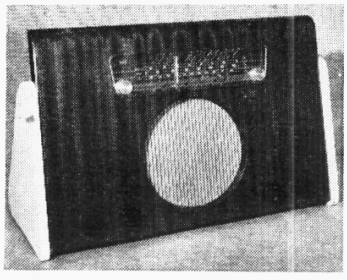
"TRADER" SERVICE SHEET
933

MURPHY A124

Three-band A.C. Superhet



The Murphy A124 superhet.

DESIGNED with the needs of service requirements in mind, the Murphy A124 is of very open style, and is almost completely accessible upon removal of the back cover. The receiver is a 3-valve (plus rectifier) 3-band superhet designed for use on A.C. mains of 200-250 V, 50-100 c/s. The wavelength ranges are 17-51 m, 190-555 m and 900-2,050 m.

In the interests of economy, an auto-transformer is used for the mains input, so the chassis remains "live" to the mains, and the makers stress the importance of providing a good earth.

Release date and original price: July 1948; £16 10*s. plus purchase tax.*

CIRCUIT DESCRIPTION

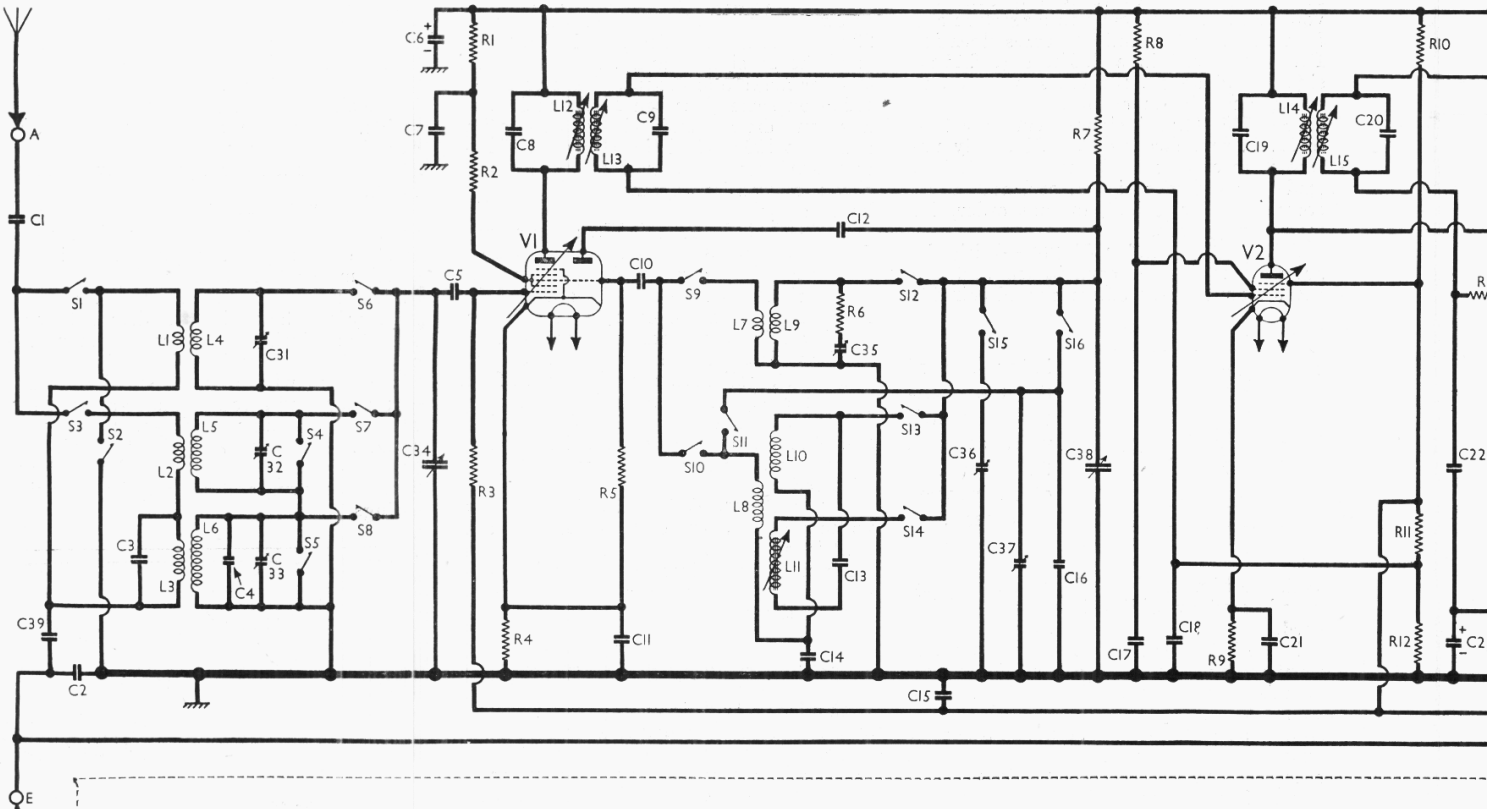
Aerial input via series capacitor **C1** and coupling coils **L1** (S.W.), **L2** (M.W.) and **L3** (L.W.) to single tuned circuits **L4, C34** (S.W.), **L5, C34** (M.W.) and **L6, C34** (L.W.), which precede a triode heptode valve **(V1, Mazda 10C1),** operating as frequency changer with internal coupling. Provision is made for mounting a Murphy aerial filter on the inside of the cabinet near the aerial coils. This is connected in series with the aerial lead and tuned to the wavelength of any transmitter which is powerful enough to produce whistles in the receiver output, due to overloading.

Triode oscillator anode coils **L9** (S.W.), **L10** (M.W.) and **L11** (L.W.) are tuned by **C38.** Parallel trimming by **C35** (S.W.), **C36** (M.W.) and **C37** (L.W.), with series tracking by **C14** (M.W.) and **C13** (L.W.). Reaction coupling by grid coils **L7** (S.W.) and **L8** (M.W. and L.W.). S.W. damping by **R6.** In the S.W. position **C16** and **C37** are shunted across **L8,** tuning the coil resonance somewhere outside the S.W. band.

Second valve **(V2, Mazda 10F9)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier, with tuned transformer couplings **C8, L12, L13, C9** and **C19, L14, L15, C20.**

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode output tetrode valve **(V3, Mazda**



Circuit diagram of the Murphy A124 3-band A.C. mains superhet. The oscillator circuit is of unusual design: on M.W., **S13** and **S14** c ing the ends of the L.W. circuit **L11, L13** together and short-circuiting them; on L.W., only **S14** closes, so that **L11, C13, L10** and nected in series; the L.W. trimmers **C16, C37** are connected to their circuit by **S16** on L.W., but on S.W. they shunt **L8** via **S11** to range. As **T2** is an auto-transformer, the chassis is "live" to the mains, and it is important that a good earth is used with the receiv metal parts, such as scale lamp sockets and speaker sockets, are connected directly to **E** socket. **NOTE: S4** returns to chassis, not to **S**

metallized Pen 45DD). Audio frequency component in rectified output is developed across diode load resistor **R14** and passed via **C25** and manual volume control **R15** to grid of tetrode output section.

Three-position tone control is provided by **R18, R19, C27** and switches **S17, S18, S19.** Provision is made for the connection of a low impedance external speaker across **T1** secondary winding.

Second diode of **V3,** fed from **V2** anode via **C24,** provides D.C. potentials which are developed along the potential divider comprising **R21, R11** and **R12** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic gain control. Delay is achieved by tying the A.G.C. line down to **V2** cathode until the signal exceeds a given value.

This is done by connecting **V2** suppressor to the potential divider comprising **R10, R11** and **R12** across the H.T. circuit, so that grid current flows, the suppressor-grid path of **V2** acting as a diode. As the diode impedance is low and the value of **R10** is high, and the A.G.C. line is connected to the suppressor, the A.G.C. line is held at cathode potential until the output from the A.G.C. diode of **V3** is great enough to neutralize the positive potential at the junction of **R10** and **R11,** when **V2** suppressor ceases to conduct, and the A.G.C. line is free to become increasingly negative with increased signal strength.

H.T. current is supplied by half-wave rectifying valve **(V4, Mazda U404).** Resistance-capacitance smoothing by **C29, R22, R23** and **C30.**

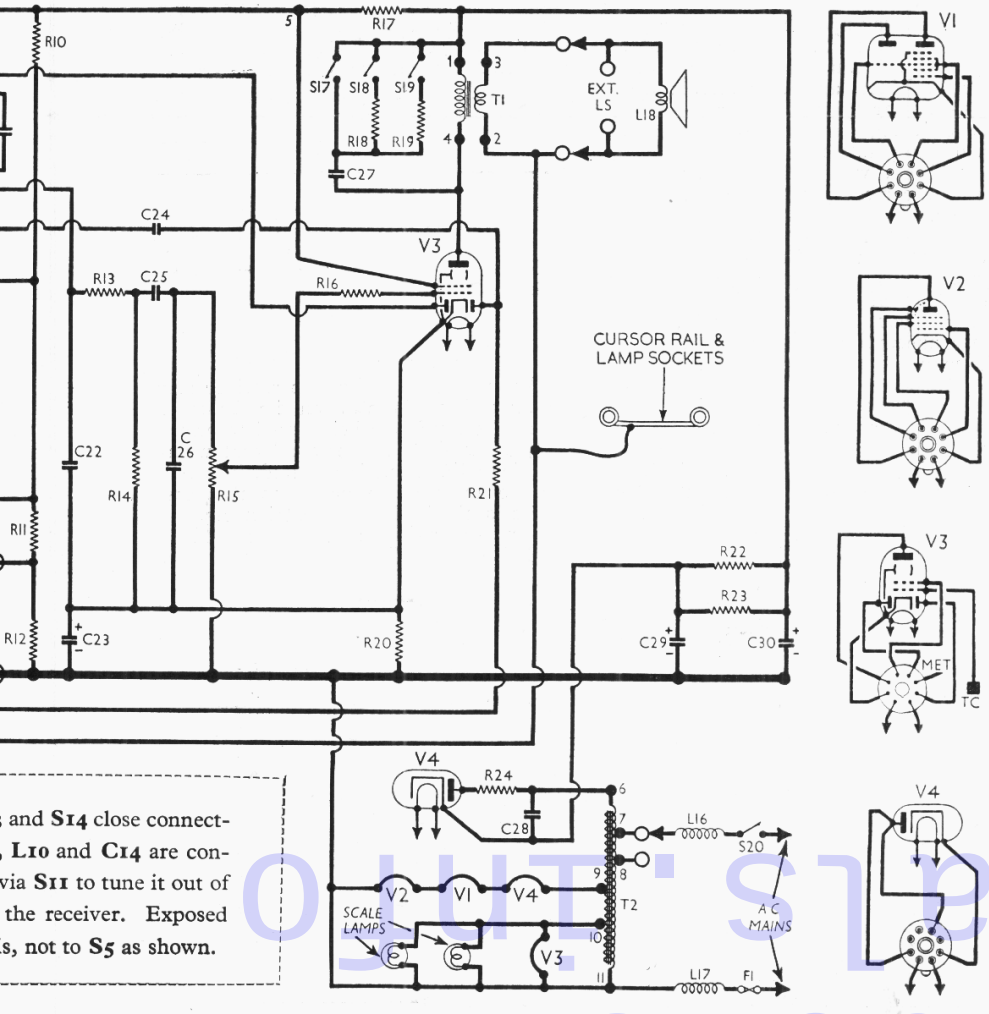
COMPONENTS AND VALUES

	RESISTORS	Values (ohms)	Locations
R1	V1 S.G. decoup.	15,000	G3
R2	V1 S.G. stopper ...	25	G3
R3	V1 Heptode C.G. ...	1,000,000	G3
R4	V1 fixed G.B. ...	560	G4
R5	V1 osc. C.G. ...	22,000	G3
R6	S.W. osc. damping	56	H4
R7	Osc. anode load ...	33,000	G4
R8	V2 S.G. H.T. feed	47,000	G4
R9	V2 fixed G.B. ...	470	G4
R10	H.T. potential divider resistors	4,700,000	G4
R11		680,000	G4
R12		1,200,000	G4
R13	I.F. stopper ...	47,000	F4
R14	Signal diode load ...	470,000	F4
R15	Volume control ...	1,000,000	E3
R16	I.F. stopper ...	47,000	C1
R17	H.T. decoupling	2,200	G3
R18	Tone control resistors	3,900	D3
R19		22,000	D3
R20	V3 G.B. ...	180	F4
R21	A.G.C. diode load	680,000	G4
R22	H.T. smoothing resistors	2,200	G4
R23		470	G4
R24	V4 surge limiter	47	E4

	CAPACITORS	Values (μF)	Locations
C1	Aerial series ...	·0005	A1
C2	Isolating capacitor	0·01	J4
C3	L.W. aerial shunt	0·00047	H4
C4	L.W. fixed trimmer	0·000027	J3
C5	V1 heptode C.G. ...	0·0005	H3
C6*	V1, V2 H.T. smooth	16·0	J4
C7	V1 S.G. decoup.	0·05	G3
C8	1st I.F. transformer tuning	0·0001	B2
C9		0·0001	B2
C10	V1 osc. C.G. ...	0·0001	H3
C11	V1 cath. by-pass	0·05	G3
C12	V1 osc. anode coup.	0·0001	H3
C13	L.W. tracker ...	0·00018	H4
C14	M.W. tracker ...	0·00062	G4
C15	A.G.C. decoupling	0·05	F5
C16	L.W. osc. fixed trim.	0·000085	G4
C17	V2 S.G. decoup.	0·05	G5
C18	V2 C.G. decoup. ...	0·05	G5
C19	2nd I.F. transformer tuning	0·0001	B2
C20		0·0001	B2
C21	V2 cath. by-pass	0·05	G5
C22	I.F. by-pass	0·0001	F4
C23*	V3 cth. by-pass ...	50·0	E4
C24	A.G.C. coupling ...	0·000033	G4
C25	A.F. coupling ...	0·002	F4
C26	I.F. by-pass ...	0·0001	F4
C27	Tone control ...	0·05	E3
C28	V4 R.F. by-pass ...	0·05	D4
C29*	H.T. smoothing ...	16·0	C2
C30*		32·0	J4
C31‡	Aerial S.W. trim	0·000035	H3
C32‡	Aerial M.W. trim	0·000035	J3
C33‡	Aerial L.W. trim	0·000035	J3
C34†	Aerial tuning ...	0·000546	A1
C35‡	Osc. S.W. trim ...	0·000035	H4
C36‡	Osc. M.W. trim ...	0·000035	H4
C37‡	Osc. L.W. trim ...	0·000035	H4
C38†	Oscillator tuning	0·000546	A2
C39	Earth isolator ...	0·01	A2

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Aerial coupling coils	very low	A1
L2		1·0	
L3		21·0	
L4	Aerial tuning coils	very low	A1
L5		4·0	
L6		22·0	
L7	Oscillator coupling coils	very low	H4
L8		0·5	H4
L9	Oscillator tuning coils	0·5	H4
L10		3·0	
L11		6·0	
L12	1st I.F. trans.	Pri. 7·5	B2
L13		Sec. 7·5	B2
L14	2nd I.F. trans.	Pri. 7·5	B2
L15		Sec. 7·5	B2
L16	Mains R.F. filter chokes ...	8·5	E4
L17		8·5	E4
L18	Speech coil ...	3·0	—
T1	Output trans.	Pri. 320·0	F3
		Sec. 0·3	
T2	Mains auto-trans.	6–7 9·0	C1
		7–8 20·0	
		8–9 80·0	
		9–10 64·0	
		10–11 0·5	
		total 173·5	
S1-S16	W/band switches ...	—	H3
S17, S19	Tone control switches ...	—	D3
S20	Mains switch, g'd R15	—	E3



; and **S14** close connect-, **L10** and **C14** are con-via **S11** to tune it out of the receiver. Exposed s, not to **S5** as shown.

DISMANTLING THE SET

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

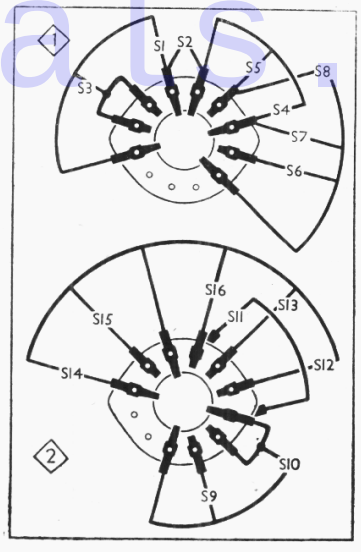
unplug and unclip the speaker leads, and free the brown earthing lead from the cursor guide rail;

remove scale lamps by withdrawing them (rearwards) from their clamps, and disengage the drive cord from the cursor carrier;

remove four large bolts (with two nuts

Waveband Switch Table and Diagrams

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



Diagrams of the waveband switch units, drawn as seen from the rear of an inverted chassis. **S2** is omitted in some chassis. The associated table is on the left.

and two cupped washers each), and lift out chassis.

When replacing, a cupped metal washer should be fitted to either side of the chassis supporting rubber grommets.

The scale lamps should be carefully pushed into their clamps until maximum brilliance is obtained on the scale, care being taken not to press hard enough to break them.

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

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

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. **S2** will not occur on late 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. 4. 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 **R15.**

Scale Lamps.—The lamps specified for this receiver are Osram or Philips. Their type number is given by the makers as 16880, and it is important that the correct type are used so that the scale will be adequately illuminated. They are rated at 6.2 V, 0.3 A, and have M.E.S. bases and large clear spherical bulbs.

When being fitted they should be pushed gently into their sockets as far as they will go, when their filaments will adopt the correct position in relation to the slots.

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.

Chassis Divergencies.—C39 will not be found on late models. It was necessitated by the presence of **S2,** which occurs only "incidentally" in the M.W. and L.W. positions and would short-circuit **C2** if **C39** were not fitted. The switch design has been altered, however, to eliminate **S2,** so **C39** is eliminated also.

R2 is not fitted in some early samples, and **C29** may consist of a 16 μF + 8 μF, the two sections being connected in parallel, giving 24 μF instead of 16 μF as in our case. A Mullard UAF42 may be used for **V2** instead of a Mazda 10F9. The diode would be earthed automatically. A 39,000 Ω resistor was once connected between the junction of **S13** and **L11** and chassis.

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."

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 230-250 V tapping on the mains transformer. 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 measured total H.T. current was 54 mA.

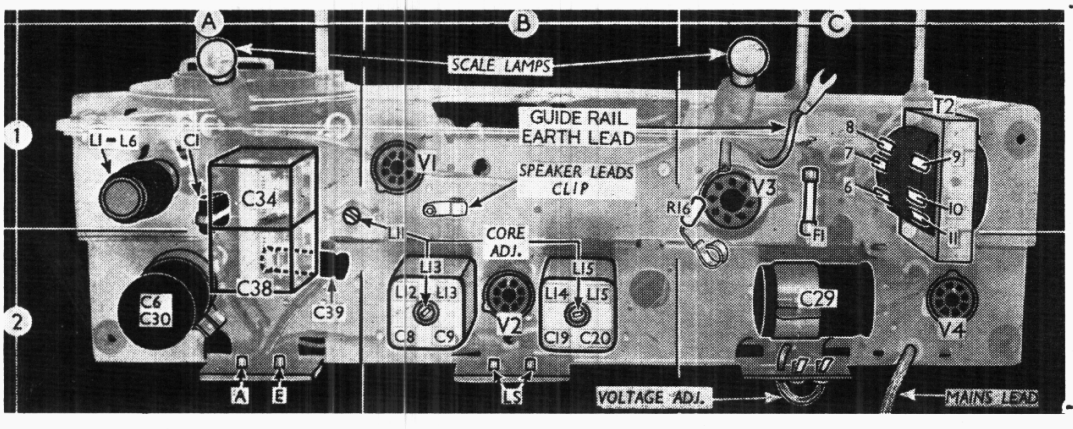
Valves	Anode		Screen		Cath.
	V	m/A	V	m/A	V
V1 10C1	180 Oscillator 64	2·2 3·4	94	5.5	5·8†
V2 10F9	180	6·4	75	2·1	3·5†
V3 PEN45DD	220	26·0	180	4·7	5·9†
V4 U404	243§	—	—	—	248·0

§ A.C. † 10v. range

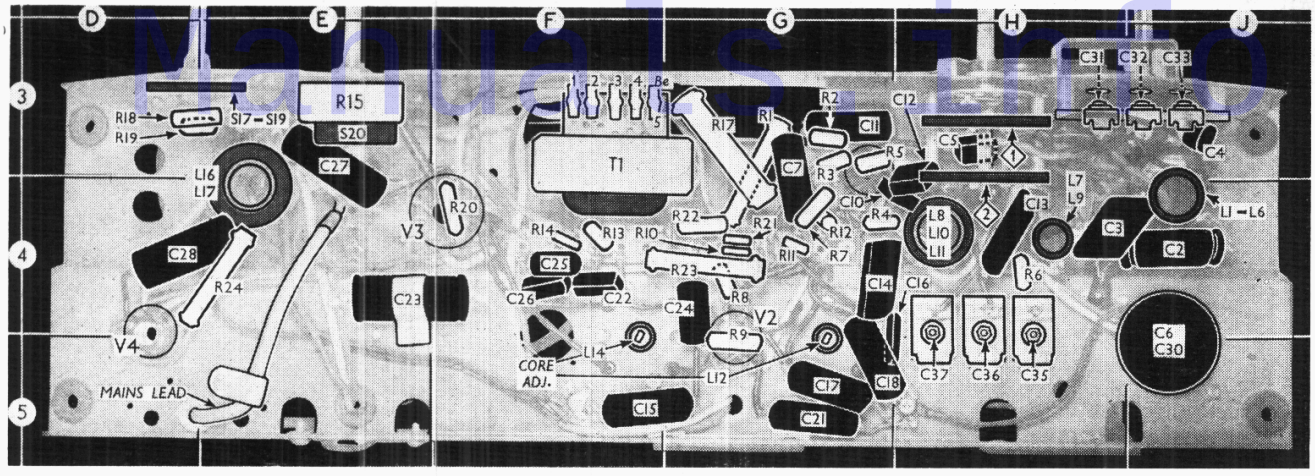
CIRCUIT ALIGNMENT

The makers state that the receiver may be aligned while still on its baffle, a cranked screwdriver being used to adjust **C31, C32** and **C33.** 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 so



Plan view of the chassis. The tags on the mains auto-transformer **T2** are numbered **6-11** to agree with those in the circuit diagram overleaf.



Under-chassis view, showing the positions of the switch units as viewed in the diagrams in cols. 2 and 4. The tag numbers **1, 2, 3, 4, 5** on the output transformer **T1** have to be rearranged in some chassis to **2, 1, 3, 4, 5** to agree with the markings in the circuit diagram overleaf. To adjust the trimmers **C31-C33** from the direction shown here, the baffle must be removed.

that the adjustment is not upset by the removal of the screwdriver, and also to avoid damaging the trimmer cores.

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 the volume control and gang to maximum and fully unscrew **L14** and **L15** cores (location 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 M.W. trimmer tag **C32** (J3), fully unscrew the cores of **L12** and **L13** (G4, B2), feed in a 465 kc/s signal, and adjust the cores of **L12** and **L13**, in that order, for maximum output.

R.F. and Oscillator Stages.—With the gang at maximum capacitance and the baffle mounted, the cursor should coincide

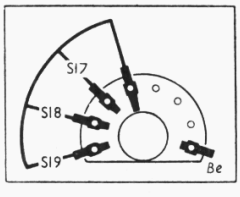


Diagram of the tone control switch unit, as seen from the rear of an inverted chassis.

with the 52 m mark on the scale. It may be adjusted by sliding it along the drive cord.

If the baffle has been removed, an alignment scale printed on the gang drum may be used for calibration. With the gang at maximum, zero reading on this scale should be opposite the pointer associated with it. It may be adjusted if the two fixing screws are slackened. 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., and unscrew **C33** (J3) and **C37** (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 **C37** and **C33** 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** (A1) for maximum output. Repeat these operations until no improvement results.

M.W.—Switch set to M.W. and unscrew **C32** (J3) and **C36** (H4), tune to 220 m on scale (158 deg), feed in a 220 m (1,363 kc/s) signal, and adjust **C36** and **C32** for maximum output. Tune to about 300 m on scale (between 111.75 and 119.5 deg on drum) 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., and unscrew **C31** (H3) and **C35** (H4). Tune to 20 m on scale (156.5 deg), feed in a 20 m (15 Mc/s) signal and adjust **C35** and **C31** for maximum output, choosing the peak on **C35** involving the lesser capacitance. Tune to about 31.25 m on 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.

Aerial Filter.—When 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 filter core for maximum reading on the meter.

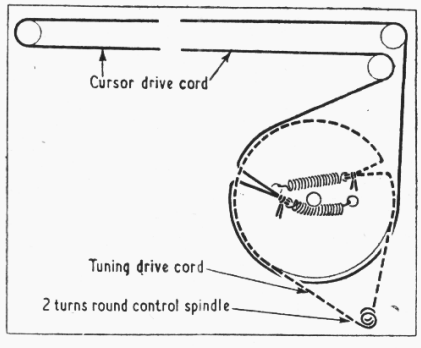
DRIVE CORD REPLACEMENT

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 below, 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. Then run the cord 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 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.



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

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