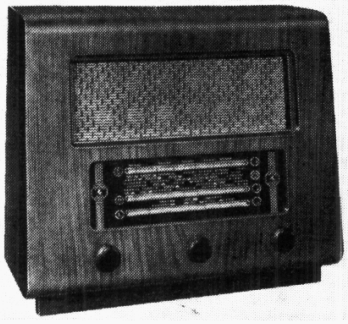
"TRADER" SERVICE SHEET

1004

INVICTA "STATIONMASTER"

3-band A.C. Superhet



THE Invicta model 15 "Stationmaster" is a 3-valve (plus rectifier) 3-band superhet designed to operate from A.C. mains of 200-260 V. The waveband ranges are 14-48 m, 185-550 m and 900-2,000 m.

The mains transformer is double-wound, and a special circuit is used to delay A.G.C. action. Provision is made for using a pick-up, the frequency changer triode acting as its pre-amplifier.

Release date and original price: November 1950, £15 2s 9d. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.), **L2** (M.W.) or **L3** (L.W.) to single tuned circuits **L4, C26** (S.W.), **L5, C26** (M.W.) and **L6, C26** (L.W.), which precede triode hexode valve **(V1, Mullard ECH42).**

Oscillator grid coils **L7** (S.W.), **L8** (M.W.) and **L9** (L.W.) are tuned by **C27.** Parallel trimming by **C28** (S.W.), **C29** (M.W.) and **C9** (L.W.); series tracking by **C10** (S.W.), **C11** (M.W.) and **C12** (L.W.). Reaction coupling from anode across the common impedance of the trackers, with the addition of inductive coupling by **L10** (S.W.) and **L11** (M.W.).

Intermediate frequency amplifier is part of double diode R.F. pentode valve **(V2, Mullard EBF80)** with tuned transformer couplings.

Intermediate frequency 420 kc/s.

Detector diode section of **V2** develops the A.F. component in its rectified output across load resistor **R11,** which is then passed via **C19** and volume control **R12** to control grid of pentode output valve **(V3, Mullard EL41).** I.F. filtering by **C17, R10** and **C18.** D.C. potential developed across **R11** is fed back as bias to F.C. and I.F. valves giving automatic gain control.

A.G.C. delay is achieved by holding down the junction of **R8** and **R9** to chassis potential until the signal voltage at the detector reaches a predetermined value. **R7, R9** and **R11** form a potential divider across the H.T. circuit, and in the absence of a signal the delay diode anode is positive with respect to its cathode and conducts, forming a low-resistance path from junction **R7, R8, R9** to chassis.

With a rising negative voltage across **R11** as the signal strength increases, the delay diode anode become less positive until at length, when the signal strength is great enough, the positive potential is completely neutralized, and the diode ceases to conduct. This frees the A.G.C. line, which becomes more negative in proportion to the strength of the signal.

Provision is made for the connection of a gramophone pick-up, and when the waveband switch is turned to Gram, **S12** opens and **S13** closes, connecting the pick-up into the grid circuit of **V1** triode section, which then operates as A.F. amplifier. **S11** opens and **S10** closes to provide automatic bias across **R3. S23** opens and the A.F. signal developed across **R6** is passed via **C13** and **S24** to the grid circuit of **V3.** Tone correction in **V3** anode circuit by **C20.**

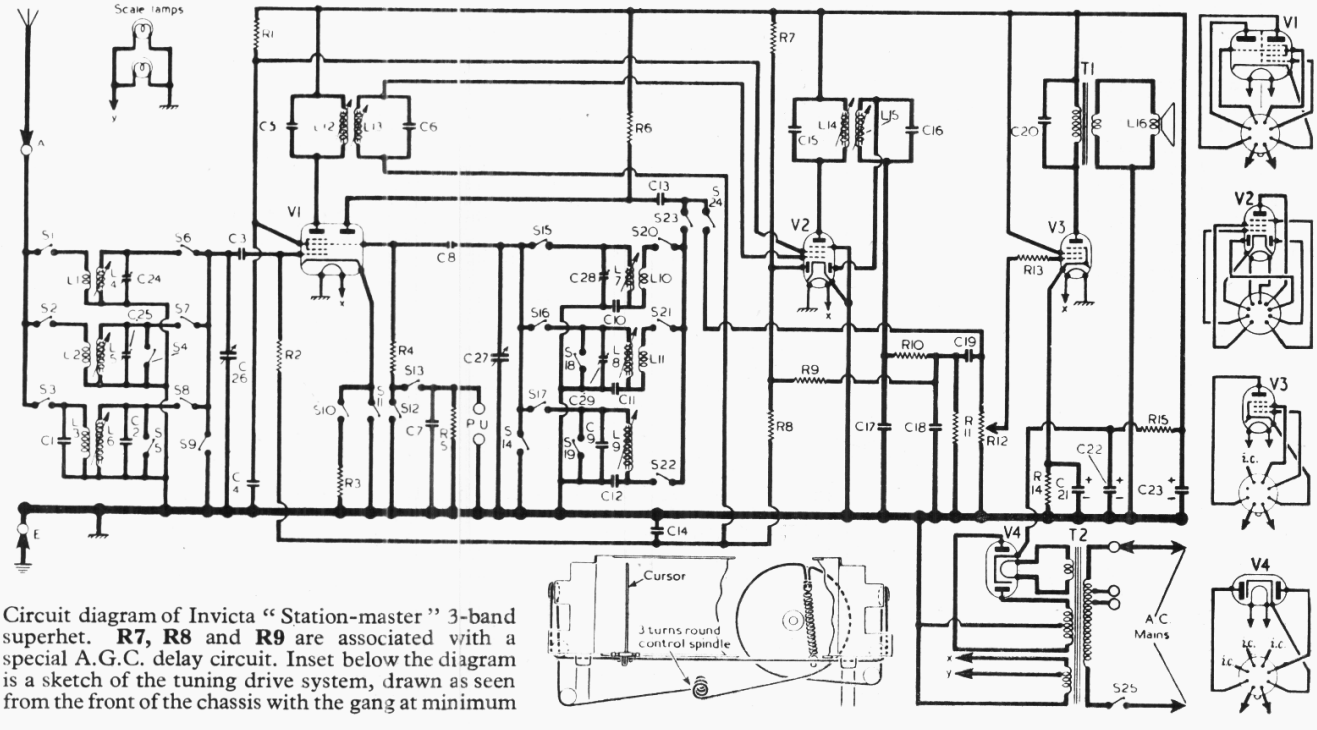
H.T. current is supplied by I.H.C. full-wave rectifying valve **(V4, Mullard EZ40).** Smoothing by electrolytic capacitors **C22, C23** and resistor **R15.** Scale lamps are fed from a separate tapping on **T2** heater secondary.

COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	V1, V2 S.G. feed ...	47kΩ	F4
R2	V1 hex. C.G. ...	680Ω	G4
R3	V1 G.B. ...	330Ω	G3
R4	V1 osc. C.G. ...	47kΩ	G4
R5	P.U. shunt ...	680kΩ	E4
R6	V1 osc. anode feed	10kΩ	G4
R7	V2 diode feed ...	22MΩ	F4
R8	A.G.C. decoup. ...	1MΩ	F4
R9		680kΩ	F4
R10	I.F. stopper ...	47kΩ	F4
R11	Diode load ...	270kΩ	F4
R12	Volume control ...	1MΩ	D3
R13	V3 C.G. stopper ...	47kΩ	D3
R14	V3 G.B.	180Ω	D4
R15	H.T. smoothing ...	1·5kΩ	D3

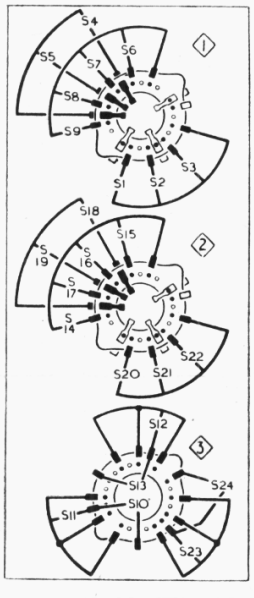
	CAPACITORS	Values	Locations
C1	L.W. aerial shunt	100pF	F3
C2	L.W. aerial trim....	110pF	F3
C3	V1 hex C.G. ...	100pF	G3
C4	V1, V2 S.G. decoup.	0·03μF	G4
C5	1st I.F. trans	125pF	A2
C6	tuning	125pF	A2
C7	P.U. shunt ...	0·002μF	E4
C8	V1 osc. C.G. ...	60pF	G3
C9	L.W. osc. trim. ...	150pF	F3
C10	S.W. osc. tracker...	0·005μF	F3
C11	M.W. osc. tracker	500pF	F3
C12	L.W. osc. tracker	220pF	F3
C13	Osc. anode coup.	0·01μF	G4
C14	A.G.C. decoup. ...	0·05μF	G4
C15	2nd I.F. trans. ...	125pF	B2
C16	tuning ...	125pF	B2
C17	I.F. by-passes ...	100pF	F4
C18		100pF	F4
C19	A.F. coupling ...	0·002μF	F4
C20	Tone corrector ...	0·002μF	E3
C21*	V3 cath. by-pass	25μF	C2
C22*	H.T. smoothing ...	32μF	C2
C23*		32μF	C2
C24‡	S.W. aerial trim.	50pF	F3
C25‡	M.W. aerial trim.	50pF	F3
C26†	Aerial tuning ...	—	A1
C27†	Oscillator tuning	—	A1
C28‡	S.W. osc. trim. ...	50pF	F3
C29‡	M.W. osc. trim. ...	50pF	F3

* Electrolytic. † Variable. ‡Pre-set.



Circuit diagram of Invicta "Station-master" 3-band superhet. **R7, R8** and **R9** are associated with a special A.G.C. delay circuit. Inset below the diagram is a sketch of the tuning drive system, drawn as seen from the front of the chassis with the gang at minimum

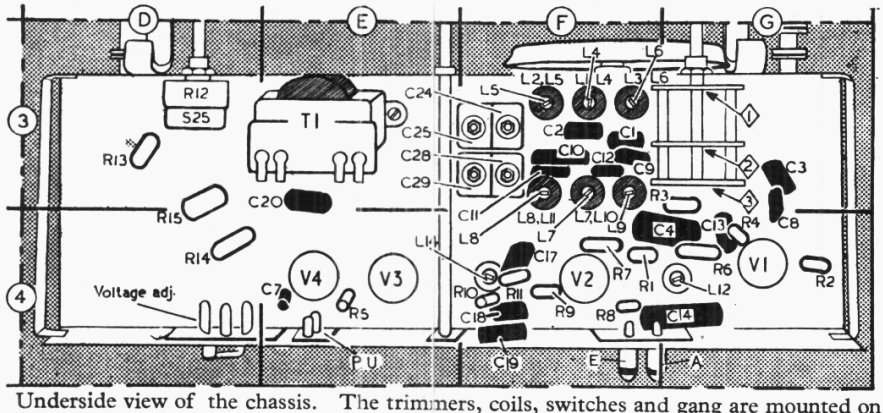
	OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils		—	F3
L2			40·0	F3
L3			260·0	F3
L4	Aerial tuning coils		—	F3
L5			2·4	F3
L6			16·0	F3
L7	Osc. tuning coils ...		—	F3
L8			2·3	F3
L9			5·0	F3
L10	Osc. reaction coils		—	F3
L11			0·6	F3
L12	1st I.F. trans.	Pri.	10·0	A2
L13		Sec.	10·0	A2
L14	2nd I.F. trans.	Pri.	10·0	B2
L15		Sec.	10·0	B2
L16	Speech coil ...		1·7	—
T1	Primary		220·0	E3
	Secondary ...		—	
T2	Primary, total ...		32·0	
	H.T. sec., total ...		600·0	C2
	Rect. htr.		—	
	Heater sec., total...		—	
S1—				
S24	Waveband switches		—	G3
S25	Mains sw., g'd R12		—	D3



Diagrams of the three waveband switch units, drawn as seen when viewed from the rear of an inverted chassis. The associated switch table appears in col. 3.

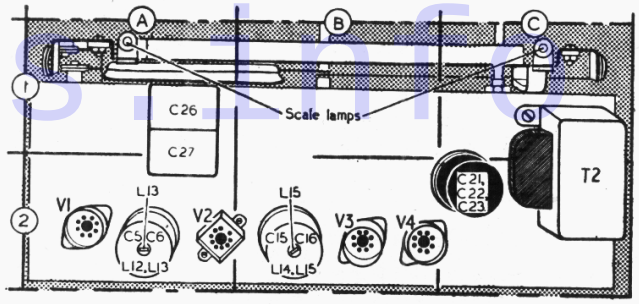
DISMANTLING THE SET

Removing Chassis.—Remove three control knobs (recessed grub screws), with felt washers; unsolder leads from speech coil tags on speaker; remove two short 2BA round-head bolts from rear chassis member, and two long 2BA round-head bolts with washers from underside of cabinet, and withdraw chassis.



Underside view of the chassis. The trimmers, coils, switches and gang are mounted on a sub-assembly which can be removed if required for greater accessibility.

Plan view of the chassis. **V2** is a noval based valve, provided with a square screening case which is screwed to the chassis deck.



VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver while it was operating from 230V A.C. mains. The set was switched to M.W. and the volume control and gang were turned to maximum, but there was no signal input.

Voltage readings were measured with an Avo Electronic Test Meter, and, as it causes no appreciable voltage drop, allowances must be made for the current drawn by other meters. Chassis was the negative connection.

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 ECH42	203·0	1·3	60·0	3·0	3·6*
	Oscillator				
	170·0	6·5			
V2 EBF80	230·0	3·7	60·0	1·0	—
V3 EL41	220·0	34·0	230·0	4·7	6·4
V4 EZ40	260·0†	—	—	—	320·0

* Measured on Gram. † A.C. volts, each anode.

GENERAL NOTES

Switches.—**S1-S24** are the waveband and radio/gram change-over switches, ganged in three rotary units beneath the chassis. These are indicated in our underside view of the chassis, and shown in detail in the diagrams in col. 1, where they are drawn as seen from the rear of an inverted chassis.

The table in col. 3 gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C** closed.

S25 is the Q.M.B. mains switch, ganged with the volume control **R12.**

Scale Lamps.—These are two Osram lamps, with small clear spherical bulbs and M.E.S. bases, rated at 6.5 V, 0.3 A. They are fed from a tapping on the valve heater secondary of the mains transformer.

Tuning Assembly.—The entire tuning circuit for the R.F. and oscillator stages is assembled on a platform which forms part of the chassis deck. If the connecting leads are coded and unsoldered, four screws are removed and the waveband switch bush nut is slackened, the complete assembly, including the gang, can be lifted out for servicing or replacement. A hole in the front chassis member is slotted to permit the switch spindle to pass out.

Drive Cord Replacement.—About five feet of nylon braided glass yarn is required for a new drive cord, which should be run as shown below the circuit diagram, where it is viewed from the front of the chassis when the gang is at minimum capacitance.

This is the most convenient position in which to run it, pulling against the gang stop to hold the cord in place. The drum must then be turned to maximum position for the anchoring of the tension spring.

Switch Table

Switch	S.W.	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
S11	C	C	C	—
S12	C	C	C	—
S13	—	—	—	C
S14	—	—	—	C
S15	C	—	—	—
S16	—	C	—	—
S17	—	—	C	—
S18	C	—	—	—
S19	—	C	—	—
S20	C	—	—	—
S21	—	C	—	—
S22	—	—	C	—
S23	C	C	C	—
S24	—	—	—	C

CIRCUIT ALIGNMENT

The following adjustments can be made accessible with the chassis in the cabinet upon the removal of the small cabinet base cover.

I.F. Stages.—Switch set to M.W. and connect output of signal generator, via a 0.01 μF capacitor in the "live" lead to control grid (pin 6) of **V1** and chassis. Feed in a 420 kc/s (714.3 m) signal and adjust the cores of **L15** (location reference B2), **L14** (F4), **L13** (A2) and **L12** (G4) for maximum output, reducing the input as the circuits come into line to avoid A.G.C. effects.

R.F. and Oscillator Stages.—All the following adjustments should be made with the chassis in the cabinet, as the tuning scale is fixed to the cabinet. Transfer signal generator leads, via a suitable dummy aerial, to **A** and **E** sockets.

S.W.—Switch set to S.W., tune to 15m, feed in a 15m (20 Mc/s) signal and adjust **C28, C24** (F3) for maximum output. Tune to 37.5m, feed in a 37.5m (8 Mc/s) signal and adjust the cores of **L7, L4** (F3) for maximum output.

M.W.—Switch set to M.W., tune to 200m, feed in a 200m (1.5 Mc/s) signal and adjust **C29, C25** (F3) for maximum output. Tune to 500m, feed in a 500m (600 kc/s) signal and adjust the cores of **L8, L5** (F3) for maximum output.

L.W.—Switch set to L.W., tune to 1,500m, feed in a 1,500m (200 kc/s) signal and adjust the cores of **L9, L6** (F3) for maximum output.

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