PHILIPS

Instruction manual
Gerätehandbuch
Notice d'emploi et d'entretien

L.F.-Generator
N.F.Generator
Générateur de b.f.

PM 5107
(9445 051 07..1)

PHILIPS

9499 450 07302

760412/1/01

IMPORTANT

In correspondence concerning this instrument, please quote the type number and serial number as given on the type plate.

WICHTIG

Bei Schriftwechsel über dieses Gerät wird gebeten, die Typennummer und die Gerätenummer anzugeben. Diese befinden sich auf dem Typenschild an der Rückseite des Geräts.

IMPORTANT

RECHANGE DES PIECES DETACHEES (Réparations)

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez TOUJOURS indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette caractéristiques.

Note:

The design of this instrument is subject to continuous development and improvement. Consequently, this instrument may incorporate minor changes in detail from the information contained in this manual.

Bemerkung:

Die Konstruktion und Schaltung dieses Geräts werden ständig weiterentwickelt und verbessert. Deswegen kann das Gerät von den in dieser Anleitung stehenden Angaben abweichen.

Remarques:

Cet appareil est l'objet de développements et améliorations continuels. En conséquence, certains détails mineurs peuvent différer des informations données dans la présente notice d'emploi et d'entretien.

PRINTED IN THE NETHERLANDS

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1. General information

1.1. INTRODUCTION

The L.F. generator produces sine and squarewave signals in the frequency range 9 Hz up to 110 kHz with very low harmonic distortion. The output voltage is continuously variable and an additional 20 dB attenuation may be set by means of a pushbutton switch. A second output delivers a squarewave signal which is TTL compatible.

This compact and lightweight instrument is extremely suitable for education and service purposes due to its simple operation, and because of its low distortion it is ideal for the servicing of HI-FI equipment.

1.2. TECHNICAL DATA

General information

The instrument has been designed and tested in accordance with IEC publication 348 for Class 1 instruments and has been supplied in a safe condition.
This instruction manual contains information and warnings which must be followed by the purchaser to ensure safe operation and to maintain the instrument in a safe condition.
Only properties expressed in numerical values, with tolerances stated, are guaranteed by the factory. All specifications will be met after a warming-up period of 30 minutes in a constant position.
If not stated otherwise, relative tolerances (in p.p.m. or %) relate to the adjusted value.

SPECIFICATIONS

Frequency

Nominal range	9 Hz to 110 kHz
Measuring range	10 Hz to 100 kHz, divided into four overlapping sub-ranges
Adjustment	dial with a half-logarithmic scale, and four range-selector switches; x10 Hz, x100 Hz, x1 kHz, x10 kHz
Setting error	± 5 % ± 1 Hz of the set value
Short-time drift, within 15 minutes	$< 500 \cdot 10^{-6}$
Long-term drift, within 7 hours	$< 1500 \cdot 10^{-6}$
Temperature coefficient	$< 500 \cdot 10^{-6}$/deg C (500 ppm/deg C)
Dependance on mains voltage (within nominal range)	$< 10 \cdot 10^{-6}$

Wave forms

Sinewave
Squarewave

Outputs

1. *Output Z_o 600 Ω*

Connector	BNC socket
Internal resistance	600 Ω
Maximum load	Short-circuit proof
Load resistance	
– nominal range	⩾ 100 Ω
– reference value	600 Ω

Sinewave mode

Open circuit voltage – nominal value	2 Vr.m.s.
Step attenuator	0 dB; 20 dB ± 0.3 dB
Amplitude control range	0 dB to > 40 dB
D.c. offset voltage	< 30 mV, ATTENUATOR in 0 dB position
Distortion (in position ▬┤ LOW DISTORTION)	< 0.7 % in range 10 Hz to 100 kHz < 0.03 % in range 300 Hz to 20 kHz
Distortion (in position ▬┤ FAST SETTLING)	< 1.5 % in range 10 Hz to 100 kHz < 0.5 % in range 100 Hz to 100 kHz
Amplitude response, referred to 1 kHz	< 2 %
Temperature coefficient	± 0.3 % /deg C
Dependance on mains voltage (within nominal range)	± 10^{-3}

Squarewave mode

Open-circuit voltage, nominal value	2 Vr.m.s. (≙ 4 Vp-p)
Step attenuator	0 dB; 20 dB ± 0.3 dB
Amplitude control range	0 dB to > 40 dB
D.c. offset voltage	< 30 mV, ATTENUATOR in 0 dB position
Overshoot and ripple	< 1.5 %
Tilt	< 2 % at 20 Hz < 1 % at 50 Hz
Temperature coefficient	± 0.1 % /deg C
Duty cycle	0.5 ± 0.025 0.5 ± 0.007 in position 1x10 kHz
Rise-time	< 0.5 μs
Fall-time	< 0.5 μs

2. OUT TTL

Connector	BNC socket
Open-circuit voltage – nominal voltage	TTL-compatible + (4.5 ±0.7) V = HIGH < 0.3 V = LOW
Nominal output current	0.8 mA for HIGH 32 mA for LOW
Fan-out	20
Tilt	< 1 %
Rise-time, from 0.6 V to 2.2 V	< 30 ns, at R_L = 200 Ω and C_L = 15 pF
Fall-time, from 2.2 V to 0.6 V	< 15 ns, at R_L = 200 Ω and C_L = 15 pF
Duty cycle	0.5

ENVIRONMENTAL CONDITIONS

The environmental data are valid only if the instrument is checked in accordance with the official checking procedures. Details on these procedures and failure criteria are supplied on request by the Philips Organisation in your country, or by N.V. Philips' Gloeilampenfabrieken, Test and Measuring Dept., Eindhoven, Holland.

Ambient temperature	
– reference value	+23 deg C
– nominal operating range	+5 deg C to +40 deg C
– range for transport and storage	–40 deg C to +70 deg C
Relative humidity	
– reference value	45 % to 75 %
– nominal range	20 % to 80 %
Air circulation speed	
– reference value	0 to 0.2 m/s
– nominal value	0 to 0.5 m/s
Not designed for use in direct sunlight.	
Operating position	Optional
Power supply	
– reference value	230 V
– nominal values	115 V, 230 V (internally selectable; set to 230 V on delivery)
– nominal range	± 15 % of set value
Frequency range	50 Hz to 100 Hz
– tolerance	± 5 % of nominal value
Consumption	4 W
Warming-up period	30 min.
Cabinet	
Protection type (see IEC 144)	IP 20 (see DIN 40 050)
Protection class (see IEC 348)	Class 1, protective conductor
Overall dimensions	
– height	90 mm
– width	210 mm
– length	200 mm
Weight	1.25 kg

1.3. ACCESSORIES

Standard	1 operating manual 1 mains cable
Optional	Coaxial cable with BNC/BNC socket: PM 9075

1.4. DESCRIPTION OF THE BLOCK DIAGRAM (see Fig. 1)

The frequency-determining part of the generator is the WIEN-NETWORK in the feedback circuit of the OSCILLATOR AMPLIFIER. This oscillator generates a sinewave voltage with low distortion, stable frequency and amplitude. By means of the FAST SETTLING switch a shorter amplitude-settling time is obtained for lower frequencies (i.e. less bouncing).
The frequency, from 10 Hz to 100 kHz, can be selected in four decimal steps by means of the FREQUENCY Hz x 10 to x10 k pushbuttons. In each range the frequency is continuously variable by means of the front-panel frequency dial, which has a half-logarithmic scale from 1 Hz to 10 Hz.
Choice of sinewave or squarewave signal is provided by the WAVEFORM pushbuttons.
When pushbutton ~ is selected, the output of the oscillator is applied via the AMPLITUDE control to OUTPUT STAGE 1. This output stage serves to provide a constant output impedance of 600 Ω at the OUTPUT socket via the STEP ATTENUATOR.
The STEP ATTENUATOR provides the possibility to attenuate the output signal in one step of 20 dB.

When pushbutton ⊓⊔ is selected, a SQUARER is connected between the oscillator amplifier and the AMPLITUDE control.
The SQUARER also delivers a TTL-compatible squarewave signal via OUTPUT STAGE II to the ⊓⊔ OUT TTL socket, regardless of the waveform selected.
The POWER SUPPLY provides a stabilised d.c. voltage for the various circuits.

2. Directions for use

2.1. INSTALLATION

Before any other connection is made, the protective earth terminal must be connected to a protective conductor (see section 2.1.3. Earthing).

2.1.1. Safety Regulations (see IEC 348 or VDE 0411)

Before connecting the instrument to the mains, visually check the cabinet, controls and connectors etc., to ascertain whether any damage has occurred in transit. If any defects are apparent, do not connect the instrument to the mains.
Always disconnect the instrument from the mains before removing any protective covers.
Any maintenance and service work necessary with the instrument switched on, should only be performed by a qualified technician.
The mains connector must only be plugged into an earthed mains socket.
Do not make this safety protection ineffective; for example, by the use of an extension cable without protective conductor.

2.1.2. Position

The instrument may be used in any desired position.
Do not position the instrument on any surface which produces or radiates heat, or in direct sunlight.

2.1.3. Earthing

Before switching on, the instrument must be earthed in conformity with the local safety regulations, via the three-core mains cable.
(See also section 2.1.1. Safety Regulations.)

WARNING:

Any interruption of the protective conductor inside or outside the instrument, or disconnection of the protective earth terminal, is likely to make the instrument dangerous. Intentional interruption is prohibited.

When an instrument is brought in from a cold environment for use in a warm room condensation may cause a hazardous condition. Therefore, ensure that the earthing requirements are strictly adhered to.

2.1.4. Connection to the mains

Before inserting the mains plug into the mains socket, ensure that the instrument is set to the local mains voltage. The instrument must be connected only to an a.c. supply. On delivery the instrument is set to 230 V ± 15 %. If the instrument is to be used on 115 V supply, proceed as follows:
– Unplug the mains connector.
– Loosen the two screws at the rear and remove the lower cabinet cover.

- Change the primary connections of the transformer in accordance with the indication on the p.c. board near the transformer.
- Change the mains voltage plate on the rear of the instrument in accordance with the mains voltage selected.
- Close the instrument.

Fuse replacement

Ensure that only fuses with the required rated current and of the specified type are used for replacement. The use of repaired fuses must be avoided. The instrument must be disconnected from all voltage sources when a fuse is to be replaced.
Internal mains adjustment and fuse replacement must only be undertaken by a skilled person who is aware of the hazards involved.

2.1.5. Controls and sockets

Front panel (see Fig. 3)

Textplate indication	Function
o ON POWER o OFF	Mains switch; white spot for ON-position
⊓⊔ OUT TTL	TTL-pulse output
OUTPUT Z_o 600 Ω	Signal output
AMPLITUDE ■⊣ LOW DISTORTION ■⊣ FAST SETTLING	Amplitude control, combined with pull switch to decrease the settling time
WAVEFORM ∿ ⊓⊔	Waveform selector
ATTEN 20 dB	Step attenuator
FREQUENCY Hz x10 x100 x1 k x10 k	Frequency range selector
	Frequency control

Rear panel (see Fig. 4)

Rear panel indication	Function
230 V/50 Hz	Mains input socket

2.2. OPERATION

2.2.1. Switching on the instrument

After the generator has been connected to the mains in accordance with sections 2.1.3 and 2.1.4, it may be switched on by depressing the mains switch POWER.
The white spot inside the POWER switch indicates mechanically that the instrument is switched on.
After a warming-up period of 30 minutes the instrument is ready for use.

2.2.2. Selecting the waveform

The output signal mode can be selected by operating the relevant pushbutton (∿ or ⊓⊔) of the WAVEFORM selector.

2.2.3. Setting the frequency

The frequency can be adjusted in two different ways:
- continuously, with the frequency dial
- in steps, with the FREQUENCY Hz pushbuttons

The output frequency equals the product of the value on the frequency dial and the value of the selected FREQUENCY Hz range pushbutton (e.g. frequency dial setting 1.9 x range switch 10 k = 19 kHz output frequency).

2.2.4. Setting the amplitude

The signal amplitude at the OUTPUT BNC socket is continuously variable by means of the AMPLITUDE control to r.m.s. values between 0 V and 2 V.
An attenuation of 20 dB can be obtained by depressing the ATTEN pushbutton.

2.2.5. Decreasing the settling time

When using the instrument in sinewave mode with low frequency values it is possible to decrease the settling time by means of the LOW DISTORTION/FAST SETTLING switch, which is incorporated in the AMPLITUDE control.
Pulling the AMPLITUDE control out selects the FAST SETTLING mode.
As a result of this, the distortion factor increases.

2.2.6. TTL Impulse-signal output

A TTL-compatible squarewave signal with a duty cycle of 0.5 is available at the ⎍⎣ OUT socket. The frequency of this signal is the same as that set for the other output.

3.4.2. ELECTRICAL PARTS

Resistors

Carbon
– typical dissipation at $T_{amb.}$ = 70 °C
– max. hot spot temp. = 155 °C

CR16 = 0,2 W	CR52 = 0.67 W
CR25 = 0,33 W	CR68 = 1,15 W
CR37 = 0,5 W	CR93 = 2 W

Metal film
– typical dissipation at $T_{amb.}$ = 70 °C
– max. hot spot temp. = 175 °C

MR 25 = 0,4 W
MR30 = 0,5 W
MR52 = 0,75 W

ITEM	ORDERING NUMBER	TYPE/DESCRIPTION
TRANSISTORS		
301	5322 130 44197	BC558B
302-304	4822 130 40937	BC548B
305	5322 130 40417	BSX20
306	5322 130 40645	BD135
307	5322 130 44197	BC558B
308	4822 130 40937	BC548B
INTEGRATED CIRCUITS		
350	5322 209 85193	TAA761A
DIODES		
401	5322 130 30781	BZX79-C15
402	5322 130 34049	BZX75-C2V1
403	5322 130 30771	BZX79-C13
404	5322 130 34377	BZX70-C30
405	5322 130 30414	BY164
406	5322 130 34174	BZX79-B4V7
407,408	5322 130 30759	BZX79-C5V6
409-410	5322 130 34321	IN4151

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
CAPACITORS					
501,502	5322 121 54171	330N	1	63	POLYSTYRENE FOIL
503,504	5322 121 54111	33N	1	63	POLYSTYRENE FOIL
505,506	4822 121 50389	3,3N	1	63	POLYSTYRENE FOIL
507	5322 121 54059	220P	1	500	POLYSTYRENE FOIL
508	4822 122 31081	100P	2	100	CERAMIC PLATE
509	5322 121 54047	270P	1	500	POLYSTYRENE FOIL
510	5322 125 54025	5,5-65P		100	TRIMMER
511	5322 125 54013	2-15P		100	TRIMMER
512,513	4822 124 20526	220MU		25	ELECTROLYTIC
514	4822 122 31052	8,2P	0,25P	100	CERAMIC PLATE
515	4822 122 30043	10N	-20/+80	63	CERAMIC PLATE
516	4822 121 40337	4,7N	10	630	POLYESTER FOIL
517	5322 124 24067	1000MU		63	ELECTROLYTIC
518	5322 124 24167	2200MU		25	ELECTROLYTIC
519	4822 122 30105	1,5P	0,25P	100	CERAMIC PLATE
520	4822 122 31041	3,3P	0,25P	100	CERAMIC PLATE
521	4822 122 31081	100P	2	100	CERAMIC PLATE
522	4822 124 20526	220MU		25	ELECTROLYTIC

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
RESISTORS					
601	5322 102 34016	2X50K	2		CARBON TANDEM POTM
602	4822 100 10037	1,0K	20	0,1W	TRIMMING POTM
603	5322 116 54585	3,48K	1	MR25	METAL FILM
604	5322 116 50729	4,22K	1	MR25	METAL FILM
605	5322 116 34026	50K	20	0,003W	NTC
606	5322 116 50569	95,3	1	MR25	METAL FILM
607	4822 116 30021	4,7K	10	0,6W	NTC
608	4822 110 63107	1,0K	5	CR25	CARBON
609	4822 100 10037	1,0K	20	0,1W	TRIMMING POTM
610	4822 110 63085	150	5	CR25	CARBON
611	4822 110 63107	1,0K	5	CR25	CARBON
612	4822 110 60115	2,0K	5	CR25	CARBON
613	4822 110 60115	2,0K	5	CR25	CARBON
614	5322 116 50664	2,05K	1	MR25	METAL FILM
615	5322 100 10151	1,0K	20	0,1W	TRIMMING POTM
616	4822 110 63101	560	5	CR25	CARBON
617	4822 110 60093	300	5	CR25	CARBON
618	4822 110 63107	1,0K	5	CR25	CARBON
619,620	5322 116 54549	1,0K	1	MR25	METAL FILM
621	5322 116 54623	11K	1	MR25	METAL FILM
622	5322 116 54541	825	1	MR25	METAL FILM
623	5322 116 54565	1,62K	1	MR25	METAL FILM
624	4822 110 63096	390	5	CR25	CARBON
625	4822 110 63103	680	5	CR25	CARBON
626	5322 110 30117	2,4K	5	CR37	CARBON
627	4822 110 60097	430	5	CR25	CARBON
629	4822 110 53161	100K	5	CR37	CARBON
630	4822 110 63116	2,2K	5	CR37	CARBON
631,632	4822 110 63112	1,5K	5	CR25	CARBON
633,634	5322 116 50561	590	1	MR25	METAL FILM
635	5322 116 54513	332	1	MR25	METAL FILM
636	5322 116 50636	2,74K	1	MR25	METAL FILM
637	5322 116 54598	5,49K	1	MR25	METAL FILM
638	5322 116 54534	681	1	MR25	METAL FILM
640	5322 101 64013	22K	20	0,125W	CARBON POTM LIN + SWITCH
641	4822 110 63132	8,2K	5	CR25	CARBON
642	4822 100 10051	22K	20	0,05W	TRIMMING POTM
643	4822 110 63136	12K	5	CR25	CARBON

MISCELLANEOUS

Item	*Fig.*	*Ordering number*	*Description*
–		5322 321 10071	Mains cable
26	8	5322 146 14108	Mains transformer
27	8	4822 252 20001	Thermal fuse

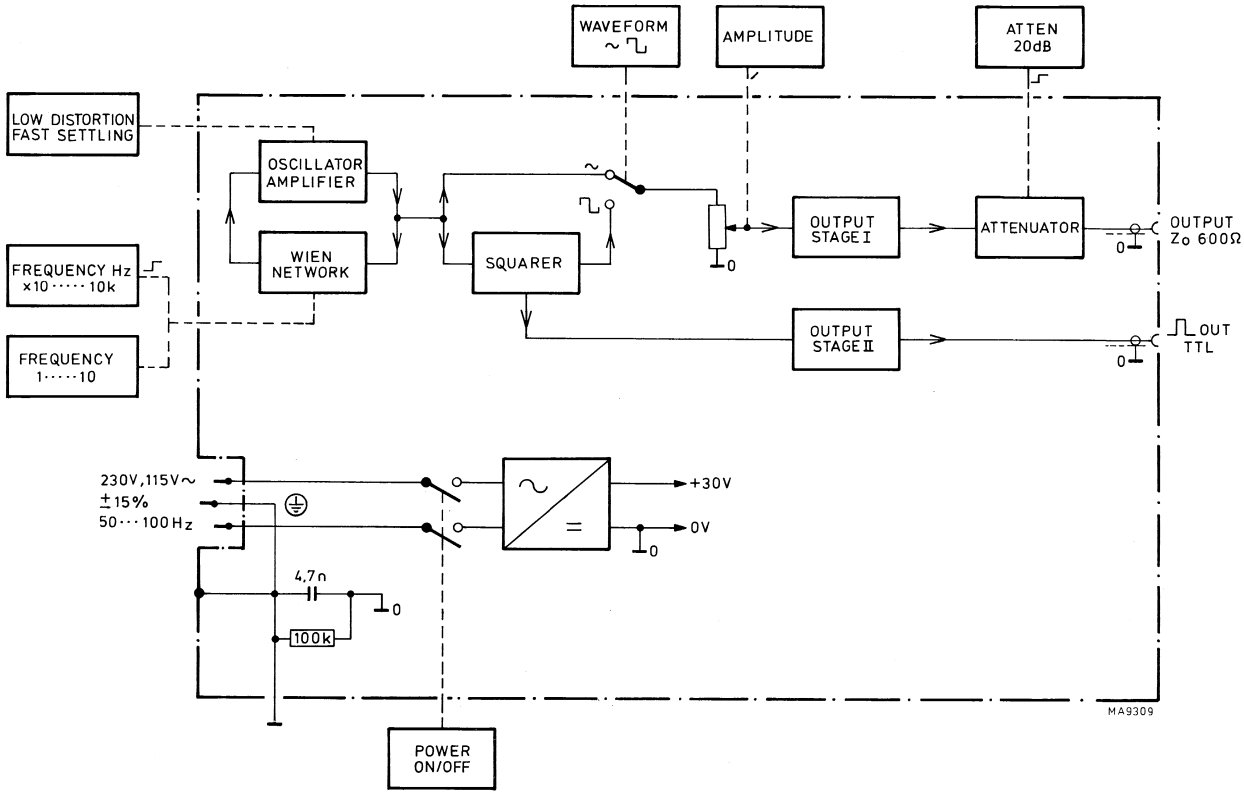

Fig. 1. Block diagram
Blockschaltbild
Schéma synoptique

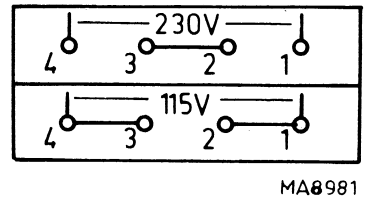

Fig. 2. Transformer connections (MA8981)
Transformator Anschlüsse
Adaptation à la tension secteur

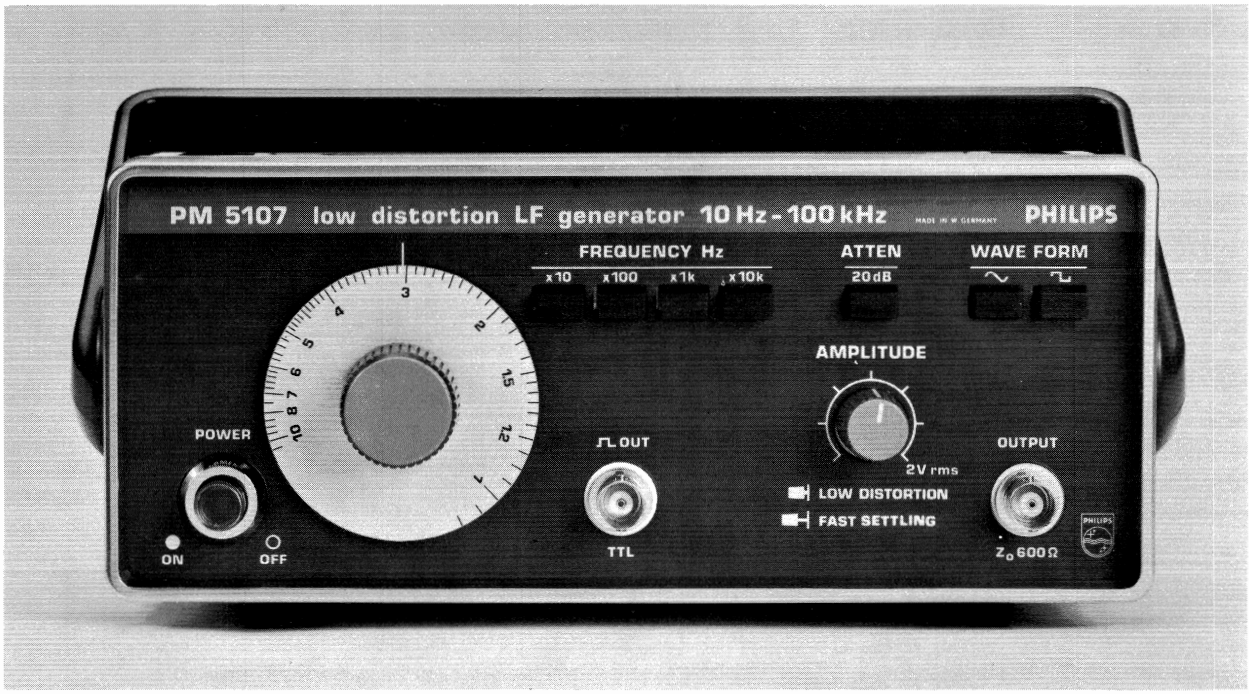

Fig. 3. *Front view*
Frontansicht
Vue avant

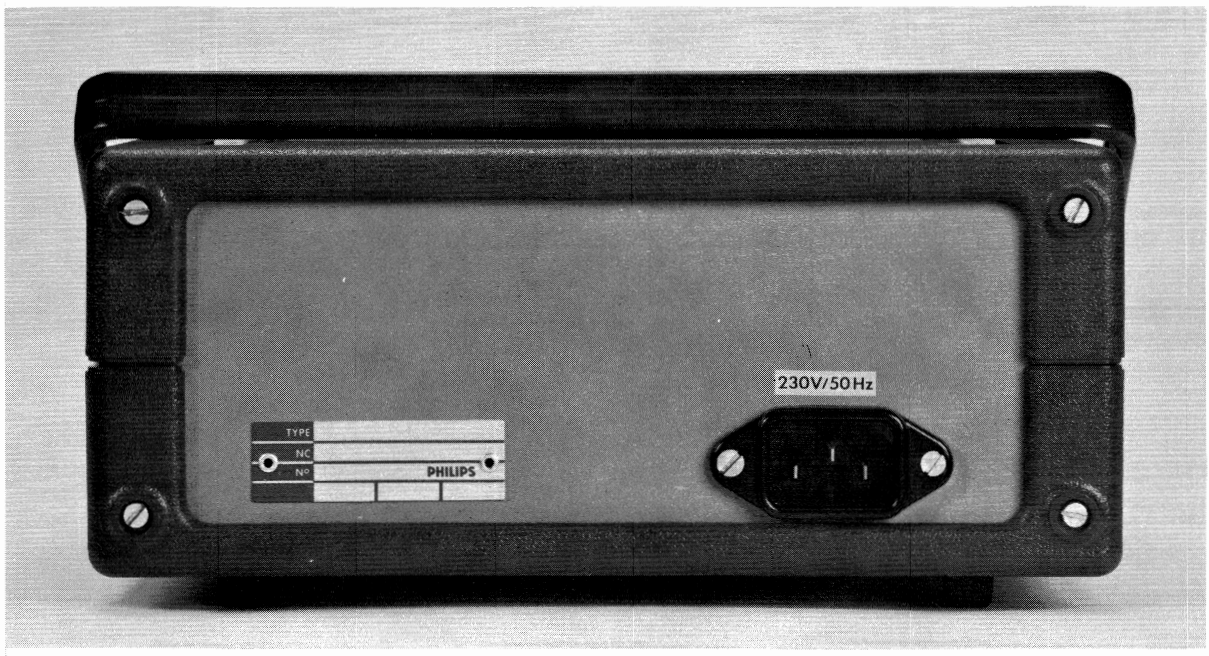

Fig. 4. *Rear view*
Rückansicht
Vue arrière

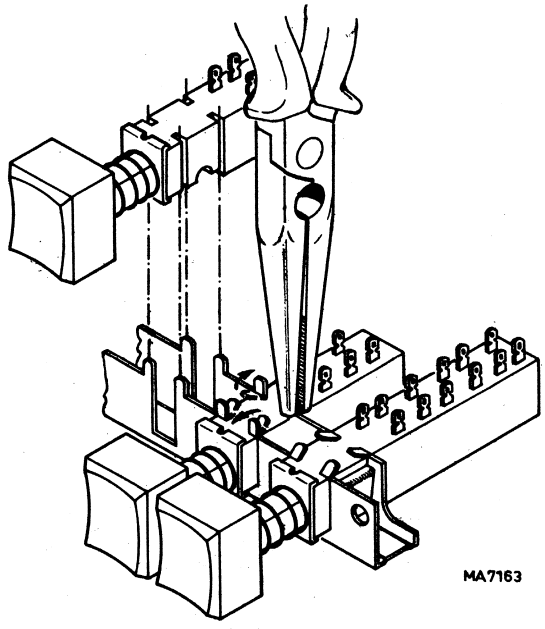

Fig. 5. Replacing a switch of the pushbutton unit.

Fig. 6. Front view mechanical parts.

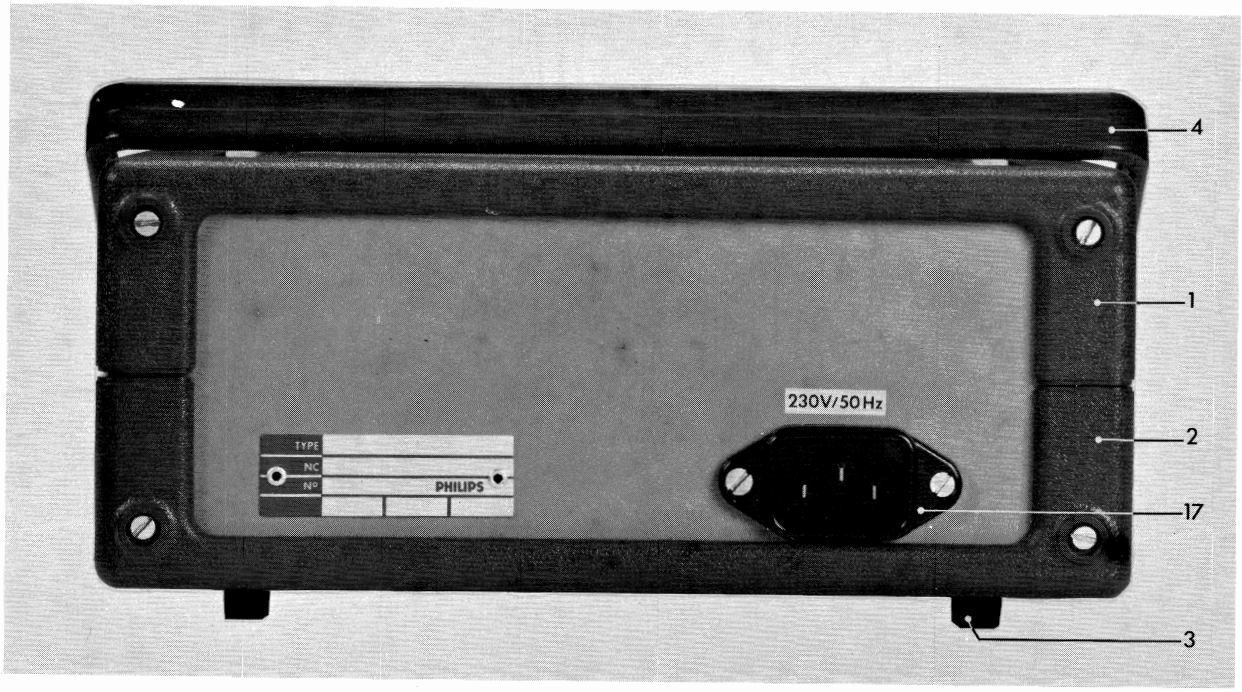

Fig. 7. Rear view mechanical parts.

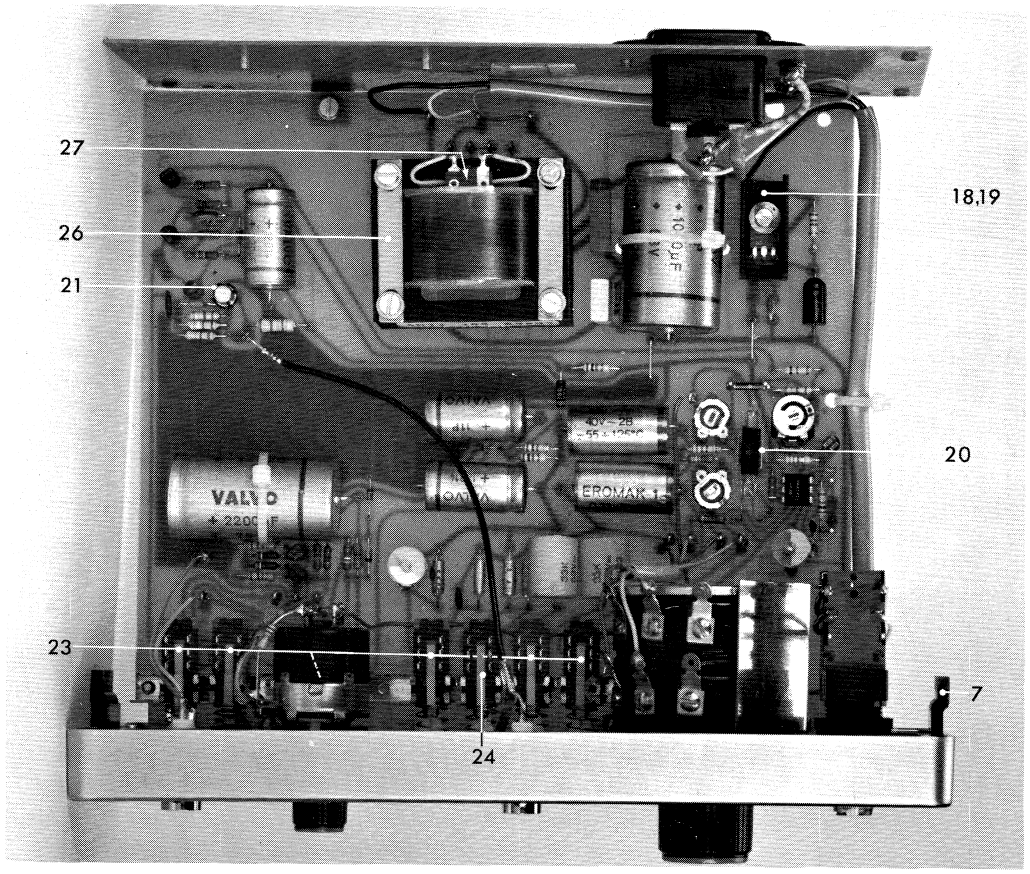

Fig. 8. Inside view top side.

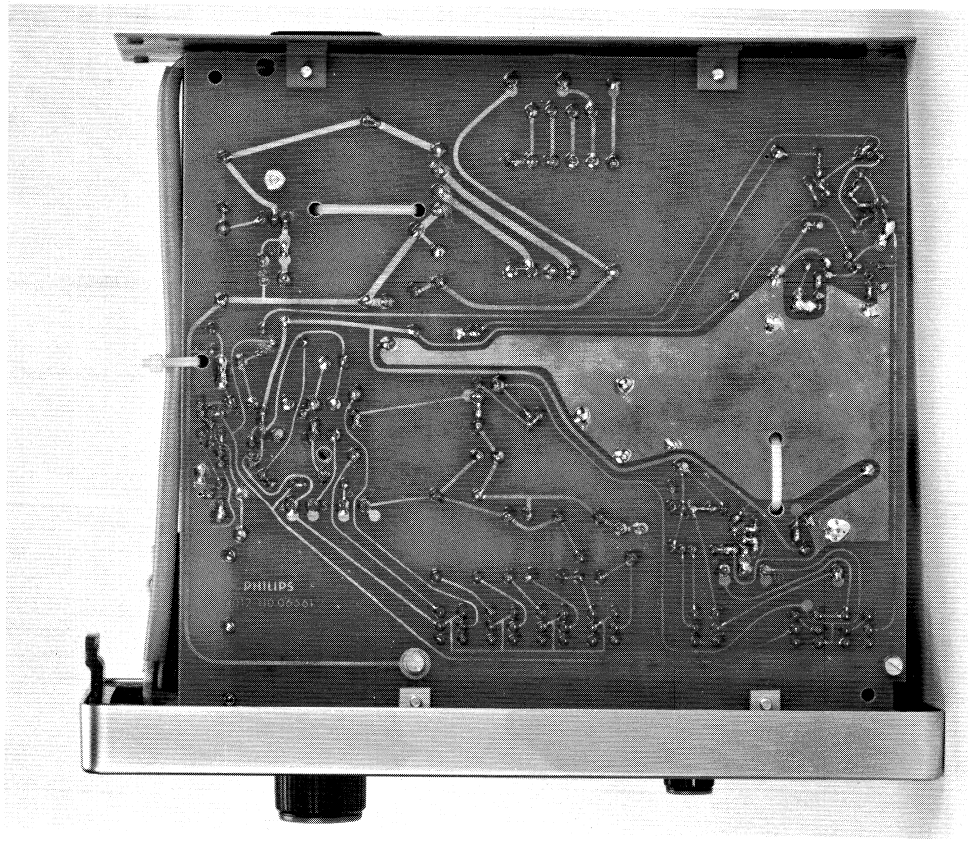

Fig. 9. Inside view bottom side.

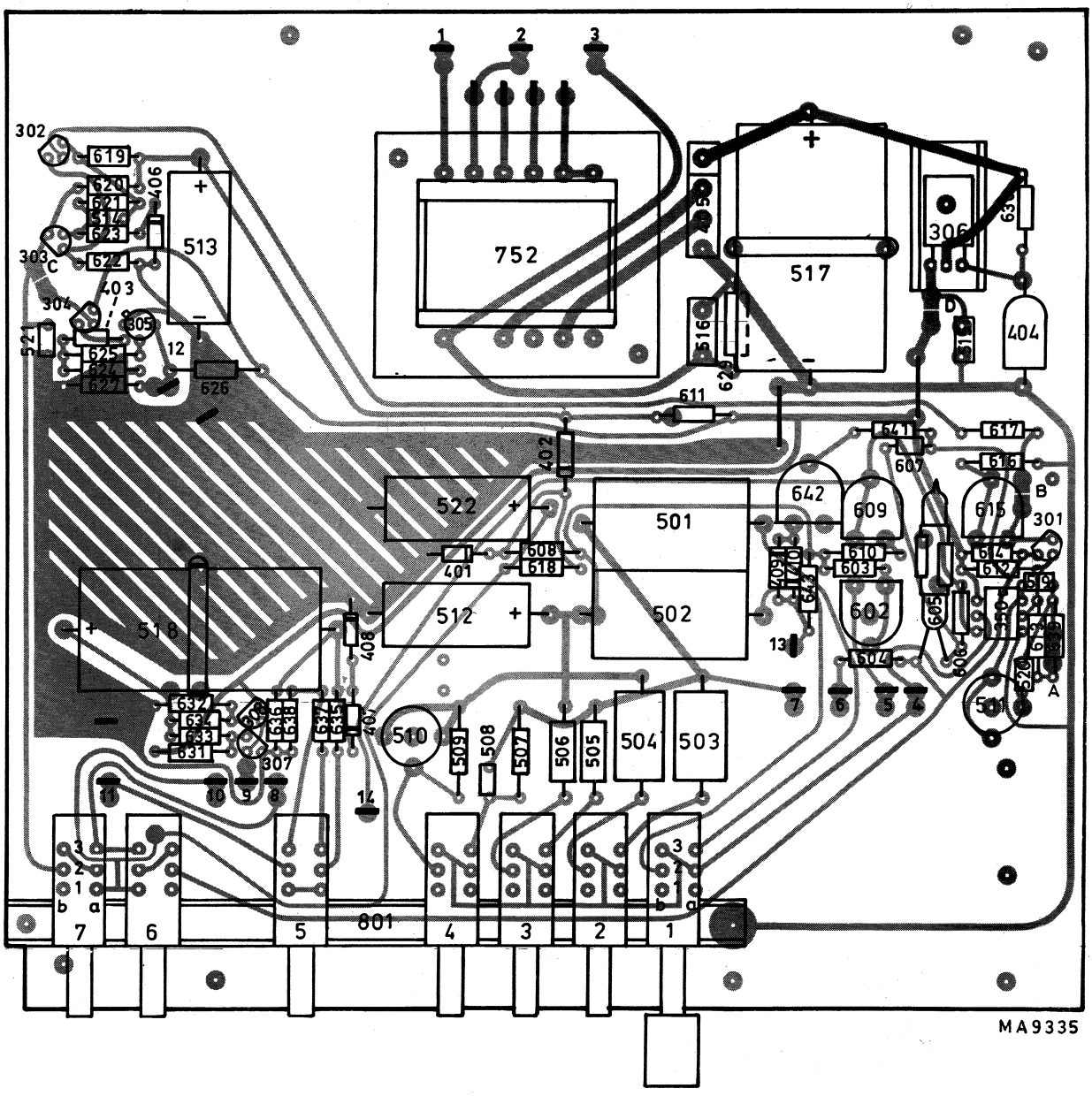

Fig. 10. Printed wiring board with components.

QUALITY REPORTING

CODING SYSTEM FOR FAILURE DESCRIPTION

The following information is meant for Philips service workshops only and serves as a guide for exact reporting of service repairs and maintenance routines on the workshop charts.
For full details reference is made to Information G1 (Introduction) and Information Cd 689 (Specific information for Test and Measuring Instruments).

LOCATION

□□□

Unit number
e.g. 000A or 0001 (for unit A or 1; **not 00UA or 00U1)**

or: Type number of an accessory (only if delivered with the equipment)
e.g. 9051 or 9532 (for PM 9051 or PM 9532)

or: Unknown/Not applicable
0000

CATEGORY

□

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

COMPONENT/SEQUENCE NUMBER

□□□□□

Enter the identification **as used in the circuit diagram,** e.g.:

GR1003	Diode GR1003
TS0023	Transistor TS23
IC0101	Integrated circuit IC101
R0....	Resistor, potentiometer
C0....	Capacitor, variable capacitor
B0....	Tube, valve
LA....	Lamp
VL....	Fuse
SK....	Switch
BU....	Connector, socket, terminal
T0....	Transformer
L0....	Coil
X0....	Crystal
CB....	Circuit block
RE....	Relay
BA....	Battery
TR....	Chopper

Parts not identified in the circuit diagram:

990000	Unknown/Not applicable
990001	Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002	Knob (incl. dial knob, cap, etc.)
990003	Probe (only if attached to instrument)
990004	Leads and associated plugs
990005	Holder (valve, transistor, fuse, board, etc.)
990006	Complete unit (p.w. board, h.t. unit, etc.)
990007	Accessory (only those without type number)
990008	Documentation (manual, supplement, etc.)
990009	Foreign object
990099	Miscellaneous