"TRADER" SERVICE SHEET

1077

G.E.C. BC5839

and BC9835 Autoradiogram

PROVIDED with six switch control positions for radio reception, three for the normal 3-band tuning and three for pre-set stations, the G.E.C. BC5839 is a 4-valve (plus rectifier) superhet designed to operate from A.C. mains of 190-250 V, 40-100 c/s. The waveband ranges are 16.5-50 m, 187-575 m and 1,000-2,000 m. The BC5839L employs an identical chassis, but the mains transformer primary is tapped for 110-130 and 210-230 V.

The BC9835 is an autoradiogram with a 3-speed motor and two interchangeable pick-up heads. It employs a modified BC5839 chassis, push-pull output and twin speakers, and the differences between the two are fully explained here, but this *Service Sheet* was actually prepared from a BC5839.

Release dates and original prices: BC5839 and BC5839L, April 1952, £24 5s 4d, *reduced January* 1953 *to* £20 11s 10d; *BC9835, September* 1952, £94 17s 4d. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input via **C2, L2** (S.W.), or by bottom capacitance coupling via **C1** (M.W. and L.W.) to single-tuned circuits comprising coils **L3** (S.W.), **L4** (M.W.) and **L5** (L.W.) tuned manually by **C36.** On these three manually tuned ranges **S7** is closed to connect **C36.**

Three further positions on the main switch control provide a choice of three pre-tuned M.W. stations. In these positions **S7** opens and **S8** closes to connect the fixed tuning capacitor **C4** across the circuit, and station-setting is performed by adjustment of the pre-set cores of **L6, L7** and **L8.** Aerial coupling in these circuits is via **C1.**

In areas of good signal strength a frame aerial **L1** housed in the receiver casing may be plugged into the aerial and earth sockets in place of the external aerial leads, when it operates on all positions of the switch control.

First valve **(V1, Osram X79)** is a triode hexode operating as frequency changer with internal coupling. Oscillator grid coils **L12** (S.W.), **L13** (M.W.) and **L14** (L.W.) are tuned manually by **C37,** which is connected via **S22.** Parallel trimming by **C39** (S.W.), **C38** (M.W.) and **C12** (L.W.); series tracking by **C13** (S.W.), **C16** (M.W.) and **C14, C16** (L.W.). Reaction coupling via **L15** (S.W.), and across the common impedance of **C16** (M.W. and L.W.). Oscillator stabilization by **R7.**

For pre-set station operation **S22** opens and **S21** closes, substituting fixed tuning capacitor **C11** in place of **C37.** Reaction coupling is across **C16,** and tuning by **L9, L10** and **L11** whose cores can be adjusted to receive the desired stations.

Second valve **(V2, Osram W77)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C7, L16, L17, C8** and **C18, L18, L19, C19.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of double diode triode valve **(V3, Osram DH77).** A.F. component in rectified output is developed across diode load **R14** and passed via **C22** and volume control **R15** to grid of triode section which operates as A.F. amplifier. On S.W. **S31** opens and **S30** closes, and bass cutting capacitor **C23** is inserted in the A.F. coupling to **R15.**

Provision is made for the connection of a gramophone pick-up across **R15** via **S32** which closes in the gram. position of the waveband switch. In this position **S30** and **S31** open to prevent radio break-through.

Second diode of **V3** is fed via **C24** from **V2** anode, and the resulting D.C. potential developed across **R19** is fed back as bias to **V1** and **V2,** giving automatic gain control.

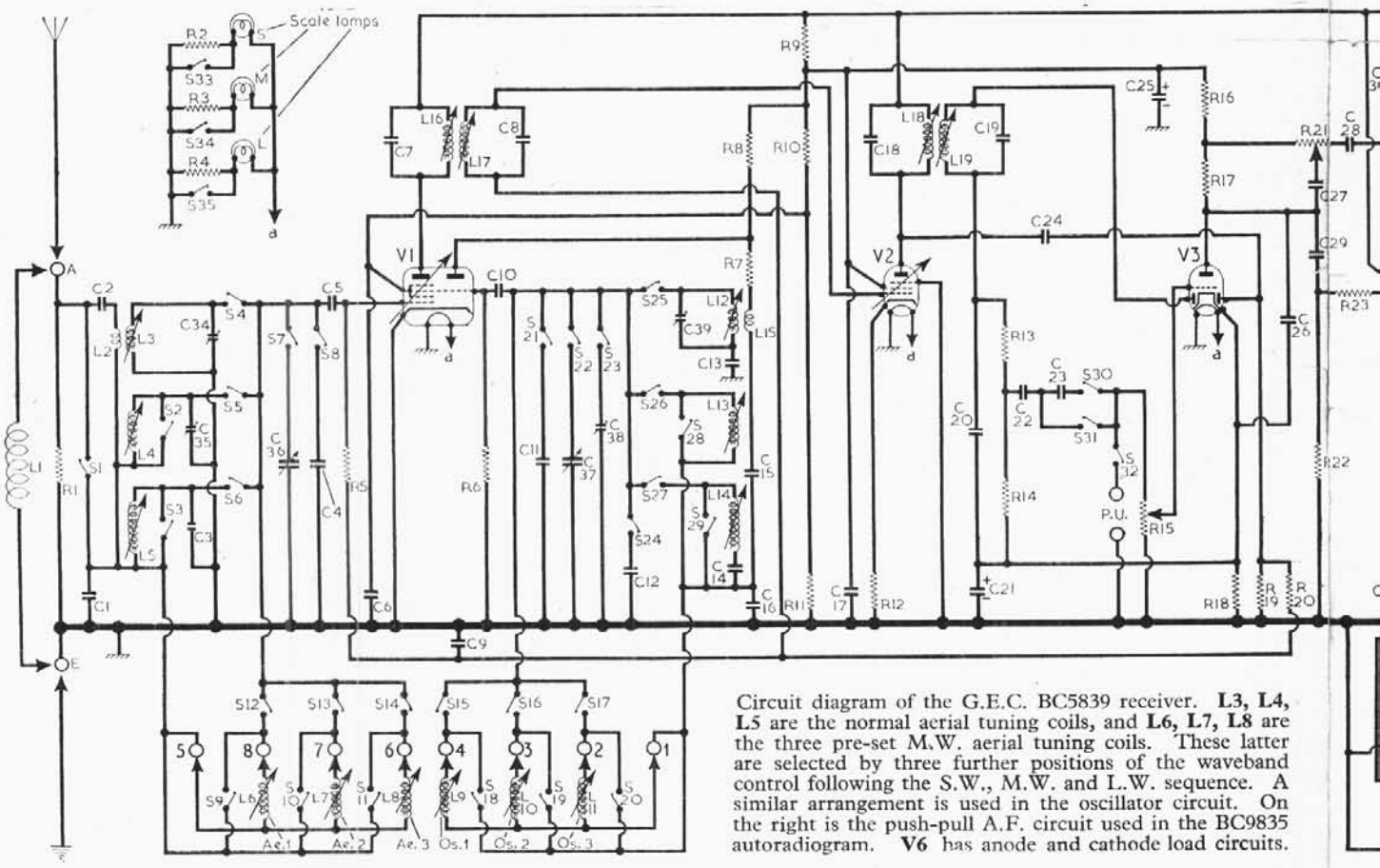
Resistance-capacitance coupling by **R16, R17, C29** and **R22** between **V3** triode and pentode output valve **(V4, Osram N78).** Fixed tone correction by **C30** in **V4** anode circuit, and variable tone control by **R21** in negative feed-back circuit **C28, R21, C27,** between **V4** and **V3** anode. Provision is made for the connection of a low impedance external speaker across **T1** secondary winding.

H.T. current is supplied by I.H.C. full-wave rectifying valve **(V5, Osram U78).** Smoothing by iron-cored choke **L21** and electrolytic capacitors **C32, C33.** In "L" versions, mains voltage adjustment tappings are provided at 115 V, 125 V and 220 V on the mains transformer primary, instead of at 200 V, 230 V and 250 V as in the standard version.

The scale lamps light dimly in all positions of the waveband control, except that on S.W., M.W. or L.W. manual tuning positions the appropriate lamp lights brightly.

In the radiogram model, whose audio frequency circuit is shown as a separate section on the right of our main circuit diagram, treble and bass controls **R26, R27** respectively, together with their associated circuits, are inserted between **S30, S31** and the manual volume control **R15.**

V3 output is coupled to a phase-splitter **(V6, Osram DH77),** whose output is developed across



Circuit diagram of the G.E.C. BC5839 receiver. **L3, L4, L5** are the normal aerial tuning coils, and **L6, L7, L8** are the three pre-set M.W. aerial tuning coils. These latter are selected by three further positions of the waveband control following the S.W., M.W. and L.W. sequence. A similar arrangement is used in the oscillator circuit. On the right is the push-pull A.F. circuit used in the BC9835 autoradiogram. **V6** has anode and cathode load circuits.

COMPONENT VALUES AND LOCATIONS

	CAPACITORS	Values	Locations
C1	Aerial coupling ...	3,950pF	F4
C2	Aerial coupling ...	0·001μF	F5
C3	L.W. aerial trim. ...	82pF	F4
C4	Pre-set aerial tune	200pF	F4
C5	V1 C.G.	100pF	G5
C6	V1 S.G. decoupling	0·05μF	E5
C7	1st I.F. trans. tun.	120pF	D2
C8	1st I.F. trans. tun.	120pF	D2
C9	A.G.C. decoupling	0·05μF	E5
C10	V1 osc. C.G. ...	100pF	E5
C11	Pre-set osc. tune ...	470pF	E3
C12	L.W. osc. trim. ...	120pF	E4
C13	S.W. osc. tracker ...	0·006μF	E4
C14	L.W. osc. tracker ...	270pF	E4
C15	Reaction coupling	0·005μF	E4
C16	M.W. osc. tracker ...	410pF	E4
C17	V2 S.G. decoupling	0·05μF	F5
C18	2nd I.F. trans. tun.	120pF	C2
C19	2nd I.F. trans. tun.	120pF	C2
C20	I.F. by-pass ...	100pF	F5
C21*	V3 cath. by-pass ...	25μF	G4
C22	A.F. coupling ...	0·05μF	F4
C23	S.W. bass cut ..	§0·001μF	E3
C24	A.G.C. coupling ...	22pF	F5
C25*	H.T. smoothing ...	4μF	F4
C26	I.F. by-pass ...	500pF	G5
C27	Part tone control...	500pF	G5
C28	Part tone control...	0·005μF	B1
C29	A.F. coupling ...	0·05μF	G4
C30	Tone corrector ...	0·002μF	B1
C31*	V4 cath. by-pass ...	100μF	G4
C32*	H.T. smoothing ...	16μF	C2
C33*	H.T. smoothing ...	32μF	C2

(Continued next column)

* Electrolytic. § 0·005μF in gram. model.

	CAPACITORS (continued)	Values	Locations
C34‡	S.W. aerial trim. ...	—	F5
C35‡	M.W. aerial trim....	—	E5
C36†	Aerial tuning ...	—	D1
C37†	Oscillator tuning ...	—	D2
C38‡	M.W. osc. trim. ...	—	E5
C39‡	S.W. osc. trim. ...	—	E5
C40	P.U. tone corrector	500pF	—
C41	Part tone controls	0·001μF	—
C42	Part tone controls	0·005μF	—
C43	H.T. by-pass ...	0·25μF	—
C44	A.F. coupling ...	0·05μF	—
C45	A.F. coupling ...	0·05μF	—
C46*	V7, V8 cath. by-passes	50μF	—
C47*	V7, V8 cath. by-passes	50μF	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values	Locations
R1	Mod. hum shunt ...	10kΩ	E5
R2	Scale lamp dimming resistors	7·5Ω	F3
R3	Scale lamp dimming resistors	7·5Ω	F3
R4	Scale lamp dimming resistors	7·5Ω	F3
R5	V1 C.G.	1MΩ	E5
R6	V1 osc. C.G. ...	100kΩ	E5
R7	Osc. stabilizer ...	470Ω	E5
R8	Osc. anode feed ...	15kΩ	E5

(Continued next column)

The G.E.C. table model BC5839.

	RESISTORS (continued)	Values	Locations
R9	H.T. potential divider	*8·2kΩ	F5
R10	H.T. potential divider	56kΩ	F4
R11	H.T. potential divider	22kΩ	F4
R12	V2 G.B.	270Ω	F5
R13	I.F. stopper ...	56kΩ	F5
R14	Diode load	†470kΩ	G5
R15	Volume control ...	1MΩ	F3
R16	V3 anode load ...	100kΩ	G5
R17	V3 anode load ...	100kΩ	G5
R18	V3 G.B.	2·2kΩ	G5
R19	A.G.C. diode load ...	470kΩ	G5
R20	A.G.C. decoupling	1MΩ	G5
R21	Tone control ...	500kΩ	G3
R22	V4 C.G.	270kΩ	G5
R23	V4 C.G. stopper ...	10kΩ	G4
R24	V4 G.B.	120Ω	G3

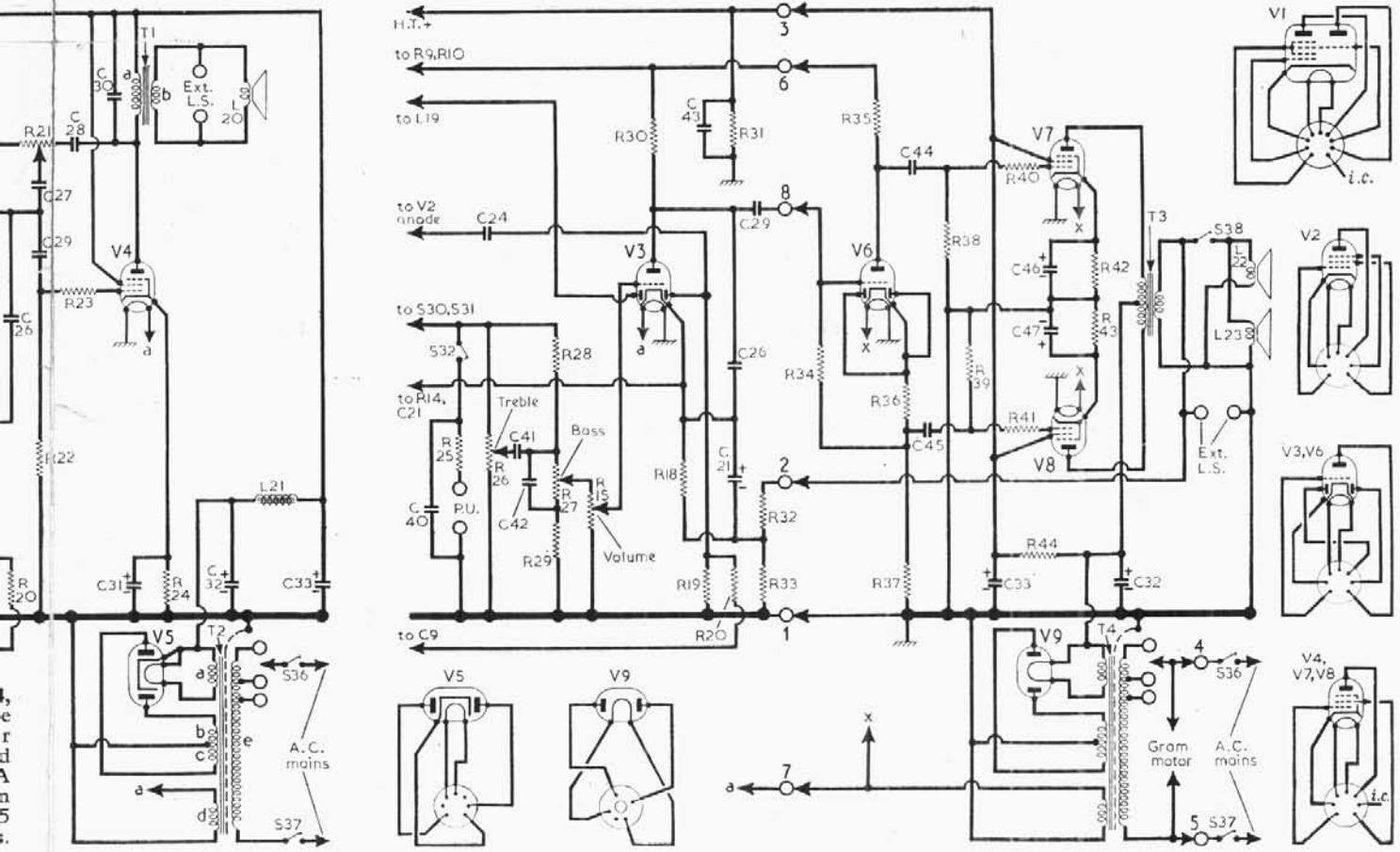
(Continued overleaf)

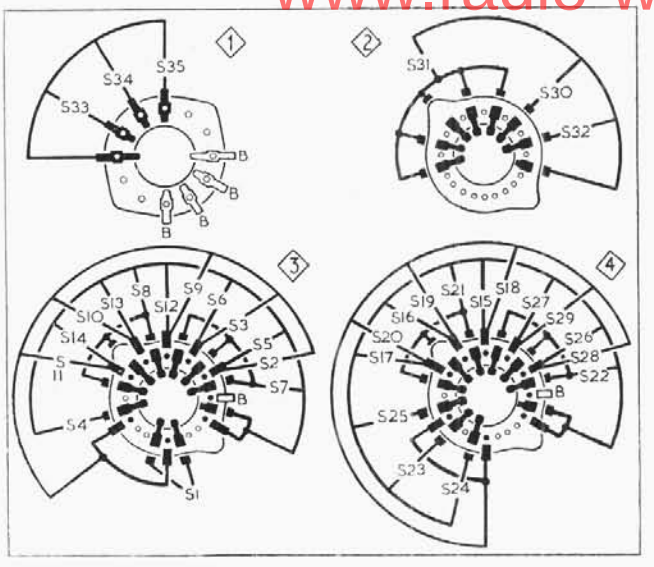
* 10k Ω in gram models. † 100k Ω in gram models.

R35 and **R37** and is fed to a push-pull output stage comprising two pentode valves **(V7, V8, Osram N78's).** The speech coil voltages developed across **T3** secondary are tapped off via the potential divider **R32, R33** and fed back to **V3** cathode circuit, giving tone correction.

A tone-filter network **R25, C40** is added to the pick-up input circuit.

H.T. current in the radiogram model is supplied by full-wave rectifying valve **(V9, Osram U50).** Smoothing by **R44** and electrolytic capacitors **C32** and **C33.**





Diagrams of the waveband switch units, drawn as seen when viewed in the directions of the arrows in the underside chassis illustration opposite. On the right is the associated switch table.

Switch	Gram	S.W.	M.W.	L.W.	1	2	3
S1	—	—	—	C	—	—	—
S2	C	C	—	C	C	C	C
S3	C	C	C	—	C	C	C
S4	—	C	—	—	—	—	—
S5	—	—	C	—	—	—	—
S6	—	—	—	C	—	—	—
S7	—	C	C	C	—	—	—
S8	—	—	—	—	C	C	C
S9	C	C	C	C	C	C	C
S10	C	C	C	C	C	—	C
S11	C	C	C	C	C	C	—
S12	—	—	—	—	C	—	—
S13	—	—	—	—	—	C	—
S14	—	—	—	—	—	—	C
S15	—	—	—	—	C	—	—
S16	—	—	—	—	—	C	—
S17	—	—	—	—	—	—	C
S18	C	C	C	C	—	C	C
S19	C	C	C	C	C	—	C
S20	C	C	C	C	C	C	—
S21	—	—	—	C	C	C	C
S22	—	C	C	C	—	—	—
S23	—	—	C	—	—	—	—
S24	—	—	—	C	—	—	—
S25	—	C	—	—	—	—	—
S26	—	—	C	—	—	—	—
S27	—	—	—	C	—	—	—
S28	C	C	—	C	C	C	C
S29	C	C	C	—	C	C	C
S30	—	C	—	—	—	—	—
S31	—	—	C	C	C	C	C
S32	C	—	—	—	—	—	—
S33	—	C	—	—	—	—	—
S34	—	—	C	—	—	—	—
S35	—	—	—	C	—	—	—

RESISTORS (*continued*)		Values	Locations
R25	P.U. tone corrector	220kΩ	—
R26	Tone controls	500kΩ	—
R27	Tone controls	1MΩ	—
R28	Part tone controls	220kΩ	—
R29	Part tone controls	220kΩ	—
R30	V3 anode load	150kΩ	—
R31	H.T. shunt	34kΩ	—
R32	Negative feed-back	390Ω	—
R33	Negative feed-back	10Ω	—
R34	V6 C.G.	470kΩ	—
R35	V6 anode load	47kΩ	—
R36	V6 G.B.	2·2kΩ	—
R37	V6 cathode load	47kΩ	—
R38	V7, V8 C.G. resistors	220kΩ	—
R39	V7, V8 C.G. resistors	220kΩ	—
R40	V7, V8 C.G. stoppers	10kΩ	—
R41	V7, V8 C.G. stoppers	10kΩ	—
R42	V7, V8 G.B.	330Ω	—
R43	V7, V8 G.B.	330Ω	—
R44	H.T. smoothing	3·9kΩ	—

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Frame aerial	0·2	—
L2	S.W. aerial coup.	—	F4
L3		—	F4
L4	Aerial tuning coils	2·0	F4
L5	Aerial tuning coils	17·0	F4
L6	Pre-set aerial tuning coils	2·4	—
L7	Pre-set aerial tuning coils	2·4	—
L8	Pre-set aerial tuning coils	2·4	—
L9	Pre-set osc. tuning coils	0·8	—
L10	Pre-set osc. tuning coils	0·8	—
L11	Pre-set osc. tuning coils	0·8	—
L12	Oscillator tuning coils	0·3	E4
L13	Oscillator tuning coils	3·0	E4
L14	Oscillator tuning coils	6·8	E4
L15	S.W. reaction coup.	—	E4
L16	1st I.F. trans. Pri.	9·5	D2
L17	1st I.F. trans. Sec.	9·5	D2
L18	2nd I.F. trans. Pri.	10·5	C2
L19	2nd I.F. trans. Sec.	10.5	C2
L20	Speech coil	2·5	—
L21	Smoothing choke	510·0	H4
T1	O.P. transformer a	560·0	B1
T1	O.P. transformer b	0·5	B1
T2	Mains transformer a	0·5	A2
T2	Mains transformer b	28·0	A2
T2	Mains transformer c	28·0	A2
T2	Mains transformer d	—	A2
T2	Mains transformer e, total	36·0	A2
S1-S35	Waveband switches	—	E4
S36, S37	Mains sw., g'd R15	—	F3

GENERAL NOTES

Switches.—**S1-S29** are the waveband and pre-set tuning switches, **S30, S31, S32** are the radio/gram change-over switches, and **S33, S34, S35** are the scale lamp switches, all ganged in four rotary units mounted beneath the chassis. These units are indicated in our underside drawing of the chassis, and shown in detail in the diagrams in cols. 1 and 2, where they are drawn as seen when viewed in the directions of the arrows in the chassis drawing.

The table in column 3 gives the switch positions for the seven control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S36, S37 are the Q.M.B. mains switches, ganged with the volume control **R15.**

Scale Lamps.—These are three Osram type OS75 lamps, with M.E.S. bases and small clear spherical bulbs, rated at 6.5 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 2-4 Ω) external speaker, a pair of plugs being provided with the receiver.

RADIOGRAM MODIFICATIONS

The differences between the radiogram model BC9835 and the table receiver from which this information was compiled are confined to the A.F., output and H.T. smoothing circuits. The A.F. and output circuits are quite different, involving push-pull output and twin speakers.

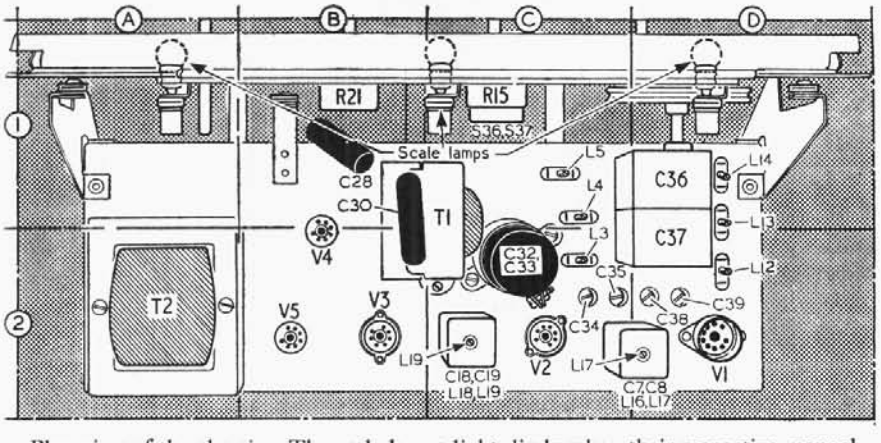
The electrical differences are shown in the section diagram on the right of our main circuit diagram overleaf, where the points of interconnection with the main circuit are indicated.

The chassis layout is considerably modified, because the phase inverting and output valves, together with the power supply unit, are mounted in a separate chassis. Interconnections between this and the main chassis are effected via a plug and socket arrangement. The plug is an octal, and the pin numbers are shown in the diagram in a vertical row between **V3** and **V6.**

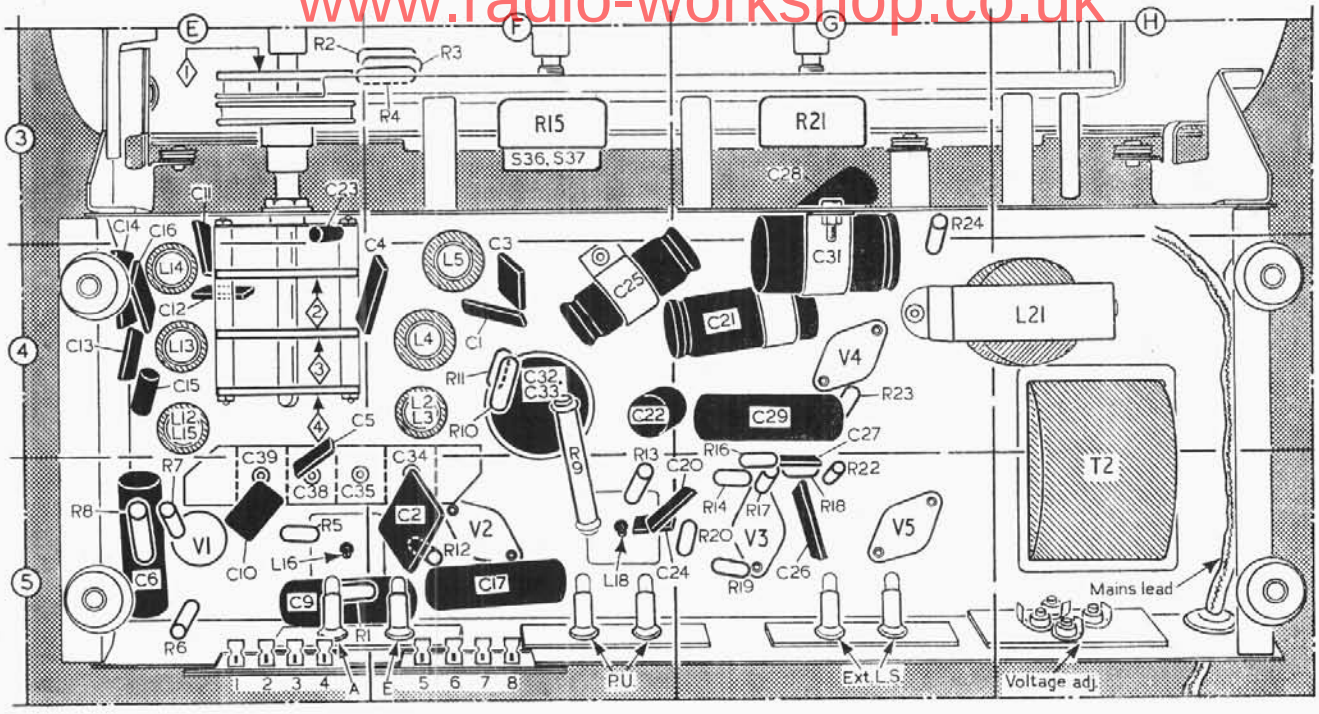
Component values that become changed in the radiogram chassis are indicated in the component tables. Added or changed components bear different numbers, and take the place in the tables in the normal sequence, after the last numbers of the table model.

An additional control spindle appears on the main chassis, the single tone control being replaced by separate treble and bass controls. The central spindle is for volume and on/off, and the treble and bass controls are disposed to the right and left of it respectively, when viewed from the front.

Pre-set Coils.—The six pre-set tuning coils **L6-L11** are mounted in a small assembly on the



Plan view of the chassis. The scale lamps light dimly when their respective manual tuning bands are not in use, but when one of these bands is active its lamp lights up brightly.



Underside view of the chassis. The eight sockets by which the back cover, carrying the pre-set tuning coils, is connected are identified at locations E5 and F5. Diagrams of the waveband switch units, numbered **1-4** in diamonds, appear at the head of cols. 1 and 2.

back cover of the receiver, and they are connected to the chassis via a row of eight plug pins which engage with a row of sockets on the rear chassis member. These sockets are numbered **1** to **8** in our circuit diagram and are indicated in our underside view of the chassis.

Frame Aerial Winding.—This is **L1** and consists of a few turns of wire on supports inside the back cover of the receiver. Its connecting plugs are on flexible leads.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch receiver to L.W. and turn gang to maximum. Connect signal generator output, via an 0.1 μF capacitor in the "live" lead, to control grid (pin 2) of **V1** and chassis. Feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L19** (location reference C2), **L18** (F5), **L17** (D2) and **L16** (E5) for maximum output.

R.F. and Oscillator Stages.—As the tuning scale does not indicate the exact trimming and tracking points, it is necessary to remove the chassis from its cabinet so that the substitute tuning scale, printed on the cursor carriage slide, can be used for accurate settings of the gang. This substitute scale has 90 divisions, readings being taken against the right-hand edge (viewed from front) of the cursor carriage.

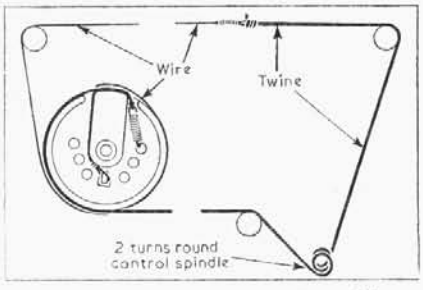
Check that with gang at maximum capacitance, the substitute scale reading is 90, and that when the chassis is in its cabinet, the cursors coincide with the dots at the high wavelength ends of the scales. If the adjustments are carried out with the back cover unplugged, a 15 pF capacitor should be shunted across **C16**.

S.W.—Switch receiver to S.W., tune to 60.5 on substitute scale and transfer signal generator leads to **A** and **E** sockets. Feed in a 7.5 Mc/s (40 m) signal and adjust the cores of **L12** (D2) and **L3** (C2) for maximum output. Tune receiver to 5.5 on scale, feed in an 18 Mc/s (16.67 m) signal and adjust **C39** (D2) and **C34** (C2) for maximum output. Repeat these adjustments.

M.W.—Switch receiver to M.W., tune to 70 on scale, feed in a 600 kc/s (500 m) signal and adjust the cores of **L13** (D2) and **L4** (C1) for maximum output. Tune receiver to 9.5 on scale, feed in a 1,400 kc/s (214.3 m) signal and adjust **C38** (D2) and **C35** (C2) for maximum output. Repeat these adjustments.

L.W.—Switch receiver to L.W., tune to 30.5 on scale, feed in a 230 kc/s (1,304 m) signal and adjust the cores of **L14** (D1) and **L5** (C1) for maximum output. Repeat these adjustments.

Pre-set Stations.—Replace chassis in cabinet, and fit back cover. Remove pre-set adjustment cover from right-hand side of back cover and switch receiver to M.W. Reading from left to right the adjustments thus exposed are as follows: Aerial 1, 2, 3; Oscillator 1, 2, 3. When adjusting the pre-sets to a desired station the



Sketch showing the tuning drive system, drawn as seen from the front with the gang at maximum. The drawing has been broken to omit the central run.

No. 1, 2 or 3 aerial and oscillator sliders should be set so that their top edges roughly coincide with the wavelength of the desired station, as indicated on the individual scales. The station can then be accurately tuned in by use of the screwdriver type vernier adjustments in the centres of the sliders.

DRIVE CORD REPLACEMENT

The tuning drive cord consists of two parts, one of wire and one of twine. Fine gauge Bowden cable with soldered end loops (21⅛in long overall in our sample) can be used for the one, and high-grade flax fishing line, plaited and waxed (27⅛in in our sample) can be used for the other. These lengths are not critical, however, so long as the overall length is 48⅛in.

The combined cord should be run as shown in the accompanying sketch, where the system is drawn as seen from the front when the gang is at maximum capacitance.

VALVE ANALYSIS

Valve voltages and currents given in the tables below are those derived from the manufacturers' information, and were measured with the receivers operating from A.C. mains of 230 V. The receivers were switched to M.W. and tuned to 200 m, but there was no signal input.

Voltage readings were measured on the 15 V and 750 V ranges of a 1,000 ohms per-volt meter, chassis being the negative connection.

Table Model

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 X79	243 Oscillator 123	0·7 3·6	35	0·9	—
V2 W77	243	6·0	177	1·5	2·0
V3 DH77	77	0·5	—	—	1·9
V4 N78	225	32·0	243	5·5	4·5
V5 U78	—	—	—	—	280·0*

* Cathode current 52.5 mA.

Gram Model

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 X79	264 Oscillator 116	0·75 3·8	35	0·8	—
V2 W77	264	5·5	173	1·6	1·9
V3 DH77	92	0·45	—	—	1·0
V6 DH77	140	0·6	—	—	30·0
V7 N78	368	17·0	264	2·5	6·4
V8 N78	368	17·0	264	2·5	6·4
V9 U50	—	—	—	—	373·0†

† Cathode current 62mA.

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