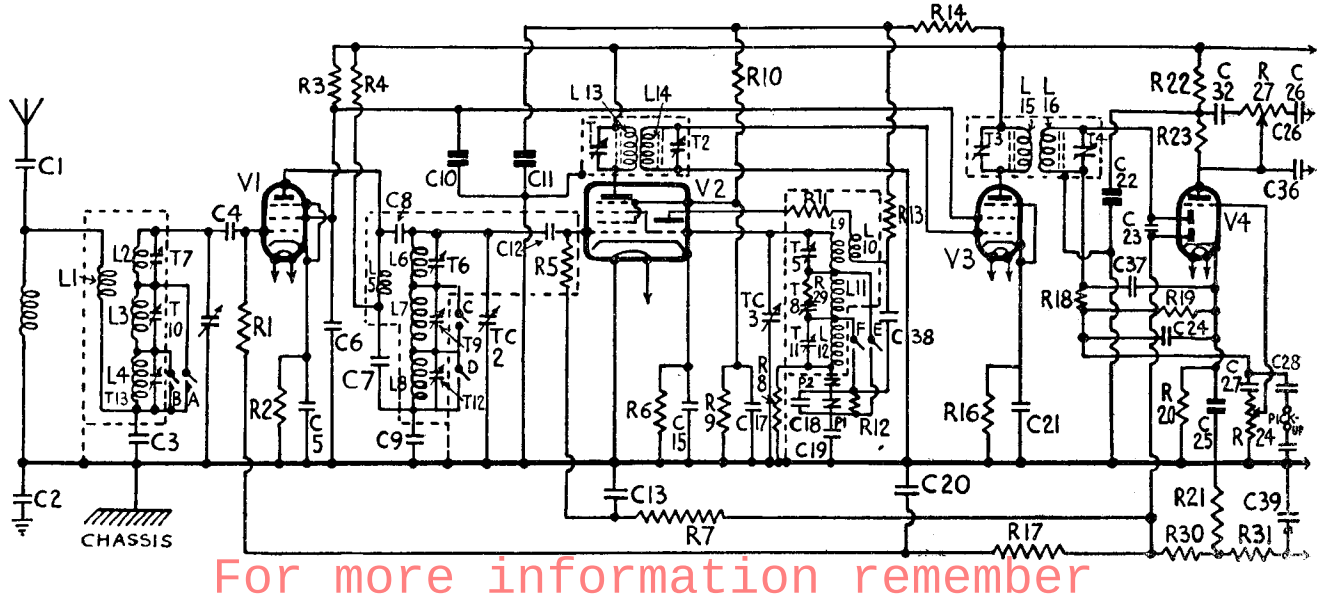
Circuit Alignment Notes

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer *via* a condenser of suitable rating and a service oscillator between the top grid of cap V2 and chassis, leaving the set connection made.

Put volume to maximum, receiver to M.W. band and gang to maximum

WINDINGS

Winding.	Ohms.	Winding.	Ohms
L1	.2	L11	2.8
L2	.02	L12	13.6
L3	4	L13	7
L4	31	L14	7
L5	2.3	L15	4
L6	.02	L16	4
L7	4	Smoothing choke	650
L8	31	Speaker transformer prim.	600
L9	.04		
L10	.4		



capacity. Set tone control to mellow position. Short oscillator section of gang.

Tune the service oscillator to 456 kc. and adjust the trimmers T1, T2, T3 and T4 in that order for maximum response. Simultaneously reduce the input from the service oscillator as the circuits come into line so as to render the A.V.C. inoperative.

Signal Circuits.—Remove short from oscillator tuning condenser and connect service oscillator to A and E terminals, preferably *via* a dummy aerial. Only feed sufficient input from the oscillator to obtain definite peaks in the output meter.

Check pointer for straightness and see that it is in line with the extreme left-hand end of the horizontal base lines of the scale when the gang condenser is at minimum.

CONDENSERS

C.	Purpose.	Mfds.
1	Series aerial	.005
2	Chassis isolating	.05
3	Aerial fixed padder	.0028
4	V1 grid isolator	.0001
5	V1 cath de shunt	.05
6	V1 and V3 screen decoupling (part).	.05
7	V1 anode decoupling	.005
8	V1 anode coupling	.000004
9	H.F. fixed padder	.003
10	V1 and V3 screen decoupling (part).	3
11	V2 screen and osc. anode decoupling.	7
12	V2 grid isolator	.0001
13	V2 A.V.C. decoupling	.25
15	V2 cathode bias shunt	.05
17	V2 screen decoupling	.05
18	L.W. oscillator fixed padder	.0003
19	Oscillator fixed padder	.0016
20	V1 A.V.C. decoupling	.05
21	V3 cathode bias shunt	.05
22	V4 anode decoupling	3
23	A.V.C. diode coupling	.0001
24	H.F. bypass	.0003
25	V4 cathode bias shunt	10
26	Tone control	.02
27	L.F. coupling	.02
28	Pick up coupling	.01
29	Pick up isolating	.01
30	Tone compensating	.005
31	V5 cathode bias shunt	20
32	Tone control	.005
33	H.T. smoothing	24
34	H.T. smoothing	7
35	Rectifier H.F. bypass	.01
36	L.F. coupling	.005
37	H.F. bypass	.0003
38	Oscillator anode decoupling.	.005
39	T.I. grid decoupling	.01

Short Waves.—Tune set and oscillator to 16.67 metres (18 mc.) and adjust T5 until signal is heard. The peak with T5 in its minimum capacity position should be used. Then adjust T6 and T7 for maximum, simultaneously rocking the gang.

Medium Waves.—Tune set and oscillator to 214 metres (1,400 kc.), and adjust T8, T9 and T10 for maximum response.

Disconnect lead to fixed vanes of oscillator section of gang and connect an external variable condenser between disconnected lead and chassis.

Tune service oscillator to 500 metres (600 kc.), and adjust the external variable condenser and receiver tuning control simultaneously to give a maximum response.

Without altering the receiver tuning control in any way, disconnect external condenser, reconnect oscillator section of gang and adjust P1 for maximum.

Repeat the 214 metres operation to check calibration and sensitivity.

Long Waves.—Tune set and oscillator to

(*Continued on page 7*)

RESISTANCES

R.	Purpose.	Ohms.
1	V1 A.V.C. feed	660,000
2	V1 cathode bias	300
3	V1 and V3 screen decoupling	33,000
4	V1 anode decoupling	9,900
5	V2 A.V.C. feed	99,000
6	V2 cathode bias	200
7	V2 A.V.C. decoupling	2 meg.
8	Oscillator grid return	55,000
9	V2 screen potr. (part)	22,000
10	V2 screen potr. (part)	9,900
11	Regeneration modifier	200
12	L.W. regeneration control	2,200
13	Oscillator anode decoupling.	9,900
14	V2 screen and osc. anode decoupling.	7,700
16	V3 cathode bias	300
17	V1 A.V.C. decoupling	660,000
18	H.F. stopper	22,000
19	Demodulating diode load	220,000
20	V4 cathode bias	3,300
21	A.V.C. diode load (part)	330,000
22	V4 anode decoupling	22,000
23	V4 anode load	19,000
24	Volume control	1 meg.
25	V5 grid leak	440,000
26	V5 cathode bias	200
27	Tone control	1 meg.
28	T.I. anode feed	1 meg.
29	M.W. regeneration control	150
30	A.V.C. diode load (part)	220,000
31	T.I. grid decoupling	2 meg.

G.E.C. Super 6 on Test

MODEL BC3865.—For universal A.C. or D.C. mains operation, 200-250 volts, 25-100 cycles. Price, 15 gns.

DESCRIPTION.—A three-band, five-valve, plus rectifier, superhet table model.

FEATURES.—Full-vision scale calibrated in metres and station names. Concentric tuning. Lever-operated tone and wave-change switches with indicators on scale. Combined volume and master switch. Visual tuning indicator. Sockets for extension speaker and pick-up.

LOADING.—86 watts.

Sensitivity and Selectivity

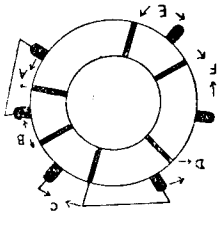
SHORT WAVES (16.5-51 metres).—Excellent gain, with exceptionally easy handling assisted by the vernier dial. Gain very well maintained and no drift.

MEDIUM WAVES (200-550 metres).—Excellent gain and selectivity, with a quiet background, although there was one whistle near London Regional. Local stations spread on adjacent channels only. A good all-round performance.

LONG WAVES (900-2,200 metres).—Similar performance to medium band, with excellent selectivity, Deutschlandsender having only slight side splash.

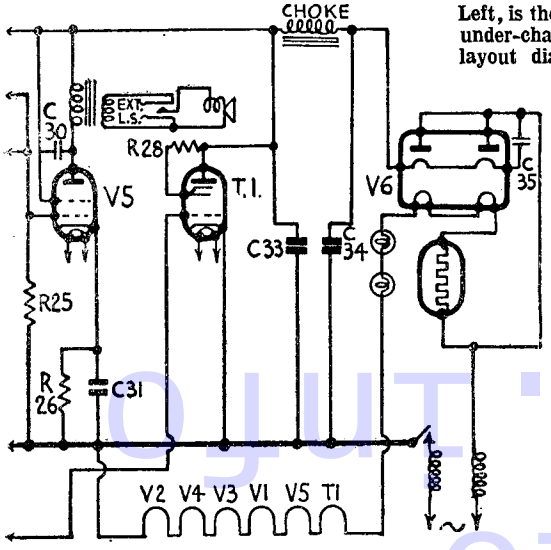
Acoustic Output

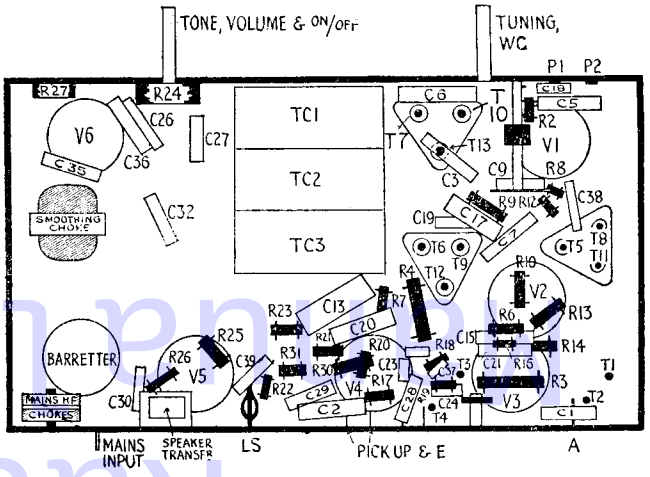
Ample volume for an ordinary room, with a pleasing tone and good balance. Considerable low-note radiation and appreciable crispness, with clean attack. Tone control is nicely graded and is not too vigorous in action.



The switch unit of the BC3865. See also text under "Switch positions."

Left, is the circuit and, right, the under-chassis layout. The other layout diagram is on page 20.





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

(*Continued from page* 17)

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. R53 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; C63 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.

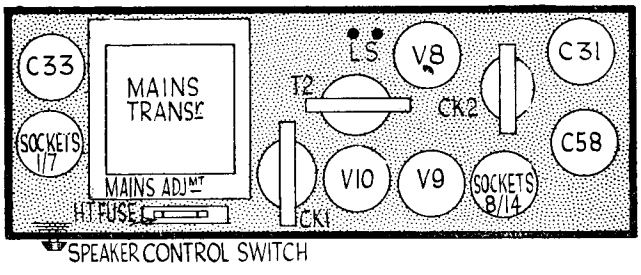
Repeat both operations until no further improvement is noticed.

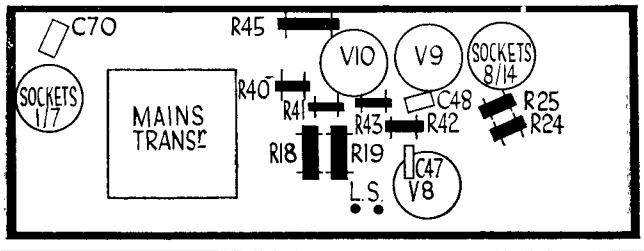
CONDENSERS (*Output Chassis*)

C.	Purpose.	Mfds.
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

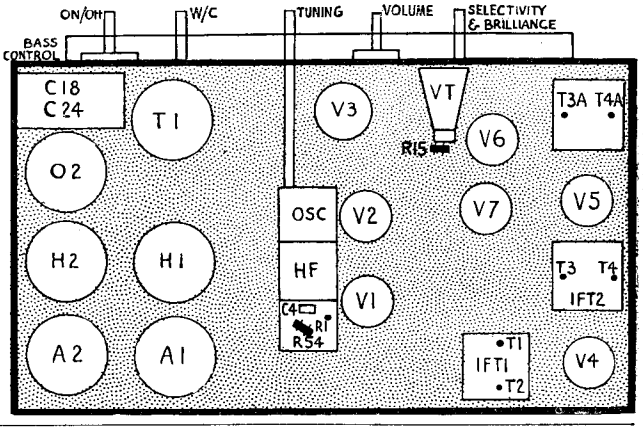
RESISTANCES (*Output Chassis*)

R.	Purpose.	Ohms.
18	Bias series resistors	100
19	Bias series resistors	100
24	V7 bias potr. (part)	50,000
25	V7 bias potr. (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.