SIGLENT®

SDS5000X Series
Digital Storage
Oscilloscope

Quick Start



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Overview

About the SDS5000X series

SIGLENT's SDS5000X series Digital Storage Oscilloscopes are available in bandwidths of 1 GHz, 500 MHz and 350 MHz. All models include a maximum sample rate of 5 GSa/s, maximum record length of 250 Mpts, and display up to 4 analog channels + 16 digital channels mixed signal analysis ability.

The SDS5000X series employs Siglent's SPO technology which features a maximum waveform capture rate of up to 110,000 wfm/s (normal mode, up to 500,000 wfm/s in Sequence mode) and a 256-level intensity grading display function plus a color temperature display mode. It also employs an innovative digital trigger system with high sensitivity and low jitter. The trigger system supports multiple powerful triggering modes including serial bus triggering. History waveform recording, Sequence acquisition, Search and Navigate functions allow for extended waveform records to be captured, stored, and analyzed. An impressive array of measurement and math capabilities, options for a built-in 25 MHz arbitrary waveform generator, as well as serial decoding are also features of the SDS5000X.

The large 10.1" display capacitive touch screen supports multi-touch gestures. With the addition of a user-friendly one-button design for most commonly used functions, the SDS5000X provides the user with enhanced operating efficiency.

SPO Technology

- Waveform capture rates of up to 110,000 wfm/s (normal mode), and 500,000 wfm/s (sequence mode)
- Supports 256-level intensity grading and color temperature display modes
- Record length up to 250 Mpts
- Digital trigger system

Specifications

For detailed specifications please refer to the data sheet.

Analog channels	
Bandwidth	350 MHz, 500 MHz, 1 GHz
Channels	2, 4
Sample rate	5 GSa/s (max)
Waveform length	250 Mpts (max)
Digital channels	
Channels	16
Sample rate	1.25 GSa/s
Detectable Pulse Width	3.3 ns (min)
Date rate	300 Mbps (max)

Packing List

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your SIGLENT sales representative.

- 1 oscilloscope
- 4/2 passive probes
- 1 AC power cord rated for the local region
- 1 quick start guide
- 1 certificate of calibration
- 1 USB cable

General Safety Summary

Carefully read the following safety precautions to avoid any personal injury or damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use Proper Power Cord

Only the power cord designed for the instrument and authorized by local government regulations should be used.

Ground the Instrument

The instrument is grounded through the protective earth conductor of the power cord. To avoid electric shock, please make certain the instrument is grounded correctly before connecting its input or output terminals.

Connect the Signal Cable Correctly

The potential of the signal cable ground is equal to the earth ground. Do not connect the signal wire to a high voltage.

Look Over All Terminals' Ratings

To avoid fire or electric shock, please look over all ratings and sign instructions of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Use Proper Overvoltage Protection

Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might be exposed to danger of electrical shock.

Electrostatic Prevention

Operate in an electrostatic-protected area environment to avoid damages induced by static discharge. Always ground both the internal and external conductors of the cable to release a static charge before connecting.

Maintain Adequate Ventilation

Inadequate ventilation may cause an increase of temperature, which may eventually damage the instrument. Maintain suitable ventilation and inspect the fan and intake regularly.

Avoid Exposed Circuits and Components

Do not touch exposed contacts or components when the instrument's power is on.

Use Only the Specified Fuse

Do Not Operate Without Covers

Do not operate the instrument with covers or panels removed.

Safety Terms and Symbols

Terms used in this product. These terms may appear in the product:

DANGER Indicates direct injury or hazards that may happen.
WARNING Indicates potential injury or hazards that may happen.
CAUTION Indicates potential damage to the instrument or other property that may happen.

Symbols used in this product. These symbols may appear on the product:



Hazardous Voltage



ProtectiveVoltage Earth Ground



Warning



Earth Ground



Power Switch

General Care and Cleaning

Care
Do not store or leave the instrument in direct sunshine for extended periods of time.
To avoid damages to the instrument or probes, please do not expose them to fog, liquid, or solvents.

Cleaning
Please perform the following steps to clean the instrument and probes regularly in accordance with its operating conditions.

1. Disconnect the instrument from all power sources and then clean with a soft wet cloth.
2. Clean the loose dust on the outside of the instrument and probe with a soft cloth. When cleaning the LCD, take care to avoid scratching it.

To avoid damage to the surface of the instrument and probe, please do not use any corrosive liquid or chemical cleansers.

Make sure that the instrument is completely dry before restarting it to avoid potential short circuits or personal injury.

Quick Start

Front of Oscilloscope



A. Touch Screen Display The display and major functions area. See "Touch Screen Display" chapter for more details.

B. Front Panel Includes knobs and buttons. See "Front Panel" chapter for more details.

C. Probe Compensation / Ground Terminal Supplies a 1 kHz square wave for compensating the probes.

D. USB Host Ports Connects the USB host ports to USB storage devices used for data transfer, or USB mouse / keyboard for control.

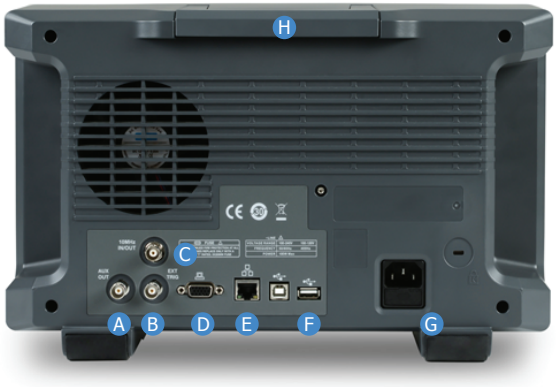
E. Digital Input Connector Receives digital signals from the SPL2016 digital probe.

F. Analog Input Connectors

G. Power Switch

H. Supporting Legs Adjust the supporting legs properly to use them as stands to tilt the oscilloscope upwards for stable positioning of the oscilloscope.

Back of Oscilloscope



A. Auxiliary Output Outputs the trigger indicator. When Pass / Fail is enabled, outputs the pass / fail signal.

B. External Trigger Input

C. 10 MHz IN/OUT Receives or outputs 10 MHz reference clock for synchronization between the oscilloscope and other instruments.

D. VGA Video Output Connects the port to an external monitor. The resolution is 1024 * 600.

E. LAN Port Connect the port to the network for remote control.

F. USB Ports One USB device to connect with a PC for remote control and one USB host to connect with a USB storage device or USB mouse / keyboard.

G. AC Power Input

H. Handle

Connecting to External Devices/Systems

Power Supply

The standard power supply for the instrument is 100~240 V, 50/60 Hz or 100~120 V, 400 Hz. Please use the power cord provided with the instrument to connect it to AC power.

Press the power switch to power on the oscilloscope after the AC power supply is connected. Pressing the power switch for approximately 2 seconds will force the oscilloscope into the Standby mode. In Standby mode the oscilloscope still consumes ~ 4 W power. To shut off the oscilloscope please disconnect the AC power supply.

The SDS5000X provides a "Power on Line" option. When enabled, the oscilloscope powers on once the AC power supply is connected. Follow the steps below to enable this option:

Utility > Power on Line

LAN

Connect the LAN port to the network with a network cable with RJ45 head for remote control.

Follow the steps below to set LAN connection:

Utility > System Setting > I/O > LAN Config

USB Peripherals

Connect a USB storage device to one of the USB host ports for data transfer, or connect USB mouse / keyboard to one of the USB host ports for controlling the instrument.

External Monitor

Use a D-Sub cable to connect the VGA port to an external monitor. The video signals from the VGA port has a 1024 * 600 resolution.

Auxiliary Output

When Pass / Fail is enabled, the port outputs the pass / fail signal, otherwise it outputs the trigger indicator.

Follow the steps below to set Pass / Fail:

Analysis > Pass/Fail

SAG1021 Waveform Generator

Activate the SDS-5000X-FG option and connect the SAG1021 USB function / arbitrary waveform generator module to any USB host pot on the oscilloscope. The oscilloscope can now control the USB module to output specified waveforms.

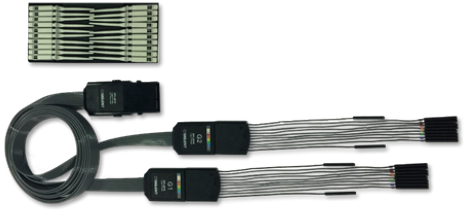
Press the WaveGen button on the front panel to set the waveform.

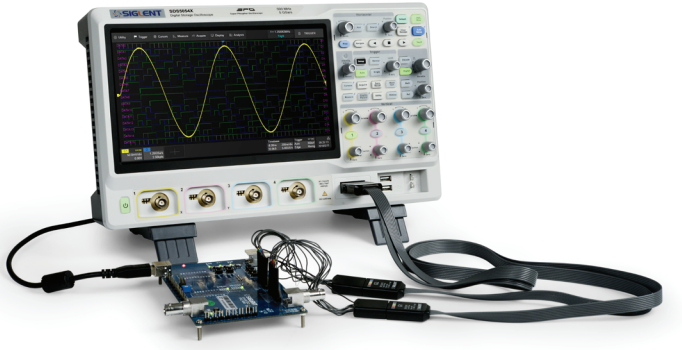
Probes

The SDS5000X series supports passive probes and active probes. The 500 MHz passive probe SP3050A is a standard accessory (1 probe / channel). The 1 GHz active probe SAP1000 is an optional accessory. Please go to www.siglent.com for more details on SIGLENT's probes.

Logic Probe

The logic probe SPL2016 is designed to probe up to 16 digital signals at once. The 16 digital channels are separated into two groups and each group has its own threshold, making it possible to simultaneously view data from different logic families.





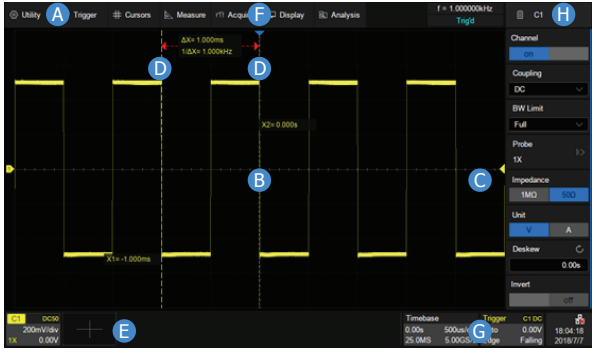
To connect the logic probe: Insert the probe, with the correct side facing up, until you hear a “click”.

To remove the logic probe: Depress the buttons on each side of the probe, then pull out it.

User Interface

Touch Screen Display

The entire SDS5000X display is a capacitive touch screen. Use your fingers to touch, drag, pinch, spread, or draw a selection box. Many controls that display information also work as "buttons" to access other functions. If you using any mouse, you can click anywhere – that you can touch - to activate a control; in fact, you can alternate between clicking and touching the control, whichever is convenient.



A. Menu Bar with drop-down menus lets you access set-up dialogs and other functions. All functionality can be accessed through the menu bar.

B. Grid Area displays the waveform traces. Traces can be moved by dragging, and re-scaled by pinch and spread.

C. Trigger Level Indicator shows the level where the waveform triggers on the vertical axis.

D. Cursors show where measurement points have been set. Move the cursors to quickly reposition the measurement point.

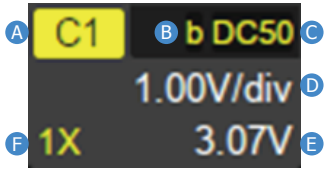
E. Channel descriptor boxes include analog channels (C1 ~ C4), digital channels (D), math (M) and reference (Ref). They are located under the grid area, showing the parameters of the corresponding traces. Touching the boxes creates a dialog box.

F. Trigger Delay Indicator locates where the waveform triggers on the horizontal axis.

G. Timebase and Trigger Descriptor Boxes show the parameters of timebase and trigger respectively. Touching the boxes creates a dialog box.

H. Dialog Box is the main area to select the parameters for a chosen specific function.

Channel descriptor box



A. Channel index

B. Bandwidth limit indicator

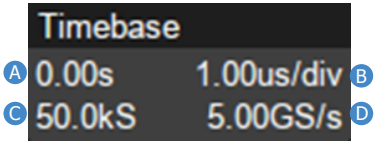
C. Coupling and impedance

D. Volts/div

E. Offset

F. Probe attenuation

Timebase and Trigger Descriptor Boxes

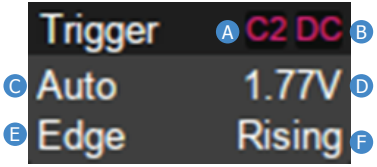


A. Trigger delay

B. Time/div

C. # Samples

D. Sample rate



A. Trigger source

B. Trigger coupling

C. Trigger mode

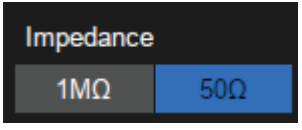
D. Trigger level

E. Trigger type

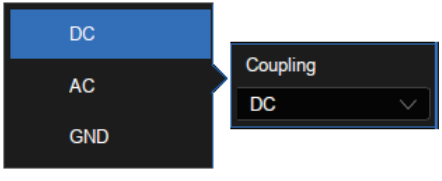
F. Trigger slope

To Set Parameters

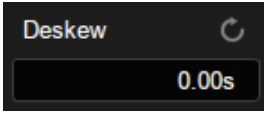
The SDS5000X provides several different ways to set parameters:



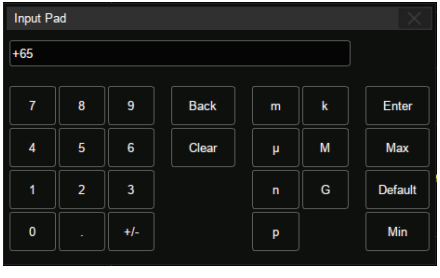
Switch – sets parameters with two states, such as to enable or disable a function. Touch the switch region to change from one state to the other.



List – sets parameters with more than two options, such as coupling mode of channels. Touch the parameter region, and then select the expected option from the pop-up list.



Virtual Keypad – Sets parameters with numerical value. Touch the parameter region, and the parameter can be adjusted by the universal knob on the front panel; touch the region again, then the virtual keypad appears;

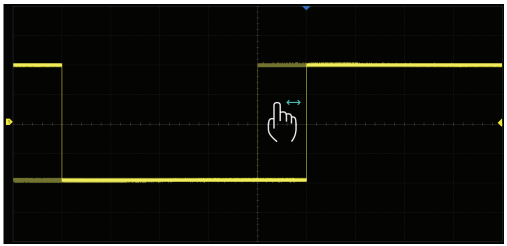


To use the operation of setting "deskew" of channel as an example: If the expected value is 65 ns, input "65" on the virtual keypad, and then choose the unit n to complete the operation. On the virtual keypad, touching the button Max , Min , and Default quickly sets the parameter to its maximum, minimum and default values.

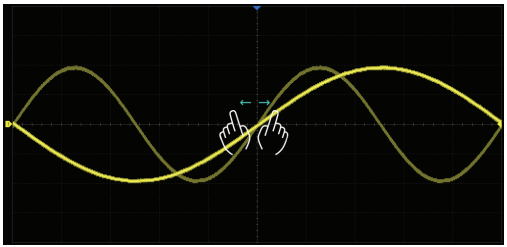
Touch Gestures

Waveforms, cursors and trigger level can be adjusted by touch gestures in the grid area.

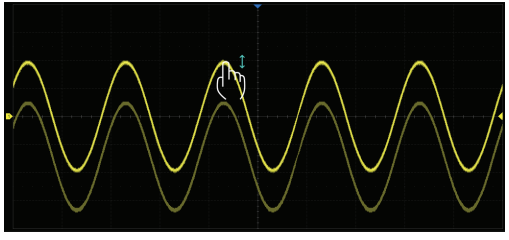




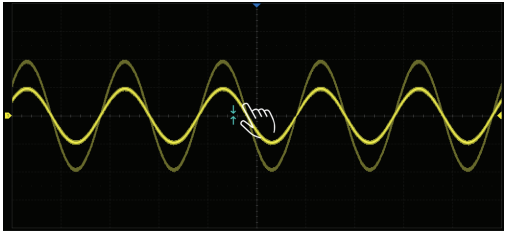
Drag the waveform left and right to move it on the horizontal axis



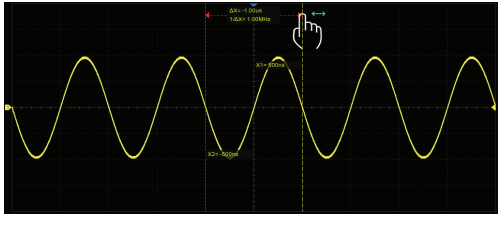
Pinch and spread the waveform horizontally to re-scale the timebase



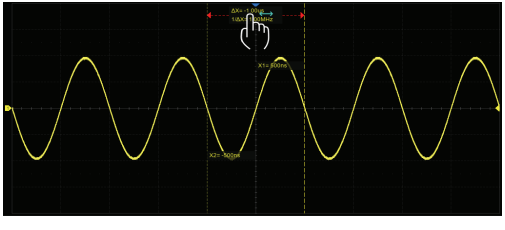
Drag the waveform up and down to move it on the vertical axis



Pinch and spread the waveform vertically to re-scale the vertical gain



Touch and drag the cursor to move it



Touch and drag the cursor information region to move the pair of cursors simultaneously.

Choosing the Language

Utility > System setting > Language

Front Panel



Most of the front panel controls duplicate functionality available through the touch screen display. They are covered in more detail in the Basics section and in the User Manual.

Shortcut buttons give quick access to commonly used functions, such as: Auto Setup automatically sets the waveform to adapt the display according its frequency and amplitude

Touch enables or disables the touch screen. When it is lighted the functionality is enabled

Rotate the universal knob to set the value of activated parameter, or to move selected cursor. Push to select a different cursor.



Basic Operations

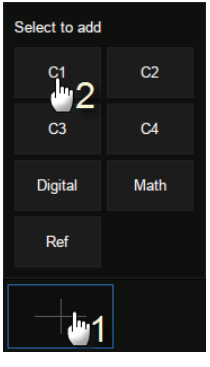
Turn On / Disable a Channel

From the Front Panel

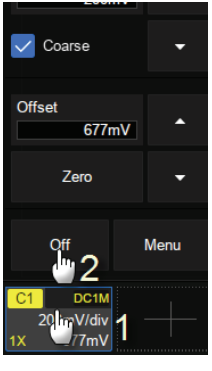
Push the channel button (1-4) to turn on the corresponding channel. Its channel descriptor box and dialog box will appear on the display. Push the same button again to disable the channel.

From the Touch Screen

Touch the + button and then select the expected channel to turn it on, and its channel descriptor box and dialog box will appear on the display. Touch the channel descriptor box and then touch the Off button to disable it.

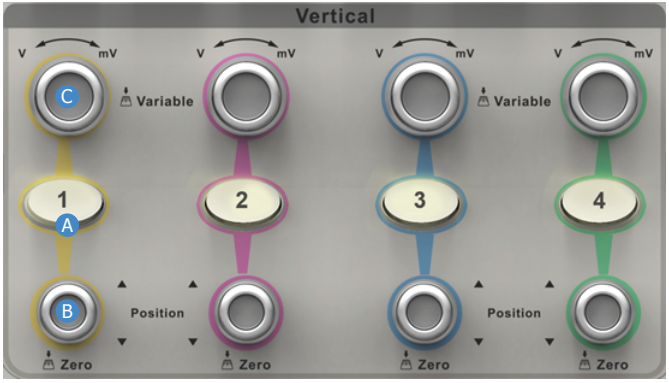


Turn on channel 1



Disable channel 1

Vertical System

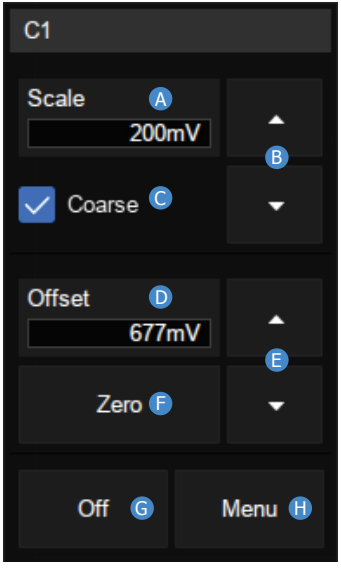


A. When the channel is disabled, push the button to turn it on. When the channel is turned on but not activated, push the button to activate it. When the channel is turned on and activated, push the button to disable it.

B. Rotate the knob to adjust the DC offset or vertical position of the channel. Push to set the offset to zero

C. Rotate the knob to adjust vertical scale (volts/div); push to switch to alternative between coarse adjust and fine adjust

Touch the channel descriptor box, a quick dialog will pop up. Vertical scale and offset can also be set from this dialog box.



A. Touch the region to set vertical scale with universal knob or virtual keypad

B. ▲ to increase vertical scale and ▼ to decrease

C. Check to coarsely adjust vertical scale and uncheck to finely adjust

D. Touch the region to set offset with universal knob or virtual keypad

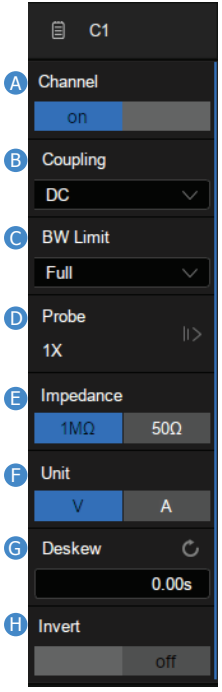
E. ▲ to increase offset and ▼ to decrease

F. Set offset to zero

G. Disable channel

H. Open the dialog box on the right side

Activating a channel or touching H in the quick dialog of the channel recalls the channel dialog box, displaying more parameters:



A. Turn channel on/off

B. Coupling (DC, AC or GND)

C. Bandwidth limit (Full, 200 MHz or 20 MHz)

D. Probe attenuation (1X, 10X, 100X or custom)

E. Impedance

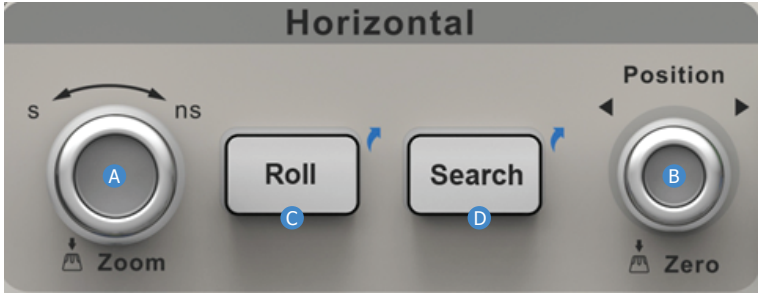
F. Units for the channel

G. Deskew

H. Enable/disable invert

Horizontal and Acquisition System

Horizontal controls adjust traces along the X axis. The horizontal setting applies to all channels.



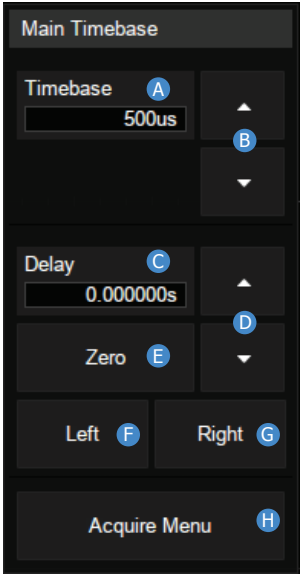
A. Rotate to adjust horizontal scale (time/div); push to enable Zoom; push again to exit Zoom mode.

B. Rotate to adjust trigger delay; push to set trigger delay to zero.

C. Push to enable horizontal Roll; push again to exit Roll mode. At timebase settings larger than 50 ms/div, it is recommended to set the oscilloscope to Roll mode so that the waveform is displayed in real time.

D. Push to enable Search; push again to close Search.

Touch the timebase descriptor box to display a quick dialog box. Timebase and Trigger Delay can also be set in this dialog box.



A. Touch the region to set timebase with universal knob or virtual keypad

B. ▲to increase timebase and ▼to decrease

C. Touch the region to set trigger delay with universal knob or virtual keypad

D. ▲to increase trigger delay and ▼to decrease

E. Set trigger delay to zero

F. Set trigger delay to left region of the display

G. Set trigger delay to right region of the display

H. Open the Acquire dialog box

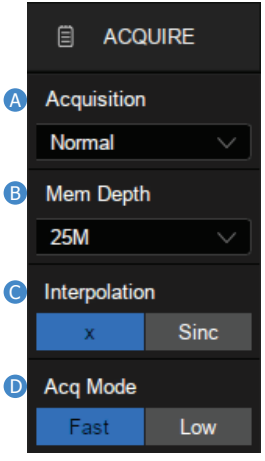
Touching H in the timebase quick dialog or pushing Acquire button on the front panel recalls the Acquire dialog box:

A. Acquisition mode (Normal, Peak detect, Average or Eres)

B. Sets the maximum memory depth

C. Interpolation mode

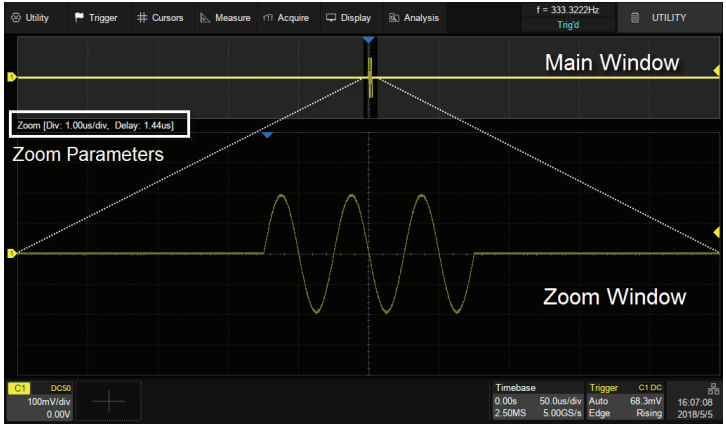
D. Acquisition mode



Zoom

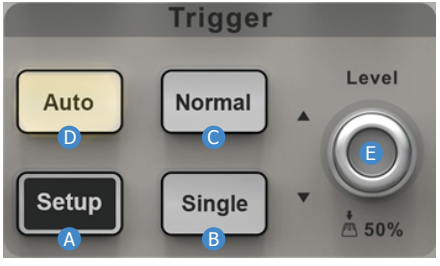
Zooming the traces displays a magnified portion of enabled channels. Pushing the timebase knob on the front panel zooms in on traces. In Zoom mode the grid area is divided into two areas. The main window appears on the top and the zoom window on the bottom. The region without the gray background in the main window is the portion of trace that is magnified in the zoom window.





Use the knobs in the Horizontal section on the front panel, or touch gestures on the touch screen to set the zoom parameters.

Trigger



A. Opens trigger setup dialog box

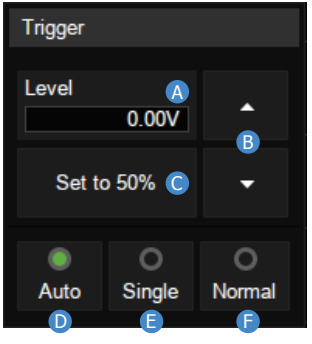
B. Single mode – triggers once when all conditions are met

C. Normal mode – triggers repeatedly when all conditions are met

D. Auto mode – triggers after preset period if no valid trigger occurs

E. Trigger level adjustment -- push to set the level to 50% of the waveform

Touch the trigger descriptor box, a quick dialog box will pop up above it and a trigger setup dialog box will on the right side of the display.



A. Touch the region to set trigger level with virtual keypad

B. ▲ to increase trigger level and ▼to decrease

C. Set trigger level to 50% of waveform

D. Auto mode

E. Single mode

F. Normal mode

A. Trigger type

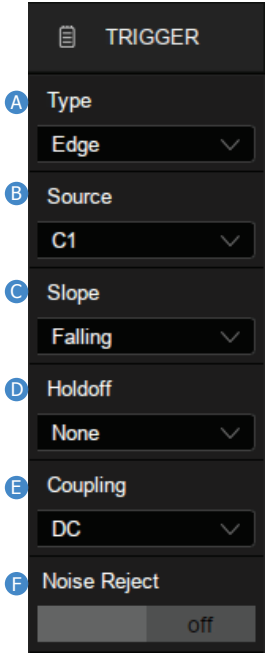
B. Trigger source

C. Trigger slope

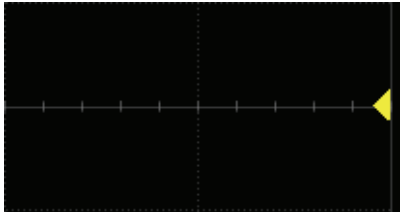
D. Sets Holdoff condition

E. Trigger coupling (DC, AC, HFR, LFR)

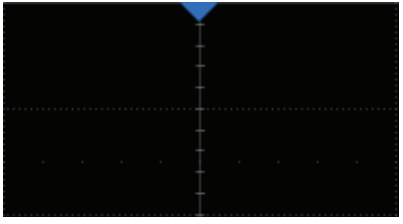
F. Enable/disable Noise Reject (Increases the trigger hysteresis so the trigger system is more immune to noise. This will degrade the trigger sensitivity)



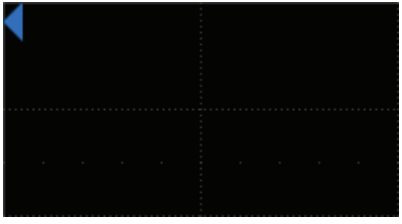
Indicators Relative to Trigger



Trigger level indicator



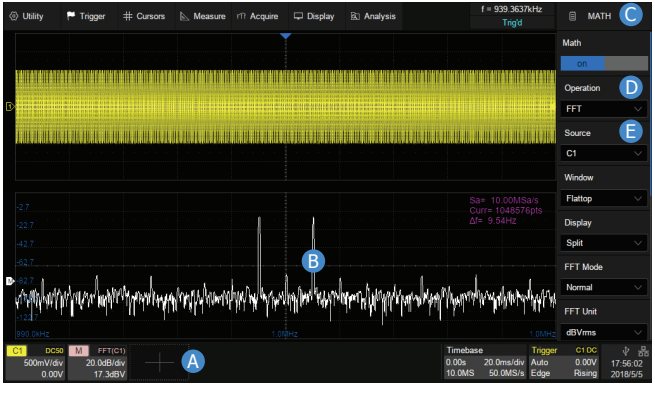
Trigger delay indicator



Trigger delay indicator (outside the screen)

Math

Math creates a new trace that displays the result of applying a mathematical function (e.g. Sum, Product, FFT) to one or more source traces



A. Touch the + > Math or push the Math button on the front panel to create math trace and open math setup dialog box C

B. Math trace

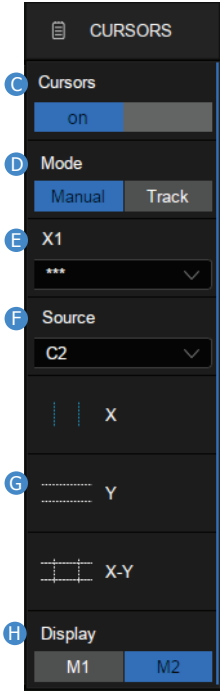
C. Math setup dialog box

D. Selects the type of math operation

E. Selects the source of math operation

Cursors

Cursors set measurement points on the Vertical or Horizontal axis of a trace (or both).



A. Push the button to open the cursors setup dialog box

B. Rotate the knob to move selected cursor; push to select different cursor



C. Enable/disable cursors

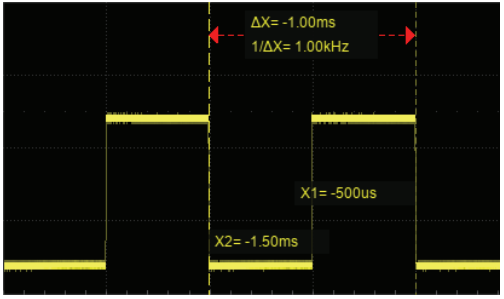
D. Cursor mode. In Track mode the vertical cursors track the waveform automatically

E. Select cursor and set its position (by touch, universal knob or virtual keypad)

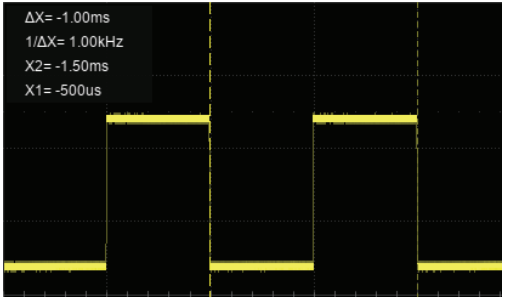
F. Selects the source

G. Cursor type (Horizontal, Vertical or Horizontal+Vertical).

H. Display mode of cursors



Display mode 1



Display mode 2

Measure & Statistics

You can set up-to-five simultaneous measurements on one or more traces and view the active readout in a table below the grid. Statistics can be added to the readout. You can also use Gate to limit the measurements to a specific portion of the trace.



A. Grid area is compressed automatically when measurement parameters are displayed

B. "All measure" region

C. Statistics region of specified measurements

D. Measurement setup dialog box. Push Measure button on the front panel or touch Measure > Menu to open it

E. Sets the source and measurement parameters

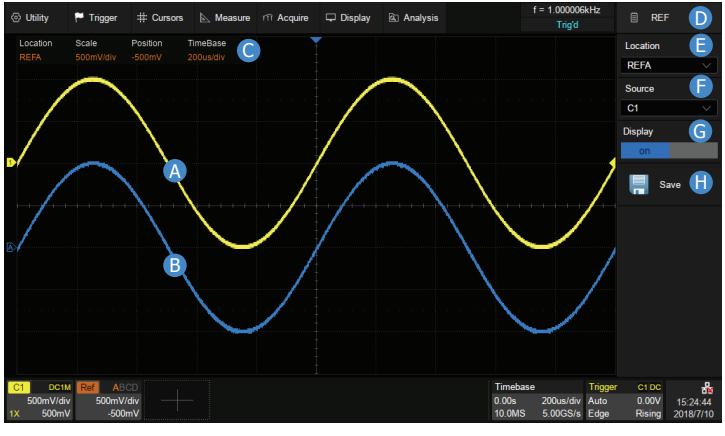
F. Clears all the measurement parameters

G. Resets the Statistics. It is equivalent to pushing the Clear Sweeps button on the front panel

H. Gating measurement setup

Reference Waveforms

Reference waveforms (REFA, REFB, REFC and REFD) are analog or math traces stored in the non-volatile memory. They can be recalled to the display for comparison with other traces.



A. Original trace of analog channel

B. Reference trace

C. Information region of reference waveform

D. Reference waveform setup dialog box

E. Selects the objective location

F. Selects the source (C1~C4, math)

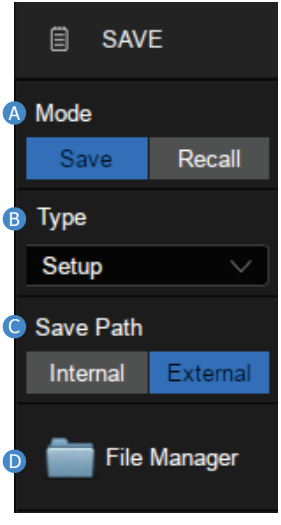
G. Displays or hides selected reference trace

H. Stores the waveform in F to location E

Save/Recall

The SDS5000X supports saving and recalling multiple formats of files, including setup, picture, waveform data and calibration data.

Press the Save Recall button on the front panel, or touch Utility > Save/Recall to open the Save/Recall setup dialog box.



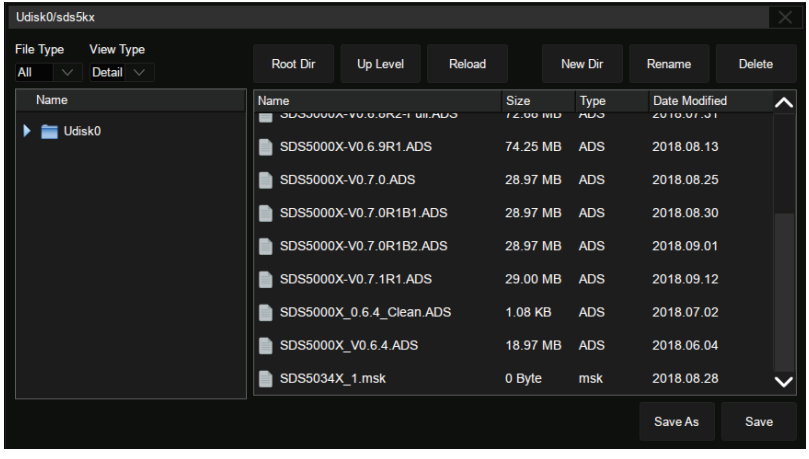
A. Choose Save or Recall operation

B. Select the object type

C. Specify the location of the object

D. When the location is "External", touch this region to **recall the** file manager for further operations

File Manager



Quickly Capture the Screen

When an external USB storage device is connected, press the Print button on the front panel to save the screen to the external device as a .bmp\.jpg\.png picture.

Calibration

The oscilloscope is calibrated at the factory prior to being shipped. The calibration is run at 23 °C (± 2 °C) and is valid for temperatures 23 ± 5 °C. Within this temperature range, the oscilloscope will meet all specifications once warmed up.

Warm up the oscilloscope for at least 20 minutes prior to each use or calibration in order for it to reach a stable operating temperature. Specifications are not guaranteed during the warm up period.

Whenever the oscilloscope is used in an environment outside 23 ± 5 °C, or when it has been more than one month since the previous calibration, manual calibration is recommended. To perform a self-calibration:

Touch Utility > Menu > Do Self Cal or

Utility > Do Self Cal

Software Options

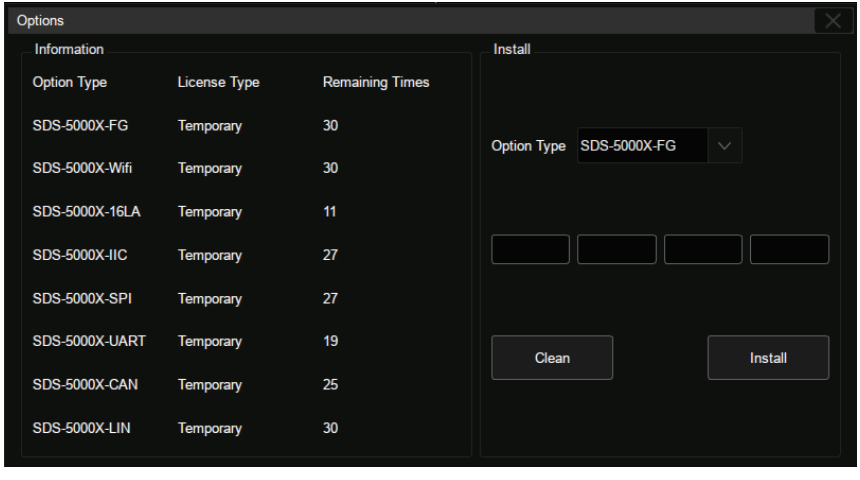
Software options are available to enhance the operation of a SDS5000X oscilloscope. The SDS5000X series provides the following software options:

Code	Description
SDS-5000X-16LA	16 digital channels
SDS-5000X-FG	25 MHz waveform generator
SDS-5000X-BW05	350 MHz to 500 MHz bandwidth upgrade

Installing a Software Option

Follow the steps below to install a software option after purchasing it and obtaining the Option Key:

1. Utility > Menu > Options or Utility > Options
2. Select the correct Option Type
3. Input the option key in the text box
4. Touch **Install** and then restart the oscilloscope



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