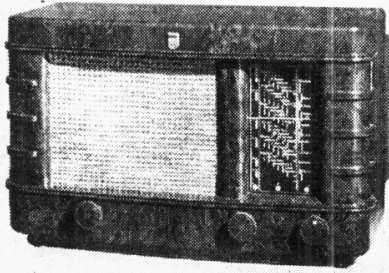


PHILIPS 206A

3-BAND AC SUPERHET



THE Philips 206A is a 3-valve (plus valve rectifier) 3-band AC superhet, suitable for use on 100-260V, 50-100 C/S mains. The SW range is 16.7-51m. The receiver is fitted into a compact moulded cabinet, the inside of the top of which is covered with metal foil, which is used as a plate aerial for the reception of the more powerful stations if desired.

Release date: May, 1940.

CIRCUIT DESCRIPTION

Aerial input, via coupling coils L1 (SW), plus L2 (MW), plus L3 (LW) to single tuned circuits L4 (SW), plus L5 (MW), tuned by C31 or L6 (LW) tuned by C31. Condensers C1 and C2 shunt MW and LW coupling coils respectively, while unwanted coils are

short-circuited to chassis both in coupling and tuning circuits.

A metallic foil stuck inside the roof of the cabinet is permanently connected via a contact strip to the aerial socket of the receiver to permit the receiver to operate without an external aerial if desired.

First valve (V1, Mullard ECH3) is a triode-heptode operating as frequency changer with internal coupling. Triode oscillator anode coils L11 (SW), plus L12 (MW), plus L13 (LW) are tuned by C35; parallel trimming by C13 (SW), C33 (MW) and C34 (LW); series tracking by C12 (MW) and C32 (LW). Reaction coupling by L8 (SW), plus L9 (MW), plus L10 (LW) via damping resistance R7.

IF suppression by tuned filter rejector circuit L7, C5 in V1 heptode control grid circuit.

Second valve (V2, Mullard EF9) is a variable- μ RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-cored transformer couplings C8, L14, L15, C9 and C18, L16, L17, C19. Tuning adjustments are made by suitably positioning the threaded cores in the coils.

Intermediate frequency 470 KC/S.

Diode second detector is part of double diode output pentode valve (V3, Mullard EBL1). Audio frequency com-

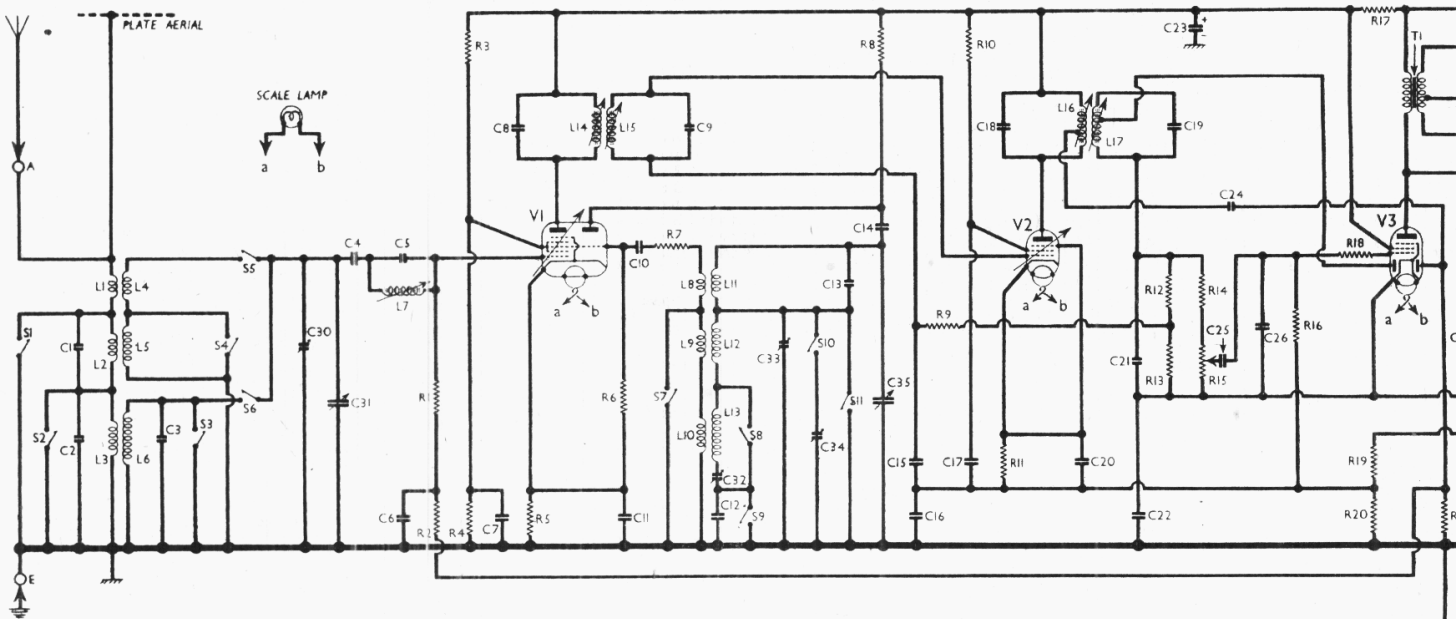
ponent in rectified output is developed across manual volume control R15 and its limiting resistance, R14, which operate as load resistance, and passed via the AF coupling condenser C25, CG resistance R16 and grid stopper R18 to CG of pentode section. IF filtering by C21 and C26.

DC potential developed across R14 and R15 appears also across R12, R13, which are connected in parallel with them to form a potential divider, from which the AVC line for V2 is tapped off and fed back via decoupling circuit to the valve grid circuit, giving undelayed automatic volume control.

Second diode of V3, fed from tapping on L16, via small coupling condenser C24, provides a second DC potential which is developed across load resistance R21 and fed back through decoupling circuit to CG of frequency changer, giving delayed automatic volume control in this case. The delay voltage, together with GB for pentode section, is obtained from drop along resistances R19 and R20, which form a potential divider in cathode lead to chassis.

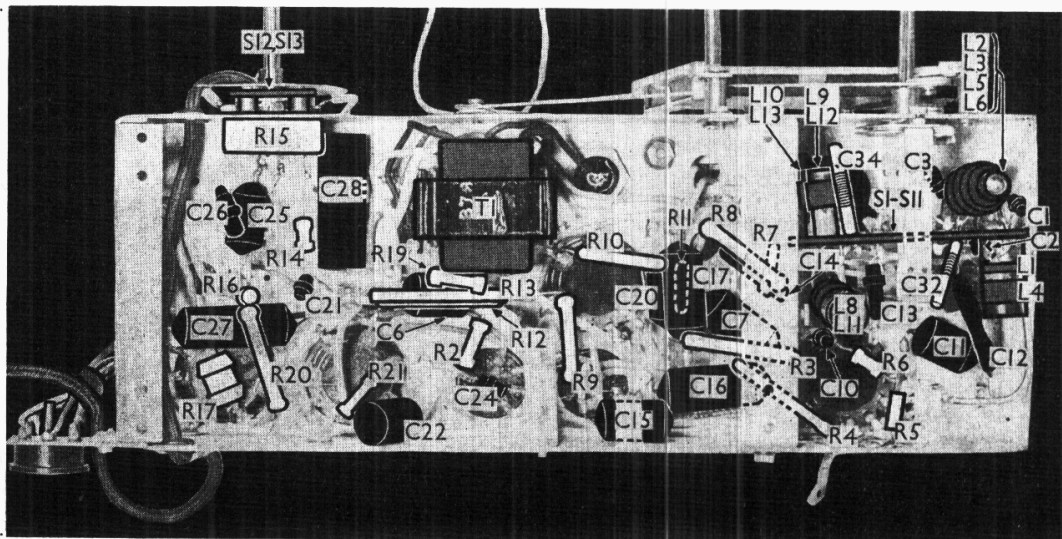
Fixed tone correction in V3 pentode anode circuit by C27.

Part of the output voltage, as it appears across the secondary winding of the output transformer T1, is tapped off and fed back to the cathode circuit of V3, where it is interposed between



Circuit diagram of the Philips 206A 3-band AC superhet. Note the plate aerial and the IF rejector in the heptode control grid circuit of V1. No smoothing choke is fitted, smoothing being carried out by C23, R17 and C29. Slight modifications in T1, and in the heater secondary of T2 may be present (See "Chassis Divergencies").

Under-chassis view. The S1-S11 unit is built on to a paxolin plate which supports the five coil units. A diagram, looking at it in the direction of the arrow, is in column 1 overleaf. C32 and C34 are small wire-wound adjustable condensers. R17 is a wire-wound resistor.



the cathode and the biasing circuit to introduce negative feed-back.

HT current is supplied by full-wave rectifying valve (V4, Mullard AZ1). Smoothing is effected by electrolytic condensers C23 and C29 in conjunction with the HT feed resistance R17.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub screws) from the front of the cabinet; remove the screw holding the plate aerial lead, with its contact strip and small sub-baffle clamping bracket to the moulded projection on the inside front of the cabinet;

remove the clip (round-head wood-screw) holding the mains lead to the floor of the cabinet.

remove the two set-screws (with washers) holding the scale assembly to the front of the cabinet; unsolder the three leads from the speaker connecting strip;

remove the four bolts (with washers) holding the chassis to the bottom of the cabinet.

When replacing, the baseboard should be so placed that the totally screened side faces downwards; the end at which the screen overlaps on to the right when viewed from the rear of the cabinet.

Connect the plain yellow speaker lead to the left-hand tag on the speaker connecting strip, as viewed from the

rear of the receiver, and the second yellow lead (with a green splash near the end) to the middle tag.

The black (earthing) lead goes to the right-hand tag, which is clamped under the top fixing nut.

Removing Speaker.—Remove the three nuts (with washers and lock-nuts) holding the speaker to the sub-baffle.

When replacing, a lock-washer should be placed under the first nut on the top bolt, and the speaker connecting strip, with the earthing tag directly beneath it, should be fitted between the two nuts.

COMPONENTS AND VALUES

CONDENSERS		Values (μF)
C1	Aerial MW shunt	0-000039
C2	Aerial LW shunt	0-000039
C3	Aerial circuit LW trimmer	0-0000039
C4	V1 heptode CG condenser	0-000033
C5	IF rejector tuning condenser	0-000047
C6	V1 heptode CG decoupling	0-047
C7	V1 SG decoupling	0-047
C8	1st IF transformer	0-000103
C9	tuning condensers	0-000097
C10	V1 osc. CG condenser	0-0001
C11	V1 cathode by-pass	0-047
C12	Osc. circuit MW tracker	0-0004355
C13	Osc. circuit SW trimmer	0-000022
C14	V1 osc. anode coupling	0-00047
C15	V2 CG decoupling	0-047
C16	GB circuit by-pass	0-1
C17	V2 SG decoupling	0-047
C18	2nd IF transformer	0-000103
C19	tuning condensers	0-000103
C20	V2 cathode by-pass	0-047
C21	IF by-pass	0-000056
C22	Part of negative feed-back coupling	0-047
C23*	HT smoothing condenser	15-0
C24	Coupling to V3 AVC diode	0-0000039
C25	AF coupling to V3 pentode	0-022
C26	IF by-pass	0-0001
C27	Fixed tone corrector	0-0047
C28*	V3 cathode by-pass	25-0
C29*	HT smoothing condenser	50-0
C30†	Aerial circuit MW trimmer	0-00003
C31†	Aerial circuit tuning	0-00049
C32†	Osc. circuit LW tracker	0-0002
C33†	Osc. circuit MW trimmer	0-00003
C34†	Osc. circuit LW trimmer	0-000032
C35†	Oscillator circuit tuning	0-00049

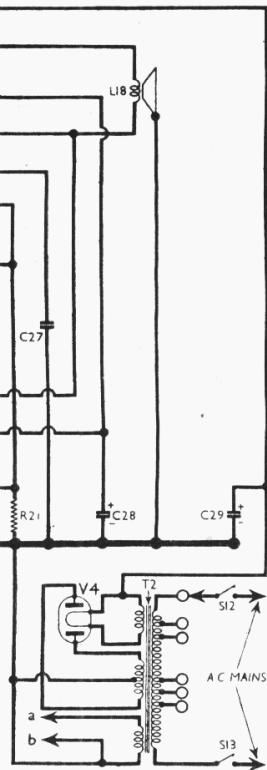
*Electrolytic. † Variable. ‡ Pre-set.

RESISTANCES		Values (ohms)
R1	V1 heptode CG resistance	470,000
R2	V1 heptode CG decoupling	1,500,000
R3	V1 SG HT potential divider	33,000
R4	resistances	39,000
R5	V1 fixed GB resistance	270
R6	V1 osc. CG resistance	47,000
R7	Oscillator reaction damping	150
R8	V1 osc. anode HT feed	27,000
R9	V2 CG decoupling	1,800,000
R10	V2 SG HT feed resistance	68,000
R11	V2 fixed GB resistance	1,200
R12	V2 AVC feed potential	2,700,000
R13	divider resistances	2,700,000
R14	Volume control limiter	47,000
R15	Manual volume control and V3 signal diode load	500,000
R16	V3 pentode CG resistance	1,000,000
R17	HT feed resistance	1,800
R18	V3 pentode grid stopper	1,000
R19	V3 pentode GB; AVC delay	220
R20	resistances	470
R21	V3 AVC diode load	1,000,000

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil	2-0
L2	Aerial MW coupling coil	23-0
L3	Aerial LW coupling coil	170-0
L4	Aerial SW tuning coil	0-1
L5	Aerial MW tuning coil	4-0
L6	Aerial LW tuning coil	45-0
L7	IF rejector coil	10-0
L8	Oscillator SW reaction coil	1-0
L9	Oscillator MW reaction coil	2-0
L10	Oscillator LW reaction coil	250-0
L11	Osc. circuit SW tuning coil	0-1
L12	Osc. circuit MW tuning coil	7-0
L13	Osc. circuit LW tuning coil	16-0
L14	1st IF trans. Pri.	7-0
L15	Sec.	7-0
L16	2nd IF trans. Pri., total	7-0
L17	Sec., total	7-0
L18	Speaker speech coil	3-0
T1	Output trans. Pri.	700-0
	Sec., total	3-2
	Pri., total	60-0
T2	Mains Heater sec.	Very low
	trans. Rect. heat. sec.	Very low
	HT sec., total	480-0
S1-S11	Waveband switches	—
S12, S13	Mains switches, ganged	—

VALVE ANALYSIS

Valve voltages and currents given in the table overleaf are those measured in our receiver when it was operating on mains of 230V, using the 220V 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 400V scale of a model 7 Universal Avometer, chassis being negative.

If the receiver should become unstable, as it did in our case, when the anode and screen currents of V1 are being measured, it can be stabilised by connecting a non-inductive condenser of about 0.1 μ F between the top cap of V1 and chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH3	230 112	1.8 3.4	88	2.2
V2 EF9	230	7.2	98	1.6
V3 EBL1	240	23.0	225	2.8
V4 AZ1	250†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—S1-11 are the waveband switches, in a single rotary unit built on to a large paxolin plate beneath the chassis, which also carries five coil units. The unit is indicated in our under-chassis view, and shown in detail in the diagram below, where it is drawn as seen looking from the front of the underside of the chassis. The table (col. 2) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and C closed.

S12, S13 are the QMB mains switches, in a unit in front of the chassis, ganged with the volume control R15.

Coils.—L1, L4; L2, L3, L5, L6; L8, L11; L9, L12 and L10, L13 are in five unshielded tubular units mounted on the paxolin plate carrying the wavechange switch. L7 is an adjustable iron-cored unit on a panel attached to the gang condenser above the chassis. The IF transformers L14, L15 and L16, L17 are in two screened units on the chassis deck. Each unit contains its two associated fixed trimmers, while the core adjustments are reached through holes at the rear of the cans, indicated in our plan chassis view.

External Speaker.—No provision is made for this, but a low resistance (3-50) type could be connected across the internal speaker speech coil tags.

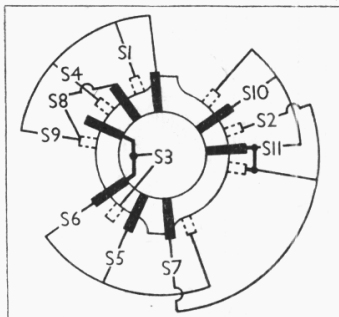
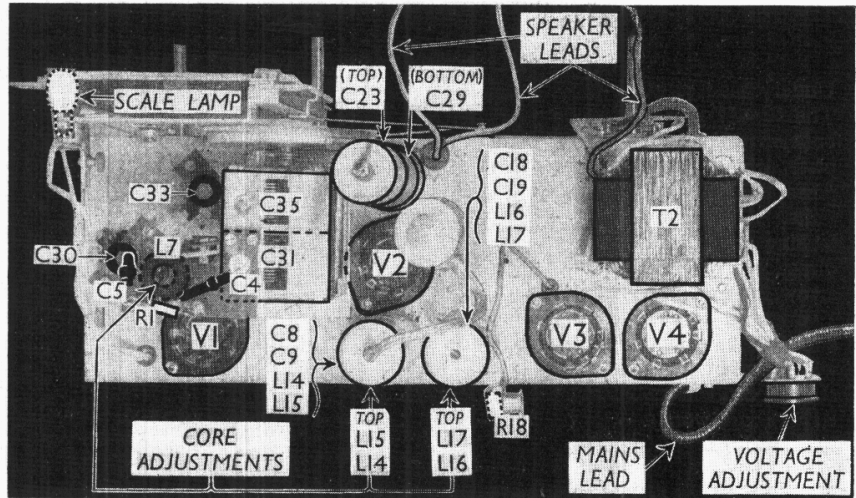


Diagram of the S1-S11 switch unit, as seen from the front of the underside of the chassis. The tags at the rear are dotted.



Plan view of the chassis. Note the dual condenser C23, C29.

Scale Lamp.—This is a Philips MES type, part No. 8045 D.

Condensers C23, C29.—These are two dry electrolytics in a single tubular metal container mounted vertically on the chassis deck. The can is the common negative connection; the tag emerging from the top of the can is the positive of C23 (15 μ F), while the tag emerging beneath the chassis is the positive of C29 (50 μ F).

Pre-set Condensers.—There are two trimmers on the chassis deck (C30, C33) and two adjustable condensers of the wire-wound type (C32, C34) beneath the chassis in the coil and switch assembly.

Resistance R18.—This is associated with the top cap connector of V3.

Chassis Divergencies.—Our model had a speaker type 9676, and output transformer with connections as shown in our circuit diagram. Other models may have a speaker of lower resistance which will be connected from the bottom to the tapping on T1 secondary. Actually the secondary is formed of two windings in series, their common connection forming the tapping.

In some models a tapping is provided on the heater secondary of T2 to enable a 4V scale lamp to be employed. The 4V scale lamp is the 8042D, while the 6.3V scale lamp is the 8045D, as in our model.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator, via a 0.032 μ F condenser, to control grid (top cap) of V1 and chassis. Switch set to MW, turn gang to minimum and volume control to maximum. Feed in

a 470 KC/S signal, connect an 80 μ F condenser across L16 for detuning, then adjust core of L17 for maximum output. Transfer 80 μ F condenser to L17, and adjust core of L16 for maximum output. Connect 80 μ F condenser across L14, and adjust core of L15 for maximum output. Transfer 80 μ F condenser to L15, and adjust core of L14 for maximum output. Finally, remove the detuning condenser.

RF and Oscillator Stages.—Connect signal generator via a suitable dummy aerial, to A and E sockets. A Philips 15 degree jig will be required for setting the gang at the lower wavelength ends of the scales. (Code No. 09.992.440.) No SW adjustments are provided.

MW.—Switch set to MW, fit the 15 deg. jig, and set the gang to it. Feed in a 1.550 KC/S (193.5m) signal and adjust C33, then C30, for maximum output. Re-check C33, then seal the trimmers.

LW.—Switch set to LW, set the gang to the 15 deg. jig, feed in a 408 KC/S (734m) signal and adjust C34 (by varying the turns of wire) for maximum output. Connect an aperiodic amplifier (type GM2404) to mixer anode of V1, and short circuit the C35 section of the gang. Feed in a 160 KC/S (1.875m) signal, tune it in on the set for maximum output from the aperiodic amplifier. Without altering the tuning of the set, remove the amplifier, and the short circuit from C35, and adjust C32 (by adding or removing turns) for maximum output. Finally, repeat the 408 KC/S adjustment.

If a new tracker is fitted, remove one-quarter of the wire winding before commencing alignment.

Where no aperiodic amplifier is available, C32 must be adjusted while rocking the gang for optimum output.

IF Rejector.—Switch set to MW, turn gang to maximum, feed in a 470 KC/S signal, and adjust core of L7 for minimum output.

Calibration.—After alignment is complete, tune to several known stations and adjust the pointer on the cord until the stations are indicated as accurately as possible.

SWITCH TABLE

Switch	SW	MW	LW
S1	C	—	—
S2	C	—	—
S3	C	C	—
S4	C	—	C
S5	C	C	—
S6	C	—	C
S7	C	—	—
S8	—	C	—
S9	—	—	C
S10	—	—	C
S11	C	—	—