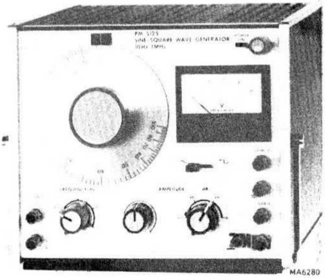


MA6280



# PHILIPS

*Manual*

## GENERATOR
## PM 5125

9445 051 25031

9499 450 04411 3/571/1/03

**IMPORTANT**

*In correspondence concerning this instrument, please quote the type number and the serial number as given on the type piate at the rear of the instrument.*

# Contents

# List of figures

# GENERAL

## *Introduction*

I

The generator PM 5125 provides stable and accurate sine and square wave signals in the frequency range from 10 Hz up to 1 MHz.
The midbank frequency response is flat within 0.1 dB. The settling time (bounce) is very short.
The frequency may be varied in steps of one decade and continuously.

The following two outputs are provided:

- one output with an impedance of 600 Ω. The output voltage may be varied continuously up to 10 V (open circuit) as well as in four accurate steps of 20 dB.
- one low impedance output. The output voltage may be varied continuously up to 10 V.

Both outputs are switched simultaneously to sine wave or to square wave.
The output voltage is monitored by means of a built-in voltmeter.
The generator frequency may be synchronised by means of an external signal.

## Technical data

II

Data expressed in numerical values as tolerances are guaranteed by the factory.
The other numerical values are for information only and indicate the characteristics of an average instrument. The maximum ambient temperature is 45° C.

### A. FREQUENCY

| | |
|---|---|
| Range | 10 Hz... 1 MHz in five overlapping subranges |
| Inaccuracy at 20° C | 100 Hz – 100 kHz: < 3% |
| | 10 Hz – 1 MHz: < 5% |
| Frequency variations at mains variations of ± 10% | negligible |
| Temperature coefficient | 0.015% per °C at 5 kHz |

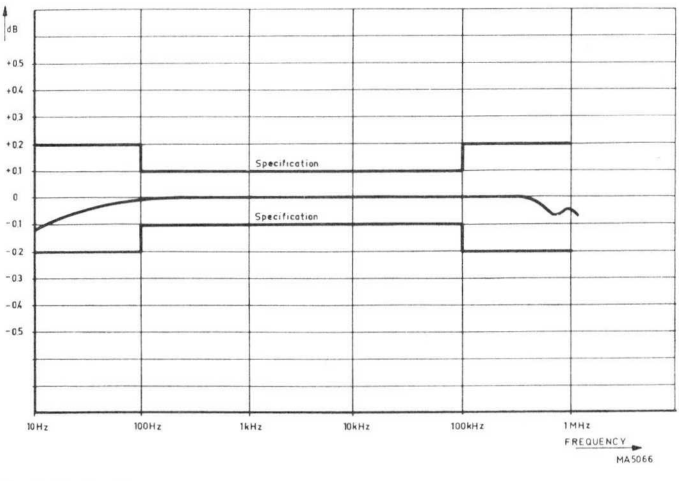



*Fig. 1. Typical frequency response curve*

Long term drift — 0.05% in 7 hours at 5 kHz after a warming up period of 20 minutes and at constant ambient temperature and mains voltage

Short term drift — 0.005% in 10 minutes at 5 kHz after a warming up period of 20 minutes and at constant ambient temperature and mains voltage

## B. OUTPUT SIGNALS

### 1. Sine wave signal

Frequency response (See Fig. 1) — 100 Hz – 100 kHz: flat within ± 0.1 dB referred to 5 kHz
10 Hz – 1 MHz: flat within ± 0.2 dB referred to 5 kHz

Total harmonic distortion (See Fig. 2) — 10 Hz – 100 kHz: ≦.3%
at 600 kHz : ≦ 1%

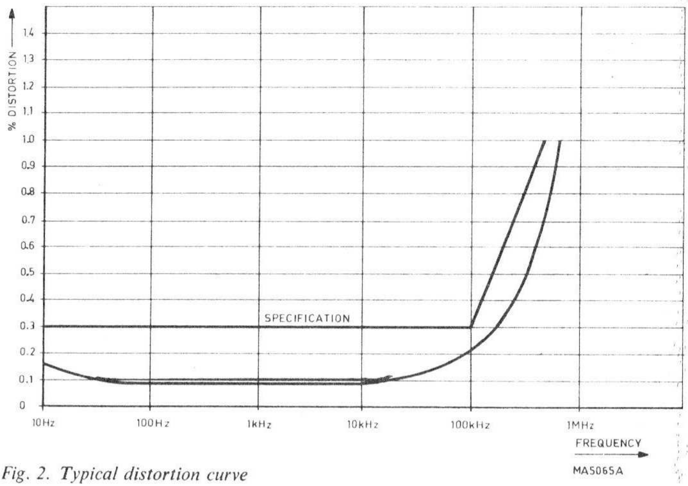



*Fig. 2. Typical distortion curve*

**2. Square wave signal**

| | |
|---|---|
| Rise and fall time | 100 nanoseconds above 5 kHz |
| Wave-form aberration | $< 3\%$ |

## C. OUTPUTS

**1. 600 Ω**

| | |
|---|---|
| Maximum amplitude | 10 $V_{rms}$ (for sine wave) or 10 $V_{pp}$ (for square wave), open circuit<br>5 $V_{rms}$ (for sine wave) or 5 $V_{pp}$ (for square wave) into 600 Ω |
| Output impedance | 600 Ω |
| Attenuation | |
| continuous | $>$ 40 dB linear (for sine wave)<br>$>$ 26 dB linear (for square wave) |
| in steps | $3 \times 20$ dB (inaccuracy: 0.2 dB/step at 5 kHz) |
| Hum and noise | $>$ 60 dB down at maximum setting of the continuous attenuator |

**2. LOW Zo**

| | |
|---|---|
| Maximum amplitude | 10 $V_{rms}$ (for sine wave) or 10 $V_{pp}$ (for square wave) into 600 Ω |
| Output impedance | 16 Ω for sine wave<br>10 Ω for square wave |
| Minimum resistive load | 600 Ω |
| Maximum capacitive load | 50 pF |
| Attenuation, continuous | $>$ 40 dB linear (for sine wave)<br>$>$ 26 dB linear (for square wave) |
| Hum and noise | $>$ 60 dB down at maximum setting of the continuous attenuator |

**Note:** Both outputs may be loaded simultaneously with 600 Ω each, with only a slight deterioration of performance.
Both outputs are switched simultaneously to the sine wave voltage or to the square wave voltage by means of waveform selector $\sqcap\!\sqcup/\sim$.

## D. OUTPUT METER

| | |
|---|---|
| Indication | The meter is switched simultaneously by means of the waveform selector to indicate:<br>a. the sine wave output voltage r.m.s., open circuit, or<br>b. the square wave output voltage p-p, open circuit. |
| Scales | 0 – 10 V<br>0 – 16 dBm |
| Inaccuracy | $<$ 5% of full scale deflection |

## E. SYNCHRONISATION

| | |
|---|---|
| Range | max. 7%<br>± 2% of set frequency with a negligible deterioration of performance |
| Required input voltage | 40 $mV_{rms}$ per % hold |
| Maximum input DC voltage | ± 15 V |
| Input impedance | 100 kΩ |

## F. POWER SUPPLY

| | |
|---|---|
| Supply voltage | 115 V or 230 V ± 15% |
| Frequency | 50 – 100 Hz |
| Power consumption | 28 W |

## G. MECHANICAL DATA

| | |
|---|---|
| Dimensions | 3 module cabinet (see chapter XIV) |
| Weight | 5 kg (11 lbs) |

## Accessories

III

- Manual

**Optional accessories**

- Coupling kit PM 9500.
- A selection of 5 different cover kits PM 9502... PM 9506.
- Rack-mounting kit PM 9510 for mounting a 6-module cabinet into a 19" rack.
- Extension test board 4822 466 10165 for carrying out measurements on the plug-in printed wiring boards while the instrument is in operation.

The description and ordering information of these accessories are given in chapter XIV of this manual.

## Description of the block diagram

IV

**(See Fig. 3)**

This instrument contains a phase-shift oscillator, an amplifier, a squarer, a voltmeter, two attenuators and a double power supply.

OSCILLATOR

The phase-shift oscillator consists of three unity gain amplifier stages. The first two amplifier stages give each a phase-shift of 90° for the oscillating frequency and the third amplifier stage gives a phase-shift of 180°. The output signal of the third amplifier stage is fed back to the input of the first amplifier stage.
The amplifier stages are coupled by means of impedance converters (emitter followers).
The unity loop gain is maintained by means of a thermistor, which is a part of the collector impedance of the third amplifier stage.

FREQ. Hz (SK3, $R1^{I}$ – $R1^{II}$)

The frequency of the oscillator may be varied continuously by means of the double potentiometer $R1^{I}$ – $R1^{II}$ and in steps of one decade by means of the switch SK3.

## SYNC. IN (BU3)

The frequency of the oscillator may be synchronised by means of an external source connected to the terminal BU3.

## WAVEFORM SELECTOR ⊓⊔/∼ (SK2)

The sine wave generated in the oscillator is applied either to the amplifier (via the continuous attenuator $R2^{I}$) or to the squarer by means of the selector switch SK2.
In position ∼ of SK2 the sine wave signal is amplified and then fed to the output terminal LOW Zo (BU1), to the step attenuator SK4 and to the meter M1, which monitors the output voltage at BU1.
In position ⊓⊔ of SK2 the squarer converts the sine wave signal into a square wave signal; then the square wave signal is also applied to the terminal LOW Zo (BU1), to the step attenuator SK4 and to the meter M1.

## AMPLITUDE ($R2^{I}$ – $R2^{II}$)

The amplitude of the output signal at the terminals LOW Zo (BU1) and 600 Ω (BU4) may be varied continuously by means of the double potentiometer AMPLITUDE ($R2^{I}$ – $R2^{II}$).

## STEP ATTENUATOR (SK4)

The amplitude of the output signal at the terminal 600 Ω (BU4) may also be varied in steps of 20 dB by means of the attenuator switch SK4.

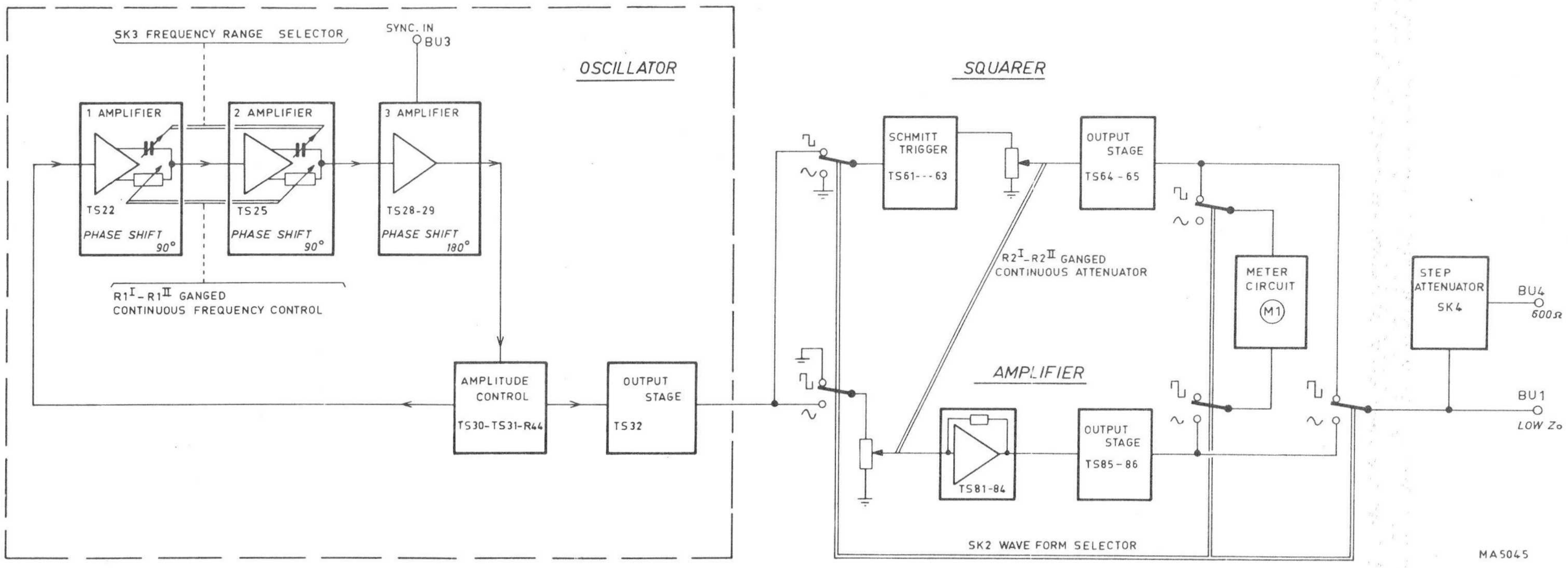



*Fig. 3. Block diagram*

# DIRECTIONS FOR USE

## *Installation*

V

For coupling two or more modular units refer to chapter XIV.

### A. ADJUSTMENT TO THE LOCAL MAINS VOLTAGE (See Fig. 4)

The instrument may be adjusted to a mains voltage of 100... 130 V or 200... 260 V by means of switch SK12 on the rear panel.
In case of a mains voltage of 100... 130 V, the fuse VL1 rated at 250 mA (delayed action) should be replaced by a fuse with a 500 mA-rating (delayed action).

### B. EARTHING (See Figs. 4 and 5)

The instrument should be earthed in conformity with the local safety regulations. This can be done:

a. via the supplied 3-core mains cable,
b. via the earthing terminal BU12, marked ⏚, on the rear panel,
c. via the earthing terminal BU6, marked ⊥, on the front panel.

**NOTE: For operation as a single unit connect BU6 to BU7**

The units of the modular system have a semi-floating circuit so that the circuit need to be earthed at one point only when several units are coupled together.

Earth currents which may give rise to hum are thus avoided.
The terminals BU6 and BU12 are connected to the metal frame of the cabinet. The signal earth is connected directly ot the terminals BU2, BU5 and BU7, marked ⏚, and to the cabinet via a 100 kΩ resistor.

This provides the following output possibilities:
- output from a circuit which is earthed by linking BU7 (⏚) to BU6 (⊥)
- output from a circuit which is earthed via other coupled modules or via auxiliary equipment.

## *Controls, terminals and their functions*

VI

**(See Figs. 4 and 5)**

| | |
|---|---|
| POWER ON (SK1, LA1) | On/off switch with neon indicator |
| Frequency dial (R1) | Continuous frequency control |
| FREQ. Hz (SK3) | Frequency control in steps. The output frequency given in Hz is equal to the product of the setting of SK3 and the setting of R1. |
| AMPLITUDE (R2) | Continuous control of the amplitude at both output terminals BU1 and BU4. |
| dB-attenuator (SK4) | Switch for setting the attenuation of the amplitude at terminal BU4 in four steps of 20 dB, viz: —60 dB, —40 dB, —20 dB and 0 dB. |
| Waveform selector ⊓⊔/∼ (SK2) | Switch for selecting the output waveform at the terminals BU1 and BU4. |
| Output terminal LOW Zo (BU1) | The output voltage at this terminal may be varied continuously by means of R2. The output impedance is 10 Ω for the square wave and 16 Ω for the sine wave. |

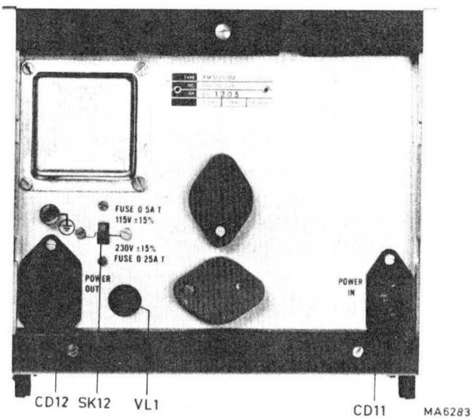



*Fig. 4.*
*Rear view*

| | |
|---|---|
| Output terminal 600 Ω (BU4) | The output voltage at this terminal may be varied continuously by means of R2 and in steps of 20 dB by means of SK4.<br>The output impedance is 600 Ω. |
| SYNC. IN (BU3) | Input terminal for the external synchronisation signal. |
| Signal earth (BU2, BU5, BU7) | Terminals to which the signal earth is connected |
| Chassis earth<br>(BU6, front panel)<br>(BU12, rear panel) | Earthing terminals connected to the metal frame of the cabinet.<br>The signal earth and the chassis earth may be connected by linking BU6 to BU7. Also refer to chapter V–B. |
| SK12, rear panel | Mains voltage selector |
| CD11, rear panel | Mains input terminal |
| CD12, rear panel | Mains output terminal |

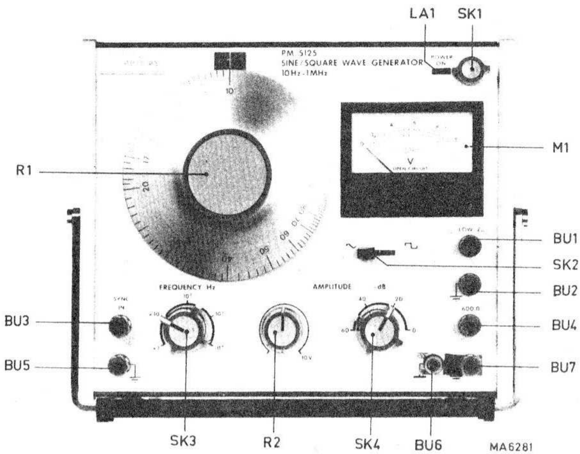



*Fig. 5. Controls and terminals*

## Operation

VII

### A. CONNECTING THE LOAD (See Figs. 5 and 6)

- Connect the load to the terminal "600 Ω" (BU4) or to the terminal LOW Zo (BU1).
- The resistive load connected to the terminal LOW Zo (BU1) should be at least 600 Ω. The capacitive load connected to the same terminal should not exceed 50 pF.
- The load connected to the terminal 600 Ω (BU4) may be very low.
- Both output terminals may be loaded simultaneously, with a slight deterioration of the performance (as indicated in chapter II "TECHNICAL DATA"), in accordance with Fig. 6 and the table below.

**TABLE OF LOADS**

| | *Normal minimum load impedance (Maximum current $I_t$ = 17 mA)* | *Absolute minimum load impedance (Maximum current $I_t$ = 25 mA)* |
|---|---|---|
| $R_a = \infty$ | $R_b$ = approaching 0 Ω | — |
| $R_a$ = 600 Ω | — | $R_b$ = 600 Ω |
| $R_b = \infty$ | $R_a$ = 600 Ω | $R_a$ = 400 Ω |
| $R_b$ = 600 Ω | — | $R_a$ = 600 Ω |
| $R_b$ = approaching 0 Ω | — | $R_a$ = 1200 Ω |

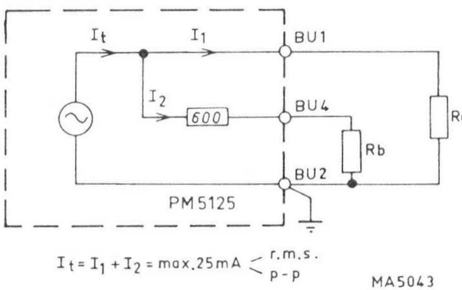



*Fig. 6. Load diagram*

## B. SWITCHING ON

- Switch on the instrument by means of the switch POWER ON (SK1). The indicator LA1 should then light up.
- Wait for 20 minutes before proceeding with the following, if a stable output frequency or voltage is required.

## C. SELECTING THE FREQUENCY

1. – Select the frequency range by means of the switch "FREQ. Hz" (SK3).
   – Adjust the desired frequency within the selected range by means of the frequency dial ($R1^{I}$ – $R1^{II}$).
2. – If synchronisation of the generator frequency is required, then apply an external signal to the terminals SYNC. IN (BU3 and BU5). This signal should have an amplitude of 40 mV per percent of required hold. For the initial set-up make sure that the generator frequency corresponds to the frequency of the external signal.

## D. SELECTING THE OUTPUT VOLTAGE

- Select the waveform of the output voltage by means of the switch ⎍/∼ (SK2).
- Set the attenuator switch "—dB" (SK4) to position 0.
- Adjust the amplitude of the output voltage at the terminals "LOW Zo" (BU1) and "600 Ω" (BU4) continuously by means of the attenuator "AMPLITUDE" (R2), as indicated by the meter M1.
- Adjust the amplitude of the output voltage at the terminal "600 Ω" (BU4) in steps of 20 dB by means of the attenuator switch "—dB" (SK4).

### Notes

1. The meter M1 indicates the output voltage at the terminal "LOW Zo". When no load is connected to the terminal "600 Ω", then the output voltage at this terminal is equal to the indication of M1 divided by a factor:
   - 1 in position 0 dB of the switch "—dB" (SK4)
   - 10 in position —20 dB of the switch "—dB" (SK4)
   - 100 in position —40 dB of the switch "—dB" (SK4)
   - 1000 in position —60 dB of the switch "—dB" (SK4).

   When a 600 Ω-load is connected to the terminal "600 Ω", then the output voltage at this terminal is halved.

The top scale of the meter M1 is calibrated for:
- RMS values in the case of sine wave operation
- peak to peak values in the case of square wave operation.

The bottom scale of M1 indicates the output variations in dBm (0 dBm  1 mW into 600 Ω (0.775 V)).

2. When the waveform selector ⊓⊔/∼ is in position ⊓⊔, it is recommended to screen the output at the terminal "600 Ω" for optimum waveform in the case that the attenuator "—dB" is set to its lowest position (—60 dB).

3. The trimming potentiometer R45 (see Fig. 12) controls the distortion and the settling time.
   A lower distortion and a higher settling time are obtained when R45 is turned anti-clockwise.
   A higher distortion and a lower settling time are obtained, when R45 is turned clockwise. (see Fig. 7)

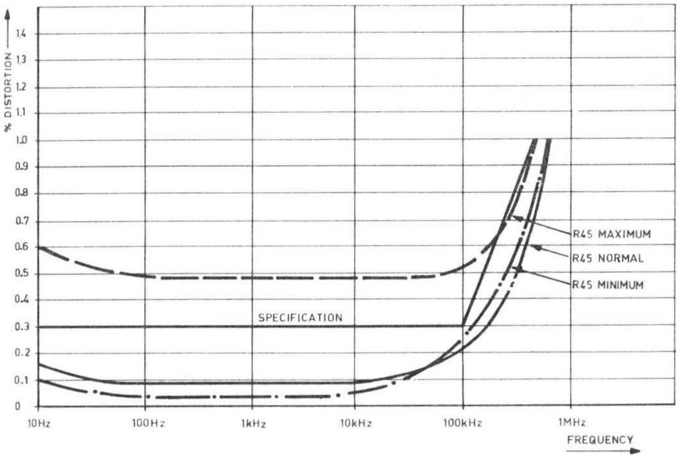



*Fig. 7. Adjustment of distortion*

# SERVICE DATA

## *Circuit description*

VIII

### A. OSCILLATOR (See Figs. 8, 9, 10 and 27)

The sine wave oscillator used in this instrument is a phase-shift oscillator consisting mainly of three amplifier stages TS22, TS25 and TS29, which are coupled by means of the emitter followers TS23–TS24, TS26–TS27 and TS30–TS21 respectively.

Two identical frequency control circuits have been used. The first one is connected between the collector and the emitter of TS22 and consists of the capacitors C21...C27 and the resistors R24–R1$^{I}$–R25. The second one is connected between the collector and the emitter of TS25 and consists of the capacitors C28...C34 and the resistors R30–R1$^{II}$–R31. These networks provide each a phase-shift of 90° at the oscillation frequency, $f_0$.

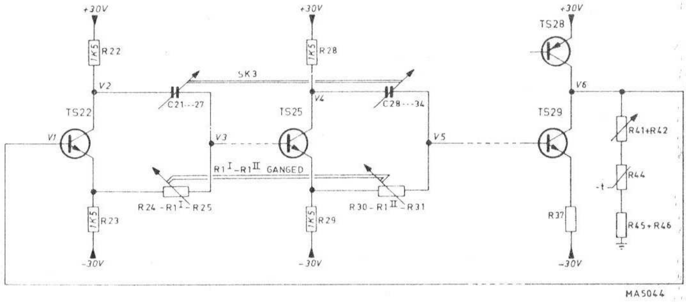



*Fig. 8. Simplified diagram of the oscillator*

In Fig. 9 the phase relationship between the voltages at the different points of the oscillator has been drawn. This figure shows that the phase-shift between the input of the first amplifier stage TS22 and the output of the first frequency control circuit is 90°; thus the phase-shift between $V_1$ and $V_3$ is 90°. The same applies to the second amplifier stage TS25 and the second frequency control circuit; thus the phase-shift between $V_3$ and $V_5$ is 90°.
The phase-shift due to the third amplifier stage TS29 is 180°; thus the phase-shift between $V_5$ and $V_6$ is 180°. The total phase-shift is then $90° + 90° + 180° = 360°$. Consequently, the input voltage $V_1$ and the output voltage $V_6$ are in phase.
The frequency is changed in steps of one decade by switching the capacitors C21...C27 and C28...C34 in steps by means of SK3. Continuous frequency control (ratio 1 : 10) is effected by means of the double potentiometer $R1^{I} - R1^{II}$

The output amplitude may be adjusted with R40 and R42. The thermistor R44 keeps the output amplitude constant. R42 is adjusted in such a way that Rs (see Fig. 10) becomes complementary to the differential resistance of R44. Hence $\frac{\Delta V \text{ total}}{\Delta I}$ becomes zero.

The diodes GR21–GR22 introduce a controlled amount of non-linear distortion, which results in a shorter settling time of the sine wave when switching over to the lowest frequency range. The current through GR21–GR22 may be adjusted with R45.

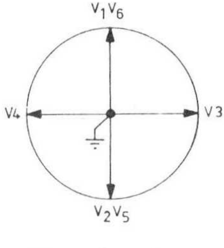



*Fig. 9. Voltage diagram*

The constant current source TS28 provides the DC current for TS29 without affecting the AC collector load of the latter. TS28 is also used for injecting an external synchronising signal into the oscillator loop. This external signal is applied to the base of TS28 via the coupling capacitor C37.
The output signal of the oscillator is applied via the emitter followers TS30 and TS32 to the waveform selector SK2.
The constant current source TS31 together with R49 restore the DC conditions within the DC feed back loop, without affecting the AC conditions.

**B. SQUARER (See Fig. 28)**

The sine wave signal coming from the oscillator and the selector switch SK2 is applied to the base of the transistor TS61 via the resistor R61. The transistor TS61 is clamped by means of the diode GR61 in such a way, that only the negative part of the sine wave signal is applied to the Schmitt trigger TS62–TS63.
A part of the switched collector current of transistor TS63 is applied to the potentiometer $R2^{II}$, with which the amplitude of the square wave can be varied continuously.

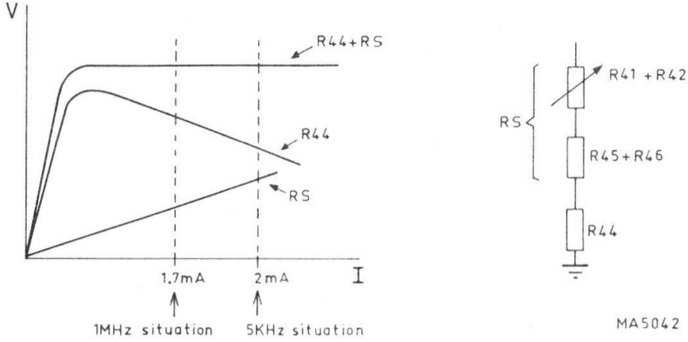



*Fig. 10. Thermistor circuit*

From the wiper of $R2^{II}$, the square wave is applied via the emitter followers TS64–TS65, the capacitors C61–C62 and the selector switch SK2 to the output terminal BU1, to the step attenuator and to the meter circuit.
The diodes GR62 and GR63 protect the transistors TS62 and TS63 respectively against high reverse voltages.
The zener diode GR65 limits the power dissipation of the transistor TS65. R73 and C69 form a filter against unwanted coupling via the DC supply lines.
R75 determines the source impedance for TS65 and minimises its tendency for instability when loaded with a capacitive load.
C63...C66 are decoupling capacitors. C67 and C68 are minor wave shaping capacitors.

## C. AMPLIFIER (See Fig. 28)

The sine wave signal coming from the oscillator and the selector switch SK2 is applied via capacitor C81 and resistor R81 to the base of the emitter follower TS82.
From the emitter of TS82, the sine wave signal is applied to the amplifier TS83. The constant current source TS81 in the collector line of TS83 provides the right DC conditions.

The signal amplified by TS83 is applied to the emitter follower TS84. A part of the signal present at the emitter of TS84 is fed back to the base of TS82, which results in an improved band width of the amplifier (negative feedback).
The signal present at the emitter of TS84 is applied via resistor R94 to the White emitter follower TS85–TS86. Then the signal is applied via capacitor C86 and the selector switch SK2 to the output terminal BU1, to the step attenuator SK4 and to the meter circuit.
The zener diode GR81 limits the power dissipation of TS84. The capacitor C84 maintaines the gain in the high end of the required frequency band.

## D. METER CIRCUIT (See Fig. 28)

The square wave signal is applied via resistor R104 to the peak detector GR101–C101...C103–R105...R107. The resulting d.c. voltage is applied to the meter M1, which monitors the output voltage.
The sine wave signal is applied via the voltage divider R101–R102–R103 to the same circuit as the square wave signal.

The indication of M1 is first adjusted with R105 for the square wave signal and after that with R101 for the sine wave signal.

## E. STEP ATTENUATOR

The output signal is applied to the terminal BU4 via the step attenuator consisting of the resistors R111... R117, the capacitor C90 and the switch SK4.
The attenuation may be adjusted in steps of 20 dB by means of SK4.
The output impedance is 600 Ω for all positions of SK4.

## F. POWER SUPPLY (See Fig. 29)

The a.c. voltages from the transformer T1 are rectified by the bridge circuits GR121 and GR122.
The output d.c. voltages of +30 V and —30 V are stabilised by comparing them with a reference voltage (GR127 resp. GR128) via a differential amplifier (TS128–TS131 resp. TS130–TS132) and by using the difference to control the current through the series regulator (TS141 resp. TS142).
The amplification of the regulating current is effected by the transistors TS127 resp. TS129. The current limitation is effected by TS124–R236 and TS126–R237.

## Gaining access to parts

IX

### A. REMOVING THE TOP PLATE

The top plate may be removed after loosening the fastener at the rear of the instrument.
To refit the top plate, place the groove of the fastener in the horizontal position and push the cover home.

### B. REMOVING THE SIDE PLATES

The side plates may be taken off after removing the screw on each side of the instrument.

### C. REMOVING THE BOTTOM PLATE

The bottom plate may be removed after loosening the appropriate screws at the rear of the cabinet.

### D. REMOVING THE STRIP WITH TILTING SUPPORT

This strip may be removed by pushing the two nylon slides "A" in the direction indicated in Fig. 11.

### E. REMOVING THE PLUG-IN PRINTED WIRING BOARDS

In order to pull out the plug-in printed wiring board of the power supply, the two fixing screws "P" (Fig. 17A) should first be removed leaving the brackets "Q" (Fig. 17A) fixed to the board.

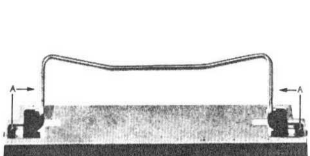



*Fig. 11. Stand assembly*

In order to pull out the two other plug-in printed wiring boards, they should first be slightly bent. Furthermore, four wires (see Fig. 12) should be loosened before removing the oscillator board.

**Note:** When mounting the oscillator board, make sure that the four wires from potentiometer R1 are connected to this board in accordance with Fig. 23.

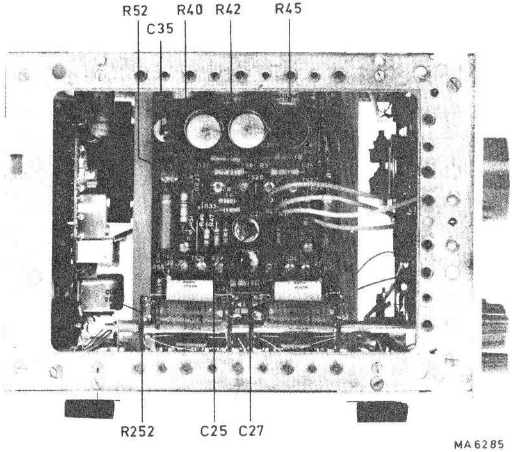
## Survey of adjusting elements

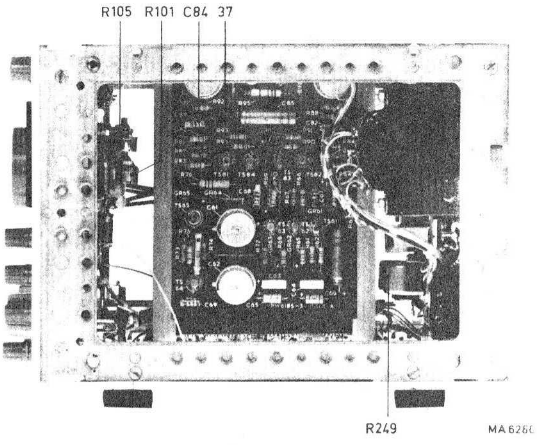
X

| *Adjustment* | *Adjusting element* | *Fig* | *Measuring equipment* | *Recommended PHILIPS equipment* | *Chapter XI, section* |
|---|---|---|---|---|---|
| MAINS CURRENT | | | a.c. ammeter | PM 2411 | B |
| SUPPLY VOLTAGES | R249, R252 | 12, 13 | digital voltmeter | PM 2421 | C |
| FREQUENCY | C25, C27, C32<br>C34, C35 | 12, 17B | frequency counter | PM 6630 | D |
| SINE WAVE VOLTAGE | R40, R42, R52 | 12 | diode voltmeter<br>digital voltmeter | GM 6000<br>PM 2421 | E |
| DISTORTION OF SINE WAVE | R45, C84 | 12, 13 | distortion meter | — | F |
| SQUARE WAVE VOLTAGE | — | | oscilloscope | PM 3231 | G |
| METER CIRCUIT | R101, R105 | 13 | digital voltmeter | PM 2421 | H |
| SYNCHRONISATION | — | | oscilloscope | PM 3231 | I |

*Fig. 12. Left-hand view indicating the adjusting elements*

*Fig. 13. Right-hand view indicating the adjusting elements*


R52
R40
R42
R45
C35
R252
C25
C27
MA 6285


R105
R101
C84
37
R249
MA 6286

# Checking and adjusting

XI

The tolerances mentioned in the following text apply only to newly adjusted instruments. The values may differ from those given in chapter II, TECHNICAL DATA.
For optimum performance the instrument should be adjusted at the temperature at which it will be used.
The adjusting elements and the auxiliary equipment required for the adjusting procedure are indicated in chapter X.

## A. GENERAL

The circuit should be earthed by connecting BU6 to BU7. All test equipment should be earthed via the instrument under test.
Accurate checking and adjusting of the frequency and the distortion according to sections D and G is only possible when the covers are fitted on the instrument and after a warming up period of at least twenty minutes.

## B. MAINS CURRENT

Connect the instrument to the mains and check that the current consumption does not exceed 150 mA at 230 V mains or 300 mA at 115 V mains.

## C. SUPPLY VOLTAGES

- Remove the printed wiring board of the oscillator and that of the squarer/amplifier.
- Check that the voltage between points CD3/9 and CD3/11 is —30 V ± 0.5 V. Adjusting elements: R249.
- Check that the voltage between points CD3/11 and CD3/14 is +30 V ± 0.5 V. Adjusting element: R252.
- Refit the printed wiring boards.

## D. FREQUENCY

1. - Set the trimmers R40, R42, R45, R52, C25 and C27 to the mid position and turn C35 completely out.
   - Set switch SK3 to position $\times 10^2$
   - Set switch SK2 to position $\sim$.

- Set switch SK4 to position 0 dB.
- Set attenuator R2 fully clockwise.
- Turn the spindle of double potentiometer R1 until the frequency at terminal BU4 is 1 kHz ± 0,4%.
- Fix the frequency dial to the spindle of R1 in such a position that the dial indicates 10.

2. – Turn the frequency dial to position 100 and check that the frequency at terminal BU4 is 10 kHz ± 0.2%.
   - Turn the frequency dial successively to positions 15, 20, 30, 50 and 70 and check that the frequency at terminal BU4 is respectively 1.5 kHz, 2 kHz, 3 kHz, 5 kHz and 7 kHz. Tolerance: < 2%.

3. – Set switch SK3 to position ×10.
   - Set the frequency dial successively to positions 10, 30 and 100 and check that the frequency at terminal BU4 is respectively 100 Hz, 300 Hz and 1 kHz. Tolerance: < 2.5%.

4. – Set switch SK3 to position ×1.
   - Set the frequency dial successively to positions 10, 30 and 100 and check that the frequency at terminal BU4 is respectively 10 Hz, 30 Hz and 100 Hz. Tolerance: < 4%.

5. – Set switch SK3 to position $\times 10^3$
   - Set the frequency dial to position 10.
   - Adjust the frequency at terminal BU4 to 10 kHz ± 0.2% by means of trimmer C25. If this is not possible, select another value for C32.
   - Set the frequency dial successively to positions 30 and 100 and check that the frequency at terminal BU4 is respectively 30 kHz and 100 kHz. Tolerance: < 2.5%.

6. – Set switch SK3 to position $\times 10^4$.
   - Set the frequency dial to position 10 and adjust the frequency at terminal BU4 to 100 kHz ± 0.2% by means of trimmer C27. If this is not possible, select another value for C34.
   - Set the frequency dial to position 100 and check that the frequency at terminal BU4 is 990 kHz ± 0.2%. If necessary, adjust by means of trimmer C35.
   - Repeat the adjustments of trimmers C27 and C35 until both frequencies are within 0.2%.
   - Set the frequency dial successively to positions 30, 50 and 70 and check that the frequency at terminal BU4 is respectively 300 kHz, 500 kHz and 700 kHz. Tolerance: < 4%.

## E. SINE WAVE VOLTAGE

1. – Set switch SK3 to position $\times\ 10^2$.
   – Set the frequency dial to position 10.
   – Set switch SK2 to position ~
   – Turn trimmer R42 and R45 fully anti-clockwise (R=0).
   – Adjust trimmer R40 so that the voltage between test-points 10 and 11 of the oscillator board is 16 mV ± 10%.
   – Measure the voltage between terminals BU4 and BU7 by means of a diode voltmeter and note the value.

2. – Adjust trimmer R40 so that the voltage between test-points 10 and 11 of the oscillator board is 20 mV ± 10%.
   – Measure the voltage between terminals BU4 and BU7; this value must be smaller than the value noted in point **1**.

3. – Turn trimmer R42 a little clockwise.
   – Adjust trimmer R40 according to point **1** and note the output voltage.
   – Adjust trimmer R40 according to point **2** and compare this output voltage with the value noted.

4. – Repeat the adjustments until both values are equal. Tolerance: 1%.
   – Adjust trimmer R40 according to point 2.

5. – Set switch SK3 to position $\times 10^2$.
   – Set the frequency dial to position 50.
   – Set attenuator R2 fully clockwise.
   – Adjust trimmer R52 so that the voltage between terminals BU4 and BU7 is 10.3 $V_{rms} \pm 0.1\ V_{rms}$. This voltage should also be present at terminals BU1–BU2.

6. – Set switch SK3 to position $\times 10^2$, set the frequency dial to position 50 and turn continuous attenuator R2 until the voltage between terminals BU4 and BU7 is 10 $V_{rms}$ (reference value).
   – Set switch SK3 and the frequency dial successively to the positions indicated in the table below and check that the corresponding voltage between BU4 and BU7 is within the indicated limits.

| *Position of SK3* | *Setting of the frequency dial* | *Voltage between the terminals BU4 and BU7* |
|---|---|---|
| $\times 1$ | 10 | between 9.8 and 10.2 $V_{rms}$ |
| $\times 10$ | 10 | between 9.9 and 10.1 $V_{rms}$ |
| $\times 10^3$ | 100 | between 9.9 and 10.1 $V_{rms}$ |
| $\times 10^4$ | 50 | between 9.8 and 10.2 $V_{rms}$ |
| $\times 10^4$ | 100 | between 9.8 and 10.2 $V_{rms}$ |

## F. DISTORTION OF THE SINE WAVE

1. – Connect a load of 600 $\Omega \pm 1\%$ to the terminals BU1 and BU2.
   – Connect a distortion meter to the terminals BU4 and BU7.
   – Set switch SK3 to position $\times 10$, set switch SK2 to position $\sim$, set the attenuator R2 fully clockwise and set the frequency dial to position 10.
   – Adjust the distortion to between 0.09% and 0.11% by means of trimmer R45.

2. – Check the distortion at the following settings of switch SK3 and of the frequency dial.

| *Position of switch SK3* | *Setting of the frequency dial* | *Distortion* |
|---|---|---|
| $\times 1$ | 10 | $< 0.25\%$ |
| $\times 10^3$ | 100 | $\leqq 0.3\%$ |
| $\times 10^4$ | 60 | $\leqq 1\%$)* |

## G. SQUARE WAVE VOLTAGE

1. – Set switch SK2 to position ⌐L.
   – Set switch SK3 to position $\times 10^2$.
   – Set attenuator R2 fully clockwise.
   – Set the frequency dial to position 50.
   – Set switch SK4 to position 0 dB.

* *If the distortion at 600 kHz is larger than 0.6%, another value should be selected for C84. This value should be selected in such a way that no instability occurs, when a capacitive load of 100 pF is connected to terminals BU1 and BU2.*

- The square wave voltage between terminals BU4 and BU7 (unloaded) should be between 10.0 $V_{pp}$ and 10.5 $V_{pp}$. The rise and the fall time should be less than 120 nanoseconds.
  Measure this voltage by means of an oscilloscope.

2. – Check that the square wave is clean for all settings of switch SK3 and of the frequency dial. The sag and the overshoot of the square wave should be less than 2%.

3. – Connect a load of 600 Ω to terminals BU1 and BU2 and repeat the check indicated in point 2.

## H. METER CIRCUIT

1. – Set switch SK2 to position ⊓⊔.
   – Set switch SK3 to position $\times 10^2$.
   – Set switch SK4 to position 0 dB.
   – Set the frequency dial to position 50.
   – Adjust attenuator R2 so that the output voltage between terminals BU4 and BU7 is 10 $V_{pp}$.
   – Adjust the meter reading to 10 V ± 1% by means of R105.

2. – Set switch SK2 to position ∼.
   – Adjust attenuator R2 so that the output voltage between terminals BU4 and BU7 is 10 $V_{rms}$.
   – Adjust the meter reading to 10 V ± 50 mV by means of R101.

3. – Adjust the output voltage between BU4 and BU7 successively to 8 V, 6 V, 4 V and 2 V by means of attenuator R2. Note the corresponding readings of meter M1.
   The difference between the meter readings and the output voltage should be less than 200 mV.

4. – Check that the meter readings at 10 Hz and 1 MHz do not differ more than 2% from the corresponding output voltage measured at the terminals BU4–BU7.

## I. SYNCHRONISATION

- Apply a signal of 100 $mV_{rms}$ ± 5% – 5 kHz to the terminals BU3 and BU5.
- Set switch SK3 to position $\times 10^2$.
- Set switch SK2 to position ∼.
- Set switch SK4 to position 0 dB.

- Set attenuator R2 fully clockwise.
- Set the frequency dial to position 50.
- Vary the frequency of the synchronising signal between 4900 Hz and 5100 Hz and check that the output frequency of the PM 5125 follows these variations.
- Check that the distortion of the output signal remains less than 0.3% during the synchronisation test.

## *Fault finding*

XII

To facilitate fault finding some d.c. voltages present at various places in the circuit have been indicated in the circuit diagrams.
The indicated voltage levels serve only as a guide.
To replace parts the instrument should be switched off.
After replacing parts, it may be necesary to readjust the instrument according to chapter XI "Checking and adjusting".
For gaining access to parts see chapter IX.

**Note:** In case of break-downs, the assistance of the PHILIPS Service Organisation can always be called upon. Whenever the instrument is to be forwarded to a PHILIPS Service Centre for repair, the following should be observed:

- Provide the instrument with a label bearing full name and address of the sender.
- Indicate as completely as possible the symptoms of the fault.
- Carefully pack the instrument in the original packing or, if this is no longer available, in a wooden crate.
- Forward the instrument to the address provided by your local PHILIPS representative.

# Lists of parts

XIII

## A. MECHANICAL

| *Item* | *Number* | *Fig.* | *Ordering number* | *Description* |
|---|---|---|---|---|
| 1 | 1 | 14 | 4822 455 70094 | Text plate |
| 2 | 1 | 14 | 4822 310 20224 | Dial + double potentiometer R1 + resistors R24 and R30 |
| 3 | 1 | 14 | 4822 413 50397 | Knob |
| 4 | 1 | 14 | 4822 413 70062 | Cap |
| 5 | 1 | 14 | 4822 450 80212 | Cursor |
| 6 | 1 | 14 | 4822 273 40115 | Switch SK1 |
| 7 | 1 | 14 | 4822 413 30084 | Knob |
| 8 | 1 | 14 | 4822 413 70038 | Cap |
| 9 | 1 | 14 | 4822 347 20063 | Meter 100 μA f.s.d. |
| 10 | 1 | 14 | 4822 273 50101 | Switch SK2 |
| 11 | 6 | 14 | 4822 290 40011 | Terminal BU1–BU2–BU3–BU4–BU5–BU7 |
| 12 | 2 | 14 | 4822 535 20023 | Terminal BU6–BU11 |
| 13 | 2 | 14 | 4822 506 40016 | Nut on BU6–BU11 |
| 14 | 2 | 15 | 4822 520 10182 | Bracket holder |
| 15 | 2 | 15 | 4822 462 70366 | Slide |
| 16 | 2 | 15 | 4822 460 60017 | Ornamental strip (6-module length) |
| 17 | 1 | 14 | 4822 273 40224 | Switch SK4 |
| 18 | 2 | 14 | 4822 413 40112 | Knob |
| 19 | 2 | 14 | 4822 413 70037 | Cap |
| 20 | 1 | 14 | 4822 413 40211 | Knob |
| 21 | 1 | 14 | 4822 413 70037 | Cap |
| 22 | 1 | 14 | 4822 273 60079 | Switch SK3 |
| 23 | 2 | 14 | 4822 310 10044 | Screw for handle bar |
| 24 | 2 | 14 | | Handle bracket |
| 25 | 2 | 14 | | Handle screw |
| 26 | 2 | 14 | | Washer for handle screw |
| 27 | 2 | 14 | 4822 460 60014 | Ornamental surround |
| 28 | 1 | 16 | 4822 267 40106 | Mains output terminal CD12 |
| 29 | 1 | 16 | 4822 277 20014 | Slide switch SK12 |
| 30 | 1 | 16 | 4822 256 40017 | Fuse holder |
| 31 | 2 | 16 | 4822 693 80008 | Transistor cover |
| 32 | 2 | 16 | 56 201 (CA) | Mica washer and bushes |
| 33 | 1 | 16 | 4822 265 30066 | Mains input terminal CD11 |
| 34 | 3 | 17 B | 4822 267 60023 | Connector CD1–CD2–CD5 |
| 35 | 4 | 17 B | 4822 462 40157 | Foot cap |
| 36 | 4 | 17 B | 4822 462 50101 | Foot (for screws) |

| *Item* | *Number* | *Fig.* | *Ordering number* | *Description* |
|---|---|---|---|---|
| 37 | 23 | 13 | 4822 255 40006 | Transistor spacer |
| — | 1 | — | 4822 321 10071 | Mains flex with plugs |
| — | — | — | 4822 263 70024 | Mains interconnection link |
| — | — | — | 4822 466 10165 | Extension test board |
| 38 | 1 | 14 | 4822 290 30111 | Link |

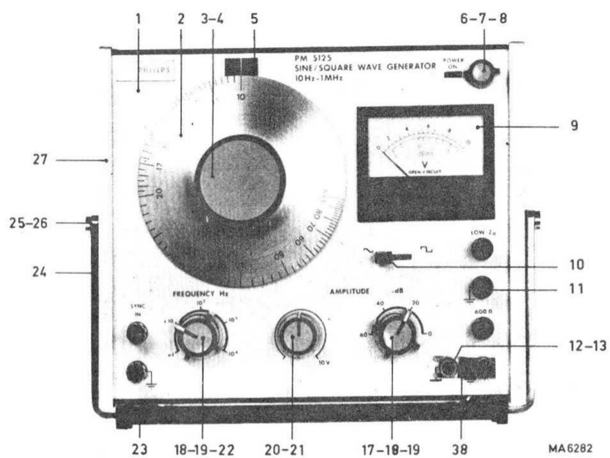



*Fig. 14. Front view indicating the mechanical components*



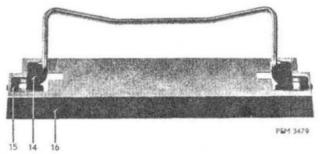



*Fig. 15. Stand assembly indicating the mechanical components*

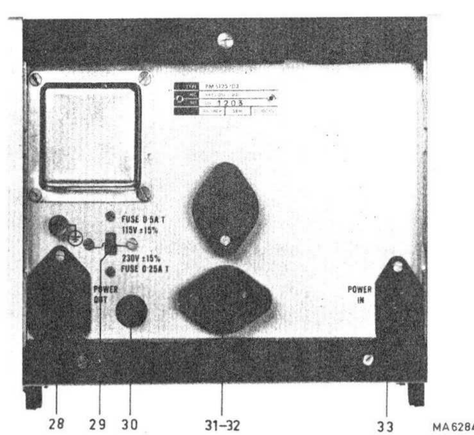



*Fig. 16. Rear view indicating the mechanical components*

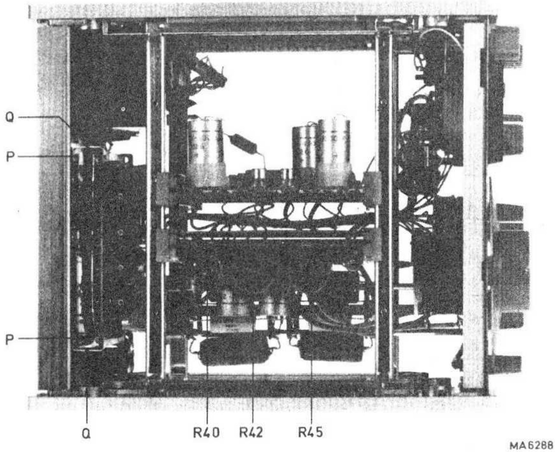



*Fig.* 17A Top view indicating the mechanical components

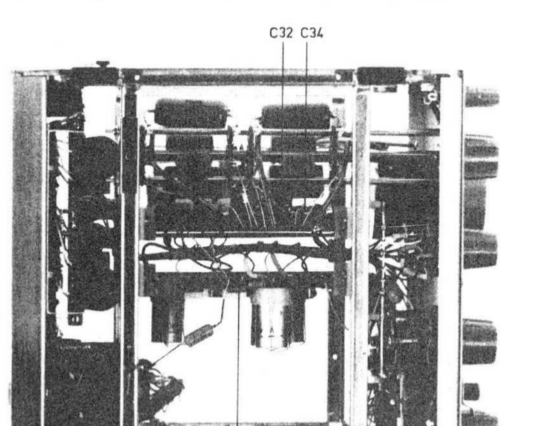



*Fig. 17B Bottom view indicating the mechanical components*

## B. ELECTRICAL — ELEKTRISCH — ELEKTRISCH — ELECTRIQUE — ELECTRICOS

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

| | |
|---|---|
| Carbon resistor E24 series<br>Kohleschichtwiderstand, Reihe E24<br>Koolweerstand E24 reeks<br>Résistance au carbone, série E24<br>Resistencia de carbón, serie E24 | 0,125 W 5% |
| Carbon resistor E12 series<br>Kohleschichtwiderstand, Reihe E12<br>Koolweerstand E12 reeks<br>Résistance au carbone, série E12<br>Resistencia de carbón, serie E12 | 0,25 W ≦ 1 MΩ, 5%<br>> 1 MΩ, 10% |
| Carbon resistor E24 series<br>Kohleschichtwiderstand, Reihe E24<br>Koolweerstand E24 reeks<br>Résistance au carbone, série E24<br>Resistencia de carbón, serie E24 | 0,5 W ≦ 5 MΩ, 1%<br>> 5 ≦ 10 MΩ, 2%<br>> 10 MΩ, 5% |
| Carbon resistor E12 series<br>Kohleschichtwiderstand, Reihe E12<br>Koolweerstand E12 reeks<br>Résistance au carbone, série E12<br>Resistencia de carbón, serie E12 | 0,5 W ≦ 1,5 MΩ, 5%<br>> 1,5 MΩ, 10% |
| Carbon resistor E12 series<br>Kohleschichtwiderstand, Reihe E12<br>Koolweerstand E12 reeks<br>Résistance au carbone, série E12<br>Resistencia de carbón, serie E12 | 1 W ≦ 2,2 MΩ, 5%<br>> 2,2 MΩ, 10% |
| Carbon resistor E12 series<br>Kohleschichtwiderstand, Reihe E12<br>Koolweerstand E12 reeks<br>Résistance au carbone, série E12<br>Resistencia de carbón, serie E12 | 2 W 5% |
| Wire-wound resistor<br>Drahtwiderstand<br>Draadgewonden weerstand<br>Résistance bobinée<br>Resistencia bobinada | 0,4 - 1,8 W 0,5% |
| Wire-wound resistor<br>Drahtwiderstand<br>Draadgewonden weerstand<br>Résistance bobinée<br>Resistencia bobinada | 5,5 W ≦ 200 Ω, 10%<br>> 200 Ω, 5% |
| Wire-wound resistor<br>Drahtwiderstand<br>Draadgewonden weerstand<br>Résistance bobinée<br>Resistencia bobinada | 10 W 5% |

| | |
|---|---|
| Tubular ceramic capacitor<br>Rohrkondensator<br>Keramische kondensator, buistype<br>Condensateur céramique tubulaire<br>Condensador cerámico tubular | 500 V |
| Tubular ceramic capacitor<br>Rohrkondensator<br>Keramische kondensator, buistype<br>Condensateur céramique tubulaire<br>Condensador cerámico tubular | 700 V |
| Ceramic capacitor, "pin-up"<br>Keramikkondensator "Pin-up" (Perltyp)<br>Keramische kondensator "Pin-up" type<br>Condensateur céramique, type perle<br>Condensador cerámico, versión "colgable" | 500 V |
| "Microplate" ceramic capacitor<br>Miniatur-Scheibenkondensator<br>"Microplate" keramische kondensator<br>Condensateur céramique "microplate"<br>Condensador cerámico "microplaca" | 30 V |
| Mica capacitor<br>Glimmerkondensator<br>Micakondensator<br>Condensateur au mica<br>Condensador de mica | 500 V |
| Polyester capacitor<br>Polyesterkondensator<br>Polyesterkondensator<br>Condensateur au polyester<br>Condensador polyester | 400 V |
| Flat-foil polyester capacitor<br>Miniatur-Polyesterkondensator (flach)<br>Platte miniatuur polyesterkondensator<br>Condensateur au polyester, type plat<br>Condensador polyester, tipo de placas planas | 250 V |
| Paper capacitor<br>Papierkondensator<br>Papierkondensator<br>Condensateur au papier<br>Condensador de papel | 1000 V |
| Wire-wound trimmer<br>Drahttrimmer<br>Draadgewonden trimmer<br>Trimmer à fil<br>Trimmer bobinado | |
| Tubular ceramic trimmer<br>Rohrtrimmer<br>Buisvormige keramische trimmer<br>Trimmer céramique tubulaire<br>Trimmer cerámico tubular | |

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.
Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.
Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.
Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.
Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

## RESISTORS

| No. | Ordering number | Value | % | Description |
|---|---|---|---|---|
| R1 | 4822 310 20224 | 15k + 15 kΩ | | Tandem-potentiometer + dial + resistors R24 and R30 |
| R2 | 4822 102 30137 | 2.5 + 2.5 kΩ | | Tandem-potentiometer |
| R25 | 4822 116 50099 | 1.2 kΩ | | Metal-film resistor |
| R31 | 4822 116 50099 | 1.2 kΩ | | Metal-film resistor |
| R40 | 4822 101 20084 | 10 kΩ | | Potentiometer |
| R42 | 4822 103 10058 | 250 Ω | | Potentiometer |
| R44 | 4822 116 90002 | | | Thermistor |
| R45 | 4822 103 10064 | 100 Ω | | Potentiometer |
| R52 | 4822 101 20277 | 2.2 kΩ | | Potentiometer |
| R101 | 4822 101 20241 | 1 kΩ | | Potentiometer |
| R105 | 4822 101 20243 | 4.7 kΩ | | Potentiometer |
| R106 | 4822 116 50178 | 34.8 kΩ | 1 | Metal-film resistor |
| R111 | 4822 116 50561 | 592 Ω | 1 | Metal-film resistor (R111–R114) |
| R112 | 4822 116 50013 | 6 kΩ | 1 | |
| R113 | 4822 116 50534 | 741 Ω | 1 | |
| R114 | 4822 116 50239 | 5.94 kΩ | 1 | |
| R115 | 4822 116 50535 | 733 Ω | 1 | Metal-film resistor (R115–R122) |
| R116 | 4822 116 50239 | 5.94 kΩ | 1 | |
| R117 | 4822 116 50345 | 660 Ω | 1 | |
| R122 | 4822 116 50102 | 2.2 kΩ | 1 | |
| R236 | 4822 111 30334 | 1 Ω | 10 | |
| R237 | 4922 111 30334 | 1 Ω | 10 | Carbon resistor |
| R248 | 4822 116 50219 | 5.62 kΩ | 1 | Metal-film resistor |
| R249 | 4822 103 10058 | 250 Ω | | Potentiometer |
| R250 | 4822 116 50518 | 1.1 kΩ | 1 | Metal-film resistor |
| R251 | 4822 116 50219 | 5.62 kΩ | 1 | Metal-film resistor |
| R252 | 4822 103 10058 | 250 Ω | | Potentiometer |
| R253 | 4822 116 50518 | 1.1 kΩ | 1 | Metal-film resistor |

## CAPACITORS

| No. | Ordering number | Value | Volt | Description |
|---|---|---|---|---|
| C21 | 4822 121 50376 | 1 μF | 160 | Polyester |
| C22 | 4822 121 40059 | 100 nF | 63 | Polystyrene |
| C23 | 4822 123 10205 | 10 nF | 125 | Polystyrene |
| C24 | 4822 123 10206 | 950 pF | 500 | Silvered mica |
| C26 | 4822 120 60076 | 68 pF | 500 | Silvered mica |
| C28 | 4822 121 50376 | 1 μF | 160 | Polyester |

| *No.* | *Ordering number* | *Value* | *Volt* | *Description* |
|---|---|---|---|---|
| C29 | 4822 121 40059 | 100 nF | 63 | Polystyrene |
| C30 | 4822 123 10205 | 10 nF | 125 | Polystyrene |
| C31 | 4822 123 10206 | 950 pF | 500 | Silvered mica |
| C33 | 4822 120 60076 | 68 pF | 500 | Silvered mica |
| C37 | 4822 124 20394 | 150 µF | 40 | Electrolytic |
| C38 | 4822 124 20426 | 2200 µF | 10 | Electrolytic |
| C39 | 4822 124 20426 | 2200 µF | 10 | Electrolytic |
| C41 | 4822 124 20409 | 470 µF | 10 | Electrolytic |
| C61 | 4822 124 20428 | 4700 µF | 4 | Electrolytic |
| C62 | 4822 124 20428 | 4700 µF | 4 | Electrolytic |
| C65 | 4822 124 20359 | 15 µF | 40 | Electrolytic |
| C66 | 4822 124 20359 | 15 µF | 40 | Electrolytic |
| C81 | 4822 124 20398 | 220 µF | 25 | Electrolytic |
| C83 | 4822 124 20419 | 1000 µF | 25 | Electrolytic |
| C85 | 4822 124 20381 | 68 µF | 63 | Electrolytic |
| C86 | 4822 124 20423 | 1500 µF | 16 | Electrolytic |
| C91 | 4822 124 20388 | 160 µF | 25 | Electrolytic |
| C101 | 4822 124 20356 | 15 µF | 63 | Electrolytic |
| C103 | 4822 124 20377 | 68 µF | 16 | Electrolytic |
| C121…124 | 4822 124 20404 | 330 µF | 63 | Electrolytic |
| C127 | 4822 121 40224 | 4.7 µF | 100 | Polyester |
| C128 | 4822 121 40224 | 4.7 µF | 100 | Polyester |
| C129 | 4822 124 20384 | 100 µF | 40 | Electrolytic |
| C130 | 4822 124 20384 | 100 µF | 40 | Electrolytic |

## SEMICONDUCTORS

| *No.* | *Type* | *Ordering number* | *Description* |
|---|---|---|---|
| GR21 – 22 | AAZ 13 | 4822 130 30231 | Diode |
| GR23 | BZY88/C20V | 4822 130 30417 | Zener diode |
| GR61…63 | BAY38 | 4822 130 40256 | Diode → BAW 62 |
| GR65 | BZY88/C7V5 | 4822 130 30287 | Zener diode |
| GR81 | BZY88/C12V | 4822 130 30346 | Zener diode |
| GR101 | BAY38 | 4822 130 40256 | Diode |
| GR121 – 122 | BY123 | 4822 130 30279 | Diode |
| GR123 – 124 | BZY88/C9V1 | 4822 130 30294 | Zener diode |

| *No.* | *Type* | *Ordering number* | *Description* |
|---|---|---|---|
| GR125 – 126 | BZY88/C3V3 | 4822 130 30392 | Zener diode |
| GR127 – 128 | BZY78 | 4822 130 30335 | Zener diode |
| TS21…27 | BC107 | 4822 130 40184 | Transistor |
| TS28 | BCY70 | 4822 130 40324 | Transistor |
| TS29…32 | BC107 | 4822 130 40184 | Transistor |
| TS61 | BCY70 | 4822 130 40324 | Transistor |
| TS62…64 | BC107 | 4822 130 40184 | Transistor |
| TS65 | 2N3553 | 4822 130 40634 | Transistor |
| TS81 | BCY70 | 4822 130 40324 | Transistor |
| TS82…84 | BC107 | 4822 130 40184 | Transistor |
| TS85 – 86 | BFY50 | 4822 130 40294 | Transistor |
| TS121 – 122 | BC107 | 4822 130 40184 | Transistor |
| TS123 | BCY70 | 4822 130 40324 | Transistor |
| TS124 | BC107 | 4822 130 40184 | Transistor |
| TS125 | BCY70 | 4822 130 40324 | Transistor |
| TS126…132 | BC107 | 4822 130 40184 | Transistor |
| TS141 – 142 | BD123)* | 4822 130 40518 | Transistor |

* If transistors TS141, TS142 are replaced, transistor type BDY62 may be used (transistor BD123 is no longer available). Ordering number BDY62: 4822 130 40717.

## MISCELLANEOUS

| *Item* | *Ordering number* | *Description* |
|---|---|---|
| LA1 | GL9 | Neon lamp |
| T1 | 4822 146 20343 | Mains transformer |
| VL1 | 4822 253 30013 | Fuse 250 mA, slow blow |
| | 4822 253 30017 | Fuse 500 mA, slow blow |
| — | 4822 216 60121 | Printed wiring board of power supply, complete with components |
| — | 4822 216 60138 | Printed wiring board of the oscillator, complete with components |
| — | 4822 216 60139 | Printed wiring board of the squarer/amplifier, complete with components |
| — | 4822 216 60141 | Printed wiring board of the meter circuit, complete with components |

# INFORMATION ON THE MODULAR SYSTEM AND OPTIONAL ACCESSORIES

XIV

## A. General

The modular LF-system consists of various units which can be used individually or combined. The application possibilities can be extended by combining units. The width of the various units is expressed in modules, one module having the following dimensions:

| | |
|---|---|
| width: | 70 mm |
| height: | 178 mm |
| depth: | 250 mm |

The units have a width of one, two or three modules. They can be linked to a maximum width of six modules.
The instruments are suitable for rack-mounting.
The following units are available.

*PM 5125 – Generator*

| | |
|---|---|
| Frequency range | 10 Hz ... 1 MHz |
| Attenuator | 0–60 dB (three steps) |
| Output voltage | 10 $V_{rms}$ into 600 Ω |
| Wave forms | – sine wave<br>– square wave |
| Width | 3 modules |
| Suitable for use with: | |
| Power amplifier | PM 5175 (width: 2 modules) |
| Wide-band transformer | PM 5181 (width: 1 module) |

*PM 5160 – Oscillator*

| | |
|---|---|
| Frequency range | 1 Hz ... 1 MHz |
| Output voltage | 2 $V_{pp}$ into 600 Ω |
| Waveforms | – sine wave<br>– square wave (from /04 version) |
| Attenuator | continuous (logarithmic) |
| Width | 2 modules |
| Suitable for use with: | |
| Wide-band amplifier | PM 5170 (width: 1 module) |
| Power amplifier | PM 5175 (width: 2 modules) |
| Monitored attenuator | PM 5180 (width: 2 modules) |

*PM 5162 – LF Sweep oscillator*

| | |
|---|---|
| Frequency range | 0.1 Hz ... 100 kHz |
| Waveforms | – triangle wave<br>– square wave<br>– sine wave |

| | |
|---|---|
| Output voltage | 3 $V_{pp}$ into 600 Ω |
| Attenuator | continuous (logarithmic) |
| Frequency sweep | |
| a. $\frac{f_{max}}{f_{min}}$ | 1 ... $10^4$ |
| b. speed | 10 ... 100 sec. |
| Width | 3 modules |
| Suitable for use in combination with: | |
| Wide-band amplifier | PM 5170 (width: 1 module) |
| Power amplifier | PM 5175 (width: 2 modules) |
| Monitored attenuator | PM 5180 (width: 2 modules) |

*PM 5168 – Function generator*

| | |
|---|---|
| Frequency range | : 0.5 mHz ... 5 kHz |
| Output voltage | 3 $V_{pp}$ into 600 Ω |
| Attenuator | continuous (logarithmic) |
| Waveforms | – triangle wave<br>– square wave<br>– sine wave |
| Facilities | – single shot<br>– external triggering |
| Width | 3 modules |
| Suitable for use in combination with: | |
| Wide-band amplifier | PM 5170 (width: 1 module) |
| Power amplifier | PM 5175 (width: 2 modules) |
| Monitored attenuator | PM 5180 (width: 2 modules) |

*PM 5170 – Wide-band amplifier*

| | |
|---|---|
| Frequency range | DC ... 1 MHz |
| Maximum output | 10 $V_{rms}$ into 600 Ω |
| Input impedance | – 600 Ω and<br>– high impedance (100 kΩ) |
| Width | 1 module |
| Suitable for use in combination with: | |
| Oscillator | PM 5160 (width: 2 modules) |
| Sweep oscillator | PM 5162 (width: 3 modules) |
| Function generator | PM 5168 (width: 3 modules) |
| Monitored attenuator | PM 5180 (width: 2 modules) |

*PM 5175 – Power amplifier*

| | |
|---|---|
| Frequency range | DC ... 1 MHz |
| Max. output | 10 W peak |

| | |
|---|---|
| Input impedance | – 600 Ω and<br>– high impedance |
| Attenuator | steps of 10 dB |
| Width | 2 modules |
| Suitable for use with: | |
| Oscillator | PM 5160 (width: 2 modules) |
| Sweep oscillator | PM 5162 (width: 3 modules) |
| Function generator | PM 5168 (width: 3 modules) |

*PM 5180 – Monitored attenuator*

| | |
|---|---|
| Attenuation | 0 ... 99.9 dB in 10–1 and 0.1 dB steps |
| Outputs | – 600 Ω unbalanced<br>– 600 or 150 Ω balanced (floating) |
| Maximum input voltage | 10 $V_{rms}$ |
| Frequency ranges | |
| a. attenuator | DC ... 1 MHz |
| b. meter | 10 Hz ... 1 MHz |
| c. transformer output | 20 Hz ... 20 kHz |
| Width | 2 modules |
| Suitable for use in combination with: | |
| Oscillator | PM 5160 (width: 2 modules) |
| Sweep oscillator | PM 5162 (width: 3 modules) |
| Function generator | PM 5168 (width: 3 modules) |
| Wide-band amplifier | PM 5170 (width: 1 module) |

*PM 5181 – Wide-band transformer*

| | |
|---|---|
| Frequency range | 10 Hz ... 1 MHz |
| Transformer ratio and output impedance for 600 Ω signal source | a) Transformer ratio 1 : 1, output impedance 600 Ω<br>b) Transformer ratio 1 : 0.5, output impedance 150 Ω |
| Input voltage | 1 mV ... 10 V |
| Width | 2 modules |

Suitable for use in combination with all instruments from the modular LF-system.

*PM 5183 – Burst gate*

| | |
|---|---|
| Frequency range | DC ... 1 MHz |
| Input voltage | 1 $V_{rms}$ |
| Output voltage | 1 $V_{rms}$ |
| Input impedance | 600 Ω |
| Output impedance | 600 Ω |
| On/off timing: | |
| on: | 1 ... 99 cycles |
| off: | 1 ... 99 cycles |

Suitable for use in combination with all instruments from the modular LF-system.

**B. Coupling accessories**

For coupling the various units to form one complete instrument, coupling accessories are available for every combination up to a width of six modules.
These accessories comprise one coupling kit and five different cover kits.
With the aid of the parts provided in the *coupling kit* any two modular units can be linked to each other.
A *cover kit* contains a top cover, a tilting assembly and an extension piece for the carrying handle; with these parts the coupled units can be equipped to form one complete instrument.

*Ordering information*

One coupling kit PM 9500 should be ordered for each coupling connection to be made. Depending on the total width of the coupled units, one of the following cover kits should also be ordered.

| Type number | Cover kit for a total width of |
|---|---|
| PM 9502 | 2 modules |
| PM 9503 | 3 modules |
| PM 9504 | 4 modules |
| PM 9505 | 5 modules |
| PM 9506 | 6 modules |

*For example:*

| | |
|---|---|
| To be coupled | one 2-module unit<br>two 1-module units |
| Required coupling accessories | two coupling kits PM 9500<br>one cover kit PM 9504 |

*The coupling kit PM 9500 includes :* (Fig. *18*)

a. 4 coupling screws with nuts
b. fixing screws for handle
c. 1 inter-units screen
d. 1 mains interconnection link
e. 2 signal interconnection links

*A cover kit PM 9502 ... PM 9506 includes:* (Fig. *19*)

a. 1 n-module top cover
b. 1 n-module tilting assembly
c. 1 n-module handle bar



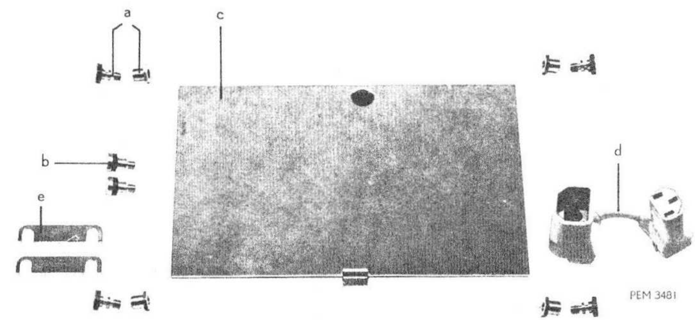



*Fig. 18. Coupling kit*

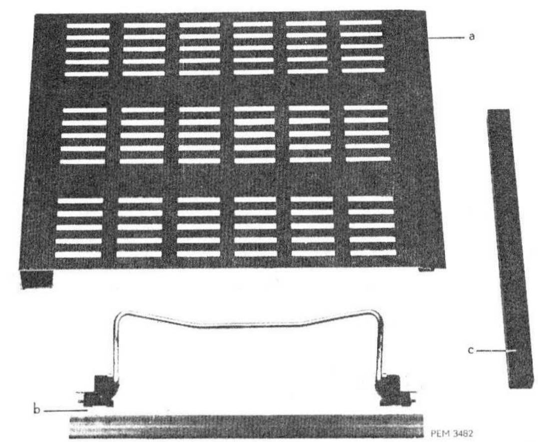
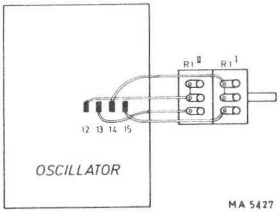



*Fig. 19. Cover kit*



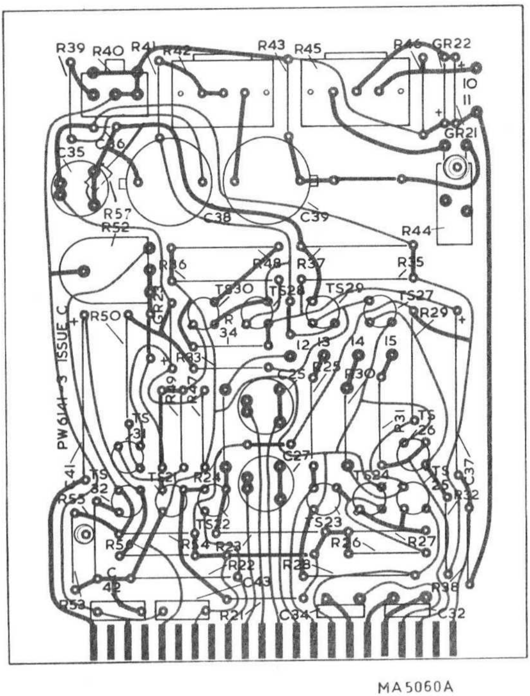




*Fig. 23. Printed wiring board of the oscillator*

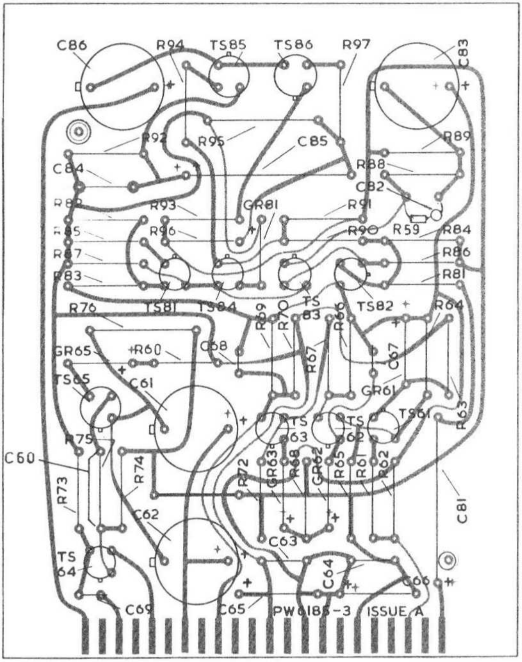
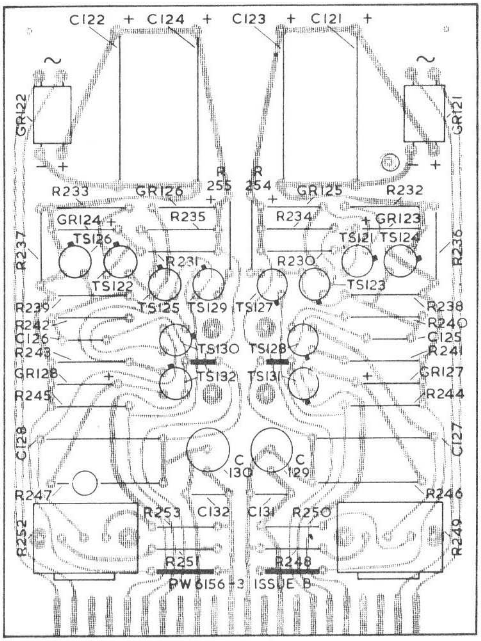



*Fig. 24. Printed wiring board of the squarer and the amplifier*




PEM 4916

*Fig. 25. Printed wiring board of the power supply*

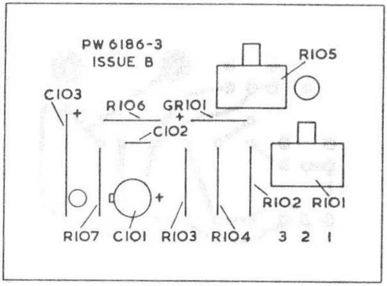



*Fig. 26. Platine du circuit de l'instrument de mesure*

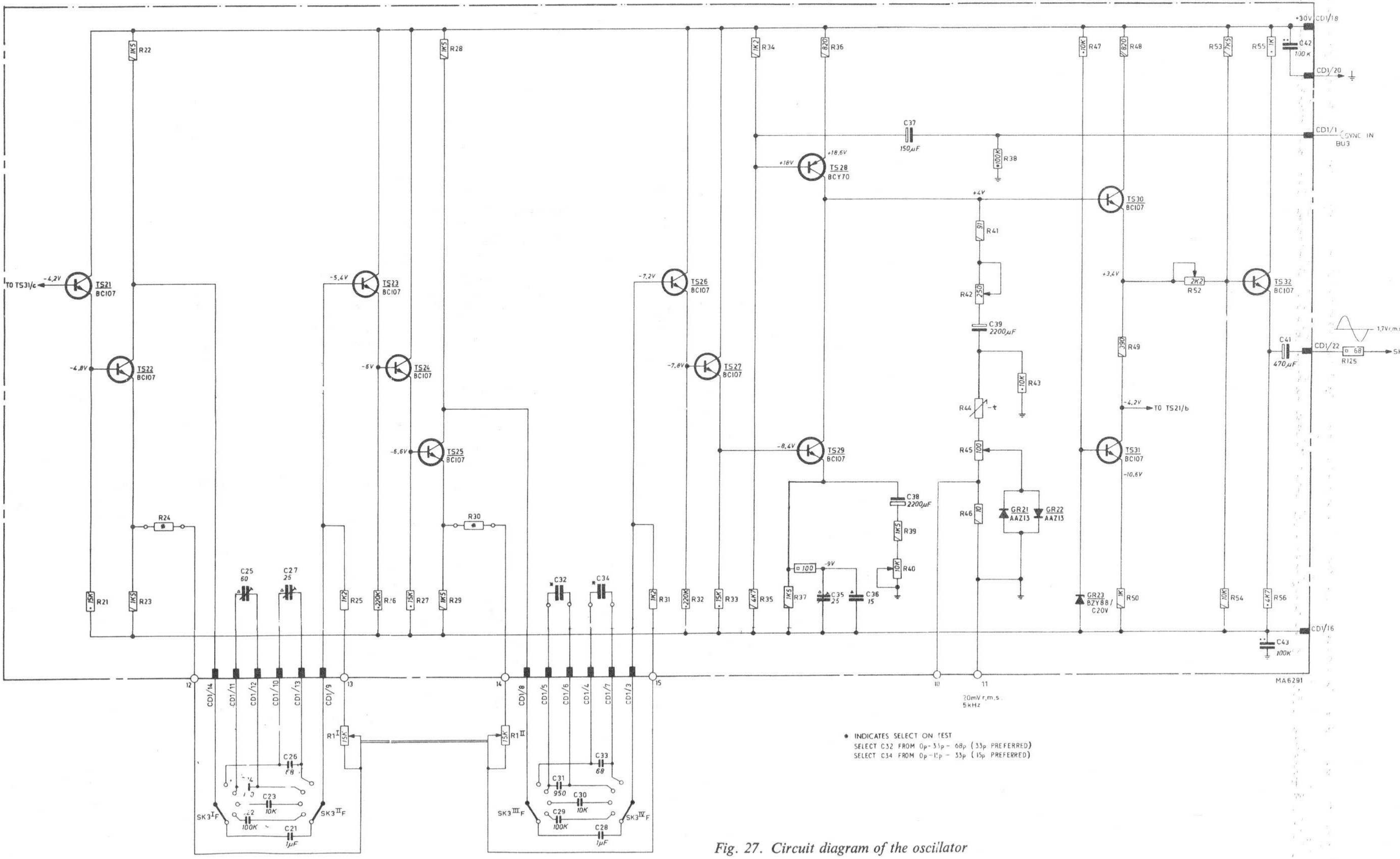



*Fig. 27. Circuit diagram of the oscillator*

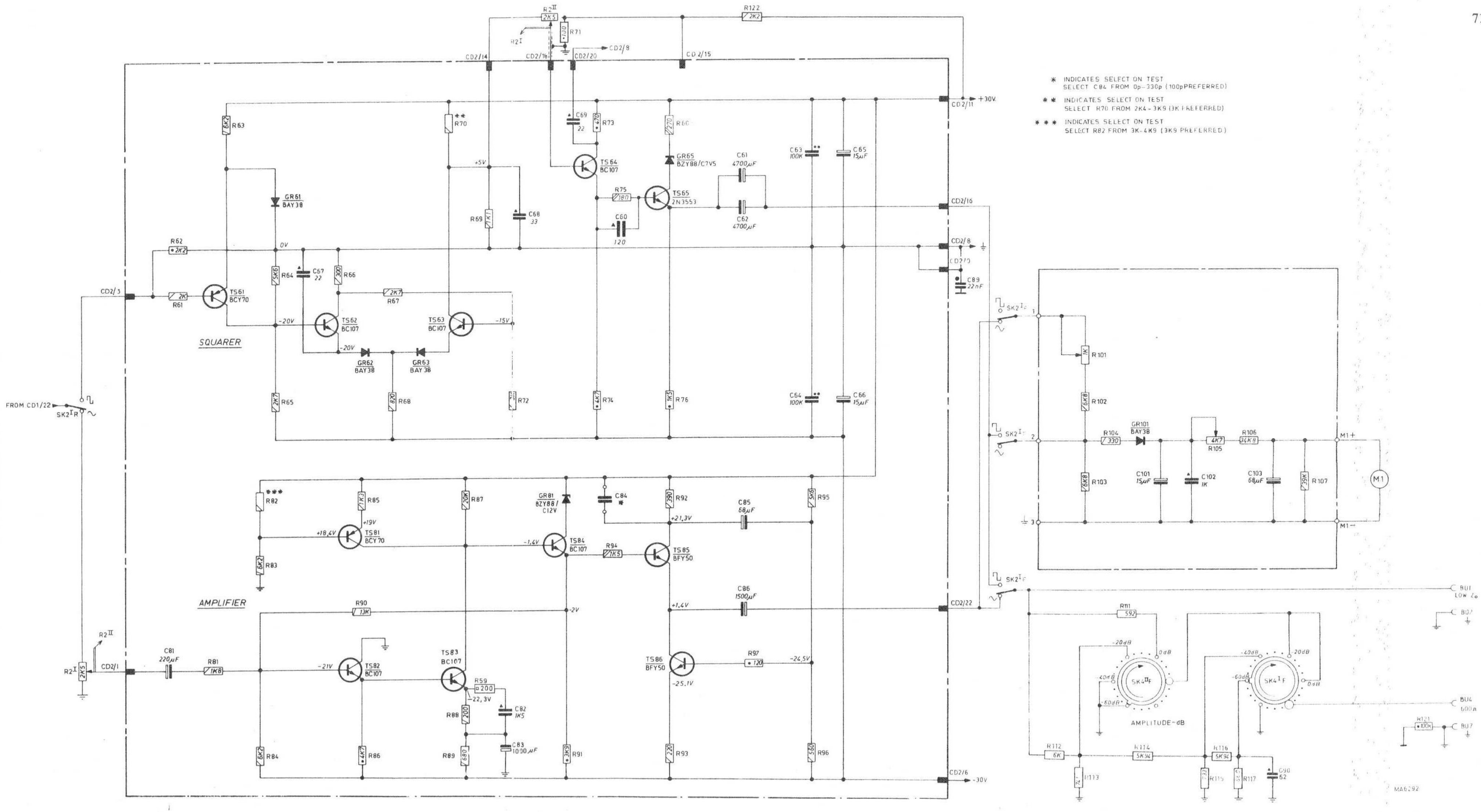



*Fig. 28. Circuit diagram of the squarer, the amplifier and the meter circuit*

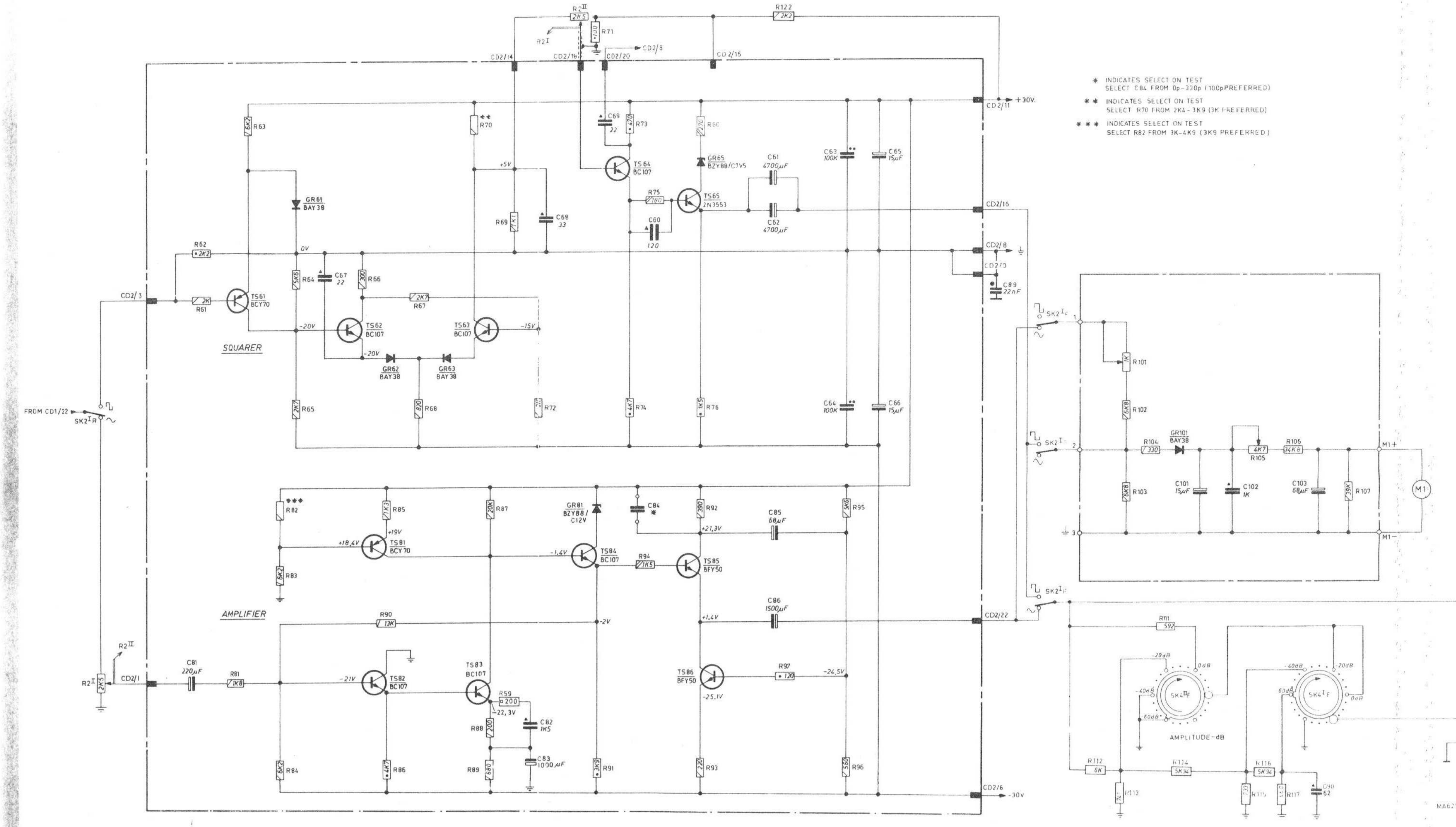



*Fig. 28. Circuit diagram of the squarer, the amplifier and the meter circuit*

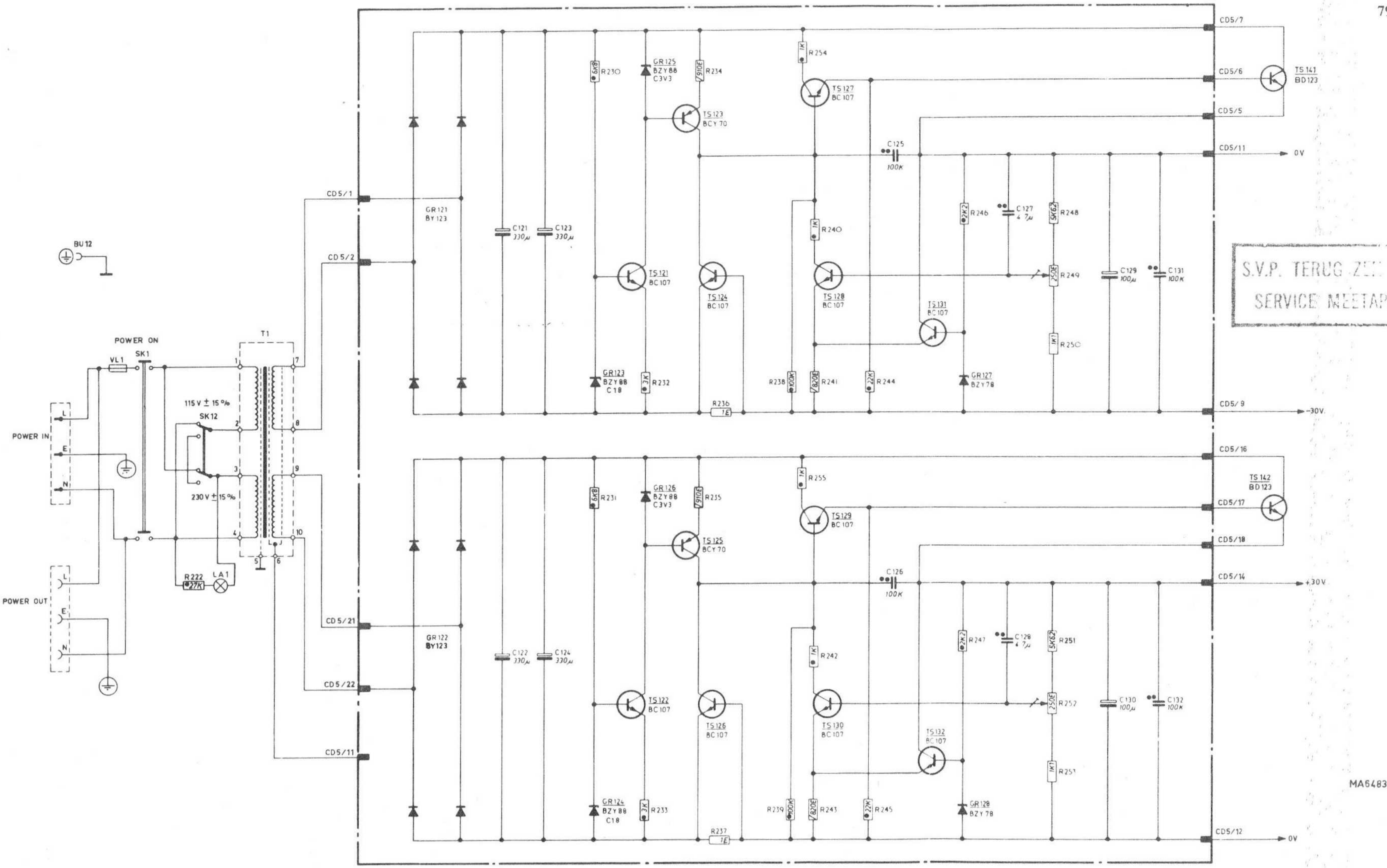





*Fig. 29. Circuit diagram of the power supply*

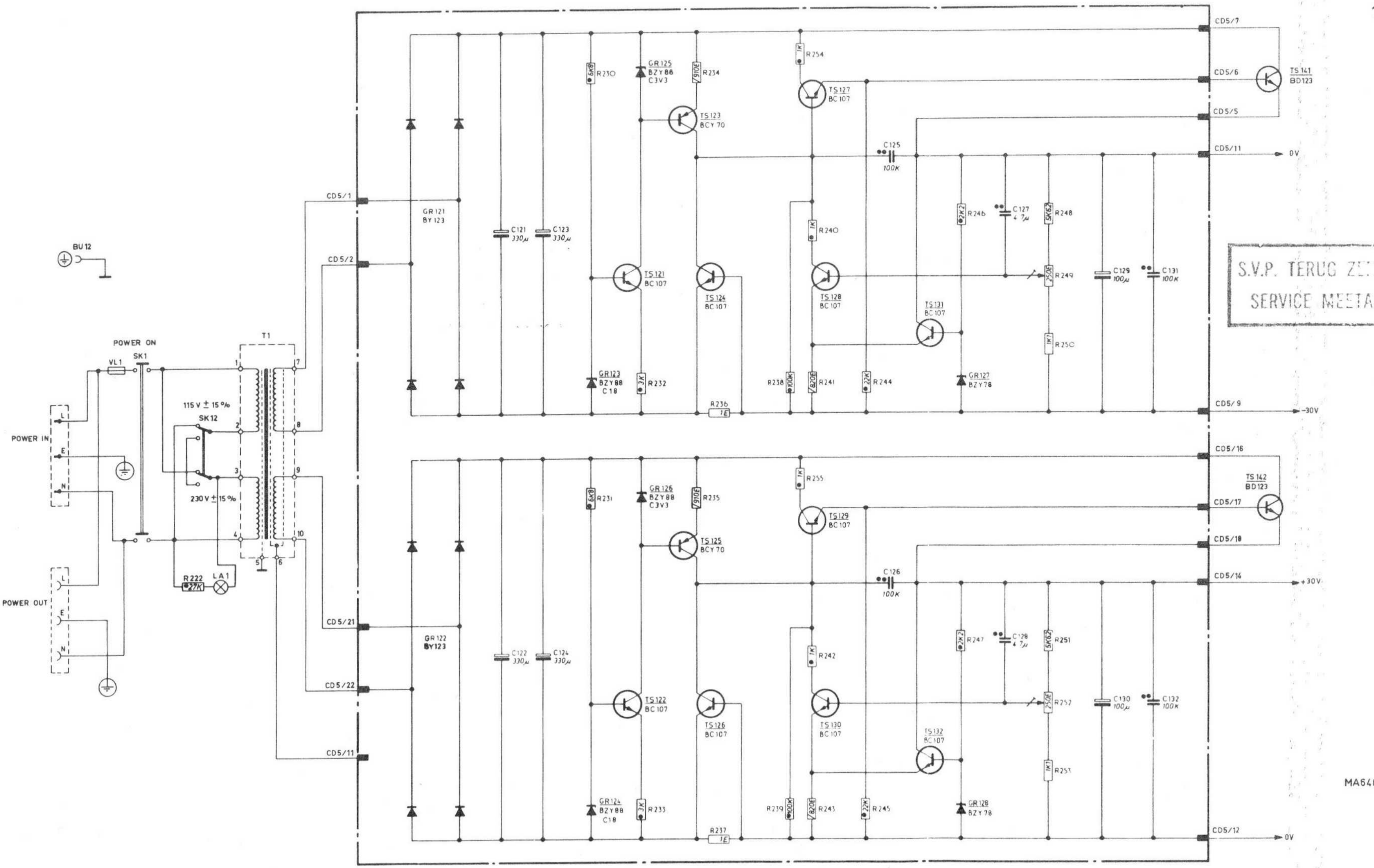





*Fig. 29. Circuit diagram of the power supply*

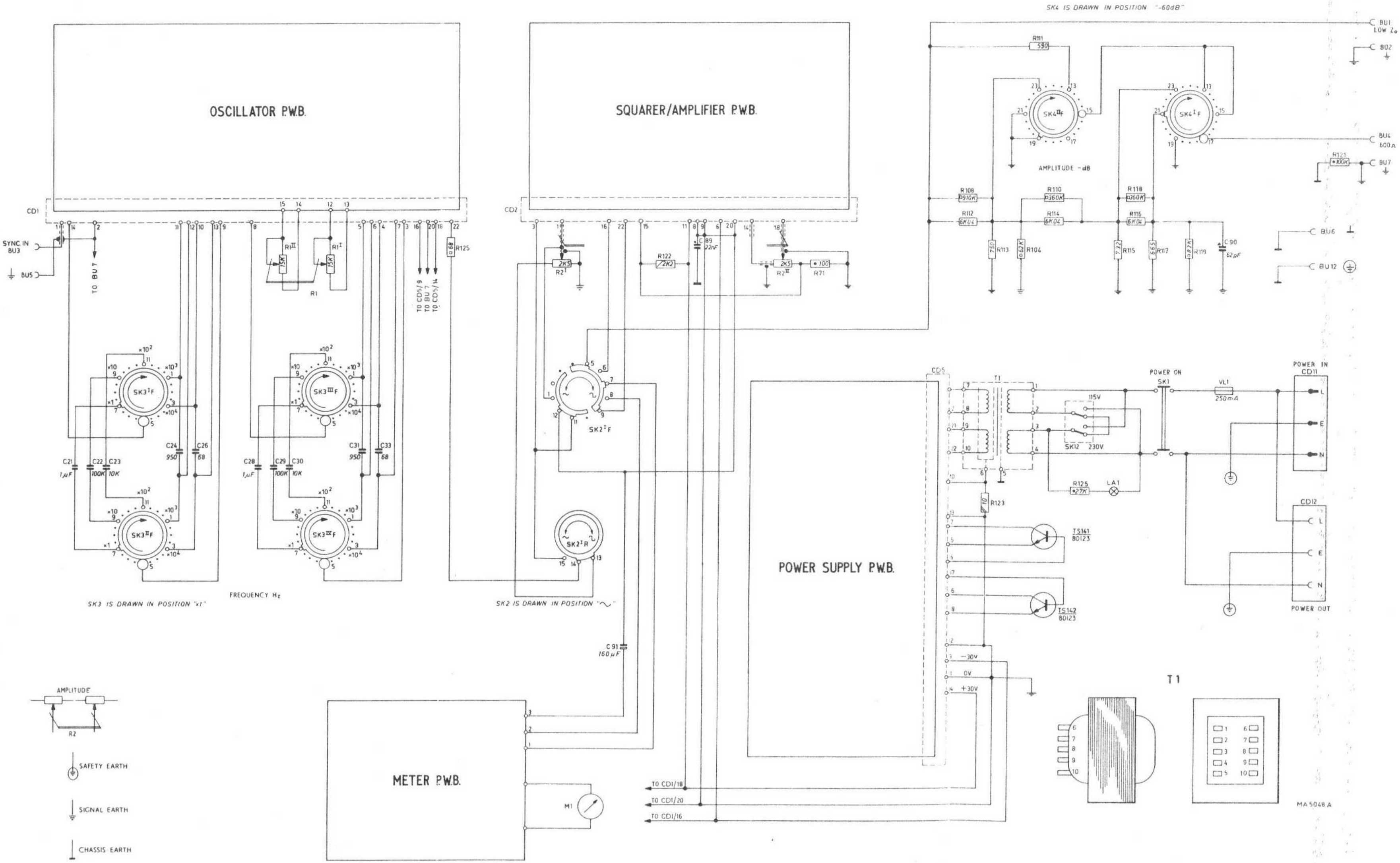



*Fig. 30. Overall diagram*