

# 1 Welcome

The PicoScope 3000 Series of PC Oscilloscopes from Pico Technology is a range of high-specification, real-time measuring instruments that connect to the USB port of your computer. The oscilloscopes obtain their power supply through the USB cable, so they do not need an additional power supply and are therefore highly portable. The 3000 Series consists of two ranges:

- General-purpose range (PicoScope 3204, 3205 and 3206 variants)
- High-precision range (PicoScope 3224 and 3424 variants)

With the PicoScope software you can use PicoScope 3000 Series PC Oscilloscopes as oscilloscopes and spectrum analysers; and with the PicoLog software you can use them as data loggers. Alternatively, using the [API functions](#),<sup>16</sup> you can develop your own programs to collect and analyse data from the oscilloscope.

A typical PicoScope 3000 Series PC Oscilloscope is supplied with the following items:

- USB cable, for use with USB 1.1 and 2.0 ports
- Software and Reference CD
- Installation Guide

## 2 Introduction

### 2.1 Safety symbols

#### Symbol 1: Warning Triangle



This symbol indicates that a safety hazard exists on the indicated connections if correct precautions are not taken. Read all safety documentation associated with the product before using it.

#### Symbol 2: Equipotential



This symbol indicates that the outer shells of the indicated BNC connectors are all at the same potential (shorted together). You must therefore take necessary precautions to avoid applying a potential across the return connections of the indicated BNC terminals as this may cause a large current to flow, resulting in damage to the product and/or connected equipment.

## 2.2 Safety warning

We strongly recommend that you read the general safety information below before using your oscilloscope for the first time. Safety protection built in to equipment may cease to function if the equipment is used incorrectly. This could cause damage to your computer, or lead to injury to yourself and others.

### Maximum input range

PicoScope 3000 Series PC Oscilloscopes are designed to measure voltages in the range -20 V to +20 V. Inputs are protected to  $\pm 100$  V ( $\pm 30$  V for external trigger). Contact with voltages outside the protection range may cause permanent damage to the unit.

### Mains voltages

Pico Technology products are not designed for use with mains voltages. To measure mains, use a differential isolating probe specifically designed for a high source voltage.

### Safety grounding

PicoScope 3000 Series PC Oscilloscopes connect direct to the ground of a computer through the interconnecting cable provided to minimise interference.

As with most oscilloscopes, avoid connecting the ground input to any potential other than ground. If in doubt, use a meter to check that there is no significant AC or DC voltage between the ground input of the oscilloscope and the point to which you intend to connect it. Failure to check may cause damage to your computer, or lead to injury to yourself and others.

You should not rely on the product to provide a protective safety earth.

### Repairs

The oscilloscope contains no user-serviceable parts. Repair or calibration of the oscilloscope requires specialised test equipment and must be performed by Pico Technology.

## 2.3 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 warning](#) .

## 2.4 CE notice

The PicoScope 3000 Series PC Oscilloscopes meet the intent of the **EMC directive 89/336/EEC** and have been designed to **EN61326-1 (1997) Class A Emissions and Immunity** standard.

PicoScope 3000 Series PC Oscilloscopes also meet the intent of the **Low Voltage Directive** and have been designed to meet the **BS EN 61010-1:2001 IEC 61010-1:2001** (safety requirements for electrical equipment, control, and laboratory use) standard.

## 2.5 Licence conditions

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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 licence is that it excludes usage in mission-critical applications; for example, life-support systems.

## 2.6 Trademarks

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Pico Technology **warrants** upon delivery, and for a period of 24 months 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.

## 2.8 Company details

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## 3 Product information

### 3.1 Minimum system requirements

To ensure that your PicoScope 3000 Series PC Oscilloscope operates correctly, you must have a computer with the minimum system requirements to run Windows or the following (whichever is the higher specification):

<b>Processor</b>	Pentium-class processor or equivalent, or better.
<b>Memory</b>	256 MB minimum.
<b>Disk space</b>	10 MB minimum.
<b>Operating system</b>	Microsoft Windows XP SP2 or Vista.
<b>Ports</b>	USB 1.1 compliant port minimum. USB 2.0 compliant port recommended. Must be connected direct to the port or a powered USB hub. Will not work on a passive hub.

### 3.2 Installation instructions

**Important**  
**Do not connect your PicoScope 3000 Series PC Oscilloscope to the PC until you have installed the software.**

#### Procedure

- Follow the instructions in the Installation Guide included with your product package.
- Connect your PC Oscilloscope to the PC using the USB cable supplied.
- There is no need for an additional power supply, as the unit obtains its power from the USB port.

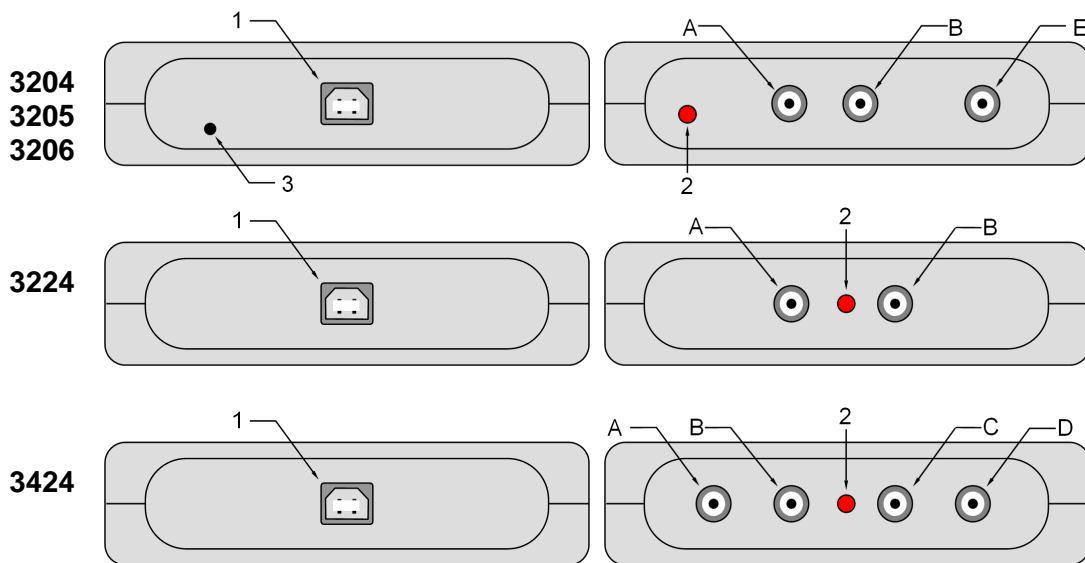
#### Checking the installation

Once you have installed the software and connected the PC Oscilloscope to the PC, start the PicoScope or PicoLog software. The software should now display any signal connected to the scope inputs. If you are using the PicoScope software and have a probe 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 .

#### Standard oscilloscope connectors

PicoScope 3000 Series PC Oscilloscopes have standard oscilloscope connectors. The input impedance is also standard, so the x10 function on scope probes works correctly.

## Connector diagrams



- 1 USB port
- 2 LED: lights when the oscilloscope is sampling data
- 3 Power socket: 12 V DC at 500 mA
- A Input channel A
- B Input channel B
- C Input channel C
- D Input channel D
- E External trigger input / signal generator output \*

\* The BNC connector labelled 'E' on the 3204/5/6 models has two functions. In normal use it is the external trigger input with an adjustable threshold. Alternatively, on some oscilloscopes, it can also be used to output sine, square and triangle waveforms which can be swept back and forth at a user-defined frequency. The integrated [signal generator](#) <sup>[15]</sup> can be controlled by the PicoScope software or by API calls. The signal generator can also be used to compensate x10 scope probes when set to output a square wave.

## Ground loops

If you experience excessive noise or voltage offsets when using the PicoScope 3204/5/6 variants, you may have a ground loop problem. See [Powering the 3204/5/6](#) <sup>[42]</sup> for advice on overcoming this.

## Moving your PicoScope PC Oscilloscope to another USB port

When you install the PicoScope 3000 Series PC Oscilloscope by plugging it into a USB port, Windows associates the Pico [driver](#) <sup>[9]</sup> with that port. If you later move the oscilloscope to a different USB port, Windows will display the "New Hardware Found Wizard" again. When this occurs, simply follow the steps listed in the Installation Guide after the instruction "Connect the PicoScope 3000 Series PC Oscilloscope to the PC..." As all the software you need is already installed on your computer, there is no need to insert the Pico Software and Reference CD again.

### 3.3 Specifications

Variant	3204	3205	3206	3224	3424
<b>Vertical resolution</b>	8 bits			12 bits	
<b>Analog bandwidth</b>	50 MHz	100 MHz	200 MHz	10 MHz	
<b>Max. sampling rate</b>					
One channel in use	50 MS/s	100 MS/s	200 MS/s	20 MS/s	20 MS/s
Two channels in use	50 MS/s	100 MS/s	100 MS/s	10 MS/s	10 MS/s
3 or 4 channels in use	-	-	-	-	5 MS/s
Repetitive signals	2.5 GS/s	5 GS/s	10 GS/s	-	-
<b>Trigger bandwidth</b>	50 MHz	100 MHz	150 MHz	10 MHz	
<b>Buffer size</b> (samples per channel)					
One channel in use	256 K	512 K	1 M	512 K	512 K
Two channels in use	128 K	256 K	512 K	256 K	256 K
3 or 4 channels in use	-	-	-	-	128 K
<b>Inputs</b>	2 BNC channels				4 BNC channels
	1 M $\Omega$ impedance AC/DC coupling 20 pF capacitance				
<b>Outputs</b>					
Signal generator	Fixed (Note 1)	Variable (Note 2)		None	
External trigger	1 BNC input shared with signal generator Variable trigger threshold $\pm$ 20 V Rising/falling 12.2 mV resolution 1 M $\Omega$ impedance			None	
<b>Voltage ranges</b>	$\pm$ 100 mV to $\pm$ 20 V in 8 ranges			$\pm$ 20 mV to $\pm$ 20 V in 10 ranges	
<b>Accuracy</b>	3% voltage 50 ppm time			1% voltage 50 ppm time	
<b>Operating environment</b>					
Temperature range	0°C to 70°C (25°C for quoted accuracy)			0°C to 70°C (20°C to 30°C for quoted accuracy)	
Humidity	25% to 75% RH			25% to 75% RH	
<b>Overload protection</b>					
Channels	$\pm$ 100 V			$\pm$ 100 V	
External trigger	$\pm$ 30 V			-	
<b>PC connection</b>	USB 2.0 Compatible with USB 1.1				
<b>Power supply</b>	From USB port: 4.6 to 5.25 V 500 mA External power supply is not required			From USB port	
<b>Dimensions</b>	140 mm x 200 mm x 45 mm				
<b>Compliance</b>	<a href="#">CE standard</a> <sup>4</sup> ; <a href="#">FCC Part 15</a> <sup>3</sup>				

(1) 1 BNC shared with external trigger. Fixed frequency 1 kHz. 5 V square wave. 600  $\Omega$  output impedance.

(2) 1 BNC shared with external trigger. Variable frequency 100 Hz to 1 MHz. 5 V square wave, 1 V sine wave and triangle functions. Repeat sweep function. Dual slope function. 600  $\Omega$  output impedance.