DSO1511E+

HANDHELD OSCILLOSCOPE

BNC

GND

Auto

平均: 1.29V
频率: 1.00KHz 峰峰值: 2.77V 占空比: 50.0%
1 1.00V DC 1X T 200us

PROFESSIONAL

OK / AUTO

RUN / STOP

POWER / xKEY

▲
◄ ►
▼

s   ns

MENU

mV

V

OSCILLOSCOPE

LED   USB

Button Function

1.Normal function

OK/Auto	1.When the menu is opened, it acts as the "OK" function. 2.When the menu is not open, it acts as an "automatic" function.
Run/Stop	1.Short press once to stop sampling, click again to run. 2.Long press to open the square wave generator window.
Xkey/Power	1. Long press as a power on/off function. 2. Short press as a "multi-function" options.
s	Increase "time base".
ns	1. Reduce "time base". 2. When the menu is switched to "set", long press this button to enter the usb connection state.
V	Increase "vertical sensitivity".
mV	Reduce "vertical sensitivity".
Menu	Open or close the menu.
↕ ↔	Move waveform or switch menu.

2. Second function(Power + other buttons)

Power+OK (short press)	Press and hold Power and short press Ok to switch the trigger edge: rising or falling.
Power+OK (long press)	Press and hold Power and long press Ok to switch the trigger mode: auto or normal.
Power+Run	Switch trigger level: optional automatic adjustment or manual adjustment.
Power+s	Turn on/off "horizontal cursor"
Power+ns	Turn on/off "Vertical Cursor"
Power+V	Turn on/off "all measurements"
Power+mV	Select probe attenuation: 1X/10X/100X
Power+ Menu	Select coupling mode: DC/AC
Power+ ↕	Adjust the trigger level line.

About cursor:

Use the direction buttons to move cursor 1, hold down the Power button and click the direction buttons to move cursor 2.

About trigger level:

If you want to adjust the trigger level manually, you need to set the trigger level to "Manual" in the menu (you can also use Power+Run to quickly switch between manual/auto).

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1 Safety Precautions

Learn about the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid possible danger, be sure to use this product as specified.

- **Only authorized personnel should perform maintenance procedures.**

- **Avoid fire and personal injury。** Use the probe correctly and ensure that the measured voltage does not exceed the maximum withstand voltage.

- **Connect the probe correctly.** Before measuring voltage greater than 40V, please switch the probe to the 10X position first.

- **Charge the battery correctly.** The ideal charging voltage is 5V, and the highest cannot be higher than 6V.

- **Do not operate in a humid environment.**

- **Keep the surface of the product clean and dry.**

2 Probes

2.1 Probe calibration

!! The probes delivered with this machine have been compensated and do not need to be calibrated again. !! If you use another **new probe** before the first use, it must be calibrated before it can be used normally, otherwise the measurement will be inaccurate (only for the 10X/100X). The calibration method is as follows:

1. Switch the probe to 10X.

2. Connect the probe to a 1KHz square wave with an amplitude of about 3V. Note that the square wave must be standard without overshoot.

3. Adjust the horizontal and vertical scales of the oscilloscope so that the waveform is displayed stably at a suitable position on the screen.

4. Use a screwdriver to rotate the adjustable capacitor on the probe until you get the waveform in the middle of the figure below. The left and right waveforms below are references for incorrect calibration.
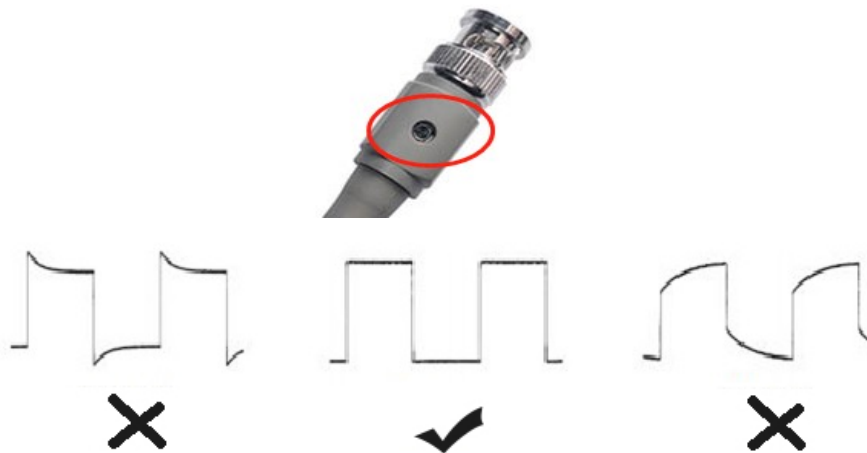

Figure1.1 Probe calibration

2.2 Probe bandwidth

Because the 1X probe has a large input capacitance, the bandwidth of the 1X is usually within 5MHz; while the bandwidth of the 10X is the standard bandwidth of the probe.

2.3 Probe withstand voltage

The maximum withstand voltage of the probe is generally marked on the probe,

which is usually 600Vpp.

2.4 Use tips

2.4.1 Large input capacitance

Because the probe 1X has a large input capacitance (usually more than 100 pf), it is not suitable for measuring some capacitively sensitive circuits. For example, when measuring a passive crystal of MCU, the large capacitor may cause the crystal to fail to vibrate. As for the output of a high-speed op amp, a capacitive load may cause the op amp to overshoot or oscillate. For circuits with large capacitances that are not suitable for measurement, please use 10X. The input capacitance of the 10X is usually several pf.

2.4.2 Measuring high voltage

The oscilloscope's measurement voltage range is -40V ~ + 40V (80Vpp). Please use the 10X probe to attenuate the signal by 10 times beyond this range. The measurable voltage range of 10X range is -300V ~ 300V (600Vpp). Please note that you must first switch the probe to the 10X position before connecting the high voltage signal, otherwise the high voltage may break down the internal circuit of the oscilloscope。

2.4.3 High bandwidth

Because the 1X probe has a large input capacitance, the bandwidth of the probe 1X is usually within 5MHz, so please use the 10X position when the measured signal bandwidth is greater than 5M.

Summary: **10X is usually used in most applications.**

# 3 Vertical system

3.1 Vertical sensitivity

Oscilloscope vertical sensitivity refers to the voltage represented by a grid in the vertical direction of the screen. There are 8 divisions in the vertical direction of the oscilloscope. You can estimate the amplitude of the signal by observing how many divisions the waveform occupies on the screen.

The scope's vertical sensitivity range is 10mV / div ~ 10V / div (1X range). In the oscilloscope button panel, the keys for adjusting the vertical sensitivity are **'mV'** and **'V'** button. Pressing the 'mV' button decreases the vertical sensitivity, which is used to measure signals with smaller voltage amplitude. Press the 'V' button to increase the vertical sensitivity for measuring signals with larger voltage amplitudes.

3.2 Vertical position

Adjust the vertical position of the waveform to make the waveform move up and down on the screen for easy observation. The method of adjusting the vertical position is as follows:

a)   In the main window, ensure that the arrow in the upper left corner of the screen is as shown below(Thick right arrow):
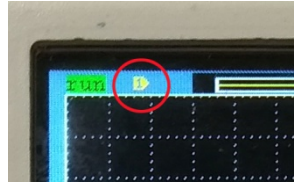
If it is not this arrow,long press the "**mV**" button to switch.

b)   Press the ↑ ↓ buttons to move the waveform up and down

4 Horizontal system

4.1 Time base

The time base refers to the time represented by each grid in the horizontal direction on the oscilloscope screen. There are 12 grids in the horizontal direction of the oscilloscope. The sampling time that can be observed on the screen = " time base" * 12.The user can estimate the signal period by observing how many grids a waveform period occupies. For example, the current time base is 500us, and one cycle of the signal occupies 2 grids,so the signal period is 1ms (1KHz).

The oscilloscope time base range is 5ns ~ 10s. The buttons for adjusting the time base in the oscilloscope button panel are '**ns**' and '**s**' button. When observing high-frequency signals, you should press the 'ns' button to decrease the time base. When observing low-frequency signals, you should press the 's' button Increase the base gear.

What you need to know is that the sampling process of the oscilloscope is:

"Sampling">>"Processing" >> "Display"

When adjusted to a large time base, the screen waveform refresh will be slow due to the longer time taken by the oscilloscope to sample the waveform. For example, if the user adjusts to the 50ms time base, that is, the entire sampling time is at least 50msx12 = 600ms, the oscilloscope waveform refresh speed is reduced to less than 2 frames of waveform per second, which is normal.

4.2 Horizontally moving waveform

In the stop mode, the user can move the waveform left and right.

5　Trigger system

About trigger

The oscilloscope will capture a frame of waveform only after the waveform meets the pre-set conditions. This action of capturing the waveform according to the conditions is the trigger.

What does trigger do?

1. Trigger can stabilize the waveform on the screen.
2. Capture the segment of the waveform you want to observe.

The trigger supported by the oscilloscope is edge trigger, including rising edge trigger and falling edge trigger.

5.1　Trigger level

In edge trigger mode, a trigger condition occurs only when the waveform crosses the trigger level. To adjust the trigger level:

1. Change "Trigger Level" to "Manual" in the menu.
2. **Method 1:**
   Press and hold the Power key, and then click the up and down direction buttons to adjust the trigger level.
   Method 2:(Not recommended)
   In the main window, make sure that the mark in the upper left corner of the screen is the trigger level arrow(Thin left arrow), as shown in the figure:

   If it is not this arrow, long press the "**mV**" button to switch.

   Press the ↑ ↓ buttons to move the trigger level up and down.

5.2　Trigger position

The default trigger position of the oscilloscope is in the middle of the screen. In

the running state, the user can move the trigger position by pressing the left and right buttons.。 The trigger position is shown on the screen as an arrow.

6 Operation Guide

6.1 POWER

In the shutdown state, long press the "POWER" button to turn on the machine, and then release the button when the screen is on.

In the power-on state, long press the "POWER" button to shut down(about 4 seconds), and release the button after the screen goes out.

6.2 Charging

The upper right corner of the oscilloscope displays the current remaining power. When the power is insufficient, use a USB cable to connect a 5V adapter for charging, and the charging current is about 700ma. The maximum charging voltage is 6V !!!

The LED on the bottom of the oscilloscope lights up during the charging process, and turns off when the battery is fully charged.

6.3 Vertical / Time base scale

Press the "mV" and "V" buttons to adjust the vertical sensitivity.
Press the "ns" and "s" buttons to adjust the time base.

6.4 Trigger Level

method 1:
Press and hold the Power key, and then click the up and down direction keys to adjust the trigger level.
Method 2: (not recommended)
Long press the "mV button, when the arrow is a thin leftward arrow, it means that the ↑ ↓ button can move the trigger level.

6.5 Auto

The auto function is a more common function in the oscilloscope. After the user presses the "Auto" button, the oscilloscope will automatically adjust the time base and vertical sensitivity so that the waveform is displayed in the middle of the screen.

Beginners can try to press the "Auto"button when they don't know how to adjust.

6.6 Run/stop

In the running state, click the "Run/Stop" button to stop the oscilloscope. After stopping, the oscilloscope no longer performs sampling, and the user can observe the last sampling data retained in the memory. Click the "Run/Stop" button in stop mode to make the oscilloscope enter the running state.

6.7 50%

The function of 50% in the oscilloscope is to return the waveform to the middle, including vertical offset, trigger position, and trigger level.

Operation method: Click the "xKey" button and select "50%".

6.8 Single

Single trigger means that after pressing the button, the oscilloscope samples a frame of waveform and then stops. That is, only one frame of waveform is acquired per click. It is important to note that there must be a trigger for this sampling. If there is no trigger, the oscilloscope displays "wait" in the upper left corner of the oscilloscope. This sampling is not completed until there is a waveform trigger.

Operation method: Click the "xKey" button and select "Single".

6.9 Reference waveform

The reference waveform is that the waveform of the previous frame is latched on the screen for display.

The reference waveform is useful for a single-channel oscilloscope. For example, when you want to compare the driving waveforms of two Mos-FETs, you can measure the waveform of one of the Mos-FET first, then latch the waveform on the screen, and then move the probe to measure Another Mos-FET, so that two driving waveforms can be displayed on the screen at the same time for easy comparison.

Operation method: Click the "xKey" button and select "REF"

6.10 Screenshot

Click the "xKey" button–> "Save" to capture the current screen.

6.11 View images

Click the "xKey" button–> "View" to enter the Image View window. In this window, the user can delete or browse historical screenshots.

Click the "Run/Stop" button to delete the current screenshots.

Click the "ok" button to zoom in on the waveform. After zooming in, click "ok" to return to the homepage.

Click the "Menu" button to return to the oscilloscope window.

6.12 Generator

Long press the "Run/Stop" button to open the window of the signal generator. The user can set the frequency and duty cycle of the output signal.

Click the "Run/Stop" button to reset the number to: 001.00KHz, 50%.

Click "ok " button to enter, the oscilloscope will output the corresponding waveform according to your settings

Note: When the frequency is greater than 1Mhz, at certain frequencies, the square wave will have small horizontal jitter.

6.13 Connect to PC

The screenshot pictures can be exported to a computer via a USB connection.

Operation method: Click "Menu" button to open the menu, switch to the "Set" menu, and then long press the "ns" button. At this time, connect the computer through the USB cable, and the computer will appear a U disk, which stores the user-stored waveform pictures.

If you want to return to the oscilloscope window, you need to disconnect the USB, and then **restart the machine**.

Serious warning:

1. This U disk is only for exporting pictures, please do not copy other files from the computer to the U disk.

6.14 Cursor

Hold down the Power button and then click the "s" button to turn on/off the horizontal cursor.

Press and hold the Power button and then click the "ns" button to turn on/off the vertical cursor.

Press the left and right direction buttons directly to move the horizontal cursor 1

Press and hold the Power button and then press the horizontal direction buttons to move the horizontal cursor 2. The same goes for the vertical cursor.

For the vertical cursor, the value of Y1 means: the voltage of the dotted line above. The value of Y2 means: the voltage of the dotted line below. dY=Y1-Y2 is the voltage difference between the two dotted lines.

7 Menu introduction

Click the "**Menu**" button to open / close the menu.

7.1 Channel

The channel menu includes two options, "Coupling" and "Probe".

The coupling method can be "DC coupling" and "AC coupling". DC coupling passes the signal directly. AC coupling is equivalent to series connection with the capacitor.

Probes are available in "1X" / "10X"/ "100X", this option corresponds to the oscilloscope probe. When the probe is switched to the 10X position, this option should be selected as "10X".

7.2 Measurement

There are 14 measurement options available, as shown below:

Frequency, Peak-to-Peak, Duty cycle, Amplitude, RMS, Average, Period, +Pulse width, -Pulse width, Max, Min,Top, Base, -Duty cycle.
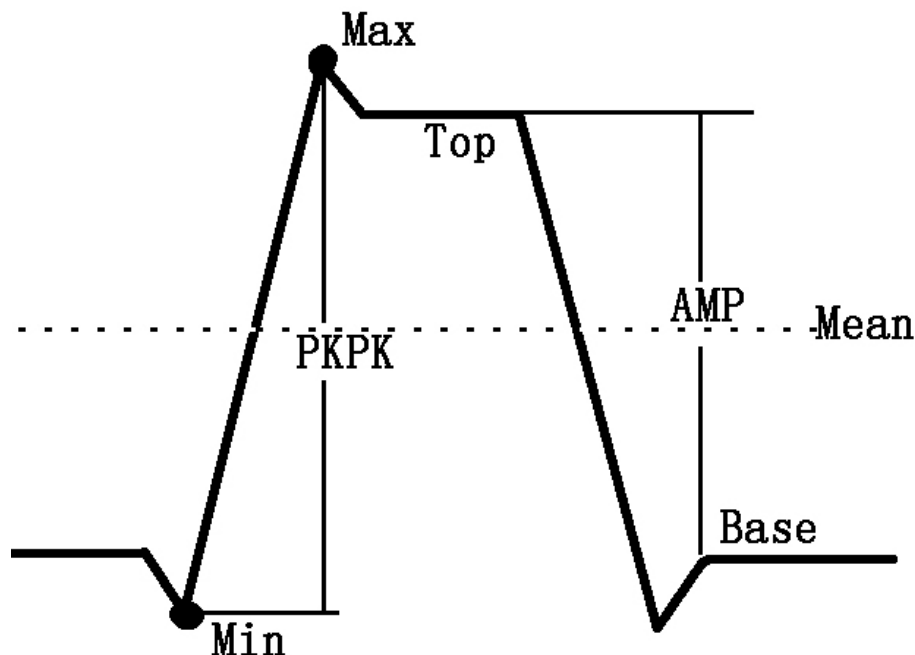
The difference between peak-to-peak and amplitude(AMP) is shown in the figure above.

7.3 Trigger

There are Three options in the trigger menu: "Trigger Mode" / "Trigger Type" and "Trigger level".

Trigger Mode can be selected from "Auto" and "Normal".

For "Auto" mode, if a waveform trigger is detected, the waveform signal will be used for triggering. At this time, the waveform can be displayed stably. If the oscilloscope cannot detect the trigger condition, it will automatically force the trigger to display the waveform, but because there is no suitable trigger condition, the waveform will not be displayed steadily.

For "Normal" mode, the oscilloscope will not refresh the display until a waveform trigger occurs. So there may be no waveform on the screen in this mode.

Trigger type includes rising and falling edges. Rising edge trigger means that the waveform crosses the trigger level line upward, and a trigger condition occurs.

Trigger level include "automatic" and "manual".

"Automatic" is suitable for novices. The oscilloscope detects the waveform position and amplitude and automatically sets the trigger level.

"Manual" is suitable for people who are familiar with the oscilloscope. <u>When using the "Single" function or the trigger mode is "Normal", you should use the "manual" option</u>. Under this option, the trigger level can be manually adjusted by the user.

7.4 Display

In this menu you can set persistence / roll mode and brightness.

"**Persistence**" is to make the historical waveform remain on the screen for a while and then disappear. Optional persistence options are: None, 1s, Infinite. When Infinity is selected, the waveforms that have appeared on the screen will remain forever and will not disappear.

"**roll**" is to display the waveform while sampling. Only when the time base is greater than or equal to 200ms will the roll mode be entered. If roll is turned off, the waveform will be displayed after one screen is sampled at any time base, resulting in a long time before the screen is refreshed for large time base.

7.5 Aux

There are two options of "Calibration" and "FFT" in the auxiliary menu.

The calibration option is used to calibrate the zero point of the oscilloscope. When the external temperature changes or the zero offset occurs due to aging, self-calibration is required. When the probe is removed, if there is a significant deviation between the waveform position and the zero arrow position, it indicates that calibration is required.

Please remove the probe and USB cable before calibration, and then click the "OK" button. The oscilloscope then starts self-calibration. Do not perform any operation on the oscilloscope until it is completed. After completing the calibration, restart the oscilloscope.

(Unless you confirm that the oscilloscope does have a large zero offset, calibration is generally not recommended)

After the FFT option is turned on, it can perform FFT calculation on the screen waveform and display the waveform after FFT. FFT display mode can be selected as: "logarithmic", linear and "music" (music spectrum).

7.6 Settings

1. In this menu, you can set whether to shut down automatically. If you choose to shut down automatically, the oscilloscope will automatically shut down 15 minutes after no button operation.
2. You can choose whether to turn on the sound.
3. Language selection: Chinese or English.
4. In this menu, long press the "ns" button to enter the usb connection state, long press "s" to change the background color of the measure.

Parameters

Model	DSO1511E+	Coupling	AC/DC
Channels	1	AUTO	Support
Screen size	2.4 inch	Measurement	14 types
Resolution	320*240	Precision of V	±2%
Bandwidth	120M	Reference	Support
Sampling rate	500M	Screenshot	Support
Rise time	<3ns	Frequency	±0.01%
Storage depth	128Kbit	Single	Support
Impedance	1M Ω	FFT	Support
Time base	5ns – 10s	Wave out	Support
Ver sensitivity	10mV/div-10V/div	50%	Support
Max voltae	±40V（x1） ±400V（x10）	Shell size	width*hight* thickness 73 mm *93 mm *32mm
Trigger mode	Auto/Normal	Language	CN/EN
Trigger type	rise/fall	Charging	MicUSB-5V-700mA
Display mode	YT / Roll		
Persistence	None/1s / ∞		