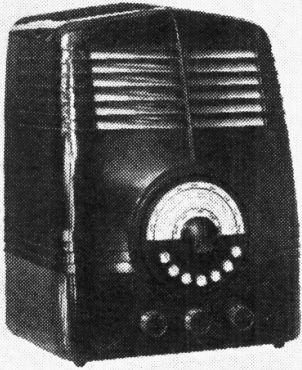


PHILCO D521B AND D521W



The Philco D521B.

BY means of a finger-hole type of dial fitted to the Philco D521 tuning can be pre-set for ten stations. There are actually only seven positions on the dial but each of three of them is made to cover both a medium and a long wave station.

The receiver is a 4-valve (plus rectifier) AC 2-band superhet suitable for mains of 200-250 V, 50-100 C/S, and includes provision for an extension speaker.

Two models of the set are made—the D521B in a moulded cabinet and the D521W in a walnut cabinet, these forming part of the Empire Automatic

range. This Service Sheet was prepared on a D521B.

CIRCUIT DESCRIPTION

Aerial input via coupling condensers **C1** and **C2** to single-tuned circuits **L2**, **C25** (MW) and **L3**, **C25** (LW). **L1** across aerial circuit suppresses modulation hum. **C3**, via **S1** across **L2** on LW, is included only on early chassis.

First valve (**V1**, Philco 6A7E) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L4** (MW) and **L5** (LW) are tuned by **C27**; parallel trimming by **C9**, **C28** (MW) and **C30** (LW); series tracking by **C8**, **C29** (MW) and **C31** (LW). Reaction from anode via **C10** coupled directly to tuning coils.

Second valve (**V2**, Philco 78E) is an RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C32**, **C4**, **L6**, **L7**, **C5**, **C33** and **C34**, **L8**, **L9**, **C35**.

Intermediate frequency 475 KC/S.

Diode second detector is part of double diode triode valve (**V3**, Philco 85). Audio frequency component in rectified output is developed across manual volume control **R7**, which also operates as load resistance, and fed to CG of triode section which operates as AF amplifier. IF filtering by **C13**, **R6**, **C14**, and **C16**.

Second diode of **V3** fed from **L9** via **C15**, provides DC potential which is developed across load resistance **R11** and fed back through decoupling circuit

as GB to FC valve, giving automatic volume control.

Resistance-capacity coupling by **R9**, **C17** and **R12** between **V3** triode and pentode output valve (**V4**, Philco 42E). Fixed tone correction in anode circuit by **C20**. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1**.

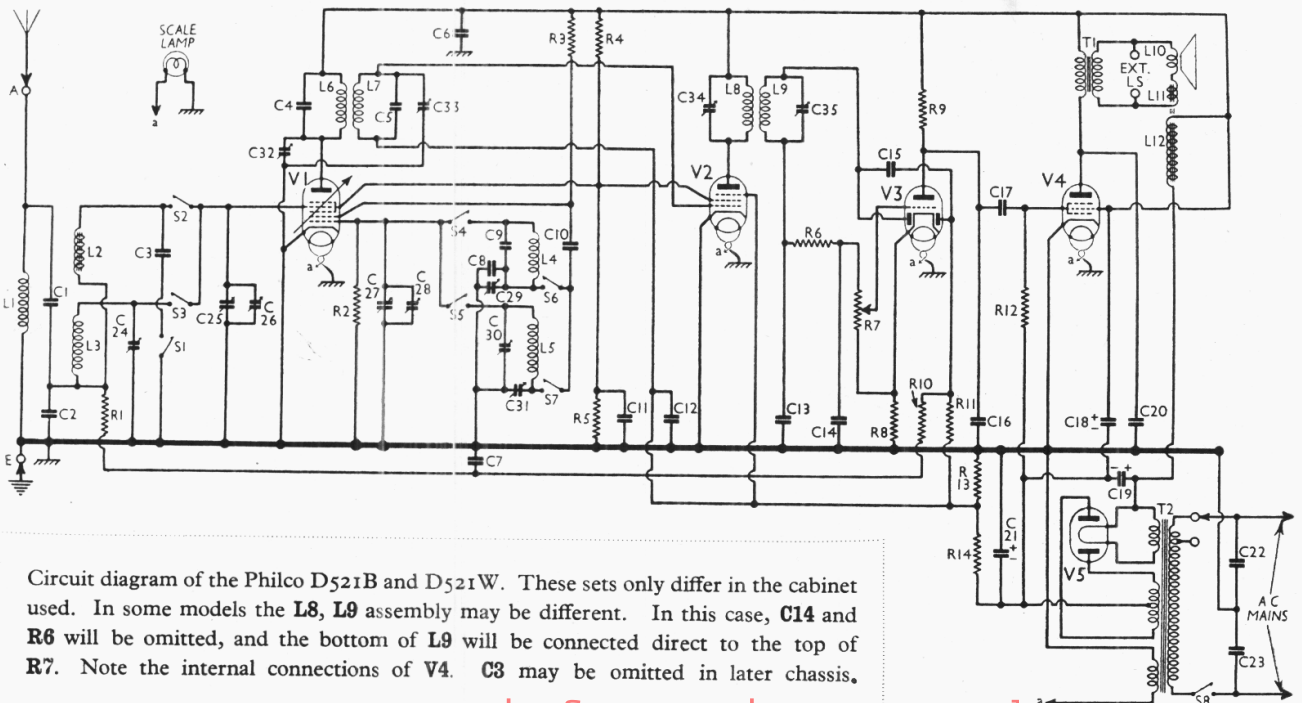
Potentials for **V2** and **V4** GB, and AVC delay, are developed across resistances **R13**, **R14** in HT negative lead to chassis, that for AVC delay being augmented by drop along **R8** in **V3** cathode circuit.

HT current is supplied by full-wave rectifying valve (**V5**, Philco 80). Smoothing by speaker field **L12** and dry electrolytic condensers **C18**, **C19**. Mains circuit RF filtering by **C22**, **C23**.

COMPONENTS AND VALUES

RESISTANCES		Values * (ohms)
R1	V1 tetrode CG decoupling	99,000
R2	V1 osc. CG resistance	99,000
R3	V1 osc. anode HT feed	20,000
R4	V1, V2 SG's HT potential divider	51,000
R5	IF stopper	160,000
R6	IF stopper	51,000
R7	Manual volume control	500,000
R8	V3 GB; part AVC delay	6,000
R9	V3 triode anode load	100,000
R10	AVC line decoupling	1,500,000
R11	V3 AVC diode load	1,500,000
R12	V4 CG resistance	500,000
R13	V4 fixed, V2, V4 auto. GB and part AVC delay resistances	63
R14		200

* Many of the resistors have alternative values. See under Chassis Divergencies.



Circuit diagram of the Philco D521B and D521W. These sets only differ in the cabinet used. In some models the **L8**, **L9** assembly may be different. In this case, **C14** and **R6** will be omitted, and the bottom of **L9** will be connected direct to the top of **R7**. Note the internal connections of **V4**. **C3** may be omitted in later chassis.

CONDENSERS		Values (μ F)
C1	Aerial coupling condensers	0.006
C2		0.00225
C3	MW aerial coil LW shunt	0.00025
C4	1st IF trans. pri. fixed trimmer	0.000115
C5	1st IF trans. sec. fixed trimmer	0.00005
C6	HT circuit RF by-pass	0.25
C7	AVC line decoupling	0.05
C8	Osc. circuit MW fixed tracker	0.00025
C9	Osc. circuit MW fixed trimmer	0.000015
C10	V1 osc. anode coupling	0.0001
C11	V1, V2 SG's decoupling	0.05
C12	V2 CG decoupling	0.01
C13	IF by-pass condensers	0.00011
C14		0.00011
C15	Coupling to V3 AVC diode	0.00011
C16	V3 triode anode IF by-pass	0.0065
C17	V3 triode to V4 AF coupling	0.03
C18*	HT smoothing	8.0
C19*		8.0
C20	Fixed tone corrector	0.0025
C21*	Auto GB by-pass	35.0
C22	Mains RF by-pass condensers	0.015
C23		0.015
C24†	Aerial circuit LW trimmer	0.00011
C25†	Aerial circuit tuning	—
C26†	Aerial circuit MW trimmer	—
C27†	Oscillator circuit tuning	—
C28†	Osc. circuit MW trimmer	—
C29†	Osc. circuit MW tracker	0.0001
C30†	Osc. circuit LW trimmer	0.00011
C31†	Osc. circuit LW tracker	0.0001
C32†	1st IF trans. pri. trimmer	—
C33†	1st IF trans. sec. trimmer	—
C34†	2nd IF trans. pri. trimmer	—
C35†	2nd IF trans. sec. trimmer	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Modulation hum suppressor	25.0
L2	Aerial MW tuning coil	3.0
L3	Aerial LW tuning coil	30.0
L4	Osc. circuit MW tuning coil	3.5
L5	Osc. circuit LW tuning coil	25.0
L6	1st IF trans.	Pri. 8.0
L7		Sec. 12.0
L8	2nd IF trans.	Pri. 12.0
L9		Sec. 8.0
L10	Speaker speech coil	2.0
L11	Hum neutralising coil	0.1
L12	Speaker field coil	1,140.0
T1	Speaker input trans.	Pri. 500.0
		Sec. 0.2
	Pri., total	20.0
T2	Mains trans.	Heater sec. 0.1
		Rect. heat. sec. 0.1
		HT sec., total 330.0
S1-S7	Waveband switches	—
S8	Mains switch, ganged R7	—

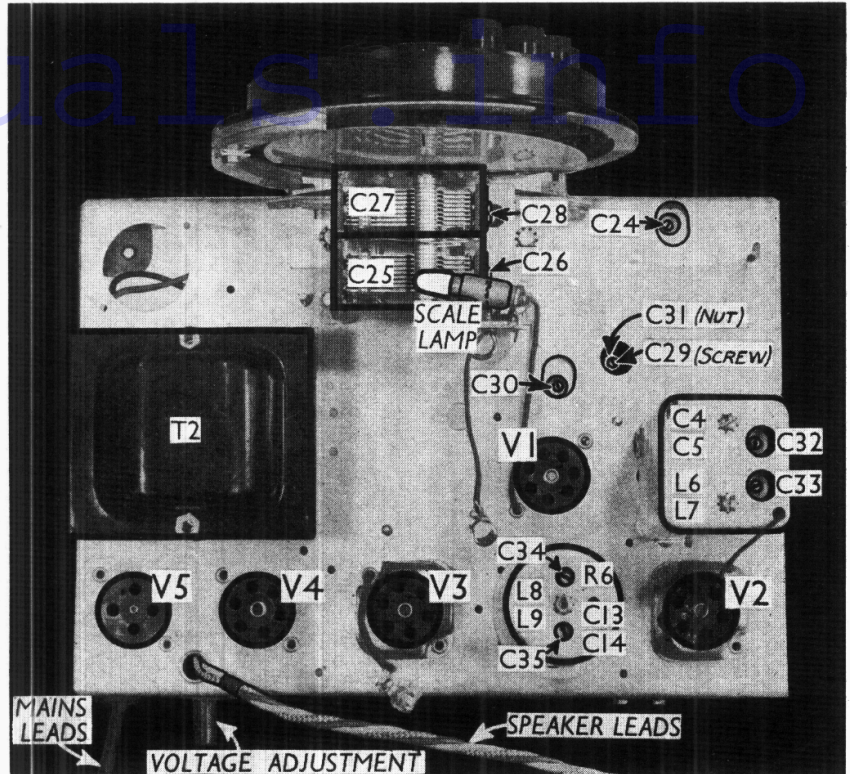
DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the three control knobs (pull off) and then the four bolts (with washers and rubber feet) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

When replacing, see that there is a rubber washer in a metal cup on each of the fixing bolts, between the chassis and the cabinet bottom and with the rubber washer against the chassis, and note that the knob for the wave-change switch has red and blue dots.

To free the chassis entirely, unsolder the speaker leads and *when replacing* connect them as follows, numbering the tags from bottom to top:—1, green/white; 2, green; 3, no external connection; 4, white.

Removing Speaker.—Should it be necessary to remove the speaker from the cabinet, unsolder the leads and remove the nuts, distance pieces and



Plan view of the chassis. C14 and R6 may be omitted from some chassis.

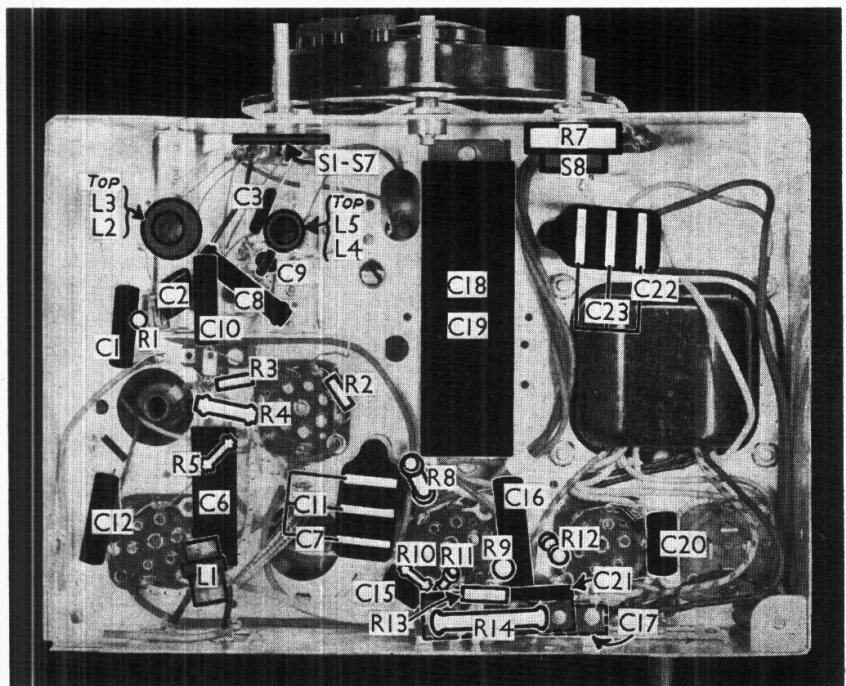
washers from the four bolts holding the speaker to the front of the cabinet. *When replacing,* see that the transformer is pointing to the top right-hand corner of the cabinet, and note that the distance pieces are cut away and that they should be placed with the cut-away end

against the cabinet and with the slot at the top. Connect the leads as above.

VALVE ANALYSIS

Valve voltages and currents given in the table (p. IV) are those measured in

(Continued overleaf)



Under-chassis view. C3 will not be present in late chassis. A diagram of the switch unit is given overleaf.

PHILCO D521—Continued

our receiver when it was operating on mains of 229 V, using the 200-230 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 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 6A7E	(282 Oscil lator 190 2·6 3·6)	2·6	90	2·0
V2 78E	282	3·6	90	0·9
V3 85	40	2·4	—	—
V4 42E	262	40·0	282	8·9
V5 80	345†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—S1-S7 are the waveband switches in a single rotary unit beneath the chassis. They are indicated in our under-chassis view and shown in detail in the diagram below.

The table below gives the switch positions for the two control settings, starting from fully anti-clockwise. A dash indicates *open* and **C** *closed*.

Switch	LW	MW
S1	C	—
S2	—	C
S3	C	—
S4	—	C
S5	C	—
S6	—	C
S7	C	—

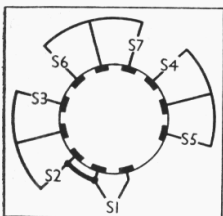


Diagram of the switch unit, drawn as seen when looking from the rear of the underside of the chassis.

S8 is the QMB mains switch, ganged with the volume control, R7.

Coils.—L1, L2, L3 and L4, L5—the aerial and oscillator coils—are on three unscreened tubular formers beneath the chassis, while L6, L7 and L8, L9—the IF transformers—are in two screened units on the chassis deck, together with their associated trimmers. The L6, L7 unit also contains C4 and C5, while the L8, L9 unit contains R6, C13 and C14.

Scale Lamp.—The scale lamp is a Tung-Sol type with a miniature bayonet cap (centre contact) and is rated at 6·3 V, 0·35 A. The Philco part number is 34-2141.

External Speaker.—Two sockets are provided on the terminal panel of the transformer for the internal speaker (T1) for a low resistance extension speaker of 2·3 O.

Condensers C18, C19.—These are two dry electrolytics in a single carton beneath the chassis, both with a working voltage rating of 475 V. The black lead is the common negative, the yellow lead is the positive of C18 and the red lead is the positive of C19.

Condensers C7, C11 and C22, C23.—Each of these pairs of condensers are in a single unit, with a common connection which is taken to chassis *via* the mounting bolt.

Condensers C13, C14 and C35.—These three condensers are housed in the L8, L9 unit on the chassis deck and are formed by four plates, one being common to both C13 and C35, while another is common to C13 and C14.

Trimmers and Trackers.—These are all reached through holes in the chassis deck. C29 and C31 are in a dual unit, the screw adjusting C29 and the nut C31.

Chassis Divergencies.—Alternative values are given in the makers' list of replacement components for most of the resistances. Thus R1 and R2 may be 100,000 O, R3 may be 25,000 O, R4 may be 40,000 O, R5 may be 150,000 O, R8 may be 6,500 O, R10 and R11 may be 1 MO, R12 may be 400,000 O and R13 may be 65 O.

C3 was only fitted in early chassis, and later models will not have it.

In some chassis an alternative assembly for the second IF transformer (L8, L9) is fitted. This omits C14 and R6, the bottom of the L9 being connected direct to R7.

AUTOMATIC DIAL

A special tool is supplied for adjusting the buttons, for which operation both hands must be used. In the event of any difficulty being experienced at any stage of the procedure described below, tighten the button and start again.

First turn the wave-change switch to the appropriate band, tune in the required station and prise out the station name-tab from the button nearest to the bottom by inserting a pin in the hole in the centre of the tab.

Then insert the prongs of the tool in the two holes in the button, press the button, rotate the dial until a click is heard and give the tool one turn in an anti-clockwise direction, to loosen the button, but do not unscrew beyond this point.

Next, holding the button depressed with the finger and thumb of the free hand, insert the blade of the tool in the screw head in the centre of the button, turn the screw (and thus the dial) until the required station is properly tuned in and keeping the blade of the tool pressed in and steady, tighten the button itself by clockwise rotation with the finger and thumb of the other hand.

Now complete the tightening of the button by inserting the prongs of the tool in the two holes and giving a final twist, check the setting by tuning the dial, pressing the button and swinging the button towards the bottom until a click is heard and, if satisfactory, insert the appropriate name-tab, a selection of which is supplied with the set.

For a detailed description of the construction of the dial reference should be made to the *Radio Maintenance Supple-*

ment dated May 14 (*Service Sheet* 315—Alba 801).

CIRCUIT ALIGNMENT

IF Stages.—Connect an output meter across the primary of the speaker input transformer, T1 (green and white leads), turn the wave-change switch to MW and the volume control to maximum (fully clockwise).

Connect a signal generator *via* a dummy aerial to the grid of V1 (top cap), keeping the grid connection in place, and chassis. Feed in a 475 KC/S (631·6 m) signal and adjust C34, C35, C33 and C32 for maximum output.

RF and Oscillator Stages.—Turn the gang condenser to minimum, insert a 0·006 in. feeler gauge under the heel of the rotor vanes and close the gang on the gauge. Check that the indicator is in line with the index mark under the letter "A" in "Leningrad." If not, slip the dial on the gang spindle. Remove the gauge.

MW.—Connect the signal generator *via* a dummy aerial to the A socket, and chassis. Tune the set to the black dot at 214 m, feed in a 214 m (1,400 KC/S) signal and adjust C28 and C26 in that order for maximum output.

Feed in a 500 m (600 KC/S) signal, tune the set to it and adjust C29 (screw) for maximum output, while rocking the gang. Then readjust C28 at 214 m, and repeat the adjustments until no further improvement results.

LW.—With the wave-change switch still in the MW position feed in a 285·7 m (1,050 KC/S) signal and tune the set to it. Keep the dial in this position, switch the set to LW, feed in a 1,293 m (232 KC/S) signal and adjust C30 and C24 for maximum output, while rocking the gang.

Tune the set to the blue dot under the letter "T" in Budapest, feed in an 1,875 m (160 KC/S) signal and adjust C31 (nut) for maximum output, while rocking the gang.

Repeat the adjustments at 285·7 and 1,293 m, then at 1,875, 285·7 and 1,293 m until no further improvement results. Check the calibration.

The set can be aligned in a simpler manner on LW, but if the MW and LW pre-set stations are to coincide properly the procedure described should be adopted.

MAINTENANCE HINT

Motor Boating in Philco 333

SEVERAL times recently the complaint has been made to me that the Philco People's Set, model 333, motorboats when operated at anything above weak volume.

The remedy has been the same in each case—to connect the accumulator to the set correctly. Service engineers will recall that the LT+ lead is white/black and the LT- lead is white, while each is plainly labelled. In spite of this the white/black lead has been connected to the negative terminal of the accumulator.—J. WHEELER, GREAT MISSENDEN.