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PicoScope® 4000 Series

PC Oscilloscopes

User's Guide



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1 Welcome

Thank you for buying a Pico Technology product!

The **PicoScope 4000 Series** PC Oscilloscopes from Pico Technology are a range of compact units designed to replace and outperform traditional bench-top models costing many times the price. This guide covers all oscilloscopes in this range.



The following models are available in the PicoScope 4000 Series:

PicoScope 4262	5 MHz 16-bit 2-channel oscilloscope
PicoScope 4224A	20 MHz 12-bit 2-channel oscilloscope
PicoScope 4424A	20 MHz 12-bit 4-channel oscilloscope
PicoScope 4824A	20 MHz 12-bit 8-channel oscilloscope

For detailed specifications on each model see the accompanying data sheet, available to download from www.picotech.com.

Here are some of the benefits provided by your new PicoScope 4000 Series PC Oscilloscope:

- **Portability:** Take the unit with you and simply plug it in to any Windows, Mac or Linux PC.
- **Performance:**
 - PicoScope 4262: Industry-leading high-precision low-distortion inputs, 16-bit resolution.
 - PicoScope 4000A: Up to 8 channels, 12-bit resolution, large buffer with up to 256M samples, fast USB 3.0 interface.
- **Flexibility:** Use as an oscilloscope, spectrum analyzer, high-performance signal generator, or high-speed data acquisition interface.
- **Programmability:** The PicoScope 4000 Series API allows you to write your own programs in your chosen programming language to control all the features of the 4000 Series scopes.
- **Long-term support:** Software upgrades are available to download from our [website](http://www.picotech.com). You can also call our technical specialists for support. You can continue to use both of these services free of charge for the lifetime of the product.
- **Value for money:** You don't have to pay twice for all the features that you already have in your PC. The PicoScope 4000 Series scope unit contains the special hardware you need and nothing more.
- **Convenience:** The software makes full use of the large display, storage, user interface and networking built in to your PC.

Programming with the PicoScope 4000 Series

An **Application Programming Interface** (API) is supplied free of charge with the PicoScope 4000 Series scopes. You can download and install the correct API and **Programmer's Guide** for your product from our website at www.picotech.com/downloads.

2 Introduction

2.1 Safety information

This product has been designed and tested in accordance with the harmonized standard publication EN 61010-1: 2010+A1:2019 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use) and EN 61010-2-030: 2010 (Requirements for Testing and Measuring Circuits). The product left the factory in a safe condition.

The following safety descriptions are found throughout this guide:










A **WARNING** identifies conditions or practices that could result in injury or death.

A **CAUTION** identifies conditions or practices that could result in damage to the product or equipment to which it is connected.

Each of these safety instructions applies to all of the 4000 Series oscilloscopes covered by this User's Guide, unless otherwise specified.

2.1.1 Symbols

These safety and electrical symbols may appear on the product and throughout this guide.

Symbol	Description
	Direct current.
	Alternating current.
	Functional earth terminal.
	Chassis ground terminal.
	Equipment protected throughout by double insulation or reinforced insulation.
	Possibility of electric shock.
	Caution.
	Static awareness. Static discharge can damage part(s).
CAT	IEC 61010 overvoltage category.
	Do not dispose of this product as unsorted municipal waste.

This terminal is connected to chassis ground, and allows you to connect the oscilloscope to an external ground reference. This terminal is not intended to provide a protective (safety) ground.

The ground terminals of connectors marked with this symbol are all connected together, and connected to the host PC via the screen of the USB cable.

Indicates a potential HAZARD: consult the product documentation every time you see this symbol, in order to identify the hazard and any actions needed to avoid it.

2.1.2 Product usage

WARNING

To prevent injury or death, use the product only as instructed and use only accessories supplied or recommended. Protection provided by the product may be impaired if used in a manner not specified by the manufacturer.

WARNING

To prevent possible electrical shock, fire, personal injury, or damage to the product, carefully read this safety information before attempting to install or use the product. In addition, follow all generally accepted safety practices and procedures for working with and around electricity.

2.1.3 Maximum input ranges

Observe all terminal ratings and warnings marked on the product.

The table below indicates the full scale measurement range and overload protection range for each oscilloscope model. The full scale measurement ranges are the maximum voltages that can be accurately measured by each instrument. The overload protection ranges are the maximum voltages that can be applied without damaging the oscilloscope.



WARNING

To prevent electric shock, do not attempt to measure voltages outside the specified full scale measurement range below.

Model	Full scale measurement range	Overload protection	
		Input channels / EXT trigger	Signal generator
PicoScope 4262	± 20 V	± 50 V pk max.	± 10 V pk max.
PicoScope 4224A	± 50 V DC / 42.4 V pk max. AC	± 100 V pk max.	± 10 V pk max.
PicoScope 4424A			
PicoScope 4824A			



WARNING

Signals exceeding the voltage limits in the table below are defined as "hazardous live" by EN 61010. To prevent electric shock, take all necessary safety precautions when working on equipment where hazardous live voltages may be present.

Signal voltage limits of EN 61010		
± 60 V DC	30 V AC RMS	± 42.4 V pk max.

WARNING

The **PicoScope 4262**, **PicoScope 4224A**, **PicoScope 4424A** and **PicoScope 4824A** oscilloscopes are not designed to measure hazardous live signals as defined by EN 61010. To prevent electric shock, do not attempt to measure voltages outside of the limits shown in the table above or the specified full scale measurement range, whichever is lower.

WARNING

To prevent injury or death, the oscilloscope must not be directly connected to the mains (line power).



CAUTION

Exceeding the overload protection range on any connector can cause permanent damage to the oscilloscope and other connected equipment.

2.1.4 Grounding

**WARNING**

The oscilloscope's ground connection through the USB cable is for measurement purposes only. The oscilloscope does not have a protective safety ground.

WARNING

Never connect the ground input (chassis) to any electrical power source. To prevent personal injury or death, use a voltmeter to check that there is no significant AC or DC voltage between the oscilloscope ground and the point to which you intend to connect it.

**CAUTION**

Applying a voltage to the ground input is likely to cause permanent damage to the oscilloscope, the attached computer, and other equipment.

CAUTION

To prevent measurement errors caused by poor grounding, always use the high-quality USB cable supplied with the oscilloscope.

2.1.5 Environment

This product is for indoor or outdoor use, in dry locations only.

**WARNING**

To prevent injury or death, do not use in wet or damp conditions, or around explosive gas or vapor.

**CAUTION**

To prevent damage, always use and store your oscilloscope in appropriate environments.

	Storage	Operating
Temperature	–20 °C to +60 °C	0 °C to +45 °C (+20 to +30 °C for quoted accuracy)
Humidity	5% to 95 %RH (non-condensing)	5% to 80 %RH (non-condensing)
Altitude	2000 m	
Pollution degree	2	

Please contact Pico technical support if you would like any advice on integrating a PicoScope into your own product or application.

2.1.6 Care of the instrument

The oscilloscope and its accessories contain no user-serviceable parts. Repair and servicing require specialized test equipment and must only be performed by Pico Technology or an approved service provider. There may be a charge for these services unless covered by the Pico five year warranty.

**WARNING**

To prevent injury or death, do not use the instrument if it appears to be damaged in any way, and stop use immediately if you are concerned by any abnormal operations.

WARNING

When cleaning the oscilloscope, use a soft cloth and a solution of mild soap or detergent in water. To prevent electric shock, do not allow liquids to enter the casing, as this will cause damage to the electronics or insulation inside.

**CAUTION**

Do not tamper with or disassemble the oscilloscope, connectors or accessories. Internal damage will affect performance.

2.2 Conformance

2.2.1 FCC notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

For safety and maintenance information see the [safety information](#).

2.2.2 CE and UKCA notices

This PicoScope oscilloscope meets the intent of the CE EMC directive 2014/30/EU and UKCA SI2016/1091 EMC Regulations.

This oscilloscope also meets the intent of the CE Low Voltage Directive 2014/35/EU and UKCA SI 2016/1101 Electrical Equipment (Safety) Regulations.

For more information, please refer to your product's UKCA Declaration of Conformity or EU Declaration of Conformity, available for download from www.picotech.com.

2.3 Software license conditions

The material contained in this software release is licensed, not sold. Pico Technology Limited grants a license to the person who installs this software, subject to the conditions listed below.

Access. The licensee agrees to allow access to this software only to persons who have been informed of these conditions and agree to abide by them.

Usage. The software in this release is for use only with Pico products or with data collected using Pico products.

Copyright. Pico Technology Ltd. claims the copyright of, and retains the rights to, all material (software, documents etc.) contained in this release. You may copy and distribute the PicoScope and PicoLog software and drivers with no modifications, additions or omissions. You may copy and modify the SDK example programs.

Liability. Pico Technology and its agents shall not be liable for any loss, damage or injury, howsoever caused, related to the use of Pico Technology equipment or software, unless excluded by statute.

Fitness for purpose. Because no two applications are the same, Pico Technology cannot guarantee that its equipment or software is suitable for a given application. It is your responsibility, therefore, to ensure that the product is suitable for your application.

Mission-critical applications. This software is intended for use on a computer that may be running other software products. For this reason, one of the conditions of the license is that it excludes usage in mission-critical applications such as life-support systems.

Viruses. This software was continuously monitored for viruses during production, but you are responsible for virus-checking the software once it is installed.

Support. If you are dissatisfied with the performance of this software, please contact our technical support staff, who will try to fix the problem within a reasonable time. If you are still dissatisfied, please return the product and software to your supplier within 14 days of purchase for a full refund.

Upgrades. We provide upgrades, free of charge, from our web site at www.picotech.com. We reserve the right to charge for updates or replacements sent out on physical media.

2.4 Trademarks

Windows is a registered trademark or trademark of Microsoft Corporation in the USA and other countries.

Pico Technology Limited and **PicoScope** are trademarks of Pico Technology Limited, registered in the United Kingdom and other countries.

PicoScope and **Pico Technology** are registered in the U.S. Patent and Trademark Office.

macOS is a trademark of Apple Inc., registered in the U.S. and other countries.

Linux is the registered trademark of Linus Torvalds, registered in the U.S. and other countries.

2.5 Warranty

Pico Technology **warrants** upon delivery, and for a period of 5 years unless otherwise stated from the date of delivery, that the Goods will be free from defects in material and workmanship.

Pico Technology shall not be liable for a breach of the warranty if the defect has been caused by fair wear and tear, wilful damage, negligence, abnormal working conditions or failure to follow Pico Technology's spoken or written advice on the storage, installation, commissioning, use or maintenance of the Goods or (if no advice has been given) good trade practice; or if the Customer alters or repairs such Goods without the written consent of Pico Technology.

3 Product information

3.1 Pack contents

Your PicoScope 4000 Series PC Oscilloscope kit or product pack contains the following items:

Part	Description	PicoScope 4000 Series oscilloscope model number			
		4262	4224A	4424A	4824A
-	Oscilloscope	1	1	1	1
TA375	Scope probe, 1:1/10:1, 100 MHz BNC	2	2	4	4
TA155	USB 3.0 cable, 1.8 m		1	1	1
MI106	USB 2.0 cable, 1.8 m	1			
DO115	Quick Start Guide	1	1	1	1
PP969	Carry case				1

3.2 Optional extras

For a complete list of optional accessories, please visit www.picotech.com.

Part	Description
TA375	100 MHz 1:1/10:1 switchable passive oscilloscope probe, BNC
TA167	2000 A AC/DC current clamp
PP877	Three-axis accelerometer and oscilloscope interface
TA487	IEPE signal conditioner
PP969	Carry case

3.3 Minimum PC requirements

To ensure that your PicoScope PC Oscilloscope operates correctly, you must have a computer with at least the minimum system requirements to run one of the supported operating systems, as shown in the following table. The performance of the software will increase with more powerful PCs, including those with multi-core processors.

Item	Specification
Operating system	Microsoft Windows, 32-bit and 64-bit versions, Linux, and macOS, 64-bit versions. See picotech.com/downloads for details.
Processor	As required by the operating system
Memory	
Free disk space	
Ports	USB 3.0 or USB 2.0 port(s)

3.4 Installation instructions

Procedure

- Follow the instructions in the USB Oscilloscope Installation Guide included with your product package.
- Connect your PC Oscilloscope to the PC using the USB cable supplied.

Checking the installation

Once you have installed the software and connected the PC Oscilloscope to the PC, start the [PicoScope](#) software. PicoScope should now display any signal connected to the scope inputs. If a probe is connected to your oscilloscope, you should see a small 50 or 60 hertz signal in the oscilloscope window when you touch the probe tip with your finger.

Moving your PicoScope PC Oscilloscope to another USB port

The process is automatic. When you move the device from one port to another, Windows displays an **Installing device driver software** message and then a **PicoScope 4000 Series PC Oscilloscope** message. Your PC oscilloscope is then ready for use.

3.5 Connections for the PicoScope 4262

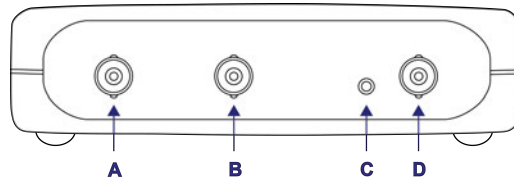
Standard oscilloscope connectors

The PicoScope 4262 PC Oscilloscope has BNC oscilloscope connectors. The inputs have an impedance of 1 M Ω , so they are compatible with all standard scope probes including x1, x10 and switched types.

Connector diagrams

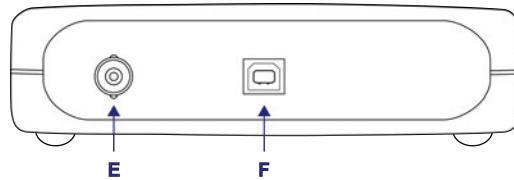
Front panel

- A. Input channel A
- B. Input channel B
- C. LED: shows when the oscilloscope is sampling data
- D. Function generator/
arbitrary waveform generator
output



Rear panel

- E. External trigger input
- F. USB 2.0 port



3.6 Connections for the PicoScope 4824A, 4424A and 4224A

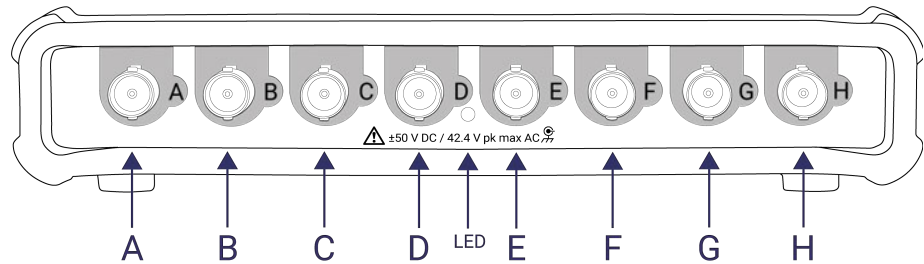
Standard oscilloscope connectors

The PicoScope 4000 Series PC Oscilloscopes have 2, 4 or 8 BNC oscilloscope connectors. The inputs have an impedance of 1 M Ω , so they are compatible with all standard scope probes including x1, x10 and switched types.

Connector diagrams

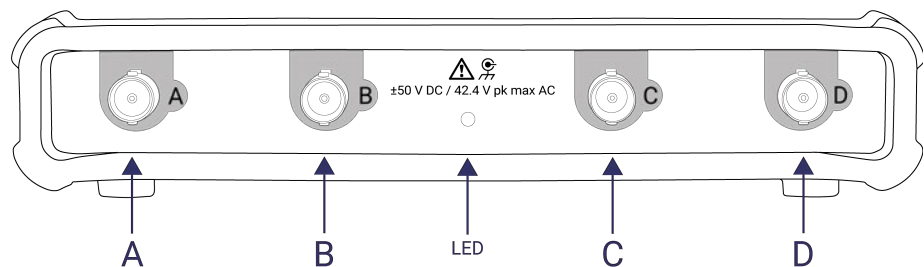
4824A front panel

- A. Input channel A
- B. Input channel B
- C. Input channel C
- D. Input channel D
- E. Input channel E
- F. Input channel F
- G. Input channel G
- H. Input channel H



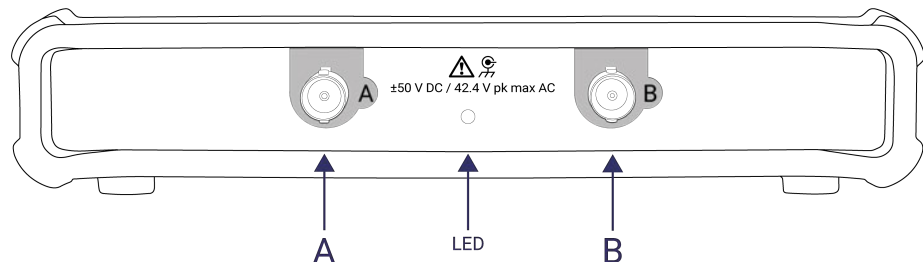
4424A front panel

- A. Input channel A
- B. Input channel B
- C. Input channel C
- D. Input channel D



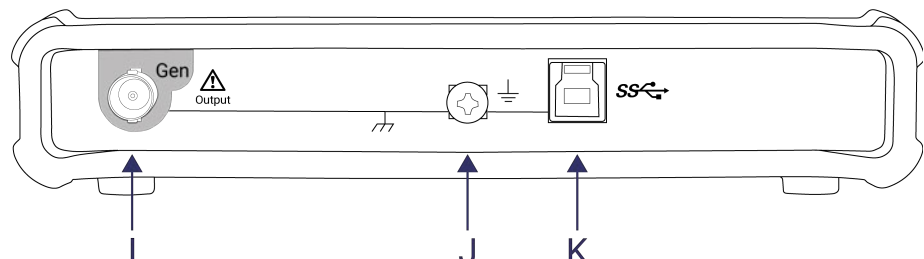
4224A front panel

- A. Input channel A
- B. Input channel B



Rear panel

- I. Arbitrary waveform generator output
- J. Earth terminal
- K. USB 3.0 port



4 Glossary

AC/DC switch. To switch between AC coupling and DC coupling, select AC or DC using the control in the PicoScope software. When AC coupling is selected the signal is capacitively coupled. The DC portion of the signal is blocked and low frequencies attenuated.

Analog bandwidth. The input frequency at which the measured signal amplitude is 3 decibels below the true signal amplitude.

Buffer size. The size of the oscilloscope buffer memory, measured in samples. The buffer allows the oscilloscope to sample data at a fast sampling rate before transferring the data to the computer at a slower rate. Once the buffer fills up, the scope must stop sampling, so on longer timebases the buffer size places an upper limit on the sampling rate that can be used.

GS/s. Gigasamples (billions of samples) per second.

Maximum sampling rate. A figure indicating the maximum number of samples the oscilloscope can acquire per second. The higher the sampling rate of the oscilloscope, the more accurate the representation of the high-frequency details in a fast signal.

MS/s. Megasamples (millions of samples) per second.

PC Oscilloscope. A virtual instrument formed by connecting a PicoScope 4000 Series oscilloscope to a computer running the PicoScope software.

PicoScope 4000 Series. Pico Technology's high-resolution USB PC Oscilloscopes.

PicoScope software. A program that accompanies all Pico PC Oscilloscopes. It turns your PC into an oscilloscope, spectrum analyzer and measuring instrument.

Real-time sampling. The normal operating mode of a digital oscilloscope. The scope collects a single, unbroken sequence of samples at or below its maximum sampling rate.

Resolution. The number of bits used to digitize an input signal. The higher the resolution, the smaller the voltage change that can be detected.

Timebase. The time base controls the time intervals marked on the horizontal divisions of the scope view. There are ten divisions across the scope view, so the total time across the view is ten times the time base per division.

USB. Universal Serial Bus (USB), an interface found on all modern PCs. Although your PicoScope will work with a USB 1.1 port, its operation will be greatly improved by using the recommended USB 2.0 or 3.0 port.

Voltage range. The range of input voltages that the oscilloscope can measure. For example, a voltage range of ± 100 mV means that the oscilloscope can measure voltages between -100 mV and +100 mV. Input voltages outside this range will not damage the instrument as long as they remain within the protection limits stated in the relevant specifications table.

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