TELEDYNE TEST TOOLS
Everywhereyoulook™

# User Manual

T3DMM6-5 Digital Multimeter
T3DMM6-5-SC Digital Multimeter

# Copyright and Statement



## Trademark Information

**Teledyne Test Tools** is registered trademark of Teledyne Test Tools.

## Statement

- **Teledyne Test Tools** products are protected by patent laws in and outside of the United States of America.
- **Teledyne Test Tools** reserves the rights to change the specification and price.
- Information in this publication replaces all previous corresponding published material.
- Contents in this manual are not allowed to be copied, extracted or translated in any form or by any means without **Teledyne Test Tools** permission.

# General Safety Summary

Read the following safety precautions carefully to avoid any personal injuries or damage to the instrument and any products connected to it. Use the instrument only as specified.

**Use only the power cord supplied with the instrument.**

**Ground the instrument.**

The instrument is grounded through the ground conductor of the power cord. To avoid electric shock, always connect to grounded outlets. Make sure the instrument is grounded correctly before connecting its input or output terminals.

**Connect the signal wires correctly.**

To avoid damage, observe input polarity and maximum voltage/current ratings at all times.

**Observe all terminal ratings and signs on the instrument to avoid fire or electric shock.** Before connecting to the instrument, read the manual to understand the input/output ratings.

**Do not operate with suspected failures.** If you suspect that the product is damaged, contact the Teledyne LeCroy service department immediately.

**Do not operate in wet/damp conditions.**

**Do not operate in an explosive atmosphere.**

**Keep the surface of the instrument clean and dry.**

**Avoid circuit or wire exposure.** Do not touch exposed contacts or components when the power is on.

**Do not operate without covers.**

Do not operate the instrument with covers or panels removed.

**Use only the fuse specified for the instrument.**

**Use proper over-voltage protection.**

**Use anti-static protection.** Operate in an anti-static protected area. Ground measurement cable conductors before connecting to the instrument to discharge any static electricity before connecting the cables to the instrument.

**Observe ventilation requirements.** Ensure good ventilation. Check the vent and fan regularly to prevent overheating.

# Safety Terms and Symbols

The following terms may appear on the instrument:

**DANGER:** Direct injury or hazard may occur.

**WARNING:** Potential injury or hazard may occur.

**CAUTION:** Potential damage to instrument/property may occur.

**CAT I (1):** IEC Measurement Category I, applicable for making measurements on ‘other’ circuits that are not directly connected to mains. See p. 6.

**CAT II:** IEC Measurement Category II, applicable for making measurements on circuits connected directly to utilization points (socket outlets and similar points) of the low voltage mains installation.

See page 6

(1) CAT I as defined in IEC/EN 61010-031:2008. Note that Measurement Category I was removed in IEC/EN 61010-031:2015 and replaced by ‘O’, indicating "other circuits that are not directly connected to mains."

The following symbols may appear on the instrument:

**CAUTION** Risk of injury or damage; refer to manual

**WARNING** Risk of electric shock or burn

Earth Ground Terminal

Protective Conductor Terminal

Frame or Chassis Terminal

ON/ Standby Power

Alternating Current

# Operating Environment

**Temperature: 0 °C to 40 °C**

**Humidity:** 5% to 90% relative humidity (non-condensing) up to +30 °C. Upper limit derates to 50% relative humidity (noncondensing) at +40 °C.

**Altitude:** ≤ 2000 m

**Use indoors only.**

**Pollution Degree 2.** Use in an operating environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation should be expected.

**AC Power**

**Input Voltage & Frequency:** 100-120 V at 50/60 Hz or
200-240 V at 50/60 Hz

**Manual AC selection with a slide switch.**

**Power Consumption:** 20 W maximum

**Mains Supply Connector:** CAT II per IEC/EN 61010-1:2010, instrument intended to be supplied from the building wiring at utilization points (socket outlets and similar).

**Fuse Type**

**Current Input Terminal:** 250 VAC F 10 A, 3 AG

**AC Mains:** 250 VAC F 300 mA, 5x20 mm

**Input terminal protection limitation.**

Protection limitation is defined for the input terminals:

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

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

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

2. **Sampling (HI Sense and LO Sense) terminals**

   HI Sense and LO Sense are used for 4-wire Resistance measurements. Two protection limits are defined:

   - **HI Sense-LO Sense protection limitation:** 2000Vpk.
   - **LO Sense-LO Sense protection limitation:** 2Vpk.

3. **Current input (I) terminal**

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

**NOTE:**

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

# IEC Measurement Category II Overvoltage Protection

To avoid the danger of electric shock, the Digital Multimeter provides overvoltage protection for line-voltage mains connections that meet both of the following conditions:

1. The HI and LO input terminals are connected to the mains under Measurement Category II conditions described in the warning below.
2. The maximum line voltage of the mains does not exceed:

300 VAC for T3DMM4-5

600 VAC for T3DMM5-5 and T3DMM6-5

**WARNING:**

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

The multimeter can make measurements with the **HI** and **LO** inputs connected to mains in such devices (≤ 300 VAC for T3DMM4-5 and ≤ 600 VAC for T3DMM5-5/T3DMM6-5) or to the branch outlet itself.

However, the **HI** and **LO** terminals of the multimeter can't be connected to mains in permanently installed electrical devices such as the main circuit-breaker panels, sub-panel disconnected boxes and permanently wired motors. Such devices and circuits are prone to exceed the protection limits of the multimeter.

**Limits for Measurements on Other Circuits Not Directly Connected to Mains**

**Max. rated input voltage:** 1000 Vrms

**Transient overvoltage:** 4000 Vpk

**WARNING:**

Voltages above 300 VAC (for T3DMM4-5) or 600 VAC (T3DMM5-5 / T3DMM6-5) can only be measured in circuits that are isolated from mains. However, there may be transient over voltage in circuits that are isolated from mains. The multimeter is able to withstand occasional transient overvoltage up to 4000 Vpk. Please don't use this instrument to measure circuits where transient overvoltage may exceed this level.

# Daily Maintenance and Cleaning

**Maintenance**

When storing or using the instrument, please avoid the liquid crystal display from being exposed for long periods of time to direct sunlight.

**NOTE:**

To avoid damage to the instrument or probe, please do not place them in mist, liquid or solvent.

**Cleaning**

Please clean the instrument or probe often according to its use.

- Wipe the external dust off the instrument and probe with a soft rag. Be careful not to scratch the transparent plastic protective screen when cleaning the screen.
- Use a damp soft rag to clean the instrument after removing the power cord. Or use a 75% isopropyl alcohol and water solvent to give a more thorough clean.

**NOTE:**

- To prevent the surface of the instrument or probe from damage, please do not use any corrosive or chemical cleaning agents.
- Please make sure the instrument is dry before reconnecting the power cord and restarting it, to avoid short circuit or personal injuries caused by water.

# Introduction of T3DMM6-5 (-SC)

**T3DMM6-5 (-SC)** is a 6½ dual-display instrument, fitted to the needs of high-precision, multifunction, and automation measurements. It delivers a combination of basic measurement functions, multiple math functions, and display functions, etc. It is available with or without a scanner option (-SC). This manual covers both models with the scanner being covered in a chapter at the back of the manual. All references to the T3DMM6-5 also refer to the T3DMM6-5-SC.

**T3DMM6-5** has a 4.3 inch colour TFT-LCD display screen with 480*272 resolution. It's clear keyboard layout and operation hints make it easier and quick to use. It supports interfaces such as USB Device and Host and LAN, which can meet users' demand.

**Main Features:**

- 4.3 inch colour TFT-LCD display screen with 480*272 resolution.
- Real 6½ digits reading resolution.
- Up to 10,000 rdgs/S measurement speed.
- True-RMS AC Voltage and AC Current measurements.
- 1 Gb Nand Flash size, mass storage configuration files and data files.
- Built-in cold terminal compensation for thermocouple.
- Support standard SCPI and control software on PC, compatible with commands of main stream multimeters.
- Supports dual-display function, with Chinese and English menus.
- Built-in help system, convenient to acquire information.
- Support USB Device, USB Host and LAN.
- Configuration and measured data can be imported or exported via VXI11, USBTMC and USB flash drive, which is convenient for users to modify, view and backup.

# Abstract

This manual introduces information on operating the T3DMM6-5 Digital Multimeter. It contains 5 chapters:

**Chapter 1 Quick Start**

Guide you to using the T3DMM6-5 Digital Multimeter and information about the Front/Back panel and user interface.

**Chapter 2 Function and Operation**

Introduce the functions and operations of T3DMM6-5 in details.

**Chapter 3 Application Examples**

Introduce you on how to easily use the advanced measurement functions of this instrument through examples.

**Chapter 4 General Troubleshooting**

Provide you some general troubleshooting information.

**Chapter 5 Appendix**

Provide you information about accessories, warranties, troubleshooting, services and support.

# Content

# Chapter 1: Quick Start

This chapter guides users to quickly get familiar with the front and rear panels, user interface and measurement connections of the multimeter.

This chapter contains the following topics:

- **General Inspection**
- **Handle Adjustment**
- **Appearance and Size**
- **The Front Panel**
- **The Back Panel**
- **Start the Multimeter**
- **User Interface**
- **Measurement Connections**
- **To Use the Built-in Help System**

# General Inspection

## 1. Inspect the shipping container.

Please keep the damaged container and packaging material until the contents of the shipment have been checked for completeness and the instrument has passed both electrical and mechanical tests.

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

## 2. Inspect the instrument.

In case of any damage, or defect, or failure, notify your Teledyne Test Tools sales representative.

## 3. Check the accessories.

Check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your Teledyne Test Tools sales representative.

## To adjust the Handle.

Adjust the handle position of the T3DMM6-5 properly, place the instrument in a stable position so that the user can manipulate and observe the display better. Please grip the handle by the two sides and pull it outward. Then rotate the handle to the appropriate position. Please operate as the following diagram.

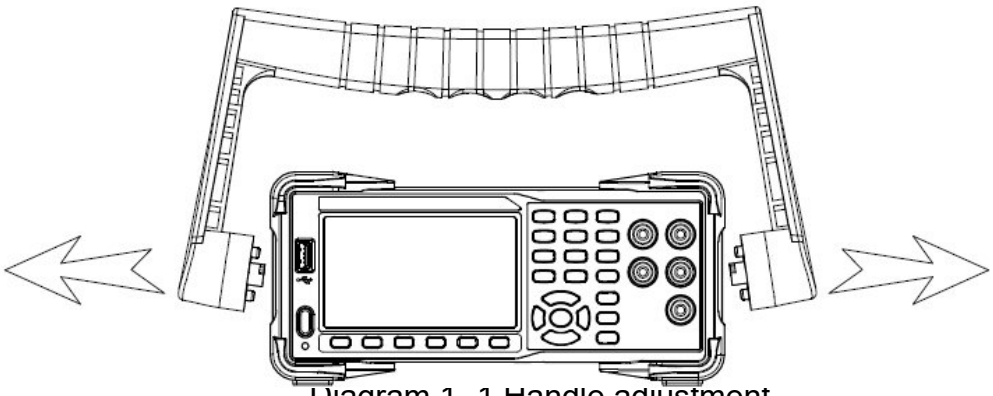


Diagram 1- 1 Handle adjustment

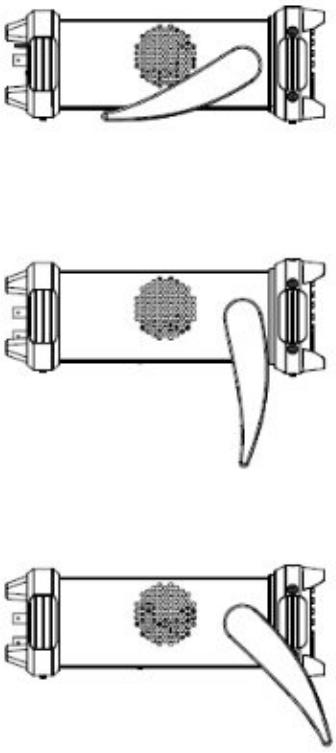


Diagram 1- 2 Horizontal Position

Diagram 1- 3 Carrying Position

## Appearance and Size

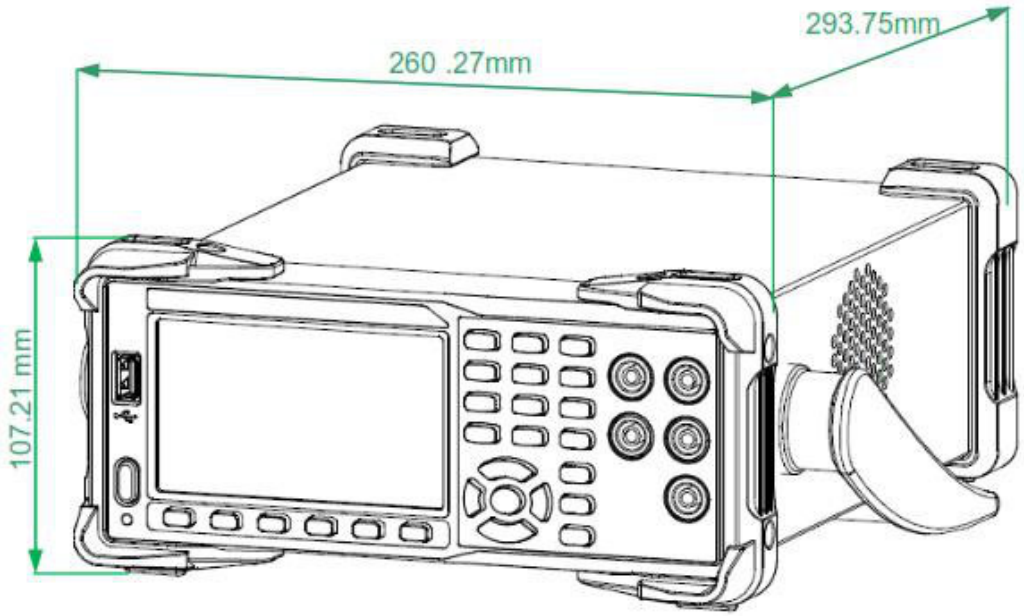



Diagram 1- 4 Appearance and Size

# Front Panel


Diagram 1- 5 Front Panel Overview

### A USB Host

By using this interface, users can store the current state or measurement data into a USB storage device. Users can also read the state files or updated firmware from the USB storage device.

### B Power Key

Press the key to turn the instrument on/off.

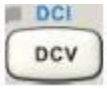
### C LCD Display

The instrument provides a 4.3 inch colour TFT-LCD display screen with 480*272 resolution that displays the current function menus, measurement parameter settings, system status, prompt messages, etc.

### D Menu Operation Keys

Press any softkey to activate the corresponding menu.

## Measurement and Assistant Function Keys




DC Voltage / Current Measurement


AC Voltage / Current Measurement


2-Wire / 4-Wire Resistance Measurement


Frequency / Capacitance Measurement


Continuity / Diode Test


Temperature Measurement /
Enable Multiple Scan Card Functions


Enable Dual-display Function / Set Up the Utility


Acquire Function / Help System


Math Function / Display Function


Auto Trigger / Stop


Single Trigger / Hold Measurement Function


Return to local control of the instrument (when in Remote mode).

Some of the front panel keys have text above them. This indicates that the key has a function that you can access by pressing and releasing【Shift】before pressing the key.

## F Range and Direction Keys

Increase the measurement range

Decrease the measurement range


Select auto or manual range

Set up measurement parameter to Move the cursor page up or down

Set up measurement parameter Move the cursor left or right


Apply the current setting

## G Signal Input Terminals

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

## Back Panel


Diagram 1- 6 Back Panel Overview

### A Power Socket

Please use the power cord provided in the accessories to connect the multimeter to the AC power through this socket.

**Important Note:** The correct voltage range must be selected first (through the Voltage Selector) before power connection.

### B Power Fuse

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

1. Turn off the multimeter and remove the power cord.
2. Press the block tongue down using a flat head screwdriver (in the direction of the dotted arrow in the Diagram 1 – 7 Change the fuse) and pull out the fuse holder.
3. Select the proper voltage range.
4. Replace using the same specified fuse type and value.
5. Reinstall the fuse holder into the slot.

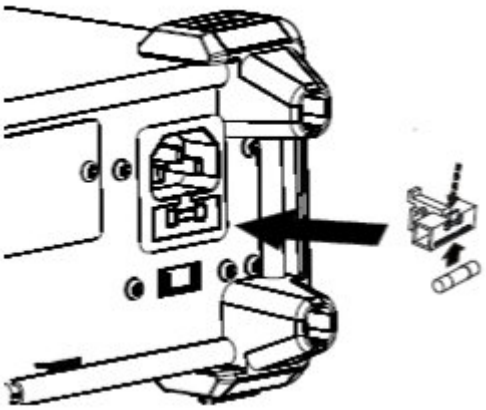


Diagram 1- 7 Change the fuse

### C AC Voltage Selector

Select a proper voltage range (110V or 220V) according to the local AC supply.

### D Inspection card (option)

An optional 16-channel Data Acquisition Module will be installed in the T3DMM6-5-SC instrument.

### E USB Device

Connect to a PC through the USB interface. You can use SCPI commands or PC software to control the T3DMM6-5 remotely.

### F. LAN

The multimeter can be connected to the LAN network for remote control.

### G. VMC Output

The mutlimeter outputs a low-true pulse from the 【VM Comp】 connector after every measurement

## H Ext trigger

Trigger the multimeter by connecting a trigger pulse through the 【Ext Trig】 connector. Note the external trigger source must be selected.

## I Current Input Fuse

Before leaving the factory the multimeter is installed with a current measurement fuse to provide 10A maximum input protection. To replace with a new one, please:

1. Turn off the multimeter and remove the power cord.
2. Turn the fuse seat counter clockwise as shown in the Diagram 1- 7 Change the fuse, using a straight screwdriver and then pull out the fuse holder.
3. Replace with a new fuse as specified.
4. Reinstall the fuse holder into the slot.

## J Instrument Lockhole

You can use the safety lock to lock the multimeter in a fixed place if necessary, using a Kensington lock.

## Start the Multimeter

Before you connect the instrument to a power source, please select the AC voltage selector on the rear panel of your multimeter according to the power supply. Then connect the power cord as shown in the below diagram.

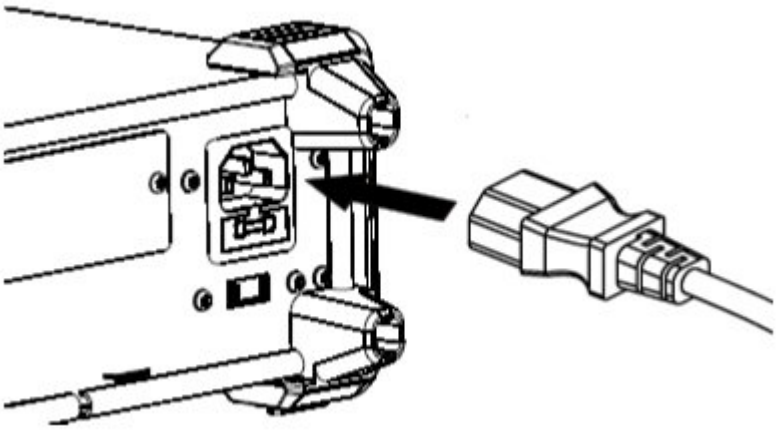


Diagram 1- 8 Connect Power Cord

Press the Power key on the front panel to start up the multimeter. If the multimeter does not starts normally, please:

1. Make sure the power cord is in properly connected and that the power cord is good and in working condition.

2. Try to restart the multimeter, if it fails, check the power fuse and replace with a new one if necessary.

3. If the problem still remains, please contact Teledyne Test Tools.

## User Interface

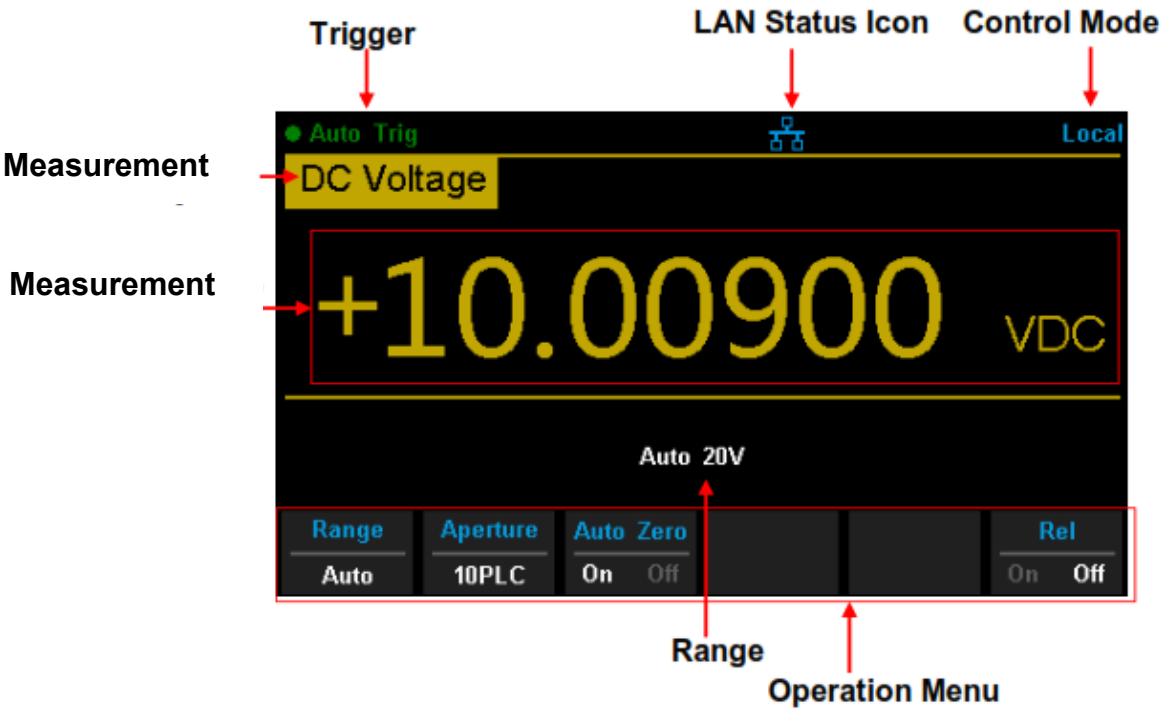
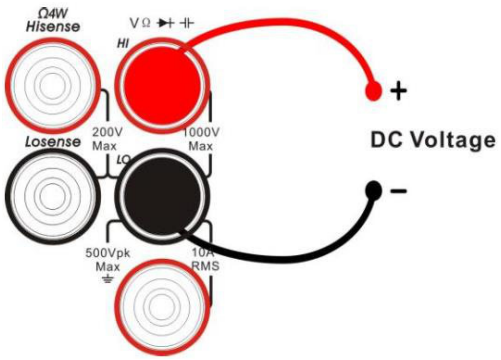



Diagram 1- 9 User Interface

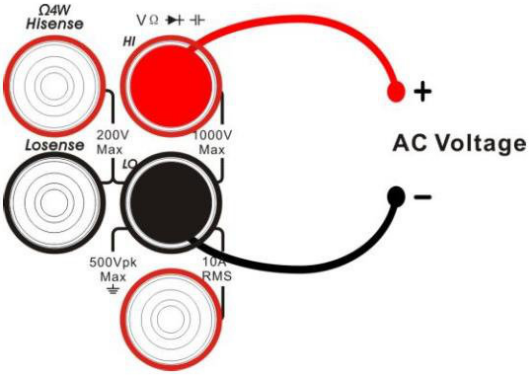
## Measurement Connections

T3DMM6-5 is designed with many built in measurement functions. After selecting the desired measurement function, please connect the signal (device) under test to the multimeter according to the method below. **Do not** switch the measurement function when measuring as it may cause damage to the multimeter. For example, when the test leads are connected to the related current terminals, AC voltage measurement should not be selected.

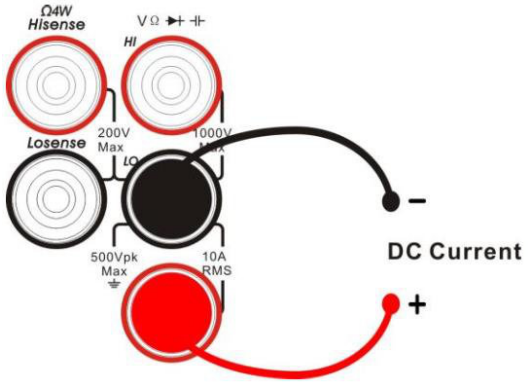
**DCV Measurement**



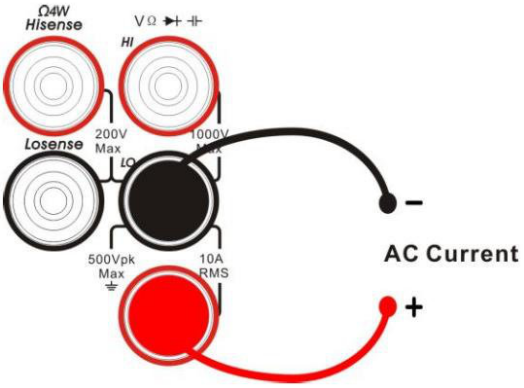

**ACV Measurement**



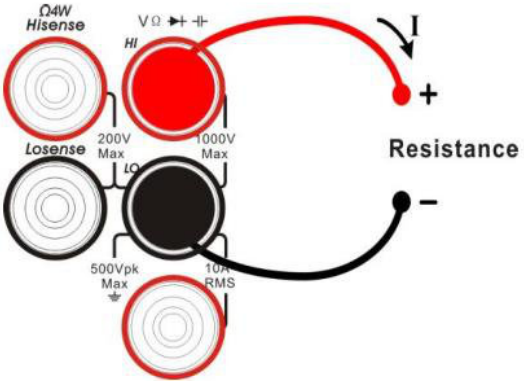

**DCI Measurement**



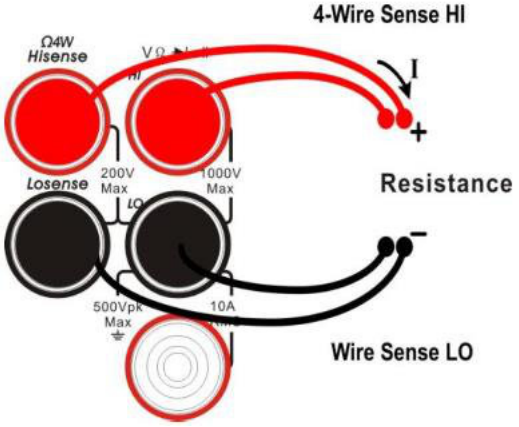

**ACI Measurement**



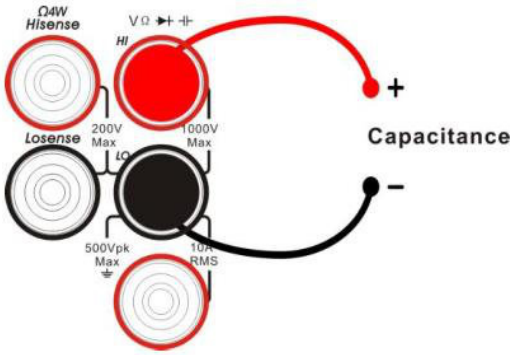
## Resistance Measurement (2-wire)



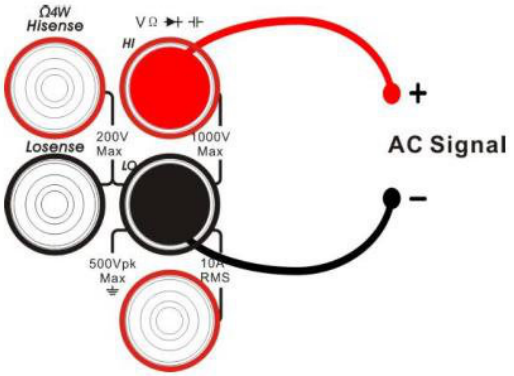

## Resistance Measurement (4 wire)



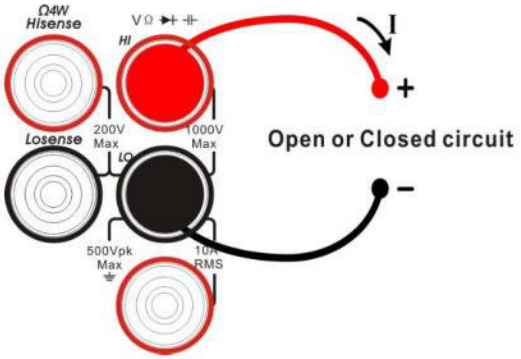

## Capacitance Measurement



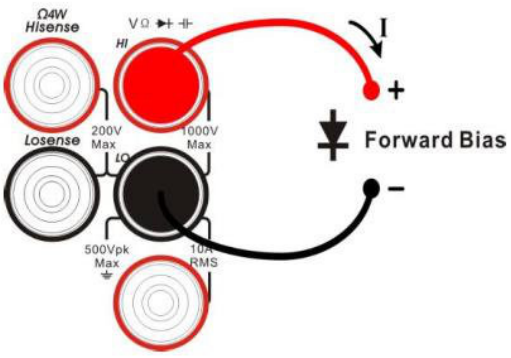

## Frequency/Period Measurement




## Continuity Measurement

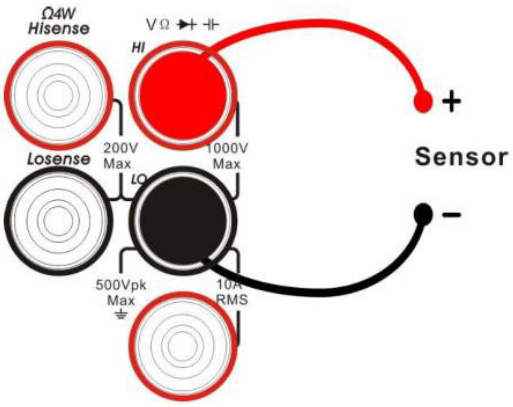



## Diode Measurement



## Temperature Measurement

## For RTD and thermcouple sensors



## To Use the Built-in Help System

To access built-in help information please press 【shift】 +【Acquire】 to enter the help system; then use the direction keys to choose the help item you want, finally press【OK】to obtain help information.

The common help information categories are listed as follows:

1. Basic Measurements.
2. Measuring Temperature.
3. Measuring Capacitance.
4. Math Function.
5. Dual-display Function.
6. Saving and Recalling Information.
7. Optional Multiple Scan Card.
8. The convention and Tips for using Softkeys.
9. Technical Support.

# Chapter 2:  Function and Operation

This chapter introduces how to use the functions of the multimeter from the front panel. The chapter contains the following topics:

- **To Set the Range**
- **To Set the Resolution**
- **Basic Measurement Functions**
- **Sensor Measurements**
- **Preset Mode**
- **Secondary Function Keys**
- **Measurement Configuration**
- **Math Operations**
- **Trigger**
- **Save and Recall**
- **Utility**

# Measurement Configuration

Most measurement parameters are user-defined. Changing a measurement parameter will change the measurement precision and speed, as well as the input impedance. An appropriate measurement parameter based on the actual application will ensure faster measurement or higher measurement precision.

The default measurement configurations of the multimeter can ensure the accuracy of the measurement results in most cases. Users can directly use these defaults for any measurement or modify the parameters of the measurement function as required.

The parameters for different measurement functions differ, see the table below.

**Table 2-1 Measurement parameter**

| Functions | Parameters |
|---|---|
| DCV | Range, Integration Time, DC impedance, Auto zero |
| ACV | Range, AC filter |
| DCI | Range, Integration Time, Auto zero |
| ACI | Range, AC filter |
| OHM（2WR、4WR） | Range, Integration Time, Auto zero |
| CAP | Range |
| CONT | Short-circuit resistance |
| DIODE | Breakover voltage |
| FREQ/PREIOD | Gate time |
| TEMP | N/A |

## Range

T3DMM6-5 provides auto and manual range selecting modes. In auto mode, the multimeter selects a proper range automatically according to the input signal. In manual mode, you can use the front panel key or menu key to set the range. The auto mode can bring a lot of convenience for users while the manual mode provides higher reading precision.

**Method 1:** use the front panel key to set the range.

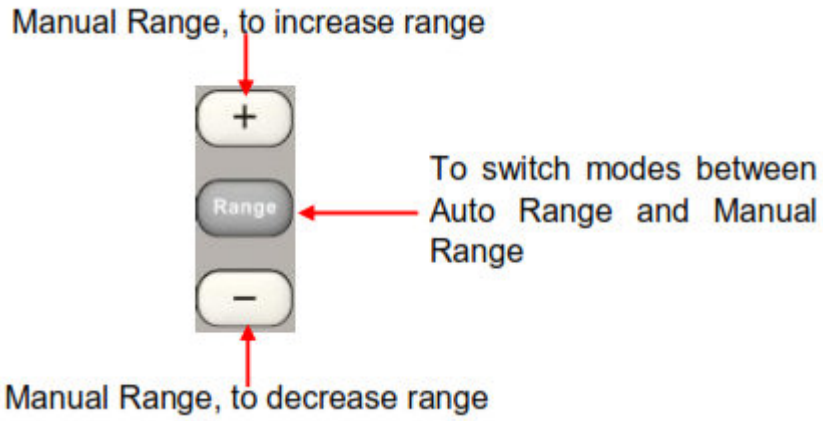



Diagram 2- 1 Range Selection Keys

**Method 2:** use the menu key to select the range.

Enter the specific measurement function and select 【Range】 in the menu to show the range setting options, as shown in Diagram 2-2 (take DCV measurement for instance). Then press the menu operation key to activate the corresponding configuration.

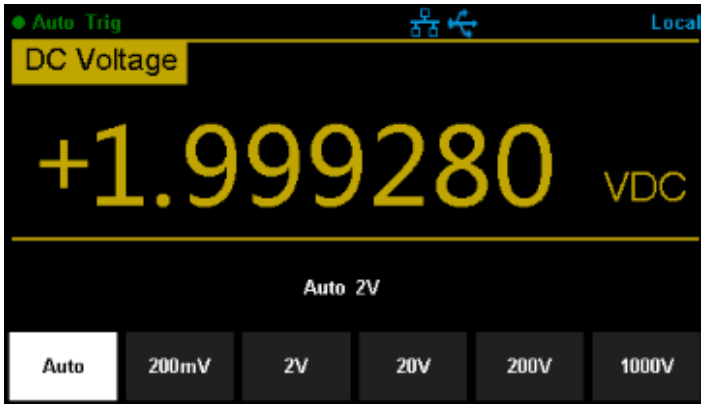



Diagram 2- 2 Range selection menu

**Note:**

1. “**overload**” will be displayed when the input signal exceeds the currently set range.
2. By default, the range is set to Auto at power-on or after a reset.
3. Auto mode is recommended if you are not sure about the measurement range in order to protect the instrument and obtain accurate data.
4. The range of CONT measurement is fixed at 2kΩ.

## Integration Time and Resolution

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

T3DMM6-5 expresses the integration time by the number of power line cycles, the unit is PLC. The multimeter automatically detects the input power line frequency at power-on. If the frequency is 50Hz, the integration time can be set to 0.005PLC, 0.05PLC, 0.5PLC, 1PLC, 10PLC, 100PLC and the default is 10PLC. If the frequency is 60Hz, the Integration time can be set to 0.006PLC, 0.06PLC, 0.6PLC, 1PLC, 10PLC, 100PLC and the default is 10PLC .

T3DMM6-5 can make measurements with reading resolutions of 4½, 5½ and 6½ digits. It automatically selects a reading resolution according to the measurement settings.

1. In DCV, DCI and OHM measurements, press 【Aperture】 to set the integration time, as shown in Diagram 2-5 (take DCV measurement for instance). The integration time affects the resolution.

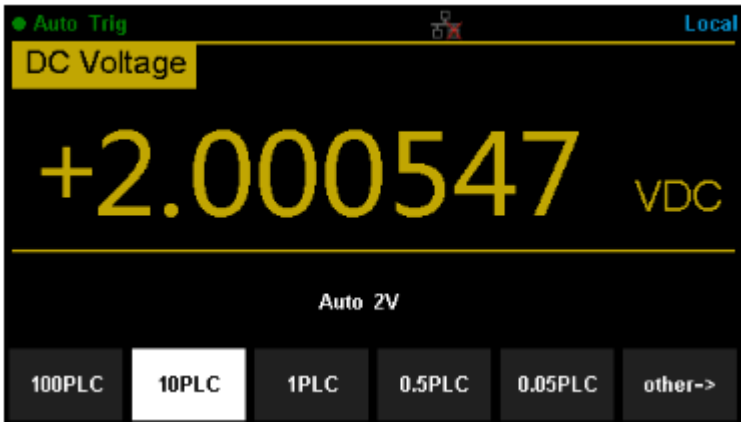



Diagram 2- 3 Integration time selection menu.

Table 2-2 Relationship between reading resolution and integration time

| Resolution | Integration time |
|---|---|
| 4½ | 0.005PLC/0.006PLC<br>0.05PLC/0.06PLC |
| 5½ | 0.5PLC/0.6PLC |
| 6½ | 1PLC<br>10PLC<br>100PLC |

2. In ACV, ACI ,FREQ/PERIOD measurements, the resolution is fixed at 6½ digits.
3. In CAP measurements, the resolution is fixed at 4½.
4. The instrument always displays 2 digits after the decimal point in CONT measurement.
5. In DIODE measurements, the resolution is fixed at 5½.
6. In TEMP measurements, the resolution is fixed at 5½.

## DC Impedance

DC impedance applies to DCV measurements. The default is “10MΩ”. In the range of 200mV, 2V or 20V, you can choose “>10GΩ” to reduce the loading error on the measured object, caused by the multimeter load.

In the range of 200 mV, 2 V or 20 V under DCV measurement, press 【 Input Z 】 in the menu to perform the setting, as shown in Diagram 2-4.

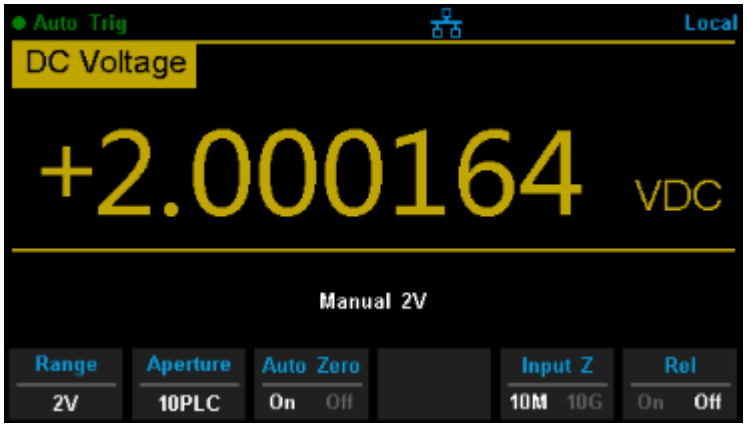



Diagram 2-4 Choose DC Input Impedance

- **10MΩ:** set the input impedance in all ranges to 10MΩ.
- **10GΩ:** set the input impedances in ranges of 200mV, 2V and 20V to 10GΩ, whilest in ranges 200V and 1000V, the impedance is still 10MΩ.

## Auto Zero

Auto zero (Auto Zero) applies to DCV, DCI, 2WR and 4WR measurements. Enter the specific measurement function and press 【Auto Zero】 in the menu to perform the setting, as shown in Diagram 2-5 (take DCV measurement for instance).

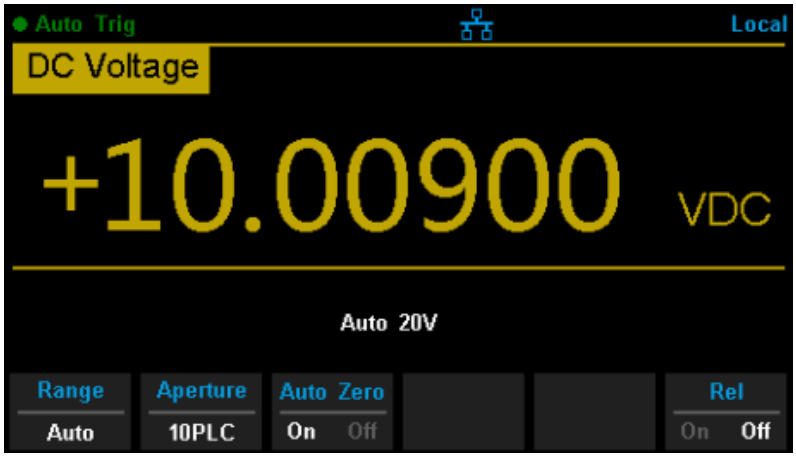



Diagram 2-5 Turn on or off Auto Zero

- **ON:** the multimeter internally disconnects the input signal and measured circuit after each measurement and takes a zero reading. It then subtracts the zero reading from the preceding reading (displaying the difference between the measurement value and zero value during the measurement), in order to reduce the impact of offset voltage from input circuit on measurement result.
- **OFF:** disable the auto zero function.

## AC Filter

AC filter applies to ACV and ACI measurements. It can optimize the low-frequency accuracy and minimize the AC settling time. T3DMM6-5 provides three types of AC filters (>3Hz, >20Hz, >200Hz).

The AC filter to be used is determined by the input signal frequency. You should generally select the highest frequency filter whose frequency is less than that of the signal you are measuring, because the higher frequency filters results in faster measurements. For example, when measuring a signal between 20Hz and 200Hz, use the 20Hz filter. If measurement speed is not an issue, choosing a lower frequency filter may result in quieter measurements, depending on the signal that you are measuring.

Press 【Filter】 in the menu of ACV or ACI measurement to show the setting options, as shown in Diagram 2-6 (take ACV measurement for instance).

Then press the menu operation key to activate the corresponding configuration.

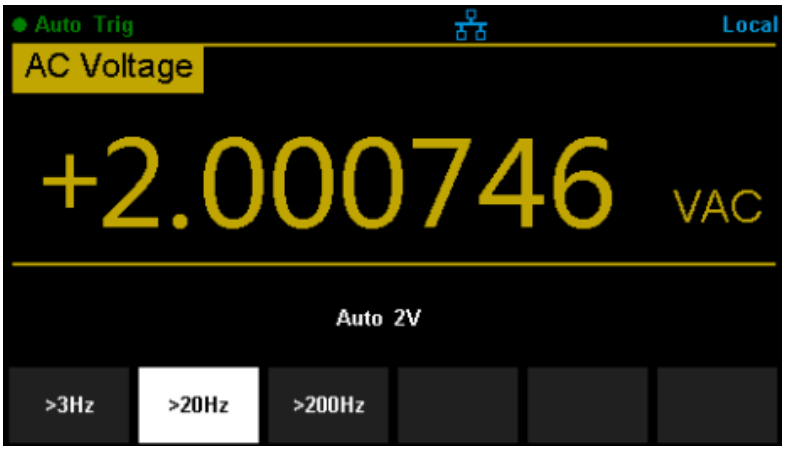



Diagram 2-6 AC Filter setting interface

## Short-circuit Resistance

This function only applies to a continuity test. When the measured circuit has a resistance lower than the short-circuit resistance, the circuit is considered as connected and the beeper sounds (if sound is on). The default short-circuit resistance is 50Ω and the setting is stored in non-volatile memory.

When continuity test is enabled, set the【Threshold】(equal to short-circuit resistance) using the direction keys. The range is from 1Ω to 2000Ω .

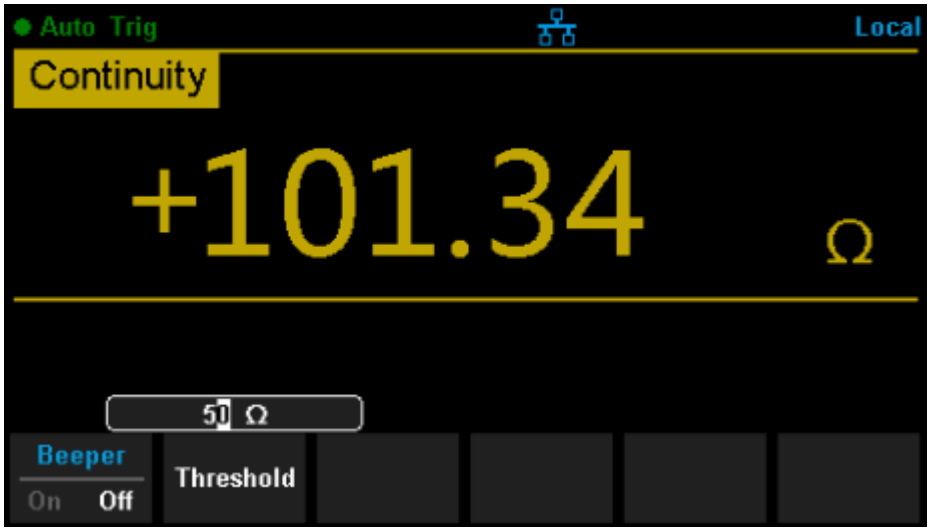



Diagram 2- 7 Set Up the Short-circuit Resistance

## Gate Time

Gate time (also called Aperture Time) applies to the FREQ / PERIOD function. It decides the resolution of a low-frequency measurement. The longer the gate time, the higher the resolution of the low-frequency measurement and the slower the measurement, and vice versa.

In FREQ / PERIOD measurement, press 【Gate Time】 to show the setting options, as shown in Diagram 2- 8 (take FREQ measurement for instance).

The gate time can be set to 1ms, 10ms, 100ms or 1s and the default is 100 ms. You can select a desired gate time by pressing the corresponding softkey.

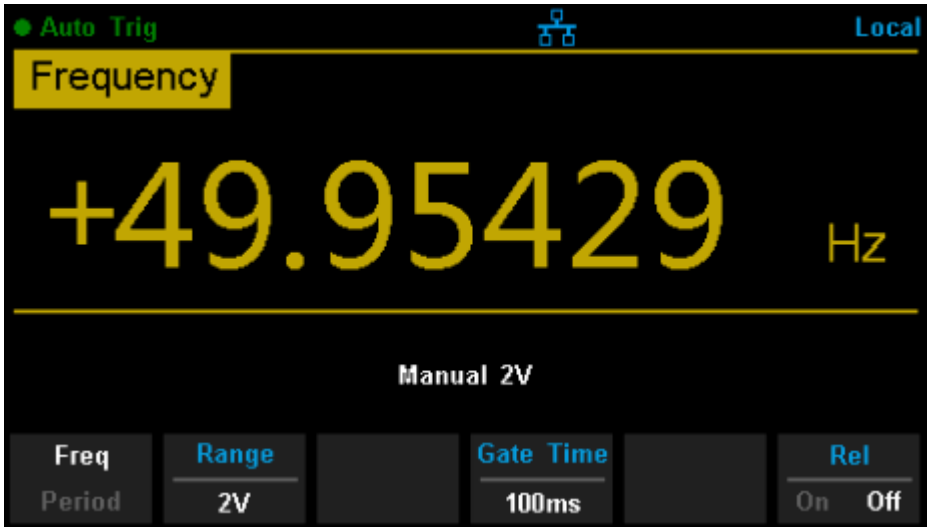



Diagram 2- 8 Set Up the Gate Time

# Basic Measurement Functions

T3DMM6-5 Digital Multimeter has the following basic functions:

- **Measure DC Voltage**
- **Measure AC Voltage**
- **Measure DC Current**
- **Measure AC Current**
- **Measure 2/4-Wire Resistance**
- **Measure Capacitance**
- **Test Continuity**
- **Test Diode**
- **Measure Frequency or Period**
- **Measure Temperature**

## To Measure DC Voltage

**Range:** 200mV, 2V, 20V, 200V, 1000V

**Max Resolution:** 100nV (in the range of 200mV)

**Input Protection:** 1000 V protection is available on all ranges and a 10% over-range for all ranges except 1000 V range. If the reading exceeds the range, “overload” will be displayed.

**Operating Steps:**

1. **Enable the DCV measurement**

   Press DCV on the front panel to enter the DC Voltage measurement interface, as shown in Diagram 2- 9.

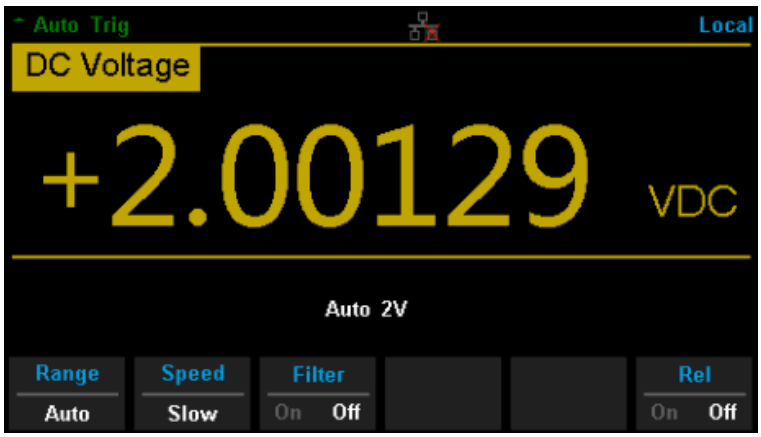



Diagram 2- 9 DC Voltage Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to “**Measurement Connections**”.

**3. Set the range**

Press【Range】to select a range for the measurement. You can also use the  ,  , and  keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range of 110% of the present range, and changes down a range when the measurement is below 10% of the present range.

**4. Set the Integration**

Press【Aperture】and choose the number of power-line cycles (PLCs) to use for the measurement. Selecting 100PLC provides the best noise rejection and resolution, but the slowest measurements.

**5. Autozero setting**

Press 【Auto Zero】to enable or disable this function. Autozero provides the most accurate measurements, but requires additional time to perform the zero measurement. With autozero enabled (On), the DMM internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DMM's input circuitry from affecting the measurement accuracy.

**6. Specify the DC input impedance (Only for Manual 200mV, 2V and 20V ranges)**

Press【Input Z】to set the DC resistance as "10M" (default value) or 10G". Users can execute the DC voltage measurement directly without modifying this parameter if they wish.

**7. Set the relative value (Optional operation)**

Press【Rel】to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to "**Math Functions**" in Chapter 2).

**8. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**9. Perform math operations (advanced)**

You can perform math operations (Statistics, Limit, dBm, dB and REL) on every DCV measurement reading. For details, please refer to "**Math Operations**".

**10. Display the graph (advanced)**

You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

## To Measure DC Current

**Range:** 200μA, 2mA, 20mA, 200mA, 2A, 10A

**Max Resolution:** 0.1nA (in the range of 200μA)

**Input Protection:** a 10A protection fuse is available in all ranges and a 10% over-range for all ranges except 10A range. If the reading exceeds the range, "**overload**" will be displayed.

**Operating Steps:**

1. **Enable the DCI measurement**

   Press Shift and DCV on the front panel to enter the DC Current measurement interface, as shown in Diagram 2- 10.

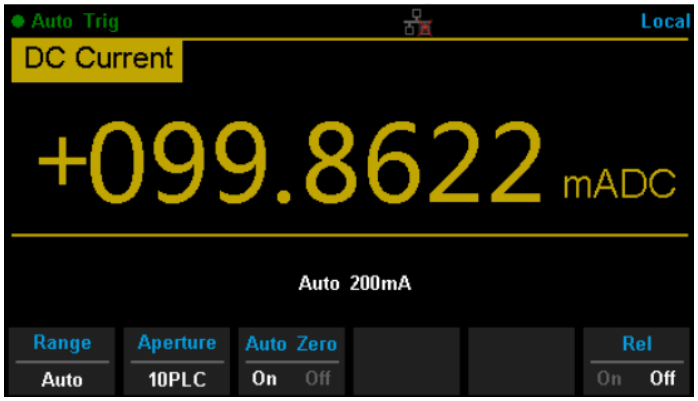



Diagram 2- 10 DC Current Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

**3. Set the range**

Press【Range】to select a range for the measurement. You can also use the  ,  , and  keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up to 110% of a range and changes up a range at 110% of the present range, and changes down a range when below 10% of the present range.

**4. Set the Integration Time**

Press 【Aperture】and choose the number of power-line cycles (PLCs) to use for the measurement. Selecting 100PLC provides the best noise rejection and resolution, but the slowest measurements.

**5. Autozero setting**

Press 【Auto Zero】to enable or disable this function. Autozero provides the most accurate measurements but requires additional time to perform the zero measurement. With autozero enabled (On), the DMM internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DMM's input circuitry from affecting the measurement accuracy.

**6. Set the relative value (Optional operation)**

Press 【Rel】 to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to "**Math Functions**" in Chapter 2.)

**7. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**8. Perform math operations (advanced)**

You can perform math operations (Statistics, Limit and REL) on every DCI measurement reading. For details, please refer to “**Math Operations**.

**9. Display the graph (advanced)**

You can analyse the measurement data by using the “Bar Meter”, “Trend Char” or “Histogram display”. For details, please refer to “**Display Mode**”.

## To Measure AC Voltage

**Range:** 200mV, 2V, 20V, 200V, 750V

**Max Resolution:** 100nV (in the range of 200mV)

**Input Protection:** 750V protection is available in all ranges and a 10% over-range for all ranges except 750V range. If the reading exceeds the range, "**overload**" will be displayed.

**Operating Steps:**

1. **Enable the ACV measurement**

   Press ACV on the front panel to enter the AC Voltage measurement interface, as shown in Diagram 2- 11.

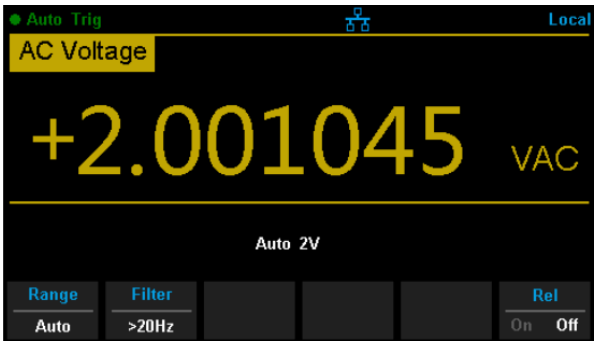



Diagram 2- 11 AC Voltage Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

3. **Set the range**

   Press 【Range】to select a range for the measurement. You can also use the +, −, and Range keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range at 110% of the present range, and down a range when below 10% of the present range.

**4. Set the filter**

Press【Filter】and choose the filter for the measurement. The instrument provides three different AC filters, “>3Hz”, “>20Hz” and “>200Hz”. You should generally select the highest frequency filter whose frequency is less than that of the signal you are measuring.

**5. Set the relative value (Optional operation)**

Press【Rel】to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to “**Math Functions**” in Chapter 2.)

**6. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**7. Perform the math operation (advanced)**

You can perform math operations (Statistics, Limit, dBm, dB and REL) on every ACV measurement reading. For details, please refer to “**Math Operations**”.

**8. Display the graph (advanced)**

You can analyse the measurement data by using the “Bar Meter”, “Trend Char” or “Histogram display”. For details, please refer to “**Display Mode**”.

## To Measure AC Current

**Range:** 200μA, 2 mA, 20 mA, 200 mA, 2A, 10A

**Max Resolution:** 0.1nA (in the range of 200μA)

**Input Protection:** 10A protection is available in all ranges and a 10% over-range for all ranges except the 10A range. If the reading exceeds the range, "**overload**" will be displayed.

**Operating Steps:**

1. **Enable the ACI measurement**

   Press Shift and ACV on the front panel to enter the AC current measurement interface, as shown in Diagram 2- 12.

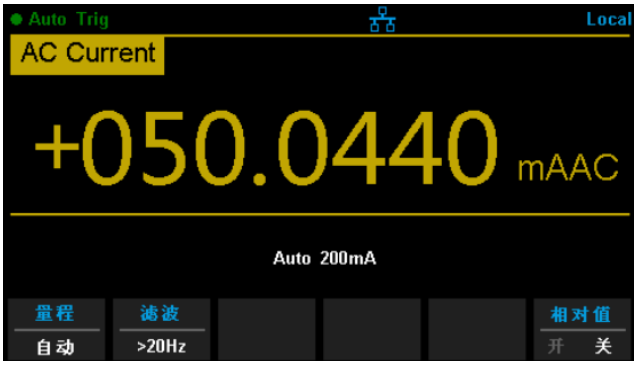



Diagram 2- 12 AC Current Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

3. **Set the range**

   Press 【Range】to select a range for the measurement. You can also use the +, −, and Range keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range at 110% of the present range, and down a range when below 10% of the present range.

**4. Set the filter**

Press【Filter】and choose the filter for the measurement. The instrument provides three different AC filters, “>3Hz”, “>20Hz” and “>200Hz”. You should generally select the highest frequency filter whose frequency is less than that of the signal you are measuring.

**5. Set the relative value (Optional operation)**

Press【Rel】to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to “**Math Functions**” in Chapter 2.)

**6. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**7. Perform the math operation (advanced)**

You can perform the math operations (Statistics, Limit and REL) on every ACI measurement reading. For details, please refer to “**Math Operations**” in Chapter 2.

**8. Display the graph (advanced)**

You can analyse the measurement data by using the “Bar Meter”, “Trend Char” or “Histogram display”. For details, please refer to “**Display Mode**”.

## To Measure Resistance

**Range:** 200Ω, 2kΩ, 20kΩ, 200kΩ, 1MΩ, 10MΩ, 100MΩ
**Max Resolution:** 100μΩ (in the 200Ω range)
**Input Protection:** 1000 V protection is available in all ranges and a 10% Over-range for all ranges. If the reading exceeds the range, "**overload**" will be displayed.

T3DMM6-5 provides 2-wire and 4-wire resistance measurements. When the measured resistance is lower than 100kΩ, the 4-wire resistance measurement is recommended to reduce the measurement error caused by the test lead resistance and contact resistance between the probe and the testing point. These two resistances should not be ignored when compared to the measured resistance.

**Operating Steps:**

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

   Press Ω2W on the front panel to enter the 2-wire resistance measurement interface, as shown in Diagram 2- 13.


Diagram 2- 13 2 Wire Resistance Measurement Interface

Press Shift and Ω2W on the front panel to enter the 4-wire resistance measurement interface, as shown in Diagram 2- 14.

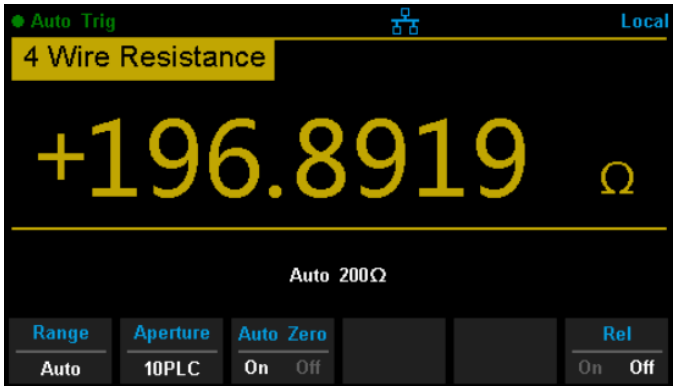



Diagram 2- 14 4 Wire Resistance Measurement Interface

**2. Make the connection**

Connect the test leads with the measured signal by referring to "**Measurement Connections**".

**3. Set the range**

Press 【Range】to select a range for the measurement. You can also use the + , − , and Range keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range at 110% of the present range, and down a range when below 10% of the present range.

**4. Set the Integration**

Press 【Aperture】and choose the number of power-line cycles (PLCs) to use for the measurement. Selecting 100PLC provides the best noise rejection and resolution, but the slowest measurements.

**5. Autozero setting**

Press 【Auto Zero】to enable or disable this function. Autozero provides the most accurate measurements, but requires additional time to perform the zero measurement. With autozero enabled (On), the DMM internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DMM's input circuitry from affecting the measurement accuracy.

**6. Set the relative value (Optional operation)**

Press 【Rel】 to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to "**Math Functions**" in Chapter 2.)

**7. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**8. Perform the math operation (advanced)**

You can perform the math operations (Statistics, Limit and REL) on every resistance measurement reading. For details, please refer to "**Math Operations**" in Chapter 2.

**9. Display the graph (advanced)**

You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

## To Measure Capacitance

**Range:** 2nF, 20nF, 200nF, 2μF, 20μF, 200μF, 2mF, 20mF, 100mF

**Max Resolution:** 1pF (in the range of 2nF)

**Input Protection:** 1000V protection is available in all ranges. If the reading exceeds the range, "**overload**" will be displayed.

**Operating Steps:**

1. **Enable the Capacitance measurement**

   Press  on the front panel to enter the Capacitance measurement interface, as shown in Diagram 2- 15.

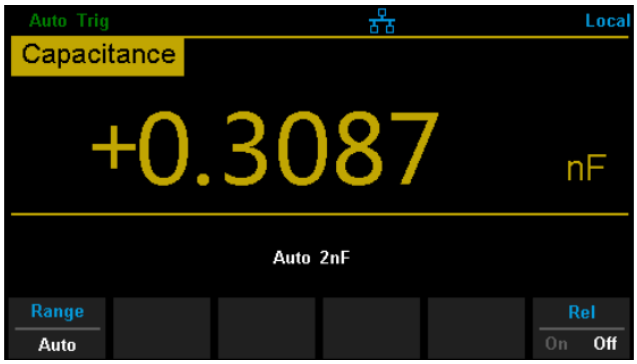



Diagram 2- 15 Capacitance Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

3. **Set the range**

   Press 【Range】to select a range for the measurement. You can also use the  ,  , and  keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range at 110% of the present range, and down a range when below 10% of the present range.

**4. Set the relative value (Optional operation)**

Press 【Rel】 to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to "**Math Functions**" in Chapter 2.)

**5. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**6. Perform the math operation (advanced)**

You can perform the math operations (Statistics, Limit and REL) on every capacitance measurement reading. For details, please refer to "**Math Operations**".

**7. Display the graph (advanced)**

You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

Remember to disconnect power to the DUT and short the legs or connections of the electrolytic capacitors before measuring the electrolytic capacitors.

## To Measure Frequency or Period

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

**Operating Steps:**

1. **Enable the Freq/Period measurement**

   Press Shift and ⊣⊢ on the front panel, then select 【Freq】 to enter the frequency measurement interface, as shown in Diagram 2- 16.

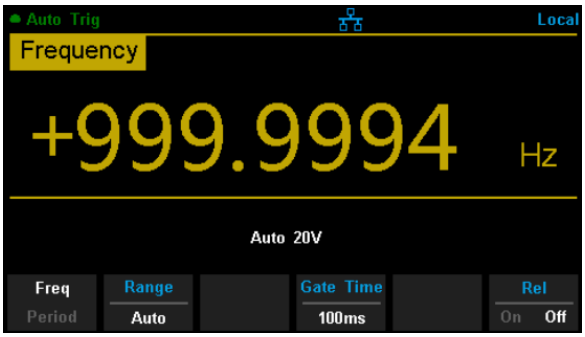



Diagram 2- 16 Frequency Measurement Interface

Select 【Period】to enter the period measurement interface, as shown in Diagram 2- 17.


Diagram 2- 17 Period Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

**3. Set the range**

Press 【Range】to select a range for the measurement. You can also use the  ,  , and  keys on the front panel to select the range. Auto (autorange) automatically selects the range for the measurement based on the input. Autoranging is convenient, but it results in slower measurements than using a manual range. Autoranging goes up a range at 110% of the present range, and down a range when below 10% of the present range.

**4. Set the gate time**

Press【Gate Time】and choose the measurement aperture of 1ms, 10ms, 100ms (default), or 1s.

**5. Set the relative value (Optional operation)**

Press【Rel】to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to "**Math Functions**" in Chapter 2.)

**6. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**7. Perform the math operation (advanced)**

You can perform math operations (Statistics, Limit and REL) on every measurement reading. For details, please refer to "Math Operations".

**8. Display the graph (advanced)**

You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

## To Test Continuity

| |
|---|
| **Test Current Source:** 1mA<br>**Max Resolution:** 0.01Ω<br>**Input Protection:** 1000V Input Protection<br>**Open-circuit Voltage:** <8V<br>**Beep Threshold (short-circuit resistance):** from 0Ω to 2000Ω |

This function measures the resistance of the circuit with about 1mA current source. When the measured resistance is lower than the short-circuit resistance (Threshold), the beeper sounds (if the Beeper is on). Otherwise, "**open**" is displayed on the screen.

**Operating Steps:**

1. **Enable the Cont measurement**

   Press Cont on the front panel to enter the Continuity test interface, as shown in Diagram 2- 18.

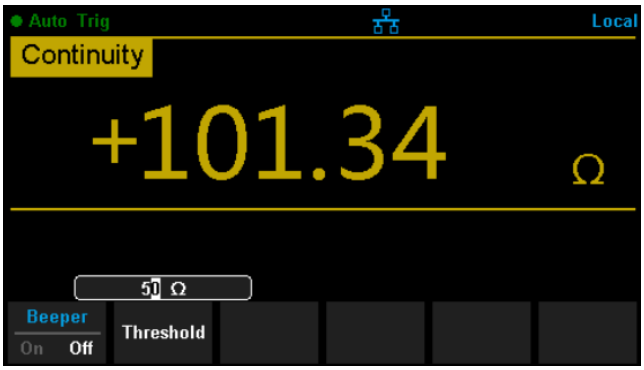



Diagram 2- 18 Continuity Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

3. **Set the short-circuit resistance (Threshold)**

   Enter a desired value using the direction keys. The range is from 0Ω to 2000Ω and the default is 50Ω.

4. **Read the measurement value**

   The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

5. **Perform the math operation (advanced)**

   You can perform math the operation (Statistics, Limit) on every measurement reading. For details, please refer to "**Math Operations**".

6. **Display the graph (advanced)**

   You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

Before testing continuity remember to disconnect the DUT power and discharge all of the DUT capacitors, to avoid damage to the Multimeter.

## To Test Diode

| |
|---|
| **Test Current Source:** 1mA |
| **Voltage Measurement Range:** 0V~4V |
| **Max Resolution:** 10μV |
| **Input Protection:** 1000V Input Protection |
| **Open-circuit Voltage:** <8V |

This function measures the forward voltage drop on the diode. When the voltage is lower than the Threshold, the beeper sounds (if the beeper is on).

**Operating Steps:**

1. **Enable the Diode measurement**

   Press Shift and Cont on the front panel to enter the Diode test interface, as shown in Diagram 2- 19.


Diagram 2- 19 Diode Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referringto "**Measurement Connections**".

3. **Set the Threshold**

   Enter a desired value using the direction keys. The range is from 0V to 4V and the default is 2V.

4. **Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen. If the reading exceeds the threshold, "**open**" will be displayed.

5. **Evaluate the results of a measurement**

Reverse the probes and measure the forward voltage drop on the diode again. Evaluate the diode according to the following rules:

- If the Multimeter displays "open" when in the reverse bias model, it indicates that the diode is normal.
- If the Multimeter shows voltage about 0V and the instrument beeps persistently when in forward and reverse bias model, it indicates that the diode is short.
- If the Multimeter shows "open" when in the forward and reverse model, it indicates that the diode is open.

6. **Perform the math operation (advanced)**

You can perform the math operation (Statistics, Limit) on every measurement reading. For details, please refer to "**Math Operations**".

7. **Display the graph (advanced)**

You can analyse the measurement data by using the "Bar Meter", "Trend Char" or "Histogram display". For details, please refer to "**Display Mode**".

Before testing continuity remember to disconnect the DUT power and discharge all of the DUT capacitors, to avoid damage to the Multimeter.

## To Measure Temperature

T3DMM6-5 can directly measure the temperature using TC (Thermocouple) and THERM (Thermistor) sensors.

**Operating Steps:**

1. **Enable the Diode measurement**

   Press Temp on the front panel to enter the Temperature measurement interface, as shown in Diagram 2- 20.

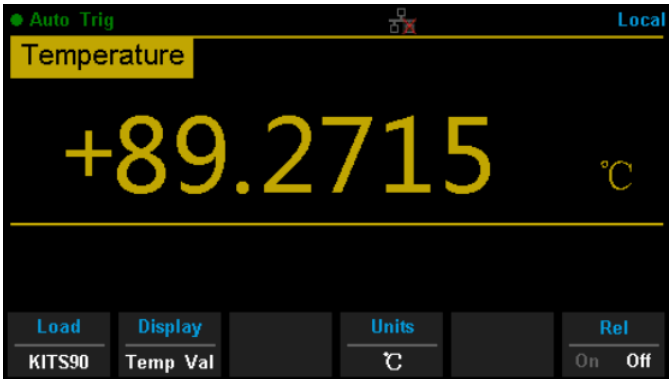



Diagram 2- 20 Temperature Measurement Interface

2. **Make the connection**

   Connect the test leads with the measured signal by referring to "**Measurement Connections**".

### 3. Set the type of sensor

Press 【Load】 and use the direction keys to choose a desired temperature sensor. Press 【Define】to view the configurations. Then press 【Read】 to apply the current temperature sensor configurations.

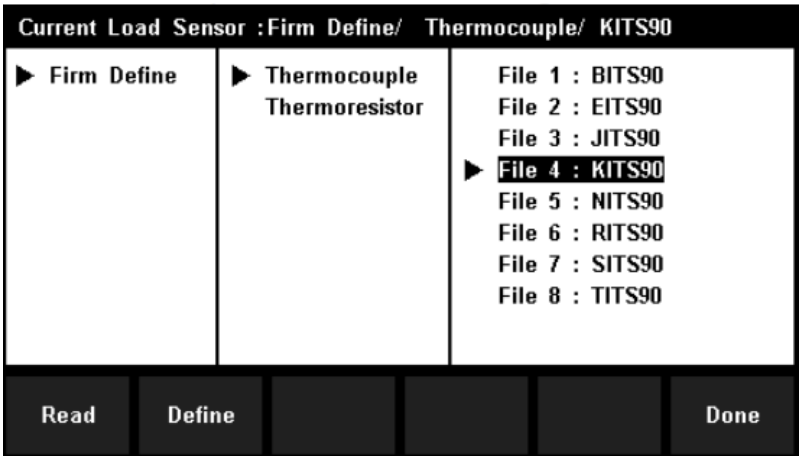



Diagram 2- 21 Load a Configuration File

### 4. Set the display mode

Press 【Display】to choose the display mode. The Multimeter supports three display modes: Temperature Value, Measured Value and All (Temperature Value and Measured Value will be shown on the display together).

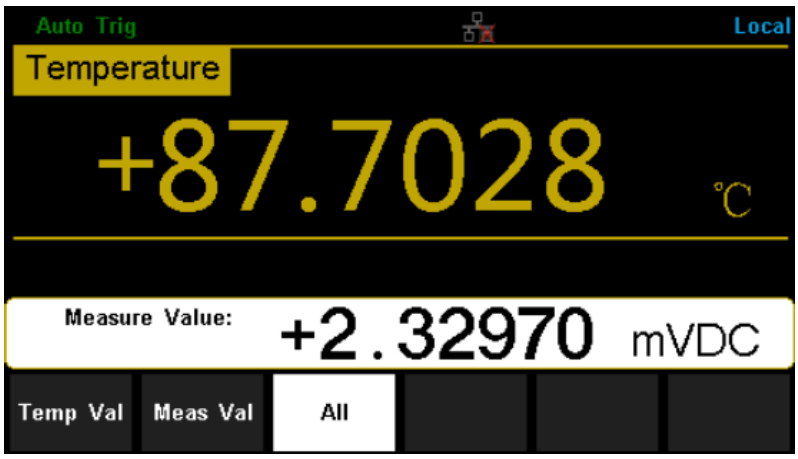



Diagram 2- 22 Choose Display Mode of Temperature Measurement

**5. Set the unit of temperature**

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

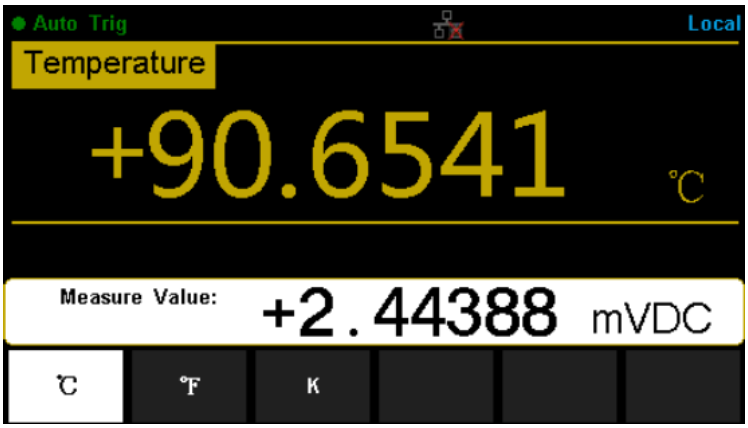



Diagram 2- 23 Unit Selection Interface

**6. Set the relative value (Optional operation)**

Press 【Rel】 to start or stop the Relative math function. When it is started, the reading displayed is a value which comes from the result of actual measurement value minus the relative value that has been set. The default relative value is the measurement value when the function is started. (For details, please refer to “Math Functions” in Chapter 2.)

**7. Read the measurement value**

The multimeter measures the input signal according to the current measurement settings and displays the measurement result on the screen.

**8. Perform the math operation (advanced)**

You can perform the math operation (Statistics, Limit and REL) on every measurement reading. For details, please refer to “**Math Operations**”.

**9. Display the graph (advanced)**

You can analyse the measurement data by using the “Bar Meter”, “Trend Char” or “Histogram display”. For details, please refer to “**Display Mode**”.

## Dual-display Function

Dual-display function is used to improve the test and measurement functions. Press 

to open the Dual-display function and the upper right corner will show “Dual”. Now press a function key if this function can be used as the second display, it will be displayed in the second Display area. The Main Display will display the function that is selected before the Dual-display function is turned on. All the available combinations are listed in table 2-3.

Table 2- 3 Available Main/Vice Function Combinations (shade is available)

| | | Main Display Function | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DCV | DCI | ACV | ACI | FREQ | PERIOD | 2-Wire R | 4-Wire R | Cap |
| Second Display Function | DCV | ■ | ■ | ■ | ■ | | | | | |
| | DCI | ■ | ■ | ■ | ■ | | | | | |
| | ACV | ■ | ■ | ■ | ■ | ■ | ■ | | | |
| | ACI | ■ | ■ | ■ | ■ | | | | | |
| | FREQ | | | ■ | ■ | ■ | | | | |
| | PERIOD | | | ■ | ■ | | ■ | | | |
| | 2-Wire R | | | | | | | ■ | | |
| | 4-Wire R | | | | | | | | ■ | |
| | Cap | | | | | | | | | ■ |

For example, press 

→ 

→ 

to enter the following interface.

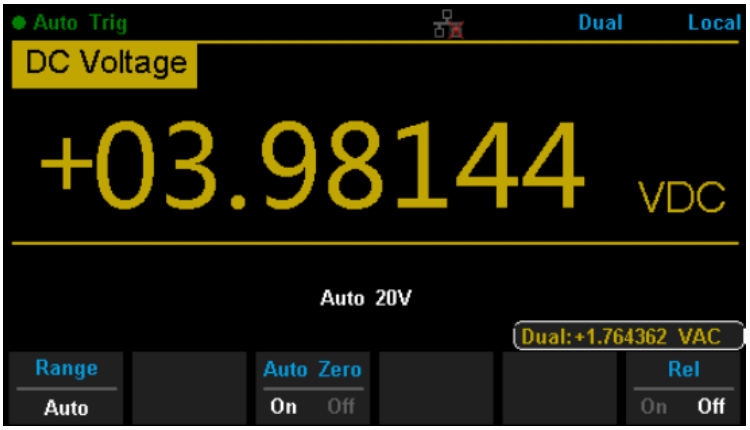



Diagram 2- 23 Dual-display Interface

**Instruction:**

1. If the same measurement function is used in both Main and second Display.

   - The readings in both displays will update at the same time.
   - If math function (dBm, dB) is used in Main Display, when opening the second Display, the math operation will be stopped automatically. The second Display will show the same measurement result as Main Display.
   - If math function (Statistics, Limits, Relative) is used in Main Display, when starting the second Display, the result will still be shown in the Main Display, and the second Display will show the same measurement result as the Main Display.

2. If different measurement functions are used in both Main and the second Display.

   - The readings in both displays will update alternately.
   - If math function (dBm, dB) is used in Main Display, when opening the second Display, the math operation will be stopped automatically. The second Display will show the second selected function normally.
   - If math function (Statistics, Limits, Relative) is used in Main Display, when opening the second Display, the result will still be shown in the Main Display and the second Display will show the second selected function normally.

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

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

5. Measured data in the second Display cannot be saved into “History”.

## Utility Function

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

Press Shift and Dual to enter the operating menu of Utility function, as the following diagram shows.

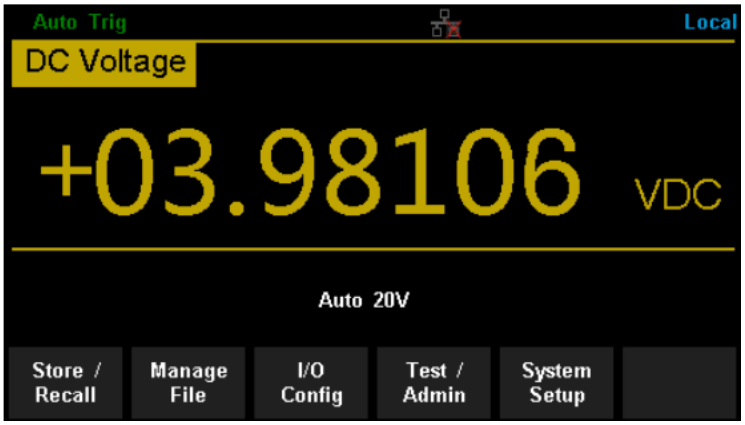



Diagram 2- 24 Utility Function Configuration Interface

Table 2- 1 Utility Function Menu Description

| Function Menu | Description |
|---|---|
| Store/Recall | Store or recall state files. |
| Manage File | Create a new file, copy, rename or delete a file. |
| I/O Config | Configure LAN. |
| Test/Admin | Provide board test function. |
| System Setup | Configure instrument's user settings. |

## Store and Recall

The Store/Recall function enables users to store and recall the instrument state and data files in the local storage as well as in the USB storage. After entering the function menu of Utility, press 【Store/Recall】to enter the interface as shown in diagram 2-25.

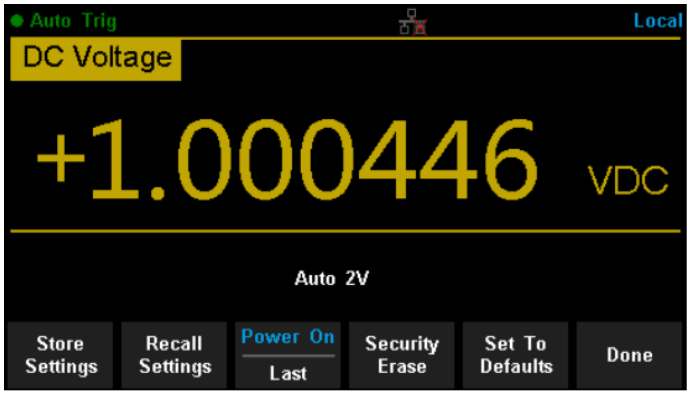



Diagram 2- 25 Store and Recall Interface

Table 2- 2 Store/Recall Function Menu Description

| Function Menu | Description |
|---|---|
| Store Settings | Store state or data files. |
| Recall Settings | Recall state files. |
| Power On | Select the state that is loaded at power-up. |
| Security Erase | Delete all the files stored in local storage and restore the instrument to factory default state. |
| Set to Defaults | Restore the instrument to factory default state. |
| Done | Return to the higher level menu. |

## Store Settings

Store settings allows you to save the system configuration (as .**xml**) or measurement data (as .**csv**) into the internal memory or an external USB storage device. After entering into the function menu of Store/Recall, press【Store Settings】to enter the following interface.

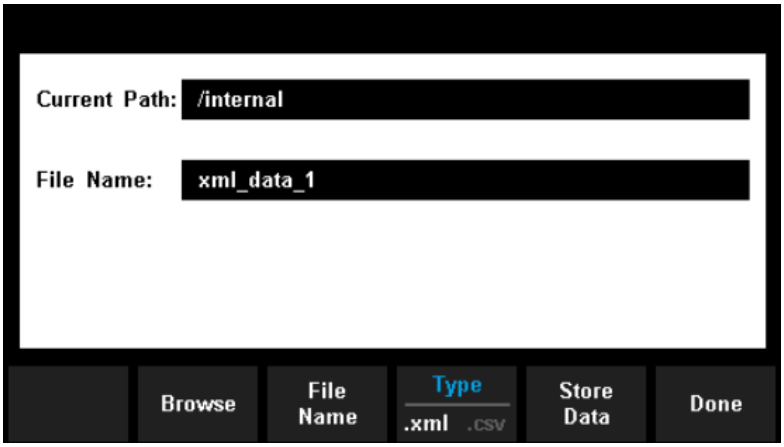



Diagram 2- 26 Store Settings Interface

Table 2- 3 Storage Function Menu Description

| Function Menu | Settings | Description |
|---|---|---|
| Browse | | Choose the location that file will be saved. |
| File Name | | Input the file name. |
| Type | .xml/ .csv | Choose the type of file that will be saved. |
| Store Data | | Store the specified file. |
| Done | | Return to the higher level menu. |

**Operating Steps:**

1. Set the storage directory

Press 【Browse】to enter the following interface, then use the direction keys or menu operation keys to choose the storage directory. Press 【Select】 to set the current directory as storage location and Return to the higher level menu.

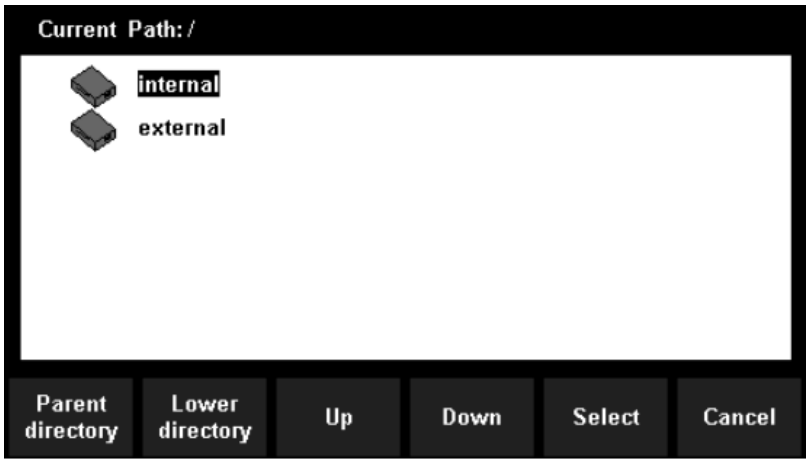



Diagram 2- 27 storage directory Settings Interface

2. Set the file name

Press 【File Name】to enter the following interface and input the name of the stored file.

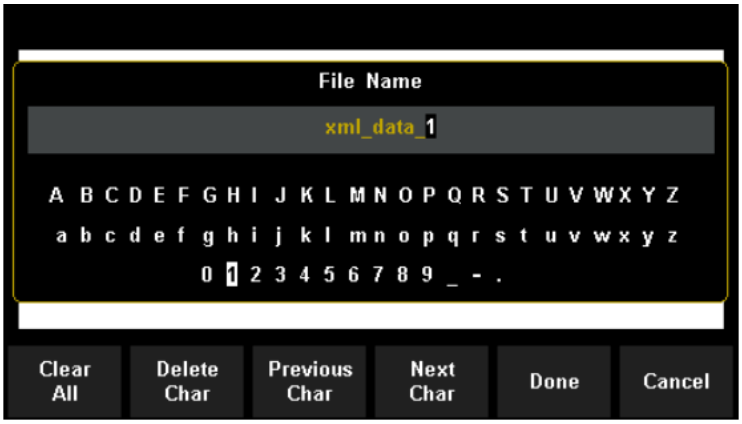



Diagram 2- 28 Input Fire name

**The method of inputting a file name:**

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

3. Set the type of stored file

   Press 【Type】to set the type of stored file.

   - .xml: save the current system configuration as an “.xml” file.
   - .csv: save the current measurement result as a “.csv” file.

4. Save the file

   Press 【Store Data】 to store the specified file.

5. Exit

   Press 【Done】to return to the higher level menu.

### Recall Settings

Recall settings allows you to read the system configuration from the internal memory or an external USB storage device. After entering the function menu of Store/Recall, press【Recall Settings】to enter the following interface.

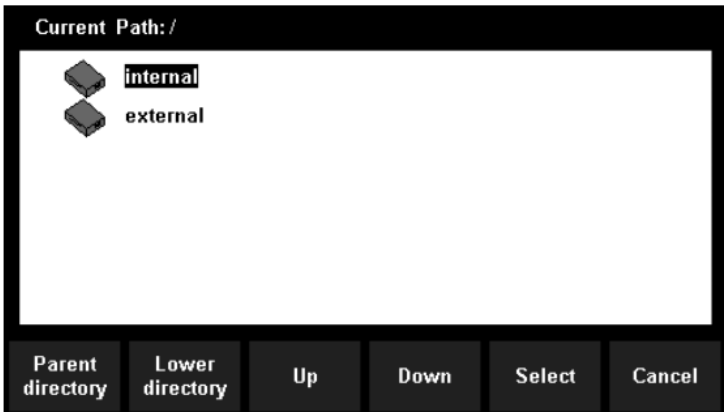



Diagram 2- 29 Recall Settings Interface

Use direction keys or menu operation keys to choose the state file with the suffix ".xml". Press【Select】to read the file and restore the instrument to a specified state. Press 【Cancel】to return to higher level menu.

### Power On

Select a system configuration to be used at power-on from "Default" and "Last" (configuration at last power-off). The setting will be available at the next power-on.

### Security Erase

Press 【Security Erase】, the instrument will display a prompt message "Are you sure you want to delete all stored files?". Press 【Yes】to confirm. The instrument will delete all the files stored in local storage and restore the instrument to the factory default state.

### Set to Defaults

Press 【Set to Defaults】and the instrument will be restored to factory default state.

## Manage File

The **Manage Files** function allows you to create, copy, delete, and rename files and folders in the instrument's internal flash memory or on a USB drive attached to the front panel. It also allows you to capture the current screen to a bitmap (*.bmp) file. After entering the function menu of Utility, press【 Manage File 】to enter the interface as shown in diagram 2-30.

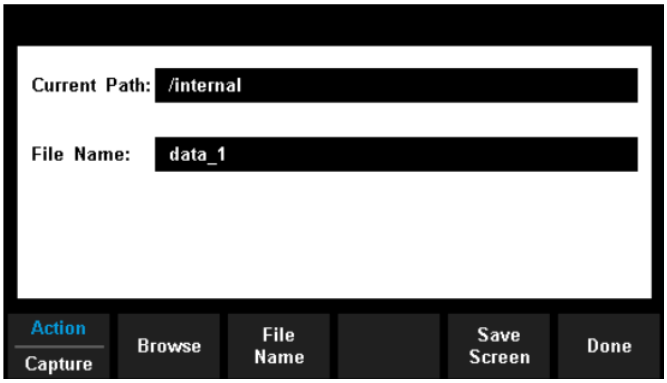



Diagram 2- 30 Manage File Interface

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

- **Folder** – To create a folder, **Browse** to the internal or external location for the folder, press **File Name**, enter a folder name and press **Done**. Press **Create Folder > Done**.
- **Capture Display** – To save a screen capture, **Browse** to the internal or external location for the screen capture. Press **File Name**, enter a name and press **Done**. Press **Save Screen > Done**.
- **Copy** – To copy a file or folder, press **Copy**. **Browse** to the folder or file to be copied and press **Select**. Press **Copy Path** and select an internal or external path for copying. Press **Perform Copy > Done**.
- **Rename** – To rename a file or folder, press **Rename**. **Browse** to the folder or file to be renamed and press **Select**. Press **New Name**, enter a new name and press **Done**. Press **Perform Rename > Done**.
- **Delete** – To delete a file or folder, press Delete and Browse to the folder or file to delete. Press Select >Perform Delete > Done.

## I/O Configuration

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

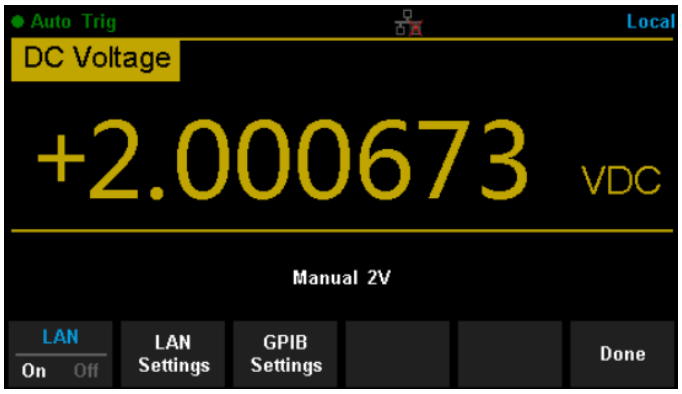



Diagram 2- 31 I/O Configuration Interface

**LAN Settings**

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

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

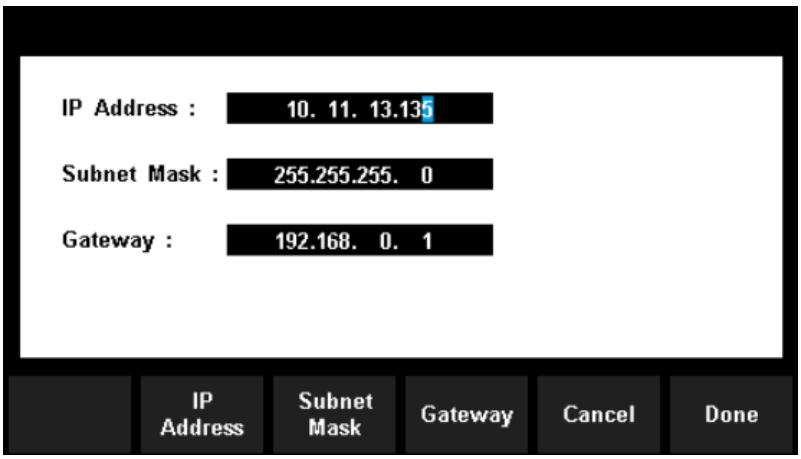



Diagram 2- 32 LAN Settings Interface

Table 2- 4 LAN Settings

| Function Menu | Description |
|---|---|
| IP Address | Set up IP address. |
| Subnet Mask | Set up subnet mask. |
| Gateway | Set up gateway |
| Cancel | Cancel current operation and return to the higher level menu. |
| Done | Save all changes and return to the higher level menu. |

## Board Test

T3DMM6-5 provides self-test functions, including Key Test, LCDTest, Beeper Test and Chip Test.

**Operating Steps:**

1. Press Shift and Dual, then choose【Test/Admin】→【Board Test】to enter the following interface.

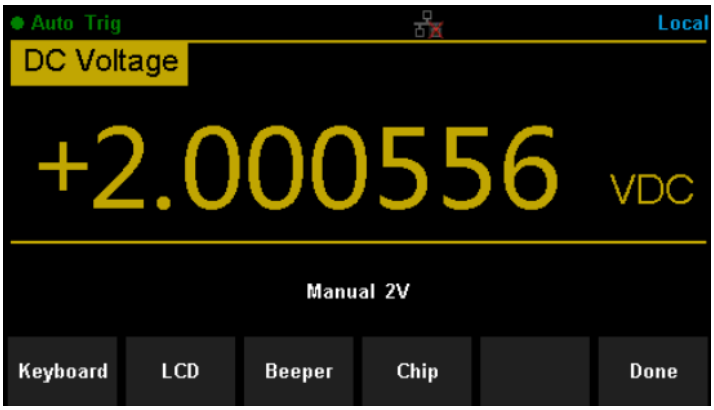



Diagram 2- 34 Board Test Interface

Table 2- 5 Board Test Function Description

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

2. Test the keys (select Keyboard).

Select【Key】to enter the key test interface, as displayed in Diagram 2-35. The on-screen rectangle shapes represent the keys on the front panel. Test all keys and knobs and you should also verify that all the back lit buttons illuminate correctly.

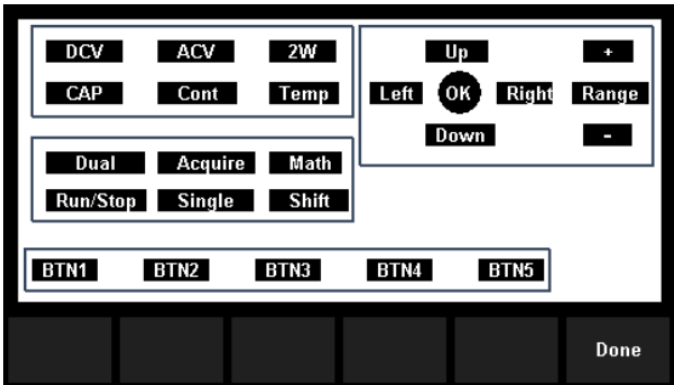



Diagram 2- 35 Key Test Interface

Before testing the keys the key shapes on the screen will be displayed in a blue colour. The on screen keys and knobs will change to a green colour when tested. Press [Done] to exit the test.

3. Test the LCD screen.

   Select【LCD】to enter the screen test interface, the screen shows the message: “Press ‘Change’ to change. Press ‘Done’ to exit”. Press 【 Change 】to start the test and observe if the screen has changed colour or other display errors as shown in Diagram 2- 36.

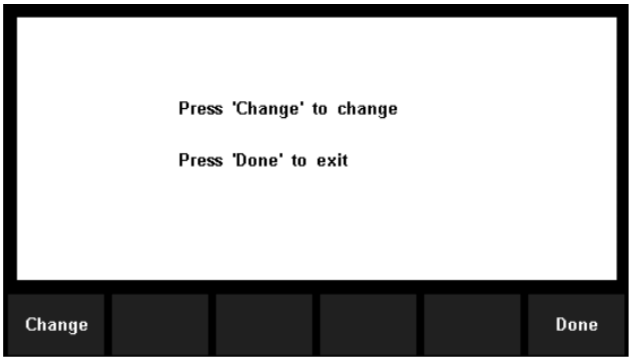



Diagram 2- 36 LCD Test Interface

**NOTE:**

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

4. Test the beeper.

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

5. Test the chips.

   Press【Chip】→【Start】to enter chip test interface, as Diagram 2- 37 shows.

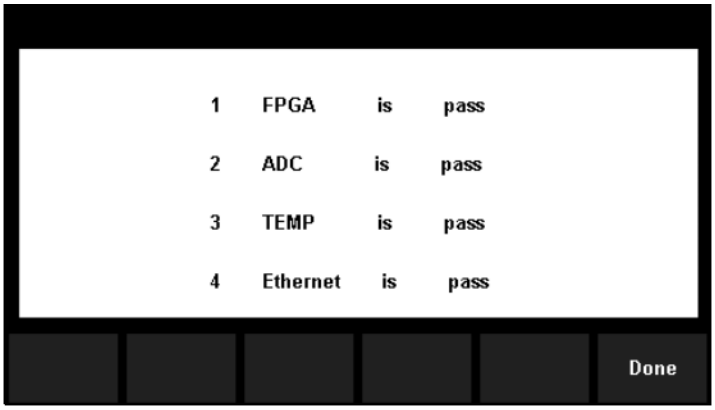



Diagram 2- 37 Chip Test Interface

**NOTE:**

- If the test is passed, the corresponding result shows “pass”.
- If the test is failed, the corresponding result shows “fail”.

6. Press【Done】to exit the board test.

## Firmware Update

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

**Operating Steps:**

1. Copy the update file to the USB flash drive.
2. Insert the USB flash drive to the USB host interface on the front panel of the Multimeter.
3. Press 

→ 

→【System Setup】→【Firmware Update】, then press【Browse】and select the update file. Next, press【Update】→【Yes】to start updating the system software.
4. On completion of the update, the screen will show the message: “Firmware Update Done!” Then you can remove the USB flash drive away.
5. Restart the Multimeter and check the version information.

   Press 

→ 

→【System Setup】→【System Info】to check if the software and hardware version has updated. If not, and the update has failed, you will need to update once more following the above operating steps.
6. After checking, press【Done】to exit the system information interface.

**NOTE:**

Do not disconnect the power or turn off the instrument whilst the instrument is updating.

## System Setup

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

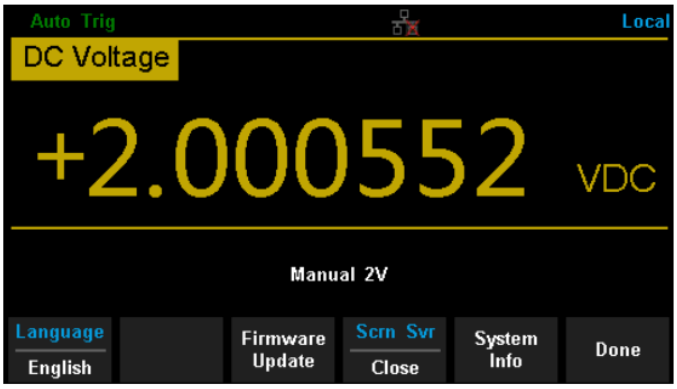



Diagram 2- 38 System Setup Interface

Table 2- 6 System Settings Menu Description

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

1. **Select language.**

   The Multimeter supports two languages, English and Chinese. Press【Language】to select the Language of the menu.

2. **Set up the screen protection timer.**

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

**3. View system information.**

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

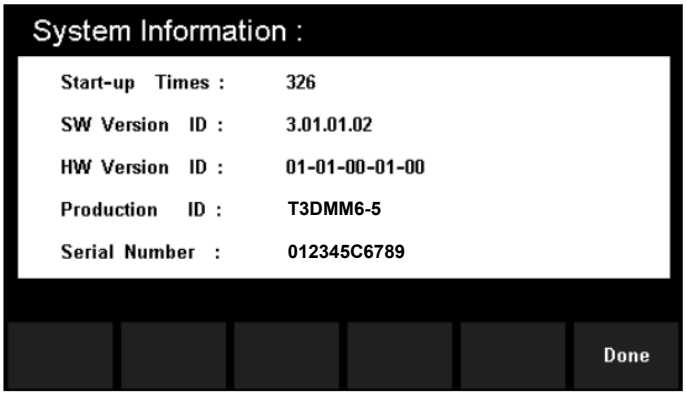



Diagram 2- 39 System Information

## Acquire

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

Press 

to enter the interface shown as the following diagram:

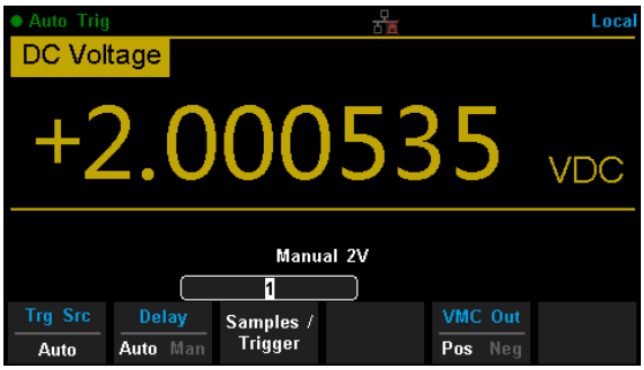



Diagram 2- 40 Acquire Interface

Table 2- 7 Function Menu of triggering parameter

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

## Auto Trigger

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

**Operating Steps:**

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

   Delay is the waiting time after the trigger signal is sent out and before the acquiring starts. Press 【Delay】to select Auto or Manual mode. When choosing Manual mode, the Left and Right keys are used to select the numerical digit to adjust. The Up and Down keys are used to change the selected digit value.
3. Set the number of samples per trigger.

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

**Sample Count**

- Sample Count indicates the number of samples taken when the Multimeter receives a Single Trigger event (samples per trigger).
- The range of sampling points should be between 1 and 599999999.
- The default value of the Sample Count is 1.

4. Set the VMC Out.

The Multimeter outputs a pulse signal through the VM COMP interface on the rear panel after the sampling signal is finished. Press【VMC Out】to choose Positive or Negative polarity.

## Single Trigger

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

**Operating Steps:**

1. Press 

, then select 【Trg Src】→【Single】or press 

on the front panel directly to enable Single Trigger.

2. Set the delay.

   Press【Delay】to select Auto or Manual mode.

3. Set the number of samples or trigger.

   Press 【Samples/Trigger】to set sample count.

4. Set the VMC Out.

   The Multimeter outputs a pulse signal through the VM COMP interface on the rear panel after the sampling signal is finished.

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

## External Trigger

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

**Operating Steps:**

1. Press 

, then select 【Trg Src】→ 【Ext】 to enable the External Trigger.

2. Set the polarity of slope.

   Press【Slope】to choose Positive or Negative polarity.

3. Set the delay.

   Press【Delay】to choose Auto or Manual mode.

4. Set the number of samples or trigger.

   Press【Samples/Trigger】to set sample count.

5. Set the VMC Out.

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

## Help System

T3DMM6-5 provides a powerful built-in help system. You can recall help information at any time whilst using the instrument. You also can get a functionality help for every button on the front panel or menu soft key by using the built-in help system. You may also get help about familiar operations with the help list.

Press Shift and Acquire to enter the help list, as the following diagram shows.

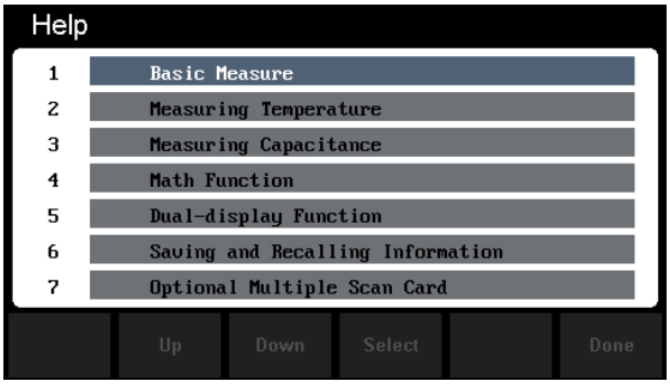



Diagram 2- 41 Help Menu

Table 2- 8 Help System Operating Menu

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

1. **Basic Measure.**

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

2. **Measuring Temperature.**

   Get the method to measure temperature.

3. **Measuring Capacitance.**

   Get the method to measure capacitance.

4. **Math Function.**

   Introduction of how to use the math function whilst making measurements.

5. **Dual-display Function.**

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

6. **Saving and Recalling Information.**

   Introduction of how to store and recall the data/parameter/sensor files.

7. **Optional Scanner Card.**

   Get help about operating the optional scanner card (T3DMM6-5-SC only).

8. **The convention and Tips of Soft Key usage.**

   Get help and tips about using the soft keys.

9. **Technical Support.**

   How to obtain technical support.

**Explanation:**

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

## Math Function

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

Press 

to show the operating menu of math functions on the screen, as shown in the following diagram.

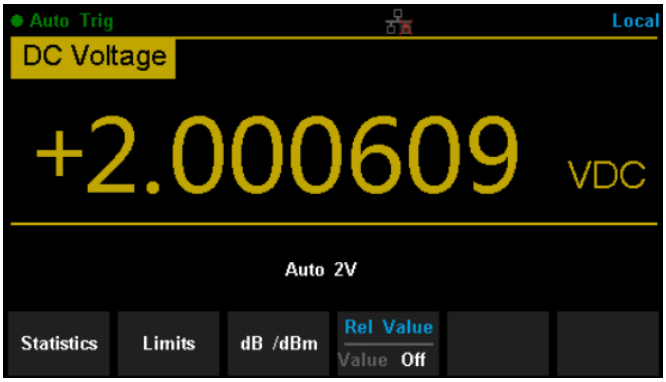



Diagram 2- 42 Math Function Menu

Table 2- 9 Math Function Menu Description

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

**Explanation:**

- Math functions are only applicable to the main display.
- If a measurement function is changed, all math functions will be stopped except Statistics.

## Statistics

There are many kinds of reading statistic functions, including: Max, Min, Average and Standard deviation.

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

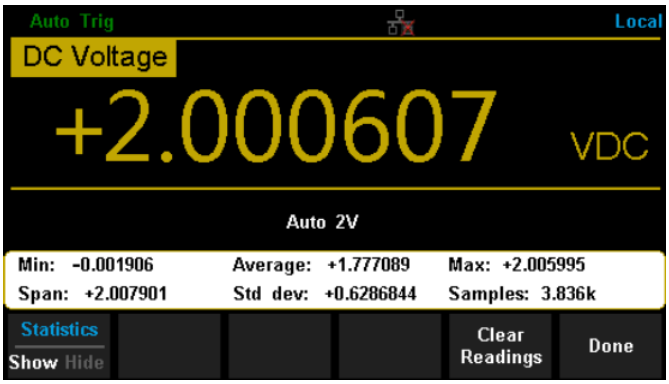



Diagram 2- 43 Statistics

Table 2- 10 Statistic Measurement Menu Function Description

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

**Statistics Function:**

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

## Limits

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

Press 

→【Limits】→【On】 to enter the interface shown in the following diagram.

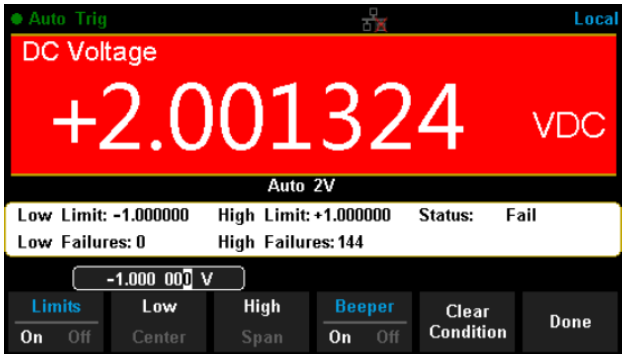



Diagram 2- 44 Limits

Table 2- 11 Limits Measurement Menu Function Description

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

## 1. How to Set Limits

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

## 2. Unit

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

## 3. Notes

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

**The range of Limits function:**

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

## dBm

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

Press Math → 【dB/dBm】→【On】and select【Function dBm】to enter the interface shown in the following diagram.

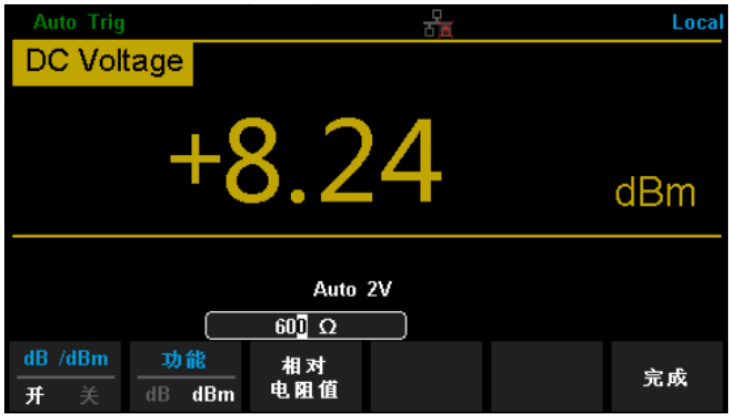



Diagram 2- 45 dBm Function Interface

Table 2- 12 dB Measurement Function Menu Function Description

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

The computation method for dBm:

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

$dBm = 10 \times Log_{10}【(Reading^2/R_{REF})/0.001W】$

## dB

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

Press Math → 【dB/dBm On】 and select 【Function dB】 to enter the interface shown in the following diagram.

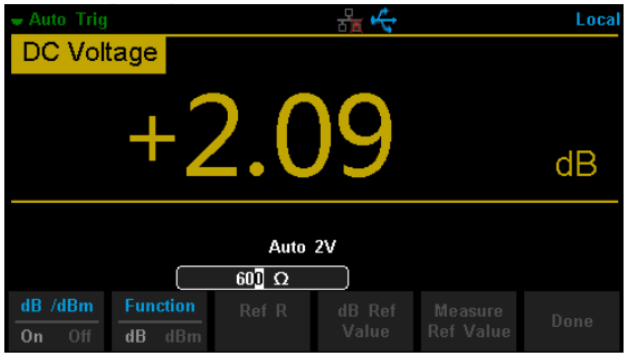



Diagram 2- 45 dB Function Interface

Table 2- 13 dB Measurement Function Menu Function Description

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

**The computation method of the dB:**

**$dB = 10 \times Log_{10}【(Reading^2/R_{REF})/0.001W】– (dB\ setting\ value)$**

$R_{REF}$ expressed measuring the resistance value in the actual electric circuit. Range of the dB setting value: -200 dBm ~ +200 dBm. The default is 0 dBm.

**dB value:**

- Input a value in dB setting interface using the direction buttons, and then store it as dB setting value.
- Settings of dB value are stored in volatile memory.

## Relative Value

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

The Multimeter Relative Value is available for the following measurement parameters: DC Voltage, AC Voltage, DC Current, AC Current, Resistance, Frequency, Period, Capacitance and Temperature.

Press 

→【Rel Value】to enter the interface shown in the following diagram.

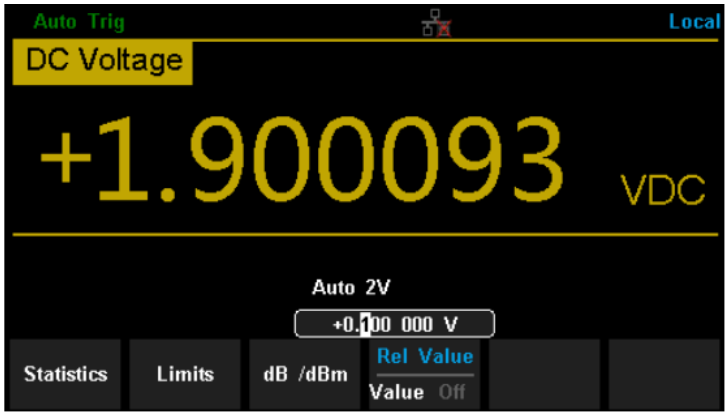



Diagram 2- 46 Relative Operation

Table 2- 14 Rel Value Operation Function Menu

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

When Rel Value function is turned on, the result of relative measurement will display on the screen.

**Main display = Measurement value – Preset value**

## Display Mode

The Multimeter supports four types of views for measured data: “Number”, “Bar Meter” ”Trend Chart” and “Histogram”.

### Number

Press Shift and Math to open the menu of display mode and press 【Display】to enter the following interface. “Number” is always the selected mode when the Multimeter is turned on.

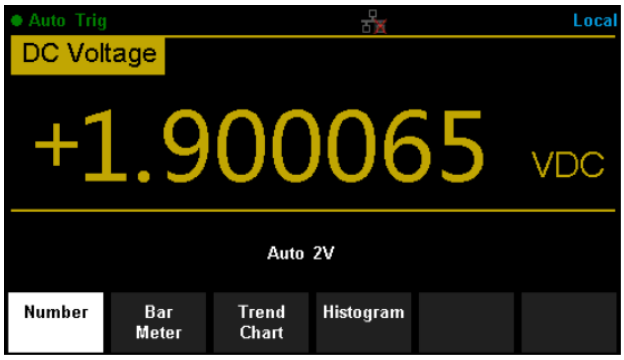



Diagram 2- 47 Number Display Mode

## Bar Meter

### Operating Steps:

1. Press【Bar Meter】to enter Bar Meter display mode.

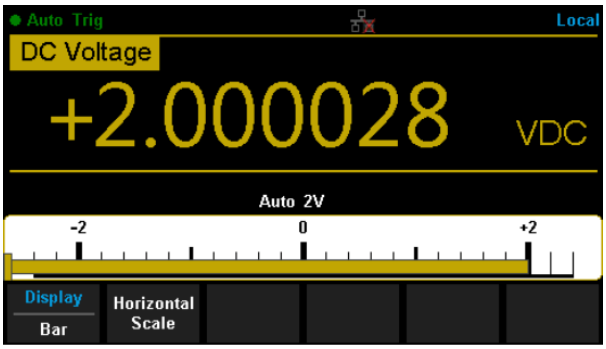



Diagram 2- 48 Bar Meter Display Mode

2. Press 【 Horizontal Scale 】 to set the vertical scale as Defaultor Manual mode.

Table 2- 15 To Set the Vertical Scale of Bar Meter manually

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

## Trend Chart

### Operating Steps:

1. Press【Trend Chart】to enter the Trend Chart display mode.

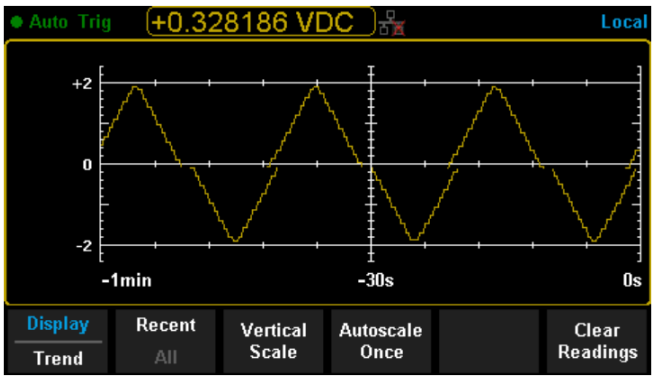



Diagram 2- 49 Trend Chart Display Mode

Table 2- 16 Trend Chart Display Mode

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

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

   Press【Auto】and the Multimeter will set the vertical scale automatically.

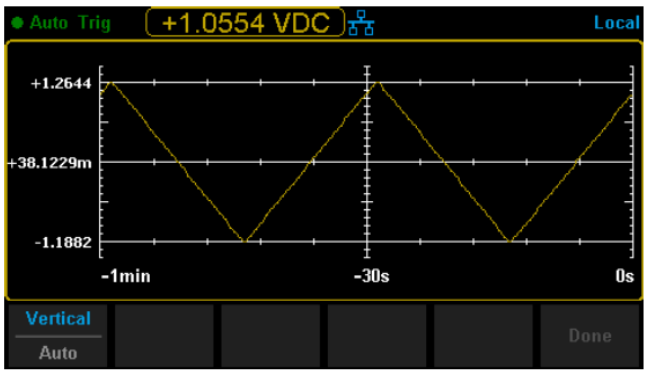



Diagram 2- 50 Auto Vertical Scale

Press【Manual】and you can set the vertical scale manually, as displayed in diagram 2- 51.

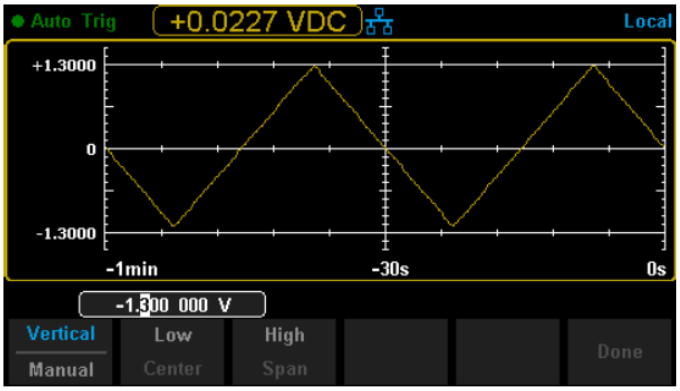



Diagram 2- 51 Manual Vertical Scale

## Histogram

### Operating Steps:

1. Press【Histogram】to enter the Histogram display mode.

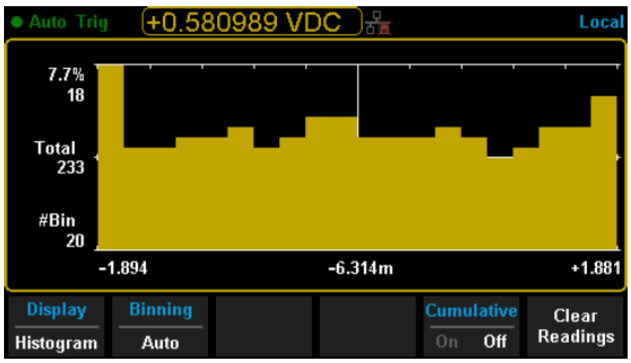



Diagram 2- 52 Histogram Display Mode

Table 2- 17 Histogram Display Mode

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

2. Press【Binning】to set Binning as the Auto or Manual mode. When in Manual mode, press【Bin Settings】to enter the following interface.

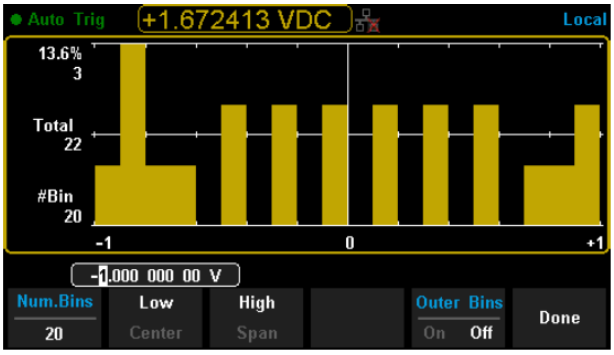



Diagram 2- 53 Bin Set Interface

Table 2- 18 Bin Set

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

# Trigger

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

**Auto Trigger**

Press Run Stop on the front panel one time and the Auto Trigger will be started to capture continuous readings automatically. The screen will show "**Auto Trigger**". Press Run Stop again and the trigger is stopped.

**Single Trigger**

Press Single on the front panel, the Single Trigger will be started one time and generate a single reading. The screen will show "**Single Trig**".

**Explanation**

In the Remote Mode, the screen will show "**Imme Trig**". Press Shift to switch back to the local mode and the Multimeter will choose Auto Trigger automatically.

## Hold Measurement Function

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

Press Shift and Single to open Hold measurement function interface, the black field just above the screen will show "·**Probe Hold**", as shown in the following diagram.

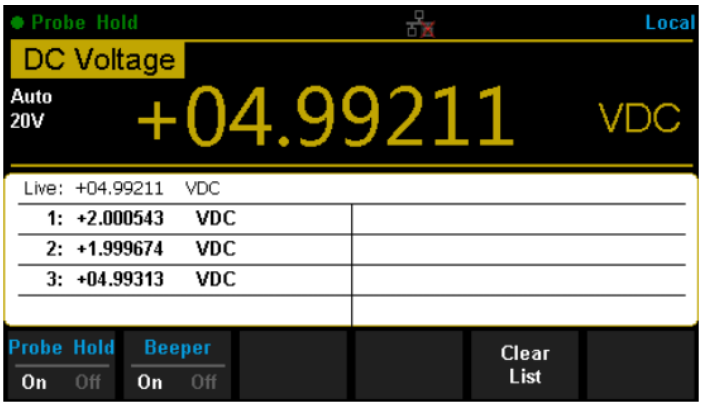
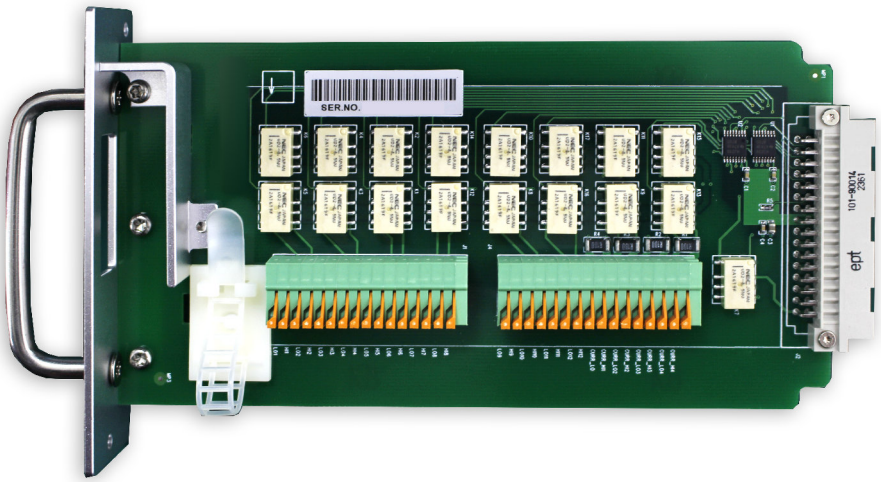



Diagram 2- 54 Hold Measurement Function Interface

Table 2- 19 Hold Measurement Function

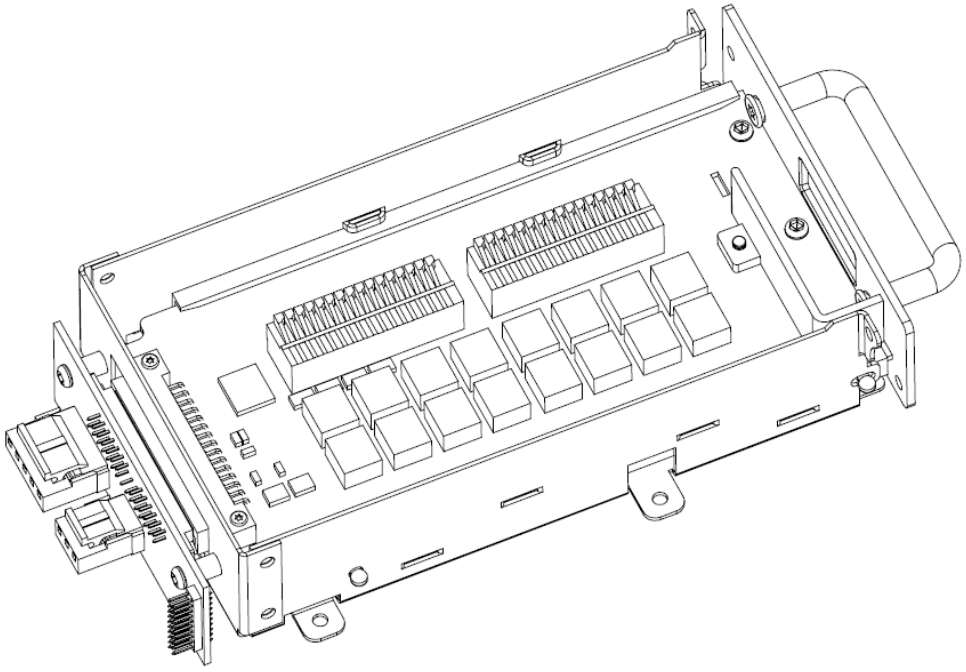
| Function Menu | Settings | Description |
|---|---|---|
| Probe Hold | On/Off | Turn on or off the Probe Hold function. |
| Beeper | On/Off | Turn on or off the Beeper. |
| Clear List | | Clear all current readings and restart the statistics. |

# Chapter 3: T3DMM6-5-SC Scanner Card




## Product Overview

The T3DMM6-5-SC scanner is a multiplexer that provides multi-point measurement capabilities to the T3DMM6-5-SC multimeter digital multimeter. The scanner features 12 multi-purpose + 4 current channels and supports the following measurement functions: DCV, ACV, DCI, ACI, 2WR, 4WR, CAP, FREQ, DIODE, CONT and TEMP (RTD and Thermocouple).It provides a convenient and versatile solution for test applications that require multiple measurement points or signals, and is an ideal tool for R&D burn-in and production testing.



**Safety:** To achieve the best performance from the product, please read this section carefully. To avoid electrical shock and personal injury, please don't use the product to measure signals that exceed the published specification.

The Teledyne Test Tools T3DMM6-5-SC Scanner capability is a ready installed multiplexer that provides multi-point measurement capabilities to the T3DMM6-5-SC. The scanner features 12 multi-purpose + 4 current channels and supports the following measurement functions: DCV, ACV, DCI, ACI, 2WR, 4WR, CAP, FREQ, DIODE, CONT and TEMP (RTD and Thermocouple).

It provides a convenient and versatile solution for test applications that require multiple measurement points or signals and is an ideal tool for R&D burn-in and production testing.

The scanner option is not available separately for the T3DMM6-5 or as an upgrade for the T3DMM6-5.

## Specifications

Please observe the specifications below to achieve the best performance from the T3DMM6-5-SC scanner capability.

| | |
|---|---|
| Maximum Switching power | 37.5 VA / 30 W |
| Maximum Switching voltage | 250 V AC / 220 V DC |
| Maximum Switching Current | 1 A |
| Contact Life | > 100000 operations, at 1 A 30V DC (at 0.5 Hz)<br>> 100000 operations, at 0.3 A 125 V AC (at 0.5 Hz) |
| Contact Resistance | 75 mΩ (maximum at 6 VDC, 1 A) |
| Actuation Time | 5 ms maximum on/off (channel to channel ) |
| Insulation Resistance | Minimum 1 GΩ ( 500 VDC ) |
| Connector Type | Clamp terminal, #24 AWG wire size |

Remarks: Please do not use the scanner capability to measure signals that exceed the specifications as this can damage or reduce the life of the scanner and cause electric shock or personal injury.

## Channel Capabilities

| Item | No. of wires | No. of channels |
|---|---|---|
| DCV, ACV | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| DCI, ACI[1)] | 2 wires (H , L) | 4 (CH13 ~ CH16) (2A Range Only ) |
| 2W Resistance | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| 4W Resistance | 4 wires (Input H , L + sense H, L) | 6 pairs (CH1 [input] & CH7[sense], 2&8, •••, 6&12) |
| Capacitance | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| Diode/Continuity | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| Period/Frequency | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| Temp (Thermocouple) | 2 wires (H , L) | 12 (CH1 ~ CH12) |
| Temp (RTD) | 2 wires (H , L) | 12 (CH1 ~ CH12) |

Remarks:

[1)] For continuous current < 2.2 A, Accuracy ± (% 3 (reading) + 0.02 % (range)).

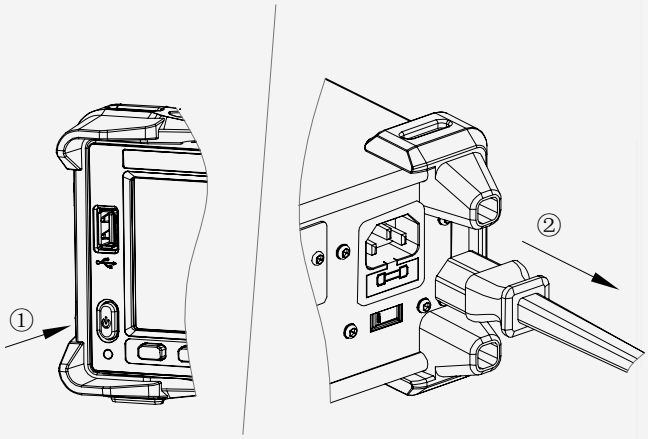
## Steps

### 1.Operations

**WARNING**

The T3DMM6-5-SC scanner is not designed to be "hot swappable". Remove power from all inputs and turn the instrument power off before installation or removal of the scanner card. Hot swapping the card could cause damage and is not covered under the warranty.

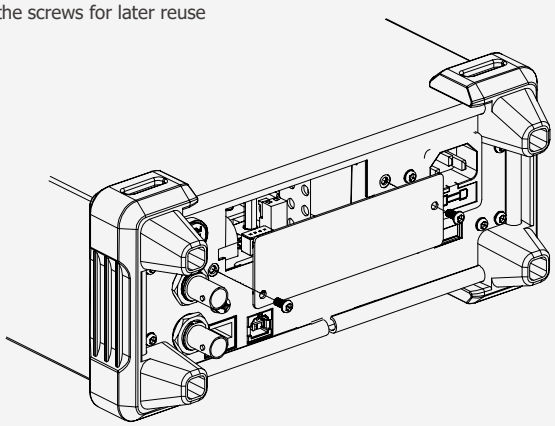
1. Turn off and remove the power cord.




**2.Open theT3DMM6-5-SC rear panel slot**

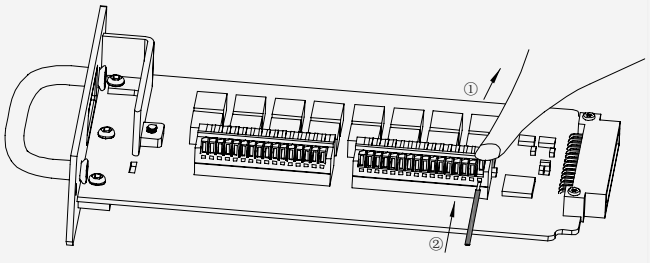
Take off the two screws on the slot corners to remove the optional slot cover.

Keep the screws for later reuse



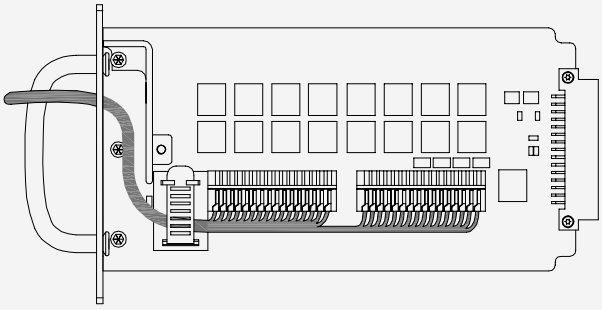
**3.Connection**

Turn the clamp and insert the wire.



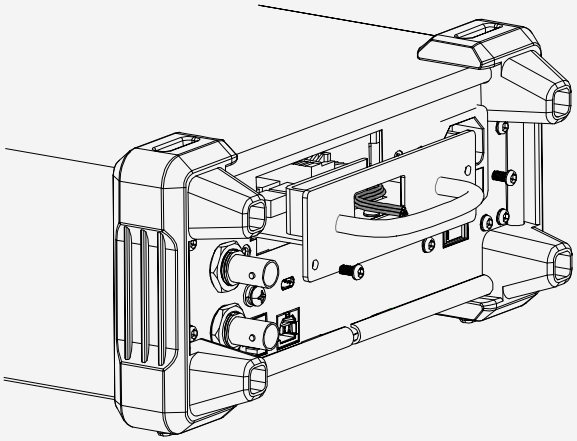

**4. Tighten cable**

Route wiring through strain relief and Cable tie rap Wrap



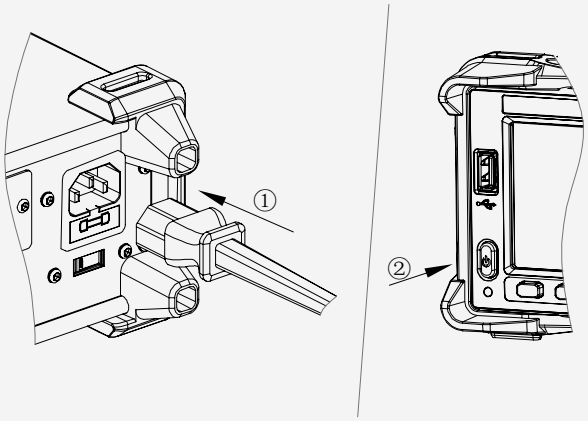
**5.Insert the Scanner**

Insert the scanner bottom-side-up. Close the cover by tightening the screws.



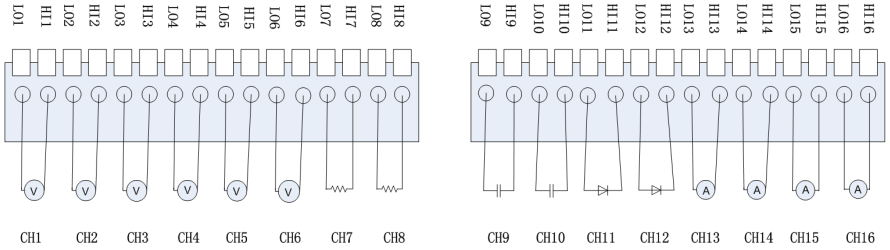
**6.Power On**

Connect the power cord and turn On the power



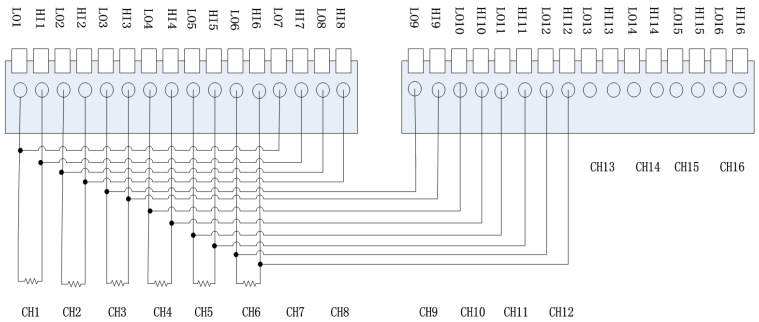

## 2.Application of 16 Channels

(1) 2-Wired Application [1](DCV/ DCI/ ACV/ ACI 2WR/ 4WR/ CAP/ FREQ/ DIODE/ CONT / TEMP)




Remarks：[1] CH1 to CH12 can be used to measure DCV /ACV/ 2WR/ 4WR/ CAP/ FREQ/ DIODE/ CONT / TEMP. CH13 to CH16 can only be used for current measurements, less-than 2.4A

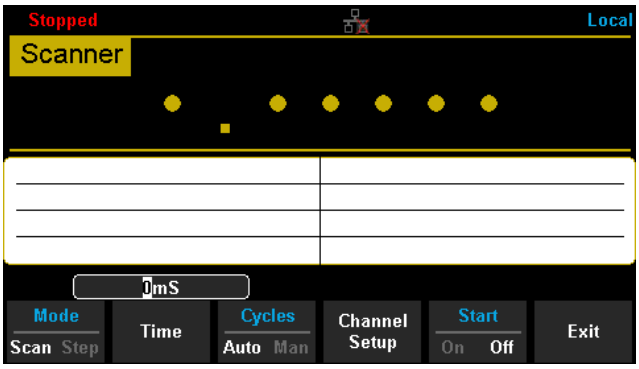
(2) 4-Wire Resistance Applications[1]




Remarks: [1] To minimize voltage errors, the remote sense connections (CH7,CH8 etc..) should be made as close to the device-under-test (DUT) as possible.

## 3.Front Panel operations

Press Shift and Temp to enter the operating menu of Utility function, as the following diagram shows.




## Scanner Function Menu

| Function Menu | Settings | Description |
|---|---|---|
| Mode | Scan/Step | Set the operation mode |
| Time | 0ms~999.999s | Sets the duration between each scan loop (Scan mode) or between each scanned channel (Step mode) |
| Cycles | Auto/Man | Sets the number of scan operations |
| Channel Setup | | Sets the scanned channel range, measurement function, and measurement parameters |
| Start | On/Off | Start or stop scan operation |
| Exit | | Exit the scanner function |

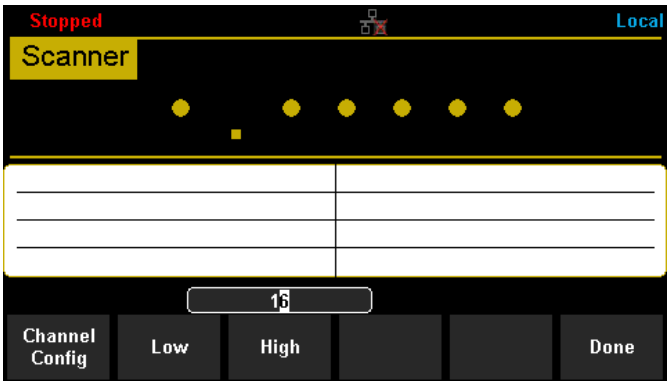
**1.Operation mode setup**
•Scan: Measures all specified channel ranges (Channel MIN~MAX) for each trigger event. Time settings are applied between each scan for the whole channel range.
•Step: Measures a single channel in the specified range (Channel MIN~MAX) at each trigger event. Time settings are applied for each channel.

**2.Time setup**
Use the direction keys to set the duration between each scan loop (Scan mode) or between each scanned channel (Step mode)

**3.Cycles**
•Auto: The instrument will scan specified channel circularly after the scan operation start and you should stop the operation manually.

•Manual: Sets the number of scan operations by direction keys. The range of the setting is from 1 to 999. After starting the scan operation the instrument will not stop scanning until it reaches cycle number.

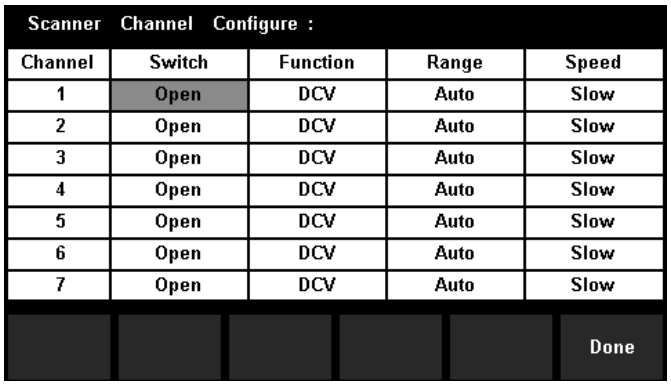
**4.Channel setup**
Press the [Channel Setup] to enter the setup interface.



## Scanner Function Menu Description

| Function Menu | Description |
|---|---|
| Channel Config | Open/close the channel and set the measurement function, measurement parameters of specified channel. |
| Low | Set the low value of scanned channel range. |
| High | Set the high value of scanned channel range. |

Press the [Channel Setup] to enter the channel configuration interface and set the channel switch, function, range and speed..




The range setting is applicable for the following functions: DC/AC Voltage (DCV/ACV), 2/4 Wire Resistance (2W/4W), Capacitance (CAP), Frequency (FRQ).

Table 3. Available Range for different measurement function

| Measurement Function | Available Range |
|---|---|
| DCV/ACV/ FRQ | Auto, 200mV, 2V, 20V, 200V |
| DCI/ACI | 2A (fixed) |
| 2W/4W | Auto, 200Ω, 2kΩ, 20kΩ, 200kΩ, 2MΩ(1MΩ for T3DMM6-5), 10MΩ, 100MΩ |
| CAP | Auto, 2nF, 20nF, 200nF, 2μF, 20μF, 200μF, 10000μF (2mF, 20mF, 100mF for T3DMM6-5) |

The scanner function provides two measurement speeds: Fast (50 reading/s = 20ms / reading) and Slow (5 reading/s = 200ms / reading). (Fast: 1PLC, Slow: 10 PLC for T3DMM6-5-SC) The speed setting is applicable for the following functions: DC/AC Voltage (DCV/ACV), 2/4 Wire Resistance (2W/4W)

**Operating instructions:**
- Move the cursor to choose the wanted parameter by direction keys and the background color of cursor's position turns to gray.
- Select the current item by pressing "OK" key and the background color of the selected item turns to green.
- Set the parameter by up and down direction keys.
- Press "OK" key again to store the setting of the selected item of which the background turns back to gray. Move the cursor and repeat the prior steps to set the next parameter.
- Press [Done] to save the current settings and return to the higher level menu.

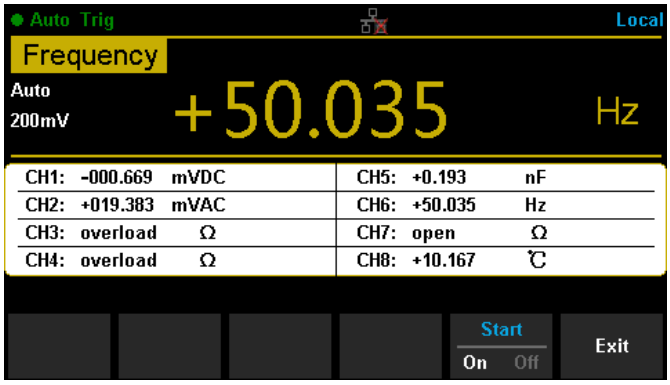
**5.Channel range setting**

Select [High] or [Low] and then input numerical value by direction keys.

Note: The upper limit value should be always bigger than the lower limit value.

**6.Start scan operation**

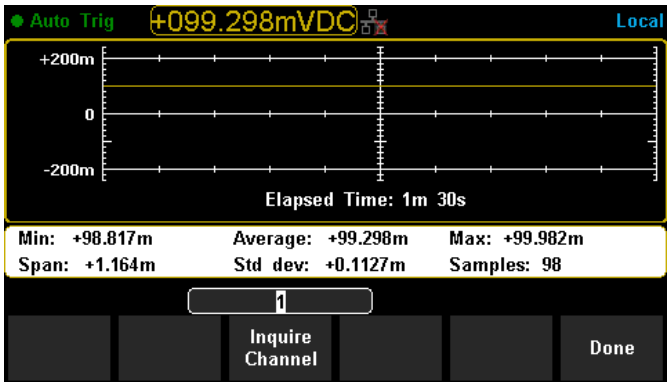
Set the [Start] to on to start the scan operation




The upper part of the interface displays the function, range, and result of the current channel. The table below records the measurement result of each channel.

**7.Enter trend chart and statistics mode (optional operation)**

Press Shift and Math to open trend chart and statistics function.




Set the [Inquire Channel] by direction keys and the interface displays the minimum, average, maximum, span, standard deviation, samples and trend chart of measurement results of the setting channel during the scan operation.

Press [Done] to return to higher level menu.

**8.Stop scan operation**

Set the [Start] to off to stop the scan operation.

If the [Cycles] is set to manual, then the instrument will stop scan when it reaches the cycle number

**9.Store measurement data (optional operation)**

Press Shift and Dual , then Select [Store/Recall] → [Store Settings] to enter the storage function interface.

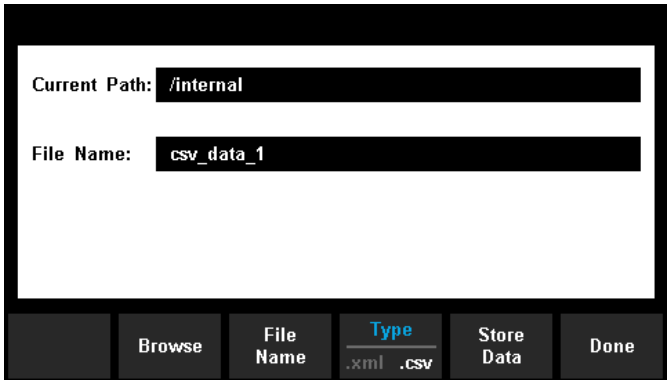


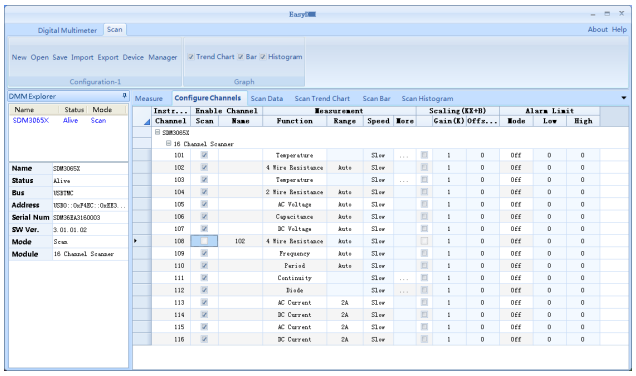
Table 4. Storage Function Menu Description

| Function Menu | Settings | Description |
|---|---|---|
| Browse | | Choose the location that file will be saved. |
| File Name | | Input a file name. |
| Type | .xml / .csv | Choose the type that the file is saved.<br>.xml: configuration of scan function<br>.csv: measurement data |
| Store Data | | Save the file with the file name input to the current selected location. |
| Done | | Return to the higher level menu. |

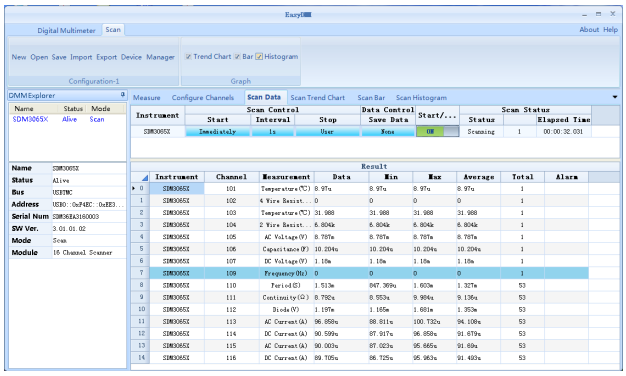
### Remote operations

The T3DMM6-5-SC series can be controlled remotely by using the EasyDMM software. It allows users to easily select the measurement function and range for each channel and start acquiring measurement data. With a rich online help system, the user is able to create a virtual instrument on the PC for data collection and instrument control. During the scanning period, the measurement data can be viewed directly on the screen or viewed graphically using trend chart, bar and histogram graph types. The data can then be automatically or manually saved to a database or exported as a CSV files

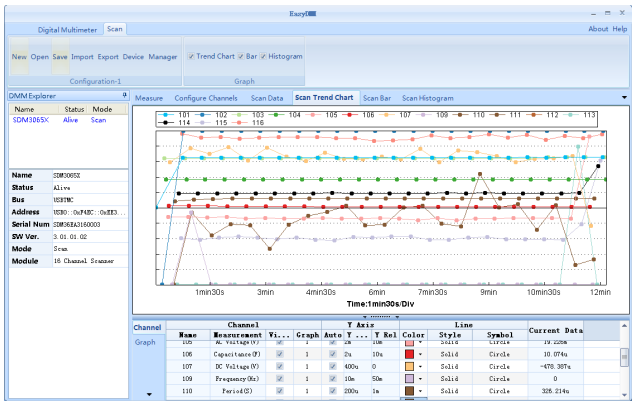
**Channel Configuration**



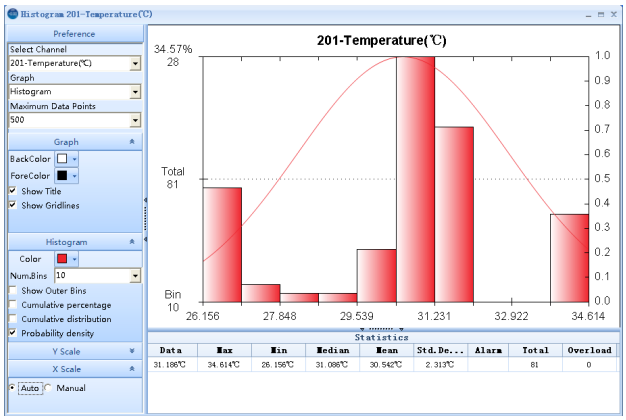
**Data Acquisition**



**Trend Chart**



**Histogram**




The latest version of EasyDMM can be downloaded for free from the Teledyne LeCroy website. Go to www.teledynelecroy.com for more information.

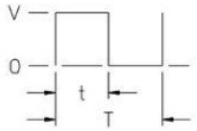
# Chapter 4: Measurement Tutorial

## True RMS AC Measurement

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

The AC voltage and AC current functions measure the “AC coupled” true RMS value, which is to measure the RMS value of the AC component (DC component is rejected) of the input signal. For sine waves, triangle waves, and square waves, the AC and AC+DC values are equal since these waveforms do not contain a DC offset. See the following table 3-1.

Table 3- 1 True RMS AC Measurement of Sine, Triangle and Square waves

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

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

An AC coupled true RMS measurement is desirable in situations where you are measuring small AC signals in the presence of DC offsets. For instance, measuring an AC ripple present on DC power supplies. There are situations, however, where you might want to know the AC+DC true RMS value. You can determine this value by combining results from DC and AC measurements as the following shows. You should perform the DC measurement using 6.5 digit mode for best AC rejection.

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

## Crest Factor Errors (non-sinusoidal inputs)

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

The greater the crest factor, the greater the energy contained in high frequency harmonics. All Multimeters have errors that are crest factor dependent. (The crest factor errors do not apply for input signals below 100Hz.)

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

**Total Error ＝ Error (Sine wave) + Error (Crest factor) + Error (Bandwidth)**

Error (Sine wave): error for sine wave

Error (Crest factor): crest factor additional error.

Error (Bandwidth): estimated bandwidth error as shown below:

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

**C.F.:** signal crest factor

**F:** fundamental frequency of pulse

**BW:** effective bandwidth of the Multimeter

**Example:**

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

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

**= 0.85%× reading + 0.08%× range**

## Loading Errors (AC Voltage)

In the AC Voltage function, the input of T3DMM6-5 appears as a 1MΩ resistance in parallel with 100pF of capacitance. The test lead that you use to connect signals to the Multimeter will also add additional capacitance and loading. The approximate input resistances of the Multimeter at different frequencies are listed in the following table.

Table 5- 2 Approximate Input Resistances at Different Frequencies

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

**For low frequencies:**

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

**For high frequencies:**

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

**F:** input frequency

**R s:** source resistance

**Cm:** input capacitance (100pF) plus test lead capacitance

# Chapter 5: General Troubleshooting

The following is a list of issues that may arise while using the Multimeter and its solutions. Please use the corresponding steps when troubleshooting. If you are still unable to resolve, please contact Teledyne Test Tools.

➢ **If the screen of the Multimeter is still dark with nothing displayed after pressing the power key:**

1. Check if the power has been connected correctly.
2. Check if the main power switch on the back panel has been turned on.
3. Check if the power fuse has blown. Replace it as desired if it has blown.
4. Restart the Multimeter after all the above steps are complete.
5. If the instrument still cannot start up properly, please contact Teledyne Test Tools.

➢ **The reading does not change when connecting an AC current signal:**

1. Check if the test lead has been connected to the current jack and LO jack correctly.
2. Check if the fuse in the current location on the back panel has blown.
3. Check if the correct measurement connectors have been selected (DCI or ACI).
4. Check if the input is ACI but the measuring location is DCI.

➢ **The reading does not change when connecting a DC current signal:**

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

➢ **USB Disks cannot be recognised by the instrument.**

1. Check if the USB disk works properly.
2. Make sure the used USB disk is of a Flash type. The instrument does not support USB disks of a hard disk type.
3. Check if the capacity of the used USB disk is too large. The Multimeter is recommended not to use USB disks which exceed 8GB.
4. After restarting the instrument, insert the USB disk again to inspect.
5. If you still cannot use the USB disk properly, please contact Teledyne Test Tools.

# Chapter 6: Appendix

## Appendix A: Accessories

**Standard Accessories:**

- Multiple power cords included.
- Two test leads (black and red).
- An USB Cable.
- A Quick Start.

**NOTE:**

- We suggest that the length of the USB data wire and LAN cable connected to the instrument should be less than 3m to avoid affecting the product performance.
- All the accessories are available by contacting your local Teledyne Test Tools office.

# Appendix B: Warranty summary

**Teledyne Test Tools** warrants that the products will be free from defects in materials and workmanship for a period of three years from the date of shipment from an authorised **Teledyne Test Tools** distributor. If a product proves defective within the respective period, **Teledyne Test Tools** 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 **Teledyne Test Tools** sales and service office. Except as provided in this summary or the applicable warranty statement. **Teledyne Test Tools** makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall **Teledyne Test Tools** be liable for indirect, special or consequential damages.

# ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
Everywhereyoulook™

## Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

## Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

Distributed by: