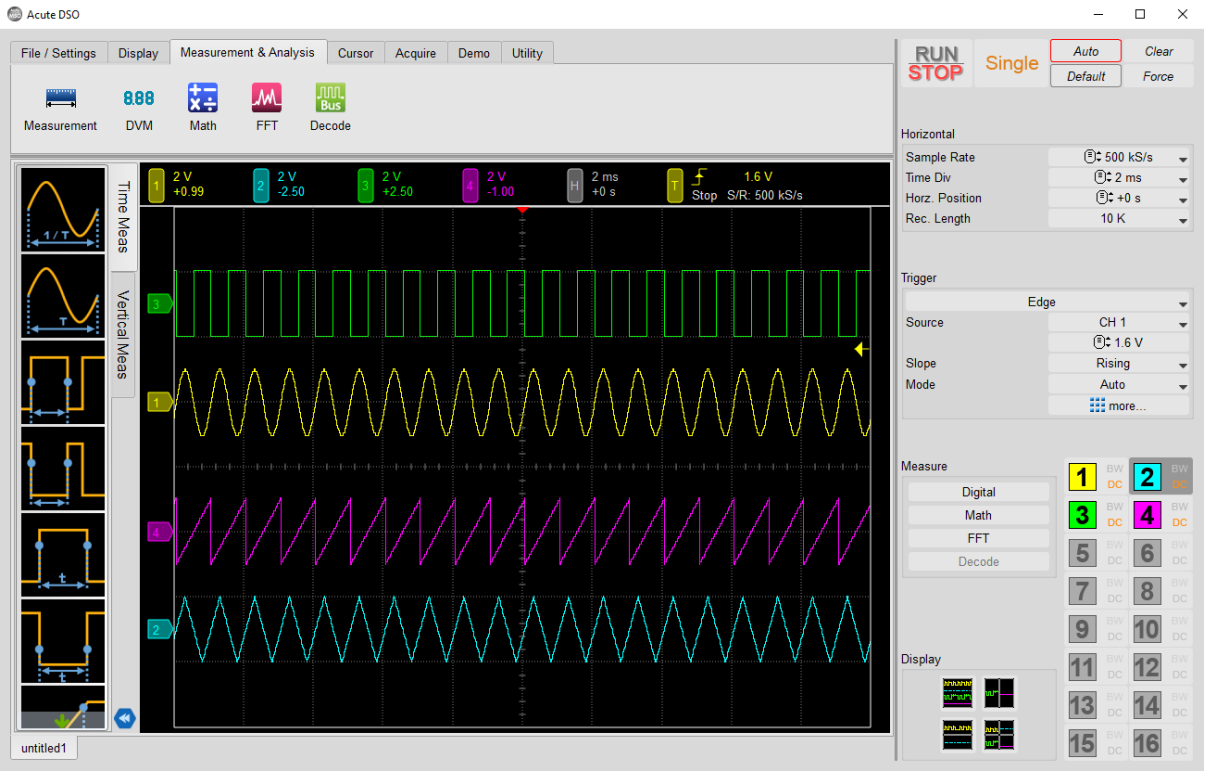
# DSO Software Manual




Public Date: 2024.12

# Index

# Applicable Models

## MSO3000 Series


## TS3000 Series

# Safety Information

Please read through the safety information before using the device. Make sure you completely understand the rules and follow the instructions below.

## ⚠WARNING

- **Do not operate without cover(s).**

  Do not operate the MSO with any cover(s) removed. This may result in electric shock or fire hazard if any part(s) inside is exposed to outer voltage.

- **About power supply**

  The MSO is powered by the PC's USB port with DC 5V. Be sure to use the USB cable we provide to connect your MSO device(s) to PC.

- **Do not operate in wet or damp conditions.**

- **Connect the probe properly**

  Connect the ground lead of the probe to earth ground only.

  Do not connect the ground lead to an elevated voltage.

  Do not connect/disconnect probes or test leads while they are probed to a voltage source.

## ⚠CAUTION

- **Observe ALL terminal ratings.**

  To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

- **Do not operate under the following conditions.**
  - Direct sunlight exposure
  - Extremely hot or humid
  - Places with frequent mechanical vibrations
  - Areas with strong lines of magnetic forces or voltage impulses.
- **Remove the USB cable when the MSO is idle.**
- **It is normal that MSO becomes a bit warmer than usual after being used.**

# Chapter 1 Installation

# Installation Procedure

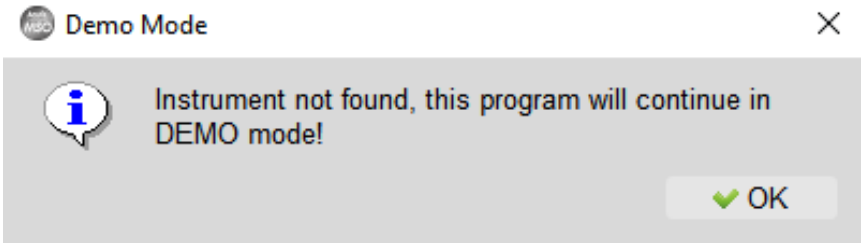
## Hardware Installation

Connect the device to USB port with the USB 3.0 cable. Start the software after the MSO is connected. You may connect to a sample signal source in order to check the hardware functionality.

## Software Installation

To install the software, please refer to the official website. Click on **Support** > **Download** > **Software** on the menu above. Follow the instructions on the software to complete to the installation process.

If the following dialog pops up after the software started,

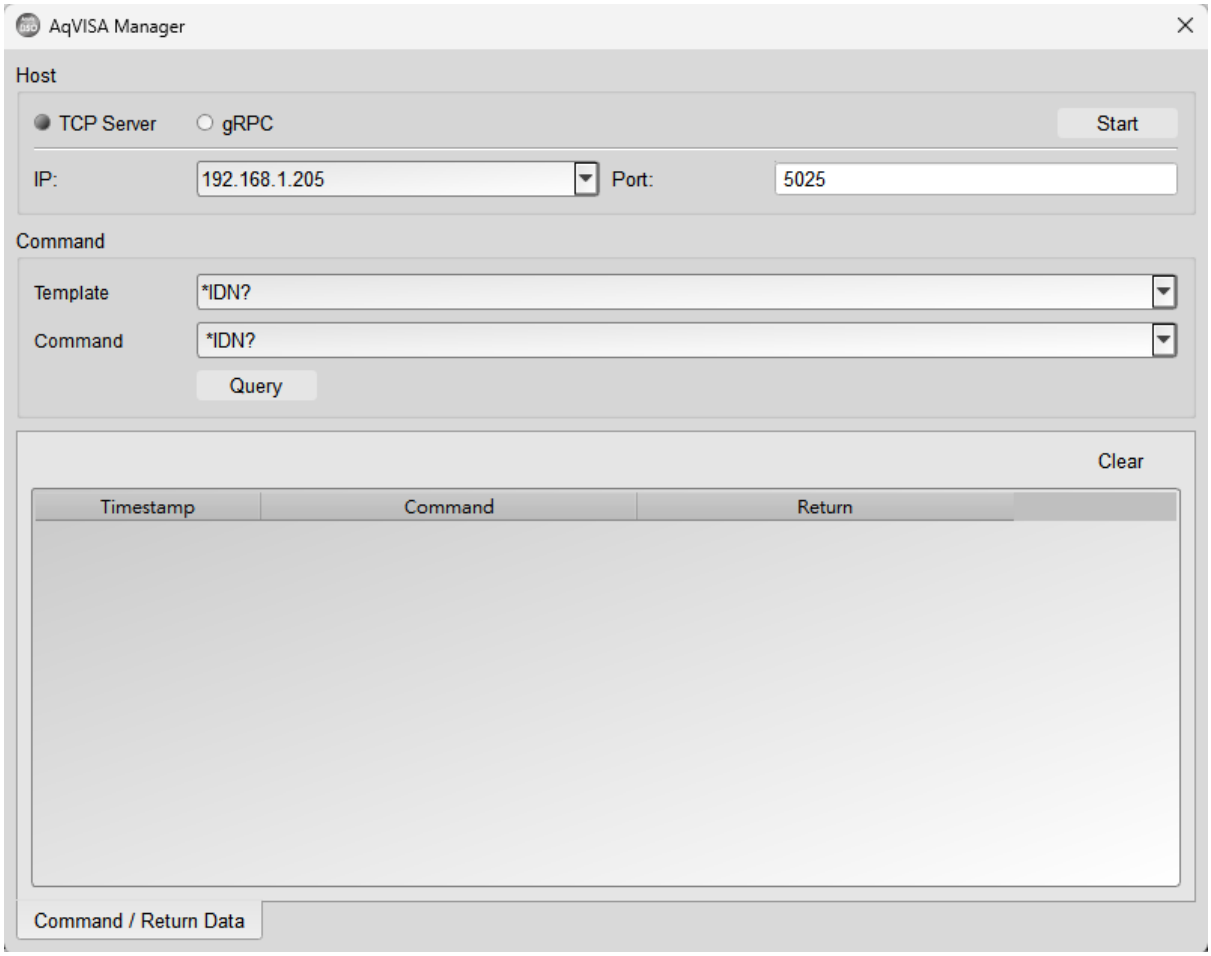



please check whether the instrument is correctly connected, then try to replug the USB cable and restart the software.

## SDK

We provide SDK for user to control the software and hardware behavior.

- **Software behavior (need to keep the software executing) :** User can monitor the software behavior by AqLAVISA Manager. Please check our official GitHub website: https://github.com/acute-technology-inc/aqvisa-grpc. Or find the label: **Download→SDK(DLL)→[Logic Analyzer]AqLAVISA SDK**, in our official website. Or contact us with e-mail.




- **Hardware behavior(DO NOT need to keep the software executing):** Please find the label, Download->SDK(DLL)-> [DSO] TS3000/ MSO3000 series SDK；Or contact us with e-mail. Please note it, there has no any decode processing, only capture data and save.

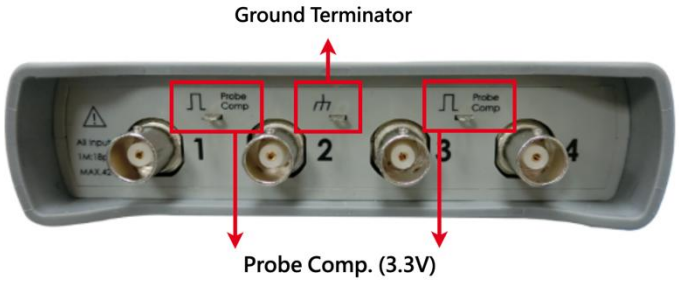
## gRPC

We provide gRPC for user to remote control our device. Please check our official GitHub website: https://github.com/acute-technology-inc/aqvisa-grpc. Or search: “aqvisa-grpc”. Or contact us with e-mail.

# Probe Compensation Adjustment

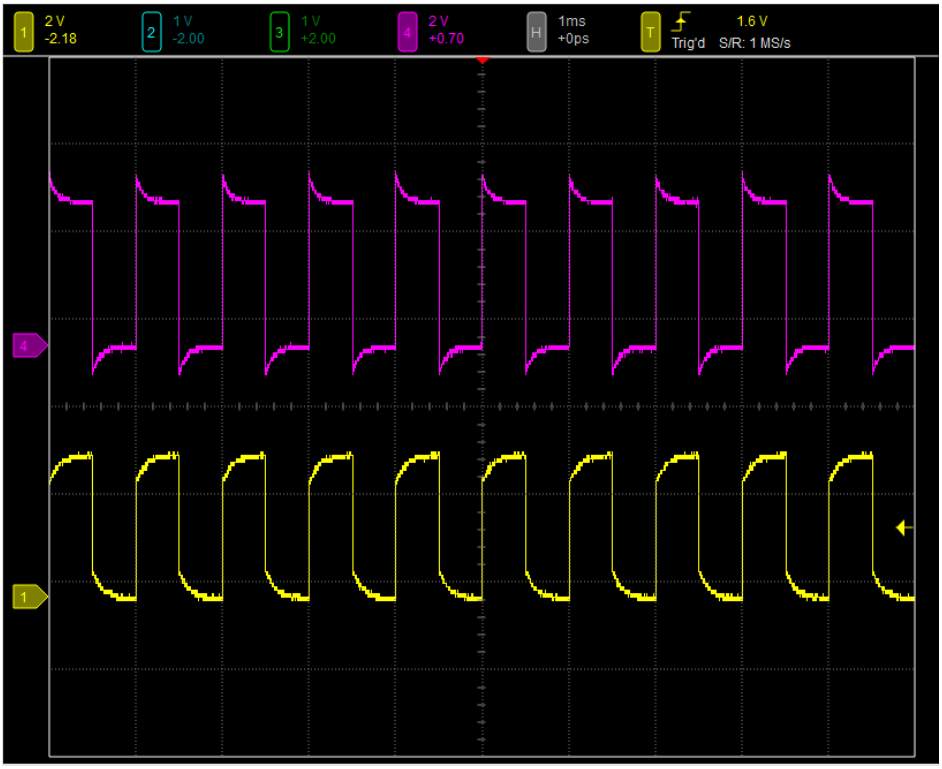
Please conduct probe compensation adjustment properly before start measuring with the oscilloscope.

1. Connect the probes to the BNC connector on MSO and lock it in place.
2. Switch the probe attenuation to “x10”.
3. Attach the probe ground lead to the MSO’s ground terminal.
4. Attach the probe tip to the “Probe Comp. (3.3V)” signal next to the ground.

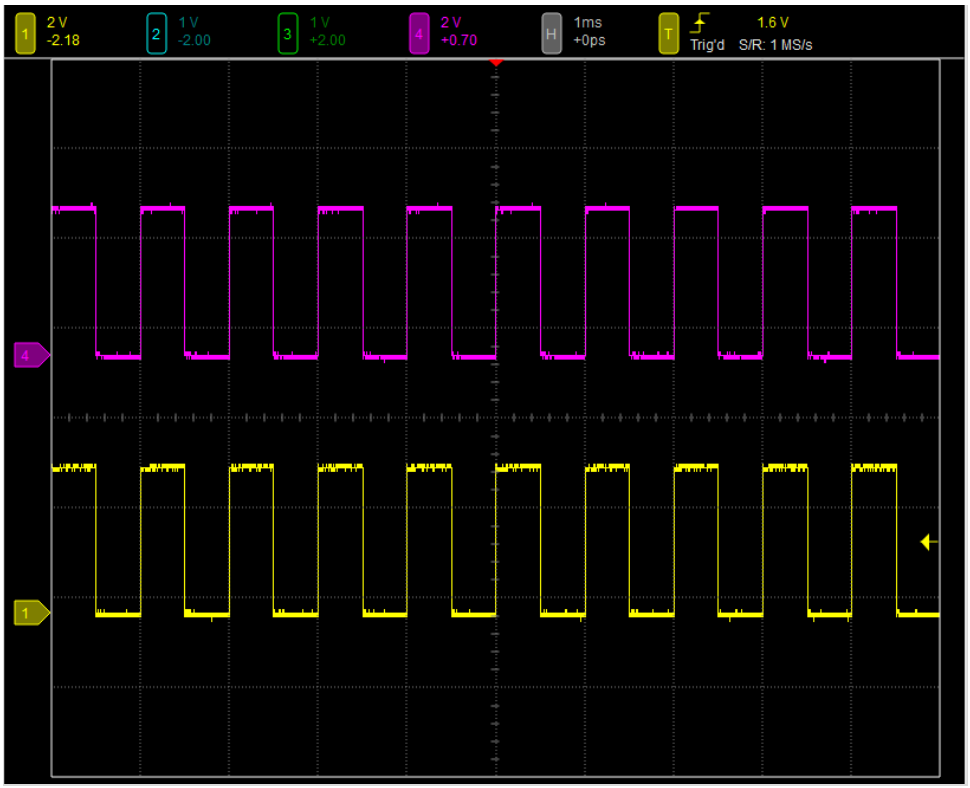



5. Run the DSO software. Set the Volt/div = 2v and the Time/div = 1ms. Verify the probe attenuation matches “x10” in the corresponding channel settings. If you see waveforms as below, please slowly turn the screw near the probe’s BNC connector (refer to the image above) and adjust the waveforms with flat tops with no overshooting and rounding.

## Waveforms before adjustment

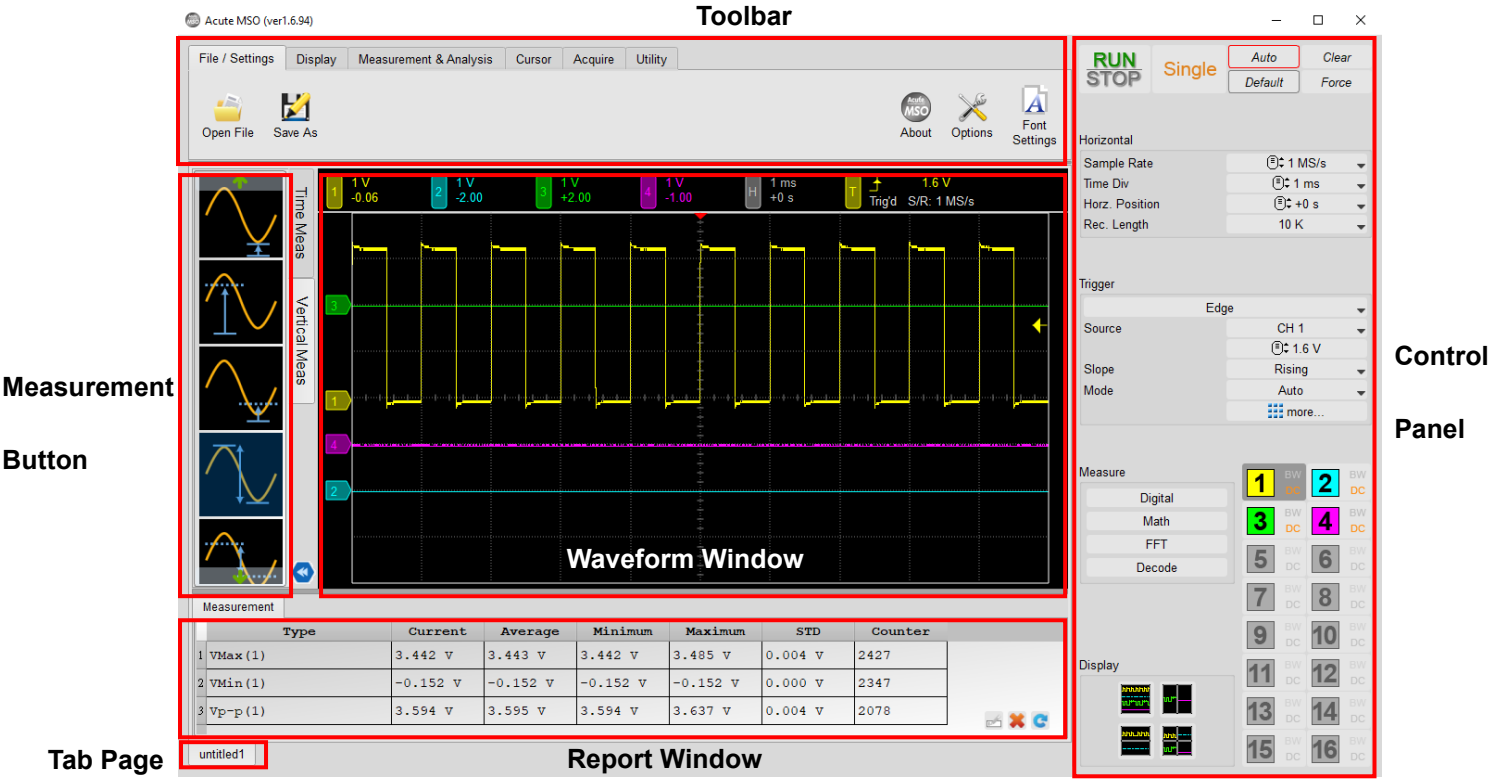



## Waveforms after adjustment



# Chapter 2 Operations

## Window




| | |
|---|---|
| **Toolbar** | Access to main functionalities such as display, cursor, measurement & analysis and acquisition. Refer to Toolbar. |
| **Control Panel** | Controller of trigger and channels settings. Refer to Control Panel. |
| **Waveform Window** | Displays waveforms. |
| **Measurement Button** | Add new measurements immediately. |
| **Report Window** | Displays the Measurement Report and the Decode Report. |
| **Tab Page** | For switching between multiple tabs. |

# Waveform Window

## Overview


**Channel Status** Shows the VOLT/DIV and the status of different channels. Single click on the channel icon to enter the channel settings dialog. Please refer to Channel Settings.

**Horizontal Axis Status** Shows the TIME/DIV and the horizontal position.

**Trigger Status** Shows currently chosen trigger mode. Please refer to Trigger Settings.

**Trigger Position** The red arrow sign on the top of the waveform window indicates the trigger position. You can adjust the trigger position by dragging the waveform window horizontally. Click on "**To Center**" in Horizontal Axis Settings of the control panel to center align the trigger position.

**Trigger Level** Trigger level is an arrow sign on the right of the waveform window. It allows you to easily modify the trigger position by dragging the arrow upwards or downwards. Current trigger level is also shown in the Trigger Status.

**Channel Tag** The channel tags on the left of the waveform window indicates the ground level of each channel. You may drag the channel tag to adjust its position.

# Basic Browsing Operation

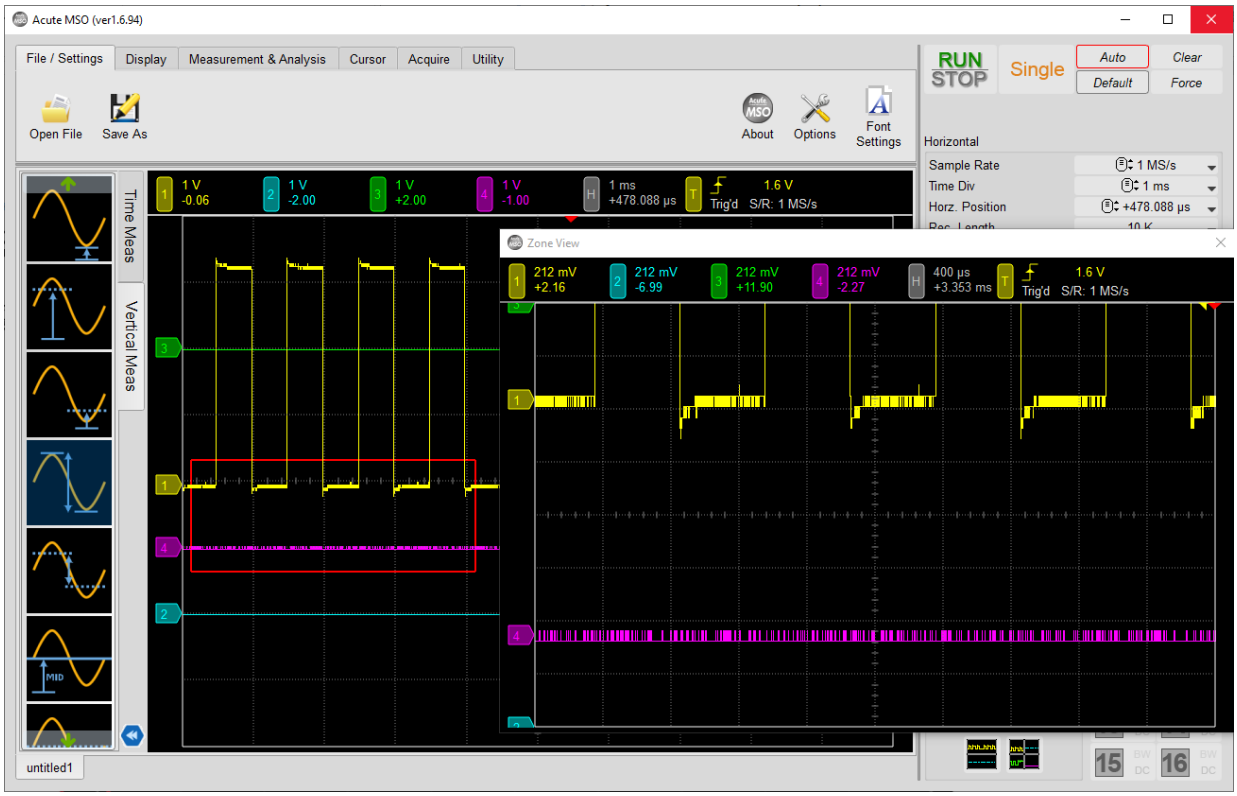
## Mouse Operation

**Waveform Dragging** Drag the waveform horizontally with the mouse.

**Zoom In/Out** Scroll the mouse wheel to zoom in/out.

**Volt/Div Adjustment** Move the cursor to the Channel Tag or the Channel Status Icon above the waveform window and scroll the mouse wheel to adjust Volt/Div. They can also be adjusted with Channel Settings.

**Zoom In** Press and hold the right mouse button to select the range of a certain waveform area, click the **Zoom in Zone View** option in the menu, and a partially enlarged window will pop up, as shown in the figure below.



## Keyboard Shortcuts

The settings can be changed in Option.

| Function | Default |
|---|---|
| Waveform Area Full Screen | F11 |
| Open File | Ctrl + O |
| Save As | Ctrl + S |
| Run / Stop | Space |

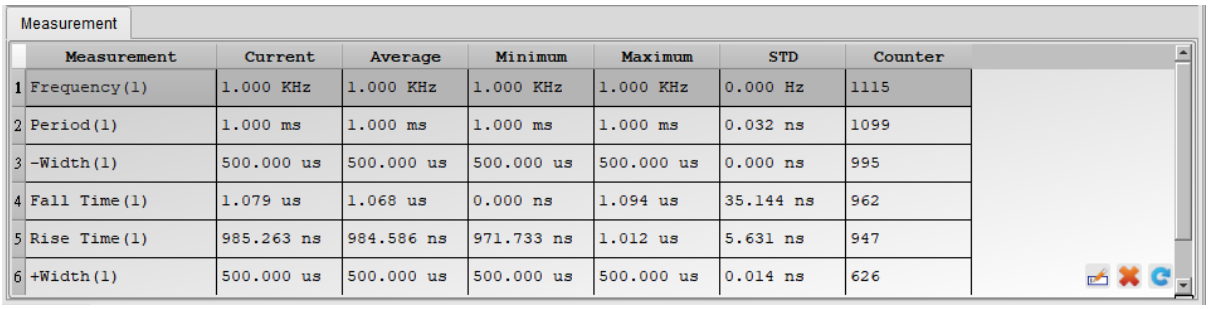
# Measurement Button


Double click on the measurement buttons on the left side of the screen to add new measurements immediately. The measurement data is calculated based on currently chosen channel and it will be displayed in the report window.

# Report Window

## Measurement Table

When a new measurement is added, the measurement table will automatically popup in the report window.




**Measurement (Channel)** The name of the measurement. Please refer to measurement list.

**Current** The current measured values.

**Average** The arithmetic average value of the measurement since measuring began.

**Minimum** The minimum value of the measurement since measuring began.

**Maximum** The maximum value of the measurement since measuring began.

**STD** The standard deviation value of the measurement since measuring began.

**Counter** The number of counts since measuring began.

3 buttons on the lower right corner

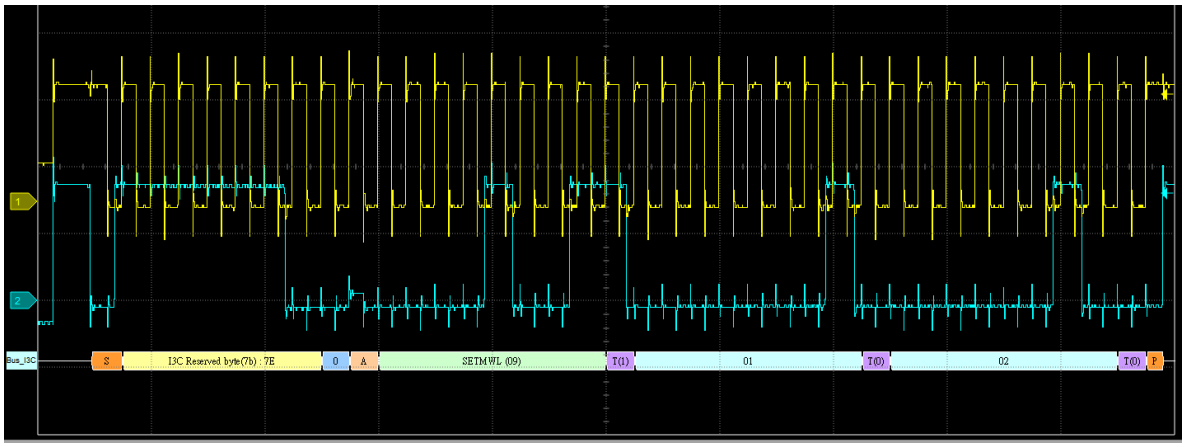
**Edit** Edit measurement's name and the measured channel.

**Clear** Clear statistical data. Click to clear chosen measurements or clear all measurements when no measurements are selected.

**Reset** Reset the counter of measurements.

# Decode Report

When using the bus to decode, an immediate decode data will be displayed as follow.




The decoding data will also be shown in the report area, as shown below is the I3C decoding data.

Bus_I3C

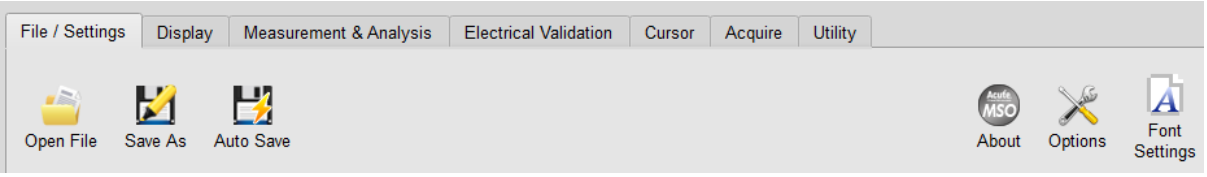
| | Timestamp | SSr | Address(7b) | Command | Data(h) | Information |
|---|---|---|---|---|---|---|
| 1 | 5.6035us | S | Wr I3C Resrv. Byte(7... | SETMWL(09) | Msb(01) | |
| 2 | 5.6035us | | | | Lsb(02) | I3C Broadcast CCC Write; |
| 3 | 100.628us | S | Wr I3C Resrv. Byte(7... | SETMWL(09) | Msb(01) | |
| 4 | 100.628us | | | | Lsb(02) | I3C Broadcast CCC Write; |
| 5 | 195.653us | S | Wr I3C Resrv. Byte(7... | SETMWL(09) | Msb(01) | |
| 6 | 195.653us | | | | Lsb(02) | I3C Broadcast CCC Write; |
| 7 | 290.678us | S | Wr I3C Resrv. Byte(7... | SETMWL(09) | Msb(01) | |

# FFT spectrogram

Please refer to FFT.

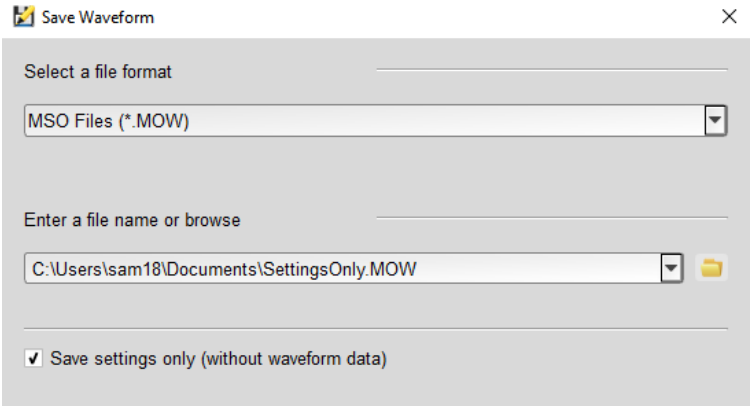
# Chapter 3 Toolbar

## File and Interface Settings



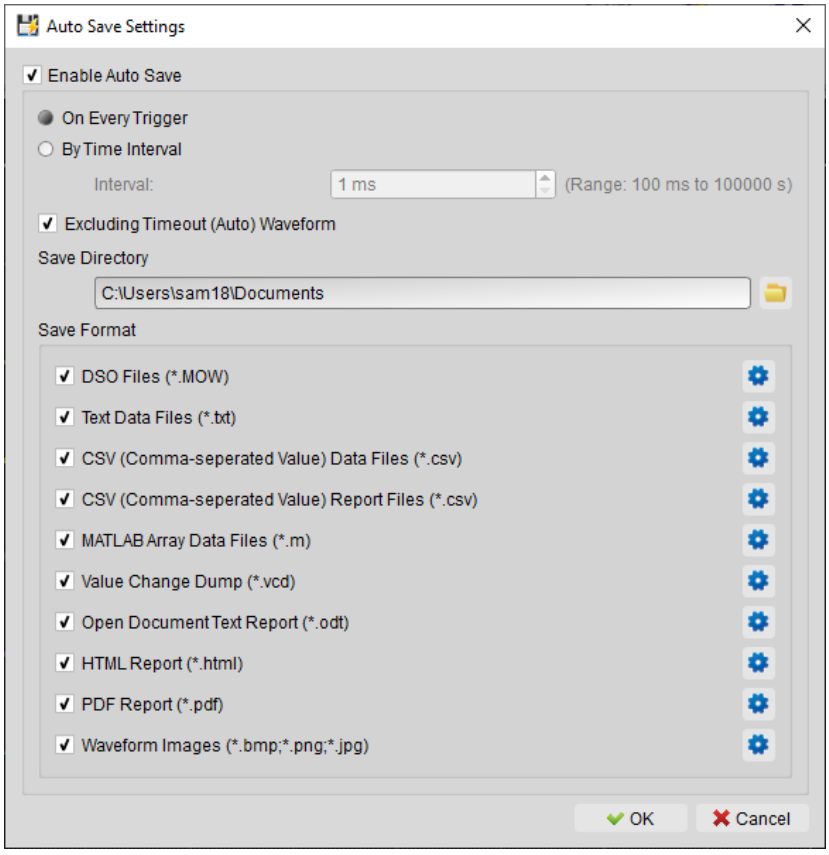

| | | |
|---|---|---|
|  | **Open File** | Load .MOW waveform file**.** |
|  | **Save As** | Save current file at a new file location. |
|  | **Auto Save** | Automatically save waveform or report files every specified time interval or after each acquisition. |
|  | **About** | Shows software version and device serial number. |
|  | **Options** | Set environment parameters such working directory, shortcut keys. |
|  | **Font settings** | Set up the fonts of the software screen. |

## Open / Save waveform as .MOW file




Save the current settings and waveform as a .MOW file through "**Save As**". You can also check “Save settings only (without waveform data)” to reduce the storage size. When reloading the .MOW file, click "**Open File**" and select the file to open.

## Auto Save

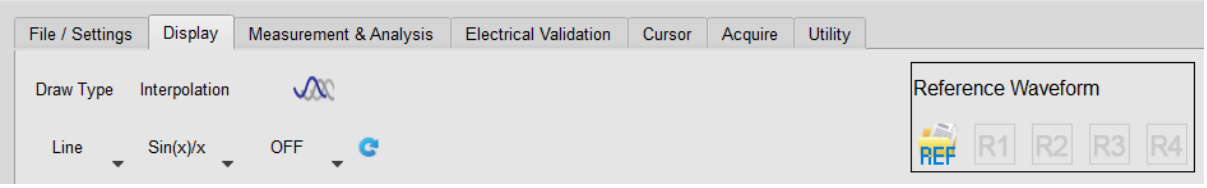



When Auto Save is enabled, it starts saving waveform data files and report files into designated output directory every specified time interval or after each acquisition.

Each saving format has its own detailed settings. Click on the  button on the right hand side to set up each configuration.

When **Excluding Timeout (Auto) Waveform** is selected, those acquired waveforms that does not meet the trigger requirements will not be saved.

# Display




## Type

Display the waveform in **dots** or connected with **lines**.

## Interpolation

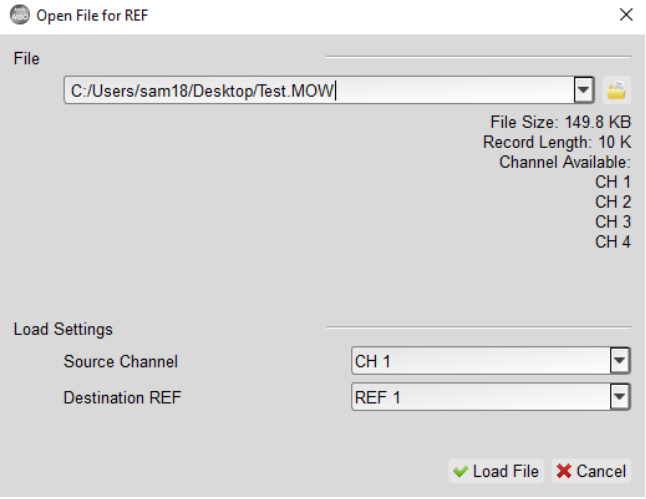
Draw straight lines (**Linear interpolation**) between the sample points or connect with smooth curves (**Sin(x)/x interpolation**).

## Persistence Mode

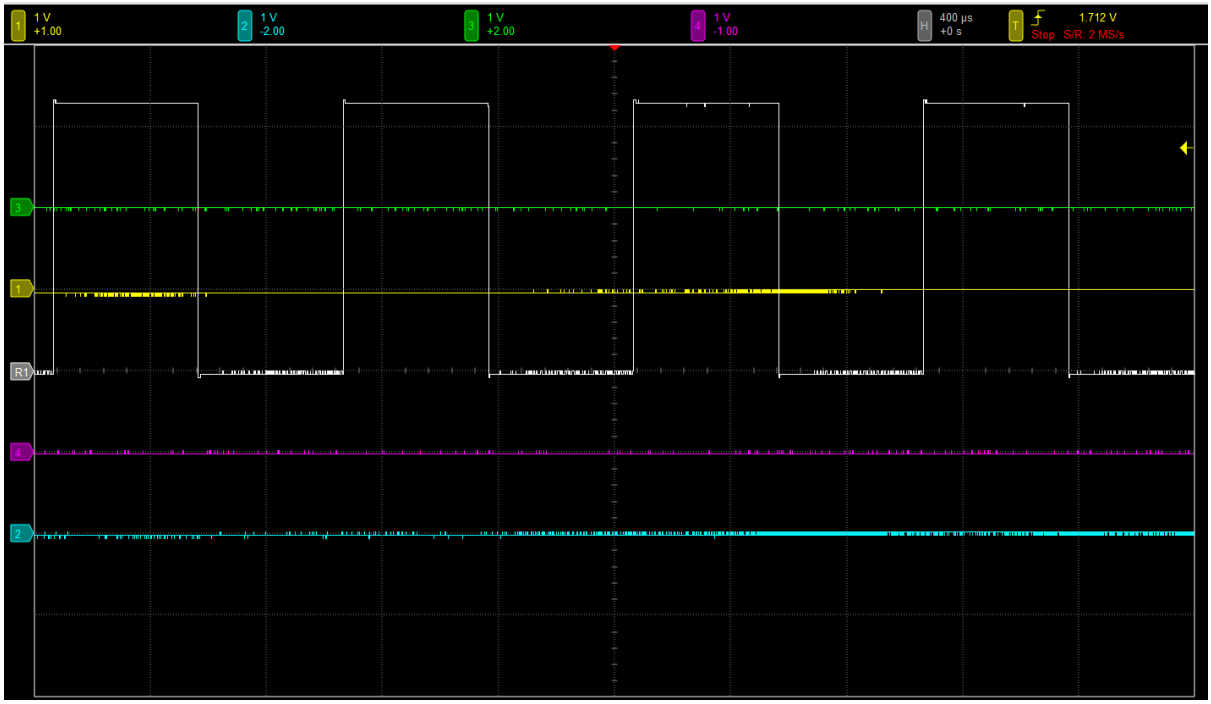
As the screen renew continuously, the older waveform fades out.

## Reference Waveform

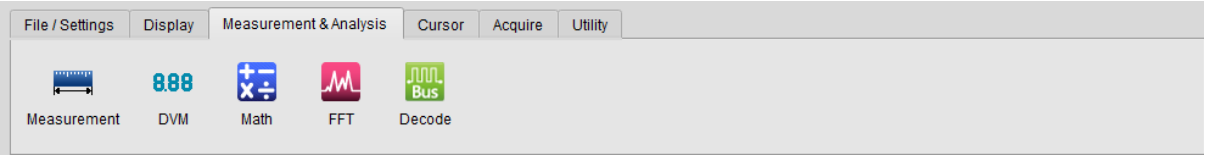
Load the waveform file as a source of reference in order to compare with the current waveform.



The reference waveform is shown in the waveform area as shown in the following figure.

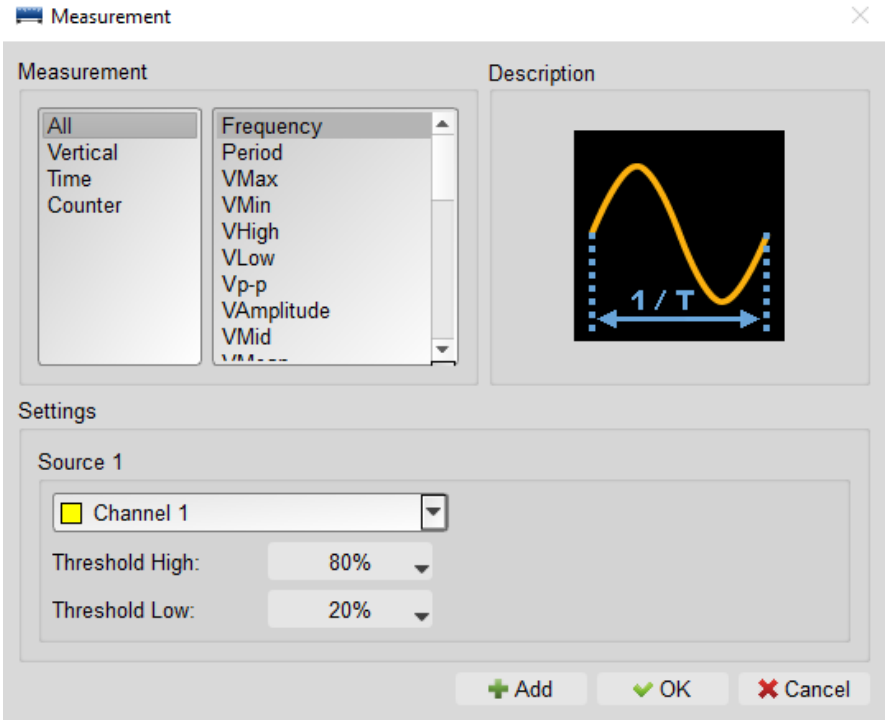


# Measurement and Analysis




## Waveform Data and Statistics

### Add Measurement




After choosing the measurements, click "**Add**". The added item will be displayed at the report window.

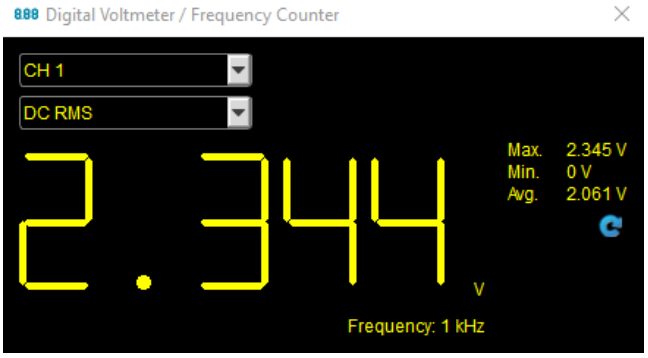
### Measurement Items

| Item | Description |
|---|---|
| Frequency | The frequency of the first cycle in the waveform. |
| Period | The time width required to complete the first cycle in the waveform. |
| VMax | The most positive peak voltage of the waveform. |
| VMin | The most negative peak voltage of the waveform. |
| VHigh | It can be calculated using the histogram method, the most common value found above the mean. |

| | |
|---|---|
| VLow | It can be calculated using the histogram method, the most common value found above the mean. |
| Vp-p | The peak-to-peak is the difference of Vmax and VMin in the entire waveform. |
| VAmplitude | The difference of VHigh and VLow in the entire waveform. |
| VRMS | The root mean square of the voltage over the entire waveform. |
| VMean | The arithmetic mean over the entire waveform. |
| VMid | (Vhigh + Vlow) / 2 |
| High Duty | (High duty) / (the width of first period), expressed in percentage. |
| Low Duty | (Low duty) / (the width of first period), expressed in percentage. |
| High Period | The ratio of the positive pulse width to the signal period expressed as a percentage. The duty cycle is measured on the first cycle in the waveform. |
| Low Period | The ratio of the negative pulse width to the signal period expressed as a percentage. The duty cycle is measured on the first cycle in the waveform. |
| Rise Time | The time for the first rising edge from low reference value (10%) to high reference value (90%). |
| Fall Time | The time for the first falling edge from high reference value (90%) to low reference value (10%). |
| Positive Overshoot | ((Max. – High) / Amplitude) x 100% in the first rising edge. |
| Negative Overshoot | ((Low – Min.) / Amplitude) x 100% in the first falling edge. |
| Cycle VRMS | The RMS of the first cycle in the waveform. |
| Cycle VMean | The arithmetic mean of the first cycle in the waveform. |
| Delay | The time difference between the rising edge or falling edge of two channels. |
| Rise Preshoot | ((Vmin- Vlow) / (Vhigh- Vlow)) x 100 |
| Fall Preshoot | ((VMax- VHigh) / (VHigh- VLow)) x 100. |
| Phase | Measures the phase difference of two sources by calculating time delay and period. |

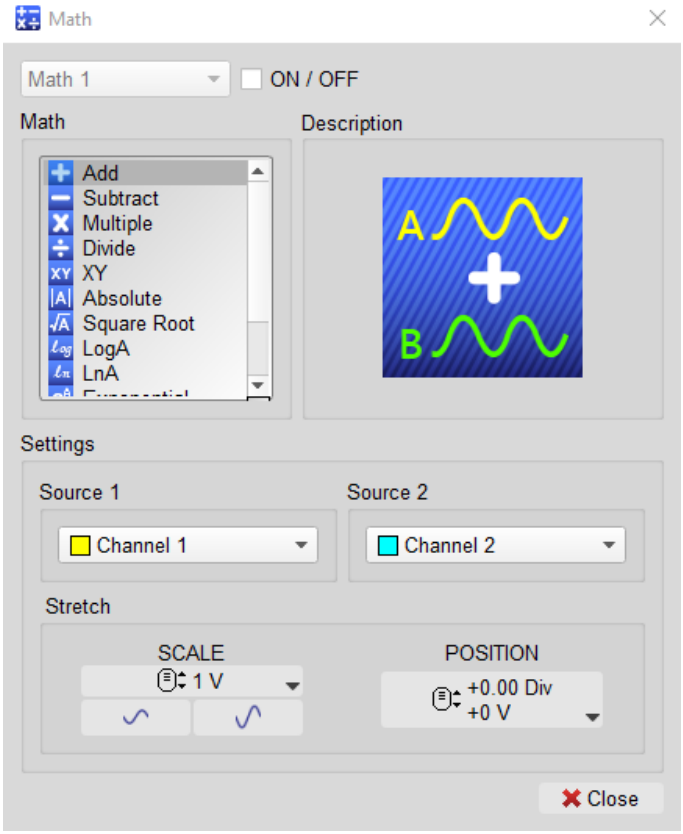
| | |
|---|---|
| Edge Count | The total counts for rising/falling edge on the screen. |
| High Pulse Count | The total counts for complete high pulses on the screen. |
| Low Pulse Count | The total counts for complete low pulses on the screen. |

## Digital Voltmeter (DVM)




Provides VRMS, VAvg, and Frequency Counter of chosen channels.

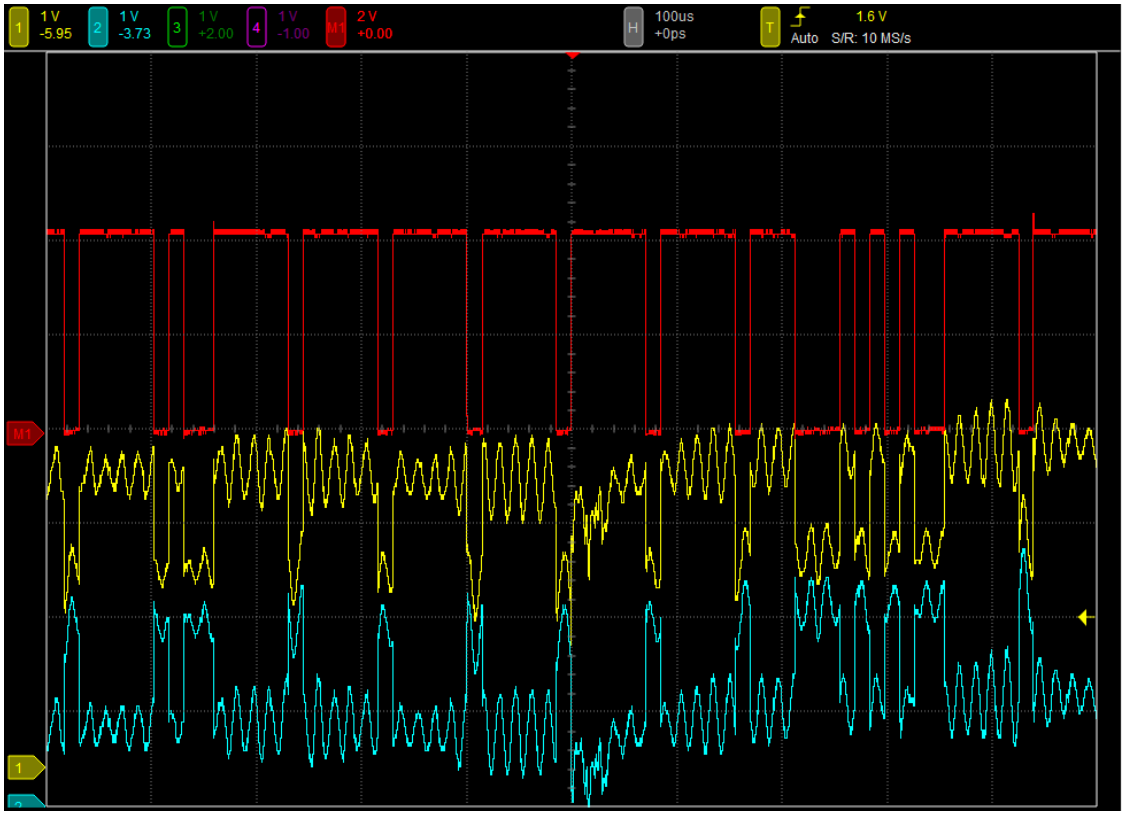
## Math




Math operations can be performed on waveforms of any two channels.

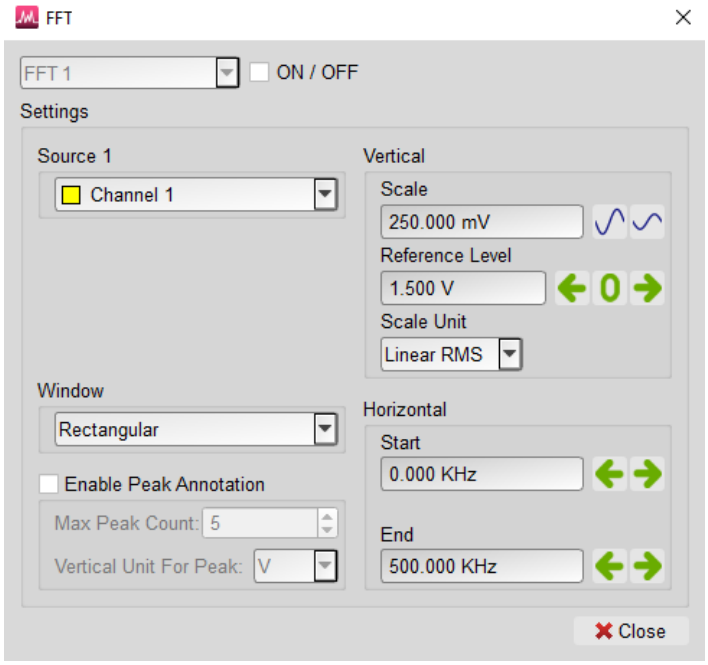
| | |
|---|---|
| **Math Operators** | A+B、A-B、A * B、A / B、XY、\|A\|、$\sqrt{A}$、Log(A)、Ln(A)、$e^A$、$\int Adt$. |
| **Source 1** | Select the first source waveform. |
| **Source 2** | Select the second source waveform. |
| **Scale** | Adjust Vertical Div of Math. |
| **Position** | Adjust Vertical Offset of Math. |

**A picture of mathematical operation**



# FFT

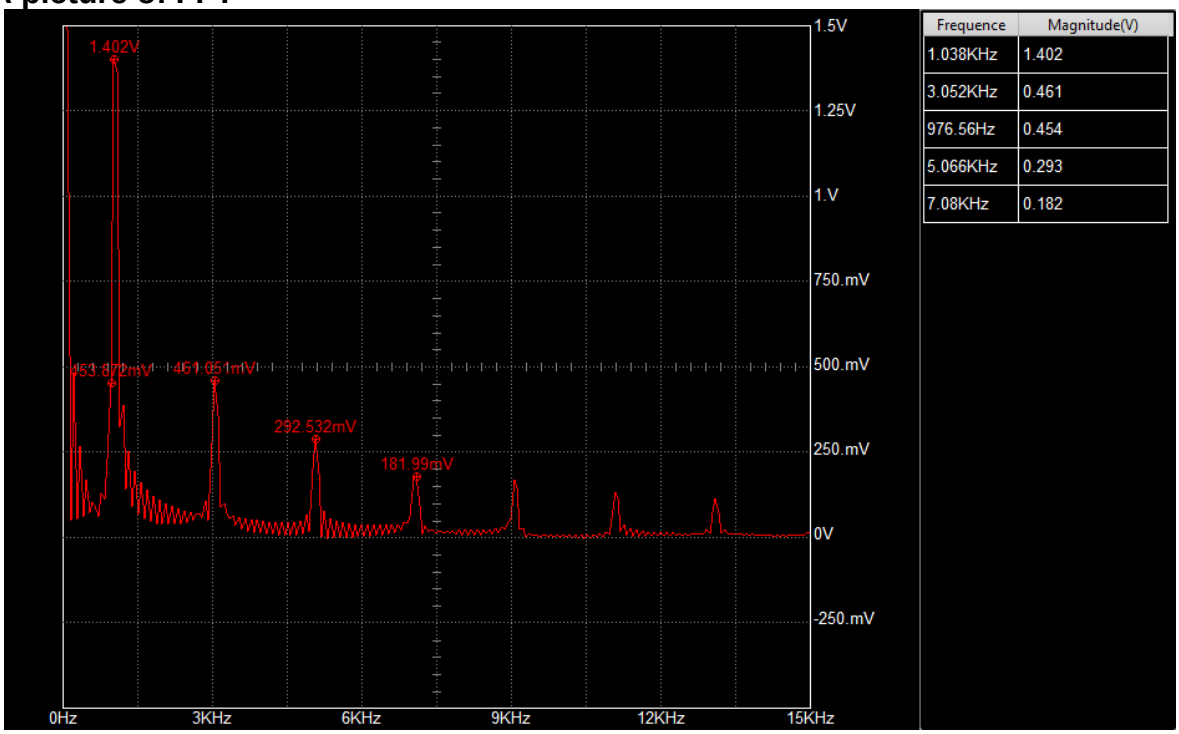
Does fast Fourier transforms for chosen channels.




Perform fast Fourier transform on the selected channel to determine the component frequency in the signal and display it in the report window.

| | |
|---|---|
| **Source** | Select a signal source. |
| **Vertical** | Adjust the vertical scale, the smallest input unit is 1uV, 1dBuV, 1udBM.<br>**Scale**: Units set on vertical graticule.<br>**Reference Level**: Reference starting point.<br>**Scale Unit**: Supports **Linear root mean square (**RMS)、**dBV RMS**, **dBm RMS**. |
| **Horizontal** | The input range is 1Hz - 1GHz. The start frequency and end frequency can be set separately. |
| **Window** | Supports **Rectangular**, **Blackman**, **Hann**, **Hamming**, **Harris**, **Triangular**, **Cosine**, **Lanczos**, **Gaussian.** |
| **Peak Annotation** | Mark the frequency and magnitude of each peak. |

**A picture of FFT**




| Frequence | Magnitude(V) |
|---|---|
| 1.038KHz | 1.402 |
| 3.052KHz | 0.461 |
| 976.56Hz | 0.454 |
| 5.066KHz | 0.293 |
| 7.08KHz | 0.182 |

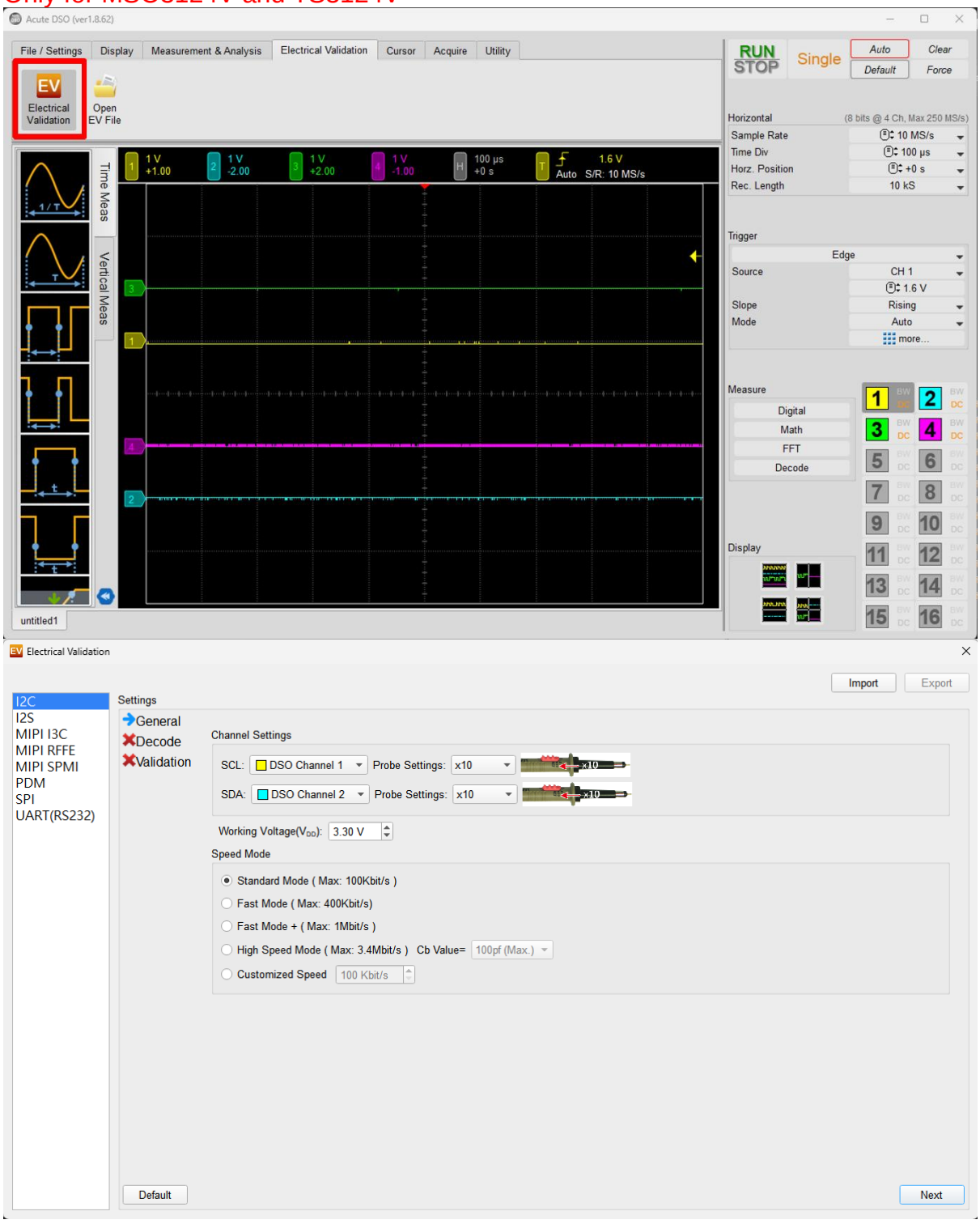
*Reference Level and Frequency of the FFT Waveform on the screen can be adjusted with mouse.

## Bus Decode

Refer to DSO manual and LA manual.

# Electrical Validation

Only for MSO3124V and TS3124V




For more information, please check the Electrical Validation manual, or go to our official website->Solution->Electrical Validation.

## Timing Sequence Analysis


This function can import a CSV file containing the parameters and measurement items. The logic analyzer will adjust the parameters, channel names and measurement types according to the settings in this file.

The CSV file compilation rules need to be based on the field names at the beginning, then separate the values in different fields with a comma. and it need to end with a semicolon (;).

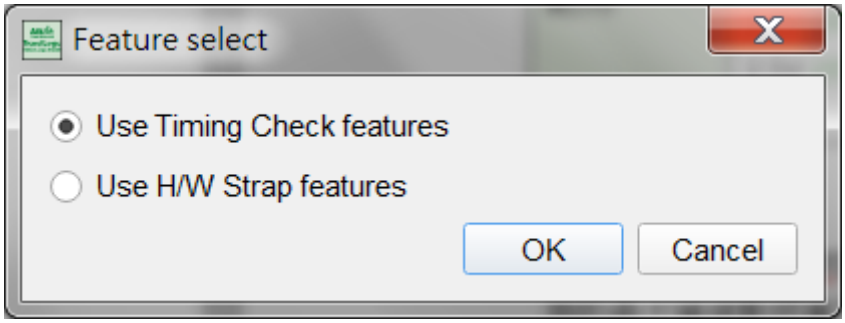
The text after the double slash (//) will be regarded as a comment and ignored.

(For sample files, Please contact us.)

# Feature Select

The LA software will ask user which function that user want to apply while reading the configure file. Set the trigger condition according to the configure file, and hide

the channels which are not in use.




## Column Items:

- [SampleRate]

  **Only accept single line input.**

  Input the sample rate value, Units: MHz, KHz, Hz.

  The maximum sampling rate range that can be used will be affected by the number of channels and trigger types, and the minimum sampling rate cannot be lower than 100KHz.

  **This item will affect both Analog and Digital Sample Rate settings, use [AnalogSampleRate] and [DigitalSampleRate] items to change the Sample Rate settings separately.**

| | |
|---|---|
| Example | [SampleRate]<br>200MHz<br>; |

- [AnalogSampleRate]

  **Only accept single line input. ONLY for MSO series.**

  Input the analog sample rate value, Units: MHz, KHz, Hz.

  The maximum analog sampling rate range that can be used will be affected by the number of channels and trigger types, and the minimum sampling rate cannot be lower than 100KHz.

| | |
|---|---|
| Example | [AnalogSampleRate]<br>25MHz<br>; |

- [DigitalSampleRate]

  **Only accept single line input.**

  Input the digital sample rate value, Units: MHz, KHz, Hz.

  The maximum digital sampling rate range that can be used will be affected by the number of channels and trigger types, and the minimum sampling rate cannot be lower than 100KHz.

| | |
|---|---|
| Example | [DigitalSampleRate]<br>25MHz<br>; |

- [RecordLength]

  **Only accept single line input.**

  Input the recording memory. Unit: MB, Mb.

  The maximum of the recording memory depends on the different models. The minimum recording memory value be lower than 16Mb.

| | |
|---|---|
| Example | [RecordLength]<br>100Mb<br>; |

- [TransitionMode]

  **Only accept single line input.**

  Transitional Mode setup. Unit: None.

  **For Acute MSO series, Transitional storage mode is not available when analog channel is on.**

| | |
|---|---|
| Example | [TransitionalMode]<br>1 //Transitional storage mode ON<br>; |

- [Threshold]

  **Available to input multiple line for adjust different threshold for the channels.** Enter the threshold level in each row, Unit: mV, V.

  For different model, it has different range of threshold level.

  MSO series threshold voltage range : ±20V

  ***For TL series, when the Schmitt circuit function is enabled, Channel 16-31 will turn into the secondary Ref. threshold voltage. Acute MSO series are unaffected.**

| | |
|---|---|
| Example | [Threshold]<br>1.6V //Ch 00-07<br>1.5V //Ch 08-15<br>1.2V //Ch 16-23 or the secondary of input for Ch00-07<br>2.5V //Channel 24-31 or the secondary of input for Ch08-15<br>; |

**Available to input multiple line for adjust different threshold for the channels.** Enter the threshold level in each row, Unit: mV, V.

For different model, it has different range of threshold level.

MSO series threshold voltage range : ±20V

***For TL series, when the Schmitt circuit function is enabled, Channel 16-31 will turn into the secondary Ref. threshold voltage. Acute MSO series are unaffected.**

| | |
|---|---|
| Example | [Threshold]<br>1.6V //Ch 00-07<br>1.5V //Ch 08-15<br>1.2V //Ch 16-23 or the secondary of input for Ch00-07<br>2.5V //Channel 24-31 or the secondary of input for Ch08-15<br>; |

- [UseSchmittCircuit]

  **Only accept single line input.**

  Enter whether to enable the hardware Schmitt circuit hysteresis function to

reduce the received digital signal noise, and the number of available channels will not be affected.

| | |
|---|---|
| Example | [UseSchmittCircuit]<br>1 //Input 1 to enable Schmitt circuit<br>; |

- [Hysteresis]

  **Only accept single line input.**

  Enter whether to enable the hardware Schmitt circuit hysteresis function to reduce the received digital signal noise.

| | |
|---|---|
| Example | [Hysteresis]<br>1 //Input 1 to enable extra Hysteresis feature.<br>; |

- [Channel]

  **Available to enter multiple lines of settings to add different channels, each line is entered in sequence**:

  1. Select Channel. CH0 -> Digital CH0, CH(A)0 -> Analog CH0
  2. Label for Channel. It is available to enter less than 31 alphabets or numbers.
  3. (Option)Select TimingCheck or HwStrap (TimingCheck+HwStrap means enable both)
  4. (Option)Enter the expect maximum voltage for auto calculate the voltage division for analog channel.
  5. (Option) Enter the expect minimum voltage for auto calculate the voltage division for analog channel.

  **The available channels will vary according to different models and the selected sampling rate.**

| | |
|---|---|
| Example | [Channel]<br>CH20, MyData0, HwStrap<br>CH22, MyData1, TimingCheck<br>CH24, MyData2, TimingCheck+HwStrap |

| | |
|---|---|
| | // (Analog Channel settings. ONLY for MSO series)<br>CH(A)1, VCC (1.8V) //Analog CH1, Using the default voltage division and offset<br>CH(A)2, VDD (1.5V) //Analog CH2, Using the default voltage division and offset<br>CH(A)3, AAA, TimingCheck, 1.5V // Analog CH3, Set up the max voltage division<br>CH(A)4, BBB,, 1.0V // Analog CH4, Set up the max voltage division<br>CH(A)5, CCC,, 2.0V, 1.0V // Analog CH5, Set up the max & min voltage division<br>; |

| Check Mode | Description |
|---|---|
| HwStrap | CH is only for H/W Strap. It will be hidden while in Timing Check. |
| TimingCheck | CH is only for Timing Check. It will be hidden while in H/W Strap. |
| TimingCheck+HwStrap | For both mode. |

- [AnalogChannel]

  **Available to enter multiple lines of settings to add different channels, each line is entered in sequence**:

  1. Select Channel. For MSO3K series, input DSO CH1 to select Analog CH1; For MSO2K series, input CH(A)0 to select Analog CH0
  2. Label for Channel. It is available to enter less than 31 alphabets or numbers.
  3. Enter the voltage division setting. For MSO3K series, the input will effect both display and acquisition settings; For MSO2K series, the input will only effect display settings.
  4. Enter the voltage offset setting. For MSO3K series, the input will effect both display and acquisition settings; For MSO2K series, the input will only effect display settings.
  5. (Option) Enter the probe attenuation setting, **ONLY for MSO3K series**, MSO2K series will ignore this setting.
  6. (Option) Enter the bandwidth limitation setting, 20MHz, 100MHz or FULL,

**ONLY for MSO3K series**, MSO2K series will ignore this setting.

7. (Option) Enter the channel coupling setting, DC or AC, **ONLY for MSO3K series**, MSO2K series will ignore this setting.

**The available channels will vary according to different models and the selected sampling rate.**

| | |
|---|---|
| Example | [AnalogChannel] //MSO3K settings sample<br>DSO CH1, MyVolt1, 1V, 1.0, 10, FULL, DC //Analog CH1, display name is MyVolt1, voltage division 1V, voltage offset +1.0 division, x10 probe attenuation, FULL bandwidth, DC coupling<br>DSO CH4, MyVolt2, 500mV, -3.0, 1, 20MHz, AC //Analog CH4, display name is MyVolt2, voltage division 500mV, voltage offset -3.0 division, x1 probe attenuation, bandwidth limited to 20MHz, AC coupling<br><br>[AnalogChannel] //MSO2K settings sample<br>CH(A)3, MyVolt5, 1V, 1.0 //Analog CH3, display name is MyVolt5, voltage division 1V, voltage offset +1.0 division; |

- [Trigger]

**Only accept single line input.** Enter in order:

1. Trigger Channel Label: Reference to the Label in [Channel] settings for trigger settings.
2. Trigger Type:

| Trigger Type |
|---|
| CHANNEL_LOW |
| CHANNEL_HIGH |
| CHANNEL_ANY |
| CHANNEL_RISING |
| CHANNEL_FALLING |
| CHANNEL_CHANGING |
| ANALOG_CH_RISING (ONLY for MSO series) |
| ANALOG_CH_FALLING (ONLY for MSO series) |

3. (Optional)Select TimingCheck or HwStrap (TimingCheck+HwStrap for both)
4. (Optional)Analog Trigger Voltage, Unit: mV、V. (Only when selecting analog CH in MSO series.

| | |
|---|---|
| Example | [Trigger]<br>// For H/W Strap, selecting MyData1 (Triggered when Ch22 Rise)<br>MyData1, CHANNEL_RISING, HwStrap<br>//For Timing Check, selecting MyData2 (Triggered when Ch24 Rise)<br>MyData2, CHANNEL_RISING, TimingCheck<br>;<br><br>[Trigger] //Analog Trigger (Only for MSO series)<br>//For Example: Timing Check VCC (1.8V)<br>(Triggered when Analog Ch1 rising equal or more than 1.5V)<br>VCC (1.8V), ANALOG_CH_RISING, TimingCheck, 1.5V<br>; |

- [TriggerPosition]

  **Only accept single line input.**

  Entering the trigger position in percentage. Input Range: 1% to 99%

| | |
|---|---|
| Example | [TriggerPosition]<br>20% //Set the trigger position to 20%<br>; |

- [RangeStart]

  **Only accept single line input.**

  Set measurement start position, available input from CursorA to CursorZ.

| | |
|---|---|
| Example | [RangeStart]<br>CursorS //Set measurement starts from Cursor S<br>; |

- [RangeEnd]

  **Only accept single line input.**

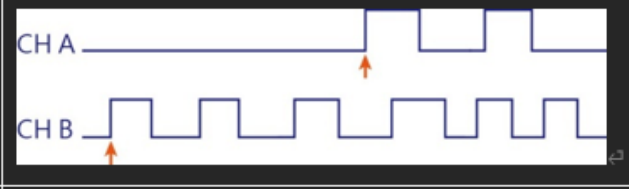
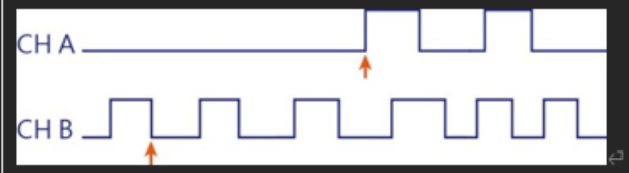
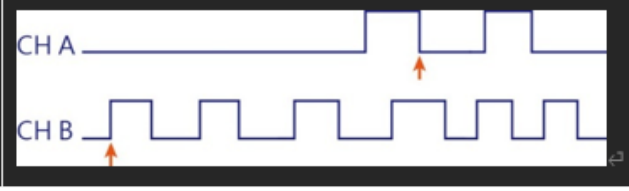
  Set measurement end position, available input from CursorA to CursorZ.

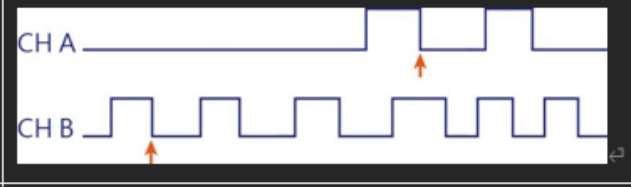
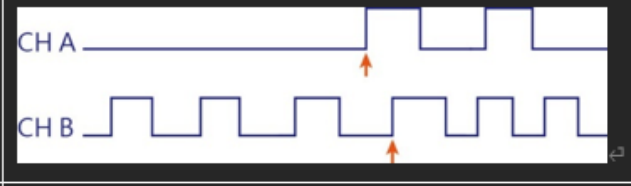
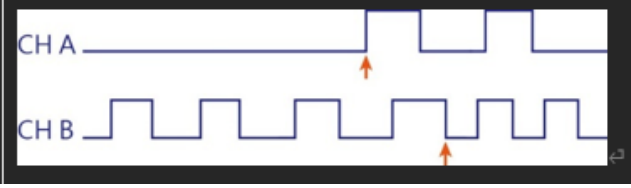
| | |
|---|---|
| Example | [RangeStart]<br>CursorE //Set measurement ends at Cursor E<br>; |

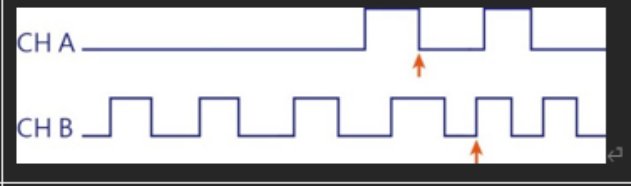
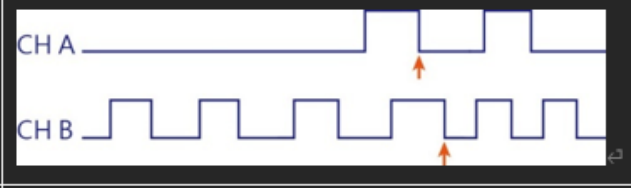
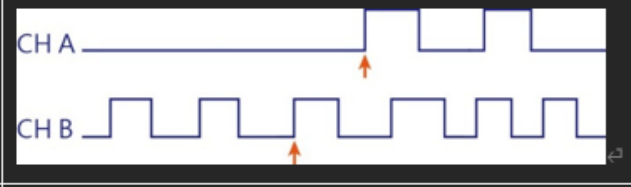
- [TimingCheck]

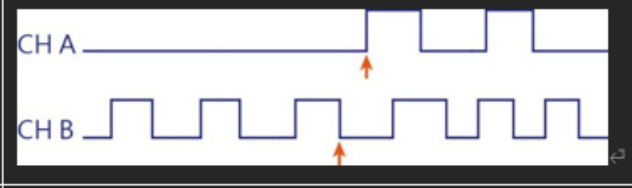
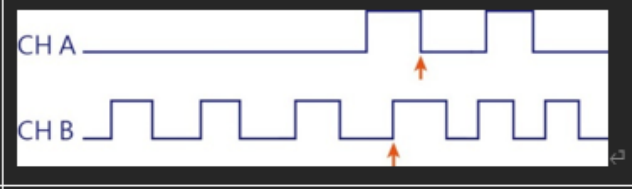
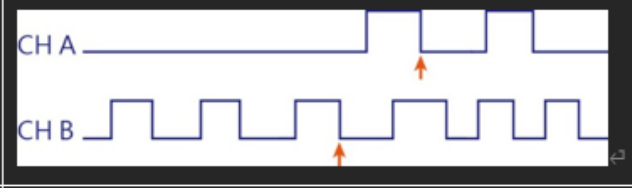
**Available to enter multiple lines of settings to add different settings**, Enter in order:

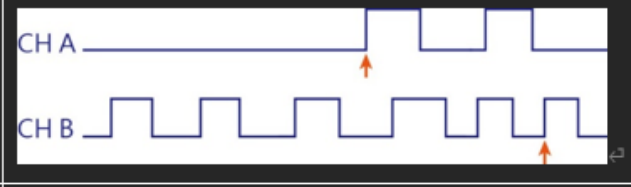
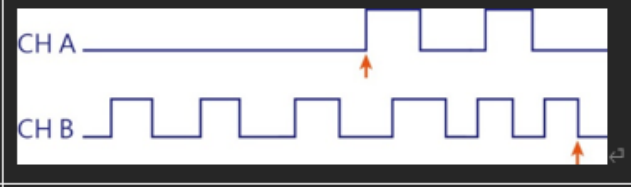
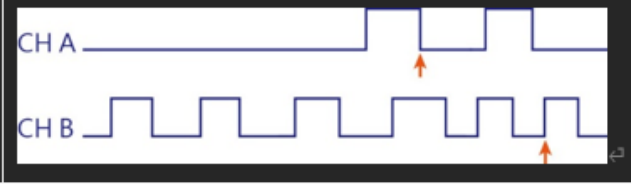
1. Timing Check Spec, Only for display.
2. Timing Check Description, Only for display.
3. Target CH A: Need reference [Channel] label name.
4. Target CH B: Need reference [Channel] label name.
5. Timing Check Type, **items marked in orange are for MSO series only.**

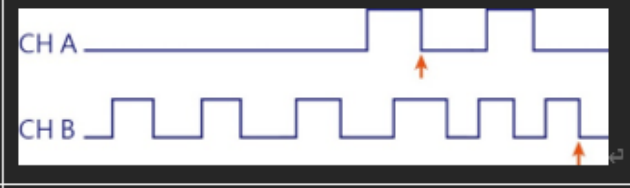
| Item | Remark |
|---|---|
| CHA_RISE_TO_CHB_RISE | Time difference from:<br>First CH A Rising Edge TO<br>First CH B Rising Edge.<br>  |
| CHA_RISE_TO_CHB_FALL | Time difference from:<br>First CH A Rising Edge TO<br>First CH B Falling Edge.<br>  |
| CHA_FALL_TO_CHB_RISE | Time difference from:<br>First CH A Falling Edge TO<br>First CH B Rising Edge.<br>  |

| | |
|---|---|
| CHA_FALL_TO_CHB_FALL | Time difference from:<br>First CH A Falling Edge TO<br>First CH B Falling Edge.<br>  |
| CHA_RISE_TO_NEXT_CHB_RISE | Time difference from:<br>First CH A Rising Edge TO<br>Next CH B Rising Edge.<br>  |
| CHA_RISE_TO_NEXT_CHB_FALL | Time difference from:<br>First CH A Rising Edge TO<br>Next CH B Falling Edge.<br>  |

| | |
|---|---|
| CHA_FALL_TO_NEXT_CHB_RISE | Time difference from:<br>First CH A Falling Edge TO<br>Next CH B Rising Edge.<br>  |
| CHA_FALL_TO_NEXT_CHB_FALL | Time difference from:<br>First CH A Falling Edge TO<br>Next CH B Falling Edge.<br>  |
| CHA_RISE_TO_PREV_CHB_RISE | Time difference from:<br>First CH A Rising Edge TO<br>Previous CH B Rising Edge.<br>  |

| | |
|---|---|
| CHA_RISE_TO_PREV_CHB_FALL | Time difference from:<br>First CH A Rising Edge TO<br>Previous CH B Falling Edge.<br>  |
| CHA_FALL_TO_PREV_CHB_RISE | Time difference from:<br>First CH A Falling Edge TO<br>Previous CH B Rising Edge.<br>  |
| CHA_FALL_TO_PREV_CHB_FALL | Time difference from:<br>First CH A Falling Edge TO<br>Previous CH B Falling Edge.<br>  |

| | |
|---|---|
| CHA_RISE_TO_FAREST_CHB_RISE | Time difference from:<br>First CH A Rising Edge TO<br>Farthest CH B Rising Edge.<br>  |
| CHA_RISE_TO_<br>FAREST_CHB_FALL | Time difference from:<br>First CH A Falling Edge TO<br>Farthest CH B Rising Edge.<br>  |
| CHA_FALL_TO_<br>FAREST_CHB_RISE | Time difference from:<br>First CH A Falling Edge TO<br>Farthest CH B Rising Edge.<br>  |

| | |
|---|---|
| CHA_FALL_TO_<br>FAREST_CHB_FALL | Time difference from:<br>First CH A Falling Edge TO<br>Farthest CH B Falling Edge.<br>  |
| CHA_HIGH_TIME | |
| CHA_LOW_TIME | |
| CHA_HIGH_PULSE_COUNT | |
| CHA_LOW_PULSE_COUNT | |
| CHA_RISE_EDGE_COUNT | |
| CHA_FALL_EDGE_COUNT | |
| CHA_EDGE_COUNT | |
| CHA_SLEW_RATE*1 | |
| CHA_V_MAX | |
| CHA_V_MIN | |
| CHA_V_PP | |
| CHA_V_HIGH | |
| CHA_V_LOW | |
| CHA_V_AMPLITUDE | |
| CHA_V_MEAN | |
| CHA_RISE_TIME | |
| CHA_FALL_TIME | |

6. Min. Limit:

   I. For Timing Measurement, Unit: ns, us, ms, s.

   II. For Voltage Measurement, Unit: mV, V.

   III. For SLEW_RATE, available units: mV/us, mV/ms, V/us, V/ms.

   mV/us or V/us will be the default units.

Input X stands for don't care.

7. Max. Limit:
   I. For Timing Measurement, Unit: ns, us, ms, s.
   II. For Voltage Measurement, Unit: mV, V.
   III. For SLEW_RATE, available units: mV/us, mV/ms, V/us, V/ms.
   mV/us or V/us will be the default units.

   Input X stands for don't care.

8. (Option)CH A Ref. Voltage: (MSO Series Only)
   I. The percentage of the amplitude.
   Ex: Entered "90%" for the position of amplitude;
   II. The voltage value for reference point
   Ex: Entered "1.25V" for the 1.25V position.

9. (Option) CH B Ref. Voltage: (MSO Series Only)
   I. The percentage of the amplitude.
   Ex: Entered "90%" for the position of amplitude;
   II. The voltage value for reference point
   Ex: Entered "1.25V" for the 1.25V position.

10. (Option) CHA pass counts: Available to ignore N times when the condition matches. (MSO Series Only)

11. (Option) CHB pass counts: Available to ignore N times when the condition matches. (MSO Series Only)

*1: Slew Rate will decide whether it is rise or fall edge by Ref. voltage.

| | |
|---|---|
| Example | [TimingCheck]<br>Spec_00, Desc_00, MyData0, MyData1, CHA_RISE_TO_CHB_RISE, 1ns, 10ms<br>Spec_01, Desc_01, MyData1, MyData2, CHA_FALL_TO_CHB_RISE, X, 100ms<br>Spec_02, Desc_02, MyData2, MyData3, CHA_FALL_TO_CHB_FALL, 100us, X<br>;<br><br>[TimingCheck] //Analog Channel (MSO series ONLY)<br>Spec_00, Desc_00, VDD (1.5V), VCC (1.8V),CHA_RISE_TO_CHB_RISE,10ms,20ms,90%,90%,0,0<br>Spec_01, Desc_01, VDD (1.5V), VCC (1.8V),CHA_RISE_TO_CHB_RISE,1ms,5ms,80%,80%,0,0<br>Spec_02, Desc_02, CH0 (3.3V), CH0 (3.3V), CHA_SLEW_RATE, 20mV/ms, 50mV/us //Rising<br>Spec_03, Desc_03, CH0 (3.3V), CH0 (3.3V), CHA_SLEW_RATE, 50mV/ms, 20mV/us //Falling<br>Spec_04, Desc_04, CH0 (3.3V), , CHA_V_HIGH, 500mV, 600mV //V High<br>Spec_05, Desc_05, CH0 (3.3V), , CHA_RISE_TIME, 50ms, 100ms //Rise Time<br>; |

# Timing Check Report Area

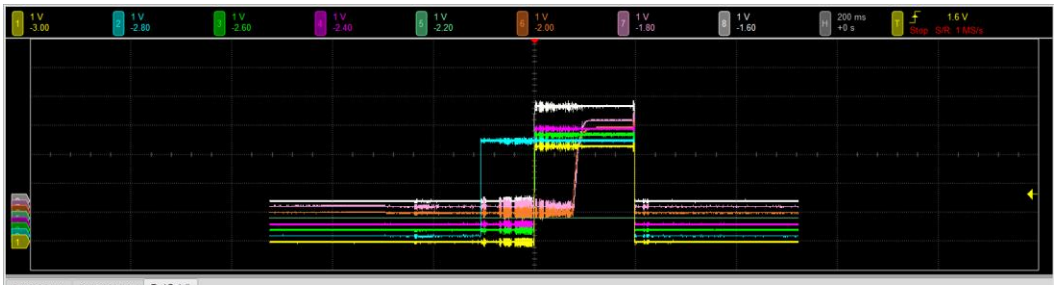
Test Overview | Spec. Overview | Test Detail

| Timing Spec. | Description | Label Name A | Label Name B | Type | Min. Limit | Max. Limit | Value | Pass/Fail | Label A Rule | Label B Rule | abel A Pass Coun | abel B Pass Coun | /aveform Inde |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tCPU00 | | VccDSW3.3V | CPU_C10_GATE# | CH A Rise to CH B Rise | 1 ms | 100 ms | -107.087 ms | Fail | --- | --- | --- | --- | 1 |
| tCPU01 | | CPU_C10_GATE# | RSMRST# | CH A Rise to CH B Rise | 1 ms | --- | 106.975 ms | Pass | --- | --- | --- | --- | 1 |
| tCPU03 | | RSMRST# | DDR_VTT_CNTL | CH A Rise to CH B Rise | --- | 25 ms | 111.444 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU04 | | DDR_VTT_CNTL | DSW_PWROK | CH A Rise to CH B Rise | 0 s | -1 ns | --- | | --- | --- | --- | --- | 1 |
| tCPU12 | | DSW_PWROK | IMVP VR_ON | CH A Rise to CH B Rise | 1 ms | --- | --- | | --- | --- | --- | --- | 1 |
| tCPU16 | | IMVP VR_ON | PCH_PWROK | CH A Rise to CH B Rise | 0 s | --- | 1.393 ms | Pass | --- | --- | --- | --- | 1 |
| tCPU22 | | PCH_PWROK | PLTRST_N | CH A Fall to CH B Fall | 1 µs | --- | 154.508 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU26 | | PLTRST_N | VccDSW3.3V | CH A Rise to CH B Rise | --- | 65 µs | 32.900 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU28b | | VccDSW3.3V | RSMRST# | CH A Fall to CH B Fall | 0 s | --- | 109.830 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU30 | | CPU_C10_GATE# | DDR_VTT_CNTL | CH A Rise to CH B Rise | 10 µs | 65 µs | 107.086 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH01 | | RSMRST# | DSW_PWROK | CH A Rise to CH B Rise | 9 ms | --- | --- | | --- | --- | --- | --- | 1 |
| tPCH02 | | DDR_VTT_CNTL | IMVP VR_ON | CH A Rise to CH B Rise | 30 ms | --- | 92.088 ms | Pass | --- | --- | --- | --- | 1 |
| tPCH03 | | DSW_PWROK | PCH_PWROK | CH A Rise to CH B Rise | 1 µs | --- | --- | | --- | --- | --- | --- | 1 |
| tPCH04 | | IMVP VR_ON | PLTRST_N | CH A Rise to CH B Rise | 9 ms | --- | -92.120 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH05 | | PCH_PWROK | VccDSW3.3V | CH A Rise to CH B Rise | 1 µs | --- | -93.480 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH06 | | PLTRST_N | CPU_C10_GATE# | CH A Rise to CH B Rise | 200 µs | --- | -107.054 ms | Fail | --- | --- | --- | --- | 1 |

While the waveform finished capture, the software will do the result(Pass/Fail) analysis and display it.

Double click the report data for positioning the CHA & the CHB referenced location in waveform area.

***Timing sequence: Measuring power-on(off) sequence.***

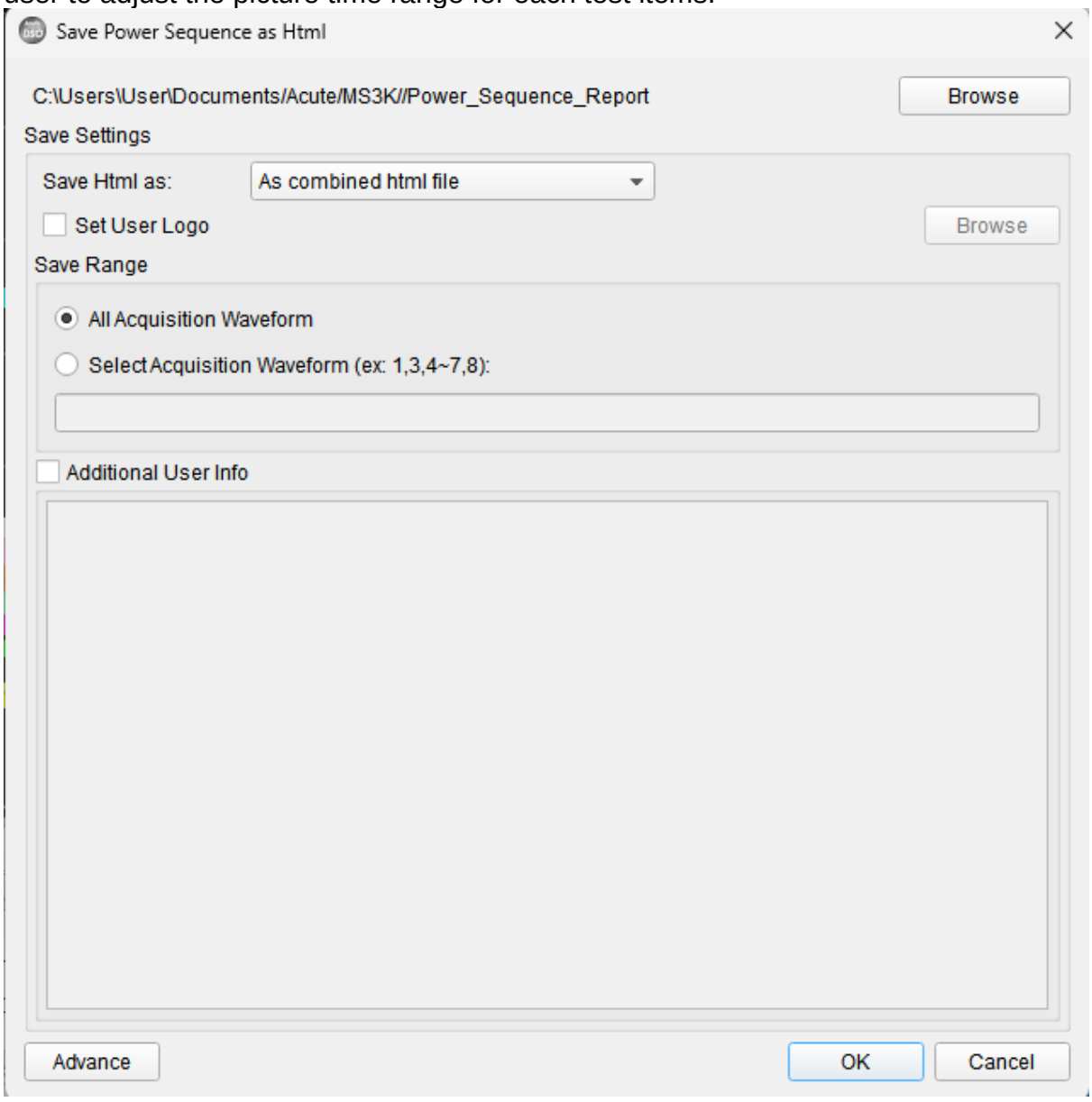


Test Overview | Spec. Overview | Test Detail

| Timing Spec. | Description | Label Name A | Label Name B | Type | Min. Limit | Max. Limit | Value | Pass/Fail | Label A Rule | Label B Rule | abel A Pass Coun | abel B Pass Coun | /aveform Inde |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tCPU00 | | VccDSW3.3V | CPU_C10_GATE# | CH A Rise to CH B Rise | 1 ms | 100 ms | -107.087 ms | Fail | --- | --- | --- | --- | 1 |
| tCPU01 | | CPU_C10_GATE# | RSMRST# | CH A Rise to CH B Rise | 1 ms | --- | 106.975 ms | Pass | --- | --- | --- | --- | 1 |
| tCPU03 | | RSMRST# | DDR_VTT_CNTL | CH A Rise to CH B Rise | --- | 25 ms | 111.444 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU04 | | DDR_VTT_CNTL | DSW_PWROK | CH A Rise to CH B Rise | 0 s | -1 ns | --- | | --- | --- | --- | --- | 1 |
| tCPU12 | | DSW_PWROK | IMVP VR_ON | CH A Rise to CH B Rise | 1 ms | --- | --- | | --- | --- | --- | --- | 1 |
| tCPU16 | | IMVP VR_ON | PCH_PWROK | CH A Rise to CH B Rise | 0 s | --- | 1.393 ms | Pass | --- | --- | --- | --- | 1 |
| tCPU22 | | PCH_PWROK | PLTRST_N | CH A Fall to CH B Fall | 1 µs | --- | 154.508 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU26 | | PLTRST_N | VccDSW3.3V | CH A Rise to CH B Rise | --- | 65 µs | 32.900 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU28b | | VccDSW3.3V | RSMRST# | CH A Fall to CH B Fall | 0 s | --- | 109.830 µs | Pass | --- | --- | --- | --- | 1 |
| tCPU30 | | CPU_C10_GATE# | DDR_VTT_CNTL | CH A Rise to CH B Rise | 10 µs | 65 µs | 107.086 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH01 | | RSMRST# | DSW_PWROK | CH A Rise to CH B Rise | 9 ms | --- | --- | | --- | --- | --- | --- | 1 |
| tPCH02 | | DDR_VTT_CNTL | IMVP VR_ON | CH A Rise to CH B Rise | 30 ms | --- | 92.088 ms | Pass | --- | --- | --- | --- | 1 |
| tPCH03 | | DSW_PWROK | PCH_PWROK | CH A Rise to CH B Rise | 1 µs | --- | --- | | --- | --- | --- | --- | 1 |
| tPCH04 | | IMVP VR_ON | PLTRST_N | CH A Rise to CH B Rise | 9 ms | --- | -92.120 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH05 | | PCH_PWROK | VccDSW3.3V | CH A Rise to CH B Rise | 1 µs | --- | -93.480 ms | Fail | --- | --- | --- | --- | 1 |
| tPCH06 | | PLTRST_N | CPU_C10_GATE# | CH A Rise to CH B Rise | 200 µs | --- | -107.054 ms | Fail | --- | --- | --- | --- | 1 |

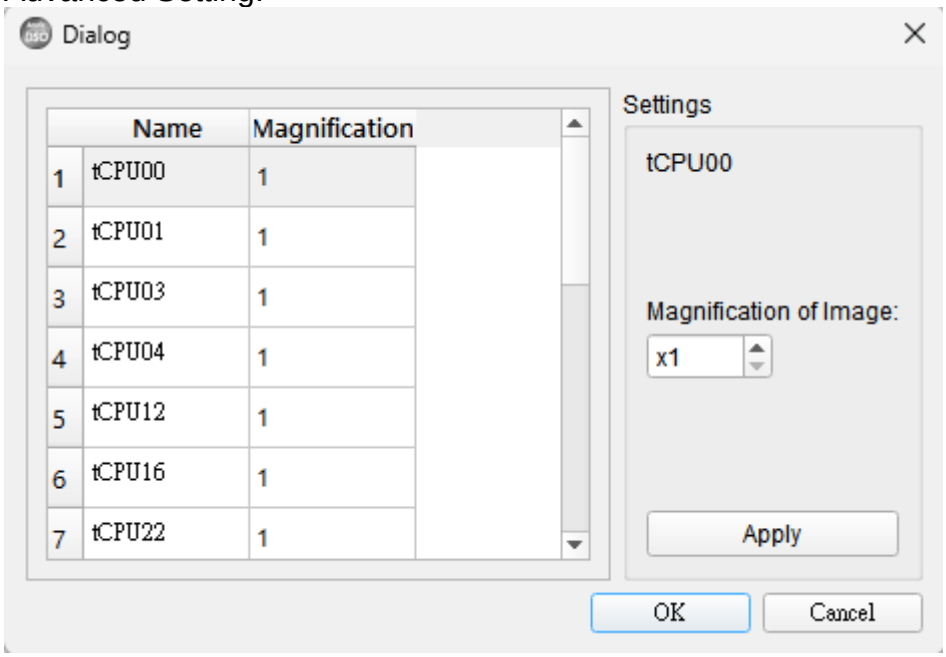
# Generating Power Sequence html format report

The power sequence report provides with waveform screenshots and testing results, and it is available to edit the report title and user-defined information. It also allows user to adjust the picture time range for each test items.




1. Save Html as:
    I. As uncombined html file: All the waveform screenshots would be saved as .jpg respectively.
    II. As combined html file: All the waveform screenshots would be embedded in html report.
2. Set User Logo: User can set the logo for html report, like company logo.

3. Save Range:
    I. All Acquisition waveform: Saved all the acquisition result.
    II. Select Acquisition waveform: User can choose certain acquisition results to saved.
4. Additional User Info: User can set the additional text for html report, like date and testing target.
5. Advanced Setting:




Users can set the size of the screenshot for a particular test.

Acute
PC-based T&M Instruments

## Power Sequence Report

| | |
|---|---|
| Test Instrument Model | MSO3124V |
| Test Instruments Serial Number | MSV31240021 |
| Test Date | 2024-06-28 16:14:57.580 |
| S/W Version | 1.8.0 |
| Reference File Name | |
| Waveform Index | 1 |

### Overview Results:

Total: 16
Pass: 8
Fail: 8

### Select Display:

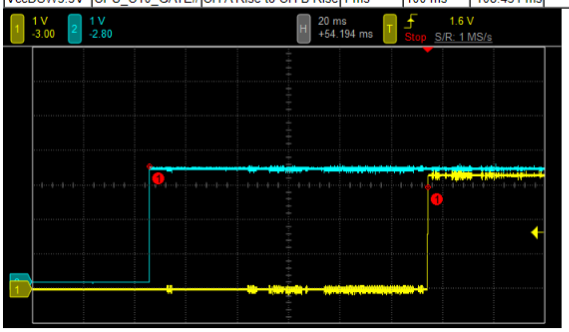
All

| Index | Timing Spec. | Description | Label Name A | Label Name B | Type | Min. Limit | Max. Limit | Value | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|
| 1 | tCPU00 | | VccDSW3.3V | CPU_C10_GATE# | CH A Rise to CH B Rise | 1 ms | 100 ms | -108.451 ms | ✖Fail |
| 2 | tCPU01 | | CPU_C10_GATE# | RSMRST# | CH A Rise to CH B Rise | 1 ms | --- | 108.338 ms | ✔Pass |
| 3 | tCPU03 | | RSMRST# | DDR_VTT_CNTL | CH A Rise to CH B Rise | --- | 25 ms | 112.444 µs | ✔Pass |
| 4 | tCPU04 | | DDR_VTT_CNTL | DSW_PWROK | CH A Rise to CH B Rise | 0 s | -1 ns | 100.000 ns | ✖Fail |
| 5 | tCPU12 | | DSW_PWROK | IMVP VR_ON | CH A Rise to CH B Rise | 1 ms | --- | 21.351 ms | ✔Pass |
| 6 | tCPU16 | | IMVP VR_ON | PCH_PWROK | CH A Rise to CH B Rise | 0 s | --- | 1.056 ms | ✔Pass |
| 7 | tCPU22 | | PCH_PWROK | PLTRST_N | CH A Fall to CH B Fall | 1 µs | --- | 148.567 µs | ✔Pass |
| 8 | tCPU26 | | PLTRST_N | VccDSW3.3V | CH A Rise to CH B Rise | --- | 65 µs | 33.900 µs | ✔Pass |
| 9 | tCPU28b | | VccDSW3.3V | RSMRST# | CH A Fall to CH B Fall | 0 s | --- | 104.496 µs | ✔Pass |
| 10 | tCPU30 | | CPU_C10_GATE# | DDR_VTT_CNTL | CH A Rise to CH B Rise | 10 µs | 65 µs | 108.450 ms | ✖Fail |
| 11 | tPCH01 | | RSMRST# | DSW_PWROK | CH A Rise to CH B Rise | 9 ms | --- | 112.544 µs | ✖Fail |
| 12 | tPCH02 | | DDR_VTT_CNTL | IMVP VR_ON | CH A Rise to CH B Rise | 30 ms | --- | 21.351 ms | ✖Fail |
| 13 | tPCH03 | | DSW_PWROK | PCH_PWROK | CH A Rise to CH B Rise | 1 µs | --- | 22.408 ms | ✔Pass |
| 14 | tPCH04 | | IMVP VR_ON | PLTRST_N | CH A Rise to CH B Rise | 9 ms | --- | -21.384 ms | ✖Fail |
| 15 | tPCH05 | | PCH_PWROK | VccDSW3.3V | CH A Rise to CH B Rise | 1 µs | --- | -22.407 ms | ✖Fail |
| 16 | tPCH06 | | PLTRST_N | CPU_C10_GATE# | CH A Rise to CH B Rise | 200 µs | --- | -108.417 ms | ✖Fail |

tCPU00 - Test Result: FAIL ✖

Description:

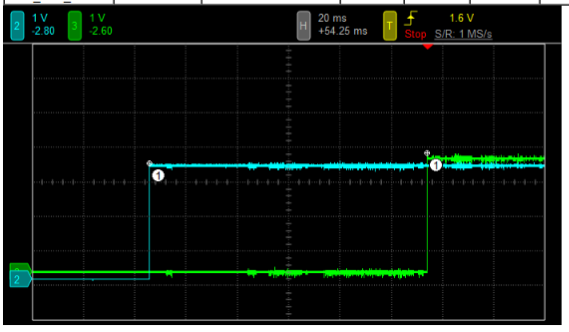
| Label Name A | Label Name B | Type | Min. Limit | Max. Limit | Value | Label A Rule | Label B Rule | Label A Pass Count | Label B Pass Count |
|---|---|---|---|---|---|---|---|---|---|
| VccDSW3.3V | CPU_C10_GATE# | CH A Rise to CH B Rise | 1 ms | 100 ms | -108.451 ms | --- | --- | --- | --- |



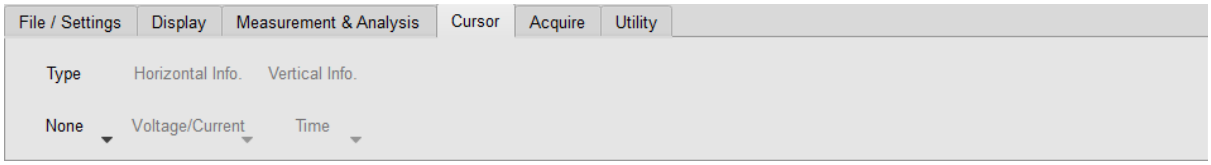

tCPU01 - Test Result: PASS ✔

Description:

| Label Name A | Label Name B | Type | Min. Limit | Max. Limit | Value | Label A Rule | Label B Rule | Label A Pass Count | Label B Pass Count |
|---|---|---|---|---|---|---|---|---|---|
| CPU_C10_GATE# | RSMRST# | CH A Rise to CH B Rise | 1 ms | --- | 108.338 ms | --- | --- | --- | --- |



# Cursor

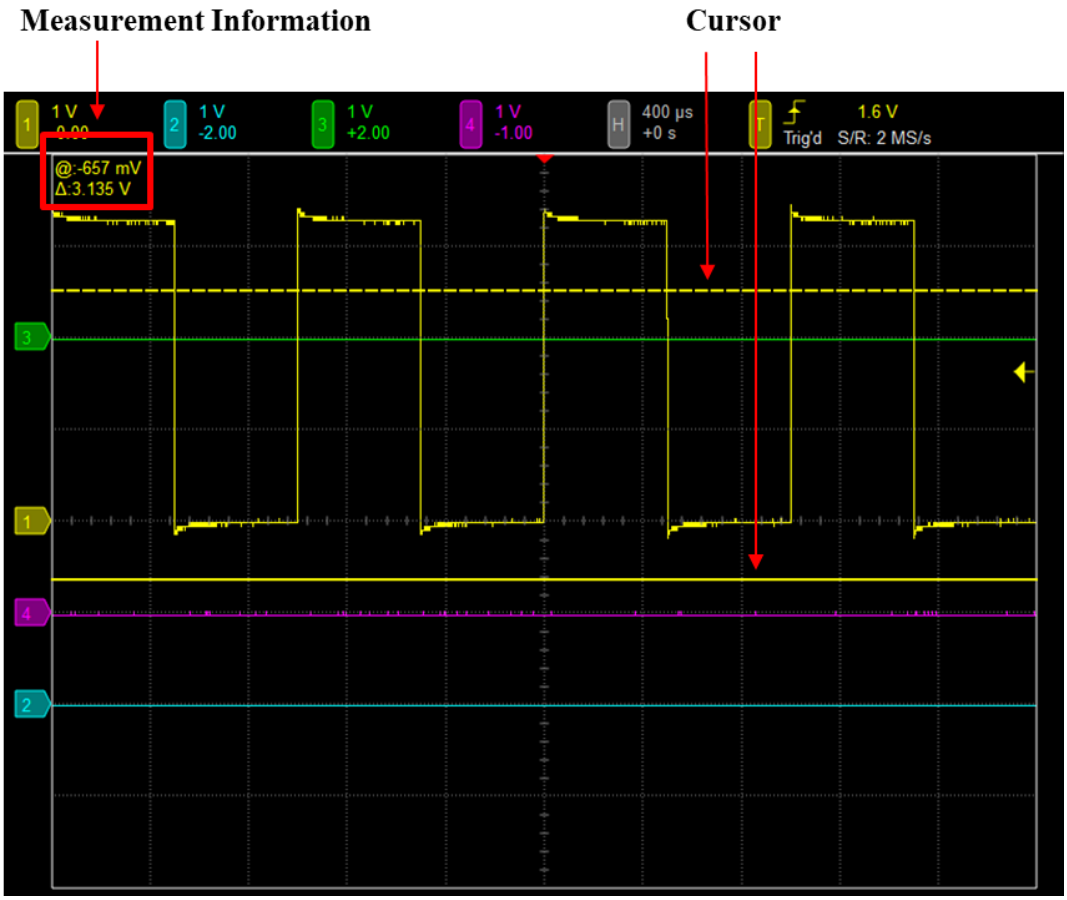



Measure the time, frequency or voltage between two cursors in the waveform area.

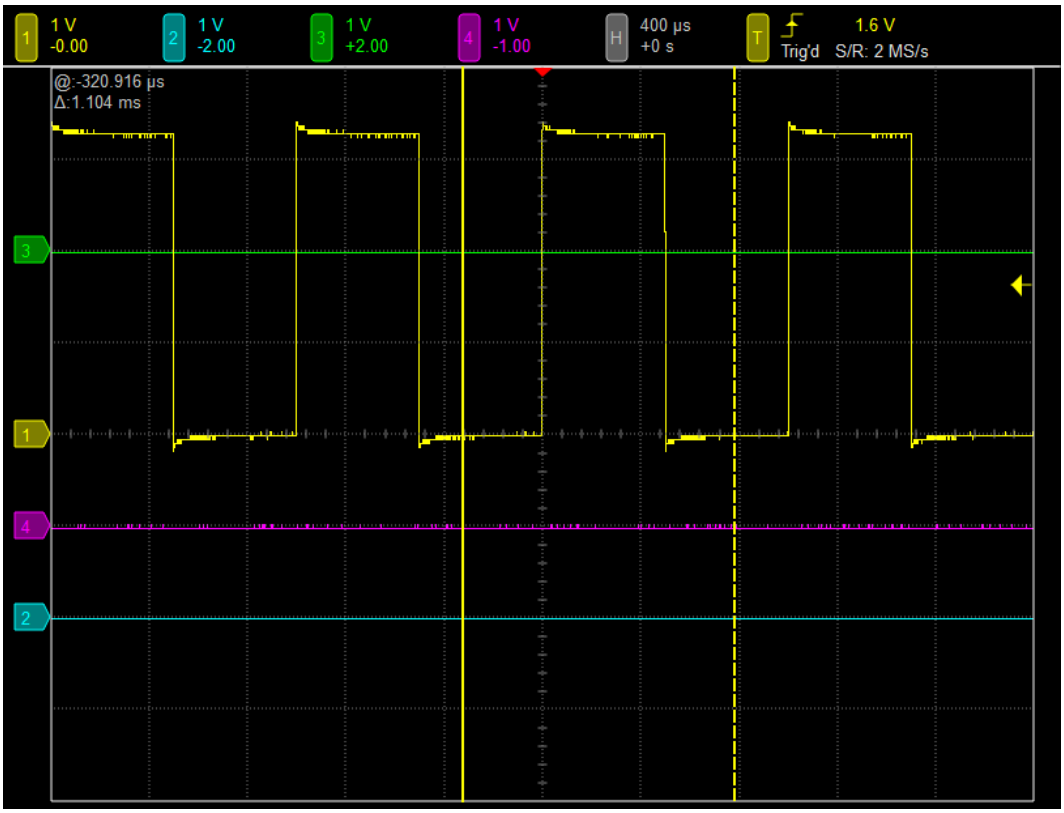
| | |
|---|---|
| **Type** | You can choose **Vertical** (time / frequency), **Horizontal** (voltage), **Both** to show vertical and horizontal cursors or **None** to hide the cursors. |
| **Horizontal Info.** | Show **Voltage/Current** information |
| **Vertical Info.** | Show **Time** or **Frequency**. |

After the measurement cursor is activated, one solid line and one dashed line will be shown. The cursor's color will respond to the color of the current chosen channel. Drag with the mouse to make the dragged line solid and the other line dashed. Measurement information will be shown on the upper left corner.

## Picture of Horizontal Cursors




## Picture of Vertical Cursors

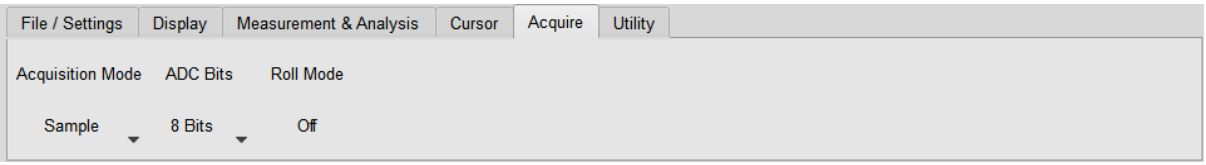


The cursor measurement information in the upper left corner is marked with "@" and "Δ" symbols.

When showing horizontal cursors, "@" denotes the voltage or current difference between the solid line and the central grid line, "Δ" denotes the voltage or current difference between the two cursors.

When showing vertical cursors, "@" denotes time difference or frequency between the selected cursor and the trigger position, and "Δ" denotes the time difference or frequency between two cursors.

# Acquire




## Acquisition Mode

**Sample** Displays waveform by sample points without post-processing.

**Average** Consecutive sample points are averaged together, which effectively denoises the waveform locally.

**Envelope** The minimum and maximum value sample points from multiple acquisitions are combined to form a waveform that shows min/max accumulation over time.

**Peak Detect** Save the minimum and maximum value sample points taken during two waveform intervals and uses these samples as the two corresponding waveform points.

**High Resolution** Multiple samples taken within one waveform interval are averaged together to produce one waveform point to have a decrease in noise and an improvement in resolution for low-speed signals.

## ADC Bits

Choose 8 / 12 / 14 / 15 / 16 ADC bits for different vertical resolution. Available range of Sampling Rate and Record Length are changed under different vertical resolution.

## Roll Mode

The waveforms are displayed continuously.

# Utility

## Calibration Tool

**Signal Path Compensation** SPC process compensates the inaccuracy of DC caused by temperature regularly change or long-term drift. If the device is placed at places with large temperature difference or it hasn't been calibrated for months, it is recommended to conduct the SPC process before any measurements.

**Restore to Factory Settings** Returns the settings to the original factory calibration settings.

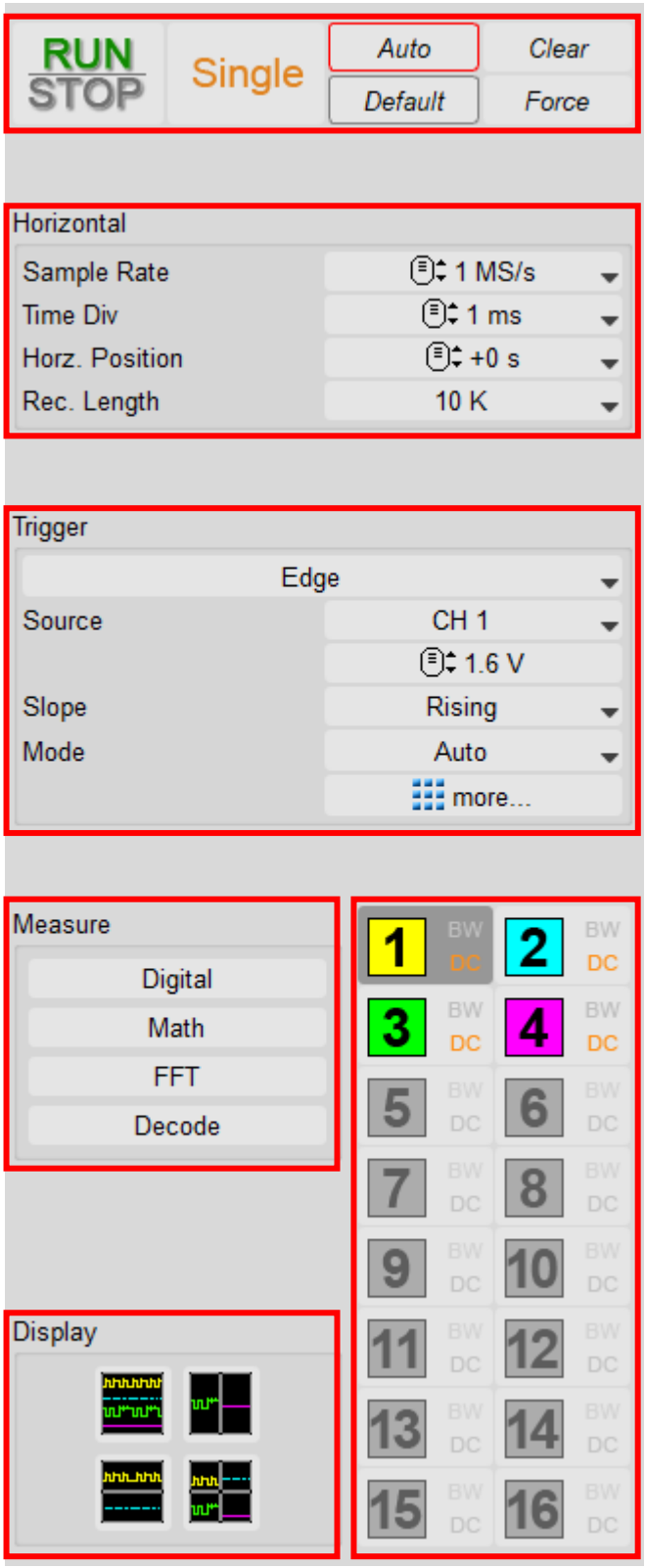
## Logger

Logger allows you to log the waveform data into the hard disk on the PC.

## AqVISA

AqVISA is an interface of the oscilloscope, which provides users access to each function and information.

# Chapter 4 Control Panel




Main Function Button

Horizontal Axis Settings

Trigger Settings

Measure Settings

Channels Settings

Display Division Settings

# Main Function Button


**Run / Stop.** Start or stop the acquire function immediately.


**Single.** Stop acquiring waveforms once the trigger occurs.


**Force Trigger.** When the trigger mode is normal or single, click the force trigger button to force it triggered successfully.


**Clear.** Clear the cache of captured waveforms, applicable to average mode.


**Default.** Restores the default settings of all functions.


**Autoset.** Automatically adjust the voltage, time, and trigger parameters to test and measure signal and display the waveform more quickly. It will automatically find the input parameters of the channel. For example, if the CH1 switch is on, then the voltage, time, and trigger of CH1 signal will be the reference of parameters for Autoset.

# Horizontal Axis Settings


**Sample Rate** Set up Sampling Rate.

**Time Div** The time interval per horizontal division.

**Horizontal Position** The time interval between the horizontal center of the screen and Trigger Position. You can either choose “To Center” in the pull-down menu to jump back to your trigger

position, or you can enter the time interval manually.

**Record Length** Record Length. Adjust the total amount of sampling points with a minimum of 1000 points.

## Sampling Rate

| | 1Ch | 2Ch | 4Ch |
|---|---|---|---|
| 8 bits | 1 GS/s | 500 MS/s | 250 MS/s |
| 12 bits | 500 MS/s | 250 MS/s | 125 MS/s |
| 14 bits | 100 MS/s | 100 MS/s | 100 MS/s |
| 15 bits | 100 MS/s | 100 MS/s | 100 MS/s |
| 16 bits | 100 MS/s | 100 MS/s | 100 MS/s |

## Record Length

(Parentheses indicate that analog and digital are turned on at the same time.)

| | 1Ch | 2Ch | 3Ch | 4Ch |
|---|---|---|---|---|
| 8 bits | 512 (256) Mpts | 256 (128) Mpts | 128 (64) Mpts | 128 (64) Mpts |
| 12 bits | 256 Mpts | 128 Mpts | 64 Mpts | 64 Mpts |
| 14 bits | 256 Mpts | 128 Mpts | 64 Mpts | 64 Mpts |
| 15 bits | 256 Mpts | 128 Mpts | 64 Mpts | 64 Mpts |
| 16 bits | 256 Mpts | 128 Mpts | 64 Mpts | 64 Mpts |

# Trigger Settings

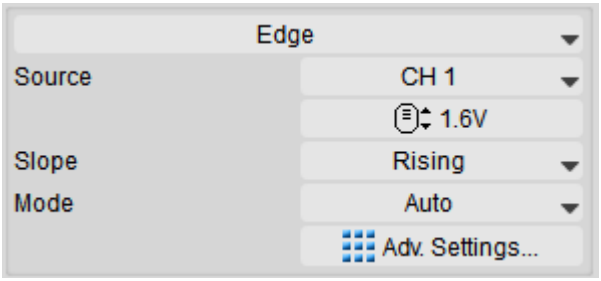
## Trigger Status

Trigger mode can be adjusted on the control panel and its current status can be found on top of the waveform window. The following are possible trigger status.

| | |
|---|---|
| **Arm** | Currently filling Pre-Trigger memory. |
| **Ready** | Pre-Trigger memory is full and MSO is waiting for trigger. |
| **Trig'd** | Triggered signal received and filling Post-Trigger memory. |
| **Auto** | Timed out for waiting the trigger and it forced to update. |
| **Stop** | Stop acquiring. |
| **Xferring** | Transferring data. |
| **Roll** | Enter Roll Mode. |

## Edge

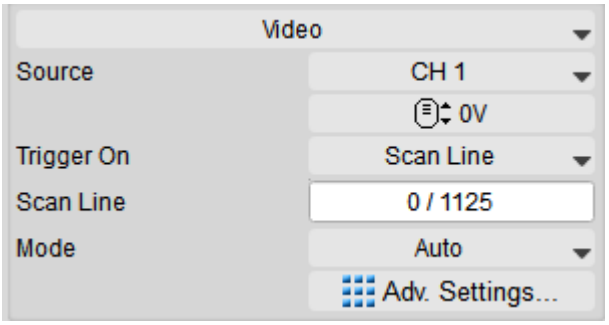
Triggers on Rising or Falling edges.




| | |
|---|---|
| **Source** | Set up the signal source channel. |
| **Slope** | Set up either rising or falling edge as the trigger signal. |
| **Mode** | Please refer to Mode. |
| **Adv. Settings** | Please refer to Advanced Settings. |

# Video

Triggers on Scan Line, One Field, Odd field, and Even field. There are different scan lines for different video signals, 525 lines for NTSC and 625 lines for PAL and SECAM. If scan line is set to 0, it scans randomly.




**Source** Set up the signal source channel.

**Trigger On** Trigger on either Scan Line, One Field, Odd field, or Even field.

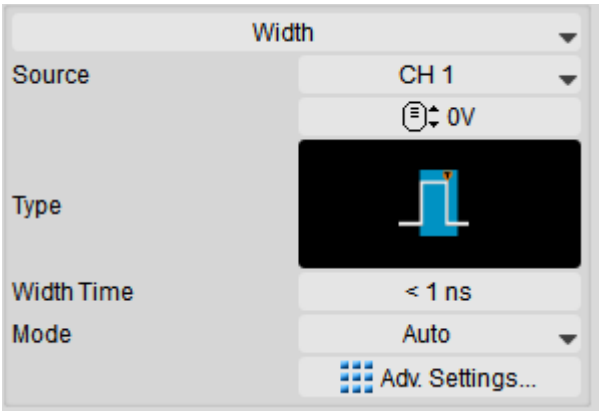
**Scan Line** Set the amount of scan lines.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

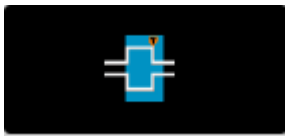
# Width

Triggered when the pulse width matches the specific mode and time condition.




**Source** Set up the signal source channel.

**Type**

| Icon | Description |
|---|---|
|  | Positive Pulse |
|  | Negative Pulse |
|  | Any Pulse |

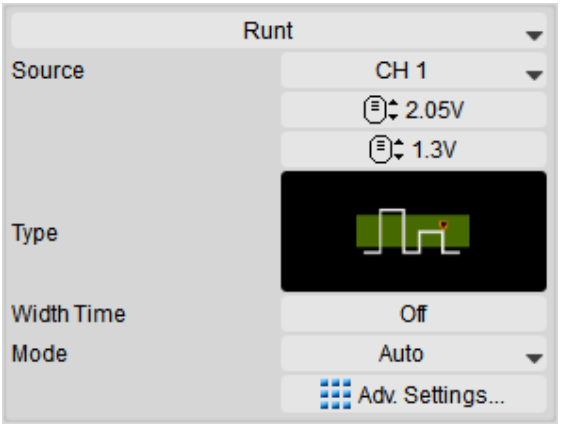
**Width Time** Triggered when the duration time length of the complete pulse width meets the trigger condition. Width time range can be set from 1ns to 68s.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

# Runt

Using two thresholds, the trigger occurs when the pulse passes the first voltage level but not the second voltage level.




**Source** Set trigger channel.

**Type**

| Icon | Width Time | Description |
|---|---|---|
|  | - | Positive runt pulse |
|  | - | Negative runt pulse |
|  | - | Positive or negative runt pulse |
|  | 1 ns – 68 s | Positive runt pulse with certain width |
|  | 1 ns – 68 s | Negative runt pulse with certain width |
|  | 1 ns – 68 s | Positive or negative runt pulse with certain width |

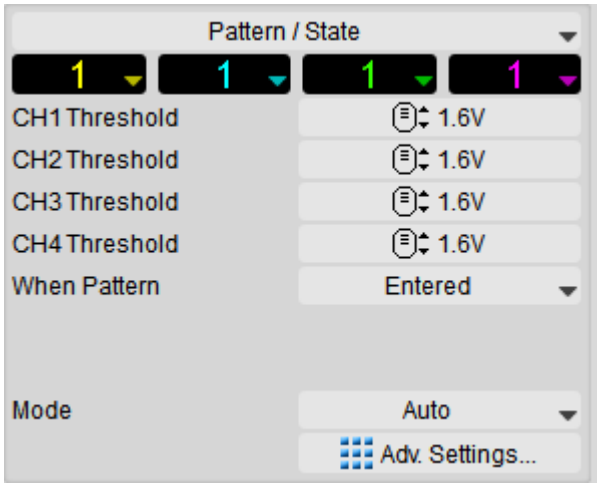
**Width Time** Trigger occurs when the width of runt pulse exceeds the configured width time. Available width time range is shown as the chart above.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

# Pattern / State

Pattern / state mode is for verifying logic combination of input signals in logic circuit. Triggered when the logic operation outputs a true statement.




**Threshold** Set the threshold voltage of each channel.

**When Pattern** Set as **Entered**, **Exited**, or **Present** to measure the time of entering, exiting, or presenting. You can also choose to set **OR** as logic operation. Triggered when the result of logic operation changes from 0 to 1.

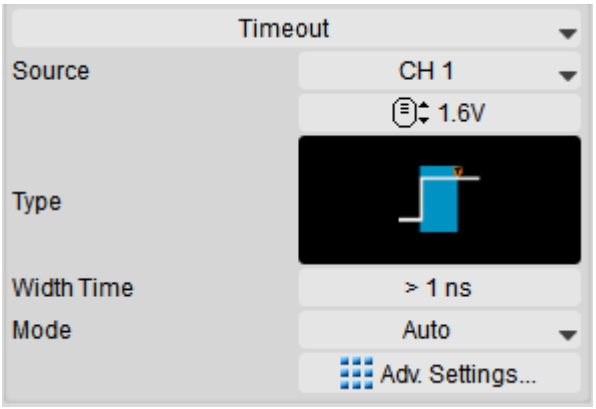
In state trigger, it's triggered when state channel meets the criteria and the output from logic channel is true.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

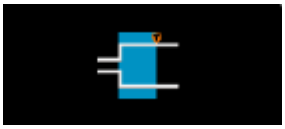
# Timeout

Often used when the system is stopped for unidentified reasons.




**Source** Set trigger signal source channel.

**Type**

| Icon | Description |
|---|---|
|  | High |
|  | Low |
|  | Either |

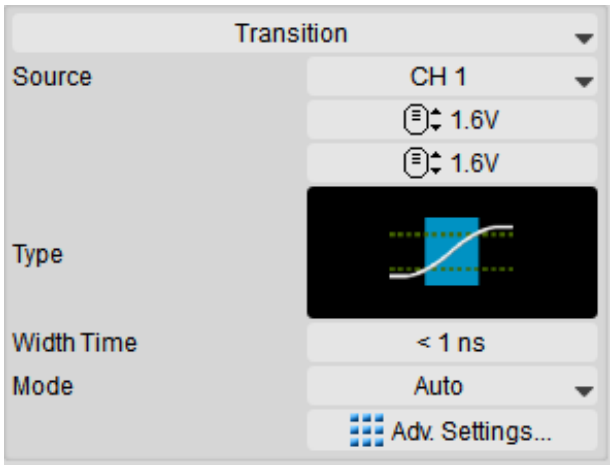
**Width Time** Triggered when no changes are made in a specific time period. Width time range can be set from 1 ns to 68 s.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

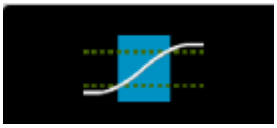
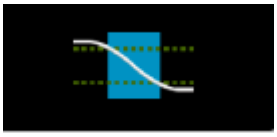
# Transition

Triggers when the state transition takes more/less time than the width time.




**Source** Set up signal source channel.

**Type**

| Icon | Description |
|---|---|
|  | Rising |
|  | Falling |

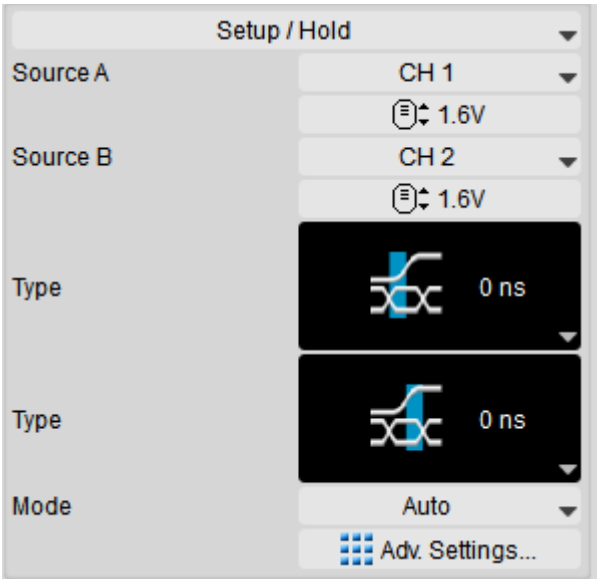
**Width Time** Set up the width time for state transition. Width time range can be set from 1 ns to 68 s.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

# Setup / Hold

Locates the specific signal quality and the details of time sequence in sync signals.




**Source (A/B)** Set up signal source channel.

**Type** Regard the signal from channel A as clock signal and the signal from channel B as data signal. Triggered when the status is changed during the setup time or hold time. Width time range can be set from 0ns to 68s.

| Icon | Description |
|---|---|
|  | Setup timing violation when clock rising. |
|  | Setup timing violation when clock falling. |
|  | Setup timing violation when clock change. |

| Icon | Description |
|---|---|
|  | Hold timing violation when clock rising. |

| | |
|---|---|
|  | Hold timing violation when clock falling. |
|  | Hold timing violation when clock change. |

**Setup Time** The time when the data remains stable before clock edge.

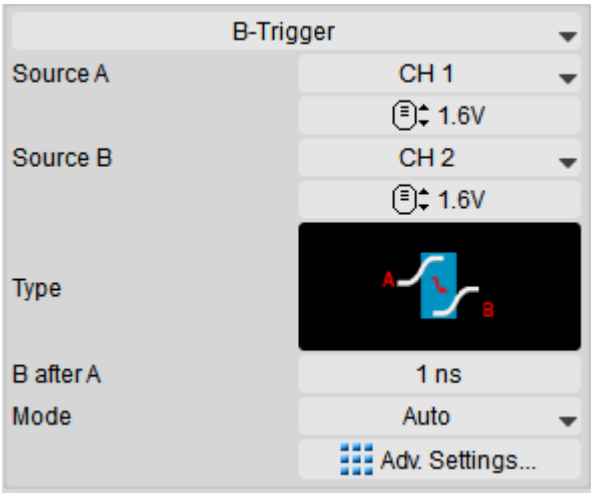
**Hold Time** The time when the data remains stable after clock edge.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

# B- Trigger

In the most demanding application, a single trigger event is not sufficient to fully define the trigger condition. Thus, B-Trigger is able to set up two trigger condition.




**Source (A/B)** Set up signal source channel.

**Type** You are able to acquire more complicated signals by combining the A-Event and B-Event. Triggered when B-Event happens in condition of occurence of A-Event within the specific time.

| Icon | Description |
|---|---|
|  | B rising after A rising |
|  | B falling after A rising |
|  | B rising after A falling |
|  | B falling after A falling |

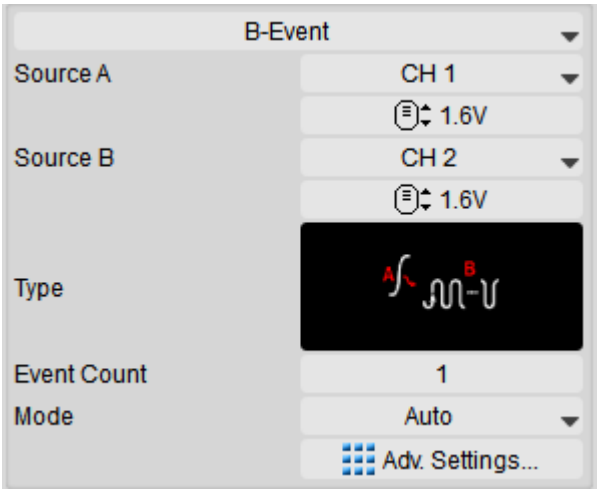
**B After A** Triggered when B happens after A with a delay time. Available time range can be set from 1 ns to 68 s.

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

# B-Event

In the most demanding application, a single trigger event is not sufficient to fully define the trigger condition. Thus, B-Event is able to set up multiple condition.




**Source (A/B)** Set up signal source channel.

**Type** Combines the triggers from A-Event and B-Event to acquire more complicated signals. Triggered when B-Event happens n times after A-Event happens. The count of occurence for B-Event ranges from 1 to 1024.

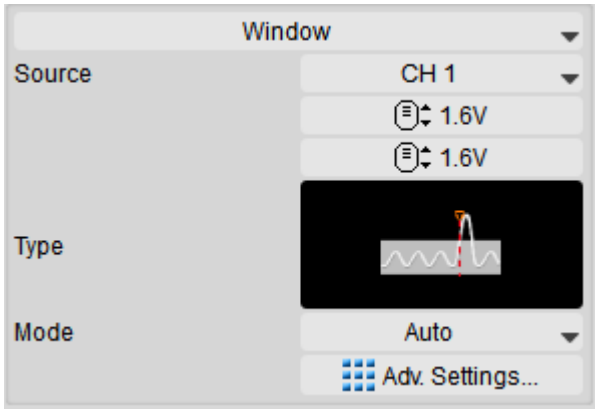
| Icon | Description |
|---|---|
|  | B rising n-times after A rising |
|  | B falling n-times after A rising |
|  | B rising n-times after A falling |
|  | B falling n-times after A falling |

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

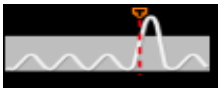
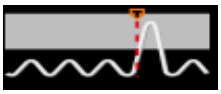
## Window

A window is composed of two trigger voltage level. Triggered when a waveform enters or exits the window.




**Source** Set trigger channel.

**Type**

| Icon | Description |
|---|---|
|  | Exit window |
|  | Enter window |

**Mode** Please refer to Mode.

**Adv. Settings** Please refer to Advanced Settings.

## Bus Trigger (DSO / LA)

Please refer to LA Decode & Trigger manual.

## Mode

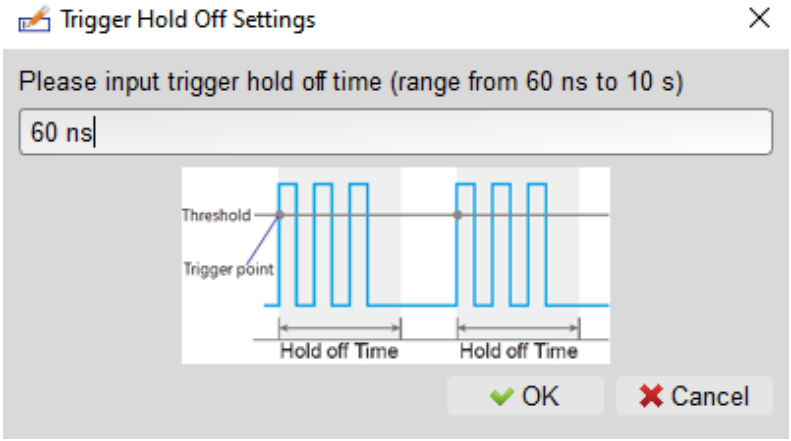
**Auto** Keeps acquiring waveforms even not triggered.

**Normal** Only acquires waveforms when triggered.

**Single** Stop acquiring waveforms when triggered once.

# Advanced Settings

## Trigger Hold Off Settings



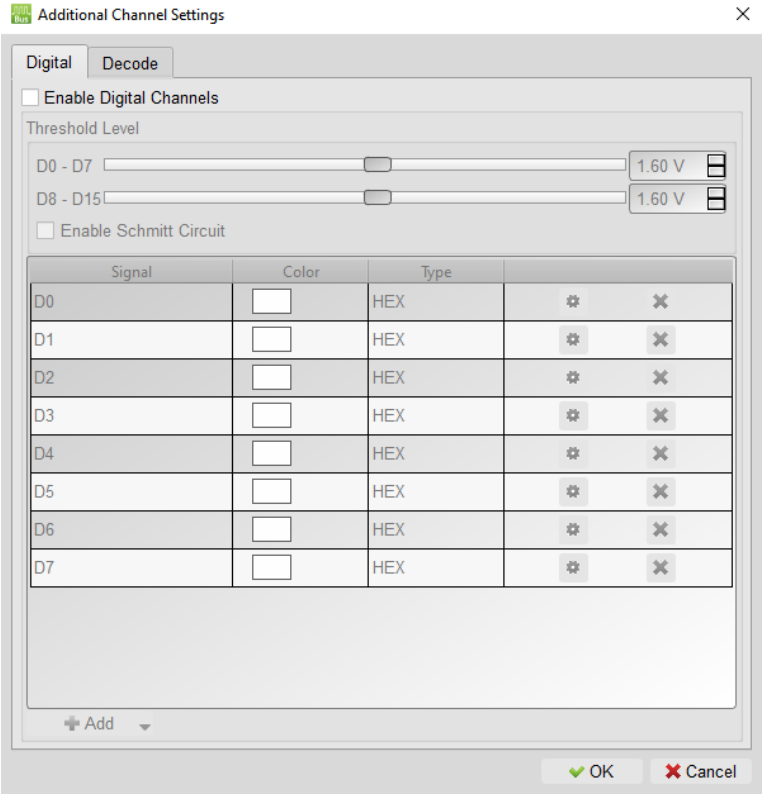

The trigger function is turned off once it successfully triggered and turned back on after the specified hold off time. Hold off time ranges from 60ns to 10s.

### Trigger Coupling

By utilizing **high frequency rejection** (~50KHz), **low frequency rejection** (~50KHz), and **noise rejection**, the disturbance caused by high frequency, low frequency or noise can be excluded. Among these three, high frequency rejection and noise rejection are for handling noise signals. For high frequency rejection, the 50KHz low-pass filter is added to trigger circuit to exclude unwanted signals. As for noise rejection, the hysteresis feature is added to trigger circuit to filter noise signals.

# Measure Settings

## Digital Channel Settings




After digital channels are enabled, you can define which channels to be measured. 8 channels are considered as a group. There are 2 groups in total, where their trigger levels can be adjusted within the group.

## Math

Refer to Math.

## FFT

Refer to FFT.

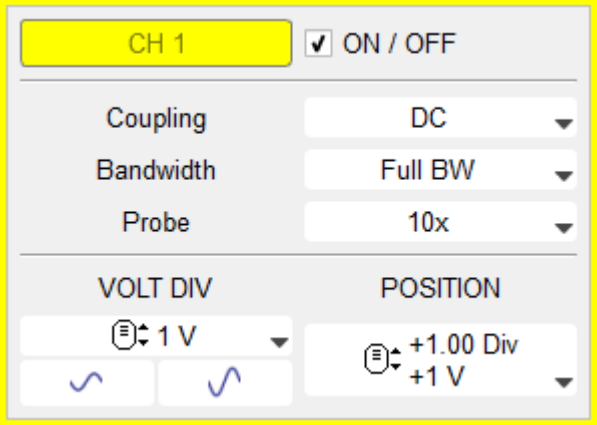
## Decode

Refer to LA Decode & Trigger manual. The results will be displayed on the Report Window.

# Channel Settings

### Channel Switch Button

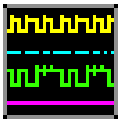
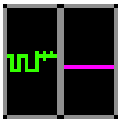
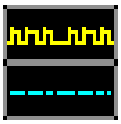

### Channel Setting Dialog




If the background color is gray, it means that this channel is unavailable. When a single device is being used, CH1-CH4 are available. When multiple MSOs are stacked and being used, CH5-CH16 will be available.

| | |
|---|---|
| **Label** | Editable channel label. |
| **ON/OFF** | Turn on/off the channels. You can also click right-click on the the channel switch to turn on/off the channels. |
| **Coupling** | Input signal DC/AC coupling. DC coupling does nothing to the signal, whereas AC coupling filters out the DC voltage level. |
| **Bandwidth** | Set up bandwidth limitation. |
| **Probe** | The probe option settings. Please be aware that the settings on the software must be identical with the probe. |
| **Volt Div** | Set voltage for each vertical division. You can also place your mouse on channel switch button and adjust voltage with the mouse wheel without tapping channel settings. |
| **Position** | Set the position of the channel. You can also change the position by dragging the labels on the left of the waveform window. |

# Display Division Settings


| Icon | Description |
|---|---|
|  | Single Display |
|  | Horizontal Division |
|  | Vertical Division |
|  | 2x2 Multi Displays |

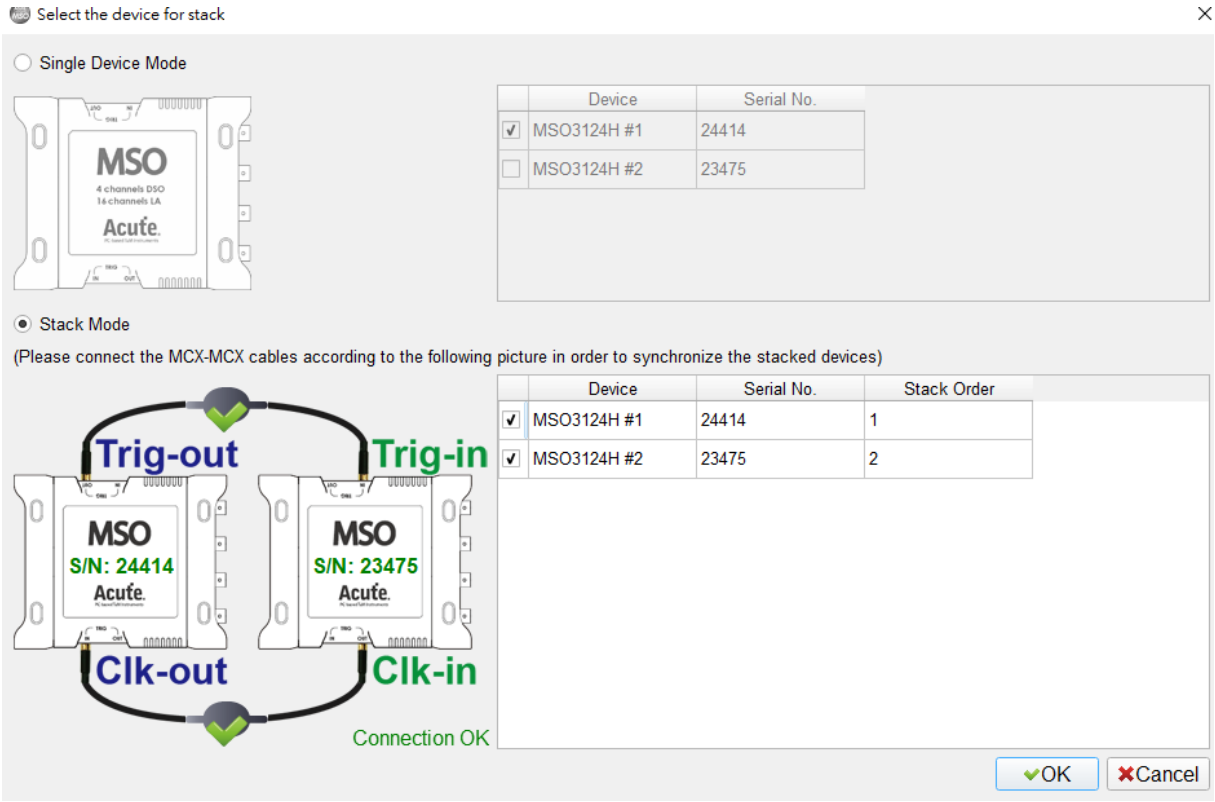
The display divisions do not affect the vertical resolutions.

# Chapter 5 How to Stack Multiple Devices

# How to Stack Multiple Devices

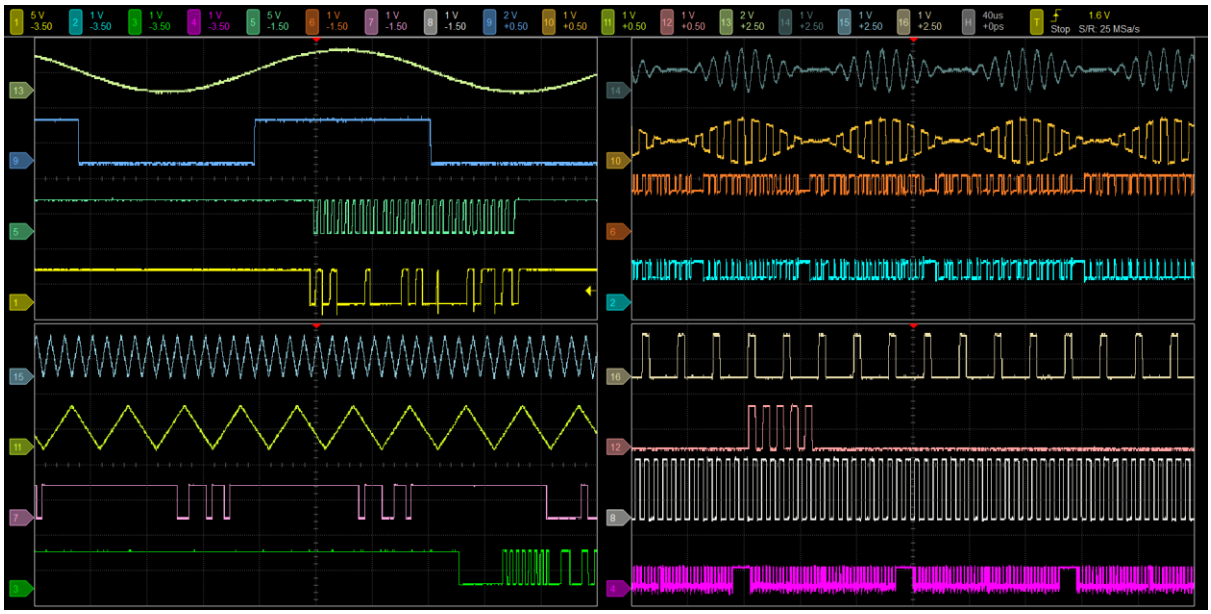
You can stack multiple devices as a multi channels oscilloscope. Take stacking two devices as an example, connect the “TRIG-OUT” of first MSO to the “TRIG-IN” of the second MSO with MCX cable and connect the “REF-OUT (CLK-OUT)” of the first device to the “REF-IN (CLK-IN)” of the second device with another MCX cable. Repeat the steps for stacking more devices if needed.

## Figure: Multiple MSOs Stack Dialog




The dialog above is shown after the software is opened. The list in the dialog shows the connected oscilloscopes, serial numbers, and the default stack order. Also, it automatically checks whether all devices are correctly stacked. If you want to change the stack order, please uncheck all the boxed of all devices in the list, and then check it with the desired order.

## Multiple Stacked Devices Software View



| | Description |
|---|---|
| **Mode** | If any device uses more than 3 channels, the maximum sampling rate is 250MHz. |
| **Trigger Source** | CH1, CH2, CH3, CH4 or Ext-Trig. Trigger function only available with the first (master) device. |
| **Phase Difference** | ± (1 / Current sampling rate) between master and slave device. |
| **Limitations of Different Models** | Please refer to the shortest record length. |

**DSO Software Manual**



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