

RIGOL

Quick Guide

M300 Data Acquisition/Switch System

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RIGOL Technologies, Inc.

Guaranty and Declaration

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Contact Us

If you have any problem or requirement when using our products or this manual, please contact **RIGOL**.

E-mail: service@rigol.com

Websites: www.rigol.com

Safety Requirement

General Safety Summary

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

Use Proper Power Cord.

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

Ground The Instrument.

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

Observe All Terminal Ratings.

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

Use Proper Overvoltage Protection.

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

Do Not Operate Without Covers.

Do not operate the instrument with covers or panels removed.

Use Proper Fuse.

Please use the specified fuses.

Avoid Circuit or Wire Exposure.

Do not touch exposed junctions and components when the unit is powered.

Do Not Operate With Suspected Failures.

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

Keep Well Ventilation.

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

Do Not Operate in Wet Conditions.

In order to avoid short circuiting to the interior of the device or electric shock, please do

not operate in a humid environment.

Do Not Operate in an Explosive Atmosphere.

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

Keep Product Surfaces Clean and Dry.

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

Electrostatic Prevention.

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

Handling Safety.

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

Safety Terms and Symbols

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



WARNING

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



CAUTION

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

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

DANGER indicates an injury or hazard may immediately happen.

WARNING indicates an injury or hazard may be accessible potentially.

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

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



Hazardous Voltage



Safety Warning



Protective Earth Terminal



Chassis Ground



Test Ground

General Care and Cleaning

General Care:

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

Cleaning:

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

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



CAUTION

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



WARNING

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

Environmental Considerations

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



Product End-of-Life Handling

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

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Document Overview

This manual introduces the front and rear panels, the user interface and the basic measurement method of M300 Data Acquisition/Switch System briefly and guides users to be familiar with the instrument quickly. For more detailed information, please refer to the User's Guide.

Quick Start

This section provides the basic information about the front and rear panels, the user interface and the plug-in modules.

General Inspection

1. Inspect the shipping container for damage

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

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

2. Inspect the instrument

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

3. Check the accessories

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

Appearance and Dimensions

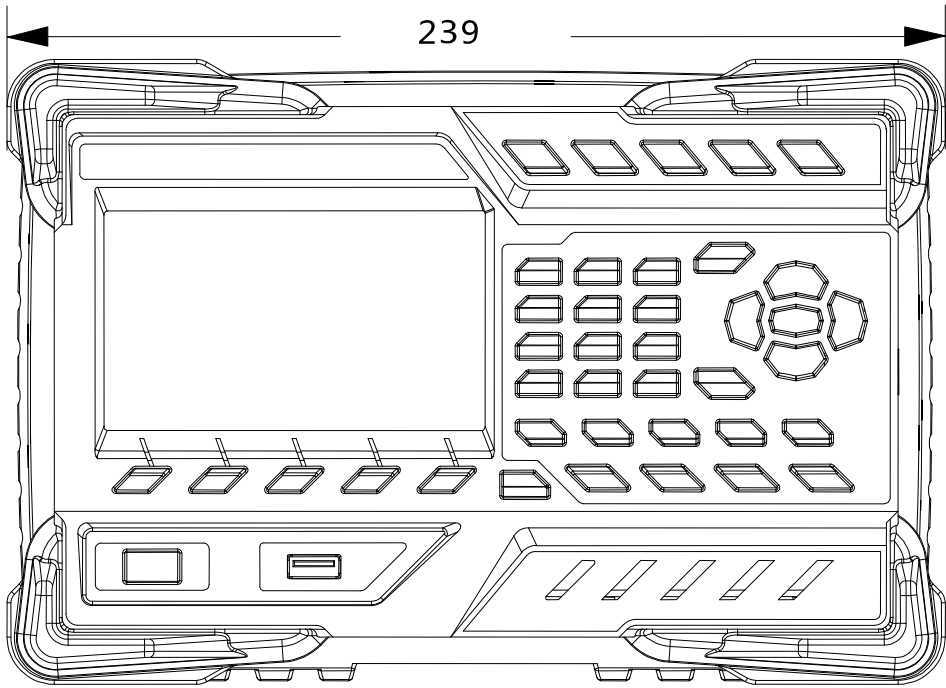


Figure 1 Front View (Unit: mm)

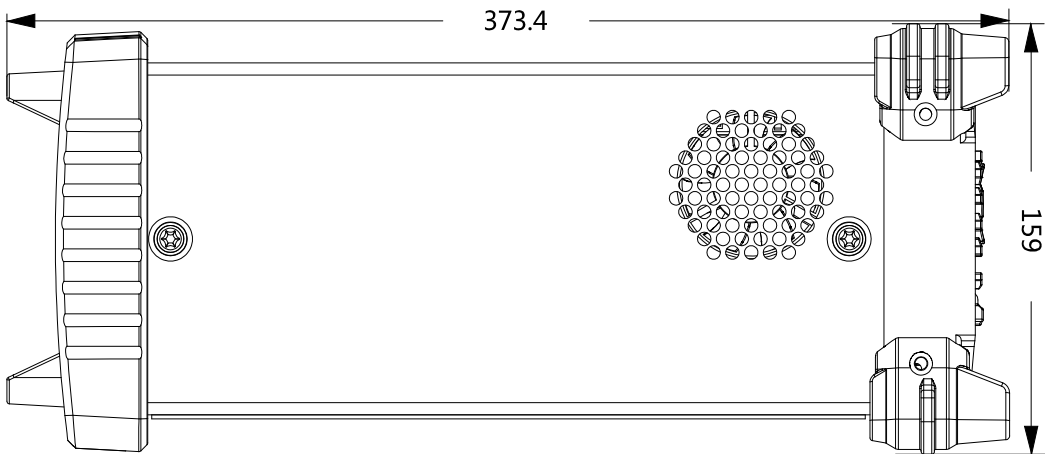


Figure 2 Side View (Unit: mm)

Front Panel

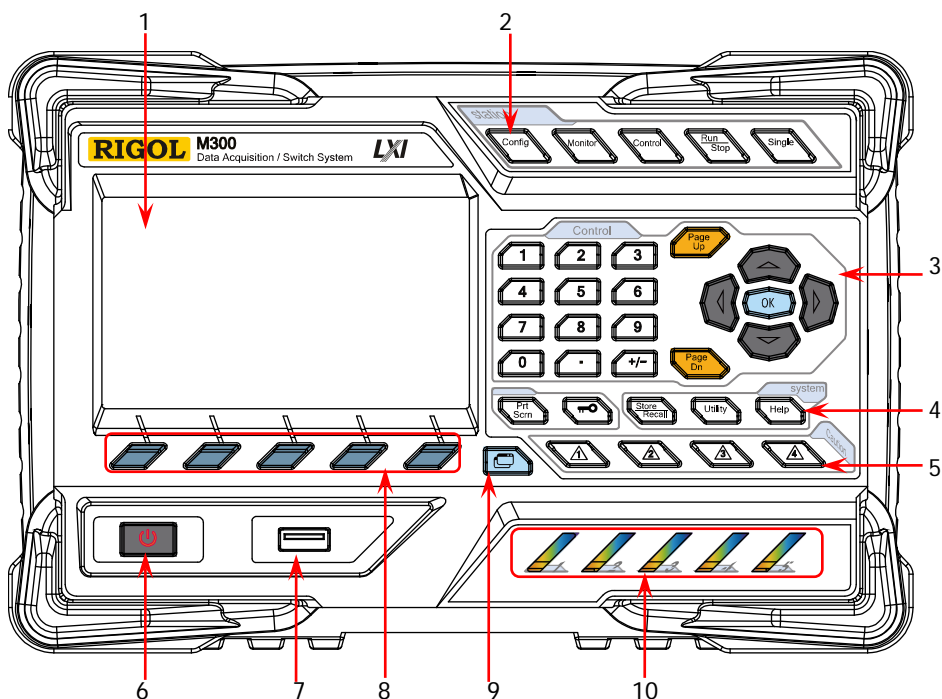


Figure 3 Front Panel

1. LCD

4.3 inches high-resolution color LCD displaying the menu, configuration guide, measurement parameters, system status, prompt messages, etc.

2. Function Keys



Configure the scan list and the measurement parameters of each channel.

- Create, edit, read and save the scan list.
- Set the number of scans, trigger mode and scan interval.
- Provide the channel configuration guide which can be used to configure the measurement parameters, scaling parameters, alarm parameters and advanced measurement parameters of the channel.



Enable or disable the channel monitor function.

- Support single-channel, multi-channel and all-channel monitor functions.
- In single-channel monitor function, you can switch the channel monitored at any time.
- In multi-channel monitor function, you can monitor up to 7 channels in the scan list.

- In all-channel monitor function, you can monitor all the channels in the scan list.



Control the modules currently inserted.

- Control the status of each channel of the modules.
- Reset the modules.
- Configure the DIO and TOT channels of multifunction module.
- Can not control the DMM module.



Auto Trigger/Stop

Press this key, the instrument triggers or enters the wait-for-trigger state and the backlight goes on; press and hold this key, the instrument stops triggering or exits the wait-for-trigger state and the backlight goes off.

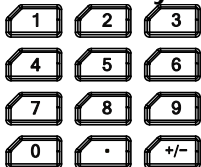
Note: this key is invalid when the scan list is empty.



Single-channel Switch

When the instrument is in the single-channel monitor interface, press this key to switch the channel monitored to the next channel in the scan list; when the instrument is in other interfaces, press this key to switch the instrument to the single-channel monitor interface.

3. Control Keys



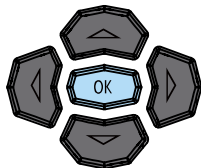
Numeric Keyboard

- Include numbers (0-9), decimal point (.) as well as positive/negative signs (+/-).
- Used to input parameter value, date and time.



Use this key to open the previous or next page of the current interface.

Note: these keys are different from the menu page up/down keys (**Page Up** and **Page Dn**).



Direction keys and confirmation key.

4. System Keys



If a USB storage device is currently connected to the instrument, press this key to store the current content on the screen in USB storage device in *.bmp format.



- When the instrument is in local mode, pressing this key can lock the front panel. At this point, all the keys at the front panel except this key become invalid.
- When the front panel is locked, press and hold this key to unlock the front panel.
- When the instrument is in remote mode, press this key to switch to local mode.



Store and recall the instrument status, measurement configuration and measurement data, etc.

- Store the file in the internal non-volatile memory or external USB storage device.
- Read the file stored.



Configure the system-related parameters.

- Set various parameters such as the time, date, system language and display brightness.
- Configure the remote interface parameters: RS232, LAN, GPIB and USB.
- Query the system information (such as the model and serial number).
- Execute self-test and view the information of each module (such as the name and model of the module).
- System update.



Enable the built-in help system. Provide Chinese/English help information for the front panel function keys and menu items.

5. Alarm Channel Setting



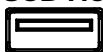
M300 provides 4 alarm channels. When an alarm is generated, the corresponding pin of the Alarms/Ext Trig interface (converted from the **[RS-232/Alarms/Ext Trig]** interface) at the rear panel outputs a pulse. You can press the corresponding key to set the output mode of the corresponding pin.

6. Power Key



Press this key to turn on or off the instrument.

7. USB Host



Via this interface, M300 can be as a host device and connected with an USB storage device to store or recall instrument status, measurement configuration, measurement data, etc.

8. Menu Softkeys

Correspond to the menus on the screen. Pressing any softkey can enable the corresponding menu.

9. View Switch

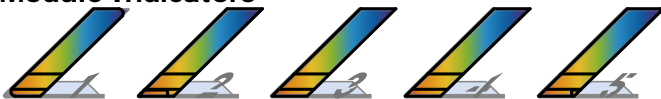
View the scan history information, channel status table, measurement curve and channel information.



- Scan history information: view the start time, scan sweep, count, channel number as well as the corresponding function, maximum, minimum, average and standard deviation measured and the scan readings of each channel of the latest scan.
- Channel status table: display the current status of each channel.
- Measurement curve: display the measurement curve of the specified channel.
- Channel information: view the cycle count of each relay of the module, the alarm messages of the current scan (the first 100, including the reading and time when the alarm is generated) and error messages (up to 20).

Note: up to 100 alarm messages on each alarm channel can be logged in the alarm queue and the other alarm messages would be lost and up to 20 error messages can be logged in the error queue and the other error messages will also be lost.

10. Module Indicators



Correspond to the 5 module slots at the rear panel respectively. The corresponding module indicator goes on when the module is inserted into the slot at the rear panel.

Rear Panel

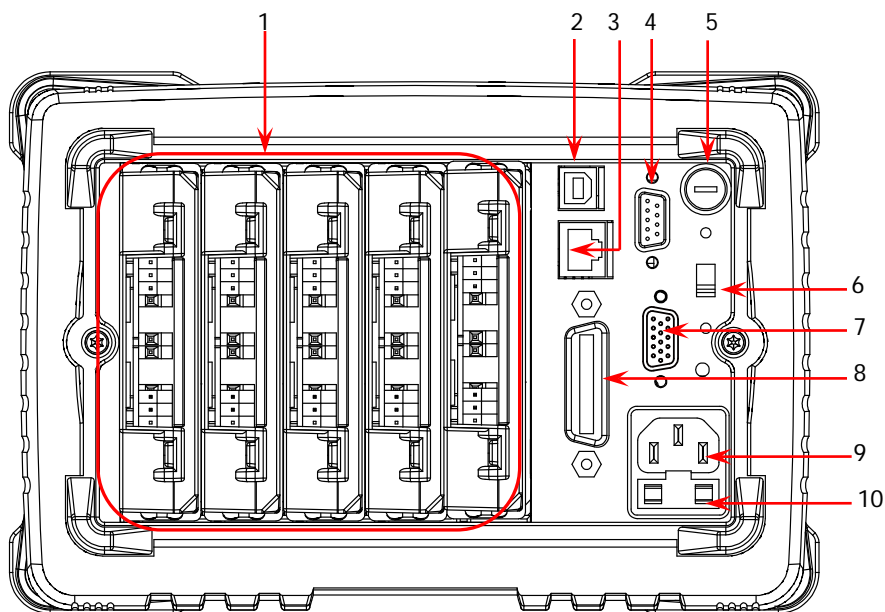


Figure 4 Rear Panel

1. Slots

M300 provides 5 slots for 5 modules and only one DMM module is permitted for one mainframe. The 5 slots from left to right in the figure above correspond to the 5 module indicators at the front panel respectively. When a module is inserted in the slot, the corresponding module indicator at the front panel goes on. Figure 4 is the schematic diagram of the rear panel without the modules inserted. For information of each module, refer to **“Plug-in Module Overview”**.

2. USB Device

Via this interface, M300 can communicate with the PC as a slave device and you can control it remotely via the PC.

3. LAN

M300 conforms to the LXI-C instrument standard. The instrument can be connected to the network via this interface and you can control the instrument remotely via a PC in the same network.

4. Analog Bus Interface (Female)

M300 provides two internal 2-wire analog buses for signal routing as well as an external interface (namely Analog Bus Interface). The analog bus interface is a 9-pin female interface.

5. DMM Module Power Fuse

The AC power supply from the power socket is divided into two paths with one for the DMM module and the other for other circuits except the DMM module. M300 is equipped with the DMM module power fuse (its specification is AC 250V T250 mA). To replace the fuse, refer to the method below.

- 1) Turn off the instrument and remove the power cord.
- 2) Press down the fuse cover using a straight screw driver and rotate clockwise.
- 3) Disassemble the fuse cap and fuse.
- 4) Replace a specified fuse and install the fuse cap.



CAUTION

Please use the specified fuse to avoid electric shock and fire.

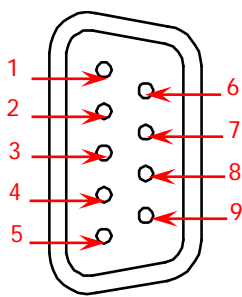
6. Voltage Selector

M300 supports two kinds of AC voltages (115 V and 230 V). Please select the proper voltage scale according to the AC power used.

7. RS-232/Alarms/Ext Trig Mix Interface (Male)

This interface is 25-pin male interface. You can convert this interface into two 9-pin interfaces using the Mix Interface Convert Cable (accessory); wherein, one is a 9-pin male interface used as a standard RS232 interface and the other is a 9-pin female interface used for alarm output, external trigger signal input, etc.

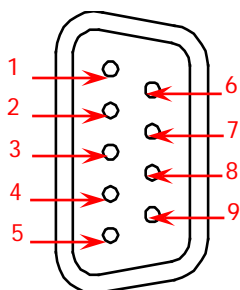
- RS232: via this interface, M300 can communicate with the PC and you can control the instrument remotely via the PC.



RS232 Interface

| Pin | Name | Definition |
|-----|------|---------------------|
| 1 | -- | -- |
| 2 | RXD | Received Data |
| 3 | TXD | Transmitted Data |
| 4 | DTR | Data Terminal Ready |
| 5 | SGND | Signal Ground |
| 6 | DSR | Data Set Ready |
| 7 | RTS | Request To Send |
| 8 | CTS | Clear To Send |
| 9 | -- | -- |

- Alarms/Ext Trig: as shown in the figure below, pin 1 to pin 4 is used to output TTL pulse when an alarm is generated in the corresponding alarm channel. Pin 6 is used to receive external trigger signal. When an external digital multimeter is connected for measurement, pin 5 and pin 6 are used together to control the measurement.



Alarms/Ext Trig Interface

| Pin | Definition |
|-----|--------------------------------------|
| 1 | Alarm 1 Output |
| 2 | Alarm 2 Output |
| 3 | Alarm 3 Output |
| 4 | Alarm 4 Output |
| 5 | Channel Closed Output |
| 6 | Ext Trig Input/Channel Advance Input |
| 7 | GND |
| 8 | Not Used |
| 9 | Not Used |

Note:

The Pin 5 outputs a TTL negative pulse with about $2\mu\text{s}$ pulse width each time the measurement is completed. The output rate is dependent upon the actual measurement rate and 2500 times per second at most.

In external trigger mode, when the Pin 6 accepts external trigger signal (which pulse width is equal to or greater than $2\mu\text{s}$) with specified edge (press **Config**, select "External" trigger mode and select "Rising" or "Falling" in **Edge** item), the instrument triggers. If the external trigger signal is continuous pulse, please make sure the pulse period is larger than $100\mu\text{s}$.

8. GPIB

M300 conforms to the IEEE-488.2 standard. Via this interface, M300 can communicate with the PC and you can control the instrument remotely via the PC.

9. Power Socket

M300 can accept two kinds of AC power supplies. Use the power cord provided in the accessories to connect the AC power supply to the instrument via this socket.

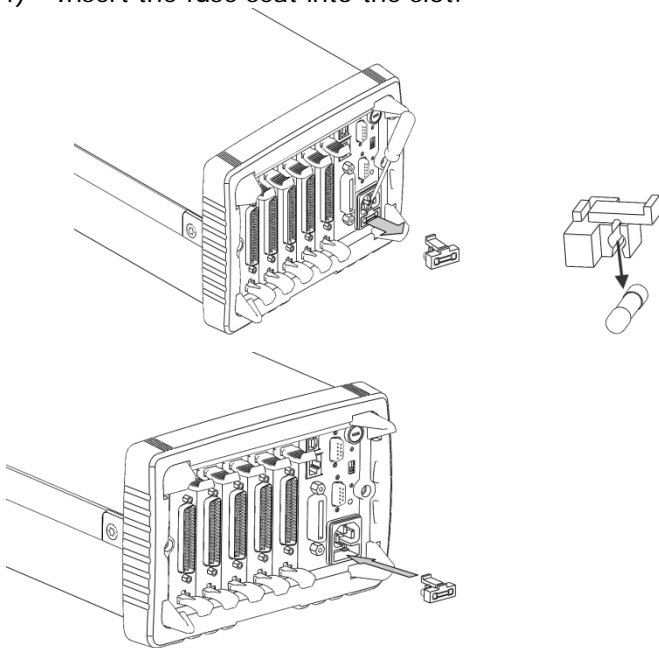
**CAUTION**

Before connecting the AC power supply, select the correct voltage scale using the **voltage selector**.

10. Power Fuse

The specification of the fuse of M300 is AC 250V T3.15 A. If a new fuse is required, please refer to the following steps.

- 1) Turn off the instrument and remove the power cord.
- 2) Insert the small straight screw driver into the slot at the power socket and prize out the fuse seat.
- 3) Replace a specified fuse.
- 4) Insert the fuse seat into the slot.



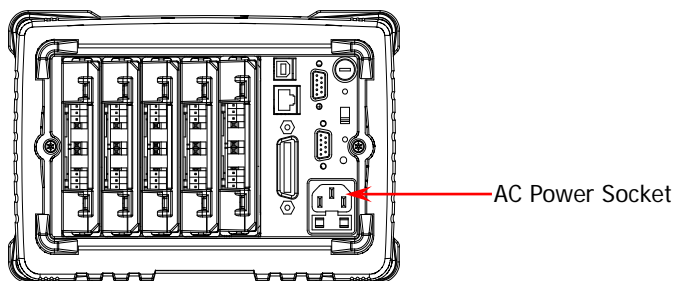
CAUTION

Please use the specified power fuse and make sure that the fuse seat is not short-circuited to avoid electric shock and fire.

Power On and Inspection

1. Connect the power

- 1) Adjust the power voltage selector at the rear panel according to the power supply voltage. M300 supports two types of AC power: if your supply voltage is in the range of $115 \times (1-10\%)$ V and $115 \times (1+10\%)$ V, please select 115 and if it is in the range of $230 \times (1-10\%)$ V and $230 \times (1+10\%)$ V, please select 230.
- 2) Connect the instrument to AC power using the power cord provided in the accessories.



2. Start the instrument

Press the power key at the front panel and the instrument starts.

After the instrument starts, it checks the modules. This process would take several to dozens of seconds according to the number of modules inserted. During this process, user operation is forbidden.

3. Check the instrument following the steps below if the instrument does not start normally






- Check whether the power is correctly connected.
- Check whether the power key at the front panel is really on.
- Check whether the power fuse is burned out. If the fuse needs to be changed, use the specified fuse.
- Check whether the correct power voltage is selected. Please select the proper power voltage according to the power supply voltage.
- Restart the instrument after finishing the above inspections. If it still does not work correctly, please contact **RIGOL**.

User Interface



Figure 5 User Interface

1. Status Bar

- Help Displayed when the built-in help is enabled.
- Error Displayed when an error occurs.
-  Displayed when the keyboard is locked.
-  Displayed when an alarm is generated.
-  Displayed when the system sound is disabled.
-  Displayed when the instrument is connected to network correctly.
-  Displayed when an USB storage device is detected.
- Local Displayed when the instrument is in local mode.
- Rmt Displayed when the instrument is in remote mode.

2. Content Area

Display the measurement configuration guide, measurement parameters settings, etc. For more detailed information, please refer to the User's Guide.

3. Menu Bar

Display the menus of the current function corresponding to the menu softkeys below respectively. Pressing the softkey can activate the corresponding menu.

Plug-in Module Overview

M300 provides 10 kinds of modules including the DMM module, 32-channel multiplexer, 64-channel multiplexer, multi-function module, etc. This section introduces the functions and characteristics of each module.

Outside View drawing of the module

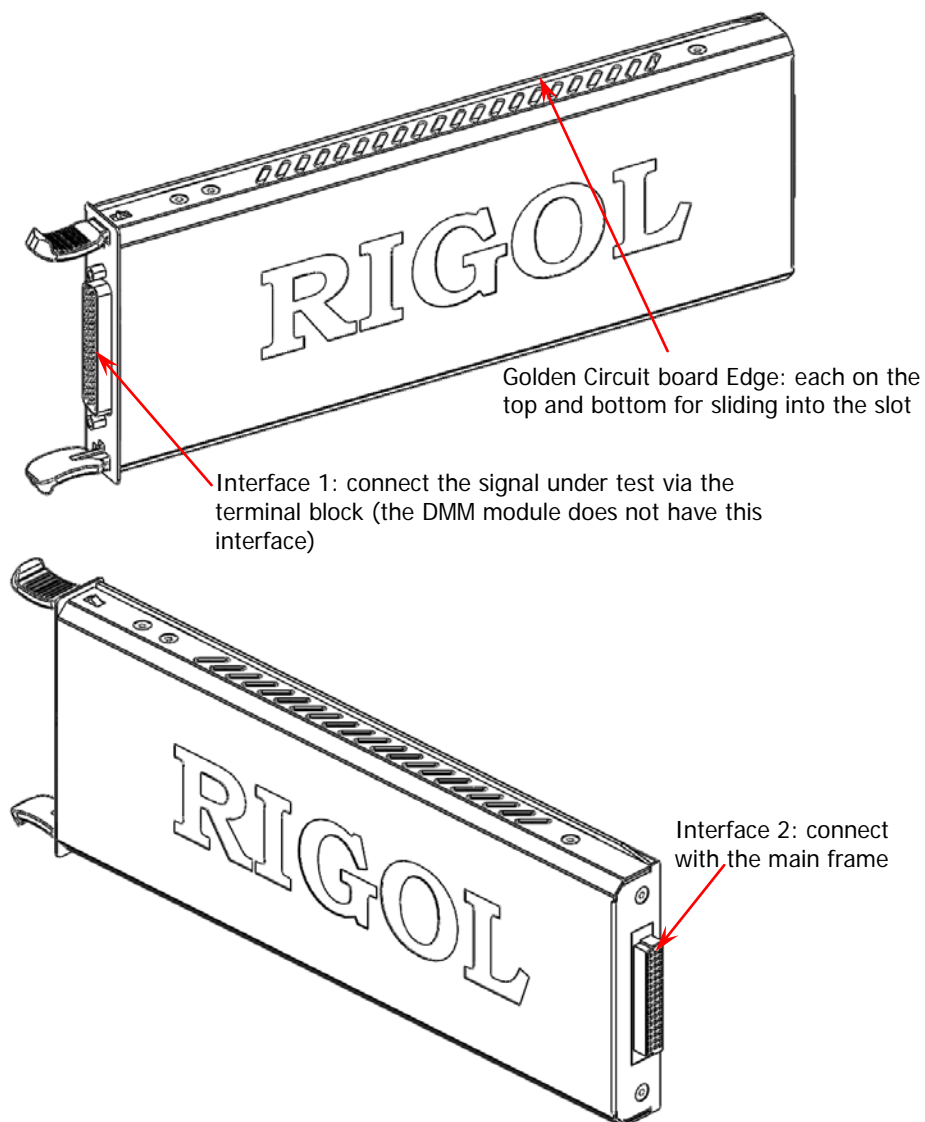


Figure 6 Outside View Drawing of the Module

Insert the Module into the Mainframe

Please turn the mainframe off firstly and insert the modules following the instructions below.

As shown in Figure 6, there is a golden circuit board edge both on the top and bottom of the module. Aim the two edges with the sliding chutes (as pointed out by the arrows in the figure below) in the main frame slot and push the module in until you hear a sound. At this point, interface 2 is connected to the main frame.

Note: please refer to “**Measurement Connections**” to connect the external terminal block and the signals to be measured and then insert it into the mainframe.

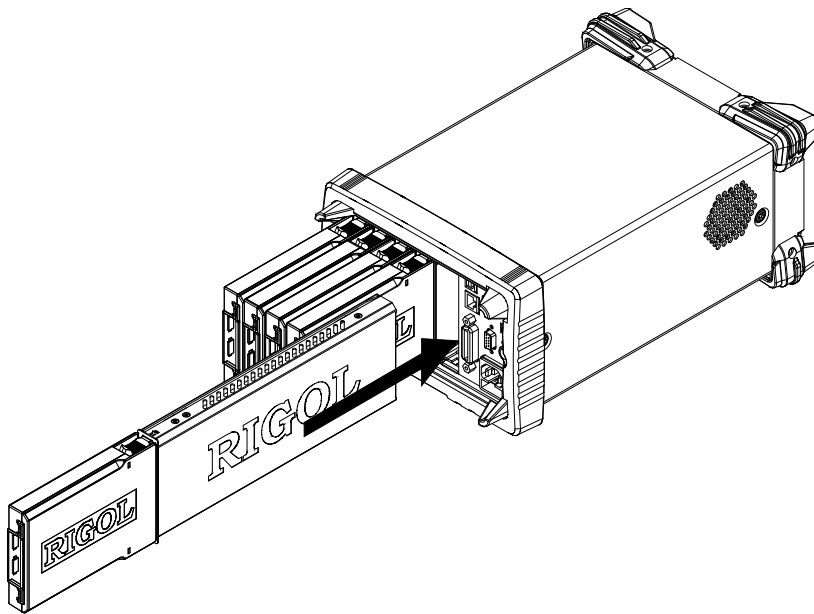


Figure 7 Insert the Module into the Mainframe

Note:

All the modules of M300 do not support hot-plugging. Please turn the mainframe off before inserting the modules into the mainframe.

Module Overview

1. MC3065 (DMM Module):

The DMM module is used to measure the signals under test and has 6½ digits reading resolution. The measurement functions include DCV, ACV, 2-wire resistance, 4-wire resistance, frequency, period, temperature and any sensor.

Note: After connecting the DMM module, make sure that the signal under test connected to the analog bus is no greater than 300 Vdc or 300 Vrms.

2. MC3132 (32-Channel Multiplexer):

32-channel multiplexer.

All 32 channels switch both HI and LO inputs, thus providing fully isolated inputs to the DMM module. MC3132 is divided into two banks (called A and B) of 16 two-wire channels each. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels are break-before-make. You can close multiple channels on this module only if you have not configured any channel to be part of the scan list. This module can be connected with MC3065 (DMM Module, if MC3065 is currently inserted). For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

3. MC3164 (64-Channel Single-Ended Multiplexer):

64-channel single-ended multiplexer.

All 64 channels can switch HI input only. MC3164 is divided into two banks (A and B) of 32 single-ended channels each. All channels are break-before-make. In any case, you cannot close multiple channels on this module. This module can be connected with MC3065 (DMM Module, if MC3065 is currently inserted) but cannot be used for 4-wire resistance measurement. For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

4. MC3232 (32-Channel Reed Multiplexer):

32-channel reed multiplexer.

MC3232 is applicable to high-speed scan and high-throughput auto test applications. All 32 channels can switch both HI and LO inputs, thus providing fully isolated inputs to the DMM module. MC3232 is divided into two banks (A and B) of 16 two-wire channels. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels are break-before-make. You can close multiple channels on this module only if you have not configured any channel to be part of the scan list. This module can be connected with MC3065 (DMM Module, if MC3065 is currently inserted). For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

5. MC3264 (64-Channel Single-Ended Reed Multiplexer):

64-channel single-ended reed multiplexer.

MC3264 is applicable to high-speed scan and high-throughput auto test applications. All 64 channels can switch HI input only. MC3264 is divided into two banks (A and B) of 32 single-ended channels each. All channels are break-before-make. In any case, you cannot close multiple channels on this module. This module can be connected with MC3065 (DMM Module, if MC3065 is currently inserted) but cannot be used for 4-wire resistance measurement. For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

6. MC3324 (24-Channel Multiplexer):

Mix multiplexer with 20 voltage channels and 4 current channels.

All 20 voltage channels switch both HI and LO inputs, thus providing fully isolated inputs to the DMM module, and is divided into two banks (called A and B) of 10 two-wire channels each. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels are break-before-make. You can close multiple channels on this module only if you have not configured any channel to be part of the scan list.

4 current channels are used in combination with the DMM module to measure DC current or AC current. All channels are break-before-make. In any case, you cannot close multiple channels on this module. This module can be connected with MC3065 (DMM Module, if MC3065 is currently inserted). For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

7. MC3416 (16-Channel Actuator):

16-channel actuator.

MC3416 can connect signal to the device under test or enable external device. Any of the 16 channels can switch to Normally-Open (NO) and Normally-Closed (NC) states. For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

8. MC3534 (Multifunction Module):

Multifunction module.

It provides 3 kinds of functions with 4 channels for each function. This module can be used to check status or control external device (such as the solenoid, power relay and microwave switch). You can also read digital inputs and the totalizer count during a scan.

- Four 8-bit digital input/output (DIO) ports
- 4 totalizer (TOT) input terminals (the first two channels are 10 MHz TOT and the other two channels are 100 kHz TOT) with 1 Vpp sensitivity
- 4 analog output terminals, ± 12 V calibrated voltage

For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

9. MC3648 (4×8 Matrix Switch):

4×8 two-wire matrix switch.

MC3648 is used to connect multiple devices to multiple points on the device under test. You can connect the rows and columns of multiple matrix switches to form relatively larger matrix (such as 8×8 and 4×16, the number of crosspoints cannot exceed 160).

32 two-wire cross points which can connect any combination of inputs and outputs at the same time. For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

10. MC3724 (Dual 4-Channel RF Multiplexers):

Dual 4-channel RF multiplexer.

MC3724 consists of two independent 4-to-1 multiplexers and can switch high frequency signal or pulse signal. For the specifications of this module, please refer to the User's Guide or Data Sheet of this product.

To Use the Built-in Help System

The built-in help system of M300 provides the help information about any front panel key and menu. To acquire the help information of any front panel key or menu, press **Help** (the backlight goes on and “Help” is displayed in the status bar in the user interface) and then press the desired key. The built-in help interface is as shown in the figure below. Press **OK** to exit.

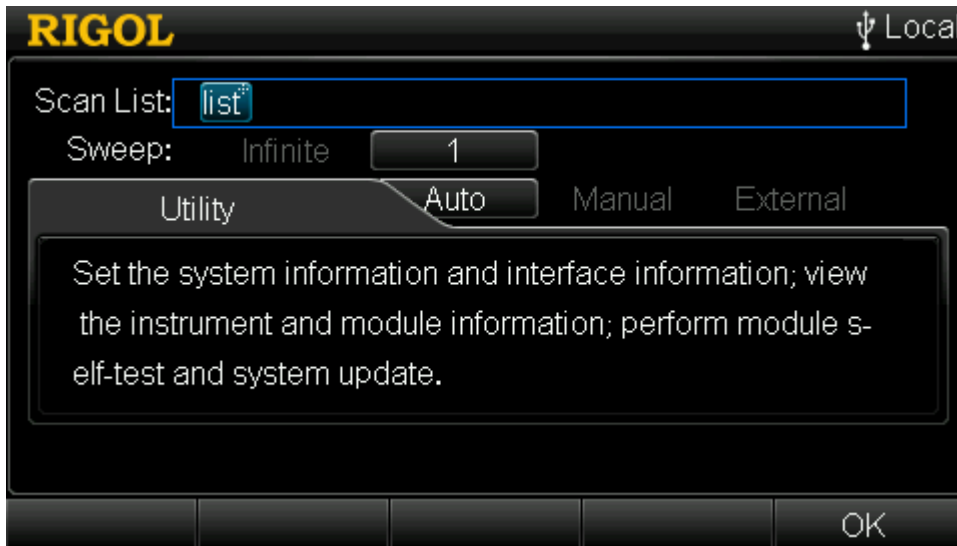
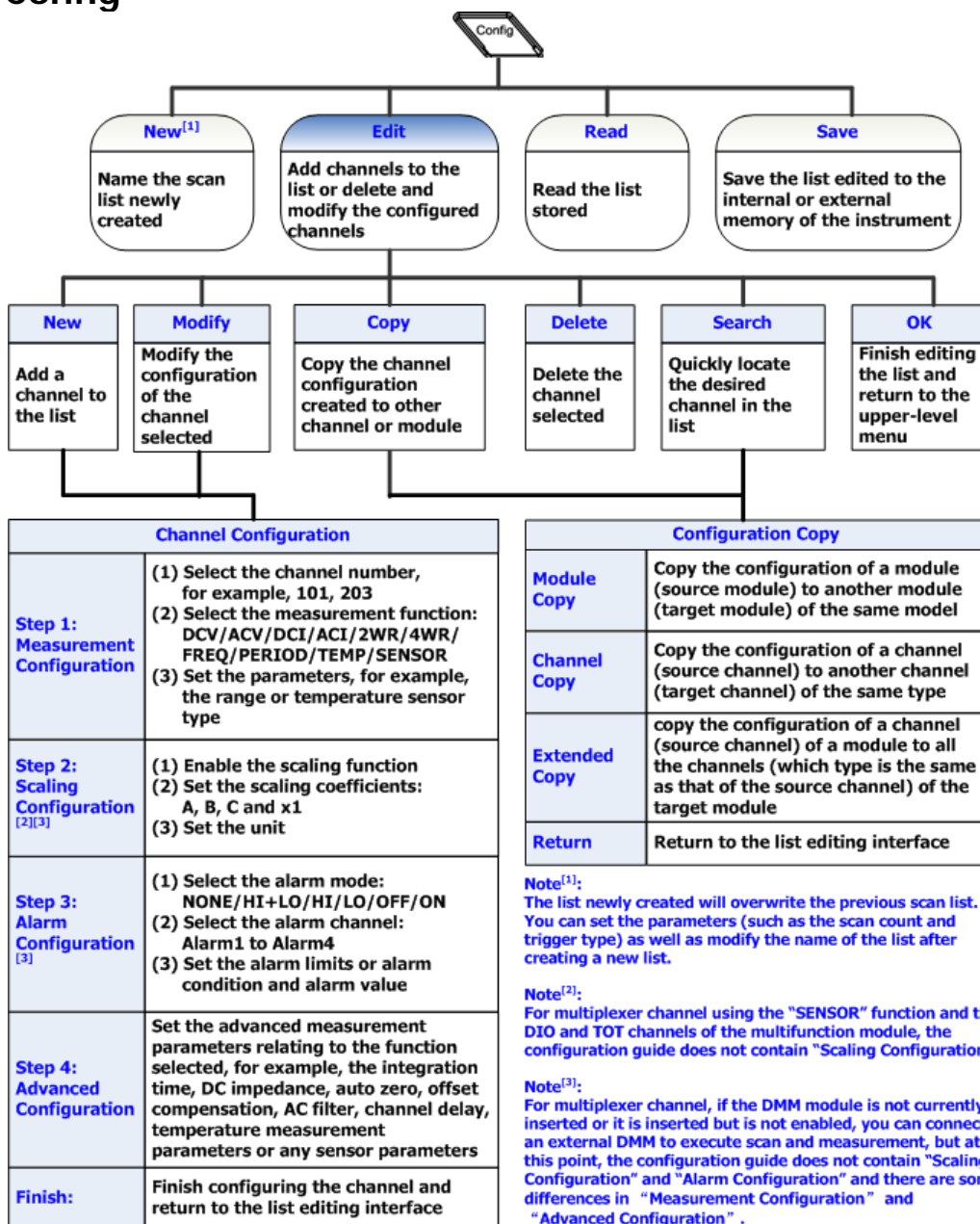


Figure 8 Built-in Help System

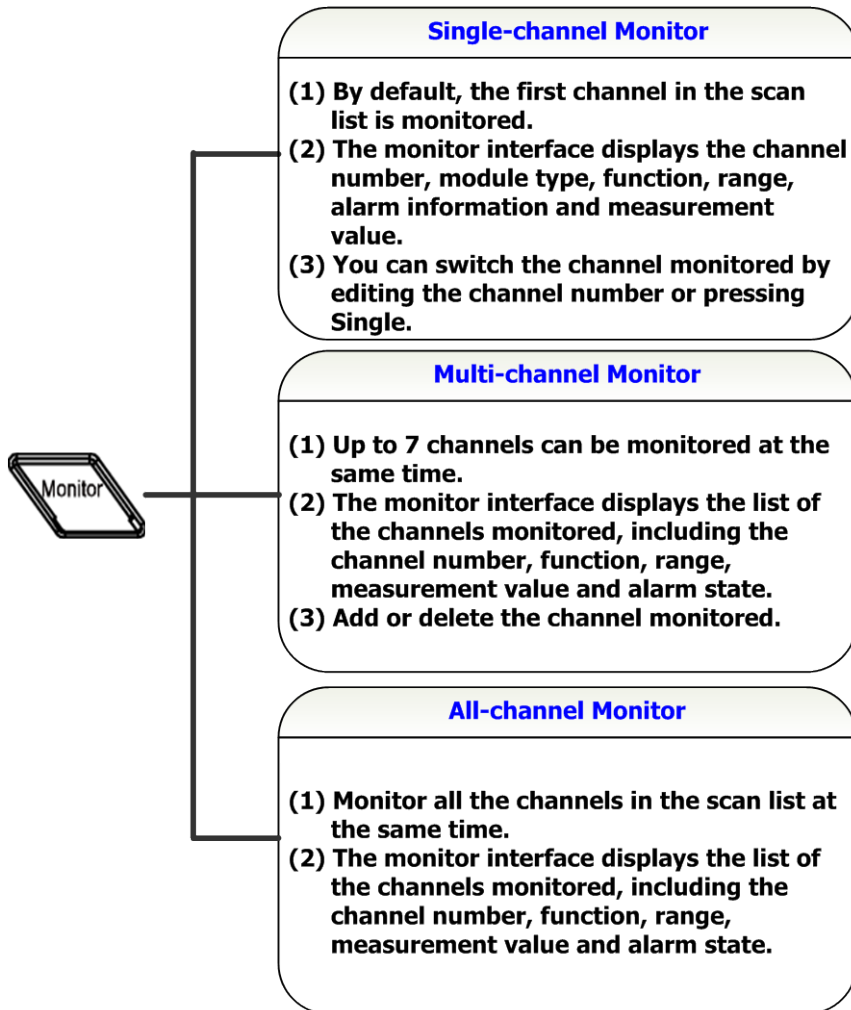
Menu Quick Navigation

This section provides the structures of the main menus for M300 to guide users to quickly get familiar with the operations. For more detailed information, please refer to the User's Guide.

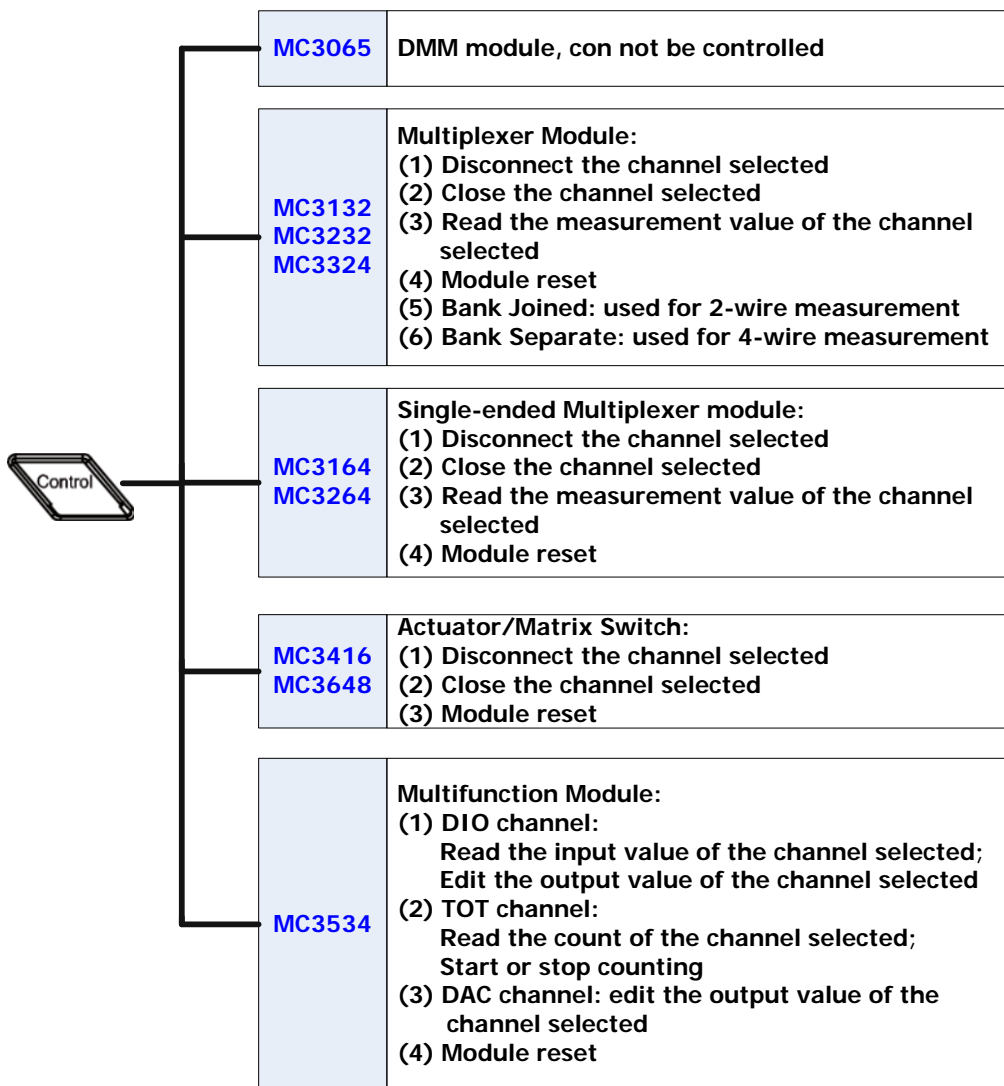
Config




Monitor

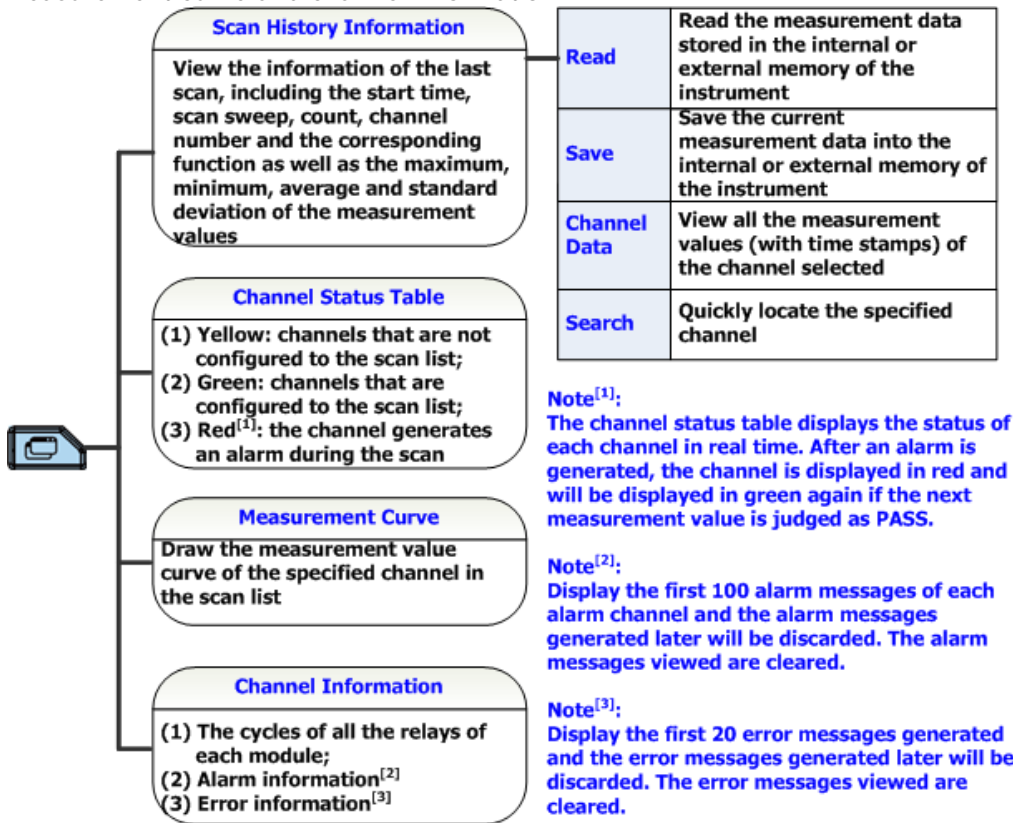


Control

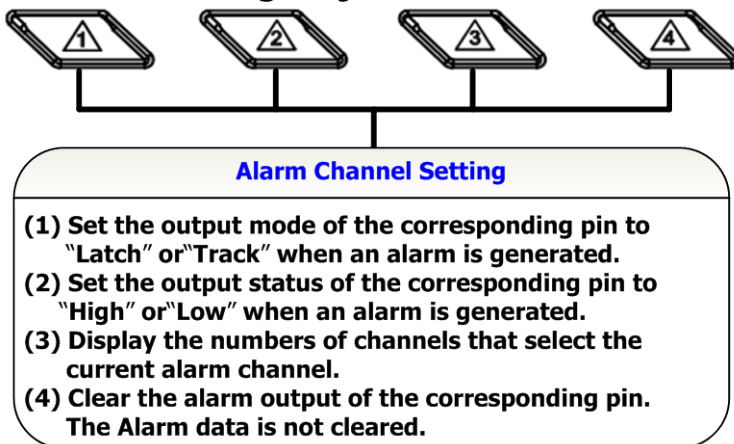


View Switch Key

Press  repeatedly to view the scan history information, channel status table, measurement curve and channel information.



Alarm Channel Setting Keys



Basic Operations

This section introduces the basic operations of M300, including how to connect the signals to be measured, how to configure the scan list as well as the remote control method.

Measurement Connections

Using External Terminal Blocks

M300 provides 6 kinds of terminal blocks to easily connect the signal to be measured to the module. The models of the terminal blocks and its corresponding modules are listed in the table below. This section introduces how to use the external block.

| | Terminal Block | Module |
|---|----------------|----------------|
| 1 | TB32 | MC3132, MC3232 |
| 2 | TB64 | MC3164, MC3264 |
| 3 | TB24 | MC3324 |
| 4 | TB48 | MC3648 |
| 5 | TB16 | MC3416 |
| 6 | TB34 | MC3534 |

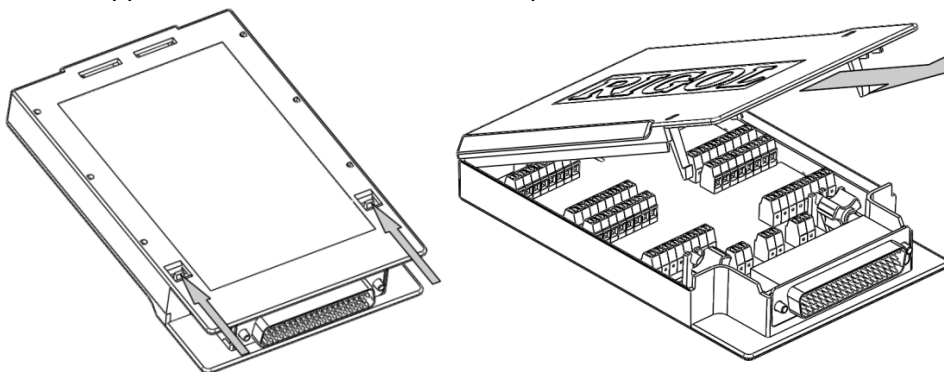
Note: for MC3724, the signal can be connected to the SMB connectors on the module directly and no terminal block is needed.



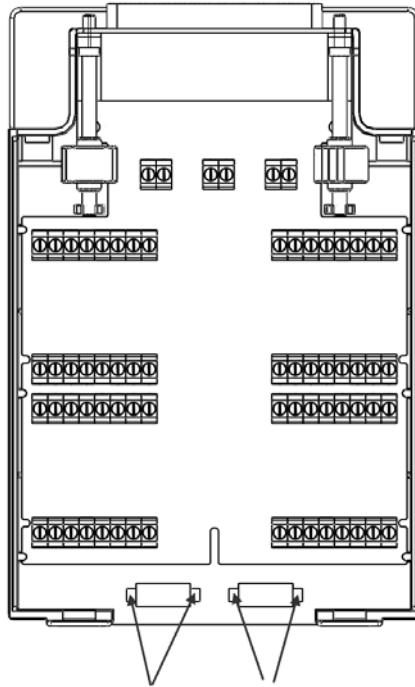
WARNING

Cut off all the power supplies before opening the terminal block or removing the terminal block from the module.

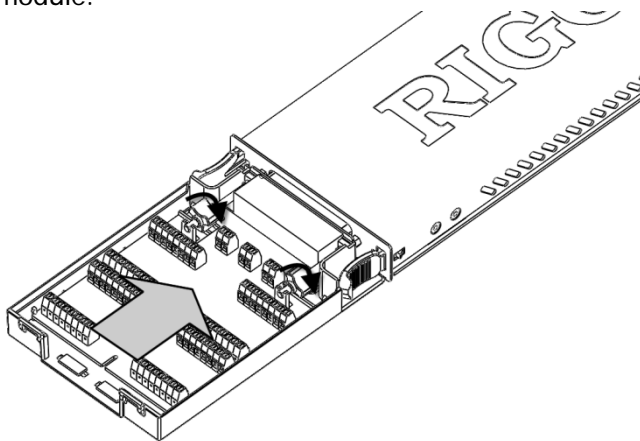
1. Place the terminal block with the front (with the **RIGOL** caption) facing downward and pull the two latches in the arrow direction in the figure below and press them down. Place the terminal block with the front facing upward and pull the upper cover of the terminal block upward and remove it.



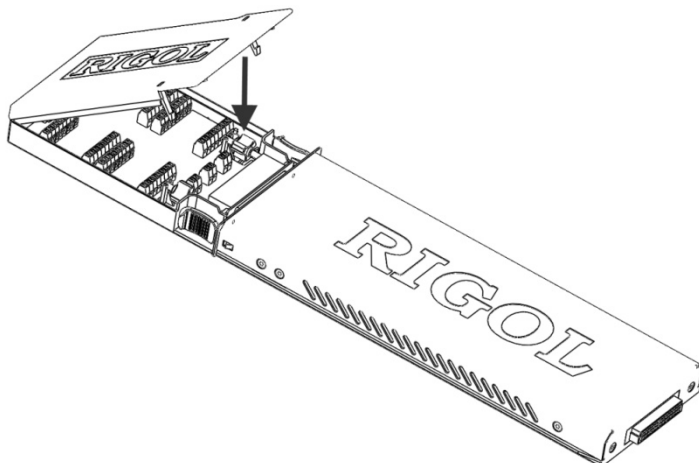
2. Connect the cables for connecting the signal under test according to the labels on the circuit board of the terminal block (for the connecting method, refer to Table 1). Pass the binding wires through the two groups of holes as pointed out by the arrows in the figure below to fix the cable connected. Pay attention to the channel or terminal connected to the cable to ensure that the signal connected is correct.



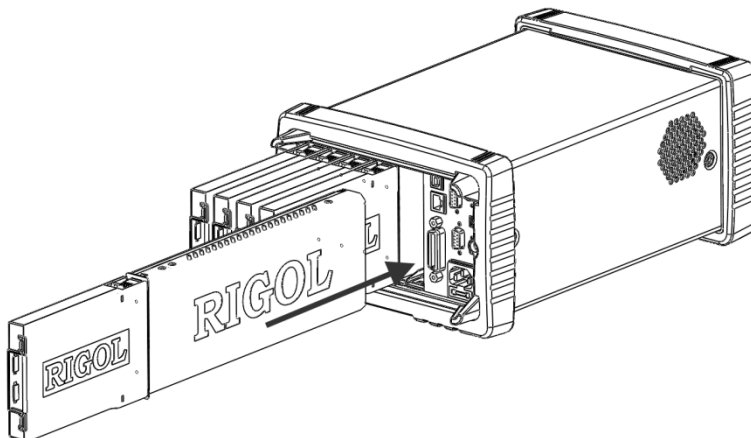
3. Connect the terminal block to the module via interface 1 (the interface definition is in Figure 6) on the module and screw down the two screw rods onto the nuts on the module.



4. Close the upper cover of the terminal block.



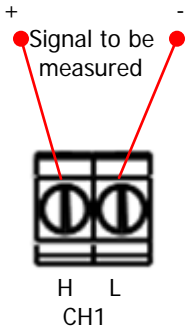
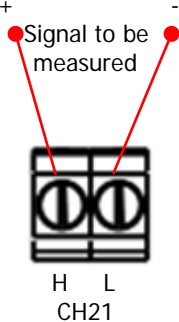
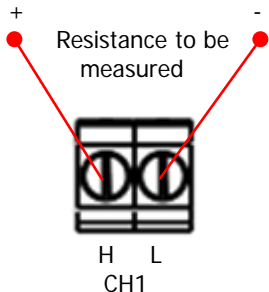
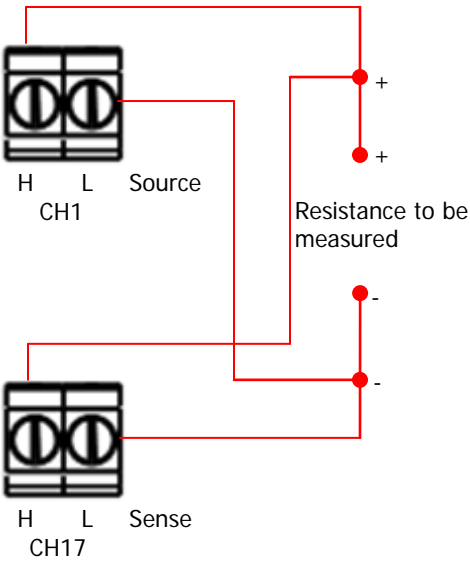
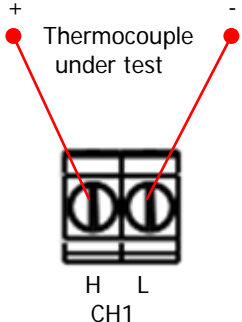
5. Insert the module with the terminal block into the slot of the mainframe.



To Connect the Signal to be Measured

The signals to be measured are connected to the plug-in modules via the external terminal blocks. The connection methods of all kinds of signals are listed in Table 1.

Table 1 Measurement Connections

| | |
|---|---|
| <p>DCV/ACV/FREQ/PERIOD/Sensor (DCV, FREQ)</p>  <p>H L CH1</p> | <p>DCI/ACI/ Sensor (DCI)</p>  <p>H L CH21</p> <p>Note: Only available for the channel 21 to channel 24 of MC3324.</p> |
| <p>2WR/RTD/Thermistor/ Sensor (2WR)</p>  <p>H L CH1</p> | <p>4WR/4WR RTD/ Sensor (4WR)</p>  <p>H L Source CH1</p> <p>H L Sense CH17</p> <p>Note: Only available for all the channels of MC3132 and MC3232 as well as the channel 1 to channel 20 of MC3324.</p> |
| <p>Thermocouple</p>  <p>H L CH1</p> | |

To Configure Scan List

Create a scan list, add any channels of the multiplexer or the DIO or TOT channels of the multifunction module to the scan list and configure the basic measurement, scaling, alarm and advanced measurement parameters for each channel. The edited scan list can be stored in internal or external memory and be recalled when required.

1. To Create a new list

Press **Config** → **New** , input the desired list name and press **OK** .

Note: the existed scan list will be overwritten by the scan list created currently.

2. To set the scan parameters

(1) Select **Sweep** and use the left/right direction keys to select "Infinite" or "1" (you need to set a value and the range is from 1 to 50000).

(2) Select **Trigger Mode** and use the left/right direction keys to select "Auto", "Manual", "External", "AbsTime" or "Alarm".

(3) If "Auto" is selected, please select **Interval** and use the numeric keyboard to set a desired interval. The range is from 00:00:00.000 to 99:59:59.999 (the time format is Hour:Minute:Second.Millisecond) and the default is 10 ms.

If "External" is selected, please select **Edge** and use the left/right direction keys to select "Rising" or "Falling".

If "AbsTime" is selected, please select **AbsTime** and use the numeric keyboard to set a desired time. The time format is "Month-Date Hour:Minute:Second".

If "Alarm" is selected, please select **Channel** and use the left/right direction keys to select "Alarm1", "Alarm2", "Alarm3" or "Alarm4".

3. Configure a channel to the scan list (taking the DCV measurement function as an example)

Press **Config** → **Edit** → **New** to enter the channel configuration guide.

(1) Step 1: Measurement Configuration

Select **Chan No.** and use the left/right direction keys to select the desired channel number (for example, 101);

Select **Function** and use the left/right direction keys to select the desired function (for example, DCV);

Select **Range** and use the left/right direction keys to select the desired range (for example, 2V).

Note: The parameters needed to be set in this step depend on the selected function.

(2) Step 2: Scaling Configuration

Select **Scaling** and use the left/right direction keys to enable the scaling

configuration;

Select **A**, **B** and **C** and use the numeric keyboard to input the desired scaling coefficients;

Select **x1** and press **Curr Value** to acquire x1.

Select **Unit** and input the desired unit.

Note: for multiplexer channel using the "SENSOR" function and the DIO and TOT channels of the multifunction module, the configuration guide does not contain scaling configuration. Besides, for multiplexer channel, if the DMM module is not currently inserted or it is inserted but is not enabled, the configuration guide also does not contain "Scaling Configuration" when you connect an external DMM to execute scan and measurement.

(3) Step 3: Alarm Configuration

Select **Mode** and use the left/right direction keys to select the desired alarm mode (for example, HI);

Select **Channel** and use the left/right direction keys to select the desired alarm channel (for example, Alarm1);

Select **HI** or **LO** and use the numeric keyboard to input the desired alarm limit (for example, 12).

Note: for multiplexer channel, if the DMM module is not currently inserted or it is inserted but is not enabled, the configuration guide does not contain "Alarm Configuration" when you connect an external DMM to execute scan and measurement.

(4) Step 4: Advanced Configuration

Note: The parameters needed to be set in this step are depended on the selected function.

Select **Integ** and use the left/right direction keys to select the desired integration time (for example 1PLC);

Select **IMP** and use the left/right direction keys to select 10M Ω or >10G Ω ;

Select **AZ** and use the left/right direction keys to select "ON" or "OFF";

Select **Delay** and use the left/right direction keys to "Auto" or set the delay time manually.

Press **Done** to finish the channel configuration guide and return to the scan list edit interface.

4. Configure other channels to the scan list

Press **New** and configure other channels to the scan list according to the step 3.

5. Save the scan list

After the scan list configuration is completed, press **Save** to save the configured scan list in internal or external memory

Configuration Copy

M300 provides configuration copy function (including module copy, channel copy and extended copy) which can configure multi channels with same configuration to the scan list easily and quickly. Press **Config** → **Edit** → **Copy** to enter the copying interface.

1. Module Copy:

Copy the configuration of a module (source module) to another module (target module) of the same model. After that, the configuration of each channel of the source module is copied to the target module automatically.

Press **Module** in the copying interface to enter the module copy interface.

- (1) The "Source Module" area is selected by default. Use the up/down direction keys to select the desired source module.
- (2) Press **Switch** to move the cursor to the "Target Module" area and use the up/down direction keys to select the desired target module.
- (3) Press **OK** to execute module copy.

Note: the source module and target module selected must be of the same model and it is forbidden to copy the configuration of a module to itself.

2. Channel Copy:

Copy the configuration of a channel (source channel) to another channel (target channel) of the same type.

Press **Channel** in the copying interface to enter the channel copy interface. The channel selected is fixed as the source channel and the upper area is selected by default. At this point, use the left/right direction keys to select the desired target channel, press **OK** to confirm it (press **OK** again to cancel it) and press **Done** to execute channel copy.

You also can press **Switch** to fix the channel selected as the target channel after entering the channel copy interface. At this point, the lower area is selected. Use the left/right direction keys to select the desired source channel and press **Done** to execute channel copy.

Tips:

- (1) When the channel selected is fixed as the source channel, multiple target channels can be selected and are displayed in the lower area.
- (2) When the channel selected is fixed as the target channel, only one source channel can be selected.
- (3) The **Switch** menu is gray and disabled if the scan list only has one channel.

Note: For channel copy, only copies between the same type of channels

(namely, channels of the same type of modules; for example, different channels of the same multiplexer or channels with the same function of different multiplexers) are allowed.

3. Extended Copy:

Copy the configuration of a channel (source channel) of a module to all the channels (which type is the same to that of the source channel) of the target module.

Press **Extended** in the copying interface to enter the extended copy interface.

- (1) The "Source Channel" area is selected by default. Use the direction keys to select the desired source channel.
- (2) Press **Switch** to move the cursor to the "Target Module" area and use the up/down direction keys to select the desired target module.
- (3) Press **OK** to execute extended copy.

Note: For extended copy, only copies among the same type of modules are allowed. This function makes it easy to configure several channels for the same measurement.

Channel Monitor

The channel monitor function of M300 allows users to monitor a single channel, multiple channels or all of the channels in the scan list. The instrument monitors the channel and takes readings from the channel monitored continuously even during a scan. This function is helpful for troubleshooting your system before a test or for watching an important signal.

The channel monitor function can monitor the following channels: multiplexer channels (configured to the scan list and the DMM module is enabled), DIO and TOT channels of the multifunction module (no matter whether they are configured to the scan list and the DMM module is not required). Press **Monitor** at the front panel to configure the channel monitor function.

1. Single-channel Monitor

Press **Monitor** → **Single** to enter the single-channel monitor interface. By default, the first channel in the scan list is monitored. If no scan list is currently configured, the first channel of the multifunction module (DIO channel) is monitored. Only one channel can be monitored at a time, but you can change the channel being monitored at any time. Readings acquired during a monitor are not stored in memory but they are displayed on the screen. When the alarm function are applied to the selected channel during monitor, all the alarm data is stored in the alarm queue (which will be cleared at power-off). You can monitor a multiplexer channel only if the DMM module is installed and enabled (**Utility**

→ **DMM** → “ON”). The channel must also be configured to be part of the scan list. You can monitor a DIO or TOT channel even if the channel is not part of the scan list.

2. Multi-channel Monitor

Press **Monitor** → **Multiple** to enter the multi-channel monitor interface. At most 7 channels can be monitored. You can add or delete the channels being monitored.

3. All Channel Monitor

Press **Monitor** → **All Moni** to enter the all channel monitor interface. All channels in the scan list can be monitored.

Remote Control

M300 can communicate with PC through USB, LAN, GPIB and RS232 (converted from the **[RS-232/Alarms/Ext Trig]** interface at the rear panel of M300) to realize remote control based on the SCPI (Standard Commands for Programmable Instruments) commands. This section introduces how to use **Ultra Sigma** to control the instrument remotely through USB interface. For the detailed information about the SCPI commands, please refer to the Programming Guide.

1. To install Ultra Sigma

Download the Ultra Sigma common PC software from www.rigol.com and install it according to the instructions.

2. To control the instrument via USB

(1) Connect the devices

Connect the USB Device interface of M300 to the USB Host interface of your computer using the USB cable.

(2) Install the USB driver

This instrument is a USB-TMC device. After you connect it to the PC and turn both on for the first time, the New Hardware Wizard is displayed on the PC. Please install the “USB Test and Measurement Device” driver following the directions in the wizard.

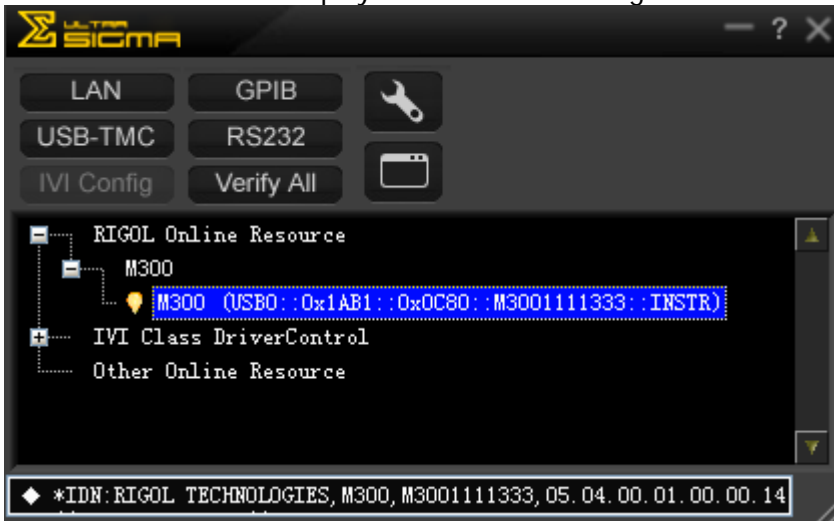
(3) Search device resource

Start up the **Ultra Sigma** and the software will automatically search for the power supply resources currently connected to the PC. You can also click **USB-TMC** to search the resources.

(4) View the device resource

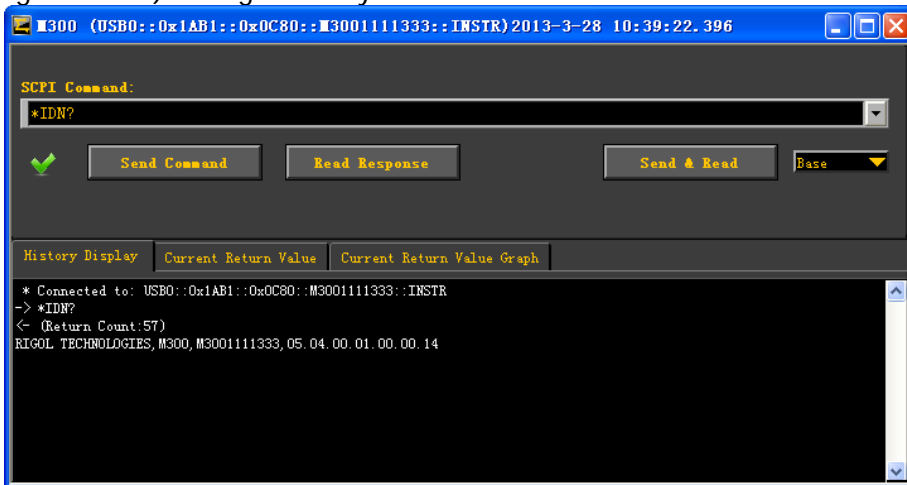
The resources found will appear under the “RIGOL Online Resource”



directory and the model number and USB interface information of the instrument will also be displayed as shown in the figure below.



(5) Communication test

Right click the resource name “M300 (USB0::0x1AB1::0x0C80::M3001111333::INSTR)” to select “SCPI Panel Control” to turn on the remote command control panel (as shown in the figure below) through which you can send commands and read data.



Note: When the instrument is in remote mode, **Rmt** is displayed in the status bar in the user interface and all the keys except  are locked. At this point, press  to exit the remote mode.

Troubleshooting

This section lists some questions and failures which might occur when using this instrument. Please solve them according to the following method. If the problem remains, please contact **RIGOL** and provide the device information of your instrument (**Utility** → **Info**).

1. The instrument does not start.

- 1) Check the power cable connection.
- 2) Check whether the power switch at the front panel is turned on.
- 3) Remove the power cord and check whether the voltage selector is at the proper scale and whether the fuse specification is correct and the fuse is in good condition. To replace the fuse refer to the instructions.
- 4) Restart the instrument after executing the above steps.
- 5) If the problem remains, please contact **RIGOL**.

2. The USB storage device cannot be recognized.

- (1) Check whether the USB storage device can work normally.
- (2) Make sure the USB storage device used is Flash storage type, as this instrument does not support hardware storage type USB storage device.
- (3) Restart the instrument and insert the USB storage device to check it.
- (4) If the USB storage device still cannot work normally, please contact **RIGOL**.




3. How to recover the configurations from the last power failure or unexpected shutdown and continue the work before the shutdown automatically?

- 1) Restart the instrument.
- 2) Press **Utility** → **System**, select **Power-off** using the up/down direction keys and select "ON" using the left/right direction keys.

4. The screen is too dark?

Press **Utility** → **System**, select **Brightness** using the up/down direction keys and set the proper brightness using the left/right direction keys.

5. The instrument is locked?

- 1) Check whether the instrument is in remote mode (namely check whether "Rmt" is displayed in the status bar of the interface). If yes, press the  key to exit the remote mode and unlock the instrument.
- 2) Check whether the front panel of the instrument is locked (namely check whether  is displayed in the status bar of the interface). If yes, press and hold the  key to unlock the front panel.
- 3) Check whether a progress bar is displayed in the interface. If yes, please wait for a moment and operate the instrument when the progress bar

disappears.

- 4) If the problem remains, please restart the instrument.

6. How to change the system language?

Press **Utility** → **System**, select **Language** using the up/down direction keys and select your desired language using the left/right direction keys.

7. How to view the information and model number of the plug-in modules?

Press **Utility** → **Test**, select the desired module using the left/right direction keys and press **View** to view the information of the module currently selected, including the function, model, serial number and version.

8. The corresponding indicator at the front panel does not go on when the module has been inserted?

- 1) Press **Utility** → **Test**, select the desired module using the left/right direction keys and press **Re-test**. If the problem remains, press **View** to view the information of the module.
- 2) If the information of the module does not been displayed correctly, please refer to the problem 9.
- 3) If the information of the module is displayed correctly, the module indicator is possibly damaged, please contact **RIGOL** to consult maintenance information.

9. Unable to view the information of the module or unable to use the module when the module has been inserted?

- 1) Turn the mainframe off, pluck the module from the mainframe and insert the module into the mainframe again firmly.
- 2) Restart the mainframe, wait for about 1 minute and view the module information again.
- 3) If the problem remains, please contact **RIGOL**.

10. Unable to do the configurations or operations related to the DMM module when it has been inserted?

- 1) Ensure the setting of **Utility** → **System** → **DMM** is "ON". If the problem remains, please refer to the next step.
- 2) Press **Utility** → **Test**, select the DMM module using the left/right direction keys and press **View** to view the information of the DMM module. If the information does not been displayed or displayed correctly, the DMM module is abnormal due to high current or power load failure probably. At this point, please turn the mainframe off and restart it a few minutes later.
- 3) If the problem remains, please contact **RIGOL**.

11. The GPIB interface does not work normally?

- 1) Check whether the cable works normally and the connection is correct and

reliable.

- 2) Ensure the GPIB addresses of M300 and computer are identical.
- 3) If the problem remains, please contact **RIGOL**.

12. The USB Device interface does not work normally?

- 1) Check whether the cable works normally and the connection is correct and reliable.
- 2) Check whether the "USB Test and Measurement Device" drive program has been installed in your computer (namely check whether "USB Test and Measurement Devices" is displayed in the device manager of your computer).
- 3) If the problem remains, please contact **RIGOL**.

13. The RS232 interface does not work normally?

- 1) Ensure the RS232 parameters (baud rate, etc.) of M300 and computer are identical. If the problem remains, please refer to the next step.
- 2) Check whether the RS232 cable is a cross line.
- 3) If the problem remains, please contact **RIGOL**.

14. The LAN interface does not work normally?

- 1) Check whether the cable works normally and the connection is correct and reliable.
- 2) Check the IP address configuration mode:
 - If DHCP is enabled, please ensure the network supports DHCP mode and can distribute network parameters (such as the IP address) to the instrument automatically.
 - If DHCP is disabled and Auto IP is enabled, please ensure the IP addresses of M300 and computer is in the same network segment.
 - If Manual IP is enabled, please ensure the IP addresses of M300 and computer is in the same network segment.
- 3) If the problem remains, please contact **RIGOL**.