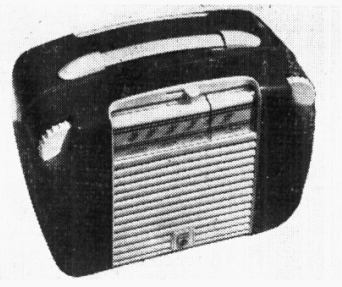
"TRADER" SERVICE SHEET

989

PHILIPS 401UB



DESIGNED to operate from self-contained batteries or from A.C. or D.C. mains of 100-250 V, the Philips 401UB is a 4-valve (plus metal rectifier) 2-band portable superhet in a plastic case. A set of safety contacts isolates the mains and the negative H.T. lead from the chassis when the carrying case is opened.

Release date and original price: June, 1950. £14 5s 5d, without batteries. Purchase tax extra.

CIRCUIT DESCRIPTION

Aerial input to single-tuned circuits **L2, C29** (M.W.) and **L1, L2, C29** (L.W.) via isolating capacitors **C1, C2,** and bottom capacitance coupler **C3.** Modulation hum is by-passed by **R1.**

First valve **(V1, Mullard DK91)** is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C31.** Parallel trimming by **C30** (M.W.) and **C32** (L.W.); series tracking by **C12** (M.W.) and **C11, C12** (L.W.). Inductive reaction coupling from oscillator anode by **L5** (M.W.) and **L6** (L.W.).

Second valve **(V2, Mullard DF91)** is an R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C7, L7, L8, C8** and **C15, L9, L10, C16.** Fixed grid bias via **R8.**

Intermediate frequency 470 kc/s.

Diode signal detector is part of diode pentode valve **(V3, Mullard DAF91).** Audio frequency component in rectified output is developed across volume control **R12,** which acts as load resistor, and is passed via **C18** to the control grid of the pentode section. I.F. filtering by **C17, R11** and the screening on the connecting leads.

D.C. potential developed across **R11, R12** is fed back as bias to F.C. stage only giving automatic gain control. Resistance-capacitance coupling between **V3** anode and control grid of output pentode **(V4, Mullard DL94)** by **R15, C20, R16.**

For battery operation power supplies are carried by switches **S5 (B)** and **S8 (B),** which close in that position, as indicated by the suffix **(B).** For mains operation **S6(M)** and **S7(M)** close. **S9, S10, S11** and **S12** are the normal "on/off" switches.

H.T. current on mains is supplied by half-wave metal rectifier **(MR1, SenTerCel RM2)** consisting of two units joined in series for 250 V mains coverage. Smoothing by **R19,** voltage adjustment resistors **R23, R24, R25, R26, R27** and electrolytic capacitors **C21** and **C25.** Filament current is taken from the H.T. circuit, the filaments being connected in series and fed via the H.T. potential divider **R19, R20, R21** and **R22.** They are shunted by **C24.**

The filaments remain series-connected for battery operation. Bias is obtained from the filament voltage drop. **R17** and **R9** are filament shunts to by-pass H.T. current past the heater chain. One half of **V4** filament is unused.

COMPONENTS AND VALUES

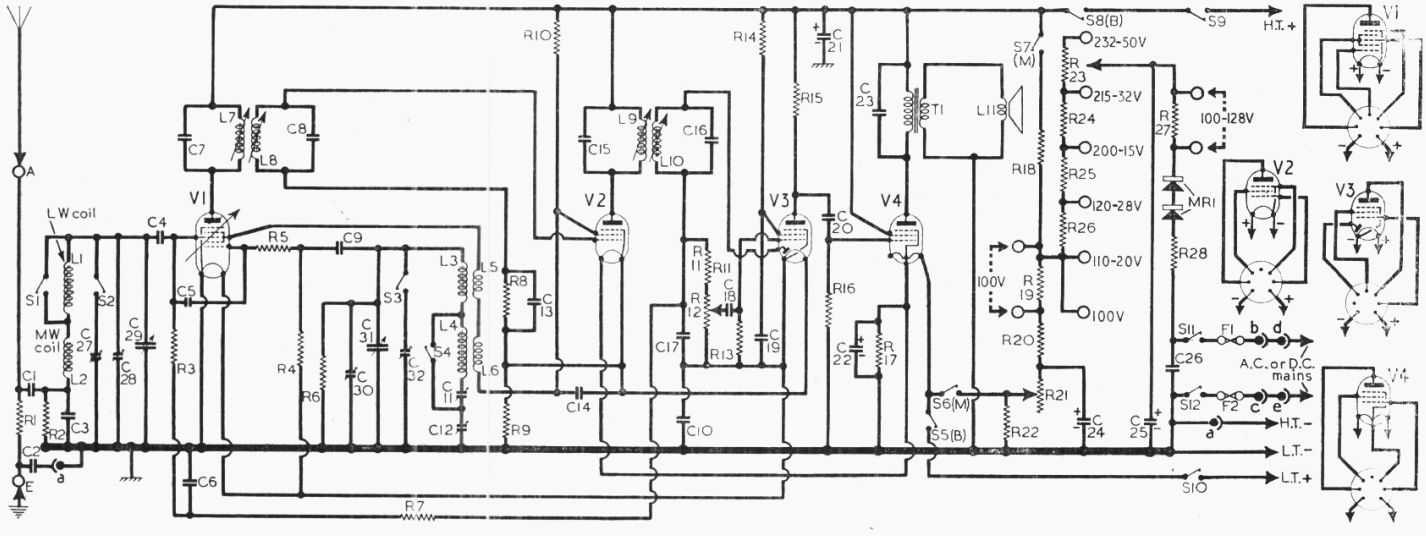
	RESISTORS	Values	Locations
R1	Aerial shunts	1MΩ	—
R2	Aerial shunts	10kΩ	F4
R3	V1 C.G.	470kΩ	G5
R4	V1 osc. C.G.	100kΩ	H4
R5	Osc. C.G. stopper	1kΩ	H4
R6	Osc. damping	33kΩ	F5
R7	A.G.C. decoupling	5·6MΩ	H5
R8	V2 C.G.	3·3MΩ	H4
R9	Filament shunt	1·5kΩ	H4
R10	H.T. decoupling	27kΩ	H5
R11	I.F. stopper	47kΩ	H5
R12	Volume control	1MΩ	D1
R13	V3 C.G.	10MΩ	H5
R14	V3 S.G. feed	4·7MΩ	H6
R15	V3 anode load	1MΩ	H6
R16	V4 C.G.	2·2MΩ	H6
R17	Filament shunt	820Ω	H6
R18	H.T. smoothing	1kΩ	E6
R19	Filament	1·32kΩ	C1
R20	H.T. potential	680Ω	C1
R21	divider	1·1kΩ*	C2
R22		3·3kΩ	E5
R23	Voltage	307Ω	C2
R24	adjustment	281Ω	C2
R25		158Ω	C2
R26		305Ω	C1
R27		150Ω	E5
R28	Surge limiter	22Ω	E5

* Variable between the limits 700-1,100Ω.

	CAPACITORS	Values	Locations
C1	Aerial series	680pF	D1
C2	Chassis isolator	0·0047μF	—
C3	Aerial coupling	0·0068μF	F4
C4	V1 C.G.	100pF	G4
C5	Neutralizing	2·2pF	H4
C6	A.G.C. decoupling	0·01μF	H5
C7	1st I.F. trans	110pF	A1
C8	tuning	110pF	A1
C9	V1 osc. C.G.	100pF	G4
C10	Filament by-pass	0·1μF	G5
C11	L.W. tracker	400pF	F4
C12	M.W. tracker	575pF	F4
C13	V2 C.G. by-pass	0·01μF	H4
C14	H.T. decoupling	0·047μF	H5
C15	2nd I.F. trans	110pF	A2
C16	tuning	110pF	A2
C17	I.F. by-pass	100pF	H5
C18	A.F. coupling	0·0047μF	H5
C19	V3 S.G. decoup.	0·047μF	H5
C20	A.F. coupling	0·0047μF	H6
C21*	H.T. smoothing	100μF	D3
C22*	Filament by-pass	250μF	A3
C23	Tone corrector	0·0022μF	A2
C24*	Filament smoothing	100μF	D3
C25*	H.T. smoothing	50μF	A3
C26	Mains by-pass	0·01μF	E5
C27‡	L.W. aerial trim.	125pF	F4
C28‡	M.W. aerial trim.	32pF	G4
C29†	Aerial tuning	§487pF	B1
C30‡	M.W. osc. trimmer	50pF	G4
C31†	Oscillator tuning	§487pF	B1
C32‡	L.W. osc. trimmer	200pF	F4

* Electrolytic. †Variable. ‡ Pre-set. § "Swing" value, min to max.

	OTHER COMPONENTS	Approx. values (ohms)	Locations
L1	Aerial tuning coils	8·0	C1
L2	Aerial tuning coils	0·3	D1
L3	Oscillator tuning	7·1	C1
L4	Oscillator tuning	11·0	C1
L5	Oscillator reaction	2·6	C1
L6	Oscillator reaction	3·2	C1
L7	1st I.F. trans. Pri.	12·0	A1
L8	1st I.F. trans. Sec.	12·0	A1
L9	2nd I.F. trans Pri.	12·0	A2
L10	2nd I.F. trans Sec.	12·0	A2
L11	Speech coil	3·5	F5
T1	Primary	890·0	B2
T1	Secondary	1·0	B2
F1	200mA fuse	—	D2
F2	200mA fuse	—	D2



Circuit diagram of the Philips 401UB. The second half of V4 filament may replace the first if the polarity is reversed.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers and were measured while the receiver was operating from 250 V A.C. mains with the voltage adjustment set at the appropriate tapping. The set was tuned to the highest wavelength end of M.W. and the volume control was at maximum, but there was no signal input.

Voltage readings were measured with a 20,000 Ω per volt meter, chassis being the negative connection.

Valve		Anode		Screen	
		V	mA	V	mA
V1 DK91	...	86	0·63	42	1·2
V2 DF91	...	86	1·25	42	0·32
V3 DAF91	...	24	0·068	22	0·014
V4 DL94	...	83	3·7	86	0·75

DISMANTLING THE SET

Removing Chassis.—Remove the four bolts (with lock washers, plain washers and spacers) holding the edges of the chassis to the cabinet;

unsolder the four leads from the tag strip mounted below the tubular battery holder in the back half of the cabinet;

the chassis may now be lifted out.

When replacing, the strap should be secured beneath the chassis fixing bolt next to V4. The four leads should be resoldered to the tag strip as follows, starting from the fixing screw end; yellow (thick), yellow (thin), red, green.

Removing Speaker.—Remove the three 6BA screws (with shake-proof washers and rubber mounting washers) securing the speaker to the chassis;

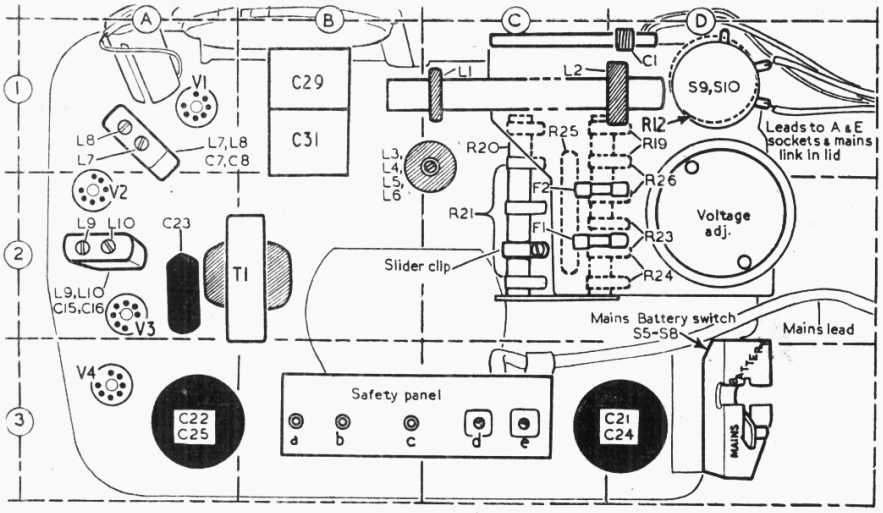
unsolder the leads from the speech coil tags and withdraw speaker.

GENERAL NOTES

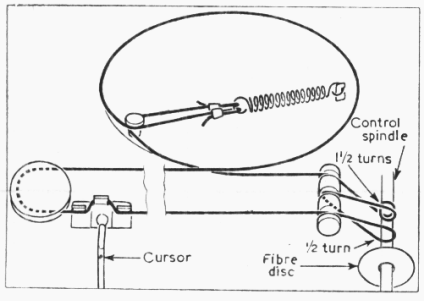
Switches.—**S1-S4** are the waveband switches, ganged in a single unit on the front of the chassis plate. Its position is indicated in our front view of the chassis, where a drawing just below the unit shows it in detail. **S1** and **S4** close on M.W. (control knob towards low wavelength end of scales), and **S2, S3** close on L.W.

S5 (B), S6 (M), S7 (M) and **S8 (B)** are the mains/battery change-over switches, ganged in a second unit, mounted on a bracket at the rear of the chassis plate. Its position is also indicated in our front view of the chassis, and a detailed diagram of the unit is inset near it in that illustration.

Safety Panel.—This is mounted on the rear side of the chassis, and carries three plugs and two sockets which are met by complementary sockets and plugs mounted in the lid when it is closed. These connections cut off the mains and H.T. battery negative leads when the lid is opened. They are coded **a, b, c, d, e** in the chassis view and circuit diagram.

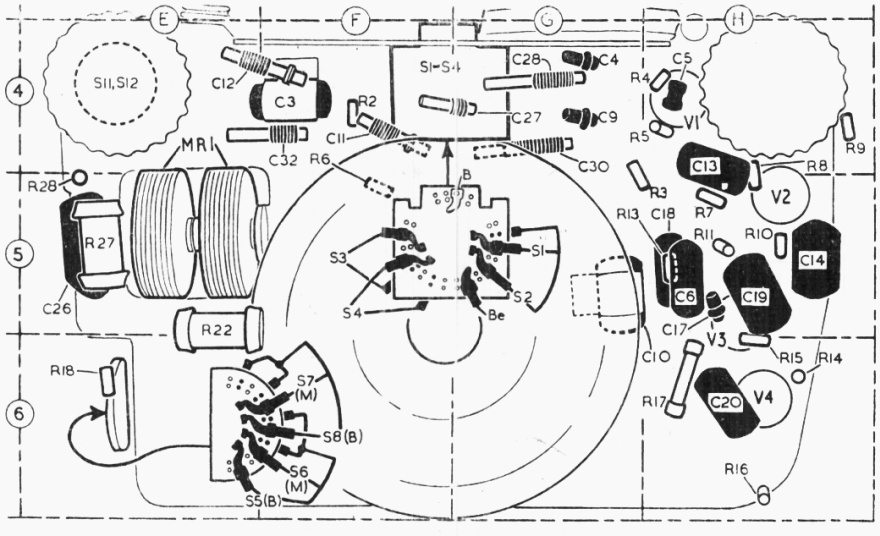


Rear view of the chassis. Five contacts in the lid engage with those coded **a, b, c, d, e** on the safety panel when it is closed. The mains lead passes through the mains/battery switch for mains operation.



Sketch showing the tuning drive system, drawn as seen from the front, taking a three-quarter plan view, with the gang at minimum capacitance.

Drive Cord Replacement.—About 3 feet of cord is required, and it should be made up with a loop at each end to measure 845 mm (33.375in, or 33⅜in) overall, using special metal collars to clamp the ends. Run on as shown in the sketch (col. 2), starting anti-clockwise round the drum.



Front face of the chassis, with diagrams of the waveband and mains/battery switch units inset. Arrows show the positions in which the units are viewed.

CIRCUIT ALIGNMENT

The I.F. adjustments are accessible with the chassis in the cabinet.

I.F. Stages.—Turn the gang and volume control to maximum. Connect the signal generator output, via a 0.047 μF capacitor in the "live" lead to control grid (pin 6) of valve **V1.** Feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L10, L9** (location reference A2) and **L8, L7** (A1) for maximum output. Repeat these adjustments.

R.F. and Oscillator Stages.—Withdraw the chassis and lay it in the back half of the cabinet with the batteries in position. Access to the trimmers is gained by removing the scale backing plate. Transfer signal generator leads, via a suitable dummy aerial, to **A** and **E** sockets.

Note that the capacitance of the trimmers is varied by adjusting the amount of wire with which they are wound. Wire may only be removed; none must be added.

M.W.—Switch set to M.W., turn the gang to minimum feed in a 187.5 m (1,600 kc/s) signal and adjust **C30** (G4) and **C28** (G4) for maximum output. Turn gang to maximum, feed in a 576.9 m (520 kc/s) signal and adjust **C12** (F4) for maximum output. Repeat these adjustments.

L.W.—Switch set to L.W., turn gang to minimum, feed in a 909 m (330 kc/s) signal and adjust **C32** (E4) and **C27** (F4) for maximum output. Turn gang to maximum, feed in a 2,027 m (148 kc/s) signal and adjust **C11** (F4) for maximum output. Repeat these adjustments.

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