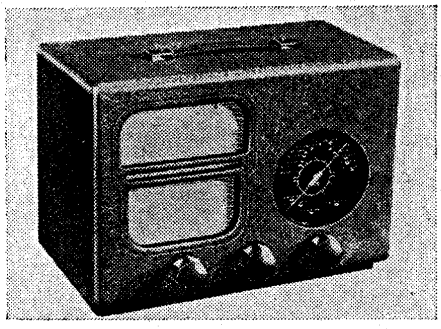
Supplement to The Wireless & Electrical Trader, May 6, 1939

"TRADER" SERVICE SHEET

401

INVICTA 690

AC/DC "IMP"



THE Invicta Imp (Model 690) is an AC/DC 2-band midget receiver of the 3-valve (plus rectifier) "straight" type, fitted in a small leatherette-covered case with a carrying handle.

The set is fitted with a permanent aerial wire, and is for 200-240 V (25-100 C/S AC) mains, while it can be used on 250 V mains by the insertion of a small extra ballast resistor in the heater circuit.

Release date: January, 1939.

CIRCUIT DESCRIPTION

Aerial input from the permanently attached aerial wire is fed via the aerial isolating condenser **C1** to the aerial coupling coil **L1** and thus to the tuned aerial circuit comprising coils **L2** (MW) plus **L3** (LW) tuned by variable condenser **C17.** Coupling is augmented on MW by the small top coupling condenser **C3.**

First valve (**V1, Mullard 6K7G**) is a variable-mu RF pentode operating as signal frequency amplifier with gain control by potentiometer **R3** which forms part of a potential divider, the other part of which is **R2,** connected across the HT supply. **R3** is so connected that, as the gain of **V1** is reduced the aerial circuit is progressively damped, and the input from it reduced.

Tuned-anode coupling by **L4** (MW), plus **L5** (LW), tuned by **C19,** between **V1** and a second RF pentode (**V2, Mullard 6J7G**) which operates as detector valve on the grid leak system with **C7** and **R6.** The conventional reaction circuit between anode and grid circuits is omitted, but as instability occurs before **R3** is fully advanced, this control, in addition to its control of aerial damping and **V1** gain, also controls reaction.

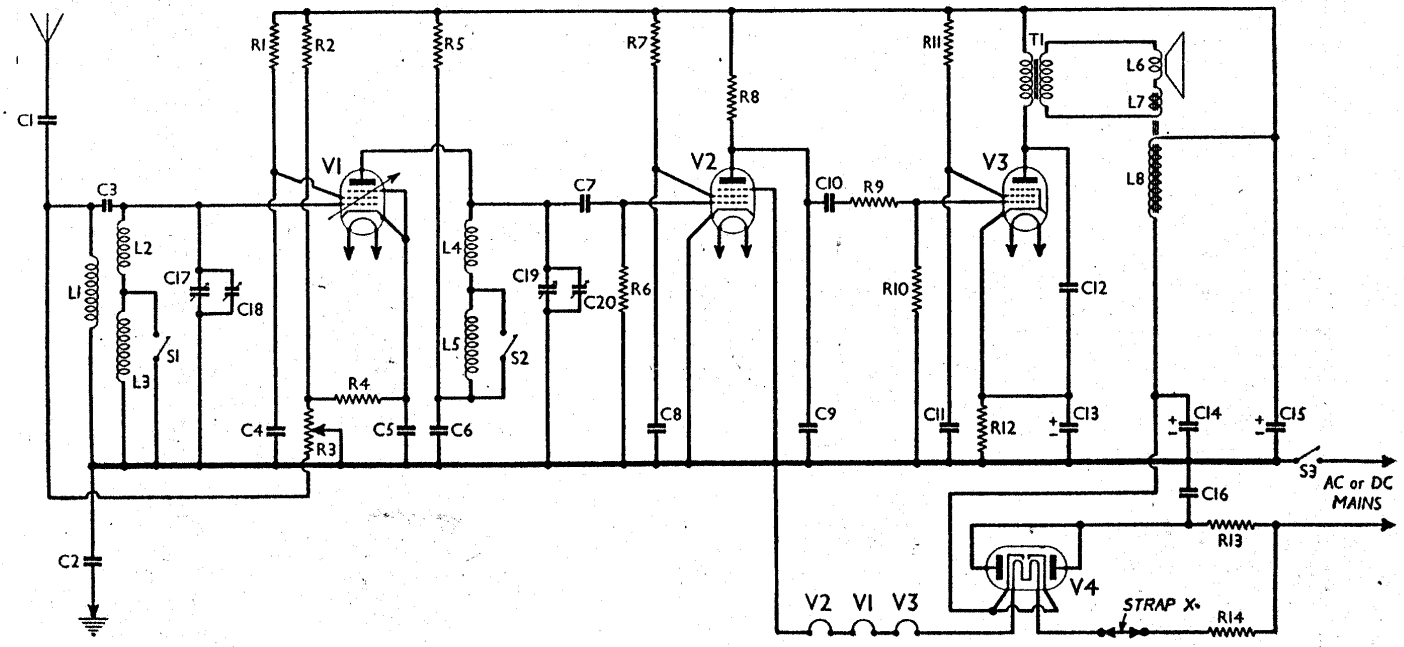
Resistance-capacity coupling by **R8, C10** and **R10,** via RF filter comprising **C9** and **R9,** is employed between **V2** and the pentode output valve (**V3, Mullard 25A6G**). Fixed tone correction is provided in the anode circuit by **C12,** connected between anode and cathode. No provision is made for connection of an external speaker but such provision could easily be effected by connections to the tags on the internal speaker input transformer **T1**; this is fully dealt with under *General Notes.*

When the receiver is used with alternating current mains, HT current is supplied by indirectly-heated cathode valve (**V4, Mullard 25Z6G**) whose two independent valves are connected in parallel to form a half-wave rectifier. Smoothing is effected by the speaker field **L8** and dry electrolytic condensers **C14** and **C15.** Resistance **R13** is included in the anode circuit to limit the maximum current resulting from a surge or an accidental short-circuit.

Valve heaters are connected in series, together with the line cord ballast resistance **R14** which is located in the mains lead, across the mains input. One end of **R14** is terminated at one tag of a paxolin panel, the opposite tag of which is connected to the first heater of the series; between the two tags is connected a shorting strap for all mains voltages from 200 V to 240 V. When the receiver is used on mains of higher voltage than 240 V, the shorting strap should be removed and replaced by a 60 ohm 6 watt resistance in order to drop the excess voltage.

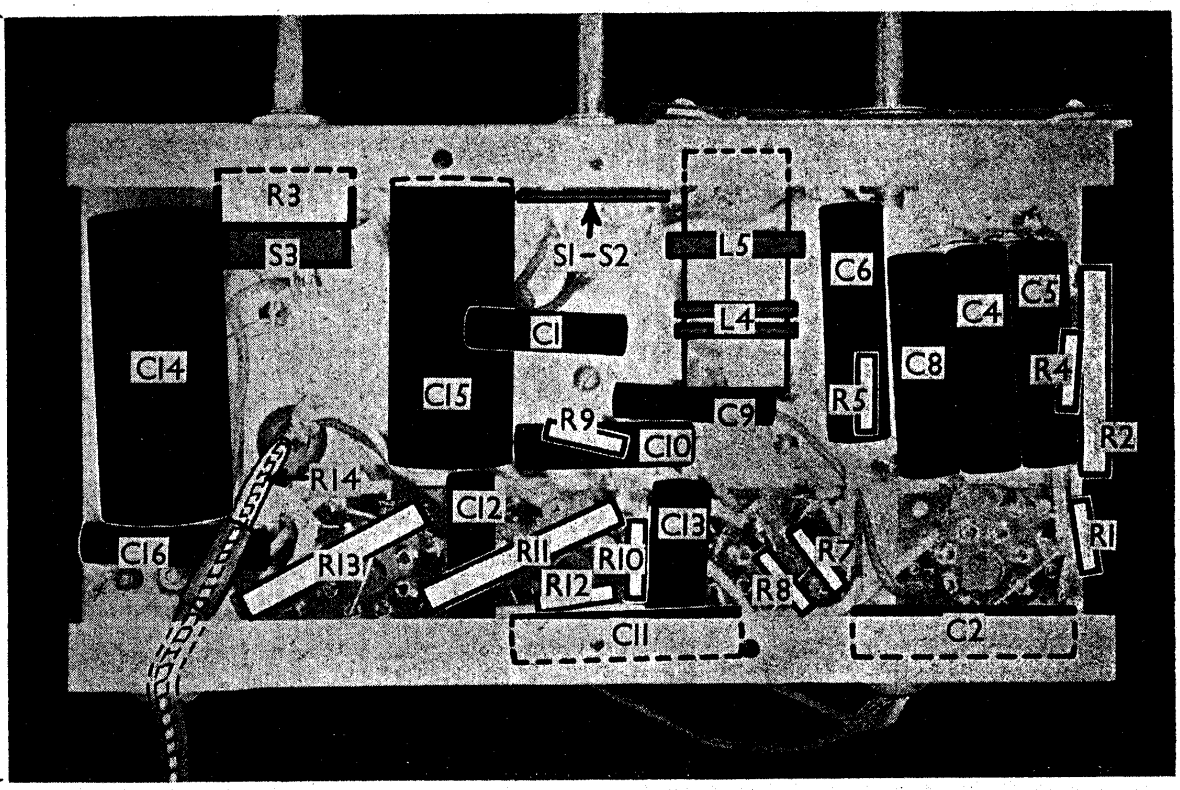
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 SG HT feed resistance ..	100,000
R2	Part of V1 GB HT potential divider	50,000
R3	V1 gain control and aerial circuit shunt resistance ..	10,000
R4	V1 fixed minimum GB resistance	450
R5	V1 anode HT feed resistance	15,000
R6	V2 grid leak	1,000,000
R7	V2 SG HT feed resistance ..	1,000,000
R8	V2 anode load resistance ..	250,000
R9	V3 CG RF stopper resistance	40,000
R10	V3 CG resistance	1,000,000
R11	V3 SG HT feed resistance ..	10,000
R12	V3 GB resistance	450
R13	V4 anodes current limiting resistance	100
R14	Line cord heater ballast resistance	530



The circuit of the Invicta 690 is quite straightforward. Strap **X** is for the insertion of an extra resistor on 250 V mains.

Under-chassis view. The **S1, S2** switch unit is shown in diagrammatic form in col. 2 overleaf. **R14,** incorporated in the mains lead, is the heater ballast resistor. Some chassis may incorporate an extra 15,000Ω resistor from HT line to chassis.



CONDENSERS		Values (μF)
C1	Aerial isolating condenser ..	0·001
C2	Earth lead isolating condenser	0·05
C3	Aerial MW "top" coupling condenser	Very low
C4	V1 SG decoupling	0·1
C5	V1 cathode by-pass	0·1
C6	V1 anode decoupling condenser	0·1
C7	V2 CG condenser	0·00015
C8	V2 SG decoupling	0·1
C9	V2 anode RF by-pass condenser	0·0003
C10	V2 to V3 AF coupling condenser	0·01
C11	V3 SG RF by-pass condenser	0·1
C12	Fixed tone corrector ..	0·005
C13*	V3 cathode by-pass condenser	10·0
C14*, C15*	HT smoothing condensers ..	16·0, 8·0
C16	V4 anodes RF by-pass condenser	0·01
C17†	Aerial circuit tuning condenser	0·000535
C18‡	Aerial circuit MW trimmer condenser	—
C19†	V1 anode circuit tuning condenser	0·000535
C20‡	V1 anode circuit MW trimmer condenser	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coil	11·0
L2	Aerial MW tuning coil ..	3·5
L3	Aerial LW tuning coil ..	11·5
L4	V1 anode circuit MW tuning coil	3·5
L5	V1 anode circuit LW tuning coil	10·5
L6	Speaker speech coil	2·0
L7	Hum neutralising coil ..	0·1
L8	Speaker field coil	600·0
T1	Speaker input trans. Pri. / Sec.	130·0 / 0·2
S1	Aerial circuit waveband switch	—
S2	V1 anode circuit waveband switch	—
S3	Mains circuit switch, ganged with R3	—
Strap "x"	Mains voltage adjusting strap	—

DISMANTLING THE SET

Removing Chassis.—If it is required to remove the chassis from the case, remove the three control knobs (recessed grub screws) and the two round-head bolts holding the chassis to the bottom of the case, then unsolder the three leads from the paxolin panel on the speaker transformer. The chassis may now be withdrawn from the casing.

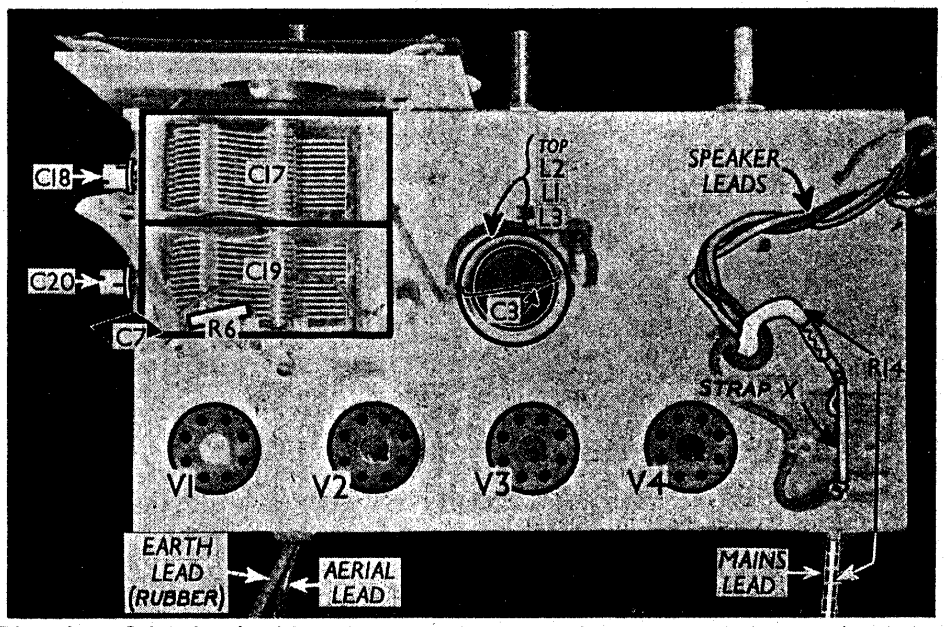
When replacing, connect the three leads as follows, numbering the tags from top to bottom: 1 and 2, joined together, black; 3, yellow; 4, red.

Removing Speaker.—To remove the speaker from the case, unsolder the three speaker leads as before and remove the two nuts holding the speaker frame to the sub-baffle at the front of the case, when the speaker can be withdrawn. This can be done without first removing the chassis if **V3** and **V4** are withdrawn from their sockets, but access to the fixing nuts is easier if the chassis has first been freed.

When replacing, see that the transformer is on the right of the speaker and connect the leads as detailed above.

VALVE ANALYSIS

Valve voltages and currents given in the table overleaf are those measured in our receiver when it was operating on mains of 222V. The receiver was tuned to the lowest wavelength on the medium band



Plan view of the chassis. Note the strap **X** connected between two tags on an insulating panel on the right.

and the gain control was advanced to a point just short of oscillation, 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 6K7G	167	1·8	126	0·425
V2 6J7G	23	0·7	15	0·2
V3 25A6G	203	32·0	136	6·0
V4 25Z6G†	—	—	—	—

† Cathode to chassis 237 V DC.

GENERAL NOTES

Switches.—**S1, S2** are the waveband switches, ganged in a small rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram in column 2, where it is drawn as seen looking from the rear of the underside of the chassis. Both switches are closed on MW, and open on LW.

S3 is the QMB mains switch, ganged with the gain control **R3.**

Coils.—**L1-L3** are in an unscreened tubular unit on the chassis deck, while **L4, L5** are in a similar unit beneath the chassis.

External Speaker.—No provision is made for this, but a low impedance

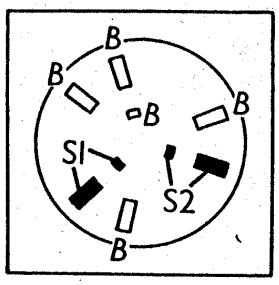


Diagram of the two wavechange switches, as seen from the rear of the underside of the chassis.

(2-4O) type could be connected across the two tags to which the internal speaker speech coil is connected. Do not use a high impedance speaker on this model, as it would not be isolated from the mains.

Resistance R14.—This is of the line cord type, incorporated in the mains lead. This lead contains three wires. The first, black rubber covered, goes direct to one side of **S3.** The other two (red rubber, and resistance wire spiralled on an asbestos core, both asbestos covered) are joined together at the plug end, while at the chassis end the red rubber lead goes to one end of **R13,** while the resistance wire (**R14**) goes to a tag insulated from chassis, and thence, through strap **X,** to the heater circuit.

Strap X.—This is a piece of wire normally joining two tags on a panel on the chassis deck, which are in series with the heater circuit. On 200-240 V mains the strap remains in position, but on 250 V mains (or on 240 V if the voltage is known to rise above this value) the strap must be removed, and a 60 O 6 W resistor inserted in its place. Two 120 O 3 W resistors in parallel could be used. The resistor can be obtained from the Invicta Service Department, price 2s.

Condenser C3.—This is a small fixed coupling, consisting of one enamelled wire spiralled on another, and mounted at the top of the **L1-L3** coil unit.

Chassis Divergencies.—In some models a 15,000 O 2 W bleeder resistance will be found connected from the HT line to chassis. It was not in our receiver.

In the makers' diagram the top of **R10** is shown connected to the junction of **R9, C10,** and not direct to grid of **V3** as in our chassis and circuit. Trimmers **C18** and **C20** are not shown on the makers' diagram. **C11** may be returned to cathode of **V3** in some models. **C3** is not shown in the makers' diagram.

CIRCUIT ALIGNMENT

With gang at maximum, pointer should indicate 550 m. Connect signal generator to aerial and earth leads, and feed in a 200 m (1,500 KC/S) signal. Switch set to MW, and tune to 200 m on scale. Keeping volume control just below oscillation point, adjust **C18** and **C20** (on gang) for maximum output.

Check at 550 m and on the LW band.

Maintenance Problems

Fading and Instability

I RECENTLY had a Pye Twin-triple mains portable which faded badly and also had bad RF instability. I spent a great deal of time in testing RF circuits and noticed that the anode volts increased on every fade. In desperation, I decided that the trouble could not be in the RF stages, so took readings on the power valve and noticed a fluctuation of anode current also.

When I tested the grid circuit of this valve, I found that the secondary of the AF transformer was O/C.

When a new transformer had been fitted, instability still remained, but *only* when the shield plate which encloses all valves in their compartments was in place, and this was finally traced to the MH4 detector valve, the metallising of which was not earthed. The curious thing was that each valve was totally shielded from each other and yet enough RF could pass along the screen to affect the unearthed metallising. It did not affect the un-metallised valve replacement which was fitted.—**E. B. Ayling, Belmont.**

Leaky IF Trimmers

I HAVE had to test two Philips receivers lately, both with the same fault. A model 588A had new volume control fitted, but still crackled, and the only way the trouble could be traced after it had been localised after the IF valve, was to disconnect individual components back from the grid of the AF valve until crackles ceased, which happened when the IF trimmer was disconnected.

Apparently there was a leak from the high to the low potential trimmers which are mounted back to back on a piece of insulation. Whether a fault is present can be ascertained by connecting an external test trimmer.

A model 580A had a similar fault but the symptoms were different. Although the set was trimmed correctly, it sounded as if it had a very bad aerial with plenty of valve hiss ; the leak in this case was causing a bias in opposition to AVC.

When replacing trimmers it is best to make sure and do both at once.—**E. B. Ayling, Belmont.**

Mains Radiation

I RECENTLY had some trouble with an Ekco UAW78, the customer had moved to a new house, and complained of intermittent reception and strong modulation hum. On test the IF valve proved to be faulty. On return to the client, however, the modulation hum proved to be as bad as ever; moreover it had a peculiar quality in that it varied in intensity.

At this stage there was some doubt as to the cause, as the set was being used on AC mains, while at the workshop, AC was obtained from a converter.

The trouble eventually proved to be strong radiation from the mains and as the usual cures at the set end proved useless, two 0.1 μF condensers were connected across the mains with their centre point to earth, in the manner of an interference filter, and this gave about a 90 per cent. cure.

I should mention that a strong signal from Droitwich was obtained in any of the downstair rooms with no A or E connected, but this vanished, when the by-pass condensers were connected.—**W. Brittain, Lewes.**

SERVICE SHEETS

376-402

(Published since the last complete list was drawn up.)

Receiver	No.
Alba 320, 335, 455 (Battery)	395
Brunswick 39/EH (AC)	390
Burndept 290, 303 (AC)	376
Bush PB53, RG52, RG52G, SUG52 (AC)	381
Cossor 485 (Battery)	377
Decca PT/M (AC)	390
PT/AW, PC/AW, PG/AW (AC)	394
Ekco AW119 (AC)	392
Ever Ready 5117 (AC)	386
Ferguson 702, 705 (AC)	383
Ferranti 617 PB (AC)	382
48 B, 49 B (Battery)	398
G.E.C. BC3960, 3964, 3968 (AC Touchtune 5)	385
H.M.V. 658, 665, 666 (AC)	384
656, 657, 668 (AC)	396
1102 (AC)	402
Invicta 570 (AC)	379
690 Imp (AC/DC)	401
Kolster-Brandes 720 (Battery)	389
Lissen 8402 (AC)	391
McMichael 381, 803 (AC)	399
Marconiphone 855, 868, 869, 870 (AC)	384
858, 853, 871 (AC)	396
874 (AC)	402
Mullard MAS24 (AC), MUS24	397
Philco D732 BG, D732 CG (AC)	387
Philips 650 A (AC)	378
Pilot PT36, PTC36 (AC)	380
T63 (AC)	400
Pye 806, 806 RG (AC)	393
Ultra 400 (AC)	388
Vidor 300 (AC)	376

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