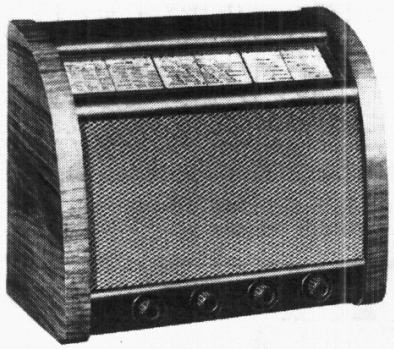
"TRADER" SERVICE SHEET
1005

G.E.C. BC5639
and BC6638



The appearance of the G.E.C. BC5639 and BC6638 superhets.

TWO 4-valve (plus rectifier) 3-band G.E.C. superhets are covered in this *Service Sheet* : the BC5639, which is designed to operate only from A.C. mains of 190-250V, 40-100 c/s; and the BC6638 which operates from A.C. or D.C. mains of 200-250V, 25-100 c/s.

The waveband ranges are 13.5-50 m, 187.5-575 m and 1,000-2,000 m. The tuning scale is divided into three waveband sections, each with its own cursor and scale lamp, the section in use being more brightly illuminated than the other two.

Our circuit diagram is based on the A.C. model but apart from the aerial, A.F. and mains input circuits, the two models are similar. The differences in the A.C./D.C. model are shown in section diagrams at either end of the A.C. diagram, the center section remaining identical in both versions.

This *Service Sheet* was prepared on the BC5639, but the information applies equally to the BC6638 unless some note is made as to a difference.

Release dates and original prices : BC5639, *August* 1950, £18 3s. 3d. *increased May* 1951 to £19 2s. 5d; BC6638, *September* 1950, £19 0s. 7d., *increased May* 1950 *to* £19 2s. 5d. *Purchase tax extra.*

CIRCUIT DESCRIPTION

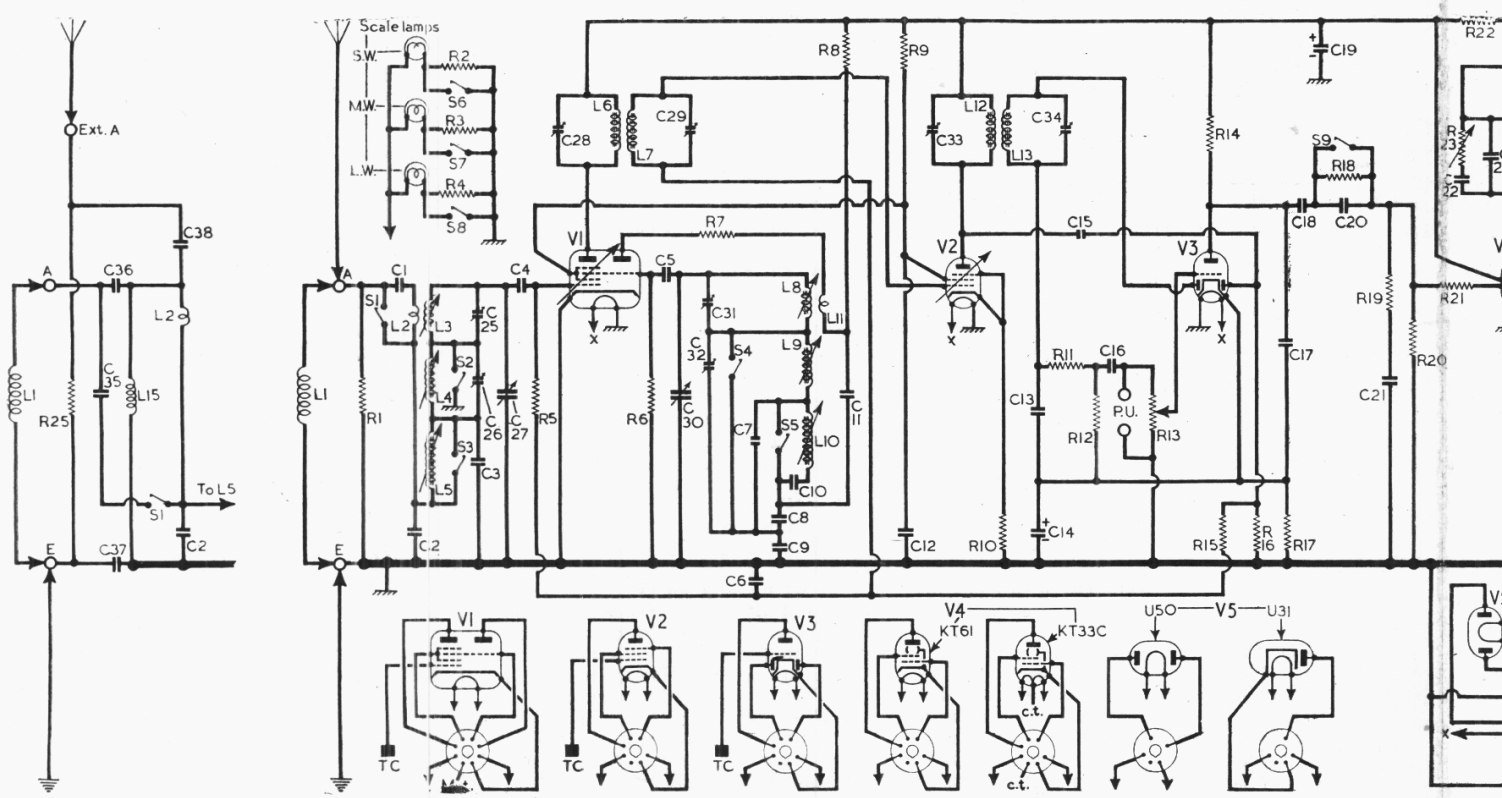
Aerial input on M.W. and L.W. across the common impedance of **C2** to single tuned circuits **L4, C27** (M.W.) or **L5, C27** (L.W.). On S.W. aerial input is via **C1** and coupling coil **L2** to single tuned circuit **L3, C27.** On L.W. **C1** and **L2** are shorted out by **S1.** Provision is made for the use of internal frame aerial **L1** where the signal strength is adequate. Modulation hum is by-passed by **R1.** In the A.C./D.C. model a separate external aerial socket is provided and modulation hum is by-passed by **L15.**

First valve **(V1, Osram X61M)** is a triode-hexode operating as frequency changer with internal coupling. Oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C30.** Parallel trimming by **C31** (S.W.), **C32** (M.W.) and **C7** (L.W.); series tracking by **C9** (S.W.), **C8, C9** (M.W.) and **C8, C9, C10** (L.W.). Reaction coupling from anode via **C11** across the common impedance of the trackers, with additional inductive coupling on S.W. via **L11.** Stabilization by **R7.**

Second valve (**V2, Osram W61 or KTW61)** is a variable-mu R.F. pentode with tuned transformer couplings **C28, L6, L7, C29** and **C33, L12, L13, C34.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of double diode triode valve **(V3, Osram DH63).** Audio frequency component in rectified output is developed across diode load resistor **R12,** and passed via **C16** and volume control **R13** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C13, R11** and the capacitance of the screened connecting leads.



Circuit diagram of the G.E.C. BC5639 A.C. 3-band superhet, with the differences in the aerial, A.F. and mains input circuits of the BC6638 indicated fitted to the cabinet back cover, for use in place of the external aerial and earth. The output transformer leads have been coded **a-e**

Provision is made for the connection of a gramophone pick-up across **R13.**

Second diode of **V3** is fed from **V2** anode via **C15** and the resulting D.C. potential developed across load resistor **R16** is fed back as bias to F.C. and I.F. stages, giving automatic gain control.

Resistance-capacitance coupling by **R14, C18** and **R20,** via stopper **R21,** between **V3** triode and control grid of beam pentode output valve **(V4, Osram KT61** (A.C. Model) or **KT33C** (A.C./D.C. Model)**).** Tone control by **R18, C20** and **S9** (which closes on S.W.), by **R19, C21** in **V4** grid circuit, and by the negative feedback voltage developed across bias resistor **R24.** Variable tone control by **C22, C23** and **R23.** Provision is made for the connection of a low impedance external speaker across **T1** secondary winding.

H.T. current is supplied by full-wave rectifying valve **(V5, Osram U50** (A.C. Model) or **U31** (A.C./D.C. model)**)** and smoothed by **R22** and electrolytic capacitors **C19** and **C24,** residual hum being neutralized by passing the current through part of the primary winding of the output transformer **T1.**

Separate scale lamps are used to illuminate the three different waveband scales, those not in use being dimmed on the A.C. model by the insertion of series resistors **R2, R3** or **R4**; or in the A.C./D.C. model by resistors **R26, R28** or **R33.**

In the A.C./D.C. model, valve heaters, together with scale lamps and their associated resistors, ballast resistor and filter chokes **L16, L17,** are connected in series across the mains input. R.F. filtering by **C43, L16** and **L17.**

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the makers' information and were measured on receivers operating from 230V A.C. mains, tuned to 300m on M.W. There was no signal input.

Voltage readings were measured on a 1,000 ohms-per-volt meter, using the 750 V and 15V ranges. Chassis was the negative connection.

A.C. Model

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 X61M	188	0·7	33	1·5	—
	Oscillator				
	90	3·0			
V2 W61	188	4·7	33	1·5	0·6
V3 DH63	113	0·7	—	—	1·4
V4 KT61	285	30·0	188	5·0	3·3
V5 U50	267†	—	—	—	302·0

† A.C.

A.C./D.C. Model

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 X61M	148	1·0	40	2·7	—
	Oscillator				
	130	5·0			
V2 W61	148	6·0	40	1·8	0·7
V3 DH63	80	0·5	—	—	1·1
V4 KT33C	193	58·0	148	9·0	8·0
V5 U31	223†	—	—	—	205·0

† A.C.

COMPONENTS AND VALUES

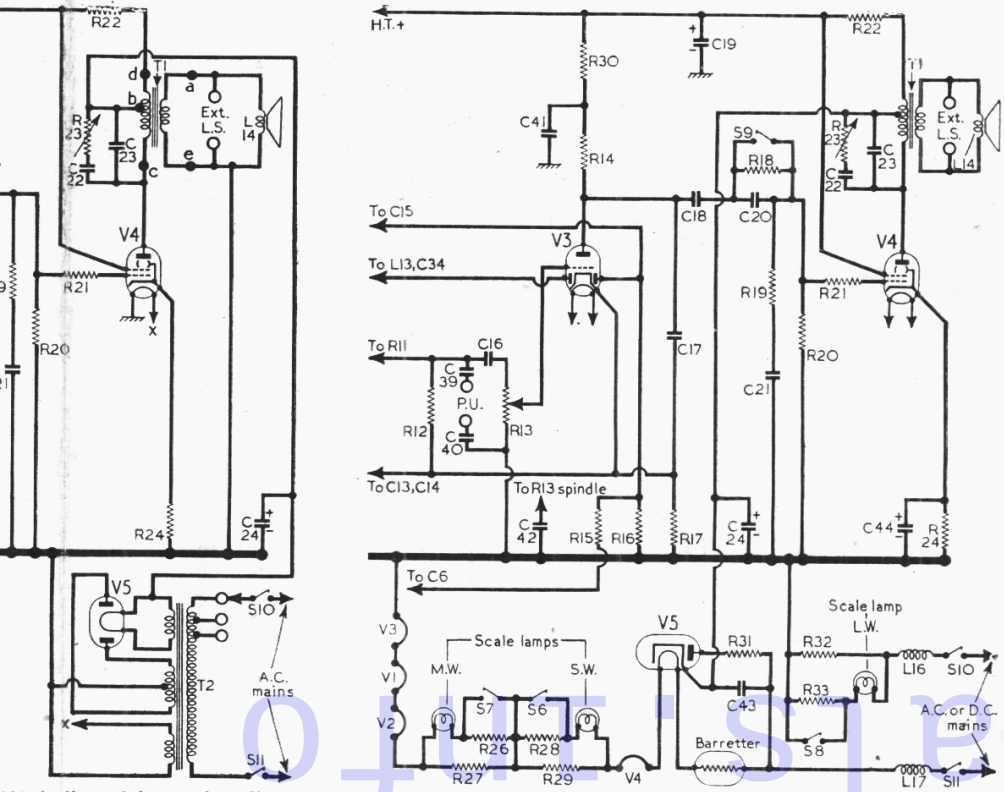
CAPACITORS	A.C. Model		A.C./D.C. Model
	Values	Locations	Values
C1	0·0011μF	D4	—
C2	0·008μF	E3	0·008μF
C3	47pF	E3	47pF
C4	100pF	D4	100pF
C5	100pF	D4	100pF
C6	0·05μF	D4	0·05μF
C7	82pF	D3	82pF
C8	470pF	D3	470pF
C9	0·006μF	D3	0·006μF
C10	270pF	D3	270pF
C11	0·005μF	D4	0·005μF
C12	0·05μF	E4	0·05μF
C13	300pF	E4	300pF
C14*	25μF	F3	25μF
C15	22pF	E4	22pF
C16	0·02μF	E4	0·02μF
C17	500pF	F4	500pF
C18	0·02μF	F4	0·02μF
C19*	32μF	B1	32μF
C20	200pF	D3	200pF
C21	0·0015μF	F4	0·0015μF
C22	0·05μF	F3	0·1μF
C23	0·005μF	F4	0·01μF
C24*	16μF	B1	32μF
C25‡	—	D4	—
C26‡	—	D3	—
C27†	—	C1	—
C28‡	—	C2	—
C29‡	—	C2	—
C30†	—	C1	—
C31‡	—	D4	—
C32‡	—	D3	—
C33‡	—	B2	—
C34‡	—	B2	—
C35	—	—	0·02μF
C36	—	—	0·001μF
C37	—	—	0·02μF
C38	—	—	0·001μF
C39	—	—	0·01μF
C40	—	—	0·01μF
C41*	—	—	4μF
C42	—	—	0·01μF
C43	—	—	0·01μF
C44*	—	—	100μF

* Electrolytic. † Variable. ‡ Pre-set.

RESISTORS	A.C. Model		A.C./D.C. Model
	Values	Locations	Values
R1	10kΩ	D4	—
R2	7·5Ω	C1	—
R3	7·5Ω	C1	—
R4	7·5Ω	C1	—
R5	1MΩ	D4	1MΩ
R6	100kΩ	D4	68kΩ
R7	390Ω	D4	390Ω
R8	33kΩ	D4	2·7kΩ
R9	47kΩ	E4	27kΩ
R10	90Ω	E4	90Ω
R11	56kΩ	E4	56kΩ
R12	470kΩ	E4	470kΩ
R13	1MΩ	E3	1MΩ
R14	100kΩ	F4	100kΩ
R15	1MΩ	F4	1MΩ
R16	470kΩ	F4	470kΩ
R17	2·2kΩ	F4	2·2kΩ
R18	680kΩ	D3	680kΩ
R19	150kΩ	F4	150kΩ
R20	330kΩ	F4	330kΩ
R21	10kΩ	F3	100kΩ
R22	6·8kΩ	F3	2·2kΩ
R23	55kΩ	F3	55kΩ
R24	100Ω	F4	120Ω
R25	—	—	1MΩ
R26	—	—	19·5Ω*
R27	—	—	100Ω
R28	—	—	19·5Ω*
R29	—	—	100Ω
R30	—	—	18kΩ
R31	—	—	100Ω
R32	—	—	27Ω
R33	—	—	12Ω

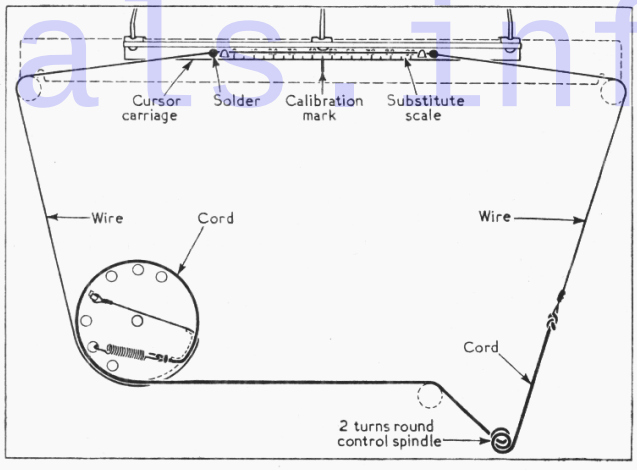
* Two 39Ω resistors in parallel.

If the component numbers in the above tables are used when ordering replacements, dealers are advised to mention the fact on the order, as these numbers may differ from those used in the manufacturers' diagram.



538 indicated in section diagrams at either end of the main A.C. circuit. An optional frame aerial is coded **a-e** to correspond with the lettered tags shown in our under-chassis view.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerial coil ...	0·4	—
L2	S.W. aerial coup. ...	0·2	E4
L3	Aerial tuning coils	—	E4
L4	Aerial tuning coils	2·0	E3
L5	Aerial tuning coils	18·0	E3
L6	1st I.F. trans. Pri.	6·5	C2
L7	1st I.F. trans. Sec.	6·5	C2
L8	Oscillator tuning coils	—	D4
L9	Oscillator tuning coils	3·2	D3
L10	Oscillator tuning coils	6·5	D3
L11	S.W. reaction coil...	0·3	D4
L12	2nd I.F. trans. Pri.	3·5	B2
L13	2nd I.F. trans. Sec.	3·5	B2
L14	Speech coil ...	3·0	—
T1	O.P. trans. d-b ...	20·0	—
T1	O.P. trans. b-c ...	580·0	E3
T1	O.P. trans. a-e ...	0·5	
T2	Primary, total ...	30·0	
T2	H.T. sec., total ...	300·0	A2
T2	Rec. heater ...	0·2	
T2	Valve heater ...	0·2	
S1-S9	Waveband switches	—	D3
S10, S11	Mains sw., g'd R13	—	E3



Sketch of the tuning drive system, showing the substitute tuning scale and calibration mark referred to in the circuit alignment. It is drawn as seen when viewed from the front of the chassis with the gang at maximum.

GENERAL NOTES

Switches.—**S1-S5** are the waveband switches, and **S6-S8** are the scale lamp switches, ganged in two rotary units beneath the chassis.

Both of these units are indicated in our underchassis view, and shown in detail in the diagram in col. 4 where the waveband unit is drawn as viewed from the rear, and the scale lamp unit as viewed from the front, of an inverted chassis.

The table in col. 4 gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S10, S11 are the Q.M.B. mains switches, ganged with the volume control **R13.**

Scale Lamps.—These are rated at 6.5V, 0.3A. They have small clear spherical bulbs and M.E.S. bases. The maker's type number for them is O.S.75 and they are the same in the A.C. and the A.C./D.C. models.

External Speaker.—Sockets are provided at the rear of the chassis for the connection of a low impedance (2-4 Ω) external speaker. In the A.C. models the speech coil circuit is connected to chassis, but in the A.C./D.C. models it is not.

P.U.—Sockets are provided at rear of the chassis for the connection of a gramophone pick-up, and when these are in use, the receiver should be switched to S.W. and tuned to a quiet spot on the scale. Muting is assisted if the aerial plug is removed.

Modifications.—In some models the I.F. transformers may be adjusted by means of pre-set dust-iron cores in the coils instead of pre-set trimmers, the trimmers being replaced by 120pF fixed capacitors.

In earlier models **C1** and **S1** were omitted and the aerial input went direct to **L2.**

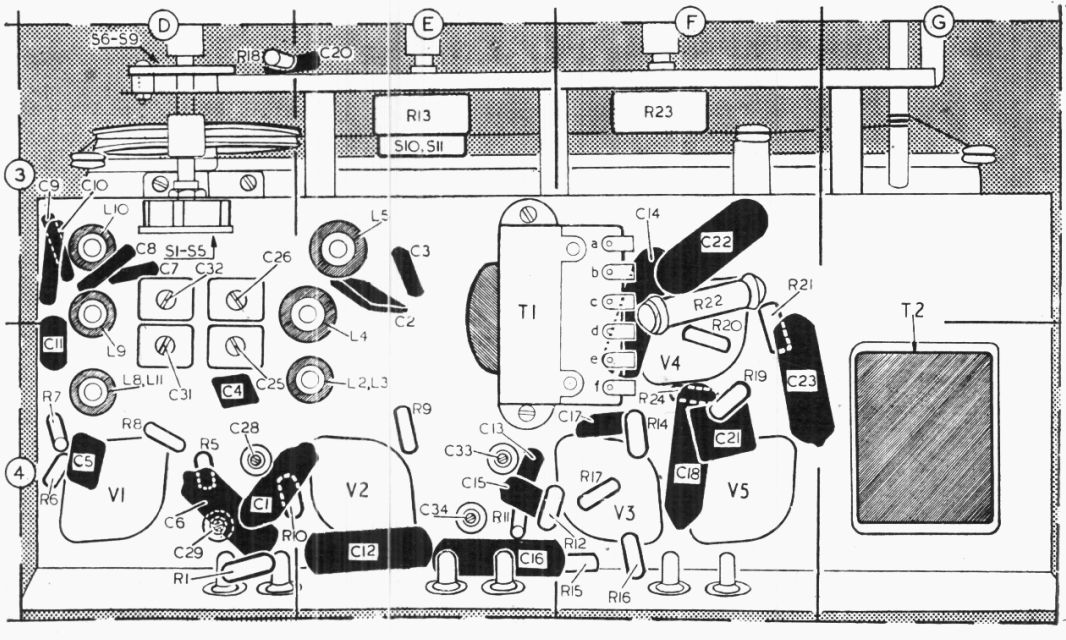
A rubber retaining ring is fitted to **V2** and holds it, and the screening can, firmly in position.

In some models **V2** may be an Osram KTW61 and as this has a larger circumference than the W61, the rubber retaining ring is not fitted. **R10** is also omitted where this valve is fitted, and the cathode is connected to chassis.

Drive Cord Replacement.—The drive cord for the tuning system consists of two sections, one part being a length of stranded steel wire, and one of stout twine, and it is convenient to make up the two sections and tie them together before fitting them. Suitable materials for the cord may be obtained from the G.E.C. Service Depot, Greycoat Street, Westminster, London, S.W.1.

Make up the wire with a loop of about $\frac{1}{8}$ inch diameter at each end so that it measures 34 inches overall. Take about 30 inches of the twine and tie one end of it with a non-slip knot to one end of the wire. The wire joints can easily be sealed by a touch of solder, and it is advisable to apply a dab of cellulose or some sealing compound to the twine knot.

Turn the gang to maximum, when the drum should take up the position shown in our sketch above. Hook the free end of the wire to the anchor tag shown and run the wire across to the upper slot and then clockwise round the drum for

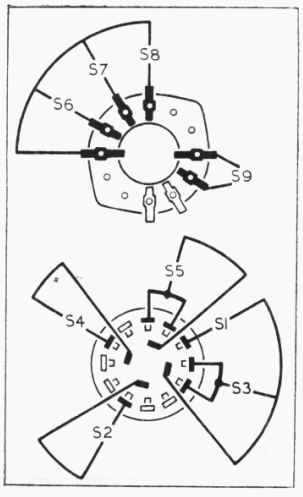


Underside drawing of the chassis, showing the I.F. and some of the R.F. adjustments. The lettered tags on the output transformer **T1** correspond to similarly coded points in the circuit diagram, tag **f** being used as an anchor point for **R14** and the H.T. line.

half a turn, taking it off to the cursor carriage as shown in the sketch.

Continuing with twine, make two turns clockwise round the control spindle, starting from the outer end of the spindle (so that the turns travel inwards when the spindle is turned) and so on round to the gang drum. There tie on the twine fairly short to one end of the tension spring, hooking the other end of the spring in the appropriate hole to give the required tension.

Solder the wire to the cursor carriage at either end of the substitute tuning scale and check that the zero line on the scale coincides with the calibration mark.



Diagrams of the scale lamp switch unit (top) and waveband switch unit (bottom). They are viewed in the direction of the arrows in the underchassis view. The associated switch table appears below.

Switches	S.W.	M.W.	L.W.
S1	—	—	C
S2	C	—	—
S3	C	C	—
S4	C	—	—
S5	C	C	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—

DISMANTLING THE SET

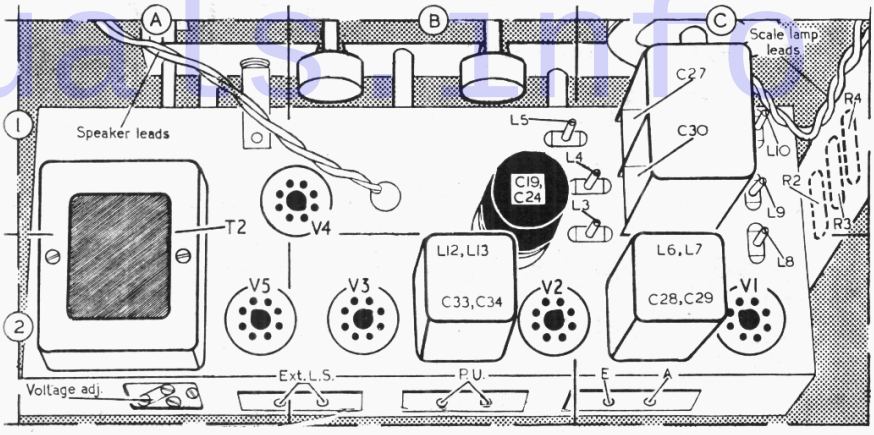
The majority of the under chassis components can be made accessible upon removing the cabinet base cover, held by six wood screws with washers.

Removing Chassis.—Remove four control knobs (pull off) with felt washers;
remove four 2BA chassis bolts with lock washers and plain washers;
withdraw chassis to extent of speaker leads and unsolder these from the speech coil tags.

When replacing, connect the black speaker lead to the left hand side speech coil tag.

Removing Speaker.—Remove the four 4BA cheese-head bolts with washers securing the circumference of the speaker to the baffle, and withdraw speaker. The baffle may also be withdrawn by removing the four woodscrews securing it to the cabinet.

When replacing, check that the speech coil tags are at the bottom.



Plan view of the chassis showing the rest of the R.F. alignment adjustments. The scale lamp series resistors are mounted on the outside of the scale backing plate.

CIRCUIT ALIGNMENT

For the following alignment the chassis should be withdrawn from the cabinet, and as the tuning scale remains fixed in the cabinet reference must be made to the substitute tuning scale printed on the cursor carriage. Readings on this scale are taken against the vertical mark in the middle of the cursor carriage rail, as indicated in our sketch of the tuning drive in cols. 2 and 3. Disconnect frame aerial.

I.F. Stages.—Connect signal generator output leads, via a 0.01μF capacitor in each lead, to control grid (top cap) of **V1** and chassis, switch set to L.W. and turn gang to maximum. Feed in a 470 kc/s (638.3 m) signal and adjust **C34, C33** (location reference E4), **C29, C28** (D4) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. effects. Repeat these adjustments.

R.F. and Oscillator Stages.—Check that with the gang at maximum capacitance the substitute tuning scale reads zero. This may be adjusted by slackening off the two fixing screws in the drive drum bush, holding the gang at maximum capacitance and rotating the drive drum independantly of it. Transfer signal generator leads to **A** and **E** sockets, leaving frame aerial disconnected.

S.W.—Switch set to S.W., tune to 3.5 on substitute scale, feed in a 50 m (6 Mc/s) signal and adjust the cores of **L8** (C2) and **L3** (C2) for maximum output. Feed in a 16.67 m (18 Mc/s) signal, tune to 80 on substitute scale and adjust **C31** (D4) and **C25** (D4) for maximum output. Repeat these adjustments.

M.W.—Switch set to M.W., tune to 19 on substitute scale, feed in a 500m (600 kc/s) signal and adjust the cores of **L9** (C1) and **L4** (C1) for maximum output. Feed in a 214.3m (1,400 kc/s) signal, tune to 80 on the substitute scale and adjust **C32** (D3) and **C26** (D3) for maximum output. Repeat these adjustments.

L.W.—Switch set to L.W., tune to 52.5 on substitute scale, feed in a 1,304m (230 kc/s) signal and adjust the cores of **L10** (C1) and **L5** (C1) for maximum output.

Radio Service Hints

FERRANTI 147

It is fairly well known that freakish results may be expected when the tuning gang earthing wipers get dirty. A new angle to this, however, was experienced recently on this model, and has since been found on others.

The complaint of intermittent weakness was traced to the A.G.C. line feeding the F.C. valve. The A.G.C. line is decoupled to one earthing wiper of the tuning gang and the chassis is connected to the second wiper. It is obvious that dirt on the wipers will result in the A.G.C. decoupling capacitor (C2 in *Trader* Service Sheet 897) being disconnected from the chassis and associated tuning circuit, with detuning of the F.C. grid circuit.

The trouble was overcome by bridging the unearthed wiper to chassis with a short piece of wire.—**E.C.S.**, *Darlington.*

COSSOR 470 A.C.

This model was silent on all three wavebands and a brief inspection soon revealed that the cause was an H.T. short circuit, as D.C. volts everywhere were either very low or non-existent, the rectifying valve was over-heating and the 7½ watt, 1.5 kΩ smoothing resistor was rapidly blistering.

Naturally we immediately suspected a short circuit in one of the electrolytic smoothing capacitors, and put our ohm meter across each one in turn. To our surprise, however, we only obtained a very high resistance reading wherever we connected our meter.

With every capacitor isolated in turn from the H.T. line we still failed to trace the cause but found that the short circuit was definitely from the anode of the Cossor OM10 frequency changer to chassis.

We immediately removed the I.F. transformer therefore and carefully inspected it for signs of a possible short circuit, but found it perfect. On replacing the I.F. transformer, we re-tested the set and found that with the OM10 valve out, voltages everywhere were correct, but immediately we replaced it in the receiver the short circuit reappeared.

The valve was flashing over internally, but when tested with an ohm meter from the anode to each of the other electrodes, no fault could be found.—**G.R.W.**, *Liverpool.*

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