

RIGOL

Quick Guide

**M300 Series
Data Acquisition/Switch System**

**Dec. 2014
RIGOL Technologies, Inc.**

Guaranty and Declaration

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

E-mail: service@rigol.com

Website: 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 injury or damage 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 for use within the 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 the power cord to the Protective Earth terminal before connecting any inputs or outputs.

Connect the Probe Correctly.

If a probe is used, do not connect the ground lead to high voltage since it has isobaric electric potential as the ground.

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 the instrument.

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 be exposed to the danger of electrical shock.

Do Not Operate Without Covers.

Do not operate the instrument with covers or panels removed.

Do Not Insert Anything Into the Holes of Fan.

Do not insert anything into the holes of the fan to avoid damaging the instrument.

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 **RIGOL** authorized 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 an increase of instrument temperature which would cause damage to the instrument. So please keep the instrument 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 the instrument in a humid environment.

Do Not Operate in an Explosive Atmosphere.

In order to avoid damage 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 the air, please keep the surface of the device clean and dry.

Electrostatic Prevention.

Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.

Proper Use of Battery.

If a battery is supplied, it must not be exposed to high temperature or in contact with fire. Keep it out of the reach of children. Improper change of battery (note: lithium battery) may cause explosion. Use **RIGOL** specified battery only.

Handling Safety.

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

Safety Terms and Symbols

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



WARNING

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



CAUTION

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

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

DANGER It calls attention to an operation, if not correctly performed, could result in injury or hazard immediately.

WARNING It calls attention to an operation, if not correctly performed, could result in potential injury or hazard.

CAUTION It calls attention to an operation, if not correctly performed, could result in damage to the product or other devices connected to the product.

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



**Hazardous
Voltage**



**Safety
Warning**



**Protective
Earth
Terminal**



**Chassis
Ground**



**Test
Ground**

Allgemeine Sicherheits Informationen

Überprüfen Sie die folgenden Sicherheitshinweise sorgfältig um Personenschäden oder Schäden am Gerät und an damit verbundenen weiteren Geräten zu vermeiden. Zur Vermeidung von Gefahren, nutzen Sie bitte das Gerät nur so, wie in diesem Handbuch angegeben.

Um Feuer oder Verletzungen zu vermeiden, verwenden Sie ein ordnungsgemäßes Netzkabel.

Verwenden Sie für dieses Gerät nur das für ihr Land zugelassene und genehmigte Netzkabel.

Erden des Gerätes.

Das Gerät ist durch den Schutzleiter im Netzkabel geerdet. Um Gefahren durch elektrischen Schlag zu vermeiden, ist es unerlässlich, die Erdung durchzuführen. Erst dann dürfen weitere Ein- oder Ausgänge verbunden werden.

Anschluss eines Tastkopfes.

Die Erdungsklemmen der Sonden sind auf dem gleichen Spannungspegel des Instruments geerdet. Schließen Sie die Erdungsklemmen an keine hohe Spannung an.

Beachten Sie alle Anschlüsse.

Zur Vermeidung von Feuer oder Stromschlag, beachten Sie alle Bemerkungen und Markierungen auf dem Instrument. Befolgen Sie die Bedienungsanleitung für weitere Informationen, bevor Sie weitere Anschlüsse an das Instrument legen.

Verwenden Sie einen geeigneten Überspannungsschutz.

Stellen Sie sicher, daß keinerlei Überspannung (wie z.B. durch Gewitter verursacht) das Gerät erreichen kann. Andernfalls besteht für den Anwender die Gefahr eines Stromschlages.

Nicht ohne Abdeckung einschalten.

Betreiben Sie das Gerät nicht mit entfernten Gehäuse-Abdeckungen.

Betreiben Sie das Gerät nicht geöffnet.

Der Betrieb mit offenen oder entfernten Gehäuseteilen ist nicht zulässig. Nichts in entsprechende Öffnungen stecken (Lüfter z.B.)

Passende Sicherung verwenden.

Setzen Sie nur die spezifikationsgemäßen Sicherungen ein.

Vermeiden Sie ungeschützte Verbindungen.

Berühren Sie keine unisolierten Verbindungen oder Baugruppen, während das Gerät in Betrieb ist.

Betreiben Sie das Gerät nicht im Fehlerfall.

Wenn Sie am Gerät einen Defekt vermuten, sorgen Sie dafür, bevor Sie das Gerät wieder

betreiben, dass eine Untersuchung durch **RIGOL** autorisiertem Personal durchgeführt wird. Jedwede Wartung, Einstellarbeiten oder Austausch von Teilen am Gerät, sowie am Zubehör dürfen nur von **RIGOL** autorisiertem Personal durchgeführt werden.

Belüftung sicherstellen.

Unzureichende Belüftung kann zu Temperaturanstiegen und somit zu thermischen Schäden am Gerät führen. Stellen Sie deswegen die Belüftung sicher und kontrollieren regelmäßig Lüfter und Belüftungsöffnungen.

Nicht in feuchter Umgebung betreiben.

Zur Vermeidung von Kurzschluß im Geräteinneren und Stromschlag betreiben Sie das Gerät bitte niemals in feuchter Umgebung.

Nicht in explosiver Atmosphäre betreiben.

Zur Vermeidung von Personen- und Sachschäden ist es unumgänglich, das Gerät ausschließlich fernab jedweder explosiven Atmosphäre zu betreiben.

Geräteoberflächen sauber und trocken halten.

Um den Einfluß von Staub und Feuchtigkeit aus der Luft auszuschließen, halten Sie bitte die Geräteoberflächen sauber und trocken.

Schutz gegen elektrostatische Entladung (ESD).

Sorgen Sie für eine elektrostatisch geschützte Umgebung, um somit Schäden und Funktionsstörungen durch ESD zu vermeiden. Erden Sie vor dem Anschluß immer Innen- und Außenleiter der Verbindungsleitung, um statische Aufladung zu entladen.

Die richtige Verwendung des Akku.

Wenn eine Batterie verwendet wird, vermeiden Sie hohe Temperaturen bzw. Feuer ausgesetzt werden. Bewahren Sie es außerhalb der Reichweite von Kindern auf. Unsachgemäße Änderung der Batterie (Anmerkung: Lithium-Batterie) kann zu einer Explosion führen. Verwenden Sie nur von **RIGOL** angegebenen Akkus.

Sicherer Transport.

Transportieren Sie das Gerät sorgfältig (Verpackung!), um Schäden an Bedienelementen, Anschlüssen und anderen Teilen zu vermeiden.

Sicherheits Begriffe und Symbole

Begriffe in diesem Guide. Diese Begriffe können in diesem Handbuch auftauchen:



WARNING

Die Kennzeichnung WARNING beschreibt Gefahrenquellen die leibliche Schäden oder den Tod von Personen zur Folge haben können.



CAUTION

Die Kennzeichnung Caution (Vorsicht) beschreibt Gefahrenquellen die Schäden am Gerät hervorrufen können.

Begriffe auf dem Produkt. Diese Bedingungen können auf dem Produkt erscheinen:

DANGER weist auf eine Verletzung oder Gefährdung hin, die sofort geschehen kann.

WARNING weist auf eine Verletzung oder Gefährdung hin, die möglicherweise nicht sofort geschehen.

CAUTION weist auf eine Verletzung oder Gefährdung hin und bedeutet, dass eine mögliche Beschädigung des Instruments oder anderer Gegenstände auftreten kann.

Symbole auf dem Produkt. Diese Symbole können auf dem Produkt erscheinen:



**GefährlicheS
pannung**



**Sicherheits-
Hinweis**



Schutz-erde



Gehäusemasse



Erde

General Care and Cleaning

General Care

Do not store or leave the instrument where it may 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 damage to the instrument, do not expose it to caustic liquids.



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 WEEE Directive 2002/96/EC.



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 briefly introduces the front and rear panels, the user interface and the basic measurement method of M300 Series Data Acquisition/Switch System. It guides users to quickly get familiar with the instrument. 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

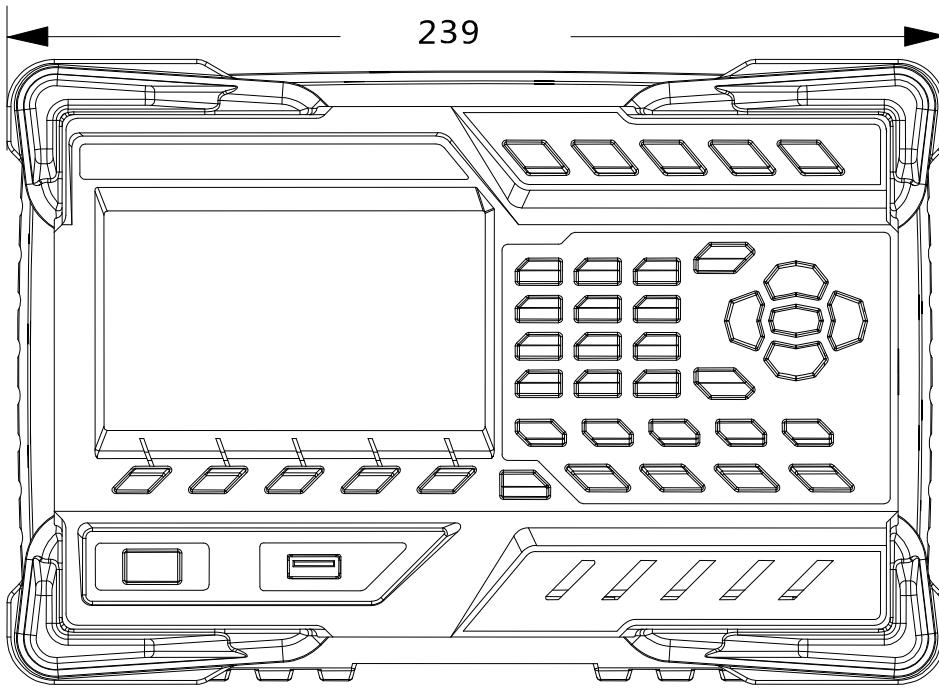


Figure 1 Front View

Unit: mm

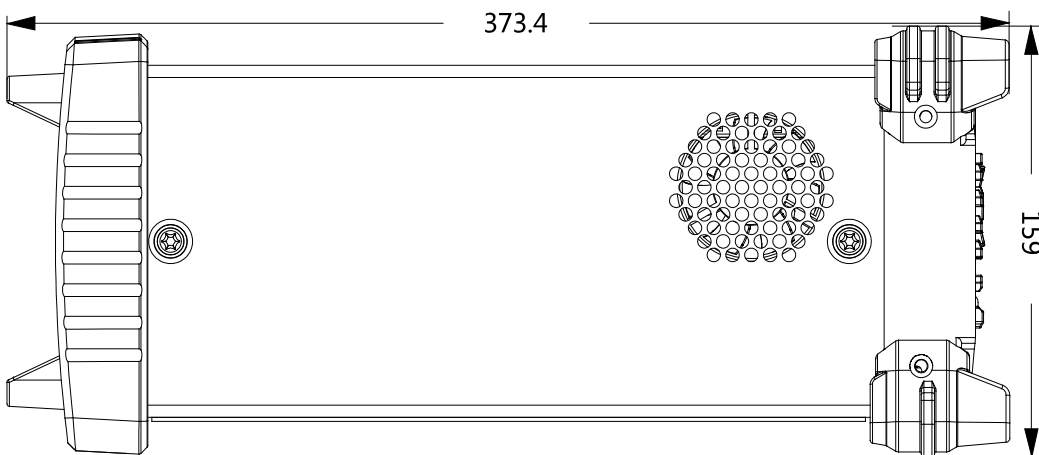


Figure 2 Side View

Unit: mm

Front Panel

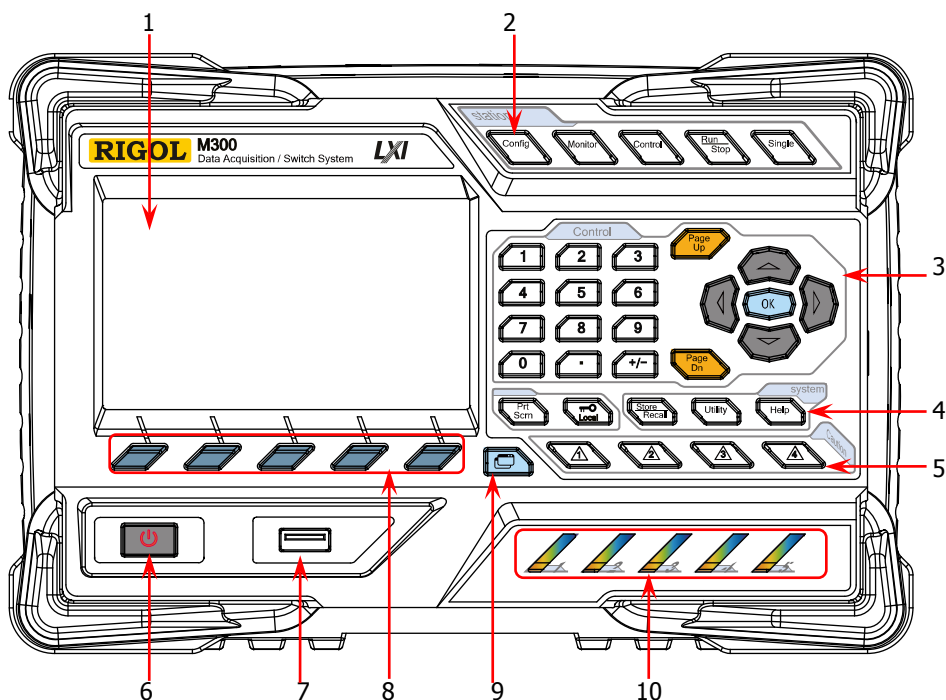


Figure 3 M300 Front Panel

1. LCD

4.3 inch high-resolution color LCD. It displays the menu, configuration guide, measurement parameters, system status, prompt messages and 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.
- Initialize the modules.
- Configure the channels of the multifunction module.
- Cannot control the DMM module.



Auto Trigger/Stop

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

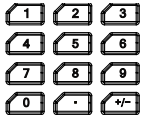
Note: This key is invalid when the scan list is empty.



Single-channel Switch

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

3. Control Keys



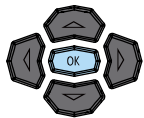
Numeric Keyboard

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



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, pressing this key will store the current content on the screen in the 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. Pressing and holding this key can unlock the front panel.

- When the instrument is in remote mode, pressing this key can switch to local mode.



Store and recall the system configuration, measurement configuration, measurement data and 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 (RS232, LAN, GPIB and USB) parameters.
- 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 connected with an USB storage device as host device to store or recall instrument status, measurement configuration, measurement data and etc.

8. Menu Softkeys

Correspond to the menus above them. Pressing any softkey can enable the corresponding menu.

9. View Switch

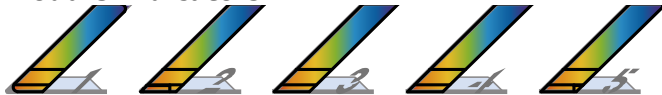
View the scan history information, channel status table, measurement curve and channel information.



- 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 as well as 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 on each alarm channel, 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 subsequent alarm messages would be lost. 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

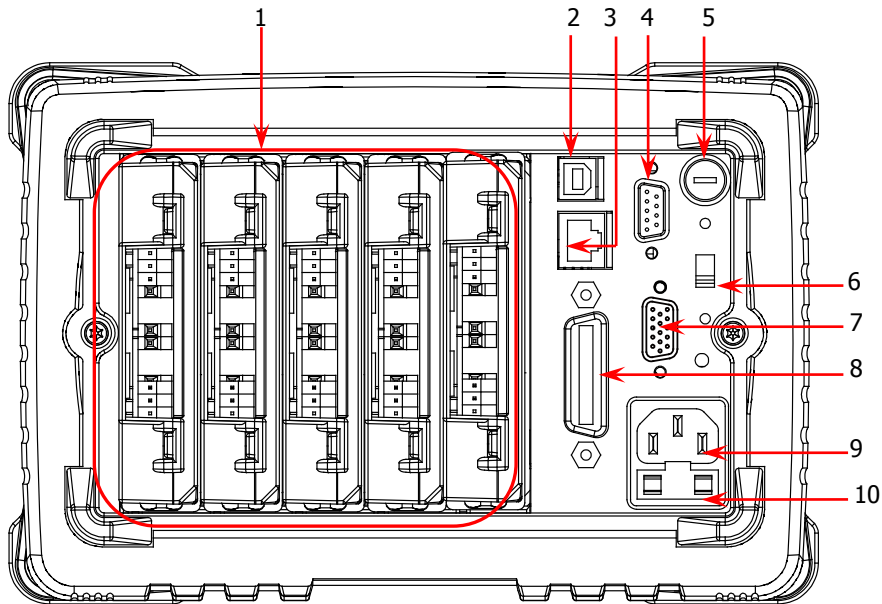


Figure 4 M300 Rear Panel

1. Slots

M300 provides 5 slots for 5 modules. 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 any module inserted. For the information of each module, refer to "**Plug-in Module Overview**".



CAUTION

Only a single DMM module is permitted for one mainframe.

2. USB Device Interface

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

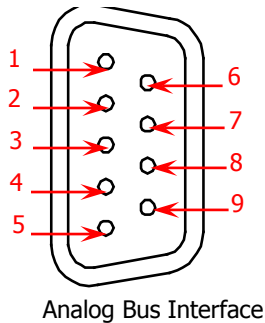
3. LAN

M300 conforms to the LXI Core 2011 Device 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 analog bus interface (namely analog bus interface). The analog bus

interface is a 9-pin female interface.



Pin	Definition
1	Current Input
2	Lo
3	LoSense
4	--
5	--
6	Hi
7	HiSense
8	Float GND
9	--

5. DMM Module Power Fuse

The AC power supply input from the power socket is divided into two paths with one for the DMM module and the other for the other circuits. M300 is equipped with the DMM module power fuse (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 the straight screw driver clockwise.
- 3) Select a proper voltage through the voltage selector.
- 4) Disassemble the fuse cap and fuse.
- 5) Replace a specified fuse and install the fuse cap.



CAUTION

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

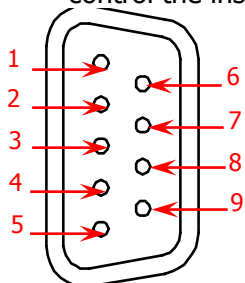
6. Voltage Selector

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 is a 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 and etc.

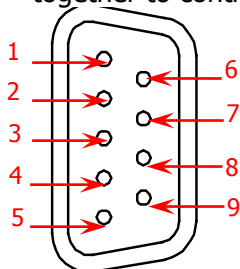
- RS232: via this interface, M300 can communicate with the PC and you can control the instrument remotely via the PC.



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 are 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:

Pin 5 outputs a TTL negative pulse with about $7\mu\text{s}$ pulse width at each measurement completion. The output rate is dependent upon the actual measurement rate and cannot exceed 1000 times per second.

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

8. GPIB Interface

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 a small straight screwdriver 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.



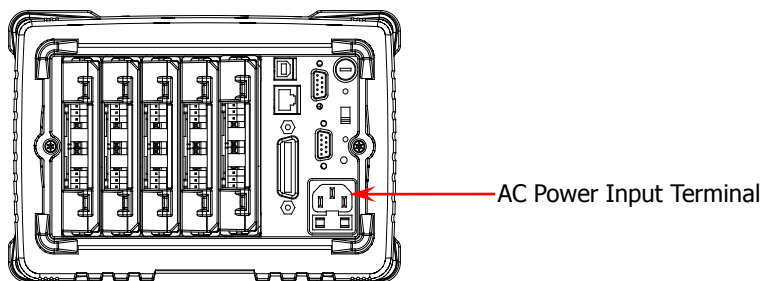
CAUTION

Please use the specified power fuse and make sure that the fuse seat is not short-circuited to avoid electric shock or 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 inputs:
If your supply voltage is between $115*(1-10\%)$ V and $115*(1+10\%)$ V, please select 115.
If it is between $230*(1-10\%)$ V and $230*(1+10\%)$ 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.
- Remove the power cord and check whether the voltage selector is at the correct scale and whether the power fuse is burned out. If the fuse is burned out, replace it with a specified one.
- Restart the instrument after finishing the above inspections.
- If it still does not work correctly, please contact **RIGOL**.

User Interface

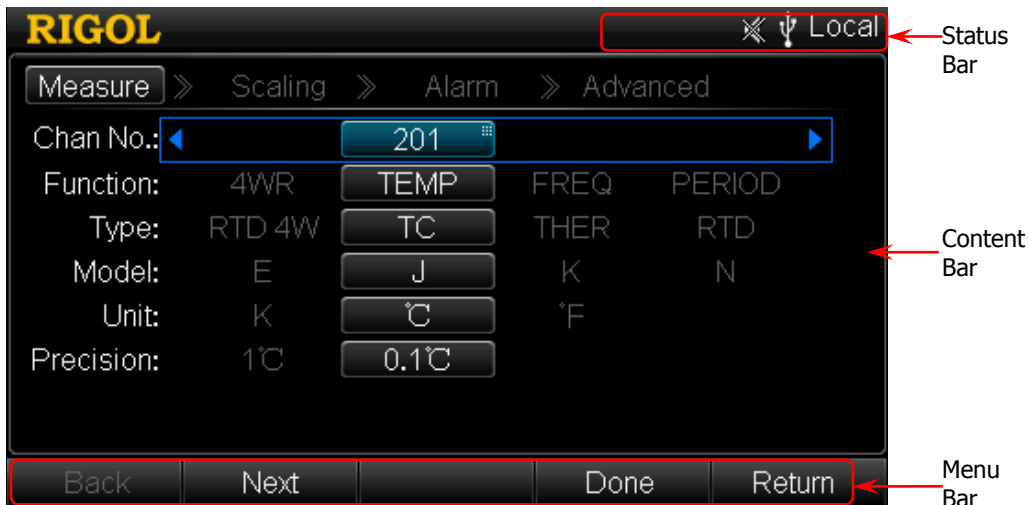







Figure 5 User Interface

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 Bar

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

3. Menu Bar

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

Plug-in Module Overview

M300 provides 8 kinds of modules including the DMM module, 20-channel multiplexer, 32-channel multiplexer, 64-channel multiplexer, multi-function module and etc. This section introduces the functions and characteristics of each module.

Outside View Drawing

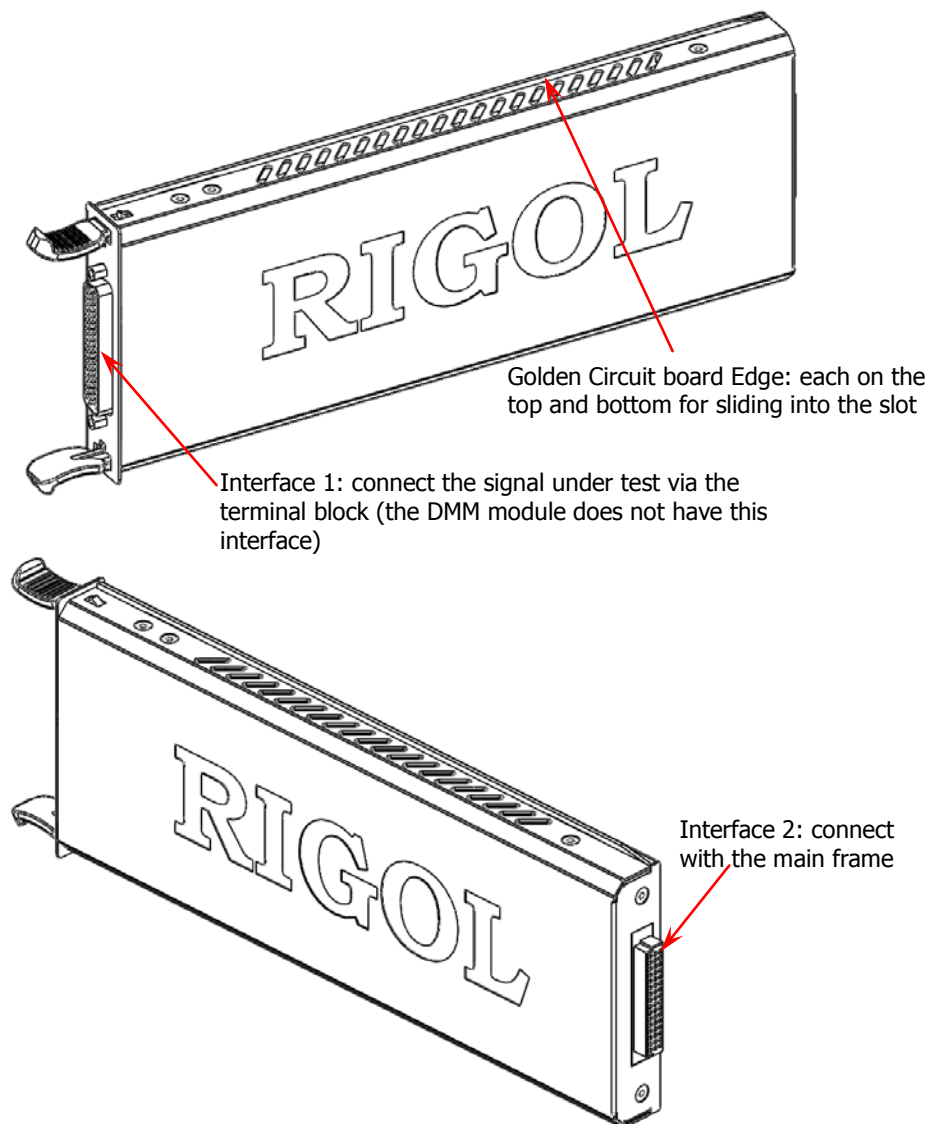


Figure 6 Outside View Drawing of the Plug-in Module

Insert the Module into the Main Frame

Turn the main frame off; and then, insert the modules following the instructions below.

As shown in Figure 6, there is a golden circuit board edge 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: For module that needs to be connected to the signal under measurement, please refer to “**Measurement Connections**” to connect the external terminal block and the signals under measurement before inserting it into the mainframe.

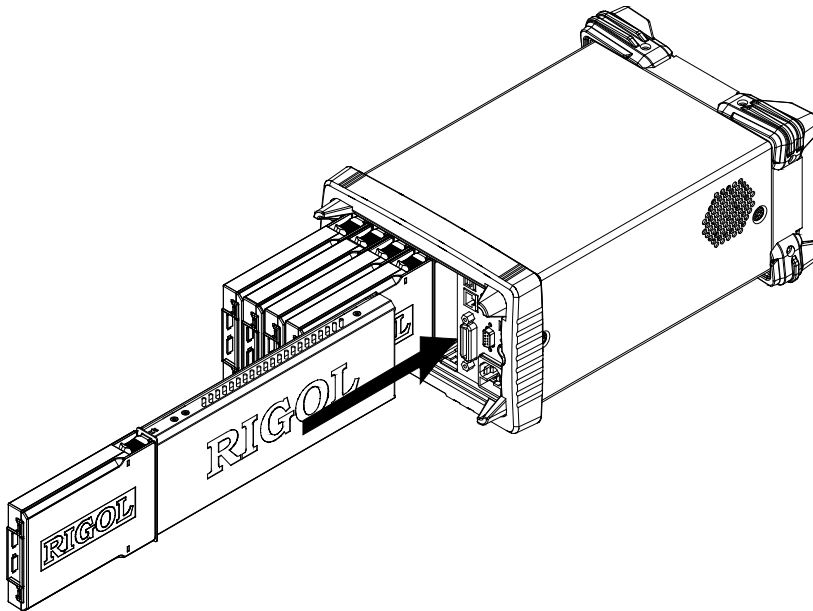


Figure 7 Insert the Module into the Main Frame

Note:

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

Module Overview

1. MC3065 (DMM Module):

The DMM module is used to measure the signals under test and provides 6½ digit reading resolution. Its measurement functions include DCV, ACV, DCI, ACI, 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. MC3120 (20-Channel Multiplexer):

All the 20 channels switch both HI and LO inputs, thus providing fully isolated signals for the DMM module. MC3120 is divided into two banks (called A and B) with 10 two-wire channels in each bank. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels in the scan list 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. MC3132 (32-Channel Multiplexer):

All the 32 channels switch both HI and LO inputs, thus providing fully isolated signals for the DMM module. MC3132 is divided into two banks (called A and B) with 16 two-wire channels in each bank. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels in the scan list 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.

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

All the 64 channels can only switch HI input. MC3164 is divided into two banks (A and B) with 32 single-ended channels in each bank. All channels in the scan list 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.

5. MC3324 (24-Channel Multiplexer):

All the 20 voltage channels switch both HI and LO inputs, thus providing fully isolated inputs for the DMM module. The 20 voltage channels are divided into two banks (called A and B) with 10 two-wire channels in each bank. When making 4-wire resistance measurement, the instrument automatically pairs channels of A bank and B bank. All channels in the scan list 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.

The 4 current channels are used in combination with the DMM module to perform DC current or AC current measurement. All channels in the scan list 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.

6. MC3416 (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.

7. MC3534 (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 the 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.

8. MC3648 (4×8 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 crosspoints 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.

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 or menu. The built-in help interface is as shown in the figure below. Pressing **OK** can exit the built-in help system.

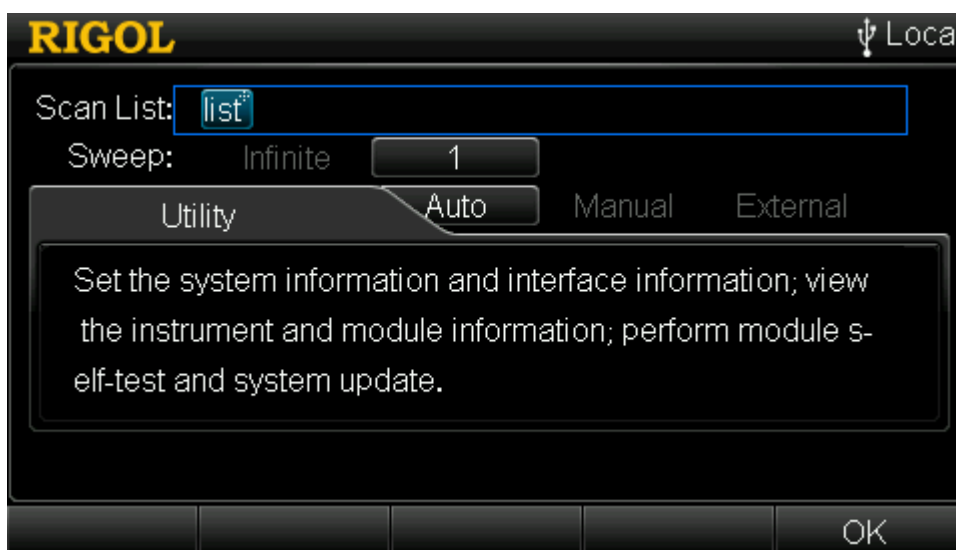
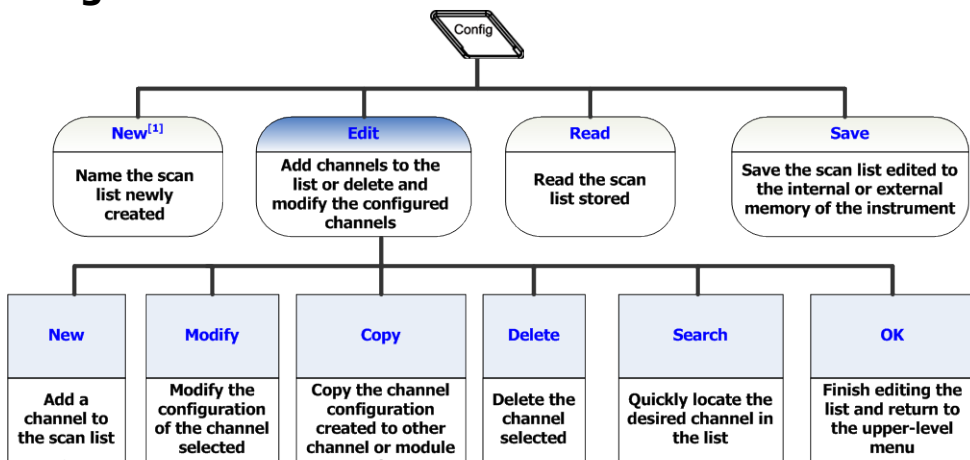


Figure 8 Built-in Help System

Menu Quick Navigation

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

Config



Channel Configuration	
Step 1: Measurement Configuration	(1) Select the channel number; for example, 101, 203 (2) Select the measurement function: DCV/ACV/DCI/ACI/2WR/4WR/FREQ/PERIOD/TEMP/SENSOR (3) Set the parameters; for example, the range or temperature sensor type
Step 2: Scaling Configuration	(1) Enabling the scaling function (2) Set the scaling coefficients: A, B, C and x1 (3) Set the unit
Step 3: Alarm Configuration	(1) Select the alarm mode: NONE/HI+LO/LO/OFF/ON (2) Select the alarm channel: Alarm1 to Alarm4 (3) Set the alarm limits or alarm condition and alarm value
Step 4: Advanced Configuration	Set the advanced measurement parameters relating to the function selected; for example, the Integration time, DC impedance, auto zero, offset compensation, AC filter, channel delay, temperature measurement parameters or any sensor parameters
Finish:	Finish the configuration of the channel and return to the list editing interface

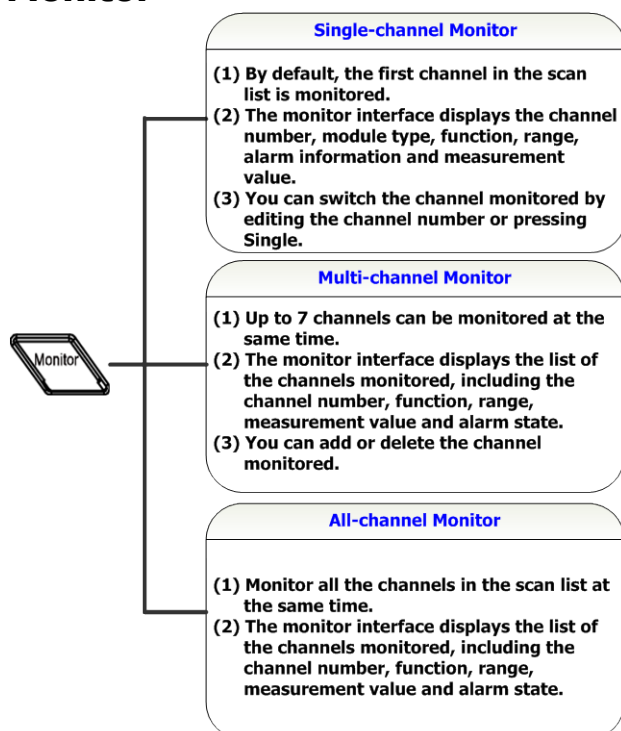
Configuration Copy	
Module Copy	Copy the configuration of a module (source module) to another module (target module) of the same model.
Channel Copy	Copy the configuration of a channel (source channel) to another channel or multiple channels (target channel) of the same type.
Extended Copy	Copy the configuration of a channel (source channel) of a module to all the channels (of which the type is the same to that of the source channel) of the target module.
Return	Return to the list editing interface

Note^[1]:
The list newly created will overwrite the previous scan list. You can set the parameters (such as the scan count and trigger type) as well as modify the name of the list after creating a new list.

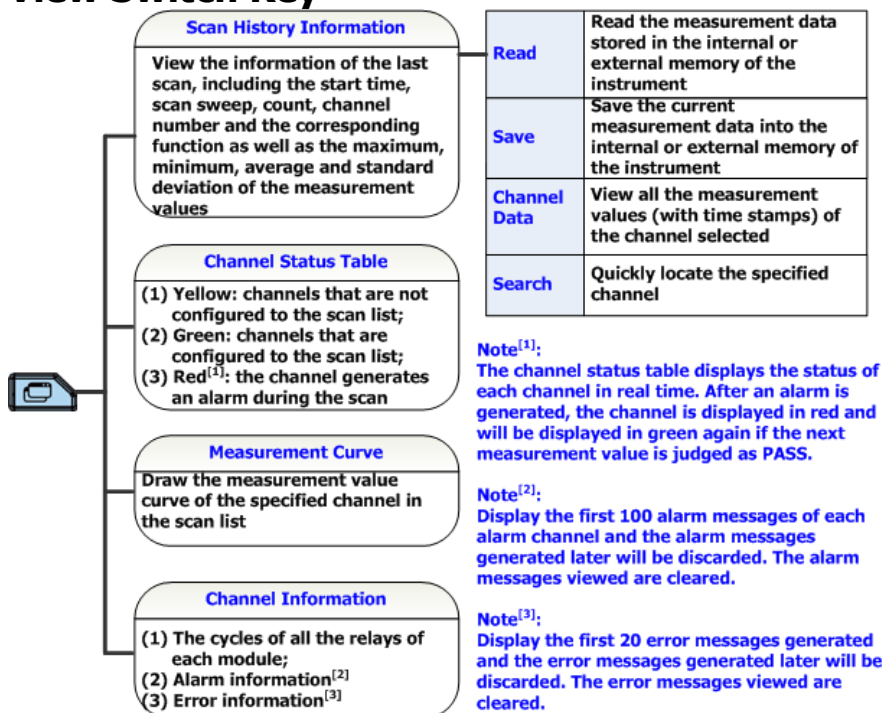
Note^[2]:
For multiplexer channel Using the "SENSOR" function and the DIO and TOT channels of the multifunction module, the configuration guide does not contain "Scaling Configuration".

Note^[3]:
For multiplexer channel, if the DMM module is not currently inserted or it is inserted but is not enabled, an external DMM can be connected to execute scan and measurement; but at this point, the configuration guide Does Not contain "Scaling Configuration" and "Alarm Configuration" and there are some differences in "Measurement Configuration" and "Advanced Configuration".

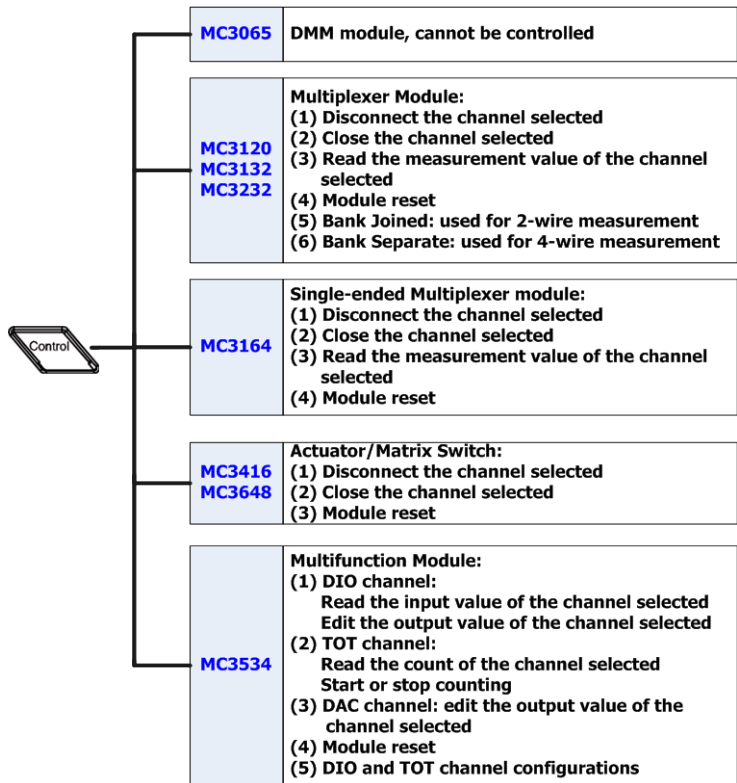
Monitor



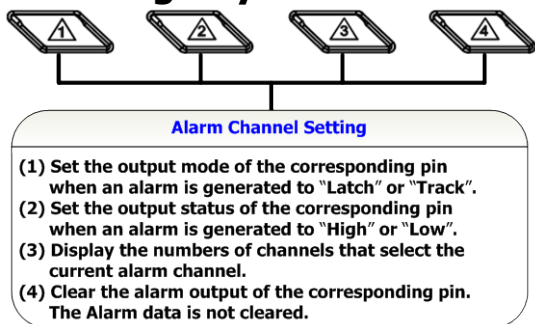
View Switch Key



Control



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 how to control the instrument remotely.

Measurement Connections

Multiple signals to be measured are connected to the plug-in modules through the external terminal blocks and then are switched to the DMM module or external DMM. M300 provides 7 kinds of terminal blocks. The models of the terminal blocks and their corresponding modules are listed in the table below. This section introduces how to connect the signals to be measured through the external blocks.

Table 1 External Terminal Blocks

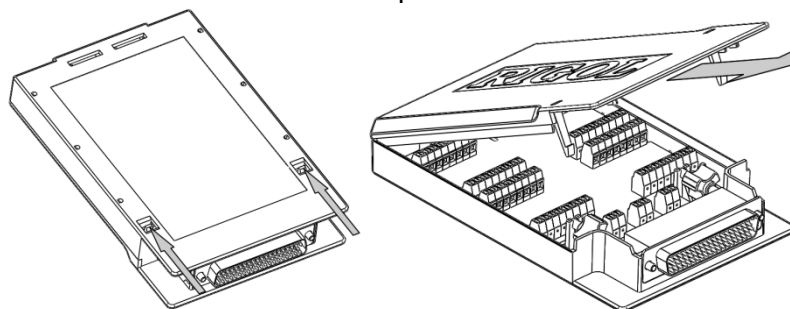
	Terminal Block	Module
1.	M3TB20	MC3120
2.	M3TB32	MC3132
3.	M3TB64	MC3164
4.	M3TB24	MC3324
5.	M3TB48	MC3648
6.	M3TB16	MC3416
7.	M3TB34	MC3534



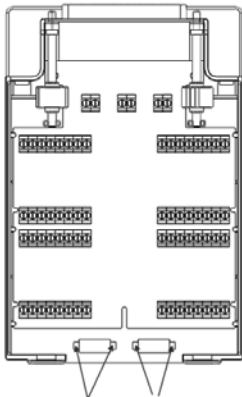
WARNING

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; 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.



- 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 2). 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.



Note:

- For the connection method of each module and the corresponding terminal block as well as the specification requirements of the connecting cable, please log in **RIGOL** official website (www.rigol.com) get more related materials.
- When using the mutliplexer module for measurement, make sure that both the amplitude of the signal under measurement and the commom mode voltage are no greater than the maximum input voltage of the module.
- When the multiplexer module is used to measure an object with high-power output ability (such as battery and power supply), to avoid damaging the relay, you are recommended to connect a fuse in serial when making connections (as shown in the figure below).

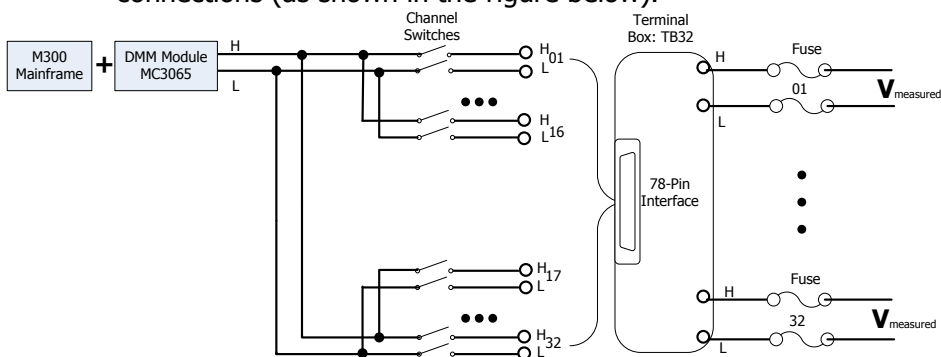
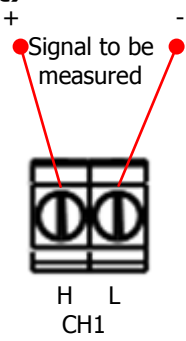
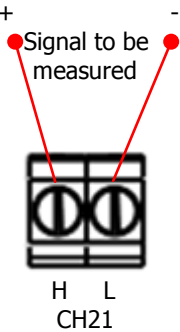
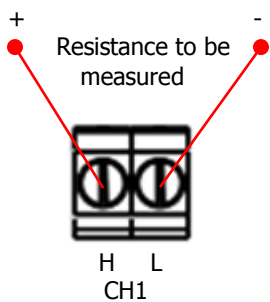
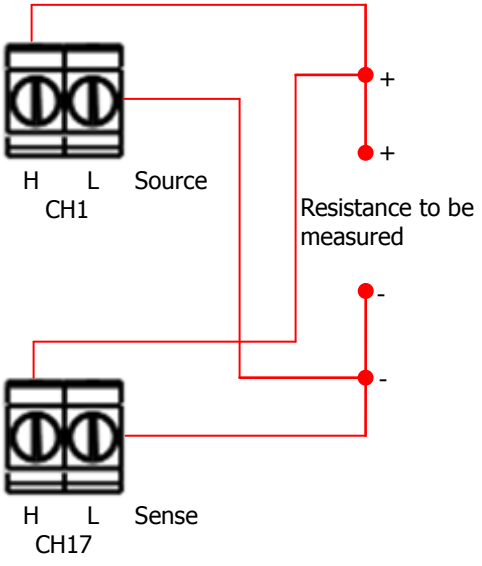
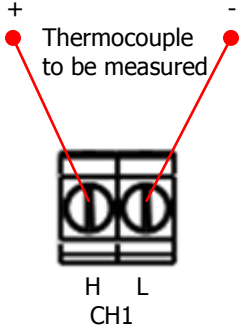


Table 2 Measurement Connections

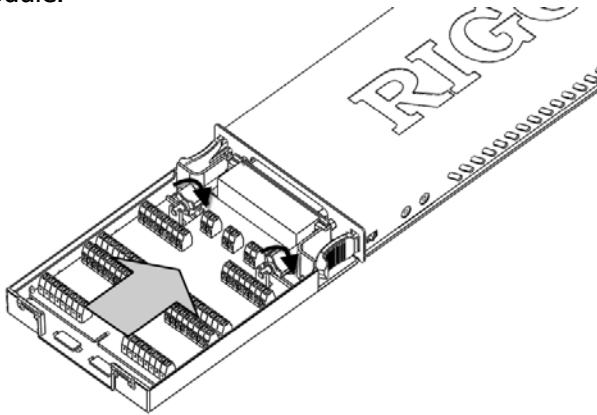
<p>DCV/ACV/FREQ/PERIOD/Sensor (DCV, FREQ)</p>  <p>Signal to be measured</p> <p>H L CH1</p>	<p>DCI/ACI/Sensor (DCI)</p>  <p>Signal to be measured</p> <p>H L CH21</p> <p>Note: Only available for CH21 to CH24 of MC3324.</p>
<p>2WR/RTD/Thermistor/Sensor (2WR)</p>  <p>Resistance to be measured</p> <p>H L CH1</p>	<p>4WR/RTD 4W/Sensor (4WR)</p>  <p>H L Source CH1</p> <p>Resistance to be measured</p> <p>H L Sense CH17</p> <p>Note: Only available for all the channels of MC3120 and MC3132 as well as CH1 to CH20 of MC3324.</p>
<p>Thermocouple</p>  <p>Thermocouple to be measured</p> <p>H L CH1</p>	



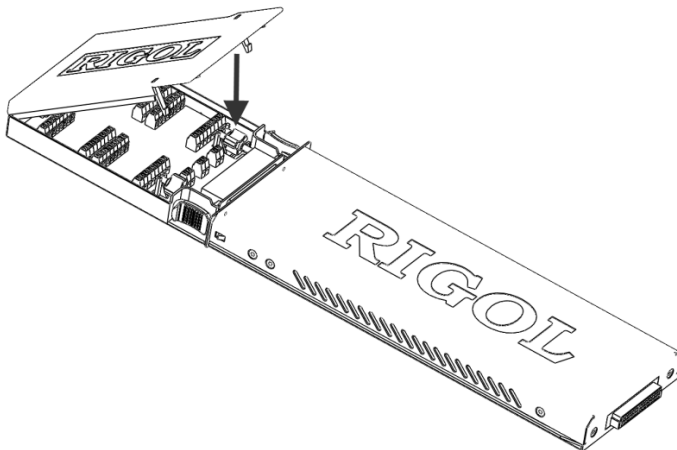
WARNING

To avoid electric shock, the measurement cables should meet the maximum voltage requirement. To avoid damaging the module, make sure that all the input signals are within the rated input range.

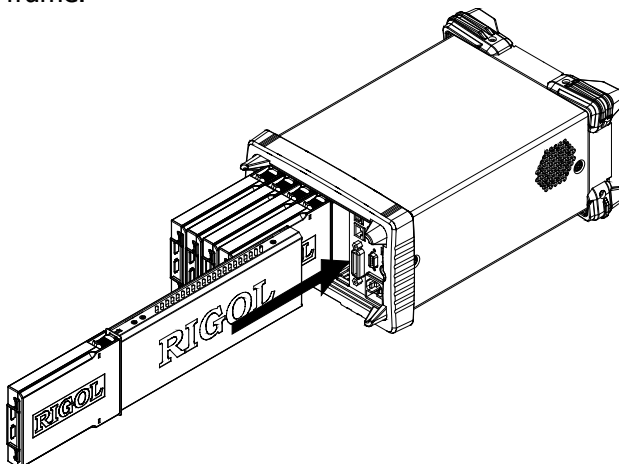
3. Connect the terminal block to interface 1 (the interface definition is in Figure 6) on the module and screw down the two screw rods to fix them onto the nuts on the module.



4. Close the upper cover of the terminal block.



5. Insert the module connected with the terminal block into the slot of the main frame.



To Configure Scan List

Create a scan list and add any channels of the multiplexer or the DIO or TOT channels of the multifunction module to the scan list; then, 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. Create a new list

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

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

2. Set the scan parameters

- (1) Select **Sweep** and use the left/right direction key 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 key 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 0. If "External" is selected, please select **Edge** and use the left/right direction key 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 key 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 key to select the desired channel number (for example, 101);
Select **Function** and use the left/right direction key to select the desired function (for example, DCV);
Select **Range** and use the left/right direction key to select the desired range (for example, 2V).

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

- (2) Step 2: Scaling Configuration
Select **Scaling** and use the left/right direction key 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 an external DMM is connected to execute scan and measurement.

(3) Step 3: Alarm Configuration

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

Select **Channel** and use the left/right direction key 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 an external DMM is connected to execute scan and measurement.

(4) Step 4: Advanced Configuration

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

Select **IMP** and use the left/right direction key to select 10MΩ or >10GΩ;

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

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

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

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

4. Configure other channels to the scan list

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

5. Save the scan list

After the scan list configuration is completed, you can press **Save** to save the configured scan list in the internal or external memory of the instrument.

Configuration Copy

M300 provides the configuration copy function (include module copy, channel copy and extended copy) which can be used to quickly configure multi-channels with the same configuration to the scan list.

Press **Config** → **Edit** → **Copy** to enter the configuration copy 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 configuration copy interface to open the module copy interface.

- (1) The "Source Module" area is selected by default. Use the up/down direction key to select the desired source module.
- (2) Press **Switch** to move the cursor to the "Target Module" area and use the up/down direction key 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. The configuration of a module to itself is not supported.

2. Channel Copy:

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

Press **Channel** in the configuration copy interface to open the channel copy interface. By default, the channel selected is fixed as the source channel and the upper area is selected. At this point, use the left/right direction key to select the desired target channel and press **OK** (pressing **OK** again will give up the selection); press **Done** to execute channel copy.

After opening the channel copy interface, you also can press **Switch** to fix the channel selected as the target channel. At this point, the lower area is selected. Use the left/right direction key 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 will be displayed in the lower area.
- (2) When the channel selected is fixed as the target channel, only a single source channel can be selected.
- (3) **Switch** is grayed out and disabled if the current scan list only has a single

channel.

Note: For channel copy, only copies between channels of the same type (namely, channels of the same type of modules) are allowed.

3. **Extended Copy:**

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

Press **Extended** in the configuration copy interface to open 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 key 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 with the same configurations.

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 observing important signals.

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 a single channel can be monitored at a time; but you can change the channel being monitored at any time. Readings acquired during the monitor process are displayed on the screen but will not be stored in memory. When the alarm function is applied to the channel being monitored, all the alarm

data will be stored in the alarm queue (the data will be cleared at power-off). To monitor a multiplexer channel, the DMM module must be installed and enabled (**Utility** → **DMM** → "ON"); the channel to be monitored must be configured to the scan list. You can monitor a DIO or TOT channel even if the channel is not configured to 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 the 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 the PC software **Ultra Sigma** of **RIGOL** to control the instrument remotely through the USB interface. For the detailed information about the SCPI commands, please refer to the Programming Guide.

1. Install Ultra Sigma

Download Ultra Sigma from **RIGOL** website (www.rigol.com) and install it according to the instructions.

2. 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 a USB cable.

(2) Install the USB driver

As this instrument is a USB-TMC device, after you connect it to the PC and turn both on for the first time, Found New Hardware Wizard is displayed on the PC. Please install the "USB Test and Measurement Device (IVI)" driver following the directions in the wizard.

(3) Search for device resources

Start up **Ultra Sigma** and the software will automatically search for the instrument resources currently connected to the PC. You can also click

USB-TMC

to search for 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.

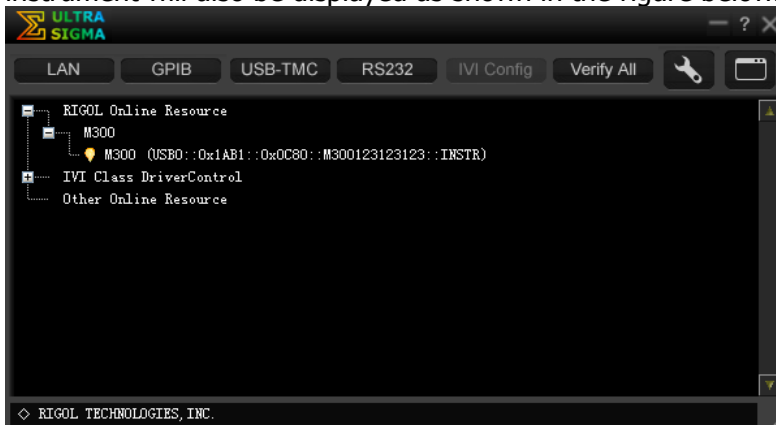




Figure 9 View USB Instrument Resource

(5) Send Command/Read Data

Right click the resource name "M300 (USB0::0x1AB1::0x0C80::M300123123123::INSTR)" and select "SCPI Panel Control" to turn on the remote command control panel 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 at the front panel (except ) are locked. At this point, you can press  to exit the remote mode.

Troubleshooting

When the failures listed below occur, please solve them according to the following steps. If the problem remains, please contact **RIGOL** and provide the system information of your instrument (**Utility** → **Info**).

1. The instrument does not start.

- 1) Check whether the power cord is correctly connected.
- 2) Check whether the power switch at the front panel is really on.
- 3) Remove the power cord; check whether the voltage selector is at the proper scale and whether the power input fuse is burned out. If the fuse is burned out, replace it with a specified one.
- 4) Restart the instrument after executing the above inspections.
- 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 type, as this instrument does not support hardware 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?

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

4. The screen is too dark.

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

5. The instrument is locked.

- 1) Check whether the instrument is in remote mode (namely check whether "Rmt" is displayed in the status bar in the user interface). If yes, you can press  to exit the remote mode and unlock the front panel.
- 2) Check whether the front panel of the instrument is locked (namely check whether  is displayed in the status bar in the user interface). If yes, you can press and hold  to unlock the front panel.
- 3) Check whether a progress bar is displayed in the interface. If yes, please wait and try again until 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 key and select the desired language using the left/right direction key.

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 key and press **View** to view the information and model number of the module currently selected.

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 key and press **Re-test**.
- 2) If the problem remains, press **View**. If the information of the module cannot be viewed, please refer to the failure 9.
- 3) If the information of the module can be viewed, the module indicator is possibly damaged. Please contact **RIGOL** for 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 main frame off and remove the module from the main frame; insert the module into the mainframe again firmly.
- 2) Restart the main frame, wait for about 1 minute and try to view the module information again.
- 3) If the problem remains, please contact **RIGOL**.

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

- 1) Make sure that **Utility** → **System** → **DMM** is set "ON".
- 2) Press **Utility** → **Test**; select the DMM module using the left/right direction key and press **View** to view whether the information of the DMM module is normal. If the information is not displayed or is not displayed correctly, it is possibly that the DMM module is working abnormally due to high current or power load failure. At this point, please turn the main frame off and restart it a few minutes later.
- 3) If the problem remains, please contact **RIGOL**.

11. The GPIB interface cannot work normally?

- 1) Check whether the cable works normally and the connection is correct and reliable.
- 2) Make sure that the GPIB addresses of M300 and the PC are identical.
- 3) If the problem remains, please contact **RIGOL**.

12. The USB Device interface cannot 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 (IVI)" drive program has been correctly installed on your PC.
- 3) If the problem remains, please contact **RIGOL**.

13. The RS232 interface cannot work normally?

- 1) Make sure that the RS232 interface parameters (such as the baud rate) settings of M300 and the PC are identical.
- 2) Check whether the RS232 cable is a cross cable.
- 3) If the problem remains, please contact **RIGOL**.

14. The LAN interface cannot work normally?

- 1) Check whether the cable works normally and the connection is correct and reliable.
- 2) Check the IP configuration mode:
 - If DHCP is enabled, please make sure that the current network supports DHCP configuration mode and can distribute network parameters (such as the IP address) to M300 automatically.
 - If DHCP is disabled and Auto IP is enabled, please check whether the IP addresses automatically acquired by M300 and the network parameters of the PC are in the same network segment.
 - If only Manual IP is enabled, please make sure that the network parameter settings of M300 and the PC are in the same network segment.
- 3) If the problem remains, please contact **RIGOL**.