



## DIGITAL MULTIMETER

# AM-1152

## User's Manual



[www.tmatlantic.com](http://www.tmatlantic.com)

## **Contents**

<b>1. GENERAL INSTRUCTIONS</b>	.....	1
<b>2. DESCRIPTION</b>	.....	5
<b>3. FUNCTION DESCRIPTION</b>	.....	9
<b>4. TECHNICAL SPECIFICATIONS</b>	.....	19
<b>5. MAINTENANCE</b>	.....	23
<b>6. ACCESSORIES</b>	.....	24

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the two screws on the battery cover.
4. Take out the battery cover from the meter.
5. Remove the used battery.
6. Replace with one new 9V battery (6F22).
7. Rejoin the battery cover and tighten the screws.

## 6. ACCESSORIES

Delivered with the multimeter:

∞ User's manual	One piece
∞ Test leads	One piece
∞ "K" type Thermocouple	One piece
∞ Multi-function socket	One piece
∞ USB line	One piece
∞ PC-Link software CD	One piece

If there are some changes in accessories, please refer to the real product as standard.

## 1. GENERAL INSTRUCTIONS

This instrument complies with IEC 61010-1: 2001, CAT III 1000V and CAT VI 600V overvoltage standards. See Specifications.

To get the best service from this instrument, read carefully this user's manual and respect the detailed safety precautions.

International symbols used on the Meter and in this manual are explained in chapter 1.2.

### 1.1 Precautions safety measures

#### 1.1.1 Preliminary

\* As the possibilities of high transient overvoltages occurred in today's power systems increase, more stringent safety standards are set for the electrical test equipment. Transients on electrical systems(power grid, feeder or branch circuits) will trigger a series of incidents that may result in serious personal injury. To protect you against transients, safety must be built into the test equipment.

Overvoltage category	In brief	Examples
CAT I	Electronic	<ul style="list-style-type: none"> <li>• Protected electronic equipment.</li> <li>• Equipment connected to (source) circuits in which measures are taken to limit transient overvoltages to an appropriately low level.</li> <li>• Any high-voltage, low-energy source derived from a highwinding resistance transformer, such as the high-voltage section of a copier.</li> </ul>
CAT II	Single-phase receptacle connected loads	<ul style="list-style-type: none"> <li>• Appliance, portable tools, and other household and similar loads.</li> <li>• Outlet and long branch circuits.</li> <li>• Outlets at more than 10 meters (30 feet) from CAT III source.</li> <li>• Outlets at more that 20 meters (60 feet) from CAT IV source.</li> </ul>
CAT III	Three-phase distribution, including single-phase commercial	<ul style="list-style-type: none"> <li>• Equipment in fixed installations, such as switchgear and polyphase motors.</li> <li>• Bus and feeder in industrial plants.</li> <li>• Feeders and short branch circuits, distribution panel devices.</li> </ul>

	lighting	<ul style="list-style-type: none"> <li>• Lighting systems in larger buildings.</li> <li>• Appliance outlets with short connections to service entrance.</li> </ul>
CAT VI	Three-phase at utility connection, any outdoor conductors	<ul style="list-style-type: none"> <li>• Refers to the "origin of installation"; i.e., where low-voltage connection is made to utility power.</li> <li>• Electricity meters, primary overcurrent protection equipment.</li> <li>• Outside and service entrance, service drop from pole to building, run between meter and panel.</li> <li>• Overhead line to detached building, underground line to well pump.</li> </ul>

\* When using this Multimeter, the user must observe all normal safety rules concerning:

- protection against the dangers of electric current.
- protection of the Multimeter against misuse.

\* For your own safety, only use the test probes supplied with the instrument. Before use, check that they are in good condition.

### 1.1.2 During use

\* If the meter is used near noise generating equipment, be aware that display may become unstable or indicate large errors.

\* Do not use the meter or test leads if they look damaged.

\* Use the meter only as specified in this manual; otherwise, the protection provided by the meter may be impaired.

\* Use extreme caution when working around bare conductors or bus bars.

\* Do not operate the meter around explosive gas, vapor, or dust.

\* Verify a Meter's operation by measuring a known voltage. Do not use the Meter if it operates abnormally. Protection may be impaired. When in doubt, have the Meter serviced.

\* Uses the proper terminals, function, and range for your measurements.

\* When the range of the value to be measured is unknown, check that the range initially set on the multimeter is the highest possible or, wherever possible, choose the autoranging mode.

\* To avoid damages to the instrument, do not exceed the maximum limits of the input values shown in the technical specification tables.

\* When the multimeter is linked to measurement circuits, do not touch unused terminals.

\* Caution when working with voltages above 60Vdc or 30Vac rms. Such voltages pose a shock hazard.

\* When using the probes, keep your fingers behind the finger guards.

\* When making connections, connect the common test lead before connecting the live test lead; when disconnecting, disconnect the live test lead before disconnecting the common test lead.

\* Before changing functions, disconnect the test leads from the circuit

## 5. MAINTENANCE

This section provides basic maintenance information, including fuse and battery replacement instructions.

Do not attempt to repair or service your Meter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

### 5.1 General Maintenance

**⚠ To avoid electrical shock or damage to the meter, do not get water inside the case. Remove the test leads and any input signals before opening the case**

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings.

To clean the terminals:

Turn the meter off and remove all test leads.

Shake out any dirt that may be in the terminals.

Soak a new swab with a cleaning and oiling agent (such as WD-40).


Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.

### 5.2 Fuse replacement

**⚠ Before replacing the fuse, disconnect test leads and/or any connectors from any circuit under test. To prevent damage or injury replace the fuse only with specified ratings.**

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the four screws on the rear cover.
4. Take out the rear cover from the meter.
5. Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket.
6. Install the replacement fuses only with specified ratings: F 0.63A/1000V  $\varnothing$ 10.3x38 and F 10A/1000V  $\varnothing$ 10.3x38
7. Rejoin the rear cover and tighten the screws.

### 5.3 Battery replacement

**⚠ To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator  appears. Before replacing the battery, disconnect test leads and/or any connectors from any circuit under test, turn the meter off and remove test leads from the input terminals.**

6.6μF	1nF	±(5.0% +3)
66μF	10nF	
660μF	100nF	
6.6mF	1μF	
66mF	10μF	Unspecified

#### 4.2.9 Temperature

Range	Resolution	Accuracy
-55°C~0°C	0.1°C	±(5.0% + 4°C)
1°C~400°C		±(2.0% + 3°C)
401°C~1000°C	1°C	±2.0%

Note: The specifications of temperature don't include thermocouple errors.

#### 4.2.10 Current

DCA:

Range	Resolution	Accuracy
660μA	0.1μA	±(1.0% +3)
6600μA	1μA	
66mA	0.01mA	±(1.5% +3)
600mA	0.1mA	
10A	10mA	±(1.8% +5)

ACA:

Range	Resolution	Accuracy
660μA	0.1μA	±(1.5% +5)
6600μA	1μA	
66mA	0.01mA	±(1.8% +8)
600mA	0.1mA	
10A	10mA	±(2% +8)

Above accuracies can be guaranteed within 5%~100% of the full range.  
The true RMS meter and the true RMS+PEAK meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement.

Overload protection: F 10A/1000V fuse for 10A range.

F 0.63A/1000V fuse for μA and mA ranges.

Maximum input current: 600mA dc or 600mA ac rms for μA and mA ranges,

10A dc or 10A ac rms for 10A ranges.

For measurements>7A, 4 minutes maximum ON to measure 10 minutes OFF; Above 10A unspecified.

under test.

\* For all dc functions, including manual or auto-ranging, to avoid the risk of shock due to possible improper reading, verify the presence of any ac voltages by first using the ac function. Then select a dc voltage range equal to or greater than the ac range.

\* Disconnect circuits power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.

\* Never perform resistance or continuity measurements on live circuits.

\* Before measuring current, check the meter's fuse and turn off power to the circuit before connecting the meter to the circuit.

\* In TV repair work, or when carrying out measurements on power switching circuits, remember that high amplitude voltage pulses at the test points can damage the multimeter. Use of a TV filter will attenuate any such pulses.

\* Use just one 6F22 battery, properly installed in the Meter's battery case, to power the Meter.

\* Replace the battery as soon as the battery indicator (🔋) appears. With a low battery, the Meter might produce false readings that can lead to electric shock and personal injury.

\* Do not measure voltages above 1000V in Category III, or 600V in Category IV installations.

\* When in REL mode, the "REL" symbol is displayed. Caution must be used because hazardous voltage may be present.

\* Do not operate the Meter with the case (or part of the case) removed.

#### 1.2 Symbols:

Symbols used in this manual and on the instrument:

⚠ **Caution:** refer to the instruction manual. Incorrect use may result in damage to the device or its components.

~ AC (Alternating Current)

— DC (Direct Current)

≈ AC or DC

⊥ Earth ground

□ Double insulated

≡ Fuse

CE Conforms to European Union directives

### 1.3 Instructions

- \* Remove test leads from the Meter before opening the Meter case or battery cover.
- \* When servicing the Meter, use only specified replacement parts.
- \* Before opening up the instrument, always disconnect from all sources of electric current and make sure you are not charged with static electricity, which may destroy internal components.
- \* Any adjustment, maintenance or repair work carried out on the meter while it is live should be carried out only by appropriately qualified personnel, after having taken into account the instructions in this present manual.
- \* A "qualified person" is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He is trained and authorized to energize and de-energize circuits and equipment in accordance with established practices.
- \* When the instrument is opened up, remember that some internal capacitors can retain a dangerous potential even after the instrument is switched off.
- \* If any faults or abnormalities are observed, take the instrument out of service and ensure that it cannot be used until it has been checked out.
- \* If the meter is not going to be used for a long time, take out the battery and do not store the meter in high temperature or high humidity environment.

### Linear frequency (6HZ~10KHZ)

Function	Range	Resolution	Accuracy
Frequency (6Hz-66KHz)	600mV	600mV	±(0.05%+8)
	6.6V	2V	
	66V	10V	
	660V	20V	

Above accuracies can be guaranteed within 10%~100% of the full range.

### 4.2.4 Duty cycle

Range	Resolution	Accuracy
1%~99%	0.01%	±(2%+10)

### 4.2.5 Resistance

Range	Resolution	Accuracy
660.0Ω	0.1Ω	±(1.2%+2)
6.600kΩ	1Ω	
66.00kΩ	10Ω	
660.0kΩ	100Ω	
6.600MΩ	1kΩ	±(2%+5)
66.00MΩ	10kΩ	

### 4.2.6 Diode Test

Range	Resolution	Test Condition
2 V	0.001V	Forward DC current approximately 1mA. Reversed DC voltage approximately 2.8V.

### 4.2.7 Continuity Check

Range	Resolution	Test Condition
660Ω	0.1Ω	Open circuit voltage: approx. 0.5V

Description: Continuity beeper≤30Ω

### 4.2.8 Capacitance

Range	Resolution	Accuracy
6.6nF	1pF	±(5.0% +5)
66nF	10pF	±(3.0% +3)
660nF	100pF	

### 4.2.1 AC Voltage

ACV:

Range	Resolution	Accuracy	
		60Hz	40Hz~400Hz
660mV	0.1mV	$\pm(1.0\% +5)$	
6.6V	1mV	$\pm(1.0\% +5)$	
66V	10mV	$\pm(1.0\% +5)$	
660V	100mV	$\pm(1.0\% +5)$	
1000V	1V	$\pm(1.5\% +5)$	

Above accuracies can be guaranteed within 5%~100% of the full range.  
The true RMS meter and the true RMS+PEAK meter has residual value within 10 counts when the test leads are shorten, but that will not affect the accuracy of measurement.

### 4.2.2 DC Voltage

DCV:

Range	Resolution	Accuracy
660mV	0.1mV	$\pm(0.5\% +5)$
6.6V	1mV	$\pm(0.8\% +5)$
66V	10mV	$\pm(0.8\% +5)$
660V	100mV	$\pm(0.8\% +5)$
1000V	1V	$\pm(1.0\% +2)$

### 4.2.3 Frequency

Logic frequency (1Hz-1MHz)

Function	Range	Resolution	Accuracy
Frequency (6Hz-66MHz)	66.00Hz	0.01 Hz	$\pm(0.1\%+3)$
	660.0Hz	0.1 Hz	
	6.600kHz	0.001kHz	
	66.00kHz	0.01kHz	
	660.0kHz	0.1kHz	
	6.600MHz	1KHz	
	66.00MHz	10KHz	

## 2. DESCRIPTION

### 2.1 Instrument Familiarization

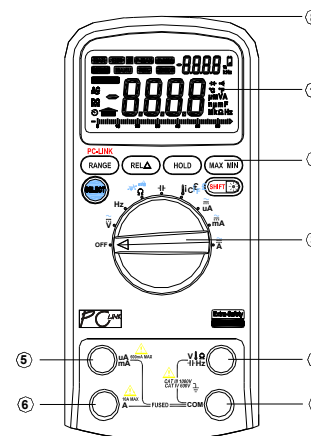


Figure 2-1

The front panel is shown as in Figure 2-1, explanation being as follows:

- ,1 LCD display  
Used for displaying the measuring results and various symbols.
- ,2 Keypad  
Measurement function keys.
- ,3 Rotary switch  
Used for selecting measurement functions.
- ,4 Terminal receiving the red test lead for voltage, resistance, capacitance, frequency, Temperature, diode and continuity measurements.
- ,5 uA/mA  
Terminal receiving the red test lead for μA, mA measurements.
- ,6 A  
Terminal receiving the red test lead for 10A measurements.
- ,7 COM  
Terminal receiving the black test lead as a common reference.
- ,8 PC-Link interface

### 2.2 LCD Display

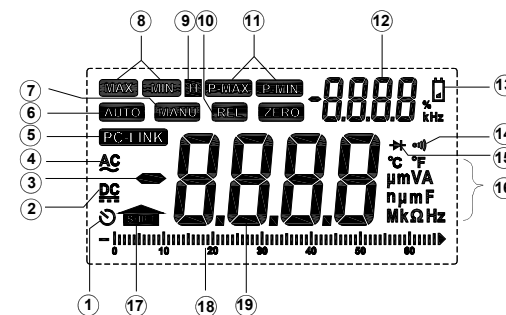


Figure 2-2

LCD screen is shown as in Figure 2-2, with its every symbol's meaning shown as in the Table 1:

No.	Symbol	Meaning
1		Indicator for auto power off
2		Indicator for DC voltage or current
3		Indicates negative readings
4		Indicator for AC voltage or current
5	<b>PC-LINK</b>	The Meter is in the data transmission mode.
6	<b>AUTO</b>	The meter is in the Autorange mode in which the meter automatically selects the range with the best resolution.
7	<b>MANU</b>	The meter is in the Manual Range mode in which the user selects the range.
8	<b>MAX MIN</b>	Display maximum/ minimum data
9	<b>H</b>	The meter is in Data Hold mode. When delay-hold is selected, the HOLD symbol will be blinking for 6 seconds.
10	<b>REL</b>	The meter is in Relative Measurement mode.
11	<b>P-MAX P-MIN</b>	Indicating the display value being the PEAK maximum value, the PEAK minimum value. (Only the true RMS+PEAK meter)
12		The sub-display usually shows sub-measurement mode or some special reading.
13		Low battery indication
14		The meter is in Continuity Check mode.
15		The meter is in Diode Test mode.

Tabel1 (continue)

No.	Symbol	Meaning
16	°C°F μmVA nμmF MKΩHz	Measurement units

**RANGE** again.

7 .More information about the PC-LINK SOFT, please refer to the Help topic including in the software or enter our website : [www.mastech.com.cn](http://www.mastech.com.cn)

## 4. TECHNICAL SPECIFICATIONS

### 4.1 General specifications

Environment conditions:

1000V CAT III and 600V CAT IV

Pollution degree: 2

Altitude < 2000m

Operating temperature: 0~40°C, 32°F~122°F (<80% RH, <10°C non-condensing)

Storage temperature: -10~60 °C, 14°F~140°F (<70% RH, battery removed)

Temperature Coefficient: 0.1×(specified accuracy) / °C (<18°C or >28°C)

MAX. Voltage between terminals and earth ground: 1000V AC rms or 1000V DC.

Fuse Protection: μA and mA: F 0.63A/1000V Ø10.3×38; A: F 10A/1000V Ø10.3×38.

Sample Rate: 3 times/sec for digital data.

Display: 6600 counts. Automatic indication of functions and symbols.

Range selection: automatic and manual.

Over Range indication: LCD will display "OL".

Low battery indication: The "" is displayed when the battery is under the proper operation range.

Polarity indication: "-" displayed automatically.

Power source: 9V

Battery type: 6F22.

Dimensions: 190(L)×90(W)×40(H) mm.

Weight: 500g. Approx. (battery included).


### 4.2 Measurement specifications

Accuracy is specified for one year after calibration, at operating temperatures of 18°C to 28°C, with relative humidity at 0% to 75%.


Accuracy specifications take the form of: ± (% of Reading + Number of Least Significant Digits)



### 3.2.8 Temperature measurement

 **To avoid electrical shock and/or damage to the instrument, do not apply more than 250Vdc or 220Vac rms between the °C terminal and the COM terminal.**  
**To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 60v dc or 24v rms. Ac.**  
**To avoid damage or burns. Do not make temperature measurement in microwave ovens.**

To measure temperature:




1. Set the rotary switch to  range and the LCD will show the current environment temperature.
2. Press SELECT key to select °C or °F.
2. Insert 'K' type thermocouples into the COM terminal and °C terminal (or you can insert it by using Multi Function Socket), Takings care to observe the correct polarity.
3. Touch the object with the thermocouple probe for measurement.
4. Read the stable reading from LCD.

### 3.2.9 PC Link

The meter has serial data output function. It can be connected with PC by USB interface, so the measured data can be recorded, analyzed, processed and printed by PC. Before use this function, you need install the PC-Link software and USB driver in your PC.


#### PC-LINK SOFT OPERATING MANUAL

1. Make sure the two **Install USB driver** and **Install software** files in the attached CD successfully installed before any measurement.
2. After turning on the meter, press the **SHIFT** key and the SHIFT symbol will appear on LCD. Then press the **RANGE** key to enter PC-Link mode, the symbol "PC-LINK" will appear on LCD, and the serial data output function is active.
3. Connect the meter's OPTICAL PORT and computer USB port with the USB line.
4. Select the default sampling rate or you can select other desired sampling rate.
5. Now press the **Start** in the PC-LINK SOFT to measure and view the synchronic data or graph in the software interface.
6. To disable the serial data output function, press **SHIFT** and then press

17		The second function is enabled.
18		Analog bar, indicating the measurement value with a graphic mode
19		The main-display for the meter's measurement value, showing all the measurement values

## 2.3 Keypad

### 2.3.1 SELECT

1. At  position  
Switches between Resistance measurement, Diode Test and Continuity check.
2. At **V** position  
Switches between dc and ac voltage.

3. At  position

Switches between °C and °F.

4. At **A mA μA** position  
Switches between dc and ac current.

### 2.3.2 RANGE

At V, Hz,  $\overline{H}$ ,  $\Omega$ , A, mA and  $\mu$ A.

1. Press **RANGE** to enter the manual ranging mode.
2. Press **RANGE** to step through the ranges available for the selected function.
3. Press and hold **RANGE** for 2 seconds to return to autoranging.

### 2.3.3 REL $\Delta$

1. Press **REL $\Delta$**  to enter the Relative measurement mode. The sub-display will show the value measured at the time when pressing the key(it is called the initial value), and the main-display shows the relative value that will be equivalent to the present value minus the initial value. By pressing the key again the relative measurement state will be exited. (Except Hz/Duty)

2. Power-up Option

Disables automatic power-off feature.

### 2.3.4 HOLD

1. Press it to enter the Data Hold mode. Used to maintain the measurement data unchanging, by pressing the key again it will exit the Data Hold mode.
2. Pressing this key and last for 2 seconds,the meter will delay for 6

seconds, then enters HOLD mode.

3. Powering on the meter while pressing **HOLD** and lasts 2 seconds turns on all LCD segments until HOLD is pressed again.

### 2.3.5 MAX/MIN

This key is for measuring maximum value and minimum value.

1. Press it to enter Max/Min mode. The main-display always shows the current value, and the sub-display shows the Maximum Value.

2. Press it again; the sub-display will show the Minimum Value.

3. Press and hold it for two seconds, the meter will return to normal measurement state. (Except Hz/Duty)


### 2.3.6

1. Press this key and last for 2 seconds, backlight on; press it again, backlight off.

2. Press the key and the 'SHIFT' symbol will be displayed on LCD. Then press the **RANGE** key to enter into the PC-LINK mode. Repeat it to exit PC-LINK mode.

3. When input AC signal, press SHIFT key and the 'SHIFT' symbol will show on LCD. Then press the MAX/MIN key to enter peak mode. The main-display always shows current value of signal, and the sub-display shows PMAX value. Repeat it to show PMIN value. To exit peak mode, after press SHIFT key, press MAXMIN key larger than 1 seconds. (Only the true RMS+PEAK meter)

### 3.2.7 Current measurement

 **To avoid damage to the Meter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 1000V.**

**To avoid damage to the meter, check the meter's fuse before proceeding. Use the proper terminals, function, and range for your measurement. Never place the probes in parallel with a circuit or component when the leads are plugged into the current terminals.**

To measure current (set up the Meter as shown in Figure 3-7):

1. Turn off power to the circuit. Discharge all high voltage capacitors.

2. Set the rotary switch to the  $\mu\text{A}$ , mA or A range.

3. Press the **SELECT** key to select DCA or ACA measuring mode. (When measuring AC current, the sub-display will show the frequency of AC signal.)

4. Connect the black test lead to the COM terminal and the red test leads to the mA terminal for a maximum of 600mA. For a maximum of 10A, move the red test lead to the A terminal.

5. Break the circuit path to be tested. Touch the black probe to the more negative side of the break; touch the red probe to the more positive side of the break. (Reversing the leads will give a negative reading, but will not damage the Meter.)

6. Turn on power to the circuit; then read the display. Be sure to note the measurement units at the right side of the display ( $\mu\text{A}$ , mA or A). When only the figure "OL" displayed, it indicates overrange situation and the higher range has to be selected.

7. Turn off power to the circuit and discharge all high voltage capacitors. Remove the Meter and restore the circuit to normal operation.

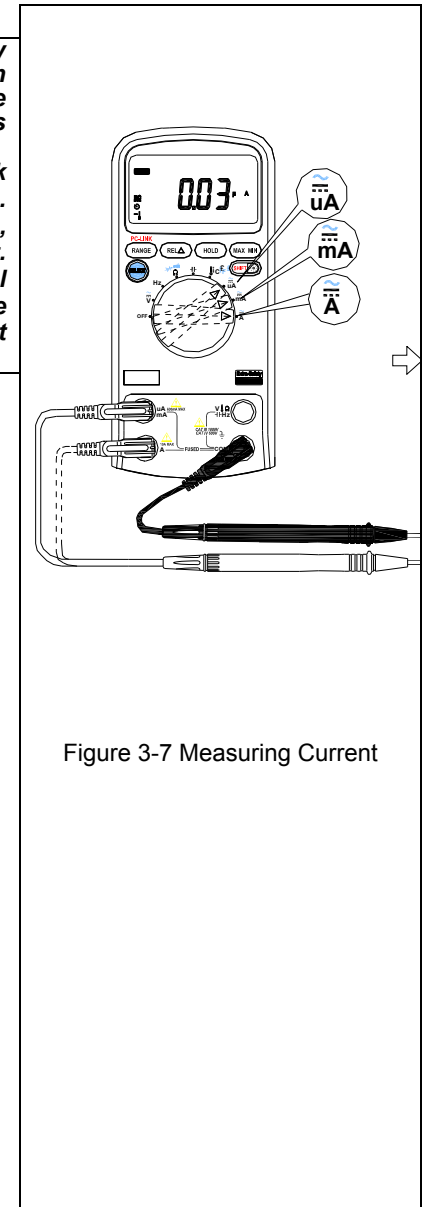


Figure 3-7 Measuring Current

### 3.2.6 Capacitance measurement

**⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the dc voltage function to confirm that the capacitor is discharged.**

Capacitance is the ability of a component to store an electrical charge. The unit of capacitance is the farad (F). Most capacitors are in the nanofarad to microfarad range. The Meter measures capacitance by charging the capacitor with a known current for a known period of time, measuring the resulting voltage, then calculating the capacitance. The measurement takes about 1 second per range.

To measure capacitance (set up the Meter as shown in Figure 3-6):

1. Set the rotary switch to **⇄** range.
3. Connect the black and red test leads to the COM and **⇄** terminals respectively.
4. Connect the test leads tip to the capacitor being measured.
5. Read the displayed value from LCD.

**NOTE:**

The meter may take a few seconds to stabilize reading when measurement on 660uF~66mF. To improve the accuracy of measurements less than 660nF, subtract the residual capacitance of the Meter and leads.

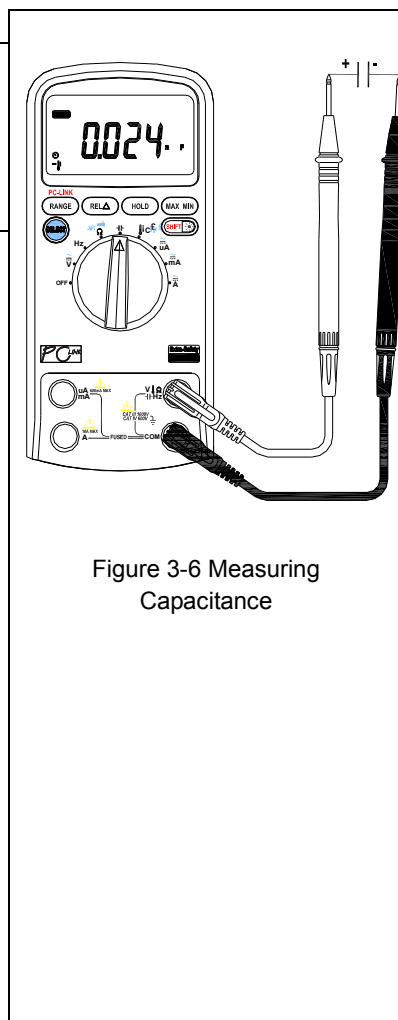


Figure 3-6 Measuring Capacitance

## 3. FUNCTION DESCRIPTION

### 3.1 General Functions

#### 3.1.1 DATA HOLD mode

Data Hold mode makes the meter stop updating the display. Enabling Data Hold function in autorange mode makes the meter switch to Manual ranging mode, but the full-scale range remains the same. Data Hold function can be cancelled by changing the measurement mode, pressing **RANGE** key, or push **HOLD** key again.

To enter and exit the Data Hold mode:

1. Press **HOLD** key (short press). Fixes the display on the current value, **H** is displayed.
2. A second short press returns the meter to normal mode.

#### 3.1.2 Manual ranging and Autorange mode

The Meter has both manual ranging and autorange options.

\* In the autorange mode, the Meter selects the best range for the input detected. This allows you to switch test points without having to reset the range.

\* In the manual ranging mode, you select the range. This allows you to override autorange and lock the meter in a specific range.

\* The Meter defaults to the autorange mode in measurement functions that have more than one range. When the Meter is in the autorange mode, **AUTO** is displayed.

To enter and exit the manual range mode:

1. Press **RANGE** key. The Meter enters the manual ranging mode. **AUTO** turns off. Each presses of **RANGE** key increments the range. When the highest range is reached, the Meter wraps to the lowest range. **NOTE:** If you manually change the measurement range after entering the Data Hold modes, the Meter exits this mode.
2. To exit the manual ranging mode, press and hold down **RANGE** key for two seconds. The Meter returns to the autorange mode and **AUTO** is displayed.

#### 3.1.3 TRUE RMS measurement

All the measurement values of the true RMS meter and true RMS+PEAK meter on the AC voltage and AC current are true root-mean-square values. The basic meter can only measure the AC average value.

#### 3.1.4 Relative measurement mode

The Meter will display relative measurement in all functions except frequency.


To enter and exit the relative measurement mode:

1. With the Meter in the desired function, touch the test leads to the circuit on which you want future measurement to be based.
2. Press **REL** key to store the measured value and activate the relative measurement mode. The difference between the reference value and subsequent reading is displayed on the sub-display. The main-display always displays the current value.
3. Press **REL** key for more than 2 seconds to return the Meter to normal operation.


### 3.1.5 Analog indication bar

Analog indication bar is used for graphic measurement value and it always synchronizes with the size of the present measured value. During the maximum value/minimum value measurement and the relative value measurement it still synchronizes with the size of the present measured value, and not indicating the maximum value/minimum value or the relative value.



### 3.1.6 Auto power off setting

1. The Meter enters the "sleep mode" and blanks the display if the Meter is on but not used for 30 minutes. Press any key or rotate the rotary switch to wake the meter up.
2. To disable the auto power off function, hold down **REL** key while turning the meter on. Then the  icon will disappear.
3. When RS232 output is active, the auto power off function is disabled.

### 3.2.5 Continuity Check

 **To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.**

To test for continuity (set up the Meter as shown in Figure 3-5):

1. Set the rotary switch to  $\Omega$    range.
2. Press the **SELECT** key twice to activate Continuity Check.
3. Connect the black and red test leads to the COM and  $\Omega$  terminals respectively.
4. Connect the test leads tip to the resistance in the circuit being measured.
5. When the test lead to the circuit is below  $30\Omega$ , a continuous beeping will indicate it.

#### NOTE:

- Continuity test is available to check open/short of the circuit.

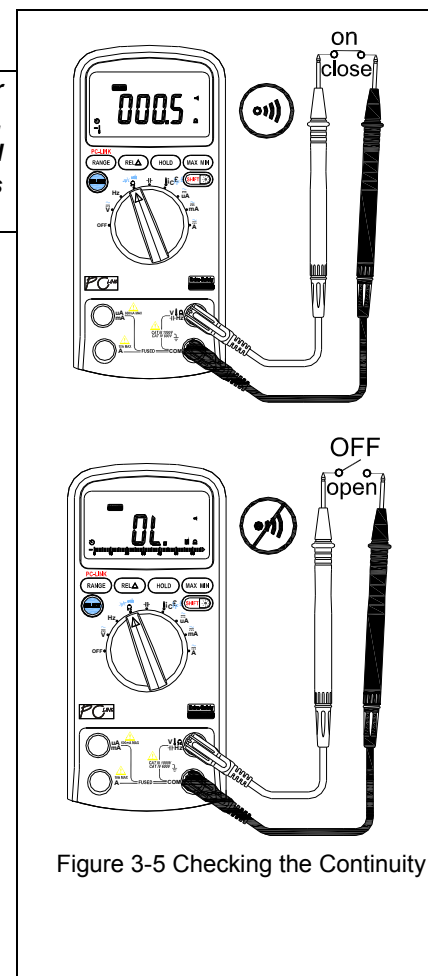


Figure 3-5 Checking the Continuity

### 3.2.4 Diode Test

**⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.**

To test a diode out of a circuit (set up the Meter as shown in Figure 3-4):

1. Set the rotary switch to  $\Omega \rightarrow \blacktriangleleft \blacktriangleright$  range.
2. Press the **SELECT** key once to activate Diode Test.
3. Connect the black and red test leads to the COM and  $V\Omega$  terminals respectively.
4. For forward-bias readings on any semiconductor component, place the red test lead tip on the component's anode and place the black test lead tip on the component's cathode.
5. The meter will show the approx. forward voltage of the diode. If the polarity of test leads is reversed, "OL" will be displayed.

In a circuit, a good diode(Silicon) should still produce a forward bias reading of 0.5V to 0.8V; however, the reverse-bias reading can vary depending on the resistance of other pathways between the probe tips.

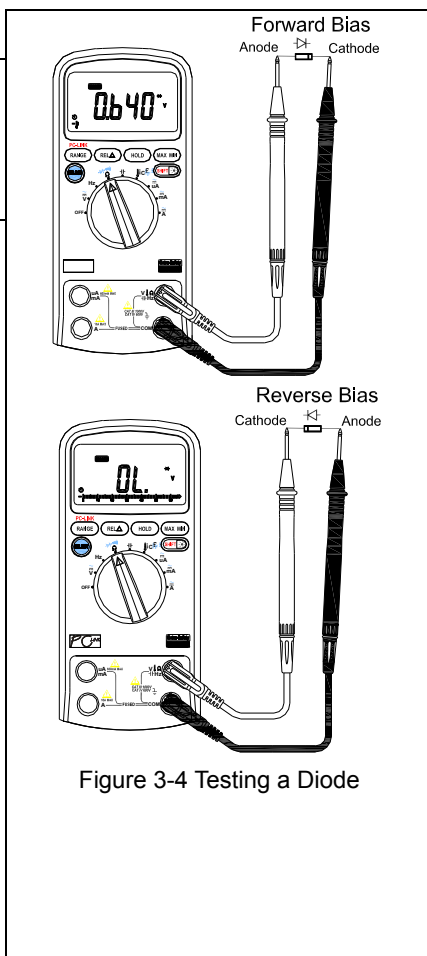


Figure 3-4 Testing a Diode

## 3.2 Measurement Functions

### 3.2.1 AC and DC Voltage measurement

**⚠ To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 1000Vdc or 1000Vac rms. To avoid electrical shock and/or damage to the instrument, do not apply more than 1000Vdc or 1000Vac rms between the common terminal and the earth ground.**

Voltage is the difference in electrical potential between two points.

The polarity of ac (alternating current) voltage varies over time; the polarity of dc (direct current) voltage is constant.

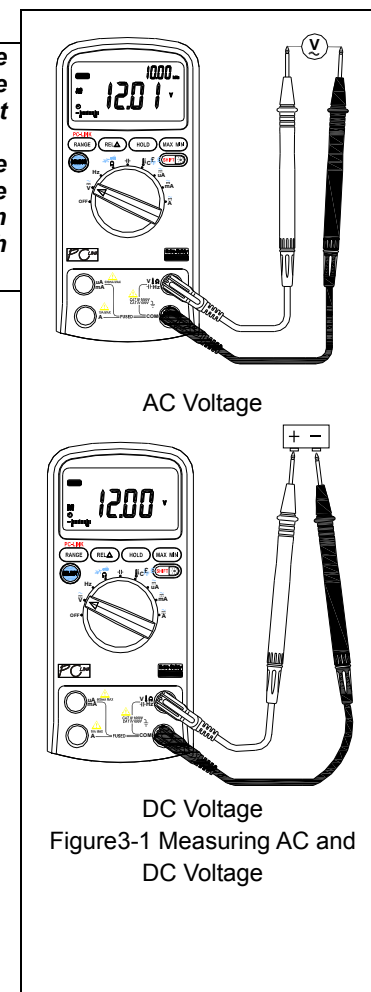
To measure ac or dc voltage (set up and connect the Meter as shown in Figure 3-1):

Set the rotary switch to the position of  $\bar{V}$ .

- 1 Press **SELECT** key to select between AC and DC voltage mode.
- 2 Connect the black and red test leads to the COM and V terminals respectively.
- 3 Connect the test leads tip in parallel with the circuit to be measured.
- 4 Read the voltage value on the main-display and read the frequency of AC signal on the sub-display.

**NOTE:**

● In case of probe hanging in the air, the voltage inducted by the test leads may cause unstable readings on the display screen, but that will not affect the accuracy of measurement.



DC Voltage  
Figure3-1 Measuring AC and DC Voltage

### 3.2.2 Frequency and Duty Cycle measurement

**⚠ Do not measure Frequency on high voltage (>1000V) to avoid electrical shock hazard and/or damage to the instrument.**

To measure frequency or Duty Cycle(set up and connect the Meter as shown in Figure 3-2):

1. Set the rotary switch to the Hz range.
2. Insert the black and red test leads into the COM and Hz input terminals.
3. Connect the test leads tip in parallel with the circuit to be measured. And don't touch any electrical conductors.
4. Read the frequency on the main-display and read the percent of duty cycle on the sub-display.

**NOTE:**

- In noisy environment, it is preferable to use shield cable for measuring small signal

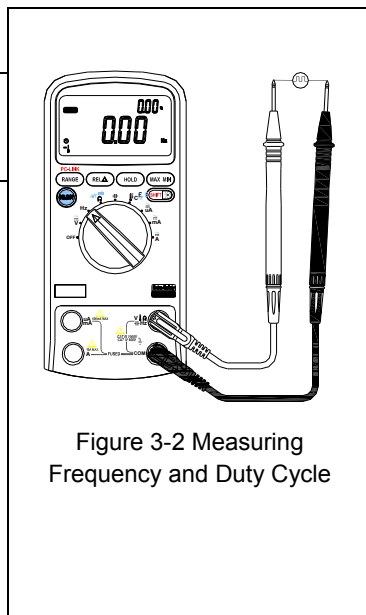


Figure 3-2 Measuring Frequency and Duty Cycle

### 3.2.3 Resistance measurement

**⚠ To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.**

Resistance is an opposition to current flow.

The unit of resistance is the ohm ( $\Omega$ ). The Meter measures resistance by sending a small current through the circuit. Because this current flows through all possible paths between the probes, an in-circuit resistance reading represents the total resistance of all paths between the probes.

To measure resistance (set up the Meter as shown in figure 3-3):

1. Set the rotary switch to  $\Omega \rightarrow \rightarrow$  range.
2. Connect the black and red test leads to the COM and  $V\Omega$  terminals respectively.
3. Connect the test leads tip to the circuit being measured.
4. Read the displayed value.

**NOTE:**

In case of performing resistance test on circuit board, it is necessary firstly to turn off the power of the circuit board and then perform the measurement. As there may be other parallel circuits, so the displayed value of test is not surely the actual value of the resistor.

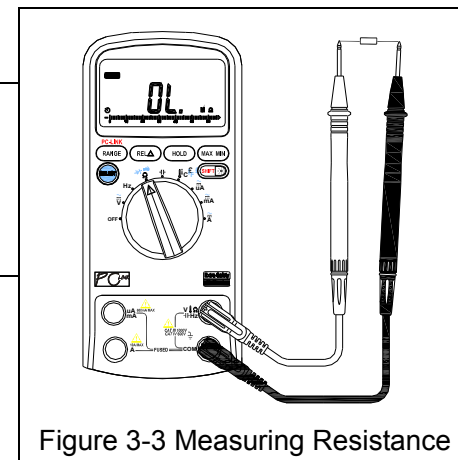


Figure 3-3 Measuring Resistance