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# PILOT "TWIN MIRACLE"

Four-valve, plus rectifier, transportable superhet covering two wavebands and for operation from all-dry batteries or AC or DC mains. Made by Pilot Radio, Ltd., 31-33, Park Royal Road, London, NW 10.

**INTERNAL** frame aerials L2 (MW), L4, (LW) may be coupled to an external aerial, if desired, via C1 and coupling coils L1, L3, L2 and L4 are tuned by VC1 and the signal passed direct to the grid of the heptode frequency changer V1.

The oscillator section of this valve has a grid circuit L5 (MW), L6 (LW) tuned by VC2; L7 is the reaction winding fed from the oscillator anode by means of HF choke L8, and C4.

The IF transformer, L9-L10, couples the IF signals to the grid of the IF pentode amplifying valve V2. A second IF transformer L11-L12 hands on the signal to the single diode-triode valve V3.

The LF signal is coupled from the load resistances by C8 to the volume control R7 which feeds the triode section of V3. The DC potential across the load resistances is fed via R10 to the grid circuit of V1 and V2 as AVC.

V3 is resistance capacity coupled by R3, C10 and R8 to the pentode output valve V4. This is transformer coupled by L13-L14 to the permanent-magnet speaker in which L15 is the speech coil.

Fixed tone correction is effected by C12, while bias is derived from the resistances R11, R12 in the HT circuit (the latter on mains operation).

The power supply on battery operation is derived from the all-dry HT and LT combined battery which plugs into a socket and is left permanently connected. Switches S3 and S4 are ganged and when these are switched to the ON position the valve filaments are in parallel across the LT section of the dry battery.

If the mains lead is then plugged into a supply socket, current flowing through the relay winding L17 energises the relay magnet and pulls the contacts over for AC-DC operation.

The HT positive line is then switched over from the battery to the smoothing circuit comprising L16, C13, C14 which is fed from a tap on the line-cord R16. The rectifying valve V5 has its heater fed from

the mains via the line-cord R16, and the HT negative line from the anode is taken via the relay contacts through the indicator lamp, R14 to the chassis.

The grid circuit of V4 is connected to HT negative via R12 for additional biasing. The filament current is taken from the HT line, the current flowing through V4, V3 and V2 in parallel, through V1 and R13 in parallel, and so through the indicator lamp and R14 to the HT negative. The indicator lamp lights up on mains but not on battery.

### GANGING

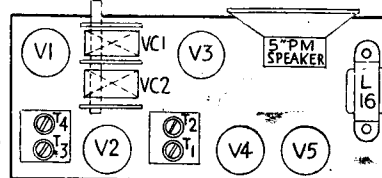
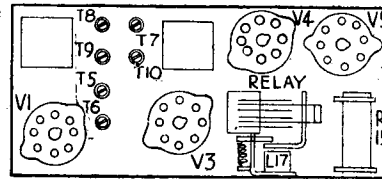
**IF Circuits.**—Inject a 451 kc signal via a .1 mfd condenser to the grid of V1. Adjust T1, T2, T3 and T4 in that order for maximum reading on output meter.

**MW Bands.**—Check that pointer is horizontal with gang at maximum. The output from the oscillator may be coupled to the aerials by a turn of wire round the outside of the cabinet.

The trimmers are accessible through the removable panel in the base of the cabinet with the battery removed; thus the receiver must be ganged when operating from the mains.

Switch to MW, tune receiver to 200m, and inject a 200m signal. Adjust T5 and T6 for maximum output.

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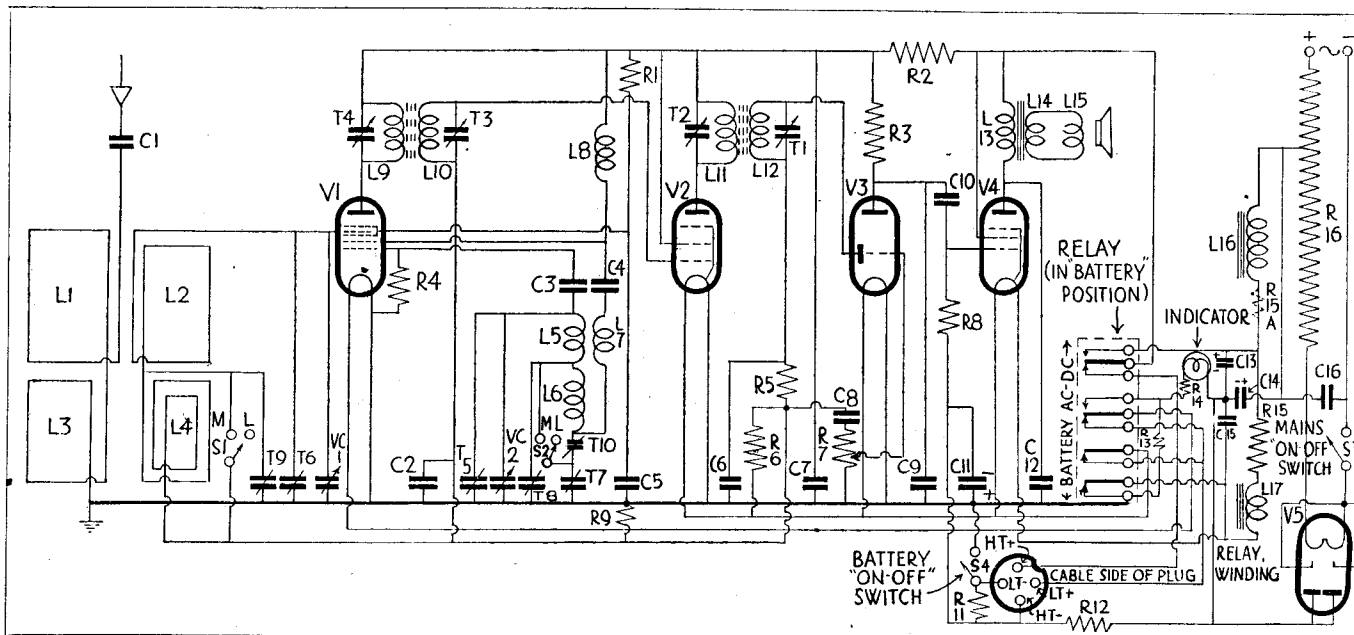


Two views of the Pilot chassis identifying the major components and showing trimmer positions.

### VALVE READINGS

V	Type	Electrode	Volts	Max
1	1A7EG	Anode	75	.3
		Osc. anode	78	1.3
		Screen	37	.6
2	1N5G	Anode	75	.8
		Screen	75	.1
3	1H5G	Anode	15	.02
4	1C5EG	Anode	78	4.7
		Screen	80	2.0
5	25Z6G	—	—	—

Above figures refer to battery operation. Values are slightly higher on mains.  
Indicator Lamp: 6.3 v. .15 amp., M.B.C.  
Battery: Ever-Ready All-dry 3.



Feature of the circuit is the relay which automatically switches over to battery or mains according to which form of supply is connected.

### CONDENSERS

C	Mfd
1	.0003
2	.05
3	.00006
4	.0003
5	.01
6	.0003
7	.25
8	.01
9	.0001
10	.01
11	.25
12	.002
13	.40
14	.40
15	.25
16	.05

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**IF Circuits.**—The wavelength switch at MW, variable condenser at minimum and volume control at maximum, apply a signal of 470kc to control grid of the V2. Detune circuits by placing across them a 20,000 ohms resistance in series with an 0.1 mfd condenser and trim for maximum output as shown in the following table:—

Detune	Tune 4th	Tune 3rd	Tune 2nd	Tune 1st
L19	—	—	L21	L22
—	—	—	—	—

Keep output low to avoid operating the AVC.

**SW Band.**—Set gang to a Philips 15° ig. Trim T1, T2, and T3 for maximum output at 17mc.

**MW Band.**—Set gang to the 15° jig. Trim T4, T5, and T6 for maximum output at 1,442kc.

Tune gang to 545kc. Trim T7 for maximum output on a 545kc signal.

Reset gang to 15° jig and retrim T4 for maximum output at 1,442kc.

**LW Band.**—Set gang to the 15° jig. Trim T8, T9, T10 at 405kc.

Tune variable to 160kc. Trim T11 for maximum output on a 160kc signal.

Reset gang to 15° jig and retrim T8 for maximum output at 405kc.

Continued from column 3

Inject and tune in a 500m signal and adjust T7, while rocking gang.

**LW Band.**—Switch to LW, tune receiver to 1,200m and feed in a 1,200m signal.

Adjust T8 and T9 for maximum output. Inject and tune in a 1,900m signal and adjust T10 for maximum output, while rocking gang.

### WINDINGS

L	Ohms	L	Ohms
1	.1	10	6.5
2	1.5	11	7.5
3	.2	12	4.5
4	21	13	430
5	3.5	14	.3
6	6.5	15	3
7	85	16	200
8	130	17	190
9	6.5		

### RESISTANCES

R	Ohms	R	Ohms
1	56,000	9	3.3 meg
2	2,200	10	3.3 meg
3	1 meg	11	1,200
4	220,000	12	2,200
5	47,000	13	25
6	2.2 meg	14	700
7	2 meg	15*	700
8	3.3 meg	16†	620

\* When 1D5 valve used, R15 and R15A = 1,500 ohms tapped at 700 ohms.  
† 910 ohms for 1D5 valve untapp ed.