

# TENMARS

## Battery Impedance Tester

TM-6002

User's Manual



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**1. Features**

1. The Battery Tester is designed for measuring the internal impedance and open circuit voltage of the secondary battery including Nickel-metal hydride battery ( NiMH), Nickel-cadmium battery(NiCd),Lithium-ion battery(Li-ion), Alkaline battery and lead-Acid battery.
2. AC four-terminal method to measure the internal impedance by eliminating lead impedance and contact impedance to get the accurate results.
3. Multi-display to show the internal impedance, voltage and clock of the battery simultaneously.
4. It has 99 sets of composite comparator function, which can be set at impedance and voltage values to get the reliable detection of battery deterioration.
5. Pin type leads, which can easily contact the battery electrodes supplied as standard to get more accurate 4-terminal measurement.

**2. SPECIFICATIONS****4-1.General specifications**

Measuring method : Impedance (AC four-terminal method).


A/D conversion: Dual slope method.

Display : LCD display and LEDs (comparator output).

Sampling rate:2 Second.

Open-Circuit terminal voltage: 7.0Vp-p max.

Input over range: the screen displays "OL" .

Low battery detection: the screen displays "  " .

Auto power off: The meter will turn off automatically after about 15 minutes of inactivity, allows user to set the inactive time (01~99 minutes).

Comparator settings: High and Low limits of the comparators impedance and voltage.

Number of comparator settings: 99 sets.

Manual and auto continuous Data logging: 9999 sets.

Operating temperature and R.H. value: 5 °C to 40 °C, 80%RH or less (non-condensation).

Storage temperature and R.H. value: -10 °C to 60 °C, 70%RH or less (non-condensation).

Operating ambience: In-door use, under environmental pollution grades two.

Operating attitude: Max 2000 meters above level.

Power supply: 1.5V × 6 NEDA 15F IEC R6 JIS SUM-3(ALKALINE).

AC adapter : AC input Voltage is 100Vac to 240Vac 1.0A with input frequency of 60 HZ or 50HZ,Free Voltage DC output is 9V<sub>DC</sub>(8~12V<sub>DC</sub>Max)

Supply current : > 1.0A<sub>DC</sub>. Socket : pin Ground Casing Positive  
External Diameter 3.5mm internal Diameter 2.0mm.

Dimension and weight: 240mm(L) x 100mm (W) x 45mm(H). approximate  
700g(including batteries).

Fuse specification: 0.5A/250V, 3.6Øx 10mm.

Accessories: One set of testing clips, Instruction Manual, Batteries, Software CD, USB cable, carrying case.

## 3. Identifying parts

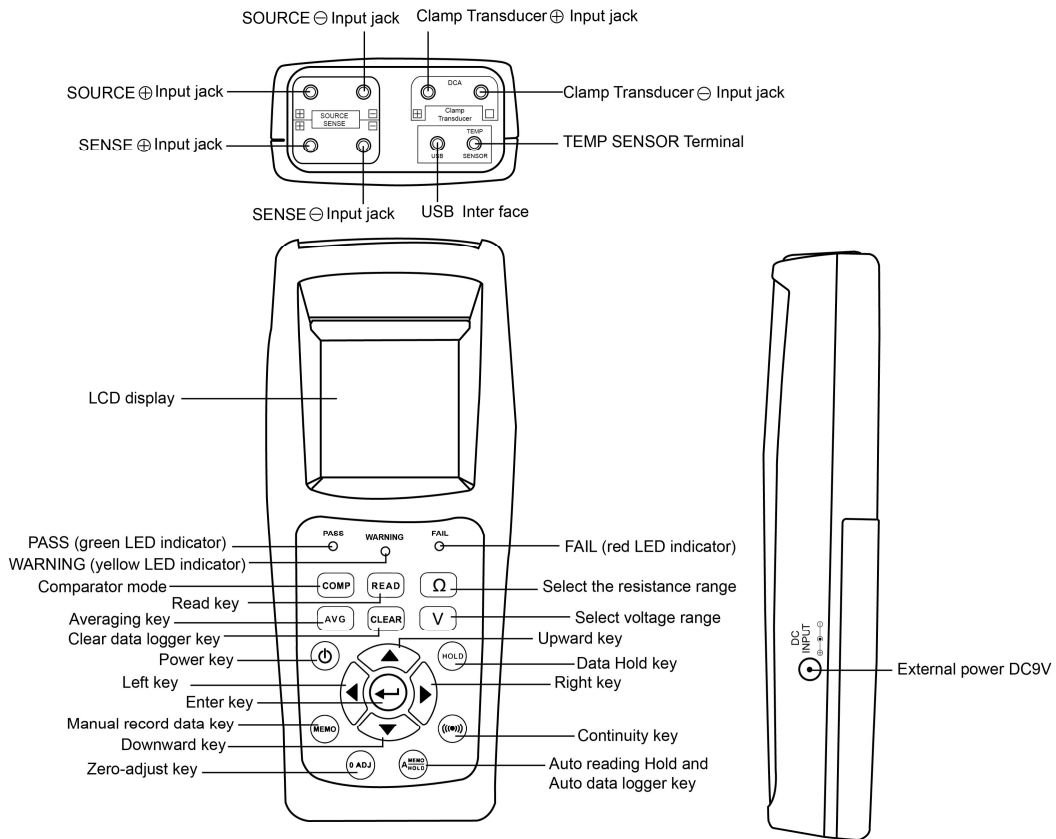














FIG (1)

1. LCD display.
2. PASS LED : To indicate the tested battery complies with the high limit of comparator.
3. WARNING LED : To indicate the tested battery is going to deteriorate.
4. FAIL LED : To indicate the tested battery has deteriorated.
5.  key : Comparator function.
6.  key : Average function.
7.  key : To show the data logged readings.
8.  key : To delete single data logged reading in the memory and settings date/time.
9.  key : Select the impedance range. (40mΩ, 400mΩ, 4Ω, 40Ω)
10.  key : Select the voltage range. (4V, 40V)
11.  key : Power ON/OFF.
12. HOLD key : Hold or disable -hold function for the displayed values.
13.  key : Turn the beeper on or off
14. **MEMO** key : For recording the displayed values.
15.  key : For implementing the zero-adjust feature.
16.  key : Select the auto-hold and auto-memory feature.
17.  key : For configuration settings and changing their values.
18.  key : To set the configuration with entering values.
19. SOURCE+ input jack : For connecting with the red test lead plug.
20. SOURCE— input jack : For connecting with the back test lead plug.
21. SENSE+ input jack : For connecting with the yellow test lead plug.
22. SENSE— input jack : For connecting with the blue test lead plug.
23. TEMPSENSOR input jack : For connecting the plug of the temperature sensor.
24. DCA+ input jack : For connecting with the red test lead plug to current probe.
25. DCA— input jack : For connecting with the back test lead plug to current probe.
26. USB interface : Used for connecting the USB cable.
27. DC input jack : Used for connecting the external power DC 9V input.

#### 4. Electrical specifications:

To ensure accuracy the ambient temperature should be  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$  with a humidity of 80% RH (maximum) non-condensing. In addition,

perform a Zero adjustment after each range change.

**Resistance measurements**

Temperature coefficient :  $(\pm 0.1\% \text{ rdg } \pm 0.5 \text{ digits})/^\circ\text{C}$ .

Measurement current frequency :  $1\text{KHZ} \pm 30\text{HZ}$ .

Measurement open-circuit terminal voltage :  $7\text{Vp-p}$



**CAUTION**

The maximum input for DC voltage is 40V (No AC voltage Input permitted). Do not attempt to measure high voltages to avoid electrical shocks or damages to the instrument. °

Range	Resolution	Measurement current	Accuracy
40mΩ	<b>10 μ Ω</b>	100mA approx.	±(0.8% reading + 10digits)
400 mΩ	<b>100 μ Ω</b>	15mA approx.	
4 Ω	<b>1mΩ</b>	1.5mA approx.	
40 Ω	<b>10mΩ</b>	150 μ A approx.	

## Voltage Measurements

Temperature coefficient : ( $\pm 0.1\%$  rdg  $\pm 0.5$ digits)/ $^{\circ}\text{C}$



### CAUTION

The maximum input for DC voltage is 40V(No AC voltage Input permitted). Do not attempt to measure high voltages to avoid electrical shocks or damages to the instrument. °

Range	Resolution	Accuracy
4V	1mV	$\pm(0.1\%$ reading +6digits)
40V	10mV	

## Temperature measurement

Measurement Range	Resolution	Accuracy
-20 $^{\circ}\text{C}$ ~ 60 $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$	$\pm 1.0^{\circ}\text{C}$
-4 $^{\circ}\text{F}$ ~ 140 $^{\circ}\text{F}$	0.1 $^{\circ}\text{F}$	$\pm 1.8^{\circ}\text{F}$

## DC Current (DCA) measurement



### CAUTION

The maximum input for DC current is 700A. Do not attempt to measure higher currents to avoid electrical shocks or damages to the instrument.

Range	Sensitivity	Resolution	Accuracy
700A	0.6A~700.0A	0.1A	$\pm(2.0\%$ reading +5digits)

## 5. Safety Precaution



### CAUTION

Take extreme care for the following conditions while measuring.

1. Measuring voltage over 20V as it may cause human body electricity conduction.
2. Do not measure voltage, current under humid or wet environment. If any unusual condition of test leads' send
3. (Metal part). And attachment of the meter, such as breakage, deformation, fracture, foreign substance, No display, etc., do not conduct any measuring.
4. Do not contact any exposed metal (conductive) parts, such as end of test lead, jack, fixing object, circuit etc,.
5. Keep you insulated from the object waiting for measuring.
6. Do not operate the meter under the environment with explosive gas



- (material), combustible gas (material) steam or filled with dust.
7. In order to avoid reading incorrect data, you have to replace the batteries immediately when the symbol BAT appears on the LCD.
  8. In order to avoid the damage caused by contamination and static electricity, do not touch the circuit board before you take any adequate action.

## ◆ Symbols Description



Caution



Danger high Voltage : risk of electric shock



Meter Double insulated



AC Voltage or Current



AC Voltage or Current






Ground

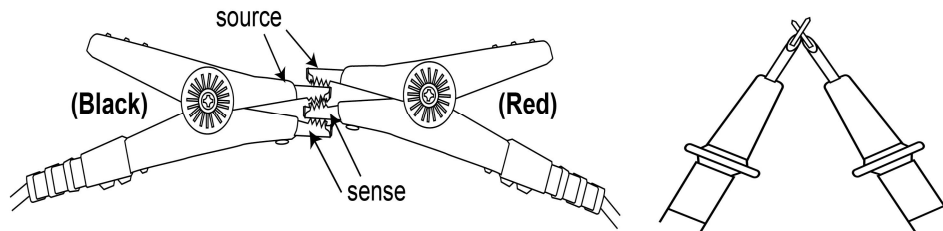
◆ Battery Replacement


### CAUTION



- Do not attempt to measure DC voltage exceeding 40V ◦ Do not attempt to measure AC voltages, This could result in injury or damage to the unit
- Do not attempt to measure the voltage of a generator. This would result in an AC voltage being applied to the voltage generating output terminals, which is dangerous.
- After measuring a high voltage battery, before continuing to measure a low voltage battery first short the measurement leads together. This will discharge the DC-elimination capacitor which is connected across the leads. Otherwise an excess voltage may be applied to the low voltage battery, which is dangerous.

1. Connect the following test leads to the meter:  
 Red test lead to SOURCE “+” jack  
 Black test lead to SOURCE “-” jack.  
 Yellow test lead to SENSE “+” jack  
 Blue test lead to SENSE “-” jack.  
 Temperature plug to TEMP SENSOR (TM-6002).
2. Press power  key turn on the meter ◦
3. Press  $\Omega$ -RANGE  key to select desired impedance ranges ◦
4. Press V-RANGE  key to select desired voltage ranges ◦
5. The zero adjustment function is to zero range of impedance. The reading during zero adjustment will be taken as zero and will be used to calibrate subsequent measurements.
6. (1).Short the red and black test leads probe four (4) terminals.

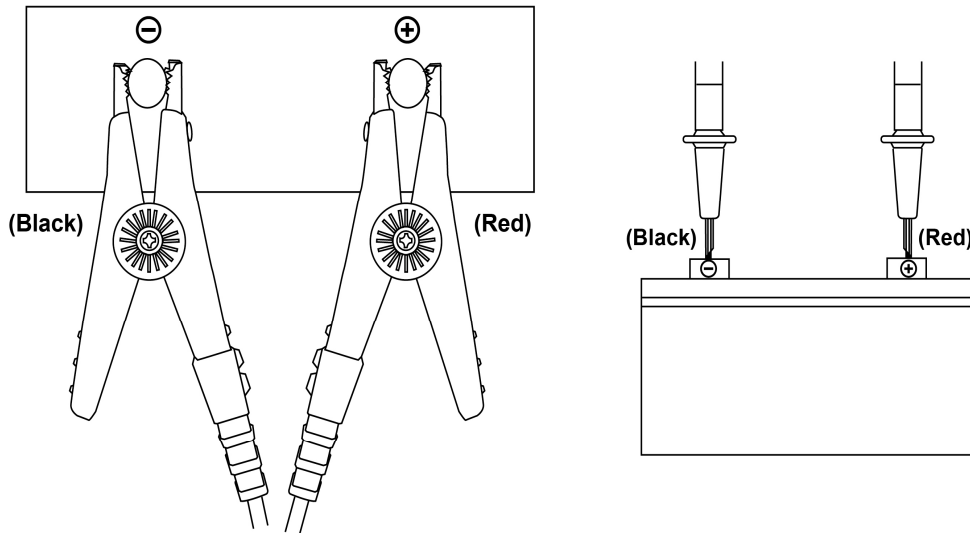


7. Press Zero adjustment  key for 2 seconds to start the zero adjustment. A flashing “0 ADJ” appears on the screen; when the tester reads a steady value of the resistance lower than 1000; then the screen

displays “0” and stop flashing ”0 ADJ”.

Press **0 ADJ** key again to disable the zero adjustment.

8. Connect the red test probe to the positive battery terminal, and the black test probe to the negative battery terminal.



9. Read the battery internal impedance or DC voltage directly and Temperature measurement(TM-6002) from the display.

Note : When the measured DC voltage or battery internal impedance value is over range, “OL” is displayed.

#### ◆ Enable average function

1. Press average **AVG** key to enable the average function.
2. Press average **AVG** key again to exit average function.

#### Clock setup



























The clock of this meter is 24-hour time format.

1. Press power: **⏻** key to turn on the meter,
2. Press clear **CLEAR** key to enter the clock setting mode.
3. Press left **⬅** or right **➡** key to select the options for adjustment.
4. Press up **⬆** key or down **⬇** key to change the digit.
5. Press **⏻** key to store the setup and exit the mode.

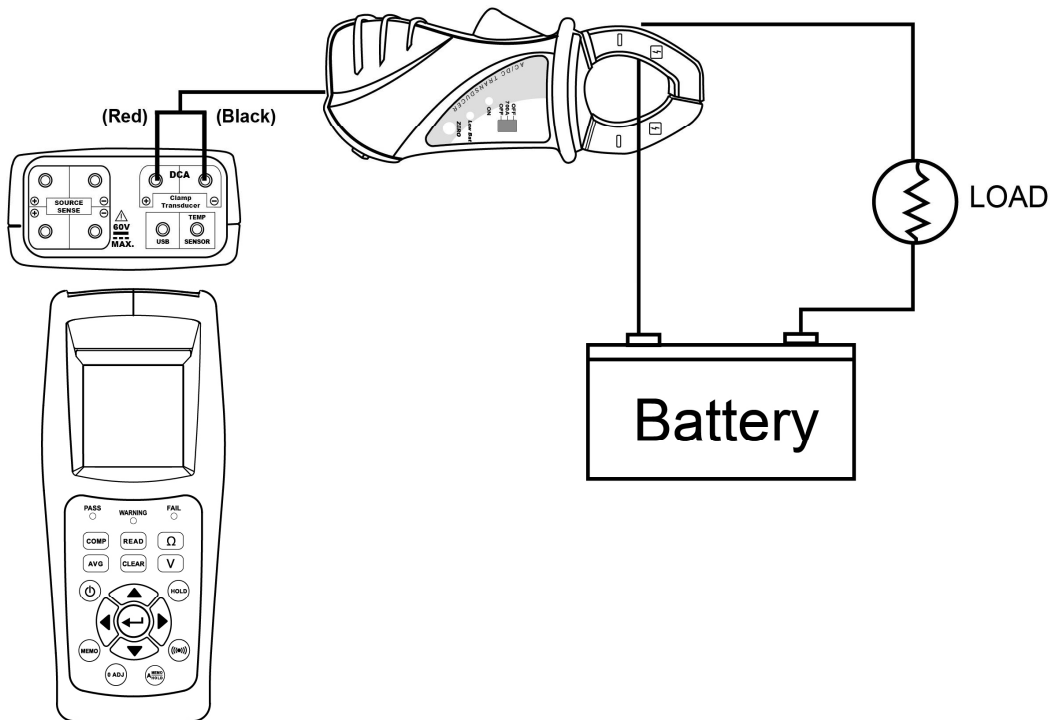
#### ◆ Comparator Settings


The comparator function compares the measured values with preset High and Low limit values for internal impedance and voltage level, and determines the range that the measurement should fall into. Then according to the following

conditions to light the corresponding LED, and sounds a beeper under the WARNING and FAIL cases.

1. Press power:  key turn on the meter.
2. Press comp  key for 2 seconds the display will show "COMP" and No "00". Each flashing to enter the comparator setting mode.
3. Use the up  key or down  key to select the desired comparator number form 01 up to 99.
4. Press left  or right  key to select option to adjust comparator low limit resistance and low limit voltage mode or select option to adjust comparator high limit resistance mode or select option to adjust comparator voltage and current mode.
5. If select option to adjust comparator high limit resistance mode, Press comp  key to display will blink "COMP" to enter comparator setting if high limit resistance.
6. Press  $\Omega$ -RANGE  key to select high limit resistance range.
7. Press left  or right  key to select option to adjust comparator high limit resistance
8. Press up  key or down  key to change the digit.
9. If you select option to adjust comparator low limit resistance and low limit voltage mode of step 5.
10. Press comp  key to display will blink "COMP" to enter comparator setting if low limit resistance and low limit voltage mode.
11. Press  $\Omega$ -RANGE  key to select low limit resistance range. or Press V-RANGE  key to select low limit voltage range.
12. Press left  or right  key to select option to adjust comparator low limit resistance and voltage
13. Press up  key or down  key to change the digit.
14. If you select option to adjust comparator voltage and current mode of step 5.
15. Press comp  key to enter comparator setting voltage and current mode
16. Press V-RANGE  key to select low limit voltage range
17. Press left  or right  key to select option to adjust comparator voltage and current.
18. Press up  key or down  key to change the digit.
19. Press  key to store the setup, exit the mode

◆ DC Current (DCA) measurement(TM-6002)






1. Connect the current probe to meter :
  - + red signal output to DCA+ JACK, and – black to signal output to DCA- JACK
2. Press power:  key turn on the meter.
3. Open the clamp and put the tested conductor in the center or clamp jaws.
4. The current value. Will be indicated on the LCD.

◆ . DATA HOLD and Back light function





1. Press HOLD key to enable data hold function.
2. Press HOLD key again to disable data hold function.
3. Please press HOLD key for more than 2 seconds to turn on the backlight display

◆ Auto Hold and Auto Recording function







1. Press "" key to start the auto-hold function, the symbol of "A.HOLD" and "HOLD" appear on the screen.
2. Press "HOLD" key to disable the hold function.
3. Press "" key for three times, the symbol of "A.HOLD " and

“A.MEMO” appear to start the Auto-recording function. Press “” key again to disable the Auto-recording function.

◆ Manual data logging mode and Clear data logger memory

1. Press manual data logging **MEMO** key enable manual data logging mode the display will show increase memory number.
2. Press reading  key to view logged readings mode
3. Press up  key or down  key to scroll through the readings, The LCD display will show READ. No : xxxx indicating memory number and measure value for internal resistance and voltage 、 time( temperature and DC current)TM-6002.
4. Press clear  key to delete sing data logged reading in the memory.

◆ Auto power off setup

1. Press power:  key turn on the meter, Press power:  key again for 2 seconds to disable auto power off function.
2. Press power:  key again for 2 seconds to auto power off setting mode.
3. Press up  key or down  key change the auto power off time. The auto power off time default value is 15 minutes.
4. Press enter  key store the setup, exit the mode.

## 6 BATTERY REPLACEMENT

	<b>WARNING</b>
If the symbol “  ” appears on the LCD, please replace the battery immediately	

The meter is powered by 1.5V battery x6pcs (NEDA 15F IEC R6 JIS UM-3).

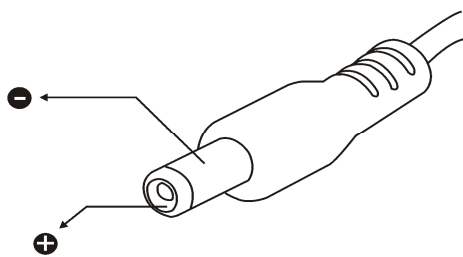
For the battery replacement procedure, please follow the steps below.

- Press power off key to turn the instrument off.
- Use a screw driver to unfasten the screws on the battery cover and remove the cover
- Take out the old batteries and replace with new batteries, taking care to note the correct polarity.
- Re-install the battery cover and tighten the holding screws.

## 7 External DC Power

- External AC to DC adapter: Voltage 9VDC(8~12VDCMax)
- Supply current : > 1.0ADC
- Socket : pin Positive, Ground Casing External

- Diameter 6.3mm; internal Diameter 2.0 mm

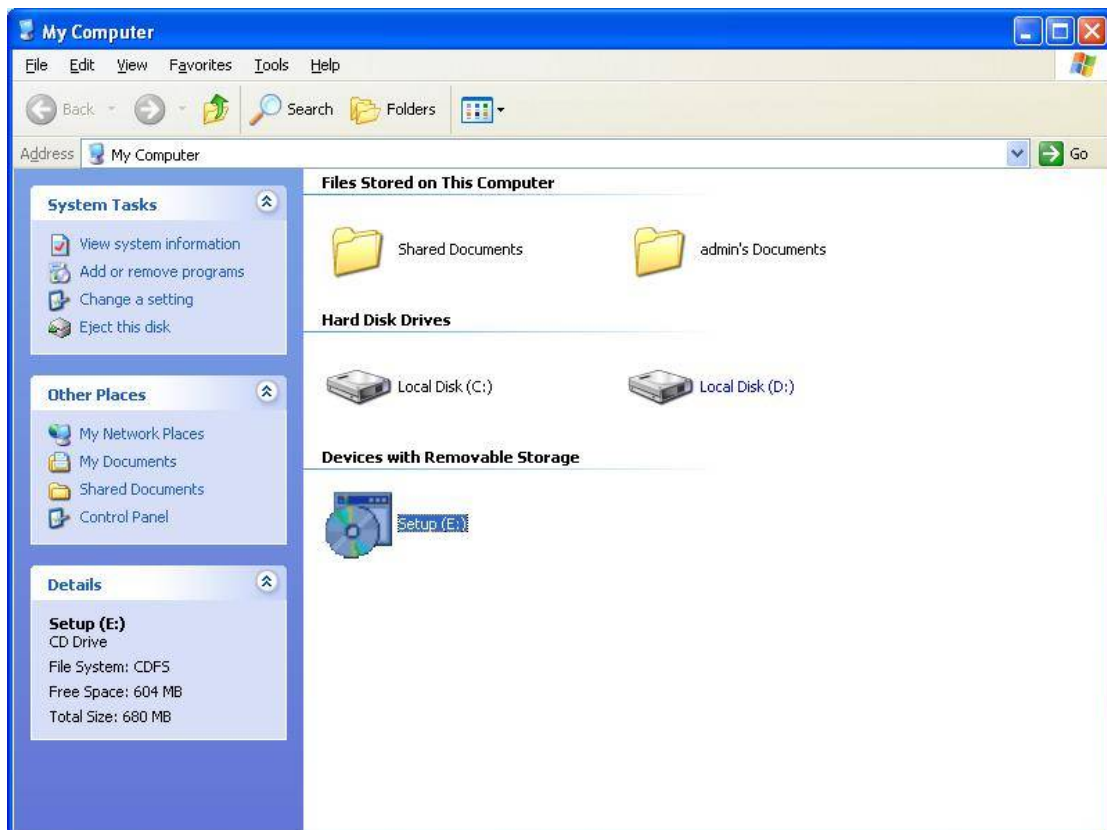


## 8 Software installation

### PC requirement:

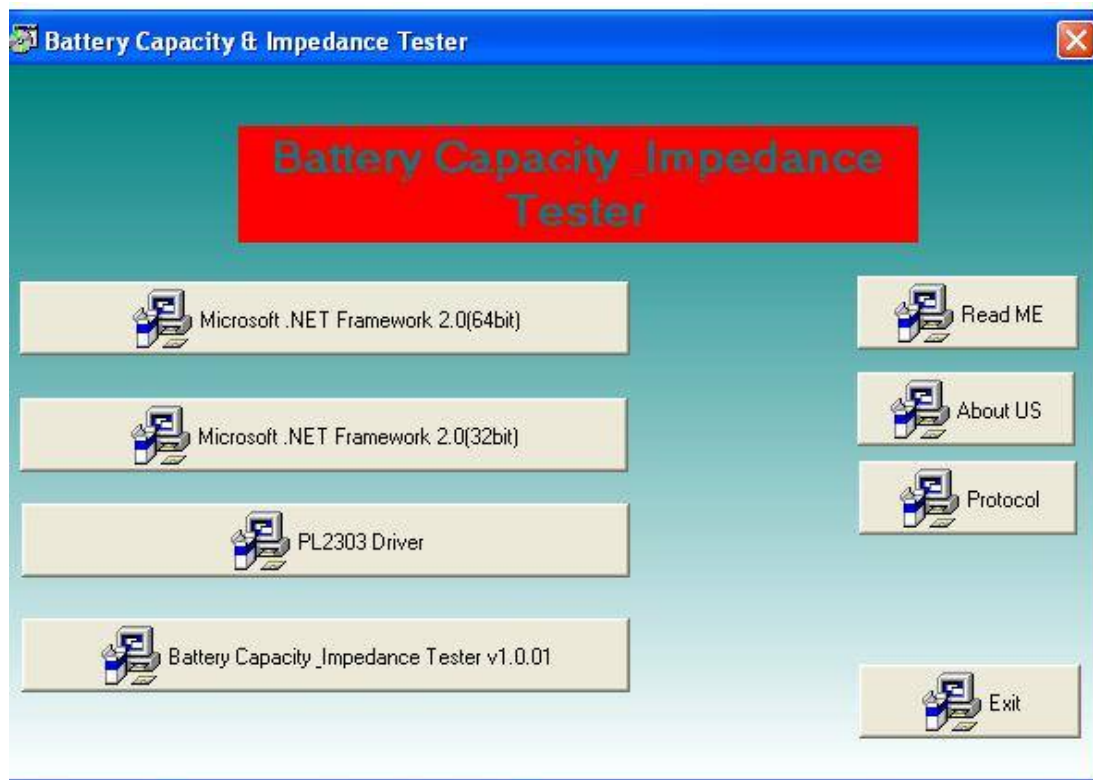
- CPU : Pentium III 1000MHZ.
- RAM:SDRAM 256MB.
- Hard Disk : 200MB.
- OS : Windows 2000 、 Windows XP 、 Windows 7 、 Windows 8.
- Display : 800×600 256 cooler.

1. Insert the CD into the PC to install the software first.

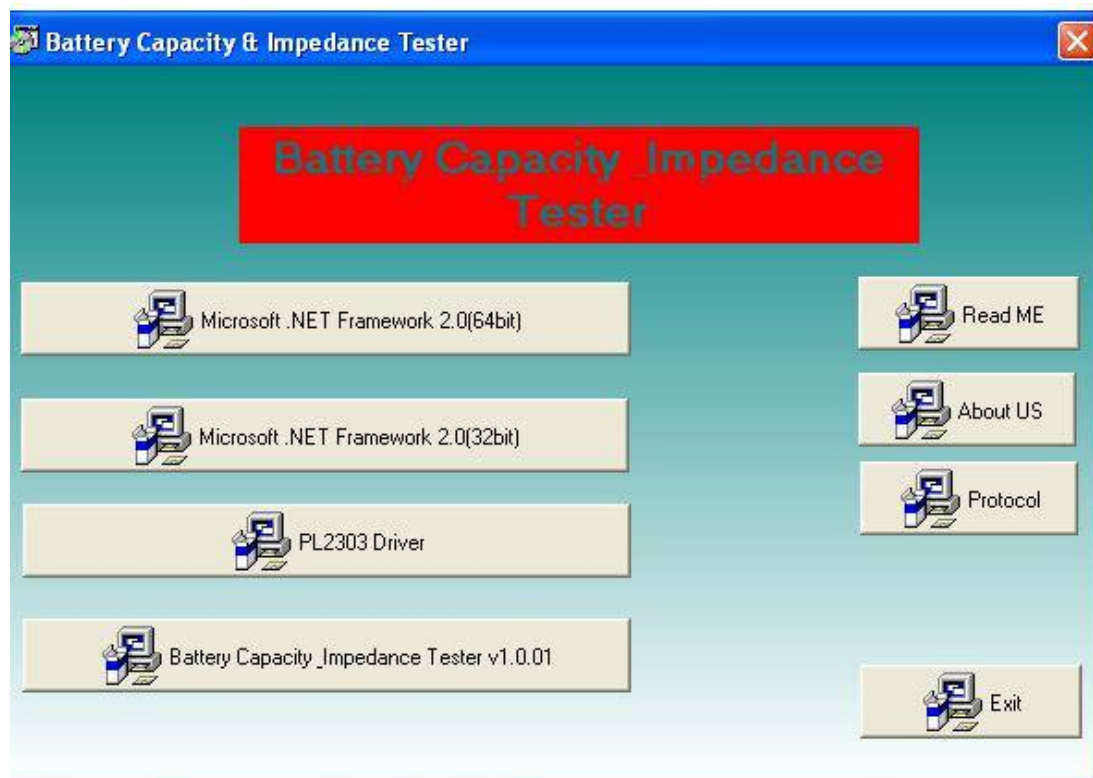


2. Select the USB drive to be installed, which is PL-2303 Drive Installer.exe, click twice on the left key of the mouse to install the USB driver.





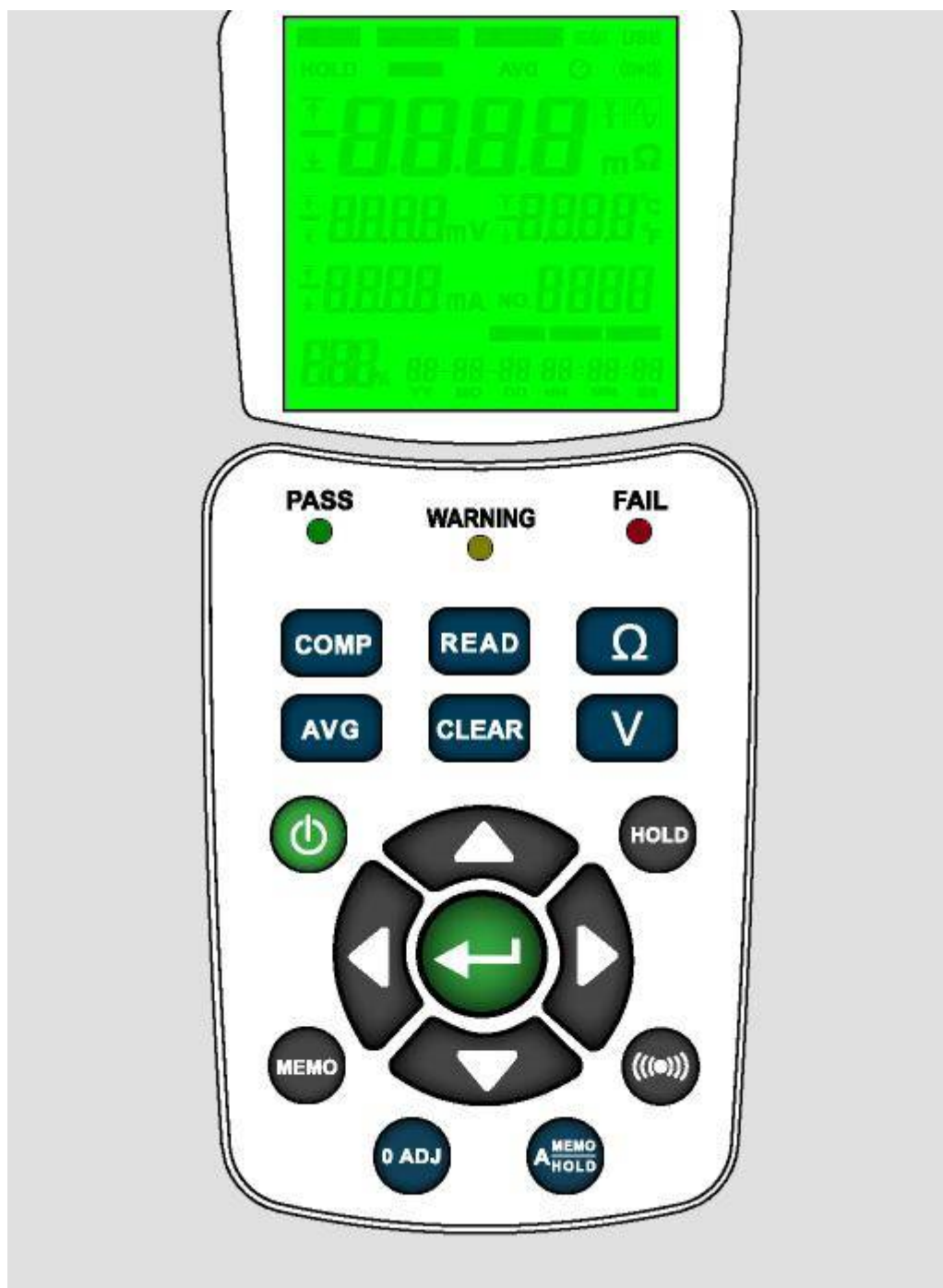
3. Select the Microsoft.NET Framework 2.0(32bit) or (64bit) and install the desktop icon.



4. Select the Battery Capacity Impedance Tester V1.0.01 and install the desktop icon.



5. Remove the CD from PC after completed the installation.
6. Use the USB cable to connect the meter and computer according to the drawing..
7. Select the desktop icon and click twice on left key of the mouse to run the procedure.



### Note



Caution: this symbol indicates that equipment and its accessories shall be subject to a separate collection and correct disposal





TENMARS ELECTRONICS CO., LTD  
6F, 586, RUI GUANG ROAD, NEIHU,  
TAIPEI 114, TAIWAN.  
E-mail: [service@tenmars.com](mailto:service@tenmars.com)  
<http://www.tenmars.com>