



High-Precision USB-Powered Oscilloscopes

OMSP-4000 Series



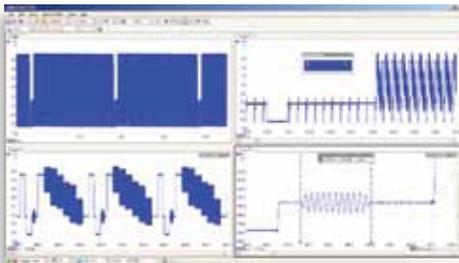
- ✓ 20 MHz to 100 MHz Bandwidths
- ✓ 32 MS Buffer Size
- ✓ 80 to 250 MS/s Real-Time Sampling
- ✓ Advanced Digital Triggers
- ✓ Built-In Function Generator/AWG (Model OMSP-4227)
- ✓ USB-Connected and Powered

The new OMSP-4000 Series offers the highest performance available from any USB-powered oscilloscope on the market today. The OMSP-4000 Series has the power to perform in many applications, such as design, research, test, education, service and repair. These USB-powered oscilloscopes are also small, light and portable. They easily slip into a laptop bag making them ideal for the engineer on the move. There is no need for an external power supply, making them ideal for field use.

High Bandwidth, High Sampling Rate

Models OMSP-4224 and OMSP-4227 have bandwidths of 20 MHz and 100 MHz respectively with sampling rate up to 250 MS/s. ETS mode boosts the maximum effective sampling rate further to 10 GS/s, allowing more detailed display of repetitive signals.

Huge Buffer Memory



The OMSP-4000 Series offers memory depths up to 32 million samples. Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The OMSP-4227 can sample at 100 MS/s at timebases all the way down to 50 ns/div. Managing all this data calls for some powerful tools, so the



OMSP-4224, shown smaller than actual size.

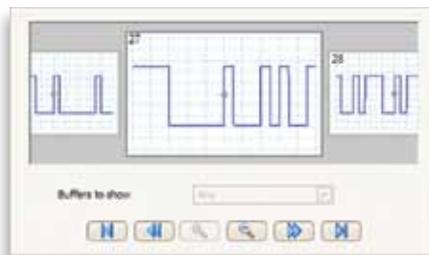
OMEGASCOPE™ software has a maximum zoom factor of 100 million combined with a choice of two zoom methods. There's a conventional set of zoom controls, plus an overview window that shows you the whole waveform while you zoom and reposition the display by simply dragging with the mouse.

Another use for the huge memory is our segmented memory. Each captured waveform is stored in the buffer so you can rewind and review thousands of previous waveforms. No longer will you see a glitch on the screen only for it to vanish before you stop the scope.

Advanced Triggers

As well as the standard range of triggers found on all oscilloscopes, the OMSP-4000 Series offers a class-leading set of advanced triggers including pulse width, windowed and dropout triggers to help you capture the data you need.

Digital Triggering

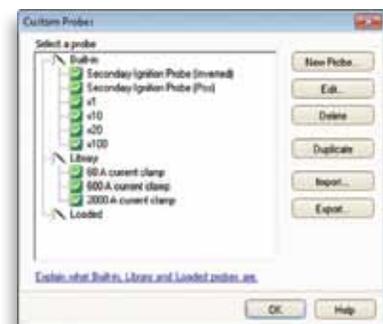


Most digital oscilloscopes sold today still use an analog trigger architecture based around comparators. This can cause time and amplitude errors that can not always be calibrated out. The use of comparators often limits the trigger sensitivity at high bandwidths

and can also create a long trigger "re-arm" delay. OMSP-4000 Series oscilloscopes use full digital triggering using the actual digitized data. This reduces trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth.

Trigger levels and hysteresis can be set with great precision and resolution. Digital triggering also reduces re-arm delay and this combined with the segmented memory allows the triggering and capture of events that happen in rapid sequence. At the fastest timebase you can use rapid triggering to collect 10,000 waveforms in under 20 milliseconds. Our mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.

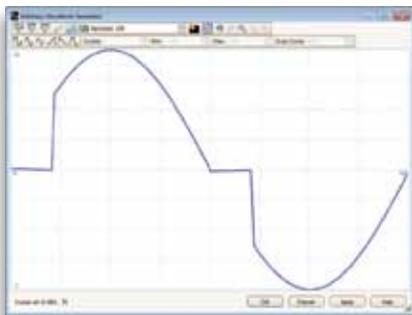
Custom Probe Settings



The custom probes feature allows you to correct for gain, attenuation, offsets and nonlinearities in special

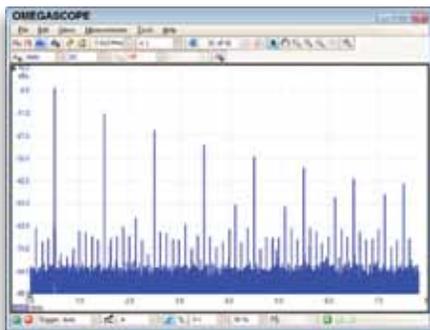
probes, or to convert to different units of measurement (such as current, power or temperature). You can save definitions to disk for later use. Definitions for standard supplied oscilloscope probes and current clamps are included.

Arbitrary Waveform and Function Generator



Model OMSP-4227 has a built-in function generator (sine, square, triangle, DC level). As well as basic controls to set level, offset and frequency, more advanced controls allow you to sweep over a range of frequencies. Combined with the spectrum peak hold option this makes a powerful tool for testing amplifier and filter responses. The OMSP-4227 also includes a full arbitrary waveform generator. Waveforms can be created or edited using the built-in AWG editor, imported from oscilloscope traces, or loaded from a spreadsheet.

Spectrum Analyzer



With the click of a button, you can display a spectrum plot of the selected channels. The spectrum analyzer allows signals up to 200 MHz to be viewed in the frequency-domain. A full range of settings gives you control over the number of spectrum bands, window types and display modes: instantaneous, average, or peak-hold. You can

Measurements

You can add any combination of automatic measurements to the display, chosen from a list of 26 scope and spectrum parameters. Every measurement includes statistics of minimum, maximum, average, standard deviation and sample size.

Channel	Name	Span	Units	Min	Max	Average	St. Dev	Capture Count
A	Frequency	Whole trace	100.1 kHz	99.93 kHz	100.1 kHz	100 kHz	45.61 Hz	20
A	AC RMS	Whole trace	642 mV	640.8 mV	643.6 mV	641.6 mV	680.4 μ V	20
A	DC Average	Whole trace	-103 mV	-103.6 mV	-101.7 mV	-102.9 mV	503.6 μ V	20

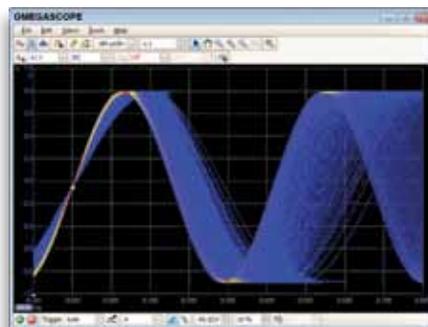
display multiple spectrum views with different channel selections and zoom factors, and OMEGASCOPE™ allows you to see these alongside time-domain waveforms of the same data. A comprehensive set of automatic frequency-domain measurements, including THD, THD+N, SNR, SINAD and intermodulation distortion, can be added to the display.

Math Channels



The OMSP-4000 Series oscilloscopes offer a full range of math functions for processing and combining channels. The functions can also operate on reference waveforms. Use the built-in list for simple functions such as addition and inversion, or open the equation editor and create complex functions involving trigonometry, exponentials, logarithms, statistics, integrals and derivatives.

Advanced Display Modes



See old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose

between analog persistence and digital color, or create a custom display mode. The design of the OMEGASCOPE software ensures that maximum display area is available for waveform viewing. Even with a laptop you have a much bigger viewing area and higher resolution than a typical benchtop scope.

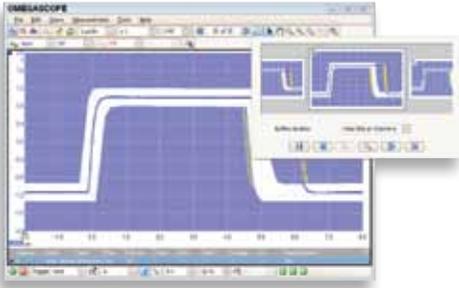
Serial Decoding



The OMSP-4000 Series with its deep memory is ideal for serial decoding as it can capture thousands of frames of uninterrupted data. Protocols currently included are I²C, SPI, RS232, UART and CAN bus. Expect this list to grow with free software updates. OMEGASCOPE displays the decoded data in the format of your choice: "in view", "in window", or both at once. The "in view" format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. You can zoom in on these frames to look for noise or distortion on the waveform. "In window" format shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in, search for frames with specified properties, or define a start pattern that the program will wait for before listing the data. You can also create a spreadsheet to fully decode the hex data into plain text.

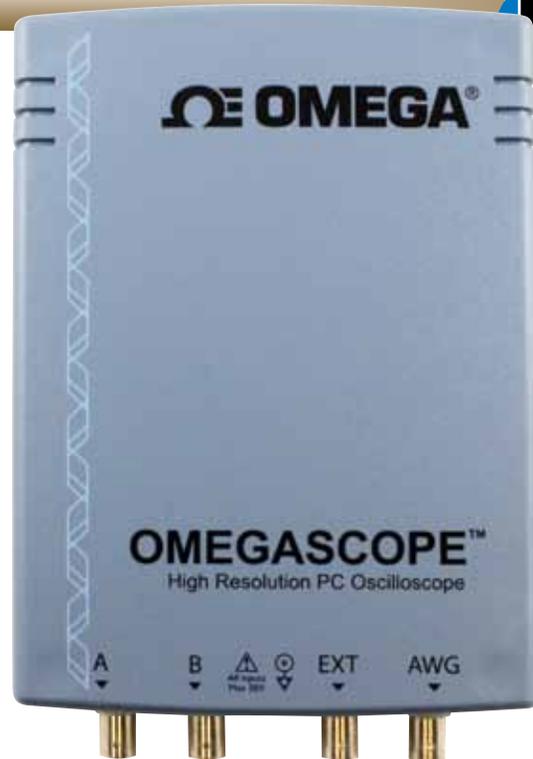


Mask Limit Testing



This feature is specially designed for production and debugging environments. Capture a signal from a known working system, and OMEGASCOPE will draw a mask around it with your specified tolerance. Connect the system under test, and OMEGASCOPE will highlight any parts of the waveform that fall outside the mask area. The highlighted details persist on the display, allowing the scope to catch intermittent glitches while you work on something else. The measurements window counts the number of failures, and can display other measurements and statistics at the same time. The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications and to modify existing masks. You can import and export masks as files.

OMSP-4227
shown smaller
than actual size.



High-End Features as Standard

With the OMSP-4000 Series, “high end” features such as mask limit testing, serial decoding, advanced triggering, measurements, math, XY, digital filtering and segmented memory are all included standard. To protect your investment, both the PC software and firmware inside the unit can be updated.

High Signal Integrity

Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion. Years of oscilloscope experience leads to improved pulse response and bandwidth flatness. The result is simple: when you probe a circuit, you can trust in the waveform you see on the screen.

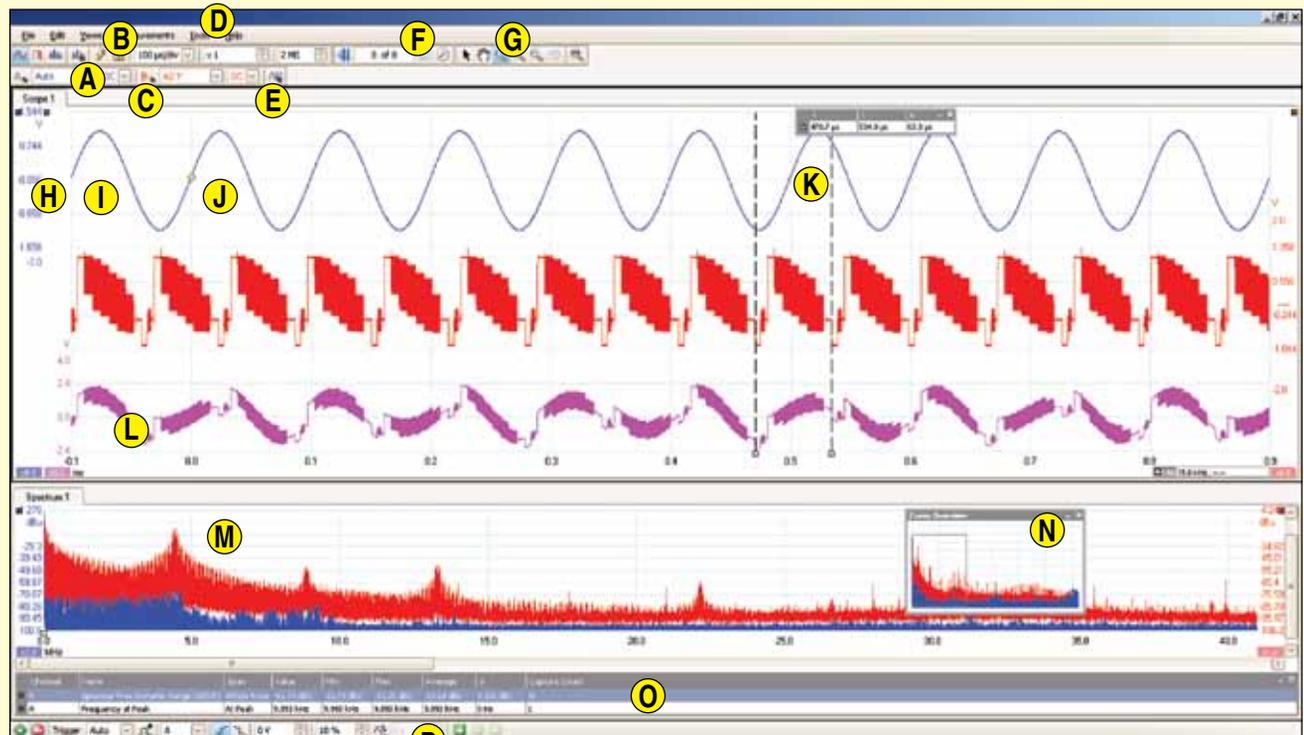


OMEGASCOPE: Power, portability and versatility

The OMEGASCOPE™ PC oscilloscope has the power to perform in many applications, such as design, research, test, education, service and repair.

These USB-powered oscilloscopes are also small, light and portable. They easily slip into a laptop bag making them ideal for the engineer on the move. There is no need for an external power supply, making them the perfect solution for field use.

The OMEGASCOPE Window



- A Toolbars:** Commonly-used controls such as voltage range selection, timebase, memory depth and channel selection are placed on the toolbars for quick access, leaving the main display area clear for waveforms.
- B Auto Setup Button:** Configures the timebase, voltage ranges and trigger for a stable display of your signals. Channel Options give access to channel-specific settings such as custom probes, resolution enhancement, offset controls and filtering. More advanced controls and functions are located in the Tools menu.
- C Channel Options:** Give access to channel-specific settings such as custom probes, resolution enhancement, offset controls and filtering.
- D Tools Menu:** More advanced controls and functions.
- E Function Generator:** Allows the scope to generate standard signals or arbitrary waveforms. Includes frequency sweep options.
- F Waveform Buffer Overview:** OMEGASCOPE automatically records up to 10,000 of the most recent waveforms. You can quickly scan through to look for intermittent events. The buffer overview can be used with the mask test tools to display only failed waveforms.
- G Zoom and Pan Tools:** OMEGASCOPE enables a zoom factor of up to 100 million, which is necessary when working with the deep memory of the OMSP-3000 Series scopes. Use the conventional zoom-in, zoom-out and pan tools, or try the zoom overview window for fast navigation.
- H Movable Axes:** The vertical axes can be dragged up and down. This feature is particularly useful when one waveform is obscuring another. There's also a command to rearrange all the axes automatically.
- I Display:** The OMEGASCOPE display can be as simple or as complex as you need. Begin with a single view of one channel, and then expand the display to include any number of live channels, math channels and reference waveforms. OMEGASCOPE is carefully designed to make the best use of the display area. You can add new scope and spectrum views, all of which are fully adjustable in size.
- J Trigger Marker:** Shows the level and time of the trigger event. Drag with the mouse to adjust.
- K Measurements Bar:** Display calculated measurements for troubleshooting and analysis. You can add as many measurements as you need on each view. Each measurement includes statistical parameters showing its variability.
- L Math Channels:** Combine input channels and saved reference waveforms using simple arithmetic, or use custom equations with trigonometric and other functions.
- M Spectrum Views:** As shown above, one or more spectrum views can be added to show an FFT of the data in the scope view. Alternatively, OMEGASCOPE can be configured as a dedicated spectrum analyzer.
- N Zoom Overview:** When a scope or spectrum view is zoomed in, the overview window allows for fast navigation. As well as providing an overview, this allows the zoom level and position to be changed using the mouse.
- O Rulers:** Each axis has two rulers that can be dragged onto the screen to make quick measurements of amplitude, time and frequency.
- P Trigger Toolbar:** Commonly-used controls are on the toolbar with more advanced trigger options available from a pop-up window.



Specifications

INPUTS

Number of Channels: 2 BNC inputs

Analog Bandwidth:

OMSP-4224: 20 MHz (10 MHz on ± 50 mV range)

OMSP-4227: 100 MHz

Voltage Ranges:

OMSP-4224: ± 50 mV to ± 100 V

OMSP-4227: ± 50 mV to ± 20 V

Sensitivity:

OMSP-4224: 10 mV/div to 20V/div

OMSP-4227: 10 mV/div to 4V/div

Vertical Resolution: 12 bits

Input Coupling: AC or DC, software-selectable

Input Impedance:

OMSP-4224: 1 M Ω ; 22 pF

OMSP-4227: 1 M Ω ; 16 pF

Overvoltage Protection:

OMSP-4224: ± 200 V

OMSP-4227: ± 100 V

SAMPLING

Timebases:

OMSP-4224: 100 ns/div to 200 s/div

OMSP-4227: 50 ns/div to 200 s/div

Max Sampling Rate (Real-Time):

OMSP-4224: 80 Ms/s

OMSP-4227: 250 MS/s (1 channel)/125 MS/s (2 channels)

Maximum Sampling Rate (ETS):

OMSP-4227: 10 GS/s

Buffer Size: 32 MS shared between active channels

TRIGGERING

Sources: Ch A, Ch B, Ext

Ch A, Ch B Trigger Types: Edge, window, pulse, interval, dropout, runt, delayed

EXT Trigger Types: Rising/falling edge

EXT TRIGGER INPUT (Model

OMSP-4227 Only)

Connector: BNC

Bandwidth: 100 MHz

Impedance: 1 M Ω ; 20 pF

Voltage Range: ± 20 V

Threshold Range: ± 150 mV to ± 20 V

Coupling: DC

Overvoltage Protection: ± 100 V

FUNCTION GENERATOR /ARBITRARY WAVEFORM GENERATOR (Model OMSP-4227 Only)

Connector: BNC

Function Generator Frequency

Range: DC to 100 kHz

Function Generator Waveforms:

Sine, square, triangle, ramp, $\sin(x)/x$, gaussian, half-sine, white noise, DC level

Buffer Size: 8192 samples

DAC Update Rate: 20 MS/s

DAC Resolution: 12 bits

Bandwidth: 100 kHz

DC Accuracy: 1%

Output Range: ± 250 mV to ± 2 V

Output Offset Range: ± 1 V

Max Combined Output: ± 2.5 V

Output Resistance: 600 Ω

Overvoltage Protection: ± 10 V

PERFORMANCE

Timeout Accuracy: 50 ppm

DC Accuracy: 1% of full scale

Trigger Resolution: 1 LSB (Ch A, Ch B)

Trigger Re-Arm Time: 1 μ s (fastest timebase, rapid trigger)

MATH CHANNELS

Functions: Arbitrary equations using these; $-x$, $x+y$, $x-y$, x^*y , x/y , \sqrt{x} , x^y , $\exp(x)$, $\ln(x)$, $\log(x)$, $\text{abs}(x)$, $\text{norm}(x)$, $\text{sign}(x)$, $\sin(x)$, $\cos(x)$, $\tan(x)$, $\arcsin(x)$, $\arccos(x)$, $\arctan(x)$, $\sinh(x)$, $\cosh(x)$, $\tanh(x)$

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: Min, max, average and standard deviation

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 5V)

Dimensions (Including Connectors):

200 L x 140 W x 40 mm D (7.9 x 5.5 x 1.6")

Weight: < 0.5 kg (1.1 lb)

Operating Environment:

0 to 45°C (32 to 113°F) (20 to 30°C for stated accuracy); 5 to 80%RH non-condensing

Storage Environment: -20 to 60°C (-4 to 140°F);

5 to 95%RH non-condensing

Safety Approvals: Designed to EN 61010-1:2001

EMC Approvals: Tested to EN61326-1:2006 and FCC Part 15 Class A

Environmental Approvals: RoHS and WEEE compliant

Software (Included):

OMEGASCOPE™ Windows® software

PC Requirements: Microsoft Windows XP, Vista or Windows 7, 32- or 64-bit

To Order Visit omega.com/omsp-4000_series for Pricing and Details

Model No.	Description
OMSP-4224	2-channel PC oscilloscope, 20 MHz bandwidth
OMSP-4227	2-channel PC oscilloscope, 100 MHz bandwidth, AWG

Comes complete with a 2 m (6') USB cable, two oscilloscope probes, quick start guide, software and operator's manual on CD.

Ordering Example: OMSP-4224 2-channel PC oscilloscope, 20 MHz bandwidth.