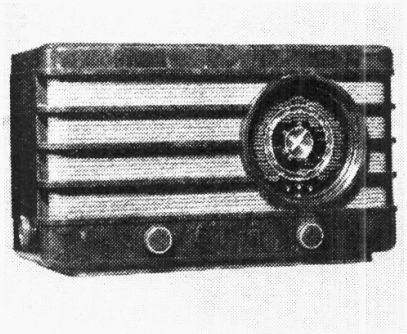
'TRADER' SERVICE SHEET

358

PHILIPS 470A

3-BAND AC SUPERHET



A SHORT-WAVE range of 16·7-51 m is covered by the Philips 470A 3-valve (plus rectifier) AC 3-band superhet, which is suitable for mains of 100-260 V, 50-100 C/S. Provision is made for both a gramophone pick-up and an extension speaker.

CIRCUIT DESCRIPTION

Aerial input on MW and LW via coupling coils **L2, L3** to capacity coupled band-pass filter. Primary coils **L4, L5** are tuned by **C27**; secondaries **L8, L9** by **C29**; coupling by **C3, C4.** On SW, input is via coupling coil **L6** to single tuned circuit **L7, C29. L1, C25** connected across aerial circuit, filters out signals at intermediate frequency.

First valve (**V1, Mullard metallised FC4**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L10** (SW), **L11** (MW) and **L12** (LW) are tuned by **C30**; parallel trimming by **C31** (MW) and **C32** (LW); series tracking by **C10** (MW) and **C9** (LW). Reaction by coils **L13** (SW), **L14** (MW) and **L15** (LW).

Second valve (**V2, Mullard metallised VP4B**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned secondary transformer couplings **C33, L16, L17, C34** and **C35, L18, L19, C36.**

Intermediate frequency 128 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 resistances **R10, R11,** the latter being the manual volume control, and passed via AF coupling condenser **C19,** IF filter **C20, R15** and CG resistance **R16** to CG of pentode section which provides the AF amplification. Provision for connection of gramophone pick-up between junction of **R10, R11,** and chassis. Variable tone control in anode circuit by **R13, C21, R14,** while **C22** provides fixed tone correction. Provision for connection of low impedance external speaker across secondary of **T1.**

Second diode of **V3,** fed from **V2** anode via **C14,** provides DC potential which is developed across load resistance **R20** and fed back through decoupling circuits as GB to FC (except on SW) and IF valves, giving automatic volume control. Delay voltage is obtained from drop along **R17, R18** in cathode lead to chassis.

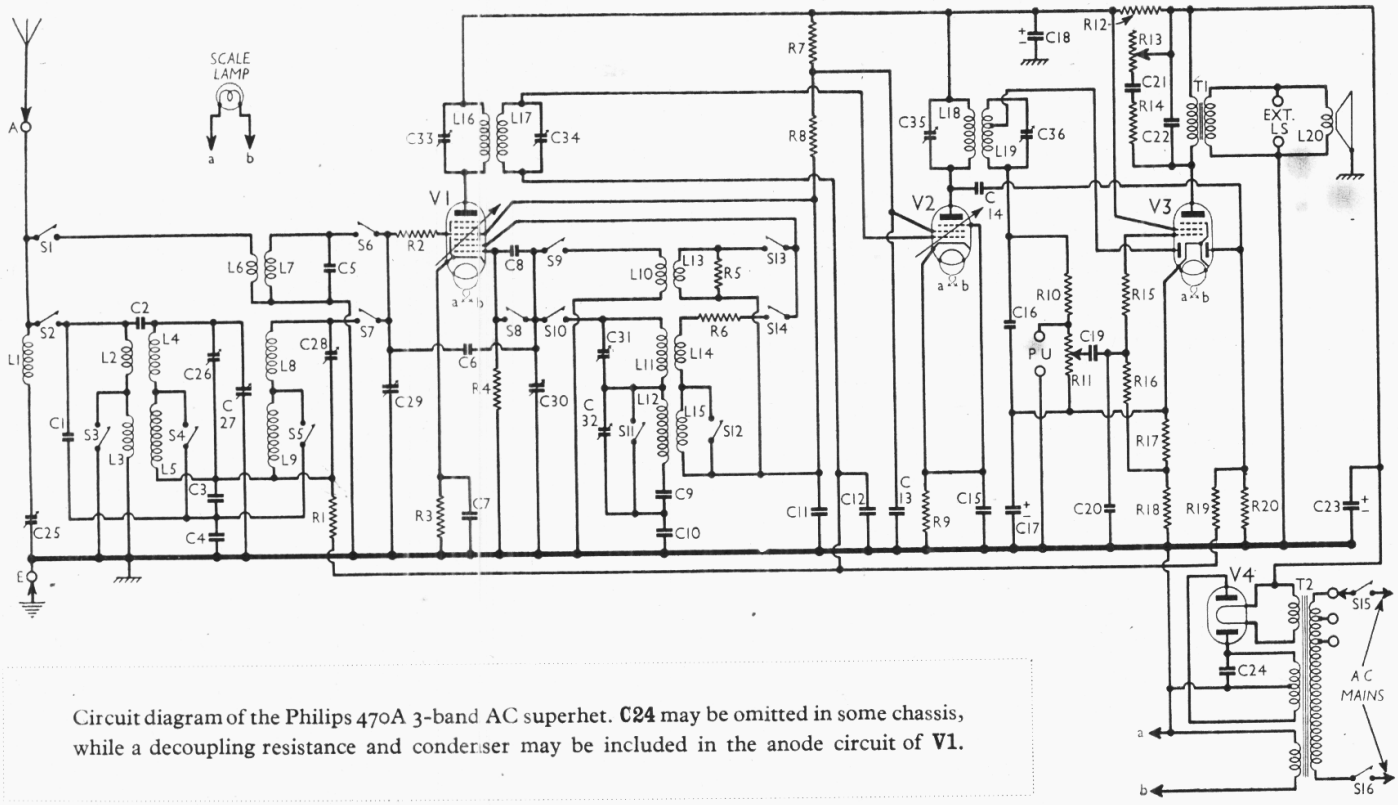
HT current is supplied by full-wave rectifying valve (**V4, Philips 1821**). Smoothing by electrolytic condensers **C18, C23** and feed resistance **R12.**

DISMANTLING THE SET

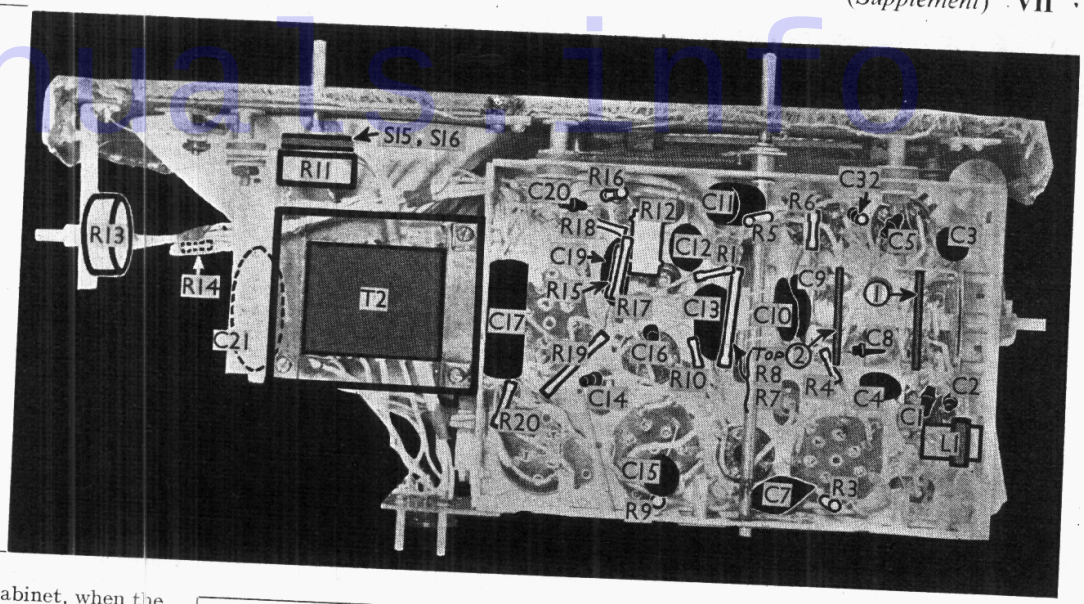
The chassis and speaker can be removed from the cabinet as a complete assembly.

Removing Assembly.—If it is desired to remove the chassis from the cabinet it is best to withdraw the chassis and speaker together, when the chassis can be tested under operating conditions. To do this, remove the two knobs at the front of the cabinet (recessed grub screws) and the two knobs at the sides of the cabinet (grub screws accessible from the inside of the cabinet.)

Unsolder the earthing lead to the screen on the bottom of the cabinet and remove the six screws holding the speaker sub-



Circuit diagram of the Philips 470A 3-band AC superhet. **C24** may be omitted in some chassis, while a decoupling resistance and condenser may be included in the anode circuit of **V1.**



Under-chassis view. Diagrams of the two wave-change switch units are over-leaf. **C32** is of the wire-wound adjustable type. **L1**, belonging to the aerial IF filter, is the only coil beneath the chassis.

baffle to the front of the cabinet, when the assembly can be withdrawn.

When replacing, do not forget to place the metal plates on the top middle and bottom right-hand fixing screws and note that the knobs with white circles go on the spindles at the front.

Removing Speaker.—The speaker can be removed from the cabinet by unsoldering the leads, slackening the three clamps holding it to the sub-baffle (nuts, lock nuts and washers) and swivelling them out of the way. *When replacing*, see that the terminal panel is on the left and connect the leads as follows, numbering the tags from bottom to top:—1 and 2 joined together, lead to top stud on output transformer and earthing lead to scale assembly; 3, lead to bottom stud on output transformer.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Image suppressor	0·00004
C2	MW and LW aerial coupling	0·000016
C3	Band-pass coupling condensers	0·016
C4		0·025
C5	Aerial circuit SW trimmer	0·000016
C6	Small coupling	0·000002
C7	V1 cathode by-pass	0·05
C8	V1 osc. CG condenser	0·00005
C9	Osc. circuit LW tracker	0·0007
C10	Osc. circuit MW tracker	0·00149
C11	V1 osc. anode and SG decoupling	0·1
C12	V2 CG decoupling	0·05
C13	V2 SG decoupling	0·05
C14	Coupling to V3 AVC diode	0·000004
C15	V2 cathode by-pass	0·05
C16	IF by-pass	0·00008
C17*	V3 cathode by-pass	25·0
C18*	Part HT smoothing	32·0
C19	AF coupling to V3 pentode	0·01
C20	IF by-pass	0·00008
C21	Part of variable tone control	0·05
C22	Fixed tone corrector	0·002
C23*	Part HT smoothing	32·0
C24	V4 anode RF by-pass	0·02
C25‡	Aerial IF filter tuning	0·0001
C26‡	Band-pass pri. MW trimmer	0·00003
C27†	Band-pass pri. tuning	0·00049
C28‡	Band-pass sec. MW trimmer	0·00003
C29†	Band-pass sec. tuning	0·00049
C30†	Oscillator circuit tuning	0·00049
C31‡	Osc. circuit MW trimmer	0·00003
C32‡	Osc. circuit LW trimmer	0·00003
C33‡	1st IF trans. pri. tuning	0·0001
C34‡	1st IF trans. sec. tuning	0·0001
C35‡	2nd IF trans. pri. tuning	0·0001
C36‡	2nd IF trans. sec. tuning	0·0001

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	V1 pentode CG decoupling	100,000
R2	V1 CG stabiliser	50
R3	V1 fixed GB resistance	250
R4	V1 osc. CG resistance	50,000
R5	Osc. SW reaction damping	20,000
R6	Osc. MW and LW damping	500
R7	V1, V2 SG's and V1 osc. anode HT feed resistances	8,000
R8		12,500
R9	V2 fixed GB resistance	250
R10	Part V3 signal diode load	50,000
R11	Part V3 signal diode load; manual volume control	500,000
R12	HT feed, except to V4 anode	2,000
R13	Variable tone control	50,000
R14	Part variable tone control	100
R15	V3 grid stopper	10,000
R16	V3 CG resistance	1,000,000
R17	V3 GB and AVC delay voltage resistances	160
R18		400
R19	AVC line decoupling	2,000,000
R20	V3 AVC diode load	500,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF filter coil	130·0
L2	Aerial MW and LW coupling coils	30·0
L3		100·0
L4	Band-pass primary coils	4·8
L5		42·0
L6	Aerial SW coupling coil	2·4
L7	Aerial SW tuning coil	0·1
L8	Band-pass secondary coils	4·8
L9		42·0
L10	Osc. circuit SW tuning coil	0·1
L11	Osc. circuit MW tuning coil	11·0
L12	Osc. circuit LW tuning coil	32·0
L13	Oscillator SW reaction coil	1·4
L14	Oscillator MW reaction coil	7·5
L15	Oscillator LW reaction coil	4·0
L16	1st IF trans. Pri.	130·0
L17	Sec.	130·0
L18	2nd IF trans. Pri.	130·0
L19	Sec., total	130·0
L20	Speaker speech coil	4·0
T1	Output trans. Pri.	700·0
	Sec.	0·6
T2	Mains trans. Pri., total	47·0
	Heater sec.	0·1
	Rect. heat. sec.	0·2
	HT sec., total	370·0
S1-S14	Waveband switches	—
S15, 16	Mains switches, ganged R11	—

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on mains of 227 V, using the 220 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 FC4	88	1·7	100	4·0
	Oscillator 235	3·1		
V2 VP4B	235	7·7	168	2·7
V3 Pen4DD	264	31·0	235	5·5
V4 1821	272†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—**S1-S14** are the waveband switches, ganged in two rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams on page VIII, where they are drawn as seen looking at the underside of the chassis in the direction of the arrows in the under-chassis view.

The table (page VIII) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C**, closed.

S15, S16 are the QMB mains switches, ganged with the volume control **R11**, and as indicated in the under-chassis view, they are at the front of the volume control.

Coils.—**L1** is beneath the chassis, and is unscreened. **L2-L5**; **L6-L9**; **L10-L15**; and the IF transformers **L16, L17** and **L18, L19** are in five screened units on the chassis deck. Each unit contains one trimmer, additional trimmers, in the case of the IF units, being mounted nearby, on the chassis deck.

Scale Lamp.—This is a Philips MES type, with a frosted bulb. Its part number is 8042-07.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (5-7 Ω) external speaker.

Condenser C32.—This is a wire-wound adjustable type.

Continued overleaf

PHILIPS 470A —*Continued*

Trimmer Capacities.—The trimmers used are rated by the makers for capacity as 70+30 $\mu\mu$F or 30+75 $\mu\mu$F. Presumably the first part represents the fixed minimum capacity, and the second the variable additional capacity. In our tables they are all indicated as having a capacity of 0·0001 μF.

Chassis Divergencies.—Two different types of mains transformer have been fitted to this receiver, one with the secondaries wound over the primary (as in our chassis) and one with the primary and secondaries side by side. If the latter is fitted, **C24** is omitted.

The makers' diagram shows a decoupling resistance and condenser in the anode circuit of **V1,** but they were not included in our chassis. If present, the resistance has a value of 8,000 O, and the condenser 0·05 μF.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to LW, and turn gang to minimum. Turn volume control to maximum. Connect signal generator to control grid (top cap) of **V1,** via a 0·032 μF condenser, and chassis. Connect a 50,000 O resistance across **C34** and an 80,000 O resistance across **C35.**

Feed in a 128 KC/S signal, and adjust **C36,** then **C33,** for maximum output. Transfer the 50,000 O resistance across **C33** and the 80,000 O resistance across **C36.** Adjust **C35,** then **C34,** for maximum output. Remove the damping resistances.

IF Filter.—Connect signal generator to **A** and **E** sockets, and feed in a 128 KC/S signal. Switch set to LW, tune to upper end of scale (2,000 m) and adjust **C25** for *minimum* output.

RF and Oscillator Circuits.—Connect signal generator to **A** and **E** sockets, and keep volume control at maximum.

MW.—Switch set to MW, and fit the special 15 degree jig to the condenser, advancing the condenser until it bears on the jig. Feed in a 1,442 KC/S (208 m) signal, and adjust **C31, C28** and **C26,** in that order, for maximum output. Re-adjust **C31** and **C28** if necessary. Remove 15 degree jig.

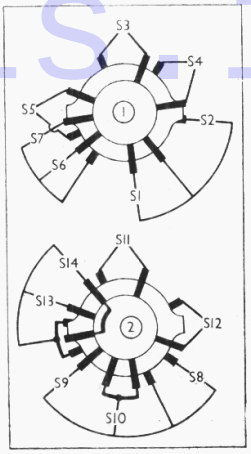
LW.—Switch set to LW and turn volume control to minimum. Connect an aperiodic amplifier (Philips GM2404) to anode of **V1.** Connect output meter to the output terminals of the aperiodic amplifier, and connect a 0·1 μF condenser between oscillator grid (pin 2) of **V1** and chassis.

Feed in a 400 KC/S (750 m) signal to **A** and **E** sockets and tune it in on receiver to give maximum output from the amplifier. Disconnect amplifier and 0·1 μF condenser. Connect output meter to output of receiver. Turn volume control to maximum, and adjust **C32** for maximum output. Do not alter setting of gang condenser.

C32 is adjusted by unwinding turns of wire (to reduce capacity). If capacity is too low, wire cannot be added, and a new condenser must be fitted and its turns reduced until resonance occurs.

DIAGRAMS AND TABLE OF THE SWITCH UNITS

Switch diagrams, looking from the underside of the chassis, in the directions of the arrows in the under-chassis view.



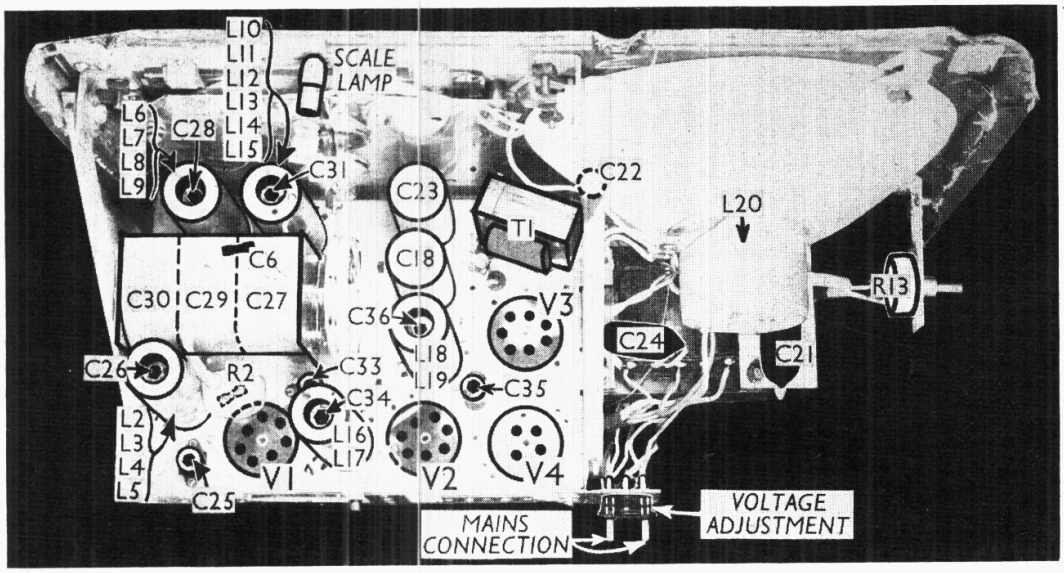
SWITCH	SW	MW	LW
S1	C	—	—
S2	—	C	C
S3	—	C	—
S4	—	C	—
S5	C	C	—
S6	C	—	—
S7	—	C	C
S8	—	C	C
S9	C	—	—
S10	—	C	C
S11	C	C	—
S12	—	C	—
S13	C	—	—
S14	—	C	C

MAINTENANCE PROBLEM

Volume Control Treatment

NO doubt every dealer in the country has been troubled with noisy volume controls at some time or another. My cure is absolutely certain providing that the volume control is treated the first time the trouble occurs. The procedure is to remove the back plate of the volume control, complete with switch, by very carefully bending back the small clips. In some cases it is difficult to remove the rotor, but this is unnecessary. The carbon track is wiped with a piece of chamois and then *clean* vaseline is packed into the control, and all over the carbon film. Place a little more vaseline in the cover and replace this by once more very carefully bending the clips.

The result will be a volume control which works so smoothly that no trace of scratch is heard in the speaker. I have under my observation sets which previously required new controls every two months, but after the above treatment they have worked beautifully for a year. I have found that in no case should a chemical degreaser be applied to a volume control of the carbon type.—H. G. REDDIN, HEREFORD.



Plan view of the chassis. Each coil unit contains one trimmer, other associated trimmers being mounted on the chassis nearby. **R2** is inside the top cap connector of **V1.**

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