"TRADER" SERVICE SHEET

1336

G.E.C. BC5645

Covering also model BC7445

THE G.E.C. BC5645 receiver is a six-valve (plus rectifier and two germanium diodes) A.M./F.M. superhet designed to operate from A.C. mains only of 200-250V, 40-100c/s. It is equipped with a double-wound mains transformer, an internal frame aerial for A.M. reception and a plate aerial for F.M. reception, while provision is made for the connection of external aerials and for the connection of a gramophone pick-up. It is fitted with an 8 × 5 inch elliptical loudspeaker. Wavebands covered are F.M. 87.5-100Mc/s; A.M. 187-545m and 1,100-1,900m.

Model BC7445 is a table radiogram version employing a similar chassis to that in the model BC5645 but fitted with three loudspeakers and a 4-speed record-playing mechanism.

Release date, both models, August 1956. *Original prices: Model BC5645,* £19 14*s* 3*d; Model BC7445,* £36 7*s* 10*d. Purchase tax extra.*

CIRCUIT DESCRIPTION

A.M. aerial tuning coils **L6** (M.W.) and **L7** (L.W.) are wound on a disc-shaped woven former to form the internal A.M. frame aerial. Provision is made for the connection of an external aerial via socket A, which is coupled to the tuned circuits by the common impedance of **C17**. Aerial circuit tuning is effected by **C18**.

Section **b** of **V3** operates as A.M. mixer, and section **a** as a local oscillator. Oscillator grid coil **L8** functions on both M.W. and L.W. and is tuned by **C24**. Parallel trimming by **C25** (M.W.) and **C26** (L.W.); series tracking by **C28** on both bands. Reaction coupling from oscillator anode via **C27** and **L9**.

V4 is a variable-mu R.F. pentode operating as single-valve A.M. intermediate frequency amplifier with tuned transformer couplings **C31, L12, L13, C32** and **C40, L17, L18, C41.**

A.M. intermediate frequency 470kc/s.

One diode section of double diode-triode valve **V5** functions as A.M. signal detector, and the audio-frequency component in its rectified output is developed across **R24,** which also functions as the volume control. **S15** closes in both A.M. positions to complete the circuit. I.F. filtering by **C42, R21** and **C44.**

Audio-frequency component developed across **R24** is passed via **C47** to the triode section of **V5,** which operates as the A.F. amplifier. Bias for **V5** is obtained mainly from the "contact potential" developed across its grid resistor **R25,** which has a very high resistance, but a small potential is also developed in the cathode circuit by the presence of **R37,** which is part of the feed-back network from winding **c** on **T1.**

The second diode of **V5** is fed with signals via **C49** and functions as the A.G.C. rectifier, and the potential developed across its load **R28** is fed as control bias via filter **R27, C23** to **V3** and **V4** on both A.M. bands.

Resistance-capacitance coupling **R26, C54, R30** is used between **V5** and the output valve **V6.** Variable tone control by network **C53, R29,** and fixed tone correction across **T1** primary by **C55, R32.**

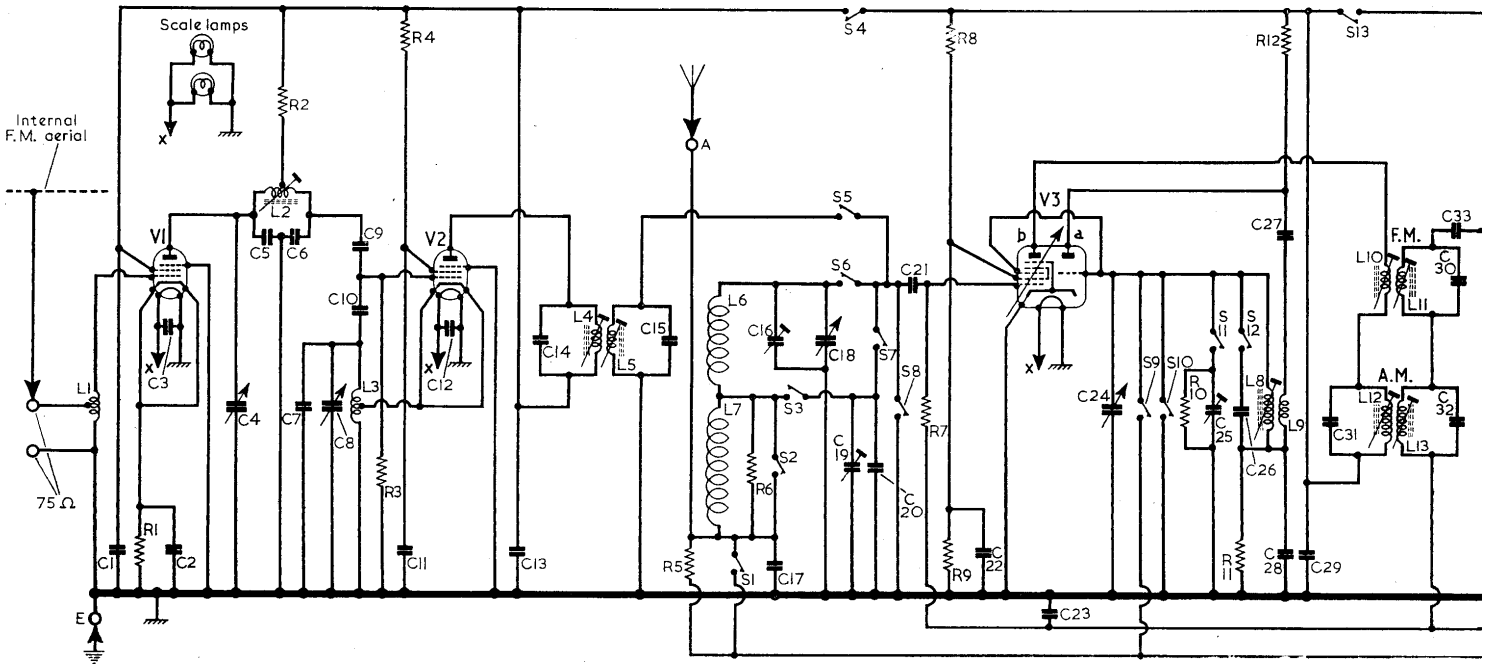
H.T. current is supplied by I.H.C. full-wave rectifying valve **V7.** H.T. smoothing by **C57, R35, C51** to **V4-V6,** and by additional decoupling **R34, C50** to **V1-V3.** Residual hum is neutralized by passing H.T. current through section **a** of the output transformer **T1** primary winding.

S4 and **S5** open on A.M. and Gram positions to prevent F.M. sections from functioning. **S13, S15** open and **S16, S10, S8** close to permit operation with a gramophone pick-up.

Operation on F.M.

F.M. aerial input (unbalanced 75Ω) via tapped aperiodic coupling coil **L1** to R.F. amplifier valve **V1. V2** functions as cathode-coupled oscillator and mixer. Oscillator coil **L3** is tuned by variable capacitor **C8** and fixed capacitor **C7.** Output from **V1** is coupled by the intervalve circuit **L2, C5, C6** and tuning capacitor **C4** to the pentode section which operates as mixer.

S9 closes on F.M. to prevent the A.M. oscillator from functioning. **S4** closes and

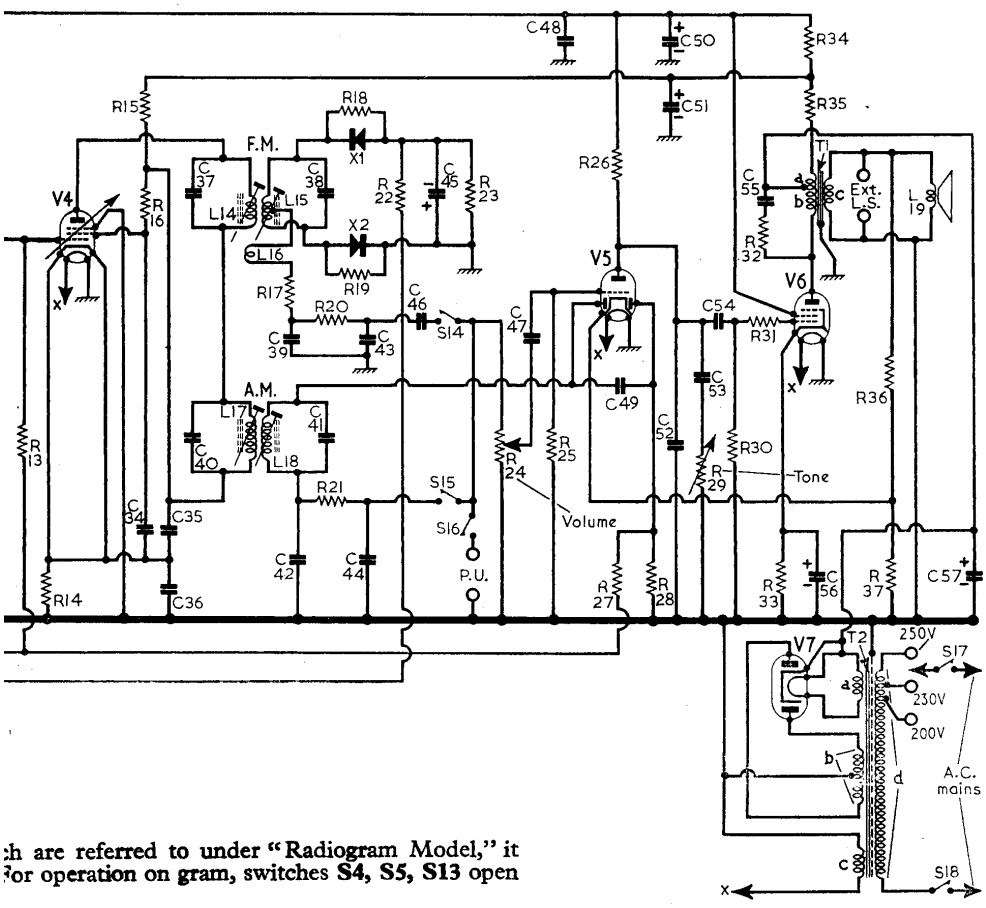


Circuit diagram of the G.E.C. model BC5645. With minor circuit alterations associated with the pick-up and loudspeaker connections, which applies also to the BC7445. The A.M. aerial coils **L6** and **L7** are wound on a disc-shaped former and illustrated in location reference A1. Fo: disconnecting **V1, V2** and **V3** from the circuit. **S8, S10** and **S16** close.

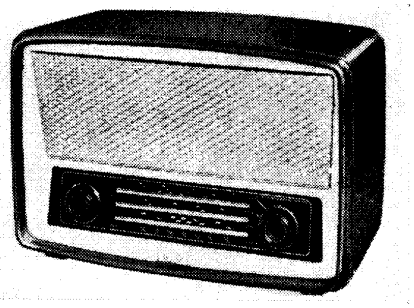
COMPONENT VALUES AND LOCATIONS

Capacitors		
C1	0·003μF	G4
C2	0·003μF	G4
C3	0·003μF	G4
C4	17·4pF[3]	A3
C5	2·2pF	H4
C6	14pF	H4
C7	20·1pF[1]	H4
C8	17·4pF[3]	A1
C9	5·6pF	G4
C10	47pF	G4
C11	0·003μF	G4
C12	0·003μF	G4
C13	0·001μF	H3
C14	10pF	B1
C15	12pF	B1
C16	—	F3
C17	0·005μF	G4
C18	528pF[3]	A2
C19	—	G3
C20	110pF	G3
C21	22pF	H3
C22	0·01μF	G3
C23	0·04μF	G4
C24	528pF[3]	A1
C25	—	G3
C26	460pF	G3
C27	0·002μF	G3
C28	420pF	G3
C29	0·01μF	G4
C30	5·6pF	B2
C31	250pF	B2
C32	250pF	B2
C33	10pF	G4
C34	0·01μF	G4
C35	0·01μF	G4
C36	0·01μF	G4
C37	10pF	C2
C38	100pF	C2
C39	330pF	F4
C40	250pF	C2
C41	250pF	C2
C42	470pF	F4
C43	200pF	F3
C44	47pF	F4
C45	5μF	F4
C46	0·01μF	F3
C47	0·01μF	E3
C48	0·01μF	H3
C49	47pF	F4
C50	32μF	F4
C51	32μF	F4
C52	330pF	F4
C53	0·01μF	E3
C54	0·01μF	F4
C55	0·005μF	F4
C56	100μF	E4
C57	32μF	F4
Resistors		
R1	390Ω	H4
R2	1kΩ	G4
R3	47kΩ	H4
R4	470kΩ	H4
R5	150Ω	H3
R6	100kΩ	A2
R7	1·5MΩ	G3
R8	68kΩ	G3
R9	100kΩ	G3
R10	22kΩ	G3
R11	22kΩ	G3
R12	100kΩ	G3
R13	1·5MΩ	G4
R14	220Ω	G4
R15	4·7kΩ	F3
R16	47kΩ	G4
R17	150Ω	F4
R18	220kΩ	F4
R19	220kΩ	F4
R20	220kΩ	F3
R21	220kΩ	F4
R22	10kΩ	F4
R23	10kΩ	F4
R24	1MΩ	E3
R25	10MΩ	F4
R26	220kΩ	F4
R27	1MΩ	F4
R28	470kΩ	F4
R29	500kΩ	E3
R30	470kΩ	E4
R31	22kΩ	E4
R32	10kΩ	E4
R33	150Ω	E4
R34	1kΩ	F3
R35	1kΩ	C1
R36	1kΩ	F4
R37	22Ω	F4
Coils*		
L1	—	G4
L2	—	G4
L3	—	H4
L4	1·6	B1
L5	1·2	B1
L6	—	A1
L7	14·9	A1
L8	2·16	G3
L9	—	G3
L10	1·5	B2
L11	1·5	B2
L12	10·5	B2
L13	10·5	B2
L14	1·5	C2
L15	0·2	C2
L16	0·3	C2
L17	10·5	C2
L18	10·5	C2
L19	3·0	—
Transformers*		
T1 a	20·0	C1
T1 b	560·0	
T1 c	—	
T2 a	—	D1
T2 b	648·0 total	
T2 c	—	
T2 d	28·3 total	
Miscellaneous		
X1	GEX34[2]	F4
X2	GEX34[2]	F4
S1-S16	—	H3
S17, S18	—	B3

**Approx. D.C. resistance in ohms.* [1] *15pF + 5.1pF.* [2] *G.E.C. manufacture.* [3] *Swing value.*



:h are referred to under "Radiogram Model," it
for operation on gram, switches **S4, S5, S13** open



Appearance of G.E.C. model BC5645.

applies H.T. current to **V1, V2. S6, S7** and **S8** open and **S5** closes, permitting the heptode section of **V3** to function as an I.F. amplifier on F.M. with tuned transformer coupling **C14, L4, L5, C15** from **V2.**

F.M. intermediate frequency 10.7Mc/s.

Output from **V3b** is transformer-coupled by **L10, L11, C30** and **C33** to second I.F. amplifying valve **V4,** whose output in turn is coupled by the discriminator transformer **L14, L15, L16** to the ratio detector comprising crystal diodes **X1** and **X2.**

Audio-frequency output from the discriminator circuit associated with **X1** and **X2** is developed across load capacitor **C39** and passed via the de-emphasis filter network **R20, C43** and coupling capacitor **C46** to volume control **R24,** after which A.F. amplification follows by the same path as has already been described for A.M. operation.

CIRCUIT ALIGNMENT

Equipment Required.—A spot frequency signal generator covering the range of 200-1,700kc/s and an F.M. signal generator covering the frequency of 10.7Mc/s and the frequency range of 87-100Mc/s. A special hexagonal trimming tool (issued by the manufacturers) and a non-metallic trimming tool. A high-resistance 20,000 ohms-per-volt (0-10V) D.C. voltmeter; a 0.002μF and a 0.001μF capacitor. An A.C. voltmeter for A.M. alignment.

General.—For A.M. alignment feed in a signal modulatd 30% at 400c/s, and for F.M. alignment feed in an unmodulated signal. For F.M. aerial circuits feed the signal via an unbalanced 75Ω coupling into the aerial sockets.

Connect the F.M. output meter across **R23** and the A.M. output meter across the secondary of **T1.** The reading on the F.M. meter should not be allowed to exceed 4V.

A.M. alignment must be carried out first after allowing the receiver to be warmed up for 5-10 minutes. If difficulty is met with in obtaining coverage of the complete F.M. range the relative physical positions of **C7** and **C10** to the tuning coil **L3** should be adjusted.

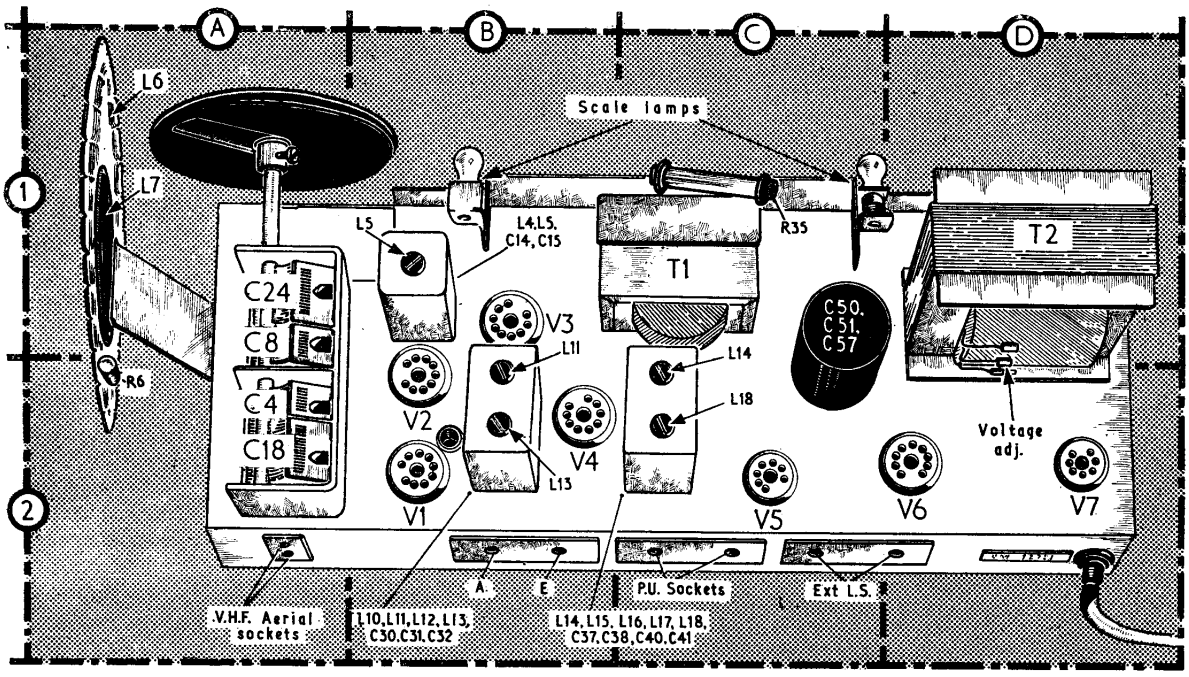
Connect the signal generator as indicated, and, using a 30% 400c/s modulated signal, carry out the following sequence of operations.

A.M. Alignment

1.—Connect live lead of the signal generator via a 0.001μF capacitor to the control grid of **V3;** switch receiver to L.W.; turn tuning gang to maximum capacitance, and while feeding in a 470kc/s signal, adjust the cores of **L18** (C2), **L17** (G4), **L13** (B2) and **L12** (G4) for maximum output on the A.M. meter. Repeat adjustments for optimum results. When adjusted correctly, the average signal level required to produce 50mW (0.387V) across a 3Ω resistive load connected to the secondary of **T1** is approximately 110μV.

2.—Transfer the "live" lead of the signal

(*Continued in col.* 1 *overleaf*)



Plan view of the chassis showing in location reference A1 the A.M. frame aerial. A.M./F.M. tuning is by combined ganged cacacitor **C24, C18** (A.M.) and **C8, C4** (F.M.)

Circuit Alignment—*continued*

generator to the A.M. aerial socket (via suitable dummy aerial). Switch receiver to M.W., set tuning gang to 500m, feed in a 600kc/s signal, and adjust the core of **L8** (G3) for maximum A.M. output. Average sensitivity figure for 50mW output is 75μV.

3.—Turn tuning gang to 200m, feed in a 1,500kc/s signal and adjust **C25** (G3) for maximum A.M. output. Repeat operations 2 and 3 for optimum results.

4.—Feed in a 1,500kc/s signal, tune receiver to the signal in, and adjust **C16** (F3) for maximum A.M. output. Average sensitivity figure for 50mW output is 50μV.

5.—Switch receiver to L.W., turn tuning gang to 1,304m, feed in 230kc/s signal, and adjust **C19** (G3) for maximum A.M. output. Average sensitivity figure for 50mW output 175μV.

F.M. Alignment

6.—Switch receiver to F.M., and turn tuning gang to minimum capacitance. Connect live lead of signal generator via a 2,000pF ceramic capacitor (using as short leads as possible) to junction of **L2** with **C6, C9.** Feed in a 10.7Mc/s modulated signal, and adjust the cores of **L14** (C2), **L11** (B2), **L10** (G4), **L5** (B1) and **L4** (G3) for maximum output on the F.M. meter. Finally, adjust output of signal generator to give a reading of 4V. Disconnect output meter.

7.—Connect F.M. output meter across **C39** (F4) and, without altering signal generator output, adjust the core of **L15** (G4) for a reading of 2V on the meter.

8.—Re-connect the output meter across **R23** (F4) and repeat the adjustments given in operation 6, but for maximum output.

9.—Re-connect the output meter across **C39** and adjust the core of **L15** (G4) to obtain a maximum and minimum figure for output reading. Add the two figures together, divide by two, and set the core of **L15** to give this reading on the output meter. Average sensitivity figure for an output reading of 4V across **R23** should be 2mV.

10.—Transfer "live" signal generator lead to F.M. aerial sockets (via unbalanced 75Ω coupling), turn tuning gang to 94Mc/s, feed in a 94Mc/s signal, and adjust **L3** (H4) by spacing or closing in the end turn adjacent to **C10** for maximum output on F.M. meter, while adjusting output of generator to maintain a 4V reading.

11.—With input signal of 94Mc/s, adjust the core of **L2** (G4), while rocking tuning gang for optimum results, for maximum output on F.M. meter. If on completion of this adjustment the scale cursor calibration is appreciably affected, readjust **L3** to correct it.

12.—Check that scale cursor and tuning system covers the full waveband on the tuning scale. If it does not, adjust relative positions of the fixed tuning capacitor **C7** to the tuning coil **L3** and the oscillator grid capacitor **C10** until full coverage is obtained, then check calibration by repeating operation 11. Average sensitivity figure for 4V reading across **R23** on completion of operation 11 should be 2.5μV.

GENERAL NOTES

Switches S1-S16.—These are the waveband/gram switches, ganged in a single rotary unit located beneath the chassis in location reference H3. A detailed diagram of the unit in Col. 3 is drawn as seen when viewed from the rear of an inverted chassis. In the associated table below, the switch operations for the four control settings are given, starting with the control knob in the fully anti-clockwise position. A dash indicates open, and **C** closed.

Drive Cord Replacement.—45in of nylon braided glass yarn is required for a new drive cord, and all the necessary details for fitting it are given in the sketch in cols. 5, 6, which is drawn as seen when viewed from the front of the chassis. With the gang turned to maximum, one end of the cord should be tied to form a loop, and the cord should then be run clockwise from the start position indicated in the drawing.

Waveband Switch Table

Switch	F.M.	M.W.	L.W.	Gram.
S1	—	C	C	—
S2	—	C	—	—
S3	—	—	C	—
S4	C	—	—	—
S5	C	—	—	—
S6	—	C	—	—
S7	—	—	C	—
S8	—	—	—	C
S9	C	—	—	—
S10	—	—	—	C
S11	—	C	—	—
S12	—	—	C	—
S13	C	C	C	—
S14	C	—	—	—
S15	—	C	C	—
S16	—	—	—	C

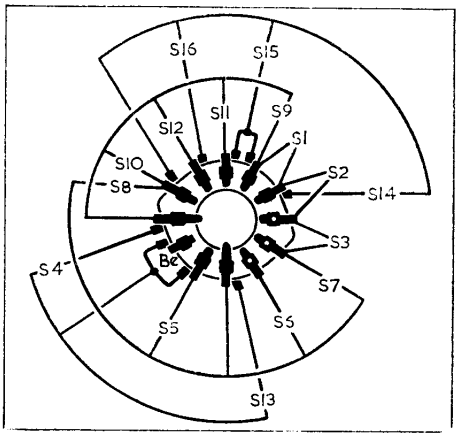


Diagram of the ganged waveband switch unit seen when viewed from the rear of an inverted chassis.

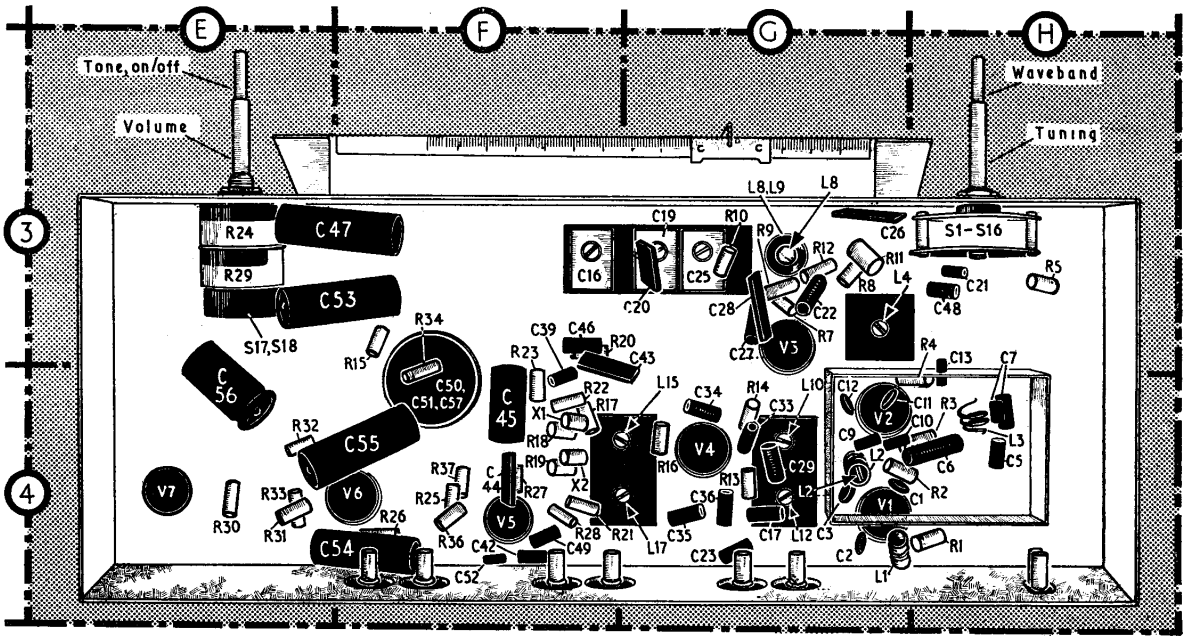
VALVE ANALYSIS

The valve voltages given in the table below are those derived from the manufacturers' information. They were measured on a

Valve	Receiver Switched to	Anode (V)	Screen (V)	Cath. (V)
V1 Z719 ..	F.M.	205	210	3·3
V2 Z719 ..	F.M.	210	45	—
V3a X719	F.M.	25	—	—
	A.M.	40	—	—
V3b X719	F.M.	210	50	—
	A.M.	240	46	—
V4 W719	F.M.	190	100	2·1
	A.M.	200	110	2·2
	Gram.	210	110	2·2
V5 DH77[1]	F.M.	80	—	—
	A.M.	85	—	—
	Gram.	85	—	—
V6 N709	F.M.	250	210	6·0
	A.M.	250	240	6·9
	Gram.	250	255	7·4
V7 U78	F.M.	*	—	265·0
	A.M.	*	—	270·0
	Gram.	*	—	275·0

**No readings quoted.*

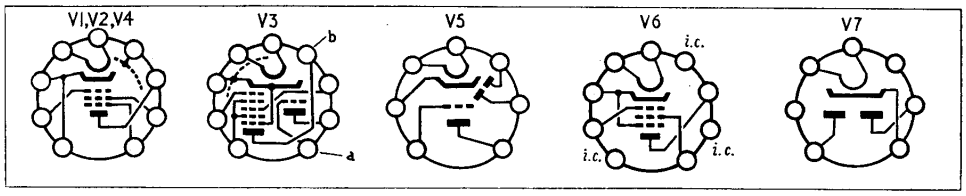
[1]Readings are for triode section only.



Underside illustration of the chassis. Tuning control is a sleeve on the shaft of the waveband switch.

20,000 ohms-per-volt meter, chassis being the negative connection in each case. The receiver was operating from 230V mains, with the voltage adjustment set to the 230V tapping.

Separate readings are given where appropriate in the table for A.M. operation, F.M. operation and for gram operation. For A.M. the receiver was tuned to 200m, and for F.M. to 94Mc/s, but in neither case was there any signal input.



Above: Diagrams of the valve bases as seen when viewed from the underside of the base, showing the free ends of the pins.

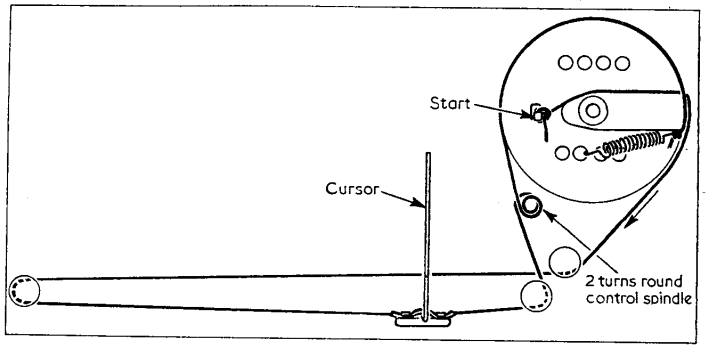
RADIOGRAM MODEL

Model BC7445.—This table radiogram employs a similar chassis to model BC5645 but it is fitted with three loudspeakers. Two high frequency units are connected in parallel, with 4μF capacitor in series, and they are wired across the secondary of **T1**.

The four-speed record player fitted is a Collaro 4/564, and the crystal pick-up is connected via a filter unit consisting of a 680kΩ resistor in series with the "live" lead, and a 150kΩ resistor and 120pF capacitor in parallel across the receiver pick-up sockets.

Access to the record player is provided by the hinged top to the cabinet, which is fitted with finger grips on either side to facilitate opening.

Right: Illustration of the drive cord assembly as seen when viewed from the front of a chassis with the tuning gang at maximum.



MODIFICATIONS

Drive Cord Bracket.—In early models, removal of the tuning control knob may cause damage to the drive cord owing to the spindle sleeve being free to move. A special bracket (part number RP124889) is provided which may be fitted over the collar and held by the control shaft locking nut. This bracket is fitted to all later models.

Instability.—In some early receivers instability occurs when using the internal F.M. plate aerial. A short lead connected from pin 6 of **V2** to chassis immediately below the valve pin will cure this instability.

ADDITIONAL NOTES

The G.E.C. BC7445 radiogram.

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