

PILOT U225

CU225 AND RU225

A FIVE-VALVE (plus rectifier) A.C./D.C. superhet chassis is fitted in the Pilot U225 receiver. It is a 3-band type covering a short wave-range of 16-51 metres, has sockets for an extension speaker, and a jack allows a gramophone pick-up to be used. Our model was suitable for 220-250 V mains.

An identical chassis is incorporated in the CU225 console receiver, and the chassis of the RU225 radio-gramophone is very similar, except for the pick-up switching. This *Service Sheet* was prepared on a U225 receiver.

CIRCUIT DESCRIPTION

Aerial input via fixed condenser **C1** and coupling coils **L1** (S.W.), **L3** (M.W.), **L5** (L.W.) to single-tuned circuits **L2**, **C38** (S.W.), **L4**, **C38** (M.W.), **L6**, **C38** (L.W.) which precede variable-mu R.F. pentode signal frequency amplifier (**V1**, Pilot 6D6).

Tuned-secondary transformer couplings by **L7**, **L8**, **C42** (S.W.), **L9**, **L10**, **C42** (M.W.), **L11**, **L12**, **C42** (L.W.) between **V1** and heptode frequency changer valve (**V2**, Pilot 6A7). Oscillator grid coils **L13** (S.W.), **L15** (M.W.), **L17** (L.W.) are tuned by **C43**; parallel trimming by **C44** (S.W.), **C45** (M.W.), **C47** (L.W.); series tracking by **C14** (S.W.), **C46** (M.W.), **C48** (L.W.); oscillator anode reaction coils **L14** (S.W.), **L16** (M.W.), **L18** (L.W.).

Single variable-mu R.F. pentode intermediate frequency amplifier (**V3**, Pilot 6D6) operating with triple-tuned transformer couplings **C49**, **L19**, **C50**, **L20**, **L21**, **C51** and **C52**, **L22**, **C53**, **L23**, **L24**, **C54**.

Intermediate frequency 456 KC/S.

Diode second detector is part of double diode triode valve (**V4**, Pilot 75). Audio-frequency component in rectified output developed across **R14** is passed via coupling condenser **C21** and manual volume control **R13** to C.G. of triode section which operates as A.F. amplifier. Provision is made for connection of gramophone pick-up by single closed circuit jack.

D.C. component in rectified output developed across **R14** is fed back through decoupling circuits as G.B. to R.F., F.C., and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along the **V4** cathode resistance **R15**.

Resistance-capacity coupling by **R17**, **C27**, **R20** between **V4** triode and pentode output valve (**V5**, Pilot 43). Fixed tone correction in anode circuit by **C32**; variable tone control by R.C. filter **R18**, **C26**.

Provision for connection of high-impedance external speaker by isolating condensers **C28**, **C29**.

When the receiver is used with A.C. mains supplies, H.T. current is provided by half-wave rectifying valve (**V6**, Pilot 25Z5), which, with D.C. supplies, behaves as a low resistance. Smoothing by iron-cored choke **L25**, resistance **R19** and dry electrolytic condensers **C25**, **C30**, **C31**. Speaker field coil **L28** is connected across main H.T. supply.

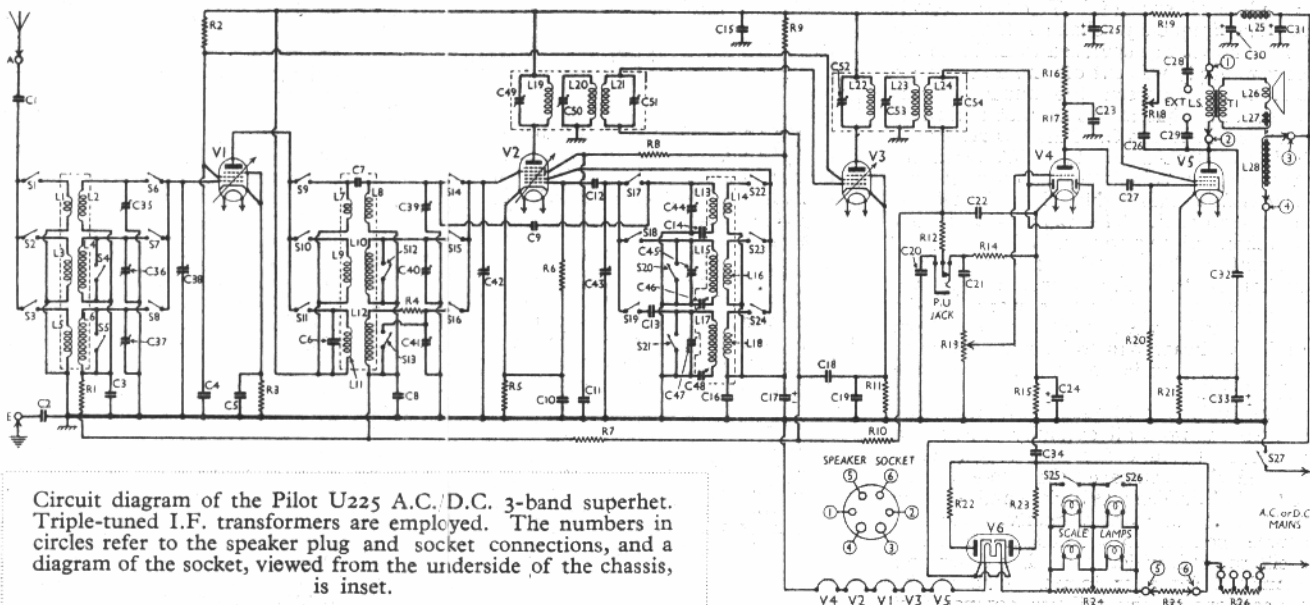
Valve heaters are connected in series together with scale lamps and ballast resistances **R25**, **R26** across mains input circuit. R.F. by-passing in mains circuit by **C34**.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 C.G. decoupling	100,000
R2	V1 and V2 S.G.'s H.T. feed	6,000
R3	V1 fixed G.B. resistance	400
R4	H.F. trans. L.W. sec. series	250
R5	V2 fixed G.B. resistance	400
R6	V2 osc. C.G. resistance	50,000
R7	V1 and V2 A.V.C. line decoupling	100,000
R8	V2 S.G.'s H.T. feed	6,000
R9	V2 osc. anode decoupling	3,000
R10	Main A.V.C. line decoupling	1,000,000
R11	V3 fixed G.B. resistance	400
R12	I.F. stopper	50,000
R13	Manual volume control	750,000
R14	V4 diode load	300,000
R15	V4 G.B. resistance	12,000
R16	V4 triode anode decoupling	50,000
R17	V4 triode anode load	500,000
R18	Variable tone control	100,000
R19	H.T. smoothing	2,500
R20	V5 C.G. resistance	500,000
R21	V5 G.B. resistance	600
R22	V6 anode resistances	100
R23		100
R24	Scale lamps shunt	80*
R25	Fixed ballast resistance	450
R26	Tapped ballast resistance	72†

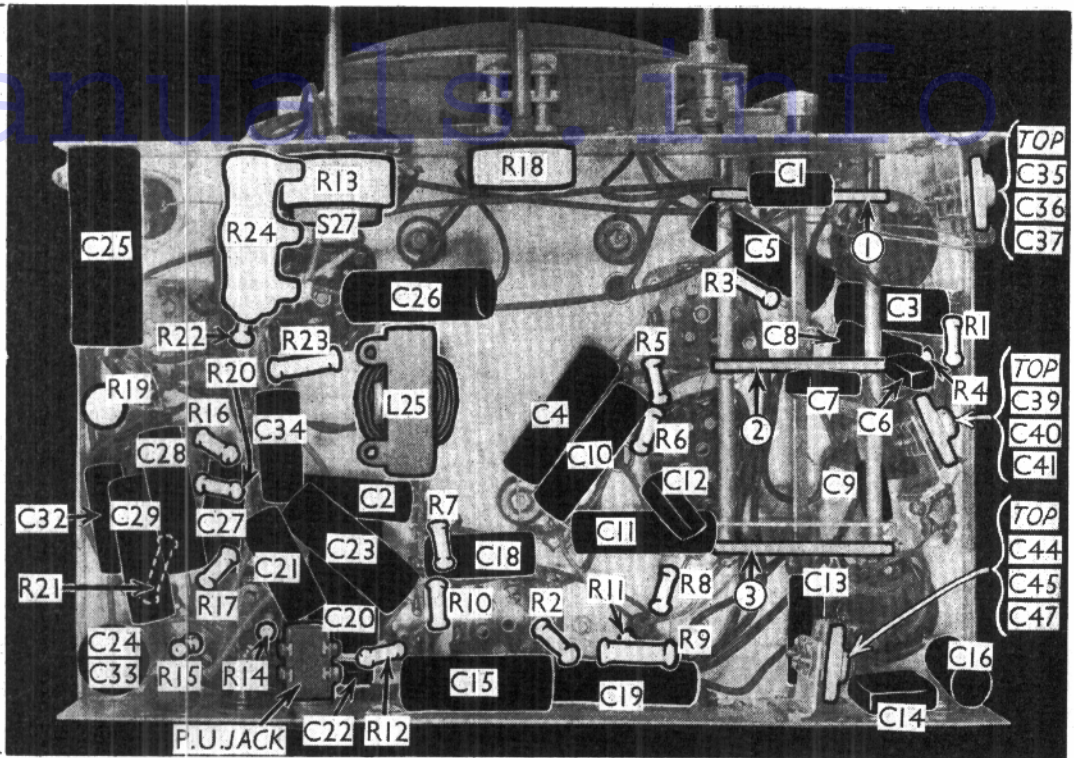
* 40+40 O. † 24+24+24 O.

CONDENSERS		Values (μF)
C1	Aerial series condenser	0.0005
C2	Earth blocking condenser	0.005
C3	V1 C.G. decoupling	0.05
C4	V1, V2 S.G.'s by-pass	0.05



Circuit diagram of the Pilot U225 A.C./D.C. 3-band superhet. Triple-tuned I.F. transformers are employed. The numbers in circles refer to the speaker plug and socket connections, and a diagram of the socket, viewed from the underside of the chassis, is inset.

Under-chassis view. The three switch units are indicated by numbers in circles and arrows, and diagrams of them are given on page VIII. The nine trimmers on the right are in three banks, each bank being numbered from top to bottom. R24 is centre-tapped. The pick-up jack is replaced by a toggle switch in the radio-gram model.



CONDENSERS—Continued		Values (μF)
C5	V1 cathode by-pass	0.1
C6	L.W. H.F. trans. pri. trimmer	0.00025
C7	S.W. H.F. trans. cap. coupling	0.0001
C8	V2 tetrode C.G. decoupling	0.05
C9	Neutralising condenser	Very low
C10	V2 cathode by-pass	0.1
C11	V2 S.G.'s by-pass	0.05
C12	V2 osc. C.G. condenser	0.00005
C13	V2 osc. L.W. C.G. condenser	0.01
C14	Oscillator S.W. tracker	0.0025
C15	H.T. supply R.F. by-pass	0.1
C16	V2 osc. anode decoupling	0.05
C17*	V2 osc. anode decoupling	4.0
C18	V3 C.G. decoupling	0.05
C19	V3 cathode by-pass	0.1
C20	Gram. P.U. isolating	0.5
C21	L.F. coupling to V4 triode	0.01
C22	I.F. by-pass	0.00025
C23	V4 triode anode decoupling	0.1
C24*	V4 cathode by-pass	10.0
C25*	H.T. smoothing	4.0
C26	Part of T.C. filter	0.05
C27	V4 to V5 L.F. coupling	0.01
C28	External speaker coupling	0.05
C29	External speaker coupling	0.05
C30*	H.T. smoothing	12.0
C31*	H.T. smoothing	16.0
C32	Fixed tone corrector	0.005
C33*	V5 cathode by-pass	10.0
C34	Mains circuit R.F. by-pass	0.01
C35†	Aerial circuit S.W. trimmer	—
C36†	Aerial circuit M.W. trimmer	—
C37†	Aerial circuit L.W. trimmer	—
C38†	Aerial circuit tuning	—
C39†	R.F. trans. S.W. sec. trimmer	—
C40†	R.F. trans. M.W. sec. trimmer	—
C41†	R.F. trans. L.W. sec. trimmer	—
C42†	R.F. trans. secs. tuning	—
C43†	Osc. circuit tuning	—
C44†	Osc. circuit S.W. trimmer	—
C45†	Osc. circuit M.W. trimmer	—
C46†	Osc. circuit M.W. tracker	0.00046
C47†	Osc. circuit L.W. trimmer	—
C48†	Osc. circuit L.W. tracker	0.000125
C49†	1st I.F. trans. pri. tuning	—
C50†	1st I.F. trans. tertiary tuning	—
C51†	1st I.F. trans. sec. tuning	—
C52†	2nd I.F. trans. pri. tuning	—
C53†	2nd I.F. trans. tertiary tuning	—
C54†	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial S.W. coupling coil	1.5
L2	Aerial S.W. tuning coil	0.05
L3	Aerial M.W. coupling coil	25.0
L4	Aerial M.W. tuning coil	3.5
L5	Aerial L.W. coupling coil	125.0
L6	Aerial L.W. tuning coil	20.0
L7	S.W. R.F. trans. pri.	4.8
L8	S.W. R.F. trans. sec.	0.05
L9	M.W. R.F. trans. pri.	100.0
L10	M.W. R.F. trans. sec.	3.5
L11	L.W. R.F. trans. pri.	125.0
L12	L.W. R.F. trans. sec.	20.0
L13	Osc. S.W. tuning coil	0.05
L14	Osc. S.W. reaction coil	0.8
L15	Osc. M.W. tuning coil	7.0
L16	Osc. M.W. reaction coil	3.3
L17	Osc. L.W. tuning coil	14.0
L18	Osc. L.W. reaction coil	6.0
L19	Primary	9.0
L20	Tertiary	9.0
L21	Secondary	13.0
L22	Primary	13.0
L23	Tertiary	9.0
L24	Secondary	9.0
L25	H.T. smoothing choke	460.0
L26	Speaker speech coil	1.8
L27	Hum neutralising coil	0.1
L28	Speaker field coil	5,000.0
T1	Speaker input trans. (Pri. Sec.)	320.0 0.2
S1-24	Waveband switches	—
S25-26	Scale lamp switches	—
S27	Mains circuit switch, ganged R13	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the three small control knobs (pull off) and the large tuning knob (recessed grub screw). Now remove the four bolts (with spring washers and washers) holding the chassis to the bottom of the cabinet.

To free the chassis entirely, remove the speaker plug from the socket on the chassis and unsolder the two top leads

from the mains resistance. When replacing, connect these leads to tags 1 and 4, numbering them from top to bottom.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts and fibre washers from the four bolts holding it to the sub-baffle. When replacing, see that the transformer is on the right.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V. 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 1,200 V scale of an Avometer, chassis being negative.

If the S.G. circuit of V3 should become unstable when measurements are being made, as in our case, it can be stabilised by connecting a 0.1 μF non-inductive condenser from S.G. to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6D6	110	5.1	95	1.5
V2 6A7*	110	1.2	75	3.4
V3 6D6	110	5.6	95	1.5
V4 75	30	0.1	—	—
V5 43	170	23.0	110	3.9
V6 25Z5†	—	—	—	—

* Oscillator anode (G2) 95 V, 2.4 mA.
† Cathode to chassis, 195 V, D.C.

GENERAL NOTES

Switches.—S1-S26 are in three ganged rotary units beneath the chassis, indicated by numbers in circles and arrows in our under-chassis view. The arrows show the

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PILOT U225—Continued

directions in which the units are viewed in the diagrams on this page. The letters "Be" and "Bl" stand for "Bearer" and "Blank" respectively.

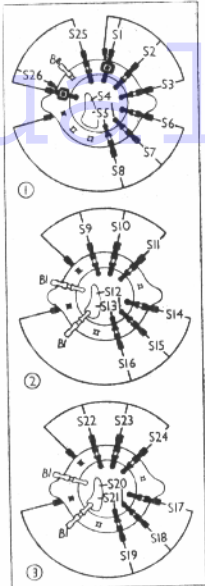
The table below gives the switch positions for the three control settings, starting from fully anti-clockwise.

Switch	L.W.	M.W.	S.W.
S1	O	O	C
S2	O	O	C
S3	C	C	O
S4	O	O	C
S5	O	O	C
S6	O	O	C
S7	O	O	C
S8	C	C	O
S9	O	O	C
S10	O	O	C
S11	C	C	O
S12	O	O	C
S13	O	O	C
S14	O	O	C
S15	O	O	C
S16	C	C	O
S17	O	O	C
S18	O	O	C
S19	C	C	O
S20	O	O	C
S21	O	O	C
S22	O	O	C
S23	C	C	O
S24	C	C	O
S25	O	O	C

S27 is the Q.M.B. mains switch, ganged with the volume control R13.

In addition, pick-up switching is performed by the single circuit jack, shown diagrammatically in the circuit.

Coils.—L1-L6, L7-L12 and L13-L18 are in three screened units on the chassis deck. The last of these also contains the trackers C46, C48. The triple-tuned I.F. transformers, L19-L21 and L22-L24 are in two further screened units, with trimmers reached through holes in the backs of the screens. These trimmers are numbered from top to bottom in our plan chassis view.



Switch unit diagrams, seen from the underside of the chassis, in the direction of the arrows in the under-chassis view. Be indicates "bearer" and BI "blank." Note the large contact on each rotor forming extra switches.

L25 is an iron-cored choke beneath the chassis.

Scale Lamps.—These are four 6.3 V 0.15 A types, fitted with miniature centre contact bayonet caps. Pilot spares No. U72151.

External Speaker.—Two sockets are provided at the rear of the chassis for a high resistance external speaker. This is isolated by two fixed condensers, C28 and C29.

Condensers C17, C30, C31.—These are three dry electrolytics in a single metal-cased tubular unit mounted on the chassis deck. The tags beneath the chassis are coded as follows: Black, common negative; yellow, positive of C17 (4μF); green, positive of C30 (12 μF); red, positive of C31 (16 μF).

Condensers C24, C33.—These are two 10 μF dry electrolytics in a single metal-cased tubular unit beneath the chassis. The case is negative, the tag connected to R15 is the positive of C24 and the other tag is the positive of C33.

Resistance R24.—This is an 80 Ω unit, centre-tapped.

Resistances R25 and R26.—These are vitreous types, on a single tubular

former mounted on the speaker unit. The two tags to which the yellow and green leads are soldered are the ends of R25 (450 Ω). The remaining four tags form the ends of R26, and two intermediate tappings, giving 24 + 24 + 24 Ω. For 250 V operation the two black leads from the chassis go to the tags at the ends of R26. For 240 V, one lead is moved one tag towards the other; for 230 V, the leads are soldered on adjacent tags; and for 220 V, the leads are connected together, and to any tag of R26 (to act as a bearer).

Speaker Socket.—The speaker is connected to the chassis by a 6-pin plug and socket. The connections are shown by arrows and numbered circles in the circuit diagram, which also includes a diagram of the connector, viewed from the free ends of the pins, or from the underside of the socket.

The colour coding for the plug is: 1, white; 2, light green; 3, black; 4, red-white; 5, yellow; 6, dark green.

Chassis Divergencies.—R26 for voltage adjustment was not included in models prior to August, 1936. The extension speaker sockets and the two coupling condensers C28, C29 were not included prior to September, 1936.

Radio-gram Modifications.—The radio-gram, model RU225, has a similar chassis, except that the pick-up is permanently connected between the top end of C20 and one fixed contact of a toggle switch. The other fixed contact of the switch connects to the bottom of R12, while the moving contact goes to the junction of R14 and C21.

CIRCUIT ALIGNMENT

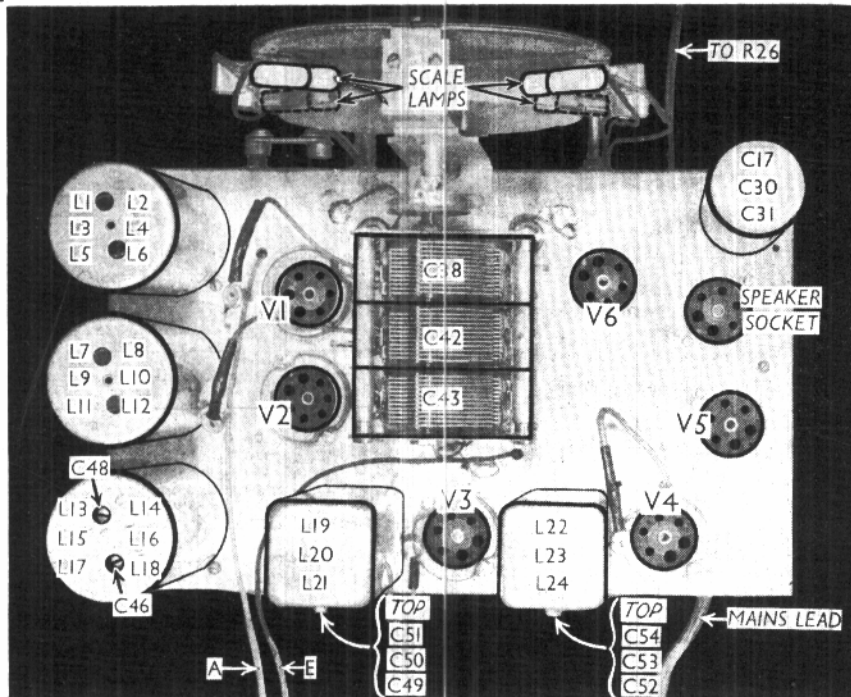
I.F. Stages.—Switch set to M.W., turn gang to maximum, and connect signal generator with the high potential lead via a 0.1 μF condenser to control grid (top cap) of V3, and the low potential lead to chassis. Feed in a 456 KC/S signal, and adjust C54, C53 and C52 in turn for maximum output. Transfer generator lead from top cap of V3 to top cap of V2, and adjust C51, C50 and C49 for maximum output. Leave generator connected to V2, and repeat the adjustments to all six trimmers. Keep the input as low as possible during this process.

H.F. and Oscillator Stages.—Connect generator to aerial and earth wires, with a 0.0002 μF condenser in series with the aerial lead. Switch set to M.W., and tune to 200 m. on the scale. Feed in a 200 m. signal and adjust C45 for maximum output. Then adjust C40 and C36.

Feed in a 500 m. signal, tune it in on the receiver, then adjust C46 for maximum output, rocking the gang for optimum results. Repeat the adjustments at 200 m. as described previously.

The L.W. adjustment is similar. Trim C47, C41 and C37 at 375 KC/S, and track C48 at 160 KC/S.

For S.W. adjustment, insert a 400 Ω non-inductive resistance in series with the aerial lead. Switch set to S.W., and feed in a 16.8 m. (17.8 MC/S) signal. Tune set to 16.8 m. on scale, and adjust C44, C39 and C35 for maximum output. Repeat these adjustments, rocking the gang very slightly for optimum results. Variable tracking is not used on this band, C14 being the fixed tracker.



Plan view of the chassis. The I.F. trimmers are numbered from top to bottom.