SERVICE ENGINEER

PHILIPS 745A FOUR VALVE ALL-WAVE SUPERHET

CIRCUIT.—A 4-valve, plus rectifier, A.C. mains receiver for operation on three wave-bands—the usual medium and long waves and short waves from 16 to 51 metres.

Signals are fed from the aerial through a band-pass filter, using top capacity coupling, and R32, which is incorporated to prevent parasitic oscillation on short waves, to V1, the frequency changer. On short waves a simple tuned coil is used in the grid circuit.

The output of V1 is then passed through an I.F. transformer tuned to 128 kc., to V2, an H.F. pentode, and then through a second I.F. transformer to V3, a double diode. The secondary connection is taken from a tap so as to cut down damping. One diode of V3 is used to supply A.V.C. bias to the preceding valves in the orthodox manner.

The L.F. output of V3 is passed *via* a resistance and capacity stage incorporating the volume control to the output pentode V4, which is tone controlled by R22, R23 and C42.

When the receiver is operating on short waves the oscillation frequency is 128 kc. lower than that of the H.F. circuits; on medium and long waves it is, of course, higher.

Mains equipment consists of transformer, full-wave rectifier, smoothing choke and electrolytic condensers.

Special Notes.—The dial lamp is an 8042 Philips type; to remove it raise the dial assembly and slacken the two bolts that will be found one in each end of the lamp bracket, which will then pivot on the right hand bolt.

The external speaker is connected to the primary of the output transformer and should have its own matching transformer.

R32 is inside the connecting cap to V1.

Switching Explanation.—It will be seen there are two concentric rings of dots and circles in each switch diagram. The small circles represent contact springs on the stators, and the dots are used where there are no contacts.

The short radial lines between the two concentric rings represent shorting contacts on the rotor. Where there is a solid line joining two or more of these short radial lines, the shorting contacts are actually connected together.

The dotted arcs show that adjacent contacts are shorted together (not permanently, but according to the position of the rotor).

The switches are shown in the open position. They work in a clockwise direction, the order of operation being: short, medium and long waves, gramophone. With each new position, of course, *all* the shorting strips move along one set of contacts clockwise.

The 745A introduced by Philips is a four-valve plus rectifier A.C. superhet, covering a 16-51 metre band, in addition to the usual medium and long bands. Finger-tip tuning silencer and Adaptovisor dial are two special features.

It may be found easier to follow the switching by working from the grid of the adjacent valve.

Quick Tests.—No quick test points are accessible on this receiver, and routine valve tests should be used for fault tracing.

Exposing Chassis.—Practically all the work necessary on this receiver may be done without removing the chassis, by removing the fibre-board from underneath the cabinet. This is secured by four screws.

Should it be found necessary to remove the chassis, the procedure is as follows: Remove the four knobs from the front. These are held by grub screws, the two large knobs having two each.

Take out four bolts from underneath the cabinet, release the dial lamp bracket from its securing bolts, and raise the scale assembly to the limit of its travel. Slacken off the small screw on the pointer.

Holding the Bowden wire, next free the cable to the wave-change indicator, and completely unscrew the hollow adjustment screw. Then unscrew the two slotted nuts on either side at the bottom of the scale and remove the copper strips. The scale may then be removed from the cabinet.

Free the bracket supporting the pointer drive cable by means of the wood screws in each end, unsolder the leads on the terminal strip on the speaker, and the chassis will then come out.

VALVE READINGS

No signal. Volume maximum. 200v. A.C. mains.

V.	Type.	Electrode.	Volts	M.a.
1	Mullard FC4	anode ...	255	6.5
	Met. (7) ...	screen ...	105	4.75
		osc. anode...	100	1.75
2	Mullard VP4B Met. (7) ...	anode ...	160	2
		screen ...	230	6.5
3	Mullard 2D4A Met. (5) ...	diode ...	—	—
4	Mullard Pen. A4 ... (7) ...	anode ...	225	38
		screen ...	250	4.75
5	Philips 1821 (4) ...	filament ...	290	—

ALIGNMENT NOTES

A special template is available from Philips Lamps, Ltd., to facilitate ganging. The template is temporarily fitted to the tuning condenser, and gives a position, 15 degrees from minimum capacity, at which certain adjustments (see below) should be made. The receiver is quite a straightforward job, however, and can be aligned satisfactorily without the template.

I.F. Circuits.—Switch the receiver to long waves with tuning condenser at maximum, connect a modulated oscillator tuned to 128 kc. to the grid cap of V1, *via* a .03 mfd. condenser, reconnecting the grid lead by a short length of wire. Connect an output meter across the external speaker terminals.

Turn C13 almost to maximum capacity. Shunt C24 with a 25,000 ohm resistance and adjust C25 for maximum output.

Remove the shunt resistance, and shunt C23 with a 10,000 ohm resistance and a .1 mfd. condenser in series and trim C22 for maximum output. Remove the shunt.

Shunt C25 with a 25,000 ohm resistance and trim C24 for maximum output. Remove the shunt.

Shunt C22 with a 10,000 ohm resistance and a .1 mfd condenser in series and trim C23 for maximum output. Remove the shunt.

Medium Waves.—Connect a modulated oscillator *via* a dummy aerial to the aerial and earth terminals.

Tune it and the receiver to 208 metres (or use the special template to obtain setting of receiver tuning condenser) and adjust C17, C14 and C15 for maximum.

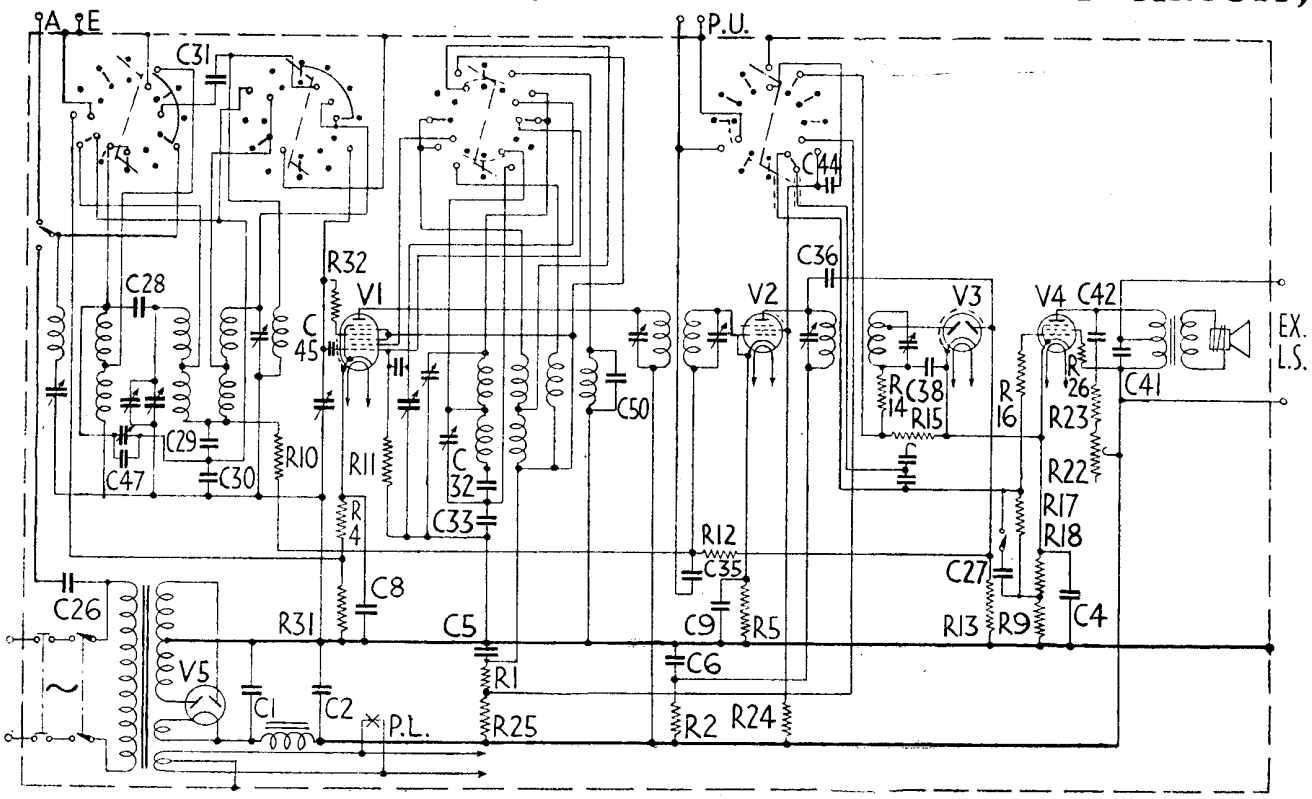
Long Waves.—Inject a signal of 760 metres to the aerial socket, tune set to this (or use special template) and adjust C18 for maximum reading on output meter.

Inject a strong signal, of 128 kc., to the aerial socket, tune the gang condenser to maximum capacity, and trim C13 for minimum output.

Image Filter.—Inject a signal of 403 metres and tune it in. Then inject a strong signal of 300 metres, and adjust C46 for minimum output.

(For diagrams and tables, see overleaf.)

PHILIPS 745A ALL-WAVE SUPERHET CIRCUIT,



The switching diagrams used in this Philips 745 A circuit are explained under a special section on page 31.

CHASSIS LAYOUTS AND COMPONENTS TABLES

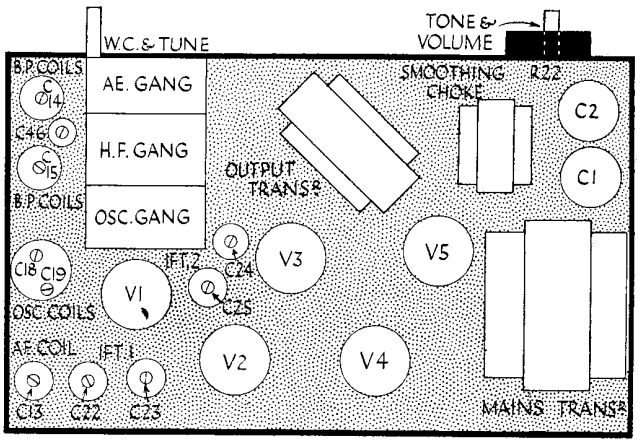
RESISTANCES

R.	Purpose.	Ohms.
1	V1 osc. anode screen decoupling	20,000
2	V2 anode decoupling	32,000
4	V1 cathode bias potr.	250
5	V2 cathode bias	250
9	V4 cathode bias potr.	100
10	V1 A.V.C. decoupling	1 meg.
11	V1 osc. grid leak	50,000
12	V2 A.V.C. decoupling	1 meg.
13	A.V.C. diode load	.5 meg.
14	Part demod. diode load	.1 meg.
15	Volume control	.5 meg.
16	V4 grid stopper	40,000
17	V4 grid leak	1 meg.
18	V4 cathode bias potr.	125
22	Tone control	50,000
23	Tone control	100
24	V2 screen decoupling	.1 meg.
25	V2 screen decoupling	16,000
26	V4 screen decoupling	32
31	V1 cathode bias potentiometer	10,000
32	V1 grid stabiliser	50

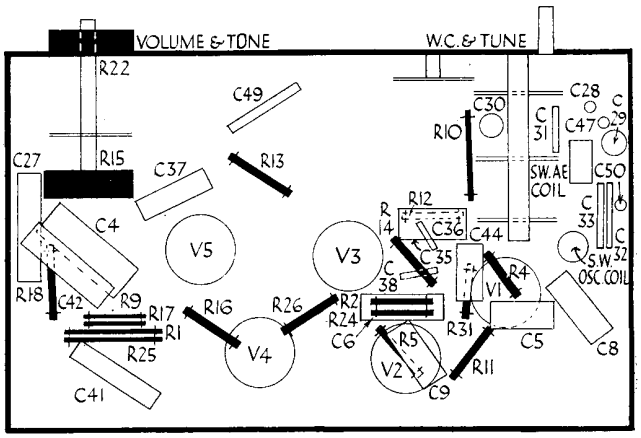
CONDENSERS

C.	Purpose.	Mfd.
1	H. T. smoothing	32
2	H. T. smoothing	32
4	V4 cathode bias shunt	50
5	V1 osc. anode screen decoupling	.1
6	V2 anode decoupling	.1
8	V1 cathode bias shunt	.05
9	V2 cathode bias shunt	.1
26	Mains aerial	.0005
27	Muting control	.02
28	Band-pass coupling	.00001
29	V1 A.V.C. decoupling	.016
30	Band-pass coupling	.025
31	Short-wave coupling	.000016
32	Padding	.0007
33	Series padding	.00149
34	V1 oscillator grid	.0001
35	V2 A.V.C. decoupling	.1
36	A.V.C. diode coupling	.0000064
37	L.F. coupling	.01
38	H.F. by-pass	.0001
41	Pentode compensating	.004
42	Tone control	.05
44	V2 screen decoupling	.1
45	Oscillator control	.000002
47	Image suppressor	.00002
49	Short-wave tone modifier	.0008
50	Short-wave band width limiter	.0000064

On the right is a layout diagram showing how components and trimmers are situated on the top of the chassis of the Philips Model 745A all-wave superhet. There are four controls arranged in two concentric groups.



This drawing enables the components inside the Philips chassis to be identified. All resistors are indicated in solid black and condensers are shown in outline. This speeds reference to the diagram.



When Changing Valves

SOME receivers having two or even three H.F. or I.F. stages use similar valves in each of these stages. When it is necessary to remove the valves from their sockets for servicing the chassis, it is a good plan to place them down in order so that they can be returned to the sockets to which they originally belonged.

It is quite possible that if the valves were inserted in a different order—although they may be of the same type number—the particular stages concerned would be thrown slightly out of trim, owing to the fact that, although the valves are rated with similar characteristics, slight differences occur which are often sufficient to upset the balance of finely tuned circuits.

Similarly, when a faulty valve has been replaced by another of exactly the same type, it may be advisable to retrim the condensers associated with that particular stage to secure maximum performance. Naturally, some receivers are far more critical than others in this respect.

Useful Temporary Replacement

SET manufacturers generally use very small and compact H.F. chokes, which are often mounted in small spaces where a replacement of the more usual type will not fit.

Where some days' delay may be incurred by ordering a replacement from the manufacturer, a temporary and often very effective replacement can be made by merely using a fixed resistance of about 10,000 ohms.

This is not satisfactory in every case, but in an emergency a satisfactory repair of this type can be made with many types of sets.

FROM the service point of view it is naturally important that all work should come in and go out as quickly as possible—consistent with good work.

Frequently temporary repairs of the type described in the last paragraph can be made and the set returned to the customer temporarily, pending the arrival of the correct replacement part from the manufacturer. The extra journey involved to and from the customer's house will, more often than not, be amply repaid by the extra goodwill thus obtained.

WHEN servicing modern receivers of the superheterodyne type, it should not be forgotten that any displacement of the wiring on the H.F. or I.F. side may lead to trouble.

When it becomes necessary to replace or repair any component on the H.F. side of a set, care should be taken to see that all wiring is replaced in exactly the original position.

Self-capacity changes brought about by alterations in the wiring may involve retrimming of some of the H.F. or I.F. coils or transformers—a lengthy procedure in the case of some sets. To avoid this it is well worth while to spend a little care.

WHEN a mains transformer is suspect, test the secondary outputs with a multi-range A.C. meter, with loads connected.

Short circuits between the windings and core cause the fuses to blow. To test for this (with, of course, a meter and battery in series), first disconnect the transformer. Most of the secondary windings are centre-tapped and connected to "earth"—that is eventually, of course, the core.

A point to remember in measuring the resistances of transformer windings is that secondaries supplying L.T. often have resistances of only a fraction of an ohm. This means that precautions should be taken not to overload the meter, and also that accurate readings must be taken if much is to be learned thereby.