Keysight P9241/42/43A Oscilloscopes

KEYSIGHT TECHNOLOGIES

Startup Guide

Notices

Manual Part Number

P9241-97000

Edition

First edition, March 2018

Printed in Malaysia

Published by:
Keysight Technologies, Inc.
1900 Garden of the Gods Road
Colorado Springs, CO 80907 USA

Print History

P9241-97000, March 2018

Warranty

The material contained in this document is provided "as is," and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Keysight disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Keysight shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Keysight and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology License

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

U.S. Government Rights

The Software is "commercial computer software," as defined by Federal Acquisition Regulation ("FAR") 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement ("DFARS") 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at www.keysight.com/find/sweula. The license set forth in the EULA represents the exclusive authority by which the U.S. government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No additional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFAR 227.7103-5 (c), as applicable in any technical data.

Safety Notices

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.

CAUTION

A **CAUTION** 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 damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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.

Contents

1 Introduction

Keysight P9241/42/43A oscilloscopes let you capture, display, measure, and analyze electronic signals.

The purpose of this Startup Guide is to detail the processes of receiving and installing the Keysight P9241/42/43A oscilloscopes.

The chapters in this guide cover the basics of setting up and configuring a USB oscilloscope system, as well as installing the required software.

If you have any questions after reviewing this information, please contact your local Keysight Technologies representative or contact us through our website at www.keysight.com/find/usb-instruments.

Follow the Startup Sequence

WARNING **Closely follow the startup process flow in this document. Deviating from the sequence can cause unpredictable system behavior, damage your system, and may cause personal injury.**

1 Unpack and inspect. See: Chapter 2, “Unpack and Inspect,” starting on page 11

2 Verify the shipment. See: Chapter 3, “Verify Shipment Contents and Model Options,” starting on page 13

3 Install drivers and software. See: Chapter 4, “Install the Software,” starting on page 15

4 Connect the oscilloscope. See: Chapter 5, “Connecting the Oscilloscope,” starting on page 19

5 Verify operation with the Soft Front Panel (SFP). See: Chapter 6, “Verify Operation,” starting on page 25

6 Make a measurement. See: Chapter 7, “Make a Measurement,” starting on page 31

7 Installation is complete. Proceed to program your product through the API. See: Chapter 8, “Applications Programming Interface (API) Overview,” starting on page 41

Related Documentation

To access documentation related to the Keysight P9241/42/43A oscilloscopes, go to www.keysight.com/manuals/P9241A.

Document	Description	File name	Format
Startup Guide (this manual)	Includes procedures to help you to unpack, inspect, install (hardware and software), verify operation, and make a basic measurement.	P924x_StartupGuide.pdf	PDF
Soft Front Panel (SFP) User's Guide	Shows how to use the P9241/42/43A oscilloscope's Soft Front Panel (SFP) user interface.	P924x_SFP_Users_Guide.pdf	PDF
		P924x_SFP_Users_Guide.chm	CHM (Microsoft Help Format)
SCPI Programmer's Guide	Shows how to program the P9241/42/43A oscilloscopes using SCPI commands.	P924x_SCPI_Programmers_Guide.chm	CHM (Microsoft Help Format)
		P924x_SCPI_Programmers_Guide.pdf	PDF

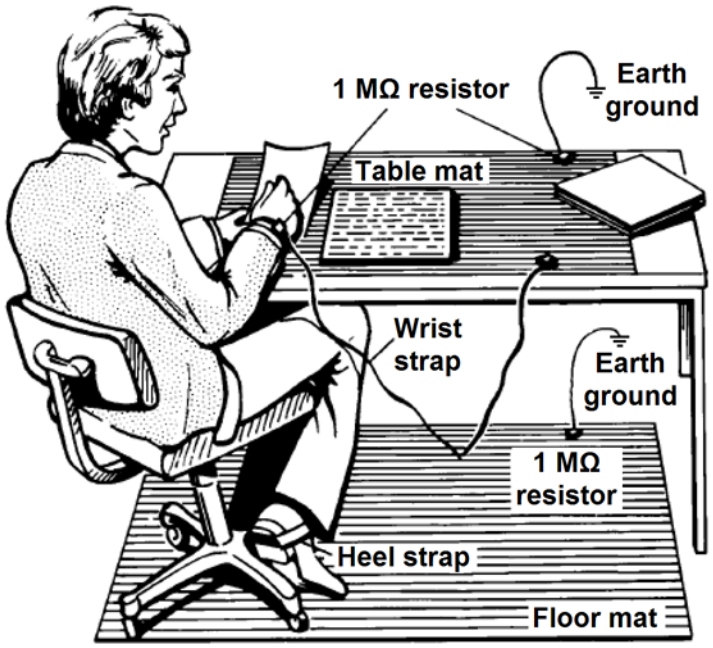
Document	Description	File name	Format
IVI Programming Guide	Shows you how to use Visual Studio 2010 with the .NET Framework to write IVI-COM Console Applications in Visual C#.	P924x_IVI_ProgrammingGuide.pdf	PDF
IVI Driver reference (help system)	Provides detailed documentation of the IVI-COM and IVI-C driver API functions, as well as information to help you get started with using the IVI drivers in your application development environment.	AgInfiniiVision.chm	CHM (Microsoft Help Format)
LabVIEW Driver Reference	Provides detailed documentation of the LabVIEW G Driver API functions.	KtInfiniiVision_LabVIEW_Help.chm	CHM (Microsoft Help Format)

See Also The data sheet introduces the product and provides full product specifications. You can find the data sheet at: www.keysight.com/products/P9241A

The Keysight P9241/42/43A Oscilloscopes Security Guide is available at www.keysight.com/find/security.

2 Unpack and Inspect

Electrostatic discharge (ESD) can damage or destroy electronic components. Use a static-safe work station to perform all work on electronic assemblies. The following figure shows a static-safe work station using two types of ESD protection: conductive table-mat and wriststrap combination, and conductive floor-mat and heelstrap combination. Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 MΩ of isolation from ground.



WARNING **DO NOT use these techniques for a static-safe work station when working on circuitry with a voltage potential greater than 500 volts.**

Inspect for Damage

After unpacking an instrument, inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty.

CAUTION **To avoid damage when handling an instrument, do not touch exposed connector pins.**

Return an Instrument for Service

Should it become necessary to return an instrument for repair or service, follow the steps below:

NOTE **It is recommended that you return all the P924xA instrument and cables for repair and calibration.**

1. Review the warranty information shipped with your product.
2. Contact Keysight to obtain a Return Material Authorization (RMA) and return address. For assistance finding Keysight contact information, go to www.keysight.com/find/assist.
3. Write the following information on a tag and attach it to the malfunctioning equipment:
   - Name and address of owner. A P.O. box is not acceptable as a return address.
   - Instrument serial number(s). The serial number label is located on the bottom panel of the instrument. The serial number can also be read from the Soft Front Panel interface - after the hardware is installed.
   - Description of failure or service required.
4. Pack the instrument in its original packaging. Include all cables. If the original packaging material is not available, use anti-static bubble wrap or packing peanuts and place the instrument in a sealed container and mark the container -FRAGILE-.
5. On the shipping label, write ATTENTION REPAIR DEPARTMENT and the RMA number.

3 Verify Shipment Contents and Model Options

P9241/42/43A Oscilloscope Shipment Contents

Items included in your P9241/42/43A oscilloscope shipment:

Qty	Keysight Part Number	Description
1	P9241A, P9242A, or P9243A	200 MHz, 500 MHz, or 1 GHz oscilloscope
1	0950-6128	Power Supply External AC-DC Adapter Switching 90W 1-Output 15V 6A Level 6 Class 1 Safety
1	5061-7383	South Korean Class A EMC Declaration
1	5185-1605	Envelope-Calibration Certificate (230 mm x 153 mm)
1	5991-3402	End User License Agreement
1	75045-61610	RF Cable MMCX to BNC 600 mm
1	9320-6678	China RoHS Addendum for Oscilloscope
1	9320-6797	Keysight safety leaflet
2	N2843-60001	N2843A passive probe - 500 MHz 10:1
1	P9241-97xxx	Startup Guide-English (this manual)
1	P9375-60010	Cable-Assembly USB 3.0 Type-A Plug to Type-C Plug 1m-LG PVC Black

Model-option list for the P9241/42/43A oscilloscope:

Model Number	Description
P9240EMBA	Embedded Serial Triggering and Analysis (I2C)
P9240MSKA	Mask Limit Testing

Model Number	Description
P9240AROA	MIL-STD 1553 and ARINC 429 Serial Triggering and Analysis
P9240VIDA	Enhanced Video/TV Triggering Application Package
P9240AWGA	WaveGen 20 MHz Function/Arbitrary Waveform Generator
P9240CMPA	Computer Serial Triggering and Analysis (RS232/422/485/UART)
P9240ATOA	Automotive Serial Triggering and Analysis (CAN, CAN-dbc, CAN FD, LIN)
P9240SNSA	SENT (Single Edge Nibble Transmission) Triggering and Analysis
P9240CXPA	CXPI Trigger and Decode
P9240FRAA	Frequency Response Analyzer
P9240NFCA	NFC Automated Test for X-Series Oscilloscopes
P9240UPDA	USB PD Trigger and Decode
N2150A	CDs, P924x oscilloscope software including electronic manuals and IO libraries

4 Install the Software

PC Requirements

Item	Requirements
Operating system	Windows 7 (64-bit) or Windows 10 (64-bit)
Processor speed	1.5 GHz dual core (x64) minimum, 2.4 GHz recommended, no support for Itanium64
Available memory	8 GB recommended for 64-bit operating systems
Available disk space	1.5 GB available hard disk space, includes: ▪ 1 GB available for Microsoft .NET Framework 3.5 SP1 ▪ 100 MB for Keysight IO Libraries Suite
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)
Connection	USB 3.0
Browser	Microsoft Internet Explorer 7.0 or greater

Software Installation Overview

This installation includes the following:

- Keysight IO Libraries Suite (IOLS), which includes the Keysight Connection Expert. This software is included with your shipment, and is also available at www.keysight.com/find/iosuite. This software must be installed first.

NOTE Keysight IO Libraries Suite 2018 Update 0.2 (or later) is required.

- Instrument software, which includes the soft front panel (SFP), device drivers (IVI-C, IVI-COM, and LabVIEW G) and documentation for the Keysight P9241/42/43A oscilloscopes. This software is included with your shipment and is also available at www.keysight.com/products/P9241A.

Software Installation Procedure:

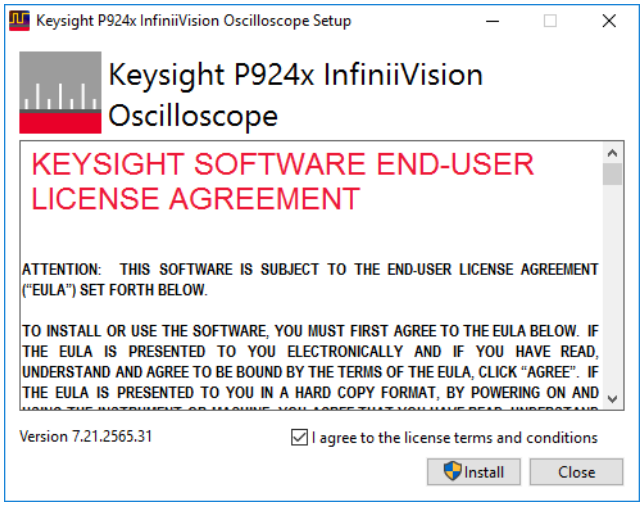
1 Install the Keysight IO Libraries Suite. Follow the installer prompts to install the IO libraries.

2 Install the P924x InfiniiVision Oscilloscope software.

NOTE **The install package for 64-bit Windows operating systems must be used with the P9241/42/43A oscilloscopes.**

---

a Launch the software installer.



b Follow the installer prompts. Choose a "Complete" installation to install all software and documentation, or a "Custom" installation to select from a listing of other features.

3 Complete the installation.

Updating Oscilloscope Firmware as New Oscilloscopes Are Connected

The software installation process on the host PC includes FPGA updates to connected P924x oscilloscopes. Because you can connect new oscilloscopes after the main software installation, there is a way to perform FPGA updates separately:

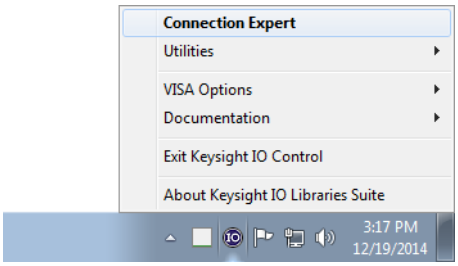
- From the Windows **Start** menu, choose **All Programs > Keysight InfiniiVision Oscilloscope > Update Keysight InfiniiVision Firmware**.

Updating Chassis Firmware

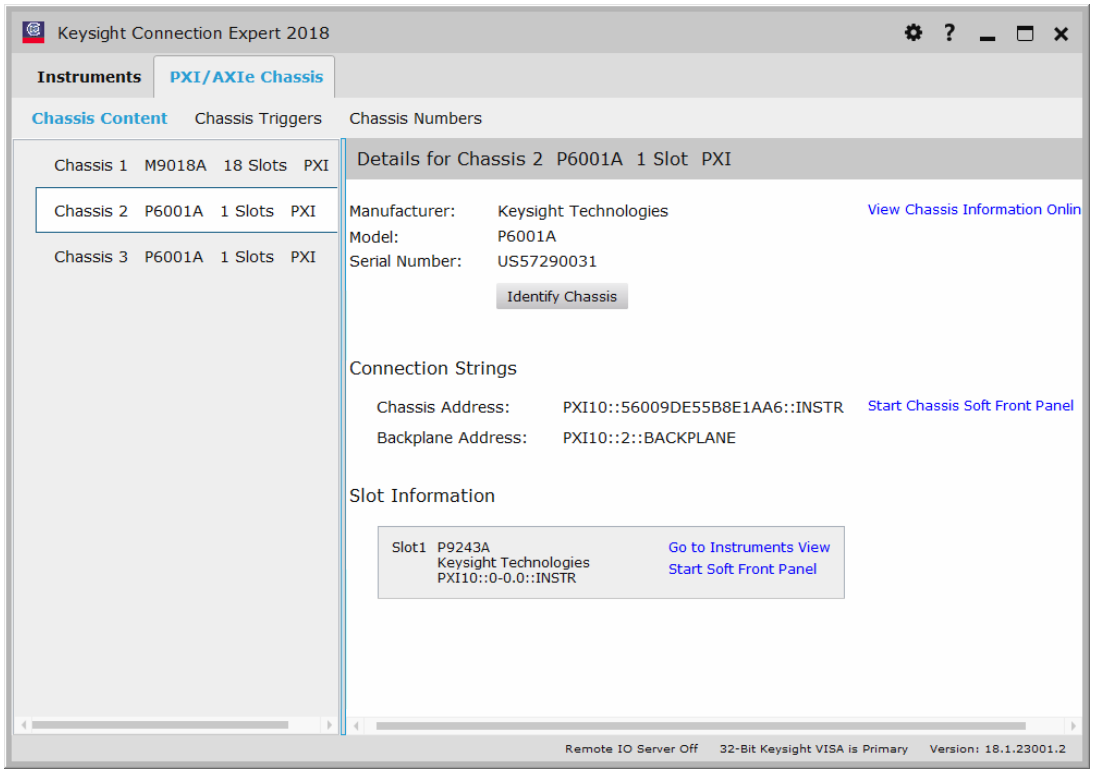
The software installation process on the host PC does not update chassis FPGA firmware. If you should need to update the chassis firmware, you can do it through the Chassis Soft Front Panel.

To open the Chassis Soft Front Panel and access the chassis firmware update options:

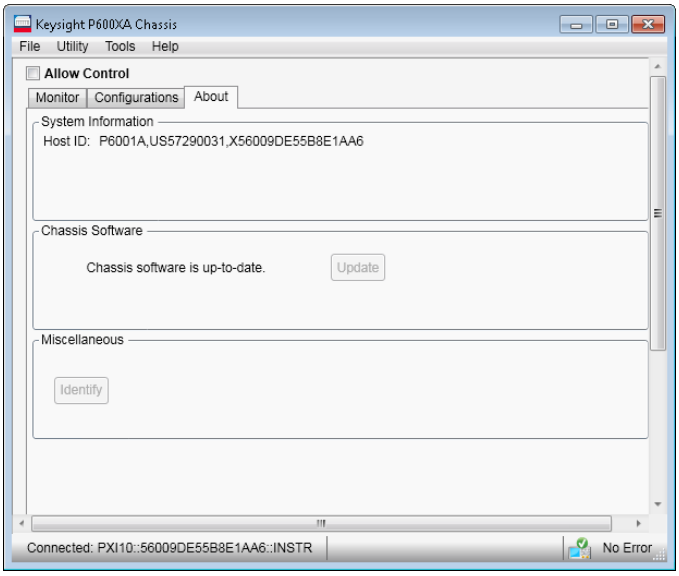
1 Click the Keysight IO Libraries Suite icon in the task bar and choose **Connection Expert** from the popup menu.



2 In the Keysight Connection Expert window, select the PXI/AXIe Chassis tab; then, for the chassis whose SFP you want to start, click the **Start Soft Front Panel** link.



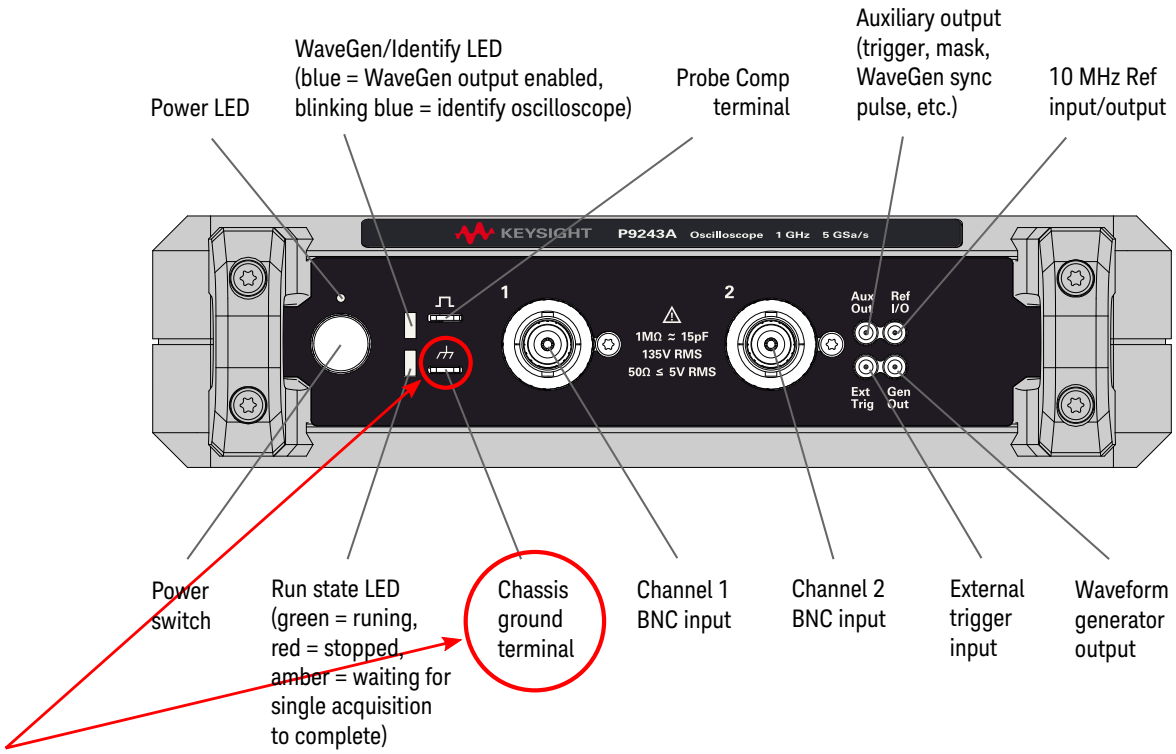
The Keysight P600XA Chassis soft front panel will open. The chassis FPGA firmware update options are in the About tab:



5 Connecting the Oscilloscope

Front Panel Features

This section describes the front panel features, that is, connectors and LEDs, for the P9241/42/43A oscilloscope.



WARNING **A voltage source should never be connected to the ground terminals of this instrument. If, for any reason, the Protective Conductor Terminal is disconnected or not functioning properly and a voltage source is connected to the equipment's ground terminals, the entire chassis will be at the voltage potential of the voltage source, and the operator or bystanders could receive an electric shock.**

LED Operation

LEDs for the P9241/42/43A oscilloscope are described in the following table.

LED	Color	When
Run state LED	Green	Acquisitions are running
	Red	Acquisitions are stopped
	Amber	Waiting for a single acquisition to complete
	Off	No driver is connected and the hardware is shut down
WaveGen/Identify LED	Blue	The WaveGen output is enabled
	Blinking blue	The "Identify Oscilloscope" feature is on
	Off	The WaveGen output is disabled

Inputs and Outputs

The P9241/42/43A oscilloscopes have the following inputs and outputs.

Channel 1 and 2 inputs

CAUTION

⚠ **Maximum input voltage at analog inputs**

135 Vrms

50Ω input: 5 Vrms Input protection is enabled in 50 Ω mode and the 50 Ω load will disconnect if greater than 5 Vrms is detected. However the inputs could still be damaged, depending on the time constant of the signal. The 50 Ω input protection only functions when the oscilloscope is powered on.

CAUTION

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

Ext Trig input

CAUTION

⚠ **Maximum voltage at oscilloscope external trigger input**

30 Vrms, 60 Vdc

1M ohm input: For steady-state sinusoidal waveforms derate at 20 dB/decade above 100 kHz to a minimum of 5 Vpk

For information on using the Ext Trig input, see the *Keysight P9241/42/43A Oscilloscopes Soft Front Panel (SFP) User's Guide*.

Probe Comp output terminal, chassis ground terminal

The Probe Comp and chassis ground terminals are used when compensating passive probes (see "Compensate Passive Probes" on page 35).

WARNING **If you should inadvertently connect the P9241/42/43A oscilloscope's chassis ground terminal to a Hazardous Live voltage and the Protective Earth Ground of the Agency Certified PXI Chassis has been defeated or is non-existent, then the chassis of the measuring equipment will also be connected to the Hazardous Live voltage and you or a bystander could receive an electrical shock from the chassis.**

Gen Out output

The Gen Out MMCX connector is for the waveform generator output. For information on using the waveform generator, see the *Keysight P9241/42/43A Oscilloscopes Soft Front Panel (SFP) User's Guide*.

Aux Out output

The Aux Out MMCX connector can be used for trigger output, NFC trigger status, mask testing status, waveform generator sync pulse, or calibration signal. For more information, see the *Keysight P9241/42/43A Oscilloscopes Soft Front Panel (SFP) User's Guide*.

Ref I/O input/output

CAUTION **⚠ Maximum input voltage at Ref I/O connector**

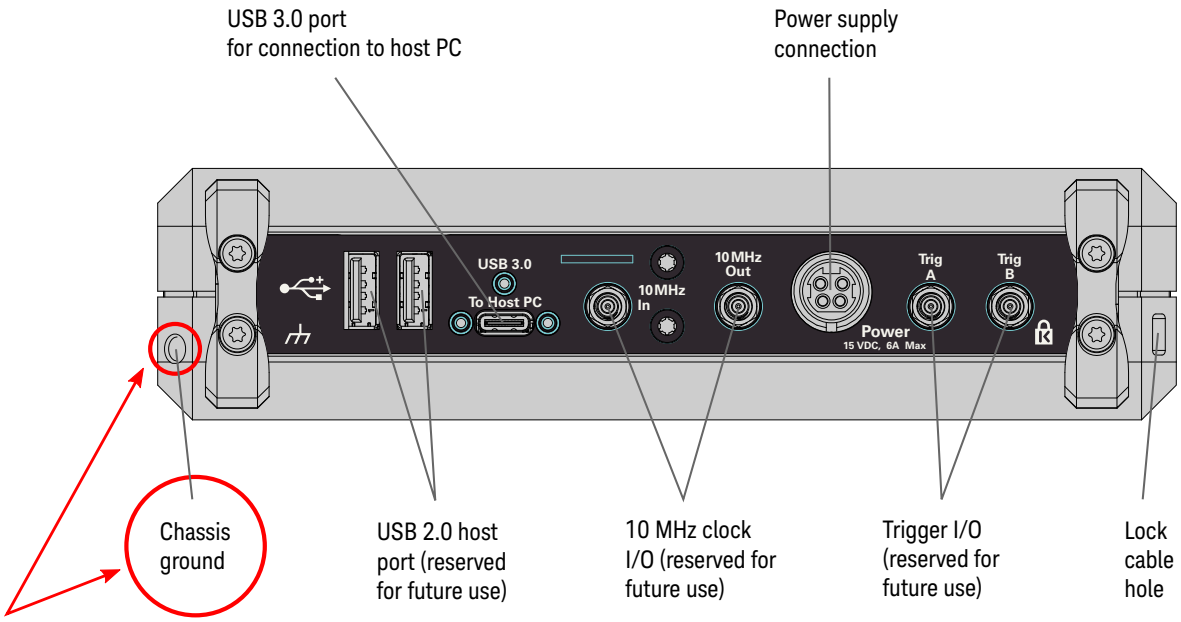
Do not apply more than 20 dBm Max (6.32 Vpp Max) at the Ref I/O MMCX connector or damage to the instrument may occur.

When used for the 10 MHz reference output signal, the amplitude is 5 Vpp into a high impedance or 2.5 Vpp into 50 Ohms. It is capable of driving into lower impedances, but the output will be reduced because of the 50 Ohm source impedance.

For information on using Ref I/O as an input or output, see the *Keysight P9241/42/43A Oscilloscopes Soft Front Panel (SFP) User's Guide*.

Rear Panel Connectors

This section describes the rear panel connectors for the P9241/42/43A oscilloscope.



WARNING **A voltage source should never be connected to the ground terminals of this instrument. If, for any reason, the Protective Conductor Terminal is disconnected or not functioning properly and a voltage source is connected to the equipment's ground terminals, the entire chassis will be at the voltage potential of the voltage source, and the operator or bystanders could receive an electric shock.**

Only the USB 3.0 To Host PC and Power rear panel connectors are used by the P9241/42/43A oscilloscope. The other rear panel connectors are reserved for future use.

NOTE A USB 3.0 (SuperSpeed) port on the host PC is required for connection to the P9241/42/43A oscilloscope. USB 2.0 ports will not work.

Cleaning the Instrument

1. Remove power from the instrument.
2. Clean the external surfaces of the oscilloscope with a soft cloth dampened with a mixture of mild detergent and water.

3 Make sure that the instrument is completely dry before reconnecting it to a power source.

6 Verify Operation

Power-On the Oscilloscope

Power Requirements

Line voltage, frequency, and power:

- 100-240 Vac, 50/60 Hz
- 90 W max

Ventilation Requirements

The air intake and exhaust areas must be free from obstructions. Unrestricted air flow is required for proper cooling. Always ensure that the air intake and exhaust areas are free from obstructions.

The fan draws air in from the right side of the oscilloscope and pushes it out the left side of the oscilloscope.

When using the oscilloscope in a bench-top setting, provide at least 4" (100 mm) clearance at the sides of the oscilloscope for proper cooling. Do not orient multiple instruments in a way that would direct warm air exhaust from one instrument into the air intake of another instrument.

To power-on the oscilloscope

The power supply automatically adjusts for input line voltages in the range 100 to 240 VAC. The line cord provided is matched to the country of origin.

WARNING **Always use a grounded power cord. Do not defeat the power cord ground.**

CAUTION **To disconnect the oscilloscope from power, you must disconnect the external power supply from the instrument. Therefore, position the instrument so that it is not difficult to disconnect the external power supply.**

1. Connect the power supply to the rear of the oscilloscope.
2. Connect the power supply to a suitable AC voltage source.

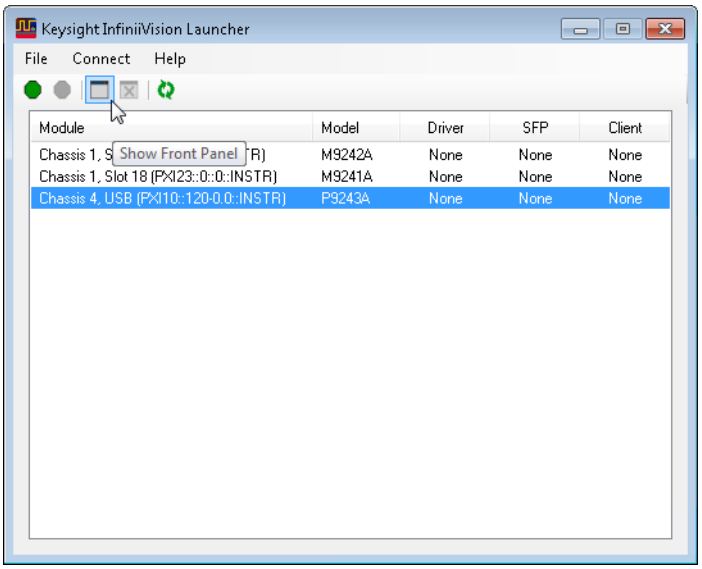
3 Press the power switch on the oscilloscope's front panel.

The power switch is located on the left side of the front panel. The oscilloscope will perform a self-test and will be operational in a few seconds.

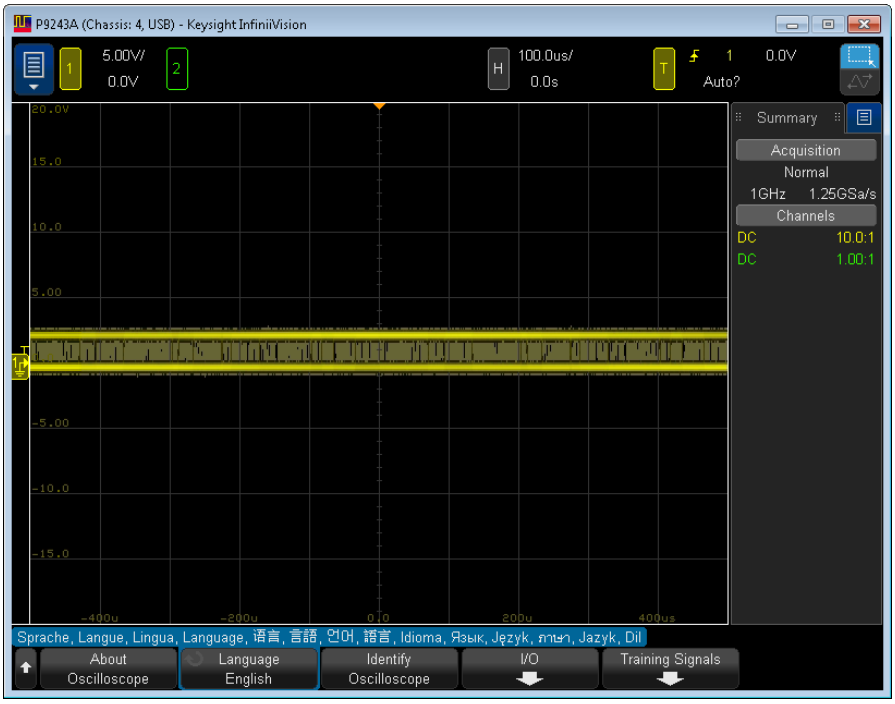
Open the P924xA Oscilloscope Soft Front Panel (SFP)

1 From the Windows operating system Start menu, choose **Start > All Programs > Keysight InfiniiVision Oscilloscope > Keysight InfiniiVision SFP**.

2 In the Keysight InfiniiVision Launcher window, select the oscilloscope whose SFP you want to start; then, click the **Show Front Panel** button.



The required Keysight InfiniiVision P924xA Driver will automatically be Connected, the SFP will be Connected, and the SFP will open:



The Keysight InfiniiVision P924xA SFP has the same user interface as other standalone Keysight InfiniiVision oscilloscopes.

If the oscilloscope is not listed in Keysight InfiniiVision Launcher

If your P924xA oscilloscope is not recognized after being plugged into a USB port on your PC (that is, it does not show up in the Keysight InfiniiVision Launcher window):

- Reboot your PC.

  This may be needed after a software update or the first time a P924xA oscilloscope is plugged into a USB port it has not previously been connected to.

- If the oscilloscope still does not appear, try rescanning in the Keysight Connection Expert:

  a Close the Keysight InfiniiVision Launcher.

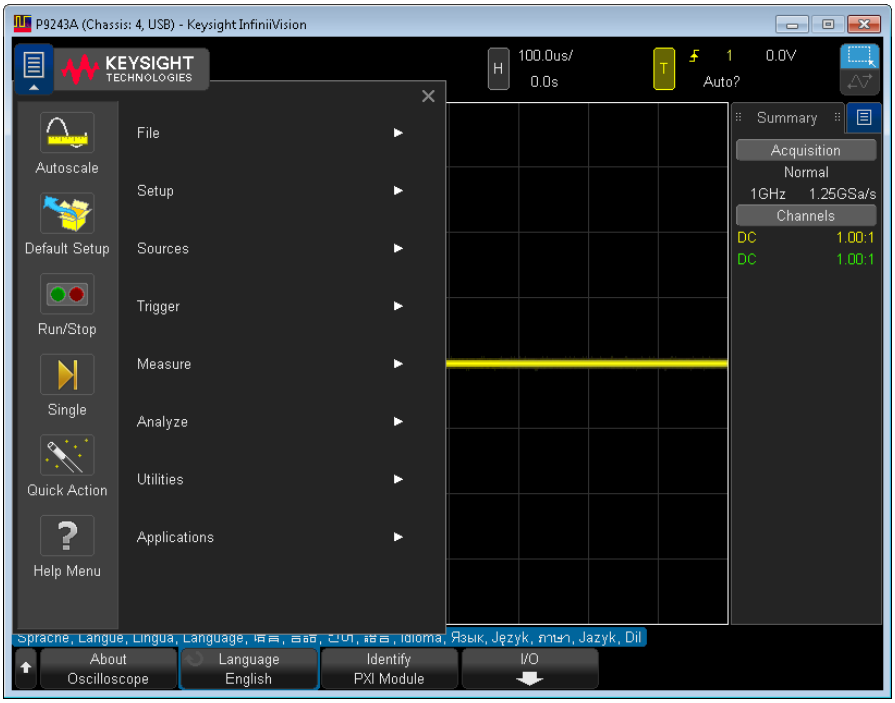
  b Start the Keysight Connection Expert, by selecting **Start > All Programs > Keysight Connection Expert**.

  If any or all oscilloscopes are still not visible, in the Instruments tab, click **Rescan**.

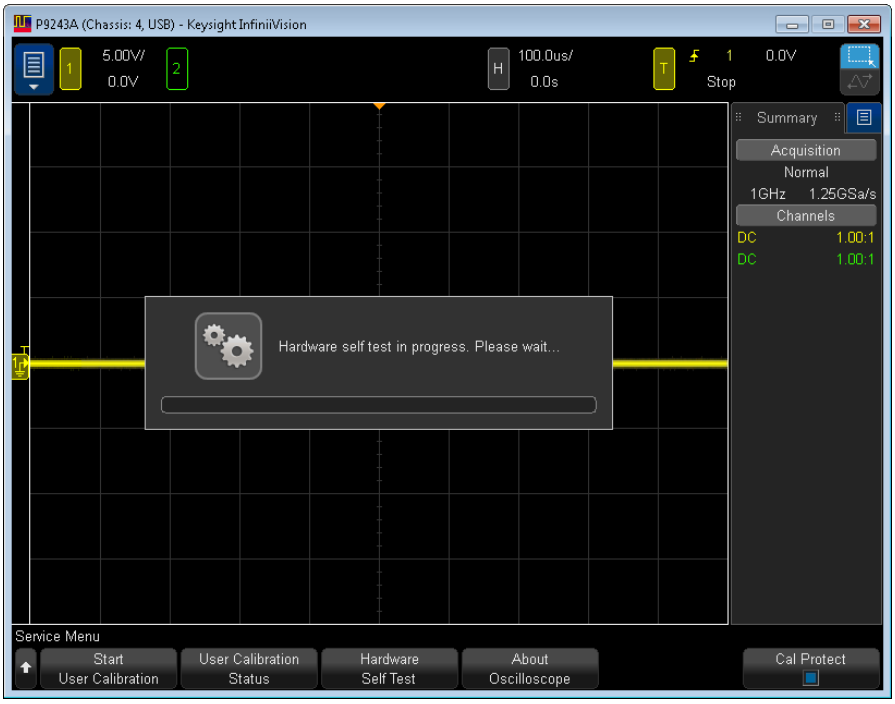
  c Restart the Keysight InfiniiVision Launcher.

Run the Oscilloscope's Hardware Self Test

1 Keysight InfiniiVision P924xA SFP interface, click the top left blue menu icon, and choose **Utilities > Service Menu**.



2 In the Service Menu, click **Hardware Self Test**.



Hardware Self Test performs a series of internal procedures to verify that the oscilloscope is operating properly. Successfully passing Hardware Self Test does not guarantee 100% of the oscilloscope's functionality. Hardware Self Test is designed to provide an 80% confidence level that the oscilloscope is operating properly.

If the Hardware Self Test fails

See: "Return an Instrument for Service" on page 12

If there are communications problems

If you are unable to communicate with the P924xA, verify that the following installations are correct:

- Keysight IO Libraries Suite
- P924xA SFP programs
- USB oscilloscope drivers
- USB cable connections to the controller PC

7 Make a Measurement

This chapter assumes you are using the Keysight InfiniiVision P924xA Soft Front Panel (SFP). If you have not already opened the SFP, see "Open the P924xA Oscilloscope Soft Front Panel (SFP)" on page 26.

Connect Probes to the Oscilloscope

1. Connect the oscilloscope probe to an oscilloscope channel BNC connector.
2. Connect the probe's retractable hook tip to the point of interest on the circuit or device under test. Be sure to connect the probe ground lead to a ground point on the circuit.

CAUTION

⚠ **Maximum input voltage at analog inputs**

135 Vrms

50Ω input: 5 Vrms Input protection is enabled in 50 Ω mode and the 50 Ω load will disconnect if greater than 5 Vrms is detected. However the inputs could still be damaged, depending on the time constant of the signal. The 50 Ω input protection only functions when the oscilloscope is powered on.

Input a Signal

The first signal to input to the oscilloscope is the Probe Comp signal. This signal is used for compensating probes.

1. Connect an oscilloscope probe from channel 1 to the Probe Comp terminal on the front panel.
2. Connect the probe's ground lead to the ground terminal (next to the Probe Comp terminal).

Using the Soft Front Panel (SFP) Interface

The Keysight InfiniiVision P924xA SFP has the same user interface as other standalone Keysight InfiniiVision oscilloscopes. While standalone oscilloscopes have keys, softkeys, and knobs—obviously different than the modular oscilloscopes—the display interface was also designed to be used with touch screens and connected USB mice, and it is just as easy to use with a mouse on the Windows operating system.

The main differences between using the interface on a standalone oscilloscope and a modular oscilloscope are:

- Instead of pressing front panel keys to open softkey menus, you use the top-left blue **Main Menu** button.
- Instead of pressing softkeys, you click the softkey label buttons.
- Instead of turning knobs to adjust scales, offets, delay positions, trigger levels, and cursor positions, there are clickable up/down, increase/decrease icon buttons that appear after clicking these values. Also, you can drag waveforms, trigger levels, and cursors.

Consider ergonomics when positioning the keyboard, monitor, and mouse.

Access the Built-In Quick Help

Soft Front Panel (SFP) help for the USB oscilloscope is different than in a traditional Windows application. Instead of a Windows HTML Help file you access through a Help menu, the USB oscilloscope's SFP help is the same quick help information that is built-in to standalone InfiniiVision oscilloscopes.

To access the built-in quick help, press and hold the left-mouse button over a softkey label button.

Quick Help remains on the screen until you close the help dialog box or open another one.

Select the User Interface Language

Another benefit of having the same user interface as standalone InfiniiVision oscilloscopes is that you have a localized user interface and built-in quick help.

To select the user interface language:

1 Choose **Main Menu > Help Menu**.

2 In the Help Menu, click the **Language** softkey label button.

3 In the Language popup menu, select the desired language.

The following languages are available: Czech, English, French, German, Italian, Japanese, Korean, Polish, Portuguese, Russian, Simplified Chinese, Spanish, Thai, Traditional Chinese, and Turkish.

Recall the Default Oscilloscope Setup

To recall the default oscilloscope setup:

1 Choose **Main Menu > Default Setup**.

The default setup restores the oscilloscope's default settings. This places the oscilloscope in a known operating condition. The major default settings are:

Table 1 Default Configuration Settings

Horizontal	Normal mode, 100 µs/div scale, 0 s delay, center time reference.
Vertical (Analog)	Channel 1 on, 5 V/div scale, DC coupling, 0 V position, 1 MΩ impedance.
Trigger	Edge trigger, Auto trigger mode, 0 V level, channel 1 source, DC coupling, rising edge slope, 40 ns holdoff time.
Display	Persistence off, 20% grid intensity, 50% waveform intensity.
Other	Acquire mode normal, **Run/Stop** to Run, cursors and measurements off.
Labels	All custom labels that you have created in the Label Library are preserved (not erased), but all channel labels will be set to their original names.

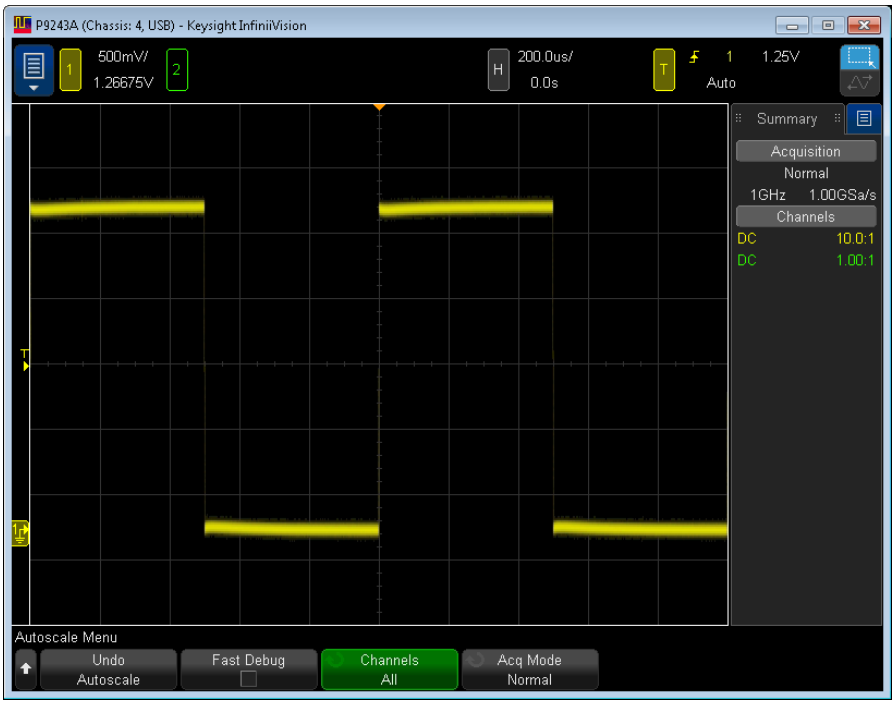
In the Default Menu, there are also options for restoring the complete factory settings.

Use Autoscale

Use Autoscale to automatically configure the oscilloscope to best display the input signals.

1 Choose **Main Menu > Autoscale**.

You should see a waveform on the oscilloscope's display similar to this:



2 If you want to return to the oscilloscope settings that existed before**,** click **Undo Autoscale**.

3 If you want to enable "fast debug" autoscaling, change the channels autoscaled, or preserve the acquisition mode during autoscale, click **Fast Debug**, **Channels**, or **Acq Mode**.

These are the same softkeys that appear under **Main Menu > Utilities > User Options Menu > Preferences > Autoscale**.

If you see the waveform, but the square wave is not shaped correctly as shown above, perform the procedure "Compensate Passive Probes" on page 35.

If you do not see the waveform, make sure the probe is connected securely to the front panel channel input BNC and to the left side Probe Comp terminal.

How Autoscale Works

Autoscale analyzes any waveforms present at each channel and at the external trigger input.

Autoscale finds, turns on, and scales any channel with a repetitive waveform that has a frequency of at least 25 Hz, a duty cycle greater than 0.5%, and an amplitude of at least 10 mV peak-to-peak. Any channels where no signal is found are turned off.

The trigger source is selected by looking for the first valid waveform starting with external trigger, then continuing with the lowest number analog channel up to the highest number analog channel.

During Autoscale, the delay is set to 0.0 seconds, the horizontal time/div (sweep speed) setting is a function of the input signal (about 2 periods of the triggered signal on the screen), and the triggering mode is set to Edge.

Compensate Passive Probes

Each oscilloscope passive probe must be compensated to match the input characteristics of the oscilloscope channel to which it is connected. A poorly compensated probe can introduce significant measurement errors.

1 Input the Probe Comp signal (see "Input a Signal" on page 32).

2 Choose **Main Menu > Default Setup** to recall the default oscilloscope setup (see "Recall the Default Oscilloscope Setup" on page 33).

3 Choose **Main Menu > Autoscale** to automatically configure the oscilloscope for the Probe Comp signal (see "Use Autoscale" on page 34).

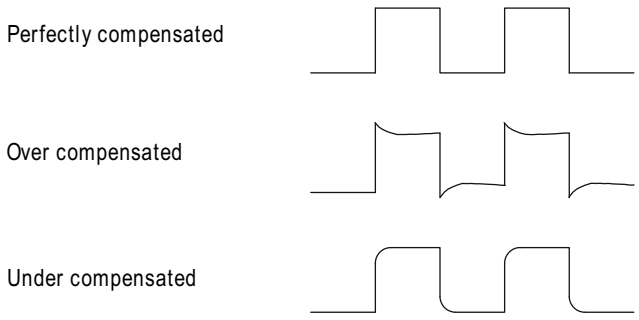
4 Click the channel button to which the probe is connected (color-coded **1**, **2**, etc. at the top of the SFP window).

5 In the Channel Menu, click **Probe**.

6 In the Channel Probe Menu, click **Probe Check**; then, follow the instructions on-screen.

If necessary, use a nonmetallic tool (supplied with the probe) to adjust the trimmer capacitor on the probe for the flattest pulse possible.

On N2894A probes, the trimmer capacitor is located on the probe BNC connector.



7 Connect probes to all other oscilloscope channels (that is, channel 2 of a 2-channel oscilloscope).

8 Repeat the procedure for each channel.

NOTE

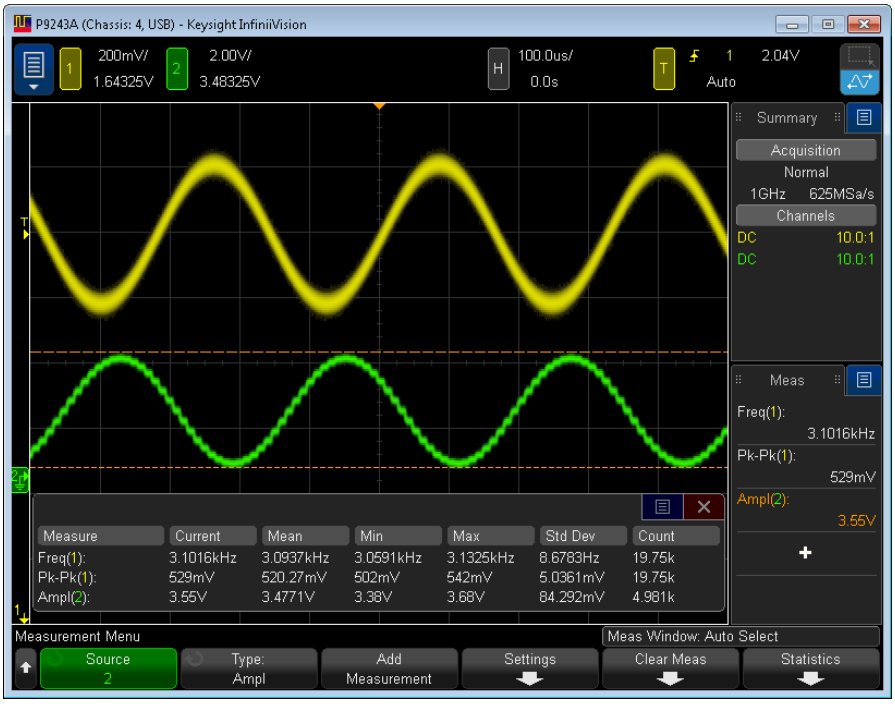
After a Default Setup, the Probe Comp signal is output to the Probe Comp terminal. However, the oscilloscope can also output training signals on this terminal. See: **Main Menu > Training Signals > Training Signals**. On P924xA oscilloscopes, the Probe Comp terminal is also the Demo 1 terminal. There is no Demo 2 terminal (unlike some other InfiniiVision X-Series oscilloscopes).

Turn On Measurements and Statistics

1 To turn on measurements, choose **Main Menu > Measure > Measurements**.

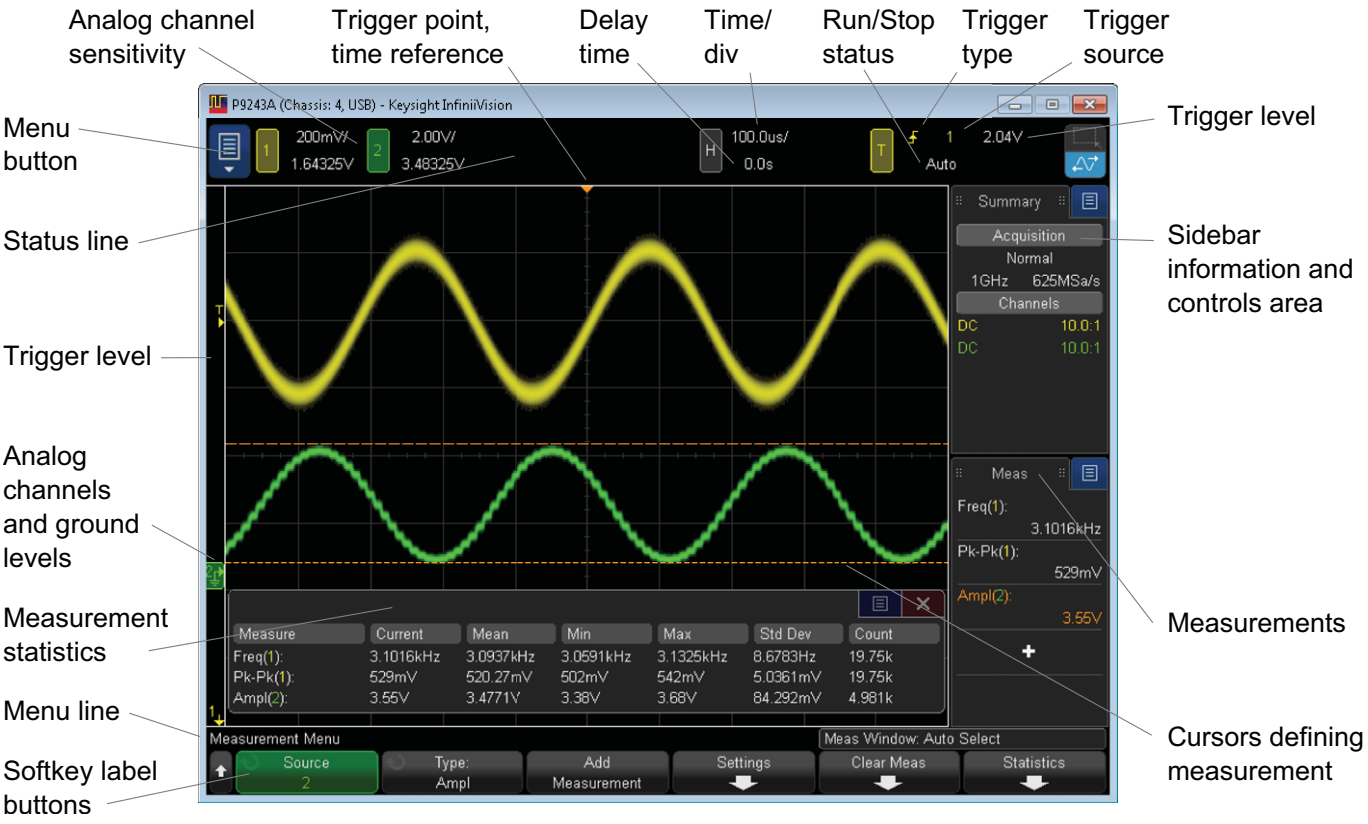
2 To turn on measurement statistics, choose **Main Menu > Measure > Statistics**.

You should see a display similar to this:



Learn the Oscilloscope Display

The oscilloscope display contains acquired waveforms, setup information, measurement results, and the softkey definitions.



Status line	The top line of the display contains vertical, horizontal, and trigger setup information.
Display area	The display area contains the waveform acquisitions, channel identifiers, and analog trigger, and ground level indicators. Each analog channel's information appears in a different color. Signal detail is displayed using 256 levels of intensity. To adjust waveform intensity, choose **Main Menu > Setup > Waveform Intensity**. To adjust other display modes and settings, choose **Main Menu > Setup > Display Menu**.
Sidebar information and controls area	The sidebar information area can contain summary, cursors, measurements, or digital voltmeter information dialogs or it can contain navigation and other control dialogs. To select the type of information or controls you want to see in the sidebar, click the blue menu icon next to the sidebar dialog box title. To undock or redock sidebar dialog boxes, drag the dialog box titles out of or back into the sidebar information area.

Menu line	This line normally contains menu name or other information associated with the selected menu.
Softkey labels	These labels describe softkey functions. Typically, softkeys let you set up additional parameters for the selected mode or menu. At the top of the menu hierarchy, clicking the left-side up-arrow button turns off softkey labels and displays additional status information describing channel offset and other configuration parameters.

8 Applications Programming Interface (API) Overview

When you have completed installation, you can use the oscilloscope Soft Front Panel (SFP) or program the instrument using the applications programming interface (API) for the supplied drivers.

To use the API, the P9241/42/43A oscilloscope's driver must be connected. See "Open the P924xA Oscilloscope Soft Front Panel (SFP)" on page 26.

IVI Drivers

Keysight's IVI drivers simplify the creation and maintenance of instrument control applications in a variety of development environments; they allow programmatic control of instrumentation while providing a greater degree of instrument interchangeability and code reuse. IVI drivers currently come in two basic types: IVI-COM and IVI-C. Although the functionality offered by both types of drivers is often very similar, the fundamental differences in interface technology results in a very different end-user experience. The IVI drivers support compiling application programs for 32- or 64-bit platforms.

Supported ADEs (application development environments)

Arguably the most important consideration in comparing IVI-COM and IVI-C drivers is the end user experience in various ADEs. Because IVI-COM drivers are based on Microsoft COM technology, it is not surprising that IVI-COM drivers offer the richest user experience in Microsoft ADEs. Users working in Visual C++, Visual C#, Visual Basic.NET, and Visual Basic 6 enjoy a host of features, such as object browsers, IntelliSense, and context-sensitive help.

When you install the product software, the IVI driver files are installed in the standard IVI Foundation directories (for example, C:\Program Files\IVI Foundation\IVI\Drivers\).

Example programs are provided to demonstrate most driver functionality (for example, C:\Program Files\IVI Foundation\IVI\Drivers\AgInfiniiVision\Examples).

The reference material for the driver functions (a Microsoft HTML Help .chm file) is installed with the IVI driver and is available for Microsoft Visual Studio's IntelliSense context linking. In addition, you can directly access the .chm file (AgInfiniiVision.chm) from this Start menu location: **Start > All Programs > Keysight Instrument Drivers > IVI-COM-C AgInfiniiVision Oscilloscope**.

LabVIEW Driver

In addition to the IVI drivers, Keysight provides a LabVIEW driver that includes all the functionality of the IVI-C driver.

When you install the InfiniiVision LabVIEW driver software, the LabVIEW driver is installed to each LabVIEW instr.lib directory for each version of LabVIEW you have on your computer (for example, C:\Program Files (x86) \National Instruments\<LabVIEW version>\instr.lib\<Keysight product model>).

If you install LabVIEW drivers before you install LabVIEW itself, the drivers will be installed in the Keysight directory instead of the National Instruments directory (for example, C:\Program Files (x86)\Keysight\<Keysight product model>\LabVIEW Driver\<LabVIEW version>\...).

Example programs are provided to demonstrate most driver functionality.

The reference information for the driver (a Microsoft HTML Help file named KtInfiniiVision_LabVIEW_Help.chm) is also installed with the driver, and the content is available from LabVIEW's context Help menu or in the LabVIEW help directory.

SCPI Interface (P9241/42/43A Oscilloscope Only)

You can access the oscilloscope's SCPI interface when the P9241/42/43A oscilloscope's driver is connected (see "Open the P924xA Oscilloscope Soft Front Panel (SFP)" on page 26).

You can find the *SCPI Programmer's Guide* in these locations:

- On the product CD.
- On the website at: www.keysight.com/manuals/P9241A

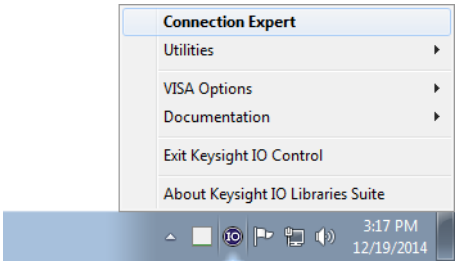
One quick way to test SCPI commands is by using the Interactive IO utility that comes with the Keysight IO Libraries Suite.

Launching Interactive IO from Connection Expert on the Host PC

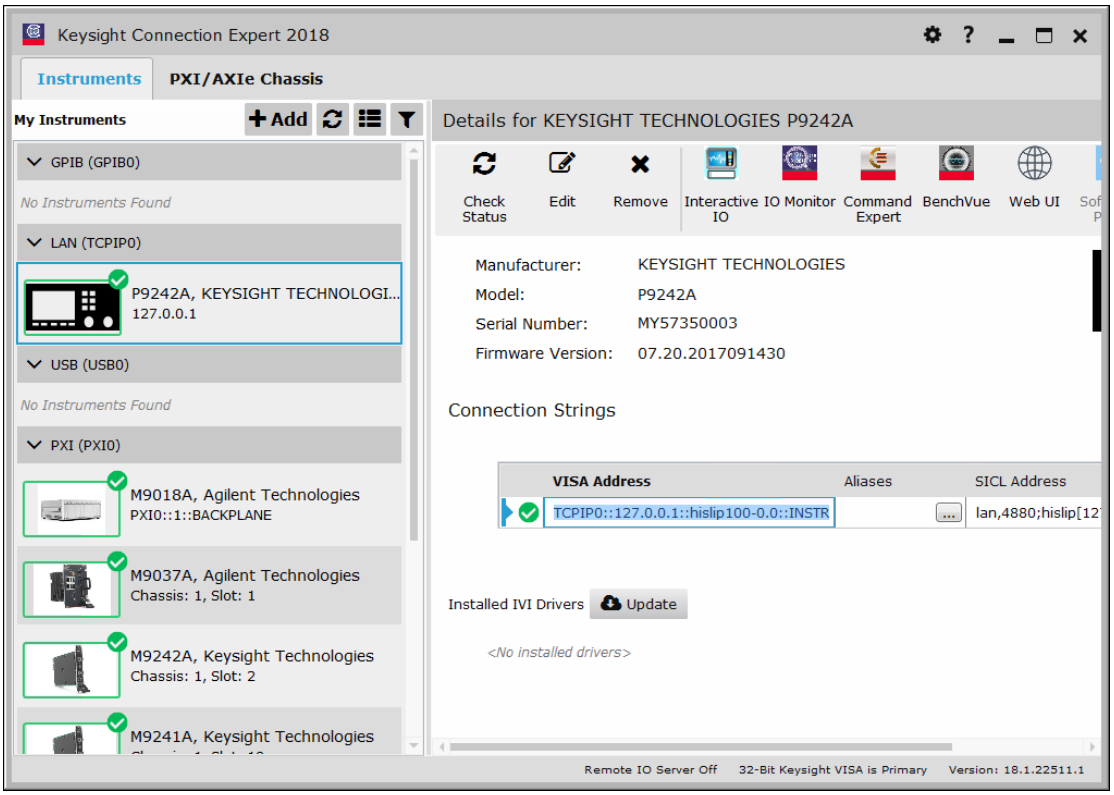
The Interactive IO utility can be started on any controller PC that has the Keysight IO Libraries Suite installed. Typically, you click on the Keysight IO Control icon in the taskbar and choose **Utilities > Interactive IO** from the popup menu (see the *SCPI Programmer's Guide* for complete instructions).

On the host PC (that is, the PC that has the USB 3.0 connection to the oscilloscope), you can also launch the Interactive IO utility from within Connection Expert:

1 Click the Keysight IO Libraries Suite icon in the task bar and choose **Connection Expert** from the popup menu.



2 In the Connection Expert window's Instruments tab, select the connected oscilloscope under the LAN (TCPIP0) interface.



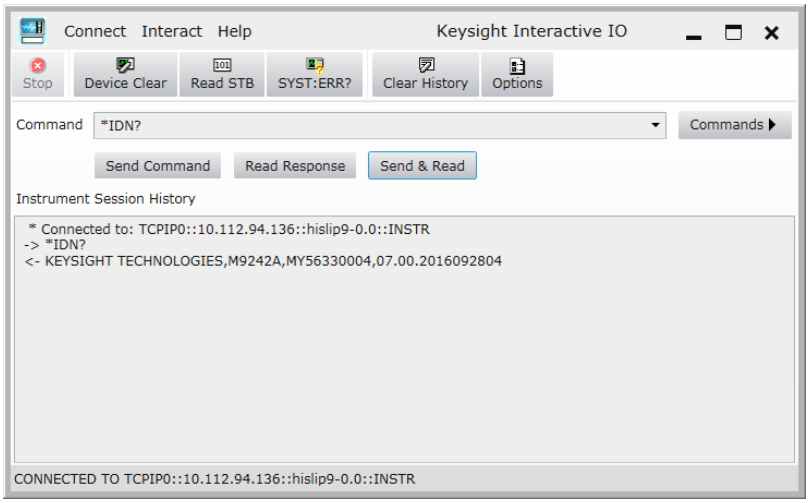
NOTE

The oscilloscope appears under the LAN (TCPIP0) interface when the P9241/42/43A oscilloscope's driver is connected (see "Open the P924xA Oscilloscope Soft Front Panel (SFP)" on page 26).

The oscilloscope also appears under the PXI (PXI0) interface, but trying to send SCPI commands through that interface gives an "Operation not supported" error.

3 In the **Details for** the selected oscilloscope, click **Interactive IO**.

4 To test SCPI commands In the Keysight Interactive IO window, enter commands in the **Command** field and click **Send Command**, **Read Response**, or **Send & Read**.



5 To exit the Keysight Interactive IO application, choose **Connect > Exit** from the menu.

Using the SFP and the Remote API at the Same Time

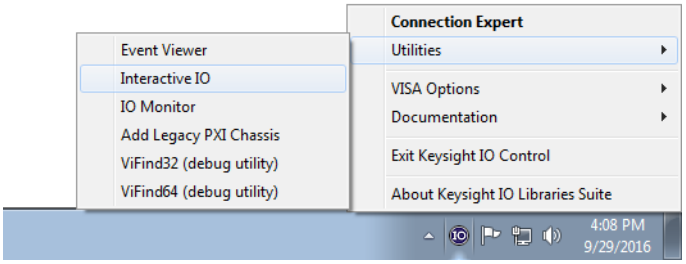
In general, you can use the Soft Front Panel (SFP) and the remote applications programming interface (API) together, at the same time. This can be useful, for example, because it lets you change oscilloscope settings while debugging remote programs.

However, the SFP can become "locked out" while the oscilloscope waits for a waveform to become fully acquired. This can happen, for example, after these SCPI commands/queries: :WAVeform:DATA?, :WAVeform:PREamble?, :LISTer:DATA?, :SEARch:COUNt?, :DIGitize, or :SINGle. In these situations, you can clear the remote operation in progress by sending a Device Clear to the remote user interface.

Sending a Device Clear to the Remote Interface

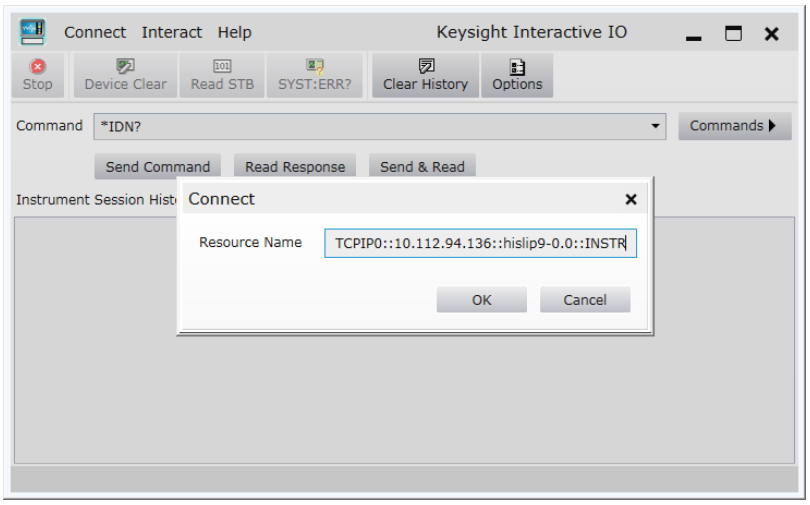
Every remote programming library gives you a way to send an IEEE 488.1-style Device Clear. For example, the IVI-COM library provides the System2.ClearIO method. Another easy way to send a Device Clear is through the IO Libraries Suite's Interactive IO application.

1 On a networked PC that has the IO Libraries Suite installed, click the Keysight IO Control icon in the taskbar and choose **Utilities > Interactive IO** from the popup menu.



2 In the Keysight Interactive IO application, choose **Connect > Connect...**.

3 In the Connect dialog box, enter the oscilloscope's HiSLIP address into the **Resource Name** field and click **OK**.

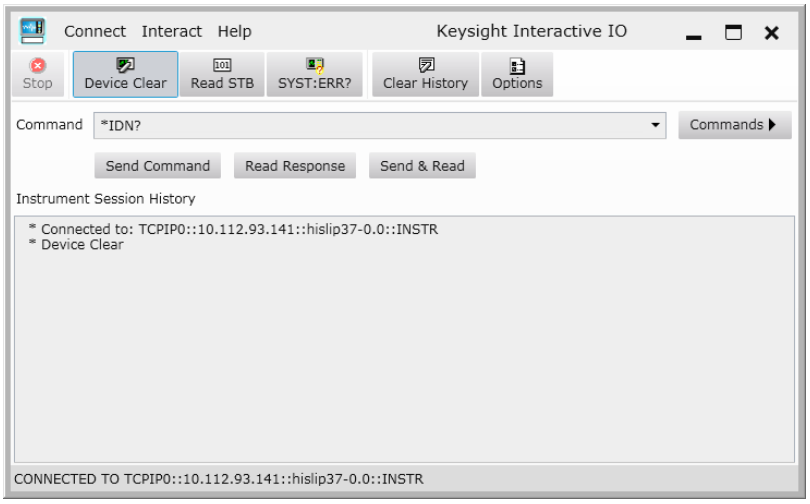


The oscilloscope's HiSLIP address can be cut-and-pasted from your remote program or you can piece it together from the controller PC's IP address (or hostname) and the oscilloscope's PXI address. For example if the controller PC's IP address is "127.0.0.1" (or hostame is "lab-pxi-3.cos.is.keysight.com")

and the oscilloscope's PXI address is "PXI37::0::0::INSTR", the oscilloscope's HiSLIP address is "TCPIP0::10.112.93.141::hislip37-0.0::INSTR" (or "TCPIP0::lab-pxi-3.cos.is.keysight.com::hislip37-0.0::INSTR").

If you are running the Interactive IO application on the controller PC, you can use the "127.0.0.1" localhost IP address, for example, "TCPIP0::127.0.0.1::hislip37-0.0::INSTR".

4 When connected, click **Device Clear**.



5 To exit the Keysight Interactive IO application, choose **Connect > Exit** from the menu.

9 Reference

Environmental Conditions

Environment	Indoor use only.
Weight	2.50 kg
Dimensions (W x H x D)	177 mm x 50 mm x 335 mm
Ambient temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +70 °C
Humidity	95% rH, non-condensing to temperatures up to 40 °C decreasing linearly to 50% rH at 55 °C
Altitude	Operating: 3,000 m (9,842 ft) Non-operating: 4,500 m (14,764 ft)
Pollution Degree	The P9241/42/43A oscilloscopes may be operated in environments of Pollution Degree 2 (or Pollution Degree 1).
Pollution Degree Definitions	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. Pollution Degree 2. Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation may occur. Example: General indoor environment. 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.

Probes and Accessories

For a list of the probes and accessories that are compatible with the P9241/42/43A oscilloscopes, see the data sheet at: www.keysight.com/products/P9241A

See Also For more information on probes and accessories, see www.keysight.com for:

- Probes and Accessories Selection Guide (5989-6162EN)
- InfiniiVision Oscilloscope Probes and Accessories Selection Guide Data Sheet (5968-8153EN)
- For compatibility information, manuals, application notes, data sheets, selection guides, SPICE models, and more for oscilloscope probes, see the Probe Resource Center at: www.keysight.com/find/PRC

Specifications and Characteristics

Please see the oscilloscope data sheet for complete, up-to-date specifications and characteristics. To download the data sheet for the P9241/42/43A oscilloscopes, please visit: www.keysight.com/products/P9241A

Measurement Category

- "Oscilloscope Measurement Category" on page 50
- "Measurement Category Definitions" on page 50

Oscilloscope Measurement Category

The Keysight P9241/42/43A oscilloscopes are not intended to be used for measurements in Measurement Category II, III, or IV.

WARNING **Use this instrument only for measurements within its specified measurement category (not rated for CAT II, III, IV). No transient overvoltages allowed.**

Measurement Category Definitions

The "Not rated for CAT II, III, IV" measurement category is for measurements performed on circuits not directly connected to MAINS. Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS derived circuits. In the latter case, transient stresses are variable; for that reason, the transient withstand capability of the equipment is made known to the user.

Measurement category II is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

Measurement category III is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

Measurement category IV is for measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.

Product Markings

These symbols are used on the P9241/42/43A oscilloscopes.

Symbol	Description
	Caution, refer to accompanying documentation
	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).
 MSIP-REM-Kst-1A16182	South Korean Certification (KC) mark; includes the marking's identifier code which follows this format: MSIP-REM-YYY-ZZZZZZZZZZZZZZ.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	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 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).
	The CSA mark is a registered trademark of the CSA International.

Index

P

Q

R

S

T

U

V

W