



INSTRUCTION MANUAL

MT1020

180MHz DUAL CHANNEL OSCILLOSCOPE



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1. PRODUCT INTRODUCTION

The MT1020 is a cost-effective handheld dual-channel digital phosphor oscilloscope by Major Tech with a two-in-one oscilloscope and signal generator. The oscilloscope has a real-time sampling rate of 500MSPS and an analog bandwidth of 180MHz.

In terms of display, a high-contrast 2.8-inch IPS full-vision LCD screen and digital fluorescent technology are used. The waveform display is effective and efficient, and the colour ways are grayscale and colour temperature. With a waveform refresh rate of up to 50000wfms, it is easier to display abnormal signals with low probability.

- The time base system includes a ZOOM time base for easy analysis of digital protocol signals. With a vertical sensitivity as low as 5mV, it can better measure small signals of 5mVPP. Ultra-high signal-to-noise ratio, fully sealed shielding measures, stable circuit feedback design, clean and clear waveform.
- The original adjustable automatic bandwidth limit and adaptive adjustable trigger suppression are suitable for analyzing and measuring signals with relatively large noise.
- With a 20M hardware bandwidth limit, it can filter out noise above 20MHz. The trigger adopts digital trigger technology with high precision. It has three trigger modes: automatic, single and normal. It has a strong ability to capture periodic signals, burst signals and protocol signals. The DDS signal generator has 14 kinds of function signal waveforms and a free-customized chopping waveform. The frequency of the sine wave can reach up to 20MHz, and the other waveforms can reach up to 10MHz.
- The original chopping output function can store up to 500 customized signals. It has three time base modes of YT, XY and rolling. Manual cursor measurement is suitable for measurements with large noise signals.
- Efficient one-button automatic adjustment, adaptive 25%, 50%, 75% electric level trigger, it only takes 2 seconds to measure 1VPP/1KHz.
- Save waveforms and screenshots with one key, up to 250 sets of waveform data or 90 pictures can be stored, and 500 intercepted wave data can be stored at the same time.
- The data browser can browse and view the currently saved waveform data and pictures, and the waveform data supports operations such as zooming and moving. High voltage anti-burning protection, all gears can withstand high voltage up to 400V. USB data export, you can connect to a computer to copy picture files, and you can also copy system files to the oscilloscope for system upgrades. 5V2A fast charging, and 1 hour can charge to 80%.

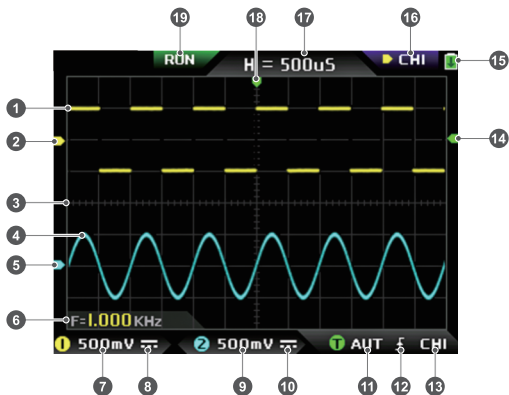
2. WARNINGS

- **When the two channels are used at the same time, the ground clips of the two probes must be connected together. It is strictly forbidden to connect the ground clips of the two probes to different electric potentials, especially the different potential terminals of high-power device or 220V. Otherwise, the main board of the oscilloscope will be burned, because the two channels are common ground, and connecting to different potentials will cause a short circuit of the internal ground wire of the main board, which is the case for all oscilloscopes.**
- **The oscilloscope's BNC terminal input can tolerate up to 400V, and it is strictly forbidden to input more than 400V voltage under the 1X probe switch.**
- **The oscilloscope must be charged with a separate charger. It is strictly forbidden to use the power supply or USB of other currently tested devices, otherwise it may cause a short circuit to the ground wire of the mainboard during the test and burn the mainboard.**
- **When measuring high-frequency and high-voltage signals, you must use 100X probes (such as ultrasonic welding machines, ultrasonic cleaning machines, etc.) or even 1000X probes (such as high-voltage ends of high-frequency transformers, inductioncooker resonant coils, etc.)**

3. NOTICE

The bandwidth of the 1X probe gear of the accessory probe is 5MHz, and the bandwidth of the 10X probe gear is 200MHz. When measuring a frequency higher than 5MHz, you need to switch the probe to the 10X gear, and the oscilloscope should also be set to the 10X gear. Otherwise the signal will be greatly attenuated, as is the case with all oscilloscopes. Because the probe line of the oscilloscope itself has a capacitance as high as 100~300pF, which is a large capacitance for high-frequency signals! The signal has been greatly attenuated when it reaches the input end of the oscilloscope through the probe, and the equivalent bandwidth is 5MHz. Therefore, in order to match the hundreds of pF of the probe line, the input end of the probe line is first attenuated by 10 times (the switch is at 10X), so that hundreds of pF capacitors are just used for impedance matching. At this time, the bandwidth is 200MHz. Note that only probes with a bandwidth of 200MHz or above can be used.

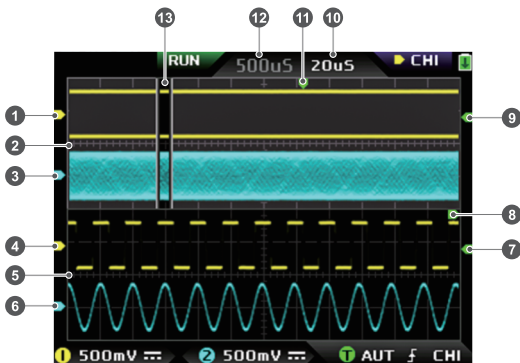
4. MAIN INTERFACE DESCRIPTION



- 1 - The signal waveform of channel 1 is displayed in yellow brightness when the colour temperature is turned off. The brighter the area, the greater the probability of this area appearing. When the colour temperature mode is turned on, the colour transition is displayed, and the temperature gradually increases from green to red, that is, the greater the probability of occurrence.
- 2 - The potential indication of channel 1, with channel 1 as a reference, indicates that the potential here is 0V.
- 3 - The background grid scale of the waveform display area, the time base and vertical sensitivity represent the interval value of a large grid.
- 4 - The signal waveform of channel 2 is displayed in cyan brightness when the colour temperature is turned off. The brighter the area, the greater the probability of this area appearing. When the colour temperature mode is turned on, the colour transition is displayed, and the colour temperature gradually increases from blue to green, that is, the greater the probability of occurrence.
- 5 - The potential indication of channel 2, with channel 2 as the reference, the potential here is 0V.
- 6 - Parameter display position, here only one parameter of measurement of frequency F is turned on.
- 7 - The vertical sensitivity of channel 1, with channel 1 as a reference, indicates the voltage interval represented by one large division in the vertical direction of the background grid scale, and 500mV here

- means that the voltage interval of one large division in the vertical direction of the grid scale is 500mV.
- 8 - The icon of the input coupling mode of channel 1. The upper part of the icon is a horizontal line and the lower part is a dotted mark, which means DC coupling. If it is a triangular waveform icon, it means AC coupling.
 - 9 - The vertical sensitivity of channel 2, with channel 2 as a reference, indicates the voltage interval represented by one large division in the vertical direction of the background grid scale, and 500mV here means that the voltage interval of one large division in the vertical direction of the grid scale is 500mV.
 - 10 - The input coupling mode icon of channel 2. The icon above is a horizontal line and the dash mark below indicates DC coupling. If it is a triangle waveform icon, it indicates AC coupling.
 - 11 - Trigger mode flag, respectively AUT, SIG, NOR. AUT means Auto automatic trigger, SIG means Single single trigger, NOR means Normal regular trigger.
 - 12 - Trigger edge indicator icon, if the middle arrow points up, it means rising edge trigger, if it points down, it means falling edge trigger.
 - 13 - Trigger signal source flag, CH1 means use channel 1 as the trigger source signal source, CH2 means use channel 2 as the trigger source signal source.
 - 14 - Trigger level indicator, indicating that the level position of the selected trigger signal source is set as the trigger threshold.
 - 15 - Battery status icon, the green area indicates the remaining power, and if there is an arrow in the middle, it means it is charging.
 - 16 - Control selection sign. When the cursor function is turned off, there are two choices of CH1 and CH2. When the cursor is turned on, there are two choices of CH1 and CH2. When the cursor is turned on, there are three choices of CH1, CH2 and CSR. You can click the (MOD/OK) button to switch. When CH1 is selected, it means the up, down and V+ of the direction keys, and V- controls CH1. When CH2 is selected, it means the up, down and V+ of the direction buttons, and V- controls CH2. When CSR is selected, it means that all direction keys only control the cursor.
 - 17 - Time base position, indicating the time interval represented by a large grid in the horizontal direction of the background grid scale, where $H=500\mu\text{s}$ means that the time interval of a large grid in the horizontal direction of the grid scale is 500 μs .
 - 18 - Arrow indicating the trigger horizontal position, which means that the trigger threshold condition has just been reached at this point.
 - 19 - Sampling running and pause flag, RUN means sampling, STOP means stop sampling.

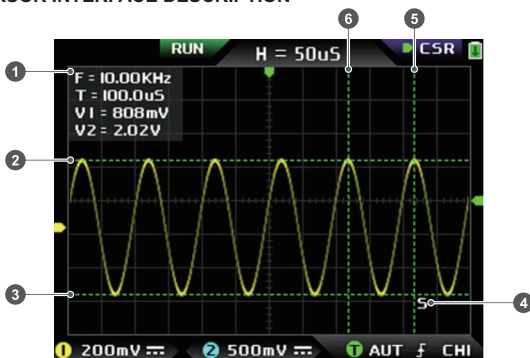
5. ZOOM INTERFACE DESCRIPTION



- 1 - Under the main time base, the reference potential indicator arrow of channel 1, with channel 1 as a reference, indicates that the potential here is 0V.
- 2 - Main time base, in the upper half of the display area, all vertical dimensions are reduced to half of the original.
- 3 - Under the main time base, the reference potential indicator arrow of channel 2, with channel 2 as a reference, indicates that the potential here is 0V.
- 4 - Under the ZOOM time base, the reference potential indicator arrow of channel 1, taking channel 1 as a reference, indicates that the potential here is 0V.
- 5 - ZOOM time base, in the lower half of the display area, all vertical dimensions are reduced to half of the original.
- 6 - Under the ZOOM time base, the reference potential indicator arrow of channel 2, with channel 2 as a reference, indicates that the potential here is 0V.
- 7 - Under the ZOOM time base, the indicator arrow of the trigger potential indicates that the potential of the selected trigger signal source is set as the trigger threshold.
- 8 - After zooming in from the selected part of the main time base, the X position of the trigger level in the main time base is mapped to the X position in the ZOOM time base.
- 9 - Under the main time base, the indicator arrow of the trigger potential indicates that the potential of the selected trigger signal source is set as the trigger threshold.

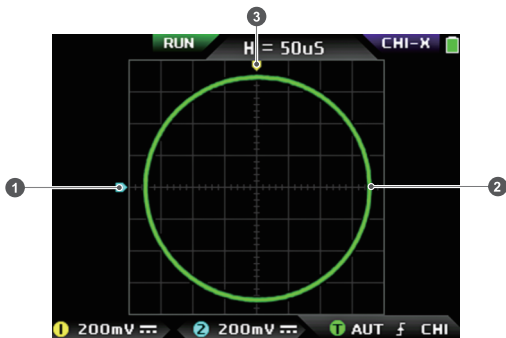
- 10 - ZOOM time base gear, indicating the time interval represented by a large grid in the horizontal direction of the grid scale of the ZOOM time base.
- 11 - The trigger horizontal position indicator arrow of the main time base, indicating that the trigger condition has just been reached at this position.
- 12 - Main time base position, indicating the time interval represented by a large grid in the horizontal direction of the grid scale of the main time base.
- 13 - The ZOOM time base is mapped to the enlarged area of the main time base, indicating that the waveform in this area is enlarged and mapped to the ZOOM time base.

6. CURSOR INTERFACE DESCRIPTION



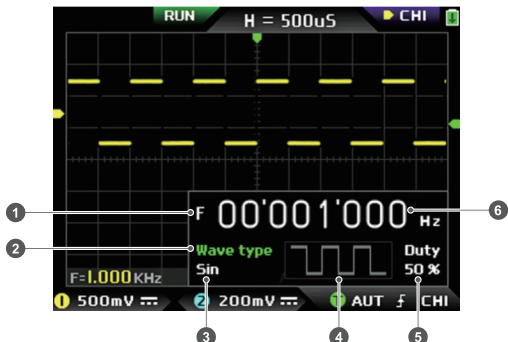
- 1 - Measurement data of cursor measurement, including equivalent frequency F , time length T , potential difference $V1$ of channel 1 and potential difference $V2$ of channel 2.
- 2 - The upper boundary line measured by the vertical cursor.
- 3 - The lower boundary line measured by the vertical cursor.
- 4 - Active cursor indication sign, the arrow keys control the cursor selected by S , under the CSR control selection, press the (AUTO) to switch the current S active cursor.
- 5 - Right boundary line of horizontal cursor measurement.
- 6 - Left boundary line of horizontal cursor measurement.

7. X-Y MODE INTERFACE DESCRIPTION



- 1 - The reference potential indicator of channel 2, with channel 2 as the reference, indicating that the potential here is 0V.
- 2 - An X-Y closed curve graph composed of the signal of channel 1 as X and the signal of channel 2 as Y, with digital fluorescent display.
- 3 - The indicator of the reference potential of channel 1, with channel 1 as a reference, indicating that the potential here is 0V.

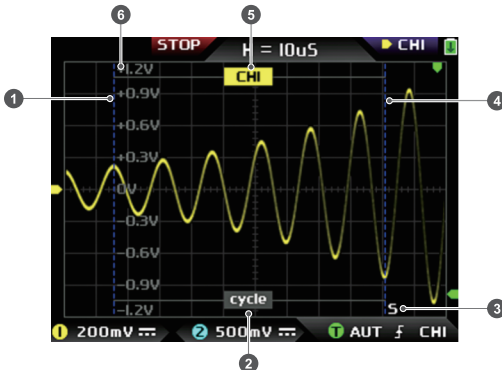
8. SIGNAL GENERATOR INTERFACE DESCRIPTION



- 1 - Frequency symbol, F is the abbreviation of Frequency, you can switch and control F, Wave type and Duty through the (MOD/OK) key, and the active state is green.

- 2 - Wave type mark, you can switch control F and Wave type and Duty through the (MOD/OK) key, and the active state is green.
- 3 - The name of the type of waveform signal, including 14 kinds of function signals and 1 kind of chopping signal.
- 4 - Thumbnail image of the waveform signal, showing 3 cycles of the waveform.
- 5 - The duty cycle of the waveform signal can only be operated when the signal is a square wave, and it is only valid for square waves.
- 6 - The frequency value of the output signal, the step is 1Hz, the sine wave can reach up to 20MHz, and the other waveform can reach up to 10MHz.

9. CLIPPING WAVE INTERFACE DESCRIPTION








- 1 - The left boundary line of the clipping wave.
- 2 - Period mark, the intercepted signal is the signal from the left boundary line to the right boundary line, as a period.
- 3 - Active cursor indication mark, the arrow keys control the cursor selected by S, in the CSR control selection mode, press the (AUTO) to switch the current S active cursor.
- 4 - The right boundary line of the clipping wave.
- 5 - The signal of CH1/CH2 can be switched by pressing (Up) and (Down) , CH1 indicates the signal of channel 1, and CH2 indicates the signal of channel 2.
- 6 - Vertical potential mark, used to refer to the amplitude value of the currently intercepted waveform.

10. KEY DESCRIPTION



Button	Function
SAVEP	One-click save screen capture, click this button, the system will automatically capture the display content of the entire screen and save it as a BMP image file to store in the local disk.
SAVEW	Save the waveform with one button, click this button and the system will automatically save the data of the opened channel as a WAV waveform file and store it on the local disk.
MOVE	Slight adjustment/Rough adjustment switch button, change the movement speed, such as waveform movement and cursor movement, etc, the movement speed of coarse adjustment is 10 times that of fine adjustment.
ORIG	One-key return to the center button. After clicking this button, all the indicator arrows will return to the middle position, that is, CH1, CH2, trigger X, and trigger Y will return to the middle position.
STO/RET	This button has two functions of pausing sampling and returning to the menu. When all menus are closed, this button switches between running and pausing sampling. When the menu is opened, this button is used for returning.

Button	Function
	Up arrow key, mainly used to move the waveform, move the cursor, switch menu items, etc.
	Down arrow key, mainly used to move the waveform, move the cursor, switch menu items, etc.
	Left arrow key, mainly used to move the waveform, move the cursor, adjust parameter values, etc.
	Right arrow key, mainly used to move the waveform, move the cursor, adjust parameter values, etc.
MOD/OK	This button has two functions of switching control selection and confirmation. When all menus are closed, this button is used to switch among CH1, CH2, and CSR three control options. When the menu is opened, This button is for confirmation.
MENU	Open/exit button of the main menu, all system settings are in this main menu, exit means to exit to the waveform main interface, and return means to return to the previous menu.
AUTO	One-key automatic adjustment, click this button and the system will automatically adjust the parameters to make the waveform reach the best display state.
MEAS	Parameter measurement shortcut key, this key is used to quickly open the menu and automatically locate the parameter setting bar.
V+	The vertical zoom-in button of the waveform, its voltage scale value will decrease, click this button, the vertical direction of the waveform of the selected channel will be zoomed in by 2~2.5 times.
V-	The vertical zoom-out button of the waveform, its voltage scale value will increase, click this button, the vertical direction of the waveform of the selected channel will be reduced by 2~2.5 times.
H+	The horizontal zoom-in button of the waveform, its time base value will decrease, click this button, the horizontal direction of the waveform of the selected channel will be enlarged by 2~2.5 times.
H-	Waveform horizontal reduction button, its time base value will increase, click this button, the horizontal direction of the waveform of the selected channel will be reduced by 2~2.5 times.

Button	Function
T+	T+ is used to increase the trigger level, increase the trigger threshold voltage and the trigger indicator arrow will move upward.
T-	T- is used to reduce the trigger level, reduce the trigger threshold voltage, and the trigger indicator arrow will move down.
TRIG	Trigger control setting shortcut key, this key is used to quickly open the menu and automatically locate the trigger control setting bar.
50%	One key to automatically set the trigger level to a suitable position, and its ratio will be adaptively adjusted to 25% or 50% or 75%.
CH1	Shortcut key for control setting of channel 1, this key is used to quickly open the menu and automatically locate to the control setting column of CH1.
CH2	Shortcut key for control setting of channel 2, this key is used to quickly open the menu and automatically locate to control setting column of CH2.
GEN	Turn on or off the DDS signal generator control interface.
ZOOM	Turn on or off the zoom time base function of ZOOM.
	In the off state, click this button to turn on the power, and in the power on state, click this button to turn off the power.

11. OPERATION GUIDE

- **Turn on:** In the power-off state, click the power button to start the system.
- **Turn off:** In the power-on state, click the power button to shut down.
- **Zoom waveform:** First observe the control selection sign in the upper left corner of the screen, and observe whether the content indicated by the arrow pointing to the right is the channel that needs to be zoomed currently, CH1 means channel 1, CH2 means channel 2, if not, you need to click (MOD/OK) button to switch to the current desired channel, such as CH1 or CH2, when the two are consistent, then click (H+)(H-) to adjust the zoom in the horizontal direction, and (V+)(V-) to perform vertical zoom adjustment.
- **Moving waveform:** First look at the control selection sign, and observe whether the content indicated by the arrow pointing to the right is the channel that needs to be moved currently. If it is moving in the horizontal direction, you only need to switch to CH1 or CH2. If it is moving in the vertical direction, you can only select the channel you want to move, and then click the button ▲ ▼ ◀ ▶ to move.

- **Automatically adjust the waveform:** the horizontal adjustment of automatic adjustment is to adjust according to the channel selected by the trigger first, and the vertical adjustment is independent adjustment. Click (AUTO) to automatically adjust the parameters of each channel to achieve the best display state of the waveform.
- **Set the movement adjustment speed:** Click (MOVE) to set the movement speed of the current direction key, which is divided into coarse adjustment and fine adjustment. The movement speed of coarse adjustment is 10 times that of fine adjustment.
- **Return the waveform to the midpoint position:** Click (ORIG) to return the waveform to the midpoint position, that is, the vertical reference potential/trigger horizontal position/trigger vertical position all return to the middle position.
- **Running and Pausing Sampling:** Click (STO/RET) to switch between running and pausing sampling.
- **Switching control selection:** Click (MOD/OK) to switch between CH1 and CH2, when the cursor is turned on, a CSR selection will be added.
- **Parameter measurement:** Click (MEAS), a menu will pop up, use ▲ and ▼ to locate the channel to be measured in the selection bar, and then click (MOD/OK), 12 kinds of measurement parameters will pop up, and then Click (MOD/OK) to select the parameters that need to be measured at present, you can choose multiple, and then click (MENU) to exit the menu.
- **Manual cursor measurement:** Click (MENU), a menu will appear, use ▲ and ▼ to the Cursor measure column, and then click (MOD/OK), and use ▲ ▼ to the Horizontal measure or Vertical measure column, and then click (MOD/OK) to turn on or off the horizontal or vertical cursor, and then click (MENU) to exit the menu. After exiting the menu, the control selection mode will automatically switch to the CSR cursor control mode, in the CSR control mode, click (AUTO) to switch the active cursor, there will be an S mark next to the active cursor, indicating that the cursor is controlled by the current direction keyboard, and you can also click (MOD/OK) to switch the control to CH1 or CH2 to move the waveform.
- **Turn on the ZOOM time base:** Click (ZOOM) to turn on the ZOOM time base. At this time, there will be two time bases. The upper half is the main time base, and the lower half is the ZOOM time base. The zoom ratio is 2~1000 times. Among them, the (H+), (H-), and ◀ + ▶ buttons can only control the parameters of the ZOOM time base, that is, the horizontal direction can only control the ZOOM time base, and the horizontal direction parameters of the main time base are stopped before ZOOM is turned on status. The waveform under ZOOM is the enlarged map of the waveform in the unobstructed area of the main time base.

- **Set the trigger mode:** Click (TRIG), a menu will pop up, use ▲▼ to the Trigger mode column, and then click (MOD/OK) to select the current trigger mode. Auto means automatic trigger, Single means single trigger, Normal means normal trigger, and then click (MENU) to exit the menu.
- **Set the trigger edge:** Click (TRIG), a menu will pop up, use ▲▼ to the Trigger edge column, and then click (MOD/OK) to switch to Rising or Falling. Rising means rising edge triggering, Falling means falling edge trigger, and then click (MENU) to exit the menu.
- **Set the trigger channel:** Click (TRIG), a menu will pop up, use ▲▼ to the Trigger channel column, then click (MOD/OK) to switch to CH1 or CH2, and then click (MENU) exit menu.
- **Adjust the trigger level:** Directly press (T+)(T-) to adjust the green trigger electric level arrow up and down.
- **Set the trigger electric level to 50%:** The trigger level will automatically analyze the signal and automatically set it to 25% or 50% or 75%. For example, a square wave signal with a dead zone or a multi-tone signal cannot be set to 50%. Click (50%) and the trigger electric level can be set to the appropriate proportional position of the signal of the selected trigger channel.
- **Set trigger high-frequency suppression:** Click (TRIG), a menu will pop up, use ▲ and ▼ to the HF rejection column, and then click (MOD/OK) to select the strength of the current trigger suppression required. There are 3 ranks in total. The greater the signal noise, the stronger the trigger suppression is required, and then click (MENU) to exit the menu.
- **Open the control panel of the signal generator:** Click (GEN) to open the parameter control panel of the signal generator, click (MOD/OK) to switch the waveform type, frequency and duty cycle control.
- **Set the signal type of the signal generator:** Click (GEN) to open the parameter control panel of the signal generator, click (MOD/OK) to switch the green to the Wave type column, and then click ◀▶ to switch the waveform type, and the corresponding thumbnails will be displayed on the right, where the Custom type is the clipping signal set by the user.
- **Set the frequency of the signal generator:** Click (GEN) to open the parameter control panel of the signal generator, click (MOD/OK) to switch the green to the F column, and then click ◀▶ to locate the desired setting Click ▲▼ to increase or decrease the value.
- **Set the duty cycle of the signal generator:** The duty cycle parameter is only valid when the waveform type is square wave, click (GEN) to open the parameter control panel of the signal generator, click (MOD/OK) to switch the green to Duty column, and then press ◀▶ to decrease or increase the value of the duty cycle.

- **Capture waveform signal as output:** Click (MENU), a menu will pop up, use ▲ and ▼ to locate the selection bar to the Capture output column, and then click (MOD/OK), two left and right cursors will appear in the display area. The left cursor is the left border of the interception, and the right cursor is the right border of the interception. The control selection mode will be temporarily set to CSR mode and cannot be changed. Click (AUTO) to switch the active cursor. There will be an S mark next to the active cursor, indicating the current direction keyboard controls the cursor, press ◀▶ to move the active cursor, click ▲▼ to switch the intercepted signal source to CH1 or CH2, click (MOD/OK) to save the current clipping data. The waveform within the cursor range is a cycle waveform, and the control selection mode will be restored to CH1 or CH2.
- **Set the clipping signal to be output:** Click (MENU), a menu will pop up, use ▲ and ▼ to locate the selection bar to the Data browser column, then click (MOD/OK), and use ▲ and ▼ to the selection bar to the Capture browser column, and then click (MOD/OK) to enter the waveform browser to browse all the stored clipped signals. One page can display 3X3 thumbnails, and there will be 4 control bars at the bottom of the screen. Among them, Select corresponds to (SAVEP), Delete corresponds to (SAVEW), Last page corresponds to (MOVE), and Next page corresponds to (ORIG). Use the direction keys to set the blue selection area to the waveform position that needs to be used as the signal source, and then click (MOD/OK) to set the signal as the clipped output signal, and there will be a yellow "Set" mark in the upper left corner.
- **Save screenshot:** Click (SAVEP) to save the current screenshot as a BMP image file to the local disk (total of 90 images can be stored).
- **Save waveform:** Click (SAVEW) to save the waveform data WAV file of the currently opened channel to the local disk (total of 250 sets of waveform data can be saved).
- **View the saved picture:** Click (MENU), a menu will pop up, use ▲ and ▼ to the Data browser column, and then click (MOD/OK), and use ▲ and ▼ to the Picture browser column, then click (MOD/OK) to enter the picture browser. One page can display 4X4 thumbnails. The full name of the file is displayed under each thumbnail, and there will be 4 controls at the bottom of the screen column. Select corresponds to (SAVEP), Delete corresponds to (SAVEW), Last page corresponds to (MOVE), and Next page corresponds to (ORIG). Use the direction keys to set the green selection area to the position of the picture you want to view, and then click (MOD/OK) to view the picture in full screen. In the full-screen view interface, you can use the direction keys to view the previous or next picture. Click (MENU) to return to the thumbnail interface of the previous level, or click (SAVEW) to delete the picture file.

- **View the saved waveform:** Click (MENU), a menu will pop up, use ▲ and ▼ for the Data browser column, and then click (MOD/OK), and use ▲ and ▼ for the Waveform browser column, then click (MOD/OK) to enter the waveform browser. One page can display 3X3 thumbnails. The full name of the file is displayed under each thumbnail. There will be 4 controls at the bottom of the screen. column, where Select corresponds to (SAVEP), Delete corresponds to (SAVEW), Last page corresponds to (MOVE), and Next page corresponds to (ORIG). Set the green selection area to the waveform position to be viewed through the direction keyboard, and then click (MOD/OK), the system automatically returns to the main interface, pauses sampling, and loads the current waveform data, which is the same as after pausing sampling, you can move, ZOOM, X-Y, measure, take a screenshot, etc.
- **Open or close the channel:** click (CH1) or (CH2), a menu will pop up, use ▲ ▼ for the Channel enable column, and then click (MOD/OK) to open or close the channel waveform display, click (MENU) to exit the menu.
- **Set the probe magnification:** Click (CH1) or (CH2), a menu will pop up, use ▲ and ▼ for the Probe gear column, and then click (MOD/OK) to pop up options, select the required settings. Then click (MOD/OK) to set the probe magnification to 1X or 10X or 100X, and then click (MENU) to exit the menu.
- **Set the input coupling mode:** Click (CH1) or (CH2), a menu will pop up, use ▲ and ▼ for the Coupling mode column, and then click (MOD/OK) to switch the coupling mode to DC DC or AC, and click (MENU) to exit the menu.
- **Display simple FFT waveform:** Click (CH1)v or (CH2), a menu will pop up, use ▲ and ▼ for the FFT display column, and then click (MOD/OK) to turn on or off the FFT display , and then click (MENU) to exit the menu.
- **Set the 20MHz hardware bandwidth limit:** Click (CH1) or (CH2), a menu will pop up, use ▲ ▼ for the Hard bandwidth limit column, and then click (MOD/OK) to open or close 20M hardware bandwidth limit, then click (MENU) to exit the menu.
- **Set automatic bandwidth limit:** Click (MENU), a menu will pop up, use ▲ and ▼ for the Function settings column, and then click (MOD/OK), and use (Up) to the Auto bandwidth limit column, and then click (MOD/OK), a menu will pop up, and select the level to be limited through ▲ and ▼. There are 6 levels in total. As the level increases, the limit strength gradually increases. The specific bandwidth value will be displayed in the upper right corner of the display area Auto BW = X Hz, and then click (MENU) to exit the menu.

- **Baseline calibration of the channel:** First pull out the probe and USB cable, click (MENU), a menu will pop up, use ▲▼ for the Function settings column, and then click (MOD/OK) and use ▲▼ for the Baseline calibration column, then click (MOD/OK), a menu will pop up, make sure all connections have been unplugged, and then click (MOD/OK) to calibrate.
- **System calibration:** System calibration refers to the calibration of the vertical system, including offset calibration, balance calibration, baseline calibration, and the calibration time is relatively long. First pull out the probe and USB cable, click (MENU), a menu will pop up, use ▲▼ for the Function settings column, and then click (MOD/OK), press ▲▼ for the System calibration column, and then click (MOD/OK), a menu will pop up, make sure that all connections have been unplugged, and then click (MOD/OK) to calibrate.
- **Adjust the brightness of the waveform:** Click (MENU), a menu will pop up, use ▲ and ▼ to position the selection bar for the Function settings column, and then click (MOD/OK), and use ▲ and ▼ for the Waveform brightness column, press ◀ to decrease the brightness of the waveform, press ▶ to increase the brightness of the waveform, it is generally recommended to set it to 50%, and then click (MENU) to exit the menu.
- **Color temperature display mode:** Click (MENU), a menu will pop up, use ▲ and ▼ for the Function settings column, and then click (MOD/OK), and use ▲ and ▼ for the Color temperature column, click (MOD/OK) to enable or disable the color temperature display mode, and then click (MENU) to exit the menu.
- **X-Y time base mode:** Click (MENU), a menu will pop up, select the column for Function settings through ▲▼ then click (MOD/OK), select the column through ▲▼. Locate the X-Y curve option column, click (MOD/OK) to enable or disable the X-Y time base mode, and then click (MENU) to exit the menu.
- **Scrolling time base mode:** Click (H-) continuously to increase the time base value unit reaches H = 100mS, and the time base mode automatically enters the scrolling mode.
- **Open or close the Background grid scale:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), press ▲ and ▼ for the Background grid display column, then click (MOD/OK) to start or shutdown the grid scale, and then click (MENU) to exit the menu.
- **Set the transparency of the menu window:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), and use ▲ and ▼ for the Transparent menu column, press ◀ to decrease transparency, press ▶ to increase transparency, and then click (MENU) to exit the menu.

- **Save the current configuration as the default configuration:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), and use ▲ and ▼ for the Save current configuration column, and then click (MOD/OK), a prompt will pop up, and then click (MOD/OK) to save the current configuration as the default configuration for system power-on and then click (MENU) to exit menu.
- **USB connection to the computer to share pictures:** First connect the oscilloscope to the computer with a Type-C USB cable, click (MENU), a menu will pop up, use ▲ ▼ to go to the System settings column, and then click (MOD/OK), use ▲ ▼ for the USB sharing mode column, and then click (MOD/OK) to enter the USB sharing mode.
- **Set automatic shutdown:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), and use ▲ and ▼ to go to the Automatic shutdown column, and then click (MOD/OK) to pop up a menu, then select the time that needs to be scheduled, and then click (MOD/OK) to set the time for scheduled shutdown, and then click (MENU) to exit the menu.
- **Restore factory settings:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), and use ▲ and ▼ to go to the Factory settings column, and then click (MOD/OK) to pop up the selection, if you are sure to restore the factory settings, select YES and confirm to restore the factory settings.
- **Storage space formatting:** Click (MENU), a menu will pop up, use ▲ and ▼ for the System settings column, and then click (MOD/OK), and use ▲ to Navigate to the Disk formatting column, and then click (MOD/OK), a warning will pop up. After confirming that formatting is required, select YES and confirm to delete all stored data.

12. COMMON PROBLEMS

Why can't turn on the device after receiving it ?

Answer: The power-on operation is to click the power button. If it still cannot be turned on, it may be that the battery is out of power. Use the attached USB to charge, the power button will display red, and you can start the device at this time.

Why is there no waveform in the test, only a straight baseline on the screen?

Answer: Please check whether the pause is pressed, if not, press the (AUTO) button, if not, it may be that the signal source has no signal output, or the probe line is short-circuited or open-circuited, please check the probe with a multimeter and whether the signal source is normal.

Why is the voltage value is zero ?

Answer: Please adjust the vertical sensitivity and time base (sampling rate), or press (AUTO), at least a clear and complete cycle waveform is displayed on the screen, and the top and bottom of the waveform must be completely displayed on the screen without clipping. At this moment, the voltage value is correct.

Why is the frequency value is zero?

Answer: First, you need to make sure that the trigger mode is Auto. If it is still 0 in Auto mode, you need to press the (AUTO) button once. After at least one clear and complete cycle waveform is displayed on the screen, and the waveform needs to be triggered. The green arrow indicates that the position is between the top and bottom of the waveform (fixed and not shaking), and the data of the frequency value is correct.

Why is the duty cycle is zero?

Answer: First, you need to make sure that the trigger mode is Auto. If it is still 0 in Auto mode, it may be that the trigger is not adjusted between the waveforms. After the trigger line is adjusted between the waveforms, the waveform will be fixed, and the screen needs to show that the duty cycle data is correct only after at least one clear cycle waveform is displayed.

Why are AC coupled and DC coupled waveforms the same?

Answer: If the input signal is a symmetrical AC signal (such as 220V for household use), the waveform is the same whether it is AC coupling or DC coupling. If it is an asymmetrical AC signal or a DC pulsating signal, then the waveform will only move up and down when the coupling is switched.

Why does the waveform jump up and down when testing the signal, but can't see the waveform but only see multiple lines jumping up and down?

Answer: Set the trigger mode to Auto, and then press the [AUTO] button once. If the problem persists, it may be that the ground clip on the probe is not grounded, or the ground clip end of the probe is broken. Please use a multimeter to check whether the probe is normal.

Why does the test waveform keep shaking from side to side and cannot be fixed?

Answer: You need to adjust the trigger voltage, this is the green arrow on the right. You need to adjust the green indicator arrow between the top and bottom of the waveform so that the waveform can be triggered. First, check whether the trigger signal source is the channel of the current shaking waveform signal. After setting, click (50%).

Why can't capture sudden pulse waveforms or digital logic signals?

Answer: Adjust the trigger mode to Single trigger mode, then adjust the trigger voltage, time base and vertical sensitivity, and finally release the

pause, wait for the arrival of the burst signal, it will automatically pause after it is captured.

Why is there no waveform when measuring a battery or other DC voltage?

Answer: The battery voltage signal is a stable DC signal, and there is no curved waveform. In the DC coupling mode, and then adjust the vertical sensitivity, there will be an upward or downward offset straight line waveform. If it is AC coupling, no matter how the adjustment has been made, no waveform will be shown.

Why is the waveform of 220V power frequency 50Hz AC measured very stuck?

Answer: To display low-frequency signals such as 50Hz, the oscilloscope needs a very low sampling rate to capture the 50Hz signal. After the sampling rate is reduced, the oscilloscope will wait, so the performance is stuck. All oscilloscopes will get stuck when measuring 50Hz signals, not because of the performance of the oscilloscope itself.

Why when measuring the mains 220V waveform, the VPP peak-to-peak data below is more than 600V instead of 220V or 310V?

Answer: 220V is a symmetrical AC signal, the positive peak voltage (maximum value) is +310V, and the negative peak voltage (minimum value) is -310V, so the peak-to-peak value is 620V, and the switching parameter is an effective value, which is 220V at this time. The voltage fluctuates between 180~260V, so the peak-to-peak VPP is in the range of 507~733V.

Why is the measured 220V mains waveform not a standard sine wave with distortion?

Answer: The power grid is generally polluted and contains more high-order harmonic components. When these harmonics are superimposed on the sine wave, a distorted sine wave will appear. This is a normal phenomenon, and the general waveform is distorted and has nothing to do with the performance of the oscilloscope itself.

Why is there a big offset between the baseline (0V) and the left arrow (0V indication) on the screen when there is no signal input?

Answer: Pull out the probe first, and then perform system calibration once. After the calibration is completed, the baseline coincides with the arrow.

Why does the measured signal voltage above 5MHz attenuate greatly, and the bandwidth is only 5MHz?

Answer: When measuring above 5MHz, you need to switch the probe to the 10X setting, and the oscilloscope should also be set to 10X input mode, because the probe line of the oscilloscope itself has a capacitance

as high as 100~300pF, which is a problem for high-frequency signals. That's a lot of capacitance! The signal has been greatly attenuated when it reaches the input end of the oscilloscope through the probe, and the equivalent bandwidth is 5MHz. Therefore, in order to match the hundreds of pF of the probe line, the input end of the probe line is first attenuated by 10 times (the switch is at 10X), so that hundreds of pF capacitors are just used for impedance matching. At this time, the bandwidth is 200MHz.

Note: that only the matching 200MHz probe can be used.



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