DIGITAL MULTIMETER

FP-2b

USER'S MANUAL

PROMAX

SAFETY NOTES

*Read the instruction manual before using the equipment, mainly "**SAFETY RULES**" paragraph.*

The symbol  *on the equipment means "**SEE INSTRUCTION MANUAL**". In this manual may also appear as a Caution or Warning symbol.*

*"**WARNING AND CAUTION**" statements may appear in this manual to avoid injury hazard or damage to this product or other property.*

TABLE OF CONTENTS

1 GENERAL CHARACTERISTICS

- Push-push power switch
- Big LCD of 22 mm with measuring units indication
- Rotary selector with 32 positions
- High sensibility up to 100 μV
- Automatic overrange indication by means of "1" on the display
- Automatic polarity indication on the DC range
- Resistance measurement from 0.1 Ω up to 200 MΩ
- Capacity measurement from 1 pF up to 20 μF
- Diode test
- Input overload protection
- Transistors test socket to directly measure the h_{FE} parameter
- Quick audible continuity test by means of a buzzer
- Low battery indication on the LCD display

2 SPECIFICATIONS

Readout	LCD 3 ½ digits
Reading update	2-3 measurements / s
Overrange indication	"1" displayed only
Polarity indication	"-" displayed automatically for negative polarity.
Low battery indication	appears on the display
Operating temperature	5 to 40 °C
Storage temperature	-10 °C to 50 °C
Power supply	9V battery (6F22)
Dimensions	W. 88 x H. 170 x D. 38 mm.
Weight	340 g. (battery included)
Included accessories	Test leads **PP-008** Case **DC-231**

NOTE: Accuracy is specified at 23 ± 5 °C and relative humidity under 75%.

DC Voltage

Range	Resolution	Accuracy
200 mV	100 µV	± (0.5% reading + 1 dig.)
2 V	1 mV	
20 V	10 mV	
200 V	100 mV	
1000 V	1 V	± (0.8% reading + 2 dig.)

Input impedance: 10 MΩ
Overload protection: 250 V rms in the 200 mV range
1000 V DC in the other ranges

AC Voltage

Range	Resolution	Accuracy
2 V	1 mV	± (0.8% reading + 3 dig.)
20 V	10 mV	
200 V	100 mV	
750 V	1 V	± (1.2% reading + 3 dig.)

Input impedance: 10 MΩ
Frequency range: 40 Hz to 1000 Hz
Overload protection: 700 V AC (sine wave signal)
Indication: Average, calibrated in RMS of sine wave

DC Current

Range	Resolution	Accuracy
2 mA	1 µA	± (0.8% reading + 1 dig.)
20 mA	10 µA	
200 mA	100 µA	± (1.5% reading + 1 dig.)
10 A	10 mA	± (2.0% reading + 5 dig.)

Overload protection: By fuse
(10 A range without protection)
Maximum input current: 10 A in continuous mode
20 A for 15 s. maximum

AC Current

Range	Resolution	Accuracy
20 mA	10 µA	± (1% reading + 3 dig.)
200 mA	100 µA	± (1.8% reading + 3 dig.)
10 A	1 mA	± (3% reading + 7 dig.)

Overload protection: By fuse
(10 A range without protection)
Frequency range: 40 Hz up to 400 Hz
Maximum input current: 10 A in continuous mode, 20 A, 15 s maximum
Response: Average, calibrated in rms of sine wave

Resistance

Range	Resolution	Accuracy
200 Ω	0.1 Ω	± (0.8% reading + 3 dig.)
2 kΩ	1 Ω	± (0.8% reading + 1 dig.)
20 kΩ	10 Ω	
200 kΩ	100 Ω	
2 MΩ	1 kΩ	
20 MΩ	10 kΩ	± (1% reading + 2 dig.)
200 MΩ	100 kΩ	± (5% (reading –10 dig.) + 10 dig.)*

***** On 200 MΩ range, if inputs are short circuited, display will read 10 digits approximately (minimum resolution units). This reading should be subtracted from the readout.

Overload protection: 250 V DC/AC rms

Capacity

Range	Resolution	Accuracy
2 nF	1 pF	± (4% reading + 3 dig.)
20 nF	10 pF	
200 nF	100 pF	
2 µF	1 nF	
2 µF	10 nF	

Frequency test

Range	Resolution	Accuracy
2 kHz	1 Hz	± (2% reading + 5 dig.)
20 kHz	10 Hz	± (1.5% reading + 5 dig.)

Overload protection: 250 V DC/AC rms
Sensitivity: 200 mV AC rms
Maximum input current: 10 V AC rms

Diode test

Range 
Readout Approximate forward voltage drop
Overload protection 250 V DC/AC rms

Continuity test

Range	♫
Threshold	50 Ω
Overload protection	250 V DC/AC rms

Transistors test

Range	h_{FE}
Readout	h_{FE} (DC gain)
Base current	10 μA
Vce voltage	3.2 V

3 SAFETY RULES

3.1 General safety rules

* This equipment can be used in **Overvoltage Category II** installations and **Pollution Degree 2** environments.

* Remember that voltages above **60 V DC** or **30 V AC rms** may be dangerous.

* When using some of the following accessories **use only the specified ones** to ensure safety:
  Test leads

* Use this instrument under the **specified environmental conditions**.

* **The user is only authorized to** carry out the following maintenance operations:

  Battery replacement
  Fuse replacement, according to the indicated **type** and **value**.

  On the Maintenance paragraph the proper instructions are given.

  Any other change on the equipment should be carried out by qualified personnel.

* Observe all **specified ratings** both of supply and measurement.

* Follow the **cleaning instructions** described in the Maintenance paragraph.

3.2 Specific safety rules

* When measuring resistances take care that circuit under test is not powered.

* When measuring currents disconnect the power supply of the circuit under test before inserting the multimeter in series.

* When measuring currents, be sure that points under test do not exceed the maximum voltage.

* Keep measuring leads in good condition.

* Between measurements higher than 10 A which extend near to the maximum time specified, keep waiting times of about 10 minutes.

* Before rotating the range selector, disconnect the test leads from the circuit under test.

* When measuring capacities, be sure capacitors are previously discharged.

* Disconnect the test leads before inserting transistors or capacitors in their respective sockets.

4 OPERATING INSTRUCTIONS

Measuring voltage

Connect the test leads to the **V/Ω/Hz** jack (red) and the **COM** jack (black). Select the desired range position (continuous or alternating) and connect test leads across the source or load under measurement.

Measuring current

Connect the black test lead to the **COM** jack and the red test lead to the **mA** jack. Set the rotary selector at desired range (continuous or alternating) and connect the test leads to the measurement points. For currents higher than 200 mA, connect the test leads to the **10 A** (red) and **COM** (black) jacks.

Measuring resistance

Connect the black test lead to the **COM** jack and the read test lead to the **V-Ω-Hz** jack, selecting the correct range.

Measuring capacities

Set the rotary selector in the suitable "**Cx**" position and take care of polarity when measuring polarized capacitors.
Before carrying out the measurement, the capacitor under test must be discharged.

> **CAUTION**
> ***Do not apply voltage to the capacitor socket since important breakdown to the instrument could be produced.***

Insert the capacitor in the "**Cx**" socket and read the value in the display.

Testing diodes and continuity test

Set the rotary selector at position. The test leads must be connected to the **V/Ω/Hz** and **COM** jacks. Connecting the test leads to the diode under test (black lead to the cathode and red lead to the anode) the meter will show the approx. forward voltage drop of the diode (between 500 and 900 mV for a silicon diode). If the lead connection is reversed, only figure "1" will be displayed.

Set the rotary switch at position and connect the test leads across two points of the circuit under testing. If continuity exists (i.e, resistance less than about 50 Ω) built-in buzzer will sound.

Testing transistor

Set the rotary selector at $\mathbf{h_{FE}}$ position and verify if transistor is PNP or NPN type. Insert leads of the transistor to be tested into proper holes. LCD display will show the approximate $\mathbf{h_{FE}}$ value.

Measuring frequencies

Set the rotary selector at **Hz** position (2 k or 20 k). Connect the black test lead to the "**COM**" jack and the red test lead to the "**V-Ω-Hz**" jack. Connect the test leads to the measuring points and red the frequency in the display.

Auto Power-off

The meter will be turned-off automatically within around 20 minutes. To turn on the meter again, push the power switch or turn the rotary selector

5 MAINTENANCE

5.1 Shipment instructions

Instruments sent to repair or to calibrate, inside or outside the warranty period, must enclose the following information: Company name, name of the person to contact if necessary, address, telephone number, purchase receipt (in the case of warranty period), and problem description. Freights will be charged to the client.

5.2 Battery replacement

- When the symbol  appears on the LCD display, it indicates that the battery should be replaced.

- After disconnecting the test leads and setting the rotary selector at the **OFF** position, remove screws on the back cover and open the case.

- Replace the exhausted battery with a new one.

- Set the cover again and fix the rear screws.

5.3 Replacing the fuse

- Disconnect the test leads and turn off the multimeter, remove screws on the back cover and open the case.
- Check if the fuse is melt, if necessary replace it with a new one of the following characteristics:

200 mA, F, 250 V

- Place and fix the lid again.

5.4 Cleaning recommendations

CAUTION

Do not use scented hydrocarbons or chlorized solvents. Such products may attack the plastics used in the construction of the cover.

The cover should be cleaned by means of a light solution of detergent and water applied with a soft cloth.

Dry thoroughly before using the system again.

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