"TRADER "SERVICE SHEET

INVICTA A49

AC SUPERHET



THE Invicta A49 is a 3-valve (plus rectifier) AC superhet covering four wavebands. The SW ranges are 13.5 to 52 m (referred to as SWI in this Service Sheet) and 50 to 200 m (referred to as SW2).

There is provision for an external speaker, and for a gramophone pick-up,

the latter being switched by a fifth position on the waveband switch control.

The receiver is suitable for AC mains of 200-250 V, 40-100 C/S.

Release date: May, 1939.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW1), **L2** (SW2) and **L3** (MW and LW) to single tuned circuits **L4**, **C30** (SW1), **L5**, **C30** (SW2), **L6**, **C30** (MW) and **L7**, **C30** (LW). On MW, coupling is assisted by small condenser C1 connected between L3 and L6.

First valve (V1, Mullard ECH2) is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator anode coils L12 (SW1), L13 (SW2), **L14** (MW) and **L15** (LW) are tuned by C33; parallel trimming by C8, C31 (MW) and C9, C32 (LW); series tracking by C10 (SW1), C11 (SW2) and C12 (MW and LW). Reaction by grid coils L8 (SW1), L9 (SW2), L10 (MW) and L11 (LW). The CG resistance R3 and condenser C7 are in the low-potential end of the reaction circuit.

Second valve (V2, Mullard EF9) is a variable-mu pentode operating as IF amplifier with tuned - primary tuned-secondary transformer couplings **C3**, **L16**, L17, C4 and C15, L18, L19, C16.

Intermediate frequency 465 KC/S. Diode second detector is part of double

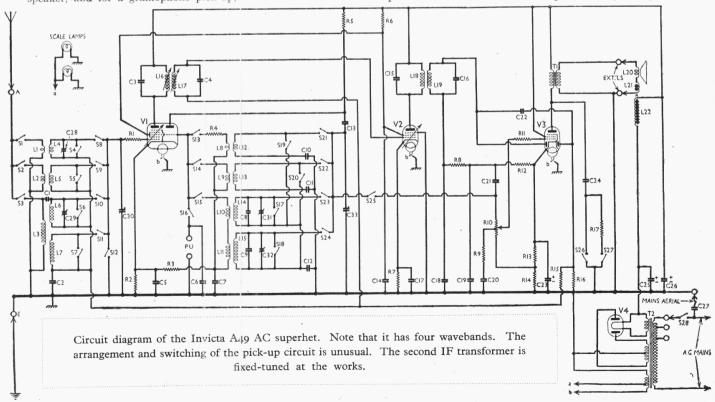
diode pentode output valve (V3, Mullard EBL1). Audio frequency component in rectified output is developed across load resistance R12 and passed via AF coupling condenser C21, manual volume control R10 and grid stopper R11 to CG of pentode section.

For operation with a gramophone pickup, a pair of sockets is provided in the grid circuit of the triode section of **V1** via **\$16.** When the switch control is turned to the "Gram" position, \$16 and \$25 close, and \$1 triode section becomes an AF amplifier with R5 as its anode load resistance and C13 as its output coupling condenser. Thus the pick-up output is handed on via C13 and S25 to the volume control, across which it is developed in amplified form.

A tone-compensating circuit R9, C20 is connected between the centre-tap on R10

and chassis.

IF filtering by C18, R8 and C19 in diode circuit. Three-position tone control in pentode anode circuit by C24, R17 and switches \$26, \$27. Either or both of the switches may be opened. Provision for connection of low impedance external speaker by sockets across secondary of the output transfomer T1. As these sockets are used also to connect the internal speaker, the plugs of the latter are provided with a further socket each, so that both speakers may be operated



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Under-chassis view. The tone control switch tags are indicated, while the two rotary switch units are shown in detail overleaf.

together if desired. Second diode of V3. fed from L19 via C22, provides DC potential which is developed across load resistance R16 and fed back through a decoupling circuit to FC and IF valves, giving automatic volume control. Delay voltage, gether with GB for pentode section, is developed across resistances R13 and R14 in cathode lead to chassis.

HT current is supplied by full-wave rectifying valve (V4, Mullard AZ1). Smoothing by speaker field L22 and dry electrolytic condensers C25 and C26. A mains aerial connection is provided via C27. When this is not in use, the plug is inserted in a second earth socket, so that C27 becomes a mains RF filter.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10	VI pentode CG stabiliser VI fixed GB resistance VI osc. CG resistance Osc. SWI reaction stabiliser VI osc. anode HT feed VI, V2 SG's HT feed V2 fixed GB resistance IF stopper Part of tone compensator Manual volume-control	47 150 22,000 47 22,000 22,000 330 60,000 60,000 1,000,000*
R11 R12 R13 R14 R15 R16 R17	V3 pentode CG stopper V3 signal diode load. V3 pent. GB and AVC delay fotential divider resistances AVC line decoupling V3 AVC diode load Part of tone control.	100,000 500,000 150 330 1,000,000 1,000,000 3,300

* Centre-tapped.

-	CONDENSERS	Values (μF)
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17	Part of MW aerial coupling VI pentode CG decoupling Ist IF transformer fixed tuning condensers VI cathode by-pass Gram PU shunt VI osc. CG condenser Osc. circuit IW fixed trimmer Osc. circuit IW fixed trimmer Osc. circuit SW2 tracker Osc. circuit SW2 tracker Osc. circuit SW2 tracker VI osc. anode coupling VI osc. anode coupling In IF transformer fixed tuning condensers V2 cathode by-pass	0.000006 0.1 0.0001 0.1 0.0001 0.1 0.00015 0.00015 0.00026 0.005 0.0013 0.000657 0.01 0.1 0.0001 0.0001 0.1

R9 S27 S26	CI4/C9 C5
C20 RIO B RIZ C6	0 LIS R3 C32 C12 C12 C14 C13 C3
C27 C25 C21 C7 C10	R6 C8
C26 LI2 CI	
C22 RI6-	CI5 CI7
RIS RIZ LI9 LI8	

	CONDENSERS (Continued)	Values (μF)
C18 C19 C20 C21 C22 C23* C24 C25* C26* C27 C28‡ C30† C31‡ C32‡ C33†	IF by-pass condensers	0.00015 0.00015 0.005 0.005 0.005 0.005 8.0 8.0 0.001 0.0003 0.0003 0.000554 0.0003 0.00053

Cother Components	Lice	attory ato. variable: 4	* x0 D000
L2		OTHER COMPONENTS	Values
SI-S15 Si7-S24 Wave band switches	L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12 L13 L14 L15 L16 L17 L16 L17 L18 L19 L10 L11 L12 L14 L15 L16 L16 L17 L17 L17 L17 L18 L19 L10 L10 L10 L10 L10 L10 L10 L10 L10 L10	Aerial SW2 coupling coil Aerial SW2 coupling Coil Aerial SW2 tuning coil Aerial SW2 tuning coil Aerial SW2 tuning coil Aerial SW2 tuning coil Aerial LW tuning coil Aerial LW tuning coil Oscillator SW2 reaction Oscillator SW2 reaction Oscillator LW reaction Osc. circuit SW2 tuning coil Osc. circuit LW tuning coil Osc. circuit SW2 tuni	1.8 65.0 Very low 0.3 3.6 13.3 50.0 85.0 12.0 Very low 0.4 2.8 7.0 7.0 9.5 9.5 1.8 0.15 2,000.0 310.0 0.15 24.0 0.15
S16,S25 Gram pick-up switches — S26,S27 Tone control switches —		· · · · · · · · · · · · · · · · · · ·	730.0
S26,S27 Tone control switches —)	_
	S28		

DISMANTLING THE SET

Removing the Chassis.—Remove the four control knobs (pull off) from the front of the cabinet, and the four bolts (with one metal and one rubber washer, a brass sleeve and a rubber bush, each) holding the chassis to the shelf inside the cabinet, when the chassis can be withdrawn to the extent of the speaker leads which is sufficient for normal purposes.

To free the chassis entirely, unsolder three leads from the connecting panel on the speaker and three leads from the panel on the speaker transformer, and withdraw the speech coil plugs from the speaker sockets at the rear of the chassis.

When replacing, connect the red lead to the top tag of the panel on the speaker; the black lead (together with a black lead from the speaker transformer) to the bottom tag, and plug the speech coil leads into the sockets on the chassis. The three remaining leads should be connected to the panel on the speaker transformer as follows: brown, to the top left-hand tag; yellow to the top right-hand tag; green to the bottom right-hand tag. Note that two felt washers are fitted between each control knob and the cabinet.

Removing Speaker.—Unsolder the leads from the top and bottom tags on the panel on the speaker transformer, withdraw the speech coil plugs from the speaker sockets at the rear of the chassis, and remove the four hexagon nuts holding the speaker to the sub-baffle.

When replacing, see that the connecting panel is on the right and connect the leads as previously indicated.

Removing Speaker Transformer.—Unsolder the four connecting leads from the panel on the transformer and remove the

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TABLE AND DIAGRAMS OF THE SWITCH UNITS

two	round-h	ead	wood	screws	holding	the
tran	sformer	to 1	the sub	-baffle.		

When replacing, the secondary (thick wire) winding should be on the right; the transformer should be on the right of the speaker; the three leads from the chassis should be connected as previously indicated, and the black lead from the speaker should be connected to the bottom left-hand tag

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 235 V using the 216-235 V tapping on the mains transformer. receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode	Anode	Screen	Screen
	Voltage	Current	Voltage	Current
	(V)	(mA)	(V)	(mA)
VI ECH2	254 Oscil	2·7 lator 6·5	75	7.0
V ₂ EF ₉	254	4·9	75	1·5
V ₃ EBL ₁	243	35·0	254	4·4

† Each anode, AC.

GENERAL NOTES

Switches.—\$1-\$25 are the waveband and gramophone pick-up switches, in two ganged rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams in col. 3, where they are drawn as seen looking from the rear of the underside of

The table (col. 2) gives the switch positions for the five control settings, starting from fully anti-clockwise.

\$26, \$27 are the tone control switches, in a 3-position rotary unit beneath the indicated in our under-chassis view.

Switch	Gram	SWI	SW ₂	MW	LW
Si	_	C	C	1	
S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11	C	-	C	C	C
S4 S5		C			
S6			C	_	
S7 S8		C		C	
S ₉			C		_
Sio				C	C
S12 ®	C	<u>C</u>			_
S13		C			
S14 S15	-		<u>c</u>	C	<u>c</u>
S16	C			_	_
S13 S14 S15 S16 S17 S18	_	_	C	<u>c</u>	7_
510	C			_	
S20 S21		CC			
S22			C		-
S23 S24			_	C	C
S25	C				_

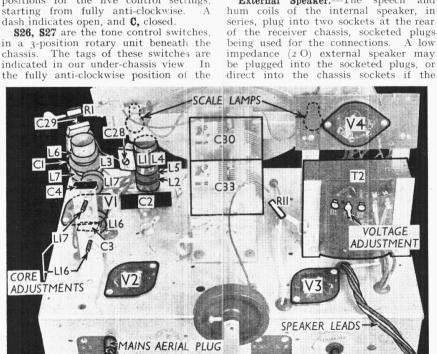
control, \$26 is closed; in the central position, \$27 is closed, while in the fully clockwise position both switches are

\$28 is the QMB mains switch, ganged with the volume control R10.

Coils.—L1, L2, L4, L5; L3, L6, L7 and the first IF transformer L16, L17 are in three unscreened tubular units on the chassis deck. **L8, L9, L12, L13; L10, L11, L14, L15** and the second IF transformer are beneath the chassis. Note that **L16** and **L17** have adjustable iron cores, whereas L18 and L19 are aircored and are fixed tuned.

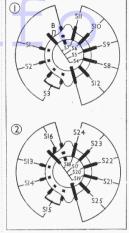
Scale Lamps.—These are two Rival MES types, rated at 6.2 V, 0.3 A. are run from a 4 V tapping on T2 heater secondary.

External Speaker.—The speech and hum coils of the internal speaker, in



Three-quarter plan view of the chassis. C1 is a wire-wound condenser.

Diagrams of the wavechange and pick-up switch units, as seen from the rear of the underside of the chassis.



internal speaker is not required.

Condensers C25, C26.—These are two $8 \mu F$ (550 peak volts) dry electrolytics, in a single carton beneath the chassis, having a common negative (black) lead. The red lead to a bearer tag on a paxolin plate on the underside of the chassis is the positive of **C25**, while the red lead to **V3** holder is the positive of **C26**.

Condenser C1.—This is a small wirewound type, at the side of the L3, L6, L7 coil unit

Pre-set Condensers.—There are two pre-set condensers, one on each aerial coil unit, on the chassis deck, and two more, on the L10, L11, L14, L15 coil unit, beneath the chassis.

Chassis Divergencies.—C6 is not shown in the makers' diagram, while C8 and C9 are not shown separate from C31 and C32. R3, R8 and R9 may each be 47,000 O; R12 may be 470,000 O.

CIRCUIT ALIGNMENT

IF Stages.—Only the first IF transformer will need adjustment, the second being fixed-tuned at the works. Connect signal generator, via a 0·1 μF condenser, to control grid (top cap) of V1 and chassis. Connect a 100,000 O resistor between control grid and chassis. Switch set to

LW, and turn gang to maximum.

Feed in a 465 KC/S signal, and adjust cores of **L16**, **L17** for maximum output. Remove the condenser and resistor.

RF and Oscillator Stages.—Check the scale position, seeing that the cross in the centre is exactly over the centre of the gang spindle, and that the bottom edge of With gang at the scale is horizontal. maximum, pointer should be horizontal also. Connect signal generator, via a suitable dummy aerial, to A and E sockets.

MW.—Switch set to MW, tune to 250 m on scale, feed in a 250 m (1,200 KC/S) signal, and adjust C31, then C29, for maximum output. Check at 550 m.

LW.—Switch set to LW, tune to 1,200 m on scale, feed in a 1,200 m (250 KC/S) signal, and adjust C32 for maximum output. Check at 2,000 m.

SW2.—There are no adjustments on this band.

SW1.—Switch set to SW1, feed in a 14 m (21.4 MC/S) signal, and tune it in accurately. Adjust **C28** for maximum accurately. output. Čheck ať 50 m.

MAINS LEAD