'TRADER' SERVICE SHEETS

RECEIVER SERIES (NUMBER SIX)

PHILCO Model 260 (and 261)

FOUR (and FIVE) STAR BABY GRAND

FOR A.C. MAINS

PHILCO models 260 and 261 are 5-valve 7-stage A.C. mains super-heterodyne receivers, employing chassis which are identical except for two refinements included in the 261. Both have heptode detector-oscillator valves and double diode-triodes which give diode detection and delayed A.V.C. In the 261 a special shadow tuning indicator is used, and is operated by a meter connected in the anode circuits of the heptode and I.F. valves. The 261 also has "four-point" tone control instead of the "two-point" control embodied in the 260. We give below service details of the 260, but naturally they are also applicable to the Model 261 except for the above differences.

CIRCUIT DESCRIPTION

One aerial connection to first aerial transformer **L1, L2, L4, L5,** the primary of which is shunted by **R1.** Secondary winding tuned by **C1,** and, in conjunction with second aerial transformer **L7, L8, L9** tuned by **C2,** forms band-pass input circuit to combined detector and oscillator valve **V1. V1 (Philco 6A7)** is a heptode (or pentagrid) valve, and has the oscillator tuning coils **L10, L11** in its oscillator control grid circuit, and the anode coils **L12, L13** in its oscillator anode circuit. Coil **L3** in cathode circuit of **V1** forms part of image rejector. Single H.F. pentode intermediate frequency amplifier (**V2, Philco 78**) with tuned primary I.F. transformers **L14, L15** and **L16, L17** (**L15** also tuned). **I.F. 125 KC.** Diode second detector forming part of double diode-triode (**V3, Philco 75**), the triode section of which functions as first L.F. amplifier. The two diode anodes are paralleled and provide also voltage which is fed back as G.B. to **V1** and **V2,** thus giving A.V.C. Rectified output from diode fed to triode by way of variable potentiometer **R10,** which serves as manual volume control. Jack **S5** provided for pick-up connection. **V3** coupled by R.C. circuit to output pentode (**V4, Philco 42**). Speaker coupled to **V4** by matching transformer **T1.** Two-point tone control by means of condenser **C26** and switch **S6.**

H.T. current supplied by full-wave rectifier (**V5, Philco 80**). Smoothing by means of speaker field **L18** and electrolytic condensers **C27, C28.**

DISMANTLING THE SET

Removing Chassis.—This is a simple operation. First of all, pull off the control knobs (no set screws are used). Now remove four hexagon-headed screws and large washers beneath cabinet, when the chassis can be withdrawn. Large soft rubber washers are interposed on the screws between the base of the cabinet and the chassis. Remember to replace these when installing the chassis again.

The triple lead from the chassis to the speaker is long enough to enable the chassis to be withdrawn about 18 ins. from the cabinet, which is ample for normal service work.

To remove the chassis entirely, take off the cover plate over the speaker terminal panel (2 screws), and unsolder the three leads. *When replacing,* the colour code is: White, top left tag; green, top right tag; white and green, bottom left tag.

Removing speaker.—This is held to the front of the cabinet by four nuts and bolts.

COMPONENTS AND VALUES

	Resistances	Value (ohms)
R1	Aerial shunt	10,000
R2	V1 grid decoupling	70,000
R3	V1 cathode resistance	500
R4	V1 osc. grid resistance	50,000
R5, R6, R7	V1 and V2 S.G.'s potential divider	13,000 / 10,000 / 25,000
R8	V2 cathode resistance	250
R9	Part of diode load	50,000
R10	Manual volume control	350,000
R11	A.V.C. circuit decoupling	2,000,000
R12	V3 grid H.F. "stopper"	25,000
R13	V3 grid resistance	1,000,000
R14	V3 grid decoupling	99,000
R15	V3 anode resistance	70,000
R16	V3 anode decoupling	70,000
R17	V4 grid resistance	490,000
R18, R19	V3 and V4 G.B. potential divider	235 / 32

	Condensers	Value (μF)
C1	First aerial trans. tuning	—
C2	Second aerial trans. tuning	—
C3	Oscillator tuning	—
C4	V1 grid decoupling	0·05
C5	V1 cathode resistance by-pass	0·09
C6, C7	Osc. compensating condensers M.W.	Fixed 0·00041 / Pre-set —
C8, C9	Osc. compensating condensers L.W.	Pre-set — / Pre-set —
C10	Pre-set tuning, 1st I.F. pri.	—
C11†	V1 and V2 anode by-pass	0·25
C12	Pre-set tuning, 1st I.F. sec.	—
C13	A.V.C. circuit decoupling	0·05
C14	V2 cathode resistance by-pass	0·09
C15†	V2 S.G. by-pass	0·09
C16†	V1 S.G. by-pass	0·09
C17	Pre-set tuning, 2nd I.F. pri.	—
C18	V3 grid H.F. filter	0·00011
C19, C20	Diode H.F. filter condensers	0·00025 / 0·00025
C21	V3 grid L.F. coupling	0·01
C22	V3 grid decoupling	0·09
C23	V3 anode H.F. by-pass	0·00025
C24	V4 grid L.F. coupling	0·01
C25†	V3 anode decoupling	0·25
C26	Tone control condenser	0·01
C27, C28	H.T. smoothing, electrolytics	8·0 / 8·0
C29†	V3 and V4 G.B. resist. by-pass	0·05
C30	Mains disturbance by-pass	0·015
C31*	Speaker field by-pass	0·09

* Not in our sample. † In condenser block.

NOTE.—The above table includes all condensers in the circuit, with the

(*Continued overleaf.*)

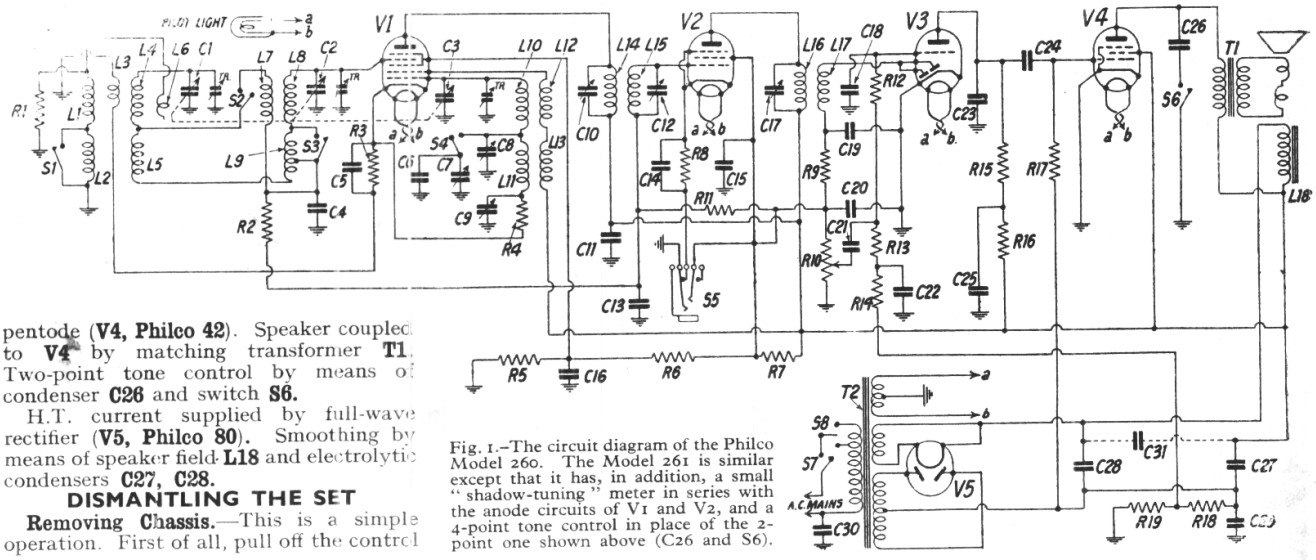


Fig. 1.—The circuit diagram of the Philco Model 260. The Model 261 is similar except that it has, in addition, a small "shadow-tuning" meter in series with the anode circuits of V1 and V2, and a 4-point tone control in place of the 2-point one shown above (C26 and S6).

PHILCO MODEL 260 (and 261) (contd.)

exception of the trimmers of the tuning condensers C1, C2, C3.

Components		Value (ohms)
L1, L2	1st aerial trans. pri.	25·0, 121·0
L3	Image rejecting coil, 1 turn	—
L4, L5	1st aerial trans. sec.	7·0, 59·0
L6	Coupling coil, very small	—
L7	2nd Aerial trans. pri., 1 turn	—
L8, L9	2nd aerial trans. sec.	6·8, 52·25
L10, L11	Oscillator tuning coils	5·6, 24·0
L12, L13	Oscillator anode coils	1·0, 6·6
L14, L15	1st I.F. trans Pri.	260·0
	1st I.F. trans Sec.	260·0
L16, L17	2nd I.F. trans. Pri.	160·0
	2nd I.F. trans. Sec.	82·0
L18	Speaker field	1140·0
T1	Speaker input trans. Pri.	450·0
	Speaker input trans. Sec.	1·25
T2	Mains transformer Pri. (total)	22·0
	Mains transformer Heater sec.	0·1
	Mains transformer Rect. fil. sec.	0·1
	Mains transformer H.T. sec.	300·0
S1-S4	Wave-band ganged switches	—
S5	Pick-up jack	—
S6	2-point tone control switch	—
S7	Mains switch (ganged with R10)	—
S8	Mains trans. tapping switch	—

VALVE ANALYSIS

Valve		Anode Volts	Screen Volts	Grid Volts	Osc. Anode Volts
V1	6A7	240	48	−0·2*	247
V2	78	240	92	Zero	—
V3	75	153	—	−0·4*	—
V4	42	230	245	−7·0	—
V5	80	†340 AC	—	—	—

† Each anode

Values given in the table are approximate only and were measured with a meter having a total resistance of 300,000 O, except where indicated with an asterisk(*). In the latter cases the meter had a resistance of 30,000 O. Readings were taken from the points shown in the table to chassis. The mains input voltage was 230 V and the switch S8 was set for 230-260 V.

GENERAL NOTES

Condenser Block.—This is shown in the under-chassis view. It contains five condensers, each with one connection to the metal case, and hence to chassis. The remaining five leads are colour-coded.

Condenser	Capacity (μF)	Colour Code
C11	0·25	White
C15	0·09	White-black
C16	0·09	White-black
C25	0·25	White
C29	0·05	Green

Switches.—**S1, S2, S3** and **S4** all form part of the 2-position rotary switch operated by the lower centre knob. On the L.W. band, all contacts are open, and on the M.W. band, they are connected in pairs.

S5 is the pick-up jack, mounted on the chassis, which takes a standard telephone plug.

S6 operates the 2-point tone control, connecting **C26** from anode of **V4** to earth.

S7 is the mains switch, ganged with **R10.**

S8 adjusts the mains transformer for 200-230 or 230-260 V.

Tuning Condenser.—This is flexibly mounted on the chassis by three bolts, with thick soft-rubber washers interposed. It is easily removed for replacement, after first unsoldering copper braid earthing connection, which goes to one of the bolt heads.

Moulded Condensers. — There is a number of fixed condensers in black moulded cases. These are held to the chassis by one bolt each. These bolts are sometimes used for earthing purposes. Some of the condensers are double, with one common connection. Others are single condensers, but have three tags. The spare tag (not connected internally) is sometimes used as an anchorage for various leads, a point to remember when tracing out the circuit.

Condenser C31.—This condenser is omitted from our sample, and also does not appear in Model 261 chassis of run No. 6 and onwards. (Run No. is stamped on rear of chassis inside a star.)

Electrolytic Condensers.—Note that these are *both* insulated from chassis by bands of insulating material inside the double clip holding them. A bolt is provided for clamping purposes.

No signals, bad hum.—In early 261 chassis, the wire from the anode of V3 to the coupling condenser C24 was pulled tight, and the heater socket tags of the V3 holder may have cut through the insulation, short-circuiting the H.T. supply, and connecting the heater to the grid of the output valve. This has since been rectified.

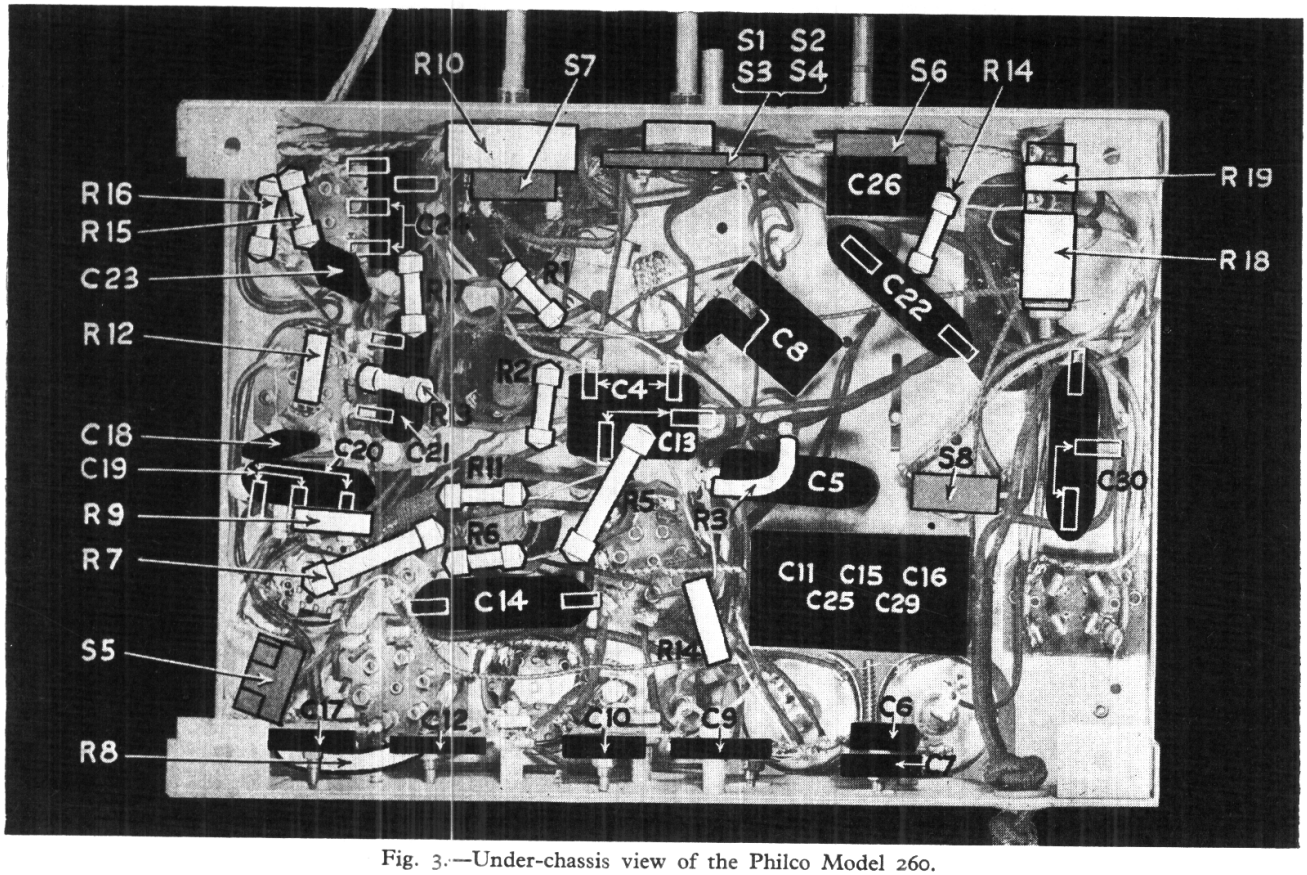


Fig. 3.—Under-chassis view of the Philco Model 260.

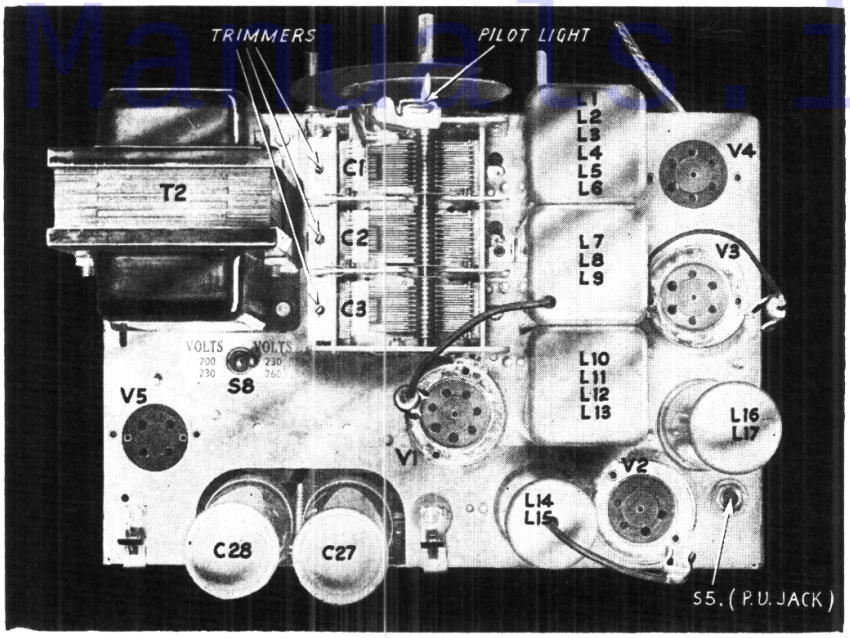


Fig. 2—Plan view of the Model 260 chassis. Valves and valve screens have been removed.

Coil Screens.—These are not easily removable from the chassis, but the coils themselves can be withdrawn from beneath the chassis after clearing away the wiring, and unbolting from the chassis the brackets holding them in position.

R3 and R8.—These are small flexible resistances, the latter being covered with a length of cotton braiding.

Padding and Trimming Condensers.—The receiver contains a number of small pre-set condensers whereby the tuning, oscillator and I.F. circuits are accurately aligned. Philco have prepared full details for the padding procedure, which are available to dealers, but which would occupy too much space to reprint here.

Five of the condensers can be reached through holes in the back of the chassis, while the sixth is beneath it. A hole is cut in the bottom of the cabinet to enable this to be adjusted, and hence the set can be re-aligned without removing it from the cabinet.

The procedure should not be attempted unless a suitable oscillator and output meter is available.

Valve Connections. — Since British service men may be unfamiliar with American valve connections, we give in col. 3 on this page diagrams showing the connections to the pins of each valve, looking at them from beneath the valves. These are also the connections of the valve-holders viewed from *beneath* the chassis.

Note that the caps on the valves (if any) are always connected to the control grids.

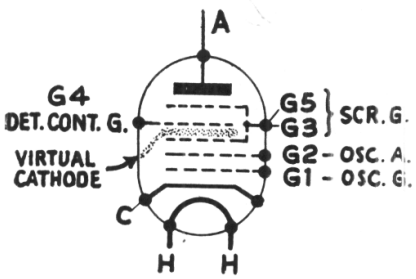
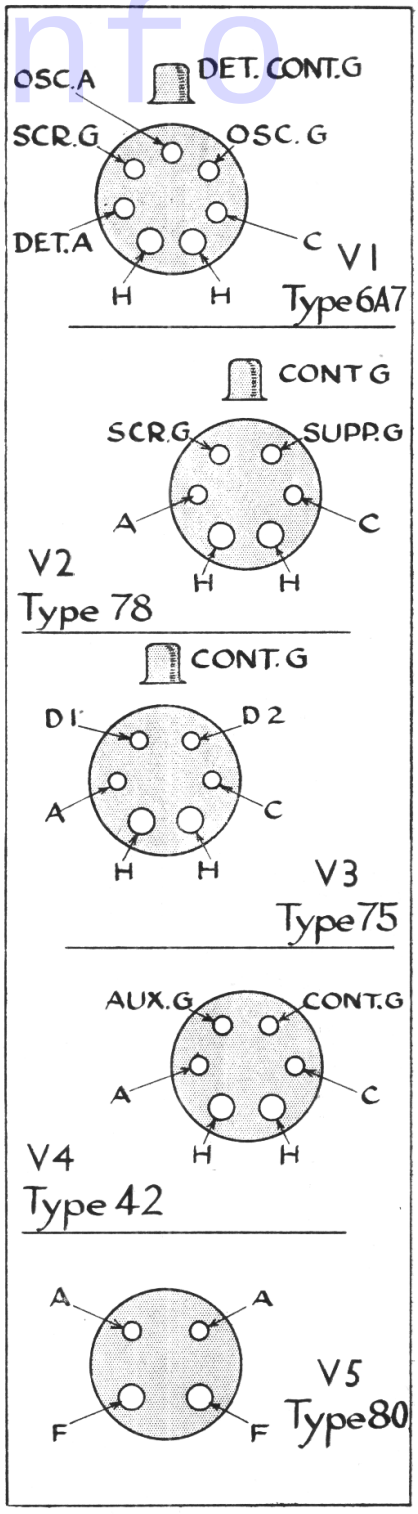


Diagram showing the electrodes of the heptode, as used in the Philco Model 260 and 261 receivers.

Valve V1.—This is a heptode or pentagrid, used as combined oscillator and first detector. It has the usual heater-cathode assembly, five grids and an anode. Starting from the innermost grid, No. 1, this is the oscillator control grid. No. 2 acts as the oscillator anode, and as the modulating grid for the electron stream. Grids Nos. 3 and 5 are connected together internally, and are accelerator grids. No. 3 screens the oscillator section of the valve (grids Nos. 1 and 2) from the detector section (grid No. 4 and anode), while No. 5 acts as the normal screen in a S.G. valve. No. 4 grid is the normal detector control grid, wound to give a variable-mu effect. Thus grids 4 and 5, and the anode form the control grid, screen grid and anode of a detector valve, while there is no actual cathode of this valve. Instead, there is what is known as a "virtual cathode," formed by an electron "cloud" between grids 3 and 4. This "cloud" is due to a proportion of the electrons which escape through grid 2 in pulses determined by the frequency of the oscillator section. They are attracted by grid 3, and pass through it towards grid 4. This, however, is negatively biassed, and repels them, and a "cloud" is thus formed, supplying the operating power for the detector section. Since the electrons arrive in pulses, with a frequency determined by the oscillator circuit, the virtual cathode is similarly varying, and so modulates the detector section, producing the usual results. There is thus no external coupling between the oscillator and 1st detector. There are several advantages of this method of "mixing."



The above diagrams show the connections of the American valves used in the Philco Model 260 (and 261) receivers, looking either at the underside of the valve bases, or at the underside of the valve holders. The metal caps on the bulbs, if any, connect in each case to control grids. Note that the heater or filament pins or sockets have a larger diameter than the remainder.