

NUMBER EIGHTY-TWO

'TRADER' SERVICE SHEETS

PHILCO 255

4-VALVE BATTERY SUPERHET

THE Philco model 255 battery receiver incorporates a 4-valve chassis using a heptode frequency changer, a variable- μ pentode I.F. amplifier, a double-diode triode (of which only one diode is used) and a double pentode valve in a Q.P.P. output stage.

Provision is made for a low resistance extension speaker and for a gramophone pick-up.

CIRCUIT DESCRIPTION

Aerial input on M.W. via switch **S2** to coupling coil **L4**, and on L.W. via choke coil **L3** to coupling coil **L5**. On L.W. switch **S2** is open and switch **S3** short-circuits M.W. coil **L4**. Coil **L1** and pre-set condenser **C14** form an I.F. filter in the aerial circuit, while coil **L2** and pre-set condenser **C15** form M.W. wave-trap for the suppression of second channel interference.

Single tuned circuit **L6, L7, C16** precedes heptode frequency changer valve (**V1, Philco 106**) operating with electron coupling. Oscillator grid coils **L9, L10** tuned by **C18**; tracking by condensers **C21** (L.W.) and **C5, C22** (M.W.); anode reaction is applied by fixed condenser **C6**.

Second valve (**V2, Philco 1A4E**) is a variable- μ H.F. pentode operating as

intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L11, L12** and **L13, L14**.

Intermediate frequency 460 KC/S.

Diode second detector forms part of double-diode triode valve (**V3, Philco 2102**) which also provides automatic volume control and L.F. amplification. D.C. potential developed across diode load resistance **R7** is fed back through decoupling circuit **R5, C2** as G.B. to F.C. and I.F. valves to give A.V.C. Audio frequency component in rectified output is passed via coupling condenser **C9** to manual volume control **R8**, and thence via coupling condenser **C10** to grid of **V3** triode section. Provision for connection of gramophone pick-up across **R7** by means of switch **S7**. **S1** and **S5** are radio muting switches on gram.

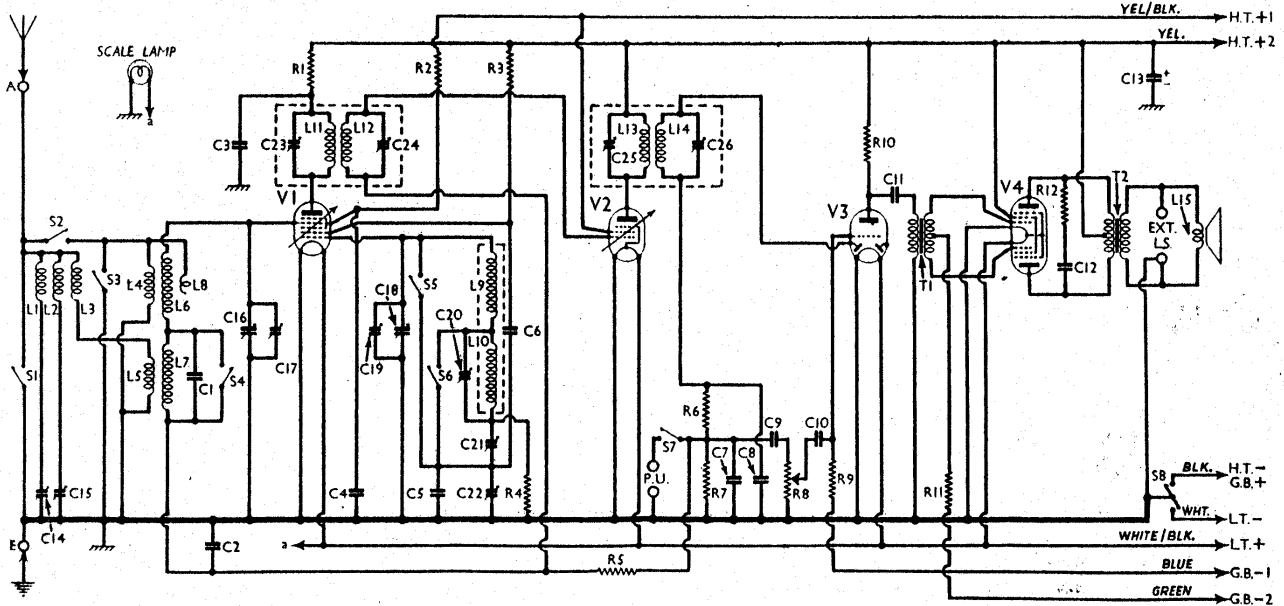
Parallel-fed transformer coupling by **R10, C11** and **T1** to output stage consisting of a double pentode valve (**V4, Philco 2103**) operating on quiescent push-pull system. Resistance **R11** prevents parasitic oscillations. Toned correction by fixed R.C. filter **R12, C12**. Coupling to speaker by special input transformer **T2**. Provision for connection of low impedance external speaker across secondary.

COMPONENTS AND VALUES

Resistances		Values (ohms)
R1	V1 tet. anode decoupling	10,000
R2	V1 S.G.'s H.T. feed	20,000
R3	V1 osc. anode resistance	51,000
R4	V1 tet. grid resistance	51,000
R5	A.V.C. line decoupling	2,000,000
R6	I.F. stopper	51,000
R7	V3 diode load	490,000
R8	Manual volume control	1,000,000
R9	V3 grid resistance	1,000,000
R10	V3 anode load	51,000
R11	V4 anti-parasitic resistance	240,000
R12	Part of tone comp. filter	35,000

Condensers		Values (μ F)
C1	Aerial circuit L.W. trimmer	0.000035
C2	A.V.C. line decoupling	0.05
C3	V1 tet. anode decoupling	0.01
C4	V1 S.G.'s by-pass	0.05
C5	Osc. M.W. tracker, fixed	0.000175
C6	V1 osc. reaction condenser	0.01
C7	I.F. by-passes	0.00011
C8		0.00011
C9	L.F. coupling to vol. control	0.01
C10	L.F. coupling to V3 grid	0.01
C11	L.F. coupling to T1	0.09
C12	Part of tone comp. filter	0.001
C13*	H.T. reservoir	8.0
C14†	Aerial I.F. filter tuning	—
C15†	Broadcast wave-trap tuning	—
C16†	Aerial circuit tuning	—
C17†	Aerial circuit trimmer	—
C18†	Oscillator tuning	—
C19†	Oscillator main trimmer	—
C20†	Oscillator L.W. trimmer	—
C21†	Oscillator L.W. tracker	—
C22†	Oscillator M.W. tracker	—
C23†	1st I.F. trans. pri. tuning	—
C24†	1st I.F. trans. sec. tuning	—
C25†	2nd I.F. trans. pri. tuning	—
C26†	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.



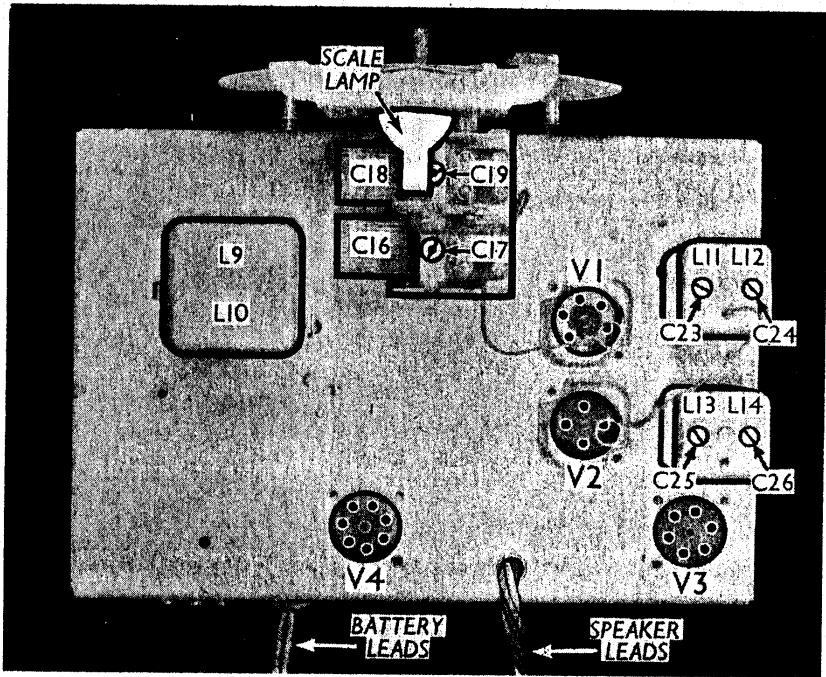
Circuit diagram of the Philco 255 battery superhet. Note that one diode anode of V3 is not used. V4 is a special double pentode output valve.

Other Components		Values (ohms)
L1	Aerial I.F. filter coil	15.0
L2	Broadcast wave-trap coil	9.0
L3	Aerial choke coil (L.W.)	40.0
L4	Aerial M.W. coupling coil	24.0
L5	Aerial L.W. coupling coil	120.0
L6	Aerial tuning coils	3.0
L7		16.0
L8	Part of aerial circuit	Very low
L9	Oscillator tuning coils	3.3
L10		13.0
L11	1st I.F. trans	Pri. 7.5
L12		Sec. 11.0
L13	2nd I.F. trans	Pri. 7.5
L14		Sec. 11.0
L15	Speaker speech coil	2.2
T1	Intervalve trans.	Pri. 600.0
T2		Sec. total 5,000.0
	Speaker input trans.	Pri. total 480.0
		Sec. 0.25
Sr, S5	Radio muting switches (gram.)	—
S2-S4	Waveband switches	—
S6		—
S7	Gram. pick-up switch	—
S8	H.T. and L.T. switch, ganged	—
R8		—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the back and disconnect and remove the batteries. Remove the three control knobs and the four bolts (with washers) holding chassis to the cabinet bottom (this may have already been done). The chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes. Take care not to lose the rubber washers between the chassis and cabinet bottom.

To free the chassis entirely unsolder the leads on the speaker terminal panel.



Plan view of the chassis. The scale lamp is a special small bayonet holder type, fitted in a reflector.

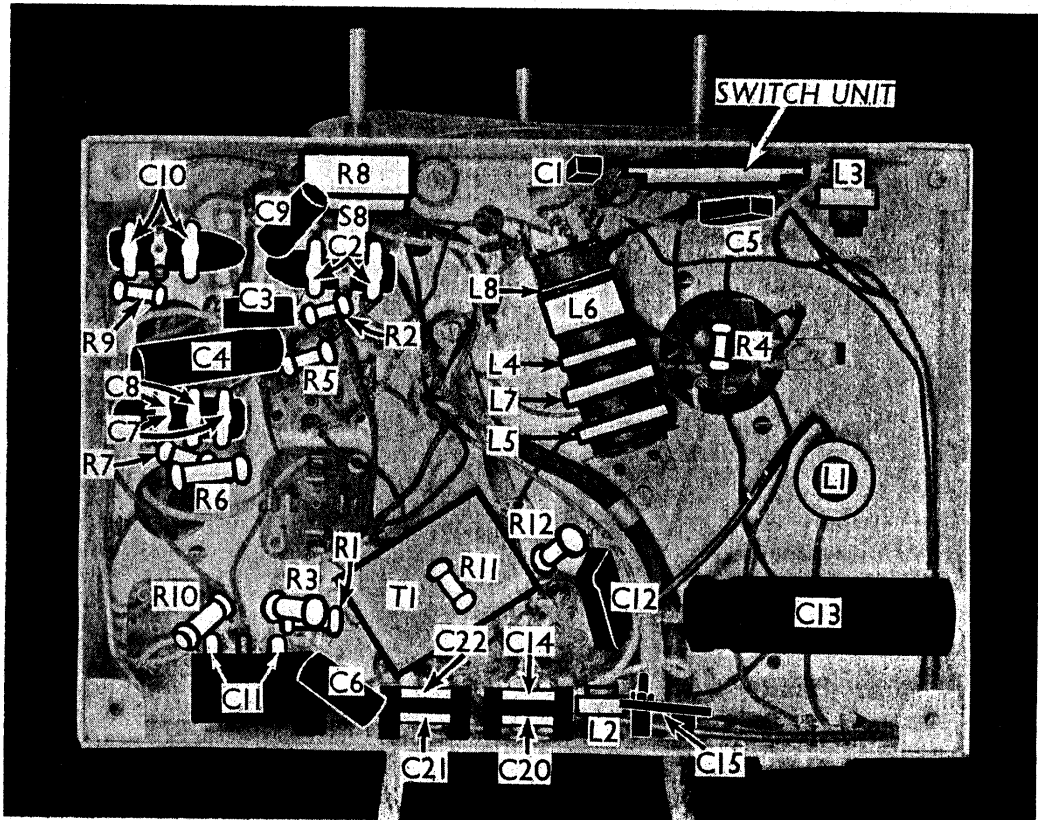
When replacing, connect as follow, numbering the tags from left to right:— 1, black; 2, green; 3, green/white; 4, white; 5, red.

When replacing chassis, do not forget

the rubber washers between the chassis and cabinet bottom and note that the large control knob is intended for the tuning condenser.

(Continued overleaf)

Under-chassis view. The connecting tags of the various moulded paper condensers are indicated. A separate sketch of the switch unit is overleaf. The trimmers C14, C15, C20, C21 and C22 are adjusted through holes in the rear of the chassis.



PHILCO 255 (continued)

Removing Speaker.—If it is necessary to remove the speaker, untie the dust bag and run off the nuts on the four bolts holding the speaker to the sub-baffle. When replacing, see that the transformer is at the bottom.

VALVE ANALYSIS

Valve voltages and currents given in the table below were measured with the receiver operating with the recommended voltages, obtained from a new battery reading 140 V on the H.T. section and 9.4 V on the G.B. section.

The volume control was at maximum and the receiver was tuned to the lowest wavelength on the M.W. band, but there was no signal input. Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 1C6*	110	1.1	45	1.1
V2 1A4E	138	4.1	70	1.0
V3 2102	90	0.8	—	—
V4 2103	135†	2.0†	138	1.1

*Osc. anode (G2) 50 V, 1.6 mA. †Each anode.

GENERAL NOTES

Switches.—The waveband switches, S1-S7, are in a single rotary unit indicated in the under-chassis view, and shown in detail in a separate sketch. This is drawn as it is seen looking at the underside of the chassis, from the rear. Note that all the switches, except S4 and S7, each have one common contact. The table below gives the switch positions for the three settings of the control, O indicating open, and C, closed.

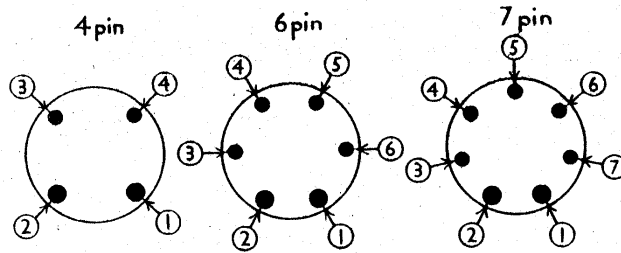
Switch	M.W.	L.W.	Gram.
S1	O	O	C
S2	C	O	O
S3	O	C	O
S4	C	O	O
S5	O	O	C
S6	C	O	O
S7	O	O	C

S8 is the Q.M.B. filament switch, ganged with the volume control, R8.

Coils.—L1, L2, L3 are three separate unscreened small coils, on formers mounted beneath the chassis. L4-L8 are wound on a single tubular former, also unscreened, and beneath the chassis.

L9 and L10 are in a screened unit on the chassis deck, and L11, L12 and L13, L14, the I.F. transformers, are in two further screened units, together with their trimmers.

Scale Lamp.—This is a special Philco c 8



4-, 6- and 7-pin American valve bases, looking at the under-sides. The valve connections are in Col. 2.

bayonet type, part No. 34-2065. To remove the lamp, the screw fixing the holder bracket to the gang condenser must be loosened to free the holder, when the lamp is removed by pushing in and rotating it.

External Speaker.—Sockets are provided at the rear of the chassis for a low impedance (2 Ω) speaker.

Battery Leads and Voltages.—The following coding for the battery leads is employed: White, L.T. negative; white-black, L.T. positive; black, H.T. negative, G.B. positive; yellow-black, H.T. positive 67.5 V; yellow, H.T. positive 135 V; blue, G.B. negative 1.5 V; green, G.B. negative 9 V.

Valve Connections.—V1 has a 6-pin base; V2, 4-pin; V3, 6-pin; and V4, 7-pin. Base diagrams are given in a sketch on this page, and each pin is numbered. The connections are as follow:—

V1.—1, Fil; 2, Fil; 3, Anode; 4, Osc. anode; 5, Osc. grid; 6, Screening grids; Top cap, Cont. grid.

V2.—1, Fil; 2, Fil; 3, Anode; 4, Screen grid; Top cap, Cont. grid.

V3.—1, Fil; 2, Fil; 3, Anode; 4, Diode (blank); 5, Diode; 6, Cont. grid.

V4.—1, Fil; 2, Fil; 3, Anode 1; 4, Grid 1; 5, Aux. grids; 6, Grid 2; 7, Anode 2.

Moulded Condensers.—Several Philco moulded condensers are employed. Each has three tags, and where there is only one condenser in the moulding, the two

outer tags are used, the central one merely acting as a bearer for other wiring; C7 and C8, however, are in one unit, and each have one common tag, as indicated in the under-chassis view.

Trimmer C15.—This is adjusted through a hole in the rear of the chassis (hexagonal nut).

Trimmers C14, C20 and C21, C22.—These are in pairs in two units, and are adjusted through holes in the rear of the chassis. Each unit has a hexagonal nut and concentric grub screw for adjustment. The two nuts adjust C20 and C21, and the two grub screws, C14 and C22.

CIRCUIT ALIGNMENT

Feed a 460 KC/S signal from an oscillator to the control grid of V1 (top cap), first removing the existing connection clip. The other output lead from the oscillator should be earthed to chassis. Connect a suitable output meter across the primary of T2. Set the receiver volume to maximum, and adjust oscillator to give a half-scale reading on output meter. Set wavechange switch to M.W. Now adjust C26, C25, C24, C23 for maximum output, reducing oscillator input as the circuits come into tune. Repeat until no further improvement is obtained. Replace V1 top cap lead.

Now feed in 460 KC/S signal between aerial and earth, keeping receiver switched to M.W. Adjust C14 (screw) for minimum output.

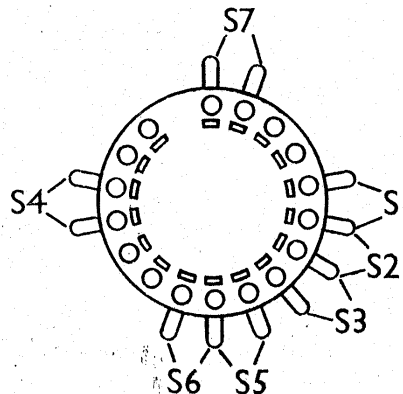
Set indicator of tuning scale to 1,400 KC/S, and feed in a 1,400 KC/S signal. Slacken off C15, and adjust C19 and C17 for maximum output.

Feed in a 600 KC/S signal, and tune it in on receiver. Rock gang condenser and adjust C22 for maximum output. Re-adjust at 1,400 and 600 KC/S until no further improvement is obtainable.

Switch receiver to L.W. Feed in a 290 KC/S signal and tune it on set. Rock gang condenser and adjust C20 for maximum output.

Feed in a 160 KC/S signal, tune, rock gang condenser and adjust C21 for maximum output. Re-adjust C14 and C19 until no further improvement results.

Switch set to M.W. and tune in the local station. Adjust C15 for minimum output. If there are two locals, tune to that which causes any undesirable whistles on the M.W. band and then adjust C15 for minimum output



The switch unit, as seen looking at the underside of the chassis, from the rear.