

Keysight Infiniium 9000 Series Oscilloscopes

Notices

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CAUTION

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WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

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

Infiniium 9000 Series Oscilloscopes—At a Glance

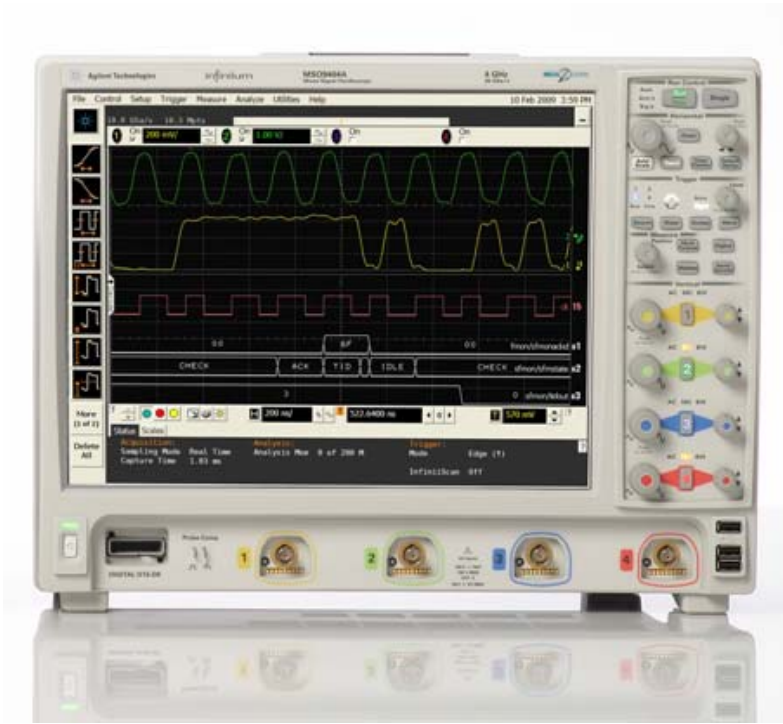


Table 1 9000 Series oscilloscope models

| Model | Analog bandwidth | Standard memory depth (2/4-channel mode) |
|--------------|------------------|--|
| DSO/MS09064A | 600 MHz | 40 Mpts/20 Mpts |
| DSO/MS09104A | 1 GHz | 40 Mpts/20 Mpts |
| DSO/MS09254A | 2.5 GHz | 40 Mpts/20 Mpts |
| DSO/MS09404A | 4 GHz | 40 Mpts/20 Mpts |
| DS09024H | 250 MHz | 100 Mpts/50 Mpts |
| DS09054H | 500 MHz | 100 Mpts/50 Mpts |
| DS09104H | 1 GHz | 100 Mpts/50 Mpts |
| DS09204H | 2 GHz | 100 Mpts/50 Mpts |

DS09024H, DS09054H, DS09104H, and DS09204H models have up to 12 bits of high resolution.

Ease of use with high performance

- The Keysight Technologies Infiniium 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.
- Graphical 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 250 MHz to 4 GHz.

Display shows waveforms and graphical user interface

- Graphical interface allows direct interaction with waveforms, including drag-and-drop positioning and instant waveform zoom.
- Touchscreen display allows oscilloscope operation without an external pointing device.
- Waveforms displayed in color, making correlations easy.
- Current configuration parameters displayed near the waveform display and are color-coded to make identification easy.
- Graphical interface menus and toolbars simplify complex measurement setups.

Horizontal controls set sweep speed and position

- Main sweep speeds from 5 ps/div to 20 s/div.
- Intensified waveforms on main sweep window make it easy to see what will appear in the zoom window.

Acquisition and general controls start and stop the scope and do basic setup

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

Hard disk drive and USB 2.0 port 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.
- Hard disk stores oscilloscope operating system.

Trigger setup controls set mode and basic parameters

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

- Use graphical user interface to simplify configuration of pattern, state, delay, and violation trigger modes.

Vertical controls set attenuation and position

- Input attenuation adjustable from 1 mV/div to 1 V/div.
- 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 Δ -time at any point on the displayed waveform.

For more information about Infiniium oscilloscopes, see www.keysight.com/find/scope.

In This Guide

This guide provides the information you need to begin using the Infiniium 9000 Series oscilloscope.

Chapter 1, “Setting Up the Oscilloscope,” starting on page 9 includes power and air flow requirements, plus other setup information.

Chapter 2, “Using the Oscilloscope,” starting on page 27 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 47 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.

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 *Keysight Infiniium Oscilloscopes Programmer’s Guide* 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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1 Setting Up the Oscilloscope

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

Safety

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Safety Compliance

This product complies with the current editions of the following standards:

- CAN/CSA-C22.2 No. 61010-1-12
- UL Std. No. 61010-1 (3rd edition)

Acoustic Statement

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermverordnung -3.GSGV Deutschland).

LpA < 70 dB

Operator position

Normal position per ISO 7779

General Safety Notices

WARNING

This is a Safety Protection Class I Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING








If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

WARNING

No operator-serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

Symbols

These symbols are used on the Infiniium oscilloscope.

| Symbol | Description |
|--|--|
|  N10149 | The C-Tick mark is a registered trademark of the Australian Spectrum Management Agency. |
|  | The CE mark is a registered trademark of the European Community. |
|  | ICES / NMB-001 Cet appareil ISM est conforme a la norme NMB du Canada. This is a marking to indicate product compliance with the Industry Canadian Interference-Causing Equipment Standard (ICES-001). This is also a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4). |
|  | This symbol indicates separate collection for electrical and electronic equipment mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive 2002/96/EC). |
|  | Indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product. |
|  | The symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001. To return unwanted products, contact your local Keysight office. |
|  | The CSA mark is a registered trademark of the CSA International. |

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
 - Localized power cord
 - Keyboard
 - Mouse
 - Touch screen stylus
 - Accessory pouch (mounts on rear of oscilloscope)
 - Front panel cover
 - N2873A 10:1 divider passive probe per scope channel
 - Channel flying lead set logic probe, MSO cable, and calibration fixture (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 9000 Series oscilloscopes, see the *Infiniium 9000 Series Oscilloscopes Data Sheets*.

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 95% 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 rd edition CAN/CSA-22.2 No. 61010-1-12 |
| Installation category | II |
| Voltage fluctuations | The mains supply voltage fluctuations are not to exceed $\pm 10\%$ of the nominal supply voltage. |
| Pollution degree | The Infiniium 9000 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> |

Ventilation

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

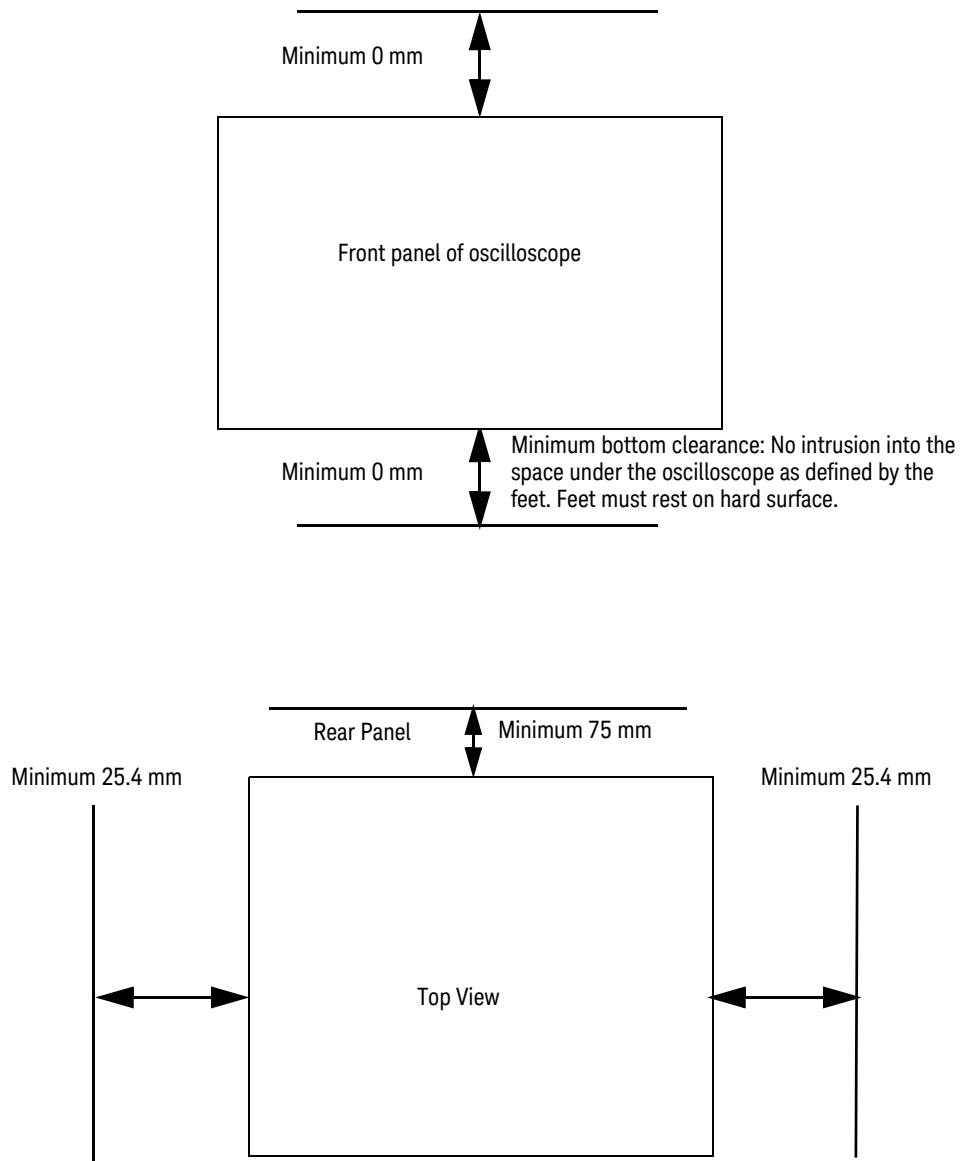


Figure 1 Positioning the 9000 Series oscilloscope with sufficient clearance

CAUTION

VENTILATION REQUIREMENTS: When installing the instrument(s) into a cabinet, consider the convection flow into and out of the cabinet. Also consider the individual instruments, to avoid having the heated discharge of one instrument become the cooling intake air for another instrument.

Location

Install the oscilloscope so that the detachable power cord is readily identifiable and is easily reached by the operator.

The detachable power cord is the oscilloscope disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the oscilloscope. (The front panel switch is only a standby switch and is not a LINE switch.)

Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

Connecting Accessories and Cables

A mouse and keyboard can be plugged into either a USB port or a PS2 port. There are several USB connectors on the front panel or the side panel that can be used. When using the PS2 port, the keyboard must be plugged in prior to turning on power to the oscilloscope.

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.

Side panel USB connectors can be used for any USB devices. There are also three USB connectors in the lower right corner of the front panel.

If you have a parallel printer, you will need a parallel printer cable. Connect the cable to the parallel port on the side panel of the oscilloscope.

If you have a serial printer, you will need a 9-pin to 25-pin serial printer cable. Some printers may require other cable configurations, but the oscilloscope has a 9-pin serial connector. Connect the cable into the RS-232 port.

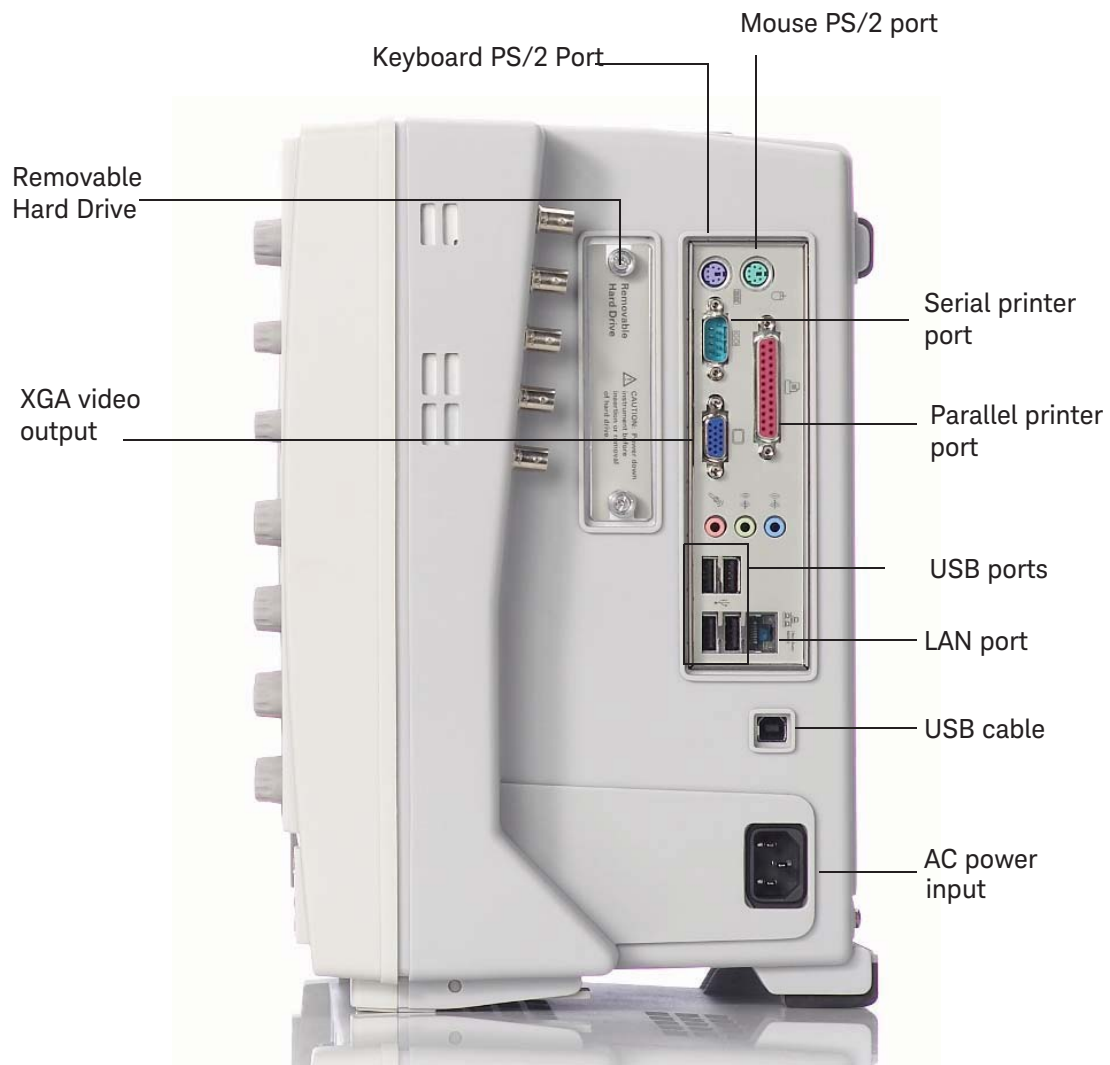


Figure 2 Side panel

Connecting Power

Table 2 Power requirements

| | |
|-------|---|
| Power | 100-120 V, 50/60/400 Hz 100-240 V, 50/60 Hz 375 W Max |
|-------|---|

CAUTION

This oscilloscope has autoranging line voltage input. Before switching on the oscilloscope, be sure the supply voltage is within the specified range and voltage fluctuations do not exceed 10% of the nominal supply voltage.

- 1 Position the oscilloscope so that it is not difficult to unplug the power cord.
 - 2 Connect the power cord to the side panel of the oscilloscope and then to a suitable ac voltage source. The power cord serves as the main disconnecting device. The maximum power dissipation is 375 W.
- The oscilloscope power supply automatically adjusts for line input voltages in the range 100 to 240 VAC. Therefore, you do not need to adjust an input line voltage setting. The line cord provided is matched by Keysight Technologies to the country of origin of the order.
 - You should regularly check the condition of the power cord.



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.

**CAUTION**

The Mains wiring and connectors must be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using the correct components may cause product damage and serious injury.

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.

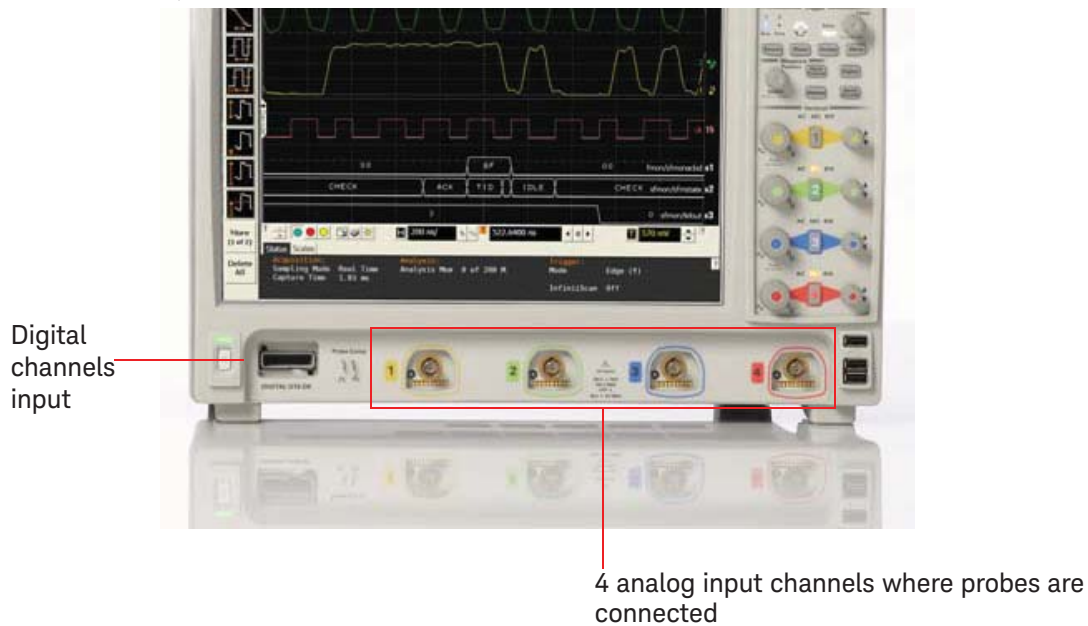


Figure 3 9000 Series oscilloscope probe connectors

CAUTION

Do not exceed the maximum input voltage rating. The maximum input voltage for the 50 Ω inputs is ± 5 V_{peak}, and for the 1 M Ω it is 135 V_{rms} (or dc).



CAUTION

Do not attempt to twist the snap-on probes on or off the oscilloscope's BNC connector. Twisting the probe connector body will damage it.

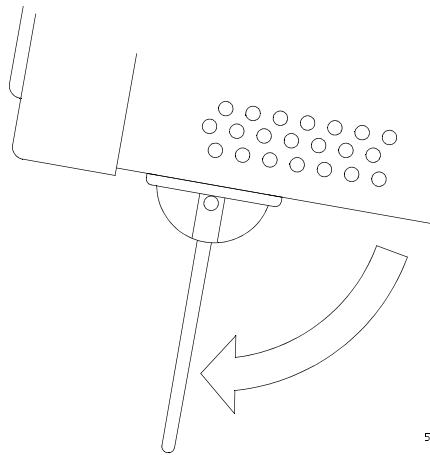
CAUTION

When measuring voltages over 30 V, use a 10:1 probe.

Keysight Infiniium 9000 Series oscilloscopes are not rated for Measurement Category II, III, or IV.

Tilting the Oscilloscope for Easier Viewing

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



54800e72

Figure 4 Latching the front feet

Turning On the Oscilloscope

- Press the power/standby 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 connector 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 Touch the pointer of the touch screen stylus to the surface of the screen and move it around while verifying that the pointer follows the movement.

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/standby 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 Infiniium oscilloscope with a soft dry cloth or one slightly dampened with a mild soap and water solution to clean the external case parts. Do not attempt to clean internally.

CAUTION



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

WARNING

To prevent electrical shock, disconnect the Infiniium oscilloscope from mains before cleaning.

WARNING

Use alcohol to clean connectors. The power cord must be removed, and the oscilloscope must be in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to powering up the oscilloscope.

2 Using the Oscilloscope

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This chapter describes how to use the Infiniium 9000 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 Controls (Keys and Knobs) Overview

The Infiniium 9000 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.

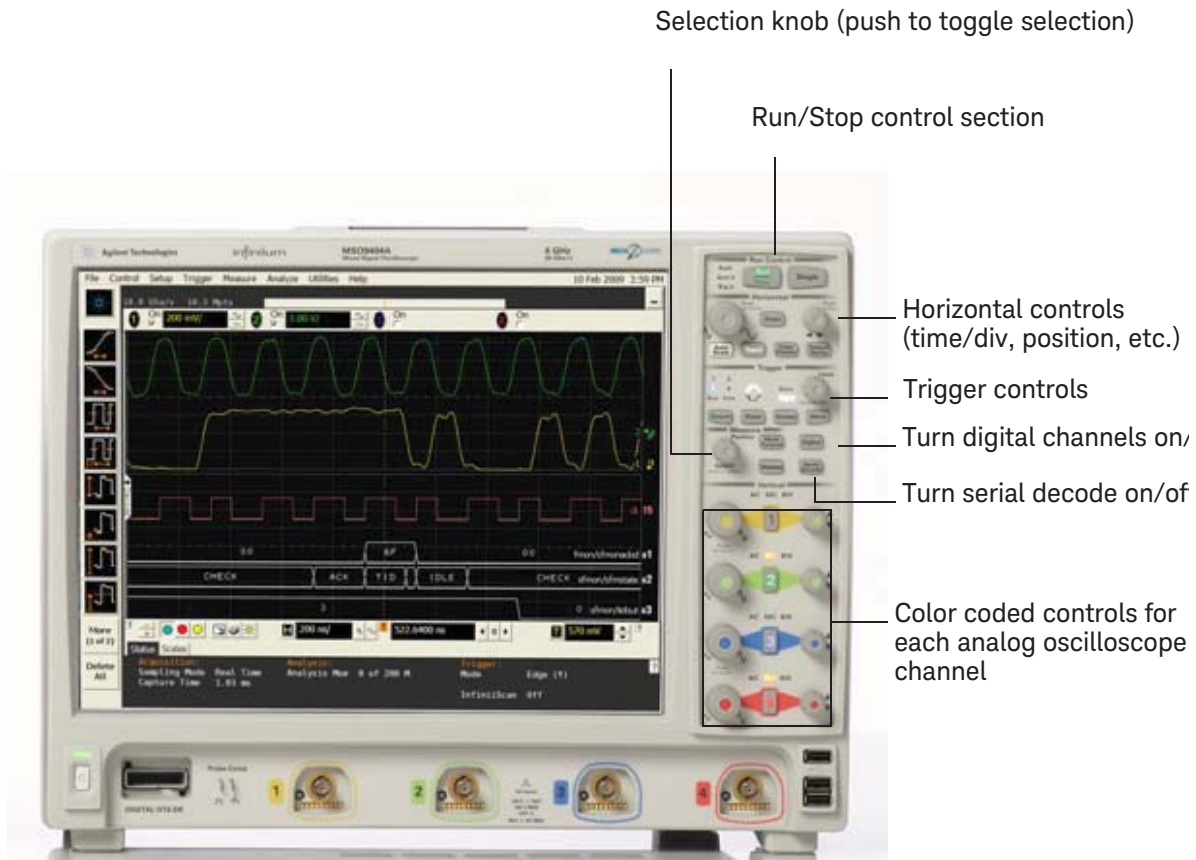


Figure 7 Infiniium 9000 Series oscilloscope front panel

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.

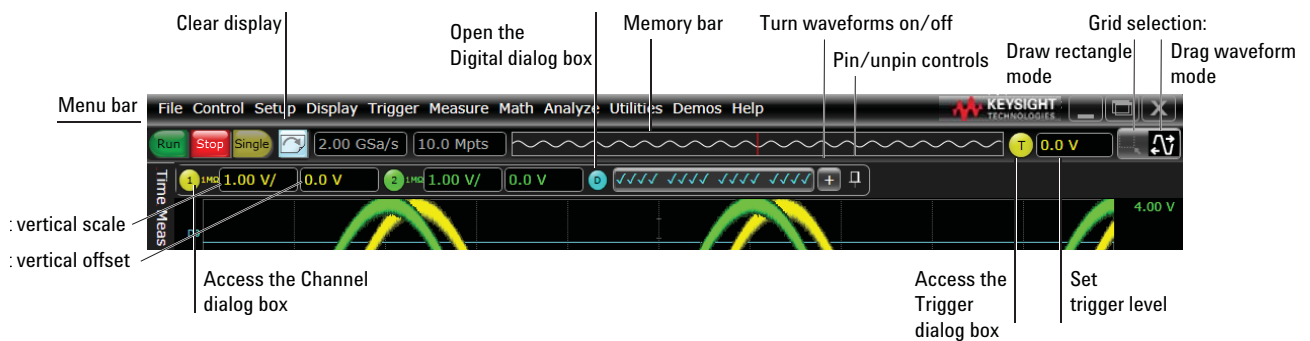


Figure 8 Infiniium oscilloscope top of display

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

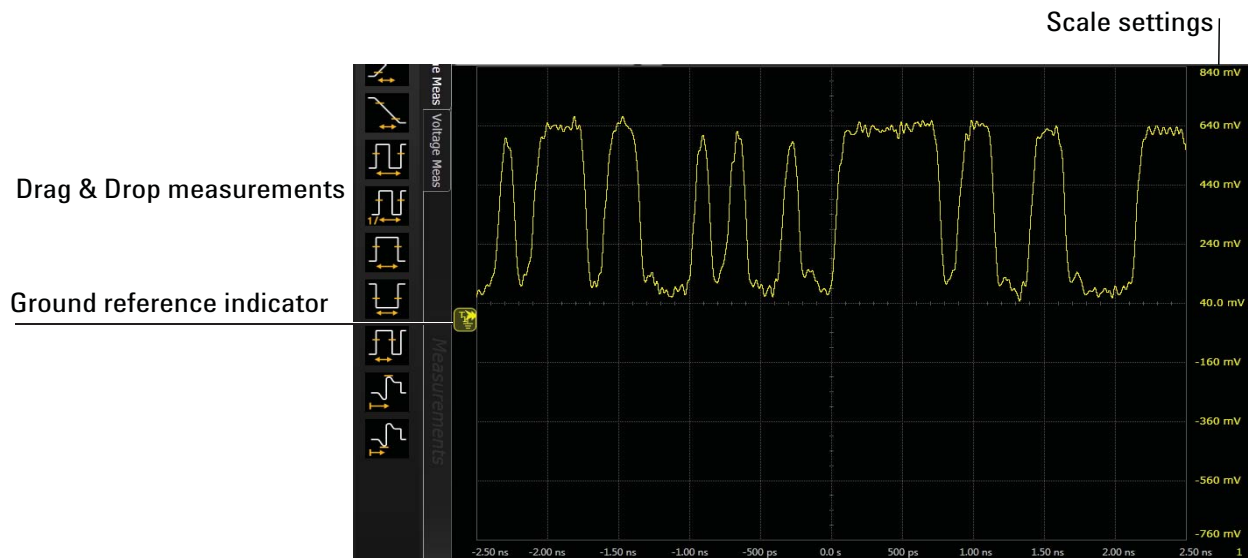


Figure 9 Infiniium oscilloscope waveform display area

The waveform display area shows up to eight waveforms areas. Several display options are available, such as grids, 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 waveform. 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.

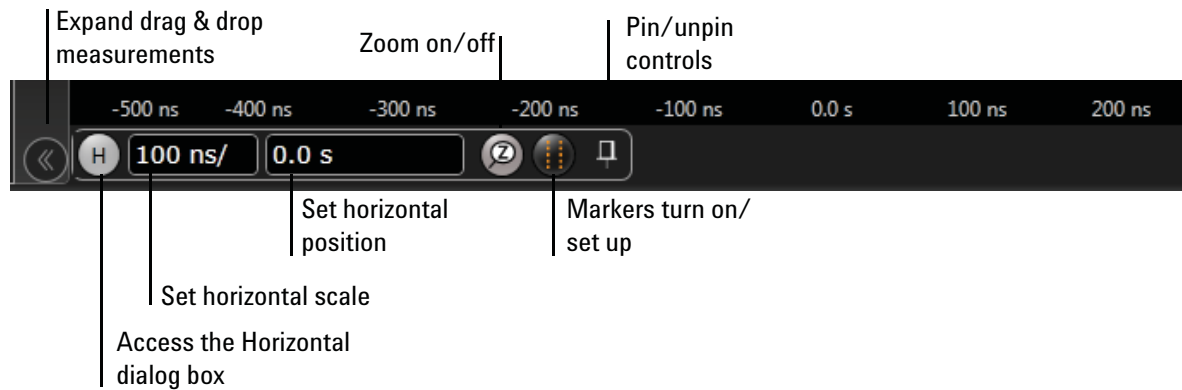


Figure 10 Infiniium oscilloscope bottom of display

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.

| 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 11 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 12 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 13 Setup and display control keys

- To automatically configure the oscilloscope for the current input signal(s), press **[Auto Scale]** or choose **Control > Autoscale** from the menu bar.
- To enable or disable the touch screen, press the **[Touch]** key or choose **Utilities > User Preferences...**
- To clear the waveform display, press **[Clear Display]** 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 **[Default Setup]** or choose **Control > Default Setup**. Choose **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 14 Acquisition run control keys and 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 red Stop button is highlighted when the acquisition is stopped.

- To start waveform acquisition, press **[Run/Stop]** 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 **[Run/Stop]** or click the Stop button. Whatever data was last acquired remains on the screen.
- To make a single acquisition, press **[Single]** or click the Single button.
- You can also choose 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, choose **Setup > Acquisition....**

Adjusting the Horizontal Time Scale and Trigger Position

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

You can use the horizontal knobs, horizontal controls, or Horizontal dialog box to adjust the horizontal scale and position.

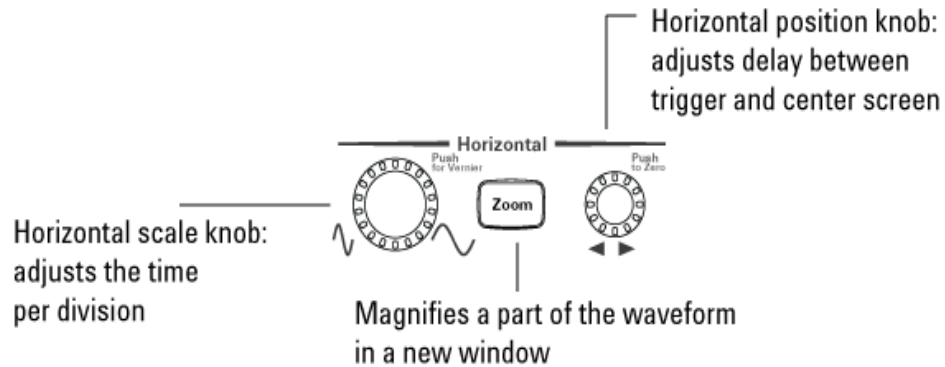


Figure 15 Horizontal scale and position knobs, [Zoom] key

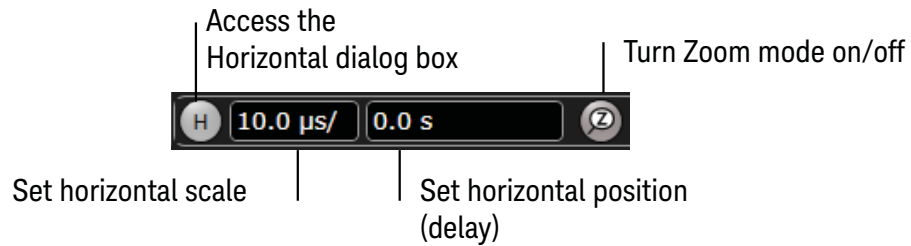


Figure 16 User interface horizontal controls

Adjusting the horizontal scale

The horizontal scale knob is the larger of the two horizontal control knobs. Turn the knob to stretch or shrink the waveform horizontally.

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.

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. Turn the knob to move the waveform to the right or left.

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 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 or touch 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 choose **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.

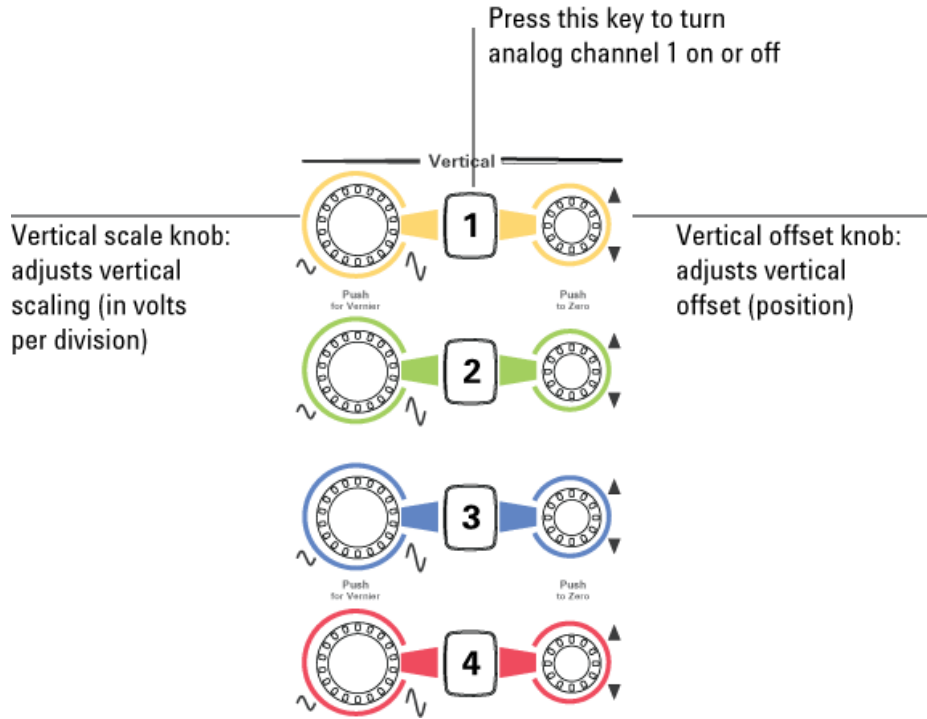


Figure 17 Channel keys and vertical scale and offset knobs

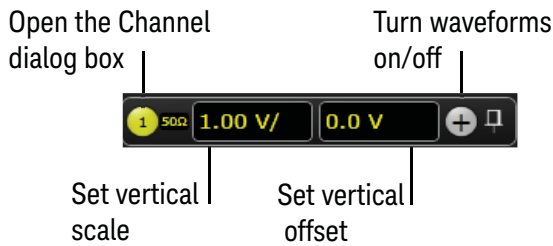


Figure 18 User interface vertical controls

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. Turn the knob to make the waveform bigger (fewer volts per division) or smaller (more volts per division). Decreasing the vertical scale makes the waveform bigger, and increasing it makes the waveform smaller.
- You can also mouse over or touch the vertical scale 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. Turn it to move the waveform up or down.
- You can drag the waveform or its ground reference indicator to the desired vertical offset if the grid is in drag mode .
- Choose **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.

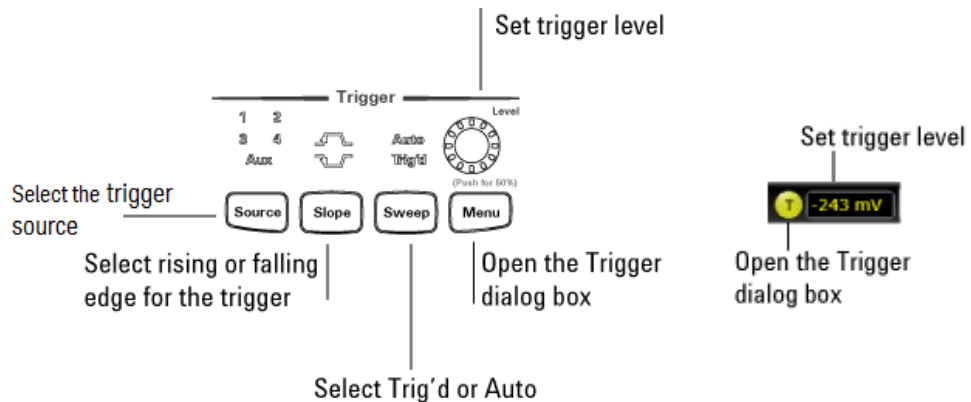


Figure 19 Trigger controls and indicators

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 saving and displaying captured 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, or drag the trigger line itself, which appears when you click or touch the grid.

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.

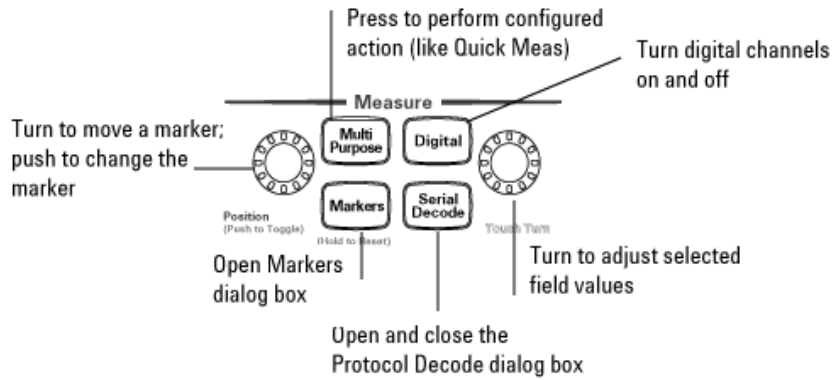


Figure 20 Front panel measure controls

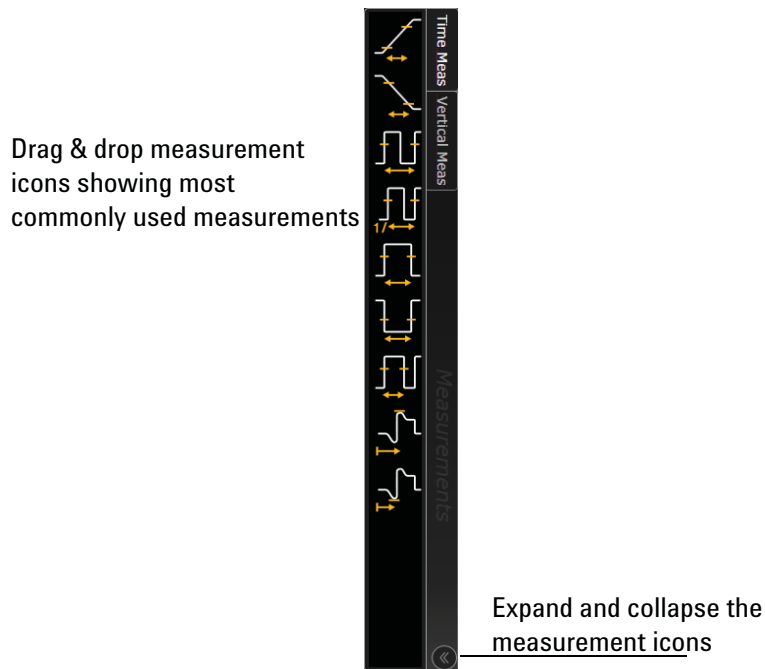


Figure 21 Drag & Drop measurements

Making a measurement on a waveform

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
- QuickSave—saves a customized set of screen images and/or waveforms to the selected file
- QuickEmail—sends an email of the current screen image
- QuickExecute—runs an executable file
- QuickControl—cycles through the possible front panel control sources
- QuickComposite—saves the composite data to the selected file

The action taken when the **[Multi Purpose]** key is pressed (or **Utilities > Multipurpose** is chosen) 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 appear 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, cycle through all channels 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 open the Markers dialog box so you can select the type of marker mode you want to use, press the **[Markers]** key.
- To turn on Marker 1 (X1), push the Select 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 Select 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 choosing **Measure > Markers...** and selecting a mode from the Markers dialog box. 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 choose **Measure > Markers...** and set the marker position precisely.

Controlling digital channels

If your oscilloscope is an MSO model, choose **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, choose **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

- Choose **File > Save >** to save your composite, setup, waveform, screen image, or measurement data. You can also save to a waveform memory.
- Choose **File > Copy Screen Image** to easily copy and paste a screen image into a document.
- Choose **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 Choose **Control > Default Setup** or press the **[Default Setup]** key.
- 2 If the oscilloscope is still not working properly, choose **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 Make sure a keyboard and mouse are connected to the USB host ports on the back of the oscilloscope.
- 3 Turn on the oscilloscope and watch closely for the system prompts.
- 4 As soon as you see the prompt to choose Microsoft Windows 7 or Agilent Recovery System, select **Agilent Recovery System** and follow the on-screen instructions.
- 5 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, install them using the license keys provided on the oscilloscope option license certificates you received, or refer to the back of the oscilloscope.

2 Using the Oscilloscope

3 Online Help and Other Information

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Navigating the Online Help 49

Using the Demo Wizard 50

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

Accessing the Online Help

To access the online help, choose **Help > Contents...** from the main menu bar or click the question mark in the top right corner of dialog boxes:

- Choose **Help > Contents...**

The online Help window appears, similar to the following figure.

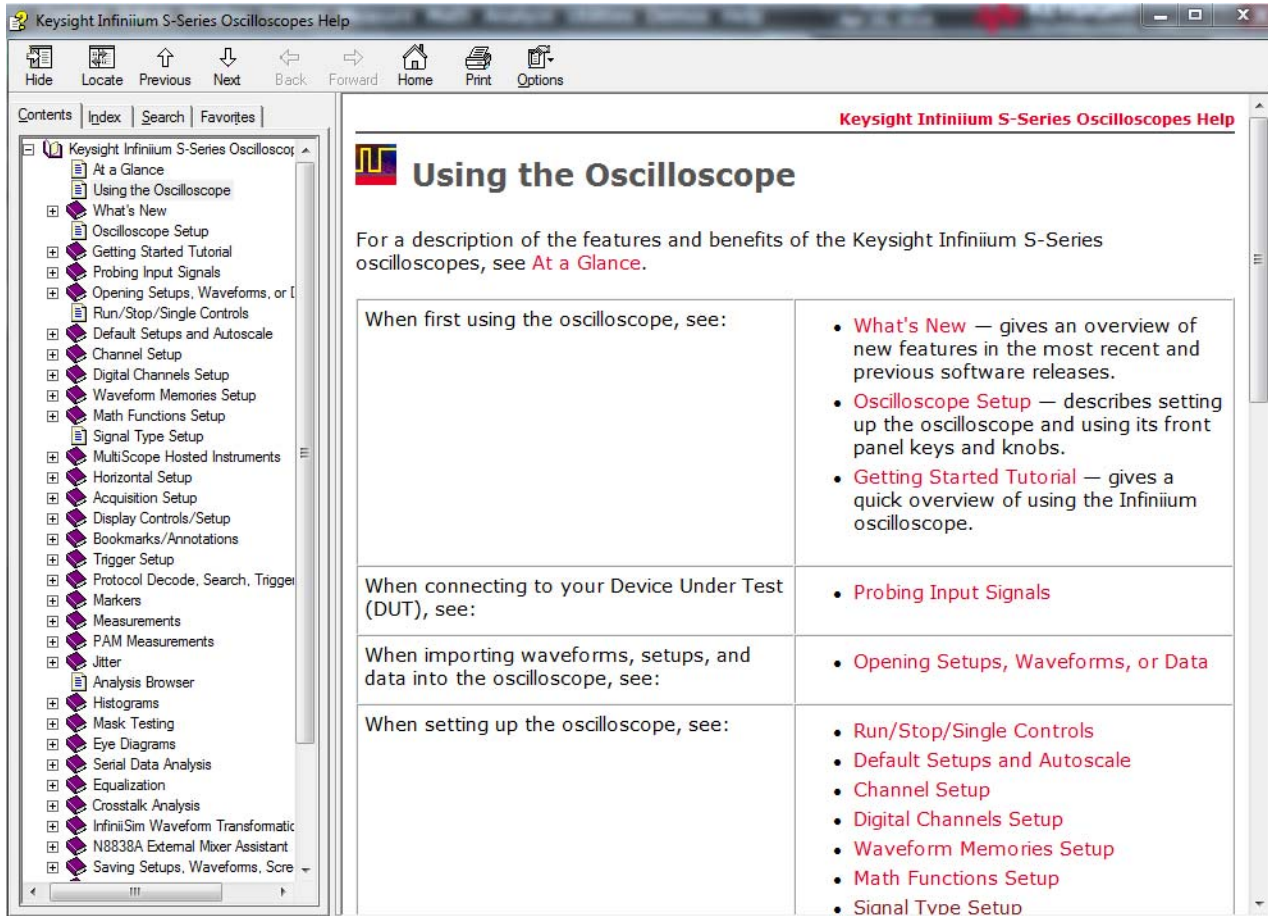


Figure 22 Online Help home page

- Click the Help button  in a dialog box.

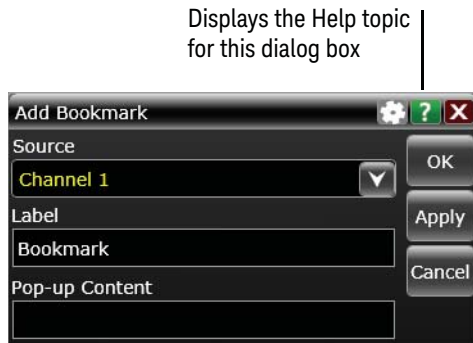


Figure 23 Help button for dialog box Help

Navigating the Online Help

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

- Use the **Search** tab to search for a word or phrase. Use quotation marks to search for an exact phrase, such as “add waveform”.
- 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 **Favorites** tab to add preferred help topics to a list for easy reference.

For details on using online help, click “How to Use This Help” under the “Help and More Information” topic in the Contents.

Using the Demo Wizard

Your 9000 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 24 FFT Demo



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