Product Name	GAOTek Signal Generator Mixed Oscilloscope
Product SKU	GAOTek-MSO-160
Product URL	https://gaotek.com/product/gaotek-signal-generator-mixed-oscilloscope/

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Chapter 1 Introduction

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1.1. General Inspection

Please check the instrument as following steps after receiving an oscilloscope:

Check the shipping container for damage:

Keep the damaged shipping container or cushioning material until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically.

Check the accessories:

Accessories supplied with the instrument are listed in "Accessories" in this manual. If the contents are incomplete or damaged, please notify the franchiser.

Check the instrument:

In case there is any mechanical damage or defect, or the instrument does not operate properly or fails performance tests, please notify the franchiser.

1.2. Prepare Instrument for Use

Adjust the Supporting Legs

Adjust the supporting legs properly to use them as stands to tilt the oscilloscope upwards for stable placement of the oscilloscope as well as better operation and observation.

Connect the Power Cord

Connect the power cord as desired.

This oscilloscope can accept 100-240 V, 45-440 Hz AC power supply. Please use the power cord supplied with the accessories to connect the oscilloscope to the power source as shown in the figure below.

Turn the instrument on by pressing the power switch in the lower left corner of front panel. If the instrument does not turn on, verify that the power cord is firmly connected. Also make sure that the instrument is connected to an energized power source.

Power Switch:

To turn off the instrument, please press the power switch.

1.3. Brief Introduction of Front Panel
The content below simply describes and introduces the front panel and the back part of this series of digital oscilloscope so that you can get familiar with this series of digital oscilloscope well

within the shortest time.
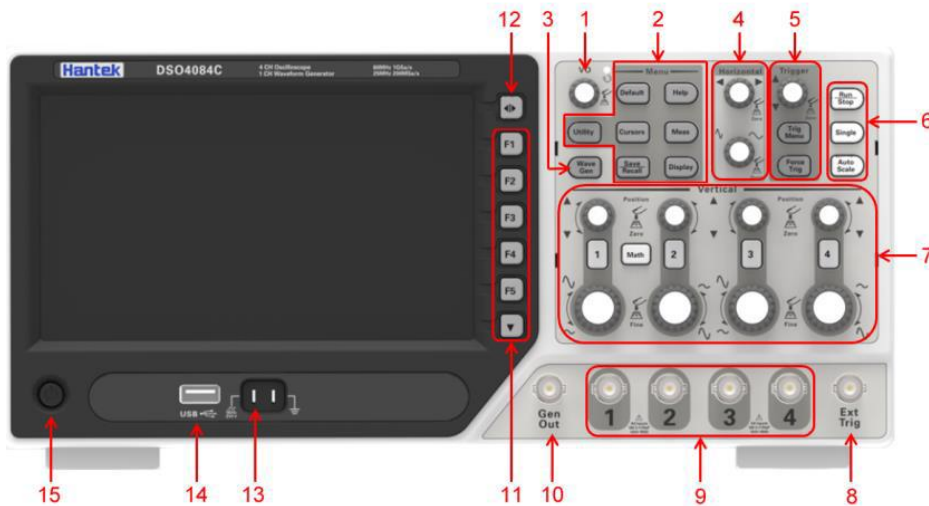
1. Universal Knob

2. Function Button

3. Waveform Generator (Only for the scopes with waveform generator function)

4. Horizontal System

5. Trigger System

6. Fast Action Button(Run/Stop, Single, Auto Scale)

7. Vertical System

8. External Trigger Input Channel

9. CH1~CH4 Input Channel for signal

10. Waveform Generator Output

11. Function Softkeys

12. Menu Button

13. Probe Compensation terminal

14. USB Port

15. Power Button

1.4. The user interface

This section will make you understand the front operation panel of this series of digital oscilloscope at first before use.
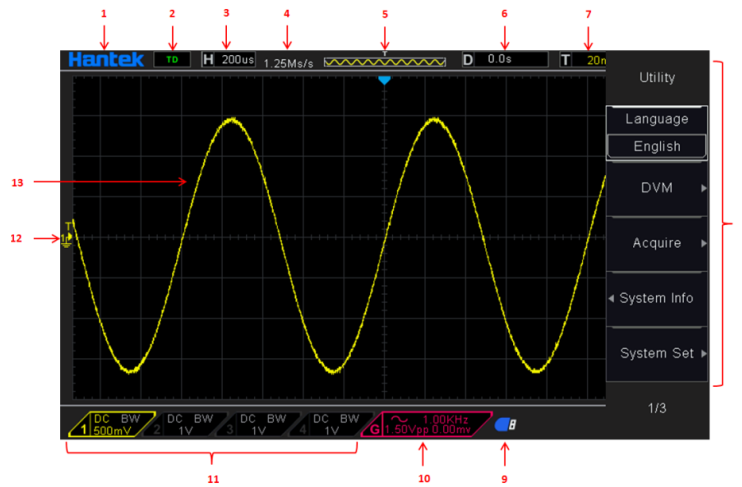
Figure 1-2 Interface display

1. GAOTek logo

2. Trigger Status

Auto:

The oscilloscope works in auto mode and is acquiring waveforms in the absence of triggers.

Ready: All pre-triggered data have been acquired and the oscilloscope is ready to accept a trigger.

Roll: The oscilloscope is acquiring and displaying waveform data continuously in roll mode.

Stop: The oscilloscope has stopped acquiring waveform data.

3. Readout shows main time base setting.

4. Sample rate.

5. Main Time Base Window

6. Tigger time

7. Trigger level, Readout tells trigger level.

8. Operating Menu shows different information for respective function keys.

9. If this icon lights up/active, it means the USB disk has been connected.

10. If this icon lights up/active, it means the wave generator works

11. The information of coupling, Bandwidth and volt/div of CH1~CH4.

12. Channel Marker

13. Window displays waveform

1.5. Functional Check
Follow the steps below to perform a quick functional check to your oscilloscope.

1.5.1. Connect the oscilloscope
Set the switch on the probe to 10X and connect the probe to Channel 1 on the oscilloscope. First, align the slot in the probe connector with the protuberance on the CH1 BNC and push to connect; then, turn to right to lock the probe in place; after that, connect the probe tip and reference lead to the PROBE COMP connectors. There is a mark on the panel: Probe COMP ~2V@1KHz.

CH1: to connect with the probe.   PROBE COMP

1.5.2. Observe the wave form
Press the **[Auto Scale]** button and you should see within a few seconds a square wave of about 2V peak-to-peak at1KHzin the display. Press the**[CH1]**MENU button twice to remove Channel 1.Push the **[CH2]**MENU button and repeat the steps to observeCH2, CH3 and CH4.

1.6. Probe Introduction
1.6.1. Safety
When using the probe, keep your fingers behind the guard on the probe body to avoid electric shock. Do not touch metallic portions of the probe head while it is connected to a voltage source. Connect the probe to the oscilloscope and connect the ground terminal to ground before you start any measurements.

Finger Guard
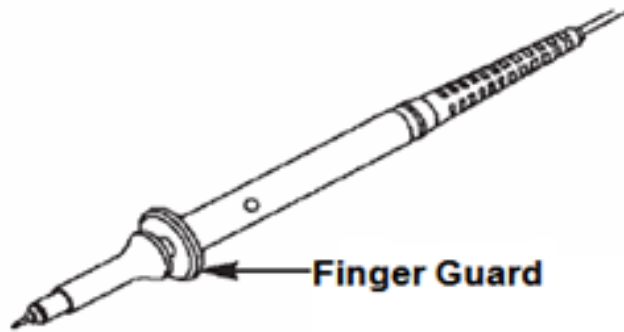
1.6.2. Probe Check Wizard

Every time you connect a probe to an input channel, you should use the probe check wizard to verify that this probe is operating correctly.

Use the vertical menu (for example, push the **[CH1]** MENU button) to set the Probe attenuation factor.

1.6.3. Manual Probe Compensation

Upon the first connection of a probe and an input channel, you should manually perform this adjustment to match the probe to the input channel. Uncompensated or Digital Storage mis compensated probes may lead to errors or faults in measurement. To adjust the probe compensation, follow the steps below.

1. Set the Probe option attenuation in the channel menu to 10X. Set the switch on the probe to10X and connect the probe to Channel 1 on the oscilloscope. If you use the probe hook-tip, ensure it is firmly inserted onto the probe. Attach the probe tip to the PROBE COMP ~2V@1KHz connector and the reference lead to the PROBE COMP Ground connector. Display the channel and then press the Auto Scale button.

2. Check the shape of the displayed wave form

   Compensated correctly

   Overcompensated

   Undercompensated
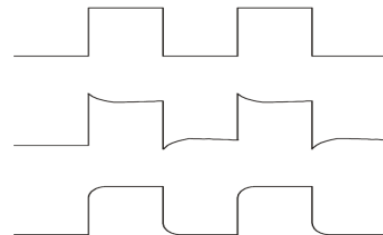
3. If necessary, use a nonmetallic screwdriver to adjust the variable capacity of your

probe until the shape of the waveform turns to be the same as the above figure. Repeat this step as necessary. See the figure below for the way of adjustment.
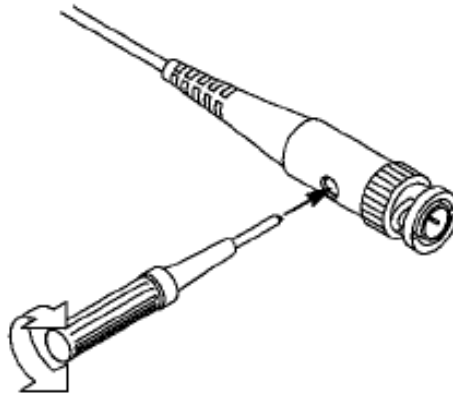
1.6.4. Probe Attenuation Setting

Probes are of various attenuation factors which affect the vertical scale of the signal. The Probe Check function is used to verify if the Probe attenuation option matches the attenuation of the probe.

You can push a vertical menu button (such as the **CH1**MENU button) and select the Probe option that matches the attenuation factor of your probe.

Make sure that the Attenuation switch on the probe matches the Probe option in the oscilloscope. Switch settings are 1X and 10X.

When the Attenuation switch is set to 1X, the probe limits the bandwidth of the oscilloscope to 6MHz. To use the full band width of the oscilloscope, be sure to set the Digital Storage Oscilloscope 9 switch to 10X.
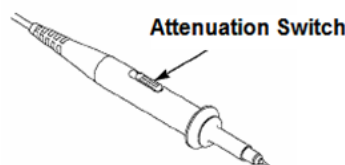
Chapter 2 Function Introduction

This chapter provides some general information that you need to learn before using an oscilloscope. It contains:

❖ **Menu and Control Keys**

❖ **Connector**

❖ **Universal Knobs and Softkeys**

❖ **Oscilloscope Setup**

❖ **Horizontal Controls**

❖ **Vertical System**

❖ **Trigger System**

❖ **Save/Recall**

❖ **Measure System**

❖ **Acquire**

❖ **Display**

❖ **Utility System**

❖ **Fast Action Buttons**

2.1. Menu and Control Keys

As shown in the figure below:

Figure 2-1 Control keys

All the keys are described as follows:

- ❖ **[CH1], [CH2],[CH3], [CH4]:**display setup menus of channel 1 and channel 2.
- ❖ **[Math]:** display "Arithmetical operation" waveform menu.
- ❖ **[Horizontal]:** Set Horizontal system.
- ❖ **[Trig Menu]:** display Trigger control menu.
- ❖ **[Force Trig]:** It is used for finishing acquisition of the current waveform no matter whether the oscilloscope detects trigger, and it is mainly applied to "Normal" and "Single" in the trigger mode.
- ❖ **[Default] :** recall the default factory setup.
- ❖ **[Help]:** enter the on-line help system.
- ❖ **[Utility]:** display "UTILITYFUNCTION" menu.
- ❖ **[Cursors]:** display the "CURSOR" menu. The [V0] knob can be used for regulating the position of the cursor when the "CURSOR" menu is displayed and the cursor is triggered.
- ❖ **[Meas]:** show the "Measure" menu.
- ❖ **[Wave Gen]:** show the waveform generator menu.
- ❖ **[Save Recall]:** show the "Save/Recall" menu of setups and waveform.
- ❖ **[Display]:** show the "Display" menu.
- ❖ **[Auto Scale]:** automatically set the control state of the oscilloscope so asto display suitable waveform.

❖ Digital Storage Oscilloscope 12
❖ **[Run/Stop]:** continuously acquire waveform or stop acquisition.
❖ **[Single]:** Acquire a single trigger, finish acquisition and then stop.

2.2. Connector

Figure 2-2 Connector

CH1, CH2 , CH4 : for an input connector of a measured signal.

❖ EXT TRIG: be used as an input connector of an external trigger source. Use

[T rig Menu button to select "External " trigger source (only for Edge trigger)), and

the trigger signal source can be used for triggering in the third channel while

acquiring data

❖ Gen Out: Waveform signal output.
❖ Probe compensation : The probe compensation signal is output and grounded

so that the probe is matched with the channels of the oscilloscope.

2.3. Universal Knobs and Softkeys

V0: **Universal** Knob. Under different menu options, it supports selecting menu options (MEASURE), moving cursors and levels (Slope Trigger).

Press this knob to reset data (trigger holdoff, overtime of the overtime trigger   and slope trigger), select menu options and so on. Easy to operate.

Press the **Wave Gen** button on the front panel to open the arbitrary waveform generator function.

Hide/Show softkey. Push it to hide the menu options on the right side of the screen and give a full screen display of waveforms. Push it again to show the menu options.

F1-F5: These five softkeys are all multi-functional. They are in charge of selecting corresponding menu options on the screen in different menu modes.

This functional softkey is mainly used to turn pages and confirm a selection, such as 'next page', 'previous page'.

2.4. Oscilloscope Setup

While operating the oscilloscope, you may often use four features: Auto Scale, saving a setup, recalling a setup and default setup. Hereinafter they are introduced one by one.

Auto Scale: This function can be used to adjust the horizontal and vertical scales of the oscilloscope automatically and set the trigger coupling, type, position, slope, level and mode, etc., to acquire a stable waveform display.

Saving a Setup: By default, the oscilloscope will save the setup each time before being closed, and automatically recall the setup once being turned on. (Note: If you modify the setup, please wait for more than 10 seconds before turning off the oscilloscope to ensure the proper storage of new settings.) You can save 10 settings permanently in the oscilloscope and reset them as necessary.

Recalling a Setup: The oscilloscope can recall any of your saved setups or the default factory setup.

Default Setup: The oscilloscope is preset for normal operations when it is shipped from the factory. This is the default setup. You may recall this setup at any time for your requirements.

2.5. Horizontal Controls

Use the horizontal controls to change the horizontal scale and position of waveforms. The horizontal position readout shows the time represented by the center of the screen, using the trigger time as zero. When you change the horizontal scale, the waveform will expand or contract to the screen center. The readout near the upper right of the screen shows the current

horizontal position in second. The oscilloscope also has an arrow icon at the top of the graticule to indicate the horizontal position.

1. Horizontal Position Knob: Used to control the trigger position against the screen center. Push this button to reset the trigger point back to the screen center.

AN: Used to set the horizontal position as zero.

Universal Knob

2. SEC/DIV Knob: Used to change the horizontal time scale so as to magnify or compress the waveform horizontally. If the waveform acquisition is stopped (by using the **[Run/Stop]**or **[Single]**button), the SEC/DIV control will expand or compress the waveform.

Press **SEC/DIV** Knob again to exit Dual-window Mode.

2.6. Vertical System

2.6.1. Vertical Controls
Vertical controls can be used to display and remove waveforms, adjust vertical scale and position, set input parameters and perform math calculations. Each channel has a separate vertical menu to set. See below for menu description.
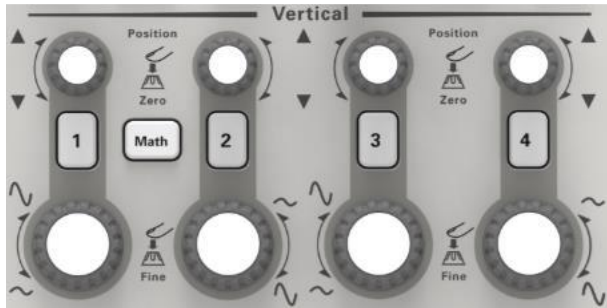
Vertical Position

Volts/div

Vertical Position

Volts/div

1. **Vertical Position Knob:** Move the channel waveform up and down on the screen. In dual-window mode, move the waveforms in both windows at the same time in a same direction. Push this knob to return waveforms to the vertical center position on the screen. Two channels correspond to two knobs.

2. **VOLTS/DIV Knob**

Control the oscilloscope to magnify or attenuate the source signal of the channel waveform. The vertical size of the display on the screen will change (increase or decrease) to the ground level.

3. **Menu (CH1, CH2, CH3, CH4):** Display vertical menu options; turn on or off the display of channel waveforms.

Options	Settings	Comments
Coupling	DC AC GND	DC passes both DC and AC components of the input signal. AC blocks the DC component of the input signal and attenuates signals below 10Hz. Ground disconnects the input signal.
BW 20MHz	OFF ON	Limits the bandwidth to reduce display noise; filters the signal to eliminate noise and other unnecessary HF components.
Div	Coarse Fine	Selects the resolution of the VOLTS/DIV knob. Coarse defines a 1-2-5 sequence. Fine changes the resolution to small steps between the Coarse settings.
Probe	1X 10X 100X 1000X	Selects a value according to the probe attenuation factor so as to ensure correct vertical readouts. Reduce bandwidth to 6MHz when using a 1X probe.

Invert	OFF ON	The invert function turns the displayed waveform 180 degrees, with respect to the ground level. When the oscilloscope is triggered on the inverted signal, the trigger is also inverted.

Coupling

❖ If the channel adopts a DC coupling mode, you can quickly measure the DC component of the signal by observing the difference between the waveform and the signal ground.

❖ If the channel adopts an AC coupling mode, the DC component in the signal is filtered. By this mode, the AC component of the signal is displayed at a higher sensitivity.

❖ If the channel adopts a GND coupling mode, cut off the input signal. Inside the channel, the channel input is connected with a zero-volt reference electric level.

Fine Resolution

In the fine resolution setting, the vertical scale readout displays the actual VOLTS/DIV setting. The vertical scale changes only after you adjust the VOLTS/DIV control and set to coarse.

Remove Waveform Display

To remove a waveform from the screen, first push the menu button to display the vertical menu, then push again to remove the waveform. A channel waveform which is unnecessary to be displayed can be used as a trigger source or for math operations.

2.6.2. Math Operation

The series of scope supports many math operations between analog channels waveforms, including addition (+), subtraction (-), multiplication (*), division (/) and FFT. You can use cursors to measure it. The contents of this chapter:

• Units for Math Waveforms

• Math Operators

• To Adjust the Math Waveform Scale and Offset

Note: If the analog channel or the math function display is truncated (waveforms do not display on the screen completely), the resulting math will also be truncated.

Operation	Unit
Addition (+)or subtraction (-)	V
multiplication (*)	$V \wedge 2$
division (/)	None
FFT	dB, Vrms,

Addition or Subtraction

Math operators perform arithmetic operations -add or subtract operation -on any two analog input channels. When you select addition or subtraction, the Source A and Source B values are added or subtracted point by point, and the result is displayed.

1. Press the **[Math]**button on the front panel to enter the MATH function menu.

2. Press the **Source 1**and **Source 2**softkey respectively, and then turn the Universal Knob to select the source to do math operation. Analog channels (CH1~CH4) can be used as Source 1or source 2.

3. Press the **Operation** softkey and then turn the universal to select + or -to make addition or subtraction operation. The resulting math waveform is displayed on the screen and labeled with "M".

Scale: Press the **Scale** softkey, and then turn the Universal Knob to select the vertical scale.

Multiplication and Division

Math operators perform arithmetic operations multiplication or division operation on any two analog input channels. When you select multiplication or division, the **Source 1** and **Source 2** values are multiplied or divided point by point and the result is displayed.

1. Press the **[Math]**button on the front panel to enter the MATH function menu.

2. Press the **Source 1**and **Source 2** softkey respectively, and then turn the **Universal Knob** to select the source to do math operation. Analog channels (CH1 ~CH4) can be used as Source 1 or source 2.

3. Press the **Operation** softkey and then turn the universal to select ***** or **/** to make multiplication or division operation. The resulting math waveform is displayed on the screen and labeled with "M".

Scale: Press the **Scale** softkey, and then turn the Universal Knob to select the vertical scale.

FFT Operation

FFT is used to compute the fast Fourier transform using analog input channels or reference waveforms. FFT takes the digitized time record of the specified source and transforms it to the frequency domain. When the FFT function is selected, the FFT spectrum is plotted on the oscilloscope display as magnitude in dBV versus frequency. The readout for the horizontal axis changes from time to frequency (Hertz) and the vertical readout changes from volts to dB. FFT operation can facilitate the following works:

❖ Measure harmonic components and distortion in the system.
❖ Measure the characteristics of the noise in DC power.
❖ Analyze vibration

To display a FFT waveform:

1. Press the **[Math]**button on the front panel to open the MATH function menu.

2. Press the **Operation** softkey and then turn the **Universal Knob** to select **FFT**. The resulting math waveform is displayed on the screen and labeled with "M".

3. Press the **Source** softkey, and then turn the **Universal Knob** to select the source to do FFT operation. Analog channels (CH1~CH4) can be used as the source. Digital Storage Oscilloscope 20

4. Press **Center** soft key and then turn the **Universal Knob** to adjust the frequency of the frequency domain waveform corresponding to the horizontal center of the screen.

5. Press **Span** soft key and then turn the **Universal Knob** to adjust the horizontal scale of the frequency domain waveform.

6. Press the **Vertical Units** softkey to select the unit of vertical axis. The units of the vertical axis can be dB or Vrms which use a logarithmic scale or a linear scale to display vertical amplitude respectively. If you need to display the FFT frequency spectrum in a relatively larger dynamic range, dB Vrms is recommended.

7. Press the **Scale** softkey to select the vertical scale.

8. Press the **Window** softkey, and then turn the **Universal Knob** to select an appropriate window.

Spectral leakage can be considerably decreased when a window function is used. The series of scope provides six kinds of FFT window functions which have different characteristics and are applicable to measure different waveforms. You need to select the window function according to different waveforms and their characteristics. Please read the table below carefully to make an appropriate option according to the input signal.

Window	Measurement	Characteristics
Rectangular	Pulse or Transient Waveform	Special-purpose window applicable to discontinuous waveforms. This is actually the same as no windows.
Hanning	Periodic Waveform	Better frequency, poorer amplitude accuracy than Flattop
Hamming	Transient or short pulse	A litter bit better frequency resolution than Hanning.
Blackman	Single frequency signal, search for higher order harmonics.	The best amplitude resolution; the poorest frequency resolution
Bartlett (Triangle)	Narrow band signal with stronger	Better frequency resolution.
Flattop	Periodic Waveform	Better amplitude, poorer frequency accuracy than Hanning

9. Press the **Show-Only** softkey to select **to display** FFT operation results only and not display the source channel.

Note:

❖ Signals with DC components or deviation would cause an error or deviation of the FFT waveform components. To reduce the DC components, set the Channel **Coupling** to **AC.**

❖ To reduce the random noise and aliasing frequency components of repetitive or single pulse, set the **Acquisition** of the oscilloscope to **Average**.

Using Cursors to measure FFT wave form

To make cursor measurements, press the **Cursors** button to turn the cursors, and then press the **Mode** softkey to select **Manual or Track**, Use the AX and BX cursors to measure frequency values and the difference between two frequency values (BX-AX). Use the AY and BY cursors to measure amplitude in dB and difference in amplitude (BY-AY).

2.7 Trigger System

The trigger determines when the oscilloscope begins to acquire data and display a waveform. Once a trigger is properly set up, the oscilloscope can convert unstable displays or blank screens to meaningful waveforms. Here introduce some basic concepts about trigger.

Trigger Source: The trigger can be generated with multiple sources. The most common one is the input channel (CH1~CH4). Whether the input signal is displayed or not, it can trigger normal operations. Also the trigger source can be any signal connected to an external trigger channel (only for Edge trigger).

Trigger Mode: You can select the Auto or Normal mode to define how the oscilloscope acquires data when it does not detect a trigger condition. Auto Mode performs the acquisition freely in absence of valid trigger. It allows the generation of untriggered waveforms with the time base set to 100ms/div or slower. Normal Mode updates the displayed waveforms only when the oscilloscope detects a valid trigger condition. Digital Storage Oscilloscope 22

Before this update, the oscilloscope still displays the old waveforms. This mode shall be used when you want to only view the effectively triggered wve forms. In this mode, the oscilloscope displays waveforms only after the first trigger. To perform a single sequence acquisition, push the**[Single]**button.

Trigger Position: The horizontal position control establishes the time between the trigger position and the screen center.

Trigger Level: It sets the amplitude level the signal must cross to cause an acquisition when using the Edge or Pulse Width trigger.

Force Trigger: Used to complete an acquisition regardless of an adequate trigger signal. This button becomes useless if the acquisition is already stopped.

Trigger Level

2.8. Save/Recall

Oscilloscope setups, waveforms, Ref, and CSV files can be saved to internal oscilloscope memory or to a USB storage device. The picture can be saved to USB storage device. The saved setups, wave form sand Ref can be recalled from an USB Host interface on the front panel to connect an USB device for external storage.

The scope supports setups, waveforms, Ref , CSV files and picture storage. The default save type is setups.

1. Setups

It's the default storage type of the scope. It saves the settings of the oscilloscope in internal or external memory in ".SET" format. At most 9 setting files (from No.1～No.9) can be stored in internal memory. The stored settings can be recalled.

2. Wave (Binary)

The scope saves the waveform data in memory in ".lwf" format.

3. Reference

The scope saves the waveform data in memory in ".REF" format. At recall, the reference waveform will be displayed on the screen directly.

4. CSV

It saves the waveform data in external memory in ".CSV" format. The stored files contain the waveform data of the displayed analog channels and the main setting information of the oscilloscope. The recall of CSV file is not supported.

5. Picture

Save the oscilloscope display interface to external storage in ".bmp" format. The recall of picture file is not supported.

2.9. Measure System

The oscilloscope displays graphs of voltage versus time and can help to measure the displayed waveform. There are several ways to take measurements, using the graticule, the cursors or performing an automatic measurement.

2.9.1. Scale measurement

Graticule: This method allows you to make a quick, visual estimate and take a simple measurement through the graticule divisions and the scale factor.

For example, you can take simple measurements by counting the major and minor graticule divisions involved and multiplying by the scale factor. If you counted 6major vertical graticule divisions between the minimum and maximum values of a waveform and knew you had a scale factor of 50mV/division, you could easily calculate your peak-to-peak voltage as follows:

6divisions x 50mV/division = 300mV.

2.9.2. Cursor measurement

Cursor: This method allows you to take measurements by moving the cursors. Cursors always appear in pairs and the displayed readouts are just their measured values. There are two kinds of cursors: Amplitude Cursor and Time Cursor. The amplitude cursor appears as a horizontal broken line, measuring the vertical parameters. The time cursor appears as a vertical broken line, measuring the horizontal parameters.

The cursor measurement includes two modes: Manual mode and Tracking mode.

1. Manual mode:

Horizontal cursors or vertical cursors appear in pair to measure time or voltage, and the distance between the cursors can be manually regulated. The signal source should be set as a waveform to be measured before the cursors are used.

2. Tracking mode:

A horizontal cursor is intersected with a vertical cursor to form a cross cursor. The cross cursor is automatically located on the waveform, and the horizontal position of the cross cursor on the waveform is regulated by selecting "Cur A" or "Cur B" and rotating the [UNIVERSAL] knob. The coordinates of the cursor point will be displayed on the screen of the oscilloscope.

Push the **CURSOR** button to display the Cursor Menu.

Options	Settings	Comments
Mode	Manual	Select a measurement cursor and display it.
Track		
Source	CH1~CH4 MATH	Select a waveform to take the cursor measurement. Use the readouts to show the measurement.
Select Cursor	AX(BX) AXBX AY(BY) AYBY	A selected cursor is highlighted, which can be moved freely. Both cursors can be selected and moved at the same time. The box behind the cursor displays the location of the cursor.

Moving Cursors: Press the key near Select Cursor to select a cursor and turn **Universal Knob** to move it. Cursors can be moved only when the Cursor Menu is displayed.

2.9.3. Automatic Measurement

Automatic Measurement: The oscilloscope performs all the calculations automatically in this mode. As this measurement uses the waveform record points, it is more precise than the graticule and cursor measurements. Automatic measurements show the measurement results by readouts which are periodically updated with the new data acquired by the oscilloscope.

Push the **Meas** button to perform auto measurements. There are 32 types of measurements and up to 4 can be displayed at a time.

Perform the steps below and select voltage or time parameters to make automatic measurements.

1. Press the**[Meas]**button on the front panel to enter the Measure function menu.

2. Press the **Source** softkey, and then use the **Universal Knob** to select the desired channel.

3. Press the **Type** softkey, and then turn the **Universal Knob** to select the desired measurement parameter.

4. Press the **Universal Knob** to add the measurement parameter, the parameters and value will be shown above the menu, and the status of the statistics will update.

5. To turn off the statistic function, press the **Statistics** softkey to select OFF.

The measurement display area can display 4measurement parameters at most, and the measurements will be arranged according to the selected order. If add a sixth measurement parameter, it will delete the first measurement.

Note: If the parameter does not match the measured condition, it will display as "*****".

To Clear Measurement Parameters

Press the **Clear All** softkey to clear all the measurement parameters that are displaying on the screen.

Statistic Function

Make statistic and display the current, average, minimum, maximum, root mean square error and count values of at most 4 measurement items that are turned on last.

1. Press the **[Meas]**button on the front panel to enter the Measure function menu.

2. Press the **Statistics** softkey to select ON.

	cur	avg	max	min	rmse	count
PkPk	2.32V	7.05V	2.01KV	-980mV	97.56V	8363
Freq	2KHz	1.96KHz	2.02KHz	-980mHz	290.11Hz	8363
VMean	199.96mV	8.19V	2.01KV	-980mV	126.06V	7735
VMax	1.36V	1.33V	1.38V	0.0V	27.86mV	7467

To Make All Measurement

All measurement could measure all parameters of the current measurement source and display the results on the screen. Digital Storage Oscilloscope 56

Do the following steps to make all parameters measurement.

1. Press the **[Meas]**button on the front panel to enter the MEASURE function menu.

2. Press the **All Measure** softkey to select ON.

3. Press the **Source** softkey to select the measure source (CH1~CH4).

2.10. Acquire

Run Control

Press the **[Run/Stop]**or**[Single]**button on the front panel to run or stop the sampling system of the scope.

When the **[Run/Stop]**is green, the oscilloscope is running, that is, acquiring data when trigger conditions are met. To stop acquiring data, press the **[Run/Stop]** button. When stopped, the last acquired waveform is displayed.

When the **[Run/Stop]** button is red, data acquisition is stopped. Red "Stop" is displayed next to the trademark logo in the status line at the top of the display. To start acquiring data, press **[Run/Stop]**.

To capture and display a single acquisition (whether the oscilloscope is running or stopped), press **[Single]** button. The Single run control lets you view single-shot events without subsequent waveform data overwriting the display.

When **[Single]**is pressed the display is cleared, the trigger mode is temporarily set to Normal(to keep the oscilloscope from auto-triggering immediately), the trigger circuitry is armed, the Single key is illuminated, and the oscilloscope waits until a user defined trigger condition occurs before it displays a waveform.

When the oscilloscope triggers, the single acquisition is displayed and the oscilloscope is stopped (the **[Run/Stop]**button is illuminated in red). Press **[Single]**button again to acquire another waveform.

When you acquire an analog signal, the oscilloscope will convert it into a digital one. The real-time acquisition has four modes: Normal, Peak Detect, Average and High Resolution. The acquisition rate is affected by the setting of time base.

Normal: In this acquisition mode, the oscilloscope samples the signal in evenly spaced intervals to establish the waveform. This mode accurately represents signals in most time. However, it does not acquire rapid variations in the analog signal that may occur between two samples, which can result in aliasing and may cause narrow pulses to be missed. In such cases, you should use the Peak Detect mode to acquire data.

Peak Detect: In this acquisition mode, the oscilloscope gets the maximum and minimum values of the input signal over each sample interval and uses these values to display the waveform. In this way, the oscilloscope can acquire and display those Digital Storage Oscilloscope 60

narrow pulses that may have otherwise been missed in Normal mode. However, noise will appear to be higher in this mode.

Average: In this acquisition mode, the oscilloscope acquires several waveforms, averages them, and displays the resulting waveform. You can use this mode to reduce random noise.

High Resolution(HR): This mode uses a kind of ultra-sample technique to average the neighboring points of the sample waveform to reduce the random noise on the input signal and generate much smoother waveforms on the screen. This is generally used when the sample rate of the digital converter is higher than the storage rate of the acquisition memory.

Note: "Average" and "HR" modes use different averaging methods. The former uses "Multi-sample Average" and the latter uses "Single Sample Average".

Time Base: The oscilloscope digitizes waveforms by acquiring the value of an input signal at discrete points. The time base helps to control how often the values are digitized. Use the SEC/DIV knob to adjust the time base to a horizontal scale that suits your purpose.

Push the **UTILITY** button and press **Acquire** softkey to set the acquisition parameter.

Options	Settings	Comments
Mode (Real Time)	Normal Peak Detect Average HR	Acquire and accurately display most waveforms. Detect glitches and eliminate the possibility of aliasing. Reduce random or uncorrelated noise in signal display. The number of averages is selectable.
Disp Mode	YT XY Roll	YT format shows the vertical voltage in relation to time (horizontal scale); XY format displays a dot between CH1 and CH2 each time when a sample is acquired, where the voltage or current of CH1 determines the X coordinate of the dot (horizontal) and the voltage or current of CH2 determines the Y coordinate (vertical). For detailed information, refer to descriptions on XY format in the following text.
Averages	4, 8, 16, 32,	Select the number of averages by pressing F3 or

2.11. Display

The waveform display is affected by settings of the oscilloscope. A waveform can be measured once it is captured. The different styles to display a waveform on the screen give significant information about it.

Push the **[Display]**button and the following menu appears.

Options	Settings	Comments
Type	Vectors Dots	Vectors fill up the space between adjacent sample points in the display; Dots only displays the sample points.
Source Intensity		Adjustable, Turn the multi-functional knob to adjust.
Grid	Dotted line Real line OFF	Off only displays the horizontal and vertical coordinates at the center graticule on the screen.
Source Intensity		Adjustable, Turn the multi-functional knob to adjust.
Key Reuse		Set the function of[Force Trig]button, Force trigger or save picture to USB.
Screen		Adjustable, Turn the multi-functional knob to adjust.
Brightness		
Persist	OFF Infinite 1s, 5s, 10s,30s	Sets the time length to display each displayed sample point.

2.12. Utility System

Push the **UTILITY** button to display the Utility Menu as follows.

Options	Comments
Language	Set the language
DVM	Enable the DVM measure function.
Acquire	Enter acquire function.

System Info	Display the software and hardware versions, serial number and some other information about the oscilloscope.
System Set	Set the sound, Network, time and date.
Update	Insert a USB disk with upgrade program. Press the Update Program button and the Software Upgrade dialog pops up. Refer to tips to upgrade or cancel.
Calibrate	Press this option and the Self Calibration dialog pops up. Refer to tips to perform the self calibration or cancel.
Self Test	Self test function.
Pass/Fail	Pass/Fail function
Front Panel Self Test	Test the function of all keys and knobs on the front panel.

2.13. Fast Action Buttons

Auto Scale: Automatically set the oscilloscope controls to generate a usable display of the input signals. Refer to the following table for relative content.

Single: Acquire a single waveform and then stop the acquisition.

Run/Stop: Continuously acquire waveforms or stop the acquisition.

Help: Display the Help menu.

Default: Recall the factory setup. Refer to the following table for relative content.

2.13.1 AUTO SCALE
Auto Scale is one of the advantages digital oscilloscopes have. When you push the Auto Scale button, the oscilloscope will identify the type of waveform (sine or square wave) and adjust controls according to input signals so that it can accurately display the waveform of the input signal.

Functions	Settings
Acquire Mode	Adjusted to Normal or Peak Detect
Cursor	Off
Display Format	Set to YT
Display Type	Set to Vectors for an FFT spectrum; otherwise, unchanged
Horizontal Position	Adjusted
SEC/DIV	Adjusted
Trigger Coupling	Adjusted to DC, Noise Reject or HF Reject
Trigger Holdoff	Minimum
Trigger Level	Set to 50%
Trigger Mode	Auto

The Auto Scale function examines all channels for signals and displays corresponding waveforms. Auto Scale determines the trigger source according to the following conditions.

❖ If multiply channels get signals, the oscilloscope will use the channel with the lowest frequency signal as the trigger source.

❖ If no signals are found, the oscilloscope will use the lowest-numbered channel displayed in Auto Scale as the trigger source.

❖ If no signals are found and no channels are displayed, the oscilloscope will display and use Channel 1 as the trigger source. When you use the Auto Scale function and the oscilloscope determines that the signal is similar to a sine wave, the oscilloscope displays the following options.

Wave Options	Details
Multi-Period	Display multiple periods that have appropriate vertical and horizontal scales.
Single-Period	Set the horizontal scale to display about one period of the waveform.
Auto scale	Auto scale setting.
Source	Select the source: only display the current source or all sources.
Cancel	Let the oscilloscope recall the previous setup.

2.13.2 Default Setup

When you push the DEFAULT SETUP button, the oscilloscope will display the CH1 waveform and remove all the others. When you are at the default setup, press F1 to **Undo**

Preset. Then the oscilloscope returns to the status before default setup. The Digital Storage Oscilloscope 69

table below gives the options, buttons and controls that change settings at default setup.

Menu or System	Option, Button or Knob	Default Setting
Acquire	(Three mode options) Averages Run/Stop	Normal 16 Run
Cursor	Type Source Horizontal (amplitude) Vertical (time)	Off CH1 ±3.2div ±4div
Display	Type Persist Format	Vectors Off YT
Horizontal	Window Mode Trigger Knob Position SEC/DIV	Single-window Level 0.00s 200μs
Math	Operation Source Position	— CH1-CH2 0div
FFT	Vertical Scale FFT Operation Source Window FFT Zoom	20dB CH1 Hanning X1
Measure	Source Type	CH1 None
Trigger (Edge)	Type Source Slope Mode	Edge CH1 Rising Auto
Trigger (Pulse)	When	>
	Pulse Width Polarity Mode	200ns Positive Auto

Trigger (Video)	Polarity	Positive
	Sync	ScanLine
	Standard	NTSC
Trigger (Slope)	Slope	Rising
	Mode	Auto
	When	>
Trigger (Overtime	Source	CH1
	Polarity	Positive
	Mode	Auto
	Time	20ns
Vertical System, All Channels	Bandwidth Limit	Unlimited
	VOLTS/DIV	Coarse
	Probe Attenuation	1X
	Invert	Off
	Position	0.00div (0.00V)

The following settings do not change when you push the **[Default]**button.

- Language Option
- Saved Settings
- Saved Reference Waveforms
- Display Contrast
- Calibration Data

Chapter 3 Waveform Generator

The series oscilloscope is equipped with waveform generator function, with one channel of arbitrary waveform output. User can edit the arbitrary waveform or choose the regular waveforms such as Sine, Ramp, Square, Exponent, Noise, DC and AM/FM.

- ❖ **Set Wave Type and Parameters**
- ❖ **Edit Arbitrary Waveform**
- ❖ **Output Arbitrary Waveform**

3.1. Set Wave Type and Parameters

1. Press the **[Wave Gen]** button on the front panel to open the arbitrary waveform generator function.

2. Press the **Wave** softkey; then turn the **Universal Knob** to select the desired waveform and push down the knob to confirm. Press the Wave Type softkey continually can also select the waveform type.

3. Press the **Frequency** softkey to set frequency.

4. Press the **Amplitude** softkey to set amplitude.

5. Press the **Offset** softkey to set offset.

6. Press the **Duty** softkey in the second page to set the duty of Square and Ramp waveform.

Set the value of frequency, Amplitude or Offset:

⬌ : Horizontal arrow, turn the **Universal Knob** to select a digit.

⬍ : Vertical arrow, turn the **Universal Knob** to set the value of the selected digit.

The waveform will output from GEN OUT BNC port.

7. Press the **modulation** softkey to enter the modulation menu.

The modulation types are AM and FM.

8. Press the **Burst** softkey to enter the burst menu.

The burst types are N cycle and Gate.

3.2. Edit Arbitrary Waveform

User can't edit arbitrary waveform directly under Wave Gen interface for the device. Firstly, please double click "Wave Editor Setup. in Wave Editor folder in CD disk and install Arbitrary Waveform Editor software according to installation wizard After the software installed successfully, you can see Wave Editor icon on desktop. Double click the icon to enter arbitrary waveform generator window.
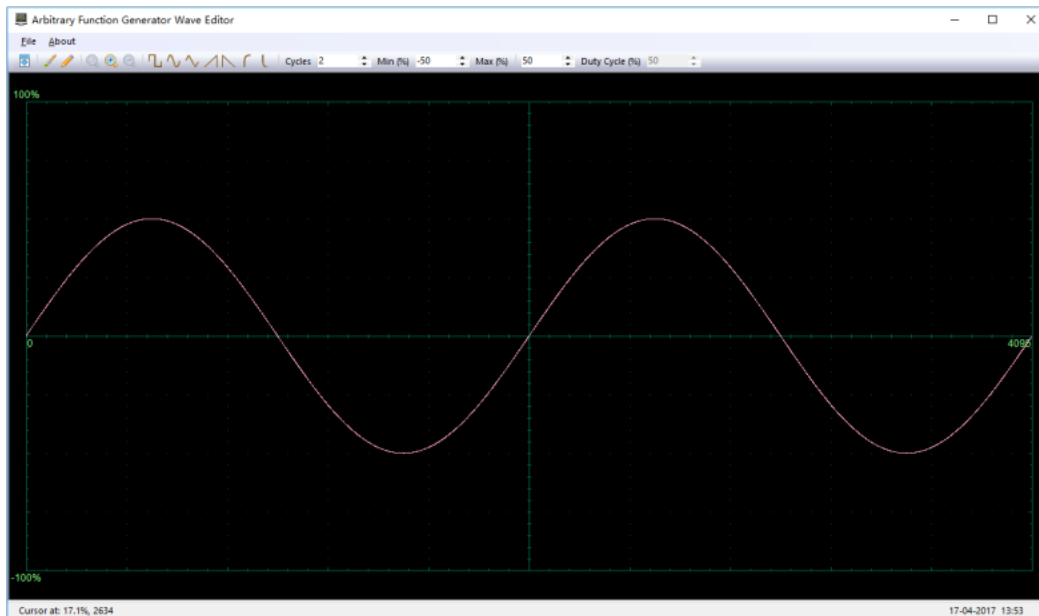
Menu:

Import from CSV: Import the CSV format file to the arbitrary wave form generator window.

Export as CSV: Save as CSV format file.

Import from ARB: Import the ARB format file to the arbitrary wave form generator window.

Export as ARB: Save as ARB format file.

Note: The device can recall ARB format file in USB disk, but CSV format file can't be recalled by the device.

Toolbar buttons

- : **Download waveform data to the device.**
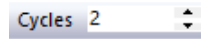- : **Smooth Drawing Mode.** You can draw any waveform shape using the left-mouse.
- : Line Drawing Mode. You can click on the waveform to draw a straight line from the previous point.
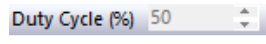- : **Zoom tools.** To zoom the time axis in or out, click the **+** or **-** zoom button and then click on the waveform area. Click the **100%** button to restore the time axis to its original scale.

⊓⋀⋁⋀⊼⌠⌐ : Standard waveform shapes. Draw a standard waveform with the settings specified in the numerical controls below the toolbar. The current waveform will be erased.

Cycles 2 : **Cycles.** The number of cycles to draw. This control is used in conjunction with the **Standard waveform shapes buttons**. Select one of the standard waveform shapes and then enter the number of cycles, and it will draw the requested number of cycles of the waveform.

Min (%) -50 : **Minimum.** When one of the **Standard waveform shapes buttons** is pressed, this control sets the minimum signal level.

Max (%) 50 : **Maximum.** When one of the **Standard waveform shapes buttons** is pressed, this control sets the maximum signal level.

Duty Cycle (%) 50 : **Duty cycle.** When a square, triangular or ramp waveform is selected using one of the **Standard waveform shapes buttons**, this control sets the duty cycle of the signal. Duty cycle is defined as the time that the signal spends above zero volts divided by the total cycle time. Thus, a symmetrical square or triangular wave has a duty cycle of 50%. Reducing the duty cycle shortens the positive part of the cycle and lengthens the negative part, and increasing the duty cycle does the opposite.

Note:

The F**requency, Amplitude, Offset** parameter of the ARB waveform can not be regulated in this Wave Editor software, but it can be done by tuning on the device directly (refer to above Chapter 3.1) after the waveform data is downloaded to device (refer to below Chapter 3.3).

Do not use the Wave Edit or and the DSO so ft war eat the same time, it will cause errors.

3.3. Output Arbitrary Waveform

1. Press the **Wave Gen** button on the front panel to enable the AWG function and enter the Wave Gen function menu.

2. Connect the device with PC which has installed the Wave Editor software using a USB cable.

3. Double click the Wave Editor icon to open the program.

4. Select a waveform file or draw an arbitrary waveform; then click the in toolbar and select waveform data download position to download waveform data to the device.
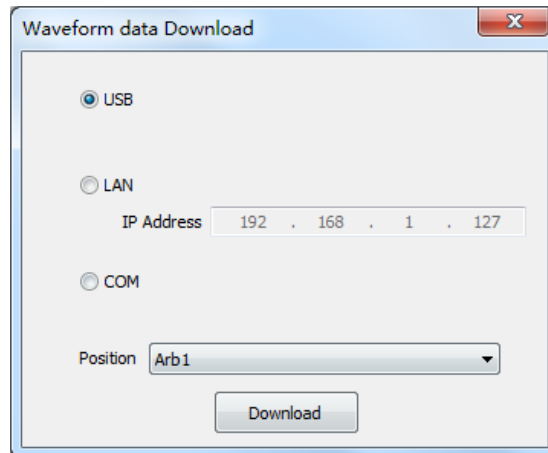
1. The waveform will output from GEN OUT BNC port.

Also, you can recall ARB format file in USB disk to output a waveform.

1. Press the **Wave Gen** button on the front panel to enter Wave Gen function menu.

2. Press the **Wave** softkey, turn the **Universal Knob** to select Arb1~Arb4and then push the knob to confirm.

3. Press **Recall** softkey and select desired recalled ARB format file in USB disk.

4. The waveform will output from GEN OUT BNC port.

Chapter 4 Troubleshooting

4.1. Problem Settlement

1. If the oscilloscope does not start up at power on, follow these steps:

1) Check the power cord to verify it has been connected properly;

2) Check the power on/off button to ensure it has been pushed;

3) Then restart the oscilloscope.

Contact your local HANTEK distributor or directly keep touch with HANTEK Technical Support department if the oscilloscope still can not be turned on normally.

2. If there is no display of waveforms on the screen when the oscilloscope is turned on, follow these steps:

1) Check the probe to assure its proper connection to the input BNC;

2) Check the channel switch (CH1~CH4menu buttons) to make sure it has been turned on;

3) Check the input signal to verify it has been connected to the probe correctly;

4) Affirm that all measured circuits have signals to output;

5) Turn up the magnitude for DC signals with large magnitude;

6) In addition, you may press the Auto Measure button to perform an automatic detection of signals at first.

Contact HANTEK Technical Support department in time if there is still no display of waveforms.

3. If the waveform of the input signal is distorted seriously, follow these steps:

1) Check the probe to assure its proper connection to the channel BNC;

2) Check the probe to assure its good connection to the measured object;

3) Check the probe to verify it has been well calibrated. Otherwise, refer to the content about calibration described in this manual.

4. If the waveform is rolling continuously on the screen but can not be triggered, follow these steps:

1) Check the trigger source to make sure it consistent with the input channel;

2) Check the trigger level to assure its correct adjustment. You may push the TRIGGER LEVEL knob to reset the trigger level back to the center of the signal;

3) Check the trigger mode to confirm it is a right choice for the input signal. The default trigger mode is edge trigger. However, it is not suitable for all kinds of input signals.

Chapter 5 Services and Support

Thank you for choosing GAOTek. Please contact us through the following ways should you have any inquiry regarding our products. We shall do our best to help you.

1．Contact your local GAOTek distributor;

2．Contact your local GAO Tek field office;

3．Contact GAOTek headquarters in New York and Toronto.

Chapter 6 General Care and Cleaning

6.1. General Care

Do not put or leave the device in a place where the LCD display will be exposed to direct sunlight for long periods of time.

Note: To avoid damage to the oscilloscope or probes, do not expose them to sprays, liquids, or solvents.

6.2. Cleaning

Examine the oscilloscope and probes as often as operating conditions require. To clean the exterior surface, perform the following steps:

1)   Use a lint-free cloth to remove floating dust on the outside of the oscilloscope and probes. Take care to avoid scratching the glabrous display filter.

2)   Use a soft cloth dampened with water to clean the oscilloscope. For more efficient cleaning, you may use an aqueous solution of 75% isopropyl alcohol.

Note: To avoid damage to the surface of the oscilloscope or probes, do not use any corrosive or chemical cleaning agents.

APPENDIX
Appendix A: Technical Specifications

All specifications herein mentioned apply to the series oscilloscopes. Before checking an oscilloscope from HANTEK to see if it complies with these specifications, make sure it meets the following conditions:

❖   The oscilloscope must have been operating continuously for twenty minutes under the specified operating temperature.

❖ The Do Self Cal operation must be performed through the Utility menu if the operating temperature changes by more than 5℃.

❖ The oscilloscope must be within the factory calibration interval.

All specifications are guaranteed unless noted 'typical'.

Oscilloscope Specifications

Horizontal	
Sample Rate Range	1GS/s(Single-channel); 500MSa/s(Dual-channel); 250MSa/s(Three/Fourchannel)
Waveform Interpolation	(sin x)/x
Record Length	Maximum 64K samples per single-channel; maximum 32K samples per dual-channel(4K,32K optional)
SEC/DIV Range	DSO4084 DSO4104 / DSO4204 DSO4254
	2ns/div to 100s/div, in a 1, 2, 5 sequence
Sample Rate and Delay Time Accuracy	±50ppm
Delta Time Measurement Accuracy (Full Bandwidth)	Single-shot, Normal mode ±(1sample interval+100ppm×reading +0.6ns)
	>16 averages ±(1sample interval +100ppm×reading +0.4ns)
	Sample interval = s/div ÷ 20

Vertical

A/D Converter	8-bit resolution, each channel sampled simultaneously
VOLTS/DIV Range	500μV/div to 10V/div at input BNC
Position Range	500μV/div to 20mV/div, ±200mV 50mV/div to 200mV/div, ±1V 500mV/div to 2V/div, ±20V

	5V/div to 10V/div, ±30V			
Selectable Analog Bandwidth Limit, typical	20MHz			
Low Frequency Response (-3db)	≤10Hzat BNC			
Rise Time at BNC, typical	DSO4084	DSO4104	DSO4204	DSO4254
	≤4.4ns	< 3.5ns	≤1.8ns	<1.4ns
DC Gain Accuracy	±3% for Normal or Average acquisition mode, 10V/div to 10mV/div ±4% for Normal or Average acquisition mode, 5mV/div to500µV/div			

Trigger

Mode	Auto, Normal	
Level	CH1~CH4	±4divisions from center of screen
	EXT	0~3.3V
Holdoff Range	20ns ~ 10s	
Trigger Level Accuracy	CH1~CH4	0.2div × volts/div within ±4 divisions from center of screen
	EXT	± (6% of setting + 40mV)
Edge Trigger		
Slope	Rising, Falling, Rising&Falling	
Source	CH1~CH4/EXT	
Pulse Width		
Polarity	Positive,Negative	
Condition(When)	<, >, !=, =	
Source	CH1~CH4	
Width Range	8ns ~ 10s	
Resolution	8ns	
Video Trigger		
Signal Standard	NTSC, PAL	
Source	CH1~CH4	
Sync	Scan Line, Linr Num, Odd Field, Even Field and All Field	
Slope Trigger		

Slope	Rising, Falling
Condition (When)	<, >, !=, =
Source	CH1 ~ CH4
Time Range	8ns ~ 10s
Resolution	8ns
Overtime Trigger	
Source	CH1~CH4
Polarity	Positive, Negative
Time Range	8ns ~ 10s
Resolution	8ns
Window Trigger	
Source	CH1~CH4
Pattern Trigger	
Pattern	0: Lower level;1: High level;
Level	CH1~CH4
Interval Trigger	
Slope	Rising, Falling
Condition(When)	<, >, !=, =
Source	CH1~CH4
Time Range	8ns ~ 10s
Resolution	8ns
Under Amp	
Polarity	Positive, Negative
Condition(When)	<, >, !=, =
Source	CH1~CH4
Time Range	8ns ~ 10s
Resolution	8ns
UART Trigger	
Condition(When)	Start, Stop, Data, Parity Error, COM Error
Source (RX/TX)	CH1~CH4
Data format	Hex
Condition(When)	<, >, !=, =
Data Length	1 byte
Data Bits Width	5 bit, 6 bit, 7 bit, 8 bit
Parity Check	None, Odd, Even
Idle Level	High, Low

Baud Rate(Selectable)	110/300/600/1200/2400/4800/9600/14400/19200/38400/57600/115200/230400/380400/460400 bit/s
Baud Rate (Custom)	300bit/s~334000bit/s
Condition(When)	Interval Field, Sync Field, Id field, Sync Id Error, Identifier, Id and Data
Source	CH1~CH4
Data format	Hex
Baud Rate (Selectable)	110/300/600/1200/2400/4800/9600/14400/19200/38400/57600/115200/230400/380400/460400 bit/s
Baud Rate (Custom)	300bit/s~334000bit/s
CAN Trigger	
Condition(When)	Start Bit, Remote Frame, Data Frame Id, Frame Id, DataFrame Id A, Error Frame, All Error, Ack Error, Overload Fram
Source	CH1~CH4
Data format	Hex
Baud Rate (Selectable)	10000, 20000, 33300, 500000, 62500, 83300, 100000, 125000, 250000, 500000, 800000, 1000000
Baud Rate (Custom)	5kbit/s~1Mbit/s
SPI Trigger	
Condition	Data
Source (CS/CLK/Data)	CH1~CH4
Data format	Hex
Data Length	4, 8, 16, 24, 32
IIC Trigger	
Source (SDA/SCL)	CH1~CH4
Data format	Hex
Data Index	0~7
When(Condition)	Start, Stop, No Ack, Address, Data, Restart

Inputs

Input Coupling	DC, ACor GND
Input Impedance, DC coupled	1MΩ±2%in parallel with20pF±3pF
Probe Attenuation	1X, 10X

Supported Probe Attenuation Factors	1X, 10X, 100X, 1000X
Overvoltage Category	300V CAT II
Maximum Input Voltage	300VRMS(10X)

Measurements

Cursors	Voltage difference between cursors: △V Time difference between cursors: △T Reciprocal of △T in Hertz (1/△T)
Automatic Measurements	Frequency, Period, Average, Pk-Pk, RMS, Period Rms, Min, Max, Rise Time, Fall Time, + Width, - Width, + Duty, -Duty, V base, V top, V mid, Vamp, Overshoot, Pre shoot, Period Avg, FOV Shoot, RPRE Shoot, B Width, FRR, FFF, FRF, FFR, LRR, LRF, LFR and LFF

General Specifications

Display	
Display Type	7 inch 64K color TFT (diagonal liquid crystal)
Display Resolution	800 horizontal by 480 vertical pixels
Display Contrast	Adjustable
Probe Compensator Output	
Output Voltage, typical	About 2Vpp into ≥1MΩload
Frequency,	1kHz
typical	
Power Supply	
Supply Voltage	100-120VACRMS(±10%),45Hzto 440Hz, CATII 120-240VACRMS(±10%),45Hzto 66Hz, CATII
Power Consumption	<30W
Fuse	T, 3.15A, 250V, 5x20mm
Environmental	

OperatingTemperature	0 to 50 °C (32 to 122 °F)	
Operation Humidity	≤90% relative humidity	
Storage Temperature	-40 to +71 °C (-40 to 159.8 °F)	
Storage Humidity	≤60% relative humidity	
Cooling Method	Convection	
Altitude	Operating and Nonoperating	3,000m (10,000 feet)
	Random Vibration	0.31gRMSfrom 50Hzto 500Hz, 10 minutes on each axis
	Nonoperating	2.46gRMSfrom 5Hzto 500Hz, 10 minutes on each axis
Mechanical Shock	Operating	50g, 11ms, half sine
Mechanical		
Dimension	318 x 110 x 150mm(L x W x H)	
Weight	2900g	

Arbitrary Waveform Generator Mode

Waveform Frequency	Sine: 0.1Hz~25MHz Square: 0.1Hz~10MHz Ramp: 0.1Hz~1MHz EXP: 0.1Hz~5MHz
Amplitude	5mV~3.5Vp-p(50Ω) 10mV~7Vp-p(High impedance)
DAC	2K~200MHz adjustable
Frequency Resolution	0.10%
Channel	1CH waveform output
Waveform Depth	4KSa
Vertical Resolution	12 bit
Frequency Stability	<30ppm
Output Impedance	50 Ω

Appendix B: Accessories

All the following accessories are available by contacting your local GAO-Tech distributor.

Standard Accessories

• Probe×4 (1.5m), 1:1, (10:1) Passive Probes

• A Powerline

• A USB Line

• A BNC to BNC(Only for the scopes with waveform generator function)

• A PC software CD of the oscilloscope

• Warranty Card

• Manufacturer Certificate

• Certificate Of Calibration

Appendix C: Harmful and Poisonous Substances or Elements

Harmful and poisonous substances or elements1						
Component2	Pb	Hg	Cd	Cr(Vi)	PBB	PBDE
Shell and Chassis	X	0	0	X	0	0
Display Module	X	X	0	0	0	0
Circuit Board	X	0	0	X	0	0
Power Supply	X	0	0	X	0	0
Electric Wire and Cable Assembly	X	0	0	0	0	0
Connector	X	0	0	X	0	0
Fastener and Installed Hardware	X	0	X	X	0	0

Other Accessories (including probes)	X	0	0	X	0	0
Others	0	0	0	0	0	0

'X' means that at least the content of this poisonous and harmful substance in a homogeneous material of this component exceeds the limit specified in the SJ/T 11363-2006 standard.

'0'indicates that the content of this poisonous and harmful substance in all homogeneous materials of this component is refrained under the limit stated in the SJ/T 11363-2006 standard.

This component list contains components approved in the file 'Management Measures'.

Appendix D: To replace the fuse

The fuse of the series of scope is replaceable.
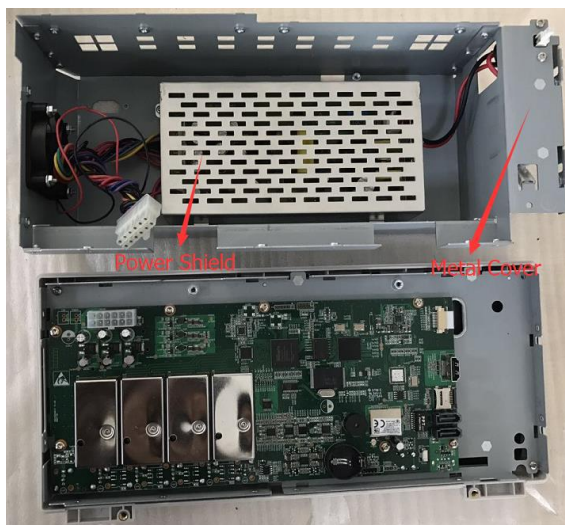
Fuse Rating: T, 3.15A, 250V, 5x20mm

Please refer to the following to replace it.

Warning: Remove power cord & all test probe before open the housing and replace the fuse.

1. Remove all the screws on the shell and separate the rear shell from other part.

2. Remove all the screws on the metal cover, separate metal cover from other part.

3. Remove all the screws on the power shield, then remove it. You can see the fuse on the power board. And replace a new fuse with the same specification.