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"TRADER" SERVICE SHEET

938

MARCONIPHONE T21A

3-band A.C. Superhet with Pre-set Stations

THREE switch-controlled pre-set stations are provided on the Marconiphone T21A, in addition to the three manually tuned wavebands. The receiver is a 4-valve (plus rect.) superhet designed to operate from A.C. mains of 195-255 V, 50-100 c/s via an auto-transformer. The waveband ranges are 16.5-52 m, 192-570 m and 900-2,000 m.

Provision is made for the use of an outside aerial, but except for S.W. operation it is seldom necessary to use one as an internal plate aerial provides ample signal pick-up in the service areas of modern transmitters. The chassis is "live" to the mains, but the pick-up sockets are isolated from the mains, and the output transformer secondary is connected directly to the **E** socket. It is advisable to use a good earth connection.

Release date and original price: July 1949; £17 19*s.* 6*d. plus purchase tax.*

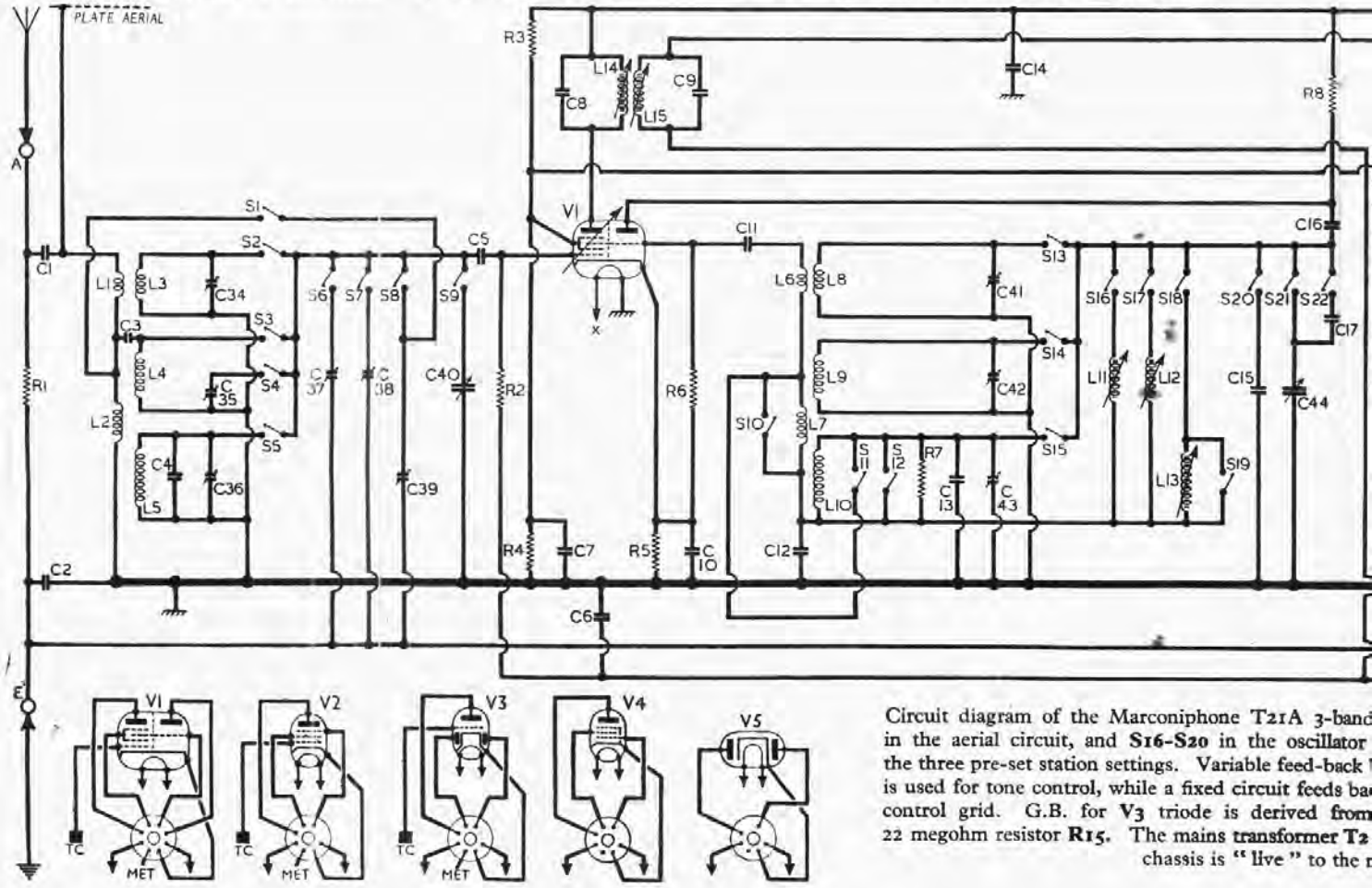
CIRCUIT DESCRIPTION

Plate aerial input via coupling coils **L1** (S.W.) and **L2** (M.W. and L.W.) to single-tuned circuits comprising coils **L3** (S.W.), **L4** (M.W.), and **L5** (L.W.) tuned manually by **C40.** On S.W. **S1** closes to by-pass **L2** via **C39.** For pre-set station tuning, **L4** is tuned by **C37** (via **S6**) or **C38** (via **S7**) in pre-set positions 2 and 3, or **L5** is tuned by **C39** (via **S8**) in position 1. In the pre-set positions, **S9** opens to disconnect **C40.**

First valve **(V1, Marconiphone metallized X147)** is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator anode coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned manually by **C44** via **S21** (S.W.) or **S22** (M.W. and L.W.). Parallel trimming by **C41** (S.W.), **C42** (M.W.) and **C13, C43** (L.W.); series tracking by **C17** (M.W.) and **C12** and **C17** in series (L.W.). Reaction coupling by **L6** (S.W.), **L7** (M.W. and L.W.) with some additional coupling across **C12** on L.W.

For pre-set station tuning, the two M.W. coils **L11** (position 3) and **L12** (position 2) are connected between grid and anode circuits via **S16** or **S17,** or the L.W. coil **L13** is connected there via **S18** (position 1). Tuning capacitance is provided by **C15** via **S20,** while **S21** and **S22** open to disconnect **C44.**

Second valve **(V2, Marconiphone metallized W147)** is a variable-mu R.F. pentode operating as intermediate frequency am-



Circuit diagram of the Marconiphone T21A 3-band
in the aerial circuit, and **S16-S20** in the oscillator
the three pre-set station settings. Variable feed-back
is used for tone control, while a fixed circuit feeds ba
control grid. G.B. for **V3** triode is derived from
22 megohm resistor **R15.** The mains transformer **T2**
chassis is "live" to the

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plifier with tuned-transformer couplings **C8, L14, L15, C9,** and **C19, L16, L17, C20.**

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Marconiphone metallized DH147),** in which the diode sections are wired in parallel. Audio-frequency component in rectified output is developed across load resistor **R11** and passed via **R12,** manual volume control **R13** and **C26** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C21, R12** and **R18.**

Provision is made for a P.U. to be connected across **R13** via isolating capacitors **C22** and **C23.** The D.C. potential developed across **R13** is tapped off and fed back, through a decoupling circuit **R10, C6,** as G.B. to F.C. and I.F. valves, giving automatic volume control.

Resistance-capacitance coupling by **R16, C28,** via grid stopper **R18,** between **V3** triode and pentode output valve **(V4, Marconiphone N147).** Fixed tone correction by **C30.** Fixed negative feed-back from **V4** cathode via **R17, C27** to **V3** triode grid circuit. Variable negative feed-back is employed as tone control between **V4** anode and control grid circuits.

Provision is made for the connection of a low impedance external L.S. across the secondary of **T1.** A plug and socket connection in this circuit permits the internal L.S. to be muted. **R22** provides an artificial load in the event of neither speaker being connected. Another safety measure is to connect both speakers directly to the **E** socket.

H.T. current is supplied from the mains input auto-transformer **T2** by rectifying valve **(V5, Marconiphone U147),** whose two sections are connected in parallel to operate as a half-wave rectifier. Resistance-capacitance smoothing by **C32, R23** and **C31** and **R20, C24.**

COMPONENTS AND VALUES

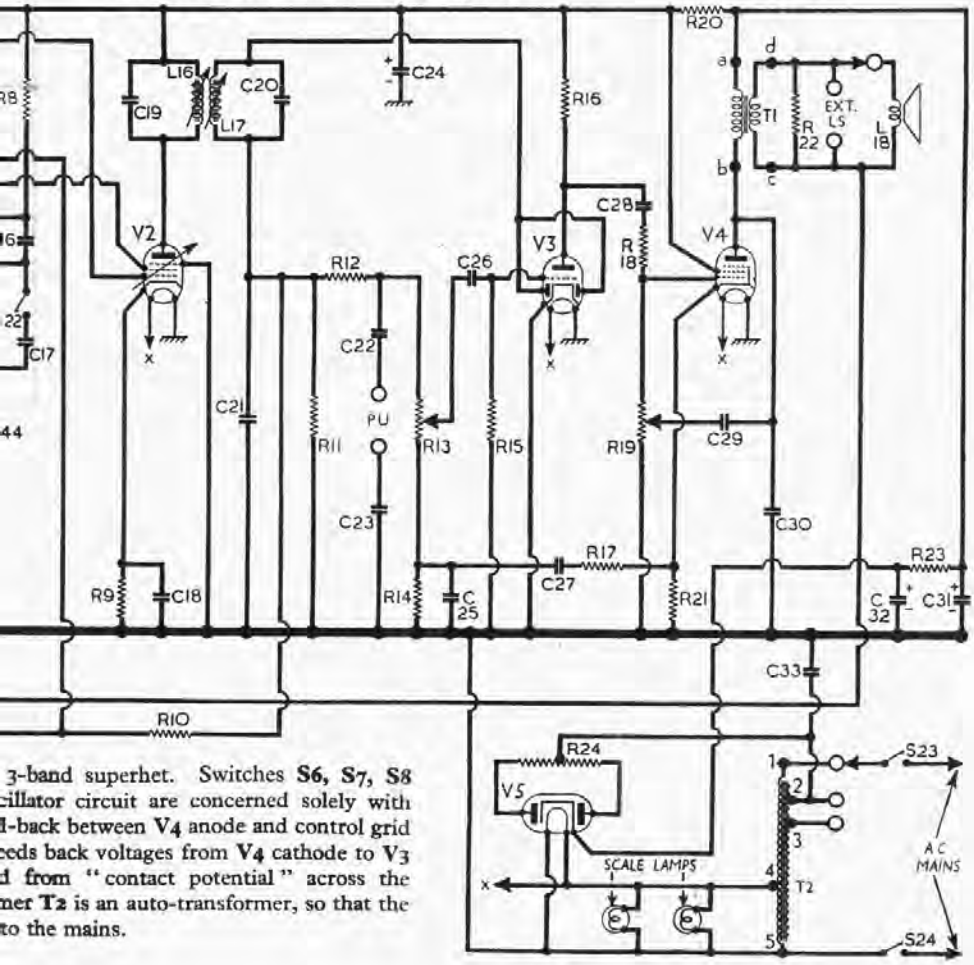
	RESISTORS	Values (ohms)	Locations
R1	Aerial shunt	1,000,000	J5
R2	V1 hex C.G.	680,000	B1
R3	V1, V2, S.G. H.T. pot. divider	22,000	G5
R4		47,000	H5
R5	V1 fixed G.B.	220	H5
R6	V1 osc. C.G.	33,000	H5
R7	Osc. damping	39,000	J4
R8	Osc. anode load	22,000	H5
R9	V2 fixed G.B.	330	G5
R10	A.G.C. decoupling	2,200,000	F4
R11	Signal diode load	470,000	E5
R12	I.F. stopper	100,000	F4
R13	Volume control	2,000,000	E3
R14	F.-B. resistor	4,700	E3
R15	V3 C.G. resistor	22,000,000	E5
R16	Triode load	220,000	F5
R17	F.-B. resistor	2,200	E4
R18	V4 C.G. stopper	47,000	E4
R19	Tone control	500,000	F3
R20	H.T. smoothing	1,000	G4
R21	V4 G.B.	150	E4
R22	Speaker shunt	33	B1
R23	H.T. smoothing	330	F5
R24	V5 surge limiter	*240	D5

* Centre tapped.

	CAPACITORS	Values (μF)	Locations
C1	External aerial series	0·001	J5
C2	Earth isolator	0·01	J5
C3	"Top" coupling	0·000005	H4
C4	Aerial L.W. trim	0·00003	J3
C5	V1, hexode C.G.	0·0001	A1
C6	A.G.C. decoupling	0·05	F4
C7	V1 S.G. decoupling	0·05	H5
C8	1st I.F. transformer tuning	0·0001	B2
C9		0·00018	B2
C10	V1 cath. by-pass	0·02	H5
C11	V1 osc. C.G.	0·0001	H5
C12	Osc. L.W. tracker	0·00027	A2
C13	Osc. L.W. fixed trim.	0·0001	G3
C14	H.T. R.F. by-pass	0·05	F4
C15	Pre-set tune II	0·00035	J4
C16	Osc. anode coupling	0·0001	H5
C17	Osc. M.W. tracker	0·00059	J4
C18	V2 cath. by-pass	0·05	G5
C19	2nd I.F. transformer tuning	0·0001	C2
C20		0·00018	C2
C21	I.F. by-pass	0·0001	E5
C22	P.U. D.C. isolating capacitors	0·01	F5
C23		0·05	G5
C24*	H.T. smoothing	16·0	G4
C25	F.-B. decoup.	0·05	F3
C26	A.F. coupling	0·01	E4
C27	F.-B. capacitor	0·05	E4
C28	A.F. coupling	0·02	E5
C29	F.-B. tone control	0·0005	E3
C30	Tone corrector	0·005	E4
C31*	H.T. smoothing capacitors	16·0	G4
C32*		32·0 §	F4
C33	Mains R.F. by-pass	0·01	E5
C34‡	Aerial S.W. trim.	—	A1
C35‡	Aerial M.W. trim.	—	A1
C36‡	Aerial L.W. trim.	—	A1
C37‡	Pre-set 3 trim.	—	A2
C38‡	Pre-set 2 trim.	—	A2
C39‡	Pre-set 1 trim.	—	A2
C40†	Aerial tuning	—	A1
C41‡	Osc. S.W. trim.	—	G4
C42‡	Osc. M.W. trim.	—	B1
C43‡	Osc. L.W. trim.	—	B1
C44†	Oscillator tuning	—	A1

* Electrolytic. † Variable ‡ Pre-set. § two 16μF in parallel.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Aerial coupling coils	0·1	H3
L2		137·0	J3
L3	Aerial tuning coils	0·1	H3
L4		2·6	J3
L5		26·0	J3
L6	Oscillator coupling coils	0·4	H5
L7		2·0	J5
L8	Oscillator tuning coils	0·1	H5
L9		2·6	J5
L10		6·8	J5
L11	Pre-set 3 coil	2·0	A2
L12	Pre-set 2 coil	2·5	A2
L13	Pre-set 1 coil	5·0	A2
L14	1st I.F. transformer Pri.	10·0	B2
L15	Sec.	4·4	B2
L16	2nd I.F. transformer Pri.	7·0	C2
L17	Sec.	4·4	C2
L18	Speech coil	4·0	—
T1	Output trans. Pri.	500·0	B1
	Sec.	0·8	
T2	Mains Auto-transformer 1-2	13·0	D4
	2-3	18·0	
	3-4	146·0	
	4-5	0·1	
S1-S22	W/band switches	—	H4
S23	Mains switches, g'd R13	—	E3
S24			



3-band superhet. Switches **S6, S7, S8** cillator circuit are concerned solely with d-back between **V4** anode and control grid eeds back voltages from **V4** cathode to **V3** d from "contact potential" across the ner **T2** is an auto-transformer, so that the to the mains.

VALVE ANALYSIS

Valve voltages and currents in the table overleaf are those measured in our receiver when it was operating on mains of 205 V, using the 195-215 V tapping on the mains adjustment panel. The receiver was tuned to the lowest wavelength on the M.W. band, and the volume control

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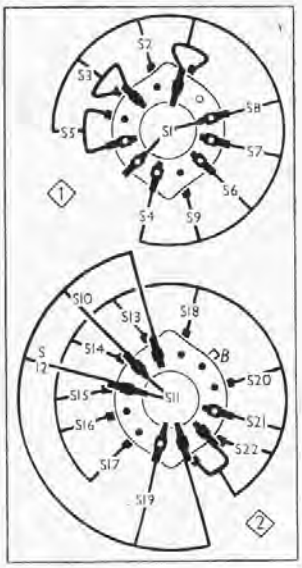
Switch Table and Diagrams

Switch	S.W.	M.W.	L.W.	3	2	1
S1	C	—	—	—	—	—
S2	C	—	—	—	—	—
S3	—	C	—	C	C	—
S4	—	C	—	—	—	—
S5	—	—	C	—	—	C
S6	—	—	—	C	—	—
S7	—	—	—	—	C	—
S8	—	—	—	—	—	C
S9	C	C	C	—	—	—
S10	C	—	—	—	C	C
S11	C	—	—	—	C	C
S12	C	C	—	C	C	C
S13	C	—	—	—	—	—
S14	—	C	—	—	—	—
S15	—	—	C	—	—	—
S16	—	—	—	C	—	—
S17	—	—	—	—	C	—
S18	—	—	—	—	—	C
S19	C	C	C	C	C	—
S20	—	—	—	C	C	C
S21	C	—	—	—	—	—
S22	—	C	C	—	—	—



Diagrams of the waveband switch units (above) drawn as seen from the rear of an inverted chassis. In several cases front and back tags are strapped together. On the left is the associated table.

VALVE ANALYSIS—*continued*

was at maximum, but there was no signal input.

With the exception of cathode readings, all voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection.

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 X147	215	1·7	94	2·0	1·5
	Oscillator				
	107	3·8			
V2 W147	215	3·9	94	1·24	1·6
V3 DH147	50	0·76	—	—	—
V4 N147	222	25·0	215	2·7	4·2
V5 U147	230†	—	—	—	250·0

† A.C. reading.

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom cover, held in place by four wood screws, and removal of this cover permits access to be gained to the components beneath the chassis.

Removing Chassis.—Pull off the four control knobs (with felt washers);

remove back and bottom covers (four wood screws each);

loosen wood screw on the left inside (viewed from the rear) holding the plate aerial spade connector, unclip the scale lamps from their brackets, and free the drive cord from the cursor carriage;

remove four 2BA chassis retaining bolts (with one plain and one spring washer each) from the underside of the cabinet, and slide chassis out to the extent of the speaker leads, which is sufficient for most purposes.

To free chassis entirely, unsolder the speaker leads.

When replacing, do not omit to replace the plate aerial connector.

Removing Speaker.—Remove four wood screws (with washers) and lift speaker out.

When replacing, the speech coil tags should be uppermost.

GENERAL NOTES

Switches.—S1-S22 are the waveband and pre-set station switches, ganged in two rotary units in a six-position assembly beneath the chassis. These units are indicated by the numbers **1** and **2** in diamonds in our under-chassis view by arrows which show the direction in which they are viewed in the diagrams in col. 2 where they are shown in detail.

The table (col. 1) gives the switch positions for the six control settings, starting from the fully anti-clockwise position of the control knob (S.W.). A dash indicates open, and **C**, closed.

S23, S24 are the double-pole Q.M.B. mains circuit switches, ganged with the manual volume control **R13.**

Scale Lamps.—These are two Osram M.E.S. type lamps, with small clear spherical bulbs, rated at 6.3 V, 0.3 A. In order to avoid damage to the mains auto-transformer when the chassis is on the bench, it is advisable to bind the scale lamps with insulating tape to prevent short-circuits.

CHASSIS DIVERGENCIES

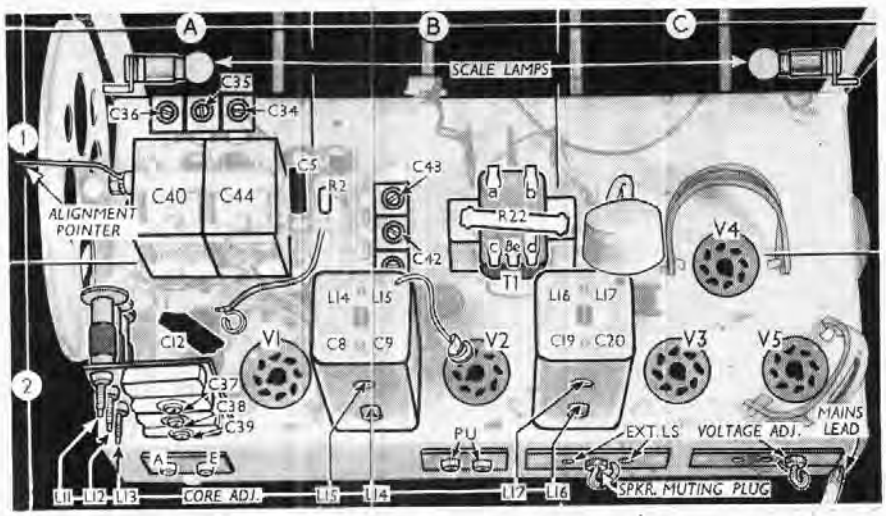
In early chassis the plate aerial, instead of being connected as we show it, was connected to the junction of **L1** and **L2**, where it was not operative on the S.W. band. Although the external aerial is provided mainly for S.W. operation, the plate aerial can sometimes be used, and the modification is necessary in any case because in the original position it sometimes caused instability on S.W., and the modification should be carried out on all early models when they come in for service. The change was introduced at serial No. 44755.

In early models also (up to serial No. 5789), the upper pick-up socket was connected via **C22** to the opposite end of **R12** to that shown in our diagram, where it sometimes caused serious distortion. This modification is already included in all chassis from serial No. 5790 onwards, and should be made to earlier models when they are brought in for service.

When this receiver is to be used with an H.M.V. playing desk 2101 or 2102 (Columbia 231), the quality will be greatly improved if a second 0.05 μF capacitor is connected in parallel with **C23.** At the same time, the earth bonding in the player between the brake mechanism and the tone filter screen should be cut. This disconnects the brake-work from the earthing system and removes hum.

In early models prior to serial No. 6049 the aerial pre-set trimmer bank **C37, C38, C39** (location reference A2) was connected directly to the earth socket, as shown in our circuit diagram, where the insulation is liable to be subjected to a higher voltage strain than is safe for it, as one side of the capacitors is in D.C. contact with the mains, and the other with the earth socket.

Where this arrangement is found, it should be modified by breaking the common earth lead from the trimmer bank and connecting it via a 0.01 μF, 1,000 V



Plan view of the chassis. All the pre-set station adjustments are grouped in the rear left-hand corner of the chassis, where they are conveniently accessible with the trimmer tool provided.

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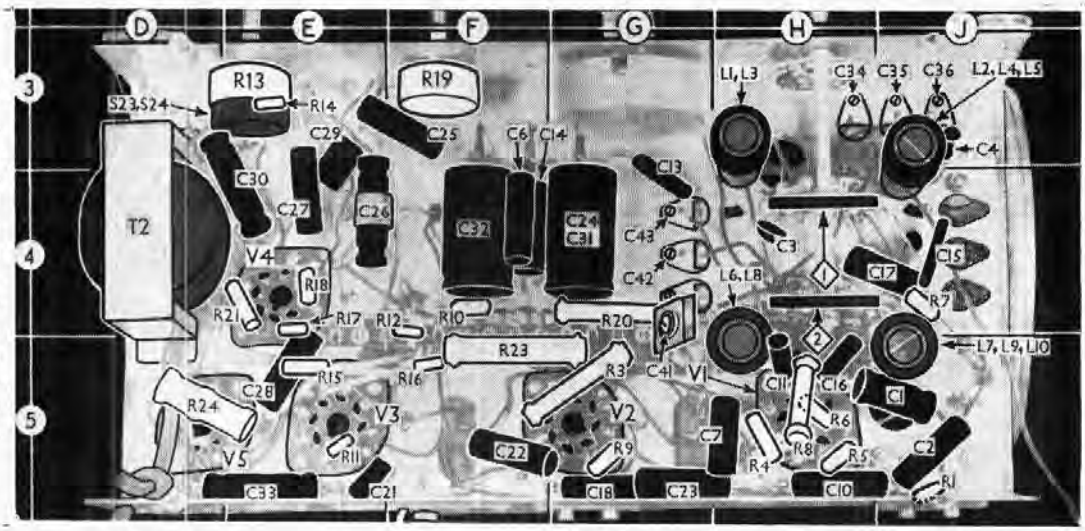


Under-chassis view. The waveband switch units indicated here by **1** and **2** in diamonds are shown in detail in the diagrams in col. 2. A sketch showing the connections of the mains auto-transformer **T2**, as seen from the opposite end of an inverted chassis, appears in col. 4 below.

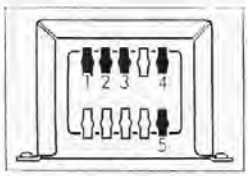
test capacitor to chassis. The makers recommend a Dubilier type 460, part No. P85463/4. A convenient chassis tag will be found between **V1** and the tuning gang on the chassis deck.

Switch S11.—This switch occurs incidentally, and as it does no harm it is allowed to remain, but it is not shown in the makers' diagram. We show it in ours in order to explain what might otherwise be mysterious short-circuits between the two points it connects in the S.W. and pre-set 1 and 2 positions of the waveband control.

CIRCUIT ALIGNMENT

These operations may be carried out with the chassis in the cabinet if the bottom cover is removed to give access to the trimmers. It may, however, be found more convenient to remove the chassis from its cabinet where a complete re-alignment is necessary. For this purpose an alignment scale is printed on the outer face of the cursor drive drum. It is calibrated in frequency, and readings are taken against a wire pointer as shown in our plan view of the chassis.

I.F. Stages.—Switch set to M.W., turn volume control and gang to maximum, connect signal generator (via a 0.01 μF capacitor in the "live" lead) to control grid (top cap) of **V2** and the **E** socket.



This sketch identifies the five connections to the mains transformer, numbered in the circuit diagram.

Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L17** (location reference C2) and **L16** (C2) for maximum output. Transfer "live" signal generator lead to control grid (top cap) of **V1**, feed in a 465 kc/s signal, and adjust the cores of **L15** (B2) and **L14** (B2) for maximum output.

R.F. and Oscillator Stages.—Transfer "live" signal generator lead to **A** socket via a suitable dummy aerial. The alignment pointer should coincide with the black line on the drum (opposite to the one with waveband markings) at maximum capacitance of the gang. The pointer may be adjusted in position by slackening its retaining nut on the end of the gang, while the drum may be adjusted upon slackening its two boss screws. At maximum capacitance of the gang, the cursor should coincide with the high wavelength ends of the tuning scales with the receiver in its cabinet. The cursor may be adjusted by sliding the carriage along the drive cord.

S.W.—Switch set to S.W., and unscrew **C41** (G4) to its minimum capacitance. Tune to 18 Mc/s on scale, feed in an 18 Mc/s (16.7 m) signal and adjust **C41**, then **C34** (H3) for maximum output.

M.W.—Switch set to M.W., tune to 230 m on scale, feed in a 230 m (1,300 kc/s) signal and adjust **C42** (G4), then **C35** (J3) for maximum output.

L.W.—Switch set to L.W., tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal and adjust **C43** (G4), then **C36** (J3) for maximum output.

Pre-set Stations

Position 1.—This will normally be set to receive the B.B.C. L.W. station on 1,500 m. Feed in a 1,500 m (200 kc/s) signal and adjust (with the special trimming tool provided) **L13** (A2) and **C39** (A2) for maximum output. This pre-set position has a waveband range of 1,250-2,000 m.

Position 2.—The range of this channel is 330-560 m. Using the trimming tool provided, adjust **L12** (A2) and **C38** (A2) for maximum output while receiving the desired transmission.

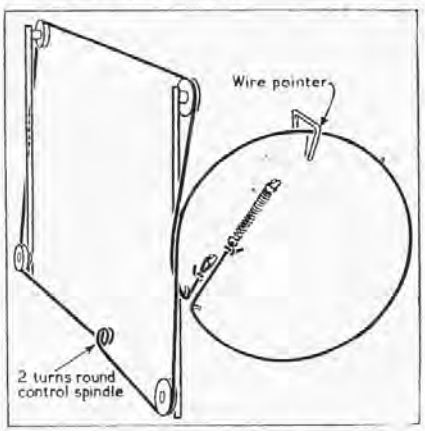
Position 3.—The range of this channel is 200-342 m. Using the trimming tool provided, adjust **L11** (A2) and **C37** (A2) for maximum output while receiving the desired transmission.

DRIVE CORD REPLACEMENT

About six feet of fine quality plaited flax twine is required for the tuning drive cord. The course it follows is shown clearly in the sketch below, where the drive system is drawn as seen when the chassis is viewed from the front right-hand corner, taking a three-quarter view of the end of the chassis which carries the drive drum, with the gang at minimum.

First check that the wire pointer coincides with the vertical calibration line on the drum when the gang is at maximum. Then tie a loop in one end of the cord, making a non-slip knot, pass the end of the cord through the hole in the drum groove, slip the loop over the nearer anchor, and turn the gang to minimum capacitance. Run the cord upwards over the upper pulley near the drum, then follow the sketch, pulling the gang against its stop at minimum to prevent the cord from slipping off its pulleys.

Make two complete turns in an anti-clockwise direction round the control spindle, and finally tie off to the tension spring so that the spring opens out to about twice its relaxed length when hooked onto its anchor.



Three-quarter end-view sketch of the drive cord system as seen from the drum end of the chassis.

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