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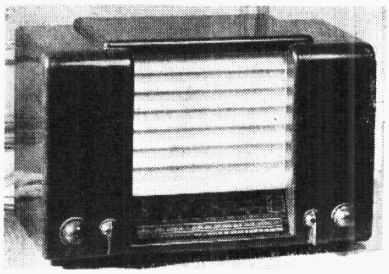
"TRADER" SERVICE SHEET

801

INVICTA MODEL 10



PROVISION for using mains aerial, a gramophone pick-up and an external speaker, and 3-point tone control with negative feedback, are features of the Invicta Model 10, a 3-valve (plus rectifier), 2-band superhet, designed to operate from A.C. mains of 200-250 V, 40-100 c/s.

Release date and original price: June, 1946; £13, plus £2 16s purchase tax.

CIRCUIT DESCRIPTION

Aerial input via coupling coil **L1** to single-tuned circuits **L2, C26** (M.W.) and **L3, C26** (L.W.) which precede triode-hexode valve **(V1, Mullard Metallised ECH35)** operating as frequency changer with internal coupling.

Triode oscillator anode coils **L6** (M.W.) and **L7** (L.W.) are tuned by **C29.** Parallel trimming by **C8, C27** (M.W.) and **C9, C28** (L.W.); series tracking by **C10.** Reaction coupling by grid coils **L4** (M.W.) and **L5** (L.W.).

Second valve **(V2, Mullard metallised EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings.

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode pentode output valve **(V3, Mullard metallised EBL31).** Audio frequency component in rectified output is developed across load resistor **R8,** and passed via **C18,** manual volume control **R9** and grid stopper **R10** to C.G. of pentode section.

I.F. filtering by **C15, R7, C16** in diode circuit and **R10** in pentode C.G. circuit.

Provision for connection of a low impedance external speaker across **T1** secondary, when **S13** may be used to mute the internal speaker.

For pick-up operation the triode section of **V1** is used as an A.F. amplifier, the pick-up output being applied to its control grid via **S5,** and the anode output developed across **R4** being fed via **C11** and **S10** to the manual volume control **R9. S5** and **S10** close when the waveband control is turned to the "gram" position, together with a muting switch **S4.**

Second diode of **V3,** fed from **L11** via **C19,** provides D.C. potential which is developed across load resistor **R13** and fed back through decoupling circuit as G.B. to F.C. and I.F. valves, giving automatic volume control.

The output from **V3** pentode anode is developed across a potential divider comprising **C20, R14, R15, R16, R17** and the tone control switches **S11, S12,** and the fraction of the output appearing across **R17** is fed back in negative phase via **R9** to **V3** C.G. circuit. Bias for the control grid is obtained by returning **R17** to the junction of **R11, R12.**

For tone control purposes the frequency characteristic of the feed-back circuit is modified from the "Brilliance" condition (both switches open) to "Normal" (**S11** closed) and "Mellow" (**S12** closed).

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH35	236	1·0	80	2·7
	Oscillator			
	84	2·5		
V2 EF39	236	4·0	80	1·1
V3 EBL31	225	32·0	236	3·5
V4 AZ31	277†	—	—	—

† 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 223V, using the 216-235V tapping on the mains transformer.

The receiver was tuned to the lowest wavelength on the M.W. band, the volume con-

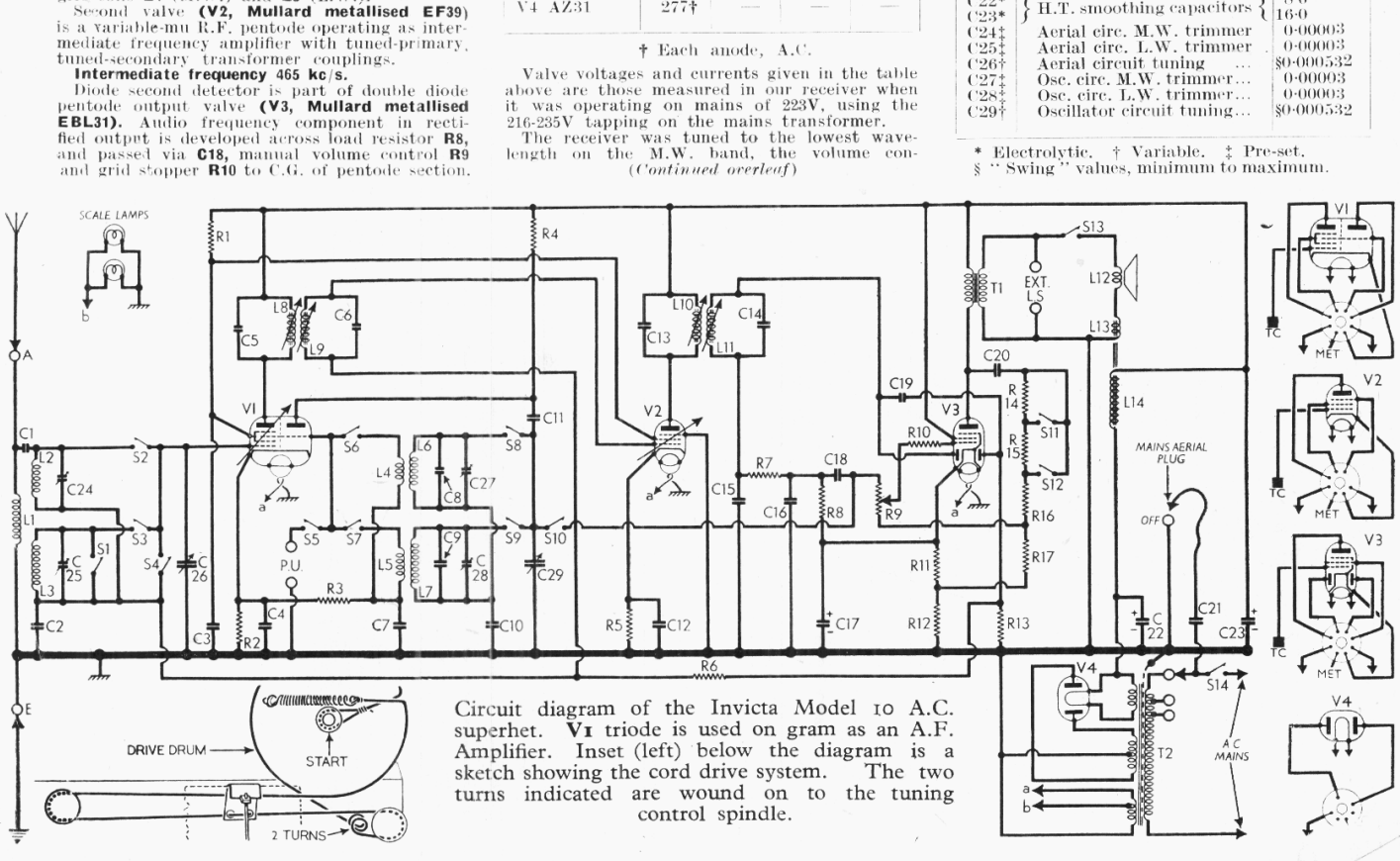
(*Continued overleaf*)

COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	V1, V2 S.G.'s H.T. feed ...	47,000
R2	V1 fixed G.B. resistor ...	330
R3	V1 osc. C.G. resistor ...	47,000
R4	V1 osc. anode H.T. feed ...	47,000
R5	V2 fixed G.B. resistor ...	220
R6	A.V.C. line decoupling ...	1,000,000
R7	I.F. stopper	47,000
R8	V3 signal diode load ...	470,000
R9	Manual volume control ...	1,000,000
R10	V3 pent. grid stopper ...	100,000
R11	V3 pent. G.B. and A.V.C.	150
R12	delay resistors	330
R13	A.V.C. diode load ...	1,000,000
R14	Tone control resistors	100,000
R15		47,000
R16	Feed - back potential	15,000
R17	divider	4,700

	CAPACITORS	Values (μF)
C1	Aerial "top" coupling ...	0·000006
C2	A.V.C. line decoupling ...	0·1
C3	V1, V2 S.G.'s decoupling	0·1
C4	V1 cathode by-pass ...	0·1
C5	1st I.F. transformer tuning	0·00007
C6	capacitors	0·00007
C7	V1 osc. C.G. capacitor ...	0·00015
C8	Osc. M.W. fixed trimmer	0·000022
C9	Osc. L.W. fixed trimmer...	0·00034
C10	M.W. and L.W. tracker ...	0·000657
C11	V1 osc. anode coupling ...	0·001
C12	V2 cathode by-pass ...	0·1
C13	2nd I.F. transformer	0·00014
C14	tuning capacitors ...	0·00014
C15	I.F. by-pass capacitors ...	0·00015
C16		0·00015
C17*	V3 cathode by-pass ...	25·0
C18	A.F. coupling to V3 pent.	0·005
C19	V3 A.V.C. diode coupling	0·000022
C20	Neg. feed-back coupling...	0·01
C21	Mains aerial coupling ...	0·001
C22*	H.T. smoothing capacitors	8·0
C23*		16·0
C24‡	Aerial circ. M.W. trimmer	0·00003
C25‡	Aerial circ. L.W. trimmer	0·00003
C26†	Aerial circuit tuning ...	§0·000532
C27‡	Osc. circ. M.W. trimmer...	0·00003
C28‡	Osc. circ. L.W. trimmer...	0·00003
C29†	Oscillator circuit tuning...	§0·000532

* Electrolytic. † Variable. ‡ Pre-set.
§ "Swing" values, minimum to maximum.



Circuit diagram of the Invicta Model 10 A.C. superhet. V1 triode is used on gram as an A.F. Amplifier. Inset (left) below the diagram is a sketch showing the cord drive system. The two turns indicated are wound on to the tuning control spindle.

DRIVE CORD REPLACEMENT

Although the cord drive system in this

the backing-plate and the scale pointer boss, which goes on next. See also that the flat rubber bands are in position round the vertical ends of the scale to take the

signal, and check calibration.

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	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coil		65·0
L2	Aerial M.W. tuning coil	...	3·7
L3	Aerial L.W. tuning coil	...	12·8
L4	Osc. M.W. reaction coil	...	1·2
L5	Osc. L.W. reaction coil	...	1·6
L6	Osc. M.W. tuning coil	...	2·0
L7	Osc. L.W. tuning coil	...	2·5
L8, L9	1st I.F. trans. Pri.	...	8·5
	Sec.	...	8·5
L10, L11	2nd I.F. trans. Pri.	...	6·0
	Sec.	...	6·0
L12	Speaker speech coil	...	2·0
L13	Hum neutralising coil	...	Very low
L14	Speaker field coil	...	1000·0
T1	Output trans. Pri.	...	270·0
	Sec.	...	0·1
T2	Mains trans. Pri., total	...	18·0
	Heater sec.	...	Very low
	Rect. heat. sec.		Very low
	H.T. sec., total		300·0
S1-S10	Waveband switches	...	—
S11, S12	Tone control switches	...	—
S13	Int. speaker switch	...	—
S14	Mains switch, ganged R9	...	—

Valve Analysis—*Continued*

trol was at maximum and the tone control was at the "Brilliant" setting, but there was no signal input. Voltages were measured on the 400V scale of a model 7 Universal Avometer, chassis being the negative connection.

DISMANTLING THE SET

Removing Chassis.—Remove the two round control knobs (recessed grub screws) and the two bar knobs (pull off);

Remove the four bolts (with steel washers, rubber grommets, and brass sleeves) holding the chassis to the base of the cabinet, when the chassis may be withdrawn to the extent of the speaker leads.

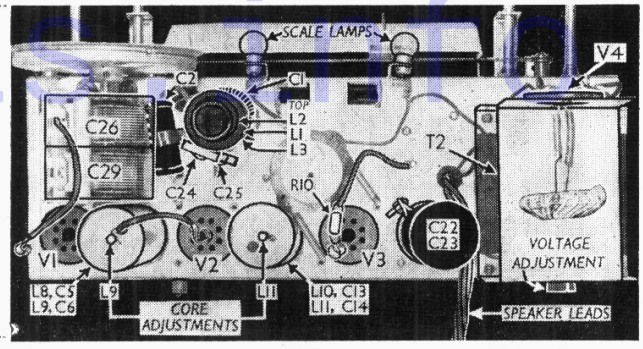
To free the chassis entirely, unsolder from the two connecting panels on the speaker the four leads joining them to the chassis.

When replacing, connect the yellow and green leads from chassis to the left-hand and right-hand tags on the field coil assembly respectively, and the red and black leads to the similarly coloured field coil leads at the connecting strip mounted under the upper right-hand speaker fixing nut.

Two of the specially shaped rubber washers should be fitted to each chassis bolt, one going each side of the base of the cabinet, with a brass distance piece between them; a flat steel washer fits beneath the head of each bolt. This operation is simplified if the two front rubber washers are placed in position inside the cabinet before inserting the chassis.

Removing Speaker.—Remove the nuts from the four bolts holding the speaker to the sub-baffle.

When replacing, the connecting panel should be at the top, and the field coil connecting strip should be mounted beneath the upper right-hand speaker fixing nut. If the leads have been unsoldered they should be reconnected as previously described.



Plan view of the chassis. **R10** is mounted in the top cap lead to **V3** and covered with sleeving. **C1** is made of enamelled wires. The mushroom-like object attached to **V4** holder is a valve retaining hood.

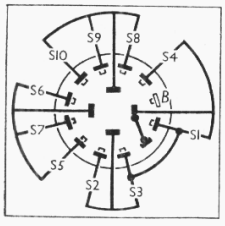


Diagram of the **S1-S10** switch unit, seen from the rear. Below is the associated switch table.

Switch	M.W.	L.W.	Gram.
S1	C	—	—
S2	C	—	—
S3	—	C	—
S4	—	—	C
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	C	—	—
S9	—	C	—
S10	—	—	C

GENERAL NOTES

Switches.—**S1-S10** are the waveband and gramophone pick-up switches, ganged in a single rotary unit beneath the chassis. This is indicated in our under-chassis illustration, and shown in detail in the diagram above, where it is drawn as seen from the rear of an inverted chassis.

The table above gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C**, closed.

S11, S12 are the tone control switches, in a second unit beneath the chassis. The three positions, starting from the anti-clockwise position of the control, are: Mellow (**S12** closed); Normal (**S11** closed); Brilliance (both switches open).

External Speaker.—Two sockets are provided for the connection of a low impedance (about 2Ω) external speaker.

Scale Lamps.—These are two Osram M.E.S. types, with large spherical bulbs, rated at 6.2V, 0.3A. They are run from a special tapping on the heater secondary of **T2**.

Capacitors C22, C23.—These are two dry electrolytics in a single tubular metal container mounted on the chassis deck, with three connecting tags at one end. The red tag is the positive of **C22** (8μF, 450V, D.C. working, surge proof); the yellow one is the positive of **C23** (16μF, 450V, D.C. working, 500V peak); the black tag is the common negative. Our sample was a Hunts K10.

Drive Cord Replacement.—This requires 50 inches of cord (Cutty Hunk fishing twine will do), which should be fitted as shown in the sketch beneath the circuit diagram overleaf.

CIRCUIT ALIGNMENT

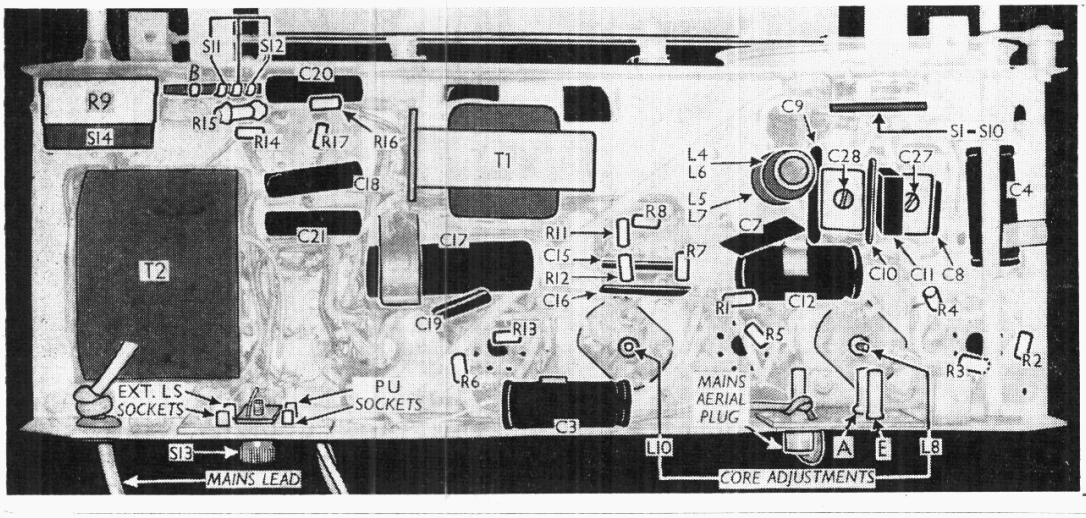
These operations may be carried out while the chassis is in the cabinet, holes being provided in the bottom to give access to these adjustments which are beneath the chassis.

I.F. Stages.—Connect signal generator via a 0.1μF capacitor to control grid (top cap) of **V1** and chassis, and connect a 100,000Ω resistor also between these points. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L8, L9, L10** and **L11** for maximum output. A slotted ebonite rod makes a suitable trimming tool. Remove shunt.

R.F. and Oscillator Stages.—Transfer signal generator leads to **A** and **E** sockets, and see that the pointer coincides with the ends of the two scales when the gang is at maximum.

M.W.—Switch set to M.W., tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C27**, then **C24**, for maximum output. Check calibration at 500 m (600 kc/s).

L.W.—Switch set to L.W., tune to 1,200 m on scale, feed in a 1,200 m (250 kc/s) signal, and adjust **C28**, then **C25**, for maximum output. Check calibration at 2,000 m (150 kc/s).



Under-chassis view. The waveband switch unit **S1-S10** is indicated here by an arrow which indicates the direction in which it is viewed in the diagram in col. 2 above. **R3** and **R6** cannot be seen in the actual chassis as they are enclosed in sleeving.

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