


FP-2

DIGITAL MULTIMETER



SAFETY NOTES


Read the user's manual before using the equipment, mainly "**SAFETY RULES**" paragraph.

The symbol  on the equipment means "**SEE USER'S 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.

ELECTRONIC MANUAL VERSION

You can access instantly to any chapter by clicking on the title of the chapter in the table of contents.

Click on the arrow  at the top right page to return to the table of contents.

USER'S MANUAL VERSION

Manual Version	Web Published Date
F1.0	December 2018















SAFETY INFORMATION

Before any operations, please read the following safety precautions to avoid any possible bodily injury and prevent damage to this product or any other products connected. To avoid any contingent danger, use this product only as specified.

- Limit operation to the specified measurement category, voltage, or amperage ratings.
- Do not use the multimeter if it is damaged. Before you use the multimeter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Do not use the test leads provided for other products. Use only the certified test leads specified for this product.
- Inspect the test leads for damaged insulation or exposed metal.
- Before use, verify the multimeter's operation by measuring a known voltage.
- Only the qualified technicians can implement the maintenance.
- Always use the specified battery type. The power for the multimeter is supplied with a battery. Observe the correct polarity markings before you insert the batteries to ensure proper insertion of the batteries in the multimeter.
- Check all Terminal Ratings. To avoid fire or shock hazard, check all ratings and markers of this product. Refer to the user's manual for more information about ratings before connecting to the multimeter.
- Do not operate the multimeter with the cover or portions of the cover removed or loosened.
- Use Proper Fuse. Use only the specified type and rating fuse for the multimeter.
- Do not operate if in any doubt. If you suspect damage occurs to the multimeter, have it inspected by qualified service personnel before further operations.
- To avoid electric shock, do not operate this product in wet or damp conditions.
- Do not operate in an explosive atmosphere.
- Keep product surfaces clean and dry.
- Do not apply more than the rated voltage (as marked on the multimeter) between terminals, or between terminal and earth ground.
- When measuring current, turn off the circuit power before connecting the multimeter in the circuit. Remember to place the multimeter in series with the circuit.
- When servicing the multimeter, use only the specified replacement parts.
- Use caution when working above 60 V DC, 30 V AC RMS, or 42.4 V peak. Such voltages pose a shock hazard.
- When using the test leads, keep your fingers behind the finger guards on the test leads.
- Remove the test leads from the multimeter before you open the battery cover.
- To avoid false readings, which may lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator appears and flashes.

- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Use the proper terminals, function, and range for your measurements. When the range of the value to be measured is unknown, set the rotary switch position as the highest range, or choose the auto ranging mode. To avoid damages to the multimeter, do not exceed the maximum limits of the input values shown in the technical specification tables.
- Connect the common test lead before you connect the live test lead. When you disconnect the leads, disconnect the live test lead first.
- Before changing functions, disconnect the test leads from the circuit under test.

SAFETY SYMBOLS

 DIRECT CURRENT	 ON (Supply)
 ALTERNATING CURRENT	 OFF (Supply)
 DIRECT AND ALTERNATING	 DOUBLE INSULATION (Class II protection)
 GROUND TERMINAL	 CAUTION (Risk of electric shock)
 PROTECTIVE CONDUCTOR	 CAUTION REFER TO MANUAL
 FRAME TERMINAL	 FUSE
 EQUIPOTENTIALITY	 EQUIPMENT OR COMPONENT TO BE RECYCLED

DESCRIPTIVE EXAMPLES OF OVER-VOLTAGE CATEGORIES

- **Cat I:** Low voltage installations isolated from the mains.
- **Cat II:** Portable domestic installations.
- **Cat III:** Fixed domestic installations.
- **Cat IV:** Industrial installations.

CAUTION: The battery used can present danger of fire or chemical burn if it is severely mistreat. Do not disassembly, cremate or heat the battery above 100 °C under no circumstances.

TABLE OF CONTENTS

1. QUICK START	1
1.1. General Inspection	1
1.2. Install the Batteries	2
1.3. Adjusting the Tilt Stand.....	2
1.4. Power On	3
1.5. Sleep Mode	3
1.6. LCD Backlight and Flashlight.....	3
1.7. Selecting the Range.....	3
1.8. Multimeter in Brief.....	5
2. MEASUREMENTS.....	10
2.1. Measuring AC or DC Voltage	10
2.2. Measuring Resistance	10
2.3. Testing for Continuity	11
2.4. Testing Diodes	11
2.6. Measuring Frequency	12
2.7. Measuring Temperature	12
2.5. Measuring Capacitance.....	12
2.8. Non-Contact Voltage Detect (NCV)	13
2.9. Measuring DC or AC Current	14
3. TOOLS	16
3.1. Data Hold Mode	16
3.2. Relative Measurements	16
3.3. Buzzer Feature.....	17
4. SPECIFICATIONS	18
5. MAINTENANCE	20
5.1. Instructions for Returning by Mail	20
5.2. Cleaning Recommendations	20



PROFESSIONAL DIGITAL MULTIMETER

FP - 2

1 QUICK START

1.1 General Inspection

Check the instrument according to the following steps:

1. Check whether there is any damage caused by transportation

If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away first till the complete device and its accessories succeed in the electrical and mechanical property tests.

2. Check the Accessories

Accessories supplied are:

■ Test lead.



■ K-type thermocouple.



■ 9 V battery (6F22).



■ Bolt driver.



■ Quick guide.



If it is found that there is any accessory lost or damaged, please get in touch with the distributor of PROMAX responsible for this service or the PROMAX local offices.

3. Check the Complete Instrument

If it is found that there is damage to the appearance of the instrument, or the instrument can not work normally, or fails in the performance test, please get in touch with the PROMAX distributor responsible for this business or the PROMAX local offices. If there is damage to the instrument caused by the transportation, please keep the package. With the transportation department or the PROMAX distributor responsible for this business informed about it, a repairing or replacement of the instrument will be arranged by the PROMAX.

1.2 Install the Batteries

The multimeter is powered by a 9V (6F22) battery.

NOTE: To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery indicator appears.

Before replacing the battery, turn off the meter, disconnect test leads and any connectors from any circuit under test, remove test leads from the input terminals. Use only the specified battery type.

Use the following procedure to install the batteries:

- 1 Ensure that the rotary switch is at the position. Remove test leads and any connectors from the input terminals.
- 2 Lift the tilt stand and loosen the screws with a suitable Phillips screwdriver and remove the battery cover.
- 3 Observe the battery polarity indicated inside the battery compartment, Insert the batteries.
- 4 Place the battery cover back in its original position and tighten the screws.

NOTE: To avoid instruments being damage from battery leakage, always remove the batteries and store them separately if the multimeter is not going to be used for a long period.



1.3 Adjusting the Tilt Stand


- 1 Pull the tilt stand outward to its maximum reach (about 85° to the meter body).

1.4 Power On

- 1 To power ON the multimeter, turn the rotary switch to any other position except OFF.
- 2 To power OFF the multimeter, turn the rotary switch to the OFF position.

1.5 Sleep Mode



The multimeter automatically enters the sleep mode if the rotary switch is not moved or a key is not pressed for 30 minutes. (When the Bluetooth is activated, this function is disabled.).

Pressing  or turn the rotary switch will turn the multimeter back to operation mode from the sleep mode.

One minute before Auto Power-off, the buzzer will beep five times to warn. Before shutoff, the buzzer will emit a long beep, and then the multimeter will shut off.

NOTE: In sleep mode, the multimeter will still consume a little power. If the multimeter is not going to be used for a long period, the power should be turned off.

1.6 LCD Backlight and Flashlight

To implement the test among darkness, you can activate the LCD backlight and flashlight by pressing   for more than 2 seconds. The backlight and flashlight will last for one minute.


To turn off manually, pressing   for more than 2 seconds.

1.7 Selecting the Range

Auto ranging is set as default when the meter is powered on, **AUTO** is displayed.

When auto ranging is enabled, press  to enter the manual range mode.



In manual range, each additional press of  sets the multimeter to the next higher range, unless it is already in the highest range, at which point the range switches to the lowest range.

When manual range is enabled, press  for more than 2 seconds to enter the auto ranging mode.

NOTE: Manual range is not available when measuring capacitance.



1.8 Multimeter in Brief

► Front Panel



Figure 1.





- 1** Non-contact Voltage Detector.
- 2** Flashlight.
- 3** LED Indicator.
- 4** Display Screen.
- 5** Select DC/AC - Select Resistance/Continuity/Diode.
- 6** Auto/Manual Range.
- 7** Backlight & Flashlight - Data Hold.
- 8** Select Frequency/Duty Cycle - Frequency in AC Voltage/Current Mode - Relative Measurements.
- 9** Rotary Switch.
- 10** Input Terminals.



► Rotary Switch

Position	Description
OFF	Power off
\approx V	DC or AC voltage measurement
\approx mV	DC or AC voltage measurement (up to 600 millivolts)
Ω → o))	Resistance measurement / Continuity test / Diode test
←	Capacitance measurement
Hz%	Frequency measurement
°C/°F	Temperature measurement
NCV	Non-contact voltage detect
\approx μ A	DC or AC current measurement (up to 600 microamperes)
\approx mA	DC or AC current measurement (up to 600 milliamperes)
\approx A	DC or AC current measurement

► Keypad

Key	Description
Select	Select DC or AC Select Resistance / Continuity / Diode
Range	Auto/Manual range
 / 	Backlight & Flashlight Data Hold
Hz/Duty  / 	Select frequency/duty cycle Measuring frequency in AC voltage/current mode Relative Measurements



► Display Screen

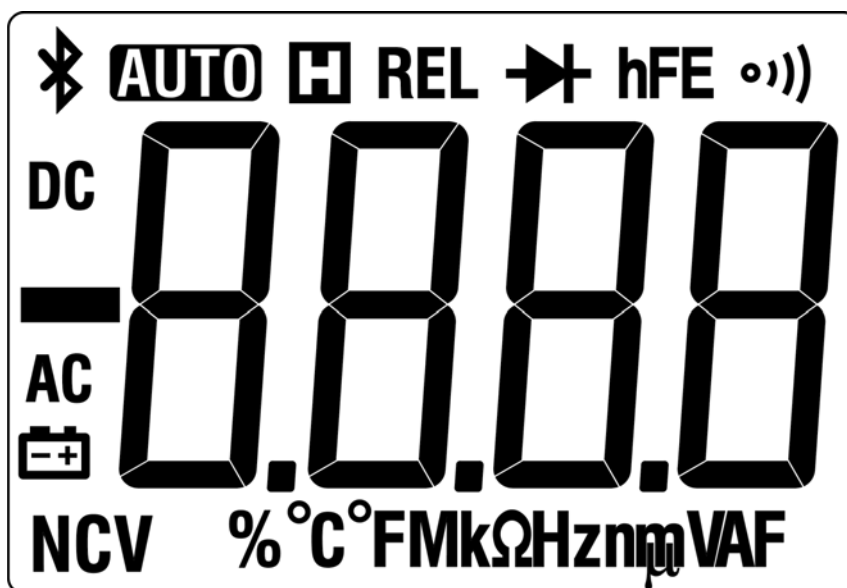


Figure 2.

Icon	Description
AUTO	Auto range
□	Data hold enabled
REL	Relative enabled
→ 	Diode test selected
o))	Continuity test selected
DC	DC
AC	AC
⊖+	Battery is low
-0.0.0.0	Measurement display ("OL" is short for overload, indicates the reading exceeds the display range)
NCV	Non-contact Voltage Detect
% °C °F M k Ω Hz n p V A F	Measuring units



► Measurement Units

Sign	Description
M	Mega 1E+06 (1.000.000)
k	kilo 1E+03 (1.000)
m	mili 1E-03 (0,001)
μ	micro 1E-06 (0,000001)
n	nano 1E-09 (0,00000001)

Sign	Description
°C	Degree Celsius (Temperature)
°F	Degree Fahrenheit (Temperature)
V	Voltage (Voltage)
A	Ampere (Current)
W	Ohm (Resistance)
Hz	Hertz (Frequency)
%	Percent (Duty cycle)
F	Faraday (Capacitance)



- 3 Probe the test points and read the display. Press **Range** to enable and cycle through the manual ranges.

CAUTION: To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before measuring resistance.

2.3 Testing for Continuity

► Operation

- 1 Rotate the rotary switch to Ω . Press **Select** once to enter continuity testing mode, Ω will be displayed.
- 2 Connect the black test lead to the **COM** terminal and the red test lead to the **V Ω Hz** terminal.
- 3 Probe the test points to measure the resistance in the circuit. If the reading is below 30 Ω , the multimeter will beep continuously.

CAUTION: To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing for continuity.

2.4 Testing Diodes

► Operation

- 1 Rotate the rotary switch to Ω . Press **Select** twice to enter diode testing mode, $\rightarrow|+$ will be displayed.
- 2 Connect the black test lead to the **COM** terminal and the red test lead to the **V Ω Hz** terminal.
- 3 Connect the red test lead to the positive terminal (anode) of the diode and the black test lead to the negative terminal (cathode). The cathode of a diode is indicated with a band.
- 4 Read the diode forward bias. If the test lead connection is reversed, the multimeter will display "OL".

WARNING: To avoid possible damage to your multimeter or to the equipment under test, disconnect the circuit power and discharge all high-voltage capacitors before testing diodes.



- 4 If voltage is detected, the LED above the display will flash, and the meter will beep.

WARNING: Always test the NCV function on a known live circuit before use.

Do not attempt to use the meter as an AC Voltage Detector if the battery is weak or bad.

Even without indication, voltage may still be present. Do not rely on NCV detection to check the shielded wire. Detection could be impaired by socket design, insulation thickness, or other factors.

External interference such as static electricity sources could mistakenly trigger NCV indication.

2.9 Measuring DC or AC Current



WARNING: Never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250 V. Doing so will cause damage to the multimeter and possible electric shock or personal injury.


CAUTION: To avoid possible damage to the multimeter or to the equipment under test, check the multimeter's fuse before measuring current. Use the proper terminals, function, and range for your measurement. Never place the test leads in parallel with any circuit or component when the leads are plugged into the current terminals.

► Operation

- 1 Turn off the power of the measured circuit. Discharge all high-voltage capacitors.
- 2 Connect the black test lead to the **COM** terminal. For currents below 600 mA, connect the red test lead to the **μA mA** terminal; for currents within 600 mA – 10 A, connect the red test lead to the **20A** terminal.
- 3 Rotate the rotary switch to the appropriate position according to the measurement range **$\tilde{\mu}\text{A}$, $\tilde{\text{mA}}$ or $\tilde{\text{A}}$** .
- 4 Disconnect the circuit path to be tested. Connect the black test lead to one side of the circuit (with a lower voltage); connect the red test lead to the other side (with a higher voltage). Reversing the leads will produce a negative reading, but will not damage the multimeter.



- 5 Select DC or AC measurement mode. Default is DC measurement mode, **DC** will be displayed. Press  to switch into AC measurement mode, **AC** will be displayed.
- 6 Turn on the power of the measured circuit, and read the display. Press  to enable and cycle through the manual ranges. If "OL" is displayed, it indicates the input exceeds the selected range and the rotary switch should be set to the position with higher range.
- 7 Turn off the power of the measured circuit and discharge all high-voltage capacitors. Remove the test leads and restore the circuit to the original condition.






NOTE: When measuring AC current, press  to cycle through frequency measuring, duty cycle measuring, and original measuring.



3 TOOLS

3.1 Data Hold Mode

► Operation

- 1 Press   to freeze the display during measurement.  will be shown on the display.
- 2 Press   again to exit this mode.




3.2 Relative Measurements

► Description

When making relative measurements, reading is the difference between a stored reference value and the input signal.

In relative measurement, the manual range mode will be activated automatically. (The relative measurement should be carried out under a certain range, that is, this function is only available under the manual range mode.)

► Operation

- 1 Press  to enter the relative mode. **REL** will be shown on the display. The measurement value when pressing  is stored as the reference value. In this mode:
 - REL (current reading) = input value - reference value.
- 2 Press  again to exit the mode.

NOTE: This function is not available when measuring AC voltage/current, transistor (only for specific models), and frequency.



3.3 Buzzer Feature

- Press the function key, the buzzer emits a short beep.
- One minute before Auto Power-off, the buzzer will beep five times to warn. Before shutoff, the buzzer will emit a long beep, and then the multimeter will shut off.
- The buzzer beeps continuously to warn once the measured DC voltage exceeds 1000 V, or the measured AC voltage exceeds 750 V.
- When the Bluetooth function is idle for 10 minutes, the Bluetooth will be turned off automatically. Before turning off, the buzzer will beep twice.



4 SPECIFICATIONS

► Technical Specifications

Function	Measurement Range	Resolution	Accuracy	
DC Voltage (V)	mV	60.00 mV / 600.0 mV	0,01 mV	±(0.5% + 2 dig)
	V	6.000 V / 60.00 V / 600.0 V	1 mV	
	V	1000 V	1 V	±(0.8% + 2 dig)
AC Voltage (V)	mV	600.0 mV	0.1 mV	±(0.8% + 3 dig)
	V	6.000 V / 60.00 V / 600.0 V	1 mV	
	V	750 V	1 V	±(1% + 3 dig)
DC Current (A)	µA	600.0 uA / 6000 uA	0.1 µA	±(0.8% + 2 dig)
	mA	60.00 mA / 600.0 mA	0.01 mA	±(0.8% + 2 dig)
	A	20.00 A ¹	0.01 A	±(1.2% + 3dig)
AC Current (A)	µA	600.0 uA / 6000 uA	0.1 µA	±(1% + 3 dig)
	mA	60.00 mA / 600.0 mA	0.01 mA	±(1% + 3 dig)
	A	20.00 A ²	0.01 A	±(1.5% + 3 dig)
Resistance (Ω)	600.0 Ω / 6.000 kΩ / 60.00 kΩ / 600.0 kΩ / 6.000 MΩ		0.1 Ω	±(0.8% + 2 dig)
	60.00 MΩ		0.01 MΩ	±(2% + 3 dig)
Capacitance (F)	60.00 nF / 600.0 nF / 6.000 µF / 60.00 µF		0.01 nF	±(3% + 3 dig)
	600.0 µF / 6.000 mF / 60.00 mF ³		0.1 µF	±(3% + 5dig)
Frequency (Hz) ⁴	9.999 Hz/99.99 Hz/999.9 Hz/9.999 kHz/99.99 kHz/99.9 kHz/9.999 MHz		0.001 Hz	±0.8% + 2 dig)
Duty Cycle ⁵	0.1% - 99.9% (típico: Vrms=1 V, f=1 kHz)		0.1 %	±(1.2% + 3 dig)
	0.1% - 99.9%(≥1 kHz)			±(2.5% + 3 dig)
Temperature (°C)	-50 °C a 400 °C		1°C	±(2.5% + 3 dig)
	-58 °C a 752 °F		1°F	±(4.5% + 5 dig)

1. When measuring current, for 10 A to 15 A, the measuring duration should not be over 2 minutes within 10 minutes, and in this 10 minutes, no other current should flow through except within the measuring duration; for 15 A to 20 A, the measuring duration should not be over 10 seconds within 15 minutes, and in this 15 minutes, no other current should flow through except within the measuring duration.
2. When measuring current, for 10 A to 15 A, the measuring duration should not be over 2 minutes within 10 minutes, and in this 10 minutes, no other current should flow through except within the measuring duration; for 15 A to 20 A, the measuring duration should not be over 10 seconds within 15 minutes, and in this 15 minutes, no other current should flow through except within the measuring duration.
3. When measuring capacitance, for the 60 mF range, the measuring duration should be over 30 seconds.
4. When measuring frequency, the typical waveform is Square or Sine. The signal meets the following conditions. Frequency between 1 and 5 MHz and amplitude equal or more than 700 mV (RMS).
5. When measuring duty cycle, the typical waveform is Square.

NOTE: All these specifications apply to the multimeter unless otherwise explanation.


Standard conditions should be between 18°C and 28°C and the relative humidity less than 80%.

When measuring AC voltage/current or capacitance, accuracy guarantee range is 5% to 100% of the range.

One year is recommended for the calibration interval period.



► **Features**

Characteristics	Instruction
Display	5999
Frequency Response	(40 - 1000) Hz
Sample rate for digital data	3 times/s
Bluetooth	Not available
Auto ranging	Available
True RMS	Available
Diodes Test	Available
Sleep Mode	Available
Continuity Test	Available
Low battery indication	The icon  is displayed when the battery is under the proper operation range.)
Data Hold	Available
Relative Measurement	Available
LCD Backlight	Available
Input Protection	Available
Input Impedance	$\geq 10 \text{ M}\Omega$
Battery	9 V (6F22)
LCD Size	58,5
Weight (without package)	0,32 kg
Dimension	190 mm x 90 mm x 56 mm
Working temperature	0°C to 40°C
Storage temperature	-10°C to 60°C \geq
Relative Humidity	$\leq 80\%$
Altitude	Operating: 3.000 m Non-operating: 15.000 m



5 MAINTENANCE

5.1 Instructions for Returning by Mail

Instruments returned for repair or calibration, either within or out of the warranty period, should be sent with the following information: Name of the Company, name of the contact person, address, telephone number, receipt (in the case of coverage under warranty) and a description of the problem or the service required.

5.2 Cleaning Recommendations

To clean the instrument exterior, perform the following steps:

- Wipe the dust from the instrument surface with a soft cloth.
- Do not make any scuffing on the screen when clean the LCD.
- Clean the instrument with a wet soft cloth not dripping water.
- It is recommended to scrub with soft detergent or fresh water.
- To avoid damage to the instrument, do not use any corrosive chemical cleaning agent.

Dirt or moisture in the terminals can distort readings. Follow the steps below to clean your multimeter:

- 1 Turn the multimeter off and remove the test leads.
- 2 Turn the multimeter over and shake out the dirt in the terminals.
- 3 Wipe the contacts in each terminal with a clean swab dipped in alcohol.



PROMAX ELECTRONICA, S.L.

Francesc Moragas, 71-75
08907 L'HOSPITALET DE LLOBREGAT (Barcelona)
SPAIN
Tel: 93 184 77 00 * Tel. Intl.: (+34) 93 184 77 02
Fax: 93 338 11 26 * Fax Intl.: (+34) 93 338 11 26
<http://www.promaxelectronics.com>
e-mail: promax@promaxelectronics.com