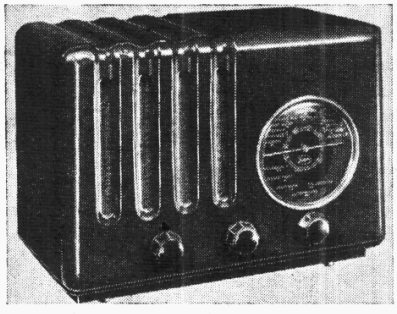
"TRADER" SERVICE SHEET 705

INVICTA 820 "PICCANINNY"



CONSTRUCTED on Midget receiver lines, the Invicta "Piccaninny" model 820 receiver is a 4-valve (plus rectifier) 2-band superhet designed to operate from AC or DC mains of 200-240 V, 40-100 c/s in the case of AC. Provision is made for fitting an additional ballast resistor for operation on 250 V mains, but no provision is made for connecting an earth lead.

Release date and original price: February, 1940; £6 10*s*.

CIRCUIT DESCRIPTION

Aerial input via isolating capacitor **C1** and coupling coil **L2** to single tuned circuit **L3, L4, C28** which precedes a triode hexode valve **(V1, Mullard metallised ECH3)** operating as frequency changer with internal coupling. An IF filter circuit **L1, C2, C26** is shunted across the aerial circuit.

V1 triode oscillator anode coils **L7** (MW) and **L8** (LW) are tuned by **C31.** Parallel trimming by **C9, C29** (MW) and **C10, C30** (LW); series tracking by **C11** on both wavebands. Reaction coupling by grid coils **L5, L6.**

Second valve **(V2, Mullard metallised EF9)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C6, L9, L10, C7** and **C14, L11, L12, C15** in which trimming is effected by the adjustment of the variable dust-iron cores.

Intermediate frequency 467 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mullard metallised EBC3).** Audio frequency component in rectified output is developed across load resistor **R5** and passed via AF coupling capacitor **C18** and manual volume control **R6** to CG of triode section, which operates as AF amplifier. IF filtering by **C16** and grid stopper **R7.**

DC potential appearing across **R5** is fed back via **R10, C4** as GB to FC and IF valves, giving automatic volume control. Second diode of **V3** is anchored to the AVC line.

Resistance-capacitance coupling by **R9, C19** and **R11** between **V3** triode and pentode output valve **(V4, Mullard EL2),** with two-position tone control by **C20** and a plug and socket device in CG circuit and fixed tone correction by **C21** in anode circuit.

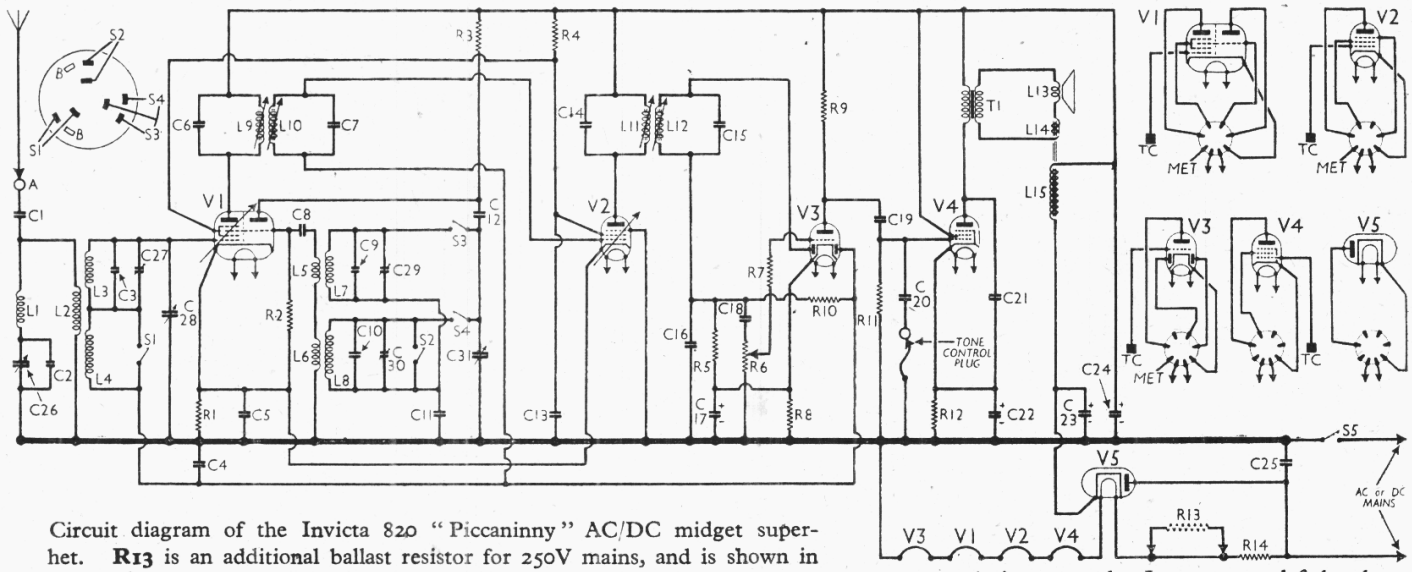
When the receiver is operating from AC mains, HT current is supplied by half-wave rectifying valve **(V5, Mullard CY1),** which with DC mains behaves as a low resistance. Smoothing is effected by speaker field **L15** and dry electrolytics **C23, C24.**

Valve heaters, together with line cord ballast resistor **R14,** are connected in series across mains input. Provision is made for the insertion of additional ballast resistor **R13** for use on mains of about 250 V. The tags provided for it are normally short-circuited by a wire link.

COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	Aerial isolator	0·001
C2	Aerial IF filter tuning...	0·00002
C3	Aerial MW fixed trimmer	0·00002
C4	AVC line decoupling ...	0·1
C5	V1, V2 cathodes by-pass	0·1
C6	1st IF transformer fixed tuning capacitors ...	0·0001
C7		0·0001
C8	V1 osc. CG capacitor ...	0·00015
C9	Osc. MW fixed trimmer	0·00002
C10	Osc. LW fixed trimmer	0·00026
C11	Osc. circuit tracker ...	0·000657
C12	V1 osc. anode coupling...	0·00015
C13	V1, V2 SG's decoupling...	0·1
C14	2nd IF transformer fixed tuning capacitors ...	0·001
C15		0·001
C16	IF by-pass	0·003
C17*	V3 cathode by-pass ...	10·0
C18	AF coupling to V3 ...	0·005
C19	AF coupling to V4 ...	0·01
C20	Tone control capacitor ...	0·01
C21	Fixed tone corrector ...	0·005
C22*	V4 cathode by-pass ...	10·0
C23*	HT smoothing capacitors	8·0
C24*		16·0
C25‡	Mains RF by-pass ...	0·01
C26‡	Aerial IF filter tuning ...	0·00003
C27‡	Aerial circ. MW trimmer	0·00003
C28†	Aerial circuit tuning ...	—
C29‡	Osc. circ. MW trimmer...	0·00003
C30‡	Osc. circ. LW trimmer...	0·00003
C31†	Oscillator circuit tuning	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Invicta 820 "Piccaninny" AC/DC midget superhet. **R13** is an additional ballast resistor for 250V mains, and is shown in broken lines as it is not normally fitted. When it is used, the shorting link across it is removed. Inset at top left-hand corner is the diagram of the waveband switch unit, drawn as seen from the rear of the underside of the chassis.

	RESISTORS	Values (ohms)
R1	V1, V2 fixed GB resistor	100
R2	V1 osc. CG resistor ...	47,000
R3	V1 osc. anode HT feed ...	22,000
R4	V1, V2 SG's HT feed ...	47,000
R5	V3 signal diode load ...	470,000
R6	Manual volume control	1,000 000
R7	V3 triode grid stopper...	47,000
R8	V3 triode GB resistor ...	1,000
R9	V3 triode anode load ...	100,000
R10	AVC feed resistor ...	1,000,000
R11	V4 CG resistor	1,000,000
R12	V4 GB resistor	450
R13	250v mains Ballast ...	50
R14	Line cord resistor ...	880

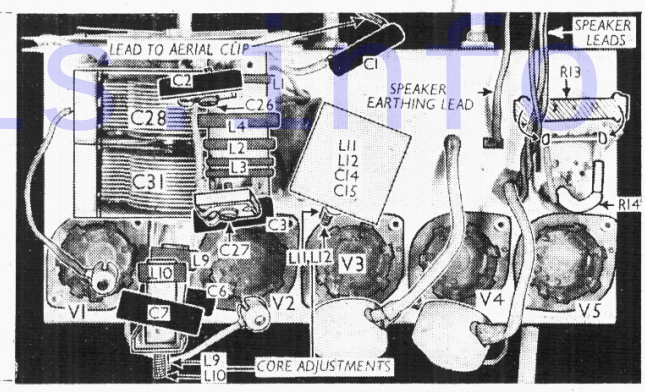
	OTHER COMPONENTS	Values (ohms)
L1	Aerial IF filter coil ...	25·0
L2	Aerial coupling coil ...	22·0
L3	Aerial MW tuning coil ...	4·0
L4	Aerial LW tuning coil ...	11·0
L5, L6	Oscillator reaction coils ...	15·0, 18·0
L7	Osc. MW tuning coil ...	2·5
L8	Osc. LW tuning coil ...	3·0
L9	1st IF trans. Pri. ...	7·0
L10	1st IF trans. Sec. ...	7·0
L11	2nd IF trans. Pri. ...	9·0
L12	2nd IF trans. Sec. ...	8·0
L13	Speaker speech coil ...	5·0
L14	Hum neutralising coil ...	Very low
L15	Speaker field coil ...	1,000·0
T1	Speaker input trans. Pri. ...	180·0
	Speaker input trans. Sec. ...	Very low
S1-S4	Waveband switches ...	—
S5	Mains switch, ganged R6	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the makers. They represent conditions to be expected in an average receiver when it is working on AC mains of 230 V, with no signal input. Voltages were measured with a high-resistance meter whose negative lead was connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH3	235	0·98	55	2·4
	Oscillator			
	136	4·0		
V2 EF9	235	0·4	55	1·0
V3 EBC3	95	1·4	—	—
V4 EL2	230	27·0	235	4·8
V5 CY1†	—	—	—	—

† Cathode to chassis, 280v, DC



Plan view of the chassis. **R13** is shown shaded, and the tags to which it is connected are indicated by arrows. The link between these tags would then be removed. The IF transformer core adjustments are indicated.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub screws); remove the three bolts (with washers) holding chassis to base of cabinet.

Chassis may now be removed to the extent of the speaker and aerial leads, but these are short, and it will usually be more convenient to unsolder them, freeing the chassis entirely.

When replacing, connect the speaker leads as follows, numbering tags on the transformer from top to bottom: 1 and 2 (joined together), brown; 3, yellow; 4, red. The green lead goes to the transformer casing.

Connect the free end of **C1** to the aerial clip in the top of the cabinet.

Removing Speaker.—Remove the nuts (with washers) from the two bolts holding speaker to sub-baffle.

When replacing, transformer should be on the right, and leads connected as previously explained.

GENERAL NOTES

Switches. — **S1-S4** are the waveband switches, ganged in a rotary unit which is indicated in our under-chassis view and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram overleaf, as seen from the rear of the underside of the chassis. **S1, S2, S3** close on MW and open on LW; **S4** opens on MW and closes on LW.

S5 is the QMB mains switch, ganged with the manual volume control **R6.**

Coils.—All the aerial circuit coils **L1-L4** are mounted with their associated trimmers in an unscreened unit on the back of the scale assembly over the gang. The oscillator coils **L5-L9** are in a similar unit beneath the chassis deck.

The IF transformers **L9, L10** and **L11, L12** are mounted on the chassis deck, only the latter being screened. The core adjustments for these are indicated in our plan view.

Electrolytic Capacitors.—There are four of these, and all are of the dry tubular type. **C17** and **C22** are each rated at 10 μF, 20 V peak; **C23** is rated at 8 μF, 450 V peak; and **C24** is rated at 16 μF, 350 V peak. The positions of **C23** and **C24** may be transposed in some chassis as compared with their positions in our under-chassis view.

Mains Voltage Adjustment.—With the line cord only as originally fitted the receiver is suitable for operation on AC or DC mains of 200-240 V, but for 250 V mains additional ballast is required, and for this purpose a 50 Ω 2 watt resistor should be connected to the two tags provided on the small panel on the chassis deck, near **V5** holder, in place of the existing wire link, which must be removed. The resistor is shown dotted as **R13** in our circuit diagram, and as a shaded resistor in our plan view. The tags to be used are the horizontal pair, which already have two leads connected to them.

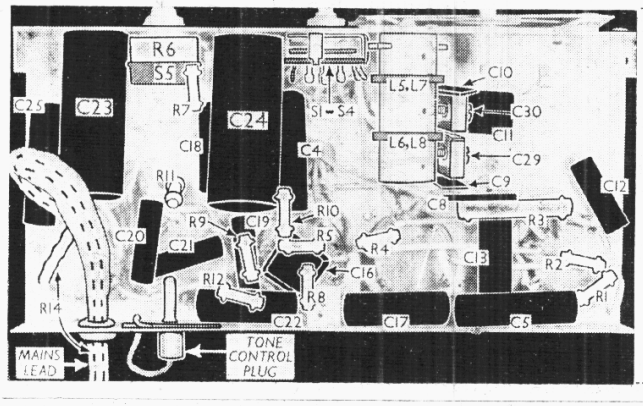
CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator leads to control grid (top cap) of **V1** and the AVC line (tag on **L10).** Switch set to MW, turn the volume control to maximum, and tune to 210 m on scale. Feed in a 467 kc/s (642.4 m) signal, and adjust the cores of **L12, L11, L10** and **L9** for maximum output.

IF Filter.—Transfer signal generator leads, via a suitable dummy aerial, to **A** clip and, via a 0.1 μF capacitor, to chassis. Feed in a strong 467 kc/s signal, and adjust **C26** for minimum output.

MW.—Switch set to MW, still tuned to 210 m on scale, feed in a 210 m (1,429 kc/s) signal, and adjust **C29,** then **C27,** for maximum output. Check calibration at 520 m (576.9 kc/s).

LW.—Switch set to LW, tune to 1,300 m on scale, feed in a 1,300 m (231 kc/s) signal, and adjust **C30** for maximum output. Check calibration at 1,800 m (166.7 kc/s).



Under-chassis view. The waveband switch unit **S1–S4** is indicated here, but it is shown in detail inset in the circuit diagram overleaf. **C23** and **C24** may be transposed in some chassis.

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