"TRADER" SERVICE SHEET

941

INVICTA 55

A.C./D.C./A.D. "TWINVICTA"

FOUR all-dry battery valves and a metal rectifier are used in the Invicta 55, which is also known as the "Twinvicta," a 2-band portable superhet designed to operate from self-contained batteries or A.C. or D.C. mains of 110 V and 200-240 V, 40-100 c/s in the case of A.C. The waveband ranges are 200-550 m and 1,000-2,000 m.

A safety device disconnects the mains lead from the chassis when the case is opened. The case has to be opened to change over from mains to battery operation, as the control is mounted on the chassis deck inside the case. The makers warn against the use of an external aerial or earth with this receiver.

Release date and original price: August, 1949; £11 10s 8d (without batteries) plus purchase tax.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1, C25** (M.W.) or **L1, L2, C25** (L.W.) precedes a heptode valve **(V1, Mullard DK91)** operating as frequency changer with electron coupling.

Oscillator grid coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C26**. Parallel trimming by **C27** (M.W.) and **C7, C28** (L.W.), with series tracking by **C6** (M.W. and L.W.). Inductive reaction coupling by oscillator anode coil **L5** (M.W. and L.W.).

Second valve **(V2, Mullard DF91)** is a variable-mu **R.F.** pentode operating as intermediate frequency amplifier with tuned transformer couplings **C2, L6, L7, C3** and **C9, L8, L9, C10,** in which the tuning capacitors are fixed and alignment adjustments are effected by varying the positions of the iron-dust cores.

Intermediate frequency 470 kc/s.

Diode second detector is part of single diode R.F. pentode valve **(V3, Mullard DAF91).** Audio frequency component in rectified output is developed across manual volume control **R7,** which is also the diode load resistor, and passed via A.F. coupling capacitor **C14** to control grid of pentode section, which operates as A.F. amplifier.

D.C. potential developed across **R7** is tapped off and fed back through decoupling circuits as G.B. to F.C. valve giving automatic gain control for **V1.** A.G.C. for **V2** is provided by **R3, C5** along which grid current developes a potential between C.G. and filament when a strong enough signal arrives. The positive potential of **V2** in the filament series precludes the use of the existing A.G.C. circuit.

Resistance-capacitance coupling by **R10, C17** and **R12** between **V3** anode and pentode output valve **(V4, Mullard DL92).** Fixed tone correction in anode circuit by **C19.**

When the mains/battery change-over switch **S4-S9** is turned to the "battery" position, the switches marked **(B)** in the circuit diagram close, connecting the filaments of **V1, V2** and **V3** in series and at the same time placing them in parallel with the dual filaments of **V4** and **R15,** the whole circuit being connected across a 4.5 V dry L.T. battery in a series/parallel circuit. In the "mains" position, the switches marked **(M)** close instead, connecting the mains via

(Continued Col. 1 overleaf)

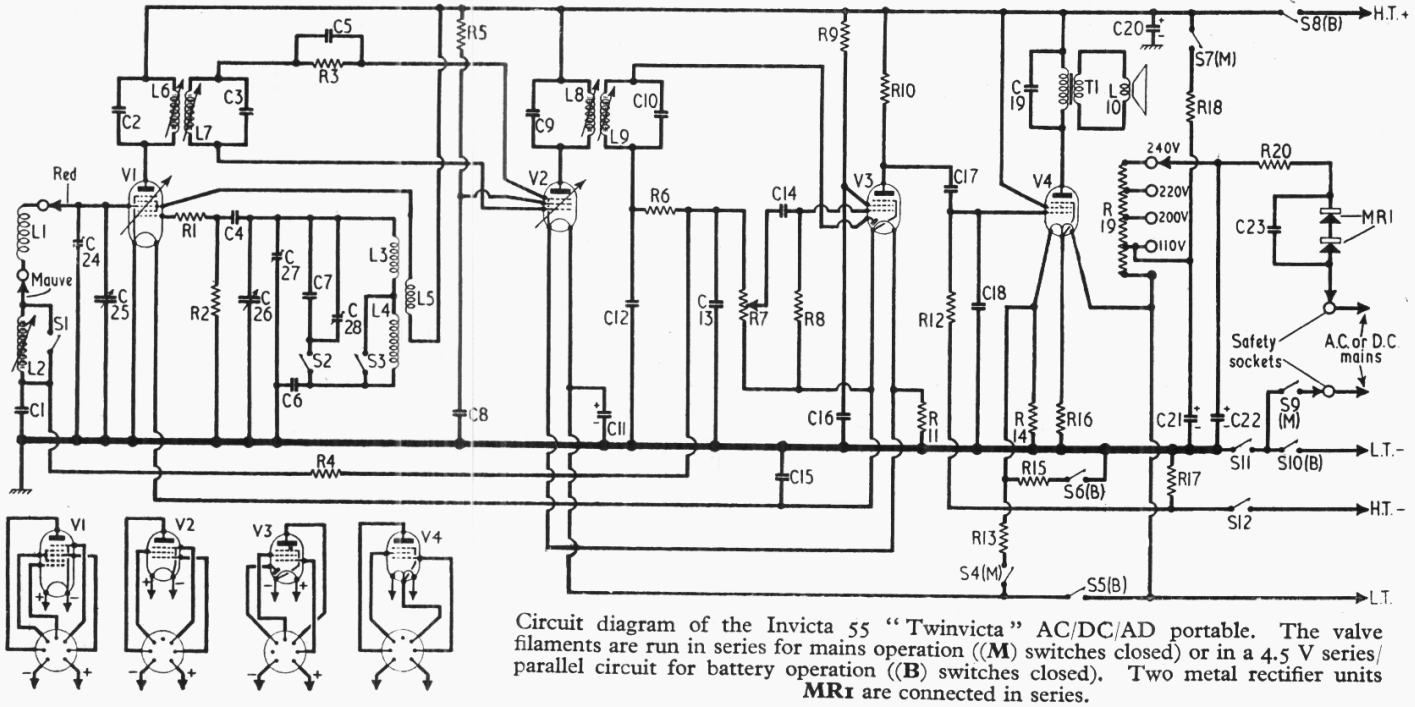
COMPONENTS AND VALUES

	RESISTORS	Values (ohms)	Locations
R1	V1 osc. stabilizer ...	10,000	E6
R2	V1 osc. C.G. ...	110,000	E6
R3	V2 grid leak ...	2,200,000	F6
R4	A.G.C. decoupling	2,200,000	F4
R5	V2 S.G. H.T. feed	220,000	G6
R6	I.F. stopper ...	47,000	G5
R7	Volume control ...	1,000,000	E4
R8	V3 pent. C.G. ...	4,700,000	G6
R9	V3 S.G. H.T. feed	3,300,000	H6
R10	V3 pent. anode load	390,000	H6
R11	Filament shunt ...	1,000	H6
R12	V4 C.G. resistor ...	1,000,000	H6
R13	V4 G.B.	47	H5
R14	Filament shunt	1,000	H6
R15	Filament ballast	27	H5
R16	Filament shunt ...	2,200	H6
R17	V4 G.B. resistor	560	H6
R18	H.T. smoothing ...	3,300	B1
R19	Ballast resistor ...	§4,150	A2
R20	Surge limiter ...	39	B2

§ Tapped at 2,200 Ω + 1,150 Ω + 400 Ω + 400Ω from V4 filament.

	CAPACITORS	Values (μF)	Locations
C1	A.G.C. decoupling	0·1	F4
C2	1st I.F. trans. tun.	0·0001	C3
C3	1st I.F. trans. tun.	0·0001	C3
C4	V1 osc. C.G. ...	0·00014	D3
C5	V2 G-B shunt ...	0·01	F6
C6	M.W. and L.W. tracker	0·0005	D2
C7	L.W. fixed trimmer	0·0003	D2
C8	V2 S.G. decoup. ...	0·05	G6
C9	2nd I.F. trans. tun.	0·0001	B3
C10	2nd I.F. trans. tun.	0·0001	B3
C11*	Filament smoothing	100·0	F6
C12	I.F. by-passes ...	0·0001	G5
C13	I.F. by-passes ...	0·0001	G5
C14	A.F. coupling ...	0·01	G6
C15	Filament by-pass ...	0·05	E6
C16	V3 S.G. decoup. ...	0·01	H6
C17	A.F. coupling ...	0·01	H6
C18	I.F. by-pass ...	0·0001	H6
C19	Tone corrector ...	0·01	C1
C20*	H.T. smoothing	30·0	A1
C21*	H.T. smoothing	40·0	A1
C22*	H.T. smoothing ...	40·0	A1
C23	R.F. by-pass ...	0·05	C2
C24‡	Aerial M.W. trim.	0·00005	D1
C25†	Aerial tuning ...	—	D2
C26†	Oscillator tuning ...	—	D2
C27‡	Osc. M.W. trim. ...	0·00005	D1
C28‡	Osc. L.W. trim. ...	0·00017	C2

* Electrolytic. † Variable. ‡ Pre-set.

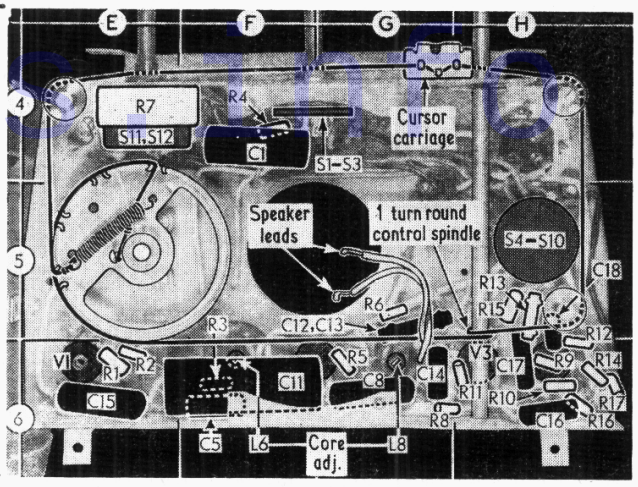


Circuit diagram of the Invicta 55 "Twinvicta" AC/DC/AD portable. The valve filaments are run in series for mains operation ((**M**) switches closed) or in a 4.5 V series/parallel circuit for battery operation ((**B**) switches closed). Two metal rectifier units **MR1** are connected in series.

Supplement to The Wireless & Electrical Trader, February 4, 1950

	OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	M.W. frame aerial		1.5	D2
L2	L.W. loading coil		28·0	D3
L3	Oscillator		2·0	C2
L4	Tuning coils		0·4	C2
L5	Osc. reaction coil		8·6	C2
L6	1st I.F. trans	Pri.	10·0	C3
L7	1st I.F. trans	Sec.	10·0	C3
L8	2nd I.F. trans.	Pri.	10·0	B3
L9	2nd I.F. trans.	Sec.	10·0	B3
L10	Speech coil	—	2·6	—
T1	O/put trans.	Pri	675·0	C1
		Sec.	0·5	
S1-S3	W/band switches		—	G4
S4–S10	Mains/Battery switches		—	H5
S11, S12	On/Off switches g'd R7		—	E4

Front view of the chassis, showing the underside of the chassis deck with the speaker removed. The course of the tuning drive cord is clearly seen. **C12, C13** (location **G5**) form a single unit with a common earth tag.



Circuit Description—(*Continued*)

S9(M), and connecting all the filaments in series via **S4(M).** H.T. current is then supplied by the metal rectifier **(MH1,** two **S.T.C. R.M.1's)** via **S7(M).**

The filaments are fed via ballast resistor **R19** from the smoothed H.T. circuit, but the H.T. current from the valves, which would otherwise overheat the frail filaments, is shunted past them via **R11, R14** and **R16,** while additional L.T. smoothing is provided by **C11. V4** G.B. potential on battery operation is obtained from the voltage drop along **R17,** but on mains it is derived from the potential of the filaments in the series chain. **S11, S12** are the on/off switches which operate on both positions of the mains/battery switch.

GENERAL NOTES

Switches.—**S1-S3** are the waveband switches, ganged in a single rotary unit beneath the chassis. The unit is indicated in our underside view of the chassis, and shown in detail in the upper diagram in col. 2 as seen from the rear of an inverted chassis. In the M.W. (clockwise) position of the control, **S1** and **S3** close. In the L.W. position **S2** closes.

S4(M)-S10(B) are the mains/battery changeover switches, in a second rotary unit beneath the chassis. This unit is indicated in our under-chassis view and shown in detail, viewed in the same direction as seen in the photograph, in the lower diagram in col. 2. The action of these switches is indicated by the letters **(M)** and **(B)** which show that they close on mains (control knob anti-clockwise) or battery (knob clockwise) respectively.

S11, S12 are ganged with the volume control **R7.** They control the power supply to the receiver on mains or battery operation.

Batteries.—No particular batteries are specified by the makers, but types similar to the Ever Ready "Batrymax" B101, rated at 67.5 V, are suitable for high tension supply. The L.T. unit is rated at 4.5 V, of the Ever Ready AD28 type.

In the absence of an L.T. unit, its connecting plug should be inserted in the parking socket provided for it, as otherwise its positive pin might come into contact with the chassis and short-circuit **V4** filament to chassis during mains operation. It should be noted that this does not cause any damage beyond annoying the user.

Chassis Divergencies.—In some early chassis a 27,000 Ω grid stopper was inserted in **V4** C.G. lead, or a 0.0001 μF capacitor was connected between **V4** anode and chassis, instead of our **C18.** Some chassis had none of these components.

At one time H.T. current was fed to **L5** from **V2** S.G. supply via a 10,000 Ω resistor and a 0.05 μF. **R5,** which feeds **V2** S.G., has in the past been 10,000 Ω and 100,000 Ω, but it is now settled at 220,000 Ω. **C17** was originally 0.01 μF, as it is now, but at one intermediate period it was 0.002 μF.

Drive Cord Replacement.—About four feet of Nylon braided glass yarn is required for the drive cord, which should be run as shown in our photograph of the underside of the chassis, where the gang is at maximum capacitance.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers when the receiver was operating from a set of new batteries. Voltages were measured on the 120 V scale of a model 40 Avometer, chassis being the negative connection.

A similar set of readings, taken when the receiver was operating from A.C. mains of 230 V with the mains adjustment set for 240 V, were approximately 15 per cent higher.

Valves	Anode		Screen	
	V	mA	V	mA
V1 DK91	55	0·6	55	1·2
V2 DF91	55	1·2	5	1·1
V3 DAF91	3	0·2	*	*
V4 DL92	50	6·0	55	1·2

* Negligible readings.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub screws);
remove carrying handle by pressing on the key-hole connectors at each end of the handle, and fold open the two halves of the carrying case;
remove batteries and battery clip (four wood screws);
remove the two chrome half-handle retainers (two 4BA nuts, two washers, a paxolin collar, and a rubber grommet each) when the tuning scale will also be freed;
unscrew two wood screws holding two brackets to a wooden batten underneath the chassis and withdraw the chassis downwards (away from the control panel) at the same time tilting the back upwards.
When replacing, the chassis should be replaced before the battery clip is screwed into position.

Removing Speaker.—This is removed from the carrying case with the chassis, and can be separated from the latter by removing two screws from the perimeter of the speaker chassis, and freed entirely by unsoldering the speaker leads.

CIRCUIT ALIGNMENT

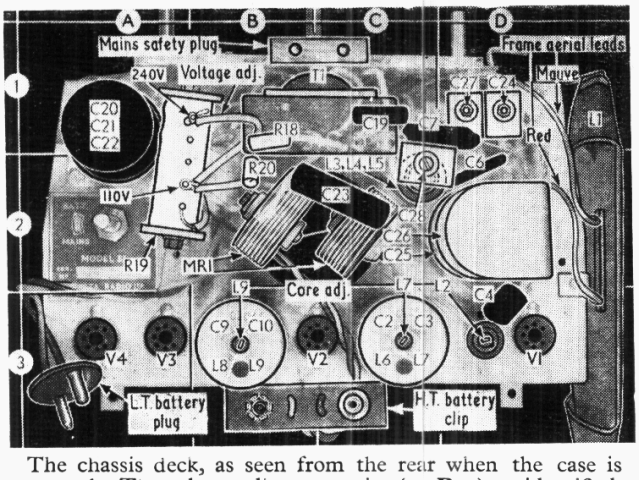
R.F. and oscillator adjustments can be made without removing the chassis from its case, but if I.F. adjustments are required the chassis, complete with frame aerial, must be removed.

I.F. Stages.—Switch set to M.W., turn gang to minimum capacitance and volume control to maximum, switch set to battery operation and connect signal generator, via a 0.01 μF capacitor in the "live" lead to the control grid (pin 6) of **V1** and chassis. Feed in a 470 kc/s (638.3 m) signal, and adjust the cores of **L9, L8, L7** and **L6** (Location references B3, G6, C3 and F6 for maximum output. Repeat these adjustments until no improvement results.

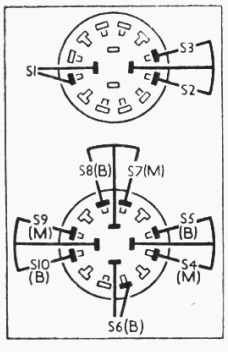
R.F. and Oscillator Stages.—With the chassis out of its cabinet the scale should be replaced in its normal position, resting on the two scale brackets. The cursor should then be just obscured by the high and low wavelength ends of the tuning scales at maximum and minimum capacitance of the gang respectively. The cursor carriage may be adjusted in position by sliding it along the cursor drive cord. The signal generator should be connected to a loop placed approximately 12in from the frame aerial.

M.W.—With the set still switched to M.W., tune to 210 m on scale, feed in a 210 m (1,429 kc/s) signal, and adjust **C27** (D1) and **C24** (D1) for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and check calibration.

L.W.—Switch set to L.W., tune to 1,250 m on scale, feed in a 1,250 m (240 kc/s) signal and adjust **C28** (C2) for maximum output. Tune to 1,800 m on scale, feed in on 1,800 m (166.7 kc/s) signal and adjust **L2** (D3) for maximum output. Repeat these adjustments until no improvement results.



The chassis deck, as seen from the rear when the case is opened. The voltage adjustment pins (on **R19**) are identified.



Diagrams of the waveband switch unit (above) and mains/battery changeover switch unit. The (M) switches of the latter close for mains operation and the (B)'s for battery.

Printed in England by The Cornwall Press Ltd., Paris Garden, London. S.E 1