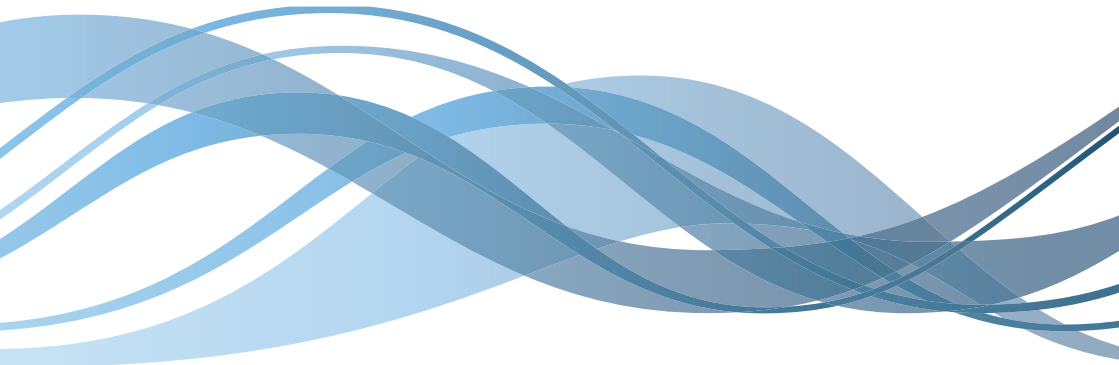


PicoScope 9000 Series PC Sampling Oscilloscopes

QUICK START GUIDE





PicoScope 9000 Series

PC Sampling Oscilloscopes

Quick Start Guide

Issue record:

17.07.08	First version.
20.11.08	Added 9211.
27.04.10	Changed part no. to 9211A.
06.06.11	Added 9221A & 9231A. Added 64-bit Windows & Win7.
12.12.11	Simplified cover.
01.02.13	Various small updates.
20.06.13	Added 9300 Series. Updated safety & setup information.
12.11.13	Added PicoScopes 9311, 9312, and 9321.

CONTENTS

1	Introduction	4
2	Safety information	4
2.1	Symbols	4
2.2	Maximum input ranges	5
2.3	Grounding	5
2.4	External connections	6
2.5	Environment	6
2.6	Care of the product	6
3	Conformance	7
3.1	FCC notice	7
3.2	CE notice	7
4	System requirements	7
5	Included with your PicoScope	8
6	Installing the PicoScope 9000 and PicoSample 3 software	9
7	Using your oscilloscope	10
7.1	Connection diagrams	10
7.2	Getting started with the software	10
7.3	Adding measurements	13
7.4	Configuring the display	14
8	Free newsletter	15
9	Software updates and replacement	15
10	Specifications	15
11	Technical support	15

1 Introduction

Thank you for purchasing a PicoScope 9000 Series PC Sampling Oscilloscope, a high-bandwidth, high-effective-sampling-rate measuring instrument specifically designed for capturing and analysing cyclical waveforms or clocked data streams.

Once you have finished the basic installations described here, the *User's Guide* will provide further information about setting up and using the hardware and software. To open the *User's Guide*, click the **Help** button in the PicoScope 9000 or PicoSample 3 software, or read it in PDF format directly from the software disc.

2 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 around 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.

2.1 Symbols

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

Symbol	Description
	Direct current
	Alternating current
	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.

2.2 Maximum input ranges

Safe input range	± 2 V relative to ground
Operating input range	± 1 V relative to ground 1 V pk-pk amplitude

Observe all terminal ratings and warnings marked on the product.



WARNING

Operate within the safe input range to prevent electric shock and injury.

WARNING

To prevent injury or death, PicoScope 9000 Series oscilloscopes must not be connected to the mains (line power), either directly or through any probe, adaptor, attenuator, or connector, except the AC adaptor supplied with the product.



CAUTION

Operation outside of the safe input range is likely to cause permanent damage to the oscilloscope and other equipment.

CAUTION

To prevent permanent damage, do not directly connect the high-voltage differential step generator of the PicoScope 9311 to channel inputs or other equipment. Do not remove the 20 dB pads fitted to the generator outputs, as they ensure the signal is reduced to safe levels. Do not replace the pads with smaller values unless safety is ensured by other test circuit losses and peak ratings.

2.3 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

Do not 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.

2.4 External connections



WARNING

To prevent injury or death, only use the power cord and adaptor supplied with the product. These are approved for the voltage and plug configuration in your country.

WARNING

To prevent injury, ensure that light or laser light sources are extinguished during connection or disconnection to optical fibre inputs. Never direct an optical source towards a naked eye.



CAUTION

Take care to avoid mechanical stress or tight bend radii for all connected leads, including all fibre and connectors for the optical fibre input on the PicoScope 9321. Doing so will cause deformation of sidewalls, and will degrade performance and measurement accuracy.

2.5 Environment



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 +50 °C	+5 °C to +35 °C
Humidity	≤ 95% RH (non-condensing)	≤ 85% RH at 35 °C (non-condensing)

2.6 Care of the product

The product contains no user-serviceable parts. Repair, servicing and calibration 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.



WARNING

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



CAUTION

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

CAUTION

Do not block the air vents at the back or front of the instrument as overheating will damage the oscilloscope.

CAUTION

When cleaning the product, use a soft cloth and a solution of mild soap or detergent in water. Do not allow water to enter the oscilloscope casing, as this will cause damage to the electronics inside.

CAUTION

To prevent dirt ingress, fit dust caps to all unmated connectors, and remove them only during connection.

3 Conformance

3.1 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 which the user will be required to correct at their own expense.

3.2 CE notice

The PicoScope 9300 Series PC Sampling Oscilloscopes meet the intent of the EMC directive **89/336/EEC** and are designed, tested, and certified to the **EN61326-1 (1997) Class B Emissions and Basic Immunity** standard.

The oscilloscopes also meet the intent of the **Low Voltage Directive** and are designed to the **BS EN 61010-1:2010 / IEC 61010-1:2010** (safety requirements for electrical equipment for measurement, control, and laboratory use) standard.

4 System requirements

Minimum system requirements	
Processor	Pentium-class processor or equivalent
Memory	1 GB
Disk space	40 MB
Operating system	Microsoft Windows XP (SP2), Windows Vista, Windows 7, Windows 8. 32-bit and 64-bit versions.
Ports	USB 2.0 (compatible with USB 1.1 and USB 3.0) and LAN

5 Included with your PicoScope

The main oscilloscope kit contains:

- 9000 Series oscilloscope
- Software disc
- Quick start guide
- USB 2.0 cable, 1.8 m
- Storage and carry case
- SMA/PC3.5/2.92 wrench
- Power supply 12 V DC at 3.5 A, universal input

Each scope comes with a number of additional accessory kits.

Model	Kits included	Model	Kits included
9201	TA170 ^{x2}	9301	TA170 ^{x2} , TA076
9211	PP896, PP898, TA170 ^{x2} , TA076	9302	PP899, TA170 ^{x2} , TA076
9221	PP898, TA170 ^{x3}	9311	PP897 ^{x2} , PP899 ^{x2} , TA170 ^{x2} , TA173 ^{x2} , TA076
9231	PP896, PP898, TA170 ^{x3} , TA076	9312	PP897 ^{x2} , PP899 ^{x2} , TA170 ^{x2} , TA172 ^{x2} , TA076
		9321	PP899, TA170 ^{x2} , TA076

Description	Order number	Contents
9200 120 ps TDR kit	PP896	Precision coaxial lead 80 cm 50 Ω SMA (m-m)
		SMA (f-f) adaptor
		SMA (m) load and short
9200 divider kit	PP898	Precision coaxial lead 30 cm 50 Ω SMA (m-m) ^{x2}
		SMA (f-f-f) 3-resistor divider
9300 TDR kit	PP897	80 cm 50 Ω SMA (m-m) cable
		SMA (f-f) adaptor
		SMA (m) 50 Ω load
		SMA (m) short circuit
9300 divider kit	PP899	Precision coaxial lead 30 cm 50 Ω SMA (m-m) ^{x2}
		3-resistor divider SMA (f-f-f)
Connector saver adaptor	TA170	Connector saver adaptor 18 GHz 50 Ω SMA (m-f)
N to SMA adaptor	TA172	N (f) – SMA (m) adaptor
20 dB attenuator	TA173	Attenuator 20 dB 10 GHz SMA
LAN cable	TA076	LAN cable, 1 m

Some product packs may contain additional items. For a full list of all available kits and additional accessories, see the *User's Guide* or visit www.picotech.com.

6 Installing the PicoScope 9000 and PicoSample 3 software

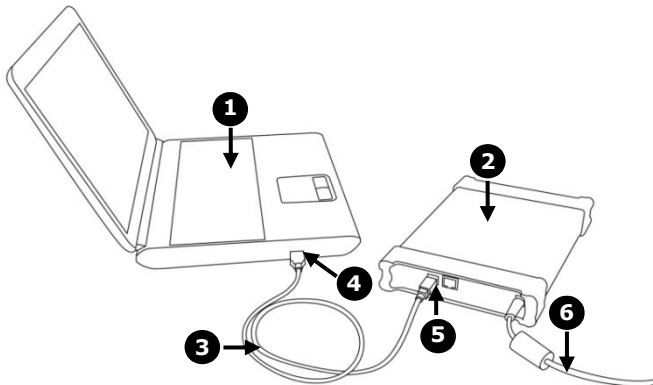
Stop! Do not connect the oscilloscope until the software has been successfully installed.

1. Insert the Pico software disc into your CD-ROM drive. It should start automatically, but if it does not simply go to **My Computer** and select the Pico CD.



For 9200 series scopes, the **PicoScope 9000** software will be installed.
For 9300 series scopes, the **PicoSample 3** software will be installed.

2. Follow the on-screen instructions to install the appropriate software. Do not connect the oscilloscope until the installation is complete.
3. Connect the mains lead (line cord) to the mains adaptor, and plug it into a mains power socket. Then connect the DC power lead to the back of the oscilloscope, and switch on the mains power.
4. Connect the oscilloscope to the PC using the USB cable supplied. Windows may display some warnings which can be ignored, such as *This device can perform faster* or *USB2 device connected to USB1 hub*. Alternatively, for information on using a LAN connection see the *User's Guide* or separate *LAN leaflet*.

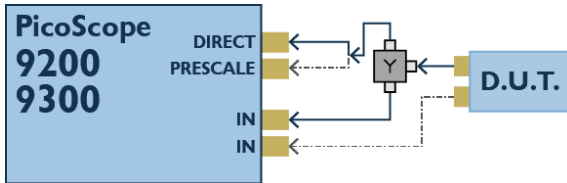


1. PC
2. PicoScope PC oscilloscope
3. USB cable
4. USB port
5. USB port
6. DC power lead from adaptor

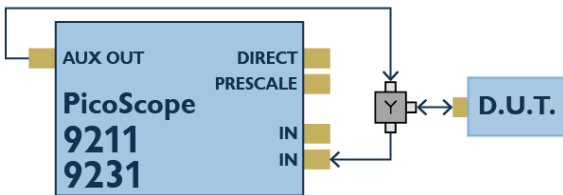
5. Follow the instructions in the Windows **New Hardware Found** wizard, which will run automatically. If the wizard asks to connect to Windows Update, select **No**. If a warning about Windows Logo Testing appears, select **Continue Anyway**.
6. The **New Hardware Found** wizard may run twice. If this happens, repeat the previous step.

7 Using your oscilloscope

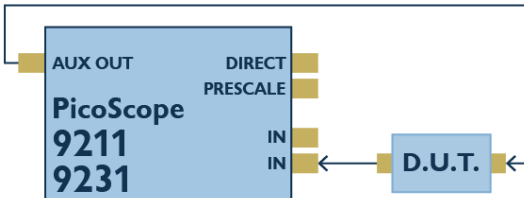
7.1 Connection diagrams



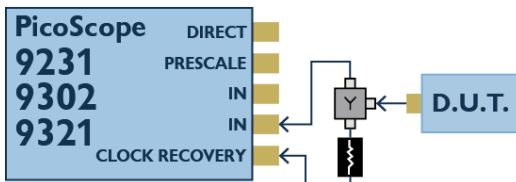
Basic setups for all 9200 and 9300 Series PicoScopes.



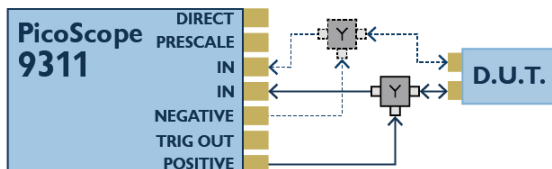
PicoScope 9211 and 9231 TDR single-ended setup.



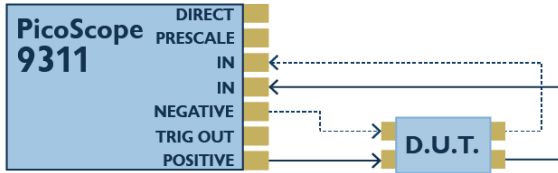
PicoScope 9211 and 9231 TDT single-ended setup.



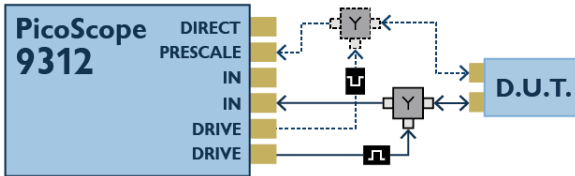
Clock recovery setup for PicoScope 9231, 9302, and 9321.



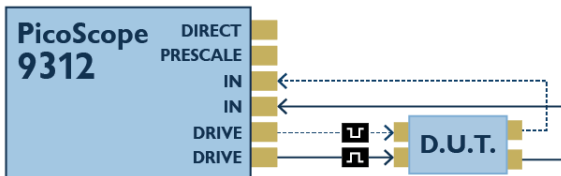
PicoScope 9311 TDR single-ended and differential setups.



PicoScope 9311 TDT single-ended and differential setups.

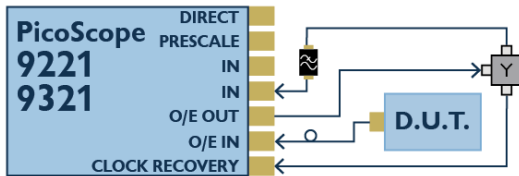


PicoScope 9312 TDR single-ended and differential setups.



PicoScope 9312 TDT single-ended and differential setups.

Note: the arrangement of the front panel connectors varies between models. Always check the labelling on the front panel of your scope before connecting any equipment.



PicoScope 9221 and 9321 optical input setup.

CAUTION
Refer to the advice regarding PicoScope 9311 outputs in section 2.2.

CAUTION
Refer to the advice regarding cable bend radii in section 2.4.






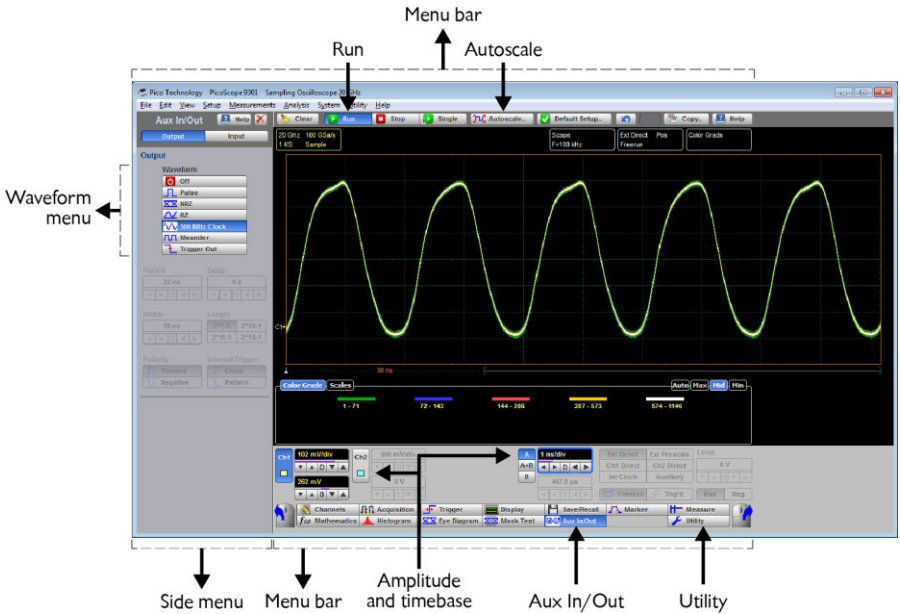
- Differential connection
- Alternative connection
-  Optical connection
-  Splitter
-  Positive pulse head
-  Negative pulse head
-  Low-pass filter (*optional*)
-  3 dB attenuator (*optional*)

Diagram key

7.2 Getting started with the software

In this example we will use the PicoSample 3 software and the PicoScope 9300 Series oscilloscope's built-in pulse generator (labelled **Aux Out** on the rear panel) as the signal source.



1. Select **PicoSample 3** (or **PicoScope 9000**) from the Windows **Start** menu.
2. You may be asked to calibrate the timebase and channels of your scope. If it's appropriate to do so, select **Ok**.
3. Connect the Aux Out to Channel 1.
4. Select **Aux In/Out** from the bottom menu bar. A new side menu will appear to the left.

Tip

When opening a new side menu, right-click on the appropriate button to open the menu to the right of the waveform display, or left-click to open it on the left.

5. Select **Pulse**, **NRZ**, **RZ**, or **500 MHz Clock** from the **Waveform** menu.
6. You should now see a signal waveform in the oscilloscope window. If it is not shown, make sure the **Run** button is active. The waveform may be unstable or incorrectly scaled at this stage.

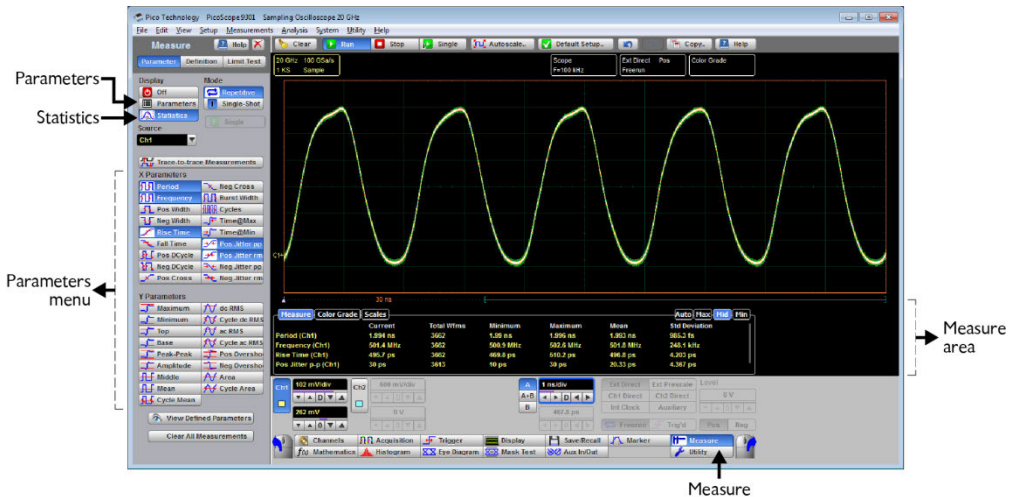
Tip

If you are using a 9000 Series oscilloscope which does not have a built-in pulse generator, select **Demo** when starting the software to use the demonstration signal generator.

7. Select **Auto Scale** from the top menu bar.
8. Adjust the basic amplitude and timebase controls.

You have now captured your first waveform using a PicoScope 9300 Series oscilloscope!

7.3 Adding measurements

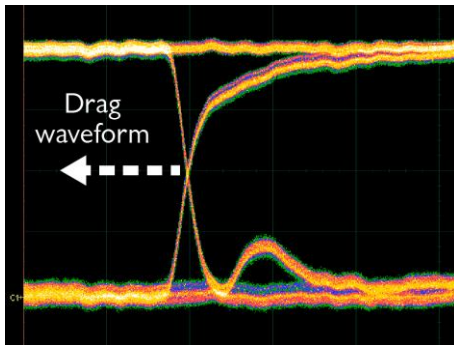
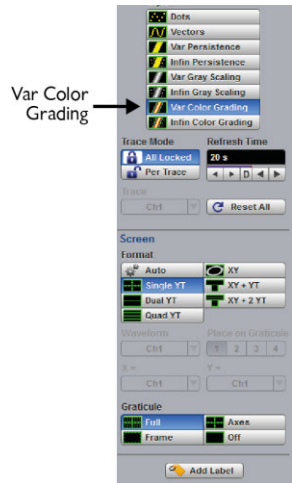


	Current	Total Wtms	Minimum	Maximum	Mean	Std Deviation
Period (CH1)	1.994 ns	3662	1.999 ns	1.993 ns	1.993 ns	986.3 fs
Frequency (CH1)	501.4 MHz	3662	500.9 MHz	501.9 MHz	501.8 MHz	248.5 kHz
Rise Time (CH1)	495.7 ps	3662	469.8 ps	510.2 ps	495.8 ps	4.203 ps
Pos Jitter p-p (CH1)	30 ps	3613	10 ps	30 ps	20.33 ps	4.387 ps

1. With the **500 MHz Clock** waveform chosen, select **Measure** from the bottom menu bar.
2. Select **Parameters** from the side menu.
3. Select up to 10 defined parameters. (The control layout is slightly different in the PicoScope 9000 software. Click one of the category buttons such as **X Parameters** to reveal the list of measurements).
4. View the results in the **Measure** area beneath the waveform.
5. Select **Statistics** from the side menu for a wider numeric perspective.
6. Resize the **Measure** area by selecting the **min**, **mid**, **max**, and **auto** tabs, which each display different data sets.

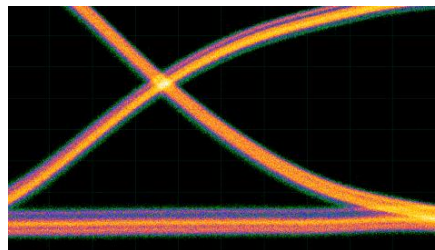
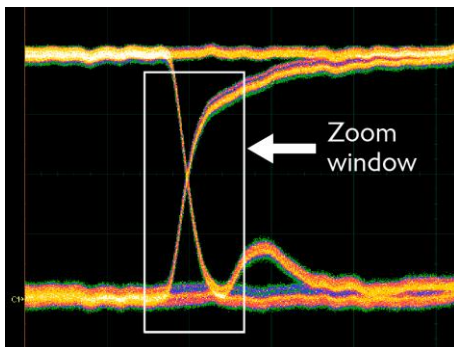
7.4 Configuring the display

1. With the **NRZ** waveform chosen, select **Display** from the bottom menu bar.
2. Select **Var Color Grading** from the side menu to adjust the view of the waveform.
3. Click on the waveform and drag it to the left, as shown below.
4. Set a faster timebase using the basic controls.



OR

5. Click outside the waveform to drag out a zoom window.
6. Click within the zoom window to zoom. A second 'B' timebase starts and is displayed.



You have now covered the basic working principles of the scope software. For further detailed information, see the *User's Guide* and the *Help* files within the software.

8 Free newsletter

Pico Technology sends out a free monthly newsletter by email. This gives news of product launches, software upgrades and application notes, as well as hints and advice. We treat your e-mail address and other details as confidential and will not pass them to any third party. To subscribe, visit

www.picotech.com/newsletter/

9 Software updates and replacement

The latest versions of all Pico software and manuals can be downloaded free of charge at

www.picotech.com

If you require a new software disc, please contact Pico Technology or your distributor. There may be a small charge for this service.

10 Specifications

The *User's Guide* and *Data Sheet* contain the latest specifications for your PicoScope PC Sampling Oscilloscope. We recommend that you print a copy of the specification table for easy reference.

11 Technical support

Regularly updated technical support information can be found at the Pico Technology technical support website and users' forum here:

www.picotech.com/support/

Pico Technology

James House
Colmworth Business Park
St. Neots
Cambridgeshire
PE19 8YP
United Kingdom

Tel: +44 (0) 1480 396395

Fax: +44 (0) 1480 396296

Website: www.picotech.com

Email: support@picotech.com



Copyright © 2008-2013 Pico Technology. All rights reserved.

