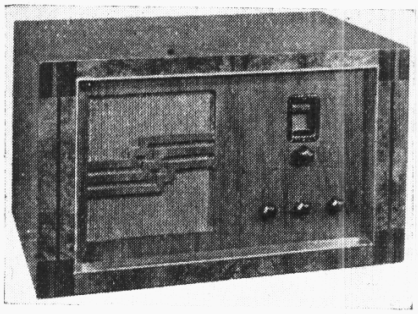
"TRADER" SERVICE SHEET 606

PHILCO 238 BATTERY SUPERHET



TWO versions were made of the Philco 238 chassis, and they are identified by a letter A or Y preceding the serial number. The differences are described under "General Notes." The receiver, which was available as a table or a console, is a 5-valve, 2-band battery superhet, with a class B output stage. The scale is calibrated in tens of kilocycles: MW band, 55 to 150 x 10 KC/S (545-200 m); LW, 15 to 32 x 10 KC/S (2,000-940 m).

Our sample had a "Y" chassis.

Release date: 1933; original prices: table model £12 12s. (plus batteries); console £17 17s. (including batteries).

CIRCUIT DESCRIPTION

Aerial input via potentiometer **R1** and coupling coils **L1, L2,** to mixed coupled band-pass filter. Primary coils **L4, L5** are tuned by **C14**; secondaries **L8, L9** by **C16.** Coupling by **L7** (MW), a few turns at bottom of **L9** (LW), and common impedance of **C1.**

First valve (**V1, 1A6**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L11** (MW) and **L12** (LW) are tuned by **C18.** Parallel trimming by **C19** (MW) and **C21** (LW); series tracking by **C20, C2,** via **S6** (MW) and **C22** (LW). Reaction from anode by coils **L13, L14,** with additional mixer coupling between oscillator and pentode anode circuits by returning "earthy" end of **L15** via **L13, L14** to HT positive line. Image suppression on MW by **L6** in negative filament lead; on LW, **S5** closes and **S2** opens. Choke **L10** is included in positive filament lead to prevent the accumulator from short-circuiting **L6.**

Second valve (**V2, 32E**) is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary input, and tuned-secondary *only* output, transformer couplings **C23, L15, L16, C24** and **L17, L18, C25.**

Intermediate frequency 125 KC/S.

Third valve (**V3, 32E**) is a second RF tetrode, operating this time as anode bend detector, with resistance-capacity coupling by **R10, C10, R12** to triode driver valve (**V4, 30**) which in turn is transformer-coupled by **T1** to double triode class B output valve (**V5, 19E**). Fixed tone correction by **C11, C12.** IF filtering by **C7, C8** (either side of LT circuit) and **R11, C9** in coupling between **V3** and **V4.**

GB for **V4** and **V5** are obtained from tappings on GB section of battery; GB for **V1, V2** and **V3** is obtained from a common source at the slider of the potentiometer **R6,** which is ganged with **R1,** the two forming a combined gain control. **R6** is connected in series with limiting resistances **R5, R7** across the GB section of the battery.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new HT battery reading 135 V on load and a separate GB battery. The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 1A6 ...	133 Oscillator 133	1·0 2·0	72	1·5
V2 32E ...	133	2·7	72	0·6
V3 32E ...	26	0·2	18	0·1
V4 30 ...	129	7·0	—	—
V5 19E ...	131†	1·2†	—	—

† Each anode.

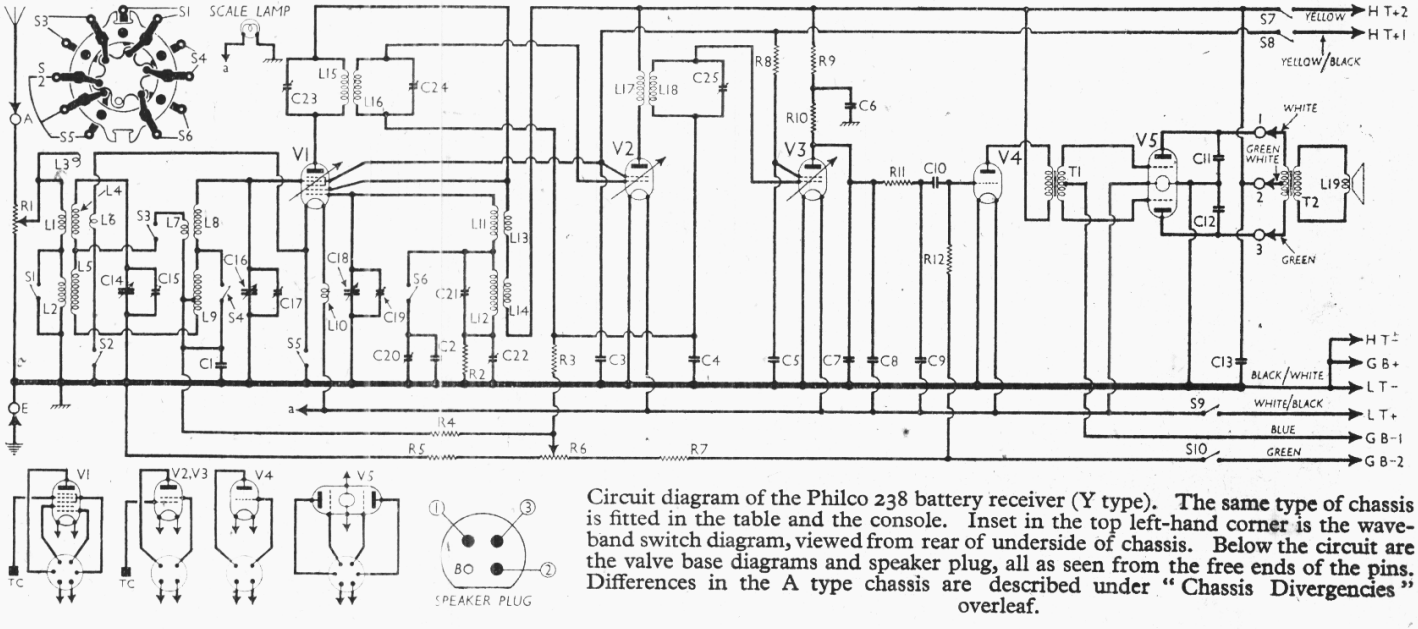
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1*	Aerial input potentiometer	5,000
R2	Oscillator circuit damping	99,000
R3	V2, V3 CG's decoupling	490,000
R4	V1 pent. CG decoupling...	70,000
R5	GB potential divider;	5,000
R6*	GB potential divider;	5,000
R7	V1–V3 gain control ...	2,500
R8	V3 SG HT feed	99,000
R9	V3 anode decoupling ...	490,000
R10	V3 anode load	240,000
R11	IF stopper	160,000
R12	V4 CG resistance ...	1,000,000

* Ganged.

	CONDENSERS	Values (μF)
C1	Part band-pass coupling...	0·05
C2	Osc. MW fixed tracker ...	0·0008
C3*	V1, V2 SG's decoupling...	0·3
C4	V2, V3 CG's decoupling...	0·09
C5*	V3 SG decoupling ...	0·3
C6*	V3 anode decoupling ...	0·5
C7	IF by-pass filter condens-	0·00025
C8	IF by-pass filter condens-	0·00025
C9	IF by-pass filter condens-	0·00025
C10	V3-V4 AF coupling ...	0·01
C11	Fixed tone correctors ...	0·003
C12	Fixed tone correctors ...	0·003
C13*	HT circuit reservoir ...	0·5
C14†	Band-pass pri. tuning ...	—
C15‡	B-P sec. MW trimmer ...	—
C16†	Band-pass sec. tuning ...	—
C17‡	B-P sec. MW trimmer ...	—
C18†	Oscillator circuit tuning...	—
C19‡	Osc. circ. MW trimmer ...	—
C20‡	Osc. circ. MW tracker ...	—
C21‡	Osc. circ. LW trimmer ...	—
C22‡	Osc. circ. LW tracker ...	—
C23‡	1st IF trans. pri. tuning...	—
C24‡	1st IF trans. sec. tuning...	—
C25‡	2nd IF trans. sec. tuning	—

* In condenser block. † Variable. ‡ Pre-set.



Circuit diagram of the Philco 238 battery receiver (Y type). The same type of chassis is fitted in the table and the console. Inset in the top left-hand corner is the waveband switch diagram, viewed from rear of underside of chassis. Below the circuit are the valve base diagrams and speaker plug, all as seen from the free ends of the pins. Differences in the A type chassis are described under "Chassis Divergencies" overleaf.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coils	26·0
L2	Aerial coupling coils	104·0
L3	Small "top" coupling	—
L4	Band-pass primary coils	8·5
L5	Band-pass primary coils	53·0
L6	Image suppressor coil	0·2
L7	B-P MW coupling	Very low
L8	Band-pass secondary coils	8·5
L9	Band-pass secondary coils	53·0
L10	VI heater buffer choke	0·2
L11	Osc. MW tuning coil	6·0
L12	Osc. LW tuning coil	24·0
L13	Oscillator reaction coils, total	7·5
L14	Oscillator reaction coils, total	7·5
L15	1st IF trans. Pri.	250·0
L16	1st IF trans. Sec.	250·0
L17	2nd IF trans. Pri.	80·0
L18	2nd IF trans. Sec.	250·0
L19	Speaker speech coil	1·0
T1	Intervalve trans. Pri.	330·0
	Intervalve trans. Sec., total	330·0
T2	Speaker input trans. Pri., total	650·0
	Speaker input trans. Sec.	0·1
S1-S6	Waveband switches	—
S7-S10	Battery switches	—

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull-off); Withdraw speaker plug from rear of chassis; remove the four self-tapping screws (with metal washers) whose heads are *recessed* in the bottom of the cabinet. These hold chassis to battens on base of cabinet.

When replacing, a rubber washer should be fitted to each screw, between chassis and batten.

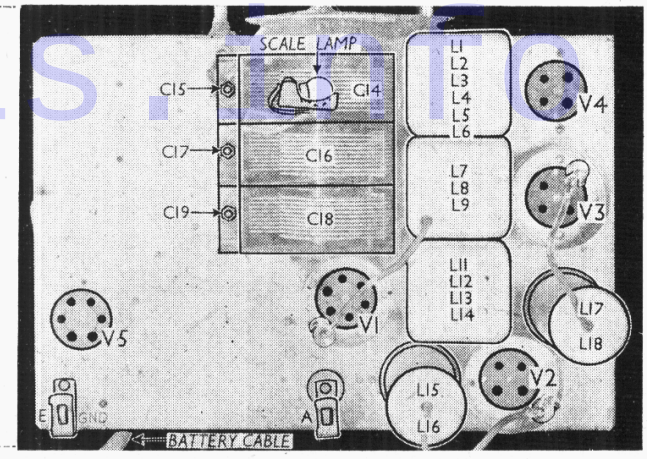
Removing Speaker.—Withdraw speaker plug and remove the four nuts holding speaker to sub-baffle.

When replacing, the transformer should be at the top.

GENERAL NOTES

Switches.—**S1-S6** are the waveband switches, in a single rotary unit beneath the chassis. Its position is indicated in our under-chassis view, and a detailed diagram viewed from the rear of the underside of the chassis is inset in the top left-hand corner of the circuit diagram overleaf. All the switches except **S5** are closed on MW and open on LW; **S5** is open on MW and closed on LW.

S7-S10 are the HT, LT and GB switches, in a second rotary unit beneath the chassis. A diagram of this unit is inset in our under-chassis view, viewed as indicated by the arrow.



Plan view of the chassis. The IF trimmers are shown in the under-chassis view. The **A** and **E** connections are sprung clips. The scale lamp is a spring fit in its holder, and can be released by easing bulb forward.

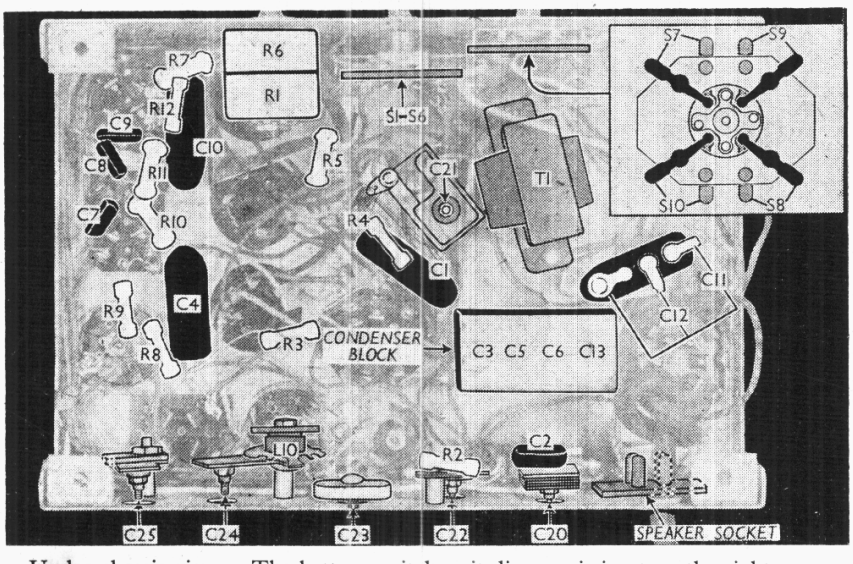
Coils.—**L1-L6**; **L7-L9**; **L11-L14**; and the IF transformers **L15, L16**; **L17, L18** are in five screened units on the chassis deck. All trimmers and trackers are external to the coil units, and some of them are reached through holes in the rear chassis member. **L10** is an isolating choke in **V1** filament lead, mounted on the rear member of the chassis.

Condenser Block.—There are four condensers, **C3, C5, C6** and **C13**, in a metal cased unit beneath the chassis, the connections being made by coloured flexible leads. Those to **C3** and **C5** are white, and those to **C6** and **C13** brown. The case is the common negative connection, but the condensers are not electrolytic. The values are not given in the makers' information, but the measured values are given in our tables.

Condenser Units.—There are, beneath the chassis, four moulded condenser units of similar appearance. **C11, C12** are contained in one of them, and their connections are indicated in our under-chassis view. **C1, C4** and **C10** are in three others, each containing only a single condenser. Spare tags are used as bearings for other connections.

Scale Lamp.—This is an MES type, with a small spherical bulb, rated at 2 V, 0.06 A.

Speaker Connections.—A 4-pin plug and socket arrangement connects the speaker to the chassis. Three large-diameter pins provide the connections, while the fourth (fine) pin is blank. A diagram of the plug, viewed from the free ends of the leads, appears beside the valve diagrams beneath our circuit overleaf. The coding of the leads is given in the circuit itself.



Under-chassis view. The battery switch unit diagram is inset on the right, as seen in the direction of the arrow. The **S1-S6** unit diagram is inset in the top left-hand corner of the chassis.

Batteries.—Almost any conventional 2 V accumulator cell may be used for LT. The original HT battery was a special production 135 V combined HT and GB Philco-Drydex type P962 fitted with a multi-pin socket. The HT, LT and GB leads were all contained in the multi-core cable seen in our chassis illustrations, but five of its leads went to the battery plug. The sixth (LT+) lead was free, and the LT− lead was an additional piece of wire joined in the cable to the common HT− GB+ lead.

As the battery is not now available, and the plug is therefore of no use, we show in the circuit diagram the lead ends as terminated by ordinary wander-plugs, so that an ordinary HT battery and separate GB battery may be used. The leads are colour coded as indicated in our circuit diagram, a single black lead with white tracer being shown for the common lead to chassis.

Battery Leads and Voltages.—LT, leads with spade tags as indicated in the diagram. HT− and GB+, black with white tracer; yellow with black tracer, HT+1 67.5 V; yellow, HT+2 135 V; blue, GB−1, −3 V; green, GB−2, −7.5 V.

Chassis Divergencies.—Our chassis bore a serial number with the **prefix Y,** and the only difference between it and the makers' diagram was that **R5** and **R7** were transposed, but this may have been done during service.

If the prefix is **A,** there are several differences. **R5** becomes 3,300 O, instead of 5,000 O, and **R7** is omitted. **R9** becomes 99,000 O. **L16** is connected directly to **R6** slider, **R3** being omitted. **L18** is disconnected from **L16** and **C4,** and connected instead to the junction of two resistances and an additional 0.09 μF condenser. The outer ends of the resistances are connected to chassis (6,000 O) and GB−2 (1,500 O). The condenser is contained in the same container as our **C4,** so that it becomes a dual unit, like **C11, C12.** The result of this modification to **V3** CG circuit is that the valve operates with a fixed negative potential, as is usual with anode bend detectors.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW, and turn gain control to maximum. Connect signal generator leads to control grid (top cap) of **V1** and chassis, leaving the normal cap disconnected, but shunting the signal generator leads with a 500,000 O resistance. Feed in a 125 KC/S (2,400 m) signal, and adjust **C23, C24** and **C25** for maximum output.

MW.—Feed in a 1,400 KC/S (214 m) signal, with everything connected as described above, and tune it in. If the scale calibration is far out (it should indicate 140 on upper scale), unscrew **C19** fully, then screw it up slowly until the first peak is reached with correct scale setting.

Transfer signal generator leads to **A** and **E** sockets, removing the resistance and replacing **V1** top cap. Feed in a 1,400 KC/S signal, and adjust **C17** and **C15** for maximum output. Feed in a 600 KC/S (500 m) signal, tune it in, and adjust **C20** for maximum output while rocking the gang for optimum results.

LW.—Switch set to LW, feed in a 150 KC/S (2,000 m) signal, tune it in, and adjust **C22** for maximum output while rocking the gang for optimum results. Feed in a 300 KC/S (1,000 m) signal, tune it in, and adjust **C21** for maximum output. **C21** can be reached through a hole cut for it in the bottom of the cabinet.

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