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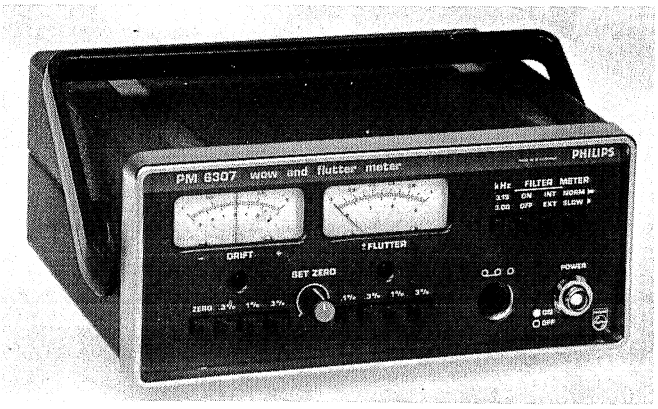

Instruction manual
Gerätehandbuch
Mode d'emploi et d'entretien

PM 6307

9452 063 07001

Wow and flutter meter
Wow und Flutter-Messgerät
Appareil de mesure de wow et flutter

PHILIPS

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CONTENTS

LIST OF FIGURES

1. GENERAL

1.1. INTRODUCTION

The easy-to-operate PM 6307 – Wow and Flutter Meter – is designed to identify and quantify unwanted speed variations in audio and video tape recorders, record players and movie projectors. With its X-tal controlled oscillator giving the choice of 3.00 kHz or 3.15 kHz (DIN standard) it is possible to make very accurate wow and flutter checks and alignments.

Readout of speed variations of, for example, a recorder is indicated on two separate analog meters, one for drift and one for wow and flutter. Calibration of the drift indicator is simple, being achieved by depressing the ZERO button, while the SET ZERO control is adjusted for zero indication. The use of the X-tal oscillator eliminates the long warm-up time associated with normal R – C types with the advantage that the instrument can be used immediately after switch-on. The measuring ranges for drift and flutter are separately selectable by pushbuttons.

There is also a convenient choice of three positions for wow and flutter measurements. With the filter switched ON, the frequency response is "weighted", according to DIN Standard 45 507.

In the filter OFF position, a linear frequency response of 0.5 Hz to > 500 Hz is available and the "unweighted" flutter is indicated.

For special measurements beyond the normal everyday usage, there is a connector on the rear panel to apply a desired external filter.

1.2. TECHNICAL DATA

General information:

On delivery from the factory, the instrument complies with the safety regulations of measuring and control equipment. 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.

1.2.1. Specifications

X-TAL OSCILLATOR SECTION

Test frequencies	3150 Hz or 3000 Hz, x-tal controlled
– Frequency accuracy	$< 10^{-4}$
– Temperature coefficient	$< 10^{-6}/K$
Outputs	
1. ⌀—⌀ ⌀	Socket according to DIN 41 524 (front panel)
Signal voltage	500 mVpp open circuit 100 mVpp with 47 k Ω load
Internal resistance	430 k Ω
2. OUTPUT 3.15/3.00 kHz	BNC-socket (rear panel)
Signal voltage	1 Vpp ⊓⊔
Internal resistance	600 Ω

MEASUREMENT SECTION

Inputs	
1. ⌀—⌀ ⌀	Socket according to DIN 41 524 (front panel)
2. INPUT	BNC-socket (rear panel)
Input voltage	2 mV ... 10 V
Input impedance	10 k Ω
Test frequencies	3.150 kHz or 3.000 kHz, selectable by means of pushbutton

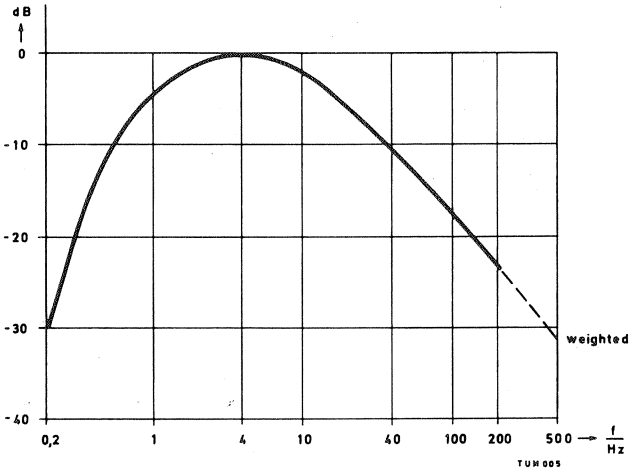
DRIFT

Measuring ranges	±0.3 %; ±1 %; ±3 %
Display	Analog, with zero point at mid-position
– Calibration	with pushbutton ZERO and control SET ZERO
Measuring accuracy limits	±5 % f. s. d.
Zero point stability	
– Short-term	±0.02 %
– Relating to environmental conditions	±0.05 %
Meter speed	pushbutton selection:
	▬ normal, according to DIN 45 507
	▪ slow

FLUTTER

Measuring ranges	0.1 %; 0.3 %; 1 %; 3 %
Display	analog
Measuring accuracy limits	±5 % f. s. d.
Frequency response	three settings:

1. weighted according to DIN 45 507
   Weighting characteristic (see Fig. 7)



2. unweighted
   lower −3 dB frequency limit 0.5 Hz
   upper −1 dB frequency limit 300 Hz
   upper −4 dB frequency limit 500 Hz
3. external filter (switchable)
   for equal indicator sensitivity, this external filter should have an open-circuit attenuation of 3 x in the pass band

Meter speed	Pushbutton selection: ■ according to DIN 45 507 ■ slow

OUTPUTS

OUTPUT UNWEIGHTED	BNC-socket (rear panel)
– Bandwidth	0 – 300 Hz, −1 dB 0 – 500 Hz, −4 dB
– Frequency variation coefficient	1 Vpp ≙ 1 %, for drift measurements ± 1 Vpp ≙ ±1 %, for flutter measurements
– Internal resistance	10 kΩ
EXT. FILTER	socket according to DIN 41 524 (rear panel)
– Open-circuit voltage	1 V ≙ 1 % (same as OUTPUT UNWEIGHTED)
– Output resistance (terminal 1)	620 Ω
– Input resistance (terminal 3)	1 MΩ
– Lower −3 dB limit	0,5 Hz

1.2.2. 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 °C ± 1 °C
Nominal working range	+ 5 °C to +40 °C
Limits for storage and transit	− 40 °C to +70 °C

Relative humidity

Reference range	45 to 75 %
Nominal working range	20 to 80 %

Air pressure

Reference value	1013 mbar (≙ 760 mm Hg)
Nominal working range	up to 2200 m height (800 to 1066 mbar)

Air speed

Reference value	0 to 0.2 m/s
Nominal working range	0 to 0.5 m/s

Operating position	upright on feet
Power supply	AC mains
Reference value	230 V
Nominal values	115/230 V selectable by solder links
Nominal operating range	±15 % of the selected nominal value
Frequency range	50 to 100 Hz
− nominal operating range	47.5 Hz ... 105 Hz
Consumption	2.5 W
Warm-up time	30 min.

1.2.3. Cabinet

Protection class (see IEC 348)	Class I, protective conductor
Protection type (see IEC 144 and DIN 40 050)	IP 30
Overall dimensions	
− height	110 mm with handle fully collapsed
− width	230 mm
− depth	200 mm
Weight	approx. 1.5 kg

1.3. ACCESSORIES

Standard	1 instruction manual 1 mains cable
Optional	5-pin DIN-cable EL 3768/14 (4822 321 20207) Test cassette 3150 Hz, TC FL 3.15 Test record disc 3150 Hz according to DIN 45 545

1.4. OPERATING PRINCIPLE (fig. 1)

The wow and flutter meter PM 6307 comprises:

- Limiter amplifier
- FM demodulator
- Filter amplifier
- Drift meter channel
- Flutter meter channel switchable to:
  weighted filter
  external filter
  attenuator
- X-tal oscillator

Test frequencies reproduced by a test cassette, test tape or record disc are either applied to input socket ⌐o ρ at the front or BNC-socket INPUT at the rear.

In the limiter amplifier the test signal is amplified and converted into a square-wave signal. These square waves, having a constant amplitude, are available at the input of the FM demodulator stage.

Speed variations, which are present as a frequency modulation e. g. of the 3.15 kHz signal, are detected in this stage. The demodulated signal is fed to the filter-amplifier, whose bandwidth ranges from DC to 500 Hz. It is obvious, that the carrier frequency is strongly suppressed.

By means of pushbutton ZERO and control SET ZERO the DRIFT-indicator can be adjusted to electrical zero. The DC output voltage of the filter-amplifier is adjusted to zero.

The unweighted modulation frequencies of 0 to 500 Hz are available for evaluations at the socket OUTPUT UNWEIGHTED by means of an oscilloscope or spectrum analyzer, for example.

The output signal at the filter-amplifier is processed in two different channels and displayed separately on a drift and flutter meter.

A constant speed deviation caused by a too slow or too fast speed as well as very slow test frequency variations between DC and 0.2 Hz are separated by the low-pass filter in the drift-meter channel. After attenuation, the drift-meter reading in % corresponds in magnitude and direction to the deviation. To detect extremely slow speed variations, the SLOW-response is selected by depressing pushbutton METER. This channel includes also an electronic switching stage controlled by the output voltage of the limiter amplifier. This switch inhibits the drift-meter channel when no signal is received by the limiter amplifier.

The flutter meter channel processes and displays short-term frequency variations. It comprises:

- a standardized weighted filter (according to DIN 45 507; see fig. B), whose characteristics are adapted to the human-ear curve in the frequency range of 0.2 to 200 Hz.
- a change-over switch FILTER INT/EXT to connect an external filter with an open-circuit voltage attenuation of 3 : 1 for equal flutter-meter sensitivity
- a change-over switch FILTER ON/OFF for approximate linear transmission of the modulation frequency from 0.5 to 500 Hz by means of the attenuator.

The flutter measuring ranges are selected by means of pushbuttons. The indicator speed is selectable by means of the pushbutton NORM/SLOW.

The x-tal oscillator generates a 3.15 or 3.00 kHz signal selected by means of the pushbutton kHz. This button is also used to adapt the FM demodulator characteristic.

The test frequency signal is available at the BNC socket OUTPUT 3.15/3.00 kHz at the rear and at the front-panel socket ⏚ (terminal 1).

The power supply provides stabilized DC voltages.

2. INSTALLATION

2.1. SAFETY REGULATIONS

Upon delivery, the instrument complies with the required safety regulations. To maintain this condition and to ensure safe operation, it is recommended to follow the instructions below.

2.1.1. Before connecting

Mains voltage

Check whether the instrument is adapted to the nominal mains voltage.

Protection

This instrument is protected according to class I (protective earth) of the IEC 348 or VDE 0411. The supplied mains cable provides earth connection. Outside specially protected rooms, the mains plug must be connected only to sockets with an earthed contact.

It is not allowed to interrupt the earth connection inside or outside the instrument.

2.1.2. Maintenance and repair

Failure and excessive stress

If the instrument is suspected of being unsafe, take it out of operation permanently.

This is the case when the instrument

- shows physical damage
- does not function anymore
- is stressed beyond the tolerable limits (e. g. during storage and transportation)

Dismantling the instrument

When removing covers or other parts by means of tools, live parts or terminals could be exposed.

Before opening the instrument, disconnect it from all power sources.

If the open live instrument needs calibration, maintenance or a repair, it must be performed only by trained personnel being aware of the risks.

After disconnection from all power sources, the capacitors in the instrument may remain charged for some seconds, observe the circuit diagrams.

Fuses

Only use the specified fuses.

Repair, Replacing parts

Repairs must be made by trained personnel. Ensure that the construction of the instrument is not altered to the detriment of safety. Above all, leakage paths, air gaps and insulation layers must not be reduced.

When replacing, use only original parts. Other spare parts are only acceptable when the safety precautions for the instrument are not impaired.

2.2. MOUNTING

The instrument may be used in any desired position. The display accuracy limits, however, are valid only for normal position. Do not position the instrument on any surface which produces or radiates heat, or in direct sunlight.

2.3. 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. "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.

2.4. ADJUSTMENT TO MAINS VOLTAGE – MAINS CONNECTION

Before inserting the mains plug into the mains socket, ensure that the local mains voltage ranges within the set mains voltage range. The instrument must be connected only to an AC supply. On delivery the instrument is set to 230 V ±15 %; the set mains voltage (±15 %) is indicated at the rear of the instrument.

If the instrument is to be used on 115 V supply, proceed as follows:

- Unplug the mains connector
- Remove the lower cabinet cover by loosening the two screws at the rear.
- Resolder links at the pins 1, 2, 3, 4 of the PCB in accordance with connection diagram, fig. 2
- Change the mains voltage plate on the rear of the instrument in accordance with the mains voltage selected. The label for the range 115 V ±15 % is found below the mains transformer.
- Close the instrument

Mains connection must be made in accordance with the local safety regulations. This implies that the instrument is connected to a mains socket with protective earth (see para. 2.3.).

2.5. DISMANTLING THE INSTRUMENT

To gain access to the printed-wiring side of the board, the top cover can be removed by unscrewing the two rear screws and the retaining screw located in the centre of the board. When replacing the top cover, care must be taken not to overtighten this retaining screw.

3. OPERATING INSTRUCTIONS

3.1. CONTROLS AND SOCKETS

Legend		Position	Function
Front panel (see fig. 3)			
POWER	o ON ● OFF	811	mains switch: white dot for ON position
DRIFT		804	display of long-term frequency variations
.3 % – .1 % – 3 %		812/B/C/D	pushbuttons for selecting drift measuring ranges
FLUTTER		803	display of short-term frequency variations
.1 % – .3 % – 1 % – 3 %		812/E/F/G/H	pushbuttons for selecting flutter measuring ranges
ZERO		812/A	pushbutton to switch on zero point calibration
SET ZERO		627	knob for zero calibration
3.15/3.00 kHz		813/D	pushbutton to change over the nominal measuring frequency
Filter	ON OFF	813/C	pushbutton to change over from weighted to unweighted frequency response
Filter	INT EXT	813/B	pushbutton to change over from internal to external filter
METER	NORM SLOW	813/A	pushbutton to change over the indicator speed
o—o ⌀		810	socket for connecting cassette and tape recorders, record players
Rear panel (see fig. 4)			
EXT FILTER 1 OUTPUT 3 INPUT ⚠		802	socket for connecting external filter see para. 3.2.
OUTPUT UNWEIGHTED 1 V ≙ 1 %		805	socket for connecting an oscilloscope or fast recorder
OUTPUT 3.15/3.00 kHz 1 V ⊓⊔		806	output socket for x-tal oscillator frequency
INPUT 2 mV ... 10 V R_i 10 k Ω		807	BNC input socket for test signal

3.2. OPERATION (Fig. 3 and 4)

Before switching on the instrument, check the DRIFT and FLUTTER-meters for correct zero indication and adjust,if necessary.

3.2.1. Switching on the instrument

After the wow and flutter meter has been connected to the mains in accordance with the paras. 2.3. and 2.4., it can be switched on by depressing the mains switch POWER.

The white spot inside the POWER switch indicates mechanically that the instrument is switched on.

With normal installation and after a warm-up time of approx. 20 to 30 min., the technical data according to para. 1.2. are valid.

Measurements are possible at room temperature immediately after switching on.

3.2.2. Zero-adjustment of drift meter

- Depress pushbutton DRIFT .3 %
- Select test frequency 3.15 or 3.00 kHz by means of pushbutton kHz
- Press pushbutton ZERO and zero-adjust the drift meter by means of the control SET ZERO, if required

This adjustment remains constant over a longer period.

3.2.3. Selecting meter speed

The normal speed of the drift and flutter meters is obtained when the pushbutton METER NORM/SLOW is released. To detect extremely slow speed variations, pushbutton METER NORM/SLOW has to be depressed (however in this position the slow response of the flutter meter is not according to standard). Take account of the meter inertia.

3.2.4. Connecting the apparatus to be tested

Normally, cassette and tape recorders, record players and movie projectors are connected via the standardized 5-pin plug-in connector or the coaxial socket INPUT.

The modulated test frequency may be also obtained via a microphone held in front of a loudspeaker. This is possible, because the input sensitivity of the meter is sufficient and eventual amplitude errors are suppressed by the limiter stage.

This is useful when interferential mass potentials occur during measurements.

3.2.5. Selecting pass band characteristic during flutter measurements

The standardized weighted filter (fig. 7) is switched on or off by means of pushbutton FILTER ON/OFF. In OFF position, the frequency variations between 0.5 Hz and approx. 500 Hz are transmitted almost linearly, in ON position the frequency range is restricted furthermore. Without weighted filter the indicated flutter value is normally higher than with weighted filter. The last value is however more representative, because it corresponds to the frequency reponse curve of the human ear.

For special error analysis it is possible to connect an external filter, switched on by means of pushbutton INT/EXT.

3.3. APPLICATIONS

To test an apparatus, use a test cassette, test tape or test record disc with the standard frequency of 3.15 kHz.

In the apparatus under test, the 3.15 kHz signal is frequency-modulated by the speed variations. This signal, applied to the PM 6307, gives an indication on the DRIFT and FLUTTER meter.

Depending on the apparatus under test, the measuring results indicated in percent can be compared with the DIN STANDARDS. The appropriate ranges for drift and flutter can be selected so that even small speed variations are indicated. In addition to this weighted flutter measurement, it is possible to measure the unweighted signal by selecting the FILTER OFF position. The frequency response in this FILTER OFF position is 0.5 Hz – 500 Hz (–4 dB), consequently the indicated flutter value is higher.

For laboratory measurements, an external filter can be connected to socket EXT. FILTER and switched on by means of pushbutton FILTER EXT.

To detect extremely slow speed variations pushbutton METER NORM/SLOW has to be depressed (However in this position, the slow response of the flutter meter is not according to standard).

If there are no test cassettes or test tapes available, it is possible to apply the internal x-tal oscillator signal to the apparatus under test (However in this way only flutter measurements can be made).

Apart from the analog meter display in percent, it is possible to connect an oscilloscope or fast recorder to the socket OUTPUT UNWEIGHTED 1 V $\triangleq$ 1 % at the rear panel.

3.3.1. Record players, light-sound projectors (fig. 5)

- Connect the output of the apparatus to be tested to the input ⌀ or INPUT, see also para. 3.2.4.
- Put on test record disc or insert test film and centre in accordance with instructions, if required
- Depending on the test frequency of the sound track, press button kHz for 3.00 kHz or release it for 3.15 kHz
- Play back test frequency and select correct measuring range for drift and flutter (buttons .3 % or 1 % or 3 % and .1 % or .3 % or 1 % or 3 %) until the meters show a definite deflection
- Note peak values and compare to the standardized limit values (see paras.3.3.3.)

For record players with automatic record changer, repeat measurement and evaluation with full or half record stack including the test record disc at the 5th or 10th place.

- Check the number of revolutions of record players and the film speed of cameras by means of the drift meter and correct, if required.

By means of the flutter meter the following defects can be detected:

- Eccentric or tumbling turntables
- Soiled friction surface of the turntable
- Eccentric intermediate gears and capstan idlers
- Slipping friction pulleys and disks which are out of true as well as damaged or brittle rubber rings
- Worn-out or brittle driving belts
- Mains-frequency-superposed angular velocity of motor armatures
- Worn-out engine mount and flywheel bearings
- Reduced torque related to the pickup point due to a slipping drive, whereby the rotational speed is changed depending on the geometry of the pickup arm and the needle.

With periodical errors, the defect part can be identified by determining its speed from the interfering frequency. After repair, the proper functioning of the instrument can be verified.

3.3.2. Magnetic tape and cassette recorders and magnetic sound film projectors and cameras

3.3.2.1. Playback

- Connect apparatus to be tested to the input ⌐o ℘ or INPUT, see also 3.2.4.
- Insert test tape, test cassette or test film with test frequency track of 3.15 kHz (3.00 kHz)
- Play back the test frequency and select required measuring range for drift and flutter (buttons .3 % or 1 % or 3 % and .1 % or .3 % or 1 % or 3 %) so that the meters show a definite deflection
- Note peak values and compare to the standardized limit values
- Check the tape speed by means of the drift meter and correct, if required

By means of the flutter meter the following defects can be detected:

- eccentric intermediate gears and capstan idlers
- slipping friction pulleys and disks which are out of true as well as damaged or brittle rubber rings
- worn-out or brittle driving belts
- worn-out engine mount and flywheel bearings
- soiled felt lining and jerking slip friction clutch
- eccentric capstan
- uneven tape tension due to defect clutch or slipping capstan idler

With periodically recurring errors, the defect part can be identified by determining its speed from the interfering frequency. After repair, the proper functioning of the instrument can be verified.

3.3.2.2. Recording and playback

- Connect tape or cassette recorder, or magnetic sound camera to the input ⌐o ℘ or INPUT
- Record test frequency 3.15 kHz at the beginning, in the middle and at the end of the tape or film. Recordings and playbacks should be made always in the same position of the apparatus to be tested.
- Playback recordings, observe flutter meter and note value; if the needle is not steady, press pushbutton METER NORM/SLOW
- As the slow frequency variations are compensated by means of the same drive assembly during recording and playback, the drift meter is only partially representative in this case.

Due to the fact that the errors of the same drive assembly are added or subtracted during recording and playback, these errors are reduced or augmented specially with symmetric periodic frequency variations. The error depends on the phase relationship of the magnetic tape or film track to the driving part. In this case, the flutter meter is indicating the differential value.

Such a frequency variation can be reduced or augmented by touching the wind-off reel. The slip in the drive assembly or between drive and tape due to the slow-down results in a phase shift facilitating the failure detection.

3.3.3. Limits

3.3.3.1. Studio tape recorder (DIN 45 511)

Nominal tape speed in cm/s	76.2	38.1	19.5
Drift	± 0.2 %	± 0.2 %	± 0.2 %
Wow and flutter	± 0.1 %	± 0.1 %	± 0.15 %

Home tape recorders (DIN 45 511)

Nominal tape speed in cm/s	2.38	4.76	9.53	19.5
Drift	± 2 %	± 2 %	± 2 %	± 2 %
Wow and flutter	± 1 %	± 0.6 %	± 0,3 %	± 0.2 %

Home hifi tape recorders (DIN 45 500)

Nominal tape speed in cm/s	4.76	9.53	19.5
Drift	± 1.5 %	± 1.5 %	± 1.5 %
Wow and flutter	± 0.2 %	± 0.2 %	± 0.2 %

Hifi-Cassette Recorder

Nominal tape speed in cm/s	4.76
Drift	± 2 %
Wow and flutter	± 0,2 %

Cassette Recorder

Drift	± 2 %
Wow and flutter	± 0.4 %

3.3.3.2 Record players

Number of revolution/min	33 1/3	45	78
Drift	± 2 %	± 2 %	± 3 %
Wow and flutter	± 0.2 %	± 0.3 %	± 0.5 %

Hifi record player (DIN 45 500)

Number of revolutions/min	33 1/3	45
Drift	+ 1.5 %	+ 1.5 %
	− 1.0 %	− 1.0 %
Wow and flutter	± 0.2 %	± 0.2 %

3.3.3.3. Explanations

- The drift is defined as medium deviation from the nominal value measured over 30 s
- For flutter measurements the peak value corresponds to the maximum pointer deflection
- The frequency variations of electronic record players should be smaller than ±0.1 %

4. SERVICE DATA

4.1. ACCESS TO PARTS

Before dismantling the instrument, the safety regulations in accordance with para. 2.1. must be strictly observed.

4.1.1. Covers

For access to the components, the lower cover should first be removed by unscrewing the two screws securing it to the rear plate of the instrument.

The cover can now be swung outwards to disengage the lips that lock into the front panel. The component side of the printed-wiring board is now accessible.

To gain access to the printed-wiring side of the board,the top cover can be removed by unscrewing the two rear screws and the retaining screw located in the centre of the board. When replacing the top cover, care must be taken not to overtighten this retaining screw.

4.1.2. Knob

Remove the cap from the knob.
Unscrew the nut and remove the knob.
When replacing the knob, ensure that the white mark is correctly aligned with the text plate markings.

4.1.3. Text plate

Remove upper and lower cover as described in section 4.1.1.
Remove the knob as described in section 4.1.2.
Carefully remove the ornamental rim.
The text plate is now free for removal.

4.1.4. Replacing a switch of the pushbutton unit

Individual switch sections can be replaced as follows (see fig. 7):

- Straighten the four retaining lugs.
- Unsolder the relevant switch contacts whilst easing the switch section away from the printed-wiring board and clean the holes (e. g. with a suction soldering iron).
- Solder the new switch onto the printed-wiring board.
- Bend the four retaining lugs back to their original position.

4.1.5. Miscellaneous components

The removal of other components follows normal practice. Care should be taken not to use excessive heat when removing components from the printed-wiring board. Heat shunts should be used to protect integrated circuits and transistors.

4.2. Check and adjustment

- The limits mentioned in this paragraph are valid only for a newly adjusted instrument and therefore might deviate from the values as stated in para. 1.2. "Technical Data".
- Adjustment of the instrument is only permitted after a warm-up time of at least 30 minutes at an ambient temperature of (+23 ±3)°C and when connected to a mains voltage of (230 ±11.5) V.
- If not explicitely stated otherwise, the voltage potentials refer to the relevant contact measured against circuit earth (⊥ o).

Preliminary work

Put meter in normal operating position.
Check mechanical zero point of the indicators and adjust, if required.

ATTENTION: The pushbuttons not mentioned in this paragraph are in released position, except for the mains switch.

4.2.1. Operating voltages

Stabilized voltages	ripple voltage
at electrolytic capacitor 541 : 9.0 ... 9.6 V	< 10 mVpp
at electrolytic capacitor 542 : 9.0 ... 9.6 V	
at electrolytic capacitor 543 : 4.8 ... 5.2 V	

4.2.2. X-tal oscillator

- Counter to test point 8/U1
- Test switch 815/U1 (fig. 11) in mid-position
- Nominal frequency f = 201.6 kHz ± 20 Hz
- Connect oscilloscope to OUTPUT 3.15/3.00 kHz; the square-wave amplitude should be between 0.9 ... 1.1 V
- Connect counter to OUTPUT 3.15/3.00 kHz; the nominal frequency must be 3150 Hz ± 1 digit
- Press button kHz 3.15/3.00; the nominal frequency must be 3000 Hz ± 1 digit
- Set test switch 815/U1 to position S1; the nominal frequency must be 2910 Hz ± 1 digit
- Release pushbutton kHz 3.15/3.00

4.2.3. Limiter amplifier

- Connect oscilloscope to output 6 of OP 351/U1
- Check DC-voltage; if necessary, adjust to ≤ 20 mV by means of trim poti 606/U1
- Connect oscilloscope to output 6 of OP 352/U1
- Interconnect socket OUTPUT 3.15/3.00 kHz and socket INPUT
- Check square-wave signal:

  upper limit should be between +5.3 to +5.9 V
  lower limit should be ≥ −0.5 V

4.2.4. FM demodulator , filter amplifier and drift indication

4.2.4.1. Zero point shift of the FM demodulator (621/U1)

- Socket OUTPUT 3.15/3.00 kHz remains connected to socket INPUT
- Set test switch 815/U1 in mid-position (fig. 11 and 13)
- Turn potentiometer SET ZERO to mid-position
- Depress button DRIFT 3 %
- Check zero-adjustment of drift meter; if necessary, adjust with potentiometer 621/U1
- Connect oscilloscope to socket OUTPUT UNWEIGHTED; the AC voltage must be $\leq$50 m Vpp
- Connect digital voltmeter ($R_i \geq 10$ M Ω) to socket OUTPUT UNWEIGHTED and adjust DC voltage to $\leq$5 mV by means of control SET ZERO

4.2.4.2. Filter-amplifier (635/U1)

- Set test switch 815/U1 to position S1 (fig. 11 and 13)
- Check DC voltage for –3.03 V ±5 mV; if necessary, adjust with potentiometer 635/U1
- Set drift indication to –3 % by means of potentiometer 644/U1

4.2.4.3. Drift variation with test frequency variation

- Set test switch 815/U1 in mid-position
- Depress button DRIFT .3 %
- Depress button kHz 3.15/3.00; the drift indication must be between –0.2 % ... +0.2 %
- Release pushbutton kHz 3.15/3.00
- Depress button drift 3 %; the drift indication must be adjustable from $\leq$ –0.8 % to $\geq$ +0.8 % by means of the control SET ZERO
- Finally set drift indication to zero

4.2.4.4. Checking drift measuring ranges

- Connect function generator PM 5127 of 3150 Hz (sinus) and 3 Vpp to socket INPUT
- Depress button DRIFT .3 %
- Set drift indicator to +0.3 % by means of control FREQ OFFSET of the PM 5127
- Depress button DRIFT 1 %; the drift indication must be between +0.27 ... +0.33 %
- Setdrift indication to +1 % by means of controlFREQ OFFSET of the PM 5127
- Depress button DRIFT 3 %; the drift indication must be between 0.9 ... 1.1 %
- Set drift meter to zero by means of control FREQ OFFSET of the PM 5127
- Depress button DRIFT .3 %
- Vary the output amplitude of the PM 5127 from 30 Vpp to 6 mVpp; the maximum permissible variation of the indication must be 0 $\leq$ 0.05 %.

4.2.5. Flutter indication

4.2.5.1. Adjust offset voltage with potentiometer 663/U1

- Depress button FILTER INT/EXT
- Depress button FLUTTER .1 %
- Connect oscilloscope to output 6 of O P 357/U1 and check for a DC voltage of $\leq$ 80 mV; if necessary, adjust with potentiometer 663/U1.

4.2.5.2. **Check attenuator for unweighted flutter measurement (solder joints A and B)**

- Depress button FLUTTER 3 %
- Connect LF-generator (e. g. PM 5108) to the SWEEP INPUT of PM 5127 function generator
- Set the sine-wave output signal of the LF-generator to 4 Hz
- Adjust amplitude of the LF-generator until flutter meter is indicating 3 %
- Depress button FILTER ON/OFF
- Flutter meter should indicate 3 % ±0.05 %; if necessary, correction is possible by connecting or disconnecting solder points A or/and B.

4.2.5.3. **Calibration of flutter indication (664/U1)**

First possibility

- Depress button FILTER ON/OFF
- Set LF- generator (PM 5108) to 100 Hz and adjust amplitude until 2.10 Vrms are measured at socket OUTPUT UNWEIGHTED
- Adjust flutter indication to 3 % by means of potentiometer 664/U1
- Release pushbutton FILTER ON/OFF
- The flutter indication must decrease till 0.24 ... 0.67 %
- Depress button METER NORM/SLOW
- Set LF-generator (PM 5108) to 0.63 Hz
- The flutter indication must be between 0.5 and 1 %

Second possibility

- Apply square-wave signal of 4 Hz with an amplitude of ≥10 Vpp to test point 10/U1
- Release pushbutton METER NORM/SLOW
- Turn test switch 815/U1 to position S 3 (fig. 11 and 13)
- Interconnect socket OUTPUT 3.15/3.00 kHz and socket INPUT
- Depress button FLUTTER 3 %
- The flutter indication must be between 1.65 and 1.75 %
- Set test switch 815/U 1 to mid-position
- Remove interconnection between socket OUTPUT 3.15/3.00 kHz and socket INPUT

4.2.5.4. **Checking FLUTTER measuring ranges**

- Apply 3150 Hz (sinus) with 3 Vpp to socket INPUT by means of the function generator PM 5127
- Connect LF-generator (e. g. PM 5108) terminated with 50 Ω -pad PM 9585, to the SWEEP INPUT of function generator PM 5127
- Set LF-generator to 100 Hz
- Depress button FILTER ON/OFF
- Depress button FLUTTER.1 %
- Vary amplitude of the LF-generator until flutter indication is.1 %
- Depress button FLUTTER .3 %; the display should be between 0.09 ... 0.11 %
- Vary amplitude of the LF-generator until flutter indication is 0.3 %
- Depress button FLUTTER 1 %; the display should be between 0.27 ... 0.33 %
- Vary amplitude of the LF-generator until flutter indication is 1 %
- Depress button FLUTTER 3 %; the display should be between 0.9 ... 1.1 %

4.3. CHECK AFTER REPAIR AND MAINTENANCE

Checking the protective leads

The correct connection and condition is checked by visual control and by measuring the resistance between the protective-lead connection at the plug and the cabinet.

The resistance should be $<0.5\,\Omega$ .During measurement the mains cable should be moved. Resistance variations indicate a defect.

Checking the insulating resistance

Measure the insulating resistance at U— = 500 V between the mains connection and the protective lead connection.

For this purpose set the mains switch to ON.

The insulating resistance should be >2 M Ω .

4.4. PARTS LIST

4.4.1. Mechanical

Item	Fig.	Quantity	Order number	Description
1	10	1	5322 447 94333	Cabinet, upper half
2	10	1	5322 447 94334	Cabinet, lower half
3	10	4	5322 462 44289	Foot
4	10	1	5322 498 54078	Handle
5	9	1	5322 414 34075	Knob (627)
6	9	1	5322 414 74015	Cap (627)
7	9	6	5322 276 14271	Push-button switch (812/U2)
8	9	2	4822 276 10559	Push-button switch (812/U2)
9	9	4	5322 276 14221	Push-button switch (813/U1)
10	9	12	5322 414 25851	Knob for push-button switch
11	9	1	5322 276 14128	Mains switch (811)
12	12	1	4822 273 30206	Switch (815/U1)
13	12	1	5322 447 94332	Front frame
14	12	1	5322 466 85335	Front rim
15	12	1	5322 447 94363	Insulating cover
16	12	3	5322 532 64214	Insulating disk
17	12	3	5322 532 54334	Insulating bush
18	10	1	5322 265 30066	Mains input socket (809)
19	10	1	4822 267 40039	Socket 5-pole (808)
20	10	3	5322 267 10004	BNC-socket (805 – 807)
21	9	1	4822 267 40278	Socket 5-pole (810)
22	9	1	5322 456 94074	Textplate

4.4.2. Miscellaneous

Item	Fig.	Quantity	Order number	Description
23	9	1	5322 344 64102	Drift meter (804)
24	9	1	5322 344 64103	Flutter meter (803)
25	12	1	5322 146 24167	Mains transformer (751)
26	12	1	4822 252 20001	Thermal fuse
27	12	1	5322 242 74138	Quartz crystal (814)
		1	5322 321 10071	Mains cable

4.4.3. Electrical

Resistors

Carbon

- typ. dissipation at T_{amb} = 70° C
  max. hot-spot temperature = 155° C
  CR 16 = 0,2 W CR 52 = 0,67 W
  CR 25 = 0,33 W CR 68 = 1,15 W
  CR 37 = 0,5 W CR 93 = 2 W

Metal film

- typ. dissipation at T_{amb} = 70° C
  max. hot-spot temperature = 155° C
  MR 24, MR 25 = 0,4 W
  MR 30, MR 34 = 0,5 W
  MR 52, MR 54 = 0,75 W
  MR 74 = 1,0 W

ITEM	ORDERING NUMBER	TYPE/DESCRIPTION
TRANSISTORS - IC'S		
301-308	5322 130 44121	BC338
309	5322 130 44104	BC328
351-357	5322 209 85254	MUA741CV
358	5322 209 84823	N74LS00A
359,360	5322 209 85527	N74LS76B
361,362	5322 209 84998	N74LS93A
363	5322 209 84996	N74LS10A
DIODES		
401,402	5322 130 30613	BAW62
404	5322 130 34173	BZX79-C5V6
405	5322 130 34233	BZX79-B5V1
406-409	5322 130 30613	BAW62
411,412	5322 130 30229	AAZ15
413	5322 130 30613	BAW62
414	5322 130 30414	BY164
416,417	5322 130 34297	BZX79-B10

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
CAPACITORS					
501	4822 121 40239	47N	10	250	POLYESTER FOIL
502	4822 124 20461	47MU		10	ELECTROLYTIC
503	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
504	4822 121 50606	30N	1	63	POLYSTYRENE FOIL
506	5322 121 54127	3,9N	1	63	POLYSTYRENE FOIL
507	5322 121 40323	100N	10	100	POLYESTER FOIL
508	4822 121 50606	30N	1	63	POLYSTYRENE FOIL
509	5322 121 54127	3,9N	1	63	POLYSTYRENE FOIL
512	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
513	4822 121 50611	20N	1	63	POLYSTYRENE FOIL
514	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
516	4822 124 20589	220MU		10	ELECTROLYTIC
517	4822 124 20515	2200MU		6,3	ELECTROLYTIC

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
518	4822 121 40232	220N	10	100	POLYESTER FOIL
519	4822 124 20461	47MU		10	ELECTROLYTIC
521,522	5322 121 40197	1,0MU	10	100	POLYESTER FOIL
523	4822 121 40257	330N	10	100	POLYESTER FOIL
526,527	4822 124 20476	10MU		25	ELECTROLYTIC
528	4822 124 20461	47MU		10	ELECTROLYTIC
530	5322 121 44028	2X2,5N	20	250	POLYESTER FOIL
531	4822 122 30045	27P	2	63	CERAMIC PLATE
532	4822 124 20476	22MU		25	ELECTROLYTIC
533	4822 122 31165	330P	10	100	CERAMIC PLATE
534	5322 121 40323	100N	10	100	POLYESTER FOIL
536	4822 124 20529	1000MU		25	ELECTROLYTIC
537	4822 124 20527	470MU		25	ELECTROLYTIC
538,539	4822 124 20587	100MU		25	ELECTROLYTIC
540	4822 124 20461	47MU		10	ELECTROLYTIC
541,542	4822 124 20587	100MU		25	ELECTROLYTIC
543	4822 124 20462	100MU		10	ELECTROLYTIC
545	4822 122 30034	470P	2	100	CERAMIC PLATE

ITEM	ORDERING NUMBER	OHM	TOL. (%)	TYPE	REMARKS
RESISTORS					
601	4822 110 63134	10K	5	CR25	CARBON
602	4822 110 60162	110K	5	CR25	CARBON
603	4822 110 63161	100K	5	CR25	CARBON
604	4822 110 63187	1,0M	5	CR25	CARBON
606	4822 100 10193	10K	20	0,05W	TRIMMING POTM
607	4822 110 63107	1,0K	5	CR25	CARBON
608	4822 110 63125	4,7K	5	CR25	CARBON
609	4822 110 60095	360	5	CR25	CARBON
611	4822 110 60115	2,0K	5	CR25	CARBON
612	5322 116 55191	412K	1	MR25	TRIMMING POTM
613	5322 116 55183	20,5K	0,25	MR24E	METAL FILM
614	5322 116 54549	1,0K	1	MR25	METAL FILM
616	5322 116 54631	14,3K	1	MR25	METAL FILM
617	5322 116 50474	42,2K	1	MR25	METAL FILM
618	5322 116 54624	11,5K	1	MR25	METAL FILM
619	5322 116 54768	4,87K	0,25	MR24E	METAL FILM
621	5322 101 14047	470	20	0,5W	TRIMMING POTM
622	4822 110 60115	2,0K	5	CR25	CARBON
623	5322 116 50479	15,4K	1	MR25	METAL FILM
624	5322 116 50474	42,2K	1	MR25	METAL FILM
626	5322 116 54624	11,5K	1	MR25	METAL FILM
627	4822 101 20441	10K	20	0,1W	CARBON POTM LIN
628	5322 116 54696	100K	1	MR25	METAL FILM
629	5322 116 50728	1,87K	1	MR25	METAL FILM
631	5322 116 54595	5,11K	1	MR25	METAL FILM
632	5322 116 54577	2,55K	1	MR25	METAL FILM
622	5322 116 54595	5,11K	1	MR25	METAL FILM
634	5322 116 50415	1,15K	1	MR25	METAL FILM
635	4822 100 10038	470	20	0,5W	TRIMMING POTM
636	5322 116 54608	7,5K	1	MR25	METAL FILM
637	4822 110 63134	10K	5	CR25	CARBON
638	5322 116 54572	2,0K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
639	5322 116 54599	5,76K	1	MR25	METAL FILM
641	5322 116 54549	1,0K	1	MR25	METAL FILM
642,643	5322 116 54576	2,37K	1	MR25	METAL FILM
644	5322 100 10112	1,0K	20	0,5W	TRIMMING POTM
646	4822 110 63118	2,7K	5	CR25	CARBON
647	4822 110 60142	20K	5	CR25	CARBON
648	5322 116 54665	40,2K	1	MR25	METAL FILM
649	4822 110 60102	620	5	CR25	CARBON
650	5322 116 54665	40,2K	1	MR25	METAL FILM
651	5322 116 54643	20,5K	1	MR25	METAL FILM
652	4822 110 60177	430K	5	CR25	CARBON
653	4822 110 60168	200K	5	CR25	CARBON
654	5322 116 54665	40,2K	1	MR25	METAL FILM
655	4822 110 63187	1,0M	5	CR25	CARBON
656	5322 116 54617	9,53K	1	MR25	METAL FILM
657	4822 110 60186	910K	5	CR25	CARBON
658	5322 116 54617	9,53K	1	MR25	METAL FILM
659	5322 116 54488	165	1	MR25	METAL FILM
661	5322 116 54574	2,21K	1	MR25	METAL FILM
662	5322 116 54516	365	1	MR25	METAL FILM
663	4822 100 10193	10K	20	0,5W	TRIMMING POTM
664	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
666	5322 116 54632	14,7K	1	CR25	METAL FILM
667	5322 116 50482	33,2K	1	MR25	METAL FILM
668	4822 110 60119	3,0K	5	CR25	CARBON
669,671	5322 116 50442	48,7K	1	MR25	METAL FILM
676,677	4822 110 63107	1,0K	5	CR25	CARBON
678	4822 110 60128	6,2K	5	CR25	CARBON
679	4822 110 63161	100K	5	CR25	CARBON
681	4822 110 60124	4,3K	5	CR25	CARBON
682	4822 110 60099	510	5	CR25	CARBON
683	4822 110 60095	360	5	CR25	CARBON
684	4822 110 60177	430K	5	CR25	CARBON
687	4822 110 60126	5,1K	5	CR25	CARBON
688	4822 110 63145	27K	5	CR25	CARBON

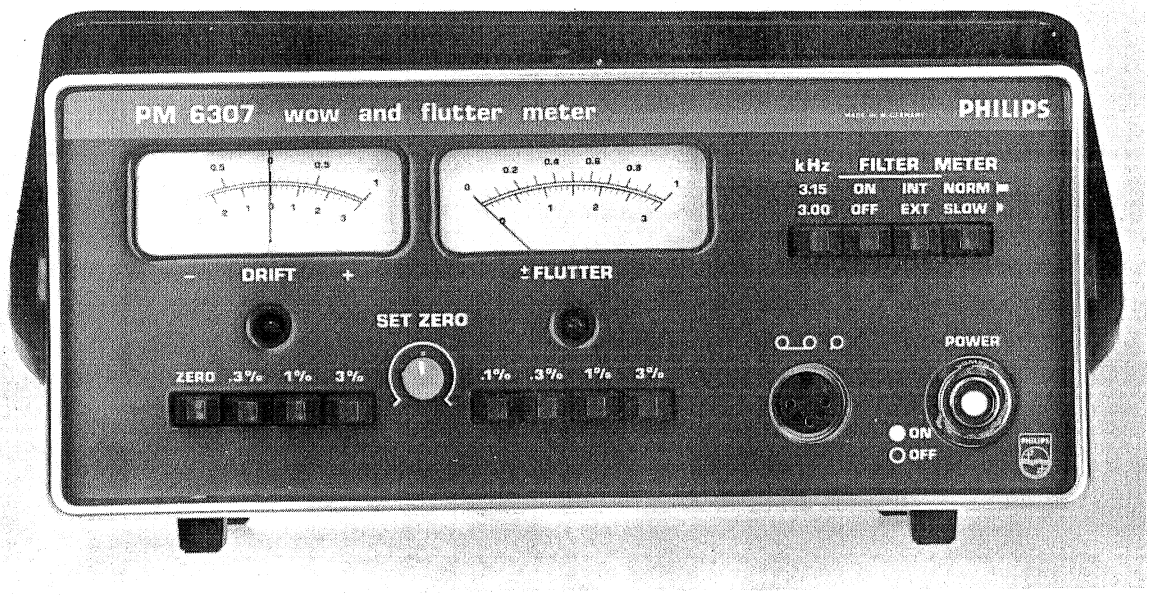


Fig. 3 Front view
Frontansicht
Face avant

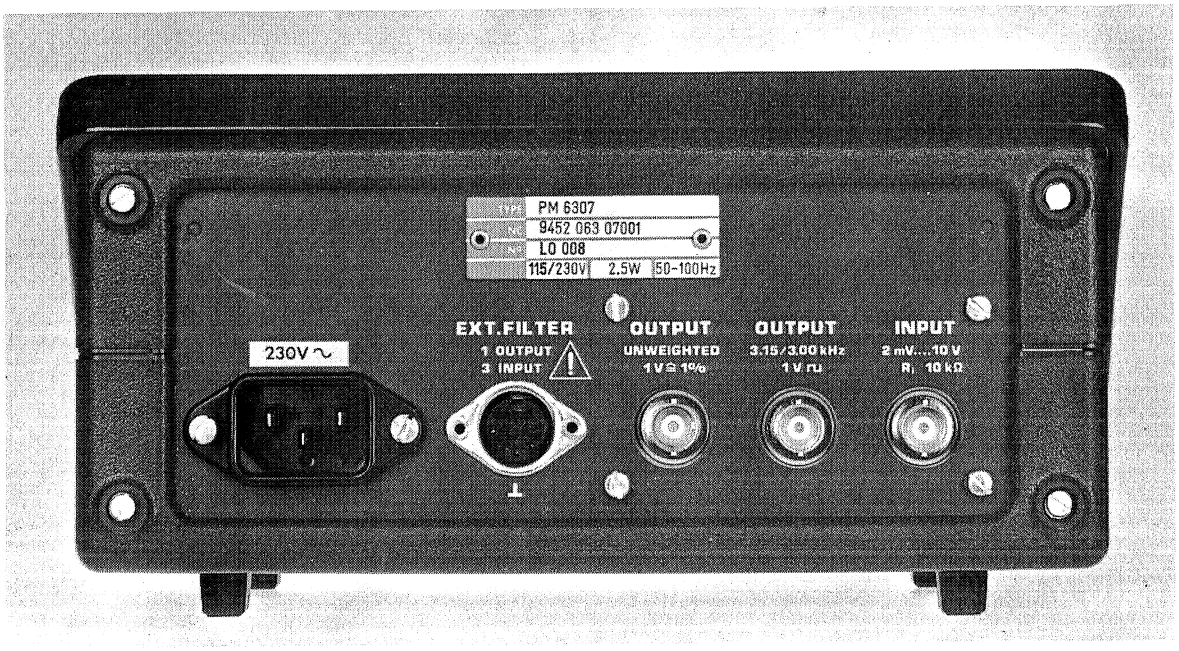


Fig. 4 Rear view
Rückansicht
Face arriere

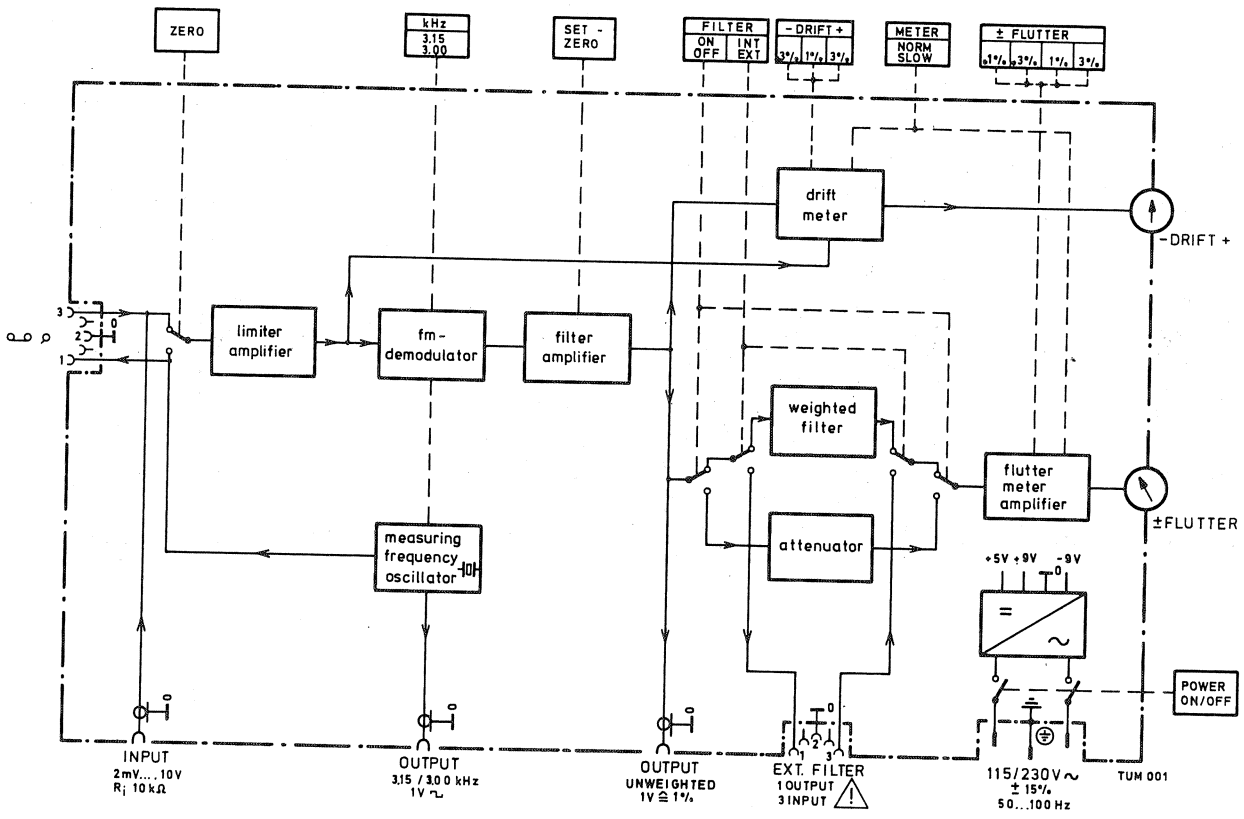


Fig. 1 Block diagram
Blockdiagramm
Schema synoptique

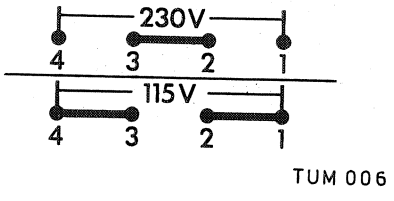


Fig. 2 Connections for two voltage ranges
Anschlußbild für zwei Netzspannungsbereiche
Connexion de deux gammes de tension

Fig. 5 Wow and flutter measurements of a record player
Gleichlaufmessung an einem Plattenspieler
Mesure de wow et flutter d'un tourne-disques

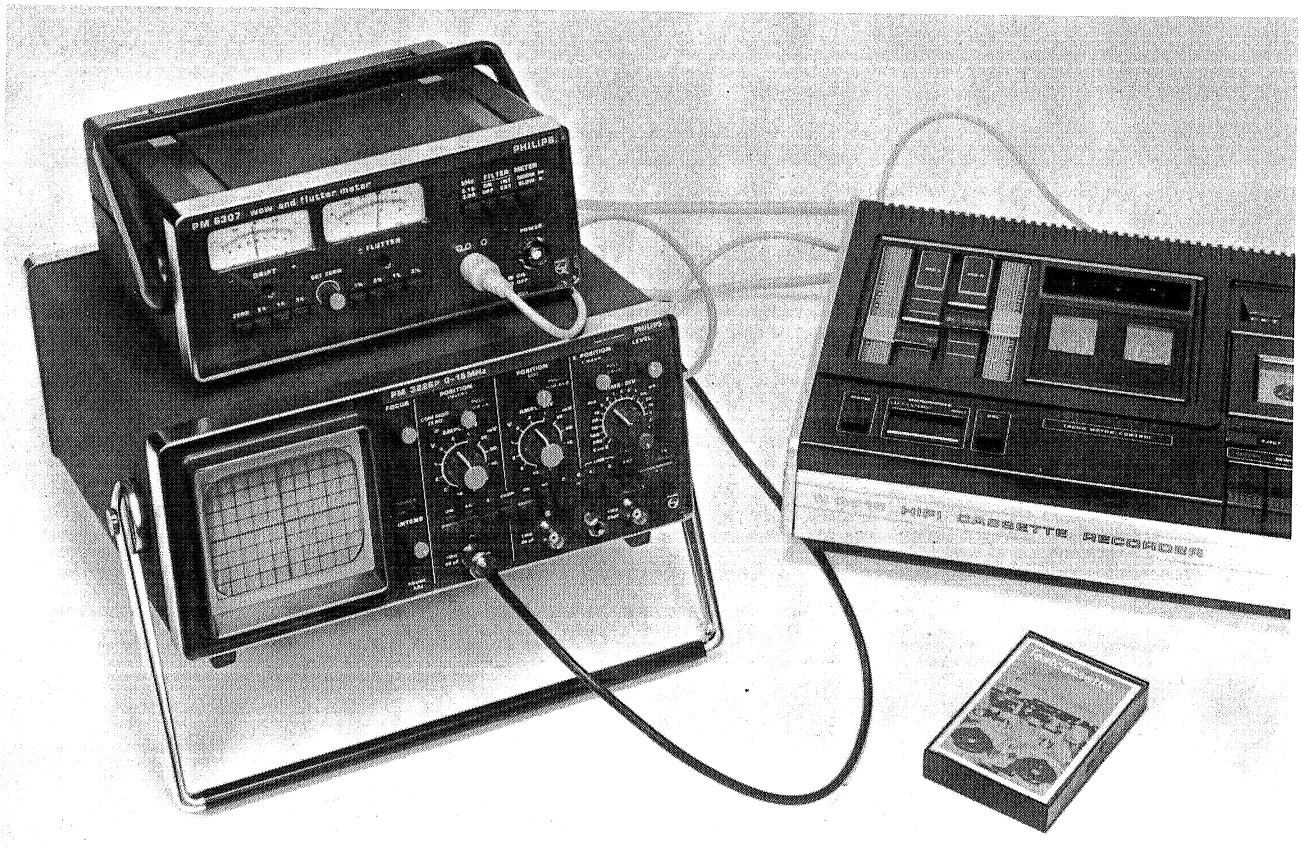


Fig. 6 Wow and flutter measurements of a cassette recorder
Gleichlaufmessung an einem Cassetten-Recorder
Mesure de wow et flutter d'un enregistreur sur cassettes

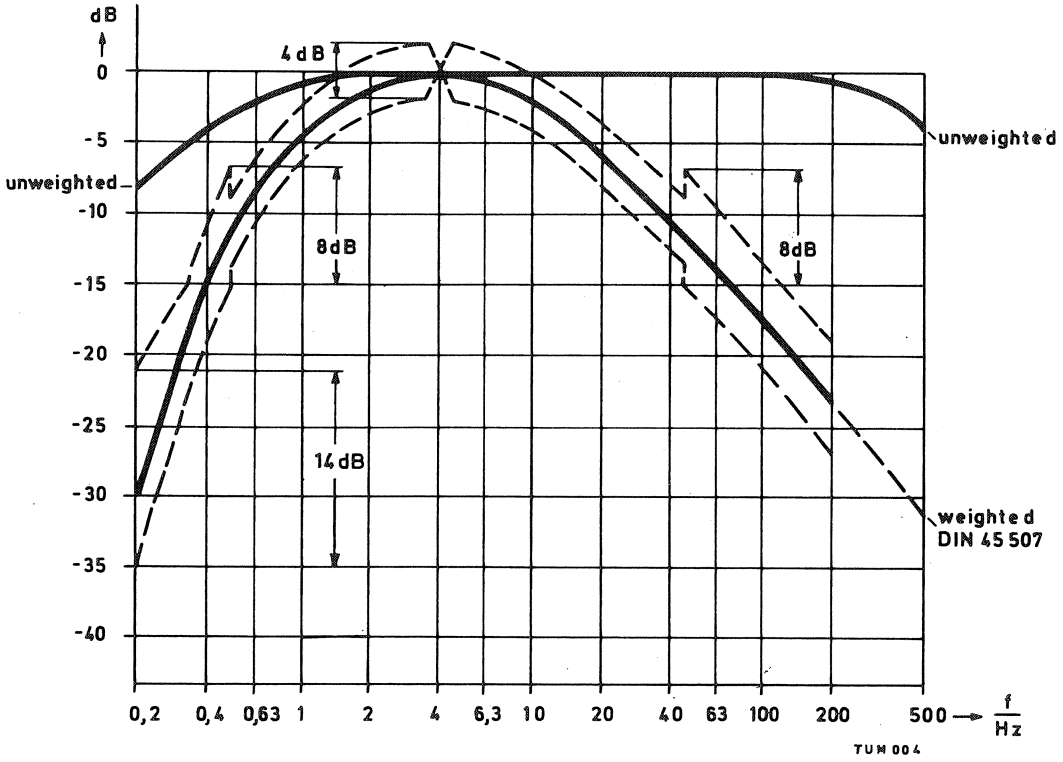


Fig. 7 Transmission characteristic of evaluated and non-evaluated measurements
Durchlaßcharakteristik für bewertete und unbewertete Messung
Characteristique de transmission de la mesure evaluee et non evaluee

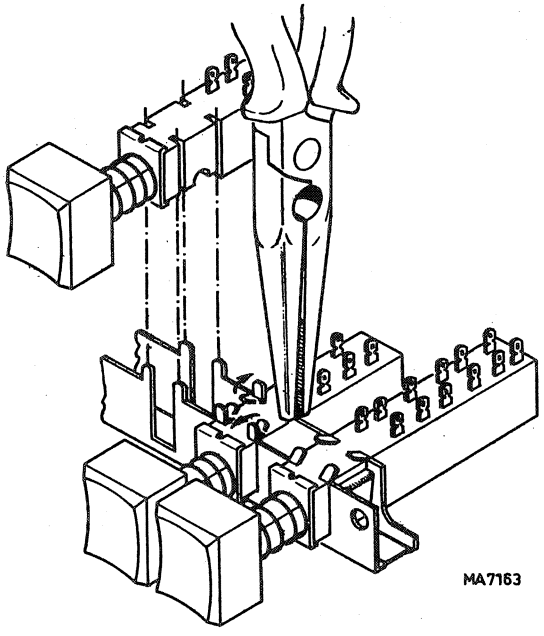


Fig. 8 Replacing a switch of the pushbutton unit

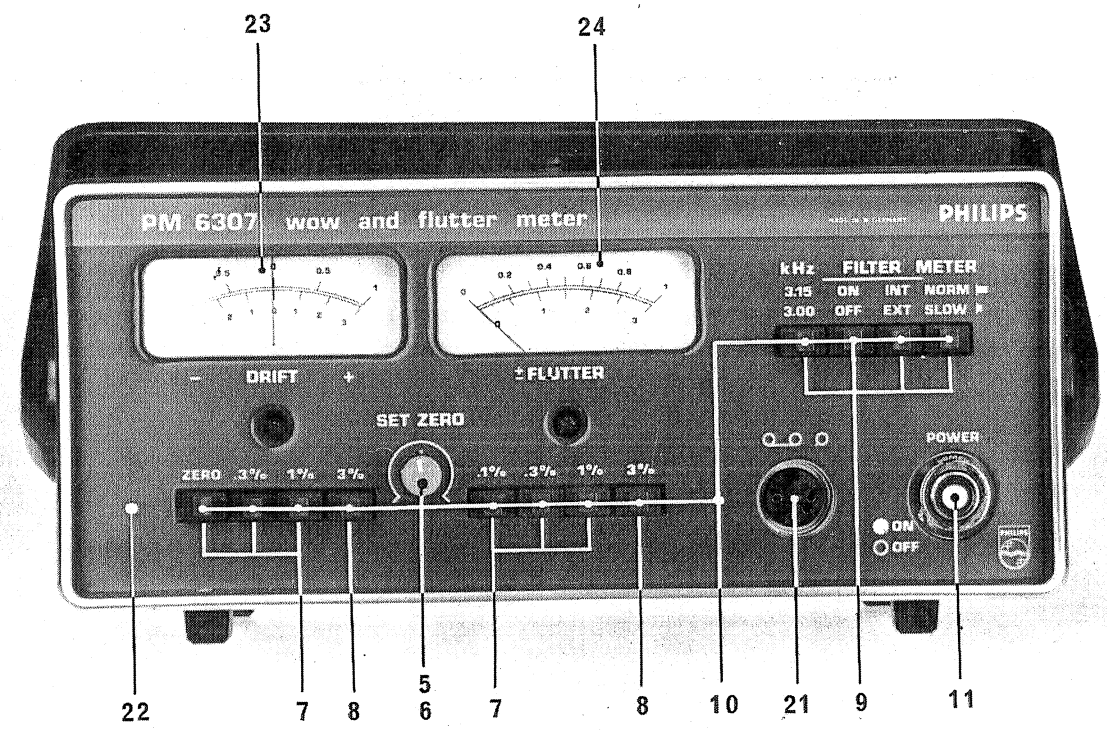


Fig. 9 Front view, mechanical parts

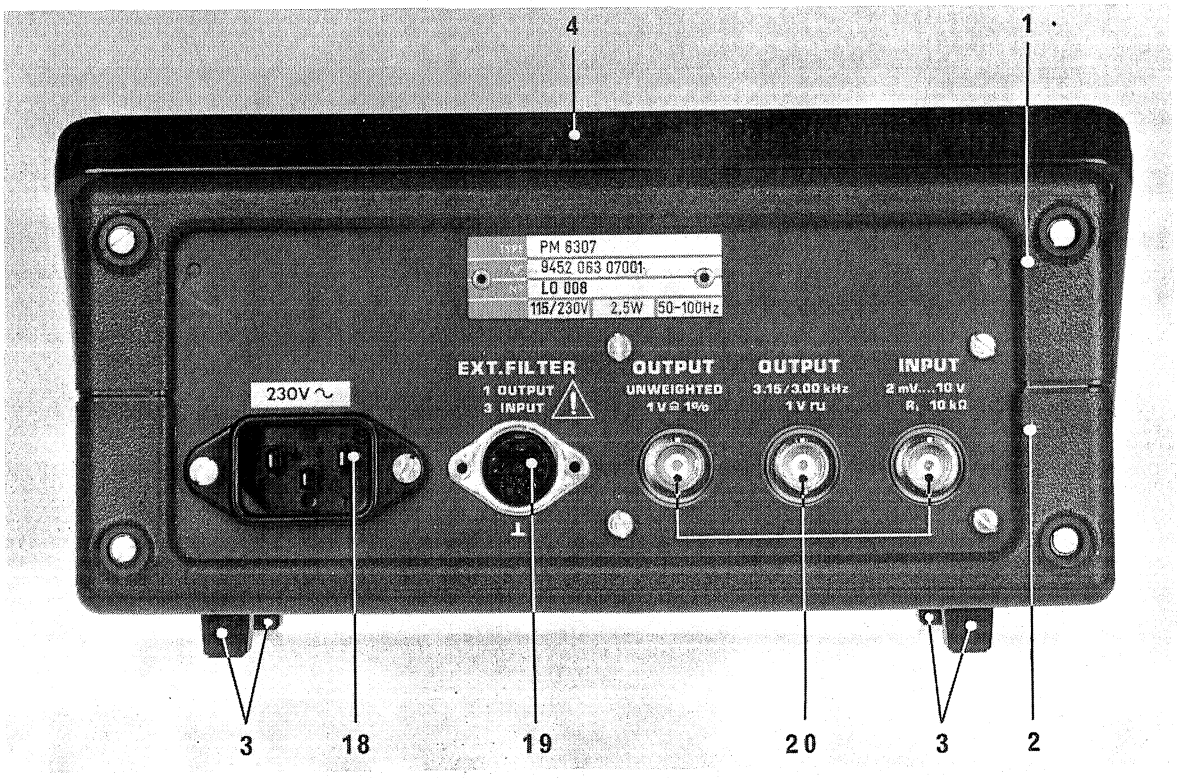


Fig. 10 Rear view, mechanical parts

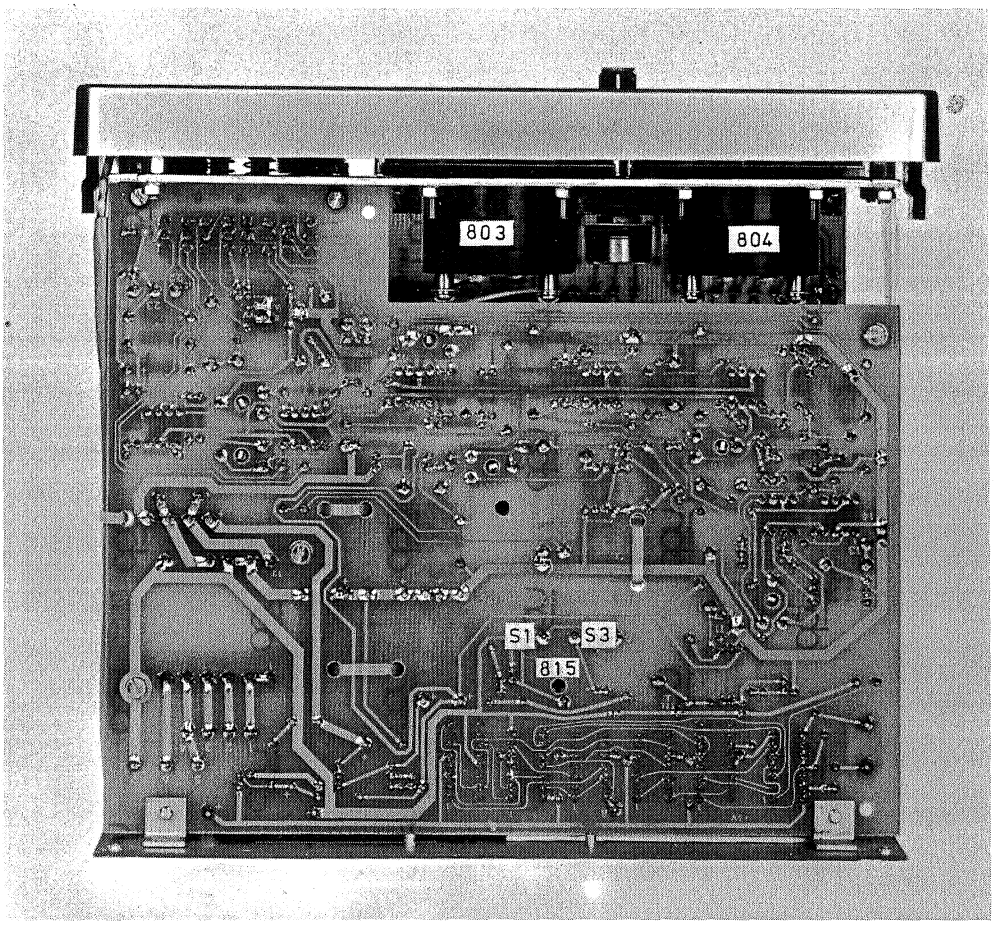


Fig. 11 Inside view top side, mechanical parts

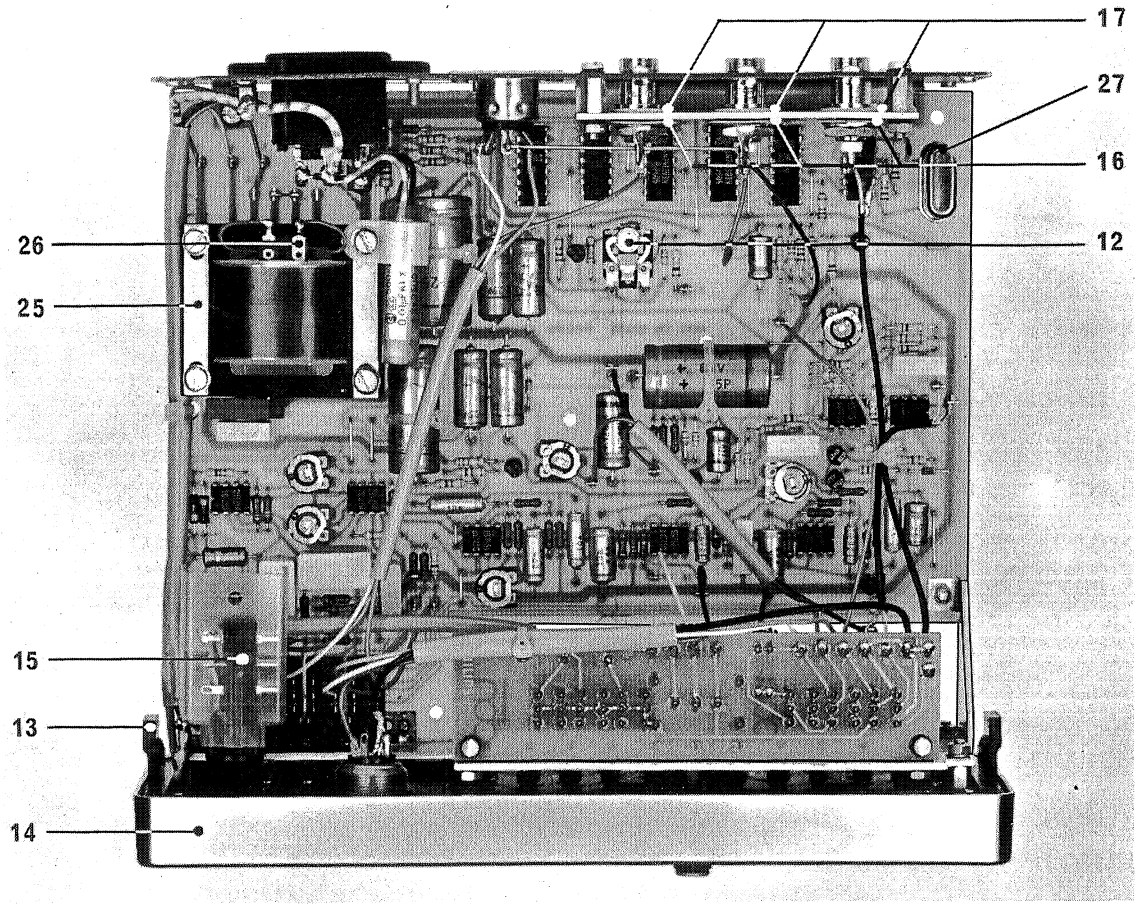


Fig. 12 Inside view bottom side, mechanical parts

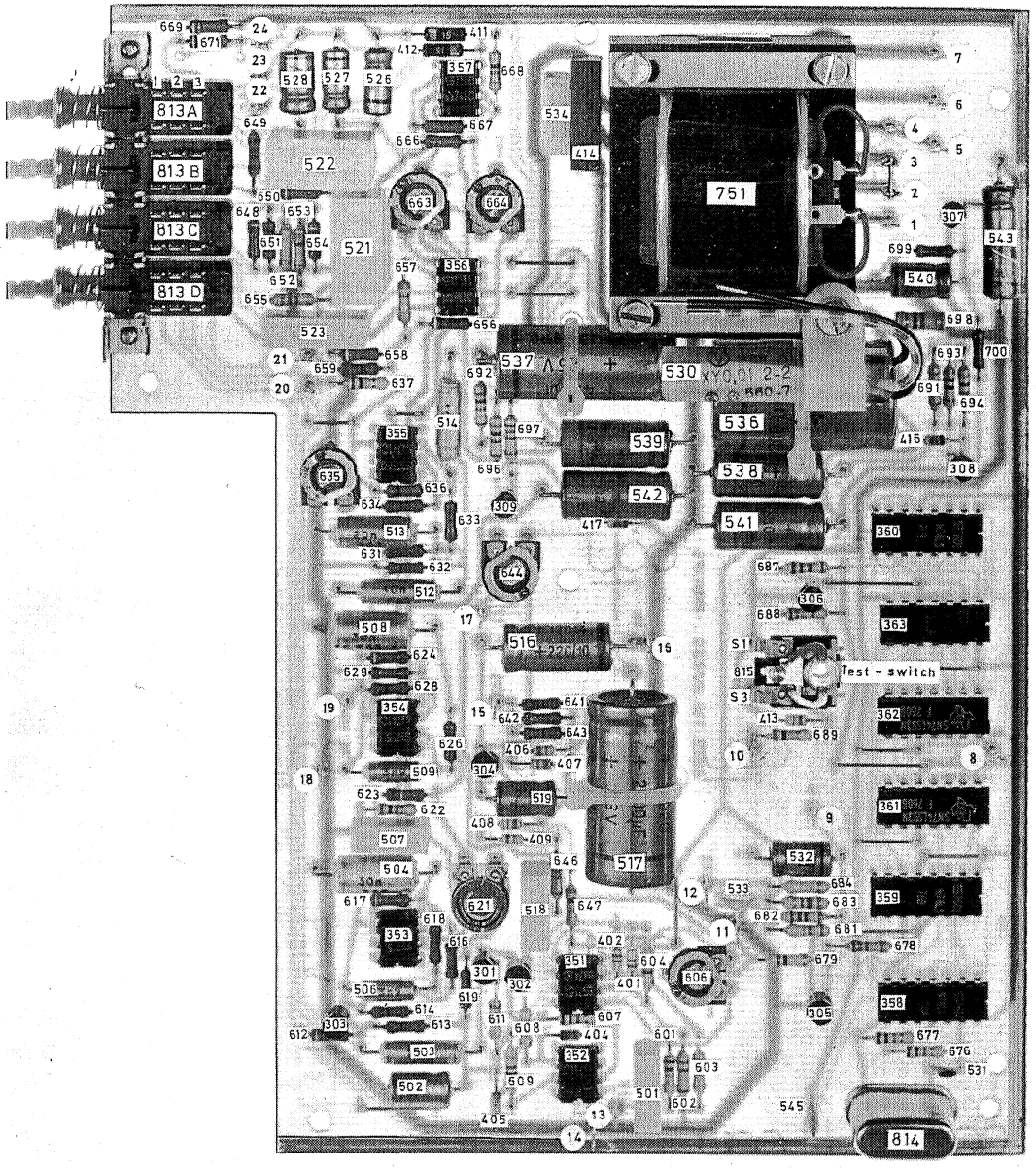


Fig. 13 Printed wiring board with components, Unit 1

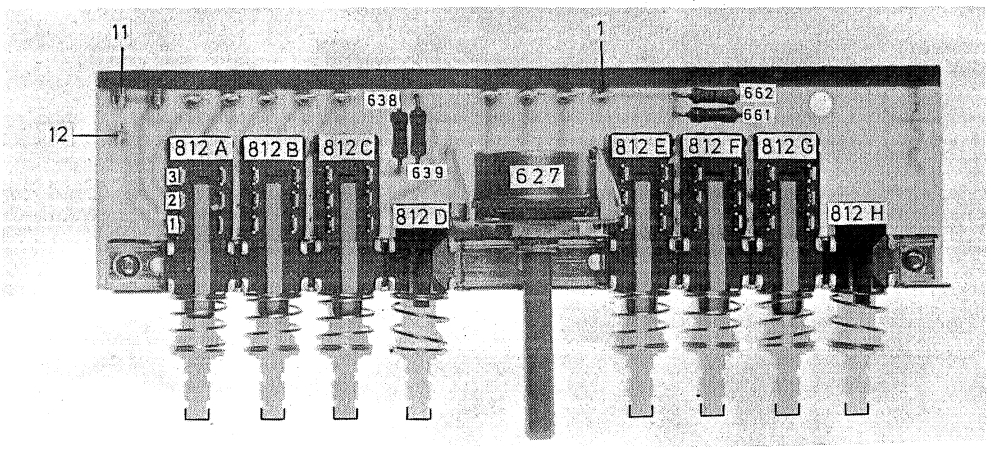


Fig. 14 Printed wiring board with components, Unit 2

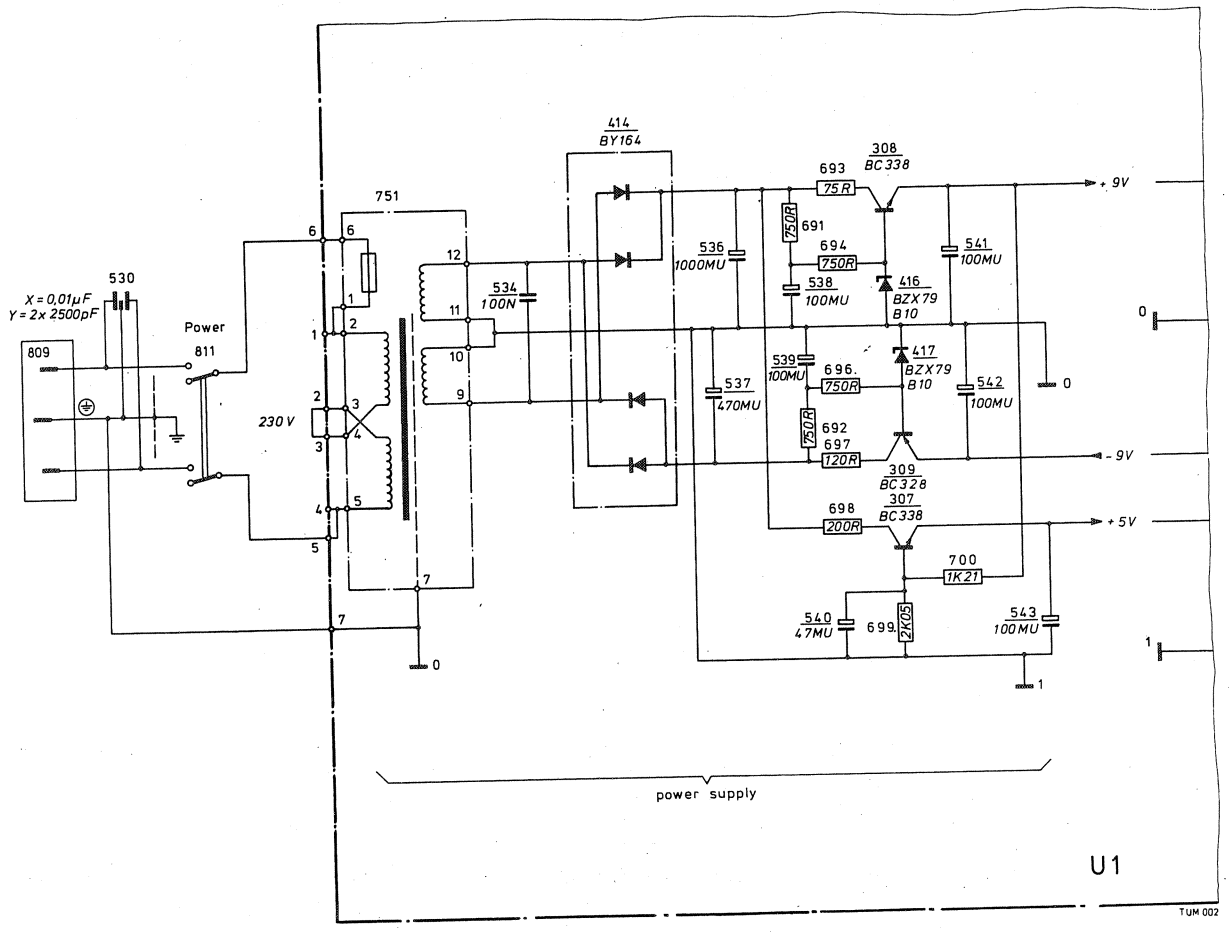
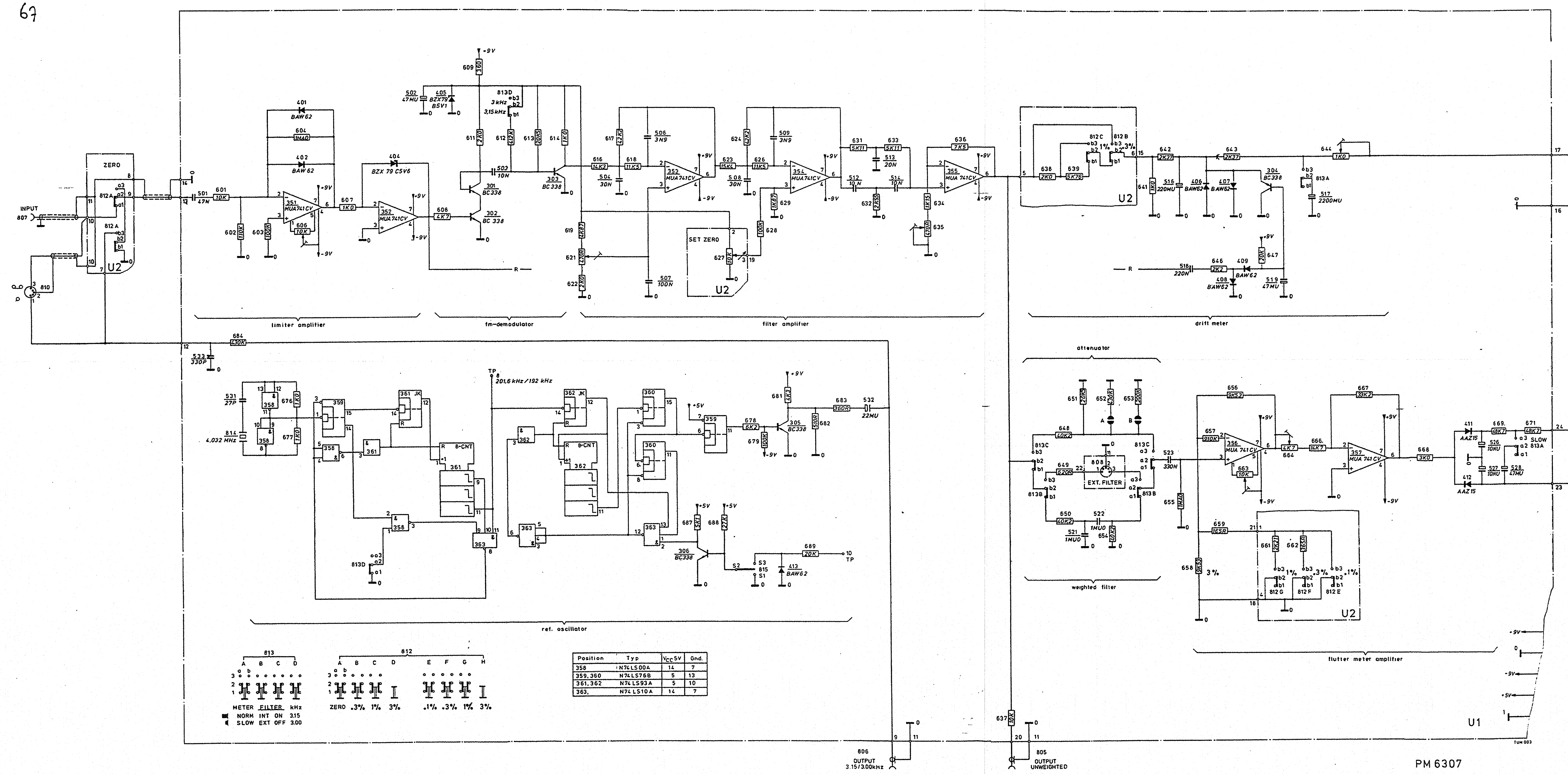


Fig. 15 Circuit diagram of power supply PM 6307



Position	Typ	V_{CC} 5V	Gnd.
358	N74LS00A	14	7
359, 360	N74LS76B	5	13
361, 362	N74LS93A	5	10
363,	N74LS10A	14	7

PM 6307

Fig. 16 Circuit diagram without power supply

PHILIPS

Instruction manual
Gerätehandbuch
Mode d'emploi et d'entretien

PM 6307

9452 063 07001

Wow and flutter-meter
Wow und Flutter-Messgerät
Appareil de mesure de wow et flutter

9499 520 07702

780430/2/01 ÷ 03

4.4. CHECK AFTER REPAIR AND MAINTENANCE

Checking the protective leads

The correct connection and condition is checked by visual control and by measuring the resistance between the protective-lead connection at the plug and the cabinet.

The resistance should be $<0.5\,\Omega$. During measurement the mains cable should be moved. Resistance variations indicate a defect.

Checking the insulating resistance

Measure the insulating resistance at U— = 500 V between the mains connection and the protective lead connection.

For this purpose set the mains switch to ON.

The insulating resistance should be $>2\ M\,\Omega$.

4.5. PARTS LIST

4.5.1. Mechanical

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1	10	1	5322 447 94333	Cabinet, upper half
2	10	1	5322 447 94334	Cabinet, lower half
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4	10	1	5322 498 54078	Handle
5	9	1	5322 414 34075	Knob (627)
6	9	1	5322 414 74015	Cap (627)
7	9	6	5322 276 14271	Push-button switch (812/U2)
8	9	2	4822 276 10559	Push-button switch (812/U2)
9	9	4	5322 276 14221	Push-button switch (813/U1)
10	9	12	5322 414 25851	Knob for push-button switch
11	9	1	5322 276 14128	Mains switch (811)
12	12	1	4822 273 30206	Switch (815/U1)
13	12	1	5322 447 94332	Front frame
14	12	1	5322 466 85335	Front rim
15	12	1	5322 447 94363	Insulating cover
16	12	3	5322 532 64214	Insulating disk
17	12	3	5322 532 54334	Insulating bush
18	10	1	5322 265 30066	Mains input socket (809)
19	10	1	4822 267 40039	Socket 5-pole (808)
20	10	3	5322 267 10004	BNC-socket (805 – 807)
21	9	1	4822 267 40278	Socket 5-pole (810)
22	9	1	5322 456 94074	Textplate

4.5.2. Miscellaneous

Item	Fig.	Quantity	Order number	Description
23	9	1	5322 344 64102	Drift meter (804)
24	9	1	5322 344 64103	Flutter meter (803)
25	12	1	5322 146 24167	Mains transformer (751)
26	12	1	4822 252 20001	Thermal fuse
27	12	1	5322 242 74138	Quartz crystal (814)
		1	5322 321 10071	Mains cable

4.5.3. Electrical

Resistors

Carbon

- typ. dissipation at T_{amb} = 70° C
  max. hot-spot temperature = 155° C
  CR 16 = 0,2 W CR 52 = 0,67 W
  CR 25 = 0,33 W CR 68 = 1,15 W
  CR 37 = 0,5 W CR 93 = 2 W

Metal film

- typ. dissipation at T_{amb} = 70° C
  max. hot-spot temperature = 155° C
  MR 24, MR 25 = 0,4 W
  MR 30, MR 34 = 0,5 W
  MR 52, MR 54 = 0,75 W
  MR 74 = 1,0 W

ITEM	ORDERING NUMBER	TYPE/DESCRIPTION
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309	5322 130 44104	BC328
351-357	5322 209 85254	MUA741CV
358	5322 209 84823	N74LS00A
359,360	5322 209 85527	N74LS76B
361,362	5322 209 84998	N74LS93A
363	5322 209 84996	N74LS10A
DIODES		
401,402	5322 130 30613	BAW62
404	5322 130 34173	BZX79-C5V6
405	5322 130 34233	BZX79-B5V1
406-409	5322 130 30613	BAW62
411,412	5322 130 30229	AAZ15
413	5322 130 30613	BAW62
414	5322 130 30414	BY164
416,417	5322 130 34297	BZX79-B10

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
CAPACITORS					
501	4822 121 40239	47N	10	250	POLYESTER FOIL
502	4822 124 20461	47MU		10	ELECTROLYTIC
503	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
504	4822 121 50606	30N	1	63	POLYSTYRENE FOIL
506	5322 121 54127	3,9N	1	63	POLYSTYRENE FOIL
507	5322 121 40323	100N	10	100	POLYESTER FOIL
508	4822 121 50606	30N	1	63	POLYSTYRENE FOIL
509	5322 121 54127	3,9N	1	63	POLYSTYRENE FOIL
512	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
513	4822 121 50611	20N	1	63	POLYSTYRENE FOIL
514	5322 121 54154	10N	1	63	POLYSTYRENE FOIL
516	4822 124 20589	220MU		10	ELECTROLYTIC
517	4822 124 20515	2200MU		6,3	ELECTROLYTIC

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
518	4822 121 40232	220N	10	100	POLYESTER FOIL
519	4822 124 20461	47MU		10	ELECTROLYTIC
521,522	5322 121 40197	1,0MU	10	100	POLYESTER FOIL
523	4822 121 40257	330N	10	100	POLYESTER FOIL
526,527	4822 124 20476	10MU		25	ELECTROLYTIC
528	4822 124 20461	47MU		10	ELECTROLYTIC
530	5322 121 44028	2X2,5N	20	250	POLYESTER FOIL
531	4822 122 30045	27P	2	63	CERAMIC PLATE
532	4822 124 20476	22MU		25	ELECTROLYTIC
533	4822 122 31165	330P	10	100	CERAMIC PLATE
534	5322 121 40323	100N	10	100	POLYESTER FOIL
536	4822 124 20529	1000MU		25	ELECTROLYTIC
537	4822 124 20527	470MU		25	ELECTROLYTIC
538,539	4822 124 20587	100MU		25	ELECTROLYTIC
540	4822 124 20461	47MU		10	ELECTROLYTIC
541,542	4822 124 20587	100MU		25	ELECTROLYTIC
543	4822 124 20462	100MU		10	ELECTROLYTIC

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
RESISTORS					
601	4822 110 63134	10K	5	CR25	CARBON
602	4822 110 60162	110K	5	CR25	CARBON
603	4822 110 63161	100K	5	CR25	CARBON
604	4822 110 63187	1,0M	5	CR25	CARBON
606	4822 100 10193	10K	20	0,05W	TRIMMING POTM
607	4822 110 63107	1,0K	5	CR25	CARBON
608	4822 110 63125	4,7K	5	CR25	CARBON
609	4822 110 60095	360	5	CR25	CARBON
611	4822 110 60115	2,0K	5	CR25	CARBON
612	5322 116 55191	412K	1	MR25	TRIMMING POTM
613	5322 116 55183	20,5K	0,25	MR24E	METAL FILM
614	5322 116 54549	1,0K	1	MR25	METAL FILM
616	5322 116 54631	14,3K	1	MR25	METAL FILM
617	5322 116 50474	42,2K	1	MR25	METAL FILM
618	5322 116 54624	11,5K	1	MR25	METAL FILM
619	5322 116 54768	4,87K	0,25	MR24E	METAL FILM
621	5322 101 14047	470	20	0,5W	TRIMMING POTM
622	4822 110 60115	2,0K	5	CR25	CARBON
623	5322 116 50479	15,4K	1	MR25	METAL FILM
624	5322 116 50474	42,2K	1	MR25	METAL FILM
626	5322 116 54624	11,5K	1	MR25	METAL FILM
627	4822 101 20441	10K	20	0,1W	CARBON POTM LIN
628	5322 116 54696	100K	1	MR25	METAL FILM
629	5322 116 50728	1,87K	1	MR25	METAL FILM
631	5322 116 54595	5,11K	1	MR25	METAL FILM
632	5322 116 54577	2,55K	1	MR25	METAL FILM
622	5322 116 54595	5,11K	1	MR25	METAL FILM
634	5322 116 50415	1,15K	1	MR25	METAL FILM
635	4822 100 10038	470	20	0,5W	TRIMMING POTM
636	5322 116 54608	7,5K	1	MR25	METAL FILM
637	4822 110 63134	10K	5	CR25	CARBON
638	5322 116 54572	2,0K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
639	5322 116 54599	5,76K	1	MR25	METAL FILM
641	5322 116 54549	1,0K	1	MR25	METAL FILM
642,643	5322 116 54576	2,37K	1	MR25	METAL FILM
644	5322 100 10112	1,0K	20	0,5W	TRIMMING POTM
646	4822 110 63116	2,2K	5	CR25	CARBON
647	4822 110 60142	20K	5	CR25	CARBON
648	5322 116 54665	40,2K	1	MR25	METAL FILM
649	4822 110 60102	620	5	CR25	CARBON
650	5322 116 54665	40,2K	1	MR25	METAL FILM
651	5322 116 54643	20,5K	1	MR25	METAL FILM
652	4822 110 60177	430K	5	CR25	CARBON
653	4822 110 60168	200K	5	CR25	CARBON
654	5322 116 54665	40,2K	1	MR25	METAL FILM
655	4822 110 63187	1,0M	5	CR25	CARBON
656	5322 116 54617	9,53K	1	MR25	METAL FILM
657	4822 110 60186	910K	5	CR25	CARBON
658	5322 116 54617	9,53K	1	MR25	METAL FILM
659	5322 116 54488	165	1	MR25	METAL FILM
661	5322 116 54574	2,21K	1	MR25	METAL FILM
662	5322 116 54516	365	1	MR25	METAL FILM
663	4822 100 10193	10K	20	0,5W	TRIMMING POTM
664	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
666	5322 116 54632	14,7K	1	CR25	METAL FILM
667	5322 116 50482	33,2K	1	MR25	METAL FILM
668	4822 110 60119	3,0K	5	CR25	CARBON
669,671	5322 116 50442	48,7K	1	MR25	METAL FILM
676,677	4822 110 63107	1,0K	5	CR25	CARBON
678	4822 110 60128	6,2K	5	CR25	CARBON
679	4822 110 63161	100K	5	CR25	CARBON
681	4822 110 60124	4,3K	5	CR25	CARBON
682	4822 110 60099	510	5	CR25	CARBON
683	4822 110 60095	360	5	CR25	CARBON
684	4822 110 60177	430K	5	CR25	CARBON
687	4822 110 60126	5,1K	5	CR25	CARBON
688	4822 110 63145	27K	5	CR25	CARBON

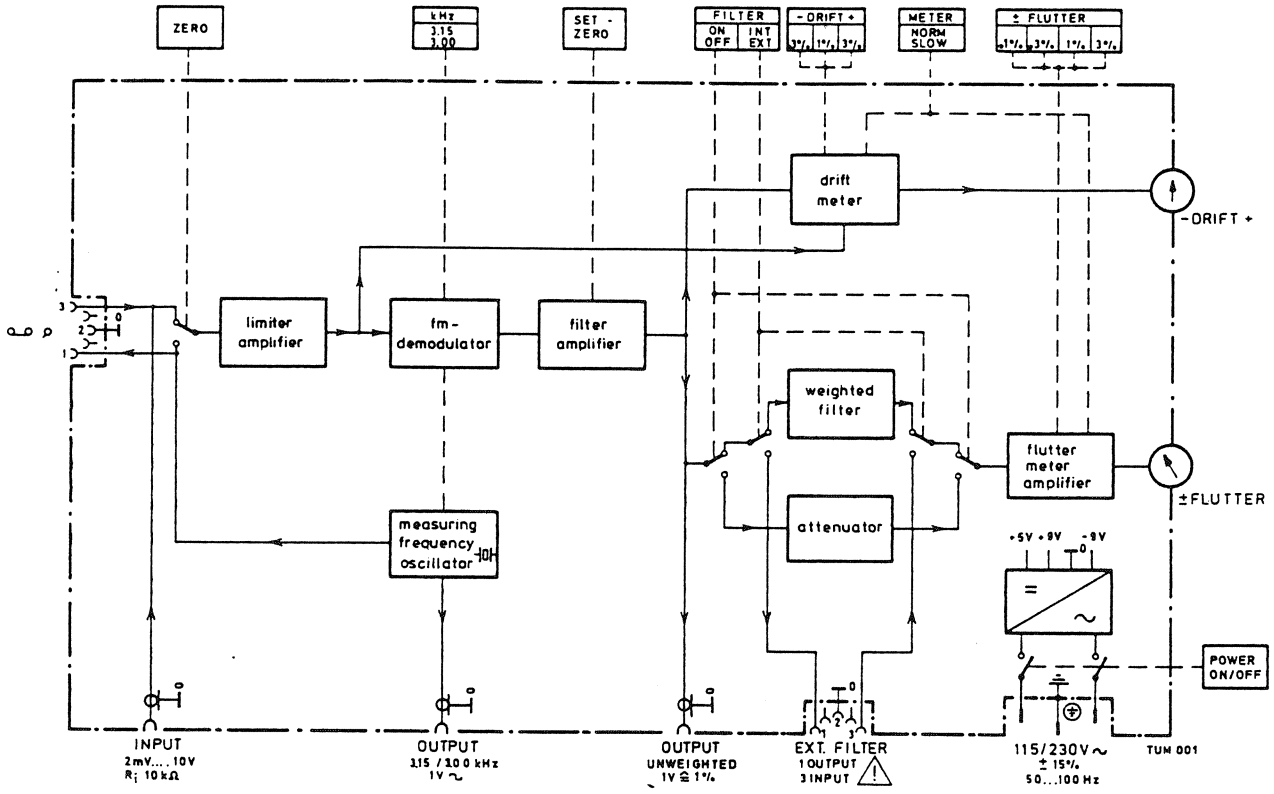


Fig. 1 Block diagram
Blockdiagramm
Schéma synoptique

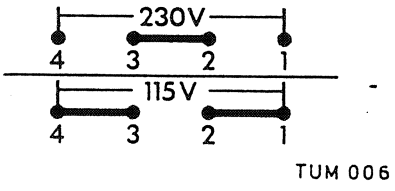


Fig. 2 Connections for two voltage ranges
Anschlußbild für zwei Netzspannungsbereiche
Connexion de deux gammes de tension

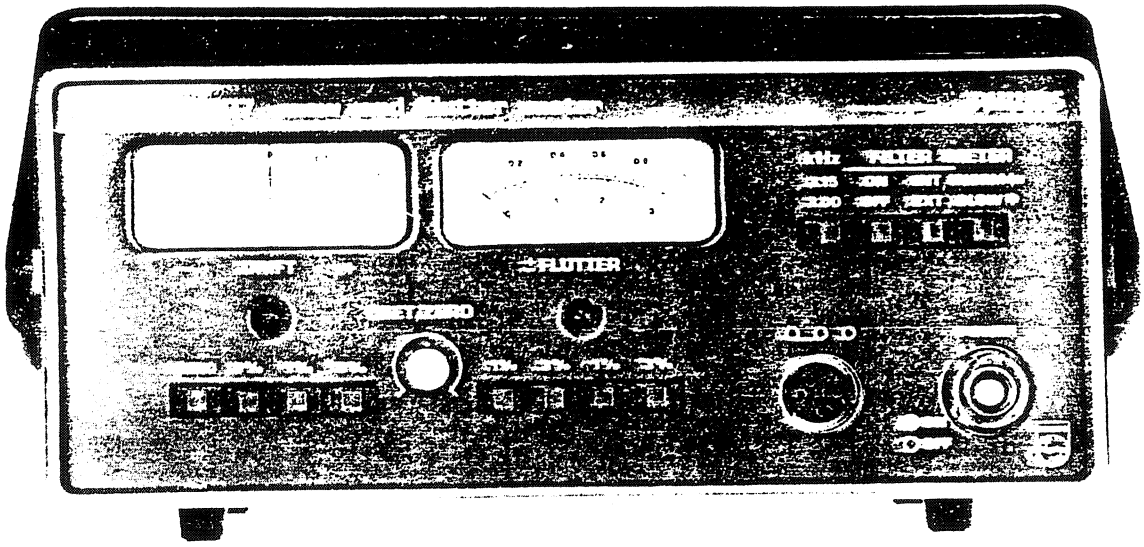


Fig. 3 Front view
Frontansicht
Face avant

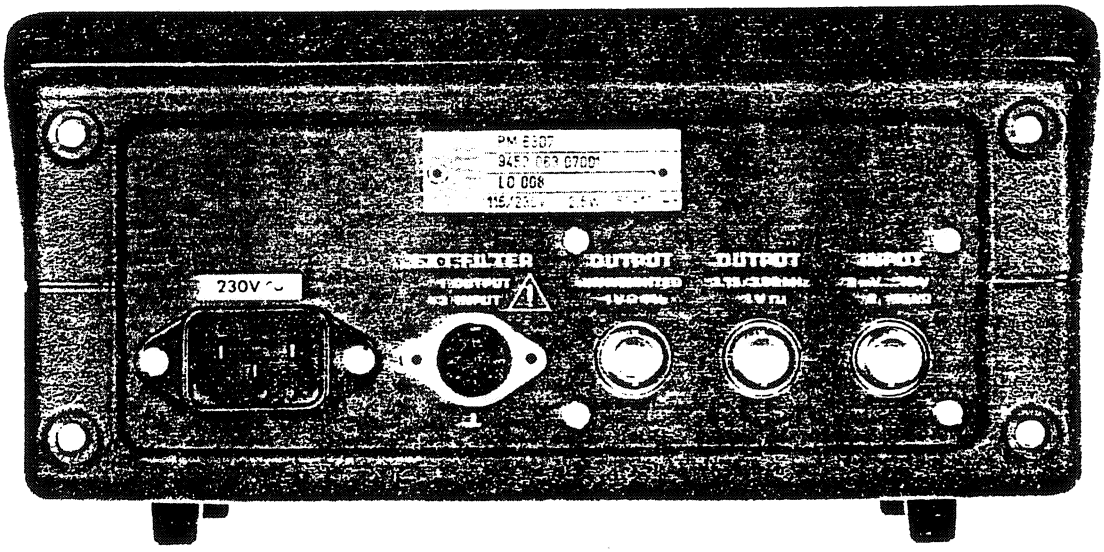


Fig. 4 Rear view
Rückansicht
Face arriere

Fig. 5 Wow and flutter measurements of a record player
Gleichlaufmessung an einem Plattenspieler
Mesure de wow et flutter d'un tourne-disques

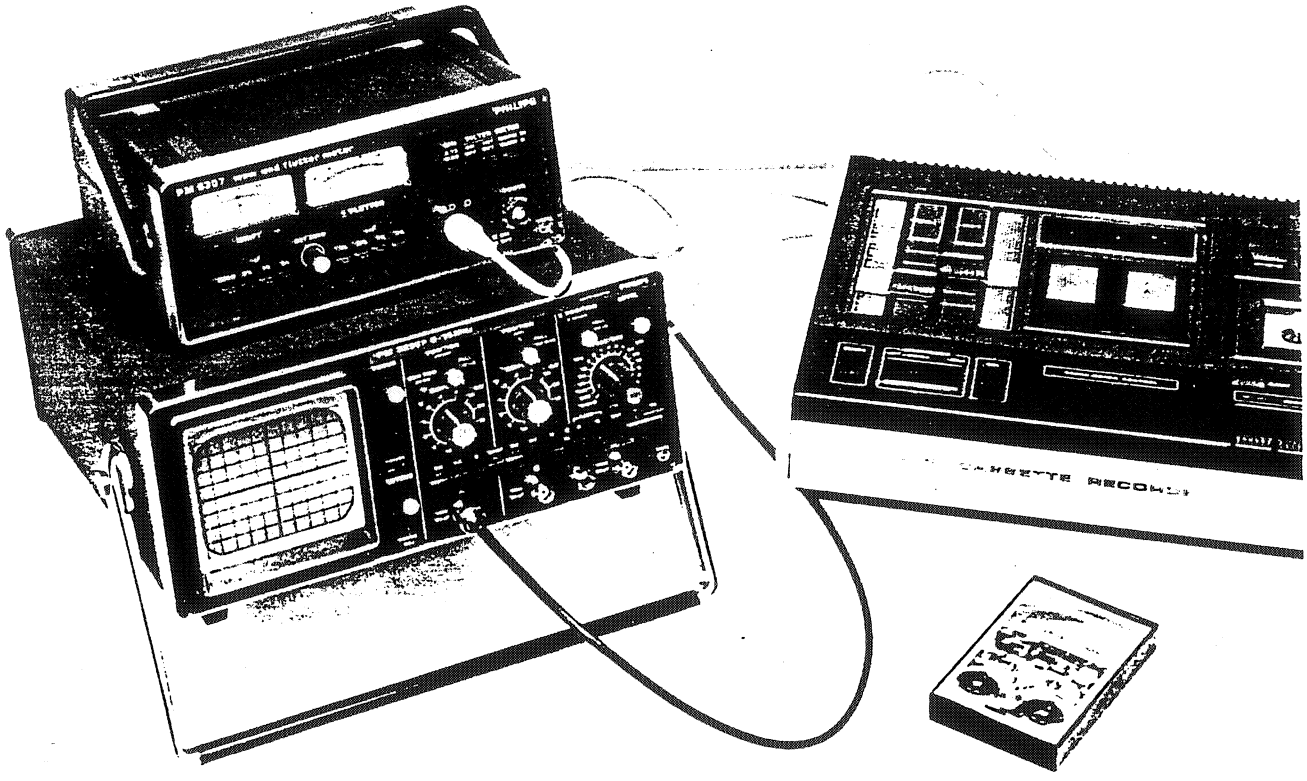


Fig. 6 Wow and flutter measurements of a cassette recorder
Gleichlaufmessung an einem Cassetten-Recorder
Mesure de wow et flutter d'un enregistreur sur cassettes

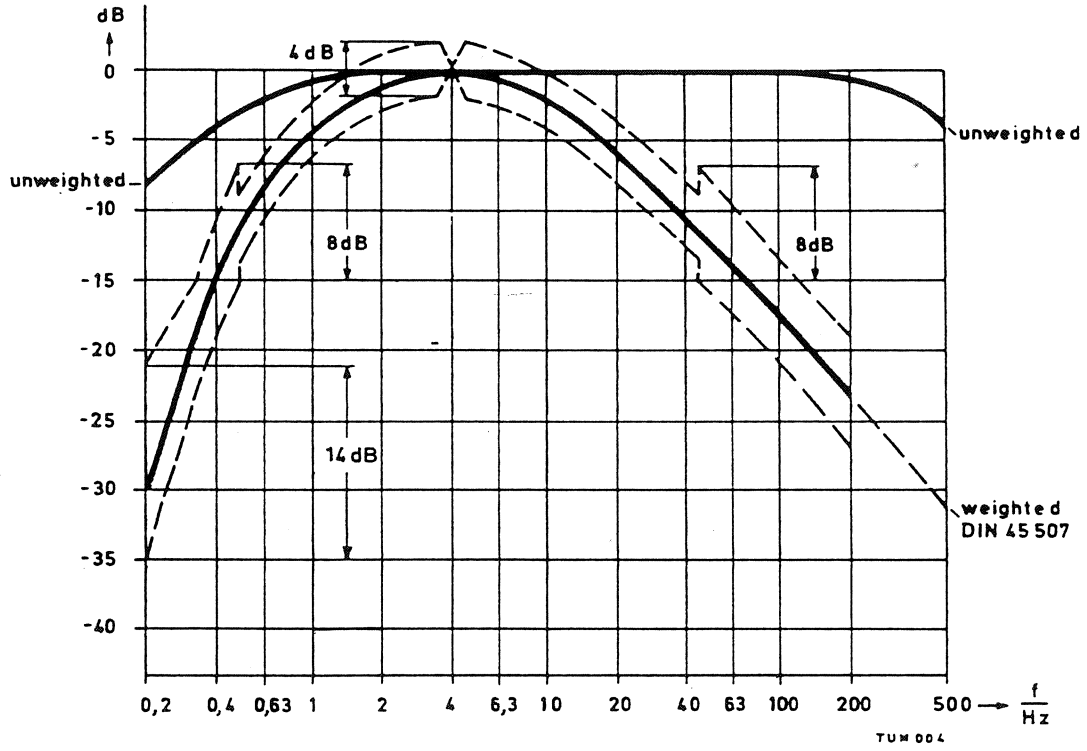


Fig. 7 Transmission characteristic of weighted and unweighted measurement
Durchlaßcharakteristik für bewertete und unbewertete Messung
Characteristique de transmission pour la mesure pondérée et non -pondérée

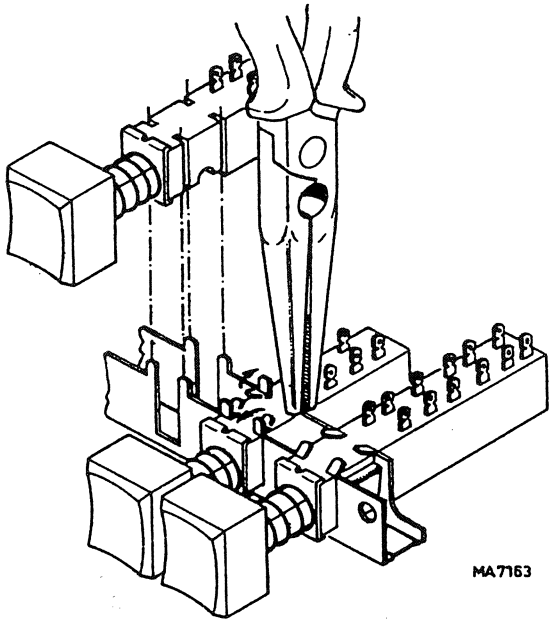


Fig. 8 Replacing a switch of the pushbutton unit

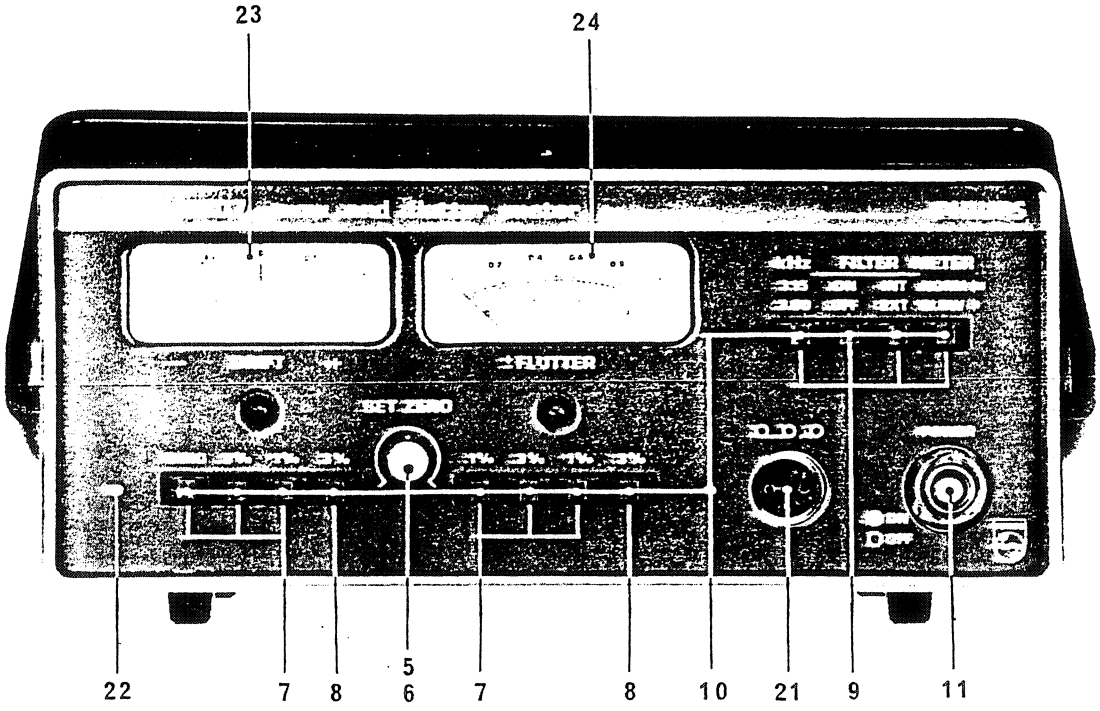


Fig. 9 Front view, mechanical parts

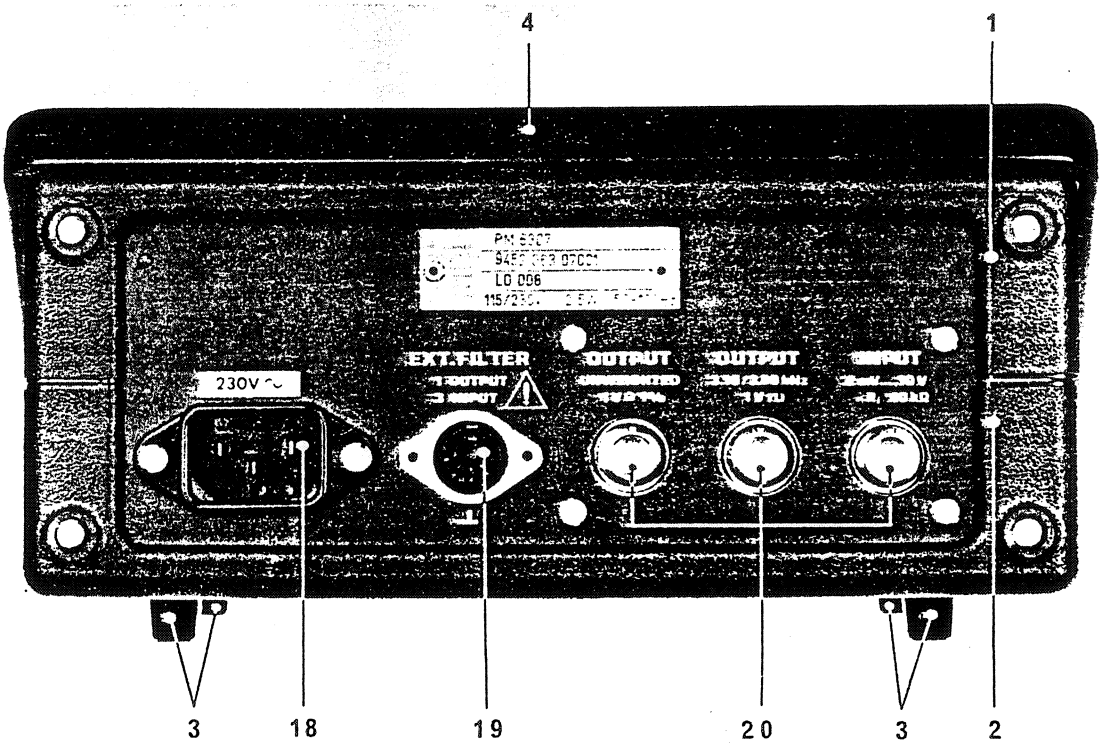


Fig. 10 Rear view, mechanical parts

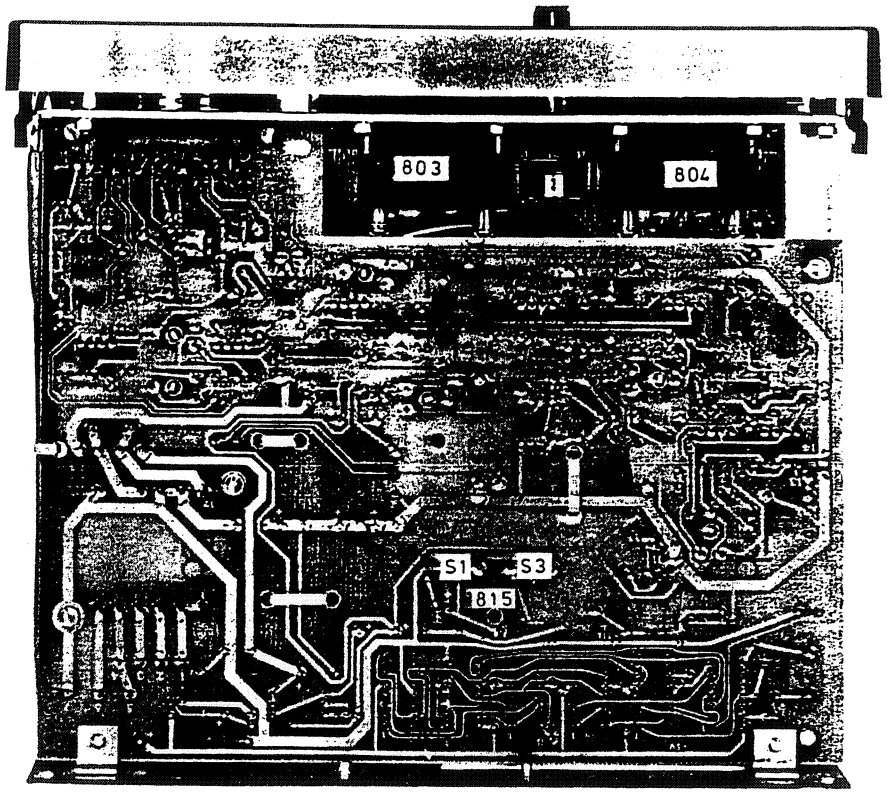


Fig. 11 Inside view top side, mechanical parts

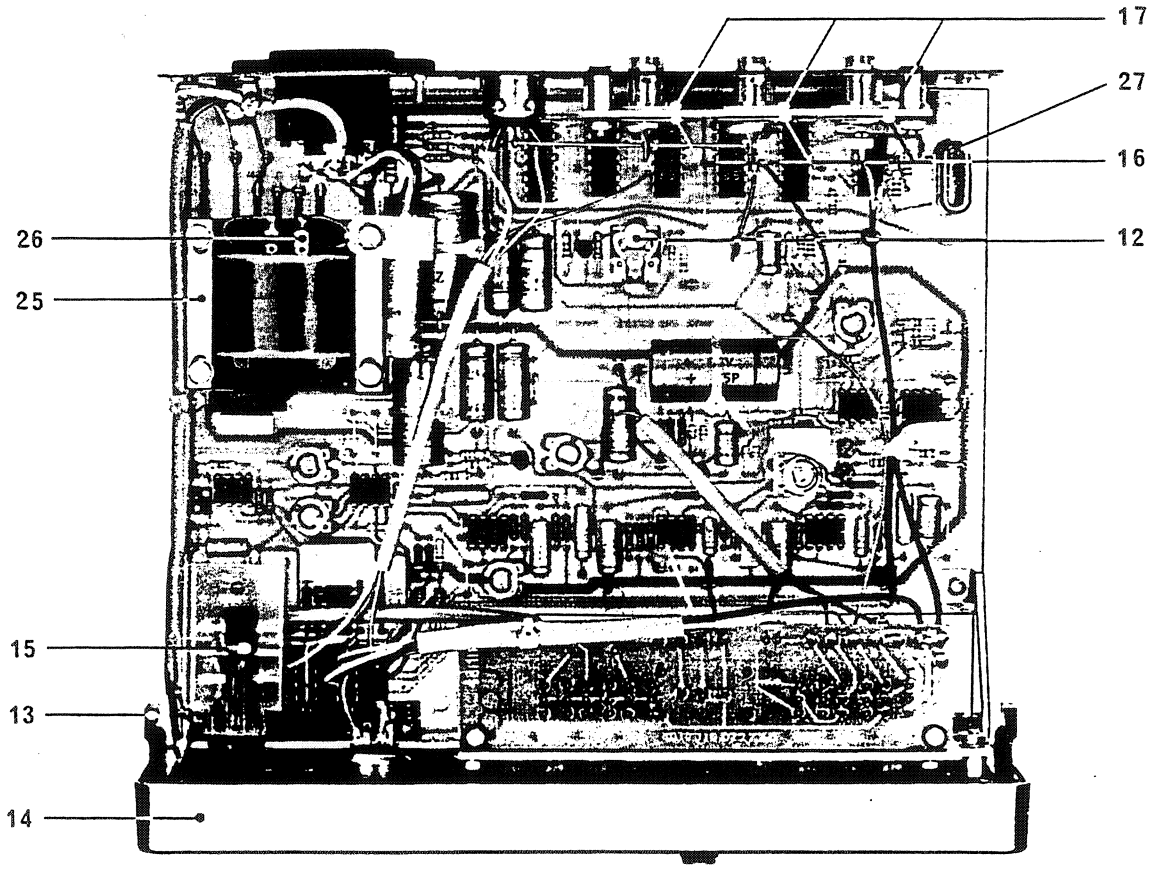


Fig. 12 Inside view bottom side, mechanical parts

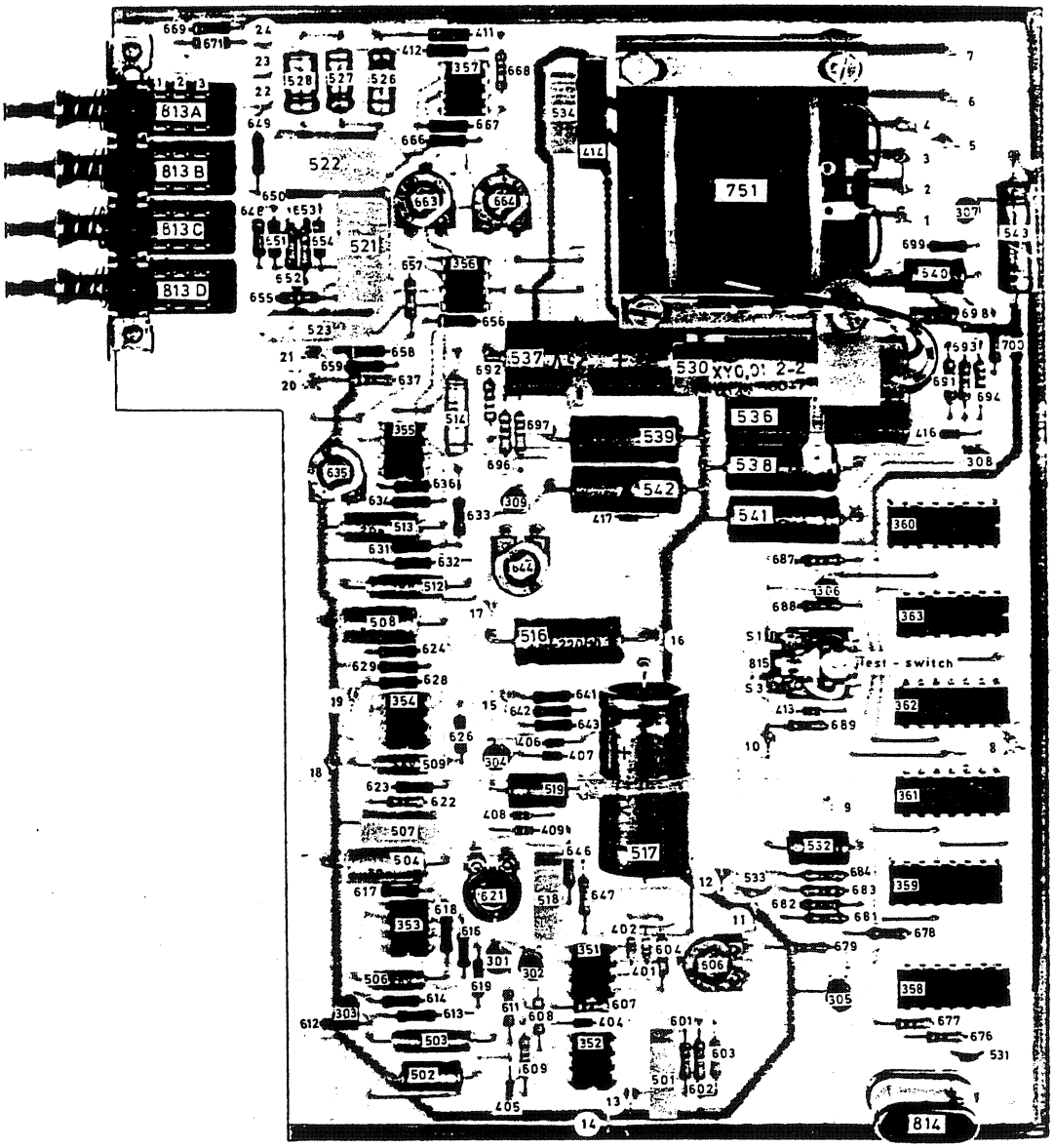


Fig. 13 Printed wiring board with components, Unit 1

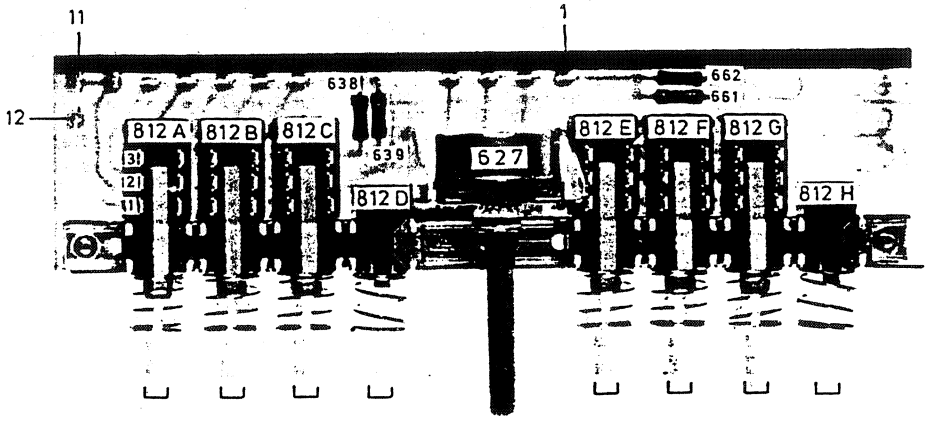


Fig. 14 Printed wiring board with components, Unit 2

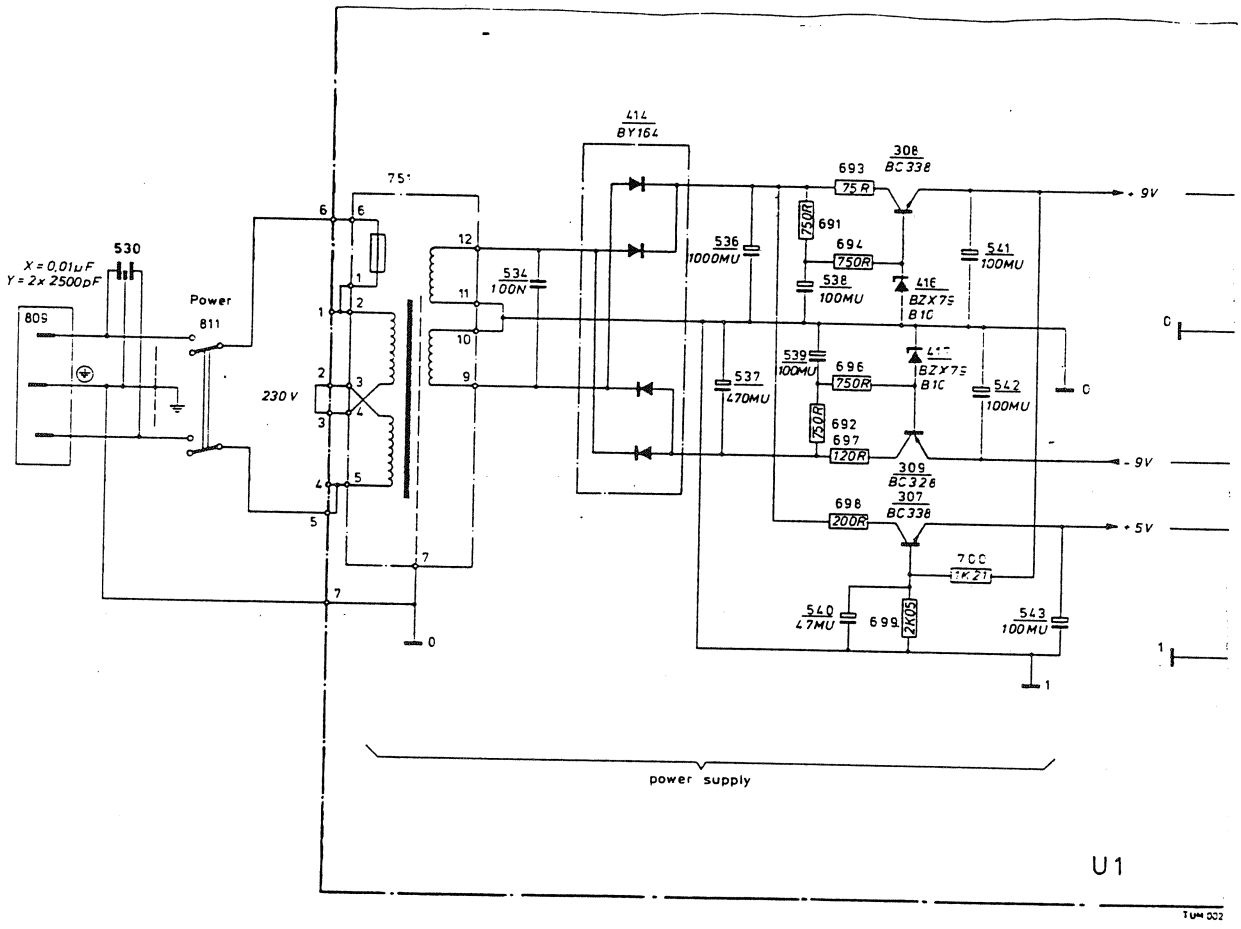
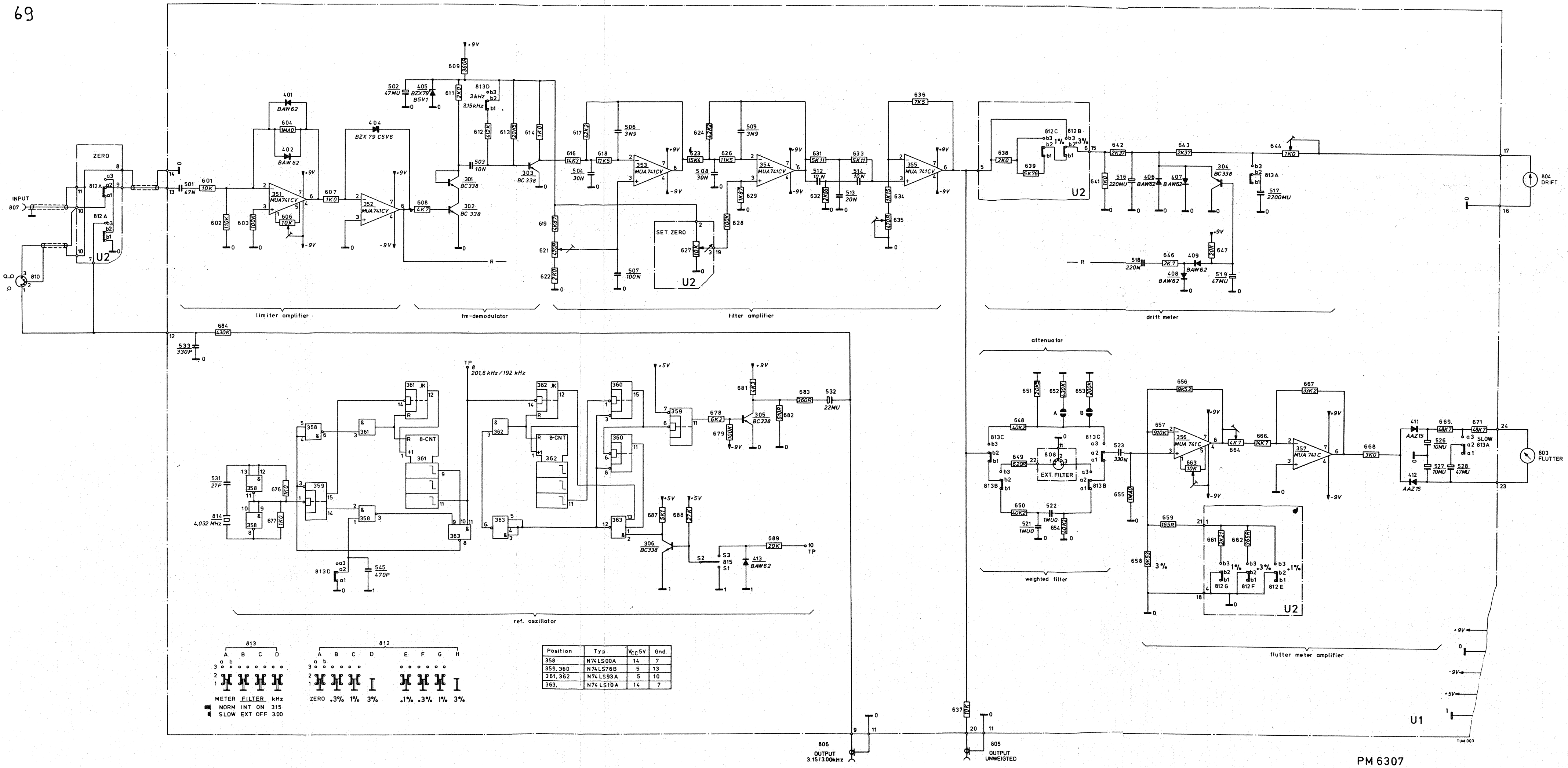


Fig. 15 Circuit diagram of power supply PM 6307



Position	Typ	V_{CC} 5V	Gnd.
358	N74LS00A	14	7
359, 360	N74LS76B	5	13
361, 362	N74LS93A	5	10
363,	N74LS10A	14	7

PM 6307

Fig. 16 Circuit diagram without power supply