User's Guide

RIGOL

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DM3000 Series Digital Multimeter

DM3061/2/4

DM3051/2/4

Safety Notices

Review the following safety precautions carefully before operating the instrument to avoid any personal injuries or damages to the instrument and any products connected to it.
To avoid potential hazards use the instrument as specified by this user's guide only.

The instrument should be serviced by qualified personnel only.

To Avoid Fire or Personal Injury.

Use Proper Power Cord. Use the power cord designed for the instrument as authorized in your country only.

Ground The Instrument. The instrument is grounded through the grounding conductor of the power cord. To avoid electric shock the instrument grounding conductor(s) must be grounded properly before making connections to the input or output terminals of the instrument.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and marks on the instrument. Follow the user's guide for further ratings information before making connections to the instrument.

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

Use Proper Fuse. Use the fuse of the type, voltage and current ratings as specified for the instrument.

Avoid Circuit or Wire Exposure. Do not touch exposed connections and components when power is on.

Do Not Operate With Suspected Failures. If suspected damage occurs with the instrument, have it inspected by qualified service personnel before further operations.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive atmosphere.

Keep Product Surfaces Clean and Dry.

The disturbance test of all the models meet the limit values of A in the standard of EN 61326: 1997+A1+A2+A3, but can't meet the limit values of B.

WARNING

IEC Measurement Category II. The HI and LO input terminals may be connected to mains in IEC Category II installations for line voltages up to 300 VAC. To avoid the danger of electric shock, do not connect the inputs to mains for line voltages above 300 VAC.

Protection Limits: To avoid instrument damage and the risk of electric shock, do not exceed any of the Protection Limits defined in the following section.

IEC Measurement Category II Overvoltage Protection

To protect against the danger of electric shock, the **RIGOL** DM3000 series Digital Multimeter provides overvoltage protection for line-voltage mains connections meeting both of the following conditions: The HI and LO input terminals are connected to the mains under Measurement Category II conditions, defined below, and The mains are limited to a maximum line voltage of 300 VAC. IEC Measurement Category II includes electrical devices connected to mains at an outlet on a branch circuit.

Such devices include most small appliances, test equipment, and other devices that plug into a branch outlet or socket. The DM3000 series Digital Multimeter may be used to make measurements with the HI and LO inputs connected to mains in such devices, or to the branch outlet itself (up to 300 VAC). However, the DM3000 series Digital Multimeter may not be used with its HI and LO inputs connected to mains in permanently installed electrical devices such as the main circuit-breaker panel, sub-panel disconnect boxes, or permanently wired motors. Such devices and circuits are subject to overvoltage that may exceed the protection limits of the DM3000 series Digital Multimeter.

Note: Voltages above 300 VAC may be measured only in circuits that are isolated from mains. However, transient overvoltage is also present on circuits that are isolated from mains. The DM3000 series Digital Multimeter is designed to safely withstand occasional transient overvoltage up to 2500 Vpk. Do not use this equipment to measure circuits where transient overvoltage could exceed this level.

Safety Terms and Symbols

Terms in This Guide. These terms may appear in this guide:

WARNING: Warning statements identify conditions or practices that could result in injury or loss of life.

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

CAT II (300V): IEC Measurement Category II. Inputs may be connected to mains (up to 300 VAC) under Category II overvoltage conditions.

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

DANGER indicates an injury hazard may happen immediately.

WARNING indicates an injury hazard may not happen immediately.

CAUTION indicates that 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

Earth Ground

General-Purpose Multimeter

DM3000 Series Digital Multimeter including:
DM306X Series: DM3061, DM3062, DM3064
DM305X Series: DM3051, DM3052, DM3054

Differences between the models:

Series	Model	Digit	Interface
DM306x	DM3064	6 ½	USB Host&Device, RS232, LAN, GPIB, Scan
	DM3062	6 ½	USB Host&Device, RS232, LAN, GPIB
	DM3061	6 ½	USB Host&Device, RS232
DM305x	DM3054	5 ¾	USB Host&Device, RS232, LAN, GPIB, Scan
	DM3052	5 ¾	USB Host&Device, RS232, LAN, GPIB
	DM3051	5 ¾	USB Host&Device, RS232

Note: In this manual, we mainly take DM3064 for example, for more information about the other models, please refer to "Chapter 5: Characteristics".

RIGOL DM3000-Series Digital Multimeter is an equipment designed for high-precision, multifunction, automation measurements. The series includes 6½ digits multimeter, with high-speed data acquisition, automatic measurements, multiplexer, mathematical operations, and flexible user sensor configurations etc. Interface includes RS232, USB, LAN and GPIB for disk storage and print.

The DM3000 has a high-resolution monochrome LCD display system for simple waveform display and recording. The concise and user-friendly layout of the front panel has a keyboard, and back lighted functional buttons, embedded with operating instructions makes the instrument more flexible, and capable. The 50kSa/s high data sampling rate allows to capture precision audio waveforms and high speed data. It has 2Mbyte of internal memory depth while the external memory depth is expandable as preferred. The AC voltage and current measurement is true RMS. It supports virtual terminal display and control, and remote network access.

With the performance and characteristics given below, you will understand how a DM3000 can satisfy your measurement requirements.

- 50kSa/s data sampling rate can be used, such as the rapidly changing high-precision audio waveform data. Meanwhile waveform can be displayed on LCD Screen
- Resolving Index: > 6½ digits and 2,400,000 Count
- 24 measurement functions
  - ✧ DC voltage and current, AC voltage and current, two-wire and four-wire resistance, capacitance, continuity test, diode test, frequency, cycle, ratio measurements, sensor measurement, and so on.
  - ✧ Upper limit and lower limit on threshold measurement
  - ✧ Arithmetic include: maximum, minimum, limit, average, dBm, dB
  - ✧ Data acquisition functions include: data records, inspection, automatic measurement.
- True RMS AC voltage and current measurement
- 16-Channels inspection functional measurement and control software (optional)
- DC voltage >10GΩ input impedance to achieve the range of 48V (±24V)
- 10 groups measuring set-up storage and unlimited setup through PC interface
- 256 x 64 pixel monochrome LCD
- I/O: RS232, USB, LAN and GPIB
- Built-in USB Host to support USB disk and USB printer
- Simple, convenient, flexible control software: Ultralogger and Ultrasensor Supports for Microsoft® Windows 98/Me/2000/XP

Content

Chapter 1 Quick Start

This chapter covers the following topics:

- General Inspection
- Handle Adjustment
- Appearance and Dimensions
- The Front Panel and User Interface
- To Measure DC Voltage
- To Measure AC Voltage
- To Measure DC Current
- To Measure AC Current
- To Measure Resistance
- To Measure Capacitance
- To Test Continuity
- To Check Diodes
- To Measure Frequency and Period
- To Make an Sensor measurement
- To Choose Digits resolving index
- To Choose Data Digit Display
- To Choose Range Options
- To Control Trigger Options

General Inspection

Inspect a new DM3000 Digital Multimeter with the following steps:

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 been checked mechanically and electrically.

2. **Check the accessories.**
   Accessories supplied with the instrument are listed in "Accessories" at Appendix B of this guide.
   If the contents are incomplete or damaged, please notify the **RIGOL** Sales Representative.

3. **Inspect the instrument.**
   In case of any damage, or defect, or failure, notify the **RIGOL** Sales Representative.
   If the shipping container is damaged, or the protective material shows signs of stress, notify the carrier as well as your **RIGOL** sales office. Keep the shipping materials for the carrier's inspection.

Handle Adjustment

To adjust the handle position of DM3000 Digital Multimeter, please grip the handle by the sides and pull it outward. Then, rotate the handle to the desired position as shown in Figure 1- 1, Figure 1- 2.

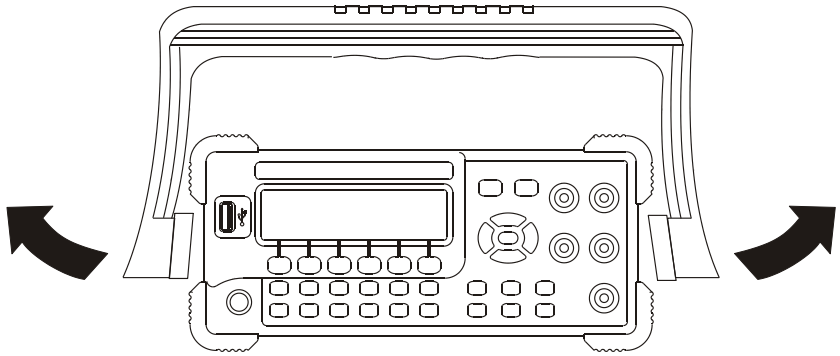


Figure 1- 1

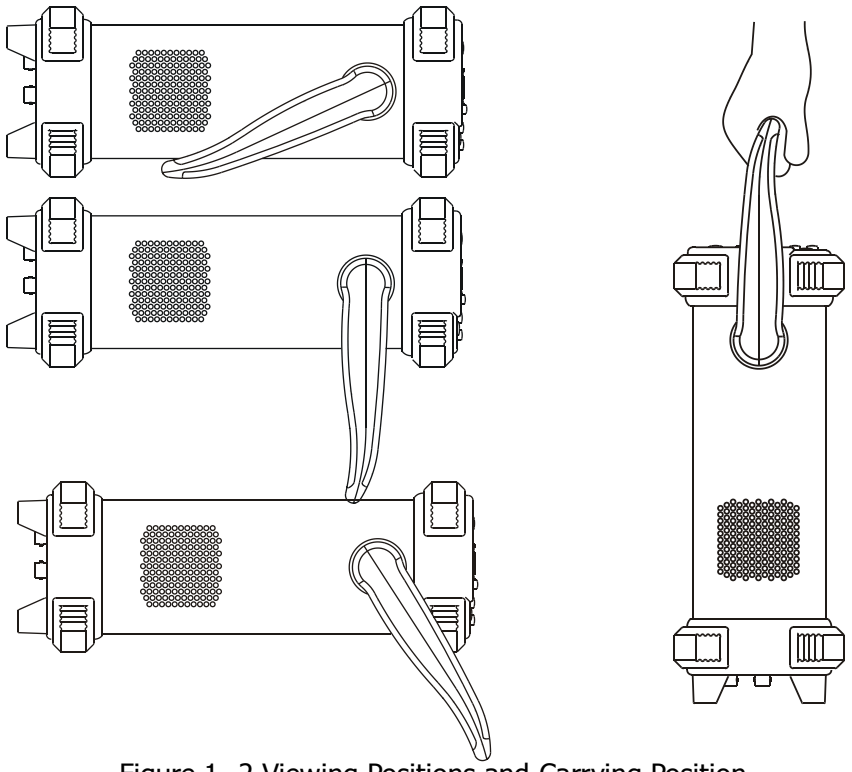
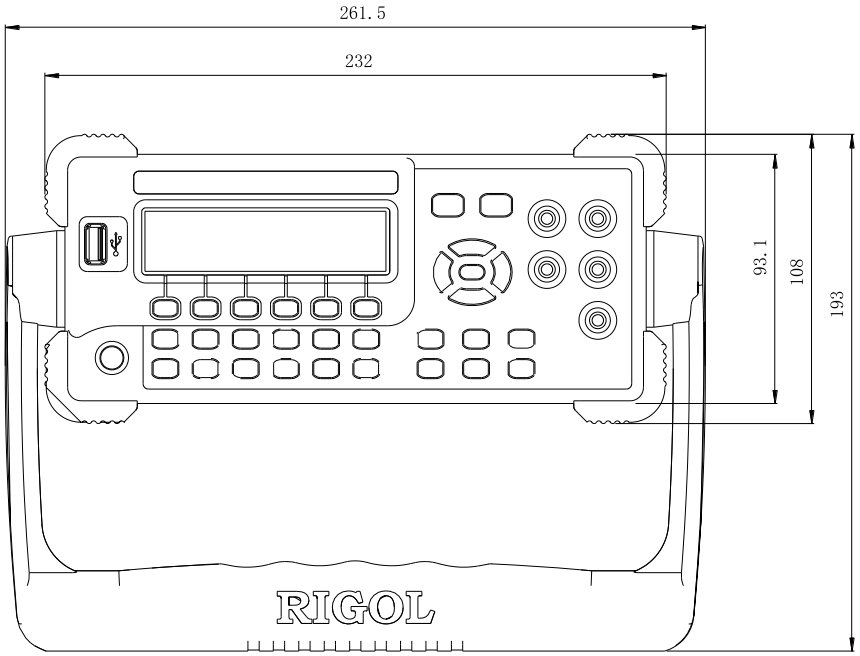
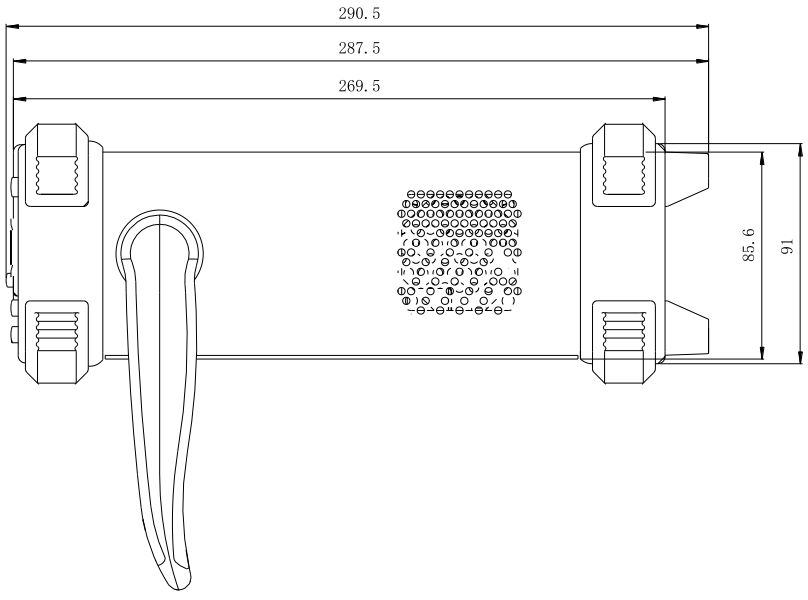


Figure 1- 2 Viewing Positions and Carrying Position

Appearance and Dimensions



Front Elevation Unit: mm



Side Elevation Unit: mm

The Front/Rear Panel and User Interface

It is important to get familiar with the front panel of a new DM3000. This chapter gives an introduction of the operation and functions of the Front Panel.

The front panel of the DM3000 is user friendly as shown below:

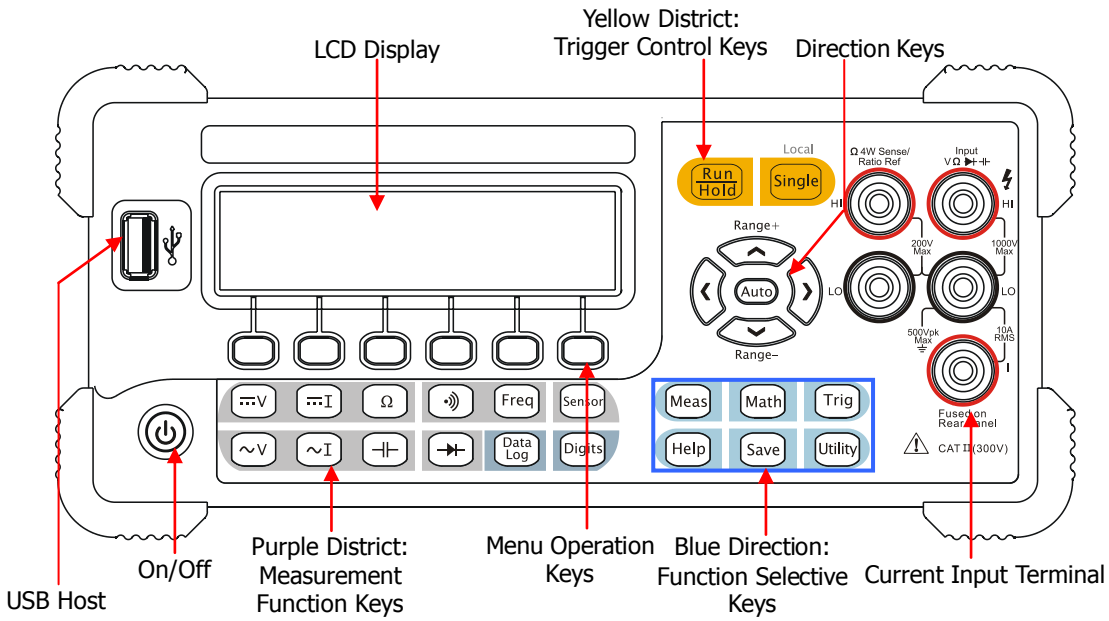


Figure 1- 3 The Front Panel

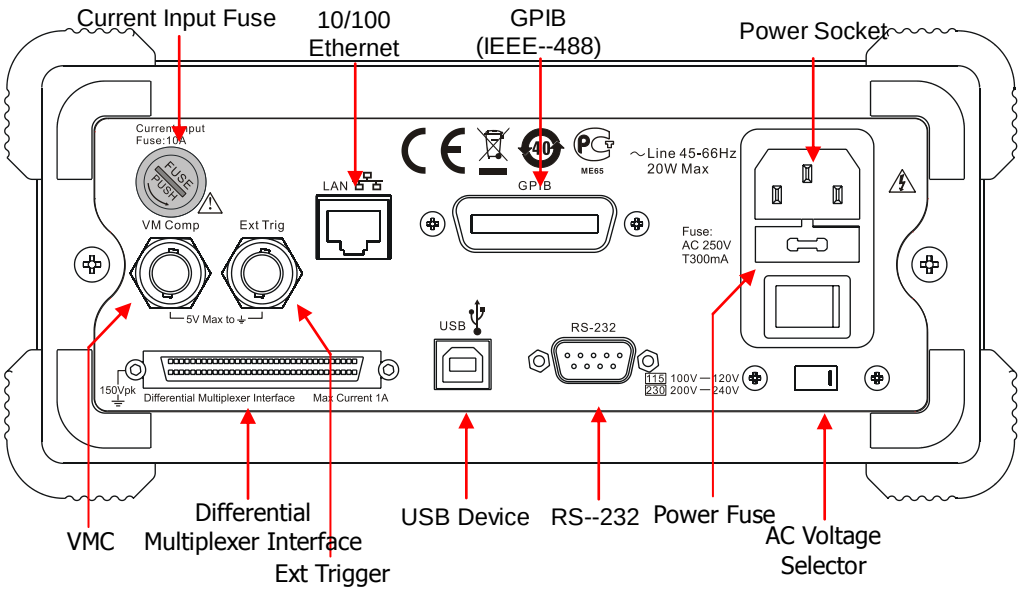


Figure 1- 4 The Rear Panel

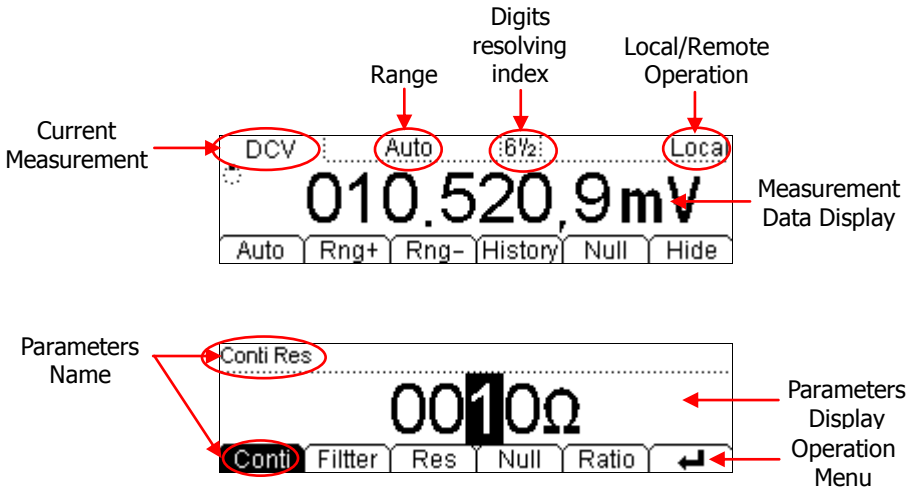


Figure 1- 5 Interface Explanation

How the definitions express in this book:

In this manual, the regarding keys writing expression has the same log with the keys on the front panel. It is noteworthy that the menu operates keys, marking with the belt shadow. For example, Conti indicates the short circuit option in menu Meas.

To Measure DC Voltage

The following shows the system connections and selection of measurement functions. This practice provides a guide to get familiar with the DC Voltage measurement technique.

Figure 1- 6 DC Voltage Measurement Data Interface

Table1- 1 DC Voltage Measurement Characteristics

Five Ranges	200mV, 2V, 20V, 200V, 1000V
Max Resolution	100nV
Input Protection	1000V on all ranges (HI Terminal)
Configurable Parameters	Range, DC impedance, Null value

Steps:

1. Connect the test leads as shown in Figure 1- 7; red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press ⎓V to select the DC Voltage measurement function.
3. Choose the appropriate measurement range.
4. Setup the DC impedance.

   Press Meas → Res, to setup the DC input impedance (Default value: 10MΩ).
5. Set the Null value.

   Null computing will be an option operation, it could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required. (To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)Lead

test leads into circuit and start to measure.

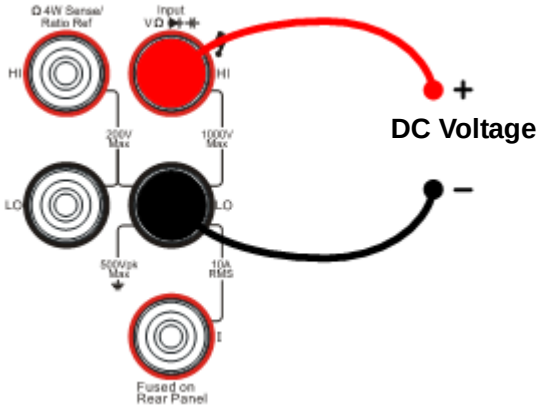


Figure 1- 7 DC Voltage Measurement

6. Use history function.

   Press History, the menu shows as below:

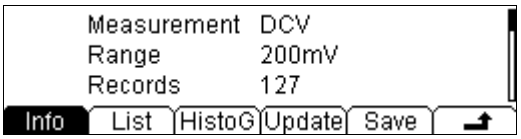


Figure 1- 8 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

Note

Select Auto range if the measurement range is uncertain to get more accurate measurement data.

To Measure AC Voltage

The following shows the system connections and selection of measurement functions. This practice provides a guide to get familiar with the AC Voltage measurement technique. (The AC functions only support 5½ digits measurement.)

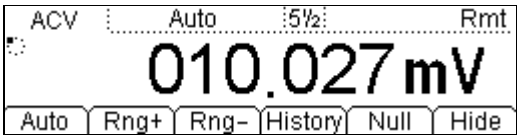


Figure 1- 9 AC Voltage Measurement Data Interface

Table1- 2 AC Voltage Measurement Characteristics

Five Ranges	200mV, 2V, 20V, 200V, 750V
Max Resolution	100nV
Input Protection	750V$_{RMS}$ on all ranges (HI Terminal)
Configurable Parameters	Range, AC Filter, Null value

Steps:

1. Connect test leads as shown in Figure 1- 10; red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press (~V) to select the AC Voltage measurement function.
3. Choose the appropriate measurement range.
4. Setup the AC Filter.

   Press (Meas) → Filter, to setup the AC Filter Bandwidth (Default value: Mid).
5. Set the Null value.

   Null computing will be an option operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

6. Lead test leads into circuit and start to measure.

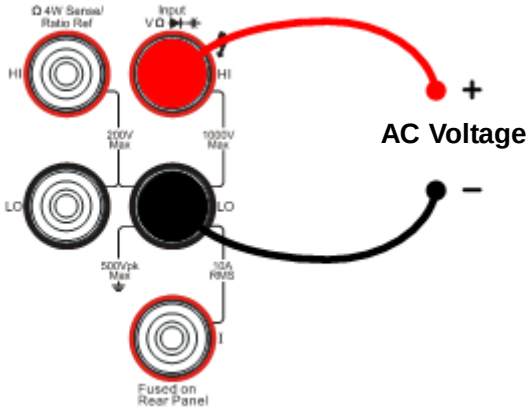


Figure 1- 10 AC Voltage Measurement

7. Use history function.
   Press History, the menu shows as below:

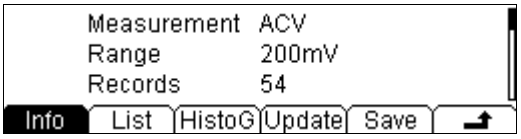


Figure 1- 11 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

To Measure DC Current

The following shows the system connections and selection of measurement functions. This practice provides a guide to get familiar with the DC Current measurement technique.

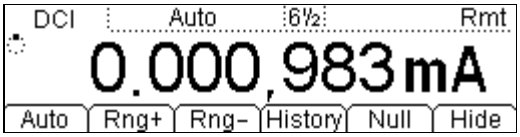


Figure 1- 12 DC Current Measurement Data Interface

Table1- 3 DC Current Measurement Characteristics

Five Ranges	2mA, 20mA, 200mA, 1A, 10A
Max Resolution	10nA
Input Protection	10A, 250V Current Input Fuse on rear panel
Configurable Parameters	Range, Null value

Steps:

1. Connect test leads as shown in Figure 1- 13; red test lead to the I Terminal, black test lead to the LO terminal.
2. Press  to select the DC Current measurement function.
3. Choose the appropriate measurement range.
4. Set the Null value.
   Null computing will be an option operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

5. Lead test leads into circuit, start to measure.

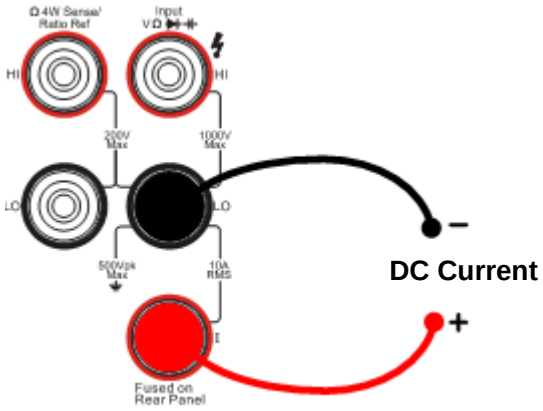


Figure 1- 13 DC Current Measurement

6. Use history function.
   Press History, the menu shows as below:

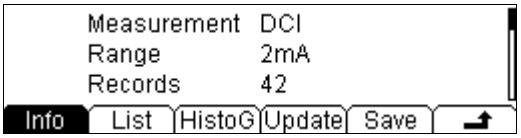


Figure 1- 14 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.
Press Update softkey to update the History data.
Press Save softkey to save data.

To Measure AC Current

The following shows the system connections and selection of measurement functions. The practice provides as guide to be familiar with the AC Current measurement technique. (The AC functions only support 5½ digits measurement.)

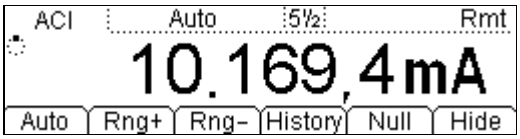


Figure 1- 15 AC Current Measurement Data Interface

Table1- 4 AC Current Measurement Characteristics

Five Ranges	20mA, 200mA, 1A, 10A
Max Resolution	100nA
Input Protection	10A, 250V Current Input Fuse on rear panel
Configurable Parameters	Range, AC Filter, Null value

Steps:

1. Connect test leads as shown in Figure 1- 16; red test lead to the I Terminal, black test lead to LO Terminal.
2. Press (~I) to select the AC Current measurement function.
3. Choose the appropriate measurement range.
4. Setup the AC Filter.

   Press (Meas) → Filter, to setup the AC Filter Bandwidth (Default value: "Mid" (Middle)).
5. Set the Null setting value.

   Null computing will be an option operation, could be setup in accordance with

user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

6. Lead test leads into circuit and start to measure.

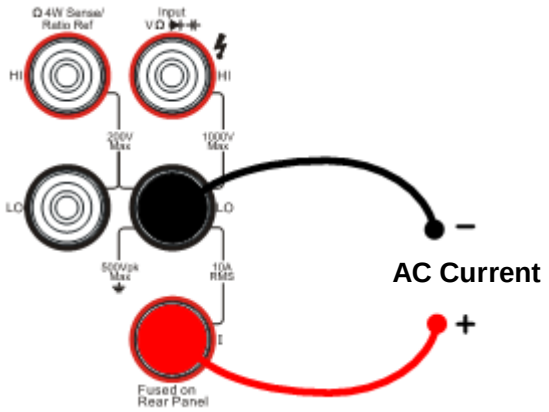


Figure 1- 16 AC Current Measurement

7. Use history function.

   Press History, the menu shows as below:

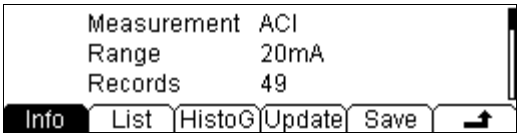


Figure 1- 17 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

To Measure Resistance

The following shows the system connections and selection of measurement functions. The practice provides a guide get familiar with the Resistance measurement technique. Resistance measurement methods include **2-Wire Resistance Measurement and 4-Wire Resistance Measurement**, and will explain separately.

2-Wire Resistance Measurement

Figure 1- 18 2-Wire Resistance Measurement Interface

Table1- 5 Resistance Measurement Characteristics

Seven Ranges	200Ω, 2kΩ, 20kΩ, 200kΩ, 1MΩ, 10MΩ, 100MΩ
Max Resolution	100uΩ
Open-circuit Voltage	<7V
Input Protection	1000V on all ranges (HI Terminal)
Configurable Parameters	Range, Null value

Steps:

1. Connect test leads as shown in Figure 1- 19; red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press Ω to select the 2-Wire Resistance Measurement.
3. Choose the appropriate measurement range.
4. Set the Null value

Null computing will be an option operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

5. Lead test leads into circuit and start to measure.

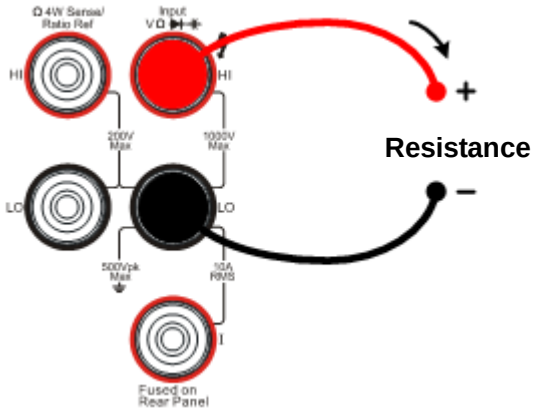


Figure 1- 19 2-Wire Resistance Measurement

6. Use history function.

   Press History, the menu shows as below:

Figure 1- 20 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

NOTE

When measuring small value resistance, Null operation will be recommended, the test wire impedance error could be eliminated.

4-Wire Resistance Measurement

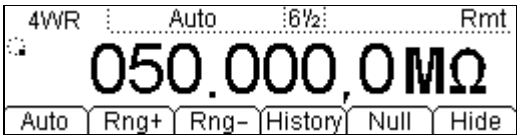


Figure 1- 21 4-Wire Resistance Measurement Interface

Table1- 6 Resistance Measurement Characteristics

Seven Ranges	200Ω, 2kΩ, 20kΩ, 200kΩ, 1MΩ, 10MΩ, 100MΩ
Max Resolution	100uΩ
Open-circuit Voltage	<7V
Import Protection	(1). $200V_{PK}$ (2). 1000V on all ranges (HI Terminal) (3). 200V on all ranges (HI Sense, LO Sense)
Configurable Parameters	Range, Null value

Steps:

1. Connect test leads as show in Figure 1- 22; red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press Ω twice to select the 4-Wire Resistance Measurement.
3. Choose the appropriate measurement range.
4. Set the Null setting value.
   Null computing will be an optional operation, it could be setup in accordance with users' demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

5. Lead test leads into circuit, start to measure.

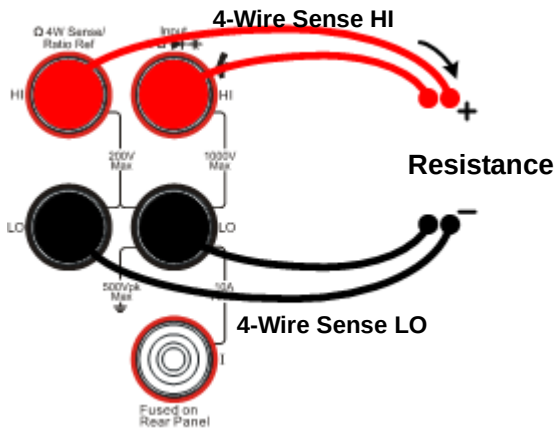


Figure 1- 22 4-Wire Resistance Measurement

6. Use history function.
   Press History, the menu shows as below:

Figure 1- 23 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

NOTE

When measuring resistances, avoid contacting both ends of the resistor for accurate measurement.

To Measure Capacitance

The following shows the system connections and selection of measurement functions. The practice provides a guide to get familiar with the Capacitance measurement technique.

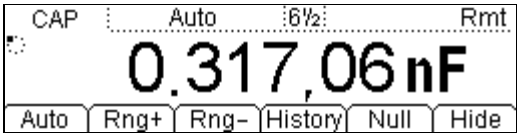


Figure 1- 24 Capacitance Measurement Data Interface

Table1- 7 Capacitance Measurement Characteristics

Six Ranges	2nF, 20nF, 200nF, 2uF, 20uF, 200uF
Max Resolution	0.1pF
Input Protection	1000V on all ranges (HI Terminal)
Configurable Parameters	Range, Null value

Steps:

1. Connect test leads as shown in Figure 1- 25; red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press ⊣⊢ to select the Capacitance measurement function.
3. Choose the appropriate measurement range.
4. Set the Null value.
   Null computing will be an optional operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

5. Lead test leads into circuit, start to measure.

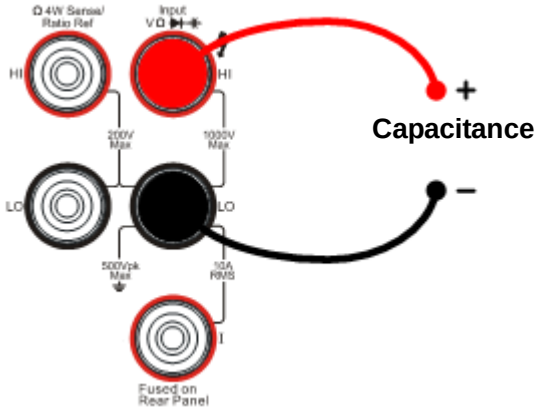


Figure 1- 25 Capacitance Measurement

6. Use history function.
   Press History, the menu shows as below:

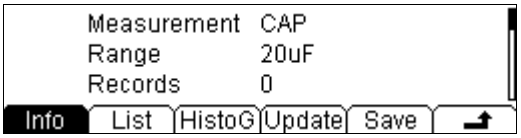


Figure 1- 26 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.
Press Update softkey to update the History data.
Press Save softkey to save data.

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

To Test Continuity

The following shows the system connections and the selection of measurement functions. The practice provides a guide to get familiar with the Continuity measurement technique.

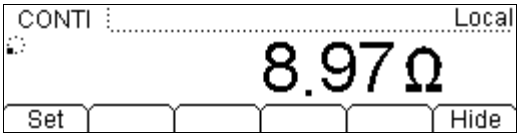


Figure 1- 27 Continuity Measurement Data Interface

Table1- 8 Continuity Measurement Characteristics

Tests Current	1mA
Max Resolution	Range fixed at 2KΩ
Open-circuit Voltage	<7V
Input Protection	1000V (HI Terminal)
Configurable Parameters	$0 \le R_{testing} \le$ Short-circuit impedance (0Ω≤Short-circuit impedance≤2kΩ)

Steps:

1. Connect test leads as Figure 1- 28 shown. Red test lead connects the HI Terminal, Black test lead connects the LO Terminal.
2. Press  to select the Continuity Measurement.
3. Setup the Short-circuit resistance.
   Press Set button to set up the Short-circuit Impedance.
   The default value is 10Ω. User may carry on the Continuity measurement directly without modification.
4. Lead test leads into circuit, start to measure.

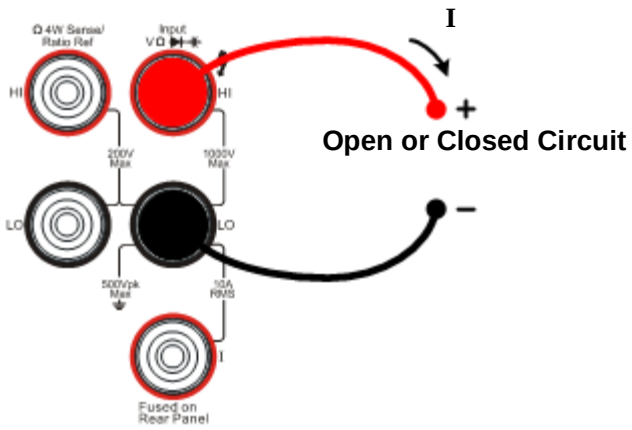


Figure 1- 28 Continuity Measurement

To Check Diodes

The following shows the system connections and selection of measurement functions. The practice provides a guide to get familiar with the Check Diodes technique.

Figure 1- 29 Check Diodes Interface

Table1- 9 Check Diodes Characteristics

Tests Current	1mA
Max Resolution	Range fixed at $2V_{DC}$
Open-circuit Voltage	<7V
Input Protection	1000V (HI Terminal)
Configurable Parameters	$0.1V \leq V_{measured} \leq 2V$

Steps:

1. Connect test leads as shown in Figure 1- 30, red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press  to select the Check Diodes.

3. Lead test leads into circuit and start to check.

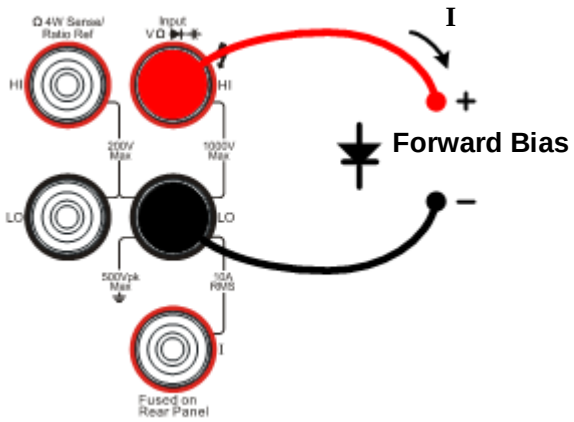


Figure 1- 30 Check Diodes

To Measure Frequency and Period

The following shows the system connections and selection of measurement functions. The practice provides a guide to get familiar with the Frequency and Period Measurement technique.

Frequency Test

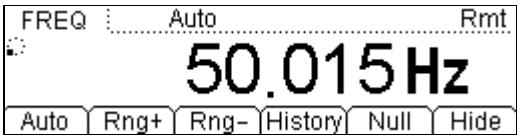


Figure 1- 31 Frequency Measurement Data Interface

Table1- 10 Frequency Test Characteristics

Ranges	200mV, 2V, 20V, 200V, 750V
Measurement Range	3Hz~300kHz
Input Signal Range	100mVAC ~ 750VAC
Input Protection	750V$_{RMS}$ on all ranges (HI Terminal)
Configurable Parameters	Null value

Basic measurement:

1. Connect test leads as Figure 1- 32 shown. Red test lead connects the HI Terminal, Black test lead connects the LO Terminal.
2. Press Freq to select the Frequency Test.
3. Set the Null value.
   Null computing will be an option operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

4. Lead test leads into circuit and start to check.

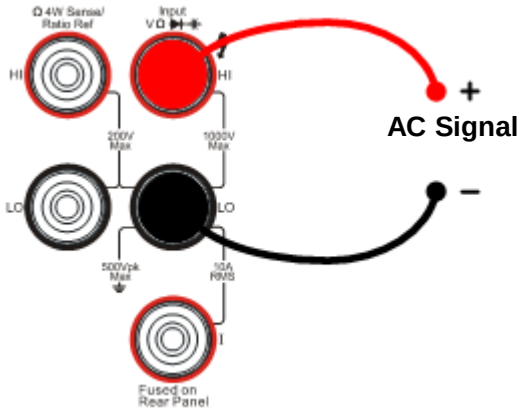


Figure 1- 32 Frequency Test

5. Use history function.
   Press History, the menu shows as below:

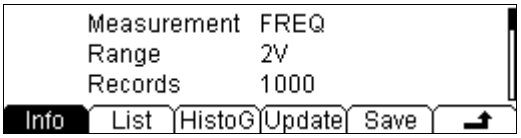


Figure 1- 33 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

Period Test

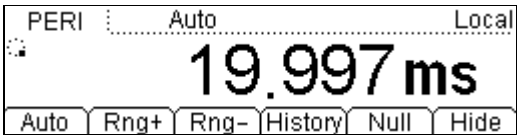


Figure 1- 34 Period Measurement Data Interface

Table1- 11 Period Test Characteristics

Range	200mV, 2V, 20V, 200V, 750V
Measurement Range	0.33s ~ 3.3us
Input Signal Range	100mVAC~750VAC
Import Protection	750V_{RMS} on all ranges (HI Terminal)
Configurable Parameters	Null value

Steps:

1. Connect test leads as Figure 1- 35 shown. Red test lead connects the HI Terminal, Black test lead connects the LO Terminal.
2. Press Freq twice to select the Period Test.
3. Set the Null value.
   Null computing will be an optional operation, could be setup in accordance with user demand. If user does not implement Null computing, this parameter is not required, direct implementation of the next step.

(To know the specific setting methods of the Null value setting, please refer to Chapter 2 "To Set up Measurement Parameters", Null computing)

4. Lead test leads into circuit, start to check.

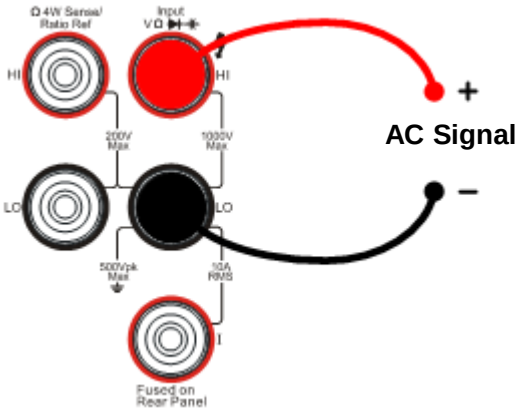


Figure 1- 35 Period Test

5. Use history function.
   Press History, the menu shows as below:

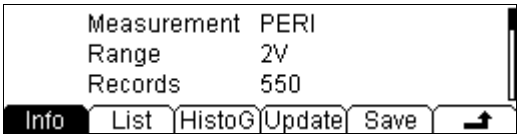


Figure 1- 36 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update softkey to update the History data.

Press Save softkey to save data.

To Measure Sensor

The DM3000 converts the sensor physical properties into electrical voltage, resistance, current for measurement. So it needs the sensor name, sensor type, sensor physical unit, sensor reference data, and arithmetic.

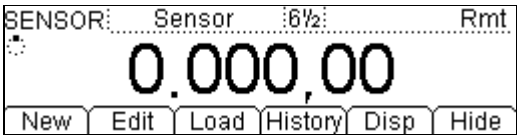


Figure 1- 37 Sensor Measurement Interface

Table 1- 12 Menu Description

Option Menu	Description
New	Newly built sensor reference data file
Edit	Edit a sensor reference data file
Load	Load a sensor reference data file
Display	Set display mode

Steps:

1. Connect test leads as shown in Figure 1- 53, Figure 1- 54, red test leads to the HI Terminal, black test leads to the LO Terminal.
2. Press Sensor to select the Sensor function.
3. Press New, the display shows:

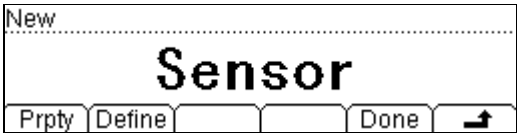


Figure 1- 38 Create a New Sensor

(1). In New function interface, press Prpty to edit the sensor Name, sensor Type and physical characteristics of the sensor.

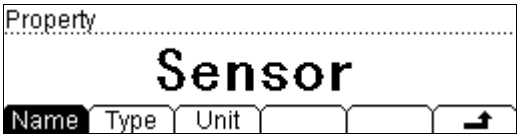


Figure 1- 39 Set Property of the Sensor

- Press Name to create a name for the sensor reference name.

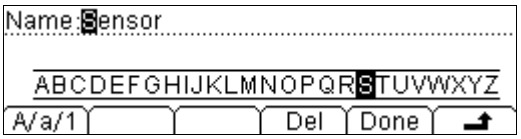


Figure 1- 40 Input Sensor Name

Press ↵ to return the higher level menu.

- Press Type to select the sensor type, include: DC voltage，DC current，2-wire, 4-wire resistance and frequency.

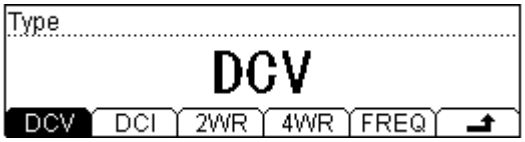


Figure 1- 41 Select Sensor Type

Press ↵ to return the higher level menu.

- Press Unit to select the physical unit, include: °, ℃, °F, % and USER.

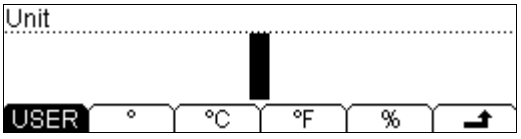


Figure 1- 42 Select Unit

Press ↵ to return the higher level menu.

(2). In New interface, press Define button to build the reference table.

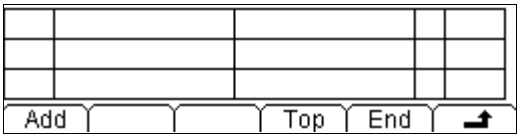


Figure 1- 43 Define Sensor Data

- Press Add to input the Measured and Corresponding value to the reference value data.

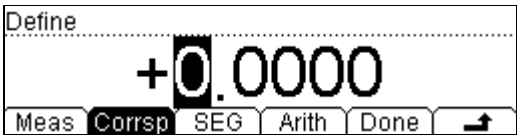


Figure 1- 44 Input "Corrsp" Data

- Press SEG, you are allowed to segment the reference value with different arithmetic.

Figure 1- 45 Turn on/off "SEG"

- Press Arith to select the algorithms to Linear or Curve.

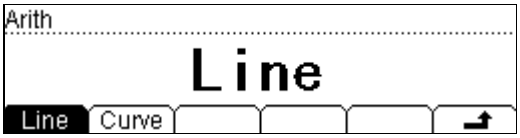


Figure 1- 46 Select the Algorithms

- Press Add to input all the required reference values.

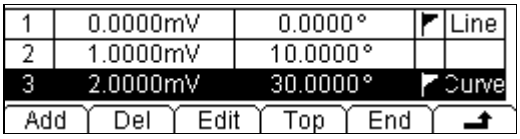


Figure 1- 47 View Sensor Data

Algorithms Explanation:

Line: at least 2 groups of data are need in a segment.

Curve: at least 5 groups of data are need in a segment.

Press ↵ to New interface then press Done button, you have finished the input work, then you can use this sensor reference immediately, or you can save it into the built-in storage space or your U-disk for future work.

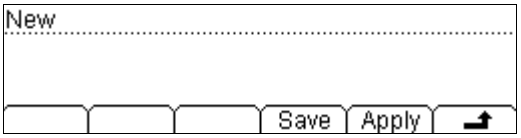


Figure 1- 48 Save or Apply Interface

- Press Save to save the file.

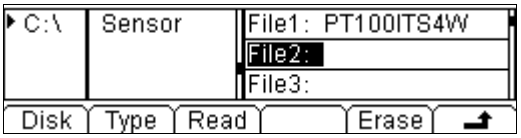


Figure 1- 49 Save Sensor Data

- Press Apply to start the sensor measurement.

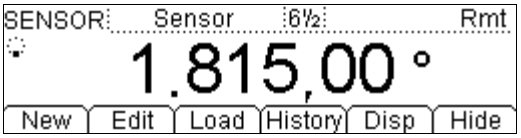


Figure 1- 50 Apply the Sensor Data

4. Press Edit to edit the saved sensor reference values.
5. Press Load to load the saved sensor reference file.
6. Press Disp to choose the value to be shown on the display interface.

Figure 1- 51 Choose display mode of the measured value

7. Press History, enter the menu shown below:

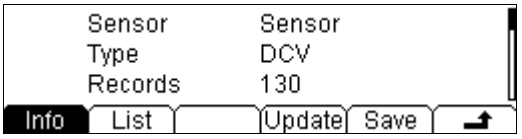


Figure 1- 52 The History Data

Use the history function to review or save the data that has acquired by the current measurement function. The data can be display "Info" (information), "List" and "HistoG" formats.

Press Update to update the History data.

Press Save to save data.

8. Lead test leads into circuit, start to measure.

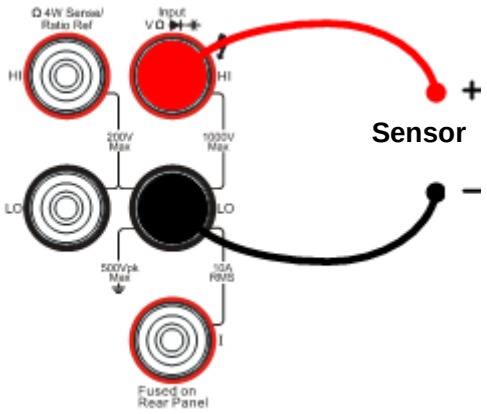


Figure 1- 53 Voltage, Resistance, and Frequency Mode Sensor

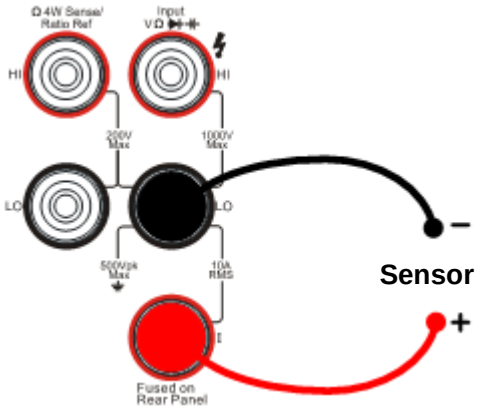


Figure 1- 54 Current Mode Sensor

To Choose Reading Resolution

The measurement reading resolutions (the accuracy) are 4 1/2, 5 1/2, 6 1/2 digits.

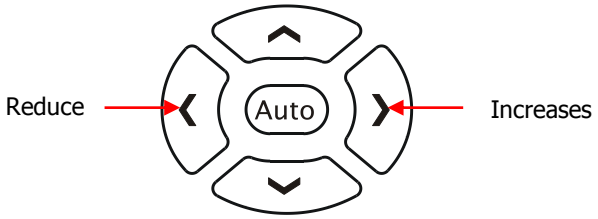


Figure 1- 55 The Digits Resolution Control Keys

Methods:

Use the left and/or right direction key to adjust the desired measurement resolution. Press left button to decrease accuracy, press right button to increase accuracy.

The digits resolving index Selection

(1). Each precision of the measure function can be set separately without influence.

(2). Choose the reading precision of 6 1/2 bit when measuring AC for best results.

(3). Save the digits resolving index in nonvolatile memory.

To Choose Data Digit Display

Digits Function to set up data display format; 5, 6 or 7 digits (Default: 5 digits).

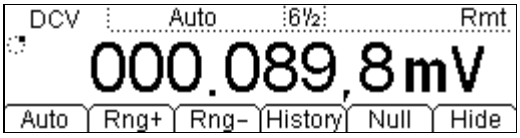


Figure 1- 56 7 Digits Data

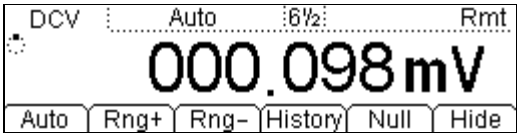


Figure 1- 57 6 Digits Data

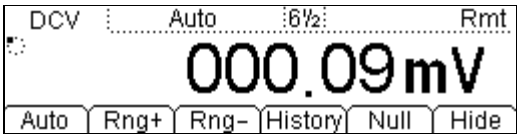


Figure 1- 58 5 Digits Data

NOTE

In high-accuracy measurement, if users need to show less data digit, it can show fewer digits for user-friendly reading.

To Choose Range Options

Use "manual" selection or "automatic" to choose measurement range. The "automatic" allows the instrument to determine the most appropriate range while for better performance choose the "manual" method.

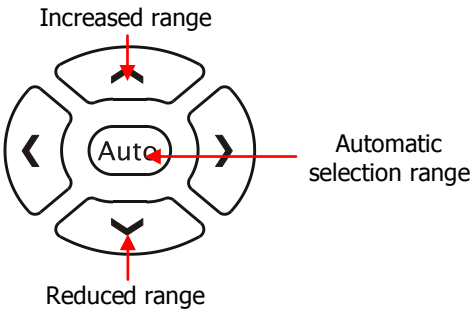


Figure 1- 59 Choice Range Options Keys

Methods 1:
Use up and down direction keys to adjust the Range. Press Up to increase the range, press Down to reduce the range.
Press (Auto) key, to select the automatic method.

Methods 2:
Use the menu option keys to adjust the range as shown in the following Figure 1- 60.

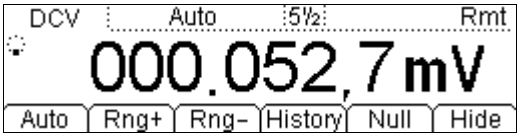


Figure 1- 60 Choice Range Options Menu

Table 1- 13 Menu Description

Option Menu	Description
Auto	Start automatically adjustment range, and banned manually adjustment range.
Range+	Start manually increased range, and banned automatically adjustment range.
Range-	Start manually reduced range, and banned automatically adjustment range.

Operation description:

- When the input signal is beyond the current range of the measurement range, the multimeter will show "OVER RANGE".
- After restarting and remote- replacement, range options will turn back default option "Automatic choice range".
- When testing the Continuity and Checking the diodes, the range option are fixed. The range of Continuity is 2KΩ while the diodes are 2V$_{DC}$.

NOTE

Other functions of the direction keys:

At measurement parameters setting menu, press the up and down keys to choose setting areas.

At data input interface, press up and down keys to change the number.

Press left and right keys to change the different digits.

To Control Trigger Options

Use Run Hold or Single to trigger the multimeter. When the multimeter is powered up, the Run Hold key will be on, indicating means this function is running.

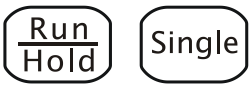


Figure 1- 61 Trigger Control Keys

Multimeter triggering options include Automatically, Single and Hold.

Auto Triggering

Press Run Hold key once, it takes continuous readings at the fast rate the specified measurement configuration.

Single Triggering

Press Single key the multimeter takes one reading, or a number of readings specified by a sample count entered.

Holding Triggering

Press Run Hold key, it allows capturing and holding a stable reading on the front panel display.

NOTE

Press Single button, during Remote Mode, to switch back to the local mode.

Chapter 2 Operating Your Multimeter

By now the front/rear panel, the function control area and keys, and the ways to set up the multimeter have been introduced.

This chapter goes through all groups of front-panel buttons and menus, and extends the knowledge the operation instructions.

Follow the exercises to get the most of the powerful measurement capabilities of the multimeter.

This chapter covers the following topics:

- To Set up Measurement Parameters (Meas)
- To Make Mathematics Operation (Math)
- To Set up Trigger System (Trig)
- To Save and Recall (Save)
- To Set up Utility (Utility)
- To Set up High-speed data acquisition and Multi-route Scanning (Data Log)
- Use the built-in help system (Help)

To Set up Measurement Parameters

Press Meas key to enter the Measurement Menu for setting to set up the measurement parameters. Users may use the factory defaults or establish desired configurations.

The Measurement parameters Menu includes: Conti, Filter, Res, Null, and Ratio. To change these parameters, satisfy the dissimilar condition of the measurement request.

Table 2- 1 Menu Description

Function Menu	Description
Conti	Set up the resistance value in continuity test.
Filter	Choose the AC filter bandwidth.
Res	Choose the DC voltage input impedance.
Null	Set up null value.
Ratio	Measured the ratio of two DC voltage signal.
Freq	Measured the frequency of AC signal.
↵	Save all changes, and end the current operation.

Continue Resistance

Set up the continue resistance value in the short test menu. When the measured resistance is below limit, the DM3000 will beep to indicate the circuit continuation. The continue resistance is only using at Continue Test.

Press Meas → Conti, enter the menu shown below:

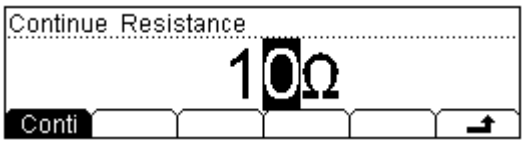


Figure 2- 1 Set the Continue Resistance

Use direction keys to change the parameter values:

Press left and right directional keys to choose different digits. Press up and down keys to change the current digit value.

Continue Resistance

The range of continue resistance is 1Ω~2000Ω. The default value is 10Ω.

The continue resistance value stored in the nonvolatile memory, the resistance still keep when the power is off.

AC Filter

There are three settings at the AC Filter menu. Choose the appropriate setting for more accurate measurements. This function applies AC Voltage and AC Current measurement only.

Press Meas → Filter, enter the menu shown below:

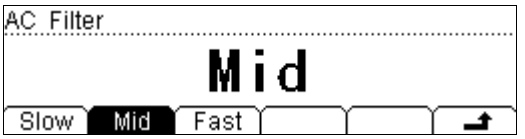


Figure 2- 2 Set the AC Filter

Table 2- 2 Menu Description

Function Menu	Description
Slow	Set up the filter with low speed.
Mid	Set up the filter with to middle speed.
Fast	Set up the filter with high speed.
↵	Save all changes, back to a higher level menu.

Table 2- 3 AC Filter Parameters Characteristics

AC Filter Options	Input Frequency	Setting Timer
Slow	3Hz～300kHz	1.2 reading/s
Mid	20Hz～300kHz	0.5 reading/s
Fast	200Hz～300kHz	0.3 reading/s

AC Filter

The AC Filter Parameters are stored in nonvolatile memory. The default is "Mid" (middle).

DC Input Impedance

The options of input impedance for DC value measurements are 10MΩ and >10GΩ. For 200mV, 2V, 20V measuring ranges, choose >10MΩ for better result.

Press Meas → Res, enter the menu shown below:

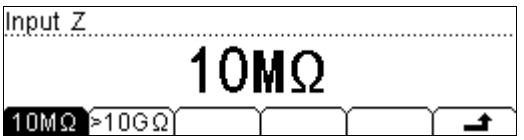


Figure 2- 3 Set the Input Impedance

Table 2- 4 Menu Description

Function Menu	Description
10MΩ	Set up the DC Input Impedance to 10MΩ.
>10GΩ	Set up the DC Input Impedance to >10GΩ.
⮠	Save all changes, back to a higher level menu.

DC input impedance selection:

(1). While the DC input impedance is selected to 10MΩ, the input impedance of all measurement range is 10MΩ;

(2). While the DC input impedance is selected to >10GΩ, the input impedance for 200mV, 2V and 20V measurement range is >10GΩ; for 200V and 1000V measurement range is kept at 10MΩ.

(3). The DC input impedance is stored in nonvolatile memory. The default is 10MΩ.

Null Measurement

The DM3000 null settings is available for DC voltage, AC voltage, DC current, AC current, resistance, frequency/period, and capacitance measurements.

With null setting each measurement is the difference between a stored null value and input signal. It is particularly important prior for making capacitance measurements. The formula used for calculating null measurements is:

Result = reading - null value

The null value is adjustable, and can be set to any value between 0 and ±120% of the highest range, for the present function.

Press Meas → Null, the display shows:

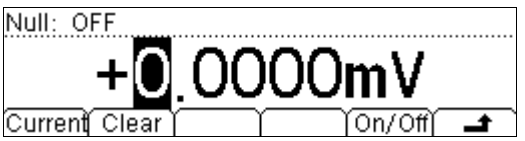


Figure 2- 4 Set the NULL Value

Table 2- 5 Menu Description

Function Menu	Description
Current	Use the measured value as the null value.
Clear	Set the value to be zero.
On/Off	Turn the Null function on or off.
⮥	Save all changes, back to a higher level menu.

Null measurement parameters setting methods:

(1). In operation interface press Null button, use the current value to be Null value.
(2). In Null setting display interface, uses the Direction Keys to input null value.
(3). The setting value of the NULL value: 0~±120%×Maximum Range

Ratio Measurement

Use Ratio measurement to measure the ratio of 2 DC voltage signal. Ratio measurement is only for measuring DC voltage.

Press Meas → Ratio, the display shows:

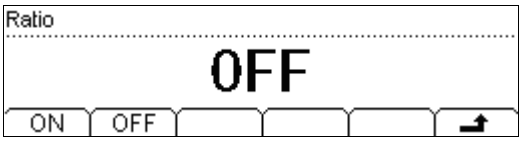


Figure 2- 5 Enable or Disable the Ratio Measurement

Table 2- 6 Menu Description

Function Menu	Description
ON	Enable the Ratio Measurement Function.
OFF	Disable the Ratio Measurement Function.
↵	Save all changes, back to a higher level menu.

The method of the radio measurement:

$$\text{Ratio} = \frac{\text{DC Voltage}}{\text{DC Reference Voltage}}$$

(1). Measuring Sense Terminal, for measuring reference DC voltage. Default automatic range option under 10V.

(2). Measuring Input Terminal, for measuring DC voltage. The measuring voltage range is under 10V.

(3). Input LO Terminal and Sense LO Terminal must have a common reference value, and the voltage difference cannot surpass ±1V.

Basic measurement:

1. Connect test leads shown in Figure 2- 6; red test leads to the HI Terminal, black test leads to the LO Terminal.
2. Press ⎓V to select the DC Voltage measurement function.
3. Choose the appropriate measurement range.
4. Set up the DC Ratio Measurement.

   Press Meas → Ratio → On, to start the DC Ratio Measurement.
5. Lead test leads into circuit, start to measure.

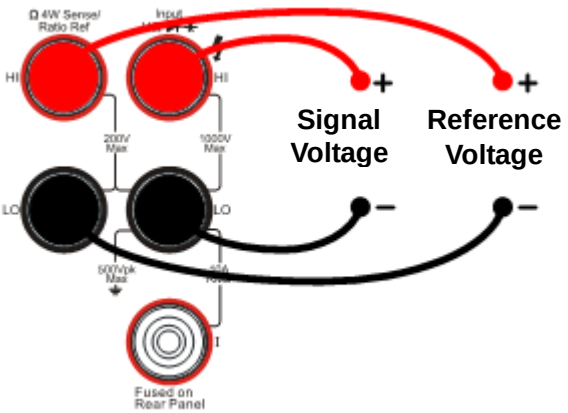


Figure 2- 6 Ratio Measurement

Frequency Measurement

Frequency measurement function is used for measuring the frequency of AC signal (voltage and current) only.

Press Meas → Freq, the display shows:

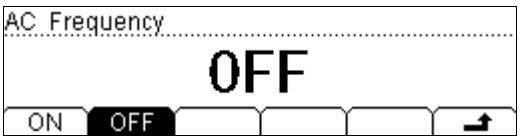


Figure 2- 7 Enable or Disable the AC Frequency measurement

Table 2- 7 Menu Description

Function Menu	Description
ON	Enable the Frequency Measurement of the AC signal
OFF	Disable the Frequency Measurement of the AC signal
↵	Save all changes, back to a higher level menu.

Basic measurement:

1. Connect test leads as shown in Figure 2-8 (or Figure 2-9); red test lead to the HI Terminal, black test lead to the LO Terminal.
2. Press ~V (or ~I) to select the AC voltage or current measurement function.
3. Choose the appropriate range.
4. Set up the AC Frequency Measurement.

   Press Meas → Freq → On, to start the AC Frequency Measurement.

   Press ↵ to save all changes, back to a higher level menu.

5. Lead test leads into circuit, start to measure.

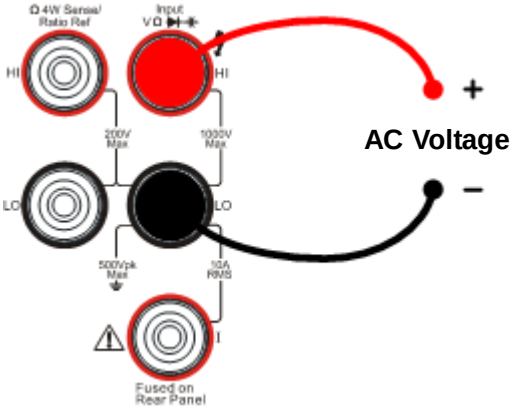


Figure 2- 8 Voltage Connection

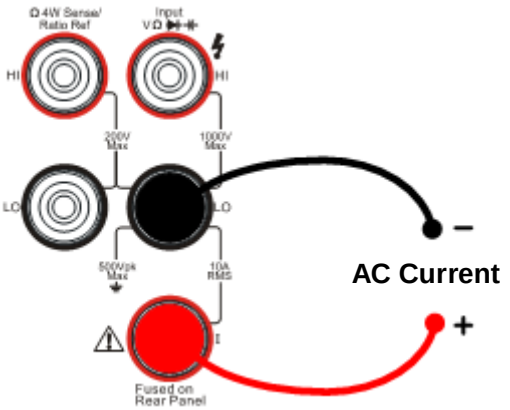


Figure 2- 9 Current Connection

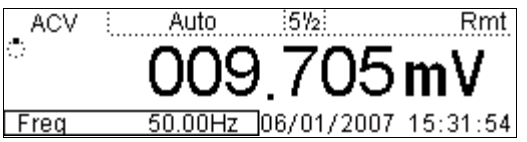


Figure 2- 10 Frequency Measurement

Math Functions

The DM3000 provides five math functions: Null, statistic, dB, dBm and Limit testing. Only one of these math functions can be enabled at a time, and remains in effect until change.

In Math function interface, choose the required math function. Press On to start the Math function.

Math functions are the combination of mathematical and the basic measurement operation. However, not all combinations are supported. In such case the math function will automatically turn off.

Table 2- 8 Menu Description

Function Menu	Settings	Description
Statistic		Reading statistic functions, including: Max, Min, Average, and number of measurement.
dB		The dB measurement is the difference between the input signal and a stored relative value.
dBm		The dBm function is logarithmic, and is based on a calculation of power delivered to reference impedance.
Limit		The limit test function performs pass/fail testing with upper and lower limits that you specify.
ON/OFF	ON OFF	Turn on Math function. Turn off Math function.
⮥		Save all changes, back to a higher level menu.

Table 2- 9 shows the supported combination of the basic measurement functions and the Math functions.

Table 2- 9 Math Function is used for the following measurement applications

Measurement Function	Supported the Math function			
	Statistic	**dB**	**dBm**	**Limit**
DC Voltage	Support	Support	Support	Support
AC Voltage	Support	Support	Support	Support
DC Current	Support			Support
AC Current	Support			Support
2-Wire Resistance	Support			Support
4-Wire Resistance	Support			Support
Frequency	Support			Support
Period	Support			Support
Continuity				
Diodes				
Ratio	Support			Support
Capacitance	Support			Support

Statistic Measurement

The Statistic function is for DC voltage, AC voltage, DC current, AC current, resistance, frequency/period, ratio and capacitance measurement.

The front panel can display the statistical data for any set of readings: average (Ave), maximum (Max), minimum (Min), and which can read with All function and the number of samples taken (Total).

Press Math → Stats, the display shows:

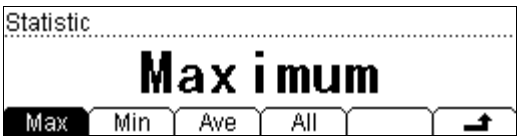


Figure 2- 11 Select Statistic Function

Table 2- 10 Statistic Measurement Menu Function Description

Function Menu	Description
Max (Maximum)	Maximum value from a set of measurements.
Min (Minimum)	Statistical measurement all reading Min value.
Ave (Average)	Statistical measurement all reading Average value.
All	The complete a set of measurement.
⮥	Save all changes, back to a higher level menu.

Limit Measurement

Use the Limit test function to perform pass/fail testing with respect to specified upper and lower limits. The limits can be set to any value between 0 and ±120% of the highest range of the current function. The upper limit must be positive than the lower limit.

Press Math → Limit, the display shows:

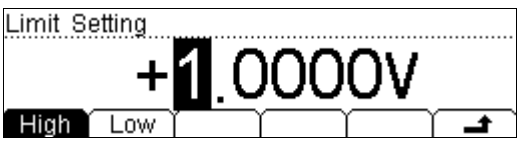


Figure 2- 12 Limit Setting

Table 2- 11 Limit Measurement Menu Function Description

Function Menu	Settings	Description
High		Set the desired Upper limit.
Low		Set the desired Lower limit.
⮥		Save all changes, back to a higher level menu.

Table 2- 12 Limit Parameters

Measurement	Description
DC Voltage	-1200V ~ +1200V
AC Voltage	0~ 900V
DC Current	-12A ~ +12A
AC Current	0~ 12A
Resistance	0 ~ 120MΩ
Capacitance	0 ~ 240uF
Frequency	3Hz ~ 300kHz
Period	3us ~ 300ms
Ratio	-1G ~ 1G

The range of Limit function:

(1). The upper limit value should be always greater than the lower limit value.

(2). The upper/lower limit values are stored in volatile memory.

dB Measurement

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

Press Math → dB, enter the menu shown below:

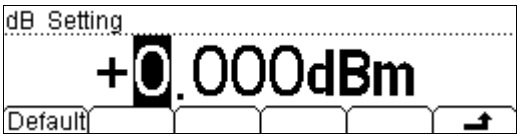


Figure 2- 13 dB Measurement

Table 2- 13 dB Measurement Function Menu Function Description

Function Menu	Description
Default	Use the default value.
⮥	Save all changes, back to a higher level menu.

dB $=10 \times \mathrm{Log}_{10}$ [$(\mathrm{Reading}^2 / R_{REF}) / 0.001\mathrm{W}$] – (dB setting value)

R_{REF} expressed measuring the resistance value in the actual electric circuit.
Range of the dB setting value: -120 dBm ~ +120 dBm. The default is 0 dBm.
You can either let the instrument automatically measure this value, or you can enter a specified value.

dBm Measurement

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

Press Math→ dBm, the display shows:

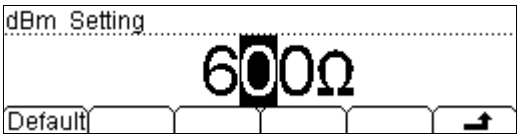


Figure 2- 14 dBm Measurement

Table 2- 14 dB Measurement Function Menu Function Description

Function Menu	Description
Default	Use the default value.
⮠	Save all changes, back to a higher level menu.

The computation method of the dBm:
$dBm = 10 \times Log_{10} [(Reading^2 / R_{REF}) / 0.001W]$
R_{REF} expressed measuring the resistance value in the actual electric circuit.

To Set up Triggering Parameter Function

The DM3000 triggering system allows generation of triggers either manually or automatically, and taking multiple readings per trigger. The DM3000 also allows setting of an internal triggering level, and to set up pre-triggering.

Selecting a Trigger Source

Specify the source of a trigger. The power–on default is auto triggering. Other types of triggering are described in the following sections.

The power–on trigger default mode was auto trigger (RUN) mode. Press Run Hold to go to the hold trigger mode. Press Single to go to the single trigger mode, a single reading is taken, and another reading is taken each time, the Single button you pressed, or when a hardware trigger is received on the **Ext Trig** connector.

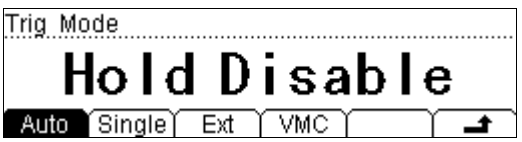


Figure 2- 15 Trigger Mode Setting

Table 2- 15 Trigger Parameters Setting Menu Function Description

Function Menu	Description
Auto	Setting system Auto trigger and reading Hold meter reading measurement schemes.
Single	Setting Single manual trigger parameter.
Ext	Setting external triggering.
VMC	Setting the output signal pulse width at sampling ending output signal.
⮠	Save all changes, back to a higher level menu.

Auto Triggering

Auto triggering takes continuous measurement at the highest sample rate for the specified measurement configuration (function, range, resolution, and so forth). Auto trigger is the default trigger mode at system power up.

Press Trig → Auto, the display shows:

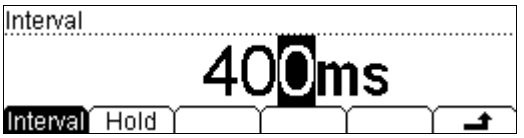


Figure 2- 16 Auto Triggering Setting

Table 2- 16 Menu Description

Function Menu	Setting	Description
Interval		Set interval time in 400~2000ms.*
Hold	ON/OFF	Set turn the Reading Hold function ON or OFF.
↵		Save all changes, back to a higher level menu.

Interval time:

The delay between the trigger signal that the first sample taken. This is useful in applications when the input signal settles before taking a reading, or for pacing a burst of readings.

- The trigger delay may be set from 400 to 7000 ms.*
- The continuity and diode test functions ignore the trigger delay.
- The default trigger delay automatically set if no specified value entered.
- If a trigger delay entered, it will be used for all measurement functions (except continuity and diode test).

***NOTE:**

The trigger interval time is 400~7000ms (6 1/2), 200~7000ms (5 1/2) and 30~7000ms (4 1/2). The range of the interval time will be different in different resolving index.

Reading Hold

The reading hold mode captures and holds a reading on the front panel display when a stable reading is detected. The system Hold ranges are 0.01%, 0.1%, 1%, and 10%.

Press Trig → Auto → Hold, the display shows:

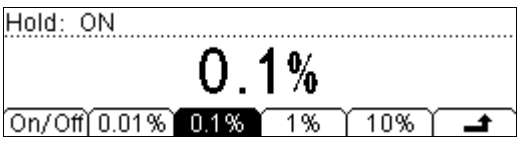


Figure 2- 17 Reading Hold Setting

Table 2- 17 Menu Description

Function Menu	Description
On/Off	Turn on/off the reading hold function.
0.01%	Set the hold range is 0.01%.
0.1%	Set the hold range is 0.1%.
1%	Set the hold range is 1%.
10%	Set the hold range is 10%.
↵	Save all changes, back to a higher level menu.

Reading Hold Function

Start the Reading Hold Function, the hold measurement use the following rules judge the reading count:

When Max() - Min() ≤ hold range x ReadingN, the multimeter hold ReadingN on the display.

The display update a new reading basing on the current value and the three preceding measurements before the reading was hold:

Max (ReadingN, ReadingN-1, ReadingN-2, ReadingN-3)

Min (ReadingN, ReadingN-1, ReadingN-2, ReadingN-3)

NOTE

Reading Hold is stored in nonvolatile memory. The default is 0.1%.

When Reading Hold started, the input resistance was set to 10MΩ for all DC voltage range to reduce noise arising from the open-loop testing.

Single Triggering

The multimeter takes one reading, or a number of readings specified by a sample count you enter, each time Trig press.

Press Trig → Single, the display shows:

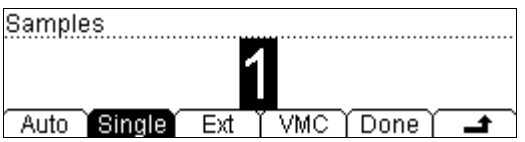


Figure 2- 18 Set the samples

Table 2- 18 Menu Description

Function Menu	Description
Single	Set a sample count, the default sample count is 1.
↵	Save all changes, back to a higher level menu.

Sample Count

While the multimeter receives a single trigger signal, the multimeter takes one reading or a number of readings.

The number of sample count range from 1 to 50,000. The factory default is 1.

External Triggering

Trig is used to set the parameter which initiates the triggering function. It requires to set the following parameter: the Rise and Fall edge. Press Done to start the external triggering, the keys Run Hold and Single on the front panel will be off to indicate the instrument using external triggering mode.

Press Trig → Ext, the display shows:

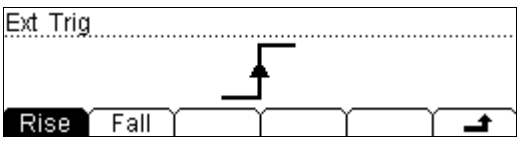


Figure 2- 19 External Triggering Setting

Using the triggering function

Auto, hold and Single trigger can switch by using Run Hold and Single, press Done button on the triggering interface (Figure 2-18) to startup the external triggering.

When external triggering start, the key Run Hold and Single on the front panel both will be off.

To Set up the VMC

At external triggering mode, when the data sampling is over, the instrument outputs a pulse signal at VM Comp located on the rear panel. The output pulse width can be adjusted.

Press Trig → VMC, the display shows:

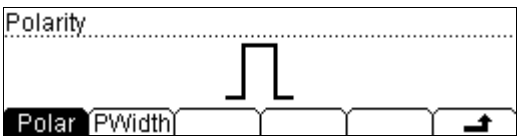


Figure 2- 20 Set the Output Polarity

Table 2- 19 Menu Description

Function Menu	Setting	Description
Polar	Pos Neg	Setting the pulse signal's polarity.
PWidth		Setting the pulse width.
⮢		Store the changing and back to the higher menu.

The VMC function output

(1).At external triggering mode, when the data sampling is over, the instrument will output a pulse signal to indicate operation completed.

(2).At external triggering mode, when operating math limited value, the instrument will export a pulse signal to indicate out of limits detected.

Store and Recall

To Storage and Recall function enable save, load, and delete the measurement data, parameters and sensor files in the local storage as well as in USB storage.

Press Save key, the display shows:

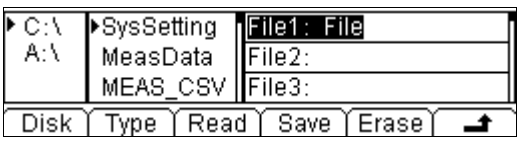


Figure 2- 21 Store and Recall Interface

Table 2- 20 Menu Description

Function Menu	Setting	Description
Disk	C:\ (Local) A:\ (U-Disk)	Choose Local or U-Disk storage.
Type	Sys Setting/ Meas Data/ MEAS_CSV …	Choose the type of the files shown.
Read		Load the selected file.
Save		Save the file to the specified location.
Erase		Delete the selected file.
⮥		Save all changes, back to a higher level menu.

File Storage

In local/U-disk storage area, you allowed to save, load and delete parameter, data and sensor documents.

1. Choose the storage location

Press Save → Disk, choose C:\ (Local storage) or A:\ (U-Disk).

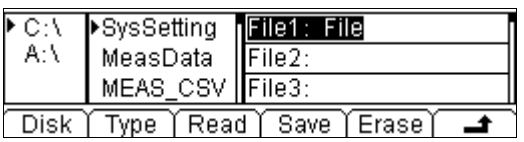


Figure 2- 22 Select Storage Location

2. Choose the storage type

Press Type to choose the storage type after select the storage location, take selecting "MeasData" for example:

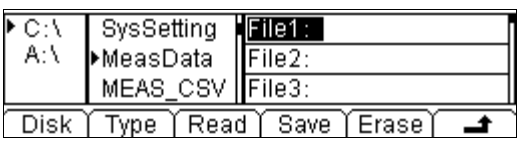


Figure 2- 23 Select "MeasData" type

NOTE: Do not remove the U disk when it is used.

File Operation

Use the up and down buttons to select the file, then press Read, Save and Erase soft keys to do the corresponding operation.

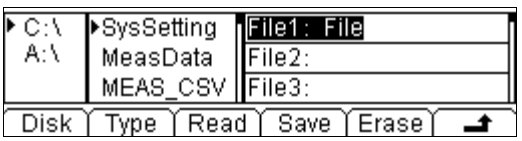


Figure 2- 24 File Operation

To save the file, name the file with letters and/or numbers.

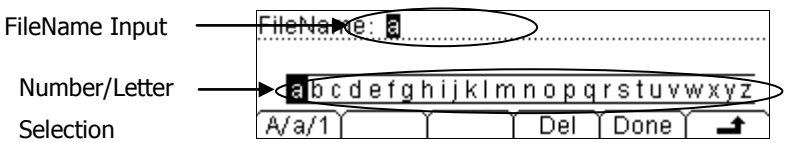


Figure 2- 25 Filename Input

Input Method:

- Press A/a/1 to select the Capital letter, Lowercase letter or Numbers.
- Use the up/down to close or open the number/letter selection area display.
- Use the left/right to move cursor in FileName or number/letter selection area.
- The Delete function can only delete the letter on which the cursor taking place.

To Set up the Utility

The Utility function establishes system parameters, interface parameters, and calibration.

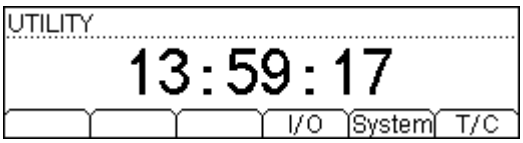


Figure 2- 26 Utility Setting

Table 2- 21 Menu Description

Function Menu	Description
I/O	To set up I/O and LAN parameters.
System	To set up system information configuration.
T/C	Test and calibration function.

Set Up the I/O System

Press Utility → I/O, the display shows:

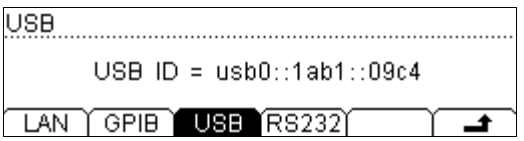


Figure 2- 27 I/O Setting Interface

Table 2- 22 Menu Description

Function Menu	Settings	Description
LAN		Set up the LAN parameters.
GPIB		Set up the GPIB address. It ranges from 1 to 30.
USB		Check USB interface ID.
RS232		Set up the Baud Rate and Parity of the serial communication.
⮥		Save all changes, back to a higher level menu.

Operation introduction:

- Remote control through LAN, GPIB (IEEE-488), USB and RS232 interface can be configured.
- The I/O interface of GPIB, USB and RS232 only one could be used at the same time.

1. To Setup the LAN Parameters

Set up a LAN configuration and remote interface from the Front Panel.

Press Utility → I/O → LAN, the display shows:

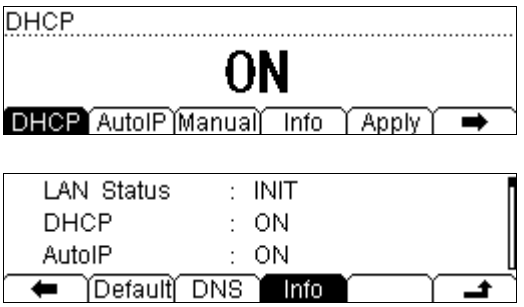


Figure 2- 28 LAN Parameter Settings Interface

Table 2- 23 Menu Description

Function Menu	Settings	Description
DHCP		Open or Close DHCP.
Auto IP		IP address will be set from 169.254.0.1 to 169.254.255.254 automatically, and Subnet Mask will be 255.255.0.0.
Manual IP		Set IP address, Mask and Gateway manually.
Info		View MAC address and other parameters.
Apply		Apply current LAN settings.
Default		Resume default settings.
DNS		Set DNS server address.
⮥		Save all changes, back to a higher level menu.

To set the IP address, there are three methods: DHCP, Auto IP and Manual IP.

- The ascending orders of priority about the three methods are: DHCP, Auto IP and Manual IP. If not only one method is enabled, the method which has higher priority works.
- To use DHCP, turn "ON" DHCP;
- To use Auto IP, turn "OFF" DHCP and select Auto IP;
- To use Manual IP, turn "OFF" DHCP and Auto IP and then select Manual IP to set the IP address manually, see the figure below.

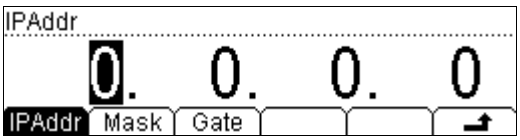


Figure 2- 29 Manual IP Setting Interface

Table 2- 24 Menu Description

Function Menu	Settings	Description
IPAddr		Setup IP address.
Mask		Setup Subnet Mask.
Gate		Setup default Gateway.
⮠		Save all the changes and go back to last Manu.

2. To Set Up the GPIB Parameter

Each device on the GPIB (IEEE–488) interface must have a unique address. You can set the address of the multimeter to any integer between 1 and 30. The default address is "7" when the instrument is shipped from the factory.

Press Utility → I/O → GPIB, enter the menu shown below:

Figure 2- 30 Set GPIB Address

Table 2- 25 Menu Description

Function Menu	Description
Direction Keys	The left and right keys alter the digit and the up and down alter the value.
⮥	Save all changes, back to a higher level menu.

3. To Set Up the RS232 Parameters

Choose RS232 (serial data interface) interface. Proper configure the baud rate and parity to make parameters the same as that settled in your computer. Make sure the connection line is unbroken. The configuration is saved in inviolate memory and shown in according menu.

Press Utility → I/O → RS232, enter the menu shown below:

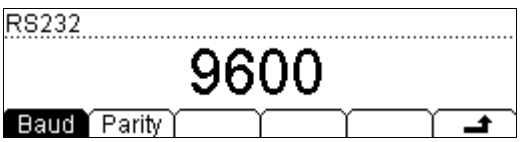


Figure 2- 31 RS232 Setting Interface

Table 2- 26 RS232 Parameter Function Menu Description

Function Menu	Display	Description
Baud	1200 2400 4800 9600 19200 38400 57600 115200	Set RS232 baud rate.
Parity	None Odd Even	The parity check include: None, Odd check and Even check.
⮌		Save all changes, back to a higher level menu.

- **Baud rate:**

Proper configure the baud rate and parity to make parameters the same as that settled in your computer.

Available baud rate values are 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The default is 9600.

- **Parity:**

Proper configure the parity to make it same as that settled in your computer. The default is "None".

Note: When RS232 interface is used, the parity of multimeter should be:
None parity: PC software should set 8 bits;
Odd/Even parity: PC software should set 7 bits

System settings

Press Utility → System, enter the menu shown below:

Figure 2- 32 System Setting

Table 2- 27 Menu Description

Function Menu	Description
Lang	Select the display interface languages.
Disp	Set up the display.
Sound	Switch beeper sound On/Off.
Clock	Set up the benchmark clock.
Format	Set up digit display format.
Cfg	Set up or reset the system values.

Select languages

DM3000 supports two kinds of languages for users.

Press Utility → Sys → Lang, enter the menu shown below:

Figure 2- 33 Select Language

Table 2- 28 Menu Description

Function Menu	Description
中文简	Select the Chinese Simplified.
English	Select the English.
↵	Save all changes, back to a higher level menu.

Set Up the Display

Press Utility → Sys → Disp, enter the menu shown below:

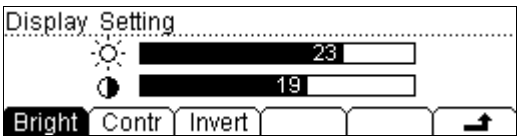


Figure 2- 34 Display Setting

Table 2- 29 Menu Description

Function Menu	Description
Bright	Increase or decrease the display light with left and right keys.
Contr	Increase or decrease the display contrast with left and right keys.
Invert	Set to invert display mode.
⮢	Save all changes, back to a higher level menu.

Beeper On/Off

Press Utility → Sys → Sound, enter the menu shown below:

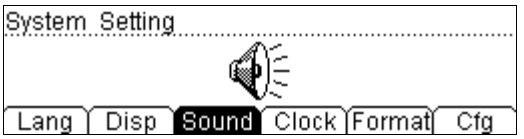


Figure 2- 35 Sound On

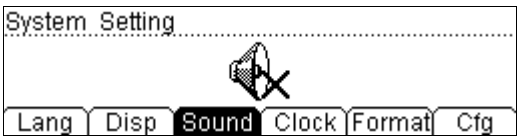


Figure 2- 36 Sound Off

Set Up System date/time

Press Utility → Sys → Clock, enter the menu shown below:

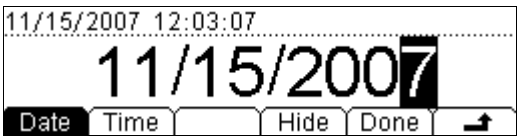


Figure 2- 37 Data Set Interface

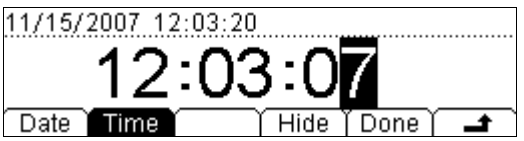


Figure 2- 38 Time Set Interface

Table 2- 30 Menu Description

Function Menu	Description
Date	Set up the date.
Time	Set up the time.
Hide	Hide data and time display.
Done	Save all changes, back to a higher level menu.
⮥	Back to a higher level menu, without save.

Set Up Digit Format

Press Utility → Sys → Format, and enter the menu shown below:

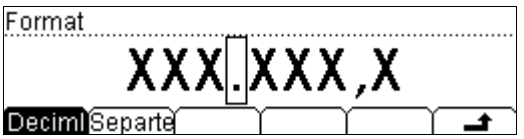


Figure 2- 39 Set Digit Format

Table 2- 31 Menu Description

Function Menu	Description
Radix Point	Expresses radix point with • or ’.
Separator	Expresses separator with ’, space or none.
↵	Save all changes, back to a higher level menu.

There are 6 kinds of display mode, take "•" and "space" for example:

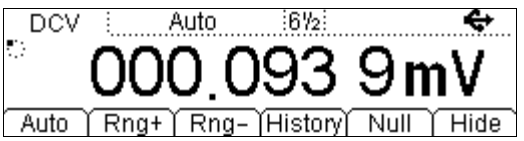


Figure 2- 40 "•" radix point, "space" separator

Notice:

The decimal and the separator cannot be the same mode, if the decimal is ’, then the separator can only be none of space; in contrarily, if the decimal is •, then the separator can only be ’, none of space.

Factory Defaults Setting

Press Utility → System → Cfg → Default, then restart the system to factory default state. The Parameter shown below:

Table 2- 32 Parameter Lists of Factory Defaults:

Measurement	**Factory Defaults Setting**
* Continue Resistance	10Ω
Filter	Fast
DC Resistance	10MΩ
Digit Resolution	6 ½
Rate	Close
Measurement Function	DCV
range	Auto

Math Function	**Factory Defaults Setting**
Math Stats	Close
Math	Statistic
Math Register	All registers cleared
* dBm Resistance	*600Ω

Trigger Parameter	**Factory Defaults Setting**
Interval	30ms, 200ms, 400ms according to Digit Resolution
Samples	1
Hold	0.1%
Trigger Sources	Auto Trigger

High-Speed Data Log	**Factor Defaults Setting**

Mode	Figure
Start Delay	0s
Start	Manual Range
Stop	Infinity

System Operations	**Factor Defaults Setting**
* Sound	* Open
* Separate	* Open
Language	Chinese
Display	Natural model
Clock	Time in main interface
Error queue	Errors cleared
Instrument parameter and data	no rejigger

Interface	**Factor Defaults Setting**
* GPIB address	*7
* I/O	*USB
*Baud	*9600band
*Parity bit	* no (8 digits)

Calibration	**Factor Defaults Setting**
Calibration Stats	Password

Parameter with (*) are saved in non-volatile Reading Storage

High-Speed Data Log

High-speed data log features: display mode settings, start acquire mode settings, and end acquires mode settings. When finish all settings, press Run Hold button to initiate the high-speed data log.

Press Data Log button, the display shows:

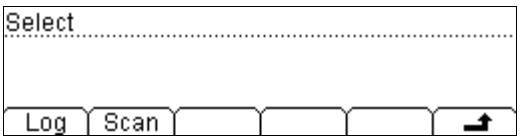


Figure 2- 41 The Main Interface of Data Log

Table 2- 33 Menu Description

Function Menu	Setting	Description
Log		Gather the data of DCV, DCI, 2WR or 4WR continuously.
Scan		Use the scanning mode to test the 16-channels signals continuously.
⮥		Save all changes, back to a higher level menu.

Notice:

Once in the Data Log mod, do not use the Auto range option function but choose the appropriate range option, thus the Log rates can be guaranteed.

Setting high-speed data log parameters

Press Log button enter the data log interface shown below.

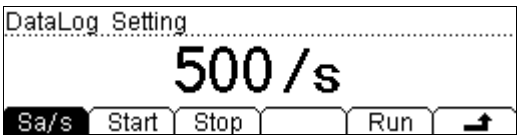


Figure 2- 42 The Data Log Setting Interface

Table 2- 34 Menu Description

Function Menu	Setting	Description
Sa/s	1/10m 1/5m . . . 50k/s	To set the sample rate with 13 values from 1/10m to 50k/s.
Start	Trig Delay	To set the sample manner to be Trig or delay.
Stop	Timer REC#	To set the data measurement stop manner to be timer or counter.
Run		Start Log the data.
↵		Save all the changes, back to a higher level menu.

Press Data Log → Log → Sa/s, the interface shows below.

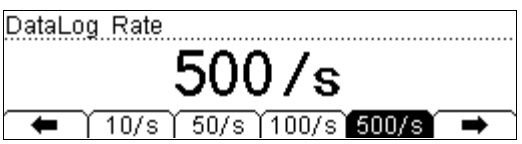


Figure 2- 43 Rate Setting

Press Data Log → Log → Start, the interface shows below.

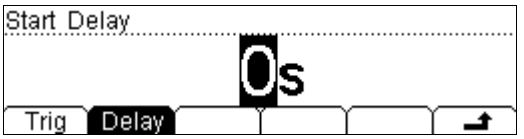


Figure 2- 44 Start Delay Setting

Press Data Log → Log → Stop, the interface shows below.

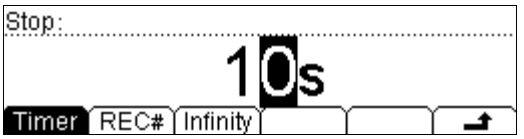


Figure 2- 45 Stop Setting

1. Data Log rate

To set the Data Log sample rate.

Press Data Log → Log → Sa/s, the interface shows below.

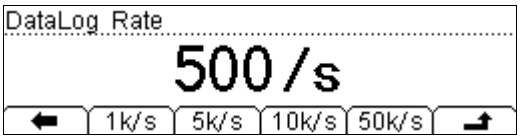


Figure 2- 46 DataLog Rate Setting

Table 2- 35 Menu Description

Function Menu	Setting	Description
1/10m 1/5m . . 50k/s		To set the sample rate with 13 values from 1/10m to 50k/s.
↵		Save all the changes, back to a higher level menu.

2. The Data Log Trigger and Delay

To set the start condition and the delay time of Data Log.

Press Data Log → Log → Start, the interface shows below.

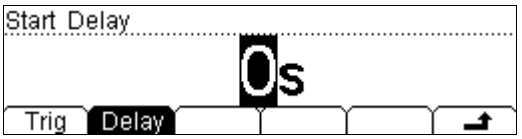


Figure 2- 47 The Menu of Start Manner Interface

Table 2- 36 Menu Description

Function Menu	Setting	Description
Trig	Manu Ext	Set trigger: Manual Set trigger: External
Delay		The time from the start of trigger to the commence of data logging.
↵		Save all the changes, back to a higher level menu.

External trigger

The multimeter receives a trigger signal from the "Ext Trig" at the rear panel. Once at External trigger mode the other trigger is prohibited.

Manual trigger

Press Run Hold under the Manual trigger mode to obtain continuous data.

The factory default trigger mode is Manual trigger.

Start delay

The start delay time refers to the time from the first sample to the start of the second sample.

Press Data Log → Log → Start → Delay, the interface shows below.

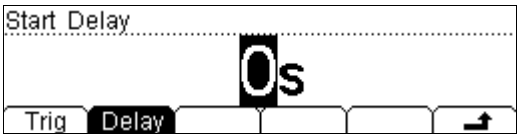


Figure 2- 48 Set the Start Delay

Table 2- 37 Menu Description

Function Menu	Setting	Description
The set value		The default value of delay time is 0s, use the direction key to set the time needed.
↵		Save all the changes, back to a higher level menu.

3. The Data log stop

To set the conditions to stop Data Log.

Press Data Log → Log → Stop, the interface shows below.

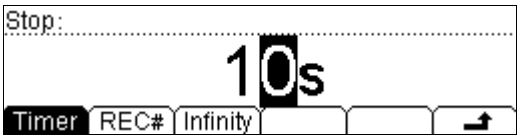


Figure 2- 49 The Stop Condition Menu Interface

Table 2- 38 Menu Description

Function Menu	Setting	Description
Timer		To set the time of Data Log, stop the sampling when the time is over.
REC#		To set the sample points of Data Log, stop the sampling when reach the set number.
Infinity		To set the Data Log don't stop sampling until you force to stop (Press Single button and hold) the sampling.
↵		Save all the changes, back to a higher level menu.

Timer

In Stop menu, press Timer button to set the stop time of Data Log, stop the sample when the time is over.

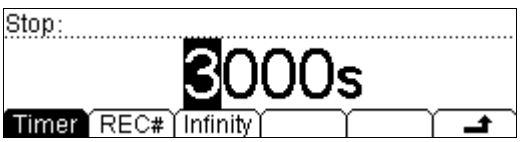


Figure 2- 50 Timer Setting

(1). In timer mode, the default value for timer is 10s and the setting range can be calculated according the sample rate.
(3). Timer parameter is saved in volatile memory.

REC#

In Stop menu, press REC# button to set the sample points of Data Log, stop the sampling when reach the set number.

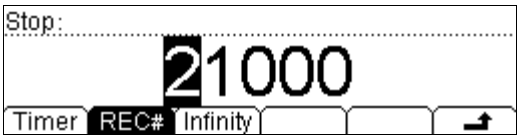


Figure 2- 51 REC# Setting

The setting range of REC# is from 1 to 2M points. The default setting is 1,000 points. The setting is saved in volatile memory.

Multi-Route Scanning

DM3054 and DM3064 have a built-in inspection Module with 16 channels for users to perform Multi-Rote Scanning. The measured results could be easily checked or analyzed under connecting with the PC software "Ultralogger". (Refer to the **Standard accessories**)

Connect the Inspection Box

Signals are inputted to the Multimeter through the Inspection Box. In order to measure signals, please do the following steps:

1. Open the Inspection Box: remove the bolt and press down the two mechanical-style slots on the surface to open it.
2. After open, you will see two rows of terminal and each row corresponds to 8 measurement channels. The name of input terminal and the number of channel are marked near every terminal. (as CH01, LO and HI)
3. The channel from CH01 to CH12 in Inspection Box may be used to measure four types of input signal that contains Voltage, 2-Wire Resistance, Capacitance and Diodes, which that is the terminals in grey zone.
4. The channel from CH13 to CH16 in Inspection Box may be used to measure Current, which that is the terminals in orange zone.
5. The terminal adopts Press mode for connection. First, press corresponding button until the down-lead has been inserted into terminal, and then release so as the down-lead could be hold down firmly.
6. After connecting the down-lead, tie up it by using the wire harness at the back of the box.
7. Cover the Module and screw down.
8. Finally, insert the Inspection Box into the interface (Differential Multiplexer Interface) on the rear panel of DM3000 shown in the following figure:

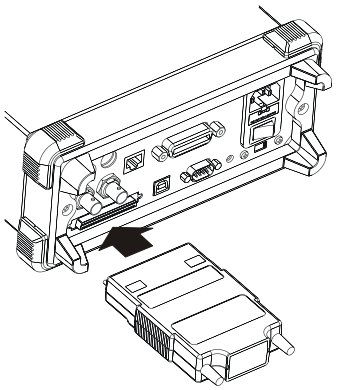


Figure 2- 52
Connect the Inspection Box

CAUTION:
Diff input voltage 150Vpeak (Max), isolated voltage between channels 150Vpeak (Max), current input terminal 1Apeak (Max), channel isolation >60dB (@10kHz), all terminal to the chassis ground voltage 150Vpeak (Max).

Choose Data Log, the menu of High-speed data sampling is shown in the following.

Press Scan to set up the multiplexing inspecting function. The Scanning operations include New, Edit and Load, Press Data Log → Scan, for the Scanning setting menu. The display shows:

Figure 2- 53 Main Interface of Scanning

Table 2- 39 Menu Description

Function Menu	Setting	Description
New		Create a new Scan task.
Edit		Edit the current Scan task.
Load		Load a stored Scan task.
Run		Implement the current Scan task.
⮥		Store the changing and return.

Create a Scan Task

Press Data Log → Scan → New, the Scanning setting menu shows:

Figure 2- 54 New Task

Table 2- 40 Menu Description

Function Menu	Setting	Description
Name		Create the name of the new scan project.
Task		Add the Scan tasks one by one.
Done	Save Apply	Save the setup. Apply the setup.
⮥		Store the changing and return.

To set up the name of the Scanning task

Press Name, and the input interface shown below.

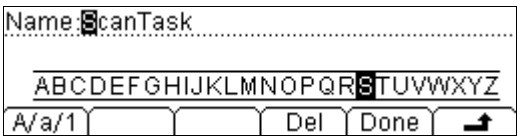


Figure 2- 55 Name the Task

Press Del, delete the letter on which the cursor sits.

Press Done after the name entered for the Scanning task.

To set up the Scanning task

Press Task, enter the main interface to set up the scanning task.

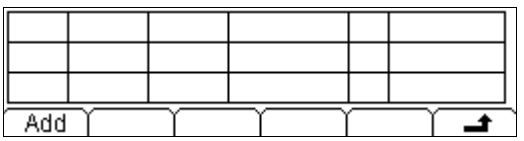


Figure 2- 56 Add the Task

Press Add, setting one of the entries in the scanning task.

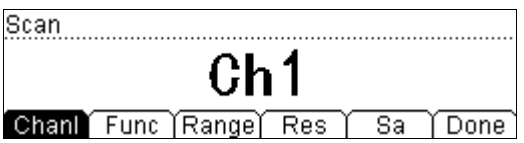


Figure 2- 57 Set the Task

Table 2- 41 Menu Description

Function Menu	Setting	Description
Chanl		Use the direction key to select which channel the task will use.
Func		Select the measure function.
Range		Select the proper range options.
Res		Select the digits reading precision.
Sa		Set the number of the sampling for the task.
Done		Store the changing and return.

Delete or edit the setting task if needed.

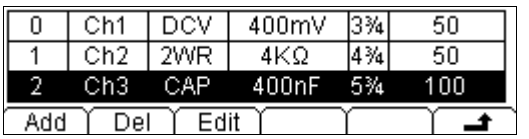


Figure 2- 58 View the Task

A new task would be added at the end of the task list. During editing and deleting, only the chosen (highlighted) task is in effect.

Press Done, choose Save or Apply to set the needed task.

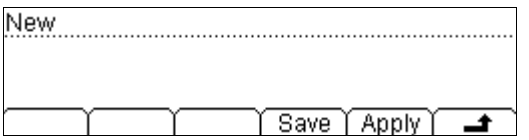


Figure 2- 59 Save or Apply the Task

Press Save, and use the up/down key to choose the location for storing the file.

Figure 2- 60 Save the Task

If data saving is not required, press Apply in figure 2-59 to measure immediately.

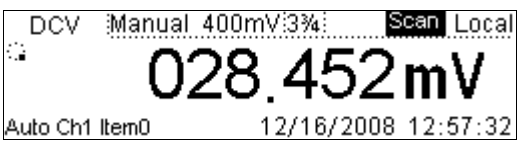


Figure 2- 61 Apply the Task

Operation hint:

1. The system will exit the scanning function after the task(s) is over and return the function interface.
2. Press Single and hold for more than 2 seconds to stop.

Edit the Scan Task

Press Edit in figure 2-68, enter the task editing interface.

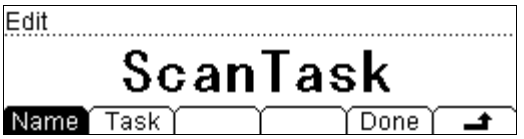


Figure 2- 62 Edit the Task

Table 2- 42 Menu Description

Function Menu	Setting	Description
Name		Edit the current scan project.
Task		Edit the current scan task.
Done		Confirm this change and save.
⮨		Store the changing and return.

After choosing the scanning task to edit, the later operation is the same as creating a new scanning task.

Load the Scan Task

Press Load in Main Interface of Scanning to load the scan task.

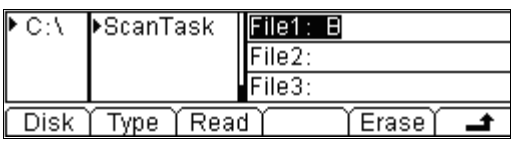


Figure 2- 63 Load a Task

Use the direction key to locate the scanning task file required, and then press Read.

Run the Scan Result

Press Run in Main Interface of Scanning to start the scan task and measure.

View the Scan Result

To view the scan result, the PC software Ultralogger has to be connected. Please connect the USB Device on the rear panel of DM3000 with the USB interface on the computer using the USB data cable we provide. See as follow:

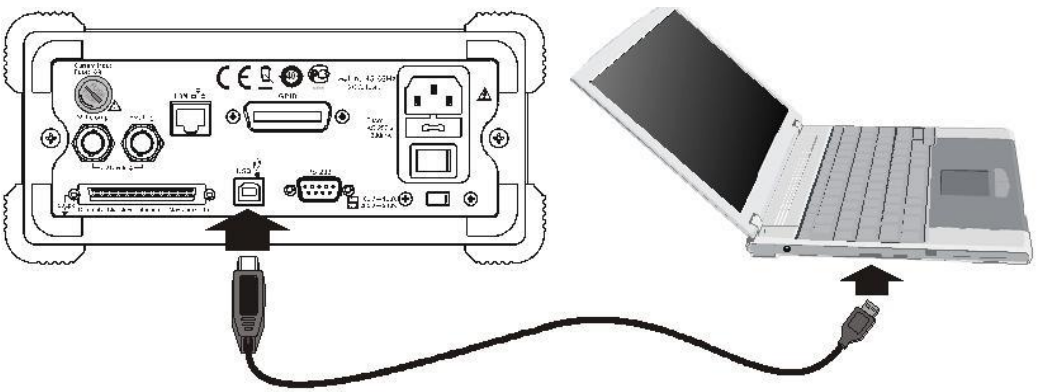


Figure 2- 64
Connection between DM3000 and computer

Run the Ultralogger software that has already installed in your computer and operate according to the description of the online help to get the measured results.

How to Use the Built-in Help System

The built-in help system provides application description of each button on the front panel.

Press Help button, the display shows below:

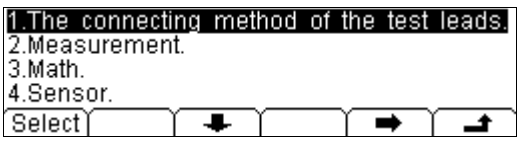


Figure 2- 65 Help System

Table 2- 43 Menu Description

Function Menu	Description
Select	To select the help information you want.
↑	Move up the cursor and select the help menu.
↓	Move down the cursor and select the help menu.
←	Enter the last page help menu.
→	Enter the next page help menu.
↵	Back to a higher level menu.

Notice: The arrowhead ↑ and ← are hidden before any operation is token.
The method of obtaining the help of the keyword:

Use the up/down key to choose the relevant keyword in the help file, press Auto.

1. **Connect the test lead**
   How to connect the lead in different measurements.

2. **Measure**
   How many functions can get when using Meas.

3. **Math measure**
   How to operate the math measure function when using Meas.

4. **Sensor measure**
   How to operate the sensor measure.

5. **To set the Data Log**
   How to set the content when using Datalog.

6. **Storage and read**
   How to store and read the data/parameter/ sensors/scan task.

7. **To set the Utility**
   The method of setting the Utility.

8. **I/O interface**
   Use method of setting the I/O interface.

9. **Help on line**
   Press and hold the key for more than 3 seconds at any operation interface to obtain Help information of the key.

10. **To change the electric power fuse**
    How to change the electric power fuse.

11. **Technique support**
    Getting the technique support.

Chapter 3 Application Examples

Example 1: Reading Statistic Functions

How to obtain the statistic of the maximum value read in the measurement.

The first reading is taken as the maximum value and being shown on the display. It will be renewed with new maximum value sub sequentially.

Do these steps as follows:

1. To measure an AC Voltage. Connect test leads as shown in Figure 1- 10.
2. Press ~V button, select AC Voltage measurement function. Choose an appropriate measurement range.
3. Set the Statistic measurement function parameters.
   (1). Press Math → Stats → Max, choose maximum value measurement.
   (2). Press ↵, save all changes, back to a higher level menu.
4. Start Statistical measurement.
   (1). Press ON, turn on the Statistic measurement function.
   (2). Press ↵, finish this setting.
5. Lead test leads into the circuit and start to measure.

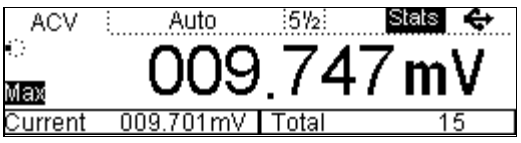


Figure 3- 1 The Statistic Maximum Interface

Example 2: Elimination Leads Resistance Error

When measuring smaller resistance, the test leads resistance may causes large measurement deviation.

Do these steps as follow:

1. To measure a Resistance. Connect test leads as shown in Figure 1- 19.
2. Press Ω button, select Resistance (2WR) measurement function. Choose an appropriate measurement range.
3. Set the Null measurement function parameters.
   (1). Short circuit the test leads.
   (2). Press Meas → Null → Current to set the Null setting value with current reading.
   (3). Press ↵ save this setting.
   (4). Press Meas to finish the setting and back to a higher level menu.
4. In resistance measurement display interface, press Null, start Null function.
5. Lead test leads into circuit and start to measure.

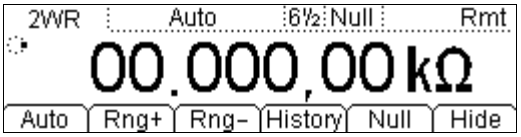


Figure 3- 2 Null Measurement

Example 3: dBm Measurement

Do these steps as follow:

1. Connect test leads into the circuit as shown in Figure 1- 7.
2. Press ⎓V button, select DC Voltage measurement function. Choose an appropriate measurement range.
3. Set the dBm measurement parameters (reference resistance).

   (1). Press Math → dBm to input the dBm setting value.

   (2). Press ↵, save all changes, back to a higher level menu.
4. Start dBm measurement.

   Press Math → ON to turn on dBm measurement function.
5. Lead test leads into circuit and start to measure. The display is the dBm of the setting resistance.

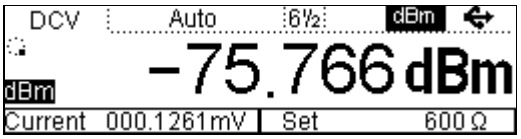


Figure 3- 3 dBm Measurement

Example 4: dB Measurement

Do these steps as follows:

1. Connect test leads into the circuit as shown in Figure 1- 7.
2. Set the reference resistance as described in Example 3.
3. Press ⎓V button, select DC Voltage measurement function. Choose an appropriate range.
4. Set the dB measurement function parameters.
   (1). Press Math → dB, set the dB measurement setting value with the direction key.
   (2). Press ↵, save all changes, back to a higher level menu.
5. Start dB measurement.
   Press Math → ON, turn on dB measurement function.
6. Lead test leads into circuit and start to measure.

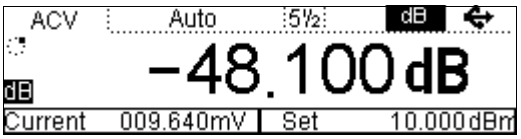


Figure 3- 4 dB Measurement

Example 5: Limit Test

Do these steps as follows:

1. Connect test leads as shown in Figure 1- 7.
2. Press ⎓V button, select DC Voltage measurement function. Choose an appropriate measurement range.
3. Set the Limit measurement function parameters.

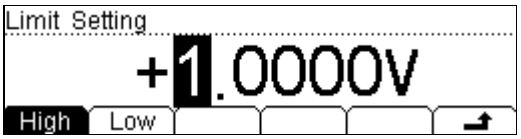


Figure 3- 5 Limit Setting

(1). Press Math → Limit → High, Set up the upper value.

(2). Press Math → Limit → Low, Set up the lower value.

(3). Press ↵, save all changes, back to a higher level menu.

4. Start Limit measurement.

(1). Press Math → ON, turn on Limit measurement function.

(2). Press ↵ to finish this setting.

5. Lead test leads into circuit and start to measure.

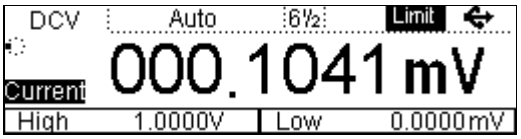


Figure 3- 6 Limit Measurement

Example 6: Temperature Sensor

Setting a sensor is the same way of setting up a temperature sensor. So it needs to set the sensor name, sensor type, sensor physical unit, sensor reference data, and mathematical operations.

Now, the DM3000 has already built-in a temperature sensor project "PT100ITS4W". With this built-in project you can use a temperature sensor convenient.

Do these steps as following:

1. Press Sensor → New to enter Sensor interface.

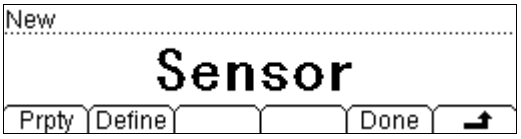


Figure 3- 7 Sensor Interface

2. Press Prpty, enter the property setting interface.

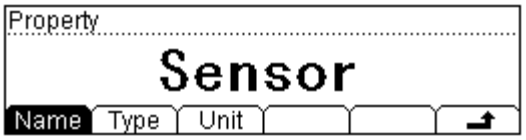


Figure 3- 8 Property Setting Interface.

(1). Press Name, to input the name of this sensor: SensorT.

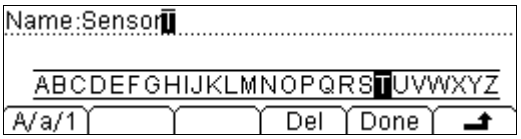


Figure 3- 9 Input Sensor Name

(2). Press Type, to select the type of the sensor: Resistance.

Figure 3- 10 Select Sensor Type

(3). Press Unit → ℃, select the unit of the sensor: ℃.

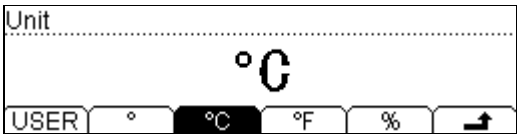


Figure 3- 11 Select Unit

When finish a proper input, press ⮨ to save all the changes and back to a higher level menu.

3. Press Define, the interface shows below:

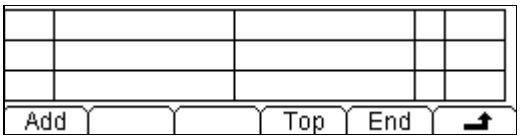


Figure 3- 12 Define Sensor Data

4. Press Add button, input the first group of reference value: 111.480Ω, 29.5℃.

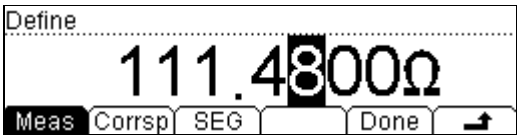


Figure 3- 13 Input Sensor Data

5. Press SEG → Arith → Line, Select the arithmetic: Line.

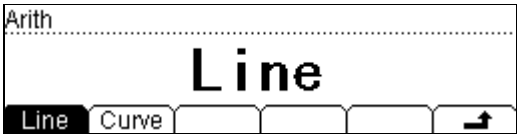


Figure 3- 14 Select Arithmetic

Press ⮨ to return (Figure 3-13) and press Done to save all changes, and continue to input other values.

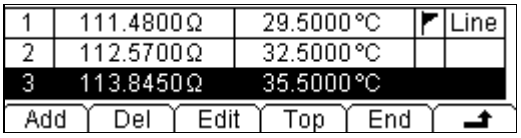


Figure 3- 15 Add Groups of Data

When you finish inputting all the data, press ⮨ and save all the changes, back to a higher level menu.

6. Press ⮨ → Done → Apply, save all the data into the local storage, and applies it immediately.

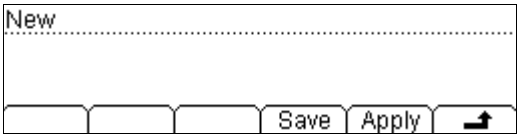


Figure 3- 16 Apply the Setting

7. According to the sensor type, select an appropriate connection method as shown in Figure 1- 53 and Figure 1- 54 and start to measure.

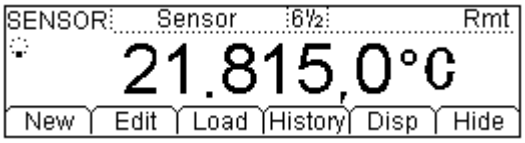


Figure 3- 17 Temperature Measurement

Example 7: Reading Hold

Do these steps as follows:

1. Connect test leads as shown in Figure 1- 7.
2. Press ⎓V button, select DC Voltage measurement function. Choose an appropriate measurement range.
3. Set the Hold measurement function parameters.

   (1). Press Trig → Auto → Hold → 0.1%, set up the hold range to 0.1%.

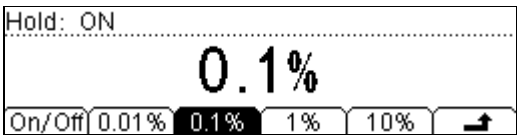


Figure 3- 18 Hold Range Setting

   (2). Press ↵ to save all changes, back to a higher level menu.

4. When the Run Hold lights, press the button once, it will blink, which means the trigger mode is now Hold mode. If current trigger mode is single, press the button twice.
5. Lead test leads into circuit, start to measure.

Chapter 4 Prompt Messages& Troubleshooting

Prompting Message

1. **Delay time is 400 to 7000ms**
   In trigger setting, the setting value range of auto trigger delay time is 400~7000ms.

2. **No useful Math**
   Currently measurement function is not available for Math function.

3. **The range of the short resistance is 1Ω to 2000Ω**
   In continuity measurement, the short-current resistance setting value range is 1Ω~2000Ω.

4. **Sample is 1 to 1,000**
   Single trigger sampling number range is 1~ 1,000.

5. **Achieves the Maximum number**
   In sensor setting, the reference value number gets the max value.

6. **Number of reference value is ****
   The sensor reference value number is: **.

7. **Resistance is -120MΩ to +120MΩ**
   In limit test and null value settings the resistance value range: -120MΩ~120MΩ.

8. **The periods setting value must larger than 1μs**
   In limit test and null value settings the periods setting value should be bigger than 1μs.

9. **Value is unable**
   Null value function setting value cannot surpass the measuring range.

10. **Upper limit should larger than lower limit**
    In limit measurement the Upper limit should larger than lower limit.

11. **GPIB address is from 1 to 30**
    GPIB I/O interface address setting value range: 1 ~ 30.

12. DCV is -1200V to 1200V

In limit test and null value settings the DC voltage setting value range is -1200V ~ 1200V.

13. DCI is 0 to 12A

In limit test and null value settings the DC current setting value range is 0~12A.

14. dB is -120dBm to 120dBm

In dB measurement function, the dB setting value range is -120dBm ~120dBm.

15. dBm is 0 to 8000Ω

In dBm measurement function, the setting value range is 0~8000Ω.

16. ACV is -900V to 900V

In limit test and null value settings the AC voltage setting value range is -900V~900V.

17. ACI is 0 to 12A

In limit test and null value settings the AC current setting value range is 0~12A.

18. Maximum value is **

Currently measurement function Max setting value: **.

19. Minimum value is **

Currently measurement function Min setting value: **.

20. Unused

The measurement for the current measuring function is unused for currently measuring function.

21. Confirm to Change settings?

Load the selected file or not.

22. Delete File?

Delete the selected file or not.

Troubleshooting

1. When press the power switch, the multimeter has blank screen with nothing displaying:

(1). Check if the power is correctly connected.
(2). Check if the main power switch on the back panel has been turn on.
(3). Check if the safety fuse has been blown, replace with a new one if necessary.
(4). Having done with the above steps, restart the instrument.
(5). If it still cannot work properly, please contact the local **RIGOL** Support center, let's serve for you.

2. When connecting a current signal, the reading has any change:

(1). Check if the test lead is correctly connected to current jack or the LO jack.
(2). Check if the safety fuse in the current location on the back panel has been blown.
(3). Check if the measure location has switched to the DCI or ACI place correctly.
(4). Check whether the input is ACI but the shelves location is DCI.

3. When connecting a DC signal, the reading display is abnormality:

(1). Check if the test lead is correctly connected with the current jack or the LO jack.
(2). Check if the safety fuse in the current location on the back panel has been blown.
(3). Check the measure location has switched to the DCI or DCV place correctly.
(4). Check whether the input is DCI but the shelves location is ACI.

To Change the Electric Power Fuse

The electric power fuse located in the rear of the Multimeter, the fuse is a kind of delay, no-burst, 250V/300mAT, 5×20mm one.

Operation steps

1. Disconnect the power. Use the tool to press down the block (as the dashed line point out), and then pull out the seat of the fuse.
2. Choose the correct voltage shelves location in the voltage selected switches.
3. Enclose the seat of the fuse to the slot after placed the fuse.

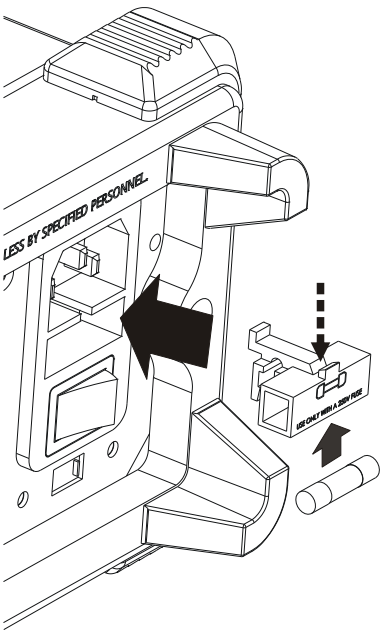


Figure 4- 1
The sketch diagram of changing the fuse

Chapter 5 Characteristics

Characteristics for DM306x

DC Characteristics

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

Function	Range[3]	Test Current or Burden Voltage	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
DC Voltage	200.0000mV		0.0030+0.0030	0.0065+0.0065	0.0085+0.0070	0.0005+0.0007
	2.000000V		0.0020+0.0006	0.0060+0.0007	0.0078+0.0007	0.0005+0.0001
	20.00000V		0.0020+0.0004	0.0065+0.0005	0.0085+0.0005	0.0005+0.0001
	200.0000V		0.0020+0.0006	0.0082+0.0011	0.0100+0.0012	0.0007+0.0002
	1000.000V[5]		0.0025+0.0006	0.0095+0.0010	0.0110+0.0010	0.0010+0.0001
DC Current	2.000000mA	<0.03V	0.010+0.014	0.060+0.035	0.076+0.050	0.0027+0.0070
	20.00000mA	<0.3V	0.010+0.002	0.058+0.006	0.075+0.006	0.0027+0.0007
	200.0000mA	<0.3V	0.020+0.002	0.065+0.005	0.081+0.005	0.0027+0.0008
	1.000000A	<0.3V	0.020+0.016	0.065+0.030	0.073+0.030	0.0027+0.0062
	10.00000A [7]	<0.6V	0.300+0.020	0.330+0.020	0.330+0.020	0.0030+0.0025
Resistance[4]	200.0000Ω	1mA	0.0106+0.0097	0.018+0.011	0.020+0.011	0.0008+0.0007
	2.000000kΩ	1mA	0.0022+0.0011	0.010+0.002	0.015+0.002	0.0008+0.0001
	20.00000kΩ	100uA	0.0020+0.0006	0.010+0.001	0.015+0.001	0.0008+0.0001
	200.0000kΩ	10uA	0.0020+0.0005	0.010+0.001	0.015+0.001	0.0008+0.0001
	1.000000MΩ	2uA	0.0020+0.0010	0.010+0.001	0.015+0.001	0.0008+0.0002
	10.00000MΩ	200nA	0.0112+0.005	0.0550+0.006	0.056+0.006	0.0060+0.0004
	100.0000MΩ	200nA||10MΩ	0.300+0.010	0.800+0.011	0.800+0.015	0.1500+0.0002
Diode Test	2.4000V [6]	1mA	0.005+0.050	0.008+0.050	0.010+0.050	0.0010+0.0020
Continuity	2000Ω	1mA	0.005+0.050	0.008+0.050	0.010+0.050	0.0010+0.0020

[1] Specifications are for 60 minutes warm–up and select 6½ reading resolution.

[2] Relative to calibration standards.

[3] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[4] Specifications are for 4–wire resistance function, or 2–wire resistance using Math Null. Without Math Null, add 0.2 Ω additional errors in 2–wire resistance function.

[5] For each additional volt over ± 500 VDC add 0.02 mV of error.

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

[7] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

Settling Considerations

Reading settling times are affected by source impedance, cable dielectric characteristics, and input signal changes. Typically, settling time <1.5s when source impedance less than 1kΩ.

AC Characteristics

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

Function	Range[3]	Frequency Range	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
True RMS AC Voltage[4]	200.000mV	3Hz-10Hz	5.0+0.05	5.0+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.53+0.05	0.57+0.06	0.60+0.07	0.035+0.004
		40Hz-20kHz	0.08++0.05	0.14+0.06	0.15+0.07	0.005+0.004
		20kHz-50kHz	0.10+0.05	0.14+0.06	0.16+0.05	0.011+0.005
		50kHz-100kHz	0.5+0.10	0.6+0.20	0.60+0.20	0.06+0.008
		100kHz-300kHz	4.0+0.80	4.5+0.80	4.50+0.80	0.2+0.02
	2.00000V to 750.00V	3Hz-10Hz	5.0+0.05	5.0+0.07	5.10+0.07	0.15+0.006
		10Hz-40Hz	0.35+0.05	0.37+0.06	0.38+0.07	0.035+0.003
		40Hz-20kHz	0.08+0.05	0.10+0.06	0.11+0.07	0.005+0.003
		20kHz-50kHz	0.40+0.05	0.40+0.06	0.40+0.07	0.011+0.005
		50kHz-100kHz	0.55+0.10	0.60+0.10	0.60+0.10	0.07+0.008
		100kHz-300kHz	4.0+0.80	4.0+0.80	4.00+0.80	0.2+0.02
True RMS AC Current[5]	20.0000mA	3Hz-10Hz	5.0+0.05	5.1+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.55+0.05	0.61+0.06	0.64+0.07	0.035+0.006
		40Hz-5kHz	0.13+0.05	0.18+0.06	0.22+0.07	0.015+0.006
		5kHz-10kHz	0.20+0.25	0.2+0.25	0.22+0.25	0.03+0.006
	200.000mA	3Hz-10Hz	5.0+0.05	5.1+0.07	5.1+0.07	0.15+0.006
		10Hz-40Hz	0.55+0.05	0.62+0.06	0.64+0.07	0.035+0.006
		40Hz-5kHz	0.13+0.05	0.20+0.06	0.22+0.07	0.015+0.006
		5kHz-10kHz	0.20+0.25	0.20+0.25	0.22+0.25	0.03+0.006
	1.00000A	3Hz-10Hz	5.0+0.16	5.1+0.25	5.2+0. 27	0.24+0.047
		10Hz-40Hz	0.64+0.16	0.70+0.25	0.71+0.27	0.035+0.047
		40Hz-5kHz	0.22+0.16	0.28+0.25	0.29+0.27	0.015+0.047
		5kHz-10kHz	0.35+0.2	0.35+0.4	0.35+0.4	0.03+0.047
	10.0000A[7]	3Hz-1Hz	5.3+0.05	5.40+0.07	5.4+0.07	0.24+0.006
		10Hz-40Hz	0.8+0.05	0.9+0.06	0.9+0.07	0.035+0.006
		40Hz-5kHz	0.40+0.06	0.90+0.06	0.90+0.06	0.015+0.006
		5kHz-10kHz	0.42+0.1	0.75+0.06	0.75+0.06	0.03+0.006

[1] Specifications are for 60 minute warm–up and select 6½ reading resolution.

[2] Relative to calibration standards.

[3] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[4] Specifications are for sine wave input >5% of range. For inputs from 1% to 5% of range and <50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range.
750 Vac range limited to 100 kHz or $8x10^7$ Volt-Hz.

[5] Specifications are for sine wave input >5% of range. Add 0.1% of the range for the sine wave input is 1%~5% of the range.

[6] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

Low Frequency Performance

Three filter settings are available:
Slow: 3Hz~300kHz
Mid: 20Hz~300kHz
Fast: 200Hz~300kHz

Frequencies greater than these filter settings are specified with no additional errors.

Settling Considerations

Applying >300VRMS (or >2ARMS) will cause self-heating in signal-conditioning components. These errors are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be less than 0.02% of reading and will generally dissipate within a few minutes.

Frequency Period Characteristics

Accuracy Specifications (% of reading)[1]

Function	Range[3]	Frequency Range	24 Hour[2] Tcal±1℃	90 Day Tcal±5℃	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal + 5 ℃) to 55 ℃
Frequency Period	200mV to 750V[3]	3Hz-5Hz	0.07	0.07	0.07	0.005
		5Hz-10Hz	0.04	0.04	0.04	0.005
		10Hz-40Hz	0.02	0.02	0.02	0.001
		40Hz-300kHz	0.005	0.006	0.007	0.001
	20mA to 10A [4]	3Hz-5Hz	0.07	0.07	0.07	0.005
		5Hz-10Hz	0.04	0.04	0.04	0.005
		10Hz-10kHz	0.005	0.006	0.007	0.001

[1] Specifications are for 60 minute warm–up and select 6½ reading resolution.

[2] Relative to calibration standards.

[3] For AC input voltages 10% to 120% of range except where noted. 750V range limited to 750VRMS. 100mV range specifications are for full scale or greater inputs. For inputs from 10mV to 100mV, multiply total % of reading error by 10.

[4] For the 20mA, 200mA, 10A ranges, the AC input current from 10% to 120% of range except where noted. For 1A range, the AC input current from 50% to 120% of range except where noted.

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 Considerations

Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. The input blocking RC time constant must be allowed to fully settle (up to 1 sec) before the most accurate measurements are possible.

Capacitance Characteristics

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

Function	Range[2]	Test Current	1 Year Tcal±5℃	Temperature Coefficient 0 ℃ to (Tcal–5 ℃) (Tcal+ 5 ℃) to 55 ℃
Capacitance	2.000nF	200nA	2 + 2.5	0.05+0.05
	20.00nF	1uA	1 + 0.5	0.05+0.01
	200.0nF	10uA	1 + 0.5	0.01+0.01
	2.000uF	100uA	1 + 0.5	0.01+0.01
	20.00uF	1mA	1 + 0.5	0.01+0.01

[1] Specifications are for 60 minute warm–up using Math Null. Additional errors may occur for non–film capacitors.

[2] Specifications are for 1% to 120% of range on the 1nF range and 10% to 120% of range on all other ranges.

Measuring Characteristics

DC Voltage

Input Resistance:	
200mV, 2V, 20V ranges	Selectable 10MΩ ± 2% or >10GΩ
200V, 1000V ranges	10MΩ ± 2%

Resistance

Measurement Method:	Selectable 4-wire or 2-wire. Current source referenced to LO input.
Open-circuit Voltage:	Limit in <7V.
Max. Lead Resistance: (4-wire ohms)	10% of range per lead for 200Ω, 1kΩ range. 1kΩ per lead on all other ranges.
Input Protection:	1000V on all ranges.

DC Current

Shunt Resistor:	0.025Ω for 1A, 10A 1.025Ω for 200mA 11.025Ω for 2mA, 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Continuity / Diode Test

Response Time:	25 samples / sec
Measurement Method:	1mA ±0.2% test current, Limit in <7V
Continuity Threshold:	Adjustable from 1Ω to 2000Ω
Input Protection:	1000V

True RMS AC Voltage

Measurement Method:	AC-coupled True RMS – measures the ac component of input with up to 400Vdc of bias on any range.
Input Impedance:	1MΩ ± 2%, in parallel with <100pF
Input Protection:	750VRMS all ranges

True RMS AC Current

Measurement Method:	Direct coupled to the fuse and shunt. AC-coupled True RMS measurement (measures the ac component only)
Max. Input:	The DC + AC current peak value <300% of the range. The RMS current including DC current <10A.

Shunt Resistor:	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Frequency and Period

Measurement Method:	Reciprocal-counting technique. AC-coupled input using the ac voltage measurement function.
Input Impedance (Voltage Signal):	1MΩ ± 2%, in parallel with <100pF
Shunt Resistor (Current Signal):	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	750VRMS all ranges; Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Capacitance

Measurement Method:	Current input with measurement of resulting ramp.
Connection Type:	2-wire

Triggering and Memory

Samples per Trigger:	1 to 1000
Trigger Delay:	0 to 2000ms
Trigger Input:	
Input Level:	TTL compatible (High level when left trigger input open)
Trigger Condition:	Selectable Rising, Falling, Low-level, High-level.
Input Impendence:	>20kΩ, in parallel with 400pF, AC-coupled
Min Pulse width:	0.24ms
VMC Output:	
Level:	TTL compatible (Input to ≥ 1kΩ load)
Output Polarity:	Selectable Positive, Negative
Output Impendence:	200Ω, typical
Nonvolatile Memory:	512k readings
Volatile Memory:	2M readings

Inspection Function on Rear Panel (for DM3064 ONLY)

CAUTION:

Voltage between LO terminal and ground limit to 150Vpeak(Max).

Channels: 12 differential voltage channels, 4 differential current channels.

Measurement Functions: 2WR, Capacitance, DCV, DCI, ACV, ACI, Diodes , frequency and Period.

Work characteristic: Thermo EMF <6uV. Maximum scanning rate is 2 channels per second.

Input characteristic: Differential input voltage 150Vpeak(Max), isolation voltage between channels 150Vpeak(Max), current input terminal 1Apeak(Max), channel isolation >60dB(@10kHz), all terminal to the chassis ground voltage 150Vpeak(Max).

Current channel protection: Internal 2A self- recover fuse

Voltage channel protection: 250V over voltage protection.

Real-time Clock

Precision:	1min/month (Environment Temperature >0℃)
Clock battery Life:	2 years

Math Functions

Null, Min/Max/Average, dBm, dB, Limit Test (with TTL output)

Other Functions

Reading Hold, Ratio Measurement

High-speed Sampling

50kSa/s (In DataLog function)

Reading Resolution

2,400,000 Count, >6 1/2 digits

USB I/O Interface

USB Host (support U-disk), USB Device interface.

Other I/O Interface

RS232, GPIB (Optional) support for SCPI command, LAN (Optional)

General Specifications

Display:	256 x 64 pixels LCD to support multi-display, menu, multi-language help and waveform display.
Data Acquisition Software:	Support Microsoft® Windows 98/Me, Windows 2000/XP
Power Supply:	100V/ 120V/ 220V/ 240V ±10%
Power Line Frequency:	45Hz to 66Hz
Power Consumption:	20VA peak
Operating Environment:	Full accuracy for 0℃ to 50℃, 95% R.H. at 40℃ non-condensing
Storage Temperature:	-20℃ to 70℃
Safety:	Measurement CAT II 300V, CAT I 1000V. Pollution Degree 1.
Vibration & Shock:	Mil-T-28800E, Type III, Class 5 (Sine Only)
Weight:	2.5kg
Size (H x W x D):	107.0mm x 231.6mm x 290.5m

Characteristics for DM305x

DC Characteristics

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

Function	Range[2]	Test Current or Burden Voltage	Input Impedance	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
DC Voltage	400.000mV		10MΩ or>10GΩ	0.025 + 0.008	0.0015+0.0005
	4.00000V		10MΩ or>10GΩ	0.025 + 0.006	0.0010+0.0005
	40.0000V		10MΩ	0.025 + 0.006	0.0020+0.0005
	400.000V		10MΩ	0.030 + 0.006	0.0020+0.0005
	1000.00V[4]		10MΩ	0.030 + 0.005	0.0015+0.0005
DC Current	2.00000mA	<0.03V		0.050 + 0.070	0.0040+0.0070
	20.0000mA	<0.3V		0.050 + 0.008	0.0040+0.0007
	200.000mA	<0.3V		0.050 + 0.009	0.0040+0.0008
	1.00000A	<0.3V		0.100 + 0.070	0.0100+0.0062
	10.0000A[5]	<0.6V		0.200 + 0.007	0.0100+0.0007
Resistance[3]	400.000Ω	1mA		0.050 + 0.010	0.0030+0.0005
	4.00000kΩ	100uA		0.015 + 0.006	0.0030+0.0005
	40.0000kΩ	10uA		0.015 + 0.006	0.0030+0.0005
	400.000kΩ	2uA		0.030 + 0.007	0.0030+0.0005
	4.00000MΩ	200nA		0.060 + 0.010	0.0030+0.0005
	100.000MΩ	200nA ||10MΩ		2.00 + 0.005	0.1500+0.0005
Diode Test	2.4000V[6]	1mA		0.05 + 0.010	0.0050+0.0005
Continuity	2000Ω	1mA		0.05 + 0.010	0.0050+0.0005

[1] Specifications are for 60 minute warm–up, selecting 5 3/4 reading resolution and calibration temperature 18 ℃ – 28 ℃.

[2] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[3] Specifications are for 4–wire resistance function, or 2–wire resistance using Math Null. Without Math Null, add 0.2 Ω additional errors in 2–wire resistance function.

[4] For each additional volt over ± 500 VDC add 0.02 mV of error.

[5] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

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

Settling Considerations

Reading settling times are affected by source impedance, cable dielectric characteristics, and input signal changes. Typically, settling time <1.5s when source impedance less than 1kΩ.

AC Characteristics

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

Function	Range[2]	Frequency Range	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
True RMS AC Voltage[3]	200.000mV	10Hz-45Hz	1.0 + 0.1	0.02+0.02
		45Hz-20kHz	0.2 + 0.1	0.02+0.02
		20kHz-50kHz	2.0 + 0.2	0.02+0.02
		50kHz-100kHz	4.0 + 0.2	0.02+0.02
	2V to 750.00V	10Hz-45Hz	1.0 + 0.1	0.02+0.02
		45Hz-20kHz	0.2 + 0.1	0.02+0.02
		20kHz-50kHz	1.0 + 0.1	0.02+0.02
		50kHz-100kHz	2.0 + 0.2	0.02+0.02
True RMS AC Current[4,6]	20.0000mA	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-10kHz	2.0+0.2	0.02+0.02
	200.000mA	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-10kHz	2.0+0.2	0.02+0.02
	1.00000A	10Hz-45Hz	1.5+0.5	0.02+0.05
		45Hz-2kHz	0.5+0.5	0.02+0.05
		2kHz-10kHz	2.0+0.5	0.02+0.05
	10.0000A[6]	10Hz-45Hz	1.5+0.1	0.02+0.02
		45Hz-2kHz	0.5+0.1	0.02+0.02
		2kHz-5kHz	2.0+0.2	0.02+0.02

[1] Specifications are for 60 minute warm–up and select 5 3/4 reading resolution.

[2] 20% over range on all ranges, except DCV 1000V, ACV 750V, DCI and ACI 10A range.

[3] Specifications are for sine wave input >5% of range. For inputs from 1% to 5% of range and <50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range.
750 Vac range limited to 100 kHz or $8x10^7$ Volt-Hz.

[4] Specifications are for sine wave input >5% of range. Add 0.1% of the range for the sine wave input is 1%~5% of the range.

[5] For current terminal, > 7A DC or ACRMS for 30 seconds ON and 30 seconds OFF.

[6] Typically 30% of reading error at 100kHz.

Low Frequency Performance

Three filter settings are available:
Slow: 3Hz~100kHz
Mid: 20Hz~100kHz
Fast: 200Hz~100kHz

Frequencies greater than these filter settings are specified with no additional errors.

Settling Considerations

Applying >300VRMS (or >1ARMS) will cause self-heating in signal-conditioning components. These errors are included in the instrument specifications. Internal temperature changes due to self-heating may cause additional error on lower ac voltage ranges. The additional error will be less than 0.02% of reading and will generally dissipate within a few minutes.

Frequency Period Characteristics

Accuracy Specifications (% of reading)[1]

Function	Range	Frequency Range	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
Frequency Period	200mV to 750V[2]	3Hz-5Hz	0.10	0.005
		5Hz-10Hz	0.07	0.005
		10Hz-40Hz	0.02	0.005
		40Hz-300kHz	0.02	0.005
	20mA to10A[3]	3Hz-5Hz	0.10	0.005
		5Hz-10Hz	0.07	0.005
		10Hz-10kHz	0.02	0.005

[1] Specifications are for 60 minute warm–up.

[2] For AC input voltages 10% to 120% of range except where noted. 750V range limited to 750VRMS. 100mV range specifications are for full scale or greater inputs. For inputs from 10mV to 100mV, multiply total % of reading error by 10.

[3] For the 20mA, 200mA, 10A ranges, the AC input current from 10% to 120% of range except where noted. For 1A range, the AC input current from 50% to 120% of range except where noted.

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 Considerations

Errors will occur when attempting to measure the frequency or period of an input following a DC offset voltage change. The input blocking RC time constant must be allowed to fully settle (up to 1 sec) before the most accurate measurements are possible.

Capacitance Characteristics

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

Function	Range[2]	Test Current	1 Year 23℃±5℃	Temperature Coefficient 0 ℃ to 18 ℃ 28 ℃ to 55 ℃
Capacitance	4.000n**F**	1uA	2 + 2.5	0.05+0.05
	40.00n**F**	10uA	1 + 0.5	0.05+0.01
	400.0n**F**	10uA	1 + 0.5	0.01+0.01
	4.000u**F**	1mA	1 + 0.5	0.01+0.01
	40.00u**F**	1mA	1 + 0.5	0.01+0.01
	200.0u**F**	1mA	1 + 0.5	0.01+0.01

[1] Specifications are for 60 minute warm–up using Math Null. Additional errors may occur for non–film capacitors.

[2] Specifications are for 1% to 120% of range on the 4nF range and 10% to 120% of range on all other ranges.

Measuring Characteristics

DC Voltage

Input Resistance:	
400mV, 4V ranges	Selectable 10MΩ ± 2% or >10GΩ
40V, 400V, 1000V ranges	10MΩ ± 2%

Resistance

Measurement Method:	Selectable 4-wire or 2-wire. Current source referenced to LO input.
Open-circuit Voltage:	Limit in <7V.
Max. Lead Resistance: (4-wire ohms)	10% of range per lead for 400Ω, 1kΩ per lead on all other ranges.
Input Protection:	1000V on all ranges.

DC Current

Shunt Resistor:	0.025Ω for 1A, 10A 1.025Ω for 200mA 11.025Ω for 2mA, 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Continuity / Diode Test

Measurement Method:	1mA ±0.2% test current, Limit in <8V
Response Time:	25 samples / sec
Continuity Threshold:	Adjustable from 1Ω to 2000Ω
Input Protection:	1000V

True RMS AC Voltage

Measurement Method:	AC coupled true-RMS-measure the ac component of input with up to 400Vdc of bias on any range
Input Impedance:	1MΩ ± 2%, in parallel with 100pF
Input Protection:	750VRMS all ranges

True RMS AC Current

Measurement Method:	Direct coupled to the fuse and shunt. AC coupled true RMS measurement (measures the ac component only)
Max. Input:	The DC + AC current peak value <300% of the range. The RMS current including DC current <10A.

Shunt Resistor:	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Frequency and Period

Measurement Method:	Reciprocal-counting technique. AC-coupled input using the ac voltage measurement function.
Input Impedance (Voltage Signal):	1MΩ ± 2%, in parallel with <150pF
Shunt Resistor (Current Signal):	0.025Ω for 1A, 10A, 1.025Ω for 200mA, 11.025Ω for 20mA
Input Protection:	750VRMS all ranges; Externally accessible 10A, 250V fuse Internal 12A, 250V fuse

Capacitance

Measurement Method:	Current input with measurement of resulting ramp.
Connection Type:	2-wire

Triggering and Memory

Samples per Trigger:	1 to 1000
Trigger Delay:	0 to 2000ms
Trigger Input:	
Input Level:	TTL compatible (High level when left trigger input open)
Trigger Condition:	Selectable Rising, Falling, Low-level, High-level.
Input Impendence:	>20kΩ, in parallel with 400pF, AC-coupled
Min Pulsewidth:	0.24ms
VMC Output:	
Level:	TTL compatible (Input to ≥ 1kΩ load)
Output Polarity:	Selectable Positive, Negative
Output Impendence:	200Ω, typical

Nonvolatile Memory: 512K readings

Volatile Memory: 2M readings

Inspection Function on Rear Panel (for DM3054 ONLY)

CAUTION:

Voltage between LO terminal and ground limit to 150Vpeak(Max).

Channels: 12 differential voltage channels, 4 differential current channels.

Measurement Functions: 2WR, Capacitance, DCV, DCI, ACV, ACI, Diodes , frequency and Period.

Work characteristic: Thermo EMF <6uV. Maximum scanning rate is 2 channels per second.

Input characteristic: Differential input voltage 150Vpeak(Max), isolation voltage between channels 150Vpeak(Max), current input terminal 1Apeak(Max), channel isolation >60dB(@10kHz), all terminal to the chassis ground voltage 150Vpeak(Max).

Current channel protection: Internal 2A self- recover fuse

Voltage channel protection: 250V over voltage protection.

Real-time Clock

Precision:	1min/month (Environment Temperature >0℃)
Clock battery Life:	2 years

Math Functions

Null, Min/Max/Average, dBm, dB, Limit Test (with TTL output)

Other Functions

Reading Hold, Ratio Measurement

High-speed Sampling

50kSa/s (In Datalog function)

Reading Resolution

480,000 Count, >5 3/4 digits

USB I/O Interface

USB Host (support U-disk), USB Device interface.

Other I/O Interface

RS232, GPIB (Optional) support for SCPI command, LAN (Optional)

General Specifications

Display:	256 x 64 pixels LCD to support multi-display, menu, multi-language help and waveform display.
Data Acquisition Software:	Support Microsoft® Windows 98/Me, Windows 2000/XP
Power Supply:	100V/ 120V/ 220V/ 240V ±10%
Power Line Frequency:	45Hz to 66Hz
Power Consumption:	20VA peak
Operating Environment:	Full accuracy for 0℃ to 50℃, 95% R.H. at 40℃ non-condensing
Storage Temperature:	-20℃ to 70℃
Safety:	Measurement CAT II 300V, CAT I 1000V. Pollution Degree 1.
Vibration & Shock:	Mil-T-28800E, Type III, Class 5 (Sine Only)
Weight:	2.5kg
Size (H x W x D):	107.0mm x 231.6mm x 290.5m

Chapter 6 Appendix

Appendix A: DM3000 Series Accessories

Standard Accessories:

- A Power Cord that fits the standard of destination country.
- A USB Data Cable
- Two Test Leads (black and red)
- A Quick Guide
- Two Backup Fuses
- A Inspection Box (DMM External Connection Module) (DM3054/3064 only)
- A CD-ROM:

  User's Guide

  UltraSensor PC Software

  UltraLogger PC Software

Optional Accessories:

- RS232 Cable
- Kelvin Test Clip
- Inspection card extended line (for DM3054/3064 ONLY)

All the accessories (standard and optional) are available by contacting your local **RIGOL** office.

Appendix B: Warranty

RIGOL warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment from an authorized **RIGOL** distributor. If a product proves defective within the respective period, **RIGOL** will provide repair or replacement as described in the complete warranty statement.

To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest **RIGOL** sales and service office.

RIGOL do 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: General Care and Cleaning

General Maintenance

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

Caution

To avoid damages to the instrument or the test leads, do not expose them to liquids which have causticity.

Cleaning

Clean the instrument and test leads regularly based on the 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 and test leads with a lint- free cloth (with a mild detergent and water). When clean the LCD, take care to avoid scarifying it.

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

Appendix D: Contact RIGOL

If you have any problem or requirement occurs when using our products, please contact **RIGOL** Technologies, Inc. or the local distributors.

In China: Please call
Tel: (86-10) 8070 6688
Fax: (86-10) 8070 5070
Service & Support Hotline: **800 810 0002**
9:00 am–5: 00 pm from Monday to Friday

Or by e-mail:
service@rigol.com

Or mail to:
RIGOL Technologies, Inc.
156# CaiHe Village, ShaHe Town, ChangPing District, Beijing, China
Post Code: 102206

Overseas: Contact the local **RIGOL** distributors or sales office.

For the latest product information and service, visit our website: www.rigol.com