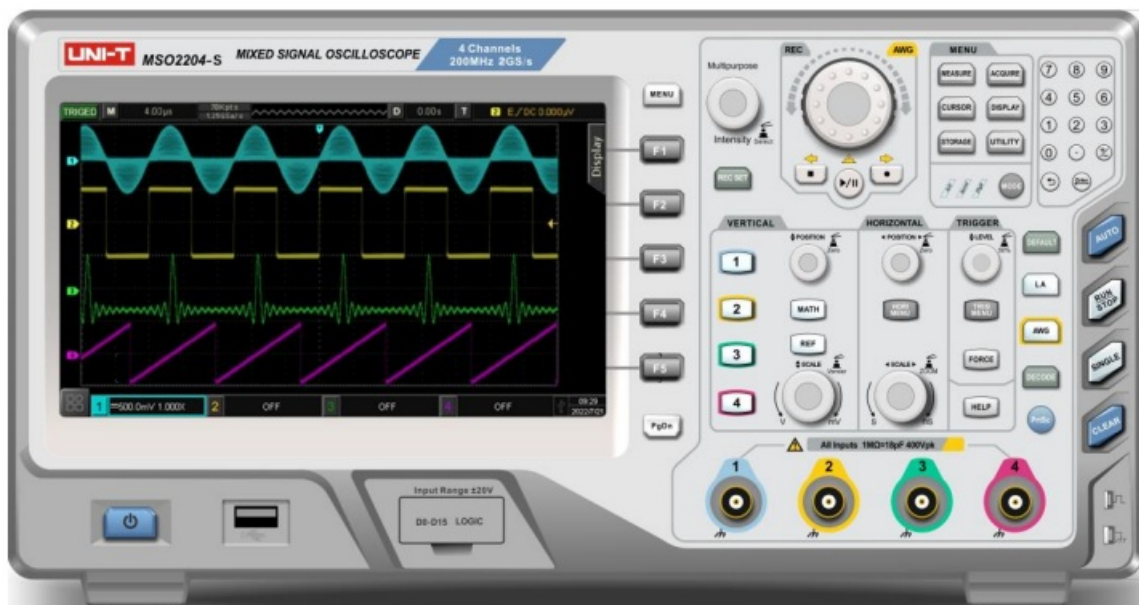


# UNI-T MSO-UPO2000 Series Digital Phosphor Oscilloscope User Guide

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## UNI-T MSO-UPO2000 Series Digital Phosphor Oscilloscope



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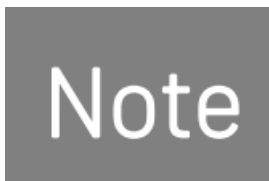



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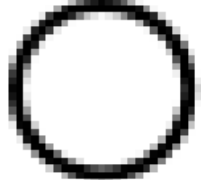


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Safety Requirements

This section contains information and warnings that must be followed to keep the instrument operating under safety conditions. In addition, user should also follow the common safety procedures


	Safety Precautions	
	<div>Warning</div>	Please follow the following guidelines to avoid possible electric shock and risk to p ersonal safety.

	<p>Users must follow the following conventional safety precautions in operation, service and maintenance of this device. UNI-T will not be liable for any personal safety and property loss caused by the user's failure to follow the following safety precautions. This device is designed for professional users and responsible organizations for measurement purposes.</p> <p>Do not use this device in any way not specified by the manufacturer. This device is only for indoor use unless otherwise specified in the product manual.</p>		
Safety Statement			
		<p>“Warning” indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the “Warning” statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated</p> <p>in the “Warning” statement.</p>	
		<p>“Caution” indicates the presence of a hazard. It reminds users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the “Caution” statement are not properly executed or observed. Do not proceed to the next step until you fully understand and</p> <p>meet the conditions stated in the “Caution” statement.</p>	
		<p>“Note” indicates important information. It reminds users to pay attention to procedures, methods and conditions, etc. The contents of the “Note” should be highlighted if necessary.</p>	
Safety Sign			
		Danger	It indicates possible danger of electric shock, which may cause personal injury or death.
		Warning	It indicates that you should be careful to avoid personal injury or product damage.
		Caution	It indicates possible danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the “Caution” sign is present, all conditions must be met before you proceed to operation.

		Note	It indicates potential problems, which may cause failure of this device if you fail to follow a certain procedure or condition. If the “Note” sign is
			present, all conditions must be met before this device will function properly.
		AC	Alternating current of device. Please check the region’s voltage range.
		DC	Direct current device. Please check the region’s voltage range.
		Grounding	Frame and chassis grounding terminal
		Grounding	Protective grounding terminal
		Grounding	Measure grounding terminal
		OFF	Main power off
		ON	Main power on
		Power Supply	Standby power supply: when the power switch is turned off, this device is not completely disconnected from the AC power supply.

<b>CAT I</b>		Secondary electrical circuit connected to wall sockets through transformers or similar equipment, such as electronic instruments and electronic equipment; electronic equipment with protective measures, and any high-voltage and low-voltage circuits, such as the copier in the office
<b>CAT II</b>		CATII: Primary electrical circuit of the electrical equipment connected to the indoor socket via the power cord, such as mobile tools, home appliances, etc. Household appliances, portable tools (e.g. electric drill), household sockets, sockets more than 10 meters away from CAT III circuit or sockets more than 20 meters away from CAT IV circuit
<b>CAT III</b>		Primary circuit of large equipment directly connected to the distribution board and circuit between the distribution board and the socket (three-phase distributor circuit includes a single commercial lighting circuit). Fixed equipment, such as multi-phase motor and multi-phase fuse box; lighting equipment and lines inside large buildings;  machine tools and power distribution boards at industrial sites (workshops)
<b>CAT IV</b>		Three-phase public power unit and outdoor power supply line equipment. Equipment designed to “initial connection”, such as power distribution system of power station, power instrument, front-end overload protection, and any outdoor transmission line
	Certification	CE indicates a registered trademark of EU
	Certification	UKCA indicates a registered trademark of UK.
	Certification	ETL indicates a registered trademark of Intertek.
	Waste	This product complies with the marking requirements of WEEE Directive (2002/96/EC). This additional label indicates that this electrical / electronic product must not be discarded in household waste.
	EFUP	This environment-friendly use period (EFUP) mark indicates that dangerous or toxic substances will not leak or cause damage within this indicated time period. The environment-friendly use period of this product is 40 years, during which it can be used safely. Upon expiration of this period, it should enter the recycling system.

Safety Requirements	
<div>Warning</div>	
Preparation before use	<p>Please connect this device to AC power supply with the power cable provided;</p> <p>The AC input voltage of the line reaches the rated value of this device. See the product manual for specific rated value.</p> <p>The line voltage switch of this device matches the line voltage;</p> <p>The line voltage of the line fuse of this device is correct.</p>
Check all terminal rated values	<p>Please check all rated values and marking instructions on the product</p> <p>to avoid fire and impact of excessive current. Please consult the product manual for detailed rated values before connection.</p>
Use the power cord properly	<p>You can only use the special power cord for the instrument approved by the local and state standards. Please check whether the insulation layer of the cord is damaged or the cord is exposed, and test whether the cord is conductive. If the cord is damaged, please replace it before</p> <p>using the instrument.</p>
Instrument Grounding	<p>To avoid electric shock, the grounding conductor must be connected to the ground. This product is grounded through the grounding conductor of the power supply. Please be sure to ground this product before it is powered on.</p>
AC power supply	<p>Please use the AC power supply specified for this device. Please use the power cord approved by your country and confirm that the insulation layer is not damaged.</p>
Electrostatic prevention	<p>This device may be damaged by static electricity, so it should be tested in the anti-static area if possible. Before the power cable is connected to this device, the internal and external conductors should be grounded briefly to release static electricity. The protection grade of this device</p> <p>is 4KV for contact discharge and 8KV for air discharge.</p>
Measurement accessories	<p>Measurement accessories are of lower class, which are definitely not applicable to main power supply measurement, CAT II, CAT III or CAT IV circuit measurement.</p>

Use the input / output port of this device properly	Please use the input / output ports provided by this device in a properly manner. Do not load any input signal at the output port of this device. Do not load any signal that does not reach the rated value at the input port of this device. The probe or other connection accessories should be effectively grounded to avoid product damage or abnormal function. Please refer to the product manual for the rated value of the input /output port of this device.
Power fuse	Please use power fuse of specified specification. If the fuse needs to be replaced, it must be replaced with another one that meets the specified specifications (Class T, rated current 5A, rated voltage 250V) by the maintenance personnel authorized by UNI-T.
Disassembly and cleaning	There are no components available to operators inside. Do not remove the protective cover. Maintenance must be carried out by qualified personnel.
Service environment	This device should be used indoors in a clean and dry environment with ambient temperature from 0 °C to 40 °C.  Do not use this device in explosive, dusty or humid air.
Do not operate in humid environment	Do not use this device in a humid environment to avoid the risk of internal short circuit or electric shock.
Do not operate in flammable and explosive environment	Do not use this device in a flammable and explosive environment to avoid product damage or personal injury.
	
Abnormality	If this device may be faulty, please contact the authorized maintenance personnel of UNI-T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI-T.
Cooling	Do not block the ventilation holes at the side and back of this device; Do not allow any external objects to enter this device via ventilation holes; Please ensure adequate ventilation, and leave a gap of at least 15 cm on both sides, front and back of this device.
Safe transportation	Please transport this device safely to prevent it from sliding, which may damage the buttons, knobs or interfaces on the instrument panel.
Proper ventilation	Poor ventilation will cause the device temperature to rise, thus causing damage to this device. Please keep proper ventilation during use, and regularly check the vents and fans.
Keep clean and dry	Please take actions to avoid dust or moisture in the air affecting the performance of this device. Please keep the product surface clean and dry.

<div style="background-color: #808080; color: white; padding: 20px; text-align: center; font-size: 48px; font-weight: bold;">Note</div>							
Calibration				The recommended calibration period is one year. Calibration should only be carried out by qualified personnel.			

## Introduction of MSO/UPO2000 Series Digital Phosphor Oscilloscope

### MSO/UPO2000 Series digital phosphor oscilloscope includes four models

Model	Analog Channel	Analog bandwidth	LA	AWG
UPO2102	2	100MHz	○	×
UPO2104	4	100MHz	○	×
UPO2202	2	200MHz	○	×
UPO2204	4	200MHz	○	×
MSO2102	2	100MHz	●	×
MSO2104	4	100MHz	●	×
MSO2202	2	200MHz	●	×
MSO2404	4	200MHz	●	×
MSO2102-S	2	100MHz	●	●
MSO2104-S	4	100MHz	●	●
MSO2202-S	2	200MHz	●	●
MSO2204-S	4	200MHz	●	●

## Getting Started Guide

This chapter introduces on using the oscilloscope for the first time, the front and rear panels, the user interface, as well as the built-in help system.

### General Inspection

It is recommended to inspect the instrument follow the steps below before using the MSO/UPO2000 series for the first time.

#### 1. Check for Damages caused by Transport

If the packaging carton or the foam plastic cushions are severely damaged, please contact the UNIDistributor of this product immediately.

#### 2. Check Attachment

Please check appendix for the list of accessories. If any of the accessories are missing or damaged, please



contact UNI-T or local distributors of this product.

### 3. Machine Inspection

If the instrument appears to be damaged, not working properly, or has failed the functionality test, please contact UNI-T or local distributors of this product.

If the equipment is damaged due to shipping, please keep the packaging and notify both the transportation department and UNI-T distributors, UNI-T will arrange maintenance or replacement.

### Before Use

To perform a quick verification of the instrument's normal operations, please follow the steps below:

#### 1. Connect to the Power Supply

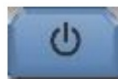
The power supply voltage range is from 100 VAC to 240 VAC, the frequency range is 45 Hz to 440 Hz.

Connect the oscilloscope to the power supply line that came with the oscilloscope or any power supply line that meets the local country standards. Turn on the power button, which on the back of the oscilloscope. The soft



power button in the front of the oscilloscope should be on red.

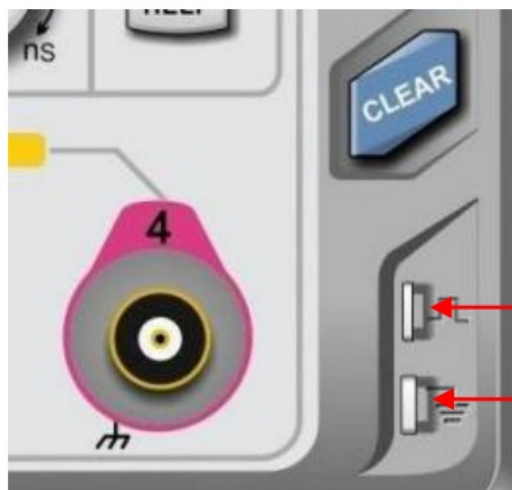
#### 2. Boot Check



Press the soft power button and the light should change to green. The oscilloscope will show a boot animation, and then enter the normal interface.

#### 3. Connect Probe

Use probe in the attachment and connect it BNC port to the channel 1 BNC port of the oscilloscope. Connect the probe's main alligator clip to the "Compensating signal port" and the ground clip is connected to the "Ground terminal" shown below. The output of the compensating signal should be amplitude 3 Vpp, default frequency is 1 kHz.



Compensating signal terminal

Ground terminal

Figure 1 Compensating signal and Ground terminal

#### 4. Function Check

Press the AUTO key, a 3 Vpp 1 kHz square wave should appear. Repeat step 3 for all channels. If the output is not a square wave with the above descriptions, please perform the probe compensation step in the next section.

5. Probe Compensation

When the probe is connected to any input channel for the first time, this step might be adjusted in order to match the probe and the input channel. Probes that are not compensated may lead to measurement errors or mistake. Please follow the following steps:

- ① Set the attenuation coefficient in the probe menu and the switch on the probe to 10x, and connect the probe to CH1. Make sure the probe's connector is properly connected with the oscilloscope. Connect the probe's main clip and ground clip to the oscilloscope's compensating signal and ground terminal respectively. Open CH1 and press the AUTO button.
- ② View the displayed waveform, as shown in Figure 2.

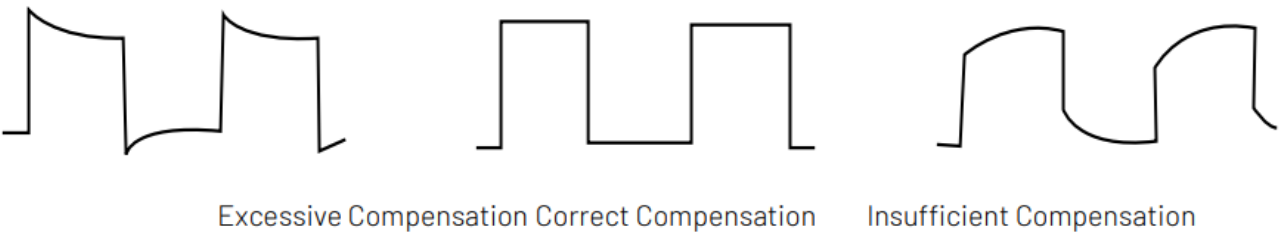


Figure 2 Compensating Calibration of Probe

- ③ If the displayed waveform is look like the above “Insufficient Compensation” or “Excessive Compensation”, use a non-metallic screwdriver to adjust the probe’s variable capacitance until the display matches the “Correct compensation” waveform.

Warning

To avoid electric shock when using the probe to measure high voltage, please ensure that the probe insulation is in good condition and avoid physical contact with any metallic part of the probe

Front Panel

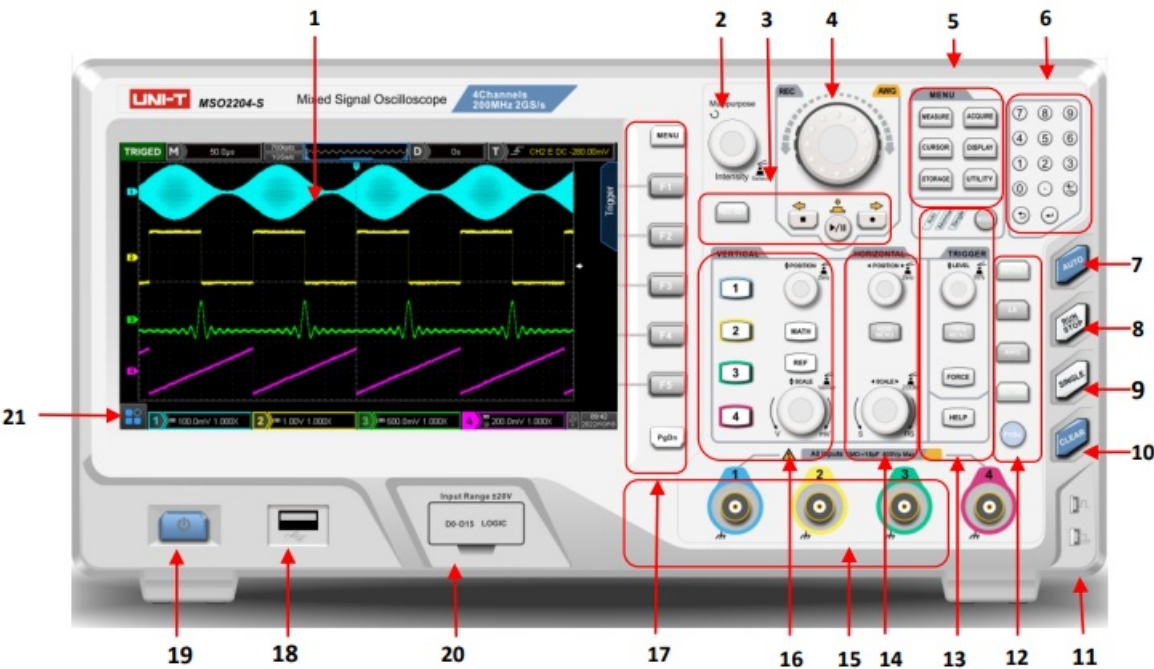


Figure 3 Front Panel

Table 1 Front Panel

No.	Description	No.	Description
1	Screen display area	12	Factory setting, LA, AWG, protocol decoding
2	Multipurpose knob	13	Trigger control (TRIGGER)
3	Recording waveform	14	Horizontal control (HORIZONTAL)
4	Jog dial knob	15	Analog channel input port
5	Function menu	16	Vertical control (VERTICAL)
6	Numeric keypad	17	Menu control soft key
7	Automatic control key	18	USB HOST interface
8	Run/Stop control key	19	Power supply soft key
9	Single trigger control key	20	Digital channel input port
10	Clear all control key	21	HOME menu
11	Compensating signal connector and ground terminal		

## Rear Panel

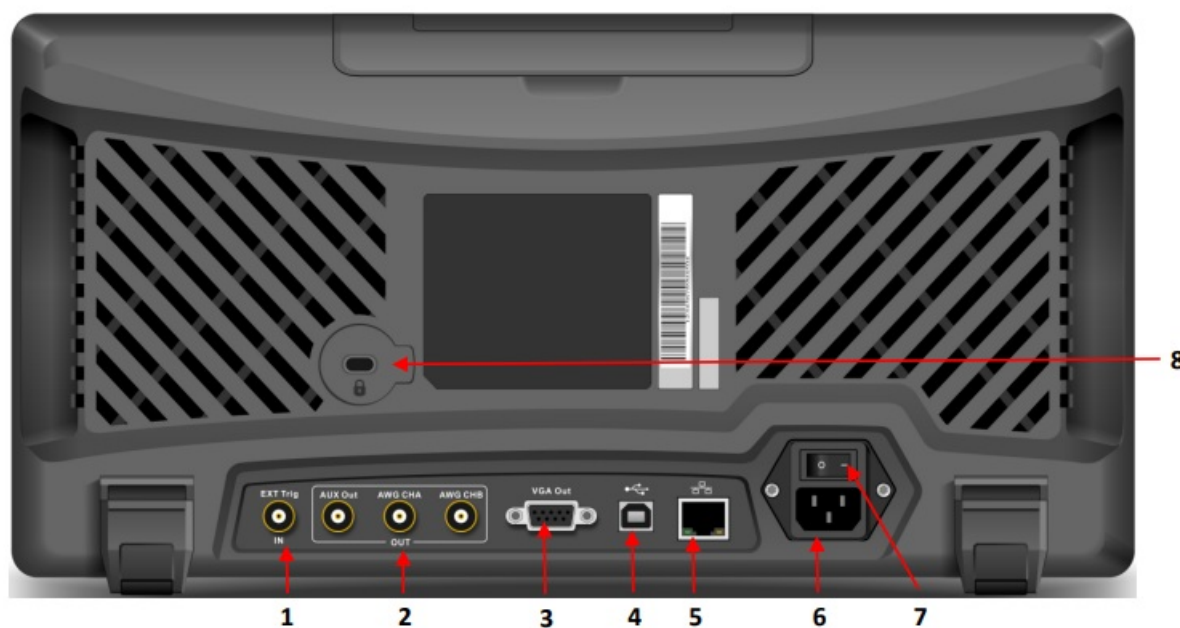


Figure 4 Rear Panel

Table 2 Rear Panel

No.	Description	No.	Description
1	EXT Trig port	5	LAN
2	AUX Out and arbitrary waveform signal output	6	AC Power Input Socket
3	VIDEO Out	7	Power Switch
4	USB Device port	8	Safety Lock

User Interface

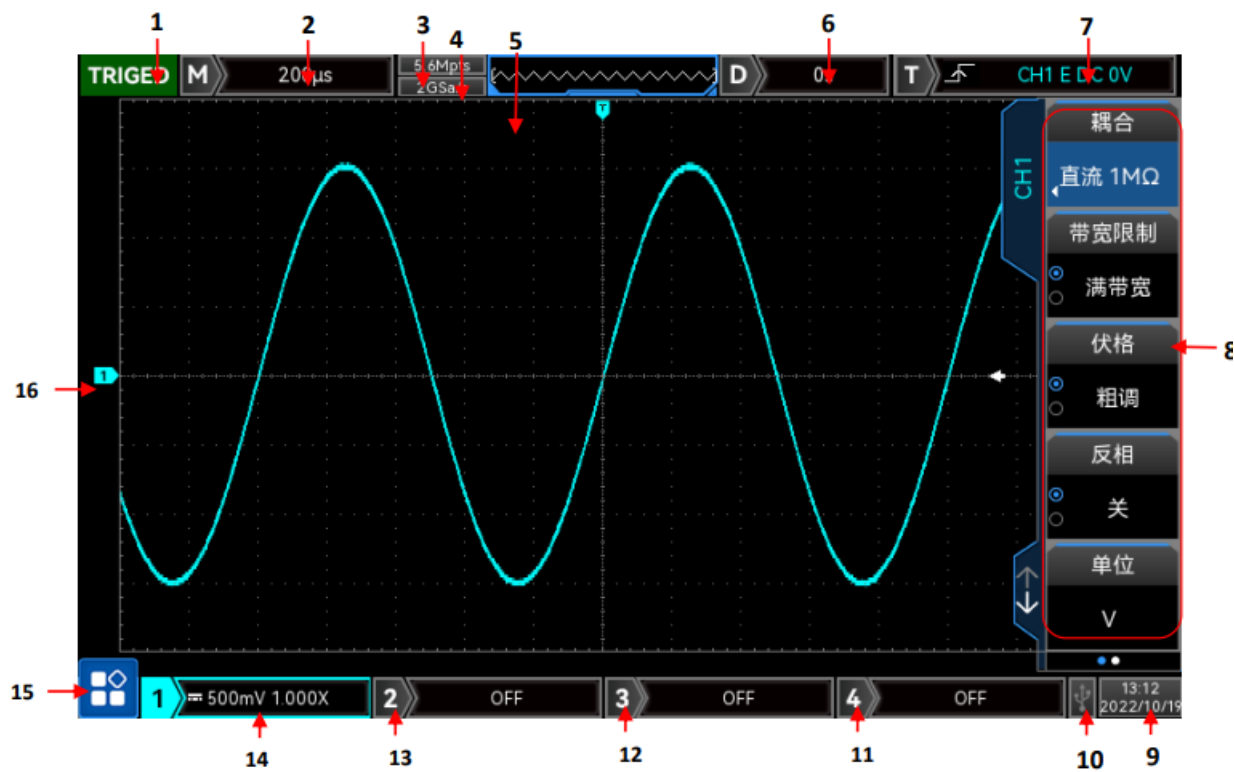


Figure 5 User Interface

Table 3 User Interface

No.	Description	No.	Description
1	Trigger status identification	9	System time
2	Time base scale	10	USB DEVICE icon
3	Sampling rate/storage depth	11	CH4 state icon
4	Waveform indicator	12	CH3 state icon
5	Waveform trigger position	13	CH2 state icon
6	Horizontal displacement	14	CH1 state icon
7	Trigger status	15	HOME menu
8	Operation menu	16	Analog channel icon and waveform

## Touch Screen

MSO2000CS+ series provides 8 inch super capacitive touch screen, multiple point touch control and gesture control. MSO2000CS+ has easily operating system with flexible and high sensitive touch screen features for great waveform display and excellent user experience. Touch control function includes tap, squeeze, drag and drawing rectangle.

Hint: The menu displayed on the screen of the oscilloscope can use the touch control function.

### Tap

Use one finger to slightly tap icon or word on the screen as shown in Figure 7. Tap can use for:

- Tap menu displayed on the screen and then to
- Tap the function guide icon on the left corner of the screen to enable
- Tap to pop out numeric keypad to set
- Tap virtual keyboard to set label and file
- Tap message to pop out close button on the right corner to close
- Tap other window displayed on the screen to setup



Figure 7 Touch Gesture

### Squeeze

Squeeze two fingers together or separate. Squeeze gesture can zoom out or zoom in the waveform. If the waveform need to zoom out, squeeze two finger together and then slide away; If the waveform need to zoom out, separate two fingers and then squeeze two fingers together as shown in Figure 8. Squeeze gesture can use for:

- Adjusting horizontal time base of waveform on the horizontal
- Adjusting vertical scale of waveform on the vertical



Figure 8 Squeeze Gesture

### Drag

Use one finger to press and drag the selected item to the aimed position as shown in Figure 9. Drag gesture can use for:

- Drag waveform to change waveform displacement or
- Drag window control to change window position (such as numeric keyboard).
- Drag cursor to change cursor



Figure 9 Drag Gesture

### Drawing Rectangle

Open function guide and tap drawing rectangle icon to switch drawing rectangle mode. Drag finger on the screen to drawing rectangle as shown in Figure 10(a), 10(b). Move finger away from the screen, menu displayed on the screen, tap to select "Area A enable", "Area B enable", "Intersection", "Non-intersecting", "Source". Drag finger on the screen from bottom right up to top left to drawing the trigger area.

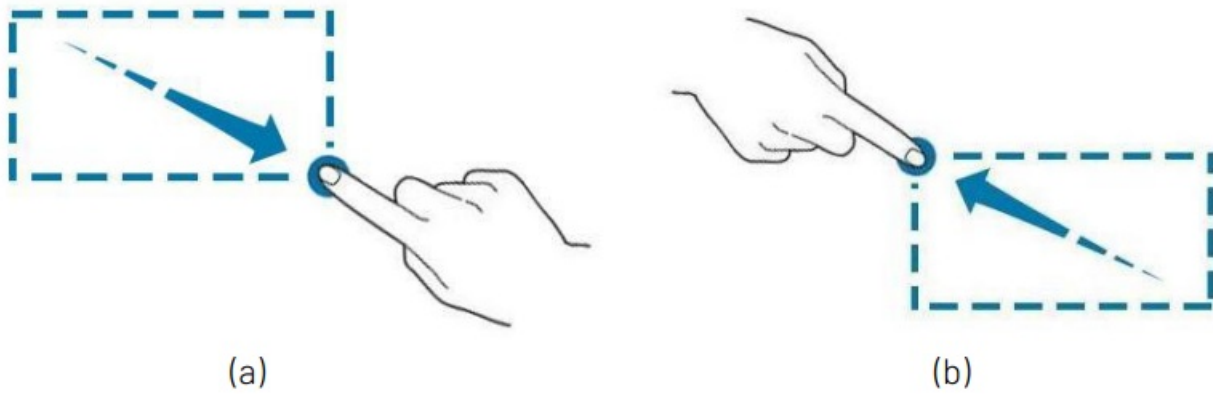


Figure 10 Drawing Rectangle Gesture


#### Select “Area A”:


- Drawing the area of trigger area A;
- Open trigger area A;
- Open “trigger area”

#### Select “Area B”:

- Drawing the area of trigger area B;
- Open trigger area B;
- Open “trigger area”

**Hints:** Press “drawing rectangle” icon to switch drawing rectangle and operating waveform mode. Press “drawing

rectangle” icon, if icon displays  , which presents the drawing rectangle mode is opened; press “drawing

rectangle” icon, if icon displays  , which presents the operating waveform mode is opened. Operating waveform mode of the oscilloscope is enabled by default.

#### Touch Shortcut Operating

Separate two fingers and meanwhile slide two fingers to one direction, this gesture can quickly turn on/off time measurement and voltage measurement cursor.

##### 1. Time measurement cursor

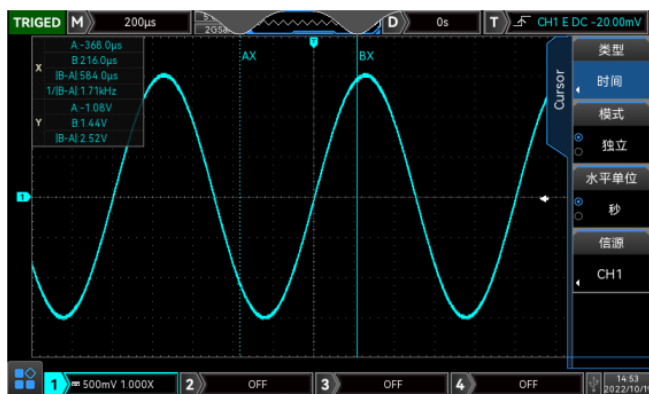
- Slide down in vertical to directly turn on time measurement cursor as shown in Figure 11 (a);
- Slide up in vertical to directly turn off time measurement cursor;

##### 2. Voltage measurement cursor

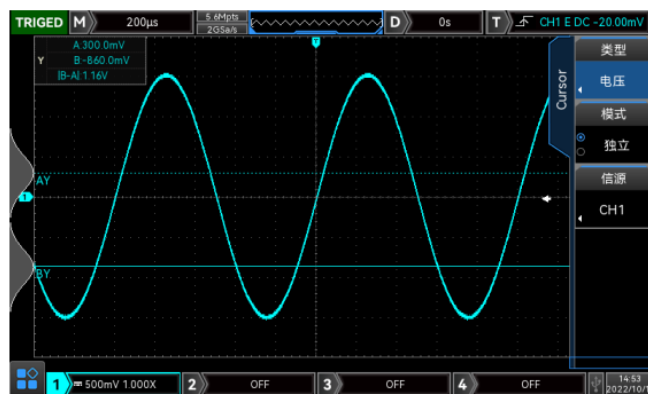
- Slide right in horizontal to directly turn on voltage measurement cursor as shown in Figure 11 (b);

#### Note

Turn on/off cursor requires that slide distance should be 3div.



(a)







(b)

Figure 11

## Operation Menu

Press any soft key to activate the corresponding menu; the following icon may be displayed on the menu.



	This symbol represents that multipurpose knob on the front panel can be used to select and adjust parameter.
	This symbol represents that there are several options.
	This symbol represents that there has next menu.
	This symbol represents that the menu has two options.
	This symbol represents that multipurpose knob and jog dial on the front panel can be used to adjust parameter.
	This symbol represents that numeric keypad on the front panel or touch to pop out numeric keyboard to input content.
	This symbol represents that the current page can be flipped up or down.
	Circle numbers represents the total pages of menu. Single page has no circle display, two pages or more have circle display. Use
	key to turn page.

## Remote Control

MSO/UPO2000 series digital phosphor oscilloscope communicates with the computer through USB interface and LAN interface to achieve remote control. Remote control is implemented based on the SCPI (Standard Commands for Programmable Instruments) command set.

MSO/UPO2000 series digital phosphor oscilloscope supports three remote control modes:

- a. User-defined programming
- b. Use PC software (instrument manager)

## Troubleshooting

1. When press the button, the oscilloscope is blank screen.
  - a. Check whether the power is correctly connected, power supply is normal or not.
  - b. Check whether the power switch is really turned on. The soft power switch button should light in green when the instrument is normal boot. And it should have relay sound.
  - c. If there is a relay sound, it indicates that the oscilloscope starts normally.  
Try the following steps: press the DEFAULT key, then press F1, if device returns to normal, it means backlight brightness is set too low.
  - d. After completing the above steps, restart the oscilloscope.
  - e. If the instrument still cannot work, please contact UNI-T.
2. After signal acquisition, signal of waveform does not appear on the screen.
  - a. Check whether BNC port is connected properly.
  - b. Check whether the signal output channel has turned on.
  - c. Check whether the input signal channel has turned on.
  - d. Check whether has DC displacement in signal of information source.
  - e. Plug out the input signal, check whether the baseline is in the screen range (if not, please perform auto-calibration.)
  - f. If the instrument still cannot work, please contact UNI-T.
3. The measured voltage amplitude value is 10 times larger or smaller than the actual value: Check the channel probe attenuation coefficient setting is consistent with the used probe attenuation rate.
4. **There is a waveform display but not stable**
  - a. Check the trigger source in the trigger menu and confirm that it matches the input channel of the actual signal.
  - b. Check the trigger type: general signal should use "Edge" trigger. The waveform can display stably only the proper trigger type is used.
  - c. Change the trigger coupling setting to high-frequency or low-frequency reject, in order to filter out the high-frequency or low-frequency noise that interferes with the trigger.
5. **No display after pressing Run/Stop button**
  - a. Check whether the mode at the trigger panel (TRIGGER) is on "Normal" or "Single" and whether the trigger level exceeds the waveform range.
  - b. If it exceeds set the trigger level to the middle or set the trigger mode to Auto.
  - c. Press AUTO button could automatically finish the above setting.
6. **Waveform refresh is very slow:**
  - a. Check whether the acquisition method is average and the average times are large.
  - b. Check whether the storage depth is the maximum.
  - c. Check whether the trigger release time is large.
  - d. Check whether the trigger is normal and the current time base is slow.
  - e. All the preceding causes slow refreshing of waveforms. Users can restore the factory settings so that the waveforms can be refreshed normally.

If the use of this product has caused any inconvenience, if you in mainland China, you can contact UNI-T company directly.

Service support: 8am to 5.30pm (UTC+8), Monday to Friday or via email. Our email address is

[infosh@unitrend.com.cn](mailto:infosh@unitrend.com.cn)

For product support outside mainland China, please contact your local UNI-T distributor or sales center.

Many UNI-T products have the option of extending the warranty and calibration period, please contact your local UNI-T dealer or sales center.

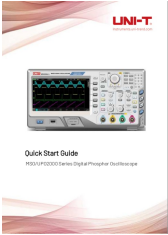
To obtain the address list of our service centers, please visit our website at URL: <http://www.unitrend.com>

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## Documents / Resources

	<p><a href="#">UNI-T MSO-UPO2000 Series Digital Phosphor Oscilloscope</a> [pdf] User Guide MSO-UPO2000 Series Digital Phosphor Oscilloscope, MSO-UPO2000 Series, Digital Phosphor Oscilloscope, Phosphor Oscilloscope, Oscilloscope</p>
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## References

-  [UNI-T Voltage Meter, Multimeter, Oscilloscope | UNI-T-UNI-T Voltage Meter, Multimeter, Oscilloscope | UNI-T](#)
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