"TRADER" SERVICE SHEET

947

EKCO A104, U109

and Export Model A129

DESIGNED to be easily convertible from A.C. to A.C./D.C. operation, the Ekco A104 is a 4-valve (plus rectifier) 3-band superhet for operation on A.C. mains of 200-250 V, 40-100 c/s. Provision is made for the use of a self-contained frame aerial, for a gramophone pick-up, and for an external speaker. The waveband ranges are: 16-51 m, 185-570 m and 950-1,250 m.

The U109 is similar in most respects to the A104, but it incorporates a simple conversion which renders it suitable for operation from A.C. or D.C. mains of the same voltage range. The differences are fully described overleaf.

A third model, the A129, is an export version of the A104. It has a Continental tuning scale, and its mains transformer is tapped for 100-135 V mains. There is no export version of the U109.

Release dates and original prices: A104, *September* 1949, £18 19*s* 9*d*; U109, *October* 1949, £18 19*s* 9*d*. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Frame or external aerial input to aerial coupling coils **L3** (S.W.), **L4** (M.W.) and **L5** (L.W.), via I.F. acceptor filter circuit **C1, L2**, is inductively coupled to single-tuned circuits **L6, C42** (S.W.), **L7, C42** (M.W.) and **L8, C42** (L.W.), which precede a triode-hexode valve **(V1, Mullard UCH42)** operating as frequency changer with internal coupling. In the A.C./D.C. version, isolating capacitors **C47, C48** are included in the aerial coupling circuit.

Triode oscillator grid coils **L9** (S.W.), **L10** (M.W.) and **L11** (L.W.) are tuned by **C43.** Parallel trimming by **C44** (S.W.), **C45** (M.W.) and **C46** (L.W.); series tracking by **C14** (S.W.), **C12** (M.W.), and **C13** (L.W.). Inductive reaction coupling is employed on all bands, with additional capacitative bottom coupling on S.W. due to the common impedance of tracker **C14** in anode and grid circuits. The neutralizing capacitor **C9** is in circuit only on S.W.

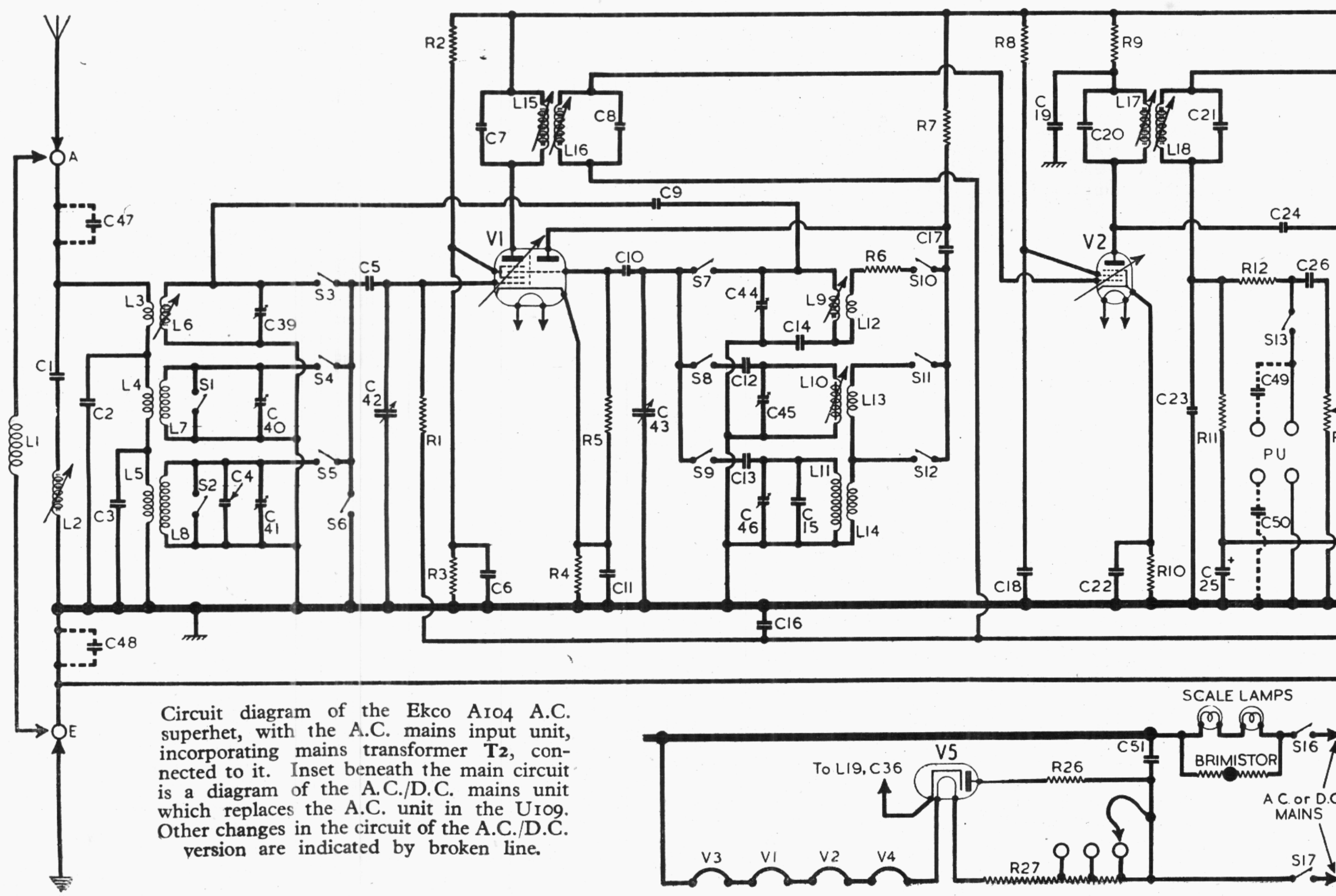
Second valve **(V2, Mullard UF41)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C7, L15, L16, C8** and **C20, L17, L18, C21.**

Intermediate frequency 460 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mullard UBC41).** Audio frequency component in rectified output is developed across diode load resistor **R11** and passed via A.F. coupling capacitor **C26** and manual volume control **R13** to grid of triode section, which acts as A.F. amplifier.

Provision is made for the connection of a gramophone pick-up across **C26, R13,** via switch **S13,** and in the A.C./D.C. model the P.U. sockets are isolated by capacitors **C49, C50.**

Second diode of **V3,** fed from **V2** anode via **C24,** provides D.C. potential which is developed across load resistor **R16** and fed back through decoupling circuit to F.C. and I.F. valves, giving automatic gain control. Delay voltage, together with G.B. for triode section, is obtained from the drop along **R14.**

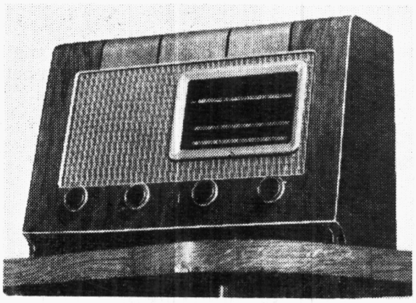


Circuit diagram of the Ekco A104 A.C. superhet, with the A.C. mains input unit, incorporating mains transformer T2, connected to it. Inset beneath the main circuit is a diagram of the A.C./D.C. mains unit which replaces the A.C. unit in the U109. Other changes in the circuit of the A.C./D.C. version are indicated by broken line.

Resistance-capacitance coupling by **R17**, **C27** and **R18**, via resistor **R19**, between **V3** triode and pentode output valve (**V4**, **Mullard UL41**). Tone control is a mixture of fixed and variable negative feedback coupling and fixed and variable shunt resistance-capacitance networks in **V3** triode anode circuit and **V4** control grid and anode circuits. While **C34** shunts **V4**, the series **C32**, **R22**, **C31**, **R21**, **C27** feeds back selectively a fixed proportion of the output of **V4** to its control grid. A measure of negative feed-back is derived from the omission of a by-pass capacitor across **R24**.

C33, **R23**, **R20** shunts **V4** anode circuit to a degree depending on the position of the slider of **R20**, while **C29**, which is small, feeds back higher frequency components of the output to the control grid when the position of **R20** slider permits it; when it doesn't, **C29** is shunted directly across the input circuit to **V4**. **C30**, **R20** shunt **V3** anode circuit, attenuating the upper frequency end of the audio spectrum to a degree depending again on the position of **R20** slider.

In the A.C. model, H.T. current is supplied by half-wave rectifying valve (**V5**, **Mullard UY41**) from the H.T. secondary **4**, **5**, **6** of the double-wound mains transformer **T2**. Smoothing is effected by the iron-cored choke **L19** and electrolytic capacitors **C36**, **C37**. Valve heaters, including that of the rectifier, are connected in series across the lower section of the H.T. secondary, between tappings **4** and **5**. The scale lamps are energized from a separate secondary winding **1**, **3**.



The appearance of all three receivers.

In the A.C./D.C. model, the same valve types are used, but their heaters are connected in a different order and they are connected via the ballast resistor **R27** directly across the mains input circuit. The rectifier anode is connected via the surge limiter **R26** to one side of the mains, but the output from its cathode goes via the same path as it does in the A.C. model. The scale lamps are inserted in series with the mains lead to the chassis pressing, and are shunted by a thermistor (**Brimistor, CZ1**). This circuit carries the combined H.T. and heater current.

Because the chassis is "live" to the mains, isolating capacitors are inserted in the aerial, earth and pick-up leads, and the speech coil circuit is returned to the **E** socket, instead of to chassis as in the A.C. model.

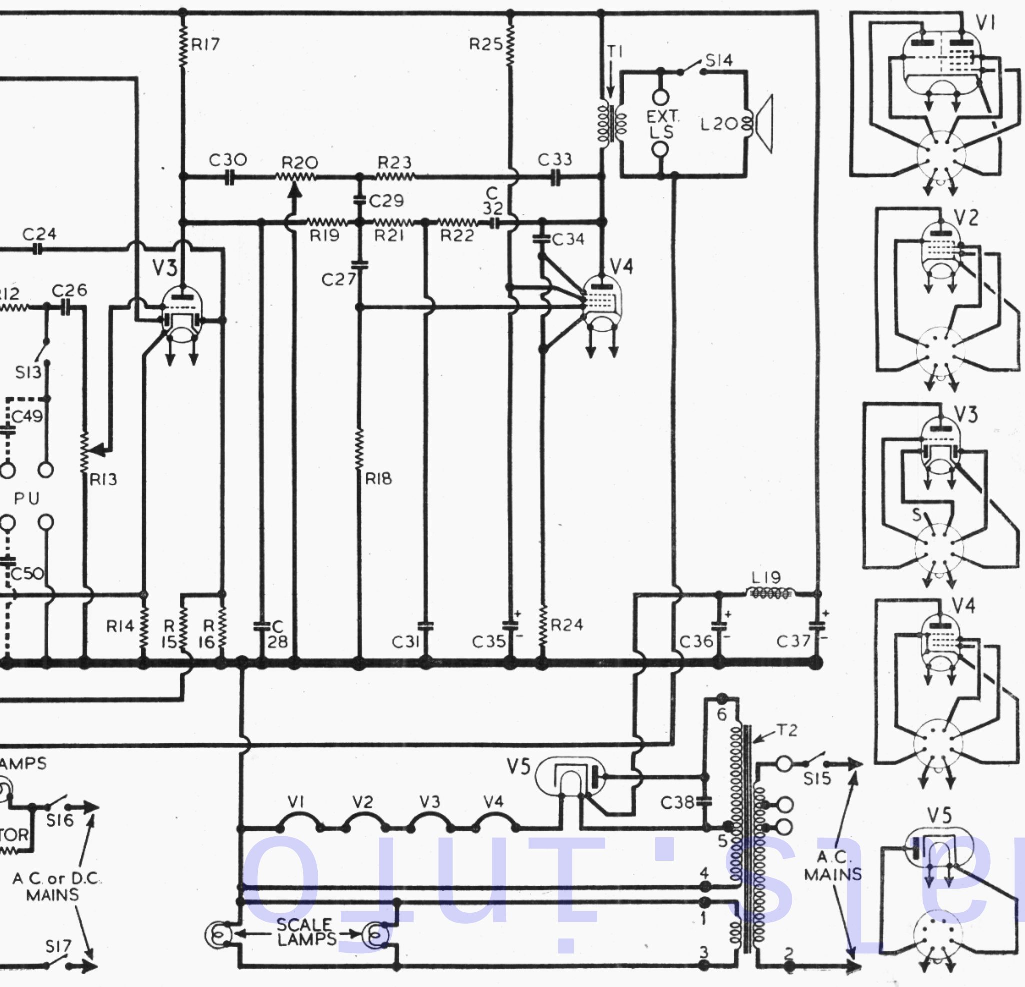
COMPONENTS AND VALVES

	CAPACITORS	Values	Locations
C1	I.F. filter tune ...	100pF	A2
C2	M.W. aerial shunt	220pF	A2
C3	L.W. aerial shunt ...	680pF	A2
C4	L.W. aerial fixed trim.	56pF	B2
C5	V1 hex. C.G. ...	300pF	G4
C6	V1 S.G. decoup. ...	0·1μF	G4
C7	1st I.F. trans. tune	56pF	A2
C8		56pF	A2
C9	S.W. neutralising ...	1pF	G3
C10	V1 osc. C.G. ...	47pF	G4
C11	V1 cath. by-pass ...	0·1μF	F4
C12	Osc. M.W. tracker	630pF	H4
C13	Osc. L.W. tracker	420pF	H4
C14	Osc. S.W. tracker ...	4,700pF	H3
C15	Osc. L.W. fixed trim.	240pF	H4
C16	A.G.C. decoup. ...	0·1μF	H5
C17	Osc. anode coupling	0·001μF	G3
C18	V2 S.G. decoupling	0·1μF	G5
C19	V2 anode decoup.	0·1μF	G5
C20	2nd I.F. trans. tune	100pF	B2
C21		100pF	B2
C22	V2 cath. by-pass ...	0·1μF	G5
C23	I.F by-pass ...	50pF	G5
C24	A.G.C. coupling ...	15pF	F5
C25*	V3 cath. by-pass ...	25μF	E5
C26	A.F. coupling ...	0·005μF	F5
C27	A.F. coupling ...	0·01μF	E5
C28	Tone control and negative feedback capacitors ...	0·0016μF	E5
C29		82pF	E4
C30		0·005μF	E5
C31		82pF	E5
C32		820pF	E5
C33		0·0025μF	E4
C34		0·005μF	E5
C35*	V4 S.G. de-coup. ...	2μF	E5
C36*	H.T. smoothing ...	32μF	C1
C37*		32μF	C1
C38	R.F. by-pass ...	0·0025μF	F4
C39‡	Aerial S.W. trim. ...	40pF	A2
C40‡	Aerial M.W. trim.	40pF	A2
C41‡	Aerial L.W. trim. ...	40pF	A2
C42†	Aerial tuning ...	580pF	A1
C43†	Oscillator tuning ...	580pF	A1
C44‡	Osc. S.W. trim. ...	40pF	G3
C45‡	Osc. M.W. trim. ...	40pF	H4
C46‡	Osc. L.W. trim. ...	40pF	H4
C47	Aerial isolator ...	0·0025μF	H5
C48	Earth isolator ...	0·1μF	H5
C49	P.U. isolators ...	0·01μF	G5
C50		0·05μF	G5
C51	Mains R.F. by-pass	0·1μF	E3

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values	Locations
R1	V1 hex. C.G. ...	470kΩ	F4
R2	V1 S.G. H.T. pot. divider ...	27kΩ	G4
R3		33kΩ	G4
R4	V1 fixed G.B. ...	330Ω	G4
R5	V1 osc. C.G. ...	47kΩ	G4
R6	S.W. osc. damping	47Ω	H3
R7	Osc. anode load ...	33kΩ	G4
R8	V2 S.G. H.T. feed ...	68kΩ	G5
R9	V2 anode de-coup.	2.2kΩ	G5
R10	V2 fixed G.B. ...	330Ω	G5
R11	Signal diode load	680kΩ	F5
R12	I.F. stopper ...	100kΩ	G5
R13	Volume control ...	1MΩ	E3
R14	V3 triode G.B. ...	4.7kΩ	F5
R15	A.G.C. de-coupling	1MΩ	F5
R16	A.G.C. diode load	1MΩ	F5
R17	V3 anode load ...	100kΩ	F5
R18	V4 C.G. resistor ...	680kΩ	F4
R19	Tone control and negative feed-back resistors ...	47kΩ	F5
R20		500kΩ	D3
R21		470kΩ	E5
R22		470kΩ	E5
R23		15kΩ	E5
R24	V4 G.B.	120Ω	F5
R25	V4 S.G. H.T. feed	12kΩ	F5
R26	Surge limiter ...	130Ω	E5
R27	Heater ballast ...	1,230Ω†	C2

† Tapped at 930Ω + 150Ω + 150Ω from V5 heater



OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Optional frame aerial	18·0	—
L2	I.F. filter tune ...	15·0	A2
L3	Aerial coupling coils	—	A2
L4		18·0	A2
L5		41·0	A2
L6	Aerial tuning coils	—	A2
L7		4·0	A2
L8		28·0	A2
L9	Osc. tuning coils	—	G3
L10		2·7	H4
L11		6·0	H4
L12	Osc. reaction coils	—	G3
L13		1·7	H4
L14		1·0	H4
L15	1st I.F. trans. Pri.	33·0	A2
L16	1st I.F. trans. Sec.	33·0	A2
L17	2nd I.F. trans. Pri.	15·0	B2
L18	2nd I.F. trans. Sec.	15·0	B2
L19	Smoothing choke	350·0	C2
L20	Speech coil ...	3·0	—
T1	Output trans. Pri. ...	350·0	E4
	Output trans. Sec. ...	0·5	E4
T2	Mains trans. Pri. (total)	40·0	B2
	Sec. 1-3	0·3	
	Sec. 4-5	28·0	
	Sec. 5-6	72·0	
S1-S13	W/band switches ...	—	H3
S14	Int. spk'r. sw. ...	—	F5
S15	A104 mains sw. g'd R13	—	E3
S16, S17	U109 mains sw's. g'd R13 ...	—	E3

DISMANTLING THE SET

Removing Chassis.—Pull off the four control knobs (spring fitting);

remove the back cover and unplug the frame aerial leads;

remove two wood screws holding the chassis fixing bolt covers in place (model U109 only);

remove the four chassis fixing bolts (with one convex washer each);

remove two wood screws from the scale support brackets.

The chassis may now be withdrawn to the extent of the speaker leads, which are of ample length for most purposes.

To free the chassis entirely, unsolder the speaker leads from the speech coil tag board.

When replacing, the long speaker leads should be coiled round the speaker magnet; an elastic band will hold them in place.

Removing Speaker.—Remove four wood screws and lift speaker out.

When replacing, the connecting tags should be at the right of the magnet when viewed from the rear.

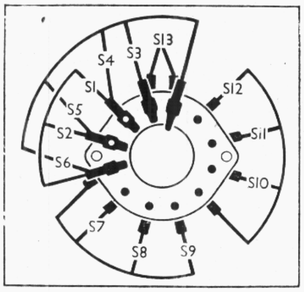


Diagram of the waveband switch unit (above). Below is the associated switch table.

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

GENERAL NOTES

Switches.—S1-S12 are the waveband switches, and **S13** the pick-up switch, ganged in a single 4-position rotary unit beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram above, where it is drawn as seen when viewed from the rear of an inverted chassis.

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

S14 is a thumb-screw operated speaker muting switch, mounted on the panel carrying the external speaker and pick-up sockets. It opens when the knob is unscrewed.

S15 is the Q.M.B. mains switch in the A.C. receiver, ganged with the manual volume control. In the A.C./D.C. receiver it is replaced by the double-pole switch unit **S16, S17.**

Coils.—L1 is the frame winding, mounted on the back cover of the receiver and terminated by two standard plugs. To bring the frame aerial into use, the plugs are inserted in the **A** and **E** sockets.

The oscillator circuit M.W. coils are provided with an adjustable brass core, as indicated in our under-chassis view, a hole being drilled in the rear chassis member to give access to the adjusting head.

Scale Lamps.—In the A.C. model, these are two Osram M.E.S. types, with small spherical frosted bulbs, rated at 6.5 V, 0.3 A. In the A.C./D.C. model they are rated at 6.2 V, 0.3 A and have large clear spherical bulbs, and they are shunted by the Brimistor.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 3 Ω) external speaker. Switch **S14,** which is associated with these sockets, permits the internal speaker to be muted.

A.C./D.C. Modifications.—The standard chassis for the A104/U109 series is so designed that it can easily become either model. The principal differences lie in the mains input circuit, where the mains transformer **T2** of the A.C. model is replaced by the ballast resistor **R27** of the A.C./D.C. model.

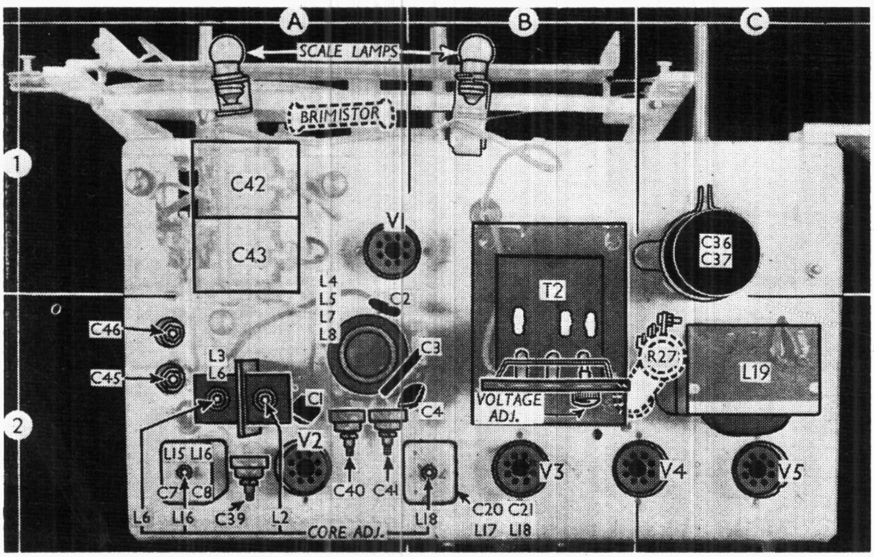
Our circuit diagram is based on the A.C. model, so it is drawn with **T2** in circuit. The input circuit for the A.C./D.C. version is inset beneath the main diagram, just to the left of that for the A.C. version. The change-over is simplified by the use of the same range of valves in both versions. These are connected in series in each case, but their sequence is different. Owing to the use of a Brimistor, too, the rating of the scale lamps, which it shunts, is slightly different.

Small differences occur elsewhere, but they are concerned with the isolation of vulnerable points from the mains. **C47, C48** are inserted in the aerial and earth leads, and **C49, C50** are inserted in the pick-up leads. The speech coil circuit, which goes to chassis in the A.C. model, is returned directly to the **E** socket.

CIRCUIT ALIGNMENT

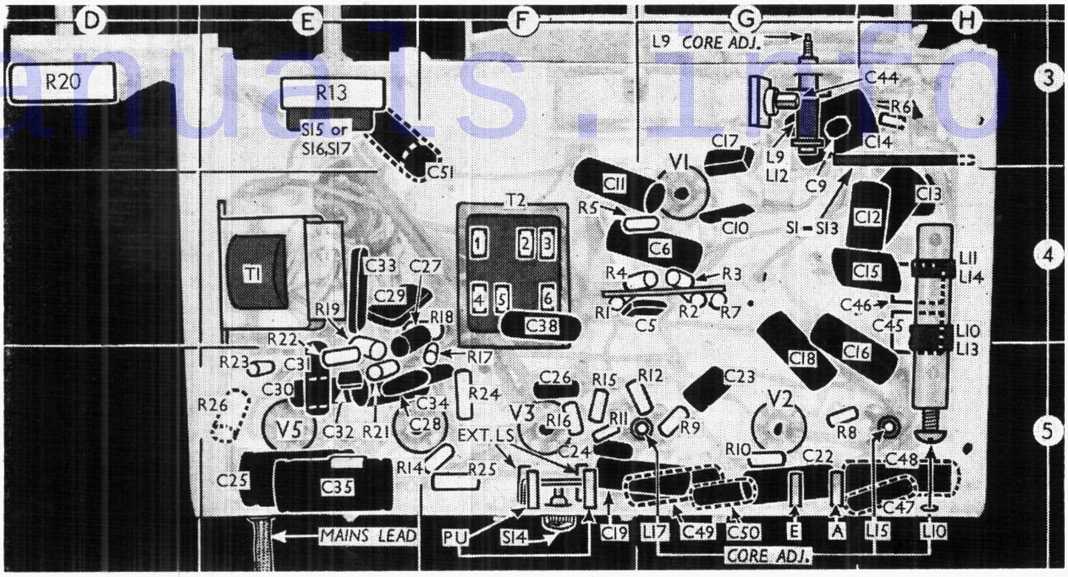
I.F. Stages.—Switch set to M.W. and turn the gang and volume control to maximum. Connect signal generator leads via a 0.1 μF capacitor to control grid (pin 6) of **V1** and chassis (via a second 0.1 μF capacitor in the A.C./D.C. version), feed in 460 kc/s (652.1 m) signal, and adjust **L18, L17, L16** and **L15** (location references B2, G5, A2, H5) in that order for maximum output, reducing the input as the circuits come into line.

Transfer signal generator leads, via a suitable dummy aerial, to **A** and **E**



Plan view of the chassis. **R27** (shown in broken line) replaces **T2** in the A.C./D.C. version.

Under-chassis view. The connecting tags of the mains transformer **T2** are numbered to agree with the circuit diagram overleaf. A diagram of the waveband switch unit **S1-S13** appears in col. 2 opposite. In early models, **C44** is omitted and **R12** is 47KΩ. Components shown in broken line are found only in A.C./D.C. versions.



sockets. Feed in a 460 kc/s signal and adjust the core of **L2** (A2) for minimum output.

R.F. and Oscillator Stages.—Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial. With the gang at maximum, the pointer should coincide with the calibration marks at the right-hand ends of the S.W. and L.W. scales. If it doesn't, it should be adjusted by sliding the cursor carriage along the drive cord.

With the exception of the S.W. band, alignment can be carried out with the chassis in its cabinet, and it is helpful to do it that way in order to use the scale readings which are mounted on the cabinet. For S.W. alignment, tune to 20 m on scale, remove the chassis from the cabinet, and mark the cursor position on the scale backing plate; then replace the chassis, check the calibration again at maximum gang position, tune to 46.16 m on scale, remove the chassis, and mark the position of the cursor again. The S.W. alignment can then be executed with the chassis out of the cabinet.

M.W.—With the receiver switched to M.W., tune to 230.8 m on scale, feed in a 230.8 m (1,300 kc/s) signal, and adjust **C45,** then **C40,** (A2) for maximum output. Tune to 375 m on scale, feed in a 375 m (800 kc/s) signal, and adjust the brass core screw of **L10** (H5) for maximum output. Check calibration at 600 m (500 kc/s) and repeat the procedure if necessary.

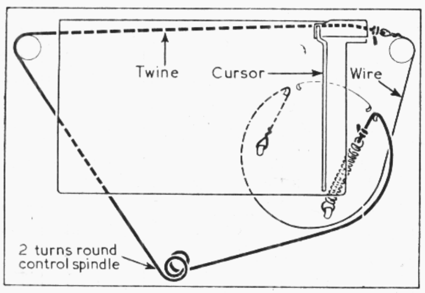
L.W.—Switch set to L.W., tune to 1,200 m on scale, feed in a 1,200 m (250 kc/s) signal, and adjust **C46,** then **C41,** (A2) for maximum output. Check the calibration at 2,000 m (150 kc/s), and repeat the procedure as necessary.

S.W.—Switch set to S.W., tune to 46.16 m mark on the scale backing plate, feed in a 46.16 m (6.5 Mc/s) signal, and adjust the cores of **L9** and **L6** (G3, A2) for maximum output. Tune to the other mark, feed in a 20 m (15 Mc/s) signal, and adjust **C44,** then **C39** (G3, A2) for maximum output. On some A.C./D.C. models **C44** will not be fitted.

DRIVE CORD REPLACEMENT

The tuning drive cord consists partly of twine (good quality plaited and waxed flax fishing line) and partly of stranded steel flexible cable, and it is advisable to make it up before trying to fit it. Suitable materials can be obtained from the Service Department, E. K. Cole, Ltd., Somerton Works, Southend-on-Sea.

The wire is prepared by making a loop of about ⅛in diameter at each end, with



Sketch of the tuning drive system, as seen from the front with the gang at maximum.

an overall length of 14 inches. The ends should be soldered before cutting, and soldered again after the loops are made.

The twine should be tied by non-slip knots to a wire loop at one end and to the tension spring at the other, but before tying on the tension spring the twine should be threaded through the appropriate hole in the drum groove, with the spring inside the drum. The overall length of the twine in our samples when knotted was 26 inches, although the makers quote 28 inches in their manual.

The cord should be fitted as shown in our sketch above, where it is shown as it appears when the gang is at maximum capacitance. It can be fitted without removing the scale backing plate if the twine is run first, with the gang at maximum and the tension spring slipped off its hook. To thread the wire end into the drum and hook it on to its anchor, the gang is swung to minimum; it is then returned to maximum again to hook the spring to its anchor and take up the tension. A short length of sleeving is slipped over the spring before it is hooked up.

Finally, the twine is dropped into the wedge clamp at the back of the cursor carriage, which should be so positioned that the right-hand of the carrier is exactly level with the right-hand end of the guide rail on which it runs, when the gang is at maximum capacitance, as shown in our sketch.

VALVE ANALYSIS

Valve voltages and currents given in the tables below are those quoted by the manufacturer, whose receivers were operating from A.C. mains of 225 V. The receivers were tuned to 300 m on the M.W. band, but there was no signal input.

Voltages were measured on a 1,000 ohms-per-volt meter, chassis being the common negative connection.

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
A.C. Model					
V1 UCH42	208 / Oscillator 93	1·7 / 3·3	85	2·4	2·6
V2 UF41	193	5·2	97	1·6	2·2
V3 UBC41	121	0·4	—	—	2·2
V4 UL41	187	49·5	106	7·0	4·6
V5 UY41	235†	—	—	—	234·0
A.C./D.C. Model					
V1 UCH42	175 / Oscillator 75	1·1 / 3·0	67·5	1·6	1·8
V2 UF41	165	4·4	80	1·3	1·8
V3 UBC41	102	0·35	—	—	1·6
V4 UL41	162	43·5	105	6·5	5·0
V5 UY41	202†	—	—	—	197·0

†A.C.

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