NUMBER NINETY-NINE **'TRADER' SERVICE SHEETS**

INVICTA CW37/AC

3-VALVE A.C. RECEIVER

IN its standard form the Invicta CW37/AC receiver is suitable for mains of 200-250 V, 40-100 c.p.s., but special models can be had for 100 - 120 V, 40 - 100 c.p.s., and for 200-250 V, 25 c.p.s. The receiver has a 3-valve (plus rectifier) circuit consisting of a variable-mu pentode H.F. amplifier, a triode detector and a pentode output valve. Provision is made for a gramophone pick-up, an extension speaker and for using the mains as an aerial.

CIRCUIT DESCRIPTION

Two alternative aerial connections (**A2** with Droitwich rejector circuit **L1, C1**) via fixed series condenser **C2** to coupling coil **L2.** Single-tuned circuit **L3, L4, C14** precedes variable-mu pentode H.F. amplifier (**V1, Mullard metallised VP4B**). Gain control by variable cathode resistance **R3** which varies G.B. applied.

Tuned-anode coupling by **L6, L7, C17** to triode detector valve (**V2, Mullard metallised 354 V**) which operates on grid leak system with **C5** and **R5.** Reaction is applied from anode by coil **L5,** and controlled by variable condenser **C16.** H.F. by - passing in anode circuit by fixed condenser **C6.** Provision for connection of gramophone pick-up in grid circuit.

Resistance - capacity coupling by **R6, C7** and **R8** to output pentode (**V3, Mullard Pen4VB**). Tone correction by fixed condenser **C9.** Provision for connection of external low-impedance speaker across secondary of output transformer **T1.**

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V4, Mullard IW3**). Smoothing by speaker field coil **L10** and dry electrolytic condensers **C10, C11.** Mains H.F. by-passing by condenser **C13.** Mains aerial coupling by **C12.**

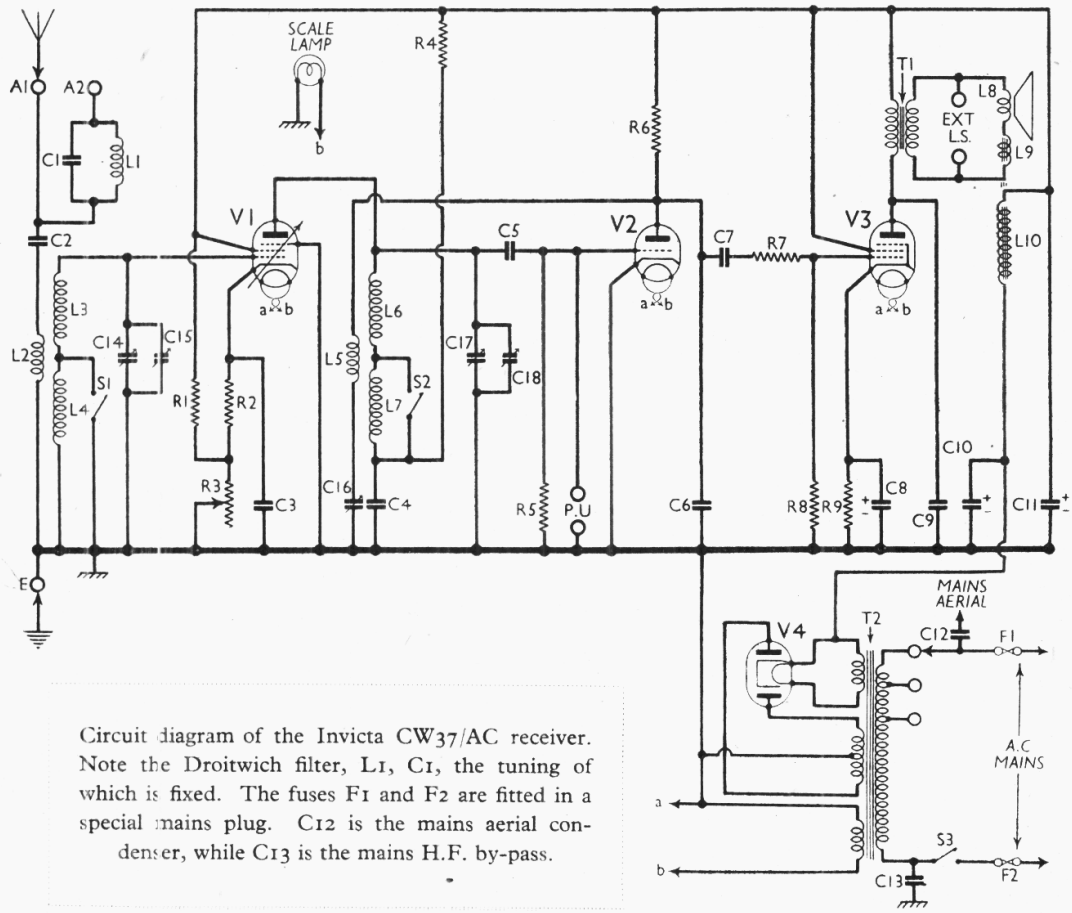
COMPONENTS AND VALUES

	Condensers	Values (μF)
C1	Droitwich rejector tuning	0·00015
C2	Aerial series condenser	0·0003
C3	V1 cathode by-pass	0·1
C4	V1 anode decoupling	0·1
C5	V2 C.G. condenser	0·00007
C6	V2 anode H.F. by-pass	0·0003
C7	L.F. coupling to V3	0·01
C8*	V3 cathode by-pass	25·0
C9	Tone corrector	0·005
C10*, C11*	H.T. smoothing	8·0, 8·0
C12	Mains aerial condenser	0·001
C13	Mains H.F. by-pass	0·01
C14†	Aerial circuit tuning	0·0005
C15‡	Aerial circuit trimmer	—
C16†	Reaction control	0·0005
C17†	V1 anode circuit tuning	0·0005
C18‡	V1 anode circuit trimmer	—

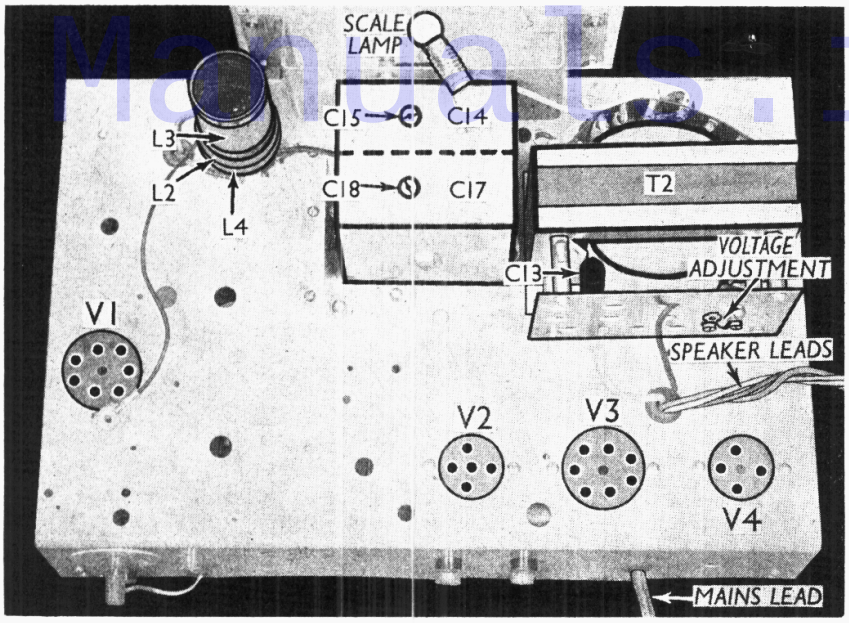
* Electrolytic † Variable ‡ Pre-set

	Resistances	Values (ohms)
R1	V1 cathode circuit bleeder	50,000
R2	V1 fixed G.B. resistance	140
R3	V1 gain control	10,000
R4	V1 anode decoupling	11,000
R5	V2 grid leak	300,000
R6	V2 anode load	300,000
R7	V3 C.G. H.F. stopper	300,000
R8	V3 C.G. resistance	1,000,000
R9	V3 G.B. resistance	140

	Other Components	Approx. Values (ohms)
L1	Droitwich rejector coil	29·5
L2	Aerial coupling coil	17·5
L3, L4	Aerial tuning coils	3·8
L5	Reaction coil	3·8
L6, L7	V1 anode tuning coils	1·8, 17·0
L8	Speaker speech coil	1·6
L9	Hum neutralising coil	0·2
L10	Speaker field coil	3,000·0
T1	Output trans. Pri. / Sec.	460·0 / 0·2
T2	Mains trans. Pri. total / Heater sec. / Rect. heat. sec. / H.T. sec. tot.	43·0 / 0·1 / 0·2 / 340·0
S1, S2	Waveband switches	—
S3	Mains switch, ganged R3	—
F1, F2	Mains circuit fuses, 1A	—



Circuit diagram of the Invicta CW37/AC receiver. Note the Droitwich filter, L1, C1, the tuning of which is fixed. The fuses F1 and F2 are fitted in a special mains plug. C12 is the mains aerial condenser, while C13 is the mains H.F. by-pass.



Plan view of the chassis. C13, the mains H.F. by-pass, is mounted in the framework of T2. There is only one coil unit on the top deck, the second unit being beneath the chassis.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the four control knobs (recessed grub screws) and the four bolts (with washers) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes. *When replacing*, do not forget the felt washers between the control knobs and the cabinet. To free the chassis entirely, unsolder the leads from the speaker terminal panel and *when replacing*, connect as follow, numbering the tags from bottom to top :—Small terminal strip, 1, yellow; 2, green; 3, blank. Big strip, 1, black; 2, 3 and 4, blank; 5, red.

Removing Speaker.—If it is desired to remove the speaker, take off the nuts and washers from the four bolts holding it to the sub-baffle and *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 230 V and with the transformer adjusted to the 216-235 V tapping. The volume control was at maximum and the reaction control was at minimum, but there was no signal input.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 VP4B ..	114	9·8	212	3·5
V2 354V ..	27	0·8	—	—
V3 Pen4VB	192	39·0	212	4·7
V4 IW3 ..	360†	—	—	—

† Each anode, A.C.

When making some of these measurements, it was found that the H.F. valve was unstable, and this was cured by connecting a 0.1 μF condenser from control grid (top cap) to earth.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

GENERAL NOTES

Switches.—There are only two waveband switches, **S1** and **S2,** and these are both *closed* on the M.W. band and *open* on the L.W. band. They are indicated in the under-chassis view.

S3 is the Q.M.B. mains switch, ganged with the gain control **R3.**

Coils.—**L1** is the Droitwich filter coil, beneath the chassis. **L2-L4** are in a tubular unscreened unit on the chassis deck, and are indicated in the plan chassis view. **L5-L7** are in a similar unit beneath the chassis. In this unit, the single layer coil is **L6,** the larger multi-layer coil **L7,** and the central (smaller) multi-layer coil **L5.**

Scale Lamp.—This is an Ever Ready M.E.S. type rated at 6.2 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low resistance external speaker (about 2 O).

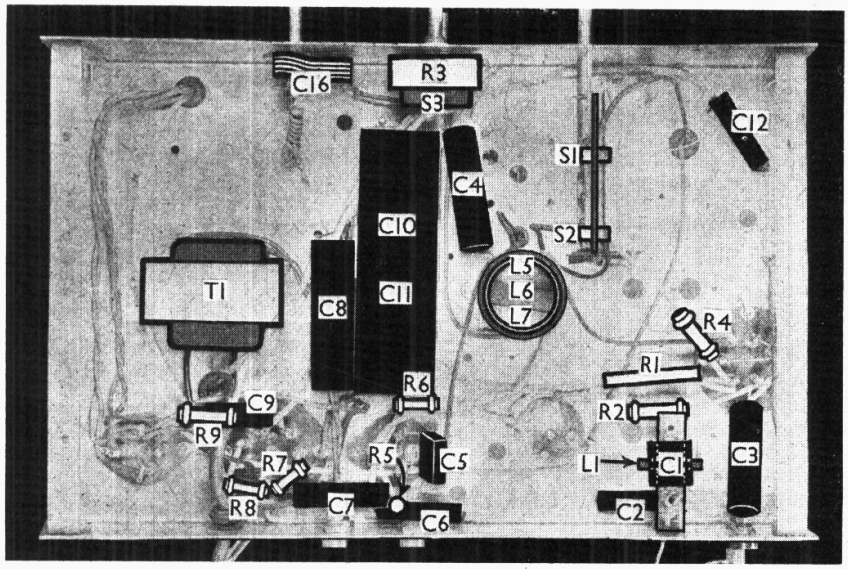
Fuses.—The two fuses, **F1, F2,** are fitted in a special fuse plug at the end of the mains lead. Both are 1 A glass tubular types, 1 in. long.

Condensers C10, C11.—These are two 8 μF dry electrolytic types in a single unit with a common negative (black) lead. The red lead to the valve-holder of **V4** is the positive of **C10,** and the other red lead, to **V3** valve-holder, is the positive of **C11.**

Transformer T1.—Note that this is mounted underneath the receiver chassis, and not on the speaker.

Droitwich Filter.—There is no provision for adjusting this, since it consists of **L1** and the fixed condenser **C1.** It is brought into action by the use of the **A2** aerial socket.

Trimming.—It is suggested by the makers that a signal generator should be used. Adjust it to 300 m., feed into A and E sockets, tune the set to 300 m. on the M.W. scale, and adjust **C15** and **C18** for maximum output. Check the adjustments again at 200 m.



Under-chassis view. Note the coil unit L5-L7. The positions of the coils are given in "General Notes" (col. 3). L1 and C1 form the fixed Droitwich filter. Note that there are only two waveband switches, S1 and S2. The speaker transformer T1 is in the receiver chassis, and not on the speaker itself.