

NUMBER 152

'TRADER' SERVICE SHEETS

INVICTA AW57

FIVE-BAND A.C. SUPERHET

or IW4/350). Smoothing by speaker field coil L28 and dry electrolytic condensers C21, C22. Mains aerial coupling by C23.

FIVE wavebands are covered by the Invicta AW57 5-valve (plus rectifier) A.C. superhet receiver. The actual short-wave bands are 13-27, 25-75 and 75-200 metres. There is provision for a pick-up, external speaker and for the use of the mains as an aerial.

CIRCUIT DESCRIPTION

Aerial input on short-wave bands via small condenser C1 (S.W.1), and coupling coils L2 (S.W.2) and L4 (S.W.3) to single tuned circuits comprising C26 and coils L1 (S.W.1), L3 (S.W.2) and L5 (S.W.3). On M.W. and L.W. bands, L6, L8, C24 and L9, L10, C26 respectively form the primary and secondary stages of inductively coupled band-pass input filters.

First valve (V1, Mullard metallised FC4) is an octode operating as frequency changer with electron coupling. Oscillator grid coils L12 (S.W.1), L14 (S.W.2), L16 (S.W.3), L18 (M.W.), L20 (L.W.) are tuned by C28; trimming by C29 (S.W.2), C30 (S.W.3), C31 (M.W.), C32 (L.W.); tracking by C7 (M.W.) and C8 (L.W.); oscillator anode reaction coils L13 (S.W.1),

separate double diode valve (V3, Mullard metallised 2D4A). Audio-frequency component in rectified output is developed across load resistance R10 and passed via coupling condenser C14 to C.G. of triode amplifier valve (V4, Mullard metallised 354V). I.F. filtering by R9, C12, C13 and C17. Provision for connection of gramophone pick-up in V4 grid circuit.

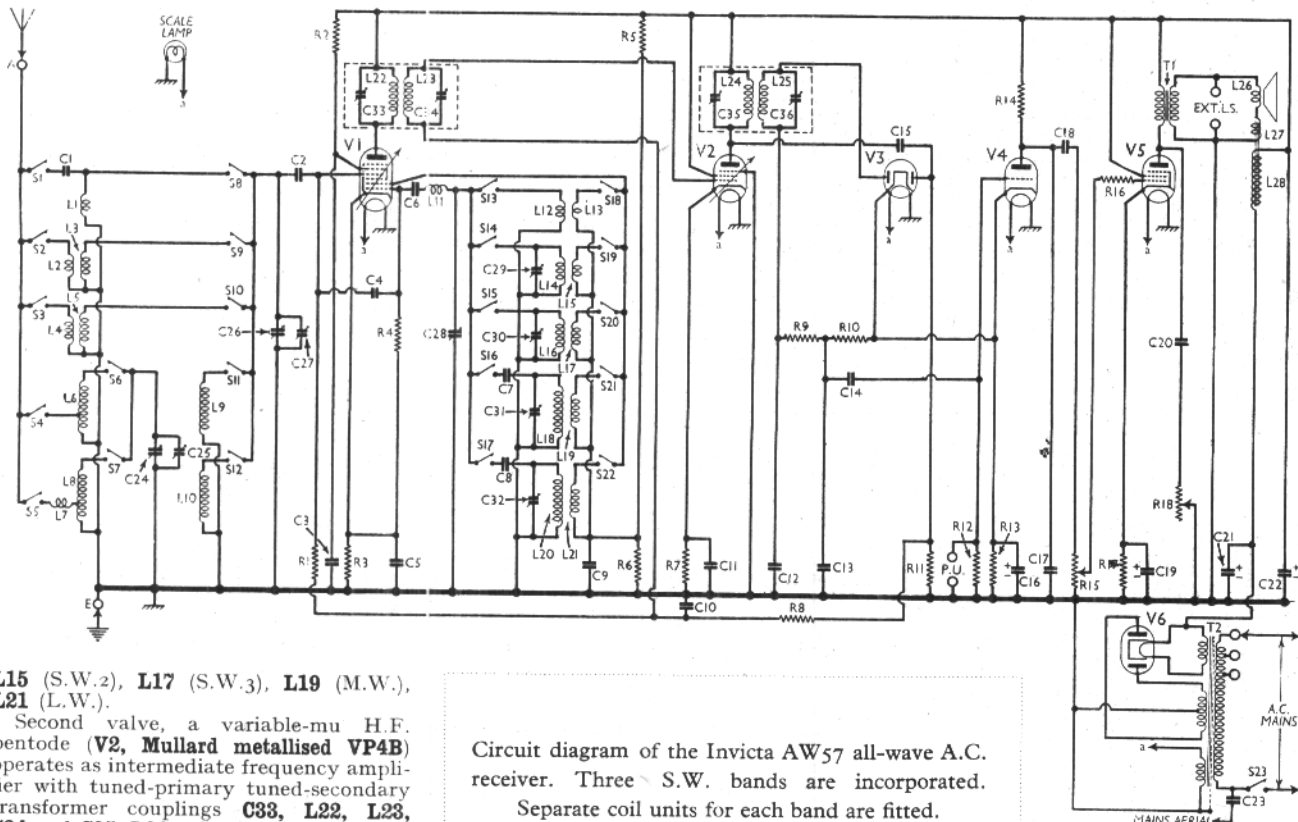
Second diode of V3, fed from V2 anode via C15, provides D.C. potential which is developed across load resistance R11 and fed back through decoupling circuit R8, C10 as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along V4 cathode resistance R18.

Resistance-capacity coupling by R14, C18 and manual volume control R15 to pentode output valve (V5, Mullard Pen4VA or Pen4VB or Pen4A). Variable tone control in anode circuit by R.C. filter R18, C20. Provision for connection of external low-impedance speaker across secondary of output transformer T1.

H.T. current is supplied by I.H.C. full-wave rectifying valve (V6, Mullard IW3

CONDENSERS		Values (μF)
C1	Aerial coupling (S.W.1)	0.00007
C2	V1 pentode C.G. condenser	0.00015
C3	V1 S.G.'s by-pass	1.0
C4	Image suppressor	0.0000018
C5	V1 cathode by-pass	0.1
C6	V1 osc. C.G. condenser	0.00015
C7	Oscillator M.W. tracker	0.00066
C8	Oscillator L.W. tracker	0.00024
C9	Osc. anode decoupling	0.1
C10	V1, V2 A.V.C. line decoupling	0.05
C11	V2 cathode by-pass	0.1
C12	I.F. by-passes	0.00015
C13	I.F. by-passes	0.00015
C14	L.F. coupling to V4	0.05
C15	Coupling to V3 A.V.C. diode	0.00015
C16*	V4 cathode by-pass	25.0
C17	V4 anode I.F. by-pass	0.001
C18	V4 to V5 L.F. coupling	0.05
C19*	V5 cathode by-pass	25.0
C20	Part of T.C. filter	0.05
C21*	H.T. smoothing	8.0
C22*	H.T. smoothing	8.0
C23	Mains aerial coupling	0.001
C24†	Band-pass pri. tuning (M.W., L.W.)	0.00055
C25†	Band-pass pri. trimmer	—
C26†	F.C. C.G. circuit tuning	0.00055
C27†	F.C. C.G. circuit trimmer	—
C28†	Oscillator C.G. circuit tuning	0.00055
C29†	Osc. trimmer (S.W.2)	0.00004
C30†	Osc. trimmer (S.W.3)	0.00004
C31†	Osc. trimmer (M.W.)	0.00004
C32†	Osc. trimmer (L.W.)	0.00004
C33†	1st I.F. trans. pri. tuning	0.00014
C34†	1st I.F. trans. sec. tuning	0.00014
C35†	2nd I.F. trans. pri. tuning	0.00014
C36†	2nd I.F. trans. sec. tuning	0.00014

* Electrolytic. † Variable. ‡ Pre-set.



L15 (S.W.2), L17 (S.W.3), L19 (M.W.), L21 (L.W.).

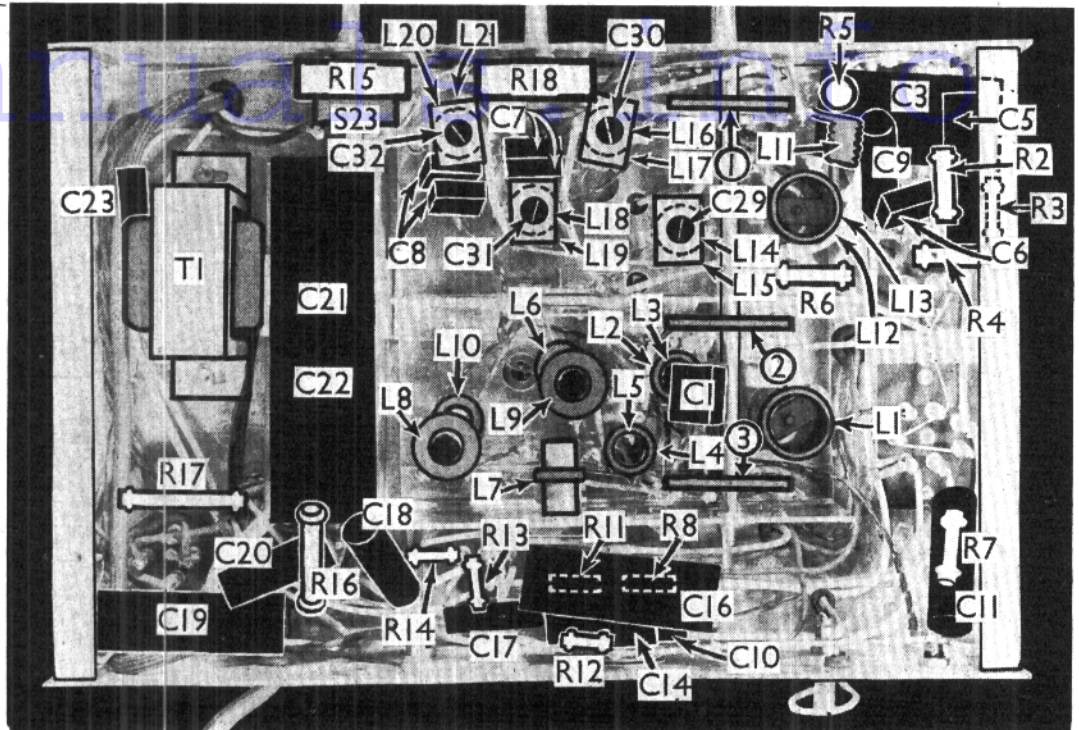
Second valve, a variable-mu H.F. pentode (V2, Mullard metallised VP4B) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings C33, L22, L23, C34 and C35, L24, L25, C36.

Intermediate frequency 465 KC/S.

Diode second detector is part of

Circuit diagram of the Invicta AW57 all-wave A.C. receiver. Three S.W. bands are incorporated. Separate coil units for each band are fitted.

Under-chassis view. Note that there is a number of coil units, mostly containing two coils each. The disposition of these is explained in "General Notes." The numbers in circles refer to the three switch units, the arrows indicating the directions in which they are viewed in the diagram overleaf. L11 is a small H.F. choke.



RESISTANCES		Values (ohms)
R1	V1 pentode C.G. resistance ..	300,000
R2	V1 S.G.'s H.T. feed ..	40,000
R3	V1 fixed G.B. resistance ..	300
R4	V1 osc. C.G. resistance ..	60,000
R5	V1 osc. anode H.T. potential divider ..	40,000
R6	V2 fixed G.B. resistance ..	40,000
R7	V1 and V2 A.V.C. line decoupling ..	140
R8	V1 and V2 A.V.C. line decoupling ..	300,000
R9	I.F. stopper ..	120,000
R10	V3 signal diode load ..	300,000
R11	V3 A.V.C. diode load ..	300,000
R12	V4 C.G. resistance ..	1,000,000
R13	V4 G.B. resistance ..	2,500
R14	V4 anode load ..	120,000
R15	Manual volume control ..	500,000
R16	V5 C.G. I.F. stopper ..	20,000
R17	V5 G.B. resistance ..	500
R18	Variable tone control ..	50,000

OTHER COMPONENTS (Continued)		Approx. Values (ohms)
T2	Mains trans. { Pri. total ..	45.0
	{ Heater sec. ..	0.1
	{ Rect. heat. sec. ..	0.15
	{ H.T. sec. total ..	360.0
S1-S22	Waveband switches ..	—
S23	Mains switch, ganged Rr5 ..	—

using the 216-235 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC4*	220	1.6	65	3.2
V2 VP4B	220	11.0	220	4.2
V3 2D4A	—	—	—	—
V4 354V	80	0.9	—	—
V5 Pen4VA	200	29.0	220	2.5
V6 IW3	330†	—	—	—

* Osc. anode (G2) 65 V, 1.3 mA.
† Each anode A.C.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, first remove the five control knobs (recessed grub screws) and the back. Next remove the four bolts (with washers and rubber washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

When replacing, see that the dot on the wave-change switch knob is hard over to the right when the receiver is on the long-wave band.

To free the chassis entirely, unsolder the speaker leads. *When replacing*, connect them as follow, numbering the tags from bottom to top:—1, red; 2, green and blue earthing lead to speaker frame; 3, blank; 4, yellow; 5, black.

Removing Speaker.—If it is desired to remove the speaker from the cabinet, first unsolder the leads and then remove the nuts and washers from the four screws holding it to the sub-baffle. *When replacing*, see that the transformer is on the right and do not forget to fix the blue earthing lead to the bottom right-hand screw holding the speaker.

VALVE ANALYSIS

The table below gives the valve voltages and currents as measured in our receiver when it was operating on mains of 220 V,

GENERAL NOTES

Switches.—The wavechange switches, twenty-two in number, are in three rotary units beneath the chassis. These are indicated in our under-chassis view, and the numbers in circles refer to the units in the separate switch diagrams, and the arrows the directions in which these are viewed, looking at the underside of the chassis.

All the switches are used in unit 1. Only one half of unit 2 is used, while unit 3 has three blank switches. Note that each half unit has one common contact. Only one switch in each half unit is closed for any position of the switch control.

The table (p. VIII) gives the switch positions for the various control settings, O indicating open, and C, closed. S.W.1 is the lowest S.W. range.

S23 is the Q.M.B. mains switch, ganged with the volume control R15.

(Continued overleaf)

OTHER COMPONENTS		Approx. Values (ohms)
L1	F.C. C.G. tuning coil (S.W.1) ..	Very low
L2	Aerial coupling coil (S.W.2) ..	0.25
L3	F.C. C.G. tuning coil (S.W.2) ..	0.2
L4	Aerial coupling coil (S.W.3) ..	0.5
L5	F.C. C.G. tuning coil (S.W.3) ..	0.5
L6	Band-pass primary (M.W.) ..	2.4
L7	Aerial choke coil (L.W.) ..	4.8
L8	Band-pass primary (L.W.) ..	17.0
L9	Band-pass secondary (M.W.) ..	2.2
L10	Band-pass secondary (L.W.) ..	17.0
L11	V1 osc. C.G. S.W. choke ..	Very low
L12	Osc. tuning coil (S.W.1) ..	Very low
L13	Osc. reaction coil (S.W.1) ..	0.4
L14	Osc. tuning coil (S.W.2) ..	0.15
L15	Osc. reaction coil (S.W.2) ..	0.35
L16	Osc. tuning coil (S.W.3) ..	0.4
L17	Osc. reaction coil (S.W.3) ..	12.5
L18	Osc. tuning coil (M.W.) ..	1.3
L19	Osc. reaction coil (M.W.) ..	36.0
L20	Osc. tuning coil (L.W.) ..	3.3
L21	Osc. reaction coil (L.W.) ..	43.0
L22	1st I.F. trans. { Pri. ..	6.0
L23		{ Sec. ..
L24	2nd I.F. trans' { Pri. ..	5.0
L25		{ Sec. ..
L26	Speaker speech coil ..	1.6
L27	Hum neutralising coil ..	0.2
L28	Speaker field coil ..	3,000.0
T1	Output trans. { Pri. ..	450.0
	{ Sec. ..	0.25

INVICTA AW57—Continued

Switch	S.W.1	S.W.2	S.W.3	M.W.	L.W.
S1	C	O	O	O	O
S2	O	C	O	O	O
S3	O	O	C	O	O
S4	O	O	O	C	O
S5	O	O	O	O	C
S6	O	O	O	O	C
S7	O	O	O	O	C
S8	C	O	O	O	O
S9	O	C	O	O	O
S10	O	O	C	O	O
S11	O	O	O	C	O
S12	O	O	O	O	C
S13	C	O	O	O	O
S14	O	C	O	O	O
S15	O	O	C	O	O
S16	O	O	O	C	O
S17	O	O	O	O	C
S18	C	O	O	O	O
S19	O	C	O	O	O
S20	O	O	C	O	O
S21	O	O	O	C	O
S22	O	O	O	O	C

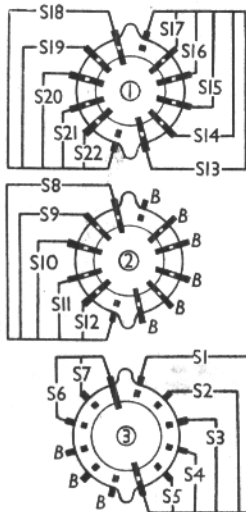
Coils.—The only coils on the chassis deck are the two I.F. transformers, **L22**, **L23** and **L24**, **L25**. The first of these contains its trimmers, while the second, in addition to its trimmers, contains also **C12**, **C13**, **C15**, **R9** and **R10**.

The remaining coils are all beneath the chassis, wound on tubular formers. They are mostly arranged with two coils on a former, and as it is difficult to indicate the positions exactly in our under-chassis view, the following notes will be of interest. It is assumed that we are looking straight down on the underside of the chassis.

L1 is on a former by itself. **L2** is a fine wire winding between the turns of **L3** at the bottom. **L4** is a separate winding below **L5**. **L6** is below **L9**. **L7** is on a former by itself. **L10** is below **L8**.

L11 is a small choke formed of a coil of

wiring-up wire. **L12** (thick wire) is below **L13**. **L15** is wound between the turns of **L14**, at the bottom. **L17** is below **L16**. **L19** is below **L18**. **L21** is the lowest of the three units on its former, the other two forming **L20**.



Diagrams of the three switch units, as seen from the underside of the chassis, looking in the direction of the arrows in the under-chassis view (p. VII).

Scale Lamp.—This is an Ever Ready M.E.S. type, rated at 6.2 V, 0.3 A.

External Speaker.—Provision is made at the rear of the chassis for an external low resistance speaker (about 2 O).

Trimmers C29-C32.—The oscillator trimmers are mounted on top of the respective coil formers. Note that the S.W.1 range has no oscillator trimmer.

Condensers C21, C22.—These are two 8 μF dry electrolytics in a single metal case beneath the chassis. The black lead is the common negative, the red lead to

V6 valveholder is the positive of **C21**, and the red lead to **V5** valveholder the positive of **C22**.

Condensers C7, C8.—The oscillator M.W. and L.W. trackers each consist of two fixed condensers in parallel.

Condenser C4.—The image suppressor is a very small fixed condenser mounted above the chassis deck, in association with **R1** and **C2**.

C12, C13, C15, R9 and R10.—These components are all mounted inside the second I.F. transformer screen. The resistances may be identified by their colour coding. The condensers, however, are all 0.00015 μF types. Of the two condensers mounted one above the other, **C12** is the upper one and **C13** the lower one. The remaining condenser, at the other side of the unit, is **C15**.

Speaker Field.—The resistance of this may be 2,500 O in early models.

CIRCUIT ALIGNMENT

I.F. Transformers.—Feed in a 465 KC/S modulated signal between **V1** pentode section control grid (top cap) and chassis. Adjust I.F. trimmers **C36**, **C35**, **C34** and **C33**, in that order, for maximum reading on output meter.

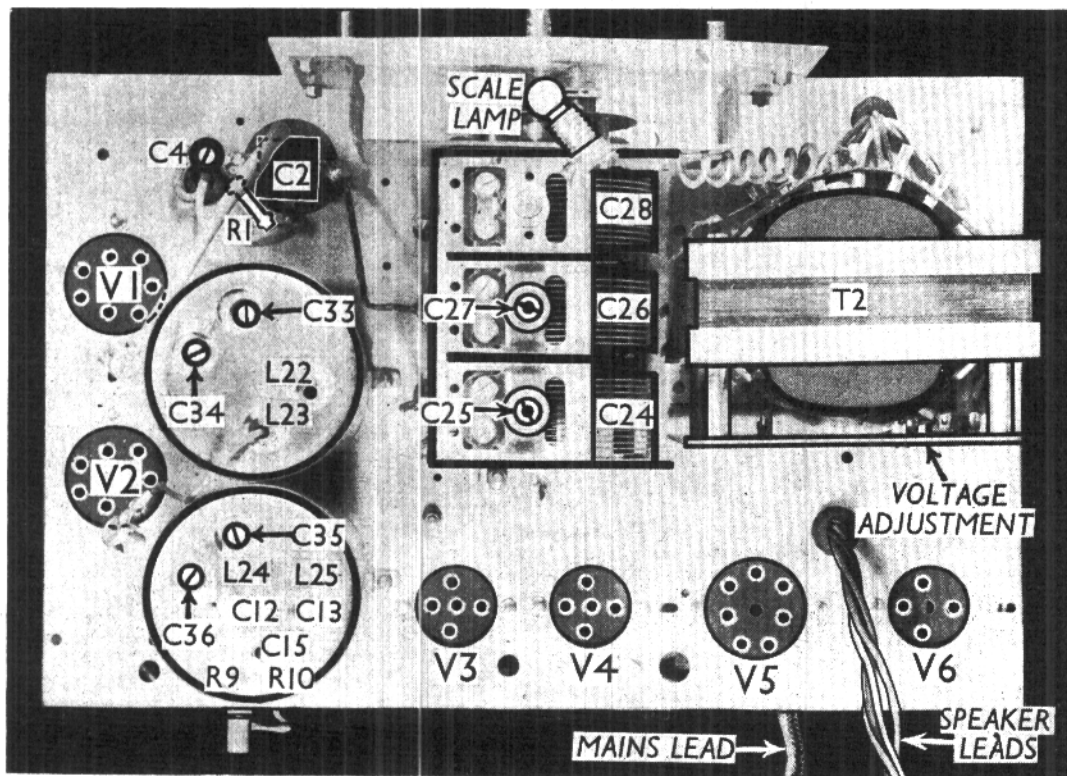
Signal Frequency and Oscillator Circuits.—First of all set scale pointer to horizontal position when gang condenser is at maximum capacity. Set waveband switch to M.W. and gang condenser to 300 m., and feed in a 300 m. signal to the aerial and earth sockets. Adjust oscillator M.W. trimmer **C31** for maximum output and then the two trimmers on the gang condenser, commencing with **C25**.

Set waveband switch to L.W. and gang to 1,200 m. Feed in a 1,200 m. signal and adjust oscillator L.W. trimmer **C32** for maximum output. Do not re-trim **C25** or **C27**.

Set gang condenser to 75 (or 100) m. on the Trawler Band (S.W.3) and feed in a 75 (or 100) m. signal. Adjust oscillator trimmer **C30**.

Set waveband switch to 30 m. (10 MC/S) band (S.W.2) and gang condenser to 30 m. Feed in a 30 m. signal and adjust oscillator trimmer **C29**.

Finally, set waveband switch to 20 m. (10MC/S) band (S.W.1) and gang condenser to 20 m. Feed in a 20m. signal and check. There is no trimmer on this band.



Plan view of the chassis. The second I.F. transformer unit contains several other components. C4 is a small fixed condenser.