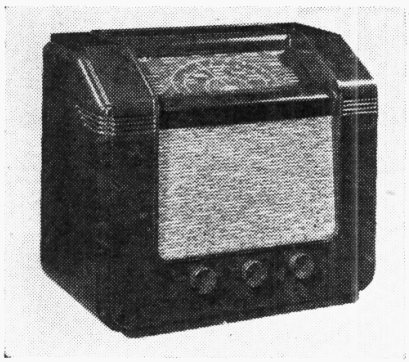
'TRADER' SERVICE SHEET 342

G.E.C. BC3950

AC ALL-WAVE 5



COVERING a short-wave range of 16-50 m, the G.E.C. AC All-Wave 5 is a 4-valve (plus rectifier) AC 3-band superhet with provision for an extension speaker. The BC3950 is for mains of 190-250 V, 40-100 C/S, and one of these models was used for the preparation of this *Service Sheet*, but the BC3950L for 110-130 and 210-230 V, 40-100 C/S, is very similar, the differences being explained under "General Notes."

CIRCUIT DESCRIPTION

Two alternative aerial input sockets, **A1** via small series condenser **C1** on SW and MW only and **A2** direct, to coupling condenser **C2,** small MW coupling **L2,** SW coupling coil **L1** and MW and LW coupling condenser **C3,** and thus to single-tuned circuits comprising **L3** (SW), plus **L4** (MW), plus **L5** (LW), tuned by **C33,** which precede triode-hexode valve (**V1, Osram X65**) operating as frequency changer with internal coupling. Triode oscillator grid coils **L6** (SW), plus **L7** (MW), plus **L8** (LW), are tuned by **C34**; parallel trimming by **C35** (SW), **C36** (MW) and **C9, C37** (LW); series tracking by **C11** (SW), **C10, C39** (MW) and **C38** (LW).

Reaction by coil **L9** (SW) and direct coupling via condenser **C12** (MW and LW).

Second valve (**V2, Osram KTW63**) is a variable-mu tetrode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-core transformer couplings **C40, L10, L11, C41** and **C42, L12, L13, C43.**

Intermediate frequency 456KC/S.

Diode second detector is part of double diode triode valve (**V3, Osram DH63**). Audio frequency component in rectified output is developed across load resistance **R17** and passed via AF coupling condenser **C19** and manual volume control **R18** to CG of triode section which operates as AF amplifier. IF filtering by **C17, R16, C18,** and **C21** in anode circuit.

Second diode of **V3,** fed from **L13** via **C20,** provides DC potential which is developed across load resistance **R22** and fed back through decoupling circuits as GB to FC, except on SW, and IF valves, giving automatic volume control. Delay voltage is obtained from drop along **R19** in cathode lead to chassis.

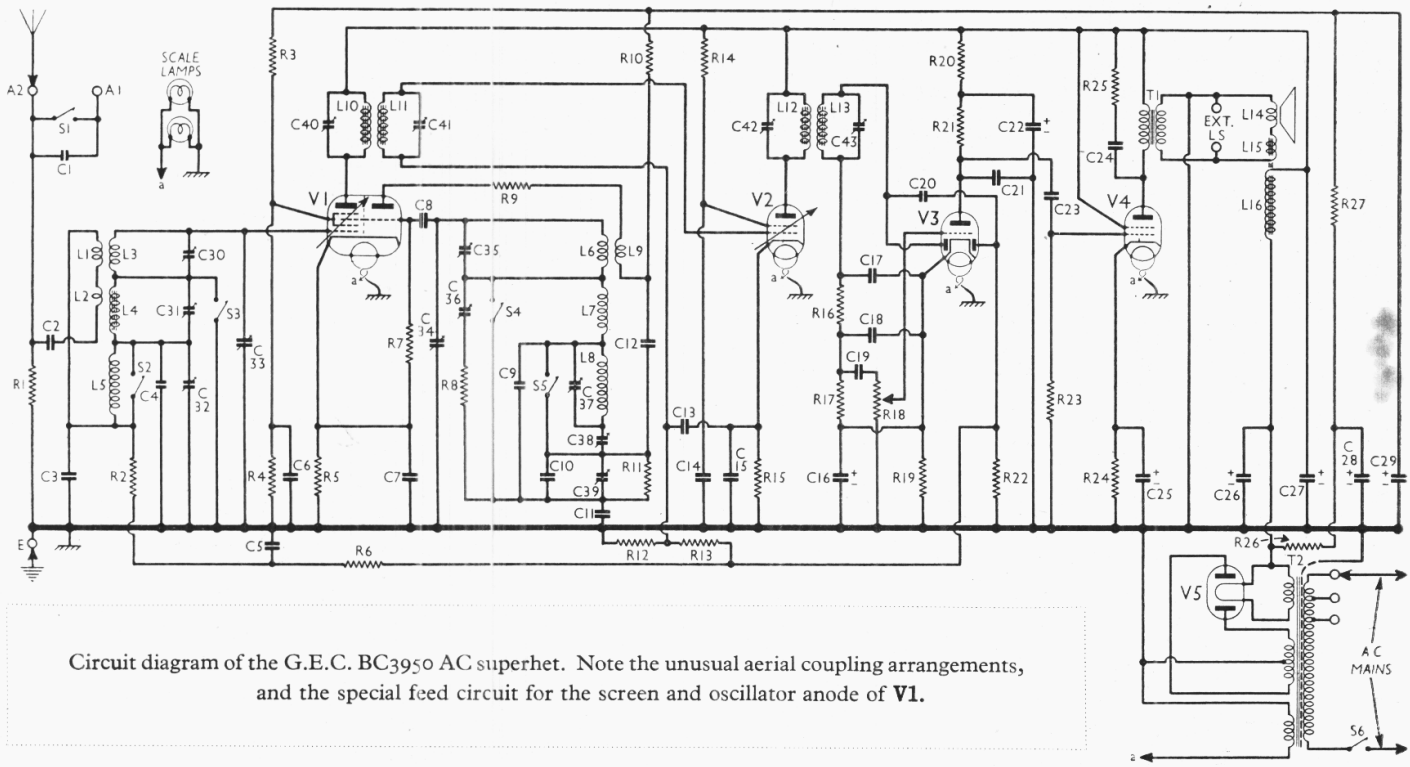
Resistance-capacity coupling by **R21, C23, R23** between **V3** triode and tetrode output valve (**V4, Osram KT63**). Fixed tone correction in anode circuit by **R25, C24.** Provision for connection of low impedance external speaker across secondary of output transformer **T1.**

HT current is supplied by full-wave rectifying valve (**V5, Osram U50**). Smoothing by speaker field **L16** and dry electrolytic condensers **C26, C27, C28** and **C29.**

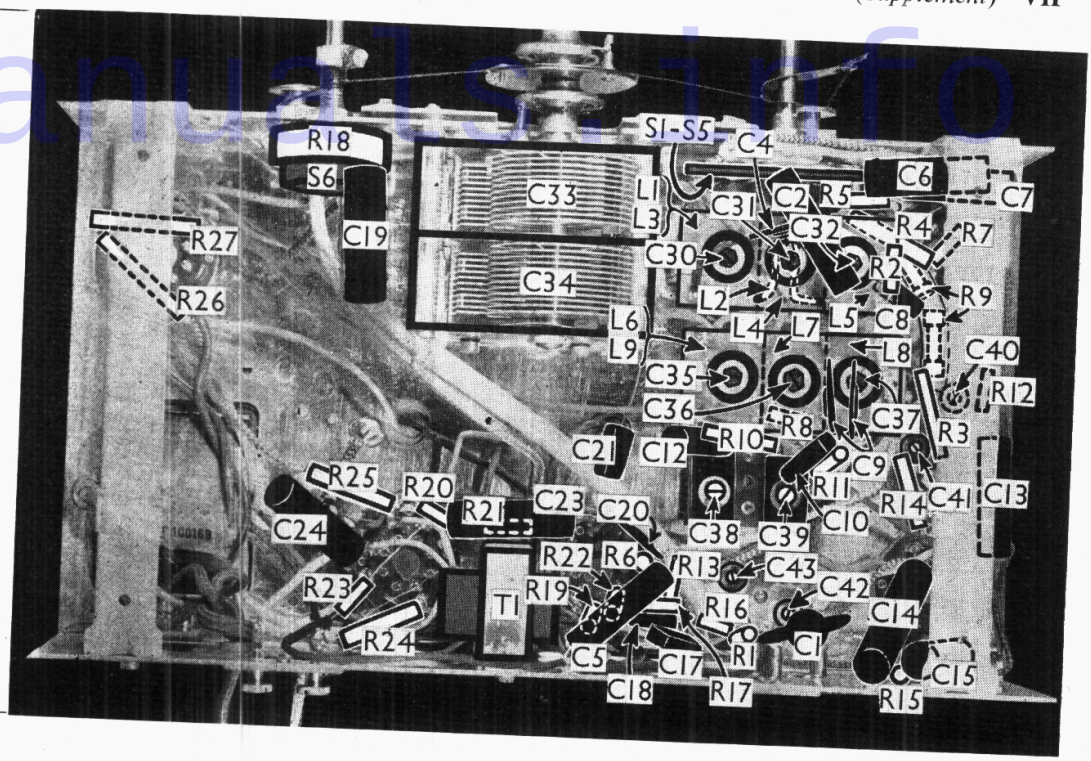
DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (six countersunk-head wood screws) gives access to most of the components beneath the chassis.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, remove the three control knobs (pull off), the four bolts (with washers and



Circuit diagram of the G.E.C. BC3950 AC superhet. Note the unusual aerial coupling arrangements, and the special feed circuit for the screen and oscillator anode of **V1.**



Under-chassis view. The coils are in units beneath the trimmers at the top right hand of the chassis. Their positions are indicated roughly by arrows. **L2** is a single turn of thick tinned copper wire. **R9** consists of two resistors in series, while **C9** is formed of two condensers in parallel.

rubber washers) holding the chassis to the bottom of the cabinet and the two round-head screws (with washers) holding the scale assembly to the top of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is adequate for normal purposes.

When replacing, see that there is a rubber washer on each of the chassis fixing bolts, between the chassis and the bottom of the cabinet.

To free the chassis entirely, unsolder the speaker leads, and *when replacing*, connect them as follows, numbering the tags from left to right:—Bottom row, 1, red/white; 2, white; 3, red. Top row, 1, black and black lead to speaker frame; 2, no external connection.

Removing Speaker.—First remove the chassis, then unsolder the leads and remove the four screws (with washers and spring washers) holding the speaker to the sub-baffle. *When replacing*, see that the terminal panel is at the top, do not forget to replace the earthing tag on the top right-hand screw, and connect the leads as above.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt	9,900
R2	V1 hexode CG decoupling	99,000
R3	V1 SG HT pot. divider	8,800
R4		15,000
R5	V1 fixed GB resistance	300
R6	AVC line decoupling	2,000,000
R7	V1 osc. CG resistance	99,000
R8	Osc. circuit MW and LW damping	75
R9	Osc. circuit SW reaction stabiliser	150*
R10	V1 osc. anode HT feed	22,000
R11	Part V1 osc. anode coupling	5,500
R12	V2 AVC potential divider resistances	2,000,000
R13		2,000,000
R14	V2 SG HT feed	99,000
R15	V2 fixed GB resistance	400
R16	IF stopper	55,000
R17	V3 signal diode load	440,000
R18	Manual volume control	1,000,000
R19	V3 triode GB resistance; AVC delay	3,300
R20	V3 triode anode decoupling	22,000
R21	V3 triode anode load	220,000
R22	V3 AVC diode load	440,000
R23	V4 CG resistance	440,000
R24	V4 GB resistance	400
R25	Part of fixed tone corrector	22,000
R26	V1 SG and osc. anode HT feed resistances	6,600
R27		6,600

* Two 75 Ω in series.

	CONDENSERS	Values (μF)
C1	A1 series (SW and MW only)	0·00002
C2	Aerial coupling condensers	0·00002
C3		0·005
C4	Aerial LW fixed trimmer	0·003
C5	AVC line decoupling	0·00002
C6	V1 SG decoupling	0·005
C7	V1 cathode by-pass	0·05
C8	V1 osc. CG condenser	0·1
C9	Osc. circuit LW fixed trimmer	0·0001
C10	Osc. circuit MW fixed tracker	0·00006§
C11	Osc. circuit SW tracker	0·0001
C12	V1 osc. anode coupling	0·00425
C13	V2 CG decoupling	0·005
C14	V2 SG decoupling	0·05
C15	V2 cathode by-pass	0·05
C16*	V3 cathode by-pass	0·1
C17	IF by-pass condensers	35·0
C18		0·0003
C19	AF coupling to V3 triode	0·0001
C20	Coupling to V3 AVC diode	0·02
C21	IF by-pass	0·00002
C22*	V3 triode anode decoupling	0·0005
C23	V3 triode to V4 AF coupling	3·0
C24	Part of fixed tone corrector	0·02
C25*	V4 cathode by-pass	0·02
C26*	HT smoothing condensers	35·0
C27*		14·0
C28*		7·0
C29*		3·0
		3·0

	CONDENSERS (Continued)	Values (μF)
C30‡	Aerial circuit SW trimmer	—
C31‡	Aerial circuit MW trimmer	—
C32‡	Aerial circuit LW trimmer	—
C33†	Aerial circuit tuning	—
C34†	Oscillator circuit tuning	—
C35‡	Osc. circuit SW trimmer	—
C36‡	Osc. circuit MW trimmer	—
C37‡	Osc. circuit LW trimmer	—
C38‡	Osc. circuit LW tracker	—
C39‡	Osc. circuit MW tracker	—
C40‡	1st IF trans. pri. tuning	—
C41‡	1st IF trans. sec. tuning	—
C42‡	2nd IF trans. pri. tuning	—
C43‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Two 0·00003 μF in parallel.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial SW coupling coil	0·3
L2	Small MW aerial coupling	Very low
L3	Aerial SW tuning coil	0·08
L4	Aerial MW tuning coil	2·0
L5	Aerial LW tuning coil	22·0
L6	Osc. circuit SW tuning coil	0·07
L7	Osc. circuit MW tuning coil	2·7
L8	Osc. circuit LW tuning coil	8·0
L9	Osc. circuit SW reaction	0·4
L10	1st IF trans. Pri.	7·0
L11	1st IF trans. Sec.	7·0
L12	2nd IF trans. Pri.	4·0
L13	2nd IF trans. Sec.	4·0
L14	Speaker speech coil	2·2
L15	Hum neutralising coil	0·1
L16	Speaker field coil	1,200·0
T1	Output trans. Pri.	485·0
	Output trans. Sec.	0·4
T2	Mains trans. Pri., total	41·5
	Mains trans. Heater sec.	0·19
	Mains trans. Rect. heat. sec.	0·16
	Mains trans. HT sec., total	580·0
S1-S5	Waveband switches	—
S6	Mains switch, ganged R18	—

G.E.C. BC3950—*Continued*

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 227 V, using the 220 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, **V1** should become unstable when measurements are being made of its anode and screen currents, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X65 ..	266	1·5	80	4·0
	Oscillator	3·0		
	82			
V2 KTW63	266	7·1	92	1·7
V3 DH63 ..	82	0·5	—	—
V4 KT63 ..	248	36·0	266	5·8
V5 U50 ..	328†	—	—	—

Each anode, AC.

GENERAL NOTES

Switches.—**S1-S5** are the waveband switches, in a single rotary unit beneath the chassis. It is indicated in our under-chassis view, and shown in detail in the diagram on this page. The table (col. 3) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates *open* and **C** *closed*.

S6 is the QMB mains switch, ganged with the volume control **R18.**

Coils.—**L1-L9** are in unscreened units beneath the chassis, to the right of the gang condenser in our under-chassis view. They are underneath two paxolin panels carrying six trimmers, and their positions are roughly indicated by arrows in our illustration. **L2** is a small coupling coil consisting of one turn of thick tinned copper wire.

The IF transformers **L10, L11** and **L12, L13** are in two screened units on the chassis deck, their trimmers being at their bases, and adjustable from beneath the chassis.

Scale Lamps.—These are two Osram MES types, with 10 mm diameter bulbs, rated at 6·5 V 0·3 A.

External Speaker.—Two terminals are provided at the rear of the chassis for a low impedance (2-4 Ω) external speaker.

Condenser Block.—The condenser block on the chassis deck contains seven dry electrolytic condensers, indicated in our plan chassis view.

The black and red leads are the negative and positive respectively of **C26** (14 μF).

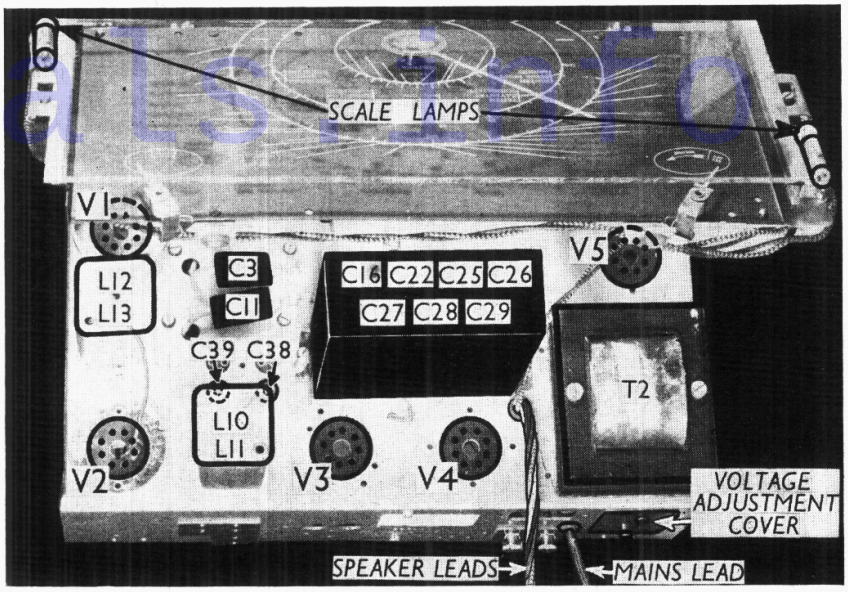
The brown lead is the common negative of **C22, C27, C28** and **C29.** The yellow lead is the positive of **C27** (7μF); the green lead to the junction of **R26, R27** is the positive of **C28** (3 μF); the green lead to the other end of **R27** is the positive of **C29** (3 μF); and the green lead to **V4** valveholder (bearer tag) is the positive of **C22** (3 μF).

The grey lead is the common negative of **C16** and **C25.** The blue lead to **V3** valveholder is the positive of **C16** (35 μF) and the blue lead to **V4** valveholder is the positive of **C25** (35 μF).

Condenser C9.—This fixed trimmer consists of two 0·00003 μF types in parallel.

Resistance R9.—This consists of two 75 Ω types in series in our chassis.

Model BC3950L Divergency.—The only difference in the low voltage model BC3950L is in the mains transformer primary winding, which has a resistance of 26 Ω total, instead of 41·5 Ω.



Plan view of the chassis. **C38** and **C39** are adjusted through two holes in the chassis. The IF trimmers are reached from beneath the chassis.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW and turn gang to maximum. Turn volume control to maximum. Short-circuit **C34,** and connect signal generator via a 0·1 μF condenser to grid (top cap) of **V1** and chassis. Leave existing top cap connection in place.

Feed in a 456 KC/S signal, and adjust **C40, C41, C42** and **C43** for maximum output. Remove the short from **C34.**

RF and Oscillator Stages.—Check that the scale is central in its clips, and that the pointer is straight, and coincides with the horizontal mark on the scale when the gang is at maximum. Connect signal generator via a suitable dummy aerial to the **A2** and earth sockets.

MW.—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust **C36,** then **C31,** for maximum output.

Disconnect **C34** by unsoldering the lead from its fixed plates, and connect an external variable condenser between the disconnected lead and chassis. Feed in a 500 m (600 KC/S) signal, and adjust external condenser and receiver tuning control together for maximum output. Disconnect external condenser and re-connect **C34.** Without altering tuning control setting, adjust **C39** for maximum output. Repeat the 214 m adjustments.

LW.—Switch set to LW, and tune to 1,000 m on scale. Feed in a 1,000 m (300 KC/S) signal, and adjust **C37,** then **C32,** for maximum output.

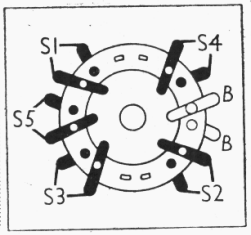
Disconnect **C34** as before, and connect external condenser. Feed in an 1,818 m (165 KC/S) signal, and adjust external condenser and receiver tuning control together for maximum output. Disconnect external condenser, re-connect **C34,** and without altering tuning control setting, adjust **C38** for maximum output. Repeat the 1,000 m adjustments.

SW.—Switch set to SW, tune to 16·7 m on scale, feed in a 16·7 m (18MC/S) signal (via a SW dummy aerial), and adjust **C35,** then **C30,** for maximum output. **C35** should be adjusted to the higher frequency peak (lower capacity). If "pulling" is experienced when **C30** is adjusted, rock the gang slightly to compensate for this.

SWITCH TABLE AND DIAGRAM

Switch	LW	SW	MW
S1	C	—	—
S2	—	C	C
S3	—	C	—
S4	—	C	—
S5	—	C	C

Switch diagram, looking from the rear of the underside of the chassis.



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