DM40 OSC & SIG User Manual

DM40

Revision History

Version	Date	Note
V1.0	2024/12/12	First Realse
V1.1	2025/09/18	Add Product Introduction and Appearance Descripion
V1.2	2025/12/11	Modify the peak-to-peak value and duty cycle UIof the signal generator

Notices

1、 Attention for high-voltage measurement:
  1. Set the probe to the X10 position.
  2. Set the oscilloscope probe ratio to X10.
  3. Do not connect USB (Use pure battery power).
  4. Do not touch any metal parts of the oscilloscope or probe with your hands.
Please strictly abide by the above attention during the measurement. Otherwise, our company will not be responsible for any safety issues or accidents caused thereby!!

2、 Due to the difference in the size of the MCX pin of the alligator clip and the oscilloscope probe (the inner pin of the alligator clip is larger), please do not attach the alligator clip to the CHA/CHB for use. The alligator clip is only used at the OUT channel (waveform output), so as to avoid the use of the alligator clip with the large MCX hole of the oscilloscope analog channel, resulting in poor contact of the oscilloscope probe.

3、 When the contact between the oscilloscope probe and the oscilloscope is loose/bad, you can use fingernail/forceps to push the 6 reeds of the outer ring of the probe MCX seat slightly out (do not dial too much, otherwise it can not be inserted) to increase the contact pressure and restore the contact well.

0，Product Introduction

  The DM40 digital multimeter is the first high-performance 3-in-1 multimeter launched by Guangzhou Xingyi Electronic Technology Co., Ltd. Its main features are as follows:

① Integrated multimeter, oscilloscope, and signal generator, featuring comprehensive functions and convenient measurement.

② Equipped with a 3.5-inch 480*320 IPS capacitive touchscreen, providing delicate display and convenient interaction.

③ 4-5/6 multimeter with a count of up to 60000 (C version), TRMS true RMS measurement, precise and reliable.

④ Automatic mV/V range and innovative uA/mA/A range design for quick and efficient measurement.

⑤ AC+DC mixed measurement (B/C versions), no signal escapes detection.

⑥ Super diode measurement with multi-segment beep design, quick response, and support for resistance (<1K Ω) measurement.

⑦ Supports resistance, capacitance, continuity, frequency, temperature, and other measurements.

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⑧ Supports manual (V/A/Ω)/automatic range, REL relative measurement, extreme value measurement, data hold.

⑨ Supports trend chart display for efficient data analysis with 3 adjustable time bases.

⑩ Oscilloscope with 50MSa/s sampling rate, 10MHz bandwidth, and 10-bit vertical resolution.

⑪ Oscilloscope supports multiple trigger modes and types, as well as FFT and ABS operations.

⑫ Signal generator supports sine wave, sawtooth wave, triangle wave, and square wave up to 10MHz.

DM40 Basic Parameters:

Basic Information	
Model	DM40A、DM40B、DM40C
Screen	3.5' (480*320) IPS Touchscreen
Battery Life	≈12H(Multimeter) ≈10H(Oscilloscope)
Dimensions	142 * 83 * 28mm
Weight	≈260g
Interface	USB TypeC/MCX Socket/Banana Jack Socket
Conditions	Temperature 0~40℃、Humidity <75%

Table 1.0   DM40 Basic information

DM40 Oscilloscope Technical Parameters:

Oscilloscope Technical Parameters			
Sample Rate	50MSa/S	Input lmpedance	1MΩ
Bandwidth	10Mhz	Timebase Mode	YT/ROLL
Memory Depth	64Kpts	Sweep Mode	Auto/Normal/Single
Time Scale	100ns~50s	Trigger Type	Rising/Falling
Vertical Scale	10mV~10V /div(X1)	Persistence	OFF /Min/1S/∞
Resolution	10bit	Math	FFT/ABS
Coupling	AC、DC	Measurement items	20 types
Waveform Capture Rate	150 wfms/s		

Table 1.1 Oscilloscope Technical Parameters

DM40 Signal Generator Technical Parameters:

Signal generator Technical Parameters				
Wave out	Sine Wave	Sawtooth Wave	Triangle Wave	Square Wave

Frequency	1Hz~50KHz		100KHz~10MHz
Amplitude	0.5V~3.0Vpp		3.0Vpp
Duty	Not Adjustable	0~100%	Not Adjustable

Table 1.2 Signal Generator Technical Parameters

DM40 Adjustable MCX Probe Parameters:

Adjustable MCX Probe Parameters				
Attenuation Ratio	Bandwidth	Input Impedance	Input Capacitance	Maximum Voltage
X1	20MHz	1MΩ±2%	50pF±20pF	40VRMS CATⅡ
X10	140MHz	10MΩ±2%	15pF±5pF	400VRMS CATⅡ

Table 1.3 Adjustable MCX Probe Parameters
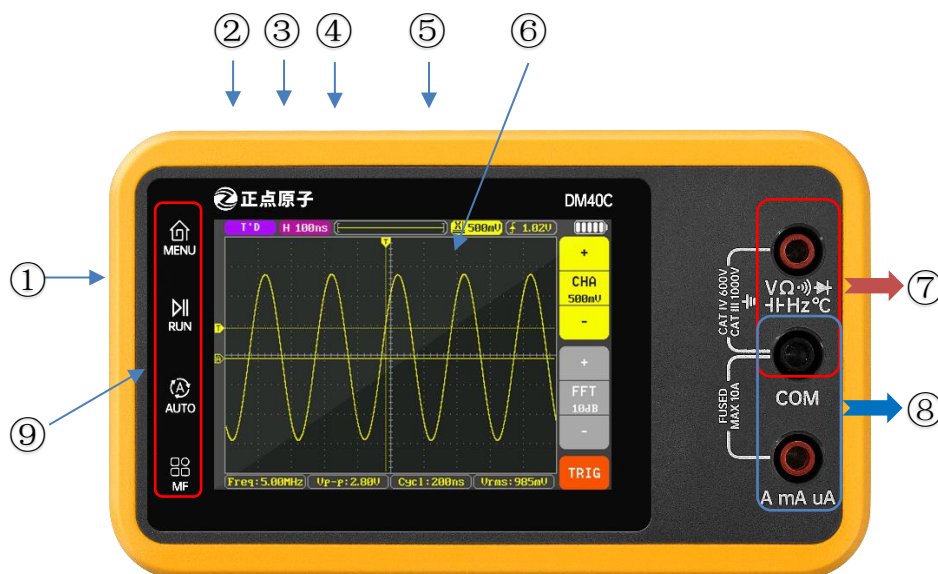
1， Quick Start

1.1 Appearance Description

图 2.1.1 DM40 Appearance

Description

① Power Button (Long press to turn on/off, double-click to lock/unlock touch)

② TypeC Port (For charging and USB communication, input voltage <5.2V)

③ Charging Indicator (Blue light when charging, off when fully charged)

④ MCX Signal Generator Port

⑤ MCX Oscilloscope Port

⑥ 3.5" (480*320) IPS Touchscreen

⑦ Voltage, Resistance, Capacitance, Continuity, Diode, Frequency, Temperature Measurement Ports (Black COM is common)

⑧ Current Measurement Port (Black COM is common)

⑨ Multi-function Touch Buttons (MENU, RUN, AUTO, MF)

1.2，Oscilloscope UI
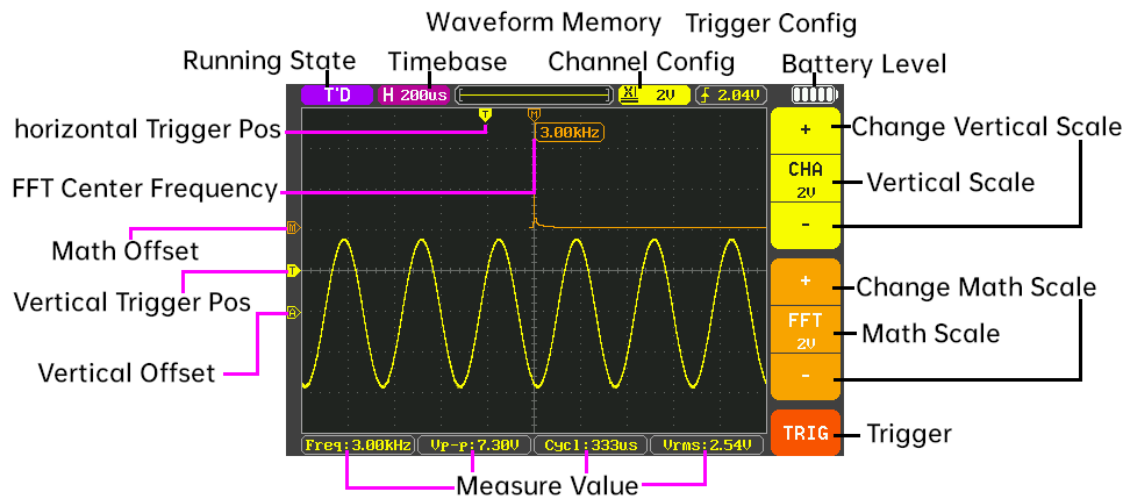

1.3，Signal Generator UI
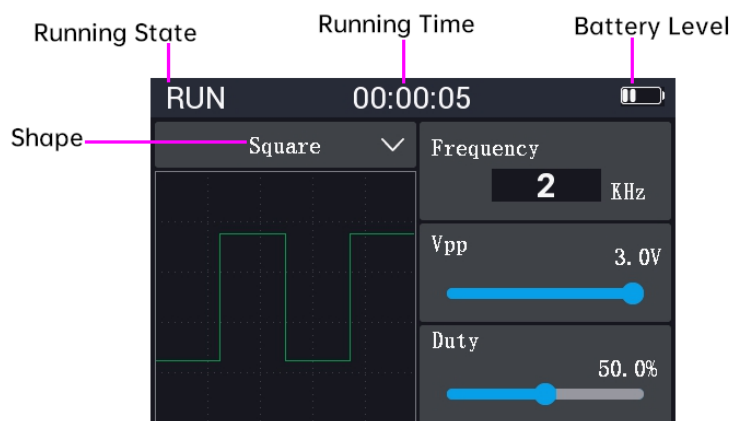
1.4，Functional Inspection

1、 Connect the probe to the alligator clip, and then connect the probe to the analog channel, and the alligator clip is connected to the output interface of signal generator.

2、 Set the probe to X10, note that this is the X10 and X1 selector switch on the probe, not the oscilloscope probe ratio setting.

3、 Set the output waveform in the oscilloscope, the peak-to-peak value is 3.0V, the type is square wave, and the frequency is 1kHz. Refer to the section " Signal Generator" for setting.

4、 Press the key AUTO of the oscilloscope and the input waveform will be automatically display properly.

5、 Observe the waveform on the display screen of the oscilloscope, normally as shown in the figure below.
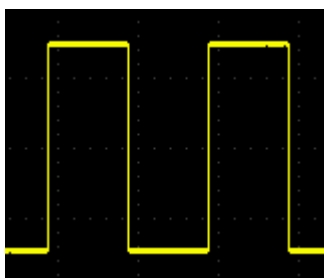
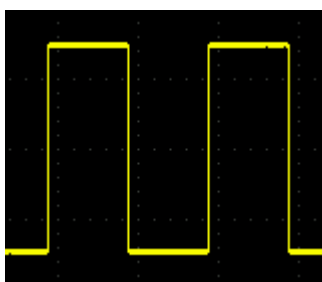## 1.5，Probe Compensation

When the probe is used for the first time, if the probe can compensate (such as P6100), you should compensate the probes to make them match the input channels of the oscilloscope.
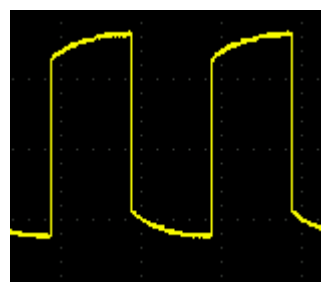
1、Perform the steps in the previous section, and the waveform obtained is compared with the below.
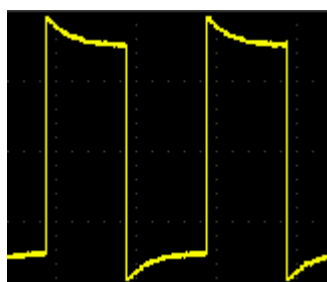
Over compensated   Perfectly compensated   Under compensated

2、Adjust the compensation place until the displayed waveform "Perfectly compensated" as shown above.

2，Vertical System

2.1，Channel Coupling

Descriptions are shown in the following table:

Coupling Mode	Note
DC	The DC and AC components of the signal under test can both pass the channel.
AC	The DC components of the signal under test are blocked

The channel label on the top-right is displayed, as shown in the figure below:

DC   AC

Refer to the following figure to set the following steps：

1、 Click the "Vertical Scale" button.

2、 Select the "coupling" on the pop-up page.

3、 Set coupling mode.
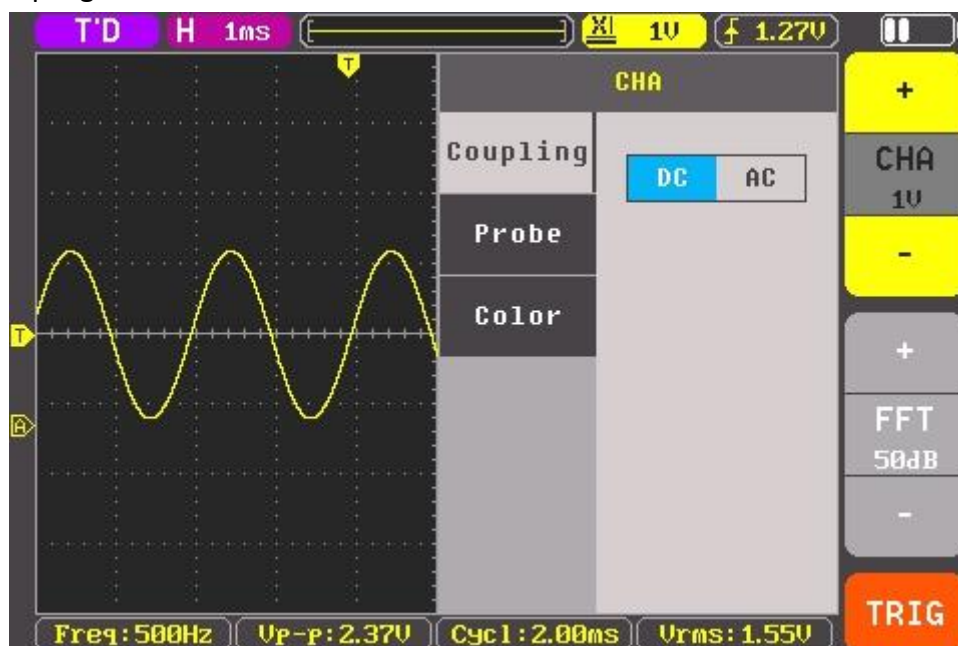
2.2，Probe Ratio

Probe ratio as shown in the table below:

probe	display amplitude of the signal: actual amplitude of the signal
X0.1	0.1:1
X0.2	0.2:1
X0.5	0.5:1

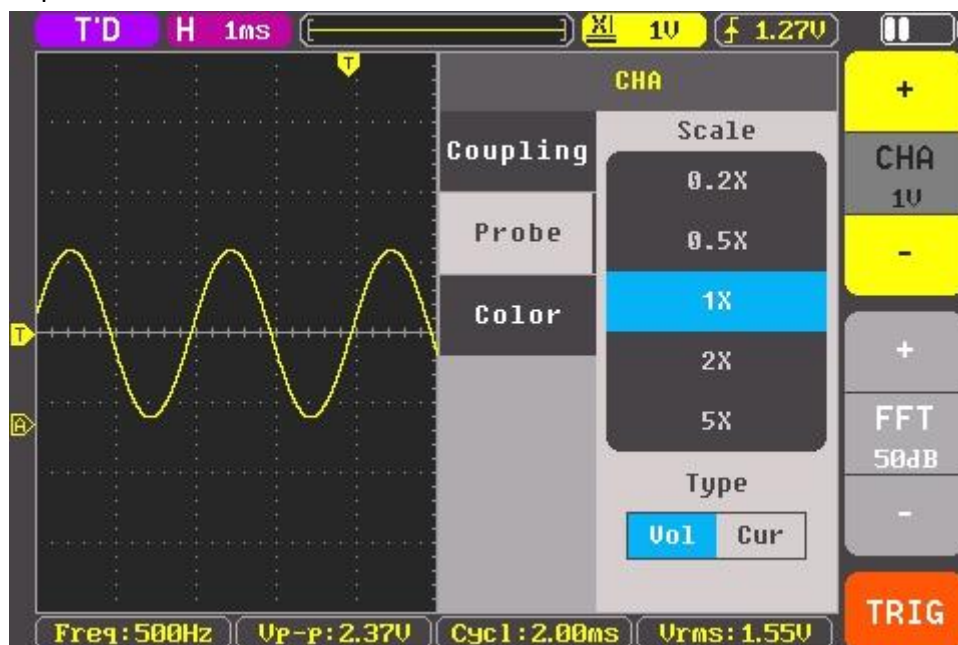| X1（default）	1:1
X2	2:1
X5	5:1
X10	10:1
X20	20:1
X50	50:1
X100	100:1
X200	200:1
X500	500:1
X1000	1000:1

Refer to the following figure to set the following steps：

1、 Click the "Vertical Scale" button.

2、 Select the "Probe" on the pop-up page.

3、 Set probe ratio.

2.3，Probe Type

Refer to the picture in the previous section. The setting steps are as follows:

1、 Click the "Vertical Scale" button.

2、Select the "Probe" on the pop-up page.

3、Set probe type.

2.4，Vertical Scale

Vertical scale indicates the voltage value per grid in the vertical axis of the screen. It is often expressed in V/div. While you adjust the vertical scale, the display amplitude

of the waveform would enlarge or reduce. At the same time, the information of the label on the upper-right of the screen will also change in real time, as shown in the figure below:

The adjustable range of the vertical scale is related to the currently set probe ratio. By default, the probe ratio is X1. The adjustable range of the vertical scale is from 10mV/div to 10 V/div.

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:
1、Click the "Change Vertical Scale" button to set the required scale.

2.5，Vertical Offset

Vertical offset indicates the offset of the signal ground level position of the waveform from the screen center in the vertical direction. When adjusting the vertical offset, the waveforms of the corresponding channel move up and down.

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:
1、 Click the " Vertical Offset" nonius to select the vertical offset.
2、 Use a single finger to slide up and down the waveform area to set the corresponding offset.

3，Horizontal System

3.1，Horizontal Timebase

Horizontal timebase, also called the horizontal scale, refers to the time of each grid in the horizontal direction of the screen. It is usually expressed in s/div. The label on the upper-left of the screen will display the timebase in real time, as shown in the figure below:

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:
1、Click on the waveform area, click on the left side to increase the time gear, and click on the right side to decrease the time gear.

4，Sample System

4.1，Timebase Mode

DM40 supports two available timebase modes, as shown in the table below.

Timebase Mode	Note
YT mode	In this mode, the Y axis represents voltage, and the X axis represents time. (Timebase range is 1s to 100ns)
ROLL mode	In this mode, the waveform scrolls from right to left to update the display,and the trigger function is invalid. (Timebase range is 50s to 200ms)

Refer to the following figure to set the following steps：
1、 Press the MF key to pop up the menu.
2、 Click the "Display" page.
3.、Set the "Roll" option.
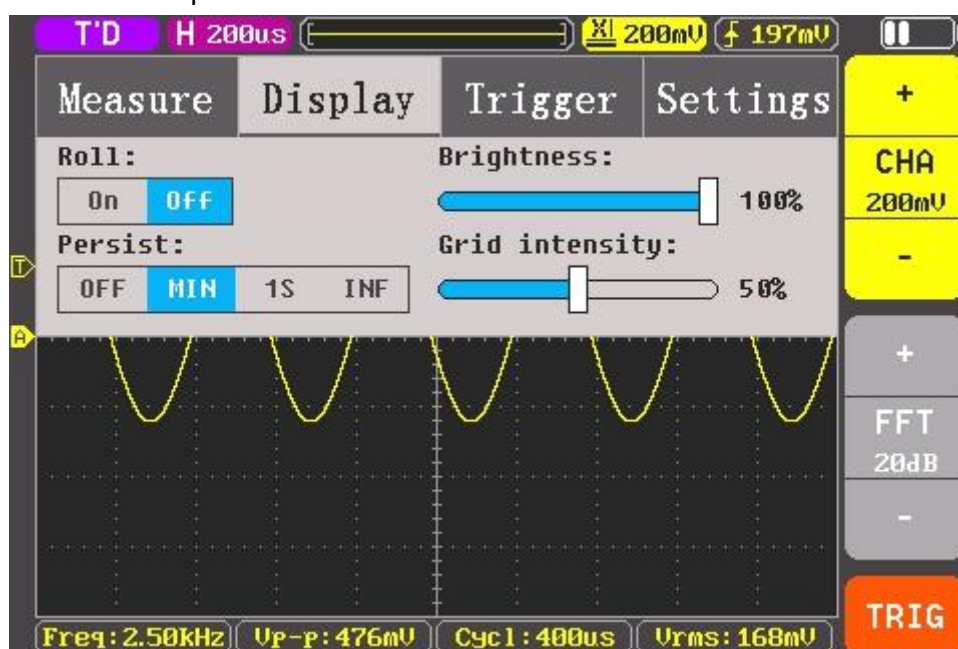
4.2，Sampling Mode

DM40 only supports the real-time sampling mode. In this mode, the oscilloscope produces the waveform display from samples collected during one trigger event.

4.3，Sample Rate And Memory Depth

Sampling is the process of converting the analog signal into the digital signal at a specified time interval and then restoring them in sequence. The sample rate is the reciprocal of the time interval.

The maximum real-time sample rate of DM40 is 50MSa/s.
Memory depth refers to the number of points of the oscilloscope that can store in one trigger acquisition. It reflects the storage capability of the acquisition storage. This oscilloscope is equipped with memory depth of up to 64Kpts. The relationship between timebase, sampling rate and memory depth is as follows.

The situation in AUTO trigger mode of YT mode is shown in the table below:

Timebase	Sampling Rate	Memory Depth
100ns	50MSa/S	50pts
200ns	50MSa/S	100pts
500ns	50MSa/S	250pts
1us	50MSa/S	500pts
2us	50MSa/S	1Kpts
5us	50MSa/S	2.5Kpts
10us	50MSa/S	5Kpts
20us	50MSa/S	10Kpts
50us	50MSa/S	25Kpts
100us	50MSa/S	50Kpts
200us	25MSa/S	50Kpts
500us	10MSa/S	50Kpts
1ms	5MSa/S	50Kpts
2ms	2.5MSa/S	50Kpts
5ms	1MSa/S	50Kpts
10ms	500K Sa/S	50Kpts
20ms	250KSa/S	50Kpts
50ms	100KSa/S	50Kpts
100ms	50KSa/S	50Kpts
200ms	25KSa/S	50Kpts
500ms	10KSa/S	50Kpts
1s	5KSa/S	50Kpts

The situation in NORMAL trigger mode of YT mode is shown in the table below:

Timebase	Sampling Rate	Memory Depth
100ns	50MSa/S	50pts
200ns	50MSa/S	100pts

500ns	50MSa/S	250pts
1us	50MSa/S	500pts
2us	50MSa/S	1Kpts
5us	50MSa/S	2.5Kpts
10us	50MSa/S	5Kpts
20us	50MSa/S	10Kpts
50us	50MSa/S	25Kpts
100us	25MSa/S	25Kpts
200us	12.5MSa/S	25Kpts
500us	5MSa/S	25Kpts
1ms	2.5MSa/S	25Kpts
2ms	1.25MSa/S	25Kpts
5ms	500KSa/S	25Kpts
10ms	250KSa/S	25Kpts
20ms	125KSa/S	25Kpts
50ms	50KSa/S	25Kpts
100ms	25KSa/S	25Kpts
200ms	12.5KSa/S	25Kpts
500ms	5KSa/S	25Kpts
1s	2.5KSa/S	25Kpts

The situation in SINGLE trigger mode of YT mode is described as below:

Sampling rate is the same as AUTO trigger mode. The memory depth is 64Kpts .

The situation in ROLL mode of single channel is described as below:

The memory depth is 64Kpts.

In timebase range is 200ms to 1s, sampling rate is the same as in the AUTO trigger mode in YT mode.

The situation in timebase range is 2s to 50s, is shown in the table below:

Timebase	Sampling Rate
2s	2.5KSa/S
5s	1KSa/S
10s	500Sa/S
20s	250Sa/S
50s	100Sa/S

5，Trigger System

As for trigger, you set certain trigger condition according to the requirement and when a waveform in the waveform stream meets this condition, the oscilloscope captures this waveform as well as the neighboring part, and displays them on the screen. For the digital oscilloscope, it samples waveform continuously no matter whether it is stably triggered, but only stable trigger can be stably displayed. The trigger system ensures that every timebase sweep or acquisition starts from the user-defined trigger condition, namely every sweep is synchronous with the acquisition and the waveforms acquired is overlapped so as to display the stable waveforms

5.1，Trigger Mode

The following figure is the schematic diagram of the acquisition memory. In order to easily understand the trigger event, we classify the acquisition memory into the pre-trigger buffer and post-trigger buffer.

Trigger Position

| Pre-trigger Buffer | Post-trigger Buffer |

Acquisition Memory
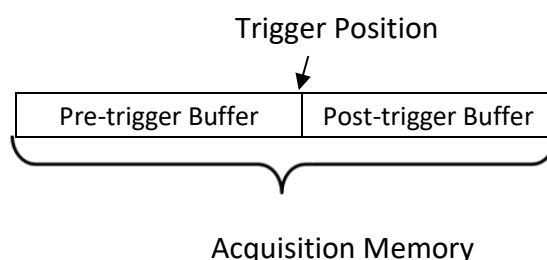
After sampling begins, the oscilloscope will first fill the pre-trigger buffer. After filling, the oscilloscope will start the search trigger, and during the search, the sampled data will continue to be transferred to the pre-trigger buffer (new data will constantly overwrite existing data). When a trigger is found, the pre-trigger store will contain the sampled data before the trigger. The oscilloscope will then fill the post-trigger buffer and display the data from the acquisition memory.

The trigger mode of DM40 is described in the following table:

Trigger Mode	Note
AUTO	In this trigger mode, if the specified trigger condition is not found within a certain period of time, the oscilloscope will force triggering and collecting to display the waveform.
NORMAL	In this trigger mode, the oscilloscope will trigger and collect once only when the specified trigger condition is found.
SINGLE	In this trigger mode, the oscilloscope will trigger and collect once only when the specified trigger condition is found. And then stop sampling.

Refer to the following figure to set the following steps：

1、 Click the "Trigger" button.

2、 Set the trigger mode.
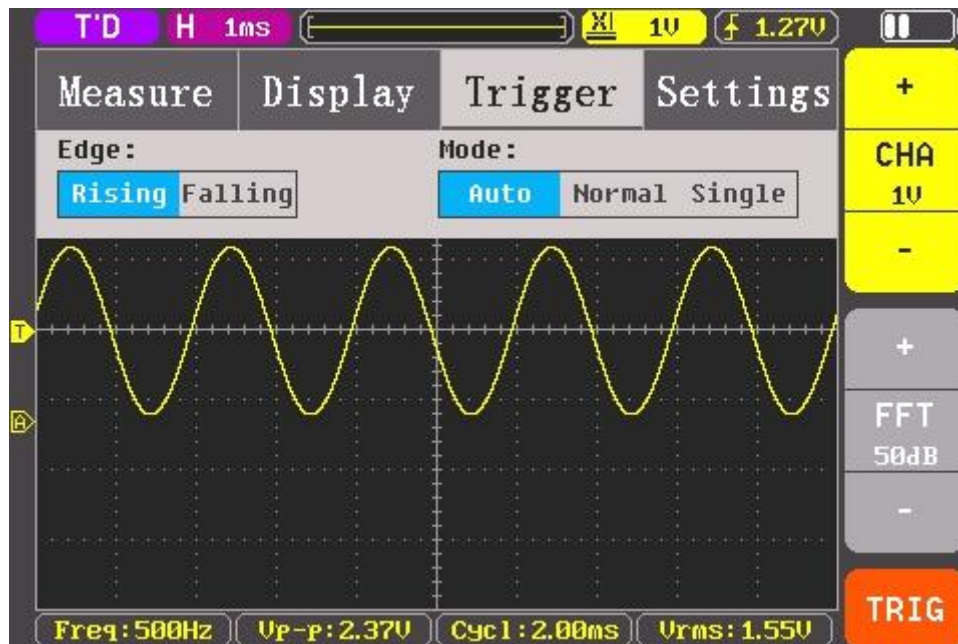
5.2，Trigger Edge

Refer to the picture in the previous section. The setting steps are as follows:

1、 Click the "Trigger" button.

2、Set the trigger edge.

5.3，Vertical Trigger Position

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:

1、 Click the " Vertical Trigger Pos" nonius to select the vertical trigger.

2、 Use a single finger to slide up and down in the waveform area to set the corresponding trigger position.

5.4，Horizontal Trigger Position

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:

1、 Click the " Horizontal Trigger Pos" nonius to select the horizontal trigger.

2、Use a single finger to slide left and right in the waveform area to set the corresponding trigger position.

6，Operations and Measurements

DM40 can perform math operations, auto measurements, and cursor measurements on sampled and displayed data.

6.1，Measurements Setting

Refer to the following figure to set the following steps：

1、 Press the MF key to pop up the menu.
2、 Click the "Measure" page.
3、 Set the required measurement items, up to 4 items.
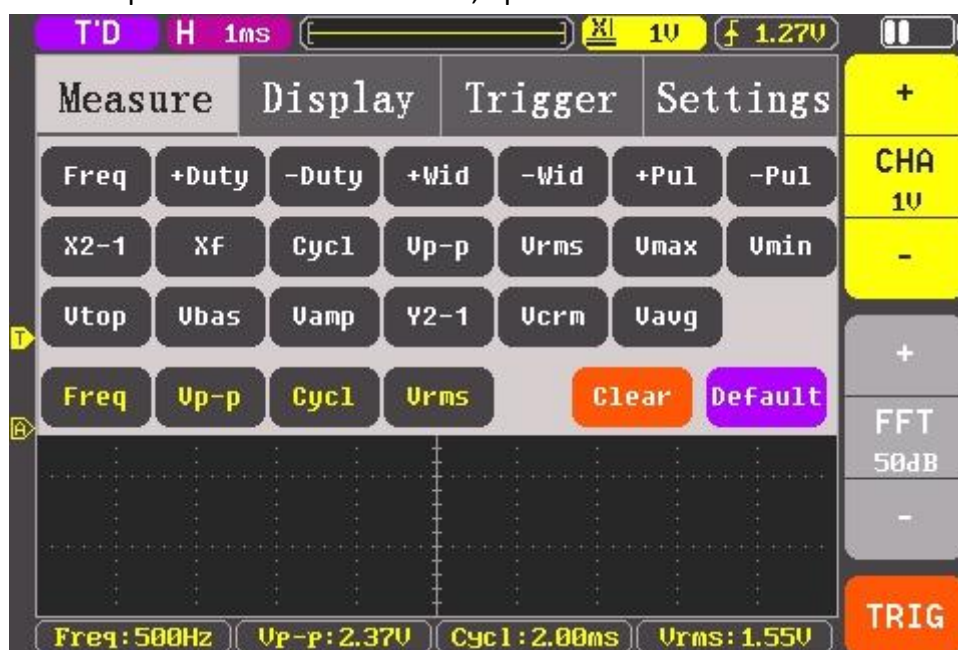
6.2，Measurement Parameter

Note: Only the signal displayed on the screen is calculated, not the total memory depth.

Horizontal measurement parameters are described in the table below:

Parameter	Note
Freq	Frequency
Cycl	Cycle（1/Freq）
+Duty	Positive duty cycle (average positive duty cycle for all periods)
+Wid	Positive pulse width (average of positive pulse width for all cycles)
+Pul	Positive pulse count
-Duty	Negative duty cycle (average of negative duty cycle for all periods)
-Wid	Negative pulse width (average of negative pulse width for all cycles)
-Pul	Negative pulse count
X2-1	The time of cursor X2 minus cursor X1

| Xf | The frequency between cursor X2 and cursor X1 |

Vertical measurement parameters are described as follows:

Parameter	Note
Vavg	Average value
Vrms	Root-mean-square value
Vcrm	Root-mean-square value of period (point less than one cycle, not calculated)
Vmax	Maximum value
Vmin	Minimum value
Vp-p	Peak-to-peak value(Vmax – Vmin)
Vtop	Top value(The value with the highest probability between (Vmax – 0.3*Vp-p) to Vmax)
Vbas	Base value(The value with the highest probability between Vmin to (Vmin + 0.3*Vp-p))
Vamp	Amplitude value(Vtop – Vbas)
Y2-1	The value of cursor Y2 minus cursor Y1

6.3，Cursor Measurement

Cursor measurement can measure the X-axis values (e.g Time) and Y-axis values (e.g. Voltage) of the selected waveform.

6.3.1，X Cursor

Refer to the picture in the "Oscilloscope UI" section and measurements Settings. The setting steps are as follows:
1、 Measurement value select "X2-1" or "Xf".
2、 Click the corresponding cursor and select it.
3、 Use a single finger to slide left and right the waveform area to set the corresponding value.

6.3.2，Y Cursor

Refer to the picture in the "Oscilloscope UI" section and measurements Settings. The setting steps are as follows:
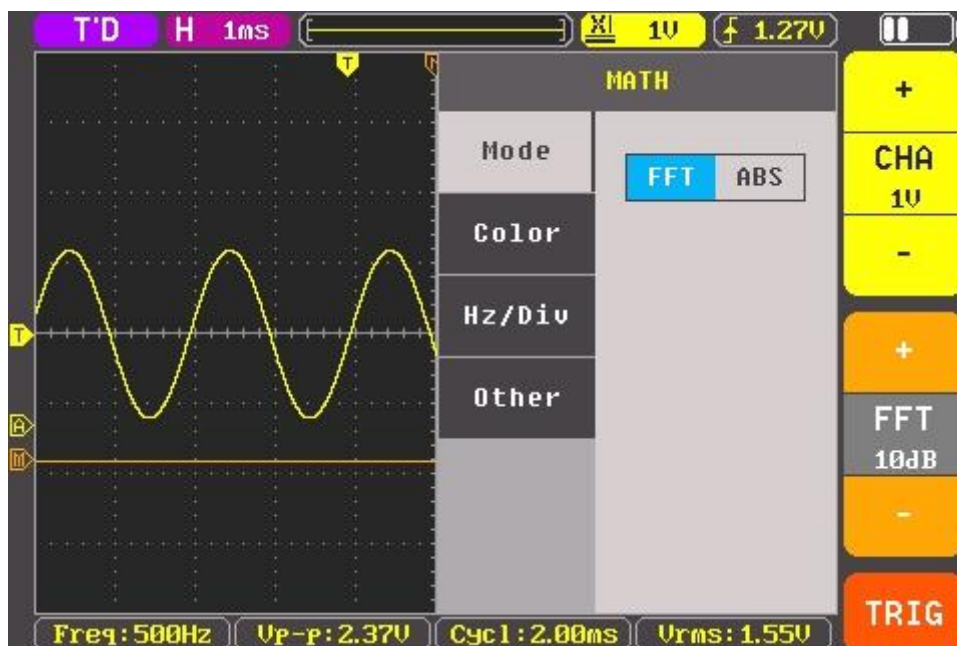4、 Measurement value select "Y2-1".
5、 Click the corresponding cursor and select it.
6、 Use a single finger to slide up and down the waveform area to set the corresponding value.

6.4，Abs

6.4.1，Function Settings

Refer to the following figure to set the following steps：
1、 Click the "Math Scale" button.
2、 Select the "Mode" on the pop-up page.
3、 Set the "ABS".

6.4.2，Gear Settings

Refer to the picture in the "Oscilloscope UI" section. The setting steps are as follows:
1、Click the "Change Math Scale" buttons to adjust to the desired gear.

6.5，FFT

FFT (Fast Fourier Transform) is used to transform time-domain signals to frequency-domain components (frequency spectrum). FFT counts up to 1000 points. When less than 1000 points, the missing part is zeroed. The logarithm calculation formula is 20lg(VRMS), that is, calculate the logarithm base 10 of the Root-mean-square value of the corresponding frequency point, and then multiply by 20.

6.5.1，Function Settings

Refer to the following figure to set the following steps：

1、 Click the "Math Scale" button.

2、 Select the "Mode" on the pop-up page.
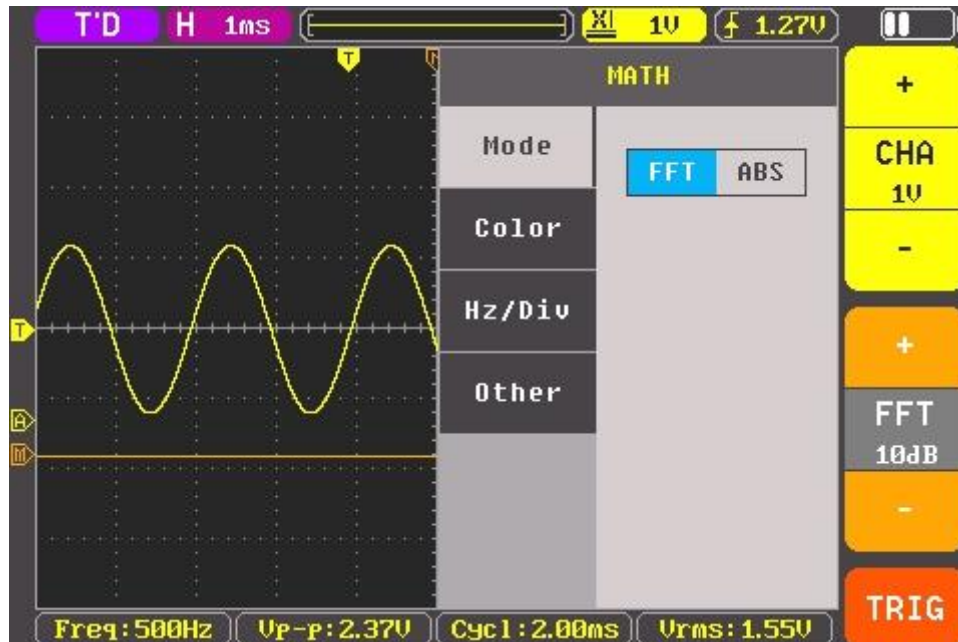
3、Set the "FFT".

6.5.2，Horizontal Gear
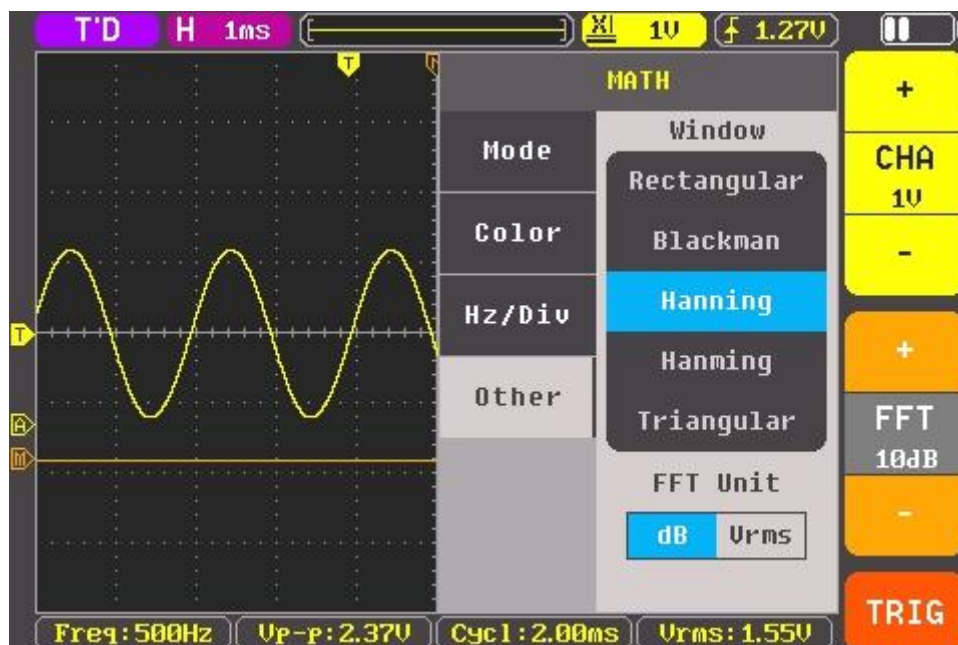
Refer to the following figure to set the following steps：

1、 Click the "Math Scale" button.

2、 Select the "Hz/Div" on the pop-up page.

3、 Set the gear.
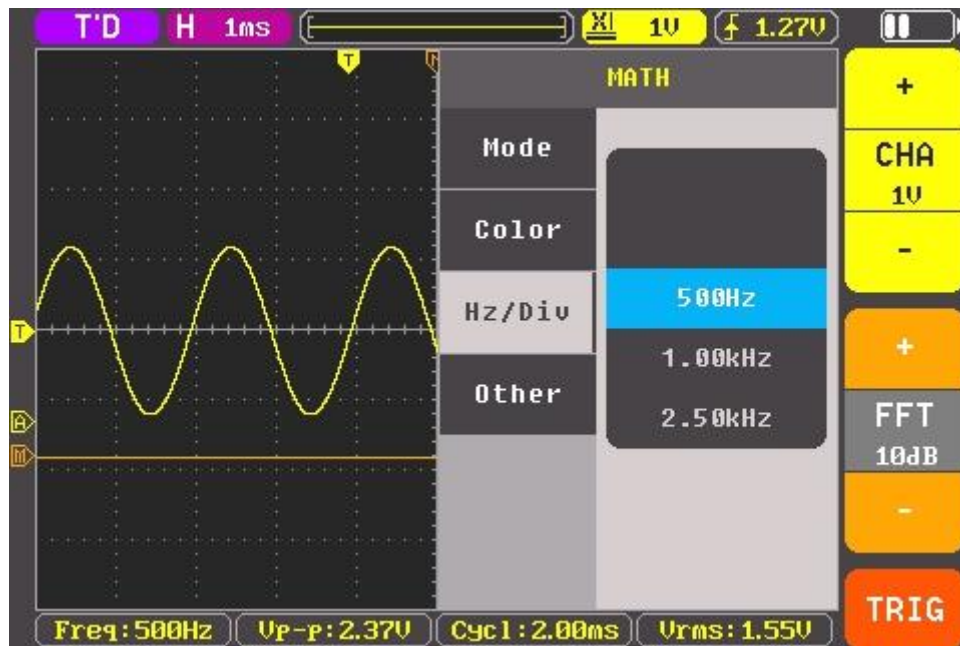
6.5.3，Window
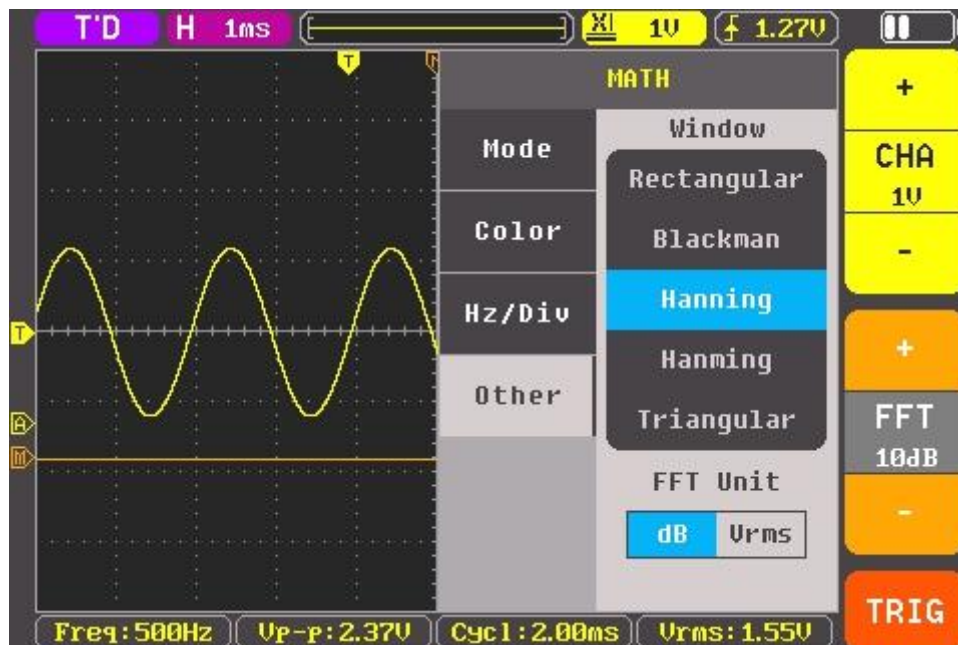
Refer to the following figure to set the following steps：

1、 Click the "Math Scale" button.

2、 Select the "Other" on the pop-up page.

3、 Set the "window".

6.5.4，Unit

Refer to the following figure to set the following steps：

1、 Click the "Math Scale" button.

2、 Select the "Other" on the pop-up page.

3、Set the "FFT Unit".

7，Waveform Storage

DM40 has 16M flash, support to save the collected waveform, you can choose to save "bmp" format or "csv" format. When you save the waveform in "csv" format, you need to pause sampling first.

Refer to the following figure to set the following steps：

1、 Press the MF key to pop up the menu.
2、 Click the "Settings" page.
3、 Click the corresponding button as needed.
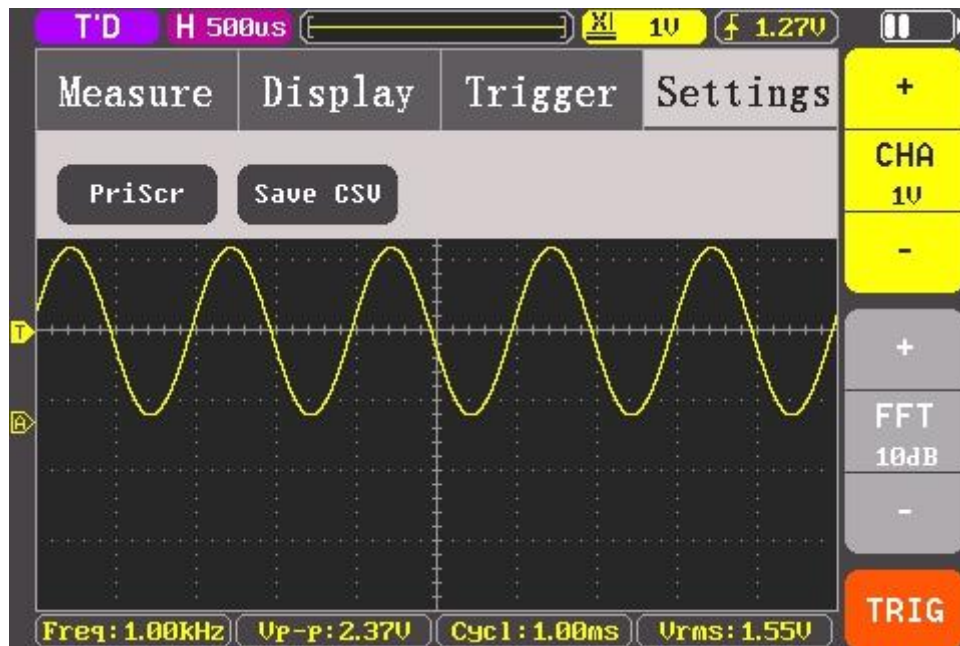
8，Waveform Generator

The DM40 has a built-in waveform generator. The output signal has a DC offset of the half of the peak-to-peak value. Note that the signal is only output at the Oscilloscope UI and Signal Generator UI.

Wave Shape: Sine, Square, Sawtooth, Triangle.
Frequency: Minimum 1Hz, maximum 50 kHz. Square wave also supports 100K, 200K, 500K, 1M, 2M, 5M and 10M frequency points.
Duty: When the square wave is less than or equal to 50kHz, the duty cycle can be set.
Peak-to-peak value: When the frequency is less than or equal to 50kHz, peak-to-peak value setting is supported.

8.1，To Enable or Disable

Modification steps：
1、 Press the RUN key to change.

8.2，Shape
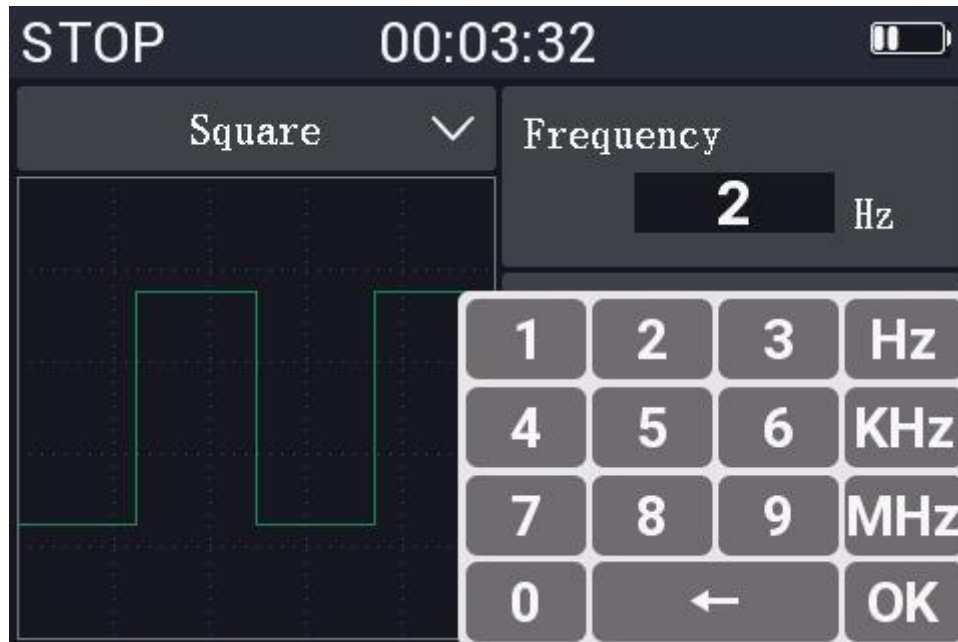
Refer to the following figure to set the following steps：
1、 Click the shape item.
2、 Select the required waveform in the pop-up page.
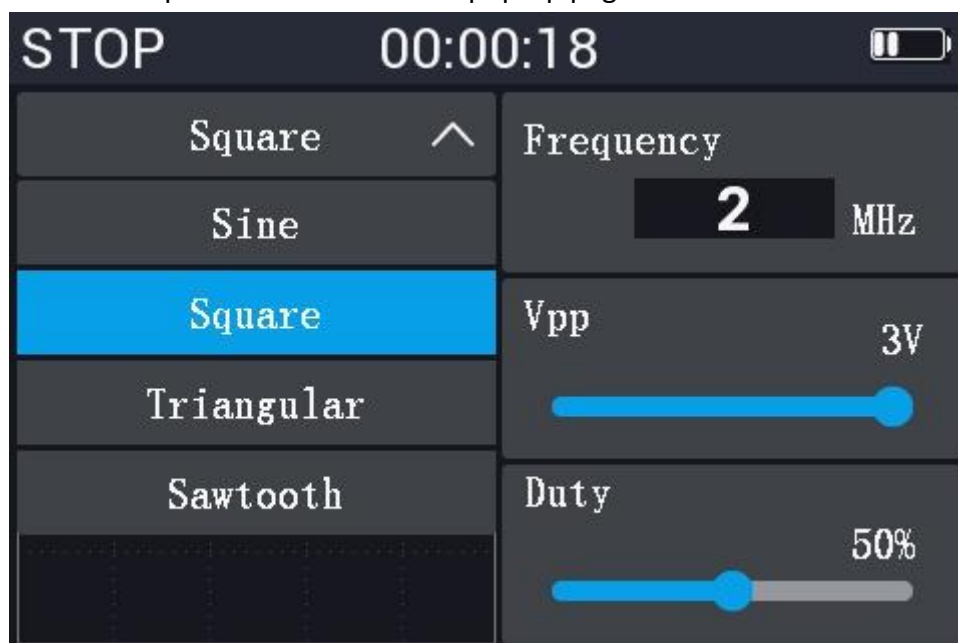
8.3，Frequency
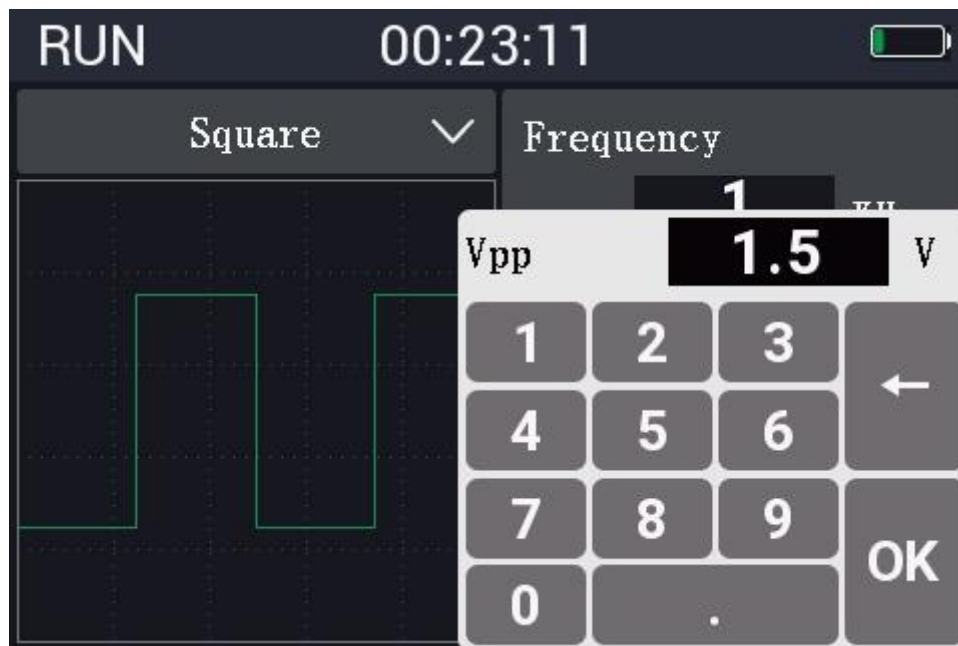
Refer to the following figure to set the following steps：

1、 Click the number corresponding to the frequency.

2、 Set the frequency within the range on the pop-up page.

3、Press the OK key.

8.4，Vpp
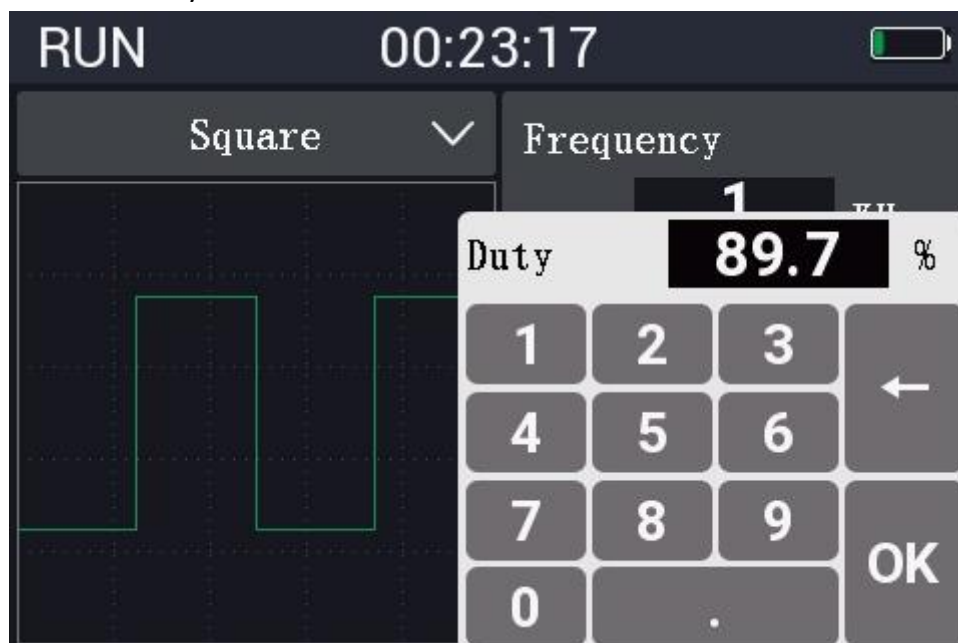
Refer to the following figure to set the following steps：

1、 Click the number corresponding to the peak-to-peak value.

2、 Set the peak-to-peak value within the range on the pop-up page.

3、 Press the OK key.

8.5，Duty

Refer to the following figure to set the following steps：
1、 Click the number corresponding to the duty.
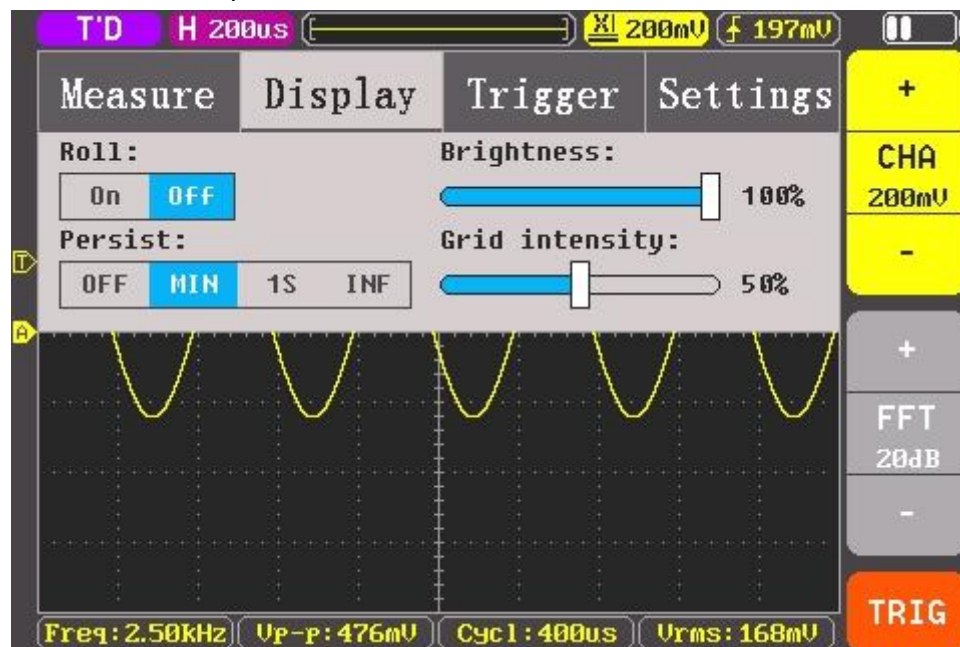2、 Set the duty within the range on the pop-up page.
3、Press the OK key.

9，Other Settings

9.1，Persistence Time

Persistence is a dimmer way to show the waveforms that have disappeared. It can be set only in YT mode.
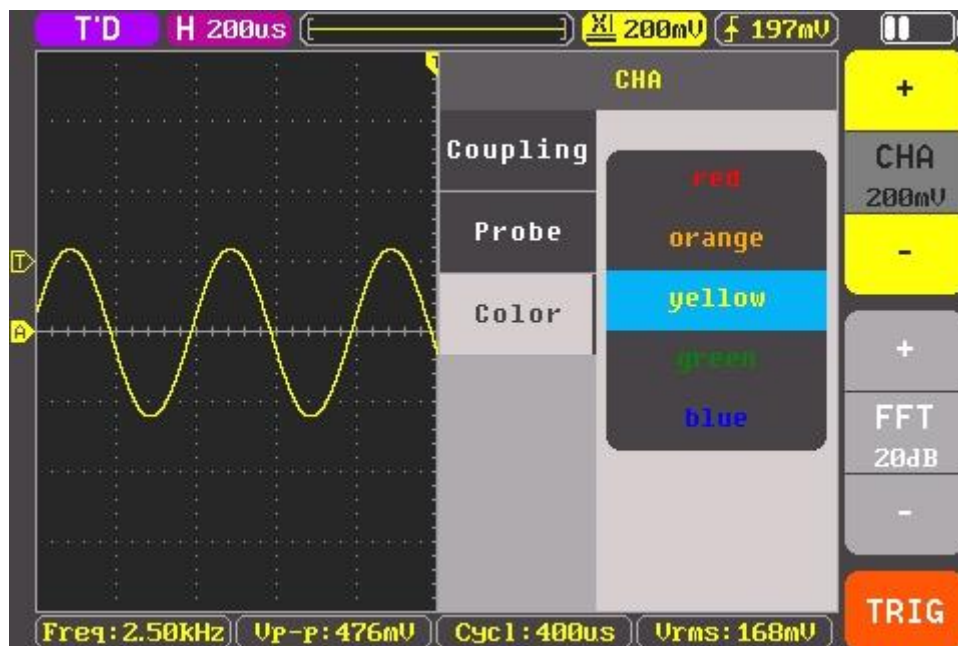
Refer to the following figure to set the following steps：
1、 Press the MF key to pop up the menu.
2、 Click the "Display" page.
3、 Set the "Persist" option.

9.2，Custom the analog channel color
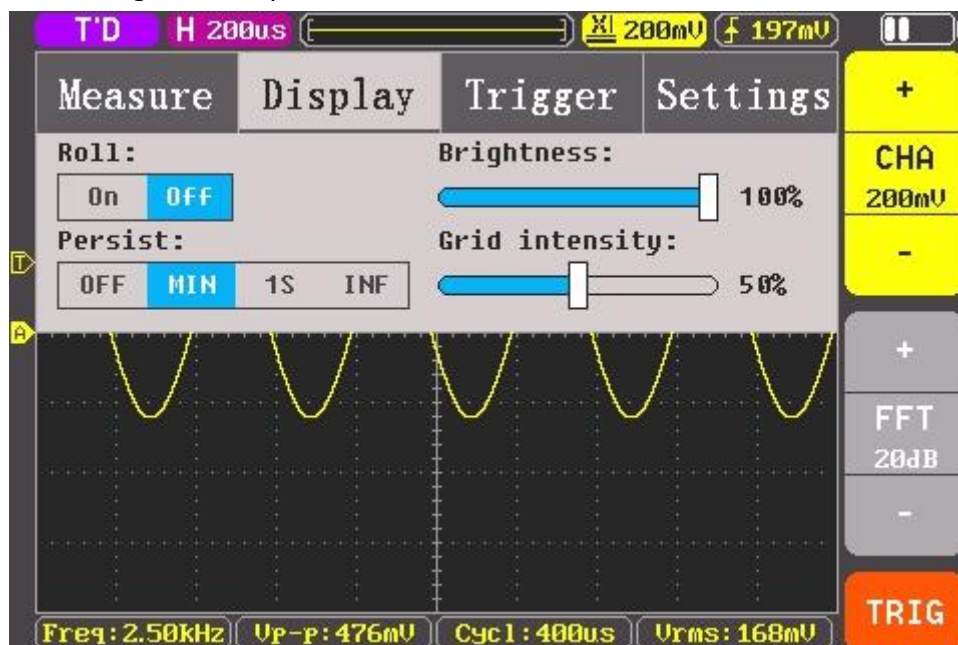
Refer to the following figure to set the following steps：
1、 Click the "Vertical Scale" button.
2、 Select the "Color" on the pop-up page.
3、 Set the color.

9.3，Brightness

Refer to the following figure to set the following steps：
1、 Press the MF key to pop up the menu.
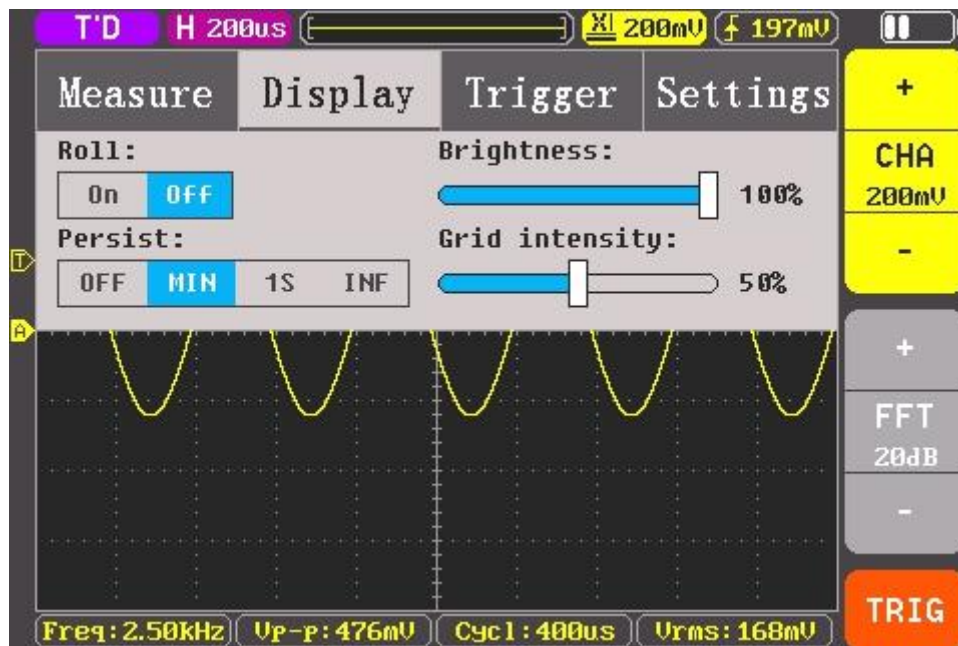2、 Click the "Display" page.
3、Set the "Brightness" option.

9.4，Grid Intensity

Refer to the following figure to set the following steps：
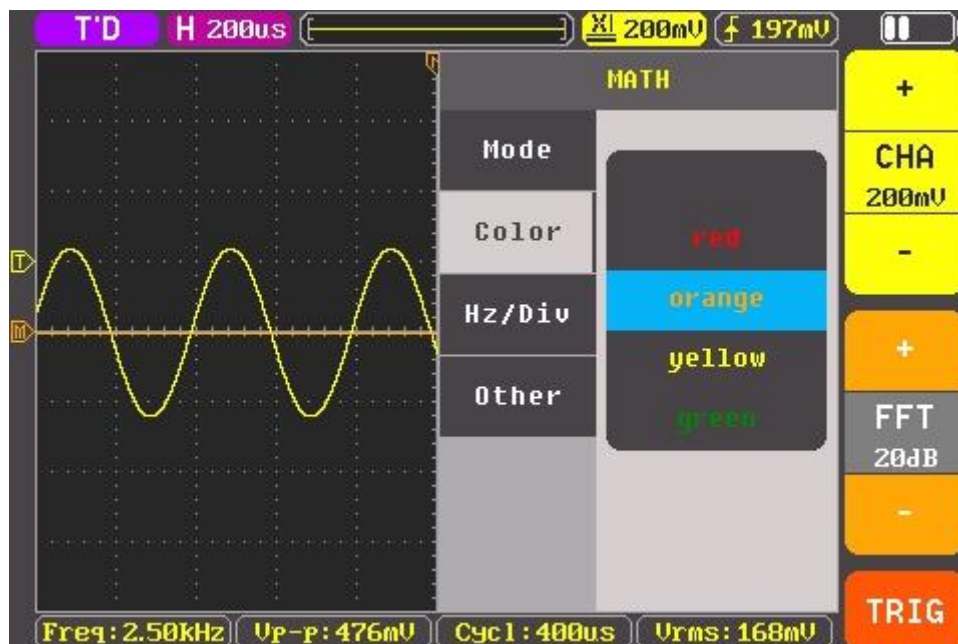3、 Press the MF key to pop up the menu.
4、 Click the "Display" page.

3、Set the "Grid intensity" option.

9.5，Custom the operations color

Refer to the following figure to set the following steps：

1、 Click the " Math Scale " button.
2、Select the "Color" on the pop-up page.
3、 Set the color.

10，Services

1. After – sales Service：

    We warrant that the product will be free from defects in materials and workmanship for a period of 1 years from the date of purchase of the product by the original purchaser from our company. This warranty only applies to the original purchaser and is not transferable to a third party.

    If the product proves defective during the warranty period, we will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product.

    This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care.

2. Website

    Download   : www.alientek.com/download

    Company   : www.alientek.com

    Aliexpress   : www.aliexpress.com/store/1102909571

3. Contact US

    E-mail   : fae-smt@alientek.com