



# **PicoScope 3000 Series**

## **A, B and D MSO model oscilloscopes**

User's Guide



# Contents

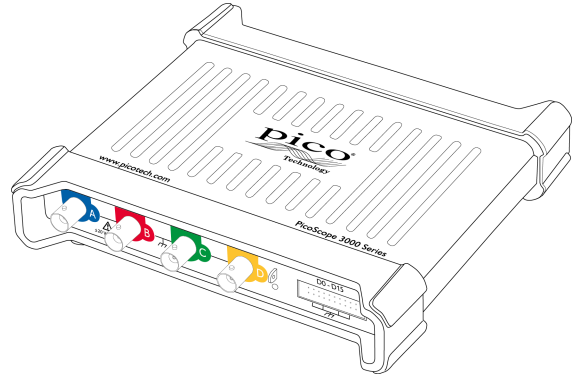
1 Introduction .....	1
<b>1 Safety information</b> .....	3
1 Symbols .....	4
2 Maximum input ranges .....	5
3 Grounding .....	6
4 External connections .....	6
5 Environment .....	7
6 Care of the instrument .....	8
<b>2 Conformance</b> .....	8
1 FCC notice .....	8
2 CE notice .....	8
<b>3 Software licence conditions</b> .....	9
<b>4 Trademarks</b> .....	9
<b>5 Warranty</b> .....	10
<b>6 Company details</b> .....	10
2 Product information .....	11
<b>1 Model comparison table</b> .....	12
<b>2 Connector diagrams</b> .....	13
1 PicoScope 3000 2-channel A and B model oscilloscopes .....	13
2 PicoScope 3000 4-channel A and B model oscilloscopes .....	14
3 PicoScope 3000 2-channel D MSO model oscilloscopes .....	15
4 PicoScope 3000 4-channel D MSO model oscilloscopes .....	16
5 Digital inputs for PicoScope 3000 D MSO models .....	17
<b>3 Connectivity, power and installation</b> .....	18
<b>4 Pack contents</b> .....	20
<b>5 Minimum system requirements</b> .....	21
<b>6 Compensating probes</b> .....	22
3 Glossary .....	23
Index .....	25



# 1 Introduction

Thank you for buying a PicoScope 3000 Series Oscilloscope from Pico Technology.

The PicoScope 3000 Series oscilloscopes from Pico Technology are a range of high-specification real-time measuring instruments which connect to the USB port of your computer. With the [PicoScope software](#) you can use these devices as oscilloscopes and spectrum analyzers. The various model options offer portability, deep memory, mixed-signal inputs, fast sampling rates and high bandwidth, making these highly versatile oscilloscopes suitable for a wide range of applications.



The A models are high-speed portable oscilloscopes with a function generator:

PicoScope 3204A	PicoScope 3205A	PicoScope 3206A	PicoScope 3207A
PicoScope 3404A	PicoScope 3405A	PicoScope 3406A	

The B models have all of the functions of the A models with the addition of an arbitrary waveform generator and deeper memory:

PicoScope 3204B	PicoScope 3205B	PicoScope 3206B	PicoScope 3207B
PicoScope 3404B	PicoScope 3405B	PicoScope 3406B	

The D MSO models are mixed-signal-oscilloscopes with deep memory and an arbitrary waveform generator, plus 16 digital inputs:

PicoScope 3204D MSO	PicoScope 3205D MSO	PicoScope 3206D MSO
PicoScope 3404D MSO	PicoScope 3405D MSO	PicoScope 3406D MSO

Here are some of the benefits provided by the PicoScope 3000 Series oscilloscopes:

- Portability. Take the unit with you and simply plug it in to any Windows PC.
- Performance. Up to 1 GS/s sampling, 250 MHz bandwidth and 512 MS buffer.
- Mixed signal capability. Display analog and digital signals on the same timebase using the MSO models.
- Flexibility. Use as an oscilloscope, spectrum analyzer, signal generator, or high-speed data acquisition interface.
- Programmability. The PicoScope 3000A SDK lets you write your own programs, in your chosen programming language, to control all of the features of the scope. Using the API functions, you can develop your own programs to collect and analyze data from the oscilloscope. Refer to the *PicoScope 3000 Series (A API) Programmer's Guide* for more information.
- Long-term support. Software upgrades are available to download from [www.picotech.com](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 features already available on your PC, as the PicoScope 3000 Series oscilloscope contains the specialised hardware you need and nothing more.
- Convenience. The software makes full use of the display, disk storage, user interface and networking built into your PC using a fast USB connection.
- Five-year warranty. Your oscilloscope is covered against manufacturing faults for five years from the day of purchase. We don't charge a penny extra for this.

For further information on the PicoScope 3000 Series oscilloscopes, see the [comparison table](#) in this manual, and the specifications tables in the PicoScope 3000 Series data sheet available at [www.picotech.com](http://www.picotech.com).

## 1.1 Safety information

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 near electricity.

The product has been designed and tested in accordance with the European standard publication EN 61010-1: 2010, and left the factory in a safe condition.

The following safety descriptions are found throughout this guide:



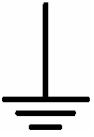
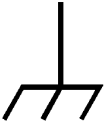
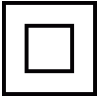



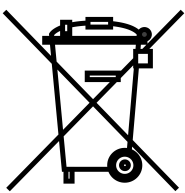
A WARNING identifies conditions or practices that could result in injury or death.

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 3000 Series oscilloscopes covered by this User's Guide, unless otherwise specified.

### 1.1.1 Symbols

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

Symbol	Description
	Direct current
	Alternating current
	Earth (ground) terminal This terminal can be used to make a measurement ground connection. It is not a safety or protective earth.
	Chassis terminal
	Equipment protected throughout by double insulation or reinforced insulation.
	Possibility of electric shock
	Caution Appearance on the product indicates a need to read these safety instructions.
	Static awareness. Static discharge can damage part(s)
<b>CAT</b>	IEC 61010 overvoltage category
	Do not dispose of this product as unsorted municipal waste



#### WARNING

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



### 1.1.2 Maximum input ranges

Observe all terminal ratings and warnings marked on the product.

The table below indicates the full scale measurement range and overvoltage protection range for each oscilloscope model. The full scale measurement ranges are the maximum voltages that can be accurately measured by each instrument. The overvoltage 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	Overvoltage protection		
		Input channels / EXT trigger	Signal generator	Digital channels (MSO models)
All PicoScope 3000 Series models	$\pm 20$ V	$\pm 100$ V	$\pm 20$ V	$\pm 50$ V



#### 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 the Low Voltage Directive (LVD)		
$\pm 70$ V DC	33 V AC RMS	$\pm 46.7$ V pk max.

#### WARNING

The PicoScope 3000 Series 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). To measure mains voltages, use a differential isolating probe specifically rated for mains use, such as the TA041 listed at [www.picotech.com](http://www.picotech.com).



#### CAUTION

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

### 1.1.3 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.

### 1.1.4 External connections



#### WARNING

To prevent injury or death, only use the power adaptor supplied with the product, where applicable. This is approved for the voltage and plug configuration in your country.

PicoScope model	USB connection			Ext DC power input		
	USB 2.0	USB 2.0 double-headed	USB 3.0	Voltage (V)	Current (A pk)	Total power (W)
3204, 3205, 3206 A and B	•			-	-	-
3207 A and B		•	•	-	-	-
3404, 3405, 3406 A and B	•	•		5 V	1.2 A	6.0 W
3204, 3205, 3206 D MSO		•	•	-	-	-
3404, 3405, 3406 D MSO		•	•	5 V	1.3 A	6.5 W

## 1.1.5 Environment

**WARNING**

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

**CAUTION**

To prevent damage, always use and store your oscilloscope in appropriate environments. Recommended temperatures and humidity conditions for each model are shown in the table below.

PicoScope 3204A, 3204B, 3205A, 3205B, 3206A, 3206B, 3207A and 3207B		
	Storage	Operating
Temperature	−20 °C to +60 °C	0 °C to +50 °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	

PicoScope 3404A, 3404B, 3405A, 3405B, 3406A and 3406B		
	Storage	Operating
Temperature	−20 °C to +60 °C	0 °C to +40 °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	

PicoScope 3204D, 3205D, 3206D, 3404D, 3405D and 3406D MSO		
	Storage	Operating
Temperature	−20 °C to +60 °C	0 °C to +40 °C +15 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	

### 1.1.6 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.

## 1.2 Conformance

### 1.2.1 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 [section 1.1](#).

### 1.2.2 CE notice

The product meets the intent of the EMC directive 2004/108/EC and has been tested to EN61326-1:2006 Class A Emissions and Basic Immunity.

The product also meets the intent of the Low Voltage Directive and has been designed to meet BS EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use.

### 1.3 Software licence conditions

The software supplied with this product is licensed, not sold. Pico Technology Limited grants a licence 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 Technology products or with data collected using Pico Technology products.

**Copyright.** Pico Technology Limited 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 licence 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 [www.picotech.com](http://www.picotech.com). We reserve the right to charge for updates or replacements sent out on physical media.

### 1.4 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.

## 1.5 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.

## 1.6 Company details

Address:	Pico Technology James House Colmworth Business Park St Neots Cambridgeshire PE19 8YP United Kingdom
Phone:	+44 (0) 1480 396 395
Fax:	+44 (0) 1480 396 296
Email	
Technical Support:	<a href="mailto:support@picotech.com">support@picotech.com</a>
Sales:	<a href="mailto:sales@picotech.com">sales@picotech.com</a>
Web site:	<a href="http://www.picotech.com">www.picotech.com</a>

## 2 Product information

### Standard oscilloscope connectors

The analog input channels have standard BNC connectors and standard input impedances. They are therefore compatible with most oscilloscope probes including x10 and switched x1/x10 variants.

Each PicoScope 3000 Series oscilloscope is supplied with probes that have been compensated specifically for use with that model. For optimum performance, always use the probes provided. Although other oscilloscope probes can be used, the specified performance cannot be guaranteed. Replacement probes can be ordered at [www.picotech.com](http://www.picotech.com).

### Signal generator output

The GEN (signal generator) or AWG (arbitrary waveform generator) connector is the output of the oscilloscope's built-in signal generator, which can generate a number of built-in waveforms. All models have a signal generator, and select models (B and D MSO) can also generate user-defined arbitrary waveforms with the AWG.

- If you are using the PicoScope 6 software, refer to the *PicoScope 6 User's Guide* for information on how to configure the signal generator.
- If you are writing your own software, refer to the *PicoScope 3000 Series (A API) Programmer's Guide*.

### External trigger (EXT) input (A and B models only)

The EXT input can be used as a trigger source. Select it from the Trigger menu in the PicoScope software, or by using a function call if you are writing your own software.

The EXT input uses dedicated circuitry, in combination with a software-configurable threshold, to detect a trigger signal. This leaves the analog channels free for viewing signals. The input characteristics of the EXT input are matched to a scope channel so that the supplied, compensated probes can be used with the EXT input to give high vertical accuracy.

Where trigger timing accuracy is critical, we recommend using one of the main input channels as the trigger source. These channels use accurate digital triggering (to one sample period) and have a vertical resolution of 1 LSB.

EXT inputs are not available on D MSO models.

### Digital inputs for mixed-signal oscilloscopes (D MSO models only)

Alongside the analog channels, the mixed-signal 3000 D MSO Series oscilloscopes also feature 16 digital inputs. The PicoScope software allows you to view both digital and analog signals simultaneously. Your digital inputs are easily manageable, and can be reordered, grouped, and renamed.

Features such as triggering and serial decoding can also be used on the digital channels.

The D MSO models also include SuperSpeed USB 3.0 connectivity, deep memory, and an arbitrary waveform generator.

## 2.1 Model comparison table

For full specifications, refer to the PicoScope 3000 Series data sheets on the Software and Reference CD or to the PicoScope 3000 Series page at [www.picotech.com](http://www.picotech.com).

PicoScope model	Analog channels	16 digital channels	Bandwidth	Buffer memory	Sampling rate	USB*	AWG**
3204A	2		60 MHz	4 MS	500 MS/s	2.0	
3204B	2		60 MHz	8 MS	500 MS/s	2.0	•
3205A	2		100 MHz	16 MS	500 MS/s	2.0	
3205B	2		100 MHz	32 MS	500 MS/s	2.0	•
3206A	2		200 MHz	64 MS	500 MS/s	2.0	
3206B	2		200 MHz	128 MS	500 MS/s	2.0	•
3207A	2		250 MHz	256 MS	1 GS/s	3.0	
3207B	2		250 MHz	512 MS	1 GS/s	3.0	•
3404A	4		60 MHz	4 MS	1 GS/s	2.0	
3404B	4		60 MHz	8 MS	1 GS/s	2.0	•
3405A	4		100 MHz	16 MS	1 GS/s	2.0	
3405B	4		100 MHz	32 MS	1 GS/s	2.0	•
3406A	4		200 MHz	64 MS	1 GS/s	2.0	
3406B	4		200 MHz	128 MS	1 GS/s	2.0	•
3204D MSO	2	•	60 MHz	128 MS	1 GS/s	3.0	•
3205D MSO	2	•	100 MHz	256 MS	1 GS/s	3.0	•
3206D MSO	2	•	200 MHz	512 MS	1 GS/s	3.0	•
3404D MSO	4	•	60 MHz	128 MS	1 GS/s	3.0	•
3405D MSO	4	•	100 MHz	256 MS	1 GS/s	3.0	•
3406D MSO	4	•	200 MHz	512 MS	1 GS/s	3.0	•

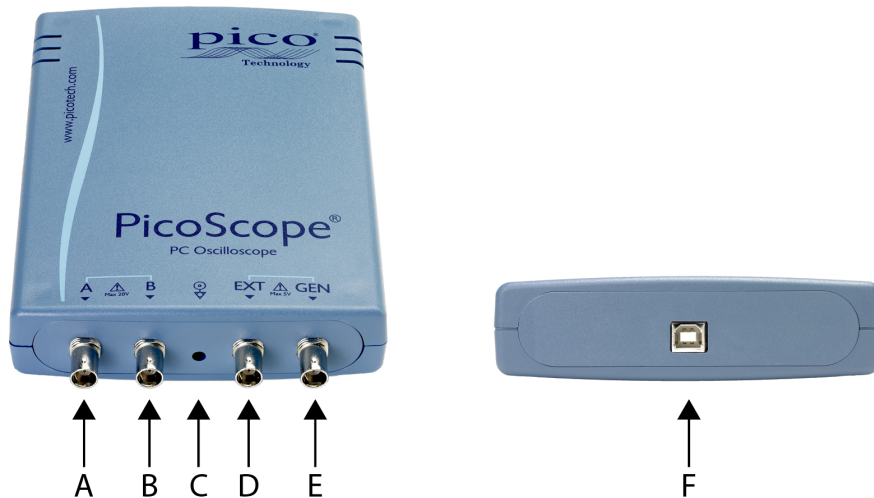
\* All models are backwards-compatible. See [Connectivity, power and installation](#) for more information.

\*\* Arbitrary waveform generator. All models feature a function generator.



## 2.2 Connector diagrams

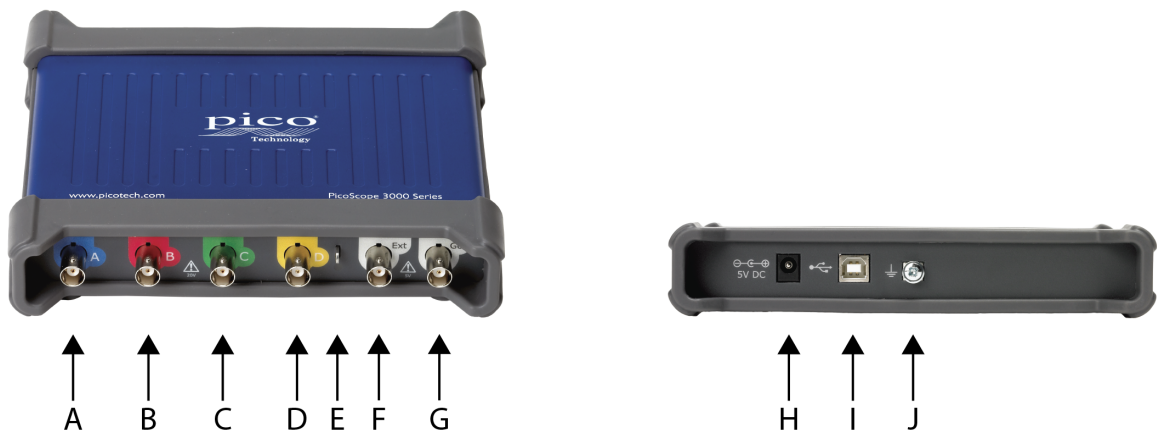
### 2.2.1 PicoScope 3000 2-channel A and B model oscilloscopes



- A. Input channel A
- B. Input channel B
- C. LED  
Flashes red when the oscilloscope is sampling data
- D. External trigger input
- E. Signal generator output (GEN or AWG)
- F. USB port \*

\* See [Connectivity, power and installation](#) for more information.

### 2.2.2 PicoScope 3000 4-channel A and B model oscilloscopes

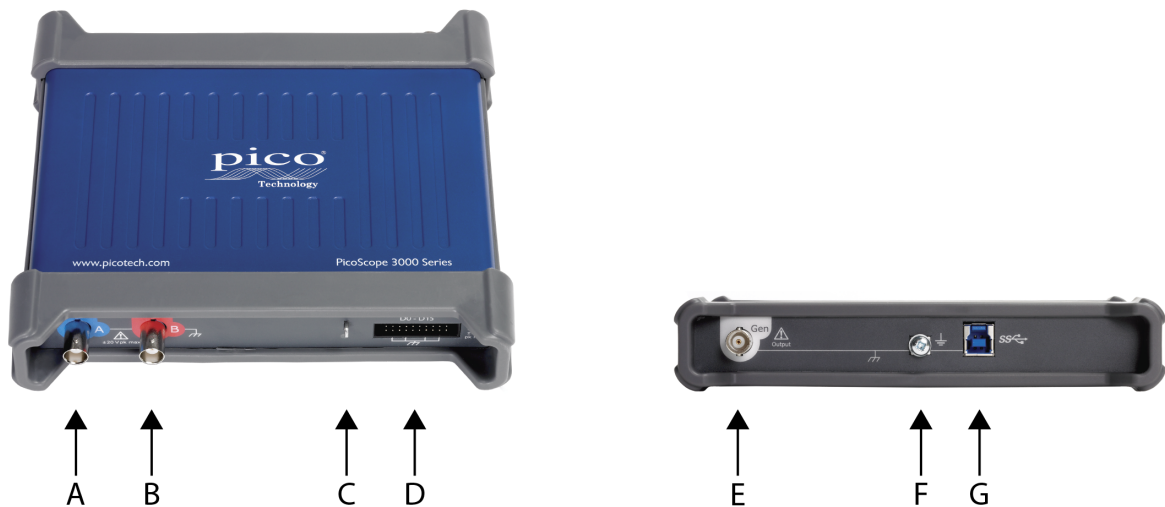


- A. Input channel A
- B. Input channel B
- C. Input channel C
- D. Input channel D
- E. Probe compensation pin (above)  
LED (below)  
Flashes green when the oscilloscope is sampling data
- F. External trigger input
- G. Signal generator output (GEN or AWG)
- H. DC power input \*
- I. USB port \*
- J. Earth terminal \*\*

\* See [Connectivity, power and installation](#) for more information.

\*\* External noise may sometimes interfere with your measurements if the PicoScope is used with a computer which does not have a ground connection. If this is the case, connect the earth terminal to an external ground point (for example, on the system you are testing) to provide a ground reference for the oscilloscope.

## 2.2.3 PicoScope 3000 2-channel D MSO model oscilloscopes



A. Input channel A

B. Input channel B

C. Probe compensation pin (above)

LED (below)

Flashes green when the oscilloscope is sampling data

D. Digital inputs D0 to D15 \*

E. Signal generator output

F. Earth terminal \*\*

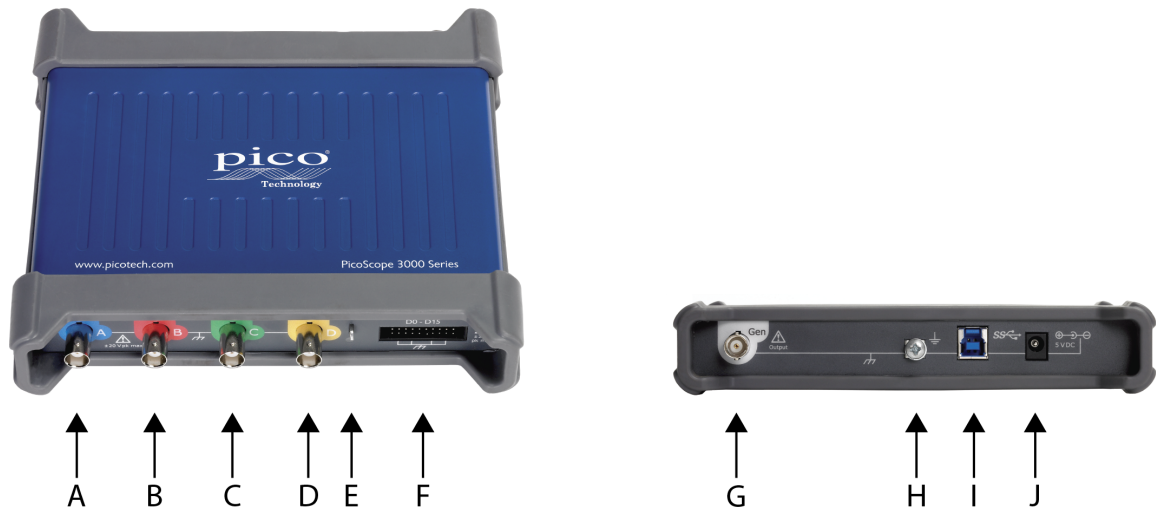
G. USB port \*\*\*

\* See [Digital inputs for PicoScope 3000 Series D MSO models](#) for more information.

\*\* External noise may sometimes interfere with your measurements if the PicoScope is used with a computer which does not have a ground connection. If this is the case, connect the earth terminal to an external ground point (for example, on the system you are testing) to provide a ground reference for the oscilloscope.

\*\*\* See [Connectivity, power and installation](#) for more information.

### 2.2.4 PicoScope 3000 4-channel D MSO model oscilloscopes



A. Input channel A

B. Input channel B

C. Input channel C

D. Input channel D

E. Probe compensation pin (above)

LED (below)

Flashes green when the oscilloscope is sampling data

F. Digital inputs D0 to D15 \*

G. Signal generator output

H. Earth terminal \*\*

I. USB port \*\*\*

J. DC power input \*\*\*

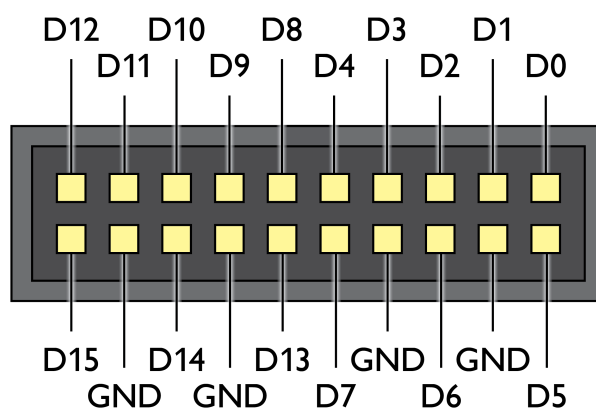
\* See [Digital inputs for PicoScope 3000 Series D MSO models](#) for more information.

\*\* External noise may sometimes interfere with your measurements if the PicoScope is used with a computer which does not have a ground connection. If this is the case, connect the earth terminal to an external ground point (for example, on the system you are testing) to provide a ground reference for the oscilloscope.

\*\*\* See [Connectivity, power and installation](#) for more information.

### 2.2.5 Digital inputs for PicoScope 3000 D MSO models

The digital input pins of the 20-pin IDC header plug are shown below. The diagram is drawn as you look at the front panel of the oscilloscope.



To avoid crosstalk on the digital inputs when probing signals with very fast edges, always take extra care to:

- Keep leads carrying fast signals separate from other input leads.
- Keep leads carrying fast signals as close as possible to the ground leads.
- Connect all four black ground leads to the ground of the circuit under test.

## 2.3 Connectivity, power and installation

### 1. PicoScope software installation

Before setting up your PicoScope 3000 Series oscilloscope, it is recommended that you first install the PicoScope 6 software by following the instructions in the supplied *Quick Start Guide*.

There are different connectivity and power supply options for each oscilloscope model depending on its specifications.

### 2. USB connectivity

For best results only use the high-quality USB cables supplied with your PicoScope

- USB 2.0 oscilloscopes

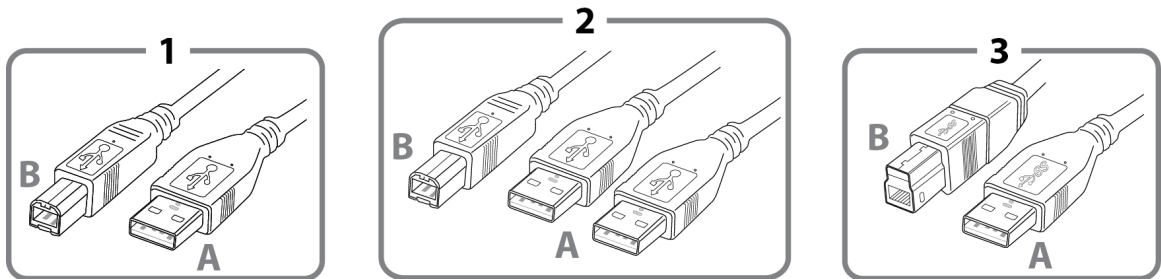
Simply connect the oscilloscope to the PC using the USB 2.0 cable supplied (image 1).

For models with 4 analog channels, you may need to use the double-headed USB cable (image 2). This cable enables you to use a second USB port for additional power. The PicoScope software will notify you if the double-headed USB cable is required.

- USB 3.0 oscilloscopes

Simply connect the oscilloscope to a USB 3.0 port on the PC using the USB 3.0 cable supplied (image 3).

If your computer does not have an available USB 3.0 port, you can use the double-headed USB 2.0 cable instead (image 2). This cable enables you to use a second USB port for additional power. The PicoScope software will notify you if the double-headed USB cable is required.



Connector A: Connect to the USB port on your PC

Connector B: Connect to the USB port on your PicoScope 3000 Series oscilloscope

### 3. Oscilloscope installation

Once you have connected a USB cable between your PC and the oscilloscope, Windows will install the device. You will see different alerts depending on your operating system. There is no need to reinsert the software CD.

- Windows XP

A *New Hardware Found* wizard will be displayed. Simply click *Next* to run through the installation. If a *Windows Logo Testing* warning is displayed, click *Continue Anyway*.

- Windows Vista, Windows 7 and Windows 8

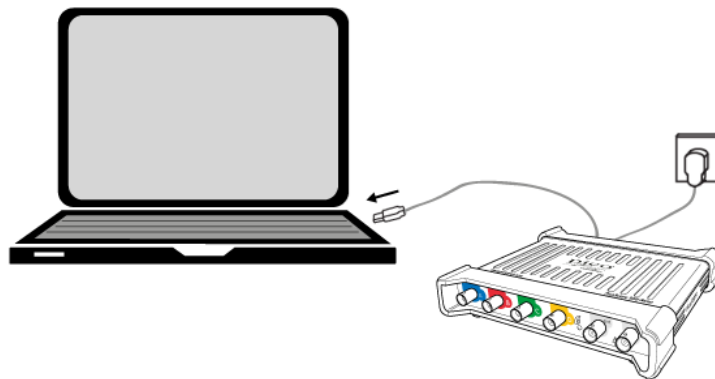
The process is automatic. An *Installing device driver software* message will be displayed during the installation.

Note: After the installation is complete, if you move your oscilloscope to a different USB port the installation process will be repeated.

### 4. External power supply

For PicoScope 3000 Series oscilloscopes with 4 analog channels, the supplied AC power adaptor may be required if the USB port(s) provide less than 1200 mA. The PicoScope software will notify you if the AC adaptor is required. Simply connect the adaptor and USB cable as shown below.

Note: if the AC adaptor is connected or disconnected while the oscilloscope is in operation, it will restart automatically and any unsaved data will be lost.



### 5. Running the PicoScope software

Once you have connected the oscilloscope, start the PicoScope software. Signals connected to the scope inputs should now be displayed. If you touch a connected probe's tip with your finger, you should see a small 50 or 60 Hz signal in the oscilloscope window.

## 2.4 Pack contents

All PicoScope 3000 Series oscilloscope kits contain:

- PicoScope 3000 Series oscilloscope
- Quick Start Guide
- Software and reference CD

Each model is also supplied with probes and additional items as shown below.

PicoScope model	Probes (x1/x10)	Digital cable	Test clips (20)	AC power adaptor	USB 2.0 cable	USB 2.0 double-headed cable*	USB 3.0 cable
3204A and B	2 x 60 MHz				•		
3205A and B	2 x 150 MHz				•		
3206A and B	2 x 250 MHz				•		
3207A and B	2 x 250 MHz					•	•
3404A and B	4 x 60 MHz			•	•	•	
3405A and B	4 x 150 MHz			•	•	•	
3406A and B	4 x 250 MHz			•	•	•	
3204D MSO	2 x 60 MHz	•	•			•	•
3205D MSO	2 x 150 MHz	•	•			•	•
3206D MSO	2 x 250 MHz	•	•			•	•
3404D MSO	4 x 60 MHz	•	•	•		•	•
3405D MSO	4 x 150 MHz	•	•	•		•	•
3406D MSO	4 x 250 MHz	•	•	•		•	•

- \* A double-headed USB 2.0 cable is supplied for all oscilloscopes with USB 3.0 connectivity or with 4 analog channels. See [Connectivity, power and installation](#) for more information.



## 2.5 Minimum system requirements

To ensure that your PicoScope 3000 Series oscilloscope operates correctly, you must have a computer with the system requirements and one of the operating systems shown in the table below. The performance of the oscilloscope will be better with a more powerful PC, and will greatly benefit from a multi-core processor.

Item	Specification
Operating system	Windows XP (SP3), Windows Vista, Windows 7, Windows 8 (not Windows RT). 32 bit and 64 bit versions.
Processor	As required by the Windows operating system
Memory	
Free disk space	
Ports	<a href="#">USB 2.0</a> or <a href="#">USB 3.0</a> port(s) <a href="#">USB 1.1</a> port*

\* PicoScope 3000 Series oscilloscopes will operate slowly on a USB 1.1 port. Not recommended. See [Connectivity, power and installation](#) for more information.

## 2.6 Compensating probes

We recommend that you compensate each oscilloscope probe before using it with your PicoScope. Specific compensation instructions are supplied in a leaflet with each probe kit.

The compensation procedure should be repeated each time the probe is moved to a different input channel.

All required compensation accessories are available in the probe kit.

Connecting a probe for compensation

- PicoScopes with a probe compensation pin

1. Plug the probe's BNC connector into an input channel on the oscilloscope.
2. Fit the spring hook on to the probe tip.
3. Attach the spring hook to the [probe compensation pin](#) on the front panel of the oscilloscope.
4. Attach the ground lead to the probe.
5. Connect the crocodile clip to the ground shell of another input channel.
6. Run the PicoScope software.
7. Set the input coupling to DC and the input range to 2 V.
8. Follow the compensation instructions in the probe leaflet.

- PicoScopes without a probe compensation pin

(PicoScope 3204, 3205, 3206 and 3207 A and B models only)

1. Plug the probe's BNC connector into an input channel on the oscilloscope.
2. Fit the BNC adaptor on to the probe tip.
3. Connect the probe tip with the BNC adaptor to the oscilloscope's [signal generator output](#).
4. Run the PicoScope software.
5. Click the *Signal Generator* button and set the output to a 1 kHz 1.8 V square wave.
6. Set the input coupling to *DC* and the input range to 2 V.
7. Follow the compensation instructions in the probe leaflet.

## 3 Glossary

**API.** Application Programming Interface. A set of function calls that give programmers access to the PicoScope 3000A Series driver.

**AWG.** Arbitrary waveform generator. A signal generator that can play back a waveform of any shape defined by the user.

**Bandwidth.** The range of input frequencies over which the measured signal amplitude is no more than 3 decibels below its true value.

**Buffer size.** The size of the oscilloscope buffer memory, measured in samples. In block mode, the buffer memory is used by the oscilloscope to store temporary data. This allows the oscilloscope to sample data independently of the speed at which it can transfer data to the computer.

**Device Manager.** A Windows program that displays the current hardware configuration of your computer. For Windows XP: Right-click on *My Computer*, select *Properties*, then click the *Hardware* tab and the *Device Manager* button. For Windows Vista, Windows 7 and Windows 8: From the *Start Menu* right-click on *Computer*, choose *Properties*, then click *Device Manager* in the left panel.

**Driver.** A program that controls a piece of hardware. The driver for the PicoScope 3000A Series oscilloscopes is supplied in the form of a 32-bit or 64-bit Windows DLL, *ps3000a.dll*. This is used by the PicoScope software, and by user-designed applications, to control the oscilloscopes.

**External trigger.** The BNC connector marked EXT on the oscilloscope. It can be used as a trigger source but not as a waveform input.

**GS/s.** Gigasamples (billions of samples) per second. Used to quantify the sampling rate of an oscilloscope.

**Maximum sampling rate.** A figure indicating the maximum number of samples the oscilloscope can acquire per second. Maximum sampling rates are usually given in MS/s (megasamples per second) or GS/s (gigasamples 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. Used to quantify the sampling rate of an oscilloscope.

**MSO.** Mixed-signal oscilloscope. An oscilloscope that has both analog and digital inputs.

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

**PicoScope software.** The software product that accompanies all Pico Technology oscilloscopes. It enables your PC to be an oscilloscope, spectrum analyzer, and meter display.

**Signal generator.** A built-in circuit that generates signals suitable for driving an external device under test. Its output is the BNC connector marked GEN or AWG on the oscilloscope. Connect a BNC cable between this output and one of the channel inputs to send a signal into the channel.

**Timebase.** A timer that controls the speed at which the scope captures data. At slow timebases this process is visible as PicoScope draws the trace across the scope view from left to right. At fast timebases PicoScope draws the whole trace in a single operation. The timebase is measured in units of time (such as seconds) per division. There are ten divisions across the scope view, so the total time across the width of the view is ten times the "per division" setting.

**USB.** Universal serial bus. A standard port that enables you to connect external devices to a computer.

**USB 1.1.** An early version of the USB standard, found on some older PCs. PicoScopes will operate slowly using a USB 1.1 port; performance will be greatly improved by using the recommended USB 2.0 or 3.0 port.

**USB 2.0.** A USB 2.0 port uses signaling speeds of up to 480 megabits per second and is backwards-compatible with USB 1.1.

**USB 3.0.** A USB 3.0 port uses signaling speeds of up to 5 gigabits per second and is backwards-compatible with USB 2.0 and USB 1.1.

**Vertical resolution.** A value, in bits, indicating the precision with which the oscilloscope converts input voltages to digital values. The resolution enhancement function can enhance the effective vertical resolution.

**Voltage range.** The range of input voltages that the oscilloscope can measure. For example, a voltage range of  $\pm 20$  V means that the oscilloscope can measure voltages between -20 V and +20 V. Input voltages outside of this range will not be measured correctly. However they will not damage the instrument as long as they remain within the overvoltage protection range stated in the specifications.

# Index

## A

Arbitrary waveform generator 11, 12  
AWG output 13, 14, 15, 16

## B

Bandwidth 12  
Buffer size 12

## C

CE notice 8  
Cleaning 8  
Company details 10  
Contact details 10

## D

DC power 14, 16, 18  
Digital inputs 15, 16, 17

## E

Earth terminal 11, 14, 15, 16  
EXT connector 11, 13, 14  
External trigger 11, 13, 14

## F

FCC notice 8  
Function generator (GEN) 11, 13, 14, 15, 16

## G

GEN output 13, 14  
Grounding 6

## H

Humidity 7

## I

Input channels 12, 13, 14, 15, 16  
Input ranges 5  
Installation guide 20

## L

LED 13, 14, 15, 16

Licence conditions 9

## M

Memory 12  
Mixed-signal oscilloscope (MSO) 15, 16, 17  
Model comparison 12  
MSO 12

## P

PicoScope software 11, 21  
Power adaptor 6, 20  
Probe compensation pin 14, 15, 16  
Probes 11, 20  
    compensating 22

## R

Repair 8

## S

Safety  
    symbols 4  
Sampling rate (maximum) 12  
Servicing 8  
Signal generator 11, 12  
Software and reference CD 20  
Specifications 12  
System requirements 21

## T

Technical support 10  
Temperature 7  
Trademarks 9

## U

USB cables 20  
USB port 11, 13, 14, 15, 16, 18, 21

## W

Warranty 10







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