1 YEAR WARRANTY

OMEGACARE℠ Extended Warranty Program

CE

OMEGA®

User's Guide

OMSP-4224 MODEL

OMSP-4227 MODEL

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OMEGASCOPE™ OMSP-4000 SERIES PC Oscilloscopes

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It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

WARNING: These products are not designed for use in, and should not be used for, human applications.

Contents

1 Welcome

The OMSP-4000 Series of PC Oscilloscopes is a range of compact units designed to replace traditional bench-top models costing many times the price. This guide covers the various OMSP-4000 Series Oscilloscopes.

The following models are available in the OMSP-4000 Series:

OMSP-4224	20 MHz 12-bit 2-channel oscilloscope
OMSP-4227	100 MHz 12-bit 2-channel oscilloscope

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

- Portability: Take the unit with you and plug it in to any Windows PC.
- Performance: Up to 16-bit resolution, large buffer with up to 32 M samples, fast USB 2.0 interface.
- Flexibility: Use as an oscilloscope, spectrum analyser or high-speed data acquisition interface.
- Long-term support: Software upgrades are available to download from our website. 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 OMSP-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.

2 Introduction

2.1 Safety symbols

The following symbols appear on the top cover of the OMSP-4000 Series PC Oscilloscope.

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. Such a potential could cause a large current to flow, resulting in damage to the product or connected equipment, or both.

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. Do not exceed the "Overvoltage protection" range stated in the Specifications table for your model of oscilloscope. Contact with voltages outside the protection range may cause permanent damage to the unit.

Mains voltages. These products are not designed for use with mains (line) voltages. To measure mains, use a differential isolating probe specifically rated for mains use.

Magnetic Fields. OMEGASCOPE™ oscilloscopes can be adversely affected by strong magnetic fields. It is advised that strong magnets be kept away from the oscilloscope unit.

Safety grounding. OMSP-4000 Series PC Oscilloscopes connect directly to the ground of a computer through the USB 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 injury to yourself and others.

The product does not have a protective safety ground.

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 OMSP-4000 Series PC Oscilloscopes meet the intent of the EMC directive 2004/108/EC and have been designed to EN61326-1 (2006) Class A Emissions and Immunity standard.

OMSP-4000 Series PC Oscilloscopes also meet the intent of the Low Voltage Directive 2006/95/EC and have been designed to meet the BS EN 61010-1:2001 IEC 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use standard.

2.5 Trademarks

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

OMEGASCOPE™ is a trademark of Omega Engineering, Inc.

2.6 Company details

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Sales: sales@omega.com

Web site: www.omega.com

3 Product information

3.1 Pack contents

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

OMSP-4224	OMSP-4227	Description
1		OMEGASCOPE™ 4224
	1	OMEGASCOPE™ 4227
1	1	USB cable, for use with any standard USB 1.1 or 2.0 port
1	1	Software and reference CD
1	1	Installation Guide
2	2	Probe

3.2 Minimum PC requirements

To ensure that your OMSP-4000 Series 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	Windows XP SP2 Windows Vista Windows 7
	32 bit and 64* bit versions supported
Processor	As required by Windows
Memory	
Free disk space	
Ports	USB

* While the driver will run on a 64 bit operating system, the driver itself is 32 bit, and therefore will run as 32 bit.

3.3 Installation instructions

IMPORTANT
Do not connect your OMSP-4000 Series scope device to the PC before you have installed the OMEGASCOPE™ software. If you do, Windows might not recognise the scope device correctly.

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 OMEGASCOPE™ software. The software 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 OMEGASCOPE™ PC Oscilloscope to another USB port

- Windows XP SP2

When you first installed the OMSP-4000 Series PC Oscilloscope by plugging it into a USB port, Windows associated the driver 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, just click "Next" in the wizard to repeat the installation. If Windows gives a warning about Windows Logo Testing, click "Continue Anyway". As all the software you need is already installed on your computer, there is no need to insert the OMEGASCOPE™ Software CD again.

- Windows Vista and Windows 7

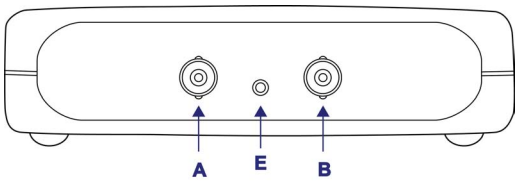
The process is automatic. When you move the device from one port to another, Windows displays an "Installing device driver software" message and then a "OMSP-4000 Series PC Oscilloscope" message. The PC Oscilloscope is then ready for use.

3.4 Connections

Standard oscilloscope connectors

OMSP-4000 Series PC Oscilloscopes have BNC oscilloscope connectors. The inputs have an impedance of 1 MΩ, so they are compatible with all standard scope probes including x1, x10 and x1/x10 attenuated types.

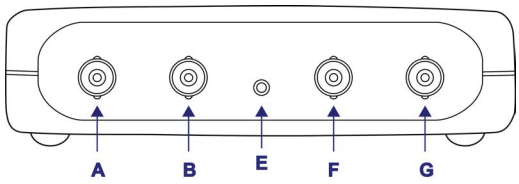
Connector diagrams



OMSP-4224

Front panel

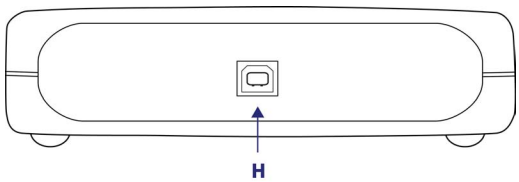
A. Input channel A
B. Input channel B
E. LED: shows when the oscilloscope is sampling data
F. External trigger input
G. Function generator/arbitrary waveform generator output



OMSP-4227

Rear panel

H. USB 2.0 port



3.5 Specifications

Oscilloscope model	OMSP-4224	OMSP-4227
Inputs		
Number of channels	2	2
Analog bandwidth	DC to 20 MHz (10 MHz on ±50 mV range)	DC to 100 MHz
Impedance (nominal)	1 MΩ // 22 pF	1 MΩ // 16 pF
Coupling	Software-selectable AC/DC	
Voltage ranges	±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V, ±50 V, ±100 V	±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V
Overload protection	±200 V	±100 V
Vertical resolution	12 bits	
Sampling		
Timebases (real-time sampling)	100 ns/div to 200 s/div	50 ns/div to 200 s/div
Maximum sampling rate (real-time sampling) One channel in use Two channels in use 3 or 4 channels in use	 80 MS/s 80 MS/s -	 250 MS/s 125 MS/s -
Maximum sampling rate (equivalent-time sampling)	-	10 GS/s
Buffer size	32 MS shared between enabled channels	
Performance specifications		
Time base accuracy	50 ppm	
Trigger re-arm time	1 µs on fastest time base	
DC accuracy	1% of full scale	
Trigger resolution	1 LSB	
Function generator / Arbitrary waveform generator		
Connector	-	BNC
Standard waveforms		Sine, square, triangle, DC voltage, sin(x)/x, Gaussian, half sine
Frequency range		100 kHz
Resolution		12 bits
Buffer size		8192 samples
DAC sample rate		20 MS/s
Accuracy		1%
Output range		±250 mV to ±2 V
Output offset range		±1 V
Max. combined output		±2.5 V
Output resistance		600 Ω
Overload protection		±10 V

Oscilloscope model	OMSP-4224	OMSP-4227
External trigger		
Connector	-	BNC
Modes		Rising/falling edge
Bandwidth		100 MHz
Impedance		1 MΩ ∥8 pF ±2 pF
Voltage range		±50 mV to ±20 V
Coupling		DC
Overload protection		±100 V
Digital trigger		
Modes	None, auto, repeat, single, rapid (segmented memory)	
Basic triggers	Rising, falling	
Advanced triggers	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse	
Environment		
Operating environment Temperature range (for stated accuracy) Humidity	0 °C to 45 °C 20 °C to 30 °C 5% to 80% RH non-condensing	
Storage environment Temperature range Humidity	-20°C to +60°C 5% to 95% RH non-condensing	
PC connection	USB 2.0. Compatible with USB 1.1.	
Power supply	5 V @ 0.5 A max. (from USB port)	
Dimensions	200 mm x 140 mm x 38 mm	
Weight	< 0.5 kg	
Compliance	European EMC and LVD standards RoHS and WEEE FCC Rules Part 15 Class A	

4 Glossary

AC/DC switch. To switch between AC coupling and DC coupling, select AC or DC from the control on the OMEGASCOPE™ toolbar. The AC setting filters out very low-frequency components of the input signal, including DC, and is suitable for viewing small AC signals superimposed on a DC or slowly changing offset. In this mode you can measure the peak-to-peak amplitude of an AC signal but not its absolute value. Use the DC setting for measuring the absolute value of a signal.

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 time bases the buffer size places an upper limit on the sampling rate that can be used.

Equivalent-time sampling (ETS). A specialised sampling mode that can be used to increase the effective sampling rate of an oscilloscope as long as the signal is a stable, repetitive waveform. A single sample is collected during one cycle of the waveform. The scope then re-arms and re-triggers on another cycle of the waveform, and collects another sample with a slight time offset relative to the previous one. Over a large number of cycles, enough samples are collected to display a high-resolution picture of the waveform. Also called sequential sampling.

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" is an abbreviation for megasamples (millions of samples) per second.

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

Oversampling. The process of taking measurements more frequently than the requested sample rate, and then combining them to produce the required number of samples. If, as is usually the case, the signal contains a small amount of noise, this technique can increase the effective vertical resolution of the oscilloscope.

PC Oscilloscope. A virtual instrument formed by connecting an OMSP-4000 Series oscilloscope to a computer running the OMEGASCOPE™ software.

OMEGASCOPE™ software. A program that accompanies all OMSP-4000 Series PC Oscilloscopes. It turns your PC into an oscilloscope, spectrum analyser 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. Compare with equivalent-time sampling.

(Vertical) Resolution (bit). The number of bits used to digitise an input signal. The higher the resolution, the smaller the voltage change that can be detected.

Time base. 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 1.1. Universal Serial Bus (Full Speed). This is a standard port used to connect external devices to PCs. A typical USB 1.1 port supports a data transfer rate of 12 megabits per second, so is much faster than an RS232 COM port.

USB 2.0. Universal Serial Bus (Hi-Speed). This is a standard port used to connect external devices to PCs. A typical USB 2.0 port supports a data transfer rate 40 times faster than USB 1.1 when used with a USB 2.0 device, but can also be used with USB 1.1 devices.

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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WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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