"TRADER" SERVICE SHEET
1049

PILOT "MARINER"

Covering the A.C. Version and the Standard and Low-voltage A.C./D.C. Versions

THE Pilot "Mariner" range comprises three models, three versions really of the same model. One of them is designed to operate only on A.C. mains of 200-250V, 40-100 c/s, and another from A.C. or D.C. mains within the same voltage limits, while the third is designed specially to operate from A.C. or D.C. mains of 110V or 200-250V. This is called the low-voltage model.

Apart from their power supply and speech output circuits, the circuits of all three models are alike. They employ four valves (plus rectifier) and cover three wavebands. The waveband ranges are 13-50 m, 180-550 m and 1,000-2,000 m. All have the same external appearance, and in all models the chassis is "live" to the mains.

This *Service Sheet* was prepared from an A.C. version, for which we show a complete circuit diagram. This is followed by two diagram sections for the two A.C./D.C. versions showing the output valve and mains input circuits, which contain all the differences from the A.C. version. Throughout this Sheet reference is made to any departure in the A.C./D.C. versions from the information as it is presented for the A.C. version.

Release date, all models, September, 1951. Original prices: A.C. model and Standard A.C./D.C. model, £19 8s 1d; Low-voltage model, £19 18s 7d. Purchase tax extra.

CIRCUIT DESCRIPTION

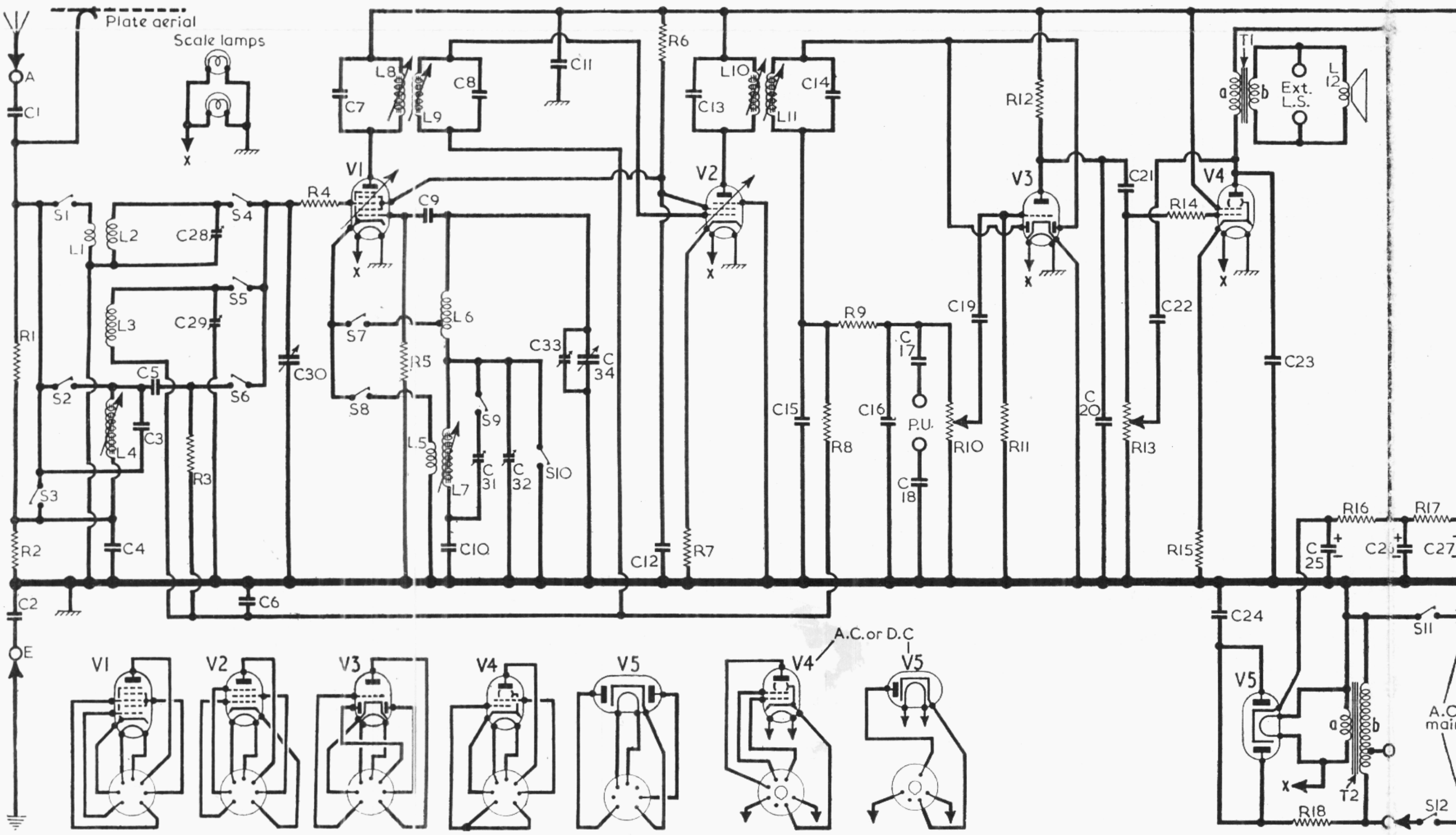
Aerial input on S.W. is coupled via **L1** to single-tuned circuit **L2, C30.** On L.W. it is bottom capacitance-coupled via **S3** and **C4** to single-tuned circuit **L4, C30, S2** being open. On M.W., **S2** and **S5** close, and **S3** opens, and aerial coupling to the single-tuned circuit **L3, C30** is effected via **L4,** which then operates as a coupling coil. **R1** and **R2** shunt the aerial circuit to prevent modulation hum.

First valve (**V1, Brimar 6BE6** (in the A.C. model) or **12BE6** (in the A.C./D.C. versions)) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L6** (S.W.) and **L7** (M.W. and L.W.) are tuned by **C34.** Parallel trimming by **C33** (S.W.), **C32, C33** (M.W.) and **C31, C32, C33** (L.W.); series tracking by **C10** (M.W. and L.W.). Reaction coupling from cathode by a tap on **L6** (S.W.) and by cathode coil **L5** (M.W. and L.W.).

Second valve (**V2, Brimar 6BA6** (A.C. model) or **12BA6** (A.C./D.C. model)) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C7, L8, L9, C8** and **C13, L10, L11, C14.**

Intermediate frequency 470 kc/s

Diode signal detector is part of double diode triode valve (**V3, Brimar 6AT6** (A.C. model) or **12AT6** (A.C./D.C. model)), the diode anodes being connected together. Audio frequency component in rectified output is developed across the manual volume control **R10,** which acts as diode load, and passed via **C19** to control grid of the triode section, which operates as A.F. amplifier. I.F. filtering by **C15, R9** and **C16** in the diode



Circuit diagram of the Pilot "Mariner" A.C. mains receiver with, on the right, power and output circuit sections for the standard A.C./D.C. ...

circuit, and by **C20** in the triode anode circuit. Provision is made for the connection of a gramophone pick-up across **R10** via isolaing capacitors **C17** and **C18.** Grid bias for the triode section of **V3** is obtained from the "Contact" potential resulting from the use of a very high value for the grid resistor **R11.**

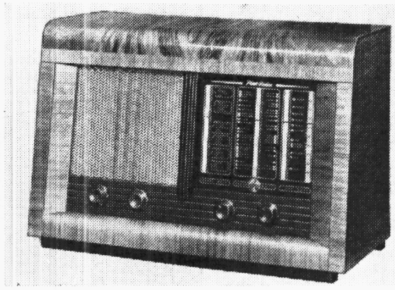
D.C. potential developed across **R9, R10** is fed back as bias via decoupling circuit **R8, C6** to **V1** and **V2,** giving automatic gain control. On M.W., A.G.C. is applied to **V1** control grid via the tuning coil **L3,** which is returned directly to the A.G.C. line, and on L.W. it is applied via the grid resistor **R3,** while **C5** isolates **R3** from the aerial shunt **R2,** which would otherwise return it to chassis. On S.W., the tuning coil is returned directly to chassis, and A.G.C. is inoperative on the frequency changer on that band.

Resistance-capacitance coupling, via **R12, C21** and **R13,** between **V3** triode anode and beam tetrode output valve **(V4, Brimar 6AQ5** (A.C. model) or **35L6GT** (A.C./D.C. model)). Fixed tone correction by **C23,** and, in the A.C. model, by the negative feed-back voltage developed across **R15,** where the usual cathode by-pass is omitted. Variable tone control by negative feed-back between **V4** anode and grid circuits via **C22** and control **R13.** Provision is made for the connection of a low impedance external speaker across **T1** secondary winding.

In the A.C. model, H.T. current is supplied by I.H.C. rectifying valve **(V5, Brimar 6X4)** whose anodes are strapped to form a half-wave rectifier. Smoothing by **R16, R17** and electrolytic capacitors **C25, C26** and **C27.** Heater transformer **T2** feeds the heaters of all the valves, including **V5,** from its single secondary winding. **V5** anodes are fed via surge limiting resistor **R18** from the mains input, one side of which is connected to chassis. Mains R.F. filtering by **C24.**

In the A.C./D.C. models H.T. current is supplied by half-wave I.H.C. rectifying valve **(V5, Brimar 35Z4GT).** Smoothing in the standard (200-250 V) A.C./D.C. model is as in the A.C. model, but the valve heaters, together with the scale lamps and their shunt resistors **R20, R21,** and ballast resistor **R22,** are connected in series across the mains input circuit. Both H.T. and heater currents flow through the scale lamps, so that after dimming initially as the heaters warm up, they brighten again when the H.T. current begins to flow.

In the low-voltage A.C./D.C. model (110 V and 200-250 V) smoothing is effected by electrolytic capacitors **C25, C26, C27** in conjunction with iron-cored choke **L13** and resistor **R24.** Scale lamps, shunts and valve heaters are connected as in the standard model, but ballast resistor **R23** has no voltage adjustment tapping. In the 110 V position of voltage adjustment control **S13-S15** all the switches close, short-circuiting **R24, R18** and **R23.** In the 200-250 V position of the control, all three switches are open.



This is the appearance of all three Pilot "Mariner" receivers.

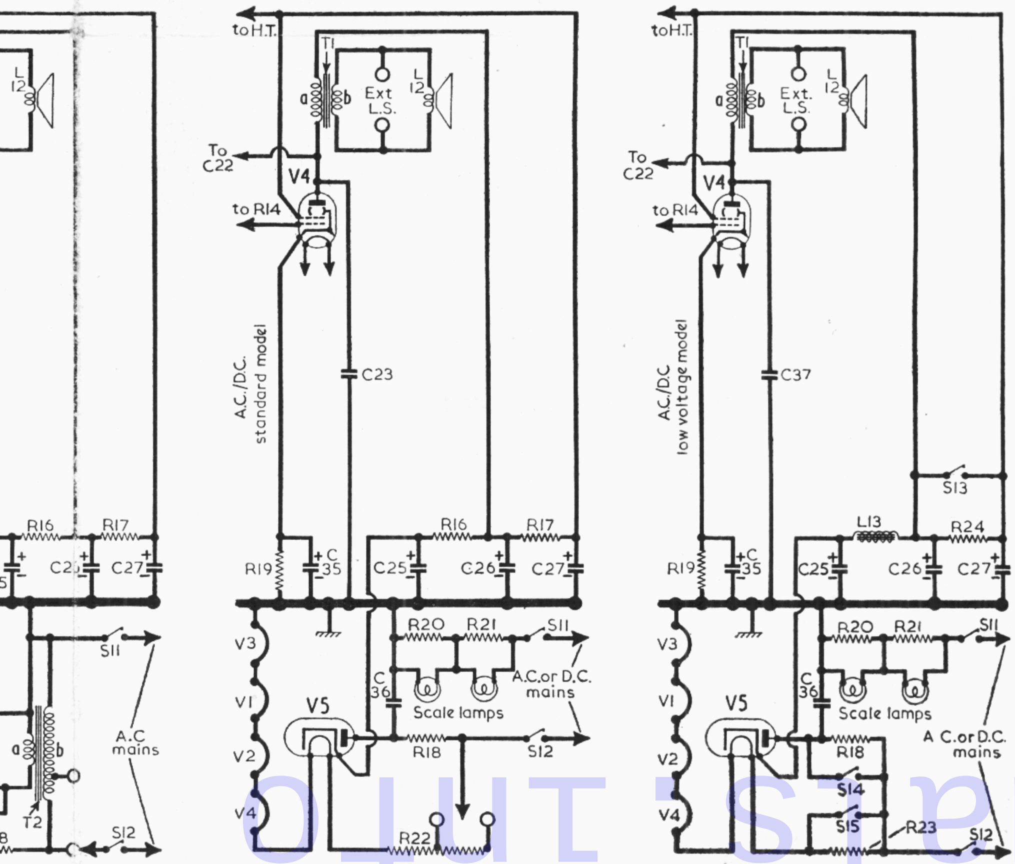
COMPONENTS AND VALUES

	CAPACITORS	Values	a-Loc tions
C1	Chassis isolators ...	0·002μF	G4
C2		0·002μF	G4
C3	L.W. aerial trim ...	100pF	G3
C4	Aerial coupling	0·0013μF	G3
C5		0·005μF	G3
C6	A.G.C. decoupling	0·1μF	F4
C7	1st I.F. trans. tuning ...	100pF	B2
C8		100pF	B2
C9	V1 osc. C.G. ...	100pF	A2
C10	Osc. tracker ...	530pF	F3
C11	R.F. by-pass ...	0·1μF	G4
C12	S.G. decoupling ...	0·1μF	F4
C13	2nd I.F. trans. tuning	100pF	B2
C14		100pF	B2
C15	I.F. by-passes ...	100pF	E4
C16		100pF	F3
C17	P.U. isolators ...	0·02μF	E4
C18		0·02μF	E4
C19	A.F. coupling ...	0·001μF	E3
C20	I.F. by-pass ...	100pF	E4
C21	A.F. coupling ...	0·01μF	E3
C22	Neg. feed-back ...	500pF	D3
C23	Tone corrector ...	0·002μF	E3
C24	Mains R.F. by-pass	0·01μF	D4
C25*	H.T. smoothing ...	16μF	C1
C26*		16μF	C1
C27*		8μF	E3
C28‡	S.W. aerial trim	50pF	A2
C29‡	M.W. aerial trim.	50pF	A1
C30†	Aerial tuning ...	528pF	B1
C31‡	L.W. osc. trim. ...	750pF	A1
C32‡	M.W. osc. trim.	50pF	A1
C33‡	S.W. osc. trim. ...	50pF	A2
C34†	Oscillator tuning	528pF	B2
C35*	V4 cath. by-pass	25μF	—
C36	Mains R.F. by-psss	0·05μF	—
C37	Tone corrector ...	0·005μF	—

* Electrolytic. † Variable. ‡Pre-set.

	RESISTORS	Values	Locations
R1	Aerial shunts ...	33kΩ	G3
R2		4·7kΩ	G3
R3	A.G.C. decoupling	1MΩ	G3
R4	V1 C.G. stopper ...	33Ω	G3
R5	V1 osc. C.G. ...	22kΩ	G3
R6	S.G. feed	4·7kΩ	F4
R7	V2 G.B.	68Ω	F4
R8	A.G.C. decoupling	1MΩ	F4
R9	I.F. stopper ...	47kΩ	F4
R10	Volume control ...	500kΩ	E3
R11	V3 C.G.	10MΩ	E4
R12	V3 anode load ...	470kΩ	E3
R13	Tone control ...	1MΩ	D3
R14	V4 C.G. stopper ...	4·7kΩ	E3
R15	V4 G.B.	220Ω	E3
R16	H.T. smoothing ...	680Ω	D3
R17		2·2kΩ	E4
R18	V5 surge limiter	100Ω	D4
R19	V4 G.B.	180Ω	—
R20	Scale lamp shunts	100Ω	—
R21		100Ω	—
R22*	Heater ballast resistors ...	840Ω	C2
R23		830Ω	C2
R24	H.T. smoothing ...	3·9kΩ	—

* Tapped at 740Ω + 100Ω from V5 heater.



d A.C./D.C. model and the low-voltage A.C./D.C. model. In all versions the chassis is "live."

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coil	—	G3
L2	Aerial tuning coils	—	G3
L3		2·6	G3
L4		11·0	G3
L5	Osc. reaction coil ...	0·3	F3
L6	Osc. tuning coils ...	—	G3
L7		2·6	F3
L8	1st I.F. trans. Pri.	7·5	B2
L9	Sec.	7·5	B2
L10	2nd I.F. trans. Pri.	7·5	B2
L11	Sec.	7·5	B2
L12	Speech coil ...	2·8	—
L13	Smoothing choke ...	275·0	C1
T1	O.P. trans. a ...	450·0	—
	b ...	0·5	—
T2	Heater trans. a ...	0·3	C2
	b, total	160·0	
S1-S10	Waveband switches	—	G3
S11, S12	Mains sw., g'd R13	—	D3
S13-S15	Voltage adj. sw. ...	—	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' information when the receivers, including A.C. and A.C./D.C. models, were operating from 230 V A.C. mains.

Valve voltages were measured on the 10 V and 400 V ranges of a Model 7 Avometer, chassis being the negative connection in every case. The voltage readings generally will be considerably lower in the low-voltage model when used on low-voltage mains.

A.C. Model

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 6BE6 ...	150	2·8	95	7·0	—
V2 6BA6 ...	150	10·0	95	3·4	0·9
V3 6AT6 ...	56	0·2	—	—	—
V4 6AQ5 ...	205	25·0	150	2·0	6·0
V5 6X4 ...	224†	—	—	—	240·0

† A.C. reading.

A.C./D.C. Model

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 12BE6 ...	140	2·8	90	7·0	—
V2 12BA6 ...	140	10·0	90	3·4	0·9
V3 12AT6 ...	46	0·2	—	—	—
V4 35L6GT...	195	28·0	140	4·0	5·8
V5 35Z4GT...	224†	—	—	—	240·0

† A.C. reading.

Waveband Switch Diagram

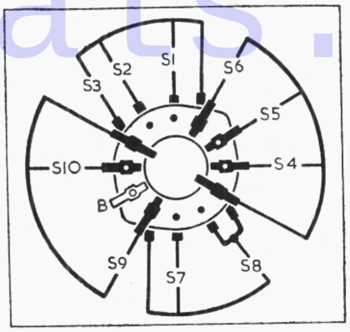


Diagram of the waveband switch unit, drawn as seen from the rear of an inverted chassis. Below is the associated switch table.

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

DISMANTLING

The majority of under chassis components can be made readily accessible by removing the cabinet base cover (six wood screws).

Removing Chassis. — Remove control knobs (pull off) with felt washers; remove cabinet base cover (six wood screws) and release the three 2BA chassis fixing bolts with "D" shaped metal washers and insulating washers thus revealed; unsolder the four connecting leads from the speaker transformer tags, and withdraw chassis.

When replacing, the speaker leads should be connected to the transformer tags as follows, starting at the top: green, brown, red, black. The insulating washers should cover the "D" shaped washers on the chassis fixing bolts. The short chassis bolt should go just below the tuning scale.

Removing Speaker.—Remove four 4BA nuts and washers from fixing brackets round circumference of speaker.

When replacing, the output transformer should be on the right.

GENERAL NOTES

Switches.— S1-S10 are the waveband switches, ganged in a single rotary unit beneath the chassis. This unit is indicated in our underside drawing of the chassis, and it is shown in detail in the diagram in col. 2, where it is drawn as seen when viewed from the rear of an inverted chassis.

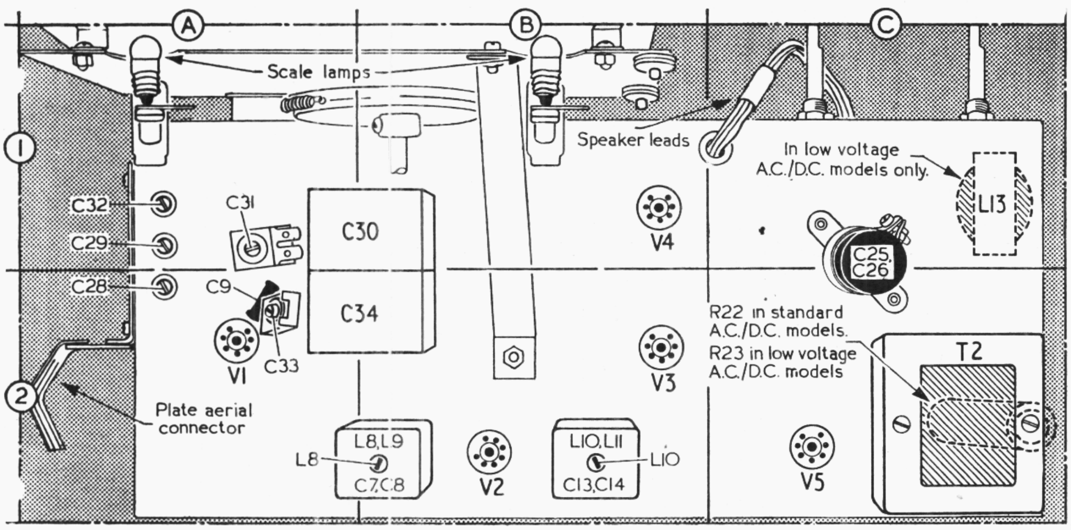
The table below the diagram gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C,** closed.

S11, S12 are the Q.M.B. mains switches, ganged with the variable tone control **R13.**

S13, S14, S15 are found only in the low-voltage A.C./D.C. models. They provide the method of changing from low-voltage conditions to normal mains voltages around 200 V.

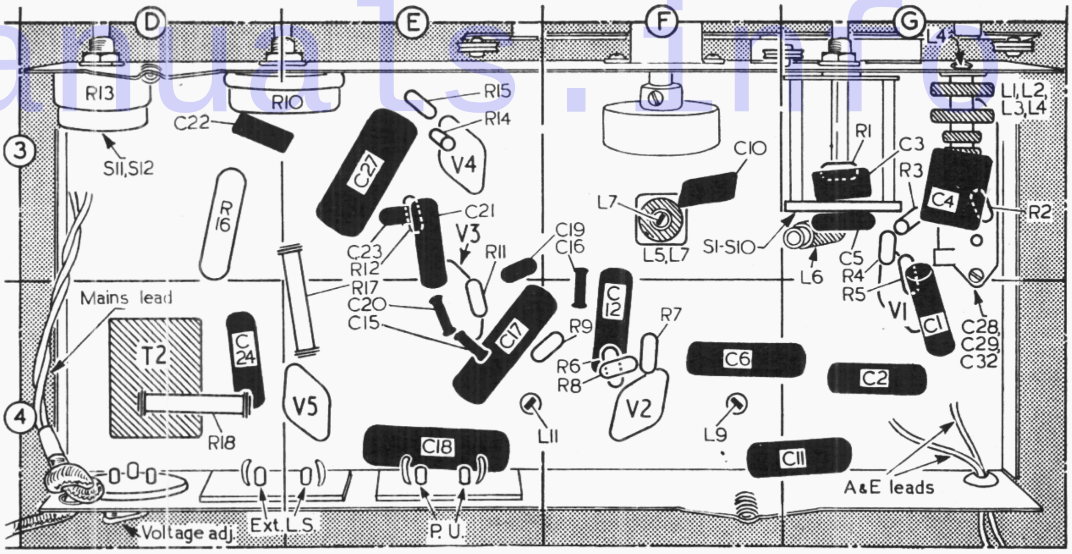
Scale Lamps.—In the A.C. model, the scale lamps are energized from the heater transformer secondary, and they are rated at 6.5 V, 0.3 A. In the A.C./D.C. models they are rated at 10 V, 0.2 A, and they are series connected and shunted by a 100 Ω resistor each. In all cases they have small, clear spherical bulbs and M.E.S. bases.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 3·5 Ω) external speaker.



Plan view of the chassis of the A.C. mains model. In the A.C./D.C. models the mains transformer **T2** is replaced by the ballast resistor **R22** (in standard models) or **R23** (in low-voltage models). In the low-voltage models only there is also a smoothing choke **L13.** These last two items are shown in broken line.

Underside view of the chassis of the A.C. mains model. In the A.C./D.C. models **T2** will not be present, and in the low-voltage model **R16** will be omitted, while the mains voltage rotary switch will be present on the member. Otherwise this illustration covers all three versions.



CIRCUIT ALIGNMENT

It is necessary to remove the chassis from its cabinet in order to make all the I.F. and R.F. adjustments accessible. The following instructions apply to all versions.

I.F. Stages.—Switch receiver to M.W. and tune to 550m. Connect output of signal generator, via an 0.1μF isolating capacitor in each lead, to the junction of **C30, R4** and to chassis. These capacitors are necessary as the receiver chassis is "live" to one side of the mains input. Fed in a 470kc/s (638.3m) signal and adjust the cores of **L11, L10, L9** and **L8** (location references E4, B2 and F4) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—Transfer signal generator output leads via a dummy aerial to **A** and **E** connectors. Check that with the gang at maximum capacitance the cursor is horizontal and coincides with 100 on the log scale at the right hand side of the tuning scale. Any error in the cursor position can be corrected by sliding its ends up and down on the drive cord.

S.W.—Switch receiver to S.W., tune to 20 m, feed in a 20 m (15 Mc/s) signal and adjust **C33** (A2) and **C28** (A2) for maximum output, setting **C33** to the lower capacitance peak if two are found.

M.W.—Switch receiver to M.W., tune to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C32** (location ref. A1) for maximum output. Tune receiver to 500 m, fed in a 500 m (600 kc/s) signal and adjust the core of **L7** (F3) for maximum output. Repeat these adjustments until no further improvement results.

L.W.—Switch receiver to L.W., tune to 1,500 m, feed in a 1,500 m (200 kc/s) signal and adjust **C31** (A1) for maximum output. Tune receiver to 1,304 m, feed in a 1,304 m (230 kc/s) signal and adjust the core of **L4** (G3) for maximum output. Repeat these adjustments until no further improvement results.

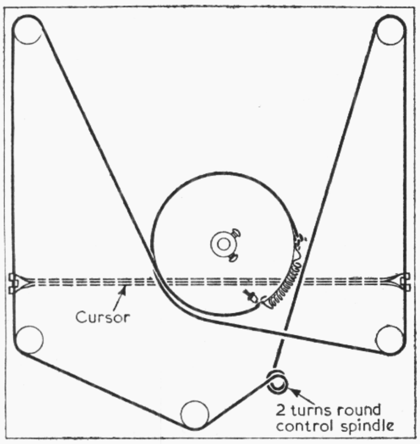
DRIVE CORD REPLACEMENT

About five feet of nylon-braided glass yarn is required for a new tuning drive cord. The makers' part number for a suitable material is P126-4. The cord should be run as shown in the accompanying sketch, where the complete system is drawn as seen when viewed from the rear of the chassis, neglecting obstructions, when the gang is at minimum capacitance.

A start should be made by threading one end of the cord through an eyelet provided for it in the groove of the drive drum, threading the end through from the outside to the inside. Viewed from the rear, the end can be seen through a circular aperture cut in the drum, and it should be pulled through this aperture also.

A small metal collar should then be threaded on to the cord, and a non-slip knot should then be tied behind it to prevent it from coming off again. If the knot is doped with something like Durofix it will not slip. The main length of cord may now be pulled back until the metal collar meets the inside of the drum groove, where it acts as a stop.

The cord may now be run as shown, starting off downwards round the drum in a clockwise direction and going off to the top left-hand pulley. The cord can be held in position by pulling it constantly against the minimum gang stop. Finally, tie off the cord to the tension spring at such a point as to cause the spring to double its length when hooked on to the anchor at which the cord started. The cursor can be slipped on afterwards.



Sketch showing the course taken by the tuning drive cord, drawn as seen when viewed from the rear with the gang at minimum capacitance.

SERVICE SHEET CORRECTION

It has been pointed out to us by the manufacturers that three errors occur in our *Service Sheet* 1043/T25 covering the Philips 1101U television receiver. They also offer some additional information that was not available to us when we were preparing the information.

In the first place R10, which we show as 82Ω, should consist of two 82Ω resistors in parallel, one being connected to each cathode pin of V1. The correct total resistance should therefore be 41Ω.

Secondly, in the alignment instructions we referred to the vision output meter as of the A.C. type. This is quite suitable, but it was not intended, and if an A.C. meter is used an *increase* in modulated output signal would produce an *increased* reading on the meter. The makers would like to add that a 10,000 ohms-per-volt meter (10V scale) can be used instead of an electronic meter if desired.

Thirdly, although when channel changing the capacitance trimmers remain in the chassis when the coils are changed, it is unnecessary to re-trim them. Only the oscillator trimmer C15 on the chassis deck need be adjusted for maximum sound.

The additional information they would like mentioned is that R101 in the coupling circuit to the frame output valve might be 330kΩ+220kΩ as we show it (total 550kΩ); or there may be in series with the 330kΩ two 220kΩ in parallel (440kΩ); or the 330kΩ alone; since this provides a linearity adjustment.

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