

Multimeter PM2525

Operation Manual

4822 872 30361

870801



I&E

Industrial & Electro-acoustic Systems Division



**Industrial &
Electro-acoustic Systems**

PHILIPS

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ST5237



PHILIPS

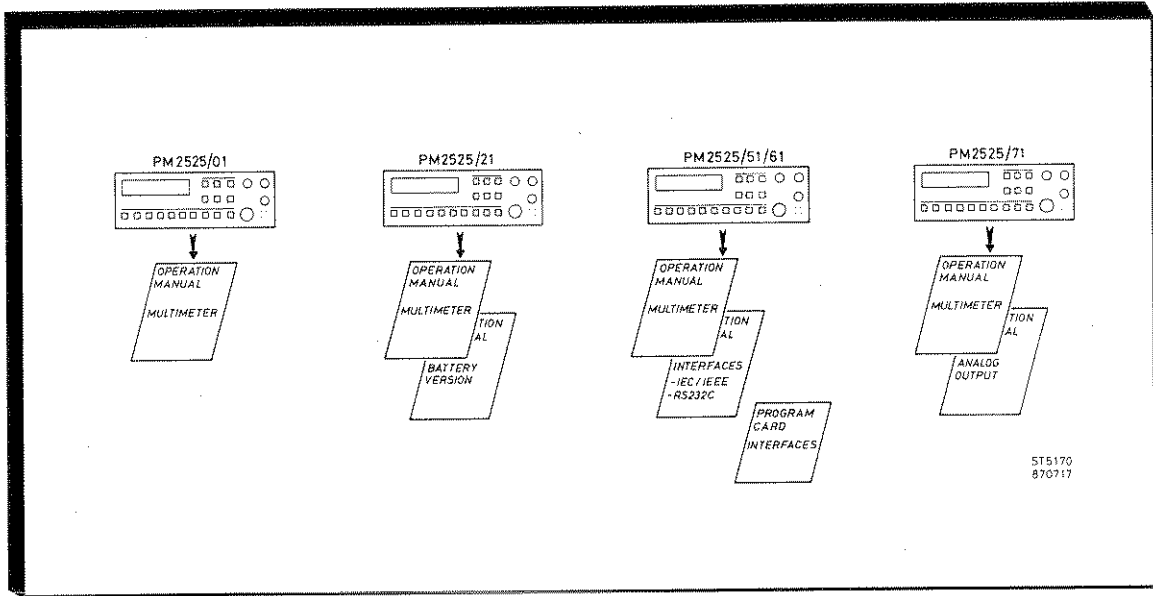
OPERATION MANUAL STRUCTURE FOR PM2525 FAMILY

The PM2525 family consists of different type numbers viz:

- The standard multimeter version PM2525/01
- The battery operated version PM2525/21
- The IEC-625/IEEE-488 interface version PM2525/51
- The RS-232C/V24 interface version PM2525/61
- The analog output version PM2525/71

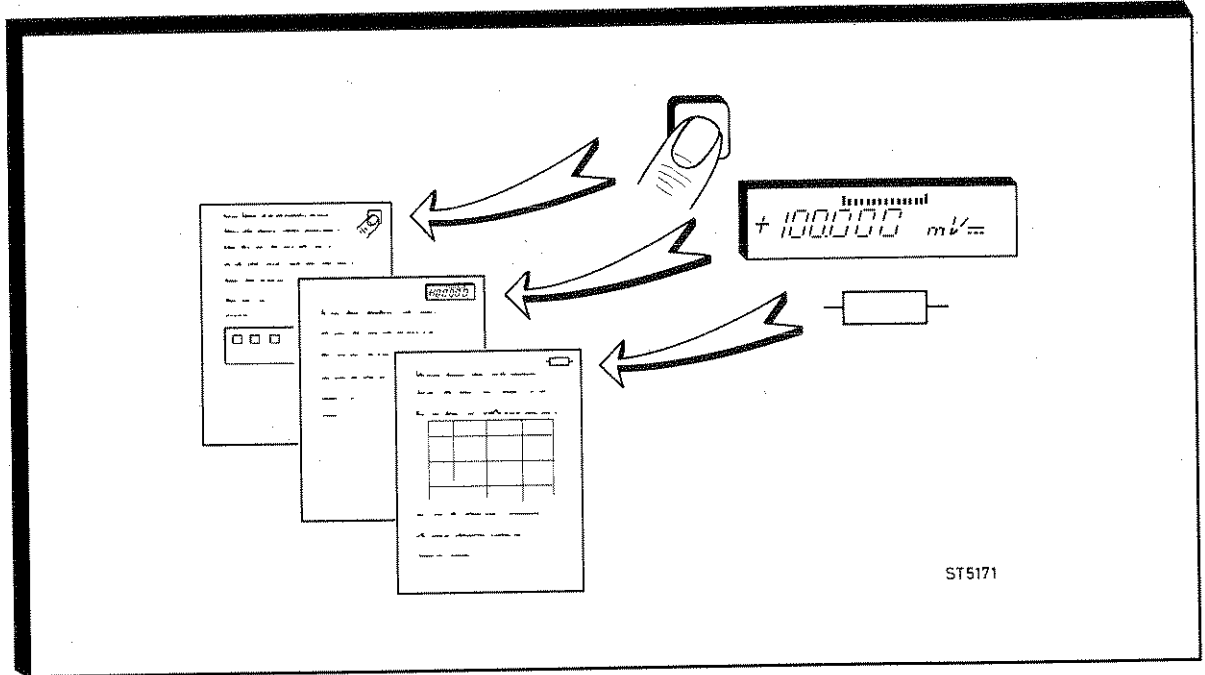
*rechargeable battery
P/N 841783*

The following operation manuals should be used.








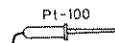


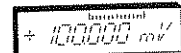

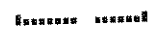















HOW TO USE THE ICONS FOR QUICK REFERENCE

For quick reference icons are used in the right-hand topcorner of the pages. These icons are an additional aid, besides the contents, to find the correct chapters in a quick way. The following icons are used:



ST5171

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	INSTALLATION INSTRUCTIONS		FOUR-WIRE RESISTANCE MEASUREMENTS
	SWITCHING-ON		TEMPERATURE MEASUREMENTS
	KEYBOARD		DC CURRENT MEASUREMENTS
	DISPLAY		AC CURRENT MEASUREMENTS
	BARGRAPH		CAPACITY MEASUREMENTS
	DECIBEL MEASUREMENTS		DIODE MEASUREMENTS
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1. OPERATOR SAFETY

Read this page carefully before installation and use of the instrument.

1.1 GENERAL INFORMATION

The instrument described in this manual is designed to be used by properly-trained personnel only. Adjustment, maintenance and repair of the exposed equipment shall be carried out only by qualified personnel, who are aware of the hazards involved.

1.2 SAFETY PRECAUTIONS

For the correct and safe use of this instrument it is essential that both operating and service personnel follow generally-accepted safety procedures in addition to the safety precautions specified in this manual. Specific warning and caution statements and/or symbols are marked on the apparatus.

1.3 CAUTION AND WARNING STATEMENTS

CAUTION: *is used to indicate correct operating or maintenance procedures in order to prevent damage to or destruction of the equipment or other property.*

WARNING: **calls attention to a potential danger that requires correct procedures or practices in order to prevent personnel injury.**

1.4 SYMBOLS



Read the operating instructions

Explanation of symbol

To preserve the instrument from damage the operator must refer to an explanation in the instruction manual.

1.5 IMPAIRED SAFETY PROTECTION

Whenever it is likely that safe operation is impaired, the instrument must be made inoperative and secured against any unintended operation.
The appropriate servicing authority must then be informed.

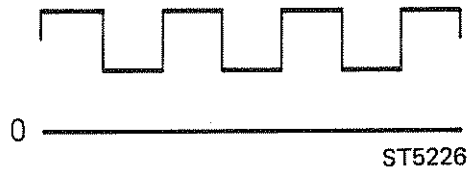
2. GENERAL INFORMATION

2.1 INTRODUCTION

The PM2525 offers a complete DMM with every standard measuring function that can be expected from a general purpose instrument.

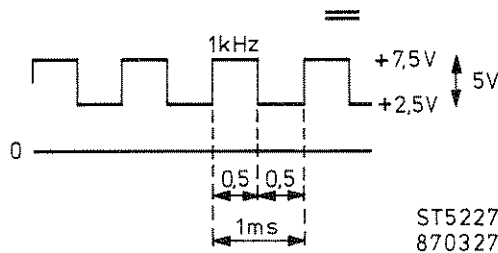
A whole range of extra unique functions, makes the PM2525 extremely suitable for measurements in digital micro processor circuits.

EXAMPLE: What can be measured from the next signal without interchanging the measuring leads.



V_{DC}	= +5 V	dBV_{DC}	= +16.2 dB
$V_{\text{AC rms}}$	= 2.5 V	dBV_{AC}	= +10.1 dB
$V_{\text{PK rms}}$	= 5 V	dBV_{PK}	= +16.2 dB
V_{p+}	= +7.5 V	s	= 1 ms
V_{pp}	= 5 V	s	= 0.5 ms
		s	= 0.5 ms
Hz	= 1 kHz	s	= 1 ms

Remarks - In functions V_{DC} and Hz also high resolution mode can be selected.
 - In function ZERO the measured values can be used as relative reference.



V_{DC}	= +5 V	= +16.2 dB
V_{AC}	= 2.5 V	= +10.1 dB
V_{PK}	= 5 V	= +16.2 dB

The PM2525 has the following measuring functions:

Function	Max. res	Max. range	Accuracy
V $\overline{\sim}$ (HI-res.)	1 μ V	1000 V	0.02 %
V \sim rms	10 μ V	1000 V	0.3 %
V $\overline{\sim}$ (DC coupled) rms	10 μ V	1000 V	0.3 %
V _{peak}	1 mV	1000 V	1.0 %
I $\overline{\sim}$	100 pA	10 A	0.1 %
I \sim	100 pA	10 A	0.4 %
R (2-wire)	10 mohm	200 Mohm	0.1 %
R (4-wire)	10 mohm	2 Mohm	0.1 %
Hz (HI-res.)	0.1 Hz	20 MHz	0.01 %
Capacitance	1 pF	200 μ F	1.0 %
		2000 μ F	10 %
Time	1 μ s	10 ⁵ s	0.01 %
Temperature	0.1°C	- 100... + 850°C	1.0 %
Diode	100 μ V _{DC}	2 V	—
dB (V $\overline{\sim}$)	0.1 dB	- 77... + 43 dB	as V $\overline{\sim}$
dB (V \sim)	0.1 dB	- 57... + 43 dB	as V \sim
Relative reference			

The ranges can be selected either manual or automatic.

To display the measured quantities the PM2525 has extended display facilities.

This results in:

- Extended message indication
- Analog bargraph for precise trend display

2.2 CHARACTERISTICS

General notes:

1. Specification points, marked with ** apply only for the PM2525/51 and PM2525/61.
2. This characteristics describes the overlapping specification points from the versions PM2525/01/21/51/61/71.

2.2.1 Safety Characteristics

This apparatus has been designed and tested in accordance with Safety Class 2 requirements of IEC Publication 348. Safety Requirements for Electronic Measuring Apparatus and CSA 556B, and has been supplied in a safe condition.

This manual contains information and warnings which must be followed to ensure safe operation and to retain the instrument in a safe condition.

This instrument:

- satisfies the requirements of EEC Council Directive NO. 73/23 EEC in that it conforms with IEC Publication 348.
- is listed by the Canadian Standards Association as certified.
- is certified by the independent German Testing and Approvals Institute VDE (and has been tested according to VDE 0411, Part 1).

2.2.2 Performance Characteristics

- Properties expressed in numerical values with stated tolerance are guaranteed by PHILIPS. Specified tolerance numerical values indicate those that could be nominally expected from the mean of a range identical instruments.

This specification is valid after power on. This instrument needs no warming-up.

2.2.3 DC voltage measurements (V_{rms})

RANGES	RESOLUTION **		ACCURACY		TEMP. COEFF. ± % rdg/°C	INPUT IMPEDANCE	MAXIMUM INPUT
	HI.RES	NORMAL	± % rdg	± % mg			
200 mV	1 μV	10 μV	0.02	0.01	0.003	20 MΩ//50 pF 20 MΩ//50 pF 11 MΩ//80 pF 10 MΩ//90 pF 10 MΩ//90 pF	HI-LO 1000 Vrms HI-Earth 1000 Vrms LO-Earth 250 Vrms
2 V	10 μV	100 μV					
20 V	100 μV	1 mV					
200 V	1 mV	10 mV					
2000 V*	10 mV	100 mV					

* Maximum input 1000 V

** Resolution in High Speed mode is 100 μV in 200 mV range

Maximum VHz product : 10 ⁷	Maximum CM voltage : 250 Vrms 350 Vpeak
Number of representation: Normal mode 21000	Response time : 0.8 s without ranging
units High resolution 210000	1.5 s with ranging
** High Speed 2100	Zeroing : Automatic
Offset current in input : <20 pA	Zeropoint drift : 0.. +35 °C 2 μV/°C
Series mode : >80 dB 50 Hz signals	+35.. +45 °C 10 μV/°C
rejection ratio (SMRR) + 0.1 %	Maximum input voltage : HI-LO 1000 Vrms
>60 dB 50 Hz signals ± 1 %	HI-Earth 1000 Vrms
Maximum SM signal : 2 × range except	LO-Earth 250 Vrms
2000 V range	
Common mode rejection : >120 dB for DC signals	
ratio (CMRR) >120 dB for 50 Hz signals	
± 0.1 %	

2.2.4 dB measurements in DC ranges (V_{rms})

RANGES	RESOLUTION	ACCURACY	TEMP. COEFF. ± dB/°C	INPUT IMPEDANCE	R.REFERENCE
-77.. +62.2 dB	0.1 dB >1 mV 1 dB <1 mV	+0.2 dB >1 mV +1 dB <1 mV	0.0013	0..1.8 V 20 MΩ//50 pF 1.8..18 V 11 MΩ//80 pF 18 V..600 V 10 MΩ//90 pF	Initial 600 Ω programmable between 0.0001 and 9999

0 dB reference : 1 mW, Rref 600 Ω initial	Common mode rejection : >120 dB for DC
Number of representation units : 999 >1 mV 99 <1 mV	ratio (CMRR) >120 dB for 50 Hz ± 0.1 %
Underload indication (UL) : <0.1 mV	Response time : 1.5 s
Overload indication (OL) : >1000 V	

2.2.5 AC voltage measurements (V_{rms})

RANGES	RESOLUTION* NORMAL **	ACCURACY (between 3 %-100 %)			Additional Accuracy DC component ± % rdg ± % rng	Input Impedance
		± % rdg	± % rng	Frequency range		
200 mV	10 μV	0.3	0.1	40 Hz - 100 Hz	0.2	200 mV 20 MΩ//50 pF
		1	0.5	100 Hz - 20 kHz		
		± 2 dB		20 kHz - 100 kHz		
2 V	100 μV	0.3	0.1	40 Hz - 100 Hz		
20 V	1 mV	1	0.1	100 Hz - 20 kHz	20 V 11 MΩ//80 pF	
200 V	10 mV	5	0.5	20 kHz - 100 kHz	200 V 10 MΩ//90 pF	
2000 V	100 mV	0.3	0.1	40 Hz - 60 Hz	2000 V 10 MΩ//90 pF	

* <0.5 % of range is displayed as zero.
 ** Resolution in High Speed mode is 100 μV in range 200 mV.

Temperature coefficient : (± 0.03 % rdg + 0.01 % rng)/°C Common mode rejection : >120 dB for DC rati on (CMRR) > 60 dB for AC 50 Hz DC voltage on V _{rms} for no additional error : 25 × range Maximum input voltage : HI-LO 750 Vrms HI-Earth 750 Vrms LO-Earth 250 Vrms	Response time : 1.5 s without ranging 3 s with ranging AC detector : True rms Crest factor : 2 at full scale increasing down scale via 2 × full scale/reading Maximum VHz product : 10 ⁷ Number of representation units : Normal mode 21000 ** High Speed 2100
--	---

2.2.6 dB measurements in AC ranges (V_{rms}, V_{rms})

RANGES	RESOLUTION	ACCURACY	Additional Accuracy DC component
-57.7... +57.7 dB	0.1 dB	-57.7 dB...+47.3 dB 40 Hz ... 20 kHz ± 0.2 dB	± 0.2 dB
		-57.7 dB...-11.7 dB 20 kHz...100 kHz ± 2 dB	
		+43.7 dB...+57.7 dB 40 Hz ... 60 Hz ± 0.2 dB	
		-11.7 dB...+43.7 dB 20 kHz...100 kHz ± 1 dB	

Input Impedance : 0...1.8 V 20 MΩ//50 pF 1.8 V...18 V 11 MΩ//80 pF >18 V 10 MΩ//90 pF Underload (UL) indication: Measured value <1 mV Overload (OL) indication : Measured value >1000 V Reference resistor : Initial 600 Ω Programmable between 0.0001 and 9999 Common Mode : >120 dB for DC signals Rejection Ration (CMRR) : >60 dB for AC signals 50 Hz ± 1 % 0 dB reference : 1 mW, Rref 600 Ω initial	Temperature coefficient : ± 0,02 dB/°C Response time : 3 s AC detector : True rms Crest factor : 2 Maximum input voltage : HI-LO 750 Vrms, HI-Earth 750 Vrms LO-Earth 250 Vrms Number of representation units : 999 Maximum VHz product : 10 ⁷
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2.2.7 Vpeak measurements (Vp+, Vp-, Vpp)

RANGES	RESOLUTION	ACCURACY		TEMP. COEFF. ±% rng/°C	INPUT IMPEDANCE	RESPONSE TIME
		±% rdg	±% rng			
2 V 20 V 200 V	1 mV 10 mV 100 mV	1 (DC + 20 Hz ... 20 kHz)	0.5 (20 Hz ... 100 kHz)	0.15	20 MΩ/50 pF 11 MΩ/80 pF 10 MΩ/90 pF	Without ranging Vpp 1.5 s Vp +/- 1 s With ranging
2000 V*	1 V	1 (DC + 20 Hz...60 Hz)	1		10 MΩ/90 pF	Vpp 5 s VP +/- 2.5 s

* Maximum input 850 Vpeak

Number of representation units : 2100 DC voltage on Vpeak for no additional error : 25 x range Maximum VHz product : 10 ⁷ Measuring time : 500 ms	Maximum input voltage : HI-LO 600 Vrms HI-Earth 600 Vrms LO-Earth 250 Vrms Common mode rejection ratio (CMRR) : > 120 dB for DC signals > 60 dB for AC signals 50 Hz
---	---

2.2.8 DC current measurements (A_{DC})

RANGES	RESOLUTION NORMAL **	ACCURACY		TEMP. COEFF.		VOLTAGE DROP	PROTECTION	RESPONSE TIME
		±% rdg	±% rng	(±% rdg	±% rng)/°C			
1 μA 10 μA 100 μA 1 mA 10 mA 100 mA 1 A 10 A	0.1 nA 1 nA 10 nA 100 nA 1 μA 10 μA 100 μA 1 mA	0.1	0.05	0.01	0.005	<2.5 mV <2.5 mV <2.5 mV <2.5 mV <40 mV <400 mV <40 mV <400 mV	Fuse 630 mA 250 Vrms NOT PROTECTED	2.5 s with ranging 0.8 s without ranging

** Resolution in High Speed mode is 1 nA in range 1 μA

Maximum input voltage : HI-LO 250 Vrms HI-Earth 250 Vrms LO-Earth 250 Vrms Number of representation units : Normal mode 11000 ** High speed 1100	Maximum CM voltage : 250 Vrms 350 Vpeak
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2.2.9 AC current measurements (A~)

RANGES	RESOLUTION NORMAL **	ACCURACY *		TEMP. COEFF. (± % rdg ± % rng)/°C		VOLTAGE DROP	PROTECTION
		± % rdg	± % rng	± % rdg	± % rng		
1 μA 10 μA 100 μA 1 mA 10 mA 100 mA 1 A 10 A	0.1 nA 1 nA 10 nA 100 nA 1 μA 10 μA 100 μA 1 mA	0.4	0.15	0.04	0.015	<2.5 mV <2.5 mV <2.5 mV <2.5 mV <40 mV <400 mV <40 mV <400 mV	Fuse 630 mA T 250 Vrms NOT PROTECTED

* Between 3 % and 100 % of range
Measured value under 1% of range is displayed as zero
** Resolution in High Speed mode is 1 nA in range 1 μA

Crest factor	: 4 at full scale	Maximum CM voltage	: 250 Vrms 350 Vpeak
AC detector	: rms convertor, AC coupled	Maximum input voltage	: HI-LO 250 Vrms HI-Earth 250 Vrms LO-Earth 250 Vrms
Response time	: 1.5 s (without ranging) 3 s (with ranging)		
Number of representation units	: Normal mode 11000 ** High Speed 1100		

2.2.10 Resistance measurements (Ω2W, Ω4W)

RANGES Ω2W	Ω4W*	RESOLUTION NORMAL **	ACCURACY		TEMP. COEFF. (± % rdg ± % rng)/°C		MEASURING CURRENT	POLARITY INPUT SOCKETS
			± % rdg	± % rng	± % rdg	± % rng		
200 Ω 2 kΩ 20 kΩ 200 kΩ 2 MΩ 20 MΩ 200 MΩ	200 Ω 2 kΩ 20 kΩ 200 kΩ 2 MΩ	10 mΩ 100 mΩ 1 Ω 10 Ω 100 Ω 1 kΩ 100 kΩ	0.1 0.5 5	0.05 0.1 1	0.01 0.05 0.5	0.005 0.01 0.1	1 mA 1 mA 100 μA 10 μA 100 nA 10 nA	- on HI + on LO

* Via PROBE input.
** Resolution in High Speed mode is 100 mΩ in range 200 Ω.

Number of representation units	: 200 ..20 MΩ	Normal	**Speed	Protection	: 250 Vrms													
Maximum voltage	: 4 V	21000	2100	Maximum input voltage	: HI-LO 250 V HI-Earth 250 V rms LO-Earth 250 V rms													
Maximum voltage	: 4 V	200 MΩ	1000	Maximum lead resistance on Ω4 W configuration	: 2 Ω													
Response time	:	<table border="1"> <thead> <tr> <th>Range</th> <th>Ranging without</th> <th>with</th> </tr> </thead> <tbody> <tr> <td>200 Ω 2 kΩ 20 kΩ 200 kΩ</td> <td>0.8 s</td> <td>2.5 s</td> </tr> <tr> <td>2 MΩ 20 MΩ</td> <td>2 s</td> <td>3.5 s</td> </tr> <tr> <td>200 MΩ</td> <td>9 s</td> <td>10 s</td> </tr> </tbody> </table>			Range	Ranging without	with	200 Ω 2 kΩ 20 kΩ 200 kΩ	0.8 s	2.5 s	2 MΩ 20 MΩ	2 s	3.5 s	200 MΩ	9 s	10 s		
Range	Ranging without	with																
200 Ω 2 kΩ 20 kΩ 200 kΩ	0.8 s	2.5 s																
2 MΩ 20 MΩ	2 s	3.5 s																
200 MΩ	9 s	10 s																

2.2.11 Diode measurements (→)

RANGE	DRIVING CURRENT	RESOLUTION	POLARITY ON INPUT SOCKETS	RESPONSE TIME	MAXIMUM INPUT VOLTAGE	NUMBER OF REPRESENTATION UNITS
2000.0 mV	1 mA	0.1 mV	- on HI + on LO	0.8 s without ranging	HI-LO 250 V HI-Earth 250 V LO-Earth 250 V	20000

CONTINUITY CHECK (CONT ↓)

RANGE	DRIVING CURRENT	SHORT CIRCUIT	ISOLATION	RESPONSE TIME
BUZZER ↓	1 mA	Audible tone 0 ... 10 Ω	>10 Ω no tone	<0.15 s

2.2.12 Capacity measurements (F)

RANGES	RESOLUTION NORMAL **	ACCURACY		TEMP. COEFF.		MEASURING CURRENT	POLARITY INPUT SOCKETS
		± % rdg	± % rng	(± % rdg	± % rng)/°C		
20 nF	1 pF	1	0.1	0.1	0.01	100 nA	- on HI + on LO
200 nF	10 pF	1	0.1	0.1	0.01	1 μA	
2 μF	100 pF	1	0.1	0.1	0.01	10 μA	
20 μF	1 nF	1	0.1	0.1	0.01	100 μA	
200 μF	10 nF	1	0.1	0.1	0.01	1 mA	
2000 μF	1 μF	10	0.1	1	0.1	1 mA	

** Resolution in High Speed mode is 10 pF in range 20 nF.

Number of representation : Range units Normal mode ** High Speed	20 nF/200 μF 2000 μF 21000 2100 2100 —	Protection : 250 Vrms Maximum input voltage : HI-LO 250 V rms HI-Earth 250 V rms LO-Earth 250 V rms
Maximum voltage at input : <2.5 V Response time : 1 s without ranging 1.5 s with ranging		

2.2.13 Temperature measurement (°C)

RANGES	RESOLUTION		ACCURACY *		MEASURING excluding probe	LINEARISATION	MAX. VOLTAGE ON PROBE TIP
	NORMAL **		± % rdg	± % rng			
-100...+850 °C	0.1 °C		0.3	0.3	1 mA	Probe characteristic is linearised within limits stated in DIN 43760	Depends on probe

* Additional Pt-100 temperature probe needed. (e.g. PM9249)

** Resolution in High Speed mode is 1 °C

Number of representation: Normal mode	8500	Response time : 0.5 s excluding probe
units ** High Speed	850	
Temperature coefficient : (±0.03 % rdg ±0.003 % rng)/°C		

2.2.14 Counter measurements (Hz)

RANGES	RESOLUTION		ACCURACY		TEMP. COEFF. ± % rdg/°C	COUNTER CONVERSION	NUMBER OF REPRESENTATION UNITS	
	HI.RES	NORMAL	± % rdg	± digits			HI.RES	NORMAL
10 kHz	0.1 Hz	1 Hz						
100 kHz	1 Hz	10 Hz						
1 MHz	10 Hz	100 Hz	0.01	2	0.001	1 conv./s.	100000	10000
10 MHz	100 Hz	1 kHz						
100 MHz*	1 kHz	10 kHz					20000	2000

* MAX 20 MHz

Input impedance : 10 MΩ//50 pF	Max VHz product : 10 ⁷ for >5 V
Coupling : AC	
Maximum input voltages : HI-LO 250 V rms HI-Earth 250 V rms LO-Earth 250 V rms	Response time : Normal mode Without ranging 1.5 s Range 10 kHz 0.3 s Range >10 kHz With ranging 0.5 s Range >10 kHz High resolution mode Without ranging 2.5 s Range >10 kHz With ranging 3 s Range >10 kHz 13 s Range 10 kHz
Sensitivity 10 Hz ...100 Hz : 1 Vpeak 100 Hz ... 10 MHz : 250 mVpeak 10 MHz... 20 MHz : 500 mVpeak	
Measuring indication : ~ sign	

2.2.15 Time measurements (s)

RANGES	RESOLUTION	ACCURACY ± % rdg	HOLD-OFF TIME	TRIGGER LEVEL	MAXIMUM VHz product
1 s	10 μs	0.01	30 μs	+1 V	10 ⁷
10 s	100 μs				
100 s	1 ms				
1000 s	10 ms				
10000 s	100 ms				
100000 s	1 s				

<p>Number of representation: 99999 units</p> <p>Start : By positive or negative trespassing of the triggerlevel. Selectable with pushbutton s.</p> <p>Stop : By positive or negative trespassing of the triggerlevel. Selectable with pushbutton s.</p>	<p>Maximum input voltage : HI-LO 250 V HI-Earth 250 V LO-Earth 250 V</p> <p>Reset : - By pushbutton on DATA HOLD probe PM9267 if connected. - By a stop pulse</p> <p>General : - Old measurements are displayed at least 500 ms - Display is up dated at the stop condition moment. - 10 s after a start condition the display starts counting the time in seconds until the stop condition is met. - If measuring time > 10 s, the bleeper will be activated by the stop condition. A moving bargraph indicates a measurement in progress</p>
---	--

2.2.16 Calculate functions

a. Relative reference	: Setting with pushbutton ZERO. Relative reference values can be entered manually or by measuring a signal. With pushbutton RCL the stored relative reference value can be recalled. The relative reference function is valid in in all measuring functions except in continuity check (CONT r!).
b. Minimum/Maximum	: Highest and lowest measured values are stored and can be displayed within a function. The MIN/MAX function is valid in all main functions.
c. dBm	: Display = $20 \log \frac{V_x}{V_r}$ V_x = measured value V_r = reference value The dBm function is valid in functions $V_{\text{---}}$, V_{\sim} , $V_{\overline{\sim}}$

2.2.17 Conversion characteristics

Kind of conversion :	Linear	Means of representation of output value.	: Liquid crystal display. Reflective. Additional analog represent function with Bargraph LCD.
Operating principle:	Delta modulation	Means of polarity representation.	+ or - or blanked according measured quantity.
Basic mode operation :	Repetitive triggered	Means of decimal point representation.	Automatic
Range setting :	Manual with UP and DOWN pushbuttons. Automatic Up-ranging (100 % of scale) Down-ranging (9.5 % of scale)	Means of function representation.	Selected function is indicated in the display.
	2000 10000 20 000 200000	190 950 1900 19000	OL in the display.
Polarity setting	Automatic on V_{\sim} , A_{\sim} , V_{peak} , °C, dB, Relative reference,	Means of overload representation.	1 in the display
Display		Means of representation of exceeding crestfactor.	
Number of digits	5.5, 4.5, 4, 3.5 depending on function and range.	Means of measuring mode representation	: High speed SPEED 3 Normal SPEED 2 High resolution SPEED 1
Number of representation units	2100 depending on function and range 11000 on 21000 function and 210000 range		
			<i>Note: SPEED 3 only on /51, /61 version for V_{\sim}, V_{\sim}, Ω, F, A_{\sim}, A_{\sim}. SPEED 1 only on /51, /61 version for °C.</i>
		Range hold	With pushbutton AUT/MAN
		Data hold	With optional DATA HOLD probe PM9267.

2.2.18 External triggering (/51 and /61 version only)

Response times (single trigger, without ranging) in seconds.			
FUNCTION	HSM (SPEED 3)	NM (SPEED 2)	HRM (SPEED 1)
V_{\sim}	0.1	0.4	4
V_{\sim}	0.25	0.55	-
V_{p+} , V_{p-}	-	0.5	-
V_{pp}	-	1.0	-
A_{\sim}	0.1	0.4	-
A_{\sim}	0.25	0.55	-
°C	-	0.5	4.5
Hz	-	0.3	1.2 (Range 100 kHz...20 MHz)
Hz	-	1.5	1.1 (Range 10 kHz)
\sphericalangle	0.1	-	-
\rightarrow	0.1	0.5	-
F	0.2	0.5	-

2.3 ENVIRONMENTAL CONDITIONS

2.3.1 General

The environmental data mentioned in this manual are based on the results of the manufacturer's checking procedures.

Details on these procedures and failure criteria are supplied on request by the PHILIPS organisation in your country, or by PHILIPS, INDUSTRIAL & ELECTRO-ACOUSTIC SYSTEMS DIVISION, EINDHOVEN, THE NETHERLANDS.

Operating conditions are specified according to IEC 359.

2.3.2 Operating conditions

<p>Climatic conditions : Group 1 with extension of the temperature limits.</p> <p>Temperature.</p> <p>Reference : +23 °C ± 5 °C</p> <p>Rated range of use : 0 °C... +40 °C</p> <p>Limit range of operation : 0 °C... +55 °C</p> <p>Limit range of storage and transport : -40 °C... +70 °C</p> <p>Adjustment range : +21 °C... +25 °C (factory only)</p> <p>Humidity</p> <p>Reference : 20 %...80 % RH excluding condensation</p> <p>Limit range of storage and transport : 5 %...95 % RH</p> <p>Max. dew point : 26 °C</p>	<p>Mechanical conditions : according UN-D 1639/03 class: portable equipment sub class 1.</p> <p>EMC Emmision : CISPR publ. 11 and 14 VDE 871-B and 875-K according VFG 1046/84</p>
---	--

2.3.3 Line supply conditions

<p>Line voltage</p> <p>Group : S2</p> <p>Reference value : 230 V + 1 %</p> <p>Rated range of use : 230 V + 12%-15 %</p> <p>Note 1 : Instrument can be altered for nominal line voltage of 11 V</p> <p>Line frequency</p> <p>Reference : 50 Hz + 1 %</p> <p>Rated range of use : 50 Hz + 5 %</p> <p>Note 1 : PM2525 can be altered for nominal line frequency of 60 Hz</p> <p>Note 2 : Mains frequency can influence Series Mode Rejection To meet same spec. for 60 Hz as for 50 Hz signals, the settings of the PM2525 must be altered in the CHECK function.</p>	<p>Line supply interruptions</p> <p>Interruption < 30 ms : no influence</p> <p>> 30 < 500 ms : PM2525 may either restart or continue</p> <p>> 500 ms : PM2525 will restart, conditions equals situation after power-on.</p> <p>Power consumption : 12 VA</p>
--	--

2.4 CALIBRATION

Recalibration interval : 1 year

2.5 MISCELLANEOUS

Dimensions : L x W x H 287 x 210 x 86 mm excluding feet
287 x 210 x 106 mm including feet

Weight : 2.5 kg /01
3.5 kg /21 /51 /61 /71

Cabinet : BAYBLEND KL 1441 /01 /21. /51 /61 /71 steel backplate

2.6 SAFETY

Class 2, according IEC 348

2.7 ACCESSORIES

Supplied with the : Measuring leads PM9266 (incl. probes)
PM2525 Mains cable
Spare fuses; 2 x 630 mA for current ranges
1 x 630 mA for mains.
Operation manual

Optional accessories : PM9101 Current gun
PM9102 Current gun
PM9210 High frequency voltage probe
PM9213 High frequency voltage probe
PM9244 Shunt
PM9245 Current transformer
PM9246 EHT probe
PM9249/01 Pt-100 temperature probe
PM9264/01 4 wire Ohm cable 5322 321 20506
PM9266 Measuring leads including probes
PM9267/01 Data hold probe
PM9877/J Thermo coupler Linearizer
PM9877/K Thermo coupler Linearizer
PM2193 19 inch Rackmount

3. INSTALLATION INSTRUCTIONS

3.1 INITIAL INSPECTION

Check the contents of the shipment for completeness and note whether any damage has occurred during transport. If the contents are incomplete, or there is damage, a claim should be filed with the carrier immediately, and the Philips Sales or Service organisation should be notified in order to facilitate the repair or replacement of the instrument.

3.2 SAFETY INSTRUCTIONS

3.2.1 Earthing (Grounding)

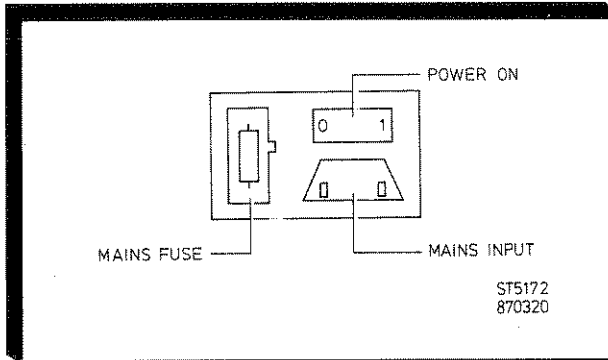
This instrument has a double-insulated power supply. In normal operation the need of a protective earth connection is obviated.

3.2.2 Mains voltage setting and fuses

- Before inserting the mains plug into the mains socket, make sure that the instrument is set to the local mains voltage.

NOTE: *If the mains plug has to be adapted to the local situation it should only be done by a qualified person.*

WARNING: **The instrument shall be disconnected from all voltage sources when a fuse is to be renewed, or when the instrument is to be adapted to a different mains voltage.**



- The instrument shall be set to the local mains voltage only by a qualified person who is aware of the hazards involved.
- Make sure that only fuses of the required current rating, and specified type are used for renewal. The use of repaired fuses, and/or the short-circuiting of fuse holders, is prohibited.
- Fuses shall only be renewed by a qualified person who is aware of the hazard involved.

MAINS VOLTAGE

On the typenumber plate at the rear of the instrument is indicated to what mains voltage the instrument is set. The following codes are used.

STANDARD VERSIONS

PM2525/01	230 V - 12/ + 15 %, 50 Hz, EUROPE power cord
PM2525/013	115 V - 12/ + 15 %, 50 Hz, USA power cord
PM2525/014	230 V - 12/ + 15 %, 50 Hz, UK power cord
PM2525/015	230 V - 12/ + 15 %, 50 Hz, CH power cord

For modification from one version to another refer to the service manual of this instrument.

MAINS FUSE

The mains fuse is located in a holder on the rear panel, adjacent to the mains socket. To replace it, first remove the mains cable and prise out the lift-out lug with a screwdriver.

MAINS	FUSE
230 V	630 mA/250 V DIN41571
115 V	630 mA/250 V DIN41571

3.3 OPERATING POSITION OF THE INSTRUMENT

- The instrument may be used in the position. With the handle folded down, the instrument may be used in a sloping position. The characteristics mentioned in Section 2 are guaranteed for the normal (horizontal) position as well as for the sloping position or when the handle is folded down.
- Do not position the instrument on any surface which produces or radiates heat, or in direct sunlight.

4. OPERATING INSTRUCTIONS

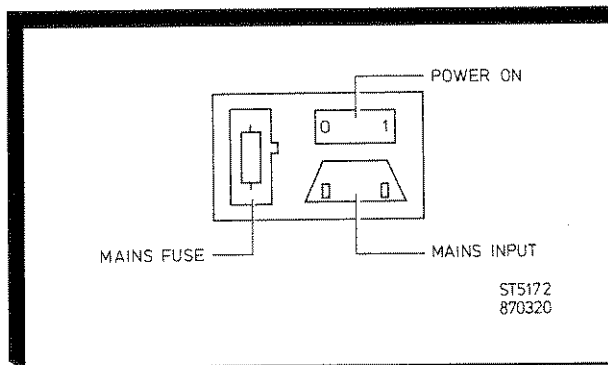
4.1 GENERAL INFORMATION

This section outlines the procedures and precautions necessary for operation. It identifies and briefly describes the functions of the front and rear panel controls and indicators, and explains the practical aspects of operation to enable an operator to evaluate quickly the instruments main functions.

4.2 SWITCHING-ON

The instrument may be switched "ON" after making sure that the installation instructions, described in Section 3 have been followed.

Having switched on, it is immediately ready for use.



REMARK: After switching-on the complete display will be lighted for about 6 seconds. In this period the PM2525 carries out an internal check procedure. After the check procedure the PM2525 jumps to its initial Power On state.

The initial Power On state is:

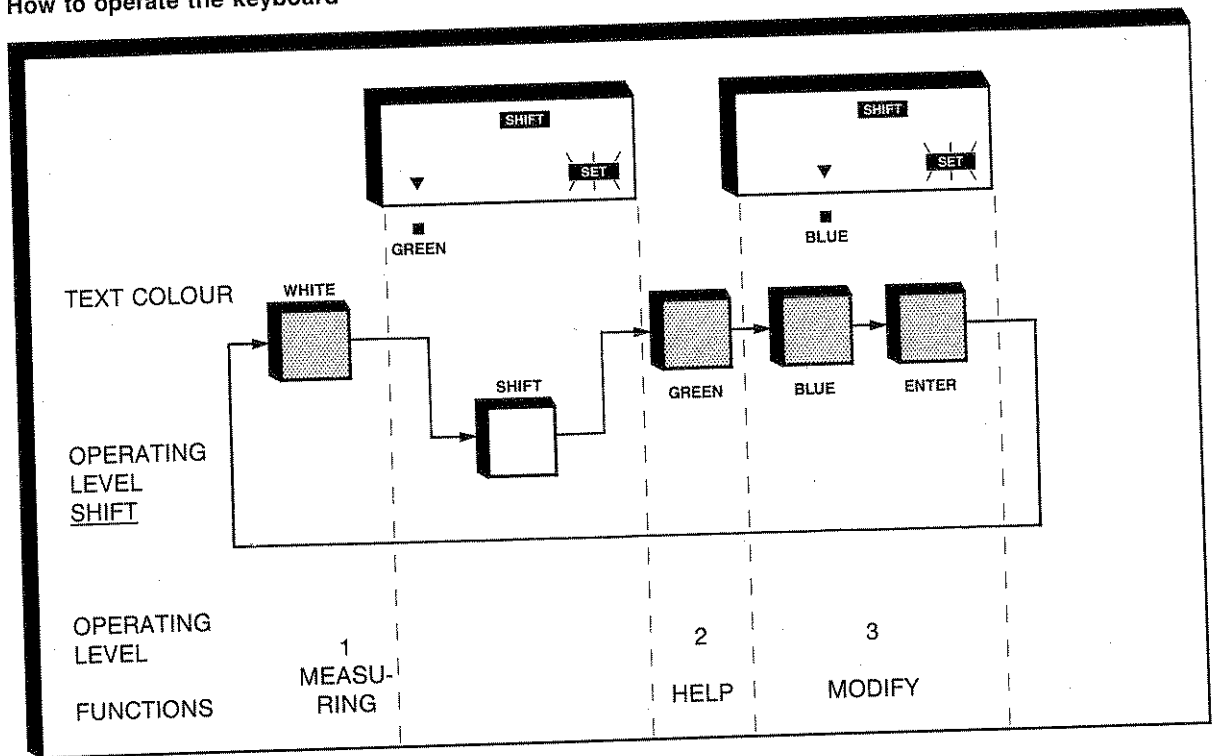
Function : V ---

Ranging : AUTomatic



4.3 KEYBOARD

4.3.1 How to operate the keyboard



The functions on the keyboard can be subdivided into three operating levels. Each operating level has its own operation sequence.

1. MEASURING FUNCTIONS (white text)
 - The indication is situated ABOVE and in the FIRSTLINE UNDER the keys.
 - The functions ABOVE the keys can be direct operated.
 - The functions UNDER the keys are toggle functions from the functions ABOVE the keys.
2. HELP FUNCTIONS (green text)
 - The indication is situated in the FIRST LINE UNDER the right-hand top keys.
 - Operation after pressing the operating level SHIFT key.
3. MODIFYING AND ENTERING FIGURES (blue) IN THE HELPFUNCTIONS
 - The indication is situated UNDER the keys in the SECOND LINE.
 - The entering of figures is automatically requested in the relevant help-functions with the blinking SET on the display.
 - The figured can be cleared with the CLR key.
 - The ENTER key TERMINATES the action.

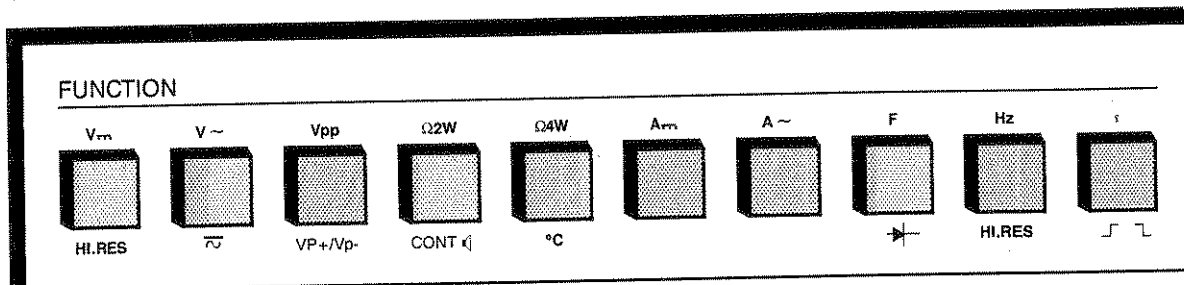
4.3.2 Short description of the keyboard controls

4.3.2.1 Measuring functions (white text, direct operation)

The multimeter functions can be subdivided into three categories viz:

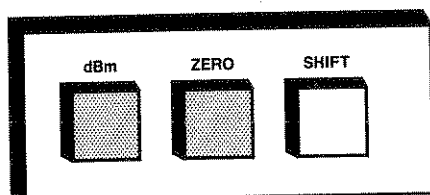
- CATEGORY 1 MEASURING FUNCTIONS
- CATEGORY 2 RELATED TO SPECIFIC MEASURING FUNCTIONS
- CATEGORY 3 RELATED TO ALL MEASURING FUNCTIONS

CATEGORY 1 MEASURING FUNCTIONS



The measuring functions such as V_m , V_{\sim} can be direct operated. To switch-on a function from the FIRST LINE UNDER the keys press the concerning key twice (toggle operation)

CATEGORY 2 RELATED TO SPECIFIC MEASURING FUNCTIONS



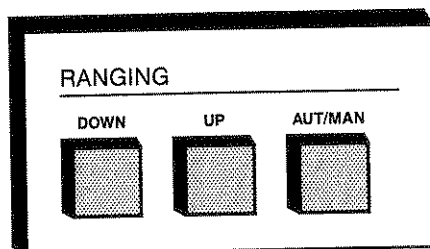
Function dBm has a direct relation to function V_m , V_{\sim} , and $V_{\overline{\sim}}$. In these three functions the dBm function can be switched on and off. For the other functions it is locked.

Function ZERO is related to all main functions except function (s) and continuity check (CONT \square).

Both function dBm and ZERO are switched-off when leaving the measuring function.

Function SHIFT enables selection of the help functions (green).

CATEGORY 3 RELATED TO ALL MEASURING FUNCTIONS



A selection can be made between manual (M RNG on the display) or automatic ranging. The UP and DOWN buttons are used to range.



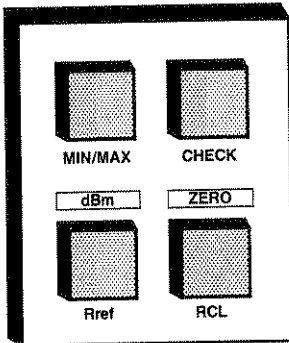
RESET

Pushbutton (pencil-point operation) to reset the PM2525 to the initial state

CAL

The calibration mode (pencil-point operation) can be enabled (Refer to the service manual of this instrument).

4.3.2.2 Help functions (green text, under the SHIFT key)



MIN/MAX (minimum/maximum)

In the MIN/MAX function the minimum and maximum measured values in a measuring function can be displayed. The MIN/MAX registers are cleared with the CLR key while reading or by selecting another measuring function.

Rref

The Rreference function is related to function dBm. Via Rref the reference resistors (default $V \approx 50\Omega$, $V \approx 600\Omega$) can be modified.

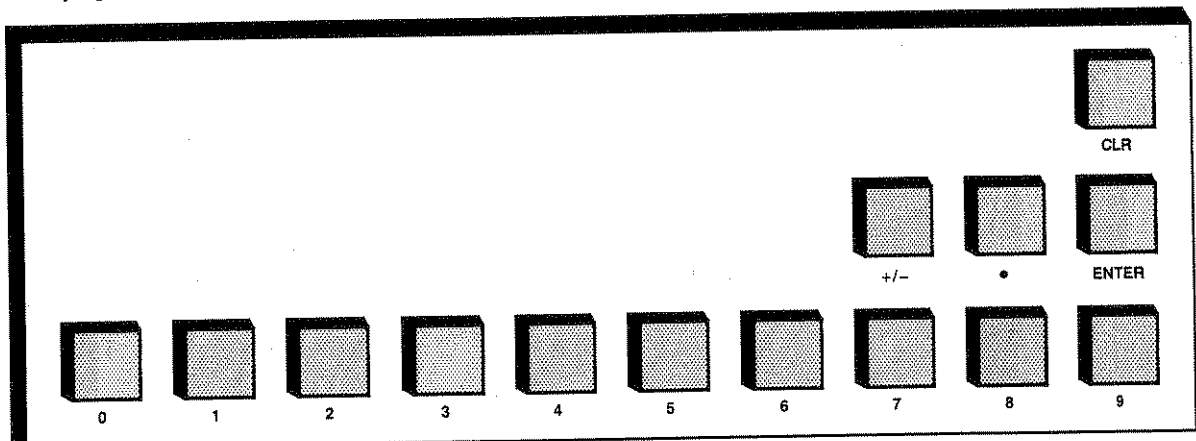
CHECK

The check function allows adaption to the local mains frequency (50/60 Hz) and checks the software version.

RCL

The recall function (RCL) is related to the ZERO function. It allows to check or modify the relative reference value.

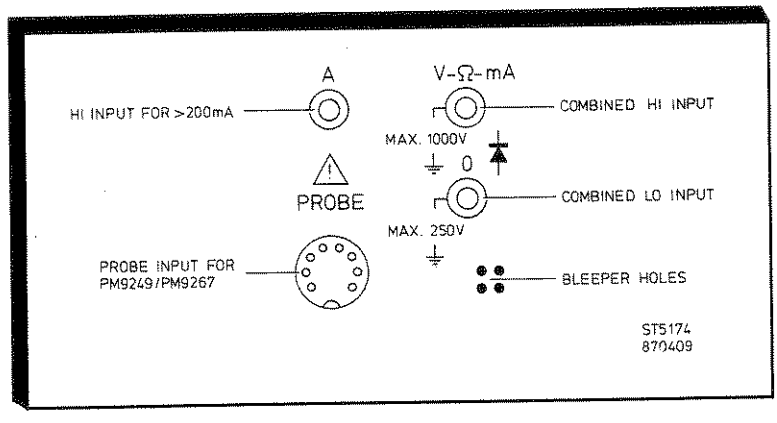
4.3.2.3 Modifying and entering figures (blue text, under SHIFT key)



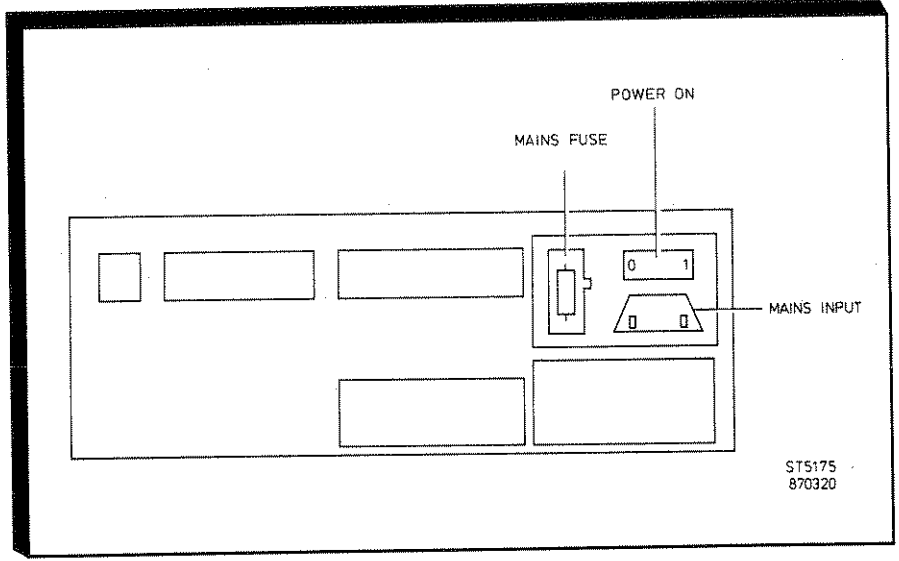
In the help functions, figures have to be input for parameters.

Filling the display goes from left to right. At selection of a help function the old parameters are shown first. If no change is wanted ENTER can be pressed. With the CLR (clear) key a mistaken entry of figures can be cleared.

4.3.2.4 Inputs



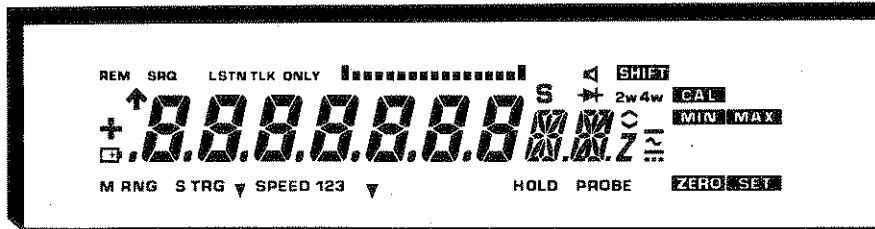
4.3.2.5 Rear panel controls





4.4 DISPLAY

4.4.1 Display indications



■ (gn) ■ (bl)

ST5182

In this chapter an overview of all the display functions is given. Each function is followed by a short description. These descriptions give the reader an idea of the status of the PM2525.

IEEE-488/IEC-625 MESSAGES (not used in PM2525/01)

REM	Remote, no control via keyboard possible.
SRQ	Service request, instrument asks service.
LSTN	Listener, instrument is ready to accept data.
TLK	Talker, instrument is ready to send data.
TLK ONLY	Talk only, operation without controller.

MULTIMETER MESSAGES



Bargraph indicator.
Dependent on the function the bargraph is used as:
TREND INDICATOR
ZERO ADJUSTMENT INDICATOR
CONTINUITY CHECK INDICATOR
TIMER START INDICATOR



Bleeper function on indicator in function CONTINUITY CHECK.



Crestfactor exceed indicator.



Polarity indicator in functions V $\overline{\text{---}}$, A $\overline{\text{---}}$, ZERO SET, °C, Vp+, Vp-



Battery low indicator for PM2525/21 battery version.



Result indication and/or message indication.

M RNG

Manual ranging indicator.

S TRG

Single trigger indicator. The single trigger mode is valid for all functions if switched on via the IEEE-488/IEC-625 interface or via the optional data hold probe PM9267.

(green)▼

Help functions indicator, green text is valid.

SPEED 123

Measuring speed indicators.

(blue)▼

Input of figures indicator. Blue text is valid.

HOLD

Data hold indicator, used in combination with DATA HOLD probe PM9267.

PROBE

Probe indicator. At the moment a probe is connected, the PROBE indicator is lit. As probes can be used: PM9249 Pt-100 TEMPERATURE
PM9267 DATA HOLD

S

Unit indicator for time measurements.



Diode indicator for function $\overline{\text{---}}$.

2w 4w

Resistance measurements indicator.
2W = 2-wire configuration.
4W = 4-wire configuration.

^
v

Peak voltage indicator.
^ = Volt positive peak.(Vp+)
v = Volt negative peak.(Vp-)
v^ = Volt peak-peak. (Vpp)



Message/Unit indicator (mV VΩ H A ∫ ∫ dB °C).

Z

Z indicator of unit Hz.

~

AC indicator. ~ = AC volts, AC currents.
~ = AC volts + DC component.

—

DC indicator. V —, A —

SHIFT

Keyboard operating level SHIFT indicator.
LEVEL 1 = white text
LEVEL 2 = green text
LEVEL 3 = blue text

CAL

Calibration mode indicator.

MIN MAX

Minimum/maximum indicators. The displayed result is the MIN or MAX value measured in the previous time.

ZERO

Relative reference mode indicator.

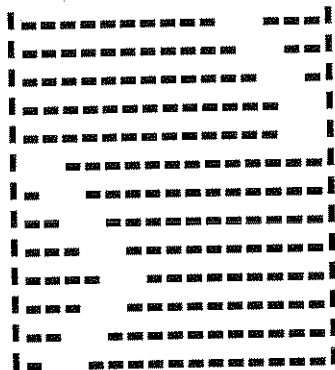
SET

Indication that figures have to be entered.

4.4.2 Bargraph

The PM2525 has an analog bar display which can be used when making the following measurements.

TREND PEAK and VALLEY V_{max} , V_{min} , V_{avg} , V_{pp} , V_{p+} , V_{p-} , Ω_{2W} , Ω_{4W} , A_{max} , A_{min} , F



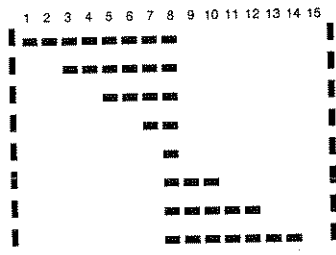
When the gap in the bargraph moves to the right the measured value is increasing.

When the gap reaches one end of the bargraph it reappears at the other end.

When the gap changes its direction of movement a peak (or valley) value has been passed. At this point the bargraph resolution is 1% of reading (minimum 10 digits).

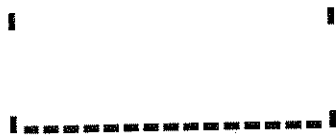
When the gap in the bargraph moves to the left the measured value is decreasing.

ZERO ADJUSTMENT using Relative Reference Mode



Measured value less than Z.S. by 2048 dig.
 Measured value less than Z.S. by 512 dig.
 Measured value less than Z.S. by 128 dig.
 Measured value less than Z.S. by 32 dig.
 Measured value is within 32 dig. of Z.S.
 Measured value more than Z.S. by 64 dig.
 Measured value more than Z.S. by 256 dig.
 Measured value more than Z.S. by 1024 dig.
 (Z.S. is the ZERO SET value)


CONTINUITY CHECK in function CONT



Measured value $> 200 \Omega$

Measured value $\leq 10 \Omega$ - Beeper high tone

TIMER START INDICATOR in function s.



When the gap in the bargraph moves the time measurement is started and still running (Gate indication)

4.5 FUNCTION RELATED DISPLAYS

DISPLAY	FUNCTION	REMARKS
<p>+ 0.0000 mV =</p> <p>SPEED 2</p> <p>+ 000.000 mV =</p> <p>SPEED 1</p>	<p>V\equiv</p> <p>V\equiv,Hi.RES</p>	<p>5 DIGITS</p> <p>6 DIGITS SPEED 1</p>
<p>000.00 mV ~</p> <p>000.00 mV \approx</p>	<p>V\sim</p> <p>V\approx</p>	<p>5 DIGITS</p> <p>5 DIGITS</p>
<p>0000.0 dB =</p> <p>0000.0 dB ~</p> <p>0000.0 dB \approx</p>	<p>dBm,V\equiv</p> <p>dBm,V\sim</p> <p>dBm,V\approx</p>	<p>Rref = DEFAULT 600 Ω</p> <p>Rref = DEFAULT 600 Ω</p> <p>Rref = DEFAULT 600 Ω</p>
<p>0.0000 Vp\circ</p> <p>+ 0.0000 Vp\sim</p> <p>- 0.0000 Vp\sim</p>	<p>Vpp</p> <p>Vp+</p> <p>Vp-</p>	<p>4 DIGITS</p>
<p>0000.00 Ω 2w</p> <p>0000.00 Ω 4w</p> <p>PROBE</p>	<p>Ω 2W</p> <p>Ω 4W</p>	<p>5 DIGITS RANGE 200M Ω IS 4 DIGITS</p>
<p>OPEN</p> <p>CLOSED</p>	<p>CONT. \square</p> <p>CONT. \square</p>	<p>> 10 Ω</p> <p>< 10 Ω \approx</p>
<p>+ 0000.0 \circC</p> <p>PROBE</p>	<p>\circC</p>	<p>Pt-100 PROBE HAS TO BE CONNECTED</p>
<p>Error</p>	<p>All except A\equiv, A\sim and plug in A socket.</p>	<p>ERROR INDICATION. REMOVE PLUG FROM A SOCKET OR SELECT FUNCTION A\equiv OR A\sim</p>

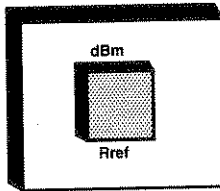
1000000 mV

DISPLAY	FUNCTION	REMARKS
<p>000000 $\mu A =$</p> <p>000000 $\mu A \sim$</p>	<p>A=</p> <p>A~</p>	5 DIGITS
<p>000.00 μF</p>	F	5 DIGITS 4 digits (2000 μF)
<p>000000 mV</p>		5 DIGITS
<p>00.000 $kHz \sim$ SPEED 2</p> <p>00.000 $MHz \sim$ SPEED 2</p> <p>00.00000 $kHz \sim$ SPEED 1</p> <p>00.00000 $MHz \sim$ SPEED 1</p>	<p>Hz</p> <p>Hz</p> <p>Hz, Hi.RES</p> <p>Hz, Hi.RES</p>	<p>5 DIGITS</p> <p>5 DIGITS</p> <p>6 DIGITS SPEED1</p> <p>6 DIGITS SPEED1</p>
<p>0.000000 s</p> <p>0.000000 s</p> <p>0.000000 s</p> <p>0.000000 s</p>	S	
<p>600.0 Ω</p>	V~,dBm, SHIFT,Rref	MODIFY Rref AND/OR ENTER Rref
<p>8.8888</p>	X,ZERO, SHIFT,RCL	MODIFY ZERO VALUE AND/OR ENTER
<p>8.8888</p>	SHIFT,MIN	CLR OR ENTER
<p>8.8888</p>	SHIFT,MIN ENTER	CLR OR ENTER

4.6 DETAILED MEASURING FUNCTION EXPLANATION

4.6.1 Related to specific measuring functions

4.6.1.1 dBm decibel measurements



The measured input voltage (V_{\sim} , V_{\sim} , V_{\sim}) can be converted into dB value (0dBm = 1 mW, in a selectable reference resistor). Default the reference resistors 600 Ω . The reference resistor can be modified (cleared at power-off). At measuring overload "OL" will appear on the display. At short-circuited input "UL" which means "underload" will appear on the display.

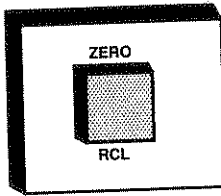
EXAMPLE 1	OPERATION	DISPLAY
ENTER 50 Ω R REF IN FUNCTION V_{\sim}		①
		②
		③

- ① Previous value for Rref. (default value for V_{\sim}).
- ② Enter Rref. Remark: Press "CLR" key to clear a mistaken entry.
- ③ After the next measurement dBm with 50 Ω R ref in V_{\sim} is calculated and displayed.

EXAMPLE 2	OPERATION	DISPLAY
SWITCH ON dBm and CHECK Rref in V_{\sim}		①
		②

- ① Previous value for Rref is shown for 1 second.
- ② After the next measurement dBm with 50 Ω R ref in V_{\sim} is calculated and displayed.

4.6.1.2 ZERO (Relative reference)



In the ZERO function measuring results can be stored as relative reference values. The ZERO function is not valid in continuity check (CONT \ast) function. From the successive measured values (X) the contents of the ZERO register (D) is subtracted (X-D). Relative reference values can be entered manually or by measuring a signal. The ZERO function can be switched off by leaving the measuring function or by pressing the ZERO key again.

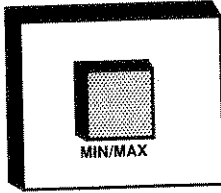
EXAMPLE 1	OPERATION	DISPLAY
ENTER D= MEASURED VALUE		+ 100.00 mV =
		+ 100.00 mV = ①
		- 100.00 mV = ②

- ① Last measured value stays on the display for 1 second.
- ② Calculated X-D.

EXAMPLE 2	OPERATION	DISPLAY
ENTER D=10V _{DC}		+ 000.00 mV =
		+ 000.00 mV = ①
	 	10000 mV = ②
		+ 0 1000 V = ③

- ① Contents of ZERO register. Press ENTER to use this value for parameter of D.
- ② Enter D. Remark: Press "CLR" key to clear mistaken entry.
- ③ After the next measurement X-D is calculated and displayed. +11 V will generate +1 V.

4.6.1.3 MIN/MAX



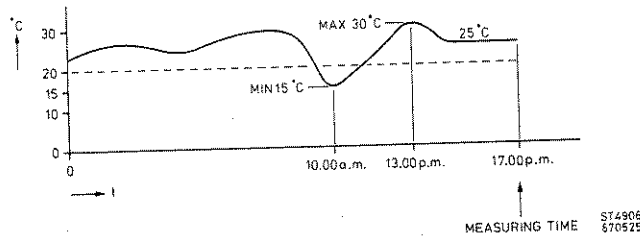
The function minimum/maximum is continuously updating the extreme values of the measuring results. The minimum and maximum are stored in registers within one function. Via the MIN/MAX key the stored values can be read.

During reading, measuring of the minimum and maximum values is continued. If a new extreme is measured it will be immediately displayed.

The MIN/MAX mode is valid in all measuring functions.

The MIN/MAX registers are cleared when selecting another mainfunction or pressing the CLR key when MIN/MAX is on.

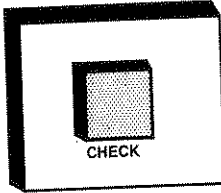
EXAMPLE: Measurement of minimum and maximum temperatures.
(MIN/MAX thermometer)





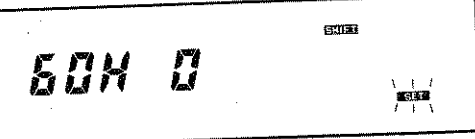



EXAMPLE 1	OPERATION	DISPLAY
READ MINIMUM AND MAXIMUM TEMPERATURE. (FUNCTION °C WITH THE PT100 PROBE MP9249)		+ 025.0 °C PROBE
		+ 015.0 °C v (BL) PROBE
		+ 030.0 °C v (BL) PROBE
		+ 025.0 °C PROBE






- ① Present value.
- ② Minimum value.
- ③ Maximum value.
- ④ New measuring value. While reading, the PM2525 keeps on measuring. The new results are compared with the "OLD" values and refreshed.

4.6.1.4 **CHECK**



In the check function the instrument can be adapted to another mains frequency and the software version can be checked.

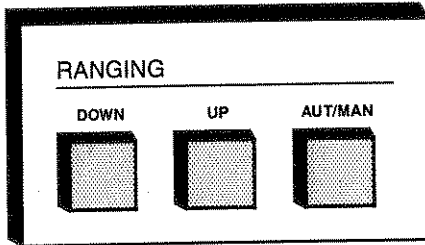
EXAMPLE 1	OPERATION	DISPLAY
Set PM2525 to 60 Hz mains frequency	 	
		
		PM2525 IS SET TO 60 Hz AND WILL JUMP TO NORMAL MEASURING

EXAMPLE 2	OPERATION	DISPLAY
Check the instrument software version	  	SOFT XX
		
		NORMAL MEASUREMENT

Remark: In case of PM2521/51/61 first the IEEE-488/IEC-625 parameters can be modified (4 steps)

4.6.2 Related to all measuring functions

4.6.2.1 RANGING
















Manual or automatic ranging mode is available for all functions (except °C). Selection between the modes can be made by pressing the AUT/MAN pushbutton. Manual ranging is indicated with M RNG on the display. Auto ranging has no special indication.

The UP ranging level is at >100 % of range (200/20.000/220.000 digits).

The DOWN ranging level is at >9.5 % of range (190/1900/19000 digits).

To eliminate the hysteresis in the automatic ranging mode, higher or lower range can be selected with the UP or DOWN key.

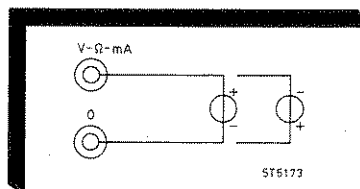
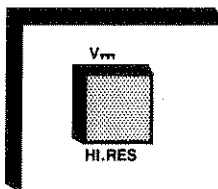
REMARK: Selecting another function will set the AUT ranging mode.

EXAMPLE	OPERATION	DISPLAY
Select range 200 V _{max}	 	
	  	
Select range 2 V _{max} (from range 200 V _{max})	 	
Autoranging (from manual)	 or OTHER 	



4.6.3 Measuring functions

4.6.3.1 DC voltage measurements (V_{DC} , HI.RES)



The dc-voltages are measured with the testleads connected to the V_{Ω} mA and the 0 frontpanel sockets. In the dc voltage function two modes are available viz:

NORMAL MODE with a 5 digit display.

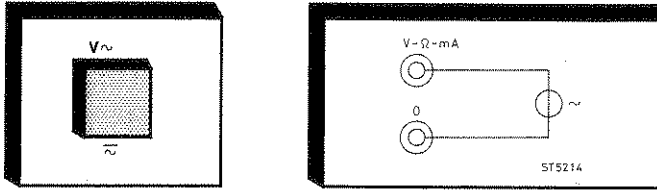
HIGH RESOLUTION MODE with a 6 digit display and slow measuring speed 1.

- Ranges available : 200 mV, 2 V, 20 V, 200 V, 2000 V.
- Range selection (Refer to 4.6.2.1) : Manual with pushbuttons DOWN or UP, in manual ranging mode. Automatic with pushbutton AUT.
- Relative reference (Refer to 4.2.1.1) : With pushbutton ZERO the value present on the display is stored as relative reference value. To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
- dBm (Refer to 4.2.1.1.) : With pushbutton dBm the present value is converted into dB value with the default reference resistor of 600 Ω . To enter any resistor value press SHIFT, Rref, the desired value and terminate with ENTER.
- High resolution : Press HI.RES. The display will be extended with one digit. The measuring speed is set to speed 1.
- Maximum input voltages : 1000 V dc or ac.
- Overload : Overload is indicated with "OL" on the display. For dBm also underload "UL" is indicated at short-circuited input.

EXAMPLE 1	OPERATION	DISPLAY
Select the V_{DC} HIGH RESOLUTION function		

- ① Normal resolution, 5 digits display.
- ② High resolution, 6 digits display, speed 1.

4.6.3.2 AC voltage measurements (V_{\sim} , $V_{\overline{\sim}}$)



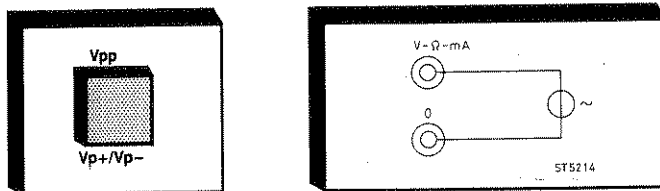
From the ac voltages the RMS value can be measured. Two modes are available viz: Excluding ($V_{\overline{\sim}}$) and including (V_{\sim}) dc component.

The ac voltages are measured with the test-leads connected to the VΩ mA and the 0 frontpanel sockets.

- Ranges available : 200 mV, 2 V, 20 V, 200 V, 2000 V.
- Range selection : Manual with pushbuttons DOWN or UP in manual ranging mode.
(Refer to 4.6.2.1) Automatic with pushbutton AUT.
- Relative reference : With pushbutton ZERO the value present on the display is stored as relative
(Refer to 4.6.1.2) reference value.
To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
- dBm : With pushbutton dBm the present value is converted into dB value with the default
(Refer to 4.6.1.1) reference resistor of 600 Ω. To enter any resistor value press SHIFT, Rref, the desired value and terminate with ENTER.
- $V_{\overline{\sim}}$: Press $V_{\overline{\sim}}$. The PM2525 will measure the RMS value of the dc + ac component.
- Maximum input : 600 V ac or dc, 1000 V peak.
- voltages Overload : Overload is indicated with "OL" on the display.
For dBm also underload "UL" is indicated at short-circuited input.

EXAMPLE 1	OPERATION	DISPLAY
Select function $V_{\overline{\sim}}$		

4.6.3.3 Peak voltage measurements (V_{pp} , V_{p+} , V_{p-})

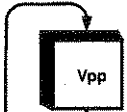

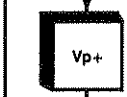

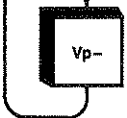



The V-peak function permits the top V_{p+} (\wedge), the bottom V_{p-} (\vee) and the peak-to-peak voltage V_{pp} (\diamond) to be measured of a repetitive voltage wave-form.
 The V_{p+} and V_{p-} function are DC-coupled.
 The V_{pp} function is AC-coupled.

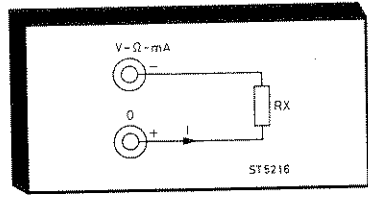
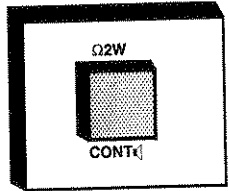
DEFINITION OF V_{p+} (\wedge)	V_{p-} (\vee)	V_{pp} (\diamond)
SYMMETRICAL PULSES		
<div style="float: right; margin-left: 20px;"> $V_{p+} = +4V$ $V_{p-} = -5V$ $V_{pp} = 9V$ </div>		
POSITIVE PULSES		
<div style="float: right; margin-left: 20px;"> $V_{p+} = +4V$ $V_{pp} = 3V$ </div> <p style="font-size: small; margin-top: 10px;">REMARK: V_{p-} CANNOT BE MEASURED. THE DISPLAY WILL SHOW ZERO. V_{p-} CAN BE CALCULATED. $V_{p-} = (V_{p+}) - V_{pp} = +1V$</p>		
NEGATIVE PULSES		
<div style="float: right; margin-left: 20px;"> $V_{p-} = -4V$ $V_{pp} = 3V$ </div> <p style="font-size: small; margin-top: 10px;">REMARK: V_{p+} CANNOT BE MEASURED. THE DISPLAY WILL SHOW ZERO. V_{p+} CAN BE CALCULATED. $V_{p+} = (V_{p-}) - V_{pp} = -1V$</p>		

The peak voltages are measured with the test-leads connected to the $V\Omega$ mA and the 0 frontpanel sockets.

- Ranges available : 2 V, 20 V, 200 V, 2000 V.
- Range selection : Manual with pushbuttons DOWN or UP in manual ranging mode.
 (Refer to 4.6.2.1) Automatic with pushbutton AUT.
- Relative reference : With pushbutton ZERO the value present on the display is stored as relative reference value.
 (Refer to 4.6.1.2.) To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
- V_{p+} : Press V_{p+} when in function V_{pp} .
- V_{p-} : Press V_{p-} when in function V_{p+} .
- Maximum input voltage : 600 V dc or ac. 850 V peak

EXAMPLE 1	OPERATION	DISPLAY
Select function Vp- (v)		
		
		

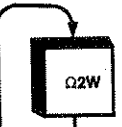

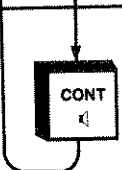
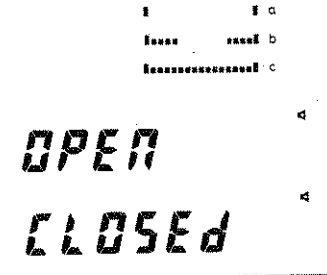
4.6.3.4 Resistance measurements two wire configuration $\Omega 2W$ and continuity check κ




In the resistance function two modes are available viz:
 TWO WIRE $\Omega 2W$ resistance measurements, divided over seven ranges.
 CONTINUITY CHECK κ with one fixed range together with a additional bleeper. Between 0...10 Ω the bleeper produces a tone. >10 Ω no tone is produced.
 The driving current is 1 mA.

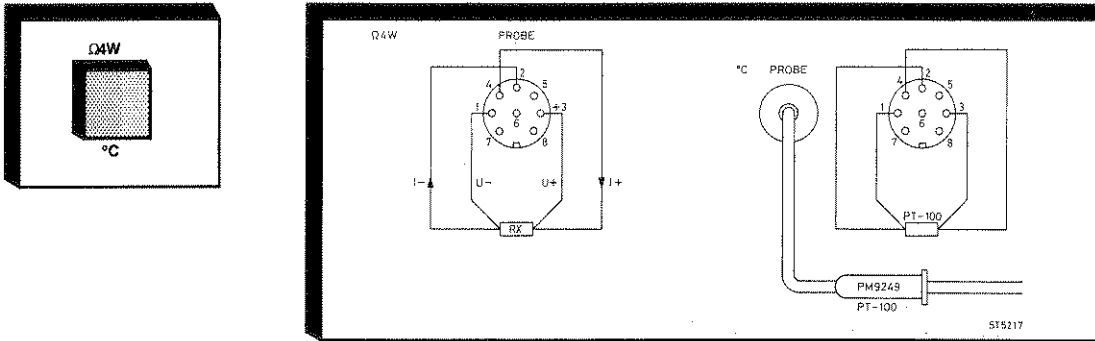
The resistances are measured with the test-leads connected to the V Ω mA and the 0 frontpanel socket.

- Ranges available : $\Omega 2W$; 200 Ω , 2 k, 20 k, 200 k, 2 M, 20 M, 200 M (max 100 M Ω)
- : CONT κ ; 2k Ω (driving current 1 mA)
- Range selection : Manual with pushbuttons DOWN or UP in manual ranging mode.
(Refer to 4.6.2.1) Automatic with pushbutton AUT.
- Relative reference : With pushbutton ZERO the value present on the display is stored as relative reference value.
(Refer to 4.6.1.2) To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
(Not valid in function CONTINUITY CHECK)
- CONT κ : Press CONT κ when in function $\Omega 2W$.
- Maximum input voltage : Between HI and LO 250 V
HI and EARTH 250 V
LO and EARTH 250 V

EXAMPLE 1	OPERATION	DISPLAY
Select function CONT κ		
		

- ① Bargraph indications a = OPEN
b = bad connection
c = CLOSED
- ② >10
- ③ 0 ... 10 Ω and κ 

4.6.3.5 Resistance measurements four-wire configuration $\Omega 4W$ and temperature measurements $^{\circ}C$



In the four-wire resistance measurements two modes are available viz:
 FOUR WIRE $\Omega 4W$ resistance measurements, divided over seven ranges.
 TEMPERATURE MEASUREMENTS $^{\circ}C$ with one fixed range.

The resistances are measured with a special four-wire measuring cable (PM9264/01) CONNECTED TO THE PROBE INPUT.

The temperatures are measured with a PT-100 temperature probe PM9249/01 CONNECTED TO THE PROBE INPUT.

Ranges available : $\Omega 4W$; 200 Ω , 2 k, 20 k, 200 k, 2 M, 20 M
 : $^{\circ}C$; -100 $^{\circ}C$...+850 $^{\circ}C$

Range selection : Manual with pushbuttons DOWN and UP in manual ranging mode.
 (Refer to 4.6.2.1) Automatic with pushbutton AUT.

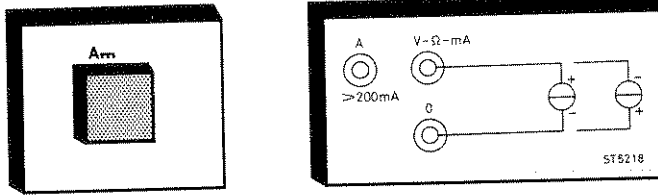
Relative reference : With pushbutton ZERO the value present on the display is stored as relative
 (Refer to 4.6.1.2) reference value.
 To enter any value press SHIFT, RCL the desired value and terminate with ENTER.

$^{\circ}C$: Press $^{\circ}C$ when in function $\Omega 4W$.

Maximum input voltage : Between HI and LO 250 V
 HI and EARTH 250 V
 LO and EARTH 250 V



EXAMPLE 1	OPERATION	DISPLAY
Select function $^{\circ}C$		

4.6.3.6 DC current measurements A_{DC}

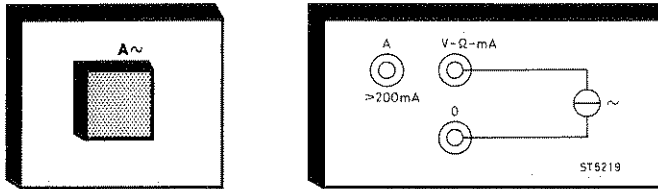


The dc-currents are measured with the test-leads connected to the VΩ mA and the 0 frontpanel sockets.

- Ranges available : 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA, 1 A, 10 A
- Range selection : Manual with pushbuttons DOWN or UP in manual ranging mode.
(Refer to 4.6.2.1) Automatic with pushbutton AUT.
- Relative reference : With pushbutton ZERO the value present on the display is stored as relative reference value.
(Refer to 4.6.1.2) To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
- Maximum input : Between HI and LO 250 V
HI and EARTH 250 V
LO and EARTH 250 V
- Protection : Ranges 1 μ A...100 mA 250 V, Fuse 630 mA.T.
The fuse is located in the bottom cover.
Ranges 1 A, 10 A not protected.



EXAMPLE 1	OPERATION	DISPLAY
Select function A_{DC}		

4.6.3.7 AC current measurements A~

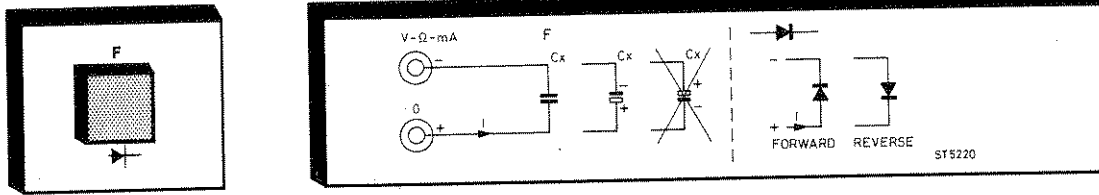


The ac-currents are measured with the test-leads connected to the VΩ mA and the 0 frontpanel sockets. From the ac-currents the RMS value is measured. The ac-current function is AC-coupled (DC component is blocked).

- Ranges available : 1 μ A, 10 μ A, 100 μ A, 1 mA, 10 mA, 100 mA, 1 A, 10 A
- Range selection (Refer to 4.6.2.1) : Manual with pushbuttons DOWN or UP in manual ranging mode. Automatic with pushbutton AUT.
- Relative reference (Refer to 4.6.1.2) : With pushbutton ZERO the value present on the display is stored as relative reference value. To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.
- Maximum input : Between HI and LO 250 V
HI and EARTH 250 V
LO and EARTH 250 V
- Protection : Ranges 1 μ A...100 mA 250 V, Fuse 630 mA. The fuse is located in the bottom cover. Ranges 1 A, 10 A not protected.

EXAMPLE 1	OPERATION	DISPLAY
Select function A~		

4.6.3.8 Capacity F measurements and diode  measurements




In the capacity function two modes are available viz:


CAPACITY (F) measurements divided over six ranges. The polarity of the input sockets allows no incorrect connection of the capacitors. The 0 socket is positive with respect to the V ΩmA socket. The maximum measuring voltage over the input sockets is 4 V.

Remark: At shortcircuited input the display will show overload (OL). This overload is due to the measuring principle used in the PM2525.

Short description of the measuring principle:


Cx is calculated by the time measured to charge Cx to a reference voltage. Charging Cx is done with a reference current. At shortcircuited input measured time will be endless, causing overload.

DIODE  measurements with one fixed range. The driving current is 1 mA.


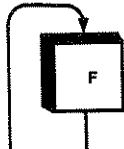



Ranges available : F : 20 nF, 200 nF, 2 μF, 20 μF, 200 μF, 2000 μF
 : one range, driving current 1 mA

Range selection : Manual with pushbuttons DOWN and UP in manual ranging mode.
 (Refer to 4.6.2.1) Automatic with pushbutton AUT.

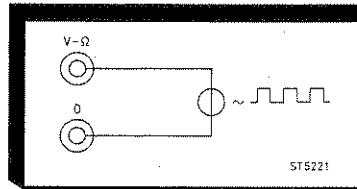
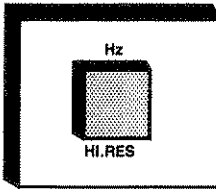
Relative reference : With pushbutton ZERO the present value on the display is stored as relative
 (Refer to 4.6.1.2) reference value.
 To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.

 : Press  when in function F.

Maximum input voltage : between HI and LO 250 V
 HI and EARTH 250 V
 LO and EARTH 250 V

EXAMPLE 1	OPERATION	DISPLAY
Select function 		
		

4.6.3.9 Frequency measurements Hz and Hz HI.RES



In the frequency function two modes are available viz:

NORMAL MODE (speed 2) with a 5 digit display and a measuring time of 100 ms.

Range 10 kHz has a measuring time of 1 s.

HIGH RESOLUTION MODE (speed 1) with a 6 digit display and a measuring time of 1 s.

Range 10 kHz has a measuring time of 10 s.

Both modes are AC-coupled (DC component is blocked).

The frequencies are measured with the test-leads connected to the VΩ mA and the 0 frontpanel socket.

Ranges available : 10 kHz, 100 kHz, 1 MHz, 10 MHz, 100 MHz (max 20 MHz)

Range selection : Manual with pushbuttons DOWN and UP in manual ranging mode.
Automatic with pushbutton AUT.

Relative reference : With pushbutton ZERO the value present on the display is stored as relative reference value.
(Refer to 4.6.1.2) To enter any value press SHIFT, RCL, the desired value and terminate with ENTER.

HI.RES : Press HI.RES when in function Hz.

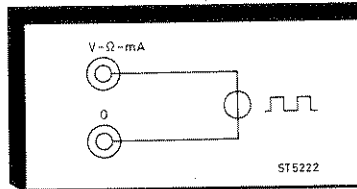
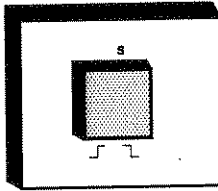
Maximum input voltage : between HI and LO 250 V
HI and EARTH 250 V
LO and EARTH 250 V

EXAMPLE	OPERATION	DISPLAY
Select function HI.RES		

- ① Normal mode 5 digit display.
- ② High resolution, 6 digit display, speed 1.

Remark: The blinking ~ indicates that the PM2525 is measuring.

4.6.3.10 Time measurements s.



The time-measurements function is intended to be used for measuring time interval of voltages in TTL and CMOS circuits.

The time function has four modes viz:

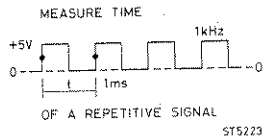

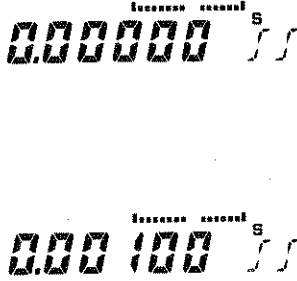
- START on a rising edge and STOP on a rising edge.
- START on a rising edge and STOP on a falling edge.
- START on a falling edge and STOP on a rising edge.
- START on a falling edge and STOP on a falling edge.

All the modes are selected with pushbutton s.






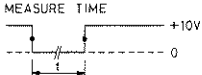



The input signals are measured with the testleads connected to the V ΩmA and the 0 front panel socket.

- Ranges available : 1 s, 10 s, 100 s, 1 000 s, 10 000 s, 100 000 s.
- Range selection : Manual with pushbuttons DOWN and UP in manual ranging mode.
(Refer to 4.6.2.1) Automatic with pushbutton AUT.
- Relative reference : With pushbutton ZERO the value present on the display is stored as relative reference value.
(Refer to 4.6.1.2) To enter any value press SHIFT, RCL the desired value and terminate with ENTER.
- Trigger level : +0.8 V
- Input : DC coupled
- Maximum input : between HI and LO 250 V
HI and EARTH 250 V
LO and EARTH 250 V

With the DATA HOLD PM9267/01 probe extra facilities, such as reset of the display, can be incorporated. (Refer to 4.6.3.11).

EXAMPLE 1	OPERATION	DISPLAY
<p>Select function s, </p> 		

① 3 times per second the display will be refreshed.
t = 1 ms.

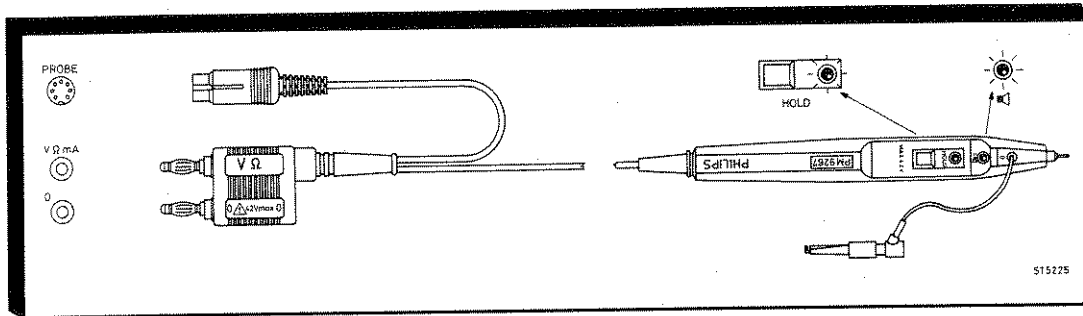
EXAMPLE 2	OPERATION	DISPLAY
Select function s, \square \square		
		
	 measure time  <p>MEASURE TIME OF A NON REPETITIVE SIGNAL STS224</p>	  

- ①
- ②
- ③

- ① The instrument is waiting for the first trigger \square .
- ② The instrument is triggered. The gap in the bargraph starts moving to indicate that the measurement is still running.
- ③ The instrument is stopped by the second trigger \square . The gap in the bargraph stops moving. The time measured is displayed (8 s.)

Remark: If the time is >10 s, the time will be followed by the display. The end of the measurement is signalled by a bleeper signal.

4.6.3.11 Data hold measurements



With the optional DATA HOLD probe PM9267/01 the display of the PM2525 can be frozen. Pressing the HOLD button on the probe will give data hold.

A led on the probe indicates the hold mode.

An additional led (= κ) on the probe indicates the exceed of conditional warnings of the multimeter e.g. Buzzer warnings.



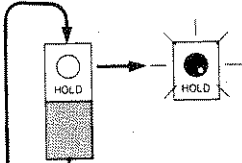

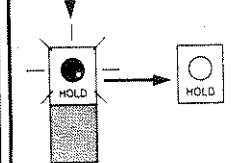

The DATA HOLD probe has to be connected to the VΩ mA, 0-sockets and the PROBE input. Connecting the probe will light the probe indicator on the display.

Using the DATA HOLD probe gives three operation modes:


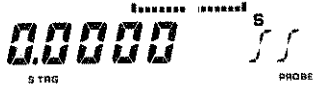
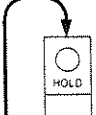


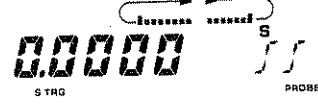


1. Data hold when using the internal triggering of the PM2525. (Not valid in function s.)
2. Data hold when using single triggering. Single trigger is only possible via the IEEE-488 interface of the PM2525/51 or RS232C/V24 interface of the PM2525/61. (Refer to the operation of the PM2525 interfaces).
3. Single trigger in function s.

PROBE SPECIFICATIONS

Maximum input voltages	Probe tip to common 30 Vac 42 Vdc Common to earth 42 Vdc
Maximum input current	200 mA
Input capacity	< 150 pF
Resistance V and 0 leads	< 1,5 Ω

EXAMPLE 1	OPERATION	DISPLAY
<p>Hold data in function</p> <p>V_{max}</p>		 <p>①</p>
		 <p>②</p>
		 <p>③</p>

- ① Probe indicator on display lights when probe is connected.
- ② Display is frozen. The PM2525 keeps on measuring internally while the bargraph also keeps on running.
- ③ PM2525 is measuring and displaying again.

EXAMPLE 2	OPERATION	DISPLAY
<p>START A MEASUREMENT IN FUNCTIONS S</p>		 <p>①</p>
		 <p>②</p>
		 <p>③</p>
		 <p>④</p>

- ① PM2525 is set to single trigger (STRG).
- ② PM2525 is waiting for the trigger condition.
- ③ The PM2525 is triggered. The gap in the bargraph starts moving and the display starts counting to indicate that the measurement still is running.
- ④ The measurement is stopped by the second trigger. The bleeper signal indicates the end.

