EUROSMC, S.A

DIGITAL MICROOHMMETER

INSTRUCTION MANUAL

PME - 100

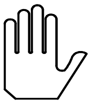
-REFERENCE: HABVMV02
EDITION: 14-09-12
VERSIÓN: 3

"The priority of EUROSMC, S.A. is to obtain the highest standards and quality in all our products, serving to satisfy the expectations and necessities of our clients."

INDEX

OPERATING AND SAFETY SYMBOLS

The following operating and safety symbols are used in this manual. They must be observed during all phases of operation and maintenance of the instrument. Failure to comply with these precautions may cause violation to the design standards of the instrument or injury to the operator



WARNING
Warning signs all attention for a condition that could possibly cause injury to the operator. The instructions must be carefully followed to prevent personnel injury.

CAUTION
Caution signs calls attention for a condition that could possibly cause damage to the instrument. The instructions must be carefully followed to prevent damage.

NOTES
The notes contains important instructions for the operation of the instrument by calling attention to a procedure, field practice or condition that requires special consideration from the operator.

1.- INTRODUCTION

The PME-100 was designed and manufactured as instrument to fulfil the highest levels of quality and standards. Its function is to measure timed events in relay testing and in any temporized time event.

The reduce size and weight, high measurement accuracy, makes this instrument one of the most advance on the market, at this stage..

In achieving this objective, EUROSMC relied on various professionals and companies of recognized prestige, in protection relay maintenance and commissioning. Most of the functions and specifications of the unit, were obtained as a result of advice, ideas, and suggestions given by the above mentioned. The most important features of the PME-100 are:

- Robust mechanical and electrical features.
- Easy transport.
- The capability to have various measurements in one unit to avoid carrying a large number of instrument.
- Easy to operate.

Furthermore, supplied with the PME-100 unit are all the accessories needed for testing, such as cables, clips, transport bag, etc.

In any case, we appreciate suggestions you may have of the PME-100 and this Instruction Manual, in that we always welcome new ideas and advice form users to make or product better. Whatever doubt you may have as an operator, whether it be for applications, use, etc, the technical staff of EUROSMC are at your complete disposal. Our address to assist you:

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2.- GENERAL INFORMATION

The PME-100 is a portable, high precision digital microohmmeter designed for measuring the contact resistance of transformers and motors, resistance of metal alloys and electrodes, resistance of cable splices and fuses, busbar and other joint resistances.

Designed for work under different environment conditions this rugged, compact microohmmeter is easy to use and operates on 120V or 220V AC mains. The instrument can also be powered by its internal rechargeable battery for measurement up to 10A. Being a very versatile portable test instrument, it can be used with great flexibility in the field or in the laboratory, as well as in a production line.

Working as a fully portable test instrument, the PME-100 provides six resistance measurement ranges with full-scale values of resistance, 200Ω, 20Ω, 2Ω, 0.2Ω, 20mΩ, y 2mΩ. The DC test current provided by the instrument depends upon the selected range. When powered by its internal rechargeable battery, the availability of the instrument in the terms of battery life will also depend upon the selected measurement range.

Two additional 2000μΩ and 200μΩ ranges are available for measurements with 100A DC test current. When testing with these two high current ranges the PME-100 can be powered by the AC mains only.

The PME-100 operates under the well-known, four-wire measurement principle with the voltage drop across the resistance under test being measured by an accurate circuit and displayed directly in ohms, miliohms or microohms in a 3 and 1/2-digit LCD display. Operation of the PME-100 is simple and easy consisting of connecting the leads, turning on the instrument and reading. Warm-up time is negligible..

2.1.- Accessories included

The PME-100 includes a set of standard accessories. When you receive your PME-100, please verify that the items mentioned below are included.

- Voltage Supply cable, 3 m
- Cable for Earth connection 2 m
- 2 Cables for 10 A measurement, 8 m
- 2 Cables for 100 A measurement, 14 m
- 2 Cables for voltaje measurement , 14 m
- 2 Voltage probes
- 3 clips
- Instruction manual

2.2.- Front Panel Description

Figure 2.2 illustrates the front panel of the PME-100 and the location of the controls and connectors. The description of the their functions are listed on the following page.

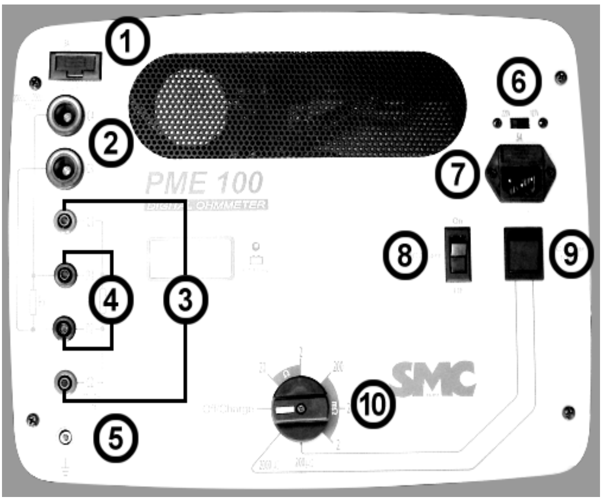


Fig. 2.2. Front Panel of the PME-100.

1. Measurement Circuit Protection Fuse.
   This 8 A fuse protects the instrument against improper test connections. It is mounted in a fuse holder that incorporates a compartment for holding one spare fuse.

2. 100A Test Current Terminals
   Used for measurements in the 2000μΩ and 200μΩ ranges with 100A test current.

3. 10A Test Current Terminals
   Used for measurements in the 20Ω,2Ω, 0.2Ω, 20mΩ and 2mΩ ranges with test currents up to 10A.

4. Potential Terminals
   Used in all test ranges to complete the Kelvin connection to the resistance under test.

5. Ground Terminal
   Used for electrical grounding (Safety Grounding).

6. Selecting Voltage Line Supply 127/220V Selection Switch

7. Power Input Plug
   AC input power plug. Incorporates the line power protection fuse). It also has a fuse holder compartment for holding one spare fuse

8. 100A ON/OFF Switch
   Controls the 100A power supply during the measurements in the 200μΩ and 2000μΩ ranges
   .

9. AC Power ON/OFF Switch
   Controls the AC power input to the PME-100.

10. Test Range Selection Switch
    Allows the selection of the ranges as indicated in Table I. In the CHARGE position allows the charge of the internal battery when the AC power ON/OFF switch is on.

2.3.- Technical Characteristics

2.3.1.- Electrical Specifications

Measurement Ranges: As indicated in Table **I.**

Table I.- PME-100 **Measurement Ranges**

Scale	Range	Resolution	Test Current (± 20%)	Battery Life (Estimated)
20Ω	0 a 19,99Ω	10 mΩ	1 mA	130 Hours
2Ω	0 a 1,999Ω	1 mΩ	10 mA	130 Hours
200mΩ	0 a 199,9mΩ	100 μΩ	100 mA	100 Hours
20 mΩ	0 a 19,99 mΩ	10 μΩ	1 A	30 Hours
2 mΩ	0 a 1,999 mΩ	1 μΩ	10 A	3 Hours*****
2000μΩ	0 a 1999μΩ	1 μΩ	100 A	**
200μΩ	0 a 199,9μΩ	100 nΩ	100 A	**

***** In this range if the PME-100 is connected to the AC power line the internal battery would provide an estimated useful life of 6 hours.

****** In these ranges the PME-100 is powered by the AC power line service only.

Uncertainty:

± 0, 25% of Reading ± 0, 25 % of Full Scale at ambient temperature of 25ºC.

No-Load Output Voltage:

8 VDC for the two 100A test ranges,
2.1 VDC for other ranges.

Display: 3 ½ - digit LCD display

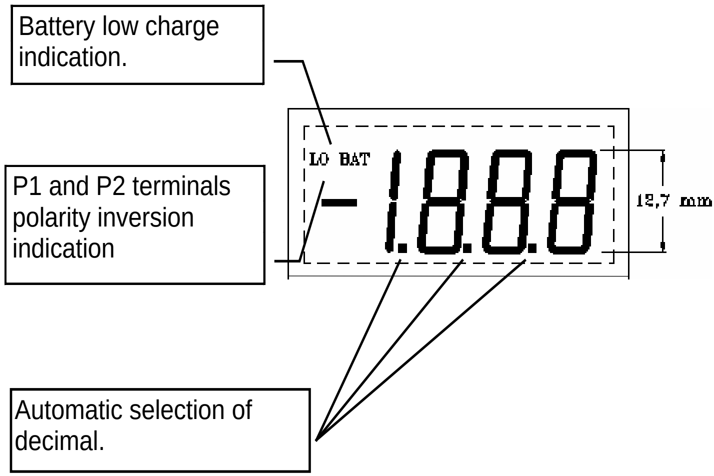


Fig. 2.4.- The LCD Display

Measurement Time Delay:

- 6 seconds for purely resistive circuits.
- In case of highly inductive circuits it is necessary to wait for the reading to become stable.

Sampling Time: 25 ms.

Working Temperature: 0 a 50° C.

AC Power Requirements: 120/220VAC ±10%, 50-60Hz, < 530VA.

Internal Battery: 2V- 40A maintenance-free rechargeable battery.

Protection: Two miniature 8A 20x5mm fuses

2.3.2.- Mechanical Characteristics

Instrument Case: Is a watertight ABS extra rigid and resitance plastic, with a handle for easy carrying.

Fig. 2.5.- The PME-100 Case Style and Size (mm).

Net Weight of the PME-100: 11,5 Kg.

Net Weight of the Accessories: 20,5 Kg.

Size of the accessories Carrying Case:460mm x460mm x375mm.

2.4 Accessories

Power Cord:

Standard power cord 3m length with standard IEC/NEMA.

Measurement Cables for 10A Test Current:

Two 4-wire 8m long flexible duplex test leads equipped with a C-clamp for carrying test currents up to 10A, as shown in Figure 2.7. The potential passes through a separated conductor insulated from the C-clamp current conductor. Used in all measuring ranges from 20Ω to 2mΩ.

Fig. 2.6.-. 10A Test Current Measurement Cables.

Potential Cables:

Two 14m long potential hand spikes for use during measurements with 100A test current, as shown in Figure 2.8. Used in the 2000μΩ and 200μΩ ranges in conjunction with the 100A current leads.

Fig. 2.7.-. Potential Test Cables.

Measurement Cables for 100A Test Current:

Two 14m long heavy-duty test leads equipped with a large C-clamp for carrying test currents up to 100A in the 2000μΩ and 200μΩ ranges, as shown in Figure 2.9 .

Fig. 2.8.-. 100A Test Current Measurement Cables.

Grounding Cable:

One flexible 2m long grounding cable used to ground the instrument case for safety purposes, as shown in Figure 2.10. This cable is equipped with lugs for connecting to the instrument ground terminal and stout clips or clamps for attaching to the nearest ground point

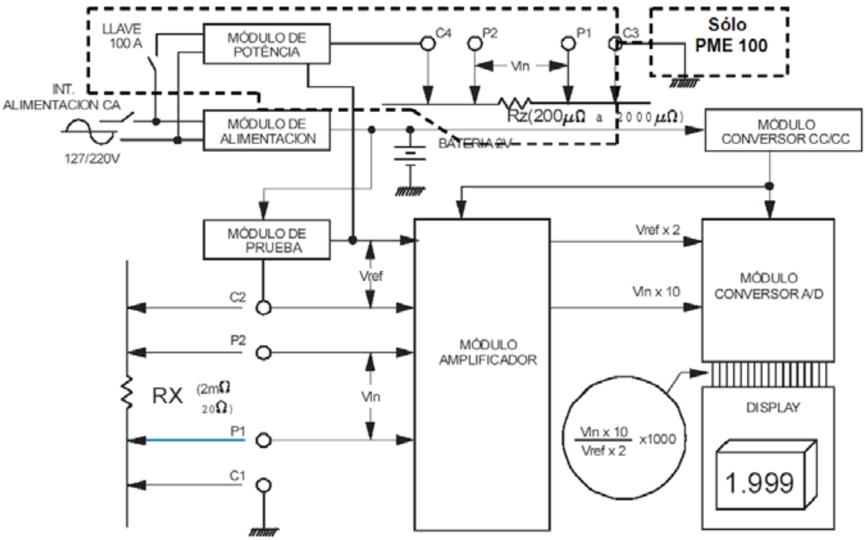
Fig. 2.9.-. Grounding Cable.

3.- THEORY OF OPERATION

3.1.- Introduction

The PME-100 measures the unknown resistance in a 4-wire measurement configuration by sampling the current that is circulating in the circuit or device under test and the resulting potential drop across it.

A stable, high precision electronic circuit divides the voltage drop in the resistance under test by the test current flowing thought it. The result is then converted into a digital code and sent to the LCD display allowing a direct reading in ohms, miliohms or microohms depending upon the selected measuring range.



Blockdiagram

3.2.- Power Supply Module

The function of the Power Supply Module is to provide the energy required for the measurements and also for recharging the internal battery. The block diagram of the Power Supply is shown in Figure 3.1.

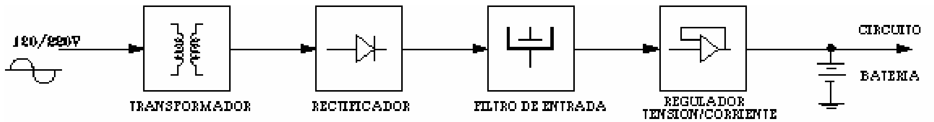


Fig 3.1.- Block Diagram of the Power supply

The AC service line voltage is stepped-down by the input transformer and sent to a full-wave rectifier and smoothing filter circuits. A close-loop regulator at the output of the filter constantly monitors the charge condition of the battery.

As internal impedance of the battery reflects its charge condition, the power supply will provide charging current to the battery through the regulator only when necessary, otherwise the battery will remain in floating condition.

During the time the instrument is on and powered by AC mains the battery will stay under charge condition in all measurement ranges but the 2mΩ range. In the case of this particular range a 10 A test current is used, being delivered by the Power Supply and by the internal battery as well.

For the execution of the 100A tests using the 2000μΩ or the 200μΩ ranges the 100A power supply is powered exclusively by the AC mains, but the battery is kept under normal charging condition.

3.3.- The DC/DC Converter Module

The function of the DC/DC Converted Module is to generate the regulated, stable DC voltages required for the operation of the electronic circuits of the PME-100. The Block Diagram of the DC/DC Converted Module is shown in Figure 3.2

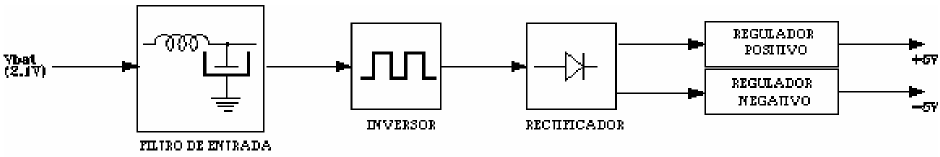


Fig. 3.2.- DC/DC Converter

One inverter circuit working under a self-oscillating principle converts the 2VDC input voltage from the internal battery into a 300Hz - 20Vpp, 50% duty-cycle square-wave output signal

The output of the inverter is applied to full-wave rectifier circuit to generate + 10VDC and -10VDC at the inputs of the final voltage regulators. These monolithic output voltage regulators generates + 5VDC and - 5VDC for use in the various electronic circuits of the PME-100.

The function of the input LC filter is to block any high frequency ripple signal generated by the operation of the inverter from returning to the battery or causing EMI to other electronic circuits.

3.4.- The Test Module

The Test Module is responsible for marking the Kelvin connection to the resistance under test. It is also responsible for the necessary current limiting action during the measurements and for the sampling of the voltage signal that is proportional to the current flowing into the unknown resistance. Figure 3.3 shows the basic circuits of the Test Module.

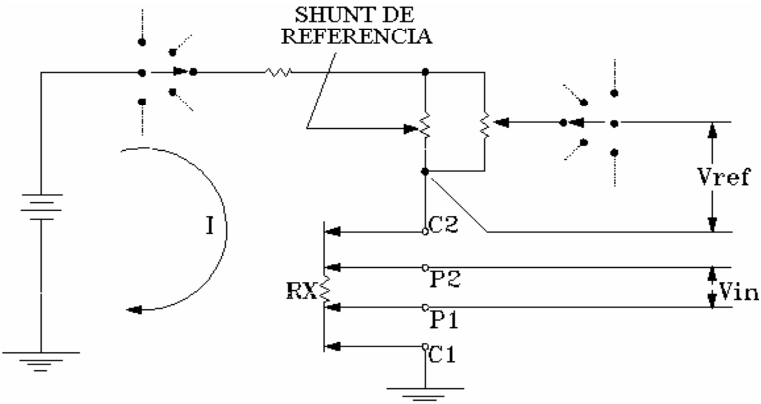


Fig. 3.3.- Basic 4 - Wire Test Circuit.

In the case of the 2000μΩ and 200μΩ ranges the basic test circuit is quite similar to Figure 3.3. The high current terminals C3 and C4 are use now, and the potential terminals P1 and P2 are also used to make the 4-wire Kelvin connection to the resistance under test.

The value of the test current I in Figure 3.3 depends upon the selected measurement range as show before in Table I.

3.5.- The Amplifier Module

The function of this module is to provide the required amplification for the sampled voltage signal Vin and for the Vref current signal developed during the measurement of the resistance under test.

The integrity of the low level input signal processing is assured by the use of two precision, high-performance instrumentation amplifiers.

The amplified signals are

- Vref x2
- Vin x10

3.6.- The A/D Converter and Display Module

One 3 ½ - digit analog to digital converter is responsible for converting the analog input signals V_{in} and V_{ref} into a digital code that is directly equivalent to the value of the resistance under test. This code is them sent to the LCD display. Figure 3.4 shows the block diagram of the A/D Converter Module.

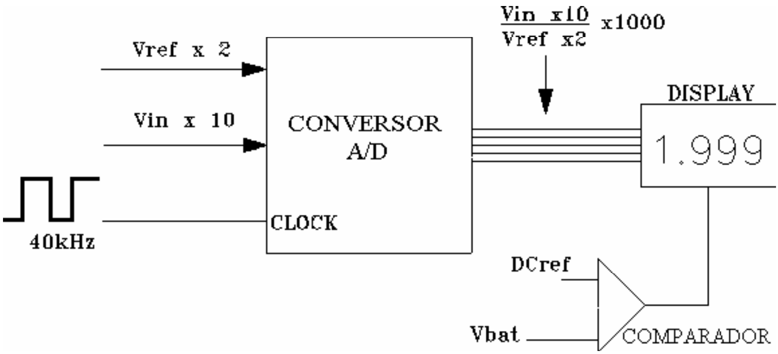
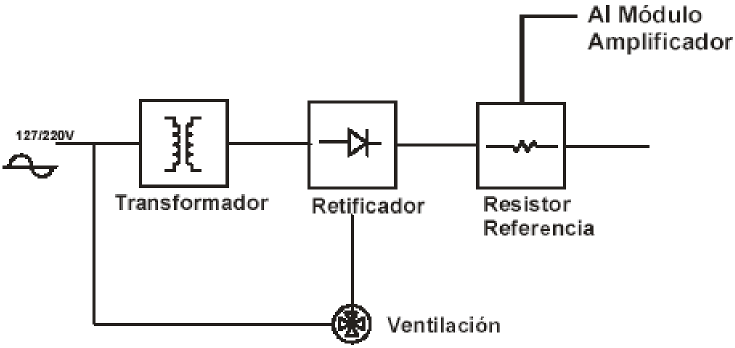


Fig. 3.4.- A/D Converter and Display

A comparator circuit constantly checks the voltage of the internal battery. If the voltage falls bellow a value that corresponds to only 20% of the rated charge capacity, a LO BAT warning message will be shown in the display. In this case, the battery shall be placed in charging condition as described in paragraph 4.5 bellow.

3.7.- 100A Power Module

The function of the 100A Power Module is to generate the 100A DC test current for use in the 2000μΩ and 200μΩ measurement ranges..



The limiting action for the test current is provided by the measurement cables themselves. A high-precision manganin wire shunt is used for sampling the current flowing through the resistance under test.

The 100A power supply can be turned on only if the AC on /off switch is on.

4.- OPERATION OF THE PME-100

4.1.- Preliminary Check

Before using the PME-100 make sure that the resistance under test it completely disconnected from any external voltage source that may cause wrong reading or possible damage to the instrument.

Verify that the AC power source matches the setting of the PME-100´s line voltage selection switch and that the proper fuse is installed.

If you need to charge the position of the AC line voltage input selection switch, turn the power off and remove the power cord. With a small screwdriver move the switch to the appropriate position as shown in the front panel

4.2.- Applying AC Power

The PME-100 can operate from either 120VAC or 220VAC power sources. It is recommended to perform the following procedures to energize the instrument:

1.- Place the range selection switch in the “CHARGE” position.

2.- Verify that the AC line voltage selection switch is set to match the local line voltage.

The PME-100 comes with a three conductor AC power cable. You should always plug the power cable into an approved three-contact electrical outlet.

If this is not possible the instruments´s case should be grounded to the nearest grounding point. Use the supplied grounding cable connected to the front panel ground terminal.

3.- Plug in the AC power cord. Turn the AC power switch on.

4.3.- Using the Internal Battery

When the PME-100 is powered by the internal battery it is always recommended to ground the case using the grounding cable provided with the instrument.

Being a portable test instrument for measurements in the 20Ω to the 2mΩ ranges with test currents up to 10A DC, the PME-100 will be turned-on by merely selecting the desired range without any additional operation.

4.4.- Measurements in the 20Ω, 2Ω, 200mΩ,20mΩ and 2mΩ Ranges

Always use the test cables provided with the instrument once their resistance is part of the measuring circuit, otherwise the test current will remain out of specifications and may cause damage to the instrument.

Make certain that the range selection switch is placed in the “CHARGE” position before connecting and disconnecting the test cables.

Do not short C1 and C2 output terminals directly.

Connect the unknown resistance to the PME-100. Make sure the connections are well tight at both sides of the cables to obtain the best accuracy in the measurements. If necessary, clean the contact region from any dirt, grease or oil usually found on terminals in the field.

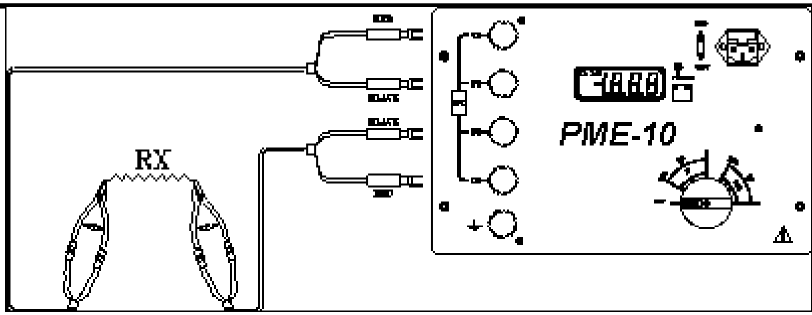


Fig. 4.1.-10 A Test connections in the PME-10 (similar to PME-100)

Turn the AC Power switch on and select the best for the measurements. Read the value of the resistance under test in the LCD display directly..

If the instrument is being powered by its internal battery, just select the best range for the measurements.

During the execution of the measurements two situations may occour:

1.- The display shows 1 or -1, in the left side, as illustrated in Figure 4.1. That means an over-range condition.

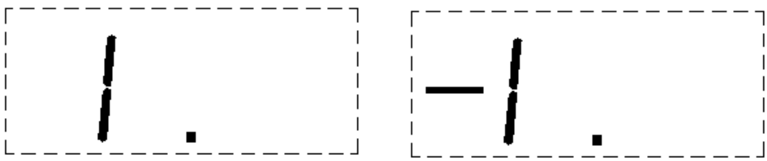


Fig. 4.2.- Display Over-Range Indication.

Causes:

- The resistance under test is much lower than the selected range. Move the range switch to the next higher test range and make the reading. If the selected rang is 200 Ω and the display still shows an over-range condition, the resistance under test can't be measured with the PME-100.

- The circuit or resistance under test is open. Turn the instrument off and check the connections and the operating conditions of the external circuitry.

2.- The display shows near zero value:

The resistance under test is much lower than the selected range. Move the range switch to a lower range until stable reading with good resolution is displayed.

If the display still shows very low resistance values in the 2mΩ range, it is necessary to use the 200μΩ range. In this case, make sure that the circuit or resistance under test is capable to handle 100A test current. See paragraph 4.5 bellow.

After completion of the measurements, return the range selection switch to the "CHARGE" position, Before disconnecting the test cables and closing the instrument´s case

4.5.- Measurements in the 200μΩ and 2000μΩ ranges with 100A

Before using the 2000μΩ and the 200μΩ ranges,make sure that the circuit or resistance under test is capable to handle 100 test current. Disconnect the 10A test cables from the instrument.

Always connect and disconnect the 100A test cables with the 100A switch in the off position to prevent arcing.

Do not short C3 and C4 output terminals directly.

Using the 14m 100A current and potential test cables connect the unknown resistance to the PME-100 as shown in Figure 4.3. Make sure the connections are well tight at both sides of the cables to obtain the best measurement conditions with minimum power losses. If necessary, clean the contacts from any dirt, oil or grease usually found in the field.

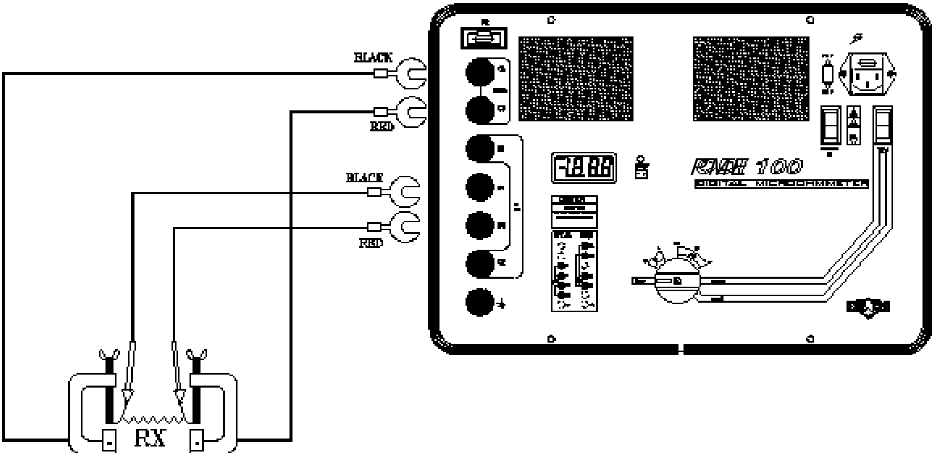


Fig. 4.3. - The Connections for Measurements in the 200μΩ and 2000μΩ ranges.

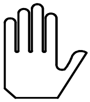
Select the 200μΩ range or the 2000μΩ range as required by the measurements.

Turn the AC Power switch on, and the 100A switch on. Make sure that the cooling air intake and outlet vents are clear from any obstacle;

Make the measurement by reading the display. Contact the potential cables as close as possible to the terminals of the resistance under test to guarantee a good Kelvin connection;

Turn the 100A switch off before disconnecting the test cables and then turn the AC Power switch off.

Before closing the case, make sure that range switch is left in the CHARGE position.



The power circuit responsible for the generation of the 100A DC test current was designed for 25 minutes of continuous work.

Beyond this period the instrument should be operated with 5 minutes of cooling internals between measurements.

4.6.- Recharging the Battery

If the internal battery falls into a low charge condition, the LCD display will show a LO BAT warning indication. Under this condition the battery should be placed on charge according to the following instructions:

* Place the range selection switch in the CHARGE position
* Connect the PME-100 to the AC mains and turn the AC Power switch on, leaving the PME-100 in this condition for 10 hours.

In order to increase the useful life of the battery it is recommended to keep it under full-charge all the time. Recharge the battery after using the instrument as a portable unit for a while. The same recommendation holds true if the 2mΩ range is used frequently or during long periods of testing time.

During field test with AC power applied, the battery will stay under charge in all measurement ranges with the exception of the 2mΩ range.

The battery should be recharged at least two times per year during or after long periods of storage time.

5.- MAINTENANCE INSTRUCTIONS

5.1.- Battery Replacement

The battery should be replaced when it can't hold full charge anymore. This particular condition occours when, after a long period of charging, the LO BAT indication still remain activated in the LCD front panel display.

The battery should be replaced by the specified model as indicated in the spare parts list, or by an equivalent one.

Before replacing the battery, make sure that the power cord is removed from the instrument and that the range selection switch is set in the CHARGE position.

Do not apply AC power to the PME-100 with the battery disconnected from the instrument.

1.- Turn the PME-100 off by placing the range selection switch in the CHARGE position and the AC Power switch in the off position.

2.- Remove de power cord from the instrument.

3.- Follow the instructions illustrated in Figure 5.1 to remove the old battery.

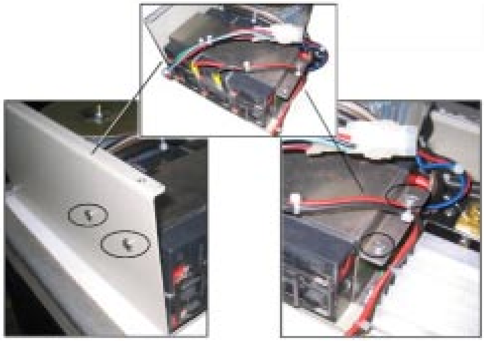
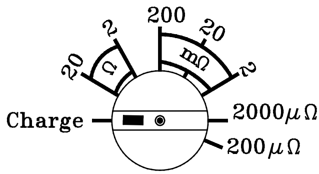
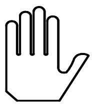


Fig.5.1.- Basic Sequence for Battery Replacement.



Range Selection Switch in
“CHARGE”position

4.- Remove defective battery.



Do nor open or burn the old battery. Batteries leak toxic substances and may explode if exposed on fire.

5.- Clean the contacts of the new battery and mount it in position. Make sure that the polarities are correct before energizing the instrument.

6.- Close the instrument by reversing the steps outline above. If necessary, place the new battery in charge condition for a period of 10 hours.

5.2.- Power Line Fuse Replacement

If eventually becomes necessary to replace the AC line input protection fuse, proceed as follows:

1.- Remove the power cord from the instrument..

2.- Place the range selection switch in the CHARGE position.

3.- Remove the fuse cap as shown in Figure 5.2.

4.- Replace the fuse with the appropriate spare one. Re-install the fuse cap and apply power.

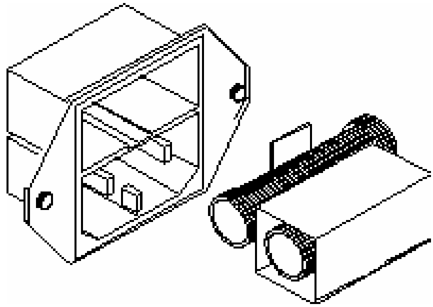


Fig. 5.2.- AC Line Fuse Replacement.

5.3.- Front Terminal Fuse Replacement

1. Turn the AC Power switch off and place the range selection switch in the “CHARGE” position.

2. Remove the fuse cap and replace the fuse with the spare one. Re-install the fuse cap and apply power.

5.4.- Calibration

The PME-100 is factory-calibrated using precision standards and usually doesn’t require any additional field adjustment. If eventually becomes necessary to make field calibration or repair, we recommend users to send the instrument to the nearest EUROSMC sales office or to the factory for servicing.

If it is desirable to verify the calibration the following instructions should be followed. All measurements are taken with respect to ground unless otherwise specified. Use the negative terminal of the battery or the output terminal C1 as ground reference. Keep all test leads as short as possible. Calibration should be checked with 120V or 220V AC input voltage.

Test Instruments Required for Calibration

The following test instruments or equivalent ones are required to perform calibration and overall check of the PME-100:

- Philips model 2521 digital multimeter, or equivalent.
- Tektronix 2215A oscilloscope, or equivalent.
- Set of 4-wire Precision Calibrating Shunts.
- Laboratory Power Supply, 0-10 VDC, 0-500 mA.

Do not short C1 to C2 or C3 to C4 output terminals directly with power applied.

Power Supply Check and Battery Charging Current Verification

1. Switch the AC power off and place the range selection switch in the "CHARGE" position.

2. Remove the instrument form the case illustrated in Figure 5.1.

3. Turn AC power on. Check that the Battery Under Charge LED in the front panel is lit. Using the DVM, check the power supply voltages at the following test points:

    - VL= 4.7 DC, ±0.5V.
    - VC= 11 VDC, ±1V.
    - Vref2= 1.25 VDC, ±50 mV.

4. Turn the AC power off again. Disconnect the positive terminal of the battery. Keep the range selection switch in the "CHARGE" position. Locate terminal H4 in the PCB assembly. Place a heavy short from terminal H4 to the negative terminal of the battery.

5. Connect the DVM between test points TP3 and TP4. Turn AC power on. Adjust potentiometer POT11 for 550m VDC ± 50 mV reading in the DVM. This voltage corresponds to 5A maximum battery charging current.

Make this check as quickly as possible to limit the power dissipation in the voltage regulator pass transistor.

6. Switch the AC power off, remove the short and reconnect terminal H4. Turn the AC power on again. Check the voltage at test point VCARGA= 2.3 VDC±0.1V.

DC/DC Converter Check

1. Turn AC power off. Make sure that these is no test cables connected to the output terminals.

2. Place the range selection switch in the 20Ω position.

3. Connect the oscilloscope in test point TP2, and check a 300Hz, ±30Hz, 50% duty-cycle 4.1 Vpp ± 0.2V square-wave signal.

4. Using the DVM, check the input of the CI5 and CI7 voltage regulators for +10VDC and -10VDC, ±1V reading.

5. Check the outputs of the DC/DC converter for +5VDC, ± 4% at the output of CI5, and for -5VDC, ± 4% at the output of CI7.

LO BAT Indication and Consumption Checks

1. With the AC power off, place the range selection switch in the "CHARGE" position.

2. Adjust the external laboratory power supply for 2.1 VDC.

3. Disconnect the positive terminal of the internal battery. Connect the external power supply in place of the battery. Make sure that the polarities are correct and be very careful with this connection as the electronic circuits of the PME-100 will now be energized by the external supply.

4. Energize the instrument by placing the range selection switch in the 20Ω range. The current drawn from the external supply should be less than 320mADC in this condition.

5. Reduce the output voltage of the external supply slowly until the LO BAT warning indication is turned on in the front panel LCD display. The power supply output should be 1.8VDC±30mV.

6. Now further reduce the output voltage of the external supply slowly while measuring the output of the +5VDC and -5VDC voltage regulators in the DC/DC converter. Both outputs should stay within ±4% of their nominal 5V values for an input voltage to the DC/DC converter of 1.65VDC or less.

7. Turn the external supply off and disconnect it from the circuit. Place the range selection switch in the CHARGE position. Reconnect the positive terminal of the battery.

Instrumentation Amplifiers Off-Set Adjustment and A/D Convert clock check.

1. Place a short across output terminals P1 and P2 in front panel. Using a grounded soldering iron, place a short across JP1. Leave all test cables unconnected. Turn the instrument on by placing the range selection switch in the 200μΩ range. Do not turn the AC power on. Wait for 5 minutes warm-up time.

2. Using the DVM measure the off-set of amplifier CI3 at test point REF. If necessary, adjust POT10 for zero milivolts DC reading.

3. Measure the off-set of amplifier CI6 at test point IN. If necessary, adjust POT9 for zero milivolts DC reading.

4. Place the range switch in the 2000μΩ position. Adjust POT8 for zero milivolts DC reading.

5. Connect the oscilloscope between test point TP1 and GND. Check for a 40 KHz±2 KHz, 5Vpp clock signal.

6. Turn the instrument off by placing the range switch in the CHARGE position. Remove the short across the output terminals P1 and P2 and across the pins of JP1.

Test Module Verification

1. Place the range selection switch in the “CHARGE” position. Using the 10A test cables connect the calibrating shunt for the 20Ω range as indicated in the Table II. Use Fig. 4.1 as reference. Switch the AC power on. Place the range selection switch in the 20Ω position. Adjust POT5 for a display reading equals to the value of the shunt.

2. Repeat the operation for the other ranges in sequence and perform the adjustment if necessary. Don´t forget to place the range switch in the “CHARGE” position before changing the shunts. Insure that all shunts can handle the power dissipated during the test.

3. After checking the 2mΩ range, place the range switch in the “CHARGE” position. Disconnect the 10A cables and connect the 100A current and potential test cables. Use Fig. 4.3 as reference.

4. Mount the appropriate 100A shunts as indicated in TABLE II and turn the AC power on. Make sure the current cables are well tight and that the potential cables are making a good connection as close as possible to the Kelvin potential points of the shunts.

5. Turn the 100A switch on and read the display. If necessary, adjust the correspondent potentiometer to obtain the specified shunt value in the display. Switch the 100A power off before changing or disconnecting the 100A shunts.

6. Reverse the polarity of the potential cables and check for the minus sign with same reading in the display. At the end of the verifications, turn the 100A power switch off and next turn the AC power off. Place the range switch in the “CHARGE” position and disconnect the shunts and cables.

7. The test current can be known by measuring with the DVM the voltage drop across the Kelvin points of the shunts and divining the voltage by the shunt resistance. Consult TABLE I to obtain the specified values for the test currents.

Table II. PME-100 CALIBRATION

Shunt Value	Range	Display	Adjust.
18,19936 Ω	20Ω	18.19	POT5
1,81952 Ω	2Ω	1.819	POT4
150,5546 mΩ	200mΩ	150.5	POT3
15,07662 mΩ	20 mΩ	15.07	POT2
1,49783 mΩ	2 mΩ	1.498	POT1
1507,32 µΩ	2000µΩ	1507	POT6
149,974 µΩ	200µΩ	149.9	POT7

6.- TECHNICAL ASSISTANCE, AFTER SALES SERVICE AND WARRANTY

6.1.- WARRANTY

Our warranty expresses the confidence we have in our products, based on the reliability and functions that are expected by our clients..

The warranty covers the repairs and/or replacements of components which faulty without costs.

Warranty Period: All products made by EUROSMC are guaranteed for a period of one year from the date and/or way reflected in the warranty, which is include with the unit.

EUROSMC will to repair or replace any abnormal function or defects in our product that were not provoked by the following, which may cause the warranty to be revoked.

- Improper use of the product, incorrect connections or operations not specified or explained in this instruction manual
- Any manipulation of the product, repairs, adjustments, or changes, made by unauthorized persons.
- The use of the product outside the specifications.

6.2.- AFTER SALES SUPPORT

EUROSMC offers the supply of materials and components in all it our products for 3 years after the product is no longer manufactured, we offer technical support for 5 years.

6.3.- OTHER PRODUCTS

For more information of our product range, please consult us or your local representative. Generally we manufacture the following:

- Relay testing equipment for voltage, current, frequency, and synchronizing relays.
- Circuit Breaker Analysers for medium and high voltage.
- Portable chronometers.
- Alternating current test equipment.
- Current supplies.
- Systems to test MCB´s.
- Voltage and current regulation equipment.