XDM6000 Series Digital Multimeter
User Manual

For product support, visit:www.owon.com.hk/download

※:The illustrations, interface, icons and characters in the user manual may be slightly different from the actual product. Please refer to the actual product.

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General Warranty

We warrant that the product will be free from defects in materials and workmanship for a period of 3 years from the date of purchase of the product by the original purchaser from our company. This warranty only applies to the original purchaser and is not transferable to a third party.

If the product proves defective during the warranty period, we will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by our company for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of our company.

To obtain service under this warranty, the customer must notify our company of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to our designated service centre, a copy of the customer's proof of purchase is also required.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. We shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than our company representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of not our supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest sales and service offices for services.

Excepting the after-sales services provided in this summary or the applicable warranty statements, we will not offer any guarantee for maintenance definitely declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. We should not take any responsibilities for any indirect, special or consequent damages.

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1 Safety Information

1.1 General Safety Requirements

Before any operations, please read the following safety precautions to avoid any possible bodily injury and prevent this product or any other products connected from damage. In order to avoid any contingent danger, this product is only used within the range specified.

- Check AC power input setting according to the standards in your own country (see page 12, **AC Power Input Setting**).
- **Use Proper Power Cord.** Use only the power cord supplied with the product and certified to use in your country.
- **Product Grounded.** This instrument is grounded through the power cord grounding conductor. To avoid electric shock, the grounding conductor must be grounded. The product must be grounded properly before any connection with its input or output terminal.
- **Limit operation to the specified measurement category, voltage, or amperage ratings.**
- **Check all Terminal Ratings.** To avoid instrument damage and the risk of electric shock, check all the Measurement Limits and markers of this product. Refer to the user's manual for the Measurement Limits before connecting to the instrument. Do not exceed any of the Measurement Limits defined in the following section.
- **Do not operate without covers**. Do not operate the instrument with covers or panels removed.
- **Use Proper Fuse.** Use only the specified type and rating fuse for this instrument.
- **Avoid exposed circuit**. Do not touch exposed junctions and components when the instrument is powered.
- **Do not operate if in any doubt.** If you suspect damage occurs to the

instrument, have it inspected by qualified service personnel before further operations.

- **Use your instrument in a well-ventilated area.** Inadequate ventilation may cause increasing of temperature or damages to the device. Please keep well ventilated and inspect the intake regularly.
- **Do not operate in wet conditions.** In order to avoid short circuiting to the interior of the device or electric shock, please do not operate in a humid environment.
- **Do not operate in an explosive atmosphere.**
- **Keep product surfaces clean and dry.**
- **Only the qualified technicians can implement the maintenance.**

1.2 Safety Terms and Symbols

Safety Terms

Terms in this Manual. The following terms may appear in this manual:

Warning: Warning indicates the conditions or practices that could result in injury or loss of life.

Caution: Caution indicates the conditions or practices that could result in damage to this product or other property.

Terms on the Product. The following terms may appear on this product:

Danger: It indicates an injury or hazard may immediately happen.

Warning: It indicates an injury or hazard may be accessible potentially.

Caution: It indicates a potential damage to the instrument or other property might occur.

Safety Symbols

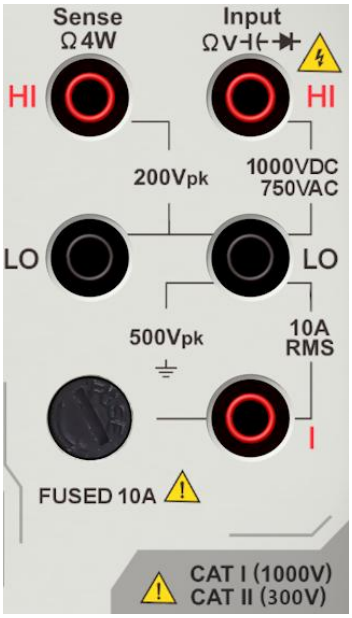
Symbols on the Product. The following symbol may appear on the product:

	Direct current (DC)		Warning, risk of electric shock
	Alternating current (AC)		Caution, risk of danger (refer to this manual for specific Warning or Caution information)
	Both direct and alternating current		Conforms to European Union directives
	Ground terminal		Chassis Ground
CAT I	IEC Measurement Category I. The maximum measurable voltage is 1000 Vpk in the HI -LO terminal.		

CAT II	IEC Measurement Category II. Inputs may be connected to AC mains power (up to 300 VAC) under Category II overvoltage conditions.
	This product complies with the WEEE Directive (2002/96/EC) marking equipment. The affixed product label indicates that you must not

1.3 Measurement Limits

The protection circuitry of the multimeter can prevent damage to the instrument and protect against the danger of electric shock, when the Measurement Limits are not exceeded. To ensure safe operation of the instrument, do not exceed the Measurement Limits shown on the front panel, it is defined as follows:



The user-replaceable 10A current-protection fuse is on the front panel. To maintain protection, replace fuse only with fuse of the specified type and rating. About the specified type and rating of the fuse, please refer to "5 Current Terminal Fuse" in "Front Panel Overview" on page 9.

1.3.1 Main Input Terminals Measurement Limits

The HI and LO input terminals are used for voltage, resistance, continuity, frequency (period), capacitance, diode, and temperature test measurements. Two Measurement Limits are defined for these terminals:

HI Input to LO Input Measurement Limit

- The Measurement Limit from HI Input to LO Input is 1000 VDC or 750 VAC,

which is also the maximum voltage measurement. This limit can also be expressed as 1000 Vpk maximum.

LO Input to Ground Measurement Limit

- The LO input terminal can safely "float" a maximum of 500 Vpk relative to ground, where ground is defined as the Protective Earth Conductor in the AC mains power cord connected to the instrument.

As implied by the above limits, the Measurement Limit for the HI input terminal is a maximum of 1500 Vpk relative to ground when LO Input is at its maximum of 500 Vpk relative to ground.

1.3.2 Current Input Terminal Measurement Limits

The Measurement Limit from the current input terminal (I) to the LO Input terminal is 10 A (DC or AC). Note that the current input terminals will always be at approximately the same voltage as the LO Input terminal, unless a current protection fuse is open.

1.3.3 Sense Terminals Measurement Limits

The HI and LO sense terminals are used for four-wire resistance measurements.

- The Measurement Limit from HI Sense to LO Input is 200 Vpk. The Measurement Limit from HI Sense to LO Sense is 200 Vpk.
- The Measurement Limit from LO Sense to LO Input is 2 Vpk.

Note: The 200 Vpk limit on the sense terminals is the Measurement Limit. Operational voltages in resistance measurements are much lower–up to ±12 V in normal operation.

1.4 Measurement Category

The safety rating of the multimeter:

- **1000 V, CAT I:** IEC Measurement Category I. The maximum measurable voltage is 1000 Vpk in the HI -LO terminal.
- **300 V, CAT II:** IEC Measurement Category II. Inputs may be connected to AC mains power (up to 300 VAC) under Category II overvoltage conditions.

Measurement category definition

Measurement CAT I applies to measurements performed on circuits not directly connected to the AC mains. Examples are measurements on circuits not derived from the AC mains and specially protected (internal) mains-derived circuits.

Measurement CAT II applies to protect against transients from energy-consuming equipment supplied from the fixed installation, such as TVs, PCs, portable tools, and other household circuits.

Measurement CAT III applies to protect against transients in equipment in fixed equipment installations, such as distribution panels, feeders and short branch circuits, and lighting systems in large buildings.

Measurement CAT IV applies to measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary over current protection devices and ripple control units.

2 Quick Start

2.1 General Inspection

After you get a new multimeter, it is recommended that you should make a check on 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.**

   The supplied accessories have been already described in the Appendix A: Accessories of this Manual. You can check whether there is any loss of accessories with reference to this description. If it is found that there is any accessory lost or damaged, please get in touch with our distributor responsible for this service or our 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 our distributor responsible for this business or our local offices. If there is damage to the instrument caused by the transportation, please keep the package. With the transportation department or our distributor responsible for this business informed about it, a repairing or replacement of the instrument will be arranged by us.

2.2 Front Panel Overview

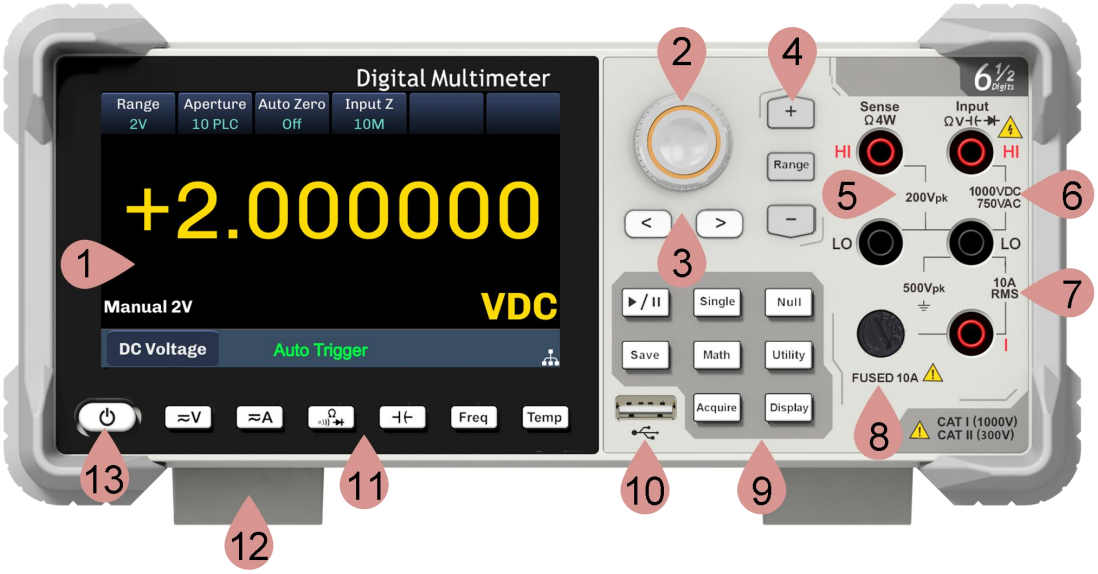


Figure 2- 1 Front Panel Overview

1	**Touch Display Screen**	Display the user interface.
2	**Knob**	Change parameters value.
3	**< > keys**	When setting parameters, press the < > directional keys to move the cursor position.
4	**Range + - keys**	Press **Range** to switch Auto and Manual range mode. Press **+ -** key to increase/decrease range manually.
5	**HI and LO Terminals**	Signal input terminals, used for four-wire resistance measurements.
6	**HI and LO Terminals**	Signal input terminals, used for voltage, resistance, continuity, frequency (period), capacitance, diode, and temperature test measurements.
7	**AC/DC Current Terminals**	Signal input terminals, used for current measurements.
8	**Current Terminal Fuse**	The rating is 10A，250 VAC.
9	**Operation Keys**	**Run/Stop:** auto trigger or stop trigger. **Single:** Enter single measurement. **Null:** Enter null measurement. **Save:** Save test data, screenshot and import or export parameters. **Math:** Setting null, zoom, statistics and limits.

		Utility: Enter system settings. **Acquire:** Setting trigger sample, data log and probe hold. **Display:** Switch number, bar, trend, histogram display mode.
10	**USB Host**	Through this interface, can store the current instrument status or measurement data to an external device. You can also read the saved instrument status or upgrade files from the external device when needed.
11	**Measurement Function Keys**	≂V switch DC or AC voltage measurement; ≂A switch DC or AC current measurement; Ω switch resistance, continuity or diode measurement; ⊣⊢ capacitance measurement; Freq frequency (period) measurement; Temp temperature measurement.
12	**Stool**	Adjust the tilt angle of the instrument.
13	**Power key**	Turn on / off instrument.

2.3 Rear Panel Overview

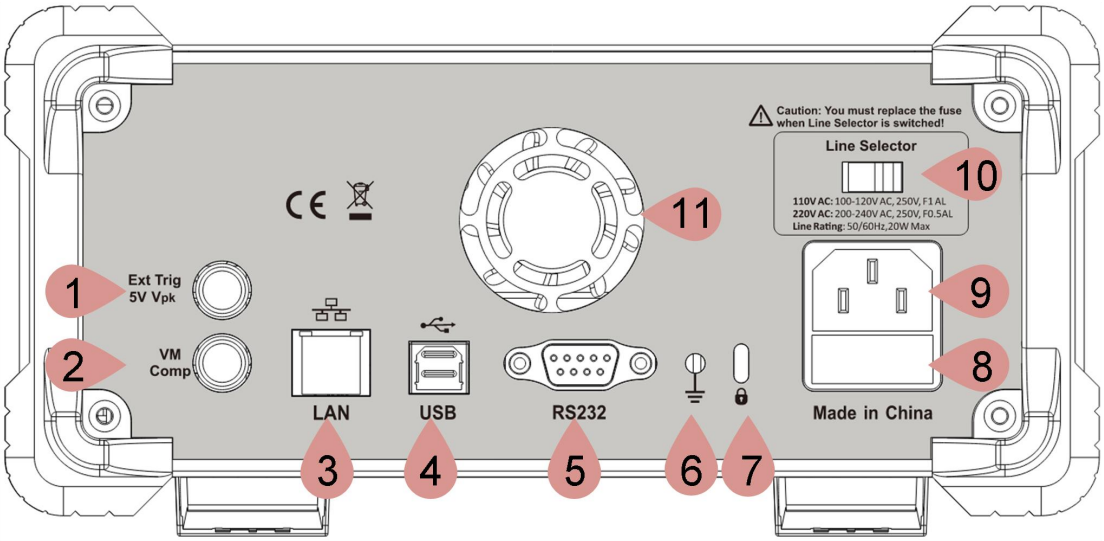


Figure 2- 2 Rear Panel Overview

1	**Ext Trig 5V Vpk**	Trigger the multimeter by connecting a trigger pulse. The external trigger source must be selected.

2	**VM Comp**	A pulse is output from this port upon the completion of each sampling cycle.
3	**LAN**	Network control interface.
4	**USB**	USB TMC communication interface.
5	**RS232**	Serial communication interface.
6	**Ground Terminal**	Ground the instrument.
7	**Safety Lock Slot**	Can be used through this slot to secure the instrument in a fixed position, ensuring the instrument's safety.
8	**Power Fuse**	Use the specified fuse according to the voltage scale.
9	**AC Mains Input**	AC mains input connector.
10	**Line Selector**	Select a proper voltage scale according to the AC supply used. Switch between 110 V and 220 V.
11	**Air Vent**	Do not block the air vent; otherwise, the internal heat will not dissipate, leading to excessively high internal temperatures.

2.4 Adjusting the Tilt Stand

Pull the tilt stand outward to its maximum reach.

2.5 User Interface

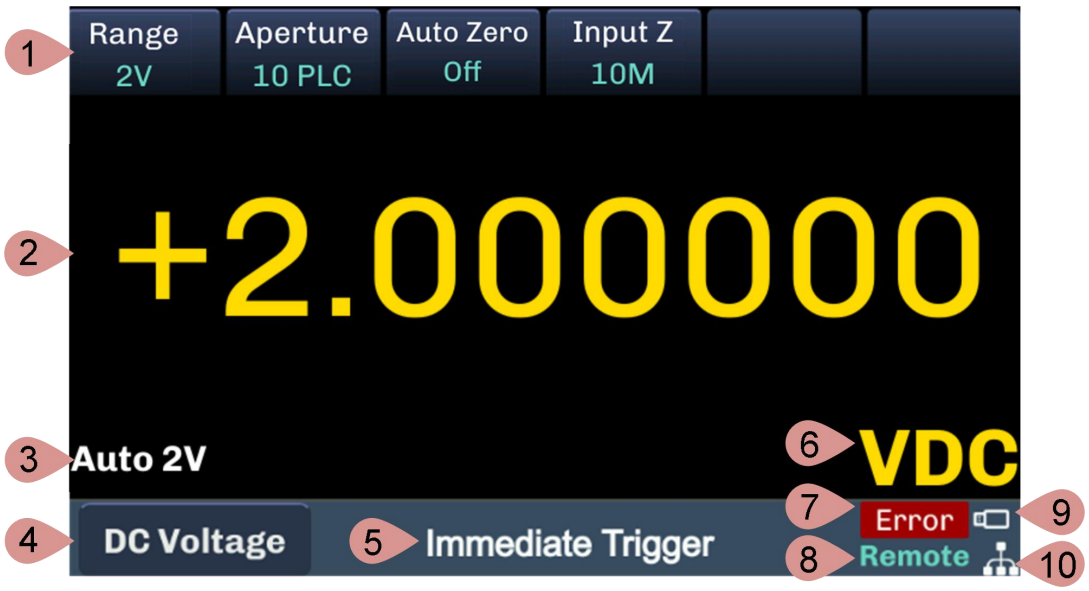


Figure 2-3 User Interface

1	Measurement menu.
2	Current measurement value.
3	Current range status.
4	Measurement mode.
5	Trigger mode indicator.
6	Measurement unit.
7	Error: SCPI command error indicator.
8	Current in remote control mode.
9	USB connection icon.
10	LAN Port Connection icon. Press and hold this icon to view network information.

2.6 AC Power Input Setting

Adopt 100 - 120 VAC or 200 - 240 VAC power source. Users should regulate the voltage scale of the **AC Mains Line Voltage Selector** according to the standards in their own country (see Figure 2-1 Front Panel Overview) at

the rear panel, and use an appropriate fuse.

Voltage	Fuse
100 - 120 V AC	250 V, F1AL
200 - 240 V AC	250 V, F0.5AL

To change the voltage scale of the instrument, do the following steps:

(1) Turn off the power button at the front panel, and remove the power cord.

(2) Check if the fuse installed before leaving factory (250 V, F0.5AL) can match with the selected voltage scale; if not, change the fuse. (See page 102, Appendix C: Line Fuse Replacement.)

(3) Regulate the AC Mains Line Voltage Selector to the desired voltage scale.

2.7 Power On

(1) Connect the instrument to the AC supply using the supplied power cord.

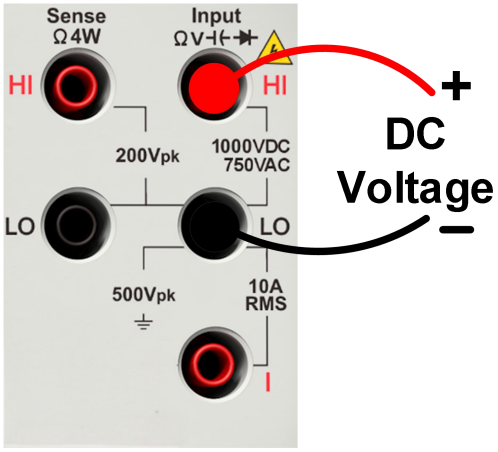
> ⚠ **Warning**:
> To avoid electric shock, the instrument must be grounded properly.

(2) Press the **power button** at the front panel, the screen shows the boot screen.

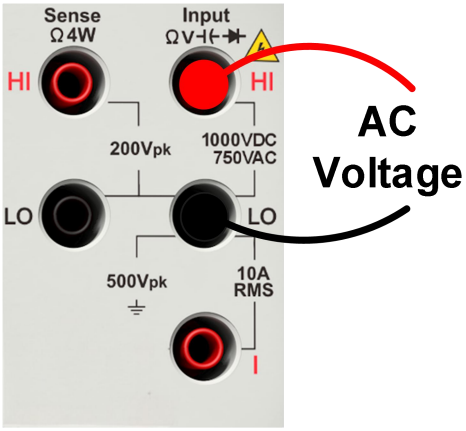
2.8 Measurement Connections

After selecting the desired measurement function, please connect the signal (device) under test to the multimeter according to the method below. To avoid instrument damage, do not discretionarily switch the measurement function when measuring.

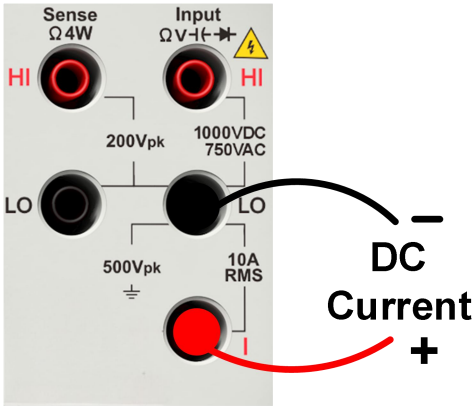
DC Voltage Measurement



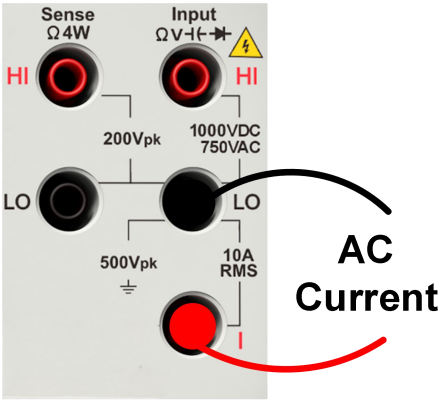
AC Voltage Measurement



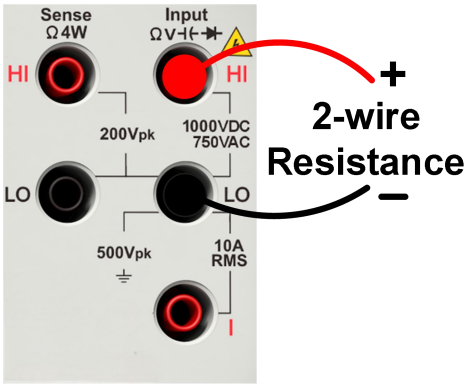
DC Current Measurement



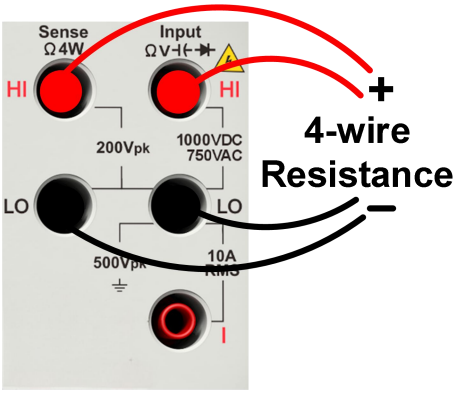
AC Current Measurement



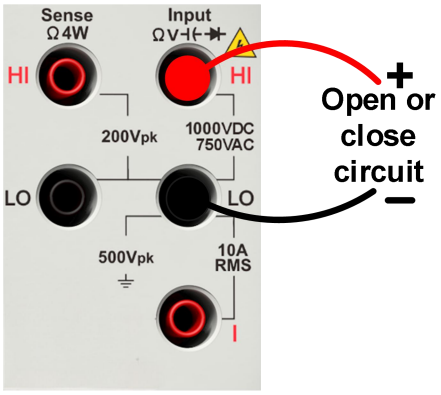
2-wire Measurement



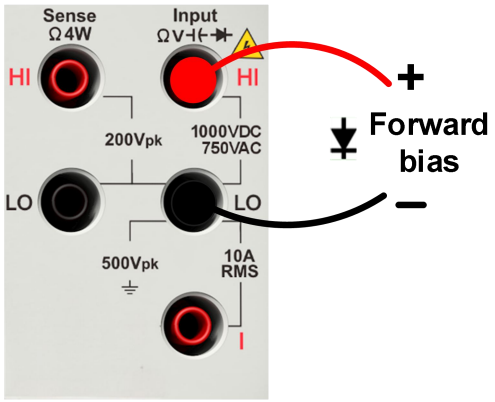
4-wire Measurement



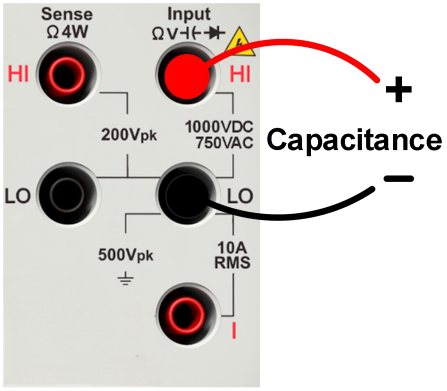
Continuity Measurement



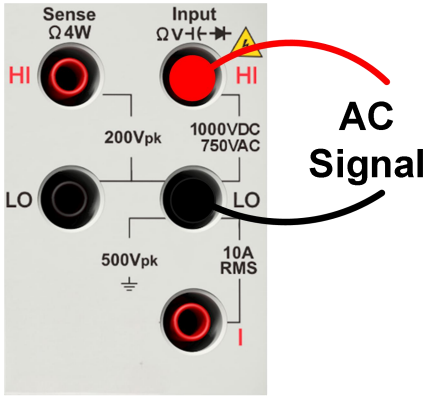
Diode Measurement



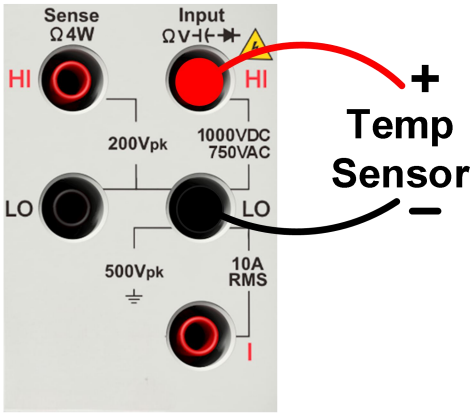
Diode Measurement



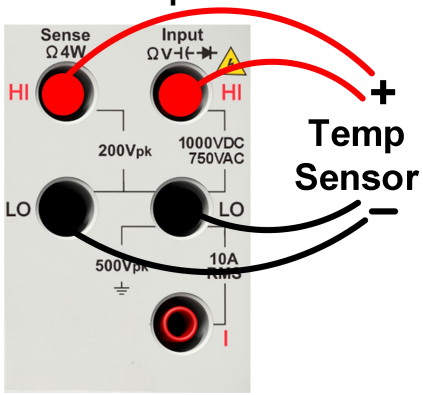
Frequency/Period Measurement



2-wire Temperature Measurement



4-wire Temperature Measurement



3 Function and Operations

3.1 Front Panel Menu Reference

The following table summarizes the front panel keys and the menu structure.

Key	Descriptions	
Knob	Change parameters value; press the knob can enable or disable numeric keypad in digit input mode.	
< / >	Move cursor to left or right.	
+ / -	Increase or decrease range manually.	
Range	Switch to manual or auto range mode.	
▶/II	Start or stop measurement.	
Single	Single trigger.	
Null	Enter null measurement.	
Save	Save test data, screenshot and import or export parameters.	
Math	Null	Turn on / off Null and set this parameter.
	dB/dBm	Turn on / off dB, dBm. (Only DCV/ACV)
	Statistics	Show or hide data and clear readings.
	Limits	Turn on / off limits.
Utility	User Settings	Set number format, sounds, language, brightness and screen saver.
	System Setup	Set data time and firmware update.
	I/O Config	Set LAN setting, USB and Serial.
	Test Admin	Enter key position test or LED RGB test.
	Key Lock	Enable key lock.
	Preset	Set system status.
Acquire	Acquire	Select Continue, Data Log or Prob Hold mode.
	Trigger Settings	Set trigger sample.
	VMC Out	Set the polarity of the sampling completion output pulse signal.
Display	Display	Select number, bar, trend or histogram to display.
	Label	Turn on / off label display.
	Label Text	Edit display label text.
	2nd Meas	Enable or disable auxiliary measurement.
	Digit Mask	Set the number of digit display for measurement.
≂V	DCV	Set DC voltage measurement. Range: Auto, 200mV, 2V, 20V, , 200V or 1000V.

		Aperture: 100PLC, 10PLC, 1PLC, 0.2PLC, 0.06PLC, 0.02PLC or 0.006PLC. Auto Zero: Turn on / off auto zero. Input Z: 10M or Auto.
	ACV	Set AC voltage measurement. Range: Auto, 200mV, 2V, 20V, 200V or 750V. Filter: >3Hz, >20Hz or >200Hz.
≂A	DCI	Set DC current measurement. Range: Auto, 200uA, 2mA, 20mA, 200mA, 2A or 10A. Aperture: 100PLC, 10PLC, 1PLC, 0.2PLC, 0.06PLC, 0.02PLC or 0.006PLC. Auto Zero: Turn on / off auto zero.
	ACI	Set AC current measurement. Range: Auto, 200uA, 2mA, 20mA, 200mA, 2A or 10A. Filter: >3Hz, >20Hz or >200Hz.
Ω	Ω	Ω2W/4W: Set 2-wire resistance measurement or 4-wire resistance measurement. Set 2-wire resistance measurement. ● Range: Auto, 200Ω(~1mA), 2kΩ(~1mA), 20kΩ(~100uA), 200kΩ(~10uA), 1MΩ(~5uA), 10MΩ(~500nA)or 100MΩ(~500nA)。 ● Aperture: 100PLC, 10PLC, 1PLC, 0.2PLC, 0.06PLC, 0.02PLC or 0.006PLC. ● Auto Zero: Turn on / off auto zero. (only 2-wire resistance measurement.)
		Set continuity measurement. Beeper: Turn on / off beeper. Threshold: Set continuity threshold.
		Set diode measurement. Beeper: Turn on / off beeper. Threshold Low: Set diode low threshold. Threshold High: Set diode high threshold.
⊣⊢	Set diode measurement. Range: Auto, 2nF, 20nF, 200nF, 2uF, 20uF, 200uF, 2mF, 20mF or 100mF.	
Freq	Set frequency or period measurement. Range: Auto, 200mV, 2V, 20V, 200V or 750V. Filter: >3Hz, >20Hz or >200Hz. Gate Time: 10ms, 100ms or 1s.	

Temp	Set temperature measurement. Probe: TCouple, RTD2W, RTD4W, Thermis2W or Thermis4W. Probe Settings: Set probe parameters. Auto Zero: Turn on / off auto zero. Aperture: 100PLC, 10PLC, 1PLC, 0.2PLC, 0.06PLC, 0.02PLC or 0.006PLC. Units: ℃, ℉ or K.

3.2 Measurement Configuration

Most of the measurement functions of the multimeter have modifiable measurement parameters. Changing the measurement parameters can change the range, measurement accuracy, measurement speed and input impedance of the multimeter. Modifying the measurement parameters according to the practical application can achieve faster measurement speed or higher measurement accuracy.

The default measurement configuration of the multimeter ensures accurate measurement results in most cases. Users can directly perform any measurement operation, and can also modify the measurement parameters under various measurement functions according to their needs.

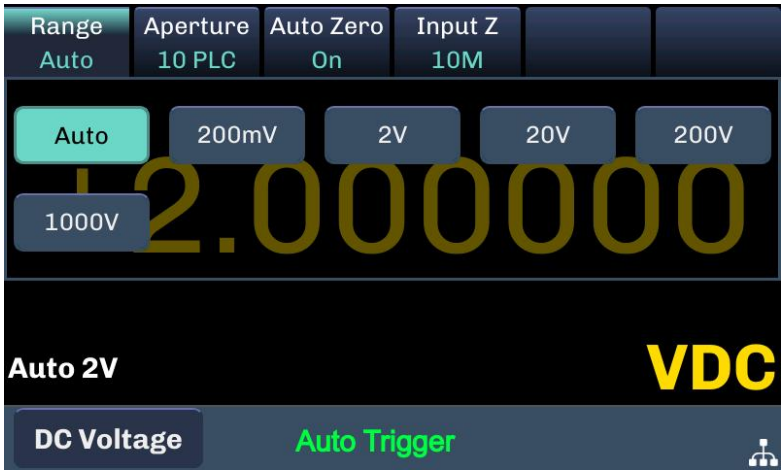
3.2.1 Range

There are two ways to select the measuring range: auto and manual. Auto range can automatically select the measuring range for measurement according to the input signal, providing convenience for users. Under manual range, you can set the range using the front panel buttons or menu softkeys for higher reading accuracy.

Method 1: Use the front panel buttons to set the range.

Press the **Range** key to switch between auto and manual Range modes. Press the **+/-** arrow keys to set the manual range mode and increase/decrease the range.

Method 2: Select the range in the measurement function menu.



Select auto range: Press **Range** softkey and select Auto.

Select manual range: Press **Range** softkey to select a measuring range other than Auto.

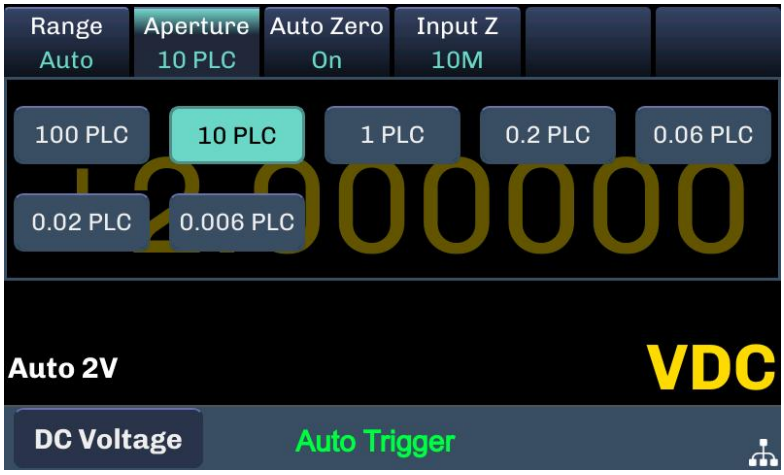
Description:

- When the input signal exceeds the current range, the multimeter will display "Overload" or "OPEN".
- When set to factory settings, the range defaults to "Auto".
- It is recommended that users choose the "Auto" range when the measuring range cannot be predicted to protect the instrument and obtain more accurate readings.
- Connectivity tests and diode tests are fixed range.

3.2.2 Aperture

The integration time refers to the sampling period of the input signal by the analog/digital converter of the instrument during the measurement. The longer the integration time, the slower the measurement rate and the higher the measurement resolution; The shorter the integration time, the faster the measurement rate and the lower the measurement resolution. The integration time is suitable for DCV, DCI, 2WR and 4WR measurement functions.

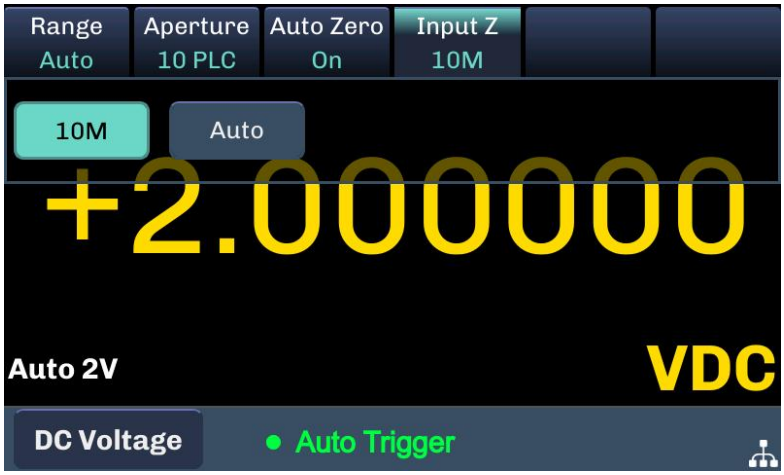
Select the **Aperture** in the menu, and can see the setting options, as shown in the figure below (take DCV measurement as an example). Press the corresponding menu key to implement the corresponding configuration.



3.2.3 Input Impedance

The input impedance setting is suitable for the DCV measurement function. The factory default is "10M". For ranges of 200 mV, 2V and 20 V, "Auto" can be selected to reduce the load error introduced by the multimeter to the measured object.

The current measurement function is DCV, and the range is 200mV, 2V or 20V. Select the **Input Z** in the menu to set it, as shown in the figure below.



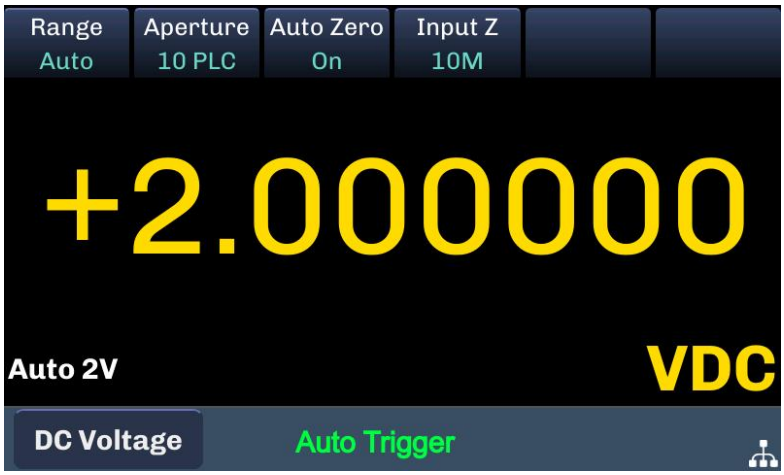
Description:

- When "10 MΩ" is selected, the input impedance value is 10 MΩ for all ranges.
- When **Auto** is selected, the input impedance is "> 10GΩ" for the 200 mV, 2 V, and 20 V ranges and "10MΩ" for the 200 V and 1000 V ranges.

3.2.4 Auto Zero

Auto zero is suitable for DCV, DCI, 2WR and 4WR measurement functions. Auto zero provides the most accurate measurement, but requires additional time to perform the zeroing measurement.

After entering the corresponding measurement function, press **Auto Zero** in the menu key to set it, as shown in the figure below (taking DCV measurement as an example).



When auto zero is enabled, DMM will take an internal measurement of the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the DMM input circuit from affecting the measurement accuracy.

With auto zero off, the DMM takes one measurement of the offset and subtracts the offset value from all subsequently measured parameters. Each time a function, range, or integration time is changed, the DMM takes a new offset measurement.

3.2.5 Filter

AC filter is suitable for ACV and ACI measurement functions. The AC filter will optimize low frequency accuracy and minimize AC settling time.

During the measurement, the type of AC filter should be selected according to the frequency of the input signal. Typically, you should choose the highest frequency filter with a frequency less than the frequency of the measured signal. For example, when measuring signals in the range of 20 to 200Hz, a 20Hz filter is used. If measurement speed is not the main

consideration, choosing a lower frequency filter results in a more stable measurement, depending on the signal you are measuring.

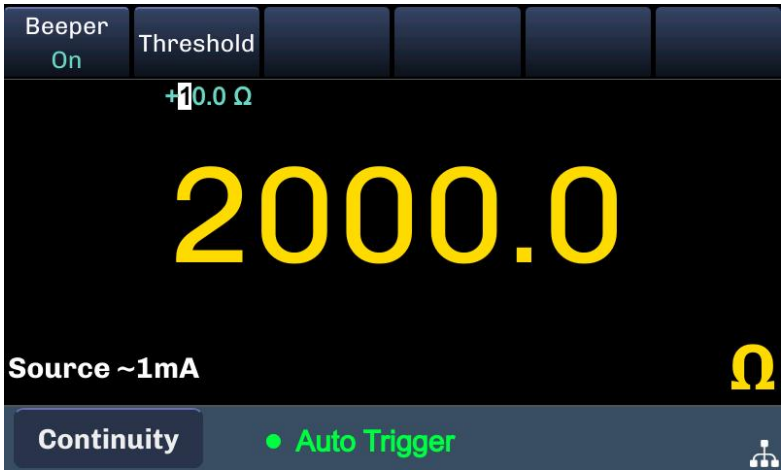
When measuring ACV and ACI, select **AC Filter** in the menu, and you can see the setting options, as shown in the figure below (taking ACV measurement as an example). Press the corresponding menu key to implement the corresponding configuration.

3.2.6 Short Circuit Resistance

During the Continuity test, you need to set the short-circuit resistance value in the test circuit. When the resistance value of the measured resistor in the circuit under test is lower than the short-circuit resistance value, it is judged that the circuit is connected and a Beeper sound is emitted (if the Beeper is turned on).

When the Continuity measurement function is currently selected, press the **Threshold** key, you can modify the values as follows.

- Press the **</>** direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the knob to display the numeric keypad. Enter the desired value and press **OK** to complete the setting.



3.2.7 Conduction Voltage

During Diode testing, it is necessary to set the conduction voltage in the test circuit. When the on-voltage value of the measured diode in the circuit under test is lower or higher than the set value, the instrument continuously beeps (if the Beeper is turned on).

When the Diode measurement function is currently selected, press the **Threshold Low/Threshold High** key, you can modify the values as follows.

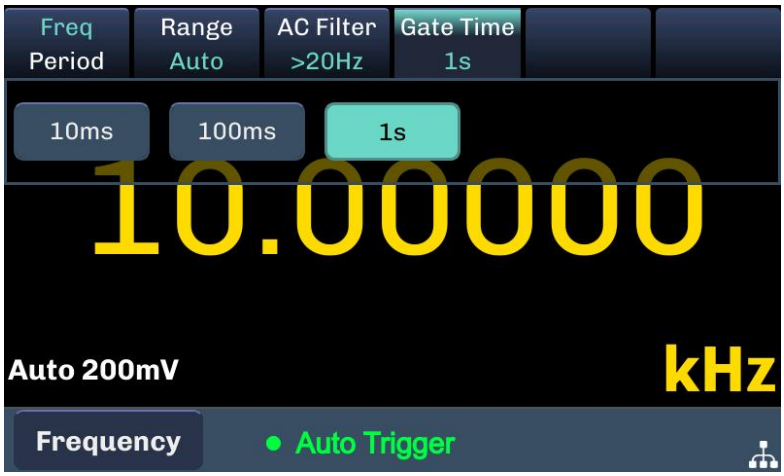
- Press the **</>** direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the knob to display the numeric keypad. Enter the desired value and press **OK** to complete the setting.

3.2.8 Gate time

The gate time applies to the Frequency/Period measurement function. The length of the gate time determines the resolution of the low frequency

measurement. The longer the gate time, the higher the low-frequency measurement resolution and the lower the measurement rate; On the contrary, the lower the low-frequency measurement resolution, the higher the measurement rate.

When measuring Frequency/Period, press the **Gate Time** key to see the setting options, as shown in the figure below (taking Frequency measurement as an example). Press the corresponding menu key to implement the corresponding configuration.



3.3 Basic Measurement Functions

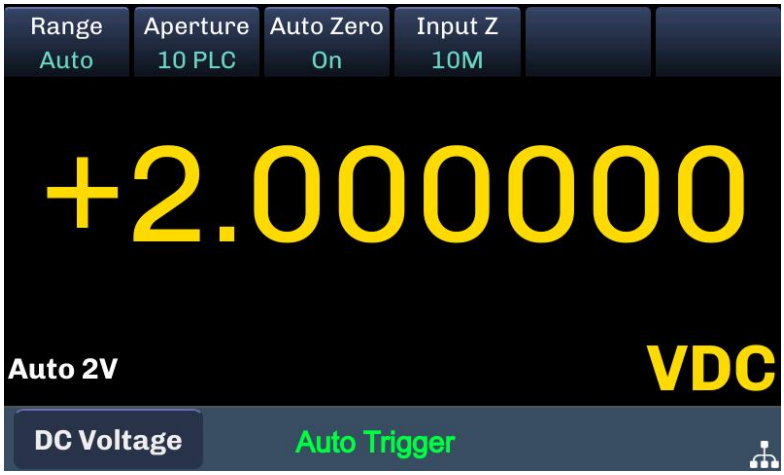
3.3.1 Measuring DC Voltage

This section describes how to configure DC voltage measurements.

Operation steps:

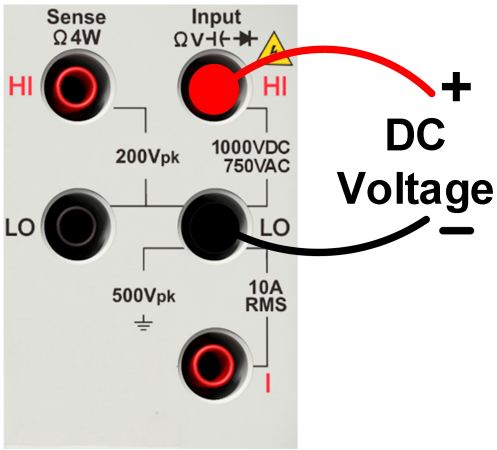
1. **Enable the DC voltage measurement function.**

   Press the front panel ≂V key, switch to DC voltage measurement, as shown in the figure below.



2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the range.**

   Press the Range softkey to set the required range.

   Description:

   - There is 1000 V input protection at any range.
   - All ranges except the 1000 V range have a 10% over-range.

- At 1000 V range, "Overload" is displayed when the reading exceeds 1050 V.

4. Set the integration time.

Press the **Aperture** softkey to select an integration time for the measurement.

5. Set auto zero.

Press the **Auto Zero** softkey turns this on or off, auto-zero provides the most accurate measurement but requires additional time to perform the zero measurement. When auto-zeroing is enabled, the multimeter will take an internal measurement of the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the input circuit of the multimeter from affecting the measurement accuracy.

6. Set the input impedance (limited range of 200mV, 2V and 20V only).

Press the **Input Z** softkey to select the input impedance value.

Description:

- 200 mV, 2 V, and 20 V ranges, with the option of "Auto" or "10MΩ".
- 200V and 1000V ranges, fixed at 10MΩ.

7. Set the relative value.

Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

8. Read the measured value.

The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

9. Mathematical operations (advanced operations).

Mathematical operations (Statistics, Limits, dBm, dB, relative values) can

be performed on measured readings. For specific operations, please refer to "Math Operations".

10. Graphical display.

The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

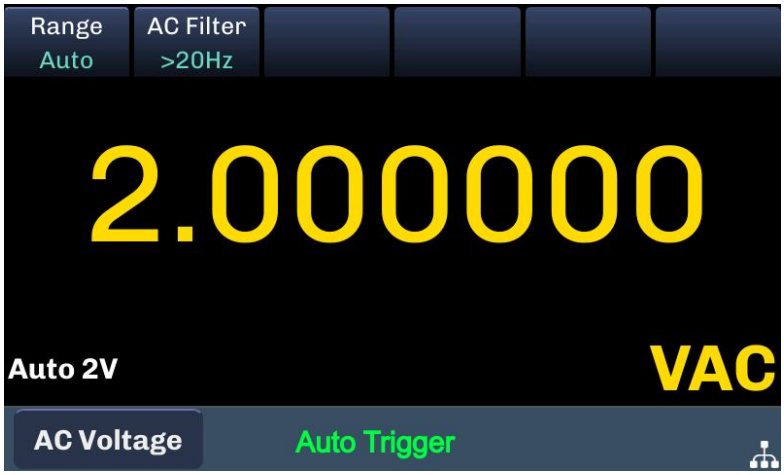
3.3.2 Measure AC voltage

This section describes how to configure AC voltage measurements.

Operation steps:

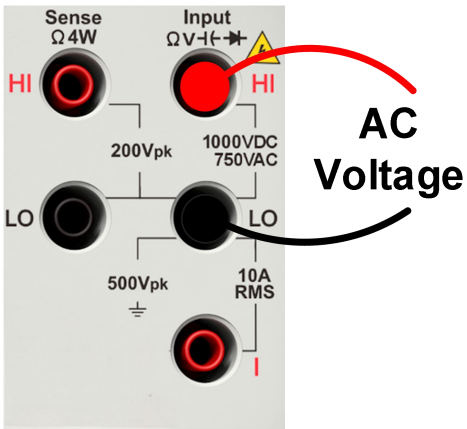
1. Enable the AC voltage measurement function.

Press the front panel ≂V key, switch to AC voltage measurement, as shown in the figure below.



2. Connect the test leads.

As shown in the figure below.



3. Set the range.

Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

Description:

- There is 750 Vrms input protection at any range.
- All ranges except the 750 Vrms range have a 10% over-range.
- "Overload" is displayed when the reading exceeds 787.5 Vrms at the 750 Vrms range.

4. Set filtering.

Press the **Filter** softkey to select > 3 Hz, > 20 Hz, and > 200 Hz filtering.

说明：

Description:

- The AC filter will optimize low frequency accuracy and minimize AC settling time.

5. Set the relative value.

Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

6. Read the measured value.

The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

7. Mathematical operations (advanced operations).

Mathematical operations (Statistics, Limits, dBm, dB, relative values) can be performed on measured readings. For specific operations, please refer to "Math Operations".

8. Graphical display.

- The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

3.3.3 Measuring DC Current

This section describes how to configure DC current measurements.

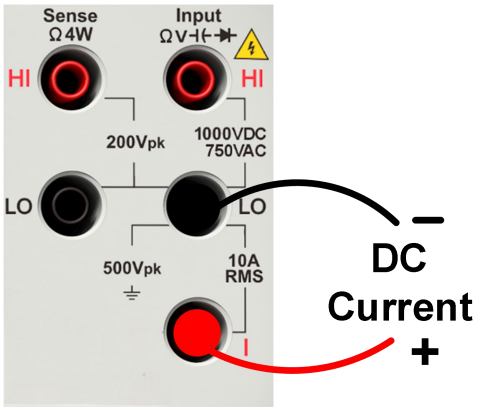
Operation steps:

1. **Enable the DC current measurement function.**

   Press the front panel ≂A key, switch to DC current measurement, as shown in the figure below.

2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the range.**

   Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

   Description:

   - Use two types of fuses for input protection. There is a 10 A current input fuse on the front panel and a 12 A current input fuse is built into the instrument.
   - All ranges except the 10 A range have a 10% over-range.

- "Overload" is displayed when the reading exceeds 10.5 A in the 10 A range.

4. Set the integration time.

Press the **Aperture** softkey to select an integration time for the measurement.

5. Set auto zero.

Press the **Auto Zero** softkey turns this on or off, auto-zero provides the most accurate measurement but requires additional time to perform the zero measurement. When auto-zeroing is enabled, the multimeter will take an internal measurement of the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the input circuit of the multimeter from affecting the measurement accuracy.

6. Set the relative value.

Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

7. Read the measured value.

The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

8. Mathematical operations (advanced operations).

Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

9. Graphical display.

The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

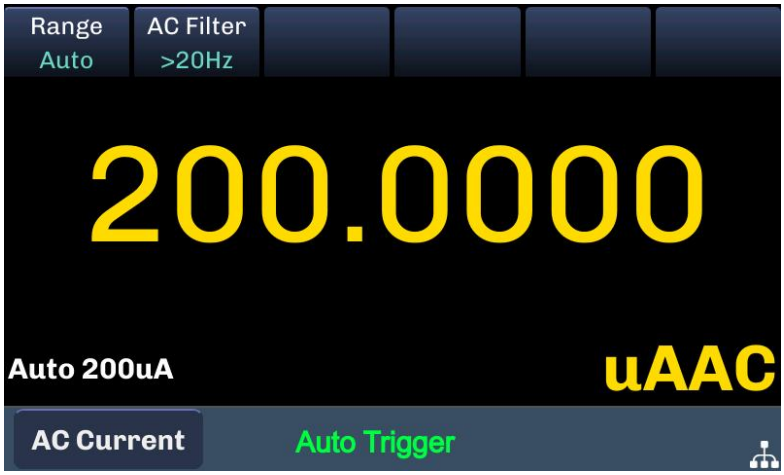
3.3.4 Measuring AC Current

This section describes how to configure AC current measurements.

Operation steps:

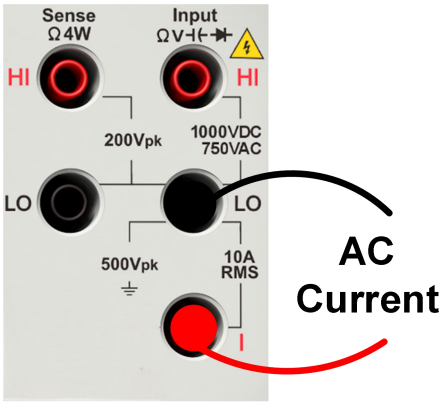
1. **Enable the AC current measurement function.**

   Press the front panel [≂A] key, switch to AC current measurement, as shown in the figure below.



2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the range.**

   Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

   Description:

   - Use two types of fuses for input protection. There is a 10 A current input fuse on the front panel and a 12 A current input fuse is built into the instrument.
   - All ranges except the 10 A range have a 10% over-range.

- "Overload" is displayed when the reading exceeds 10.5 A in the 10 A range.

4. **Set filtering.**

   Press the **Filter** softkey to select > 3 Hz, > 20 Hz, and > 200 Hz filtering.

   Description:

   - The AC filter will optimize low frequency accuracy and minimize AC settling time.

5. **Set the relative value.**

   Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

6. **Read the measured value.**

   The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

7. **Mathematical operations (advanced operations).**

   Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

8. **Graphical display.**

   The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

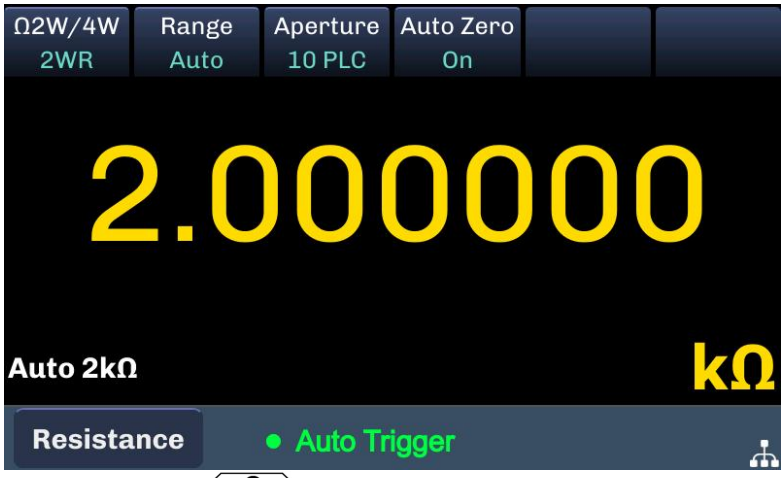
3.3.5 Measurement Resistance

This section describes how to configure two-and four-wire resistance measurements.

Operation steps:

1. **Enable 2-wire/4-wire resistance measurement function.**

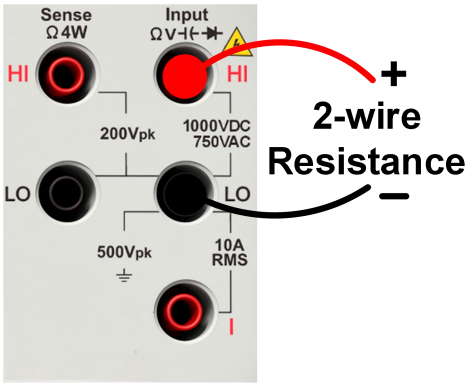
Press the front panel key, switch to the resistance measurement mode, and press **Ω2W/Ω4W** in the menu to switch the 2-wire resistance measurement, as shown in the figure below.



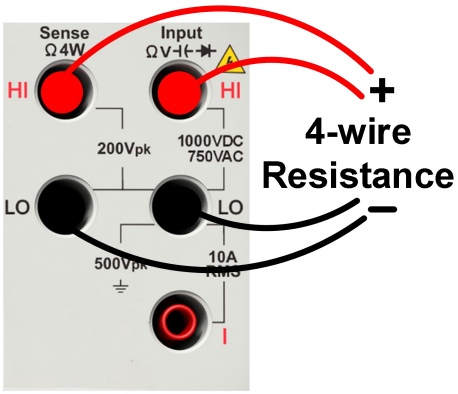
Press the front panel key, switch to the resistance measurement mode, and press **Ω2W/Ω4W** in the menu to switch the 4-wire resistance measurement, as shown in the figure below.

2. Connect the test leads.

The test lead connection of the 2-wire resistor is shown in the figure below.



The test lead connection for the 4-wire resistor is shown in the figure below.



3. Set the range.

Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

Description:

- There is 1000 V input protection at any range.
- All ranges have a 10% over-range.
- "Overload" is displayed when the reading exceeds 110 MΩ in the 100 MΩ range.

4. Set the integration time.

Press the **Aperture** softkey to select an integration time for the measurement.

5. Set up automatic zeroing (2-wire resistance measurement only).

Press the **Auto Zero** softkey turns this on or off, auto-zero provides the most accurate measurement but requires additional time to perform the zero measurement. When auto-zeroing is enabled, the multimeter will take an internal measurement of the offset after each measurement. This

measurement is then subtracted from the previous reading. This prevents the offset voltage on the input circuit of the multimeter from affecting the measurement accuracy.

6. Set the relative value.

Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

7. Read the measured value.

The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

Description:

- When using 2-wire resistors to measure resistors with smaller resistance values, it is recommended to use relative value calculations, which can eliminate test wire impedance errors.
- When measuring a resistance, both ends of the resistance cannot be placed on a conductive table top or held by hand for measurement, which will lead to inaccurate measurement results, and the greater the resistance, the greater the impact.
- When the resistance value of the measured resistance is less than 100 kΩ, the resistance of the test lead and the contact resistance between the probe and the test point cannot be ignored compared with the measured resistance. At this time, the four-wire resistance measurement mode can reduce the measurement error.

8. Mathematical operations (advanced operations).

Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

9. Graphical display.

The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

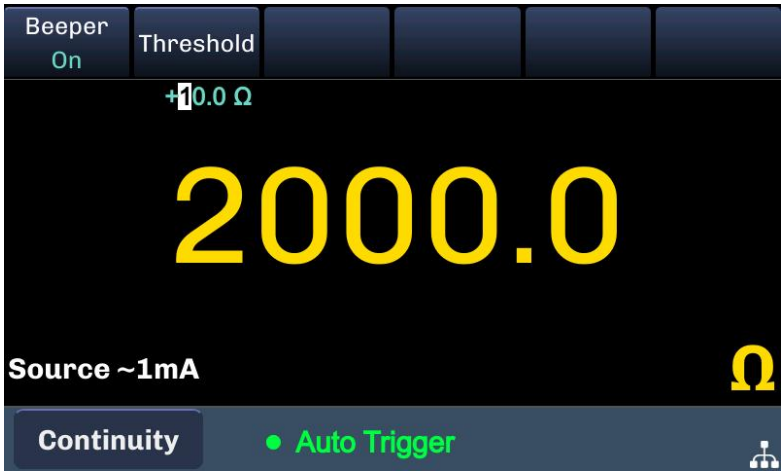
3.3.6 Continuity Testing

This section describes how to configure continuity tests.

Operation steps:

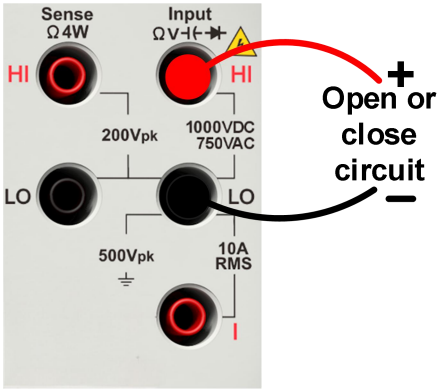
1. **Enable the connectivity testing feature.**

   Press the front panel key, switch to connectivity measurement, as shown in the figure below.



2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the beeper.**

   Press the **Beeper** softkey to turn the beeper function on or off. When the Beeper is turned on, if the resistance of the circuit under test is less than the set threshold, the beeper will make a continuous sound.

4. **Set the threshold.**

   Press the threshold softkey to set the short circuit resistance value. Press the **</>** arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.

5. **Read the measured value.**

   The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

   Description:

   - Before the test circuit is on and off, disconnect the circuit power and discharge all high-voltage capacitors to avoid damaging the multimeter.

6. **Mathematical operations (advanced operations).**

   Mathematical operations (Statistics, Limits) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

7. **Graphical display.**

   The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

3.3.7 Diode Testing

This section describes how to configure diode tests.

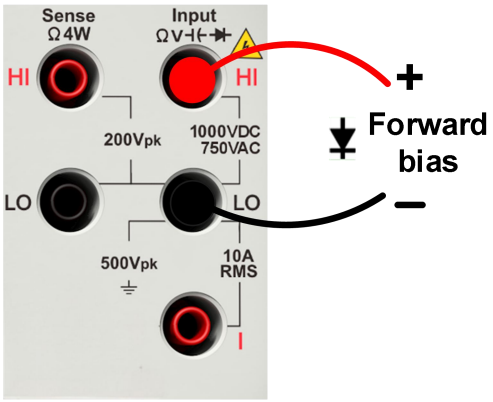
Operation steps:

1. **Enable the diode test function.**

   Press the front panel  key, switch to diode measurement, as shown in the figure below.

2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the beeper.**

   Press the **Beeper** softkey to turn the beeper function on or off. When the beeper is turned on, such as the diode is turned on, the beeper will make a continuous sound.

4. **Set the threshold lower.**

   Press the **Threshold Low** softkey to set the lower threshold limit of the diode. Press the **</>** arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.

5. **Set the threshold upper.**

   Press the **Threshold High** softkey to set the upper diode threshold. Press the **</>** arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.

6. **Read the measured value.**

If the diode is on, the multimeter screen will display the measured voltage, otherwise the screen will display "OPEN".

Description:

- Before testing the diodes, disconnect the circuit and discharge all high voltage capacitors to avoid damaging the multimeter.

7. Evaluate measurement results

Invert the probe and measure the voltage in the diode again. The diodes were evaluated according to the following criteria:

- If the multimeter displays "OPEN" when in reverse bias mode, the diode is OK.
- If the multimeter displays a voltage value of approximately 0V while in forward and reverse bias modes, and the multimeter continuously beeps, the diode is shorted.
- If the multimeter displays "OPEN" when in forward and reverse bias modes, the diode is OPEN.

8. Mathematical operations (advanced operations).

Mathematical operations (Statistics, Limits) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

9. Graphical display.

The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

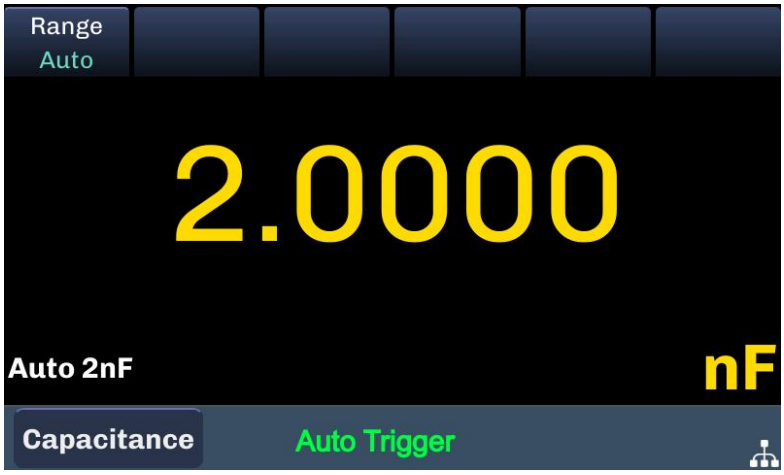
3.3.8 Measurement Capacitance

This section describes how to configure capacitance measurements.

Operation steps:

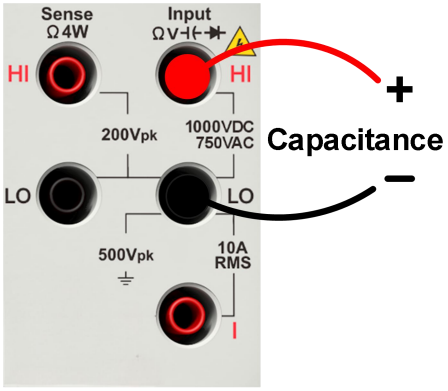
1. Enable the capacitance measurement function.

Press the front panel  key, switch to capacitance measurement, as shown in the figure below.



2. Connect the test leads.

As shown in the figure below.



Description:

- Before measuring the electrolytic capacitor, please use the test lead to short-circuit the two pins of the electrolytic capacitor for a moment to discharge, and then measure.

3. Set the range.

Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

Description:

- There is 1000 V input protection at any range.
- All ranges have a 10% over-range.
- "Overload" is displayed when the reading exceeds 110 mF in the 100 mF range.

4. Set the relative value.

Press the relative value softkey to turn on or off the relative operation

function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

5. **Read the measured value.**

   The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

   Description:

   - Before measuring the electrolytic capacitor with a multimeter, the two short pins of the electrolytic capacitor should be connected with the test lead each time for discharge, and then it can be measured.

6. **Mathematical operations (advanced operations).**

   Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

7. **Graphical display.**

   The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

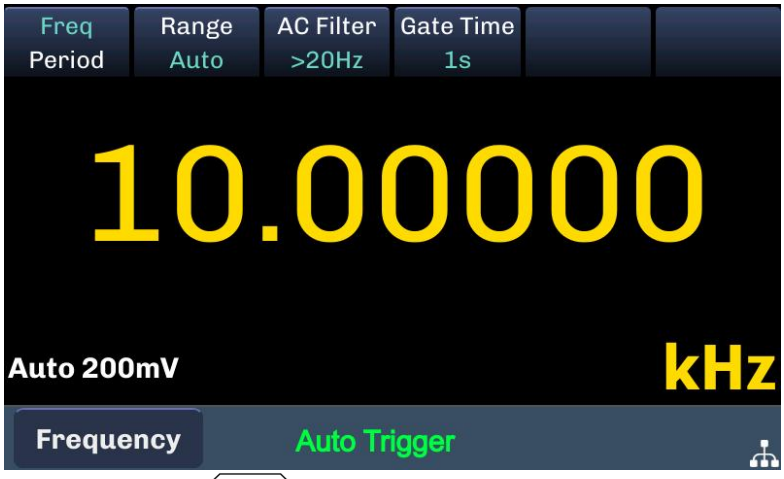
3.3.9 Measurement Frequency and Period

This section describes how to configure frequency and period measurements.

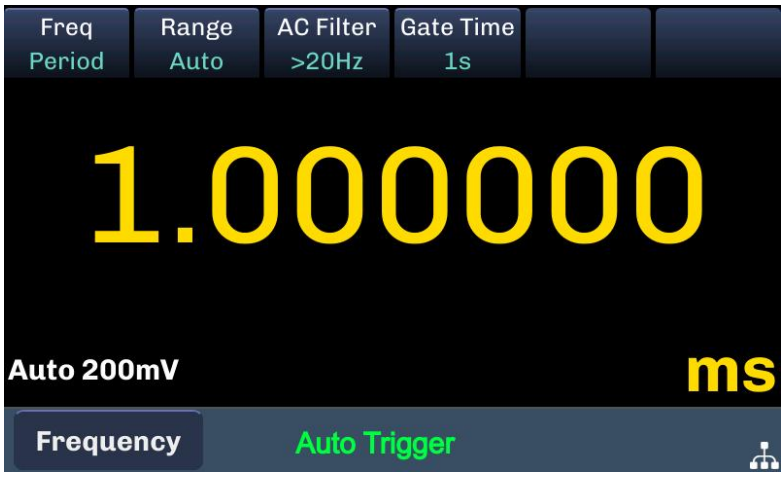
Operation steps:

1. **Enable frequency or period measurement functions.**

   Press the front panel Freq key, select frequency in the menu to enter the frequency measurement interface, as shown in the figure below.

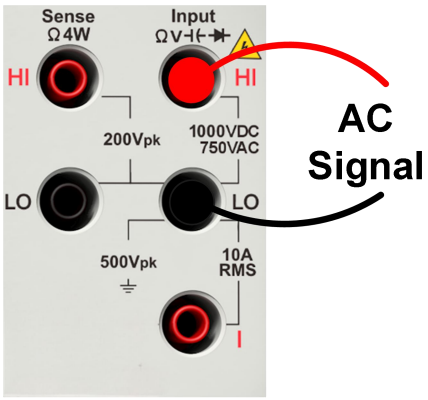


Press the front panel Freq key, select period in the menu to enter the period measurement interface, as shown in the figure below.



2. Connect the test leads.

As shown in the figure below.



3. Set the range.

Press the **Range** softkey to set the required range. Auto range can be automatically selected for the measurement based on the input.

Description:

- Frequency range: 1 Hz to 1 MHz.
- Period range: 1 μs to 1 s.
- There is 750 Vrms input protection at any range.

4. **Set filtering.**

   Press the **Filter** softkey to select > 3 Hz, > 20 Hz, and > 200 Hz filtering.

   Description:

   - The AC filter will optimize low frequency accuracy and minimize AC settling time.

5. **Set the gate time.**

   Press the **Gate Time** softkey to select 10 ms, 100 ms, or 1 s.

6. **Set the relative value.**

   Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

7. **Read the measured value.**

   The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

8. **Mathematical operations (advanced operations).**

   Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

9. **Graphical display.**

   The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

3.3.10 Measure Temperature

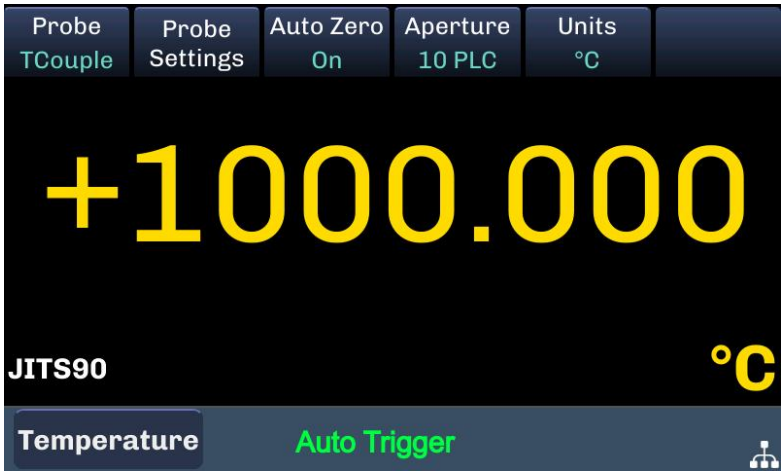
This section describes how to configure temperature measurements. A

temperature sensor probe is required for temperature measurement. Supported probes are TCouple, RTD2W, RTD4W, Thermis2W, Thermis4W; Where the thermocouple supports JITS90, KITS90, EITS90, TITS90, NITS90, RITS90, SITS90 and BITS90.

Operation steps:

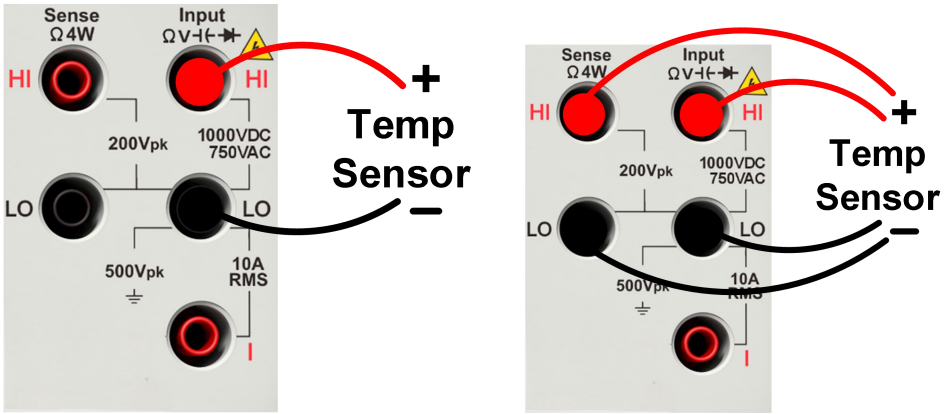
1. **Enable the temperature measurement function.**

   Press the front panel Temp key, enter temperature measurement mode, as shown in the figure below.



2. **Connect the test leads.**

   As shown in the figure below.



3. **Set the probe type.**

   Press the **Probe** softkey to select the probe type. The following introduces the measurement parameters that need to be set for different types of temperature sensors.

   TCouple

Thermocouple is one of the most commonly used temperature detection components in industry. It is a sensing device that converts temperature change information into voltage change information. Such sensors have a large temperature measurement range.

Commonly used thermocouples are mainly JITS90, KITS90, EITS90, TITS90, NITS90, RITS90, SITS90 or BITS90.

- **Set the reference temperature:** Press the **Reference** softkey to select internal or fixed as the reference temperature. Press the **</>** arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- **Set offset:** When the reference temperature is internal, offset calibration can be set. When the reference temperature is fixed, a fixed offset may be set. Press the **</>** arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the **Back** softkey to return to the previous menu.

RTD2W / RTD4W

Thermal resistance is the most commonly used temperature detector in medium and low temperature areas. Its main features are high measurement accuracy and stable performance. Thermal resistance measures the temperature by using the characteristic that the resistance of a substance changes when the temperature changes. When the resistance value changes, the multimeter displays the temperature value corresponding to the resistance value. Such sensors have good linearity.

- **Set R0:** R0 is an RTD nominal resistance at 0 °C and defaults to 100 Ω. Press the **R0** softkey, press the **</>** direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.

Thermis2W / Thermis4W

The THERM temperature sensor is a sensing device that converts temperature change information into resistance change information. Such sensors have good temperature sensitivity.

4. Set auto zero (probe types TCouple, RTD2W, Thermis2W only).

Press the **Auto Zero** softkey turns this on or off, auto-zero provides the most accurate measurement but requires additional time to perform the zero measurement. When auto-zeroing is enabled, the multimeter will take an internal measurement of the offset after each measurement. This measurement is then subtracted from the previous reading. This prevents the offset voltage on the input circuit of the multimeter from affecting the measurement accuracy.

5. **Set the integration time.**

   Press the **Aperture** softkey to select an integration time for the measurement.

6. **Set the unit.**

   Press the **Units** softkey to select a unit for the measurement. ℃ (Celsius), ℉ (Fahrenheit), K (open temperature). The temperature conversion relationship is as follows:

   - ℉ = (9/5) ×℃ + 32
   - K ≈ ℃ + 273.15

7. **Set the relative value.**

   Press the relative value softkey to turn on or off the relative operation function. When the relative operation is turned on, the reading displayed at this time is the actual measured value minus the set relative value. The default relative value is the measured value when the function is turned on. (For the specific setting method of relative value, please refer to "Math Operations").

8. **Read the measured value.**

   The multimeter will measure the input signal according to the current measurement settings and display the measurement results in the screen.

9. **Mathematical operations (advanced operations).**

   Mathematical operations (Statistics, Limits, relative values) can be performed on measurement readings. For specific operations, please refer to "Math Operations".

10. Graphical display.

The measured data can be analyzed in three ways: "Bar", "Trend" and "Histogram". For specific operations, please refer to "Display Mode".

3.4 Dual Display Function

Press the **Display** panel key to enter the menu, and press the **2nd Meas** softkey to select the corresponding mode to turn on the dual Display mode, as shown in the figure below (taking DCV measurement as an example).

The main and auxiliary measurement functions correspond to the following table.

Primary measurement function	**Auxiliary measurement function**	
DCV	DCI	
DCI	DCV	
ACV	Frequency	ACI
ACI	Frequency	ACV
Frequency	Period	
Period	Frequency	
Temp	Sensor	Ref Temp (thermocouple only optional)

Description:

- When appears ⇅ , click the logo to directly switch the main and auxiliary display or click Auxiliary Measurement, select the main and auxiliary display switch, or switch the display.
- Click the blank area of the main Display to call up the main Display measurement menu, and press and hold the blank area of the auxiliary Display to call up the Display menu.

3.5 Acquire Function

Press the **Acquire** panel key to enter the trigger and sampling settings interface. Click on the main display area to return to the current measurement configuration menu.

The trigger and sampling function menu is shown in the following table.

Function Menu	Setting	Description
Acquire	Continue/Data Log/Probe Hold	Set acquire mode
Trigger Settings	Auto/Single/External	Set the trigger mode of the trigger source
VMC Output	Negative/positive	Setting the polarity of the pulse signal outputted to the outside after the sampling is completed

3.5.1 Acquire mode

Continue mode

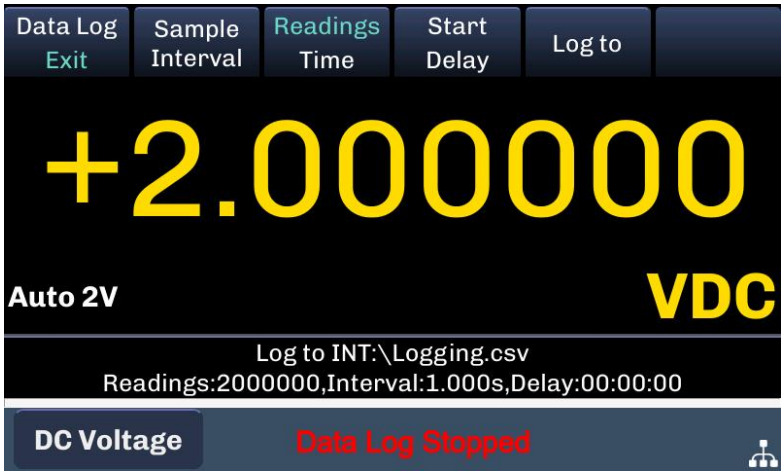
Press **Acquire-Acquire-Continue** to enter continuous acquire mode. The continuous sampling menu is shown in the table below.

Function Menu	Setting	Description
Acquire	Continue/Data Log/Probe Hold	Set acquire mode

Trigger Settings		Set the trigger mode of the trigger source
	Trigger Source	Set the trigger mode to automatic, single, or external
	Delay	Set the sampling delay manual or automatic
	Samples/Trigger	Set the number of samples
	Back	Return to the previous menu
VMC Output	Negative/positive	Setting the polarity of the pulse signal outputted to the outside after the sampling is completed

Data Log mode

Press **Acquire-Acquire-Data Log** to enter recorder sampling mode.



The data log sampling menu is shown in the table below.

Function Menu	**Setting**	**Description**
Acquire	Continue/Data Log/Probe Hold	Set acquire mode
Data Log Exit		Click to exit data log sampling mode
Sampling Interval		Set the interval between samples
Readings Time		Set the number of readings or total duration of sampling

Start Delay		Set the time when sampling starts
Log to		Set the sampled information storage address
	File name	Set Storage File Name
	Metadate	Set auxiliary information status
	Rows/File	Set file line size
	Separator	Sets the symbol (comma, tab, or semicolon) that separates the information on each line
	Back	Return to the previous menu

1. **Set the sampling interval.**

   Press the **Sample Interval** softkey to set the sampling time interval between two measurement data.

2. **Set the reading / time.**

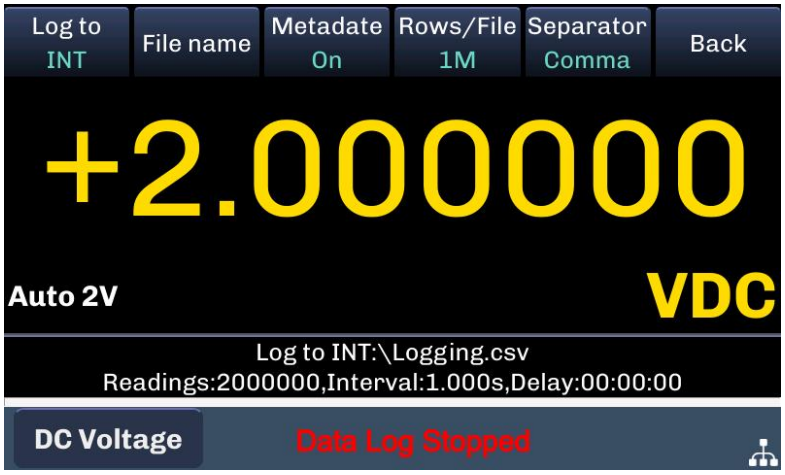
   Press the **Readings/Time** softkey to switch the duration mode to the number of readings or length of time mode. Press the </> arrow keys to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.

3. **Set the startup delay.**

   Press the **Start Delay** softkey to set the time to start data recording (delay start recording or start recording immediately).

4. **Settings log to.**

   Press the **Log to** softkey to enter the Record to interface, and you can store the recorded data points internally or externally.



- **Set File Name:** Sets the file name of the record csv.
- **Set auxiliary information:** Can turn the auxiliary information on or off.
- **Set the number of file lines:** It can be set to 1M or the maximum, and stop recording when the set value is reached.
- **Set separator:** You can set the symbol (comma, tab, or semicolon) that separates the information on each line.

5. Start recording readings.

Press ▶/II . Data logging will begin after the specified delay. The data record will be recorded for the specified duration (time or number of readings) or again by pressing ▶/II after that, the prompt box "This operation will stop the current recording mode. **Yes No**" will pop up on the screen. Click **Yes** to stop the current recording.

Description:

- After the data logging is complete, if the data is logged externally, the instrument will save the file with the specified name and path. If data is logged to memory, you can press **Save** to Save the readings in the main menu of data logging immediately.

Probe Hold mode

Press **Acquire-Acquire-Probe Hold** to enter the probe hold sampling mode.

The probe hold sampling menu is shown in the following table.

Function Menu	**Setting**	**Description**
Acquire	Continue/Data Log/Probe Hold	Set acquire mode
Probe Hold Exit		Click to exit probe hold sampling mode
Beeper	On/Off	Set beeper status
Clear List		Clear currently recorded measurements
Remove Last		Except for the latest recorded data

Note: Suitable for functions other than diode, continuity, temperature.

1. **Set the beeper.**

   Press the **Beeper** softkey to enable or disable the Beeper. When the Beeper is turned on, it is detected that the signal instrument makes a sound, and the measurement results are automatically recorded.

2. **Clear the data.**

   Press the **Clear List** softkey to clear the currently recorded measurement results.

3. **Remove the latest data.**

   Press the **Remove Last** softkey to remove the latest recorded data.

3.5.2 Trigger Setting

Set Trigger Source

Press the **Trigger Src** softkey to select the trigger source to be auto, single or external mode.

Description:

- When the trigger source is Auto, the instrument continues to measure, and as long as one measurement is completed, a new trigger will be automatically issued.
- When the trigger source is Single, the instrument will emit a trigger every time the Single button on the front panel is pressed.
- When the trigger source is Ext, the instrument will emit a trigger if the slope is met.

Set Delay

Sets the waiting time for the first sampling point to start. Press the **Delay** softkey to select manual or automatic mode. When the delay is set to manual, you can modify the values as follows.

- Press the </> direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the knob to display the numeric keypad. Enter the desired value and press **OK** to complete the setting.

Set the Trigger Sampling Times

Press the **Samples/Trigger** times softkey and rotate the knob to set the sampling value, you can modify the values as follows.

- Press the </> direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the knob to display the numeric keypad. Enter the desired value and press **OK** to complete the setting.

Set Slope

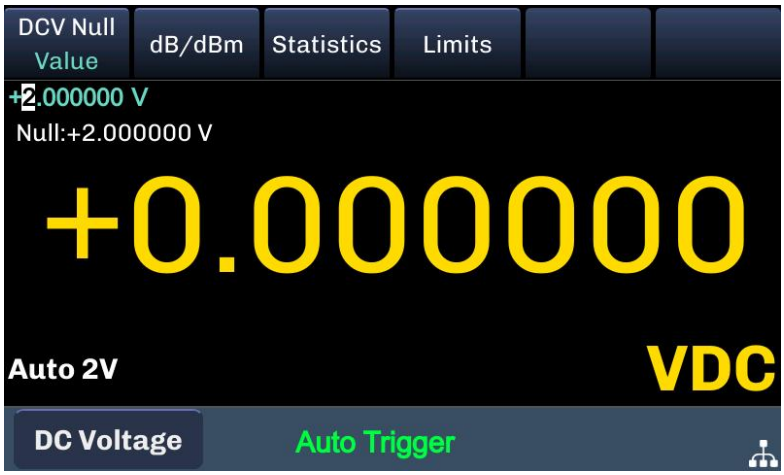
When the trigger source is set to External, the Slope option appears in the menu. Press Slope to select Positive or Negative, configuring the external trigger mode for rising or falling edge triggering, respectively.

3.5.3 VMC Output

Press the **VMC Out** softkey, select positive or negative, and set the polarity of the pulse signal. When the data acquisition is completed, the instrument will output a pulse signal through the VM COMP connector on the back panel.

3.6 Math Operations

Mathematical operations mainly include five functions: statistics, limits, dBm, dB and relative operations. Different mathematical operation functions are selected to meet the measurement requirements of different conditions. Different measurement functions can perform different mathematical operations. Press **Math** panel key to enter the mathematical operation interface. Click on the main display area to return to the current measurement configuration menu.



3.6.1 Relative value

When the relative calculation of the current measurement function is turned on, the reading displayed on the screen is the difference between the actual measurement value and the "relative value". This relative value is specific to the current measurement function, even when you return to use this function after exiting this function.

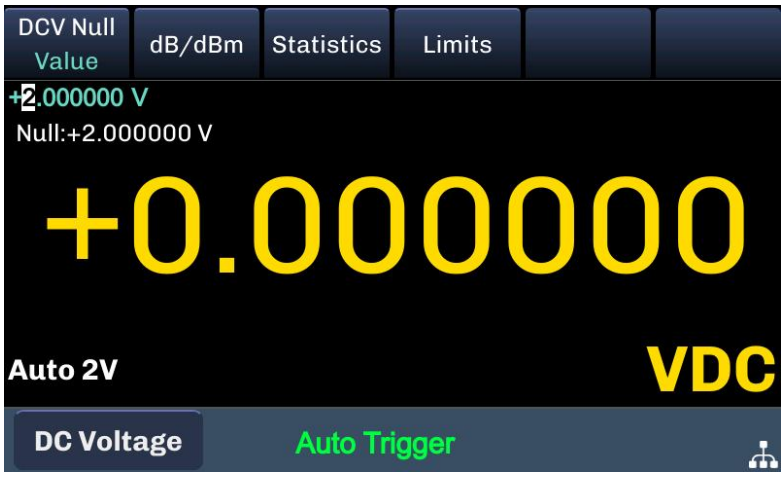
Read value = actual measurement value-relative value

Under the basic measurement interface, press **Math** panel key, press the relative value softkey, switch to ON, enter the relative value setting interface; or press **NULL** to enable or disable relative function quickly, you can modify the values as follows.

- Press the </> direction key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor.
- Press the knob to display the numeric keypad. Enter the desired value and

press **OK** to complete the setting.

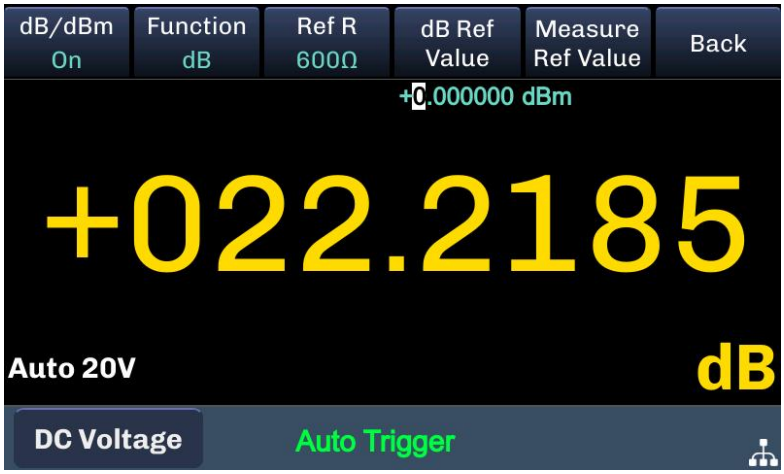
The unit is determined by the current measurement function, as shown in the figure below (taking DCV measurement as an example).



3.6.2 dB

The dB and dBm calculations are only suitable for ACV and DCV measurements, with which you can make scaling measurements against a reference value.

Press **Math** panel key, press the **dB/dBm** softkey to enter the dB/dBm menu. Press the **dB/dBm** softkey to turn the dB/dBm operation on or off. Press the mode softkey to select the arithmetic function to **dB**.



dB is used to characterize the relative value, and it is used for the relative operation of dBm values. When dB calculation is enabled, the multimeter calculates the dBm value of the reading and displays the dB calculation result after differentiating this dBm value from the set dB relative value:

dB = 10 x log10 (read ^{2}/relative resistance value/1 mW)-dB relative

dB function menu, as shown in the following table.

Function Menu	Setting	Description
dB/dBm	On/Off	Turn the dB/dBm function on or off.
Function	dB/dBm	Turn on the dB operation, and "dB" is displayed in the lower right corner of the screen.
Ref R		Selectable parameters: 50Ω, 75Ω, 93Ω, 110Ω, 124Ω, 125Ω, 135Ω, 150Ω, 250Ω, 300Ω, 500Ω, 600Ω, 800Ω, 900Ω, 1000Ω, 1200Ω or 8000Ω.
dB Ref Value		Sets the reference value of dB.
Measure Ref Value		Take the current measured dBm value as the dB reference value.
Back		Save all changes and return to the previous menu.

3.6.3 dBm

The dB and dBm calculations are only suitable for ACV and DCV measurements, with which you can make scaling measurements against a reference value.

Press **Math** panel key, press the **dB/dBm** softkey to enter the dB/dBm menu. Press the **dB/dBm** softkey to turn the dB/dBm operation on or off. Press the mode softkey to select the arithmetic function to **dBm**.

The dBm operation is used to characterize the absolute value of the power value, and the measured voltage result is used to calculate the power value of

the reference resistor, relative to 1 mW:

dBm = 10 x log10 (reading ^{2}/relative resistance value/1 mW)

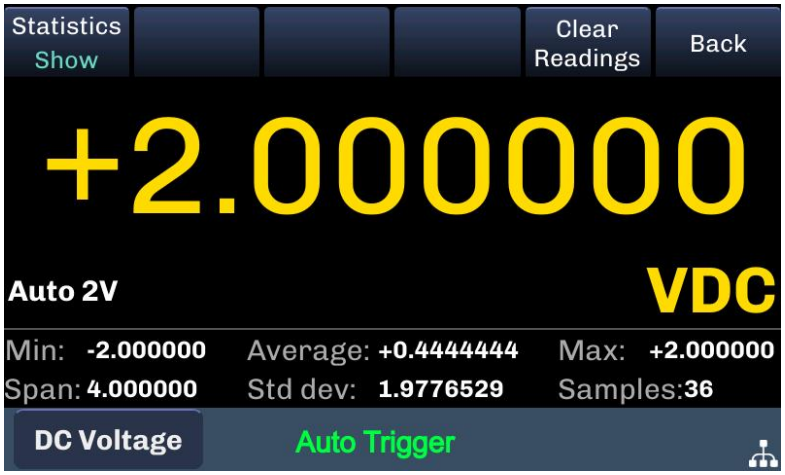
dBm function menu, as shown in the following table.

Function Menu	Setting	Description
dB/dBm	On/Off	Turn the dB/dBm function on or off.
Function	dB/dBm	Turn on the dBm operation, and "dBm" is displayed in the lower right corner of the screen.
Ref R		Selectable parameters: 50Ω, 75Ω, 93Ω, 110Ω, 124Ω, 125Ω, 135Ω, 150Ω, 250Ω, 300Ω, 500Ω, 600Ω, 800Ω, 900Ω, 1000Ω, 1200Ω or 8000Ω.
Back		Save all changes and return to the previous menu.

3.6.4 Statistics

Statistical operations are used to count the minimum value, mean value, maximum value, range of deviation, standard deviation, and number of samples of readings during measurement.

Press **Math** panel key, press the **Statistics** softkey, switch to display, and enter the statistics menu to automatically display statistics data.



Statistical operation function menu, as shown in the following table.

Function Menu	Setting	Description
Statistics	Show/Hide	Show or hide the statistics function interface.

Clear Readings		Clear all current readings and start counting again.
Back		Save all changes and return to the previous menu.

The definition of statistical operation parameters is shown in the following table.

Parameter	Description
Min	The minimum value of all readings during the measurement statistics.
Average	Measure the average of all readings during the statistical period.
Max	The maximum value of all readings during the measurement statistics.
Span	The range of deviation of the readings during the measurement statistics.
Std dev	The standard deviation of all readings during the measurement statistical period.
Samples	Count the current number of samples.

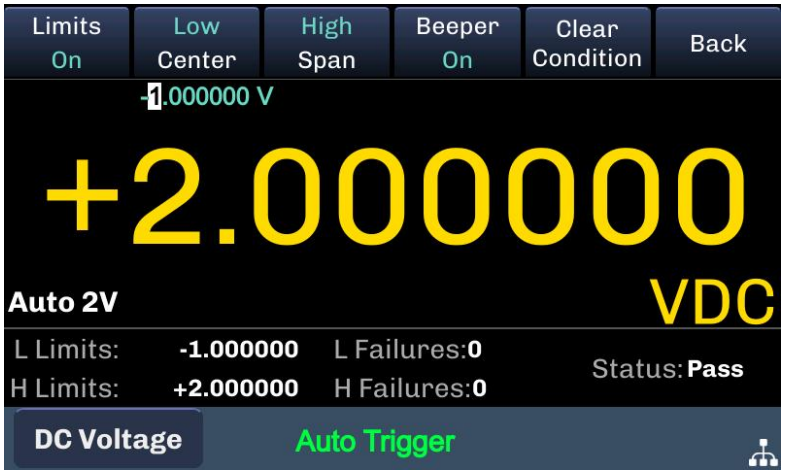
Description:

- The Span value is the value of Max minus Min.
- With multiple consecutive readings, the minimum value always displays the smallest value of all current readings; The maximum value always displays the largest value in the current reading.
- The maximum, minimum, average and reading values in the statistics are stored in the volatile memory and are automatically cleared when the power goes down.

3.6.5 Limits

The limit check indicates how many samples exceed the specified limit and may prompt signals exceeding the specified limit.

Press **Math** panel key, press the **Limits** softkey to enter the limit menu, and press the limit to switch on the display limit interface.



Limit calculation function menu, as shown in the following table.

Function Menu	Setting	Description
Limits	On/Off	Turn on or off the limit function interface.
Low Center		Specifies the lower limit/center value of the bound range.
High Span		Specifies the upper limit value/size of the bound range.
Beeper	On/Off	When the Beeper is turned on, if the reading exceeds the set limit, it beeps once.
Clear Condition		Clear all current readings and re-perform the limit check.
Back		Save all changes and return to the previous menu.

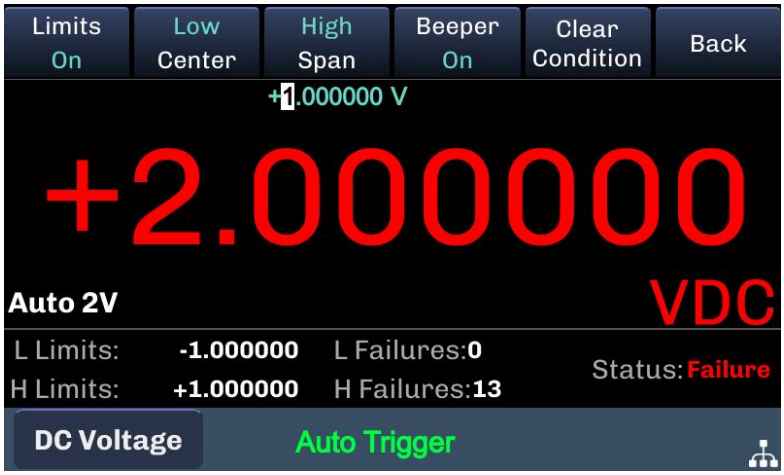
Limit operation parameters are defined as shown in the following table.

Parameter	Description
L Limits	The lower limit value currently set.
H Limits	The upper limit value currently set.
L Failures	The number of times the lower limit is exceeded.
H Failures	The number of times the upper limit has been exceeded.
Status	The state of the limit operation (Pass / Failure).

Description:

- **Overrun prompt:** The measurement value in the measurement value display area is red, indicating that the displayed measurement value

exceeds the limit value, and the multimeter beeps at the same time (if the Beeper is turned on).



- The specified upper value should always be greater than the lower value.

3.7 Display Function

Press the **Display** panel key to enter the menu, and press the **Display** mode softkey to choose to display the measurement data as a number, bar chart, trend chart or histogram. Click on the main display area to return to the current measurement configuration menu.

3.7.1 Number

Press the **Display** panel key to enter the menu, and press the **Display** mode softkey to select the **Number**, which can cause the multimeter to display the reading in digital form.

1. **Set the label.**

Press the **Label** softkey to choose to turn the label on or off. Displays the label text content when the label is open.

2. **Sets the label text.**

   Press the **Label Text** softkey to customize the label name via the on-screen keyboard.

3. **Set up auxiliary measurements.**

   Press the **2nd Meas** softkey to select the corresponding mode to turn on the dual display mode.

4. **Sets the number of display digits.**

   Press the **Digit Mask** of Digits softkey to select Auto, $3^{1/2}$, $4^{1/2}$, $5^{1/2}$ or $6^{1/2}$. In automatic mode, the number of digits will be adjusted according to the integration time.

3.7.2 Bar Chart

Press the **Display** panel key to enter the menu, and press the **Display** mode softkey to select the **Bar**. The bar chart adds a moving bar under the standard digital display.

1. **Set the range mode.**

   Press the **Scale** softkey to select default or manual.

   Description:

   - **Default:** The multimeter sets the horizontal scale to the current measurement range. For example, under DCV measurement, if the current range is 200 mV, the horizontal scale is automatically set to-200 mV to 200 mV.
   - **Manual:** Allows you to configure the horizontal scale by setting upper and lower limits, or center and range values. For example, a scale with a lower -50 mV limit and an upper 100 mV limit can be specified as 25 mV in the center and 150 mV in the span.

2. **Set up auxiliary measurements.**

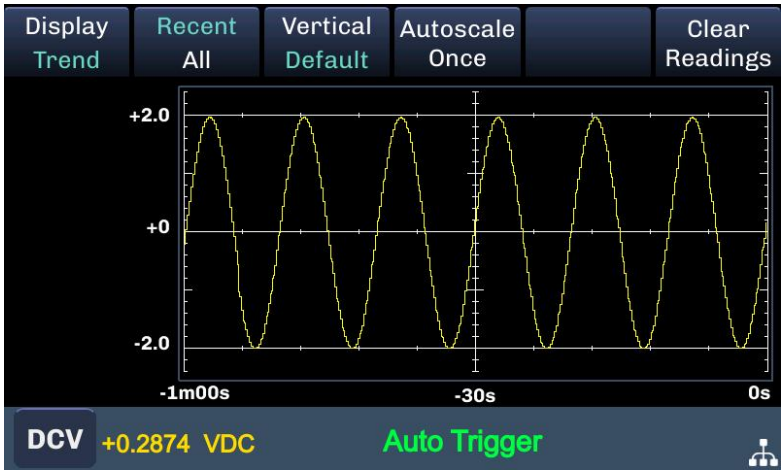
   Press the **2nd Meas** softkey to select the corresponding mode to turn on the dual display mode.

3. **Sets the number of display digits.**

   Press the **Digit Mask** softkey to select Auto, $3^{1/2}$, $4^{1/2}$, $5^{1/2}$ or $6^{1/2}$. The measurement data is displayed according to the selected number of bits mask.

3.7.3 Trend Chart

Press the **Display** panel key to enter the menu, and press the **Display** mode softkey to select the trend chart. The trend chart will Display the data trend over a period of time, and users can observe the changes of measured data.



1. Set Mode.

Press the **Recent/All** softkey to choose to display all data in the trend chart (All) or only the most recent data (Recent).

Description:

- **All:** The trend chart will show all the readings taken and arranged from left to right. After filling the display, the data on the left side of the display will be compressed as new data is added to the right side of the display.
- **Recent:** The trend chart will show the readings taken in the last 1 minute.

2. Set the vertical range.

Press the **Vertical** softkey to specify the current vertical zoom. You can set the vertical range to default, manual, or auto.

Description:

- **Default:** Sets the vertical range to the current measurement range. For example, under DCV measurement, if the current range is 200 mV, the vertical scale is-200 mV to 200 mV.
- **Manual:** Allows you to configure vertical ranges by setting upper and lower limits, or center and range values. For example, a scale with a lower-50 mV limit and an upper 100 mV limit can be specified as 25 mV in the center and 150 mV in the range.
- **Auto:** The zoom ratio can be automatically adjusted to fit the straight line currently displayed on the screen as much as possible.

3. **Set the autoscale once.**

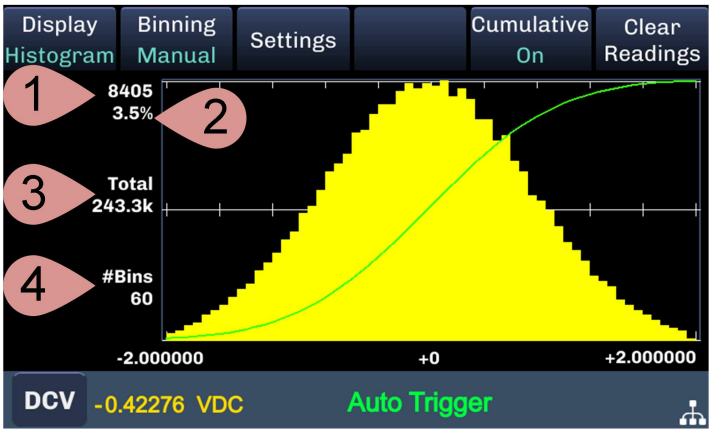
   Press the **Autoscale** softkey once to automatically set the vertical range once.

4. **Set clear readings.**

   Press the **Clear Readings** softkey to clear the reading memory and start drawing again.

3.7.4 Histogram

Press the **Display** panel key to enter the menu, and press the **Display** mode softkey to select the **Histogram**. In the histogram Display, the data are grouped according to the column represented by the vertical bar, which can Display the distribution of measurement data.



Numerical definitions, as shown in the following table.

Num.	Description
1	Sample in the largest column.
2	Percentage of samples in the largest column.
3	Total number of samples.
4	Total number of columns.

1. **Set compartments.**

   Press the **Binning** softkey to select automatic cylindrical processing or manual cylindrical processing.

   Description:

   - **Automatic column processing:** According to the received reading,

the column range of the histogram is automatically adjusted, and when the new value exceeds the current range, the data is re-columned. The number of columns displayed versus the number of readings received is shown in the following table.

Note: If the integration time is set to less than 1 PLC, the maximum number of bars is 100.

Number of readings	0~ 100	101~ 500	501~ 1000	1001~ 5000	5001~ 10000	>10000
Number of columns	10	30	60	100	300	600

- **Manual cylindrical processing:** Click Manual, and the prompt box "This action will clear all existing measurement data. Do you want to continue? **Yes No**" appears on the screen. Click **Yes**, and press the setting softkey to enter the cylindrical setting menu.
  - Press the **Num. Bins** softkey to set the number of columns to 10, 30, 60, 100, 300, or 600.
  - Columnar ranges can be specified as lower and upper limits, or as center and range values. For example, a cylindrical range with a lower-5 V limit and an upper 10 V limit is equivalent to 2.5 V in the center and a range of 15 V.
  - Press the **Outer Bins** softkey to turn on or off the outer cylinder. The outer bars are two additional bars used to represent readings above or below the range of bars.
  - Press the **Back** softkey to save all changes and return to the previous menu.

2. Set the cumulative curve.

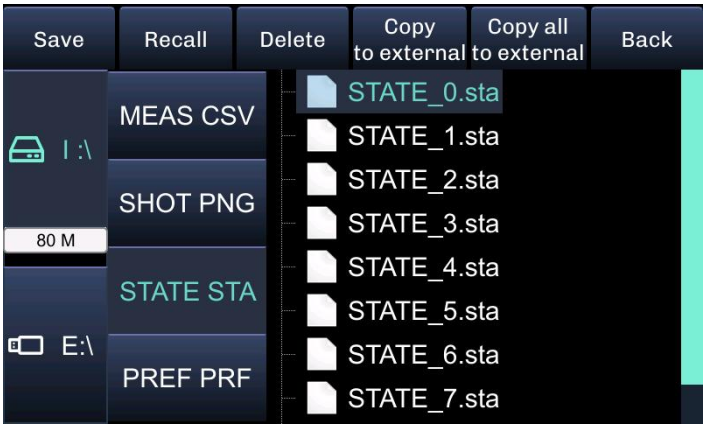
Press the **Cumulative** softkey to hide or show a line representing the cumulative distribution of histogram data.

3. Set clear readings.

Press the **Clear Readings** softkey to clear the reading memory and start drawing again.

3.8 Save Function

Press the **Save** panel key to enter the Save menu. Measurement data, screenshots, measurement configurations, or preferred configurations can be saved or deleted.



Measurement data: Select **MEAS CSV**, press the **Save** softkey, and the keyboard will pop up to set the save name. After the setting is completed, click **OK** to complete the save. In the saved data file, select the data file to be deleted and click **Delete** to delete the data file.

Screenshot: Select **SHOT PNG**, press the **Save** softkey, and the keyboard will pop up to set the save name. After the setting is completed, click **OK** to complete the save. In the saved pictures, select the picture you want to delete and click **Delete** to delete the picture.

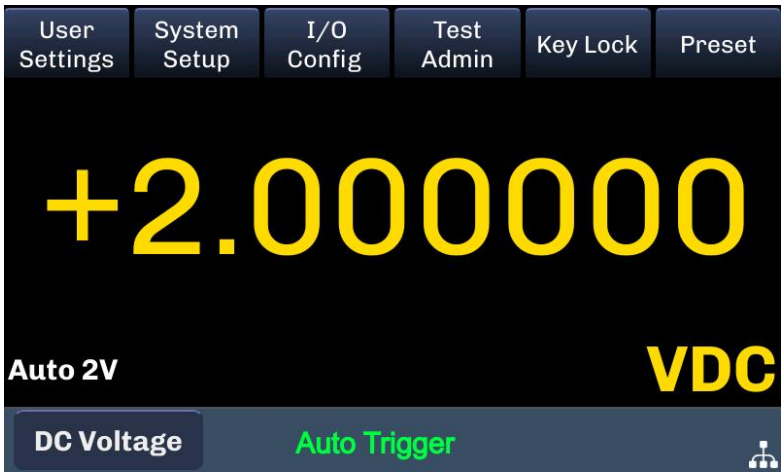
Measurement configuration: Select **STATE STA**, press the **Save** softkey, and pop up the keyboard to set the save name. After the setting is completed, click **OK** to complete the save. In the saved configuration file, select the configuration file to be called, and click **Recall** to call the configuration; select the configuration file you want to delete and click **Delete** to delete the configuration file.

Preferred configuration: Select **PREF PRF**, press the **Save** softkey, and pop up the keyboard to set the save name. After the setting is completed, click OK to complete the save. In the saved configuration file, select the configuration file to be called, and click **Recall** to call the configuration; Select the configuration file you want to delete and click **Delete** to delete the configuration file.

Note: Files saved to an external device will be located in its DMM folder.

3.9 Utility System Function

In the auxiliary system function settings, you can set the parameters of multimeter system-related functions. Press Utility panel key to enter the system settings menu interface, as shown in the figure below.



3.9.1 User Settings

Press **Utility** panel key, press the **User Settings** softkey to enter the user settings interface.

Number Format

Press the **Number Format** softkey to set decimal format (period, comma) and separator format (none, on or space).

Sounds

Press the **Sounds** softkey to enable or disable the Beeper or Key Click sound.

Language

Press the **Language** softkey to switch the display language.

Brightness

Press the **Brightness** softkey to adjust the backlight brightness to 1% ~ 100%.

Screen Saver

Press the **Screen Saver** softkey to set the screensaver time to Off, 1 hour, 4 hour, or 8 hour.

3.9.2 System Settings

Press **Utility** panel key, press the **System Setup** softkey to enter the system settings interface.

Date Time

Press the **Date Time** softkey to edit the current date and time, press the **</>** arrow key to move the cursor position, and rotate the knob to increase or decrease the value at the cursor. The time always uses the 24-hour format (00:00:00 to 23:59:59).

Firmware Upgrade

Press the **Firmware Upgrade** softkey, and the instrument will automatically search for whether there is an upgradable compressed package. If there is an upgradable compressed package, follow the steps to upgrade.

The instrument firmware can be updated with a USB storage device via the front panel USB connector.

USB storage device requirements:

This instrument supports USB storage devices for FAT32 or FAT16 file systems. If the USB storage device cannot be used properly, format the USB storage device to a FAT32 or FAT16 file system and try again, or replace the USB storage device and try again.

⚠ Note: Updating the instrument firmware is a sensitive operation, to prevent damage to the instrument, please do not power off the instrument or unplug the USB storage device during the update process.

To update the instrument firmware, follow the following steps:

1. Press **Utility** panel key, press the system setting softkey to check the instrument model and firmware version number.
2. Visit our website on your PC and check if an updated firmware version for the corresponding model is available. Download the firmware file to the PC. The filename of the firmware file is fixed to DMMFW.zip. Copy this firmware file to the root directory of the USB storage device.
3. Plug the USB storage device into the USB connector on the front panel of

the instrument. If it appears in the lower right corner of the screen  图 icon indicates that the U flash drive was successfully recognized.

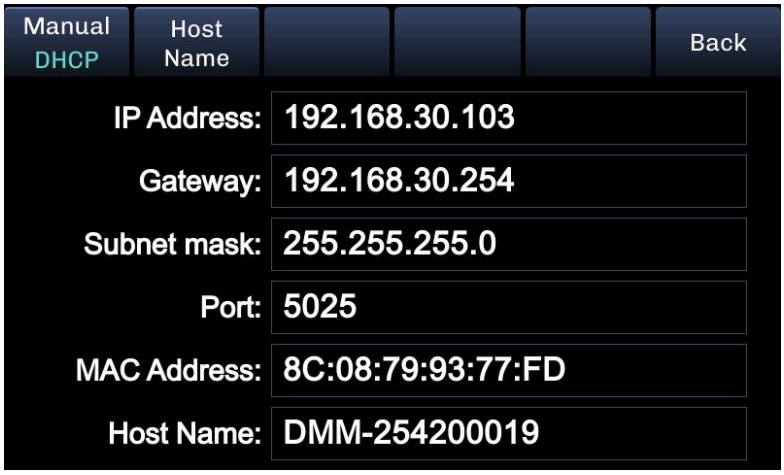
4. Press **Utility** panel key, press the **System Setup** Softkey, and press the **Firmware Upgrade** Softkey.
5. The instrument will display a message telling you not to unplug the USB device or power off the instrument until the update process is complete. The progress bar indicates that the update process is being performed.
   Description: Firmware updates typically take about a minute. Do not unplug the USB storage device during the update process. Do not power off the instrument if the USB storage device is unplugged inadvertently during the update process. Repeat the installation process from step 3.
6. Wait until the instrument displays "Upgrade Successful" and then the instrument will automatically restart.
   Description: Do not power off the instrument if the operation complete message is not displayed. Repeat the installation process from step 2 using a different type of USB storage device.
7. Unplug the USB storage device from the front panel USB connector.
8. Press **Utility** panel key, press the **System Setup** softkey, and check the firmware version number to confirm that the firmware has been updated.

3.9.3 I/O Configuration

In interface settings, can set various interface parameters.

Network Setting

Press **Utility** panel key, press the **I/O Config** softkey, and then press the **LAN** softkey to switch to select off and on. When the LAN is turned on, press the **LAN Setting** softkey to enter the setting interface.



1. **Set the network status.**

   Press the **Manual/DHCP** softkey to switch the network acquisition mode. When switching to manual, you can set the hostname, IP address, gateway, and subnet mask separately.

2. **Set the hostname.**

   Press the **Host Name** softkey to customize the host name. After the input is completed, click **OK** to complete the modification.

3. **Set IP Address/Gateway/Subnet Mask (in manual state only).**

   Press **IP Address**, **Gateway**, **Subnet Mask** softkeys, press **</>** to move the cursor position, and rotate the knob to change the value.

USB Setting

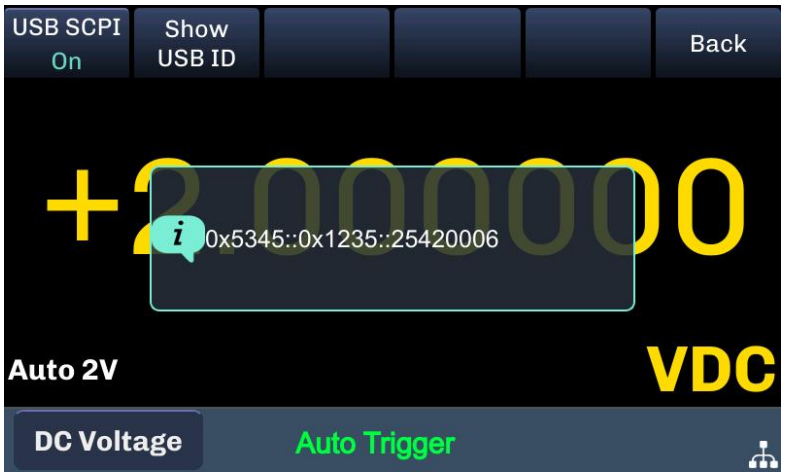
Press **Utility** panel key, press the **I/O Config** softkey, and then press the **USB** softkey to enter the USB setting interface.

1. **Set USB SCPI.**

   Press **USB SCPI** to switch on or off. The USB SCPI can enable or disable the rear panel USB control port. After changing the interface status, turn off and then turn on the instrument power for the change to take effect. When this interface is disabled, this interface cannot be configured through the host computer.

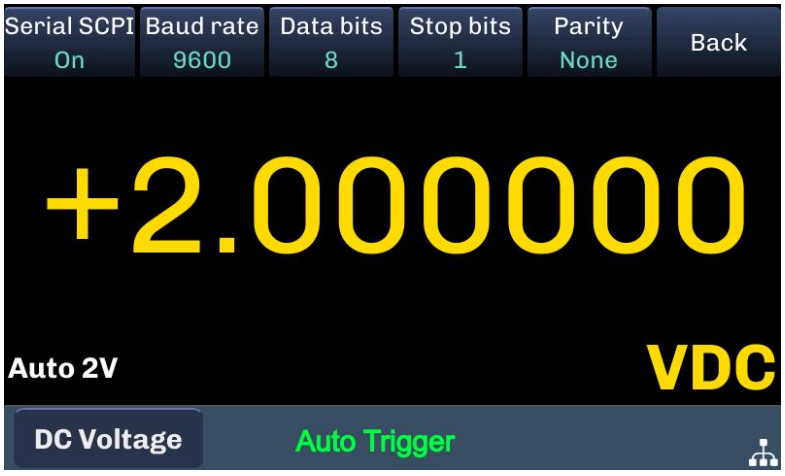
2. **Settings Display USB ID.**

   Press **Show USB ID** to display the current USB details.



Serial Port Setting

Press **Utility** panel key, press the **I/O Config** softkey, and then press the **Serial** softkey to enter the serial port setting interface.



1. **Set the serial port SCPI.**

   Press the **Serial SCPI** to switch on or off state. Serial Port SCPI can enable or disable the rear panel serial control port. After changing the

interface status, turn off and then turn on the instrument power for the change to take effect. When this interface is disabled, this interface cannot be configured through the host computer.

2. **Set the baud rate.**

   Press the **Baud rate** softkey to set the baud rate to 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200. Ensure that the baud rate settings of the instrument match the baud rate settings of the computer used.

3. **Sets the data bits.**

   Press the **Data bits** softkey to set the data bit to 5, 6, 7, or 8.

4. **Set the stop bit.**

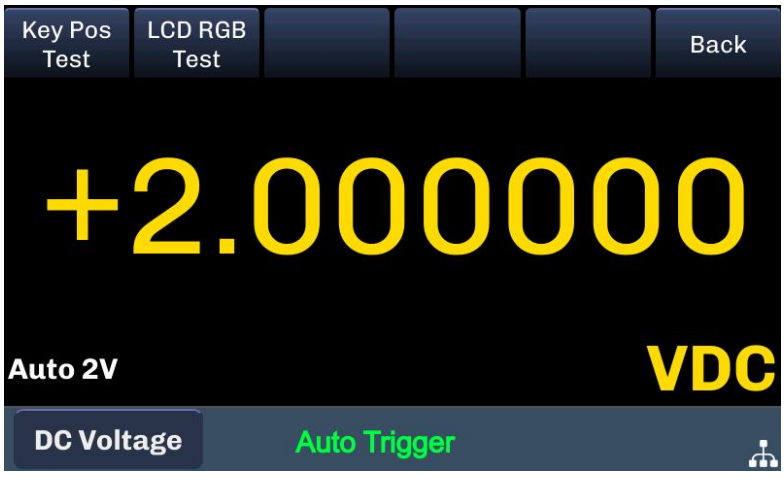
   Press the **Stop bits** softkey to set the stop bit to 1, 1.5 or 2.

5. **Set the check digit.**

   Press the **Parity** softkey to set the check digit to None, Even, Odd, Space or Mark.

3.9.4 Test Management

Press **Utility** panel key, press the **Test Admin** softkey to enter the test management interface.



Key Position Test

This multimeter provides key position self-test function, which can test all keys on the front panel.

Press the **Key Pos Test** to enter the key test interface. Each graphic on the

test interface represents a front panel key. Press any button on the front panel, and the corresponding graphic of the test interface will turn yellow. Press **Back** to exit the test.

LCD RGB Test

This multimeter provides screen self-test function, which can test the LCD screen of the multimeter.

Press **LCD RGB Test** to enter the on-screen test interface. A prompt box pops up on the screen "Press screen to switch RGB colors. **Yes No**" Press the **Yes** softkey to test, and click on the screen to switch the colors to red, green and blue. Observe the screen for problems such as severe color casts, stains, or screen scratches. When the screen color is blue, tap the screen again to exit the test.

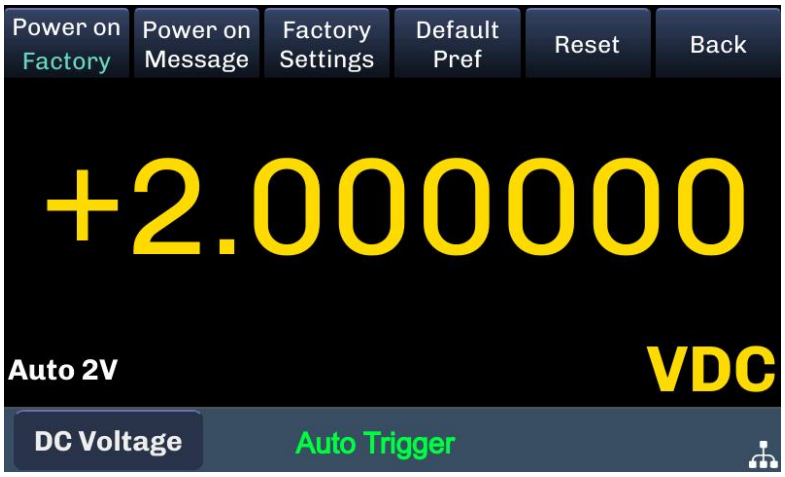
3.9.5 Key Lock

Press **Utility** panel key, press the **Key Lock** softkey, and a prompt box "Should the key lock be enabled? **Yes No**" will pop up on the screen. Click **Yes** to turn on the key lock, and alternately press Acquire and Display three times to unlock it.

Note: When the keypad lock function is enabled, all remote SCPI access will be disabled.

3.9.6 Preset Setting

Press **Utility** panel key, press the **Preset** softkey to enter the preset interface.



Power on Settings

Press the **Power on** softkey to set the next power-on status to Factory Defaults, User Defined or Last.

Power on Message

Press the **Power on Message** softkey to set the next power-on prompt information. The next time you turn on, the set power-on information will pop up on the screen.

Factory Settings

Press the **Factory Settings**, and the prompt box "Restore factory settings? (Including preferences, measurement settings and user files.) **Yes No**" will pop up on the screen. Click **Yes** to restore the instrument to the factory default state.

Default Preferences

Press **Default Pref**, and the prompt box "Restore default preferences? (Includes user preferences and I/O settings which are kept in non-volatile memory.) **Yes No**" will pop up. Click **Yes** to restore the default preferences.

Parameter			Factory settings
System setting	Power on		Default
	Decimal Pt		Point
	Separator		None
	Beeper		On
	Sound		On
	Brightness		100%
	Scrn Svr		Off
	Power on Message		None
	Label		Off
	Label Text		None
I/O setting	LAN	LAN	On
		IP Obtain mode	DHCP
		Host Name	dmm-device serial number
	USB	USB SCPI	On
	Serial	Serial SCPI	On
		Baud rate	9600
		Data bits	8
		Stop bits	1
		Parity	None

Reset

Press **Reset**, and the prompt box "Restore default state? (Includes most measurement settings and display content selections.) **Yes No**" will pop up. Click **Yes** to restore the instrument default settings.

Parameter			Factory settings	
Test Function			DCV	
Basic Functions	DCV	Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
		Input Z	10M	
	ACV	Range	Auto	
		Filter	>20Hz	
	DCI	Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
	ACI	Range	Auto	
		Filter	>20Hz	
	Ω2W/Ω4W	Ω2W/Ω4W	2WR	
		Range	Auto	
		Aperture	10 PLC	
		Auto Zero	On	
	Cont	Threshold	10 Ω	
	Diode	Threshold Low	300mV	
		Threshold High	800mV	
	CAP	Range	Auto	
	Freq	Frequency/Period	Frequency	
		Range	Auto	
		Filter	>20Hz	
		Gate time	100ms	
	Temp	Probe	TCouple	
		Probe Setting	Type	JITS90
			Reference	Internal
			Offset Adjust	0℃
			Fixed Offset	0℃
		RTD R0	100Ω	
		Auto Zero	On	
		Aperture	10 PLC	
		Units	℃	

Parameter			Factory settings
Math	Relative	All measurement function	Off
		Reference value	0
	Statistics	On/Off	On
	Limits	On/Off	Off
		High	0
		Low	0
		Center	0
		Span	0
	dB/dBm	On/Off	Off
		Function	dB
		Ref R	600 Ω
		dB Ref Value	0 dBm
Acquire	Acquire mode		Continue
	Trigger Settings	Trigger Source	Auto
		External Slope	Negative
		Delay	Auto
		Manual Delay	0s
		Samples/Trigger	1
	VMC Output	Negative/positive	Negative
Display	Display Mode		Number
	Number	2nd Meas	Off
		Digit Mask	Auto
	Bar	Scale	Default
	Trend	Recent/All	Recent
	Histogram	Binning/Auto	Auto
		Cumulative	Off

3.10 Web Remote Control Function

The instrument includes a built-in web interface that supports remote monitoring through a web browser, along with simulated keypad operation or SCPI command control.

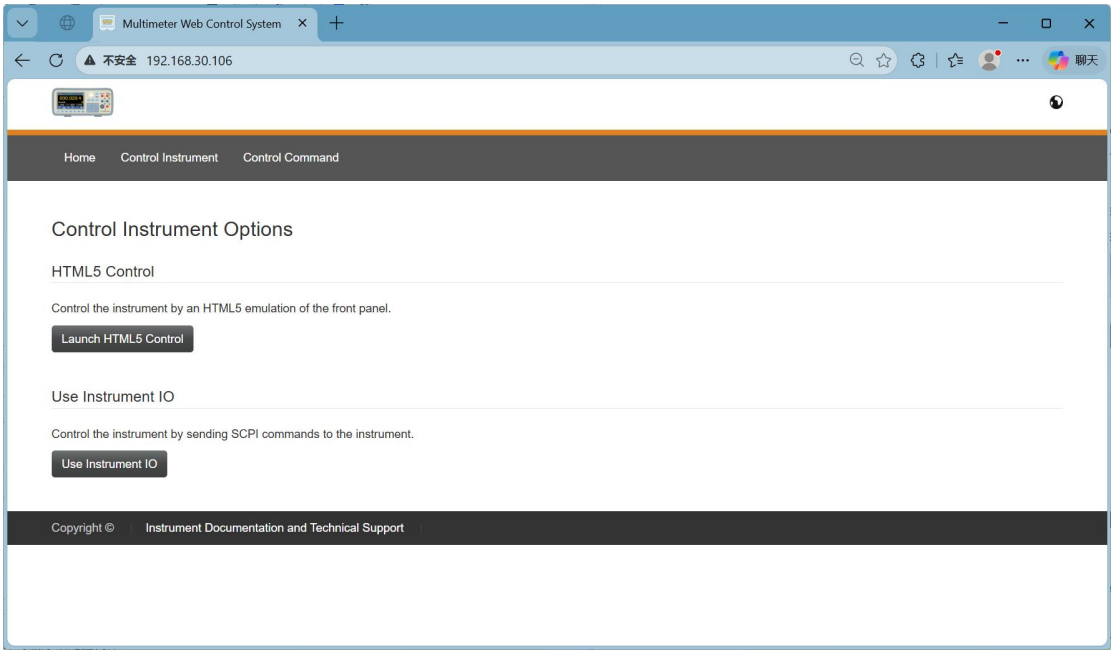
3.10.1 Login Method

IP Login

After connecting to the network, obtain the device IP via the following methods.

- Press and hold the network icon to view the device IP.
- Press **Utility** -> I/O Config -> LAN Setting to view the device IP.

Open your PC's web browser, enter the device IP (e.g., 192.168.30.106) in the address bar, and press Enter to access the web interface.

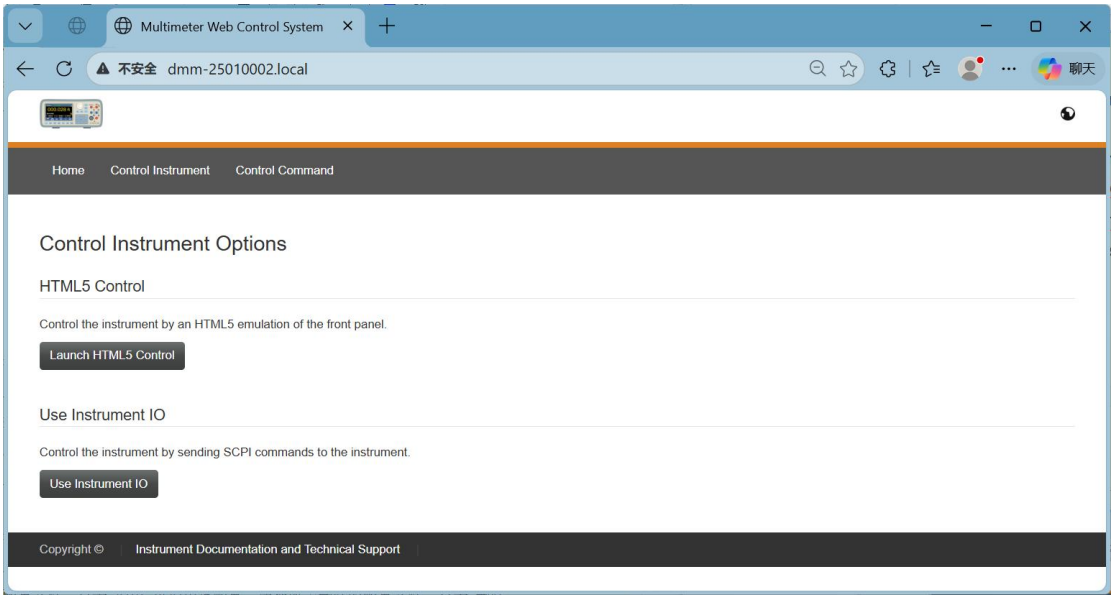


Host Name Login

After connecting to the network, obtain the device host name via the following methods.

- Press and hold the network icon to view the device host name.
- Press **Utility** -> I/O Config -> LAN Setting to view the device host name.

Enter the instrument's mDNS domain name (e.g., DMM-25010002.local) in the address bar of your PC's web browser to access the web interface.

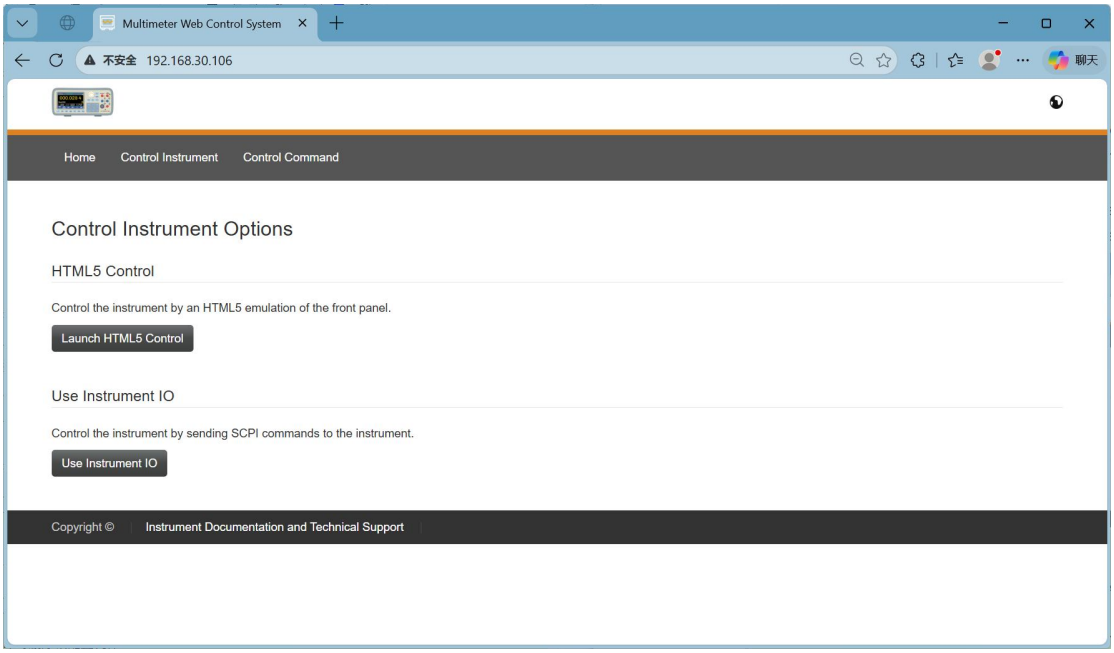


3.10.2 Web Interface

The web interface consists of three main sections: Home, Control Instrument, and Control Command.

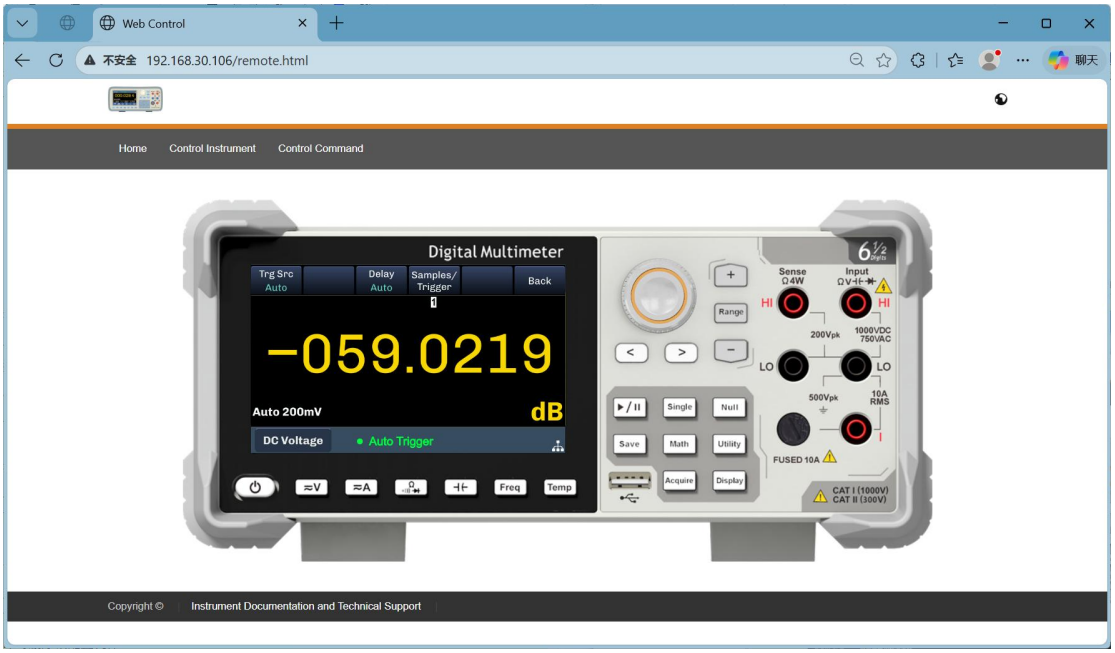
Home

Click Home to view home interface.



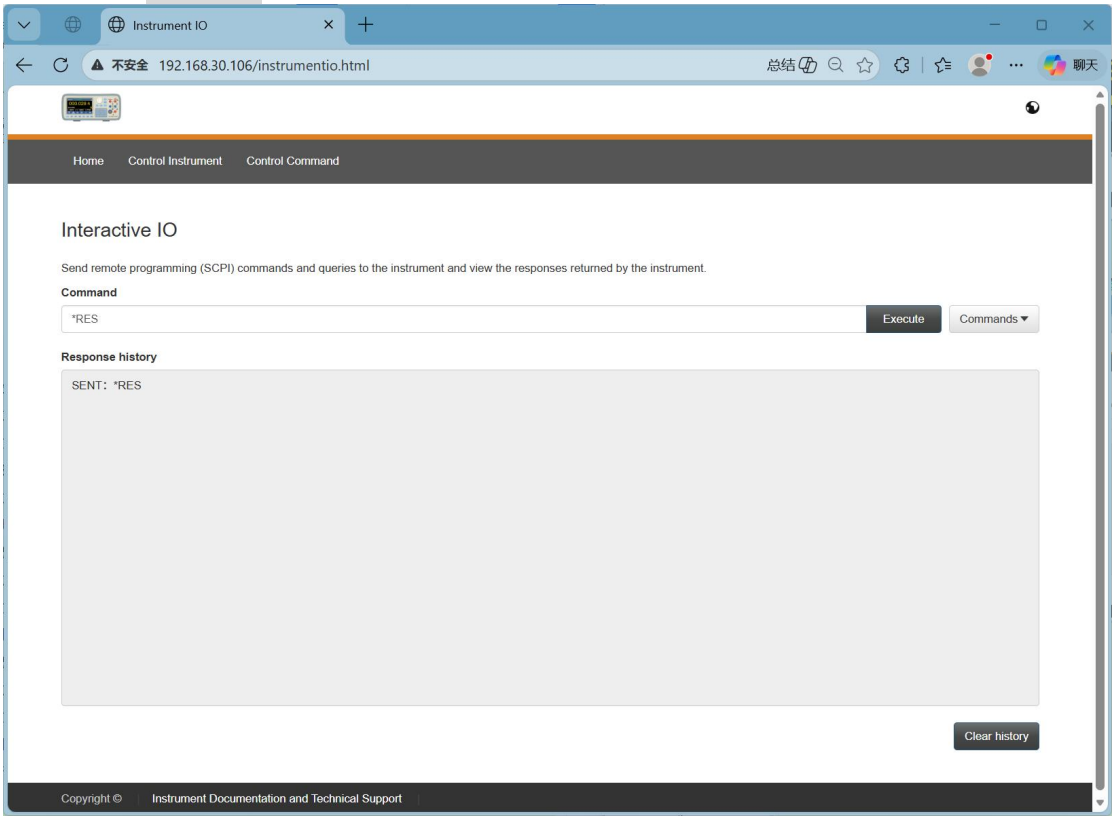
Control Instrument

Click Control Instrument to view control instrument interface. Actions executed in this interface mirror those on the instrument panel, except for power operations.



Control Command

Click Control Command to view control command interface. Input command, then click Execute to run command.

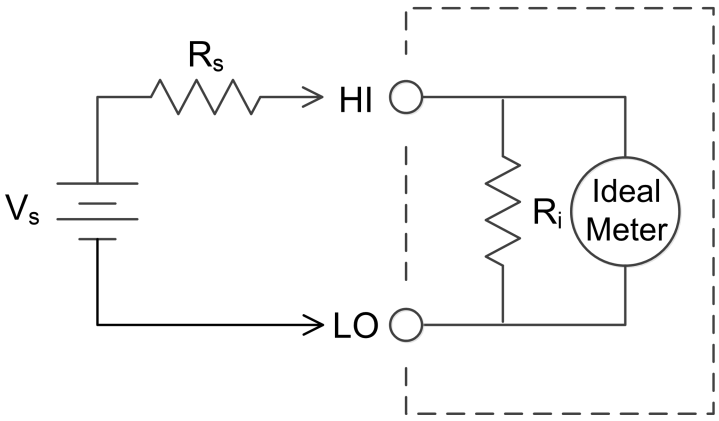


4 Measurement Guidance

This chapter guides you on how to eliminate common potential measurement errors to achieve high measurement accuracy.

4.1 Load error DC voltage

If the resistance of the Device-Under-Test (DUT) accounts for a large proportion of the input resistance of the multimeter itself, a measurement load error will occur, as shown below.



Vs = ideal DUT voltage

Rs = DUT Source resistance

Ri = Multimeter input resistance (10 MΩ or > 10 GΩ)

$$\text{Error}\ (\%) = \frac{100 \times R_s}{R_s + R_i}$$

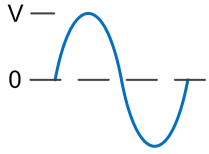
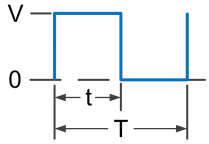
To reduce the impact of load errors and reduce noise interference, set the input resistance of the multimeter to > 10 GΩ for 200 mV and 2 V ranges. For the 20 V, 200 V, and 1000 V ranges, the input resistance is maintained at 10 MΩ.

4.2 True RMS AC measurement

The AC measurement of this multimeter has a true RMS response. The power dissipated by the resistor is proportional to the square of the applied voltage, independent of the signal waveform. If the waveform contains negligible energy outside the effective bandwidth of the multimeter, this

multimeter can accurately measure the true RMS voltage or current.

This multimeter has an effective AC voltage bandwidth of 100 kHz and an effective AC current bandwidth of 10 kHz.

Waveform	Crest factor (C.F.)	AC effective value	AC + DC RMS
	$\sqrt{2}$	$\frac{V}{\sqrt{2}}$	$\frac{V}{\sqrt{2}}$
	$\sqrt{3}$	$\frac{V}{\sqrt{3}}$	$\frac{V}{\sqrt{3}}$
 (50% duty cycle)	1	$\frac{V}{C.F.}$	$\frac{V}{C.F.}$

The AC voltage and AC current functions of the multimeter can measure the AC coupled true RMS, only the RMS of the AC component of the input waveform (the DC component is blocked). As shown in the figure above, for sine waves, triangle waves, and square waves, since these waveforms do not produce DC offset, the RMS of AC is equal to the RMS of AC + DC. However, for asymmetric waveforms, such as pulse sequences, the AC-coupled true RMS measurement of this multimeter will block the contained DC voltage component.

AC-coupled true RMS measurement is ideal for measuring small AC signals with large DC offsets, for example, measuring AC ripples that occur in DC power output. However, in some cases it is necessary to measure the true RMS value of AC + DC, which can be calculated by combining the DC measurement and the AC measurement:

$$ac + dc = \sqrt{ac^2 + dc^2}$$

4.3 Load error AC voltage

When using the AC voltage measurement function, the input impedance of

the multimeter is a parallel connection of a 1 MΩ resistor and a 100 pF capacitor. The test leads that connect the signal to the multimeter also have capacitance and load themselves. The table below shows the approximate value of the input resistance of the multimeter at different frequencies.

Input frequency	**Input resistance**
100 Hz	1 MΩ
1 kHz	850 kΩ
10 kHz	160 kΩ
100 kHz	16 kΩ

For low frequencies, the load error is:

$$\text{Error } (\%) = \frac{-100 \times R_s}{R_s + 1\,M\Omega}$$

For high frequencies, the additional load error is:

$$\text{Error } (\%) = 100 \times \left[\frac{1}{\sqrt{1 + \left(2\pi \times F \times R_S \times C_{in}\right)^2}} - 1 \right]$$

Rs = source resistance

F = input frequency

Cin = input capacitance (100 pF) plus test lead capacitance

4.4 Application of Analog Filter

Analog filters can be used to reduce the influence of AC components on measurement results during DC measurements. Most applications do not require the use of analog filters, but sometimes it can be used to improve DC measurements. For example, if the DC power supply under test contains large AC ripple components, analog filters can be used to reduce the influence of AC components.

Analog filters cannot be used to filter out multimeter internal noise. When the DCI measurement is open, when the DCV measurement is short, or when the precision DC calibrator output is measured, the analog filter usually does not work and instead introduces additional noise and a large reading offset.

Due to the large offset, the multimeter must be cleared at the selected range and reading rate settings when using analog filters. If it is inconvenient to perform the clearing operation in practical application, the additional error in the measurement results is shown in the following table. For ranges and reading rates not listed in the table, the corresponding analog filter additional errors can be ignored.

DC voltage analog filter error

Measuring range	**Additional analog filter error**
200mV	10μV
	20μV
	20μV
2V	15μV
	20μV
	20μV
20V	0.8mV
	1mV
	1mV

DC current analog filter error

Measuring range	**Additional analog filter error**
200μA	0.002% range
	0.005% range
	0.005% range
20mA,2A	0.040% range
	0.060% range
	0.080% range
200mA	0.004% range
	0.010% range

	0.010% range
10A	0.008% range
	0.010% range
	0.010% range

4.5 Crest factor error (non-sinusoidal input)

There is usually the following misunderstanding: "Since a multimeter can measure the true RMS of a signal, its sine wave accuracy index can naturally be applied to input signals of other waveforms". In practice, the waveform of the input signal affects the accuracy of the measurement. Generally, the peak factor is used to describe the signal waveform. The peak factor is the ratio of the peak value of the waveform to its effective value.

Generally speaking, the greater the peak factor, the greater the energy contained in high-frequency harmonics. All multimeters have errors related to crest factor. Please note that crest factor errors do not apply to input signals below 100Hz.

The measurement error caused by the signal crest factor can be estimated as follows:

Sum of errors = error (sine wave) + error (crest factor) + error (bandwidth)

Error (sine wave): Sine wave error (as shown in Chapter 6).

Error (crest factor): Peak factor plus error (as shown in Chapter 6).

Error (bandwidth): The bandwidth error can be estimated according to the following formula.

Bandwidth error= $\frac{-C.F.^2}{4\pi \times BW} \times 100\%$

C.F.: Signal crest factor

F: Pulse fundamental frequency

BW: Effective bandwidth of multimeter

Example:

The approximate measurement error of the pulse sequence input is calculated with a peak factor of 2 and a fundamental frequency of 20kHz. The multimeter is assumed to have a one-year accuracy of ± (0.05% reading + 0.03% range).

Sum of errors = (0.05% reading + 0.03% range) + (0.05% range) + (0.8% reading)

= 0.85% reading + 0.08% range

5 Troubleshooting

1. The instrument is powered on but no Display.

1) Check if the power is connected properly.
2) Check if the AC Mains Line Voltage Selector is in the proper voltage scale.
3) Check if the line fuse which is below the AC Mains Input is used appropriately and in good condition (see page 102, Appendix C: Line Fuse Replacement).
4) Restart the instrument after the steps above.
5) If the problem still exists, please contact us for our service.

2. The reading does not change when a current signal is input.

1) Check whether the test lead is correctly inserted into the current input terminals (I terminal and LO Input terminal).
2) Check whether the current terminal fuse at the front panel is burned out.
   Please refer to "7 Current Terminal Fuse" in "Front panel overview" on page 9.
3) Check whether the DCI or ACI measurement function is enabled.
4) Check whether the DCI measurement function is used to measure AC current.

If you encounter other problems, try to reset the settings or restart the instrument. If it still can not work properly, please contact us for our service.

6 Technical specifications

6.1 DC Characteristics

Accuracy ± (% of Reading + % of Range) [1]

Function	Range[2]	Test Current or Load Voltage	24 Hours[3] TCAL℃ ±1℃	90 Days TCAL℃ ±5℃	1 Year TCAL℃±5℃	Temperature Coefficient 0℃~(TCAL℃ -5℃) (TCAL℃ +5℃)~ 50℃
DC Voltage	200.0000 mV	/	0.0020+0.0020	0.0030+ 0.0025	0.0040+0.0025	0.0005+0.0005
	2.000000 V		0.0015+0.0005	0.0020+ 0.0006	0.0035+0.0006	0.0005+0.0001
	20.00000 V		0.0020+0.0004	0.0030+ 0.0005	0.0040+0.0005	0.0005+0.0001
	200.0000 V		0.0020+0.0006	0.0040+ 0.0006	0.0050+0.0006	0.0005+0.0001
	1000.000 V [4]		0.0020+0.0006	0.0040+ 0.0010	0.0055+0.0010	0.0005+0.0001
DC Current	200.0000 µA	< 0.03V	0.010 + 0.012	0.040 + 0.015	0.050 + 0.015	0.0020+0.0030
	2.000000 mA	< 0.25V	0.007 + 0.003	0.030 + 0.003	0.050 + 0.003	0.0020+0.0005
	20.00000 mA	< 0.07 V	0.007 + 0.012	0.030 + 0.015	0.050 + 0.015	0.0040+0.0020
	200.0000 mA	< 0.7V	0.010 + 0.002	0.030 + 0.003	0.050 + 0.003	0.0040+0.0005
	2.000000 A	< 0.12 V	0.050 + 0.020	0.080 + 0.020	0.100 + 0.020	0.0050+0.0010
	10.00000 A[5]	< 0.6 V	0.100 + 0.010	0.120 + 0.010	0.150 + 0.010	0.0050+0.0020
Resistance[6]	200.0000 Ω	1 mA	0.0030+0.0030	0.008 + 0.004	0.010 + 0.004	0.0006+0.0005
	2.000000 KΩ	1 mA	0.0020+0.0005	0.008 + 0.001	0.010 + 0.001	0.0006+0.0001
	20.00000 KΩ	100 µA	0.0020+0.0005	0.008 + 0.001	0.010 + 0.001	0.0006+0.0001
	200.0000 KΩ	10 µA	0.0020+0.0005	0.008 + 0.001	0.010 + 0.001	0.0006+0.0001
	1.000000 MΩ	5 µA	0.002 + 0.001	0.010 + 0.001	0.012 + 0.001	0.0010+0.0002
	10.00000 MΩ	500 nA	0.015 + 0.001	0.030 + 0.001	0.040 + 0.001	0.0030+0.0004
	100.0000 MΩ	500nA|| 10MΩ	0.300 + 0.010	0.800 + 0.010	0.800 + 0.010	0.1500+0.0002
Diode Test [7]	0 ~ 5 V	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010+0.0020
Con	2000.0 Ω	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010+0.0020

tinuity Test						

[1] Specifications are for 90 minutes warm-up, and integration time 100 PLC. For integration time < 100 PLC, add the appropriate “RMS Noise Adder” listed in the following table.

[2] 10% over range on all ranges except for DCV 1000 V and DCI 10 A range.

[3] Relative to the calibration standards.

[4] For each additional volt over ± 500 V, add 0.03 mV error.

[5] 30 seconds OFF after 30 seconds ON is recommend for the continuous current that higher than DC 7 A or AC 7 Arms.

[6] Specifications are for 4-wire resistance measurement or 2-wire resistance measurement using “Ref” operation. Without “Ref” operation, add 0.2 Ω additional error in 2-wire resistance measurement.

[7] Accuracy specifications are only for voltage measuring at input terminal. The typical value of current under measure is 1mA. Voltage drop at diode junction may vary with current supply.

Performance Versus Integration Time

Integration Time	Resolution[1]	NMRR[2]	Readings/s[3]		RMS Noise Adder[4] (% Range)			
Number of Power Line Cycles[5] (NPLC)	(ppm Range)	(dB)	50Hz	60Hz	DC Voltage 20V	DC Voltage 2V 200V Resistance 2KΩ 20KΩ	DC Voltage 1000V DC Current 2mA 200mA	DC Voltage 200mV Resistance 200Ω DC Current 10A
0.006	2.7	0	8333	10000	0.0006	0.0010	0.0015	0.0080
0.02	1.6	0	2500	3000	0.0004	0.0008	0.0008	0.0080
0.06	1	0	833	1000	0.0004	0.0008	0.0006	0.0075
0.2	0.5	0	250	300	0.0001	0.0005	0.0003	0.0015
1	0.22	60	50	60	0	0.0001	0.0002	0.0004
10	0.08	60	5	6	0	0	0	0.0002
100	0.035	60	0.5	0.6	0	0	0	0

[1] Typical value. Resolution is defined as the typical 20 V range RMS noise.

[2] Normal mode rejection ratio for power-line frequency ± 0.1%. For power-line frequency ± 1%, subtract 20 dB. For ± 3%, subtract 30 dB.

[3] Maximum rate for DCV, DCI, 2-wire resistance and 4-wire resistance functions.

[4] The basic DC accuracy specifications include RMS noise at 100 PLC. For < 100 PLC, add “RMS Noise Adder” to the basic DC accuracy specifications.

[5] The PLC parameters in parentheses represent the integration time at 60 Hz power frequency in the power grid.

SFDR & SINAD[1]

Function	Range	Spurious-Free Dynamic Range (SFDR)	Signal to Noise and Distortion (SINAD)

DCV	200mV	80	76
	2V	78	78
	20V	79	75
	200V	83	80
	1000V	86	82
DCI	200uA	89	69
	2mA	86	81
	20mA	88	69
	200mA	81	79
	2A	69	64

[1] Typical value, -1 dBFS, 1 kHz single tone. 1000 us aperture time and trigger delay time set to 0, autozero off and sample point is 4096.

6.2 AC Characteristics

Accuracy ± (% of Reading + % of Range) [1]

Function	Range[2]	Frequency Range	24 Hours[3] TCAL℃±1℃	90 Days TCAL℃±5℃	1 Year TCAL℃±5℃	Temperature Coefficient 0℃ to (TCAL℃ -5℃) (TCAL℃ +5℃) to 50℃
True RMS AC Voltage [4]	200.000 mV	3Hz- 5Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100+ 0.004
		5Hz-10Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035+ 0.004
		10Hz-20kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005+ 0.004
		20kHz-50kHz	0.10 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060+ 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	2.000000 V	3Hz- 5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100+ 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035+ 0.003
		10Hz-20kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005+ 0.003
		20kHz-50kHz	0.10 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060+ 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	20.00000 V	3Hz- 5Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100+ 0.004
		5Hz-10Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035+ 0.004
		10Hz-20kHz	0.04 + 0.04	0.07 + 0.04	0.08 + 0.04	0.008+ 0.004

		20kHz-50kHz	0.10 + 0.05	0.12+ 0.05	0.15 + 0.05	0.012+ 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060+ 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	200.0000 V	3Hz- 5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100+ 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035+ 0.003
		10Hz-20kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008+ 0.003
		20kHz-50kHz	0.10 + 0.04	0.12+ 0.05	0.15 + 0.05	0.012+ 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060+ 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	750.000 V[5]	3Hz- 5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100+ 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035+ 0.003
		10Hz-20kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008+ 0.003
		20kHz-50kHz	0.10 + 0.04	0.12+ 0.05	0.15 + 0.05	0.012+ 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060+ 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
True RMS AC Current [7]	200.0000 uA	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200+ 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100+ 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015+ 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030+ 0.006
	2.000000 mA	3Hz- 5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100+ 0.006
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035+ 0.006
		10Hz-5kHz	0.12 + 0.04	0.12 + 0.04	0.12 + 0.04	0.015+ 0.006
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030+ 0.006
	20.00000 mA	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200+ 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100+ 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015+ 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030+ 0.006
	200.0000 mA	3Hz- 5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100+ 0.006
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035+ 0.006
		10Hz-5kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015+ 0.006
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030+ 0.006
	2.000000 A	3Hz- 5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.100+ 0.006

		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.035+ 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015+ 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030+ 0.006
	10.00000 A[6]	3Hz- 5Hz	1.10 + 0.08	1.10 + 0.10	1.10 + 0.10	0.100+ 0.008
		5Hz-10Hz	0.35 + 0.08	0.35 + 0.10	0.35 + 0.10	0.035+ 0.008
		10Hz-5kHz	0.15 + 0.08	0.15 + 0.10	0.15 + 0.10	0.015+ 0.008

Additional Error in AC Measurement

Additional Low Frequency Errors(% of Reading)				**Additional Crest Factor Errors (No-sinewave)[8]**	
Frequency	**AC Filter**			**Wave Crest Coefficient**	**Error (% Range)**
	>3Hz	**>20Hz**	**>200Hz**		
10Hz-20Hz	0	0.74	--	1 - 2	0.05
20Hz-40Hz	0	0.22	--	2 - 3	0.2
40Hz-100Hz	0	0.06	0.73	3 - 4	0.4
100Hz-200Hz	0	0.01	0.22	4 - 5	0.5
200Hz-1kHz	0	0	0.18		
>1kHz	0	0	0		

[1] Specifications are for 90 minutes warm-up, filter set to > 3 Hz and sinewave input.

[2] 10% over range on all ranges except for ACV 750 V and ACI 10 A range.

[3] Relative to calibration standards.

[4] Specifications are for amplitude of sine wave input > 5% of range. For inputs from 1% to 5% of range and < 50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range additional error.

[5] ACV750 range limited to 8 x107 Volts·Hz. For input over 300 Vrms, add 0.7mV error for each additional volt.

[6] Specifications are for amplitude of sine wave input > 5% of range. For inputs within 1% to 5% of range, add 0.1% of range additional error. Specifications are typical values for 200uA, 2mA, 2A and 10A ranges when frequency > 1kHz.

[7] 30 seconds OFF after 30 seconds ON is recommend for the continuous current that higher than DC 7 A or AC 7 Arms.

[8] For frequency below 100 Hz, the specifications of slow filter are only for sinewave input.

6.3 Frequency and Period Characteristics

Accuracy ± (% of Reading + % of Range) [1]

Function	**Range[2]**	**Frequency Range**	**24 Hours[3] TCAL℃±1℃**	**90 Days TCAL℃±5℃**	**1 Year TCAL℃±5℃**	**Temperature Coefficient 0℃~(TCAL℃ -5℃)**

						(TCAL℃ +5℃)~ 50℃
Frequency, Period	200 mV to 750 V	3 Hz – 5Hz	0.07	0.07	0.07	0.005
		5 Hz – 10 Hz	0.04	0.04	0.04	0.005
		10 Hz – 40 Hz	0.02	0.02	0.02	0.001
		40 Hz–300 KHz	0.005	0.006	0.007	0.001
		300KHz–1 MHz	0.005	0.006	0.007	0.001

Frequency	**Gate Time (Resolution)**		
	1 s (0.1ppm)	**0.1 s (1ppm)**	**0.01 s (10ppm)**
3 Hz – 5Hz	0	0.12	0.12
5 Hz – 10 Hz	0	0.17	0.17
10 Hz –40 Hz	0	0.20	0.20
40 Hz – 100 Hz	0	0.06	0.21
100 Hz –300 Hz	0	0.03	0.21
300Hz – 1 KHz	0	0.01	0.07
> 1 K Hz	0	0	0.02

[1] Specifications are for 90 minutes warm-up, using 1s gate time.

[2] For frequency ≤ 300 kHz, the specification is the 10% to 110% of range of the AC input voltage. For frequency > 300kHz, the specification is the 20% to 110% of range of the AC input voltage. The maximum input is limited to 750 Vrms or 8 ×107 Volts·Hz (whichever is less). The accuracy is 10 times of reading accuracy in table when the AC voltage is at 200 mV range.

6.4 Capacitance Characteristics

Accuracy ± (% of Reading + % of Range) [1]

Function	**Range[2]**	**Test Current**	**1 Year TCAL℃±5℃**	**Temperature Coefficient 0℃~(TCAL℃ -5℃) (TCAL℃ +5℃)~ 50℃**
Capacitance	2.0000 nF	5 μA	2 + 2.5	0.05 + 0.05
	20.000 nF	5 μA	1 + 0.3	0.05 + 0.01
	200.00 nF	10μA	1 + 0.3	0.01 + 0.01
	2.0000μF	100μA	1 + 0.3	0.01 + 0.01
	20.000μF	1mA	1 + 0.3	0.01 + 0.01
	200.00μF	1mA	1 + 0.3	0.01 + 0.01
	2.0000 mF	1 mA	1 + 0.3	0.01 + 0.01
	20.000 mF	1 mA	1 + 0.3	0.01 + 0.01
	100.00 mF	1 mA	3 + 0.2	0.05 + 0.02

[1] Specifications are for 90 minutes warm-up and “Ref” operation. Using of non-film capacitor may generate additional errors.

[2] Specifications are for from 1% to 110% on 2 nF range and from 10% to 110% on other ranges.

6.5 Temperature Characteristics

Accuracy ± (% of Reading + % of Range) [1]

Function	Probe Type	Probe Model	Working Temperature Range	1 Year TCAL℃±5℃	Temperature Coefficient 0℃~(TCAL℃ -5℃) (TCAL℃ +5℃)~ 50℃
Temperature	RTD[2](R0 within 80Ω~120kΩ)	α=0.00385	-200℃~ 660℃	0.16℃	0.01℃
	Thermistor	5 kΩ	-80℃~150℃	0.16℃	0.01℃
	TC[3]	B	350℃~ 1820℃	0.76℃	0.14℃
		E	-200℃~ 1000℃	0.5℃	0.02℃
		J	-200℃~ 1200℃	0.5℃	0.02℃
		K	-200℃~ 1372℃	0.5℃	0.03℃
		N	-200℃~ 1300℃	0.5℃	0.04℃
		R	0℃~ 1768℃	0.5℃	0.09℃
		S	0℃~ 1768℃	0.6℃	0.11℃
		T	-200℃~ 400℃	0.5℃	0.03℃

[1] Specifications are for 90 minutes warm-up, not include probe error.

[2] Specifications are for 4-wire measure or 2-wire measure under “Ref” operation.

[3] Relative to cold junction temperature, accuracy is based on ITS-90. Built-in cold junction temperature refers to the temperature inside the banana jack and its accuracy is ± 2 ℃.

6.6 Measurement Rate

Multimeter Measurement Rate[1]

Function	Setting	Integration Time	Readings/s 50Hz(60Hz)
DC Voltage DC Current 2-Wire Resistance 4-Wire Resistance	0.006 NPLC	120(100)us	8333 (10000)
	0.02 NPLC	400(333.3)us	2500 (3000)
	0.06 NPLC	1.2 (1)ms	833 (1000)
	0.2 NPLC	4 (3.33)ms	250 (300)
	1 NPLC	20(16.7)ms	50 (60)
	10 NPLC	200(167)ms	5 (6)
	100 NPLC	2(1.67)s	0.5 (0.6)
AC Voltage	3Hz AC Filter		0.4

AC Current	20Hz		1.6
	200Hz		5
Frequency / Period[2]	1s Gate Time		1
	0.1s		10
	0.01s		100

[1] Auto trigger, zero trigger delay, auto zero off and auto range off.

[2] 20V Range, 1kHz input.

6.7 Measuring Method and Other Characteristics

DC Voltage	
Input Resistance	200 mV, 2 V, 20V range: 10 MΩ or >10 GΩ selectable (For these ranges, input beyond ±26V are clamped through inner 106 kΩ resistor)
	200 V and 1000 V Range; 10 MΩ±1%
Input Bias Current	50 pA, 25°C , typical
Input Protections	1000 V on all ranges
CMRR	140dB, for the 1 KΩ unbalanced resistance in LO lead, max ± 500 VDC peak
Resistance	
Testing Method	2-wire resistance or 4-wire resistance
	Current source reference to LO input
Open Circuit Voltage	Limited to <10V
Max. Lead Resistance(4-wire resistance)	10% of range per lead for 200 Ω, 2 kΩ ranges, 1 kΩ per lead on all other ranges
Input Protection	1000 V on all ranges
DC Current	
Shunt Resistor	200uA, 2mA range: 100Ω
	20mA, 200mA range: 1Ω
	2A, 10A range: 0.01Ω
Input Protection	Replaceable 10 A, 250 V fast-acting fuse located on the panel
	Internal 12 A,250 V low-acting fuse
Continuity / Diode Test	
Measurement Method	Measure resistance or voltage using 1 mA ± 5% constant-current source
Response Time	1000 samples/s
Beeper	Yes
Continuity	Adjustable from 1Ω to 2 KΩ

Threshold	
Diode Threshold	Adjustable from 0V~5V
Input Protection	1000 V on all ranges
Setting Time Considerations	
Reading settling times are affected by source impedance, cable dielectric characteristics and input signal changes. The default measurement delay is selected to give first reading right for most measurements	
Measurement Considerations	
Teflon or other high-impedance, low-dielectric absorption wire insulation is recommended for these measurements	
True RMS AC Voltage	
Measurement Method	AC-Coupled True-RMS measurement with up to 400 V DC of bias on any range
Wave Crest Factor	≤ 5 at full scale
Input Impedance	1MΩ±2％ in parallel with <150 pF capacitance on all ranges
Input Protection	750V rms on all ranges
AC Filter Bandwidth	Slow: 3 Hz ～ 300 KHz
	Medium: 20 Hz ～ 300 KHz
	Fast: 200 Hz ～ 300 KHz
CMRR	70dB, Maximum ±500 VDC peak for 1 kΩ imbalance resistance on LO leads and common-mode frequency < 60 Hz
True RMS AC Current	
Measurement Method	DC Coupled to the fuse and shunt; AC Coupled the True-RMS measurement (measure the AC components only)
Wave Crest Factor	≤ 3 at full scale
Max Input	< 10 Arms (RMS current including DC component)
Shunt Resistor	200uA, 2mA: 100Ω
	20mA , 200mA: 1Ω
	2A,10A : 0.01Ω
Input Protection	Replaceable 10 A, 250 V fast-acting fuse located on the panel
	Internal 12 A,250 V low-acting fuse
Setting Time Considerations	
The default measurement delay is selected to give first reading right for most measurements. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement. Applying > 300 Vrms (or > 5 Arms) will cause self-heating in signal-conditioning components and these errors are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower AC voltage ranges. The additional error will be lower than 0.02% of reading and will generally dissipate within a few minutes	
Frequency / Period	
Measurement Method	Reciprocal-counting technique, AC-Coupled input using AC voltage measurement function
Input Impedance	1 MΩ ± 2% in parallel with < 150 pF capacitance on all ranges
Input Protection	750V rms on all ranges

Measurement Considerations	All frequency counters introduce errors when measuring low-voltage, low-frequency signals. Shielding the input is very helpful for reducing measurement errors caused by external noise.
Setting Time Considerations	Errors will occur when attempting to measure the frequency or period of an input following a DC current change. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement
Capacitance Measuring	
Measurement Method	Measure the rate of change of voltage generated during the current flowing the capacitance
Connection Type	2-wire
Input Protection	1000 V on all ranges
Measurement Considerations	Since small capacitance measurements are susceptible to the external noise, shielding inputs from external noise pickup is critical for minimizing measurement errors
Temperature Measuring	
Measurement Method	Supports temperature measurement for thermocouples, RTDs, and thermistors
Measurement Considerations	The built-in cold junction temperature tracks the temperature inside the banana jack. The change of the temperature in banana jack may cause additional error. When using the built-in cold junction compensation, connect the sensor terminal of the thermocouple to the banana jack and allow it warm up for more than 3 minutes to minimize the error
Trigger and Memory	
Samples / Trigger	Delay trigger, Internal Trigger or External Trigger, Rising Edge Trigger or Falling Edge Trigger
Time Base Resolution	<40us
Trigger Delay	Adjusting from 0 ~ 3600s
Single Trigger Samples	1 to 1 000 000
External Trigger Input	Input Level: 5V TTL compatible (High level when left input terminal is hanging in the air)
	Trigger Condition: rising and falling selectable
	Input Impedance：≥ 30KΩ//500pF
	Delay: < 50 μs
	Max Rate: 1000 / s
	Min Pulse: 2μS
VMC Output	Level: 5V TTL compatible
	Output Polarity: positive and negative optional
	Output Impedance: 100Ω, typical
	Pulse Width: about 2μs
History Record Function	
Volatile memory	1 000 000
Non-volatile	80M NAND Flash total capacity for massive storage of instrument setup files and data files

memory	(TBC)
Math Function	
Min / Max / Average / Standard deviation, dBm, dB, Limit, Relative, Bar, Trend, Histogram	

6.8 General Specifications

Power Supply	
AC 100 V ～ 120 V	45 Hz ~ 66 Hz
AC 200 V ～ 240 V	45 Hz ~ 66 Hz
Consumption	25VA max
Mechanism	
Dimension(W*H*D) (mm)	109 * 226 * 320
Weight	Approx. 3.5kg
Other Characteristics	
Display Screen	4.3-inch, IPS touch screen with resolution 480x800
Operation Environment	Full accuracy for 0℃~ 50℃; Full accuracy to 40℃, 80%RH (non-condensing)
	Storage temperature: -20℃ ~70℃
	Shock and Vibration: MIL-T-28800E, Class III, Grade 5 (Sine only)
	Altitude: up to 3000 meters
Electromagnetic Compatibility	Complies with EMC Directive (2004/108/EC), compliant to standards EN 61326-1:2013, EN 61010-2-030
Safety	Compliant with the Low Voltage Directive (2006/95/EC) and standard EN61010-1:2010, measurement CAT I 1000V/CAT II 600V，EN61010-2-030
Remote Interface	10 / 100Mbit LAN, USB Device, USB Host, RS232
Programmer Language	SCPI-compliant with the latest widely used multimeter command sets
Warm-up Time	120 minutes

Interval Period of Adjustment:

One year is recommended for the calibration interval period.

7 Appendix

7.1 Appendix A: Accessories

Standard Accessories (subject to final delivery)

Power Cable

Test Lead

Quick Guide

USB Cable

Fuse

Alligator Clip

7.2 Appendix B: General Care and Cleaning

General Care

Do not store or leave the instrument where the liquid crystal display will be exposed to direct sunlight for long periods of time.

Cleaning

To clean the instrument exterior, perform the following steps:

1. To prevent electrical shock, disconnect the instrument from AC mains power and disconnect all test leads before cleaning.
2. Clean the outside of the instrument using a wet soft cloth not dripping water. Do not make any scuffing when cleaning the LCD screen.
3. To avoid damage to the instrument, do not use any corrosive chemical cleaning agent.

Caution: To avoid any damage to the instrument, do not exposed it to any sprays, liquids, or solvents.

Warning: Before power on again for operation, it is required to confirm that the instrument has already been dried completely, avoiding any electrical short circuit or bodily injury resulting form the moisture.

7.3 Appendix C: Line Fuse Replacement

The line fuse is in the plastic fuse box below the power line input on the rear panel.

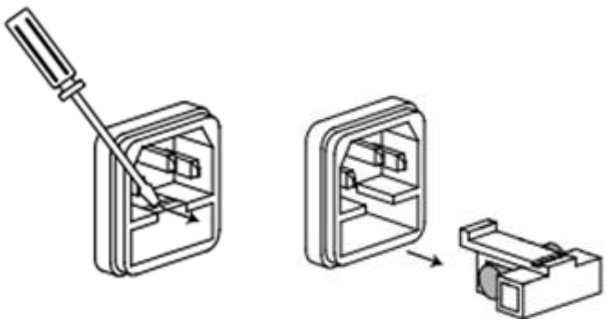
Warning: Disconnect the line cord at the rear panel and remove all test leads connected to the instrument before replacing the line fuse. Failure to do so could expose the operator to hazardous voltages that could result in personal injury or death.

Use only the correct fuse type. Failure to do so could result in personal injury or instrument damage.

Voltage	Fuse
100 - 120 V AC	250 V, F1AL
200 - 240 V AC	250 V, F0.5AL

To perform the line fuse replacement, follow these steps:

1. Turn off the multimeter, remove all measurement leads and other cables from the instrument, including the power cord.
2. Use a flat-blade screwdriver to remove the fuse box.



3. Replace the fuse with a new one, which should match with the voltage;

install it into the fuse box, and push the fuse box back on to the rear panel.