"TRADER" SERVICE SHEET

1150

PHILCO A3646U

Covering A.C./D.C. 3-band Table Superhet A3646U and 3-speed Auto Radiogram Version A3672U

HOUSED in a plastic cabinet, the Philco A3646U is a compact 4-valve (plus rectifier) 3-band table superhet designed to operate from A.C. or D.C. mains of 200-250V, 50-60 c/s in the case of A.C. The waveband ranges are 16.2-51.2m, 187-555m and 810-2,142m.

Model A3672U is a 3-speed radiogram version of model A3646U on which this Service Sheet was prepared. The differences between the two models are explained in "General Notes" overleaf.

Release date, both models: November 1953. Original prices: A3646U £14 6s 2d; A3672U £54 17s 6d. Purchase tax extra.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.) and **L2** (M.W. and L.W.) to single-tuned circuits **L3, C36** (S.W.), **L3, L4, C36** (M.W.) and **L3, L4, L5, C36** (L.W.) which precede triode hexode valve **(V1, Brimar 14S7)** operating as frequency changer with internal coupling. **C1** shunts **L2** on L.W. to move its resonance outside the band.

Oscillator grid coils **L6** (S.W.), **L7** (M.W.) and **L8** (L.W.) are tuned by **C37.** Parallel trimming by **C38** (S.W.), **C38, C39** (M.W.) and **C11, C38, C40** (L.W.); series tracking by **C12, C41** (M.W.) and **C42** (L.W.). Reaction coupling from oscillator anode via the common impedance of the trackers on M.W. and L.W., and by **L9** on S.W. Oscillator stabilization by **R4.**

Second valve **(V2, Brimar 7B7)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C8, L11, L12, C9** and **C17, L13, L14, C18.**

Intermediate frequency 470 kc/s.

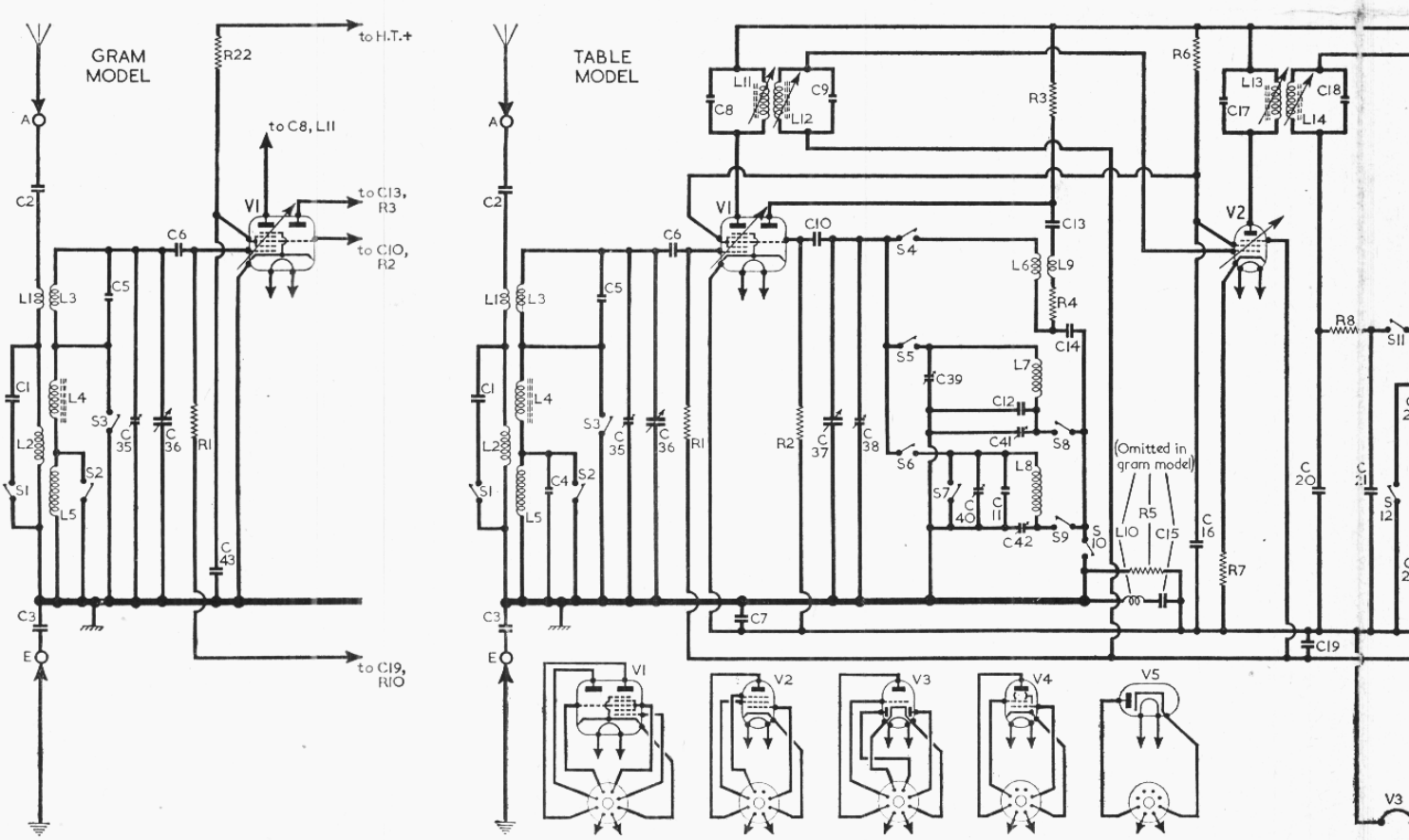
Diode signal detector is part of double diode triode valve **(V3, Brimar 7C6).** Audio frequency component in rectified output is developed across volume control **R9,** which operates as diode load, and is passed via **C24** to grid of triode section. I.F. filtering by **C20, R8, C21.**

D.C. potential developed across **R8, R9** is tapped off from the signal diode anode and fed back as bias to **V1** and **V2** giving automatic gain control. Second diode of **V3** is connected across the A.G.C. line to prevent it from going positive.

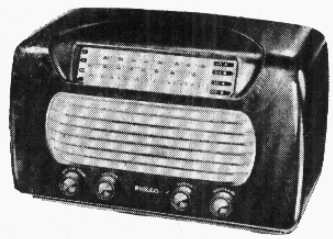
Resistance-capacitance coupling between **V3** and pentode output valve **(V4, Brimar 35A5).** Further I.F. filtering by **C25.** Tone correction in anode circuit by **C30.** Variable tone control by **R13** in the negative feed-back circuit **C27, R13** between **V4** anode and control grid circuits.

In the gram model negative feed-back is applied from the anode of the output valve, and from a third winding on the output transformer **T3,** to the cathode circuit of **V3.** Tone correction is applied in the volume control circuit by **C50, R25, C49** and **C52, R28.**

H.T. current is supplied by I.H.C. half-wave rectifying valve **(V5, Brimar 35Z3).** H.T. smoothing by **R16, R17** and electrolytic capacitors **C31, C32** and **C33.** Valve heaters, together with **R18 (Brimistor CZ2),** ballast resistor **R19** and scale lamps, are connected in series across the mains input. In the table model the chassis is isolated from the mains supply and all current-carrying and decoupling circuits are returned to a common H.T. negative line. **R5** prevents the build-up



Circuit diagram of the Philco A3646U. The differences in the A3672U autoradiogram are shown in the separate sections of circuit on e



Appearance of the Philco A3646U.

of a static charge on the chassis and **L10, C15** by-pass modulation hum voltages.

In the radiogram model the scale lamps are shunted by two thermistors **R40** and **R41 (Brimistor CZ3's)** which in the event of scale lamp failure maintain the heater circuit.

COMPONENTS AND VALUES

	CAPACITORS	Values	Locations
C1	L.W. aerial shunt	0·001μF	F3
C2, C3	Aerial and earth isolators	0·002μF, 0·01μF	F3, G4
C4	L.W. aerial trim.	5pF	B1
C5	S.W. aerial trim.	15pF	F3
C6	V1 C.G.	100pF	F4
C7	R.F. by-pass	0·01μF	F4
C8, C9	1st I.F. trans. tuning	75pF, 75pF	A2, A2
C10	V1 osc. C.G.	100pF	F3
C11	L.W. osc. trim.	12pF	G4
C12	M.W. osc. tracker	450pF	G4
C13, C14	Osc. anode couplers	220pF, 3,900pF	F3, G3
C15	Part R.F. filter	0·25μF	F3
C16	H.T. decoupling	0·05μF	F4

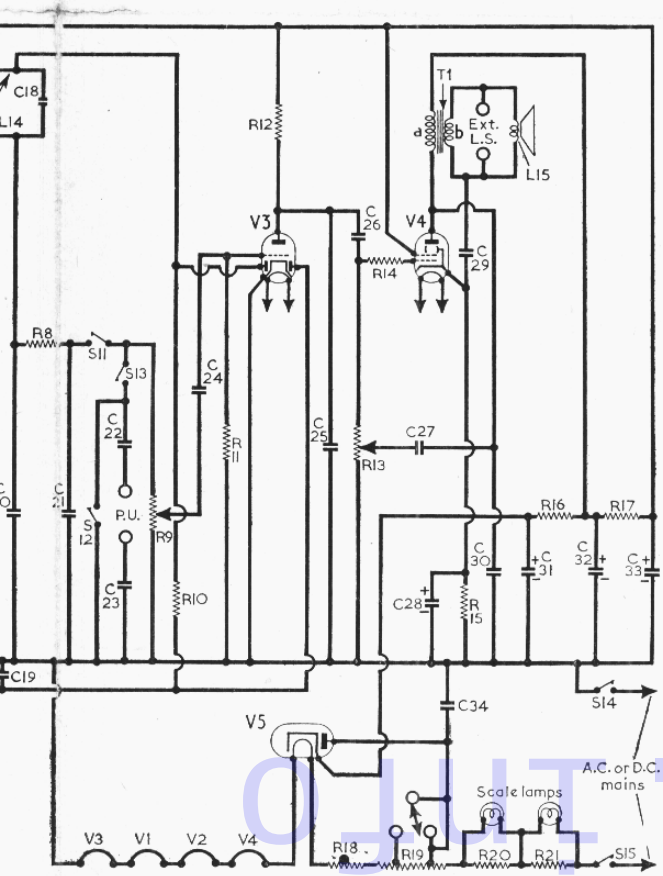
(*Continued next column*)

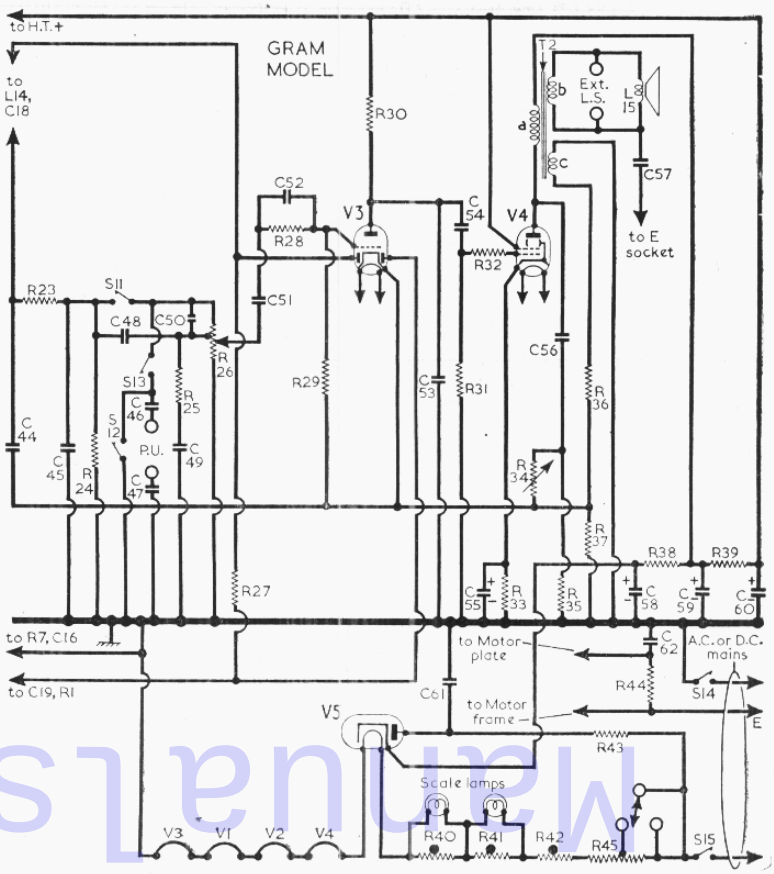
	CAPACITORS (*Continued*)	Values	Locations
C17, C18	2nd I.F. trans. tuning	75pF, 75pF	B2, B2
C19	A.G.C. decoupling	0·01μF	F4
C20, C21	I.F. by-passes	100pF, 100pF	E4, E4
C22, C23	P.U. isolators	0·004μF, 0·05μF	F4, F4
C24	A.F. coupling	0·005μF	E4
C25	I.F. by-pass	220pF	E4
C26	A.F. coupling	0·005μF	E4
C27	Part tone control	220pF	E3
C28*	V4 cath. by-pass	25μF	E4
C29	Ext. L.S. isolator	0·002μF	E4
C30	Tone corrector	0·02μF	D4
C31*, C32*, C33*	H.T. smoothing	40μF, 30μF, 20μF	B2, B2, B2
C34	Mains R.F. filter	0·05μF	D4
C35‡	S.W. aerial trim.	—	A2
C36†	Aerial tuning	483pF	A2
C37†	Oscillator tuning	483pF	A1
C38‡	S.W. osc. trim.	—	A1
C39‡	M.W. osc. trim.	—	G3
C40‡	L.W. osc. trim.	—	G4
C41‡	M.W. osc. tracker	—	G4
C42‡	L.W. osc. tracker	—	G4
C43	V1 S.G. decoup.	0·02μF	—
C44	I.F. by-passes	100pF	—
C45		100pF	—
C46, C47	P.U. isolators	0·01μF, 0·05μF	—
C48		100pF	—
C49	Tone correctors	0·01μF	—
C50		56pF	—
C51	A.F. coupling	0·005μF	—
C52	Tone corrector	0·002μF	—
C53	I.F. by-pass	220pF	—
C54	A.F. coupling	0·01μF	—
C55*	Cath. by-pass	25μF	—
C56	Part tone control	0·015μF	—
C57	Ext. L.S. isolator	0·005μF	—
C58*	H.T. smoothing	40μF	—
C59*, C60*		30μF, 20μF	—
C61	Mains R.F. filter	0·05μF	—
C62	Motor isolator	0·01μF	—

* Electrolytic. † Variable. ‡ Pre-set.

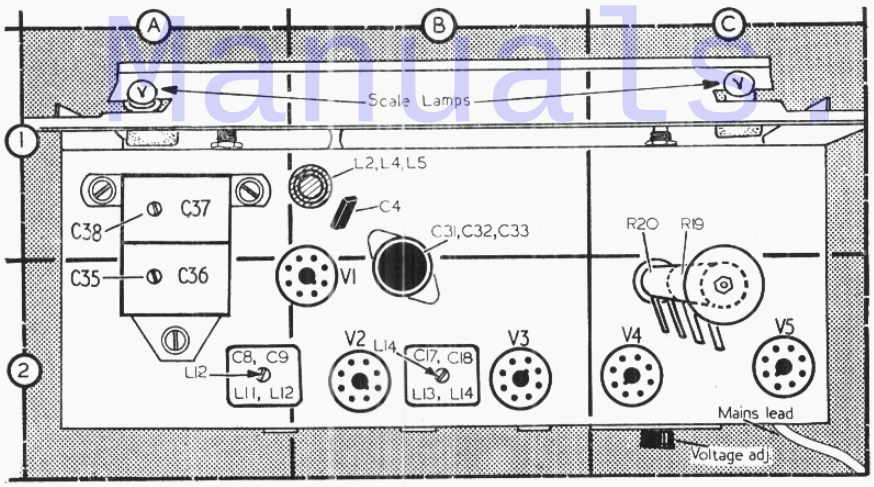
	RESISTORS	Values	Locations
R1	V1 C.G.	1MΩ	F4
R2	V1 osc. C.G.	47kΩ	F3
R3	Osc. anode feed	10kΩ	F3
R4	Osc. stabilizer	68Ω	G3
R5	Anti-static leak	150kΩ	F4
R6	H.T. decoupling	15kΩ	F4
R7	V2 G.B.	470Ω	F4
R8	I.F. stopper	47kΩ	E4
R9	Volume control	500kΩ	E3
R10	A.G.C. decoupling	2·2MΩ	E4
R11	V3 C.G.	10MΩ	E4
R12	V3 anode load	470kΩ	E4
R13	Tone control	500kΩ	D3
R14	V4 C.G. stopper	47kΩ	E4
R15	V4 G.B.	180Ω	E4
R16, R17	H.T. smoothing	150Ω, 1kΩ	D4, E3
R18	Thermistor CZ2	—	D4
R19†	Ballast resistor	707Ω	C2
R20, R21	Scale lamp shunts	50Ω, 56Ω	C2, E3
R22	V1 S.G. feed	15kΩ	—
R23	I.F. stopper	47kΩ	—
R24	Signal diode load	470kΩ	—
R25	Tone corrector	47kΩ	—
R26	Volume control	2MΩ	—
R27	A.G.C. decoupling	2·2MΩ	—
R28	Tone corrector	1MΩ	—
R29	V3 C.G.	10MΩ	—
R30	V3 anode load	470kΩ	—
R31	V4 C.G.	470kΩ	—
R32	V4 C.G. stopper	47kΩ	—
R33	V4 G.B.	180Ω	—
R34	Tone control	500kΩ	—
R35	Part tone control	4·7kΩ	—
R36	Neg. feed-back	390Ω	—
R37		47Ω	—
R38, R39	H.T. smoothing	680Ω, 2·7kΩ	—
R40, R41	Thermistors CZ3	—	—
R42	Thermistor CZ2	—	—
R43	V5 surge limiter	100Ω	—
R44	Anti-static leak	2·2MΩ	—
R45‡	Ballast resistor	767Ω	—

† Tapped at 325Ω + 150Ω + 232Ω from R18.
‡ Tapped at 600Ω + 167Ω from R42.





circuit on either side of the main circuit diagram. The chassis is isolated from the mains in the table model but not in the gram model.



Plan view of the chassis. **R19** provides the mains voltage adjustment tappings.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils	2·5	F3
L2		30·0	B1
L3		—	F3
L4	Aerial tuning coils	2·0	B1
L5		35·0	B1
L6		—	G3
L7	Oscillator tuning coils	3·5	G3
L8		9·0	G3
L9	S.W. osc. reaction	—	G3
L10	R.F. filter coil	—	F3
L11	1st I.F. trans. Pri.	7·5	A2
L12	1st I.F. trans. Sec.	7·5	A2
L13	2nd I.F. trans. Pri.	7·5	B2
L14	2nd I.F. trans. Sec.	7·5	B2
L15	Speech coil	2·5	—
T1	O.P. trans. A3646U a	190·0	D3
	O.P. trans. A3646U b	—	
T2	O.P. trans A3672U a	300·0	—
	O.P. trans A3672U b	—	
	O.P. trans A3672U c	—	
S1-S13	Waveband switches	—	G3
S14, S15	Mains sw., g'd R13	—	D3

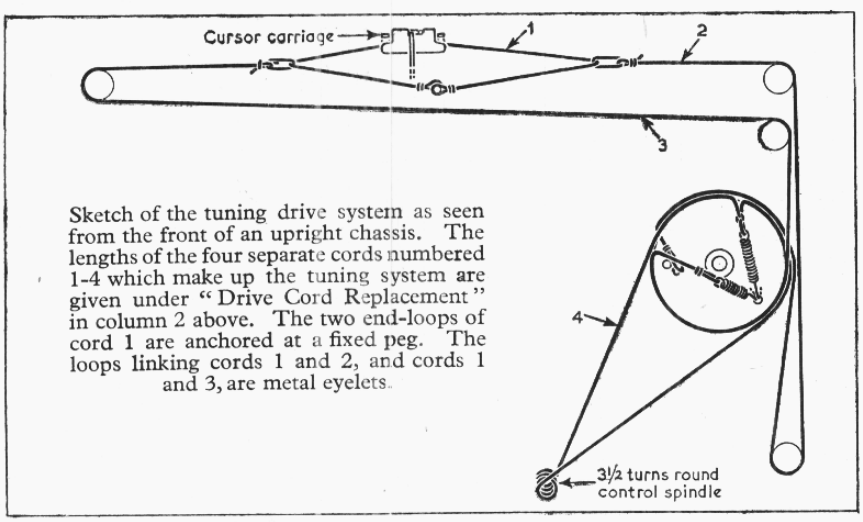
GENERAL NOTES

Switches.—S1-S13 are the waveband switches, ganged in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis illustration (location reference G3), and is shown in detail in the waveband switch diagram in column 3, where it is drawn as seen from the rear of an inverted chassis. The associated switch table appears in col. 3, where a dash indicates open, and **C,** closed.

S14, S15.—These are the Q.M.B. mains switches ganged with the tone control **R13.**

Drive Cord Replacement—The tuning system is unusual in that there is a two-to-one step-up drive on the cursor section, devised by means of an anchored loop to which the cursor is attached. The complete drive consists of four lengths of nylon braided glass yarn, numbered 1, 2, 3 and 4 in the sketch of the drive cord system below. Cord 1 is $10\frac{3}{4}$ inches long, cord 2 is $15\frac{1}{8}$ inches long, cord 3 is $20\frac{5}{8}$ inches long, and cord 4 is 15 inches long.

Model A3672U.—This is the 3-speed radiogram version of model A3646U and is covered by two extra sections of circuit on either side of the main circuit diagram overleaf. Other changes in component values are as follows, **R4** in the gram model is 100Ω, **R6** is 22 kΩ and **R7** is 180Ω. In this model, which employs a Garrard RC75A universal record changer, the chassis is not isolated from the mains as in the A3646U.



Sketch of the tuning drive system as seen from the front of an upright chassis. The lengths of the four separate cords numbered 1-4 which make up the tuning system are given under "Drive Cord Replacement" in column 2 above. The two end-loops of cord 1 are anchored at a fixed peg. The loops linking cords 1 and 2, and cords 1 and 3, are metal eyelets.

VALVE ANALYSIS

Valve voltages and currents given in the tables below are those derived from the manufacturers' information and were measured on a table model and a gram model which were operated from A.C. mains of 237 V. The receivers were tuned to the low wavelength end of M.W., but there was no signal input.

Voltages were measured on a 20,000 ohms-per-volt meter, chassis being the negative connection for the gram model, and the junction of **C15, C19, C20** being the negative connection for the table model.

Table Model

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 14S7 ...	136	1·0			
	Oscillator		77	2·7	—
	100	3·6			
V2 7B7 ...	136	4·0	77	1·3	2·5
V3 7C6 ...	74	0·1	—	—	—
V4 35A5 ...	143	46·0	136	6·0	9·3
V5 35Z3 ...	205*	—	—	—	160·0†

*A.C. reading. †Cathode current 65mA.

Gram Model

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 14S7 ...	140	1·3			
	Oscillator		95	3·0	—
	95	4·5			
V2 7B7 ...	140	7·0	95	2·0	1·8
V3 7C6 ...	70	0·15	—	—	—
V4 35A5 ...	180	45	140	8·0	9·5
V5 35Z3 ...	227*	—	—	—	250·0†

*A.C. reading. †Cathode current 70mA.

Switch Diagram and Table

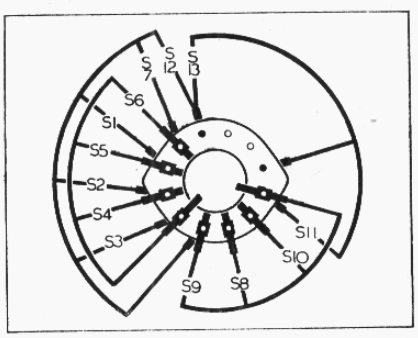
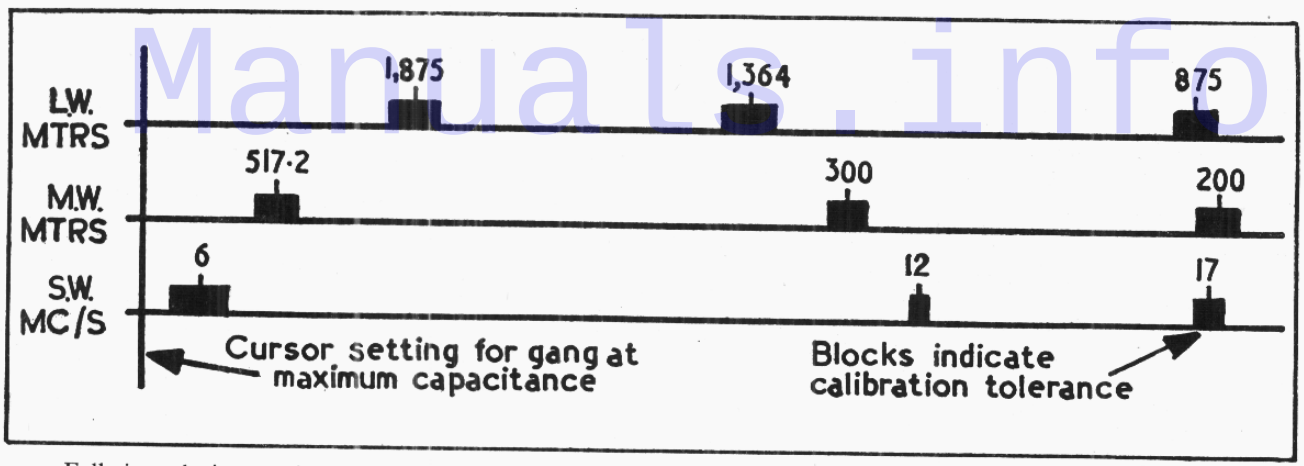


Diagram of the waveband switch unit, drawn as seen from the rear of an inverted chassis. The associated switch table appears below.

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



Full size substitute tuning scale for use when aligning the receiver as described under "Circuit Alignment" below.

CIRCUIT ALIGNMENT

Remove chassis from cabinet and position it on the bench so that all the core and trimmer adjustments are accessible. It should be noted that while the chassis of the table model is isolated from the mains, this is not the case in the gram model, which should be connected to the mains so that its chassis is at earth potential.

I.F. Stages.—Switch receiver to M.W. and turn gang to minimum capacitance. Connect output of signal generator, via an 0.05μF capacitor in each lead, to control grid (pin 6) of **V1** and chassis. Feed in a 470 kc/s (638.3m) signal and adjust the cores of **L14** (location reference B2), **L13** (E4), **L12** (A2) and **L11** (F4) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—As the tuning scale remains in the cabinet when the chassis is withdrawn a substitute tuning scale must be used during the following alignment. A suitable substitute scale is printed in full size at the top of this page and may be clipped against the scale backing plate during alignment. When the chassis is finally replaced in its cabinet check that with the gang at maximum capacitance the cursor coincides with the dots at the high wavelength ends of the tuning scales.

S.W.—Switch receiver to S.W. and transfer signal generator leads to **A** and **E** sockets, using a 400Ω series resistor in the "live" lead as dummy aerial. Tune receiver to 17 Mc/s, feed in a 17 Mc/s (17.65m) signal and adjust **C38** (A1) and **C35** (A2) for maximum output. Feed in a 12 Mc/s (25m) signal and check the calibration. Feed in a 6 Mc/s (50m) signal and check the calibration.

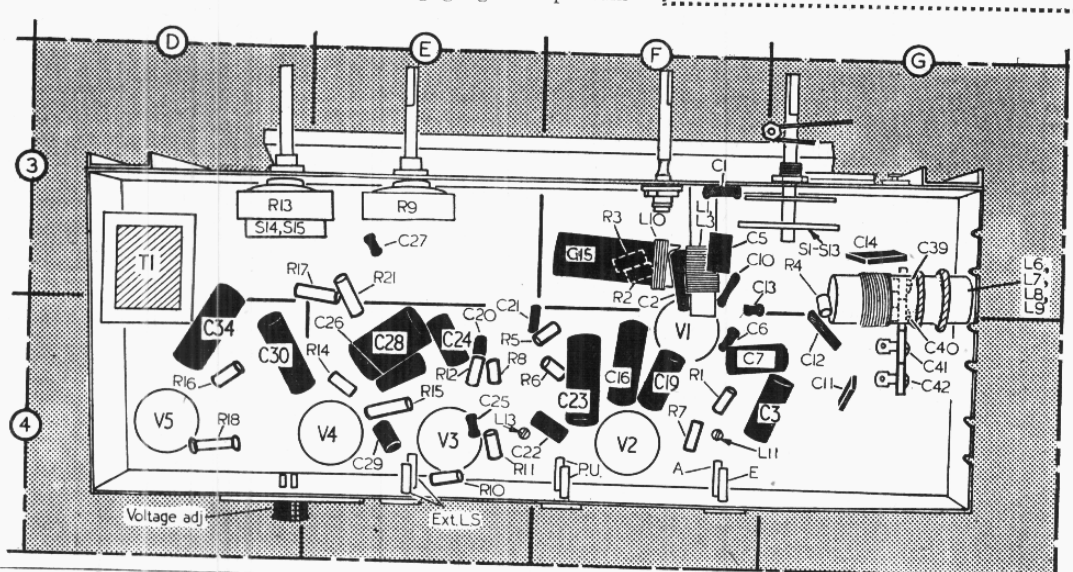
L.W.—Switch receiver to L.W. and replace 400Ω dummy aerial with a 200pF capacitor. Tune receiver to 857m, feed in an 857m (350 kc/s) signal and adjust **C40** (G4) for maximum output while rocking the gang for optimum results. Tune receiver to 1,875m, feed in a 1,875m (160 kc/s) signal and adjust **C42** (G4) for maximum output while rocking the gang for optimum results. Repeat these adjustments until no further improvement results. Feed in a 1,364m (220 kc/s) signal and check calibration.

M.W.—Switch receiver to M.W., tune to 200m, feed in a 200m (1,500 kc/s) signal and adjust **C39** (G3) for maximum output while rocking gang for optimum results. Tune receiver to 517.2m, feed in a 517.2m (580 kc/s) signal and adjust **C41** (G4) for maximum output while rocking gang for optimum results. Repeat these adjustments until no further improvement results. Feed in a 300m (1 Mc/s) signal and check calibration.

Service Sheet Correction

Owing to a typographical error that was unfortunately not noticed during the final check before printing, the H.T. voltage at the rectifier output in the Pilot "Dandy" receiver in Service Sheet 1018 is quoted as approximately 100 V. This should read 200 V.

This figure is quoted at the end of the explanatory note to the valve analysis table, where it is given as the voltage across C27. It will be appreciated as a favour if readers will kindly mark the correction on their copies to prevent confusion at some future date.



Underside view of the chassis. In the table model, the mains and the H.T. negative circuit are isolated from the chassis, and voltage measurements should therefore be made from the H.T. negative circuit and not from chassis.

Printed in England by Cornwall Press Ltd., Paris Garden, London, S.E.1.