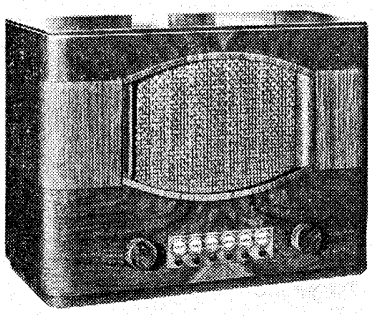
'TRADER' SERVICE SHEET

355

INVICTA 520

NO MANUAL TUNING FITTED



PRESS-BUTTON tuning of the permeability type is provided in the Invicta 520 3-valve (plus rectifier) AC 2-band superhet, but no manual tuning is included. The receiver is suitable for mains of 200-250 V, 40-100 C/S, and has provision for a pick-up, an extension speaker and for using the mains as an aerial.

Six separate models are available with different standard station groupings and bear the suffix A, B, C, D, E and F after the model number, while a seventh has the letter S and is set up to customers' requirements. In all models, however, the coils for a given button have the same inductance.

This *Service Sheet* was prepared on a 520A.

CIRCUIT DESCRIPTION

Aerial input is fed via series condenser **C1** to coupling condenser **C2**, the latter forming a common impedance in the aerial and tuning circuits **L1** to **L6, C3.** As no manual tuning is employed, **C3** is fixed, tuning being effected by iron cored coils having trimmer type core adjustments, and selector switches **S1** to **S6** which are attached to the press-buttons.

First valve (**V1, Mullard metallised TH4A**) is a triode hexode operating as frequency changer with internal coupling. Triode oscillator tuning coils **L7** to **L12** are tuned by fixed condensers **C10, C11,** adjustable iron cores and switches effecting the selection of transmissions as in the aerial circuits. As each coil is associated only with one frequency, no tracking is necessary. Reaction is obtained by connecting the selected coil directly between the grid and anode circuits.

Second valve (**V2, Mullard metallised VP4B**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C6, L13, L14, C7** and **C15, L15, L16, C16.** Both of these transformers are tuned at works, and no tuning adjustments are provided.

Intermediate frequency 465 KC/S.

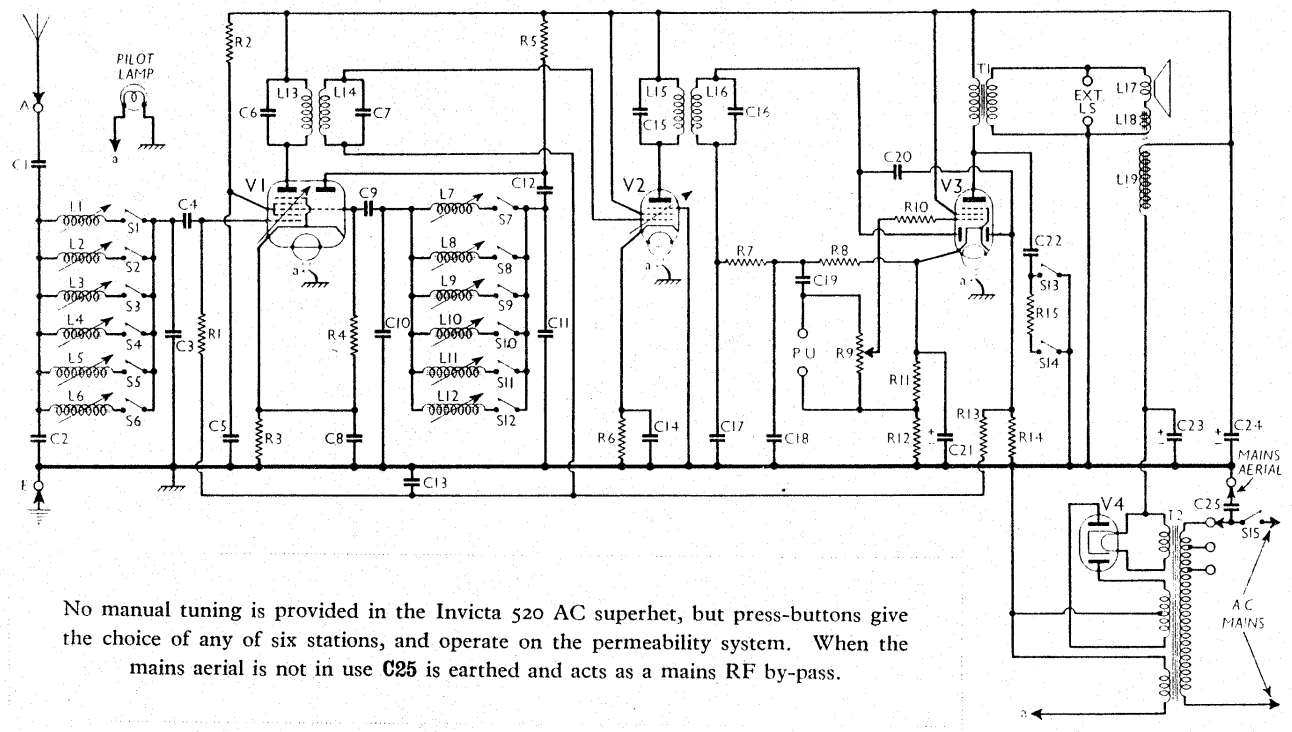
Diode second detector is part of double diode pentode output valve (**V3, Mullard Pen4DD**). Audio frequency component in rectified output is developed across load resistance **R8** and passed via AF coupling condenser **C19,** manual volume control **R9** and grid stopper **R10** to CG of pentode section, which provides the only AF amplification. IF filtering by **C17, R7, C18.** Provision for connection of gramophone pick-up across **R9.** Three position tone control by **C22, R15, S13** and **S14** in pentode anode circuit and provision for connection of low impedance external speaker across secondary of output transformer **T1.**

Second diode of **V3,** fed from **L16** via **C20,** provides DC potential which is developed across load resistance **R14** and fed back through decoupling circuit as GB to FC and IF valves, giving automatic volume control.

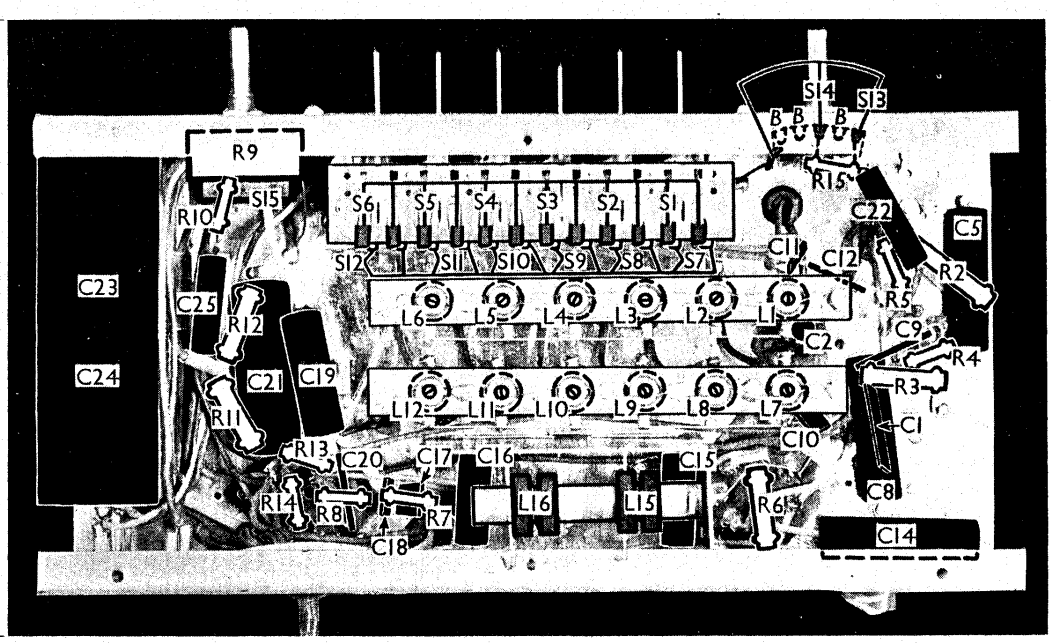
HT current is supplied by IHC full-wave rectifying valve (**V4, Mullard IW4/350**). Smoothing by speaker field **L19** and dry electrolytic condensers **C23, C24.** Provision for mains aerial connection via **C25** by flying lead and plug which can be inserted in the aerial socket. An alternative socket for use when a normal aerial is employed connects the plug to chassis, so that **C25** becomes a mains RF by-pass.

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (four countersunk-head wood screws) gives access



No manual tuning is provided in the Invicta 520 AC superhet, but press-buttons give the choice of any of six stations, and operate on the permeability system. When the mains aerial is not in use **C25** is earthed and acts as a mains RF by-pass.



The coils for the press-button tuning are arranged in two banks with the adjustments for the cores in the centre of the formers. The press-button and tone control switches are clearly indicated in this under-chassis view.

to most of the components beneath the chassis and also to the adjustments for the coils.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, remove the two control knobs (pull off) and the four bolts holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the leads, which is just sufficient for normal purposes. *When replacing*, make sure that the buttons are in place on the press-button unit as some may fall off owing to the fact that they are a very loose fit, and do not forget to replace the felt washers on the spindles of the manual controls.

To free the chassis entirely, unsolder the speaker and indicator lamp leads and, *when replacing*, connect the speaker leads as follows, numbering the tags from bottom to top:—1, blue; 2, green; 3, yellow; 4, no external connection; 5, black.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts from the four screws holding the speaker to the sub-baffle and, *when replacing*, see that the terminal panel is on the right and do not forget to fix the indicator lamp holder on the top right-hand screw. Connect the leads as above.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 hexode CG resistance	250,000
R2	V1 SG HT feed	20,000
R3	V1 fixed GB resistance	200
R4	V1 osc. CG resistance	20,000
R5	V1 osc. anode HT feed	100,000
R6	V2 fixed GB resistance	100
R7	IF stopper	100,000
R8	V3 signal diode load	500,000
R9	Manual volume control	500,000
R10	V3 grid stopper	100,000
R11	V3 GB potential divider; AVC delay	200 / 150
R12		
R13	AVC line decoupling	1,000,000
R14	V3 AVC diode load	1,000,000
R15	Part of tone control circuit	60,000

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0003
C2	Aerial coupling impedance	0·001
C3	Aerial fixed tuning condenser	0·0003
C4	V1 hexode CG condenser	0·00015
C5	V1 SG decoupling	0·1
C6	1st IF trans. pri. fixed tuning	0·00015
C7	1st IF trans. sec. fixed tuning	0·00015
C8	V1 cathode by-pass	0·1
C9	V1 osc. CG condenser	0·00015
C10	Oscillator circuit fixed tuning condensers	0·0003
C11		0·0003
C12	V1 osc. anode coupling	0·00015
C13	AVC line decoupling	0·1
C14	V2 cathode by-pass	0·1
C15	2nd IF trans. pri. fixed tuning	0·00015
C16	2nd IF trans. sec. fixed tuning	0·00015
C17	IF by-pass condensers	0·00015
C18		0·00015
C19	AF coupling to V3 pentode	0·05
C20	Coupling to V3 AVC diode	0·00015
C21*	V3 cathode by-pass	20·0
C22	Part of tone control circuit	0·005
C23*	HT smoothing	8·0
C24*		8·0
C25	Mains aerial coupling	0·001

* Electrolytic.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial circuit MW tuning coils		1·4
L2			1·4
L3			1·9
L4			2·9
L5	Aerial circuit LW tuning coils		22·5
L6			33·0
L7	Oscillator circuit MW tuning coils		1·1
L8			1·1
L9			1·4
L10	Oscillator circuit LW tuning coils		1·8
L11			3·4
L12			3·3
L13	1st IF trans.	Pri...	6·0
L14		Sec...	6·0
L15	2nd IF trans.	Pri...	6·0
L16		Sec...	6·0
L17	Speaker speech coil		3·5
L18	Hum neutralising		0·1
L19	Speaker field coil		3,000·0
T1	Output trans.	Pri...	310·0
		Sec...	0·15
T2	Mains trans.	Pri. total	22·0
		Heater sec.	0·05
		Rect. heat. sec.	0·1
		HT sec., total	750·0
S1-S6	Aerial circuit selector switches		—
S7-S12	Osc. circuit selector switches		—
S13,14	Tone control switches		—
S15	Mains switch, ganged R9		—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, using the 216-235 V tapping on the mains transformer. The lowest wavelength button (Radio Normandie) was pressed 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.

If, as in our case, **V3** should become unstable when its anode current is being measured, it can be stabilised by connecting a non-inductive condenser of about 0.1 μF from control grid (top cap) to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH4A	214	2·7	85	6·6
	Oscillator			
	36	2·0		
V2 VP4B	214	12·0	214	4·5
V3 Pen4DD	205	22·0	214	3·7
V4 IW4/350	365†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—**S1-S6** are the auto selector switches for the aerial circuit, and **S7-S12** those for the oscillator circuit. They are ganged together in a press-button unit, each button controlling two switches, one aerial and one oscillator. Thus the first button (on the right, looking at the front of the set) controls **S1** and **S7**, and so on.

When a button is depressed, its associated switches are *closed*, while in the "out" position of a button, its switches are *open*.

The switches, which are situated on both sides of the press-button unit, are all indicated in our under-chassis view.

S13, S14 are the tone-control switches,

Continued overleaf

INVICTA 520—*Continued*

in a rotary unit at the front of the chassis. The individual switches are indicated in our under-chassis view. In the fully anti-clockwise position of the control **S13** is closed; in the central position **S14** is closed; and in the fully clockwise position both switches are open.

S15 is the QMB mains switch, ganged with the manual volume control, **R9.**

Coils.—**L1-L6** are the aerial tuning coils and **L7-L12** the oscillator tuning coils, in twelve separate tubular units beneath the chassis. Each coil is iron-cored, and is provided with an adjusting screw for station selection. All the coils are indicated in our under-chassis view.

Each pair of coils only covers a certain wavelength range, and in the standard model receivers these are as follows: **L1, L7,** 200-300 m; **L2, L8,** 200-300 m; **L3, L9,** 290-410 m; **L4, L10,** 390-540 m; **L5, L11,** 1,000-1,400 m; **L6, L12,** 1,450-1,900 m. It will be seen that the last two pairs of coils (the two left hand buttons) can only be used for LW stations.

L13, L14 and **L15, L16** are the two IF transformers, which are both unscreened, and are fixed-tuned by parallel fixed condensers. The first IF unit is on the chassis deck, and the second is beneath the chassis.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2 O) external speaker.

Pick-up.—Two sockets are provided at the rear of the chassis for a pick-up, which must be of the high output type (2-3 V). Alternatively, a transformer between the pick-up and its sockets must be used. All press-buttons should be "out" when using a pick-up. This is achieved by depressing a button half-way, which will release the button which is already in the depressed position.

Condensers C23, C24.—These are two 8 μF dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The red lead to **V3** valve-holder is the positive of **C24** and the red lead to **V4** valve-holder (above **T2**) is the positive of **C23.**

Pilot Lamp.—This is an MES type, rated at 6·2 V, 0·3 A.

Chassis Divergencies.—Resistance **R10** is not shown in the makers' diagram, while the tone control components **C22, R15, S13, S14** are shown connected from the junction of **C19, R9** to chassis.

V3 Connections.—The anode and cathode connections of the Pen4DD valve are reversed, compared with those of certain other similar types of valve.

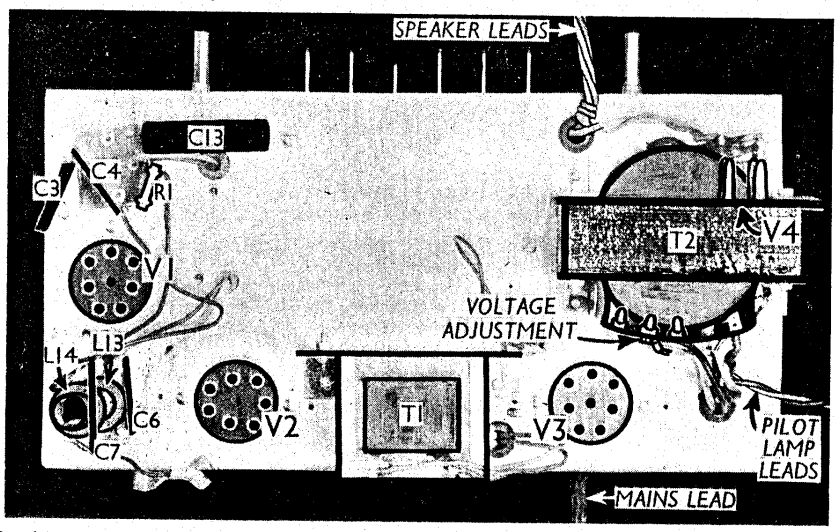
STATION SELECTION

Stations are selected by adjusting the iron cores of the pairs of coils associated with the particular press-button to be used. Note that the stations receivable on any button are limited to the wave ranges given under "Coils" above.

Adjustment can be carried out on the actual stations, or by means of a signal generator.

As an aid to accurate setting, a wire link will be found between two tags on a piece of insulating material at the right of the coil adjustment strips beneath the chassis. If this link is temporarily removed, and a milliammeter (0-20 mA) connected across the two tags, the coil cores are then adjusted for *minimum* deflection on the milliammeter.

The milliammeter is actually connected in series with **L15** in the anode circuit of **V2.** After setting the stations, the wire link must be re-connected between the two tags.



As this plan view shows, there are very few components on the chassis deck owing to the absence of the usual gang condensers and coils.

MAINTENANCE PROBLEMS

H.M.V. 653 Wiring Fault

REQUIRING one of these models for a demonstration, we unpacked one from stock, and put it on our usual "soak test," before taking it out. The set functioned quite O.K., and after about 3 hours was switched off, and the cabinet polished to remove packing dust.

It was then switched on again, and although the pilot light lit, no response was forthcoming. The back and chassis were removed, and the components and voltages were generally checked over, and it was found that there was no filament voltage on the heater of the third valve (Marconi DH63), due to a faulty earth return lead. Upon replacing this particular wire lead, the set worked quite O.K.

The faulty lead was a cotton covered wire, and in the assembling, apparently the lead had been bent into position by means of cutting pliers, and although at the bend the insulation was still intact, the wire inside was broken.—D. HILL, BRIGHTON.

Faulty Wiring in HT Supply

RECENTLY we had a Bush PB53 (manual tuning, plus press-buttons) with a rather unusual fault in it. When tested after being unpacked it seemed to be working up to standard, and the next day it went out on demonstration.

After about two days the prospective buyer mentioned the "pronounced hum" on the set. On listening to the set, hum was certainly more than normal, although the set was working perfectly otherwise.

I quickly tried a new set of valves, but with no improvement. I next removed the chassis and, suspecting the electrolytics, I disconnected them and temporarily fitted replacements, but still the hum persisted.

Next the output valve only was plugged in and the hum was still there as bad as ever. I then suspected reversal of the hum bucking coil in the speaker, but this was tried with no improvement.

The fault was eventually traced to incorrect wiring of the rectifier smoothing circuits. The smoothing on this set is carried out by the speaker field; and this field, together with the speaker transformer, is connected to the set by means of a 4-pin plug and socket.

It was found after very careful inspection that two of these connections (the field pair) had been wired the reverse way round at the plug end. This caused the output valve to get unsmoothed HT, while the other valves got properly smoothed HT.

Reversal of the leads in question (numbers 3 and 4 in the Bush service manual) effected a complete cure. We have had two PB53's with the same trouble.—W. G. EVERSHED, DORKING.

Trimmer Leakage

SEVERE crackle and no signals in Philips 588A and 580A receivers has been traced to leakage between the two sections of the double trimmer tuning the second IF transformer.

The most practical cure is to disconnect the half of the trimmer tuning the primary winding, and mount a single midget trimmer across this winding under the chassis.—G. W. GREEN, IPSWICH.