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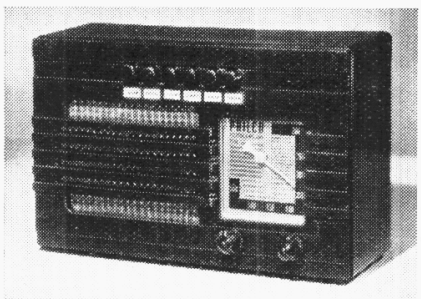
"TRADER" SERVICE SHEET

410

PHILCO A1 AND A1 RADIOGRAM



The Philco A1 table receiver.

THE Philco A1 is a 4-valve (plus rectifier) AC superhet midget receiver, with press-button trimmer tuning for five stations, and a sixth button for manual switching. On manual, only the MW band is covered, but two of the five auto buttons cover from 1,000 to 2,000 m.

The receiver is for use on 200-250 V, 50-100 C/S AC mains, and a self-contained aerial wire is provided.

There is also a table radiogram model, the A1RG, which has a similar chassis, the differences being explained under "Radiogram Modifications." This model is for 50-60 C/S mains only.

This *Service Sheet* was prepared on an A1 table receiver.

Release date for both models: April, 1939.

CIRCUIT DESCRIPTION

Aerial input is via coupling coil **L1** to single tuned circuit comprising tuning coils **L2** (MW), plus **L3** (LW). For MW operation, **L2** is tuned manually by **C15** or automatically by pre-set trimmer condensers **C17, C18** and **C19,** while **L3** remains short-circuited.

No provision is made for manual tuning on LW, but two LW buttons are provided on the press-button unit. When either of these is in use, **L3** is automatically brought into circuit and tuned by **C20** or **C21** via the selector switches **S5a** and **S6a** respectively.

The switches associated with the press-button unit have been numbered and lettered to indicate their functions: a suffix letter **a** indicates that its switch closes when the button by which it is operated is pressed, while a switch numbered with a suffix **x** or **y** opens; the position is reversed when the press-button is released by depression of another button, **a**'s opening and **x**'s and **y**'s closing. All switches bearing the same number are operated by the same press-button. It will be seen, therefore, that **S5x** and **S5y** will open when **S5a** closes, and **S6y** will open when **S6a** closes. Thus, **S5y** and **S6y** operate as waveband switches, and one of them is automatically opened when a LW button is depressed.

First valve (**V1, Brimar 7A8E**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L4** (MW), plus **L5** (LW) are tuned automatically by pre-set trimmer condensers **C22** to **C26** via selector switches **S7a** to **S11a.** For manual operation, **L4** is tuned by **C27** via **S12a** (MW only) while **L5** is short-circuited by switches **S7y** and **S8y.**

Second valve (**V2, Brimar 7B7E**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C30, L6, L7, C31** and **C32, L8, L9, C33.**

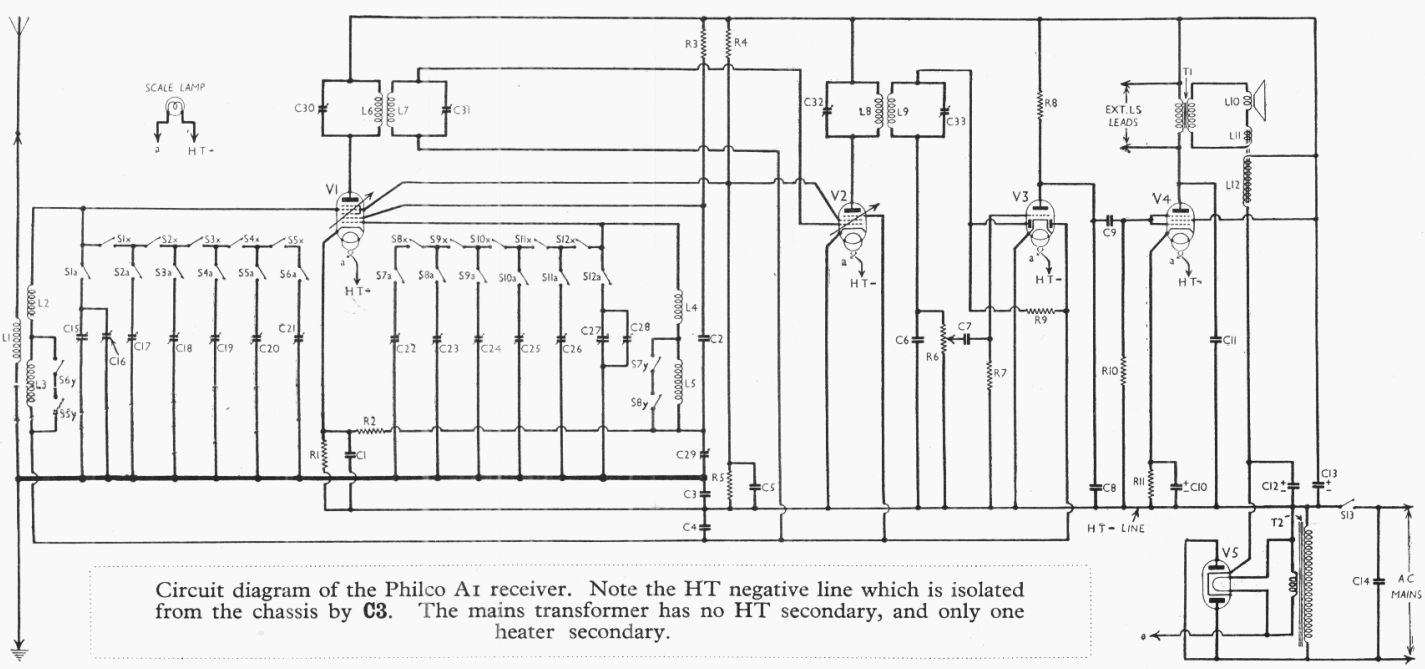
Intermediate frequency 470KC/S.

Diode second detector is part of double diode triode valve (**V3, Brimar 7C6**). Audio frequency component in rectified output is developed across manual volume control **R6,** which also operates as load resistance, and passed via AF coupling condenser **C7** and CG resistance **R7** to CG of triode section, which operates as AF amplifier. IF filtering by **C6** in diode circuit and **C8** in triode anode circuit.

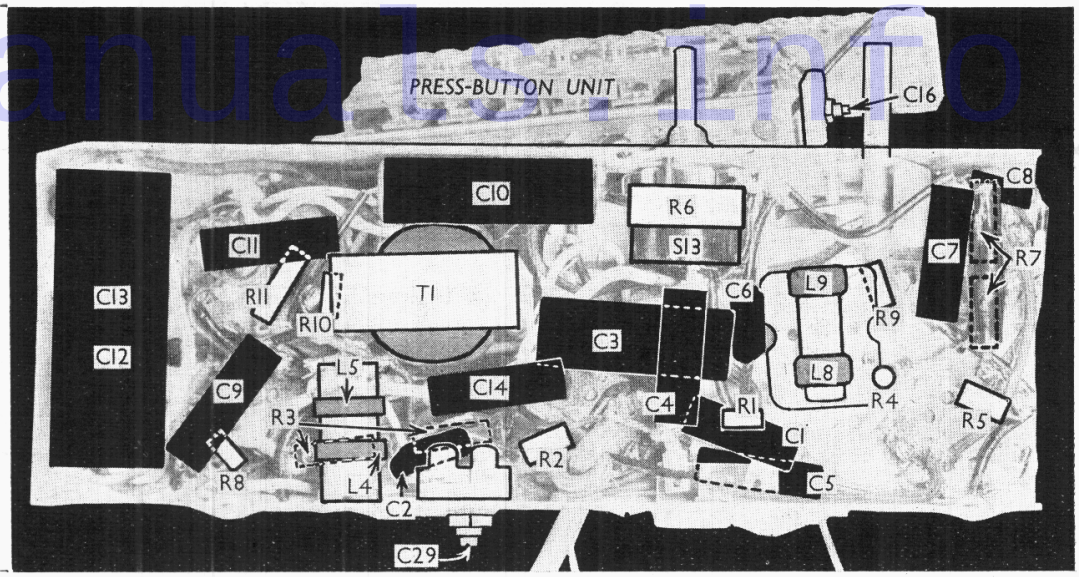
Second diode of **V3,** fed from **L9** via **R9,** provides DC potential which is developed across **R9** and **R6** and fed back to FC and IF valves as GB, giving automatic volume control.

Resistance-capacity coupling by **R8, C9** and **R10** between **V3** triode and pentode output valve (**V4, Brimar 7B5E**) in which the control grid and suppressor grid are strapped together. Fixed tone correction in anode circuit by **C11.** Provision by means of a pair of unterminated leads for connection of high impedance external speaker in anode circuit.

HT current is supplied by IHC rectifying valve (**V5, Brimar 7Y4**) which operates with its anodes strapped together as a half-wave rectifier. The mains trans-



Circuit diagram of the Philco A1 receiver. Note the HT negative line which is isolated from the chassis by **C3.** The mains transformer has no HT secondary, and only one heater secondary.



Under-chassis view. **C16** is mounted at the side of the press-button unit. **R3** and **R7** each consist of two resistors in series. **L8, L9** form the second IF transformer, the trimmers being adjusted through holes in the chassis deck.

former **T2** is provided with only one secondary winding, which supplies heater current to all the valves, including the rectifier. The mains input is connected directly across the primary winding via **S13,** and no mains voltage adjustment is provided. One side of the mains is connected directly to the anodes of **V5 ;** the other side goes to the HT negative line, from which, it should be observed, the chassis is isolated by **C3.**

DISMANTLING THE SET

Removing Chassis and Speaker.—Remove the two control knobs (pull off) and the three self-tapping screws holding the chassis to the bottom of the cabinet, when the chassis and speaker can be withdrawn as a whole.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	V1 cathode by-pass	0·04
C2	V1 osc. anode coupling	0·00025
C3	Earth isolating condenser	0·1
C4	AVC line decoupling	0·04
C5	V1, V2 SG's decoupling	0·04
C6	IF by-pass condenser	0·00025
C7	AF coupling to V3 triode	0·006
C8	IF by-pass condenser	0·00025
C9	V3 triode to V4 AF coupling	0·006
C10*	V4 cathode by-pass	25·0
C11	Fixed tone corrector	0·006
C12*, C13*	HT smoothing condensers	10·0, 10·0
C14	Mains RF by-pass	0·025
C15†	Aerial circuit manual tuning	—
C16‡	Aerial manual MW trimmer	0·00002
C17‡, C18‡, C19‡	Aerial circuit MW automatic tuning trimmers	0·000145, 0·00023, 0·0004
C20‡, C21‡	Aerial circuit LW automatic tuning trimmers	0·00046, 0·00046
C22‡, C23‡	Oscillator circuit LW automatic tuning trimmers	0·00046, 0·00046
C24‡, C25‡, C26‡	Oscillator circuit MW automatic tuning trimmers	0·0004, 0·00023, 0·000145
C27†	Oscillator circuit MW manual tuning	—
C28‡	Osc. manual MW trimmer	—
C29‡	Osc. circuit MW tracker	0·0007
C30‡	1st IF trans. pri. tuning	—
C31‡	1st IF trans. sec. tuning	—
C32‡	2nd IF trans. pri. tuning	—
C33‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	V1 fixed GB	250
R2	V1 osc. CG resistance	99,000
R3	V1 osc. anode HT feed	20,000*
R4, R5	V1, V2 SG's HT potential divider resistances	65,000, 45,000
R6	V3 signal diode load ; manual volume control	500,000
R7	V3 triode CG resistance	4,000,000†
R8	V3 triode anode load	250,000
R9	V3 AVC diode feed	2,500,000
R10	V4 CG resistance	400,000
R11	V4 GB resistance	500

* Two 10,000 Ω resistances in series.
† Two 2,000,000 Ω resistances in series.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coil	30·0
L2	Aerial MW tuning coil	1·75
L3	Aerial LW tuning coil	35·0
L4	Osc. circuit MW tuning coil	2·5
L5	Osc. circuit LW tuning coil	5·5
L6, L7	1st IF trans. Pri., Sec.	20·0, 20·0
L8, L9	2nd IF trans. Pri., Sec.	25·0, 25·0
L10	Speaker speech coil	3·5
L11	Hum neutralising coil	0·15
L12	Speaker field coil	1,000·0
T1	Output trans. Pri., Sec.	700·0, 0·5
T2	Mains trans. Pri., Sec.	350·0, 0·5
S1a, x S12a, x	Auto/manual change switches	—
S2a, x to S11a, x	Automatic tuning selector switches	—
S5y to S8y	Waveband switches	—
S13	Mains switch, ganged R6	—

VALVE ANALYSIS

Valve voltages and currents given in the table (next col.) are those measured in our receiver when it was operating on 228V mains. Note that the mains plug should be reversed if bad hum is heard. The receiver was tuned to the lowest wavelength on the medium band (manual) and the volume control was at maximum but there was no signal input, the aerial and earth leads being joined together to minimise noise.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer. As the chassis is isolated from the HT circuit, it cannot be used as the negative connection, and the negative meter lead must be clipped on to the HT negative line. A convenient point to which to anchor the clip is the top tag of the volume control, as seen looking at the underside of the chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 7A8E	230 (Oscillator)	1·5	50	1·0
	170	2·0		
V2 7B7E	230	4·6	50	0·9
V3 7C6	90	0·5	—	—
V4 7B5E	210	25·0	230	4·8
V5 7Y4†	—	—	—	—

† Cathode to HT negative line, 275 V DC.

GENERAL NOTES

Switches.—**S1a, x, S12a, x** are the auto/manual change switches, **S2a, x** to **S11a, x** the auto-tuning selector switches, and **S5y** to **S8y** the waveband switches, all incorporated in the press-button unit mounted above the chassis. In our plan chassis view this unit has been removed to show the components beneath it, and has been allowed to hang in front of the chassis to show the ten trimmers mounted at its rear.

The switch unit is shown in the diagrams in cols. 2 and 3 overleaf. The upper diagram shows the side seen looking down on the chassis, while the lower diagram is a view of the reverse side, as seen when the unit is removed and turned over.

The action of the switches is fully explained at the beginning of the Circuit Description, the numbering, with suffixes, following our conventional practice.

There are six press-buttons, each operating two groups of switches. Looking at the front of the receiver, the right-hand button operates **S1a, x** and **S12a, x,** while the left-hand button operates **S6a, y** and **S7a, y.**

S13 is the QMB mains switch, ganged with the volume control **R6.**

Coils.—**L1-L3** is an unscreened tubular unit on the chassis deck, while **L4, L5** is a similar unit beneath the chassis. The first IF transformer (**L6, L7**) is in a screened unit on the chassis deck, with its associated trimmers. The second IF transformer (**L8, L9**) is an unscreened unit beneath the chassis deck, mounted on a ceramic base carrying the associated trimmers. These are adjusted through holes in the chassis deck, and are shown dotted beneath the gang condenser in our plan chassis view.

Scale Lamp.—This is a Tung-Sol lamp, rated at 6-8 V, 0·15A, and has a miniature centre contact bayonet cap base.

External Speaker.—Two insulated leads (normally taped up) are provided inside the receiver, to which a suitable high impedance external speaker could be connected if desired. These leads are not isolated from the HT supply.

Trimmers.—Apart from the ten trimmers for auto-tuning station selection, mounted behind the press-button unit, there is **C16** at the side of the press-button unit, **C28** on the gang condenser and **C29** at the rear of the chassis. The IF trimmers are mentioned under "Coils."

Mains Transformer.—Note that this has only one secondary, supplying the heaters of all the valves. The HT supply is taken direct from the mains, **V5** being used as a half-wave rectifier. To prevent the chassis being "live," HT negative is isolated, and a separate HT negative line is used.

Resistances R3, R7.—These each consist of two resistors in series in our chassis.

Loctal Valve Connections.—The base connections used in the Loctal valves are as follows, numbering the pins as in the ordinary octal type.

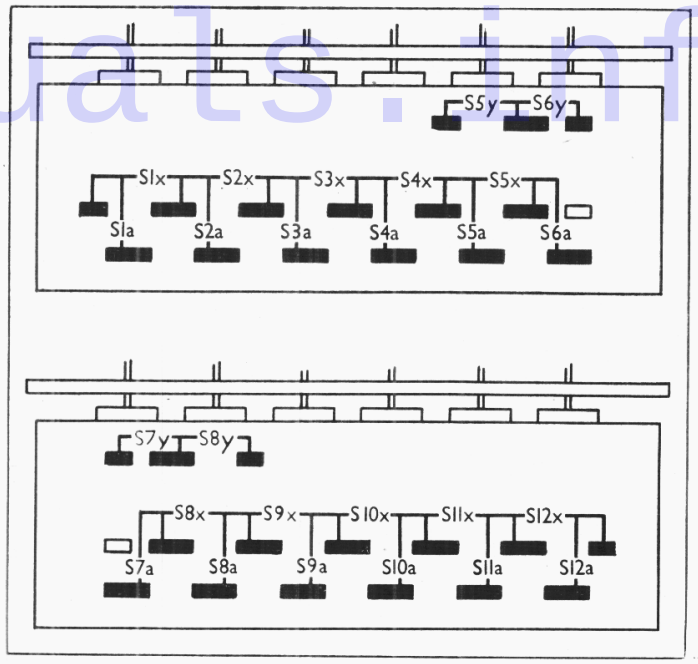
V1, 7A8E, 1, H; 2, A; 3, G2; 4, G1; 5, G3, G5; 6, G4; 7, C; 8, H.

V2, 7B7E, 1, H; 2, A; 3, G2; 4, G3; 5, —; 6, G1; 7, C; 8, H.

V3, 7C6, 1, H; 2, A; 3, G1; 4, —; 5, D1; 6, D2; 7, C; 8, H.

V4, 7B5E, 1, H; 2, A; 3, G2; 4, G3; 5, —; 6, G1; 7, C; 8, H.

V5, 7Y4, 1, H; 2, —; 3, A1; 4, —; 5, —; 6, A2; 7, C; 8, H.



Diagrams showing both sides of the press-button switch unit. The upper one is the view looking down on the chassis, while the lower one is that seen when the unit is removed and turned over.

Chassis Divergencies.—**C7, C9,** and **C11** were all 0·006 μF in our chassis, not 0·01 μF as shown in the makers' diagram. **R5** was 45,000 O, not 40,000 O.

RADIOGRAM MODIFICATIONS

In the table radiogram model, a radio/gram switch is used. In the radio position the bottom of **L9** is connected to the top of **R6,** as in our diagram; in the gram. position this connection is broken to mute radio, while one side of the pick-up is connected to the top of **R6.** The other side of the pick-up is connected permanently, via a 0·1 μF condenser, to the HT negative line of the set. The pick-up screening is connected, via a 0·01 μF condenser to the radio chassis (and hence earth). Across the pick-up is a variable tone control circuit, consisting of a 0·04 μF condenser and 100,000 O variable resistance in series.

The pick-up has a resistance of 2,000 O. Instead of the energised speaker, a 6-in. PM type is used. This necessitates the use of a smoothing choke in place of **L12,** and its resistance is 450 O. **T1** is also different, its primary resistance being 450 O, instead of 700 O. All the valve voltages and currents will be slightly increased, compared with the table model.

CIRCUIT ALIGNMENT

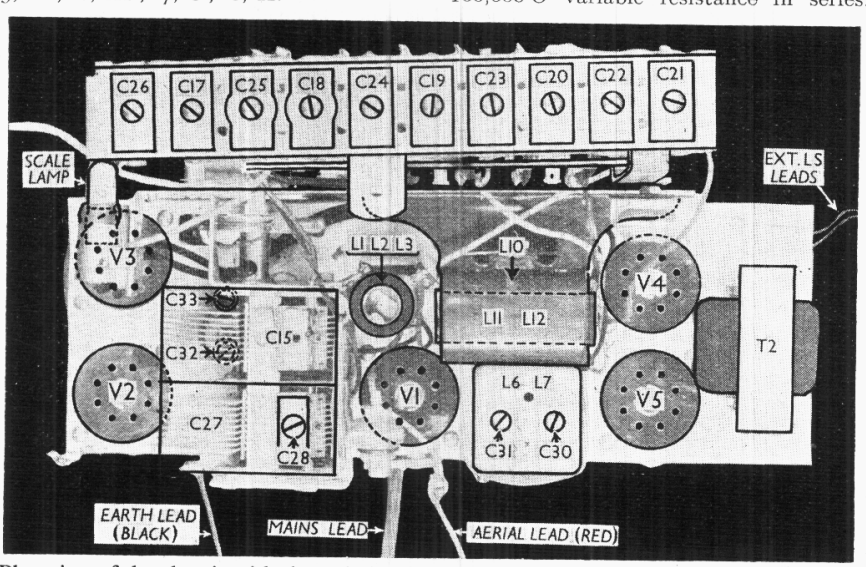
IF Stages.—Connect signal generator via a 0·1 μF condenser to converter control grid (pin 6) of **V1** and chassis. Turn receiver volume control to maximum, and press in manual button. Feed in a 470 KC/S signal, and adjust **C30, C31, C32** and **C33** in turn for maximum output. Check these settings.

RF and Oscillator Stages.—Connect signal generator via a suitable dummy aerial to **A** and **E** leads. Turn gang to minimum, and see that pointer coincides with dot on scale above the "E" in Bourne, then tune to 214 m on scale (dot against Radio Lyons). Press manual button, and feed in a 214 m (1,400 KC/S) signal. Adjust **C28,** then **C16,** for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C29** for maximum output, while rocking the gang for optimum results. Re-check **C28** at 214 m.

AUTO-TUNING ADJUSTMENTS

The coverage of the five auto-tuning buttons, numbering them from left to right, looking at the front of the set, is: 1, 1,000-2,000 m; 2, 1,000-2,000 m; 3, 270-555 m; 4, 240-400 m; 5, 200-300 m.

To set a station, press the desired button, feed in a signal of the correct wavelength via the **A** and **E** leads, and adjust the associated oscillator trimmer, then the corresponding aerial trimmer, for maximum output. To ensure that the oscillator is not set to an image signal, rotate signal generator tuning control over the whole of the MW and LW bands. Only the chosen signal should be obtained. Final adjustments to the trimmers should be made on the actual station.



Plan view of the chassis with the switch unit removed, drawn forward and turned to show the pre-set condensers.

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