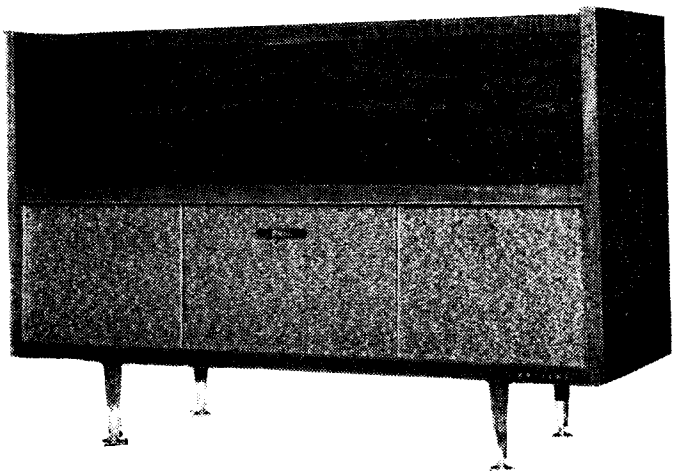
PHILIPS Service notes

PHILIPS RADIOGRAM 228



SPECIFICATIONS

Power supply	200/230, 240/250V, 40-50 c/s
Power consumption	90W
Tuning range	530-1620 kc/s
Intermediate frequency	455 kc/s
Power output	7W (approx.) per channel
Cabinet	Single-unit stereophonic radiogram
Record changer	AG 1015
Pick-up head	AG 3222 ceramic stereo, 75 μ sapphire macrogroove, 18 μ diamond microgroove.

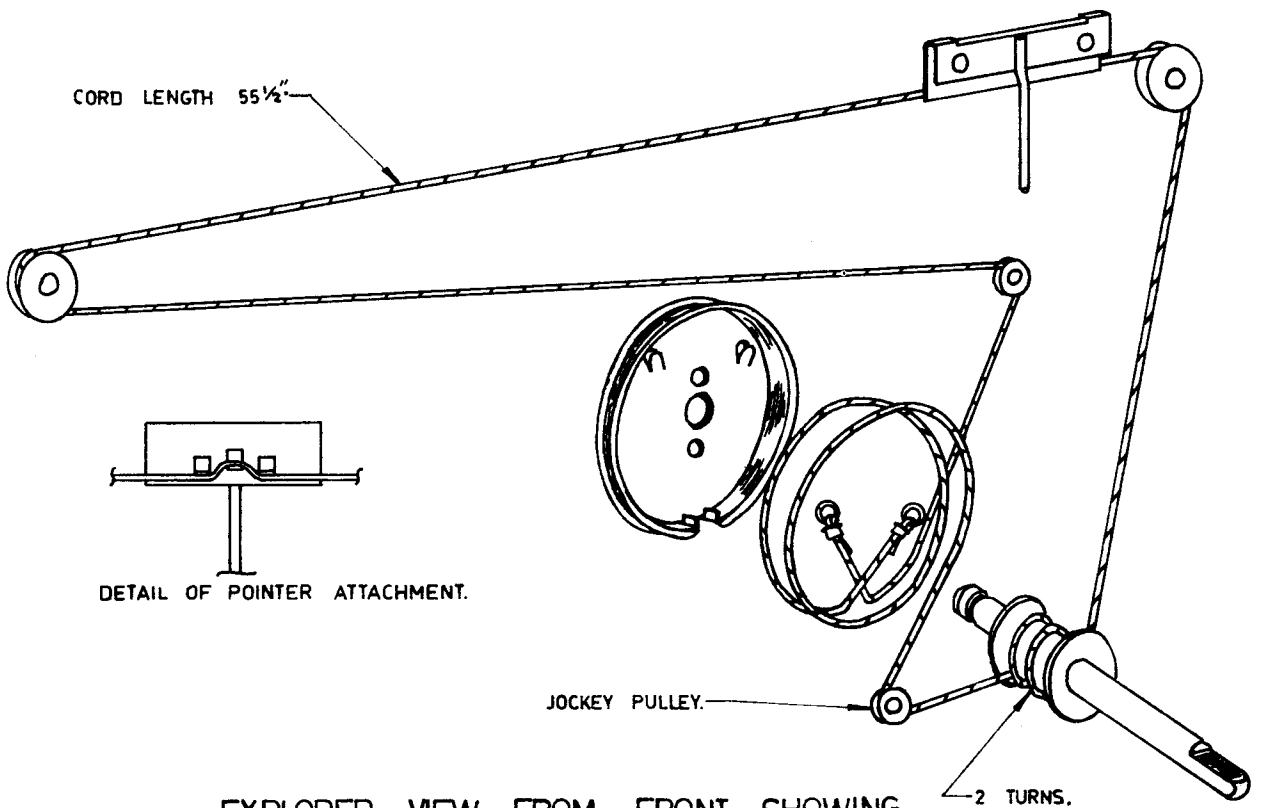
VALVE AND LAMP EQUIPMENT AND FUNCTIONS

Frequency converter	V1 6AN7
I.F. amplifier A.V.C. and demodulator	V2 6N8
R.H. Channel	
Audio amplifier	V3a 6GW8 (triode)
Phase splitter	V5a 6GW8 (triode)
Push-pull power amplifier	V3b 6GW8 (pentode)
	V5b 6GW8 (pentode)
L.H. Channel	
Audio amplifier	V4a 6GW8 (triode)
Phase splitter	V6a 6GW8 (triode)
Push-pull power amplifier	V4b 6GW8 (pentode)
	V6b 6GW8 (pentode)
Rectifier	V7 6CA4
Dial lamps	V10, V11 6.3V, 0.32A tubular screw, 8045D.
Bezel lamp	V12 6.3V, 0.32A tubular screw, 8045D.

JANUARY 1962 — PUBLISHED BY PHILIPS ELECTRICAL INDUSTRIES PTY. LTD.
SYDNEY — MELBOURNE — BRISBANE — ADELAIDE — PERTH — HOBART — CANBERRA
NEWCASTLE — WOLLONGONG

MISCELLANEOUS COMPONENTS

DESCRIPTION	CODE No.
Aerial and earth terminal panel	CZ.375.068 (C/F679-2-5)
Baffle cloth	CE.083.33 (Tygan A142)
Cursor assembly	CR.480.681
Dial drum cord, 55½"	bal's 06.606.28
Dial drum	CS.360.015
Dial scale	CS.412.456
Felt washer, control knobs, 4x	CS.467.187
Knob, control, 4x	CR.523.762
Knob, on/off-tone switch, 6x	P5.420.26/139/FY
Lamp holder, bezel lamp	CZ.367.920
Lamp holder, dial lamp, 2x	CZ.367.924 (C/F 733-5-4)
Plug, 2 pin pol. (bezel lamp)	CZ.365.108 (C/F 691-5-1)
Plug, 4 pin (pick-up)	CZ.365.320 (McMurdo B4CP)
Plug, 4 pin (speakers)	CR.249.955 (McMurdo B4CP special)
Plug, 8 pin (power supply lead)	CZ.365.436 (Teletron PS18G/8)
Scale, dial	CS.412.456
Schock, moulding, centre rail and baffle	CD.906.416 (1074 AGA)
Schock moulding, sides and bottom	CD.906.417 (1275 AGA)
Socket, 2 pin pol. (bezel lamp)	CZ.370.107 (C/F 733-16-1)
Socket, 4 pin (pick-up)	CZ.370.512 (McMurdo 4QMS/C)
Socket, 4 pin (speakers)	CZ.370.517 (McMurdo X4QAS/C)
Socket, octal (power supply lead)	CZ.369.703 (C/F 733-2-11)
Socket, noval (valves) 7x	CZ.369.718 (C/F 733-2-25)
Speaker terminal panel (3 terminal)	CZ.375.090 (C/F 1723)
Spring dial cord tension	CS.200.012
Spring, I.F.T. mounting, 2x	A3.652.58
Switch assembly, on/off-tone (complete)	A3.790.47
PARTS OF ABOVE SWITCH	
Contact lip (fixed lug) 76x	971/79
Sliding contact (moving contact, double spaced, A.C. mains) 4x	971/78
Sliding contact (moving contact, single spaced) 48x	971/77
Contact plate (micarta, carries fixed lugs) 5x	971/109
Contact slider (micarta, carries moving contacts) 5x	971/110
Spring (for returning all buttons to "up") 6x	971/107
Spring (for moving mains contacts when "radio" or "gram" pressed) 1x	971/106
Spring (for holding button "down" locking bar) 2x	971/105
Plastic button, 6x	P5.420.26/139FY
NOTE: No other piece parts are available for this switch.	
Terminal panel, aerial and earth (2 terminal)	CZ.375.068 (C/F 679-2-5)
Terminal panel, speaker (3 terminal)	CZ.375.090 (C/F 1723)
Tuning spindle assembly	CR.371.236



EXPLODED VIEW FROM FRONT SHOWING GANG CONDENSER IN CLOSED POSITION.

Rotary Colorprint, Sydney—1/62—3M

CAPACITORS

No.	Description	Type and Code No.
1	100 pF mica 20%	MS
2	0.047 μF 200V paper 20%	TPB
3	Tuning capacitor, geared basic unit 4252A, 434 pF	CZ.107.759
4		
5	30 pF air trimmer	CZ.113.700
6	60 pF air trimmer	49.005.58
7	475 pF mica 2%	SS
8-9	Part of I.F. transformer	
10	0.047 μF 400V paper 20%	TPB
11	0.047 μF 400V paper 20%	TPB
12	33 pF mica 20%	MS
13	0.047 μF 100V paper 20%	TPB
14	100 pF mica 20%	MS
15-16	Part of I.F. transformer	
17	0.1 μF 150V paper 25%	W48
18	0.1 μF 150V paper 25%	W48
19	1.5 nF 200V paper 20%	TPB
20	1.5 nF 200V paper 20%	TPB
21	4.7 nF 200V paper 20%	TPB
22	4.7 nF 200V paper 20%	TPB
23	1.5 nF 200V paper 20%	TPB
24	1.5 nF 200V paper 20%	TPB
25	0.047 μF 100V paper 20%	TPB
26	0.047 μF 100V paper 20%	TPB
27	0.047 μF 100V paper 20%	TPB
28	0.047 μF 100V paper 20%	TPB
29	1 μF 350VW electrolytic	ETIX
30	0.001 μF 600V paper 20%	TPB
31	0.001 μF 600V paper 20%	TPB
32	0.01 μF 600V paper 20%	TPB
33	0.01 μF 600V paper 20%	TPB
34	0.01 μF 600V paper 20%	TPB
35	0.01 μF 600V paper 20%	TPB
36	18 pF mica 10%	MS
37	18 pF mica 10%	MS
38	25 μF 12VW electrolytic	ETIX
39	25 μF 12VW electrolytic	ETIX
40	2.2 nF 600V paper 20%	TPB
41	2.2 nF 600V paper 20%	TPB
42	2.2 nF 600V paper 20%	TPB
43	2.2 nF 600V paper 20%	TPB
44	50 μF 350VW electrolytic	EBS507
45	50 μF 350VW electrolytic	EBS507
46	8 μF 450VW electrolytic	EE5C
47	4.7 nF 600V paper 20%	TPB

NOTE: — nF = nanofarad, i.e. 10^{-9} farad.

RESISTORS

No.	Description	Type or Code No.
1	2,700 Ω ½w carbon 10%	BTS
2	560 Ω ½w carbon 10%	BTS
3	22,000 Ω ½w carbon 10%	BTS
4	22,000 Ω 1w carbon 10%	BTA
5	1 MΩ ½w carbon 10%	BTS
6	1 MΩ ½w carbon 10%	BTS
7	68,000 Ω 1w carbon 10%	BTA
8	47,000 Ω ½w carbon 10%	BTS
10	15,000 Ω ½w carbon 10%	BTS
11	15,000 Ω ½w carbon 10%	BTS
12	22,000 Ω ½w carbon 10%	BTS
13	22,000 Ω ½w carbon 10%	BTS
14	100,000 Ω ½w carbon 10%	BTS
15	100,000 Ω ½w carbon 10%	BTS
16	100,000 Ω ½w carbon 10%	BTS
17	100,000 Ω ½w carbon 10%	BTS
18	2 x 1 MΩ tapped 0.5 MΩ carbon potentiometer, taper A, type Q, dual ganged (tone)	CZ.029.345
19		
20	22,000 Ω ½w carbon 10%	BTS
21	10,000 Ω ½w carbon 10%	BTS
22	10,000 Ω ½w carbon 10%	BTS
23	2 x 2 MΩ tapped 100,000 Ω carbon potentiometer, taper C, type Q dual ganged (volume)	CZ.029.344
24		
25	3 MΩ carbon potentiometer, taper A, type Q (balance)	CZ.029.343
26	4.7 MΩ ½w carbon 10%	BTS
27	4.7 MΩ ½w carbon 10%	BTS
28	1,200 Ω ½w carbon 10%	BTS
29	1,200 Ω ½w carbon 10%	BTS
30	270,000 Ω ½w carbon 10%	BTS
31	270,000 Ω ½w carbon 10%	BTS
32	10 MΩ ½w carbon 10%	BTS
33	10 MΩ ½w carbon 10%	BTS
34	47,000 Ω ½w carbon 10%	BTS
35	47,000 Ω ½w carbon 10%	BTS
36	47,000 Ω ½w carbon 10%	BTS
37	47,000 Ω ½w carbon 10%	BTS
38	47,000 Ω 1w carbon 10%	BTA
39	4,700 Ω ½w carbon 10%	BTS
40	4,700 Ω ½w carbon 10%	BTS
41	4,700 Ω ½w carbon 10%	BTS
42	4,700 Ω ½w carbon 10%	BTS
43	820,000 Ω ½w carbon 10%	BTS
44	820,000 Ω ½w carbon 10%	BTS
45	820,000 Ω ½w carbon 10%	BTS
46	820,000 Ω ½w carbon 10%	BTS
47	180 Ω 1w w/w 10%	BW1
48	180 Ω 1w w/w 10%	BW1
49	3,300 Ω 5w w/w 10%	PW5
50	22Ω 1w w/w 10%	BW1
51	470,000 Ω ½w carbon 10%	BTS
52	150 Ω 1w w/w 10%	BW1
53	150 Ω 1w w/w 10%	BW1

COILS AND TRANSFORMERS

No.	Ohms	Description	Type or Code No.
L1	19.6-26.4	Aerial Coil (Yellow)	CZ.323.026
L2	1.5-2.0		
L3	1.2-1.7	Oscillator Coil (red)	CZ.330.613
L4	<0.5		
L5	4.7-5.2	1st I.F. Transformer	A3.126.84
L6	8.3-9.2		
L7	4.7-5.2	2nd I.F. Transformer	A3.126.84
L8	8.3-9.2		
L9	17	Power Transformer	CZ.344.136
L10	205		
L11	<0.5		
L12	700	Output Transformer. 12,500Ω/15Ω	CZ.345.082 M.S.P. 2TU
L13	0.8		
L14	700	Output Transformer. 12,500Ω/15Ω	CZ.345.082 M.S.P. 2TU
L15	0.8		
L16		Twin Cone Speaker	CZ.161.234 M.S.P. 8TAX/15
L17		Twin Cone Speaker	CZ.161.234 M.S.P. 8TAX/15

WHEN BUTTONS ARE DEPRESSED SLIDING CONTACTS MOVE TO UPPER POSITION.

SWITCH SHOWN IN RADIO AND ORCHESTRA POSITION.

S6 SPEECH | S5 ORCHESTRA | S4 BASS | S3 ON GRAM | S2 ON RADIO | S1 OFF

SHOWS VOLTAGES MEASURED WITH A V.T.V.M. POSITION BROADCAST.

R10 15K | R11 15K | R20 22K

R18 1M TAPER "A" TAP AT .5M | C17 .1 150 | R19 1M TAPER "A" TAP AT .5M.

C18 .1 150 | C20 .0015 400 | R14 100K | C19 .0015 400 | R15 100K

R12 22K | C22 .0047 200 | C24 .0015 400 | R13 22K | C21 .0047 200V | C23 .0015 400

TONE CONTROL

MAINS INPUT

TO RECORD CHANGER MOTOR

POWER SUPPLY SUB CHASSIS

240-250 | 200-230 | L9 | L10 | L11

V7 6CA4 | 300

R52, R53 150Ω 1W W.W.

R49 3.3k. 5W.

C44 50μF 350V | C45 50μF 350V | C46 8μF 450V.

1·9 | R50 22 1W W.W. | R51 470K

V12

X Y | WHITE | BLACK | RED | ORANGE | BLACK | GREY

MAIN CHASSIS

BACKBIAS FOR A.V.C.

-B

V10 V11 → X, Y

P.U. ARM ON RECORD CHANGER

P.U. HEAD AG3222

WHITE | GOLD | RED | YELLOW | SILVER | BLUE | RED WHITE | BLUE YELLOW.

A E

V2 6N8

VI 6AN7

C11 .047 400 | C12 MICA 33 | R7 68K 1W | 220 | 65 | 90 | 65

C1 MICA 100 | L1 | L2 | C3 | C5 30 | R2 560 | R3 22K | R1 2·7K

C8 195 2% CER | C9 110 2% CER | C15 195 2% CER | C16 110 2% CER

L5 | L6 | R5 1M | R6 1M | C14 MICA 100 | L7 | R8 47K | L8

C2 .047 200 | L3 | L4 | C4 | C6 60 | R4 22K 1W | C7 MICA 475 2% | C10 .047 400 | C13 .047 100

BACK BIAS GREY -B

R23 2M TAPER "C" TAP AT 100K. | R21 10K | C25 .047 100 | R17 100K | R25 3M | TAPER "A" | R16 100K | R24 2M TAPER "C" TAP AT 100K | R22 10K | C26 .047 100

VOLUME CONTROL — BALANCE CONTROL

RIGHT HAND CHANNEL

V3a 6GW8 | V5a 6GW8 | V4a 6GW8 | V6a 6GW8

100 | 135 | 100 | 135

C31 .001 600 | R37 47K | R31 270K | R33 10M | 22 | R35 47K

C27 .047 100 | R27 4.7M | R29 1·2K

C29 1μF 350 | 157 | R30 270K | R36 47K.

C28 .047 100 | C30 .001 600 | C36 MICA. 18. | R32 10M. | 22 | R34 47·K.

R26 4.7M | R28 1·2K.

LEFT HAND CHANNEL

C33 0.01 600 | R39 4·7K | 289 | 7·5

C37 MICA 18 | R43 820K | R47 180 1W W.W. | C39 25 UF 12V

R45 820K | R41 4.7K. | C35 .01 600 | 289

V5b 6GW8

R38 47K 1W

C32 0.01 600 | R40 4·7K. | 289 | 7·5

C38 25UF 12V. | R44 820K | R48 180 1W W.W.

R46 820K | R42 4·7K. | C34 ·01 600 | 289

V6b 6GW8

C43 .0 022 600 | L12 | L13 | 12.500Ω p.t.p. 15Ω V.C.

C41 .0022 600 | C42 .0022 600 | L14 | L15 12·500Ω p.t.p. 15 Ω V.C. | C40 .0022 600

L | E | R | YELLOW | BLACK. | WHITE | L16 | L17 | R.H. | L.H.

M.S.P. TYPE 8 TAX 15Ω

NOTE:-
PLUGS DRAWN LOOKING AT PINS.
SOCKETS VIEWED FROM UNDER CHASSIS.
PINS INDICATED BY DOTS.

NOTE:-
CONDENSER VALUES.
WHOLE NUMBERS = pF
DECIMAL = μF
SECOND FIGURE = D.C.V.W.
TOLERANCES ± 20% UNLESS OTHERWISE SHOWN.
RESISTORS ARE ± 10% ½W UNLESS OTHERWISE SHOWN.

AERIAL & OSCILLATOR COIL LUG PANEL
VIEW OF LUGS.

PRIMARY AND SECONDARY WINDINGS ARE NOT SYMMETRICAL. CORRECT CONNECTION IS ESSENTIAL.

CODE Nº

P | Q

I.F. TRANSFORMER BASE VIEW OF LUGS

SG S5 S4 S3 S2 S1

B.C. AERIAL COIL | L1,L2 | C3 | C4 | B.C. AERIAL TRIMMER | C5 | 6AN7 (V1) | C6 B.C. OSC. TRIMMER. | B.C. OSC. PADDING | L3,L4 | 6GW8 (V4) (V3) (V5) (V6) | L5 L6 (V2) 6N8 | L7 L8 | P.U. | MAINS POWER OUTLET | LOUDSPEAKER

TO MAINS SUPPLY

C47 ·0047 600V

RECORD CHANGER

TO REMOVE CHASSIS

Remove power plug from wall socket, unscrew cabinet back, disconnect internal aerial from aerial terminal panel, unscrew aerial terminal panel from cabinet. Remove the following plugs from their respective sockets — speaker, power supply and pick-up. Remove the AC input leads for the power supply chassis and record changer from the connector block. Remove the control knobs by means of their grub screws. Remove two screws from the top corners of the dial backplate and two from the side flanges of the main chassis. The chassis may now be lifted from the cabinet.

Replacement of the chassis is a reversal of the above procedure.

TO REMOVE POWER SUPPLY CHASSIS

Remove power plug from wall socket and unscrew cabinet back. Remove AC input lead for the power supply chassis from the connector block. Remove the bezel lamp plug from its socket. Remove three screws from the side flanges of the chassis and lift out the chassis. Replacement is a reversal of the above procedure.

TO REMOVE RECORD CHANGER

Remove power plug from wall outlet socket and unscrew cabinet back. Remove AC input lead for the changer from the connector block. Remove the pick-up plug from its socket. Remove the speed control knob from the changer, a direct upward pull is required, and remove the decorative function overlay. Unscrew the four nylon mounting bushes, one from each corner. Lift out the changer, at the same time clear the leads through the hole in the cabinet.

Replacement of the changer is a reversal of the above procedure.

DIAL CALIBRATION

In the event of a dial scale calibration error which is equal over the whole band, provision for easily moving the dial cursor on the dial drive cord, without recourse to chassis removal, is made.

MAINS VOLTAGE ADJUSTMENT

Primary winding voltage tappings of 200/230 volts and 240/250 volts are provided for adjustment to local supply mains conditions. Before leaving the factory, the receiver is adjusted to the 240/250 volts tapping.

ALIGNMENT

For alignment, set controls as follows — volume control maximum, balance control centre, push-buttons radio and bass, for I.F. alignment tuning control fully closed, before doing R.F. alignment set dial cursor with tuning capacitor fully closed to marks on dial scale slightly to the left of the vertical column of State numerals. The trimmer position drawing is shown as an inset of the main circuit diagram drawing.

I.F. ALIGNMENT

With signal generator set at 455 kc/s and applied, through a 0.1 μF capacitor as dummy, to V1 signal grid, peak trimmers in the following order:—

Secondary of 2nd I.F.T.

Primary of 2nd I.F.T.

Secondary of 1st I.F.T.

Primary of 1st I.F.T.

Do not change setting of trimmers after primary of 1st I.F.T. is peaked.

R.F. ALIGNMENT

Check stop mark setting as above. Connect signal generator through standard R.M.A. dummy to aerial wire.

Set dial cursor on 600 kc/s (7ZL) and generator to 600 kc/s. Adjust core of oscillator coil to peak, adjust core of aerial coil to peak. Set dial cursor on 1420 kc/s (3XY) and generator to 1420 kc/s. Peak oscillator trimmer C6 and aerial trimmer C5.

Repeat the above steps.

LOUDSPEAKER PHASING

For correct stereophonic reproduction it is essential that the loudspeakers be phased. If speaker replacement is to be made, the new unit should be phased to the other one. The voice coil terminal marked on the circuit diagram as ⊕ is referred to as positive. It is essential to observe the correct connections, as per circuit diagram, when installing the new unit. The positive terminal can be determined as follows:— Using a low-voltage battery connected to the voice coil terminals, when the cone movement is outwards or forward, the positive terminal of the voice coil is that one which is connected to the positive side of the battery.