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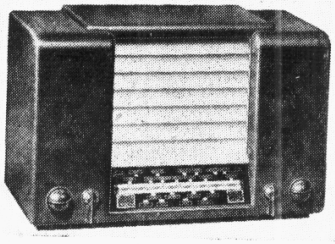
"TRADER" SERVICE SHEET

905

INVICTA 20

All-dry Superhet with Accumulator Adaptor



DESIGNED for use with dry battery or accumulator L.T. supply, the Invicta 20 is a 4-valve, 2-band battery superhet operating from a self-contained frame aerial or an external aerial. When used with an accumulator, the dry battery connecting plug goes into a socket on the chassis deck, introducing a ballast resistor into the filament circuit.

Release date and original price: October 1947; £13 5s., plus purchase tax, without batteries.

CIRCUIT DESCRIPTION

Input is from bottom-coupled frame aerial winding **L1** to single-tuned circuits **L3, C23** (M.W.) and **L3, L4, C23** (L.W.) which precede a heptode valve **(V1, Mullard metallized DK32)** operating as frequency changer with electron coupling. Provision is made for the connection of an external aerial.

Input from an external aerial is coupled to the tuning circuits via **L2,** but when operating from the frame aerial **L2** is short-circuited by inserting the muting-plug into the external aerial socket.

Oscillator grid coils **L5** (M.W.) and **L6** (L.W.) are tuned by **C24,** with parallel trimming by **C25** (M.W.), **C9, C26** (L.W.) and series tracking by **C7** (M.W.), **C8** (L.W.). Reaction coupling by coils **L7** (M.W.) and **L8** (L.W.).

(*Continued col. 1 overleaf*)

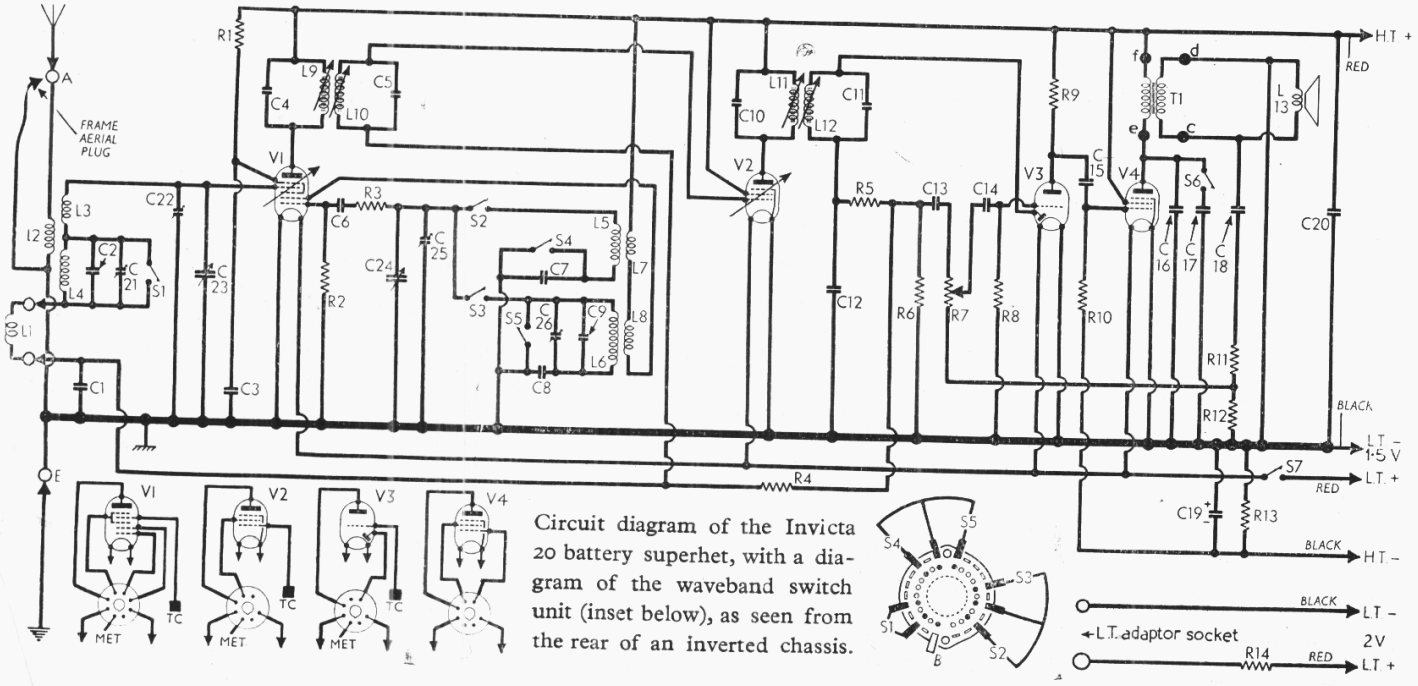
COMPONENTS AND VALUES

	CAPACITORS	Values (μF)	Locations
C1	A.G.C. decoupling	0·05	G4
C2	Aerial L.W. trim ...	0·000022	B1
C3	V1 S.G. decoup. ...	0·05	H3
C4	1st I.F. trans- former tuning	0·00007	A2
C5		0·00007	A2
C6	V1 osc. C.G. ...	0·00015	H3
C7	Osc. M.W. tracker...	0·00056	G3
C8	Osc. L.W. tracker...	0·00018	G3
C9	Osc. L.W. trimmer	0·000047	H3
C10	2nd I.F. trans- former tuning	0·00007	B2
C11		0·00007	B2
C12	I.F. by-pass ...	0·0001	G4
C13	A.F. coupling capacitors	0·01	F4
C14		0·005	F4
C15		0·01	G3
C16	Tone corrector ...	0·005	F3
C17	Tone control ...	0·01	D3
C18	F.-B. coupling ...	0·05	E3
C19*	V4 G.B. by-pass ...	50·0	G3
C20	H.T. reservoir ...	1·0	B1
C21‡	Aerial L.W. trim ...	0·00003	B1
C22‡	Aerial M.W. trim ...	0·00003	B1
C23†	Aerial tuning ...	0·0005	A2
C24†	Oscillator tuning ...	0·0005	A1
C25‡	Osc. M.W. trim ...	0·00003	H4
C26‡	Osc. L.W. trim ...	0·00003	H3

* Electrolytic † Variable ‡ Pre-set

	RESISTORS	Values (ohms)	Locations
R1	V1 S.G. H.T. feed	47,000	H4
R2	V1 osc. C.G. ...	100,000	H4
R3	Osc.stabilizer ...	2,200	H4
R4	A.G.C. decoupling	5,000,000	G4
R5	I.F. stopper ...	22,000	F4
R6	Diode load ...	560,000	F4
R7	Volume control ...	1,000,000	D3
R8	V3 grid resistor	5,000,000	F4
R9	V3 triode load ...	560,000	F4
R10	V4 C.G. resistor...	1,000,000	F3
R11	Negative feed-back potential divider	22,000	D3
R12		4,700	D3
R13	V4 G.B. resistor	680	G3
R14	Filament ballast	2	E3

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerial ...	0·6	—
L2	Aerial coupling ...	68·0	B1
L3	Aerial tuning coils	2·2	B1
L4		13·0	B1
L5	Oscillator tuning coils	2·0	G3
L6		4·0	G3
L7	Oscillator reaction coils total	180·0	G3
L8			G3
L9	1st I.F. trans. Pri. ...	10·0	A2
L10	Sec. ...	9·0	A2
L11	2nd I.F. trans. Pri. ...	10·0	B2
L12	Sec. ...	9·0	B2
L13	Speech coil ...	3·0	—
T1	Output trans Pri. ...	640·0	F3
	Sec. ...	0·1	
S1-S5	W/bandswitches ...	—	H3
S6	Tone switch ...	—	D3
S7	L.T. circ. switch ...	—	D3



Circuit diagram of the Invicta 20 battery superhet, with a diagram of the waveband switch unit (inset below), as seen from the rear of an inverted chassis.

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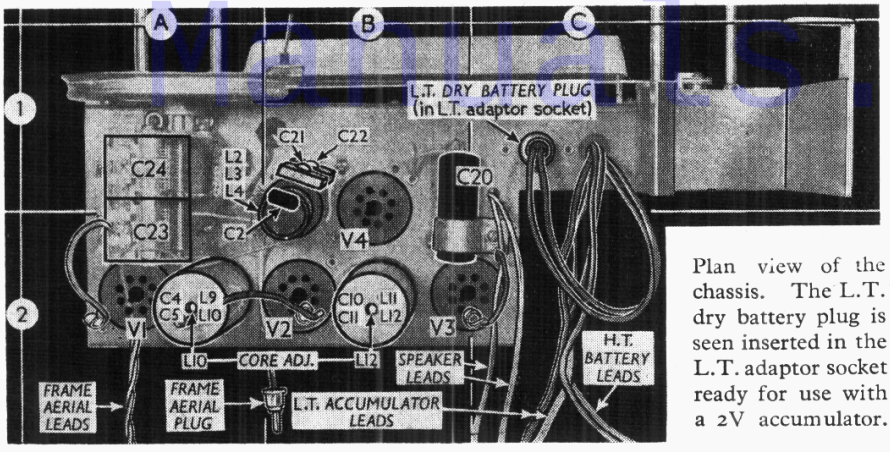


Plan view of the chassis. The L.T. dry battery plug is seen inserted in the L.T. adaptor socket ready for use with a 2V accumulator.

Circuit Description—*continued*

Second valve **(V2, Mullard metallized DF33)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C4, L9, L10, C5** and **C10, L11, L12, C11.**

Intermediate frequency 465 kc/s.

Diode second detector is part of single diode triode valve **(V3, Mullard metallized DAC32).** Audio frequency component in rectified output is developed across load resistor **R6** and passed, via **C13, R7, C14, R8,** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C12, R5** in diode circuit.

The D.C. potential developed across **R6** is tapped off and fed back through a decoupling circuit **R4, C1** as G.B. to F.C. and I.F. valves, giving automatic gain control.

Resistance capacitance coupling by **R9, C15, R10** between **V3** triode and pentode output valve **(V4, Mullard DL35).** Fixed tone correction in anode circuit by **C16,** and two-position tone control by **S6, C17.** The A.F. voltage developed across **T1** secondary winding is applied to a potential divider network **C18, R11, R12,** from which it is tapped off and fed back to **V3** grid circuit to improve the quality of reproduction.

The G.B. potential for **V4** is obtained from the drop across **R13** in the negative H.T. lead to chassis.

GENERAL NOTES

Switches.—**S1-S5** are the waveband switches in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram inset beneath the circuit diagram overleaf, where it is viewed from the rear of an inverted chassis.

In the M.W. (anti-clockwise) position of the control knob, **S1, S2** and **S5** close; in the L.W. position, **S3** and **S4** close.

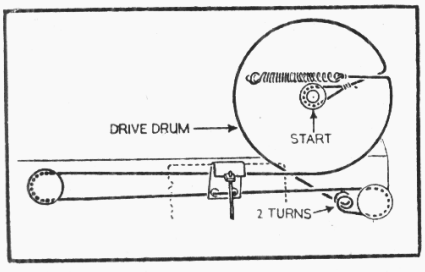
S6 is the tone control switch, in a small two-position rotary unit beneath the chassis. **S7** is the Q.M.B. L.T. circuit switch, ganged with the volume control **R7.**

Batteries.—Recommended H.T. batteries are Drydex H1146 and Ever Ready Portable 61, 90 V, for which ordinary wander plugs are provided.

The all-dry valve filaments may be energized from a 1.5 V dry battery such as the Ever Ready All Dry No. 1 or Drydex H1155, a suitable two-pin plug being provided on flexible leads; but a 2 V accumulator may be used instead, a pair of spade tags being provided for it.

When using an accumulator, the dry battery plug is inserted into the L.T. adaptor socket, as seen in our plan view. The required voltage drop is then provided by **R14,** a wire-wound resistor rated at 2Ω, 1 W. The recommended accumulator is the Exide **CYU3K,** which fits the compartment provided for it.

Chassis Divergencies.—In a few early receivers, **C2** will be 0.000047 μF (47 pF) instead of 0.000022 μF. Although some receivers are fitted with a carrying handle on top, most of them are not.



Sketch showing the tuning drive system, as seen from the front when the gang is at maximum capacitance.

Drive Cord Replacement.—This requires about 50 inches of cord (Cutty Hunk fishing twine will do) which should be fitted as shown in the sketch above, where the system is viewed from the front of the chassis with the gang at maximum.

DISMANTLING THE SET

Removing Chassis.—Remove the two round control knobs (recessed grub screws) and the two bar knobs (pull off) with their felt washers; unsolder the two speaker leads and remove the three round-head screws (with steel washers, rubber grommets and brass sleeves) securing the chassis, which may then be slid from the cabinet.

When replacing, two of the specially shaped rubber grommets should be fitted to each chassis screw, one on each side of the cabinet base, with a brass sleeve between them, and a metal washer goes beneath the head of each screw.

Removing Speaker.—Loosen the nuts of the four speaker retaining clamps, swivel the clamps aside, and lift out the speaker.

When replacing, the speech coil connecting panel should be on the right.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from a 2 V accumulator and an H.T. battery reading 93 V on load. The receiver was tuned to the lowest wavelength on the M.W. band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 100 V range of a model 7 Avometer, chassis being the negative connection. The total H.T. current was 10 mA.

Valves	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 DK32	85	0·5	31	1·0
	Oscillator			
	85	1·6		
V2 DF33	85	0·9	85	0·2
V3 DAC32	7·5	0·04	—	—
V4 DL35	81	4·7	85	1·0

CIRCUIT ALIGNMENT

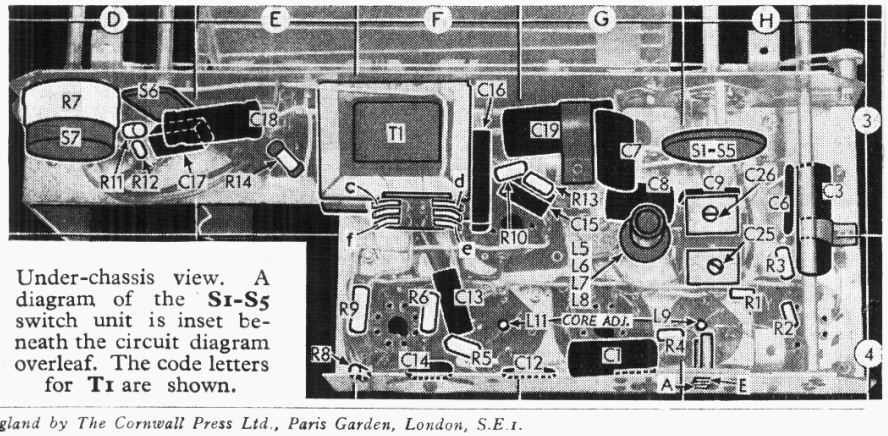
Before removing chassis from cabinet to carry out the operations described below, check that with the gang closed the cursor coincides with the 550 m calibration mark on the scale. It may be adjusted in position by slackening the two drive drum screws and rotating the drum on its spindle. Next, tune to 1,200 m on scale and mark the position of the left-hand edge of the cursor carriage in pencil on the rear of the scale backing plate, and repeat this operation at 200 m on scale.

I.F. Stages.—Switch set to M.W., turn gang and volume control to maximum, connect signal generator (via an 0.1 μF capacitor in the "live" lead) to control grid (top cap) of **V1** and the **E** socket, feed in a 465 kc/s (645 m) signal, and adjust the cores of **L12, L11, L10, L9** (location references B2, F4, A2, H4) for maximum output.

R.F. and Oscillator Stages.—Set up the chassis with the frame aerial in its correct position, and couple signal generator by means of a few turns of wire set up on the bench at a short distance from the frame winding.

M.W.—With set still switched to M.W., turn gang until the left-hand edge of the cursor carriage coincides with the 200 m pencil mark on the scale backing plate, feed in a 200 m (1,500 kc/s) signal, and adjust **C25** (H4) and **C22** (B1) for maximum output.

L.W.—Switch set to L.W., tune to 1,200 m pencil mark on scale backing plate, feed in a 1,200 m (250 kc/s) signal, and adjust **C26** (H8) and **C21** (B1) for maximum output.



Under-chassis view. A diagram of the **S1-S5** switch unit is inset beneath the circuit diagram overleaf. The code letters for **T1** are shown.

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