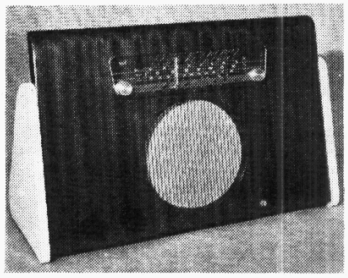
"TRADER" SERVICE SHEET

935

MURPHY U124

Three-band A.C./D.C. Superhet



ALMOST completely accessible for all service work upon removal of a fibreboard cover, the Murphy U124 is a 4-valve (plus rectifier) 3-band superhet designed to operate from A.C. or D.C. mains of 200-250 V, 50-100 c/s in the case of A.C. The waveband ranges are 17-51 m, 190-555 m and 900-2,050 m.

Provision is made for the connection of an external speaker, and there is a three-position tone control. As the chassis is "live" to the mains, the speaker sockets are connected directly to the **E** socket, as are also other exposed metal parts such as the scale supports, and it is therefore important that a reliable earth connection is used.

Release date and original price: August 1948; £16 17*s.* 6*d. Plus P.T.*

CIRCUIT DESCRIPTION

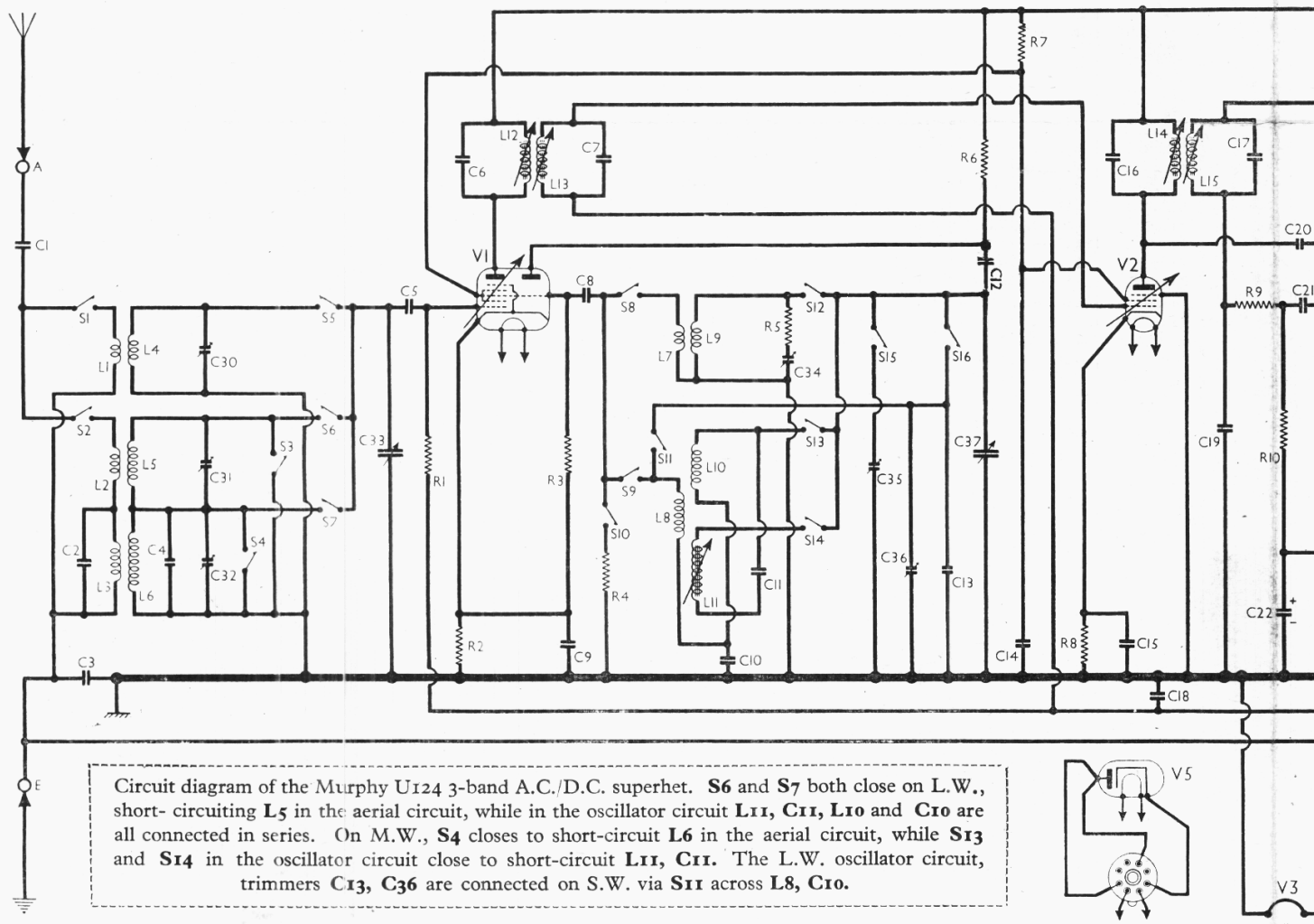
Aerial input via series capacitor **C1** and coupling coils **L1** (S.W.), **L2** (M.W.) and **L3** (L.W.) to single tuned circuits **L4, C33** (S.W.), **L5, C33** (M.W.) and **L6, C33** (L.W.) which precede a triode heptode valve **(V1, Mazda 10C1),** operating as frequency changer with internal coupling. Provision is made for the insertion of a rejector circuit in series with the aerial lead, tuned to the local transmitter when it is powerful enough to overload the receiver, causing whistles in its output.

Triode oscillator anode coils **L9** (S.W.), **L10** (M.W.) and **L11** (L.W.) are tuned by **C37.** On M.W., **S13** and **S14** close, short-circuiting **L11, C11;** on L.W. **S14** closes only, so that **L11, C11, L10** and **C10** are connected in series. Parallel trimming by **C34** (S.W.), **C35** (M.W.) and **C13, C36** (L.W.); series tracking by **C10** (M.W.) with the addition of **C11** (L.W.).

Reaction coupling by grid coils **L7** (S.W.) and **L8** (M.W. and L.W.). S.W. damping by **R5.** On S.W., **C13** and **C36** are shunted across **L8** to tune it to a frequency outside the band in use.

Second valve **(V2, Mazda 10F9)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C6, L12, L13, C7,** and **C16, L14, L15, C17.**

Intermediate frequency 465 kc/s.



Circuit diagram of the Murphy U124 3-band A.C./D.C. superhet. **S6** and **S7** both close on L.W., short- circuiting **L5** in the aerial circuit, while in the oscillator circuit **L11, C11, L10** and **C10** are all connected in series. On M.W., **S4** closes to short-circuit **L6** in the aerial circuit, while **S13** and **S14** in the oscillator circuit close to short-circuit **L11, C11.** The L.W. oscillator circuit, trimmers **C13, C36** are connected on S.W. via **S11** across **L8, C10.**

Diode second detector is part of double diode triode valve **(V3, Mazda 10LD11).** Audio-frequency component in rectified output is developed across signal diode resistor **R10,** and passed via A.F. coupling capacitor **C21** and manual volume control **R13** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **R9** and **C19** in diode circuit.

Second diode of **V3,** fed from **V2** anode via coupling capacitor **C20,** provides a D.C. potential which is developed across **R16** and fed back through a decoupling network **R15, C18** as G.B. to F.C. and I.F. valves, giving automatic gain control.

Resistance-capacitance coupling by **R14, C24** and **R17,** via grid stopper **R18,** between **V3** triode and beam tetrode output valve **(V4, Mazda 10P14).** Three-position tone control is provided by **C25, R20, R21** and **R22** in **V4** anode circuit.

When the receiver is operating from A.C. mains, H.T. current is supplied by half-wave rectifying valve **(V5, Mazda U404),** which behaves as a low resistance with D.C. mains. Smoothing is effected by iron-cored choke **L18** and electrolytic capacitors **C28** and **C29.** Valve heaters, ballast resistor **R25,** fuse **F1** and mains filter chokes **L16** and **L17** are connected in series across the mains input. Mains R.F. filtering by **C27** and earth isolation by **C3.**

COMPONENTS AND VALUES

If the component numbers given in the following tables are used when ordering replacements, dealers should mention the fact in the order, as they may differ from those used in the manufacturers' diagram.

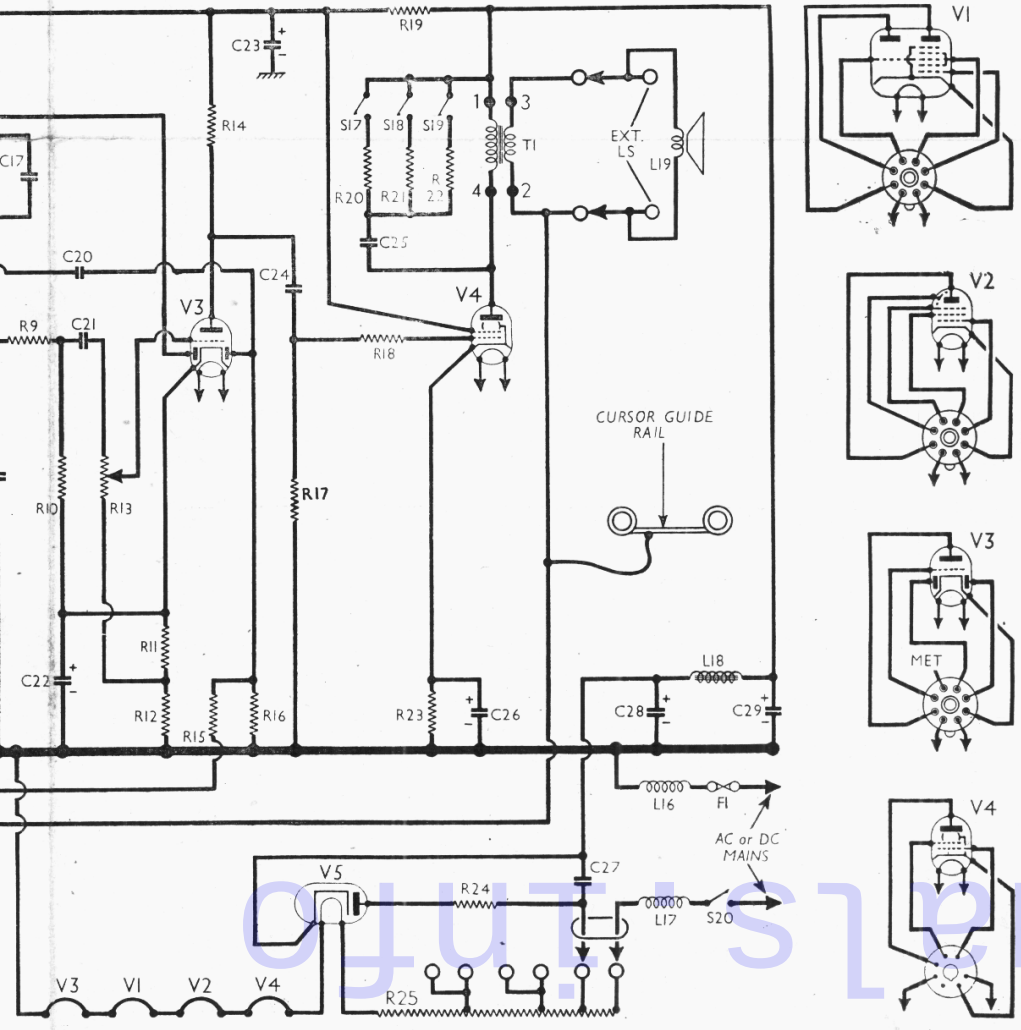
	RESISTORS	Values (ohms)	Locations
R1	V1 heptode C.G.	470,000	G3
R2	V1 fixed G.B. ...	180	G4
R3	V1 osc. C.G. ...	22,000	G3
R4	L8 shunt	39,000	H3
R5	S.W. osc. damping	33	H4
R6	V1 osc. anode load	22,000	G4
R7	V1, V2 S.G. decoup.	8,200	G4
R8	V2 fixed G.B. ...	330	G4
R9	I.F. stopper ...	330,000	G4
R10	Signal diode load	180,000	F4
R11	V3 G.B. and A.G.C. delay	1,500	F4
R12		3,300	F4
R13	Volume control ...	1,000,000	E3
R14	Triode anode load	50,000	F4
R15	A.G.C. decoupling	1,200,000	G4
R16	A.G.C. diode load	1,000,000	F5
R17	V4 C.G. resistor ...	470,000	F4
R18	V4 grid stopper ...	47,000	F4
R19	H.T. decoupling ...	1,800	G3
R20	Tone corrector resistors	1,000	E3
R21		2,700	E3
R22		12,000	E3
R23	V4 fixed G.B. ...	180	F4
R24	V5 surge limiter ...	47	E4
R25	Heater ballast ...	1,030*	C1

*Tapped at 700Ω + 200Ω + 80Ω + 50Ω from V5 heater.

	CAPACITORS	Values (μF)	Locations
C1	Aerial series ...	0·0005	A1
C2	L.W. aerial shunt...	0·00047	H4
C3	Isolating capacitor	0·01	J4
C4	L.W. fixed trimmer	0·000027	J3
C5	V1 heptode C.G. ...	0·0005	H3
C6	1st I.F. transformer tuning	0·00015	B2
C7		0·00015	B2
C8	V1 osc. C.G. ...	0·0001	H3
C9	V1 cath. by-pass ...	0·05	G3
C10	M.W. tracker ...	0·00062	G4
C11	L.W. tracker ...	0·00018	H4
C12	V1 osc anode coup.	0·0001	H3
C13	L.W osc. fixed trim.	0·000082	H5
C14	V1, V2 S.G. decoup.	0·05	G3
C15	V2 cath. by-pass ...	0·05	G5
C16	2nd I.F. transformer tuning ...	0·00015	B2
C17		0·00015	B2
C18	A.G.C. decoupling...	0·05	H5
C19	I.F. by-pass ...	0·0002	G4
C20	A.G.C. coupling ...	0·000033	G4
C21	A.F. coupling ...	0·005	F4
C22*	V3 cath. by-pass ...	50·0	E5
C23*	H.T. decoupling ...	16·0	A2
C24	A.F. coupling ...	0·01	F4
C25	Tone corrector ...	0·1	E3
C26*	V4 cath. by-pass ...	50·0	E4
C27	V5 R.F. by-pass ...	0·05	D4
C28*	H.T. smoothing ...	16·0	C2
C29*		32·0	A2
C30‡	Aerial S.W. trim....	0·000035	H3
C31‡	Aerial M.W. trim....	0·000035	J3
C32‡	Aerial L.W. trim....	0·000035	J3
C33†	Aerial tuning ...	0·000546	A1
C34‡	Osc. S.W. trim. ...	0·000035	H4
C35‡	Osc. M.W. trim. ...	0·000035	H4
C36‡	Osc. L.W. trim. ...	0·000035	H4
C37†	Oscillator tuning ...	0·000546	A2

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Aerial coupling coil	very low	A1
L2		1·0	
L3		21·0	
L4	Aerial tuning coils	very low	A1
L5		3·5	
L6		21·0	
L7	Oscillator reaction coils	very low	H4
L8		0·5	H4
L9	Oscillator tuning coils	very low	H4
L10		1·8	H4
L11		5·2	H4
L12	1st I.F. trans. Pri. ...	6·0	B2
L13	Sec. ...	6·0	B2
L14	2nd I.F. trans. Pri. ...	6·0	B2
L15	Sec. ...	6·0	B2
L16	Mains R.F. filter chokes	8·5	E3
L17		8·5	E3
L18	H.T. smoothing ...	280·0	C1
L19	Speech coil ...	3·0	—
T1	Output trans. Pri.	350·0	F3
	Sec.	0·3	
S1-S16	W/band switches ...	—	H3
S17-S19	Tone control switches ...	—	E3
S20	Mains sw., g'd R13	—	E3
F1	Mains fuse, 0·5A...	—	C1



VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C.

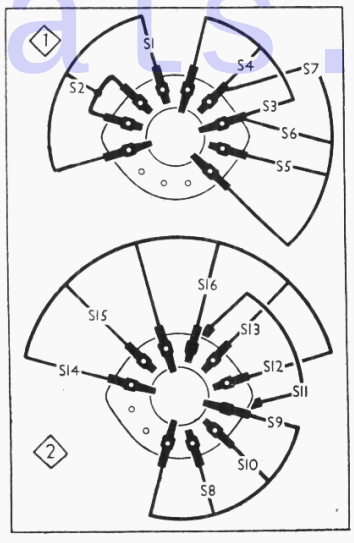
Valves	Anode		Screen		Cath.
	V	m/A	V	m/A	V
V1 10C1 ...	160	3·0	84	7·7	2·7†
	Oscillator				
	62	3·9			
V2 10F9 ...	160	4·8	84	1·7	2·0†
V3 10LD11	74	1·3	—	—	4·0†
V4 10P14	204	36	160	7·2	7·3†
V5 U404...	210§	—	—	—	230·0

§ A.C. † 10V range.

Waveband Switch Table and Diagrams

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

On the right are diagrams of the waveband switch units, drawn as seen from the rear of an inverted chassis. Above is the associated switch table.



Valve Analysis—*continued*

mains of 230 V, using the 220-230 V tapping on **R25.** The receiver was tuned to the lowest wavelength on the M.W. 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 Avometer, except where otherwise indicated, chassis being the negative connection. The total H.T. current measured between **L18** and **C29** was 67 m/A.

GENERAL NOTES

Switches.—S1-S16 are the waveband switches, ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams in col. 2, where they are drawn as seen from the rear of an inverted chassis.

The table above 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.

S17-S19 are the tone control switches in a three-position rotary unit, indicated in our under-chassis view and shown in detail in the diagram in col. 6. In the anti-clockwise (mellow) position of the control, **S17** closes; in the normal position **S18** closes; and in the brilliant (clockwise) position **S19** closes.

S20 is the Q.M.B. mains switch, ganged with the volume control **R13.**

External Speaker.—Two sockets are provided at the rear of the chassis for the plugs of the internal speaker, and sockets in the tops of these permit a low impedance (about 2-3 Ω) external speaker to be connected at the same time. These plugs may, of course, replace those of the internal speaker if this speaker is not required.

In order to render the leads safe to handle, the isolated output transformer secondary is connected directly to the **E** socket, and as the chassis is "live" to the mains, it is important that a good earth connection is used.

Aerial Rejectors.—Special units are supplied by the makers for use in areas where the local station tends to swamp the whole band. These contain tuned rejector circuits and are made to fit on the side-piece of the baffle cabinet. They have a socket to receive the aerial plug, and a plug of their own on a flexible lead to go into the aerial socket of the receiver. Instructions for trimming them are given at the end of "Circuit Alignment."

Chassis Divergency.—C28, which in our chassis was a single 16 μF unit, may in some cases be a double unit containing a 16 μF and an 8 μF section. Where this is fitted, the two sections are connected in parallel giving a total capacitance of 24 μF.

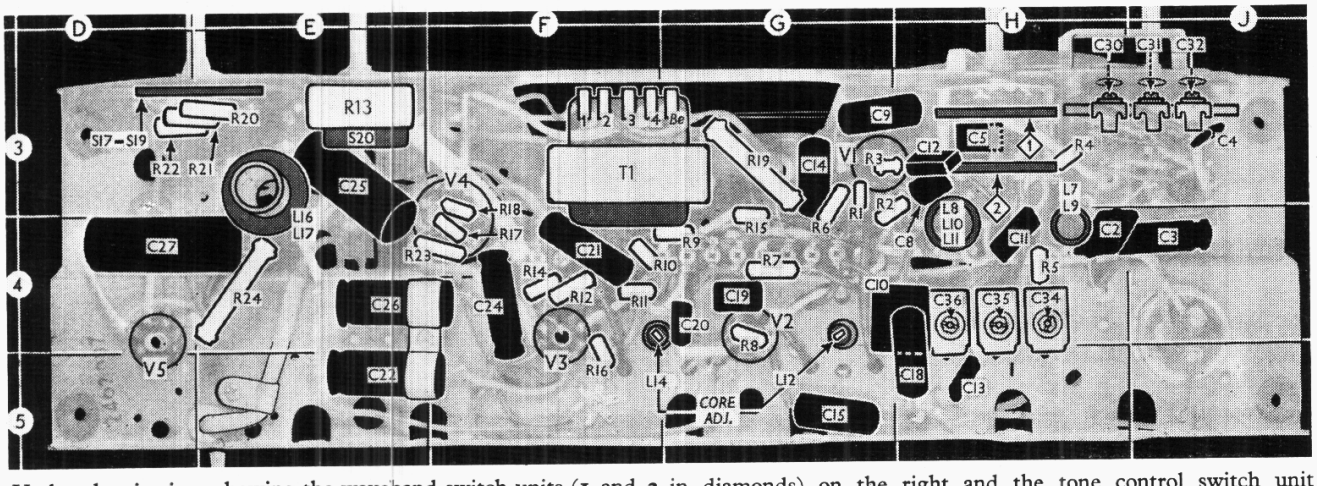
DRIVE CORD REPLACEMENT

There are two drive cords in this receiver: the tuning drive, and the cursor drive. It is advisable to fit the cursor drive cord before the tuning drive cord. About six feet of cord is required altogether for both cords, and suitable material (spec. No. 936) can be obtained from the Service Department, Murphy Radio, Ltd., Welwyn Garden City, Herts. Before fitting, it should be stretched by suspending a weight of 3 or 4 lb for an hour or so.

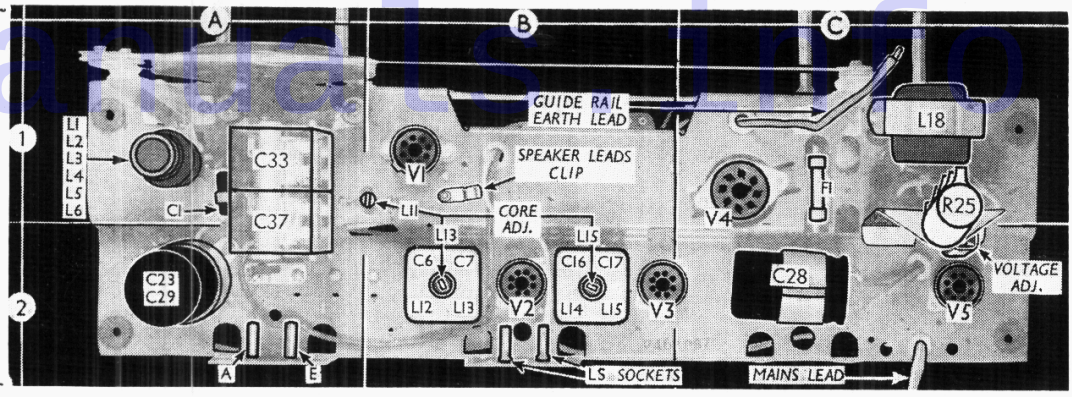
The two cords are seen in the sketch (col. 4), where the system is drawn as seen from the front with the gang at maximum. The tuning drive cord is drawn in broken line to distinguish it from the other.

Cursor Drive.—Take about four feet of cord and make up a loop which when stretched between two pins stuck in the bench measures 22⅝in. The spring should be tied in the knot, and the cord is then threaded through the appropriate holes in the side of the drum, leaving the spring inside. The cord is run as shown in our sketch, but the spring should not be hooked up until the tuning drive cord is fitted.

Tuning Drive.—Take about two feet of cord and make up a loop which, when stretched between two pins stuck in the bench measures 9in., the spring being tied



Under-chassis view, showing the waveband switch units (1 and 2 in diamonds) on the right and the tone control switch unit (S17-S19) on the left, with arrows to indicate the directions in which they are viewed in the diagrams in cols. 2 and 6 respectively.



Plan view of the chassis. The cursor guide rail earthing lead goes together with a lead from the speaker sockets directly to the E socket.

in the knot. Thread the loop through the appropriate holes in the drum, leaving the spring inside the drum. Remove the circlip from the end of the tuning control spindle and withdraw the spindle. Make 2½ turns round a rod or finger as we show round the spindle, and put the control spindle back, passing it through the turns. Finally, run the cord round the drum as shown, and hook up both tension springs.

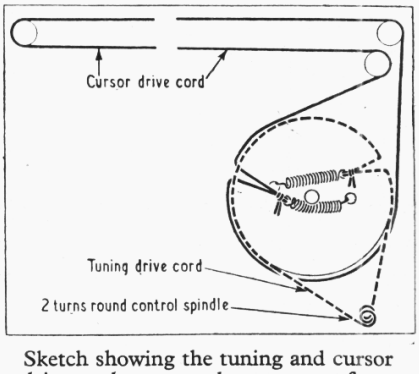
CIRCUIT ALIGNMENT

The makers state that the receiver may be aligned while still on its baffle, a cranked screwdriver being used to adjust **C30, C31** and **C32.** We found that where a major adjustment is required, it is simpler to remove the baffle so that free access is obtained to these trimmers.

A non-metallic screwdriver should be used for the I.F. core adjustments in order that a tuned circuit, once adjusted, is not upset by the removal of the trimming tool. Further, the trimmer cores might be damaged by a metal blade.

I.F. Stages.—Connect signal generator, via a 0.1 μF capacitor in the "live" lead, to control grid (pin 6) of **V2** and the **E** socket. Switch set to M.W., turn volume control and gang to maximum and fully unscrew **L14** and **L15** cores (location references F4, B2), feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L14** and **L15** for maximum output.

Transfer live signal generator lead to the tag of the M.W. trimmer **C31** (J3), fully unscrew the cores of **L12** and **L13** (G4, B2),



Sketch showing the tuning and cursor drive cord systems, drawn as seen from the front of the chassis when the gang is at maximum capacitance.

feed in a 465 kc/s signal, and adjust the cores in the order described, for maximum output.

R.F. and Oscillator Stages.—With the chassis mounted on the baffle, the pointer should coincide with the 52 m mark on the scale when the gang is at maximum. It may be adjusted in position by sliding the cursor carriage along the drive cord. If the baffle has been removed, an alignment scale printed on the gang drum may be used. With the gang at maximum, zero reading on the scale should be opposite the pointer associated with it. It may be adjusted after slackening the two drum drive boss screws. In the following instructions readings are given for the tuning scale and for the alignment scale. Connect the signal generator leads to **A** and **E** sockets via a suitable dummy aerial.

L.W.—Switch set to L.W., unscrew **C32** (J3) and **C36** (H4), tune to 1,000 m on scale (168.5 deg. on alignment scale), feed in a 1,000 m (300 kc/s) signal, and adjust **C36** and **C32** for maximum output. Tune to 1,900 m on scale (34 deg.), feed in a 1,900 m (158 kc/s) signal, and adjust **L11** (B1) for maximum output. Repeat these operations until no improvement results.

M.W.—Switch set to M.W., unscrew **C31** (J3) and **C35** (H4), tune to 220 m on scale (158 deg.), feed in a 220 m (1,363 kc/s) signal, and adjust **C35** and **C31** for maximum output. Tune to 300 m on scale (119.5 deg.) and check calibration against a 300 m (1,000 kc/s) signal. Tune to 500 m on scale (29.5 deg.) and likewise check calibration against a 500 m (600 kc/s) signal.

S.W.—Switch set to S.W., unscrew **C30** (H3) and **C34** (H4), tune to 20 m on scale (156.5 deg.), feed in a 20 m (15 Mc/s) signal and adjust **C34** and **C30** for maximum output, choosing the peak on **C34** involving the lesser capacitance. Tune to about 31.25 m on the scale (94.5-97.5 deg.) and check calibration against a 31.25 m (9.6 Mc/s) signal. Tune to 41.4 m on scale (50 deg.) and check calibration against a 41.4 m (7.25 Mc/s) signal. In cases of large error, the turns of **L4** or **L9** may be adjusted, although this is not recommended by the makers unless it is essential.

Aerial Rejector.—If an aerial rejector is fitted, connect a voltmeter between cathode of **V2** and chassis, switch to the 10 V range, tune the receiver to the interfering station and adjust the rejector core for maximum reading on the meter.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws), and the back cover (four screws and retaining plates);

withdraw the speaker plugs from their sockets and free the leads from the clip on the chassis deck;

free the blue earth lead (screw and spade tag) from the cursor guide rail, and disengage the drive cord from the cursor carriage;

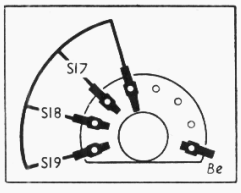
remove four large chassis bolts (with two nuts and two cupped washers each), and lift out chassis.

When replacing, a cupped metal washer should be fitted to either side of the rubber grommets on which the chassis is mounted.

Removing Speaker.—Remove the four woodscrews and washers (lower two first) and lift off.

When replacing, the speech coil tag panel should be uppermost.

Diagram of the tone control switch unit, as seen from the rear of an inverted chassis.



Service Sheet Correction

Owing to an unfortunate confusion between two blocks, the wrong switch unit diagram appeared in Service Sheet 934 for the Alba "Rover" A.C./D.C./battery portable. This has no doubt already been noticed as the mistake is obvious from the caption.

The correct diagrams are printed on page 1108 of this issue of the journal, and service personnel are requested to cut the drawing out and paste it securely over the incorrect diagram. Further copies are available upon request.

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