

# **Agilent Infiniium 90000 Q-Series Oscilloscopes**

## **User's Guide**



**Agilent Technologies**

# Notices

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## Safety Notices

### CAUTION

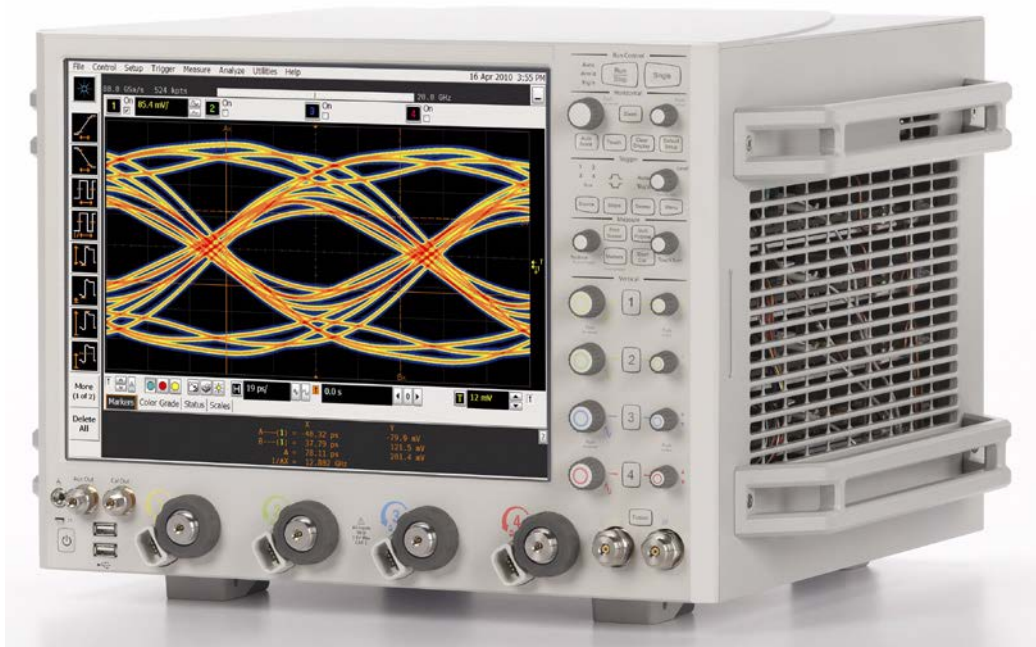
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### WARNING

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See also [Appendix A](#), “Safety Notices,” starting on page 83.

## 90000 Q-Series Oscilloscopes—At a Glance



**Table 1** 90000 Q-Series Oscilloscope Bandwidths, Sample Rates, and Memory Depths

	Bandwidth		Sample rate		Memory depth	
	2 channel	4 channel	2 channel	4 channel	Standard	Maximum
DSAX96204Q	63 GHz	33 GHz	160 GS/s	80 GS/s	50 Mpts	2 Gpts
DSOX96204Q	63 GHz	33 GHz			20 Mpts	2 Gpts
DSAX95004Q	50 GHz	33 GHz			50 Mpts	2 Gpts
DSOX95004Q	50 GHz	33 GHz			20 Mpts	2 Gpts
DSAX93304Q	33 GHz	33 GHz	80 GS/s	80 GS/s	50 Mpts	2 Gpts
DSOX93304Q	33 GHz	33 GHz			20 Mpts	2 Gpts
DSAX92504Q	25 GHz	25 GHz			50 Mpts	2 Gpts
DSOX92504Q	25 GHz	25 GHz			20 Mpts	2 Gpts
DSAX92004Q	20 GHz	20 GHz			50 Mpts	2 Gpts
DSOX92004Q	20 GHz	20 GHz			20 Mpts	2 Gpts

### **Ease of use with high performance**

The Agilent 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, dialogs boxes, and toolbars provides easy access to dozens of configuration and analysis tools, ensuring you can set up and make the most complex measurements.
- All models offer 80 GSa/s sampling rate on all four channels.
- Models with bandwidths from 20 GHz to 63 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 correlation easy.
- Current configuration parameters displayed near the waveform display and are colorcoded to make identification easy.
- Graphical interface menus and toolbars simplify complex measurement setups.

### **Horizontal controls set sweep speed and position**

- 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 oscilloscope 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.
- Use auxiliary trigger to increase triggering flexibility.

### **Vertical controls set attenuation, and position**

- Color-coded knobs make it easy to find the controls that affect each waveform.

### **Marker and quick measurements help measure waveform parameters**

- Waveform markers A and B to check voltage or  $\Delta$ -time at any point on the displayed waveform.

## In This Book

This book gives you the information you need to begin using the Infiniium 90000 Q-Series oscilloscopes. It contains four chapters:

**Chapter 1**, “Setting Up the Oscilloscope,” starting on page 13 contains inspection, power requirements, air flow, and setup information.

**Chapter 2**, “Working in Comfort,” starting on page 27 contains recommendations for working comfortably and safely while operating the Infiniium oscilloscope.

**Chapter 3**, “Using the Oscilloscope,” starting on page 31 gives an overview of the front and back panel inputs and outputs, front-panel controls, and graphical user interface, and tells you how to perform basic operations with the oscilloscope.

**Chapter 4**, “Accessing the Online Help,” starting on page 79 describes the Infiniium oscilloscope application’s online help contents and navigation. The online help describes how to use the Infiniium oscilloscope application in more 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 *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* manual found in the Infiniium oscilloscope application’s online help.

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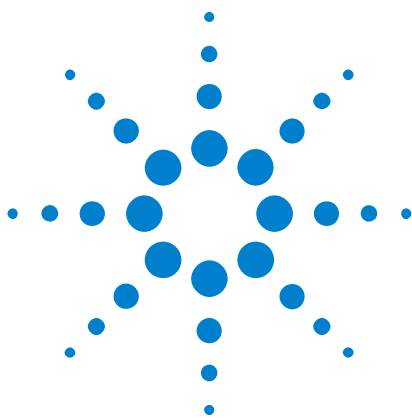
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This chapter shows you how to set up your Infiniium oscilloscope, connect power and accessories, and verify general operation.



## To inspect package contents

- ✓ Inspect the shipping container for damage.

Keep a damaged shipping container or cushioning material until you have inspected the contents of the shipment for completeness and have checked the oscilloscope mechanically and electrically.
- ✓ 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 Agilent Technologies Sales Office.
  - If the shipping container is damaged, or the cushioning materials show signs of stress, notify the carrier and your Agilent Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Agilent Technologies Sales Office will arrange for repair or replacement at Agilent's option without waiting for claim settlement.
- ✓ Verify that you received the following items in the Infiniium oscilloscope packaging.
  - Infiniium oscilloscope.
  - Power cord.
  - Keyboard.
  - Mouse (USB optical).
  - Touchscreen stylus.
  - Front panel cover.
  - Calibration cable (the 50 GHz and 62 GHz bandwidth models include a second calibration cable for the RealEdge inputs).
  - Connector saver adapters (quantity 5 for 20 GHz, 25 GHz, and 33 GHz bandwidth models; additional 2 for 50 GHz and 63 GHz bandwidth models).
  - ESD wrist strap.
  - Quick Start sheet.

If anything is missing, contact your nearest Agilent Technologies Sales Office. If the shipment was damaged, contact the carrier, then contact the nearest Agilent Technologies Sales Office.

## To inspect options and accessories

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

If anything is missing, contact your nearest Agilent Technologies Sales Office. If the shipment was damaged, or the cushioning materials show signs of stress, contact the carrier and your Agilent Technologies Sales Office.

For a complete list of options and accessories available for the 90000 Q-Series oscilloscopes, see the [Infiniium 90000 Q-Series Oscilloscopes Data Sheet](#).

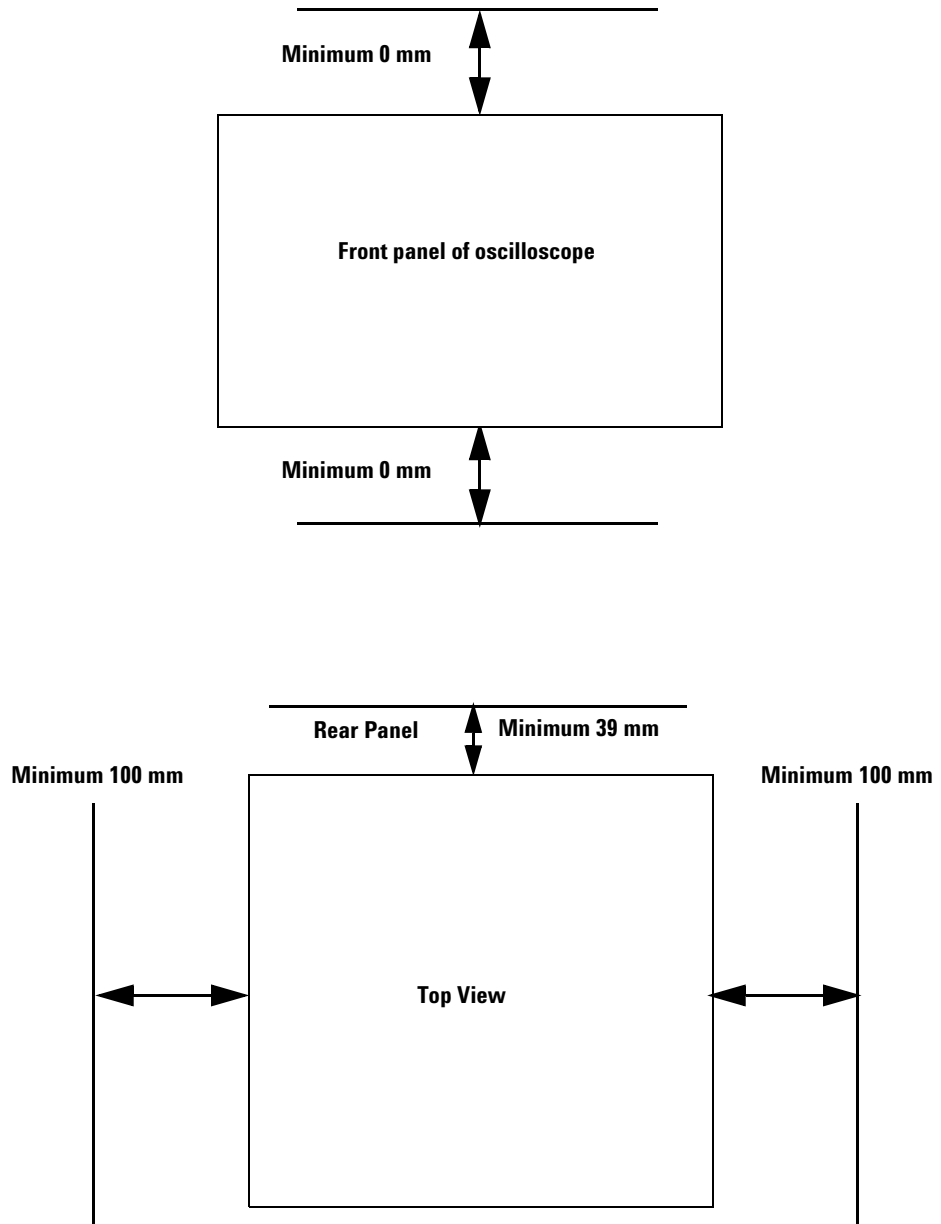
## Environmental Conditions

**Table 2** 90000 Q-Series Oscilloscope Environmental Characteristics

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 (12,000 feet); Non-operating: up to 15,300 meters (50,000 feet)
Vibration	Operating random: 00.21 g(rms) Non-operating random: 2.0 g(rms) Swept sines: (0.50g).
Weight	71 lbs
Dimensions	20 in. wide (50.8 cm), 13.3 in. tall (33.8 cm), and 19.4 in. deep (49.3 cm)
Safety	CAN/CSA-C22.2 No. 61010-1-04 UL Std. No. 61010-1 (2nd Edition)

## To position for proper airflow

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



**Figure 1** Positioning the 90000 Q-Series Oscilloscope with Sufficient Clearance

**CAUTION**

Do not place the oscilloscope side-by-side with other instruments blowing warm air.



## To connect the mouse, keyboard, and LAN

**Mouse and Keyboard** A mouse and keyboard can be plugged into either USB host ports or the PS/2 ports.

There are several USB host ports on the back and front panel of the oscilloscope that can be used. (The USB device port is used for remote control of the oscilloscope from a PC.)

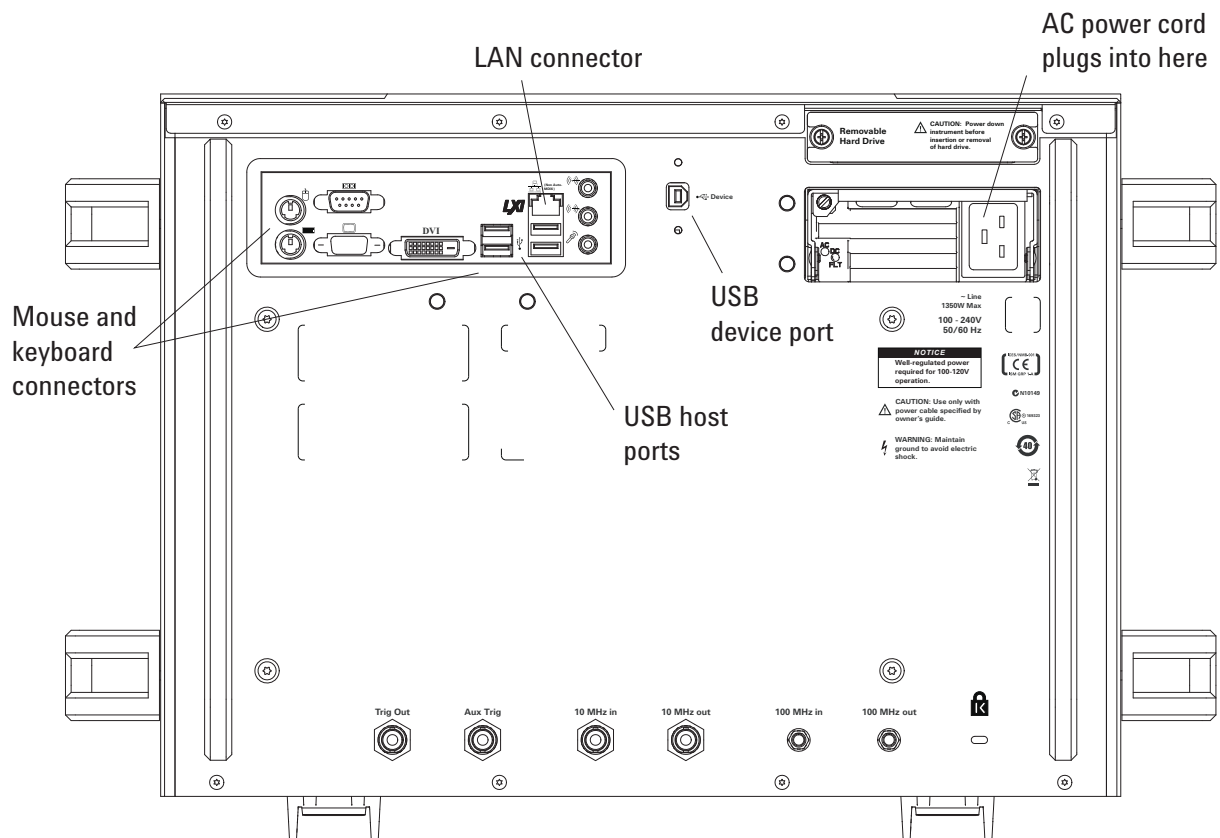
When using the PS/2 ports, the mouse and/or keyboard must be plugged in prior to turning on power to the oscilloscope.

**LAN Cable** Connect your LAN cable to the RJ-45 connector on the back panel of the oscilloscope.

### NOTE

After you have connected to the LAN card, you must set up the network. Before you try to set up your network, you should exit the oscilloscope application.

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** Back Panel

## To connect power

**Table 3** Power Requirements

Power	100 - 240 VAC +-10% at 50/60 Hz; Typical input power for models <= 33 GHz 1280 Watts Maximum input power for models > 33 GHz 1350 Watts Well regulated power is required for 100-120VAC operation
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- 1 Connect the power cord to the rear of the oscilloscope, then to a suitable AC voltage source.

**CAUTION**



Use only power cords designed for your oscilloscope.

The line cord provided is matched by Agilent to the country of origin of the order.



**Figure 3** 90000 Q-Series Oscilloscope Power Cord Connection

**WARNING**



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

**NOTE**

Note that the oscilloscope's power supply has a built-in safety feature that, after turning the oscilloscope off, requires the oscilloscope to remain off for about 10 seconds before turning it back on.

## Power Supply Protection Features

The Infiniium 90000 Q-Series oscilloscope's power supply has built-in protection features for over voltage, over current, and over temperature conditions.

**Table 4** Power Supply LED Meanings

AC LED	DC/FLT (Fault) LED	Condition
Green	Green	Normal operation
Off	Red	Low or NO AC
Green	Red	Over-Voltage Protection
Green	Red	Over Current
Green	Orange	Thermo Alarm Warning
Green	Red	Fault Over Temp
Green	Red	Remote On/Off

When the over-voltage fault occurs (and the power supply shuts down), you must unplug the power cord, wait 10 to 30 seconds, and plug the power cord back in to reset the protection latch and allow the oscilloscope to be powered-on again.

When the over temperature fault occurs, the temperature must drop below 110 °C before you can power-on the oscilloscope again.

## To connect oscilloscope probes

**CAUTION**

Do not exceed the maximum input voltage rating.

Oscilloscope channels 1-4, 1R, and 3R are rated for maximum input of  $\pm 5V$  including transients.

The Infiniium 90000 Q-Series oscilloscope channel 1-4 inputs have:

- 3.5 mm threaded RF connectors (like Agilent sampling oscilloscopes) to ensure the most reliable signal integrity.
- A convenient automatic torque mechanism that ensures a consistent 8 in. lbs. connection.

## 1 Setting Up the Oscilloscope

- An AutoProbe II interface connector with pins that provide probe power, identification, and other communication signals.



**Figure 4** 90000 Q-Series Oscilloscope Probe Connectors

The AutoProbe II interface works with the InfiniiMax III probing system. There are four different InfiniiMax III probe amplifiers ranging from 16 to 30 GHz. For more information, see [Agilent InfiniiMax III Probing System Data Sheet](#).

Before using the InfiniiMax III probes, review the *InfiniiMax III Probe Handling Guide* included with the probes. These probes are ESD sensitive devices and there is a proper order for connecting probe amplifiers to the oscilloscope, probe heads to the device under test (DUT), and probe heads to the amplifier. You can also find the *InfiniiMax III Probe Handling Guide* on the Agilent web site ([www.agilent.com](http://www.agilent.com)) or with other Agilent oscilloscope probes documentation in the Probe Resource Center ([www.agilent.com/find/prc](http://www.agilent.com/find/prc)).

The N5442A Precision BNC 50  $\Omega$  adapter lets you use the InfiniiMax II probing system with the 90000 Q-Series oscilloscopes.

## To connect threaded RF cables

You can connect threaded RF cables to the Infiniium 90000 Q-Series oscilloscope inputs.

For input channels 1 through 4, you can connect 3.5 mm threaded RF cables, and you can use the automatic torque “clutch” mechanism to ensure a consistent 8 in. lbs. connection.

The **Aux Out** and **Cal Out** connectors also work with 3.5 mm threaded RF cables.

For RealEdge input channels 1R and 3R (on the 50 GHz and 62 GHz bandwidth models), you can connect 1.85 mm threaded RF cables, and you will need a torque wrench to apply the necessary 8 in. lbs. of torque.

## To tilt the oscilloscope for easier viewing

There are tabs under the oscilloscope's front feet that can be flipped out to tilt the oscilloscope.



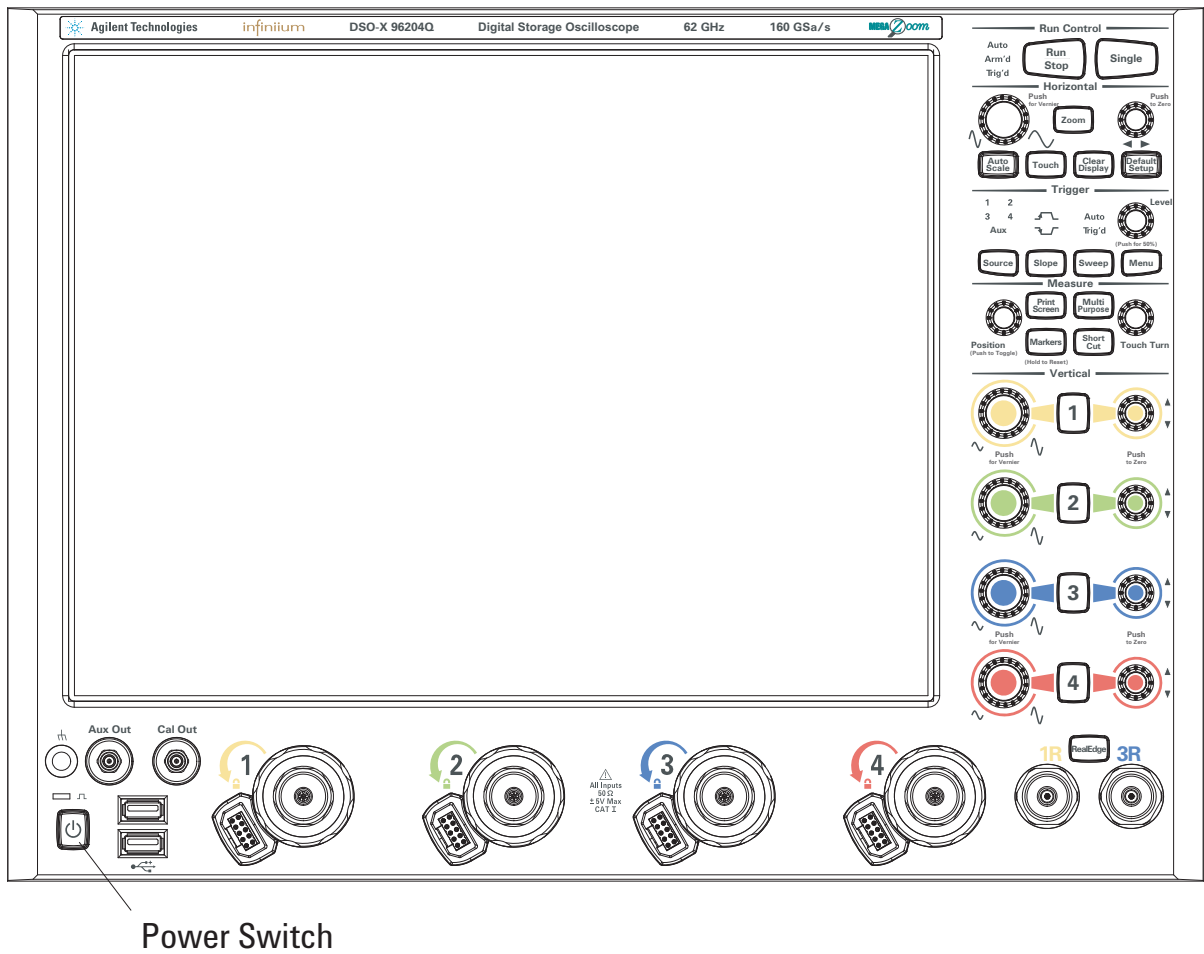
**Figure 5** Flip-Out Tabs Under Front Feet

## To turn on the oscilloscope

**NOTE**

The first time you turn on the oscilloscope, you must have a mouse connected in order to accept the Microsoft end-user license agreement for the Windows 7 operating system.

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



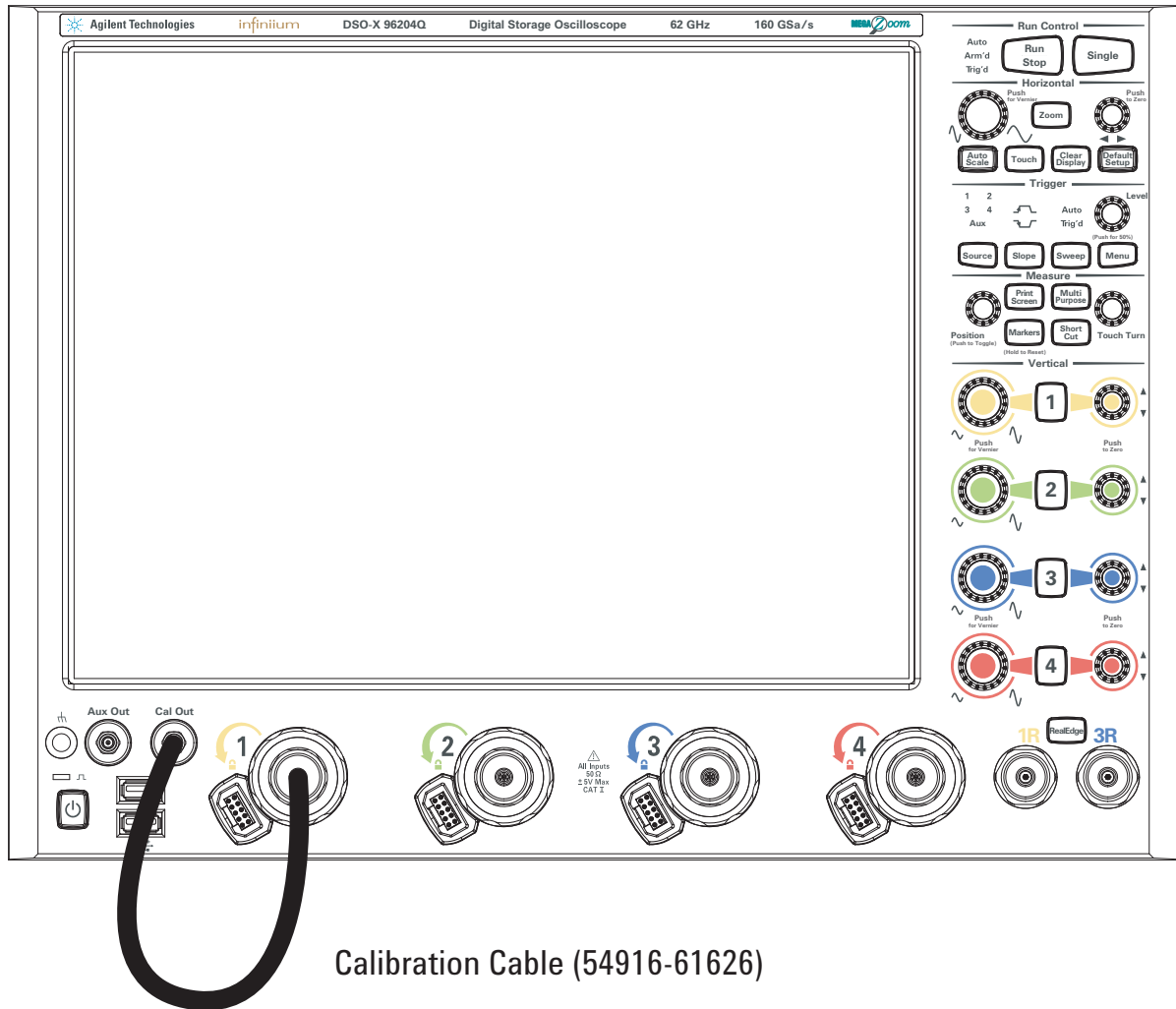
**Figure 6** Turning on the Oscilloscope

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

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

## To verify basic oscilloscope operation

- 1 Connect one end of the 54916-61626 calibration cable to oscilloscope input channel 1.
- 2 Connect the other end of the calibration cable to the **Cal Out** connector on the front panel.



**Figure 7** Verifying Basic Oscilloscope Operation

- 3 Press the [**Default Setup**] key on the front panel.

The display will pause momentarily while the oscilloscope is configured to its default settings.

- 4 Press the [**Auto Scale**] key 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 4 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 channel input and to the probe calibration 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. Agilent has verified that the following applications are compatible with the Infiniium oscilloscope application.

- Agilent Vector Signal Analysis.
- Agilent VEE Pro.
- Amherst Systems Oscilloscope Tools.
- Microsoft Office.
- MathWorks MATLAB.
- Mathsoft MathCad 2001i.
- McAfee VirusScan.
- Symantec Norton AntiVirus.

### NOTE

Before installing any software, you should exit the oscilloscope application.

If you install an application other than those which Agilent has tested, it is possible that it could break the oscilloscope application. This would potentially require you to recover the oscilloscope hard drive using the hard drive's hidden recovery partition.



## Changing Windows Operating System Settings

**NOTE**

Before changing any Windows operating system settings outside of the oscilloscope application you should exit the oscilloscope application.

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There are many Windows operating system settings that can be changed to suit your own personal preferences. However, there are some operating system settings that you should avoid changing because it will interfere with the proper operation of the oscilloscope.

- Do not change the Power Options.
- Do not change the System Properties Hardware Tab settings.
- Do not change the Regional and Language Options Advanced Tab settings.
- Do not remove Fonts.
- Regarding Display Settings:
  - Do not change the screen resolution from 1024 by 768 pixels or the color quality from Highest (32 bit).
  - Do not change the Font size to Extra Large.
  - Do not use a Menu font size greater than 14 points.
- Do not use the Administrative Tools to enable or disable Internet Information Services (Web Server). Use the Infiniium Web Control dialog box to enable or disable the Web Server.
- Do not delete or modify the Infiniium Administrator user account.

### To turn off the oscilloscope

- 1 Momentarily 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.

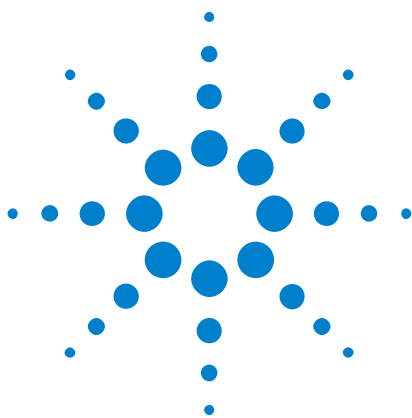
### To clean the oscilloscope

- 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 front panel, damaging sensitive electronic components.

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## 2 Working in Comfort

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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 you may wish to consult 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 wish to 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 there are many other risk factors that 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?

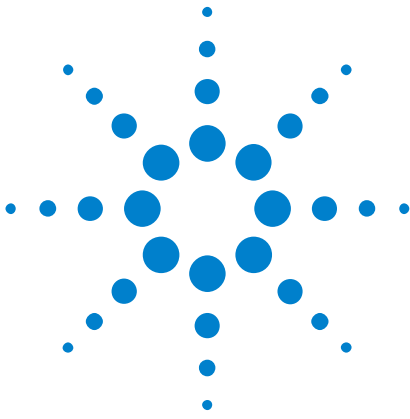
If you are experiencing any discomfort, seek professional medical advice immediately. Typically, the earlier a problem is diagnosed and treated, the easier it is to resolve.

## 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 as 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.

## 2 Working in Comfort



## 3 Using the Oscilloscope

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This chapter tells how to use the Infiniium 90000 Q-Series oscilloscope's inputs and outputs, front-panel controls, and graphical user interface.

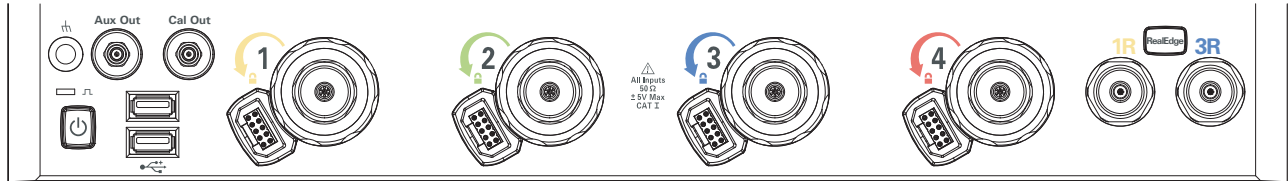
- The familiar front-panel oscilloscope interface with knobs and keys is optimized for common tasks and basic measurements. See [“Front Panel Controls \(Keys and Knobs\)”](#) on page 37.
- The Infiniium oscilloscope application's graphical interface with menus, windows, dialog boxes, and toolbars provides easy logical access to dozens of configuration and analysis tools, making it easy for you to set up and make the most complex measurements.

The Infiniium oscilloscope application also provides online help, which gives detailed information on using the oscilloscope. See [“Using the Graphical Interface”](#) on page 48.



## Front Panel Inputs and Outputs

On the Infiniium 90000 Q-Series oscilloscopes, the channel inputs and the **Aux Out** and **Cal Out** outputs appear on the lower part of the front panel.



**Figure 8** Infiniium 90000 Q-Series Oscilloscope Front Panel I/O

### Channel 1-4 Inputs

The channel 1-4 inputs have:

- 3.5 mm threaded RF connectors.
- A convenient automatic torque mechanism.
- An AutoProbe II interface connector with pins that provide probe power, identification, and other communication signals.

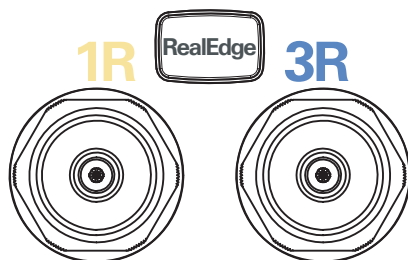
The AutoProbe II interface works with the InfiniiMax III probing system. See [“To connect oscilloscope probes”](#) on page 19.

You can also connect 3.5 mm threaded RF cables to the channel 1-4 inputs.

### RealEdge 1R, 3R Channel Inputs

The **[RealEdge]** key and 1R and 3R channel inputs appear on 50 GHz and 62 GHz bandwidth models.

Pressing the **[RealEdge]** key enables or disables the RealEdge 1R and 3R channel inputs. The **[RealEdge]** key is lit when enabled.



**Figure 9** RealEdge Channel Inputs and [RealEdge] Key



When enabled, the RealEdge 1R and 3R channel inputs take over the standard channels 1-4, except for the trigger circuitry on channels 2 and 4. When RealEdge is enabled, you can still trigger on signals connected to the channel 2 and 4 inputs (but you cannot capture or display data from these signals).

You can connect 1.85 mm threaded RF cables to the RealEdge 1R and 3R channel inputs.

## Ground

The ground plug is convenient for ESD wrist straps.

## 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.

## Cal Out

This calibration output is used when performing user calibration on the oscilloscope.

A calibration cable is included with the oscilloscope. The 50 GHz and 62 GHz bandwidth models include a second calibration cable for the RealEdge channel inputs.

You can also use the Infiniium oscilloscope application's Calibration Output dialog box (under the Utilities menu) to select other output signals, just like you can for the **Aux Out** output.

## 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.

## USB Host Ports

There are two USB host ports on the front panel, next to the power switch.

## Front or Back Panel Inputs and Outputs

These inputs and outputs appear on the back panel in 50 GHz and 62 GHz bandwidth models, and they appear on the front panel in other bandwidth models.

### Trig Out

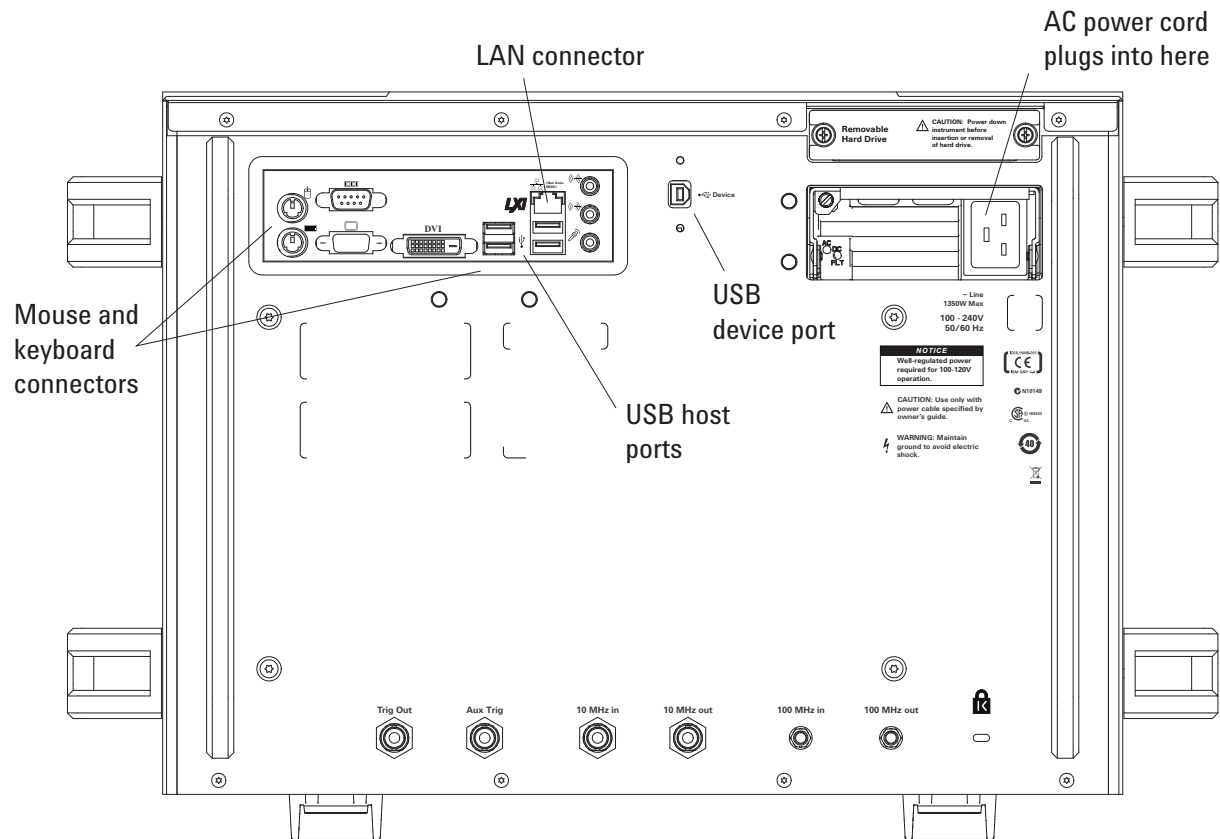
Pulses corresponding to oscilloscope triggers can be sent to this BNC output.

### Aux Trig

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

## Back Panel Inputs and Outputs

The Infiniium 90000 Q-Series oscilloscope's back panel has the motherboard I/O connectors, a USB device port, and reference clock synchronization connectors.



**Figure 10** Infiniium 90000 Q-Series Oscilloscope Back Panel I/O

### Motherboard I/O

These are the inputs/outputs/ports provided by the motherboard in the oscilloscope: PS/2 mouse and keyboard connectors, external monitor connectors, serial interface, USB host ports, LAN port, speaker and microphone connectors, etc.

### USB Device Port

The back panel USB device port can be used for remote control of the oscilloscope from a PC.

#### 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: 178 mV peak to 1 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 Setup dialog box (under **Setup > Horizontal...**), enable the 10 MHz External 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.

#### 100 MHz In, 100 MHz Out

The 100 MHz IN SMA 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: 178 mV peak to 1 V peak.
- Frequency: 100 MHz  $\pm$ 5 ppm high-quality sine wave or square wave.

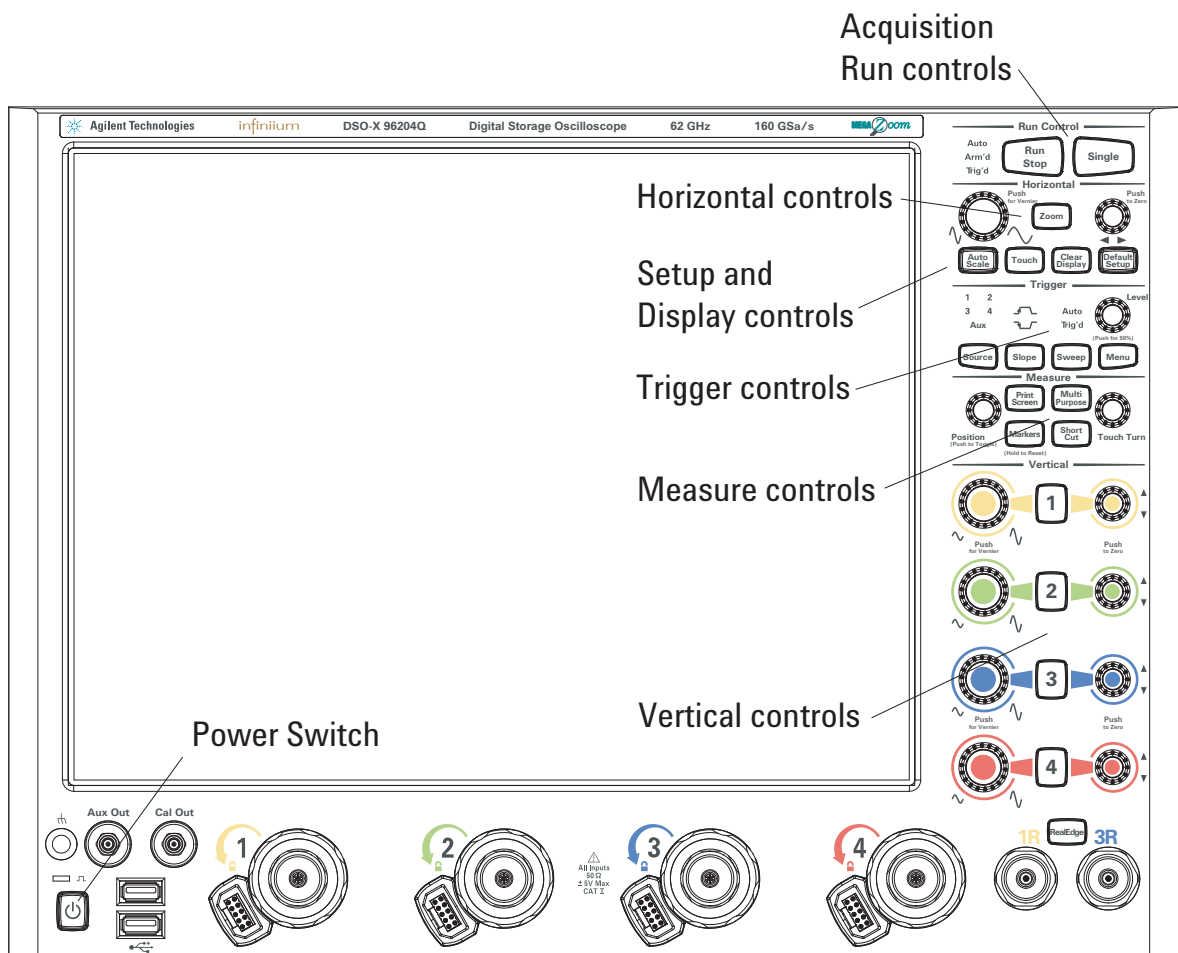
To use a 100 MHz external reference clock, connect the external clock to the 100 MHz In SMA connector; then, in the Infiniium oscilloscope application's Horizontal Setup dialog box (under **Setup > Horizontal...**), enable the 100 MHz External Reference Clock.

You can use the 100 MHz Out SMA connector to send the oscilloscope's 100 MHz reference clock output signal to another instrument's reference clock input.

## Front Panel Controls (Keys and Knobs)

The Infiniium 90000 Q-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. In addition, the front panel has a set of LED (Light-Emitting Diode) indicators; by using these and the display, you see the oscilloscope's configuration at a glance.

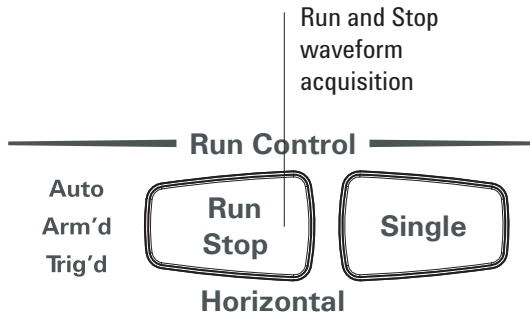
The oscilloscope uses color consistently throughout the front panel and user interface. For example, the color of the knob for channel 1 is the same color as the waveform for channel 1. All the configuration items and values related to channel 1 are displayed in the same color.



**Figure 11** Infiniium 90000 Q-Series Oscilloscope Front Panel

## Acquisition Run Controls

Using the acquisition run controls, you control whether the oscilloscope is running or stopped.



**Figure 12** [Run/Stop] and [Single] Keys

### To start and stop waveform acquisition

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

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

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

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

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

- To make a single acquisition, press the [**Single**] key.

The [**Single**] key is lit yellow while the acquisition takes place. When the single acquisition is complete, the [**Single**] key is unlit and the [**Run/Stop**] key turns red.

## Setup and Display Controls

The [**Default Setup**] key lets you reset the oscilloscope to its default setup.

The [**Auto Scale**] key automatically configures the oscilloscope for the current input signal(s).

The [**Clear Display**] key erases the waveforms from the display and resets such things as measurement statistics and averaging.

The [**Touch**] key enables or disables the touch screen.



**Figure 13** Setup and Display Control Keys

### To set the oscilloscope to a known starting condition

- Press the [**Default Setup**] key.

You can set up the oscilloscope for many different kinds of complex measurements. To easily reset the oscilloscope to a known measurement configuration, use the [**Default Setup**] key.

If you use the [**Default Setup**] key with the graphical interface enabled, you can select Undo Default Setup from the Control menu to return the oscilloscope to its original configuration.

#### NOTE

### Save the Current Oscilloscope Configuration

Before using [**Default Setup**], you may want to save the current oscilloscope configuration for later use. See the online help (described in chapter 4) for instructions on saving and recalling setups, and for information on the exact configuration that is set when you press [**Default Setup**].

### To clear the waveform display

- Press the [**Clear Display**] key.

The oscilloscope clears the waveform display. If the oscilloscope is in Run mode and is receiving triggers, it will update the display as it collects new waveform data.

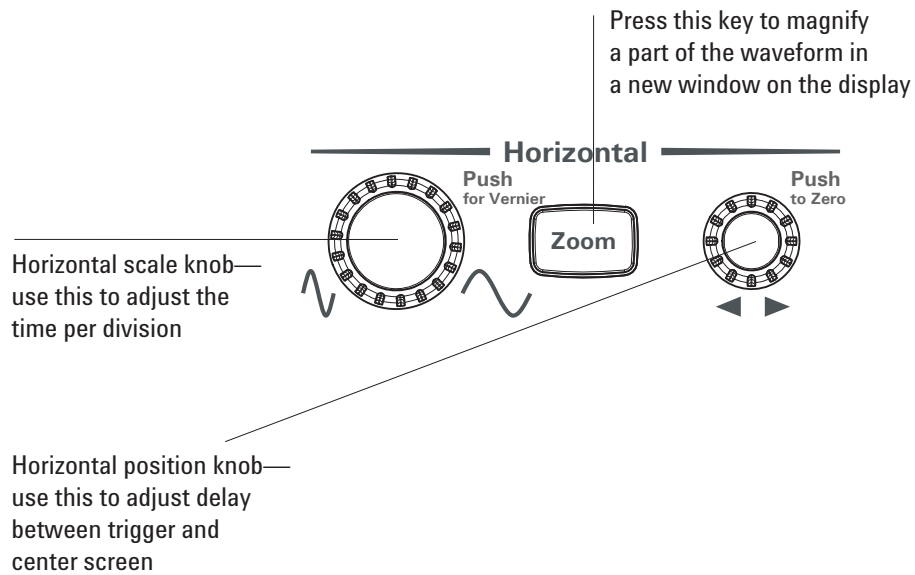
Clearing the waveform display also resets averaging, infinite persistence, and color grade persistence, histogram, and mask testing database.

**To enable or disable the touch screen**

- To enable or disable the touch screen, press the front panel **[Touch]** key.

**Horizontal Controls**

Using the horizontal controls, you configure the oscilloscope’s horizontal scale (time per division) and horizontal position of the waveform. You can also view a magnified section of the waveform using the zoom window, which uses software to expand part of the acquisition memory.



**Figure 14** Horizontal Scale and Position Knobs, **[Zoom]** key

**To adjust the horizontal scale and horizontal position**

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

The horizontal scale knob is the larger of the two horizontal control knobs. It is marked with a set of sine wave symbols. Stretching the waveform means there are fewer seconds displayed per division. Shrinking the waveform means there are more seconds displayed per division.

- To move the waveform to the right, turn the horizontal position knob clockwise. To move the waveform to the left, turn the horizontal position 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 (data acquired after the trigger event).

The horizontal position knob is the smaller of the two horizontal control knobs. It is marked with a set of arrows. There is a detent programmed into the software so there is a momentary pause at zero while you are turning the knob. Continuing to turn the knob will move the horizontal position through zero.

### **To magnify a part of the waveform using Zoom**

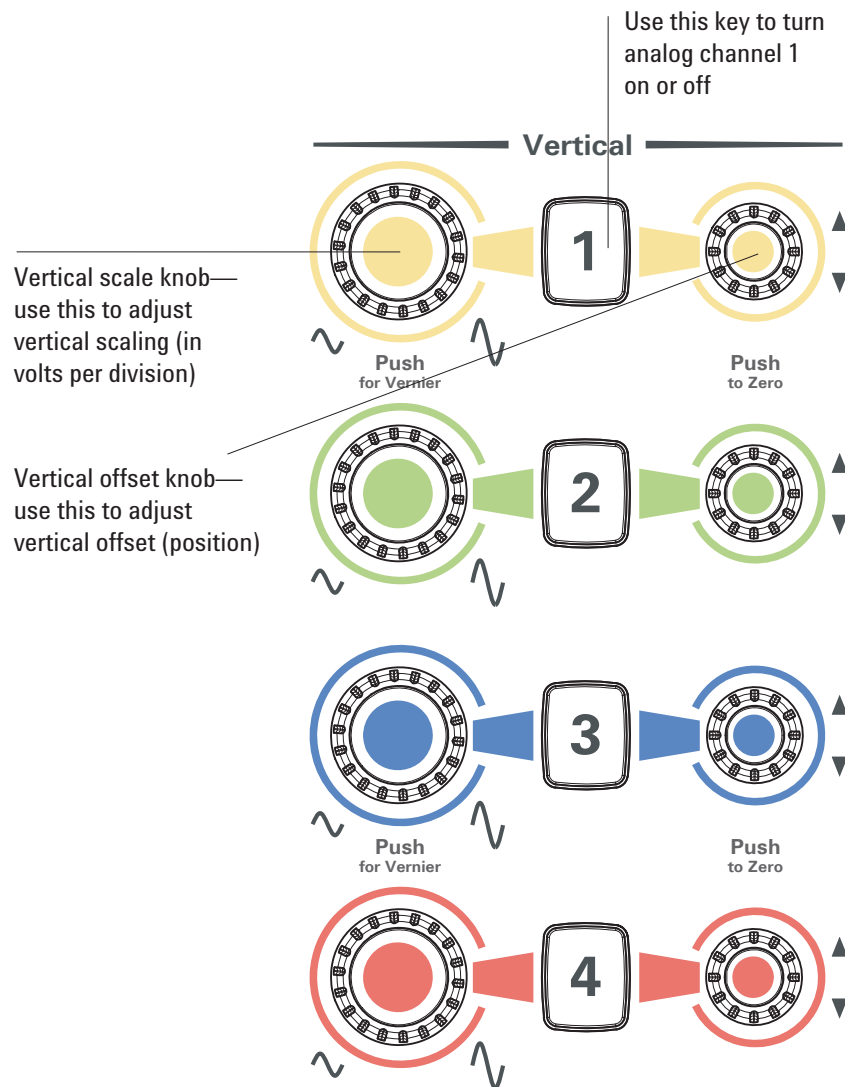
- To turn on zoom, press the **[Zoom]** key. To turn it off, press the **[Zoom]** key again.

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

The horizontal scale and horizontal position controls now change how the waveform is shown in the delayed sweep 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.

## Vertical Controls

Using the vertical controls, you set the vertical scaling (volts per division) and vertical offset. You can also turn the display on or off for a particular channel.



**Figure 15** Channel Keys and Vertical Scale and Offset Knobs

### To turn an analog channel on or off

- To turn an analog channel on, press the channel number key until it is illuminated. To turn it off, press the channel number key again.

If you are not using a particular analog channel, you can turn it off. This simplifies the waveform display and also increases the display update rate. While a analog channel is turned off, data acquisition continues for that channel. Therefore, you can still use the analog channel as a source for functions.

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

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

**To adjust the analog channel's vertical scale and offset**

- To make the waveform bigger, turn the vertical scale knob clockwise. To make it smaller, turn the knob counter-clockwise.

The vertical scale knob is the larger of the two knobs for a channel. It is marked with a set of sine wave symbols. Decreasing the vertical scale makes the waveform bigger. There are fewer volts displayed per division. Increasing the vertical scale makes the waveform smaller. There are more volts displayed per division.

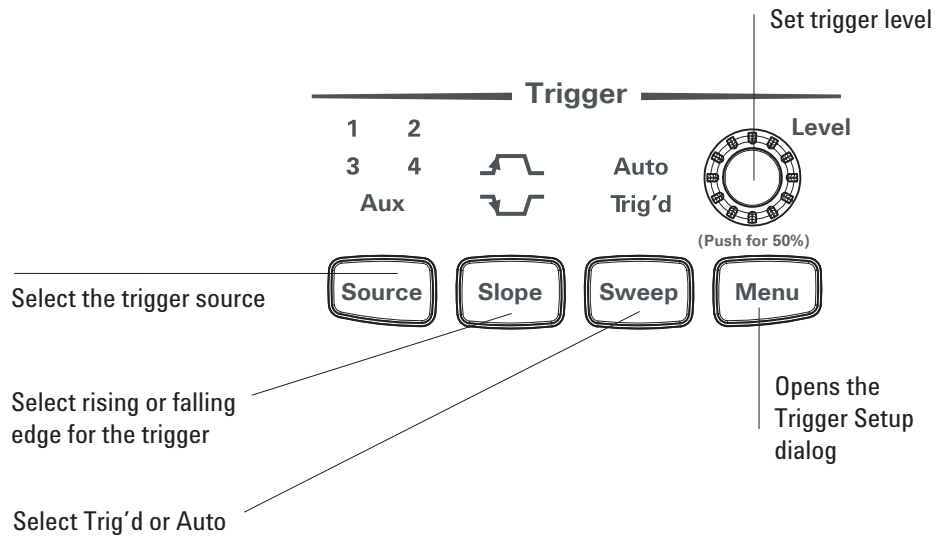
- To move the waveform toward the top of the display, turn the vertical offset knob clockwise. To move it toward the bottom of the display, turn the knob counter-clockwise.

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

**Trigger Controls**

Using the trigger controls, you 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 can be selected from the front panel, and the parameters for edge triggering can be set up here as well.

Trigger configuration settings you make using the graphical interface are reflected in the front-panel status indicators, and will remain set unless you change them (either using the front panel or the graphical interface) or press the **[Default Setup]** key. See [“Using the Graphical Interface”](#) on page 48 for information on accessing the graphical interface.



**Figure 16** Trigger Controls and Indicators

**To set the oscilloscope to trigger on an edge**

- 1 Press and release the **[Source]** key until the desired source LED is illuminated.

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

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

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

- 3 Press the **[Sweep]** key until the Trig'd LED is illuminated.

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

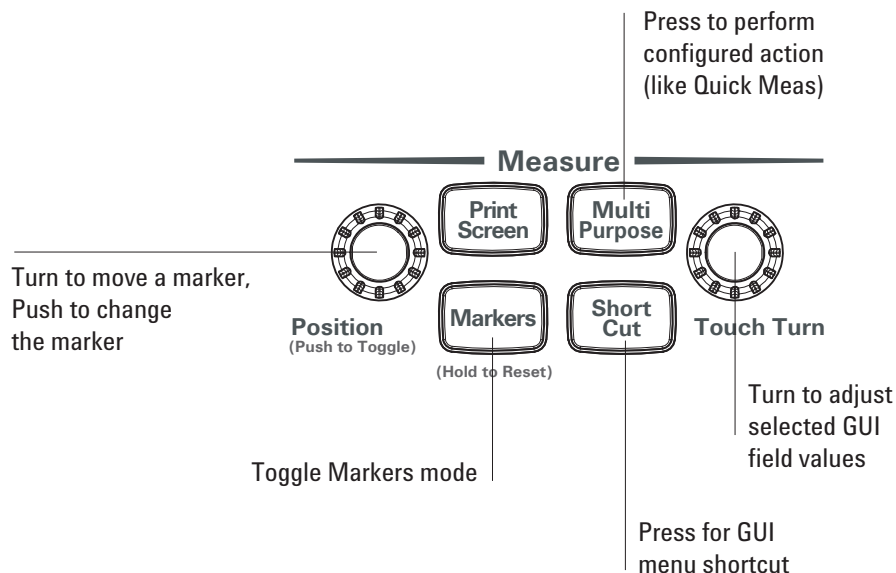
When Auto is selected, if a trigger does not occur within a certain amount of time, an acquisition is automatically saved and displayed. In Auto trigger mode, you are able to see your signals while setting up the desired trigger.

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

## Measure Controls

The measure controls consist of:

- The **[Markers]** key and Position knob for displaying and adjusting markers.
- The **[Multi Purpose]** key for performing 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.
  - QuickE-mail – sends an e-mail of the current screen image.
  - QuickExecute – runs an executable file.
  - QuickControl – cycles through the possible front panel control sources.
- The **[Print Screen]** key for sending the oscilloscope's screen image to a printer.
- The Touch Turn knob for adjusting highlighted user interface field values.
- The **[Short Cut]** key for quickly performing a GUI menu selection.



**Figure 17** Measure Controls

#### To use the 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 that the values are highly accurate.

Using the marker and measurement controls, you control two sets of markers within the oscilloscope graticule. You use markers to make more accurate measurements of waveform events than you could make visually.

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 that you want to use, press the **[Markers]** key until the mode appears in the pop-up dialog box.
- To turn on Marker A, push the Position knob until the marker that you want to move appears in the pop-up dialog box.

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

- To turn on Marker B, push the Position knob until the marker that you want to move appears in the pop-up dialog box.

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

- To move a marker, turn the Position knob.

In Measurement Marker mode, the marker position cannot be changed.

#### To use the quick measurements

The action taken when the **[Multi Purpose]** key is pressed depends on the feature selected in the Customize Multipurpose dialog box. The default feature is QuickMeas (quick measurements), which is described as follows.

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

The five preset measurements defined in the Quick Measurement configuration are enabled and results are displayed on the screen for the first waveform source. The factory default measurements are: Vp-p, Period, Frequency, Rise time, and Fall time.

- 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.

The measurement results disappear from the screen.

See the Infiniium oscilloscope application's online help (described in Chapter 4) for information on how to configure the quick measurement capability, using the Customize Measurement feature of the graphical interface.

## Using the Graphical Interface

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

### Graphical User Interface Layout

The graphical interface looks like the following two figures.

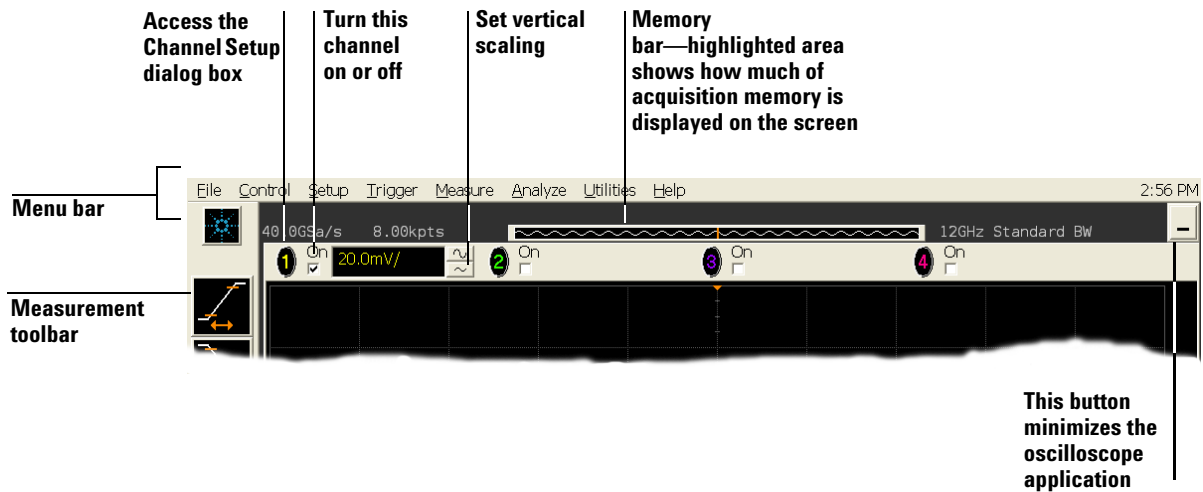
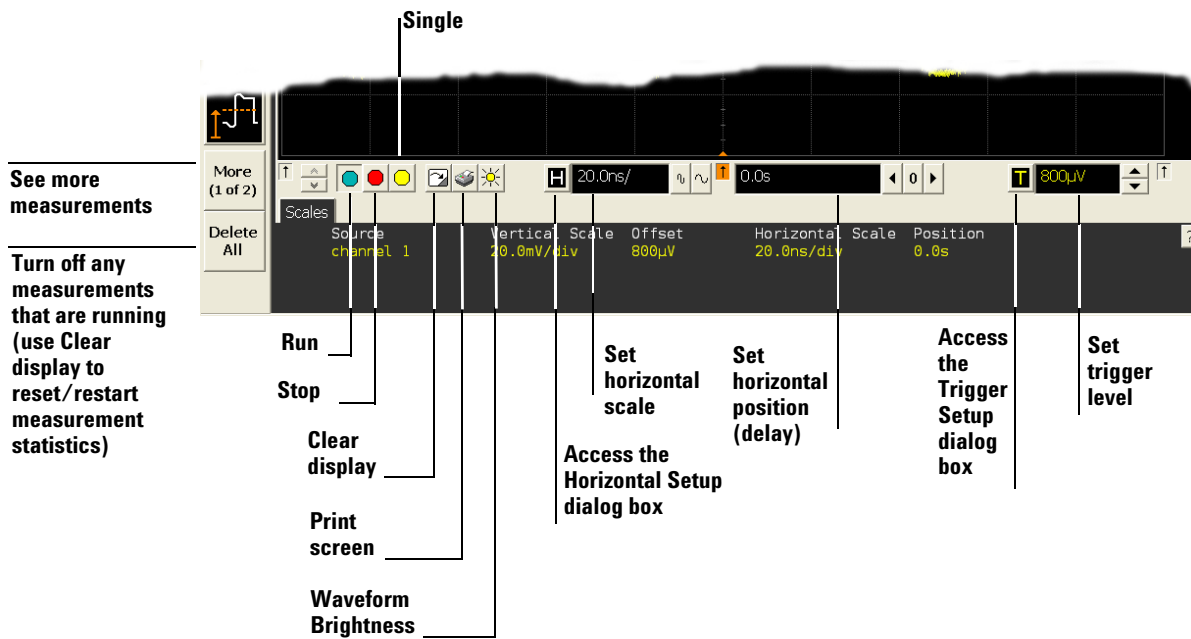


Figure 18 Infiniium Oscilloscope Top of Display





**Figure 19** Infiniium Oscilloscope Bottom of Display

To make it easy to see which controls affect each waveform, the oscilloscope uses color consistently throughout the graphical interface. These colors match the ones used on the front-panel channel inputs. For example, the color of the waveform for channel 1 matches the color for that channel. If channel 1 is the trigger signal, all of the trigger configuration items, including the trigger level reference icon (at the right side of the waveform display area), will match that color. The buttons associated with that channel, vertical scaling and offset settings, ground reference indicator, and measurements done on that channel also have the same color.

The graphical interface is arranged so that the most common functions affecting the waveform display are located around the edge of the waveform viewing area. These include the measurement toolbar, horizontal and trigger toolbar, and vertical toolbar.

### Measurement Toolbar

The measurement toolbar contains icons representing the most commonly used automatic measurements built into the oscilloscope.

**Drag and Drop Measurements** By dragging one of the measurement icons to a waveform in the waveform display area, you can make that measurement on the waveform. As you drag a measurement icon around the screen, the icon outline changes color to match the color of the closest waveform. This makes it easy to see which waveform will be measured when you drop the

icon. For those measurements that are done on waveform features, the measurement is made at the feature closest to the location where you dropped the icon. For example, you might want to measure the rise time of the fifth rising edge; dropping the rise time measurement icon at that edge will cause the measurement to be made on that edge.

You can also make a measurement by simply clicking the icon on the measurement toolbar, then selecting the source to be measured in the dialog box that appears. When you start a measurement this way, any measurements on waveform-specific features will measure the feature closest to the horizontal reference indicator.

Each waveform can have multiple simultaneous measurements and the measurements can all be of the same type, if desired. For example, you can have three pulse width measurements on different parts of the same waveform.

**Geometric Measurement Indicators** For each measurement currently running, a geometric indicator at the measurement location on the waveform corresponds to an identical indicator in the measurement results readout. This makes it easy for you to verify that the readout shows results for the correct waveform and the correct feature on that waveform. See Figure 41 for an example.

**Tool Tips** To find out what a particular measurement tool does, move the mouse pointer over it for a moment. A small popup will appear that describes the measurement.

**Other Measurement Features** There are more measurements available than will fit on a single toolbar. Click the More (1 of 2) or More (2 of 2) icons to see other measurements. Clicking Clear All will remove all selected measurements from the waveform display area.

#### Tab Display Area

The tab display area is located beneath the waveform viewing area.

Minimize and maximize tabs buttons

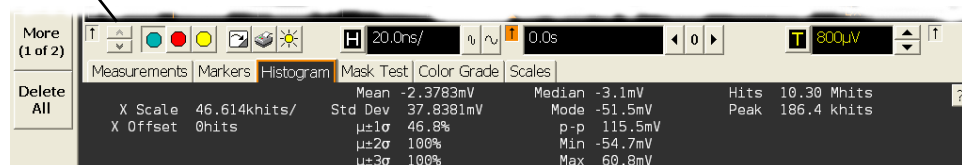


Figure 20 Tab Display Area

The display area shows information and statistics for the particular tab that is selected. The type of markers that are shown in the waveform viewing area depend on the tab that you have selected. The selected tab has an orange border to reflect the type of markers being displayed. For example, when the Histogram tab is selected, the markers are histogram markers and are used to define the histogram window.

### Waveform Display Area

The waveform display area shows the waveforms, and optionally, the results of your measurements. Several display options, including a grid, are available and can be configured using the graphical interface.

**Waveform Manipulation** When using the graphical interface, two features are available that can simplify your work with waveforms:

- **Direct Manipulation** – you can use the mouse to click and drag waveforms to new vertical positions, which changes the vertical offset, or to new horizontal positions, which changes the horizontal position or delay value.
- **Zoom** – you can click and drag a rectangular area on the display, then click the Waveform Zoom menu item to zoom on that section of displayed waveforms. The oscilloscope does this in one of two ways. If acquisition is stopped, the magnification is done by the oscilloscope software. If acquisition is running, the oscilloscope automatically adjusts the vertical scaling and offset and the horizontal scale and position to present the zoomed section of the waveforms.

See “To zoom on a section of the waveform” on page 71.

#### 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** A small symbol is shown at the right side of the waveform display area for each waveform that is on, including channels, waveform memories, and functions. This symbol represents the ground reference point for each channel; it moves when you change the vertical offset. You can also drag this symbol up and down using the mouse or touch screen; doing so automatically changes the vertical offset for that waveform.

#### Menu Control and Menus

The display looks like Figure 18 and Figure 19, including a menu bar, measurement toolbar (if enabled), and graphical controls for vertical, horizontal, trigger, and acquisition.

You can use the menu bar for most oscilloscope configuration functions. *Context-sensitive* menus, which pop up to provide a selection of commands within particular regions of the user interface, are available in the following regions:

- Memory bar.
- Waveform display area.
- Measurement toolbar.
- Horizontal and acquisition controls.

You display a context-sensitive menu by clicking the right mouse button with the pointer in one of these regions. For more information on context-sensitive menus, see [“To select a command from a context-sensitive menu”](#) on page 58.

**Vertical Settings and Controls** The top of the waveform display area includes the vertical settings and controls. All channels are shown with the corresponding vertical scaling settings in volts per division. Each has a checkbox allowing you to turn that channel on or off, and a set of controls allowing you to change the vertical scaling. Clicking directly on the vertical scaling value displays a pop-up numeric keypad allowing you to set a precise vertical scale.

#### Horizontal and Trigger Toolbar

At the bottom of the waveform display area is the horizontal and trigger toolbar. This toolbar includes the run/stop controls, the horizontal controls, and the trigger controls.

**Run/Stop Control** See Figure 19. At the left side of the Horizontal and Trigger toolbar are six icons:

- The leftmost is a blue-green octagon. Clicking this starts an acquisition. (Same as pressing the **[Run]** key on the front panel.)
- The next control is a red octagon. Clicking this stops acquisition. (Same as pressing the **[Stop]** key on the front panel.)
- The next control is a yellow octagon. Clicking this starts a single acquisition. (Same as pressing the **[Single]** key on the front panel.)
- The next control is a small windshield wiper. Clicking this clears acquired waveform data from the display. (Same as pressing the **[Clear Display]** key on the front panel.)

- The next control is a printer. Clicking prints the screen to the default printer.
- The rightmost control is the waveform brightness control.

**Horizontal settings and controls** The middle of the Horizontal and Trigger toolbar contains the horizontal settings and controls. Leftmost is a button, labeled with an “H.” Clicking this displays the horizontal setup dialog box.

Next is the current horizontal scale. Clicking this displays a pop-up numeric keypad so you can set a particular horizontal scale. Or, you can click the two icons to the right of the horizontal scale setting to cycle through the preset speeds. The left icon shrinks the waveform, which decreases the horizontal scale and increases the time per division. The right icon stretches the waveform, which increases the horizontal scale and decreases the time per division.

Next is the horizontal position (delay) setting. Clicking this displays a pop-up numeric keypad that lets you set a particular position. Or, you can use the three icons to the right. The left arrow moves the waveform to the left, the center “0” resets the delay to zero, and the right arrow moves the waveform to the right.

Across the toolbar are three vertical arrows. These are the left, center, and right horizontal reference indicators. Clicking one of these arrows moves the horizontal position to the respective horizontal reference position on the display—left, center, or right. Assuming the horizontal position is at zero:

- Left means the information on the display is all post-trigger.
- Center means the information to the left of center is pretrigger; to the right is post-trigger.
- Right means the information on the display is pretrigger.

The horizontal position value represents the time relative to the trigger at the respective horizontal reference. When you change the horizontal scale, the waveforms expand and contract about this reference position.

**Trigger settings and controls** The right side of the Horizontal and Trigger toolbar contains the trigger settings and controls. These will vary depending on the current trigger configuration, which can be set using the front panel and the graphical interface. Advanced trigger configuration items are available only through the graphical interface. You can click the button labeled with a “T” to bring up the trigger setup dialog box.

When the scope is set for edge trigger on a particular channel, the trigger level setting is shown. You can click it to display a pop-up numeric keypad that lets you set a particular trigger level. You can also click the up and down arrows to the right of the setting to increase or decrease the trigger

level, respectively. You can also click the trigger reference indicator at the right side of the display and drag it up or down to change the trigger level.

#### To perform basic user interface operations

- To move the pointer on the screen, move the mouse or touch the screen with the stylus and move it.
- To *click* an item in the graphical interface, point at that item with the pointer, then press and release the left mouse button or touch screen.
- To *right-click* an item in the graphical interface, point at that item with the mouse pointer, then press and release the right mouse button. The right mouse button capability is not available using the touch screen stylus.

Use the right-click operation to access context-sensitive menus. See “To select a command from a context-sensitive menu” on page 58.

- To use a *option button*, click to select the desired item.

Option buttons appear in many different dialog boxes in the oscilloscope graphical interface. See the Persistence option buttons in Figure 21. You can choose only one option at a time.

- To use a *check box*, click with the pointer in the box.

A check mark in the box indicates that item is selected. See the Color Grade check box in Figure 21. To clear the selection, click with the pointer in the box.

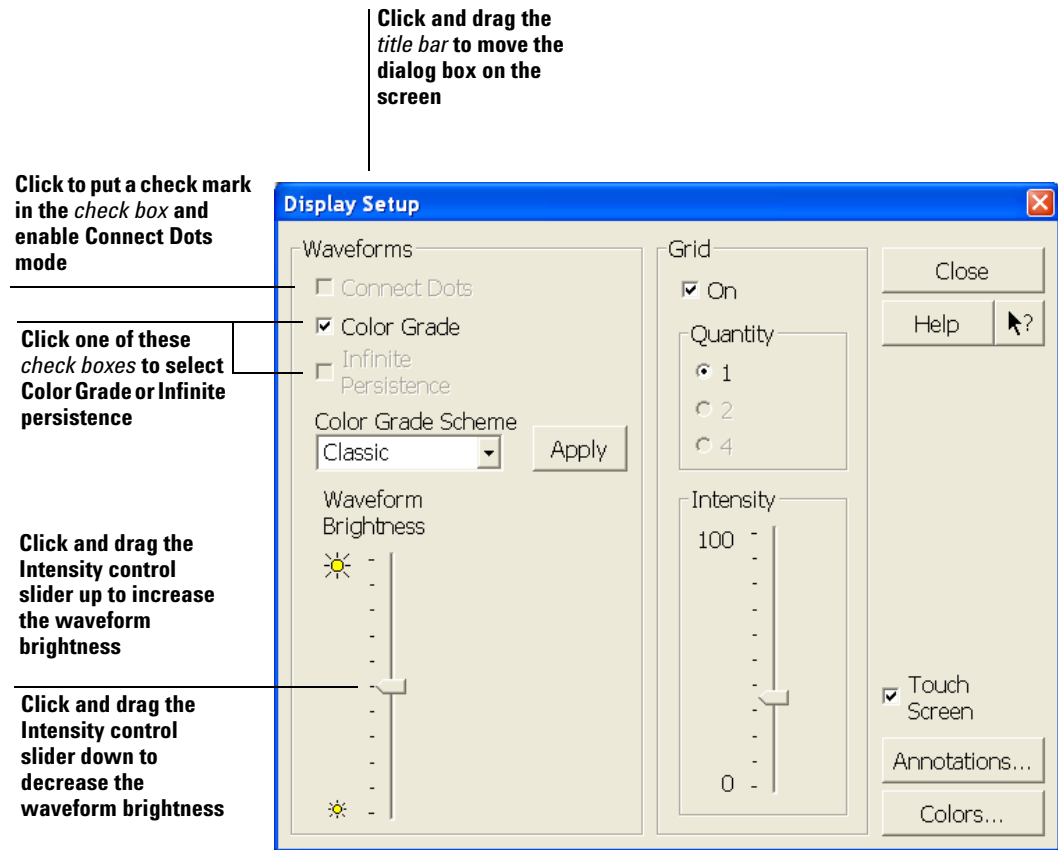
- To use a *drop-down list box*, click the arrow at the right side of the box. Then click the desired choice to highlight it.

See the Multipurpose selection list box in Figure 23.

- To use a *spin box*, click the up arrow to increase the value displayed in the box, and the down arrow to decrease it.

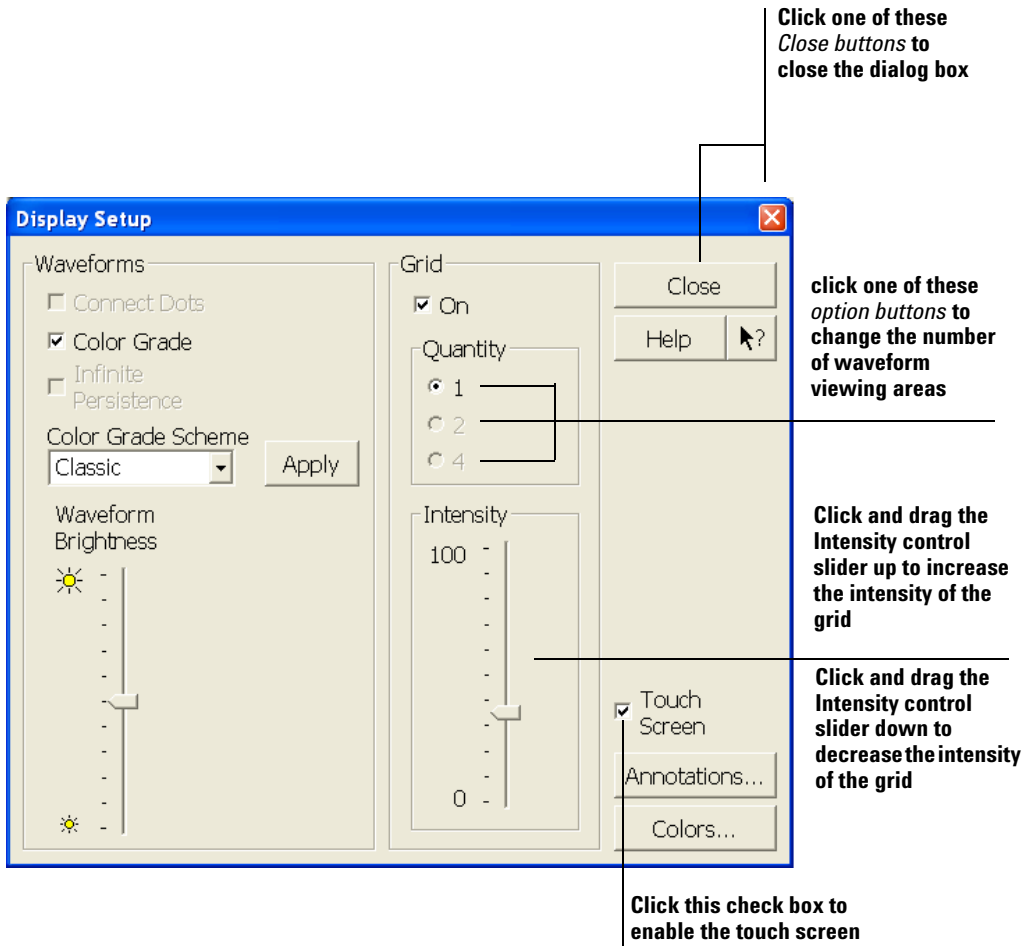
See the Suffix spin box in Figure 23.

- To move a *dialog box*, press and hold the left mouse button or touch screen stylus with the pointer in the *title bar*, drag the box to a new position on the screen, then release.
- To close a *dialog box*, click the “X” symbol in the upper right corner of the box, or click **Close** in the box.



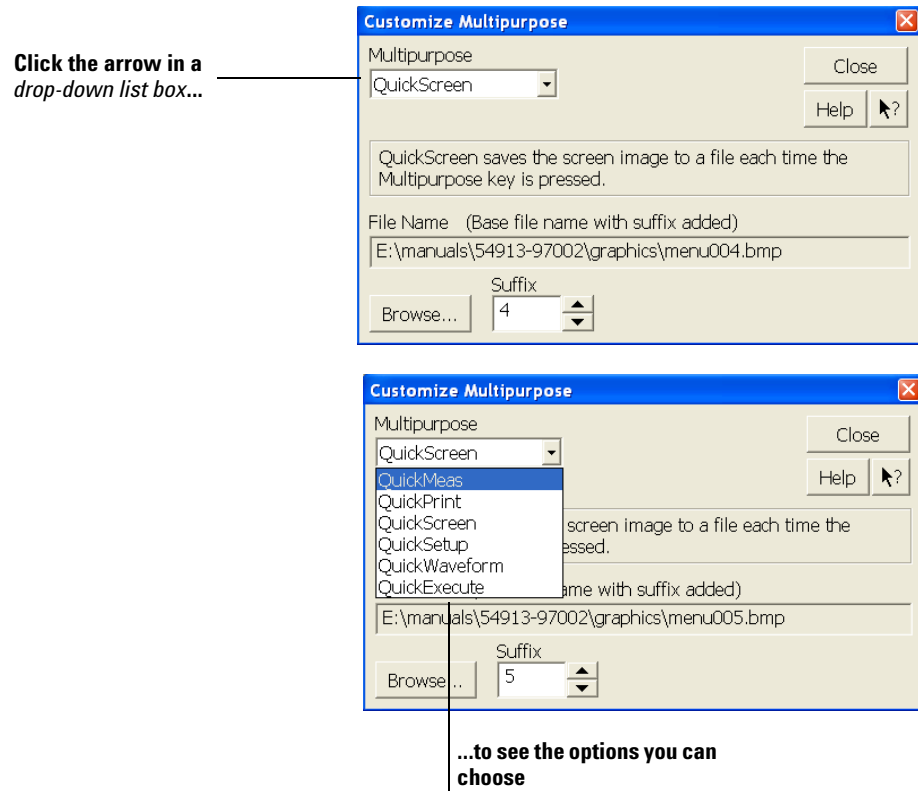
**Figure 21** Dialog Box Interface Elements

### 3 Using the Oscilloscope



**Figure 22** Dialog Box Interface Elements





**Figure 23** Dialog Box with a Drop-Down List Box

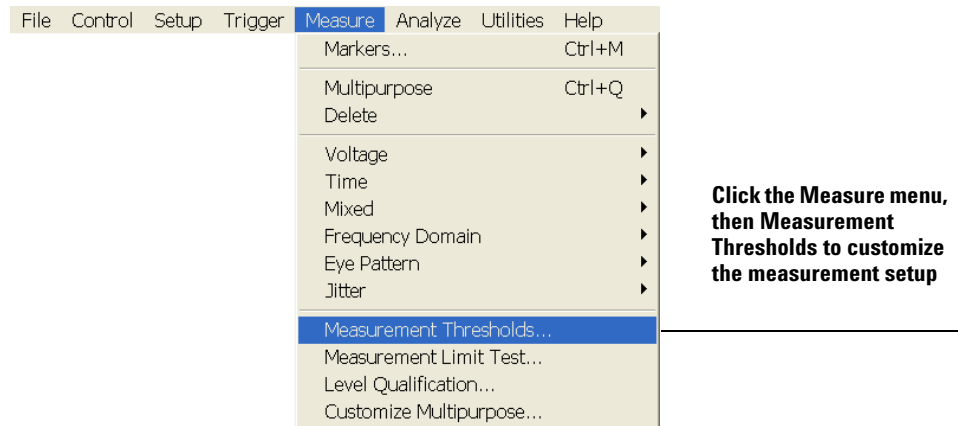
### To select a command from the menu bar

- 1 Click a menu bar item.
- 2 Move the pointer to the desired menu item.
- 3 Click the mouse button or touch screen.

The desired command is executed, or a dialog box is presented for you to configure the oscilloscope.

If you continue to hold the mouse button after step 1, release the button in step 3 to execute the command.

Some menus have submenus. These are indicated by an arrow at the right side of the command. When you move the pointer to one of these menu commands, the submenu automatically appears. You can then move the pointer to the desired command on that submenu and click the mouse button or touch screen to execute the command.



**Figure 24** Selecting a Command from the Menu Bar

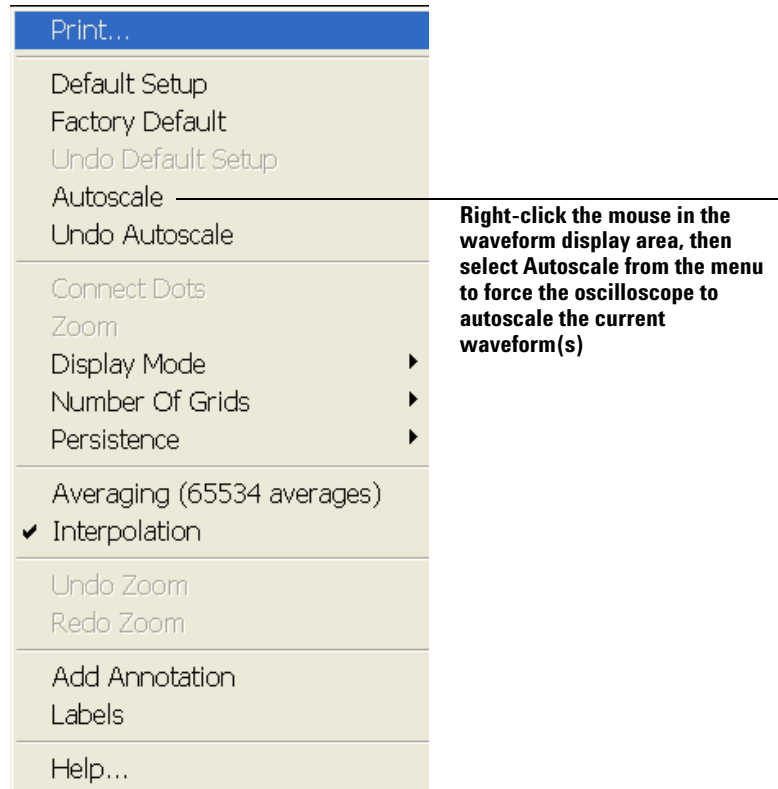
#### To select a command from a context-sensitive menu

- 1 Move the mouse pointer to a particular area of the display in which you want to change the oscilloscope configuration.

*Context-sensitive menus* provide quick access to commands and configuration items that relate only to the context of the particular graphical interface item in which they are found. They are available in the following display areas: memory bar, measurement toolbar, waveform display area, and horizontal settings and controls.

- 2 Click the right mouse button. Right click is not available using the touch screen stylus.
- 3 Move the pointer to the desired menu item.
- 4 Click the left or right mouse button.

If you continue to hold the mouse button after step 2, release the button in step 4 to execute the command.



**Figure 25** Selecting a Command from a Context-Sensitive Menu

### 3 Using the Oscilloscope

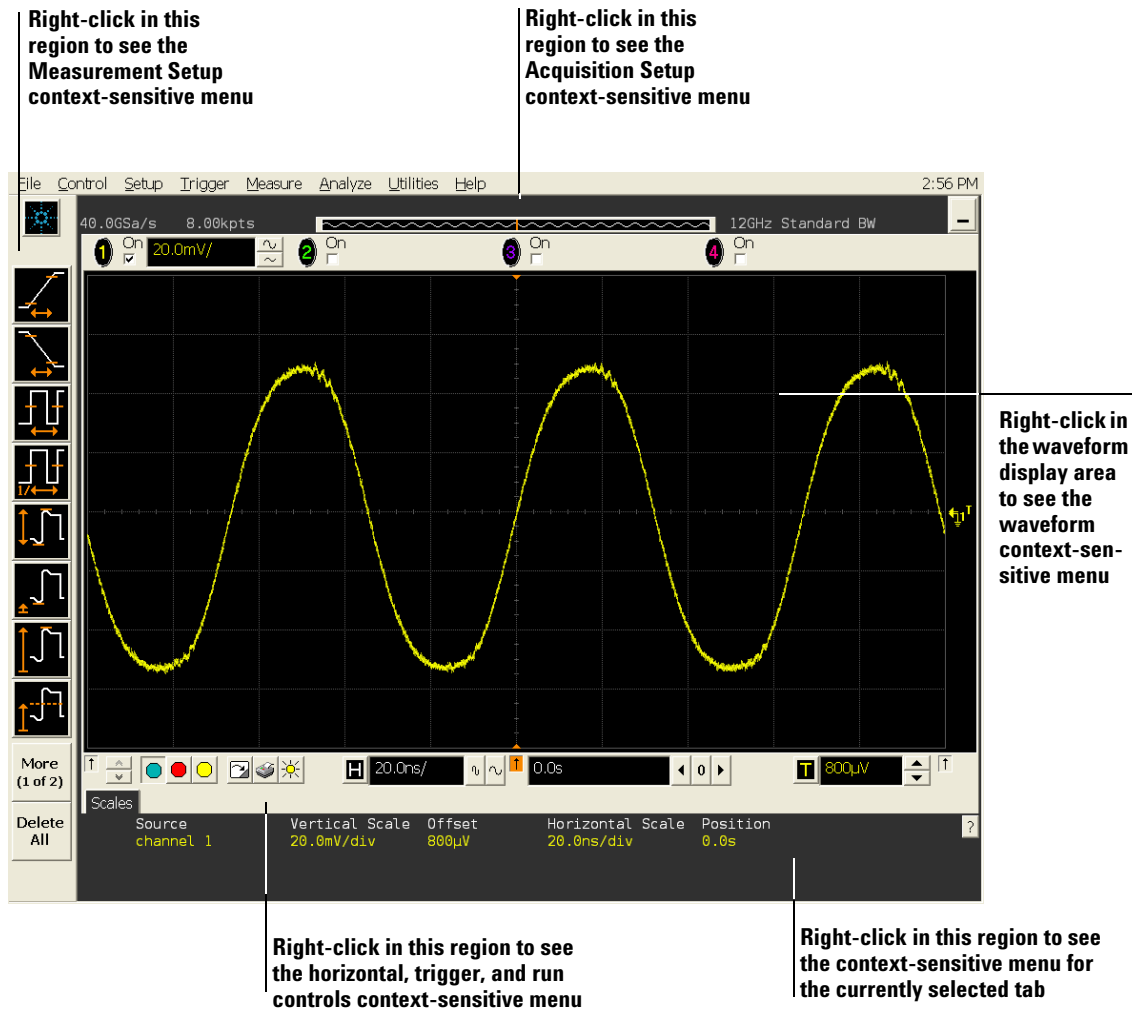


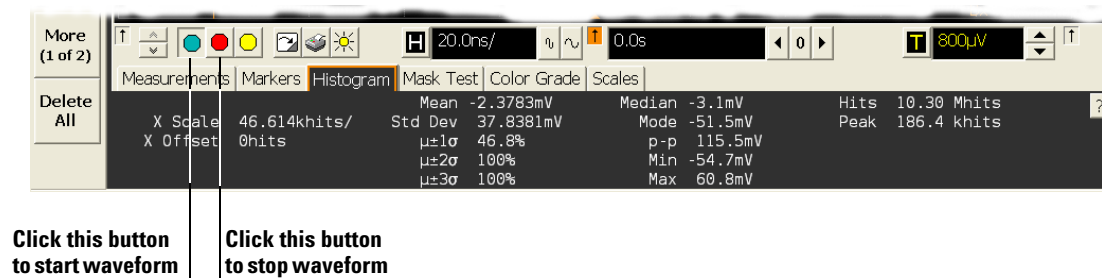
Figure 26 Location of Context-Sensitive Menus

## To start and stop waveform acquisition

- To start waveform acquisition, click the start button at the bottom of the waveform display area.
- To stop waveform acquisition, click the stop button at the bottom of the waveform display area.

See Figure 27.

You can still use the **[Run/Stop]** key on the front panel.



**Figure 27** Start and Stop Icons

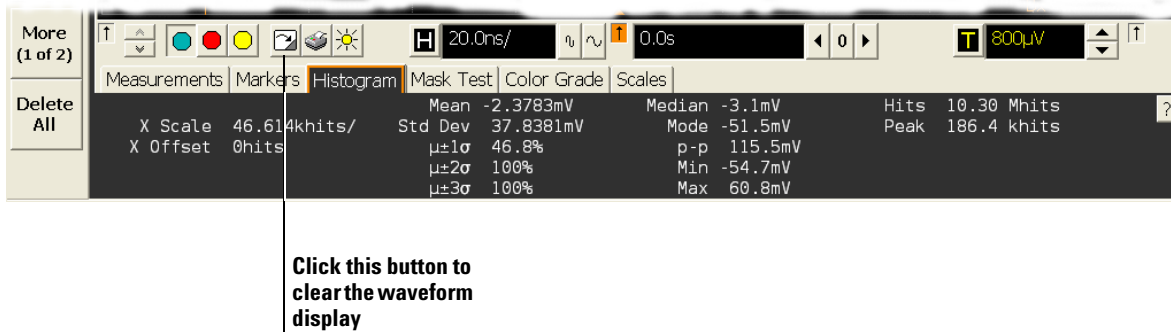
## To clear the waveform display

- Click the clear display button at the bottom of the waveform display.

See Figure 28.

You can still use the **[Clear Display]** key on the front panel while the graphical interface is enabled.

Clearing the display removes all displayed waveform data in preparation for another acquisition. It also resets all automatic measurements and measurement statistics.



**Figure 28** Clearing the Display

### To print the screen

- Click the print button at the bottom of the waveform display.

See Figure 29.

Infiniium prints the screen to the default printer according to the configuration that you have selected in the Windows Control Panel.

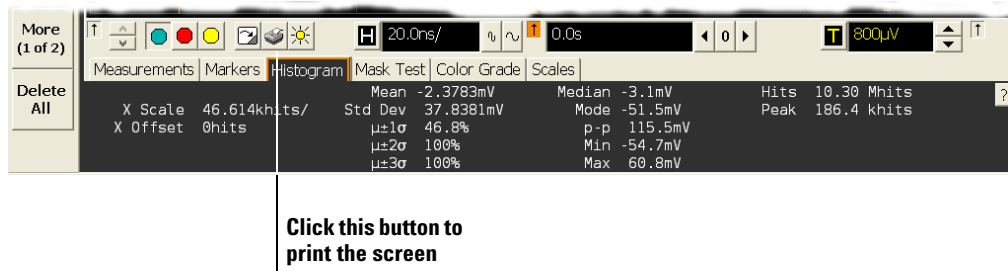


Figure 29 Printing the Screen

### To change waveform brightness

- Click the waveform brightness button at the bottom of the waveform display.

See Figure 30.

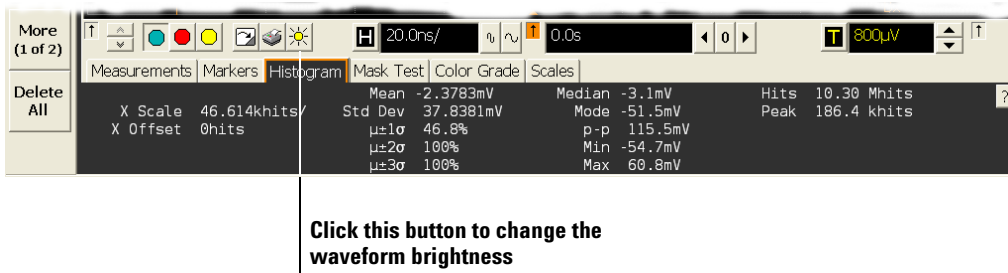


Figure 30 Changing Waveform Brightness

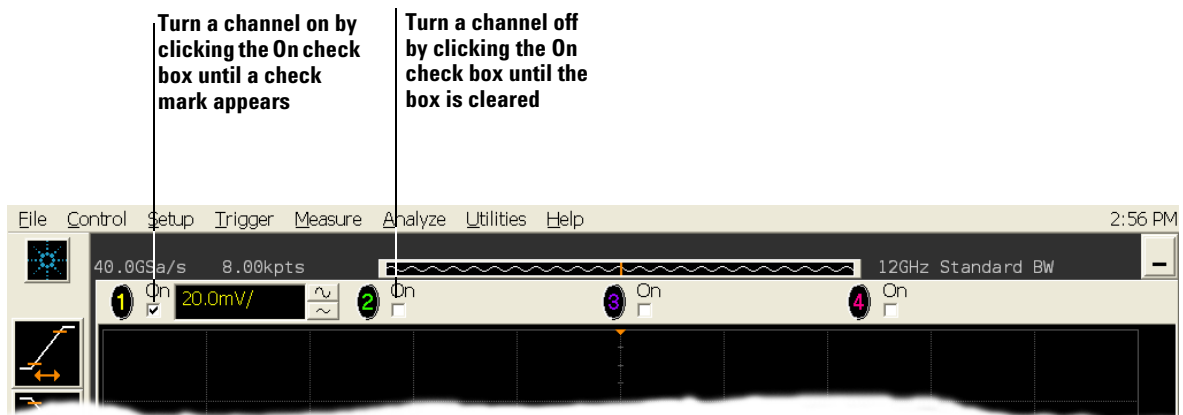
## To turn a channel on or off

- To turn a channel on, click the check box next to the channel number so that a check mark appears in the box. To turn a channel off, click the check box again to clear it.

See Figure 31.

If you are not using a channel, you can turn it off. This simplifies the waveform display and also increases the display update rate. When you turn off a channel, the current vertical scaling factor and vertical scale buttons for that channel disappear. They re-appear when you turn the channel on.

You can also turn a channel on or off by using the Channel Setup dialog box, or by using the front panel key for that channel.



**Figure 31** Turning a Channel On or Off

## To adjust the vertical offset

- Click and hold the left mouse button or touch screen stylus on the waveform you want to move, then drag the pointer up or down to move the waveform to the desired offset. Release when finished.

or

- Click and hold the left mouse button or touch screen stylus on the ground reference indicator for the waveform you want to move, then drag the pointer to move the waveform to the desired offset. Release when finished.

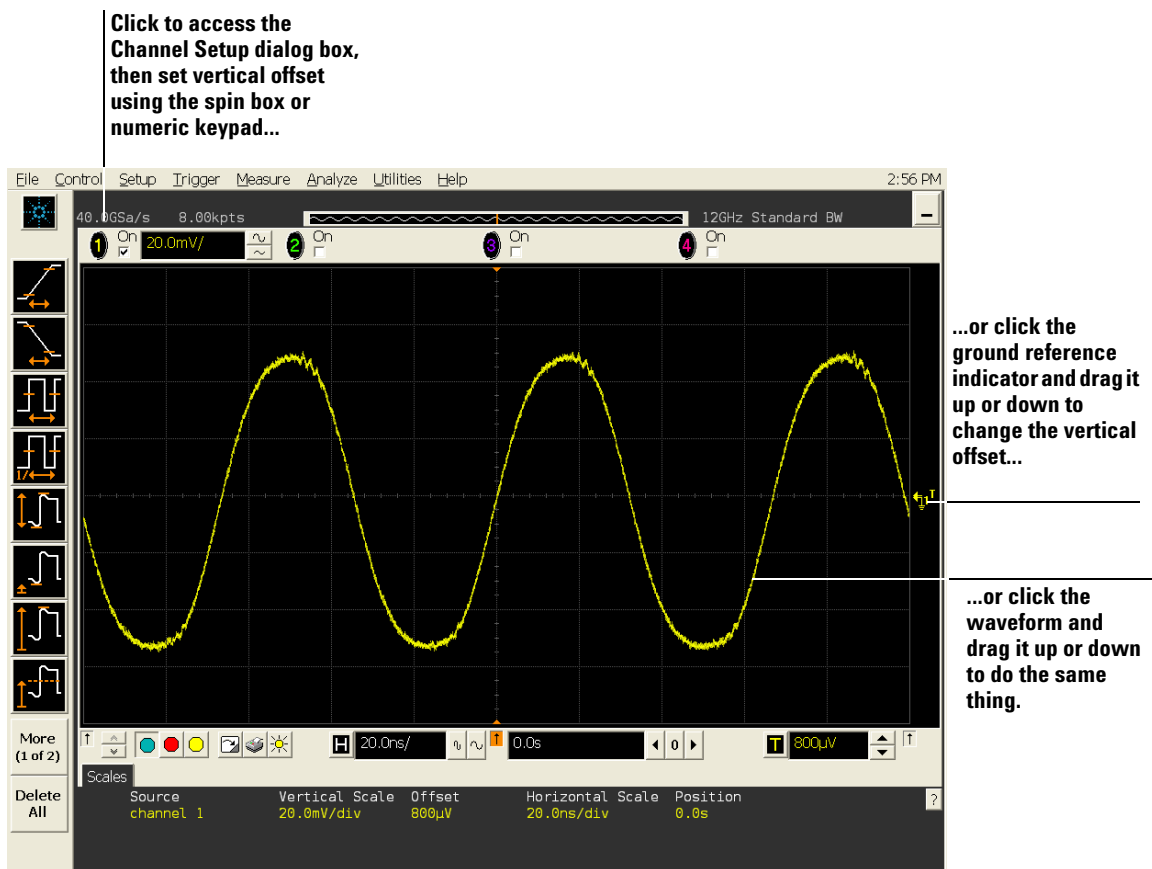
or

- Click the channel button in the vertical toolbar, then set the vertical offset using the spin box control in the Channel Setup dialog box.

### 3 Using the Oscilloscope

If you leave the mouse pointer on the waveform (without clicking), the pointer changes into crossed arrows as a visual indicator that you can drag the waveform when you click and hold. If you move the crossed arrow pointer up or down, the interface constrains the movement vertically and adjusts vertical offset only. If you initially move the crossed arrow pointer left or right, the interface constrains the movement horizontally and changes the horizontal position setting only.

You can also adjust the vertical offset through the Channel Setup dialog box. See “To access the channel setup” on page 66.



**Figure 32** Adjusting Vertical Offset



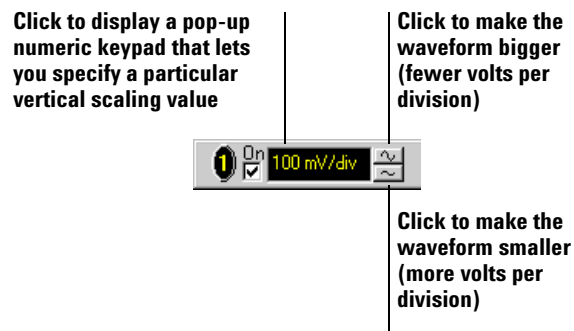
## To adjust vertical scaling

- To make the waveform bigger, click the larger waveform button next to the channel number near the top of the display. To make the waveform smaller, click the smaller waveform button.

See figure 33. The number of volts per division decreases.

The number of volts per division increases. The current setting in volts per division is shown next to the waveform buttons for the channel. Notice that the setting is color-coded to match the waveform color for easy recognition.

You can also adjust the vertical scaling by clicking the current setting, which is shown next to the waveform buttons for the channel. This displays a pop-up numeric keypad that lets you set an exact value for the scaling. Or, you can adjust the vertical scaling through the Channel Setup dialog box. See [“To access the channel setup”](#) on page 66.



**Figure 33** Adjusting Vertical Scaling

### To access the channel setup

- Click the channel number button at the top of the waveform display.
- or
- Select the desired channel from the Setup menu.

With the channel setup dialog box, you can set the vertical scaling, offset, input coupling, and input impedance. It also lets you specify the characteristics of the probe, using the Probes button. You can set attenuation ratio, attenuation units, and measurement units for the probe, or perform a probe calibration.

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

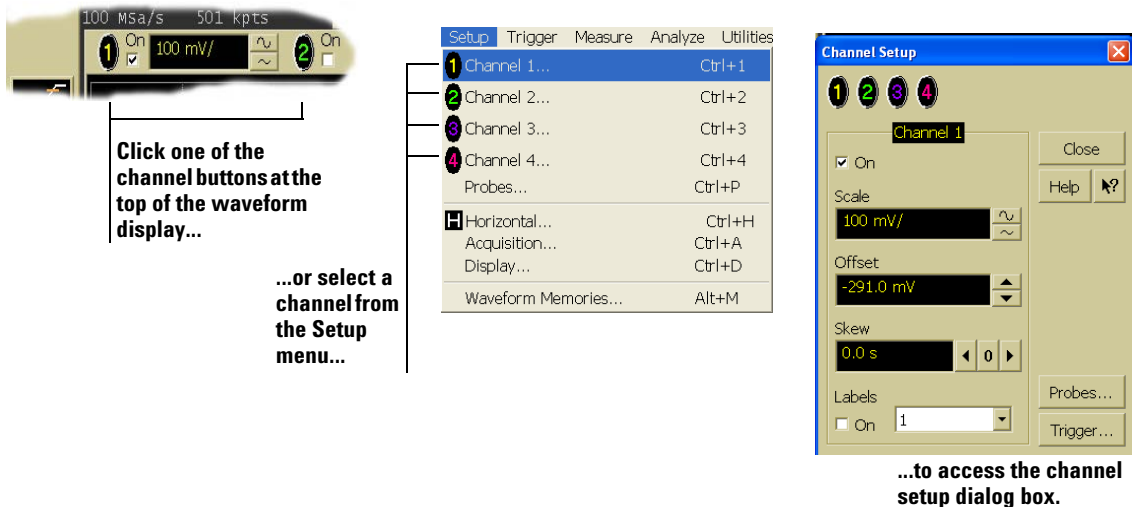


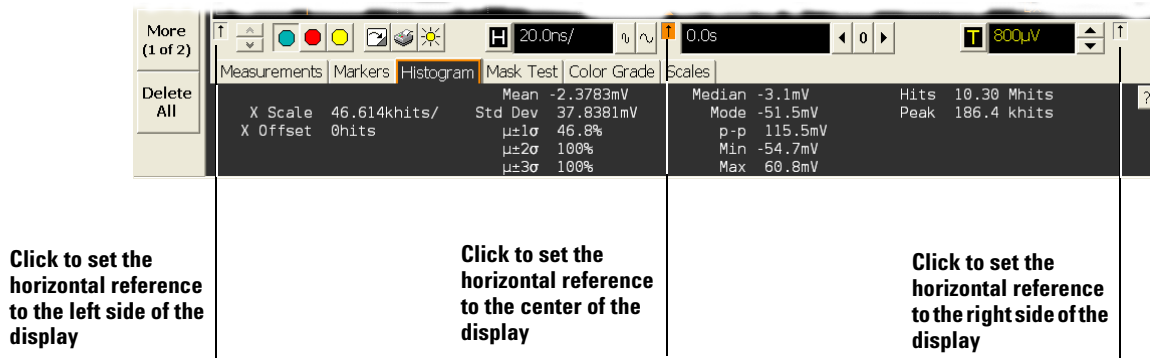
Figure 34 Accessing the Channel Setup

## To set the horizontal reference point

- Click one of the arrows at the bottom of the waveform display.

The selected horizontal reference is highlighted.

The vertical arrows at the bottom of the display correspond to the left, center, and right horizontal reference points. This is the position of the trigger if the horizontal position is set to zero delay. A non-zero horizontal position value is the time relative to the trigger event at the selected horizontal reference point.



**Figure 35** Horizontal Reference Points

### To adjust horizontal scale

- To stretch the waveform horizontally, click the larger waveform button next to the horizontal scale setting at the bottom of the waveform display. To shrink the waveform horizontally, click the smaller waveform button.

See Figure 36. The oscilloscope decreases or increases the number of seconds per division based on your selection.

You can also adjust the horizontal scale by clicking the current setting. This displays a pop-up numeric keypad that lets you set an exact value for the horizontal scale. Or, you can adjust the horizontal scale through the Horizontal Setup dialog box. See “To access the horizontal setup” on page 70.

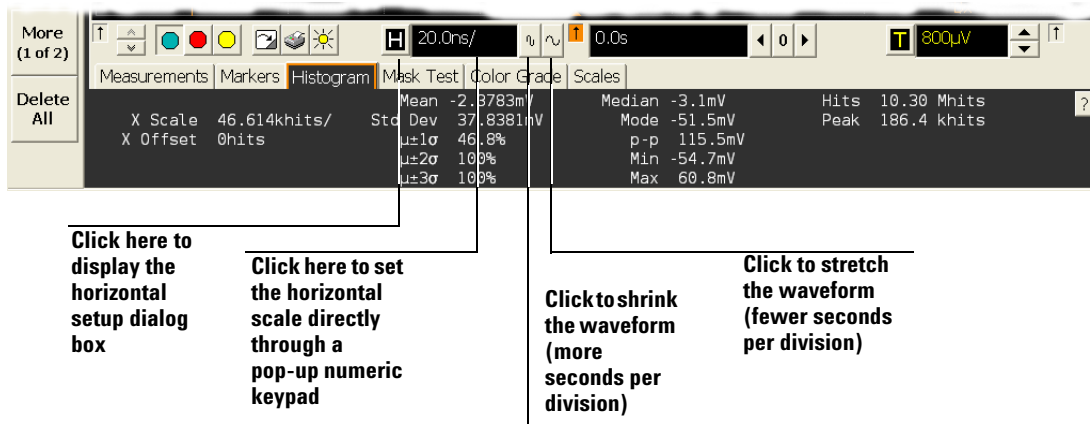


Figure 36 Adjusting Horizontal Scale

## To adjust horizontal position

The *horizontal position* is the time relative to the trigger at the highlighted horizontal reference point.

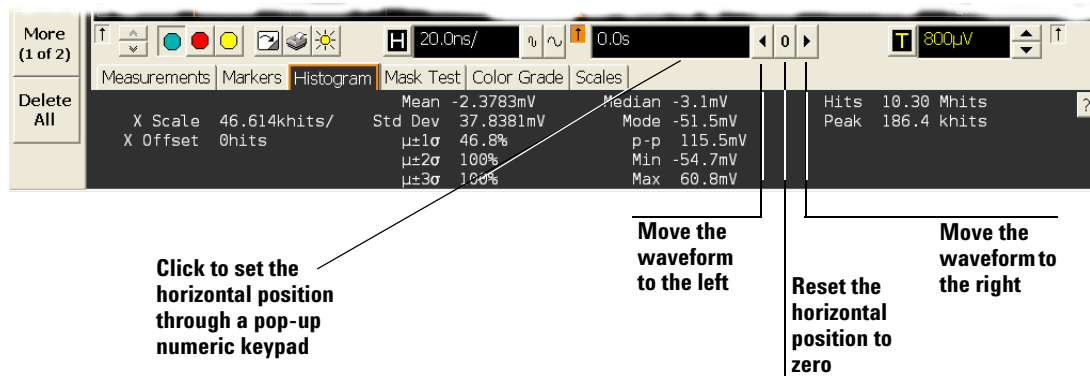
- To zero the horizontal position, click the 0 button next to the position value at the bottom of the waveform display.

This will position the trigger event at the highlighted horizontal reference point.

- To move the waveform to the right or left, click the right or left arrow next to the position value at the bottom of the waveform display. Or, click and hold the mouse button on the desired waveform and drag the waveform to the right or left. Release the mouse button when the waveform is in the desired position.

When you click and drag a waveform, this changes the horizontal position for all channels and functions on the display, but not that of waveform memories.

You can also adjust the horizontal position through the horizontal setup dialog box.



**Figure 37** Adjusting Horizontal Position

### To access the horizontal setup

- Click the horizontal setup button at the bottom of the waveform display.
- or
- Select Horizontal from the Setup menu.

See Figure 38.

Using the Horizontal Setup menu, you can set scale, position, and the horizontal reference. You can also set up the delayed time base window, which uses software expansion to present a magnified view of an area of the waveform. See the Infiniium oscilloscope application’s online help (described in Chapter 4) for details.

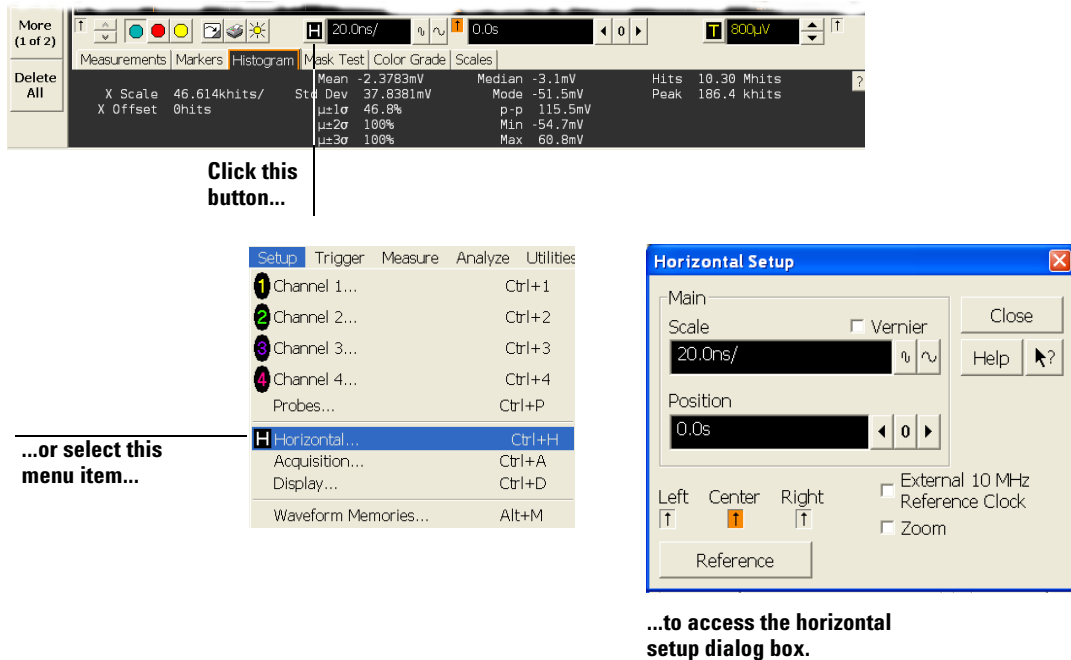


Figure 38 Accessing the Horizontal Setup

## To zoom on a section of the waveform

- 1 Click and hold the left mouse button or touch screen stylus in a blank space within the waveform display area, then drag the pointer to draw a rectangle around the areas of interest on the waveform(s), then release.
- 2 Click the Waveform Zoom menu item.

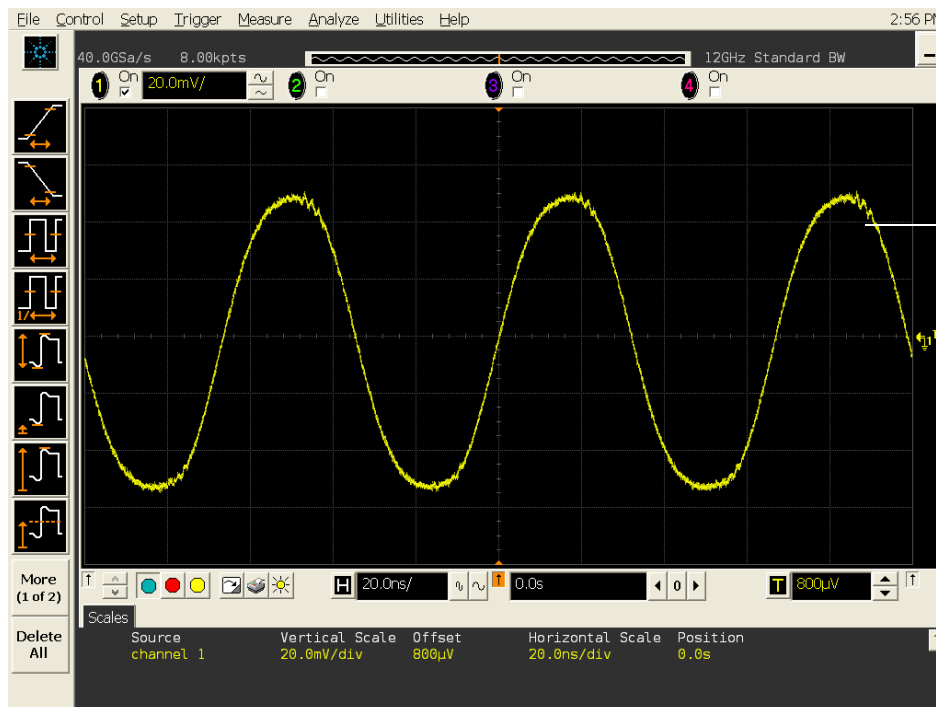
How the zoom takes place depends on whether acquisition is running or stopped. If running, the oscilloscope adjusts vertical scale, vertical offset, horizontal scale, and horizontal position as necessary to best rescale the area you defined in step 1. If stopped, the oscilloscope does a software magnification of the waveform.

In either case, a small dialog box appears in the corner of the screen, with an “Undo” button; by clicking this button, you will undo the zoom and return the oscilloscope to its previous settings.

### NOTE

#### Avoid Overdriving the Vertical Input Amplifiers

When the oscilloscope is running, the input waveform can overdrive the vertical input amplifiers if you expand the vertical excessively. The result is distortion of the waveform. Ensure that you select a region that will keep all of the waveform on the screen vertically.



**Figure 39** Zooming on a Section of the Waveform

## To move the markers using the graphical interface

- 1 Turn on the markers.

You can use the **[Markers]** key on the front panel, or select Markers from the Measure menu.

- 2 Click and hold the left mouse button or touch screen stylus while the mouse pointer is on one of the markers, then drag the marker to the position you want on the waveform, then release.

Clicking and 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, you can select the Markers command from the Measure menu and set the marker position precisely. See the Infiniium oscilloscope application's online help (described in Chapter 4) for details.

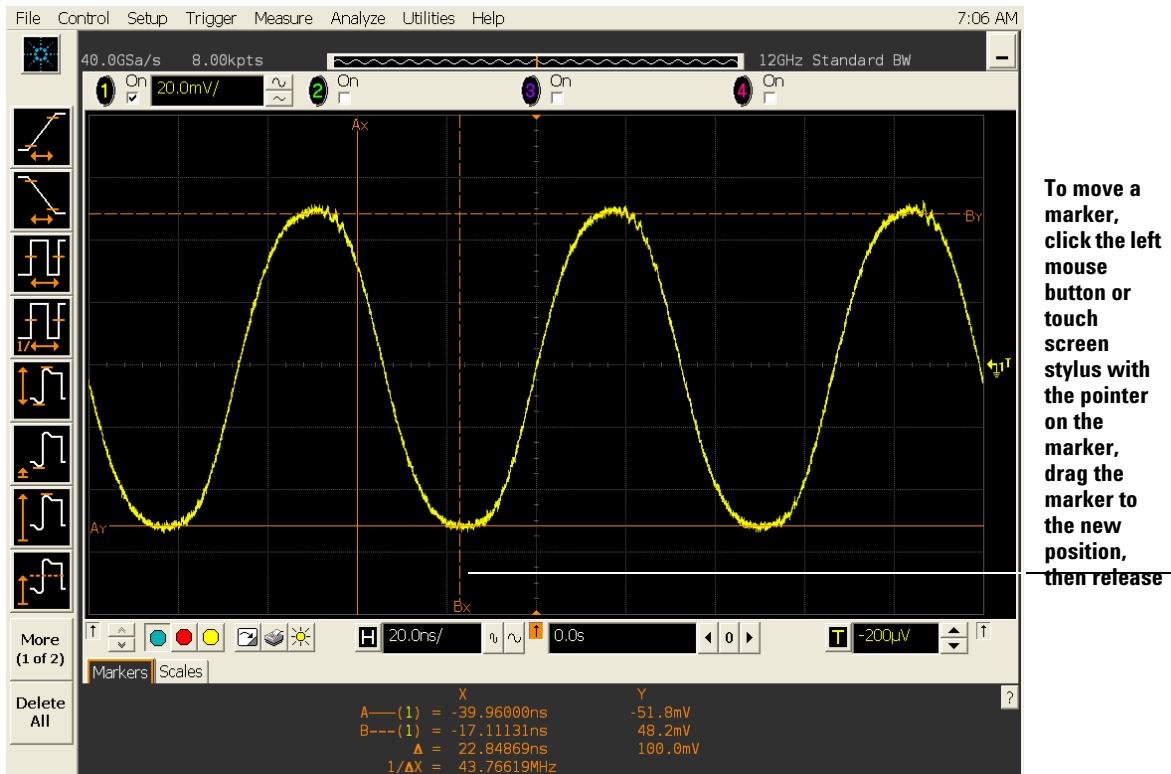


Figure 40 Moving the Markers



## To make a measurement on a waveform

- Click and hold the mouse button or touch screen stylus on a measurement icon, then drag the icon to the waveform event you want to measure then release.

or

- Click a measurement icon, then specify which source you want to measure in the dialog box that is displayed.

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.

Only the most commonly used measurements are available on the toolbar. Others are available by selecting them from the Measure menu. A few specialized measurements are available only through the remote programming command set. See the *Programmer's Reference*.

When you drag and drop a measurement icon on a waveform, notice that the icon outline changes color to match the color of each waveform it touches. This lets you easily see which waveform will be measured when you release. Also, the measurement results are also displayed in color to make it easy to see which waveform source is being measured.

For edge-sensitive measurements, when you drop the measurement icon on a waveform, a geometric icon appears in the waveform marker color. This icon shows exactly where the measurement is being made. The icon is also displayed next to the measurement results readout to associate the readout with the waveform and feature being measured. See Figure 41. This feature helps you distinguish measurement results from each other when you make multiple measurements on the same waveform, but at different waveform features. For example, a series of rise time measurements on several different edges of the same waveform all have unique geometric icons to show each measurement's location.

### 3 Using the Oscilloscope

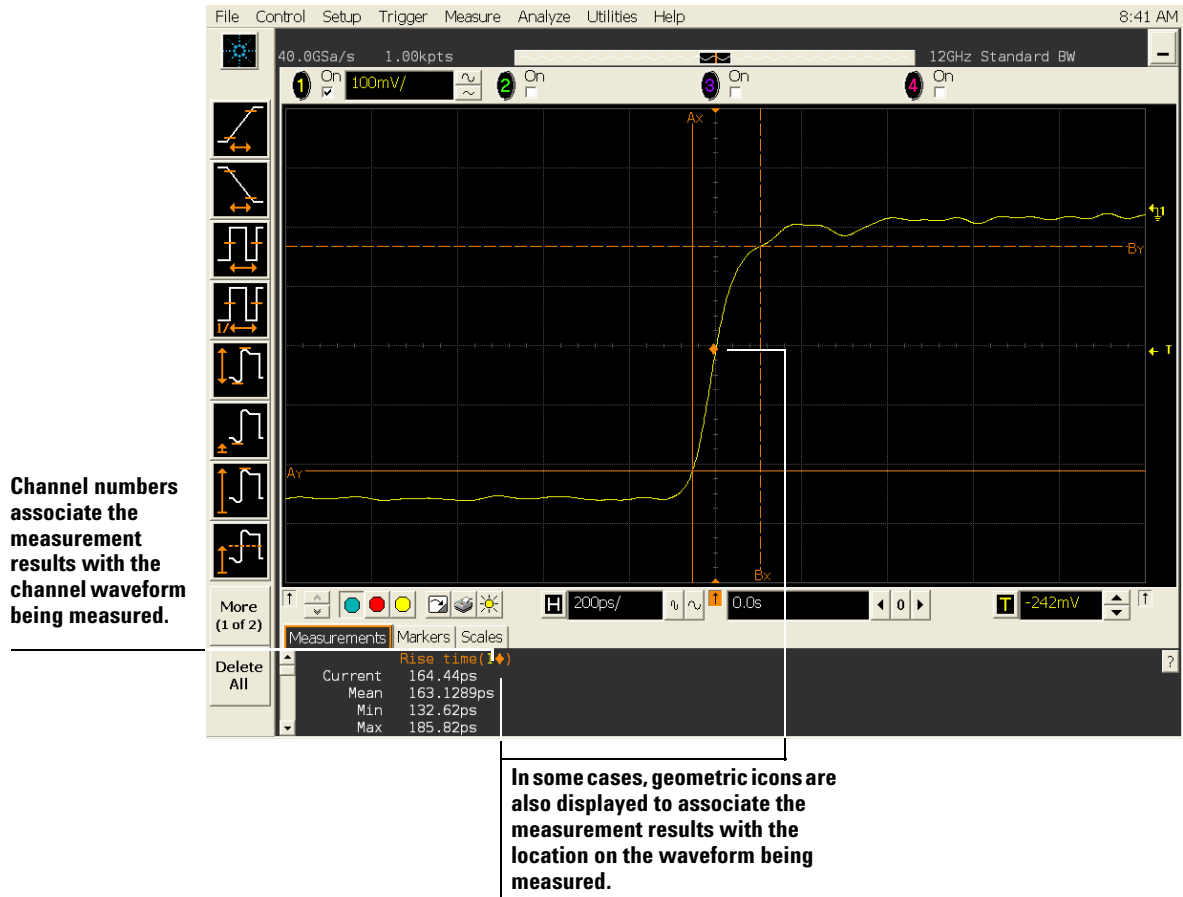
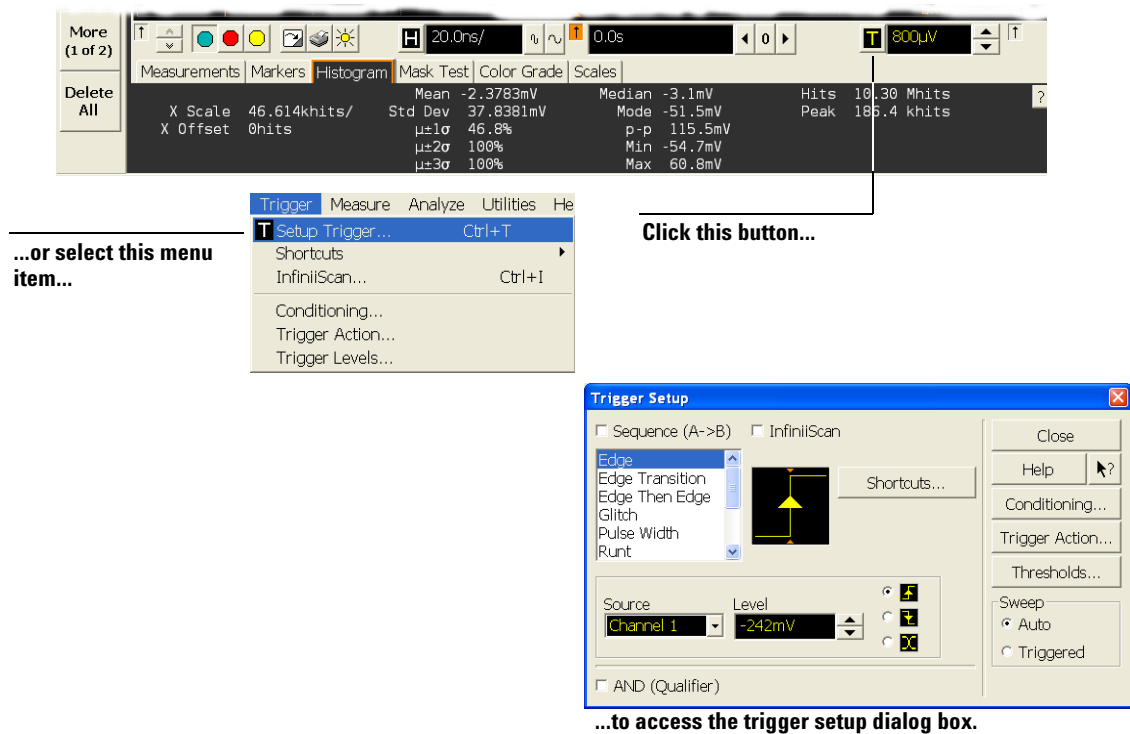


Figure 41 Waveform Measurements

## To access the trigger setup

- Click the trigger setup button at the bottom of the waveform display.
- or
- Select Trigger from the Setup menu.
- The trigger setup dialog box lets you select any of the different modes of triggering supported by the oscilloscope—Edge, Glitch, or Advanced, with choices under Advanced of Pattern, State, Delay by Time, Delay by Events, or Violation. You can set the parameters and conditions for each of those trigger modes.



**Figure 42** Accessing the Trigger Setup

### To set an edge trigger

- 1 Click the trigger setup button at the bottom of the waveform display.  
The trigger configuration dialog box appears. See “To access the trigger setup” on page 75.
- 2 Click Edge.
- 3 Click the source you want to use for the trigger signal.
- 4 Click to select the rising edge, falling edge, or both edges for the trigger source.
- 5 Set the trigger level using the spin box.

You can also click the trigger level setting to display a pop-up numeric keypad, where you can enter the trigger level directly.

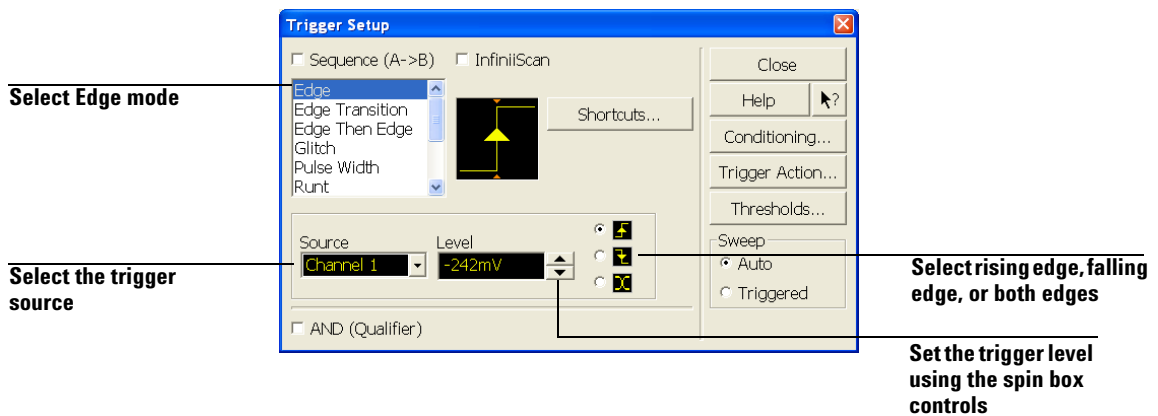
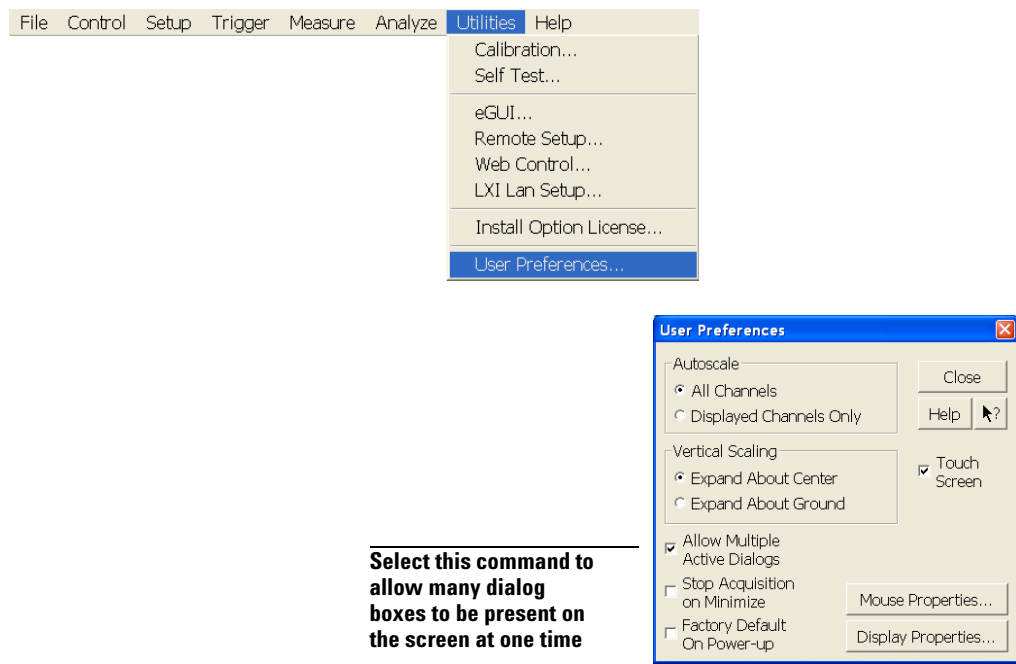


Figure 43 Setting an Edge Trigger

## To set dialog box preferences

- To allow multiple dialog boxes on the screen at a time, select Utilities, then User Preferences. Then select Allow Multiple Active Dialogs in the User Preferences dialog box.

Normally, the oscilloscope displays only one dialog box at a time, and you must close that dialog box before opening another. With Allow Multiple Active Dialogs, you can change several different aspects of the oscilloscope configuration simultaneously.



**Figure 44** Setting Dialog Box Options

## Removable Hard Drive

The Infiniium 90000 Q-Series oscilloscopes have a removable hard drive.

**CAUTION**

Power down the instrument before removal or insertion of a removable hard drive.



### To recover your Infiniium hard disk

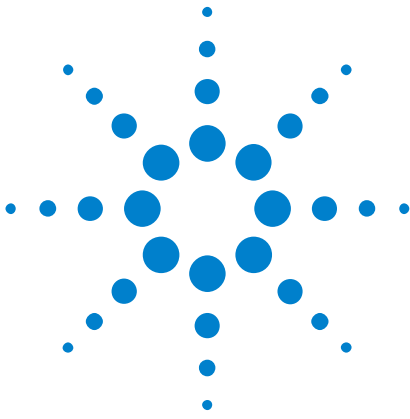
The Infiniium hard disk recovery system is contained in a hidden partition on the Infiniium hard disk. If you have to use the recovery system, the Infiniium hard disk is returned to the condition it was in when it left the factory. Before recovering the Infiniium hard disk, use the following procedure to return the Infiniium to normal operation.

- 1 Turn off the Infiniium.
- 2 Turn on the Infiniium. If the oscilloscope does not successfully restart then try recycling the power again.
- 3 After the Windows 7 load screen disappears, press and release the Infiniium [**Default Setup**] key on the front panel. If the oscilloscope still does not successfully restart, follow the instructions for recovering the hard drive.

### Infiniium Hard Drive Recovery

Use the following instructions to recover your Infiniium hard drive.

- 1 Turn off the Infiniium.
- 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 Infiniium.
- 5 When 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.



## 4 Accessing the Online Help

- To access the online help 79
- To navigate through the online help 81
- To access context-sensitive information 81

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

The online help is accessible from the menu bar and from dialog boxes. This chapter explains how to use the help to find the information you need to use the oscilloscope effectively.

### To access the online help

- Select Contents from the Help menu.

The Contents page for the oscilloscope online help is displayed.



**Figure 45** Help Menu

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

The *Using the Oscilloscope* topic is shown when you access the online help from the Help menu. It looks like the following figure.

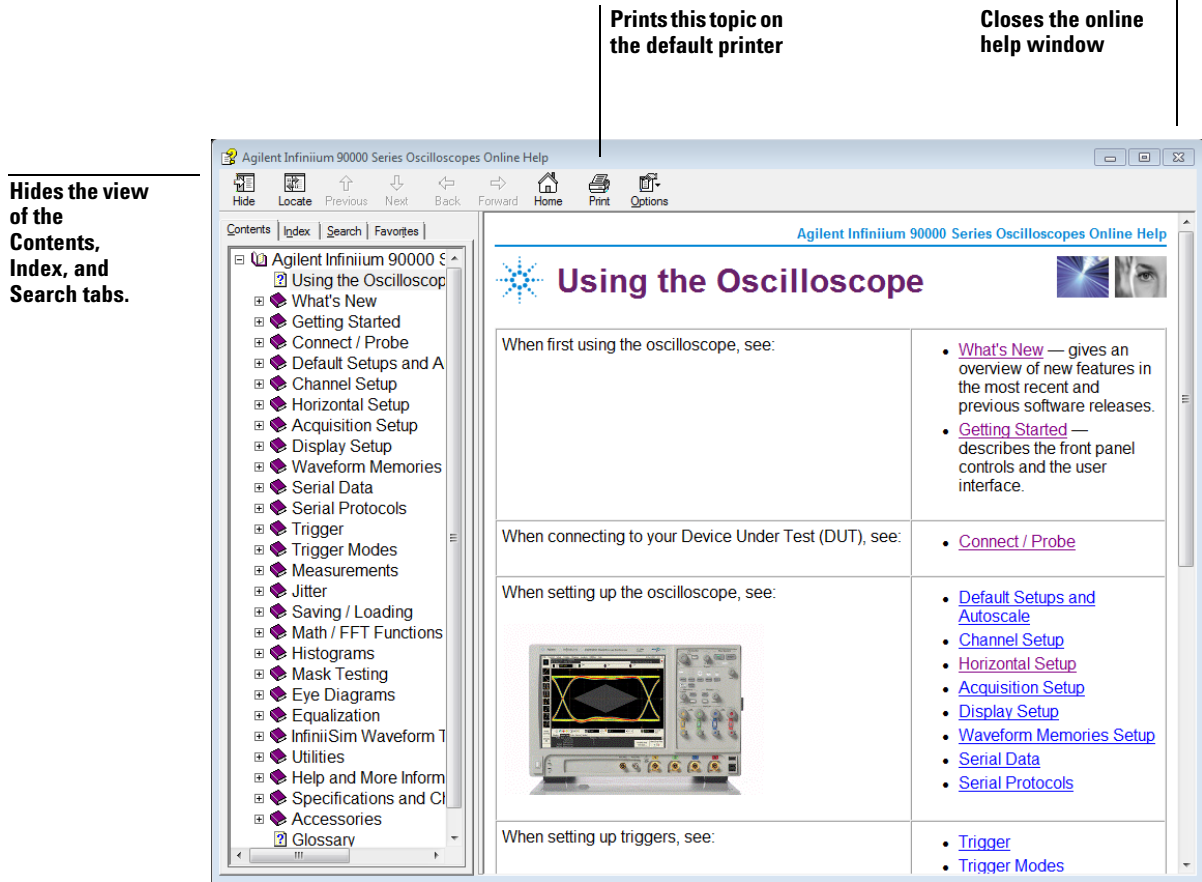


Figure 46 Online Help Home Page

**NOTE** Viewing the Online Help Window

The online help window will always stay on top of the interface display, so you can refer to it while working with the oscilloscope. You can move the window around the screen or resize it to make it easier to use.

The *Index* tab is the second method of finding information. You can type in a keyword and search the index for that keyword or you scroll through the list to find a topic.

The *Search* tab is the final method of finding information. You can type in a keyword and if that word exists in the help system, a list of topics containing the keyword is shown.

*Hyperlinks* throughout the online help allow you to reach the information you need. Most hyperlinks will be in blue underlined text, but some hyperlinks also have buttons (many of the reference topics) or tabs (in setup guide topics). You can find out whether a particular item has a



hyperlink by pointing to it; if it is a hyperlink, the pointer will change to a hand icon. Clicking once will follow the hyperlink to display a new topic with the relevant information.

## To navigate through the online help

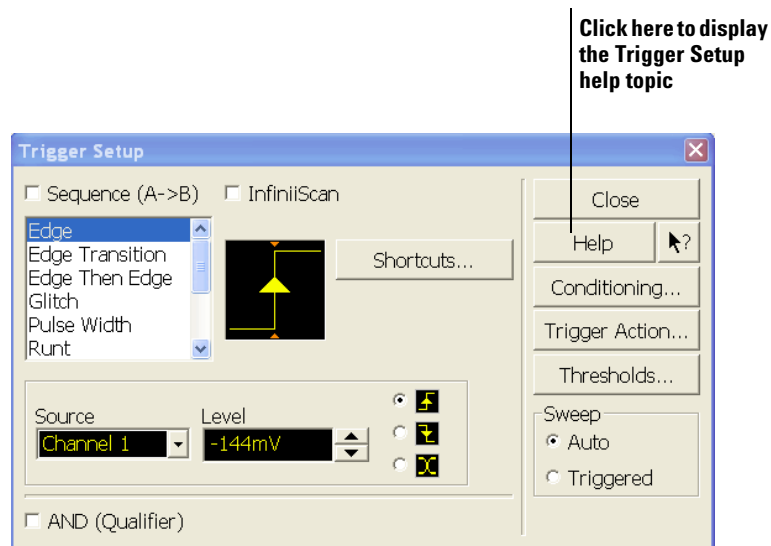
Once you are in the online help window, you may need to navigate to find the information you need.

For most topics:

- To display information for another topic or category described in a hyperlink, click that hyperlink or on the button icon next to it.
- To return to the previously visited topic, click the Back button near the top of the Help window.

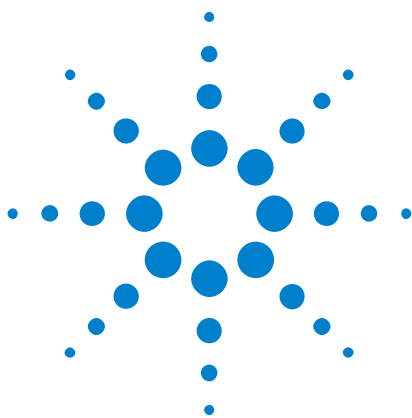
## To access context-sensitive information

- To see overview information for items in a dialog box, click the Help button in that dialog box.



**Figure 47** GUI Help Buttons for Context-Sensitive Help

## **4 Accessing the Online Help**



## A Safety Notices

Warnings 83

Safety Symbols 84

This apparatus has been designed and tested in accordance with UL 61010-1:2004 2nd Edition, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

### Warnings

- The mains plug shall be inserted only in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.
- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.
- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
- Do not use the instrument in a manner not specified by the manufacturer, or the protection provided by the equipment may be impaired.



## Safety Symbols



Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product.



Hazardous voltage symbol.



Frame or chassis terminal symbol: Used to indicate a circuit common connected to grounded chassis.

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