

# Keysight Infiniium S-Series Oscilloscopes

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For more safety information, refer to the *For Your Safety* booklet included with your Infiniium oscilloscope.

# Infiniium S-Series Oscilloscopes—At a Glance

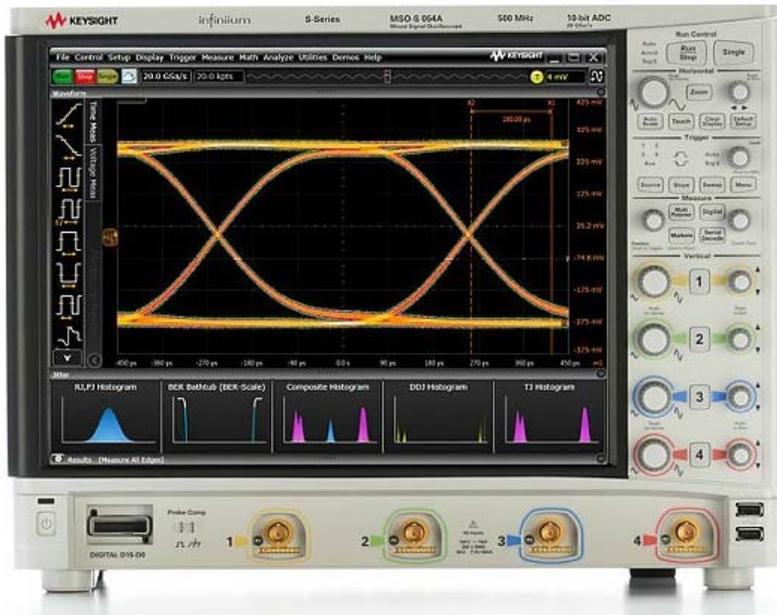


Table 1 S-Series Oscilloscope Band widths

Model	Analog Band width	Maximum Sampling Rate (2-channel)	Standard Memory Depth (2/4-channel mode)
DSOS054A/MSOS054A	500 MHz	20 GSa/s	100 Mpts/50 Mpts
DSOS104A/MSOS104A	1 GHz	20 GSa/s	100 Mpts/50 Mpts
DSOS204A/MSOS204A	2 GHz	20 GSa/s	100 Mpts/50 Mpts
DSOS254A/MSOS254A	2.5 GHz	20 GSa/s	100 Mpts/50 Mpts
DSOS404A/MSOS404A	4 GHz	20 GSa/s	100 Mpts/50 Mpts
DSOS604A/MSOS604A	6 GHz	20 GSa/s	100 Mpts/50 Mpts
DSOS804A/MSOS804A	8 GHz	20 GSa/s	100 Mpts/50 Mpts

## Ease of use with high performance

The Infiniium S-Series oscilloscopes combine unprecedented ease of use with high-performance digitizing oscilloscope functionality to simplify your design and analysis measurement tasks.

- Traditional oscilloscope front-panel interface provides direct access to the controls needed for most troubleshooting tasks.
- User interface with menus, windows, dialog boxes, and toolbars provides easy access to dozens of configuration and analysis tools, ensuring you can set up and make the most complex measurements.
- Models with bandwidths from 500 MHz to 8 GHz.
- 16 digital channels on MSO models at 2 GS/s.

## Display shows waveforms and user interface

- User interface allows direct interaction with waveforms, including drag-and-drop positioning and instant waveform zoom.
- Large capacitive touch screen display with multi-touch (gestures), handles, and resizing allows oscilloscope operation without an external pointing device.
- Waveforms are displayed in color, making correlation easy.
- Current configuration parameters displayed near the waveform display area are color-coded to make identification easy.
- Menus and toolbars simplify complex measurement setups.

## Horizontal controls set sweep speed and position

- Zoom box on main sweep window makes it easy to see what will appear in the zoom window.

## Acquisition and general controls start and stop the oscilloscope and do basic setup

- Run, stop, and single controls for continuous or single acquisitions.
- Clear display before one or more acquisitions.
- Default setup and Autoscale set initial configuration.

## Removable solid-state drive and USB 2.0 and 3.0 ports for saving and restoring setups and measurement results

- Store measurement displays for inclusion in reports and test setup guides.
- Store oscilloscope setups to repeat tests another time.
- 250 Gb removable solid state drive for fast boot-up.

## Trigger setup controls set mode and basic parameters

- Select Edge, Glitch, or Advanced Modes.
- Choose input source and slope.

- Use the user interface to simplify configuration of pattern, state, delay, and violation trigger modes.
- Use auxiliary trigger to increase triggering flexibility.

Vertical controls set attenuation and position

- Vertical scaling down to 2 mV/div in hardware.
- Color-coded knobs make it easy to find the controls that affect each waveform.

Marker and quick measurements help measure waveform parameters

- Use waveform markers 1 and 2 to check voltage or  $\Delta$ -time at any point on the displayed waveform.

## In This Guide

This guide provides the information you need to begin using the Infiniium S-Series oscilloscopes.

**Chapter 1**, “Setting Up the Oscilloscope,” starting on page 11 includes power and air flow requirements, plus other setup information.

**Chapter 2**, “Using the Oscilloscope,” starting on page 25 gives an overview of the front and side panel inputs and outputs, front-panel controls, and user interface, and tells you how to perform basic operations with the oscilloscope.

**Chapter 3**, “Online Help and Other Information,” starting on page 49 describes the Infiniium oscilloscope application’s online help contents and online demos. The online help describes how to use the Infiniium oscilloscope application in detail.

**Chapter 4** provides recommendations for working comfortably and safely while operating the Infiniium oscilloscope.

### For More Information

- For detailed information on how the oscilloscope makes measurements and how to use the oscilloscope, see the Infiniium oscilloscope application’s online help.
- For information on controlling the oscilloscope from a remote computer, see the *Oscilloscopes Programmer’s Reference* found in the Infiniium oscilloscope application’s online help.
- For information on testing and servicing the oscilloscope, see the *Service Guide* found in the Infiniium oscilloscope application’s online help.

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This chapter shows how to set up your Infiniium oscilloscope, connect power and accessories, and verify general operation.

## Inspecting Package Contents

- ✓ Inspect the shipping container for damage.
  - Keep the shipping container or cushioning material until you have inspected the contents of the shipment for completeness and have checked the oscilloscope mechanically and electrically.
  - If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier and your Keysight Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Keysight Technologies Sales Office will arrange for repair or replacement at Keysight's option without waiting for claim settlement.

- ✓ Inspect the oscilloscope.

If there is mechanical damage or a defect, or if the oscilloscope does not operate properly or does not pass performance tests, notify your Keysight Technologies Sales Office.

- ✓ Verify that you received the following items in the Infiniium oscilloscope packaging.

- Infiniium oscilloscope
- Power cord
- Keyboard
- Mouse (USB optical)
- Accessory pouch (mounts on rear of oscilloscope)
- Front panel cover
- Calibration cable
- Quick Start poster
- 500 MHz passive probes (4)
- Digital channels cable, BNC probe tip adapter, and 17-channel flying lead kit (MSO models only)

If anything is missing, contact your nearest Keysight Technologies Sales Office.

- ✓ Verify that you received the options and accessories you ordered and that none were damaged.

For a complete list of options and accessories available for the S-Series oscilloscopes, see the *Infiniium S-Series Oscilloscopes Data Sheet*.

## Environmental Characteristics

Environment	Indoor use only
Ambient temperature	Operating: 5 °C to +40 °C Non-operating: -40 °C to +65 °C
Humidity	Operating: up to 90% relative humidity (non-condensing) at +40 °C Non-operating: up to 90% relative humidity at +65 °C
Altitude	Operating: up to 4,000 meters (13,123 feet) Non-operating: up to 15,300 meters (50,000 feet)
Weight	26 lbs (11.8 kg)
Dimensions	16.8 in (43 cm) wide, 12.9 in (33 cm) tall, and 9 in (23 cm) deep
Safety	UL61010-1 3 <sup>rd</sup> edition CAN/CSA-22.2 No. 61010-1-12 3 <sup>rd</sup> edition
Installation/ Measurement Category	Installation category: II Measurement category: 1
Voltage Fluctuations	Note that the main supply voltage fluctuations are not to exceed $\pm 10\%$ of the nominal supply voltage.
Pollution Degree	The Infiniium S-Series oscilloscopes may be operated in environments of Pollution Degree 2.
Pollution Degree Definitions	<p>Pollution Degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence. Example: A clean room or climate-controlled office environment.</p> <p>Pollution Degree 2. Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation may occur. Example: General indoor environment.</p> <p>Pollution Degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. Example: Sheltered outdoor environment.</p>

## Positioning for Proper Airflow

- 1 Position the oscilloscope where it will have sufficient clearance for airflow around the back and sides.

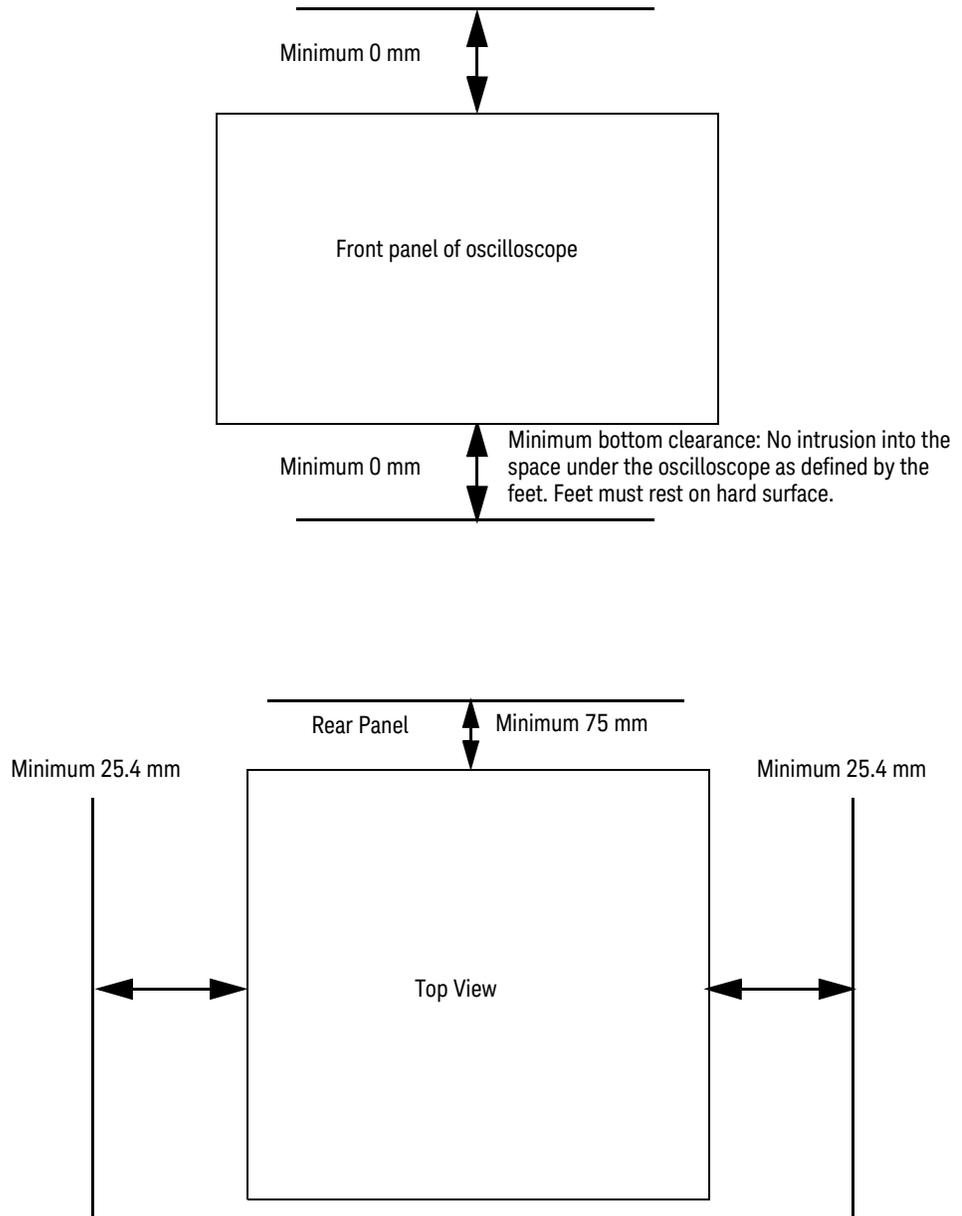


Figure 1 Positioning the S-Series Oscilloscope with Sufficient Clearance

## Connecting a Mouse, Keyboard, and LAN Cable

A mouse and keyboard can be plugged into the USB host ports. Four host ports are on the side panel, with two more on the front panel. Connect your LAN cable to the RJ-45 connector on the side panel of the oscilloscope.

### NOTE

After you have connected to the LAN card, you must set up the network. Exit the oscilloscope application before you start setting up your network.

If you do not know how to set up a network in the Windows 7 operating system, see your network administrator or use the Windows 7 operating system's online help.

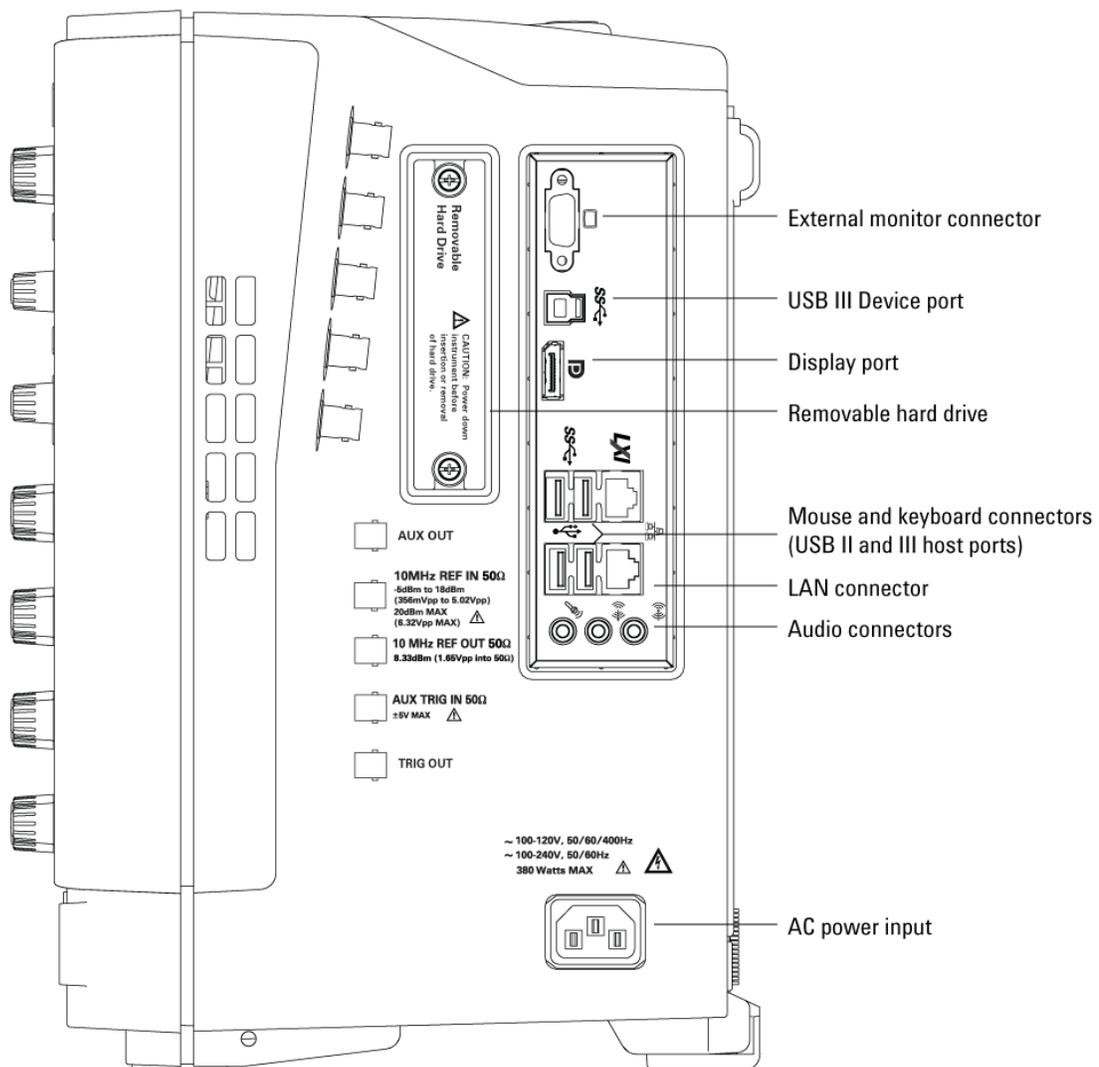


Figure 2 Side Panel

## Connecting Power

**Table 2** Power Requirements

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Power	100-120 V, 50/60/400 Hz 100-240 V, 50/60 Hz 380 W Max
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- 1 Connect the power cord to the side of the oscilloscope, then to a suitable AC voltage source.

**CAUTION**



Use only power cords designed for your oscilloscope.

The power cord provided is matched to the country of origin of the order.

---

**WARNING**



**To avoid electric shock, be sure the oscilloscope is properly grounded.**

---

## Connecting Oscilloscope Probes

- 1 Attach the probe connector to the desired oscilloscope channel or trigger input using the probe instructions.
- 2 Connect the probe to the circuit of interest using the browser or other probing accessories.
- 3 Disconnect the probe.

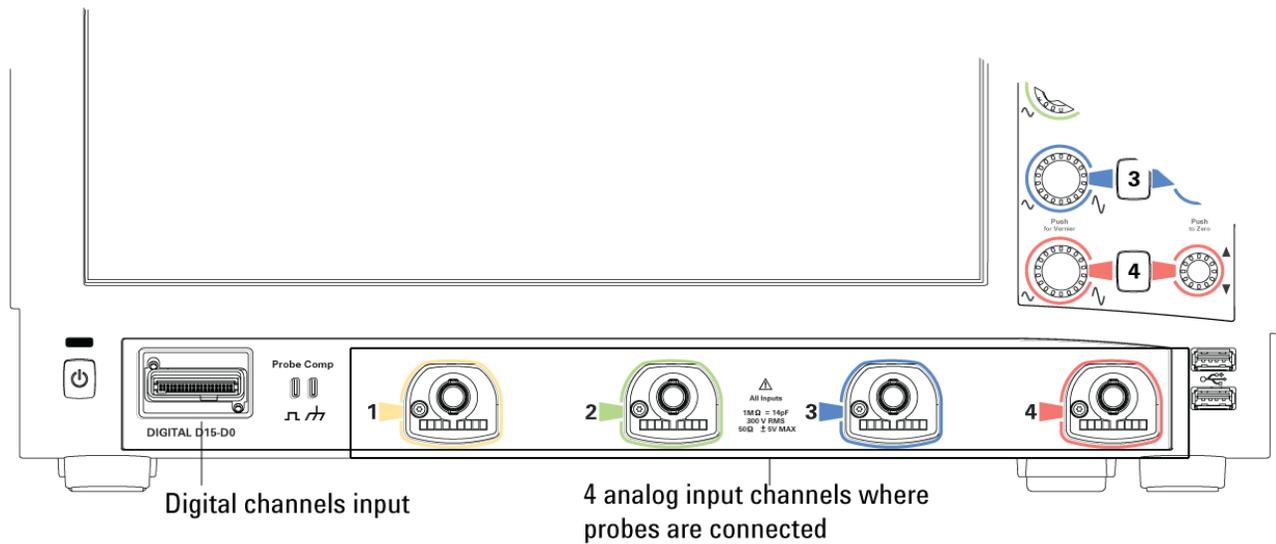


Figure 3 S-Series Oscilloscope Probe Connectors

### CAUTION

Do not exceed the maximum input voltage rating. The maximum input voltage for the 50  $\Omega$  inputs is  $\pm 5$  V<sub>peak</sub>, and for the 1 M  $\Omega$  it is 300 V<sub>rms</sub>.



## Tilting the Oscilloscope for Easier Viewing

Tabs under the front feet of the oscilloscope can be flipped out to tilt the oscilloscope.



Figure 4 Latching the Front Feet

## Turning On the Oscilloscope

- Press the power switch in the lower left corner of the oscilloscope front panel.

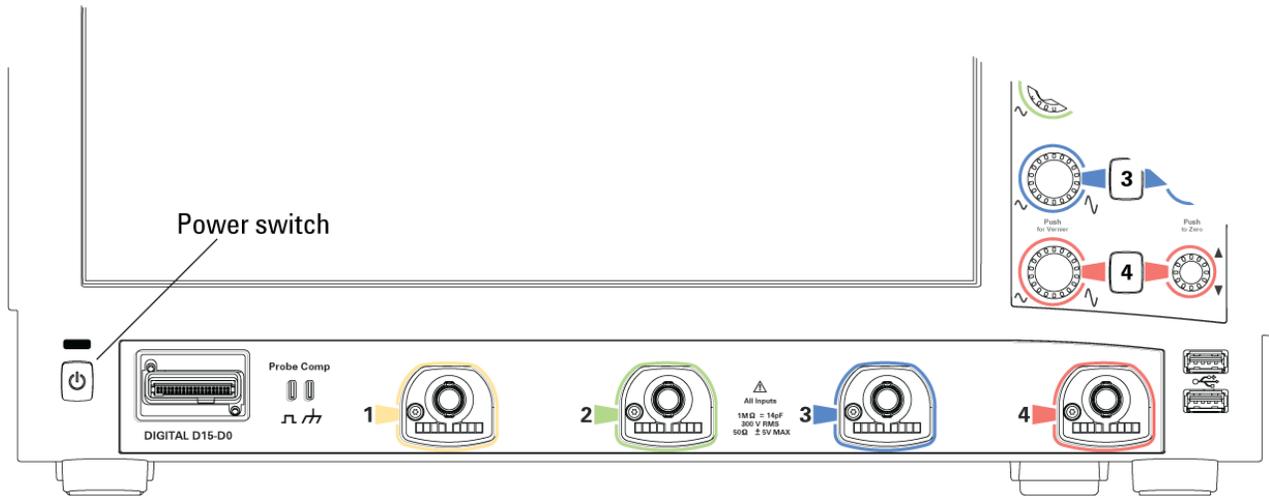


Figure 5 Turning On the Oscilloscope

After a short initialization period, the oscilloscope display appears. The oscilloscope is ready to use.

- You can connect and disconnect probes and cables while the oscilloscope is turned on.

## Verifying Basic Oscilloscope Operation

- 1 Connect one end of the passive probe cable to oscilloscope input channel 1.
- 2 Connect the other end of the passive probe cable to the front panel probe comp with the square wave label.

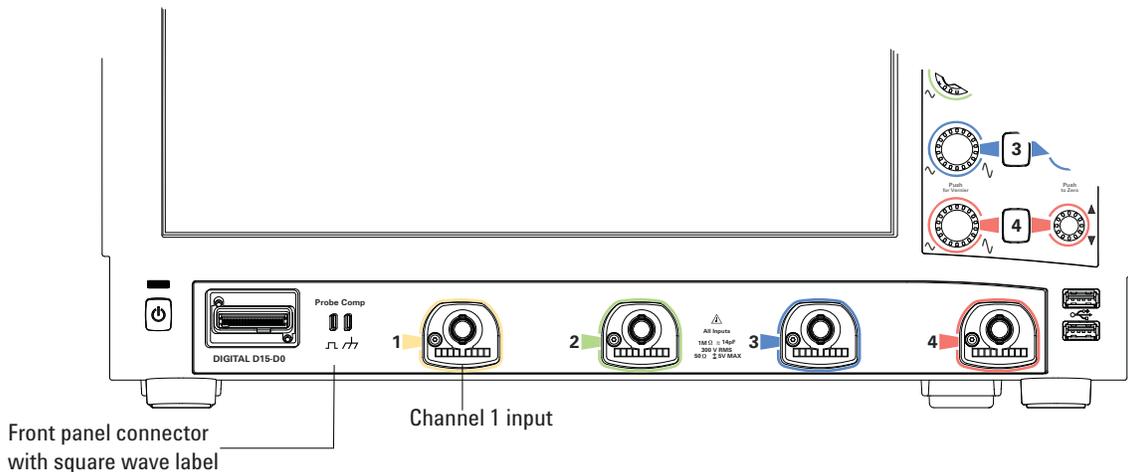


Figure 6 Verifying Basic Oscilloscope Operation

- 3 Press **[Default Setup]** on the front panel.  
The display will pause momentarily while the oscilloscope is configured to its default settings.
- 4 Press **[Auto Scale]** on the front panel.  
The display will pause momentarily while the oscilloscope adjusts the time/div setting and vertical scale. You should then see a square wave with about four cycles on screen and a peak-to-peak amplitude of approximately five divisions.  
If you do not see the waveform, make sure your power source is adequate, the oscilloscope is properly powered on, and the probe is connected securely to the front panel connector output.
- 5 Move the mouse around the mouse surface and verify that the on-screen pointer follows the mouse movement.
- 6 Press the **[Touch]** key on the front panel to turn on the touch screen. Press and hold your finger to the screen. A right-click menu appears, which verifies that the touch screen is working properly.

## Installing Application Programs on Infiniium

Infiniium has an open Windows operating system, which lets you install your own application software. Any application that runs on Microsoft Windows 7 Embedded and uses 8 GB of RAM or less may be installed on your Infiniium oscilloscope.

**NOTE**

Exit the oscilloscope application before installing any software.

---

**CAUTION**

Installing an application that does not meet these requirements may break the oscilloscope application and require a hard drive recovery.



## Changing Windows Operating System Settings

**NOTE**

Exit the oscilloscope application before changing any Windows operating system settings outside of the oscilloscope application.

---

Many Windows operating system settings can be changed to suit your own personal preferences. However, some operating system settings should not be changed because doing so would interfere with the proper operation of the oscilloscope.

- Do not change the Power Options.
- Do not change the Language settings.
- Do not remove Fonts.
- Do not change the screen resolution from 1024 by 768 pixels.
- Do not use the Administrative Tools to enable or disable Internet Information Services. Use the Infiniium Remote Setup dialog box to enable or disable the Web Server.
- Do not delete or modify the Infiniium Administrator user account.

## Turning Off the Oscilloscope

- Press the power switch at the lower left corner of the oscilloscope front panel. The oscilloscope will go through a normal Windows operating system shutdown process.

## Cleaning the Oscilloscope

Clean the oscilloscope with a soft cloth dampened with a mild soap and water solution.

**CAUTION**

Do not use too much liquid in cleaning the oscilloscope. Water can enter the Infiniium panels, damaging sensitive electronic components.



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## 2 Using the Oscilloscope

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This chapter describes how to use the Infiniium S-Series oscilloscope's inputs and outputs, front panel controls, and user interface.

- The familiar front-panel oscilloscope interface with knobs and keys is optimized for common tasks and basic measurements.
- The Infiniium oscilloscope application's user interface with menus, windows, dialog boxes, and toolbars provides easy logical access to dozens of configuration and analysis tools, making it easy for you to set up and make complex measurements.
- You have the option of using either the front panel controls or the user interface for many common tasks.

## Front Panel Inputs and Outputs

On the Infiniium S-Series oscilloscopes, the channel inputs, digital channels connector, probe compensation terminal, and ground plug appear on the lower part of the front panel. Two USB 2.0 host ports are also located here.

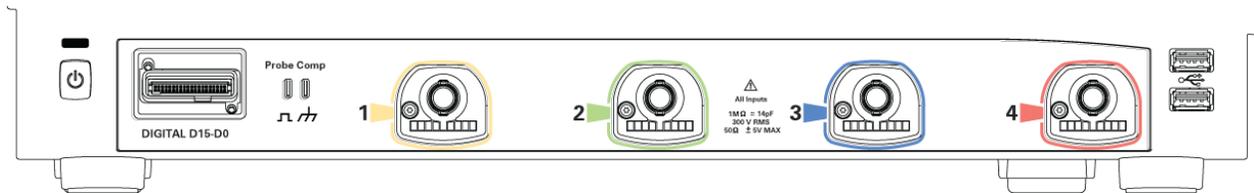


Figure 7 Infiniium S-Series Oscilloscope Front Panel I/O

### Channel inputs

Your Infiniium oscilloscope comes with four 10:1 500 MHz passive probes.

The AutoProbe interface works with the InfiniiMax III probing system. See [“Connecting Oscilloscope Probes”](#) on page 17.

For the latest information about probes for your Infiniium oscilloscope, install the Probe Resource Center. Instructions for downloading are in the online Help described in [Chapter 3](#), “Online Help and Other Information”.

### Digital channels connector

MSO models include a 17-channel flying lead set logic probe, an MSO cable, and a calibration fixture.

### Probe compensation terminal

This terminal has a square wave signal that is used to adjust compensated passive probes.

You can also output a DC level on this terminal using the Infiniium oscilloscope application's Calibration Output dialog box ([Utilities > Calibration Output...](#)).

### Ground

The ground plug is convenient for ESD wrist straps.

## Side Panel Inputs and Outputs

The Infiniium S-Series oscilloscope's right side panel has the motherboard I/O connectors, reference clock synchronization connectors, and BNC connectors.

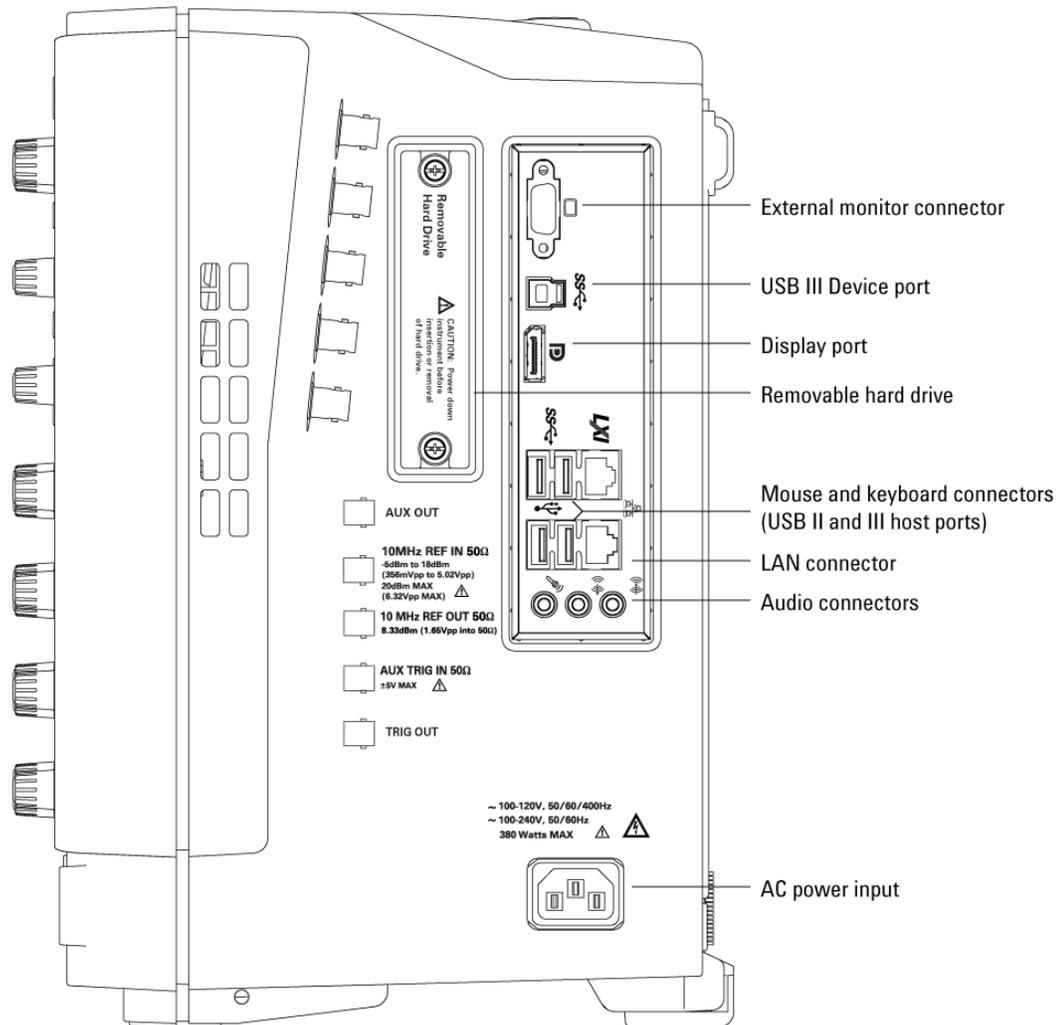


Figure 8 Infiniium S-Series Oscilloscope Side Panel I/O

### Motherboard I/O

The motherboard provides these inputs/outputs/ports in the oscilloscope: four USB ports for peripherals, an external monitor connector, a USB III device port (for remote control of the oscilloscope from a PC), a LAN port, and speaker and microphone connectors.

## Aux Out

This output signal is selected by the Infiniium oscilloscope application's Calibration Output dialog box. It can be a DC level, the probe compensation signal (a square wave used to adjust compensated passive probes), the trigger out signal, or a demo signal.

## 10 MHz In, 10 MHz Out

The 10 MHz In BNC connector is used to synchronize the oscilloscope's horizontal timebase system to a reference clock that you provide. The clock that you provide must meet the following specifications:

- Amplitude: 800 mV peak to 1.26 V peak
- Frequency: 10 MHz  $\pm$ 5 ppm high-quality sine wave or square wave

To use an external reference clock, connect the external clock to the 10 MHz In BNC connector; then, in the Infiniium oscilloscope application's Horizontal dialog box (**Setup > Horizontal...**), enable the External 10 MHz Reference Clock.

You can use the 10 MHz Out BNC connector to send the oscilloscope's 10 MHz reference clock output signal to another instrument's reference clock input.

## Trig Out

Pulses corresponding to oscilloscope triggers can be sent to this BNC output.

## Aux Trig

You can set up the oscilloscope to trigger on the auxiliary trigger signal connected to this BNC input.

## Front Panel Controls (Keys and Knobs) Overview

The Infiniium S-Series oscilloscope front panel gives you direct access to the functions needed to perform the most common measurements, using a traditional oscilloscope interface. Knobs and keys let you directly set vertical and horizontal parameters. The front panel also has a set of LED indicators; by using these and the display, you see the oscilloscope's configuration at a glance.

The oscilloscope uses color consistently throughout the front panel and user interface. For example, the color of the knob for channel 1 is the same color as the waveform for channel 1. All the configuration items and values related to channel 1 are displayed in the same color.

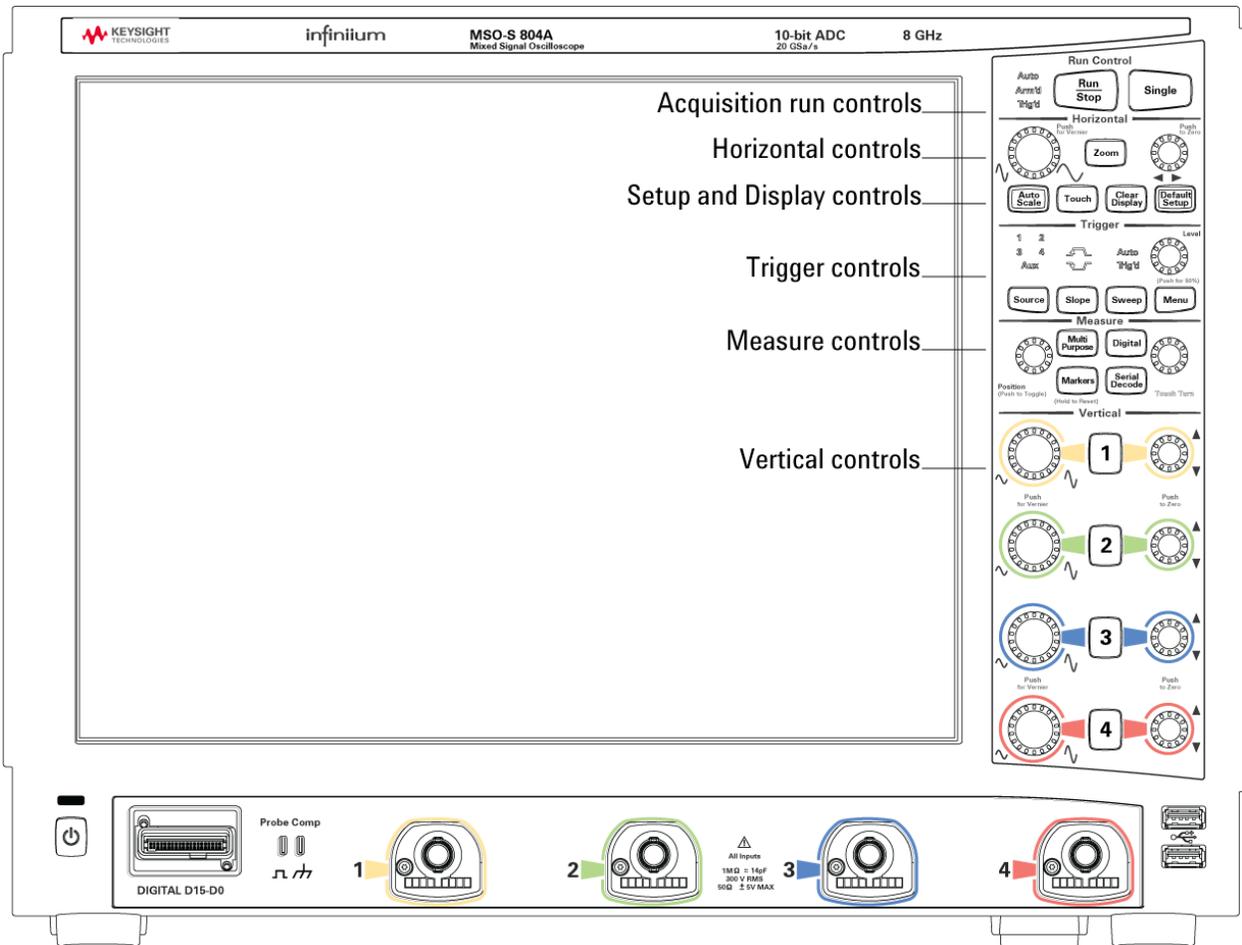


Figure 9 Infiniium S-Series Oscilloscope Front Panel

## User Interface Overview

With the user interface for the Infiniium oscilloscope, you can access all the configuration and measurement features of the oscilloscope through an easy-to-use system of windows, menus, toolbars, dialog boxes, icons, wizards, and buttons.

The user interface is arranged so the most common functions affecting the waveform display are located around the edge of the waveform display area.

Context-sensitive menus are available when you right-click something in the waveform display area, such as the grid, a signal, a bookmark, or a measurement. You can mouse over or touch other areas, such as the drag & drop measurements area and horizontal and acquisition control regions, to find more information about those areas or to enter data.

The following figures call out the areas and controls of the user interface.

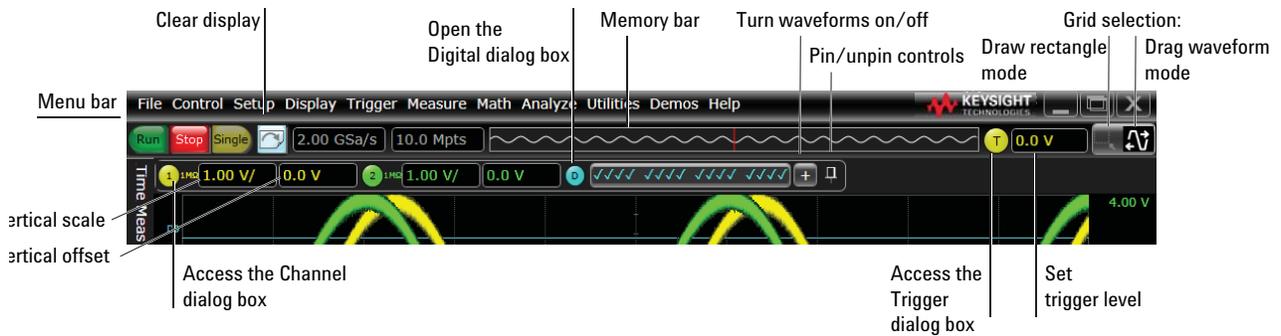


Figure 10 Infiniium Oscilloscope Top of Display

The selected grid mode in the upper right corner determines whether you draw a selection box or manipulate waveforms when you touch the screen.

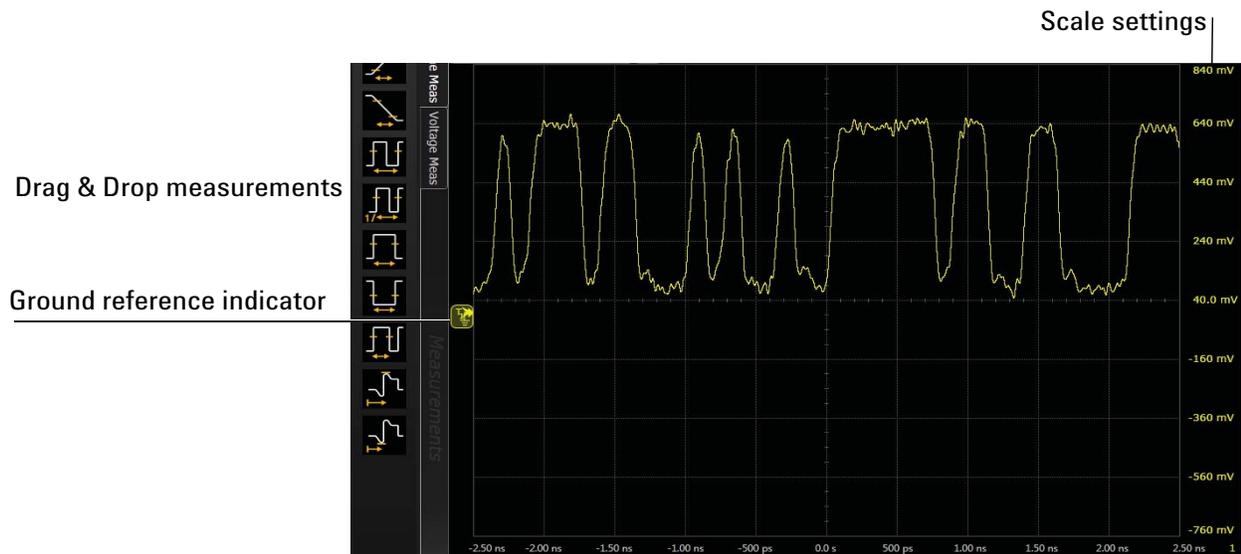


Figure 11 Infiniium Oscilloscope Waveform Display Area

The waveform display area shows up to eight waveforms areas. Several display options are available, such as a grid, or horizontal and vertical scales.

#### NOTE

#### Avoid Overdriving Vertical Input Amplifiers

When zooming on a waveform with the oscilloscope running, be careful to keep the signal within the screen vertically to avoid overdriving the vertical input amplifiers. Overdriving causes waveform distortion and erroneous measurement results.

Ground reference indicators appear for each displayed channel, waveform memory, or math function. The symbol represents the ground reference point for each waveform; it moves when you change the vertical offset. You can also drag this symbol up and down to change the vertical offset for that waveform.

## 2 Using the Oscilloscope

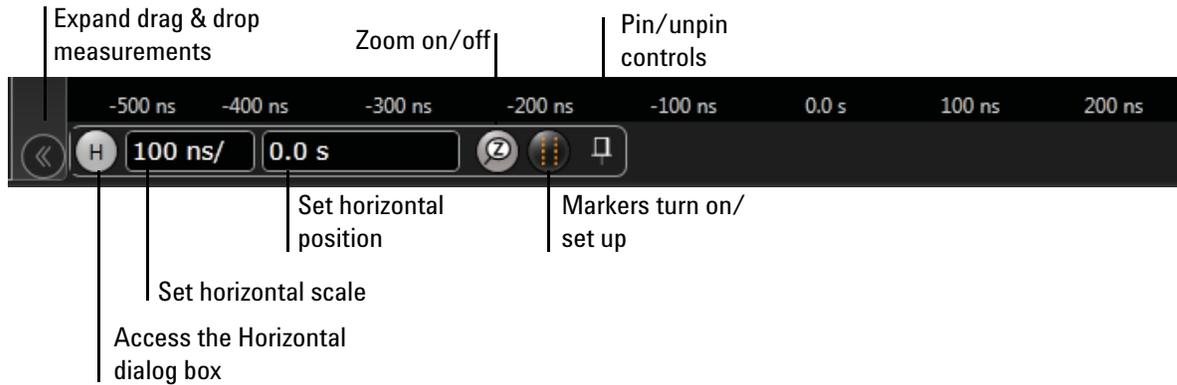


Figure 12 Infiniium Oscilloscope Bottom of Display

A Results pane is visible at the very bottom of the display when you do anything that requires it, such as taking a measurement. When it is not needed, the Results pane is not visible.

The Results pane displays a table of measurement data. The table has columns for Measurement, Current, Mean, Min, Max, Range (Max-Min), Std Dev, and Count. The first row shows '+ Width(1)' with 'Edge?' values for Current, Mean, Min, Max, Range, and Std Dev, and a count of '-----'. The second row shows 'V p-p(f2)' with '0.0 V' values for Current, Mean, Min, Max, Range, and Std Dev, and a count of '93'.

Measurement	Current	Mean	Min	Max	Range (Max-Min)	Std Dev	Count
+ Width(1)	Edge?	Edge?	Edge?	Edge?	Edge?	Edge?	-----
V p-p(f2)	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	0.0 V	93

Figure 13 Results Pane

### Menu overview

You can use menus to perform defined operations, set up measurement parameters, and access every function the oscilloscope provides.

Take a few minutes to look through the menus to get an overview of the many features and capabilities of your Infiniium oscilloscope.

The sub-menu selections will vary slightly, depending on which licenses are installed.



Figure 14 Menu bar

## Using the Setup and Display Controls

You can set the oscilloscope to a known starting condition and set the display to suit your preferences.

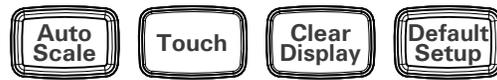


Figure 15 Setup and Display Control Keys

- To automatically configure the oscilloscope for the current input signal(s), press the **[Auto Scale]** key or click **Control > Autoscale** from the menu bar.
- To enable or disable the touch screen, press the **[Touch]** key. Or, click **Utilities > User Preferences...** to open the User Preferences dialog box, and click the Enable Touch Screen check box.
- To clear the waveform display, press the **[Clear Display]** key or click the Clear Display button .

The oscilloscope clears acquired waveform data from the display in preparation for another acquisition. If the oscilloscope is in Run mode and is receiving triggers, it will update the display as it collects new waveform data.

Clearing the waveform display also resets measurements, averaging, infinite persistence, color grade persistence, histograms, and the mask testing database.

- To reset the oscilloscope to its default setup, press the **[Default Setup]** key or click **Control > Default Setup**.

You can click **Control > Undo Default Setup** to return the oscilloscope to its original configuration.

### NOTE

#### Save the Current Oscilloscope Configuration

Before using the default setup, you may want to save the current oscilloscope configuration for later use. See the online help (described in chapter 3) for instructions on saving and recalling setups, and for information on the exact configuration that is set when you use the default setup.

## Starting and Stopping Waveform Acquisitions

Use the acquisition run controls to run and stop acquisitions or make a single acquisition. The boxed area of the memory bar above the waveform display area shows how much of acquisition memory is displayed on the screen.



Figure 16 Front Panel Acquisition Run Control Keys



Figure 17 User Interface Acquisition Run Control Buttons

The **[Run/Stop]** key is lit green and the green Run button is highlighted when the oscilloscope is running (acquiring data). The **[Run/Stop]** key is red and the Stop button is highlighted when the acquisition is stopped.

- To start waveform acquisition, press the **[Run/Stop]** key or click the Run button.

The oscilloscope begins acquiring data. When it receives a trigger signal, it finishes acquiring data, updates the display, and then starts another acquisition cycle if it is in Trig'd or Auto trigger mode.

- To stop waveform acquisition, press the **[Run/Stop]** key or click the Stop button.

The oscilloscope stops acquiring data. Whatever data was last acquired remains on the screen.

- To make a single acquisition, press the **[Single]** key or click the Single button.
- You can also click the Run, Run Single, and Stop commands from the Control menu.
- To set up how you want the signals to be sampled, such as sampling rate and mode, click **Setup > Acquisition...**

## Adjusting the Horizontal Time Scale and Trigger Position

Use the horizontal controls to configure the oscilloscope's horizontal scale (time per division) and horizontal position of the waveform. You can view a magnified section of the waveform using the zoom window.

Use the horizontal scale and position knobs, the horizontal controls, or the Horizontal dialog box to adjust the horizontal scale and position.

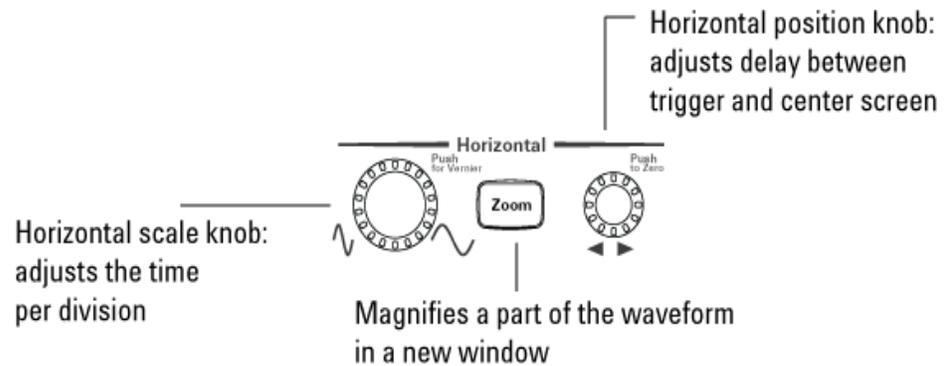


Figure 18 Horizontal Scale and Position Knobs, **[Zoom]** key

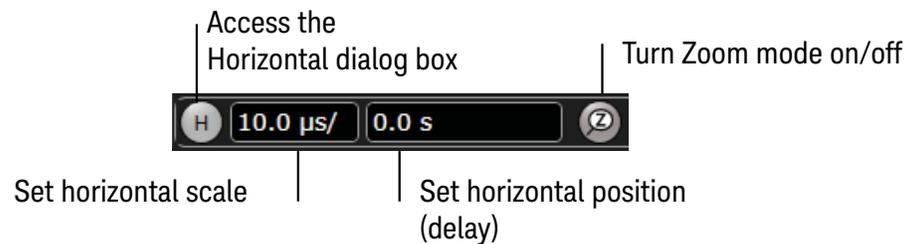


Figure 19 User Interface Horizontal Controls

### Adjusting the horizontal scale

The horizontal scale knob is the larger of the two horizontal control knobs.

- To stretch the waveform horizontally, turn the horizontal scale knob clockwise. To shrink it horizontally, turn the knob counter-clockwise.

Stretching the waveform means fewer seconds are displayed per division. Shrinking it means more seconds are displayed per division.

- Push and turn the horizontal scale knob to change the scaling in finer (Vernier) increments.
- Use the multi-touch gesture capability to stretch or shrink the waveform.

- You can also use the controls in the horizontal toolbar to adjust the horizontal scale. Mouse over or touch the horizontal scale field and use the resulting controls to set a particular horizontal scale. You can click the **Scale** field to enter an exact value, or click the “narrower” or “wider” buttons.

### Adjusting the horizontal trigger position (delay)

The horizontal position knob is the smaller of the two horizontal control knobs.

- To move the waveform to the right, turn the horizontal position knob clockwise. To move it to the left, turn the knob counter-clockwise.

Moving the waveform to the right shows more of the pre-trigger data (data acquired before the trigger event). Moving the waveform to the left shows more of the post-trigger data.

When you click and drag the desired waveform, the horizontal position will change for all channels and functions on the display. Waveform memories will also move if you check the Tie to Timebase box in the Waveform Memories dialog box.

- You can also use the controls in the horizontal toolbar to adjust the horizontal position. Mouse over the horizontal position field and use the resulting controls to set a particular horizontal position (time relative to the trigger at the highlighted horizontal reference point).

### Magnifying a part of the waveform using Zoom

- To turn on zoom, press the  key or click the Zoom button.

The waveform display area splits into two regions. The top one is the main timebase. The bottom is the zoomed timebase, which represents an expansion of the acquired waveform data. A section of the waveform in the main timebase window is highlighted to indicate the part shown in the zoomed timebase window.

The horizontal scale and horizontal position controls now change how the waveform is shown in the zoomed timebase window. The horizontal scale will change the amount of magnification, while the position will change the part of the waveform in the main window that is shown in the zoomed window.

- Press the  key or click the Zoom button again to turn off Zoom.

### Setting the scale, position, and timebase reference

You can use the Horizontal dialog box to set scale, position, and timebase reference. You can also set up the zoomed timebase window.

- To access the Horizontal dialog box, click the  in the horizontal toolbar, or click **Setup > Horizontal...** from the menu bar.

- The Timebase Reference control is a slider from 0 to 100% of the screen. The center of the screen is at 50%. The slider correlates to the solid orange triangle at the bottom of the display area, showing you where the horizontal offset is on the screen.

## Adjusting the Vertical Settings

Use the vertical controls to set the vertical scaling (volts per division) and vertical offset for each analog channel. You can also turn the display on or off for a particular channel.

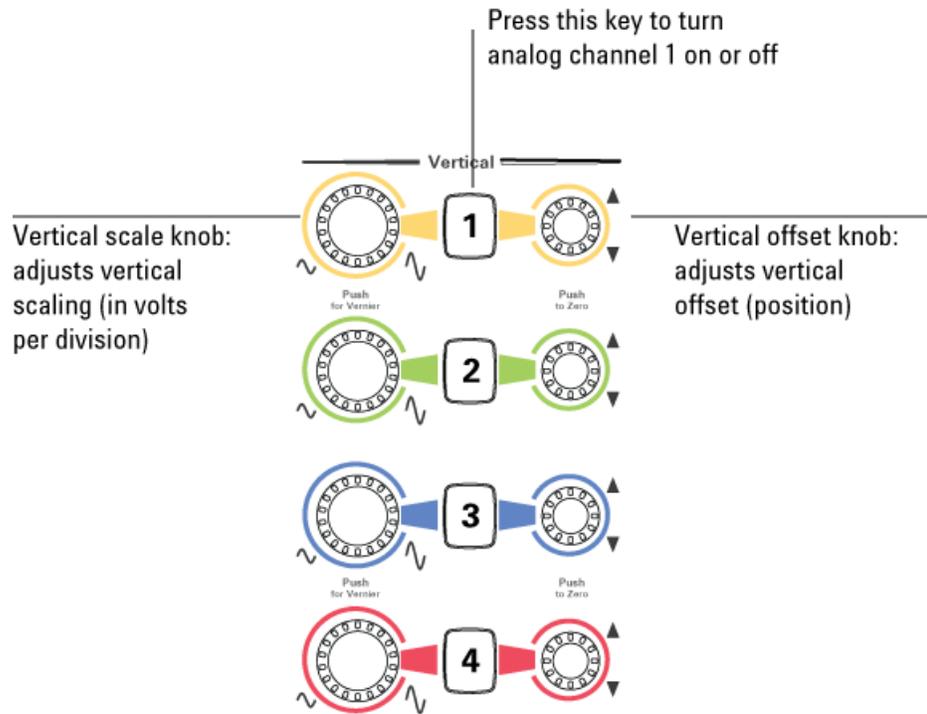


Figure 20 Channel Keys and Vertical Scale and Offset Knobs

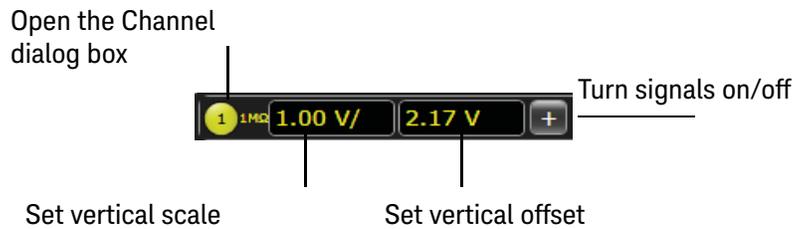


Figure 21 User Interface Vertical Controls

### Turning an analog channel on or off

- To turn an analog channel on or off, press the channel number key on the front panel or click the Add Waveforms button . When you turn off a channel, the current vertical scale and offset fields for that channel disappear.

If you are not using a particular analog channel, you can turn it off to simplify the waveform display and increase the display update rate. Functions continue to run on a channel source that is turned off. Data acquisition continues for a channel if a function requires it.

**NOTE****Using an Analog Channel as Trigger**

Any analog channel can be used as a trigger source. If you need a trigger but do not need all analog channels, you can use an analog channel as a trigger without displaying it by turning the analog channel display off.

**Adjusting the analog channel's vertical scale and offset**

You can use the vertical scale and offset knobs, the vertical user interface controls, or the Channel dialog box to adjust the vertical scale and offset.

The vertical scale knob is the larger of the two knobs for a channel. It is marked with a set of sine wave symbols.

- To make the waveform bigger (fewer volts per division), turn the vertical scale knob clockwise. To make it smaller (more volts per division), turn the knob counter-clockwise.

Decreasing the vertical scale makes the waveform bigger, and increasing it makes the waveform smaller.

- You can also mouse over or touch the vertical scaling field and use the resulting controls to set an exact value for the scaling.

The vertical offset knob is the smaller of the two knobs for a channel. It is marked with a set of arrows.

- To move the waveform toward the top of the display, turn the vertical offset knob clockwise. To move it toward the bottom of the display, turn the knob counter-clockwise.
- You can click and drag the waveform or its ground reference indicator to the desired vertical offset if the grid is in drag mode .
- Click **Setup > Channel N...** or click a channel number to open the Channel dialog box, in which you can set the vertical scale, offset, skew, and labels. You can also specify the characteristics of a probe, or perform a probe calibration.

For Keysight Technologies probes that are compatible with AutoProbe II interfaces, the oscilloscope will automatically set these characteristics (except for skew) after identifying the probe when it is connected to the channel input.

## Setting Up Triggers

Use the trigger controls to set the conditions on which the oscilloscope will trigger and acquire an input signal. You can set up a variety of trigger conditions. Edge triggers and the parameters for edge triggering can be set up from the front panel.

Trigger configuration settings you make using the user interface are reflected in the front panel status indicators, and will remain set unless you change them or press the **[Default Setup]** key.

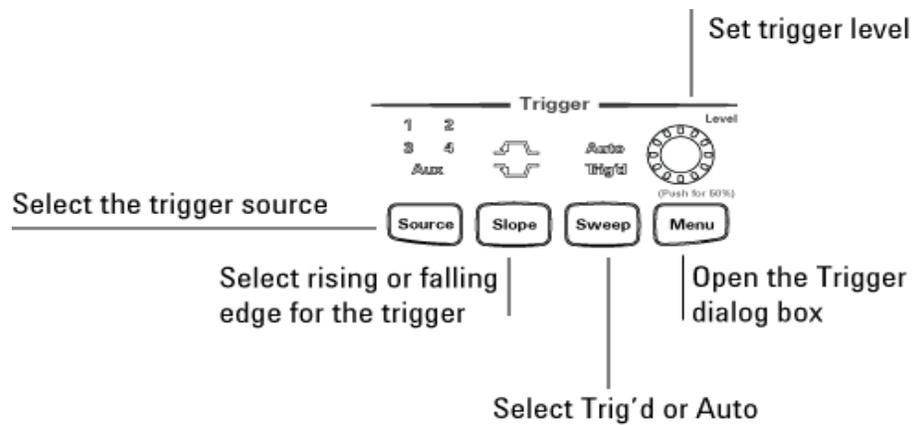


Figure 22 Front Panel Trigger Controls and Indicators

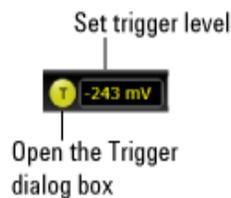


Figure 23 User Interface Trigger Controls

### Setting the oscilloscope to trigger on an edge

- 1 Press the **[Source]** key until the desired source LED is lit.

You can choose any of the channels or the **Aux Trig** or **Line** input as the source for an edge trigger.

- 2 Press the **[Slope]** key until the desired slope LED is lit.

You can have an edge trigger on a rising or falling edge, or both.

- 3 Press the **[Sweep]** key until the desired LED is lit (Trig'd or Auto).

When Trig'd is selected, the oscilloscope must find the trigger before capturing and displaying data.

When Auto is selected, if a trigger does not occur within a certain amount of time, an acquisition is automatically saved and displayed. In Auto trigger mode, you are able to see your signals while setting up the desired trigger.

- 4 Turn the Level knob to adjust the voltage level at which the oscilloscope will trigger.

Use the Trigger dialog box to select any of the different modes of triggering, the parameters and conditions for each trigger mode, and advanced configuration items.

You can also mouse over the Trigger Level field and use the resulting controls to set a particular trigger level when the scope is set for edge trigger on a particular channel. You can also drag the trigger reference indicator at the left side of the display.

## Using Markers and Making a Measurement

With the measurement controls you can display and adjust markers, define a key to perform automatic measurements or other quick actions, and make measurements.

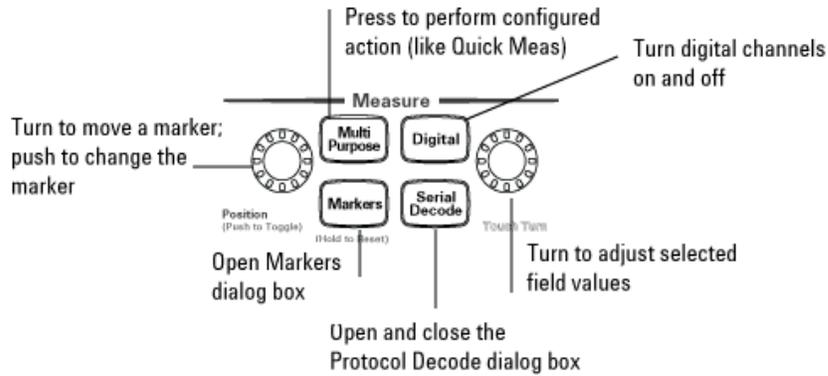


Figure 24 Front Panel Measure Controls

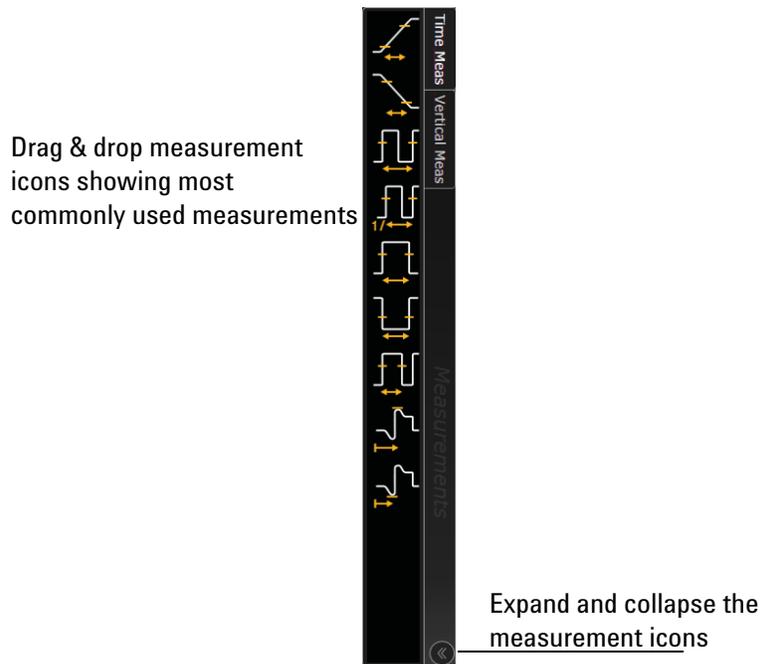


Figure 25 Drag & Drop Measurement Toolbar

## Making a measurement on a waveform

Click and drag a measurement icon to the waveform event you want to measure, or click a measurement icon and specify which source you want to measure in the dialog box that appears.

For measurements on waveform features, such as those that involve waveform edges, if you click the measurement icon and specify a source, the measurement defaults to using the feature closest to the horizontal reference point. When you make the measurement using drag-and-drop, the measurement uses the waveform feature closest to the point where you drop the icon.

The most commonly used measurements are available in the drag and drop area. Others are available from the Add Measurement dialog box.

When you drag and drop a measurement icon on a waveform, the icon outline changes color to match the color of each waveform it touches so you can easily see which waveform will be measured.

For edge-sensitive measurements, when you drop the measurement icon on a waveform, a circled number appears in the waveform marker color. This number shows exactly where the measurement is being made. It is displayed next to the measurement readout in the Results area.

This feature helps you distinguish measurement results from each other when you make multiple measurements on the same waveform, but at different waveform features.

## Using quick measurements

- You can define the **[Multi Purpose]** key to perform one of these quick actions:
  - QuickMeas—performs automatic measurements
  - QuickPrint—prints the screen image to the default printer
  - QuickScreen—saves the screen image to a file
  - QuickSetup—loads a setup file
  - QuickWaveform—saves waveform data to a file
  - QuickEmail—sends an email of the current screen image
  - QuickExecute—runs an executable file
  - QuickControl—cycles through the possible front panel control sources

The action taken when the **[Multi Purpose]** key is pressed depends on the feature selected in the Customize Multipurpose dialog box (**Utilities > Customize Multipurpose...**). The default feature is QuickMeas.

- To turn on the quick measurement display, press the **[Multi Purpose]** key.

The 10 preset measurements defined in the Quick Measurement configuration are enabled and results are displayed on the screen for the first waveform source.

- To measure parameters for another waveform, press the **[Multi Purpose]** key until that waveform is the one shown in the measurement readout.

Continuing to press the **[Multi Purpose]** key cycles through each of the waveforms available.

- To turn off the quick measurement display, press and release the **[Multi Purpose]** key until the measurements are turned off.

See the Infiniium oscilloscope application's online help for information on how to configure the quick measurement capability.

## Using markers

Markers make it easier to make precise measurements because the marker measurement readouts show exact voltage and time positions for the markers. The measurements are based on actual waveform data from the acquisition system, not on approximations based on the display position, so you can be sure the values are highly accurate.

Using the marker and measurement controls, you control two sets of markers within the oscilloscope grid.

Both time and voltage differences between the markers are updated continuously on the screen. By default, the markers track the source waveform. Voltage measurements from the markers are the value of the waveform at the time set with the marker arrow keys.

- To select the type of marker mode you want to use, press the **[Markers]** key.
- To turn on Marker 1 (X1), push the Position knob. Turn the knob to move the marker. Push the knob again to select Marker 1 (Y1).

Marker 1 (X1 and Y1) has a solid line pattern on the waveform display. It is associated with the first available source on the display.

- To turn on Marker 2 (X2), push the Position knob again.

Marker 2 has a dashed line pattern on the waveform display. It is associated with the first available source on the display.

- In Track Measurements mode, the marker position cannot be changed.

## Moving markers using the user interface

- 1 Turn on the markers by clicking **Measure > Markers...** and selecting a mode. You can also click the Markers button  to either turn on markers or bring up the Markers dialog box.
- 2 Drag one of the markers to the position you want on the waveform.

Dragging a marker makes it easy to quickly move the marker to the desired waveform event. You can use the front-panel Position knob for fine adjustment, or click **Measure > Markers...** and set the marker position precisely.

## Controlling digital channels

If your oscilloscope is an MSO model, click **Setup > Digital Channels...** to open the Digital dialog box so you can set up controls for the digital channels.

## Turning digital channels on or off

To turn the digital channels on, click the Add Waveforms button  and select the check box next to the , or press the **[Digital]** key.

## Decoding serial data

- To open the Protocol Decode dialog box so you can define parameters for selected decodes, click **Setup > Protocol Decode...** or press **[Serial Decode]**.

You can perform up to four decodes at the same time using p1-p4.

- After selecting the protocol decode parameters, click **Auto Setup** to automatically configure the oscilloscope for the selected decode type.
- You can view decoded acquisition data in the Digital Listing Window that appears.

## Saving and Printing Data

- Click **File > Save >** to save your composite, setup, waveform, screen image, or measurement data.
- Click **File > Copy Screen Image** to easily copy and paste a screen image into a document.
- Click **File > Print...** to print waveform and setup data to a specified file.
- You can customize the **[Multi Purpose]** key to perform a QuickPrint.

## Forcing a Default Setup

If your Infiniium oscilloscope is not working properly when you start it up, follow these steps to perform a default setup and return the Infiniium to normal operation.

- 1 Click **Control > Default Setup** or press the **[Default Setup]** key.
- 2 If the oscilloscope is still not working properly, click **Control > Factory Default** to return the oscilloscope to the default settings it had when it left the factory.
- 3 If the oscilloscope is still not working properly, turn it off.
- 4 Turn the oscilloscope back on. If it does not successfully restart, try recycling the power again.
- 5 As soon as the Windows 7 load screen disappears, press **[Default Setup]**. If the oscilloscope still does not successfully restart, follow the instructions for recovering the hard drive.

### Infiniium hard drive recovery

Follow these steps to recover your Infiniium hard drive.

- 1 Turn off the oscilloscope.
- 2 Connect the keyboard to the keyboard connector on the rear panel of the oscilloscope.
- 3 Connect the mouse to the mouse connector on the rear panel of the oscilloscope.
- 4 Turn on the oscilloscope.
- 5 As soon as you see the message press F2 to boot the Infiniium Recovery System, press **[F2]** and follow the on-screen instructions.
- 6 Once the recovery process is finished and the oscilloscope is running, check in the About Infiniium dialog box under installed options to see if all of the options you ordered are installed. If the options are not installed, please install them using the license keys provided on the oscilloscope option license certificates you received, or refer to the rear panel of the oscilloscope.

## 2 Using the Oscilloscope

## 3 Online Help and Other Information

Accessing the Online Help **49**

Navigating the Online Help **51**

Using the Demo Wizard **51**

Most of the information about using the Infiniium oscilloscope effectively is included in the online help.

The online help is accessible from the menu bar and by clicking the question mark in the top right corner of dialog boxes.

### Accessing the Online Help

- Click **Help > Contents...**

The Using the Oscilloscope topic appears on the home page. It looks like the following figure.

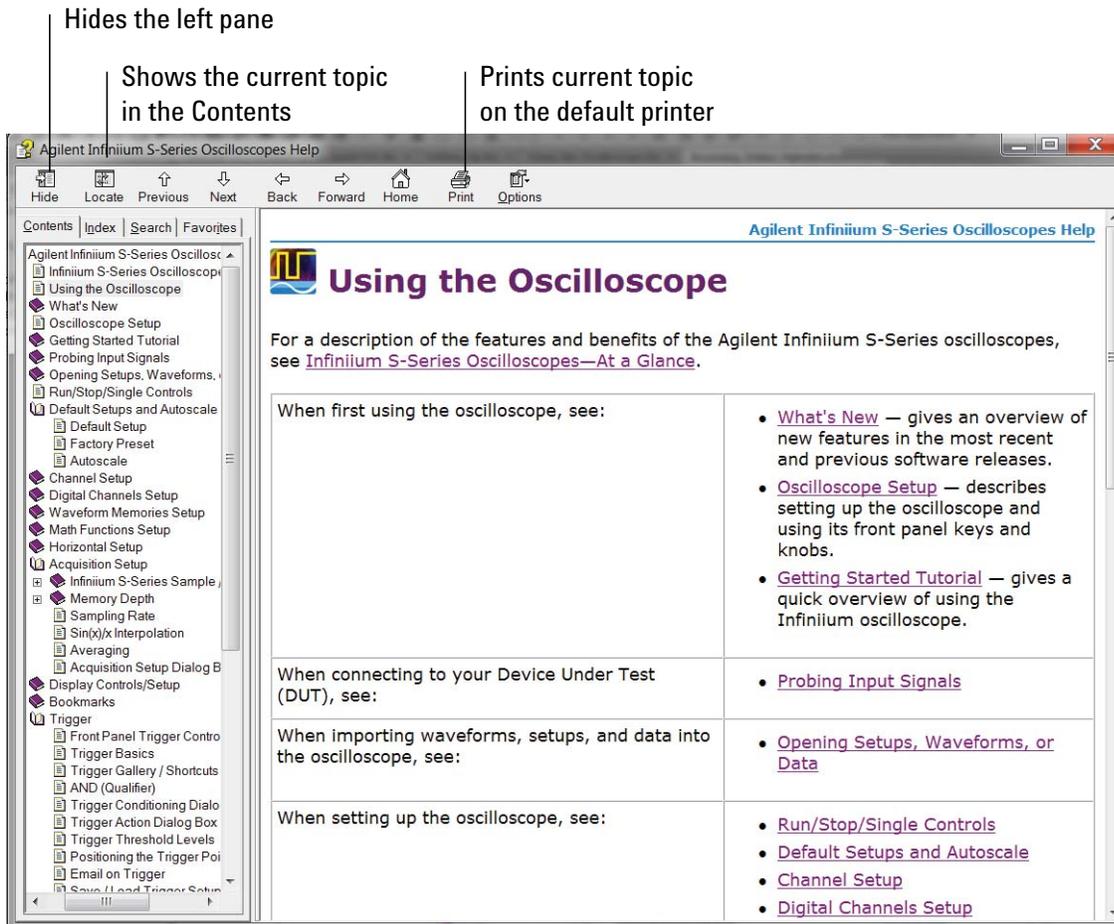


Figure 26 Online Help Home Page

- For information about items in a dialog box, click the Help button in that dialog box.

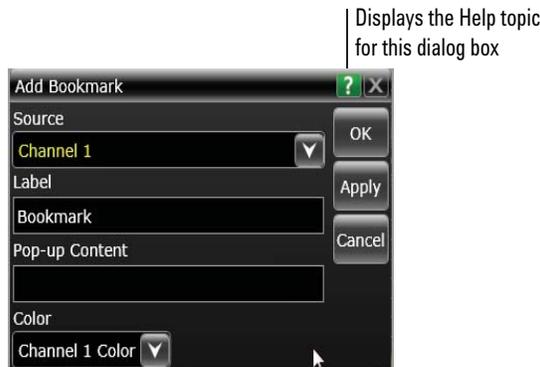


Figure 27 Help Button for Dialog Box Help

## Navigating the Online Help

The online help provides several ways to find the information you need.

Use the Contents tab to browse topics in the help system by clicking topics in the left pane.

Use the Index tab to type in a keyword and search the index for that keyword or scroll through the list to find a topic.

Use the Search tab to type in a keyword and if that word exists in the online help, a list of topics containing the keyword appears.

Use the Favorites tab to add preferred help topics to a list for easy reference.

## Using the Demo Wizard

Your S-Series oscilloscope comes with a built-in demo wizard that showcases many of the oscilloscope's capabilities. To see the demos, click **Help > Show Demo Wizard...** You can then select a specific demo, such as a particular protocol or a UI demo showing bookmarks.

For example, the following screen display shows the initial demo page for the FFT function. To experiment with the demo, click **Load Demo...**

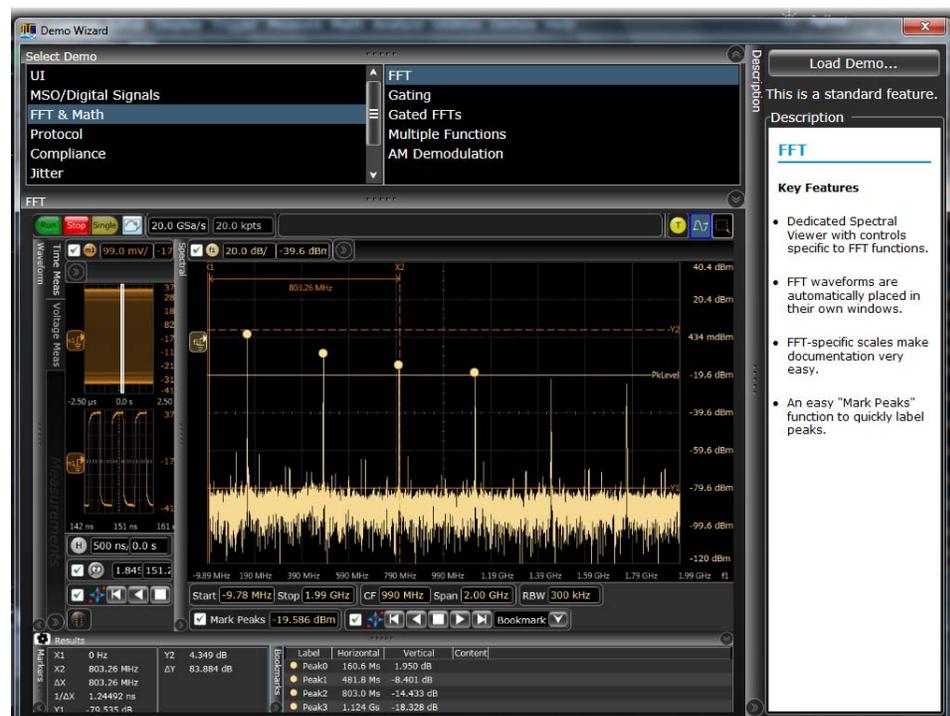


Figure 28 FFT Demo

### 3 Online Help and Other Information

## 4 Working in Comfort

**About Repetitive Strain Injury** 54

**Mice and Other Input Devices** 55

To optimize your comfort and productivity, it is important that you set up your work area correctly and use your Infiniium oscilloscope properly. With that in mind, we have developed some setup and use recommendations for you to follow based on established ergonomic principles.

Improper and prolonged use of keyboards and input devices are among those tasks that have been associated with repetitive strain injury (RSI) to soft tissues in the hands and arms. If you experience discomfort or pain while using the oscilloscope, discontinue use immediately and consult your physician as soon as possible. For more information on RSI, read the “About Repetitive Strain Injury” section, next.

Please study the recommendations offered here in this chapter. Included are references to relevant parts of international standards, regulations, and guidelines, such as ISO 9241 and the European Community Display Screen Equipment directive. You may also consult your employer's human resources department or other relevant departments for guidance specific to your company.

## About Repetitive Strain Injury

Because your comfort and safety are our primary concern, we strongly recommend that you use the Infiniium oscilloscope in accordance with established ergonomic principles and recommendations. Scientific literature suggests that there may be a relationship between injury to soft tissues—especially in the hands and arms—and prolonged improper use of keyboards or other equipment requiring repeated motions of the hands and forearms. This literature also suggests that many other risk factors may increase the chance of such injury, commonly called Repetitive Strain Injury.

### What is RSI?

Repetitive Strain Injury (RSI—also known as cumulative trauma disorder or repetitive motion injury) is a type of injury where soft tissues in the body, such as muscles, nerves, or tendons, become irritated or inflamed. RSI has been a reported problem for those who perform repetitive tasks such as assembly line work, meatpacking, sewing, playing musical instruments, and computer work. RSI also has been observed in those who frequently engage in activities such as carpentry, knitting, housework, gardening, tennis, windsurfing, and lifting children.

### What causes RSI?

The specific causes of RSI have not been established. Nevertheless, the incidence of RSI has been associated with a variety of risk factors, including:

- Too many uninterrupted repetitions of an activity or motion
- Performing an activity in an awkward or unnatural posture
- Maintaining static posture for prolonged periods
- Failing to take frequent short breaks
- Other environmental and psychosocial factors

In addition, there have been reports associating the occurrence of RSI with the use of keyboards, mice, and other input devices. Also, certain medical conditions, such as rheumatoid arthritis, obesity, and diabetes, may predispose some people to this type of injury.

### What if I experience discomfort?

If you are experiencing any discomfort, seek professional medical advice immediately. Typically, the earlier a problem is diagnosed and treated, the easier it is to resolve.

## Mice and Other Input Devices

Various aspects of using mice and other input devices may increase your risk of discomfort or injury. Observing the following recommendations may reduce that risk.

- Try to keep your hand, wrist, and forearm in a neutral position while using your mouse or other input device.
- If you use your thumb to rotate the ball on a trackball or spaceball, keep it in a relaxed, natural shape, and maintain a neutral posture in your hand, wrist, and forearm.
- Hold the mouse gently by draping your fingers over it. Keep your hand relaxed and fingers loose. Do not grip the mouse tightly.
- It takes very little pressure or force from your fingers to activate the buttons or scroll wheel on your mouse, scrolling mouse, trackball, or other input device. Using too much force can place unnecessary stress on the tendons and muscles in your hands, wrists, and forearms.
- If you are using a scrolling mouse, be sure to keep your fingers and hand in a relaxed, neutral position when activating the scroll wheel. Also, this type of mouse features software that can minimize the number of mouse movements or button clicks.
- When using a mouse, trackball, or other input device, position it as close to the keyboard as possible, and keep it at the same level so you do not have to stretch while using it.
- Be sure to keep your mouse and trackball clean. Regular removal of accumulated dust and dirt helps ensure proper tracking and reduces unnecessary hand and wrist motions.



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