RIGOL

User's Guide

DM3068 Digital Multimeter

Dec. 2010

RIGOL Technologies, Inc.

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Publication Number

UGC06102-1110

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Safety Requirement

General Safety Summary

Please review the following safety precautions carefully before putting the instrument into operation so as to avoid any personal injuries or damages to the instrument and any product connected to it. To prevent potential hazards, please use the instrument only specified by this manual.

Use Proper Power Cord.
Only the power cord designed for the instrument and authorized by local country could be used.

Ground The Instrument.
The instrument is grounded through the Protective Earth lead of the power cord. To avoid electric shock, it is essential to connect the earth terminal of power cord to the Protective Earth terminal before any inputs or outputs.

Observe All Terminal Ratings.
To avoid fire or shock hazard, observe all ratings and markers on the instrument and check your manual for more information about ratings before connecting.

Use Proper Overvoltage Protection.
Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might expose to danger of electrical shock.

Do Not Operate Without Covers.
Do not operate the instrument with covers or panels removed.

Use Proper Fuse.
Please use the specified fuses.

Avoid Circuit or Wire Exposure.
Do not touch exposed junctions and components when the unit is powered.

Do Not Operate With Suspected Failures.

If you suspect damage occurs to the instrument, have it inspected by qualified service personnel before further operations. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by **RIGOL** authorized personnel.

Keep Well Ventilation.

Inadequate ventilation may cause increasing of temperature or damages to the device. So please keep well ventilated and inspect the intake and fan regularly.

Do Not Operate in Wet Conditions.

In order to avoid short circuiting to the interior of the device or electric shock, please do not operate in a humid environment.

Do Not Operate in an Explosive Atmosphere.

In order to avoid damages to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.

Keep Product Surfaces Clean and Dry.

To avoid the influence of dust and/or moisture in air, please keep the surface of device clean and dry.

Electrostatic Prevention.

Operate in an electrostatic discharge protective area environment to avoid damages induced by static discharges. Always ground both the internal and external conductors of the cable to release static before connecting.

Handling Safety

Please handle with care during transportation to avoid damages to keys, knob and, interfaces as well as other parts on the panels.

The disturbance tests of all models conform to the P/F values of A based on the standard of EN 61326: 1997+A1+A2+A3 instead of P/F values of B.

Input Terminal Protection Limit

The protection limit applies to input terminals:

1. **Main input (HI and LO) terminals**

   HI and **LO** terminals are used for Voltage, Resistance, Capacitance, Continuity, Frequency and Diodes measurements and should be used under the following two conditions:

   1) **HI-LO** protection limit: at most 1000 VDC or 750 VAC, this is also the maximum measurable voltage. The limit can be expressed as 1000 Vpk.
   2) **LO**-ground protection limit: at most 500 Vpk (relative) is allowed to float at **LO** terminal with safety.

   Since the HI terminal holds a maximum protection of 1000 Vpk relative to the ground, the sum of the "float" and measured voltages cannot exceed 1000 Vpk.

2. **Sampling (HI Sense and LO Sense/200 mA) terminals**

   HI Sense and **LO Sense/200 mA** terminals are used for 4-Wire Resistance measurement and should be used under the following two conditions:

   1) **HI Sense**-**LO Sense/200 mA** protection limit: 200 Vpk.
   2) **LO Sense/200 mA**-**LO** protection limits: 0.5 Vpk. The current input fuse on the rear panel provides the current passing through **LO Sense/200 mA** up to 500 mA protection.

3. **Current input (10 A** and **Sense/200 mA) terminals**

   10 A and **LO** terminals are used for current measurements of 2 A and 10 A. The maximum current which goes through the **10 A** terminal is limited to 10 A by the internal fuse. **LO Sense/200 mA** and **LO** terminals are used for current measurements ranging from 200 μA to 200 mA. The maximum current which go through the **LO Sense/200 mA** terminal is limited to 500 mA by the internal fuse.

   NOTE:

   In order to prevent the fuse from blowing out and protect the multimeter, please use the current input terminals according to the following requirements:

   1) Do not connect the **10 A** and **LO Sense/200 mA** input terminals into the current measuring circuit at the same time.

2) Only use **10 A** and **LO** terminals for measurements when the measured current AC+DC RMS value goes within 200 mA and 10 A.
3) Select a proper current input terminal according to the estimated current magnitude before connect the multimeter to AC supplies if you want to use current measurement.
4) The current into **10 A** cannot exceed 13.5 A, otherwise it will blow out the internal fuse; while the current into the **LO Sense/200 mA** terminal cannot exceed 650 mA, otherwise the current fuse from the rear panel may be blown out.

IEC II Overvoltage Protection

In order to prevent electric shock, DM3068 provides overvoltage protection for line-voltage mains connections meeting both of the following conditions:

1. The HI and LO input terminals are connected to the mains under Measurement Category II conditions, defined below.
2. The mains are limited to a maximum line voltage of 300 VAC.

WARNING: IEC II includes electrical devices connected to mains at an outlet on a branch circuit. Such devices include most small appliances, test equipments and other devices that inserted into a branch socket.
DM3068 may be used to make measurements with the HI and LO inputs connected to mains in such devices (up to 300 VAC), or to the branch socket itself. However, DM3068 may be used with its HI and LO inputs connected to mains from neither permanently installed electrical device such as a main circuit-breaker panel, sub-panel disconnected box nor wired motors. Such devices and circuits are readily to beyond the protection from DM3068.

NOTE: Voltages above 300 VAC may be measured only in circuits that are isolated from mains. However, a transient overvoltage is also present in such circuits. DM3068 was designed to safely withstand occasional transient overvoltage up to 2500 Vpk. Do not use this device to measure circuits whose transient overvoltage may exceed this level.

Safety Terms and Symbols

Terms in this Manual. These terms may appear in this manual:

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

CAUTION
Caution statements indicate the conditions or practices that could result in damage to this product or other property.

CAT I (1000V)
IEC Measurement Category I. The maximum voltage can be measured by HI-LO terminal is 1000Vpk.

CAT II (300V)
IEC Measurement Category II. Inputs may be connected to mains (up to 300VAC) in the case of overvoltage in Category II.

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury or hazard may immediately happen.
WARNING indicates an injury or hazard may be accessible potentially.
CAUTION indicates a potential damage to the instrument or other property might occur.

Symbols on the Product. These symbols may appear on the product:

Hazardous Voltage

Refer to Instructions

Protective Earth Terminal

Chassis Ground

Test Ground

General Care and Cleaning

General Care:

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

Cleaning:

Clean the instrument regularly according to its operating conditions. To clean the exterior surface, perform the following steps:

1. Disconnect the instrument from all power sources.
2. Clean the loose dust on the outside of the instrument with a lint- free cloth (with a mild detergent and water). When clean the LCD, take care to avoid scarifying it.

CAUTION

To avoid damages to the instrument, do not expose them to liquids which are corrosive.

WARNING

To avoid injury resulting from short circuit, make sure the instrument is completely dry before reconnecting into a power source.

Environmental Considerations

The following symbol indicates that this product complies with the applicable European Union requirements according to Directives 2002/96/EC on waste electrical and electronic equipment (WEEE) and batteries.

Product End-of-Life Handling

The equipment may contain substances that could be harmful to the environment or human health. In order to avoid release of such substances into the environment and harmful to human health, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately. Please contact your local authorities for disposal or recycling information.

DM3068 Digital Multimeter Overview

DM3068 is a 6 ½ digits, dual display digital multimeter. It was designed for users who need high precision, many functions and auto measurement, combining common measurement functions, various math operations and any sensor measurements as well as other functions.

DM3068 has high-resolution 256 x 64 monochrome LCD, easy-to-use keypad locations and key backlight as well as operation prompts. It supports RS232, USB, LAN and GPIB interfaces, USB flash device storage, virtual terminal display and control, remote network access.

Main Features:

- Real 6 ½ digits reading resolution.
- Minimum integration time: 0.006 PLC.
- Dual display: synchronously show two different characteristics of a same signal.
- Preset mode: quickly recall preset configurations.
- DC voltage range: -1050 V to 1050 V.
- DC current range: -10.5 A to 10.5 A.
- AC voltage range: True-RMS, 0 V to 787.5 V.
- AC current range: True-RMS, 0 A to 10.5 A.
- Resistance range: 0 Ω to 110 M Ω; support 2-wire (2WR) and 4-wire (4WR) resistance measurements.
- Capacitance range: 0 F to 110 mF.
- Frequency range: 3 Hz to 1 MHz.
- Continuity and Diode tests.
- Any sensor measurements and three types of temperature sensors: TC, RTD and THERM.
- Plenty of math operations such as STA (MAX, MIN, AVG, ALL), P/F, dBm, dB, REL under tendency and/or histogram views.
- USB flash device available.
- Plenty of interfaces: USB Device, USB HOST, GPIB, RS-232 and LAN. Conform to USB-TMC, IEEE 488.2 standards, LXI-C and SCPI standards.
- Compatible with multimeter's commands from other manufacturers.
- Front panel power switch controllable.

- Built-in ten groups of system configurations and five groups of sensor configurations with capabilities of remote control, storage or recall.
- Configurations clone: can copy all configurations of the multimeter into other DM3068 unit using a USB flash device.
- English and Chinese menus, built-in help system.
- Powerful remote control and any sensor editing software.

Document Overview

Chapter 1 Quick Start
This chapter guides you to quicky familar with the front and rear panles, user interface and measurement connections of the multimeter.

Chapter 2 Front-panel Operations
This chapter guides you how to use functions that the multimeter has.

Chapter 3 Remote Control
This chapter guides you how to control the multimeter from distance by using either virtual panel based on web page or commands.

Chapter 4 Troubleshooting
This chapter provides some general troubleshootings.

Chapter 5 Measurement Tutorial
This chapter guides you how to eliminate possible errors caused during the measurement and obtain accurate result.

Chapter 6 Specifications
This chapter lists specifications and characteristics.

Chapter 7 Appendix
Information about accessories and others such as the service.

Format Conventions:

- **Button:** function buttons from the multimeter are expressed by an icon itself. For example, ⎓V denotes a dc voltage measurement function.
- **Menu:** the operation menu under the screen is expressed by a combination of menu character and shade. For example, the menu "REL" is expressed in this document like "REL".
- **Operation step:** the possible procedures in this document are described using an arrow for clarity. For example, "press ⎓V → REL"; this sentence has a same meaning with "press ⎓V and then REL".

Contents

Chapter 1 Quick Start

This chapter guides you to quicky familar with the front and rear panles, user interface and measurement connections of the multimeter.

This chapter contains the following topics:

- General Inspection
- Handle Adjustment
- Appearance and Dimensions
- The Front Panel
- The Rear Panel
- User Interface
- First-use of Multimeter
- Measurement Connections
- Using the Built-in Help System
- Using a Rackmount Kit

General Inspection

1. Inspect the shipping container for damage

Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has passed both electrical and mechanical tests.

The consigner or carrier shall be liable for the damage to the instrument resulting from shipment. **RIGOL** would not be responsible for free maintenance/rework or replacement of the unit.

2. Inspect the instrument

In case of any damage, or defect, or failure, notify your **RIGOL** sales representative.

3. Check the accessories

Please check the accessories according to the packing lists. If the accessories are incomplete or damaged, please contact your **RIGOL** sales representative.

Handle Adjustment

To adjust the handle position of the multimeter, grip the handle in both sides and pull it outward, then rotate the handle to a desired position, see figure below.

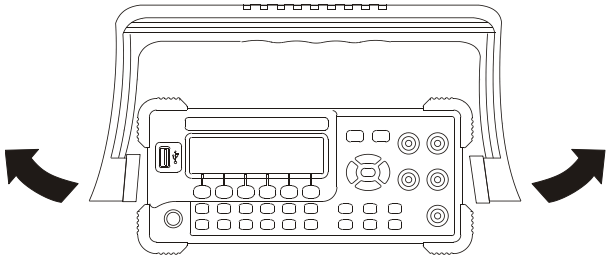
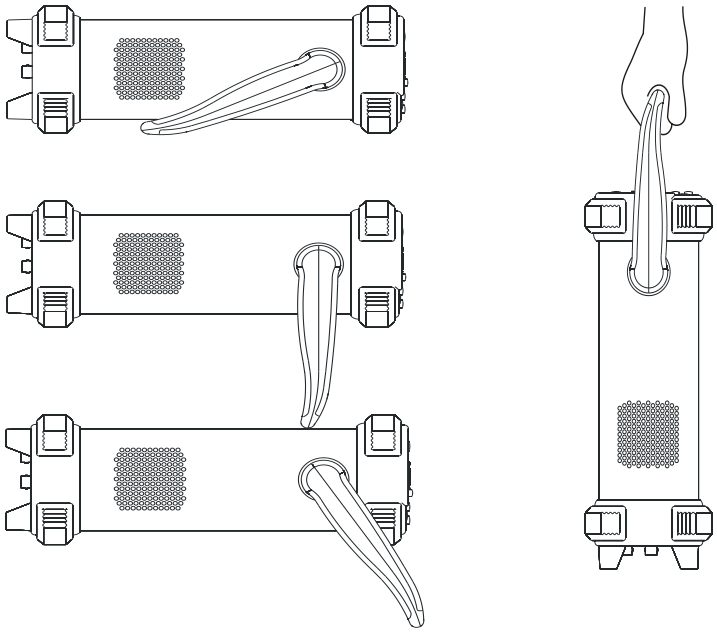


Figure 1-1 Handle Adjustment



Viewing Position Carrying Position

Figure 1-2 Locate the Multimeter

Appearance and Dimensions

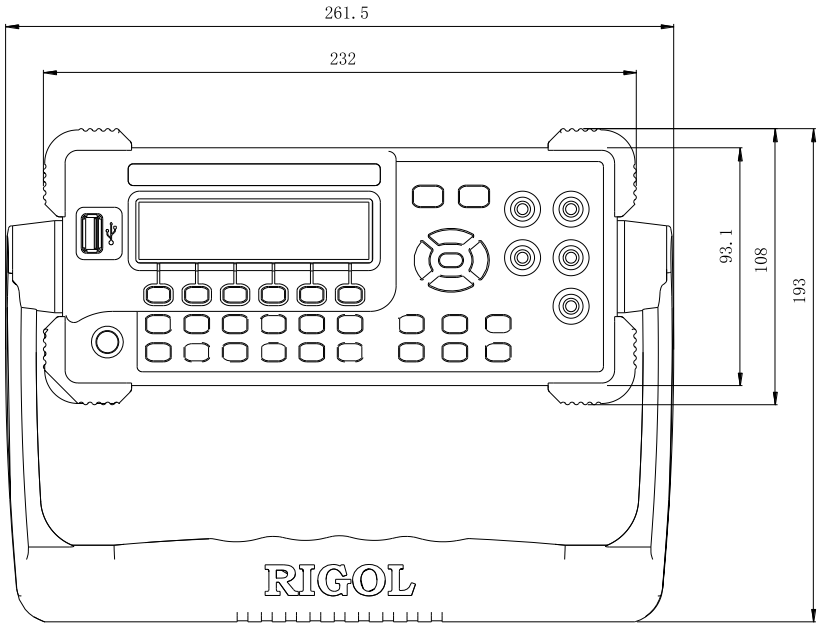


Figure 1-3 Front Elevation Unit: mm

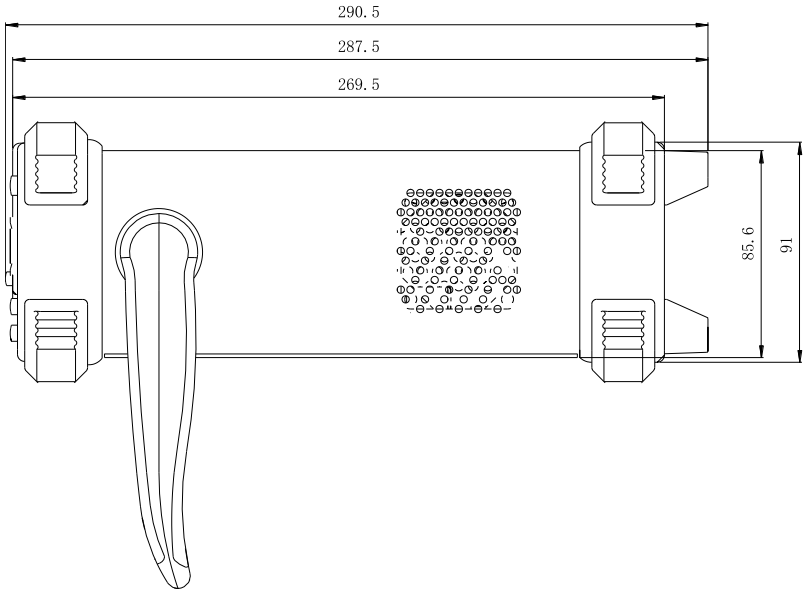


Figure 1-4 Side Elevation Unit: mm

The Front Panel

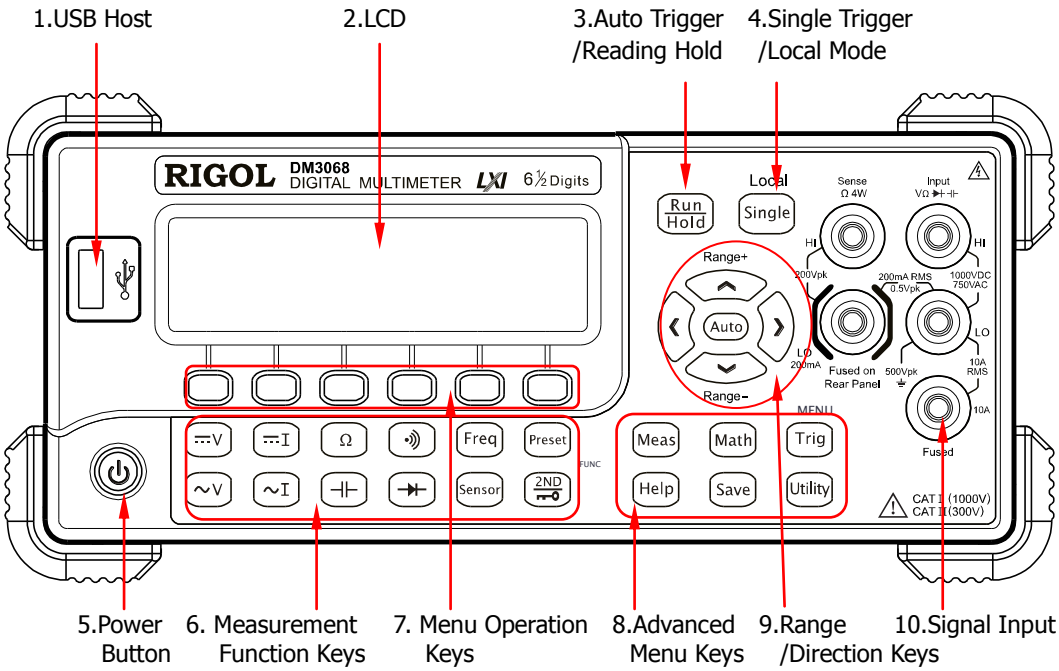


Figure 1-5 Front Panel Overview

1. USB Host

It supports all FAT-format USB flash devices. By using this interface, users can easily save the current instrument status and measured data into such device for future use.

2. LCD

This is a 256 x 64 monochrome LCD that can display the current function menus, measurement parameters, system configuration and status and so on.

3. Auto Trigger/Reading Hold

Continuously pressing this key can switch between auto trigger and reading hold functions.

- Auto Trigger: the backlight always on; the multimeter continuously takes readings at the fastest rate possible for the present configuration.

- Reading Hold: the backlight blinks; the multimeter obtains a stable reading and displays.

4. Single Trigger/Local Mode

Pressing this key during the front panel operation will cause the multimeter generate one reading or specified number of readings (**S No.**) and then wait for the next trigger. Whatever, this key is also an access to local mode from remote control.

5. Power Button

Turns on or off the multimeter. Users can enable or disable this key as required.

Press Utility → System → Cfg → Switch and select **On** or **Off**.

6. Measurement Function Keys

Basic Measurement Keys

⎓V	DC Voltage Measurement (DCV)
~V	AC Voltage Measurement (ACV)
⎓I	DC Current Measurement (DCI)
~I	AC Current Measurement (ACI)
Ω	Resistance Measurement (OHM)
⊣⊢	Capacitance Measurement (CAP)
•))	Continuity Test (CONT)
→|	Diode Test (DIODE)
Freq	Frequency/Period Measurements (FREQ/PERIOD)
Sensor	Any Sensor Measurements (SENSOR), such as DCV, DCI, 2WR, 4WR, FREQ, TC (thermoelectric couple), RTD (resistance temperature detectors), THERM (thermistor).

Common Function Keys

Preset	Quickly save or recall at least 10 groups of instrument settings.
2ND	Secondary Function key ● Enables the dual display. ● Quickly saves the current instrument configuration in connection with Preset.

- Quickly enters the setting interface of relative measurement.

7. Operation Menu Keys

Activates the corresponding menu.

8. Assistant Functions

(Meas) Sets all the measurement parameters.

(Math) Performs math operations (statistic, P/F, dBm, dB, REL) for measured results and displays real-time measurements in trend graph and histogram.

(Trig) Provides auto, single, external and level trigger sources; enables to set the reading hold function, samples per trigger, delay time before reading and edge of the trigger input signal as well as the trigger output parameter.

(Save) Saves, recalls and deletes data and parameter files from both internal memory and external USB devices.

(Utility) Sets the command set, interface parameters and system information, tests the multimeter and displays error messages.

(Help) Provides common help information and the method to use built-in help. The multimeter allows users to quickly recall the help information about any front panel keys and menu softkeys.

9. Range/Direction Keys

(Auto) Enables auto range.

- Configures the measurement parameters.
- Selects the digit position while entering a parameter.

- Increases or decreases the measurement range.
- Enters desired numeric value while setting a parameter.
- Pages up or down.

10. Signal Input Terminals

The measured signal (device) will be connected into the multimeter through these terminals. Different measured objects have different connection methods. for details please see "**Measurement Connections**".

The Rear Panel

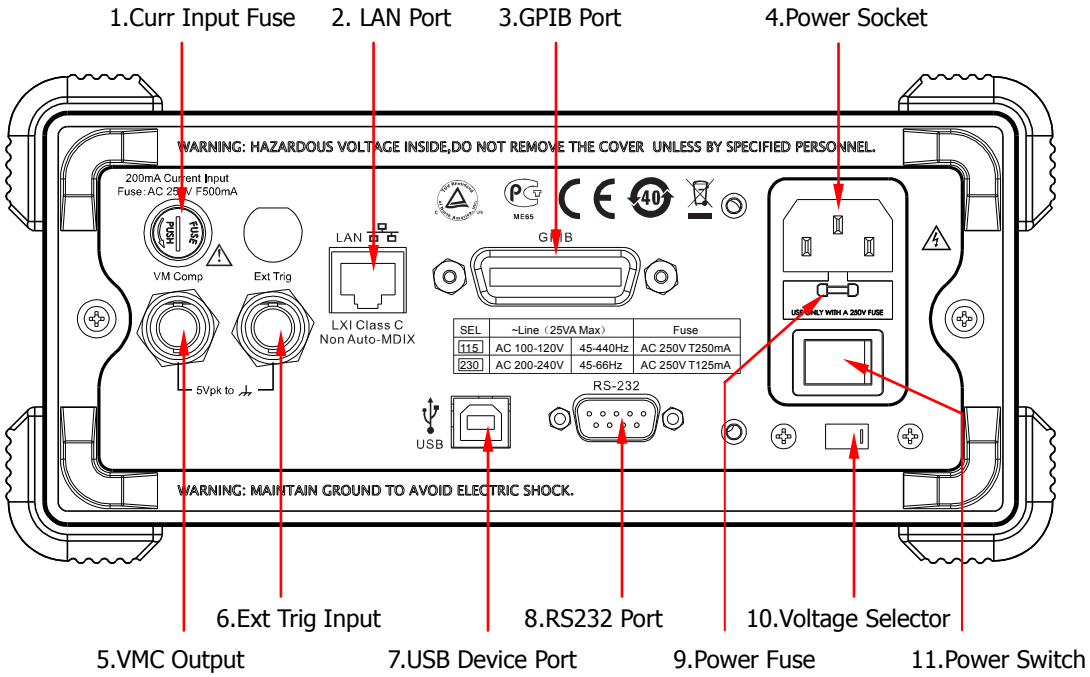


Figure 1-6 Rear Panel Overview

1. Curr Input Fuse

The multimeter uses two kinds of fuses for protecting high and low currents and both fuses were already installed before leaving factory. The current into **10 A** cannot exceed 13.5 A, otherwise it will blow out the internal fuse; while the current into **LO Sense/200 mA** terminal cannot exceed 650 mA, otherwise the current fuse from the rear panel may be blown out. To replace the low current fuse, please:

1) Cut off the power supply.
2) Pull out the fuse seat by turning a straight screwdriver counterclockwise as shown in the figure.
3) Place a new specified fuse.
4) Reinstall the fuse seat into the slot.

NOTE: The high current fuse stands inside the multimeter and is not allowed to be replaced by users themselves. If such work must be

done, send your multimeter back to the factory.

2. LAN Port

Provides the multimeter an access to LAN for remote controlling. The multimeter conforms to LXI-C standards; it can be used in connection with other standard devices for a testing system built, easily approaching a LAN based system integration.

3. GPIB Port

Conforms to IEEE-488.2 standards.

4. Power Socket

The multimeter allows two types of AC supplies. Users should use the power cord that came with your multimeter to connect the multimeter to the AC power through this socket. Note a proper voltage scale must be first selected (through the **Voltage Selector**) before power connection.

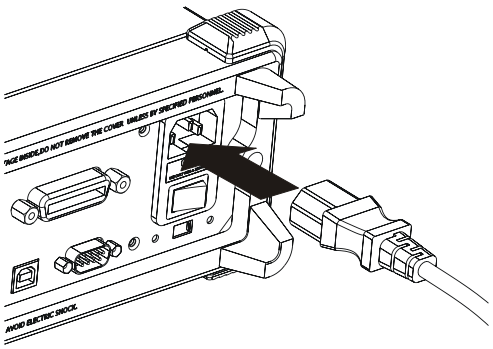


Figure 1-7 Connect the Power Cord

5. VMC Output

Outputs a low-true pulse from **[VM Comp]** terminal after every measurement when VM output is enabled (Trig→ VMC → ON).

6. Ext Trig Input

Triggers the multimeter by connecting a trigger pulse through **[Ext Trig]** connector. Note the external trigger source must be selected (Trig→ Source → Ext).

7. USB Device Port

Communicates with a computer and controls your multimeter through PC software. It is available for USB-TMC devices.

8. RS232 Port

Provides an access for multimeter controlling through PC software and outputs P/F test result.

9. Power Fuse

The multimeter is already installed a power fuse before leaving factory. To replace a new one, please:

1) Cut off the power supply.
2) Press down the block tongue using a straight screwdriver (in the direction of the dotted arrow in figure below) and pull out of the fuse seat.
3) Select a proper voltage scale.
4) Replace a specified fuse.
5) Reinstall the fuse seat into the slot.

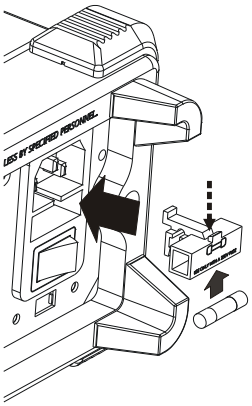


Figure 1-8 Replace the Power Fuse

WARNING

In order to avoid electric shock or fire, please just use the specified fuse and make sure the fuse holder is in good connection and not shorted.

10. Voltage Selector

Select a proper voltage scale according to the used AC supply: 115 V or 230 V.

11. Power Switch

Connect or disconnect the AC supply. If the front power button is disabled (Utility → System → Cfg → Switch → OFF), turning on this switch will directly start up the multimeter.

User Interface

Single Display

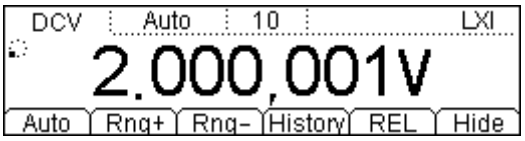


Figure 1-9 User Interface (Single Display)

Dual Display

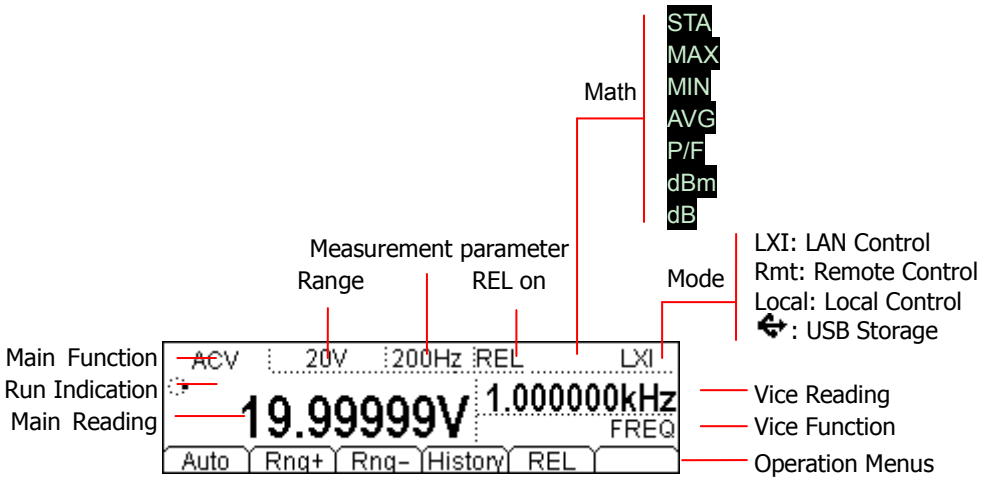


Figure 1-10 User Interface (Dual Display)

First-use of Multimeter

Start your multimeter according to the following steps when first use.

1. Connect the AC Power Supply

1) Select an appropriate voltage scale according to the present AC power using the voltage selector on the rear panel.
2) Insert one end of the supplied power cord into the ac outlet and the other end into the power socket on the rear panel.

2. Turn On the Multimeter

Turn on the power switch under the power socket and the power button on the front panel. Note the multimeter will directly start after you turning on the rear power switch if the front power button is disabled (Utility → System → Cfg → Switch → OFF).

3. Boot Process

1) Normal start: the multimeter executes self-test and then enters the user interface.
2) Start with a USB device having update file inserted: the multimeter directly updates if an update file is detected and then starts.

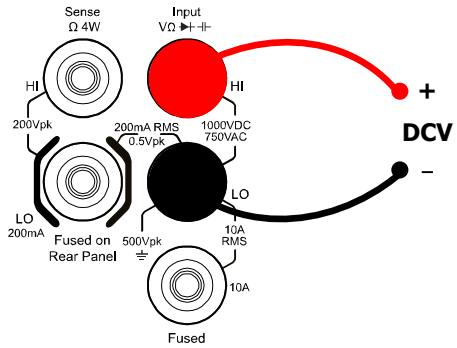
4. If the multimeter does not starts normally, please:

1) Make sure the power cord is in good connection.
2) Make sure the rear power switch is turned on.
3) Try to restart the multimeter, if it fails, check the power fuse and replace a new one when necessary.
4) If the problem still remains, contact **RIGOL**.

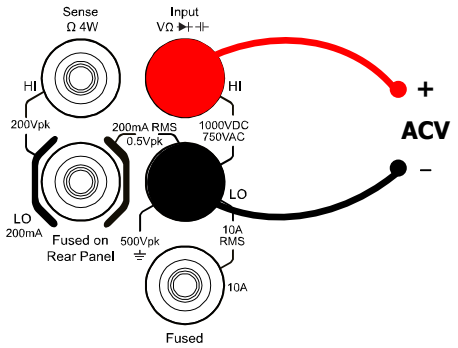
Measurement Connections

DM3068 was designed with many measurement functions and different measurements have different connections. Do not discretionarily switch the measurement function when measuring as it may cause damage to the multimeter. For example, when the test leads are connected to the related current terminals, AC voltage measurement should not be taken.

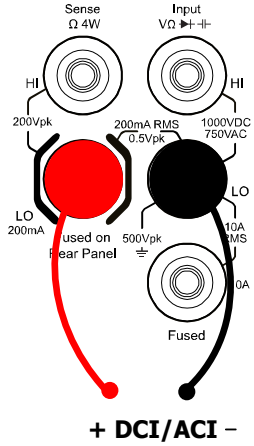
DCV Measurement



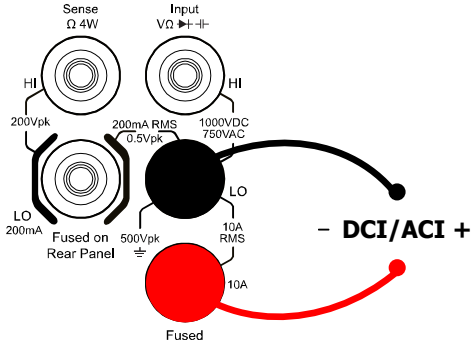
ACV Measurement



DCI/ACI Measurement (Low Current)



DCI/ACI Measurement (High Current)



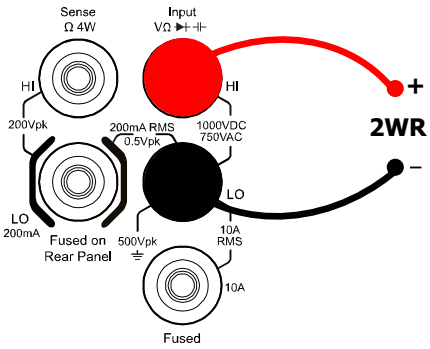
NOTE:

In order to protect the multimeter, please execute DC/AC current measurement following the requirements below:

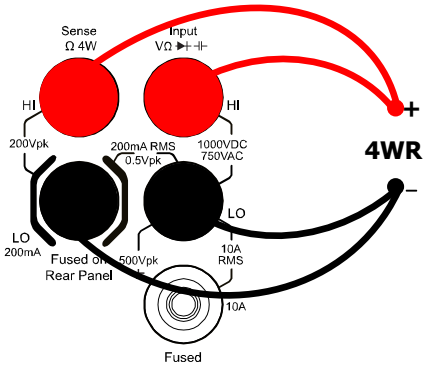
1. Do not connect the **10 A** and **LO Sense/200 mA** input terminals into the current measuring circuit at the same time.

2. Select a proper current input terminal according to the estimated current magnitude before connect the multimeter to AC supplies if you want to use current measurement.
3. Only use **10 A** and **LO** terminals for measurements when the measured current AC+DC RMS value goes within 200 mA and 10 A.

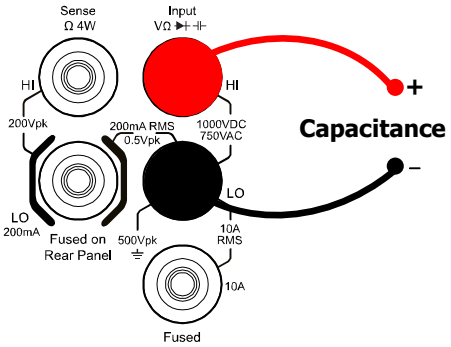
Resistance Measurement (2-wire)



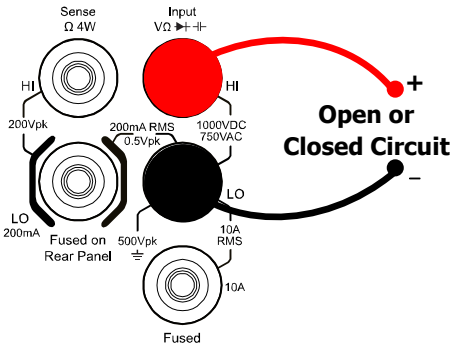
Resistance Measurement (4-wire)



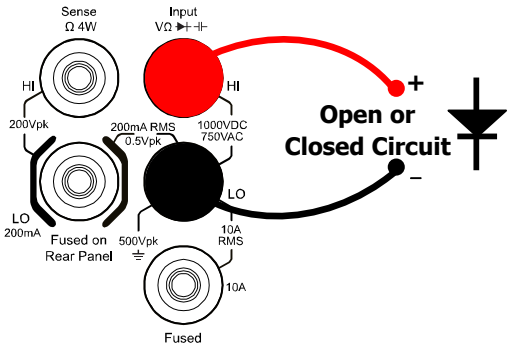
Capacitance Measurement



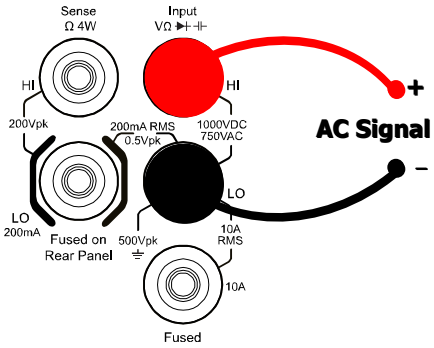
Continuity Measurement



Diode Measurement

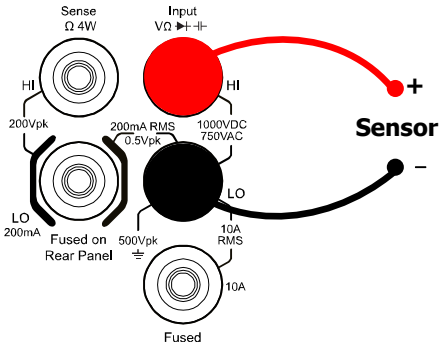


Frequency/Period Measurement



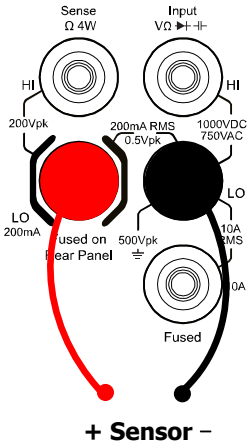
Any Sensor Measurement

(For DCV, 2WR, FREQ, TC, 2-wire RTD and THERM sensors)



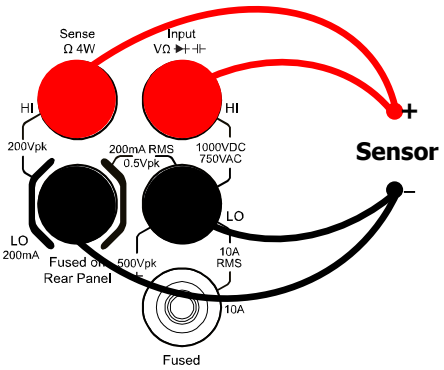
Any Sensor Measurement

(For DCI sensor)



Any Sensor Measurement

(For 4WR and 4-wire RTD sensors)



Using the Built-in Help System

The built-in help system provides information for users to quickly recall and use the basic functions of the instrument as well as how to use the built-in help system, including key (front panel) help and menu help. Press Help to enter the following interface.

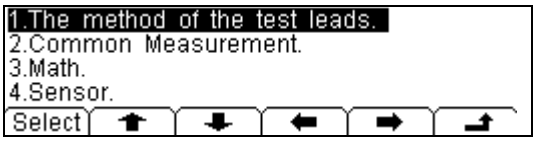


Figure 1-11 Help Topics

Table 1-1 Help Menu

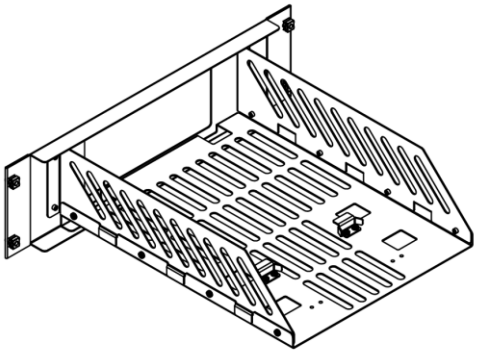
Menu	Description
Select	Go to the selected help topic
↑	Cursor up
↓	Cursor down
←	Page up
→	Page down
↵	Go to the previous menu

Help Topics

1. **The method of the test leads.**
2. **Common measurement.**
3. **Math.**
4. **Sensor.**
5. **Store and recall.**
6. **Utility.**
7. **I/O interface.**
8. **Online help.**
9. **To change the power fuse.**
10. **Support.**

Using a Rackmount Kit

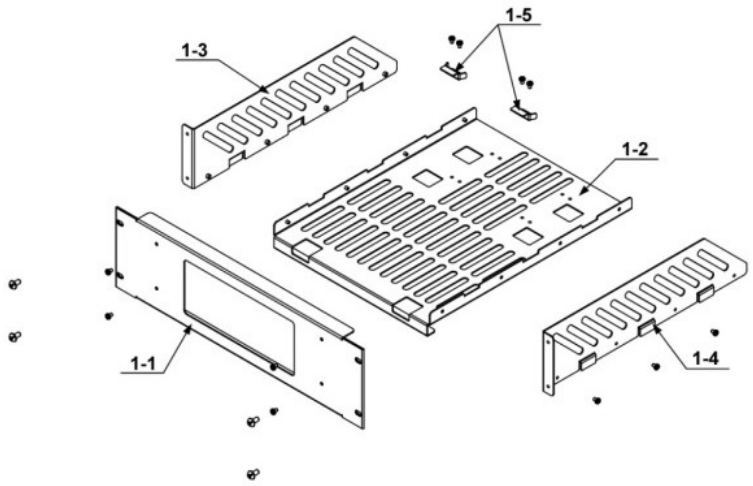
DM3068 can be mounted in a standard 19-inch rack cabinet. Before any kit installations, please remove the package or cushioning material from the multimeter body.

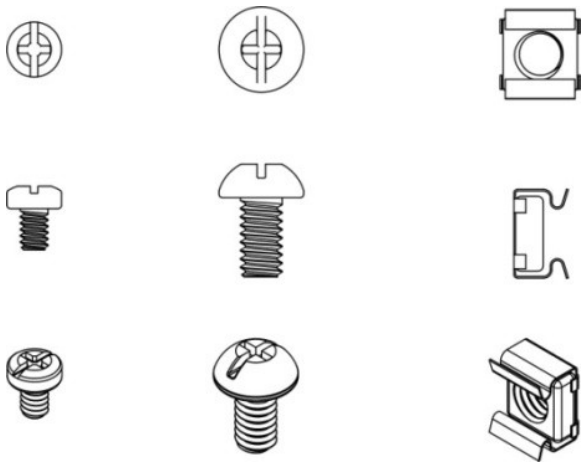


Kit Parts List

Table 1-2 Kit Parts List

No.	Name	Qty	Part Number	Description
1-1	Front Panel	1	RM-DM-3-01	-
1-2	Support Board	1	RM-DM-3-02	-
1-3	Left Plate	1	RM-DM-3-03	-
1-4	Right Plate	1	RM-DM-3-04	-
1-5	Fixed Finger	2	RM-DM-3-05	-
2-1	M4 Screw	16	RM-SCREW-01	M4*8 Phil-Slot Pan Head Machine Screw Nail
2-2	M6 Screw	4	RM-SCREW-02	M6*20 Phil-Slot Pan Head Machine Screw Nail
2-3	M6 Nut	4	RM-SCREW-03	M6*4 Square Machine Female Screw with Lock Blade





2-1 2-2 2-3

Tool Requirements

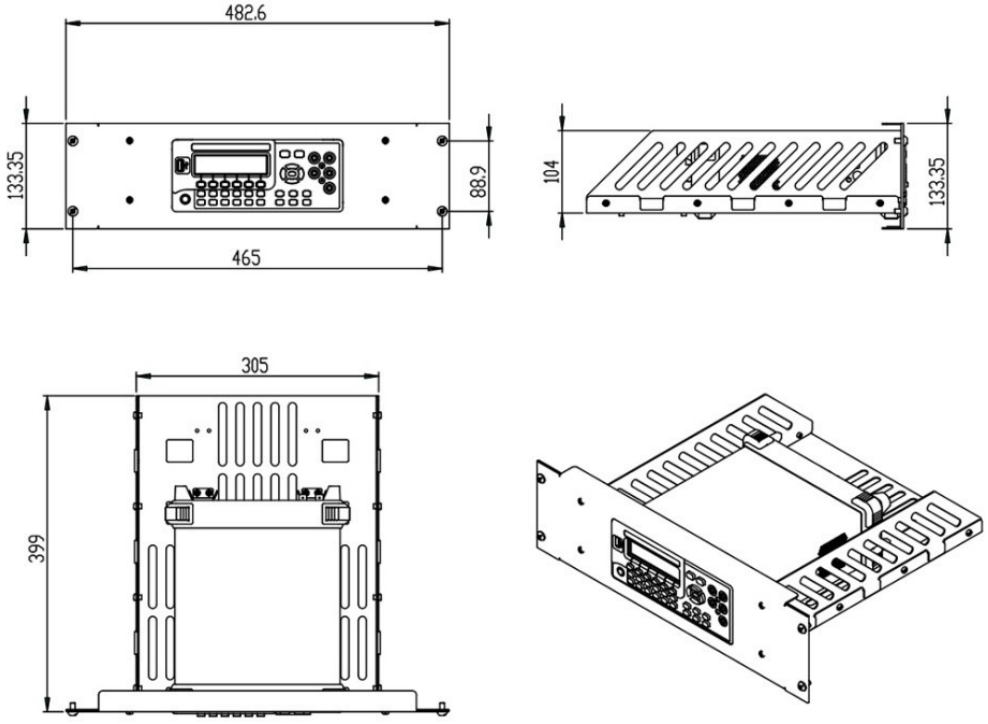
A PH2 cross screwdriver is recommended.

Space Requirements

The DM3068 should be mounted under the following spaces:

- The machine cabinet should be a standard 19-inch one.
- At least a 3U space (133.5 mm) should be provided by machine cabinet.
- The depth inside the machine cabinet should not be less than 400 mm.

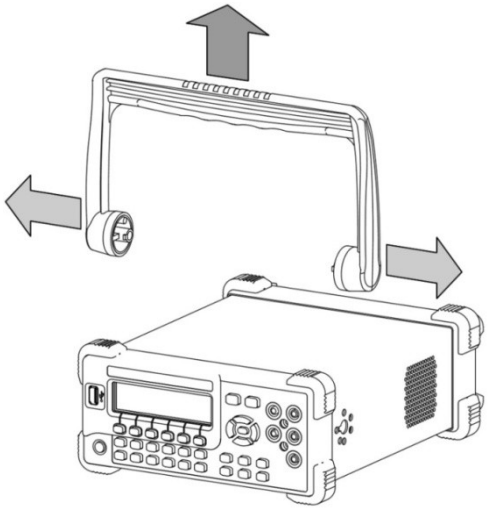
Dimensions after the rackmount kit on:



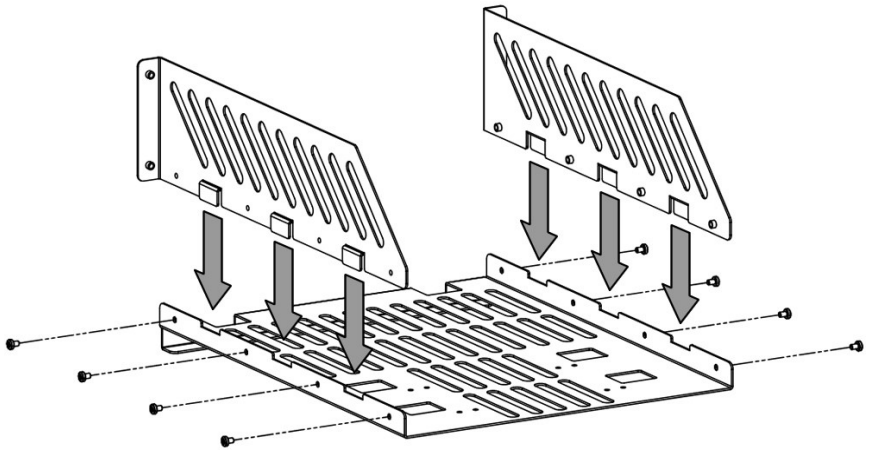
Procedure of Installation

This operation should be executed only by authorized officer. Improper or incorrect operations may cause installation fails or damages to the multimeter.

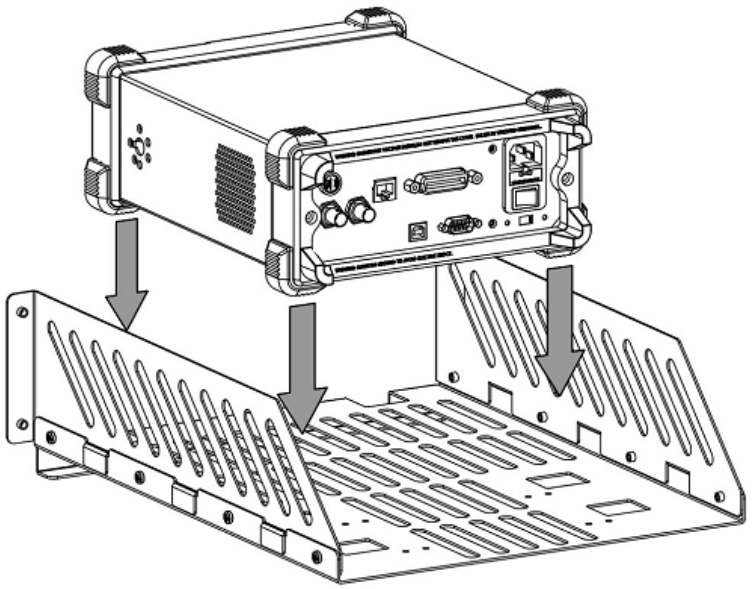
1. Remove the handle from the multimeter: grip the handle in both sides and pull it outward. Then, push the unit upward to release it from the instrument.



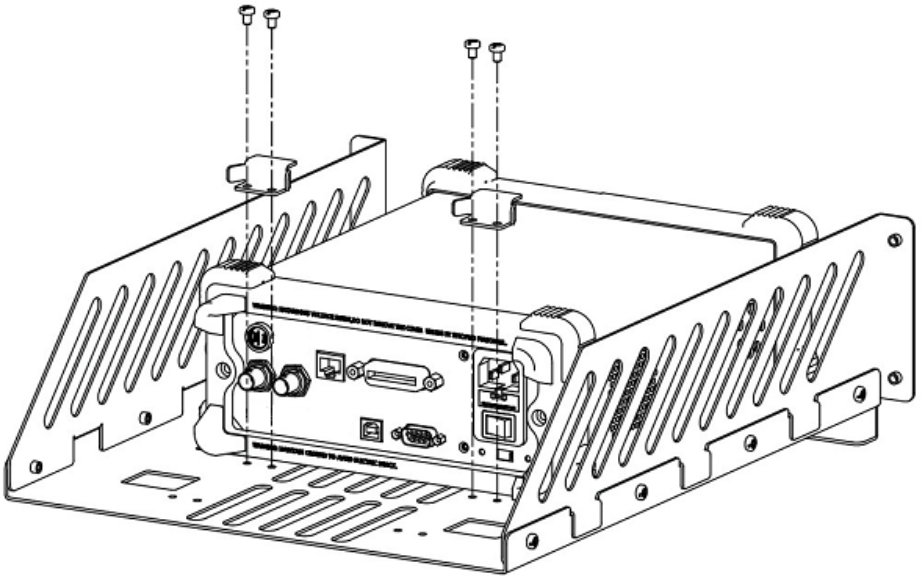
2. Install left and right plates: aim the detents of right and left plates at the openings on support board and insert selectively, then fix them using eight M4 screws.



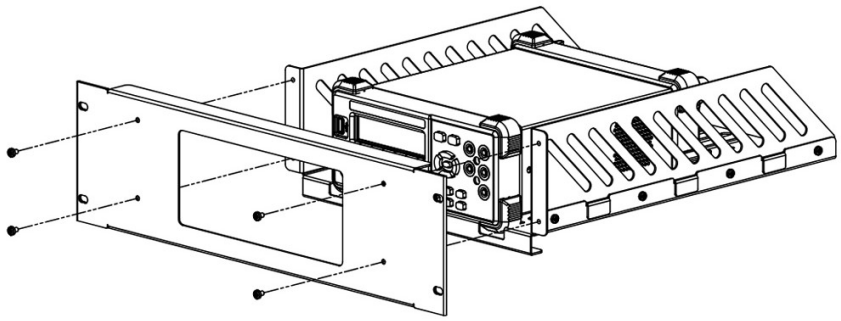
3. Place the instrument: aim the parallels at the corresponding openings and then put the multimeter onto the support board.



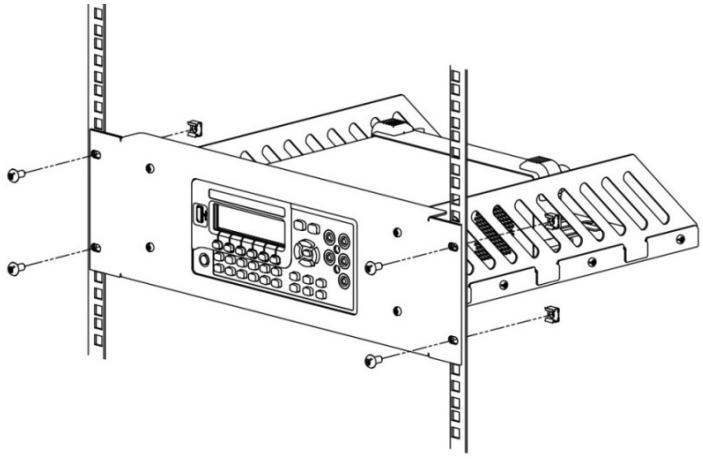
4. Fix the instrument: fasten or fit the instrument tightly into the support board using two fixed fingers in connection with four M4 screws.



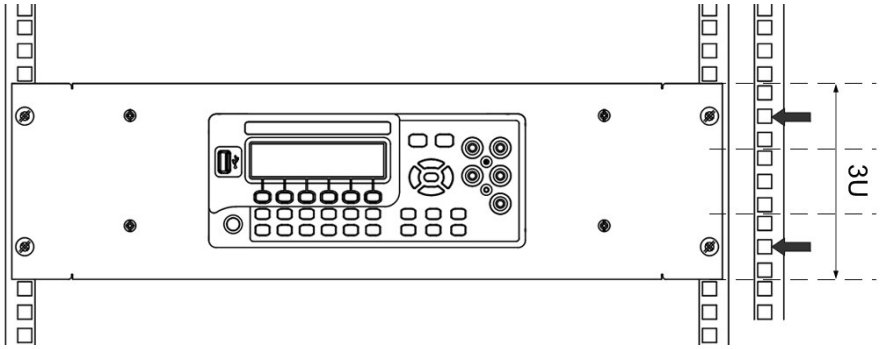
5. Mount the front panel: aim the front panel opening at the front of instrument and fix them using four M4 screws.



6. Load into machine cabinet: mount the rack with instrument-fixed onto a standard 19-inch machine cabinet using four M6 screws and four M6 square nuts, respectively.



7. Note the rock holds a height of 3U, holes in compliance with the arrow direction are the mounting holes for rack.



Chapter 2 Front-panel Operations

This chapter guides you how to use functions that the multimeter has.

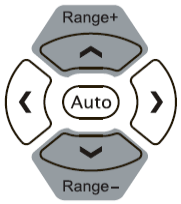
The chapter contains the following topics:

- To Set the Range
- To Set the Resolution
- Basic Measurements
- To Measure Any Sensor
- Preset Mode
- Secondary Function Key
- Measurement Configuration
- Math Operations
- Trigger
- Save and Recall
- Utility

To Set the Range

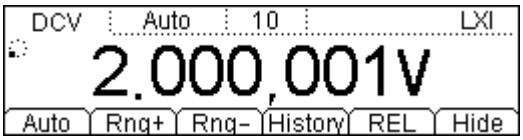
The multimeter allows users to select a range manually and automatically. The manual mode can bring a lot of convenience for users and the others provide higher reading precision. To set a range, use function keys on the front panel or menu keys.

Method 1 (by panel keys)**:**



- Auto mode: Press Auto will directly enable the auto range.
- Manual mode: Press ^ (increase) or v (decrease) key to specify a desired range manually.

Method 2 (by menu keys)**:**



- Auto range: Press Auto to directly enable the auto range.
- Manual range: Press Rng+ or Rng- to specify a desired range manually.

NOTE:

- The meter displays "**OVER LOAD**" when you input a signal beyond the current range.
- The multimeter uses **Auto** as the range mode when power-on or after you restore the multimeter from remote to local mote.
- It is recommended to use **Auto** mode if you are not sure the measurement range in order to protect the instrument and obtain accurate data.
- In FREQ/PERIOD measurements, the multimeter uses different gate times to include all input signals within 3 Hz and 1 MHz.
- The ranges in CONT and DIODE measurements are fixed at 2 kΩ and 2 V, respectively.

To Set the Resolution

The DM3068 holds reading resolutions of 3 ½, 4 ½, 5 ½ and 6 ½ digits. It automatically selects a reading resolution according to the current measurement settings. The greater the resolution is, the higher the measurement accuracy; the lower the resolution is, the faster the measurement. Different measurement function has different resolution.

1. In DCV, DCI, OHM measurements, pressing the left or right direction key on the front panel ( ) will set the reading resolution to $4^1/_2$, $5^1/_2$ or $6^1/_2$ digits. The resolution affects the integration time and vice versa.

Table 2-1 Relationship between reading resolution and integration time

Resolution	Integration time	Status bar shown
Fast $4^1/_2$ digits	0.006 PLC	0.006
Slow $4^1/_2$ digits	0.02 PLC	0.02
Fast $5^1/_2$ digits	0.06 PLC	0.06
Slow $5^1/_2$ digits	0.2 PLC	0.2
Fast $6^1/_2$ digits	1 PLC, 2 PLC, 10 PLC	1, 2, 10
Slow $6^1/_2$ digits	100 PLC	100

2. In ACV and ACI measurements, the resolution is fixed at $6^1/_2$ digits. Pressing the left or right direction key will set the filter type.

Table 2-2 Relationship between the frequency and speed of ac filter

Resolution	AC filter	Speed	Status bar shown
$6^1/_2$	200 Hz	Fast	200 Hz
$6^1/_2$	20 Hz	Mid	20 Hz
$6^1/_2$	3 Hz	Slow	3 Hz

3. In FREQ and PERIOD measurements, the resolution is fixed at $6^1/_2$ digits. Pressing the left or right direction key will set the gate time.

Table 2-3 Relationship between the resolution and gate time

Resolution	Gate Time	Status bar shown
$6^1/_2$	1 ms	1 ms
$6^1/_2$	10 ms	10 ms
$6^1/_2$	100 ms	100 ms
$6^1/_2$	1 s	1 s

4. The resolution is 3 ½ in CAP measurement.

5. The resolution is 5 ½ in SENSOR measurement.

6. The resolutions are 4 ½ in both CONT and DIODE measurements.

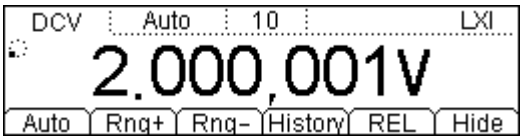
Basic Measurements

To Measure DC Voltage

Range: 200 mV, 2 V, 20 V, 200 V, 1000 V
Max Resolution: 100 nV (in the range of 200 mV)
Input Protection: a 1000 V protection is available in all ranges and a 10% over range exists on all ranges except for 1000 V. If the reading beyond 1050 V in the range of 1000 V, the screen displays "**OVER LOAD**".

Operating Steps:

1. **Enable the DCV measurement**
   Press ⎓V on the front panel to enter the following interface. Note this is the default measurement function every time after you power on the multimeter.



2. **Make connection**
   Connect the test lead with the measured signal by referring to "**Measurement Connections**".

3. **Set the range and resolution**
   Specify an appropriate range and resolution according to the measured signal and measurement requirements. Note a high voltage icon "⚡" may appear on the screen when the 1000 V range is selected.

4. **Set the measurement parameters (Optional)**
   The DCV measurement allows users to configure the integration time, dc impedance and auto zero. For details please see "**Measurement Configuration**".

5. **Read the measured value**

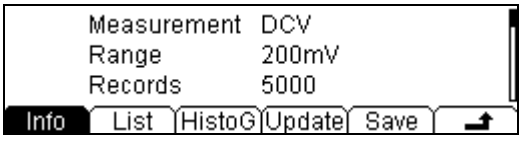
The multimeter then measures the input signal according to the current settings and displays the value on the screen.

6. Make math operation (advanced)

Perform a math operation supported by multimeter (STA, P/F, dBm, dB, REL) as required. Take **REL** for instance, the multimeter subtract the pre-specified value of REL from the actual measurement result and displays the result. For details please see "**Math Operations**".

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and **SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

To Measure AC Voltage

Range: 200 mV, 2 V, 20 V, 200 V, 750 V
Max Resolution: 100 nV (in the range of 200 mV)
Input Protection: a 750 V protection is available in all ranges and a 10% over range exists on all ranges except for 750 V. If the reading beyond 787.5 V in the range of 750 V, the screen displays "**OVER LOAD**".

Operating Steps:

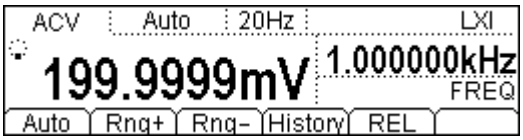
1. **Enable the ACV measurement**
   Press ~V on the front panel to enter the following interface.

2. **Make connection**
   Connect the test lead with the measured signal by referring to "**Measurement Connections**".

3. **Set the range and resolution**
   Specify an appropriate range (the resolution is fixed at $6^1/_2$ digits) according to the measured signal and measurement requirements. Note a high voltage icon "⚡" may appear on the screen when the 750 V range is selected.

4. **Set the measurement parameters (Optional)**
   The ACV measurement allows users to configure the filter. For details please see "**Measurement Configuration**".

5. **Read the measured value**
   The multimeter then measures the input signal according to the current settings and displays the value on the screen. During the ACV measurement, user can also enable the frequency measurement. Press ~V first and then 2ND and Freq to enable the synchronous measurement, see figure below.



6. Make math operation (advanced)

Perform a math operation supported by multimeter (STA, P/F, dBm, dB, REL) as required. Take **REL** for instance, the multimeter reduces the actual measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**".

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.

- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and **SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

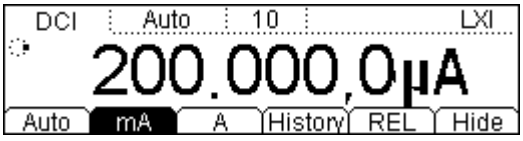
To Measure DC Current

Range: 200 μA, 2 mA, 20 mA, 200 mA, 2 A, 10 A
Max Resolution: 0.1 nA (in the range of 200 μA)
Input Protection: the multimeter uses two kinds of fuses for current protection, one is on the rear panel for low current protection (500 mA quick-acting fuse) and the other is inside the multimeter for high current protection (10 A). 10% over range exists on all ranges except for 10 A. If the reading beyond 10.5 A in the range of 10 A, the screen displays "**OVER LOAD**".

In order to obtain more accurate measurement results, DM3068 deals with input currents having quantity of electricity separately. The multimeter will use low current scale when a current within 200 mA is input and then change to high current scale once a current that equal to or higher than 2 A is input.

Operating Steps:

1. **Enable the DCI measurement**
   Press ⎓I on the front panel to enter the following interface.



2. **Make connection**
   Connect the test lead with the measured signal by referring to "**Measurement Connections**".

3. **Set the range and resolution**
   Specify an appropriate range and resolution according to the measured signal and measurement requirements. Note a high voltage icon "⚡" may appear on the screen when the 10 A range is selected.

4. **Set the measurement parameters (Optional)**
   The DCI measurement allows users to configure the integration time and auto zero. For details please see "**Measurement Configuration**".

5. Read the measured value

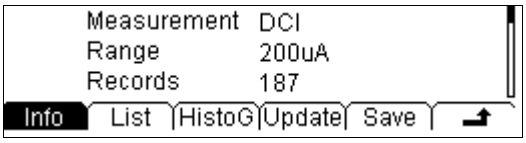
The multimeter then measures the input signal according to the current settings and displays the value on the screen.

6. Make math operation (advanced)

Perform a math operation supported by multimeter (STA, P/F, and REL) as required. Take **REL** for instance, the multimeter reduces the actual measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**"

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and **SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

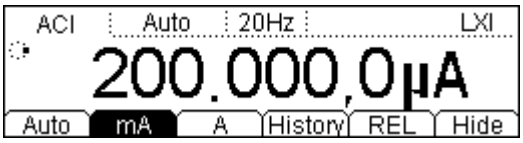
To Measure AC Current

Range: 200 μA, 2 mA, 20 mA, 200 mA, 2 A, 10 A
Max Resolution: 0.1 nA (in the range of 200 μA)
Input Protection: the multimeter uses two kinds of fuses for current protection, one is on the rear panel for low current protection (500 mA quick-acting fuse) and the other is inside the multimeter for high current protection (10 A). 10% over range exists on all ranges except for 10 A. If the reading beyonds 10.5 A in the range of 10 A, the screen displays "**OVER LOAD**".

In order to obtain more accurate measurement results, DM3068 deals with input currents having quantity of electricity separately. The multimeter will use low current scale when a current within 200 mA is input and then change to high current scale once a current that equal to or higher than 2 A is input.

Operating Steps:

1. **Enable the ACI measurement**
   Press [~I] on the front panel to enter the following interface.



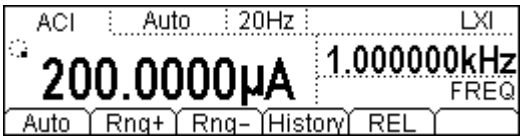
2. **Make connection**
   Connect the test lead with the measured signal by referring to "**Measurement Connections**".

3. **Set the range and resolution**
   Specify an appropriate range (the resolution is fixed at $6^1/_2$ digits) according to the measured signal and measurement requirements. Note a high voltage icon "⚡" may appear on the screen when the 10 A range is selected.

4. **Set the measurement parameters (Optional)**
   The DCI measurement allows users to configure the filter. For details please refer "**Measurement Configuration**".

5. Read the measured value

The multimeter then measures the input signal according to the current settings and displays the value on the screen. During the ACV measurement, user can also enable the frequency/period measurement. Press ~I first and then 2ND and Freq to enable the synchronous measurement, see figure below.

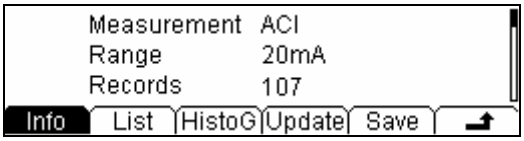


6. Make math operation (advanced)

Perform a math operation supported by multimeter (STA, P/F, and REL) as required. Take **REL** for instance, the multimeter reduces the actual measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**".

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and **SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

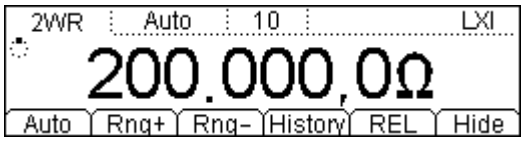
To Measure Resistance

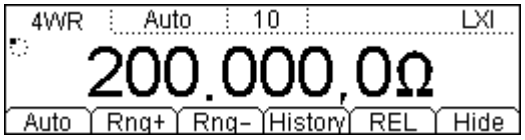
Range: 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 1 MΩ, 10 MΩ, 100 MΩ
Max Resolution: 100 μΩ (in the range of 200 Ω)
Input Protection: a 1000 V protection is available in all ranges. 10% over range exists on all ranges.

DM3068 provides 2-wire (2WR) and 4-wire (4WR) resistance measurements. When the measured resistance less than 100 kΩ, the 4-wire resistance measurement is suggested to be used to reduce the measurement error caused by test lead resistance and contact resistance between the probe and the testing point because these two resistances cannot be ignored any more, compared to the measured resistance.

Operating Steps:

1. **Enable the 2WR/4WR measurement**
   Press Ω on the front panel to enter the following interface.





2. **Make connection**
   Connect the test lead with the measured resistance by referring to "**Measurement Connections**".

3. **Set the range and resolution**
   Specify an appropriate range and resolution according to the measured signal and measurement requirements.

4. **Set the measurement parameters (Optional)**

The 2WR/4WR measurement allows users to configure the integration time, auto zero and offset compensation. For details please see "**Measurement Configuration**".

5. Read the measured value

The multimeter then measures the measured resistance according to the current settings and displays the value on the screen.

6. Make math operation (advanced)

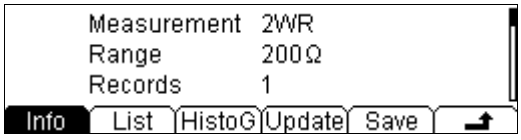
Perform a math operation supported by the multimeter (STA, P/F, dBm, dB, REL) as required. Take **REL** for instance, the multimeter reduces the actual measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**".

NOTE

- If the measured resistance is small, REL operation is recommended in order to reduce the error caused by test lead.
- Both ends of the measured resistance should be placed far away from your body and desks that can conduct electricity, as this may make the errors of measurement. The greater the measured resistance is, the more it suffers from such error.

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press

up or down direction key or menu softkey to go to the desired item.

- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average and SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

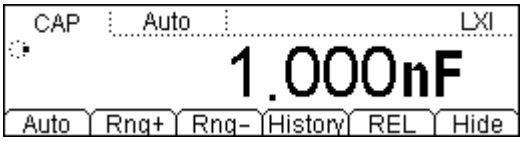
In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

To Measure Capacitance

Range: 2 nF, 20 nF, 200 nF, 2 μF, 20 μF , 200 μF, 2 mF, 20 mF, 100 mF
Max Resolution: 1 pF (in the range of 2 nF)
Input Protection: a 1000 V protection is available in all ranges. 10% over range exists on all ranges.

Operating Steps:

1. **Enable the CAP measurement**
   Press ⊣⊢ on the front panel to enter the following interface.



2. **Make connection**
   Connect the test lead with the measured capacitance by referring to "**Measurement Connections**".

> **NOTE**
>
> Please short contact the two feet of an electrolytic capacitor by using a test lead before measuring the electrolytic capacitor.

3. **Set the range and resolution**
   Specify an appropriate range (the resolution is fixed at $3^1/_2$ digits) according to the measured signal and measurement requirements.

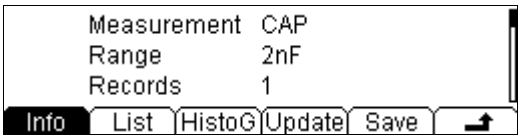
4. **Read the measured value**
   The multimeter then measures the measured capacitance according to the current settings and displays the value on the screen.

5. **Make math operation (advanced)**
   Perform a math operation supported by multimeter (STA, P/F, and REL) as required. Take **REL** for instance, the multimeter reduces the actual

measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**".

6. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and **SDEV** values under Info menu. This operation synchronizes with the information in List and HistoG.
- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

7. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

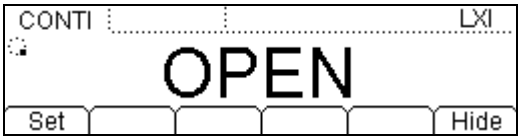
To Measure Continuity

Test Current Source: 1 mA
Max Resolution: 0.1 Ω (the range is fixed at 2 kΩ)
Input Protection: 1000 V Input Protection.
Open-circuit Voltage: < 8 V
Beep Threshold (short-circuit resistance): from 1 Ω to 2000 Ω

Operating Steps:

1. **Enable the CONT measurement**

   Press  on the front panel to enter the following interface.



2. **Make connection**

   Connect the test lead with the measured circuit by referring to "**Measurement Connections**".

3. **Set the short-circuit resistance**

   Press Set and enter a desired value by using direction keys, the default is **10 Ω**.

4. **Read the measured value**

   - The circuit is considered to be connected when the measured circuit has a resistance smaller than the specified short-circuit resistance, the multimeter screen displays the actual resistance value and makes a buzzer (beeper is on).
   - When the measured circuit has a resistance within the specified short-circuit resistance and 2.2 kΩ, the multimeter screen displays the actual resistance value but does not make a buzzer.
   - When the measured circuit has resistance greater than 2.2 kΩ, the multimeter screen displays "**OPEN**" but does not make a buzzer.

5. Hide the menu

In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

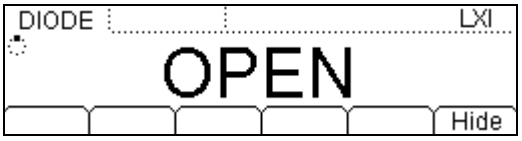
To Measure Diode

Test Current Source: 1 mA
Max Resolution: 100 μV (the range is fixed at 2 V)
Input Protection: 1000 V Input Protection.
Open-circuit Voltage: < 8 V

The diode measurement is for measuring the forward voltage drop on the diode.

Operating Steps:

1. **Enable the DIODE measurement**
   Press ⇥ on the front panel to enter the following interface.



2. **Make connection**
   Connect the test lead with the measured diode by referring to "**Measurement Connections**".

3. **Read the measurement value**
   The multimeter screen displays the measured voltage value and makes a buzzer (beeper is on) when the diode is connected, otherwise displays "**OPEN**".

4. **Hide the menu**
   In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

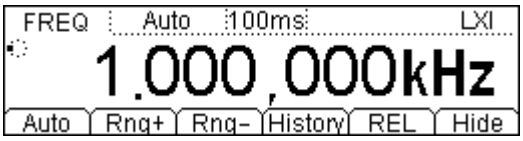
To Measure Frequency and Period

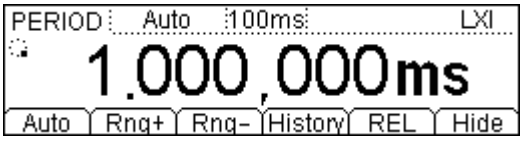
Frequency (Period) Range: from 3 Hz to 1 MHz (from 0.33 s to 1 μs)
Input Signal Range: 200 mV, 2 V, 20 V, 200 V, 750 V
Input Protection: a 750 V protection is available in all ranges.

To obtain the measured signal's frequency and period, directly press Freq or use the secondary measurement function during voltage or current measurment.

Operating Steps:

1. **Enable the FREQ/PERIOD measurement**
   Press Freq on the front panel to enter either interface shown below.





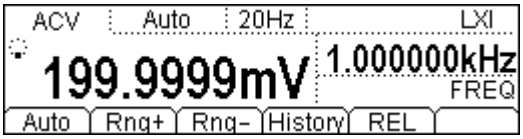
2. **Make connection**
   Connect the test lead with the measured signal by referring to "**Measurement Connections**".

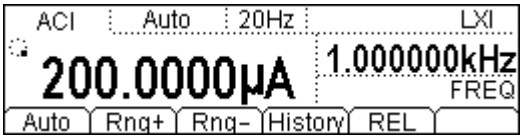
3. **Set the range and resolution**
   Specify an appropriate range (the resolution is fixed at $6^1/_2$) according to the measured signal.

4. **Set the measurement parameters (Optional)**
   In FREQ/PERIOD measurement, you can set the gate time or filter as required. For details please see "**Measurement Configuration**".

5. **Read the measured value**
   The multimeter then measures the input signal according to the current

settings and displays the value on the screen. Besides, the multimeter can measure voltage and current of the signal during the frequency/period measurement. Pressing (~V) or (~I) and then (2ND) and (Freq) one by one will obtain the results shown in figures below.



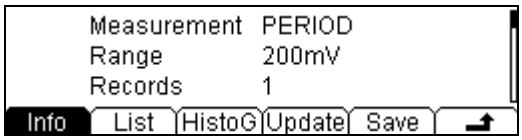


6. Make math operation (advanced)

Perform a math operation supported by multimeter (STA, P/F, and REL) as required. Take **REL** for instance, the multimeter reduces the actual measurement result from the pre-specified value of REL and displays the result. For details please see "**Math Operations**".

7. View history data

Up to 5000 latest measured data can be viewed. Press History to enter the following interface.



- **Info**: provides information about measurement. Press up or down direction key to go to the desired item.
- **List**: contains all measurement results since last update in a table. Press up or down direction key or menu softkey to go to the desired item.
- **HistoG**: displays the average (AVG) and standard deviation (SDEV) of measurements in a histogram.
- **Update**: refreshes **Records**, **Maximum**, **Minimum**, **Average** and

SDEV values under Info menu. This operation synchronizes with the information in List and HistoG.

- **Save**: enables you to store the current measurement data into the internal memory or an external USB flash device. Pressing this key will light the Save button. For more details please see "**Save and Recall**".

8. Hide the menu

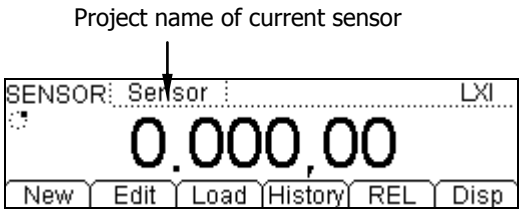
In order to observe the measurement results clearly, users can hide the operation menu by pressing Hide. Repressing this key will redisplay the operation menu.

To Measure Any Sensor

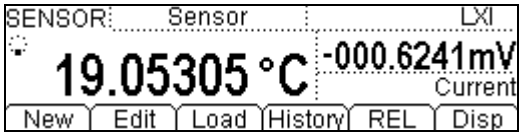
This function enables you to easily convert a measured physical quantity (such as pressure, flow rate, temperature, etc.) into an easy-measured quantity such as voltage, resistance. By pre-inputting a response curve, the multimeter converts and amends the data according to the internal arithmetic for displaying. Users can edit and modify the display unit of the measured physical quantity at will.

DM3068 supports user-defined (DCV, DCI, 2WR, 4WR, FREQ) and temperature (TC, RTD, THERM) sensor measurements.

Press Sensor to enter the following interface.



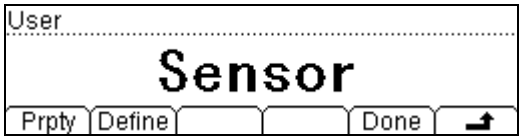
- **New**: creates a new sensor configuration file.
- **Edit**: modifies the opened or stored sensor configuration file.
- **Load:** loads the sensor configuration files from the internal nonvolatile memory or USB flash device. For details please see "**Save and Recall**". The backlight of Save goes on when you use this function.
- **History**: displays newest measured data up to 5000 items.
- **REL**: quickly enables the REL operation. Besides, you can perform **STA** and **P/F** operations. For details please see "**Math Operations**".
- **Disp**: sets the display mode of the result from sensor measurement. **Meas** indicates that only the measurement value, while **Corrsp** indicates the corresponding value. **All** indicates both values will be displayed: the measurement value is on the main interface, and the other is on the vice interface. The corresponding value refers to the value of measured physical quantity.



To create a new sensor configuration file, you can define a fitting curve when DCV, DCI, 2WR, 4WR or FREQ sensor is used. Since the temperature sensor (TC, RTD, THERM) presets a conversion relationship on the basis of the international temperature scale and calculates the temperature according to the electrical signal (such as voltage, resistance), you can directly choose a desired temperature sensor.

User-defined Sensor

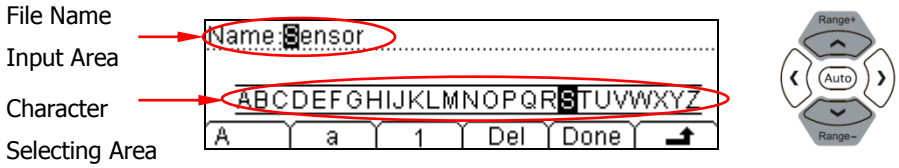
Press Sensor → New → User to enter the following interface.



- **Prpty**: sets the sensor name, type and unit.
- **Define**: defines the response curve of the sensor.

1. Defining the Sensor Name

Press Prpty → Name to enter the following interface and enter a memorable name for the new defined sensor. The name should be within 9 characters.



File Name Input Method

Press up or down direction key and place the cursor in File Name Input Area or Character Selecting Area.

- In File Name Input Area, select the cursor position to be edited by pressing right and left direction keys (or hold the press), while the Character Selecting Area is hidden.
- In Character Selecting Area, choose a desired character type from the item shown on the lower screen by pressing the related soft menu and then select a letter by pressing right and left direction keys.

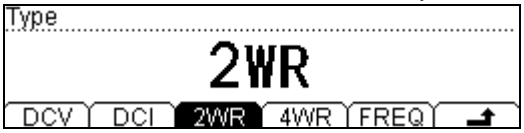
The available character types are:

- **A**: switches to capital letters entry (A-Z).
- **a**: switches to lower-case letters entry (a-z).
- **1**: switches to numbers entry (0-9).

- **Del:** deletes the character where the cursor locates.
- **Done**: finishes the name entry.
- : returns to previous menu.

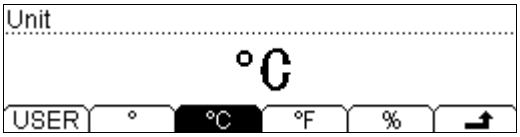
2. Specifying the Sensor Type

Press Prpty → Type to enter the following interface and select a type to be converted. Press ⮌ to return to previous menu.



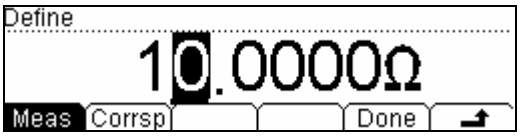
3. Selecting the Sensor Unit

Press Prpty → Unit and select a desired unit for displaying. When USER is selected, you can define a unit up to 2 digits by using direction keys. Press ⮌ to return to previous menu.

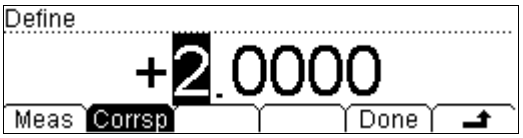


4. Adding the Sensor Arithmetic Curve

Press Define→ Add to enter the following interface, from which you can adds data pairs on the curve. The meter takes the specified arithmetic to fit a relation function between the input signal and measurement result based on these data pairs and then calculates the result for displaying.



Press Meas and enter an appropriate value by using direction keys. Note the unit should be **Ω** if the sensor type is **2WR**.

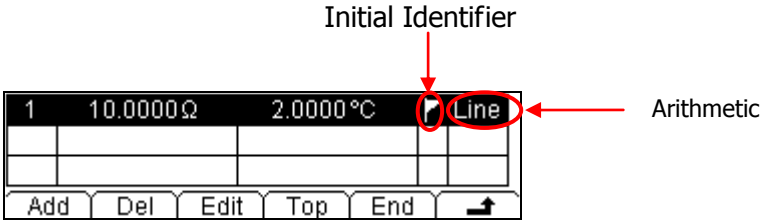


Press Corrsp and enter an appropriate value by using direction keys. Note the unit to be used is the one you have set in step 3, ℃.

Table 2-4 User-defined sensor measurement range

Measurement	Range
DCV	-1100 V to 1100 V
DCI	-220 mA to 220 mA
2WR	0 Ω to 110 MΩ
4WR	0 Ω to 110 MΩ
FREQ	0 Hz to 1100 kHz

When you finish a pair of data entry, press Done, the multimeter goes to the following interface. The icon ◤ indicates the arithmetic that the multimeter adopts for data since this point until which marked with◤. The first data segment uses **Line** as default.



Press ⮥ to return to previous menu and create another group of data in the same way. From the second group of data, you can use segment function.

Press SEG → **ON**→ Arith and select Line or Curve.

Line: the calculated curve is point-point tangential path having no curvature. It applies to the sensors having step-variation in the data or having variation based on straight slope and better linearity within a certain area. **This arithmetic requires at least 2 groups of reference data.**

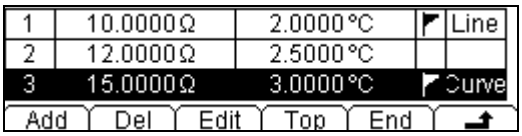
Curve: the calculated curve is an approximate that has a certain curvature. It applies to the data has unfavorable linearity. **This arithmetic requires at least 5 groups of reference data.**

NOTE

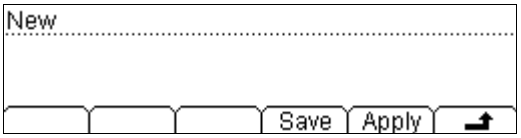
If the linearity of a certain data segment from the sensor relation curve is good, Line arithmetic is recommended, otherwise use Curve arithmetic. But for those curves have good and poor linearity, **Segment** function namely using different arithmetic for different measurement section, should be used.

5. Storing and Recalling Sensor Configurations

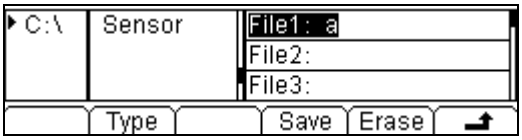
Adds reference data pairs (measurement and corresponding values) for the arithmetic curve to be taken. When completed, the interface goes to:



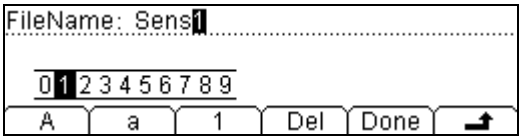
Press ⮈ to finish setting and returns to the User interface. Then, press Done to enter the following interface.



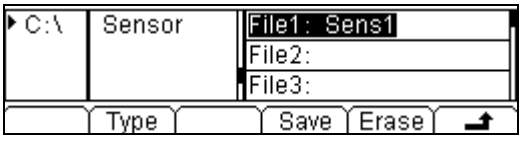
- Press Save, the multimeter enters the store and recall interface, the backlight of Save goes on.



Press Save and enter a desired file name by referring to "**Name/File Name input method**" such as **Sens1**.

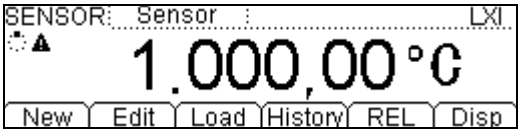


When finished, press Done and save the current sensor configuration into the specified path: (C:\) or USB flash device (A:\).



Press ⮥ and returns to User interface.

- Press Apply, the multimeter starts measuring according to the current configurations. See figure below, the ⚠ shown on the screen to indicates that the result is incredible.



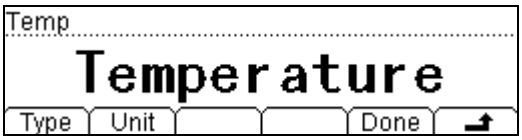
If you suspect the stored any sensor configuration files or data, press Edit to make a modification.

Temperature sensor

DM3068 can directly measure the temperature detected by TC (Thermocouple), RTD (Resistance Temperature Detector) and THERM (Thermistor) sensors.

Different temperature sensor uses different form to convert temperature into electrical signal as its special characteristics. A temperature sensor that conforms to ITS-90 standards should be used for measurement.

Press Sensor → New → Temp to enter the following interface.



- **Type**: chooses a desired temperature sensor type from TC, RTD and THERM and sets the related parameters.
- **Unit**: chooses the measured temperature unit from °C, °F and K. The relationship between these units are:

  °F = (9/5) * ℃ + 32

  K ≈ °C + 273.15
- **Done**: saves and applies the current temperature sensor configurations.

For the connection method please see "**Measurement Connections**".

The following parts introduce each temperature sensor supported by DM3068 in details.

TC

The TC (thermocouple) is one of the most common industrial thermometers. It converts the temperature value into voltage reading, and can measure temperatures in a wide range.

The common thermometers are B (Pt Rh 30- Pt Rh6), E (NI CR-WRCK), J (Fe-WRCK), K (NI CR-NiSi), N (NiCrNi-NiSi), R (Pt Rh13 -Pt), S (Pt Rh10-Pt), T (Cu-WRCK). Among them, B, R and S are precious metal thermocouple, while E, J, K, N, T are cheap metal thermometers. For the reference table about each thermocouple, please see the ITS-90 standards.

The DM3068 provides two cold junction compensation modes: **Internal cold junction temperature & Simulated cold junction temperature**.

Internal cold junction temperature refers to the internal temperature of the banana jack detected by the multimeter. Connect the thermocouple wire to the inside of the banana jack and prevent air flow from interfering the temperature around the banana jack. The radiating structure on the banana jack connected with the thermocouple wire would cause additional cold junction temperature error. About 3-minute warm-up is needed to build up the thermal balance after the cold junction is connected.

Simulated cold junction temperature refers to the temperature at the cold junction compensation point of the thermocouple. The internal temperature of the banana jack might be different from the actual temperature at the cold junction compensation point. If external cold junction compensation equipment is used, the thermocouple voltage signal compensated can not be connected to the banana jack through the compensation lead, otherwise, additional cold junction error will be caused. The accuracy of the measurement when using simulated cold junction depends on the accuracy of cold junction compensation.

To use the TC sensor, you should select the type of the thermometer and the compensation mode of the cold junction as follows.
Press TC → Type to select desired thermometer type and press .
Press TC → JUNC, select INT or SIM to input correct cold junction temperature (with -273 and 999) and then .

RTD

RTD is a resistance temperature detector commonly used in low temperature, having high measurement accuracy, stable performance and better linearity. It measures the temperature depending on the changing resistance of the measured substance with the temperature. The multimeter will display the temperature, corresponds to changing resistance.

The multimeter adopts the approximate algorithm of IEC751 standards and converts the resistance signal from the temperature sensor into the related temperature for displaying. For the reference table about each thermometer, please see related standards.

To use the RTD sensor, set the measurement parameters according to the following steps.

1. **Set the R0 Value**
   Press RTD → R0 and enter a desired value within 49 Ω and 2100 Ω by using direction keys, the default is **100 Ω**.

2. **Set the Temperature Coefficient**
   Press RTD → ALPHA and select a desired value from 385 (0.00385), 389 (0.00389), 391 (0.00391) and 392 (0.00392).

3. **Set the Connection Type**
   The RTD lead usually uses 2-wire or 4-wire connection. Press the desired option and ⮌ to back to the previous menu.

THERM

The THERM (thermistor) converts the temperature reading into resistance value. It is typically sensitive to temperature, but the measurement range is limited.

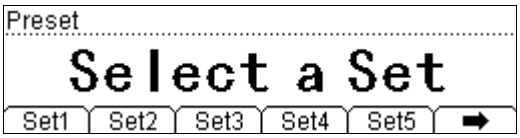
In this measurement, the multimeter adopts Steinhart-Hart approximate algorithm and converts the resistance from temperature sensor into the related temperature for displaying.

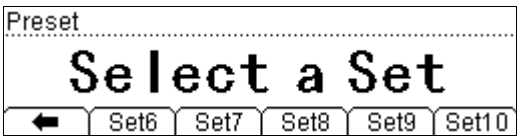
To use the THERM sensor, press **THERM** and select a desired value from 2.2K, 3K, 5K, 10K and 30K as the resistance of the sensor and then press .

Preset Mode

Preset mode applies to production lines for avoiding misoperations.

Press Preset in any mode to enter the setting interface, from which you can choose a preset configuration from up to 10 groups. Note the configurations in this interface correspond to the 10 groups of system configurations (Save → Type → SysSetting).





Press any set (Set1 to Set10) will automatically recall the corresponding settings and exit Preset menu.
If a set contains efficient configuration, the multimeter makes a sound after you choose it and recall the stored configuration, otherwise directly returns to the former testing status.

Press Preset → 2ND → Set1 (or other sets), the multimeter stores the current measurement configuration into the selected set by using the set name such as **Set1**.

Besides, you can recall or save preset configurations by using Save function. For details please see "**Save and Recall**".

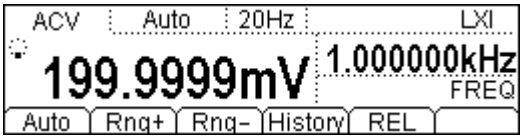
Secondary Function Key

The Secondary function key 2ND is used to enable the dual display mode and quickly store the current settings in co-ordination with Preset and enter the REL setting interface.

1. Turn On The Dual Display

This mode enables you to simultaneously measure both voltage or current and frequency of an ac signal. The voltage or current value is shown on the main display, while the frequency is shown on the vice.

For example: press ~V → 2ND → Freq will enter the following interface.



NOTE:

- The multimeter measures functions from both screens at the same time and updates in real-time.
- If the measurement from the main display uses math operation (STA<MAX, MIN, AVG, ALL>, P/F, dBm, dB), turning on the measurement from the vice display will automatically disable the math operation in use, while the vice display presents the measurement value.
- The math operation (MAX, MIN, AVG, dBm, dB) only works with the main display when dual display function is used. Turning on P/F will automatically disable the dual display.
- If the measurement on the main display uses math operation (REL), turning on the vice display will not change the display result on the main display and the vice display presents its measurement value.

2. Quickly Store Current Settings

Press Preset → 2ND → Set1 (or Set2, Set3….), the meter stores the current measurement configurations into the selected location in the name of "**Set1**" (or Set2, Set3….) in addition to use Save, for details please see "**Save and Recall**".

3. Quickly Enter REL Interface

In addition to Math button, you can press 2ND → REL in common measurement interface to directly enter the REL setting interface.

Measurement Configuration

Most measurement parameters are user-defined. Changing a measurement parameter will change the measurement precision and speed as well as the input impedance. An appropriate measurement parameter based on the practical application will enable the fastest measurement or highest measurement precision.

The multimeter holds a group of default measurement configurations, which can ensure the accuracy of measurement in most cases. Users can uses these defaults or modify them as required.

Only parameters allowed by the multimeter can be modified, see table below.

Table 2-5 Measurement parameter

Measurement Function	**Assignable Parameters**
DCV	integration time, DC impedance, Auto zero (AZ)
ACV	AC filter
DCI	integration time, Auto zero (AZ)
ACI	AC filter
OHM (2WR, 4WR)	Integration time, Auto zero (AZ), Offset compensation (OC)
CAP	N/A
CONT	Short-circuit resistance
DIODE	N/A
FREQ/PREIOD	Gate time, AC filter
SENSOR	N/A

To set the measurement parameter, select a measurement function and then press Meas. For more details please see the following content.

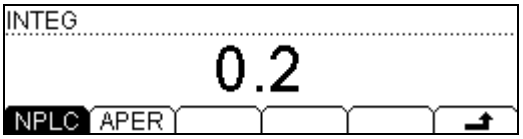
Integration Time

Integration time is the period during which the multimeter's analog-to-digital (A/D) converter samples the input signal for a measurement. The longer the integration time is, the slower the measurement speed and the higher the resolution; the shorter the integration time is, the faster the measurement and the lower the resolution. The integration time applies to DCV, DCI, 2WR and 4WR measurements.

DM3068 provides two types of ways to set the integration time:

- **NPLC**: expresses the integration time by the power line cycles, the unit is **PLC**. It can be set to 0.006, 0.02, 0.06, 0.2, 1, 2, 10, 100, the default is **10**. For the relationship between the integration time and resolution, please see "**Table 2-8**". The multimeter automatically detects the input power frequency when power on and considers frequencies within 55 Hz and 66 Hz as 60 Hz and others as 50 Hz.
- **APER**: expresses the integration time by aperture time, the unit is **s**. It can be set from 100 μs to 1s, the default is **100 ms**.

In DCV, DCI, 2WR or 4WR measurement, press Meas → INTEG to enter the following interface.



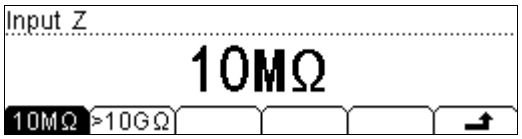
- **NPLC**: chooses a desired integration time from the options.
- **APER**: sets a desired integration time by using direction keys. When finished, press Done.

The setting is stored in nonvolatile storage.

DC Impedance

DC impedance applies to DCV measurement. The default is **10 MΩ**. In the range of 200 mV, 2 V or 20 V, you can choose "**>10GΩ**" to reduce the loading error to the measured object caused by multimeter (refer to "**Loading Errors (DCV)**"). The setting is stored in nonvolatile.

In DCV measurement, press Meas → Res to enter the following interface.

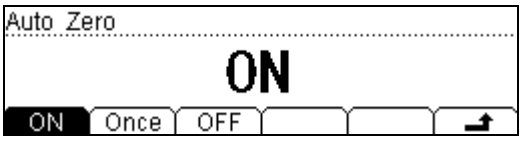


- **10MΩ**: sets the input impedances in all ranges to **10MΩ**.
- **>10GΩ**: sets the input impedances in ranges of 200 mV, 2 V and 20 V to **>10GΩ**, while in ranges of 200V and 1000V are still **10MΩ**.

Auto Zero

Auto zero (Auto Zero) applies to DCV, DCI, 2WR and 4WR measurements.

Press Meas → AZ to enter the following interface.

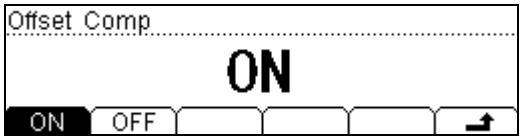


- **ON**: the multimeter internally disconnects the input signal and measured circuit after each measurement, and takes a zero reading. It then subtracts the zero reading from the preceding reading (displaying the difference between the measurement value and zero value during the measurement), in order to reduce the impact of offset voltage from input circuit to measurement result.
- **Once**: the multimeter takes a zero reading and then disables the auto zero. The following measurement value will reduce this reading.
- **OFF**: disable the auto zero function. Whatever, the multimeter automatically takes a zero reading once the function, or range, or integration time is changed. The following measurement value will reduce this reading.

Offset Compensation

OC (Offset Comp) applies to resistance measurements in the range of 200 Ω, 2 kΩ and 20 kΩ. It eliminates the impact of small dc offset from test lead to measurement result.

In 2WR or 4WR measurement, when the range is set to 200 Ω, 2 kΩ or 20 kΩ, press Meas → OC to enter the following interface.



- **ON**: the multimeter adds two different currents to the measured resistance and measures the voltage variable quantity on both sides of the resistance, and then divides the voltage variable quantity by current variable quantity to obtain the value of measured resistance.
- **OFF**: the multimeter does not execute offset compensation.

NOTE

The offset compensation and auto zero repel each other. The used auto zero function will be disabled automatically once you turn on the offset compensation, and vice versa.

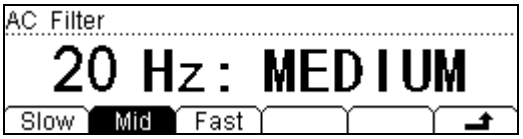
AC Filter

AC filter optimizes the low-frequency accuracy and gives stability in the shortest time.

It applies to ACV, ACI and FREQ/PERIOD measurements. The DM3068 provides three types of AC filters, which are slow, middle and high. The AC filter to be used is defined by the input signal frequency.

Input Frequency	AC Filter
3 Hz to 300 kHz	Slow
20 Hz to 300 kHz	Mid
200 Hz to 300 kHZ	Fast

In ACV, ACI or FREQ/PERIOD measurement, press Meas → Filter to enter the following interface.

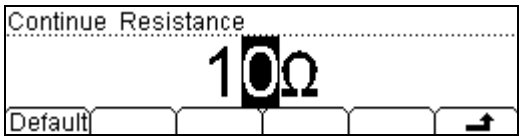


Press Slow, Mid or Fast to select 3 Hz, 20 Hz or 200 Hz as the lowest frequency of the AC filter. The default is **20 Hz: Mid**.

Short-Circuit Resistance

This function only applies to continuity test. When the measured circuit has a resistance smaller than the short-circuit resistance, the circuit is considered to connected, and the multimeter makes a buzzer (beeper is on). The default short-circuit resistance is **10 Ω** and the setting is stored in nonvolatile storage.

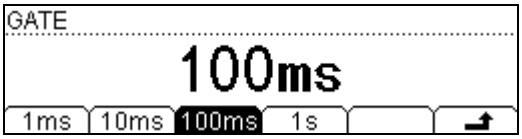
When continuity test is enabled, press Meas → **Set** will enter the following interface, from which you can set a desired value by using direction keys. The value is allowed within 1 Ω and 2000 Ω.



Gate Time

Gate time (also called Aperture Time) applies to FREQ/PERIOD function. It decides the resolution of low-frequency measurement. The longer the gate time, the higher the resolution of the low-frequency measurement is and the slower the measurement is, and vice versa. For details please see "**Specifications**".

When the current measurement function is FREQ/PERIOD, Press Meas → GATE to enter the following interface.

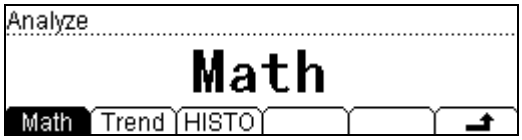


The gate time can be set to1 ms, 10 ms, 100 ms or 1 s, the default is **100 ms**. You can select a desired gate time by pressing the corresponding soft key.

Math Operations

DM3068 provides basic math operations (STA, P/F, dBm, dB and REL) for measurement results and displays the history data through a tendency graph and histogram.

In DCV, ACV, DCI, ACI, 2WR, 4WR, CAP, FREQ/PERIOD or SENSOR (except for CONT and DIODE) measurement, press Math to enter the following interface.



Math: sets the desired math function.
Trend: involves the tendency graph.
HISTO: involves the histogram.

Math

The multimeter provides 5 math functions: STA (MAX, MIN, and AVG, ALL), P/F, dBm, dB and REL. Different measurement function allows different math functions. See table below.

Table 2-6 Math Operation

Measurement Function	Available Math Functions
DCV	STA, P/F, dBm, dB, REL
ACV	STA, P/F, dBm, dB, REL
DCI	STA, P/F, REL
ACI	STA, P/F, REL
OHM (2WR, 4WR)	STA, P/F, REL
CAP	STA, P/F, REL
CONT	N/A
DIODE	N/A
FREQ/PREIOD	STA, P/F, REL
SENSOR	STA, P/F, REL

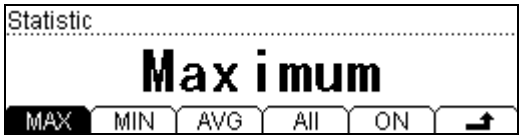
Take the DCV for instance, press Math → Math to enter the following interface.

Press the related menu to enter the desired measurement interface. Note you can only use one math operation at a time except REL.

STA

STA calculates the min, max, average and mean square deviation of readings during the measurement.

Press STA to enter the following interface.

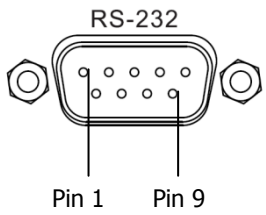


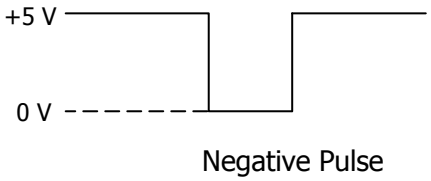
After you choose a desired STA function, press ON to enable it and the multimeter enters the reading interface. The reading is updating during the measurement.

- When **MAX** or **MIN** is selected, the multimeter takes the first reading as the maximum (or minimum) for displaying. The reading shown on the screen is always the maximum (or minimum) within the current readings when measuring more consecutive readings. The measurement interface displays the maximum (or minimum) reading, current measurement value and number of samples.
- When **AVG** is selected, the multimeter always displays the average value of all current readings. The measurement interface displays the average value, current measurement value and number of samples.
- When **All** is selected, the measurement interface displays the maximum, minimum, average values of the measured readings, mean square deviation and number of samples.

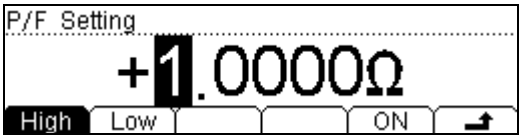
P/F

P/F operation prompts the signal testing result (message display and beep) according to the specified high and low parameters and outputs low-true pulse through the RS232 serial port on the rear panel. See figures below, the multimeter outputs a negative pulse from the Pin 1 (Pin 9) if the test succeed (or failed).



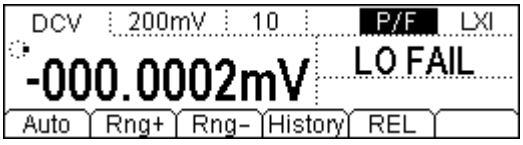


Press P/F to enter the following interface.



Press High or Low and enter a desired value by using direction keys. Note the High value should always greater than the low value and the unit is decided by the current measurement function. The P/F parameters range from -110% to +110% of the maximum range of the selected measurement function. The settings are stored in volatile storage and will be cleared automatically when power failure occurs.

After you setting the desired parameters, press **ON** to enable the P/F operation. The multimeter at this moment automatically exits the P/F setting interface and goes to the measurement main interface as shown in figure below:



- The status bar displays "**P/F"**.
- The main display contains the current measurement reading.
- The vice display presents "**PASS"** if the test succeed.
- If the current reading beyond the high or low value, the vice display shows **HI**

FAIL or **LO FAIL** and makes a sound (beeper is on: Utility → System → Sound).

WARNING

The P/F signal from pins 1 and 9 of RS232 is not compatible with the handshake signal (Carrier Detect and Ring Indicator) from standard RS232.

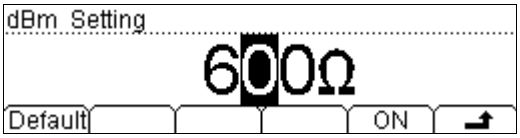
dBm

dBm represents the absolute value of the power. The dBm operation calculates the power value of the reference resistance according to the measured voltage.

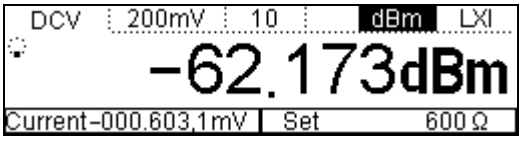
$$dBm = 10 \times Log_{10} [(Reading^2 / R_{REF}) / 1\ mW]$$

Wherein, Reading denotes the measurement voltage, R_{REF} denotes the reference resistance.

Press dBm to enter the following interface, from which you can directly press direction keys to specify a reference resistance within 2 Ω and 8000 Ω. The setting is stored in volatile storage and will be cleared automatically when power failure occurs.



Default: restores the reference resistance value to **600 Ω**.
On: enables dBm operation. The multimeter then automatically goes to the main interface, see figure below.



- The status bar displays "**dBm**".
- The screen center displays the result after dBm operation.
- Values on the lower left and right sides of the screen represent the current measurement reading and reference resistance value, respectively.

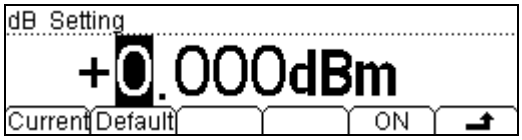
dB

dB represents the relative value. When enabled, the multimeter calculates the dBm value of the next reading and reduces the preset dB from this value and then displays the result.

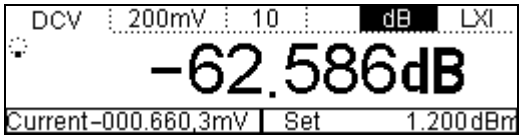
$$dB = 10 \times Log_{10} [(Reading^2 / R_{REF}) / 1\ mW] - dB\ preset$$

Wherein, Reading denotes the measurement voltage, R_{REF} denotes the reference resistance.

Press dB to enter the following interface, from which you can directly press direction keys to specify a value within -120 dBm and +120 dBm (the unit is dBm). The setting is stored in volatile storage and will be cleared automatically when power failure occurs.



Current: calculates the dBm value on the basis of the reference resistance from the present dBm menu.
Default: restores the dB preset value to **0 dBm**.
On: enables dB operation. The multimeter then automatically goes to the main interface, see figure below.



- The status bar displays "**dB**".
- The screen center displays the result after dB operation.
- Values on the lower left and right sides of the screen represent the current measurement reading and dB preset value, respectively.

REL

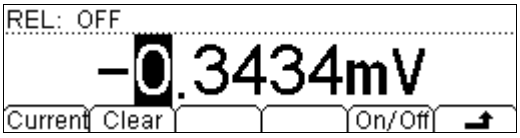
The reading displayed on the screen in REL operation is the difference between measured and preset values.

Reading = measured value – preset value

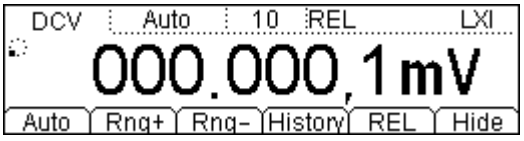
Users can pre-specify a REL value by each of the following way:

1) In basic measurement interface, press REL, the multimeter automatically uses the current measurement result as the preset value.
2) In basic measurement interface, press Math → Math → REL to enter the preset value setting interface.
3) In basic measurement interface, press 2ND → REL to enter the preset value setting interface.

In the preset value setting interface, you can directly press direction keys to specify a value as the default. The unit is decided by the used measurement function.



Current: sets the preset value to the current reading.
Clear: restores the preset value to 0.
On/Off: enables or disables REL operation. When it is on, pressing ↵ will go to the main interface, see figure below.

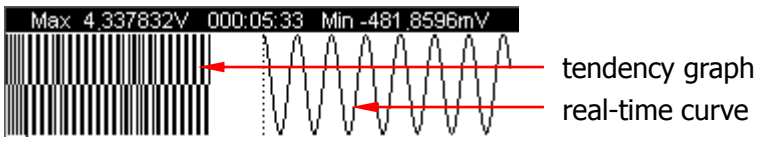


- The status bar displays "**REL**".
- The screen center displays the result after REL operation.
- Repressing REL under the main interface will close the REL operation. The identifier **REL** disappears.

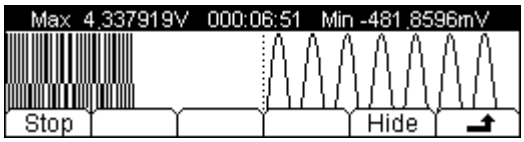
Tendency Graph

The multimeter puts the real-time measured data into a tendency graph that users can directly observe the variation of the measured data without other supplementary means. This function is available for DCV, DCI, ACV, ACI, 2WR, 4WR, CAP, FREQ/PERIOD and SENSOR measurements.

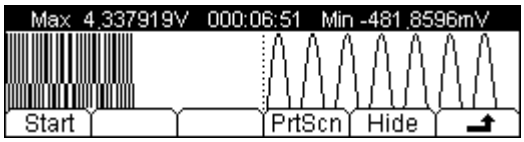
Press Math → Trend, the multimeter starts drawing. See interface below, the screen displays the MAX and MIN values of the measured data, the drawing time of the tendency graph as well as the real-time curve and tendency graph of the measured data. The multimeter supports up to 999 hours 59 minutes and 59 seconds drawing time. When the drawing time exceeds this limit, the timer is reset and starts to time again (but the waveform drawn is kept). When the real-time curve reaches the maximum display length, it is compressed and added onto the tendency graph and the multimeter starts to draw new real-time curve. When the tendency graph reahces the maximum display length, it is compressed into half to make sure that the compressed data on the real-time curve can be added onto it continuously to form cumulative tendency graph.



Press any soft menu at this moment will open the operation menu as shown in figure below.



Press Stop, the multimeter stops drawing and enters the following interface.



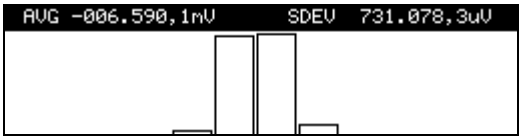
Start: enables the multimeter to redraw the graph according to the current measurement data.
PrtScn: saves the current tendency graph into an external USB flash device in BMP. Note this function is available only when an external USB flash device is well connected.

Histogram

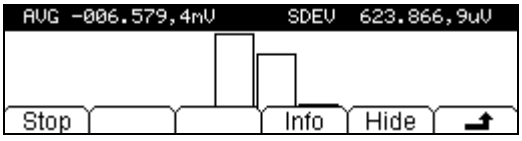
The real-time histogram displays the distribution situation of the measurement data from DCV, DCI, ACV, ACI, 2WR, and 4WR, CAP, FREQ/PERIOD and SENSOR.

Note the histogram changes in real time differing from the histogram in basic measurements (→ History → HistoG).

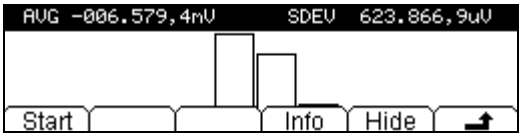
Press Math → HISTO to enter the following interface, which contains the average (AVG) of measured data, standard deviation (SDEV) and a histogram. All these information are in constant motion during the measurement.



Press any soft menu at this moment will open the operation menu as shown in figure below.



Press Stop, the multimeter stops updating histogram and enters the following interface.

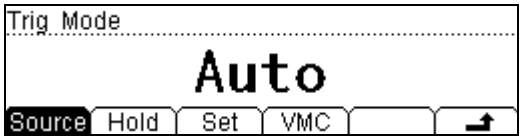


Start: enables the multimeter to redraw the gram according to the current measurement data.
Info: provides information about the current measurement.
Hide: hides the operation menu.

Trigger

The DM3068 provides four types of triggers: auto, single, external and level. It reads one or more specified number of readings (up to 50 000) on every received trigger signal and allows users to set the delay time between the start of triggering and reading.

Press Trig on the front panel to enter the following interface.



Source: chooses a trigger source from Auto, Single, Ext, and Level.
Hold: enables or disables the reading hold function.
Set: refers to the setup of related triggering parameters.
VMC: enables or disables the triggering output.

To Select a Trigger Source

Press Trig → Source to enter the following interface. The default is **Auto**.

Auto Triggering:

Press Auto and Done to enable the auto triggering. The backlight of Run/Hold on the front panel then turns on, and the multimeter continuously takes readings as fast it can according to the current configuration. If you press Run/Hold during triggering, the reading hold function will be enabled with the backlight flickers and a stable reading hold on the screen.

Single Triggering:

Press Single and Done to enable the single triggering. The backlight of Single on the front panel then goes on. The multimeter takes one or specified number of reading every time you press Single.

External Triggering:

Press Ext and Done to enable the external triggering. The backlights of both Run/Hold and Single on the front panel then go off. The multimeter will then receive the trigger pulse from **[Ext Trig]** connector on the rear panel and make a trigger at the specified edge of the pulse signal and acquire measured data.

Level Triggering:

This mode applies to DCV/DCI/OHM measurement functions. Press Level and enter a desired electrical level by using direction keys, then press Done to enable the level triggering. The backlights of both Run/Hold and Single on the front panel then go off. The multimeter will trigger on a positive or negative crossing (as selected) of a specified input level and acquire measured data.

NOTE

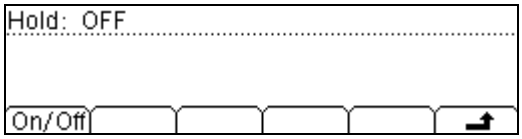
Press Single in remote control mode will switch the multimeter into Local mode.

Reading Hold

The multimeter captures stable reading and holds it on the screen when the reading hold function is enabled.

The sensitive determines whether the reading is enough stable and can be displayed on the screen. This parameter is expressed in the form of reading percentage based on the current range. The multimeter will not capture and display new reading unit this reading beyond the selected sensitive range for continuous three times.

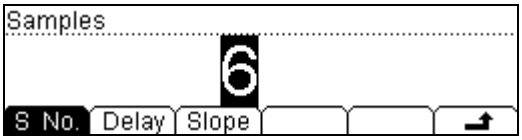
Press Trig → Hold to enter the following interface.



Press On/Off to enable or disable the reading hold function. When it is enabled, the backlight Run Hold on the front panel starts flashing. The settable sensitive range is 0.01%, 0.1%, 1% and 10%, the default is **0.1%**.
For example, if you choose 0.1%, the input signal into the multimeter is 5 V and the new reading will be displayed if reading runs outside the range of 4.9975 V and 5.0025 V for continuous three times.

To Set the Trigger Parameters

Press Trig → Set to enter the following interface.



S No.

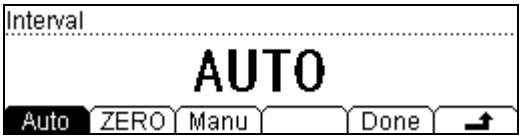
S No. presents the number of readings to be taken when a trigger signal is received.

Press S No. and enter a desired number within 1 and 50 000 by using direction keys. The default is **1**.

Delay:

This option presents the delay time between the trigger signal and the first sample (reading) that follows or between the two adjacent readings.

Press Delay to enter the following interface.



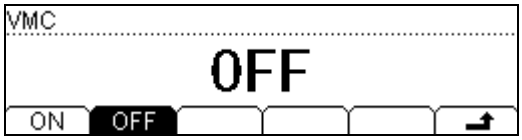
- **Auto**: the delay time in this mode is decided by a combination of the used measurement function, range, integration time and AC filter and other factors.
- **ZERO**: the delay time in this mode is **0 s**.
- **Manu**: the delay time in this mode can be set to any value within 0 s and 3600 s.

Slope:

This menu allows you to select an edge type for the pulse from **[Ext Trig]** connector on the rear panel when using external (or level) triggering. The default is **Rise**.

Trigger Output

Press Trig → VMC to enter the following interface.

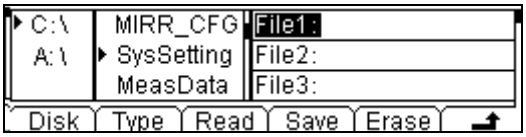


From this interface, you can enable or disable the trigger output. When it is enabled, the multimeter outputs a low-true pulse from the **[VM Comp]** connector after each measurement.

Save and Recall

The multimeter allows you to save the status configuration and measurement data into the internal memory or an external USB flash device for future use.

Press Save to enter the following interface.



Disk: chooses a desired storage location. "C:\" indicates an internal storage, while "A:\" indicates an external storage.
Type: chooses a desired file type for storing or reading.
Read: reads the selected file. This menu is available only when the current disk has the specified type of file.
Save: provides an access for storing the selected file by assigning a file. This menu is available only when the current disk allows the specified type of file.
Erase: clears the selected file. This menu is available only when the current disk has the specified type of file.

Storage Type

The multimeter can save and recall files in types, which are:

- **MIRR_CFG**: saves all system and sensor configurations files from the internal storage into an external USB flash device in a same file. The file suffix is ".xmir".
- **SysSetting**: saves the current system configuration as an ".xmir" file.
- **MeasData**: saves the current measurement data as an ".xdat" file.
- **MEAS_CSV**: saves the current measurement result as a ".csv" file. To view the stored data, please use the Microsoft Office Excel on your computer.
- **Sensor**: saves the current sensor configuration as an ".xsen" file.
- **SensorData**: saves the current sensor measurement result as an ".xsda" file.

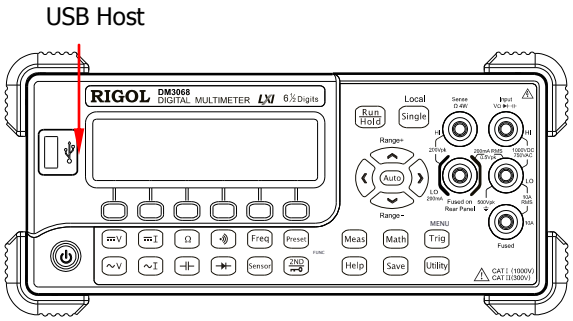
Internal Storage

The internal storage (C:\) of the multimeter holds up to 10 groups of system configurations, 10 groups of measurement data, 5 groups of sensor configurations and 5 groups of sensor measurement results.

External Storage

The external storage (A:\) can save 6 types of files according to the used device's capability.

To use the external storage, insert an USB flash device into the USB Host interface on the front panel and wait until the screen appears an icon on the status bar.

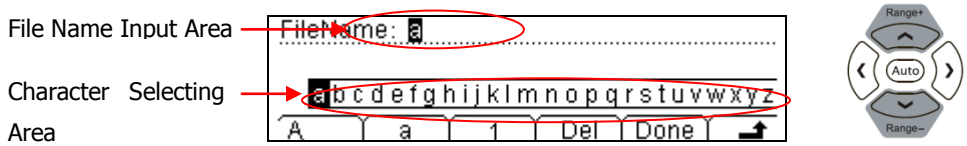


CAUTION

Do not remove the USB flash device under "A:\" disk operations.

To Save a File

When the current storage disk allows specified file type, press **Save** to enter the following interface. From where, you can assign a name for the file to be saved. The file name should be within 9 characters.



Name/File Name input method

Place the cursor to a desired location by using up and down direction keys such as File Name Input Area or Character Selecting Area.

- In File Name Input Area, select the cursor position to be edited by pressing right and left direction keys, while the Character Selecting Area is hidden.
- In Character Selecting Area, choose a desired character type from the items shown on the lower screen by pressing the related soft key and then select a letter by pressing right and left direction keys (or hold the press).

The name allows uppercase and lowercase letters as well as numbers.

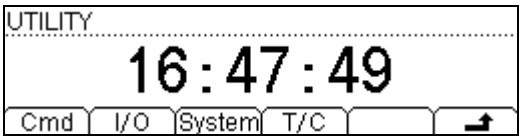
- **A**: switches to uppercase letters (A-Z) input.
- **a**: switches to lowercase letters (a-z) input.
- **1**: switches to numbers (0-9) input.

- **Del:** deletes the character where the cursor locates.
- **Done**: finishes the name entry.
- : returns to previous menu.

Utility

The button contains parameters setup relating to the multimeter system.

Press Utility to enter the following interface.

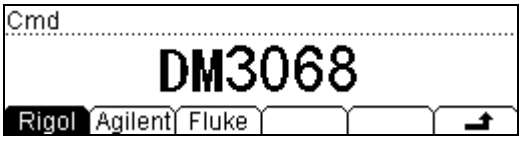


Cmd: selects a desired command system from those supported by DM3068.
I/O: configures remote control interfaces such as LAN.
System: involves system parameters setup such as language.
T/C: executes self-test and listing error information and so on.

Command Set

The DM3068 supports the command sets of RIGOL (DM3068), Agilent 34401A and Fluke 45.

Press Utility → Cmd to enter the following interface, from which you can choose a desired command set. The default is **RIGOL** (DM3068).

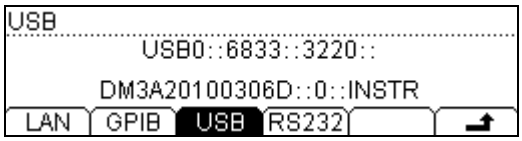


For more information about commands please see the Programming Guide of DM3068.

Interface Configurations

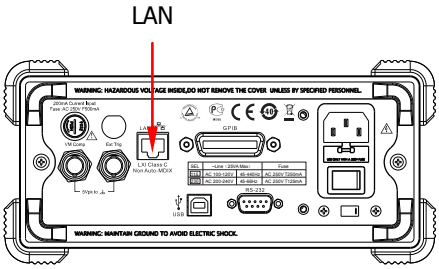
The DM3068 provides some remote interfaces such as LAN, GPIB, USB (configure-free) and RS232 for users to execute remote control.

Press Utility → I/O to enter the following interface.

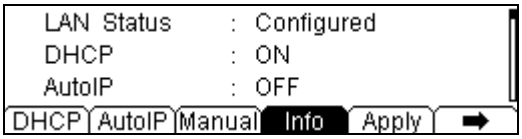


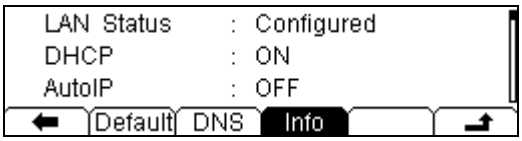
To Set the LAN

The LAN configuration parameters conform to LXI-C standards.
Before using this interface, connect the multimeter into your local LAN.



Press Utility → I/O → LAN to enter the following interfaces.





1. LAN Status

Provides connection status information between the multimeter and LAN, which are:

- **Configured**: indicates the LAN is connected.
- **Unlink**: indicates the LAN is not connected.

The Info provides information relates to the current LAN status. Using up and down direction keys can go to other items under this menu.

2. To Set IP Configuration Mode

The IP address mode can be set to DHCP, AutoIP or ManualIP. Different modes may have differences in parameter configuration.

NOTE

- When all three IP configuration modes are ON, the multimeter configures in the order of DHCP, AutoIP and ManualIP.
- At least one IP configuration mode should be ON.

1) DHCP

The DHCP server from the current network in this mode assigns network parameters to the multimeter such as IP address.

Press DHCP to turn on or off the DHCP configuration mode.

2) AutoIP

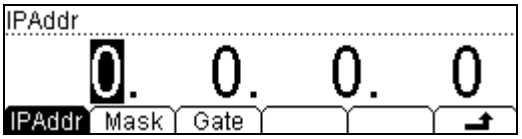
The multimeter in this mode automatically acquires an IP address from 169.254.0.1 to 169.254.255.254 and a subnet mask 255.255.0.0 according to the current network configurations.

Press AutoIP to turn on or off the AutoIP configuration mode. To enable this mode, DHCP must be OFF.

3) ManualIP

The user in this mode should define network parameters such as IP address, subnet mask and gateway.

Press Manual to turn on or off the ManualIP configuration mode. If it is ON, the multimeter enters the following interface and users have to set corresponding parameters. To enable this mode, neither DHCP nor AutoIP should be ON.



- **IPAddr:**

  The format of IP address is **nnn.nnn.nnn.nnn**. The first **nnn** ranges from 0 to 223 (except for 127) and the others range from 0 to 255. Please ask your network administrator for an available IP address as possible as you can.

  Press IPAddr and enter a desired IP address by using direction keys.

- **Mask:**

The format of subnet mask is **nnn.nnn.nnn.nnn**. All **nnn** ranges from 0 to 255. Please ask your network administrator for an available subnet mask as possible as you can.
Press Mask and enter a desired subnet mask by using direction keys.

- **Gate:**
  The format of gateway is **nnn.nnn.nnn.nnn**. The first **nnn** ranges from 0 to 223 (except for 127) and the others range from 0 to 255. Please ask your network administrator for an available gateway as possible as you can.
  Press Gate and enter a desired gateway by using direction keys.

3. To Set Domain Name Server

The format of domain name server (DNS) address is **nnn.nnn.nnn.nnn**. The first **nnn** ranges from 0 to 223 (except for 127) and the others range from 0 to 255. Please ask your network administrator for an available address.
Press DNS and enter a desired address by using direction keys. Note users generally do not need to set the domain name server address. This parameter can generally be ignored and users will not be required to set it.

4. To Apply Network Parameters

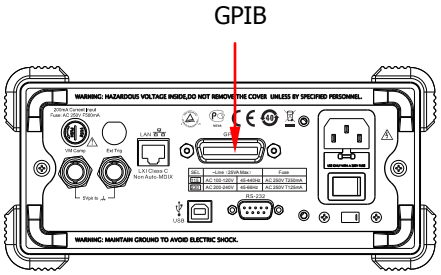
Press Apply to enable the current network parameters.

5. To Restore Factory Defaults

Press Default to restore the network parameters to defaults, in which the DHCP and AutoIP are ON and the ManualIP is disabled.

To Set the GPIB

The GPIB (IEEE-488.2) interface must assign a unique address for each device connected to it. Before using this interface, have a GPIB cable to connect your multimeter with the PC.

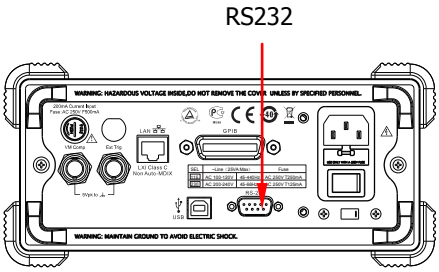


Press Utility → I/O → GPIB to enter the following interface.

The GPIB address can be any integer within 0 and 30. The default is 7. This setting is stored in nonvolatile storage.

To Set the RS232

Before any related operations, have a RS232 cable to connect the multimeter to a PC or data terminal equipment (DTE). Then, set the interface parameters such as baud rate, parity and handshake and match them with the PC or data terminal equipment, in order to control the meter. The measured result can be transferred into serial receiving device (PC).



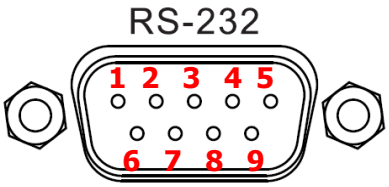


Table 2-7 RS232 Pin definition

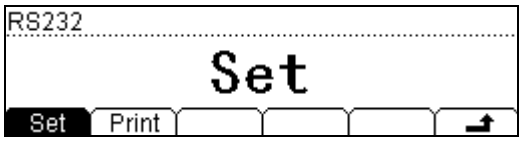
Pin	Abbreviation	Function
1*	PASS (Carrier Detect)	Output low-true pulse if P/F test succeed
2	RXD (Receive Data)	Receive data
3	TXD (Transmit Data)	Send data
4	DTR (Data Terminal Ready)	Data terminal is ready for receiving.
5	GND (Signal Ground)	Signal Ground
6	DSR (Data Set Ready)	Data is ready.
7	RTS (Request To Send)	Unused
8	CTS (Clear To Send)	Unused
9*	FAIL (Ring Indicator)	Output low-true pulse if P/F test failed

*Remark: Pins 1 and 9 always outputs high electrical level when P/F output is disabled.

WARNING

The P/F signal from pins 1 and 9 of RS232 is not compatible with the handshake signal (Carrier Detect and Ring Indicator) from standard RS232.

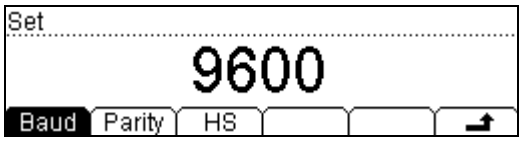
Press Utility → I/O → RS232 to enter the following interface.



Set: sets RS232 interface parameters.
Print: enables you to turn on or off the data output from the RS232.

1. To Set RS232 Parameters

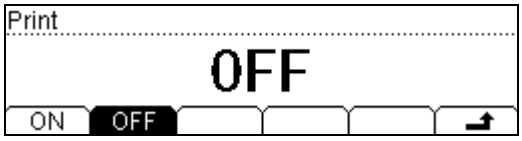
Press Set to enter the following interface, from which you can set the baud rate, parity and handshake status.



Baud: selects a desired baud rate from 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The default is **9600**. This setting is stored in nonvolatile storage.
Parity: selects a desired parity from None, Odd and Even. The default is **None**. This setting is stored in nonvolatile storage.
HS: enables or disables the serial hardware handshake function. When it is disabled, please do not connect DTR/DSR pins into a logic high level.

2. Print

Press Print to enter the following interface, from which you can turn on or off the measured data output from serial ports.



System Configuration

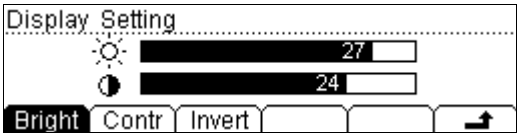
To Select a Language

DM3068 supports bilingual (English-Chinese) menus, built-in helps, context helps, and messages.

Press Utility → System → Lang to enter the following interface and choose a desired language type.

To Set the Display Parameter

Press Utility → System → Disp to enter the following interface.



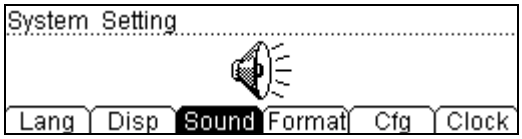
1. **Bright**
   Press Bright and set an appropriate brightness within 0 and 32 by using left and right direction keys. The default is **22**. This setting is stored in nonvolatile storage.

2. **Contr**
   Press Contr and set an appropriate contrast within 0 and 32 by using left and right direction keys. The default is **19**. This setting is stored in nonvolatile storage.

3. **Invert**
   Press Invert to switch the screen between normal and invert display. The default is **normal**.

To Set the Beeper

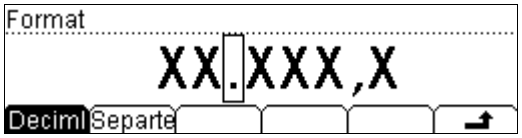
Press Utility → System → Sound to enter the following interface.



This menu determines if the multimeter makes a sound when any front-panel key is pressed and when the continuity test result is considered connected. The setting is stored in nonvolatile storage.

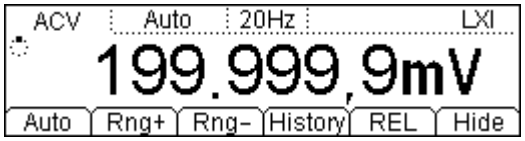
To Set the Number Format

Press Utility → System → Format to enter the following interface.



1. **Decimal**
   Sets the display type of the data's decimal point on the screen to "." or ",".

2. **Separte**
   Sets the display format of data separator on the screen to ",", "None" or "Space". For example:

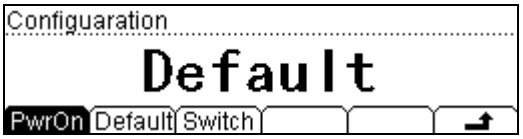


Decimal point: .
Separator: ,

Decimal point: .
Separator: Space

To Set the Configuration

Press Utility → System → Cfg to enter the following interface.



1. PwrOn

Selects a system configuration to be used at power-on from "Default" and "Last**"** (configuration at last power-off).

- This setting will be available for every power-on unless you change it.
- The multimeter will always use DCV as the default measurement at every power-on whether it is in Default or Last type.

2. Default

Restores the multimeter into factory defaults (see Table 2-8).

3. Switch

Enables or disables the front power button. The default status is OFF.

- **ON**: indicates the front power button is available. Users should press switches on both rear and front panel to turn on the multimeter.
- **OFF**: indicates the front power button is invalid. Users can directly start the multimeter by pressing the rear power switch in this mode. However, you can turn off the multimeter by pressing the front power button.

Table 2-8 Factory defaults

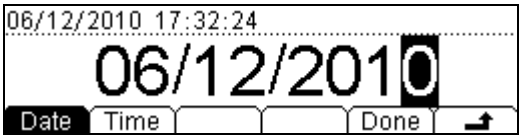
Parameter	**Factory Default**
Measurement Parameters	
*Short-circuit Resistance	10 Ω
AC Filter	Mid
DC Input Impedance	10 MΩ
Reading Resolution	6 ½
Measurement Function	DCV
Range	Auto

Math Operations	
Math Status	OFF
Math Item	STA
Math Register	All registers cleared
dBm Reference Resistance	600 Ω
Trigger Parameters	
*Delay	Auto
*Number of Samples	1
*Holding Range	0.1%
*Trigger Source	Auto
System	
*Beeper	ON
*Separator	,
*Language	English
*Display Mode	Normal (black text on white background)
Error Queue	Cleared
Saved Instrument Parameters and Data	No change
Remote Interfaces	
*GPIB Address	7
*Interface	USB
*Baud Rate	9600
*Parity Check	None (8 data bit)
*HS (Handshake)	OFF

Remark*: Parameters marked with data * in the above table are stored in nonvolatile storage.

To Set the System Clock

Press Utility → System → Clock to enter the following interface.

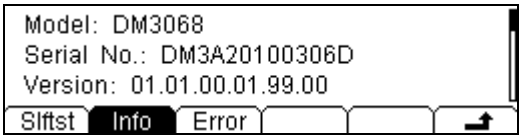


To remove the cursor, press left or right direction key. To change the data, press up or down direction key. When finished, press Done to apply the setting.

To Perform the Self-Test

DM3068 can automatically detect the system hardware and display the results in error list.

Press Utility →T/C to enter the following interface.



Slftst: starts self testing.
Info: provides information about the multimeter such as the model.
Error: lists the newest error information (up to 21 items) from the error queue.

Chapter 3 Remote Control

This chapter guides you how to control the multimeter from a distance by using either virtual panel based on web page or commands.

The chapter contains the following topics:

- Web Page Control
- Command Control

Web Page Control

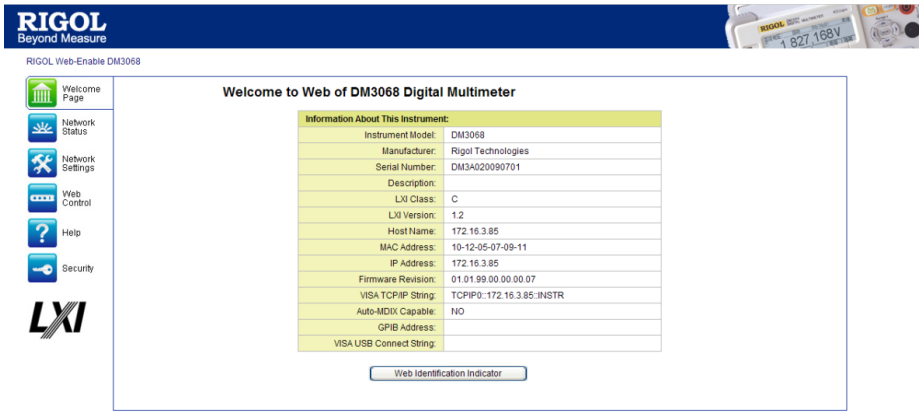
DM3068 confirms to LXI-C standard and can be remotely controlled via web page. Please take the following steps:

1. Setting the LAN

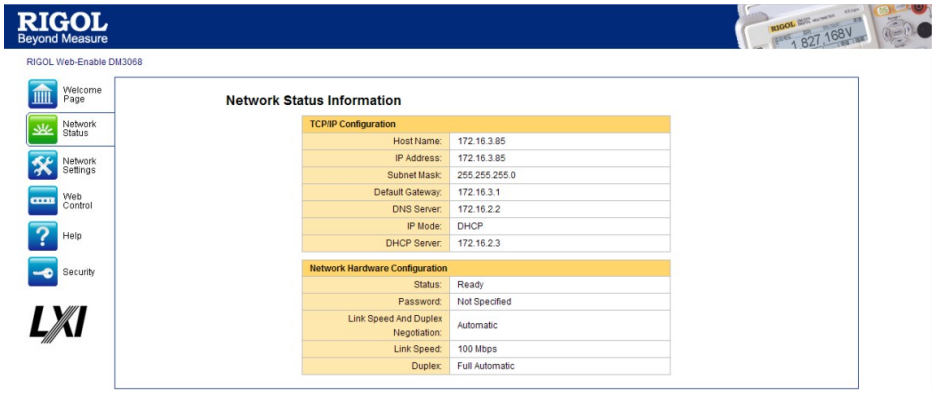
Connect the multimeter to LAN, set and obtain the IP address by referring to "**Interface Configurations**" in chapter 2.

2. Executing Remote Control

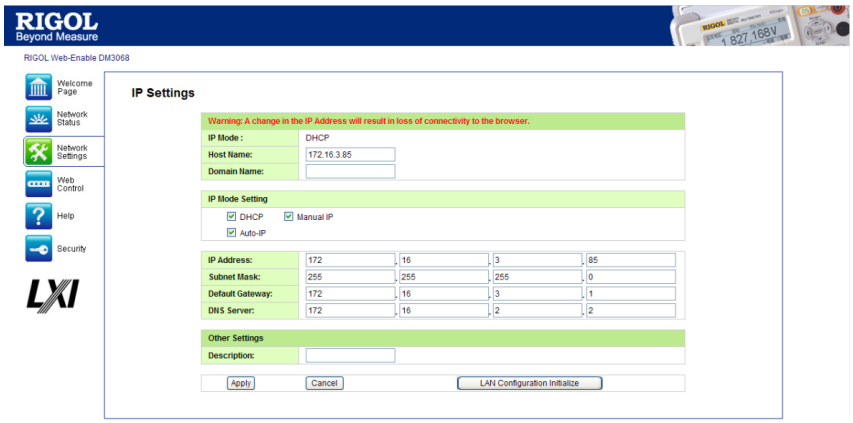
Fill the obtained IP address in the internet explorer and enter the following welcome interface. Then, click **Web Identification Indicator** and you will hear a sound from the multimeter.



1) **Network Status** provides information about TCP/IP and network hardware, see figure below.



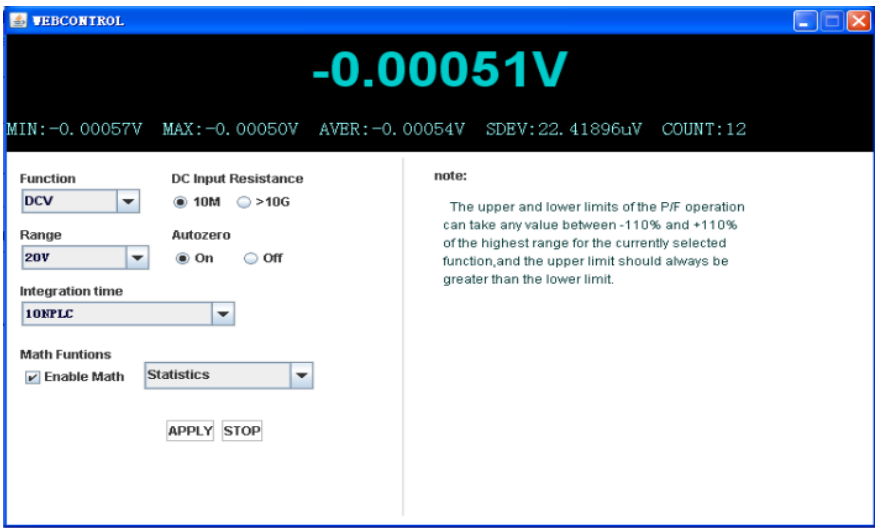
2) **Network Settings** allows you to set the network parameters, such as IP address. To restore the factory defaults, click **LAN Configuration Initialize**.



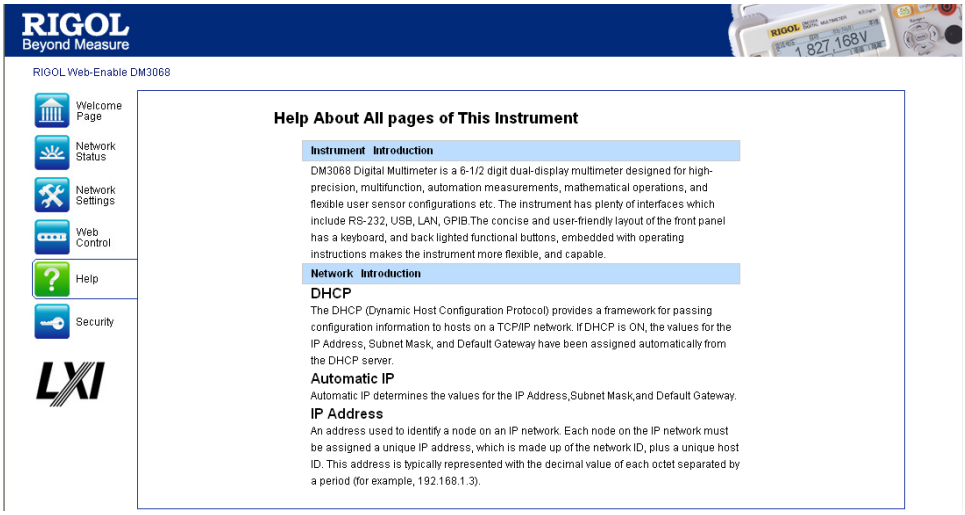
NOTE:

A correct user name and password is required to enter the setting interface of network if the multimeter has had a password set on it (the default user name and password are empty).

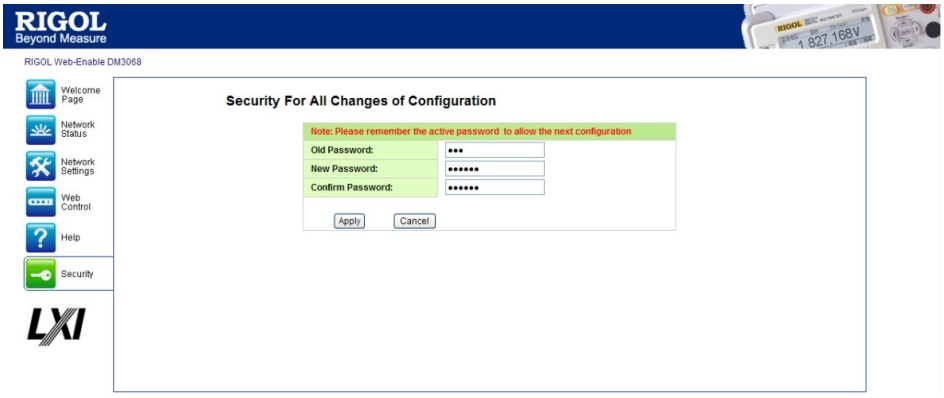
3) **Web Control** provides the same function operations as the front panel, from which you can configure the related parameters and obtain the measurement result. See figure below.



4) **Help** contains both instrument and network information.



5) **Security** is for modifying the password of network setting and controlling. After you enter the old password once and the new password twice, click **Apply** and the page appears "Note: Your password setting successful".



6) LXI provides an access for directly entering the LXI association official website http://www.lxistandard.org/.

Command Control

The DM3068 digital multimeter can be remotely controlled by programming using commands in two ways, which are:

User-Defined Programming

Users can program by themselves and send SCPI (Standard Commands for Programmable Instruments) commands to control the multimeter remotely. For more details about programming, please see the "Programming Guide" of DM3068.

Use Software Offered by RIGOL or Others

RIGOL specifically designed Ultra Sigma for instrument remote controlling through commands. Users can use this software or **Measurement & Automation Explorer** from NI (National Instruments Corporation) or **Agilent IO Libraries Suite** from Agilent (Agilent Technologies, Inc.) as required.

The DM3068 uses USB, LAN, RS232 or GPIB interface to communicate with PC. The next part will introduce how to control the instrument by using **Ultra Sigma** through the interfaces mentioned above. To obtain the software and detailed operation methods, please contact **RIGOL**.

Through USB

1. Connect the Instrument

Connect the USB Device interface of DM3068 to the PC USB Host interface using a USB cable.

2. Install the USB Driver

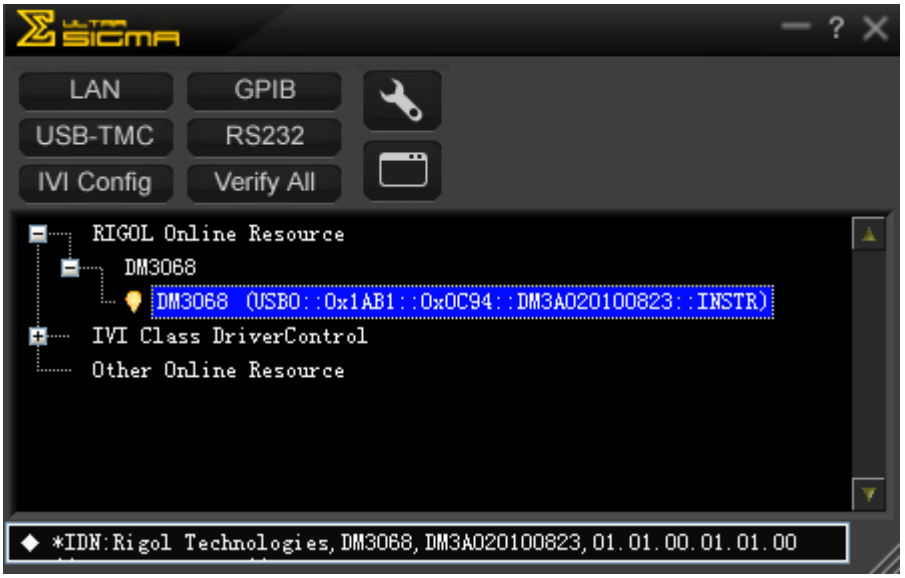
DM3068 digital multimeter is a USBTMC device. After the connection between the instrument and PC, turn on both devices and you will see a **Hardware Update Wizard** dialog box on the PC for installing "USB Test and Measurement Device" driver, please follow the guide.

3. Search USB Devices

Open the Ultra Sigma, the software automatically searches instruments connected to the PC. Additionally, you can click USB-TMC to starts searching. The status bar becomes the following status in process of searching.

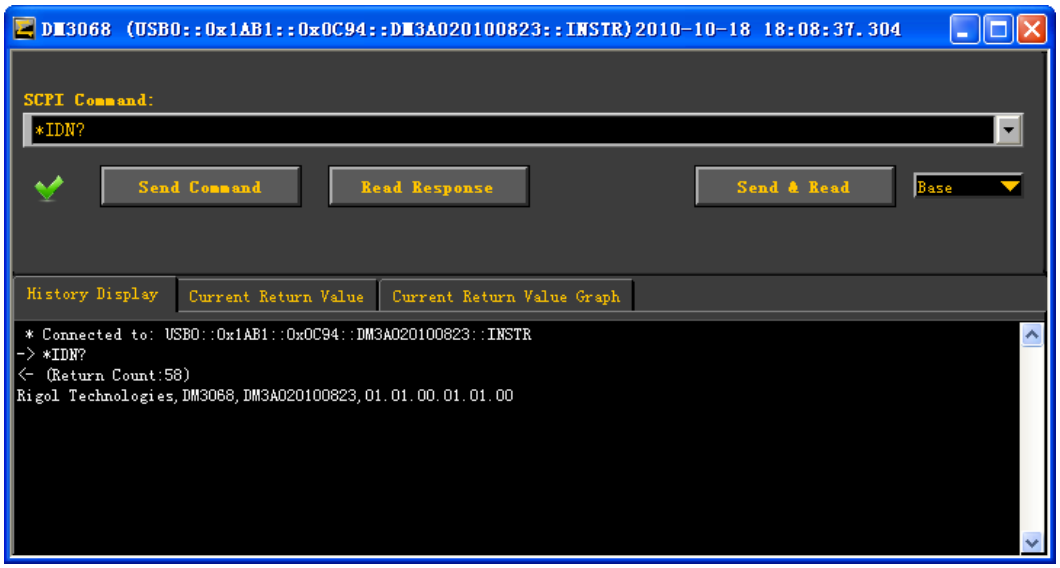
4. View USB Device

The searched instruments are shown under **RIGOL Online Resource** with the model and USB interface information, see figure below.



5. Test the Communication

Right click the source name **DM3068 (USB0::0x1AB1::0x0C94::DM3A020100823::INSTR)** and then select **SCPI Panel Control** to open the remote command control panel, from which you can send commands and read data. See figure below.



Through LAN

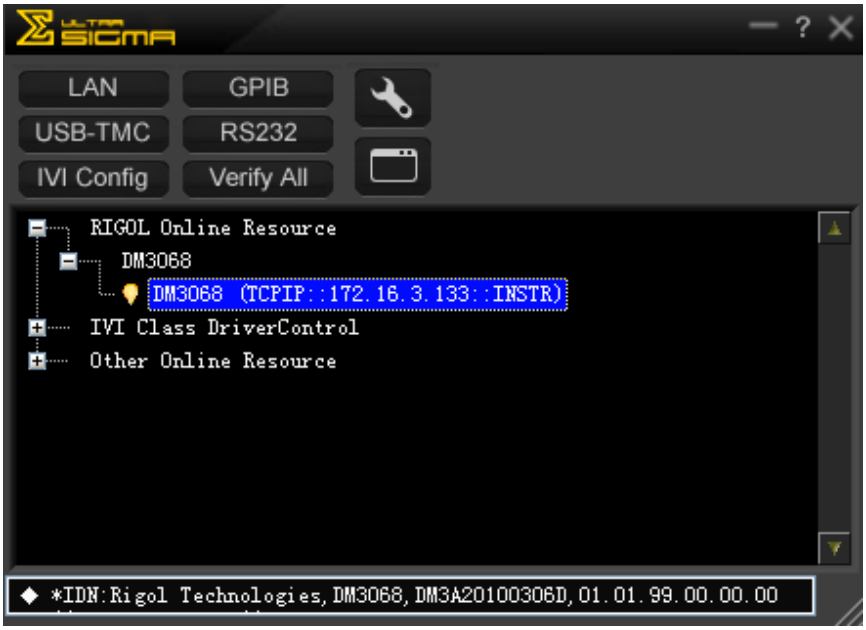
1. **Connect the Instrument**
   Connect the multimeter to you local network using a LAN cable.

2. **Configure LAN Parameters**
   Select **LAN** and configure its parameters according to "**Interface Configurations**".

3. **Search LAN Device**

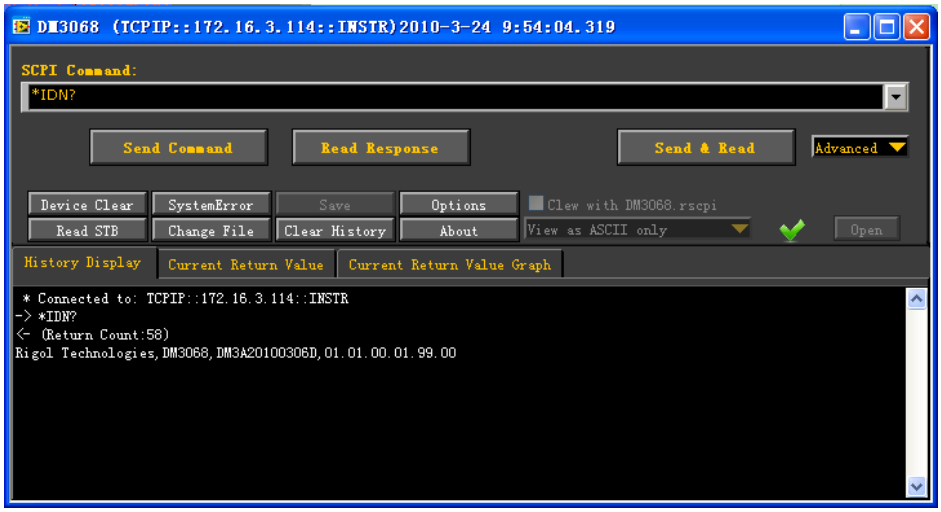
   Open the Ultra Sigma and click LAN to search the instrument resource connected to LAN. The status bar becomes the following status in process of searching.

4. **View LAN Device**
   The searched instruments are shown under **RIGOL Online Resource**, see figure below.



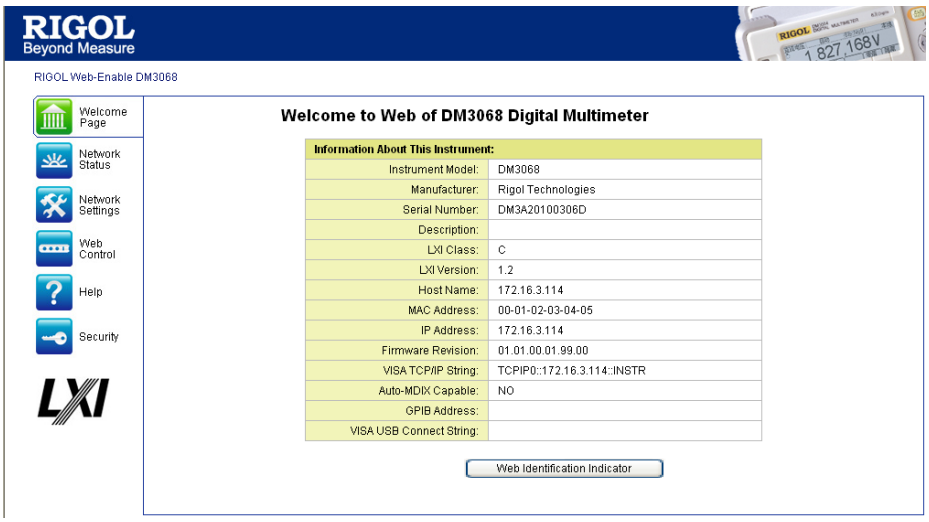
5. Test the Communication

Right click the source name **DM3068 (TCPIP::172.16.3.133::INSTR)** and then select **SCPI Panel Control** to open the remote command control panel, from which you can send commands and read data. See figure below.



6. Load LXI Web

Users can load LXI web by using Ultra Sigma (right click the source name and select **LXI-Web**). The page shows variety of important information about the instrument, see figure below.



Through GPIB

1. **Connect the Instrument**
   Connect the multimeter to PC using a GPIB cable.

2. **Configure GPIB Address**
   Select **GPIB** and configure its address according to "**Interface Configurations**".

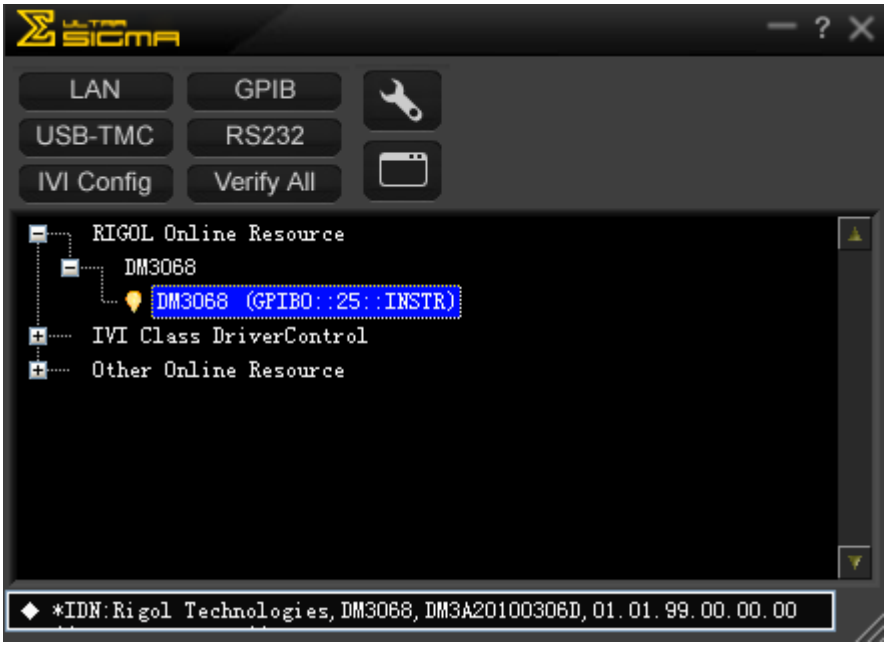
3. **Search RS232 Devices**

   Open the Ultra Sigma and click GPIB to enter the GPIB setting interface as shown below. To search GPIB devices connected to the PC, click **Search**. The searched devices are shown in the right side of the panel.

When Cannot Automatically Search any resources:

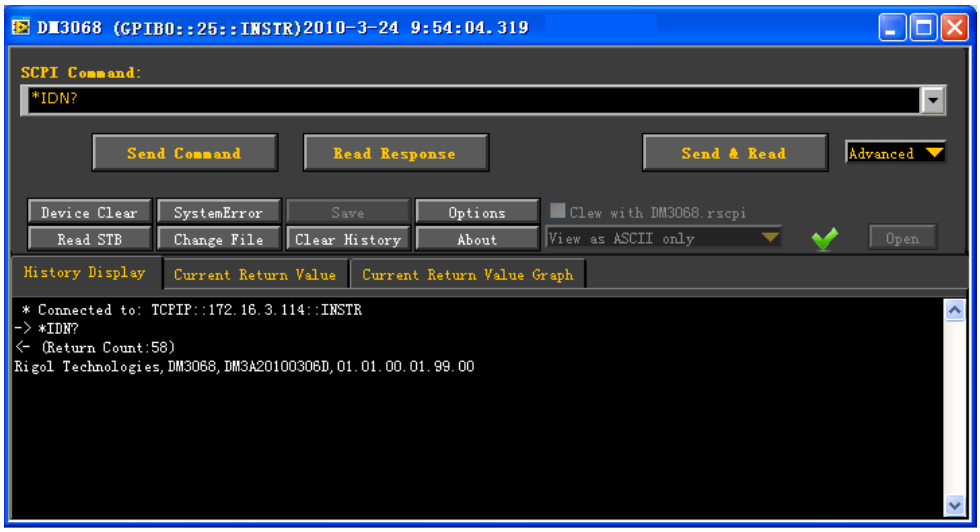
- Select the GPIB card address of PC from **GPIB::** drop-down menu and select the multimeter GPIB address from **INSTR::** drop-down menu.
- Click **Test** to verify if the GPIB communication is succeed. If failed, follow the guides.

4. **View GPIB Device**
   Click **OK,** the software return to its main interface. The searched instruments are shown under **RIGOL Online Resource**, see figure below.



5. Test the Communication

Right click the source name **DM3068 (GPIB0::25::INSTR)** and then select **SCPI Panel Control** to open the remote command control panel, from which you can send commands and read data. See figure below.



Through RS232

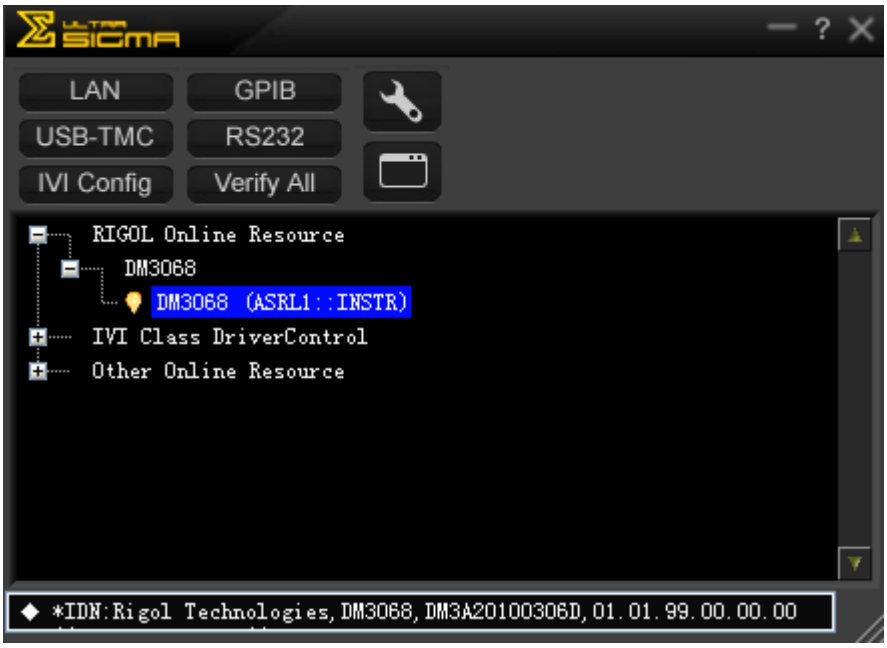
1. **Instrument Connection**
   Connect the multimeter to PC using a RS232 cable.

2. **Configure RS232 Parameters**
   Select **RS232** and configure its parameters according to "**Interface Configurations**".

3. **Search RS232 Device**

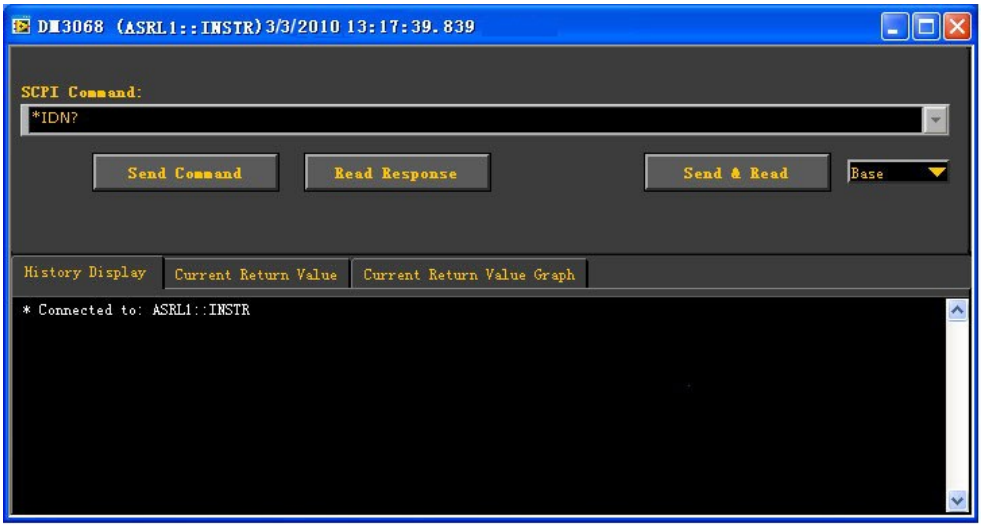
   Open the Ultra Sigma and click RS232 to enter the interface shown below. After you configure parameters, click TEST to test the RS232 communication. When succeed, the searched devices are shown in the right side of the panel, otherwise, follow the guides.

4. **View RS232 Device**
   Click **OK**, the software returns to the main interface and searched instruments are shown under **RIGOL Online Resource**, see figure below.



5. Test the Communication

Right click the source name **DM3068 (ASRL1::INSTR)** and then choose **SCPI Panel Control** to open the remote command control panel, from which you can send commands and read data. See figure below.



Chapter 4 Troubleshooting

To help you solve commonly encountered problems, we have listed some typical issues with their respective solutions. If the problems persist, contact **RIGOL** and prepare your device information (**Utility** →**T/C** → **Info**).

1. The screen still dark (no display) after power on:

(1) Check if the power cord is well connected.
(2) Check if the power switch on the rear panel is switched on.
(3) Check if the safety fuse has melted and replace a new one when necessary.
(4) Having done with the above steps, restart the instrument.
(5) If the problem persists please contact **RIGOL** for service options.

2. The reading is constant when a current signal is input:

(1) Check if the test lead is correctly inserted to the current and/or LO terminals.
(2) Check if the current fuse on the rear panel has melted.
(3) Check if the measurement function is switched to DCI or ACI.
(4) Check if the enabled measurement function matches with the actual input current.

3. The reading is abnormal when a DC signal is input:

(1) Check if the test lead is correctly inserted to the current and/or LO terminals.
(2) Check if the current fuse on the rear panel has melted.
(3) Check if the measurement function is switched to DCI or DCV.
(4) Check if the enabled measurement function matches with the actual input current.

4. The USB flash device cannot be identified:

(1) Check if the USB flash device is in good condition.
(2) Make sure the USB device you used is a flash device.
(3) Check the capacity of your USB device. A USB flash device with less than 4G bytes capacity is recommended.
(4) Restart the multimeter and insert the USB flash device.
(5) If the problem persists please contact **RIGOL** for service options.

Chapter 5 Measurement Tutorial

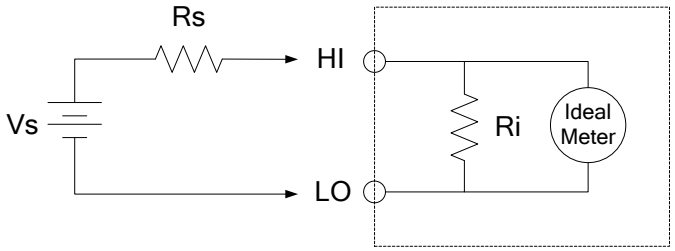
This chapter guides you to eliminate the potential error that appears during your measurement in order to obtain accurate measurement result.

The chapter contains the following topics:

- Loading Errors (DCV)
- True-RMS AC Measurements
- Crest Factor Errors (non-sinusoidal inputs)
- Loading Errors (ACV)

Loading Errors (DCV)

Measurement loading errors occur when the resistance of the device-under-test (DUT) is an appreciable percentage of the multimeter's own input resistance. The diagram below shows this error source.



Vs = ideal DUT voltage

Rs = DUT source resistance

Ri = input resistance of the multimeter (**10MΩ** or **>10GΩ**)

Error (%) = $\frac{100 \times Rs}{Rs + Ri}$

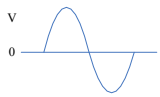
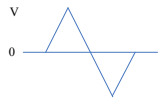
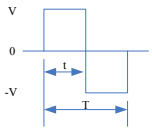
To reduce the effects of loading errors and minimize noise pickup, you can set the input resistance of the multimeter to ">10GΩ" in the range of 200 mV, 2 V and 20 V, and "10MΩ" for the 200 V and 1000 V ranges.

True-RMS AC Measurements

The AC measurement of DM3068 has true RMS response. The power dissipated in a resistor over a period of time is proportional to the square of the measured true RMS voltage, whatever the waveform shape is. The DM3068 can accurately measure the true RMS voltage and current if the waveform shapes whose energy beyond the effective bandwidth of the multimeter can be negligible. The effective AC voltage bandwidth of DM3068 is 800 kHz and the effective AC current bandwidth is 100 kHz.

The multimeter's ACV and ACI functions measure the "AC coupled" true RMS value, that is to measure the RMS value of AC component (DC component is filtered) from the input signal. As shown in table 5-1, since the sine, triangle and square waves (50% duty cycle) do not have DC offset; each wave has an equal value in AC and AC+DC.

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

Waveform	Crest Factor (C.F.)	AC RMS	AC+DC RMS
	$\sqrt{2}$	$\frac{V}{\sqrt{2}}$	$\frac{V}{\sqrt{2}}$
	$\sqrt{3}$	$\frac{V}{\sqrt{3}}$	$\frac{V}{\sqrt{3}}$
	1	$\frac{V}{C.F.}$	$\frac{V}{C.F.}$

Non-symmetrical waveforms such as pulse trains contain DC component which will be filtered during the AC coupled true RMS measurements.

The AC coupled true RMS measurement is especially useful for measuring small AC signals having DC offset such as the AC ripple from DC power supplies. However, in fewer cases the AC+DC true RMS value must be measured. First you can

determine the DC and AC components of the signal by using DCV and ACV measurements, and then substitute the results in the formula given below and work out the AC+DC true RMS value. In order to obtain the best AC rejection, select 6.5 digits when measuring DC voltage.

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

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.

In general, the greater the crest factor, the greater the energy contained in high frequency harmonics. All multimeters have errors that are relevant to crest factor. Crest factor errors from DM3068 are listed in "**AC Characteristics"** section in chapter 6.

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

$$\text{Bandwidth Error} = \frac{-\text{C.F.}^2 \times \text{F}}{4\pi \times \text{BW}} \times 100\% \quad \text{(\% reading)}$$

$C.F.$: signal crest factor
F : input fundamental frequency
BW : multimeter's effective bandwidth

Example:
Calculate the approximate measurement error for a pulse train input with a crest factor of 2 and a fundamental frequency of 20 kHz. Then, assume the multimeter's 1-year accuracy is ± (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 (ACV)

In the AC Voltage function, the input impedance of DM3068 appears as a 1MΩ resistance in parallel with 100 pF of capacitance. The test lead that you use to connect signals to the multimeter will also add additional capacitance and loading. The table below gives the multimeter's approximate input resistance at various frequencies.

Table 5-2 Resistances at various frequencies

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

For low frequencies:

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

Additional error for high frequencies:

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

R_s : source resistance

F : input frequency

C_{in} : input capacitance (100 pF) plus test lead capacitance

Chapter 6 Specifications

DC Characteristics

Accuracy Specifications: ±(% of reading + % of range)[1]

Function	Range[2]	Test Current or Burden Voltage	24 Hour[3] T_{CAL}℃±1℃	90 Day T_{CAL}℃±5℃	1 Year T_{CAL}℃±5℃	Temperature Coefficient 0℃ to (T_{CAL}℃-5℃) (T_{CAL}℃+5℃) to 50℃
DC Voltage	200.0000mV		0.0020+ 0.0020	0.0030 + 0.0025	0.0040 + 0.0025	0.0005 + 0.0005
	2.000000V		0.0015 + 0.0005	0.0020 + 0.0006	0.0035 + 0.0006	0.0005 + 0.0001
	20.00000V		0.0020 + 0.0004	0.0030 + 0.0005	0.0040 + 0.0005	0.0005 + 0.0001
	200.0000V		0.0020 + 0.0006	0.0040 + 0.0006	0.0050 + 0.0006	0.0005 + 0.0001
	1000.000V[4]		0.0020 + 0.0006	0.0040 + 0.0010	0.0055 + 0.0010	0.0005 + 0.0001
DC Current	200.0000uA	<0.03V	0.010 + 0.012	0.040 + 0.015	0.050 + 0.015	0.0020 + 0.0030
	2.000000mA	<0.25V	0.007 + 0.003	0.030 + 0.003	0.050 + 0.003	0.0020 + 0.0005
	20.00000mA	<0.07V	0.007 + 0.012	0.030 + 0.015	0.050 + 0.015	0.0020 + 0.0020
	200.0000mA	<0.7V	0.010 + 0.002	0.030 + 0.003	0.050 + 0.003	0.0020 + 0.0005
	2.000000A	<0.12V	0.050 + 0.020	0.080 + 0.020	0.100 + 0.020	0.0050 + 0.0010
	10.00000A[5]	<0.6V	0.100 + 0.010	0.120 + 0.010	0.150 + 0.010	0.0050 + 0.0020
Resistance[6]	200.0000Ω	1mA	0.0030 + 0.0030	0.008 + 0.004	0.010 + 0.004	0.0006 + 0.0005
	2.000000kΩ	1mA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	20.00000kΩ	100uA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	200.0000kΩ	10uA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	1.000000MΩ	2uA	0.002 + 0.001	0.010 + 0.001	0.012 + 0.001	0.0010 + 0.0002
	10.00000MΩ	200nA	0.015 + 0.001	0.030 + 0.001	0.040 + 0.001	0.0030 + 0.0004

	100.0000MΩ	200nA || 10MΩ	0.300 + 0.010	0.800 + 0.010	0.800 + 0.010	0.1500 + 0.0002
Diode Test	2.0000V[7]	1mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020
Continuity Test	2000.0Ω	1mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.0010 + 0.0020

[1] Specifications are for 90-minute warm-up and 100NPLC integration time. For integration time <100NPLC, add the appropriate "**RMS Noise Adder**" listed in the following table.

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

[3] Relative to calibration standards.

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

[5] For continuous current > 7A DC or 7A AC RMS, 30 seconds ON and 30 seconds OFF.

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

[7] Accuracy specifications for the voltage measured at the input terminal only. 1 mA test current is typical. Variation in the current source will create some variation in the voltage drop across a diode junction.

Performance Versus Integration Time – 50Hz (60Hz) Power-line Frequency

Integration Time Number of Power line Cycles (NPLC)	Resolution[1] (ppm Range)	NMRR[2] (dB)	Readings/s[3]		RMS Noise Adder [4] (% of Range)			
			50Hz	60Hz	DCV 20V	DCV 2V 200V Resistance 2kΩ 20kΩ	DCV 1000V DCI 2mA 200mA	DCV 200mV Resistance 200Ω DCI 10A
0.006	2.7	0	10000	10000	0.0006	0.0007	0.0015	0.0040
0.02	1.6	0	2500	3000	0.0004	0.0004	0.0008	0.0025
0.06	1	0	833	1000	0.0003	0.0003	0.0006	0.0025
0.2	0.5	0	250	300	0.0001	0.0002	0.0003	0.0015
1	0.22	60	50	60	0	0.0001	0.0002	0.0004
2	0.17	60	25	30	0	0	0.0001	0.0003
10	0.08	60	5	6	0	0	0	0.0002
100	0.035	60	0.5	0.6	0	0	0	0

[1] Typical value. Resolution is defined as the typical 20V range RMS noise (using auto zero "Once").
[2] Normal mode rejection ratio for power-line frequency ±0.1%. For power-line frequency ±1%, subtract 20dB. For ±3%, subtract 30dB.
[3] Maximum rate for DCV, DCI, 2-wire resistance and 4-wire resistance functions.
[4] The basic DC accuracy specifications include RMS noise at 100 NPLC. For <100 NPLC, add "**RMS Noise Adder**" to the basic DC accuracy specifications.

SFDR & SINAD[1]

Function	Range	Spurious-Free Dynamic Range (SFDR)	Signal-to-Noise-and-Distortion (SINAD)
DCV	200mV	81	76
	2V	79	78
	20V	79	75
	200V	83	80
	1000V	86	82
DCI	200uA	89	69
	2mA	86	81
	20mA	88	69
	200mA	81	79
	2A	69	64

[1] Typical value. -1dBFS, 1kHz single tone. 100us aperture time, zero trigger delay, auto zero off and 4096 samples.

Measuring Characteristics

DC Voltage	
Input Resistance	200mV, 2V, 20V ranges: Selectable 10MΩ or >10GΩ (For these ranges, input beyond ±26V are clamped through 106kΩ (typical))

	200V and 1000V ranges: 10MΩ±1%
Input Protection	1000V
Input Offset Current	50pA, at 25℃, typical
CMRR (common mode rejection ratio)	140dB for 1 kΩ unbalance in LO lead, ±500VDC peak maximum.
Resistance	
Measurement Method	Selectable 4-wire or 2-wire resistance Current source referenced to LO input
Open-circuit Voltage	Limited to <10V
Max. Lead Resistance (4-wire)	10% of range per lead for 200 Ω, 2 kΩ ranges, 1 kΩ per lead on all other ranges
Input Protection	1000V on all ranges
Offset Compensation	Available on 200Ω, 2kΩ and 20 kΩ ranges.
DC Current	
Shunt Resistor	100Ω for 200uA, 2mA
	1Ω for 20mA , 200mA
	0.01Ω for 2A, 10A
Input Protection	Externally accessible 500mA, 250V fast blow fuse at the rear panel for 200uA, 2mA, 20mA and 200mA ranges. Internal 10A, 250 V slow blow fuse for 2A and 10A ranges.
Continuity/Diode Test	
Response Time	300 samples/sec, with audible tone
Continuity Threshold	Adjustable from 1 Ω to 2000 Ω
Autozero OFF Operation (typical value)	

Following instrument warm-up at the environment temperature ±1℃ and <5 minutes, add 0.0001 % range + 2 uV for DCV and 2 mΩ for resistance.
Settling Time Considerations
Reading settling times are affected by source impedance, cable dielectric characteristics and input signal changes. The default measurement delay is selected to give first reading right for most measurements.
Measurement Considerations
Telon or other high-impedance, low-dielectric absorption wire insulation is recommended for these measurements.

AC Characteristics

Accuracy Specifications: ±(% of reading + % of range)[1]

Function	Range[2]	Frequency Range	24 Hour[3] T_{CAL}℃±1℃	90 Day T_{CAL}℃±5℃	1 Year T_{CAL}℃±5℃	Temperature Coefficient 0℃ to (T_{CAL}℃-5℃) (T_{CAL}℃+5℃) to 50℃
True RMS AC Voltage [4]	200.0000mV	3Hz- 5Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		5Hz-10Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
		10Hz-20kHz	0.04 + 0.03	0.05 + 0.04	0.06 + 0.04	0.005 + 0.004
		20kHz-50kHz	0.10 + 0.05	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz- 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	2.000000V	3Hz-5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10Hz-20kHz	0.04 + 0.02	0.05 + 0.03	0.06 + 0.03	0.005 + 0.003
		20kHz-50kHz	0.10 + 0.04	0.11 + 0.05	0.12 + 0.05	0.011 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz - 300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	20.00000V	3Hz-5Hz	1.00 + 0.03	1.00 + 0.04	1.00 + 0.04	0.100 + 0.004
		5Hz-10Hz	0.35 + 0.03	0.35 + 0.04	0.35 + 0.04	0.035 + 0.004
		10Hz-20kHz	0.04 + 0.04	0.07 + 0.04	0.08 + 0.04	0.008 + 0.004
		20kHz- 50kHz	0.10 + 0.05	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz-300kHz	4.00 + 0.50	4.00 + 0.50	4.00 + 0.50	0.20 + 0.02
	200.0000V	3Hz-5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10Hz-20kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008 + 0.003

		20kHz-50kHz	0.10 + 0.04	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz-300kHz	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.20 + 0.02
	750.000V[5]	3Hz-5Hz	1.00 + 0.02	1.00 + 0.03	1.00 + 0.03	0.100 + 0.003
		5Hz-10Hz	0.35 + 0.02	0.35 + 0.03	0.35 + 0.03	0.035 + 0.003
		10Hz-20kHz	0.04 + 0.02	0.07 + 0.03	0.08 + 0.03	0.008 + 0.003
		20kHz-50kHz	0.10 + 0.04	0.12 + 0.05	0.15 + 0.05	0.012 + 0.005
		50kHz-100kHz	0.55 + 0.08	0.60 + 0.08	0.60 + 0.08	0.060 + 0.008
		100kHz-300kHz	4.0 + 0.50	4.0 + 0.50	4.0 + 0.50	0.20 + 0.02
True RMS AC Current [8]	200.0000uA	3Hz-5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
	2.000000mA	3Hz-5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10Hz-5kHz	0.12 + 0.04	0.12 + 0.04	0.12 + 0.04	0.015 + 0.006
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.006
	20.00000mA	3Hz-5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.200 + 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.100 + 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15+ 0.06	0.015 + 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006
	200.0000mA	3Hz-5Hz	1.00 + 0.04	1.00 + 0.04	1.00 + 0.04	0.100 + 0.006
		5Hz-10Hz	0.30 + 0.04	0.30 + 0.04	0.30 + 0.04	0.035 + 0.006
		10Hz-5kHz	0.10 + 0.04	0.10 + 0.04	0.10 + 0.04	0.015 + 0.006
		5kHz-10kHz	0.20 + 0.25	0.20 + 0.25	0.20 + 0.25	0.030 + 0.006
	2.000000A	3Hz-5Hz	1.10 + 0.06	1.10 + 0.06	1.10 + 0.06	0.100 + 0.006
		5Hz-10Hz	0.35 + 0.06	0.35 + 0.06	0.35 + 0.06	0.035 + 0.006
		10Hz-5kHz	0.15 + 0.06	0.15 + 0.06	0.15 + 0.06	0.015 + 0.006
		5kHz-10kHz	0.35 + 0.70	0.35 + 0.70	0.35 + 0.70	0.030 + 0.006

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

Additional Low Frequency Errors (% of reading)				Additional Crest Factor Errors (non-sinewave) [7]	
Frequency	AC Filter			Crest Factor	Error (% of reading)
	Slow	Medium	Fast		
10Hz-20Hz	0	0.74	--	1 - 2	0.05
20Hz-40Hz	0	0.22	--	2 - 3	0.2
40Hz-100Hz	0	0.06	0.73	3 - 4	0.4
100Hz- 200Hz	0	0.01	0.22	4 - 5	0.5
200Hz-1kHz	0	0	0.18		
>1kHz	0	0	0		

[1] Specifications are for 90-minute warm-up, slow ac filter and sinewave input.
[2] 10% overrange on all ranges except ACV 750 V and ACI 10 A ranges.
[3] Relative to calibration standards.
[4] Specifications are for sinewave input >5% of range. For inputs within 1% and 5% of range and <50 kHz, add 0.1% of range additional error. For 50kHz to 100kHz, add 0.13% of range additional error.
[5] ACV 750 range limited to $8x10^7$ Volt-Hz. For input over 300V rms, add 0.7mV error for each additional volt.
[6] For continuous current > DC 7A or AC RMS 7A, 30 seconds ON and 30 seconds OFF.
[7] For frequency blow 100 Hz, the specification of slow filter is only for sinewave input.
[8] Specifications are for sinewave input >5% of range. For inputs within 1% to 5% of range, add 0.1% of range additional error. Specifications are typical values for 200uA and 2mA, 2A and 10A ranges when frequency >1kHz.

Measuring Characteristics

True RMS AC Voltage

Measurement Method	AC-coupled True-RMS measurement with up to 400V DC of bias at on any range.
Crest Factor	≤ 5 at full range
Input Impedance	1MΩ ± 2% in parallel with <150pF capacitance on any range
Input Protection	750V rms on all ranges
AC Filter Bandwidth	Slow: 3Hz - 300kHz
	Medium: 20Hz - 300kHz
	Fast: 200Hz - 300kHz
CMRR (common mode rejection ratio)	70 dB, for the 1 kΩ unbalance in LO lead, <60Hz,±500VDC peak maximum.
True RMS AC Current	
Measurement Method	Direct coupled to the fuse and shunt; AC-coupled True RMS measurement (measure the AC component only).
Crest Factor	≤ 3 at full range
Max. Input	DC + AC current peak value <300% of range. The RMS current <10A rms including the DC component.
Shunt Resistor	100Ω for 200uA, 2mA
	1Ω for 20mA , 200mA
	0.01Ω for 2A, 10A
Input Protection	Externally accessible 500mA, 250V fast blow fuse at the rear panel for 200uA, 2mA, 20mA and 200mA ranges. Internal 10A, 250 V slow blow fuse for 2A and 10A ranges.
Settling Time Considerations	
The default measurement delay is selected to give first reading right for most measurements. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement. Applying >300Vrms (or >5Arms) will cause self-heating in signal-conditioning components and these error are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be lower than 0.02% of	

reading and will generally dissipate within a few minutes.

Frequency and Period Characteristics

Accuracy Specifications: ±(% of reading)[1][2]

Function	Range	Frequency Range	24 Hour[3] T_{CAL}℃±1℃	90 Day T_{CAL}℃±5℃	1 Year T_{CAL}℃±5℃	Temperature Coefficient 0℃ to (T_{CAL}℃-5℃) (T_{CAL}℃+5℃)to 50℃
Frequency, Period	200mV to 750V	3 Hz-5 Hz	0.07	0.07	0.07	0.005
		5 Hz-10 Hz	0.04	0.04	0.04	0.005
		10 Hz-40 Hz	0.02	0.02	0.02	0.001
		40 Hz-300 kHz	0.005	0.006	0.007	0.001
		300 kHz-1 MHz	0.005	0.006	0.007	0.001

Additional Low Frequency Errors: (% of reading)

Frequency	Gate Time (Resolution)			
	1 s (0.1ppm)	0.1 s (1ppm)	0.01 s (10ppm)	0.001 s (100ppm)
3 Hz-5 Hz	0	0.12	0.12	0.12
5 Hz-10 Hz	0	0.17	0.17	0.17
10 Hz-40 Hz	0	0.20	0.20	0.20
40 Hz-100 Hz	0	0.06	0.21	0.21
100 Hz-300 Hz	0	0.03	0.21	0.21
300 Hz-1 kHz	0	0.01	0.07	0.07
>1kHz	0	0	0.02	0.02

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

[2] For frequency ≤300kHz, the specification is the 10% to 110% of range of the AC input voltage. For frequency >300kHz, the specification is the 20% to 110% of range of the AC input voltage. The maximum input is limited to 750V rms or 8 x 10^7 Volts-Hz (whichever is less). 200mV range is full range

input or input that is larger than the full range. For 20mV to 200mV, multiply % of reading error ×10.

[3] Relative to calibration standards.

Measuring Characteristics

Frequency and Period	
Measurement Method	Reciprocal-counting technique, AC-coupled input using the AC voltage function.
Input Impedance	1MΩ ± 2% in parallel with <150pF capacitance on any range
Input Protection	750V rms on all ranges
Measurement Considerations	
All frequency counters are susceptible to error when measuring low–voltage, low–frequency signals. Shielding inputs from external noise pickup is critical for minimizing measurement errors.	
Settling Time Considerations	
Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. Make sure the RC circuit of input terminal has been fully settled (about 1s) before accurate measurement.	

Capacitance Characteristics

Accuracy Specifications: ± (% of reading + % of range)[1][2]

Function	Range[2]	Test Current	1Year T_{CAL}℃±5℃	Temperature Coefficient 0℃ to (T_{CAL}℃-5℃) (T_{CAL}℃+5℃) to 50℃
Capacitance	2.000nF	200nA	2 + 2.5	0.05+0.05
	20.00nF	2uA	1 + 0.3	0.05+0.01
	200.0nF	10uA	1 + 0.3	0.01+0.01
	2.000uF	100uA	1 + 0.3	0.01+0.01
	20.00uF	1mA	1 + 0.3	0.01+0.01
	200.0uF	1mA	1 + 0.3	0.01+0.01
	2.000mF	1mA	1 + 0.3	0.01+0.01
	20.00mF	1mA	1 + 0.3	0.01+0.01
	100.0mF	1mA	3 + 0.2	0.05+0.02

[1] Specifications are for 90 minutes warm–up and using REL operation. Additional errors may be caused by non–film capacitors.

[2] Specifications are the 1% to 110% of range on 2nF range and 10% to 110% of range on all other ranges.

Measuring Characteristics

Capacitance Measurement	
Measurement Method	Apply constant current into the capacitance, and measure the voltage changing rate.
Connection Type	2-wire
Measurement Considerations	
Since small capacitance measurements are susceptible to the external noise, shielding inputs from external noise pickup is critical for minimizing measurement errors.	

Temperature Characteristics

Accuracy Specifications [1]

Function	Probe Type	Type	Optimum Range	1 Year T_{CAL}℃±5℃	Temperature Coefficient 0℃ to (T_{CAL}℃-5℃) (T_{CAL}℃+5℃) to 50℃
Temperature	RTD[2] (R_0 is within 49Ω and 2.1kΩ)	α=0.00385	-200℃ to 660℃	0.16℃	0.01℃
		α=0.00389	-200℃ to 660℃	0.17℃	0.01℃
		α=0.00391	-200℃ to 660℃	0.14℃	0.01℃
		α=0.00392	-200℃ to 660℃	0.15℃	0.01℃
	Thermal Resistance	2.2kΩ	-40℃ to 150℃	0.08℃	0.002℃
		3kΩ	-40℃ to 150℃	0.08℃	0.002℃
		5kΩ	-40℃ to 150℃	0.08℃	0.002℃
		10kΩ	-40℃ to 150℃	0.08℃	0.002℃
		30kΩ	-40℃ to 150℃	0.08℃	0.002℃
	Thermocouple[3]	B	0℃ to 1820℃	0.76℃	0.14℃
		E	-270℃ to 1000℃	0.5℃	0.02℃
		J	-210℃ to 1200℃	0.5℃	0.02℃
		K	-270℃ to 1372℃	0.5℃	0.03℃
		N	-270℃ to 1300℃	0.5℃	0.04℃
		R	-270℃ to 1768.1℃	0.5℃	0.09℃
		S	-270℃ to 1768.1℃	0.6℃	0.11℃
		T	-270℃ to 400℃	0.5℃	0.03℃

[1] Specifications are for 90 minutes warm-up. Exclusive of sensor error.

[2] Specification is for 4WR sensor measurement or 2WR measurement using REL operation.

[3] Relative to cold junction temperature, accuracy is based on ITS-90. Built-in cold junction temperature refers to the temperature inside the banana jack and its accuracy is ±2.5 ℃.

Measuring Characteristics

Measurement Considerations
The built-in cold junction temperature tracks the temperature inside the banana jack. The change of the temperature in banana jack might cause additional error. When using the built-in cold junction compensation, connect the sensor terminal of the thermocouple to the banana jack and warm it up for more than 3 minutes to minimize the error.

Measurement Rate

Measurement Rate [1]

Function	Setting	Integration Time	Readings/s 50Hz（60Hz）
DC Voltage **DC Current** **2-wire Resistance** **4-wire Resistance**	0.006 NPLC Integration Time	100(100) us	10000(10000)
	0.02 NPLC	400(333) us	2500(3000)
	0.06 NPLC	1.2(1) ms	833(1000)
	0.2 NPLC	4(3.33) ms	250(300)
	1 NPLC	20(16.7) ms	50(60)
	2 NPLC	40(33.3) ms	25(30)
	10 NPLC	200(167) ms	5(6)
	100 NPLC	2(1.67) s	0.5(0.6)
AC Voltage **AC Current** **[2]**	3Hz AC Filter		0.2
	20Hz		1.5
	200Hz		10
	200Hz		50[3]
Frequency and Period **[4]**	1s Gate Time		1
	0.1s		10
	0.01s		80
	0.001s		500
Capacitance[5]			25

[1] Auto trigger, zero trigger delay, auto zero off, auto range off, math function off and external interface off.

[2] Use the default trigger delay setting.
[3] The maximum rate available when trigger delay is set to 0.
[4] 20V range, fast filter, 1kHz input.
[5] Measure 20nF capacitance on 200nF range. The measurement period changes with the capacitance under test. The maximum measurement period on 100mF is 4s (typical value).

Other Measurement Characteristics

Triggering and Storage	
Trigger	Pre-trigger or Pos-trigger, Internal Trigger or External Trigger, Rising Edge Trigger or Falling Edge Trigger
Time Base Resolution	33.333us, 0.01% Accuracy
Trigger Delay	0 to 3600s available (about 33μs step size)
Sample Timer	0 to 3600s available (about 33μs step size)
Internal Trigger Level Accuracy	±1% of range
Reading Hold Sensitivity	0.01%, 0.1%, 1% or 10% of reading
Single Trigger Samples	1 to 50000
External Trigger Input	Level: 5V TTL compatible
	Impedance: >30kΩ in parallel with 500pF
	Delay: < 50 μs
	Jitter: < 50 μs (ACV, ACI, FREQ and PREIOD <2ms)
	Polarity: rising edge, falling edge available
	Maximum Rate: 300/s
	Minimum Pulse Width: 2μs
VMC Output	Level: 5V TTL compatible
	Output Impedance: 100Ω, typical
	Output Polarity: Falling Edge
	Pulse Width: about 2μs

History Record and Storage	
Volatile Memory	512k reading history data record
Non-volatile Memory	10 sets history data storage (5000 readings/group) 5 sets sensor data storage (5000 readings/group) 10 sets instrument setup storage 5 sets Anysensor setup storage Support USB flash device backup data and setting.

General Specifications

Display	256×64 LCD, dual display, graphical menu, selectable Chinese or English, online help.
Power Supply	AC 100V - 120V, 45Hz - 440Hz AC 200V - 240V, 45Hz - 66Hz Detect the power-line frequency automatically at power-on, 400Hz defaults to 50Hz
Power Consumption	25 VA Max
Working Environment	Full accuracy for 0℃ to 50℃ Full accuracy to 40℃, 80% R.H., Non-coagulation
Storage Temperature	-40℃ to 70℃
Operation Altitude	Up to 2000m
Safety	IEC 61010-1; EN 61010-1; UL 61010-1; CAN/CSA-C22.2 No. 61010-1 Measurement CAT I 1000V/CAT II 300V Pollution Degree 2
EMC	EN 61326-1
Weight	About 3.2 kg (without package)
Dimension	(height×width×length): 107.0mm×231.6mm×290.5mm
Remote Interface	GPIB, 10/100Mbit LAN, USB 2.0 Full Speed Device & Host (support USB flash device), RS-232C
Programming Language	SCPI
LXI Compatibility	LXI Class C, Version 1.2
Warm-up Time	90 minutes

Chapter 7 Appendix

Appendix A: DM3068 Accessories

	Description	Order Number
Model	DM3068 (6 ½, dual-display)	DM3068
Standard Accessories	Power Cord conforming to the standard of the country	-
	Two Test Leads (black and red)	-
	Two Alligator Clips (black and red)	-
	USB Cable	CB-USB-150
	Four Spare Fuses (two kinds): 2 AC, 250V, T250mA fuses 2 AC, 250V, T125mA fuses	-
	Quick Guide	-
	Resource CD (User's Guide and Application Software)	-
Optional Accessories	Kelvin Test Clip	-
	RS232 Cable	-
	Rack Mount Kit	RM-DM-3

NOTE: All the standard or optional accessories can be ordered from you local RIGOL Office.

Appendix B: Warranty

RIGOL warrants that its products mainframe and accessories will be free from defects in materials and workmanship within the warranty period.

If a product is proven to be defective within the respective period, **RIGOL** guarantees the free replacement or repair of products which are approved defective. To get repair service, please contact with your nearest **RIGOL** sales and service office.

RIGOL does not provide any other warranty items except the one being provided by this summary and the warranty statement. The warranty items include but not being subjected to the hint guarantee items related to tradable characteristic and any particular purpose. **RIGOL** will not take any responsibility in cases regarding to indirect, particular and ensuing damage.

Appendix C: Have Comment On Our Document?

If you have any question or comment on this document, please send email to:
service@rigol.com

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