User Manual

SDM3055 Digital Multimeter

UM06035-E02A

Copyright and Statement

Copyright

Trademark Information

Statement

General Safety Summary

Read the following safety precautions carefully to avoid any personal injuries or damages to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use proper power line.
It's only allowed to use the special power line which is approved by local state.

Ground the instrument.
The instrument is grounded through the protective terra conductor of the power line. The ground conductor must be connected to the earth to avoid electric shock. Make sure the instrument is grounded correctly before connecting its input or output terminals.

Connect the signal wire correctly
The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage.

Observe all terminal ratings
Please observe all ratings and sign instructions on the instrument to avoid fire or electric shock. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Do not operate with suspected failures
If you suspect that the product is damaged, please contact SIGLENT's qualified service personnel to inspect it. Any repair and adjustment to the product or replacing a component should be done by qualified personnel only.

Avoid circuit or wire exposure
Don't touch exposed contacts or components when the power is on.

Don't operate without covers.
Don't operate the instrument with covers or panels removed.

Use proper fuse.
It's only allowed to use the specified fuse for the instrument.

Use proper over-voltage protection.
Make sure there is no over-voltage (like voltage caused by thunder and lightning) reaching to the instrument, otherwise the operator may suffer an electric shock.

Antistatic protection.
Static electricity will cause damages to the instrument, so test in antistatic areas as far as possible. Ground its inner and outer conductors to release the static electricity temporarily before connecting the cable to the instrument.

Keep good ventilation.
Improper ventilation will cause the rise of the instrument's temperature. Keep good ventilation and check the vent and fan regularly when using it.

Keep the surface of the instrument clean and dry.

Do not operate in wet or damp conditions.

Do not operate in flammable or explosive environment.

The disturbance test of all the models meets the limit values of A in the standard of EN 61326-1:2013.

Input terminal protection limitation

Protection limitation is defined for the input terminal：

1. Main input（HI and LO）terminal

HI and LO terminals are used for Voltage, Resistance, Capacitance, Continuity, Frequency and Diode measurement. Two protection limitations are defined:
● **HI-LO protection limitation:** 1000VDC or 750AVC. It's the maximum measurable voltage. The limitation can be expressed as 1000Vpk.
● **LO-ground protection limitation**：LO terminal can "float" 500Vpk relative to the ground safely. The maximum protection limitation of HI terminal relative to the ground is 1000Vpk. Therefore, the sum of the "float" voltage and the measured voltage can't exceed 1000Vpk.

2. Sampling (HI Sense and LO Sense) terminal

HI Sense and LO Sense are used for 4-wire Resistance measurement. Two protection limitations are defined:
● **HI Sense-LO Sense protection limitation:** 2000Vpk.

● **LO Sense-LO Sense protection limitation:** 2Vpk.

3. Current input (I) terminal

I and LO terminals are used for current measurement. The maximum current which go through the **I** terminal is limited to 10A by the fuse on the back panel.

NOTE:

Voltage on the current input terminal corresponds to voltage on LO terminal. To keep good protection, only use the fuse of specified type and level to replace this fuse.

IEC Measurement Category II Over-voltage Protection

SDM3055 Digital Multimeter provides over-voltage protection for line-voltage mains connections meeting both of the following conditions to avoid the danger of electric shock：

● The HI and LO input terminals are connected to the mains under Measurement Category II conditions as following.
● The maximum line voltage of the mains is 600VAC.

WARNING:

IEC Measurement Category II includes electrical devices connected to mains at an outlet on a branch circuit, such as most small appliances, test equipments, and other devices that plug into a branch outlet or socket.

SDM3055 is capable of making measurements with the HI and LO inputs connected to mains in such devices (up to 600VAC) or the branch outlet itself. However, the HI and LO terminals of SDM3055 can't be connected to mains in permanently installed electrical devices such as the main circuit-breaker panels, sub-panel disconnected boxes and permanently wired motors. Such devices and circuits are prone to exceed the protection limits of SDM3055.

NOTE:

Voltages above 600VAC only can be measured in circuits that are isolated from mains. However, there may be transient over-voltage in circuits that are isolated from mains. SDM3055 is able to withstand occasional transient over-voltage up to 4000Vpk. Please don't use this instrument to measure circuits that transient over-voltage may exceed this level.

Safety Terms and Symbols

Terms in this manual. Terms may appear in this manual.

⚠ **WARNING**: Warning statements indicate the conditions and behaviors that could result in injury or loss of life.

⚠ **CAUTION**: Caution statements indicate the conditions and behaviors that could result in damage to this product or other

⚠ **CAT I (1000V)**: IEC Measurement Category I. The highest measurable voltage is 1000Vpk in the HI-LO terminal.

⚠ **CAT II (600V):** IEC Measurement Category II. Inputs may be connected to mains (up to 600VAC) under Category II overvoltage

Terms used on the instrument. Terms may appear on the instrument:

DANGER   indicates an injury or hazard that may immediately happen.
WARNING   indicates an injury or hazard that may not immediately happen.
CAUTION   indicates that a potential damage to the instrument or other property might occur.

Symbols used on the instrument. Symbols may appear on the instrument.

Hazardous Voltage   **Protective Earth Ground**   **Warning**   **Test Ground**   **Chassis Ground**

Introduction of SDM3055

SDM3055 is a 5½ dual-display instrument designed with 5½ digits readings resolution and dual-display, especially fitting to the needs of high-precision, multifunction, and automation measurements. It realized a combination of basic measurement functions, multiple math functions, and display functions, etc.

SDM3055 holds a 4.3 inch color TFT-LCD display screen. Its clear keyboard layout and operation hints make it easier and agility to use. Besides, it supports multi-interface such as USB Device & Host, LAN and GPIB (only for SDM3055A), which can meet users' demand furthest.

Main Features:

- 4.3 inch color TFT-LCD display screen with 480*272 high resolutions
- Real 5½ digits readings resolution
- Up to 150rdgs/S measurement speed
- True-RMS AC Voltage and AC Current measurements
- 1 Gb Nand Flash size, mass storage configuration files and data files
- Built-in cold terminal compensation for thermocouple
- Support standard SCPI and control software on PC, compatible with commands of main stream multimeters
- Supports dual-display function, Chinese and English menu
- Built-in help system, convenient to acquire information
- Support USB Device, USB Host, LAN, and GPIB (only for SDM3055A) interfaces
- Configuration and measured data can be imported or exported via VXI 11, USBTMC and USB flash drive, which is convenient for users to modify, view and backup

Abstract

The manual mainly introduces corresponding information of operating the SDM3055 Digital Multimeter. It contains these chapters:

Chapter 1   Quick Start
Guide you to prepare the SDM3055 Digital Multimeter and know about the Front/Back panel and user interface.

Chapter 2   Function and Operation
Introduce the functions and operations of SDM3055 in details.

Chapter 3   Application Examples
Introduce you how to use strong measurement functions of this instrument easily through some examples.

Chapter 4   Measurement Tutorial
Guide you to eliminate the errors that may appear during your measurement and obtain accurate result.

Chapter 5   General Troubleshooting
Provide you some general troubleshooting.

Chapter 6   Appendix
Provide you information about accessories, warranties, troubleshooting, services and supports.

Content

Chapter 1　Quick Start

- **General Inspection**

- **Handle Adjustment**

- **The Front Panel**

- **The Back Panel**

- **To Connect Power Line**

- **User Interface**

- **To Use Safety Lock**

General Inspection

1. Inspect the shipping container.

Please keep the damaged container or cushioning material until the contents of the shipment have been checked completely and the instrument has passed the electrical and mechanical test.

Damages of the instrument caused by the shipment will be compensated by the shipper or carrier. SIGLENT will not be responsible for the free repair or replacement.

2. Inspect the instrument.

If there exit any mechanical damages or lacking of components, or the instrument fails the electrical and mechanical test, please contact your SIGLENT sales.

3. Check the accessories.

Check the accessories according to the packing list carefully. If there exit any accessories damaged or missing, please contact your SIGLENT sales.

To adjust the Handle

Adjust the handle position of SDM3055 properly to place the instrument stably so that users can manipulate and observe the display better. Please grip the handle by the two sides and pull it outward. Then rotate the handle to the appropriate position. Please operate as the following diagram.
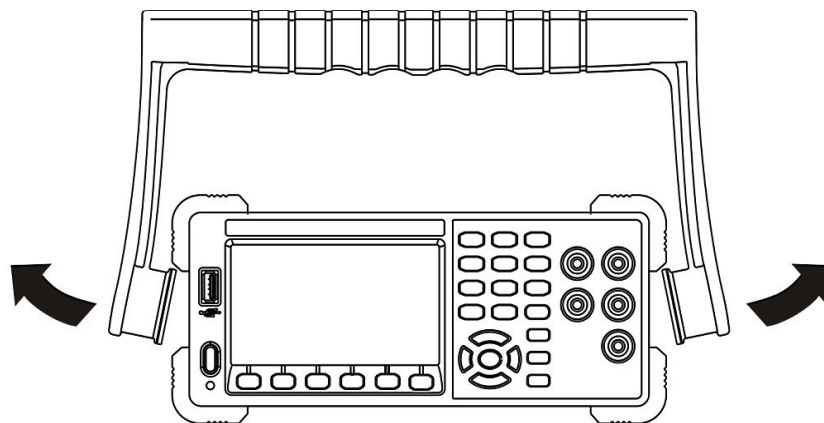
Diagram 1- 1   Handle adjustment
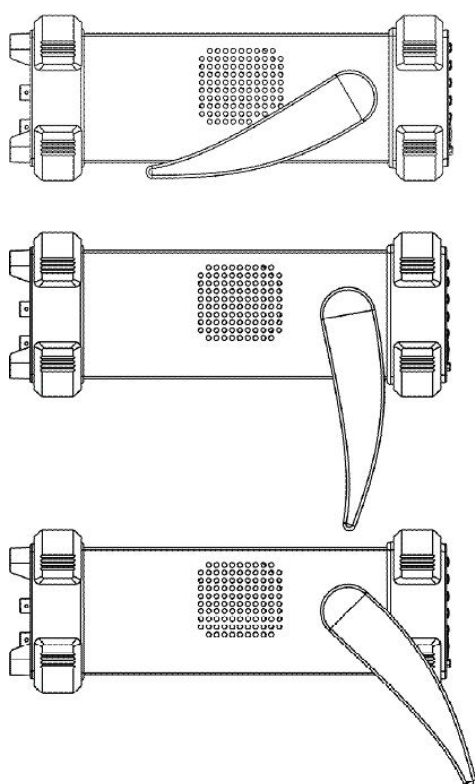
Diagram 1- 2   Horizontal Position
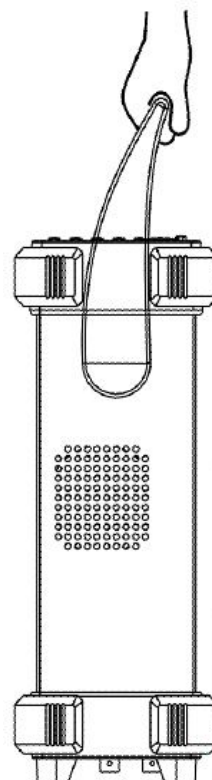
Diagram 1- 3   Carrying Position

Front Panel

SDM3055 Digital Multimeter provides users with brief and clear front panel. These control buttons are group by logic and users only need choose corresponding buttons to carry out basic operations, as shown in Diagram 1-4.
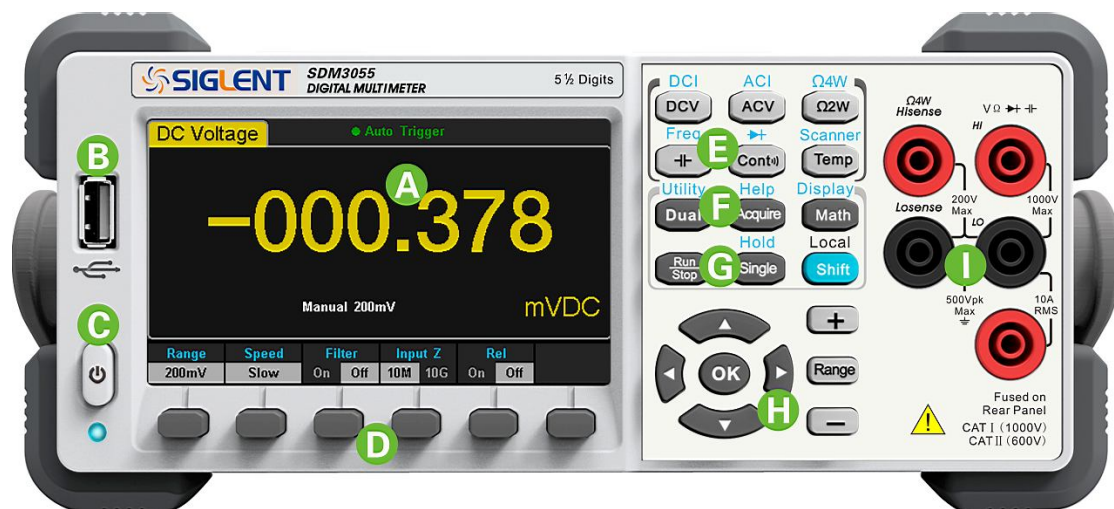
Diagram 1- 4   Front Panel Overview

A   LCD Display

B   USB Host

C   Power Key

D   Menu Keys

E   Basic Measurement Function Keys

F   Auxiliary Measurement Function Keys

G   Enable Trig Keys

H   Direction Keys

I   Signal Input Port

Back Panel

SDM3055 Digital Multimeter's Back Panel provides users with abundant interfaces, including USB Device、USB Host、LAN and GPIB（Only for SDM3055A）, as shown in the following diagram.

Diagram 1- 5　Back Panel Overview

A Power Socket		**B** Power Fuse	
C AC Voltage Selector		**D** Inspection card interface	
E USB Device（USBTMC）		**F** 10/100 Ethernet	
G VMC Output		**H** Ext Trig	
I Current Input Fuse			

NOTE:

- SDM3055 doesn't support GPIB and Inspection Card;
- SDM3055A doesn't support Inspection Card;
- SDM3055S doesn't support GPIB.

Power On

Please power on the instrument as the following steps:

1. Adjust AC Voltage Selector to 110 (100~120V, 45~440Hz, AC) or 220 (200~240V, 50/60Hz, AC) in accordance with power standards in your country;

2. Connect the instrument to AC supply via power cord supplied by **SIGLENT**;

3. The power indicator light on the front panel will glitter slowly;

4. Press the power key on the front panel, the instrument will be started a few seconds later.

User Interface

Single Display：

Trigger Mode

Main Display Function

Reading Display

AC Voltage   ● Auto Trigger

+004.847

Auto 200mV

mVAC

Range	Speed			Rel	
Auto	Slow			On	Off

Softkey Menu   Measurement Range   Unit
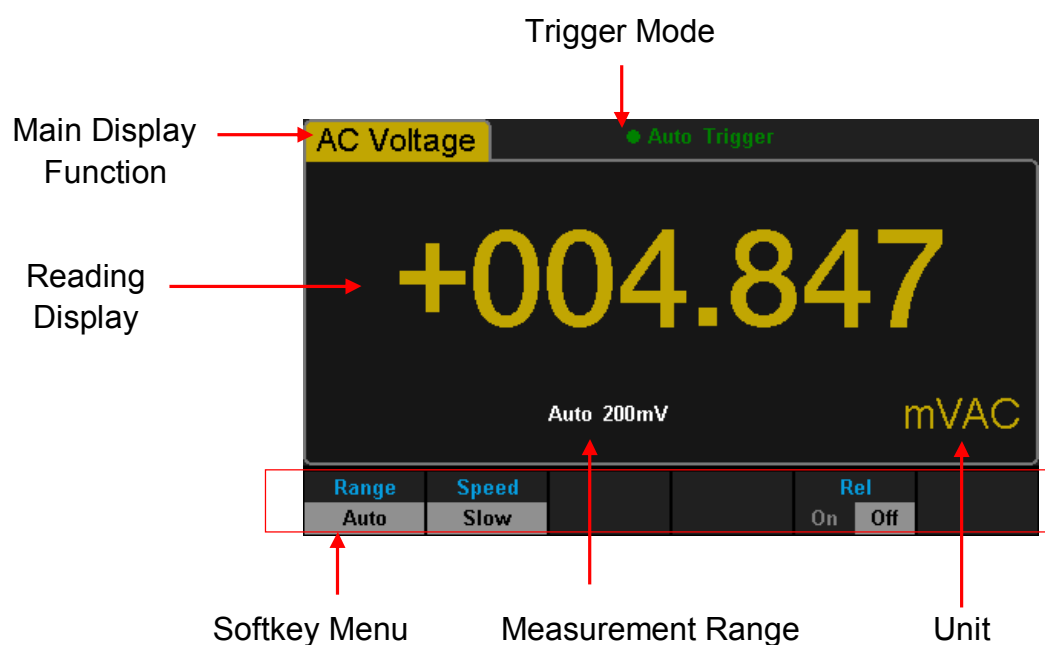
Diagram 1- 6   Single Display Interface

Dual-Display：

Main Display Function

Main Display

AC Voltage   ● Auto Trigger   Dual

+004.846

Auto 200mV

mVAC

Dual: +49.971 Hz

Range	Speed			Rel	
Auto	Slow			On	Off

Vice-display
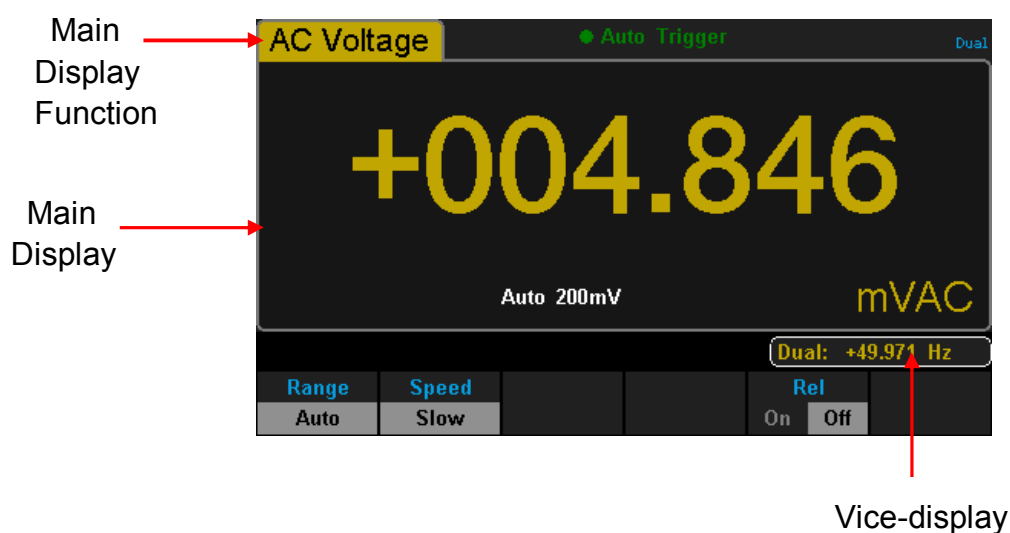
Diagram 1-7   User Interface

Chapter 2   Function and Operation

- To Measure DC Voltage / Current

- To Measure AC Voltage / Current

- To Measure 2-Wire / 4-Wire Resistance

- To Measure Frequency / Capacitance

- To Test Continuity / Diode

- To Measure Temperature / Optional Multiple Scan Card

- To use Dual-display Function or Set Up the Utility

- Acquire Function or Help System

- Math Function or Display Function

- Run / Stop

- Single Trigger / Hold Measurement Function

- To Switch Functions or Return to Local Menu

- To Select Measurement Range

To Select Measurement Range

The Multimeter has two kinds of modes of selecting measurement range: "Auto" and "Manual". It can select appropriate range according to the signals input in Auto mode, which is very convenient for users. While in Manual mode, you can obtain higher reading precision. Range selection keys are on the right side of the front panel as the following diagram.
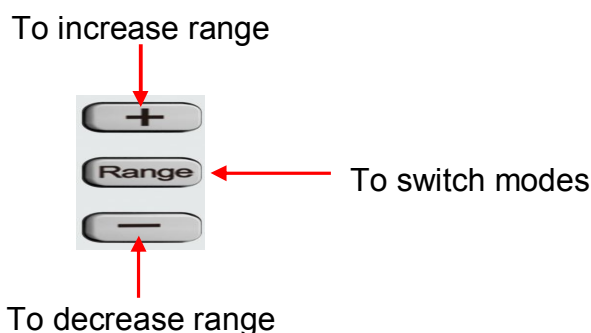
Diagram 2- 1   Range Selection Keys

Method 1: By Function keys on the Front Panel

Auto Range: Press 〔Range〕 to switch between Auto Range and Manual Range.

Manual Range: Press 〔+〕 to increase range and press 〔—〕 to decrease range.

Method 2: By softkeys on the measurement main interface as Diagram 2-2.

Auto Range: Press【Auto】to choose Auto Range, meanwhile Manual Range is forbidden.

Manual Range: Press【200mV】、【2V】、【20V】、【200V】or【1000V】 to choose required range manually. Auto Range is forbidden at this moment.
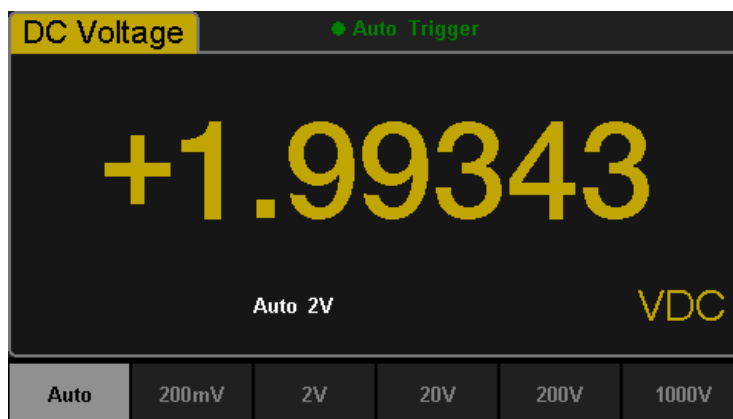
Diagram 2- 2 Range selection menus

Explanations:

1. When the input signal is beyond the current scope of the measurement range, the Multimeter will show "overload".

2. Range option will turn back to default setting "Auto" after restarting and remote reset.

3. Users are suggested to select "Auto" range so as to protect the instrument against damage and get exact data as much as possible when it's hard to predict the range of measurement.

4. For Dual-display Function, the measurement ranges of Main display and vice display are similar and can't be changed independently

5. The range is fixed during testing the Continuity and Diode. The range of continuity is selected as 2kΩ, while the Diode is 2V.

6. Auto Range is not suitable for measuring current up to 10A. If the signal is used to **I** Terminal, users need to choose range manually.

To Select Measurement Speed

The instrument provides three types of measurement rate: 5 reading/s, 50 reading/s and 150 reading/s. 5 reading/s belongs to "Slow" rate; 50 reading/s belongs to "Middle" rate; 150 reading/s belongs to "Fast" rate.

Measurement speed can be controlled by softkey menu. Press 【Speed】 and then press 【Slow】, 【Middle】or【Fast】to choose measurement speed.
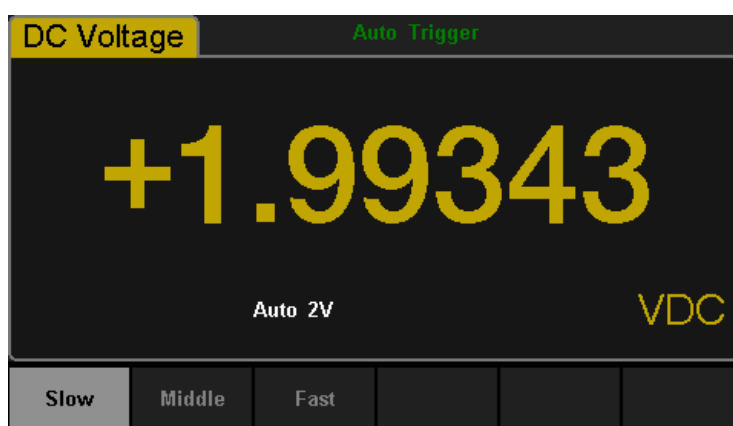
Diagram 2- 3   Range selection menu

Explanations:

1. Three reading rates are available for DCV, ACV, DCI, ACI and 2-Wire/4-Wire Resistance: "Slow", "Middle" and "Fast".

2. There is a linkage for both reading resolution and reading (measurement) rate.

3. 5 reading/s belongs to 5.5 digit resolution.

4. Both 20 reading/s and 123 reading/s belong to 4.5 digit resolution.

5. The reading resolution of Temperature is fixed at 5.5 digit and "Slow" respectively.

6. The reading resolutions and measurement rates of both Diode and Continuity are fixed at 4.5 digit and "Fast" respectively.

7. The reading resolution and measurement rate of the Frequency function are fixed 5.5 digit and "Slow" respectively.

8. The reading resolution and measurement rate of the Capacitance function are fixed at 5.5 digit and "Slow" respectively.

Basic Measurement Functions

SDM3055 Digital Multimeters have following basic functions:

- **To Measure DC Voltage**

- **To Measure AC Voltage**

- **To Measure DC Current**

- **To Measure AC Current**

- **To Measure 2/4-Wire Resistance**

- **To Measure Capacitance**

- **To Test Continuity**

- **To Test Diode**

- **To Measure Frequency or Period**

- **To Measure Temperature**

To Measure DC Voltage

The Multimeter enables to measure DC Voltage up to 1000V. The method to connect and measure DC Voltage will be introduced in details as the following steps. (**NOTE: DC Voltage is always the selected function when the Multimeter is turned on**)

Operating Steps:

1. Press DCV on the front panel to enter the DC Voltage measurement interface, as shown in Diagram 2- 4.

Diagram 2- 4   DC Voltage Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
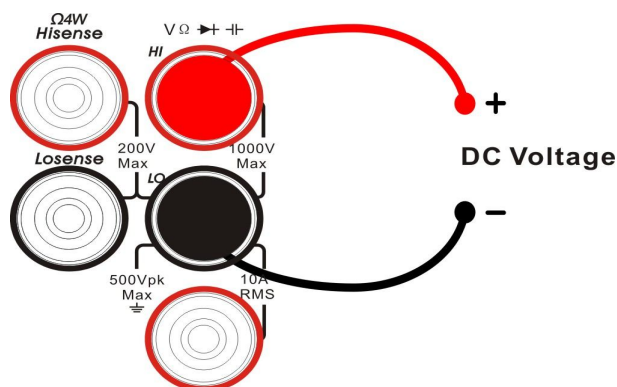
Diagram 2- 5   Sketch Map for Measuring DC Voltage

3. Choose a proper voltage range according to the measured circuit.

Table 2- 1   Measurement Characteristics of DC Voltage

Ranges*	200mV、2V、20V、200V、1000V
Input Protection	1000V on all ranges（HI terminal）
Configurable	Range, DC input impedance, Rel

NOTE*:
●   All the ranges enable to obtain 20% value higher than original except 1000V. Besides, both Manual and Auto are available for setting every range.
●   When inputting range is higher than 1000V at 1000V Level, "overload" will be shown on the screen.
●   1000V input protection exists in every range.

4. Set the DC input impedance (Only for Manual 200mV and 2V ranges).
   Press 【Input Z】to set the DC resistance as "10M" (default value) or ">10G". Users can execute DC voltage measurement directly without modifying this parameter which has been setup before leaving factory.

5. Set AC Filter function.
   Press【Filter】to open or close the AC Filter. (**NOTE: Only DC Voltage and DC Current have this function**.)

6. Set relative value (Optional operation).
   Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

7. Read measurement result.
   Select required measurement rate (reading rate) by pressing 【Speed】 and read the measurement result.

8. View history data.
   There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Measure DC Current

The Multimeter enables to measure DC Current up to 10A. The method to connect and measure DC Current will be introduced in details as the following steps.

Operating Steps:

1. Press (Shift) and (DCV) on the front panel to enter the DC Current measurement interface, as shown in Diagram 2- 6.

Diagram 2- 6   DC Voltage Measurement Interface

2. Connect the red lead to terminal Input-I and black lead to terminal Input-LO as the following diagram.

Diagram 2- 7   Sketch Map for Measuring DC Current

3. Choose a proper current range according to the measured circuit.

Table 2- 2   Measurement Characteristics of DC Current

Ranges*	200μA、2mA、20mA、200mA、2A、10A
Input Protection	10A(back panel), 12A(inside the instrument)
Configurable	Range, Rel

NOTE*:

All the ranges enable to obtain 20% value higher than original except 10A. Besides, both Manual and Auto are available for setting every range.

4. Set AC Filter function.

Press 【Filter】to open or close the AC Filter.

5. Set relative value (Optional operation).

Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

6. Read measurement result.

Select required measurement rate (reading rate) by pressing【Speed】and read the measurement result.

7. View history data.

There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Measure AC Voltage

The Multimeter enables to measure AC Voltage up to 750V. The method to connect and measure DC Voltage will be introduced in details as the following steps.

Operating Steps:

1. Press ⬚ACV on the front panel to enter the AC Voltage measurement interface, as shown in Diagram 2- 8.
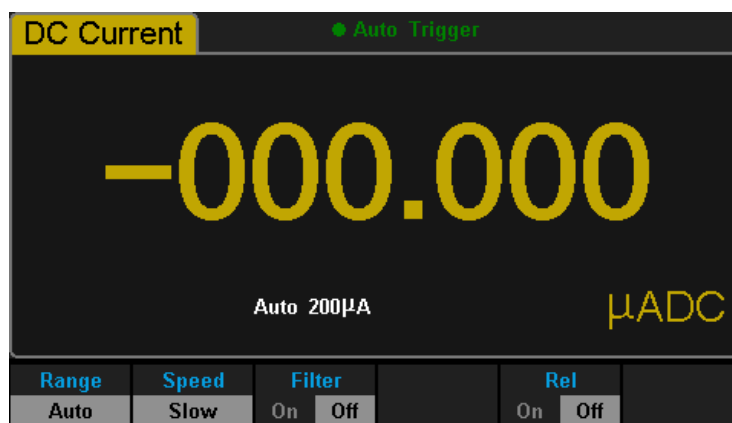

Diagram 2- 8   AC Voltage Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
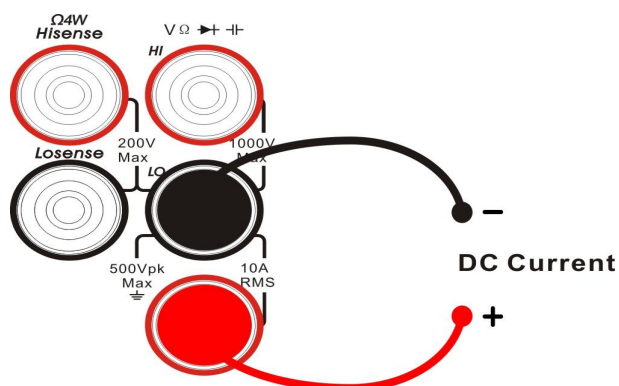

Diagram 2- 9   Sketch Map for Measuring AC Voltage

3. Choose a proper voltage range according to the measured circuit.

Table 2- 3   Measurement Characteristics of AC Voltage

Ranges*	200mV、2V、20V、200V、750V
Input Protection	750Vrms on all ranges（HI terminal）
Configurable	Range, Rel

NOTE*:

● All the ranges enable to obtain 20% value higher than original except 750V. Besides, both Manual and Auto are available for setting every range.

● When inputting range is higher than 750V at 750V Level, "overload" will be shown on the screen.

● 750V input protection exists in every range.

4. Set relative value (Optional operation).

Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

Select required measurement rate (reading rate) by pressing 【Speed】and read the measurement result. If you press `Dual` and then press `Shift` and `+⊢` to get the frequency value measured from input AC signal.

Diagram 2- 10   Dual-display

6. View history data.

There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Measure AC Current

The Multimeter enables to measure AC Current up to 10A. The method to connect and measure AC Current will be introduced in details as the following steps.

Operating Steps:

1. Press [Shift] and [ACV] on the front panel to enter the AC Current measurement interface, as shown in Diagram 2- 11.

Diagram 2- 11   AC Voltage Measurement Interface

2. Connect the red lead to terminal Input-I and black lead to terminal Input-LO as the following diagram.
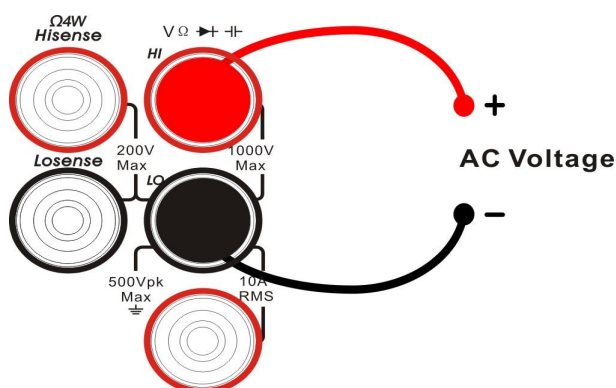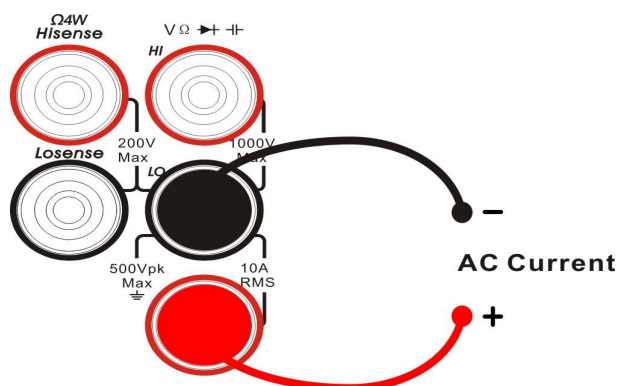

Diagram 2- 12   Sketch Map for Measuring AC Current

3. Choose a proper current range according to the measured circuit.

Table 2- 4   Measurement Characteristics of AC Current

Ranges*	200μA、2mA、20mA、200mA、2A、10A
Input Protection	10A(back panel), 250V(fuse), 12A(inside the instrument)
Configurable	Range, Rel

NOTE*:
All the ranges enable to obtain 20% value higher than original except 10A. Besides, both Manual and Auto are available for setting every range.

4. Set relative value (Optional operation).

   Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

   Select required measurement rate (reading rate) by pressing 【Speed】 and read the measurement result.

6. View history data.

   There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Measure 2-Wire/4-Wire Resistance

The Multimeter enables to measure 2-Wire Resistance and 4-Wire Resistance. The method to connect and measure 2-Wire/4-Wire Resistance will be introduced in details separately.

2-Wire Resistance

Operating Steps:

1. Press `Ω2W` n the front panel to enter the 2-Wire Resistance measurement interface, as shown in Diagram 2- 13.
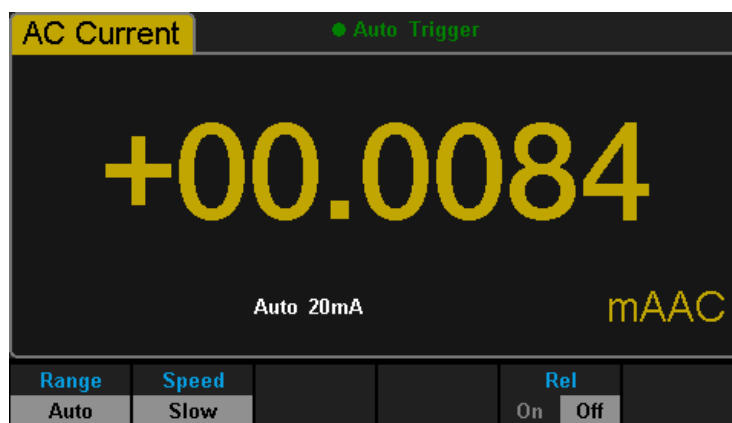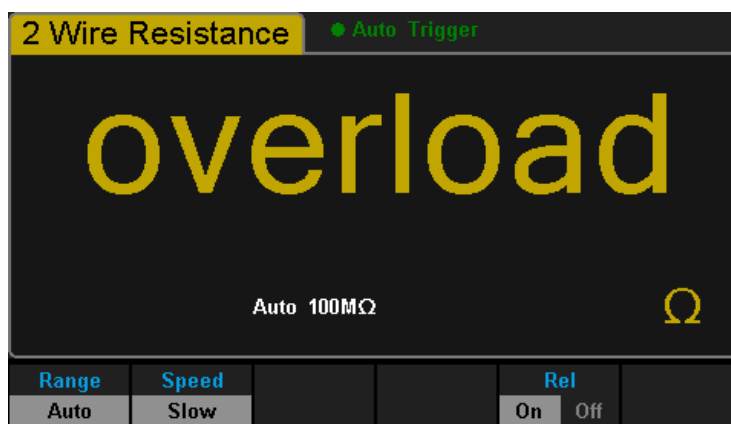

Diagram 2- 13   2-Wire Resistance Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
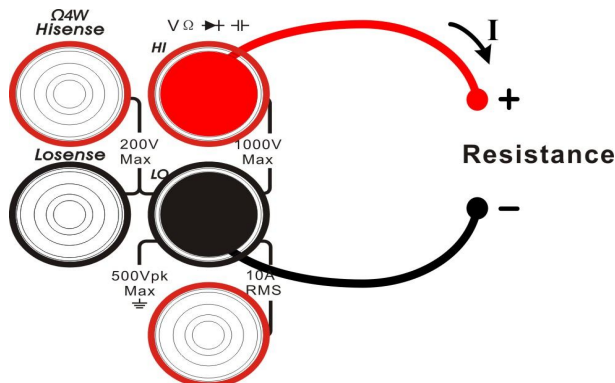
Diagram 2- 14   Sketch Map for Measuring 2-Wire Resistance

3. Choose a proper resistance range according to the scope.

Table 2- 5   Measurement Characteristics of 2-Wire Resistance

Ranges*	200µA、2mA、20mA、200mA、2A、10A
Open-circuit Voltage	<8V
Input Protection	1000V on every range (HI terminal)
Configurable	Range, Rel

NOTE*:

All the ranges enable to obtain 20% value higher than original. Besides, both Manual and Auto are available for setting every range.

4. Set relative value (Optional operation).

   Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

   Select required measurement rate (reading rate) by pressing 【Speed】 and read the measurement result.

6. View history data.

   There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

NOTE:

You are suggested to make use of Relative function when measuring small resistance to reduce or escape impedance error from Test leads.

4-Wire Resistance

Operating Steps:

1. Press (Shift) and (Ω2W) on the front panel to enter the 4-Wire Resistance measurement interface, as shown in Diagram 2- 14.

Diagram 2- 15   4-Wire Resistance Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.

Diagram 2- 16   Sketch Map for Measuring 4-Wire Resistance

3. Choose a proper resistance range according to the scope.

Table 2- 6   Measurement Characteristics of 4-Wire Resistance

Ranges*	200Ω、2kΩ、20kΩ、200kΩ、2MΩ、10MΩ、100MΩ
Open-circuit Voltage	<8V
Input Protection	(1) 1000V on each range (HI terminal) (2) 200V on each range (HI Sense, LO Sense)
Configurable Parameters	Range, Rel

NOTE*:

All the ranges enable to obtain 20% value higher than original. Besides, both Manual and Auto are available for setting every range.

4. Set relative value (Optional operation).

   Press 【Rel】to open or close Relative math function. When it is open, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

   Select required measurement rate (reading rate) by pressing 【Speed】 and read the measurement result.

6. View history data.

   There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

> **NOTE：**
> Please do not put the terminals of the resistance on the conductive plane or in your hand to avoid error. The bigger of the resistance, the more affection it will be brought.

To Measure Capacitance

The Multimeter enables to measure Capacitance up to 1000µF. The method to connect and measure Capacitance will be introduced in details as the following steps.

Operating Steps:

1. Press ⌷⊣⊢⌷ on the front panel to enter the Capacitance measurement interface, as shown in Diagram 2- 16.

Diagram 2- 17   Capacitance Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
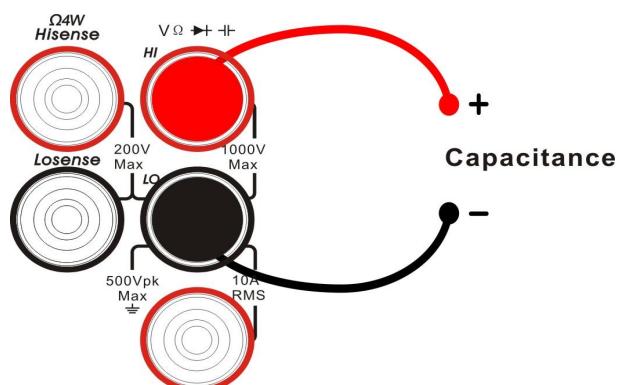
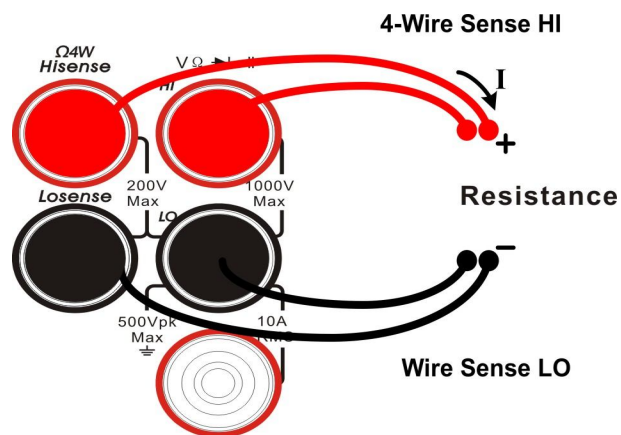Diagram 2- 18   Sketch Map for Measuring Capacitance

3. Choose a proper capacitance range according to the measured circuit.

Table 2- 7   Measurement Characteristics of Capacitance

Ranges*	2nF、20nF、200nF、2μF、200μF、200μF、10000μF
Input Protection	1000V on all ranges (HI terminal)
Configurable Parameters	Range, Rel

NOTE*:

All the ranges enable to obtain 20% value higher than original. Besides, both Manual and Auto are available for setting every range.

4. Set relative value (Optional operation).

   Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

   Capacitance measurement is fixed at "Slow" rate. Therefore, you can't adjust the reading rate when reading the result.

6. View history data.

   There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

NOTE:
Before measuring the electrolytic capacitance, you should make the two legs of the electrolytic capacitance short circuit and let it be discharged.

To Measure Frequency or Period

The Frequency or Period of a signal could be obtained by Dual-display Function during measuring its voltage or current or by the function button on the front panel. The method to connect and measure Frequency or Period will be introduced in details as the following steps.

To Measure Frequency

Operating Steps:

1. Press ⬤Shift and ⟨ ⊣⊢ ⟩ on the front panel to enter the Frequency measurement interface. The lower right corner of the screen shows the unit of Frequency, as shown in Diagram 2- 17.

Diagram 2- 19   Frequency Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
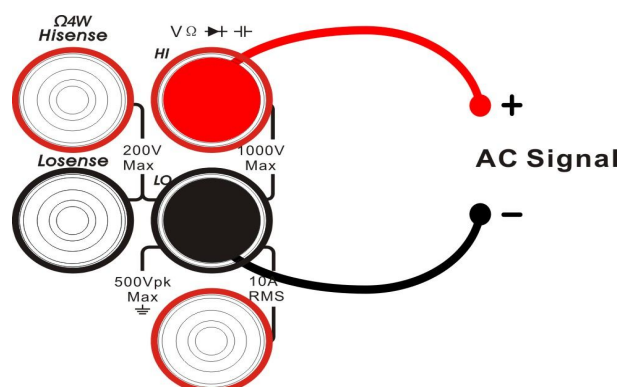
Diagram 2- 20   Sketch Map for Measuring Frequency

3. Choose a proper voltage range according to the measured circuit.

Table 2- 8   Measurement Characteristics of Frequency

Ranges	200mV, 2V, 20V, 200V, 750V
Measurement Range	20Hz ~ 1MHz
Input Protection	750Vrms on all ranges (HI terminal)
Configurable	Rel

4. Set relative value (Optional operation).

Press【Rel】to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

Frequency measurement is fixed at "Slow" rate. Therefore, you can't adjust the reading rate while reading the result.

6. View history data.

There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Measure Period

Operating Steps:

1. Press [Shift] and [⊣⊢] on the front panel and select 【Period】to enter the Period measurement interface. The lower right corner of the screen shows the unit of Period, as shown in Diagram 2- 21.

Diagram 2- 21   Period Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
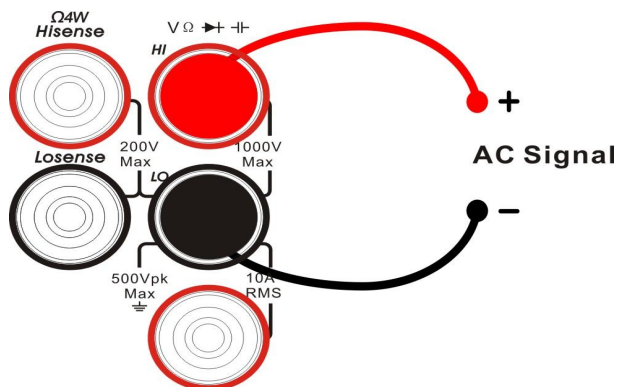
Diagram 2- 22   Sketch Map for Measuring Period

3. Choose a proper voltage range according to the measured circuit.

Table 2- 9   Measurement Characteristics of Period

Ranges	200mV, 2V, 20V, 200V, 750V
Measurement Range	20Hz ~ 1MHz
Input Protection	750Vrms on all ranges (HI terminal)
Configurable	Rel

4. Set relative value (Optional operation).

    Press 【Rel】to open or close Relative math function. When it is open, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

5. Read measurement result.

    Period measurement is fixed at "Slow" rate. Therefore, you can't adjust the reading rate while reading the result.

6. View history data.

    There are four types of way to view historical data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

To Test Continuity

Continuity test uses double leads method to measure the resistance of the measured circuit via about 0.5mA current. When the measured resistance in circuit is lower than the selected one, it is considered being connected with instrument. The method to test Continuity will be introduced in details as the following steps.

Operating Steps:

1. Press (Cont⏀) on the front panel to enter the Continuity test interface, as shown in Diagram 2- 23.
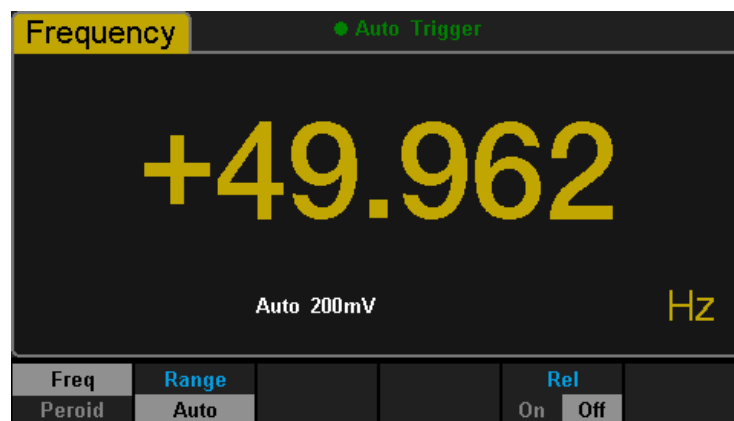

Diagram 2- 23   Continuity Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
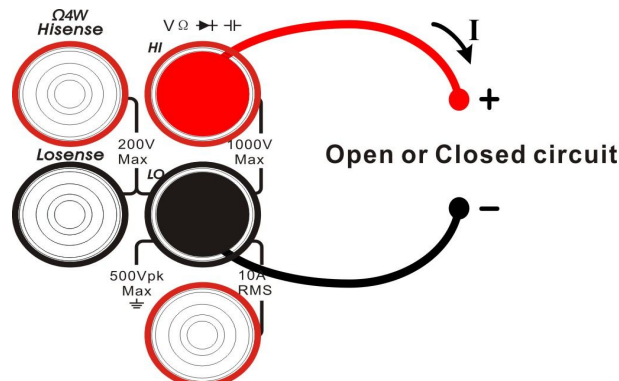

Diagram 2- 24   Sketch Map for Testing Continuity

3. Set the Short-circuit resistance.

The default value is set as 50Ω before leaving factory. The value can be changed by using direction keys. You also can execute the Continuity measurement directly without modification.

Table 2- 10   Measurement Characteristics of Continuity

Test Current	1mA
Ranges*	Fixed at 2kΩ
Open-circuit Voltage	<8V
Input Protection	1000V on all ranges (HI terminal)
Beep Condition	0≤$R_{testing}$≤Short-circuit impedance 1Ω≤Short-circuit impedance≤2kΩ

4. Set the Beeper function.

Press 【Beeper】to turn on or off the Beeper. If the circuit is continuous, the instrument will beep once when the Beeper is turned on.

5. Search for the test point and read measurement result.

NOTE:
Before testing continuity, please cut off the power and discharge all the high-voltage containers to avoid damages to the Multimeter.

To Test Diode

If input voltage is under +0.7V (about 1.4kΩ), the Beeper will beep one time. If input voltage is under 50mV (about 100Ω) the Beeper will beep persistently. The method to test Diode will be introduced in details as the following steps.

Operating Steps:

1. Press **Shift** and **Cont»** on the front panel to enter the Diode test interface, as shown in Diagram 2- 25.
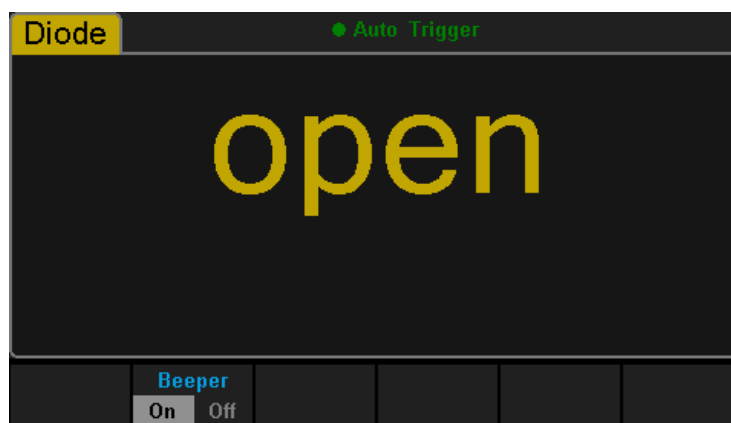
Diagram 2- 25   Diode Test Interface

2. Connect red lead to both terminal Input-HI and anode of the Diode and black lead to both terminal Input-LO and cathode of the Diode as the following diagram.
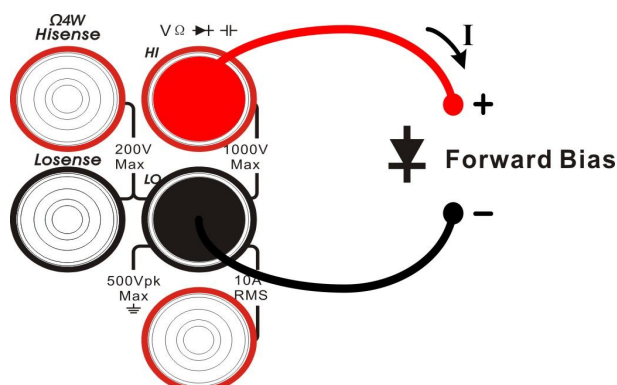
Diagram 2- 26   Sketch Map for testing Diode

3. Set the Beeper function.

    Press 【Beeper】to turn on or off the Beeper. If the circuit is continuous, the nstrument will beep once when the Beeper is turned on.

Table 2- 11   Characteristics of Checking Diodes

Test Current	1mA
Ranges*	Fixed at 2V
Open-circuit Voltage	<8V
Input Protection	1000V (HI terminal)
Beep Condition	0.1V≤V measured≤2.0V

4. Read measurement result.

5. Reverse the probes and measure the voltage in the diode once more. Evaluate the diode according to the following rules:
● If the Multimeter shows "overload" when in reverse bias model, it indicates that the diode is normal.
● If the Multimeter shows voltage about 0V and the instrument beeps persistently when in forward and reverse bias model, it indicates that the diode is short.
● If the Multimeter shows "overload" when in forward and reverse model, it indicates that the diode is open.

Note:
Before testing diode, please cut off the power and discharge all the high-voltage containers to avoid damages to the Multimeter.

To Measure Temperature

The Multimeter supports for two types of temperature sensor: TC and RTD. The method to connect and measure Temperature will be introduced in details as the following steps.

Operating Steps:

1. Press 〔Temp〕 on the front panel to enter the Temperature measurement interface, as shown in Diagram 2- 27.
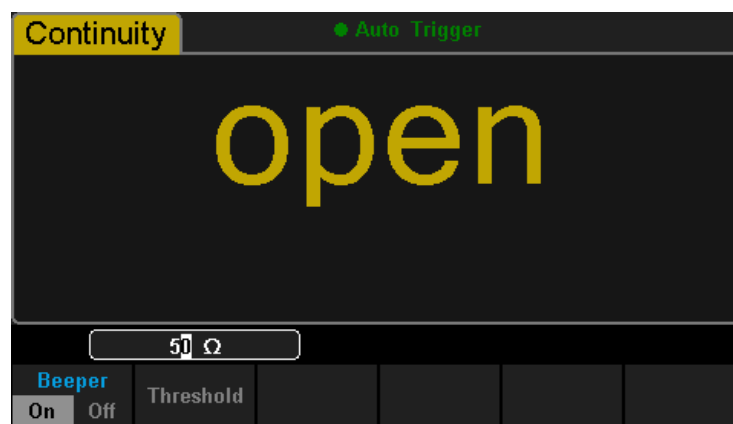

Diagram 2- 27　Temperature Measurement Interface

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as the following diagram.
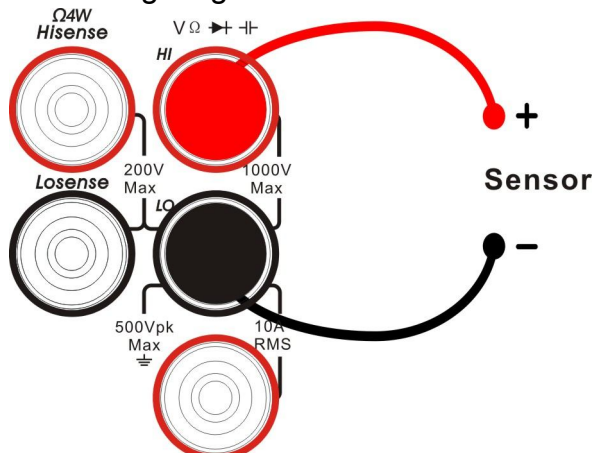

Diagram 2- 28　Sketch Map for Measuring Temperature

3. Press 【Load】and use direction keys to select the required file. Then press 【Read】to recall an existing configuration file.
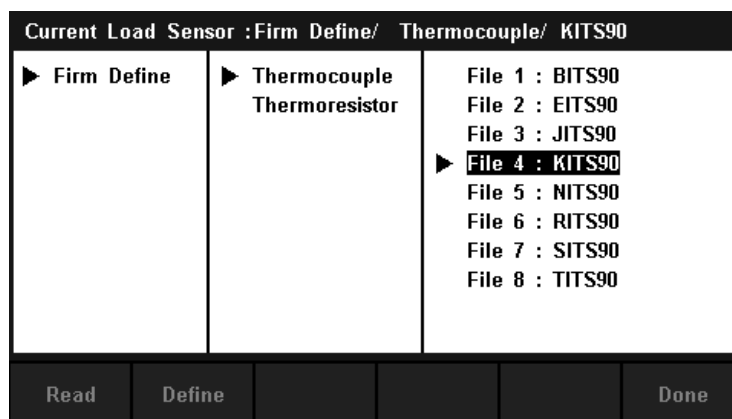
Diagram 2- 29   Load a Configuration File

4. Press 【Define】to view the configuration, as shown in the following diagram:

Diagram 2- 30   Configuration of the Sensor

5. Press【Display】to choose a display mode. The Multimeter supports three display modes: Temperature Value, Measured Value and All.
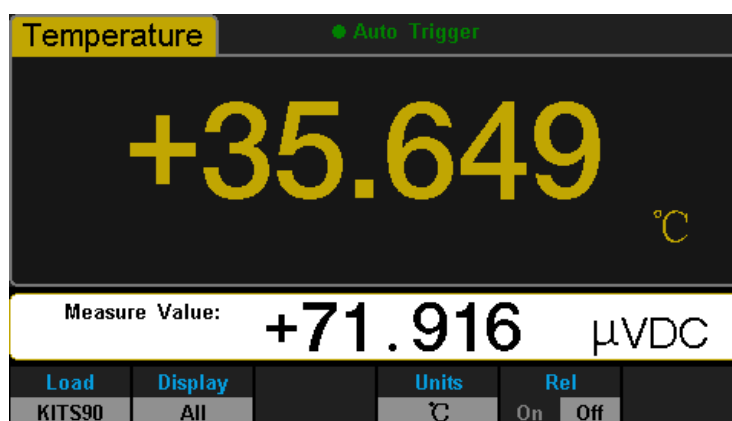
Diagram 2- 31   Choose Display Mode of Temperature Measurement

Press 【All】, the measured value will be shown on the Vice display and the corresponding value will be shown on the Main display at the same time, which is convenient for users to observe temperature and voltage values.
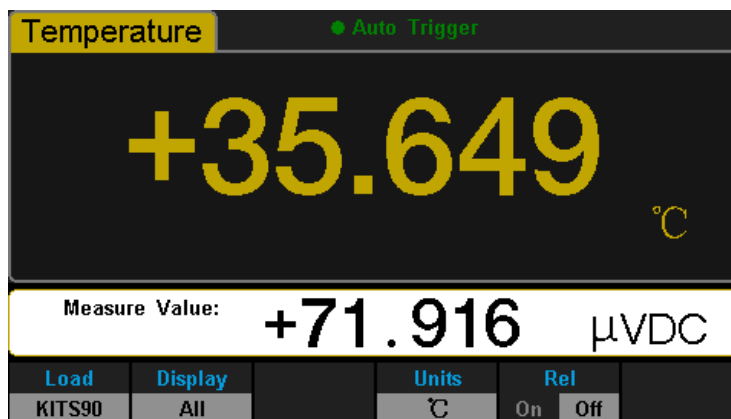
Diagram 2- 32   Show Temperature And Voltage Values

6. Press 【Units】to choose the unit of temperature. The Multimeter supports three units: ° C 、 ° F 、 K.

Diagram 2- 33   Unit Selection Interface

7. Set relative value (Optional operation).

Press 【Rel】 to open or close Relative math function. When it is opened, the reading displayed is a relative value which comes from the result of actual measurement value subtracts the value that has been set. (Please refer to " Math Functions" in Chapter 2 to know about the details.)

Measurement Parameters

The parameters have been configured before the Multimeter leaving factory. Users can either measure directly or modify them to meet your own requirements.

AC Filter

AC Filter is applicable for DC Voltage and DC Current measurement. When DC Voltage or DC Current function is selected, press【Filter】to open the filter, as shown in the following diagram. If AC component existing in inputted DC signal, it can be filtered by AC Filter so as to make the data more exactly.
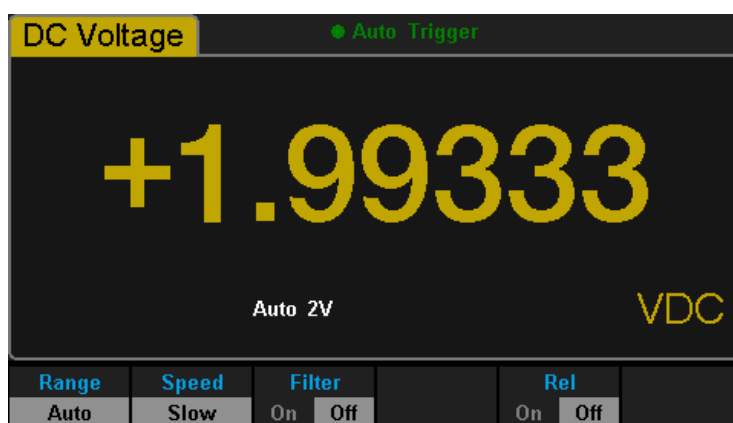
Diagram 2- 34   Turn on or off AC Filter

DC Input Impedance

DC input impedance is only applicable for DC voltage measurement. When DC Voltage function is selected, press【Range】 and select 【200mV】 or 【2V】 to show the menu【Input Z】, as the following diagram shows.
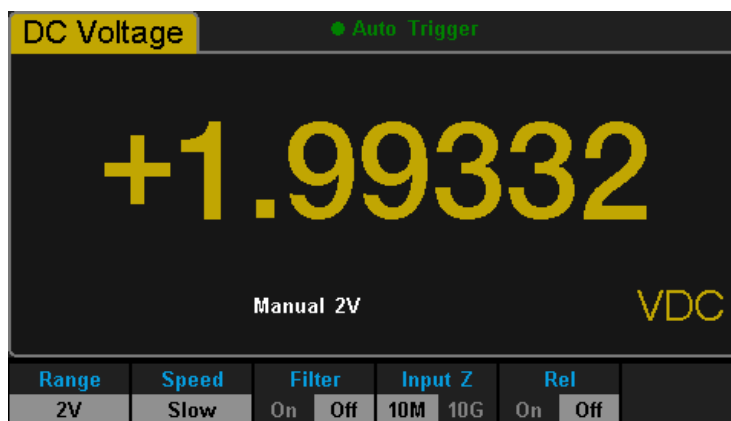
Diagram 2- 35　Choose DC Input Impedance

The options of input impedance for DC voltage measurements are 10MΩ and 10GΩ. 10MΩ impedance is general for the Multimeter, but for 200mV and 2V manual ranges, 10GΩ should be chosen for better result. The current selection will be saved in nonvolatile memory.

DC input impedance selection:
- While the DC input impedance is selected as 10MΩ, the input impedance of all measurement range is 10MΩ;
- While the DC input impedance is selected to 10GΩ, the input impedance for 200mV and 2V measurement range is 10GΩ; for 20V, 200V and 1000V measurement range is kept at 10MΩ.
- The default value of DC input impedance is 10MΩ; settings of DC input impedance are stored in the nonvolatile memory.

Short-circuit Resistance

Set up the short-circuit resistance value in the short-circuit test menu. When the measured resistance is lower than the short-circuit resistance, the circuit is considered as connected, and the beeper sounds (if sound is turned on). The short-circuit resistance is only applicable to the continuity test.

Operating Steps:

1. When Continuity function is selected, press【Threshold】to enter interface as the following diagram.

Diagram 2- 36   Set Up the Short-circuit Resistance

2. Use direction keys to change the parameter values.

    Press left and right directional keys to choose different digits. Each press for the Left key, former number will be selected, vice versa. Press up and down keys to change the current digit value. Each press for the up key, value will be increased 1, vice versa.

> **Short-circuit Resistance:**
> ● The range of short-circuit resistance is 0Ω~2000Ω. The default value is 50Ω.
> ● The value of short-circuit resistance is stored in the nonvolatile memory and the resistance remains unchanged after the power is off.

Dual-display Function

Dual-display function is used to improve test and measurement functions. Press ⬭Dual to open Dual-display function and the upper right corner will show "Dual". By this time, press a function key if this function can be used as the vice display, it will be displayed in the Vice Display. The Main Display will display the function that is selected before the Dual-display function is turned on. All the available combinations are listed in table 2-12.

Table 2- 12 Available Main/Vice Function Combinations (shade is available)

		Main Display Function								
		DCV	DCI	ACV	ACI	FREQ	PERIOD	2-Wire R	4-Wire R	Cap
Vice Display Function	DCV	▓	▓	▓	▓					
	DCI	▓	▓	▓	▓					
	ACV	▓	▓	▓	▓	▓	▓			
	ACI	▓	▓	▓	▓					
	FREQ			▓	▓	▓	▓			
	PERIOD			▓	▓	▓	▓			
	2-Wire R							▓		
	4-Wire R								▓	
	Cap									▓

Explanations:

1. If the same measurement function is used in both Main and Vice Display.
● The readings in both of the display will update at the same time.
● If math function (dBm, dB) is used in Main Display, when opening Vice Display, math operation will be closed automatically and Vice Display will show the same measurement result as Main Display.
● If math function (Statistics, Limits, Relative) is used in Main Display, when opening Vice Display, the result will still be shown in Main Display and Vice Display will show the same measurement result as Main Display.

2. If different measurement functions are used in both Main and Vice Display.
● The readings in both of the display will update alternately.
● If math function (dBm, dB) is used in Main Display, when opening Vice Display, math operation will be closed automatically and Vice Display will show the second selected function normally.
● If math function (Statistics, Limits, Relative) is used in Main Display, when opening Vice Display, the result will still be shown in Main Display and Vice Display will show the second selected function normally.

3. If Temperature function is used in Main Display, set the display mode (⬛Temp → 【Display】→【All】). Then the result (corresponding value) will be shown in Main Display and the current measurement value is shown in Vice Display.

4. Auto Range is adopted by Vice Display. If the same measurement function is used in both the display, so does the range.

5. Measured data in Vice Display cannot be saved into "History".

Utility Function

The Utility function enables users to set up system parameters, interface parameters of the multimeters.

Press ⬤Shift and ⬤Dual to enter the operating menu of Utility function, as the following diagram shows.
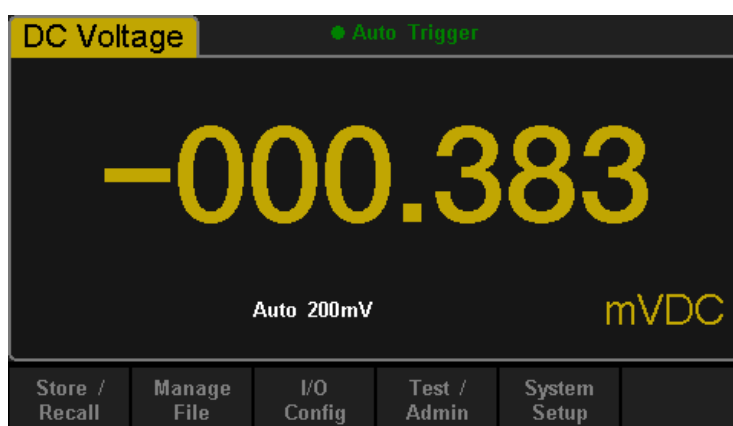
Diagram 2- 37   Utility Function Configuration Interface

Table 2- 13   Utility Function Menu Description

Function Menu	Description
Store/Recall	Store or recall setting files.
Manage File	Create a new file, copy, rename or delete a file.
I/O Config	Set up LAN and GPIB parameters.
Test/Admin	Provide board test and firmware update function.
System Setup	Set up system information configuration.

Store and Recall

The Store/Recall function enables users to store and recall the instrument parameters and data files in the local storage as well as in USB storage.

Operating Steps:

1. After entering into the function menu of Utility, press 【Store/Recall】 to enter the interface as shown in diagram 2-38.
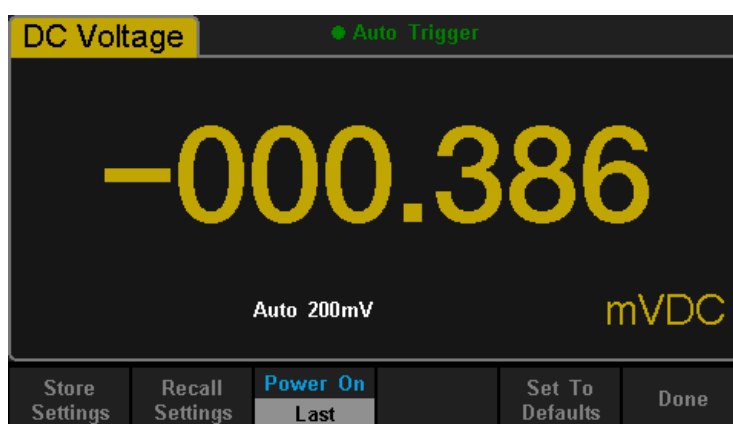
Diagram 2- 38　Store and Recall Interface

2. Press【Store Settings】to enter the following interface.
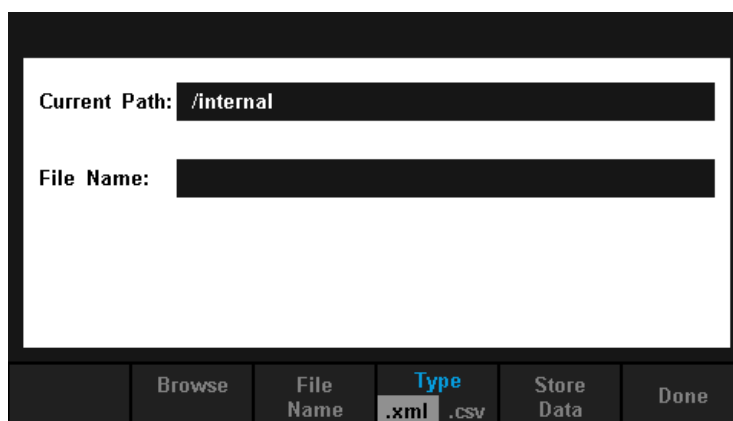
Diagram 2- 39　Store Settings Interface

Table 2- 14   Storage Function Menu Description

Function Menu	Settings	Description
Browse		Choose the location that file will be saved.
File Name		Input a file name.
Type	.xml / .csv	Choose the type that the file is saved.
Store MS Data		Save the file as input file name to the current selected location.
Done		Save all changes and return to the higher level menu.

3. Press【Recall Settings】to enter the following interface. Use direction keys to choose storage path and location, and press【Select】to recall the corresponding file.

Diagram 2- 40   Recall Function Interface

4. Press【Power on】to set the Power On state of the instrument.
● You can choose【Last】or【Factory Default】as the initial state when the instrument is turned on.
● The configuration is effective when you restart the Multimeter.
● DC Voltage is always the selected function when the instrument is turned on even if you have selected【Last】or 【Factory Default】as the Power On state.

5. Press【Set to Defaults】to select "Factory Default" as the Power On state.

Manage File

The Manage File function enables users to create a new folder and save, copy, rename or delete files in the local storage as well as in USB storage.

Operating Steps:

1. After entering into the function menu of Utility, press【Manage File】to enter the interface as shown in diagram 2-41.
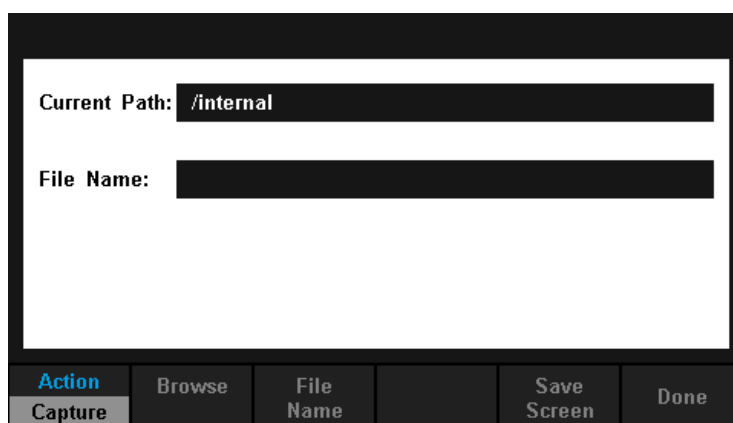
Diagram 2- 41　Manage File Interface

2. Choose the file location.
   Press【Browse】and use direction keys to select the corresponding file.

3. Press【File Name】to enter the following interface.

Diagram 2- 42 Input File Name

The method of inputting file name:

- Press direction keys to select a desired char in the input area.
- Press "OK" key on the front panel to input selected char in the input area.
- Press【Clear All】to clear all input chars.
- Press【Delete Char】to delete the letter on which the cursor taking place.
- Press【Previous Char】to move the cursor in the file name area to the previous char.
- Press【Next Char】to move the cursor in the file name area to the next char.
- Press【Done】to save the current file and return to the higher level menu.
- Press【Cancel】to cancel the current operation and return to the higher level menu.

4. Press【Action】and select【Folder】,【Capture Display】,【Copy】,【Rename】or【Delete】to do the corresponding operation.

Table 2- 15　Action Settings

Function Menu	Description
Folder	Press【Create Folder】to create a new folder.
Capture Display	Press【Save Screen】to save current captured screen picture as standard BMP format.
Copy	Press【Perform Copy】to copy the selected file.
Rename	Press【Perform Rename】to rename the selected file.
Delete	Press【Perform Delete】to delete the selected file.
Done	Save all changes and return to the higher level menu.

I/O Configuration

Press【I/O Config】to enter the following interface and set up the parameters.

Diagram 2- 43   I/O Configuration Interface

LAN Settings

The Multimeter enables users to operate instrument remotely by LAN interface and store or recall internet settings. You can look over current LAN settings and set up IP address and subnet mask.

After entering into the function menu of Utility, press 【I/O Config】. Select【On】→【LAN Settings】→【Modify Settings】to enter the following interface.
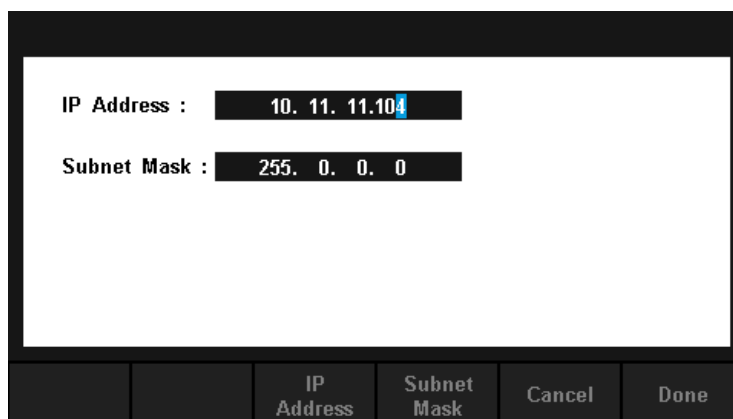
Diagram 2- 44   LAN Settings Interface

Table 2- 16   LAN Settings

Function Menu	Description
IP Address	Set up IP address and the default setting is $10.11.11.104$.
Subnet Mask	Set up subnet mask and the default setting is $255.0.0.0$.
Cancel	Cancel current operation and return to the higher level menu.
Done	Save all changes and return to the higher level menu.

GPIB Settings (Only for SDM3055A)

Each device on the GPIB (IEEE–488) interface must have a unique address. The default address is 30 when the instrument is leaving the factory. The address of Multimeter can be any integral value between 1 and 30.

Operating Steps:

1. After entering into the function menu of I/O configuration, press 【GPIB Settings】to enter the interface shown in diagram 2-45.
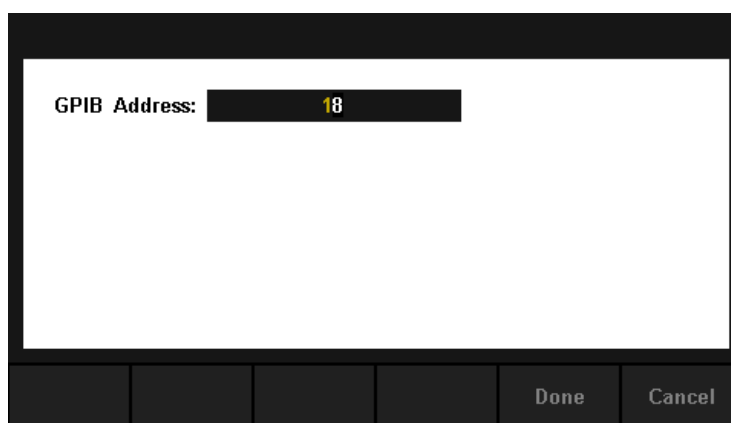
Diagram 2- 45   GPIB Settings

2. Users can change the value of GPIB address by direction keys.

3. Press【Select】to set the input value as GPIB address and return to the higher level menu.

Board Test

SDM3055 provides self-test functions, including Key Test, LCD Test, Beeper Test and Chip Test.

Operating Steps:

1. Press (Shift) and (Dual) , then choose【Test/Admin】→【Board Test】 to enter the following interface.
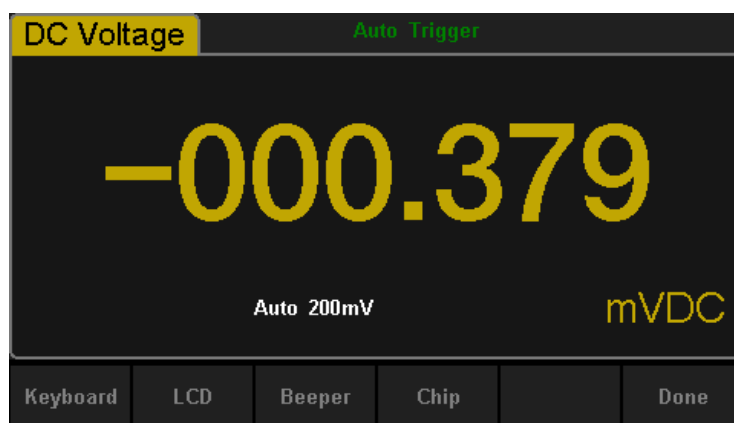
Diagram 2- 46   Board Test Interface

Table 2- 17   Board Test Function Description

Function Menu	Description
Key	Test the instrument's keys.
LCD	Test the instrument's LCD screen.
Beeper	Test the instrument's beeper.
Chip	Test the instrument's chips.
Done	Return the higher level menu.

2. Test the keys.

Select【Key】to enter the key test interface, as the Diagram 2-47 shows. The on-screen lathy rectangle shapes represent the keys on the front panel. Test all keys and knobs and you should also verify that all the backlit buttons illuminate correctly.
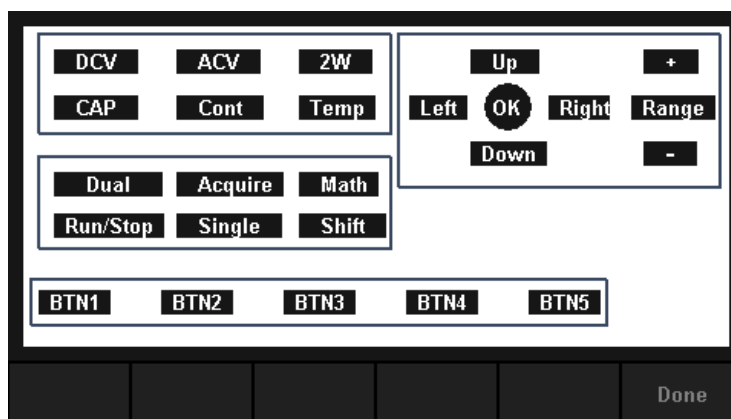
Diagram 2- 47 Key Test Interface

NOTE:
- Before you operate, the shapes on the screen display blue color.
- The corresponding area of tested buttons or knobs would display green color.
- Press【Done】to exit the test.

3. Test the LCD screen.

Select【LCD】to enter the screen test interface, the screen shows the message:" Press 'Change' to change Press 'Done' to exit". Press【Change】to start the test and observe if the screen has severe color or other display error. As the Diagram 2-48 shows.

Diagram 2- 48   LCD Test Interface

NOTE:
- Press【Change】to change the color of the screen. There are three colors: red, blue and green.
- Press【Done】to exit the test.

4. Test the beeper.

Press 【Beeper】to test the beeper. Under regular circumstance, press 【Beeper】 one time and the instrument will beep one time.

5. Test the chips.

Press【Chip】→【Start】to enter chip test interface, as Diagram 2-49 shows.

1	CPLD	is	pass
2	ADC	is	pass
3	TEMP	is	pass
4	NET_FACE	is	pass
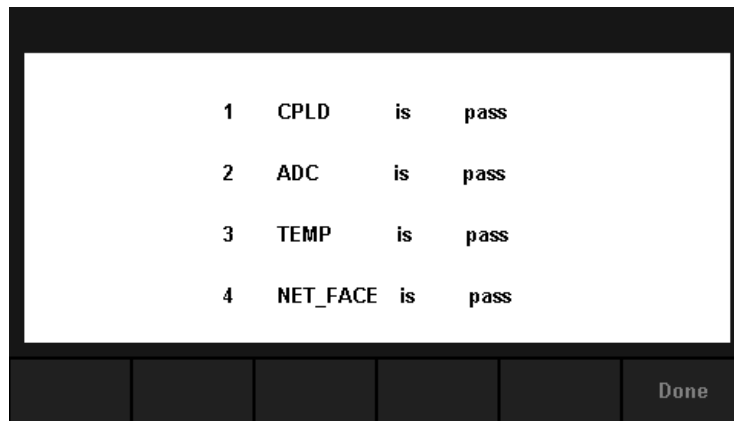
Done

Diagram 2- 49   Chip Test Interface

NOTE:
- If the test is passed, the corresponding result shows "pass".
- If the test is failed, the corresponding result shows "fail".

6. Press【Done】to exit the board test.

Firmware Update

The software of the Multimeter can be updated directly via USB flash drive, updating current software version to desired software version.

Operating Steps:

1. Copy the update file to the USB flash drive.

2. Insert USB flash drive to USB host interface on the front panel of the Multimeter.

3. Press 〔Shift〕 → 〔Dual〕→【Test/Admin】→【Firmware Update】, then press 【Browse】 and select the update file. Next, press 【Update】 → 【Yes】 to start updating the system software.

4. After accomplishing update, the screen shows message: " Firmware Update Done!" Then you can move the USB flash drive away.

5. Restart the Multimeter and check the version information.
    Press 〔Shift〕 → 〔Dual〕 → 【System Setup】 → 【System Info】 to check if the software and hardware version after updating is in accordance with the desired version. If not, the updating is failed and you need update once more as the above steps.

6. After checking, press 【Done】 to exit the system information interface.

> **NOTE**:
>   Don't cut off the power during the instrument is updating

System Setup

Press 【Shift】 and 【Dual】, then select【System Setup】to enter the following interface.

Diagram 2- 51   System Setup Interface

Table 2- 18   System Settings Menu Description

Function Menu	Description
Language	Select the display interface language.
Screen	Set up the screen protection function.
System Info	View system information.
Done	Return to the higher level menu.

1. Select language.

The Multimeter supports two kinds of languages, English and Chinese. Press 【Language】 to enter the following interface.

Diagram 2- 52 Choose Language

2. Set up the time of screen protection.

Press【Screen】to set screen protection as 1 Min, 5 Mins, 15 Mins, 30 Mins, 1 Hour, 2 Hours or 5 Hours according to different demands. Activate the screen saver program and screen saver will be on if no action is taken within the time that you have selected. Press any button the resume.

3. View system information.

Press【System Info】to view system information, including startup times, software version, hardware version, production ID and serial number, as shown in the following diagram.

```
System Information :

    Start-up  Times :       1

    SW Version  ID :        01.01.01.06.0806

    HW Version  ID :        02-00-00-11-00

    Production    ID :      SDM 305x

    Serial Number  :        0123456789


                                                    Done
```
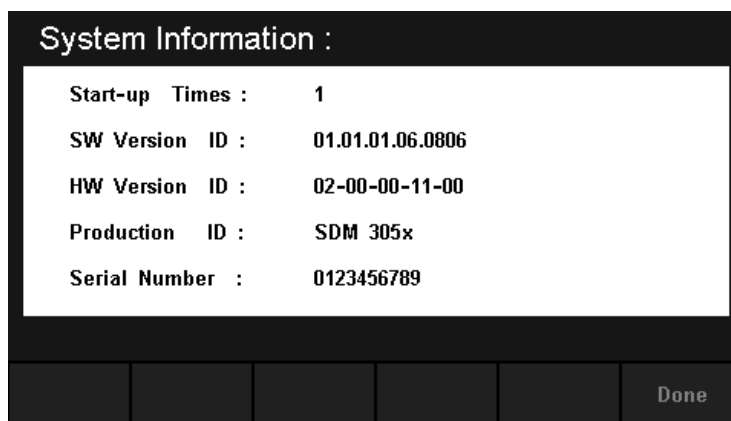
Diagram 2- 53   System Information

Acquire

Sampling is a process of acquiring and digitizing signal. The optional Trigger methods of the Multimeter include Auto Trigger, Single Trigger and External Trigger.

Press Acquire to enter the interface shown as the following diagram:
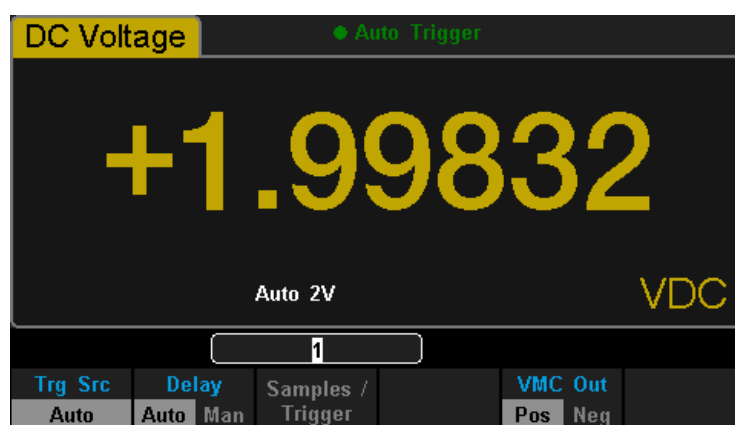
Diagram 2- 52 Acquire Interface

Table 2- 19   Function Menu of triggering parameter

Function Menu	Description
Trg Src	Set the source of trigger.
Slope	Set the slope polarity of external trigger.
Delay	Set the delay.
Samples/Trigger	Set the number of samples or trigger.
VMC Out	Set the polarity of output pulse signal when sampling signal is finished.

Auto Trigger

Auto Trigger parameters that need to be set up include delay, samples/ trigger and VMC out.

Operating Steps:

1. Press [Acquire], then select 【Trg Src】→【Auto】or press [Run Stop] on the front panel directly to enable Auto Trigger.

2. Set the delay.
   Delay is the waiting time after the trigger signal is sent out and before the auquiring starts. Press 【Delay】to select Auto or Manual mode. When choosing Manual mode，Left and Right keys are used to switch the number of a numerical value, Up and Down keys are used to change the selected value.

3. Set the number of samples or trigger.
   Press 【Samples/Trigger】to set the sample count. Left and Right keys are used to switch the number of a numerical value, Up and Down keys are used to change the selected value.

Sample Count
- Sample Count indicates the count of point sampled while the Multimeter getting a signal of Single Trigger.
- The range of sampling point should be between 1 and 599999999.
- The default value of Sample Count is 1.

---

4. Set the VMC Out.
   Press 【VMC Out】to choose Positive or Negative polarity.

Single Trigger

Single Trigger parameters that need to be set up include delay, samples /trigger and VMC out.

Operating Steps:

1. Press ⬤Acquire, then select 【Trg Src】→【Single】or press ⬤Single on the front panel directly to enable Single Trigger. See the diagram below.
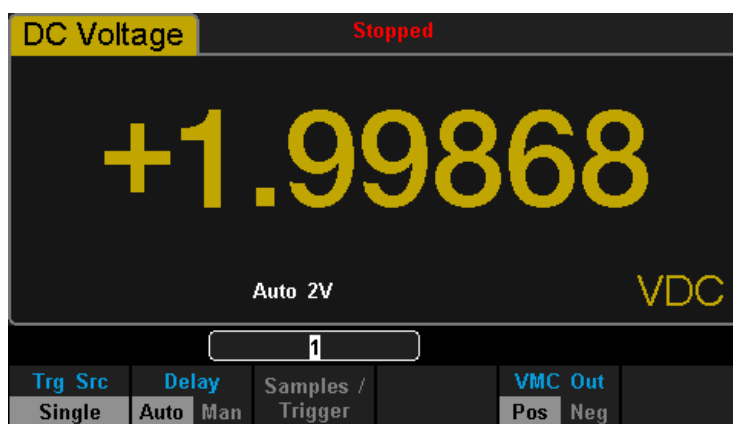
Diagram 2- 53   Setting interface of Auto Trigger

2. Set the delay.
   Press 【Delay】to select Auto or Manual mode.

3. Set the number of samples or trigger.
   Press 【Samples/Trigger】to set sample count.

4. Set the VMC Out.
   Press 【VMC Out】to choose Positive or Negative polarity.

External Trigger

The external trigger signal will be input via EXT TRIG interface on the rear panel. External trigger parameters that need to be set up include delay, samples /trigger, slope and VMC out.

Operating Steps:

1. Press 〔Acquire〕, then select 【Trg Src】→【Ext】or press 〔Single〕 on the front panel directly to enable External Trigger.
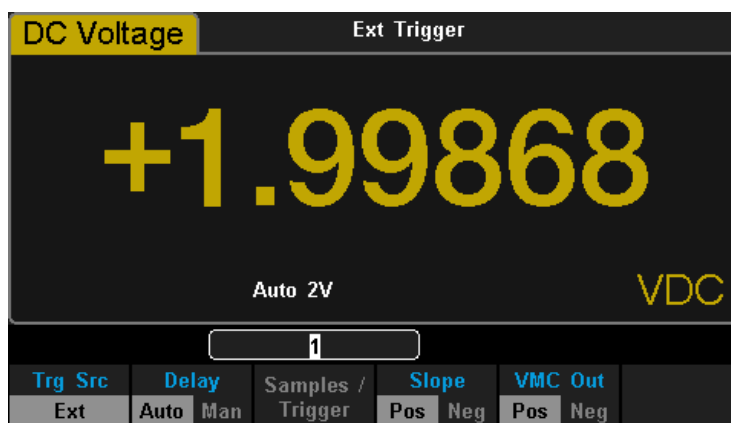
Diagram 2- 54   Setting interface of Ext Trigger

2. Set the polarity of slope.
   Press 【Slope】to choose Positive or Negative polarity.

3. Set the delay.
   Press 【Delay】to choose Auto or Manual mode.

4. Set the number of samples or trigger.
   Press 【Samples/Trigger】to set sample count.

5. Set the VMC Out.
   In External Trigger mode, the Multimeter could output a pulse signal through the VM COMP interface on the rear panel after sampling signal is finished.

Help System

SDM3055 provides powerful built-in help system. You can recall help information at any time during using the instrument. You also can get a particularly help for every button on the front panel or menu softkey by using the built-in help system. Or you can get help about familiar operations with the help list.

Press (Shift) and (Acquire) to enter the help list, as the following diagram shows.
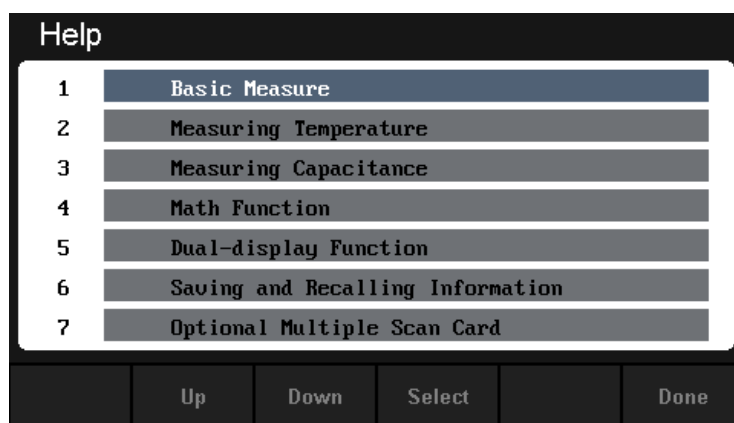
Diagram 2- 55   Help Menu

Table 2- 20   Help System Operating Menu

Function Menu	Description
Up	Move up the cursor and select the help menu.
Down	Move down the cursor and select the help menu.
Select	Select the help information you want and read it.
Done	Return to the higher menu.

1.   Basic Measure.

Get basic measurement types and methods to connect the leads in different measurements.

2.   Measuring Temperature.

Get the method to measure temperature.

3.   Measuring Capacitance.

Get the method to measure temperature.

4.   Math Function.

Introduce how to use the math function while you are measuring.

5.   Dual-display Function.

Get the method to use the dual-display function while you are measuring.

6.   Saving and Recalling Information.

Introduce how to store and recall the data/parameter/ sensors files.

7.   Optional Multiple Scan Card.

Get help about operating optional multiple scan cards.

8.   The convention and Tips of Softkeys.

Get help about the convention and tips of softkeys.

9.   Technical Support.

Get the method to obtain technical support.

Explanation:
- In the help menu interface, you also can move cursor and select the corresponding menu by up and down direction keys and press "OK" to read the help information.
- While reading help information, you also can look up and down the information by up and down direction keys.

Math Function

The Multimeter provides five math functions: Statistics, Limits, dBm, dB and Relative. Choose different math functions to meet different measurement demands. Math functions can only be used in DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Period and Temperature measurement. Among these functions, dBm and dB are only used in DC Voltage and AC Voltage measurement.

Press Math to show the operating menu of math functions on the screen, as shown in the following diagram.
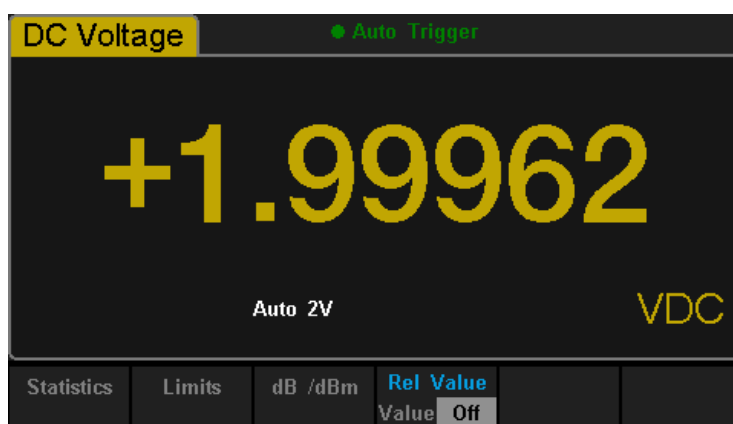
Diagram 2- 56   Math Function Menu of DC Voltage

Diagram 2- 57   Math Function Menu of AC Current

Table 2- 21   Math Function Menu Description

Function Menu	Settings	Description
Statistics		Reading statistic functions, including: max, min, average, span, std dev and samples.
Limits		The Limits function performs Pass/Fail testing according to the specified upper and lower limits.
dBm		The dBm is based on a calculation of power delivered to a reference resistance, 0dBm = 1mW.
dB		The dB measurement is the difference between the input signal and a stored relative value.
Rel Value	Value/Off	Turn on the relative value function and set up the value. Or turn off the function.

Explanations:
- Math function can only be applicable to the main display.
- If measurement function is changed, all math functions will be closed except Statistics.

Statistics

There are many kinds of reading statistic functions, including: Max, Min, Average, Standard deviation and so on. The Statistic function is available for DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency，Period, Capacitance and Temperature measurement.

Press 【Math】 → 【Statistics】 → 【Show】 to enter the interface shown in the following diagram.
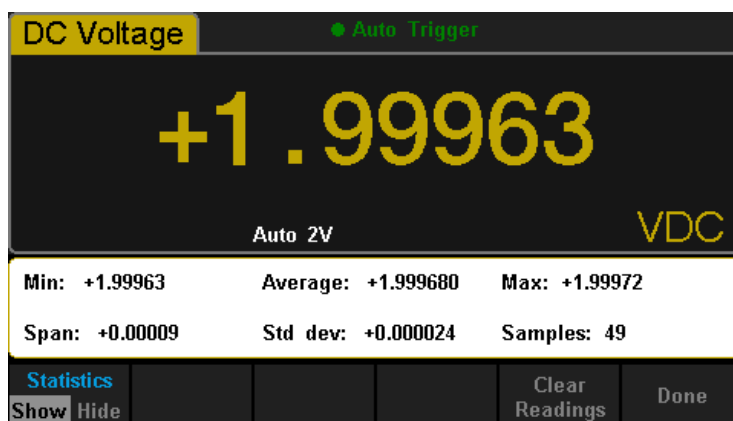
Diagram 2- 58   Statistics

Table 2- 22   Statistic Measurement Menu Function Description

Function Menu	Settings	Description
Statistics	Show/Hide	Show or hide the statistics function interface.
Min		Show the minimum statistics value of current measurement.
Average		Show the average statistics value of current measurement.
Max		Show the maximum statistics value of current measurement.
Span		Show the span of current measurement.
Std dev		Show the std dev statistics value of current measurement.
Samples		Show the maximum statistics value of current measurement.
Clear Readings		Clear all current readings and restart statistics.
Done		Return to the higher level menu.

Statistics Function:
- In statistic function, the first reading is usually set to the maximum or minimum value. When getting more readings, current displaying value is always the maximum/minimum reading among all the measured values.
- The maximum, minimum, average and reading quantities are stored in volatile memory.

Limits

Limits function is available to prompt signals beyond ranges according to the upper and lower parameters. Following are some measurement functions which are able to do limit operation: DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Period, Capacitance and Temperature.

Press Math →【Limits】→【On】 to enter the interface shown in the following diagram.
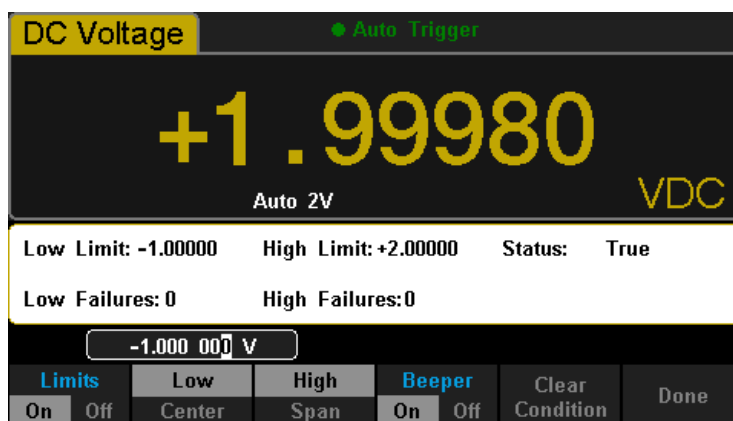
Diagram 2- 59   Limits

Table 2- 23 Limits Measurement Menu Function Description

Function Menu	Settings	Description
Limits	On/Off	Turn on or turn off the Limits function.
Low		Set the desired lower limit.
Center		Set the desired center value
High		Set the desired upper limit.
Status		Show the status of limit test.
Low Failures		Show the times that reading is lower than the limit.
High Failures		Show the times that reading is higher than the limit.
Span		Set the desired span.
Beeper	On/Off	When the beeper is on, if the reading is lower or higher than limits, the instrument will beep once.
Clear Condition		Clear all current readings and restart to test.
Done		Save all changes and return to the higher level menu.

1. How to Set Limits

Select 【High】,【Low】,【Center】or【Span】 and then switch to the needed digit by Left or Right Direction keys and input numerical value by Up and Down Direction keys.

2. Unit

The unit of Limits is decided by the current measurement function.

3. Over hint

- When the reading is lower than the set lower limit, the color of main display will switch blue to red.
- When the reading is higher than the set higher limit, the color of main display will switch blue to red.
- When the reading is lower or higher than the set limits, the Beeper will beep once. (The beeper is turned on.)

The range of Limits function:
- The Limits range is -120% ~ +120% of the current measurement range.
- The upper limit value should be always bigger than the lower limit value.
- The upper and lower values are stored in volatile memory. They will be set to default values when the power is on.

dBm

The dBm function is logarithmic and based on a calculation of power delivered to a reference resistance, relative to 1 mill watt. Besides，this function only applies to AC voltage and DC voltage measurements.

Press 〔Math〕 → 【dB/dBm】 → 【On】 and select 【Function dBm】 to enter the interface shown in the following diagram.
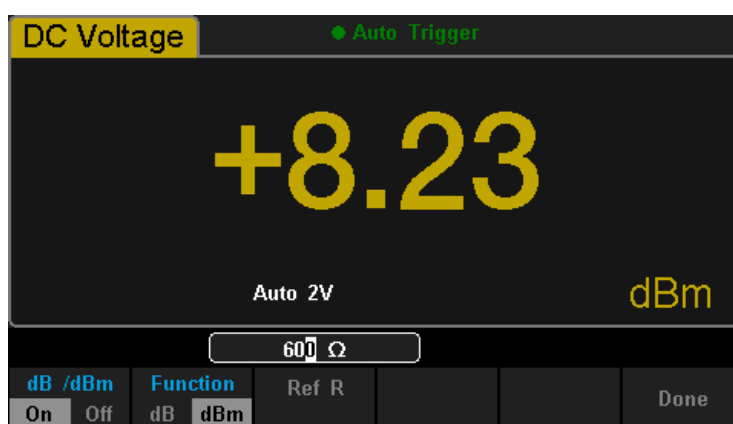
Diagram 2- 60   dBm Function Interface

Table 2- 24   dB Measurement Function Menu Function Description

Function Menu	Settings	Description
dB/dBm	On/Off	Turn on or turn off dB or dBm function.
Function dBm		Open dBm function and the lower right corner of the main display show "dBm".
Ref R		Set the parameter via direction keys: 50Ω ~ 8000Ω.
Done		Save all changes and return to the higher level menu.

The computation method of the dBm:

When dBm function is turned on, the measured value of voltage is transformed into dBm according to the following formula.

dBm = 10 x Log$_{10}$ [(Reading^2 / R$_{REF}$) / 0.001W]

dB

Each dB measurement is different between the input signal and a stored relative value, with both values converted to dBm. The dB function applies to AC voltage and DC voltage measurements only.

Press ⬜Math → 【dB/dBm On】and select【Function dB】to enter the interface shown in the following diagram.
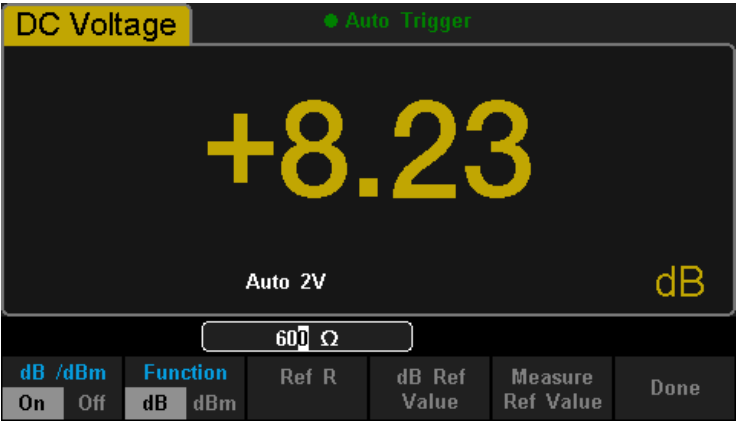
Diagram 2- 61   dB Function Interface

Table 2- 25   dB Measurement Function Menu Function Description

Function Menu	Settings	Description
dB/dBm	On/Off	Turn on or turn off dB or dBm function.
Function dB		Open dB function and the lower right corner of the main display show "dB".
Ref R		Set the parameter via direction keys: 50Ω ~ 8000Ω.
dB Ref Value		Set the referred value of dB.
Measure Ref Value		Set the referred value of measurement.
Done		Save all changes and return to the higher level menu.

The computation method of the dB:
dB = 10 x Log$_{10}$ [(Reading^2 / R$_{REF}$) / 0.001W] – (dB setting value)
R$_{REF}$ expressed measuring the resistance value in the actual electric circuit.
Range of the dB setting value: -120 dBm ~ +120 dBm. The default is 0 dBm.

dB value:
- Input a value in dB setting interface by direction button, and then store it as dB setting value.
- Settings of dB value are stored in volatile memory.

Relative Value

Relative value is used for relative measurement. Actual measurement reading is the depression between measurement value and preset value.

The Multimeter allows operating for the following parameters: DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Period, Capacitance and Temperature.

Press 〖Math〗 → 【Rel Value】 to enter the interface shown in the following diagram.

Diagram 2- 62   Relative Operation

Table 2- 26   Rel Value Operation Function Menu

Function Menu	Description
Value	Select current measurement value as preset value.
Off	Turn off the relative operation function.

The computation method of the dB:

When dBm function is turned on, the result of relative measurement will show on the screen.

Main display = Measurement value – Preset value

Display Mode

The Multimeter supports four types of way to view measured data: "Number", "Bar Meter" "Trend Chart" and "Histogram".

Number

Press ⬤ Shift and ⬤ Math to open the menu of display mode and press【Display】 to enter the following interface. "Number" is always the selected mode when the Multimeter is turned on.
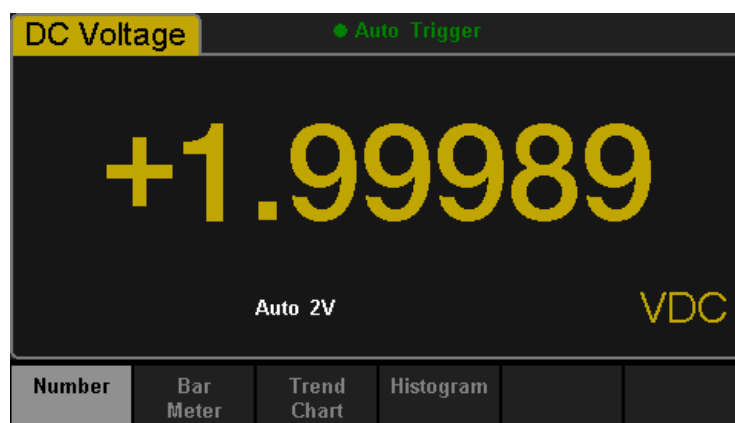
Diagram 2- 63   Number Display Mode

Bar Meter

Operating Steps:

1. Press【Bar Meter】to enter Bar Meter display mode.
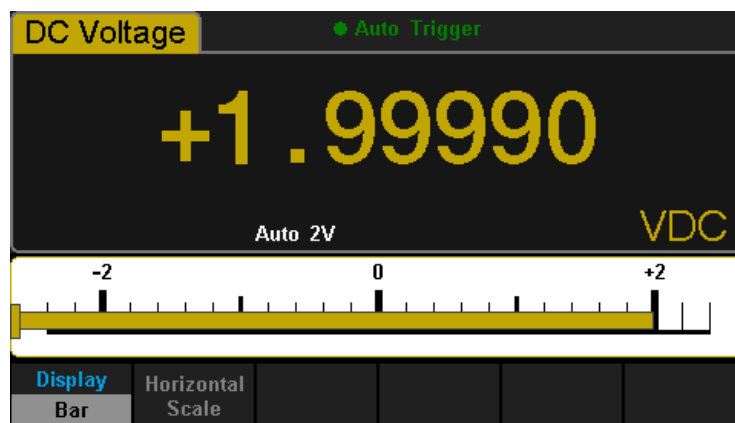
Diagram 2- 64　Bar Meter Display Mode

2. Press【Horizontal Scale】to choose the way to set the vertical scale as Default or Manual mode.

Table 2- 27　To Set the Vertical Scale of Bar Meter manually

Function Menu	Description
Low	Set the low value of horizontal scale.
High	Set the high value of horizontal scale.
Center	Set the center value of horizontal scale.
Span	Set the span of horizontal scale.
Done	Save all changes and return to the higher level menu.

Trend Chart

Operating Steps:

1. Press【Trend Chart】to enter Trend Chart display mode. The default vertical scale is -2V to 2V when DC Voltage measurement is selected.
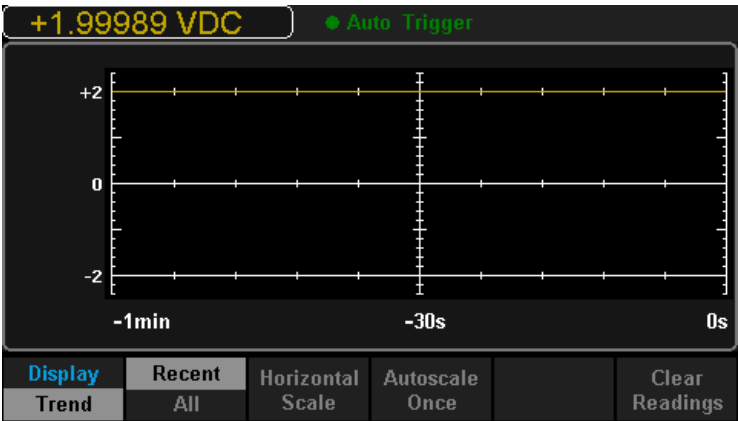
Diagram 2- 65   Trend Chart Display Mode

Table 2- 28   Trend Chart Display Mode

Function Menu	Description
Display Trend	Currently selected display mode is Trend Chart.
Recent All	Show recent or all readings.
Horizontal Scale	Choose the mode of Horizontal Scale.
Autoscale Once	Automatically set the horizontal scale once.
Clear Readings	Clear all current readings and restart statistics.

2. Press【Horizontal Scale】to choose the way to set the horizontal scale as Default , Auto or Manual mode.
   Press【Auto】and the Multimeter will set the vertical scale automatically.
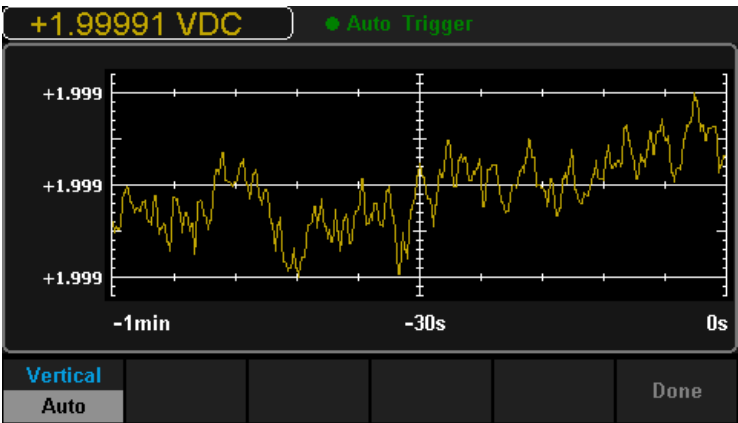
Diagram 2- 66   Auto Vertical Scale

Press【Manual】and you can set the vertical scale manually, as the following diagram shows.
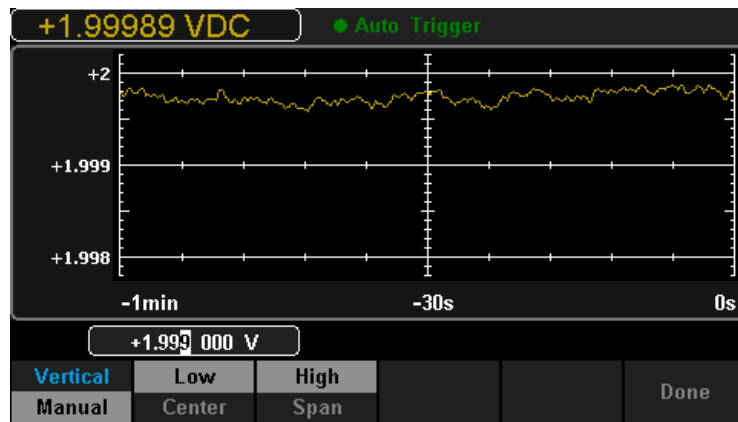
Diagram 2- 67   Manual Vertical Scale

Histogram

Operating Steps:

1. Press【Histogram】to enter Histogram display mode.
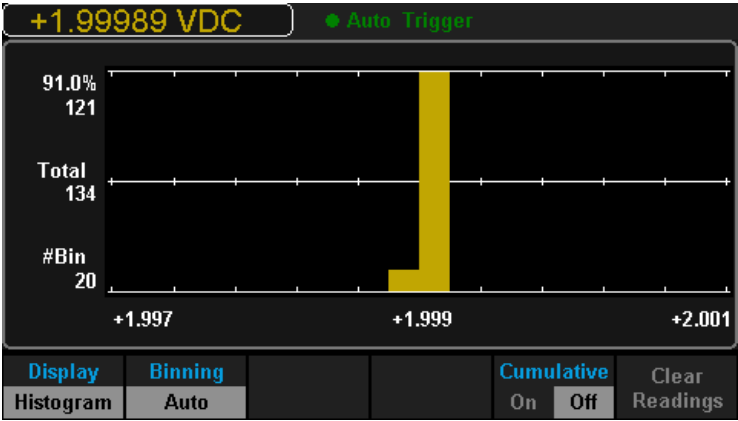
Diagram 2- 68　Histogram Display Mode

Table 2- 29　Histogram Display Mode

Function Menu	Settings	Description
Display Histogram		Currently selected display mode is Histogram.
Binning		Set Binning as Auto or Manual mode.
Bin Set		Set the parameters of Bin.
Cumulative	On/Off	Turn on or off Cumulative function.
Clear Readings		Clear all current readings and restart statistics.

2. Press【Binning】to choose the way to set Binning as Auto or Manual mode. When in Manual mode, press【Bin Settings】to enter the following interface.
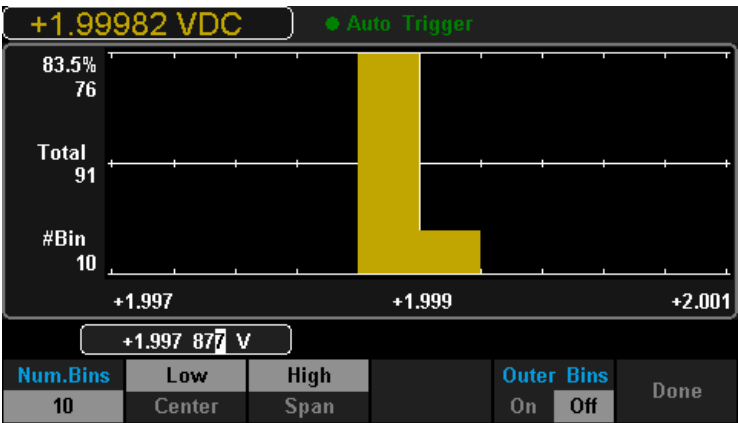
Diagram 2- 69　Bin Set Interface

Table 2- 30   Bin Set

Function Menu	Settings	Description
Num.Bins		Set the number of Bins, 10, 20, 40, 100, 200 or 400 selected.
Low		Set the low value of horizontal scale.
High		Set the high value of horizontal scale.
Center		Set the center value of horizontal scale.
Span		Set the span of horizontal scale.
Outer Bins	On/Off	Show the bins beyond the scope or not.
Done		Save all changes and return to the higher level menu.

Trigger

The Multimeter supports Trigger function. Press [Run/Stop] or [Single] on the front panel to trigger the Multimeter by Auto or Single mode .Auto trigger is considered as a default when the power is on.

Auto Trigger

Press [Run/Stop] on the front panel one time and Auto Trigger will be started to capture continuous readings automatically. By the time, the black field of the screen will show "·Auto Trigger". Press again and the trigger is stopped.

Single Trigger

Press [Single] on the front panel, Single Trigger will be started one time and generate an effective reading. By the time, the black field of the screen will show "·Single Trigger".

Explanation：
In Remote Mode, the black field just above the screen will show "·Immediate Trigger". Press [Shift] to switch back to the local mode and the Multimeter will choose Auto Trigger automatically.

Hold Measurement Function

Hold Measurement function provides users with a stable reading on the screen of the front panel. When the test leads are put away, the reading is still held on the screen, which makes users can view measured history data.

Press (Shift) and (Single) to open Hold measurement function interface, the black field just above the screen will show " • Probe Hold", as shown in the following diagram.
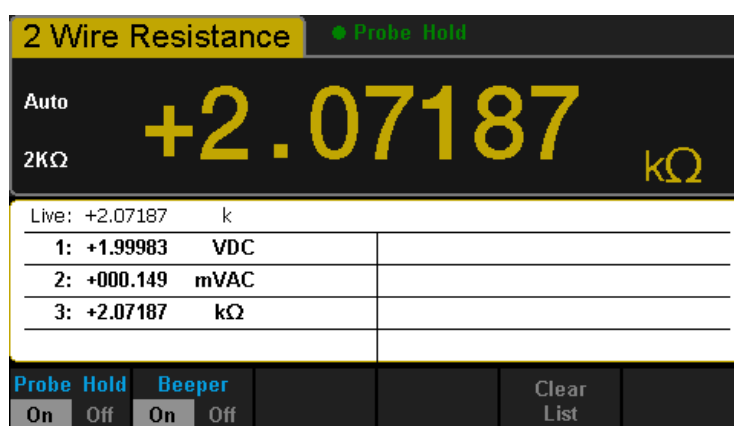
Diagram 2- 70   Hold Measurement Function Interface

Table 2- 31   Hold Measurement Function

Function Menu	Settings	Description
Probe Hold	On/Off	Turn on or off Probe Hold function.
Beeper	On/Off	Turn on or off the Beeper.
Clear List		Clear all current readings and restart to statistics.

Chapter 3   Application Examples

This chapter mainly introduces few application examples to help users control and manipulate SDM3055 quickly.

- **Example 1: Reading Statistic Functions**

- **Example 2: To Eliminate Leads Impedance**

- **Example 3: dBm Measurement**

- **Example 4: dB Measurement**

- **Example 5: Limits Test**

- **Example 6: Thermocouple Setting and Measurement**

- **Example 7: To Use Hold Measurement Function**

- **Example 8: To Use Application Software EasySDM**

Example 1: Reading Statistic Functions

Introduce how to realize the statistic function during measuring. When continually measuring few readings, the Multimeter will update statistic values constantly.

Operating Steps：

1. Press [ACV] on the front panel to select AC Voltage measurement function and choose a proper voltage range.
2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-9.
3. Set the Statistics function parameters.

   Press [Math] →【Statistics】to turn on the statistics function.
4. Lead test leads into the circuit and start to measure. Statistics will update with the increasement of samples, as the following diagram shows.
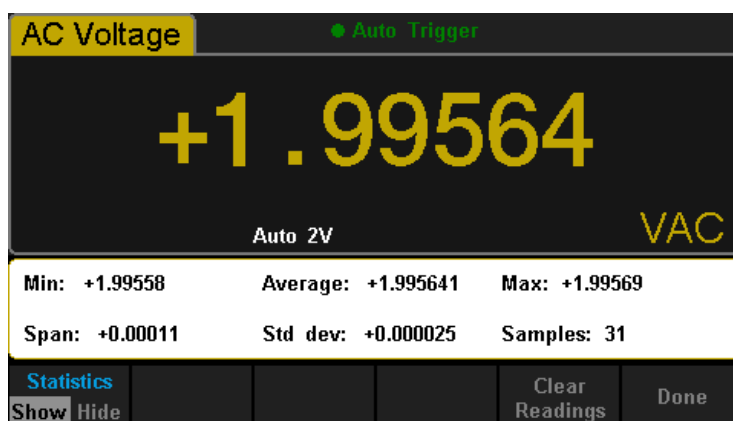
Diagram 3- 1   Statistics 1
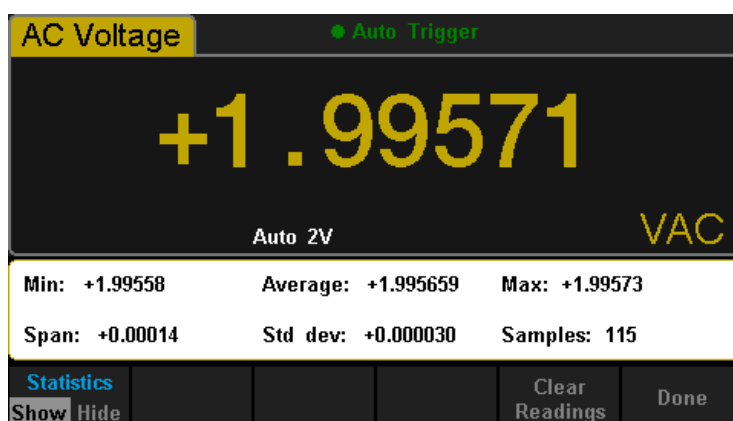
Diagram 3- 2   Statistics 2

Example 2: To Eliminate Leads Impedance

Relative Operation could eliminate impedance errors from leads when measuring smaller resistance.

Operating Steps:

1. Press [Ω2W] on the front panel to select 2-Wire Resistance measurement function.
2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-14.
3. Choose a proper resistance range according to the scope. The default is Auto Range.
4. Lead impedance will be shown on the screen as follow after connecting with two leads together.

Diagram 3- 3   Test Lead Impedance

5. Set parameters for Relative operation.
   Press [Math] →【Rel Value】set relative value as current measured value.

Diagram 3- 4   Set Relative Value

6. Besides, pressing【Rel】on the softkey menu could also open Relative operation.

The Relative Operation has been turned on.

Diagram 3- 5   Lead Impedance after Operation

Example 3: dBm Measurement

dBm is commonly used in audio signal measurement. The following will introduce you how to measure dBm value.

Operating Steps：

1. Press [ACV] on the front panel to select AC Voltage measurement function and choose a proper voltage range.
2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-9.
3. Set the dBm parameters.

   Press [Math] → 【Statistics】to turn on the statistics function and set the selective value of dBm as a reference value within supposed circuit by using direction keys: 50Ω.

Diagram 3- 6   Select Reference Resistance as Measurement Value

4. Press【Done】to return to the higher level menu. At this time, the reading shown on the screen is the Power value of reference resistance.
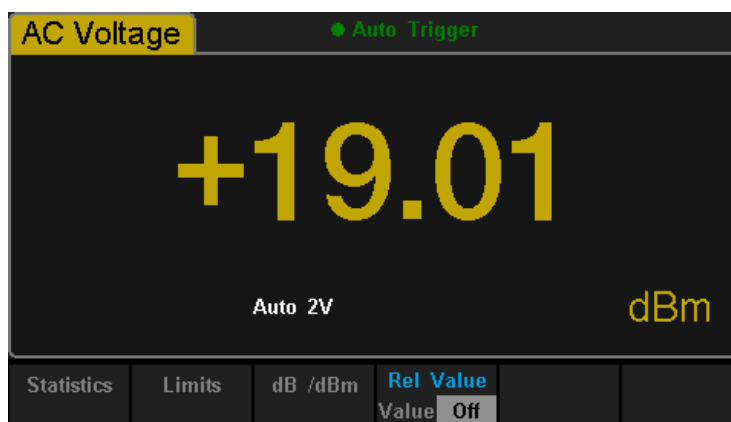
Diagram 3- 7   dBm Operation Result

Example 4: dB Measurement

As a common measuring unit, dB has been widely used in electrical engineering, radio science, mechanics, shock and vibration, mechanical power and acoustics areas. The following will introduce you how to measure dB between two circuits.

Operating Steps:

Method 1:

Measure dBm_1 and dBm_2 existing in two circuits separately according to Example 3, and then dB could be got:.
dB = dBm$_1$-dBm$_2$

Method 2:

1. Press ⟨ACV⟩ on the front panel to select AC Voltage measurement function and choose a proper voltage range.

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-9.

3. Set up dBm_2 according to Example 3.

4. Press ⟨Math⟩ →【dB/dBm】to turn on the dB function and Set parameters of dB operation (dBm_1).
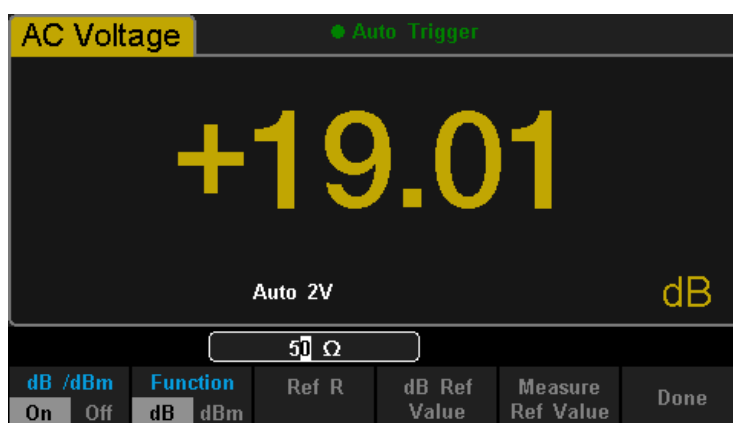
Diagram 3- 8   Set the Parameters of dB

5. Press【Done】to return to the higher level menu. At this time, the reading shown on the screen is the power difference between two circuits.

Diagram 3- 9 dB Operation Result

Example 5: Limits Test

Limits Operation hints you the signal is overstep its range according to the selected High and Low Limit parameters; meanwhile the beeper makes a sound to alarm (if sound is on.)

Operating Steps:

1. Press ⌈ACV⌉ on the front panel to select AC Voltage measurement function and choose a proper voltage range.

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-9.

3. Press ⌈Math⌉ → 【Limits】 to set the Limits parameters.
   Press 【Low】 to set the low limit value.
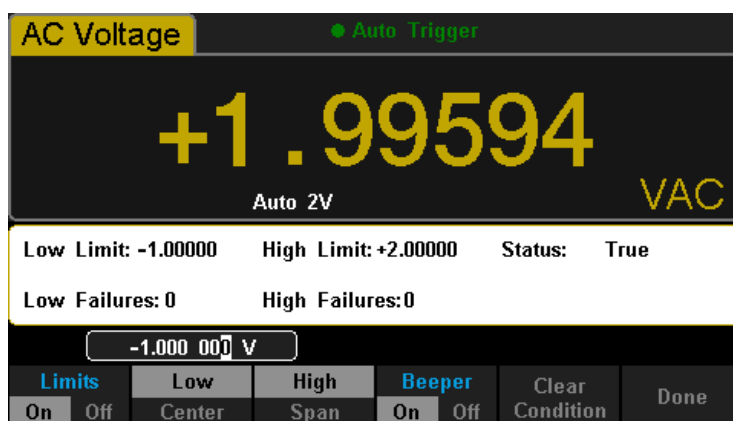
Diagram 3- 10   Set the Low Limit Value

Press 【High】 to set the high limit value.
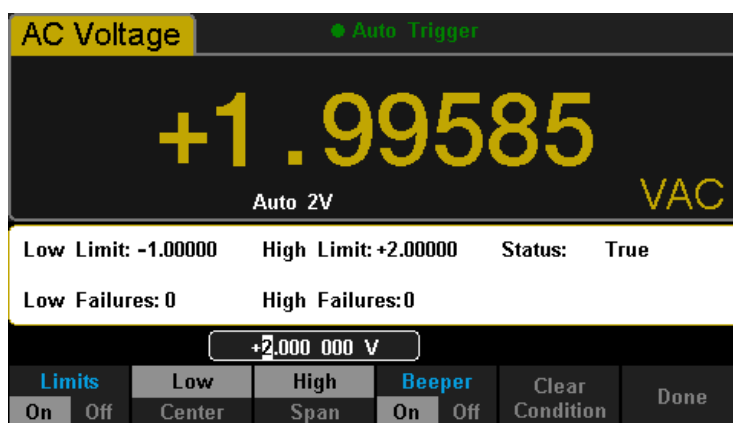
Diagram 3- 11   Set the High Limit Value

4. Turn on the beeper and start Limits Test. As shown in Diagram 3-11. The measured result is between the Low and High limits, so the test status is "True".

5. If changing the high limit value to 1V, the measured result is not between the Low and High limits. So the instrument beep once, and the main display is red. The test status is "Fail" and High Failures is shown. As the following diagram shows.
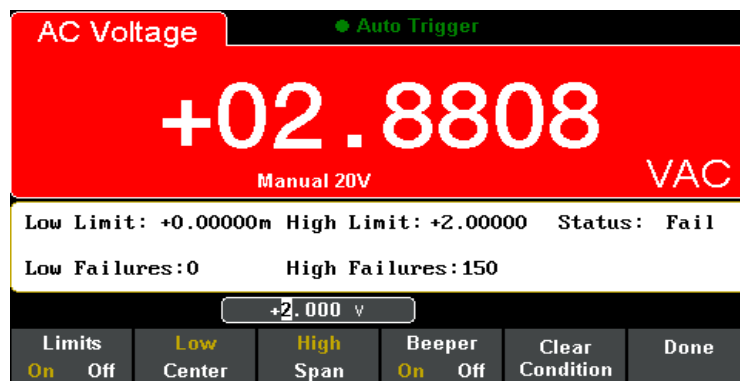
Diagram 3- 12   Limits Test Result

Example 6: Thermocouple setting and measurement

Thermocouple is a common temperature sensor. Type, voltage and cold-side temperature are required for thermocouple measurement.

The instrument can measure temperature of HI and LO terminals (cold-side), and calculate absolute temperature of hot-side. Besides, only the relationship between thermocouple voltage and cold-side temperature is need to be input according thermocouple type when you set the thermocouple sensor.

Operating Steps:

1. Please refer to "To Measure Temperature" in chapter 2 to know about the connection of Sensor.
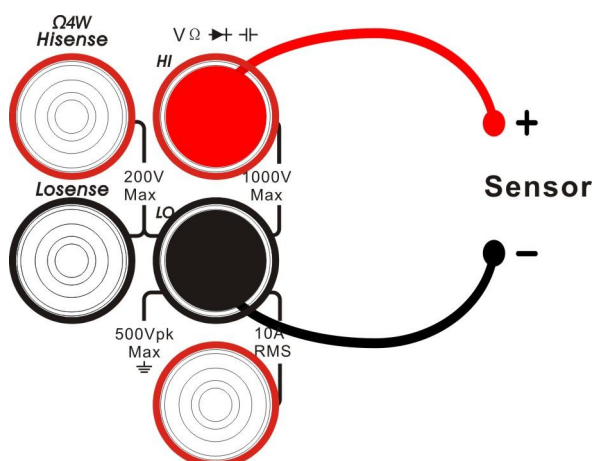
Diagram 3- 13　Sketch map for connecting the sensor

2. Select the type of thermocouple.

   Press【Load】and choose thermocouple measurement. The Multimeter supports 8 kinds of probe type: B、E、J、K、N、R、S and T.
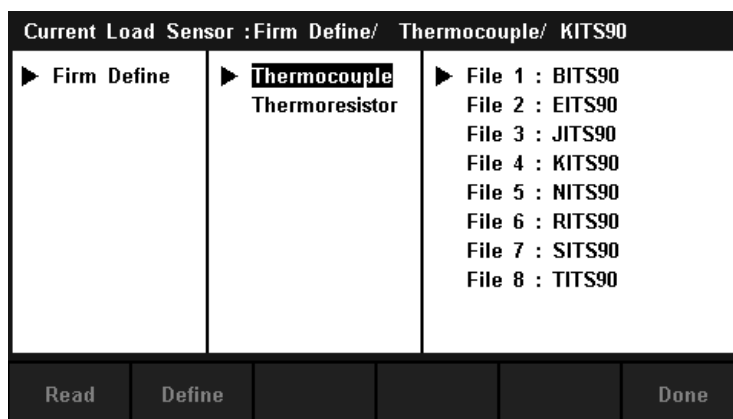
Diagram 3- 14   Select the Type of Thermocouple

3. Use direction keys to select corresponding file and press【Read】to recall the sensor settings file.
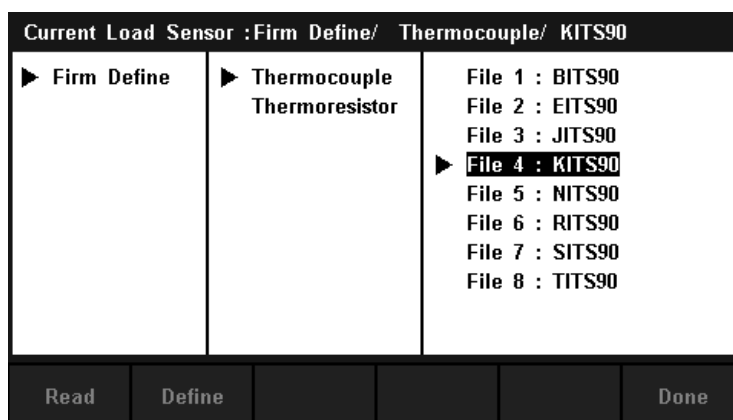
Diagram 3- 15   Select Sensor Settings File

4. Press 【Units】to choose the unit of temperature.

5. View measured result.

    Press 【Display】and select display mode of measurement result as "All" to view measurement value and its corresponding value.
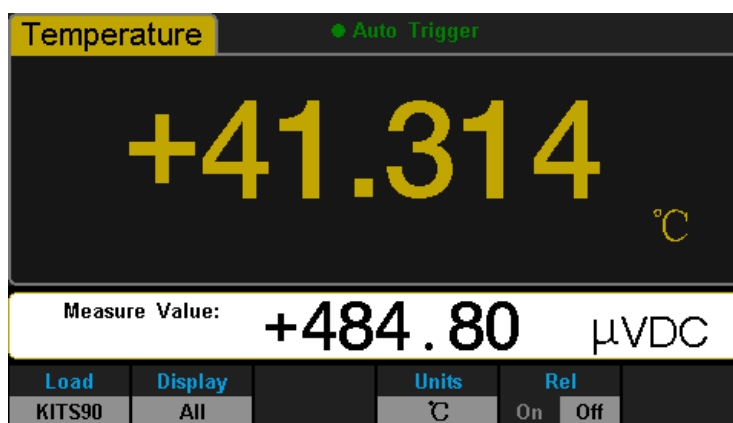
Diagram 3- 16   View measured result

Example 7: To Use Hold Measurement Function

Reading Hold can help user to obtain a stable reading and hold it on the display of Front Panel. The reading would be held all the same although testing pen had been moved away. Then we will introduce how to keep the readings displayed on screen.

Operating Steps:

1. Press `DCV` on the front panel to select DC Voltage measurement function and choose a proper voltage range.

2. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-4.

3. Press `Shift` and `Single` to open Hold measurement function interface. By the time, the screen will record the result of measuring DC voltage, as shown in the following diagram.
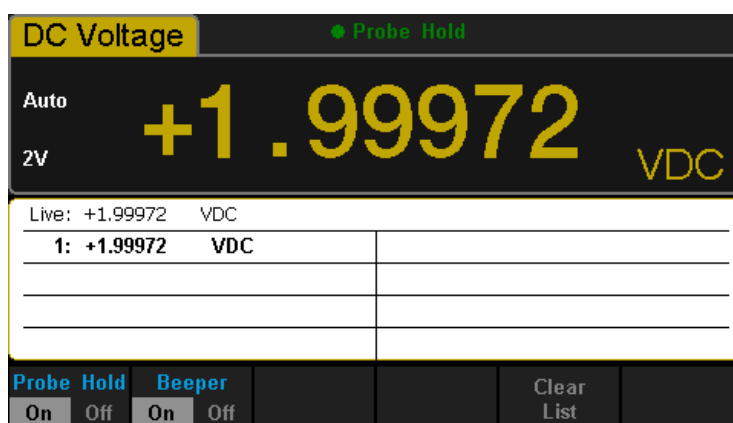
Diagram 3- 17　Result 1

4. Press `ACV` on the front panel to select AC Voltage measurement function and choose a proper voltage range.

5. Connect the red lead to terminal Input-HI and black lead to terminal Input-LO as Diagram 2-9. By the time, the screen will record the result of measuring AC voltage, as shown in the following diagram.
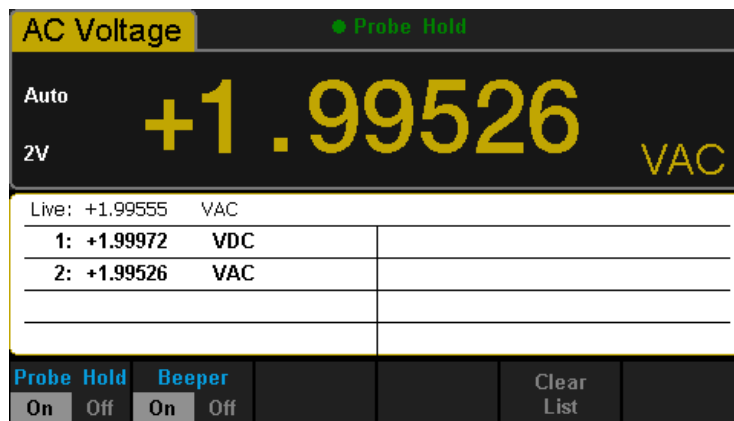
Diagram 3- 18 Result 2

Example 8: To Use Application Software EasySDM

Remote Control function based on EasySDM enables users to operate instrument remotely. The software supports basic measurements, Acquire, Statistics, Trend Chart and Histogram, etc. The method to use the software will be introduced in details as the following steps.

Operating Steps:

1. Connect the Multimeter to your computer by using USB data wire.

2. Open the main interface of EasySDM, Click【Control】on the upper left corner and choose【Connect】to contact the instrument with the software. As shown in the following diagram.
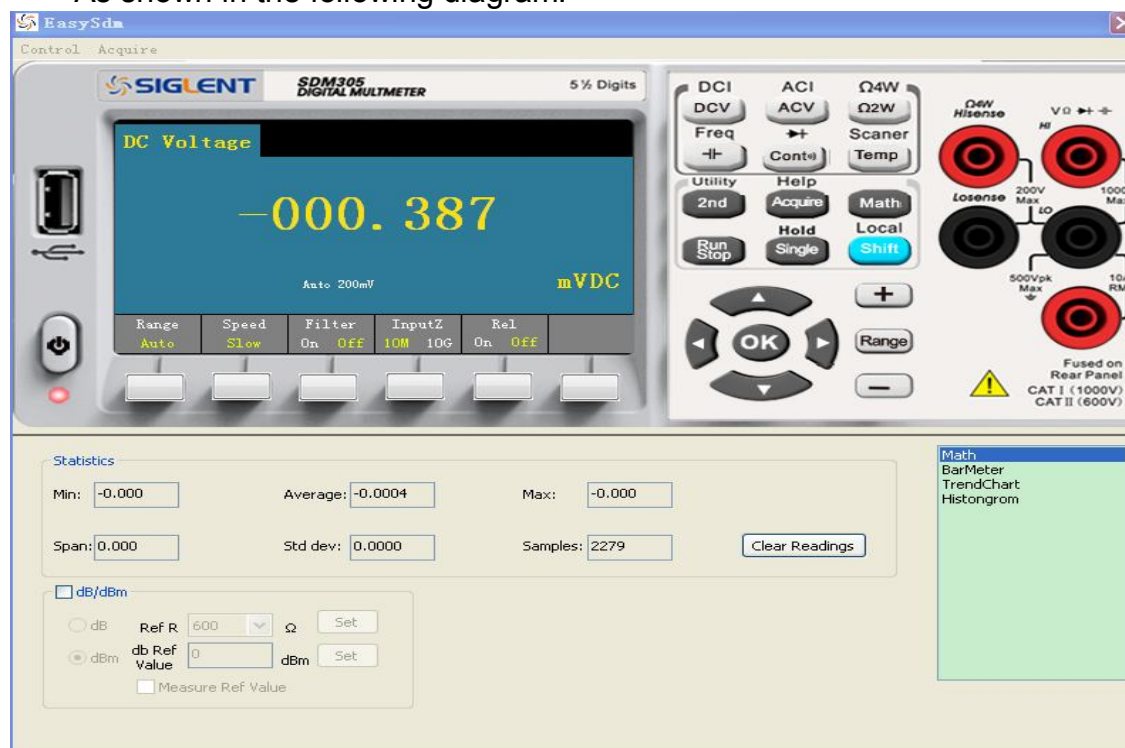
Diagram 3- 19   The Main Interface of EasySDM

3. Click any button on the operating interface to do corresponding operating.

4. If you want to exit the remote control, turn off the software, and then press 【Shift】 on the front panel to close the remote function.

Chapter 4   Measurement Tutorial

True RMS AC Measurement

The AC measurement of the Multimeter has true RMS response. The power dissipated in a resistor within a time is proportional to the square of the measured true RMS voltage, independent of wave shape. The instrument can accurately measure true RMS voltage or current, as long as the wave shape contains negligible energy above the effective bandwidth.

The AC voltage and AC current functions measure the "AC coupled" true RMS value, which is to measure the RMS value of the AC component (DC component is rejected) of the input signal. For sine waves, triangle waves, and square waves, the AC and AC+DC values are equal since these waveforms do not contain a DC offset. See the following table 5-1.

Table 5- 1   True RMS AC Measurement of Sine, Triangle and Square waves

Waveform	Crest Factor （C.F.）	AC RMS	AC+DC RMS
Sine	$\sqrt{2}$	$\dfrac{V}{\sqrt{2}}$	$\dfrac{V}{\sqrt{2}}$
Triangle	$\sqrt{3}$	$\dfrac{V}{\sqrt{3}}$	$\dfrac{V}{\sqrt{3}}$
Square	$\sqrt{\dfrac{T}{t}}$	$\dfrac{V}{C.F.} \times \sqrt{1 - \left(\dfrac{1}{C.F.}\right)^2}$	$\dfrac{V}{C.F.}$

Non-symmetrical waveforms, such as pulse trains, contain DC voltages which are rejected by AC coupled true RMS measurements.

An AC coupled true RMS measurement is desirable in situations where you are measuring small AC signals in the presence of DC offsets. For instance, measuring AC ripple present on DC power supplies. There are situations, however, where you might want to know the AC+DC true RMS value. You can determine this value by combining results from DC and AC measurements as the following shows. You should perform the DC measurement using 5.5 digit mode for best AC rejection.

$$RMS_{(AC+DC)} = \sqrt{AC^2 + DC^2}$$

Crest Factor Errors (non-sinusoidal inputs)

A common misconception is that "since an ac Multimeter is true RMS, its sine wave accuracy specifications apply to all waveforms." Actually, the shape of the input signal can dramatically affect measurement accuracy. A common way to describe signal wave shapes is "crest factor". Crest factor is the ratio of the peak value to RMS value of a waveform.

Generally speaking, the greater the crest factor, the greater the energy contained in high frequency harmonics. All Multimeters have errors that are crest factor dependent. Crest factor errors of SDM3055 are listed in the **AC Characteristics** section of chapter 6. (The crest factor errors do not apply for input signals below 100Hz.)

You can estimate the measurement error due to signal crest factor as shown below:

Total Error＝Error (Sine wave) + Error (Crest factor) + Error (Bandwidth)
Error (Sine wave): error for sine wave as shown in chapter 6.
Error (Crest factor): crest factor additional error as shown in chapter 6. Error (Bandwidth): estimated bandwidth error as shown below:

Bandwidth error = $\dfrac{-C.F.\times F}{4\pi \times BW}$ ×100% （% reading）

C.F.: signal crest factor
F: fundamental frequency of pulse
BW: effective bandwidth of the Multimeter

Example:
Calculate the approximate measurement error for a pulse train input with a crest factor of 2 and a fundamental frequency of 20 kHz. For this example, assume 1-year accuracy specifications of the Multimeter: ± (0.05%× reading + 0.03%×range).

Total Error = (0.05%×reading+0.03%×range) + (0.05%×range) +
       (0.8%×reading)
       =0.85%×reading + 0.08%×range

Loading Errors (AC Voltage)

In the AC Voltage function, the input of SDM3055 appears as a 1MΩ resistance in parallel with 100pF of capacitance. The test lead that you use to connect signals to the Multimeter will also add additional capacitance and loading. The approximate input resistances of the Multimeter at different frequencies are listed in the following table.

Table 5- 2   Approximate Input Resistances at Different Frequencies

Input Frequency	Input Resistance
100Hz	1MΩ
1kHz	850kΩ
10kHz	160kΩ
100kHz	16kΩ

For low frequencies:

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

For high frequencies:

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

F: input frequency
R_s: source resistance
C_m: input capacitance (100pF) plus test lead capacitance

Application of the Analog Filter

The analog filter of the Multimeter can be used to reduce the influence of the AC component in DC measurement. Generally the filter may not be required, but sometimes it can improve the DC measurement. For example, if the measured DC electrical source has a big AC ripple, the analog filter can reduce the influence.

The analog filter can't be used to filter the internal noise of the instrument. It has no use in DCI opening measurement, DCV short measurement or in measurement of the output from a precise DC calibration instrument. On the contrary, it may lead in additional noise and a bigger reading offset. The Multimeter should be cleared under the selected range and reading rate to decrease the offset when using the analog filter. If you cannot clear the instrument, the measured results will have errors. For other ranges and reading rates, the additional error generated by the filter can be omitted.

Table 5- 3   Analog Filter Error in DCV measurement

Range	Reading Rate	Additional Analog Filter Error
200mV	Slow	10µV
	Middle	20µV
	Fast	20µV
2V	Slow	15µV
	Middle	20µV
	Fast	20µV
20V	Slow	0.8mV
	Middle	1mV
	Fast	1mV

Table 5- 4   Analog Filter Error in DCI measurement

Range	Reading Rate	Additional Analog Filter Error
200µA	Slow	0.002% range
	Middle	0.005% range
	Fast	0.005% range
20mA，2A	Slow	0.040% range
	Middle	0.060% range
	Fast	0.080% range
200mA	Slow	0.004% range
	Middle	0.010% range
	Fast	0.010% range
10A	Slow	0.008% range
	Middle	0.010% range
	Fast	0.010% range

Chapter 5   General Troubleshooting

The following is a list of the troubles that you may meet while using the Multimeter and their solutions. Please handle as the corresponding steps when meeting these troubles. If you still can't handle them, please contact SIGLENT in time.

1. If the screen of the Multimeter is still dark with nothing displaying after pressing the power key:
(1) Check if the power has been connected correctly.
(2) Check if the main power switch on the back panel has been turned on already.
(3) Check if the power fuse has blown. Replace it as desired if it has blown.
(4) Restart the Multimeter after all above steps have been done.
(5) If the instrument still can't start up properly, please contact SIGLENT.

2. The reading doesn't change when connecting an AC current signal:
(1) Check if the test lead has been connected to the current jack or LO jack correctly.
(2) Check if the fuse in the current location on the back panel has blown.
(3) Check if the measuring location has switched to the DCI or ACI place correctly.
(4) Check if the input is ACI but the measuring location is in DCI place.

3. The reading doesn't change when connecting a DC current signal:
(1) Check if the test lead has been connected to the current jack or LO jack correctly.
(2) Check if the fuse in the current location on the back panel has blown.
(3) Check if the measuring location has switched to the DCI or ACI place correctly.
(4) Check if the input is DCI but the measuring location is in ACI place.

4. USB Disks can't be recognized by the instrument.
(1) Check if the USB disk can work properly.
(2) Make sure the used USB disk is of Flash type. The instrument doesn't support USB disks of hard disk type.
(3) Check if the capacity of the used USB disk is too large. The Multimeter is recommended not to use USB disks which exceed 4GB.
(4) After restarting the instrument, insert the USB disk again to inspect.
(5) If you still can't use the USB disk properly, please contact SIGLENT.

Chapter 6   Appendix

Appendix A: Accessories

Standard Accessories:

A Power Cord that fits the standard of destination country.

Two test leads (black and red)

An USB Cable

One backup fuses

A Quick Start

An Application software

NOTE:
● We suggest that the length of USB data wire and LAN cable connected to the instrument should be less than 3m to avoid affecting the product performance.
● All the accessories are available by contacting your local **SIGLENT** office**.**

Appendix B: Warranty summary

SIGLENT warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years from the date of shipment from an authorized **SIGLENT** distributor. If a product proves defective within the respective period, **SIGLENT** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest **SIGLENT** sales and service office. Except as provided in this summary or the applicable warranty statement, **SIGLENT** makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall **SIGLENT** be liable for indirect, special or consequential damages.

Appendix C: Daily Maintenance and Cleaning

Maintenance

When storing or placing the instrument, please avoid the liquid crystal display from direct sunlight for a long time.

NOTE:
To avoid damages to the instrument or probe, please don't place them in mist, liquid or solvent.

Cleaning

Please often clean the instrument or probe according to the use of them.
● Wipe the external ash of the instrument and probe by a soft rag. Be careful not to scratch the transparent plastic protective screen when cleaning the liquid crystal screen.

● Use a soft rag that has been soaked by water to clean the instrument after cutting off the power. Or use 75% isopropyl alcohol of water solvent to get a more thorough cleaning.

NOTE:
● To prevent the surface of the instrument or probe from damages, please don't use any corrosive or chemical cleaning reagents.

● Please make sure the instrument is already dry before restarting it to avoid short circuits or personal injuries caused by water.

Appendix D: Contact SIGLENT

SIGLENT TECHNOLOGIES CO., LTD.

Address: 3F, NO.4 building, Antongda Industrial Zone, 3rd Liuxian Road, 68th District, Baoan District, Shenzhen, P.R. China

Tel: +86-755-36615186

Fax: +86-755-3591582

Post Code: 518101

E-mail: sales@siglent.com

Http://www.siglent.com

Quick Strat

SDM3055 Digital Multimeter

QS06035-E02A

Copyright Information

General Safety Summary

Read the following safety precautions carefully to avoid any personal injuries or damages to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use proper power line.

It's only allowed to use the special power line which is approved by local state.

Ground the instrument.

The instrument is grounded through the protective terra conductor of the power line. The ground conductor must be connected to the earth to avoid electric shock. Make sure the instrument is grounded correctly before connecting its input or output terminals.

Connect the signal wire correctly

The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage.

Observe all terminal ratings

Please observe all ratings and sign instructions on the instrument to avoid fire or electric shock. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Do not operate with suspected failures

If you suspect that the product is damaged, please contact SIGLENT's qualified service personnel to inspect it. Any repair and adjustment to the product or replacing a component should be done by qualified personnel only.

Avoid circuit or wire exposure

Don't touch exposed contacts or components when the power is on.

Don't operate without covers.

Don't operate the instrument with covers or panels removed.

Use proper fuse.

It's only allowed to use the specified fuse for the instrument.

Use proper overvoltage protection.

Make sure there is no overvoltage (like voltage caused by thunder and lightning) reaching to the instrument, otherwise the operator may suffer an electric shock.

Antistatic protection.

Static electricity will cause damages to the instrument, so test in antistatic areas as far as possible. Ground its inner and outer conductors to release the static electricity temporarily before connecting the cable to the instrument.

Keep good ventilation.

Improper ventilation will cause the rise of the instrument's temperature. Keep good ventilation and check the vent and fan regularly when using it.

Keep the surface of the instrument clean and dry.

Do not operate in wet or damp conditions.

Do not operate in flammable or explosive environment.

The disturbance test of all the models meets the limit values of A in the standard of EN 61326-1:2013.

Input terminal protection limitation

Protection limitation is defined for the input terminal：

1. Main input（HI and LO）terminal

HI and LO terminals are used for Voltage, Resistance, Capacitance, Continuity, Frequency, Diode and temperture measurement. Two protection limitations are defined:

- **HI-LO protection limitation:** 1000VDC or 750AVC. It's the maximum measurable voltage. The limitation can be expressed as 1000Vpk.
- **LO-ground protection limitation：** LO terminal can "float" 500Vpk relative to the ground safely. The maximum protection limitation of HI terminal relative to the ground is 1000Vpk. Therefore, the sum of the "float" voltage and the measured voltage can't exceed 1000Vpk.

2. Sampling (HISense and LOSense) terminal

HISense and LOSense are used for 4-wire Resistance measurement. Two protection limitations are defined:

- **HISense-LOSense protection limitation:** 2000Vpk.

- **LOSense-LOSense protection limitation:** 2Vpk.

3. Current input (I) terminal

I and LO terminals are used for current measurement. The maximum current which go through the I terminal is limited to 10A by the fuse on the back panel.

NOTE:

Voltage on the current input terminal corresponds to voltage on LO terminal. To keep good protection, only use the fuse of specified type and level to replace this fuse.

IEC Measurement Category II Overvoltage Protection

SDM3055 Digital Multimeter provides overvoltage protection for line-voltage mains connections meeting both of the following conditions to avoid the danger of electric shock：

1. The HI and LO input terminals are connected to the mains under Measurement Category II conditions as following.

2. The maximum line voltage of the mains is 600VAC.

WARNING:

IEC Measurement Category II includes electrical devices connected to mains at an outlet on a branch circuit, such as most small appliances, test equipments, and other devices that plug into a branch outlet or socket.

SDM3055 is capable of making measurements with the **HI** and **LO** inputs connected to mains in such devices (up to 600VAC) or the branch outlet itself. However, the **HI** and **LO** terminals of SDM3055 can't be connected to mains in permanently installed electrical devices such as the main circuit-breaker panels, sub-panel disconnected boxes and permanently wired motors. Such devices and circuits are prone to exceed the protection limits of SDM3055.

NOTE:

Voltages above 600VAC only can be measured in circuits that are isolated from mains. However, there may be transient overvoltage in circuits that are isolated from mains. SDM3055 is able to withstand occasional transient overvoltage up to 4000Vpk. Please don't use this instrument to measure circuits that transient overvoltage may exceed this level.

Safety Terms and Symbols

Terms in this manual. Terms may appear in this manual:

WARNING: Warning statements indicate the conditions and behaviors that could result in injury or loss of life.

CAUTION: Caution statements indicate the conditions and behaviors that could result in damage to this product or other properties.

CAT I (1000V): IEC Measurement Category I. The highest measurable voltage is 1000Vpk in the **HI-LO** terminal.

CAT II (600V): IEC Measurement Category II. Inputs may be connected to mains (up to 600VAC) under Category II overvoltage conditions.

Terms used on the instrument. Terms may appear on the instrument:

DANGER indicates an injury or hazard that may immediately happen.

WARNING indicates an injury or hazard that may not immediately happen.

CAUTION indicates that a potential damage to the instrument or other property might occur.

Symbols used on the instrument. Symbols may appear on the instrument:

Hazardous Voltage	Protective Earth Ground	Warning	Test Ground	Chassis Ground

Daily Maintenance and Cleaning

Maintenance

When storing or placing the instrument, please avoid the liquid crystal display from direct sunlight for a long time.

NOTE:
- To avoid damages to the instrument or test leads, please don't place them in mist, liquid or solvent.

Cleaning

Please often clean the instrument and test leads according to the use of them.
- Wipe the external ash of the instrument and test leads by a soft rag. Be careful not to scratch the transparent plastic protective screen when cleaning the liquid crystal screen.

- Use a soft rag that has been soaked by water to clean the instrument after cutting off the power. Or use 75% isopropyl alcohol of water solvent to get a more thorough cleaning.

NOTE:
- To prevent the surface of the instrument or test leads from damages, please don't use any corrosive or chemical cleaning reagents.
  Please make sure the instrument is already dry before restarting it to avoid short circuits or personal injuries caused by water.

Content

General Inspection

1. Inspect the shipping container.

Please keep the damaged container or cushioning material until the contents of the shipment have been checked completely and the instrument has passed the electrical and mechanical test.

Damages of the instrument caused by the shipment will be compensated by the shipper or carrier. **SIGLENT** will not be responsible for the free repair or replacement.

2. Inspect the instrument.

If there exit any mechanical damages or lacking of components, or the instrument fails the electrical and mechanical test, please contact your SIGLENT sales.

3. Check the accessories.

Check the accessories according to the packing list carefully. If there exit any accessories damaged or missing, please contact your **SIGLENT** sales.

Appearance and Size
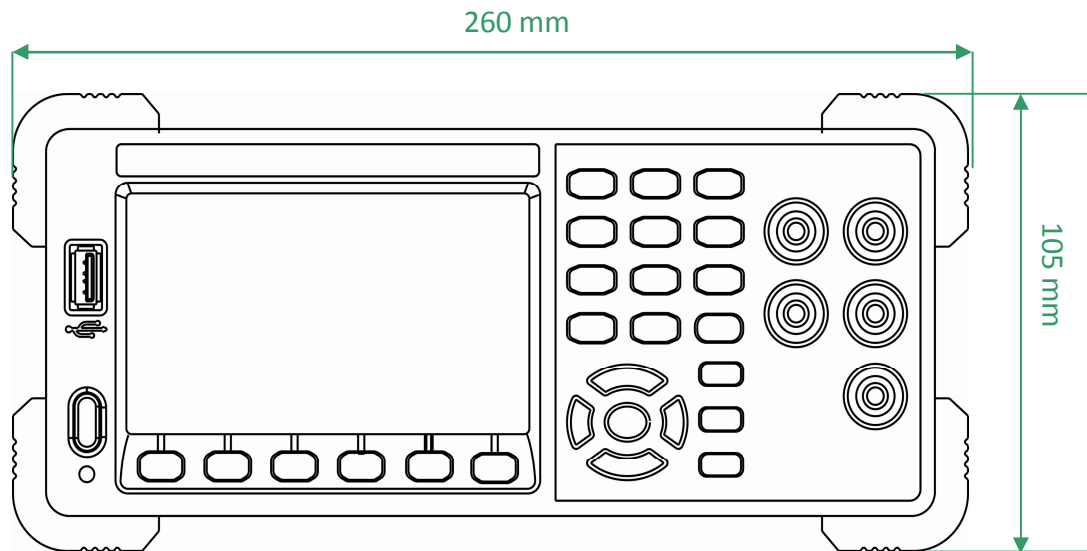
Front View
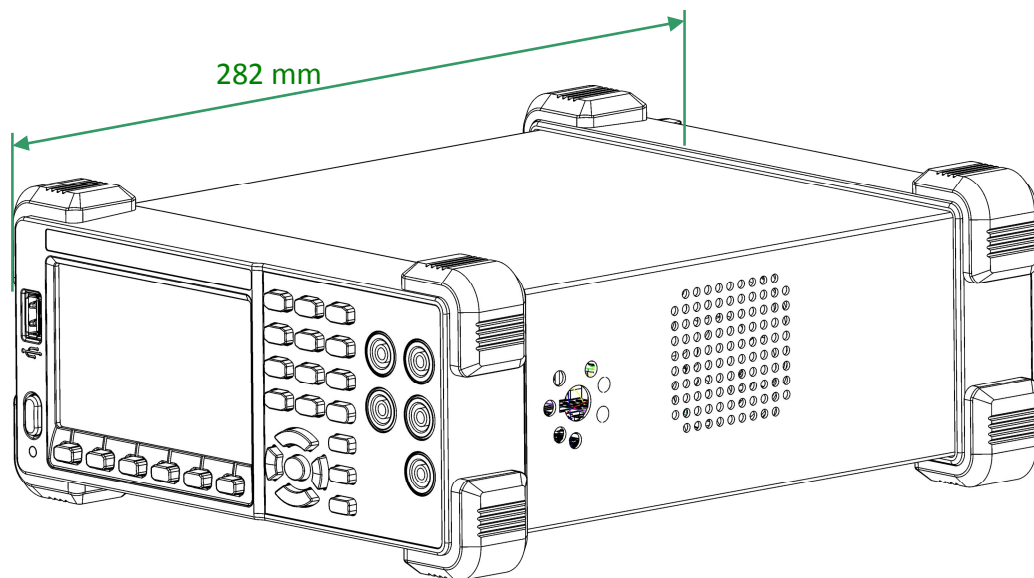
Side View

To adjust the Handle

Please grip the handle by the two sides and pull it outward to adjust the handle position of SDM3055. Then rotate the handle to the appropriate position. Please operate as the following figure:
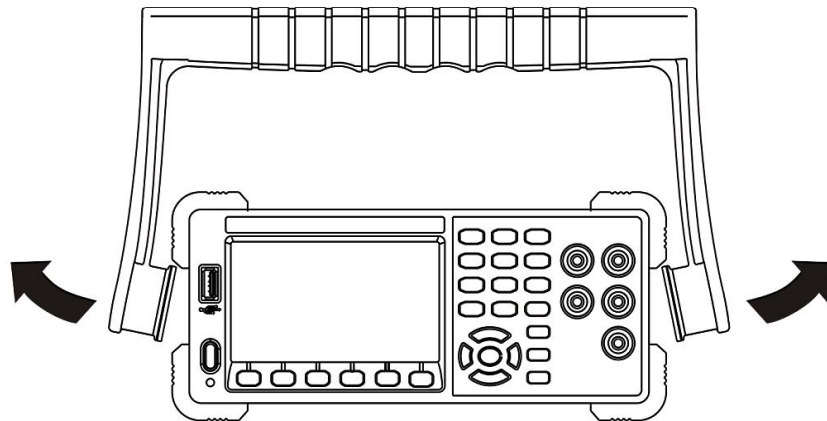
Handle Adjustment
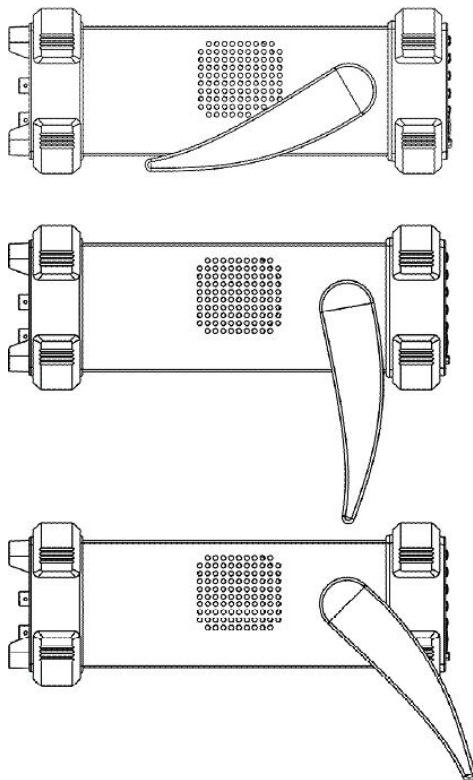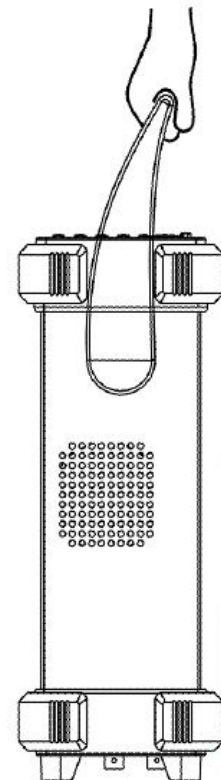
Horizontal Position   Carrying Position

Front Panel

A   LCD Display   **B**   USB Host

C   Power Key   **D**   Menu Operation Keys

E   Basic measurement keys   **F**   Auxiliary Measurement Keys

G   Enable trigger key   **H**   Range/Direction Keys

I   Signal input terminals

Rear Panel

A Power Socket		**B** Power Fuse	
C AC Voltage Selector		**D** Inspection card [1]	
E USB Device（USBTMC）		**F** LAN	
G VMC Output		**H** Ext trigger	
I Current Input Fuse			

Explanation： [1] Only SDM3055S support inspection card.

Connect Power Cord

Before connect the instrument to a power source, please select the AC voltage selector on the rear panel of your multimeter according to the power supply.Then connect the power cord as shown in the following figure.
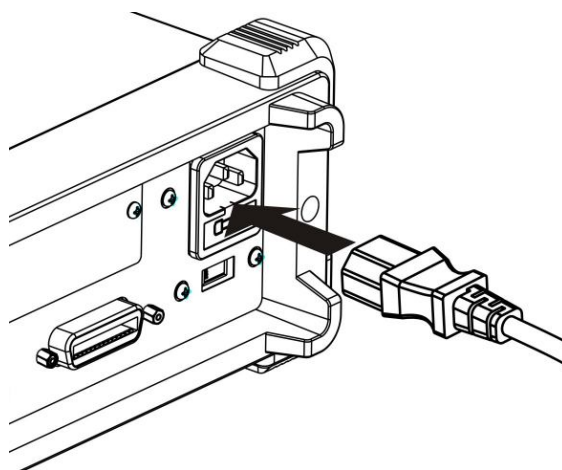
Connect Power Cord

Press the Power key on the front panel to start up the multimeter.

If unable to start up the multimeter, take the follow steps:

1. Check the power cord connection.

2. After the inspection, if the power key is not lit, please take out the fuse and check, refer to the fuse specification shown in the User Manual to change the fuse if needed.

4. After the above inspections, the power key is still not lit, please contact **SIGLENT** for help.

Power Selection

The Multimeter is able to operate on multiple power distribution standards and must be set up according to the supply voltage. If the selected supply voltage doesn't match the working voltage while using, the setting of the Multimeter's supply voltage must be changed. The power selector is located under the power fuse on the rear panel.

Change the Power Fuse

The power fuse is located in the fuse block on the back panel. The Multimeter has installed a power fuse before leaving the factory. It's a kind of fast-melt, no-burst, F300mA, 5×20mm one.
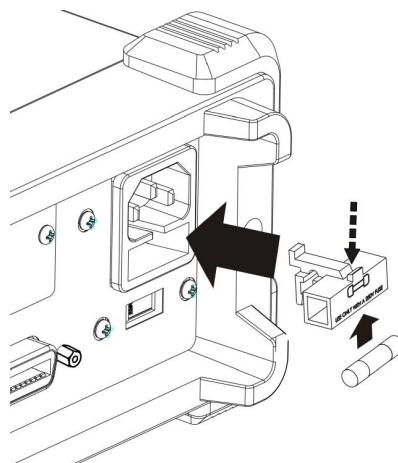
Change the fuse

Connect Test Leads

1. DC Voltage Measurement

Connect the test leads and tested circuit as the following figure, red test lead to the **HI** Terminal and black lead to the **LO** Terminal.
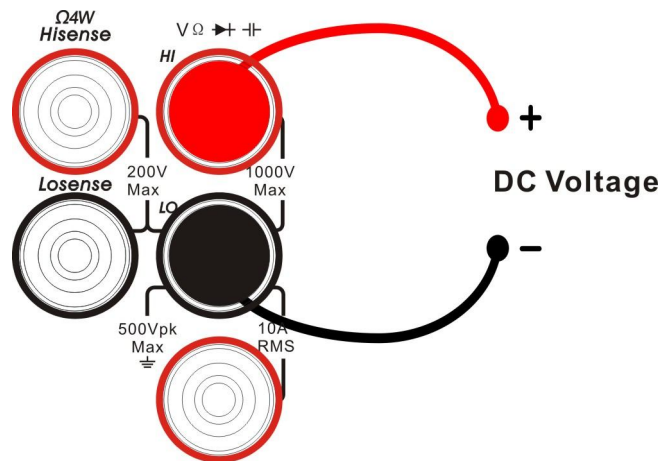
2. AC Voltage Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
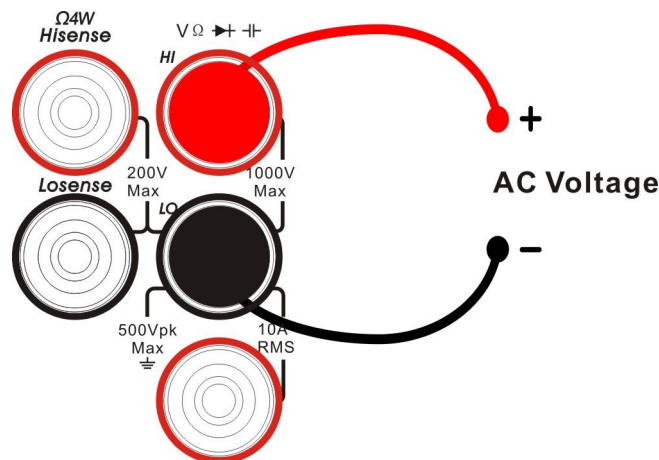
3. DC Current Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
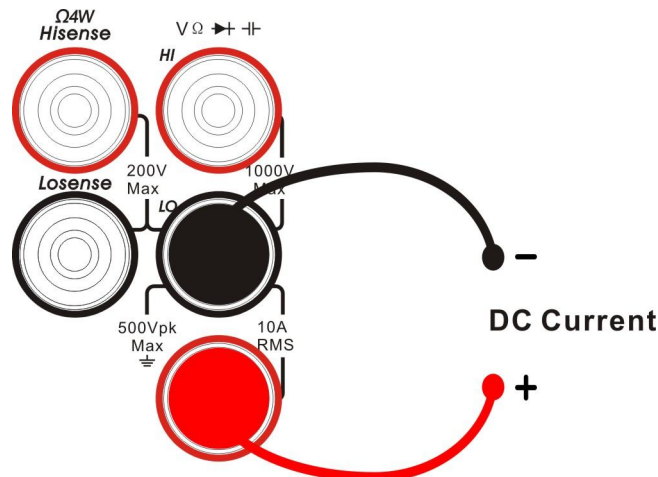
4. AC Current Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
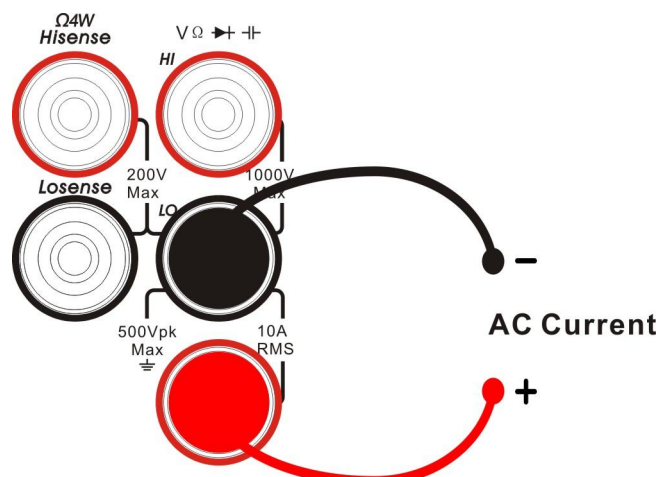
5. 2-Wire Resistance Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
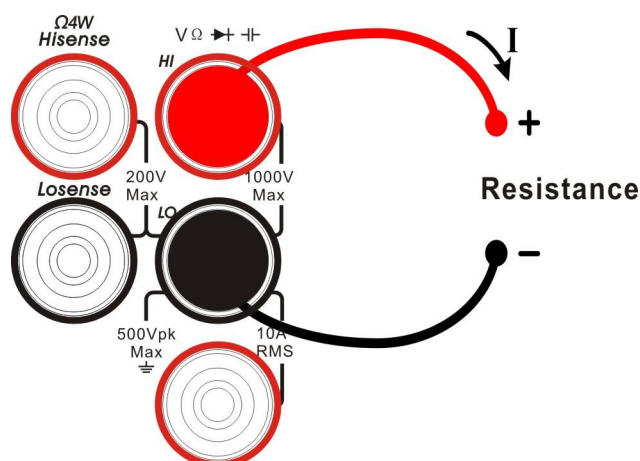
6. 4-Wire Resistance Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
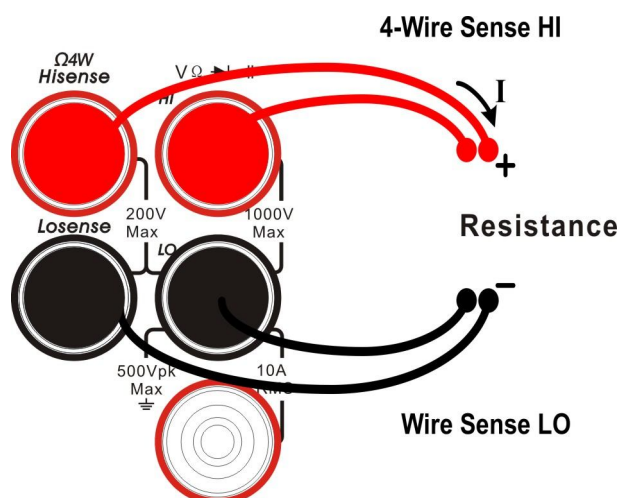
7. Capacitance Measurement

Connect the test leads and tested capacitor as the following diagram, red test lead to the positive pole of the capacitor and black lead to the negative pole.
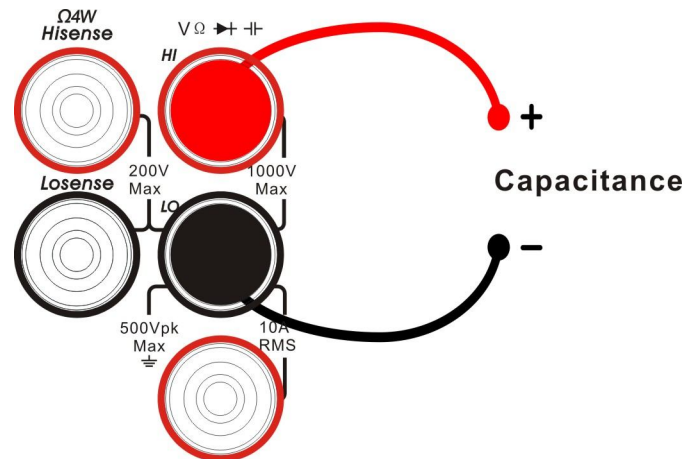
8. Continuity Testing

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
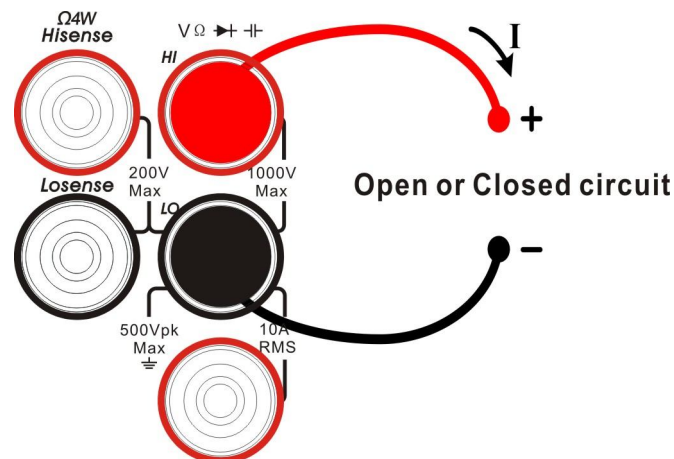
9. Diode Testing

Connect the test leads and tested diode as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
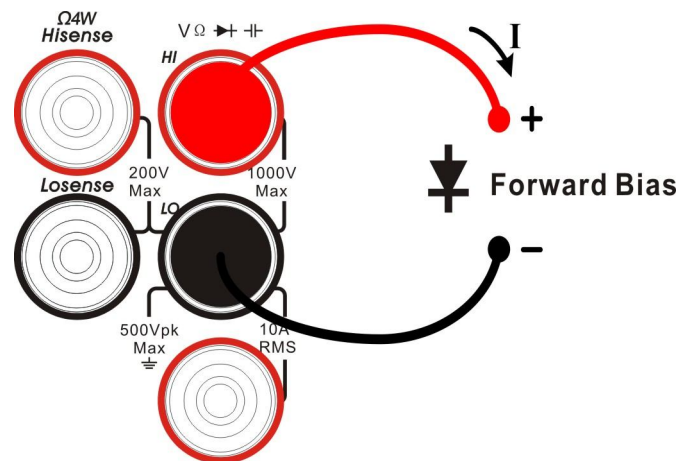
10.Frequency/Period Measurement

Connect the test leads as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
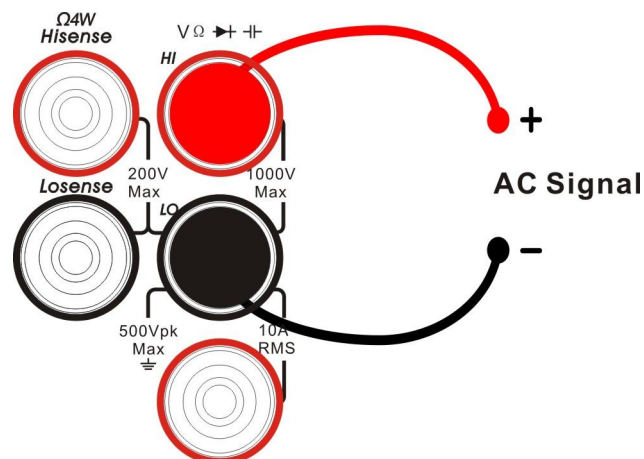
11.Temperture Measurement

Connect the test leads and tested circuit as the following diagram, red test lead to the HI Terminal and black lead to the LO Terminal.
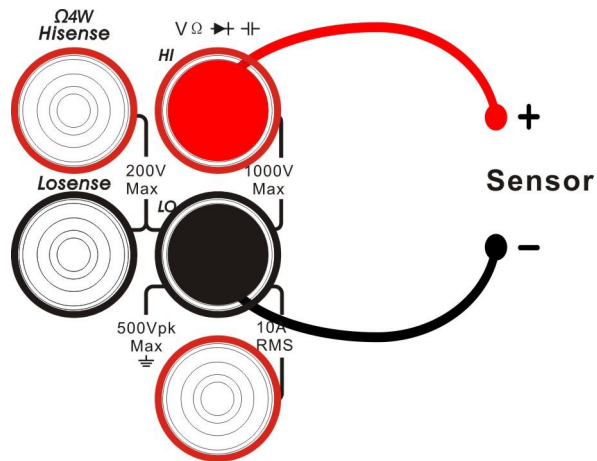
TC and RTD Sensor

Connect USB and LAN Ports

SDM3055 has plenty of I/O ports. To use any of the ports,

follow the next instruction:
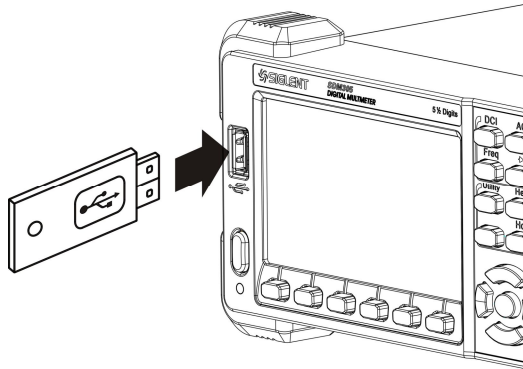
Connect USB Host
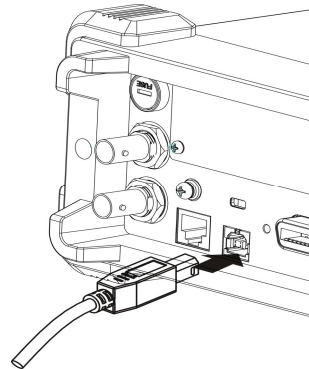
Connect USB Device
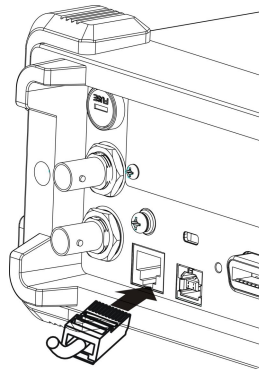
Connect LAN

Use Safety Lock

You can use the safety lock to lock the multimeter in a fixed place if necessary. The methods are as the following：

1. Align the key into the keyhole in the vertical direction of the back panel.

2. Then rotate clockwise to lock the multimeter.

3. Remove the key at last.

Troubleshooting

The general failures and consequential solutions are listed below. When you find them, please deal with them in the following corresponding ways. If the problem proves to be unsolvable by yourself, please contact **SIGLENT** for help.

1. If the screen is still dark with nothing displayed after pressing the power key:
   (1) Check if the power is correctly connected.
   (2) Check if the power fuse has blown. Replace it if necessary.
   (3) If the instrument still can't start up properly, please contact SIGLENT.

2. The reading doesn't change when connecting an AC current signal:
   (1) Check if the test lead is correctly connected to the current jack or LO jack .
   (2) Check if the fuse in the current location on the back panel has blown.
   (3) Check if the measure location has switched to the DCI or ACI place correctly.
   (4) Check if the input is ACI but the measure location is in DCI place。

3. The reading doesn't change when connecting a DC current signal:

(1) Check if the test lead is correctly connected to the current jack or LO jack.

(2) Check if the fuse in the current location on the back panel has blown.

(3) Check if the measure location has switched to the DCI or ACI place correctly.

(4) Check if the input is DCI but the measure location is in ACI place.

4. USB storage can't be recognized:

(1) Check if the USB can work normally.

(2) Make sure that the USB storage being used is of flash type, the instrument does not support USB of hardware type.

(3) Make sure that the capacity of the USB storage is not too large. It is suggested that the capacity of the USB matches to the multimeter is no larger than 4 G.

(4) Restart the instrument and then insert the USB to check it.

(5) If it is still in abnormal use, please contact **SIGLENT**.

Contact SIGLENT

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Liuxian Road, Bao'an District, Shenzhen, P.R.China

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Http://www.siglent.com

Remote Manual

SDM3055/SDM3055A
Digital Mulimeter

RC06035-E01A

Catalogue

SCPI Command

Introduction to the SCPI Language

SCPI (Standard Commands for Programmable Instruments) is an ASCII-based programming language for test and measurement instruments. SCPI commands use a hierarchical structure known as a tree system. Associated commands are grouped under a common node or root, thus forming subsystems. A portion of the SENSe subsystem illustrates this, below.

SENSe:
    VOLTage:
        DC:RANGe {<*range*>|MIN|MAX|DEF}
        DC:RANGe? [MINimum | MAXimum | DEFault]

SENSe is the root keyword of the command, **VOLTage** is a second-level keyword, and **DC** is a third-level keyword. A colon (**:**) separates consecutive keywords.

Syntax Conventions

The command syntax format is illustrated below:

VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}

Most commands (and some parameters) are a mixture of upper- and lower-case letters. The upper-case letters indicate the command's abbreviated spelling, which yields shorter program lines. For better program readability, use the long form.

For example, consider the keyword VOLTage, above. You can type VOLT or VOLTage in any combination of upper- or lower-case letters. Therefore, VolTaGe, volt and Volt are all acceptable. Other forms, such as VOL and VOLTAG, will generate an error.

- Braces (**{ }**) enclose the parameter choices. The braces are not sent with the command string.
- A vertical bar (**|**) separates parameter choices. For example, {<*range*>|MIN|MAX|DEF} in the above command indicates that you can specify a numeric range parameter, or "MIN", "MAX" or "DEF". The bar is not sent with the command string.
- Angle brackets (**< >**) indicate that you must specify a value for the enclosed parameter. For example, the above syntax statement shows the <*range*> parameter in angle brackets. Do not send the brackets with the command string. You must specify a value for the parameter (for example "VOLT:DC:RANG 10") unless you select one of the other options shown in the syntax (for example "VOLT:DC:RANG MIN").
- Optional parameters are enclosed in square brackets (**[ ]**). The brackets are not sent with the command string. If you do not specify a value for an optional parameter, the instrument uses a default value.

Command Separators

A colon (:) separates consecutive different levels of keywords.. You must insert a blank space to separate a parameter from a command keyword. If a command requires more than one parameter, separate adjacent parameters using a comma:

  CONF:VOLT:DC 20,1

A semicolon (;) separates commands within the same subsystem and can also minimize typing. For example, the following string:

TRIG:COUNT 2;SOUR EXT

Equivalent to the following two commands:

TRIG:COUNT 2

TRIG:SOUR EXT

Use a colon and a semicolon to link commands from different subsystems. For example, in the following example, an error is generated if you do not use both the colon and semicolon:

TRIG:COUN 2;:SAMP:COUN 2

Using the MIN, MAX and DEF Parameters

For many commands, you can substitute "MIN" or "MAX" in place of a parameter. In some cases you may also substitute "DEF". For example, consider The following example:

VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}

Instead of selecting a specific value for the *<range>* parameter, you can substitute MIN to set the range to its minimum value, MAX to set the range to its maximum value or DEF to set the range to its default value.

Querying Parameter Settings

You can query the current value of most parameters by adding a question mark (**?**) to the command. For example,The following example sets the trigger count to 10 measurements:

TRIG:COUN 10

You can then query the count value by sending:

TRIG:COUN?

You can also query the minimum or maximum count allowed as follows:

TRIG:COUN? MIN

TRIG:COUN? MAX

IEEE-488.2 Common Commands

The IEEE-488.2 standard defines a set of common commands that perform functions such as reset, self-test and

status operations. Common commands always begin with an asterisk (*), are three characters in length and may

include one or more parameters. The command keyword is separated from the first parameter by a blank space. Use a

semicolon (;) to separate multiple commands as shown below:

*RST; *CLS; *ESE 32; *OPC?

SCPI Parameter Types

The SCPI language defines several data formats to be used in program messages and response messages.

Numeric Parameters

Commands that require numeric parameters will accept all commonly used decimal representations of numbers including optional signs, decimal points, and scientific notation. Special values for numeric parameters such as MIN,MAX and DEF are also accepted. You can also send engineering unit suffixes with numeric parameters (e.g., M, k, m or u). If a command accepts only certain specific values, the instrument will automatically round the input numeric parameters to the accepted values. The following command requires a numeric parameter for the range value:

VOLTage:DC:RANGe {<range>|MIN|MAX|DEF}

Because the SCPI parser is case-insensitive, there is some confusion over the letter "M" (or "m"). For your convenience, the instrument interprets "mV" (or "MV") as millivolts, but "MHZ" (or "mhz") as megahertz. Likewise "MΩ" (or "mΩ") is interpreted as megΩ. You can use the prefix "MA" for mega. For example, "MAV" is interpreted as megavolts.

Discrete Parameters

Discrete parameters are used to program settings that have a limited number of values (like IMMediate, EXTernal or BUS). They have a short form and a long form just like command keywords. You can mix upper- and lower-case letters. Query responses will always return the short form in all upper-case letters. The following example requires discrete parameters for the temperature units:

UNIT:TEMPerature{C|F|K}

Boolean Parameters

Boolean parameters represent a single binary condition that is either true or false. For a false condition, the instrument will accept "OFF" or "0". For a true condition, the instrument will accept "ON" or "1". When you query a Boolean setting, the instrument will always return "0" or "1". The following example requires a Boolean parameter:

DISPlay:STATe {ON|1|OFF|0}

Command in this Manual

1.1. ABORt

Aborts a measurement in progress, returning the instrument to the trigger idle state.

Pameter	Typical Return
(none)	(none)
Abort a measurement in progress: TRIG:SOUR IMM //Set the trigger source for immediate trigger TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for "wait for trigger" ABOR //Interrupt the measurement	

This command may be used to abort a measurement when the instrument is waiting for a trigger, or for aborting a long measurement or series of measurements.

1.2. FETCh?

Waits for measurements to complete and copies all available measurements to the instrument's output buffer. The readings remain in reading memory.

Parameter	Typical Return
(none)	-5.75122019E-04, -5.77518360E-04, -5.73923848E-04, -5.76020647E-04
Set the trigger source for immediate trigger,the INIT command will instrument in "waiting for trigger" state, in the immediate trigger condition, measurements will immediately be triggered and the measurement results are sent to the measurement of memory,The FETCh? query transfers the measurement from reading memory to the instrument's output buffer. TRIG:SOUR IMM //Set the trigger source for immediate trigger TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for "wait for trigger" FETC? //Read the resulting measurement value	

◆ The **FETch?** query does not erase measurements from the reading memory. You can send the query multiple times to retrieve the same data.

◆ You can store up to 1,000 measurements in the reading memory of theSDM3055x . If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).

◆   The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:
INITiate
MEASure:<function>?
READ?
*RST
SYSTem:PRESet

1.3. INITiate[:IMMediate]

Set the trigger state for "wait for trigger".Measurements will begin when the specified trigger conditions are satisfied following the receipt of the INITiate command. This command also clears the previous set of measurements from reading memory.

Parameter	Typical Return
(none)	(none)
Set the trigger source for "wait for trigger",it can effectively receives the triggersignal: TRIG:SOUR BUS //Set the trigger source to trigger bus TRIG:COUN 10 //Set the trigger source for 10 times INIT //Set the trigger state for "wait for trigger" *TRG //Send a trigger signal FETCh? //After measuring can read the measured memory	

◆ Storing measurements in reading memory with I**NITiate** is faster than sending measurements to the instrument's output buffer using **READ?** (provided you do not send **FETCh?** until done). The INITiate command is also an "overlapped" command. This means that after executing INITiate, you can send other commands that do not affect the measurements.

◆ You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).

◆ To retrieve the measurements from the reading memory, use **FETCh?.** Use **DATA:REMove?** or **R?** to read and erase all or part of the available measurements.

◆ The **ABORt** command may be used to return to idle.

1.4. OUTPut:TRIGger:SLOPe {POSitive|NEGative}

OUTPut:TRIGger:SLOPe?

Selects the slope of the *voltmeter complete* output signal on the rear-panel VM Comp BNC connector.

Parameter	Typical Return
{POSitive|NEGative}, default NEGative	(none)
Configure DC voltage measurements and make two measurements. The signal on the rear-panel **VM Comp** connector will output a positive pulse as each measurement is completed: CONF:VOLT:DC 10 SAMP:COUN 2 OUTP:TRIG:SLOP POS INIT	

This parameter is set to its default value after a Factory Reset (***RST**) or Instrument Preset (**SYSTem:PRESet**).

1.5. R? [<max_readings>]

Reads and erases all measurements from the reading memory up to the specified *<max_readings>*. The measurements are read and erased from the reading memory starting with the oldest measurement first.

Parameter	Typical Return
1 to 10,000 readings Default is all readings in memory	#247-1.06469770E-03,-1.08160033E-03,-1.22469433E-03 The "#2" means that the next 2 digits indicate how many characters will be in the returned memory string. These two digits are the "47" after the "#2". Therefore, the remainder of the string is 47 digits long: -1.06469770E-03,-1.08160033E-03,-1.22469433E-03
Read and remove the three oldest readings: TRIG:COUN 3 INIT R? 3	

◆   The R? and DATA:REMove? queries allow you to periodically remove measurements from the reading memory that would normally cause the reading memory to overflow.

◆   You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).

◆   The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:
INITiate
MEASure:<function>?
READ?
*RST
SYSTem:PRESet

1.6. **READ?**

Read and erase measurement results from reading storage ,up to the specified < max_readings >.This command reads the data will begin with the first measurement results.

Parameter	Typical Return
(none)	-1.23006735E-03,-1.30991641E-03,-1.32756530E-03, -1.32002814E-03
Transmission measurements from the reading memory: TRIG:COUN 4 SAMP:COUN 1 READ?	

◆ The FETch? query does not erase measurements from the reading memory. You can send the query multiple times to retrieve the same data.

◆ You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register .

◆ It is important to note that the following command will measurements to empty, leading to FETCh? The return value of the change:
INITiate
MEASure:<function>?
READ?
*RST
SYSTem:PRESet

1.7. SAMPle:COUNt {<count>|MIN|MAX|DEF}

SAMPle:COUNt? [{MIN|MAX|DEF}]

Specifies the number of measurements (samples) the instrument will take per trigger.

Parameter	Typical Return
1(default) 至 100,000	1
Set a single trigger sampling frequency for 10 times, the back panel of the VM Comp BNC connector on the oscilloscope will only observe a pulse: SAMP:COUN 10 //Set the sampling frequency for 10 times TRIG:COUN 1 //Set the trigger for 1 times TRIG:SOUR EXT;SLOP NEG //Set the trigger source to the external trigger and trigger signal is set to the falling edge OUTP:TRIG:SLOP POS //Set the trigger output signal to rise READ? //Start the wheel measurement and reading	

◆ You can use the specified sample count in conjunction with a trigger count (TRIGger:COUNt), which sets the number of triggers to be accepted before returning to the "idle" trigger state. The total number of measurements returned will be the product of the sample count and trigger count.

◆ You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register .

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

1.8. UNIT:TEMPerature {C|F|K}

UNIT:TEMPerature?

Selects the units (°C, °F or Kelvin) to be used for all temperature measurements.

Parameter	Typical Return
{C|F|K},default C	C, F or K
Set to return the result in °F UNIT:TEMP F //Set the temperature measurement unit in °F MEAS:TEMP? //Recovery temperature default configuration and read a set of temperaturemeasurements	

◆ The command also accepts CEL or FAR, but the query returns C or F.
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

System Command

2.1 CALCulate Subsystem

2.1.1 CALCulate:CLEar[:IMMediate]

Clears all limits, histogram data, statistics and measurements.

Parameter	Typical Return
(none)	(none)
Clear all limits, histogram data, statistics, and measurements: CALC:CLE:IMM CALC:CLE:IMM	

The items cleared by this command are cleared synchronously, so that the histogram, statistics, and limit data all restart at the same time that measurements restart.

2.2 CALCulate:LIMit Subsystem

This subsystem specifies measurements and indicates when a limit has been exceeded.

Example

The following example enables limit testing of 100 DC voltage measurements and indicates whether measurements were outside the range of 2.4 to 3.6 V. Measurements above 3.6 V will set bit 12 (Upper Limit Failed) of the Questionable Status Register; measurements below 2.4 V will set bit 11 (Lower Limit Failed).

```
*CLS
STAT:PRES
CONF:VOLT 10,.001
SAMP:COUN 100
CALC:LIM:LOW 2.4
CALC:LIM:UPP 3.6
CALC:LIM:STAT ON
INIT
*WAI
STAT:QUES?
```

Typical Response: +4096 (at least one measurement was above the upper limit)

Command Summary

```
CALCulate:LIMit:CLEar[:IMMediate]
CALCulate:LIMit:{LOWer|UPPer}[:DATA]
CALCulate:LIMit[:STATe]
```

2.2.1 CALCulate:LIMit:CLEar[:IMMediate]

Clears front-panel indications of limits being exceeded and clears bit 11 ("Lower Limit Failed") and bit 12 ("Upper Limit Failed") in the Condition Register of the Questionable Data Register event register group. The corresponding event register bits are unaffected.

A condition register continuously monitors the state of the instrument. Condition register bits are updated in real time;they are neither latched nor buffered.

An event register is a read-only register that latches events from the condition register. While an event bit is set,subsequent events corresponding to that bit are ignored.

Parameter	Typical Return
(none)	(none)
Clear the limit test results: CALC:LIM:CLECALC:LIM:CLE:IMM	

◆   This command does not clear measurements in reading memory.

◆   The instrument clears front-panel indications of limits being exceeded and clears bits 11 and 12 in the Questionable Data Register when the measurement function changes, or when any of the executed:

CALCulate:LIMit:STATe ON

INITiate

MEASure:<function>?

READ?

CALCulate:LIMit:CLEar

*RST

SYSTem:PRESet

◆   To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.2.2 CALCulate:LIMit:{LOWer|UPPer}[:DATA] {<value>|MIN|MAX|DEF}

CALCulate:LIMit:{LOWer|UPPer}[:DATA]? [{MIN|MAX|DEF}]

Sets an upper or lower limit.

Parameter	Typical Return
	+1.00000000E+00
-1.0E+15to-1.0E-15， Or 0.0(default) To +1.0E-15　至 1.0E+15	
See Example.	

◆ You can assign a lower limit, an upper limit or both. Do not set the lower limit above the upper limit.If the limit set is higher than the upper limit, the limit value is set to the same limitwill force the same value.

◆ Limit crossing: If a measurement is less than the specified lower limit, bit 11 ("Lower Limit Failed") is set in the Questionable Data Condition Register. A measurement greater than the specified upper limit sets bit 12 ("Upper Limit Failed"). See STATus Subsystem Introduction for further information.

◆ A CONFigure command resets both limits to 0.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.2.3 CALCulate:LIMit[:STATe]{ON|1|OFF|0}

CALCulate:LIMit[:STATe]?

Enables or disables limit testing.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
See Example.	

◆ The instrument clears front-panel indications of limits being exceeded and clears bits 11 and 12 in the Questionable Data Register when the measurement function changes, or when any of the following commands is executed:
CALCulate:LIMit:STATe ON
INITiate
MEASure:<function>?
READ?
CALCulate:LIMit:CLEar
*RST
SYSTem:PRESet
◆ The instrument turns this setting OFF when the measurement function is changed or after ***RST** or **SYSTem:PRESet.**

2.3   CALCulate:TRANsform:HISTogram Subsystem

The HISTogram subsystem configures the histogram display. The instrument clears histogram data when the measurement function changes and when any of the following commands is sent:

CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]

CALCulate:TRANsform:HISTogram:POINts

CALCulate:TRANsform:HISTogram:RANGe:AUTO

CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}

CALCulate:TRANsform:HISTogram[:STATe]

INITiate[:IMMediate]

MEASure:<*function*>?

READ?

*RST

SYSTem:PRESet

Command Summary

CALCulate:TRANsform:HISTogram:ALL?

CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]

CALCulate:TRANsform:HISTogram:COUNt?

CALCulate:TRANsform:HISTogram:DATA?

CALCulate:TRANsform:HISTogram:POINts

CALCulate:TRANsform:HISTogram:RANGe:AUTO

Example

This example enables an automatically scaled, 100-bin histogram of 1000 DCV measurements. It then returns the computed histogram, including the lower and upper range values, the total measurement count, and the bin data.

CONF:VOLT:DC 10,0.001

SAMP:COUN 1000

CALC:TRAN:HIST:RANG:AUTO ON

CALC:TRAN:HIST:POIN 100

CALC:TRAN:HIST:STAT ON

INIT

*WAI

CALC:TRAN:HIST:ALL?

Typical Response: +9.99383828E+00,+1.00513398E+01,+1000,<*102 bin counts*>

Note: The above response indicates 102 bin counts because the histogram includes bins for values below and above the histogram range.

2.3.1 CALCulate:TRANsform:HISTogram:ALL?

CALCulate:TRANsform:HISTogram:DATA?

The ALL form of the query returns a comma-separated list of the lower and upper range values, the number of measurements, and the bin data collected since the last time the histogram data was cleared. The DATA form returns only the bin data.

Parameter	Typical Return
(none)	See Example.
See Example.	

- The bin data includes the following, in order:
- The number of measurements less than the lower range value .
- The number of measurements in the each of the bins, starting at the lower range value bin
- The number of measurements greater than the upper range value
- Range values are real numbers returned in the form +1.00000000E+00. The number of measurements and bin data are signed, positive integers returned in the form +100.

2.3.2   CALCulate:TRANsform:HISTogram:CLEar[:IMMediate]

Clears the histogram data and restarts histogram ranging if it is enabled
(CALCulate:TRANsform:HISTogram:RANGe:AUTO ON).

Parameter	Typical Return
（none）	（none）
Clear the histogramdata: CALC:TRAN:HIST:CLE	

- This command does not clear measurements in reading memory.
- To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.3.3   CALCulate:TRANsform:HISTogram:COUNt?

Returns the number of measurements collected since the last time the histogram was cleared.

Parameter	Typical Return
（none）	+96
Return the number of measurements used to compute the current histogram: CALC:TRAN:HIST:COUN?	

2.3.4   CALCulate:TRANsform:HISTogram:POINts{<value>|MIN|MAX|DEF}

CALCulate:TRANsform:HISTogram:POINts?[{MIN|MAX|DEF}]

Sets the number of bins between the lower and upper range values for the histogram. Two additional bins always exist:one for measurements below the lower range and one for measurements above the upper range.

Parameter	Typical Return
{10|20|40|100|200|400|MIN|MAX|DEF},default 100	+100
See Example.	

◆   You can specify the lower and upper range values using CALCulate:TRANsform:HISTogram:RANGe: {LOWer|UPPer}. Lower and upper range values are computed automatically if CALCulate:TRANsform:HISTogram:RANGe:AUTO is ON.

◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.3.5   CALCulate:TRANsform:HISTogram:RANGe:AUTO{ON|1|OFF|0}

CALCulate:TRANsform:HISTogram:RANGe:AUTO?

Enables or disables automatic selection of the histogram's lower and upper range values.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
See Example.	

◆ **ON:** the instrument uses the first 1,000 measurements to set the lower and upper range values.

◆ OFF: the lower and upper range values are specified by CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}.

◆ Setting the lower or upper range value (CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer) disables automatic selection of the lower and upper range values (CALCulate:TRANsform:HISTogram:RANGe:AUTO OFF).

◆ The instrument restarts automatic range value selection (if enabled) when INITiate, MEASure? or READ? is

executed.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.3.6

CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}{<value>|MIN|MAX|DEF}

CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer}?[{MIN|MAX|DEF}]

Sets the histogram's lower and upper range values. Setting the lower or upper range value. (CALCulate:TRANsform:HISTogram:RANGe:{LOWer|UPPer) disables automatic selection of the lower and upper range values (CALCulate:TRANsform:HISTogram:RANGe:AUTO OFF).

Parameter	Typical Return
-1.0E+15 to -1.0E-15, or 0.0 (default) or +1.0E-15 to 1.0E+15	+1.00000000E+06
See Example.	

◆ If automatic range value selection is enabled (CALCulate:TRANsform:HISTogram:RANGe:AUTO ON), the query returns the computed range value. If no histogram data exists, 9.91E37 (Not a Number) is returned.

◆ Lower and upper range values are computed automatically if CALCulate:TRANsform:HISTogram:RANGe:AUTO is ON.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.3.7   CALCulate:TRANsform:HISTogram[:ST・ATe]{ON|1|OFF|0}

CALCulate:TRANsform:HISTogram[:STATe]?

Enables or disables histogram computation.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
See Example.	

◆   The instrument turns this setting OFF when the measurement function is changed or after *RST or SYSTem:PRESet.

2.4 CALCulate:SCALe Subsystem

This subsystem scales ACV and DCV measurements.

Command Summary
CALCulate:SCALe:DB:REFerence
CALCulate:SCALe:DBM:REFerence
CALCulate:SCALe:FUNCtion
CALCulate:SCALe:REFerence:AUTO
CALCulate:SCALe[:STATe]

2.4.1 CALCulate:SCALe:DB:REFerence {<reference>|MIN|MAX|DEF}

CALCulate:SCALe:DB:REFerence? [{MIN|MAX}]

Stores a relative value in the multimeter's dB Relative Register, which is used for the dB function in CALCulate:SCALe:FUNCtion. When the dB function is enabled, this value will be subtracted from the each voltage measurement after the measurement is converted to dBm.
Note: This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
-200.0 dBm to +200.0 dBm, default 0	+5.00000000E+02
Enable dB scaling with a -10 dB reference reference resistance: CALC:SCAL:DB:REF -10.0 CALC:SCAL:FUNC DB CALC:SCAL:STAT ON	

◆ Specifying a reference value disables automatic reference selection (CALCulate:SCALe:REFerence:AUTO OFF).

◆ The dB relative value parameter is relative to the dBm reference set with CALCulate:SCALe:DBM:REFerence.

◆ The instrument sets the reference value to 0.0 with automatic reference selection enabled after a Factory Reset (*RST), an Instrument Preset (SYSTem:PRESet), a change in math function, or a change in measurement function.

2.4.2 CALCulate:SCALe:DBM:REFerence {<reference>|MIN|MAX|DEF}

CALCulate:SCALe:DBM:REFerence? [{MIN|MAX}]

Selects the reference resistance for converting voltage measurements to dBm. This reference value affects the dBm and dB scaling functions.

Note:This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
50、75、93、110、124、125、135、150、250、300、500、600((default)、800、900、1000、1200 or 8000Ω	+6.00000000E+02
Enable dBm scaling with a reference resistance of 600 Ω: CALC:SCAL:DBM:REF 600 CALC:SCAL:FUNC DBM CALC:SCAL:STAT ON	

◆ The instrument sets the reference value to its default value after a Factory Reset (*RST), an Instrument Preset (SYSTem:PRESet), a change in math function, or a change in measurement function.

2.4.3 CALCulate:SCALe:FUNCtion {DB|DBM}

CALCulate:SCALe:FUNCtion?

Selects the operation that will be performed by the scaling function:
◆ DB performs a relative dB computation. The result will be the difference between the input signal and the stored DB relative value (CALCulate:SCALe:DB:REFerence), with both values converted to dBm (dB = measurement indBm – relative value in dBm).
◆ DBM performs a dBM computation. The result is logarithmic and is based on a calculation of power delivered to a reference resistance
(CALCulate:SCALe:DBM:REFerence), relative to 1 milliwatt. (dBm = 10 × log10 (measurement 2 / reference resistance / 1 mW)).

Note: This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
{DB|DBM}	DBorDBM
Enable the DB scaling function referenced to the next measurement taken: CALC:SCAL:FUNC DBM CALC:SCAL:STAT ON	

◆ For the dB function, the reference value can be automatically selected using the first measurement converted to dBm as the reference value
(see CALCulate:SCALe:REFerence:AUTO), or it can be specified by
CALCulate:SCALe:DB:REFerence.
◆ Scaling function results must be in the range of -1.0E+24 to -1.0E-24, or +1.0E-24 to 1.0E+24. Results outside these limits will be replaced with -9.9E37 (negative infinity), 0, or 9.9E37 (positive infinity).
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.4.4 CALCulate:SCALe:REFerence:AUTO {ON|1|OFF|0}

CALCulate:SCALe:REFerence:AUTO?

Enables or disables automatic reference selection for the dB scaling functions

Note:This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
{ON|1|OFF|0}, default ON	0(OFF)or1(ON)
Enable the DB function with automatic reference selection and use the first measurement as the reference value: CALC:SCAL:DBM:REF 50 CALC:SCAL:FUNC DB CALC:SCAL:REF:AUTO ON CALC:SCAL:STAT ON READ?	

◆   **ON:** the first measurement made will be used as the reference for all subsequent measurements, and automatic reference selection will be disabled:

● For the dB scaling function, the first measurement is converted to dBm, and CALCulate:SCALe:DB:REFerence is set to the result.

◆ **OFF:**CALCulate:SCALe:DB:REFerence specifies the reference for DB scaling.

◆ The instrument enables automatic reference selection when the scaling function is enabled (CALCulate:SCALe:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.4.5 CALCulate:SCALe[:STATe] {ON|1|OFF|0}

CALCulate:SCALe[:STATe]?

Enables or disables the scaling function.

Note :This command applies only to ACV and DCV measurement functions.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Enable the DB function with automatic reference selection and use the first measurement as the reference value: CALC:SCAL:DBM:REF 50 CALC:SCAL:FUNC DB CALC:SCAL:REF:AUTO ON CALC:SCAL:STAT ON READ?	

◆ Enabling the scaling function also enables automatic null value selection (CALCulate:SCALe:REFerence:AUTO).

◆ The instrument turns this setting OFF when the measurement function is changed or after *RST or SYSTem:PRESet.

2.5 CALCulate:AVERage Subsystem

This subsystem calculates measurement statistics.

Command Summary
CALCulate:AVERage[:STATe]
CALCulate:AVERage:CLEar[:IMMediate]
CALCulate:AVERage:ALL?
CALCulate:AVERage:AVERage?
CALCulate:AVERage:COUNt?
CALCulate:AVERage:MAXimum?
CALCulate:AVERage:MINimum?
CALCulate:AVERage:PTPeak?
CALCulate:AVERage:SDEViation?

2.5.1 CALCulate:AVERage[:STATe]{ON|1|OFF|0}

CALCulate:AVERage[:STATe]?

Enables or disables statistics computation.

Parameter	Typical Return
{ON|1|OFF|0}, default OFF	0 (OFF) or 1 (ON)
Return the statistics of 100 frequency measurements: CONF:FREQ SAMP:COUN 100 CALC:AVER:STAT ON INIT CALC:AVER:ALL? Typical Response: -4.10466677E-04,+3.13684184E-04,+1.75743178E-02,-6.74799085E-04	

◆ Statistics are cleared when the measurement function changes or when any of these commands is executed:
CALCulate:AVERage:STATe ON
CALCulate:AVERage:CLEar
INITiate
MEASure:<*function*>?
READ?
*RST
SYSTem:PRESet

◆ The instrument turns this setting OFF when the measurement function is changed or after *RST or SYSTem:PRESet.

2.5.2 CALCulate:AVERage:ALL?

CALCulate:AVERage:AVERage?

CALCulate:AVERage:COUNt?

CALCulate:AVERage:MAXimum?

CALCulate:AVERage:MINimum?

CALCulate:AVERage:PTPeak?

CALCulate:AVERage:SDEViation?

The CALCulate:AVERage:ALL? query returns the arithmetic mean (average), standard deviation, minimum value and maximum value of all measurements taken since the statistics were last cleared. The count and peak-to-peak statistics are not returned by CALCulate:AVERage:ALL?.

The other six queries listed above return individual values.

Parameter	Typical Return
(none)	(see below)
Return the statistics of 100 frequency measurements: CONF:FREQ SAMP:COUN 100 CALC:AVER:STAT ON INIT CALC:AVER:ALL? Typical Response: -4.10466677E-04,+3.13684184E-04,+1.75743178E-02,-6.74799085E-04	

◆ Statistics are cleared when the measurement function changes or when any of these commands is executed:
CALCulate:AVERage:STATe ON
CALCulate:AVERage:CLEar
INITiate
MEASure:<*function*>?
READ?
*RST
SYSTem:PRESet

◆ All values except the COUNt are returned in the form +1.23450000E+01. The count is as a signed, positive integer: +129.

◆ When dB or dBm scaling is used, the CALC:AVER:AVER and CALC:AVER:SDEV queries return +9.91000000E+37 (not a number).

2.5.3 CALCulate:AVERage:CLEar[:IMMediate]

Clears all computed statistics: minimum, maximum, average, peak-to-peak, count and standard deviation.

Parameter	Typical Return
(none)	(none)
Clear the stored statistical data: CALC:AVER:CLE	

◆   This command does not clear measurements in reading memory.
◆   Statistics are cleared when the measurement function changes or when any of these commands is executed:
    CALCulate:AVERage:STATe ON
    CALCulate:AVERage:CLEar
    INITiate
    MEASure:<*function*>?
    READ?
    *RST
    SYSTem:PRESet
◆   To clear statistics, limits, histogram data, and measurement data, use CALCulate:CLEar[:IMMediate].

2.6 CONFigure Subsystem

The CONFigure commands are the most concise way to configure measurements.These commands use default measurement configuration values. However, these commands do not automatically start measurements, so you can modify measurement attributes before initiating the measurement.

Use INITiate or READ? to initiate measurements.

Command Summary

CONFigure?
CONFigure:CONTinuity
CONFigure:CURRent:{AC|DC}
CONFigure:DIODe
CONFigure:{FREQuency|PERiod}
CONFigure:{RESistance|FRESistance}
CONFigure:TEMPerature
CONFigure[:VOLTage]:{AC|DC}
CONFigure[:VOLTage][:DC]:RATio

Default Settings for the CONFigure Command

The CONFigure commands select the function, range and sampling rate in one command.All other parameters are set to their default values (below).If no range and sampling speed settings, which will restore the default value.

Measurement Parameter	Default Setting
Autozero	OFF
Range	AUTO
Samples per Trigger	1 sample
Trigger Count	1 trigger
Trigger Delay	1 trigger
Trigger Source	Immediate
Trigger Slope	NEGative
Math Functions	Disabled

Using CONFigure

The following example uses CONFigure and READ? to make an externally-triggered measurement. The CONFigure command configures DC voltage measurements but does not place the instrument in the "wait-for-trigger" state.

The READ? query places the instrument in the "wait-for-trigger" state, initiates a measurement when the rear-panel **Ext Trig** input is pulsed (low by default), stores the measurement in reading memory, and transfers the measurement to the instrument's output buffer. The default range (autorange) and resolution (10 PLC) are used for the measurement.

CONF:VOLT:DC

TRIG:SOUR EXT

READ?

Typical Response: -5.21391630E-04

The following example is like the previous one, but it uses INITiate and FETCh? instead of READ?. The INITiatecommand places the instrument in the "wait-for-trigger" state, triggers a measurement when the rear-panel **Ext Trig** input is pulsed (low by default), and sends the measurement to reading memory. The FETCh? query transfers the measurement from reading memory to the instrument's output buffer.
CONF:VOLT:DC
TRIG:SOUR EXT
INIT
FETC?
Typical Response: -5.21205366E-04

Storing measurements in reading memory with INITiate is faster than sending measurements to the instrument's output buffer using READ? (provided you do not send FETCh? until done). The INITiate command is also an "overlapped" command. This means that after executing INITiate, you can send other commands that do not affect the measurements. This allows you to check for data availability before initiating a read attempt that might otherwise time out. Note that the FETCh? query waits until all measurements are complete to terminate. You can store up to 1,000 measurements in the reading memory of the SDM3055x.

The following example configures the instrument for 2-wire resistance measurements, triggers the instrument to make one measurement using INITiate, and stores the measurement in reading memory. The 10 kΩ range is selected with 100 Ω resolution.
CONF:RES 10000,100
INIT
FETC?
Typical Response:+5.21209585E+04

2.6.1 CONFigure?

Returns a quoted string indicating the present function, range, and resolution. The short form of the function name (CURR:AC, FREQ) is always returned.

Parameter	Typical Return
(none)	"VOLT +2.00000000E-01"
Return the present function, range, and resolution. CONF?	

2.6.2 CONFigure:CONTinuity

Sets all measurement parameters and trigger parameters to their default values for continuity measurements.

Parameter	Typical Return
(none)	(none)
Configure the instrument for continuity measurements.Then make a measurement using an external trigger with positive slope (rising edge) and read the measurement: CONF:CONT TRIG:SOUR EXT;SLOP POS READ?	

◆   The range and resolution are fixed at 1 kΩ for continuity tests (a 2-wire resistance measurement).

◆   The instrument beeps (if the beeper is enabled) for each measurement less than or equal to the continuity threshold (The threshold can be passed by [: SENSe]: CONTinuity:THReshold:VALue command), and the actual resistance measurement appears on the display.

◆   From 10 Ω to 1.2 kΩ, the instrument displays the actual resistance measurement with no beep. Above 1.2 kΩ,the instrument displays "OPEN" with no beep.

◆   The FETCh?, READ?, and MEASure:CONTinuity? queries return the measured resistance, regardless of its value.

◆   Use READ? or INITiate to start the measurement.

2.6.3 CONFigure:CURRent:{AC|DC} [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC current measurements. Also specifies the range and resolution through the incoming parameters.

Parameter	Typical Return
<range>：{200uA|2mA|20mA|200mA|2A|10A|AUTO}, default AUTO (autorange),The 200uA and 2mA file can be set only in DC current mode , The minimum gear for 20mA in AC mode .	(none)
Using 2 a range configuration ac current measurements. Two measurement and reading: CONF:CURR:AC 2 SAMP:COUN 2 READ? Typical Response： +4.32133675E-04,+4.18424606E-04	

◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ Use READ? or INITiate to start the measurement.

2.6.4 CONFigure:DIODe

Sets all measurement parameters and trigger parameters to their default values for diode tests.

Parameter	Typical Return
（none）	（none）
Configure, make, and read a default diode measurement: CONF:DIOD READ? Typical Response： +1.32130000E-01	

◆ The range and resolution are *fixed* for diode tests: the range is 1 VDC.
◆ The FETCh?, READ?, and MEASure:DIODe? queries return the measured voltage, regardless of its value.
◆ Use READ? or INITiate to start the measurement.

2.6.5 CONFigure:{FREQuency|PERiod}

Sets all measurement parameters and trigger parameters to their default values in the frequency/cycle mode.

Parameter	Typical Return
(none)	（none）
Configure, make, and read a default frequency measurement： CONF:FREQ READ? Typical Response： +7.79645018E+01	

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "+9.90000000E+37" from the remote interface.

2.6.6 CONFigure:{RESistance|FRESistance}

[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for 4-wire (FRESistance) or 2-wire (RESistance) resistance measurements.Also specifies the range and resolution.

Parameter	Typical Return
<range>：{200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}，AUTO(default)	（none）
Configure 4-wire resistance measurements using the 200 Ω range with default resolution.Make and read two measurementsCONF:FRES 200 SAMP:COUN 2 READ? Typical Response： +6.71881065E+01,+6.83543086E+01	

◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ Use READ? or INITiate to start the measurement.

2.6.7 CONFigure:TEMPerature [{RTD|THER|DEFault}

[,{<type>|DEFault}]]

Sets all measurement parameters and trigger parameters to their default values in On-off mode.

Parameter	Typical Return
<probe_type> ： {RTD|THER} ， default THER. The default command can only choose the built-in sensormanufacturers, does not support user defined sensor selection.	none
<type> ： PT100 (for RTD only choice) or {BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90} (for THER can choose the sensor)	
Configuration RTD measurement. Then read measurement results: CONF:TEMP RTD,PT100 READ? Typical Response： -2.00000000E+02	

◆   To change temperature units, use UNIT:TEMPerature.
◆   If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
◆   Use READ? or INITiate to start the measurement.

2.6.8 CONFigure[:VOLTage]:{AC|DC} [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC voltage measurements. Also specifies the stalls through the incomingparameters.

Parameter	Typical Return
<range>：{200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)}，default AUTO (autorange)	（none）
Configure AC voltage measurements using the 200 V range.Make and read two measurements: CONF:VOLT:AC 200 SAMP:COUN 2 READ? Typical Response： +2.43186951E-02,+2.56896019E-02	

◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ Use READ? or INITiate to start the measurement.

2.6.9 CONFigure:CAPacitance[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for capacitance measurement. Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF |20uF| 200uF|10000uF}，default AUTO (autorange)	（none）
Configure capacitance measurement using the 2uv range.Make and read two measurements: CONF:CAP 2uF SAMP:COUN 2 READ? Typical Response： +7.26141264E-10,+7.26109188E-10	

◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ Use READ? or INITiate to start the measurement.

2.7 DATA Subsystem

This subsystem allows you to configure and remove data from reading memory. The instrument clears all measurements from reading memory when the measurement configuration changes, or when any of these commands is executed:

INITiate

MEASure:*<function>*?

READ?

*RST

SYSTem:PRESet

Command Summary

DATA:LAST?

DATA:POINts?

DATA:POINts:EVENt:THReshold

DATA:REMove?

2.7.1 DATA:LAST?

Returns the last measurement taken. You can execute this query at any time, even during a series of measurements.

Parameter	Typical Return
（none）	One measurement with units. If no data is available, 9.91E37 (Not a Number) is returned with units Example： -4.79221344E-04　VDC
Return the last measurement： DATA:LAST?	

2.7.2 DATA: POINts?

Returns the total number of measurements currently in reading memory. You can execute this query at any time, even during a series of measurements.

Parameter	Typical Return
（none）	+20
Return the number of measurements in reading memory:DATA:POIN?DATA:POIN?	

You can store up to 1,000 measurements in the reading memory on the SDM3055x.

2.7.3 DATA:REMove?<num_readings> [,WAIT]

Reads and erases <num_readings> measurements from the reading memory. If fewer than <num_readings> measurements are available, the query will return an error unless the WAIT parameter is specified, in which case the query will wait until <num_readings measurements are available.

Parameter	Typical Return
1~10000	-4.55379486E-04,-4.55975533E-04,-4.56273556E-04, -4.53591347E-04,-4.55379486E-04
Read and erase the five oldest readings from reading memory:： DATA:REMove? 5	

◆   The R? and DATA:REMove? queries allow you to periodically remove measurements from the reading memory that would normally cause the reading memory to overflow.

2.8 MEASure Subsystem

The MEASure queries are the easiest way to program measurements because they always use default measurement parameters. You set the function, range, and resolution in one command, but you cannot change other parameters from their default values. The results are sent directly to the instrument's output buffer.

Note: A MEASure query is functionally equivalent to sending CONFigure followed immediately by READ?. The difference is that CONFigure commands allow you to change parameters between the CONFigure and the READ?

Command Summary

MEASure:CONTinuity?

MEASure:CURRent:{AC|DC}?

MEASure:DIODe?

MEASure:{FREQuency|PERiod}?

MEASure:{RESistance|FRESistance}?

MEASure:TEMPerature?

MEASure[:VOLTage]:{AC|DC}?

MEASure[:VOLTage][:DC]:RATio?

Default Settings for MEASure?

With the MEASure? queries, you can select the function, range and resolution in one command. All other parameters are set to their default values (below).

Parameter	Default Setting
OFF	OFF
Range	AUTO
Samples per Trigger	1 sample
Trigger Count	1 trigger
Trigger Delay	Automatic delay
Trigger Source	Immediate
Trigger Slope	NEGative
Math Functions	Disabled

Using the MEASure? Query

The following example configures DC voltage measurements, internally triggers the instrument to take a measurement, and reads the measurement. The default range (autorange) and resolution (10 PLC) are used for the measurement.

MEAS:VOLT:DC?

Typical Response: +4.23450000E-03

The following example configures the instrument for 2-wire resistance measurements, triggers the instrument to take a measurement, and reads the measurement. The 1 kΩ range is selected with 0.1 Ω resolution.

MEAS:RES? 1000,0.1

Typical Response: +3.27150000E+02

2.8.1 MEASure:CONTinuity?

Sets all measurement parameters and trigger parameters to their default values for continuity test and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+9.84739065E+02
Configure the instrument for continuity measurements. Then make and read one measurement: MEAS:CONT?	

◆   The range and resolution are fixed at 1 kΩ for continuity tests (a 2-wire resistance measurement).

◆   The instrument beeps (if the beeper is enabled) for each measurement less than or equal to the continuity threshold (≤10 Ω), and the actual resistance measurement appears on the display.

◆   From 10 Ω to 1.2 kΩ, the instrument displays the actual resistance measurement with no beep. Above 1.2 kΩ, the instrument displays "OPEN" with no beep.

◆   The FETCh?, READ?, and MEASure:CONTinuity? queries return the measured resistance, regardless of its value.

2.8.2 MEASure:CURRent:{AC|DC}? [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for AC or DC current measurements and immediately triggers a measurement. Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range> ： {200uA|2mA|20mA|200mA|2A|10A|AUTO} ，default AUTO(autorange).The 200uA and 2mA file can only be set in DC current mode,AC mode minimum gear for 20mA	None
Configure AC current measurement using the 2A range.Make and read two measurements: CONF:CURR:AC 2 SAMP:COUN 2 READ? Typical Response： +4.32133675E-04,+4.18424606E-04	

- ◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).
- ◆ Autoranging (AUTO or DEFault), will generate an error if you specify a *<resolution>* because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the *<resolution>* or omit the *<resolution>* altogether.
- ◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.3 MEASure:DIODe?

Sets all measurement parameters and trigger parameters to their default values for diode test measurements and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+9.84733701E-01
Configure, make, and read a default diode measurement: MEAS:DIOD?	

◆ The range and resolution are *fixed* for diode tests: the range is 2 VDC.
◆ The FETCh?, READ?, and MEASure:DIODe? queries return the measured voltage, regardless of its value.

2.8.4 MEASure:{FREQuency|PERiod}?

Sets all measurement parameters and trigger parameters to their default values for frequency or period measurements and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
（none）	+7.19480528E+01
configure and read the default frequency measurements： MEAS:FREQ?	

◆ If the input voltage is too large for the selected voltage range (manual ranging), the instrument displays the word Overload on the front panel and returns "9.9E37" from the remote interface. Autoranging can be enabled for the input voltage.

2.8.5 MEASure:{RESistance|FRESistance}?

[{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement and trigger parameters to their default values for 4-wire resistance (FRESistance) or 2-wire (RESistance) measurements, and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}，AUTO (default) or DEFault	（none）
Configure 4-wire resistance measurements using the 200 Ω range with default resolution. Then make and read one measurement:： MEAS:FRES? 200 Typical Response： +6.71881065E+01	

2.8.6 MEASure:TEMPerature?[{RTD|THER|DEFault} [,{<type>|DEFault}]]

Sets all measurement parameters and trigger parameters to their default values and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.

Parameter	Typical Return
<probe_type>：{RTD|THER}，default FRTD.The default command can only choose the built-in sensor manufacturers, does not support user defined sensor selection.	（none）
<type> ： PT100(only possible value for RTD/FRTD) or {BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(The sensor can be selected for THER)	
Configure the RTD measurement. Then read out the measuring results: MEAS:TEMP? RTD,PT100 Typical Response： -2.00000000E+02	

◆ To change temperature units, use UNIT:TEMPerature.
◆ For RTD measurements, the instrument autoranges to the correct range for the transducer resistance measurement.
◆ For 4-wire RTD measurements, the instrument always enables the autozero function.

2.8.7 MEASure[:VOLTage]:{AC|DC}? [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values and immediately triggers a measurement. The results are sent directly to the instrument's output buffer.Also specifies the stalls through the incoming parameters.

Parameter	Typical Return
<range>：{200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)}，default AUTO (automatic adjustment range)	（none）
Configure AC voltage measurements using the 200 V range. Then make and read one measurement： MEAS:VOLT:AC? 200 Typical Response: +2.43186951E-02,+2.56896019E-02	

◆ You can let autoranging select the measurement range, or you can manually select a fixed range. Autoranging conveniently selects the range for each measurement based on the input signal. For fastest measurements, use manual ranging (autoranging may require additional time for range selection).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.8.8 MEASure:CAPacitance [{<range>|AUTO|MIN|MAX|DEF}]

Sets all measurement parameters and trigger parameters to their default values for capacitance measurement.Also specifies the stalls through the incoming parameters .

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF |20uF| 200uF|10000uF}，AUTO (default) or DEFault	（none）
Configure DC voltage ratio measurements using the 2uF resolution. Then make and read one measurement: MEAS:CAP? 2uF READ? Typical Response： +7.26141264E-10	

◆ For the *Input* terminals, you can allow the instrument to select the measurement range by autoranging or you can select a fixed range using *manual ranging*. Autoranging decides which range to use for each measurement based on the input signal. For faster measurements, use manual ranging on each measurement (additional time is required for autoranging to select a range).

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.9 SENSe Subsystem Introduction

The SENSe subsystem configures measurements. The most basic SENSe command is [SENSe:]FUNCtion[:ON], which

selects the measurement function. All other SENSe commands are associated with specific measurement types:

Current

Frequency and Period

Resistance

Temperature

Voltage

[SENSe:]FUNCtion[:ON] "<*function*>"

[SENSe:]FUNCtion[:ON]?

Selects the measurement function (all function-related measurement attributes are retained).

Parameter	Typical Return
CONTinuity CURRent:AC CURRent[:DC] DIODe FREQuency FRESistance PERiod RESistance TEMPerature VOLTage:AC VOLTage[:DC] CAPacitance The default is VOLTage [: DC].	The short form of the selected function is returned in quotation marks, with no optional keywords： "CONT"、"CURR:AC"、"CURR"、"DIOD" and so on.
Select the AC voltage function: FUNC "VOLT:AC"	

◆ If you change the measurement function, all measurement attributes of the previous function (range, resolution,etc.) are remembered. If you return to the original function, those measurement attributes will be restored.

◆ Changing the measurement function disables scaling, limit testing, histogram, and statistics (CALC:SCAL:STAT,CALC:LIM:STAT, CALC:TRAN:HIST:STAT, and CALC:AVER:STAT set to OFF).

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

[SENSe:]CURRent Subsystem
This subsystem configures AC and DC current measurements.

Command Summary
[SENSe:]CURRent:{AC|DC}:NULL[:STATe]
[SENSe:]CURRent:{AC|DC}:NULL:VALue
[SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO
[SENSe:]CURRent:{AC|DC}:RANGe
[SENSe:]CURRent:{AC|DC}:RANGe:AUTO
[SENSe:]CURRent[:DC]:NPLC
[SENSe]:CURRent[:DC]:FILTer[:STATe]

2.9.1 [SENSe:]CURRent:{AC|DC}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]CURRent:{AC|DC}:NULL[:STATe]?

Enables or disables the null function for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters
are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure AC current measurements, using the null function to subtract 100 mA from the measurements. Then make two measurements and send them to the instrument's output buffer:CONF:CURR:AC CURR:AC:NULL:STAT ON;VAL 100mA SAMP:COUN 2 READ? Typical Response： -9.92150377E-02,-9.98499843E-02	

◆ Enabling the scaling function also enables automatic null value selection
([SENSe:]CURRent: {AC|DC}:NULL:VALue:AUTO ON).
◆ To set a fixed null value, use this command:
[SENSe:]CURRent:{AC|DC}:NULL:VALue.
◆ The instrument disables the null function after a Factory Reset (*RST), Instrument
Preset (SYSTem:PRESet), or CONFigure function.

2.9.2 [SENSe:]CURRent:{AC|DC}:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CURRent:{AC|DC}:NULL:VALue? [{MIN|MAX|DEF}]

Sets the null value for AC or DC current measurements.

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
-12 to 12 A, default 0	+1.00000000E-01
Configure AC current measurements, using the null function to subtract 100 mA from the measurements. Then make two measurements and send them to the instrument's output buffer: CONF:CURR:AC CURR:AC:NULL:STAT ON;VAL 100mA SAMP:COUN 2 READ? Typical Response： -9.92150377E-02,-9.98499843E-02	

◆ Specifying a null value disables automatic null value selection
    ([SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO OFF).

◆ To use the null value, the null state must be on
    ([SENSe:]CURRent:{AC|DC}:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.3 [SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO{ON|1|OFF|0}

[SENSe:]CURRent:{AC|DC}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for AC or DC current measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters
are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Using automatic selection of zero value to measure: CURR:AC:NULL:VAL:AUTO ON READ? Typical Response： -4.67956379E-08,+2.33978190E-08	

◆ When automatic reference selection is ON, the first measurement made is used as
   the null value for all subsequent measurements.
   [SENSe:]CURRent:{AC|DC}:NULL:VALue will be set to this value. Automatic null
   value selection will be disabled.
◆ When automatic null value selection is disabled (OFF), the null value is specified by
   this command: [SENSe:] CURRent:{AC|DC}:NULL:VALue.
◆ The instrument enables automatic null value selection when the null function is
   enabled ([SENSe:]CURRent:{AC|DC}:NULL:STATe ON).
◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument
   Preset (SYSTem:PRESet), or CONFigure function.

2.9.4 [SENSe:]CURRent:{AC|DC}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]CURRent:{AC|DC}:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range.

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
<range>：{200uA|2mA|20mA|200mA|2A|10A|AUTO}，default is AUTO(autorange).	+2.00000000E-01
Configure AC current measurements using the 2 A range. Make and read two measurements: CONF:CURR:AC CURR:AC:RANG 2 SAMP:COUN 2 READ? Typical Response： +3.53049833E-04,+3.54828343E-04	

◆ Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.5   [SENSe:]CURRent:{AC|DC}:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]CURRent:{AC|DC}:RANGe:AUTO?

Disables or enables autoranging for AC or DC current measurements.

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Configure AC current measurements and perform an immediate autorange. Make and read two measurements: CONF:CURR:AC CURR:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +5.79294185E-06,+5.79294185E-06	

◆   With autoranging enabled, the instrument selects the range based on the input signal.

◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.6 [SENSe:]CURRent[:DC]:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]CURRent[:DC]:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for DC current measurements. Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement.

Parameter	Typical Return
{0.3|1|10}，default 1 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure DC current measurements using a 10 PLC integration time.: CONF:CURR:DC CURR:DC:NPLC 10	

◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.7 [SENSe]:CURRent[:DC]:FILTer[:STATe] {ON|1|OFF|0}

[SENSe]:CURRent[:DC]:FILTer[:STATe]?

Dc current measurement mode filter switch configuration.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Open the dc current mode filter：	
CONF:CURR:AC	
CURR:FILTER ON	

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

[SENSe:]{FREQuency|PERiod}

This subsystem configures frequency and period measurements.

Command Summary
[SENSe:]{FREQuency|PERiod}:NULL[:STATe] {ON|1|OFF|0}
[SENSe:]{FREQuency|PERiod}:NULL:VALue {<value>| minimum | maximum |
default}[SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO {ON|1|OFF|0}
[SENSe:]{FREQuency|PERiod}:RANGe:LOWer {<filter>|MIN|MAX|DEF}
[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe {<range>|MIN|MAX|DEF}
[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO {OFF|ON|ONCE}

2.9.8 [SENSe:]{FREQuency|PERiod}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]{FREQuency|PERiod}:NULL[:STATe]?

Enables or disables the null function for frequency and period measurements.
This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure frequency measurements, using the null function to subtract 1kHz from the measurements. Make and read two measurements: CONF:FREQ FREQ:NULL:STAT ON;VAL 1 kHz SAMP:COUN 2 READ? Typical Response： +1.15953012E+02,+1.07954466E+02	

◆   Enabling the scaling function also enables automatic null value selection ([SENSe:]
{FREQuency|PERiod}:NULL:VALue:AUTO ON).
◆   To   set   a   fixed   null   value,   use   this   command:
     [SENSe:]{FREQuency|PERiod}:NULL:VALue.
◆   The instrument disables the null function after a Factory Reset (*RST), Instrument
     Preset (SYSTem:PRESet), or CONFigure function.

2.9.9 [SENSe:]{FREQuency|PERiod}:NULL:VALue

{<value>|MIN|MAX|DEF}

[SENSe:]{FREQuency|PERiod}:NULL:VALue? [{MIN|MAX|DEF}]

Set to zero

This parameter is shared between frequency and period measurements.

Parameter	Typical Return
-1.2E6 to +1.2E6, default 0	+1.00000000E-02
Configure frequency measurements, using the null function to subtract 1kHz from the measurements. Make and read two measurements: FREQ:NULL:STAT ON;VAL 1 kHz SAMP:COUN 2 READ? Typical Response： +1.15953012E+02,+1.07954466E+02	

◆   Specifying a null value disables automatic null value selection
     ([SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO OFF).

◆   To use the null value, the null state must be on
     ([SENSe:]{FREQuency|PERiod}:NULL:STATe ON).

◆   This parameter is set to its default value after a Factory Reset (*RST), Instrument
     Preset (SYSTem:PRESet), or CONFigure function.

2.9.10 [SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]{FREQuency|PERiod}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for frequency and period measurements.
This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Using automatic selection of zero value measurement: FREQ:NULL:VAL:AUTO ON READ?	
Typical Response： +1.15953012E+02,+1.07954466E+02	

◆ When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
[SENSe:]{FREQuency|PERiod}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.

◆ When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:]{FREQuency|PERiod}:NULL:VALue.

◆ The instrument enables automatic null value selection when the null function is enabled ([SENSe:]{FREQuency|PERiod}:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.11 [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe {<range>|MIN|MAX|DEF} [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe? [{MIN|MAX|DEF}]

Manually choose frequency/cycle measurement mode voltage range:

Note：This parameter is shared between frequency and period measurements.

Parameter	Typical Return
<range>：{200 mV|2 V|20 V|200 V|750V}，default20V	+2.00000000E+01
Configures frequency measurements using the 10 VAC range. Make and read two measurements:CONF:FREQ FREQ:VOLT:RANG 20 SAMP:COUN 2 READ?	

◆ Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.

◆ If the input voltage is too large for the selected voltage range (manual ranging), the instrument displays the word Overload on the front panel and returns "9.9E37" from the remote interface. Autoranging can be enabled for the input voltage.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.12 [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO

   {OFF|ON|ONCE}

   [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO?

Disables or enables voltage autoranging for frequency and period measurements.
Note：This parameter is shared between frequency and period measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0 (OFF) or 1 (ON)
Configure frequency measurements and perform an immediate AC voltage autorange. Make and read two measurements: CONF:FREQ FREQ:VOLT:RANG:AUTO ONCE SAMP:COUN 2 READ?	

◆   With autoranging enabled, the instrument selects the range based on the input signal.
◆   Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.
◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

[SENSe:]{RESistance|FRESistance} Subsystem

This subsystem configures two- and four-wire resistance measurements.

Command Summary
[SENSe:]{RESistance|FRESistance}:NPLC
[SENSe:]{RESistance|FRESistance}:NULL[:STATe]
[SENSe:]{RESistance|FRESistance}:NULL:VALue
[SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO
[SENSe:]{RESistance|FRESistance}:RANGe
[SENSe:]{RESistance|FRESistance}:RANGe:AUTO

2.9.13 [SENSe:]{RESistance|FRESistance}:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for all alternating current measurements.Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement.

Parameter	Typical Return
{0.3|1|10}，default 1 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure 4-wire resistance measurements using a 10 PLC integration time. CONF:RES CURR:DC:NPLC 10	

This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.14 [SENSe:]{RESistance|FRESistance}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]{RESistance|FRESistance}:NULL[:STATe]?

Enables or disables the null function for all resistance measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0 (OFF) or 1 (ON)
Configure 2-wire resistance measurements, using the null function to remove 100 mΩ of wiring resistance. Make and read two measurements CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ?	

◆ Enabling the scaling function also enables automatic null value selection ([SENSe:]{RESistance/FRESistance}:NULL:VALue:AUTO ON).

◆ To set a fixed null value, use this command: [SENSe:]{RESistance/FRESistance}:NULL:VALue.

◆ The instrument disables the null function after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.15 [SENSe:]{RESistance|FRESistance}:NULL:VALue

{<value>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for all resistance measurements.

Parameter	Typical Return
-120 MΩ to +120 MΩ，default 为 0	+1.00000000E+02
Configure 2-wire resistance measurements, using the null function to remove 100 mΩ of wiring resistance. Make and read two measurements: CONF:RES RES:NULL:STAT ON;VAL 0.1 SAMP:COUN 2 READ? **Typical Return**： +1.04530000E+02,+1.04570000E+02	

◆ Specifying a null value disables automatic null value selection
   ([SENSe:]{RESistance/FRESistance}:NULL:VALue:AUTO OFF).
◆ To use the null value, the null state must be on
   ([SENSe:]{RESistance|FRESistance}:NULL:STATe ON).
◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument
   Preset (SYSTem:PRESet), or CONFigure function.

2.9.16 [SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO

{ON|1|OFF|0}

[SENSe:]{RESistance|FRESistance}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for all resistance measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default on	0 (OFF) or 1 (ON)
Using automatic selection of zero value to measuret：	
RES:NULL:VAL:AUTO ON	
READ?	
Typical Return： +1.23765203E+02,+1.16564762E+02	

◆ When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
[SENSe:]{RESistance/FRESistance}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.

◆ When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:] {RESistance/FRESistance}:NULL:VALue.

◆ The instrument enables automatic null value selection when the null function is enabled ([SENSe:] {RESistance/FRESistance}:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.17 [SENSe:]{RESistance|FRESistance}:RANGe

{<range>|MIN|MAX|DEF}

[SENSe:]{RESistance|FRESistance}:RANGe? [{MIN|MAX|DEF}]

Selects a fixed measurement range for all resistance measurements.

Parameter	Typical Return
<range>：{200 Ω|2 kΩ|20 kΩ|200 kΩ|2 MΩ|10 MΩ|100 MΩ}，default 2 kΩ	+2.00000000E+03
Configure 2-wire resistance measurements using the 10 kΩ range. Then make and read one measurement: CONF:RES RES:RANG 2E3 SAMP:COUN 2 READ?	

◆ Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables auto ranging.

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

2.9.18 [SENSe:]{RESistance|FRESistance}:RANGe:AUTO

{OFF|ON|ONCE}

[SENSe:]{RESistance|FRESistance}:RANGe:AUTO?

Disables or enables autoranging for all resistance measurements. Autoranging is convenient because it automatically selects the range for each measurement based on the input signal. Specifying ONCE performs an immediate autorange and then turns autoranging off.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF) or 1(ON)
Configure 2-wire resistance measurements and perform an immediate autorange. Make and read two measurements: CONF:RES RES:RANG:AUTO ONCE SAMP:COUN 2 READ?	

◆ Autoranging goes down a range at less than 10% of range and up a range at greater than 120% of range.

◆ Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

[SENSe:]TEMPerature Subsystem

This subsystem configures temperature measurements.

Command Summary

[SENSe:]TEMPerature:NULL[:STATe]

[SENSe:]TEMPerature:NULL:VALue

[SENSe:]TEMPerature:NULL:VALue:AUTO

[SENSe:]TEMPerature:TRANsducer?

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:LIST?

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer

[SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:POINt?

2.9.19 [SENSe:]TEMPerature:NULL[:STATe] {ON|1|OFF|0}

       [SENSe:]TEMPerature:NULL[:STATe]?

Enables or disables the null function for temperature measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Configure 4-wire RTD measurements, using the null function to subtract 25°. TEMP:NULL:STAT ON;VAL 25	

◆ Enabling the scaling function also enables automatic null value selection ([SENSe:]TEMPerature:NULL:VALue:AUTO ON).

◆ To set a fixed null value, use this command: [SENSe:]TEMPerature:NULL:VALue.

◆ The instrument disables the null function after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.20 [SENSe:]TEMPerature:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]TEMPerature:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for temperature measurements.

Parameter	Typical Return
-1.0E15 TO +1.0E15，default 0	+0.00000000E+00
Configure 4-wire RTD measurements, using the null function to subtract 25°. TEMP:NULL:STAT ON;VAL 25	

◆ Specifying a null value disables automatic null value selection ([SENSe:]TEMPerature:NULL:VALue:AUTO OFF).

◆ To use the null value, the null state must be on ([SENSe:]TEMPerature:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.21 [SENSe:]TEMPerature:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]TEMPerature:NULL:VALue:AUTO?

Enable or disable the automatic zero value choice

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Using automatic zero value choice for measurement： TEMP:NULL:VAL:AUTO ON	

◆ When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements. [SENSe:]TEMPerature:NULL:VALue will be set to this value. Automatic null value selection will be disabled.

◆ When automatic null value selection is disabled (OFF), the null value is specified by this command: [SENSe:] TEMPerature:NULL:VALue.

◆ The instrument enables automatic null value selection when the null function is enabled ([SENSe:] TEMPerature:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.22 [SENSe:]TEMPerature:TRANsducer?

Query user-defined/manufacturer curing RTD/THER sensor list.

Parameter	Typical Return
(none)	MANU DEFINE,THER,BITS90
Query current effective sensor: TEMP:TRAN? Typical Response：PT100	

2.9.23 [SENSe:]TEMPerature:{UDEFine|MDEFine}

:{THER|RTD}:TRANsducer   <transducer>

Set the current effect of sensors.

Parameter	Typical Return
PT100(RTD)/{BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(THER)	(none)
Set the THER KITS90 as the current sensor： TEMP:MDEF:THER:TRAN KITS90	

◆ The information can be obtained through the [SENSe:]TEMPerature:{UDEFine|MDEFine}:{THER|RTD}:TRANsducer:LIST?
◆ This command will respond to the defaultsensor(KITS90) after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.24 [SENSe:]TEMPerature:{UDEFine|MDEFine}

:{THER|RTD}:TRANsducer:POINt?

Inquiry   definition of information sensor.

Parameter	Typical Return
PT100(RTD)/{BITS90|EITS90|JITS90|KITS90|NITS90|RITS90|SITS90|TITS90}(THER)	1|-6.45800|-270.0000,2|-6.44100|-260.0000… The return value to serial number voltage value		temperature (point) of the format arrangement, comma-separated between different points.
Inquiry detailed information of THER KITS90 definition TEMP:MDEF:THER:TRAN:POIN? KITS90	

[SENSe:]VOLTage   Subsystem

This subsystem configures AC voltage measurements and DC voltage and ratio measurements.

Command Summary
[SENSe:]VOLTage:{AC|DC}:NULL[:STATe]
[SENSe:]VOLTage:{AC|DC}:NULL:VALue
[SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO
[SENSe:]VOLTage:{AC|DC}:RANGe
[SENSe:]VOLTage:{AC|DC}:RANGe:AUTO
[SENSe:]VOLTage[:DC]:NPLC
[SENSe]:VOLTage[:DC]:FILTer[:STATe]
[SENSe:]VOLTage[:DC]:IMPedance

2.9.25 [SENSe:] VOLTage:{AC|DC}:NULL[:STATe] {ON|1|OFF|0}

[SENSe:] VOLTage:{AC|DC}:NULL[:STATe]?

Enables or disables the null function for AC or DC voltage measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for ACand DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default OFF	0(OFF)or1(ON)
Configure AC voltage measurements, using the null function to subtract 100 mV from the measurements. Make and read two measurements: CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100mV SAMP:COUN 2 READ? Typical Response： +1.03625390E+00,+1.03641200E+00	

◆ Enabling the scaling function also enables automatic null value selection ([SENSe:]VOLTage: {AC|DC}:NULL:VALue:AUTO ON).
◆ To set a fixed null value, use this command:
[SENSe:]VOLTage:{AC|DC}:NULL:VALue.
◆ The instrument disables the null function after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.26 [SENSe:]VOLTage:{AC|DC}:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]VOLTage:{AC|DC}:NULL:VALue? [{MIN|MAX|DEF}]

Stores a null value for voltage measurements.

NOTE: This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
-1200 TO +1,200 V，default 0	+1.00000000E+01
Configure AC voltage measurements, using the null function to subtract 100 mV from the measurements. Make and read two measurements:CONF:VOLT:AC VOLT:AC:NULL:STAT ON;VAL 100mV SAMP:COUN 2 READ? Typical Response： +1.03625390E+00,+1.03641200E+00	

◆ Specifying a null value disables automatic null value selection ([SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO OFF).

◆ To use the null value, the null state must be on ([SENSe:]VOLTage:{AC|DC}:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.27 [SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]VOLTage:{AC|DC}:NULL:VALue:AUTO?

Enables or disables automatic null value selection for AC voltage or DC voltage and ratio measurements.

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0OFF)or1(ON)
Make a second set of measurements using automatic null value selection:VOLT:AC:NULL:VAL:AUTO ON READ? Typical Response： +0.00000000E+00,+0.01230000E+00	

◆ When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements.
  [SENSe:]VOLTage:{AC|DC}:NULL:VALue will be set to this value. Automatic null value selection will be disabled.

◆ When automatic null value selection is disabled (OFF), the null value is specified by this command:[SENSe:]VOLTage:{AC|DC}:NULL:VALue.

◆ The instrument enables automatic null value selection when the null function is enabled ([SENSe:]VOLTage: {AC|DC}:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.28 [SENSe:]VOLTage:{AC|DC}:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]VOLTage:{AC|DC}:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range

Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
<range>：{200 mV|2 V|20 V|200 V|1000 V(DC)/750V(AC)} AC default:20V. DC default:1000V.	+2.00000000E+00
Configure AC voltage measurements using the 100 V range. Make and read two measurements: CONF:VOLT:AC VOLT:AC:RANG 2 SAMP:COUN 2 READ? Typical Response： +8.21650028E-03,+8.17775726E-03	

◆ Selecting a fixed range ([SENSe:]<*function*>:RANGe) disables autoranging.

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ The instrument is set to the default range, with autoranging enabled ([SENSe:]VOLTage:{AC|DC}:RANGe:AUTO ON), after a Factory Reset (*RST) or an Instrument Preset (SYSTem:PRESet)

2.9.29 [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]VOLTage:{AC|DC}:RANGe:AUTO?

Disables or enables autoranging for AC and DC voltage measurements and for DC ratio measurements.
Note:This parameter is not shared between AC and DC measurements. The parameters are independent for AC and DC measurements.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Configure DC voltage measurements and perform an immediate autorange. Make and read two measurements:CONF:VOLT:AC VOLT:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +8.36187601E-03,+8.34387541E-03	

◆ Under the condition of opening in automatic adjustment range, the instrument is based on the input signal selection range.
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.30 [SENSe:]VOLTage[:DC]:NPLC {<PLC>|MIN|MAX|DEF}

[SENSe:]VOLTage[:DC]:NPLC? [{MIN|MAX|DEF}]

Sets the integration time in number of power line cycles (PLC) for DC voltage and ratio measurements. Integration time is the period that the instrument's analog-to-digital (A/D) converter samples the input signal for a measurement. A longer integration time gives better measurement resolution but slower measurement speed.

Parameter	Typical Return
{0.3|1|10}，default 1 On the front panel, 0.3|1|10 corresponds to the Speed menu under fast|middle|slow	+1.00000000E+01
Configure DC voltage measurements using a 10 PLC integration time. CONF:VOLT:DC VOLT:DC:NPLC 10	

This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.31 [SENSe]:VOLTage[:DC]:FILTer[:STATe] {ON|1|OFF|0}

[SENSe]:VOLTage[:DC]:FILTer[:STATe]?

Dc voltage measurement mode filter switch configuration.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or(ON)
Open the dc current mode filter CONF:VOLT:AC VOLT:FILTER ON	

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.32 [SENSe:]VOLTage[:DC]:IMPedance <impedance>

[SENSe:]VOLTage[:DC]:IMPedance?

Select the input impedance of DC voltage measurement mode

Parameter	Typical Return
{10M|10G}，default open	10M
Select 10M as the input impedance: VOLT:DC:IMP 10M	

◆ This parameter is only valid in the 200mV and 2V gear to.
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

[SENSe:]CAPacitance Subsystem

This subsystem is configured capacitance measurement.
.
Command Summary
[SENSe:]CAPacitance:NULL[:STATe]
[SENSe:]CAPacitance:NULL:VALue
[SENSe:]CAPacitance:NULL:VALue:AUTO
[SENSe:]CAPacitance:RANGe
[SENSe:]CAPacitance:RANGe:AUTO

2.9.33 [SENSe:]CAPacitance:NULL[:STATe] {ON|1|OFF|0}

[SENSe:]CAPacitance:NULL[:STATe]?

Enable or disable the zero function.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Use zero functions from the measured value minus 100 nf to configure the capacitance measurement.Make and read two measurements,sent the results to the output buffer of the instrument. CONF:CAP CAP:NULL:STAT ON;VAL 100nF SAMP:COUN 2 READ? Typical Response: +4.79899595E-10,+4.79906446E-10	

◆ Enable the scaling function will also enable automatic zero value choice.([SENSe:]Capacitance:{AC|DC}:NULL:VALue:AUTO ON).
◆ To set a fixedr eturn null,use this command:[SENSe:]Capacitance:{AC|DC}:NULL:VALue.
◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.34 [SENSe:]CAPacitance:NULL:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CAPacitance:NULL:VALue? [{MIN|MAX|DEF}]

Set to zero.

Parameter	Typical Return
-12 to +12 mF，default 0.	+1.20000000E-02
Using zero function from the measured value minus 100 nf to configure the ac current measurements.Make and read two measurements,sent the results to the output buffer of the instrument. CONF:CAP CAP:NULL:STAT ON;VAL 100nF SAMP:COUN 2 READ? Typical Response： +4.79899595E-10,+4.79906446E-10	

◆ Specifies the return to zero will disable automatic selection to zero ([SENSe:]Capacitance:NULL:VALue:AUTO OFF).

◆ To use the zero value, must first open thezeroswitching ([SENSe:]Capacitance:NULL:STATeON).

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.9.35 [SENSe:]CAPacitance:NULL:VALue:AUTO {ON|1|OFF|0}

[SENSe:]CAPacitance:NULL:VALue:AUTO?

Enable or disable the automatic zero value choice.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Using the automatic selection of zero value to measure. CAP:NULL:VAL:AUTO ON READ? Typical Response： +0.00000000E+00,+1.02300000E-01	

◆ When automatic reference selection is ON, the first measurement made is used as the null value for all subsequent measurements. [SENSe:]Capacitance:NULL:VALue will be set to this value. Automatic null value selection will be disabled.

◆ When automatic null value selection is disabled (OFF), the null value is specified by this command:[SENSe:]Capacitance:NULL:VALue.

◆ The instrument enables automatic null value selection when the null function is enabled ([SENSe:]Capacitance:NULL:STATe ON).

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.36 [SENSe:]CAPacitance:RANGe {<range>|MIN|MAX|DEF}

[SENSe:]CAPacitance:RANGe? [{MIN|MAX|DEF}]

Manually choose measurement range.

Parameter	Typical Return
<range>：{2nF|20nF|200nF|2uF|20uF|200uF|10000uF|AUTO} Default 2uF.	+2.00000000E-06
Using the 2uFfileconfigurationcapacitance to measure.Make and read two measurements. CONF:CAP CAP:RANG 2E-6 SAMP:COUN 2 READ? Typical Response： +7.28283777E-10,+7.28268544E-10	

◆ Choose the fixed range ([SENSe:]<function>:RANGe) ,disable the automatic adjustment range.

◆ If the input signal is greater than can be measured on the specified manual range, the instrument displays the word Overload on front panel and returns "9.9E37" from the remote interface.

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.9.37 [SENSe:]CAPacitance:RANGe:AUTO {OFF|ON|ONCE}

[SENSe:]CAPacitance:RANGe:AUTO?

Enable or disable automatic adjustment range.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1ON)
Configure AC current measurement and executed immediately .Make and read two measurements. CONF:VOLT:AC VOLT:AC:RANG:AUTO ONCE SAMP:COUN 2 READ? Typical Response： +8.36187601E-03,+8.34387541E-03	

◆ The situation in the automatic adjustment range enabled, the input signal range based on the instrument.

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

[SENSe:]CONTinuity

This subsystem is configured continuity measurement.

Command Summary
[SENSe:]CONTinuity:THReshold:VALue

2.9.37 [SENSe:]CONTinuity:THReshold:VALue {<value>|MIN|MAX|DEF}

[SENSe:]CONTinuity:THReshold:VALue?

◆ Disable or enable automatic adjustment range.

Parameter	Typical Return
0~2000 Ω，default 0	+2.00000000E+03
Sets the threshold resistance to 2000 CONT:THR:VAL 2000	

◆ This parameter is set to its default value after a Factory Reset (*RST), Instrument Preset (SYSTem:PRESet), or CONFigure function.

2.10 SYSTem Subsystem

2.10.1 SYSTem:BEEPer:STATe {ON|1|OFF|0}

SYSTem:BEEPer:STATe?

Disables or enables the beep heard during continuity, diode, or Probe Hold measurements, or when an error is generated from the front panel or remote interface.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Disable keyboard click: SYST:BEEP:STAT OFF	

◆   This command not affect the beeper heard associated with diode and continuity tests, errors and so on.
◆   This setting is non-volatile; it is not changed by power cycling, a Factory Reset (*RST), or an Instrument Preset (SYSTem:PRESet).

2.10.2 SYSTem:COMMunicate:LAN:IPADdress "<address>"

SYSTem:COMMunicate:LAN:IPADdress? [{CURRent|STATic}]]

Assigns a static Internet Protocol (IP) address for the instrument.

Parameter	Typical Return
Command： "nnn.nnn.nnn.nnn" Query： {CURRent|STATic}，default CURRent Default：169.254.3.5	"192.168.1.101"
Set a static IP address: SYST:COMM:LAN:IPAD "10.11.13.212"	

◆   This setting is non-volatile; it is not changed by power cycling, a Factory Reset (*RST), or an Instrument Preset.(SYSTem:PRESet).
◆   This parameter is set to its default value when the instrument is shipped from the factory and after SYSTem:SECurity:IMMediate.

2.10.3 SYSTem:COMMunicate:LAN:SMASk "<mask>"

SYSTem:COMMunicate:LAN:SMASk? [{CURRent|STATic}]]

Assigns a subnet mask for the instrument to use in determining whether a client IP address is on the same local subnet.

Parameter	Typical Return
Command"nnn.nnn.nnn.nnn",default"255.255.0.0" Query：{CURRent|STATic}，default CURRent	"255.255.255.0"
Set the subnet mask: SYST:COMM:LAN:SMAS "255.255.255.0"	

◆ A value of "0.0.0.0" or "255.255.255.255" indicates that subnetting is not being used.

◆ **CURRent:** returns address currently being used by the instrument.

◆ **STATic:** returns static address from non-volatile memory. This address is used if DHCP is disabled or unavailable.

◆ This setting is non-volatile; it is not changed by power cycling, a Factory Reset (*RST), or an Instrument Preset(SYSTem:PRESet).

2.11 TRIGger Subsystem

The TRIGger subsystem configures the triggering that controls measurement acquisition.

Command Summary
TRIGger:COUNt
TRIGger:DELay
TRIGger:DELay:AUTO
TRIGger:SLOPe
TRIGger:SOURce

2.11.1 TRIGger:COUNt {<count>|MIN|MAX|DEF|INFinity} TRIGger:COUNt?

[{MIN|MAX|DEF}]

Selects the number of triggers that will be accepted by the instrument before returning to the "idle" trigger state.

Parameter	Typical Return
1 to 1,000,000 or continuous (INFinity). Default 1	+1.00000000E+00 For a continuous trigger (INFinity), the query returns "9.9E37".
Return ten sets of five DC voltage measurements, CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 READ? Typical Response: -1.85425399E-04, … (50 measurements)	

◆ You can use the specified trigger count in conjunction with a sample count (SAMPle:COUNt), which sets the number of samples to be made per trigger. In this case, the number of measurements returned will be the sample count multiplied by the trigger count.

◆ You can store up to 1,000 measurements in the reading memory of the SDM3055x. If reading memory overflows, new measurements will overwrite the oldest measurements stored; the most recent measurements are always preserved. No error is generated, but the Reading Mem Ovfl bit (bit 14) is set in the Questionable Data Register's condition register (see Status System Introduction).

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.11.2 TRIGger:DELay {<seconds>|MIN|MAX|DEF} TRIGger:DELay?

[{MIN|MAX|DEF}]

Sets the delay between the trigger signal and the first measurement.

Parameter	Typical Return
0 to ~3600 seconds (~1 µs steps), default 1 s	+1.00000000E-06
Return five DC voltage measurements. There is a 2 second delay before each measurement. CONF:VOLT:DC 10 SAMP:COUN 5 TRIG:DEL 2 READ? Typical Response： +3.07761360E-03,-1.16041169E-03,+5.60585356E-06,+1.21460160E-04,+2.85898531E-04	

◆   Due to internal quantization, the actual delay that you set may be slightly different than your specified value. The increment is approximately 1 µs. Use the query to determine the exact delay. For example, if you send TRIG:DEL 500 ms and then TRIG:DEL? the actual delay may be +5.00000753E-01.

◆   By default, TRIGger:DELay:AUTO is ON. The instrument automatically determines the delay based on function, range and integration time (see Automatic Trigger Delays). However, you may need to set a delay longer than the automatic delay for long cables, high capacitance or high impedance signals.

◆   If you specify a trigger delay with this command, that delay is used for *all* functions (*except* CONTinuity and DIODe) and ranges. The CONTinuity and DIODe tests ignore the trigger delay setting.

◆   If you have configured the instrument for more than one measurement per trigger (SAMPle:COUNt >1), the delay is inserted after the trigger and between consecutive measurements.

◆   The instrument selects automatic trigger delay after a Factory Reset (*RST) or an Instrument Preset (SYSTem:PRESet).

2.11.3 TRIGger:DELay:AUTO {ON|1|OFF|0} TRIGger:DELay:AUTO?

Disables or enables automatic trigger delay.

Parameter	Typical Return
{ON|1|OFF|0}，default ON	0(OFF)or1(ON)
Return 5 DC voltage measurements, with an automatic delay between each measurement. CONF:VOLT:DC 10 SAMP:COUN 5 TRIG:DEL:AUTO 1 READ? Typical Response： +3.07761360E-03,-1.16041169E-03,+5.60585356E-06,+1.21460160E-04,+2.85898 531E-04	

◆   Selecting a specific trigger delay using TRIGger:DELay disables the automatic trigger delay.

◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.11.4 TRIGger:SLOPe {POSitive|NEGative} TRIGger:SLOPe?

Selects whether the instrument uses the rising edge (POS) or the falling edge (NEG) of the trigger signal on the rearpanel *Ext Trig* BNC connector.

Parameter	Typical Return
{POSitive|NEGative} ，default NEGative	POS orNEG
Return ten sets of five DC voltage measurements, using a positive-going external trigger to start each measurement set: CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 TRIG:SOUR EXT;SLOP POS READ? Typical Response: -1.85425399E-04, …(50 measurements)	

◆   This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).

2.11.5 TRIGger:SOURce {IMMediate|EXTernal|BUS} TRIGger:SOURce?

Selects the trigger source for measurements:

Source	Description
IMMediate	The trigger signal is always present. When you place the instrument in the "wait-for-trigger" state, the trigger is issued immediately..
BUS	The instrument is triggered by *TRG over the remote interface once the DMM is in the "wait-for-trigger" state.
EXTernal	The instrument accepts hardware triggers applied to the rear-panel **Ext Trig** input and takes the specified number of measurements (SAMPle:COUNt), each time a TTL pulse specified by OUTPut:TRIGger:SLOPe is received. If the instrument receives an external trigger before it is ready, it will buffer one trigger.

Parameter	Typical Return
{IMMediate|EXTernal|BUS} ，default IMMediate	IMM、EXT or BUS
Return ten sets of five DC voltage measurements, using a positive-going external trigger to start each measurement set: CONF:VOLT:DC SAMP:COUN 5 TRIG:COUN 10 TRIG:SOUR EXT;SLOP POS READ? Typical Response: -1.85425399E-04, … (50 measurements)	

◆ After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state by sending INITiate or READ?. A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.

◆ This parameter is set to its default value after a Factory Reset (*RST) or Instrument Preset (SYSTem:PRESet).