

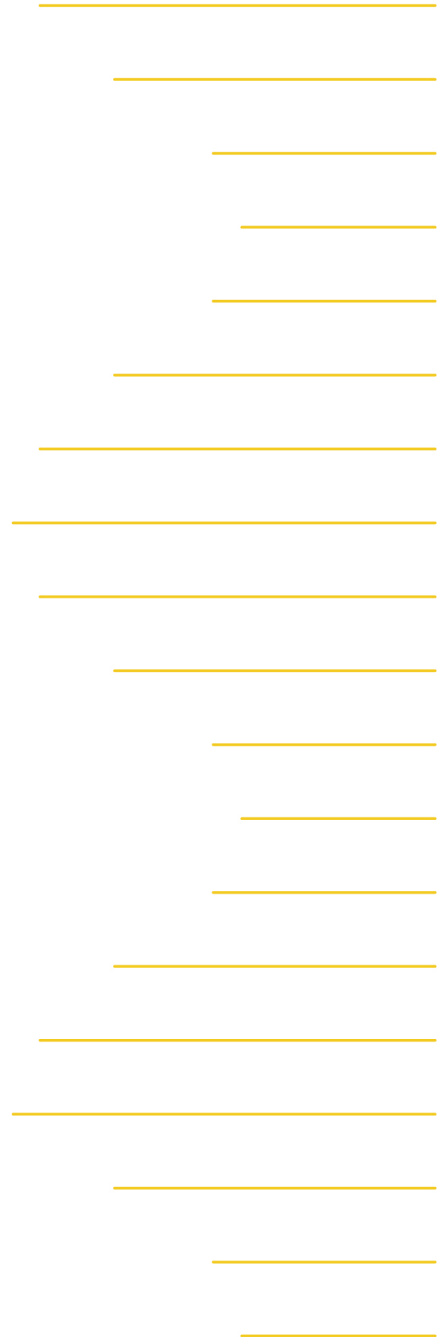


# DS70000 Series

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## Digital Oscilloscope

Quick Guide  
Jul. 2024



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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](mailto:service@rigol.com)

Website: <http://www.rigol.com>

# 1 Safety Requirement

## 1.1 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 follow the instructions specified in this manual to use the instrument properly.

- |   |  |    |  |
|---|--|----|--|
| 1 | Only the exclusive power cord designed for the instrument and authorized for use within the destination country could be used. | 9  | Do not operate the instrument with suspected failures. |
| 2 | Ensure that the instrument is safely grounded.   | 10 | Provide adequate ventilation.                          |
| 3 | Observe all terminal ratings.  | 11 | Do not operate in wet conditions.                      |
| 4 | Use proper overvoltage protection.   | 12 | Do not operate in an explosive atmosphere.             |
| 5 | Do not operate without covers.   | 13 | Keep instrument surfaces clean and dry.                |
| 6 | Do not insert objects into the air outlet.   | 14 | Prevent electrostatic impact.                          |
| 7 | Use the proper fuse.   | 15 | Handle with caution.                                   |
| 8 | Avoid circuit or wire exposure.  |    |  |



### WARNING

Equipment meeting Class A requirements may not offer adequate protection to broadcast services within residential environment.

## 1.2 Safety Notices and Symbols

Safety Notices in this Manual:



### WARNING

Indicates a potentially hazardous situation or practice which, if not avoided, will result in serious injury or death.



### CAUTION

Indicates a potentially hazardous situation or practice which, if not avoided, could result in damage to the product or loss of important data.

**Safety Notices 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.

**Safety Symbols on the Product:**

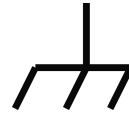
**Hazardous  
Voltage**



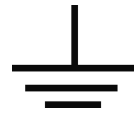
**Safety Warning**



**Protective Earth  
Terminal**



**Chassis Ground**



**Test Ground**

## 1.3 Measurement Category

**Measurement Category**

This instrument can make measurements in Measurement Category I.

**WARNING**

This instrument can only be used for measurements within its specified measurement categories.

**Measurement Category Definitions**

- **Measurement category I** is for measurements performed on circuits not directly connected to MAINS. Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS derived circuits. In the latter case, transient stresses are variable. Thus, you must know the transient withstand capability of the equipment.
- **Measurement category II** is for measurements performed on circuits directly connected to low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.
- **Measurement category III** is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring (including cables, bus-bars, junction boxes, switches and socket-outlets) in the fixed installation, and equipment for industrial use and some other



equipment. For example, stationary motors with permanent connection to a fixed installation.

- **Measurement category IV** is for measurements performed at the source of a low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.

## 1.4 Ventilation Requirement

This instrument uses a fan to force cooling. Please make sure that the air inlet and outlet areas are free from obstructions and have free air. When using the instrument in a bench-top or rack setting, provide at least 10 cm clearance beside, above and behind the instrument for adequate ventilation.



### CAUTION

Inadequate ventilation may cause an increase of temperature in the instrument, which would cause damage to the instrument. So please keep the instrument well ventilated and inspect the air outlet and the fan regularly.

## 1.5 Working Environment

### Temperature

Operating: 0°C to +50°C

Non-operating: -30°C to +70°C

### Humidity

- **Operating:**
  - Below +30°C: ≤90% RH (without condensation)
  - +30°C to +40°C: ≤75% RH (without condensation)
  - +40°C to +50°C: ≤45% RH (without condensation)
- **Non-operating:**
  - Below +65°C: ≤90% RH (without condensation)



### WARNING

To avoid short circuit inside the instrument or electric shock, never operate the instrument in a humid environment.

### Altitude

- **Operating:** below 3 km
- **Non-operating:** below 15 km

### Protection Level Against Electric Shock

ESD  $\pm 8\text{kV}$

### Installation (Overvoltage) Category

This product is powered by mains conforming to installation (overvoltage) category II.



#### WARNING

Ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the operator might be exposed to the danger of an electric shock.

### Installation (Overvoltage) Category Definitions

Installation (overvoltage) category I refers to signal level which is applicable to equipment measurement terminals connected to the source circuit. Among these terminals, precautions are done to limit the transient voltage to a low level.

Installation (overvoltage) category II refers to the local power distribution level which is applicable to equipment connected to the AC line (AC power).

### Pollution Degree

Pollution Degree 2

#### Pollution Degree Definition

- **Pollution Degree 1:** No pollution or only dry, nonconductive pollution occurs. The pollution has no effect. For example, a clean room or air-conditioned office environment.
- **Pollution Degree 2:** Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected. For example, indoor environment.
- **Pollution Degree 3:** Conductive pollution or dry nonconductive pollution that becomes conductive due to condensation occurs. To be found in industrial environment or construction sites (harsh environments). For example, sheltered outdoor environment.
- **Pollution Degree 4:** The pollution generates persistent conductivity caused by conductive dust, rain, or snow. For example, outdoor areas.

### Safety Class

Class 1 – Grounded Product

## 1.6 Care and Cleaning

### 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.

1. Disconnect the instrument from all power sources.
2. Clean the external surfaces of the instrument with a soft cloth dampened with mild detergent or water. Avoid having any water or other objects into the chassis via the heat dissipation hole. 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 short-circuit resulting from moisture or personal injuries, ensure that the instrument is completely dry before connecting it to the power supply.

## 1.7 Environmental Considerations

The following symbol indicates that this product complies with the WEEE Directive 2012/19/EU.



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

You can click on the following link <https://int.rigol.com/services/services/declaration> to download the latest version of the RoHS&WEEE certification file.

## 1.8 Keep Hands Clear



### WARNING

While the main screen is opening or closing, keep hands clear from the inclination angle between the main screen and its instrument body to avoid being pinched.

## 2 Document Overview

This manual gives you a quick review about the front and rear panel of DS70000 series, the user interface, and the basic operation method.



### TIP

For the latest version of this manual, download it from the official website of RIGOL (<http://www.rigol.com>).

### Publication Number

QGA29101-1110

### Software Version

Software upgrade might change or add product features. Please acquire the latest version of the manual from RIGOL website or contact RIGOL to upgrade the software.

### Format Conventions in this Manual

#### 1. Key

The front panel key is denoted by the menu key icon. For example, indicates the "Default" key.

Default


#### 2. Menu

The menu item is denoted by the format of "Menu Name (Bold) + Character Shading" in the manual. For example, **Setup** indicates clicking or tapping the "Setup" sub-menu under the "Utility" function menu to view the basic setting configuration items.

#### 3. Operation Procedures

The next step of the operation is denoted by ">" in the manual. For example,



> **Storage** indicates that first clicking or tapping the icon , then clicking or tapping **Storage**.

### Content Conventions in this Manual

DS70000 series digital oscilloscope includes the following models. Unless otherwise specified, this manual takes DS70504 as an example to illustrate the functions and operation methods of DS70000 series.

Model	Max. Analog Bandwidth	No. of Analog Channels
DS70504	5 GHz	4

Model	Max. Analog Bandwidth	No. of Analog Channels
DS70304	3 GHz	4

## 3 General Inspection

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### 1. Inspect the packaging

If the packaging has been damaged, do not dispose the damaged packaging or cushioning materials until the shipment has been checked for completeness and has passed both electrical and mechanical tests.

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

### 2. Inspect the instrument

In case of any mechanical damage, missing parts, or failure in passing the electrical and mechanical tests, contact your RIGOL sales representative.

### 3. Check the accessories

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

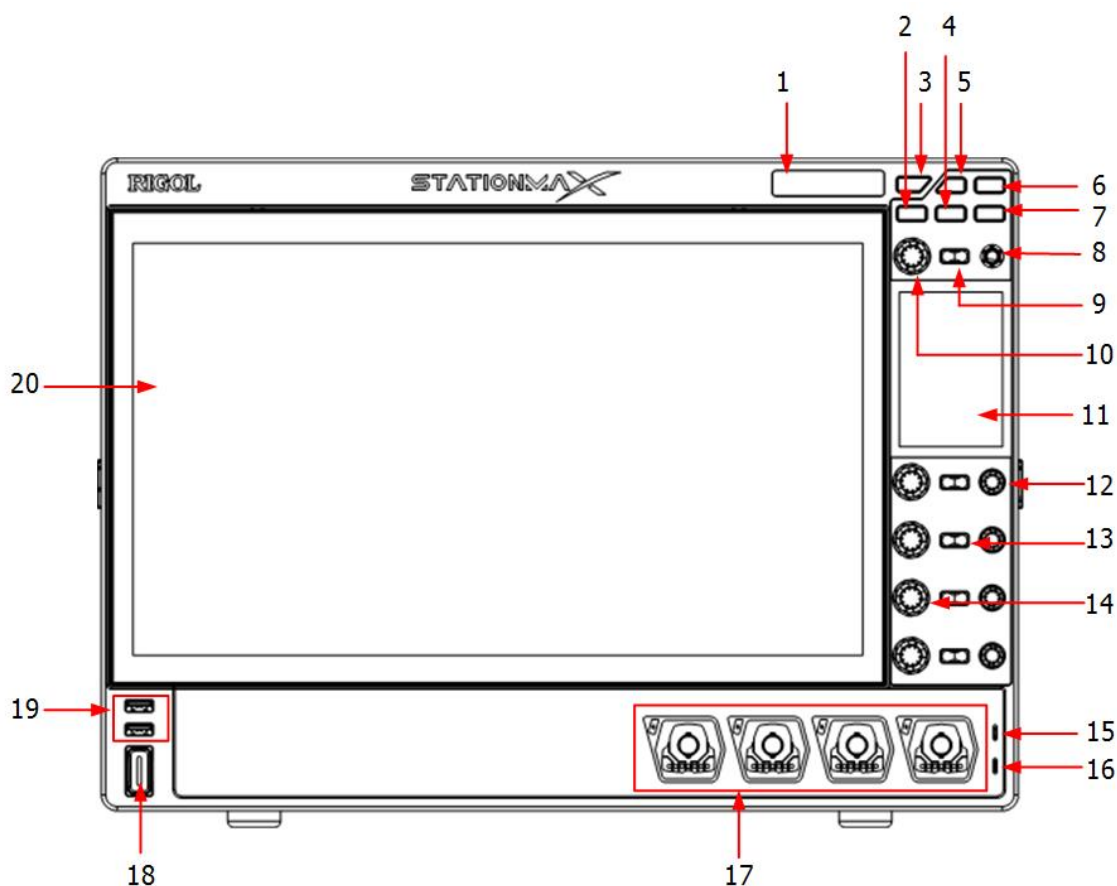
### Recommended Calibration Interval

RIGOL suggests that the instrument should be calibrated every 18 months.

## 4 Product Overview





DS70000 series is RIGOL's 7th generation of the digital oscilloscope. Built on RIGOL's "Phoenix" platform, it delivers excellent performance with a maximum sample rate of 20 GSa/s, 5 GHz real-time bandwidth. In addition to the improvement of hardware specification, the DS70000 series also has many user-friendly designs to ensure high-quality user experience.

### 4.1 Front Panel Overview

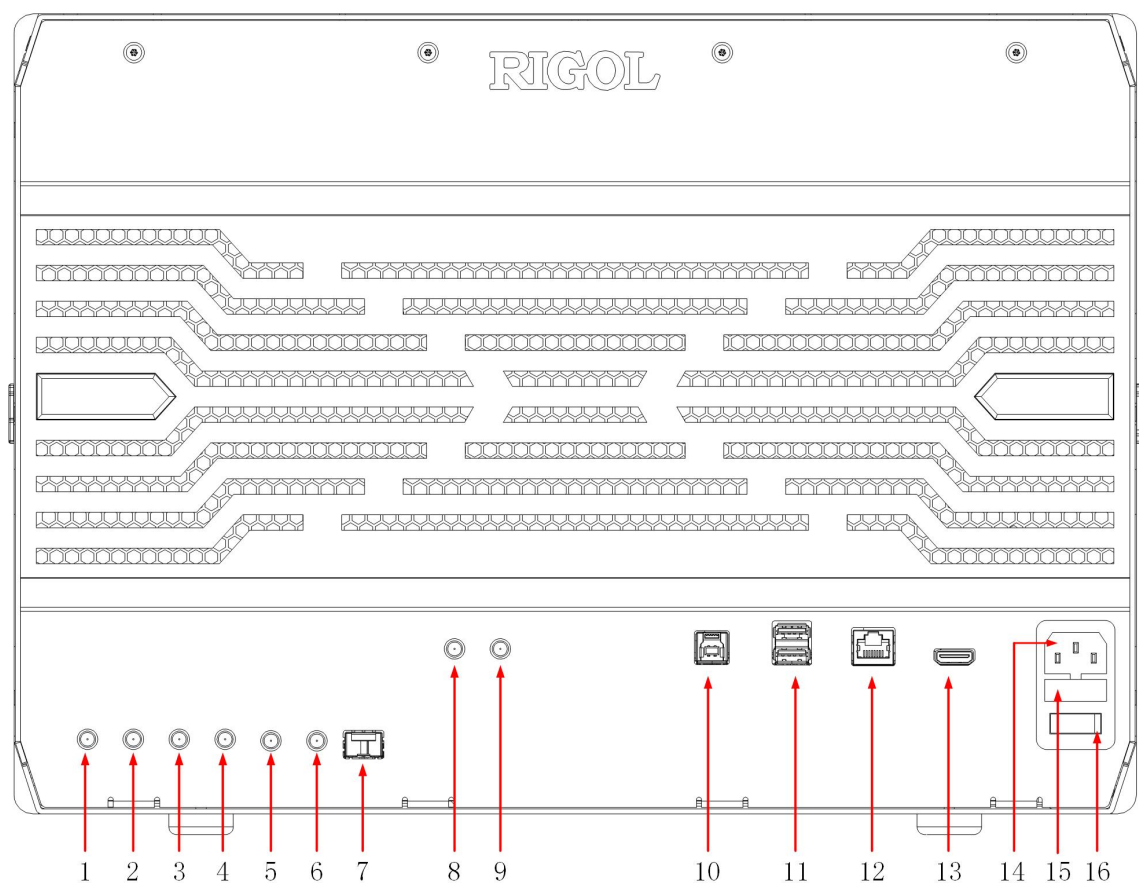


**Figure 4.1 Front Panel**

1	Electronic Label	11	High-Definition Smart and Quick-responsive Shortcut Menu Display
2	Screen Tilt Adjustment Key	12	Channel Vertical Position Knob
3	RUN/STOP Key	13	Channel On/Off Key
4	Default Key	14	Channel Vertical Scale Knob
5	Working Mode Switchover Key	15	Probe Compensation Signal Output Terminal

6	Quick Operation Key (related to quick operation setting)	16	Probe Compensation Signal Ground Terminal
7	 Local Key	17	Analog Channel Input Terminals
8	 <b>Multifunction</b> Knob	18	Power Key
9	 <b>Multifunction</b> Key	19	USB HOST Interface
10	 <b>Multifunction</b> Knob	20	High-Definition Large Touch Screen with One-Button Electronic Tilt

## 4.2 Rear Panel Overview



**Figure 4.2 Rear Panel**

1	Pulse Source Input (temporarily unavailable)	9	10 MHz IN Reference Clock Input
2	Pulse Source Output (temporarily unavailable)	10	USB DEVICE Interface
3	Pulse Source Reverse Output (temporarily unavailable)	11	USB HOST Interface



4	Pulse Source Reverse Input (temporally unavailable)	12	LAN Interface
5	AUX OUT Trigger Output	13	HDMI Video Output
6	EXT (1M $\Omega$ /18pF) Trigger Input Terminal	14	AC Power Cord Connector
7	SFP+ Interface (10 Gbps) (temporally unavailable)	15	Fuse
8	10 MHz OUT Reference Clock Output	16	Power Switch

## 4.3 User Interface

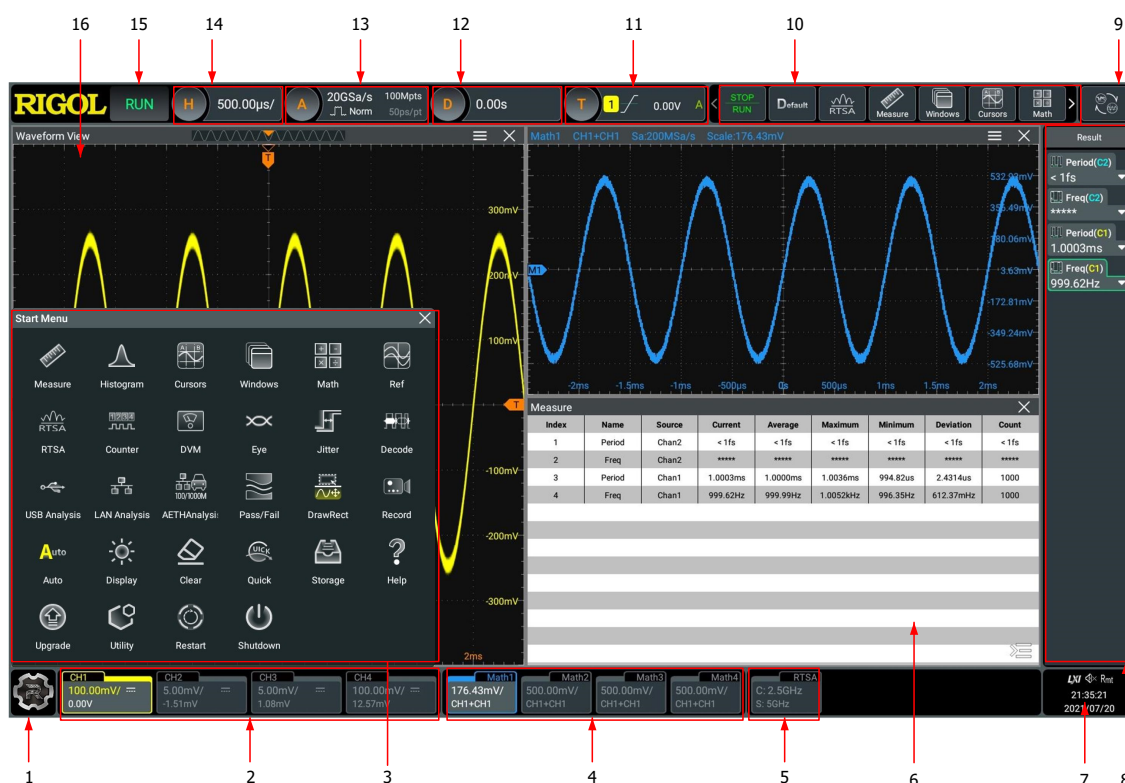


Figure 4.3 User Interface

1	Function Navigation Icon	9	Mode Switchover Icon
2	Channel Label	10	Function Icon Bar
3	Function Navigation Menu	11	Trigger Information Label
4	Channel Operation Label	12	Horizontal Position Label
5	RTSA Label	13	Sample Rate and Memory Depth Label
6	Multi-window Display Area	14	Horizontal Time Base Label
7	Notification Area	15	Operating Status
8	Result Display Window	16	Waveform Display Area

## 5 To Prepare for Use

### 5.1 To Connect to AC Power

The power requirements of the oscilloscope are 100-240 V, 45-440 Hz. Please use the power cord provided in the accessories to connect the oscilloscope to the AC power source, as shown in *Figure 5.1*.

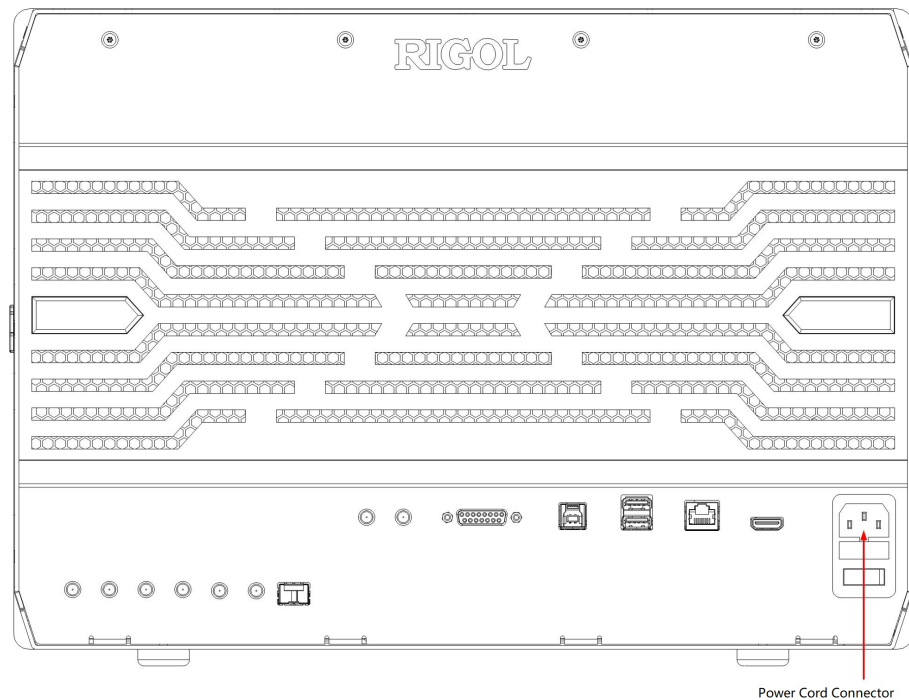



Figure 5.1 To Connect to AC Power




#### WARNING


To avoid electric shock, ensure that the instrument is correctly grounded.

### 5.2 Turn-on Checkout


After the instrument is connected to the power source, press the power key  at the lower-left corner of the front panel to power on the instrument. During the start-up process, the instrument performs a series of self-tests. After the self-test, the splash screen is displayed.

- **Restart:** Click or tap the function navigation icon  at the lower-left corner of the screen to open the function navigation. Click or tap the **Restart** icon, then a

prompt message "Are you sure to reboot?" is displayed. Click or tap **OK** to restart the instrument.

- **Shutdown:** Click or tap the function navigation icon  at the lower-left corner of the screen to open the function navigation. Click or tap the **Shutdown** icon, then a prompt message "Are you sure to shutdown?" is displayed. Click or tap **OK** to shut down the instrument. You can also press the Power key at the lower-left corner of the instrument to turn off the instrument.

## 5.3 To Set the System Language

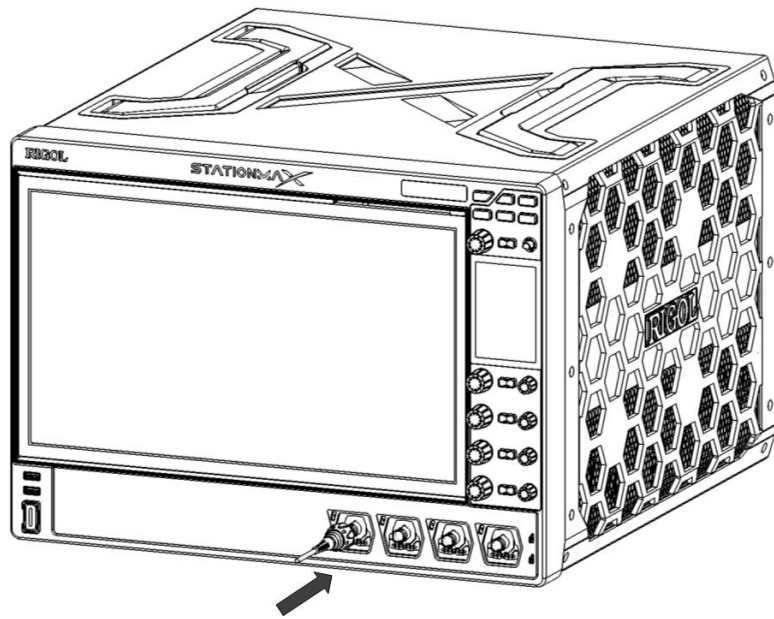
This instrument supports multiple languages. You can click or tap  > **Utility** > **Setup** > **Language** to set the system language.

## 5.4 To Connect the Probe

**RIGOL** provides the passive and active probes for the DS70000 series. For specific probe models, please refer to *DS70000 Data Sheet*. For detailed technical information of the probes, please refer to the corresponding Probe User Guide.

### Connect the Passive Probe

1. Connect the BNC terminal of the probe to an analog channel input terminal of the oscilloscope on the front panel as shown in *Figure 5.2*.
2. Connect the ground alligator clip or spring of the probe to the circuit ground terminal, and then connect the probe tip to the circuit point to be tested.



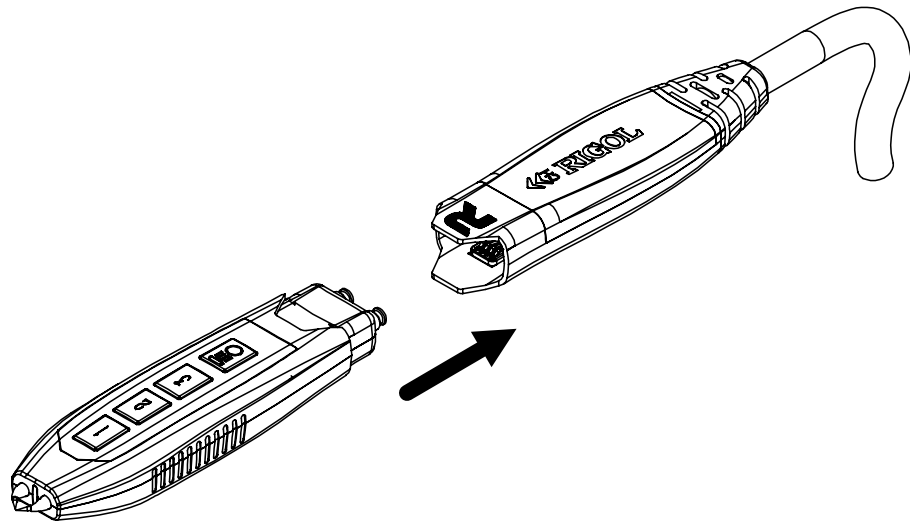
**Figure 5.2 Connect the Passive Probe**

After you connect the passive probe, check the probe function and probe compensation adjustment before making measurements. For detailed procedures, refer to *Function Inspection* and *Probe Compensation*.

#### **Connect the Active Probe**

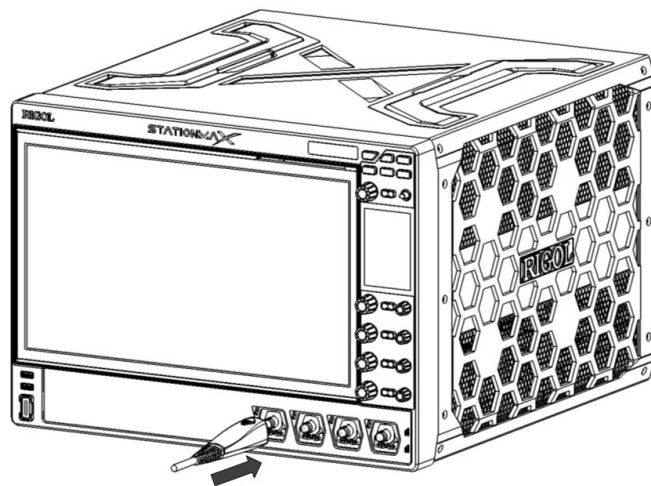
Take PVA8000 (active differential probe) as an example.

1. Connect the probe head to the preamp of the active probe, as shown in the figure below.



**Figure 5.3 To Connect the Probe Head to the PA of the Active Probe**

2. Connect the other end of the preamp to an analog channel input terminal of the oscilloscope on the front panel, as shown in the figure below. Note that you need to push the probe to the due position to lock it firmly.



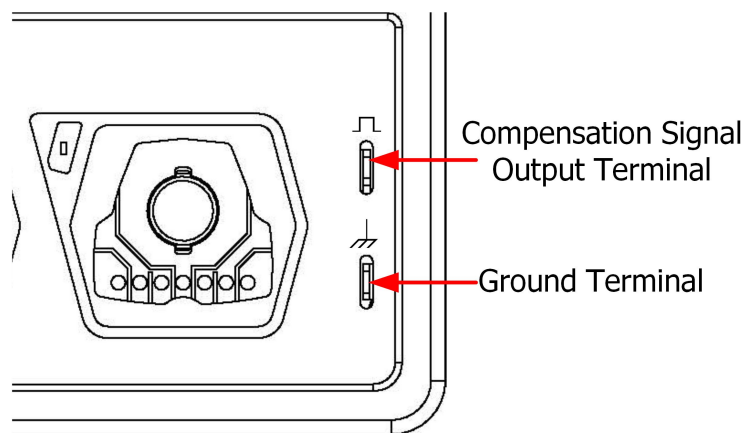
**Figure 5.4 Connect the Active Probe**

3. Use the probe's auxiliary device to connect the probe head to the circuit under test. For detailed information of the probes, please refer to *User Guide for PVA8000 Series Active Probe*.


After connecting the active probe, you can perform probe calibration and offset voltage adjustment if necessary. For detailed procedures, refer to descriptions about the active probe in User Guide.

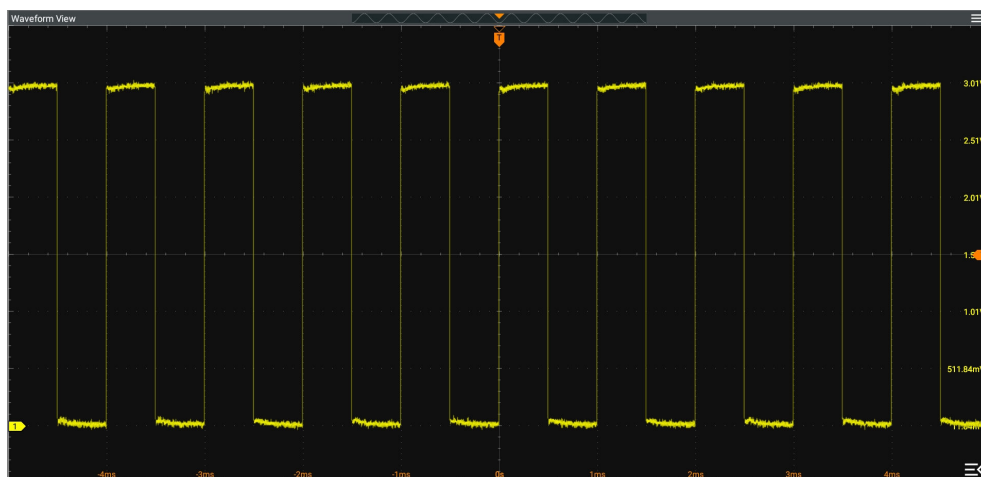
## 5.5 Function Inspection

1. Press **Default** on the front panel, then a prompt message displaying "Restore default settings?" appears on the screen. Click **OK** to restore the instrument to its factory default settings.
2. Connect the ground alligator clip of the probe to the "Ground Terminal" as shown in *Figure 5.5* below.
3. Use the probe to connect the input terminal of CH1 of the oscilloscope and the "Compensation Signal Output Terminal" of the probe, as shown in *Figure 5.5*.



**Figure 5.5 To Use the Compensation Signal**

4. Set the probe ratio based on the attenuation of the probe, and then click  > **Auto**.
5. Observe the waveform on the display. In normal condition, the square waveform as shown in the figure below should be displayed.



**Figure 5.6 Waveform Signal**

6. Use the same method to test the other channels. If the square waveforms actually shown do not match that in the figure above, please perform "**Probe Compensation**" introduced in the next section.



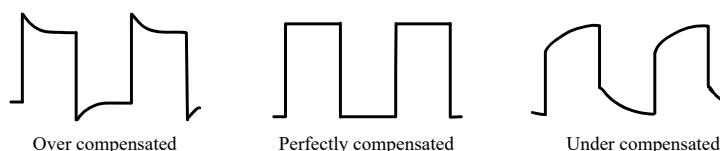
#### **WARNING**

To avoid electric shock when using the probe, please make sure that the insulated wire of the probe is in good condition. Do not touch the metallic part of the probe when the probe is connected to high voltage source.

## 5.6 Probe Compensation

When used for the first time, the oscilloscope probe must be compensated to match the input characteristics of the oscilloscope channel to which it is connected. The non-compensated or poorly compensated probe may cause measurement errors. The compensation procedure is as follows:

1. Perform Step 1, 2, 3 and 4 in **Function Inspection**.
2. Check the displayed waveforms and compare them with the waveforms shown in *Figure 5.7*.



**Figure 5.7 Probe Compensation**

3. Use the probe compensation adjustment tool provided in the accessories to adjust the low-frequency compensation adjustment hole on the probe until the displayed waveform is consistent with the "Perfectly compensated" waveform shown in the above figure.



## 6 Touch Screen Gestures

The instrument provides a super large capacitive touch screen, which is convenient for users to operate and make configurations. It has strong waveform display capability and excellent user experience. It features great convenience, high flexibility, and great sensitivity. The actions supported by the touch screen controls include tapping, pinching&stretching, dragging, and rectangle drawing.

### 6.1 Tap

Use one finger to tap the symbol or characters on the screen slightly, as shown in *Figure 6.1*. With the Tap gesture, you can perform the following operations:

- Tap the menu displayed on the screen to operate on the menu.
- Tap the function navigation icon at the lower-left corner of the touch screen to enable the function navigation.
- Tap the displayed numeric keypad to set the parameters.
- Tap the virtual keypad to set the label name and the filename.
- Tap the close button at the upper-right corner of the message box to close the prompt window.
- Tap other windows on the touch screen and operate on the windows.

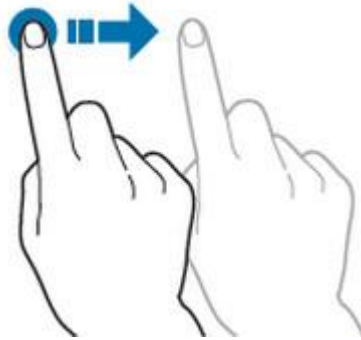


**Figure 6.1 Tap Gesture**

### 6.2 Drag

Use one finger to select the object, and then drag the object to a destination place, as shown in *Figure 6.2*. With the drag gesture, you can perform the following operation:

- Drag the waveform to change its position or scale.
- Drag the window controls to change the position of the window (e.g. numeric keypad).
- Drag the cursor to change the position of the cursor.
- In multi-window display, drag one of the displayed windows to change its position on the screen.



**Figure 6.2 Drag Gesture**

## 6.3 Pinch&Stretch


Pinch or stretch two points on the screen with two fingers to zoom in or out the waveform. To zoom in the waveform, first pinch the two fingers and then stretch the fingers; to zoom out the waveform, first stretch the two fingers, and then pinch the fingers together, as shown in the figure below. With the pinch&stretch gesture, you can perform the following operation:

- Pinching&stretching in the horizontal direction can adjust the horizontal time base of the waveform.
- Pinching&stretching in the vertical direction can adjust the vertical scale of the waveform.



Figure 6.3 Pinch&Stretch Gesture

## 6.4 Rectangle Drawing

Click or tap  > **DrawRect** to switch to the rectangle drawing mode. Drag your finger from upper-left part to lower-right part of the screen to draw a rectangle on the screen, as shown in [Figure 6.4](#). Move your finger away from the screen, and then a menu is displayed on the screen. At this time, you can tap to select "Horizontal zoom in", "Vertical zoom in", "Waveform zoom in", or "Reset". Drag your finger from lower-right part to upper-left part of the screen to draw a rectangle on the screen, as shown in [Figure 6.5](#). Move your finger away from the screen, and then a menu is displayed on the screen. At this time, you can tap to select "Horizontal zoom out", "Vertical zoom out", "Waveform zoom out", or "Reset".

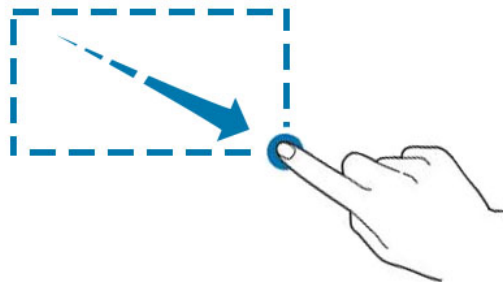
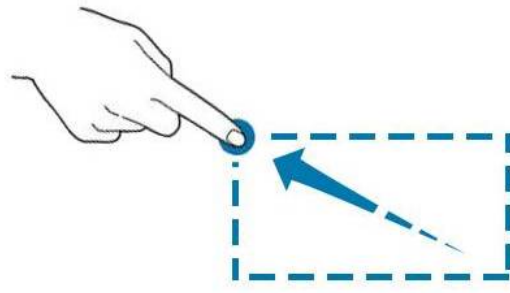


Figure 6.4 Rectangle Drawing Gesture (a)



**Figure 6.5 Rectangle Drawing Gesture (b)**

- Horizontal zoom in: expands the waveforms in the horizontal direction.  
Horizontal zoom out: compresses the waveforms in the horizontal direction.
- Vertical zoom in: expands the waveforms in the vertical direction. Vertical zoom out: compresses the waveforms in the vertical direction.
- Waveform zoom in: expands the waveforms both in the horizontal and vertical direction. Waveform zoom out: compresses the waveforms both in the horizontal and vertical direction.
- Reset: resets the waveforms to its original state where no zoom in or out operation is done to the waveforms.




**TIP**

Click or tap the "DrawRect" icon to switch between the rectangle drawing and waveform operation modes.




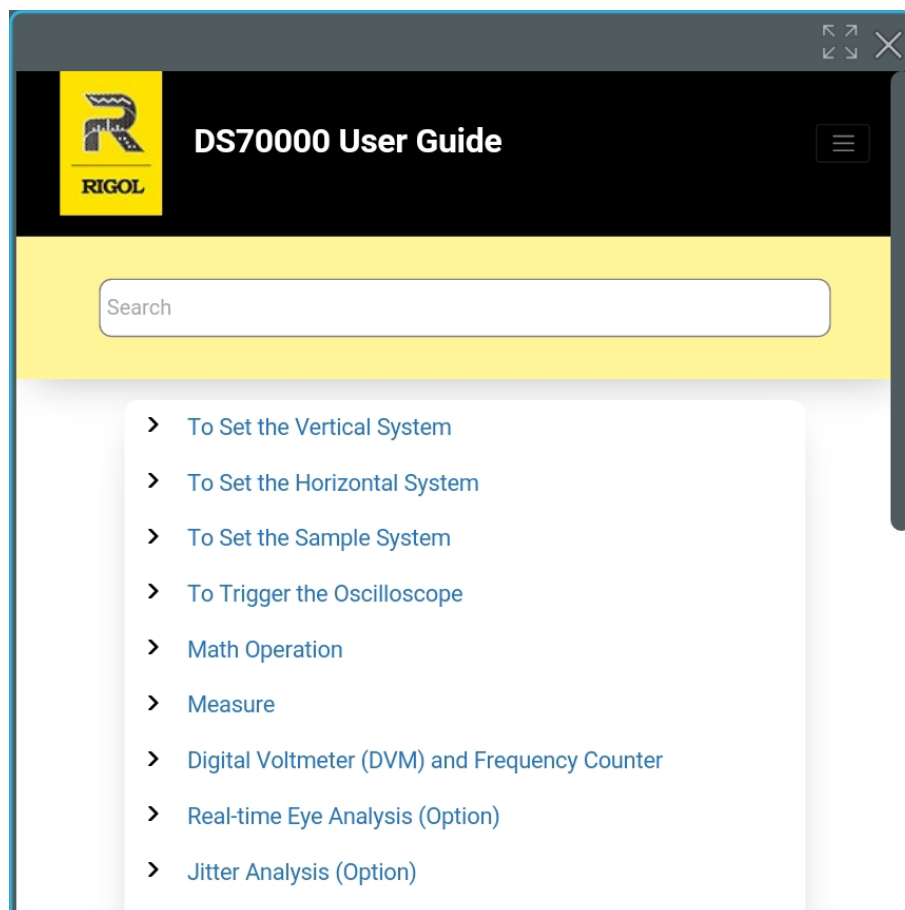
Click or tap the "DrawRect" icon, if  is displayed, it indicates that the rectangle drawing



mode is enabled. Click or tap the "DrawRect" icon, if  is displayed, it indicates that the waveform operation mode is enabled. By default, the waveform operation mode is enabled.

## 7 To Use the Built-in Help System

The help system of this oscilloscope provides instructions for all the function keys on the front panel and their corresponding menu keys. Click or tap  > **Help** to enter the help system.



**Figure 7.1 Help Information**

After opening the help interface, you can get its help information by clicking on or tapping the link for the desired item.

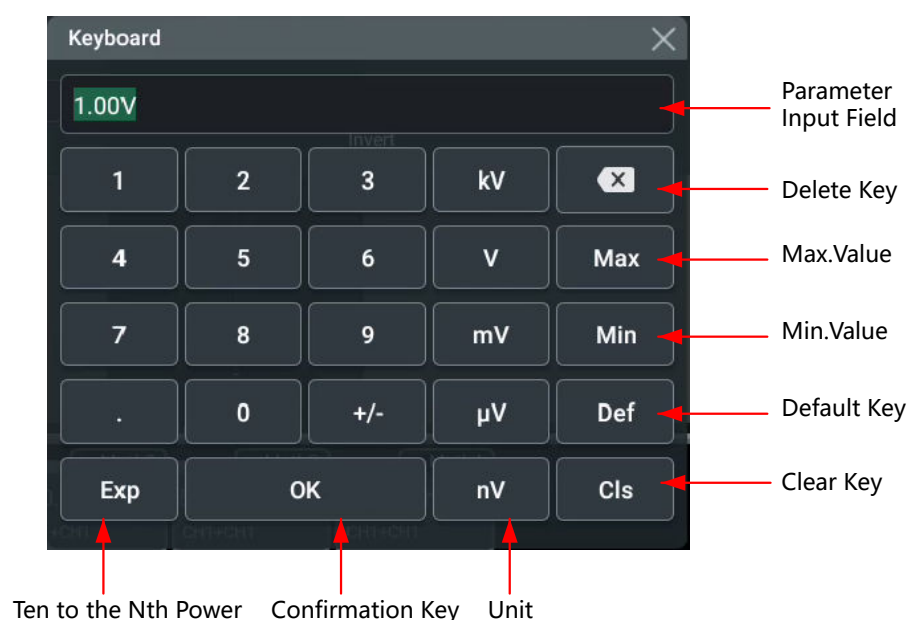
## 8 Parameter Setting Method

For this instrument, you can use the knob and touch screen to set parameters. The common parameter setting methods are as follows:

- **Method 1:** Some parameters can be adjusted by rotating the knob on the front panel.
- **Method 2:** Click or tap the input field of a specified parameter, then a virtual keypad is displayed. Complete the parameter setting with the keypad.

### Input a Value

When setting or modifying a parameter, input an appropriate value with the keypad in *Figure 8.1*.



**Figure 8.1 Numeric Keypad**

Click or tap the value or unit in the numeric keypad to complete the input. After you input all the values and select the desired units, the numeric keypad is turned off automatically. This indicates that you have completed parameter setting. Besides, after you have input the values, you can also click or tap "OK" directly to close the numeric keypad. At this time, the unit of the parameter is the default unit. In the numeric keypad, you can perform the following operations:

- Delete the parameter value that has been input;
- Set the parameter value to a maximum or minimum value;
- Set the parameter to a default value;

- Clear the parameter input field.

## 9 Fuse Replacement

If you need to replace the fuse, use only the specified fuse (AC 250V, T3.15A; 5.2 mm×20 mm) and perform the following operations (as shown in *Figure 9.1*):

1. Turn off the instrument, cut off the power, and remove the power cord.
2. Use a small straight slotted screwdriver to pry out the fuse holder.
3. Take out the fuse holder.
4. Replace the old fuse with a specified fuse.
5. Install the fuse holder.

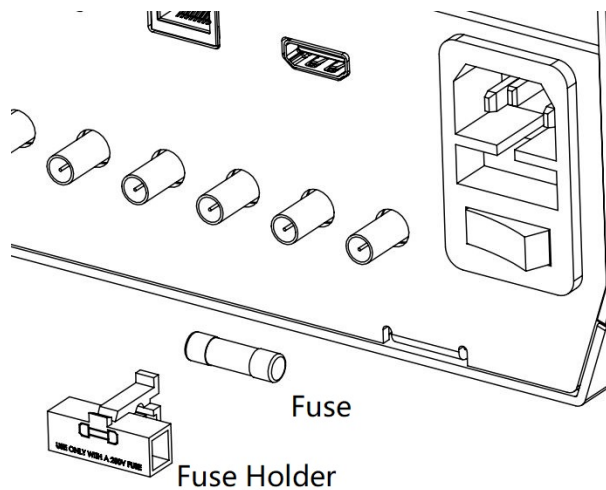


Figure 9.1 Fuse Replacement



### WARNING

To avoid electric shock, please ensure that the instrument has been turned off, the power source has been cut off, and the fuse to be used conforms to the fuse rating.



## 10 Remote Control

The following ways of remote control are supported:

- **User-defined Programming**

Users can program and control the instrument by using the SCPI (Standard Commands for Programmable Instruments) commands. For details about the SCPI commands and programming, refer to *Programming Guide* of this product series.

- **PC Software**

Users can use the PC software to send commands to control the instrument remotely. RIGOL Ultra Sigma is recommended. You can download the software from RIGOL official website (<http://www.rigol.com>).

**Operation Procedures:**

- Set up communication between the instrument and PC.
- Run Ultra Sigma and search for the instrument resource.
- Open the remote command control panel to send commands.

- **Web Control**

This instrument supports Web Control. Connect the instrument to the network, then input the IP address of the instrument into the address bar of the browser of your computer. The web control interface is displayed. Click Web Control to enter the web control page. Then you can view the display of the real-time interface of the instrument. Through the Web Control method, you can migrate the device control to the control terminals (e.g. PC, Mobile, iPad, and other smart terminals) to realize remote control of the instrument.

This instrument can be connected to the PC via the USB, LAN, or GPIB interface to set up communication and realize remote control through the PC. The remote control can be realized by using SCPI (Standard Commands for Programmable Instruments) commands.




**CAUTION**

**Before connecting the communication cable, please turn off the instrument to avoid causing damage to the communication interfaces.**

# 11 More Product Information

## 1. Obtain the Device Information

Click or tap  > **Utility** > **About** to obtain the information of the instrument, such as the model, serial number, firmware version number, and hardware version number.

## 2. View the Option Information and Install the Option

The instrument is installed with the trial versions of the options before leaving factory. The trial time starts from the time when you power on the instrument for the first time, and the trial time is about 2,160 minutes. Open the "**Utility**" menu, and then click or tap **Option List** to view the options currently installed on the oscilloscope and their information. For details about the option installation, refer to descriptions in User Guide.

For more information about this instrument, refer to the relevant manuals by logging in to the official website of RIGOL (<http://www.rigol.com>) to download them.

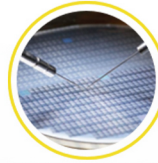
- *DS70000 User Guide* introduces the functions of the instrument and the operation methods, remote control methods, possible failures and solutions in using the instrument, specifications, and order information.
- *DS70000 Programming Guide* provides detailed descriptions of SCPI commands and programming examples of the instrument.
- *DS70000 Datasheet* provides the main features and technical specifications of the instrument.

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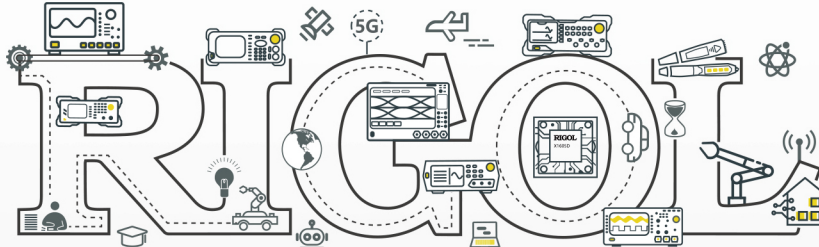
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Semiconductors

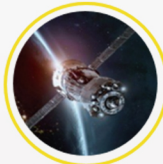


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