Supplement to The Wireless & Electrical Trader, January 28, 1939

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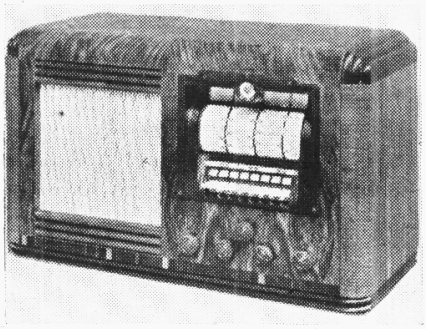
"TRADER" SERVICE SHEET

380

PILOT PT36 AND PTC36



The Pilot PT36.

MECHANICAL tuning for eight stations, operated by keys resembling those of a piano, is incorporated in the Pilot PT36 4-valve (plus rectifier) AC 3-band superhet. The receiver covers a short-wave range of 16-56 m and is suitable for mains of 200-250 V, 50 C/S, and refinements are a cathode-ray tuning indicator and provision for a pick-up and an extension speaker, a jack-switch allowing the internal speaker to be cut out.

An identical chassis is fitted in the PTC36 console but this *Service Sheet* was prepared on a PT36.

Release date for both models: August, 1938.

CIRCUIT DESCRIPTION

Aerial input is via coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single-tuned circuits **L4, C30** (SW), **L5, C30** (MW) and **L6, C30** (LW) which precede triode hexode valve (**V1, Osram X65**) operating as frequency changer with internal coupling.

Triode oscillator grid coils **L7** (SW), **L8** (MW) and **L9** (LW) are tuned by **C31**; parallel trimming by **C33** (SW), **C34** (MW) and **C35** (LW); series tracking by **C7** (SW), **C8** (MW) and **C32** (LW). Reaction by coils **L10** (SW), **L11** (MW) and **L12** (LW).

Second valve (**V2, Brimar 6U7G**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformers **C3, L13, L14, C4** and **C14, L15, L16, C15**; tuning is effected by adjusting the iron cores.

Intermediate frequency 451 KC/S.

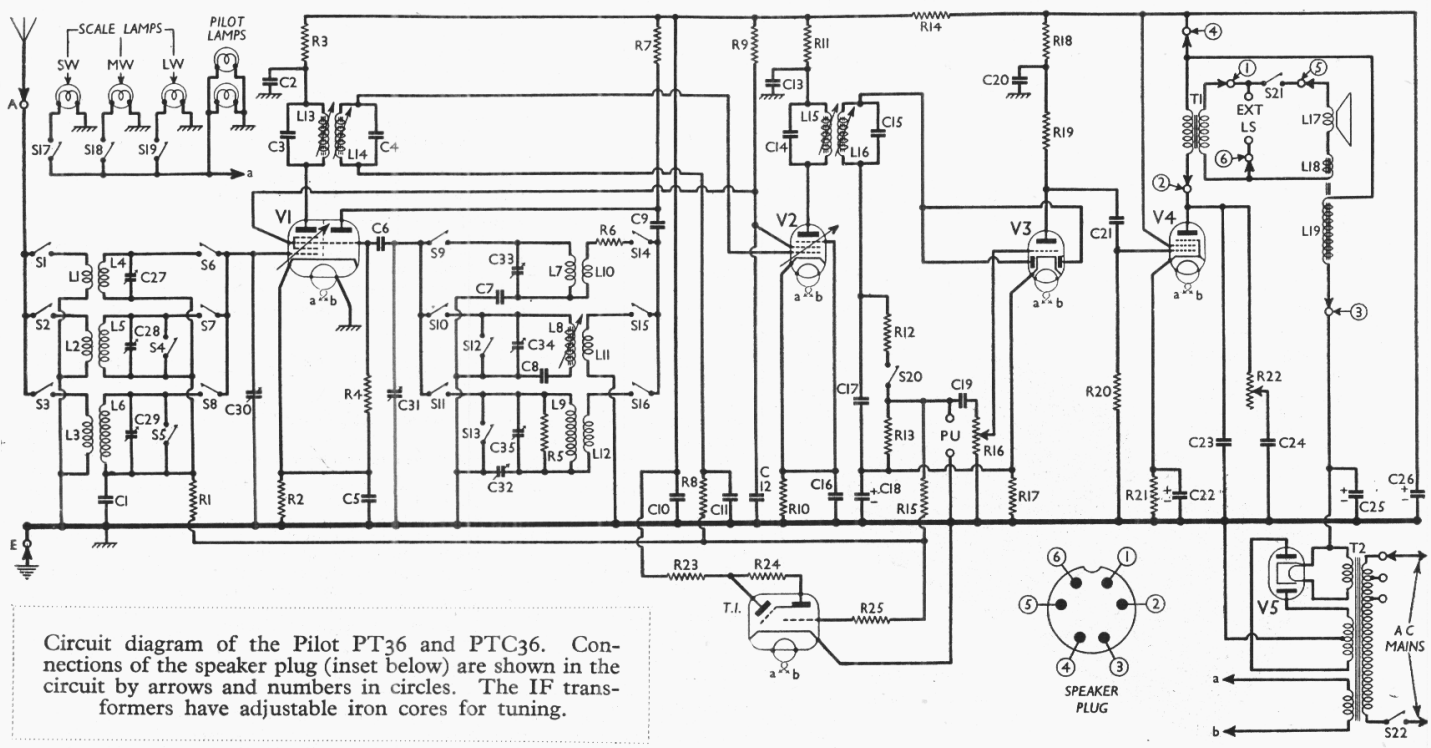
Diode second detector is part of double diode triode valve (**V3, Brimar 6Q7G**), with both diodes strapped to operate as single diode. Audio frequency component in rectified output is developed across load resistances **R12** and **R13,** that across **R13** being passed via AF coupling condenser **C19** and manual volume control **R16** to CG of triode section, which operates as AF amplifier. IF filtering by **C17.**

Provision for connection of gramophone pick-up by jack-switch across **C19, R16.** The switch **S20,** which forms the junction between **R12** and **R13** on radio, and is part of the gramophone jack-switch, opens when the pick-up plug is inserted and turned a few degrees anti-clockwise to mute radio.

DC potential developed across **R13** is fed back via **R15** and further decoupling circuits as GB to FC and IF valves, giving automatic volume control. AVC line potential is also employed to operate the cathode-ray tuning indicator (**T.I., Tungsram 6G5**).

Resistance capacity coupling by **R19, C21** and **R20** between **V3** triode and pentode output valve (**V4, Brimar 6F6G**). Fixed tone correction by **C23** and variable tone control by **R22, C24,** both in anode circuit. Provision for connection of low impedance external speaker by a jack-switch, similar to that used for pick-up connection, across the secondary of the internal speaker input transformer **T1.** When the external speaker plug is inserted and turned anti-clockwise, **S21** opens to mute the internal speaker.

HT current is supplied by IHC full-wave rectifying valve (**V5, Brimar 5Z4G**). Smoothing by speaker field **L19** and two electrolytic condensers **C25, C26.**



Circuit diagram of the Pilot PT36 and PTC36. Connections of the speaker plug (inset below) are shown in the circuit by arrows and numbers in circles. The IF transformers have adjustable iron cores for tuning.

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DISMANTLING THE SET

Removing Chassis.—Remove the five knobs (pull off) from the four lower spindles. Then remove the four bolts (with spring washers, washers and rubber washers) holding the chassis to the bottom of the cabinet and unplug the speaker leads from the socket on the chassis deck, when by lifting the back upwards, the chassis can be withdrawn.

Removing Speaker.—To remove the speaker from the cabinet, unplug the leads from the socket on the chassis deck and free them from the staple on the bottom of the cabinet. Then remove two of the clamps and slacken the other two (nuts and lock washers). *When replacing*, see that the transformer is on the right.

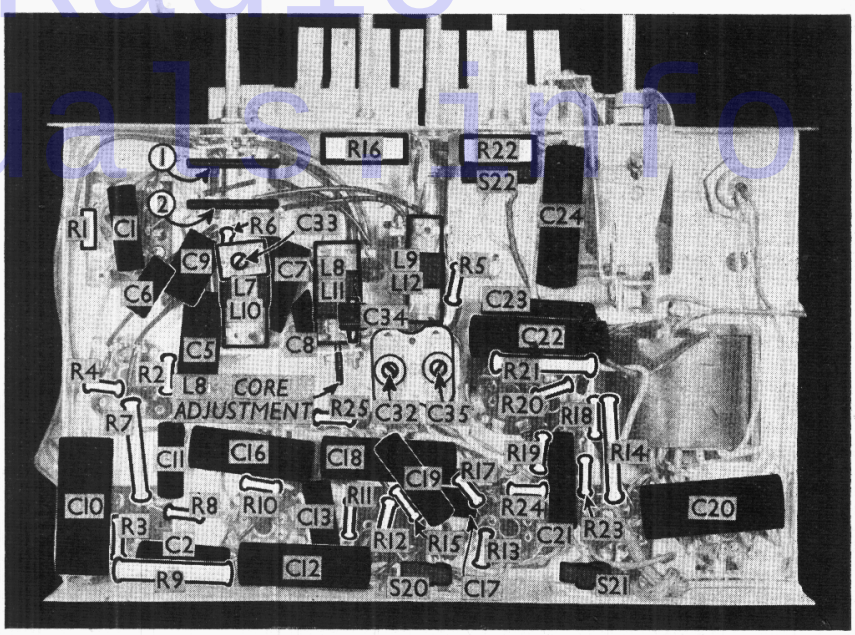
If the speaker leads have been unsoldered, reconnect them as follows, numbering the tags from bottom to top, with the transformer on the right:—1, red; 2, blue; 3, white/red; 4, red/white; 5, white; 6, yellow.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 hexode CG decoupling	100,000
R2	V1 fixed GB resistance	250
R3	V1 hexode anode HT feed	1,000
R4	V1 osc. CG resistance	100,000
R5	Osc. circuit LW damping	33,000
R6	Osc. SW reaction damping	60
R7	V1 osc. anode HT feed	30,000
R8	V2 CG decoupling	100,000
R9	V1, V2 SG's HT feed	20,000
R10	V2 fixed GB resistance	390
R11	V2 anode HT feed	1,000
R12, R13	V3 signal diode load resistances	47,000, 470,000
R14	V1, V2 and T.I. HT feed	1,000
R15	AVC line decoupling	1,000,000
R16	Manual volume control	1,000,000
R17	V3 GB resistance	4,000
R18	V3 triode anode decoupling	100,000
R19	V3 triode anode load	250,000
R20	V4 CG resistance	470,000
R21	V4 GB resistance	440
R22	Variable tone control	100,000
R23, R24	T.I. anode HT feed resistances	22,000, 1,000,000
R25	T.I. CG decoupling	1,000,000

	CONDENSERS	Values (μF)
C1	V1 hexode CG decoupling	0·01
C2	V1 hexode anode decoupling	0·01
C3, C4	1st IF transformer fixed tuning condensers	0·00011, 0·00011
C5	V1 cathode by-pass	0·1
C6	V1 osc. CG condenser	0·0001
C7	Osc. circuit SW tracker	0·00325
C8	Osc. circuit MW tracker	0·00045
C9	V1 osc. anode coupling	0·002
C10	HT circuit RF by-pass	0·1
C11	V2 CG decoupling	0·01
C12	V1, V2 SG's decoupling	0·1
C13	V2 anode decoupling	0·01
C14, C15	2nd IF transformer fixed tuning condensers	0·00011, 0·00011
C16	V2 cathode by-pass	0·1
C17	IF by-pass	0·00025
C18*	V3 cathode by-pass	10·0
C19	AF coupling to V3 triode	0·01
C20	V3 triode anode decoupling	0·1
C21	V3 triode to V4 AF coupling	0·01
C22*	V4 cathode by-pass	10·0
C23	Fixed tone corrector	0·003
C24	Part of variable tone control	0·03
C25*, C26*	HT smoothing condensers	16·0, 8·0
C27‡	Aerial circuit SW trimmer	0·00003
C28‡	Aerial circuit MW trimmer	0·00003
C29‡	Aerial circuit LW trimmer	0·00003
C30†	Aerial circuit tuning	—
C31†	Oscillator circuit tuning	—
C32‡	Osc. circuit LW tracker	0·00016
C33‡	Osc. circuit SW trimmer	0·00003
C34‡	Osc. circuit MW trimmer	0·00003
C35‡	Osc. circuit LW trimmer	0·00008

* Electrolytic. † Variable. ‡ Pre-set.



Under-chassis view. Diagrams of the switch units are overleaf. **S20** and **S21** are radio and internal speaker muting switches, operated by the pick-up and external speaker plugs respectively.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial SW coupling	1·2
L2	Aerial MW coupling	19·0
L3	Aerial LW coupling	120·0
L4	Aerial SW tuning coil	0·05
L5	Aerial MW tuning coil	2·8
L6	Aerial LW tuning coil	17·0
L7	Osc. circuit SW tuning coil	0·05
L8	Osc. circuit MW tuning coil	4·0
L9	Osc. circuit LW tuning coil	9·5
L10	Oscillator SW reaction coil	0·13
L11	Oscillator MW reaction coil	0·8
L12	Oscillator LW reaction coil	0·3
L13, L14	1st IF trans. Pri.	4·5
	1st IF trans. Sec.	4·5
L15, L16	2nd IF trans. Pri.	4·5
	2nd IF trans. Sec.	4·5
L17	Speaker speech coil	3·0
L18	Hum neutralising coil	0·2
L19	Speaker field	1,400·0
T1	Speaker input trans. Pri.	700·0
	Speaker input trans. Sec.	0·4
T2	Mains trans. Pri., total	22·0
	Mains trans. Heater sec.	0·1
	Mains trans. Rect. heat. sec.	0·1
	Mains trans. HT sec., total	300·0
S1-S16	Waveband switches	—
S17-19	Scale lamps switches	—
S20	Radio muting switch	—
S21	Speaker switch	—
S22	Mains switch, ganged R22	—

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X65	248	1·6	98	5·3
	Oscillator			
	106	4·4		
V2 6U7G	244	7·4	98	2·0
V3 6Q7G	85	0·5	—	—
V4 6F6G	246	35·0	274	7·3
V5 5Z4G	333†	—	—	—
T.I. 6G5	48	0·2	—	—
	Target			
	192	2·0		

† Each anode, A.C

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 225 V, using the 225 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium 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.

If, as in our case, **V2** should become unstable when its anode and screen currents are being measured, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from the electrode concerned to chassis.

GENERAL NOTES

Switches.—**S1-S16** are the waveband switches, and **S17-S19** the scale lamp switches, in two rotary units beneath the chassis. These are indicated in the under-chassis view, and shown in detail in the diagrams overleaf, where they are as seen looking from the rear of the underside of the chassis. The table overleaf gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S20 is the radio muting switch, of the rotary type, associated with the pick-up sockets at the rear of the chassis. **S20** is normally closed, but when the 2-pin pick-up plug is inserted and rotated anti-clockwise, it opens **S20** and so mutes radio by breaking the input to the grid circuit of **V3.** When the pick-up plug is rotated clockwise, however, **S20** closes for radio operation.

S21 is a similar switch associated with the external speaker sockets, also at the rear of the chassis. When an external speaker is plugged in, and the 2-pin plug is rotated anti-clockwise, **S21** opens and mutes the internal speaker by disconnecting its speech coil circuit. In the clockwise position, however, **S21** is closed, and both speakers are in operation.

S22 is the QMB mains switch, ganged with the tone control **R22.**

Coils.—**L1-L6,** and the IF transformers

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L13, L14 and **L15, L16,** are in three screened units on the chassis deck. Note that the trimmers **C27-C29** are reached through three holes in the front of the **L1-L6** can. The core adjustments of the IF transformers are at the rear of their cans, and are indicated in the plan chassis view.

L7, L10 ; L8, L11 and **L9, L12** are in three unscreened tubular units beneath the chassis. **L8** has a variable iron core for tracking, the screw adjustment being indicated in the under-chassis view.

Scale and Pilot Lamps.—There are three scale lamps, switched by **S17-S19,** and two pilot lamps which light whenever the set is " on." They are all Ever Ready miniature bayonet cap types, rated at 7·3 V, 0·25 A.

External Speaker.—Provision is made at the rear of the chassis for a low impedance (4 Ω) external speaker. A special 2-pin plug is supplied, which, on partial rotation, operates **S21** and mutes the internal speaker if desired. See also " Switches."

Condensers C25, C26.—These are two 475PV electrolytics in a single tubular metal case, mounted on the chassis deck. The case is isolated, and the black lead is the common negative. The red lead is the positive of **C25** (16μF) and the green lead the positive of **C26** (8μF).

Speaker Plug and Socket.—The speaker is connected to the receiver by means of a 6-pin plug and socket, a diagram of the plug, looking at the free ends of its pins, being given beneath the circuit diagram. The plug and socket connections, numbered to agree with this diagram, are indicated by circles and arrows in the circuit.

The colour coding of the connections to the pins of the plug is as follows : 1, red/white ; 2, blue ; 3, red ; 4, yellow ; 5, white ; 6, white/red.

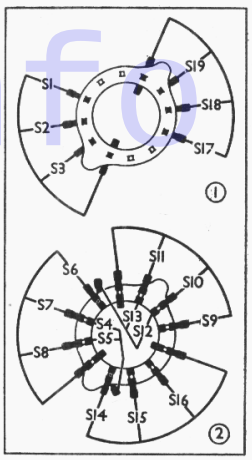
At their opposite ends the coloured leads are connected to the speaker transformer terminal strip. The connections here are given under " Removing Speaker."

Trimmer C34.—This is of the cylindrical interleaving type, the variable electrode screwing in or out of the fixed one.

TABLE AND DIAGRAMS OF THE SWITCH UNITS

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	C	C	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	C	—	—
S13	C	C	—
S14	C	—	—
S15	—	C	—
S16	—	—	C
S17	C	—	—
S18	—	C	—
S19	—	—	C

Diagrams of the two switch units, as seen looking from the rear of the underside of the chassis.



CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW, and turn gang condenser to maximum. Connect signal generator via a 0·1 μF condenser to control grid (top cap) of **V2,** and chassis.

Feed in a 451 KC/S signal, and adjust the core of **L15,** then **L16,** for maximum output. Transfer signal generator to control grid (top cap) of **V1,** and adjust the core of **L13,** then **L14,** for maximum output. Re-check all settings with the signal generator connected to **V1.**

RF and Oscillator Stages.—With gang condenser at maximum, pointer should cover the arrow heads at the high wavelength ends of the three scales. Connect signal generator to **A** and **E** leads via a 0·0002 μF condenser.

MW.—Switch set to MW, and tune to 200 m on scale. Feed in a 200 m (1,500 KC/S) signal, and adjust **C34,** then **C28,** for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust the core of **L8** for maximum output, while rocking the gang for optimum results. Repeat the 200 m adjustments.

LW.—Switch set to LW, and tune to 1,100 m on scale. Feed in a 1,100 m (272·5 KC/S) signal, and adjust **C35,** then **C29,** for maximum output. Feed in a 1,900 m (158 KC/S) signal, tune it in, and adjust **C32** for maximum output, while rocking the gang for optimum results. Repeat the 1,100 m adjustments.

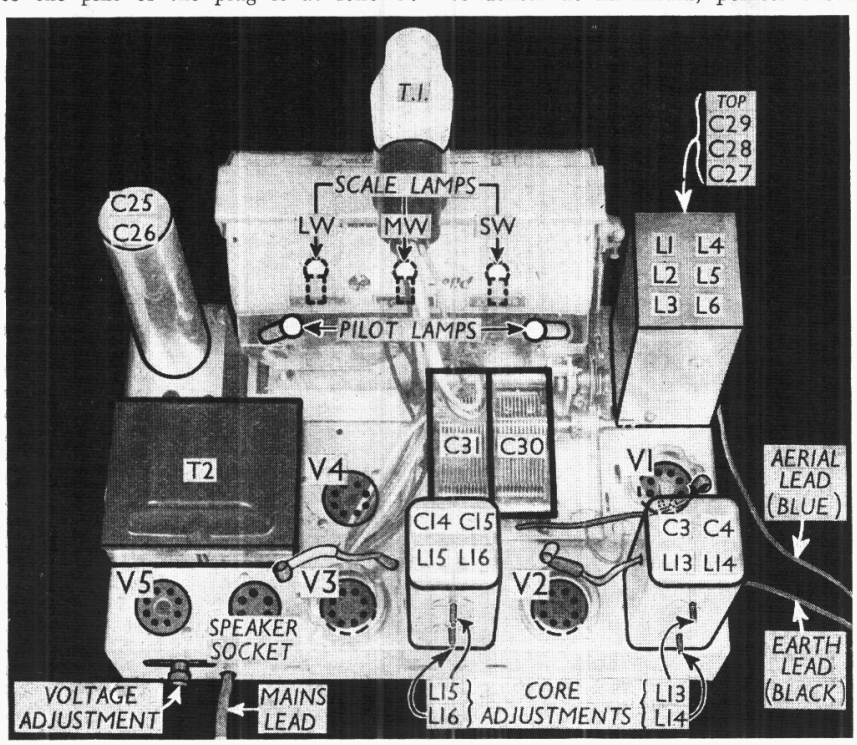
SW.—Switch set to SW, and tune to 17 m on scale. Feed in a 17 m (17·65 MC/S) signal, and adjust **C33,** then **C27,** for maximum output. Repeat these adjustments very accurately. There is no variable SW tracker to be adjusted.

AUTOMATIC TUNING

A mechanical " piano-key " system is used, in which plungers operated by the keys cause a rotary motion of a spindle which is linked up to the gang spindle by bell-cranks and a system of gearing. The drum-type scale is operated in the same way from the spindle of the automatic tuner.

The manual tuning knob, when depressed, releases any piano key which is down, and at the same time links the manual tuning spindle via a worm wheel to a sector gear attached to the spindle of the auto unit. Manual tuning can then be carried out. When any piano-key is depressed, the manual tuning spindle is disconnected from the drive.

To change a station, the auto-system is unlocked by rotating the locking control (the knob in the centre above the row of four) anti-clockwise for several turns. The appropriate key is then fully depressed, and keeping it depressed the manual tuning drive is engaged, and the receiver tuned to the desired station. The locking control is then fully tightened up (clockwise). If desired, all keys can be re-set whilst the locking control is unscrewed.



Plan view of the chassis. Note the iron-core and pre-set condenser adjustments in the various coil units.

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