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OMEGASCOPE™ OMSP-3000 SERIES PC Oscilloscopes

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ISO 9001 Certified

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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 new OMSP-3000 Series of PC Oscilloscopes 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 new OMSP-3000 Series consists of three high-speed, portable oscilloscopes with function generator, arbitrary waveform generator and deep memory:

- OMSP-3204
- OMSP-3205
- OMSP-3206

Here are some of the benefits provided by your new OMSP-3000 Series oscilloscope:

- Portability: Take the unit with you and plug it in to any Windows PC.
- Performance: 500 MS/s sampling, with up to 200 MHz bandwidth and a 128 MS buffer.
- 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, as the OMSP-3000 Series oscilloscope contains the special hardware you need and nothing more.
- Convenience: The software makes full use of the full-sized display, disk storage, user interface and networking built in to your PC.

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
The new OMSP-3000 Series PC Oscilloscopes are designed to measure voltages in the range -20 V to +20 V. Inputs are protected to ±100 V. Contact with voltages outside the protection range may cause permanent damage to the unit.

Mains (line) voltages

These products are not designed for use with mains (line) voltages. To measure mains (or line) voltage, use a differential isolating probe specifically designed for that purpose.

Safety grounding

OMSP-3000 Series PC Oscilloscopes connect direct to the ground of a computer through the interconnecting cable provided to minimize 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 specialized test equipment and must be performed by the factory.

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.

2.4 CE notice

The OMSP-3000 Series PC Oscilloscopes meet the intent of the EMC directive 89/336/EEC and have been tested to EN61326-1:2006 Class A Emissions and Immunity standard.

The product also meets the intent of the Low Voltage Directive and has been designed to meet the BS EN 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

2.7 Minimum system requirements

To ensure that your OMSP-3000 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 oscilloscope will be better with a more powerful PC, and will benefit from a multi-core processor.

Item	Absolute minimum	Recommended minimum	Recommended full specification
Operating system	Windows XP SP2 Windows Vista Windows 7		
	32 bit and 64 bit versions supported		
Processor	As required by Windows	300 MHz	1 GHz
Memory		256 MB	512 MB
Free disk space*		1.5 GB	2 GB
Ports	USB 1.1 compliant port	USB 2.0 compliant port	

* The OMEGASCOPE™ software does not use all the disk space specified in the table. The free space is required to make Windows run efficiently.

3 Product information

With the OMEGASCOPE™ you can use OMSP-3000 Series as oscilloscopes and spectrum analyzers.

An OMSP-3000 Series PC Oscilloscope is supplied with the following items:

- USB cable, for use with any standard USB 1.1 or 2.0 port
- Software and Reference CD
- Installation Guide
- 2 x Probes (see below for probe details)

3.1 Comparison table for Models OMSP-3204, OMSP-3205, and OMSP-3206

Model	Bandwidth	Sampling	Memory	Waveform Output	Probes Supplied
OMSP-3204	60 MHz	500 MS/s	8 MS	Function generator and AWG	2 x 60 MHz
OMSP-3205	100 MHz	500 MS/s	32 MS	Function generator and AWG	2 x 150 MHz
OMSP-3206	200 MHz	500 MS/s	128 MS	Function generator and AWG	2 x 250 MHz

3.2 Installation Instructions

Important:
Do not connect your OMSP-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 OMEGASCOPE™ software. The software should now display any signal connected to the scope inputs. If you 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

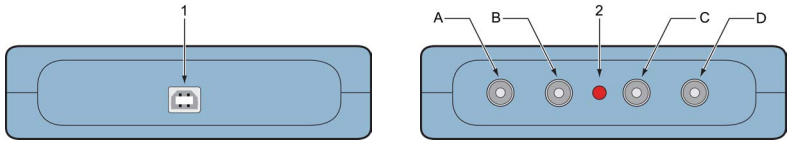
The new OMSP-3000 Series PC Oscilloscopes have standard oscilloscope connectors. The input impedance is also standard, so the x10 function on scope probes works correctly.

Connector diagrams

OMSP-3204

OMSP-3205

OMSP-3206



1 USB port

2 LED: flashes when the oscilloscope is sampling data

A: Input channel A

B: Input channel B

C: External trigger input

D: Function generator and AWG output

Moving your OMSP-3000 Series PC Oscilloscope to another USB port

- Windows XP

When you first installed the OMSP-3000 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 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-3000 Series PC Oscilloscope" message. The PC Oscilloscope is then ready for use.

3.3 Specifications

VERTICAL	OMSP-3204	OMSP-3205	OMSP-3206
Bandwidth (-3 dB)	60 MHz	100 MHz	200 MHz
Rise time (calculated)	5.8 ns	3.5 ns	1.75 ns
Resolution	8 bits		
Input characteristics	2 channels, 1 MΩ ±1%, in parallel with 13 pF ±1 pF		
Input coupling	AC/DC		
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)		
Input ranges	±50 mV to ±20 V in 9 ranges		
Analogue offset range (vertical position adjustment)	±250 mV (50 mV, 100 mV, 200 mV ranges) ±2.5 V (500 mV, 1 V, 2 V ranges) ±20 V (5 V, 10 V, 20 V ranges)		
DC accuracy	±3% of full scale		
Overload protection	±100 V (DC + AC Peak)		
HORIZONTAL			
Sampling rate (real time 1 Ch)	500 MS/s	500 MS/s	500 MS/s
Sampling rate (real time 2 Ch)	250 MS/s	250 MS/s	250 MS/s
Sampling rate (repetitive sampling)	2.5 GS/s	5 GS/s	10 GS/s
Sampling rate (cont. USB streaming)	1 MS/s in OMEGASCOPE™ software.		
Timebase ranges	2 ns/div to 200 s/div	1 ns/div to 200 s/div	500 ps/div to 200 s/div
Buffer memory*	8 MS	32 MS	128 MS
Waveform buffer (no. of segments)	1 to 10,000		
Timebase accuracy	±50 ppm		
Sample jitter	< 5 ps RMS		
* Shared between active channels			
DYNAMIC PERFORMANCE (typical)			
Crosstalk	Better than 400:1 up to full bandwidth (equal voltage ranges)		
Harmonic distortion	< -50 dB at 100 kHz full scale input		
SFDR	52 dB Typical		
ADC ENOB	7.6 bits		
Noise	180 µV RMS (on most sensitive range)		
Pulse response	< 5% overshoot		
Bandwidth flatness	(+0.3 dB, -3 dB) at scope input, from DC to full bandwidth		

TRIGGER			
Trigger modes	Auto, repeat, single, none, rapid (segmented memory)		
Advanced digital triggers (Ch A, Ch B)	Edge: rising, falling or dual edge with adjustable hysteresis Window: signal enters or exits a user-defined voltage range Pulse width: a negative or positive pulse is wider or narrower than a set width, or inside / outside a range of widths Window pulse width: signal is inside or outside a voltage range for a set time Dropout: signal does not cross a voltage threshold for at least a set time Window dropout: signal does not enter or exit a voltage range for at least a set time Interval: time between two edges is greater or less than a set time, or inside / outside a time range Logic: arbitrary logic state of Channels A, B and EXT matches a user-defined pattern Runt pulse: signal crosses one voltage threshold and returns without crossing the other		
Trigger sensitivity (Ch A, Ch B)	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope		
Max. pre-trigger capture	Up to 100% of capture size		
Max. post-trigger delay	Up to 4 billion samples		
Trigger re-arm time	< 2 µs on fastest timebase		
Max. trigger rate	Up to 10,000 waveforms in a 20 ms burst		
EXTERNAL TRIGGER INPUT			
Trigger types	Edge, pulse width, dropout, interval, logic, delayed		
Input characteristics	Front panel BNC, 1 MΩ ±1% in parallel with 13 pF ±1 pF		
Bandwidth	60 MHz	100 MHz	200 MHz
Voltage range	±5 V, DC coupled		
Overvoltage protection	±100 V (DC + AC peak)		

MODEL	OMSP-3204	OMSP-3205	OMSP-3206
FUNCTION GENERATOR			
Standard output signals	Sine, square, triangle, DC voltage, ramp, sinc, Gaussian, half-sine, white noise, PRBS		
Standard signal frequency	DC to 1 MHz		
Bandwidth	> 1 MHz		
Output frequency accuracy	±50 ppm		
Output frequency resolution	< 0.01 Hz		
Output voltage range	±2 V with ±1% DC accuracy		
Output voltage adjustment	Signal amplitude and offset adjustable in approx. 1 mV steps within overall ± 2 V range		
Amplitude flatness	< 0.5 dB to 1 MHz, typical		
SFDR	> 60 dB, 10 kHz full scale sine wave		
Connector type	Front panel BNC with 600 Ω output impedance		
Overvoltage protection	±10 V		
Sweep modes	Up, down, dual with selectable start/stop frequencies and increments		
AWG			
Update rate	20 MS/s		
Buffer size	8 kS	8 kS	16 kS
Resolution	12 bits (output step size approx. 1 mV)		
Standard signal frequency	DC to 1 MHz		
Bandwidth	> 1 MHz		
Rise time (10 - 90%)	< 100 ns		
SPECTRUM ANALYZER			
Frequency range	DC to 60 MHz	DC to 100 MHz	DC to 200 MHz
Display modes	Magnitude, average, peak hold		
Windowing functions	Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top		
Number of FFT points	Selectable from 128 to 1 million in powers of 2		
MATH CHANNELS			
Functions	Arbitrary equations using these: - x, x+y, x- y, x*y, x/y, sqrt (x), x^y, exp(x), ln(x), log(x), abs(x), norm(x), sign(x), sin (x), cos(x), tan(x), arcsin(x), arccos(x), arctan(x), sinh(x), cosh(x), tanh(x)		
Operands	A, B (input channels), T (time), reference waveforms, constants, pi		
AUTOMATIC MEASUREMENTS			
Oscilloscope	AC RMS, true RMS, DC average, cycle time, frequency, duty cycle, falling rate, fall time, rising rate, rise time, high pulse width, low pulse width, maximum, minimum, peak to peak		
Spectrum	Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD %, THD dB, THD plus noise, SFDR, SINAD, SNR, IMD		
Statistics	Minimum, maximum, average and standard deviation		

MODEL	OMSP-3204	OMSP-3205	OMSP-3206
SERIAL DECODING			
Protocols	CAN Bus, I²C, SPI, RS232/UART		
MASK LIMIT TESTING			
Statistics	Pass/fail, failure count, total count		
DISPLAY			
Interpolation	Linear or sin(x)/x		
Persistence modes	Digital color, analog intensity, custom, or none		
GENERAL			
PC connectivity	USB 2.0 hi-speed		
Power requirements	Powered from USB port (500 mA at 5 V)		
Dimensions	200 x 140 x 40 mm (including connectors)		
Weight	< 0.5 kg		
Temperature range	Operating: 0 °C to 50 °C (20 °C to 30 °C for stated accuracy)		
Safety approvals	Designed to EN 61010-1:2001		
EMC approvals	Tested to EN61326-1:2006 and FCC Part 15 Subpart B		
Environmental approvals	RoHS and WEEE compliant		
Software/PC requirements	OMEGASCOPE™, Microsoft Windows XP, Vista or Windows 7.		
Accessories	USB cable and 2 probes in probe case.		
Languages (full support):	English, French, German, Italian and Spanish		
Languages (UI only):	Chinese (Simplified and Traditional), Czech, Danish, Dutch, Finnish, Greek, Hungarian, Japanese, Norwegian, Polish, Portuguese, Romanian, Russian, Swedish and Turkish		

4 Glossary

Bandwidth. The input frequency at which the measured signal amplitude is 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 data temporarily. This allows the oscilloscope to sample data independently of the speed at which it can transfer data to the computer.

Device Manager. Device Manager is a Windows program that displays the current hardware configuration of your computer. Right-click on 'My Computer,' choose 'Properties', then click the 'Hardware' tab and the 'Device Manager' button.

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

External trigger. This is the BNC socket marked EXT on the new OMSP-3000 Series PC oscilloscopes. It can be used to start a data collection run but cannot be used to record data.

Maximum sampling rate. A figure indicating the maximum number of samples the oscilloscope can acquire per second. Maximum sample 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.

PC Oscilloscope. The instrument formed by connecting a OMSP-3000 Series PC Oscilloscope to a computer running the OMEGASCOPE™ software application.

OMSP-3000 Series. An oscilloscope range comprising the OMSP-3204, OMSP-3205, and OMSP-3206 PC Oscilloscopes.

OMEGASCOPE™ software. This is a software product that accompanies all our oscilloscopes. It turns your PC into an oscilloscope, spectrum analyzer, and meter display.

Signal generator. A built-in circuit that generates signals suitable for driving an external device under test. The signal generator output is the BNC socket marked GEN on the oscilloscope. If you connect a BNC cable between this and one of the channel inputs, you can send a signal into one of the channels.

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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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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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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