

"TRADER" SERVICE SHEET
1033

KOLSTER-BRANDES GR40

10-Band Superhet with Seven Band-spread Ranges

SEVEN band-spread ranges are provided on the Kolster-Brandes GR40, in addition to the normally tuned S.W., M.W., and L.W. bands. The waveband ranges are 1,000-2,300 m, 188-560 m, 58.7-188 m (designated the Trawler band) and band-spread coverages of 5.95-6.3 Mc/s for the 49-m band, 7.0-7.4 Mc/s (42 m), 9.35-9.9 Mc/s (31 m), 11.5-12.1 Mc/s (25 m), 14.8-15.8 Mc/s (19 m), 17.2-18.4 Mc/s (16 m) and 20.8-22.4 Mc/s (13 m). Each band is calibrated on a 9in scale on a rotary drum.

Provision is made for the connection of a gramophone pick-up and an external speaker, and switches are provided to mute radio and the internal speaker. The mains transformer is double-wound, and a third wire is provided in the mains cable for an earth connection.

Release date and original price: August, 1951; £27 6s 3d plus purchase tax.

CIRCUIT DESCRIPTION

Aerial input on the normal S.W. tuning band, designated the Trawler band, is via a tapping in the tuning coil L1. On M.W. and L.W. coupling is via the capacitive potential dividers C1, C2

(M.W.) and C1, C3 (L.W.) to single-tuned circuits L2, C42 and L3, C42 respectively. On these ranges S18 is closed and S19 open. They precede a variable-mu R.F. pentode valve (V1, Brimar 6BA6) which operates as signal frequency amplifier.

On the seven band-spread ranges S18 opens, and S1, S19 close, and the band-spread coils L4 (49 m), L5 (42 m), L6 (31 m), L7 (25 m), L8 (19 m), L9 (16 m) and L10 (13 m) are variably tuned by C42 in conjunction with band-spreading capacitors C4, C5. Aerial coupling is via C1 to the junction of C4, C5.

Aperiodic resistance-capacitance coupling by R4, C10 and R6 is employed on the three normal broadcast bands between V1 and a heptode valve (V2, Brimar 6BE6) which operates as frequency changer with electron coupling. On the band-spread ranges the control grid circuit of V2 is fixed-tuned by C12 and coils L11 (49 m), L12 (42 m), L13 (31 m), L14 (25 m), L15 (19 m), L16 (16 m) and L17 (13 m) to the mid-points of their respective bands.

In the oscillator circuit, on the three normal waveband ranges S29 closes, S30 opens, and oscillator coils L26 (S.W.), L27 (M.W.) and L28 (L.W.) are tuned by

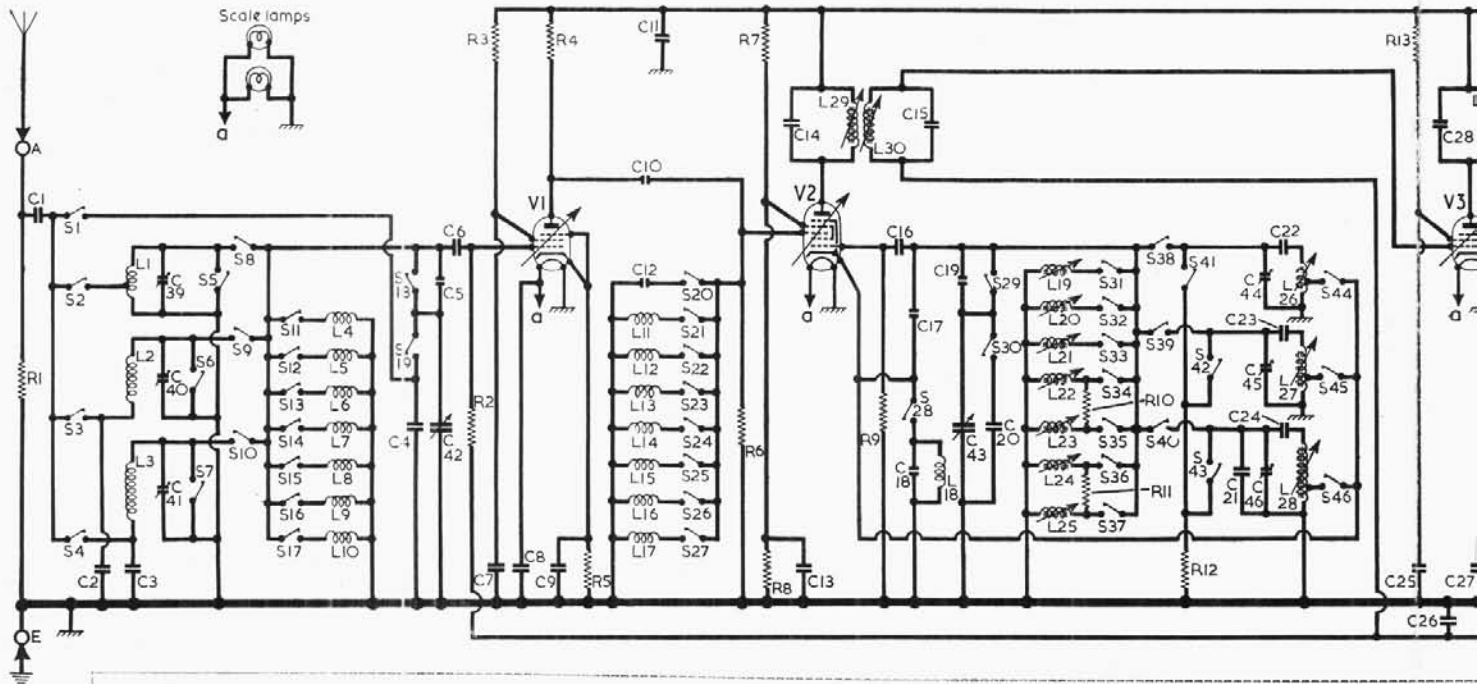
C43. Parallel trimming by C44 (S.W.), C45 (M.W.) and C21, C46 (L.W.); series tracking by C22 (S.W.), C23 (M.W.) and C24 (L.W.), in the high potential sides of the circuit. Reaction coupling from cathode via coil tapplings.

For band-spread operation, S29 opens, S30 closes, and the band-spread coils L19 (49 m), L20 (42 m), L21 (31 m), L22 (25 m), L23 (19 m), L24 (16 m) and L25 (13 m) are tuned by C20, C43 via band-spreading capacitor C19. Reaction coupling from cathode across common impedance of L18, C18 in A.C. potential divider C17, L18, C18.

Third valve (V3, Brimar 6BA6) is a variable-mu R.F. pentode, operating as intermediate frequency amplifier with tuned transformer couplings C14, L29, L30, C15 and C28, L31, L32, C29.

Intermediate frequency 422 kc/s.

Diode signal detector is part of double diode triode valve (V4, Brimar 6AT6). Audio frequency component in rectified output, developed across manual volume control R18, which acts as diode load, is passed via C32 to control grid of triode section. I.F. filtering by C30, R15 and C31. D.C. potential developed across R18 is fed back as bias via decoupling



Circuit diagram of the Kolster-Brandes GR40 A.C. superhet. The three normally-tuned waveband coils are drawn vertically, and the seven band-spread coils are drawn horizontally. Reading from top to bottom the bands are respectively: trawler, M.W., L.W., and then 49 m, 42 m, 31 m, 25 m, 19 m, 16 m and 13 m. V1 is aperiodically coupled to V2, but on the band-spread ranges the coils are fixed-tuned by C12.

circuit **R16, C26** to R.F., F.C. and I.F. stages, giving automatic gain control.

Resistance-capacitance coupling, via **R21, C34** and **R22**, between **V4** triode and beam tetrode output valve (**V5, Brimar 6V6GT**). Variable tone control by **R22** and **C33**, giving negative feed-back between control grids of **V5** and **V4**. Tone correction by negative feed-back between winding **e** on output transformer **T1** and lower end of volume control **R18**.

To prevent negative feed-back voltages appearing at the top end of **R18** and operating the signal diode, a balanced bridge circuit is formed by windings **d, e** on **T1** and resistors **R17, R18**, the junction of **R17, R18** being at zero feed-back potential. **C37, R25** and **R26** form a frequency correcting network in the feed-back path.

H.T. current is supplied by L.H.C. full-wave rectifying valve (**V6, Brimar 6X4**). Smoothing by **R23** and electrolytic capacitors **C35, C36**, residual hum being neutralized by passing the H.T. current through a section of **T1** primary. **V6** is connected to the same heater winding on **T2** as the other valves.

DISMANTLING THE SET

Removing Chassis.—Remove four control knobs (recessed grub screws): unsolder leads from speech coil tags on speaker; remove four 2BA cheese-head chassis bolts, with shake-proof and claw washers, and withdraw chassis from cabinet.

When replacing, the speaker leads are connected to the outer speaker tags, the centre tag being blank.

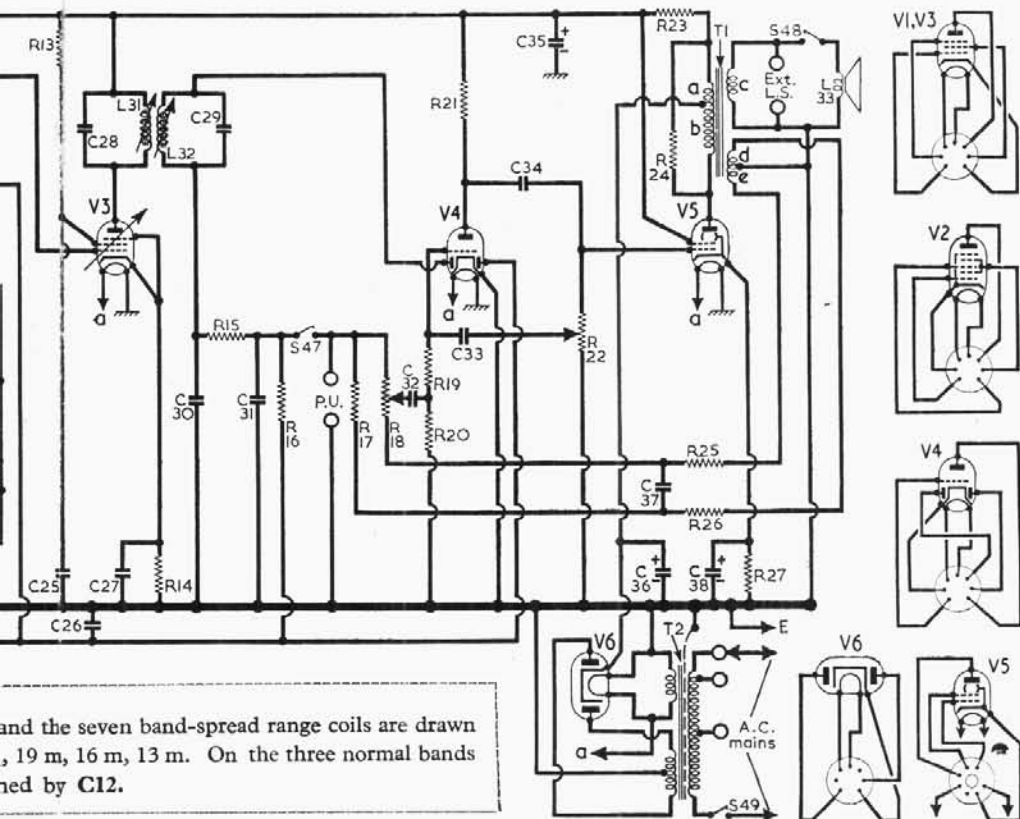


COMPONENTS AND VALUES

RESISTORS		Values	Locations
R1	Mod. hum shunt	10kΩ	F5
R2	V1 C.G.	220kΩ	E4
R3	V1 S.G. feed	33kΩ	E4
R4	V1 anode load	15kΩ	E4
R5	V1 G.B.	68Ω	E4
R6	V2 C.G.	220kΩ	E4
R7	V2 S.G. pot. divider	10kΩ	E4
R8		27kΩ	E4
R9	V2 osc. C.G.	22kΩ	E4
R10	Oscillator damping	15kΩ	E5
R11		10kΩ	F5
R12	Oscillator shunt	100Ω	E5
R13	V3 S.G. feed	33kΩ	D4
R14	V3 G.B.	68Ω	D4
R15	I.F. stopper	47kΩ	D4
R16	A.G.C. decoupling	2MΩ	D3
R17	Feed-back neut.	4.7MΩ	D3
R18	Volume control	5MΩ	D3
R19	V4 C.G.	100kΩ	D3
R20		10MΩ	D3
R21	V4 anode load	470kΩ	D4
R22	Tone control	500kΩ	C3
R23	H.T. smoothing	820Ω	C3
R24	T1 shunt	47kΩ	C3
R25	Neg. feed-back	240Ω	D3
R26		2.2kΩ	C3
R27	V5 G.B.	240Ω	D3

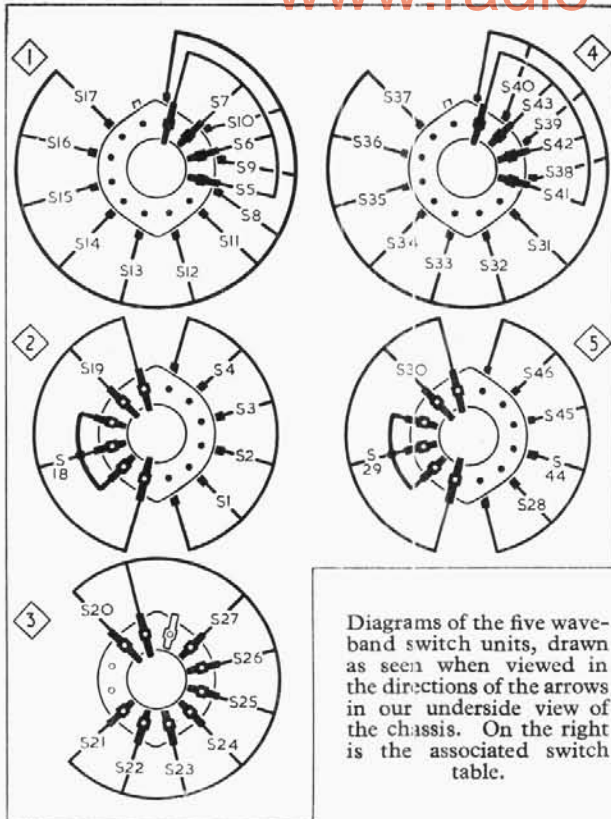
CAPACITORS		Values	Locations
C1	Aerial series	0.005μF	F5
C2	M.W. coupler	0.005μF	E3
C3	L.W. coupler	0.005μF	E3
C4	Band-spread trim.	100pF	F3
C5	Band-spreader	40pF	F3
C6	V1 C.G.	100pF	E4
C7	V1 S.G. decoup.	0.02μF	E4
C8	Heater by-pass	0.1μF	E4
C9	V1 cath. by-pass	0.02μF	E4
C10	R.F. coupling	25pF	E4
C11	H.T. decoupling	2μF	E3
C12	Band-spread tune	34pF	E4
C13	V2 S.G. decoup.	0.02μF	E4
C14	1st I.F. trans. tuning	250pF	B2
C15		ing	250pF
C16	V2 osc. C.G.	100pF	E5
C17	Oscillator coupling	20pF	E5
C18		60pF	E4
C19	Band-spreader	40pF	E5
C20	Band-spread trim.	100pF	F5
C21	L.W. osc. trim.	100pF	E5
C22	S.W. osc. tracker	0.002μF	E4
C23	M.W. osc. tracker	550pF	E5
C24	L.W. osc. tracker	200pF	E5
C25	V3 S.G. decoup.	0.02μF	D4
C26	A.G.C. decoupling	0.02μF	D5
C27	V3 cath. by-pass	0.1μF	D5
C28	2nd I.F. trans. tuning	250pF	B1
C29		ing	250pF
C30	L.F. by-passes	100pF	D4
C31	A.F. coupling	100pF	D4
C32		0.005μF	D3
C33	Part tone control	100pF	D3
C34	A.F. coupling	0.02μF	D3
C35*	H.T. smoothing	32μF	B1
C36*		32μF	B1
C37	Neg. feed-back	0.1μF	D3
C38*	V5 cath. by-pass	25μF	C4
C39†	S.W. aerial trim.	—	A1
C40†	M.W. aerial trim.	—	A1
C41†	L.W. aerial trim.	—	A1
C42†	Aerial tuning	—	A1
C43†	Oscillator tuning	—	A1
C44†	S.W. osc. trim.	—	A2
C45†	M.W. osc. trim.	—	A2
C46†	L.W. osc. trim.	—	A2

* Electrolytic. † Variable. ‡ Pre-set. § 33pF ± 7pF (negative temp. coeff.), in parallel.



and the seven band-spread range coils are drawn 19 m, 16 m, 13 m. On the three normal bands tuned by C12.

OTHER COMPONENTS		Approx. Values (ohms)	Locations	
L1	Aerial tuning coils	1.6	E3	
L2		3.0	E3	
L3		35.0	E4	
L4		—	F3	
L5		—	F4	
L6		—	F3	
L7		Band-spread aerial tuning coils	—	F4
L8	—		F3	
L9	—		F4	
L10	—		F3	
L11	Band-spread R.F. tuning coils	—	F4	
L12		—	F4	
L13		—	F4	
L14		—	F4	
L15	B-s osc. coup.	—	F4	
L16		—	F4	
L17		—	F4	
L18		10.0	E5	
L19	Band-spread osc. tuning coils	—	F4	
L20		—	F5	
L21		—	F5	
L22		—	F5	
L23	Oscillator tuning coils	1.2	E5	
L24		4.0	E5	
L25		9.5	E5	
L26		5.0	B2	
L27	1st I.F. trans.	5.0	B2	
L28		5.0	B2	
L29	2nd I.F. trans.	5.0	B1	
L30		5.0	B1	
L31	Speech coil	2.8	—	
L32		2.0	—	
L33	200.0	—		
T1	O.P. trans.	3.0	B1	
T2		1.0	—	
S1-846		Waveband switches	30.0	—
S47			H.T. sec., total	216.0
S48	Heater secondary		—	—
S49	Primary, total		—	—
S49	P.U. switch	—	E3	
S48	Int. L.S. switch	—	D5	
S49	Mains sw., g'd R22	—	C3	



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

Switch	L.W.	M.W.	S.W.	40 m	42 m	31 m	25 m	19 m	16 m	13 m
S1	—	—	—	—	—	—	—	—	—	—
S2	—	—	—	—	—	—	—	—	—	—
S3	—	—	—	—	—	—	—	—	—	—
S4	—	—	—	—	—	—	—	—	—	—
S5	—	—	—	—	—	—	—	—	—	—
S6	—	—	—	—	—	—	—	—	—	—
S7	—	—	—	—	—	—	—	—	—	—
S8	—	—	—	—	—	—	—	—	—	—
S9	—	—	—	—	—	—	—	—	—	—
S10	—	—	—	—	—	—	—	—	—	—
S11	—	—	—	—	—	—	—	—	—	—
S12	—	—	—	—	—	—	—	—	—	—
S13	—	—	—	—	—	—	—	—	—	—
S14	—	—	—	—	—	—	—	—	—	—
S15	—	—	—	—	—	—	—	—	—	—
S16	—	—	—	—	—	—	—	—	—	—
S17	—	—	—	—	—	—	—	—	—	—
S18	—	—	—	—	—	—	—	—	—	—
S19	—	—	—	—	—	—	—	—	—	—
S20	—	—	—	—	—	—	—	—	—	—
S21	—	—	—	—	—	—	—	—	—	—
S22	—	—	—	—	—	—	—	—	—	—
S23	—	—	—	—	—	—	—	—	—	—
S24	—	—	—	—	—	—	—	—	—	—
S25	—	—	—	—	—	—	—	—	—	—
S26	—	—	—	—	—	—	—	—	—	—
S27	—	—	—	—	—	—	—	—	—	—
S28	—	—	—	—	—	—	—	—	—	—
S29	—	—	—	—	—	—	—	—	—	—
S30	—	—	—	—	—	—	—	—	—	—
S31	—	—	—	—	—	—	—	—	—	—
S32	—	—	—	—	—	—	—	—	—	—
S33	—	—	—	—	—	—	—	—	—	—
S34	—	—	—	—	—	—	—	—	—	—
S35	—	—	—	—	—	—	—	—	—	—
S36	—	—	—	—	—	—	—	—	—	—
S37	—	—	—	—	—	—	—	—	—	—
S38	—	—	—	—	—	—	—	—	—	—
S39	—	—	—	—	—	—	—	—	—	—
S40	—	—	—	—	—	—	—	—	—	—
S41	—	—	—	—	—	—	—	—	—	—
S42	—	—	—	—	—	—	—	—	—	—
S43	—	—	—	—	—	—	—	—	—	—
S44	—	—	—	—	—	—	—	—	—	—
S45	—	—	—	—	—	—	—	—	—	—
S46	—	—	—	—	—	—	—	—	—	—

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured in our receiver when it was operating from A.C. mains of 230 V. The receiver was tuned to the highest wavelength end of M.W., with the volume control at maximum, but there was no signal input.

Voltage readings were measured with an Avo Electronic TestMeter, and as this instrument draws no appreciable current, allowance must

Valve	Anode		Screen		Cath.
	V	mA	V	mA	
V1 6BA6	75	7.0	100	3.0	0.7
V2 6BE6	190	3.4	90	6.4	—
V3 6BA6	190	8.0	95	3.0	0.7
V4 6AT6	57	0.28	—	—	—
V5 6V6GT	220	36.0	190	3.0	9.0
V6 6X4	200†	—	—	—	223.0

† A.C. voltage each anode.

be made for the current drawn by other types. Chassis was the negative connection.

GENERAL NOTES

Switches.—S1-S46 are the waveband switches, ganged in five rotary units beneath the R.F. section of the chassis. They are indicated in our underside view of the chassis, where they are identified by the numbers 1-5 in diamond surrounds, with arrows to show which way round they are viewed in the diagrams seen above, where they are shown in detail. It should be noted that whereas units 1, 2, 4, 5 are drawn as seen from the front of an inverted chassis, 3 is viewed from the rear of an inverted chassis.

The table beside the diagrams gives the switch positions for the ten control settings, starting from the fully anti-clockwise position of the control spindle. A dash indicates open, and C, closed.

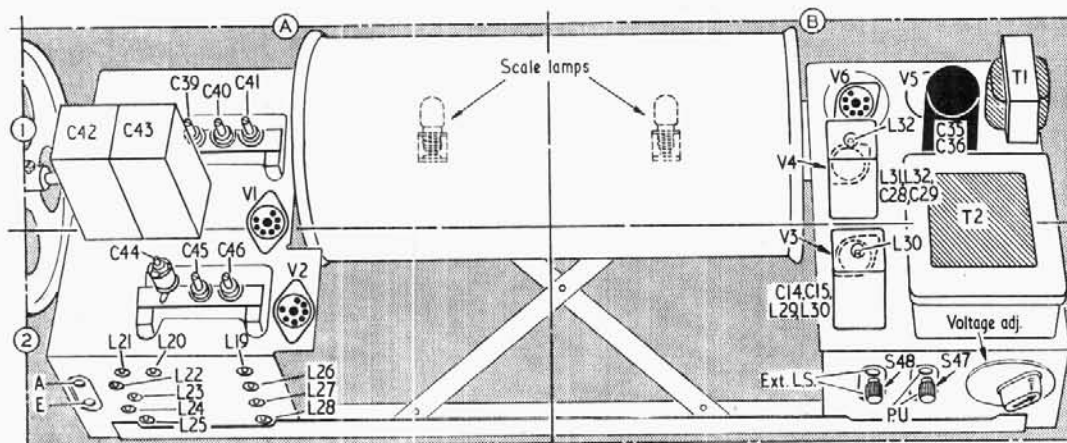
S47 and S48 are respectively the gram pick-up and internal speaker switches, associated with the sockets for the external connections. They are of the screw-in type.

S49 is the Q.M.B. mains switch, ganged with the tone control R22.

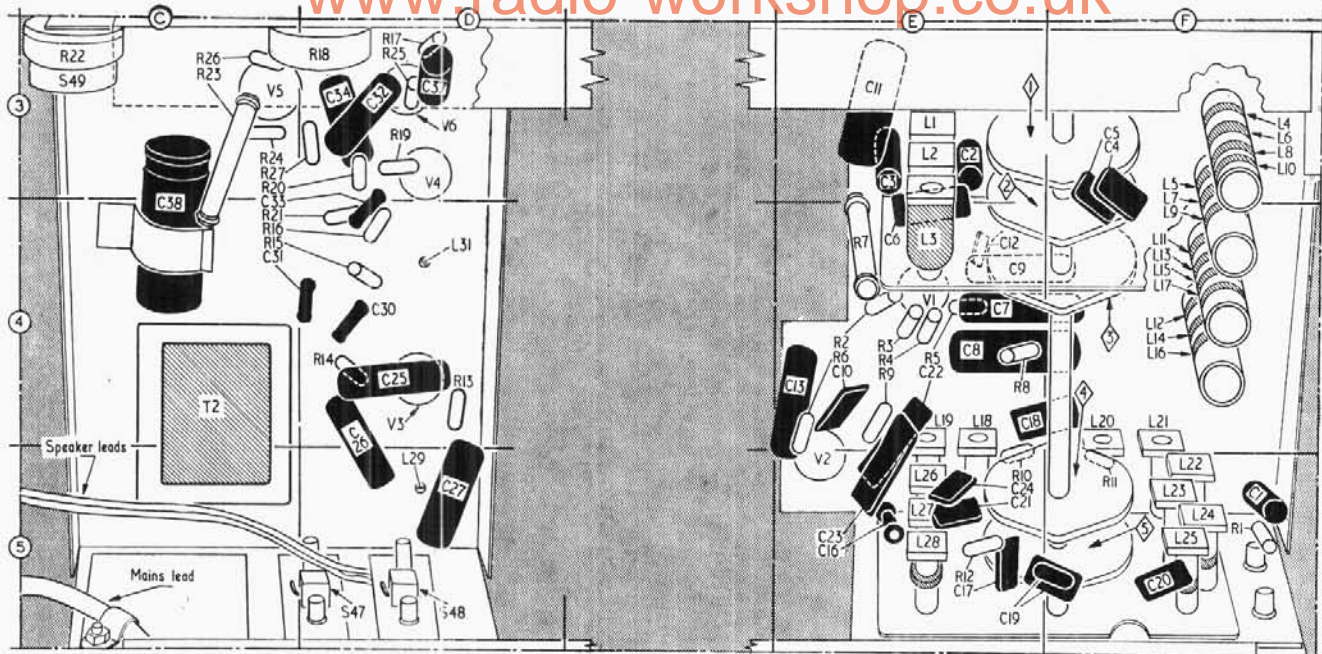
Scale Lamps.—These are two M.E.S. type lamps, with clear tubular bulbs, rated at 6.5 V, 0.3 A. They are located inside the tuning scale drum, and access to them for replacement is gained by removing the scale sheet. This is done by removing the two screws holding its ends to the drum wheels at each end, and unwinding the sheet. Leads to the lamps are passed into the drum through a hollow tube at its centre.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 3-4 Ω) external speaker. A screw-type switch S48, which mutes the internal speaker, is operated by a knob between the two sockets.

Valve V6.—This in our receiver was a 6X4, an indirectly heated miniature full-wave rectifier on a 7-pin American button base. The valve specified in the makers' manual was the Brimar 724, which has a loctal base, whose connections are: 1, heater; 2, blank; 3, anode; 4, 5, blank; 6, anode; 7, cathode; 8, heater.



Plan view of the chassis, which consists of two sections separated by the rotary scale drum. On the left are the R.F. and oscillator stages, and on the right the I.F., output and mains input stages.



Underside drawings of the two units of the chassis, with the space between them, which is occupied by the drum, omitted. The five wave band switch units are indicated by the numbers 1-5 in diamond surrounds.

CIRCUIT ALIGNMENT

I.F. Stages.—Remove chassis from cabinet and connect output of signal generator, via an $0.1\mu\text{F}$ capacitor in the "live" lead, to control grid (pin 7) of **V2** and chassis. Tune receiver to highest wavelength end of M.W. and turn volume control to maximum. Feed in a 422 kc/s (710.8 m) signal and adjust the cores of **L32** (location reference B1), **L31** (D4), **L30** (B2) and **L29** (D5) for maximum output. Repeat these adjustments.

R.F. and Oscillator Stages.—The following adjustments can be made without removing the chassis from its cabinet. Check that with the gang at maximum capacitance, the cursor coincides with the white dots in the ends of the tuning scales. Connect output of signal generator via a suitable dummy aerial to **A** and **E** sockets. When adjusting aerial trimmers, "rock" gang for optimum results.

L.W.—Switch set to L.W., tune to white calibration dot at 175 kc/s, feed in a 175 kc/s (1,714 m) signal and adjust the core of **L28** (A2) for maximum output. Tune set to 250 kc/s, feed in a 250 kc/s (1,200 m) signal and adjust **C46** (A2) and **C41** (A1) for maximum output. Repeat these operations until the calibration is correct at both ends of band.

M.W.—Switch set to M.W., tune to 500 m, feed in a 500 m (600 kc/s) signal and adjust the core of **L27** (A2) for maximum output. Tune set to 214.3 m, feed in a 214.3 m (1,400 kc/s) signal and adjust **C45** (A2) and **C40** (A1) for maximum output. Repeat these adjustments until calibration is correct at both ends of the band.

S.W.—Switch set to Trawler band, tune to 2 Mc/s, feed in a 2 Mc/s (150 m) signal and adjust the core of **L26** (A2) for maximum output. Tune set to 4.5

Mc/s, feed in a 4.5 Mc/s (66.67 m) signal and adjust **C44** (A2) and **C39** (A1) for maximum output. Repeat these adjustments until calibration is correct at both ends of band.

49 m.—Switch set to 49 m, tune to 6.1 Mc/s, feed in a 6.1 Mc/s (49.18 m) signal and adjust the core of **L19** (A2) for maximum output.

42 m.—Switch set to 42 m, tune to 7.2 Mc/s, feed in a 7.2 Mc/s (41.67 m) signal and adjust the core of **L20** (A2) for maximum output.

31 m.—Switch set to 31 m, tune to 9.6 Mc/s, feed in a 9.6 Mc/s (31.25 m)

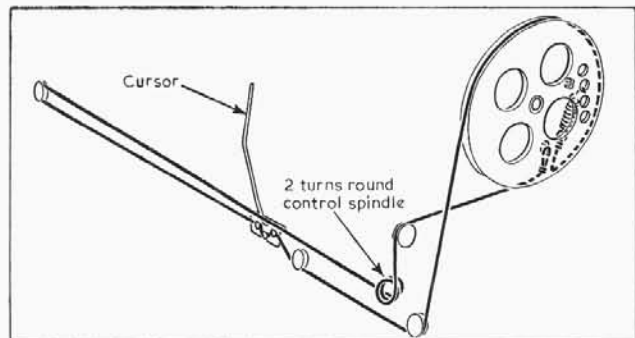
17.8 Mc/s, feed in a 17.8 Mc/s (16.85 m) signal and adjust the core of **L24** (A2) for maximum output.

13 m.—Switch set to 13 m, tune to 21.6 Mc/s, feed in a 21.6 Mc/s (13.89 m) signal and adjust the core of **L25** (A2) for maximum output.

DRIVE CORD REPLACEMENT

Six feet of nylon braided glass yarn is required for a new tuning drive cord, which should be run as shown in the accompanying sketch. Here the complete system is shown as seen when viewed from

Sketch showing the course followed by the tuning drive cord. It is drawn as seen from the front right-hand corner of the chassis, with the gang at maximum.



signal and adjust the core of **L21** (A2) for maximum output.

25 m.—Switch set to 25 m, tune to 11.8 Mc/s, feed in a 11.8 Mc/s (25.42 m) signal and adjust the core of **L22** (A2) for maximum output.

19 m.—Switch set to 19 m, tune to 15.3 Mc/s, feed in a 15.3 Mc/s (19.61 m) signal and adjust the core of **L23** (A2) for maximum output.

16 m.—Switch set to 16 m, tune to

the front right-hand corner of the chassis, with the gang at maximum capacitance.

Four anchor holes are provided in the gang drum for the tension spring, so the actual length of cord is not very critical, and the length we give leaves an ample margin for tying off. The cursor can be fitted afterwards, and should be adjusted so that it covers the white dot at the high wavelength ends of the scales when the gang is at maximum capacitance.