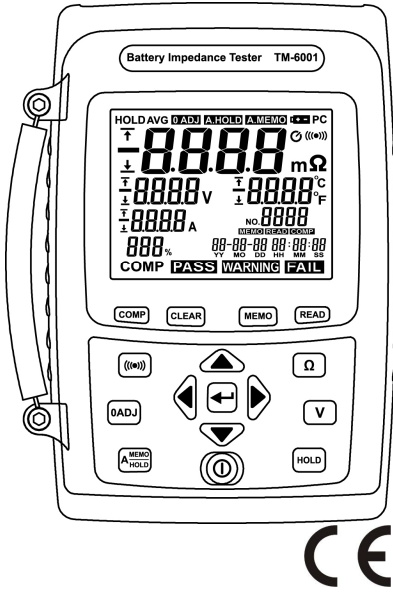
TENMARS

TM-6001
Battery Impedance Tester
User's Manual



CE

HB2TM6001M00

Contents:

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 Accessories

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1	Meter
1	User's Manual
1	Kevin Clip type leads with temperature sensor
1	Pin type leads
1	AC100~240V 9V/1A switching transformer
6	1.5 V – LR6 – AA – AM3 – MN 1500.
1	Carrying Case
1	USB cable
1	Installation CD

3 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
7. (material), combustible gas (material) steam or filled with dust.
8. In order to avoid reading incorrect data, you have to replace the batteries immediately when the symbol BAT appears on the LCD.
9. 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

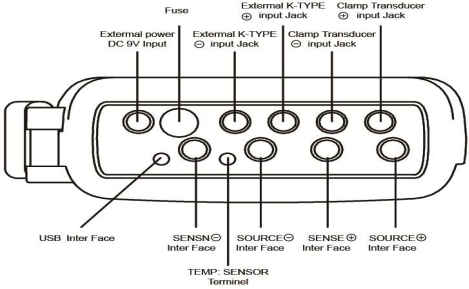

AC Voltage or Current

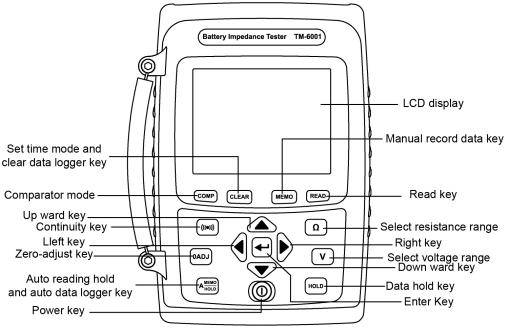

AC Voltage or Current


Ground


FUSE

4 Meter Description





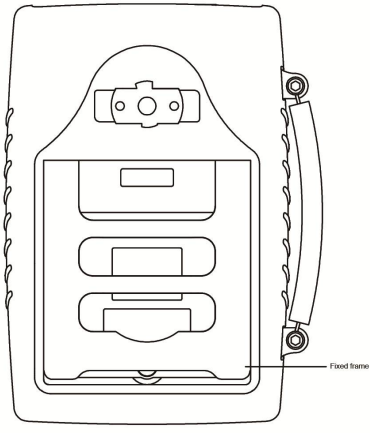


FIG (1)

1. LCD display..
2. COMP key ：Comparator function.
3. CLEAR key ：To delete single data logged reading in the memory and settings date/time.
4. READ key ：To show the data logged readings..
5. MEMO key ：For recording the displayed values.
6. Ω key ：Select the impedance range. (4mΩ, 40mΩ,400mΩ, 4Ω, 40Ω,400Ω)

7.  key ：Select the voltage range. (6V, 60V).
8.  key ：Hold or disable -hold function for the displayed values.
9.  key ：Power ON/OFF.
10.  key ：Turn the beeper on or off
11.  key ：For implementing the zero-adjust feature.
12.  key ：Select the auto-hold and auto-memory feature.
13.  key ：For configuration settings to increase values.
14.  key ：For configuration settings to decrease values.
15.  key ：For configuration settings to left changing digit.
16.  key ： For configuration settings to right changing digit.
17. key ：To set the configuration with entering values.
18. SOURCE＋ input jack：For connecting with the red test

lead plug.

19. SOURCE－ input jack：For connecting with the back test lead plug.
20. SENSE＋ input jack：For connecting with the yellow test lead plug.
21. SENSE－ input jack：For connecting with the blue test lead plug.
22. TEMPSENSOR input jack：For connecting the plug of the temperature sensor.
23. DCA＋ input jack：For connecting with the red test lead plug to current probe.
24. DCA－ input jack：For connecting with the back test lead plug to current probe.
25. K-TYPE＋ input jack：For connecting the external T10 adapter and K-type＋ probe.
26. K-TYPE- input jack：For connecting the external T10 adapter and K-type – probe.
27. Ratings and type of fuse：0.5A/250V 5ψ×20mm FAST MIN INTERRUPT RATINGS.1500A.
28. USB interface：Used for connecting the USB cable.
29. DC input jack：Used for connecting the external power DC 9V input.

5 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 9VDC(8~11VDCMax) Supply current：＞1.0ADC. Socket：pin Ground Casing Positive External Diameter 5.5mm internal Diameter 2.1mm.
- Dimension and weight: 240mm(L) x 170mm (W) x 66mm(H). approximate 1500g(including batteries).

6 Electrical specifications:

To ensure accuracy the ambient temperature should be 23°C ± 5°C with a humidity of 80% RH (maximum) non-condensing. In addition, perform a Zero adjustment after each range change.
±(0.8% reading +10digits)

Resistance measurements

Temperature coefficient ：±(0.1% rdg +0.5digits)/℃.
Measurement current frequency：1KHZ±30HZ.
Measurement open-circuit terminal voltage：7Vp-p

CAUTION

The maximum input for DC voltage is 60V (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
4mΩ	1μΩ	150mA approx.	±(1% reading + 20digits)
40mΩ	10μΩ	150mA approx.	±(0.8% reading + 10digits)
400mΩ	100μΩ	50mA approx.	
4Ω	1mΩ	15mA approx.	
40Ω	10mΩ	1.5**m**Aapprox.	
400Ω	100mΩ	150**μ**A approx.	

Voltage Measurements

Temperature coefficient ：(±0.1% rdg ±0.5digits)/℃

CAUTION
The maximum input for DC voltage is 60V(No AC voltage Input permitted). Do not attempt to measure high voltages to avoid electrical shocks or damages to the instrument.

Range	Resolution	Accuracy
6V	**1mV**	±(0.1% reading ＋6digits)
60V	**10mV**	

Temperature measurement

Measurement Range	Resolution	Accuracy
-20℃～60℃	0.1℃	±1.0℃
-4℉～140℉	0.1℉	±1.8℉

CAUTION
The maximum input for AC voltage is 24Vrms DC voltage is 60V. Do not attempt to measure high voltages to avoid electrical shocks or damages to the instrument.

External T10 adapter and K-Type temperature measurement

Measurement Range	Resolution	Accuracy
0℃～400℃	0.1℃	±2.0℃
32℉～752℉	0.1℉	±3.6℉

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.

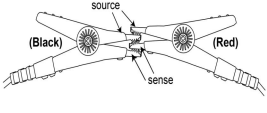
Range	Sensitivity	Resolution	Accuracy
700A	0.6A～700.0A	0.1A	±(2.0% reading ＋ 5digits)

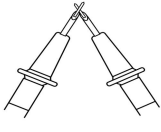
7 Operation:

CAUTION

- Do not attempt to measure DC voltage exceeding 60V ◦ Do not attempt to measure AC voltages, This could result in jury 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 .
2. Press power ⏻ key turn on the meter。
3. Press Ω-RANGE [Ω] key to select desired impedance ranges。
4. Press V-RANGE [V] 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.

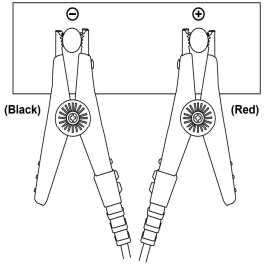




7. Press Zero adjustment (0ADJ) key for 2 seconds to start the zero adjustment. A flashing “0 ADJ” appears on the screen; when the tester reads a steady value of the resistance lower than 1000; then the screen displays “0” and stop flashing ”0 ADJ”.

   Press (0ADJ) 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 from the display.

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

7.1 Clock setup

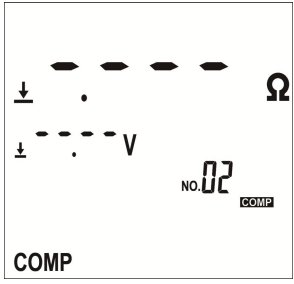
The clock of this meter is 24-hour time format.

1. Press power:  key to turn on the meter,
2. Press 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.

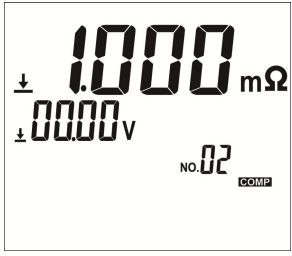
7.2 Comparator Settings

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 will be indicated on the display, and sounds a beeper under the WARNING and FAIL cases.

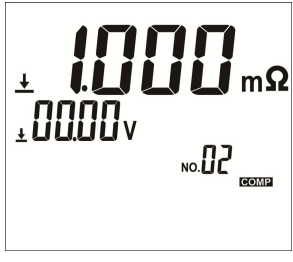
1. Press power: ⏻ key turn on the meter.



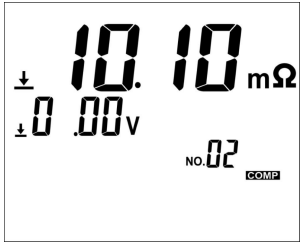
2. Press comp COMP key for 2 seconds the display will show ”COMP” and No ” 00” .Each flashing to enter the comparator setting mode.
3. Use the up ▲ key or down ▼ key to select the desired comparator number form 01 up to 99.



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 you select option to adjust comparator low limit resistance and low limit voltage mode of step 5.
6. Press comp COMP key to display will blink ”COMP” to enter comparator setting if low limit resistance and low limit voltage mode.
7. Press Ω-RANGE Ω key to select low limit resistance range. or Press V-RANGE V key to select low limit voltage range.

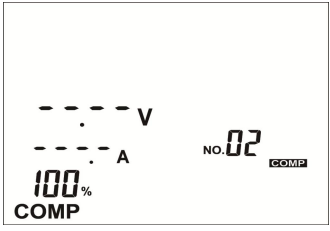


8. Press left  or right  key to select option to adjust comparator low limit resistance and voltage

9. Press up  key or down  key to change the digit.

10. 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.

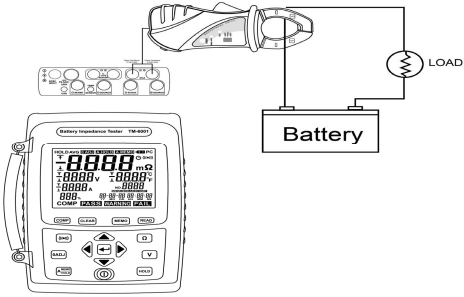
11. Press Ω-RANGE (Ω) key to select high limit resistance range.
12. Press left ◀ or right ▶ key to select option to adjust comparator high limit resistance
13. Press up ▲ key or down ▼ key to change the digit.
14. If you select option to adjust comparator voltage and current mode of step 5.



15. Press comp (COMP) key to enter comparator setting voltage and current mode
16. Press V-RANGE (V) 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.

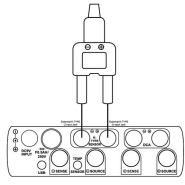
19. Press  key to store the setup, exit the mode

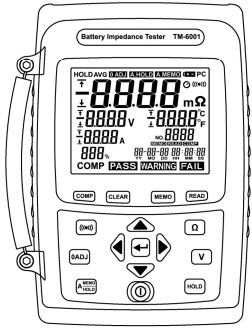
7.3 DC Current (DCA) measurement



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.

7.4 Temperature measurement(K-TYPE)





1. Insert the banana plug adapter T10 with correct + plug into K-Type sensor + JACK, and－plug into K-Type sensor－JACK
2. With banana pins to K-Type socket to adapt other standard K-Type mini plug temperature probes.

Remarks：temperature measurement can only select one of the NTC test clip or external K-Type thermocouple for the selection first priority.

7.5 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.

7.6 Auto Hold and Auto Recording function

1. Press (A MEMO HOLD) 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 (A MEMO HOLD) key for three times, the symbol of ”A.HOLD “ and “A.MEMO“ appear to start the Auto-recording function. Press “(A MEMO HOLD) “ key again to disable the Auto-recording function.

7.7 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 (READ) 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、 DC current.
4. Press clear  key to delete sing data logged reading in the memory.

7.8 Fuse replacement

When fuse replacement is required the user should select a fuse with these specifications 0.5A/250V,5ψ×20mm FAST MIN INTERRUPT RATINGS 1500A. to ensure the normal protection of circuit.

1. Press power:  key turn OFF the meter.
2. Use a screw driver to unfasten screws on the fuse holders cover and remove the old fuse replace a new fuse with the same specifications.
3. Use a screw driver to tighten screw on the fuse holders cover.

7.9 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.

Press enter key store the setup, exit the mode.

8. Battery Replacement

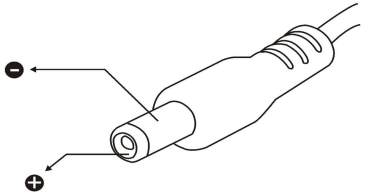
	WARNING
⚠	If the symbol "[+ -]" appears on the LCD, please replace the battery immediately

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.

9. External DC Power

- External AC to DC adapter: Voltage 9VDC(8~12VDCMax)
- Supply current：＞1.0ADC
- Socket：pin Positive, Ground Casing External
- Diameter 5.5mm; internal Diameter 2.1 mm

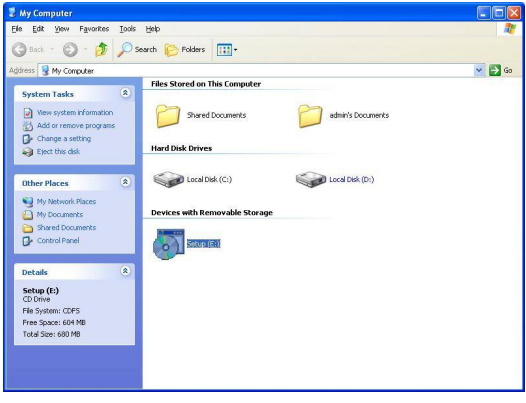


10. Software installation

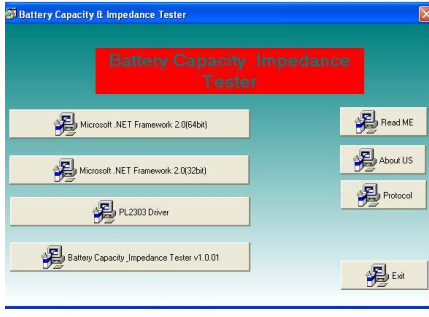
PC requirement:

- CPU：PentiumⅢ 1000MHZ.
- RAM:SDRAM 512MB.
- Hard Disk：200MB.
- OS：Windows XP、Windows 7、Windows 8.
- Display：1024×768 256 color.

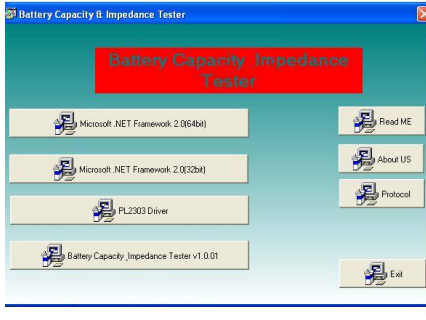
1. Insert the CD into the PC to install the software first.



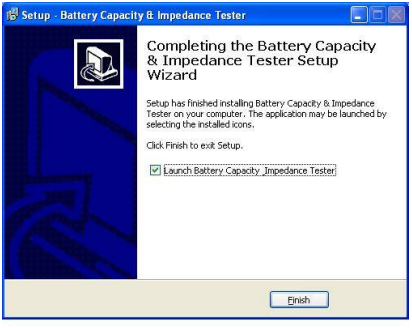
2. Select the USB drive to be installed, which is PL-2303 Drive Installer.exe, click twice on the left key of the mouse to install the USB driver.



3. Select the Microsft.NET Framework2.0(32bit) or (64bit) installs the desktop icon.

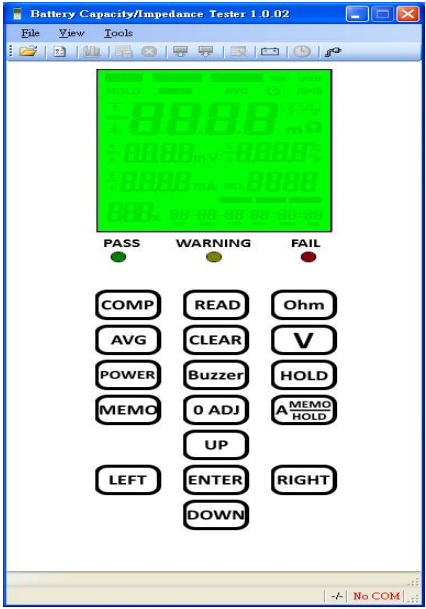


4. Select the Battery Capacity Impedance Tester V1.0.01and installs the desktop icon



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.



11. End of Life Disposal

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

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