'TRADER' SERVICE SHEET

220

PHILIPS V5A

3-BAND A.C. SUPERHET

An interesting point in the Philips V5A is that its construction does not follow conventional lines, as no chassis is employed. Instead the components are mounted direct on to the moulded cabinet.

The receiver is a 3-band 4-valve (plus rectifier) A.C. superhet type with a short-wave range of 16·7-51 metres, and is suitable for mains of 100-260 V, 50-100 C/S. Provision is made for the connection of a gramophone pick-up.

CIRCUIT DESCRIPTION

Aerial input on M.W. and L.W. via coupling coils **L2, L3** and small condenser **C2** to capacity coupled band-pass filter. Primary **L4, L5** tuned by **C25**; secondary **L9, L10** tuned by **C28**; coupling by condensers **C4** and **C5**. I.F. filter **L1, C1** in aerial circuit. A special circuit **C3, L6, L11** is claimed to increase the sensitivity and selectivity on M.W. and L.W. bands, thus improving the signal/noise ratio. On S.W. band aerial input is via coupling coil **L7** to single-tuned circuit comprising **L8** and **C28.**

First valve (**V1, Mullard metallised FC4**) is an octode operating as frequency changer with electron coupling. Resistance **R2** in pentode C.G. circuit prevents parasitic oscillation on S.W. Oscillator grid coils **L12** (S.W.), **L13** (M.W.) and **L14** (L.W.) are tuned by **C29**; parallel trimming by **C30** (L.W.); series tracking by fixed condensers **C11** (M.W.) and **C10** (L.W.); oscillator reaction coils **L15** (S.W.), **L16** (M.W.) and **L17** (L.W.). The resistance **R5** provides damping on S.W.

Second valve (**V2, Mullard metallised VP4B**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier, with tuned-primary tuned-secondary transformer couplings **C8, L18, L19, C9** and **C15, L20, L21, C16.** Tuning is varied by altering spacing between the two sections of each coil.

Intermediate frequency 128 KC/S.

Diode second detector is part of double-diode triode valve (**V3, Mullard metallised TDD4**). Audio frequency component in rectified output is developed across **R8** and manual volume control **R9** and passed via **C18** to C.G. of triode section which operates as A.F. amplifier. **R8** prevents the full signal voltage being applied to the C.G. of triode section on radio to avoid overloading; it has no effect on gramophone pick-up operation. Provision for connection of gramophone pick-up across **R9.** Tone correction by **C19.**

Second diode of **V3,** fed from **V2** anode via **C21,** provides D.C. potential which is developed across load resistance **R14** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **R18** in H.T. negative circuit.

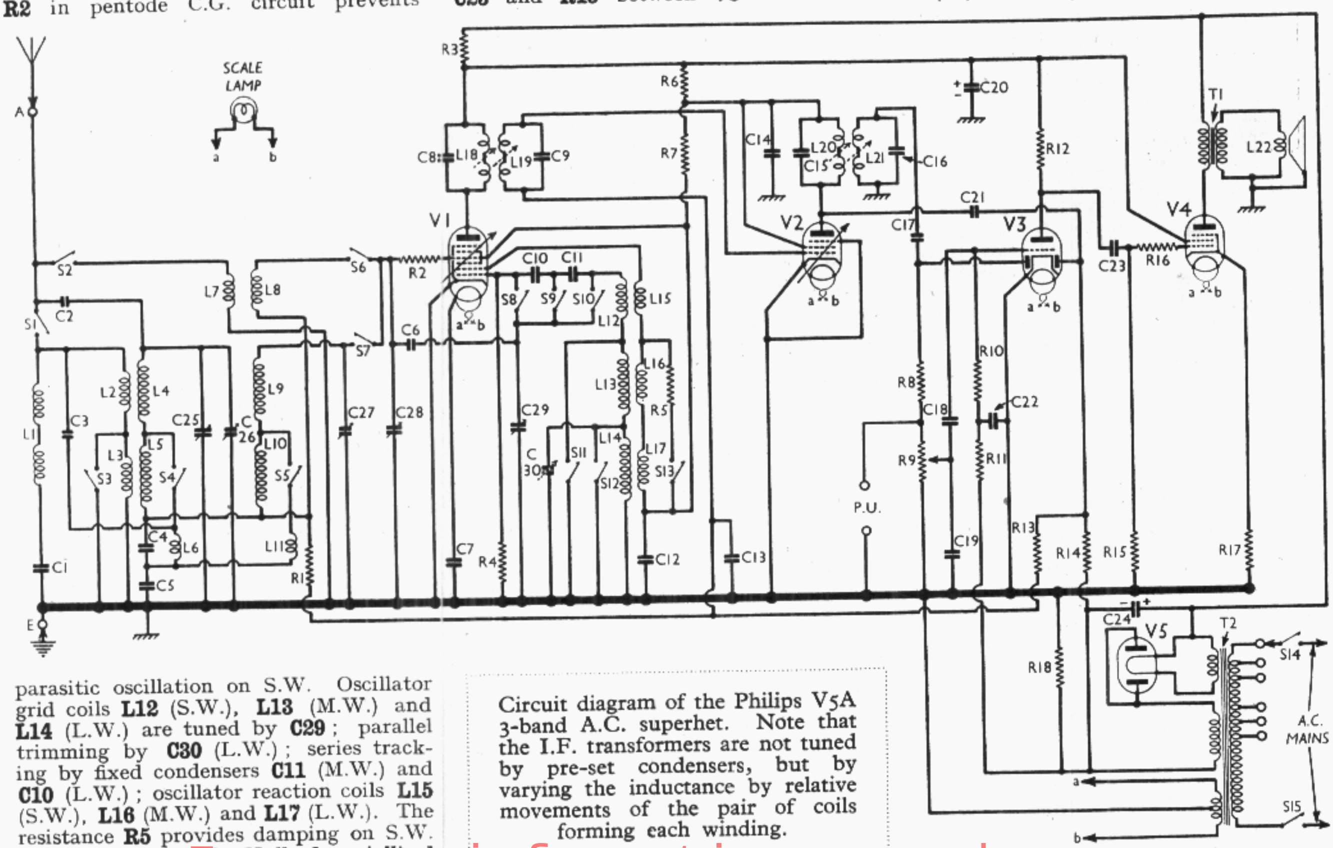
Resistance-capacity coupling by **R12, C23** and **R15** between **V3** triode and pentode output valve (**V4, Mullard Pen A4**).

H.T. current is supplied by rectifying valve (**V5, Philips 1821**), the two anodes being strapped together to give half-wave rectification. Smoothing by resistance **R3** and large capacity wet electrolytic condensers **C20, C24.**

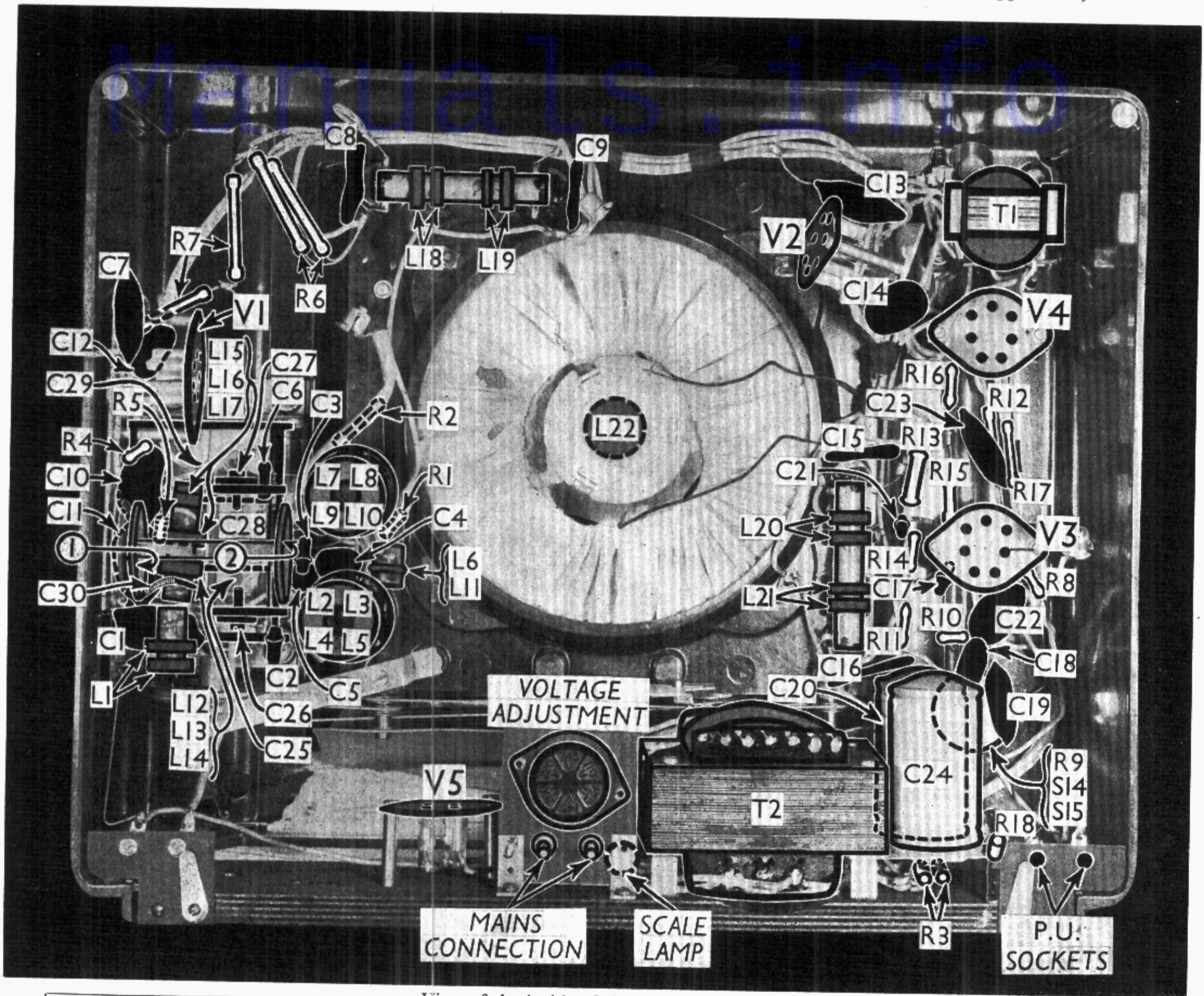
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode C.G. decoupling ..	100,000
R2	V1 pentode C.G. resistance	50
R3*	V1, V2, V3 H.T. feed resistance	2,000
R4	V1 osc. C.G. resistance ..	50,000
R5	Osc. anode series resist. (S.W.)	40
R6†	V2 anode decoupling ..	5,000
R7‡	V1 S.G. and osc. anode decoupling	16,400
R8	Part signal diode load ..	200,000
R9	Manual volume control and part signal diode load ..	500,000
R10	V3 triode C.G. resistance ..	800,000
R11	V3 triode C.G. decoupling ..	250,000
R12	V3 triode anode load	320,000
R13	A.V.C. line decoupling ..	1,000,000
R14	V3 A.V.C. dioede load ..	500,000
R15	V4 C.G. resistance	800,000
R16	I.F. stopper	200,000
R17	V4 G.B. resistance	125
R18	V3 triode G.B. and A.V.C. delay resistance	40

* Two 4,000 O resistances in parallel.
† Two 10,000 O resistances in parallel.
‡ 10,000 O and 6,400 O resistances in series.



Circuit diagram of the Philips V5A 3-band A.C. superhet. Note that the I.F. transformers are not tuned by pre-set condensers, but by varying the inductance by relative movements of the pair of coils forming each winding.



View of the inside of the cabinet, showing all the components *in situ*. Some have had to be shown by dotted lines.

CONDENSERS		Values (μF)
C1	I.F. filter fixed tuning condenser	0·0001
C2	Aerial M.W. and L.W. series	0·00002
C3	Part special selectivity circuit	0·00005
C4	Band-pass couplings ..	0·016
C5		0·025
C6	Small coupling	0·000002
C7	V1 heater R F. by-pass ..	0·01
C8	1st I.F. trans. pri. fixed tuning	0·00018
C9	1st I.F. trans. sec. fixed tuning	0·00018
C10	Osc. circuit L.W. fixed tracker	0·0007
C11	Osc. circuit M.W. fixed tracker	0·00149
C12	V1 S.G. and osc. anode decoupling	0·1
C13	V2 C.G. decoupling	0·1
C14	V2 anode decoupling ..	0·1
C15	2nd I.F. trans. pri. fixed tuning	0·00018
C16	2nd I.F. trans. sec. fixed tuning	0·00018
C17	V3 signal diode coupling ..	0·000016
C18	A.F. coupling to V3 triode ..	0·01
C19	Fixed tone corrector	0·001
C20*	H.T. smoothing	32·0
C21	V3 A.V.C. diode coupling ..	0·000002
C22	V3 triode C.G. decoupling ..	0·25
C23	V3 to V4 A.F. coupling ..	0·01
C24*	H.T. smoothing	32·0
C25†	Band-pass primary tuning ..	0·00049
C26‡	Band-pass primary trimmer ..	0·000055
C27‡	Band-pass secondary trimmer	0·000055
C28†	Band-pass sec. and S.W. aerial tuning	0·00049
C29†	Osc. circuit tuning	0·00049
C30‡	Osc. circuit L.W. trimmer ..	0·00002

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial I.F. filter coil	130·0
L2	Aerial M.W. and L.W. coupling coils ..	25·0
L3		90·0
L4	Band-pass primary coils	4·5
L5		50·0
L6	Part special selectivity circuit	0·75
L7	Aerial S.W. coupling coil ..	2·0
L8	Aerial S.W. tuning coil ..	0·2
L9	Band-pass secondary coils	4·5
L10		45·0
L11	Part special selectivity circuit	0·75
L12	Osc. S.W. tuning coil ..	0·2
L13	Osc. M.W. tuning coil ..	10·0
L14	Osc. L.W. tuning coil ..	25·0
L15	Osc. S.W. reaction coil ..	25·0
L16	Osc. M.W. reaction coil	6·5
L17	Osc. L.W. reaction coil	
L18	1st I.F. trans. Pri. ..	85·0
L19	1st I.F. trans. Sec. ..	85·0
L20	2nd I.F. trans. Pri. ..	85·0
L21	2nd I.F. trans. Sec. ..	85·0
L22	Speaker speech coil	1·5
T1	Output trans. Pri. ..	500·0
	Output trans. Sec. ..	0·4
T2	Mains trans. Pri. total ..	40·0
	Mains trans. Heater sec. ..	0·2
	Mains trans. Rect. heat. sec.	0·2
	Mains trans. H.T. sec. total	130·0
S1-S13	Waveband switches	—
S14-15	Mains circuit switches.	—

DISMANTLING THE SET

It is not possible to remove the receiver as a whole from the cabinet but there are various sub-assemblies which can be taken out as units, if necessary. Some of the components are held in place with pitch and a similar material will have to be used for re-fixing them.

Removing Speaker.—If it is desired to remove the speaker from the cabinet, unsolder the speech coil leads and then remove the four screws (with washers), one at each corner of the speaker moulding. The grille covering the speaker aperture can then be removed, exposing the heads of four bolts (with nuts and lock-nuts) which hold the speaker to the cabinet. These should be removed, when the speaker can be withdrawn from the front of the cabinet.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in

Continued overleaf

PHILIPS V5A—*Continued*

our receiver when it was operating on mains of 235 V, using the 245 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, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC4*	220	1·1	65	4·2
V2 VP4B	170	2·5	170	0·9
V3 TDD4	55	0·5	—	—
V4 PenA4	235	35·0	220	5·6
V5 1821	245†	—	—	—

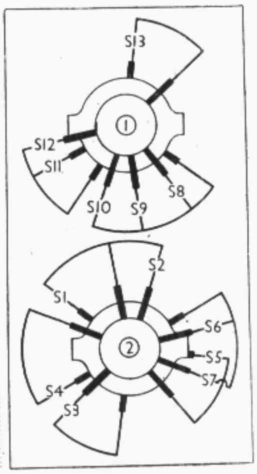
* Oscillator anode (G2) 65 V, 2·1 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S13** are the waveband switches, in two ganged rotary units mounted on the left centre, looking at the rear of the cabinet. They are indicted by numbers in circles and arrows in the inside cabinet view, and are shown in detail in separate diagrams, where the units are seen looking from the right-hand side of the rear of the cabinet. The table below gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open, and **C** closed.

Switch	S.W.	M.W.	L.W.
S1	O	**C**	**C**
S2	**C**	O	O
S3	O	**C**	O
S4	O	**C**	O
S5	**C**	**C**	O
S6	**C**	O	O
S7	O	**C**	**C**
S8	O	O	**C**
S9	O	**C**	O
S10	**C**	O	O
S11	**C**	O	O
S12	O	**C**	O
S13	**C**	O	O

Switch diagrams, looking from the right hand side of the rear of the cabinet.



S14, S15 are the two mains circuit switches, ganged with the volume control **R9**, and mounted between it and the front of the cabinet.

Coils.—**L1** is in two sections on a tubular former, and is unscreened. **L2-L5** and **L7-L10** are in two tubular screened units. **L6** and **L11** are on another small tubular unscreened former, between the two screened units. The oscillator coils, **L12-L17**, are also unscreened, and are on a tubular former under the switch assembly, in two groups of three.

The I.F. transformers **L18, L19** and **L20, L21** are to the top left and bottom right of the speaker. They are unscreened, and the primary and secondary in each case consists of two coils in series, whose relative position can be altered if alignment becomes necessary.

External Speaker.—No provision is made for this, but a high impedance type could be connected across the two tags on **T1** to which the primary is connected.

Scale Lamp.—This is a special Philips M.E.S. type, with a frosted bulb, Part No. 8042-07. It can be removed and replaced more easily if its holder and mounting bracket are first twisted anti-clockwise through 90 degrees.

Resistances R3, R6, R7.—**R3** consists of two 4,000 O types in parallel; **R6**, two 10,000 O types in parallel; and **R7**, a 10,000 O and 6,400 O type in series.

Condenser C30.—This is a small condenser consisting of a spiral insulated wire wound over a thick insulated wire.

CIRCUIT ALIGNMENT

I.F. Stages.—Feed a 128 KC/S signal via a 0·032 μF condenser to the control grid of **V2.** Warm the *outer* coils of **L20, L21** until the wax softens, by means of a soldering iron. First adjust the outer coil of **L21,** then the outer coil of **L20,** until maximum output is obtained. The coils should be moved along the former very slightly, taking care not to break the fine connecting wires.

Next apply the 128 KC/S signal via the 0·032 μF condenser to the control grid (top cap) to **V1,** and adjust **L19** and **L18** in the same way.

Feed the 128 KC/S signal to the **A** socket via a 0·00014μF condenser, switch set to L.W., and turn the gang to maximum. Heat **L1,** and adjust the spacing of the two coils until the *minimum* output is obtained.

R.F. and Oscillator Stages.—Switch set to M.W. Rotate adjusting screw of **C27** completely clockwise, and that of **C26** about half-way. Feed a 1,450 KC/S (207 m.) sginal via a 0·00014 μF condenser to the **A** socket, and rotate the tuning condenser until the first signal from the minimum position becomes audible. Adjust the gang accurately to maximum output. Now adjust **C26** and **C27** for maximum output.

Without altering the tuning condenser setting, switch set to L.W. Feed in a 411 KC/S (730 m.) signal, and adjust **C30** for maximum output. If the capacity is too high, unwind some of the spiralled wire; if it is too low, a new and longer piece of thin wire must be wound over the thicker wire.

MAINTENANCE PROBLEMS

Trouble With Cossor 350

MANY Cossor 350 receivers have been returned to me with the complaint that the volume control potentiometer has no effect whatever on medium waves but works perfectly on long waves. It appears that the trouble is caused by a short circuit on a small condenser which is mounted on lugs alongside the coil in the first coil can.

I have found that the cure is to take the condenser out, dismantle it, clean all the parts and reverse the connecting plates. —L. P. SPAIN, DEAL.

Intermittent Signals and Instability

INTERMITTENT signals and sometimes a continuous whistle were obtained from a battery superhet which was sent in for service. Valves and batteries were first tested and these proved to be O.K.

In this set a separate oscillator valve is used and it was found that the intermittent signals were due to periodical failure of the oscillator circuit, due to a 2,000 O resistor in the grid lead making loose contact with a soldering tag. On repairing this joint, signals were continuous and the steady whistle had cleared.

While giving the set a broadcast test it was found that on connecting or disconnecting the aerial, with the receiver tuned to a station, a short hoot was produced. The quality of reproduction was also found to be below standard.

Faulty decoupling was suspected but everything was O.K., and it was then found that a steady A.F. howl could be produced when certain groups of leads were touched. These groups were the leads to the volume control, a potentiometer forming the diode load, and those to the tone control, a variable resistance with a series condenser across the primary of the output transformer, feedback and A.F. instability thus being caused by the stray coupling. Separating the leads cured the trouble.—W. G. GOUGH, WORCESTER.

Detector Out of Action

NO results at all could be obtained from an Alba 740 when it was operating on radio but it was quite O.K. on gramophone. At first it was thought that the oscillator had stopped but it was found that only a forced signal from a generator could be obtained through the set, from the signal grid of the FC13.

All voltages were more or less O.K. but no signal of normal strength could be obtained even from the grid of the I.F. amplifier. I came to the conclusion that the double diode (2D13A) was not detecting and checked the I.F. transformers and all components associated with it.

It is usually taken for granted when an A.C./D.C. set lights up that all the valves are in circuit, but when I went to replace the double diode without switching the set off, I noticed to my surprise that the pilot bulbs and the other heaters kept alight.

Upon examining the wiring it was found that the pilot bulbs were connected to the heater of the 2D13A and further examination showed a short from one side of the bulb holder to chassis, thus shorting the heater of the valve.—B. TREE, COTTINGHAM.

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