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"TRADER" SERVICE SHEET

1552

INVICTA 322

Transistor Portable Radio

INVICTA 322 is a portable radio receiver employing a six-transistor circuit incorporated on a printed panel. It is designed for Medium and Long wave reception covering the ranges 183-555m (M.W.) and 1,180-2,060m (L.W.) and is powered by a single 9v battery. It is fitted with an internal ferrite rod aerial and a socket for the connection of an external aerial if required.

Release date and original price: December 1961, £12 4s 5d. Purchase tax extra.

TRANSISTOR ANALYSIS

Transistor voltages given in the table col. 2 were derived from information supplied by the manufacturers. They were measured on a 20,000Ω/voltmeter with the receiver tuned to a quiet spot near 450m and the volume control set at minimum output. All voltages are negative with respect to chassis.

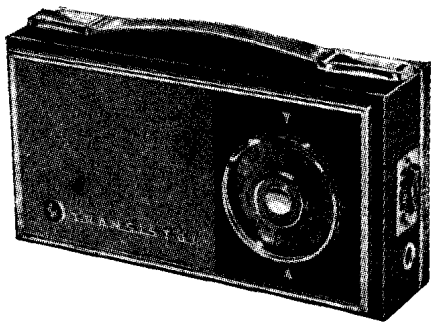
Transistor Table

Transistor	Emitter (V)	Base (V)	Collector (V)
VT1 NKT 152	0·90	0·85	6·4
VT2 NKT 153/35	0·65	0·70	7·2
VT3 NKT 154/35	0·95	1·0	7·2
VT4 NKT 254	1·4	1·4	8·8
VT5 NKT 251	—	0·15	9·0
VT6 NKT 251	—	0·15	9·0

CIRCUIT DESCRIPTION

VT1 operates as a self-oscillating mixer and receives the R.F. signal from the ferrite rod aerial **L2** (M.W.) or **L4** (L.W.) or from an external aerial via the coupling coil **L1**. The appropriate aerial section is selected by switches **S3** and **S4**. **L8** in conjunction with **C7, C8** and **C9** (M.W.), with **C10** and **C11** added in parallel (L.W.), is tuned at local oscillator frequency. The heterodyne signal is generated by feedback from collector to emitter of **VT1** and is injected via **L7** at the emitter.

The resultant I.F. signal developed in the first I.F. transformer **L9/L10** is at 470kc/s.



Appearance of the 322

The I.F. signal is fed to the base of **VT2** and receives two further stages of amplification by **VT2** and **VT3** which are coupled by transformer **L11/L12**. **L9, L11** and **L13** are matched to the low output impedance of their associated transistor by suitable tappings. Amplified output from **VT3** is fed to the detector diode **MR1** which is connected in the secondary winding **L14**. Rectified audio signals are developed across **R12** and the volume control **RV1**. Rectified carrier signals produce a positive D.C. voltage at the junction of **R12** and **RV1** which is filtered by **R5** and **C12** and applied to the base of **VT2** as A.G.C. bias.

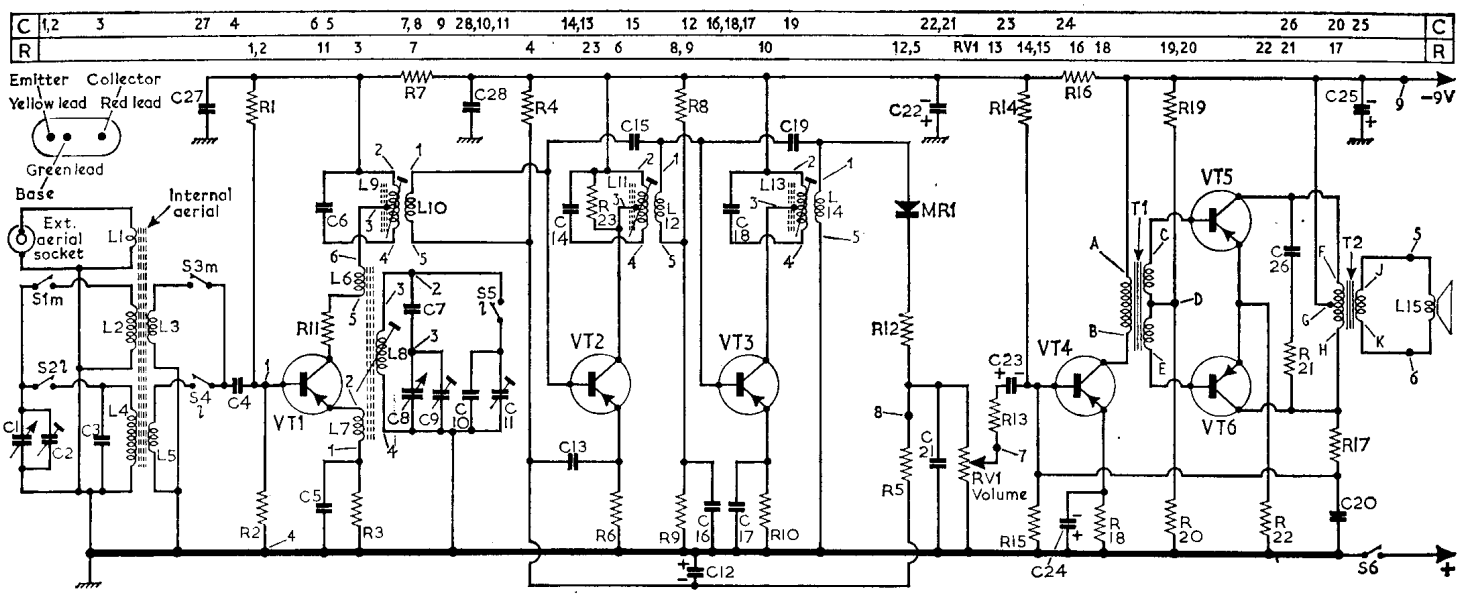
From the slider of **RV1** the audio signal is fed via coupling capacitor **C23** to the base of driver transistor **VT4**. The primary winding of **T1** is connected in **VT4** collector circuit and the secondary winding is centre-tapped to feed the output transistors **VT5** and **VT6** in anti-phase. Output is fed to the loudspeaker **L15** via the push-pull output transformer **T2**. A portion of output is returned via **R17** to the base of **VT4** as negative feedback.

(*Continued overleaf col. 1*)

Resistors			C4	0·04μF	A2	L4	11·2	D3
R1	56kΩ	A2	C5	0·01μF	B2	L5	—	D3
R2	10kΩ	A2	C6	250pF	B2	L6	—	B2
R3	3·3kΩ	B2	C7	286pF	A2	L7	—	B2
R4	68kΩ	B2	C8	229pF	A2	L8	—	A2
R5	8·2kΩ	B2	C9	25pF	A2	L9	—	B2
R6	680Ω	B2	C10	200pF	A1	L10	—	B2
R7	4·7kΩ	B2	C11	80pF	A1	L11	—	C2
R8	22kΩ	B2	C12	8μF	B2	L12	—	C2
R9	4·7kΩ	C2	C13	0·04μF	B2	L13	—	C2
R10	1kΩ	C2	C14	250pF	C2	L14	—	C2
R11	390Ω	A2	C15	175pF	C2	L15	3·0	—
R12	470Ω	C2	C16	0·04μF	C2			
R13	2·2kΩ	B2	C17	0·1μF	C2	***Transformers****		
R14	68kΩ	B2	C18	250pF	C2	T1 Pri	153·0	C1
R15	22kΩ	C1	C19	60pF	C2	T1 Sec	37·0	C1
R16	680Ω	C1	C20	0·03μF	C2	T1 Sec	37·0	C1
R17	1MΩ	B1	C21	0·03μF	C2	T2 Pri	3·6	B1
R18	1kΩ	C1	C22	100μF	B1	T2 Pri	3·6	B1
R19	4·7kΩ	C1	C23	8μF	B1	T2 Sec	0·22	B1
R20	91Ω	C2	C24	100μF	C1			
R21	100Ω	B1	C25	100μF	C1	***Miscellaneous***		
R22	4·7Ω	B1	C26	0·25μF	A1	MR1	NKT155	C2
R23§	4·7kΩ	B2	C27	0·04μF	B2	S1-S5	—	A1
RV1	5kΩ	A1	C28	0·04μF	B2	S6	—	A2
Capacitors			***Coils****					
C1	344pF	A2	L1	—	D3			
C2	25pF	A2	L2	1·4	E3			
C3	82pF	D3	L3	—	E3			

**Approximate D.C. resistance in ohms.*

§In some receivers only.



Circuit diagram of Invicta 322. **R23** *in* **VT2** *collector circuit is omitted from some receivers*

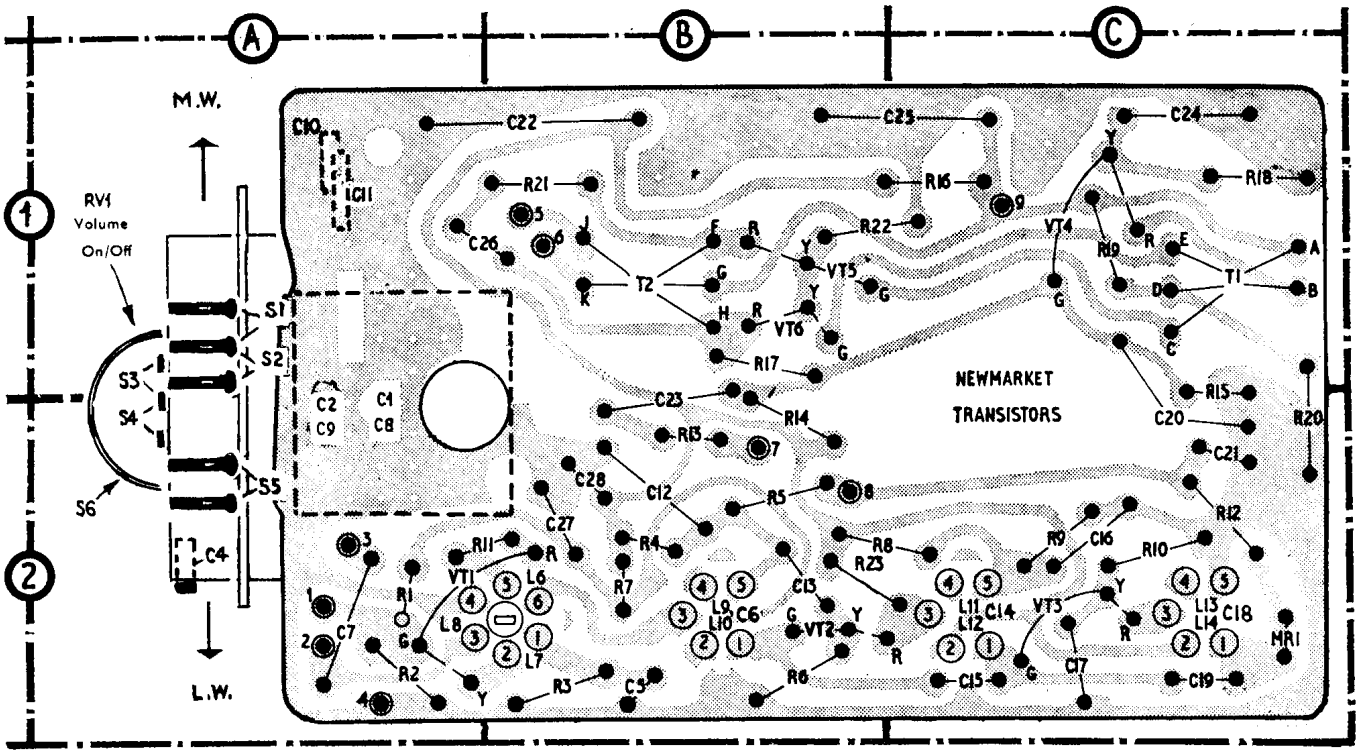


Illustration of the foil side of the printed circuit panel giving the component connections

(Continued from overleaf)

CIRCUIT ALIGNMENT

Equipment Required.—A signal generator with a 30 per cent modulated output at 1,000c/s or 400c/s; an output meter or a 0-5V A.C. voltmeter; an R.F. coupling coil; two 0.1μF capacitors and a bladed type insulated trimming tool.

1.—Connect the output meter in place of the loudspeaker, or the 0-5 A.C. voltmeter across the loudspeaker speech coil. Set the volume control to maximum output.

2.—Switch receiver to M.W. and tune to a quiet spot around 450m. Insert a 0.1μF. capacitor in each generator lead and connect the generator across **L3.**

3.—Feed in a 470kc/s signal and adjust the generator for an output of 50mW in the output meter (0.5V on the A.C. voltmeter). adjust the cores of **L13** (location reference D3), **L11** (D3) and **L9** (E3) in that order for maximum output. Repeat as necessary.

4.—Disconnect the signal generator and output meter and replace the printed panel in the case. Fit the tuning knob so that with the gang fully meshed, the datum marks line up with the studs on the case.

5.—Connect the signal generator output leads to the R.F. coupling coil and place the coil at a distance of approximately 12in from the centre of ferrite rod, coaxial with the rod on the **L2** side. Connect the output meter at the panel end of the loudspeaker leads.

Note: The oscillator coil **L8** can be adjusted through the foil side of the printed panel and capacitors **C2** and **C9** through the escutcheon aperture. **C2** is the upper adjustment.

6.—Tune receiver to 500m. Feed in a 500kc/s signal and adjust **L8** (A2) and **L2** (E3) for maximum output.

7.—Tune to 200m, feed in a 1,500kc/s signal and adjust **C9** for maximum output. Tune to 214.3m, feed in 1,400kc/s signal and adjust **C2** for maximum output.

8.—Repeat operations 6 and 7 until no further improvement can be obtained.

9.—Switch receiver to L.W. and tune to 1,400m. Feed in a 214.3kc/s signal and adjust **C11** (A1) and **L4** (D3) for maximum output.

Where it is not convenient to use the coupling loop method of signal injection (the preferred method), the external aerial socket may be used although this may introduce an error at the H.F. end of the M.W. band.

DISMANTLING

Release two coin slotted screws in the back cover, disengage the lower clip, then remove the cover.

Remove the side control escutcheon held by two wood screws.

Using fine nose pliers or tweezers, undo the central special screw holding the tuning knobs.

Pull off the outer tuning knob then line up the "flats" on the outer section of the tuning spindle with those on the inner section to enable the scale knob to be removed

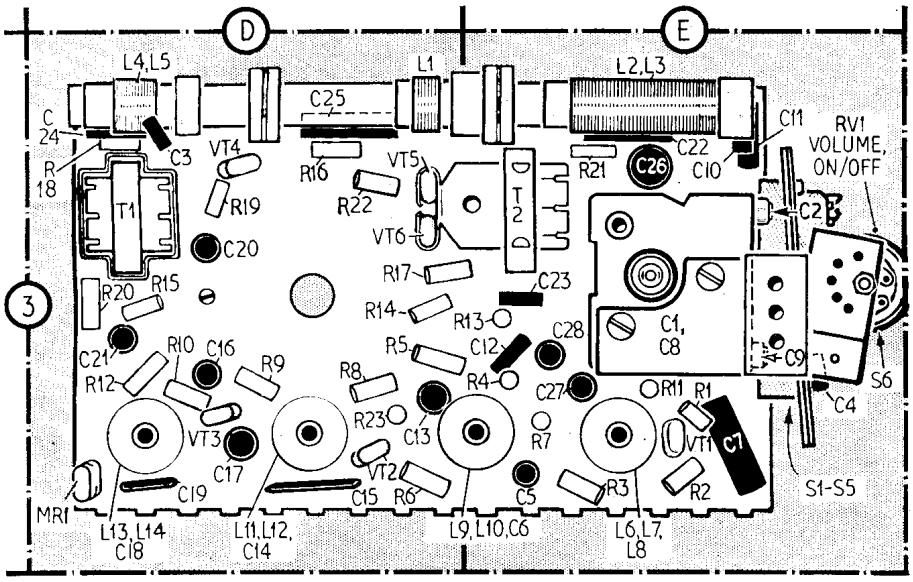
Remove the screw exposed by removal of the scale knob.

From the rear of the printed panel remove the screw in the cable clamp and lift out the chassis to the extent of the speaker leads.

When replacing the side escutcheon ensure that the switch slider slot is in line with the switch arm before pressing home.

BATTERY

Ever-Ready PP7, Drydex DT7, Vidor T6007 or 9V equivalent.



Front, or component side, view of the chassis removed from its cabinet

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