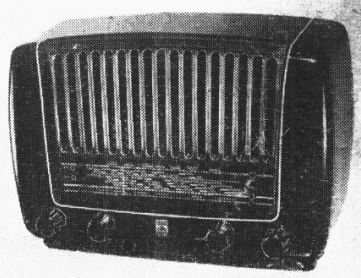
"TRADER" SERVICE SHEET

1070

PHILIPS

310A, 411A and 622A



The appearance of the Philips 310A.

THREE Philips receivers are covered here, but the basic one, of which we had a sample, is the **310A.** This is a 4-valve (plus rectifier) 3-band superhet operating from A.C. mains of 100-250 V, 50-100 c/s using a double-wound mains transformer. The wave-band ranges are 16.5-51 m, 185-580 m and 1,053-1,974 m. Owing to its complicated nature, space is not available here to describe the tuning drive system fully.

The essential electrical difference in the Philips 411A is the addition of a tuning indicator, whose circuit we show below the main diagram. The 622A employs a similar chassis to that in the 310A, but it has a separate pick-up pre-amplifier whose diagram is shown overleaf.

Release date, all models, August 1952. *Original prices:* 310A, £14 6s 9; 411A, £18 7s 8d; 622A, £55 3s 1d. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input via I.F. filter **L1, C1** to coupling coils **L2** (S.W.) and **L3** (M.W.), and across the common impedance of **C3** (L.W.). Single-tuned aerial circuits **L4, C30** (S.W.), **L5, C30** (M.W.) and **L6, C30** (L.W.) precede triode hexode valve **(V1, Mullard ECH42).**

Oscillator anode coils **L10** (S.W.) and **L11** (M.W.) are tuned by **C33.** **L11** is also used for L.W. operation, when it is shunted by **C11.** Parallel trimming by **C32** (S.W.), **C31** (M.W.) and **C11, C31** (L.W.); series tracking by **C9** (S.W.), **C12** (M.W.) and **C12, C13** (L.W.). Reaction coupling from grid by **L9** (M.W. and L.W.). On S.W., the reaction coupling comprises a double resonant circuit **L7, C9, L8** which resonates at both ends of the band to maintain a constant oscillator output over this range.

Second valve **(V2, Mullard EAF42)** is a diode R.F. pentode, its pentode section operating as a variable-mu intermediate frequency amplifier with tuned transformer couplings.

Intermediate frequency 470 kc/s.

Diode section of **V2** is used as signal detector, the audio frequency component in its rectified output being developed across volume control **R10** and passed via **C22** to grid of double diode triode valve **(V3, Mullard EBC41).** I.F. filtering by **C20, R8** and the capacitance of the screened leads. Bass correction at low volume settings of **R10** is effected by **R9, C21.**

Resistance-capacitance coupling by **R13, C24** and **R16** between **V3** and pentode output valve **(V4, Mullard EL41).** Fixed tone correction by **C25** in anode circuit; by negative feed-back via **R15** between **V4** and **V3** cathodes; by feed-back from winding **d-e** on **T1** to volume control; and by feed-back from windings **c-d-e** to **V3** cathode.

Tone control **R19** varies the coupling in this last circuit, and as the windings are earthed at **d** it also varies the phase of the feed-back voltage, thus modifying the frequency response. Provision is made for the connection of a low impedance external speaker across winding **c-d.**

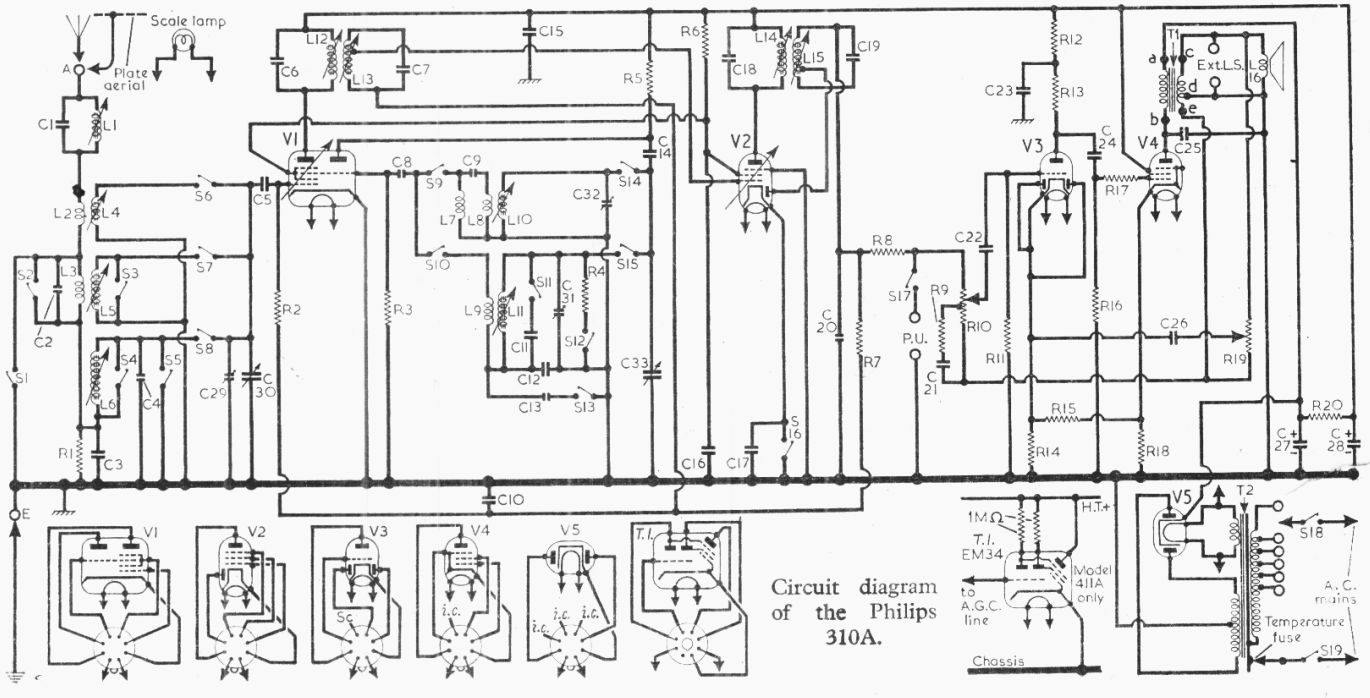
H.T. current is supplied by I.H.C. full-wave rectifying valve **(V5, Mullard EZ40).** Smoothing by **R20** and electrolytic capacitors **C27, C28.** The temperature fuse opens only if transformer **T2** overheats.

COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	L.W. aerial shunt...	12kΩ	F4
R2	V1 C.G.	820kΩ	F4
R3	V1 osc. C.G. ...	33kΩ	F3
R4	M.W. osc. stabilizer	8·2kΩ	F3
R5	Osc. anode feed ...	33kΩ	E3
R6	S.G. H.T. feed ...	56kΩ	E4
R7	A.G.C. decoupling	1·5MΩ	F4
R8	I.F. stopper ...	47kΩ	E4
R9	Tone compensator	27kΩ	D4
R10	Volume control ...	500kΩ	D3
R11	V3 C.G.	1MΩ	D4
R12	V3 H.T. decoup. ...	100kΩ	E4
R13	V3 anode load ...	120kΩ	E4
R14	V3 G.B.	1·8kΩ	E4
R15	Neg. feed-back ...	43kΩ	E4
R16	V4 C.G.	680kΩ	E4
R17	V4 C.G. stopper ...	1kΩ	E4
R18	V4 G.B.	180Ω	E4
R19	Tone control ...	50kΩ	E3
R20	H.T. smoothing ...	1·2kΩ	F4

	CAPACITORS	Values	Locations
C1	I.F. filter tune ...	270pF	G4
C2	M.W. aerial shunt	39pF	G4
C3	L.W. aerial coup....	1,780pF	G4
C4	L.W. aerial trim. ...	72pF	G4
C5	V1 C.G.	220pF	F4
C6	1st I.F. trans. tun.	115pF	A2
C7	1st I.F. trans. tun.	115pF	A2
C8	V1 osc. C.G. ...	56pF	F3
C9	S.W. osc. coup. ...	68pF	G3
C10	A.G.C. decoup. ...	0·047μF	F4
C11	L.W. osc. trim. ...	370pF	G3
C12	M.W. osc. track ...	415pF	G3
C13	L.W. osc. track ...	47pF	F3
C14	Osc. anode coup. ...	470pF	F3
C15	H.T. decoupling ...	0·0018μF	E3
C16	S.G. decoup. ...	0·1μF	E3
C17	S16 spark quench...	0·0027μF	F4
C18	2nd I.F. trans. tun.	115pF	B2
C19	2nd I.F. trans. tun.	115pF	B2
C20	I.F. by-pass ...	82pF	F4
C21	Tone compensator	0·0015μF	D4
C22	A.F. coupling ...	0·0082μF	D4
C23	H.T. decoupling ...	0·1μF	E3
C24	A.F. coupling ...	0·0033μF	E4
C25	Tone corrector ...	0·0068μF	B1
C26	Part tone control...	0·012μF	B4
C27*	H.T. smoothing ...	50μF	A2
C28*	H.T. smoothing ...	50μF	A2
C29‡	M.W. aerial trim.	30pF	B2
C30†	Aerial tuning ...	500pF	A2
C31‡	M.W. osc. trim. ...	30pF	A1
C32‡	S.W. osc. trim. ...	30pF	A1
C33†	Oscillator tuning ...	500pF	A1

* Electrolytic. † Variable. ‡Pre-set.



Circuit diagram of the Philips 310A.

	OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	I.F. filter		8·0	A2
L2	Aerial coupling coils		1·5	A2
L3			41·0	A2
L4	Aerial tuning coils		0·2	A2
L5			3·1	A1
L6			48·0	A2
L7	Oscillator reaction coils		0·5	A1
L8			0·3	A1
L9			4·0	A1
L10	Oscillator tuning coils		0·6	A1
L11			11·0	A1
L12	1st I.F. trans.	Pri.	8·0	A2
L13		Sec., total	8·0	A2
L14	2nd I.F. trans.	Pri.	8·0	B2
L15		Sec., total	8·0	B2
L16	Speech coil ...		2·6	—
T1	O.P. trans.	a-b	780·0	
		c-d	0·6	B1
		d-e	—	
T2	Mains trans.	Pri., total	64·1	
		H.T. sec., total	320·0	C1
		Htr. sec.	0·1	
S1-S15	Waveband switches		—	F3
S16, S17	Radiogram switches		—	D3
S18, S19	Mains sw., g'd R10		—	D3

GENERAL NOTES

Switches.—**S1-S15** are the waveband switches, ganged in two rotary units beneath the chassis. They are indicated in our underside view of the chassis, and shown in detail in the diagrams inset beside the plan view, where they are viewed from the rear of an inverted chassis. The table below them gives the action for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

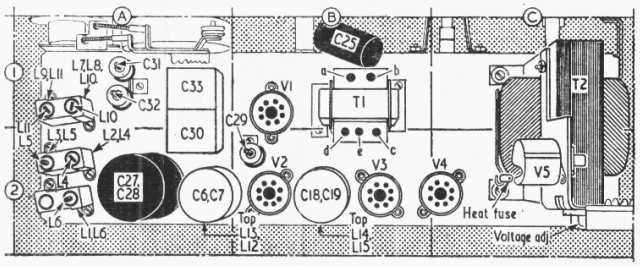
S16-S17 are the radio/gram change-over switches, ganged in a 2-position Q.M.B. unit mounted concentrically with the volume control spindle. In the anti-clockwise position of the control **S16** is closed, and **S17** is open, for radio operation.

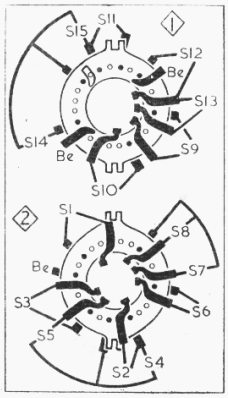
Scale Lamp.—This is a Philips type 8028D-00, with a clear tubular bulb and an M.E.S. base, rated at 6.5 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low impedance (about 5-7 Ω) external speaker.

Drive Cord Replacement.—The drive cord system on this receiver is rather complex, and requires more space than is available here to explain it. A full description of a similar system is given in *Service Sheet* 973, where the only differences are in the position of the tuning scale run relative to the drive, and the lengths of the various cables. The cord lengths are: 960 mm overall, divided by the collar to 440 mm+520 mm; outer casings: 65 mm+77 mm; wire cables 410 mm+680 mm overall. Start the shorter wire cable from the slot at 4 o'clock, and the longer one at 12 o'clock.

Temperature Fuse.—This consists of a soft-metal link normally looped over two hooks, one of which is embedded in the transformer windings. When the link melts, the outer hook springs away, opening the mains circuit. Replacements are made with a type 08.100.99 fuse.



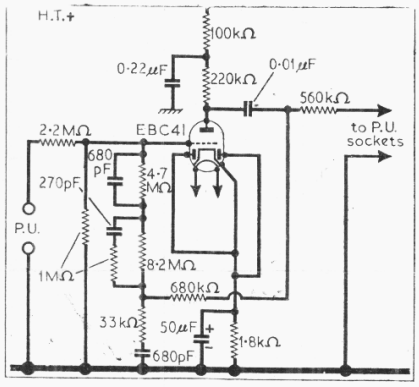


Plan view of the chassis (above) in which the output transformer windings are coded to agree with the circuit diagram overleaf. On the right are diagrams of the waveband switch units, as seen from the rear of an inverted chassis, and below them is the associated switch table.

CIRCUIT ALIGNMENT

All the R.F. and I.F. adjustments are accessible with the chassis in its cabinet.

I.F. Stages.—Switch receiver to M.W. and turn gram switch to the "radio" position. Unscrew the dust-iron cores of both I.F. transformers and turn volume control to maximum. Connect output of signal generator, via an 0.047 μF capacitor in the "live" lead, to control grid (pin 6) of **V1** and chassis, feed in a 470 kc/s



The pre-amplifier circuit in the 622A.

(638.3 m) signal and adjust the cores of **L15, L14, L12** and **L13** (location references B2, A2) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. action.

I.F. Filter.—Transfer signal generator leads to **A** and **E** sockets, feed in a 470 kc/s signal and adjust the core of **L1** for minimum output, using the first minimum reached, starting with the core fully out **(G4)**.

R.F. and Oscillator Stages.—The high-frequency trimming point on S.W. and M.W. is with the gang at minimum capacitance, when the cursor should coincide with the letter "M" in the left-hand end of the tuning scales.

M.W.—Switch receiver to M.W., tune to 550 m, and with the output leads of the signal generator connected to the **A** and **E** sockets via a dummy aerial, feed in a 550 m (545.5 kc/s) signal and adjust the cores of **L11** (A1) and **L5** (A2) for maximum output. Tune receiver to 184 m ("M" on scale), feed in a 184 m (1,630 kc/s) signal and adjust **C31** (A1) and **C29** (B2) for maximum output. Repeat these adjustments until no further improvement results.

L.W.—Switch receiver to L.W., tune to 1,900 m, feed in a 1,900 m (157.8 kc/s) signal and adjust **L6** (A2) for maximum output.

S.W.—Switch receiver to S.W., tune to 50 m, feed in a 50 m (6 Mc/s) signal and adjust the cores of **L10** (A1) and **L4** (A2) for maximum output. Tune receiver to 14.92 m ("M" on scale), feed in a 14.92 m (20.1 Mc/s) signal and adjust **C32** (A1) for maximum output. Repeat these adjustments until no further improvement results.

Switch	S.W.	M.W.	L.W.
S1	C	—	—
S2	—	—	C
S3	C	—	C
S4	—	C	—
S5	C	C	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	C
S11	—	—	C
S12	—	C	—
S13	—	—	C
S14	C	—	—
S15	—	C	C

VALVE ANALYSI

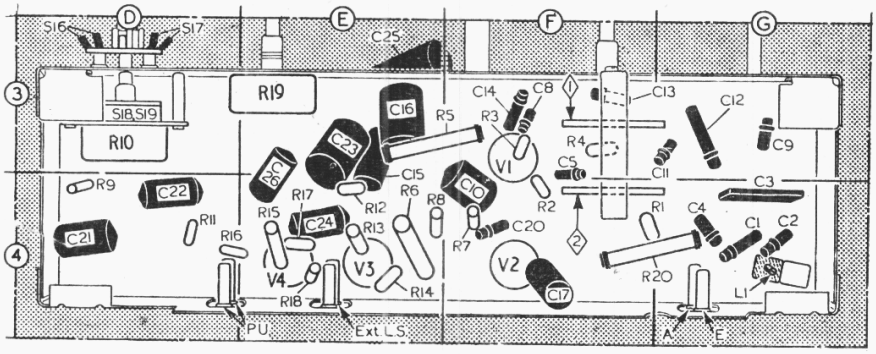
Valve voltages and currents given in the table below are those derived from the manufacturers' information, and are the average of measurements made on a number of receivers operating from 220 V A.C. mains. The volume controls were turned to maximum, the gangs to minimum capacitance and the tone controls to maximum "top" setting, but there was no signal input.

Voltage readings were measured with a 20,000 ohms-per-volt meter, and allowance should be made for the current drawn by meters with a lower internal resistance. Chassis was the negative connection.

Total consumption on 220 V, 50 c/s mains, using the 220 V adjustment setting, is quoted as 210 mA; at 245 V, 50 c/s, using the 245 V setting, consumption is 190 mA.

Valve	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 ECH42	250 (Oscillator)	1·6	54	2·5	—
	107	4·2			
V2 EAF42	250	3·5	54	1·0	—
V3 EBC41	111	0·6	—	—	1·3
V4 EL41	244	35·0	250	4·5	6·5
V5 EZ40	*251	—	—	—	†270·0

*Each anode, A.C. †Cathode current 53 mA.



Underside view of the chassis.

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