# Data Acquisition System

DAQ-9600

USER MANUAL

Mess- und Prüftechnik. Die Experten.

**Ihr Ansprechpartner /**
**Your Partner:**

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ISO-9001 CERTIFIED MANUFACTURER

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# SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow when operating the DAQ-9600 and when keeping it in storage. Read the following before any operation to insure your safety and to keep the DAQ-9600 in the best possible condition.

## Safety Symbols

These safety symbols may appear in this manual or on the DAQ-9600.

| | |
|---|---|
|  WARNING | Warning: Identifies conditions or practices that could result in injury or loss of life. |
|  CAUTION | Caution: Identifies conditions or practices that could result in damage to the DAQ-9600 or to other property. |
|  | DANGER High Voltage |
|  | Attention Refer to the Manual |
|  | Protective Conductor Terminal |
|  | Earth (ground) Terminal |
|  | Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. |

# Safety Guidelines

General Guideline

- Make sure that the measurement voltage input level does not exceed DC600V/AC400V.

CAUTION

- Do not place any heavy object on the instrument.
- Avoid severe impact or rough handling that can lead to damaging the instrument.
- Do not discharge static electricity to the instrument.
- Use only mating connectors, not bare wires, for the terminals.
- Do not block or obstruct the cooling fan vent opening.
- Do not perform measurement at the source of a low-voltage installation or at building installations (Note below).
- Do not disassemble the instrument unless you are qualified as service personnel.

(Note) EN 61010-2-030 specifies the measurement categories and their requirements as follows.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.

- Do NOT to use the equipment for measurements on MAINS.
- Do NOT to use the equipment for measurements on circuits which with a TRANSIENT OVERVOLTAGE over 1500 V.
- Measuring circuits without a MEASUREMENT CATEGORY: Measuring circuits are not intended to be directly connected to the MAINS.
- Measurement category of the instrument is rated as without a MEASUREMENT CATEGORY.

The transient overvoltage may be present on the measuring circuits. Refer to the table below for the transient overvoltage on general mains circuits.

| Voltage line to neutral derived from nominal voltages AC or DC up to and including | Rated impulse withstand voltage Overvoltage Category | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| V | V | V | V | V |
| 50 | 330 | 500 | 800 | 1500 |
| 100 | 500 | 800 | 1500 | 2500 |
| 150 | 800 | 1500 | 2500 | 4000 |
| 300 | 1500 | 2500 | 4000 | 6000 |
| 600 | 2500 | 4000 | 6000 | 8000 |
| 1000 | 4000 | 6000 | 8000 | 12000 |
| 1250 | 4000 | 6000 | 8000 | 12000 |
| 1500 | 6000 | 8000 | 10000 | 15000 |

**Power Supply**



WARNING

- AC Input voltage: 100/120/220/240 V AC ±10%, 50Hz / 60Hz
- The power supply voltage should not fluctuate more than 10%.
- Connect the protective grounding conductor of the AC power cord to an earth ground, to avoid electrical shock.

**Power Cord Requirement**

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Do NOT replace the detachable MAINS supply cords by inadequately RATED cords.

Suitable supply cord set for use with the equipment:

- Mains plug: Shall be national approval
- Mains connector: C13 type
- Cable:
  1. Length of power supply cord: less than 3 m
  2. Cross-section of conductors: at least 0.75 mm2
  3. Cord type shall meet the requirements of IEC 60227 or IEC 60245 (e.g.: H05VV-F, H05RN-F)

**Fuse**



WARNING

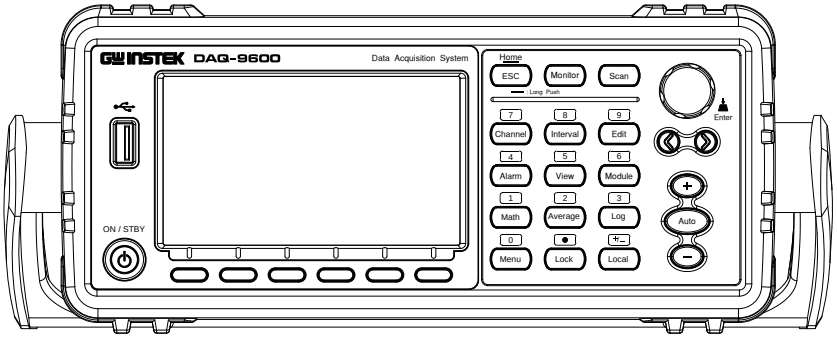
- Fuse type: T0.125A 100/120 VAC
  T0.125A 220/240 VAC
- Make sure the correct type of fuse is installed before power up.
- To avoid risk of fire, replace the fuse only with the specified type and rating.
- Disconnect the power cord before fuse replacement.
- Make sure the cause of a fuse blowout is fixed before fuse replacement.

| | |
|---|---|
| Cleaning the Instrument | • Disconnect the power cord before cleaning.<br>• Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the DAQ-9600.<br>• Do not use chemicals or cleaners containing harsh material such as benzene, toluene, xylene, and acetone. |
| Operation Environment | • Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)<br>• Temperature: Full accuracy for 0°C to 55°C.<br>• Humidity:<br>< 30°C: < 80%RH (non-condensing)<br>30°C~40°C: <70%RH (non-condensing)<br>>40°C: <50%RH (non-condensing)<br>• Altitude: <2000m<br><br>(Note) EN 61010-1 specifies the pollution degrees and their requirements as follows. The DAQ-9600 falls under degree 2. Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity".<br>• Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.<br>• Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.<br>• Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled. |
| Storage Environment | • Location: Indoor<br>• Temperature: −40°C to 70°C<br>• Humidity:<br>< 40°C: < 90%RH (non-condensing)<br>>40°C: <60%RH (non-condensing) |
| Disposal  | Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact. |

# GETTING STARTED

This chapter describes the DAQ-9600 in a nutshell, including an Overview of its main features and front / rear panel introduction. After going through the Overview, follow the Power-up sequence to properly setup the DAQ-9600.

Please note the information in this manual was correct at the time of printing. However, as GW Instek continues to improve its products, changes can occur at any time without notice. Please see the GW Instek website for the latest information and content.

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# Characteristics

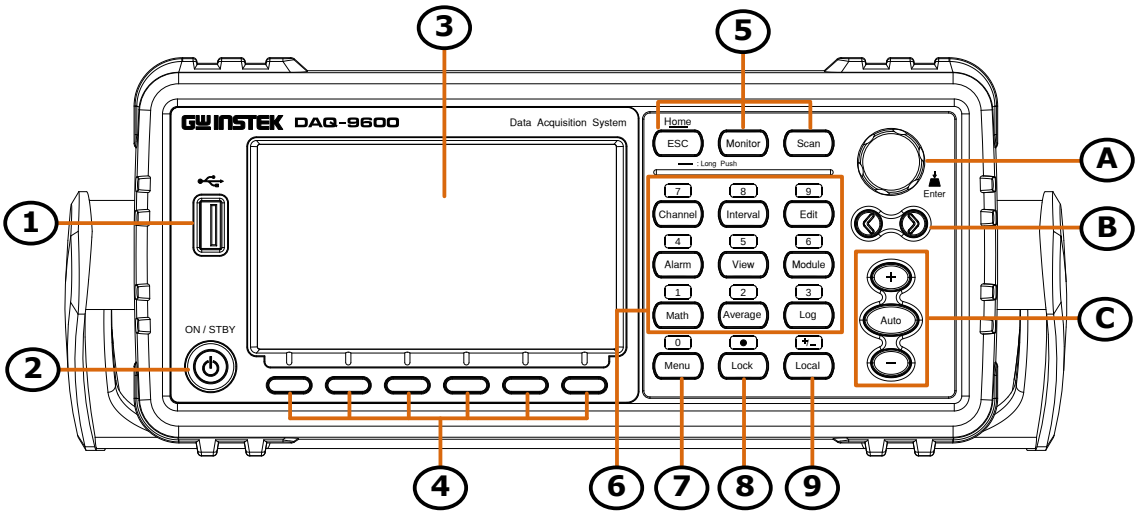
The DAQ-9600 data acquisition system stands as a modularized solution to offer notable flexibility and high performance level. At its core, the mainframe boasts 3 module slots, while its foundational testing and measurement capabilities are anchored by an integrated precise 6 $^{1/2}$ digital DMM. To meet varied measurement demands, up to 5 distinct modules are available. Whether engaged in research and development for scrutinizing product characteristics, or system testing and fault diagnosis during production and manufacturing, this system adeptly meets diverse measurement requirements. Through expansion and modification, DAQ-9600 streamlines the overall testing process, rendering a simpler, more efficient and reliable solution.

| | |
|---|---|
| Performance | • The highest DCV accuracy: 35 ppm<br>• The highest current:2A<br>• The highest voltage: 600 VDC,400 VAC<br>• The highest ACV frequency response: 300 kHz<br>• Internal memory:100 k read memory<br>• Data Logging to USB |
| Features | • 3-Slot mainframe with built-in 6½ digit DMM<br>• Multi functions: ACV, DCV, ACI, DCI, 2W/4W R, Hz, Temp, Strain, Diode, Period, Capacitance test, REL, dBm, Hold, MX+B, 1/X, REF%, dB, Compare and Statistics.<br>• Manual or Auto ranging<br>• AC true RMS<br>• Up to 3 temperature measurements:<br>  • RTD, Thermistor and Thermocouples (Built-in Cold-Junction Compensation)<br>• Graph Display: BarMeter, TrendChart, Histogram |
| Interface | • USB device/LAN for remote control /<br>• GPIB(factory install)<br>• 9-pin Digital I/O port<br>• USB device port supports USBCDC and USBTMC<br>• USB Host |
| Software | • DAQ-Data Logger |

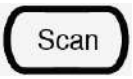
## Accessories

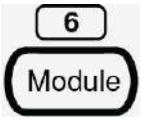
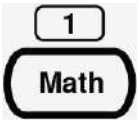
| Standard Accessories | Part number | Description |
|---|---|---|
| | 82xx-xxxxxxxx | Safety Instruction Sheet |
| **Optional Accessories** | **Part number** | **Description** |
| | GTL-246 | USB Cable, USB 2.0, A-B type, 1200 mm |
| | GTL-258 | Mini GPIB Cable, approx. 1.9 m |
| | GRA-422 | Rack Mount Kit (19” 2U) |
| | GRA-436 | Rack Mount Kit (19”, 2U) for two sets |

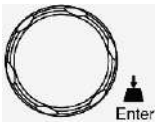
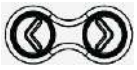
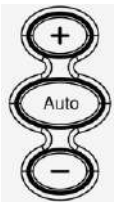
# Front Panel Overview



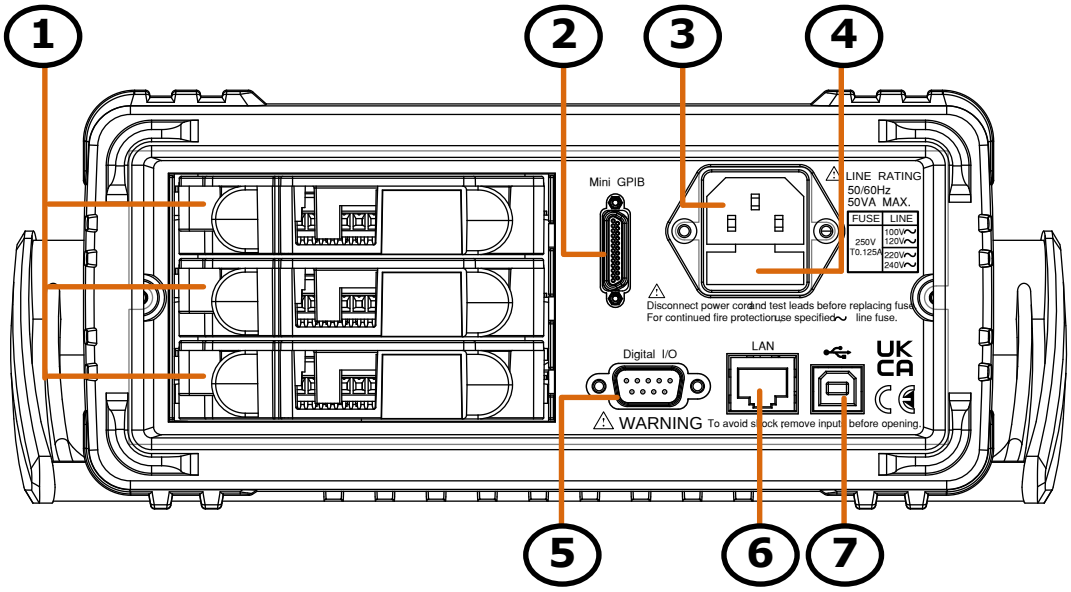

| Item | Description |
|---|---|
| 1 | USB Host Port |
| 2 | Power Switch |
| 3 | Main Display |
| 4 | Function keys (F1 through F6, functions vary per modes) |
| 5 | Operation menus keys for measurement |
| 6 | Configuration menus keys for parameters<br>(also the numerical keypad functions) |
| 7 | Menu key (also the numerical keypad function) |
| 8 | Lock key (also the numerical keypad function) |
| 9 | Local key (also the numerical keypad function) |
| A | Knob key |
| B | Arrow keys (Speed selection keys) |
| C | Range keys |

| | | |
|---|---|---|
| USB Host Port |  | Connects with USB flash drive for data log storage and screenshot hardcopy. |
| Power Switch |  | Power On/Standby switch with LED lights (green: power on, red: standby). For the power up sequence, see page 22. |
| Main Display | The 4.3"TFT LCD shows measurement results and parameters. For display configurations, see page 185. | |
| Function Keys | The 6 keys have varied functions per different settings. | |
| Operation menus keys | The 3 operation-related menus keys are well described below. | |
| Home/ESC key |  | Single press to escape from current page. Press and hold the ESC key for 2 seconds to return to the Home screen. Refer to page 42 for more details of Home screen. |
| Monitor key |  | Single press to activate the Monitor mode in which real-time measured data on a select channel is shown. Refer to the page 46 for details on the Monitor mode. The monitor icon will flash from the status bar when activated. |
| Scan key |  | Single press to activate Scan mode in which measurements of all available channels will be proceeded to orderly. Press and hold the key for 2 seconds to exit scan mode. Refer to page 57 for details on Scan mode. The scan icon will be shown from the status bar when activated. In addition, it is available to enable monitor mode on a select channel even though the scan mode is activated. |

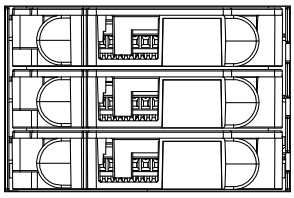
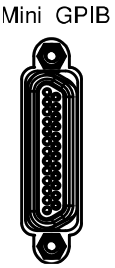
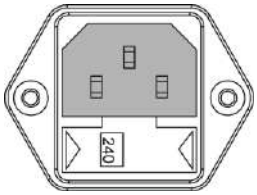
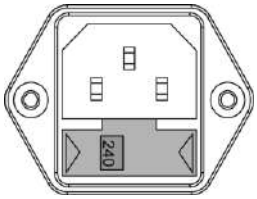
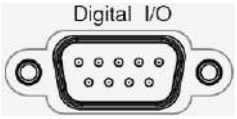
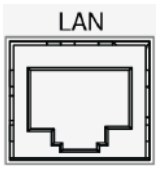
| Configuration menus keys | The 9 configuration-related menus keys are well described below. | |
|---|---|---|
| Channel Key |  | Press to enter the Channel setting menu for each channel. Refer to the page 62 for details of channel configurations. When inputting parameters values, it acts a direct number key – 7. |
| Interval Key |  | Press to enter the Interval setting menu for all channels. Refer to the page 111 for details of interval configurations. When inputting parameters values, it acts a direct number key – 8. |
| Edit Key |  | Press to enter the Edit setting menu in which user can copy set parameters from channels to channels. Refer to the page 114 for details of edit configurations. When inputting parameters values, it acts a direct number key – 9. |
| Alarm Key |  | Press to enter the Alarm setting menu for each channel. Refer to the page 117 for details of alarm configurations. When inputting parameters values, it acts a direct number key – 4. |
| View Key |  | Press to enter the View menu in which the measurement data from scan mode can be viewed in various details. Refer to the page 120 for details of view configurations. When inputting parameters values, it acts a direct number key – 5. |
| Module Key |  | Press to enter the Module setting menu in which all channels from each module can be set up in general for either Scan mode or Switch mode. Refer to the page 131 for details of scan and switch modes configurations. When inputting parameters values, it acts a direct number key – 6. |
| Math Key |  | Press to enter the Math setting menu for each channel. Refer to the page 133 for details of math configurations. When inputting parameters values, it acts a direct number key – 1. |

| | | |
|---|---|---|
| Average Key |  | Press to enter the Average setting menu for each channel. Refer to the page 148 for details of average configurations. When inputting parameters values, it acts a direct number key – 2. |
| Log Key |  | Press to enter the Log setting menu in which user can store measured data from scan mode or capture screenshot to the USB disk. Refer to the page 150 for details of log configurations. When inputting parameters values, it acts a direct number key – 3. |
| Menu Key |  | Press to enter the general Menu setting page for DAQ-9600 unit. Refer to the page 164 for details of menu configurations. When inputting parameters values, it acts a direct number key – 0. |
| Lock Key |  | Press and hold for 1 second to lock all keys on panel. Press and hold again to unlock. The lock icon is shown on the status bar when activated. When inputting parameters values, it acts a direct number key – decimal ".". |
| Local Key |  | Press to return to the local operation from remote control mode. When inputting parameters values, it acts a direct number key – "+" and "-". |
| Knob Key |  | Scrolls the knob to select parameters in various setting pages. Press the key until click to confirm setting. |
| Arrow Keys |  | Press the left or right arrow keys to move parameter cursor rightward or leftward. Also, it is able to promptly configure Speed setting under Channel menu. |
| Range Selection Keys |  | Presses the Auto key to activate auto-range setting, whilst clicking "+" or "–" key can increase or decrease range parameter, respectively under Channel menu. Also, it is available to promptly change among channels in Interval, Alarm, Math and Average menus. |

# Rear Panel Overview



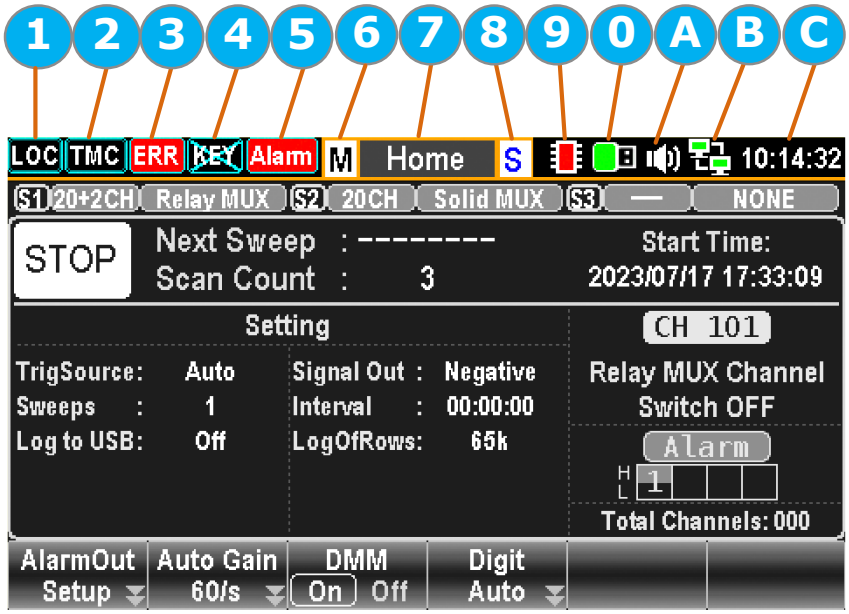

| Item | Description |
|---|---|
| 1 | Slots for Modules Installation |
| 2 | Mini GPIB Connector |
| 3 | AC Mains Input (Power Cord Socket) |
| 4 | AC Mains Line Voltage Selector and Fuse Socket |
| 5 | Digital I/O Connector |
| 6 | Ethernet (LAN) Connector |
| 7 | USB Interface Connector (B Type) |

| | | |
|---|---|---|
| Slots for Modules Installation |  | DAQ-9600 provides up to 3 slots for plug-in modules installation. Refer to page 24 for details of Modules. |
| Mini GPIB Port |  | It accepts a mini GPIB cable for remote control. For GPIB details, see page 206. |
| Power Cord Socket |  | Accepts the power cord. AC 100/120/220/240V ±10%, 50Hz / 60Hz ±10%.<br>For power on sequence, see page 22. |
| Line Voltage Selector and Fuse Socket |  | Holds the main fuse:<br>100/120 VAC: T0.125A<br>220/240 VAC: T0.125A<br>For fuse replacement details, see page 373. |
| Digital I/O Port |  | It accepts a digital I/O cable for the Hi/Lo limit tests; DB-9 pin, female connector. For digital I/O details, see page 153. |
| LAN Port |  | It accepts a LAN cable for remote control. For Ethernet remote control details, see page 209. |
| USB Interface Port |  | It accepts a USB device cable for remote control; Type B, female connector. For USB remote control details, see page 200. |

# Status Bar

Background Identify each icon within the top status bar.

Status Bar Display



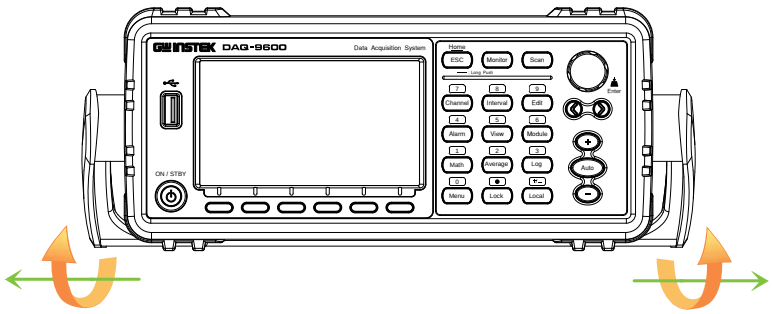

| Item | Description |
|---|---|
| 1 | Local/Remote control icon |
| 2 | USB-CDC/USB-TMC/LAN/GPIB interface icon |
| 3 | Error icon for commands from remote control |
| 4 | Locked key icon |
| 5 | Alarm triggered icon |
| 6 | Monitor mode underway icon |
| 7 | Configuration menu identifications |
| 8 | Scan mode underway icon |
| 9 | Internal memory overflowed icon |
| 0 | USB disk connection icon |
| A | Beep/Key Sound setting icon |
| B | Internet connection status icon |
| C | Time display |

| | | |
|---|---|---|
| Local Control |  | It indicates the unit is under local control mode. |
| Remote Control |  | It indicates the unit is under remote control. Refer to page 199 for details. |
| USB - CDC |  | It indicates USB - CDC interface is activated. Refer to page 205 for details. |
| USB - TMC |  | It indicates USB - TMC interface is activated. Refer to page 205 for details. |
| LAN |  | It indicates LAN interface is activated. Refer to page 209 for details. |
| GPIB |  | It indicates GPIB interface is activated. Refer to page 206 for details. |
| ERROR |  | It indicates error occurs in commands. To erase the error icon, it is required to read or sweep the error by remote control commands or reboot action. Refer to page 345 for details. |
| Lock Key |  | It indicates all panel keys are locked. Press and hold the Lock key for 1 second to unlock and the icon will disappear. |
| Alarm icon |  | It indicates when the set threshold(s) of alarm is triggered. Refer to page 118 for details of alarm configurations. To clear alarm state with icon, go to the Home mode. Refer to page 43 for details. |
| Monitor mode |  | It indicates the Monitor mode is ongoing. Press the Monitor key to exit and the icon will disappear. Refer to page 46 for details. |
| Configuration menu identification |  | It indicates the unit is under one of the configuration menus including Channel, Interval, Edit, Alarm, View, Module, Math, Average and Log. In addition, the icons of Home screen and Monitor mode are shown here. |

| | | |
|---|---|---|
| Scan mode |  | It indicates the Scan mode is ongoing. Press and hold the Scan key for 1 second to exit and the icon will disappear. Refer to page 57 for details. |
| Internal memory overflowed |  | It indicates the internal memory for scan data has reached 100,000 readings. And therefore the oldest readings will be replaced by the new readings. |
| Flash Drive – Save Reading |  | It indicates the USB disk is ready to save log file types including Capture and Scan Data. The "ex" stands for exFat format. The "32" signals fat32 format. and the "16" represents fat16 format. |
| Flash Drive – Save Log (Capture & Data) |  | It indicates the unit is saving log including Capture and Scan Data into the USB disk. Refer to the page 150 for details of Capture. And refer to page 151 for details of Scan Data. |
| Flash Drive – Failure |  | It indicates something error occurs and thus USB disk fails to connect to unit. |
| Sound – Beep |  | It indicates sound of beep is enabled. Refer to page 164 for details. |
| Sound - Key |  | It indicates sound of key is enabled. Refer to page 165 for details. |
| Sound – All |  | It indicates sounds of beep and key are both enabled. |
| Sound – Off |  | It indicates sounds of beep and key are both disabled. |
| Internet On |  | It indicates internet connection is established. Refer to page 209 for details. |
| Internet Off |  | It indicates internet connection is Not well established. |
| Time Display |  | It indicates the time display. For detailed setting, refer to page 167. |

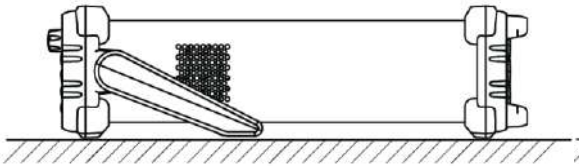
# Set Up

## Horizontal/Tilt/Vertical Applications



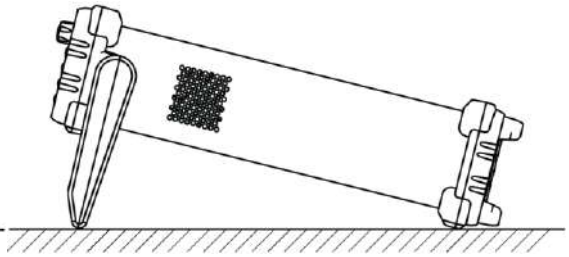
Pull out the handle sideways and rotate it clockwise for the applications below.

### Horizontal



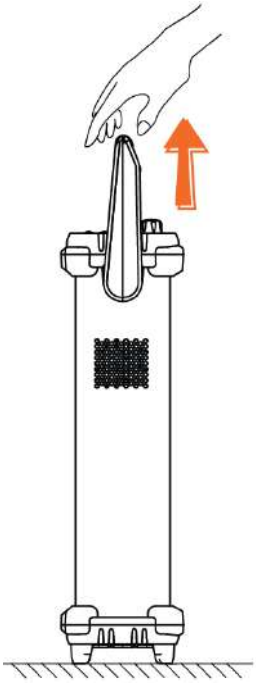
Place the unit horizontally.

### Tilt



Rotate the handle for tilt stand.

### Vertical

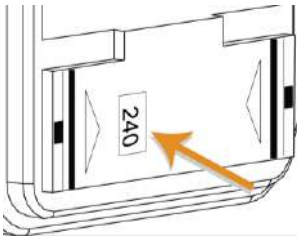


Place the handle vertically for hand carry.

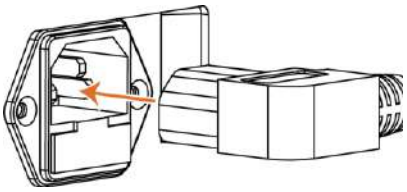
## Power Up

Steps

1. Ensure the correct line voltage is clearly shown on the fuse socket (240V in the right figure for example). If not, see page 373 to set the proper line voltage and fuse.



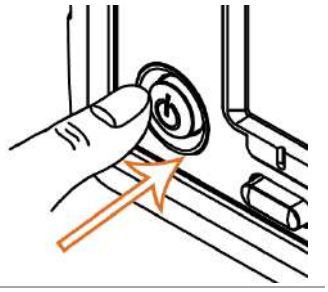

2. Connect the power cord to the AC Voltage input.



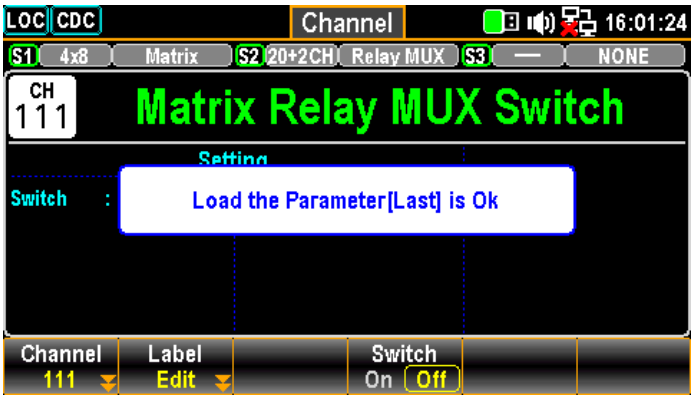
Note

Make sure the ground connector on the power cord is connected to a safety ground. This will affect the measurement accuracy.

3. Push the power button until click to turn on the main power switch on the front panel.



4. The screen firstly shows the logo brand of GWINSTEK followed by the message "Load the Parameter [Last] is Ok" indicating the previous parameter is loaded in the initial startup.



# MODULE OVERVIEW

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# Modules List

Bckground

The DAQ-9600 is available for a series of plug-in modules to provide user with measurements, switching as well as control capabilities. Each module owns specific microprocessor, which efficiently shares loading from the processor of mainframe and thus lessens, in order to faster throughput, backplane communications. There are up to 7 different plug-in modules available for DAQ-9600. See the detailed info with spec below.

- DAQ-900 20-Channel Solid-state multiplexer
- DAQ-901 20-Channel Armature multiplexer
- DAQ-903 40-Channel single-ended multiplexer
- DAQ-904 4 x 8 Two-wire matrix switch
- DAQ-909 8-Channel high voltage multiplexer
- DAQ-908 20-Channel Actuator/General Purpose Switch
- DAQ-907 Multifunction DIO/Totalizer/DAC

| Model description | Type | Speed (ch/sec) | Max volts | Max amps | Bandwidth | Thermal offset | Comments |
|---|---|---|---|---|---|---|---|
| DAQ-900<br>20 ch Multiplexer | 2-wire solid-state<br>(4-wire selectable) | 450 | 120 V | | 10 MHz | < 4 µV | Built-in cold junction reference |
| DAQ-901<br>20 ch Multiplexer + 2 current channels | 2-wire armature<br>(4-wire selectable) | 80 | 300 V | 1 A | 10 MHz | < 4 µV | Built-in cold junction reference 2 additional current channels (22 total) |
| DAQ-903<br>40 ch Single-Ended Mux | 1-wire armature<br>(common low) | 80 | 300 V | | 10 MHz | < 1 µV | No four-wire measurements |
| DAQ-904<br>4 x 8 Matrix | 2-wire armature | | 300 V | | 10 MHz | < 1 µV | |
| DAQ-909<br>8 ch HV Multiplexer + 2 current channels | 2-wire armature<br>(4-wire selectable) | 60 | DC600 V<br>AC400 V | 2 A | 10 MHz | < 4 µV | 2 additional current channels (10 total) |
| DAQ-908<br>20-channel Actuator/General Purpose Switch | SPDT/from C | | 300 V | | 10 MHz | < 4 µV | |
| DAQ-907<br>DIO/Totalizer/DAC | 2 x 8 bit DIO<br>29 bit counter<br>2 x 16bit DAC | | DC 42 V<br>DC 42 V<br>± 12 V | 400 mA<br><br>15mA | <br>100 kHz<br>DC | | Open drain<br>Selectable input threshold<br>Max 40 mA total output per frame |

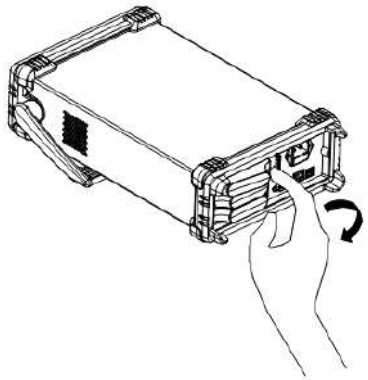
# Module Slot Cover Removing

Background

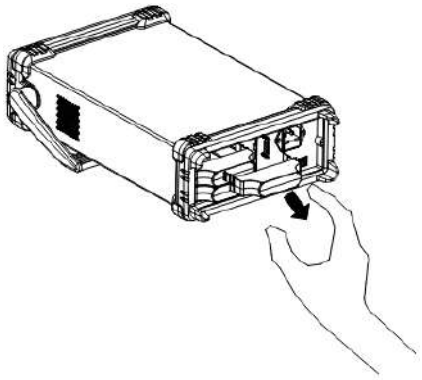
Prior to module installation, follow the steps below for how to remove a module slot cover from DAQ-9600 unit.

Steps

1. First release inner hook by pressing on curve area from either right or left side on slot cover. Use finger to subtly shake the curve area so as to make inner hook unleashed from DAQ-9600 unit.



2. Use 2 fingers to grip curve areas of both right and left sides on slot cover and gently pull outward so as to remove slot cover from DAQ-9600 unit.



Note

Press and shake curve area from either right or left side alternately when it is difficult to release inner hook in one side.

# Module Installation

**Background**

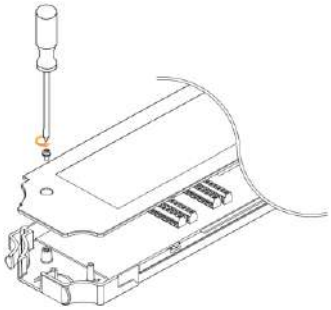
Follow the steps below for how to connect wire to a module and install it to a slot from the rear panel of DAQ-9600 unit.

**Note**

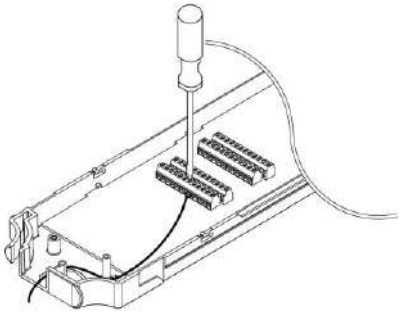
- It is recommended to utilize wire size ranging from 16 gauge to 22 gauge for screw terminals on the module.
- It is forbidden to install module when power is on.
- Do Not install module into DAQ-9600 unit during power on in that it may cause unexpected issues.

**Steps**

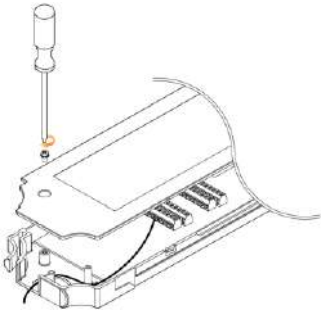
1. Use a Phillips-head screwdriver to loose the screw from the top of a module followed by taking away the upper cover from module.



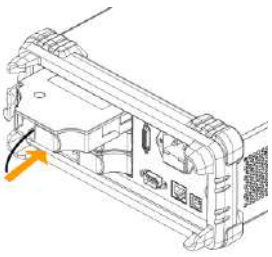
2. With help of a Phillips-head screwdriver, connect the wire to the terminal followed by routing the wire to the end port of module.



3. Restore the upper cover back to the module followed by fastening the screw by a Phillips-head screwdriver.



4. Insert the module into one of the module slots from the rear panel of DAQ-9600 unit.



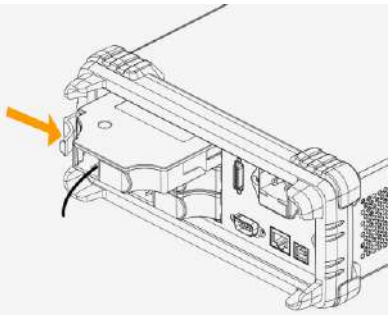
# Module Uninstallation

Background

Follow the step below for how to uninstall a module out of a slot on rear panel of DAQ-9600 unit.

Step

1. First push inward the clip at the rear-left corner of a module followed by pulling module out from a slot on rear panel of DAQ-9600 unit.



Note

Do Not uninstall module from DAQ-9600 unit during power on in that it may cause unexpected issues.

# Modules Introduction

Background

This subchapter introduces each plug-in module with block diagram and schematics available for DAQ-9600 unit.

Note

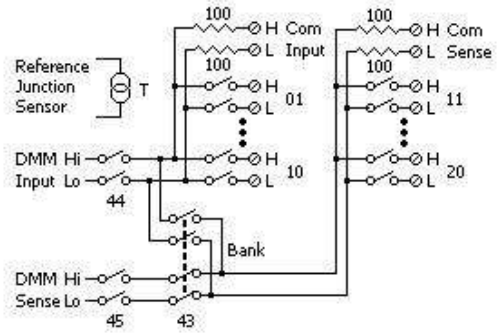
- DO NOT MEASURE MORE THAN THE RATED VOLTAGE.
  Maximum voltage as marked on each module is as below:
  1) DAQ-900: 120 Vrms
  2) DAQ-901, DAQ-903, DAQ-904, DAQ-908: 300 Vrms
  3) DAQ-909: 600 Vdc/400Vrms
- Limitations on measurement input terminals of all modules.
  1) Sense LO to Input LO terminals are limited to 2Vpk for all modules. (DAQ-900, DAQ-901, DAQ-903 and DAQ-909)
  2) Sense HI to Sense LO terminals are limited to 200Vpk for DAQ-901 and DAQ-903. Sense HI to Sense LO terminals are limited to 100Vpk for DAQ-900.
  3) Input LO to Earth ground are limited to 500Vpk for DAQ-901 and DAQ-903. Input LO to Earth ground are limited to 200Vpk for DAQ-900.

## DAQ-900 20-Channel Solid-State Multiplexer

**Background**

Partitioned into 2 banks and each bank consists of 10 two- wire channels, this module has up to 20 channels, which switch both Hi and Lo inputs, and it offers fully isolated inputs to an external device or to the internal DMM. Channels of bank A are paired with channels of bank B automatically, in the midst of four-wire resistance measurements, to offer the source and sense connections. In addition, this module can minimize errors, which result from thermal gradients when measurement, by the built-in thermocouple reference junction.

**Block Diagram**




**Note**

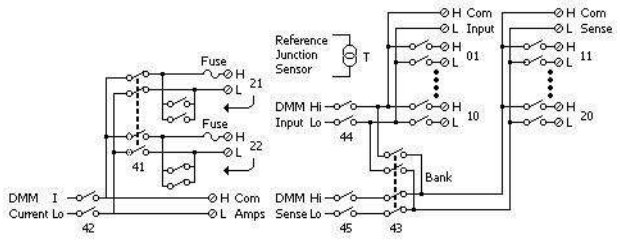
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.
- For the measurement of 100 Ω and 1 kΩ resistance ranges, it is recommended to use 4-wire resistance.
- User can configure the list of channels for 4-Wire external scanning. When enabled, the instrument automatically pairs channel n with channel n+10.

## DAQ-901 20-Channel Armature Multiplexer

**Background**

Partitioned into 2 banks and each bank consists of 10 two- wire channels, this module has two additional fused channels to make direct and calibrated AC or DC current measurement with internal DMM. The 22 channels in total, which switch both Hi and Lo inputs, offer fully isolated inputs to an external device or to the internal DMM. Channels of bank A are paired with channels of bank B automatically, in the midst of four-wire resistance measurements, to offer the source and sense connections. In addition, this module can minimize errors, which result from thermal gradients when measurement, by the built-in thermocouple reference junction.

**Block Diagram**




**Note**

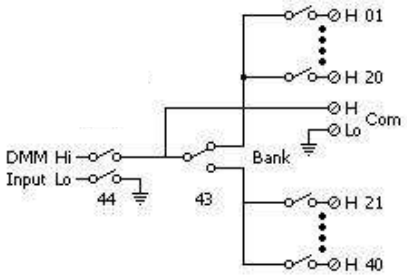
- Because one of the two channels (21 and 22) will be closed when the other one is connected, be sure to connect one of the channels (21 or 22) to the internal DMM or COM at a time.
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.
- User can configure the list of channels for 4-Wire external scanning. When enabled, the instrument automatically pairs channel n with channel n+10.

## DAQ-903 40-Channel Single-Ended Multiplexer

**Background**

This module is partitioned into 2 banks and each bank consists of 20 channels. The all 40 channels, with a common Lo for the module, switch Hi only. This module is suitable for applications of high-density switching which are in demand of, with a common Lo, single-wire inputs.

**Block Diagram**




**Note**

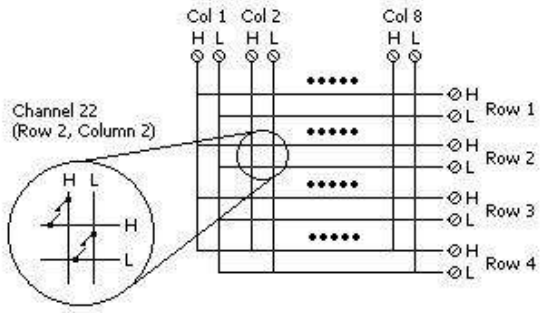
- This module is not allowed to measure 4-wire or current measurements directly.
- One channel can be closed at one time only, and shutting a channel will thus open the formerly closed channel.
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.

## DAQ-904 4 x 8 Two-Wire Matrix Switch

**Background**

Organized in a 8-column by 4-row configuration, this module consists of 32 two-wire crosspoints. By connecting columns and rows between multiple modules, it is available to build larger matrices with up to 96 crosspoints within a mainframe. Also, user can utilize this module to connect to multiple instruments to multiple points or to any hybrid of outputs and inputs on DUT simultaneously. Since this module is not allowed to connect to the internal DMM, each relay of crosspoint owns an unique channel label which represents the column and row. Take the diagram below for instance, the channels 32 stands for the crosspoint between the row 3 and column 2.

**Block Diagram**




**Note**

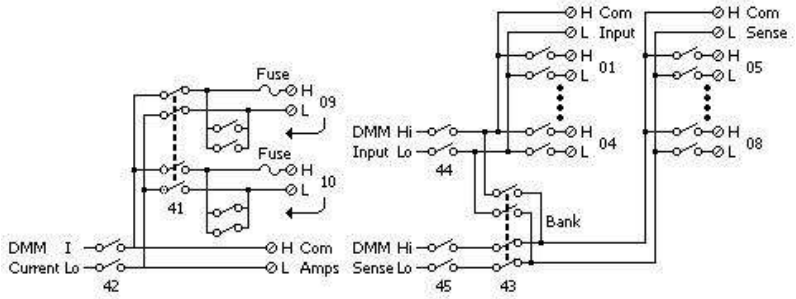
- It is available to close multiple channels on this module simultaneously.
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.

## DAQ-909 8-Channel High Voltage Multiplexer

**Background**

Partitioned into 2 banks and each bank consists of 4 two- wire channels, this module has two additional fused channels to make direct and calibrated AC or DC current measurement with internal DMM. The 10 channels in total, which switch both Hi and Lo inputs, offer fully isolated inputs to an external device or to the internal DMM. Channels of bank A are paired with channels of bank B automatically, in the midst of four-wire resistance measurements, to offer the source and sense connections.

**Block Diagram**




**Note**

- Because one of the two channels (09 and 10) will be closed when the other one is connected, be sure to connect one of the channels (09 or 10) to the internal DMM or COM at a time.
- It is required to utilize external parallel resistor when executing current measurement from channel 01 to 08.
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.
- User can configure the list of channels for 4-Wire external scanning. When enabled, the instrument automatically pairs channel n with channel n+4.

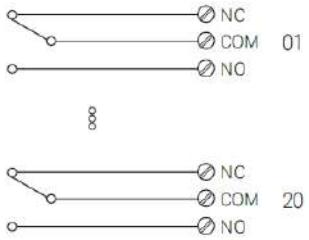
## DAQ-908 20-Channel Actuator/General Purpose Switch

**Background**

This module features 20 independent Single-Pole Double-Throw (SPDT) latching relays, also known as Form C relays. Each relay can switch up to 300 V and 1 A, with a maximum switching power of 50 W. The module is equipped with screw terminals that provide access to the Normally-Open, Normally-Closed, and Common contacts for each of the 20 relays. It is designed to interface with your Device Under Test (DUT) or to actuate external devices but does not connect to the internal Digital Multimeter (DMM). This module is ideal for applications demanding high-integrity contacts or reliable connections for non-multiplexed signals.

- 300 V, 1 A actuation and control
- SPDT (Form C) latching relays

**Block Diagram**




- This module allows for the simultaneous closure of multiple channels. The channel CLOSE and OPEN commands manage the state of the Normally Open (NO) to Common (COM) connection for each channel. For instance, issuing the command CLOSE 201 will connect the Normally Open contact to the Common contact on channel 01.
- Always utilize only wire which is rated for the highest voltage so as to avoid electrical shock. Prior to removing a cover of module, all power to external devices which are connected to the module should be turned off.
- It is strongly suggested that when multiplexing multiple sources, in order to prevent multiple signal sources from interconnected one another, the sources are supposed to be connected on separate banks of the identical module or simply on separate modules.
- When a hazardous voltage source is connected to any channel of the module, both the unit and DUT (Device Under Test) are supposed to be supervised with conforming to the local EHS (Environment, Health and Safety) practices.

## DAQ-907 Multifunction Module

Background

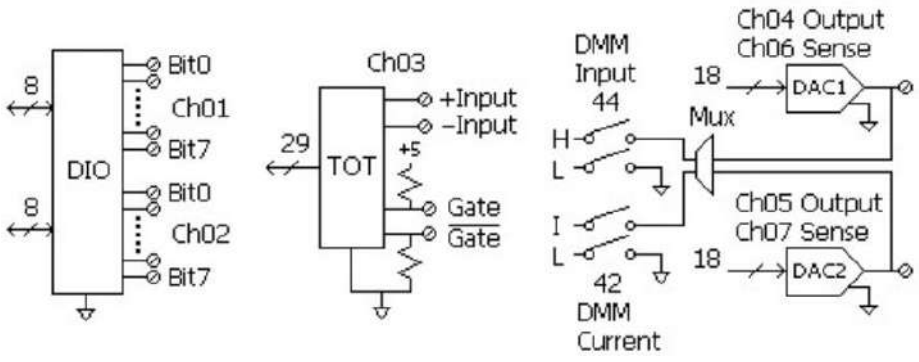
The DAQ-907 multifunction module, which consists of up to 7 available channels, expands the capabilities of DAQ system by providing majorly three functions described below in a neatly single module, making it ideal for automated testing and versatile signal measurements.

- Up to 16-bit Digital Input/Output: Allows for controlling external devices or reading digital signals.
- 29-bit Totalizer: Counts pulses at a 100 kHz rate, also counting on the rising or falling edge of the input signal.
- Analog DAC Output: Generates dual DAC voltage or current outputs for controlling other devices.

This module is particularly useful for applications requiring a mix of digital control, analog signal output, and event counting, making it suitable for laboratory testing, industrial automation, and data logging environments.

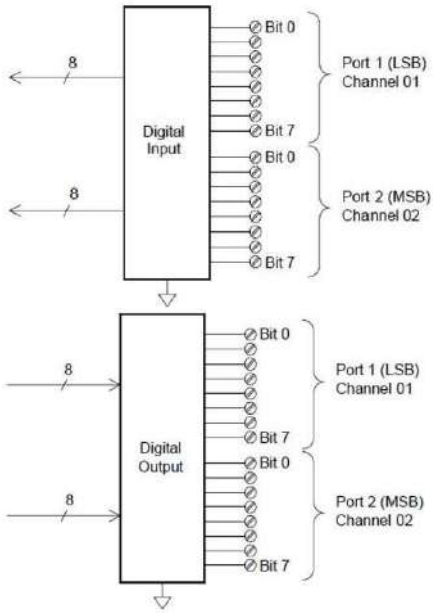
| Channel Number | Channel Function |
|---|---|
| **01** | 8-bit Digital I/O channel |
| **02** | 8-bit Digital I/O channel |
| **03** | Totalizer channel |
| **04** | DAC Output channel |
| **05** | DAC Output channel |
| **06** | DAC Output Sense channel |
| **07** | DAC Output Sense channel |

Block Diagram



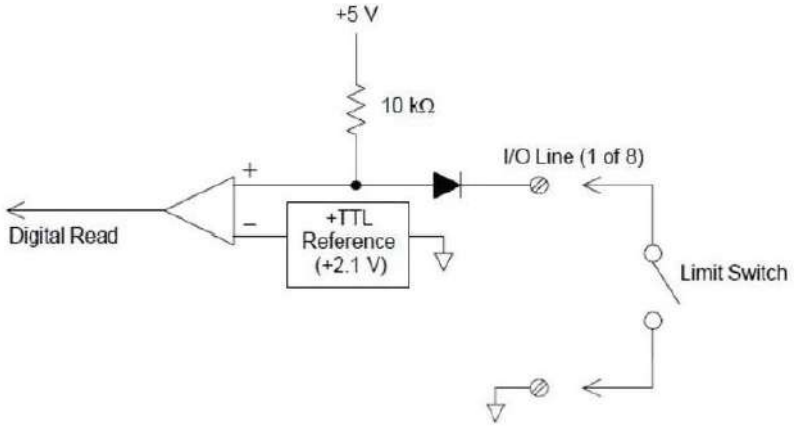
**Digital Input/Output (DIO)**

The Digital Input/Output function features two non-isolated 8-bit input/output ports, which can be used for reading or outputing digital patterns. You can either monitor the real-time status of the bits on each port or configure a scan to perform a digital read. Each port is assigned a unique channel number within the module and consists of 8 bits. The two ports can also be combined to read or output a 16-bit word. The detailed introduction can be divided into 2 sections below, Digital Input and Digital Output.



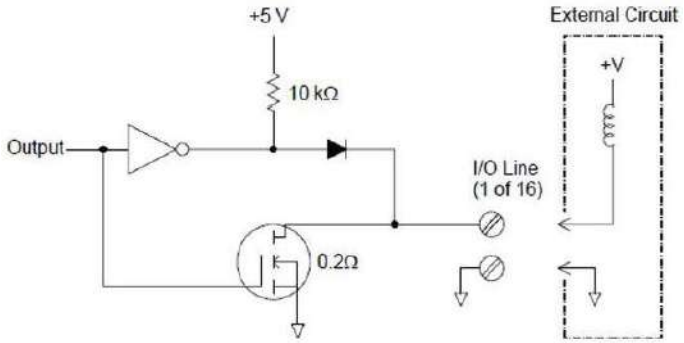
**Digital Input:**

- To monitor the live status of the bits on the port or configure a scan to perform a digital read.
- An alarm can be triggered when a specific bit or pattern change is detected on an input channel, regardless of whether the channels are included in the scan list.
- The internal +5 V pull-up circuitry enables the digital input to detect contact closures, such as those from micro-switches or limit switches. When an input is open, it floats to +5 V and is read as "1." Conversely, an input shorted to ground is read as "0." See the diagram of a contact closure detection channel shown below:



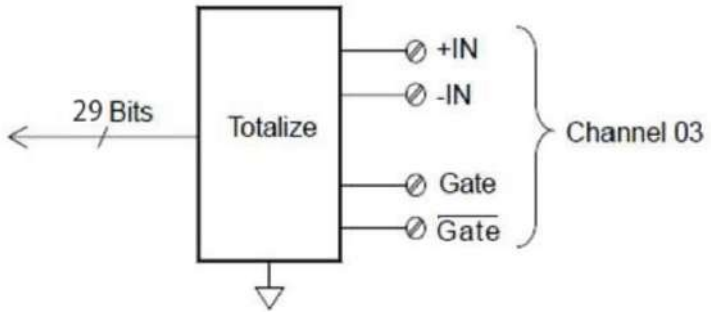
**Digital Output:**

- Each output bit can directly drive up to 10 TTL loads (no more than 1 mA). The port buffer is used to deliver a high output from the internal +5 V supply via a diode, with a drive rating of at least +2.4 V at 1 mA.
- Additionally, each output bit can actively sink current, handling up to 400 mA from an external power supply. A FET with a nominal "on" resistance of 0.2 Ω is used for current sinking.
- When using an external power supply and pull-up, which is necessary for non-TTL logic, the supply voltage should be between +5 VDC and +42 VDC.

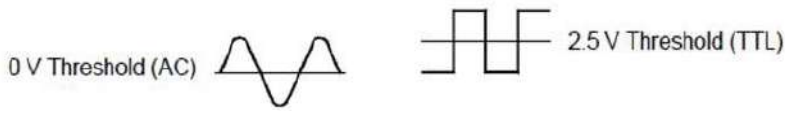


**Totalizer (TOT)**

The 29-bit Totalizer feature is capable of counting pulses at a rate of 100 kHz. The totalizer count can be read manually or included in a scan for automatic reading.

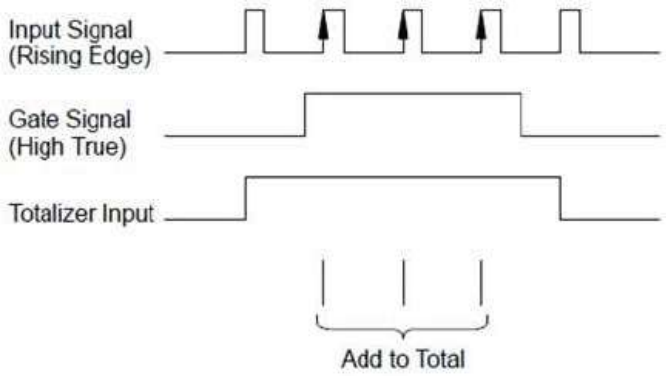



The pulses on either rising or falling edge of the input signal can be counted by configuring totalizer. The threshold for edge detection is controlled using the "Totalize Threshold" hardware jumper on the module. Setting the jumper to the "AC" position enables detection of changes through 0 volts, while the "TTL" position (by default) detects changes at TTL threshold levels.



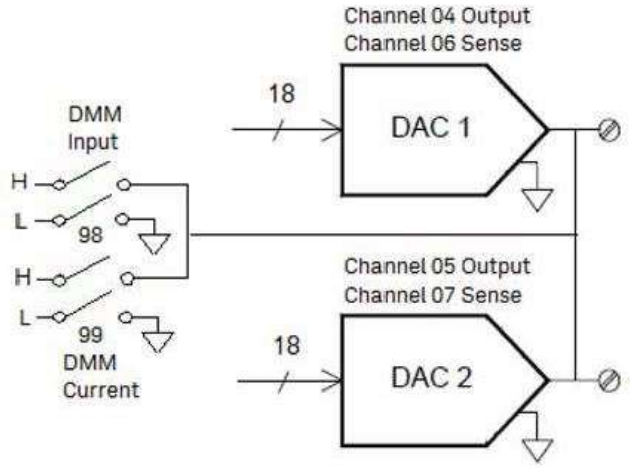
The maximum count for the totalizer is 999999999. Once this value is reached, the count rolls over to zero 0.

Counting can be controlled using a gate signal applied to the "**G**" and "$\overline{G}$" terminals on the module. When a TTL high signal is applied to the "**G**" terminal, counting is enabled; a low signal disables it. Conversely, applying a TTL low signal to the "$\overline{G}$" terminal enables counting, while a high signal disables it. The totalizer will only count when both terminals are enabled. You can use either the "**G**" terminal, the "$\overline{G}$" terminal, or both. If no gate is connected, the gate terminal defaults to the enabled state, creating a "gate always" condition.

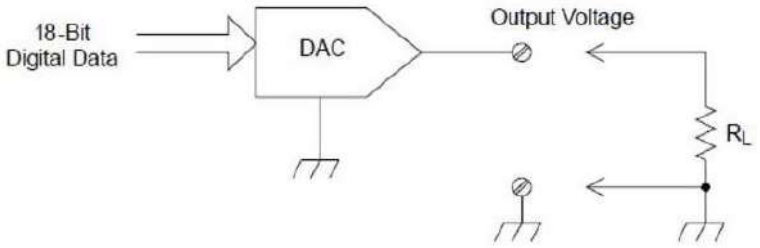


**Analog Output (DAC)**

The DAC Analog Output features two analog output channels (04 and 05) and sensing channels (06 and 07) capable of delivering calibrated voltages or currents between ±12 V, with 18-bit resolution. Each channel can function as a programmable voltage or current source for other devices.



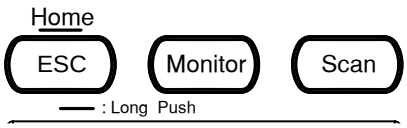

The DAC Analog Output provids output voltages adjustable in 100 µV increments or currents adjustable in 0.2 µA increments. The DAC channels are, instead of floating, earth-referenced, with a maximum current supply of 15 mA in voltage mode, or a maximum current supply of 24 mA in current mode. Note that the total output current is limited within 40 mA for both two DAC channels.




| Characteristics - typical | |
|---|---|
| DAC (output and readback) | Accuracy |
| Voltage | ± 0.027 % of output + 4.4 mV |
| Current | ± 0.115 % of output + 4.4 µA |

1. ACAL is mandatory every 30 days to maintain performance accuracies.
2. ACAL accommodates a ± 2 °C variance with no extra TC adders.
3. Calibrate the mainframe DMM using the DAQ-901 module.

# OPERATION MENUS

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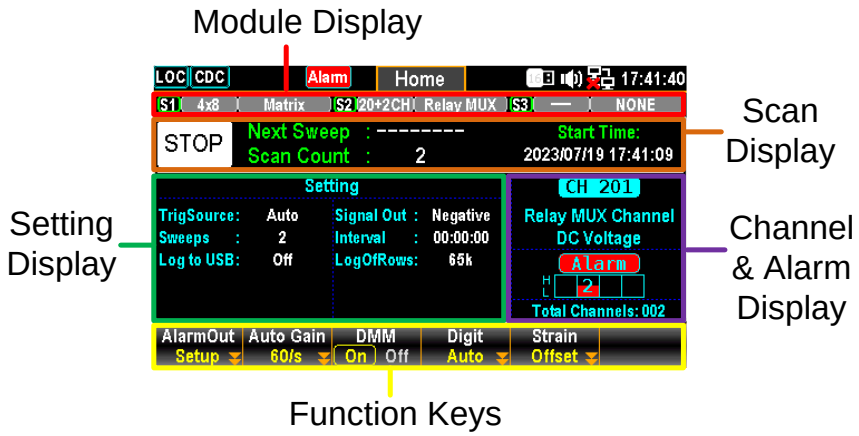
# Home Mode

**Background**

Press and hold the *Home* key on the front panel for 1 second to enter the Home menu in which several basic settings are displayed. Refer to the diagram below for details.




**Home Menu Diagram**




| | |
|---|---|
| **Module Display** | It includes module slot number and module name as well as total channels of each module. Up to 3 installed modules can be displayed. |
| **Scan Display** | The status of Scan mode relevant info. Refer to page 151 for details of the Scan menu. |
| **Channel & Alarm Display** | The upper indicates current channel number and module name with measure type info. Use *knob* key or *arrow* keys to navigate channels. The lower indicates alarm related info in which up to 4 alarms are displayed in red if triggered. And the triggered alarm of Hi and Low limits are shown in half by each (upper half & lower half) for every alarm outputs. Also, the total activated channels number is read below within this section. |
| **Setting Display** | Few basic settings including "Interval" (page 111) and "Log" (page 150) are displayed here. |
| **Function Keys** | The operable function keys are available for user to configure several functions. Refer to the following section for more details. |

Home Function Keys Selection




F1 (AlarmOut) key to set up alarm mode relevant settings

Alarm Mode

- Latch:
  The triggered alarm output is remained unit user clear the alarm manually.
- Track:
  The triggered alarm output is automatically cleared when a measured reading is within limits.

Alarm Out

- Pos:
  All 4 alarm output lines are configured to indicate alarm at 3.3 V.
- Neg:
  All 4 alarm output lines are configured to indicate alarm at 0 V.

Alarm Clear

- Alarm1 ~ 4:
  Clears alarm state of a selected alarm output line.
- All:
  Clears alarm states of all 4 alarm output lines.

AlarmOut Selection




F2 (Auto Gain) key to specify the gain value for Scan mode

When executing the Scan mode consisting of groups of sweeps covering multiple channels for an extended period of time, it is suggested to activate the Auto Gain feature in an attempt to regain the relative value of reference voltage, which is way vulnerable to be affected by long-term scan measurement. By activating this feature, the total scan time will be subtly extended depending on the selected speed option due to an additional Auto Gain action performed prior to initiation of each sweep.

Auto Gain Selection



| | | |
|---|---|---|
| F3 (DMM) key to enable or disable internal DMM function | Basically, DAQ-9600 is equipped with the internal DMM function which allows up to 3 modules with several channels to measure the connected different DUTs. However, in accord with specific applications, user may need to connect with external DMM for measurement, while preserving the function of multiple modules connectivity with DUTs provided by DAQ-9600 simultaneously. In this case, turn Off the DMM function and thus DAQ-9600 simply acts as a multiple channels switch hub and reroutes signals received from connected DUTs to the external DMM for measurement. When disabling DMM function, the internal DMM is off and therefore the icon "DMM" appears in the upper status bar. Also, the available options for Measure setting of each channel will be limited. Refer to the page 95 through page 103 for details. | |
| DMM Selection |  | |
| F4 (Digit) key to define the maximum digit numbers for measurement | Auto | The maximum digit numbers vary by the applied measuring functions and refresh rates automatically. |
| | 6 1/2 | The maximum digit numbers is fixed in 6 ½ display.<br> |
| | 5 1/2 | The maximum digit numbers is fixed in 5 ½ display.<br> |
| | 4 1/2 | The maximum digit numbers is fixed in 4 ½ display.<br> |
| Digit Selection |  | |

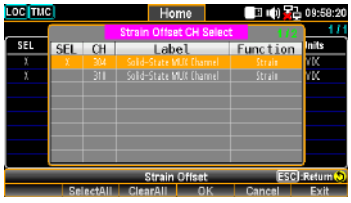
F5 (Strain) key to set up Offset value for Strain measurement

If user configures channel(s) for strain measurement, Strain Offset is available for calculating strain measurement.

Select

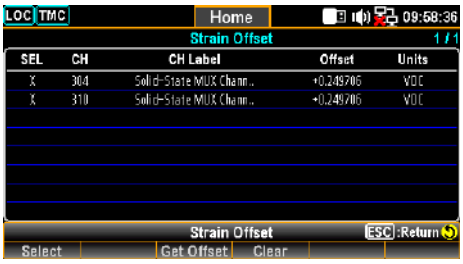
Press to launch strain channel list where available channel(s) set in strain measure are shown for select. Use *knob* key to navigate channels followed by pressing *Select* or *SelectAll* to confirm channels. Press *Cancel* or *ClearAll* to deselect channels. Press *OK* to confirm selection. Press *Exit* to leave the page without saving the selection.



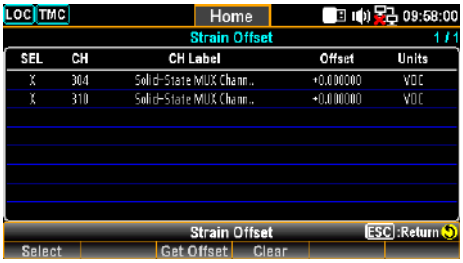

Get Offset

Press to get offset value(s) for selected channel(s) immediately. The offset values are displayed for each selected channel accordingly.




Clear

Press to clear the offset value(s) of selected channel(s). The offset value(s) on the list are returned to 0 instantly after execution.




Strain Offset Selection



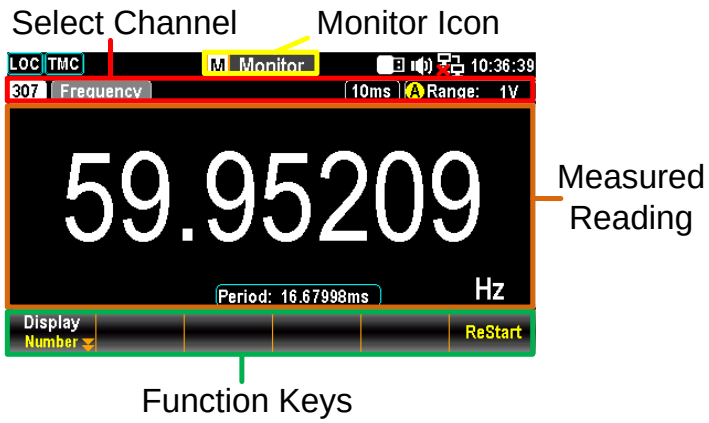
# Monitor Mode

**Background**

Press the *Monitor* key on the front panel to launch the monitor function to see real-time measured reading on a select channel. When the Scan mode is activated with Monitor mode simultaneously, the measured reading on a select channel is updated only when the select channel being scanned by a sweep within a scan course. Press the *Monitor* key again to exit monitor mode. Refer to the diagram below for details.




**Monitor Menu Diagram**




| | |
|---|---|
| **Monitor Icon** | The status icon along with menu identification indicates the Monitor mode is underway. |
| **Select Channel** | Use *knob* or *arrow* keys to navigate channels. The select channel number along with affiliated configurations are displayed here. |
| **Measured Reading** | The real-time measured reading of select channel is shown within this section. |
| **Function Keys** | The operable function keys are available for user to configure several Display modes. Refer to the following subchapters for more details. |

## Display - Number

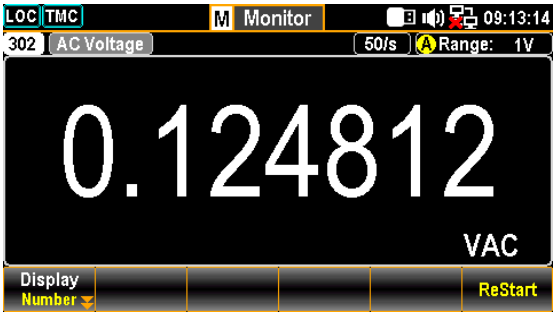
Function Keys in Display – Number




F1 (Display) key to enter Number display

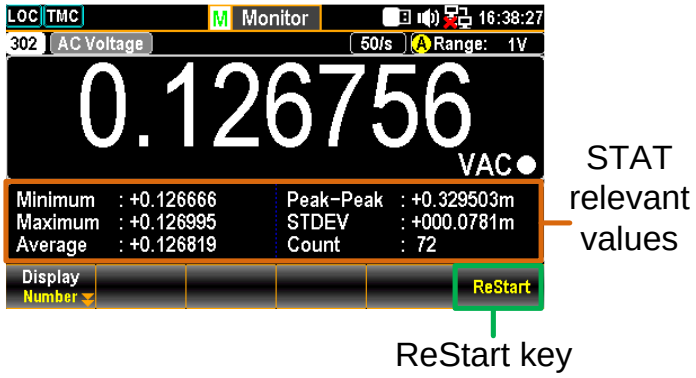
Number

The screen shows the Number mode for reading display. And the maximum digits for number display depend on the Digit configuration.




- Restart:

  Identical to the Restart key in trend chart and histogram, it is particularly available for Number display when STAT of MathDisp is activated. The relevant STAT values will be remeasured once user presses the *Restart* key. Refer to page 133 for details of STAT in Math chapter.



## Display – Bar Meter

Function Keys in Display – Bar Meter

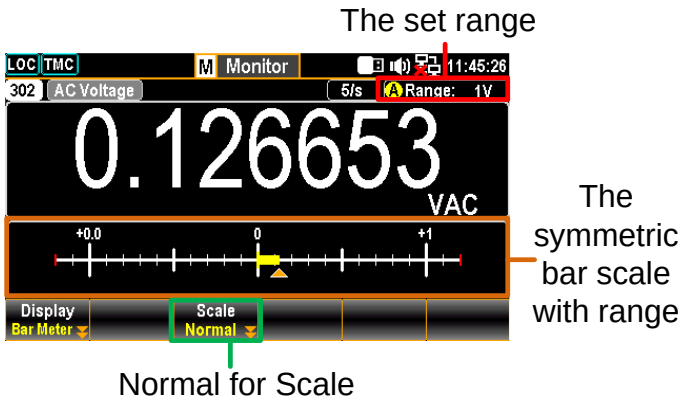



F1 (Display) key to enter Bar Meter display

Bar Meter

The screen shows Bar Meter display in lower section along with Number display in top for reading display. And the maximum digits for Number display depend on the Digit configuration.

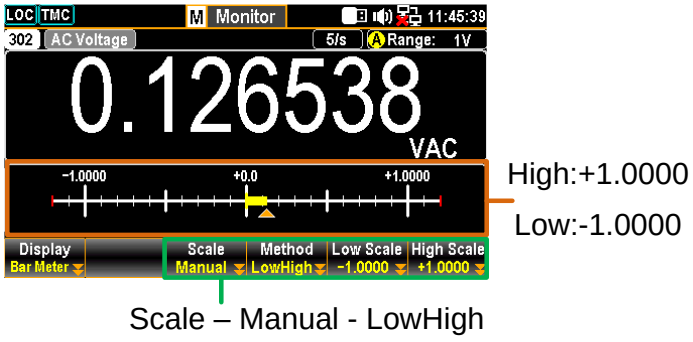
- Scale - Normal:
  It allows the scale of bar meter to be symmetric with the selected range of measurement.




- Scale - Manual:
  It allows the scale of bar meter to be customized in varied range of scale.

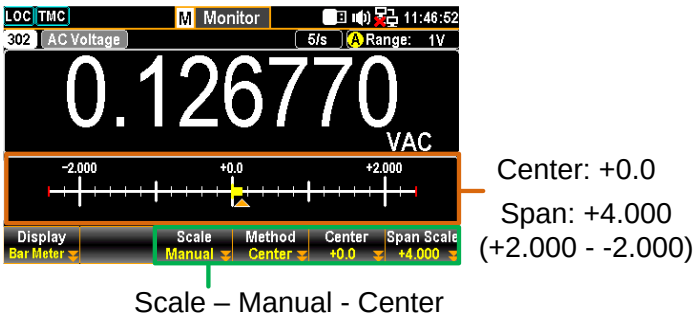
LowHigh for Method

When LowHigh is selected, it is available to further determine the exact scales for both the high and low ends on the bar meter display.



### Center for Method

When Center is selected, it is available to further determine the exact Center value and the Span Scale for the meter bar display.




## Display – Trend Chart

Function Keys in Display – Trend Chart

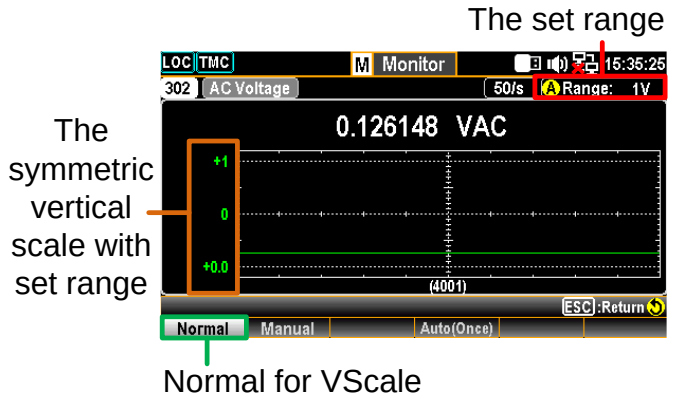



F1 (Display) key to enter Trend Chart display

Trend Chart

The screen shows Trend Chart display in lower along with Number display in top for reading display. And the maximum digits for Number display depend on the Digit configuration.

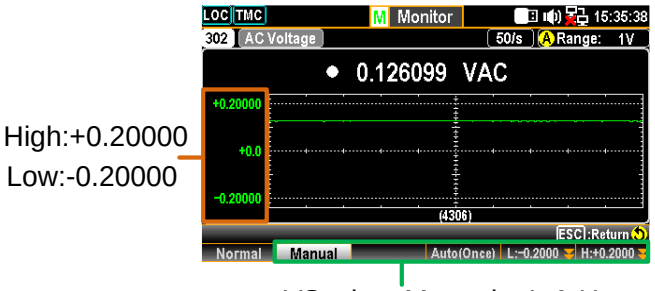
- VScale - Normal:
  It allows the vertical scale of trend chart to be symmetric with set range of measurement.




- VScale - Manual:
  It allows the vertical scale of trend chart to be customized in varied range.

### L & H for Manual

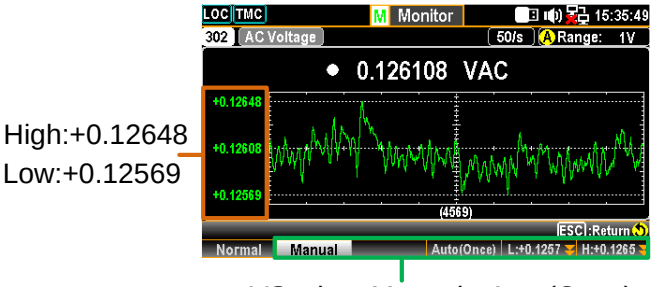
After L and H are set up individually, the vertical upper and lower ranges are corresponding to the set values accordingly.




VScale – Manual – L & H

### Auto(Once) for Manual

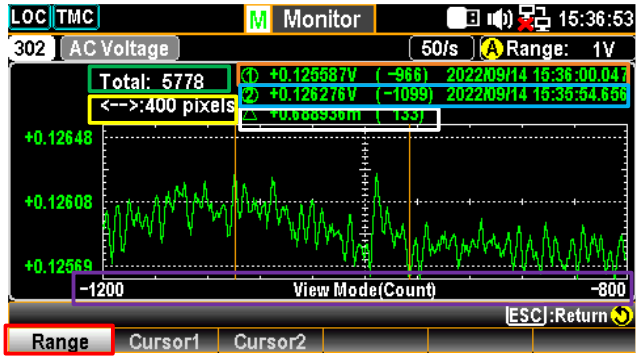
After Auto(Once) is pressed, the vertical upper and lower ranges are automatically defined in accord with the latest 400 counts of measurement from the trend chart.




VScale – Manual - Auto(Once)

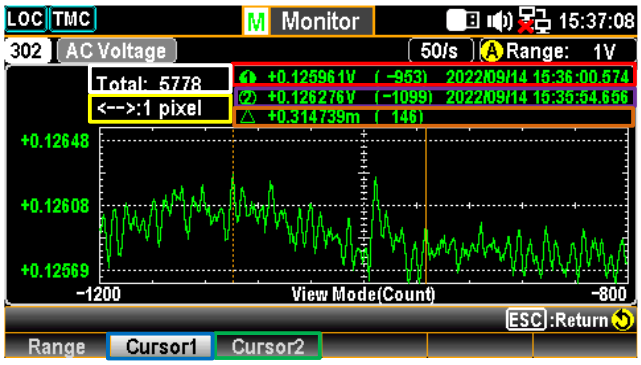
- HScale - Count:
  The horizontal scale of trend chart is symmetric with the set speed of measurement. For example, setting 50/s results in a faster horizontal trend speed, whilst 1/s leads to a slower horizontal trend speed.

- Stop&View - Range:
  Press *Stop&View* key to stop measurement and view detailed info on the trend chart. Press *Range* key followed by scrolling *Knob* key rightward or leftward to move cursors on different sections.




| | |
|---|---|
| Green Sect. | The total counts of measurements before entering the Stop&View. |
| Yellow Sect. | Press the *Knob* key to change the maximum counts moving by scrolling *knob* key per time.<br>1 pixel – 40 pixels – 400 pixels |
| Orange Sect. | The lowest value of the selected count with its affiliated serial number and time stamp. |
| Blue Sect. | The highest value of the selected count with its affiliated serial number and time stamp. |
| White Sect. | The delta between the highest and lowest values of the selected count with its affiliated serial number. |
| Purple Sect. | The horizontal scale of measurements displayed is fixed in the 400 counts |
| Red Sect. | It indicates the counts of moving range by scrolling *Knob* key rightward or leftward to different section per time. Based on the Yellow Sect., when 400 pixels is defined, scroll the *Knob* key once, the scale increases or decreases 400 counts per time. |

- Stop&View – Cursor 1 & Cursor 2:
  Press *Stop&View* key to stop measurement and view the lowest and highest values of each count on the trend chart. Scroll *Knob* key rightward or leftward to move cursors on different sections.




| | |
|---|---|
| White Sect. | The total counts of measurements before entering the Stop&View. |
| Green Sect. | Press the *Cursor1* for checking the lowest value of each count. |
| Blue Sect. | Press the *Cursor2* for checking the highest value of each count. |
| Red Sect. | The lowest value of the selected count with its affiliated serial number and time stamp. |
| Purple Sect. | The highest value of the selected count with its affiliated serial number and time stamp. |
| Yellow Sect. | Press the *Knob* key to change the maximum counts moving by scrolling *knob* key per time.<br>1 pixel – 10 pixels – 20 pixels |
| Orange Sect. | The delta between the highest and lowest values of the selected count with its affiliated serial number. |

- Start/Restart:
  After entering the Stop&View, the measured reading in trend chart is suspended. Press the *Start* key to restart reading in trend chart.

## Display – Histogram

Function Keys in Display – Histogram

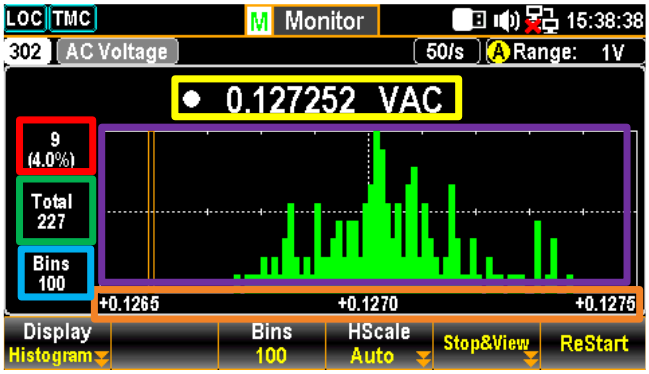



F1 (Display) key to enter Histogram display

Histogram

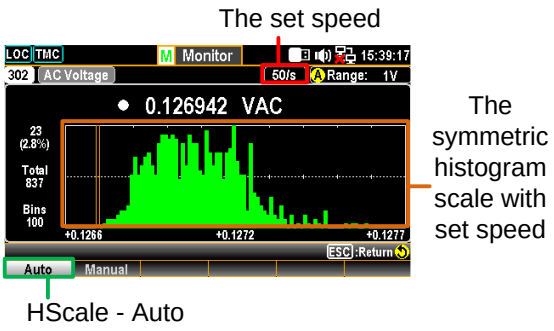
The screen shows the Histogram display in lower along with Number display in top for reading display. And the maximum digits for Number display depend on the Digit configuration.

- Bins - 100:
  Up to 100 strip-like bins, which represents the measured counts, can be seen in histogram display.




| | |
|---|---|
| Green Sect. | It indicates the total measured bins accumulated currently. |
| Red Sect. | It indicates bins of the highest section of measured values with its affiliated percentage from the total counts of measurements. |
| Yellow Sect. | The currently measured reading in number mode. |
| Purple Sect. | The histogram display for the measured bins. Up to the 100 latest bins can be shown concurrently. |
| Blue Sect. | The maximum bin numbers displayed within the purple section. |
| Orange Sect. | The range of horizontal scale of histogram display. |

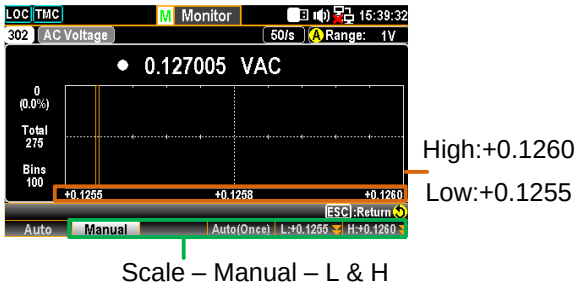
- Hscale - Auto:
  The horizontal scale of histogram is symmetric with the set speed of measurement. For example, setting 50/s results in a faster horizontal histogram speed, whilst 1/s leads to a slower horizontal histogram speed.




- HScale - Manual:
  It allows the horizontal scale of histogram to be customized in varied sections.

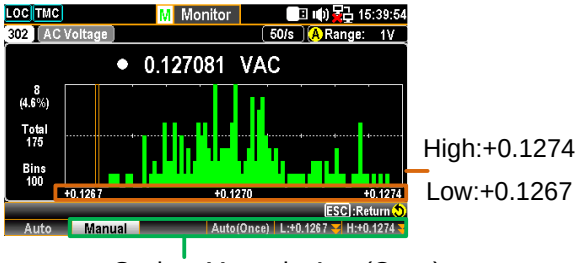
L & H for Manual

After *L* and *H* are set up individually, the horizontal left and right scales are corresponding to the set L and H values accordingly.

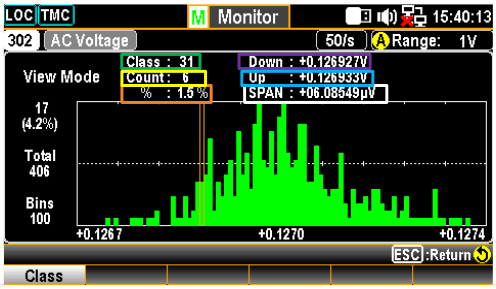


Auto(Once) for Manual

After *Auto(Once)* is pressed, the horizontal left and right scales are automatically defined in accord with the latest bins of measurement from the histogram.




- Stop&View - Class:
  Press *Stop&View* key to stop measurement and view detailed info on the histogram. Scroll the *Knob* key rightward or leftward to move cursors on different bins.




| | |
|---|---|
| Green Sect. | It indicates the selected bin number. Scroll the *knob* key right or left to change bin number for checking. |
| Yellow Sect. | It indicates the total accumulated counts of measurement. |
| Orange Sect. | It indicates the exact percentage of the total counts of measurement from the selected bin number. |
| Purple Sect. | It indicates the lowest value being measured within the selected bin number. |
| Blue Sect. | It indicates the highest value being measured within the selected bin number. |

| | |
|---|---|
| White Sect. | It indicates the difference in value between the highest and lowest values. |

- Start/Restart:

  After entering the Stop&View, the measured reading in histogram is suspended. Press the *Start* key to restart reading in histogram.

# Scan Mode

**Background**

Press the *Scan* key on the front panel to initiate the scan function. During a scan course, DAQ-9600 scans available channels whose measurement functions are configured previously. Also, the Computer channels (401-420), whose computed formula are configured previously, will be scanned by DAQ-9600 in a scan course as well. Refer to page 107 for details of Computer channels.



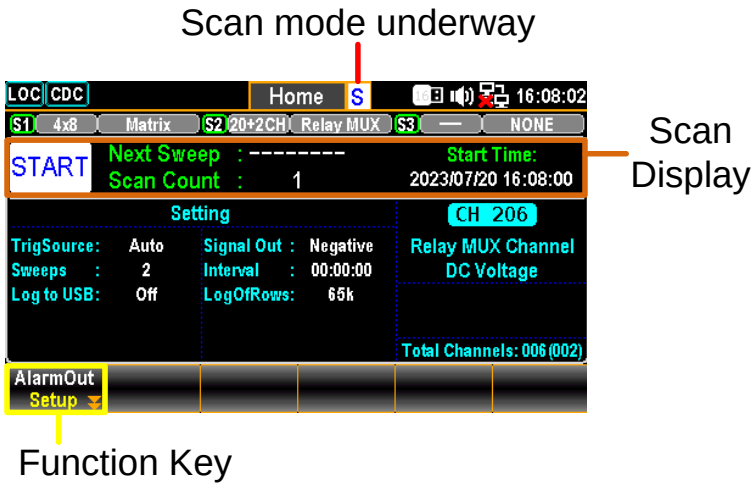

For those channels whose measurement functions are Not configured previously, the Scan mode will skip them from a scan course. DAQ-9600 scans available channels from slot 1 to slot 3 followed by Computer channels (401-420). A scan course consists of user-defined sweep(s) and a sweep indicates one pass through the available channels.

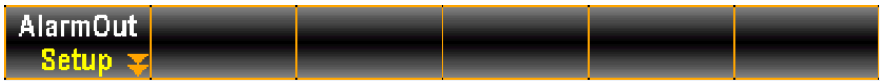
There are up to 100,000 readings data with time stamp stored in memory during a scan course. All readings data from the previous scan course will be cleared automatically in memory once user starts a new scan course.

In order to stop a scan course, press and hold the *Scan* key for 1 second and scan will be halted instantly.

**Scan Mode Diagram**

In essence, the Scan mode display is almost identical to that of Home mode. Refer to page 42 for description of Home Mode diagram if necessary. And here we put emphasis on the introduction of relevant info of Scan Display.



| | | | |
|---|---|---|---|
| | Scan Display | START /STOP | The status becomes START after user presses *Scan* key. And it turns STOP after a scan course is completed or after user presses and holds *Scan* key for 1 second. |
| | | Next Sweep | It indicates the interval actions between each sweep. The actions vary in accordance with the Trig Source setting. See page 111 for details of Interval. |
| | | Scan Count | It indicates the completed counts of sweeps for a scan course. Scan counts of sweeps is based on Sweeps setting. See page 111 for details of Interval. |
| | | Start Time | The latest start date and time of a scan course is displayed here. |
| | Function Key | The operable function key *AlarmOut* during a scan course is for user to clear alarm 1 ~ alarm 4 individually or to clear all alarms if any. | |
| Scan Function Key Selection |  | | |
| F1 (AlarmOut) key to clear alarm(s) during scan mode | Alarm Clear | ▪ Alarm1 ~ 4:<br>Clears alarm state of a selected alarm output line.<br>▪ All:<br>Clears alarm states of all 4 alarm output lines. | |

## Scan Mode with Monitor Mode simultaneously

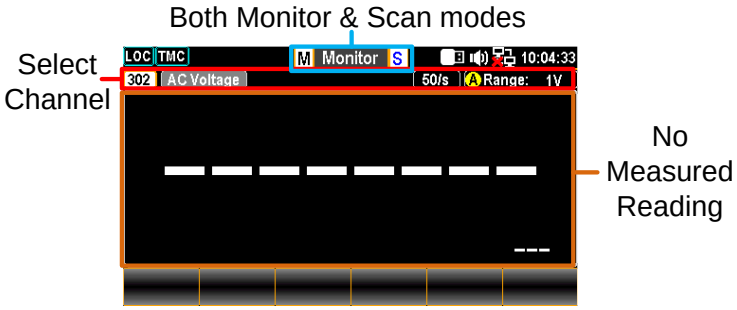
**Description**

It is available for user to activate both Scan mode and Monitor mode at the same time. When Scan mode is activated with Monitor mode simultaneously, the measured reading on a select channel is updated once only when the select channel is being scanned by a sweep within a scan course.

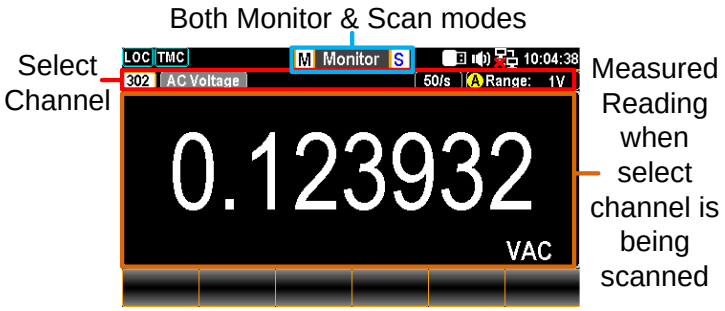
Also, similar to the Monitor mode, it is available to navigate channels via using *knob* or *arrow* keys to watch the updated measured reading of each channel.

**Scan & Monitor mode Diagram**

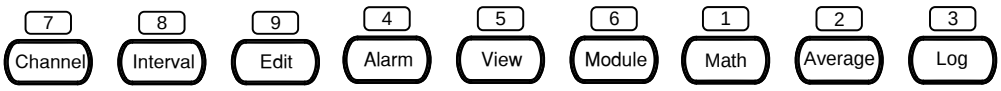
When the select channel hasn't been scanned from the 1st sweep, it reads no measured reading on the display.




When the select channel is being scanned from a sweep within a scan course, measured reading will be displayed and be updated again only when being scanned again in the next sweep.



# CONFIGURATION MENUS

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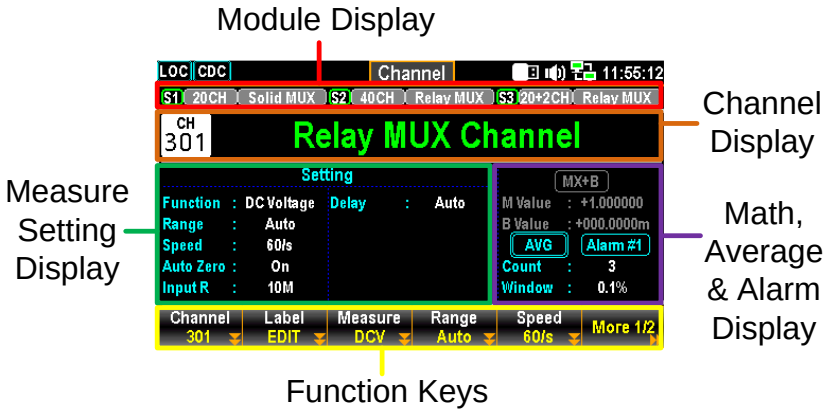
# Channel Menu

**Background**

Press the *Channel* key on the front panel to enter the Channel menu in which various measurements can be selected for each channel from slots modules. Refer to the diagram below for details.




**Channel Menu Diagram**




| | |
|---|---|
| **Module Display** | It includes module slot number and module name as well as total channels of each module. Up to 3 installed modules can be displayed. |
| **Channel Display** | The select channel number along with channel name are shown here. |
| **Measure Setting Display** | The parameters settings for each measurement of select channel are displayed. The available settings vary in accord with each measurement. |
| **Math, Average & Alarm Display** | Math function setting for select channel is displayed. See page 133 for details of Math.<br>Average Count & Window setting for select channel is displayed. See page 148 for details of Average.<br>Alarm Hi & Lo limits setting for select channel is displayed. See page 117 for details of Alarm.<br>Press *knob* key to toggle between AVG and Alarm setting display. |
| **Function Keys** | The operable function keys are available for user to configure measurements of each channel. Refer to the following section for more details. |

Channel Function Keys Selection



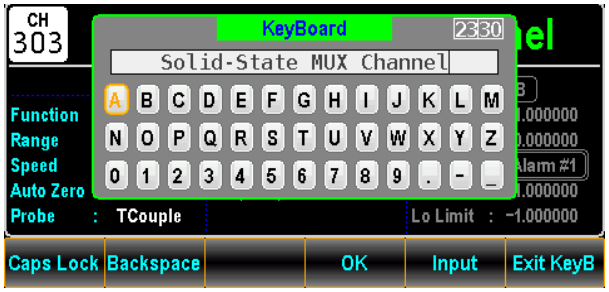

F1 (Channel) key to select a channel

Press the F1 key to select a channel. Use either *numerical keypad* or rotate *knob* key to confirm selection. Also, it is available directly rotate *knob* key from Channel display to navigate channels.




F2 (Label) key to name a channel

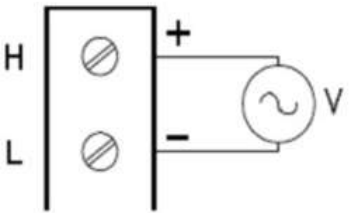
Press the F2 key to launch the keyboard in which user rotates *knob* key to select characters followed by clicking *Input* to confirm selection. Press *OK* to save whilst press *Exit KeyB* to exit without saving. *Caps Lock* toggles characters between high and low case. And *Backspace* simply moves cursor backwards with deleting character.




F3 (Measure) key to configure measurement

Measurement part contains several types of measurements with complicated settings and we will introduce in the following subchapters in details.

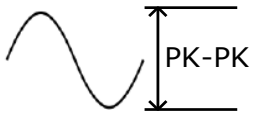
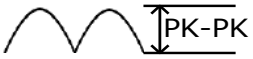
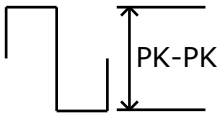
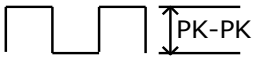
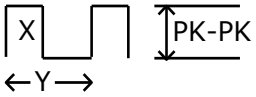
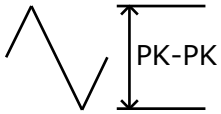
## DCV/ACV Measurement

| | |
|---|---|
| Description | The DC and AC voltage measurements configurations. |
| F3 (Measure) key to select ACV or DCV | DCV<br><br>ACV<br> |
| Voltage source and module terminals connection |  |
| F4 (Range) key to select range for ACV and DCV | Press the key to enter Range menu and select a target range for ACV and DCV measurements individually. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key to select speed for ACV and DCV | Press the key to enter Speed menu and select a target speed for ACV and DCV measurements individually. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page | DCV<br><br>ACV<br> |

| | |
|---|---|
| Auto Zero (F1) key to set Auto Zero (DCV only) | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Input R (F2) key to select input resistance (DCV only) | It specifies the measurement terminal input impedance, which is 10 MΩ or Auto. The Auto mode selects high impedance (Hi-Z) for the 100 mV, 1 V and 10 V ranges, and 10 MΩ for the 100 V and 600 V ranges. In most situations, 10 MΩ is high enough to not load most circuits, but low enough to make readings stable for high impedance circuits. It also leads to readings with less noise than the (Hi-Z) option, which is included for situations where the 10 MΩ load is significant. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## Voltage Conversion Table

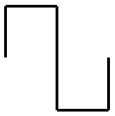
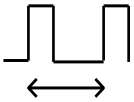
Background This table shows the relationship between AC and DC reading in various waveforms.

| Waveform | Peak to Peak | AC (True RMS) | DC |
|---|---|---|---|
| Sine   | 2.828 | 1.000 | 0.000 |
| Rectified Sine (full wave)   | 1.414 | 0.435 | 0.900 |
| Rectified Sine (half wave)   | 2.000 | 0.771 | 0.636 |
| Square   | 2.000 | 1.000 | 0.000 |
| Rectified Square   | 1.414 | 0.707 | 0.707 |
| Rectangular Pulse   | 2.000 | 2K $K=\sqrt{(D-D^{2})}$ D=X/Y | 2D D=X/Y |
| Triangle Sawtooth   | 3.464 | 1.000 | 0.000 |

## Crest Factor Table

Background

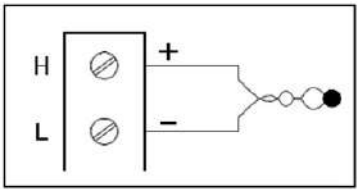
Crest factor is the ratio of the peak signal amplitude to the RMS value of the signal. It determines the accuracy of AC measurement. If the crest factor is less than 3.0, voltage measurement will not result in error due to dynamic range limitations at full scale. If the crest factor is more than 3.0, it usually indicates an abnormal waveform as seen from the below table.

| Waveform | Shape | Crest factor |
|---|---|---|
| Square wave |  | 1.0 |
| Sine wave |  | 1.414 |
| Triangle sawtooth |  | 1.732 |
| Mixed frequencies |  | 1.414 ~ 2.0 |
| SCR output 100% ~ 10% |  | 1.414 ~ 3.0 |
| White noise |  | 3.0 ~ 4.0 |
| AC Coupled pulse train |  | >3.0 |
| Spike |  | >9.0 |

## Temperature Measurement

| | | |
|---|---|---|
| Description | The temperature measurements configurations. Generally, it requires a temperature transducer with the supported probes Thermocouple, Thermistor and Resistance Temperature Detector (RTD). | |
| Temperature Range | Thermocouple | -200°C ~ +1820°C (vary by sensor types) |
| | RTD | -200°C ~ +630°C |
| | Thermistor | -80°C ~ +150°C |
| ⚠ Note | Depending on varied installed modules, some temperature measurements (Thermistor, RTD) may not available. | |

### Thermocouple Setting

| | |
|---|---|
| F3 (Measure) key to select TEMP | TEMP   |
| F4 (Probe) key to select TCouple | TCouple   |
| Thermocouple and module terminals connection |   |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |

| | |
|---|---|
| Function Keys in More 2/3 page |  |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Unit (F2) key to set temperature unit | Press the key to enter the Temperature Unit menu followed by setting temperature measurement unit as °C (Celsius), °F (Fahrenheit), or °K. |
| Type (F3) key to specify a sensor type | Press the key to enter the sensor Type menu followed by specifying sensor type as J, K, N, R, S, T, B, or E. |
| Simulated (F4) key to set up simulated method | Press the key to enter the Simulated Method Setup menu followed by selecting Auto, Fixed or External for the so-called "Reference Junction Temperature". |
| Fix Value (F5) key for Fixed of simulated method | When "Fixed" is selected for Simulated, press F5 key to further configure a Fix Value. |
| Ref CH (F5) key for External of simulated method | When "External" is selected for Simulated, press F5 key to further select a reference channel from the list. |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| ADJ (F1) key to set Auto SIM Offset | When "Auto" is selected for Simulated, press F1 key to further define an Offset value for Auto SIM. |

| | |
|---|---|
| Open Check (F3) key to set open circuit authentication | In order to authenticate the proper connection of thermocouples for measurements, turn on the Open Check feature. When activated, DAQ-9600 executes a resistance measurement alongside each temperature assessment to detect any open circuits. Should one be identified, the outcome will display as +Overload. Neglecting this verification can lead to a voltage reading close to zero, rendering the temperature reading invalid. The setting is Off by default. And be aware that measurement time will be increased, more or less, due to the Open Check feature activation. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## Thermocouple Sensor Type

| | |
|---|---|
| Background | The instrument accepts thermocouple inputs and calculates the temperature from the voltage difference of two dissimilar metals. Thermocouple sensor type is one of the main factors to be considered. |

Parameter

| Thermocouple Sensor Type | Measurement Range | Resolution |
|---|---|---|
| J | -210 to +1200˚C | 0.002 °C |
| K | -200 to +1372˚C | 0.002 °C |
| N | -200 to +1300˚C | 0.003 °C |
| R | -50 to +1768˚C | 0.01 °C |
| S | -50 to +1768˚C | 0.01 °C |
| T | -200 to +400°C | 0.002 °C |
| B | +250 to +1820˚C | 0.01 °C |
| E | -200 to +1000°C | 0.002 °C |

## Reference Junction Temperature (SIM Temperature)

**Background**

**(Thermocouple only)**

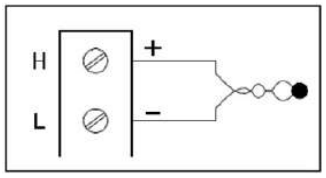
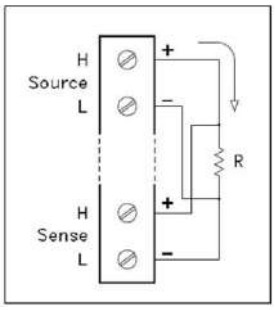
When a thermocouple is connected to the DAQ-9600, the temperature difference between the thermocouple lead and the DAQ-9600 input terminal should be taken into account and be cancelled out; otherwise an erroneous temperature might be added. The value of the reference junction temperature should be determined by the user.

| Type | Range | Resolution |
|---|---|---|
| SIM (simulated) | -20°C ~ +80°C | 0.01°C |

The terminal temperature is manually defined by user.

Default value: Auto

## Thermistor 2W/4W Setting

| | |
|---|---|
| F3 (Measure) key to select TEMP | TEMP<br> |
| F4 (Probe) key to select Them2W or Them4W | Them2W<br><br>Them4W<br> |
| Thermistor and module terminals connection | Therm2W<br><br>Therm4W<br> |

| Parameter | Type | Range | Resolution |
|---|---|---|---|
| | All | -80~150°C | 0.001°C |

| | |
|---|---|
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page |  |

| | |
|---|---|
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Unit (F2) key to set temperature unit | Press the key to enter the Temperature Unit menu followed by setting temperature measurement unit as °C (Celsius), °F (Fahrenheit), or °K. |
| Type (F3) key to specify a sensor type | Press the key to enter the sensor Type menu followed by specifying sensor type as 2.2kΩ, 5kΩ, 10kΩ or User type. |
| User Type (F4) key to set up User Type coefficients | When "User" is selected for Type, press F4 key to further customize A, B and C coefficients individually as defined by the Steinhart–Hart equation. |

| Type | A | B | C |
|---|---|---|---|
| Coefficient | | | |
| 2.2k | 0.0014733 | 0.0002372 | 1.07E-07 |
| 5k | 0.0012880 | 0.0002356 | 9.56E-08 |
| 10k | 0.0010295 | 0.0002391 | 1.57E-07 |

Equation

$$T_K = \frac{1}{A + B(\ln R) + C(\ln R)^3}$$

where: $T_K$ is the calculated temperature in Kelvin.

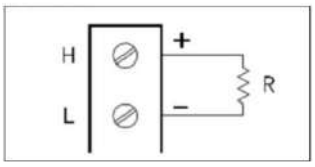
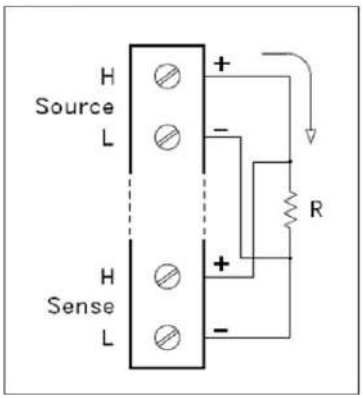
ln R is the natural log of the measured resistance of the themistor.

A, B, and C are the curve fitting constants.

| | |
|---|---|
| Use as Ref (F5) key to enable | Enable Use as Ref to make selected channel be used as the reference channel for subsequent thermocouple measurements that specify an external reference source. |

| | |
|---|---|
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| Power Low (F3) key to enable | Selects the low-power resistance measurement, which sources less current resulting in lower power dissipation, and less self-heating, in the resistance under test. Typically, this is about 1/10th the current sourced for the standard resistance measurements and is only for the condition of equal to or less than 100k. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## RTD 2W/4W Setting

| | |
|---|---|
| F3 (Measure) key to select TEMP | TEMP<br> |
| F4 (Probe) key to select RTD 2W or RTD 4W | RTD 2W<br><br>RTD 4W<br> |
| RTD and module terminals connection | RTD 2W<br><br>RTD 4W<br> |

| Parameter | RTD type | Range | Resolution |
|---|---|---|---|
| | All (based on PT100) | -200~630°C | 0.001°C |

| | |
|---|---|
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page |  |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Unit (F2) key to set temperature unit | Press the key to enter the Temperature Unit menu followed by setting temperature measurement unit as °C (Celsius), °F (Fahrenheit), or °K. |
| Type (F3) key to specify a sensor type | Press the key to enter the sensor Type menu followed by specifying sensor type as PT100, D100, F100, PT385, PT3916 or User type. |
| User Type (F4) key to set up User Type coefficients | When "User" is selected for Type, press F4 key to further customize alpha, beta, delta and R0 coefficients individually as defined by the Callendar–Van Dusen equation. |

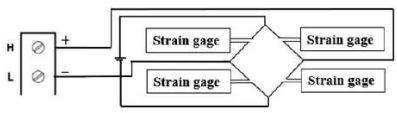
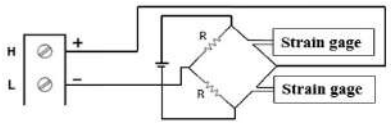
| Type Coefficient | Alpha (α) | Beta (β) | Delta (δ) |
|---|---|---|---|
| PT100 | 0.00385 | 0.10863 | 1.49990 |
| D100 | 0.00392 | 0.10630 | 1.49710 |
| F100 | 0.00390 | 0.11000 | 1.49589 |
| PT385 | 0.00385 | 0.11100 | 1.50700 |
| PT3916 | 0.00392 | 0.11600 | 1.50594 |

| | | |
|---|---|---|
| Equation | -200°C to 0°C range | $R_{RTD} = R_0[1+AT+BT^2+CT^3 (T-100)]$<br>where: $R_{RTD}$ is the calculated resistance of the RTD<br>$R_0$ is the known RTD resistance at 0°C<br>T is the temperature in °C<br>A = alpha [1+ (delta/100)]<br>B = -1 (alpha)(delta)(1e-4)<br>C = -1 (alpha)(beta)(1e-8) |
| | -0°C to 630°C range | $R_{RTD} = R_0 (1+AT+BT^2)$<br>where: $R_{RTD}$ is the calculated resistance of the RTD<br>$R_0$ is the known RTD resistance at 0°C<br>T is the temperature in °C<br>A = alpha [1+ (delta/100)]<br>B = -1 (alpha)(delta)(1e-4) |
| Use as Ref (F5) key to enable | Enable Use as Ref to make selected channel be used as the reference channel for subsequent thermocouple measurements that specify an external reference source. | |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. | |
| Function Keys in More 3/3 page |  | |
| Power Low (F3) key to enable | Selects the low-power resistance measurement, which sources less current resulting in lower power dissipation, and less self-heating, in the resistance under test. Typically, this is about 1/10th the current sourced for the standard resistance measurements and is only for the condition of equal to or less than 100k. | |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. | |

## Strain Measurement

| | |
|---|---|
| Description | The strain measurements configurations. Generally, a body deforms when a force is applied to the body,. The deformation per unit length is the so-called strain. Strain may be either compressive (-) or tensile (+).<br>DAQ-9600 supports two types of strain measurements which are Bridge and Direct resistive methods.<br>After configuring strain measurement function for channels, go to Home menu to get the unstrained offset value, which will be subtracted from strain measurements before the strain conversion is executed. Refer to page 45 for details of how to get unstrained offset value. |

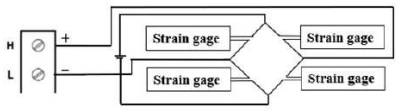
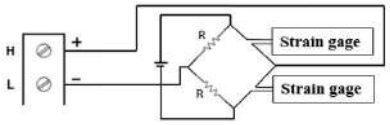
### Full & Half Bending Bridge Setting

| | |
|---|---|
| F3 (Measure) key to select STRAIN | STRAIN<br> |
| Bridge source and module terminals connection | Full Bending Bridge<br><br>Half Bending Bridge<br> |
| F4 (Range) key to select range | Press the key to enter Range menu and select a target range for strain measurement. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |

| | |
|---|---|
| Function Keys in More 2/3 page | Full Bending Bridge<br><br>Half Bending Bridge<br> |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Sense (F2) key to select Bridge | Press the key to enter the Sense menu followed by selecting Bridge for sense. |
| Config (F3) key to specify Full or Half | Press the key to enter the Config menu followed by selecting either Full or Half. |
| Type (F4) key to select Bending | Press the key to enter the Type menu followed by selecting Bending for type. |
| GageFactor (F5) key to specify a ratio | Gage factor indicates the ratio of fractional change in resistance to, along the axis of the gage, the fractional change in length (strain).The more sensitive strain gage, the larger the value. Gage factor itself is a dimensionless quantity with the default value of approximate 2. |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |

| | |
|---|---|
| Excitation (F2) key | Strain bridge conversions require the voltage of the external bridge excitation, for which user can designate a multiplexer channel to measure the excitation voltage or can specify a known fixed voltage value.<br>Fixed (Fix) - The fixed value specified by the excitation voltage will be used for the strain conversion.<br>External (Ext) - DCV measurements on the enabled reference channel will be used for subsequent strain bridge measurements that specify an external excitation voltage source. Note that the external DCV reference channel must be a lower-numbered channel than the strain channel. |
| EXCI Volt (F3) key | When "Fix" is selected for Excitation, press F3 key to further configure an excitation voltage applied to the bridge by an external voltage source. This value will be used to convert strain bridge measurements on the selected channel. |
| Ext Chan. (F3) key | When "Ext" is selected for Excitation, press F3 key to further select a reference channel from the list. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

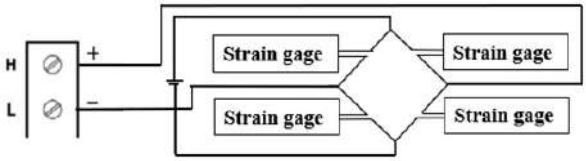
## Full & Half Poisson Bridge Setting

| | |
|---|---|
| F3 (Measure) key to select STRAIN | STRAIN<br> |
| Bridge source and module terminals connection | Full Poisson Bridge<br><br>Half Poisson Bridge<br> |
| F4 (Range) key to select range | Press the key to enter Range menu and select a target range for strain measurement. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |

| | |
|---|---|
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page | Full Poisson Bridge<br><br>Half Poisson Bridge<br> |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Sense (F2) key to select Bridge | Press the key to enter the Sense menu followed by selecting Bridge for sense. |
| Config (F3) key to specify Full or Half | Press the key to enter the Config menu followed by selecting either Full or Half. |
| Type (F4) key to select Poisson | Press the key to enter the Type menu followed by selecting Poisson, which is defined as the negative ratio of the strain in the transverse direction to the strain in the longitudinal direction. |
| GageFactor (F5) key to specify a ratio | Gage factor indicates the ratio of fractional change in resistance to, along the axis of the gage, the fractional change in length (strain).The more sensitive strain gage, the larger the value. Gage factor itself is a dimensionless quantity with the default value of approximate 2. |

| | |
|---|---|
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| PoisRatio(F1) key | User specifies a Poisson ratio, which is defined as the negative ratio of the strain in the transverse direction to the strain in the longitudinal direction, of the strain gage. |
| Excitation (F2) key | Strain bridge conversions require the voltage of the external bridge excitation, for which user can designate a multiplexer channel to measure the excitation voltage or can specify a known fixed voltage value.<br>Fixed (Fix) - The fixed value specified by the excitation voltage will be used for the strain conversion.<br>External (Ext) - DCV measurements on the enabled reference channel will be used for subsequent strain bridge measurements that specify an external excitation voltage source. Note that the external DCV reference channel must be a lower-numbered channel than the strain channel. |
| EXCI Volt (F3) key | When "Fix" is selected for Excitation, press F3 key to further configure an excitation voltage applied to the bridge by an external voltage source. This value will be used to convert strain bridge measurements on the selected channel. |
| Ext Chan. (F3) key | When "Ext" is selected for Excitation, press F3 key to further select a reference channel from the list. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

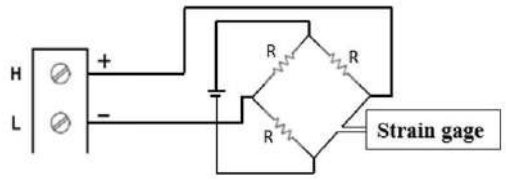
## Full Bending Poisson Bridge Setting

| | |
|---|---|
| F3 (Measure) key to select STRAIN | STRAIN<br> |
| Bridge source and module terminals connection | Full Bending Poisson Bridge<br> |
| F4 (Range) key to select range | Press the key to enter Range menu and select a target range for strain measurement. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page | Full Bending Poisson Bridge<br> |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Sense (F2) key to select Bridge | Press the key to enter the Sense menu followed by selecting Bridge for sense. |

| | |
|---|---|
| Config (F3) key to specify Full | Press the key to enter the Config menu followed by selecting Full. |
| Type (F4) key to select BendPois | Press the key to enter the Type menu followed by selecting BendPois for type, which is a combination ratio of Bending and Poisson. |
| GageFactor (F5) key to specify a ratio | Gage factor indicates the ratio of fractional change in resistance to, along the axis of the gage, the fractional change in length (strain).The more sensitive strain gage, the larger the value. Gage factor itself is a dimensionless quantity with the default value of approximate 2. |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| PoisRatio(F1) key | User specifies a Poisson ratio, which is defined as the negative ratio of the strain in the transverse direction to the strain in the longitudinal direction, of the strain gage. |
| Excitation (F2) key | Strain bridge conversions require the voltage of the external bridge excitation, for which user can designate a multiplexer channel to measure the excitation voltage or can specify a known fixed voltage value.<br>Fixed (Fix) - The fixed value specified by the excitation voltage will be used for the strain conversion.<br>External (Ext) - DCV measurements on the enabled reference channel will be used for subsequent strain bridge measurements that specify an external excitation voltage source. Note that the external DCV reference channel must be a lower-numbered channel than the strain channel. |
| EXCI Volt (F3) key | When "Fix" is selected for Excitation, press F3 key to further configure an excitation voltage applied to the bridge by an external voltage source. This value will be used to convert strain bridge measurements on the selected channel. |
| Ext Chan. (F3) key | When "Ext" is selected for Excitation, press F3 key to further select a reference channel from the list. |

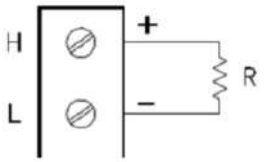
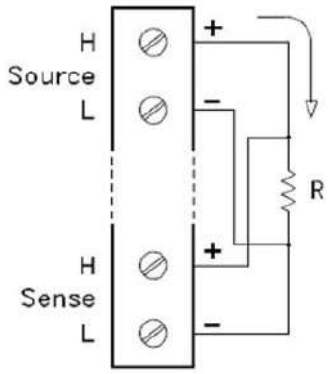
| | |
|---|---|
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## Quarter Bridge Setting

| | |
|---|---|
| F3 (Measure) key to select STRAIN | STRAIN<br> |
| Bridge source and module terminals connection | Quarter Bridge<br> |
| F4 (Range) key to select range | Press the key to enter Range menu and select a target range for strain measurement. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page | Quarter Bridge<br> |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |

| | |
|---|---|
| Sense (F2) key to select Bridge | Press the key to enter the Sense menu followed by selecting Bridge for sense. |
| Config (F3) key to specify Quarter | Press the key to enter the Config menu followed by selecting Quarter. |
| GageFactor (F5) key to specify a ratio | Gage factor indicates the ratio of fractional change in resistance to, along the axis of the gage, the fractional change in length (strain).The more sensitive strain gage, the larger the value. Gage factor itself is a dimensionless quantity with the default value of approximate 2. |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| Excitation (F2) key | Strain bridge conversions require the voltage of the external bridge excitation, for which user can designate a multiplexer channel to measure the excitation voltage or can specify a known fixed voltage value.<br>Fixed (Fix) - The fixed value specified by the excitation voltage will be used for the strain conversion.<br>External (Ext) - DCV measurements on the enabled reference channel will be used for subsequent strain bridge measurements that specify an external excitation voltage source. Note that the external DCV reference channel must be a lower-numbered channel than the strain channel. |
| EXCI Volt (F3) key | When "Fix" is selected for Excitation, press F3 key to further configure an excitation voltage applied to the bridge by an external voltage source. This value will be used to convert strain bridge measurements on the selected channel. |
| Ext Chan. (F3) key | When "Ext" is selected for Excitation, press F3 key to further select a reference channel from the list. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## 2W & 4W Direct Setting

| | |
|---|---|
| F3 (Measure) key to select STRAIN | STRAIN<br> |
| Direct source and module terminals connection | 2W Direct<br><br>4W Direct<br> |
| F4 (Range) key is fixed in Fix 1kΩ | Under the either 2W or 4W Direct setting, the Range is fixed in Fix 1kΩ by default. |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/3) key to enter next function keys page | Press the key to enter the next page (More 2/3) of more functions configurations for measurement. |
| Function Keys in More 2/3 page | 2W Direct<br><br>4W Direct<br> |

| | |
|---|---|
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Sense (F2) key to select Direct | Press the key to enter the Sense menu followed by selecting Direct for sense. |
| Config (F3) key to specify 2-Wire or 4-Wire | Press the key to enter the Config menu followed by selecting either 2-Wire or 4-Wire. |
| GageOhms (F4) key to specify resistance | Press the key to specify Gage resistance, which is used to convert direct strain measurements on selected channel. |
| GageFactor (F5) key to specify a ratio | Gage factor indicates the ratio of fractional change in resistance to, along the axis of the gage, the fractional change in length (strain).The more sensitive strain gage, the larger the value. Gage factor itself is a dimensionless quantity with the default value of approximate 2. |
| F6 (More 2/3) key to enter next function keys page | Press the key to enter the next page (More 3/3) of more functions configurations for measurement. |
| Function Keys in More 3/3 page |  |
| PowerLow (F3) key | Selects the low-power resistance measurement, which sources less current resulting in lower power dissipation, and less self-heating, in the resistance under test. Typically, this is about 1/10th the current sourced for the standard resistance measurements and is only for the condition of equal to or less than 100k. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## 2-Wire & 4-Wire Resistance Measurement

**Description**

The resistance measurements configurations. Generally, the 2-Wire resistance indicates using the standard Input HI-LO terminals and it is recommended for measuring resistances larger than 1kΩ. And 4-Wire resistance indicates compensating the test lead effect using the 4W compensation terminals, in addition to the standard Input HI-LO terminals. Recommended for measuring sensitive resistances smaller than 1kΩ.

**F3 (Measure) key to select 2W OHM or 4W OHM**

2W OHM

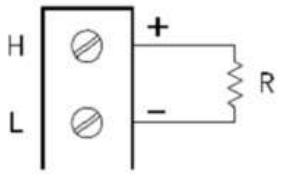



4W OHM

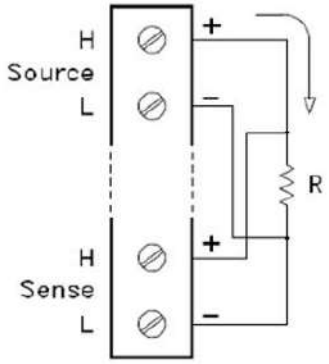



**Resistance source and module terminals connection**

2W OHM




4W OHM




**F4 (Range) key to specify range**

Press the key to enter Range menu and select a target range for 2W OHM and 4W OHM measurements individually. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range keys* can select range promptly.

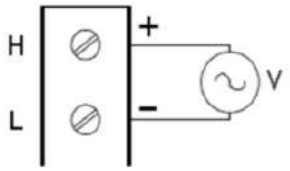
**Selectable Resistance Ranges**

| Range | Resolution | Full scale |
|---|---|---|
| 100Ω | 0.1mΩ | 119.9999Ω |
| 1kΩ | 1mΩ | 1.199999kΩ |
| 10kΩ | 10mΩ | 11.99999kΩ |

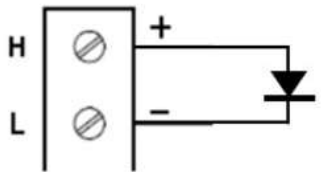
| | | | |
|---|---|---|---|
| | 100kΩ | 100mΩ | 119.9999kΩ |
| | 1MΩ | 1Ω | 1.199999MΩ |
| | 10MΩ | 10Ω | 11.99999MΩ |
| | 100MΩ | 100Ω | 119.9999MΩ |
| | 1GΩ | XXX | XXXX |

| | |
|---|---|
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed temperature measurements. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page |  |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| PowerLow (F3) key | Selects the low-power resistance measurement, which sources less current resulting in lower power dissipation, and less self-heating, in the resistance under test. Typically, this is about 1/10th the current sourced for the standard resistance measurements and is only for the condition of equal to or less than 100k. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

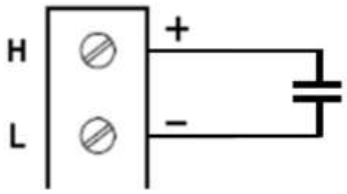
## Frequency/Period Measurement

| | |
|---|---|
| Description | The frequency/period measurements configurations. |
| F3 (Measure) key to select either Frequency or Period | FREQ<br><br>PERIOD<br> |
| Input source and module terminals connection |  |
| F4 (Range) key to specify range | Press the key to enter Range menu and select a target range for Frequency/Period measurements individually. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (GeteTime) key to select speed | Press the key to specify the threshold to recalculate Frequency/Period. Slower the gate time, e.g., 1s, more accurate the reading value. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page |  |
| TimeOut (F1) key to define value | It defines the exact value for timeout, which means measurement will be suspended after reaching the set timeout value when none of input is detected.<br>Note that when selecting "Auto", the timeout setting will fully sync with the Gate Time value. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

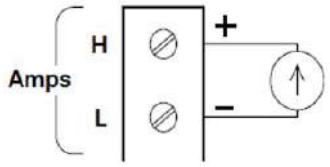
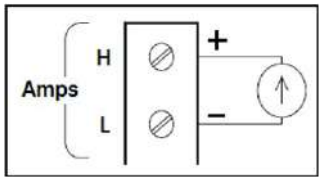
## Diode Measurement

| | |
|---|---|
| Description | The diode measurement configurations. |
| F3 (Measure) key to select Diode | DIODE<br> |
| Diode source and module terminals connection |  |
| F4 (Range) key is fixed in 5V | The Range selection is fixed in 5V for Diode measurement. |
| F5 (Speed) key to select speed | Press the key to enter Speed menu and select a target speed for Diode measurement. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page |  |
| Auto Zero (F1) key to set Auto Zero | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## Capacitance Measurement

| | |
|---|---|
| Description | The capacitance measurement configurations. |
| F3 (Measure) key to select capacitance | CAP   |
| Capacitance source and module terminals connection |   |
| F4 (Range) key to specify range | Press the key to enter Range menu and select a target range for capacitance measurement. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key is fixed in Auto | The Speed selection is fixed in Auto for Capacitance measurement. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page |   |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## DCI/ACI Measurement

| | |
|---|---|
| Description | The DCI and ACI current measurements configurations. |
| ⚠ Note | Both DC and AC current measurements are available on the channels 21 and 22 of DAQ901 module only. |
| F3 (Measure) key to select either ACI or DCI | DCI<br>Channel 221 \| Label EDIT \| Measure DCI \| Range Auto \| Speed 60/s \| More 1/2<br>ACI<br>Channel 221 \| Label EDIT \| Measure ACI \| Range Auto \| Speed 5/s \| More 1/2 |
| Current sources and module terminals connection | DCI<br><br>ACI<br> |
| F4 (Range) key to select range for ACI and DCI | Press the key to enter Range menu and select a target range for ACI and DCI measurements individually. The Auto indicates a range, which is based on the source input, is selected automatically. It is sometimes results in, compared with manual select range, slower measurement. Also, using the *Range* keys can select range promptly. |
| F5 (Speed) key to select speed for ACI and DCI | Press the key to enter Speed menu and select a target speed for ACI and DCI measurements individually. Also, using the *Arrow* keys can select speed promptly. |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page | DCI<br>Auto Zero On Off \| RangeLow 1µA \| \| \| Delay Auto \| More 2/2<br>ACI<br>\| RangeLow 100µA \| \| \| Delay Auto \| More 2/2 |

| | |
|---|---|
| Auto Zero (F1) key to set Auto Zero (DCI only) | By turning On Auto Zero, the most accurate measurements is provided, but it requires extra time to execute the zero measurement. With autozero On, DAQ-9600 internally measures the offset following each measurement. It then subtracts that measurement from the preceding reading. This prevents offset voltages present on the DAQ-9600 input circuitry from affecting measurement accuracy. With autozero Off, DAQ-9600 measures offset once and subtracts the offset from all subsequent measurements. |
| Range Low (F2) key to select rate | The range of current is limited within the select low ranges when Auto range is activated. This function is effective by utilizing low impedance to lessen errors from shunt when current range changes overly. |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

## Scan 2-Wire & 4-Wire Connection

| | |
|---|---|
| Description | The 2-wire and 4-wire connections are available for diversified measurements connected with external DMM unit when internal DMM function is disabled. In accord with varied measurements for different DUTs, select and physically wire the applicable 2W or 4W connections. |
| ⚠ Note | Only when DMM function is deactivated can both "Scan 2W" and "Scan 4W" options for Measure be available. Refer to page 44 and page 103 for details. |
| F3 (Measure) key to select either Scan 2W or Scan 4W | Scan 2W<br><br>Scan 4W<br> |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for measurement. |
| Function Keys in More 2/2 page | Scan 2W & Scan 4W<br> |
| Delay (F5) key to select a delay time | User defines a delay time to be inserted between the actual measurement on each channel from a scan course. |

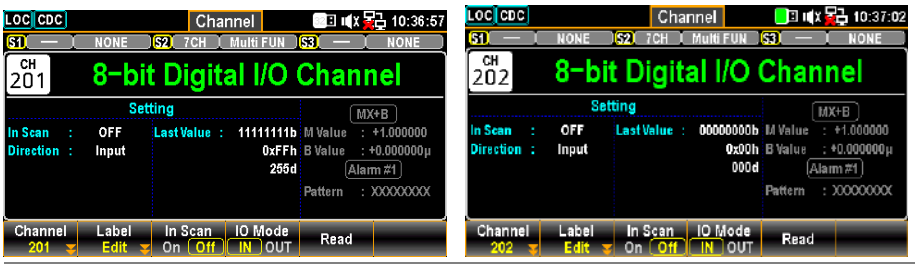
# Configurations of DAQ-907 Multifunction Module

## Digital Input/Output (DIO)

### Configure the DIO Channels

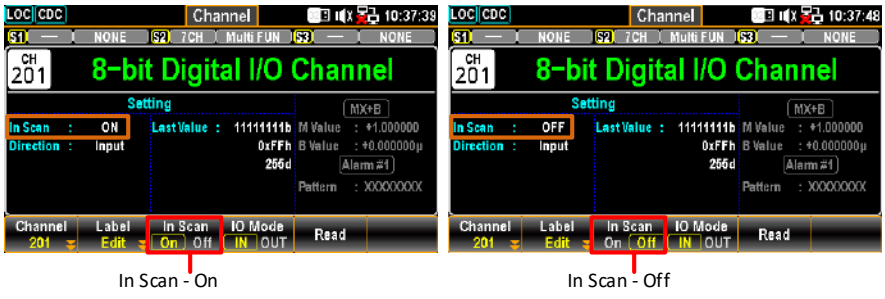
Press the *Channel* key on front panel to enter the Channel menu followed by selecting the DIO channel 01 and channel 02 (e.g., 201 & 202 in the figure below).




Press the F3 (In Scan) key to designate if the select channel is included in (On) or excluded from (Off) the scan list.

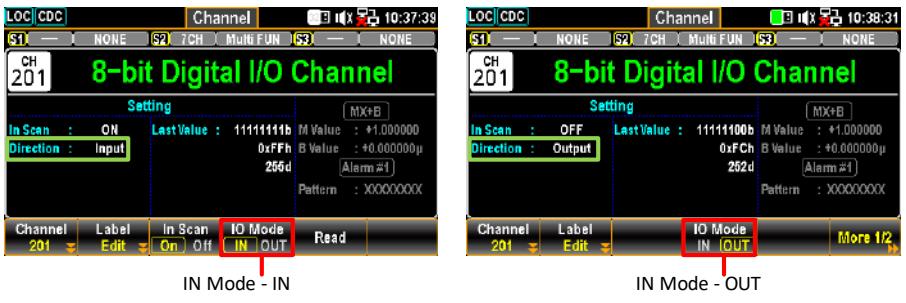



### IO Mode – Digital Input

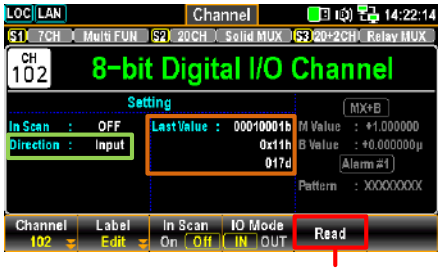
Press the F4 (IO Mode) key to define whether the select channel is in Input Direction (IN) or Output Direction (OUT).




When the Input Direction (IN) is selected, press the F5 (Read) key to fetch the signal source, which will be shown on the Last Value of Setting area on display.



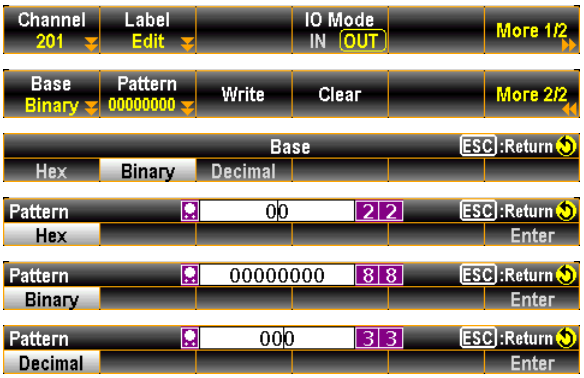



Read key

## IO Mode – Digital Output

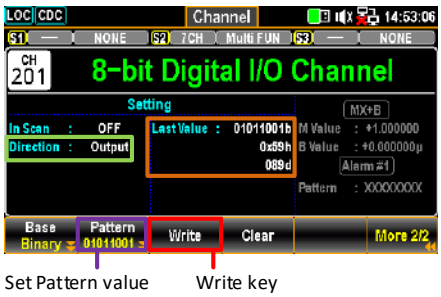



When Output Direction (OUT) is selected, press the F6 (More 1/2) key to forward to the next page where the F1 (Base) key contains 3 options (Hex, Binary and Decimal) for number base, and the F2 (Pattern) key allows user to define each output pattern in accord with the select number base.




Press the F3 (Write) key to output the set Pattern on the selected channel of digital output. The Last Value of Setting area on display will be updated accordingly.

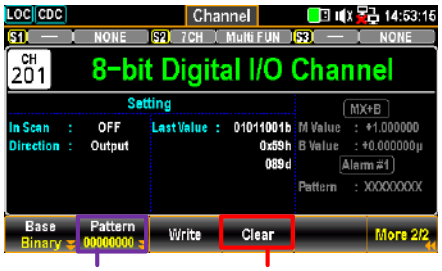



Set Pattern value Write key

Press the F4 (Clear) key to define the set Pattern back to zero "0". Repeat pressing the F3 (Write) key to overwrite newly set output Pattern.



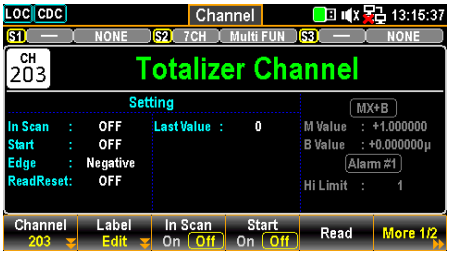



## Totalizer (TOT)

Configure the Totalizer Channels

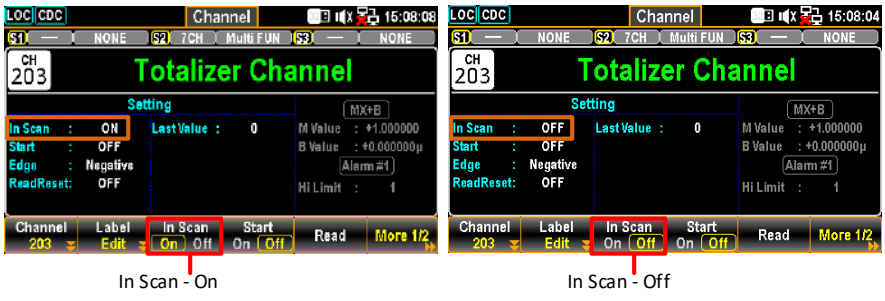
Press the *Channel* key on front panel to enter the Channel menu followed by selecting the Totalizer channel 03 (e.g., 203 in the figure below).



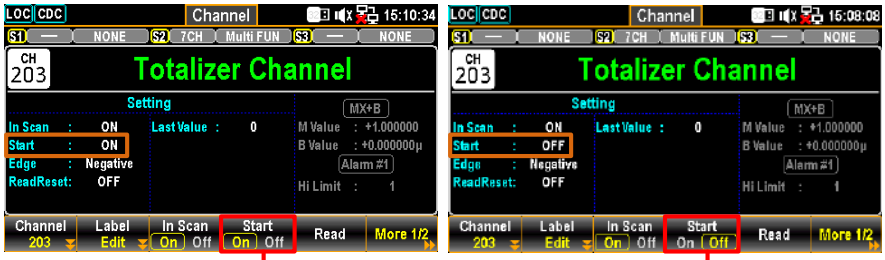

Press the F3 (In Scan) key to designate if the select channel is included in (On) or excluded from (Off) the scan list.




Press the F4 (Start) key to toggle between On and Off, which indicates that it starts to count on the totalizer channel or it stops to count on the totalizer channel.






Press the F5 (Read) key to fetch the latest count of totalizer. Please note that since number of count(s) doesn't refresh on the display automatically, pressing the Read key to read count once each time.

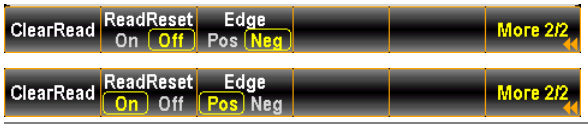






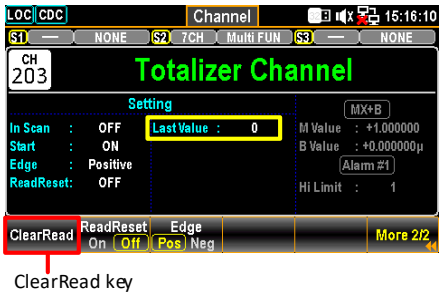
Press the F6 (More 1/2) key to forward to the next page where the F2 (ReadReset) key allows user to turn On or Off automatic reset on totalizer count, and the F3 (Edge) key allows user to specify whether the totalizer channel should count on the rising (Pos) edge or falling (Neg) edge.




Press the F1 (ClearRead) key to clear and reset the totalizer count back to zero "0".



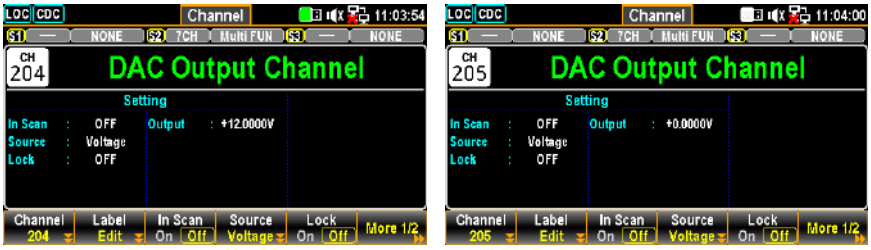



## Analog Output (DAC)

### Configure the DAC Output Channels

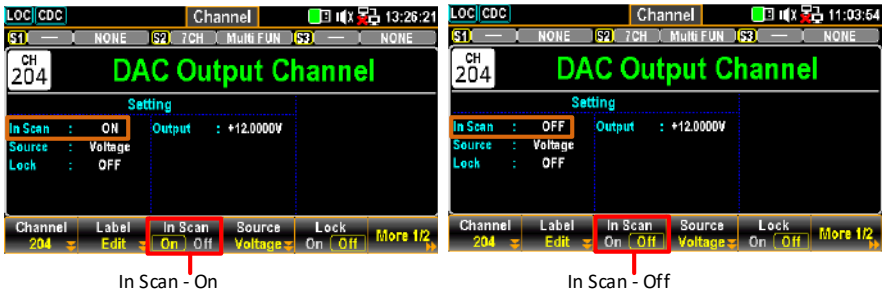
Press the *Channel* key on front panel to enter the Channel menu followed by selecting the DAC output channel 04 and 05 (e.g., 204 & 205 in the figure below).



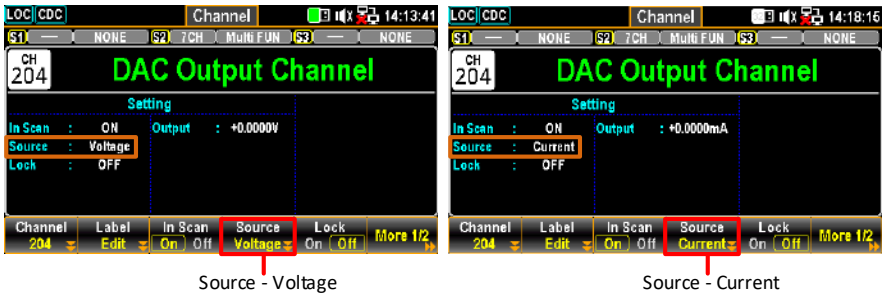

Press the F3 (In Scan) key to designate if the select channel is included in (On) or excluded from (Off) the scan list.



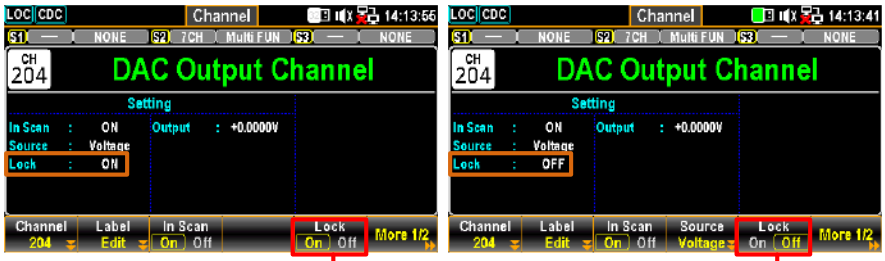

Press the F4 (Source) key to toggle between Voltage and Current, which indicates that the selected DAC channel outputs in either Voltage or Current mode.




Press the F5 (Lock) key to toggle between On and Off, which indicates that the selected output mode from F4 (Source) key is locked or vice versa.



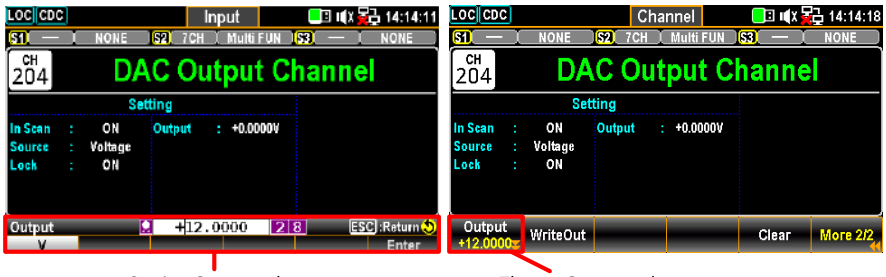



Note

When the Lock On is enabled, the function of F4 (Source) key will be hidden and thus invisible to user.

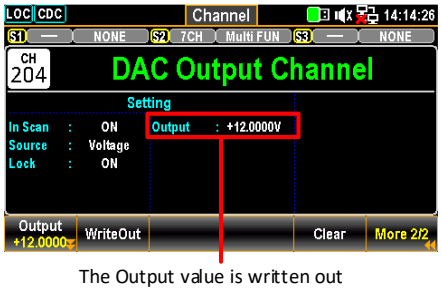
Press the F6 (More 1/2) key to forward to the next page where the F1 (Output) key allows user to specify a value for either voltage or current output.



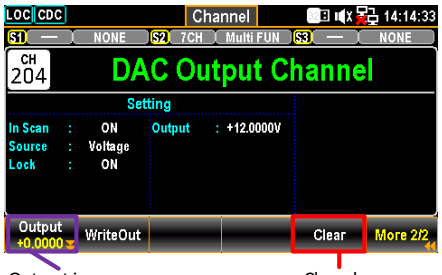

The F2 (WriteOut) key allows user to write in the set Output value to the Output field, which is located in the Setting area on display.




Press the F5 (Clear) key to restore the set Output value back to zero "0". Repeat pressing the F2 (WriteOut) key to overwrite newly set Output value.



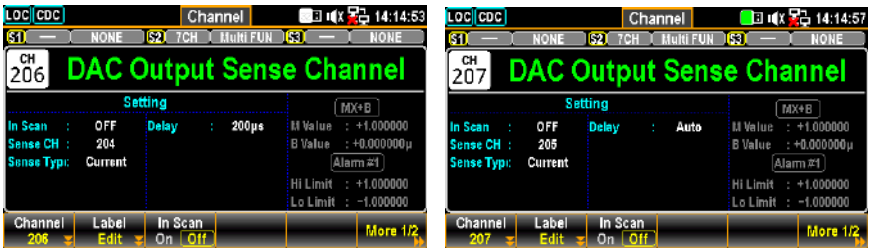



Output in zero Clear key

## Configure the DAC Sense Channels

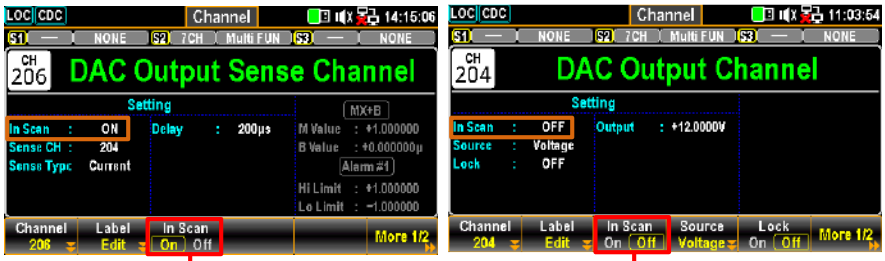
Press the *Channel* key on front panel to enter the Channel menu followed by selecting the DAC sense channel 06 and 07 (e.g., 206 & 207 in the figure below).



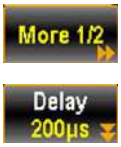

Press the F3 (In Scan) key to designate if the select channel is included in (On) or excluded from (Off) the scan list.




In Scan - On In Scan - Off

Press the F6 (More 1/2) key to forward to the next page where the F5 (Delay) key allows user to define a delay time to be inserted between the actual measurement on each channel from a scan course.







Setting Delay Time The set Delay time

# DMM Off for External Device

Introduction

Essentially, DAQ-9600 is equipped with internal DMM function that allows up to three multi-channel modules installed to measure various connected DUTs. However, depending on specific applications, user may need to, for instance, connect an external DMM for measurement while still maintaining the DAQ-9600's capability to connect multi-channel modules to several DUTs simultaneously.

In such case, turn off the internal DMM function, allowing DAQ-9600 to act purely as a multi-channel switch hub, rerouting signals received from the connected DUTs and send to the external DMM, which is connected to the Common Terminal (COM) of multi-channel module, for measurement.

To construct scanning with an external DMM, two control lines are required for 2-Wire scan and, on the other hands, four control lines required for 4-Wire scan. Once DAQ-9600 and external DMM are properly configured, they can synchronize the scan sequence.

For an externally controlled scan, DAQ-9600's internal DMM must be disabled by navigating through ***Home key*** > ***F3 key (DMM)*** to turn Off internal DMM function.

Once the internal DMM is Off, readings from the multi-channel modules are no longer stored in the internal DMM memory.

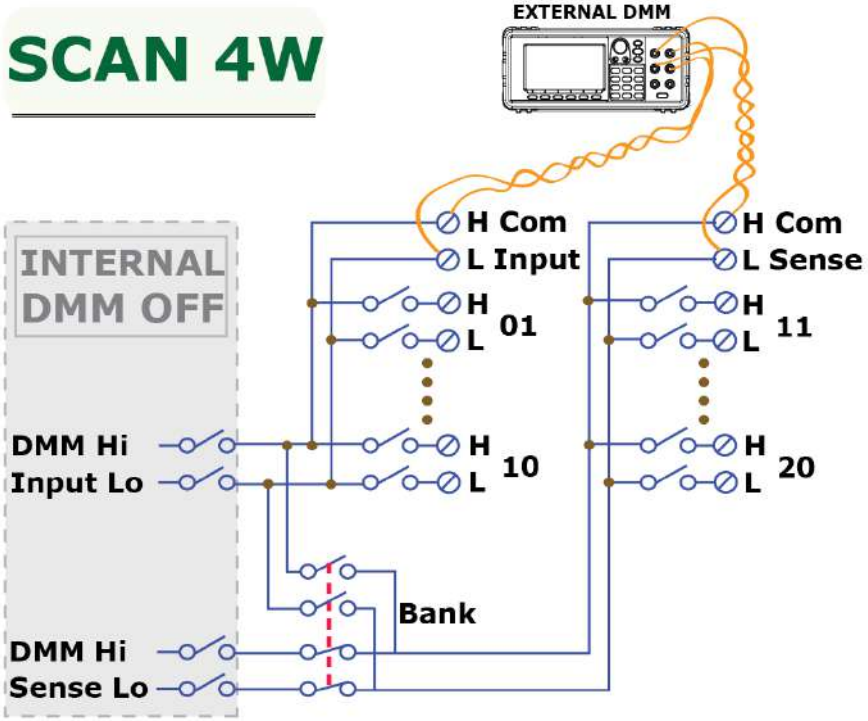
In addition, DAQ-9600 must inform the external DMM when a relay is closed and settled and DAQ-9600 outputs a Channel Closed pulse from pin 5 on the rear-panel connector.

In return, the external DMM must inform DAQ-9600 when it has completed its measurement and is ready to advance to the next channel in the scan list.

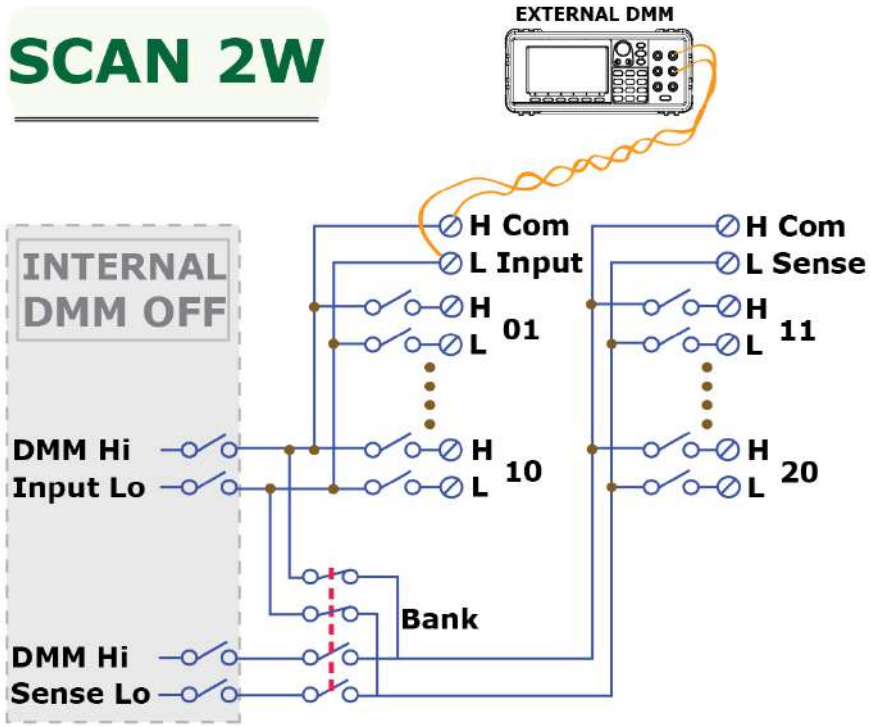
Thus, DAQ-9600 receives a Channel Advance signal on the External Trigger input line (pin 6).

Also, user can configure the list of channels for 4-Wire external scanning. When enabled, the instrument automatically pairs channel n with channel n+10.

Scan 4-Wire w/t External DMM When Internal DMM Off




Scan 2-Wire w/t External DMM When Internal DMM Off



# Switch Mode for Channels

Background

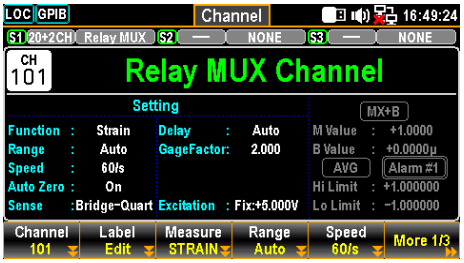
The Switch mode from multiplexer modules empowers user to open and close channels individually. We will introduce how to turn on and configure channels to the Switch mode in details.

⚠ Note

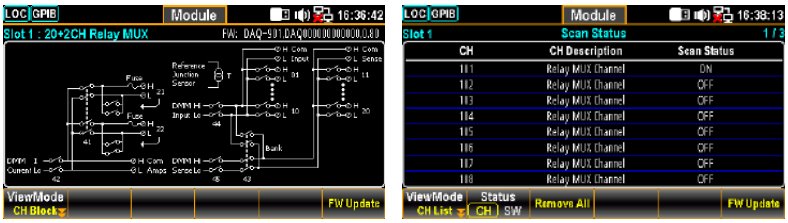
Switch mode is available on the multiplexer DAQ900, DAQ901 and DAQ903 modules only.

Steps

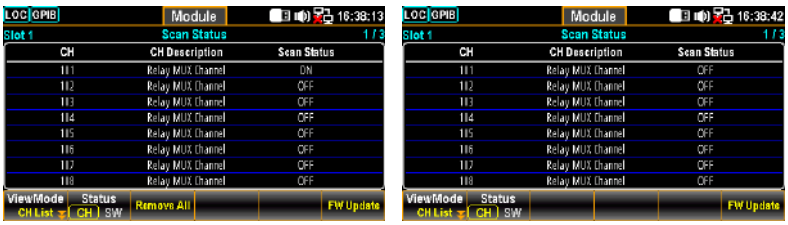
1. From the instance below in the Channel menu, the channel 101 is configured to measure mode STRAIN.



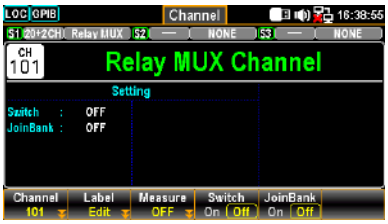

2. Press the *Module* key from the front panel followed by clicking the *ViewMode* key and then *CH List* key.




3. Use the *Knob* key to navigate through pages of a module (Slot 1 in the instance). It is seen that only the channel 101 is turned ON in Scan Status (measurement). Press the *Remove All* (F3) key to OFF all channels on Slot 1 module from Scan Status, which indicates that measurements of all channels on the module can now be configured to the Switch mode.



4. Press the *Channel* key from the front panel. It is seen that the *Measure* is OFF for the channel 101 and the *Switch* key and *JoinBank* key are available for On or Off by user.



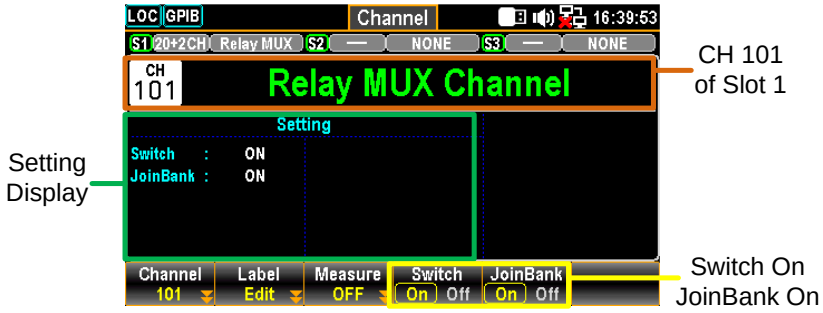

- Switch:
  To enable or disable switch for each channel.
- JoinBank:
  To enable or disable multiple banks join of a module.

5. If user reselects a measurement from the Measure key (TEMP in the instance), the channel 101 will return to Scan Status On and both the *Switch* key and *JoinBank* key are no longer available.




Display

6. The figure below shows both Switch and JoinBank are turned ON for the channel 101 of the Slot 1 module.




⚠ Note

When enabling JoinBank function on any of the channels, the JoinBank of all channels from the same module will be turned ON simultaneously.

# Computer Channels

**Background**

Computer channels (401 – 420) can execute various mathematical operations from readings of measurement channels or other computer channels.

**Note**

- To execute mathematical operations in computer channels, it is required to set up measurement channels beforehand.
- Computer channels are not able to be monitored readings in the Monitor mode. However, it is able to monitor readings of computer channels when the Scan mode is performed.

**Types**

The mathematical operations of computer channels can be divided into mainly three types as following:

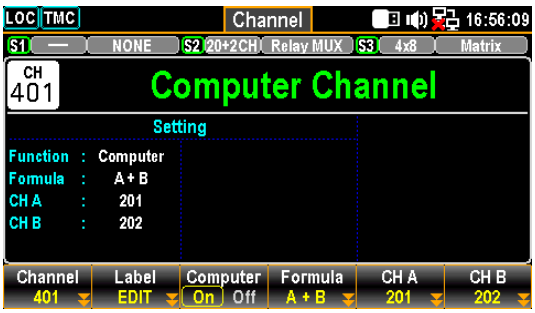
| Type | Soft key | Description |
|---|---|---|
| Basic Math | A + B | Addition |
| | A – B | Subtraction |
| | A * B | Multiplication |
| | A / B | Division |
| | 1 / A | Reciprocal |
| | A * A | Power |
| | Sqrt(A) | Square root |
| Statistics | AVG(List) | Calculates the average readings from a list of selected channels, where average reading = total sum of all the readings/number of selected channels |
| | MIN(List) | Calculates the minimum reading from a list of selected channels |
| | MAX(List) | Calculates the maximum reading from a list of selected channels |
| | SDEV(List) | Calculates the standard deviation readings from a list of selected channels |
| Polynomial 5TH(A) | | Polynomial 5TH |

## Basic Math

**Description** An example of mathematical operation A + B on the channel 401 will be illustrated below.

**Steps**

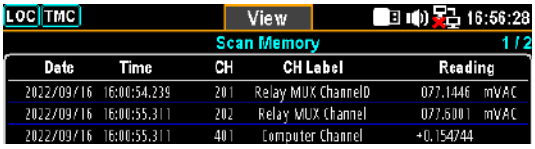
1. From the example below in the Channel menu, the *Computer* (F3) key is turned On and the *Formula* (F4) key is configured A + B. Also, press the *CH A* (F5) and the *CH B* (F6) keys to specify source channels as 201 and 202, individually.




**Note** The source channels of CH A and CH B can be an identical one. For instance, it is available to specify both as 201 channel.

2. Launch a scan course by pressing the *Scan* key from the front panel followed by clicking the *View* key from the front panel and the scan result is displayed here.

   CH401 (+0.154744) =
   CH201 (077.1446) + CH202 (077.6001)



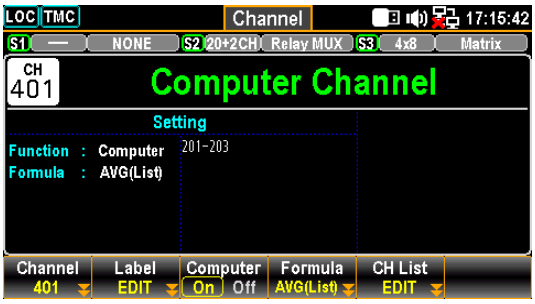
## Statistics

**Description**

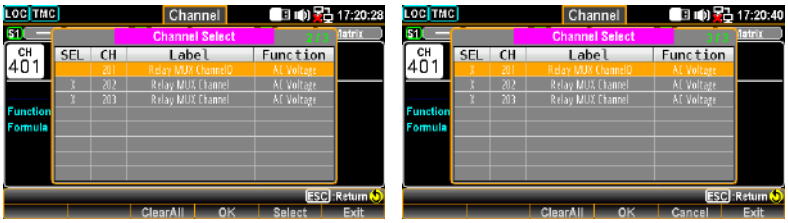
An example of mathematical operation AVF(List) on the channel 401 will be illustrated below.

**Steps**

1. From the example below in the Channel menu, the *Computer* (F3) key is turned On and the *Formula* (F4) key is configured AVG(List). Also, press the *CH List* (F5) key to enter the channel list edit.



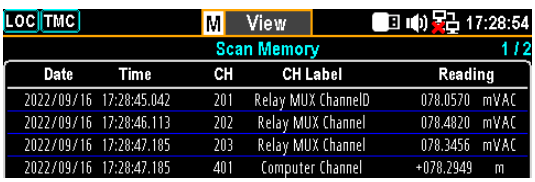

2. Use *knob* key to navigate channels. Press the *Select* (F5) key to select a channel followed by press the OK (F4) key to confirm all selections. If a channel is selected, press the *Cancel* (F5) key to deselect a channel or press the *ClearAll* (F3) key to deselect all channels. Press the *Exit* (F6) key to leave without saving.




3. Launch a scan course by pressing the *Scan* key from the front panel followed by clicking the *View* key from the front panel and the scan result is displayed here.

   CH401 (+078.2949) =

   [CH201 (078.0570) + CH202 (078.4820) + CH203 (078.3456)]/3

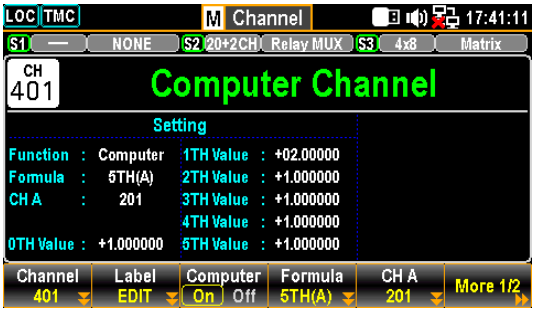


## Polynomial 5TH

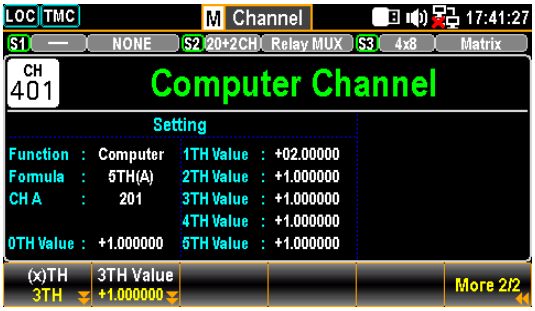
**Description** An example of mathematical operation 5TH(A) on the channel 401 will be illustrated below.

**Steps**

1. From the example below in the Channel menu, the *Computer* (F3) key is turned On and the *Formula* (F4) key is configured 5TH(A). Press the *CH A* (F5) key to specify source channels as 201 followed by pressing the *More 1/2* (F6) key to enter the next page.



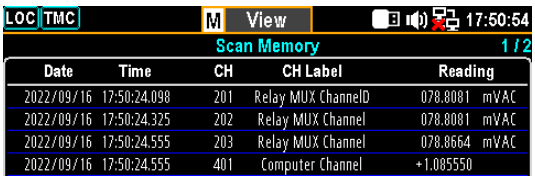

2. Press the *(x)TH* (F1) key to select a coefficient order (0TH, 1TH, 2TH, 3TH, 4TH, 5TH) followed by pressing the *TH Value* (F2) key to configure parameters for each coefficient order.




3. Launch a scan course by pressing the *Scan* key from the front panel followed by clicking the *View* key from the front panel and the scan result is displayed here.

   CH401 (+1.085099) =

   The polynomial 5TH order from CH201 (078.8081)



# Interval Menu

Background

Press the *Interval* key on the front panel to enter the Interval menu to configure the method to start each sweep and a total number of sweeps for a scan course. The screen layout of Interval menu is almost identical to that of Home screen and is only different in the function keys.




F1 (TrigSource) key to select a trigger source method

Auto

It indicates an immediate trigger, which means each sweep starts automatically when a scan course begins.



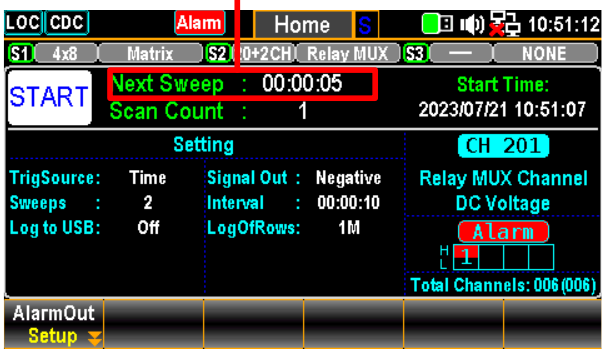

Time

It indicates a timer to start each sweep at a designated interval. Press the *Time* (F2) key to configure the interval for this method.




During a scan course, each sweep only starts when the set timer completes countdown.

Next sweep waits until countdown by set timer

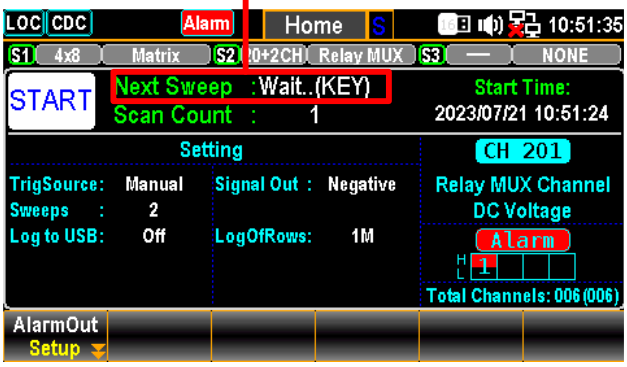


Manual It indicates a manual trigger. When selecting this method, user needs to press the *Scan* key on the front panel to start each sweep for a scan course.




During a scan course, each sweep only starts when user presses the *Scan* key.

Next sweep waits until Scan Key by user

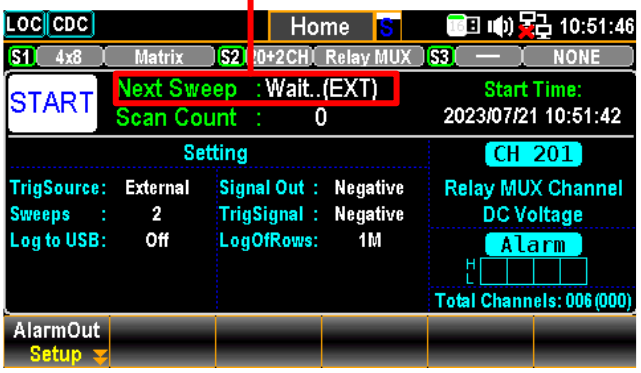



External It indicates a trigger signal received from the rear panel to start each sweep for a scan course. Press the *TrigSignal* (F2) key to configure the polarity of external signal in either Pos or Neg.




During a scan course, each sweep only starts when an External signal is received.

Next sweep waits until External signal

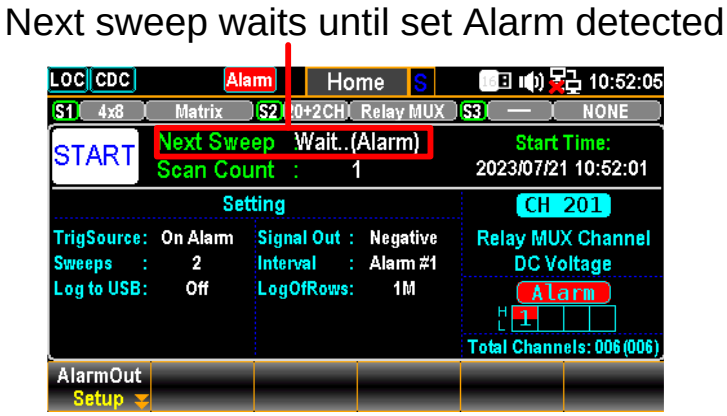


On Alarm

It indicates a sweep starts when an alarm is detected from the set channel. Press the *On Alarm* (F2) key to specify which alarm (1-4) is used to report on the select channel.




During a scan course, each sweep only starts when an designated Alarm is detected




F2 (Time) key to set interval

When Time of TrigSource is selected, press the key to specify a time interval.

F2 (TrigSignal) key configure the polarity

When External of TrigSource is selected, press the key to configure the polarity of external signal in either Pos or Neg.

F2 (On Alarm) key specify alarm

When On Alarm of TrigSource is selected, press the key to specify which alarm (#1 - #4) is used to report on the select channel.

F3 (Sweeps) key specify number

It specifies a total number of times of sweeps that DAQ-9600 will run through a scan course.

F4 (Sweeps INF) key set INF sweeps

It configures that DAQ-9600 will execute a scan course indefinitely until user stop scan course via long pressing the *Scan* key on the front panel.

F6 (Signal Out) key set polarity

It configures either Pos or Neg polarity will be used as signal out on the rear panel.

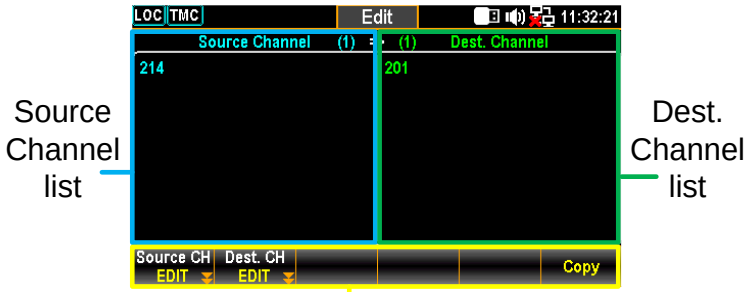
# Edit Menu

**Background**

Press the *Edit* key on the front panel to enter the Edit menu in which user is able to copy measurement functions, alarm settings and so on from channels to channels with ease.




**Edit Menu Diagram**




| | |
|---|---|
| **Source Channel** | The channels selected as source are displayed in detail within the lower list section and the upper section indicates the total number of source channels selected. |
| **Dest. Channel** | The channels selected as destination are displayed in detail within the lower list section and the upper section indicates the total number of destination channels selected. |
| **Function Keys** | The function keys here are simple. Press *Source CH* (F1) key to select source channel(s) and press *Dest. CH* (F2) key to select destination channel(s) followed by pressing *Copy* (F6) key to perform the action of channel copying. |

**Note**

Source channel(s) must be configured with measurement function beforehand.

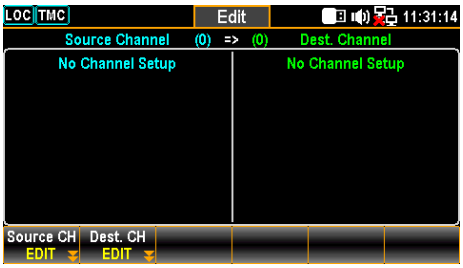
## Copy Channels

**Description**

Channel(s) copying can be performed in various ways: one-to-one, one-to-many and many-to-many. In this chapter an example of many-to-many channels copying is illustrated.

**Steps**

1. Press the *Edit* key on the front panel to enter the Edit menu followed by pressing the *Source CH* (F1) key to edit the Source Channel Select list.



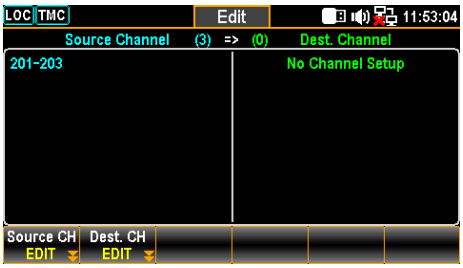

2. Use *knob key* to navigate channels followed by pressing *Select* or *SelectAll* to select source channels. Press *Cancel* or *ClearAll* to deselect channels. Press *OK* to confirm selection. Press *Exit* to leave the page without saving the selection.



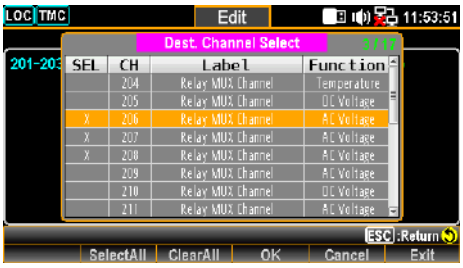

**Note**

Only the channels with measurement functions are displayed in the Source Channel Select list since source channel(s) must be configured with measurement beforehand.

3. After pressing *OK* key from the previous page, the selected channels are displayed within the left part (201 – 203 for example). Further press the *Dest. CH* (F2) key to edit list of Dest. Channel Select.



4. Use *knob* key to navigate channels followed by pressing *Select* or *SelectAll* to select destination channels. Press *Cancel* or *ClearAll* to deselect channels. Press *OK* to confirm selection. Press *Exit* to leave the page without saving the selection.




Note

Those selected as source channels previously will not displayed here within the Dest. Channel Select list.

5. After pressing *OK* key from the previous page, the selected channels are displayed within the right part (206 – 208 for example). Further press the *Copy* (F6) key to perform channels copying action.




6. The configurations of channels 201 – 203 are well copied to the channels 209 through 211. It is seen that the prompt message of "3 channels copied" is shown in display.




Note

The Computer channels (401 – 420) are not available for channels copying operations.

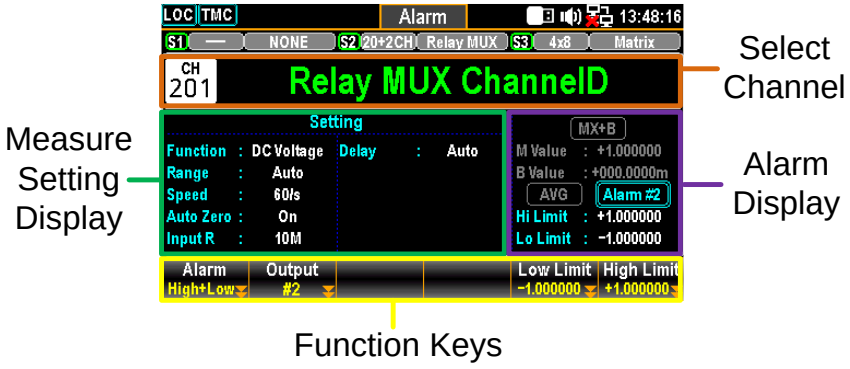
# Alarm Menu

Background

Press the *Alarm* key on the front panel to enter the Alarm menu to configure the conditions of triggered alarm for select channels. The screen layout of Alarm menu is almost identical to that of Channel menu and is only different in the function keys.




Alarm Menu Diagram



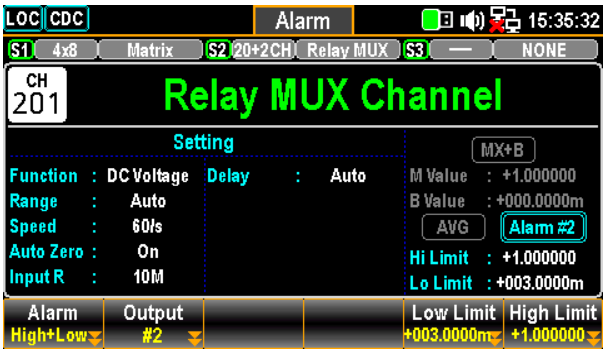

| | |
|---|---|
| Select Display | It indicates the current selected channel |
| Measure Setting Display | It indicates the parameters settings of the current selected channel. |
| Alarm Display | Alarm Hi & Lo limits settings for selected channel are displayed. Press the *knob* key to toggle between AVG and Alarm setting display. |
| Function Keys | The operable function keys of Alarm menu. |

## Alarm Configuration

**Description** This section demonstrates how to configure alarm conditions for each selected channels.

**Steps**

1. Press the *Alarm* key on the front panel to enter the Alarm menu and use the *knob* key to navigate channels to select a target one (channel 201 for example below).




2. Press the *Alarm* (F1) key to select an alarm limit(s) mode to report for select channel.

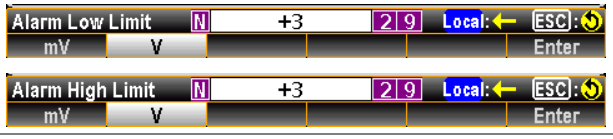



| | |
|---|---|
| OFF | Alarm condition is disabled for select channel. |
| High+ Low | Both High and Low limits of Alarm condition are activated. |
| High | High limit of Alarm condition is activated. |
| Low | Low limit of Alarm condition is activated. |

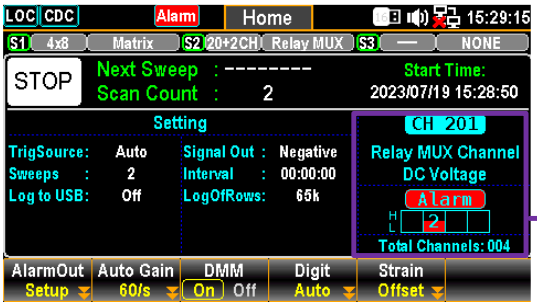
3. Press the *Output* (F2) key to select which of the four alarms will be utilized to report alarm conditions for select channel.




4. Press the *Low Limit* (F5) and the *High Limit* (F6) keys to specify alarm limits individually for select channel.

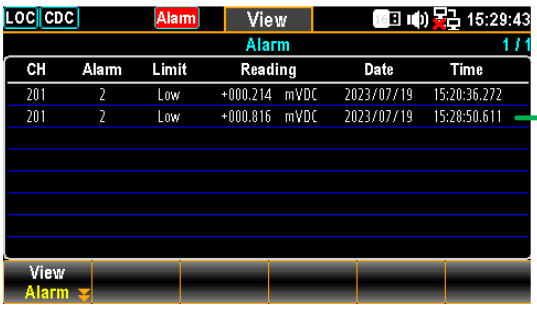


5. Press the *Scan* key on the front panel to initiate a scan course. When the set alarm occurs for select channel during a scan course, the alarm status will be shown clearly as the following example.




The set low limit of alarm #2 is triggered

6. Also, the alarm details will be saved in the memory when the set alarm occurs for select channel during a scan course. Press the *View* key on the front panel to view the info of triggered alarm. Refer to page 120 for details of View menu.




The details of alarm #2 for channel 201 is well displayed

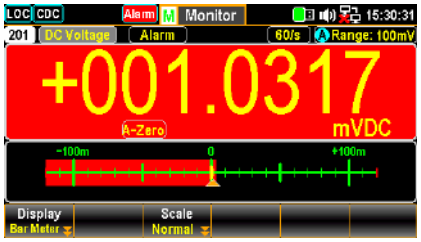
**Alarm in Monitor mode**

Under the Monitor mode, if set limit of alarm is exceeded, the color of reading becomes warning red in different display modes.

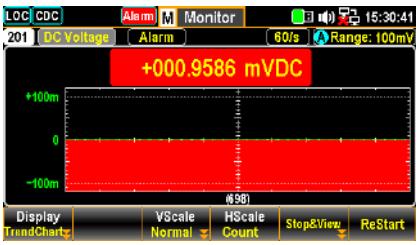
**Number display**



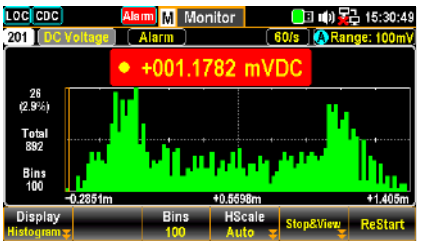

**Bar display**




**Trend display**




**Histogram display**



# View Menu

Background

Press the *View* key on the front panel to enter the View menu where several relevant info after scanned measurement including Data, Alarm, Error and Relay Cycle are displayed for user to have better understanding of measured info by a scan course.




## Data View

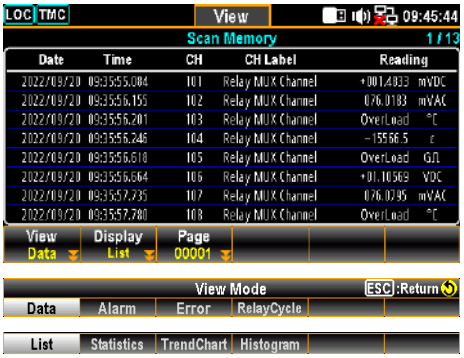
Background

This section introduces view menu for measured scan Data, which can be viewed in various displays including List, Statistics, TrendChart and Histogram.

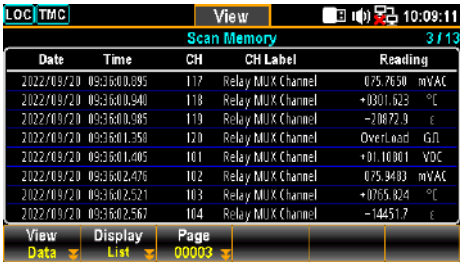
### List Display

Steps

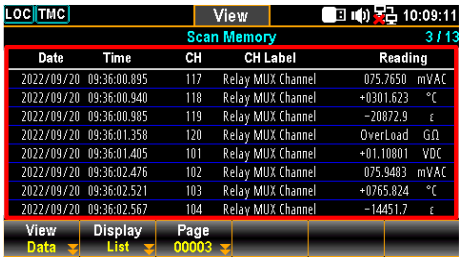
1. Press the *View* (F1) key followed by pressing the *Data* (F1) key. And then press the *Display* (F2) key followed by selecting the *List* (F1) key to enter the page of scanned data in List display.




2. Press the *Page* (F3) key to jump to each page of measured data or it is available to use the *knob* key to navigate through pages conveniently.



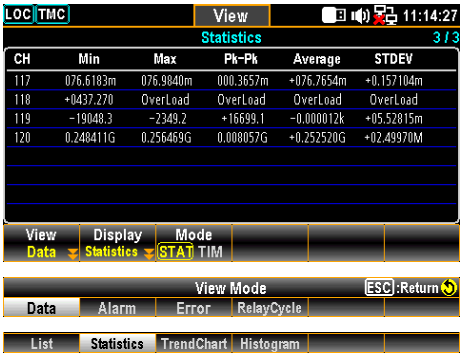
3. The list mode displays Date, Time, Channel, Channel Label (naming by user) and reading of each measured data from a scan course.



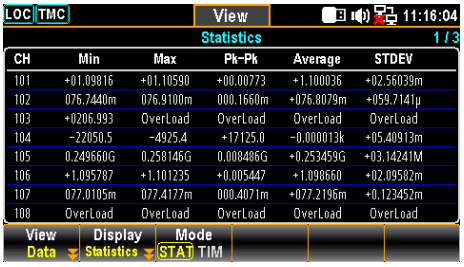

## Statistics Display

Steps

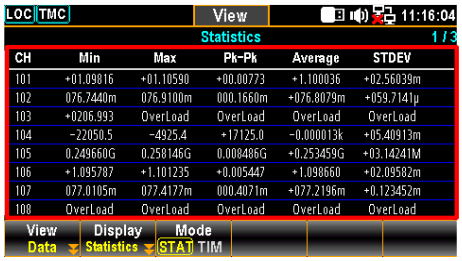
1. Press the *View* (F1) key followed by pressing the *Data* (F1) key. And then press the *Display* (F2) key followed by selecting the *Statistics* (F2) key to enter the page of scanned data in Statistics display.



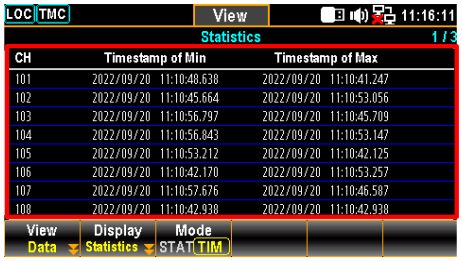

2. Use the *knob* key to navigate through pages conveniently.



3. The statistics mode displays Channel, Minimum, Maximum, Pk-Pk (Peak-to-Peak), Average and STDEV (Standard Deviation) of readings data from a scan course.



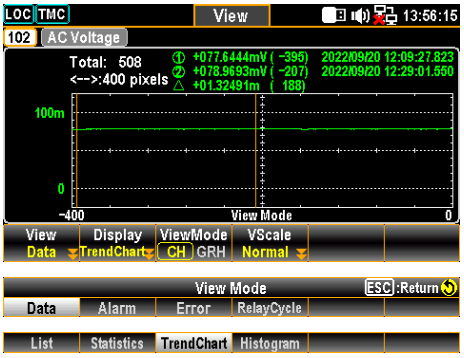

4. Press the *Mode* (F3) key to toggle between STAT (Statistics) and TIM (Time Stamp) displays. The TIM mode displays the Date & Time of Minimum and Maximum readings of each channel from a scan course.



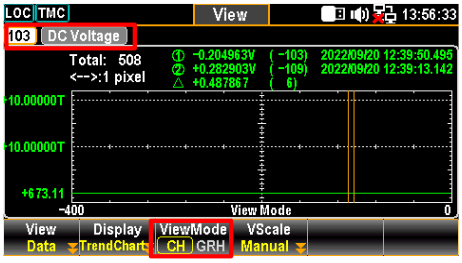

## Trend Chart Display

Steps

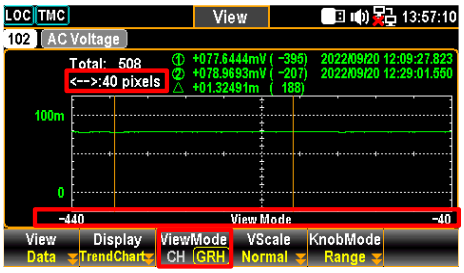
1. Press the *View* (F1) key followed by pressing the *Data* (F1) key. And then press the *Display* (F2) key followed by selecting the *TrendChart* (F3) key to enter the page of scanned data in Trend Chart display.



2. When the "CH" is selected for *ViewMode* (F3) key, scroll the *knob* key to navigate through channels.



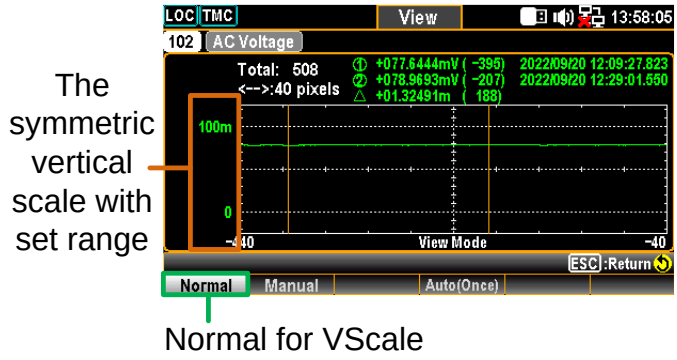

3. When the "GRH" is selected for *ViewMode* (F3) key, scroll the *knob* key to navigate through scanned counts. If pressing *knob* key, the maximum counts moving by scrolling *knob* key per time will be changed.




Pixels options: 1 pixel – 40 pixels – 400 pixels

F4 (Vscale) key to edit scale ranges

- VScale - Normal:
  It allows the vertical scale of trend chart to be symmetric with the set range for channel.

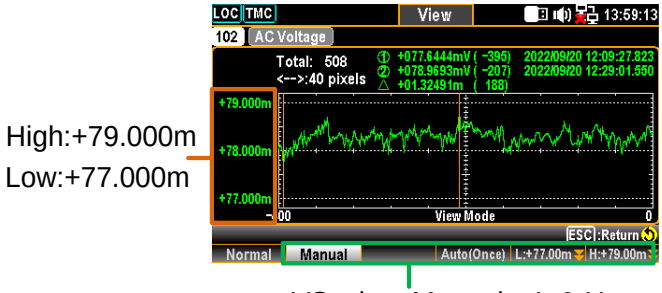


- VScale - Manual:

  It allows the vertical scale of trend chart to be customized in the following 2 ways.

### L & H for Manual

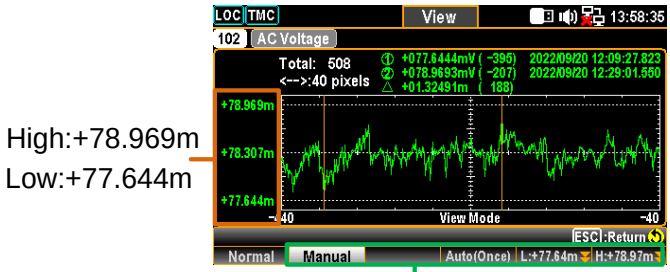
After L and H are set up individually, the vertical upper and lower ranges are corresponding to the set values accordingly.




VScale – Manual – L & H

### Auto(Once) for Manual

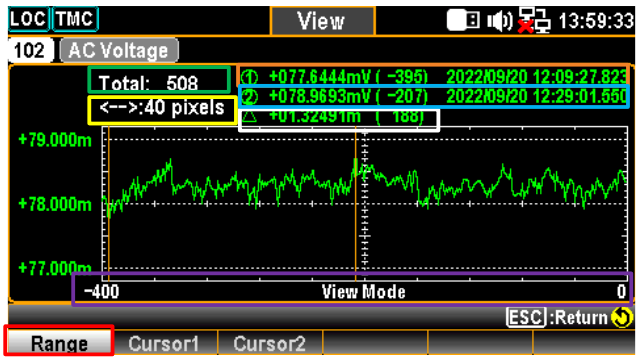
After Auto(Once) is pressed, the vertical upper and lower ranges are automatically defined in accord with the latest 400 counts of scanned data.




VScale – Manual - Auto(Once)

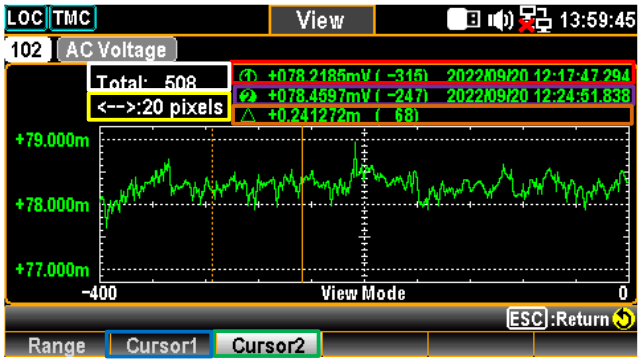
F5 (KnobMode) key to view in details

- KnobMode - Range:
  It allows user to view detailed info on the trend chart. Press *Range* key followed by scrolling *knob* key rightward or leftward to move cursors on different sections.




| | |
|---|---|
| Green Sect. | The total counts of scanned measurements. |
| Yellow Sect. | Press the *knob* key to change the maximum counts moving by scrolling *knob* key per time.<br>1 pixel – 40 pixels – 400 pixels |
| Orange Sect. | The lowest value of the selected count with its affiliated serial number and time stamp. |
| Blue Sect. | The highest value of the selected count with its affiliated serial number and time stamp. |
| White Sect. | The delta between the highest and lowest values of the selected count with its affiliated serial number. |
| Purple Sect. | The horizontal scale of measurements displayed is fixed in the 400 counts |
| Red Sect. | It indicates the counts of moving range by scrolling *knob* key rightward or leftward to different section per time. Based on the Yellow Sect., when 400 pixels is defined, scroll the *Knob* key once, the scale increases or decreases 400 counts per time. |

- KnobMode – Cursor 1 & Cursor 2:
  It allows user to view the lowest and highest readings of each count on the trend chart. Press the *Cursor1* (F2) *or Cursor2* (F3) key followed by scrolling *knob* key rightward or leftward to move cursors on different sections.

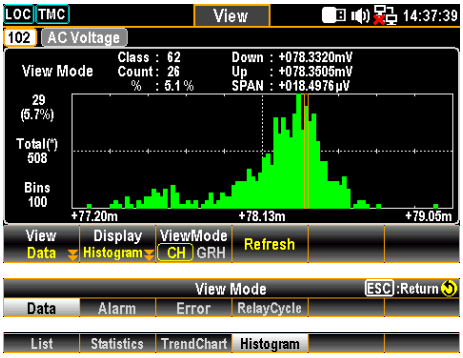



| | |
|---|---|
| White Sect. | The total counts of scanned measurements. |
| Green Sect. | Press the *Cursor1* for checking the lowest value of each count. |
| Blue Sect. | Press the *Cursor2* for checking the highest value of each count. |
| Red Sect. | The lowest value of the selected count with its affiliated serial number and time stamp. |
| Purple Sect. | The highest value of the selected count with its affiliated serial number and time stamp. |
| Yellow Sect. | Press the *knob* key to change the maximum counts moving by scrolling *knob* key per time.<br>1 pixel – 10 pixels – 20 pixels |
| Orange Sect. | The delta between the highest and lowest values of the selected count with its affiliated serial number. |

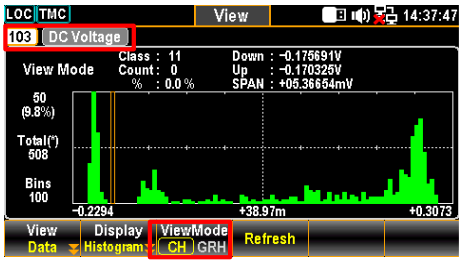
## Histogram Display

Steps

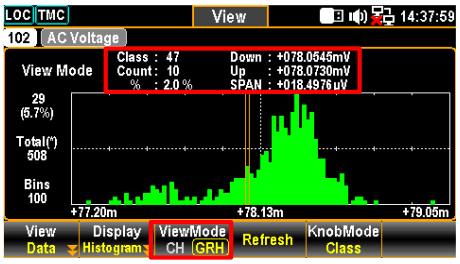
1. Press the *View* (F1) key followed by pressing the *Data* (F1) key. And then press the *Display* (F2) key followed by selecting the *Histogram* (F4) key to enter the page of scanned data in Histogram display.




2. When the "CH" is selected for *ViewMode* (F3) key, scroll the *knob* key to navigate through channels.




3. When the "GRH" is selected for *ViewMode* (F3) key, scroll the *knob* key to navigate through each scanned count.




4. Due to readings are not updated with the live scan in histogram display, press the *Refresh* (F4) key to update live readings when a scan course is ongoing.

## Alarm View

**Description**

This section introduces view menu for Alarms. Only when alarm setting is configured beforehand for select channel, the alarm list will display details of channel, limit, reading and time stamp of the latest 40 alarms. Refer to page 117 for details of how to configure alarms. After user reads the Alarm list here, the whole Alarm list will be cleared.

**Steps**

1. Press the *View* (F1) key followed by pressing the *Alarm* (F2) key. And the Alarm list page shows the latest alarms in details.




2. Use the *knob* key to navigate through pages to have view on more alarms from different pages.



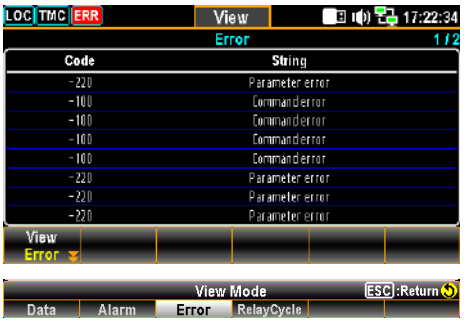
## Error View

**Description**

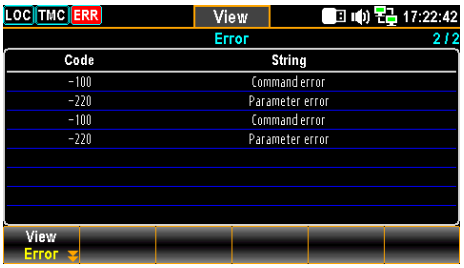
This section introduces view menu for Errors. The Error list displays Code and String of the latest 20 errors. After user reads the Error list here, the ERR icon on the top status bar will be erased and the whole Error list will be cleared.

**Steps**

1. Press the *View* (F1) key followed by pressing the *Error* (F3) key. And the Error list page shows the latest errors in details.




2. Use the *knob* key to navigate through pages to have view on more errors from different pages.



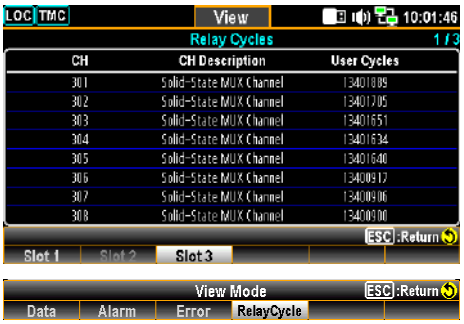
## Relay Cycle View

**Description**

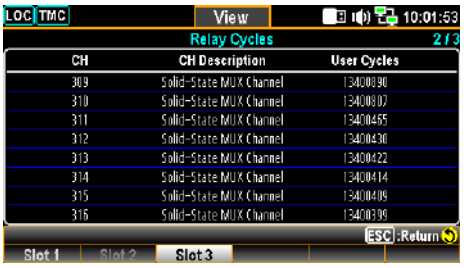
This section introduces view menu for Relay Cycle of each channel from the installed module. It empowers user to track if any relay failures or to figure out requirements of maintenance.

**Steps**

1. Press the *View* (F1) key followed by pressing the *RelayCycle* (F4) key. And the Relay Cycles list page displays the number of cycles on each relay from the installed modules.



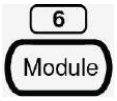

2. Use the *knob* key to navigate through pages to have view on the number of cycles of each relay from different channels.



# Module Menu

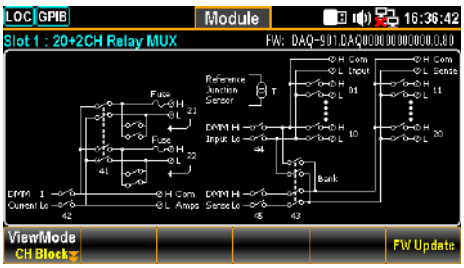
Background

Press the *Module* key on the front panel to enter the Module menu where user can view circuit diagrams of installed modules, check both scan and switch status of channels from installed modules and proceed to firmware update for installed modules.

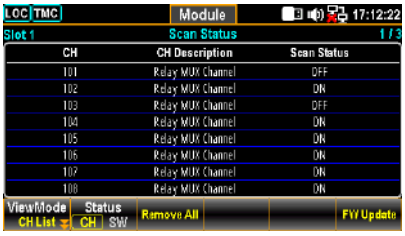


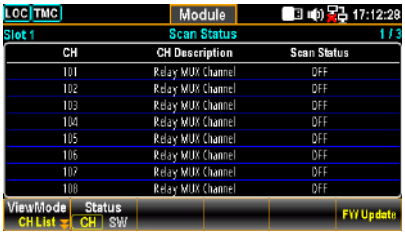

Steps

1. After pressing the *Module* key on the front panel, the circuit diagram of installed module is displayed. Scroll the *knob* key to navigate through installed modules to select a target module.



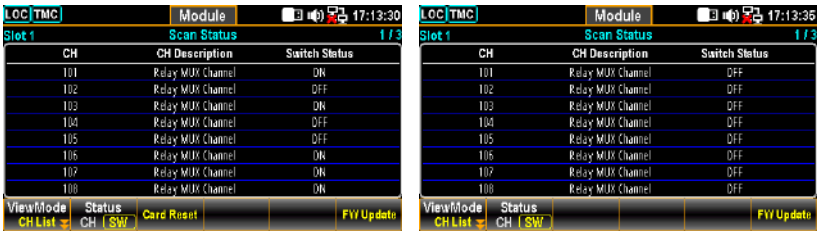

2. Press the *ViewMode* (F1) key followed by pressing the *CH List* (F2) key. And the Scan Status of all channels from select module will be shown. Scroll the *knob* key to navigate through pages of different channels. Press *Remove All* (F3) key to remove the set measurements of all channels at once. Refer to page 62 for details of Switch mode.



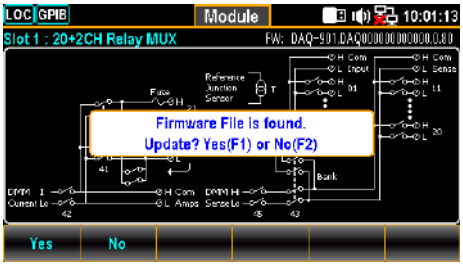






3. If any channel is set Switch mode, press the *Status* (F2) key to select SW followed by pressing the *Card Reset* (F3) key to reset the select module. All channels on the module will be opened. Refer to page 103 for details of Switch mode.




4. When user intends to carry out firmware update for installed module, press the *FW Update* (F6) key to perform update process. The prompt message pops up and user can press *Yes* (F1) to carry on the update.



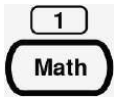

Note

- Connect an USB disk containing compatible module firmware file to the USB host port on front panel of DAQ-9600 before proceeding to FW Update for the installed module.
- Prior to update, please rename and confirm the downloaded firmware files as below:
  - ✓ C_IMAGE.bin

# Math Menu

**Background**

Press the *Math* key on the front panel to enter the Math menu. Math measurement runs 5 types of mathematical equations, dB, dBm, MX+B, 1/X and Percent, based on the measurement results of each channel.




**Math Equation**

| Equation | Description |
|---|---|
| dBm | 10 x log10 (1000 x Vreading2 / Rref) |
| dB | dBm – dBmref |
| MX+B | Multiplies the reading (X) by the factor (M) and adds/subtracts offset (B). |
| 1/X | Divides 1 by the reading (X). |
| Percentage | $\frac{(\text{ReadingX} - \text{Reference})}{\text{Reference}} \times 100\%$ |

**Note**

- User needs to configure channel measurement before setting up the Math equations.
- If the measurement of channel is changed (from ACV to DCV for example), Math function will be Off. Reconfigure Math function after changing measurement.
- dBm and dB equations are available on channels set in DCV and ACV measurements only.

## dBm Measurement

**Math Equation**

10 x log10 (1000 x Vreading2 / Rref)

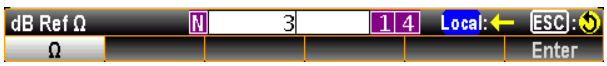
**F1 (Function) key to select dBm equation**

dBm




**F3 (REF Ω) key to select reference resistance**

Press the key to enter the menu to change the reference resistance, which indicates reference resistance simulating an output load.



F2 (MathDisp) key to select display modes

Press the key to show the MathDisp menu for 4 different displays. See the following descriptions for details.



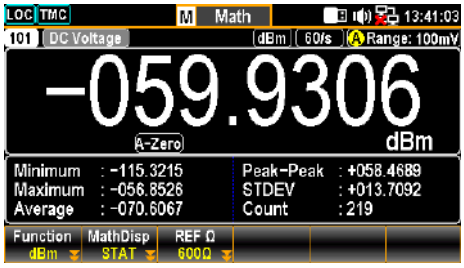

Note

Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate.

Show STAT Result

Description

The STAT page in MathDisp allows user to make statistical calculations for measurements including Minimum, Maximum, Average Peak-Peak, Standard Deviation and Count.



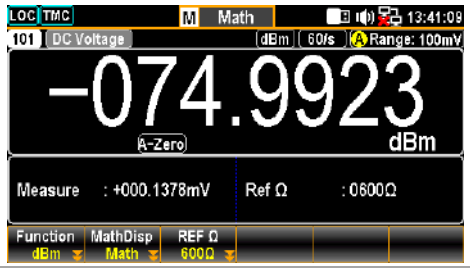

Values

| | |
|---|---|
| -059.9306 dBm | Indicates the latest dBm value |
| Minimum | Indicates the minimum value |
| Maximum | Indicates the maximum value |
| Average | Indicates the average value |
| Peak-Peak | Indicates the peak to peak value |
| STDEV | Indicates the standard deviation value |
| Count | Indicates the latest counts of dBm |

Show Math Result

Description

The Math page in MathDisp allows user to view mathematical calculations for several parameters.

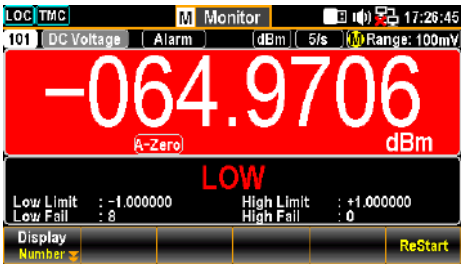



Values

| | |
|---|---|
| -074.9923 dBm | Indicates the latest dBm value |
| Measure | Indicates the originally measured Voltage value |
| RefΩ | Indicates the defined ref Ω value |

**Show Alarm Result**

Description: The Alarm page in MathDisp allows user to track if measured data exceeds the set High and Low limits, individually.




Values

| | |
|---|---|
| Low Limit | Indicates the set low limit of channel |
| High Limit | Indicates the set high limit of channel |
| Low Fail | Indicates the numbers of low limit exceeding |
| High Fail | Indicates the numbers of high limit exceeding |

**Show ALR+STAT Result**

Description: The ALR+STAT page in MathDisp allows user to view information from both STAT and Alarm pages simultaneously.



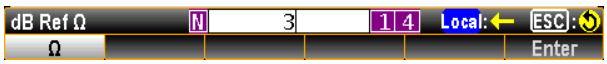
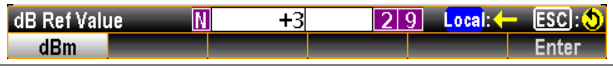

Values

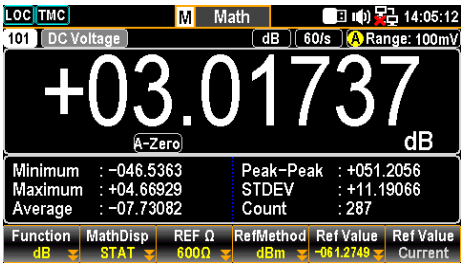
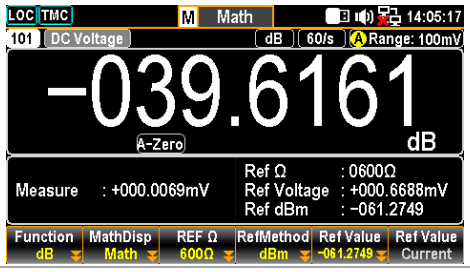
| | |
|---|---|
| Left Sec. | The numbers of High and Low limits exceeding are shown individually. |
| Right Sec. | The values, which based on dBm calculation, identical to STAT page are well displayed. |

**Note**

Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. Refer to page 117 for details of Alarm.

## dB Measurement

| | |
|---|---|
| Math Equation | dBm – dBmref |
| F1 (Function) key to select dB equation | dB<br> |
| F3 (REF Ω) key to select reference resistance | Press the key to enter the menu to change the reference resistance, which indicates reference resistance simulating an output load.<br> |
| F4 (Ref Method) key select dB reference method | Press the key to enter the Reference method menu which involves the 2 ways to calculate dB value. When dBm option is selected, user can specify a definite dBm value for dB calculation. If selecting Voltage option, system regards the defined voltage value as the Vreading parameter for dBm calculation, thus resulting in different dB value than the previous option.<br> |
| F5 (Ref Value) to define reference value (voltage or dBm) | In order to define either voltage or dBm reference value, both of which are corresponding to the previous F4 (Ref Method) option, press the key to enter the Ref Value menu to configure either voltage or dBm reference value.<br>Voltage<br><br>dBm<br> |
| F6 (Ref Value) key to get value at once | Press the key to instantly make the current dBm value, which is calculated by the current input voltage with the equation, as the Ref dBm (dBm reference).<br> |
| F2 (MathDisp) key to select display modes | Press the key to show the MathDisp menu for 4 different displays. See the following descriptions for details.<br> |
| Note | Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. |

| | | | |
|---|---|---|---|
| Show STAT Result | Description | The STAT page in MathDisp allows user to make statistical calculations for measurements including Minimum, Maximum, Average Peak-Peak, Standard Deviation and Count.   | |
| | Values | +03.01737 dB | Indicates the latest dB value |
| | | Minimum | Indicates the minimum value |
| | | Maximum | Indicates the maximum value |
| | | Average | Indicates the average value |
| | | Peak-Peak | Indicates the peak to peak value |
| | | STDEV | Indicates the standard deviation value |
| | | Count | Indicates the latest counts of dB |
| Show Math Result | Description | The Math page in MathDisp allows user to view mathematical calculations for several parameters.   | |
| | Values | -039.6161 dB | Indicates the latest dB value |
| | | Measure | Indicates the originally measured Voltage value |
| | | RefΩ | Indicates the defined ref Ω value |
| | | Ref Voltage | Indicates the measured reference voltage value |
| | | Ref dBm | Indicates the measured reference dBm value |

**Show Alarm Result**

Description: The Alarm page in MathDisp allows user to track if measured data exceeds the set High and Low limits, individually.




Values

| | |
|---|---|
| Low Limit | Indicates the set low limit of channel |
| High Limit | Indicates the set high limit of channel |
| Low Fail | Indicates the numbers of low limit exceeding |
| High Fail | Indicates the numbers of high limit exceeding |

**Show ALR+STAT Result**

Description: The ALR+STAT page in MathDisp allows user to view information from both STAT and Alarm pages simultaneously.



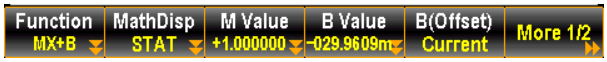
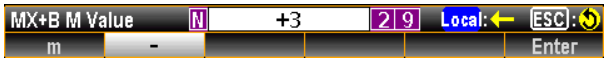
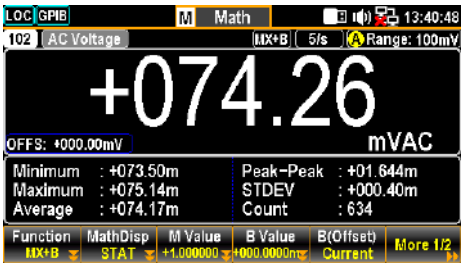

Values

| | |
|---|---|
| Left Sec. | The numbers of High and Low limits exceeding are shown individually. |
| Right Sec. | The values, which based on dB calculation, identical to STAT page are well displayed. |

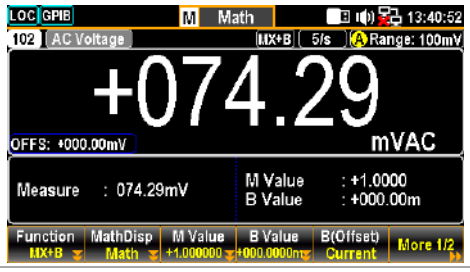
**Note**

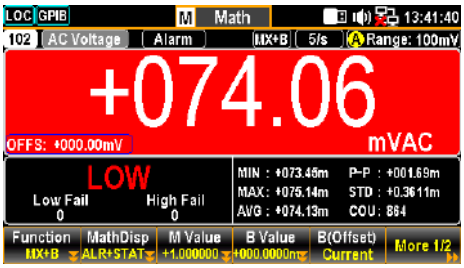
Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. Refer to page 117 for details of Alarm.

## MX+B Measurement

| | |
|---|---|
| Math Equation | Multiplies the reading (X) by the factor (M) and adds/subtracts offset (B). |
| F1 (Function) key to select MX+B equation | MX+B<br> |
| F3 (M Value) key to set the gain M value | Press the key to enter the menu to configure a M (Gain) value for MX+B equation.<br> |
| F4 (B Value) key to set the offset B value | Press the key to enter the menu to configure a B (Offset) value for MX+B equation.<br> |
| F5 (B (Offset)) key to get value at once | Press the key to instantly perform an offset current measurement for the B (Offset) value. |
| F2 (MathDisp) key to select display modes | Press the key to show the MathDisp menu for 4 different displays. See the following descriptions for details.<br> |
| Note | Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. |
| Show STAT Result Description | The STAT page in MathDisp allows user to make statistical calculations for measurements including Minimum, Maximum, Average Peak-Peak, Standard Deviation and Count.<br> |

| Values | | |
|---|---|---|
| | +074.26 mVAC | Indicates the latest MX+B value |
| | Minimum | Indicates the minimum value |

| | | | |
|---|---|---|---|
| | | Maximum | Indicates the maximum value |
| | | Average | Indicates the average value |
| | | Peak-Peak | Indicates the peak to peak value |
| | | STDEV | Indicates the standard deviation value |
| | | Count | Indicates the latest counts of MX+B |
| Show Math Result | Description | The Math page in MathDisp allows user to view mathematical calculations for several parameters. | |
| | |  | |
| | Values | +074.29 mVAC | Indicates the latest MX+B value |
| | | Measure | Indicates the originally measured Voltage value |
| | | M Value | Indicates the defined M value |
| | | B Value | Indicates the defined B value |
| Show Alarm Result | Description | The Alarm page in MathDisp allows user to track if measured data exceeds the set High and Low limits, individually. | |
| | |  | |
| | Values | Low Limit | Indicates the set low limit of channel |
| | | High Limit | Indicates the set high limit of channel |
| | | Low Fail | Indicates the numbers of low limit exceeding |
| | | High Fail | Indicates the numbers of high limit exceeding |

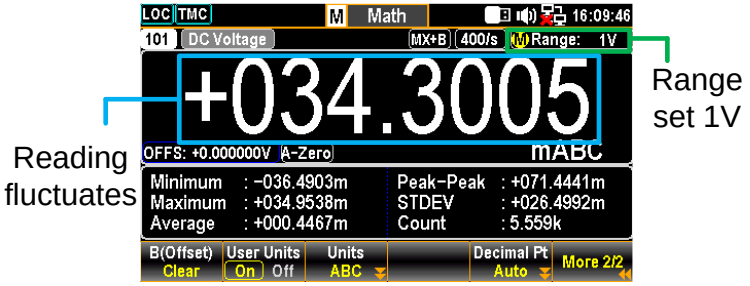
| | | | |
|---|---|---|---|
| Show ALR+STAT Result | Description | The ALR+STAT page in MathDisp allows user to view information from both STAT and Alarm pages simultaneously.   | |
| | Values | Left Sec. | The numbers of High and Low limits exceeding are shown individually. |
| | | Right Sec. | The values, which based on MX+B calculation, identical to STAT page are well displayed. |
| Note | Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. Refer to page 117 for details of Alarm. | | |
| F6 (More 1/2) key to enter next function keys page | Press the key to enter the next page (More 2/2) of more functions configurations for MX+B. | | |
| Function Keys in More 2/2 page |   | | |
| F1 (B (Offset)) key to clear B value | Press the key to clear the B value to zero. | | |
| F2 (User Units) key to turn On or Off user-defined units | Press the key to enable or disable user-defined units. Choosing On will display user-defined units on measurement; selecting Off will display default units (VDC). | | |
| F3 (Units) key to edit User Units | Press the key to specify a user-defined string, which consists of up to 3 characters and is shown in the Monitor mode display. | | |

F5 (Decimal PT) key to configure

Press the key to show the Decimal Point menu to configure either Auto or Range mode for Monitor display. Auto means that the unit of measured reading fluctuates with the actual measured condition, whilst Range indicates that the unit of measured reading is fixed in accord with the set range setting.

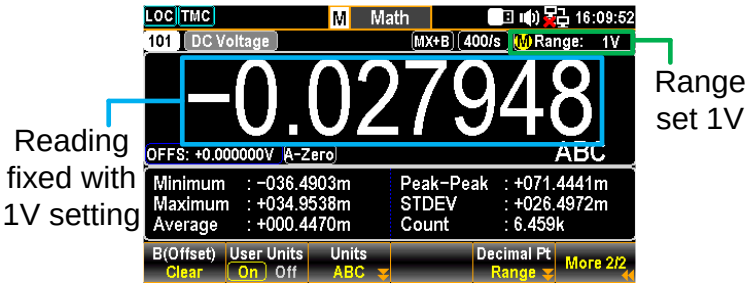
Auto

The measured reading display fluctuates with actual condition.




Range

The measured reading display is consist with the set range.




## 1/X Measurement

Math Equation

Divides 1 by the reading (X).

F1 (Function) key to select 1/X equation

1/X



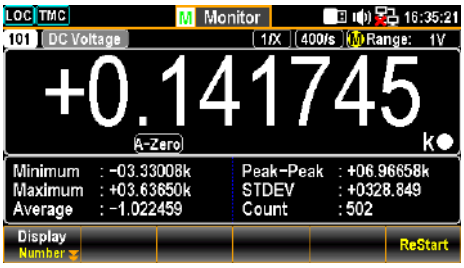
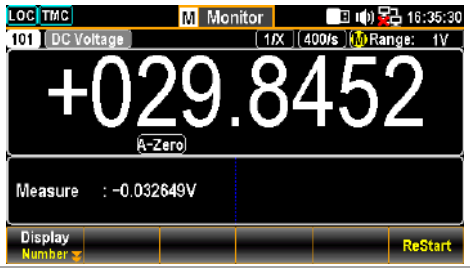

F2 (MathDisp) key to select display modes

Press the key to show the MathDisp menu for 4 different displays. See the following descriptions for details.



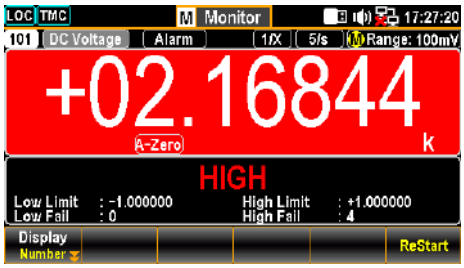

Note

Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate.

| | | | |
|---|---|---|---|
| Show STAT Result | Description | The STAT page in MathDisp allows user to make statistical calculations for measurements including Minimum, Maximum, Average Peak-Peak, Standard Deviation and Count.   | |
| | Values | +0.141745 k | Indicates the 1/X calculation |
| | | Minimum | Indicates the minimum value |
| | | Maximum | Indicates the maximum value |
| | | Average | Indicates the average value |
| | | Peak-Peak | Indicates the peak to peak value |
| | | STDEV | Indicates the standard deviation value |
| | | Count | Indicates the latest counts of 1/X |
| Show Math Result | Description | The Math page in MathDisp allows user to view mathematical calculations for several parameters.   | |
| | Values | +029.8452 | Indicates the 1/X calculation |
| | | Measure | Indicates the originally measured Voltage value |

**Show Alarm Result**

Description: The Alarm page in MathDisp allows user to track if measured data exceeds the set High and Low limits, individually.

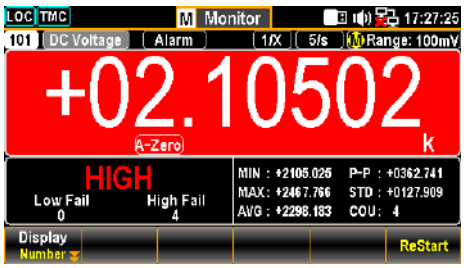



Values

| | |
|---|---|
| Low Limit | Indicates the set low limit of channel |
| High Limit | Indicates the set high limit of channel |
| Low Fail | Indicates the numbers of low limit exceeding |
| High Fail | Indicates the numbers of high limit exceeding |

**Show ALR+STAT Result**

Description: The ALR+STAT page in MathDisp allows user to view information from both STAT and Alarm pages simultaneously.




Values

| | |
|---|---|
| Left Sec. | The numbers of High and Low limits exceeding are shown individually. |
| Right Sec. | The values, which based on 1/X calculation, identical to STAT page are well displayed. |

**Note**

Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. Refer to page 117 for details of Alarm.

## Percent Measurement

Math Equation

$$\frac{(\text{ReadingX} - \text{Reference})}{\text{Reference}} \times 100\%$$

F1 (Function) key to select Percent equation

Percent




F3 (REF %) key to set the Reference value

Press the key to enter the menu to configure a Reference value for Percent equation.




F4 (REF %) key to get value at once

Press the key to instantly perform an reference measurement for the REF % value.

F2 (MathDisp) key to select display modes

Press the key to show the MathDisp menu for 4 different displays. See the following descriptions for details.

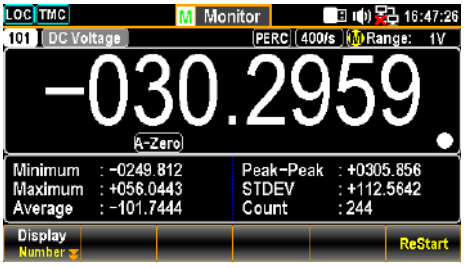



Note

Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate.

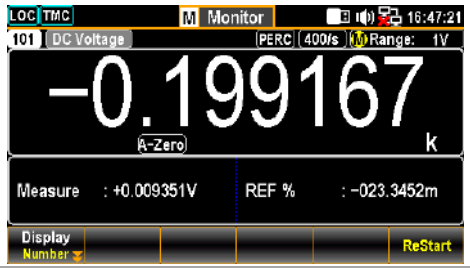
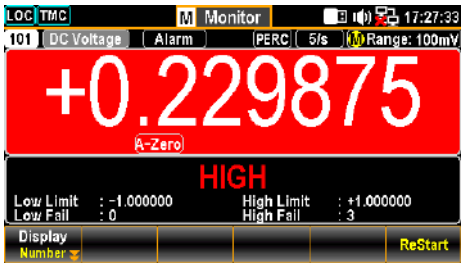
Show STAT Result Description

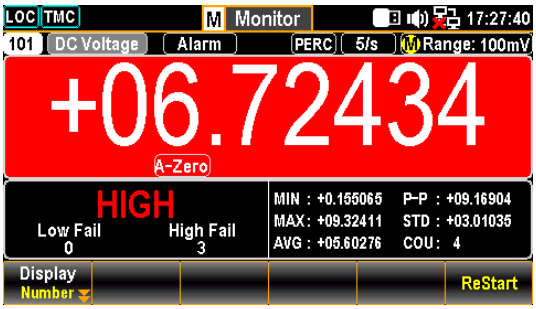
The STAT page in MathDisp allows user to make statistical calculations for measurements including Minimum, Maximum, Average Peak-Peak, Standard Deviation and Count.




Values

| | |
|---|---|
| -30.2959 | Indicates the Percent calculation |
| Minimum | Indicates the minimum value |
| Maximum | Indicates the maximum value |
| Average | Indicates the average value |
| Peak-Peak | Indicates the peak to peak value |

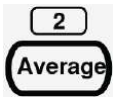
| | | | |
|---|---|---|---|
| | | STDEV | Indicates the standard deviation value |
| | | Count | Indicates the latest counts of Percent |
| Show Math Result | Description | The Math page in MathDisp allows user to view mathematical calculations for several parameters.   | |
| | Values | -0.199167 k | Indicates the Percent calculation |
| | | Measure | Indicates the originally measured Voltage value |
| | | REF % | Indicates the defined reference % value |
| Show Alarm Result | Description | The Alarm page in MathDisp allows user to track if measured data exceeds the set High and Low limits, individually.   | |
| | Values | Low Limit | Indicates the set low limit of channel |
| | | High Limit | Indicates the set high limit of channel |
| | | Low Fail | Indicates the numbers of low limit exceeding |
| | | High Fail | Indicates the numbers of high limit exceeding |

| | | | |
|---|---|---|---|
| Show ALR+STAT Result | Description | The ALR+STAT page in MathDisp allows user to view information from both STAT and Alarm pages simultaneously.   | |
| | Values | Left Sec. | The numbers of High and Low limits exceeding are shown individually. |
| | | Right Sec. | The values, which based on Percent measurement, identical to STAT page are well displayed. |
| Note | Only when Alarm configuration is enabled can the "Alarm" and "ALR+STAT" of Math Display are available to activate. Refer to page 117 for details of Alarm. | | |

# Average Menu

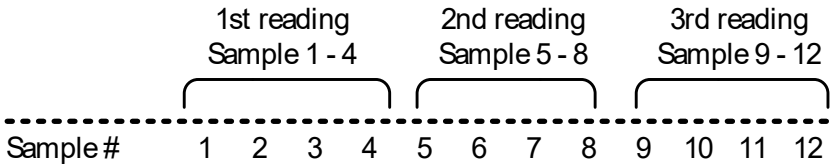
Background

Press the *Average* key on the front panel to enter the Average menu. The digital average function averages a specified number of input signal samples to generate one reading. The following diagram demonstrates the method of Average using 4 samples per reading.




Average

The digital average renews a whole group of samples per reading. This method is recommended when using the optional scanner.




F1 (Average) key to turn On/Off Average function

Press the key to enable or disable the Average function.




F2 (Count) key to specify sample counts per reading

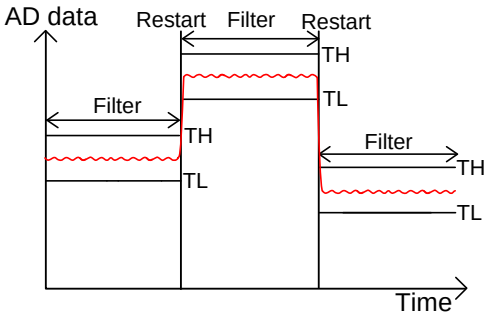
Press the key to enter the menu to specify count of average, which defines the number of samples to be averaged per reading. More samples offer low noise but a long delay. Less samples offer high noise but a short delay.



F3 (WinMethod) key to select Average Window Method

Press the key to enter the Average Window Method menu. Average window defines the threshold for when the digital average data is updated again. When the data falls in the range between TH and TL, the Average keeps processing. When the data falls out of the range between TH and TL, the Average will restart. When measuring unstable signals, appropriately setting the average window can improve the measurement speed.




TH: Threshold High, TL: Threshold Low

F4 (Window) key to specify Average Window range

Measure:

Previous Meas*(1-window)< threshold< Previous Meas*(1+window).

Range:

Previous Measure + (Range * window)< threshold <Previous Measure + (Range * window)



# Log Menu

Background

Press the *Log* key on the front panel to enter the Log menu, which allows user to perform Capture function, which captures screenshot of hardcopy, or to operate ScanData, which saves data log of scanned readings into installed USB disk.




Note

Before performing Log functions, be aware of the supported USB disk as following:

- USB Disk Type: Flash Disk Only
- FAT Format: Fat16 or Fat32 (Recommended)
- Max memory size: 128GB
- USB disk which requires card adaptor is Not recommended to be used in this application.

## Capture

Steps

1. Press the *Log PARA* (F1) key to select Capture.

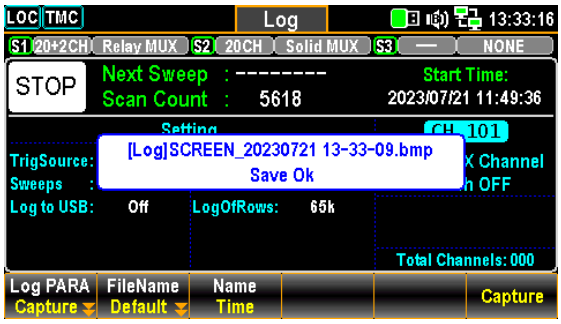



2. Press the *FileName* (F2) key to determine filename of captured screenshots. The "Default" option remains filename in date & time format (e.g., SCREEN_20220909 13-20-25).

3. If selecting "Manual" option, press the *EditName* (F3) key to enter the keyboard page to edit an user-defined filename.




4. Press the Capture (F4) key to perform screenshot capturing. The prompt message pops up after completing capturing.



## Scan Data

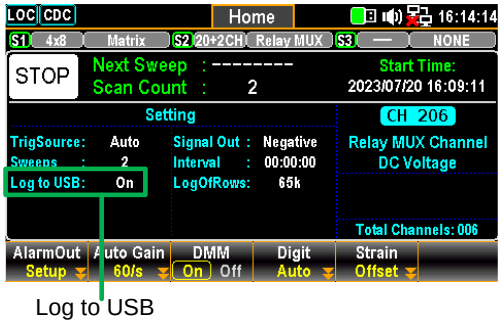
Steps

1. Press the *Log PARA* (F1) key to select ScanData.




2. Press the *Logging* (F2) key to activate if scanned readings data will be saved into the inserted USB disk automatically. Selecting "Off" will not automatically save data into the USB disk and instead require manual operation for saving data.

From the Home screen, if auto-Logging function is enabled, the Log to USB will be shown "On". Refer to page 42 for details of Home screen.



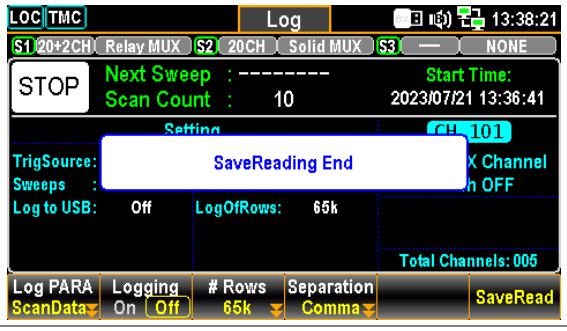

3. Press the # *Rows* (F3) key to specify the row limit, which indicates the max. number of rows for sweep data, of each data logging file. The "65k" means the limit is 65,536 rows per file. The "1M" indicates the limit is 1,048,576 rows per file and the "Infinite" stands for the limit varies based on the number of bytes permitted by file system itself.



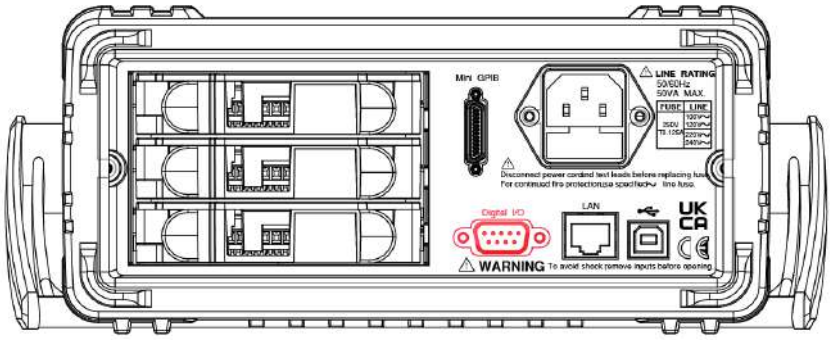

4. Press the *Separation* (F4) key to designate a symbol of separation (Comma, Semicolon or TAB), which is placed between intervals of each count of readings within the export scanned data.



5. Press the *SaveRead* (F6) key to perform data log of scanned readings saving into installed USB disk manually.



# DIGITAL I/O




Digital I/O Overview ..... 154
Application: Alarm Output ..... 156
Application: External Trigger ..... 158

# Digital I/O Overview

**Background**

The Digital I/O port contains 1 pin for External Trigger Input and 4 pins for Alarm Output.

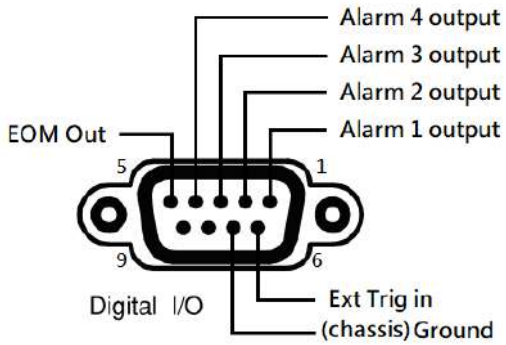
When external trigger pulse is received by the external trigger input pin, the designated channel will be triggered accordingly.

In terms of the 4 alarm output pins, anyone of the 4 pins can be assigned to anyone of the input channels to trigger external LED light, Relay control or send a TTL-compatible pulse to control system.

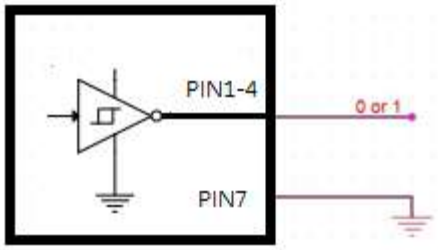
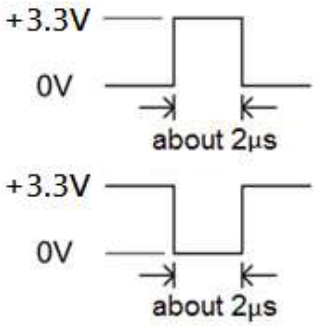
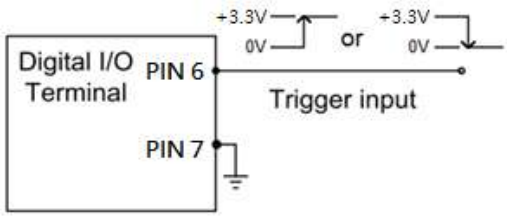
**Pin Assignment**

Connector type: DB-9 female




| Pin No | Pin Definition |
|---|---|
| 1 | Alarm_OUT1 |
| 2 | Alarm_OUT2 |
| 3 | Alarm_OUT3 |
| 4 | Alarm_OUT4 |
| 5 | EOM Out |
| 6 | External Trigger In |
| 7 | Digital Ground |
| 8 | NC |
| 9 | NC |

| | |
|---|---|
| Pin1-4 | Pin 1-4 are Output TTL-compatible pins, which are selectable for TTL logic Hi or Lo alarm outputs. |
| Pins 1-4 output wiring diagram |  |
| Pin5 | EOM (End Of Measurement) signal Output. Activates when compare measurement is over.<br>It is also available in other measurements. |
| EOM pulse width timing |  |
| Pin6 | External Trigger Input. Accepts external trigger signals. For using external signals. |
| Pins 6-7 output wiring diagram |  |
| Pin7 | Digital (chassis) Ground. |

# Application: Alarm Output

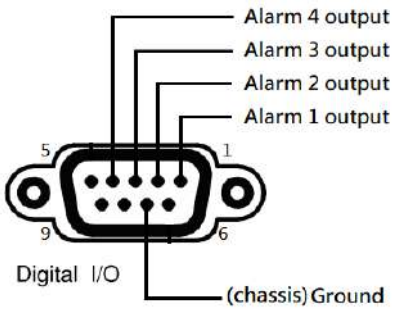
**Background**

The alarm output pins of Digital I/O port located on the rear panel, which send a TTL-compatible alarm output, can trigger the connected external alarm devices like sirens and LED lights.

Anyone of the 4 alarm output pins can be assigned to anyone of the input channels to trigger external devices or send a TTL-compatible pulse to control system.

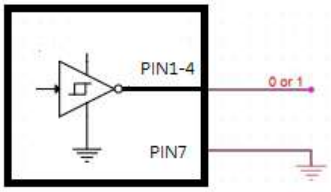
**Alarm output connection**

Connect the external alarm output devices to the specific pins of Digital I/O port located on the rear panel.




| Pin1-4 | Alarm output pins |
|---|---|

**Connection**




**Activate alarm output**

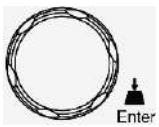
Press the *Alarm* key on the front panel to enter the Alarm menu.

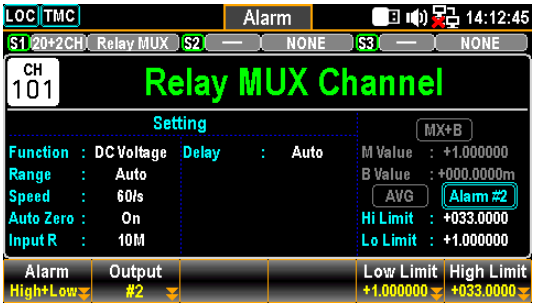






Use the *knob* key to navigate channels to select a target channel (channel 101 for example below).



Press the *Alarm* (F1) key to select an alarm limit(s) mode for the select channel.

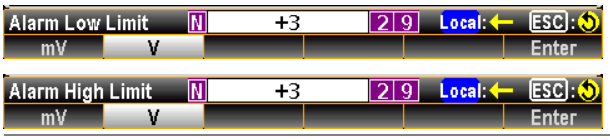



- OFF Alarm condition is disabled for select channel.
- High+Low Both High and Low limits of Alarm condition are activated.
- High High limit of Alarm condition is activated.
- Low Low limit of Alarm condition is activated.

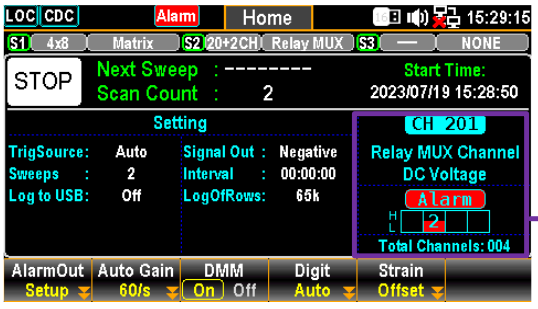
Press the *Output* (F2) key to select which of the 4 alarm output lines will be utilized to send alarm pulse for the selected channel.




Press the *Low Limit* (F5) and the *High Limit* (F6) keys to specify alarm limits individually for the selected channel.




Press the *Scan* key on front panel to initiate a scan course. When the set alarm occurs for select channel during a scan course, the alarm status will be shown clearly as the following example.




The set low limit of alarm #2 is triggered

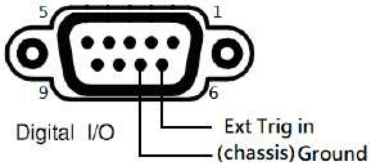
# Application: External Trigger

**Background**

The external trigger uses the digital I/O pin for manual triggering of the DAQ-9600. To trigger the DAQ-9600 a pulse of ≥10μs is required.

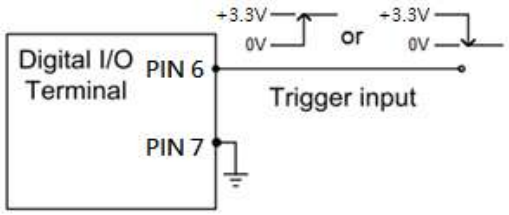
**Signal connection**

Connect the external trigger signal to the specific pins of Digital I/O port located on the rear panel.




| Pin6 | External Trigger Input pin |
|---|---|

**Connection**




**Activate external trigger**

Press the *Interval* key on the front panel to enter the Interval menu.







Press the *TrigSource* (F1) key to enter the trigger source menu followed by pressing the *External* (F4) to select External Trigger mode.

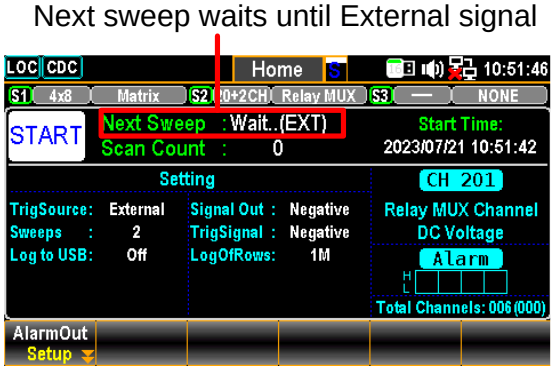






During a scan course, each sweep only starts when an external triggered signal is received.

Next sweep waits until External signal



# SYSTEM & FIRMWARE

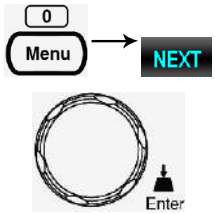
View System Info ..... 160
Firmware Update ..... 161

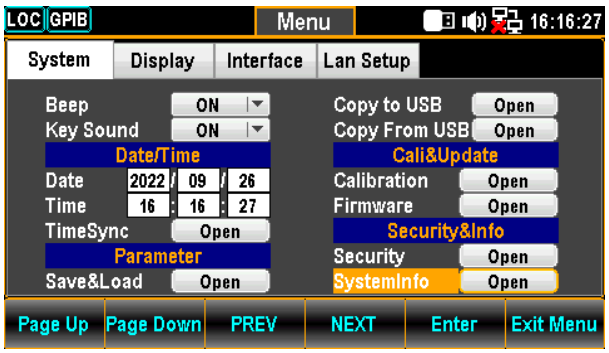
# View System Info

**Background** View system information including Vendor, Model Name, Serial Number, Master Firmware and Slave Firmware.

**Step**

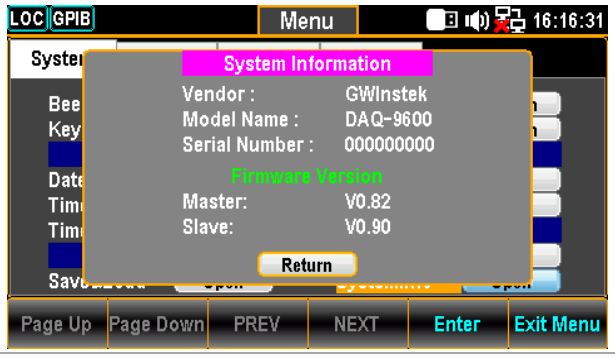
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Security&Info – SystemInfo field.




2. Press the F5 (Enter) key or Knob key to enter the System Information where all the critical contents are exposed for check.



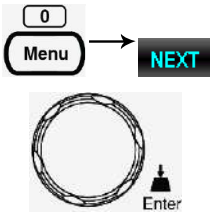



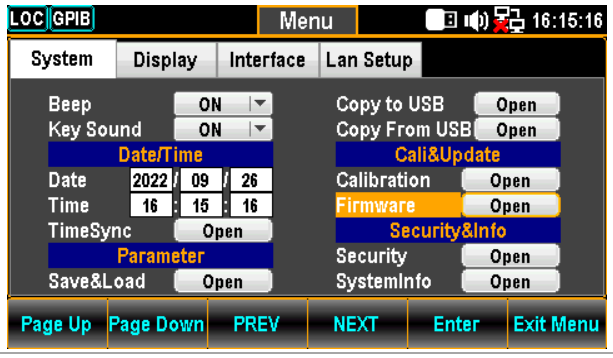
# Firmware Update

**Background** This section is for updating the latest firmware.

**Step**

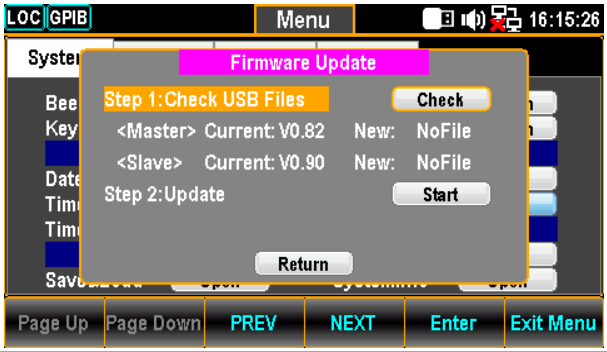
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Cali&Update - Firmware field.




2. Press the F5 (Enter) key or Knob key to enter the Firmware Update menu.




**Firmware Update Process** Prior to update, make sure if the required firmware file is stored within the flash drive plugged into the USB port on the front panel. Also, user can check the current Master and Slave firmware version respectively in this menu.

Note

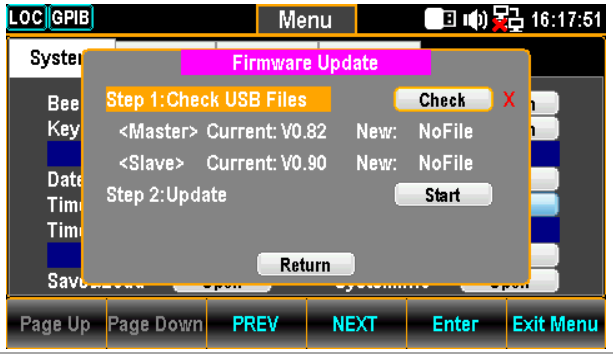
Prior to update, please rename the downloaded firmware files as below:

- ✓ Master file: M_IMAGE.bin
- ✓ Slave file: S_IMAGE.bin

1. Press the F5 (Enter) key or Knob key first, the qualified firmware version will show then.




Note: If flash drive has no update files, it will show as the figure below.




2. Press the NEXT key or scroll Knob key to move to the Update followed by pressing the F5 (Enter) key or Knob key to Start update.




Note

Refer to page 132 for details of how to update firmware for those installed modules.

# MENU SETTING

**Configure System ..... 164**
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**Configure Display ..... 185**
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# Configure System

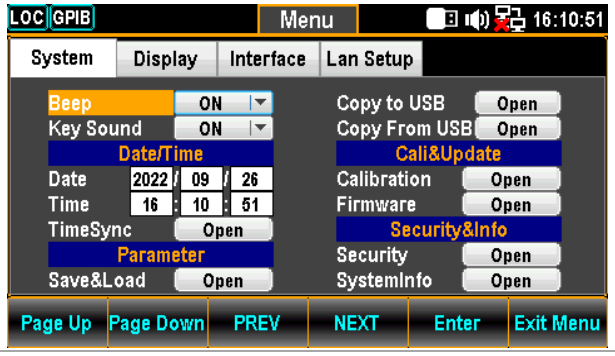
## Beep Setting

**Background** Enable or Disable Beep Sound.

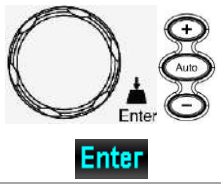
**Step**

1. Press the Menu key, the System configuration menu appears.



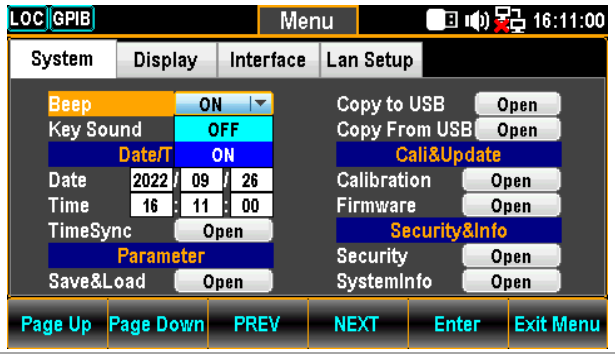




2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.



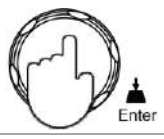







3. Press the F5 (Enter) key or Knob key to select the ON option.



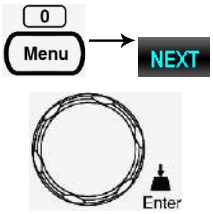



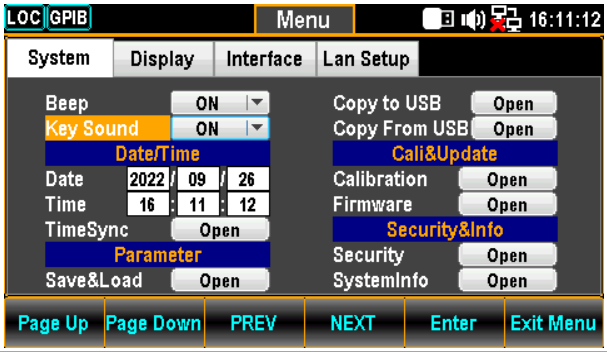
## Key Sound Setting

**Background** Enable or Disable Key Sound.

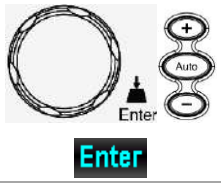
**Step**

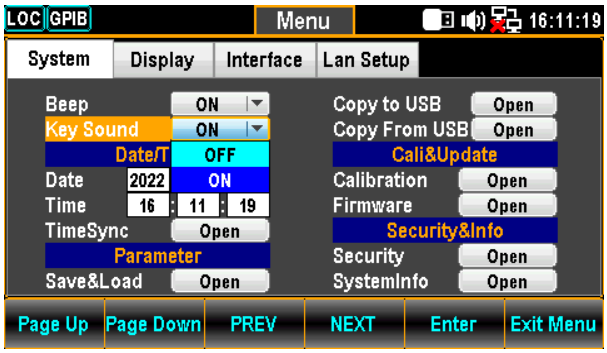
1. Press the Menu key, the System configuration menu appears. And then press the NEXT key repeatedly or scroll the Knob key to move to the Key Sound field.




2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the On option.




3. Press the F5 (Enter) key or Knob key to select the ON option for Key Sound.

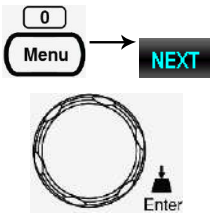


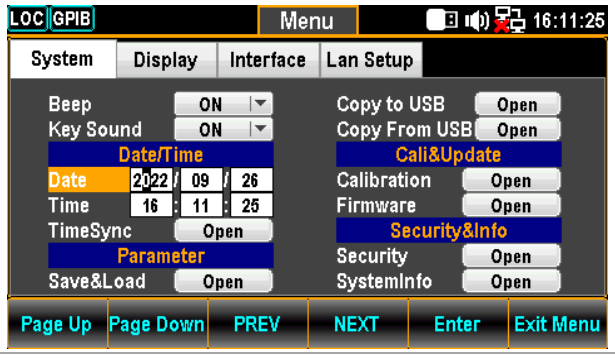
## Date Setting

**Background** Manually adjust date for system or automatically set date via TimeSync setting.

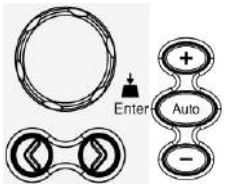
**Step**

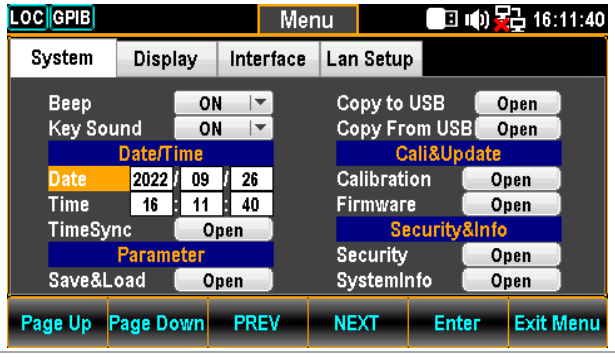
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Date/Time - Date field.



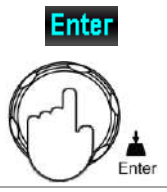




2. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define year of Date. Also, you can press Number keys to directly input a specific digit.




3. Press the F5 (Enter) key or Knob key to confirm the input digit for year of Date.



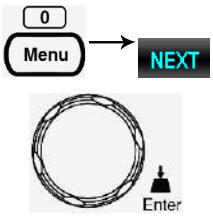

4. Repeat steps 2 to 3 for month and day.

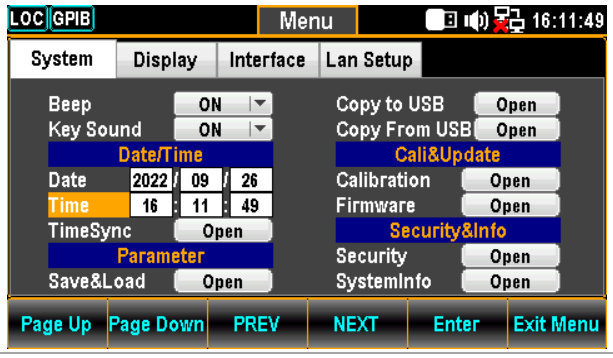
## Time Setting

**Background** Manually adjust time for system or automatically set time via TimeSync setting.

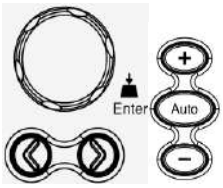
**Step**

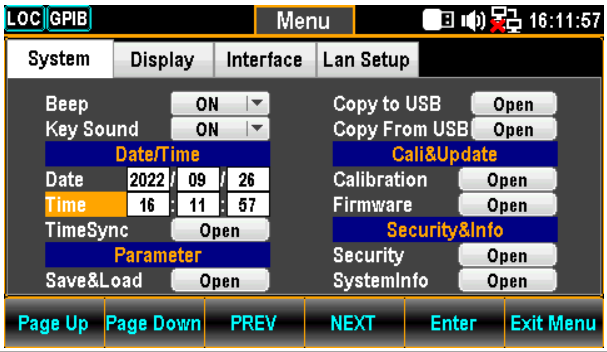
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Date/Time - Time field.




2. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define hour of Time. Also, you can press Number keys to directly input a specific digit.




3. Press the F5 (Enter) key or Knob key to confirm the input digit for hour of Time.




4. Repeat steps 2 to 3 for minute and second.

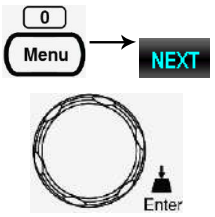
## TimeSync Setting

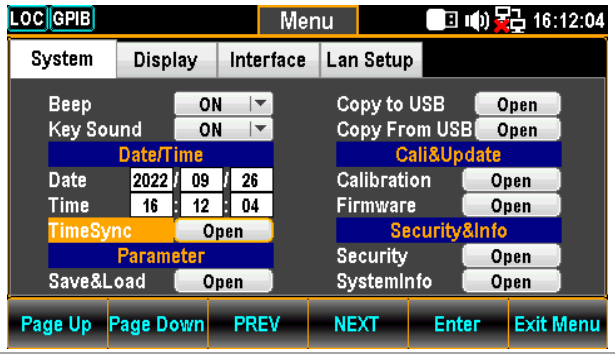
**Background**

TimeSync is only available when connecting to internet with appropriate network setting.

**Step**

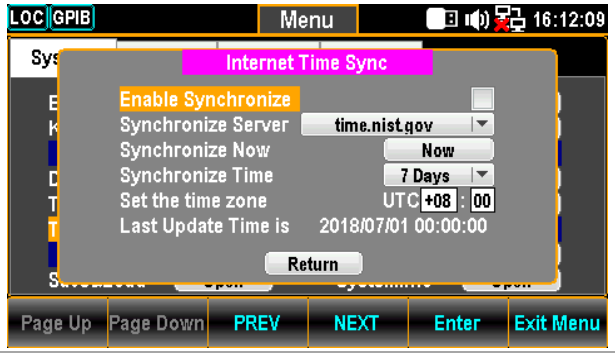
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Date/Time - TimeSync field.




2. Press the F5 (Enter) key or Knob key to enter the Internet Time Sync menu.




**Internet Time Synchronize**

| | |
|---|---|
| Enable Synchronize | Enable or disable time sync |
| | Check / Uncheck |
| Synchronize Server | Choose remote server for time sync |
| | time.nust.gov / time-nw.nist.gov |
| | The 2nd server is available for user customization. Refer to page 247 for SCPI setting. |

| | | |
|---|---|---|
| | Synchronize Now | Retrieve the currently standard time from the remote sever. |
| | Synchronize Time | Define an interval to retrieve the currently standard time from the remote sever. |
| | | 7 Days / 14 Days / 30 Days |
| | Set the time zone | Set UTC (Coordinated Universal Time) |
| | | hour / minute |
| | Last Update Time is | Display the currently standard time. |

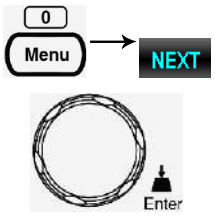
## Save and Load Parameters

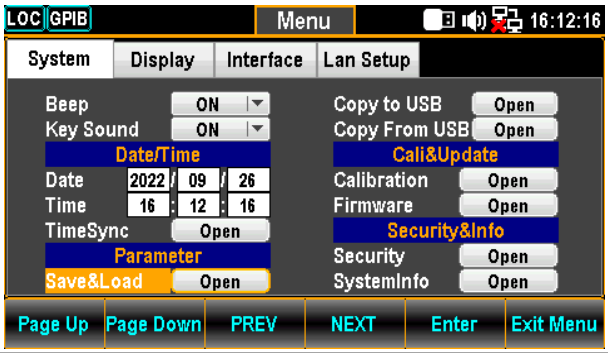
**Background**

The DAQ-9600 can save several instrument settings, which include the state, function, I/O and range settings. The Load function makes the saved settings or default setting to be recalled at the next power up or immediately.

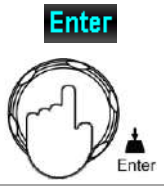
**Step**

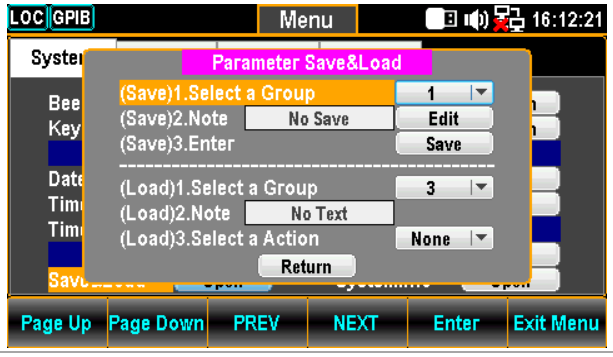
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Parameter – Save&Load field.




2. Press the F5 (Enter) key or Knob key to enter the Parameter Save&Load menu.



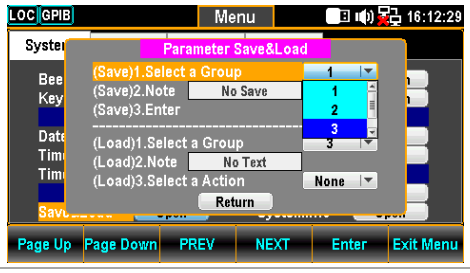



Parameter Save&Load

## Save

Select a Group

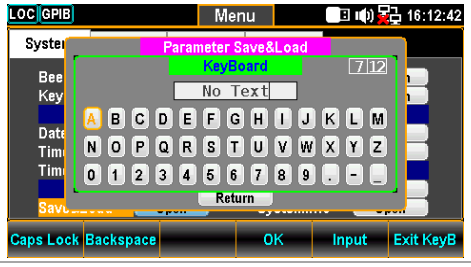
1. Press the F5 (Enter) key or Knob key to open the dropdown menu.




2. Scroll the Knob key or pressing +/- keys followed by pressing the F5 (Enter) key or Knob key to confirm the group selection.

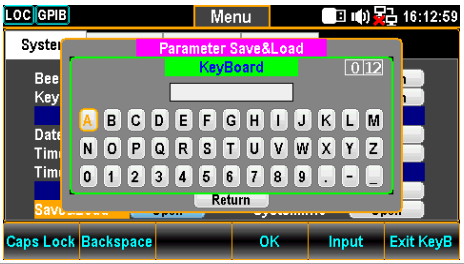



3. Press the F5 (Enter) key or Knob key to open the KeyBoard page.



4. Press the F2 (Backspace) key to clear default words.

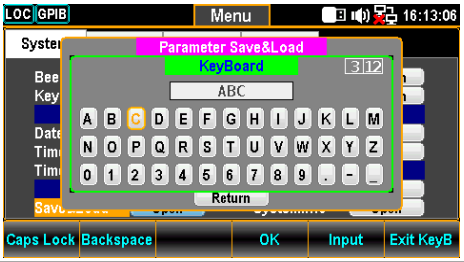
Backspace




5. Use the Left/Right and +/- keys or scroll the Knob key to move the cursor to desired word followed by pressing the F5 (Input) key or Knob key to input the word.




Input




6. Press the F4 (OK) or the Knob key to confirm the input words.

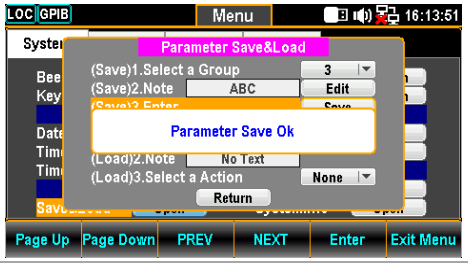
OK




Enter

7. Press the F5 (Enter) key or Knob key to saved the input words.

Enter

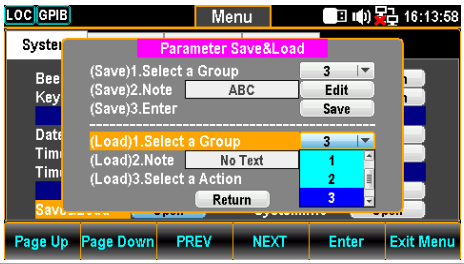



# Load

Select a Group

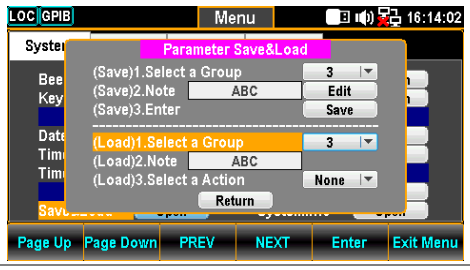
1. Press the F5 (Enter) key or Knob key to open the dropdown menu.



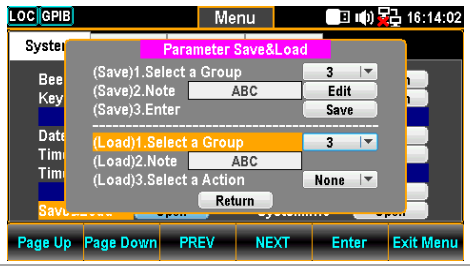




2. Scroll the Knob key or press +/- keys followed by pressing the F5 (Enter) key or Knob key to confirm the group selection.



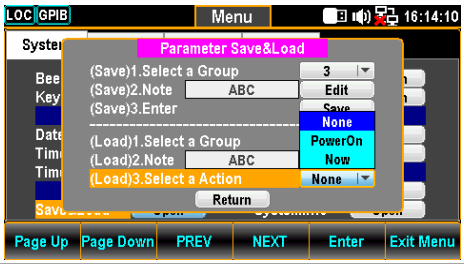

3. The currently selected group name appears in the Note field.




Select a Action

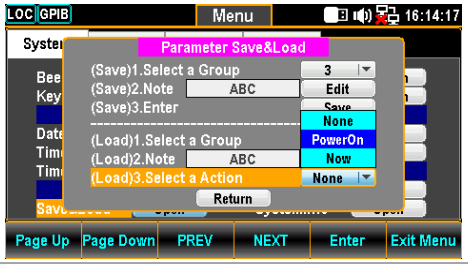
4. Press the F5 (Enter) key or Knob key to open the dropdown menu.



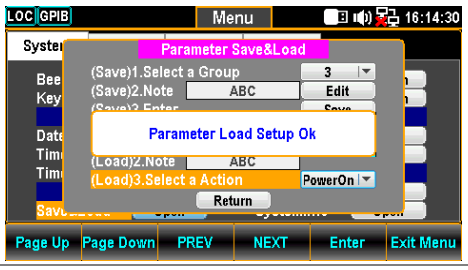
5. Scroll the Knob key or press +/- keys followed by pressing the F5 (Enter) key or Knob key to confirm the action selection.




6. Press the F5 (Enter) key or Knob key to confirm the action selection.




Parameter

None: no recall action

Power On: recall at next power up

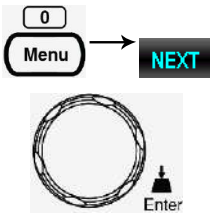
Now: recall instantly

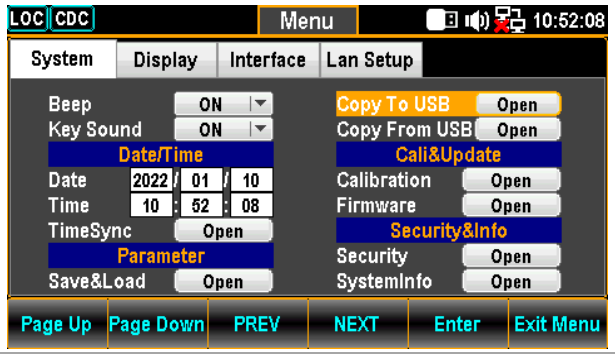
## Copy Parameters To USB

**Background** This section introduces how to copy the parameters of DAQ-9600 to the connected USB disk.

**Step**

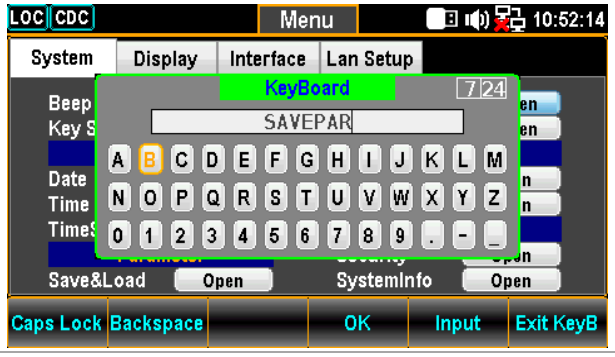
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Copy To USB field.



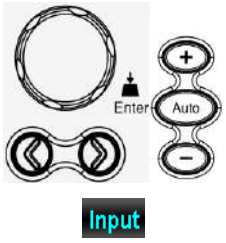




2. Press the F5 (Enter) key or Knob key to bring about the KeyBoard page.



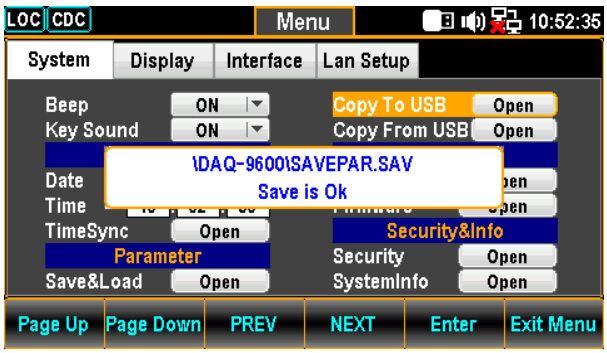




3. Use the Left/Right and +/- keys or scroll the Knob key to move the cursor followed by pressing the F5 (Input) key or the Knob key to specify a name for parameters.



4. Press the F4 (OK) key to confirm the parameters name and copy it to the connected USB disk.



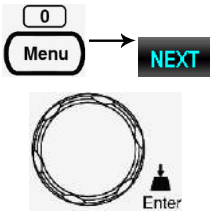

5. The prompt message pops up and indicates the file of parameters is saved to the connected USB completely.

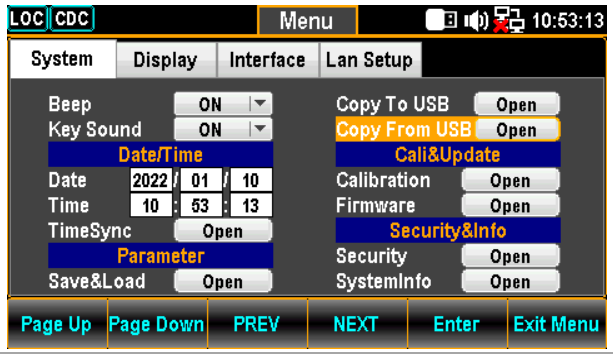
## Copy Parameters From USB

**Background** This section introduces how to recall the saved parameters from the connected USB disk to DAQ-9600.

**Step**

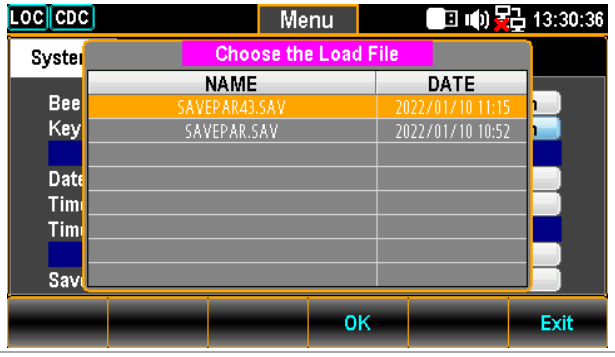
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Copy From USB field.



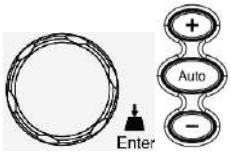




2. Press the F5 (Enter) key or Knob key to bring about the Choose the Load File page.



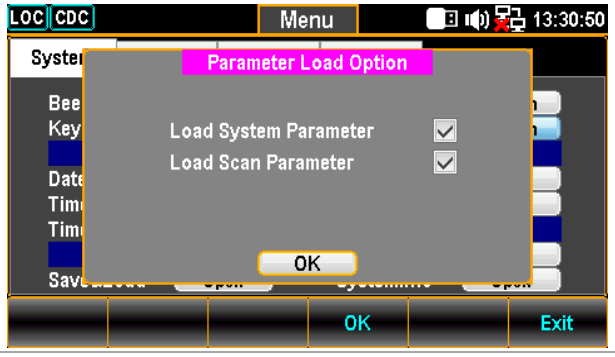



3. Use the +/- keys or scroll the Knob key to move among parameters files within the list.

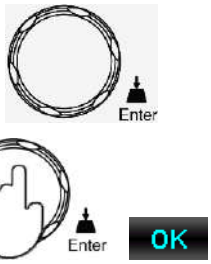


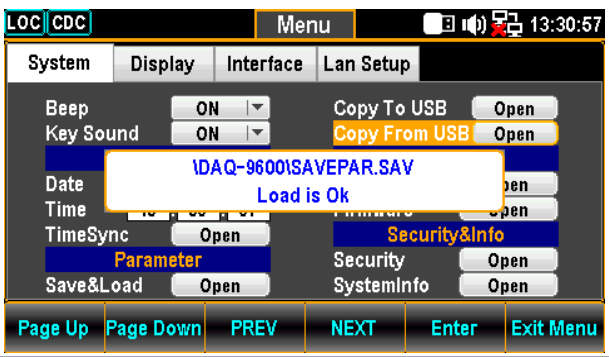

4. Press the F4 (OK) key to confirm the selection followed by entering the Parameter Load Option page.




5. Scroll the Knob key to move between System and Scan Parameters followed by pressing Knob key to select/unselect parameters. Press F4 (OK) key to load parameters to DAQ-9600.



6. The prompt message indicates the selected parameters is loaded from the connected USB disk to DAQ-9600.

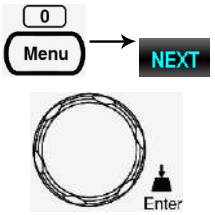
## Calibration Setting

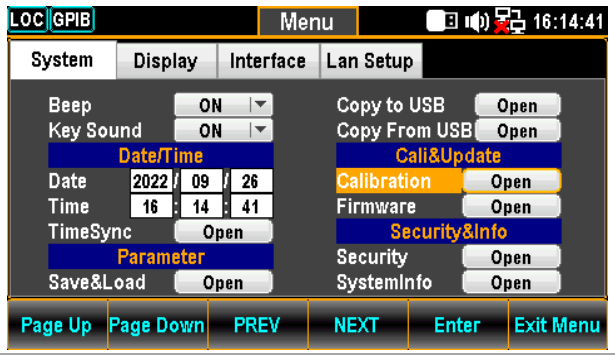
**Background**

This section mainly provides several calibrations for frequency, DC gain and DMM. Note that only the certified technician can operate the calibration procedure. Refer to the qualified personnel for more details when necessary.

**Steps**

1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Cali&Update - Calibration field.




2. Press the F5 (Enter) key or Knob key to enter the Calibration menu.





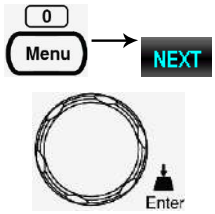

| | | |
|---|---|---|
| Frequency Calibration | Frequency Compensate (1.005000) | Enable or disable frequency compensation (the value indicates the compensation coefficient; default: Factory calibration value)<br>Check the box to enable:<br>Frequency = Original Frequency x Compensate Coefficient<br>Uncheck the box to disable:<br>Frequency = Original Frequency |
| | Input Compensate Value | 1. Input a compensation coefficient.<br><br>2. Use the Left/Right keys to move the cursor followed by pressing the F5 (Enter) key to save the frequency compensation coefficient. The value changes as the figure shown below.<br> |
| DC Gain Calibration | DC Gain Calibration | Click "Start" to execute DC Gain Calibration, which is an internally self-calibration function that does Not require external signal source. It corrects the gain of internal amplifier, though it is not necessary for general conditions unless the significant change in the gain of internal amplifier. It is suggested performing this calibration one time monthly. |
| DMM Calibration | ⚠ NOTE | The calibration procedure can be only executed by the certified technician in accordance with the standard instruments. Refer to the manufacturer or qualified personnel of authorized dealer for details. |

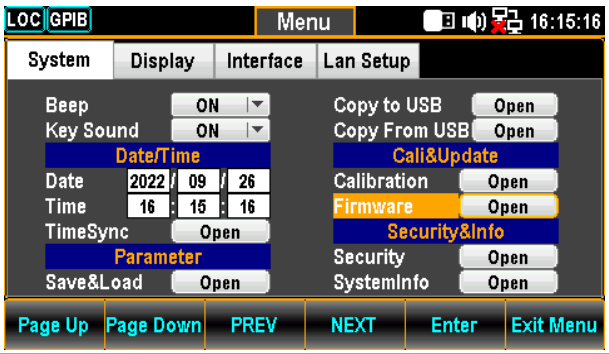
## Firmware Update

**Background** This section is for updating the latest firmware.

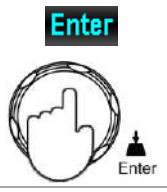
**Step**

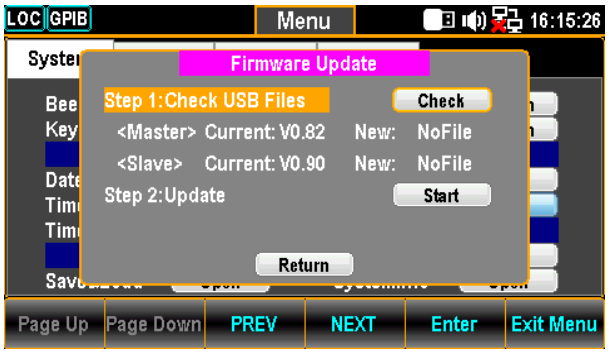
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Cali&Update - Firmware field.




2. Press the F5 (Enter) key or Knob key to enter the Firmware Update menu.



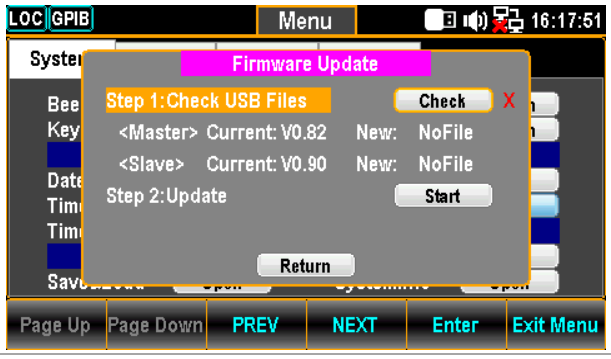




**Firmware Update Process** Prior to update, make sure if the required firmware file is stored within the flash drive plugged into the USB port on the front panel. Also, user can check the current Master and Slave firmware version respectively in this menu.

1. Press the F5 (Enter) key or Knob key first, the qualified firmware version will show then.




Note: If flash drive has no update files, it will show as the figure below.




2. Press the NEXT key or scroll Knob key to move to the Update followed by pressing the F5 (Enter) key or Knob key to Start update.

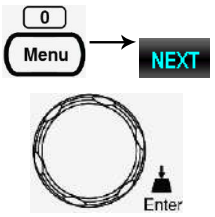


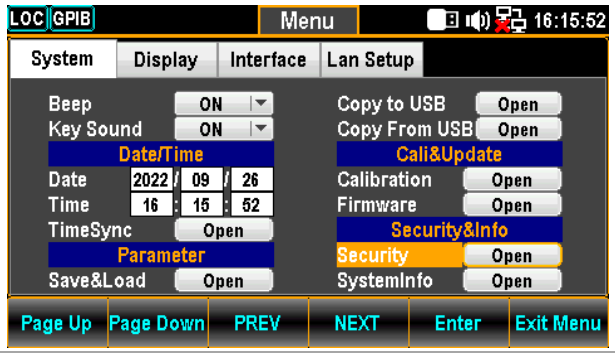
## Security Setting

**Background** This section is to change the password and enable or disable Lan password.

**Step**

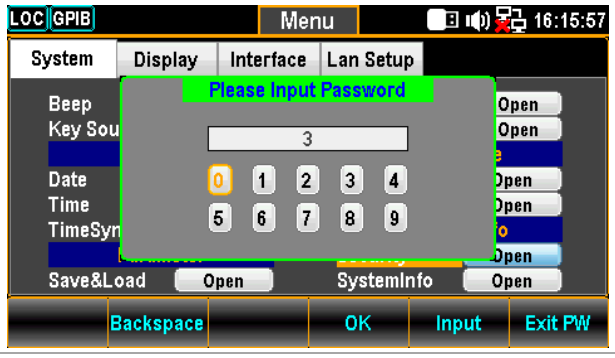
1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Security&Info – Security field.



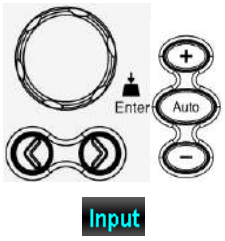



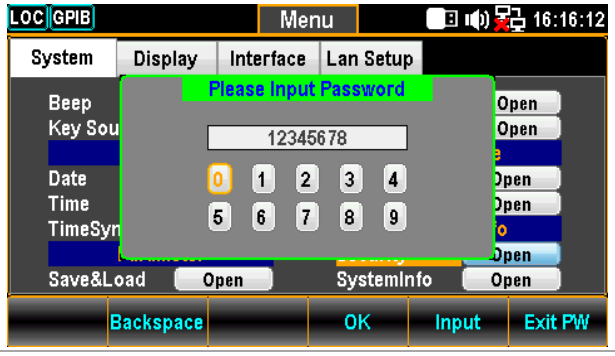

2. Press the F5 (Enter) key or Knob key to enter the Please Input Password page.



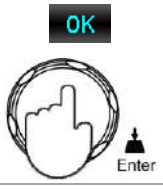



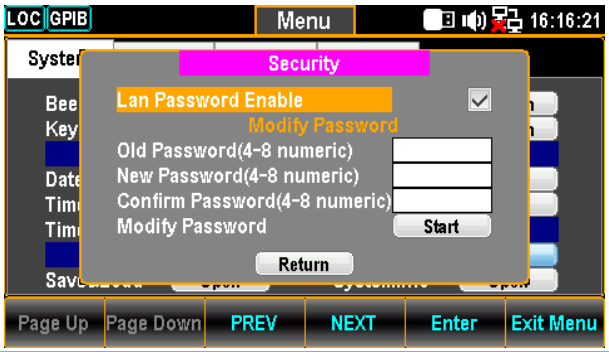

3. Use the Left/Right and +/- keys or scroll the Knob key to move the cursor followed by pressing the F5 (Input) key or the Knob key to input the password.






4. Press the F4 (OK) key or Knob key to enter the Security page.



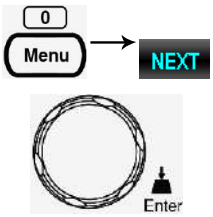

| | | |
|---|---|---|
| Security | Lan Password Enable | Enable or disable password requirement for Lan web and telnet Control. |
| | | Check / Uncheck |
| | Old Password | Enter the old password |
| | New Password | Enter the new password |
| | Confirm Password | Enter the new password again |
| | Modify Password | Change password by clicking Start |

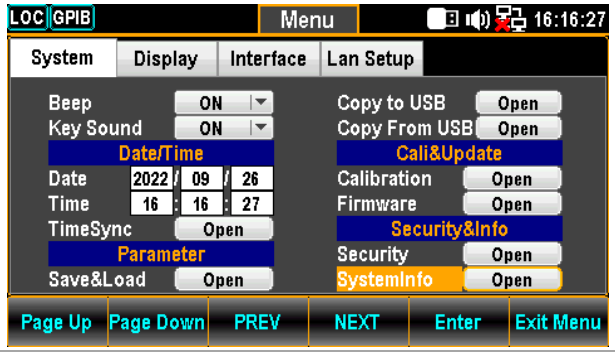
## View System Info

**Background** View system information including Vendor, Model Name, Serial Number, Master Firmware and Slave Firmware.

**Step**

1. Press the Menu key, the System configuration menu appears. And press the NEXT key repeatedly or scroll the Knob key to move to the Security&Info – SystemInfo field.




2. Press the F5 (Enter) key or Knob key to enter the System Information where all the critical contents are exposed for check.





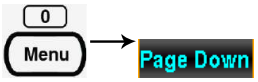

# Configure Display

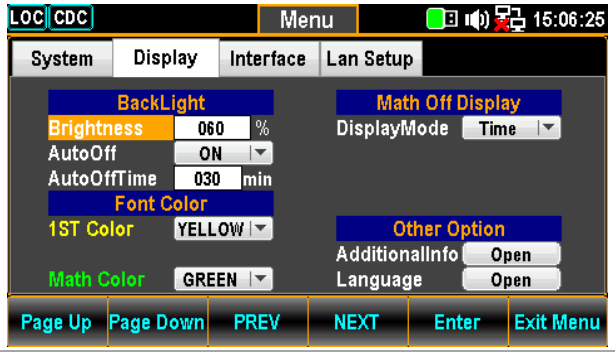
## Brightness Setting

**Background** Backlight brightness adjustment

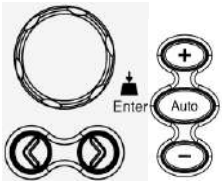
**Step**

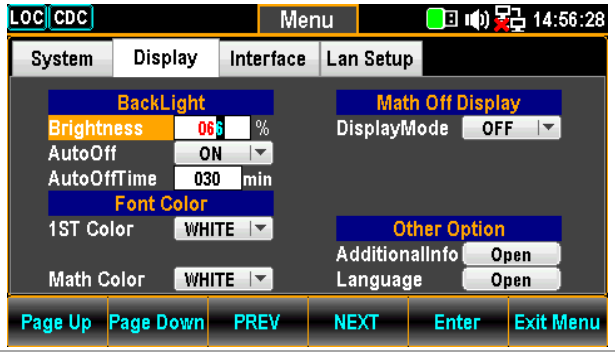
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



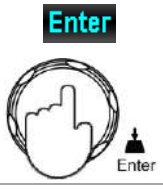




2. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define digit. Also, you can press Number keys to directly input a specific digit.




3. Press the F5 (Enter) key or Knob key to confirm the input digit for backlight brightness.



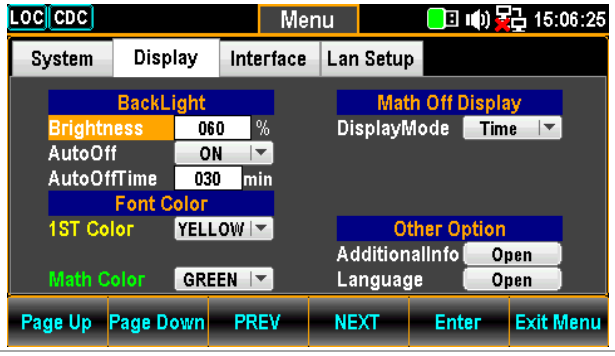
## Auto Off Setting

**Background** Enable or disable automatic brightness adjustment

**Step**

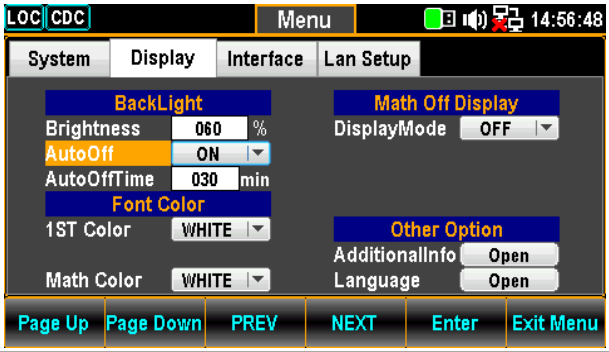
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



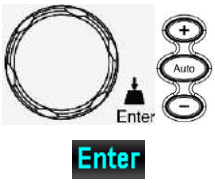



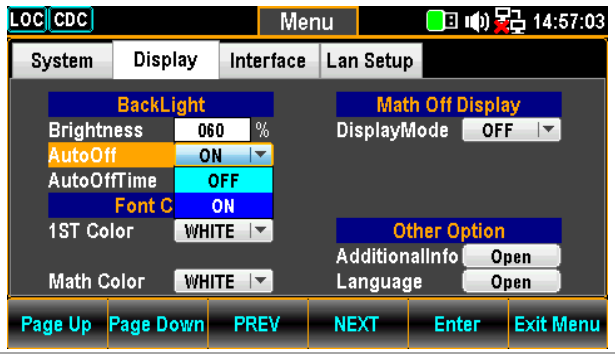

2. Press the NEXT key repeatedly or scroll the Knob key to move to the BackLight - AutoOff field.



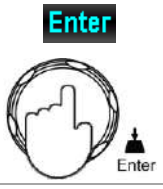




3. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to select the ON option.






4. Press the F5 (Enter) key or Knob key to confirm the ON option for AutoOff.




## Auto Off Time Setting

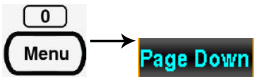
**Background**

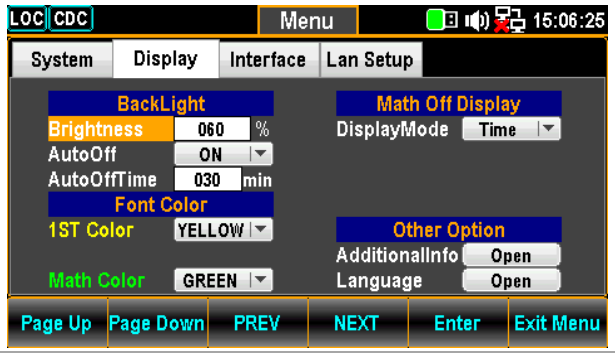
Set the duration before automatic brightness adjustment. When the machine has been idle for the set duration, the screen will change to automatic brightness adjustment.

⚠NOTE: Auto Off Time will be activated only when Auto Off option is turned ON.

**Step**

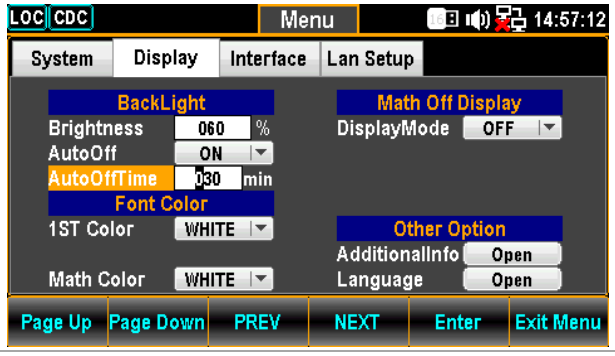
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



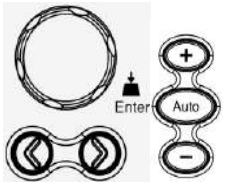



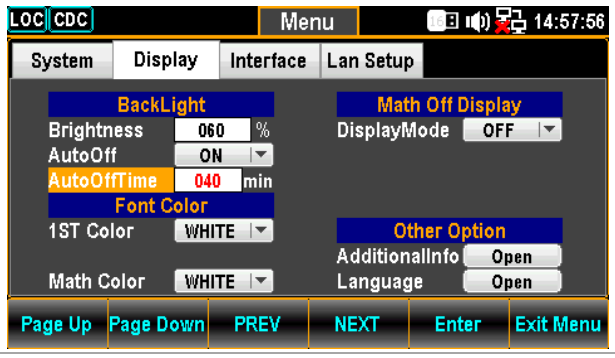

2. Press the NEXT key repeatedly or scroll the Knob key to move to the BackLight – AutoOffTime field.






3. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define minutes. Also, you can press Number keys to directly input a specific minutes.




4. Press the F5 (Enter) key or Knob key to confirm the input minutes for Auto Off Time.

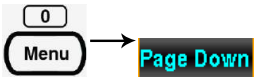


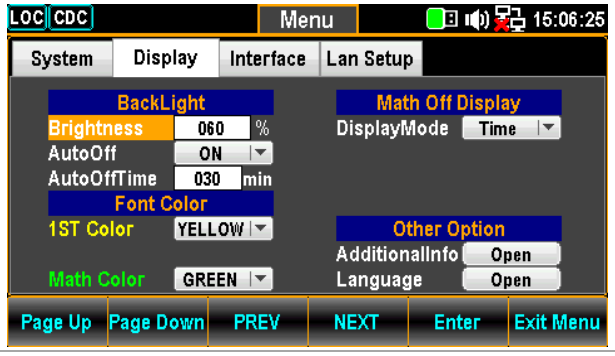
## 1ST Color Setting

**Background** Set the theme color of 1ST display

**Step**

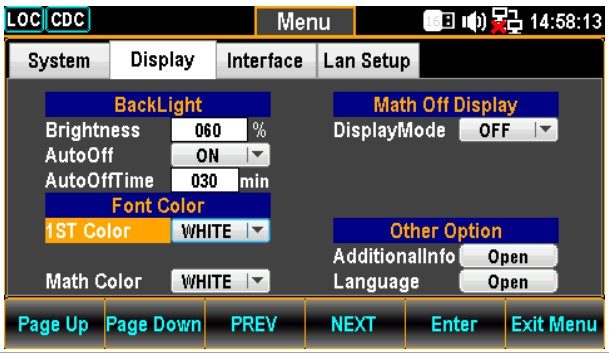
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



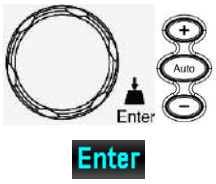



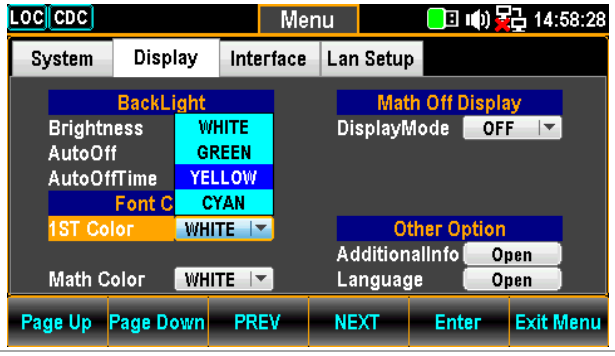

2. Press the NEXT key repeatedly or scroll the Knob key to move to the Font Color – 1ST Color field.




3. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to select desired color for 1ST display.



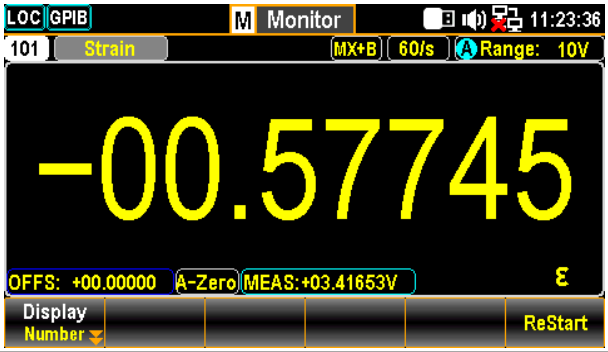



4. Press the F5 (Enter) key or Knob key to confirm the selected color.




Display result

The following figure demonstrates the defined yellow color for 1ST display.



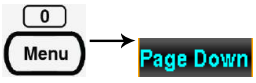

## Math Color Setting

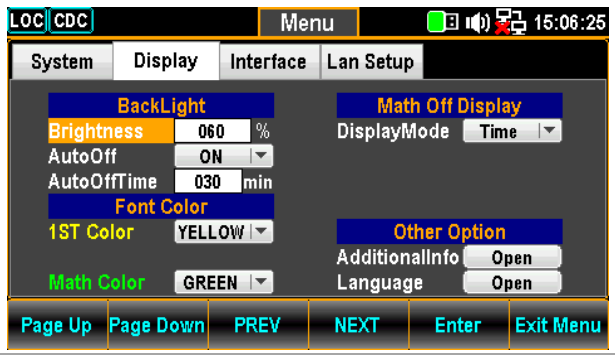
Background

Set the theme color of Math functions

Step

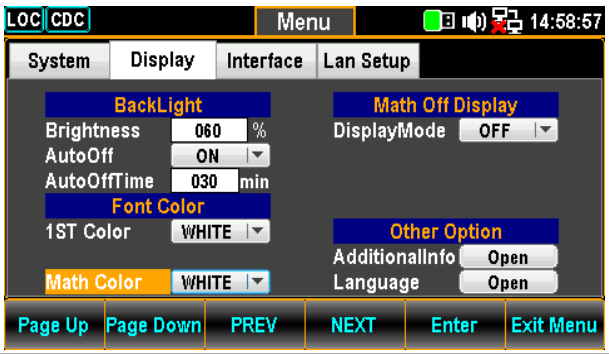
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



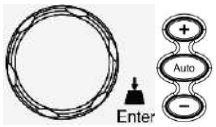



2. Press the NEXT key repeatedly or scroll the Knob key to move to the Font Color – Math Color field.

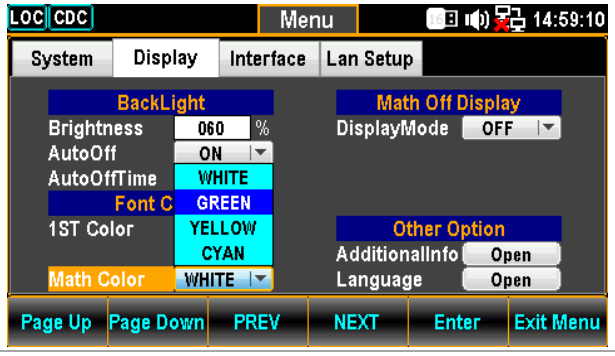



3. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to select desired color for Math display.

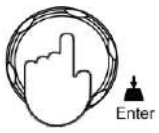



Enter



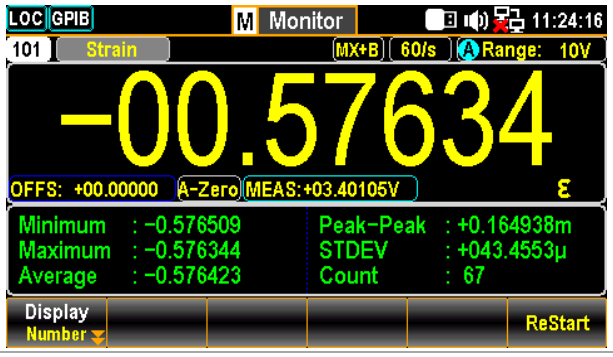

4. Press the F5 (Enter) key or Knob key to confirm the selected color.

Enter




Display result

The following figure demonstrates the defined green color for Math display.



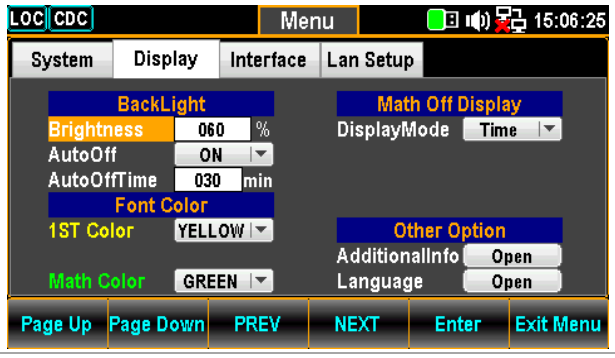

## Display Mode Setting

**Background** Enable or disable if time info or user-defined text is shown in the 1ST display only when MathDisp is off.

**Step**

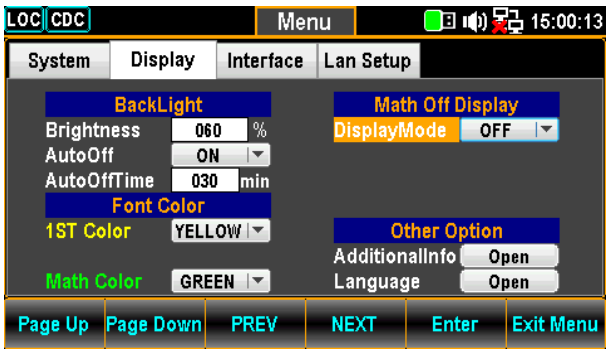
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



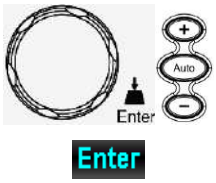

2. Press the NEXT key repeatedly or scroll the Knob key to move to the Math Off Display – DisplayMode field.



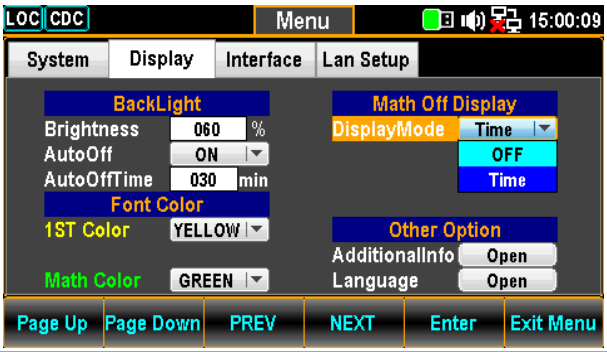



Time display

1. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to select the Time option.

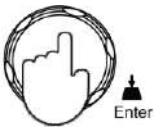


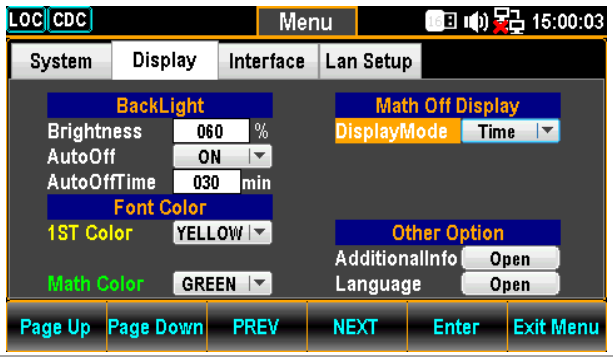

Enter




2. Press the F5 (Enter) key or Knob key to confirm the Time option.

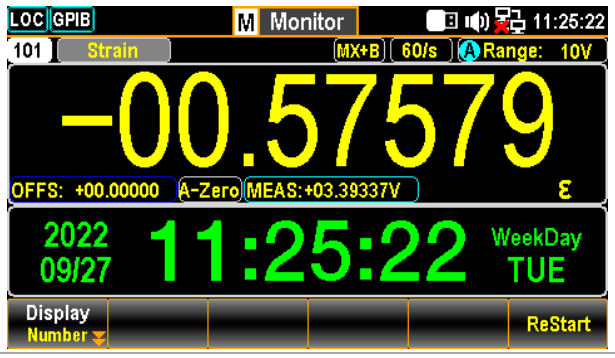
Enter




Display result

The following figure demonstrates the time info shown in the 1ST display.



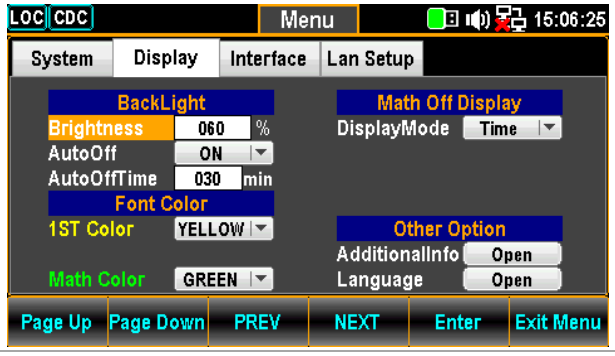
## Additional Info Setting

**Background** Enable or disable the additional information display.

**Step**

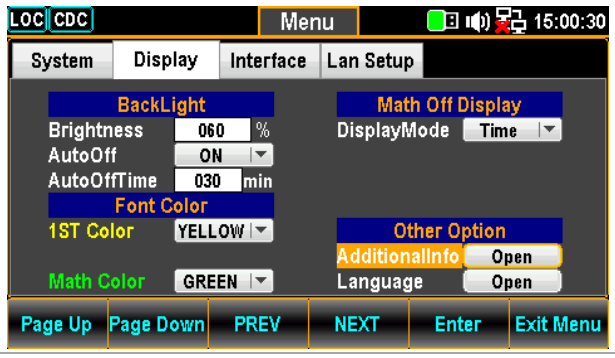
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



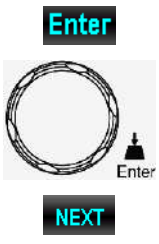



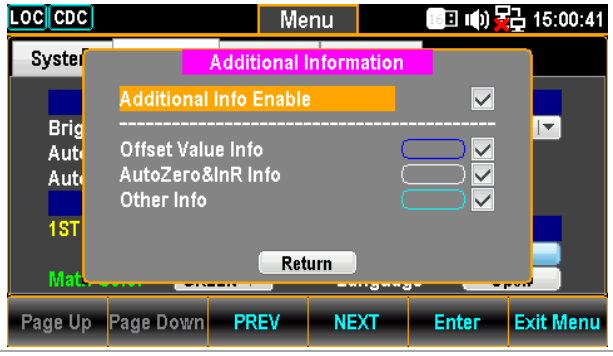

2. Press the NEXT key repeatedly or scroll the Knob key to move to the Other Option – AdditionalInfo field.




3. Press the F5 (Enter) key or Knob key to enter the Additional menu. Press the Next key or scroll the Knob key followed by pushing the F5 (Enter) key or Knob key to enable/disable each option. Move to the Return option followed by pressing the F5 (Enter) key or Knob key to have the setting take effect.

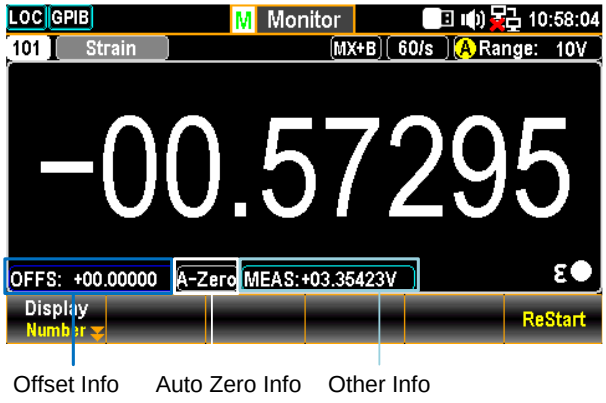





Display result

Take the Strain measurement with MX+B calculation for example as the figure below, we can clearly recognize the colors with info as follows.

- Offset Value Info is outlined by blue frame.
- Auto Zero Info is outlined by white frame.
- Other Info is outlined by cyan frame.



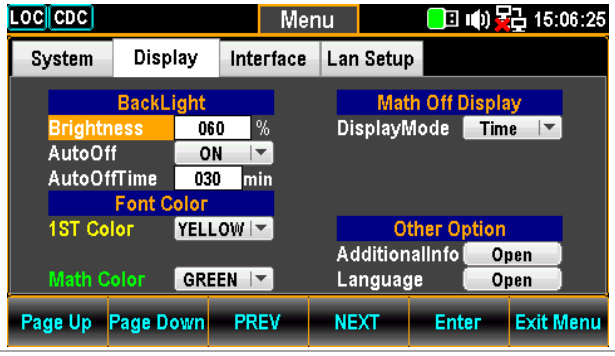
## Language Setting

**Background** Select language for user interface display.

**Step**

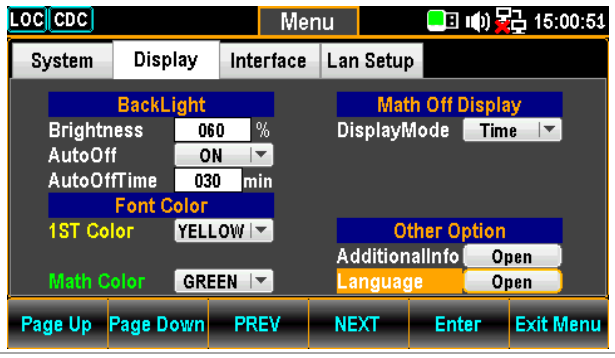
1. Press the Menu key followed by pressing the Page Down key repeatedly until the Display configuration menu appears.



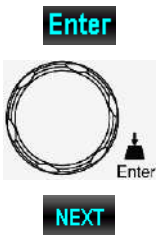




2. Press the NEXT key repeatedly or scroll the Knob key to move to the Other Option – Language field.



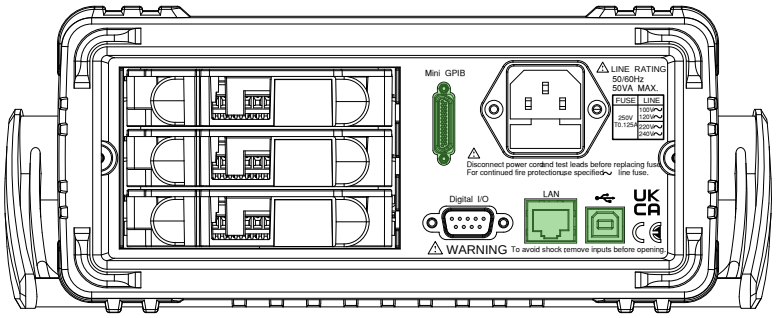

3. Press the F5 (Enter) key or Knob key to enter the Language menu. Press the Next key or scroll the Knob key followed by pushing the F5 (Enter) key or Knob key to select one of the language options. Move to the Return option followed by pressing the F5 (Enter) key or Knob key to have the setting take effect.



| | |
|---|---|
| Options | English |
| | 繁體中文 (Traditional Chinese) |
| | 简体中文 (Simplified Chinese) |



# REMOTE CONTROL




**Configure Interface ..... 199**
Return to Local Control Mode ..... 199
Configure SCPI ID Setting ..... 199
Configure USB Interface ..... 200
Set the USB Protocol ..... 205
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Activate Ethernet Interface ..... 209
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Remote Terminal Session (Telnet / TCP) ..... 225

**Web Control Interface ..... 226**

**Command Syntax ..... 230**

**Command Set ..... 233**

**Status system ..... 367**

# Configure Interface

## Return to Local Control Mode

**Background**

When the unit is in remote control mode, the RMT icon RMT above the main display can be seen. When this icon is not displayed, it indicates that the unit is in local control mode.

In order to switch back to the Local control mode (front panel operation), press the Shift key.



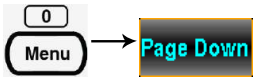

## Configure SCPI ID Setting

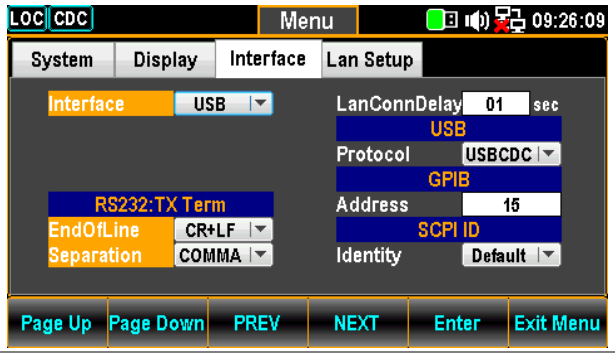
**Background**

The *IDN? query returns the manufacturer, model number, serial number and system firmware version number. When SCPI ID is set to User, a user defined manufacturer and model number is returned with the *IDN? query. Please see the SYSTem:IDNStr command on page 363 for details.

**Step**

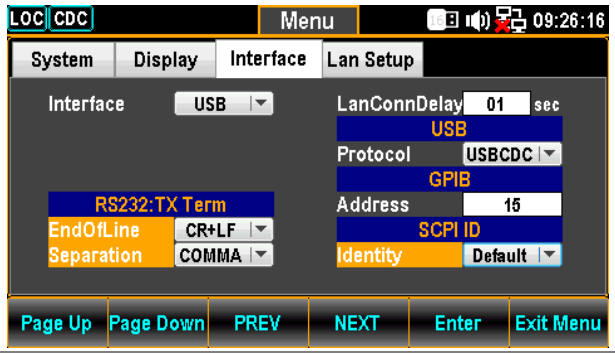
1. Press the Menu key, and then the Page Down key repeatedly until the Interface configuration menu appears.



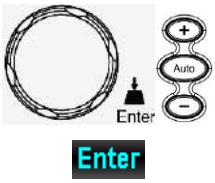



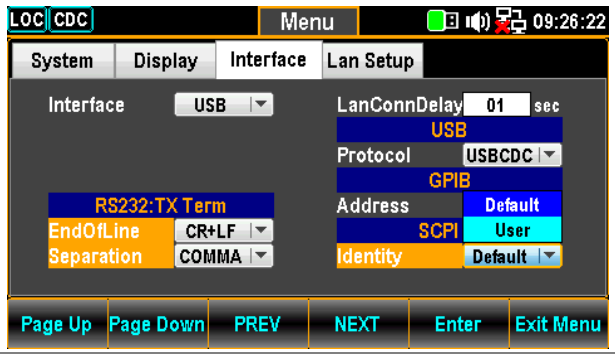

2. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the SCPI ID field.



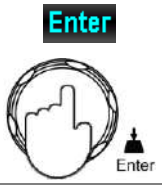



3. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the desired SCPI ID Identity option.




4. Press the F5 (Enter) key or Knob key again to confirm the desired SCPI ID Identity option

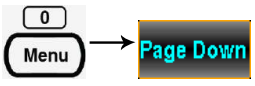


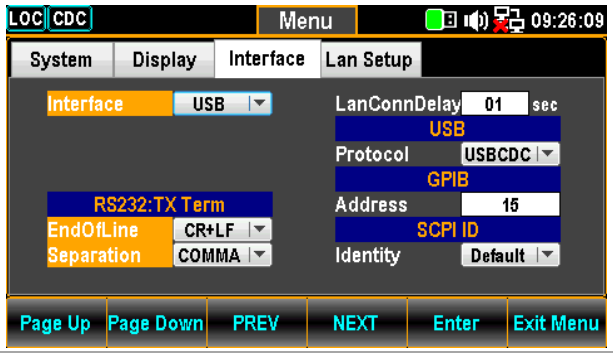

## Configure USB Interface

| | | | |
|---|---|---|---|
| USB | Configuration | PC side connector | Front panel, Type A, host |
| | | Unit side connector | Real panel, Type B, device |
| | | USB Speed | 2.0 (Full speed) |

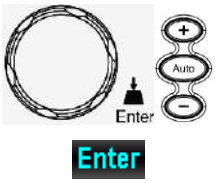
Steps

1. Press the Menu key, and then the Page Down key repeatedly until the Interface configuration menu appears.

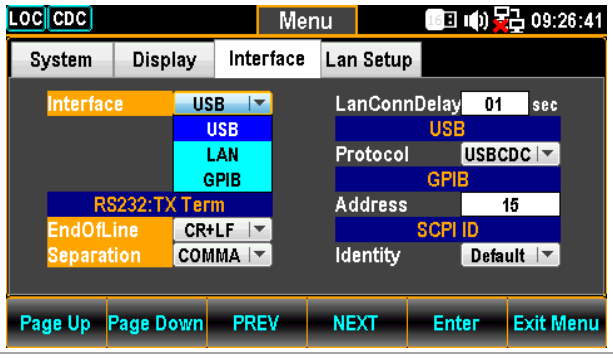





2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the USB option.

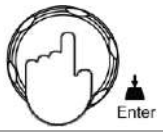



Enter



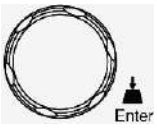

3. Press the F5 (Enter) key or Knob key to select the USB option.

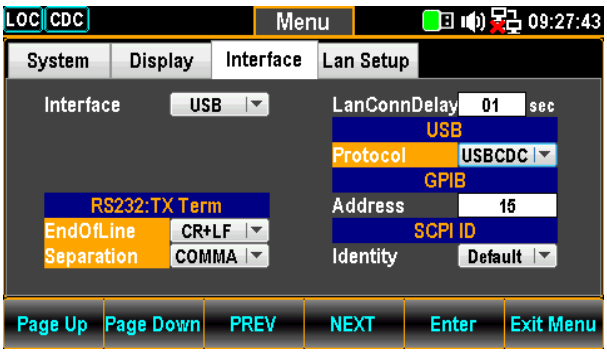
Enter



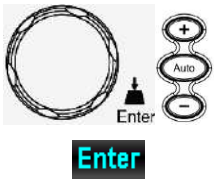

4. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the USB - Protocol field.

NEXT

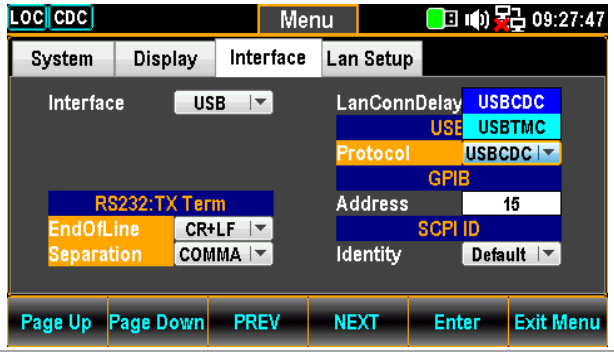


5. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the desired USB Protocol option.

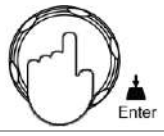



Enter




6. Press the F5 (Enter) key or Knob key again to confirm the USB Protocol option.

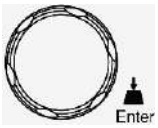
Enter

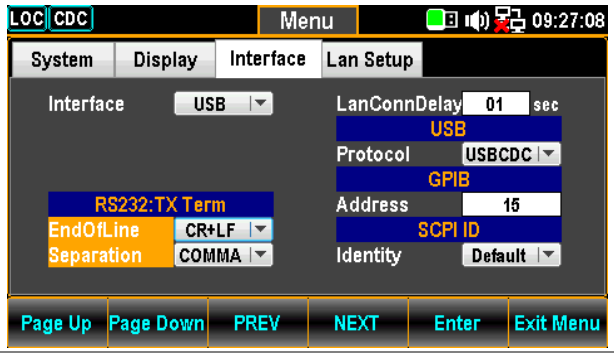



NOTE When "USBCDC" option is selected, user can proceed to the following RS232:TX Term relevant setting.

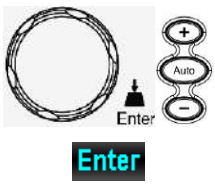
7. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the EndOfLine field.

NEXT

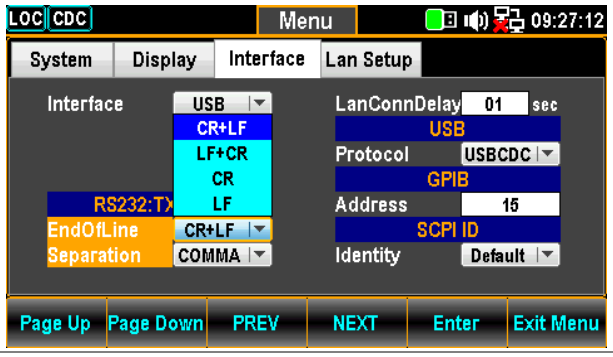


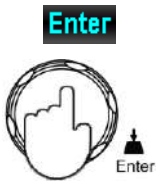

8. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the desired option of EndOfLine field.




Enter

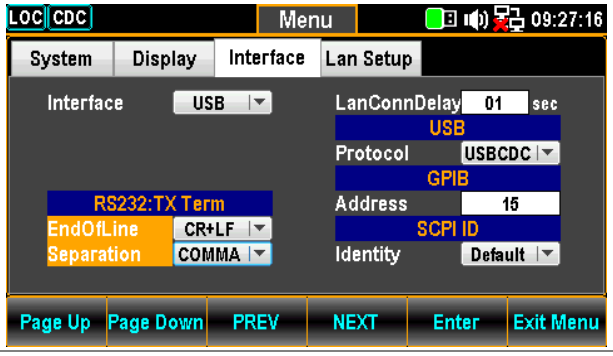



9. Press the F5 (Enter) key or Knob key again to confirm the selected option of EndOfLine field.

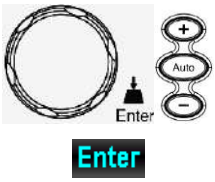


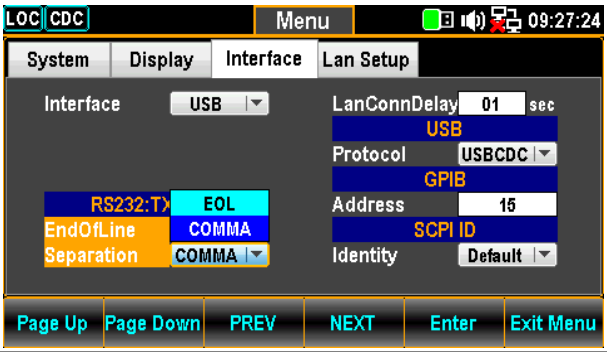

10. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Separation field.

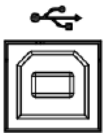



11. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the desired option of Separation field.



| | |
|---|---|
| 12. Press the F5 (Enter) key or Knob key again to confirm the selected option of Separation field. |  |
| 13. Connect the USB cable to the rear panel terminal (upper port). |  |

## Set the USB Protocol

Description

The USB device port on the rear panel is used for remote control. The USB port can be configured as either a TMC or CDC interface.

Before the DAQ-9600 can be used for remote control utilizing the CDC or TMC USB class, install the appropriate CDC or TMC USB driver included on the User Manual CD.

USBCDC:

The USB port on the DAQ-9600 will appear as a virtual COM port to a connected PC.

USBTMC:

The DAQ-9600 can be controlled using National Instruments NI-Visa software*. NI-Visa supports USB TMC.

NOTE

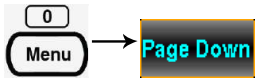
*To use the TMC interface National Instruments Measurement and Automation Explorer can be used. This program is available on the NI website, www.ni.com., via a search for the VISA Run-time Engine page, or "downloads" at the following URL, http://www.ni.com/visa/

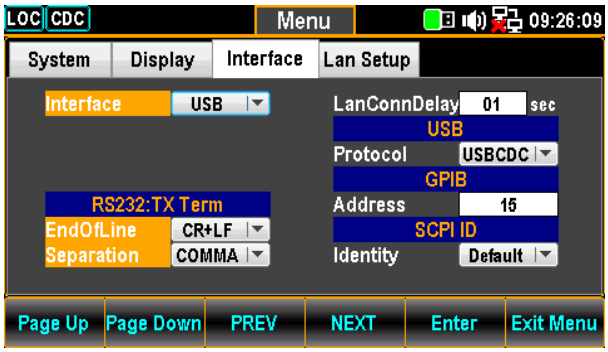
## Configure GPIB Interface

| | | |
|---|---|---|
| GPIB Configuration | Connector | 24 Pin female GPIB port |
| | Address | 0-30(default 15) |

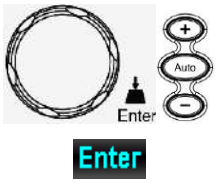
Step

1. Press the Menu key, and then the Page Down key repeatedly until the Interface configuration menu appears.

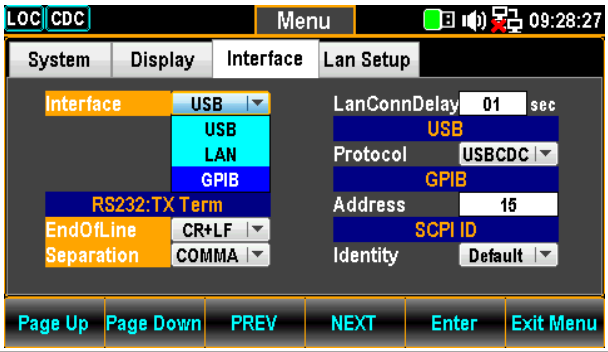



2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the GPIB option.

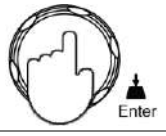



Enter



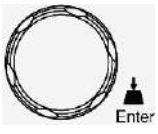

3. Press the F5 (Enter) key or Knob key to select the GPIB option.

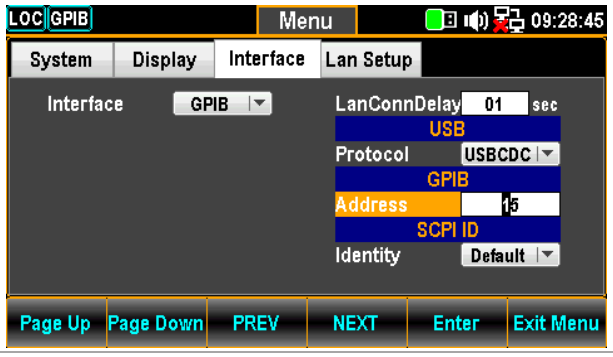
Enter



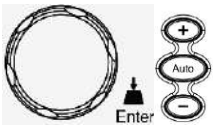

4. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the GPIB - Address field.

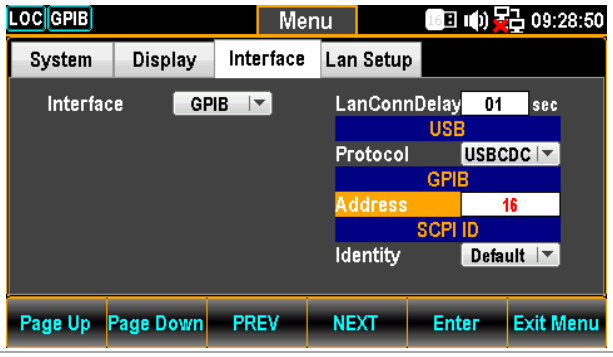
NEXT



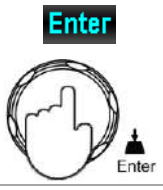



5. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define GPIB Address. Also, you can press Number keys to directly input a specific digit.

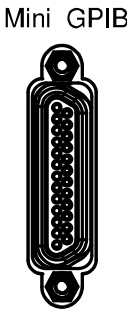



6. Press the F5 (Enter) key or Knob key again to confirm the input digit for GPIB Address.

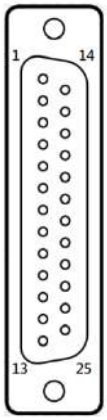


7. Connect the GPIB cable to the mini GPIB port from the rear panel of DAQ-9600.




GPIB Pin Assignment

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | Data I/O 1 | | |
| 2 | Data I/O 2 | 14 | Data I/O 6 |
| 3 | Data I/O 3 | 15 | Data I/O 7 |
| 4 | Data I/O 4 | 16 | Data I/O 8 |
| 5 | EOI | 17 | REN |
| 6 | DAV | 18 | Ground (DAV) |
| 7 | NRFD | 19 | Ground (NRFD) |
| 8 | NDAC | 20 | Ground (NDAC) |
| 9 | IFC | 21 | Ground (IFC) |
| 10 | SRQ | 22 | Ground (SRQ) |
| 11 | ATN | 23 | Ground (ATN) |
| 12 | SHIELD Ground | 24 | Logic Ground |
| 13 | Data I/O 5 | 25 | NC |



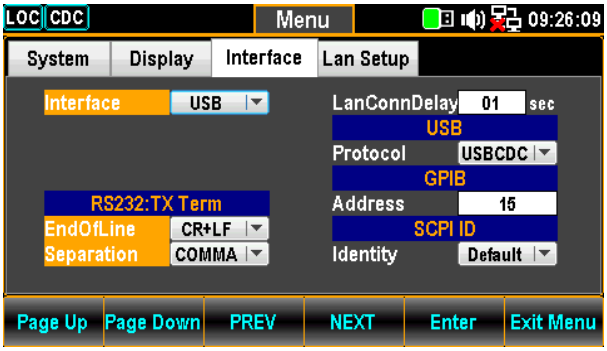
## Activate Ethernet Interface

| Overview | Speed | 10BaseT/100BaseTx |
|---|---|---|

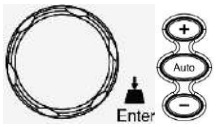
**Ethernet(LAN) port activation**

1. Press the Menu key, and then the Page Down key repeatedly until the Interface configuration menu appears.

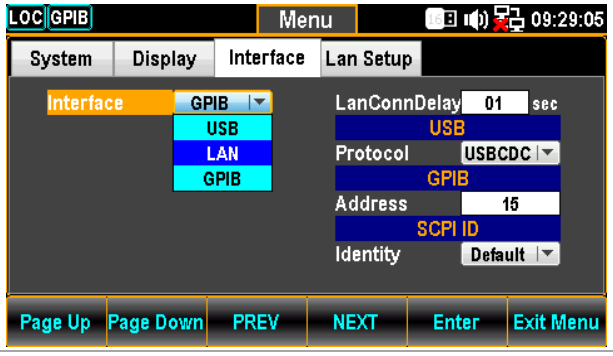



2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the LAN option.




Enter

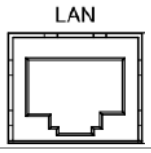



3. Press the F5 (Enter) key or Knob key to select the LAN option.

Enter




4. Connect the Ethernet cable to the rear panel Ethernet port.



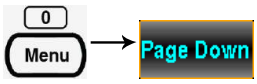
## LAN Connect Delay Time

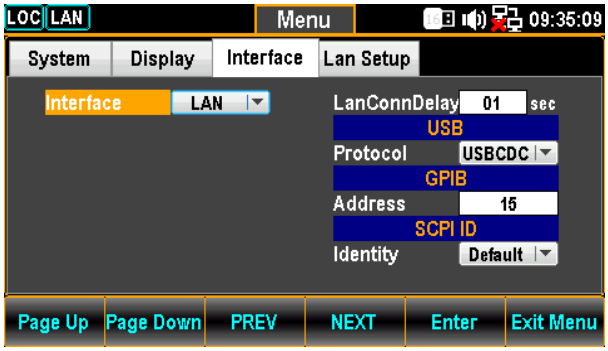
**Background**

User is able to set a delay time in second(s) for LAN connection when booting up the DAQ-9600.

**LAN Connect Delay Setting**

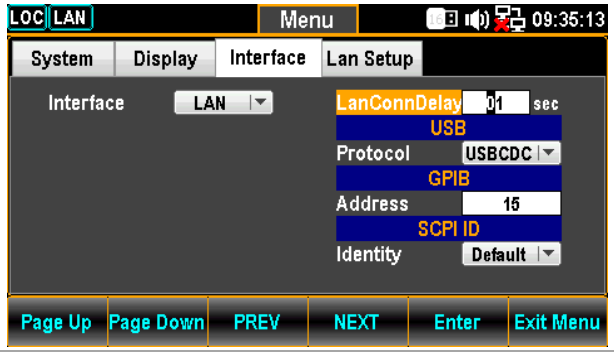
1. Press the Menu key, and then the Page Down key repeatedly until the Interface configuration menu appears.



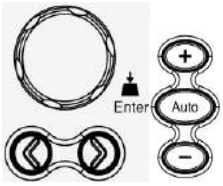



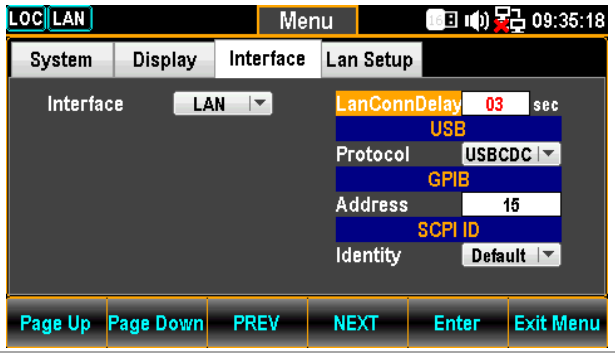

2. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to LAN Connect Delay Time.



3. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to set LAN Connect Delay Time. Also, you can press Number keys to directly input a specific digit.




4. Press the F5 (Enter) key or Knob key again to confirm the LAN Connect Delay Time.

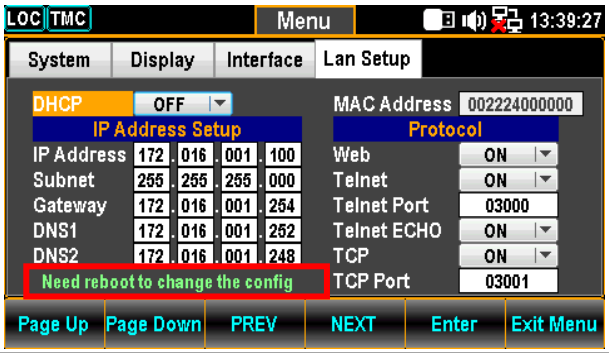



## Reboot LAN Setup

**Background**

To reboot is used to reset the Ethernet configuration when new settings have been made. When the Lan Setup settings have been edited, reboot to validate the changes and reset the Ethernet to the new configuration settings. New Ethernet configuration settings are only updated after the DAQ-9600 has been reset.

NOTE



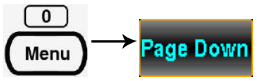
## Configure Ethernet Interface to DHCP

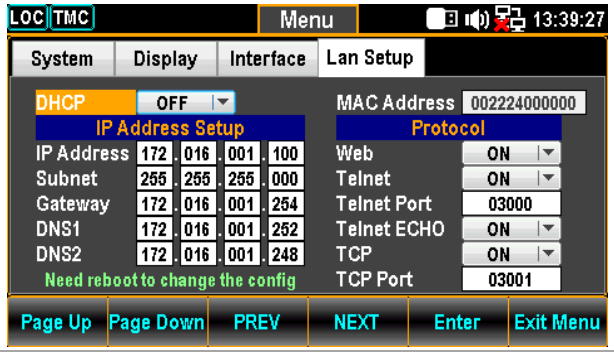
**Background**

The DAQ-9600 supports DHCP to have an IP address and other configuration parameters automatically assigned by a DHCP server.

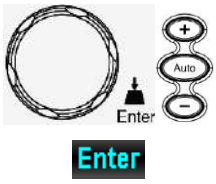
**DHCP Configuration**

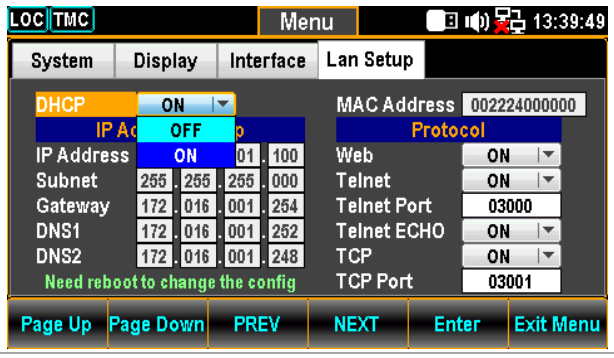
1. Press the Menu key, and then the Page Down key repeatedly until the Lan Setup configuration menu appears.




2. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.




3. Press the F5 (Enter) key or Knob key to select the DHCP ON option.



## Configure Ethernet IP

**Background**

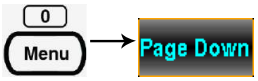
The DAQ-9600 supports manually setting of IP addresses, including the subnet mask, gateway, DNS1 and DNS2.

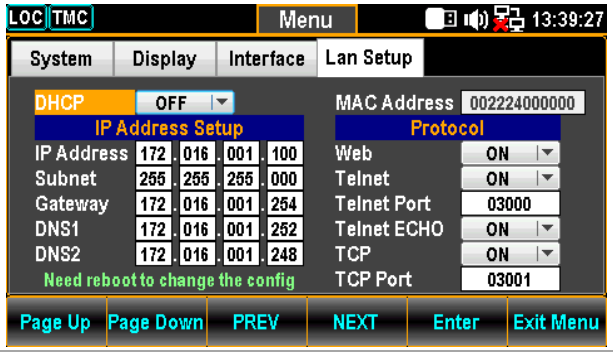
**NOTE**

The IP Address Setup can only be edited if DHCP is off.

**IP Address Configuration**

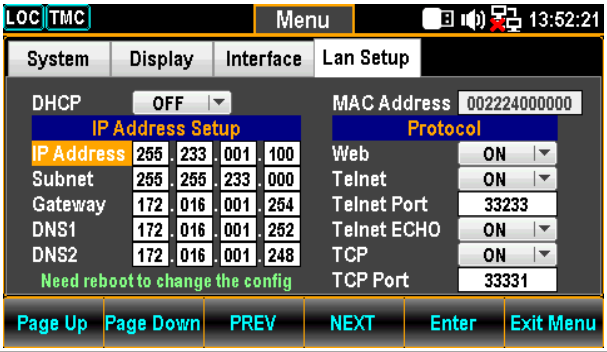
1. Press the Menu key, and then the Page Down key repeatedly until the Lan Setup configuration menu appears.



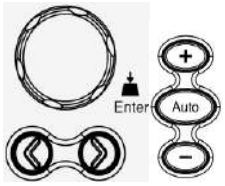



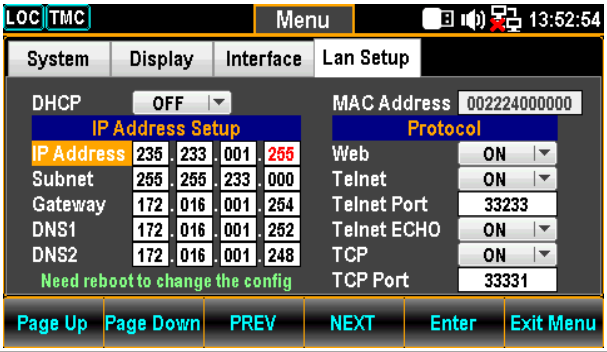

2. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the IP Address Setup – IP Address field.



3. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define IP Address. Also, you can press Number keys to directly input a specific digit.




4. Press the F5 (Enter) key or Knob key to confirm the input digit for IP1 Address. And the cursor will automatically jump to next groups.




5. Repeat the steps 3 to 4 for IP2, IP3 and IP4.

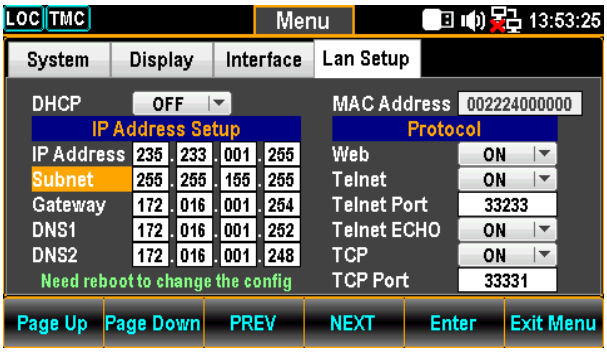
NOTE

The IP address is divided in 4 groups; IP1:IP2:IP3:IP4.

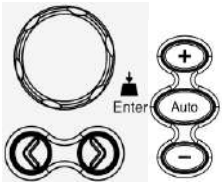
## Subnet Configuration

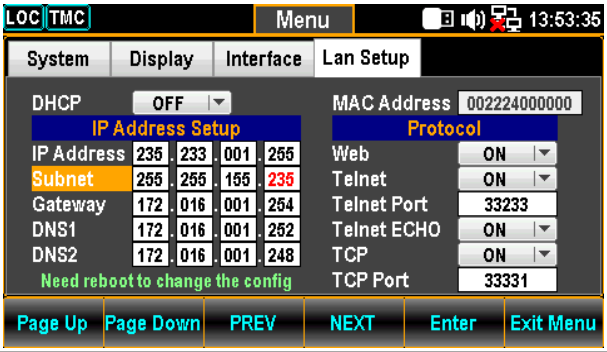
6. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the IP Address Setup – Subnet field.



7. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define Subnet. Also, you can press Number keys to directly input a specific digit.




8. Press the F5 (Enter) key or Knob key again to confirm the input digit for S1. And the cursor will automatically jump to next groups.




9. Repeat steps 7 to 8 for S2, S3 and S4.

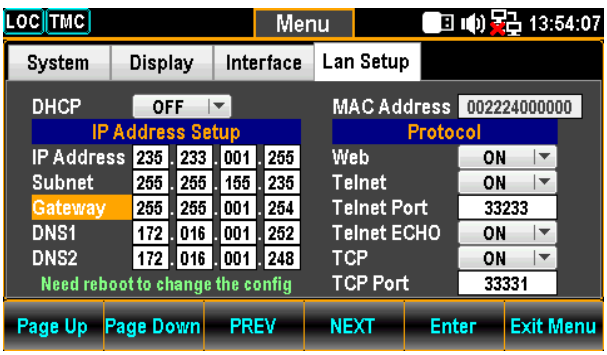
NOTE

The Subnet is divided in 4 groups; S1:S2:S3:S4.

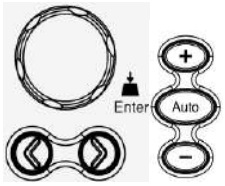
Gateway Configuration

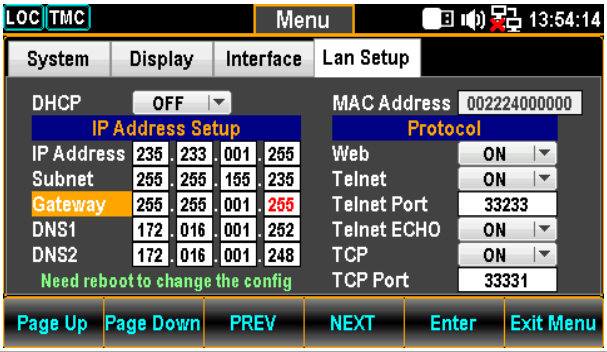
10. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the IP Address Setup – Gateway field.



11. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define Gateway. Also, you can press Number keys to directly input a specific digit.




12. Press the F5 (Enter) key or Knob key to confirm the input digit for G1. And the cursor will automatically jump to next groups.




13. Repeat steps 11 to 12 for G2, G3 and G4.

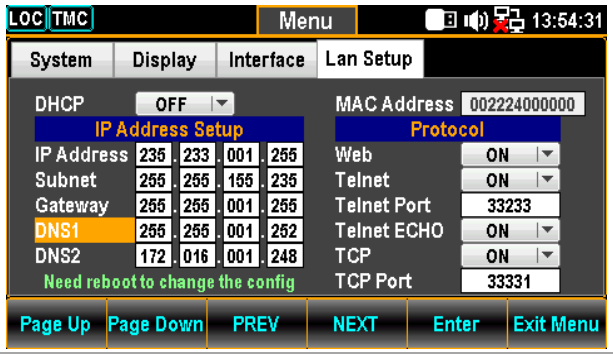
NOTE

The Gateway is divided in 4 groups; G1:G2:G3:G4.

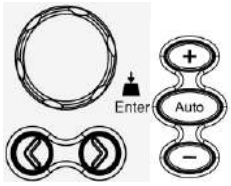
DNS1 Configuration

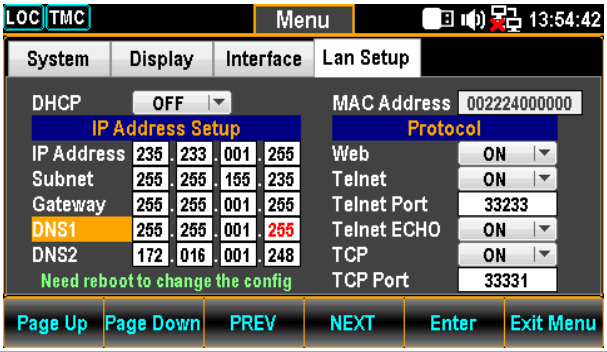
14. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the IP Address Setup – DNS1 field.



15. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define DNS1. Also, you can press Number keys to directly input a specific digit.




16. Press the F5 (Enter) key or Knob key again to confirm the input digit for D11. And the cursor will automatically jump to next groups.




17. Repeat steps 15 to 16 for D12, D13 and D14.

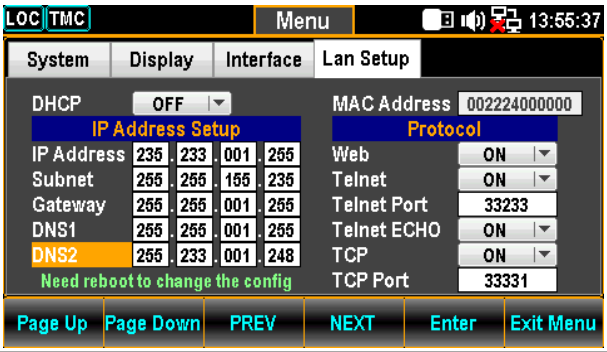
NOTE

The Gateway is divided in 4 groups; D11:D12:D13:D14.

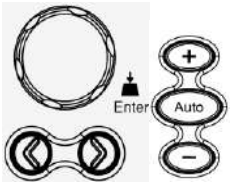
DNS2 Configuration

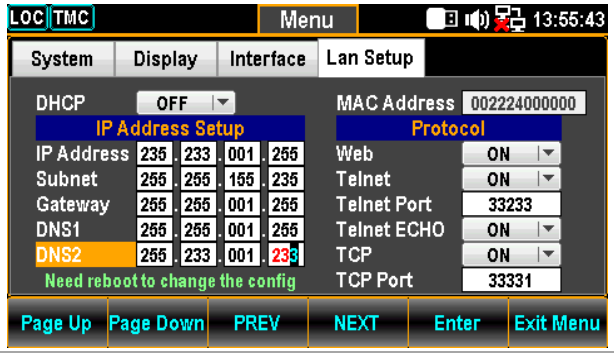
18. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the IP Address Setup – DNS2 field.



19. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define DNS2. Also, you can press Number keys to directly input a specific digit.




20. Press the F5 (Enter) key or Knob key again to confirm the input digit for D21. And the cursor will automatically jump to next groups.




21. Repeat steps 20 to 21 for D22, D23 and D24.

NOTE The Gateway is divided in 4 groups; D21:D22:D23:D24.

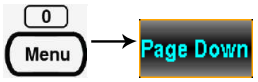
## Configure Protocol

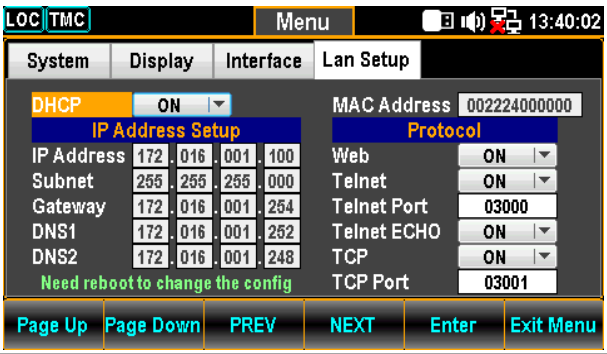
**Background**

The DAQ-9600 supports 3 Ethernet protocol to used, including the Web browser, Telnet and TCP.

**Web Configuration**

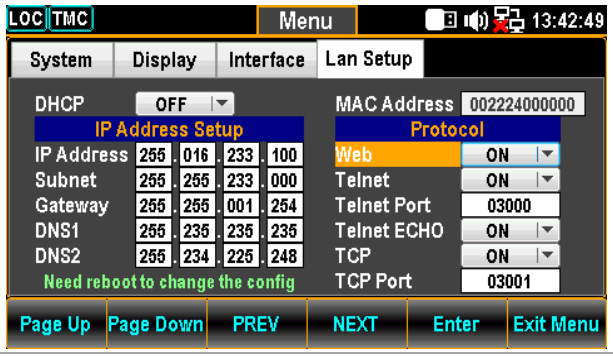
1. Press the Menu key, and then the Page Down key repeatedly until the Lan Setup configuration menu appears.



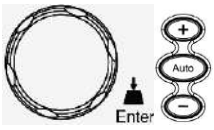




2. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol – Web field.

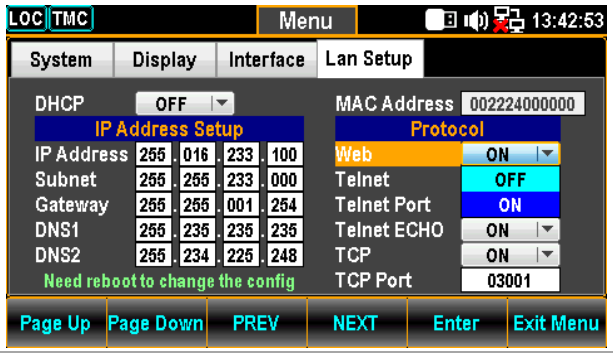



3. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.




Enter



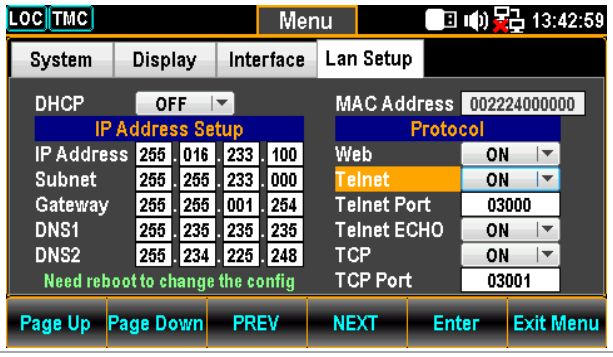

4. Press the F5 (Enter) key or Knob key to confirm the Web ON option.



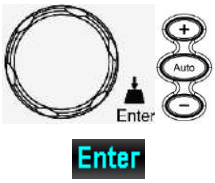

Telnet Configuration

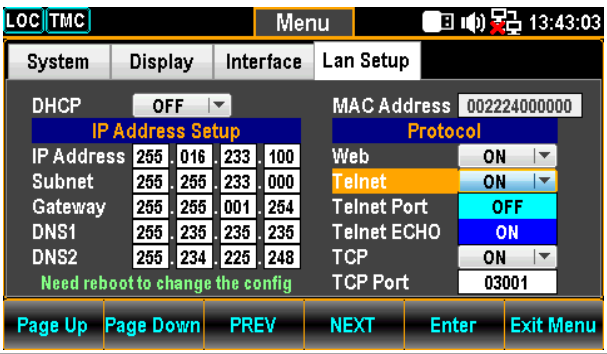
5. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol – Telnet field.



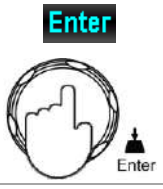




6. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.



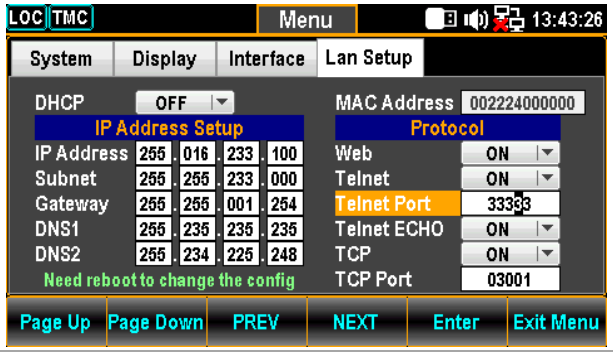
7. Press the F5 (Enter) key or Knob key to confirm the Telnet ON option.



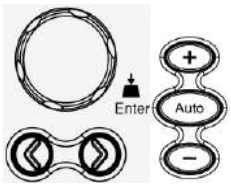

## Telnet Port Configuration

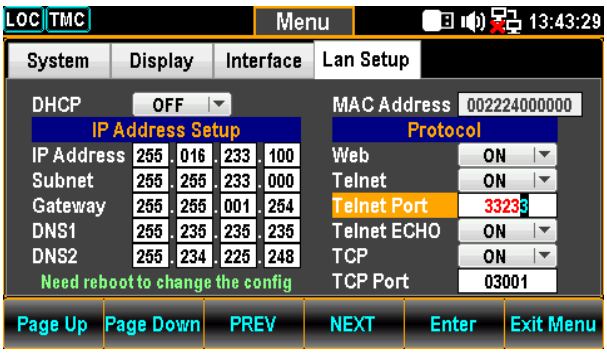
8. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol – Telnet Port field.




9. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define Telnet Port. Also, you can press Number keys to directly input a specific digit.



10. Press the F5 (Enter) key or Knob key to confirm the input digit for Telnet Port.

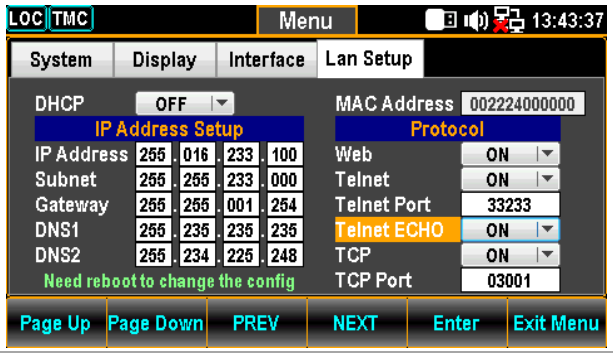



Telnet Port 1024~65535 (Default = 5024)

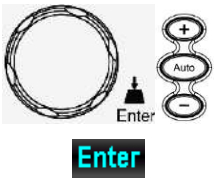
Telnet ECHO Configuration

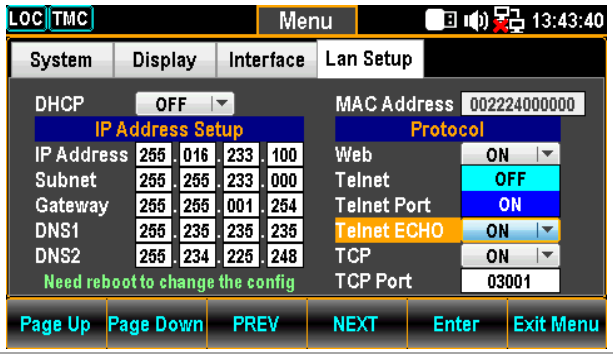
11. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol – Telnet ECHO field.



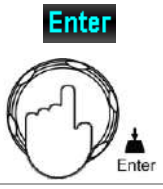




12. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.



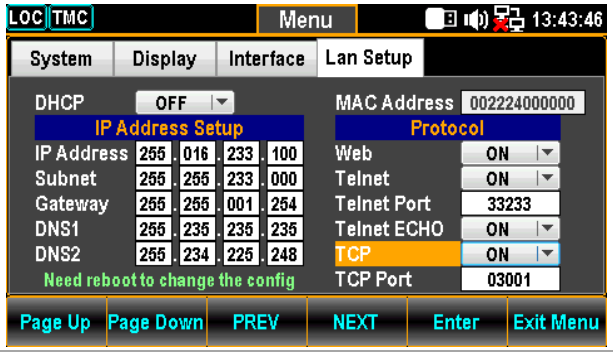
13. Press the F5 (Enter) key or Knob key again to confirm the Telnet ECHO ON option.



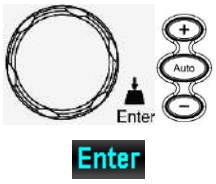

TCP Configuration

14. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol - TCP field.



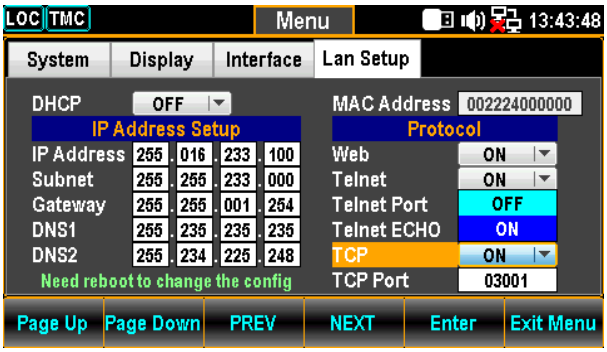




15. Press the F5 (Enter) key or Knob key followed by scrolling Knob key or pressing +/- keys to land on the ON option.

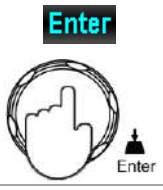








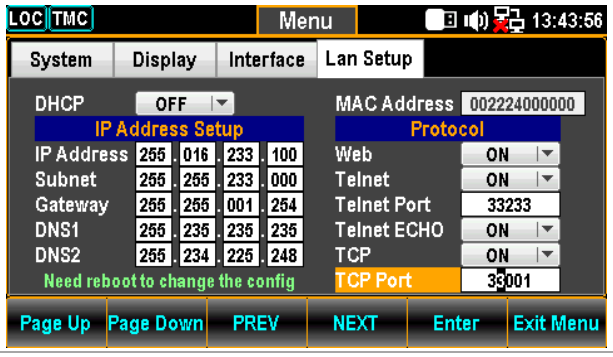

16. Press the F5 (Enter) key or Knob key again to confirm the TCP ON option



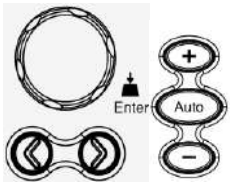

TCP Port Configuration

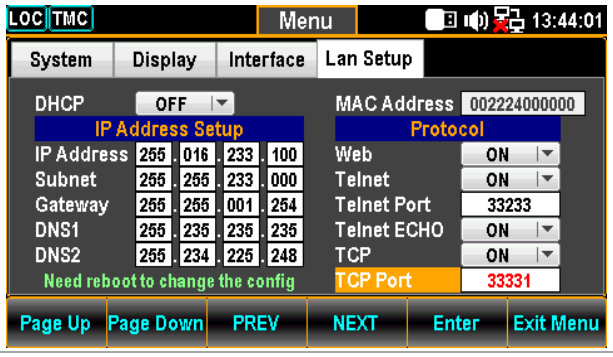
17. Press the F4 (NEXT) key repeatedly or scroll the Knob key to move to the Protocol – TCP Port field.






18. Use the Left/Right keys to move the cursor followed by scrolling Knob key or pressing +/- keys to define TCP Port. Also, you can press Number keys to directly input a specific digit.




TCP Port 1024~65535 (Default = 5025)

19. Press the F5 (Enter) key or Knob key again to confirm the input digit for TCP Port.



## Remote Terminal Session (Telnet / TCP)

| | |
|---|---|
| Background | A terminal application can be used to remotely control the DAQ-9600 via the Telnet or TCP protocol. |
| Operation | 1. Establish a connection via the Ethernet port. |
| | 2. Open a terminal program such as Hyper Terminal and enter the IP address and port number of the DAQ-9600. |
| | 3. Run this query via the terminal application:<br>*idn?<br>The command will return the instrument manufacturer, model number, serial number and firmware version in the following format:<br>>GWInstek,DAQ9600,000000000,M0.69B_S0.25B |
| | 4. See page 230 for more details on remote commands. |

# Web Control Interface

The web control interface is accessible with the standard Ethernet port. The web control interface allows remote access over LAN using a Java-enabled web browser (Java only applicable to Internet Explorer).

The web control interface allows a web browser to modify parameter settings, remotely operate, control and monitor the DAQ-9600.

Telnet and TCP parameters can also be edited by using the web control interface so that applets such as HyperTerminal or Telnet can be used to monitor measurement readings, control settings and run programs utilizing the same remote control command set used with the RS232 remote control.

| | |
|---|---|
| Background | Before trying to access the web browser control interface, please ensure your browser has JavaScript enabled. |
| Step 1 - Connection | 1. Configure the LAN interface and connect the DAQ-9600 to the LAN.. |
| | 2. Enter the IP address of the DAQ-9600 in the address field of the web browser. |
| | 3. The web control Welcome Page appears. |




DAQ-9600 Welcome Page

Step 2 - Web Control

1. To start web control, click on the Web Control icon.




2. The control panel display, which is identical to that of the physical DAQ-9600, appears.




Step 2-1 - Configuration

3. Set the basic operations and monitor measurement readings, and press apply button to enable the control settings when parameters have been changed.
4. Proceed to operation settings in the way similar to operations on the physical DAQ-9600.




Step 3 - View and Modify LAN Configuration

The current Ethernet settings can be viewed and modified from the web control interface.

1. To edit or view the current configuration settings, click on the View & Modify Configuration icon.




2. The configuration settings appear.

### Miscellaneous Settings

| | |
|---|---|
| Name: | DAQ |
| Serial Number: | GRD332211 |
| Master Firmware: | 0.89 |
| Slave Firmware: | 0.95 |
| IP Address: | 192.168.31.80 |
| MAC Address: | 00-22-24-33-22-11 |

### IP Address Settings

| | |
|---|---|
| Address Type: | DHCP |
| Static IP Address: | 192 . 168 . 31 . 80 |
| Subnet Mask: | 255 . 255 . 248 . 0 |
| Default Gateway: | 192 . 168 . 31 . 254 |
| DNS: | 172 . 16 . 1 . 248 , 172 . 16 . 1 . 252 |
| Update Settings | |

### General Configuration Settings

| | |
|---|---|
| Module Name: | DAQ |
| TCP Enable: | ON |
| TCP port number: | 3001 (1024~65535) |
| Telnet Enable: | ON |
| Telnet port number: | 3000 (1024~65535) |
| Telnet ECHO: | ON |
| Telnet Timeout: | 0 seconds(0 for no timeout) |
| Update Settings | |

### Password Modify

| | |
|---|---|
| Old Password: | (4-8 characters numeric) |
| New Password: | (4-8 characters numeric) |
| Confirm Password: | |
| Modify | |

### Restore Factory Defaults

| | |
|---|---|
| Restore all options to their factory default states: | Restore Defaults |

### DAQ Reset

| | |
|---|---|
| DAQ need Reset If Parameter has Change: | Reset |

3. The View & Modify Configuration page allows you to:

   - View the instrument name, firmware revision of the Ethernet card, IP address and MAC address.
   - Set the IP address to DHCP or static.
   - Configure the module host name and the parameters of TCP & telnet.
   - Modify the web password.
   - Restore the Ethernet to the factory default settings (equivalent to the INIT function).
   - Reset: reboot to make the new setting take effect when any parameter is modified.

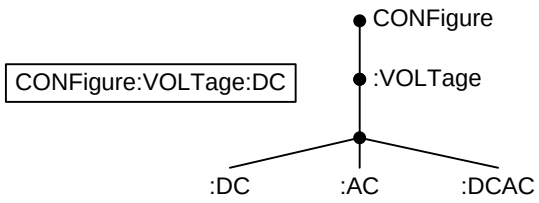
# Command Syntax

| | | |
|---|---|---|
| Compatible Standard | IEEE488.2 | Partial compatibility |
| | SCPI, 1994 | Partial compatibility |

**Command Structure**

SCPI (Standard Commands for Programmable Instruments) commands follow a tree-like structure, organized into nodes. Each level of the command tree is a node. Each keyword in a SCPI command represents each node in the command tree. Each keyword (node) of a SCPI command is separated by a colon (:).

For example, the diagram below shows an SCPI sub-structure and a command example.




**Command Types**

There are a number of different instrument commands and queries. A command sends instructions or data to the unit and a query receives data or status information from the unit.

| Command types | |
|---|---|
| Simple | A single command with/without a parameter |
| Example | CONFigure:VOLTage:DC |
| Query | A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned. |
| Example | CONFigure:RANGe? |

**Command Forms**

Commands and queries have two different forms, long and short. The command syntax is written with the short form of the command in capitals and the remainder (long form) in lower case.

The commands can be written either in capitals or lower-case, just so long as the short or long forms are complete. An incomplete command will not be recognized.

Below are examples of correctly written commands.

| | | |
|---|---|---|
| | Long form | CONFigure:DIODe<br>CONFIGURE:DIODE<br>Configure:diode |
| | Short form | CONF:DIOD<br>conf:diod |

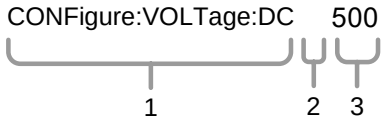
**Square Brackets**

Commands that contain square brackets indicate that the contents are optional. The function of the command is the same with or without the square bracketed items, as shown below. For example, for the query:

[SENSe:]UNIT?

Both SENSe:UNIT? and UNIT? are valid forms.

**Command Format**




1. Command header
2. Space
3. Parameter 1

**Common Input Parameters**

| Type | Description | Example |
|---|---|---|
| <Boolean> | boolean logic | 0, 1 |
| <NR1> | integers | 0, 1, 2, 3 |
| <NR2> | decimal numbers | 0.1, 3.14, 8.5 |
| <NR3> | floating point with exponent | 4.5e-1, 8.25e+1 |
| <NRf> | any of NR1, 2, 3 | 1, 1.5, 4.5e-1 |
| [MIN] (Optional parameter) | For commands, this will set the setting to the lowest value. This parameter can be used in place of any numerical parameter where indicated.<br>For queries, it will return the lowest possible value allowed for the particular setting. | |

| | | |
|---|---|---|
| | [MAX] (Optional parameter) | For commands, this will set the setting to the highest value. This parameter can be used in place of any numerical parameter where indicated.<br>For queries, it will return the highest possible value allowed for the particular setting. |
| | DEF | For commands, this will set the setting to the default value. This parameter can be used in place of any numerical parameter where indicated.<br>For queries, it will return the default value allowed for the particular setting. |
| Automatic parameter range selection | The DAQ-9600 automatically sets the command parameter to the next available value. | |
| | Example | conf:volt:dc 3<br>This will set the measurement item to DC Voltage and the range to 10V. There is no 3V range so the DMM selects the next available range, 10V. |
| Message Terminator (EOL) | Remote Command | Marks the end of a command line. The following messages are in accordance with IEEE488.2 standard. |
| | | LF, CR, CR+LF, LF+CR — The most common EOL character is CR+LF |
| Message Separator | EOL or ; (semicolon) | Command Separator |

# Command Set

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## Other Commands

### ABORt

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

●If a scan is in progress when the command is received, the scan will not be completed and you cannot resume the scan from where it left off. Note that if you initiate a new scan, all readings are cleared from reading memory.

### FETCh?

Waits for measurements to complete and copies all available measurements to the instrument's output buffer. The readings remain in reading memory will not be erased when read with this command.

Example:

```
CONF:VOLT:DC 1,(@103, 105, 109)
TRIG:SOUR EXT
INIT
FETC?
```

Returns: +4.98748741E-01,+4.35163427E-01,+4.33118686E-01

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

●You can save up to 100,000 readings in reading memory and all readings are automatically time stamped. If reading memory overflows, the new readings will overwrite the first (oldest) readings saved; the most recent readings are always preserved. No error is generated, but the Reading Memory Overflow bit (bit 12) is set in the Questionable Data Register's condition register.

●Each time you start a new scan, the instrument clears all readings (including alarm data) saved in reading memory from the previous measurement. Therefore, the contents of reading memory are always from the most recent scan.

## INITiate[:IMMediate]

Changes the state of the triggering system from "idle" to "wait-for-trigger", and clears the previous set of measurements from reading memory. Measurements will begin when the specified trigger conditions are satisfied following the receipt of INIT command.

Example:

```
CONF:VOLT:DC 10,(@101, 107)
TRIG:SOUR BUS
INIT
*TRG
FETC?
```

Returns: +4.98748741E-01,+4.35163427E-01

●Storing measurements in reading memory with INITiate is faster than sending measurements to the instrument's output buffer using READ? (provided you do not send FETCh? until done).

●The INITiate command is also an "overlapped" command. This means that after executing INITiate, you can send other commands that do not affect the measurements.

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

●Once you initiate a scan, an error will be generated if you attempt to change any measurement parameters (CONFigure and SENSe commands) or the triggering configuration (TRIGger commands).

●Use ABORt command to return to idle.

## INSTrument:DMM

Enables (On) or disables (Off) the internal DMM.

Syntax: INSTrument:DMM {OFF|ON}
Query Syntax: INSTrument:DMM?

Parameter: 0 | 1 | OFF | ON
Return Parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
INST:DMM ON
```

●When you change the state of the internal DMM, the instrument issues a Factory Reset (*RST command).

R?

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

Query Syntax: R? [<reading_number>]

Parameter: <reading_number> (1 ~ 100,000)

Example:
R? 4
Returns:
#263-1.12816521E-04,-1.13148354E-04,-1.13485152E-04,-1.13365632E-04

The "#2" means that the next 2 digits indicate how many characters are in the returned memory string.
In the above example, the 2 digits are the "63" after the "#2". Therefore, the remaining of the string is 63 digits long.

●If you do not specify a value for <reading_numbe>, all measurements are read and erased.

Example:
R?
Returns: #231-1.12816521E-04,-1.13148354E-04

●The R? and DATA:REMove? queries can be used during a long series of readings to periodically remove readings from memory that would normally cause the reading memory to overflow. R? does not wait for all readings to complete. It sends the readings that are complete at the time the instrument receives the command.

●Use Read? or Fetch? if you want the instrument to wait until all readings are complete before sending readings.

●No error is generated if the reading memory contains less readings than requested. In this case, all available readings in memory are read and deleted.

## READ?

Changes the state of the triggering system from "idle" to "wait-for-trigger". Scanning will begin when the specified trigger conditions are satisfied following the receipt of the READ? command. Readings are then sent to reading memory and the instrument's output buffer.

Example:

```
CONF:VOLT:DC 10,(@101,102)
TRIG:SOUR EXT
READ?
```

Returns: -1.13148354E-04,+3.15167734E-04

●The Read query will not return the unit or count number of the reading.

●Sending READ? is similar to sending INITiate followed immediately by FETCh?

## TIME:SYNC:SERVer

Sets or returns the server source for time sync.

Syntax: TIME:SYNC:SERVer "<server>"
Query Syntax: TIME:SYNC:SERVer?

Parameter: "<server>", max length = 24 characters
Return parameter: "<server>"

Example:

```
TIME:SYNC:SERV "time-nv.nist.gov"
```

### UNIT:TEMPerature

Specifies the units °C (Celsius), °F (Fahrenheit), or K (Kelvin) to be used for all temperature measurements.

Syntax: UNIT:TEMPerature <unit>[,(@<ch_list>)]
Query Syntax: UNIT:TEMPerature? [(@<ch_list>)]

Parameter: <unit> (C | F | K)
Return parameter: C | F | K

Example:
CONF:TEMP TC,K,(@101,102)
UNIT:TEMP C,(@101,102)

●If the corresponding channels are not configured for temperature measurements prior to sending of this command, instrument will dispatch an error message.

●The CONFigure and MEASure? commands automatically select °C.

## CALCulate Commands

### CALCulate:AVERage:ALL?

Returns all of the statistic calculation values.

Query Syntax: CALCulate:AVERage:ALL? [(@<ch_list>)]

Return parameter: <NRf> (average, standard deviation, minimum, maximum, count)

Example:
CALC:AVER:ALL? (@101)
Returns:
-2.96976783E-03,+1.09347159E-04,-3.09208611E-03,-2.78148893E-03,+1.00000000E+01

CALCulate:AVERage:{AVERage|MAXimum|MINimum|PTPeak|SDEViation}?

Returns the average, maximum, minimum, peak-to-peak or standard deviation recorded values.

Query Syntax:
CALCulate:AVERage:{AVERage|MAXimum|MINimum|PTPeak|SDEViation}? [(@<ch_list>)]

Return parameter: <NRf>

Example:
CALC:AVER:MAX? (@101,102,108)
Returns: +4.13148354E+00,+4.15167734E+00,+4.85178821E+00

●In this example, you can replace the MAX node with AVER, MIN, PTP or SDEV.

●If you omit the <ch_list> parameter, it returns the values for all channels in the currently defined scan list

CALCulate:AVERage:CLEar

Clears all of the statistic calculation values for the selected channels. The average, count, maximum, minimum, peak-to-peak and standard deviation values are cleared.

Syntax: CALCulate:AVERage:CLEar [(@<ch_list>)]

Parameter: [None]

Example:
CALC:AVER:CLE (@203:205)

CALCulate:AVERage:COUNt?

Returns the total number of recorded counts on each of the selected channels during the scan.

Query Syntax: CALCulate:AVERage:COUNt? [(@<ch_list>)]

Return parameter: <NRf>

Example:
CALC:AVER:COUN (@201:203)
Returns: +1.30000000E+01,+1.20000000E+01,+1.50000000E+01

●If you omit the <ch_list> parameter, it returns the count for all channels in the currently defined scan list.

CALCulate:AVERage:{MAXimum|MINimum}:TIME?

Returns the time that the maximum or minimum reading was taken on the selected channels during the scan (in full time and date format).

Query Syntax: CALCulate:AVERage:{MAXimum|MINimum}:TIME? [(@<ch_list>)]

Return parameter: <time> (yyyy,mm,dd,hh,mm,ss.sss)

Example:
CALC:AVER:MIN:TIME? (@101,102)
Returns: 2023,03,01,07,26,20.146,2023,03,01,07,26,29.023

●In this example, you can replace the MIN node with MAX.

●For each channel, the query returns the time in the form "yyyy,mm,dd,hh,mm,ss.sss".

CALCulate:COMPare:DATA <data>

Configures the digital output data on the specified channels. The pattern comparison feature can be used to trigger an alarm when a predefined digital pattern is detected.

Syntax: CALCulate:COMPare:DATA <data>, (@<ch_list>)
Query Syntax: CALCulate:COMPare:DATA? (@<ch_list>)

Parameter: <data> = An 8-bit digital patterns for comparison, specified as an integer from 0 to 255.
Return parameter: <NR1>

Example: CALC:COMP:DATA?(@101)
Returns: 0 ~ 255

●After specifying the desired digital patterns, use the CALCulate:COMPare:STATe command to enable patterns comparisons on the selected channels. If you want to monitor the state of specific bits, use this command in conjunction with the CALCulate:COMPare:MASK command to specify a mask patterns.
●Uses the CALCulate:COMPare:TYPE command to specify whether an alarm or hardware interrupt condition is generated when a specific bit patterns or bit patterns change is detected.
●A Factory Reset (*RST command) clears the digital patterns and turns off the patterns comparison mode.

CALCulate:COMPare:MASK <mask>

This command works in conjunction with the CALCulate:COMPare:DATA command to define the digital mask for 8-bit digital pattern comparisons on the specified channels.

Syntax: CALCulate:COMPare:MASK <mask>, (@<ch_list>)
Query Syntax: CALCulate:COMPare:MASK? (@<ch_list>)

Parameter: <mask> = An 8-bit digital patterns for comparison,specified as an integer from 0 to 255.
Return parameter: <NR1>

Example: CALC:COMP:MASK? (@101)
Returns: 0 ~ 255

● After specifying the desired digital patterns, use the CALCulate:COMPare:STATe command to enable patterns comparisons on the selected channels.
● A Factory Reset (*RST command) clears the digital patterns and turns off the patterns comparison mode.

CALCulate:COMPare:STATe {OFF | ON}

Activates (On) or deactivates (Off) the pattern comparison mode on the specified channels. The pattern comparison feature can be used to trigger an alarm when a predefined digital pattern is detected.

Syntax: CALCulate:COMPare:STATe {OFF | ON}, (@<ch_list>)
Query Syntax: CALCulate:COMPare:STATe? (@<ch_list>)

Parameter: {OFF | ON}
Return parameter: <NR1>

Example: CALC:COMP:STAT?(@101)
Returns: 0 (OFF) or 1 (ON)

● A Factory Reset (*RST command) clears the digital patterns and turns off the patterns comparison mode.

CALCulate:COMPare:TYPE {EQUal | NEQual}

Sets up the specified channels to trigger an alarm upon detecting a specific bit pattern or a change in the bit pattern. This command works in conjunction with the CALCulate:COMPare:DATA command, which defines the data bit pattern, and the CALCulate:COMPare:MASK command,which specifies the mask bit pattern.

Syntax: CALCulate:COMPare:TYPE {EQUal | NEQual}, (@<ch_list>)
Query Syntax: CALCulate:COMPare:TYPE? (@<ch_list>)

Parameter: {EQUal | NEQual}
Return parameter: EQU or NEQ

Example: CALC:COMP:TYPE?(@101)
Returns: EQU or NEQ

● Selects EQUal to generate an alarm or interrupt when the data read from the selected channel is equal to CALCulate:COMPare:DATA, after masking by CALCulate:COMPare:MASK.
●Selects NEQual (not equal) to generate an alarm or interrupt when the data read from the bank is not equal to CALCulate:COMPare:DATA, after masking by CALCulate:COMPare:MASK.
●Bits masked off as 0 ("don't care") by CALCulate:COMPare:MASK are ignored.
●A Factory Reset (*RST command) clears the digital pattern and turns off the pattern comparison mode.

CALCulate:LIMit:{LOWer|UPPer}

The instrument has four alarms which you can configure to alert you when a reading exceeds specified limits during a scan.

Syntax: CALCulate:LIMit:{LOWer|UPPer}
{<limit>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:LIMit:{LOWer|UPPer}?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <limit> (-1.2E+09 ~ +1.2E+09); DEF: -1 (Lower), +1(Upper)
Return parameter: <NRf>

Example:
CALC:LIM:LOW -3,(@101,102)
CALC:LIM:LOW? (@101,102)
Returns: -3.00000000E+00,-3.0000000E+00

●In this example, you can replace the LOW node with UPP.

●The lower limit value must always be less than or equal to the upper limit.

CALCulate:LIMit:{LOWer|UPPer}:STATe

Enables or disables the lower and upper alarm limits on the specified channels during a scan.

Syntax: CALCulate:LIMit:{LOWer|UPPer}:STATe {OFF|ON}[,(@<ch_list>)]
Query Syntax: CALCulate:LIMit:{LOWer|UPPer}:STATe? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0=OFF, 1=ON)

Example:

CALC:LIM:LOW 2(@101,102)
CALC:LIM:LOW:STAT ON,(@101,102)
CALC:LIM:LOW:STAT? (@101,102)

Returns: 1,1

●In this example, you can replace the LOW node with UPP.

## CALCulate:MATH

A computed channel performs mathematical operation on the readings from measurement channels, or other computed channels list.

Syntax: CALCulate:MATH <expression>,(@<computed_ch_list>)
Query Syntax: CALCulate:MATH? (@<computed_ch_list>)

Parameter:

| Computation type | Mathematical operation | (<expression>) |
|---|---|---|
| Basic math | Add | (@ch1+@ch2) |
| | Subtract | (@ch1-@ch2) |
| | Multiply | (@ch1*@ch2) |
| | Divide | (@ch1/@ch2) |
| | Power | (power(@ch1,2)) |
| | Square root | (sqrt(@ch1)) |
| | Reciprocal | (1/(@ch1)) |
| Polynomial | Fifth order | (poly(@ch1, <n5>, <n4>, <n3>, <n2>, <n1>, <n0>))<br>where n = value of variable in each order |
| Statistics | Min | (min(@<ch_list>)) |
| | Max | (max(@<ch_list>)) |
| | Sum | (sum(@<ch_list>)) |
| | Average | (avg(@<ch_list>)) |
| | Standard deviation | (sdev(@<ch_list>)) |

Return parameter: "<string>"

Example:

CALC:MATH (@201-@202),(@402)
CALC:MATH? (@402)
Returns: " (@201-@202) "

CALC:MATH (sqrt(@201)),(@402)
CALC:MATH? (@402)
Returns: " (sqrt(@201)) "

CALC:MATH (poly(@201,3,2,1,1,1,0)),(@402)
CALC:MATH? (@402)
Returns:
"(poly(@201,+3.00000000E+00,+2.00000000E+00,+1.00000000E+00,+1.00000000E+00,+1.00000000E+00,+0.00000000E+00)) "

CALC:MATH (max(@201:203)),(@402)
CALC:MATH? (@402)
Returns: " (max(@201,202,203)) "

●Only supported on computed channels (channels 401 through 420).

### CALCulate:SCALe:DB:REFerence

Sets or returns reference value for the dB function.

Syntax: CALCulate:SCALe:DB:REFerence
{<reference>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:DB:REFerence?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <reference> (-2.0E+02 ~ +2.0E+02); DEF: 0
Return parameter: <NRf>

Example:
CALC:SCAL:DB:REF 100
CALC:SCAL:DB:REF?
Returns: +1.00000000E+02

### CALCulate:SCALe:DBM:REFerence

Sets or returns resistance value for the dBm function.

Syntax: CALCulate:SCALe:DBM:REFerence
{<reference>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:DBM:REFerence?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <reference> (2, 4, 8, 16, 50, 75, 93, 110, 124, 125, 135, 150, 250, 300, 500, 600, 800, 900, 1000, 1200, 8000); DEF: 600
Return parameter: <NRf>

Example:
CALC:SCAL:DBM:REF DEF
CALC:SCAL:DBM:REF?
Returns: +6.00000000E+02

### CALCulate:SCALe:DECimal:POINt

Under the Math function, the display of measured values vary in accordance with either the fixed range setting (Range) or auto range setting (Auto).

Syntax: CALCulate:SCALe:DECimal:POINt <type>[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:DECimal:POINt? [(@<ch_list>)]

Parameter: <type> (AUTO | RANGe)
Return parameter: AUTO | RANG

Example:
CALC:SCAL:DEC:POIN RANG
CALC:SCAL:DEC:POIN?
Returns: RANG

### CALCulate:SCALe:FUNCtion

Sets or returns the advanced function.

Syntax: CALCulate:SCALe:FUNCtion <function>[,@<ch_list>]
Query Syntax: CALCulate:SCALe:FUNCtion? [@<ch_list>]

Parameter: <function> (OFF | DB | DBM | SCALe | INV | PCT)
Return parameter: OFF | DB | DBM | SCAL | INV | PCT

Example:
CALC:SCAL:FUNC DB

●dB scaling function is only available when the measurement function on the specified channels sets to DCV orACV.

### CALCulate:SCALe:GAIN

Sets or returns the scale factor M for math measurement.

Syntax: CALCulate:SCALe:GAIN {<gain>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:GAIN? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <gain> (-1.2E+09 ~ +1.2E+09); DEF: 1
Return parameter: <NRf>

Example:
CALC:SCAL:FUNC SCAL
CALC:SCAL:GAIN 0.5
CALC:SCAL:GAIN?
Returns: +0.50000000E+00

### CALCulate:SCALe:OFFSet

Sets or returns the offset factor B for math measurement.

Syntax: CALCulate:SCALe:OFFSet {<offset>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:OFFSet? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <offset> (-1.2E+09 ~ +1.2E+09); DEF: 0
Return parameter: <NRf>

Example:
CALC:SCAL:FUNC SCAL
CALC:SCAL:OFFS 0.01
CALC:SCAL:OFFS?
Returns: +1.0000000E-02

### CALCulate:SCALe:OFFSet:NULL

Makes an immediate null measurement on the specified channels and stores it as the offset (B) for subsequent measurements.

Syntax: CALCulate:SCALe:OFFSet:NULL [(@<ch_list>)]

Parameter: [None]

Example:

```
CALC:SCAL:FUNC SCAL
CALC:SCAL:OFFS:NULL (@101)
```

### CALCulate:SCALe:PERCent

Sets or returns the reference value for the PCT function.

Syntax: CALCulate:SCALe:PERCent
{<reference>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:PERCent? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <reference> (-1.2E+09 ~ +1.2E+09); DEF: 1
Return parameter: <NRf>

Example:

```
CALC:SCAL:FUNC PCT
CALC:SCAL:REF 0.1
CALC:SCAL:REF?
```

Returns: +1.0000000E-01

### CALCulate:SCALe:REFerence

Sets or returns the reference value for the PCT function.

Syntax: CALCulate:SCALe:REFerence
{<reference>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:REFerence? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <reference> (-1.2E+09 ~ +1.2E+09); DEF: 1
Return parameter: <NRf>

Example:

```
CALC:SCAL:FUNC PCT
CALC:SCAL:REF 0.1
CALC:SCAL:REF?
```

Returns: +1.0000000E-01

### CALCulate:SCALe:REFerence:AUTO

Enables or disables automatic reference selection for the scaling functions.

Syntax: CALCulate:SCALe:REFerence:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:REFerence:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

ON: the first measurement made is used as the reference for all subsequent measurements, and automatic reference selection is disabled.

OFF:
CALCulate:SCALe:DB:REFerence specifies the reference for DB scaling,
CALCulate:SCALe:REFerence specifies the reference for PCT scaling.

Example:
CALC:SCAL:REF:AUTO ON

### CALCulate:SCALe:REFerence:IMMediate

Makes an immediate reference measurement on PCT (%) and dB scaling functions and save the reference value for subsequent measurements.

Syntax: CALCulate:SCALe:REFerence:IMMediate [(@<ch_list>)]

Parameter: [None]

Example:
CALC:SCAL:REF:IMM

●This command performs the reference measurement on both PCT and dB scaling functions simultaneously.

### CALCulate:SCALe[:STATe]

Enables or disables the scaling function.

Syntax: CALCulate:SCALe[:STATe] {OFF|ON}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe[:STATe]? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CALC:SCAL:STAT ON

### CALCulate:SCALe:UNIT

To specify the custom unit up to three characters (for example: RPM, PSI, or °C) for scaled measurements.

Syntax: CALCulate:SCALe:UNIT "<string>"[,(@<ch_list>)]
Query Syntax:CALCulate:SCALe:UNIT? [(@<ch_list>)]

Parameter: "<string>", max length = 3 characters
Return parameter: "<string>"

Example:
CALC:SCAL:UNIT "BAR"
CALC:SCAL:UNIT?
Returns: "BAR"

### CALCulate:SCALe:UNIT:STATe

Enables or disables displaying the unit string with measurements on the front panel when the scaling function is enabled.

Syntax: CALCulate:SCALe:UNIT:STATe {OFF|ON}[,(@<ch_list>)]
Query Syntax: CALCulate:SCALe:UNIT:STATe? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CALC:SCAL:UNIT "PSI"
CALC:SCAL:UNIT:STAT ON

## CONFigure Commands

### CONFigure?

Returns the present configurations (function, range, and resolution) on the specified channels with a series of quoted strings.

Query Syntax: CONFigure? [(@<ch_list>)]

Parameter: [None]
Return parameter: "<present configurations>"

Example:
CONF:VOLT:DC 10,MIN,(@101)
CONF?
Returns: "VOLT +1.00000000E+01,+1.00000000E-05"

CONFigure:CAPacitance

Configures the channels for Capcitance measurements.

Syntax: CONFigure:CAPacitance
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter: <range> (1nF | 10nF | 100nF | 1μF | 10μF | 100μF); DEF: AUTO

Example:
CONF:CAP 10e-7,(@101)

CONFigure:CURRent:{AC|DC}

Configures the channels for AC and DC current measurements.

Syntax: CONFigure:CURRent:{AC|DC}
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
AC: (100μA | 1mA | 10mA | 100mA | 2A); DEF: AUTO
DC: (1μA | 10μA | 100μA | 1mA | 10mA | 100mA | 2A); DEF: AUTO

Example:
CONF:CURR:AC 10e-2,(@121)
CONF:CURR:DC 10e-3,DEF,(@122)

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

CONFigure:DAC:OUTPut

Configures the DAC output channels (channel 04 and 05) in the DAQ907 multifunction module. This command redefines the scan list.

Syntax: CONFigure:DAC:OUTPut (@<ch_list>)

Parameter: [none]

Example:

CONF:DAC:OUTP (@104)
CONF:DAC:OUTP (@104,105)

● Only supported on DAC output channels (channel 04 and 05) in DAQ907 multifunction module.

CONFigure:DAC:SENSe

Configures the DAC output sense channels (channel 06 and 07) in the DAQ907 multifunction module. This command redefines the scan list.

Syntax: CONFigure:DAC:SENSe (@<ch_list>)

Parameter: [none]

Example:

CONF:DAC:SENS (@106)
CONF:DAC:SENS (@106,107)

● Only supported on DAC output sense channels (channel 06 and 07) in DAQ907 multifunction module.

CONFigure:DIGital[:BYTE]

Configures the instrument to scan the specified digital I/O channels on the multifunction module as byte data, but does not initiate the scan. This command redefines the scan list.

Syntax: CONFigure:DIGital[:BYTE] (@<ch_list>)

Parameter: [none]

Example:

CONF:DIG:BYTE (@102)
CONF:DIG:BYTE (@101,102)

● Note that if you include both digital input channels in the scan list, the instrument will read data from both ports simultaneously with the same time stamp. This allows you to externally combine the two 8-bit value into one 16-bit value.

CONFigure:DIODe

Configures the channels for Diode measurements.

Syntax: CONFigure:DIODe (@<ch_list>)

Example:
CONF:DIOD (@101)

CONFigure:{FREQuency|PERiod}

Configures the channels for frequency and period measurements

Syntax: CONFigure:{FREQuency|PERiod}
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
Frequency: 3Hz ~ 300kHz; DEF: 20Hz
Period: 3.33μs ~ 333.33ms; DEF: 50ms

Example:
CONF:FREQ MAX,(@101)
CONF:PER AUTO,DEF,(@101)

CONFigure:{RESistance|FRESistance}

Configures the channels for 2-Wire and 4-Wire resistance measurements.

Syntax: CONFigure:{RESistance|FRESistance}
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range> (100Ω | 1kΩ | 10kΩ | 100kΩ | 1MΩ | 10MΩ | 100MΩ | 1GΩ); DEF: 1kΩ

Example:
CONF:RES 1e2,(@101)
CONF:FRES 1e3,MAX,(@101)

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

CONFigure:STRain:{DIRect|FDIRect}

Configures the channels for direct 2-Wire and 4-Wire strain gage measurements.

Syntax: CONFigure:STRain:{DIRect|FDIRect}
[{<gage_ohms>|MIN|MAX|DEF},[{<gage_factor>|MIN|MAX|DEF},
[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_ohms> (80 ~ 1100Ω); DEF: 120Ω
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100Ω | 1kΩ | 10kΩ | 100kΩ | 1MΩ | 10MΩ | 100MΩ | 1GΩ); DEF: 1kΩ

Example:
CONF:STR:DIR 100,1,(@101)

CONFigure:STRain:{FULL|HALF}:BENDing

Configures the channels for full and half bending bridge strain gage measurements.

Syntax: CONFigure:STRain:{FULL|HALF}:BENDing
[{<gage_factor>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|
MIN|MAX|DEF},]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO

Example:
CONF:STR:FULL:BEND 1,0.1,(@101)

CONFigure:STRain:{FULL|HALF}:POISson

Configures the channels for full and half poisson bridge strain gage measurements.

Syntax: CONFigure:STRain:{FULL|HALF}:POISson
[{<gage_factor>|MIN|MAX|DEF},[{<poisson_ratio>|MIN|MAX|DEF},[{<range
>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<poisson_ratio> (-0.9999 ~ 0.5); DEF: 0.3
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO

Example:
CONF:STR:FULL:POIS (@101)

CONFigure:STRain:FULL:BENDing:POISson

Configures the channels for full bending poisson bridge strain gage measurements.

Syntax: CONFigure:STRain:{FULL|HALF}:POISson [{<gage_factor>|MIN|MAX|DEF},[{<poisson_ratio>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<poisson_ratio> (-0.9999 ~ 0.5); DEF: 0.3
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO

Example:
CONF:STR:FULL:BEND:POIS 0.5,0.1,(@101)

CONFigure:STRain:QUARter

Configures the channels for quarter bridge strain gage measurements.

Syntax: CONFigure:STRain:QUARter {<gage_factor>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO

Example:
CONF:STR:QUAR 1,(@101)

CONFigure:TOTalize

Configures the instrument to read the specified totalizer channels on the multifunction module but does not initiate the scan. To read the totalizer during a scan without resetting the count, set to READ. To read the totalizer during a scan and reset the count to 0 after it is read, set to RRESet (this means "read and reset"). This command redefines the scan list.

Syntax: CONFigure:TOTalize:{READ | RRESet} (@<ch_list>)

Parameter: {READ | RRESet}

Example:

CONF:TOT READ,(@203)
CONF:TOT RRES,(@203)

● Note that if you include both digital input channels in the scan list, the instrument will read data from both ports simultaneously with the same time stamp. This allows you to externally combine the two 8-bit value into one 16-bit value.

CONFigure:TEMPerature

Configures the channels for temperature measurements.

Syntax: CONFigure:TEMPerature
<probe_type>,[{<type>|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<probe type> (TCouple | RTD | FRTD | THERmistor | FTHermistor)
<type>:
TCouple: (B | E | J | K | N | R | S | T | USER) ; DEF: J
RTD / FRTD : (PT100 | D100 | F100 | PT385 | PT3916 | USER) ; DEF: PT100
THERmistor / FTHermistor : (2.2kΩ| 5kΩ| 10kΩ| USER); DEF: 5kΩ

Example:

CONF:TEMP TC,K,(@101)

CONFigure[:VOLTage]:{AC|DC}

Configures the channels for AC and DC voltage measurements

Syntax: CONFigure[:VOLTage]:{AC|DC}
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
AC: (100mV | 1V | 10V | 100V | 400V); DEF:AUTO
DC: (100mV | 1V | 10V | 100V | 600V); DEF:AUTO

Example:
CONF:VOLT:AC 10e-2,(@201)
CONF:VOLT:DC 1,MAX,(@101)

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

## DATA Commands

DATA:LAST?

Returns the most recent reading or readings taken on the selected channel during the scan.

Query Syntax: DATA:LAST? [<num_rdgs>,](@<ch_list>)

Parameter: <num_rdgs> (1 ~ 1000)
Return parameter: <NRf>

Example:
DATA:LAST? 1,(@101)
Returns: +0.15900000E+01

●If no data is available for the specified channel, an error will be generated.

DATA:POINts?

Returns the total number of readings currently saved in reading memory from a scan.

Return parameter: <NR1>

Example:
DATA:POIN?
Returns: +10

●You can store up to 100,000 measurements in the reading memory.

DATA:POINts:EVENt:THReshold

Sets or returns the threshold for event number of measurement.

Syntax: DATA:POINts:EVENt:THReshold <num_rdgs>
Query Syntax: DATA:POINts:EVENt:THReshold?

Parameter: <num_rdgs> (1 ~ 100,000)
Return parameter: <NR1>

Example:
DATA:POIN:EVEN:THR 20
DATA:POIN:EVEN:THR?
Returns: +20

●When measurement numbers reach the set threshold, the Bit9 within the Operater Event Register (STATus:OPERation:EVENt) will be set as 1.

●Once the Memory Threshold bit (bit 9 in the Standard Operation Event register) is set, it remains set until cleared by STATus:OPERation:EVENt? or *CLS.

DATA:REMove?

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

Query Syntax: DATA:REMove? <num_rdgs>,[WAIT]

Parameter: <num_rdgs> (1 ~ 100,000)

Example:
DATA:REM? 4
Returns:
-1.12816521E-04,-1.13148354E-04,-1.13485152E-04,-1.13365632E-04

●You can use the DATA:POINts? query to determine the total number of readings currently in reading memory.

●If <num_rdgs> is greater than the latest counts of measurement, it will return the error. However, it will return data if <num_rdgs> of counts of measurement reach the set threshold only when WAIT parameter is specified.

●The R? and DATA:REMove? queries can be used during a long series of readings to periodically remove readings from memory that would normally cause the reading memory to overflow. R? does not wait for all readings to complete. It sends the readings that are complete at the time the instrument receives the command.

●If reading memory overflows, the new readings will overwrite the first (oldest) readings saved; the most recent readings are always preserved. No error is generated, but the Reading Memory Overflow bit (bit 12) is set in the Questionable Data Register's condition register.

## DIGital INTerface Commands

### DIGital:INTerface:MODE

Sets or returns the application mode of digital I/O (Remote Control Only). For details, refer to page 154.

Syntax: DIGital:INTerface:MODE <type>
Query Syntax: DIGital:INTerface:MODE?

Parameter: <type> (COPM | 4094 | IO)
Return parameter: COPM | 4094 | IO

Example:
DIG:INT:MODE IO

### DIGital:INTerface:DATA:OUTPut

When the 4094 mode (serial to parallel) is selected for digital I/O, make use of this command to set output status.

Syntax: DIGital:INTerface:DATA:OUTPut <data>,<strobe_pulse>

Parameter: <data> (0 ~ 255); <strobe_pulse> (0 | 1)

Example:
DIG:INT:MODE 4094
DIG:INT:DATA:OUPT 10,1

### DIGital:INTerface:DATA:SETup

When the IO mode is selected for digital I/O, make use of this command to set output status.

Syntax: DIGital:INTerface:DATA:SETup <boolean>

Parameter: <boolean> (0 | 1), (DIO1, DIO2, DIO3, DIO4)

Example:
DIG:INT:MODE IO
DIG:INT:DATA:SET 0,1,0,1
Sets DIO1 to low, DIO2 to high, DIO3 to low, DIO4 to high.

## DISPlay Commands

### DISPlay

Enables (On) or disables (Off) front panel display. When disabled, the entire front panel display turns black and time stamp is displayed.

Syntax: DISPlay {OFF|ON}
Query Syntax: DISPlay?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
DISP ON

●All keys except "Local" are disabled when the display is OFF.

●To enable the display, send DISPlay ON or press the front panel Shift key(Local).

### DISPlay:TEXT

Displays a text on the instrument's front panel display.

Syntax: DISPlay:TEXT "<message>"
Query Syntax:DISPlay:TEXT?

Parameter: "<message>", max length = 40 characters
Return parameter: "<message>"

Example:
DISP:TEXT "testing"

●Sending a text message to the display overrides the display state; this means that you can display a message even if the display is turned off.

### DISPlay:TEXT:CLEar

Clears the text message from the display.

●With DISP ON, DISP:TEXT:CLE returns the display to its normal mode.

●With DISP OFF, DISP:TEXT:CLE clears the message and the display remains disabled.

## FORMat Commands

### FORMat:READing:ALARm

Enables (On) or disables (Off) the inclusion of alarm information in the reading format.

Syntax: FORMat:READing:ALARm {OFF|ON}
Query Syntax: FORMat:READing:ALARm?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
FORM:READ:ALAR ON

### FORMat:READing:CHANnel

Enables (On) or disables (Off) the inclusion of channel number information in the reading format.

Syntax: FORMat:READing:CHANnel {OFF|ON}
Query Syntax: FORMat:READing:CHANnel?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
FORM:READ:CHAN ON

### FORMat:READing:TIME

Enables (On) or disables (Off) the inclusion of time stamp information in the reading format.

Syntax: FORMat:READing:TIME {OFF|ON}
Query Syntax: FORMat:READing:TIME?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
FORM:READ:TIME ON

FORMat:READing:TIME:TYPE

Selects the time format (absolute or relative) for time stamp returned when FORMat:READing:TIME is enabled.

Syntax: FORMat:READing:TIME:TYPE {ABSolute|RELative}
Query Syntax: FORMat:READing:TIME:TYPE?

Parameter: ABSolute | RELative
Return parameter: ABS | REL

Example:
FORM:READ:TIME:TYPE ABS

●Relative format - shows the time since the start of the scan.
Ex:+1.12379111E-03 VDC,00000000.659,101,2
1 2 3 4
1. Reading with units(1.124mV)
2. Elapsed time(659ms)
3. Channel number
4. Alarm limit threshold crossed (0 = No alarm, 1 = LO, 2 = HI)

●Absolute format - shows the time of the day with the date.
Ex:+1.12379111E-03 VDC,2021,01,28,00,43,39.218,101,0
1 2 3 4 5
1. Reading with units(1.124mV)
2. Date(January 28, 2021)
3. Time of day(0:43:39.218 AM)
4. Channel number
5. Alarm limit threshold crossed (0 = No alarm, 1 = LO, 2 = HI)

FORMat:READing:UNIT

Enables (On) or disables (Off) the inclusion of measurement units (VAC, VDC, OHM, etc.) in the reading format.

Syntax: FORMat:READing:UNIT {OFF|ON}
Query Syntax: FORMat:READing:UNIT?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
FORM:READ:UNIT ON

## HCOPy Commands

HCOPy:SDUMp:DATA?

Executes TFT LCD screenshot action.
Returns the front panel display image ("screen shot").
Returns a count of data streaming by the image file format of BMP.

## MEASure Commands

### MEASure:CAPacitance?

Configures the channels for capacitance measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:CAPacitance? [{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter: <range> (1nF | 10nF | 100nF | 1μF | 10μF | 100μF); DEF: AUTO

Example: MEAS:CAP? DEF,(@101)
Returns: +3.72695852E-11

### MEASure:CURRent:{AC|DC}?

Configures the channels for AC and DC current measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:CURRent:{AC|DC}? [{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
AC: (100μA | 1mA | 10mA | 100mA | 2A); DEF: AUTO
DC: (1μA | 10μA | 100μA | 1mA | 10mA | 100mA | 2A); DEF: AUTO
Return parameter: <NRf>

Example: MEAS:CURR:AC? 10e-2,(@121,122)
Returns: +0.32921419E-01,+0.15224990E-01

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

MEASure:DAC:OUTPut?

Configures the specified DAC output channels for unbuffered (no memory) input operations and immediately sweeps through the channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer. This command redefines the scan list.

Query Syntax: MEASure:DAC:OUTPut? (@<ch_list>)

Parameter: [None]
Return parameter: <NRf>

Example: MEAS:DAC:OUTP? (@104)
Returns: +1.23400000E-04

● Only supported on DAC output channels (channel 04 and 05) in DAQ907 multifunction module.

● There is no actual measurement on this command. Executing this command will simply return the "PROGRAMMED" DAC settings. For example, sets the value to 1.234 V will exactly return 1.234 V on the subsequent sweep of scanning.

● This command is useful when using DAC to control the measurements, varying the output from time-to-time, and record the sweep data of DAC settings in fact for that sweep.

MEASure:DAC:SENSe?

Configures the specified DAC output sense channels for unbuffered (no memory) input operations and immediately sweeps through the channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer. This command redefines the scan list.

Query Syntax: MEASure:DAC:SENSe? (@<ch_list>)

Parameter: [None]
Return parameter: <NRf>

Example: MEAS:DAC:SENS? (@106,107)
Returns: -4.14112300E-07,+1.48205109E+01

● Only supported on DAC output sense channels (channel 06 and 07) in DAQ907 multifunction module.

● This command does makes an actual measurement. The range and resolution are fixed at 1 PLC on the 10 VDC range.

● Channel 06 will make the measurement based on the output mode set in channel 04 of DAC output channel; channel 07 will make the actual measurement based on the output mode set in channel 05 of DAC output channel.

MEASure:DIGital[:BYTE]?

Configures the specified digital I/O channels for unbuffered (no memory) input operations and immediately sweeps through the channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer. This command redefines the scan list.

Query Syntax: CONFigure:DIGital[:BYTE]? (@<ch_list>)

Parameter: [None]
Return parameter: <NRf>

Example: MEAS:DIG:BYTE? (@101,102)
Returns: +2.55000000E+02,+2.55000000E+02

● Only supported on Digital I/O channels (channel 01 and 02) in DAQ907 multifunction module.

● Note that if you include both digital input channels in the scan list, the instrument will read data from both ports simultaneously with the same time stamp. This allows you to externally combine the two 8-bit value into one 16-bit value.

## MEASure:DIODe?

Configures the channels for Diode current measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:DIODe? (@<ch_list>)

Parameter: [None]
Return parameter: <NRf>

Example: MEAS:DIOD? (@101)
Returns: +0.69324990E+00

●The range and resolution for diode test are fixed at 1 VDC, with a 1 mA current source output.

## MEASure:{FREQuency|PERiod}?

Configures the channels for frequency and period measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:{FREQuency|PERiod}?
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
AC: 3Hz to 300kHz; DEF: 20Hz
DC: 3.33μs to 333.33ms; DEF: 50ms
Return parameter: <NRf>

Example: MEAS:FREQ? MIN,(@101)
Returns: +5.98876820E+01

MEASure:{RESistance|FRESistance}?

Configures the channels for 2-Wire and 4-Wire resistance measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:{RESistance|FRESistance}?
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range> (100Ω | 1kΩ | 10kΩ | 100kΩ | 1MΩ | 10MΩ | 100MΩ | 1GΩ);
DEF: AUTO
Return parameter: <NRf>

Example: MEAS:RES? 100,(@101)
Returns: +3.98776210E+01

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

---

MEASure:STRain:{DIRect|FDIRect}?

Configures the channels for direct 2-Wire and 4-Wire strain gage measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:STRain:{DIRect|FDIRect}?
[{<gage_ohms>|MIN|MAX|DEF},[{<gage_factor>|MIN|MAX|DEF},
[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_ohms> (80 ~ 1100Ω); DEF: 120Ω
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100Ω | 1kΩ | 10kΩ | 100kΩ | 1MΩ | 10MΩ | 100MΩ | 1GΩ); DEF: 1kΩ
Return parameter: <NRf>

Example: MEAS:STR:DIR? 100,1,(@101)
Returns: +7.08176210E+01

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MEASure:STRain:{FULL|HALF}:BENDing?

Configures the channels for full and half bending bridge strain gage measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:STRain:{FULL|HALF}:BENDing? [{<gage_factor>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO
Return parameter: <NRf>

Example: MEAS:STR:FULL:BEND? 1,0.1,(@101)
Returns: +7.08176210E-01

MEASure:STRain:{FULL|HALF}:POISson?

Configures the channels for full and half poisson bridge strain gage measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:STRain:{FULL|HALF}:POISson? [{<gage_factor>|MIN|MAX|DEF},[{<poisson_ratio>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<poisson_ratio> (-0.9999 ~ 0.5); DEF: 0.3
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO
Return parameter: <NRf>

Example: MEAS:STR:FULL:POIS? (@101)
Returns: +1.08176210E+00

MEASure:STRain:FULL:BENDing:POISson?

Configures the channels for full bending poisson bridge strain gage measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:STRain:FULL:BENDing:POISson? [{<gage_factor>|MIN|MAX|DEF},[{<poisson_ratio>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]]]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<poisson_ratio> (-0.9999 ~ 0.5); DEF: 0.3
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO
Return parameter: <NRf>

Example: MEAS:STR:FULL:BEND:POIS? 0.5,0.1,(@101)
Returns: +0.68176210E-01

MEASure:STRain:QUARter?

Configures the channels for quarter bridge strain gage measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:STRain:QUARter? {<gage_factor>|MIN|MAX|DEF},[{<range>|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<gage_factor> (0.5 ~ 5); DEF: 2
<range> (100mV | 1V | 10V | 100V | 600V); DEF: AUTO
Return parameter: <NRf>

Example: MEAS:STR:QUAR? 1,(@101)
Returns: +0.28176210E+00

MEASure:TEMPerature?

Configures the channels for temperature measurements and immediately sweeps through the specified channels one time (independent of the present scan list). The results are sent directly to reading memory and the instrument's output buffer.

Query Syntax: MEASure:TEMPerature?
<probe_type>,[{<type>|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<probe type> (TCouple | FRTD | RTD | FTHermistor | THERmistor)
<type>:
TCouple: (B | E | J | K | N | R | S | T | USER) ; DEF: J
RTD / FRTD : (PT100 | D100 | F100 | PT385 | PT3916 | USER) ; DEF: PT100
THERmistor / FTHermistor : (2.2kΩ| 5kΩ| 10kΩ| USER); DEF: 5kΩ

Example: MEAS:TEMP? TC,K,(@101)
Returns: +2.51176210E+01

MEASure:TOTalize?

Configures the totalizer channel and immediately sweeps through the list one time. You can read the totalizer either with or without resetting the count. The results are sent directly to the instrument's output buffer. This command redefines the scan list.

Syntax: MEASure:TOTalize? {READ | RRESet}, (@<ch_list>)

Parameter: {READ | RRESet}
Return arameter : <NRf>

Example: MEAS:TOT? READ,(@103)
Returns: +4.80000000E+01

● Only supported on totalizer channel (channel 03) in DAQ907 multifunction module.

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

Configures the channels for AC and DC voltage measurements.

Query Syntax: MEASure[:VOLTage]:{AC|DC}?
[{<range>|AUTO|MIN|MAX|DEF},[{<resolution>|MIN|MAX|DEF},]](@<ch_list>)

Parameter:
<range>:
AC: (100mV | 1V | 10V | 100V | 400V); DEF:AUTO
DC: (100mV | 1V | 10V | 100V | 600V); DEF:AUTO

Example: MEAS:VOLT:AC? 100,(@101)
Returns: +3.71176210E+01

●Autoranging (AUTO or DEFault), will generate an error if you specify a <resolution> because the instrument cannot accurately resolve the integration time (especially if the input continuously changes). If your application requires autoranging, specify DEFault for the <resolution> or omit the <resolution> altogether.

## MMEMory Commands

### MMEMory:FORMat:READing:CHEAder

Specifies the content of each column header to be either the channel number (NUMber) or the channel's user-defined label (LABel).

Syntax: MMEMory:FORMat:READing:CHEAder {NUMber|LABel}
Query Syntax: MMEMory:FORMat:READing:CHEAder?

Parameter: NUMber | LABel
Return parameter: NUM | LAB

Example:
MMEM:FORM:READ:CHEA LAB

●If the value of the column header is set to LABel using the ROUTe:CHANnel:LABel command, any channel without a user-defined label will display its factory-default channel label instead on its column header.

### MMEMory:FORMat:READing:CSEParator

Specifies the character to use for separating the information on each row.

Syntax: MMEMory:FORMat:READing:CSEParator {COMMa|SEMicolon|TAB}
Query Syntax: MMEMory:FORMat:READing:CSEParator?

Parameter: COMMa | SEMicolon | TAB
Return parameter: COMM | SEM | TAB

Example:
MMEM:FORM:READ:CSEP COMM

### MMEMory:FORMat:READing:RLIMit

Specifies the row limit (maximum number of rows for sweep data) that will be written to each data logging file by the count set by MMEMory:FORMat:READing:RLIMit:COUNt command.

Syntax: MMEMory:FORMat:READing:RLIMit {OFF|ON}
Query Syntax: MMEMory:FORMat:READing:RLIMit?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
MMEM:FORM:READ:RLIM ON

MMEMory:FORMat:READing:RLIMit:COUNt

Sets the row limits count when MMEMory:FORMat:READing:RLIMit ON is set.

Syntax: MMEMory:FORMat:READing:RLIMit:COUNt
{<number>|MIN|MAX|DEF}
Query Syntax: MMEMory:FORMat:READing:RLIMit:COUNt?
[{MIN|MAX|DEF}]

Parameter: <number> (65536 | 1048576); DEF: 65536
Return parameter: <NR1>

Example:

```
MMEM:FORM:READ:RLIM:COUN 10000
```

MMEMory:LOG[:ENABle]

Enables (On) or disables (Off) logging of the scanned memory readings to a USB drive connected to the front panel USB host port.

Syntax: MMEMory:LOG[:ENABle] {OFF|ON}
Query Syntax: MMEMory:LOG[:ENABle]?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
MMEM:LOG ON
```

## Output Commands

OUTPut:ALARm:CLEar:ALL

Clears the state of all four alarm output lines.

Parameter: [None]

Example:

OUTP:ALAR:CLE

●You can manually clear the output lines at any time (even during a scan) and the alarm data in reading memory is not cleared. However, data is cleared when you initiate a new scan.

OUTPut:ALARm{1|2|3|4}:CLEar

Clears the state of specified alarm output lines.

Parameter: [None]

Example:

OUTP:ALAR3:CLE

●You can manually clear the output lines at any time (even during a scan) and the alarm data in reading memory is not cleared. However, data is cleared when you initiate a new scan.

OUTPut:ALARm{1|2|3|4}:SOURce

Assigns one of four alarm numbers to report any alarm conditions on the specified multiplexer or digital channels.
On the digital modules, you can configure the instrument to generate an alarm when a specific bit pattern or bit pattern change is detected on a digital input channel or when a specific count is reached on a totalizer channel.

Syntax: OUTPut:ALARm{1|2|3|4}:SOURce (@<ch_list>)
Query Syntax: OUTPut:ALARm{1|2|3|4}:SOURce?

Parameter: [None]

Example:
OUTP:ALAR3:SOUR (@101:104)
OUTP:ALAR3:SOUR?
Returns: #218(@101,102,103,104)

The "#2" means that the next 2 digits indicate how many characters are in the returned memory string.
In the above example, the 2 digits are the "18" after the "#2". Therefore, the remaining of the string is 18 digits long.

●An empty scan list (with no channels selected) will return "#13(@)".

OUTPut:ALARm:MODE

Clears the state of specified alarm output lines.

Syntax: OUTPut:ALARm:MODE {LATCh|TRACk}
Query Syntax: OUTPut:ALARm:MODE?

Parameter: LATCh | TRACk
Return parameter: LATC | TRAC

Example:
OUTP:ALAR:MODE LATC

●Latch Mode: The alarm output is asserted when a channel's reading crosses a limit, and remains asserted until you clear it manually, start a new scan, or cycle power.

●Track Mode: The alarm output is asserted when a channel's reading crosses a limit, and remains asserted only while subsequent readings remain outside the limit. When a reading returns within the limits, the output is automatically cleared.

OUTPut:ALARm:SLOPe

Configures the level for all four alarm output lines that indicates an alarm, either falling edge (NEG - 0 V), or rising edge (POS - 3.3 V).

Syntax: OUTPut:ALARm:SLOPe {POSitive|NEGative}
Query Syntax: OUTPut:ALARm:SLOPe?

Parameter: POSitive | NEGative
Return parameter: POS | NEG

Example:
OUTP:ALAR:SLOP POS

OUTPut:TRIGger:SLOPe

Specifies the rising edge (POS) or falling edge (NEG) as the Channel Closed signal on the rear panel Digital I/O connector. The signal operates differently during internal or external scan.

Syntax: OUTPut:TRIGger:SLOPe {POSitive|NEGative}
Query Syntax: OUTPut:TRIGger:SLOPe?

Parameter: POSitive | NEGative
Return parameter: POS | NEG

Example:
OUTP:TRIG:SLOP POS

●For internal scans (INSTrument:DMM ON command), it is generated at the END of a sweep, not the beginning of a sweep.

●For external scans (INSTrument:DMM OFF command), it is generated when each channel is closed, and can be used to trigger the measurement on the external DMM.

## ROUTe Commands

### ROUTe:CHANnel:ADVance:SOURce

Selects the source of signal that advances to the next channel in the scan list when scanning with an external DMM (internal DMM disabled). When the channel advance signal is received, the instrument opens the currently selected channel and closes the next channel in the scan list. The instrument will accept a software command (BUS), continuous scan trigger (IMMediate), or external TTL-compatible (EXTernal) trigger pulse.

Syntax: ROUTe:CHANnel:ADVance:SOURce {BUS|IMMediate|EXTernal}
Query Syntax: ROUTe:CHANnel:ADVance:SOURce?

Parameter: BUS | IMMediate | EXTeran
Return parameter: BUS | IMM | EXT

Example:

```
ROUT:CHAN:ADV:SOUR IMM
```

### ROUTe:CHANnel:DELay

Adds a delay between channels in the scan list (useful for high-impedance or high-capacitance circuits). The delay is inserted between the relay closure and the actual measurement on each channel, in addition to any delay that will implicitly occur due to relay settling time. The programmed channel delay overrides the default channel delay that the instrument automatically adds to each channel.

Syntax: ROUTe:CHANnel:DELay {<seconds>lMIN|MAX}[,(@<ch_list>)]
Query Syntax: ROUTe:CHANnel:DELay? [{(@<ch_list>)|MIN|MAX}]?

Parameter: <seconds> (0 ~ 60s)
Return parameter: <NRf>

Example:

```
ROUT:CHAN:DEL 2
ROUT:CHAN:DEL?
```

Returns: +2.00000000E+00

ROUTe:CHANnel:DELay:AUTO

Enables (On) or disables (Off) an automatic channel delay on the specified channels. If enabled, the instrument determines the delay based on function, range, integration time, and AC filter setting.

Syntax: ROUTe:CHANnel:DELay:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: ROUTe:CHANnel:DELay:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
ROUT:CHAN:DEL:AUTO ON

ROUTe:CHANnel:FWIRe

Configures the specified channels for 4-wire external scanning. When enabled, channel n is paired with channel n+10 (DAQ-900 or DAQ-901) or n+4 (DAQ-909) to provide source and sense connections.

Syntax: ROUTe:CHANnel:FWIRe {OFF|ON}[,(@<ch_list>)]
Query Syntax: ROUTe:CHANnel:FWIRe? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
INST:DMM OFF
ROUT:CHAN:FWIRe ON,(@101,102)

●When specifying the scan list using ROUTe:SCAN, only specify the lower channel number (n) for paired channels; the upper channel number (n+10 or n+4) is not allowed in the scan list.

ROUTe:CHANnel:LABel

Assigns a user-defined label to the specified channels.

Syntax: ROUTe:CHANnel:LABel "<label>",(@<ch_list>)
Query Syntax: ROUTe:CHANnel:LABel? [{USER|FACtory},](@<ch_list>)

Parameter:"<label>", max length = 30 characters
Return parameter: "<label>"

USER = Read the user-defined label on the specified channel.
FACTory = Read the factory-default label on the specified channel.

Example:
ROUT:CHAN:LAB "test",(@101,103)
ROUT:CHAN:LAB? USER,(@101,103)
Returns: "test","test"

●When shipped from the factory, each channel is assigned a unique factory-default label (cannot be overwritten).

●Specifying a null string ("") disables the user-defined message.

ROUTe:CHANnel:LABel:CLEar:MODule

Clears all user-defined labels on all channels in the specified slot, or on all modules installed in the DAQ9600, and restores the factory-default labels.

Syntax: ROUTe:CHANnel:LABel:CLEar:MODule {<slot>|ALL}

Parameter: <slot> (1 ~ 3) | ALL

Example:
ROUT:CHAN:LAB:CLE:MOD 1

●This command does not clear the factory-default channel labels. The factory-default labels are always preserved.

●The instrument keeps a record of what module types are installed in each slot. If a different module type is detected in a specific slot at power on, all user-defined channel labels for that slot are discarded. If an empty slot is detected at power-on, any previously-defined labels for that slot are preserved and will be restored if the same module type is installed later; however, if a module of a different type is installed in that slot, the previously-defined labels will be discarded.

ROUTe:CLOSe

Closes the specified channels on a multiplexer or switch module. On the multiplexer modules, if any channel on the module is defined to be part of the scan list, attempting to send this command will result in an error.

Syntax: ROUTe:CLOSe (@<ch_list>)
Query Syntax: ROUTe:CLOSe? (@<ch_list>)

Parameter: [None]
Return parameter: 0 | 1, (0 = open, 1 = close)

Example:
ROUT:CLOS (@101,102)
ROUT:CLOS? (@101,102)
Returns: 1,1

●For the matrix module (DAQ-904), the channel number represents the intersection of the desired row and column. For example, channel 312 represents the intersection of row 1 and column 2 on the module in slot 3 (assumes two-wire mode).

ROUTe:CLOSe:EXCLusive

Opens all channels on a multiplexer or switch module and then closes the specified channels. On the multiplexer modules, if any channel on the module is defined to be part of the scan list, attempting to send this command will result in an error.

Syntax: ROUTe:CLOSe:EXCLusive (@<ch_list>)

Parameter: [None]

Example:
ROUT:CLOS:EXCL (@102)
Returns: 1,1

●This command opens all channels first, and then closes the channels in the <ch_list>, one at a time. Before it closes each channel, it opens all previous channels.

ROUTe:DONE?

Returns the status of all relay operations on modules that not involved in the scan and returns a 1 when finished (even during a scan).

Return parameter: 0 | 1, (0 = Unfinished, 1 = finished)

Example:
ROUT:DONE?
Returns: 1

ROUTe:LOOP:GAIN:AUTO

Enable or disable the Auto Gain prior to each sweep.
When enabled, Auto Gain is performed according to the parameter-defined speed.

Syntax: ROUTe:LOOP:GAIN:AUTO {OFF|ON}
Query Syntax: ROUTe:LOOP:GAIN:AUTO?

Parameter: 0 (OFF), 5/s, 20/s, 60/s, 100/s, 400/s
Return parameter: 0, 5, 20, 60, 100, 400

Example:
ROUT:LOOP:GAIN:AUTO 0
ROUT:LOOP:GAIN:AUTO?
Returns: 0

ROUTe:MONitor

Selects the channel to be displayed on the front panel. Only one channel can be monitored at a time.

Syntax: ROUTe:MONitor (@<channel>)
Query Syntax: ROUTe:MONitor?

Parameter: A single channel
Return parameter: <channel>

Example:
ROUT:MON (@101)
ROUT: MON?
Returns: #16(@101)

The "#1" means that the next 1 digits indicate how many characters are in the returned memory string.
In the above example, the 1 digits are the "6" after the "#1". Therefore, the remaining of the string is 6 digits long.

ROUTe:MONitor:DATA?

Reads the monitor data from the selected channel. It returns the reading only; the units, time, channel, and alarm information are not returned (the FORMat:READing commands do not apply to monitor readings).

Return parameter: <NRf>

Example:

ROUT:MON:STAT OFF
ROUT:MON:DATA?

Returns: +9.91000000E+37

●If the Monitor mode is not currently enabled, this query returns 9.91E37 (not a number).

●Readings acquired during a Monitor are not stored in reading memory but they are displayed on the front panel; however, all readings from a scan in progress at the same time are stored in reading memory.

ROUTe:MONitor:DATA:FULL?

Reads the monitor data from the selected channel. It returns all the reading with the units, time, channel, and alarm information (all the FORMat:READing enabled commands apply to this monitor readings).

Return parameter: <NRf>

Example:

ROUT:MON:STAT ON
ROUT:MON:DATA:FULL?

Returns: -1.20901311E-04 VDC,2022,04,17,20,15,08.613,201,0

●If the Monitor mode is not currently enabled, this query returns 9.91E37 (not a number).

●Readings acquired during a Monitor are not stored in reading memory but they are displayed on the front panel; however, all readings from a scan in progress at the same time are stored in reading memory.

### ROUTe:MONitor:STATe

Enables (On) or disables (Off) the Monitor mode. The Monitor mode is equivalent to making continuous measurements on a single channel with an infinite scan count. Only one channel can be monitored at a time but you can change the channel being monitored at any time.

Syntax: ROUTe:MONitor:STATe {OFF|ON}
Query Syntax: ROUTe:MONitor:STATe?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:RES 1000,(@101)
ROUT:MON (@101)
ROUT:MON:STAT ON
```

### ROUTe:MONitor:VIEW

Selects how measurement data is displayed (numeric, trend chart, histogram, and bar meter format) in monitoring mode.

Syntax: ROUTe:MONitor:VIEW {NUMeric|TCHart|HISTogram|METer}
Query Syntax: ROUTe:MONitor:VIEW?

Parameter: NUMeric | TCHart | HISTogram | METer
Return parameter: NUM | TCH | HIST | MET

Example:

```
ROUT:MON:VIEW NUM
```

## ROUTe:OPEN

Opens the specified channels on a multiplexer or switch module. On the multiplexer modules, if any channel on the module is defined to be part of the scan list, attempting to send this command will result in an error.

Syntax: ROUTe:OPEN (@<ch_list>)
Query Syntax: ROUTe:OPEN? (@<ch_list>)

Return parameter: 0 | 1, (0 = close, 1 = open)

Example:
ROUT:OPEN (@101,102)
ROUT:OPEN? (@101,102)
Returns: 1,1

●For the matrix module (DAQ-904), the channel number represents the intersection of the desired row and column. For example, channel 312 represents the intersection of row 1 and column 2 on the module in slot 3 (assumes two-wire mode).

## ROUTe:SCAN

Selects the channels to be included in the scan list. This command is used in conjunction with the CONFigure commands to set up an automated scan. The specified channels supersede any channels previously defined to be part of the scan list. To start the scan, use the INITiate or READ? command.

Syntax: ROUTe:SCAN (@<ch_list>)
Query Syntax: ROUTe:SCAN?

Parameter: [None]
Return parameter: <channel>

Example:
ROUT:SCAN (@101,102)
ROUT:SCAN?
Returns: #210(@101,102)

The "#2" means that the next 2 digits indicate how many characters are in the returned memory string.
In the above example, the 2 digits are the "10" after the "#2". Therefore, the remaining of the string is 10 digits long.

●To remove all channels from the present scan list, issue the command ROUT:SCAN (@).

●An empty scan list (with no channels selected) will return "#13(@)".

ROUTe:SCAN:SIZE?

Returns the number of channels in the scan list as defined by the ROUTe:SCAN command.

Return parameter: <NR1>

Example:

ROUT:SCAN (@101:105)

ROUT:SCAN:SIZE?

Returns: +5

●The present scan list is stored in non-volatile memory and will be retained when power is turned off.

## SENSe Related Commands

### [SENSe:]FUNCtion[:ON]

Selects the measurement function on the selected channels (all function-related measurement attributes areretained).

Syntax: [SENSe:]FUNCtion[:ON] "<function>"[,(@<ch_list>)]
Query Syntax: [SENSe:]FUNCtion[:ON]? [(@<ch_list>)]

Parameter:
Return Parameter:
"CAP" | "CURR:AC" | "CURR[:DC]" | "DIOD" | "FREQ" | "PER" | "FRES" | "RES" | "STR:DIR" | "STR:FDIR" | "STR:QUAR" | "STR:HALF:BEND" | "STR:HALF:POIS" | "STR:FULL:BEND" | "STR:FULL:BEND:POIS" | "STR:FULL:POIS" | "TEMP[:TC]" | "TEMP:FRTD" | "TEMP:RTD" | "TEMP:FTH" | "TEMP:THER" | "VOLT:AC" | "VOLT[:DC]"

Example:

```
FUNC "RES"
```

## SENSe AVERage Commands

### [SENSe:]AVERage:COUNt

Sets or returns the digital filter count.

Syntax: [SENSe:]AVERage:COUNt {<count>|MIN|MAX}[,(@<ch_list>)]
Query Syntax: [SENSe:]AVERage:COUNt? [{(@<ch_list>)|MIN|MAX}]

Parameter: <count> (2 ~ 100)
Return parameter: <NRf>

Example:

```
AVER:COUN MIN
AVER:COUN?
```

Returns: +0.20000000E+00

[SENSe:]AVERage:STATe

Enable(On) or disable(Off) the digital filter function state.

Syntax: [SENSe:]AVERage:STATe {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]AVERage:STATe? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
AVER:STAT ON

●If NPLC >= 7.2k/s, the filter function will be disabled.

[SENSe:]AVERage:WINDow

Sets or returns a digital filter window value.

Syntax: [SENSe:]AVERage:WINDow {<percent>|MIN|MAX}[,(@<ch_list>)]
Query Syntax: [SENSe:]AVERage:WINDow? [{(@<ch_list>)|MIN|MAX}]

Parameter: <percent> (0.01 | 0.1 | 1 | 10 | NONE)
Return parameter: <NRf>

Example:
AVER:WIND 0.1

[SENSe:]AVERage:WINDow:METHod

Sets or returns a digital filter window method type.

Syntax: [SENSe:]AVERage:WINDow:METHod <type>[,(@<ch_list>)]
Query Syntax: [SENSe:]AVERage:WINDow:METHod? [(@<ch_list>)]

Parameters: <type> (MEASure | RANGe)
Return parameter: MEASure | RANGe

Example:
AVER:WIND:METH MEAS

## SENSe CAPacitance Commands

### [SENSe:]CAPacitance:RANGe

Selects a fixed range for capacitance measurements.

Syntax: [SENSe:]CAPacitance:RANGe {<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CAPacitance:RANGe? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <range> (1nF | 10nF | 100nF | 1μF | 10μF | 100μF); DEF:AUTO
Return parameter: <NRf>

Example:

```
CONF:CAP (@101)
CAP:RANG 1e-6
CAP:RANG?
```

Returns: +1.00000000E-06

### [SENSe:]CAPacitance:RANGe:AUTO

Enables or disables autoranging for capacitance measurements.

Syntax: [SENSe:]CAPacitance:RANGe:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]CAPacitance:RANGe:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:CAP (@101)
CAP:RANG:AUTO ON
```

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

## SENSe CURRent Commands

### [SENSe:]CURRent:AC:BANDwidth

Sets or returns the ac filter bandwith for AC current measurements.

Syntax: [SENSe:]CURRent:AC:BANDwidth
{<freq>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent:AC:BANDwidth?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <freq> (3 | 20 | 200Hz); DEF: 20Hz
Return parameter: <NRf>

Example:

```
CONF:CURR:AC (@121)
CURR:AC:BAND 3
CURR:AC:BAND?
```

Returns: +3.00000000E+00

### [SENSe:]CURRent:{AC|DC}:RANGe

Selects a fixed range for AC and DC current measurements.

Syntax: [SENSe:]CURRent:{AC|DC}:RANGe
{<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent:{AC|DC}:RANGe?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter:
<range>:
AC: (100μA | 1mA | 10mA | 100mA | 2A); DEF:AUTO
DC: (1μA | 10μA | 100μA | 1mA | 10mA | 100mA | 2A); DEF:AUTO
Return parameter: <NRf>

Example:

```
CONF:CURR:AC (@121)
CURR:AC:RANG 0.1
CURR:AC:RANG?
```

Returns: +1.00000000E-01

[SENSe:]CURRent:{AC|DC}:RANGe:AUTO

Enables or disables autoranging for AC and DC current measurements.

Syntax: [SENSe:]CURRent:{AC|DC}:RANGe:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent:{AC|DC}:RANGe:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:CURR:AC (@101)
CURR:AC:RANG:AUTO ON
```

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

[SENSe:]CURRent:{AC|DC}:RANGe:LOW

Selects a limit minimum current at autoranging for AC and DC current measurements.

Syntax: [SENSe:]CURRent:{AC|DC}:RANGe:LOW
{<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent:{AC|DC}:RANGe:LOW?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter:
<range>:
AC: (100μA | 1mA | 10mA | 100mA), DEF: 100uA
DC: (1μA | 10μA | 100μA | 1mA | 10mA | 100mA) , DEF: 1uA
Return parameter: <NRf>

Example:

```
CONF:CURR:AC (@121)
CURR:AC:RANG:LOW 0.01
CURR:AC:RANG:LOW?
```

Returns: +1.00000000E-02

[SENSe:]CURRent[:DC]:APERture

Enables the aperture mode and sets the integration time in seconds (called aperture time) for DC current measurements.

Syntax: [SENSe:]CURRent[:DC]:APERture
{<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent[:DC]:APERture?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (20μs ~ 1s); DEF: 100ms
Return parameter: <NRf>

Example:
CONF:CURR:DC (@121)
CURR:APER 0.1
CURR:APER?
Returns: +1.00000000E-01

[SENSe:]CURRent[:DC]:APERture:ENABle

Enables the setting of integration time in seconds (called aperture time) for DC current measurements. If aperture time mode is disabled , the integration time is set in PLC (power-line cycles).

Syntax: [SENSe:]CURRent[:DC]:APERture:ENABle {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent[:DC]:APERture:ENABle? [{(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:CURR:DC (@121)
CURR:APER:ENAB ON

### [SENSe:]CURRent[:DC]:NPLCycles

Sets or returns the integration time in number of power line cycles (PLCs) for DC current measurements. Where one PLC is equal to 16.6 milliseconds.

Syntax: [SENSe:]CURRent[:DC]:NPLCycles {<PLCs>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent[:DC]:NPLCycles? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <PLCs> (0.0016 | 0.0032 | 0.0042 | 0.0083 | 0.0125 | 0.025 | 0.05 | 0.15 | 0.6 | 1 | 3 | 12); DEF: 1 PLC
Return parameter: <NRf>

Example:

```
CONF:CURR (@121)
CURR:NPLC 1
CURR:NPLC?
```

Returns: +1.00000000E+00

### [SENSe:]CURRent[:DC]:ZERO:AUTO

Enables or disables the autozero mode for DC current measurements.

Syntax: [SENSe:]CURRent[:DC]:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]CURRent[:DC]:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:CURR (@121)
CURR:ZERO:AUTO ON
```

## SENSe DIODe Commands

### [SENSe:]DIODe:ZERO:AUTO

Enables or disables the autozero mode for diode measurements.

Syntax: [SENSe:]DIODe:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]DIODe:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:DIOD (@101)
DIOD:ZERO:AUTO ON
```

## SENSe DIGital Commands

### [SENSe:]DIGital:DATA[:BYTE]?

Configures the specified channels as inputs and reads an 8-bit digital data format from the selected digital input channels.

Query Syntax: [SENSe:]DIGital:DATA[:BYTE]? (@<ch_list>)

Parameter: [None]
Return parameter: <NR1>

Example: DIG:DATA:BYTE?(@101)
Returns: 0 ~ 255

●The output from this command is affected by the FORMat:READing commands.

### [SENSe:]DIGital:DATA:WORD?

Configures the specified channels as inputs and reads a 16-bit digital data format from the selected digital input channels.

Query Syntax: [SENSe:]DIGital:DATA:WORD? (@<ch_list>)

Parameter: [None]
Return parameter: <NR1>

Example: DIG:DATA:BYTE?(@101)
Returns: 0 ~ 65535

●To read both ports simultaneously (WORD), you must send the command to channel 01 (LSB).
●The output from this command is affected by the FORMat:READing commands.

## SENSe FREQuency Commands

### [SENSe:]{FREQuency|PERiod}:APERture

Sets or returns the aperture time (gate time) for the frequency and period measurements.

Syntax: [SENSe:]{FREQuency|PERiod}:APERture {<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]{FREQuency|PERiod}:APERture? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (0.001 | 0.01 | 0.1 | 1s); DEF: 0.1s
Return parameter: <NRf>

Example:
CONF:FREQ (@101)
FREQ:APER 0.1
FREQ:APER?
Returns: +1.00000000E-01

[SENSe:]{FREQuency|PERiod}:RANGe:LOWer

Sets or returns the ac filter bandwith of frequency and period measurements.

Syntax: [SENSe:]{FREQuency|PERiod}:RANGe:LOWer
{<freq>|MIN|MAX|DEF}[,(@<ch_list>)
Query Syntax: [SENSe:]{FREQuency|PERiod}:RANGe:LOWer?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <freq> (3 | 20 | 200Hz); DEF: 20Hz
Return parameter: <NRf>

Example:

```
CONF:FREQ (@101)
FREQ:RANG:LOW 3
FREQ:RANG:LOW?
```

Returns: +3.00000000E+00

[SENSe:]{FREQuency|PERiod}:TIMeout:AUTO

Sets or returns the timeout time for frequency and period measurements.

Syntax: [SENSe:]{FREQuency|PERiod}:TIMeout:AUTO
{OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{FREQuency|PERiod}:TIMeout:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | ON | OFF
Return parameter: 0 | 1, (0:timeout time = 1 second, 1:timeout time is different in according with ac filter bandwith)

Example:

```
CONF:PER
PER:TIM:AUTO ON
```

[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe

Selects a fixed voltage range for frequency and period measurements.

Syntax: [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe
{<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <range> (100mV | 1V | 10V | 100V | 400V); DEF: 10V
Return parameter: <NRf>

Example:
CONF:FREQ (@101)
FREQ:VOLT:RANG 0.1
FREQ:VOLT:RANG?
Returns: +1.00000000E-01

[SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO

Enables or disables voltage autoranging for frequency and period measurements.

Syntax: [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO
{OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{FREQuency|PERiod}:VOLTage:RANGe:AUTO?
[(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:FREQ (@101)
FREQ:VOLT:RANG:AUTO ON

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

## SENSe RESistance Commands

### [SENSe:]{RESistance|FRESistance}:APERture

Enables the aperture mode and sets the integration time in seconds (called aperture time) for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:APERture {<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:APERture? [(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (20µs ~ 1s); DEF: 100ms
Return parameter: <NRf>

Example:

```
CONF:RES (@101)
RES:APER 0.1
RES:APER?
```

Returns: +1.00000000E-01

### [SENSe:]{RESistance|FRESistance}:APERture:ENABle

Enables the setting of integration time in seconds (called aperture time) for 2-wire and 4-wire resistance measurements. If aperture time mode is disabled , the integration time is set in PLC (power-line cycles).

Syntax: [SENSe:]{RESistance|FRESistance}:APERture:ENABle {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:APERture:ENABle? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:RES (@101)
RES:APER:ENAB ON
```

[SENSe:]{RESistance|FRESistance}:NPLCycles

Sets or returns the integration time in number of power line cycles (PLCs) for 2-wire and 4-wire resistance measurements. Where one PLC is equal to 16.6 milliseconds.

Syntax: [SENSe:]{RESistance|FRESistance}:NPLCycles {<PLCs>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:NPLCycles? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <PLCs> (0.0016 | 0.0032 | 0.0042 | 0.0083 | 0.0125 | 0.025 | 0.05 | 0.15 | 0.6 | 1 | 3 | 12); DEF: 1 PLC
Return parameter: <NRf>

Example:

```
CONF:RES (@101)
RES:NPLC 1
RES:NPLC?
```

Returns: +1.00000000E+00

[SENSe:]{RESistance|FRESistance}:OCOMpensated

Enables or disables offset compensation for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:OCOMpensated {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:OCOMpensated? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:RES (@101)
RES:OCOM ON
```

●Applies only to resistance measurements on the 100 Ω through 100 kΩ ranges.

[SENSe:]{RESistance|FRESistance}:POWer:LIMit[:STATe]

Enables or disables low-power for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:POWer:LIMit[:STATe] {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:POWer:LIMit[:STATe]? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:RES (@101)
RES:POW:LIM ON

●Low-power resistance measurements apply to the 100 Ω through 100 kΩ ranges only. The 1 MΩ through 1 GΩ ranges source the same current regardless of the low-power setting.

[SENSe:]{RESistance|FRESistance}:RANGe

Selects a fixed range for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:RANGe {<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:RANGe? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter:
<range> (100Ω | 1kΩ | 10kΩ | 100kΩ | 1MΩ | 10MΩ | 100MΩ | 1GΩ); DEF: 1kΩ
Return parameter: <NRf>

Example:
CONF:FRES (@101)
FRES:RANG 10e3
FRES:RANG?
Returns: +1.00000000E+04

[SENSe:]{RESistance|FRESistance}:RANGe:AUTO

Enables or disables autoranging for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:RANGe:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:RANGe:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:FRES (@101)
FRES:RANG:AUTO ON
```

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

[SENSe:]{RESistance|FRESistance}:ZERO:AUTO

Enables or disables the autozero mode for 2-wire and 4-wire resistance measurements.

Syntax: [SENSe:]{RESistance|FRESistance}:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]{RESistance|FRESistance}:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:FRES (@101)
FRES:ZERO:AUTO ON
```

## SENSe STRain Commands

### [SENSe:]STRain:APERture

Enables the aperture mode and sets the integration time in seconds (called aperture time) for strain measurements.

Syntax: [SENSe:]STRain:APERture {<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:APERture? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (20μs ~ 1s); DEF: 100ms
Return parameter: <NRf>

Example:

```
CONF:STR:DIR (@101)
STR:APER 0.1
STR:APER?
```

Returns: +1.00000000E-01

### [SENSe:]STRain:APERture:ENABle

Enables the setting of integration time in seconds (called aperture time) for strain measurements. If aperture time mode is disabled , the integration time is set in PLC (power-line cycles).

Syntax: [SENSe:]STRain:APERture:ENABle {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:APERture:ENABle? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:STR:DIR (@101)
STR:APER:ENAB ON
```

### [SENSe:]STRain:EXCitation

Specifies the excitation voltage applied to the bridge by an external DC voltage source. This value will be used to convert strain bridge measurements on the specified channel.

Syntax: [SENSe:]STRain:EXCitation {<voltage>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:EXCitation? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <voltage> (1 ~ 12V); DEF: 5V
Return parameter: <NRf>

Example:

```
CONF:STR:DIR (@101)
STR:EXC 3
STR:EXC?
```

Returns: +3.00000000E+00

●The external DC voltage reference channel must be the next lowest channel than the subsequent strain channel.

### [SENSe:]STRain:EXCitation:TYPE

Strain bridge conversions require the value of the external bridge excitation voltage. For this voltage, you can dedicate a multiplexer channel to measure the excitation voltage, or can specify a known fixed voltage value.

Syntax: [SENSe:]STRain:EXCitation:TYPE {EXTernal|FIXed}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:EXCitation:TYPE? [(@<ch_list>)]

Parameter: EXTernal | FIXed
Return parameter: EXT | FIX

FIXed = the excitation voltage specified by SENSe:STRain:EXCitation will be used for the strain conversion.

EXTernal = the next-lowest channel configured for DCV measurements with reference mode enabled (see SENSe:VOLTage:DC:REFerence command) will be used as the excitation voltage reference in the strain conversion.

Example:

```
CONF:STR:DIR (@101)
STR:EXC:TYPE FIX
STR:EXC 3
```

[SENSe:]STRain:GFACtor

Specifies the gage factor to be used to convert direct strain and strain bridge readings on the specified channel.
Gage factor is defined as the ratio of the fractional change in resistance to the fractional change in length (strain) along the axis of the edge.

Syntax: [SENSe:]STRain:GFACtor
{<gage_factor>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:GFACtor? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <gage_factor> (0.5 ~ 5); DEF: 2
Return parameter: <NRf>

Example:
CONF:STR:DIR (@101)
STR:GFAC 1
STR:GFAC?
Returns: +1.00000000E+00

●Gage factor is a dimensionless quantity. The larger the value, the more sensitive strain gage.

[SENSe:]STRain:NPLCycles

Sets or returns the integration time in number of power line cycles (PLCs) strain measurements. Where one PLC is equal to 16.6 milliseconds.

Syntax: [SENSe:]STRain:NPLCycles {<PLCs>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:NPLCycles? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <PLCs> (0.0016 | 0.0032 | 0.0042 | 0.0083 | 0.0125 | 0.025 | 0.05 | 0.15 | 0.6 | 1 | 3 | 12); DEF: 1 PLC
Return parameter: <NRf>

Example:
CONF:STR:DIR (@101)
STR:NPLC 1
STR:NPLC?
Returns: +1.00000000E+00

[SENSe:]STRain:OCOMpensated

Enables or disables offset compensation for strain measurements.

Syntax: [SENSe:]STRain:OCOMpensated {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:OCOMpensated? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

CONF:STR:DIR (@101)
STR:OCOM ON

●Applies only to resistance measurements on the 100 Ω through 100 kΩ ranges.

[SENSe:]STRain:POISson

This command sets the poisson ratio to be used to convert strain bridge readings on the specified channels.
Poisson ratio is defined as the negative ratio of the strain the transverse direction to the strain the longitudinal direction.

Syntax: [SENSe:]STRain:POISson
{<poisson_ratio>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRainPOISson? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <poisson_ratio> (-0.9999 ~ 0.5); DEF: 0.3
Return parameter: <NRf>

Example:

CONF:STR:DIR (@101)
STR:POIS 1
STR:POIS?

Returns: +1.00000000E+00

[SENSe:]STRain:RESistance

This command specifies the gage ohm value to be used to convert direct strain measurements on the specified channel.

Syntax: [SENSe:]STRain:RESistance {<gage_ohm>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:RESistance? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <gage_ohm> (80 ~ 1100Ω); DEF: 120Ω
Return parameter: <NRf>

Example:
CONF:STR:DIR (@101)
STR:RES 100
STR:RES?
Returns: +1.00000000E+02

[SENSe:]STRain:UNSTrained

This command specifies the unstrained bridge offset (can be either voltage or resistance) that will be subtracted from the strain bridge measurements before the strain conversion is performed strain bridge measurements.

Syntax: [SENSe:]STRain:UNSTrained {<offset>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:UNSTrained? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <offset> (-90 ~ 90); DEF: 0
Return parameter: <NRf>

Example:
CONF:STR:DIR (@101)
STR:UNST 10
STR:UNST?
Returns: +1.00000000E+01

[SENSe:]STRain:UNSTrained:IMMediate

This command immediately measures and stores the bridge offset voltages on the specified channel.

Syntax: [SENSe:]STRain:UNSTrained:IMMediate [(@<ch_list>)]

Parameter: [None]

Example:
CONF:STR:QUAR (@101)
STR:UNST:IMM
STR:UNST?
Returns: -9.055960E-05

[SENSe:]STRain:VOLTage:RANGe

Selects a fixed range for strain measurements.

Syntax: [SENSe:]STRain:VOLTage:RANGe
{<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:VOLTage:RANGe?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter:
<range> (100mV | 1V | 10V | 100V | 600V); DEF: 100mV
Return parameter: <NRf>

Example:
CONF:STR:QUAR (@101)
STR:VOLT:RANG 10
Returns: +1.00000000E+01

[SENSe:]STRain:VOLTage:RANGe:AUTO

Enables or disables autoranging for strain measurements.

Syntax: [SENSe:]STRain:VOLTage:RANGe:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:VOLTage:RANGe:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:STR:QUAR (@101)
STR:VOLT:RANG:AUTO ON

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

[SENSe:]STRain:ZERO:AUTO

Enables or disables the autozero mode for strain measurements.

Syntax: [SENSe:]STRain:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]STRain:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:STR:DIR (@101)
STR:ZERO:AUTO ON

## SENSe TEMPerature Commands

### [SENSe:]TEMPerature:APERture

Enables the aperture mode and sets the integration time in seconds (called aperture time) for temperature measurements.

Syntax: [SENSe:]TEMPerature:APERture {<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:APERture? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (20μs ~ 1s); DEF: 100ms
Return parameter: <NRf>

Example:

```
CONF:TEMP TC,(@101)
TEMP:APER 0.5
TEMP:APER?
```

Returns: +5.00000000E-01

### [SENSe:]TEMPerature:APERture:ENABle

Enables the setting of integration time in seconds (called aperture time) for temperature measurements. If aperture time mode is disabled , the integration time is set in PLC (power-line cycles).

Syntax: [SENSe:]TEMPerature:APERture:ENABle {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:APERture:ENABle? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:TEMP TC,(@101)
TEMP:APER:ENAB ON
```

[SENSe:]TEMPerature:NPLCycles

Sets or returns the integration time in number of power line cycles (PLCs) temperature measurements. Where one PLC is equal to 16.6 milliseconds.

Syntax: [SENSe:]TEMPerature:NPLCycles {<PLCs>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:NPLCycles? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <PLCs> (0.0016 | 0.0032 | 0.0042 | 0.0083 | 0.0125 | 0.025 | 0.05 | 0.15 | 0.6 | 1 | 3 | 12); DEF: 1 PLC
Return parameter: <NRf>

Example:

```
CONF:TEMP TC, (@101)
TEMP:NPLC 3
TEMP:NPLC?
```

Returns: +3.00000000E+00

[SENSe:]TEMPerature:RJUNction?

Returns the internal reference junction temperature on the specified channels in degrees Celsius, regardless of the temperature units currently selected. This is useful only for an internal reference source.

Query Syntax: [SENSe:]TEMPerature:RJUNction? [(@<ch_list>)]

Return parameter: <NRf>

Example:

```
CONF:TEMP TC,(@101)
TEMP:RJUN?
```

Returns: +2.76800914E+01

[SENSe:]TEMPerature:RJUNction:SIMulated:AUTO:OFFSet

Sets or returns junction reference temperature adjust value of thermocouple measurement which internal temperature is selected.

Syntax: [SENSe:]TEMPerature:RJUNction:SIMulated:AUTO:OFFSet {<temperature>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:RJUNction:SIMulated:AUTO:OFFSet? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <temperature> (-20.00 ~ 20.00); DEF:0
Return parameter: <NRf>, where unit = ˚C

Example:

```
CONF:TEMP TC,(@101)
TEMP:RJUN:SIM:AUTO:OFFS 10
TEMP:RJUN:SIM:AUTO:OFFS?
```

Returns: +1.00000000E+01

---

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:TYPE

Selects the 2-wire and 4-wire RTD sensor type.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:TYPE <sensor_type>[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:TYPE? [(@<ch_list>)]

parameter: <sensor_type> (PT100 | D100 | F100 | PT385 | PT3916 | USER)
Return parameter: PT100 | D100 | F100 | PT385 | PT3916 | USER

Example:

```
TEMP:TRAN:RTD:TYPE PT100
```

---

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:ALPHa

Sets or returns the 2-wire and 4-wire RTD alpha coefficient.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:ALPHa {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:ALPHa? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.999999); DEF: 0
Return parameter: <NRf>

Example:

```
TEMP:TRAN:RTD:USER:ALPH 0.00385
```

---

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:BETA

Sets or returns the 2-wire and 4-wire RTD beta coefficient.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:BETA {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:BETA? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.999999); DEF: 0
Return parameter: <NRf>

Example:

TEMP:TRAN:RTD:USER:BETA 0.10863

---

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:DELTa

Sets or returns the 2-wire and 4-wire RTD delta coefficient.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:DELTa {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:USER:DELTa? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.999999); DEF: 0
Return parameter: <NRf>

Example:

TEMP:TRAN:RTD:USER:DELT 1.4999

---

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:OCOMpensated

Enables or disables offset compensation for temperature measurements.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:OCOMpensated {OFF|ON}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:OCOMpensated? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

CONF:TEMP RTD,(@101)
TEMP:TRAN:RTD:OCOM ON

●This command applies only to 2-wire and 4-wire RTD measurements on the 100 Ω, 1 kΩ, and 10 kΩ ranges. Once enabled, offset compensation is applied to both 2-wire and 4-wire RTD measurements on the specified channels.

●Applies only to resistance measurements on the 100 Ω through 100 kΩ ranges.

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:POWer:LIMit[:STATe]

Enables or disables low-power for 2-wire and 4-wire RTD measurements.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:POWer:LIMit[:STATe] {OFF|ON}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:POWer:LIMit[:STATe]? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

CONF:TEMP RTD,(@101)
TEMP:TRAN:RTD:POW:LIM ON

●Low-power resistance measurements apply to the 100 Ω through 100 kΩ ranges only. The 1 MΩ through 1 GΩ ranges source the same current regardless of the low-power setting.

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:REFerence

Enables (On) or disables (Off) the specified 2-wire and 4-wire RTD channels to be used as the reference channel for subsequent thermocouple measurements that specify an external reference source.

Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:REFerence {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:REFerence? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:TEMP RTD,(@101)
TEMP:TRAN:RTD:REF ON
```

[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:RESistance[:REFerence]

Selects the nominal resistance (R0) for 2-wire and 4-wire RTD measurements. R0 is the nominal resistance of an RTD at 0 °C.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:RESistance[:REFerence] {<resistance>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{RTD|FRTD}:RESistance[:REFerence]? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <resistance> (100 ~ 1000Ω)±20%); DEF: 100Ω
Return parameter: <NRf>

Example:

```
CONF:TEMP RTD,(@101)
TEMP:TRAN:RTD:RES 1000
TEMP:TRAN:RTD:RES?
```

Returns: +1.00000000E+03

[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:POWer:LIMit[:STATe]

Enables or disables low-power for 2-wire and 4-wire thermistor measurements.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:POWer:LIMit[:STATe] {OFF|ON}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:POWer:LIMit[:STATe]? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:TEMP THER,(@101)
TEMP:TRAN:THER:POW:LIM ON

●Low-power resistance measurements apply to the 100 Ω through 100 kΩ ranges only. The 1 MΩ through 1 GΩ ranges source the same current regardless of the low-power setting.

[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:REFerence

Enables (On) or disables (Off) the specified 2-wire and 4-wire thermistor channels to be used as the reference channel for subsequent thermocouple measurements that specify an external reference source.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:REFerence {OFF|ON}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:REFerence? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:TEMP THER,(@101)
TEMP:TRAN:THER:REF ON

[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:TYPE

Sets or returns the 2-wire and 4-wire thermistor sensor type.

Syntax: [SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:TYPE {<sensor_type>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:TYPE? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <sensor_type> (2.2kΩ | 5kΩ | 10kΩ | USER); DEF: 5kΩ
Return parameter: +2000 | +5000 | +10000 | USER

Example:

```
TEMP:TRAN:THER:TYPE 2200
```

---

[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:AVALue

Sets or returns the 2-wire and 4-wire thermistor a coefficient.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:AVALue {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:AVALue? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.9999); DEF: 0
Return parameter: <NRf>

Example:

```
TEMP:TRAN:FTH :USER:AVAL 0.002154
```

---

### [SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:BVALue

Sets or returns the 2-wire and 4-wire thermistor b coefficient.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:BVALue {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:BVALue? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.9999); DEF: 0
Return parameter: <NRf>

Example:
TEMP:TRAN:FTH :USER:BVAL 0.003425

### [SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:CVALue

Sets or returns the 2-wire and 4-wire thermistor c coefficient.

Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:CVALue {<coefficient>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax:
[SENSe:]TEMPerature:TRANsducer:{THERmistor|FTHermistor}:USER:CVALue? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <coefficient> (0.0~9.9999); DEF: 0
Return parameter: <NRf>

Example:
TEMP:TRAN:FTH:USER:CVAL 0.006993

[SENSe:]TEMPerature:TRANsducer:TCouple:CHECk

Enables or disables the thermocouple check feature to verify that your thermocouples are properly connected for measurements. When enabled, the instrument measures the resistance after each thermocouple measurement to ensure a proper connection. If an open connection is detected (greater than 5 kΩ on the 10 kΩ range), the instrument reports an overload condition.

Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:CHECk? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:TEMP TC,(@101)
TEMP:TRAN:TC:CHEC ON
```

[SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction

Sets the fixed reference junction temperature in degrees Celsius (°C) for thermocouple measurements on the specified channels.

Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction {<temperature>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <temperature> (-20 ~ +80); DEF: 0
Return parameter: <NRf>

Example:

```
CONF:TEMP TC,(@101)
TEMP:TRAN:TC:RJUN 25
```

Returns: +2.50000000E+01

●For this command, you must always specify the temperature in degrees Celsius regardless of the temperature units currently selected (see UNIT:TEMPerature command).

### [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE

Selects the reference junction source for thermocouple measurements on the specified channels.

Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE <reference>[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:RJUNction:TYPE? [(@<ch_list>)]

Parameter: <reference> (INTernal | EXTeranl | FIXed)
Return parameter: INT | EXT | FIX

Example:

```
CONF :TEMP TC,(@101)
TEMP:TRAN:TC:RJUN:TYPE INT
```

---

### [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE

Sets or returns the thermocouple sensor type.

Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE <sensor_type>[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:TCouple:TYPE? [(@<ch_list>)]

Parameter: <sensor_type> (J | K | N | R | S | T | B | E)
Return parameter: J | K | N | R | S | T | B | E

Example:

```
TEMP:TRAN:TC:TYPE J
```

---

### [SENSe:]TEMPerature:TRANsducer:TYPE

Selects the transducer probe type to use for temperature measurements.

Syntax: [SENSe:]TEMPerature:TRANsducer:TYPE <probe_type>[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:TRANsducer:TYPE? [(@<ch_list>)]

Parameter: TCouple | RTD | FRTD | THERmistor | FTHermistor
Return parameter: TC | RTD | FRTD | THER | FTH

Example:

```
TEMP:TRAN:TYPE TC
```

---

[SENSe:]TEMPerature:ZERO:AUTO

Enables or disables the autozero mode for temperature measurements.

Syntax: [SENSe:]TEMPerature:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]TEMPerature:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:TEMP TC,(@101)
TEMP:ZERO:AUTO ON

## SENSe Totalizer Commands

[SENSe:]TOTalize:CLEar:IMMediate

Clears the count on the specified totalizer channels without delay.

Syntax: [SENSe:]TOTalize:CLEar:IMMediate (@<ch_list>)

Parameter: none

Example: TOT:CLE:IMM (@103)

[SENSe:]TOTalize:DATA?

This query reads the count on the specified totalizer channels. If you have configured the count to be reset when it is read (see CONFigure:TOTalize and [SENSe:]TOTalize:TYPE commands), then this command will reset the count to 0 after it is read. The count is reset regardless of whether the specified channels are in a scan list or even whether a scan is in progress.

Syntax: [SENSe:]TOTalize:DATA? (@<ch_list>)

Parameter: none
Return parameter: <NR1>

Example: TOT:DATA? (@103)
Returns: 0～999999999

- The maximum count is 999999999. The count rolls over to 0 after reaching the maximum allowed value.
- The output from this command is affected by the settings of the FORMat:READing commands. Depending on the formats selected, each reading may or may not be stored with measurement units, time stamp, channel number, and alarm status information.

[SENSe:]TOTalize:SLOPe {POSitive | NEGative}

Sets the specified totalizer channels to register counts based on the rising edge (positive) or falling edge (negative) of the input signal.

Syntax: [SENSe:]TOTalize:SLOPe {POSitive | NEGative}, (@<ch_list>)
Query Syntax: [SENSe:]TOTalize:SLOPe?

Parameter: {POSitive | NEGative}
Return parameter: POS or NEG

Example: TOT:SLOP? (@103)

[SENSe:]TOTalize:STARt

Initiates the counting process on the specified totalizer channels.

Syntax: [SENSe:]TOTalize:STARt, (@<ch_list>)

Parameter: [none]

Example: TOT:STAR (@103)

[SENSe:]TOTalize:STOP

Stop the counting process on the specified totalizer channels.

Syntax: [SENSe:]TOTalize:STOP, (@<ch_list>)

Parameter: [none]

Example: TOT:STOP (@103)

[SENSe:]TOTalize:TYPE {READ | RRESet}

Configures the specified totalizer channels to enable or disable automatic count reset.

Syntax: [SENSe:]TOTalize:TYPE {READ | RRESet}, (@<ch_list>)
READ – Reads the totalizer value during a scan without resetting the count.
PRESet – Reads the totalizer value during a scan and resets the count to zero after reading.
Query Syntax: [SENSe:]TOTalize:TYPE? (@<ch_list>)

Parameter: {READ | PRESet}
Return parameter: READ or PRES

Example: TOT:TYPE? (@103)

●The maximum count is 0 ~ 999999999. The count rolls over to 0 after reaching the maximum allowed value.

## SENSe VOLTage Commands

### [SENSe:]VOLTage:AC:BANDwidth

Sets or returns the bandwidth for AC voltage measurements.

Syntax: [SENSe:]VOLTage:AC:BANDwidth
{<freq>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage:AC:BANDwidth?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <freq> (3 | 20 | 200Hz) ; DEF: 20Hz
Return parameter: <NRf>

Example:

```
CONF:AC (@101)
VOLT:AC:BAND 20
VOLT:AC:BAND?
```

Returns: +2.00000000E+01

### SENSe:VOLTage:AC:LPF

Enable or disable the low-pass filter for AC voltage.
When enabled, the maximum input signal frequency is limited to 500 kHz.

Syntax: SENSe:VOLTage:AC:LPF {OFF|ON}
Query Syntax: SENSe:VOLTage:AC:LPF?

Parameter: 0 OFF, 1 ON
Return parameter: 0 (OFF), 1 (ON)

Example:

```
SENS:VOLT:AC:LPF ON
SENS:VOLT:AC:LPF?
```

Returns: 1

[SENSe:]VOLTage:{AC|DC}:RANGe

Selects a fixed range for AC and DC voltage measurements.

Syntax: [SENSe:]VOLTage:{AC|DC}:RANGe
{<range>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage:{AC|DC}:RANGe?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter:
<range>:
AC: (100mV | 1V | 10V | 100V | 400V); DEF: AUTO
DC: (100mV | 1V | 10V | 100V | 600V); DEF: AUTO
Return parameter: <NRf>

Example:
CONF:AC (@101)
VOLT:AC:RANG 100
Returns: +1.00000000E+02

[SENSe:]VOLTage:{AC|DC}:RANGe:AUTO

Enables or disables autoranging for AC and DC voltage measurements.

Syntax: [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage:{AC|DC}:RANGe:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
CONF:DC (@101)
VOLT:DC:RANG:AUTO ON

●Autorange thresholds:
Down range at: < 10% of range
Up range at: > 120% of range

[SENSe:]VOLTage[:DC]:APERture

Enables the aperture mode and sets the integration time in seconds (called aperture time) for DC voltage measurements.

Syntax: [SENSe:]VOLTage[:DC]:APERture {<seconds>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:APERture? [{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <seconds> (20μs ~ 1s); DEF: 100ms
Return parameter: <NRf>

Example:

```
CONF:DC (@101)
VOLT:APER 0.1
VOLT:APER ?
```

Returns: +1.00000000E-01

[SENSe:]VOLTage[:DC]:APERture:ENABle

Enables the setting of integration time in seconds (called aperture time) for DC voltage measurements. If aperture time mode is disabled , the integration time is set in PLC (power-line cycles).

Syntax: [SENSe:]VOLTage[:DC]:APERture:ENABle {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:APERture:ENABle? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

```
CONF:DC (@101)
VOLT:APER:ENAB ON
```

### [SENSe:]VOLTage[:DC]:IMPedance:AUTO

Enables or disables automatic input impedance mode for DC voltage measurements.

Syntax: [SENSe:]VOLTage[:DC]:IMPedance:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:IMPedance:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

OFF:
The input impedance for DC voltage measurements is fixed at 10 MΩ for all ranges to minimize noise pickup.

ON:
The input impedance for DC voltage measurements varies by range. It is set to "HI-Z" (>10 GΩ) for the 100 mV, 1 V, and 10 V ranges to reduce the effects of measurement loading errors on these lower ranges. The 100 V and 300 V ranges remain at a 10 MΩ input impedance.

Example:

```
CONF:DC (@101)
VOLT:DC:IMP:AUTO ON
```

### [SENSe:]VOLTage[:DC]:NPLCycles

Sets or returns the integration time in number of power line cycles (PLCs) DC voltage measurements. Where one PLC is equal to 16.6 milliseconds.

Syntax: [SENSe:]VOLTage[:DC]:NPLCycles
{<PLCs>|MIN|MAX|DEF}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:NPLCycles?
[{(@<ch_list>)|MIN|MAX|DEF}]

Parameter: <PLCs> (0.0016 | 0.0032 | 0.0042 | 0.0083 | 0.0125 | 0.025 | 0.05 | 0.15 | 0.6 | 1 | 3 | 12); DEF: 1 PLC
Return parameter: <NRf>

Example:

```
CONF:DC (@101)
VOLT:NPLC 1
VOLT:NPLC?
```

Returns: +1.00000000E+00

[SENSe:]VOLTage[:DC]:REFerence

Enables (On) or disables (Off) the specified DC voltage channels to be used as the reference channel for subsequent strain bridge measurements that specify an external excitation reference voltage source (see [SENSe:]STRain:EXCitation:TYPE command).

Syntax: [SENSe:]VOLTage[:DC]:REFerence {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:REFerence? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

CONF:DC (@101)
VOLT:REF ON

●The external DC voltage reference channel must be one channel lower than the subsequent strain channel.

[SENSe:]VOLTage[:DC]:ZERO:AUTO

Enables or disables the autozero mode for DC voltage measurements.

Syntax: [SENSe:]VOLTage[:DC]:ZERO:AUTO {OFF|ON}[,(@<ch_list>)]
Query Syntax: [SENSe:]VOLTage[:DC]:ZERO:AUTO? [(@<ch_list>)]

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

CONF:DC (@101)
VOLT:ZERO:AUTO ON

## SOURce Report Commands

### SOURce:CURRent {<current> | MIN | MAX | DEF}

Configures the DAC output channels (channels 04 and 05) to operate in current output mode.

Syntax: SOURce:CURRent {<current> | MIN | MAX | DEF}, (@<ch_list>)
Query Syntax: SOURce:CURRent? {(@<ch_list>) | MIN | MAX | DEF}

Parameter: <current> MIN: -0.024 A (-24 mA)
DEF: 0 A
MAX: 0.024 A (24 mA)
Return parameter: <NRf>

Example: SOUR:CURRent? (@104)
Returns: +1.23400000E-04

● This parameter is set to its default value after a Factory Reset (*RST command).

---

### SOURce:DIGital:DATA[:BYTE] <data>

Transmits a digital pattern as an 8-bit byte to the specified digital I/O channels. The :BYTE? query retrieves the last transmitted byte and returns it as a decimal value, such as +255.

Syntax: SOURce:DIGital:DATA[:BYTE] <data>, (@<ch_list>)
Query Syntax: SOURce:DIGital:DATA[:BYTE]? (@<ch_list>)

Parameter: <data> (:BYTE) = Any integer from 0 to 255. Default: 0
Return parameter: <NR1>

Example: SOUR:DIG:DATA? (@101)
Returns: 0 ~ 255

● Only supported on DAQ907 multifunction module (Digital I/0 channels).
● You cannot configure a port for output operations if that port has been configured to be part of the scan list (digital input).

SOURce:DIGital:DATA:WORD <data>

Transmits a digital pattern as an 16-bit word to the specified digital I/O channels. The :WORD? query retrieves the last transmitted byte or word and returns it as a decimal value, such as +65535.

Syntax: SOURce:DIGital:DATA:WORD <data>, (@<ch_list>)
Query Syntax: SOURce:DIGital:DATA:WORD? (@<ch_list>)

Parameter: <data>(:WORD) = Any integer from 0 to 65,535. Default: 65,535
Return parameter: <NR1>

Example: SOUR:DIG:DATA:WORD? (@101)
Returns: 0 ～ 65535

● Only supported on DAQ907 multifunction module (Digital I/0 channels).
● You cannot configure a port for output operations if that port has been configured to be part of the scan list (digital input).
● To write to both ports simultaneously (WORD), you must send the command to channel 01.

SOURce:MODE {CURRent | VOLTage}

Configures the output mode of the DAC output channels (channels 04 and 05) to either current or voltage.

Syntax: SOURce:MODE {CURRent | VOLTage}, (@<ch_list>)
Query Syntax: SOURce:MODE? (@<ch_list>)

Parameter: {CURRent | VOLTage}
Return parameter: CURR, VOLT

Example: SOUR:MODE? (@104)
Returns: VOLT or CURR

● Only supported on DAQ907 multifunction module (DAC output channels).
● DAC sense output mode is set to voltage (if it is unlocked with SOUR:MODE:LOCK OFF command). If the output mode is locked to current with SOUR:MODE:LOCK ON command, an error will be generated.

SOURce:MODE:LOCK {OFF | ON}

Enables(ON) or disables(OFF) the mode lock function for DAC output channels (voltage or current). When enabled(ON), the output mode remains fixed and cannot be modified unless the lock is deactivated.

Syntax: SOURce:MODE:LOCK {OFF | ON}, (@<ch_list>)
Query Syntax: SOURce:MODE:LOCK? (@<ch_list>)

Parameter: {OFF | ON}
Return parameter: 0 (OFF) or 1 (ON)

Example: SOUR:MODE:LOCK?(@104,105)
Returns: 0,1

● Only supported on DAQ907 multifunction module (DAC output channels).
● DAC sense output mode is set to voltage (if it is unlocked with SOUR:MODE:LOCK OFF command). If the output mode is locked to current with SOUR:MODE:LOCK ON command, an error will be generated.

SOURce:VOLTage {<voltage> | MIN | MAX | DEF}

Configures the output mode of the DAC output channels (channels 04 and 05) to voltage.

Syntax: SOURce:VOLTage {<voltage> | MIN | MAX | DEF}, (@<ch_list>)
Query Syntax: SOURce:VOLTage? {(@<ch_list>) | MIN | MAX | DEF}

Parameter: <voltage> MIN: -12 VDC
MAX: +12 VDC
DEF: 0 VDC
Return parameter: <NRf>

Example: SOURce:VOLTage? (@104)
Returns: +1.23400000E-01

● Only supported on DAQ907 multifunction module (DAC output channels).
● This parameter is set to its default value after a Factory Reset (*RST command).

## STATus Report Commands

### STATus:ALARm:CONDition?

Returns the total number of the Alarm Condition register.

Return parameter: <NR1> (0 ~ 32767)

Example:
STAT:ALAR:COND?
Returns: +16

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

●This register is read-only; bits are not cleared when read.

### STATus:ALARm:ENABle

Sets or returns bits in the Alarm Enable register.

Syntax: STATus:ALARm:ENABle <enable>
Query Syntax: STATus:ALARm:ENABle?

Parameter: <enable> (0 ~ 32767)
Return parameter: <NR1>

Example:
STAT:ALAR:ENAB 7

●The selected bits are then reported to the Status Byte. An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

STATus:ALARm[:EVENt]?

Returns the total number of the Alarm Event register.

Return parameter: <NR1>

Example:
STAT:ALAR:EVEN?
Returns: +7

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

●Once a bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear status).This register is read-only; bits are not cleared when read.

---

STATus:OPERation:CONDition?

Returns the total number of the Operation Condition register.

Return parameter: <NR1> (0 ~ 32767)

Example:
STAT:OPER:COND?
Returns: +4096

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

●This register is read-only; bits are not cleared when read.

---

STATus:OPERation:ENABle

Sets or returns bits in the Operation Enable register.

Syntax: STATus:OPERation:ENABle <enable>
Query Syntax: STATus:OPERation:ENABle?

Parameter: <enable> (0 ~ 32767)
Return parameter: <NR1>

Example:
STAT:OPER:ENAB 10

●The selected bits are then reported to the Status Byte. An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

---

STATus:OPERation[:EVENt]?

Returns the total number of the Operation Event register.

Return parameter: <NR1>

Example:
STAT:OPER:EVEN?
Returns: +786

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

●Once a bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear status).

STATus:PRESet

Clears all enable register bits in Alarm Register, Standard Operation Register, and Questionable Data Register.

Parameter: [None]

Example:
STAT:PRES

STATus:QUEStionable:CONDition?

Returns the total number of the Questionable Condition register.

Return parameter: <NR1> (0 ~ 32767)

Example:
STAT:QUES:COND?
Returns: +2

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

STATus:QUEStionable:ENABle

Sets or returns bits in the Ouestionable Enable register.

Syntax: STATus:QUEStionable:ENABle <enable>
Query Syntax: STATus:QUEStionable:ENABle?

Parameter: <enable> (0 ~ 32767)
Return parameter: <NR1>

Example:
STAT:QUES:ENAB 4099

●The selected bits are then reported to the Status Byte. An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

●The selected bits are then reported to the Status Byte. An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

●A STATus:PRESet clears all bits in the enable register.
●The *PSC command controls whether the enable register is cleared at power on.

---

STATus:QUEStionable[:EVENt]?

Returns the total number of the Ouestionable Event register.

Return parameter: <NR1>

Example:
STAT:QUES:EVEN?
Returns: +6

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

●Once a bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear status).

---

## SYSTem Related Commands

### SYSTem:ALARm?

Reads the alarm data from the alarm queue. A record of up to 20 alarms can be stored in the instrument's alarm queues.

Return parameter: <info>

Example:

SYST:ALAR?

Returns: +1.12379111E-03 VDC,2021,01,28,00,43,39.218,101,0,1

+1.12379111E-03 VDC,2021,01,28,00,43,39.218,101,0,1

1 2 3 4 5 6

1. Reading with units(1.124mV)
2. Date(January 28, 2021)
3. Time of day(0:43:39.218 AM)
4. Channel number
5. Alarm limit threshold crossed (0 = No alarm, 1 = LO, 2 = HI)
6. Alarm number (1-4)

●Each time you start a new scan, the instrument clears all readings (including alarm data) stored in reading memory from the previous measurement. Therefore, the contents of memory are always from the most recent scan.

### SYSTem:BEEPer[:IMMediate]

Makes buzzer beep once.

Parameter: [None]

Example:

SYST:BEEP:IMM

●This function is not affected by the state of SYST:BEEP:STAT.

### SYSTem:BEEPer:ERRor

Enables (On) or disables (Off) the beeper to sound on an SCPI error.

Syntax: SYSTem:BEEPer:ERRor {OFF|ON}
Query Syntax: SYSTem:BEEPer:ERRor?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:

SYST:BEEP:ERR ON

SYSTem:BEEPer:STATe

Enables (On) or disables (Off) the beep heard during measurements, or when an error is generated from the front panel or remote interface.

Syntax: SYSTem:BEEPer:STATe {OFF|ON}
Query Syntax: SYSTem:BEEPer:STATe?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:BEEP:STAT 0FF

●The key sound of front panel is not affected by the state.

SYSTem:CLICk:STATe

Enables (On) or disables (Off) the click heard when knob is turned or keys are pressed.

Syntax: SYSTem:CLICk:STATe {OFF|ON}
Query Syntax:SYSTem:CLICk:STATe?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:CLIC:STAT 0FF

SYSTem:CPON

Resets the module in the specified slot to its power-on state (CPON means "card power on"). This opens all channels on the module.

Syntax: SYSTem:CPON {<slot>|ALL}

Parameter: <slot> (1 | 2 | 3) | ALL

Example:
SYST:CPON? ALL

●If any channel is configured for a measurement, this command has no effect. If no channel is configured, this command opens all channels.

SYSTem:CTYPe?

Returns the identity of the plug-in modules in the specified slot.

Query Syntax: SYSTem:CTYPe? <slot>

Parameter: <slot> (1 | 2 | 3)
Returns parameter: <Company Name>,<Card Model Number>,<Serial Number>,<Firmware Rev>

Example:
SYST:CTYP? 1
Returns: GWInstek,DAQ-901,DAQ123456,1.00

---

SYSTem:DATE

Sets or returns the date for the instrument's real-time clock.

Syntax: SYSTem:DATE <year>,<month>,<day>
Query Syntax: SYSTem:DATE?

Parameter: <year> (2000 ~ 2099), <month> (1 ~ 12), <day> (1 ~ 31)
Return parameter: <date> (yyyy,mm,dd)

Example:
SYST:DATE 2020,1,1
SYST:DATE?
Returns: 2020,1,1

---

SYSTem:ERRor?

Returns the current system error, if any.

---

SYSTem:LFRequency?

Returns the AC source line freqency.

Return parameter: +50 | +60

---

SYSTem:LOCal

Enables local control (front panel control) and disables remote control.

SYSTem:REMote

Enables remote control and disables local control (front panel control, all key are disable besides Shift key(return to local control)).

SYSTem:PARameter:LOAD

Load the system parameters from 0 of 3 memory locations.

Syntax: SYSTem:PARameter:LOAD <mem_num>
Query Syntax: SYSTem:PARameter:LOAD?

Parameter: <mem_num> (0 ~ 3), (0 = default settings, 1 ~ 3 = memory number)
Return parameter: <NR1>, ( Last = state before power-off)

Example:
SYST:PAR:LOAD 0

SYSTem:PARameter:SAVE

Saves the system parameters into 1 of 3 memory slots.

Syntax: SYSTem:PARameter:SAVE <mem_num>

Parameter: <mem_num> (1 ~ 3)

Example:
SYST:PAR:SAVE 1

SYSTem:PERSona[:MANufacturer]

Sets the instrument's manufacturer ID string for backward compatibility.

Syntax: SYSTem:PERSona[:MANufacturer] "<string>"
Query Syntax: SYSTem:PERSona[:MANufacturer]?

Parameter: "<string>", max length 24 characters
Return parameter: "<string>"

Example:
SYST:PERS "HEWLETT-PACKARD"
SYST:PERS?
Returns: "HEWLETT-PACKARD"

SYSTem:PERSona[:MANufacturer]:DEFault

Sets or returns the default manufacturer's ID string.

Syntax: SYSTem:PERSona[:MANufacturer]:DEFault
Query Syntax: SYSTem:PERSona[:MANufacturer]:DEFault?

Parameter: [None]
Return parameter: "<string>"

Example:
SYST:PERS:DEF?
Returns: "Keysight Technologies"

SYSTem:PERSona:MODel

Sets the instrument's model number for backward compatibility.

Syntax: SYSTem:PERSona:MODel "<string>"
Query Syntax: SYSTem:PERSona:MODel?

Parameter: "<string>", max length 24 characters
Return parameter: "<string>"

Example:
SYST:PERS "34970A"
SYST:PERS?
Returns: "34970A"

SYSTem:PERSona:MODel:DEFault

Sets or returns the default instrument's model number.

Syntax: SYSTem:PERSona:MODel:DEFault
Query Syntax: SYSTem:PERSona:MODel: DEFault?

Parameter: [None]
Return parameter: "<string>"

Example:
SYST:PERS:MODE:DEF?
Returns: "DAQ970A"

SYSTem:PRESet

Presets the instrument to a known configuration. Readings are cleared, and channels are opened.

SYSTem:RELay:CYCLes?

Reads the cycle count on the specified channels. In addition to the channel relays, you can also query the count on the Analog Bus relays and module relays.

Query Syntax: SYSTem:RELay:CYCLes? (@<ch_list>)

Return parameter: <NR1>

Example:

SYST:REL:CYCL? (@101)

Returns: +100

SYSTem:RELay:CYCLes:CLEar

Resets the cycle count on the specified channels.

Syntax: SYSTem:RELay:CYCLes:CLEar (@<ch_list>)

Parameter: [None]

Example:

SYST:REL:CYCL:CLE (@101)

SYSTem:RELay:CYCLes:FACTory?

Reads the factory cycle count on the specified channels.

Query Syntax: SYSTem:RELay:CYCLes:FACTory? (@<ch_list>)

Return parameter: <NR1>

Example:

SYST:REL:CYCL:FACT? (@101)

Returns: +200

SYSTem:SCPi:MODE

Sets or returns the SCPI mode. The SCPI mode is used to determine whether the *IDN? query returns the "NORmal" or "COMPatible" identification string. See the SYSTem:IDNStr command for details.

Syntax: SYSTem:SCPi:MODE {NORmal|COMPatible}
Query Syntax: SYSTem:SCPi:MODE?

Parameter: NORmal | COMPatible, (NOR = Normal, COMP = User-define)
Return parameter: NORMAL | COMPATIBLE

Example:
SYST:SCP:MODE NOR

●The parameters will not be saved.

SYSTem:SCPi:AUTO:SAVE

Do the setting parameters need to be saved automatically for SCPI command?

Syntax: SYSTem:SCPi:AUTO:SAVE {OFF|ON}
Query Syntax: SYSTem:SCPi:AUTO:SAVE?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:SCP:AUTO:SAVE ON

●Parameters auto saving generally takes some time. Hence, it is suggested to disable the function when no necessity occurs.

SYSTem:SERial?

Returns the serial number(nine characters/numbers).

Return parameter: <string>

Example:
SYST:SER?
Returns: DAQ123456

SYSTem:SLOT:LABel

Allows you to add a custom label to the module in the specified slot.

Syntax: SYSTem:SLOT:LABel <slot>,"<string>"
Query Syntax: SYSTem:SLOT:LABel? <slot>

Parameter: <slot> (1 | 2 | 3); "<string>", max length 10 characters.
Return parameter: "<string>"

Example:
SYST:SLOT:LAB 1," BATTERY "
SYST:SLOT:LAB? 1
Returns: "BATTERY"

●Specifying a null string ("") disables the slot label message.

SYSTem:TEMPerature?

Returns the internal temperature of machine.

Return parameter: <NRf>, where unit = ˚C

Example:
SYST:TEMP?
Returns: +3.54375000E+01

SYSTem:TIME

Sets or returns the time for the instrument's real-time clock.

Syntax: SYSTem:TIME <hour>,<minute>,<second>
Query Syntax: SYSTem:TIME?

Parameter: <hour> (0 ~ 23); <minute> (0 ~ 59); <second> (0 ~ 59)
Return parameter: <time> (hh,mm,ss.sss)

Example:
SYST:TIME 16,20,30
SYST:TIME?
Returns: 16:20:40.000

SYSTem:TIME:SCAN?

Returns the time at the start of the scan.

Return parameter: <time> (yyyy,mm,dd,hh,mm,ss.sss)

Example:
SYST:TIME:SCAN?
Returns: 2021,09,08,20,21,22.001

SYSTem:UPTime?

Returns the amount of time that the instrument has been running since the last power-on.

Return parameter: <time> (dd,hh,mm,ss)

Example:
SYST:UPT?
Returns: +0,+1,+25,+53

●Typically used to verify that the instrument is warmed up sufficiently before calibration.

---

SYSTem:VERSion?

Returns the SCPI version.

Return parameter: 1994.0.

---

SYSTem:WMESsage

Displays a power-on message.

Syntax: SYSTem:WMESsage "<string>"
Query Syntax: SYSTem:WMESsage?

Parameter: "<string>", max length 12 characters
Return parameter: "<string>"

Example:
SYST:WMES "GWINSTEK"
SYST:WMES?
Returns: "GWINSTEK"

●Specifying a null string ("") disables the power-on message.

---

## SYSTem COMMunication Commands

### SYSTem:COMMunicate:GPIB:ADDRess

Sets or returns the GPIB address that is only on GPIB communication bus.

Syntax: SYSTem:COMMunicate:GPIB:ADDRess <address>
Query Syntax: SYSTem:COMMunicate:GPIB:ADDRess?

Parameter: <address> (0 ~ 30)
Return parameter: <NR1>

Example:
SYST:COMM:GPIB:ADDR 15

### SYSTem:COMMunicate:LAN:DHCP

Enables (On) or disables (Off) the use of the Dynamic Host Configuration Protocol (DHCP) for the instrument.

Syntax: SYSTem:COMMunicate:LAN:DHCP {OFF|ON}
Query Syntax: SYSTem:COMMunicate:LAN:DHCP?

Parameter: 0 | 1 | OFF | ON
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:COMM:LAN:DHCP ON

### SYSTem:COMMunicate:LAN:DNS[X]

Sets or returns the DNS address. which X = 1 indicate DNS1, X = 2 indicate DNS2.

Syntax: SYSTem:COMMunicate:LAN:DNS[X] "<address>"
Query Syntax: SYSTem:COMMunicate:LAN:DNS[X]? {CURRent|STATic}

Parameter: "<address>"
Return parameter: "xxx.xxx.xxx.xxx"

CURRent : Returns address currently being used by the instrument.
STATic : Returns ddreess from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:DNS1 "172.16.1.252"
SYST:COMM:LAN:DNS1?
Returns: "172.16.1.252"

SYSTem:COMMunicate:LAN:DOMain?

Returns the current network domain name.

Return parameter: "<name>"

Example:
SYST:COMM:LAN:DOM?
Returns: "abc.com"

●If a domain name has not been assigned, a null string ( " " ) is returned.

SYSTem:COMMunicate:LAN:GATeway

Sets or returns the Gateway address.

Syntax: SYSTem:COMMunicate:LAN:GATeway "<address>"
Query Syntax: SYSTem:COMMunicate:LAN:GATeway? {CURRent|STATic}

Parameter: "<address>"
Return parameter: "xxx.xxx.xxx.xxx"

CURRent : Returns address currently being used by the instrument.
STATic : Returns address from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:GAT "192.168.31.254"
SYST:COMM:LAN:GAT?
Returns: "172.168.31.254"

SYSTem:COMMunicate:LAN:HOSTname

Sets or returns the hostname.

Syntax: SYSTem:COMMunicate:LAN:HOSTname "<string>"
Query Syntax: SYSTem:COMMunicate:LAN:HOSTname? {CURRent|STATic}

Parameter: "<string>", max length 12 characters
Return parameter: "<string>"

CURRent : Returns hostname currently being used by the instrument.
STATic : Returns hostname from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:HOST "DMM"

SYSTem:COMMunicate:LAN:IPADdress

Sets or returns the IP address.

Syntax: SYSTem:COMMunicate:LAN:IPADdress "<address>"
Query Syntax: SYSTem:COMMunicate:LAN:IPADdress? {CURRent|STATic}

Parameter: "<address>"
Return parameter: "xxx.xxx.xxx.xxx"

CURRent : Returns address currently being used by the instrument.
STATic : Returns static address from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:IPAD "192.168.31.117"
SYST:COMM:LAN:IPAD?
Returns: "192.168.31.117"

SYSTem:COMMunicate:LAN:MAC?

Returns the MAC number.

Return parameter: 12 Hexadecimal characters

Example:
SYST:COMM:LAN:MAC?
Returns: "002224000090"

SYSTem:COMMunicate:LAN:SMASk

Sets or returns the subnet mask address.

Syntax: SYSTem:COMMunicate:LAN:SMASk "<address>"
Query Syntax: SYSTem:COMMunicate:LAN:SMASk? {CURRent|STATic}

Parameter: "<address>"
Return parameter: "xxx.xxx.xxx.xxx"

CURRent : Returns subnet mask currently being used by the instrument.
STATic : Returns subnet mask from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:SMAS "255.255.255.0"
SYST:COMM:LAN:SMAS?
Returns: "255.255.255.0"

SYSTem:COMMunicate:LAN:TCP:ENABle

Enables (On) or disables (Off) the use of the Transmission Control Protocol (TCP) for the instrument.

Syntax: SYSTem:COMMunicate:LAN:TCP:ENABle {OFF|ON}
Query Syntax: SYSTem:COMMunicate:LAN:TCP:ENABle?

Parameter: 0 | 1 | ON | OFF
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:COMM:LAN:TCP:ENAB ON

SYSTem:COMMunicate:LAN:TCP:PORT

Sets or returns the TCP communication port number.

Syntax: SYSTem:COMMunicate:LAN:TCP:PORT {<port>|MIN|MAX|DEF}
Query Syntax: SYSTem:COMMunicate:LAN:TCP:PORT? [{MIN|MAX|DEF}]

Parameter: <port> (1024 ~ 65535); DEF: 5025
Return parameter: <NR1>

Example:
SYST:COMM:LAN:TCP:PORT "5025"
SYST:COMM:LAN:TCP:PORT?
Returns: 5025

SYSTem:COMMunicate:LAN:TELNet:ECHO

Sets or returns the Telnet communication echo state.

Syntax: SYSTem:COMMunicate:LAN:TELNet:ECHO {OFF|ON}
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:ECHO?

Parameter: 0 | 1 | ON | OFF
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:COMM:LAN:TELN:ECHO ON

SYSTem:COMMunicate:LAN:TELNet:ENABle

Enables (On) or disables (Off) the use of the Telecommunications Network (TELNET) for the instrument.

Syntax: SYSTem:COMMunicate:LAN:TELNet:ENABle {OFF|ON}
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:ENABle?

Parameter: 0 | 1 | ON | OFF
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:COMM:LAN:TELN:ENAB ON

SYSTem:COMMunicate:LAN:TELNet:TIMeout

Sets or returns the Telnet communication timeout time, where unit = second.

Syntax: SYSTem:COMMunicate:LAN:TELNet:TIMeout <time>
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:TIMeout?

Parameter: <time> (0 ~ 60000)
Return parameter: <NR1>

Example:
SYST:COMM:LAN:TELN:TIM 0

●Since 0 indicates infinite, Telnet communication has no timeout always.

SYSTem:COMMunicate:LAN:TELNet:PORT

Sets or returns the Telnet communication port number.

Syntax: SYSTem:COMMunicate:LAN:TELNet:PORT {<port>|MIN|MAX|DEF}
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:PORT? [{MIN|MAX|DEF}]

Parameter: <port> (1024 ~ 65535); DEF: 5024
Return parameter: <NR1>

Example:
SYST:COMM:LAN:TELN:PORT "5024"
SYST:COMM:LAN:TELN:PORT?
Returns: 5024

SYSTem:COMMunicate:LAN:TELNet:PROMpt

Sets or returns the telnet prompt message.

Syntax: SYSTem:COMMunicate:LAN:TELNet:PROMpt "<string>"
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:PROMpt?

Parameter: "<string>", max length 15 characters
Return parameter: "<string>"

Example:
SYST:COMM:LAN:TELN:PROM "DAQ9600>"
SYST:COMM:LAN:TELN:PROM?
Returns: DAQ9600>

SYSTem:COMMunicate:LAN:TELNet:WMESsage

Sets or returns the telnet welcome message that telnet communication connect success.

Syntax: SYSTem:COMMunicate:LAN:TELNet:WMESsage "<string>"
Query Syntax: SYSTem:COMMunicate:LAN:TELNet:WMESsage?

Parameter: "<string>", max length 63 characters
Return parameter: "<string>"

Example:
SYST:COMM:LAN:TELN:WMES "Welcome to DAQ9600 Telnet Server"

SYSTem:COMMunicate:LAN:TIMeout

Sets or returns the TCP communication timeout time, where unit = second.

Syntax: SYSTem:COMMunicate:LAN:TIMeout <time>
Query Syntax: SYSTem:COMMunicate:LAN:TIMeout?

Parameter: <time> (1 ~ 60000)
Return parameter: <NR1>

Example:
SYST:COMM:LAN:TIM 10

SYSTem:COMMunicate:LAN:UPDate

Stores any changes made to the LAN settings into non-volatile memory and restarts the LAN driver with the updated settings.

Parameter: [None]

Example:
SYST:COMM:LAN:UPD

●This command must be sent after changing the settings for DHCP, DNS, gateway, hostname, IP address, subnet, mask, or WINS.

SYSTem:COMMunicate:LAN:WEB:ENABle

Enables (On) or disables (Off) the use of the WEB page for the instrument.

Syntax: SYSTem:COMMunicate:LAN:WEB:ENABle {OFF|ON}
Query Syntax: SYSTem:COMMunicate:LAN:WEB:ENABle?

Parameter: 0 | 1 | ON | OFF
Return parameter: 0 | 1, (0 = OFF, 1 = ON)

Example:
SYST:COMM:LAN:WEB:ENAB ON

SYSTem:COMMunicate:LAN:WINS

Assigns the static IP addresses of the Windows Internet Name System (WINS) servers.

Syntax: SYSTem:COMMunicate:LAN:WINS "<address>"
Query Syntax: SYSTem:COMMunicate:LAN:WINS? {CURRent|STATic}

Parameter: "<address>"
Return parameter: "xxx.xxx.xxx.xxx"

CURRent : Returns address currently being used by the instrument.
STATic : Returns ddreess from non-volatile memory. This address is used if DHCP is disabled or unavailable.

Example:
SYST:COMM:LAN:WINS "192.168.31.117"
SYST:COMM:LAN:WINS?
Returns: "192.168.31.117"

## TRIGger Commands

### TRIGger:COUNt

Sets or returns the number of trigger counts.

Syntax: TRIGger:COUNt {<count>|MIN|MAX|DEF|INFinity}
Query Syntax: TRIGger:COUNt? [{MIN|MAX|DEF}]

Parameter: <count> (1 ~ 1,000,000); DEF: 1
Return parameter: <NRf>

Example:

```
CONF:VOLT:DC 10(@101,103)
ROUT:SCAN (@101,103)
TRIG:COUN 2
READ?
```

●For a continuous trigger (INFinity), the query returns "+9.90000000E+37".

### TRIGger:SLOPe

Selects whether the instrument uses the rising edge (POS) or the falling edge (NEG) of the trigger signal on the rear-panel Digital I/O connector when external trigger is selected.

Syntax: TRIGger:SLOPe {POSitive | NEGative}
Query Syntax: TRIGger:SLOPe?

Parameter: POSitive | NEGative
Return parameter: POS | NEG

Example:

```
TRIG:SLOP POS
```

TRIGger:SOURce

Selects or returns current trigger source.

Syntax: TRIGger:SOURce <source>
Query Syntax: TRIGger:SOURce?

Parameter: <source> (IMMediate | EXTernal | BUS | TIMer | ALARm{(1|2|3|4)})
Return parameter: IMM | EXT | BUS | TIM | ALAR{(1|2|3|4)}

IMMediate = Continuous scan trigger
EXTernal = An external TTL-compatible pulse trigger
BUS = Software trigger
TIMer = Internally paced timer trigger
ALARm = Trigger on alarm 1,2,3, and 4

IMMediate:
The trigger signal is always present. When you place the instrument in the “wait-for-trigger" state, the trigger is issued immediately.
Example:

```
TRIG:SOUR IMM
READ?
```

EXTeranl:
The instrument accepts hardware triggers applied to the rear-panel Ext Trig input and takes the specified number of measurements, each time a TTL pulse specified by TRIGg:SLOP is received. If the instrument receives an external trigger before it is ready, it buffers one trigger.
Example:

```
TRIG:SOUR EXT
INIT
<wait external trigger in signal>
FETC ?
```

BUS:
The instrument is triggered by *TRG over the remote interface once the DMM is in the "wait-for-trigger" state.
Example:

```
TRIG:SOUR BUS
INIT
*TRG
FETC ?
```

●After selecting the trigger source, you must place the instrument in the "wait-for-trigger" state using the INITiate or READ? command. A trigger will not be accepted from the selected trigger source until the instrument is in the "wait-for-trigger" state.

TRIGger:TIMer

Sets the trigger-to-trigger interval (in seconds) for measurements on the channels in the present scan list.

Syntax: TRIGger:TIMer {<seconds>|MIN|MAX|DEF}
Query Syntax: TRIGger:TIMer? [{MIN|MAX|DEF}]

Parameter: <second> (0 ~ 360,000s); DEF: 10
Return parameter: <NR1>

Example:

TRIG:SOUR TIM
TRIG:TIM: 3600

●This command defines the time from the start of one trigger to the start of the next trigger,up to the specified trigger count.

●If the scan interval is less than the time required to measure all channels in the scan list, the instrument will scan continuously, as fast as possible (no error is generated).

## IEEE 488.2 Common Commands

*CLS

Clears the Event Status register (Output Queue, Operation Event Status, Questionable Event Status, Standard Event Status Register)

*ESE

Sets or returns the ESER (Event Status Enable Register) contents.

Syntax: *ESE <enable>
Query Syntax: *ESE?

Parameter: <enable> (0 ~ 255)
Return parameter: <NR1>

Example:
*ESE 130
*ESE?
Returns: 130. ESER=10000010

●The selected bits are then reported to bit 5 of the Status Byte Register. An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to Or read from an enable register.

*ESR?

Returns SESR (Standard Event Status Register) contents.

Return parameter: <NR1>

Example:
*ESR?
Returns: 198. SESR=11000110

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

●Once a bit is set, it remains set until cleared by reading the event register or by sending *CLS (clear status).

*IDN?

Returns the manufacturer, model No., serial number and system version number.

Example:
*IDN?
Returns: GWInstek,DAQ-9600,000000000,M0.93_S0.86

*OPC

Sets operation complete bit (bit0) in SERS (Standard Event Status Register) when all pending operations are completed.
Returns 1 to the output buffer after all pending commands complete. Other commands cannot be executed until this command completes.

Syntax: *OPC
Query Syntax: *OPC?

Parameter: [None]
Return parameter: 1;(operation completes)

Example:
CONF:VOLT:DC
TRIG:COUN 10
INIT
*OPC?

●The difference between *OPC and *OPC? is that*OPC sets a status bit when the operation completes,and *OPC? outputs "1" when the operation completes.

*PSC

Clears or returns the Power On status.

Syntax: *PSC {0|1}
Query Syntax: *PSC?

Parameter: 0 | 1
Return parameter: 0 | 1; (0= disables, 1= enables)

●Enables (1) or disables (0) the clearing of certain enable registers at power on:
Questionable Data Register (STATus:OPERation:ENABle)
Standard Operation Register (STATus:QUEStionable:ENABle)
Alarm Register (STATus:ALARm:ENABle)
Status Byte Condition Register (*SRE)
Standard Event Enable Register (*ESE)

●The *PSC command does not affect the clearing of the condition or event registers, just the enable registers.

*RCL

Load the system parameters from 0 of 3 memory locations.

Syntax: *RCL <mem_num>

Parameter: <mem_num> (0 ~ 3), (0=default settings, 1 ~ 3= memory number)

Example:
*RCL 1

*RST

Recalls default panel setup.

●Resets instrument to factory default state. This is similar to SYSTem:PRESet. The difference is that *RST resets the instrument for SCPI operation, and SYSTem:PRESet resets the instrument for front panel operation. As a result, *RST turns the histogram and statistics off, and SYSTem:PRESet turns them on.

*SAV

Save the system parameters to 1 of 3 memory locations.

Syntax: *SAV <mem_num>

Parameter: <mem_num> (1 ~ 3)

Example:
*SAV 2

*SRE

Sets or returns the SRER (Service Request Enable Register) contents.

Syntax: *SRE <enable>
Query Syntax: *SRE?

Parameter: <enable> (0 ~ 255)
Return parameter: <NR1>

Example:
*SRE 7
*SRE?
Returns: 7. SRE=00000111

●An enable register defines which bits in the event register will be reported to the Status Byte register group. You can write to or read from an enable register.

*STB?

Returns the SBR (Status Byte Register) contents.

Return parameter: <NR1>

Example:
*STB?
Returns: 81. SBR=01010001.

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

●This register is read-only; bits are not cleared when read.

*TRG

Manually triggers the DAQ-9600 if TRIG:SOUR is selected to BUS.

Example:

```
TRIG:SOUR BUS
INIT
*TRG
FETC?
```

*TST?

Runs a standard self-test which is invoked at power-on. It will take few seconds to complete.

Return parameter: 0 | 1; (0 = pass, 1 = one or more tests failed)

Example:

```
*TST?
```

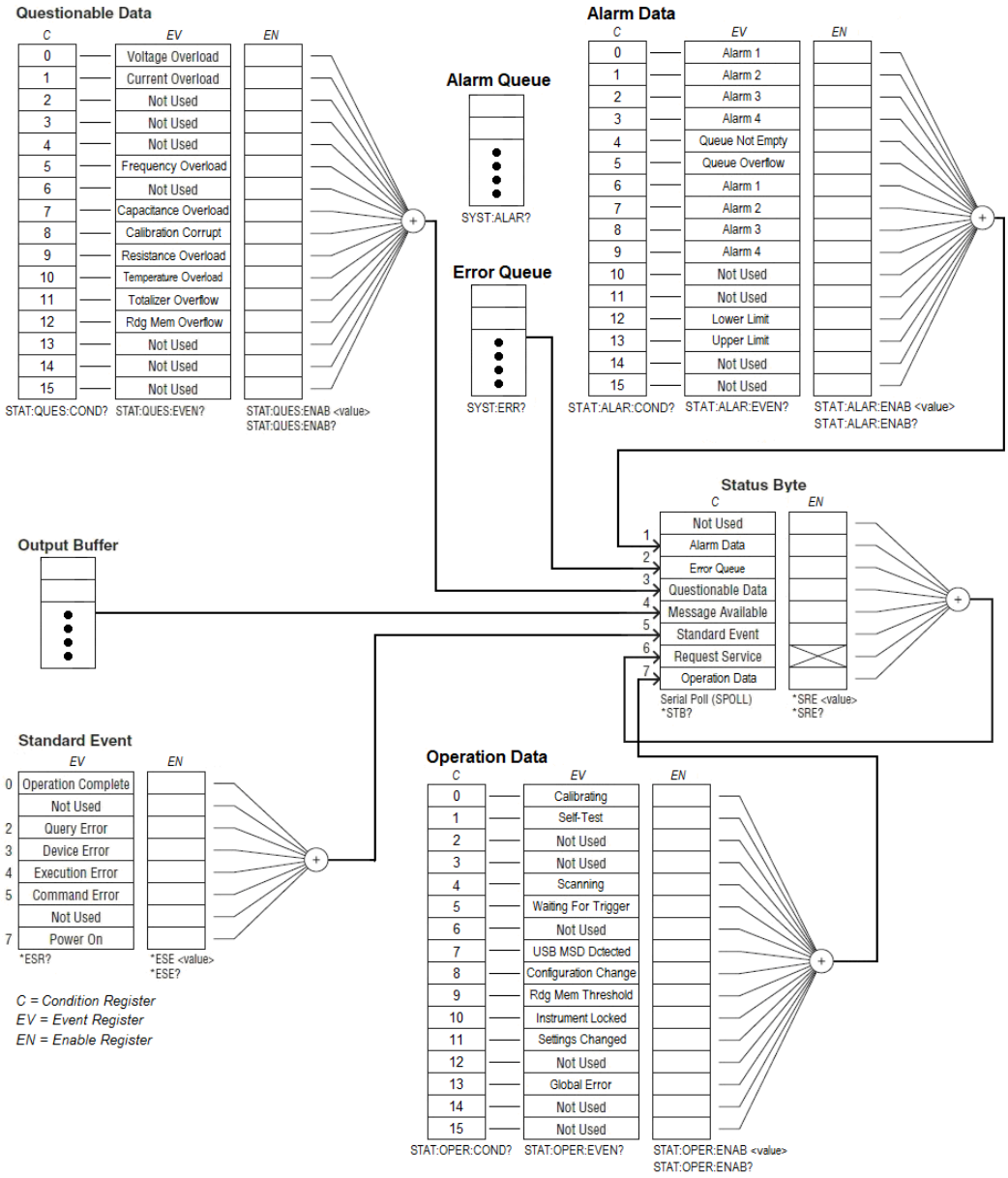
Returns: +0.

*WAI

Configures the instrument's output buffer to wait for all pending operations to complete before executing any additional commands over the interface.

# Status system

The diagram below is a description of the status system



NOTE: The overload bits are set once per INITiate command. If you clear an overload bit, it is not set again until a new INITiate is sent.

The following table lists the bit definitions for the Questionable Data Register:

| Bit | Name | Decimal | Definition |
|---|---|---|---|
| 0 | Voltage Overload | 1 | A voltage measurement overloaded. Event only; condition register will return 0. |
| 1 | Current Overload | 2 | A current measurement overloaded. Event only; condition register will return 0. |
| 2 | Not Used | 4 | (Reserved for future use) |
| 3 | Not Used | 8 | (Reserved for future use) |
| 4 | Not Used | 16 | (Reserved for future use) |
| 5 | Frequency Overload / Underflow | 32 | A frequency or period measurement overloaded or timed out due to no signal. Event only; condition register will return 0 |
| 6 | Not Used | 64 | (Reserved for future use) |
| 7 | Capacitance Overload | 128 | A capacitance measurement overloaded. Event only; condition register will return 0. |
| 8 | Calibration Corrupt | 256 | At least one calibration constant is corrupt. |
| 9 | Resistance Overload | 512 | Only reported as event. In Condition Register this bit always returns 0. Read the Event Register. |
| 10 | Temperature Overload | 1024 | A temperature measurement overloaded. Event only; condition register will return 0. |
| 11 | Totalizer Overflow | 2048 | The most recent measurement failed the lower limit test. |
| 12 | Reading Memory Overflow | 4096 | Reading memory is full. One or more (oldest) measurements have been lost. |
| 13 | Not Used | 8192 | (Reserved for future use) |
| 14 | Not Used | 16384 | (Reserved for future use) |
| 15 | Not Used | 32768 | (Reserved for future use) |

The following table lists the bit definitions for the Operation Data Register:

| Bit | Name | Decimal | Definition |
|---|---|---|---|
| 0 | Calibrating | 1 | Instrument is performing a calibration. |
| 1 | Self Test | 2 | The instrument is doing a self-test. |
| 2 | Not Used | 4 | (Reserved for future use) |

| | | | |
|---|---|---|---|
| 3 | Not Used | 8 | (Reserved for future use) |
| 4 | Scanning | 16 | The instrument is scanning. |
| 5 | Waiting For Trigger | 32 | Instrument is waiting for a trigger. |
| 6 | Not Used | 64 | (Reserved for future use) |
| 7 | USB MSD detected | 128 | A USB mass storage device (USB drive) has been detected. |
| 8 | Configuration Change | 256 | The instrument configuration has changed via front panel since the last INIT, READ? or MEASure?. |
| 9 | Reading Memory Threshold | 512 | The number of readings in memory has exceeded the memory threshold setting (DATA:POINts:EVENt:THReshold command) |
| 10 | Instrument Locked | 1024 | The instrument is locked (SYSTem:LOCK command) |
| 11 | Settings Changed | 2048 | The instrument configuration has changed via front panel or SCPI since the last INIT, READ? Or MEASure?. Event only, condition register returns 0. |
| 12 | Not Used | 4096 | (Reserved for future use) |
| 13 | Global Error | 8192 | An error is in the global error queue. |
| 14 | Not Used | 16384 | (Reserved for future use) |
| 15 | Not Used | 32768 | (Reserved for future use) |

The following table lists the bit definitions for the Alarm Data Register:

| Bit | Name | Decimal | Definition |
|---|---|---|---|
| 0 | Alarm 1 | 1 | An event has occurred on Alarm 1. Event only; condition register will return 0. |
| 1 | Alarm 2 | 2 | An event has occurred on Alarm 2. Event only; condition register will return 0. |
| 2 | Alarm 3 | 4 | An event has occurred on Alarm 3. Event only; condition register will return 0. |
| 3 | Alarm 4 | 8 | An event has occurred on Alarm 4. Event only; condition register will return 0. |
| 4 | Queue Not Empty | 16 | The alarm queue is not empty. |
| 5 | Queue Overflow | 32 | An alarm queue overflowed. Event only; condition register will return 0. |
| 6 | Alarm 1 | 64 | Alarm 1 is triggered. |
| 7 | Alarm 2 | 128 | Alarm 2 is triggered. |
| 8 | Alarm 3 | 256 | Alarm 3 is triggered. |

| | | | |
|---|---|---|---|
| 9 | Alarm 4 | 512 | Alarm 4 is triggered. |
| 10 | Not Used | 1024 | (Reserved for future use) |
| 11 | Not Used | 2048 | (Reserved for future use). |
| 12 | Lower Limit | 4096 | A lower limit alarm has occurred. |
| 13 | Upper Limit | 8192 | An upper limit alarm has occurred. |
| 14 | Not Used | 16384 | (Reserved for future use) |
| 15 | Not Used | 32768 | (Reserved for future use) |

The following table describes the Standard Event Register

| Bit | Name | Decimal | Definition |
|---|---|---|---|
| 0 | Operation Complete | 1 | All commands prior to and including *OPC have been executed. |
| 1 | Not Used | 2 | (Reserved for future use) |
| 2 | Query Error | 4 | The instrument tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read. Or, both the input and output buffers are full. |
| 3 | Device Error | 8 | A device error, including a self-test error or calibration error, occurred (an error in the -300 range or any positive error has been generated). |
| 4 | Execution Error | 16 | An execution error occurred (an error in the -200 range has been generated). |
| 5 | Command Error | 32 | A command syntax error occurred (an error in the -100 range has been generated). |
| 6 | Not Used | 64 | (Reserved for future use) |
| 7 | Power On | 128 | Power has been cycled since the last time the event register was read or cleared. |

The following table describes the Status Byte Register.

| Bit | Name | Decimal | Definition |
|---|---|---|---|
| 0 | Not Used | 1 | (Reserved for future use) |
| 1 | Alarm Data | 2 | One or more bits are set in the Alarm Enable Register. (bits must be enabled, see STATus:ALARm:ENABle command.) |
| 2 | Error Queue | 4 | One or more errors have been stored in the Error Queue. Use SYST:ERR? to read and delete errors. |
| 3 | Questionabl | 8 | One or more bits are set in the Questionable Data |

| | | | |
|---|---|---|---|
| | e Data | | Register (bits must be enabled, see STAT:QUES:ENAB). |
| 4 | Message Available | 16 | Data is available in the instrument's output buffer. |
| 5 | Standard Event | 32 | One or more bits are set in the Standard Event Register (bits must be enabled, see *ESE). |
| 6 | Request Service | 64 | One or more bits are set in the Status Byte Register and may generate a Request for Service(RQS). Bits must be enabled using *SRE. |
| 7 | Operation Data | 128 | One or more bits are set in the Standard Operation Register (bits must be enabled, see STAT:OPER:ENAB). |

# APPENDIX

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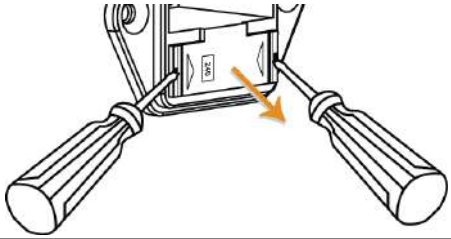
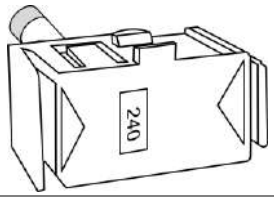
# Fuse Replacement

Steps

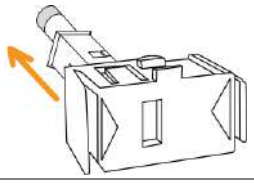
1. Unplug power cord and place dual flat-blade drivers into the grooves of fuse socket sideways followed by pinching together to pull out the fuse socket.



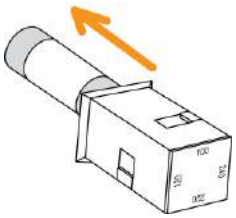
2. The fuse socket appears. The "240" symbol within the hole on fuse socket indicates the line voltage is positioned as 240V.



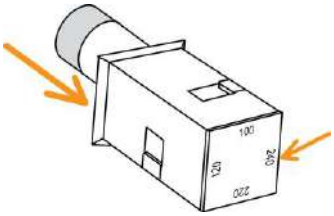

3. Pull the fuse holder out of the fuse socket gently as the right figure illustrates.



4. Further pull the fuse out of the fuse holder and replace it with a new fuse.



5. Restore the fuse holder with new fuse back to the fuse socket. Ensure that the correct line voltage shows within the hole of the fuse socket per requirement.



| | Type of fuse (time-lag) | Input line voltage |
|---|---|---|
| Rating | T0.125A, 250V, 5 mm x 20 mm | 100/120VAC |
| | T0.125A, 250V, 5x20mm | 220/240VAC |

| | | | |
|---|---|---|---|
| Replace Module Internal Current Fuse | DAQ-901 | F1.6A, 300V , 5*20mm | breaking capacity:3KA |
| | DAQ-909 | F2.5A, 600V , 6*30mm | breaking capacity:6KA |

# Battery Replacement

**Beforehand**

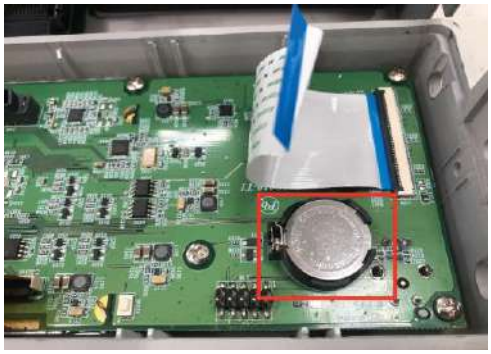
This chapter describes the procedure of battery replacement in the front panel. Before start, it is required to let a certified and trained technician properly aware of potential risks to disassemble instrument case. Some of the electrical connections are dynamic and even available after powering off the instrument. Consequently, Do disconnect all the inputs, cords and cables before disassembling the instrument.

**The steps to replace battery**

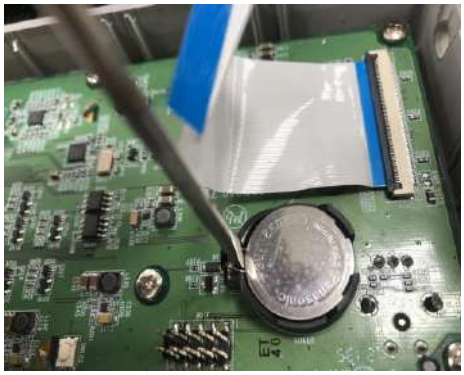
1. Power off properly and disconnect all the cables including power cord and those for external interfaces. Also, uninstall the modules from the slots of the instrument.

2. Disassemble the instrument case in light of the disassembling instructions.

3. Find the battery (CR2032) on the main board as shown from the figure below.



4. Gently remove the battery via the end tip of flat-head screwdriver as the following figure shown.



5. Use fingers to take the battery out off the compartment with ease.



6. Dispose or recycle the used battery in accord with the applicable local regulations.

7. Place a new battery (CR2032) into the compartment and beware of the polarity (+, -).
Put "+" side upwards. Gently press the battery downwards to click it into place.



8. Connect every cable and cord in need and reassemble the instrument in proper order. The procedure of battery replacement is completed.

# Factory Default Parameters

| Channel | | NOTE |
|---|---|---|
| **Item List** | **Factory Default Parameter** | **Parameter Save/Load for Group 1 - 3** |
| Slot1 | None | ✓ |
| Slot2 | None | ✓ |
| Slot3 | None | ✓ |
| Measure | Off | ✓ |
| Switch | Off | ✓ |
| JoinBank | Off | ✓ |
| **Interval** | | NOTE |
| **Item List** | **Factory Default Parameter** | **Parameter Save/Load for Group 1 - 3** |
| TrigSource | Auto | ✓ |
| Sweep | 1 | ✓ |
| Sweeps INF | Off | ✓ |
| Signal Out | Negative | ✓ |
| **Log** | | NOTE |
| **Item List** | **Factory Default Parameter** | **Parameter Save/Load for Group 1 - 5** |
| Log PARA | Capture | ✓ |
| Filename | Default | ✓ |
| Name | Time | ✓ |

| Menu | | | |
|---|---|---|---|
| **Item List** | | **Factory Default Parameter** | **Parameter Save/Load for Group 1 - 5** |
| System | Beep | On | ✓ |
| | Key Sound | On | ✓ |
| | Time Sync | Open | ✗ |
| Display | Brightness | 60% | ✓ |
| | AutoOff | OFF | ✓ |
| | AutoOff Time | 30min | ✓ |
| | 1ST Font Color | White | ✓ |
| | Math Font Color | White | ✓ |
| | Math Off Display Mode | Off | ✓ |
| | Antialiasing | Off | ✓ |
| | Additional Info | Open | ✓ |
| | Language | English | ✗ |
| Interface | Interface | USB | ✗ |
| | USB Protocol | USBCDC | ✗ |
| | GPIB Address | 15 | ✗ |
| | Identity | Default | ✗ |
| Lan | DHCP | ON | ✗ |
| | Web | ON | ✗ |
| | Telnet | ON | ✗ |
| | Telnet Port | 5024 | ✗ |
| | Telnet Echo | ON | ✗ |
| | TCP | ON | ✗ |
| | TCP Port | 5025 | ✗ |

NOTE Only utilized parameters are listed here due to over-amount parameters. The rest of the parameters unlisted, however, can be saved and loaded as well.

✓ It indicates parameters can be saved and loaded from the groups 1 to 5.

✗ It indicates the independent save zone which is free from impact of reboot.

# Specifications

## General

This section lists the general characteristics of the instrument.

| | |
|---|---|
| Note | • All specifications are ensured only under a single display.<br>• At least 1 hour of warm-up time is required before applying these specifications.<br>• MAX measuring voltage DC600V, AC400V. |
| Line Power | • Power Supply: 100 / 120 / 220 / 240 VAC ±10%<br>• Power Line Frequency: 50 Hz / 60 Hz ±10%<br>• Power Consumption: Max. 50 VA |
| Environment | • Operating Environment: Full accuracy for 0 °C to 50 °C<br>• Full accuracy to 80% R.H. at 40 °C Non–condensing<br>• Operating Altitude Up to 2,000 m<br>• Storage Temperature -40 to 70 °C |
| Mechanical | • Rack Dimensions: 88mm(H) X 220mm(W) X348.6mm(D) (without bumpers)<br>• Bench Dimensions: 107mm(H) X 266.9mm(W) X357.8mm(D) (with bumpers)<br>• Weight : 4.5 kg (9.92lbs) |
| Display | • 4.3" color WQVGA (480x272) with LED backlight<br>• Supports basic number, bar meter, trend chart and histogram views |
| Temperature Coefficient | • Increment of one coefficient per one degree Celsius when the range is beyond TCAL ± 5 °C. |
| Accuracy Specification | • It is relevant to the calibration standard. |
| Real-Time Clock/Calendar | • Set and read, year, month, day, hour, minute, seconds<br>• Battery CR-2032 coin-type, replaceable |

# DAQ-9600 Section

## DC Characteristics [1]

### DC Voltage

| Range [2] | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|
| 100.0000 mV | 0.0030 + 0.0050 | 0.0040 + 0.0060 | 0.0050 + 0.0060 | 0.0005 + 0.0005 |
| 1.000000 V | 0.0020 + 0.0006 | 0.0035 + 0.0007 | 0.0048 + 0.0007 | 0.0005 + 0.0001 |
| 10.00000 V | 0.0015 + 0.0004 | 0.0020 + 0.0005 | 0.0035 + 0.0005 | 0.0005 + 0.0001 |
| 100.0000 V | 0.0020 + 0.0006 | 0.0035 + 0.0006 | 0.0050 + 0.0006 | 0.0005 + 0.0001 |
| 600.000 V | 0.0025 + 0.0020 | 0.0040 + 0.0020 | 0.0050 + 0.0020 | 0.0005 + 0.0001 |

Accuracy Specifications: ± ( % of reading + % of range )

### Resistance [3]

| Range [2] | Test Current | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|---|
| 100.0000 Ω | 1 mA | 0.003 + 0.0030 | 0.008 + 0.004 | 0.010 + 0.004 | 0.0008 + 0.0005 |
| 1.000000 kΩ | 1 mA | 0.002 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0008 + 0.0001 |
| 10.00000 kΩ | 100 µA | 0.002 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0008 + 0.0001 |
| 100.0000 kΩ | 10 µA | 0.002 + 0.0005 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0008 + 0.0001 |
| 1.000000 MΩ | 5 µA | 0.002 + 0.0010 | 0.008 + 0.001 | 0.010 + 0.001 | 0.0010 + 0.0002 |
| 10.00000 MΩ | 500 nA | 0.015 + 0.0010 | 0.020 + 0.001 | 0.040 + 0.001 | 0.0030 + 0.0004 |
| 100.0000 MΩ | 500 nA// 10 MΩ | 0.300 + 0.0100 | 0.800 + 0.010 | 0.800 + 0.010 | 0.1500 + 0.0004 |
| 1.000000 GΩ | 500 nA// 10 MΩ | 2.50 + 0.0500 | 3.50 + 0.0500 | 3.50 + 0.0500 | 1.0000 + 0.0040 |

Accuracy Specifications: ± ( % of reading + % of range )

### DC Current

| Range [2] | Burden Voltage | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|---|
| Characteristics - typical: DC current | | | | | |
| 1.000000 µA | < 0.015 V | 0.025 + 0.050 | 0.050 + 0.050 | 0.050 + 0.050 | 0.002 + 0.003 |
| 10.00000 µA | < 0.15 V | 0.020 + 0.010 | 0.040 + 0.025 | 0.050 + 0.025 | 0.002 + 0.003 |
| 100.0000 µA | < 0.020 V | 0.010 + 0.020 | 0.040 + 0.025 | 0.050 + 0.025 | 0.002 + 0.003 |
| Specifications: DC current | | | | | |
| 1.000000 mA | < 0.20 V | 0.007 + 0.006 | 0.030 + 0.006 | 0.050 + 0.006 | 0.002 + 0.001 |
| 10.00000 mA | < 0.15 V | 0.007 + 0.020 | 0.030 + 0.020 | 0.050 + 0.020 | 0.002 + 0.002 |
| 100.0000 mA | < 0.7 V | 0.010 + 0.004 | 0.030 + 0.005 | 0.050 + 0.005 | 0.002 + 0.001 |
| 2.000000 A | < 0.8V | 0.180 + 0.020 | 0.200 + 0.020 | 0.200 + 0.020 | 0.005 + 0.001 |

Accuracy Specifications: ± ( % of reading + % of range )

Diode Test [4]

| Range [2] | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|
| 5 V | 0.002 + 0.030 | 0.008 + 0.030 | 0.01 + 0.03 | 0.001 + 0.002 |

Accuracy Specifications: ± ( % of reading + % of range )

## Measuring Characteristics

| | | | |
|---|---|---|---|
| DC Voltage | Input Resistance | Range | |
| | | 100 mV | 10 MΩ or Auto(>10 GΩ) Selectable |
| | | 1 V | |
| | | 10 V | |
| | | 100 V | 10 MΩ±1% |
| | | 600 V | |
| | Input Bias | <30 pA (Typ, 25°C) | |
| | Input Protection | 600 V on all ranges | |
| Measurement Method: Sigma-delta A/D Converter | | | |

| | | |
|---|---|---|
| Resistance | Max. Lead Resistance | 10% of range per lead for 100 Ω, 1 kΩ ranges. 1 kΩ per lead on all other ranges. |
| | Input Protection | 600 V on all ranges |
| Measurement Method: Selectable 4-wire or 2-wire ohms. | | |

| | | | |
|---|---|---|---|
| DC Current | Range | Shunt | Burden Voltage |
| | 1 μA | 10kΩ | <0.015 V |
| | 10 μA | 10kΩ | <0.15 V |
| | 100 μA | 100 Ω | <0.020 V |
| | 1 mA | 100 Ω | <0.20 V |
| | 10 mA | 1 0Ω | <0.15 V |
| | 100 mA | 1 Ω | <0.7 V |
| | 2 A | 0.1 Ω | <0.8 V |
| | Input Protection | Internal 2 A, 250V fuse_T for 2 A | |

| | | | |
|---|---|---|---|
| ADC Sample Rate (Readings/sec) | | Speed | Digits |
| | DCV<br>DCI<br>2W/4W-Resistance | 5 /s，20 /s，60 /s，100 /s | 6 ½ |
| | | 400 /s，1.2 k /s，2.4 k /s | 5 ½ |
| | | 4.8 k /s，7.5 k /s，14.4k，19.2k，38.4k | 4 ¼ |
| | | Speed | Digits |
| | Diode | 400 /s | 6 ½ |
| | | | 5 ½ |
| | | | 4 ¼ |

[1].DC Specification: In addition to the availability that requires warm-up of 60 minutes, it must be set in 5/s speed rate, A-Zero on.

[2].The entire range of measurement will pass the set range by 20% except the tests of 600 V DC, 2 A DC and diode.

[3].This specification applies to 4-wire ohms function or 2-wire ohms using math null for offset. Without math null, add 2 Ω additional error in 2-wire ohms function. The 100M and 1G ohm ranges are 2-wire only.

[4]. This specification applies to the voltage measured from input terminal. 1 mA test current is the typical value. The change of current source leads to the variation in buck of diode junction.

[5]. Due to the speed constraint by data conversion process, ADC sample rate is Not equivalent to reading rate. The reading rate, under the application of single channel, reaches the fastest speed of 1ms when Auto Zero is Off.

# AC Characteristics [1]

## True RMS AC Voltage [2] [3] [4]

| Range [2] | Frequency | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|---|
| 100 mV | 3 Hz - 5 Hz | 1.00 + 0.03 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.004 |
| | 5 Hz - 10 Hz | 0.35 + 0.03 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.004 |
| | 10 Hz - 20 kHz | 0.04 + 0.03 | 0.05 + 0.04 | 0.06 + 0.04 | 0.005 + 0.003 |
| | 20 kHz - 50 kHz | 0.10 + 0.05 | 0.11 + 0.05 | 0.12 + 0.05 | 0.011 + 0.005 |
| | 50 kHz - 100 kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | 100 kHz - 300 kHz | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.200 + 0.020 |
| 1 V ~ 400 V | 3 Hz - 5 Hz | 1.00 + 0.02 | 1.00 + 0.03 | 1.00 + 0.03 | 0.100 + 0.004 |
| | 5 Hz - 10 Hz | 0.35 + 0.02 | 0.35 + 0.03 | 0.35 + 0.03 | 0.035 + 0.004 |
| | 10 Hz - 20 kHz | 0.04 + 0.02 | 0.05 + 0.03 | 0.06 + 0.03 | 0.005 + 0.003 |
| | 20 kHz - 50 kHz | 0.10 + 0.04 | 0.11 + 0.05 | 0.12 + 0.05 | 0.011 + 0.005 |
| | 50 kHz - 100 kHz | 0.55 + 0.08 | 0.60 + 0.08 | 0.60 + 0.08 | 0.060 + 0.008 |
| | 100 kHz - 300 kHz | 4.00 + 0.50 | 4.00 + 0.50 | 4.00 + 0.50 | 0.200 + 0.020 |

Accuracy Specifications: ± ( % of reading + % of range )

## True RMS AC Current [2] [4] [5]

| Range [2] | Burden Voltage | Frequency | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|---|---|
| 100 μA | < 0.020 V, | 3 Hz – 5 Hz | 1.00 + 0.04 | 1.00 + 0.06 | 1.00 + 0.06 | 0.100 + 0.006 |
| | | 5 Hz – 10 Hz | 0.35 + 0.04 | 0.35 + 0.06 | 0.35 + 0.06 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.10 + 0.04 | 0.10 + 0.06 | 0.10 + 0.06 | 0.015 + 0.006 |
| | | 5 kHz – 10 kHz | 0.18 + 0.04 | 0.18 + 0.10 | 0.18 + 0.10 | 0.035 + 0.006 |
| 1 mA | < 0.20 V, | 3 Hz – 5 Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5 Hz – 10 Hz | 0.30 + 0.04 | 0.30 + 0.04 | 0.30 + 0.04 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.10 + 0.04 | 0.10 + 0.04 | 0.10 + 0.04 | 0.015 + 0.006 |
| | | 5 kHz – 10 kHz | 0.15 + 0.04 | 0.15 + 0.04 | 0.15 + 0.04 | 0.030 + 0.006 |
| 10 mA | < 0.15 V | 3 Hz – 5 Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5 Hz – 10 Hz | 0.35 + 0.04 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.10 + 0.04 | 0.10 + 0.04 | 0.10 + 0.04 | 0.015 + 0.006 |
| | | 5 kHz – 10 kHz | 0.18 + 0.04 | 0.18 + 0.04 | 0.18 + 0.04 | 0.030 + 0.006 |
| 100 mA | < 0.7 V | 3 Hz – 5 Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |
| | | 5 Hz – 10 Hz | 0.30 + 0.04 | 0.30 + 0.04 | 0.30 + 0.04 | 0.035 + 0.006 |
| | | 10 Hz – 5 kHz | 0.10 + 0.04 | 0.10 + 0.04 | 0.10 + 0.04 | 0.015 + 0.006 |
| | | 5 kHz – 10 kHz | 0.15 + 0.04 | 0.15 + 0.04 | 0.15 + 0.04 | 0.030 + 0.006 |
| 2 A | < 0.8 V | 3 Hz – 5 Hz | 1.00 + 0.04 | 1.00 + 0.04 | 1.00 + 0.04 | 0.100 + 0.006 |

| | | | | |
|---|---|---|---|---|
| 5 Hz – 10 Hz | 0.35 + 0.04 | 0.35 + 0.04 | 0.35 + 0.04 | 0.035 + 0.006 |
| 10 Hz – 5 kHz | 0.23 + 0.04 | 0.23 + 0.04 | 0.23 + 0.04 | 0.015 + 0.006 |
| 5 kHz – 10 kHz | 0.23 + 0.04 | 0.23 + 0.04 | 0.23 + 0.04 | 0.030 + 0.006 |

Additional Crest Factor Errors (non-sine wave)

| Crest Factor | Error (% of reading) |
|---|---|
| 1-2 | 0.05% |
| 2-3 | 0.15% |
| 3-4 | 0.30% |
| 4-5 | 0.40% |

Additional Low Frequency Errors (% of reading)

| | Speed | | |
|---|---|---|---|
| Frequency | 1/s (>3 Hz) | 5/s (>20 Hz) | 20/s (>200 Hz) |
| 10 Hz~20 Hz | 0 | 0.74 | - |
| 20 Hz~40 Hz | 0 | 0.22 | - |
| 40 Hz~100 Hz | 0 | 0.06 | 0.73 |
| 100 Hz~200 Hz | 0 | 0.01 | 0.22 |
| 200 Hz~1 k Hz | 0 | 0 | 0.18 |
| >1 k Hz | 0 | 0 | 0 |

## Measuring Characteristics

| | | | |
|---|---|---|---|
| True RMS AC Voltage | Measurement Method: | AC-coupled True RMS – measures the ac component of input with up to 400 Vdc of bias on any range. | |
| | Crest Factor | Maximum 5:1 at full scale | |
| AC Bandwidth | Speed | Bandwidth | |
| | 1/s (>3 Hz) | 3 Hz – 300 kHz (ACI:3 Hz – 10 kHz) | |
| | 5/s (>20 Hz) | 20 Hz – 300 kHz (ACI:20 Hz – 10 kHz) | |
| | 20/s(>200 Hz) | 200 Hz – 300 kHz(ACI:200 Hz – 10 kHz) | |
| | Input Impedance: | 1 MΩ ± 2%, in parallel with 100 pF | |
| | Input Protection: | 400 Vrms on all ranges | |
| True RMS AC Current | Range | Shunt | Burden Voltage |
| | 100 μA | 100 Ω | <0.020 V |
| | 1 mA | 100 Ω | <0.20 V |
| | 10 mA | 10 Ω | <0.15 V |
| | 100 mA | 1 Ω | <0.7 V |
| | 2 A | 0.1 Ω | <0.8 V |
| | Input Protection: | Internal 2 A, 250V fuse_T for 2 A | |

Operating Characteristics

| Function | Speed | Digits | AC Bandwidth |
|---|---|---|---|
| ACV | 1/s (>3 Hz) | 6 ½ | 3 Hz – 300 kHz |
| | 5/s (>20 Hz) | 5 ½ | 20 Hz – 300 kHz |
| | 20/s (>200 Hz) | 4 ½ | 200 Hz – 300 kHz |
| ACI | 1/s (>3 Hz) | 6 ½ | 3 Hz – 10 kHz |
| | 5/s (>20 Hz) | 5 ½ | 20 Hz – 10 kHz |
| | 20/s (>200 Hz) | 4 ½ | 200 Hz – 10 kHz |

[1].AC Specification: It will be available after 60 minutes of warm-up, sine wave as well as 1/s speed rate.

[2].The entire range of measurement will pass the set range by 20% except the tests of 400 VAC and 2 A AC.

[3].Specifications are for sinewave input >5% of range. For inputs from 1% to 5% of range and <50 kHz, add 0.1% of range additional error. For 50 kHz to 100 kHz, add 0.13% of range. The measurement range of 400 VAC is limited within the range of 7.5 x 10^7 Volt–Hz.

[4].Three speed settings provided for low-frequency performance: 1/s (3 Hz), 5/s (20 Hz), 20/s (200 Hz). Additional errors will Not occur for the frequency greater than the filter settings.

[5].Specifications are for sinewave input >5% of range, and is beyond 10 μA AC. For inputs from 1% to 5% of range, add 0.1% of range additional error.

# Frequency and Period Characteristics

## Frequency Period [1] [2]

| Range | Frequency | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|---|
| 100 mV ~ 400 V [3] | 3 Hz – 5 Hz | 0.100 | 0.100 | 0.100 | 0.100 |
| | 5 Hz – 10 Hz | 0.050 | 0.050 | 0.050 | 0.035 |
| | 10 Hz – 40 Hz | 0.030 | 0.030 | 0.030 | 0.015 |
| | 40 Hz – 1 M Hz [4] | 0.006 | 0.006 | 0.006 | 0.015 |

Accuracy Specifications: ± % of reading

## Measuring Characteristics

| | | |
|---|---|---|
| Frequency and Period | Measurement Method: | Reciprocal-counting technique. AC-coupled input using the ac voltage measurement function. |
| | Voltage Ranges | 100 mVrms full scale to 400 Vrms. Auto or manual ranging. |
| Settling Considerations | Errors will occur when attempting to measure the frequency or period of an input following a dc offset voltage change. The input blocking RC time constant must be allowed to fully settle (up to 1 sec) before the most accurate measurements are possible. | |
| Measurement Considerations | All frequency counters are susceptible to error when measuring low-voltage, low-frequency signals. Shielding inputs from external noise pickup is critical for minimizing measurement errors. | |

### Operating Characteristics

| Function | Gate Time | Digits |
|---|---|---|
| Frequency, Period | 1 s, 100 ms | 6 ½ |
| | 10 ms | 5 ½ |
| | 1 ms | 4 ½ |

[1].This specification will be available after 60 minutes of warm-up and sine wave input, unless stated otherwise. This specification applies to 1s gate time.

[2].This specification is available when both sine wave and square wave input ≥ 100 mV. For the input of 10 mV to 100 mV, the % of reading error needs to be multiplied by 10 times.

[3].The amplitude range is from 10% to 120% and is lower than 400 VAC.

[4].The input ≥ 60 mV, for 300 k ~ 1 MHz, within 100mV range.

## Temperature Characteristics [1]

(Exclusive of probe errors)

### RTD (Accuracy based on PT100):

(100 Ω platinum [PT100], D100, F100,PT385, PT3916, or user type)

| Range | Resolution | 1 Year (23°C ±5°C) | Temperature Coefficient 0°-18°C & 28°-55°C |
|---|---|---|---|
| -200 °C~ -100 °C | 0.001 °C | 0.09 °C | 0.004 °C / °C |
| -100 °C~-20 °C | 0.001 °C | 0.08 °C | 0.005 °C / °C |
| -20 °C~20 °C | 0.001 °C | 0.06 °C | 0.005 °C / °C |
| 20 °C~100 °C | 0.001 °C | 0.08 °C | 0.005 °C / °C |
| 100 °C~300 °C | 0.001 °C | 0.12 °C | 0.007 °C / °C |
| 300 °C~600 °C | 0.001 °C | 0.22 °C | 0.009 °C / °C |

### Thermocouples (Accuracy based on ITS-90):

| Type | Range | Resolution | 90 Day/1 Year (23 °C±5 °C)* | Temperature Coefficient 0°-18 °C & 28°-55 °C |
|---|---|---|---|---|
| E | -200 to +1000 °C | 0.002 °C | 0.2 °C | 0.03 °C / °C |
| J | -210 to +1200 °C | 0.002 °C | 0.2 °C | 0.03 °C / °C |
| T | -200 to +400 °C | 0.002 °C | 0.3 °C | 0.04 °C / °C |
| K | -200 to +1372 °C | 0.002 °C | 0.3 °C | 0.04 °C / °C |
| N | -200 to +1300 °C | 0.003 °C | 0.4 °C | 0.05 °C / °C |
| R | -50 to +1768 °C | 0.01 °C | 1 °C | 0.14 °C / °C |
| S | -50 to +1768 °C | 0.01 °C | 1 °C | 0.14 °C / °C |
| B | +350 to +1820 °C | 0.01 °C | 1 °C | 0.14 °C / °C |

*Relative to simulated junction

Thermistor: (2.2 kΩ, 5 kΩ, 10 kΩ or User Type)

| Range | Resolution | 90 Day/1 Year (23 °C±5 °C)* | Temperature Coefficient / °C |
|---|---|---|---|
| –80 ° to 150 °C | 0.001 °C | 0.1 °C | 0.003 °C/ °C |

| | Speed | Digits |
|---|---|---|
| TCO/RTD/ Thermistor | 5 /s，20 /s，60 /s，100 /s | 6 ½ |
| | 400 /s，1.2 k /s，2.4 k /s | 5 ½ |
| | 4.8 k /s，7.5 k /s，14.4k，19.2k，38.4k | 4 ½ |

[1]. The actual measurement range and test lead error will be constrained by the adopted test lead. The test lead accuracy adder covers all errors of measurements and ITS-90 temperature change.

[2]. Due to the speed constraint by data conversion process, ADC sample rate is Not equivalent to reading rate. The reading rate, under the application of single channel, reaches the fastest speed of 1ms when Auto Zero is Off.

Capacitance [1]

| Range | 24 Hour TCAL ± 1 ˚C | 90 Day TCAL ± 5 ˚C | 1 Year TCAL ± 5 ˚C | Temperature Coefficient/˚C |
|---|---|---|---|---|
| 1.000 nF | 2.00 + 2.00 | 2.00 + 2.00 | 2.00 + 2.00 | 0.05 + 0.01 |
| 10.00 nF | 2.00 + 1.00 | 2.00 + 1.00 | 2.00 + 1.00 | 0.05 + 0.01 |
| 100.0 nF | 2.00 + 0.40 | 2.00 + 0.40 | 2.00 + 0.40 | 0.05 + 0.01 |
| 1.000 μF | 2.00 + 0.40 | 2.00 + 0.40 | 2.00 + 0.40 | 0.05 + 0.01 |
| 10.00 μF | 2.00 + 0.40 | 2.00 + 0.40 | 2.00 + 0.40 | 0.05 + 0.01 |
| 100.0 μF | 2.00 + 0.40 | 2.00 + 0.40 | 2.00 + 0.40 | 0.05 + 0.01 |

Accuracy Specifications: ± ( % of reading + % of range )

[1]. Specifications are for film Capacitance inputs that are greater than 10% range.

## Capacitance

Measurement method: DC recharge & discharge.

Input protection: 500 Vpeak on all ranges.

The capacitor under test (Cx) is charged using a constant current source. The time to charge Cx is recorded. The capacitor is then discharged using a known resistance and the discharge time is recorded. The value of the resistance depends on the capacitance range that is selected. The charge and discharge time is used to calculate the capacitance of Cx if the selected capacitance range is equal to or less than 10 nF. Only the charge time is used to calculate the capacitance of Cx if the selected capacitance range is equal to or greater than 100 nF.

As measuring capacitance with the DMM is effectively a DC measurement, the measured capacitance tends to be higher than what is measured by LCR meters. For best measurement results, first perform a zeroing of the test leads when the cables are “open” to compensate for the test lead capacitance.

| Model description | Type | Speed (ch/sec) | Max volts | Max amps | Bandwidth | Thermal offset | Comments |
|---|---|---|---|---|---|---|---|
| DAQ-900<br>20 ch Multiplexer | 2-wire solid-state<br>(4-wire selectable) | 450 | 120 V | | 10 MHz | < 4 µV | Built-in cold junction reference |
| DAQ-901<br>20 ch Multiplexer + 2 current channels | 2-wire armature<br>(4-wire selectable) | 80 | 300 V | 1 A | 10 MHz | < 4 µV | Built-in cold junction reference 2 additional current channels (22 total) |
| DAQ-903<br>40 ch Single-Ended Mux | 1-wire armature<br>(common low) | 80 | 300 V | | 10 MHz | < 1 µV | No four-wire measurements |
| DAQ-904<br>4 x 8 Matrix | 2-wire armature | | 300 V | | 10 MHz | < 1 µV | |
| DAQ-909<br>8 ch HV Multiplexer + 2 current channels | 2-wire armature<br>(4-wire selectable) | 60 | DC600 V<br>AC400 V | 2 A | 10 MHz | < 4 µV | 2 additional current channels (10 total) |
| DAQ-908<br>20-channel Actuator/General Purpose Switch | SPDT/from C | | 300 V | | 10 MHz | < 4 µV | |
| DAQ-907<br>DIO/Totalizer/ DAC | 2 x 8 bit DIO<br>29 bit counter<br>2 x 16bit DAC | | DC 42 V<br>DC 42 V<br>± 12 V | 400 mA<br><br>15mA | <br>100 kHz<br>DC | | Open drain<br>Selectable input threshold<br>Max 40 mA total output per frame |

## Internal DMM measurement functions supported

| | DAQ-900 | DAQ-901 | DAQ-903 | DAQ-909 | DAQ-904/DAQ-908/DAQ-907 |
|---|---|---|---|---|---|
| **AC/DC Voltage** | √ [2,3] | √ | √ | √ | |
| **AC/DC Current** | | √ | | √ | |
| **Freq./Period** | √ | √ | √ | √ | |
| **2Wire Resistance** | √ [1] | √ | √ | √ | |
| **4Wire Resistance** | √ [1] | √ | | √ | |
| **Thermocouple** | √ | √ | | √ [4] | |
| **2Wire RTD** | | √ | √ | √ | |
| **4Wire RTD** | | √ | | √ | |
| **Thermistor** | | √ | √ | √ | |
| **Capacitance** | | √ | √ | √ | |

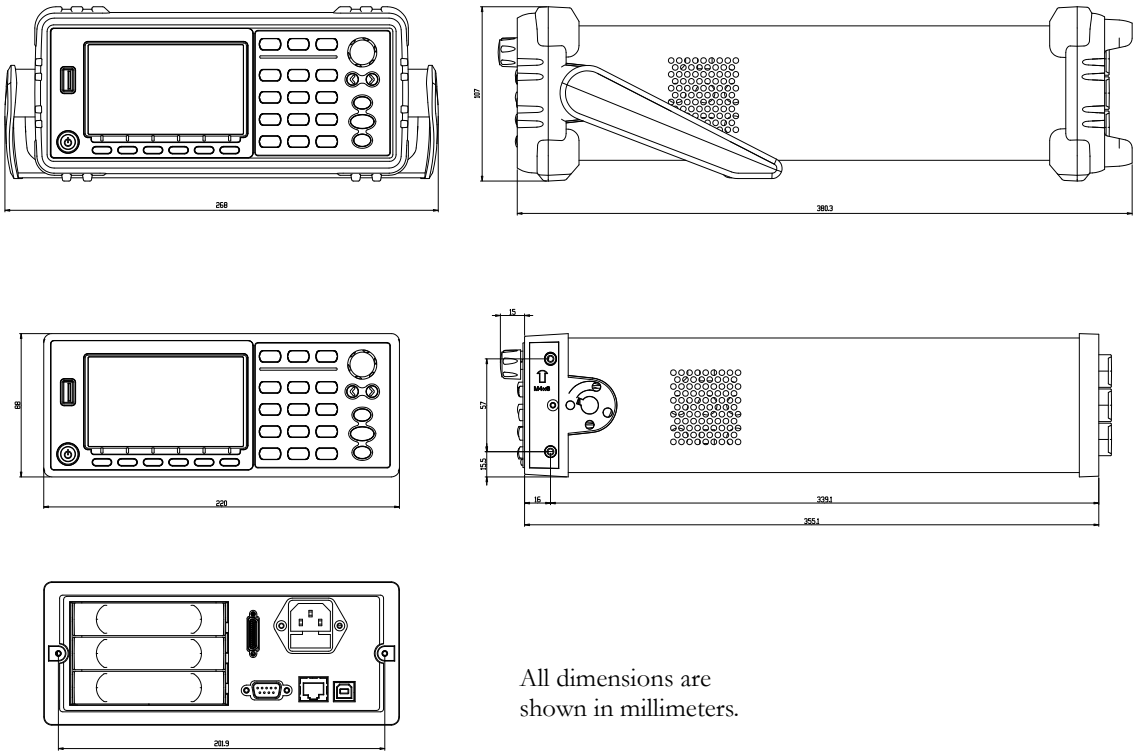
[1]. For the measurement of 100 Ω and 1 kΩ resistance ranges, it is recommended to use 4-wire resistance. The maximum resistance range of DAQ-900 is 1 MΩ.

[2]. When measuring AC voltage, the input impedance will decrease with frequency. A source impedance of 5 Ω or less will maintain specification over frequency. A source impedance of 50 Ω or less will maintain specification in the 5 kHz range.

[3]. For DC voltage measurement, if the integration time is short and the source impedance is high, more stabilization time may be required.

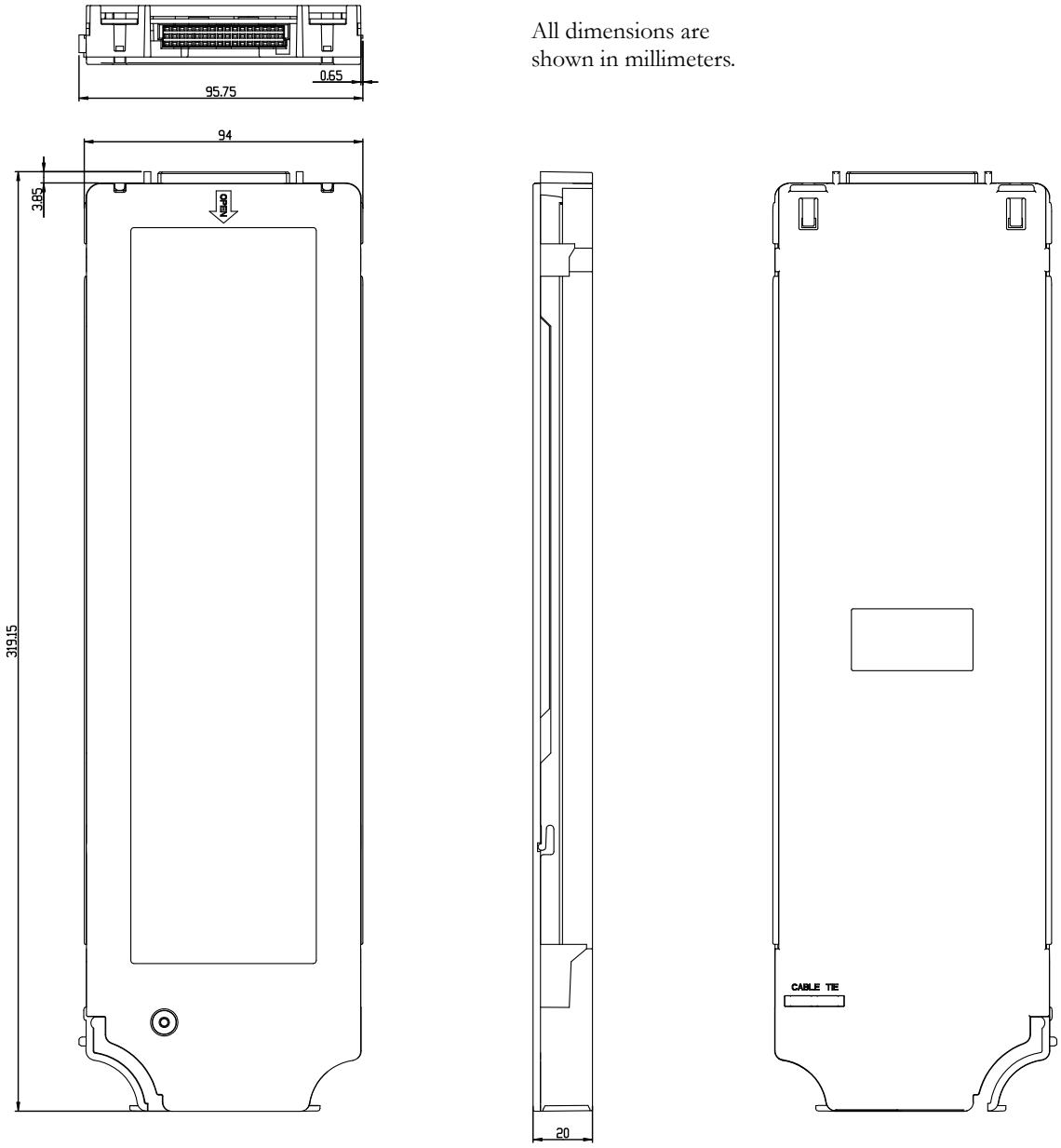
[4]. Need to use an extension cable moving the cold junction outside the chassis and manually set the reference temperature value.

## Dimensions – DAQ-9600




All dimensions are shown in millimeters.

# Dimensions – Module




All dimensions are shown in millimeters.

# Declaration of Conformity

We
**GOOD WILL INSTRUMENT CO., LTD.**
declare that the CE marking mentioned product
satisfies all the technical relations application to the product within the scope of council:
Directive: EMC; LVD; WEEE; RoHS
The product is in conformity with the following standards or other normative documents:

| ◎ **EMC** | |
|---|---|
| EN 61326-1 : | Electrical equipment for measurement, control and laboratory use — EMC requirements |
| Conducted & Radiated Emission<br>EN 55011 / EN 55032 | Electrical Fast Transients<br>EN 61000-4-4 |
| Current Harmonics<br>EN 61000-3-2 / EN 61000-3-12 | Surge Immunity<br>EN 61000-4-5 |
| Voltage Fluctuations<br>EN 61000-3-3 / EN 61000-3-11 | Conducted Susceptibility<br>EN 61000-4-6 |
| Electrostatic Discharge<br>EN 61000-4-2 | Power Frequency Magnetic Field<br>EN 61000-4-8 |
| Radiated Immunity<br>EN 61000-4-3 | Voltage Dip/ Interruption<br>EN 61000-4-11 / EN 61000-4-34 |
| ◎ **Safety** | |
| EN 61010-1 : | Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements |

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