



PoScope4

USER MANUAL



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QUICK START GUIDE

STEP 1 DOWNLOAD AND INSTALL SOFTWARE



STEP 2 PLUG IN YOUR DEVICE



STEP 3 ATTACH PROBE TO YOUR DEVICE



STEP 4 START USING YOUR DEVICE



INTRODUCTION

Dear customer!

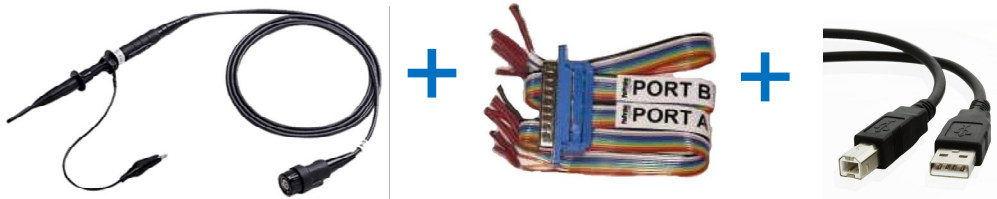
Thank you for choosing our products. We prepared this handy manual for you to get to know your new device a little better. Enclosed, you will find your PoScope Mega1+ device. Bundle package also contains:

- PoProbe 60 (60 MHz probe),
- PoProbe L2 (Logic Analyzer DB-25 probe),
- standard USB cable.



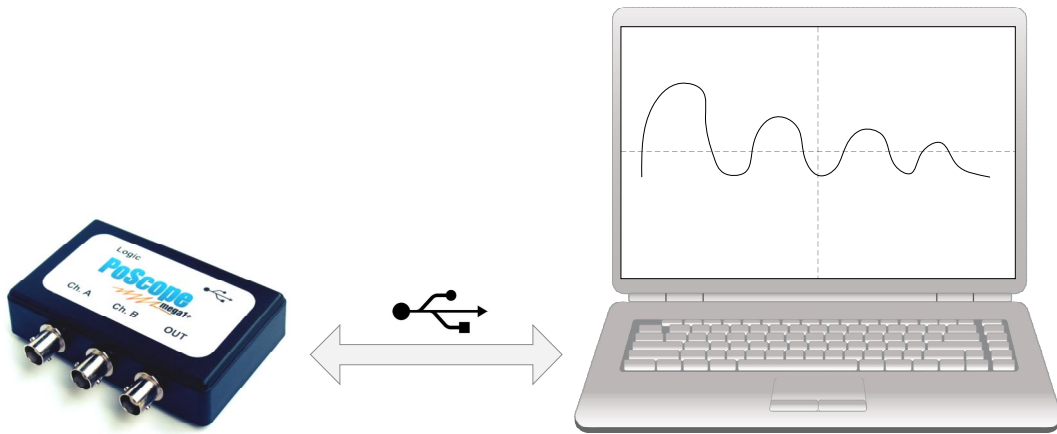
**PoScope
Mega1+**

Bundle package



Please note that PoScope Mega1+ is powered through USB connection.

PoScope Mega1+ is a PC based measurement device that can measure fast changing electrical signals. Compared to a standard oscilloscope it is incredibly small, which makes it perfect to carry around. In order to use it, you will need to connect it to a PC via standard USB cable.



We provide free software (including drivers) and updates for all our PoScope devices and you can always download it from our web site www.poscope.com. Just install it to your PC, then connect plug & play device and you are ready to go!

Besides measuring electric signals, your new device can perform some other tasks. For instance, you can record your measurements, use the device for spectral analysis, decipher most known digital communication protocols, and even analyze digital circuits with easy-to-use 16-channel logic analyzer. PoScope Mega1+ also contains function generator that can output common used waveforms which are needed in various tasks of electronic design & repair.

Our youtube channel provides an access to many tutorials on how to use your device and software. Visit us on youtube: www.youtube.com/poscopelabs

If you still encounter any difficulties with the device or you have further questions, please don't hesitate to write us to support@polabs.com.

Best regards,

PoScope TEAM

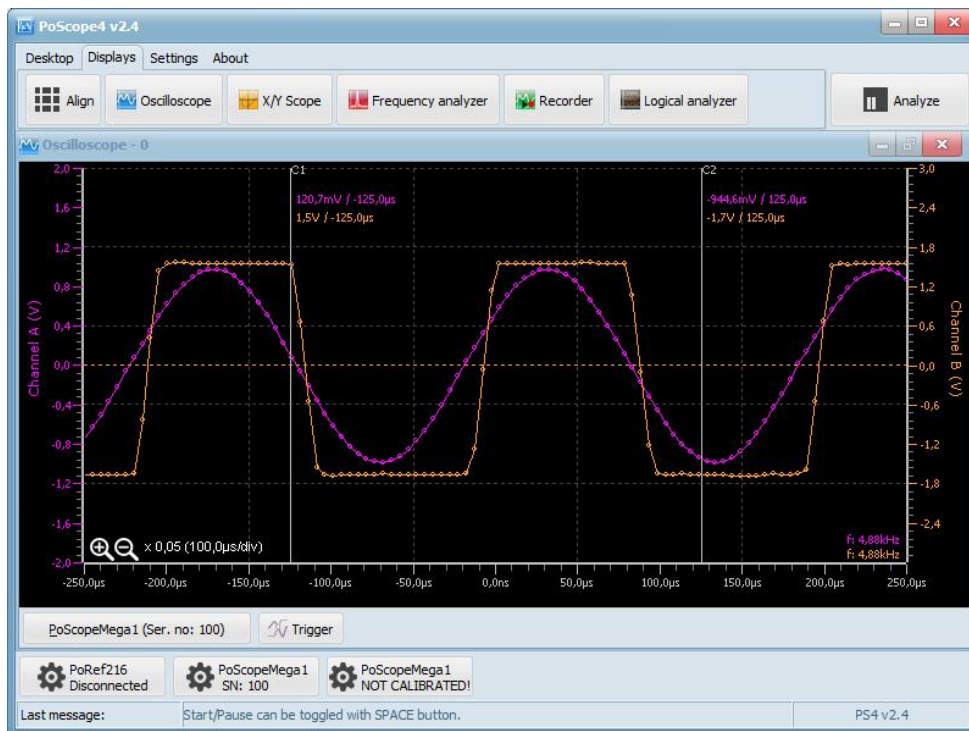
POSCOPE4 MEASUREMENT PACKAGE

PoScope measurement package consists of:

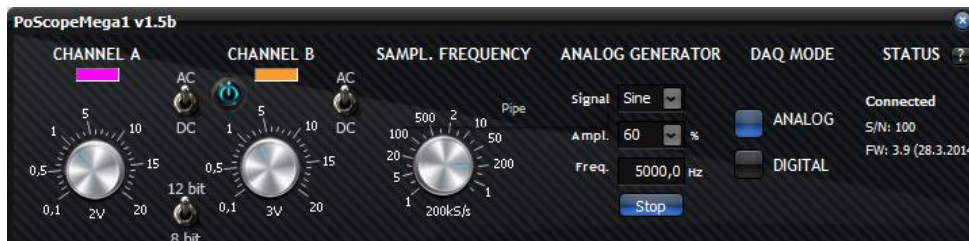
- **PoScope hardware** (Mega1, Mega1+, etc.),



- **PoScope4 software,**



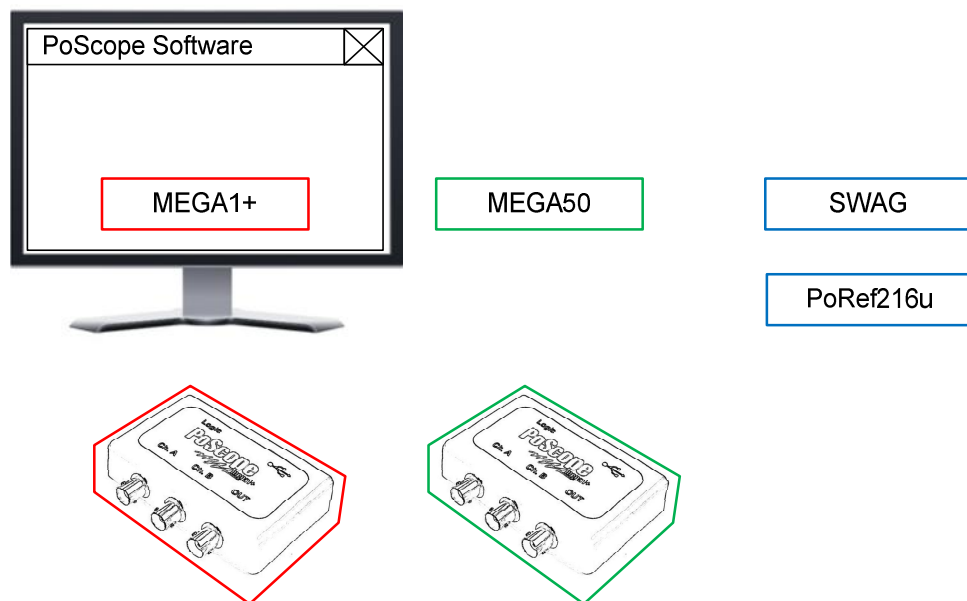
- **PoScope4 plugin** (Mega1, Mega1+, etc.)



Mega1+ is connected to a PC via USB cable. On the PC there is installed PoScope4 measurement software and one part of the PoScope4 application is device plugin. Device plugin has its own graphical interface which is used to configure and control the hardware (Mega1+, etc.). Graphical interface of plugin looks like a dashboard of a physical oscilloscope.

Plugins can support usage of physical devices or virtual software device such as SWAG (software analog generator) plugin. SWAG plugin is a virtual one-channel function generator.

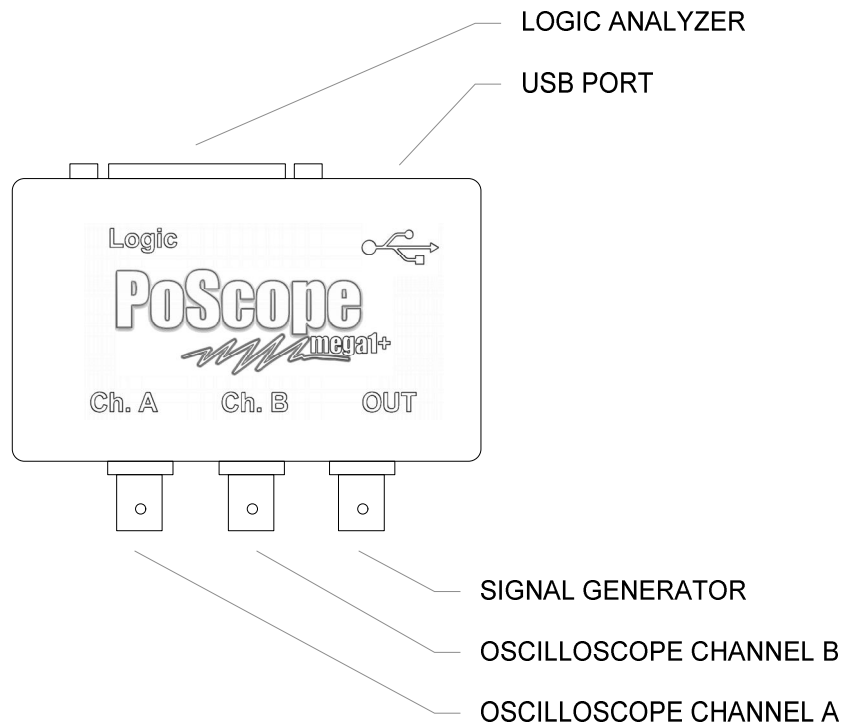
PoScope4 has excellent plugin support and whenever in the future we will design a new device it will be accompanied together with a plugin and ready to use in PoScope4.



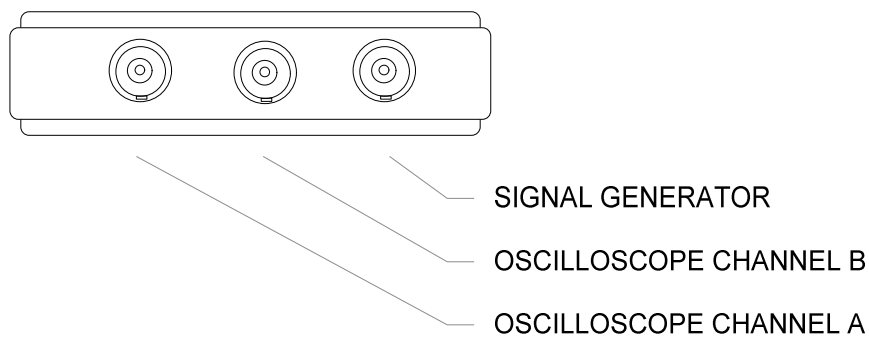
A graphical representation of PoScope4 with loaded plugins and other devices.

HARDWARE CONNECTIONS

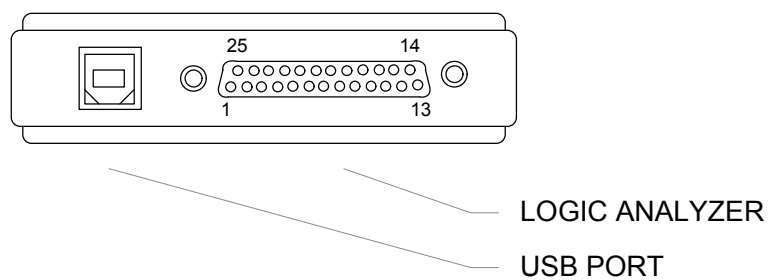
Top view



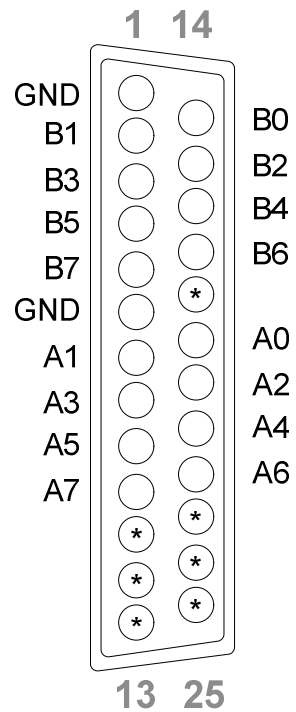
Front view



Back view

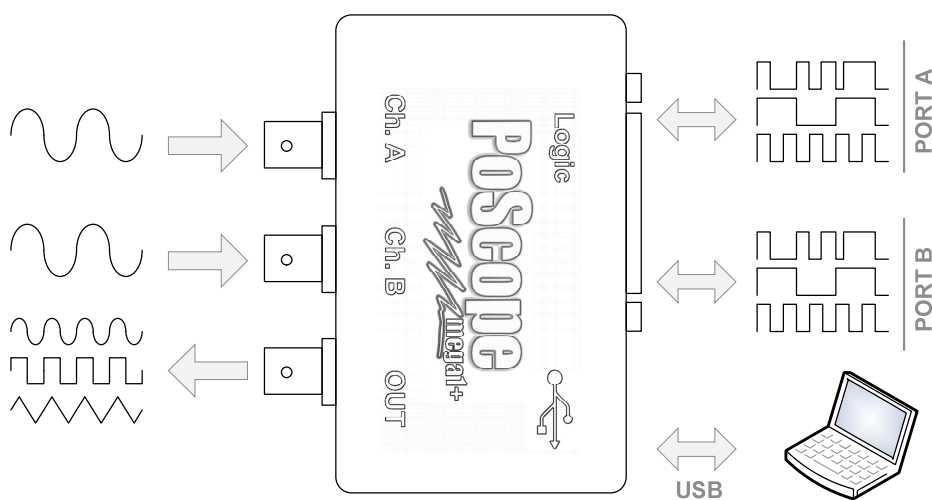


PINOUT ASSIGNMENT



*** DO NOT USE! FACTORY PURPOSE ONLY.**

INPUTS AND OUTPUTS




SOFTWARE INSTALLATION

MINIMUM SYSTEM REQUIREMENTS

RESOLUTION	1024 X 768 @ 24-BIT
MEMORY	512 MB
PROCESSOR	1 GHZ
OPERATING SYSTEM	MS WINDOWS XP SP3
CONNECTION	1 FREE USB SLOT
HARD DISK	50 MB (SOFTWARE) + RECORDER DATA
NETWORK	WORKING INTERNET CONNECTION (SOFTWARE & UPDATES DOWNLOAD)

1

Go to www.poscope.com, under measuring instruments → **PoScope Mega1** → **Downloads**, you will find 32-bit and 64-bit latest version of PoScope software. Download & install under **Administrator** rights.



The screenshot shows the Polabs website product page for the PoScope Mega1. The page includes a navigation bar with links like Home, Wish List, My Account, Shopping Cart, and Checkout. The product name 'PoScope Mega1' is prominently displayed, along with its product code (1258749) and availability (In Stock). The price is listed as 59.00€. Below the product image, there are tabs for 'Description', 'Related Products (0)', and 'Downloads (6)'. The 'Downloads (6)' tab is highlighted with a blue box, and it shows a list of downloadable files, including 'Mega1 Logical port pinout.pdf'.

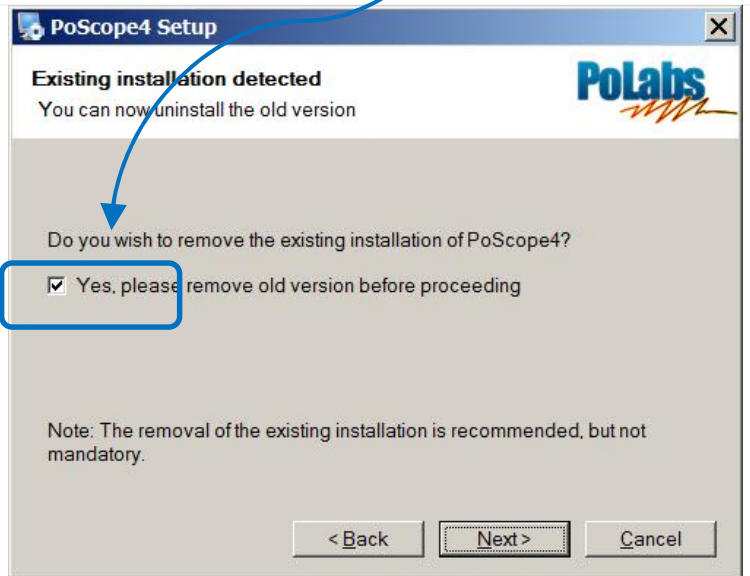
2

Follow on-screen instructions & go through PoScope installation procedure. It is advised to close all other programs at this point of the installation.



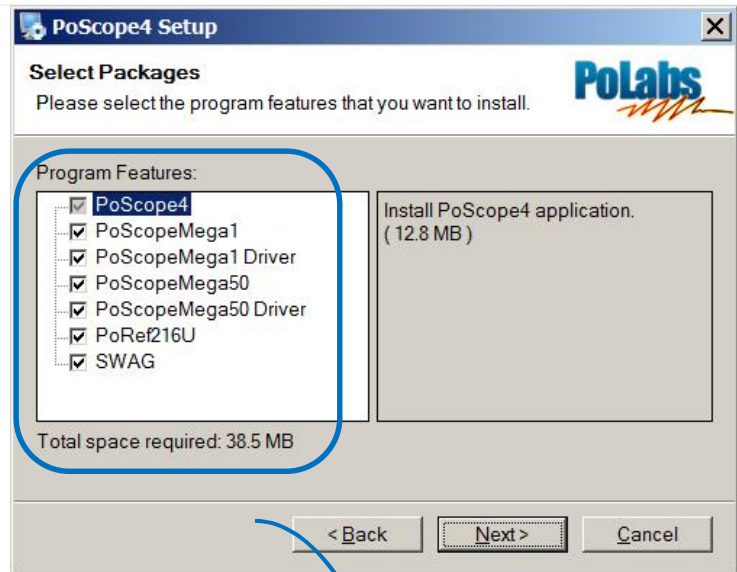
3

It is advised to remove the old version before proceeding, if you have one installed. Leave the tick in the checkbox.



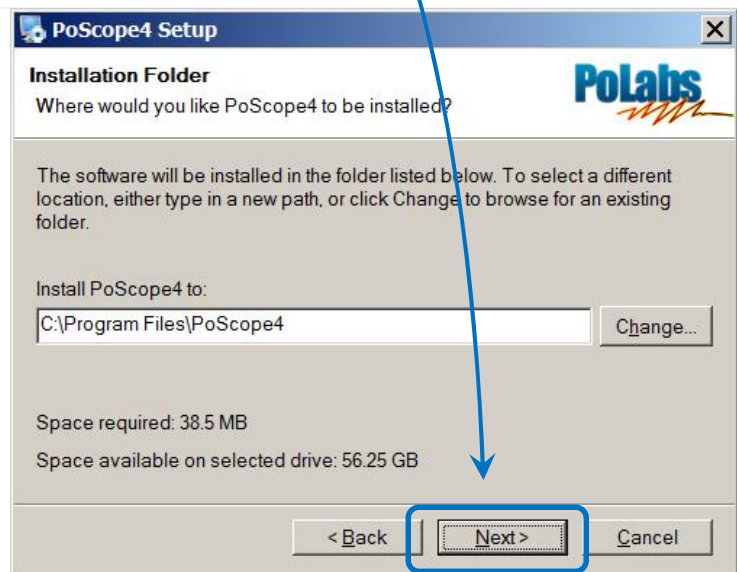
4

Package selection window lets you choose which program features to install. If you don't plan to use other devices in near future, you can deselect them by clicking the checkbox next to it. You can always install it later, if needed.



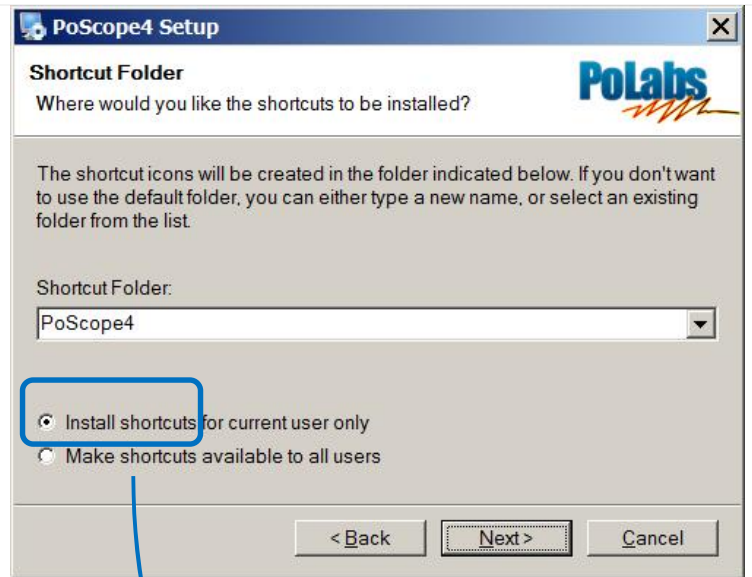
5

You can change the location, where the PoScope files get installed. If it's ok as suggested, just click Next.



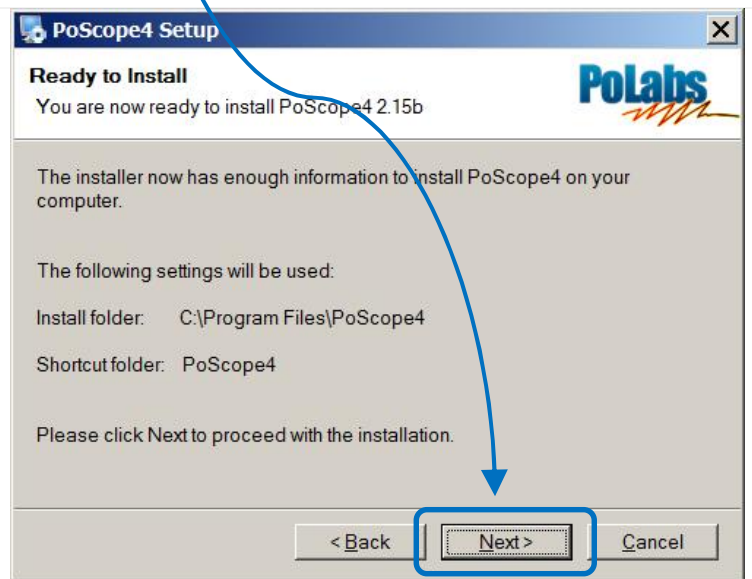
6

You can make the shortcut for PoScope available to all users or just to the currently logged Administrator.



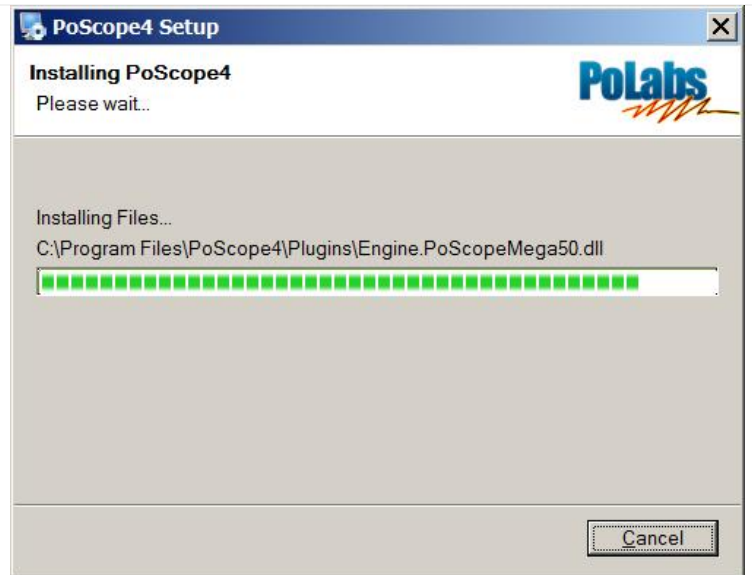
7

Installation window summarizes the installation settings; installation folder & shortcut name. If everything is OK, you're ready to go. Click next.



8

Please wait until the setup installs all the files to your PC.



9

Setup window informs you about the device driver installation. No settings needed, just click next.



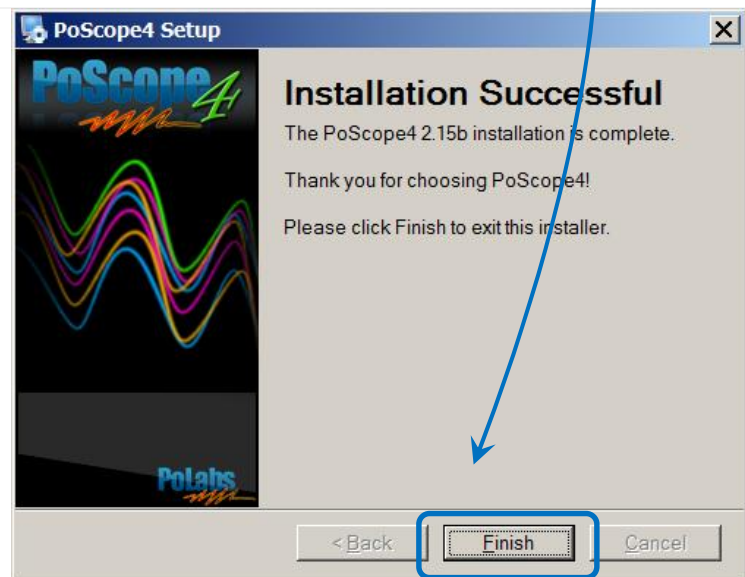
10

Green tick means that device drivers are installed and the device is ready for use. Click finish.



11

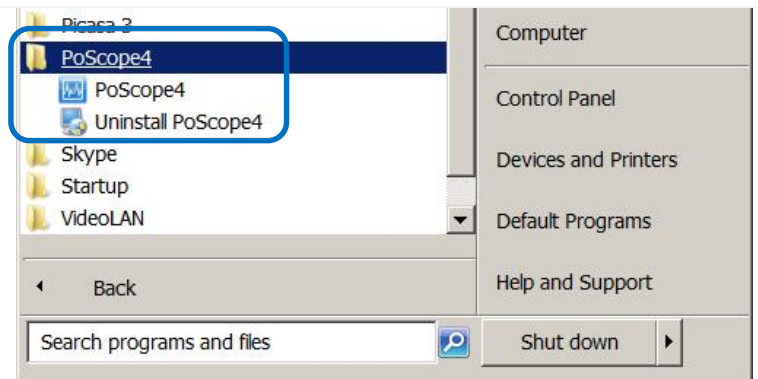
You are being informed about the successful installation of PoScope software with drivers. We are ready to move on & learn how to use the installed software. Click finish.



SOFTWARE MANUAL

Run PoScope software:

You will find PoScope shortcut under PoScope folder of your startup menu.



PoScope4 user interface

PoScope4 user interface consists of the following items:

- Main menu
- Device displays
- Analyze / Capture button
- Device plugins
- Event log

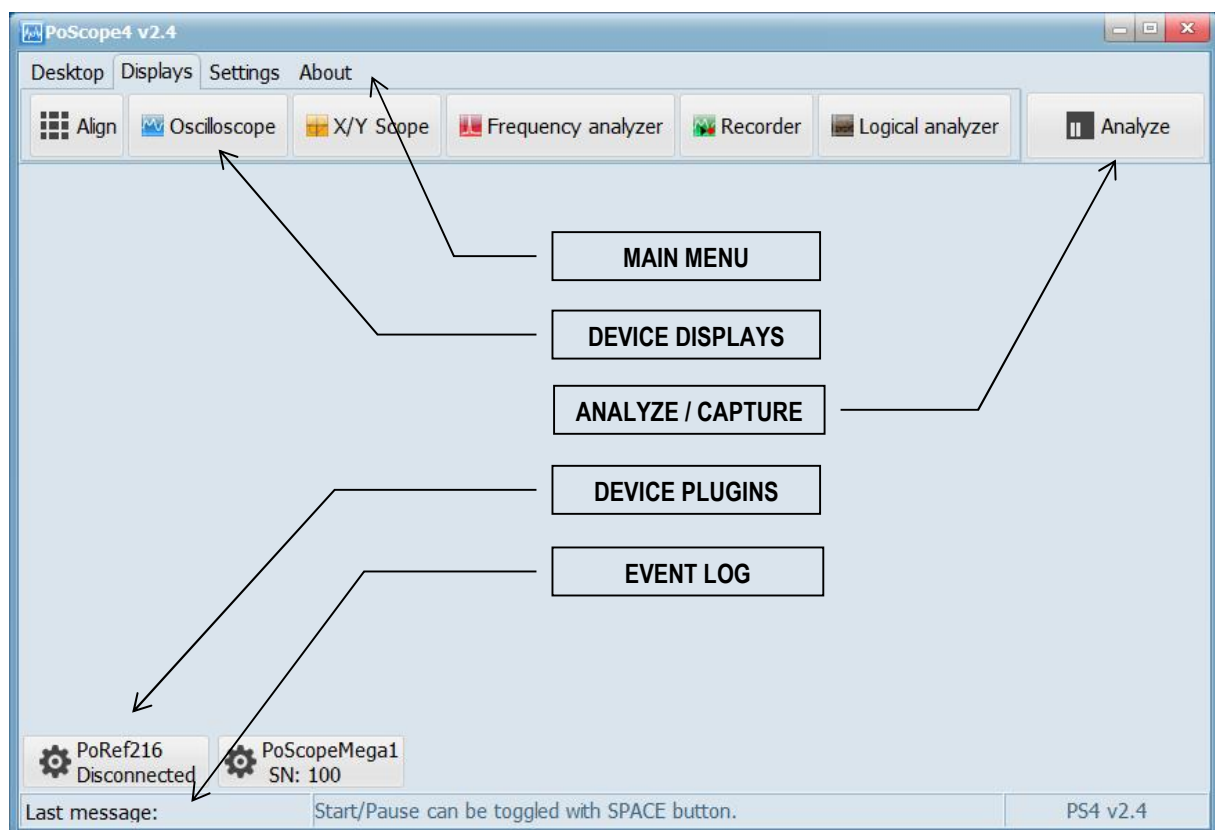
Main menu is organized into tabs.

Device displays open new windows which represent various oscilloscope functions.

Analyze / Capture button is used to switch between the Analyze and Capture mode. In Capture mode the signal waveform is being captured for analysis purposes. In Analyze mode you can perform in-depth signal analysis.

Device plugins are icons of connected devices. When we click them, device controls open. When we click them again, the device controls will close.

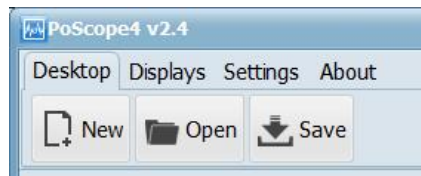
Event log is used for system diagnostics. In case of device misbehavior, open the event viewer, copy the events & paste them to a notepad file and send it to our support staff for further diagnostics.



PoScope4 version 2.4 user interface

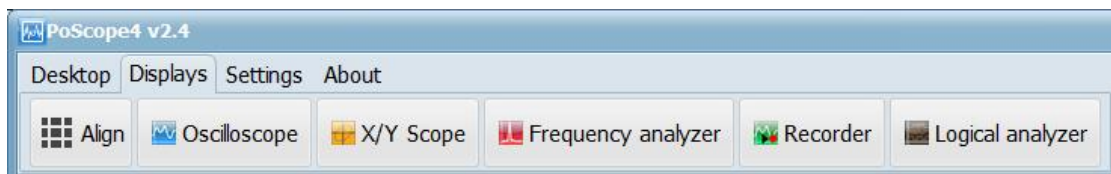
Organize your desktop

The **Desktop tab** lets you manage your work area – the desktop. You can freely organize the displays that are open in work area and save their configuration as a desktop file, so you don't have to organize them every time you restart the PoScope 4 application. Next time you open PoScope 4, last known configuration will automatically open. In desktop tab you can create new desktop configuration, open previously saved configurations and save currently set configuration.



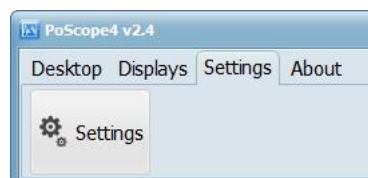
Displays tab contains the following icons:

- Align displays
- Oscilloscope
- X/Y Scope
- Frequency analyzer
- Recorder
- Logical analyzer

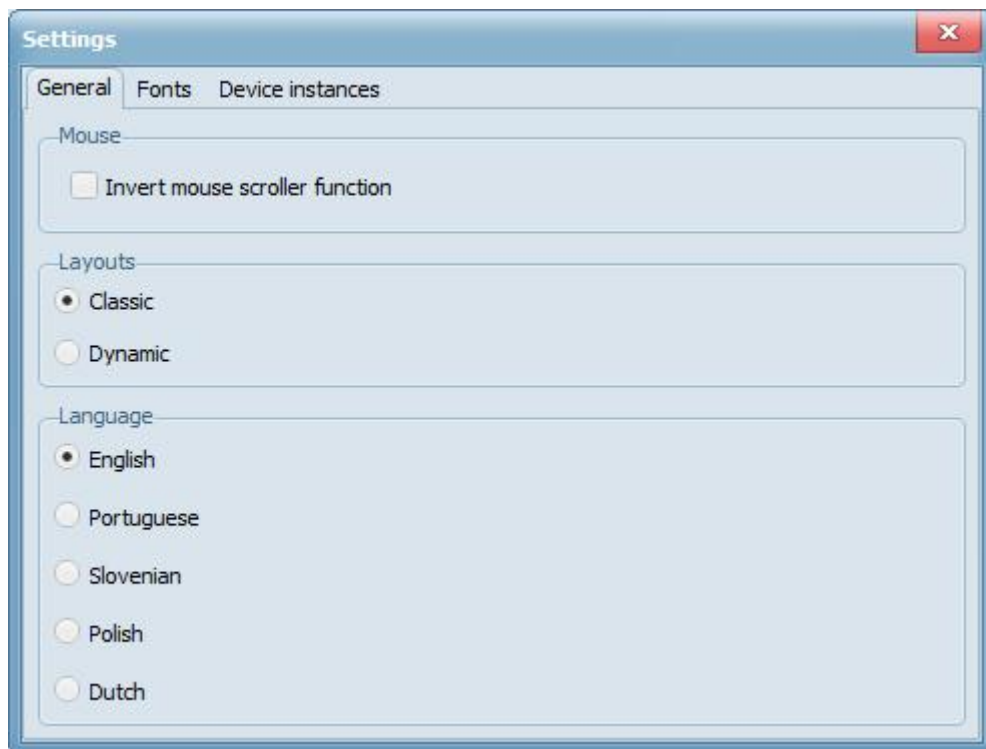


Change language settings and displays layout

When you press the Settings button, the tab dialog window will open:

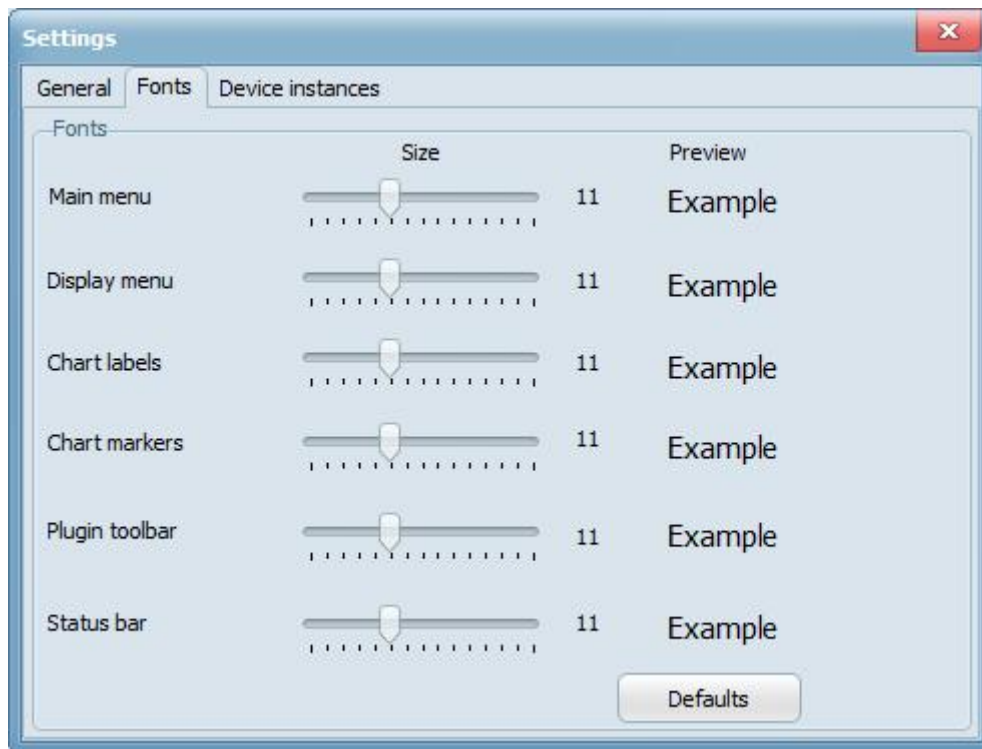


- General tab will allow you to:
 - **Invert mouse scroller function**
(zoom on forward / backward scroll)
 - **Choose between Classic or Dynamic layout**
(Classic layout keeps the Device displays in the frame of main application, while the Dynamic layout lets you freely move Device displays even over multiple monitors)
 - **Change user interface language**
(English, Portugese, Slovenian, Polish and Dutch are currently available)
The Language settings allow you to choose the language of the user interface. In order to change the language setting, application reset is required.



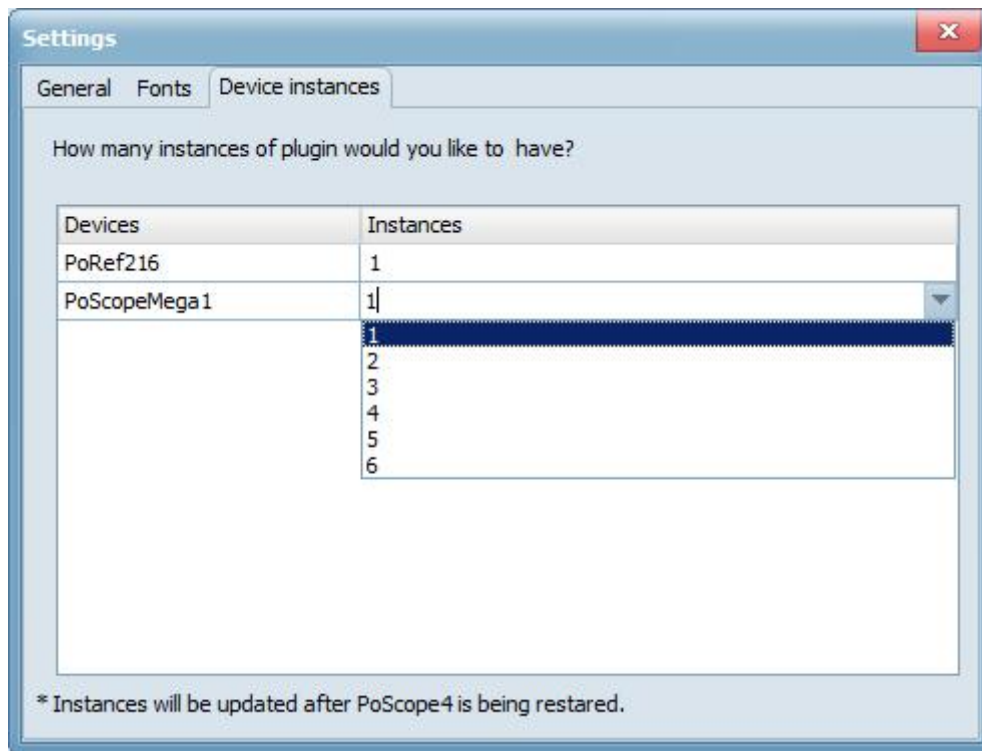
General tab settings

Fonts are also fully configurable. Find the fonts settings under the Settings tab. The **Fonts dialogue box** lets you configure the size of the fonts for each application segment.



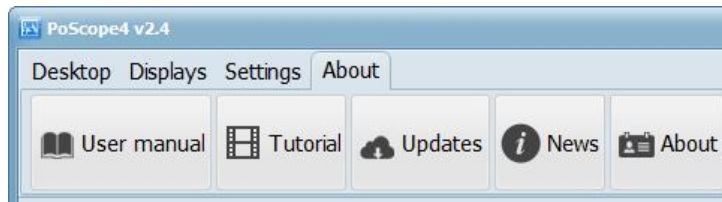
Font size user interface

You can set the number of connected devices in the device instances tab.



Device instances setup

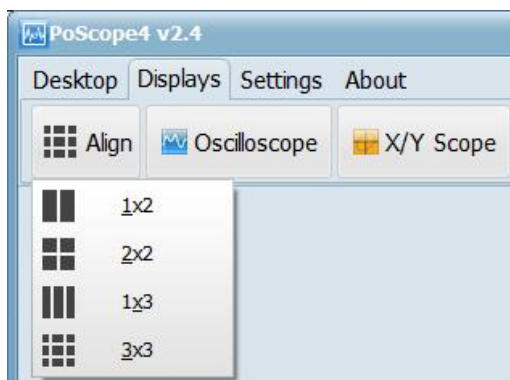
On our website you can find latest release of the PoScope software and new PoLabs devices, including the PoScope oscilloscopes and PoKeys controllers. YouTube channel provides installation and video tutorials on how to use the PoScope devices.



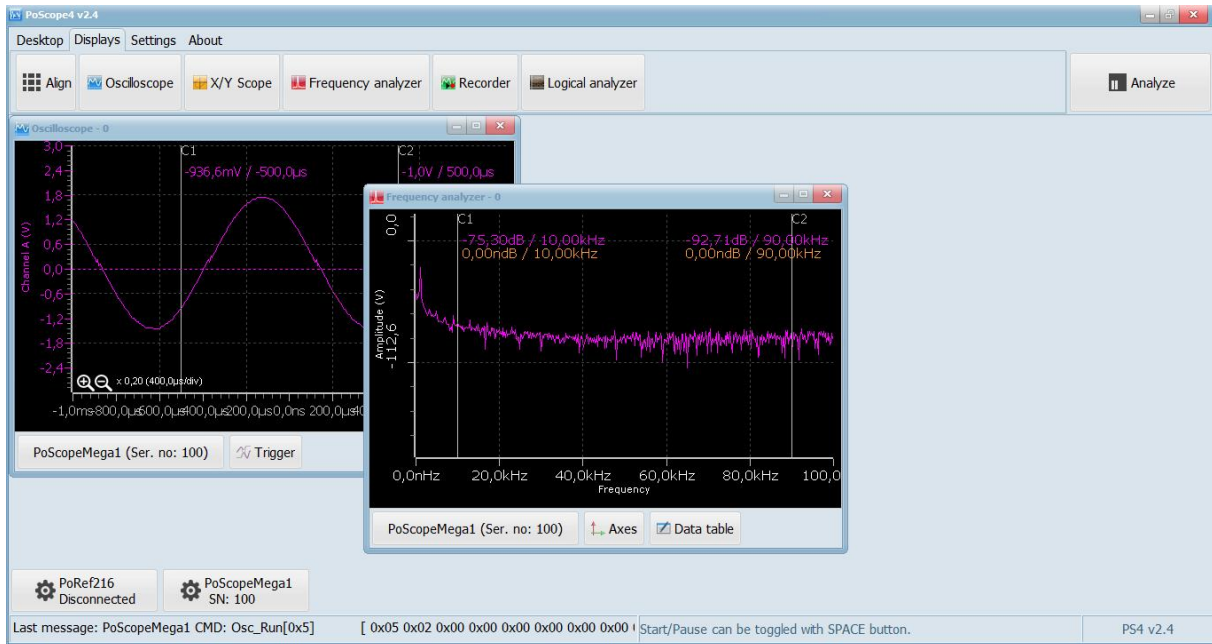
Device displays

The **Align function** lets you automatically tile the displays in the working area in following configurations:

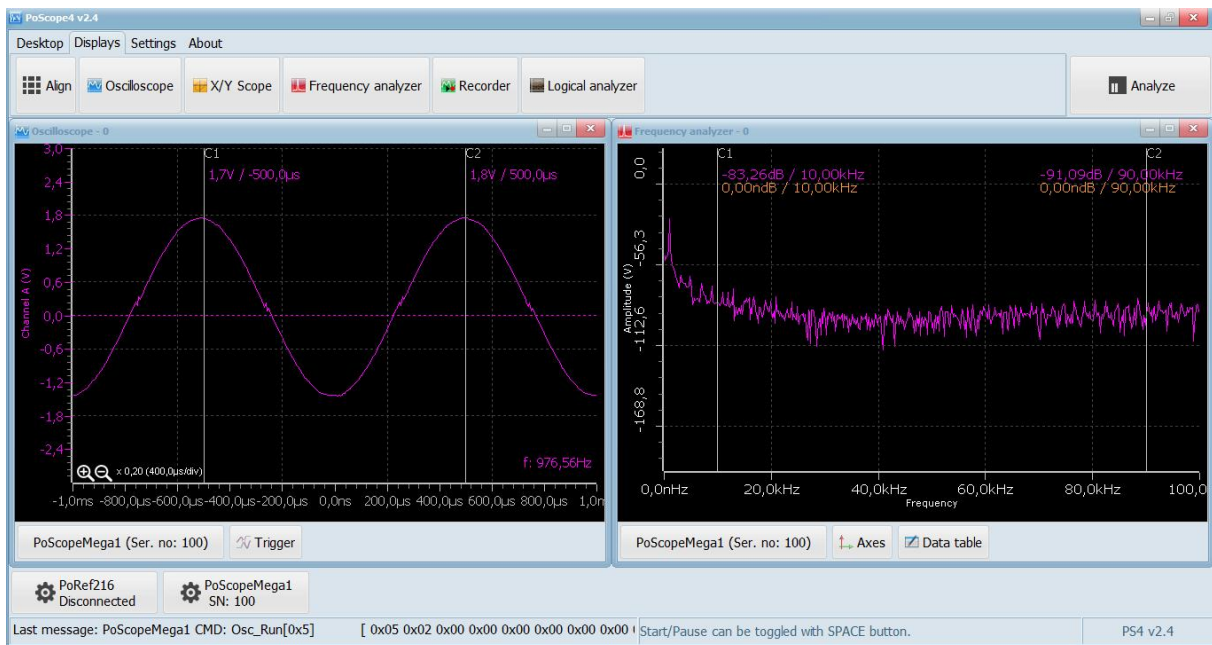
- 1 row by 2 columns,
- 2 rows by 2 columns (as shown below),
- 1 row by 3 columns,
- 3 rows by 3 columns.



If none of the above is appropriate for your use, you can always tile the displays by yourself as you wish. The location and size of the displays in the working area are fully customizable. Displays tab also shows device functions.

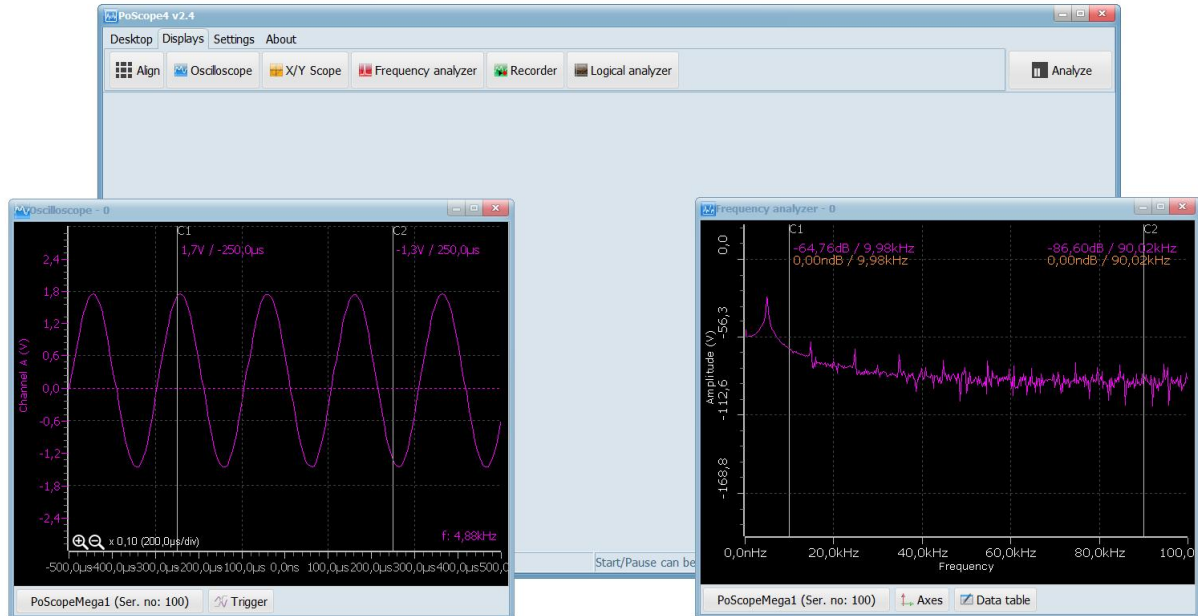


Device displays before using the align function



Device displays after using the align function

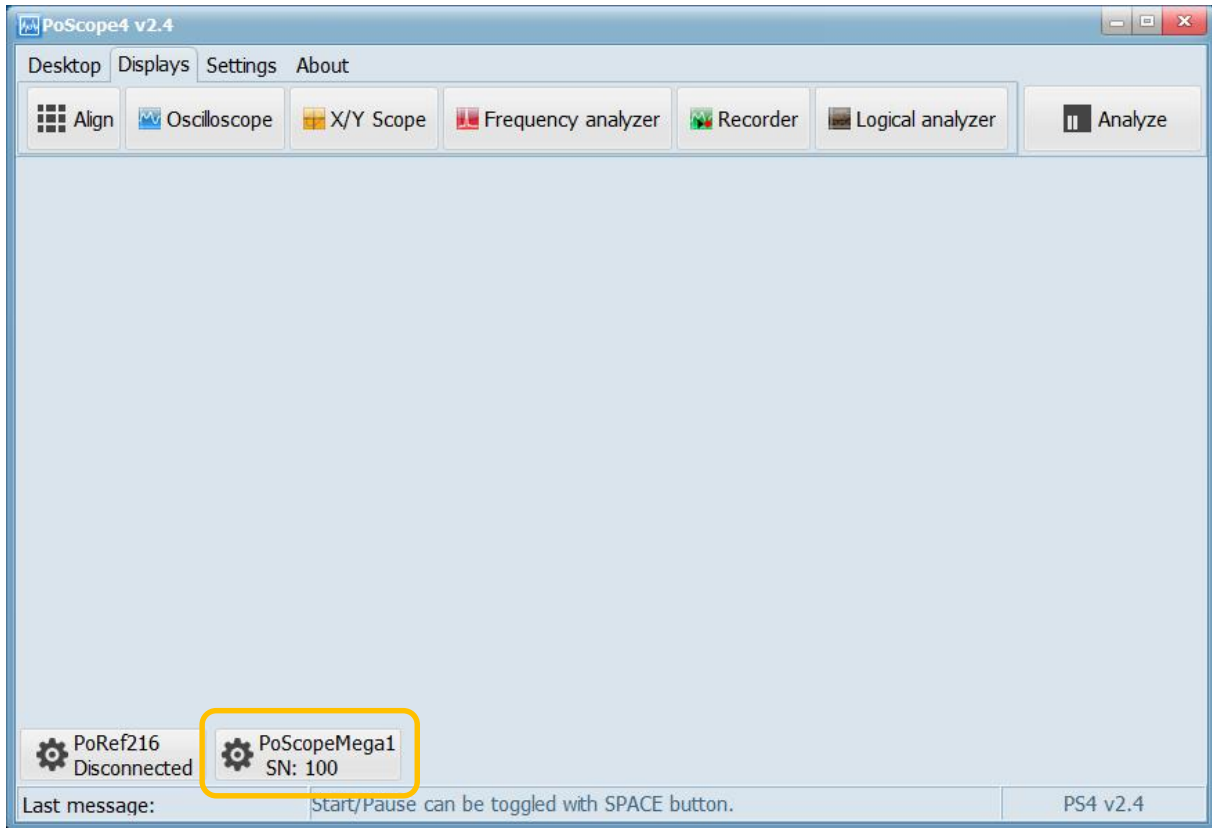
Dynamic layout is also available. You can set it in the settings menu. The Device layout lets you place Device displays also outside the main application, therefore it might come handy when multiple monitors are connected to the workstation.



Device displays outside the main application in Dynamic mode

Mega1 controls

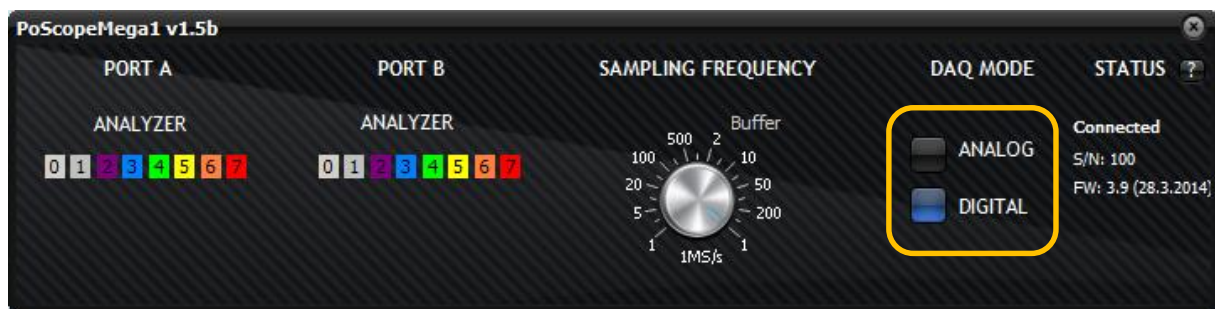
Each of the devices that you can use in the PoScope 4 environment, has its own dedicated controls. Since they are plug & play enabled, we call them plugins. Once connected, you can open the Mega 1 controls with a click on its icon.



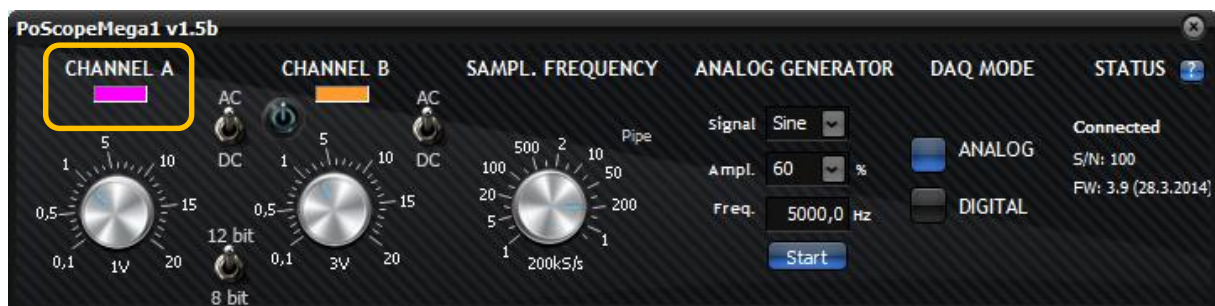
Button for Mega1 device controls

Mega 1 controls will open, showing you next settings:

- Volts /scale setting for each channel (A, B)
- AC / DC pushbuttons (cuts off DC component)
- ON / OFF button for channel B (when channel B is off, pipe mode sampling frequency for channel A is 2,5 times higher)
- Sampling frequency setting
- Analog generator settings (waveform, amplitude, frequency)
- 8-bit and 12-bit switch

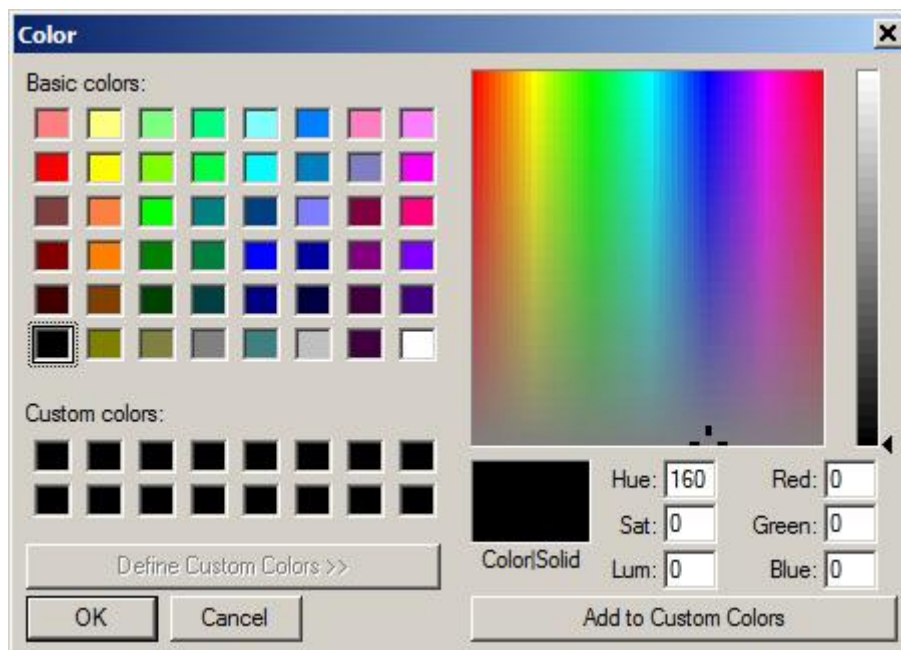


PoScope Mega1 Plugin (digital mode)



Poscope Mega1 Plugin (analog mode)

The color of graphic signal representation of each channel is also customizable by clicking the color square next to each channel.

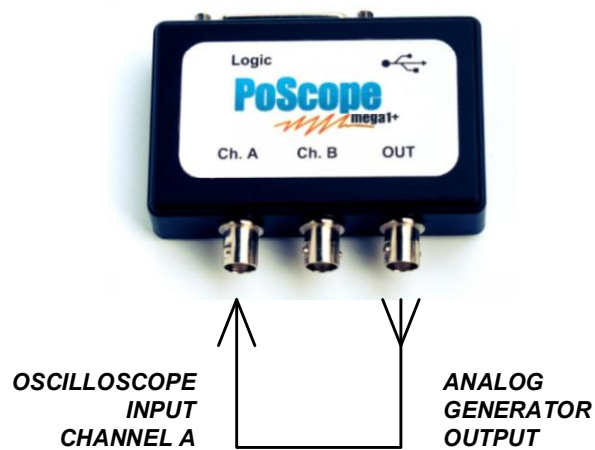


Waveform color settings

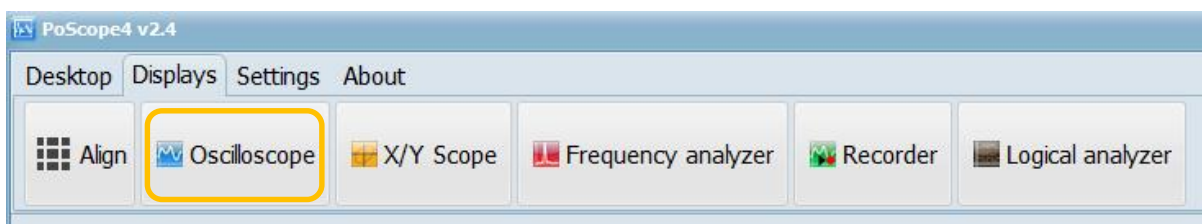
OSCILLOSCOPE

Oscilloscope is an electronics measurement device that visually represents an electric signal, either alternating or direct current (AC or DC). An oscilloscope graphically shows variations of voltage. As such it is appropriate for measuring and analyzing fast changing electric signals.

For this example we connected the analog generator output to oscilloscope channel A of the same Mega1 device. You can do that by using 2 probes. Plug them to CH.A and OUT and connect the probe's tips and the probe's grounds.



You can open the oscilloscope by clicking **Oscilloscope** icon in the device functions menu.

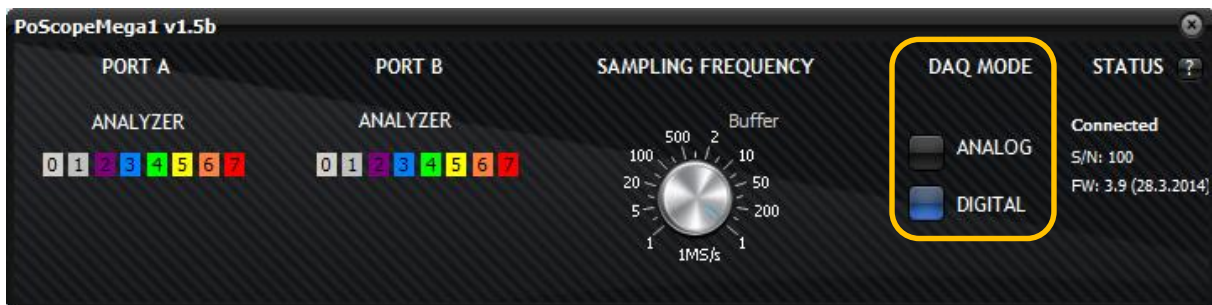


Device displays menu

You might come across the message: Device not in analog mode. In that case you will have to open the device controls and switch the device back to analog mode in the DAQ section.



"Device not in analog mode!" Error message



Device controls – digital mode

Capture mode

A window will open, showing graphical representation of a measured signal. To expand the timebase, find the magnifying glass icons in the bottom left corner of the oscilloscope display.

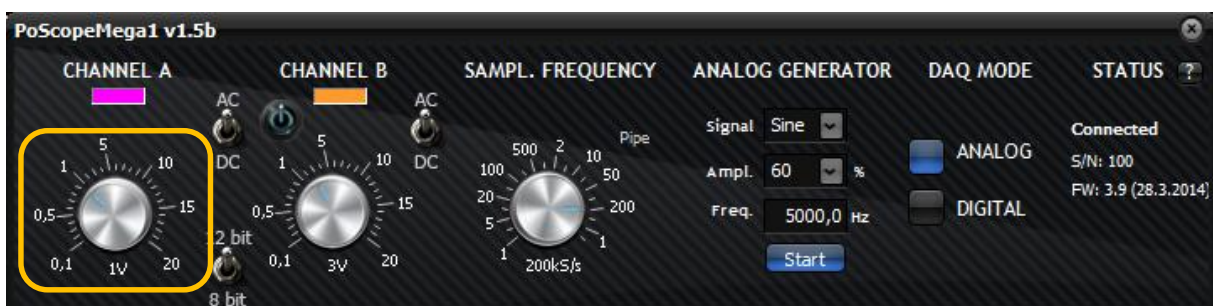


Magnifying glass icons for timebase setting

After expanding the timebase you will get far better graphical presentation of the observed signal. To view the controls of the device, you have to click the device buttons area of the GUI. To view the plugin controls of oscilloscope PoScope Mega1+, left-click the PoScopeMega1 button. If you have multiple devices connected, they will be listed here. Previously you have to set higher number of device instances in the settings menu.



There are two ways how to change voltage range of input. First way to change it by simply left-click & drag channel knob on control GUI or using mouse scroll wheel with mouse positioned above the knob. The second way is to move mouse over the axis on chart and scroll mouse wheel. The result will be same for both methods. Under the settings menu you can invert mouse scroll function if you prefer different behavior when scrolling up or down.



Since the analog generator outputs a voltage amplitude of no more than 2V, you can set the channel A knob to 2V. You will get graphical representation shown below.



Some signals change very fast. To catch the desired event, you can use **triggering**. Trigger is a standard oscilloscope function that allows you to catch the live signal at some particular point so you can closely analyze it. Just choose the correct channel, select Mode (automatic loops or a single trigger) and particular edge of the trigger (signal rising / falling / any).



When you're done with capturing the signal, you can closely examine it. Click **Analyze** in the top-right corner of the PoScope4 software. Waveform will freeze.

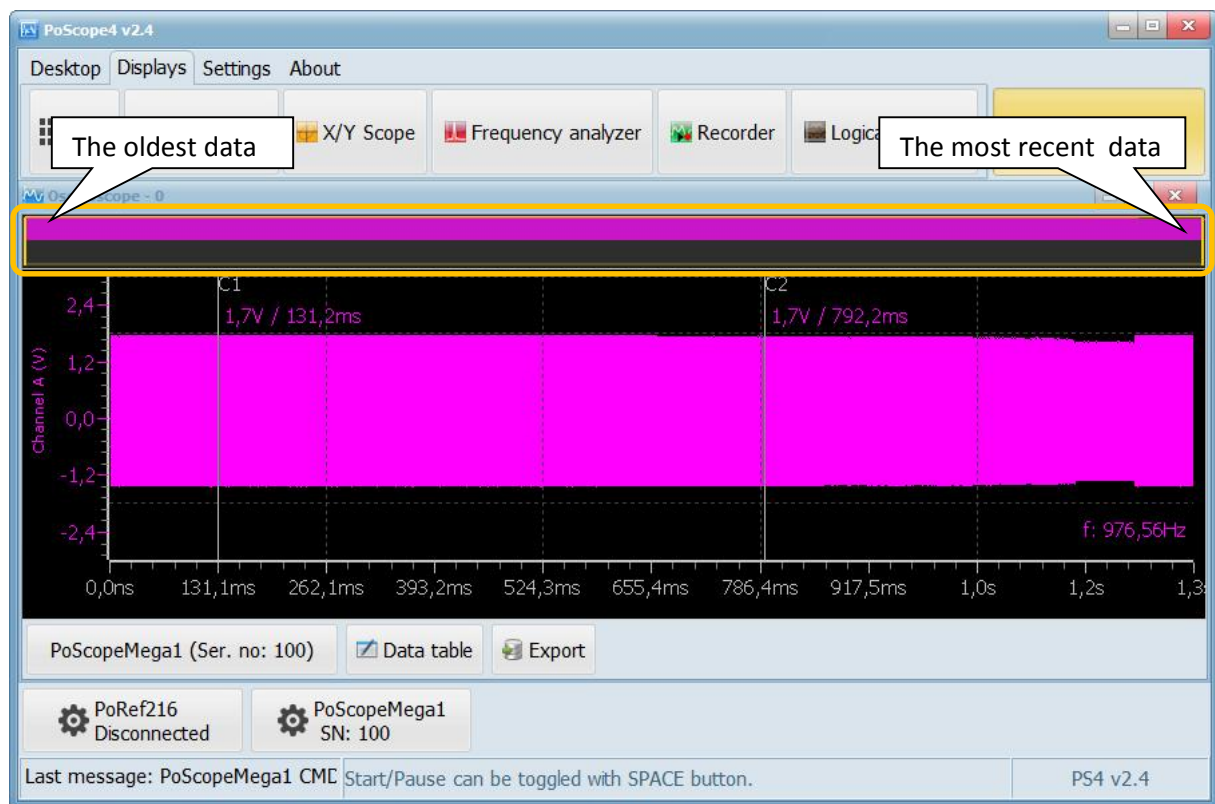


Analyze mode

When pressing analyze additional control with yellow colored selector appears on the top of the waveform. This control is called analyze overview and its purpose is to give users the idea of overall content of data in buffers for further analysis. Data displayed on overview control is ordered by time so the oldest data is left-most and most recent data is right most.

Yellow selector rectangle on overview represents portion of data to be displayed on main chart for analysis. The selector size and position on overview control can be easily modified with few mouse scrolls.

To resize the yellow selector, hover mouse over main chart or overview and use your mouse scroll wheel. To move the waveform, drag and drop with your left mouse button pressed over chart or simply drag selector rectangle on the overview.



Oscilloscope display in analyze mode with Overview window

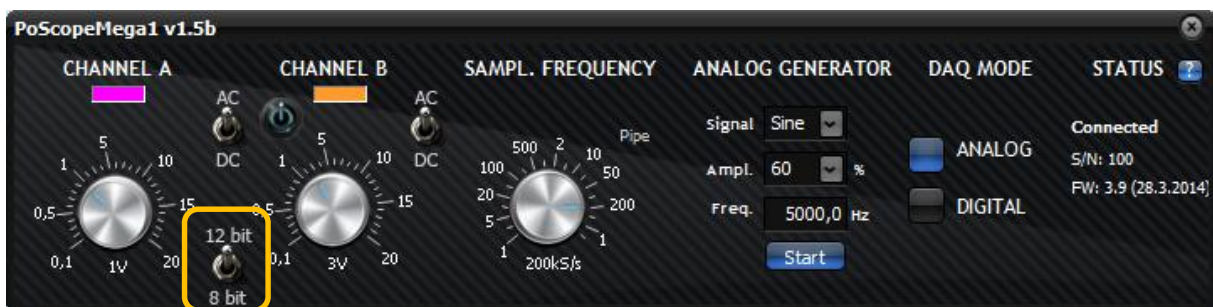
To read the amplitude of the signal, you don't have to constantly calculate the Volts/div X number of divisions. Just use the 2 vertical cursors available, **C1** and **C2**. Find them in your oscilloscope window, click & drag to desired position. Below you will find **Data table** command. It opens small table with current values of voltage amplitude and time difference between C1 and C2.



If you click with left mouse button in the data table you can toggle between time calculation between two cursors and frequency calculation.

In the right-bottom corner you can see estimated frequency calculation. It's an estimation and its accuracy depends on your sampling frequency setting and your signals applied at the inputs. If your sampling frequency is too high and signal frequency is too low the estimated calculation might be wrong.

You can switch between 8-bit and 12-bit mode. 8-bit mode results in higher pipe mode sampling frequency but less accurate data compared to 12-bit mode.



Oscilloscope 8-bit sampling



Oscilloscope 12-bit sampling

If needed, you can **export** the measured data to external file. Filter out data of interest (channel A, B) and current chart / selected buffer range, and then click Export. Supported file types are:

- .csv,
- .xls,
- .html,
- .pcm - exporting to PCM will create additional txt header file with info (available only for oscilloscope and recorder)



Oscilloscope display in Analyze mode with export settings

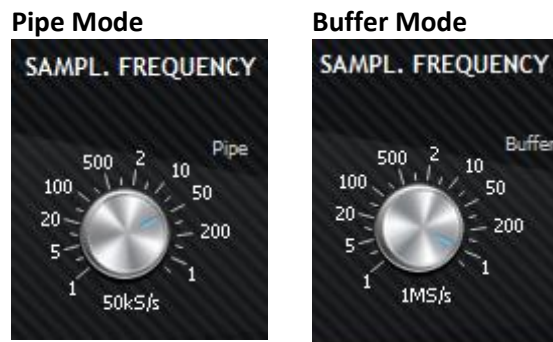
Mega1+ sampling frequency (analog and digital DAQ mode)

If you change sampling frequency knob you will note that label under the knob is changing from Pipe to Buffer. Pipe and Buffer are names for two different data transfer modes.

Data is transferred over full speed USB 2.0 which has speed limitations (1,5Mb/s theoretical). Mega1 can sample faster than we can transfer data over USB thus we introduced these two modes.

Pipe mode: sampling is slower than USB 2.0 “full speed” maximum transfer speed. Device can transfer sampled data over USB 2.0 continuously and without any interrupts

Buffer Mode: sampling is faster than USB 2.0 “full speed” maximum transfer speed. Device is transferring limited amount of data (data images) and there are interrupts between data.



Pipe mode limit is set dynamically, depending on resources used:

- f_s – Sampling frequency [Samples / second]
- N – Count of used channels [n] (is channel B on?)
- S – size of one sample in bytes [bytes] (8-bit / 12-bit)
- V_{usb} – USB 2.0 “full speed” maximum transfer rate (1,5 MB/s in theory)

$$F_s \times N \times S < V_{usb}$$

Mega1+ maximum pipe mode sampling frequency is:

- 12 bit mode and two channels: 200kS/s,
- 8 bit mode and two channels: 500kS/s,
- 12 bit mode and single channel: 500kS/s,
- 8 bit mode and single channel: 1MS/s.

When Channel B is turned off, the Mega1+ maximum buffer mode sampling frequency is 2,5MS/s (single channel only).

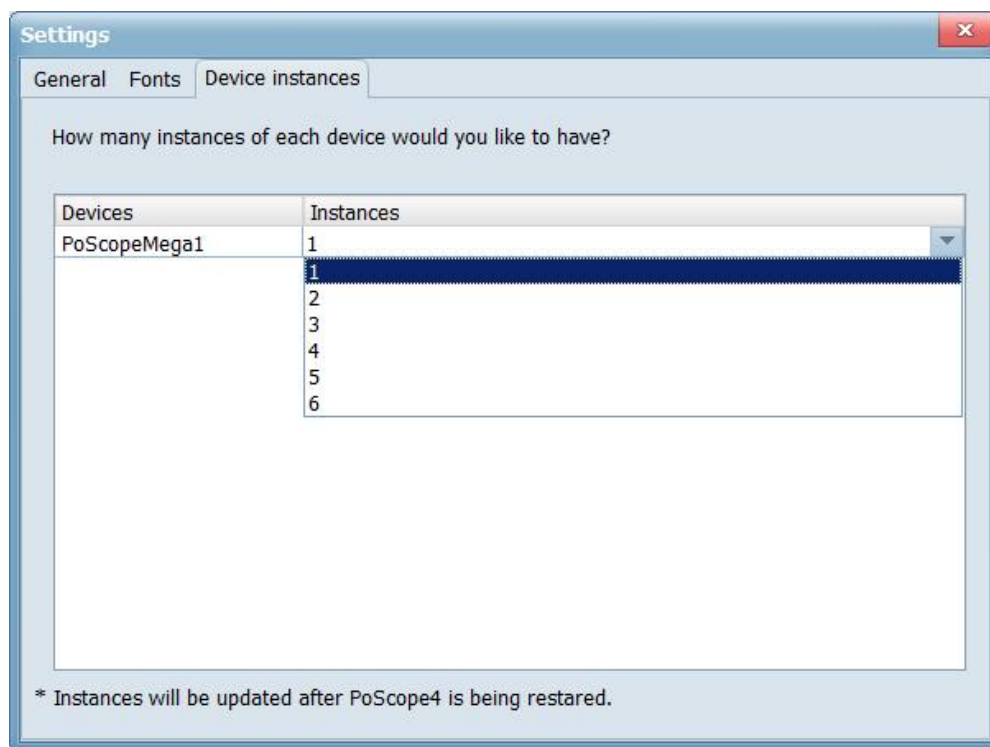
Using multiple devices in PoScope4

Sometimes there is a need to measure more than 2 analog signals. PoScope4 can load a number of different plugins (different oscilloscope devices) and also provides multiple instances of same plugin (same oscilloscope devices).

When you have more than one Mega1+ (or any other supported devices) you can set up PoScope4 to load multiple instances of Mega1+ plugin by clicking the settings tab in main menu.

In window which appears, click on the Device instances tab and select how many instances of plugin you would like to have next time you run PoScope4.

Select appropriate number and restart PoScope4. New buttons will be added to the plugin toolbar. Each instance of plugin will detect when device is attached to computer and connect to it.



Device instances setting

Synchronization issue

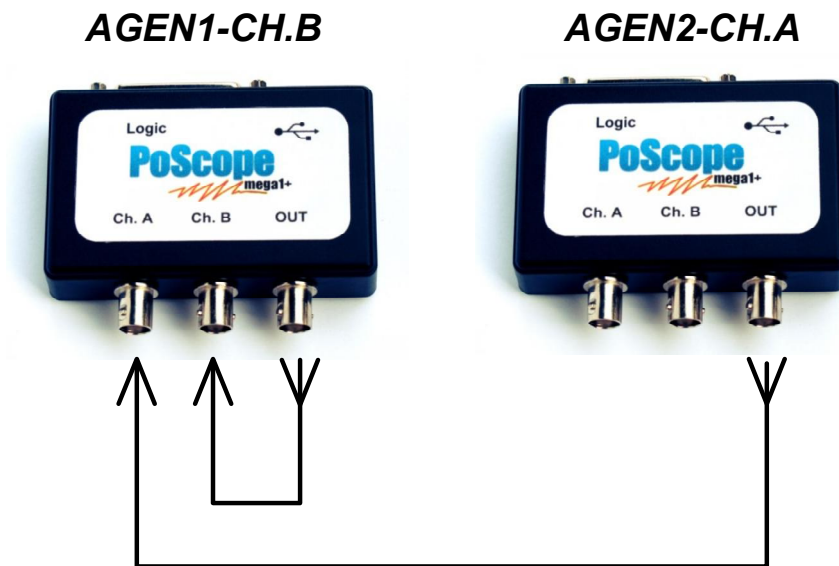
It is possible to connect two or more **Mega1(+)** devices to PoScope4 but you cannot use them on the same display while devices don't have common sync clock used for sampling. Each Mega1(+) device has its own clock and doesn't offer external clock synchronization feature therefore data cannot be properly synchronized between different devices. Those devices can still be used on separate displays.

X/Y SCOPE

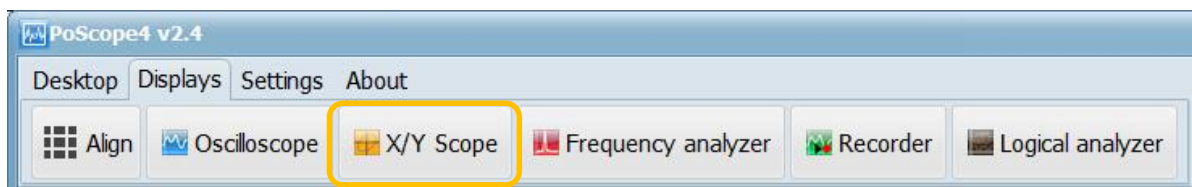
There are applications where we need to know phase differences between two or more varying voltages. Oscilloscope can be used to track phase differences between multiple input signals. X/Y scope plots them out as one voltage versus another. If input signals are periodic resulting curves are called **Lissajous figures**. We can use this tool in different fields:

- component characteristic (I-V curves),
- broadcast engineering (stereo – left/right),
- audio amplifiers (distortion between in & out),
- guitar tuning,
- etc.

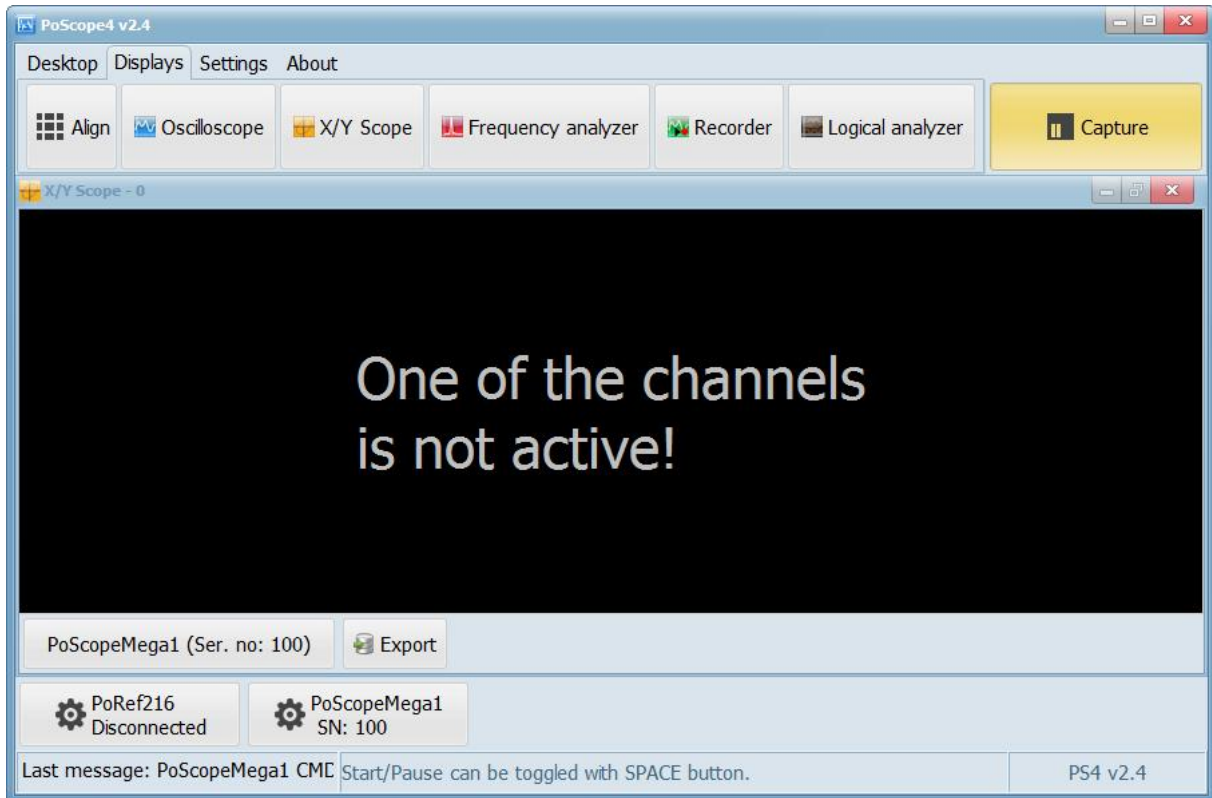
For this example we need 1 oscilloscope (Mega1) and 2 voltage sources. Analog generator is a standard feature of Mega1 oscilloscope, but since it's a single-channel, we need 2 of Mega1 devices. In order to use multiple devices in PoScope4, go to Settings and set a higher number of device instances.



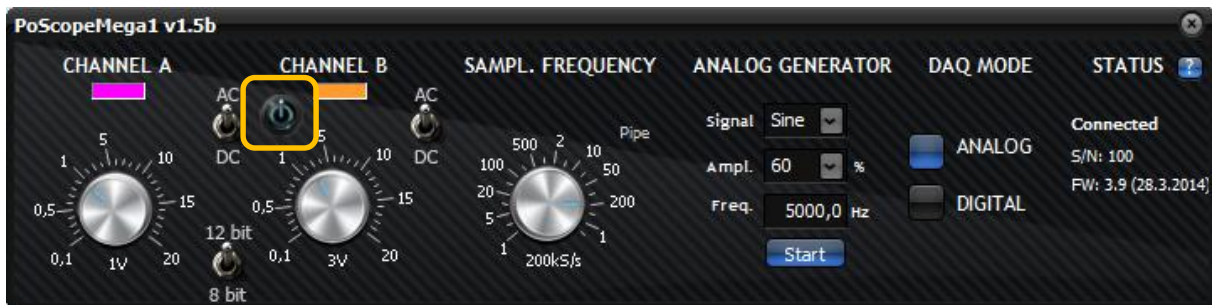
You can open the X/Y scope by clicking its icon in the DISPLAYS tab of PoScope 4 software:



You might come across this window. In order to track phase differences, both of the channels have to be active. You have to turn on the signal on channel B on the Mega1 device plugin controls.

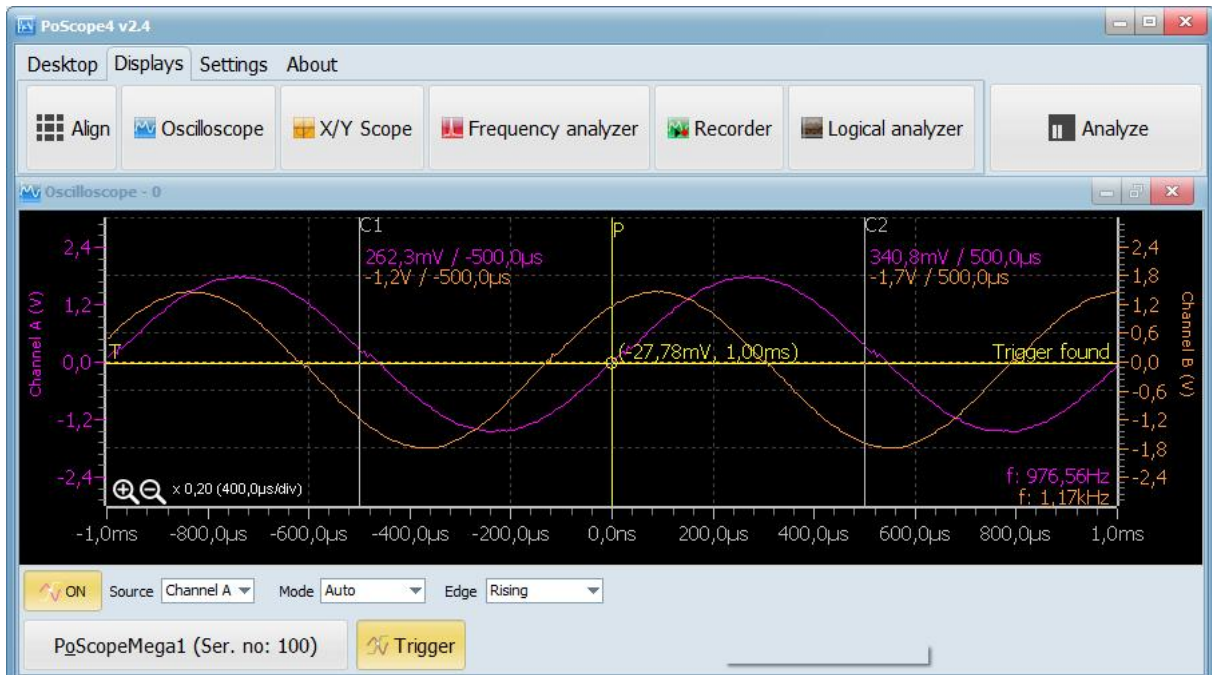


"One of the channels is not active" error message in XY mode



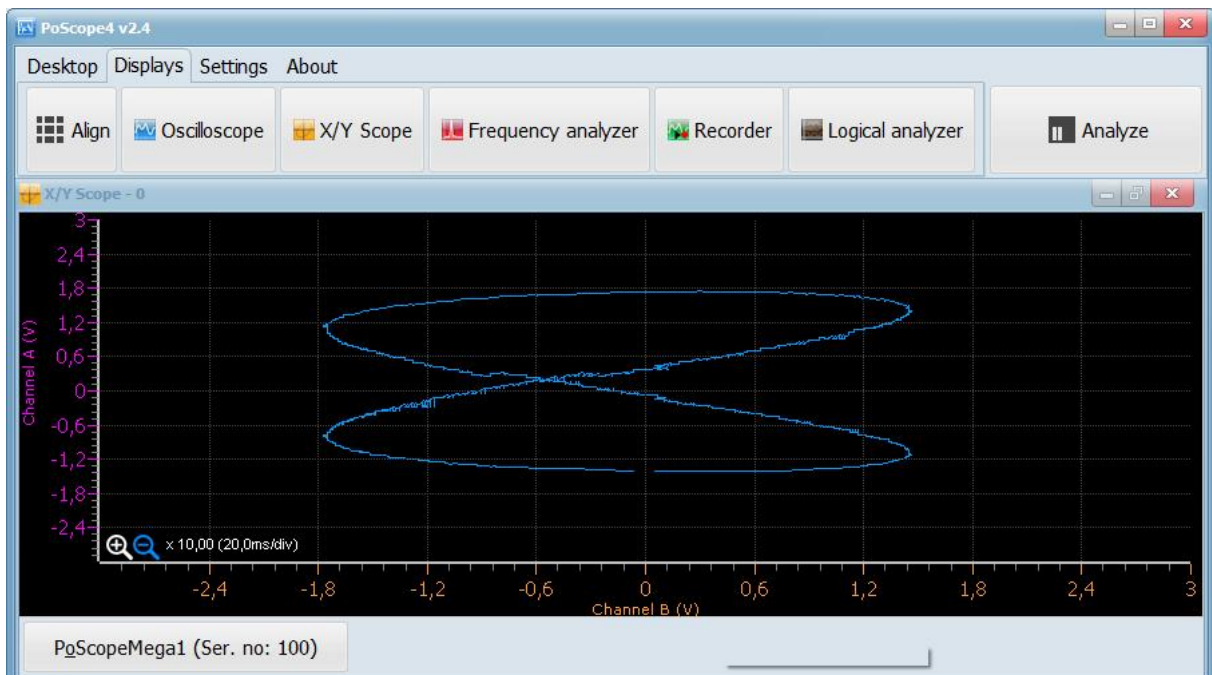
Channel B on/off button on Mega1 device controls

In order to see the phase differences, you can open oscilloscope display and enable the trigger function on one of the channels. One of the signals will freeze, the other will move across the display in relationship to the first one.



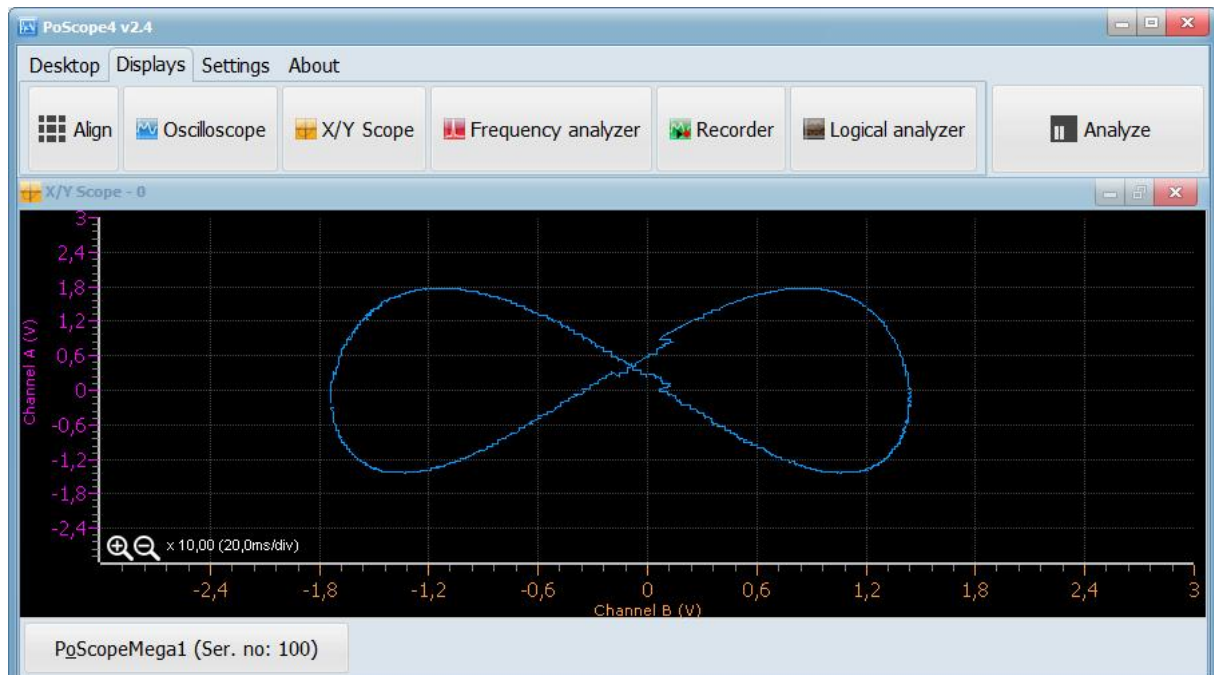
XY mode with trigger function

Now let's draw some basic Lissajous curves. If we set ratio of frequencies to 2:1, for instance 20Hz on channel A and 10Hz on channel B, we get this figure 8.



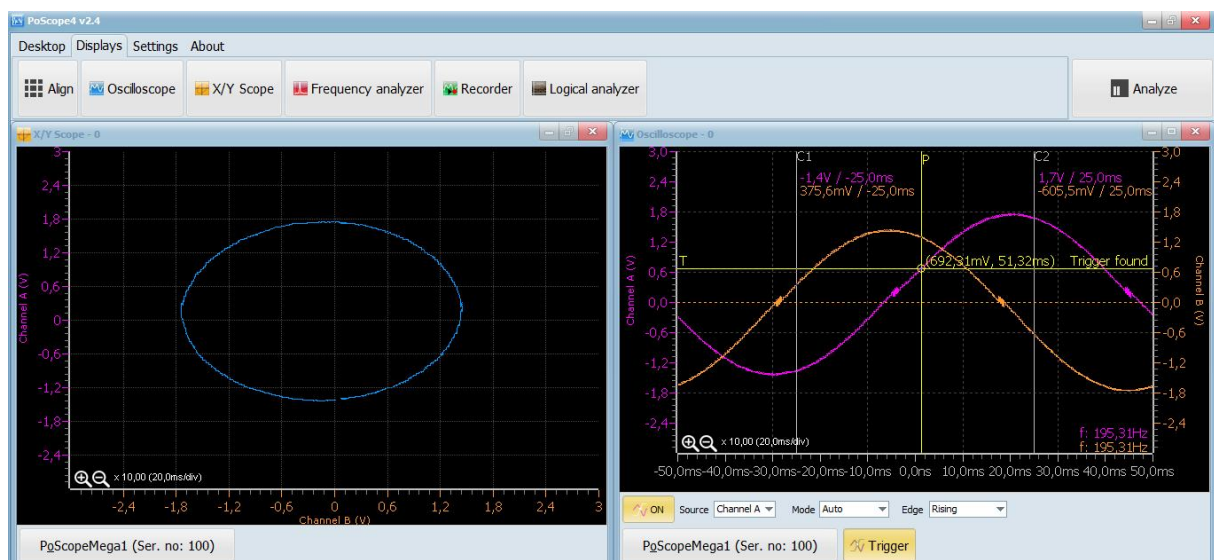
Lissajous curves figure 8 at frequency ratio 2:1

When we change the ratio to 1:2, for instance to 10Hz on channel A and 20Hz on channel B, the figure 8 rotates to 90° and we get this infinity symbol. At greater ratios we just get more twists.



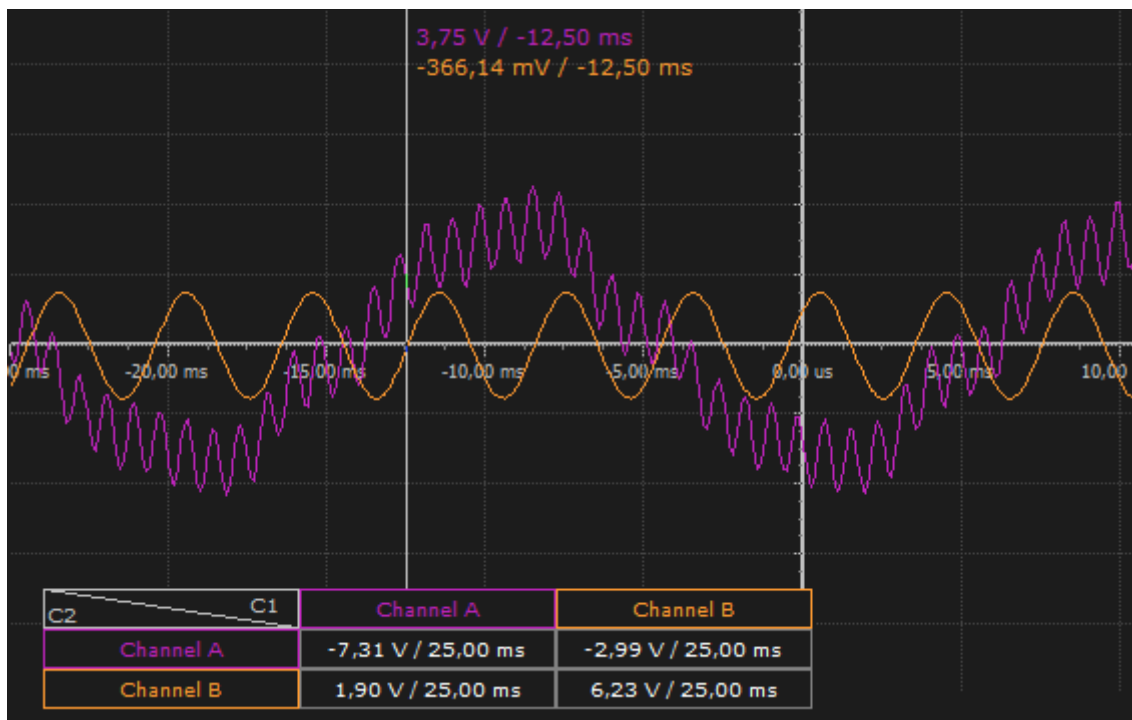
Lissajous curves figure infinite at frequency ratio 1:2

When there is 90° phase shift between the two phases, on the XY display you will get this circle. You might notice that the circle appears to be slightly elliptic, because the display isn't exactly square, therefore the X and Y scale on the XY display aren't symmetric.



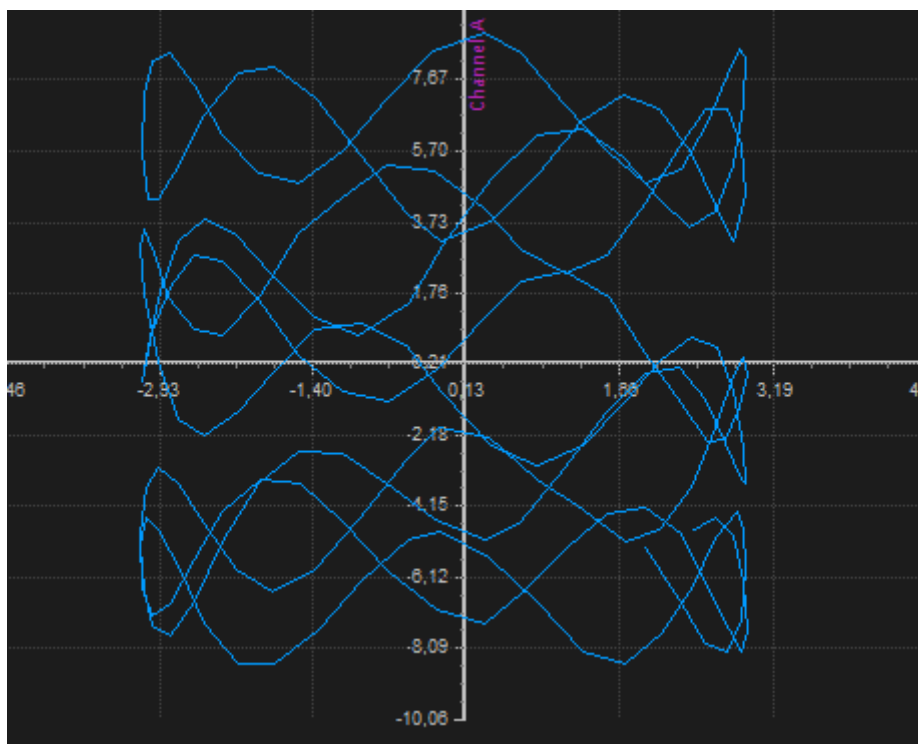
Lissajous curves circle figure at 90° phase shift

There are many different examples of Lissajous curves. One of them are drawn by periodic signals shown below. These are the source signals on the oscilloscope display.



Source signals for X/Y scope displayed on Oscilloscope.

Let's add X/Y scope and select as a source device with periodic sine waves mentioned before. X/Y or Channel A / Channel B representation would look like on a picture below.



X/Y scope for periodic input signals.

SPECTRUM ANALYZER

Spectrum analyzer measures signal amplitude over wide range of frequencies. It plots a waveform of signal amplitude (Y axis) against frequency range (X axis). With spectral analyzer you can find out the dominant frequency of a known signal and the amplitude / frequency of the unknown or undesired signals, as well as signal's other spectral components (power, distortion, harmonics, bandwidth, etc.)

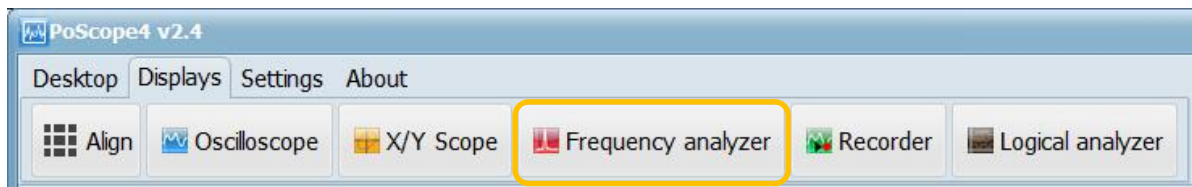
PoScope4 uses **Fast Fourier transformation** (FFT) for a frequency analysis of an electric signal. It is a mathematical process that is used to transform a waveform into the components of a signal's frequency.

Spectrum analyzer can be used for variety of tasks, including:

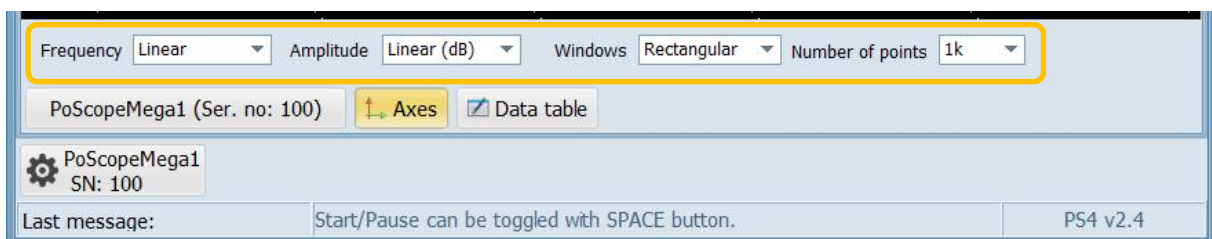
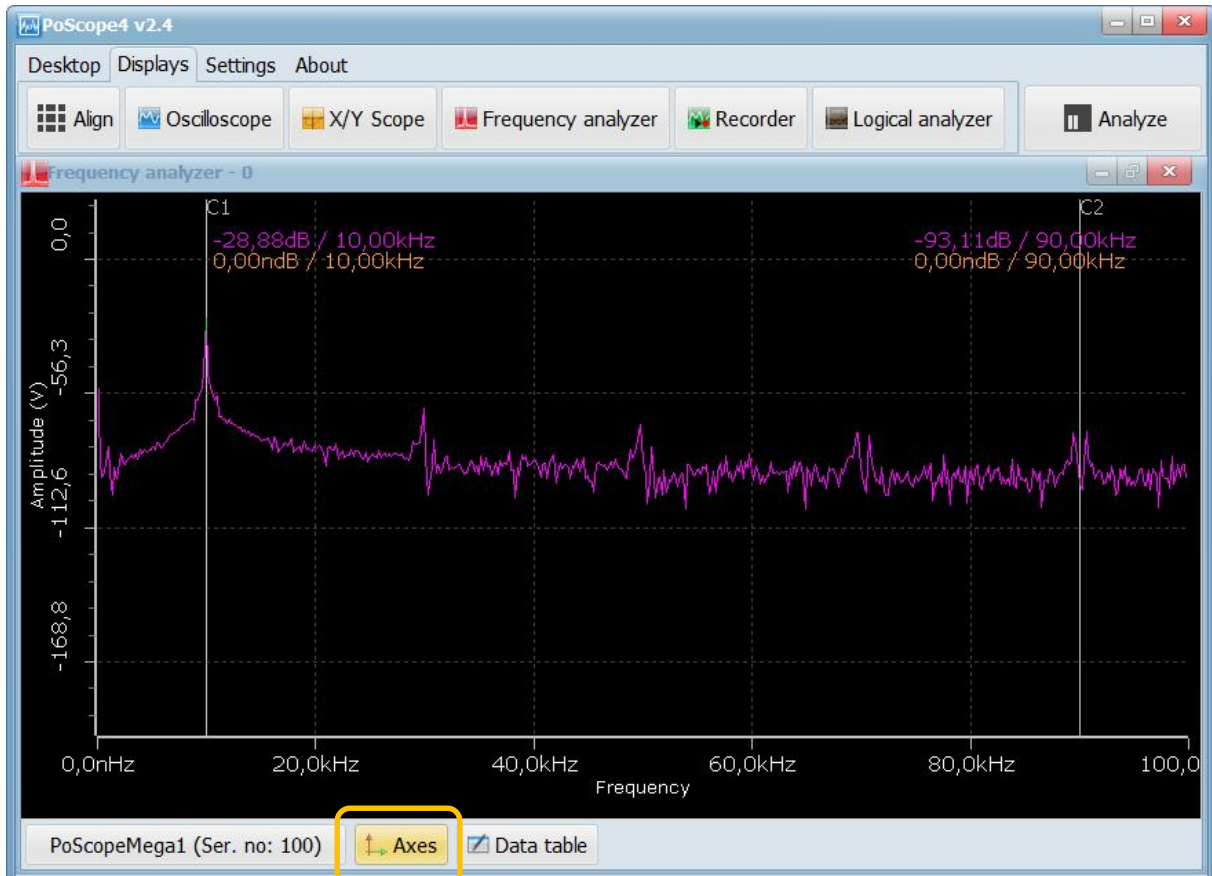
- finding dominant frequency
- searching for signal interferences
- characterization of electronic devices
- benchmark testing
- detecting unknown signals
- EMC testing.

With appropriate transducers, you can even measure non-electric frequencies, such as in audio or visual applications.

You can open the spectrum analyzer by clicking the Frequency analyzer icon in the DISPLAYS tab of PoScope4 software:



Waveform below shows frequency spectrum of periodic signal coming from analog generator. Frequency of the signal is set to approximately 10 kHz. Waveform is being plotted as signal amplitude (Y axis) vs. frequency (X axis). Clicking Axes gives you additional set of settings to examine frequencies of the input signal.



Frequency	Amplitude	Windows
linear	linear	rectangular
logarithmic	linear (0 dB)	Hanning
normalized	linear (0 dB max)	Hamming
	normalized	Flat top
		Triangle
		Blackman
		Blackman Harris
		Exponent Down

In the Frequency analyzer, cursors are also available. Drag and drop them with your mouse to find out which frequencies are most dominant. To view the relationships between C1 and C2, click on the data table.



Frequency analyzer with data table open

Click on Analyze button will take you to Analyze mode. In analyze mode the overview control will open. You can resize the yellow selector by hovering your mouse over it and use the scroll wheel to make the yellow square smaller. When done, you can pan the waveform left and right to make a FFT analysis over selected part of buffer. In Analyze mode, you can also export the data to various formats of an external file. To return to live signal, just click on Capture mode button.



Frequency analyzer in Analyze mode with Overview window

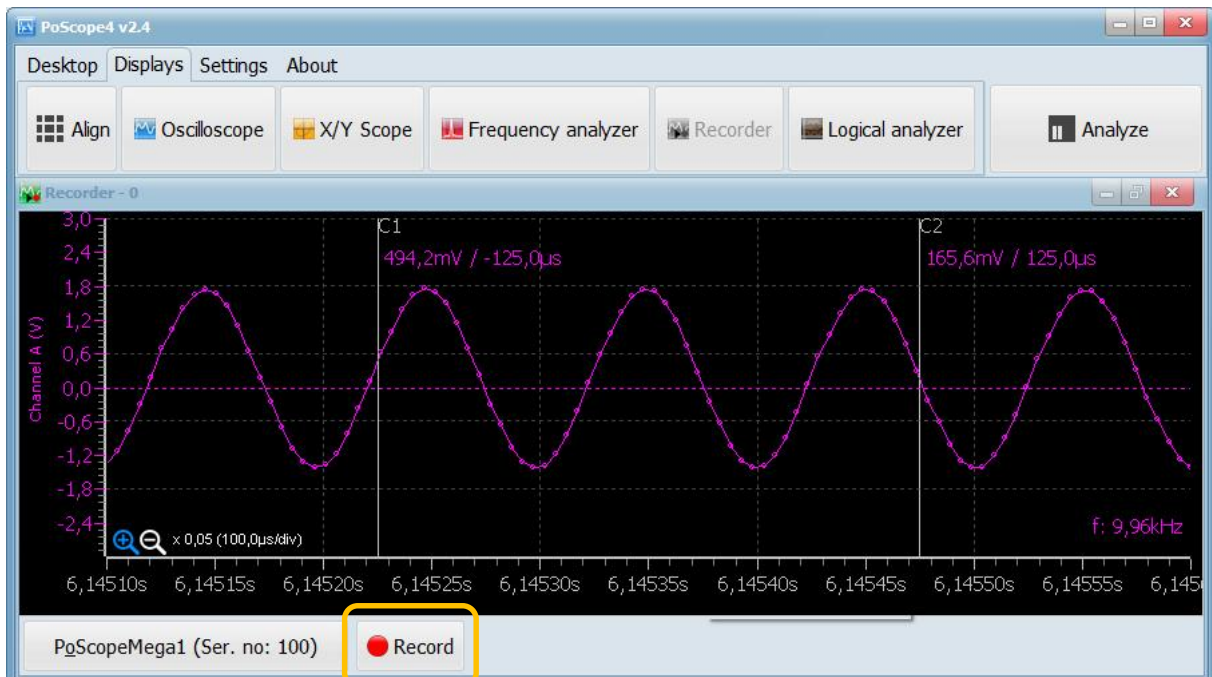
RECORDER

Analyze button is limited with the amount of RAM memory installed in a workstation where measurements are taken. To avoid the limits of RAM memory, you can save measurements to an external file on your disk. Therefore the total amount of measuring samples will be limited with the total capacity of your hard drive, SSD or USB drive.

To run the recorder module of PoScope 4 software, click the REC icon in the device functions area of PoScope 4 software.

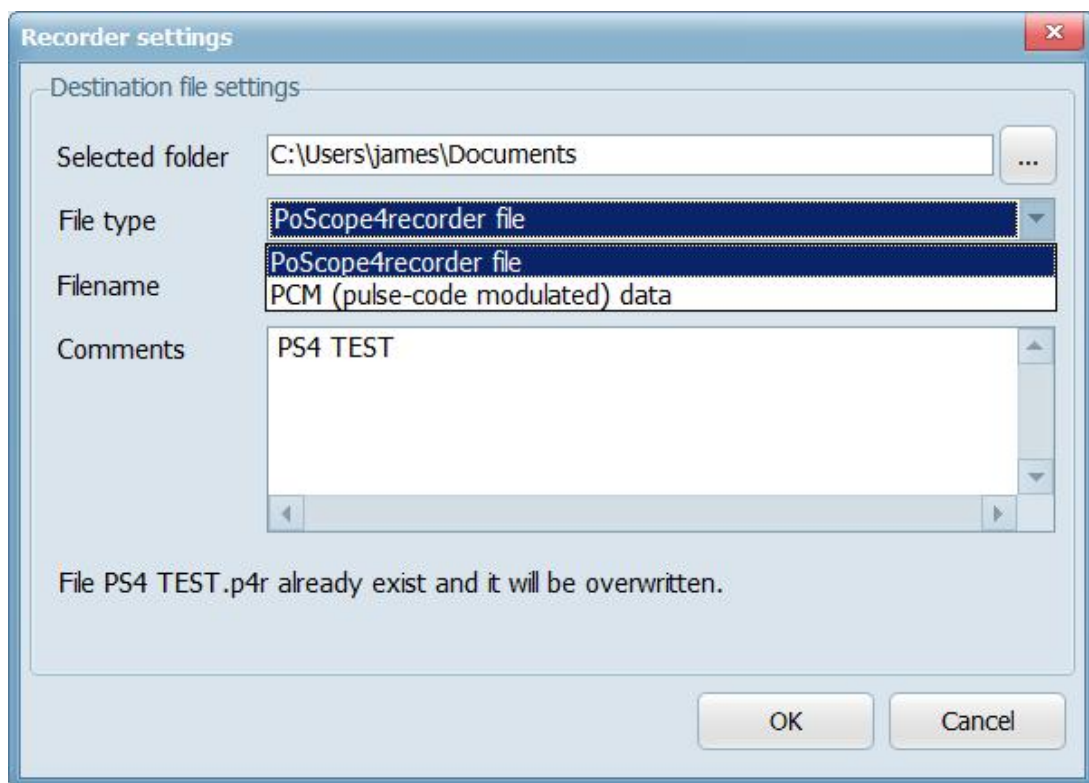


Standard oscilloscope window opens, offering you record button below to start recording.



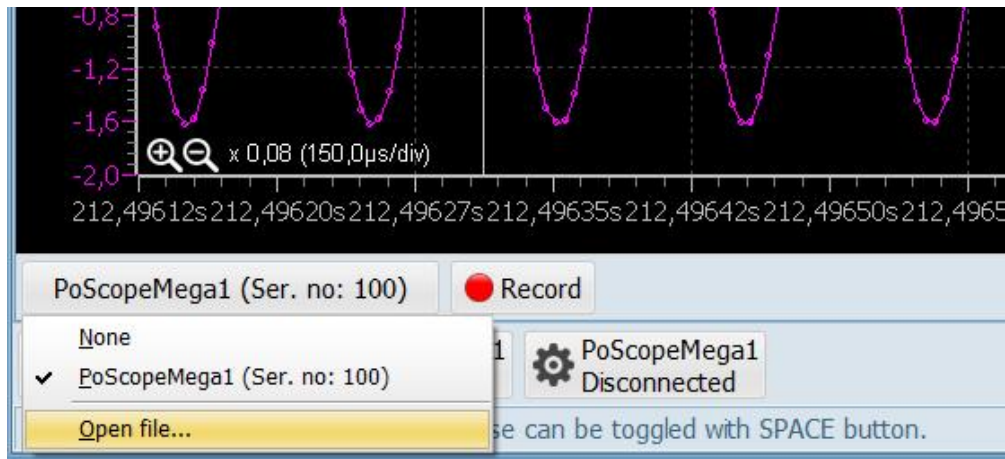
Measurement samples can be recorded to **PoScope4 recorder file** or **PCM file** (pulse-code modulated data). PCM is intended for use in 3rd party software, therefore it can't be open in PoScope4 application. Recording to PCM will create additional txt header file with following info:

- number of channels,
- data size per channel,
- bit ordering,
- sampling frequency etc.

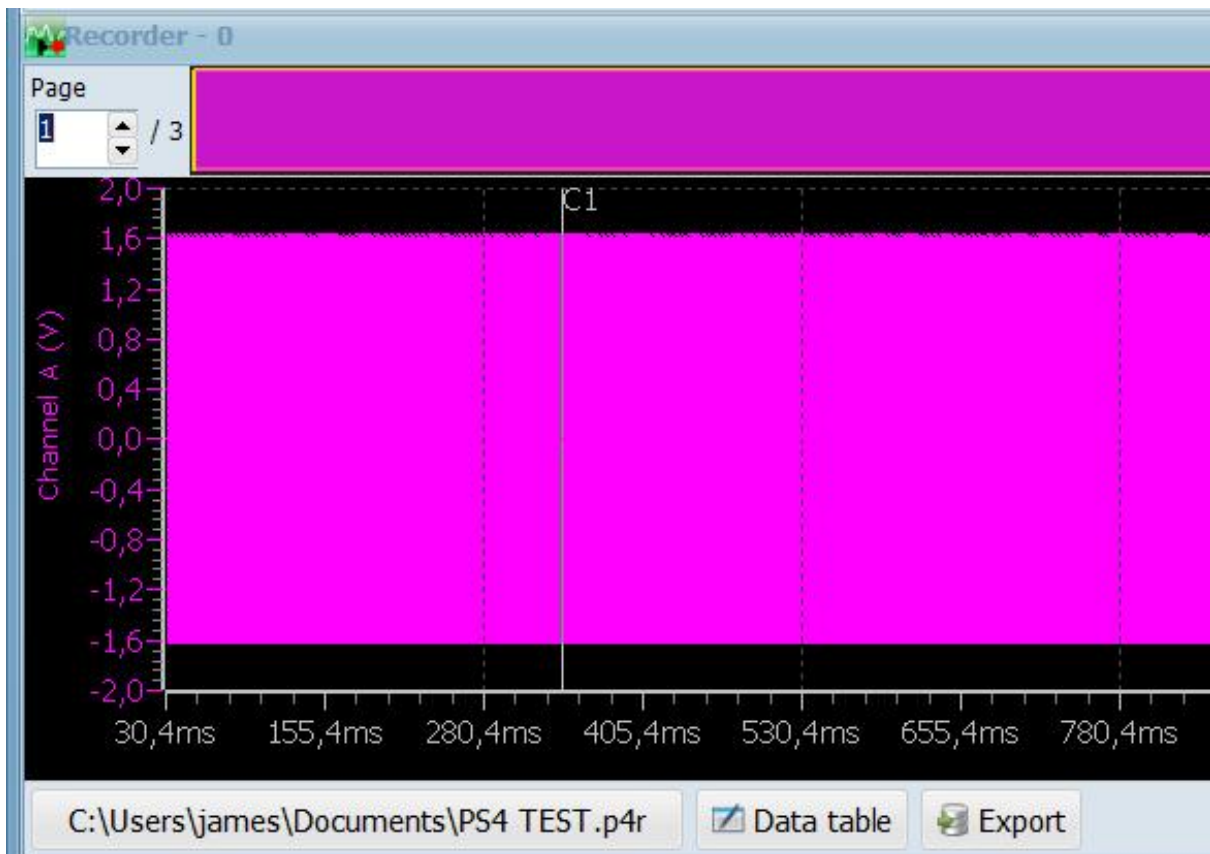


Recorder settings

Once recording you can stop it by pressing recording button again. The PoScope 4 recorder file can be open in PoScope 4 application. Click to the source and select Open file. Find and open the PoScope 4 file on your hard drive.



Once open, you can switch pages and resize the overview selector. If you hover over the waveform you can change the timebase using mouse scroller and drag the waveform left and right using you left mouse button. Data table and export features are also available as in the oscilloscope display.



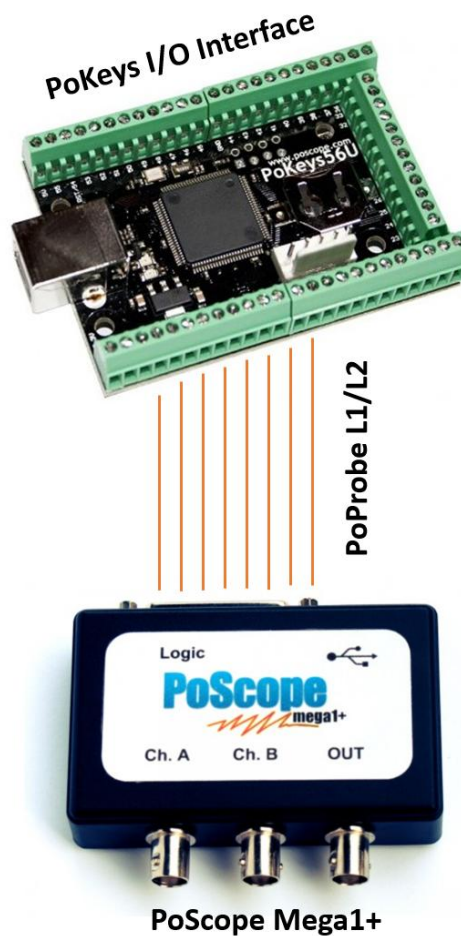
LOGIC ANALYZER

Logic analyzer is an electronic measurement instrument, capable of capturing and displaying multiple signals from a digital circuit. With this powerful tool you can observe many digital signals at the same time and perform exact time measurements. It is useful for various tasks in electronics design, testing and repair:

- analyze timing errors,
- verify timing diagrams,
- observe timing relationships among many signals,
- decode the information on buses,
- view state machine traces.

With PoScope Mega1+ you can simultaneously display, capture and analyze up to 16 digital channels varying from 0 to +5V.

For this example we used our PoKeys I/O device. PoKeys is a powerful little device with extensive amount of functions. You can program it with easy-to-use graphic tool, the PoBlocks. We used PoProbe to tap into its outputs, also available in our web store.



Logic analyzer measurements on PoKeys I/O controller

Run the **Logic Analyzer** by clicking its icon in the **Displays** tab of PoScope4 software:



Below you can see an example of displaying digital ports of a PoKeys input / output device. As in oscilloscope mode, you can click **Analyze** button to closely view the captured data.



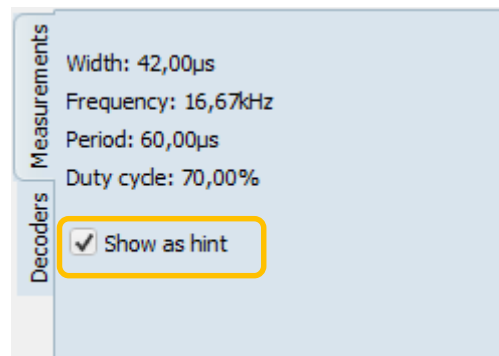
Logic analyzer waveforms

When in Analyze mode, use the yellow selector above to select the part of captured data for even closer observation. Resize the yellow selector with scroll wheel and drag it to point of interest.



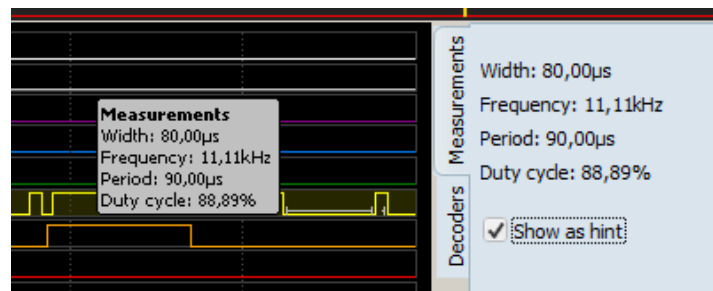
Logic analyzer in Analyze mode with Overview window open

On the right side of the Logic analyzer display you will find 2 tabs. Under measurements you will find width, frequency, period and duty cycle. Values will change as you hover over the diagram.



Logic analyzer measurements pane

When done, you can hover over the part of the certain square waveform to see additional details.



You can export the data selected in overview window to an external file in various formats.



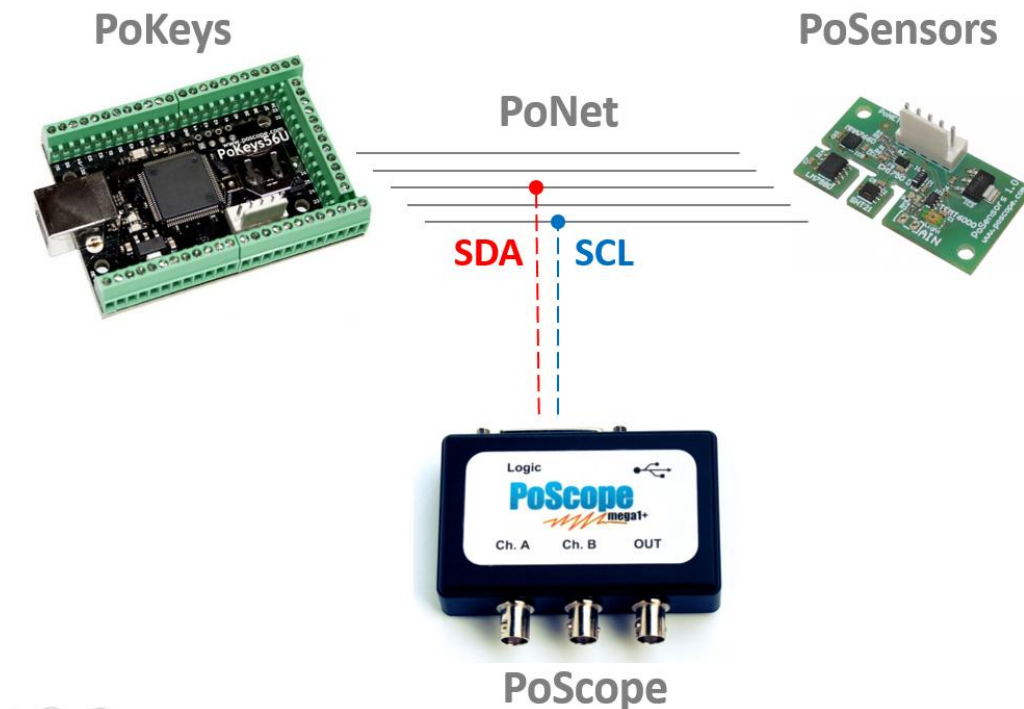
Logic analyzer export settings

I2C DECODER

Inter – integrated circuit simplifies the hardware part of electronic devices. It consists of only 2 wires. One is used for clock synchronization, the other one is for data transfer purposes. On each I2C bus you will find one master and multiple slaves. Most I2C busses work on frequencies up to 100 kHz, which can go higher if needed. I2C mostly uses 7-bit addresses which are actually 8-bit because the first bit describes whether the Master is reading or writing to the slave address. Mega 1 has the ability of decoding 8 I2C busses. Each bus can hold up to 128 devices, therefore the Mega 1 can connect up to 1024 devices.

Decoding of **UART, SPI, 1-WIRE** will be available soon as a free upgrade.

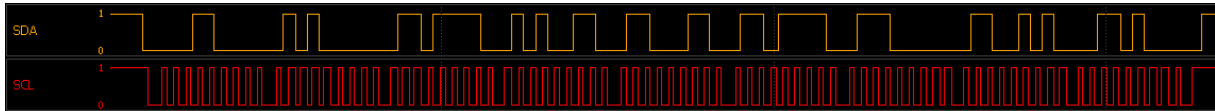
To see how I2C decoder works, you can use our PoKeys controller, connect it to PoSensors board and tap into the clock and data lines of i2c bus. They can be connected to any input of the logic analyzer port.



Connecting PoScope Mega1 I2C decoder to PoSensors

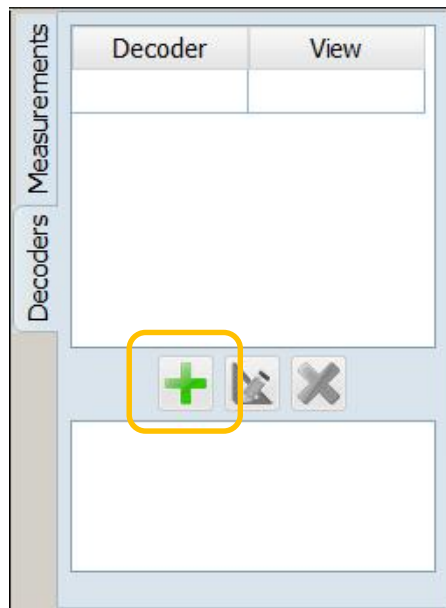
To decode an I2C bus, go to PoScope 4 application. With device set to digital mode and logic analyzer display open, click the Analyze button. In order to assure quality measurements, note that sampling rate has to be higher than the signal frequency / bus clock rate. I2C is by default 100kBits/s (different speeds are supported) so we suggest you to setup sampling frequency to 500kS/s and set PoScope4 for capturing. After a second or so (so the buffers will be full) press Analyze button to switch to analyze.

Use the overview yellow selector and mouse scroller to select part of data for analysis and decoding. Pin that has most dense pulses is usually the clock. You can also rename Pin by double-clicking its name. The second pin is data.



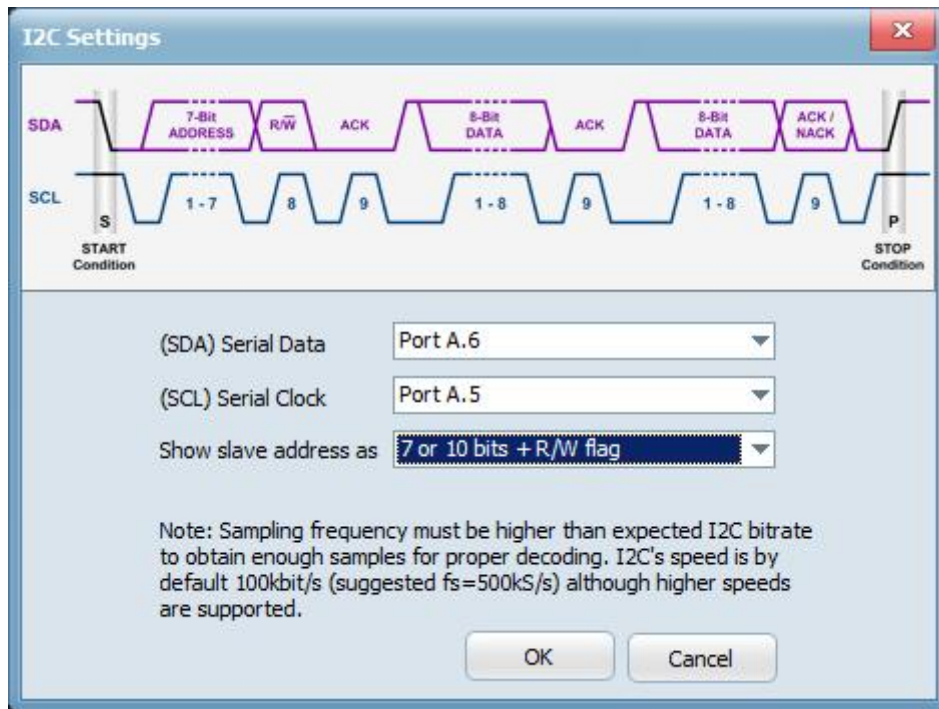
I2C decoder clock (SCL) and data (SDA) lines

To add I2C decoder, click the + button on the I2C pane under Decoders tab.

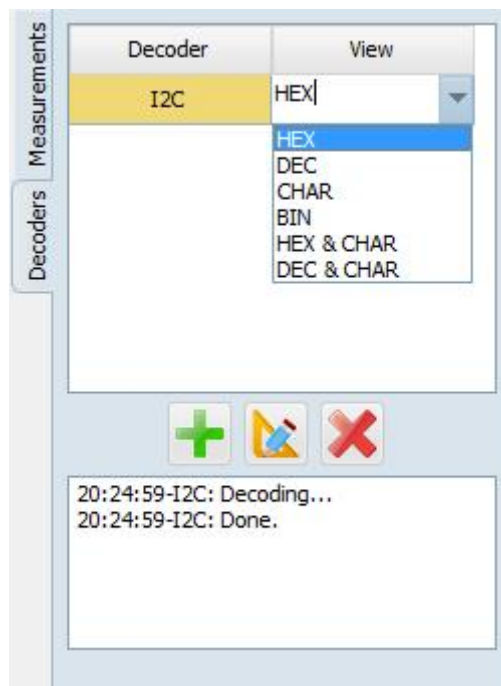


The application offers the data (SDA) and clock (SCL) parameters and how many bits to show the slave addresses.

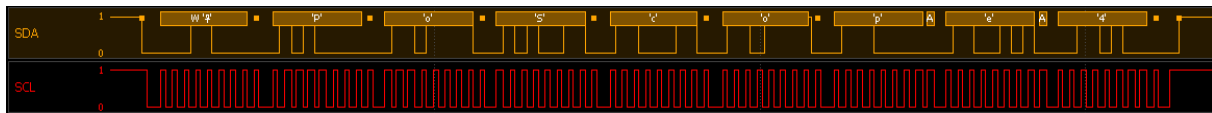
If you name your pins as I2C standard names (SCL, SDA) the decoder settings window will automatically recognize lines and use them for decoding otherwise you have to manually select pins for data sources.



I2C Settings window



Under the View, you can select how you want the decoded data to be shown. HEX, DEC, CHAR, BIN, HEX & CHAR, DEC & CHAR are available. Measurements can be shown in the side panel or as a hint when you hover the mouse cursor over the I2C data.



Decoded I2C packages in Logic analyzer display

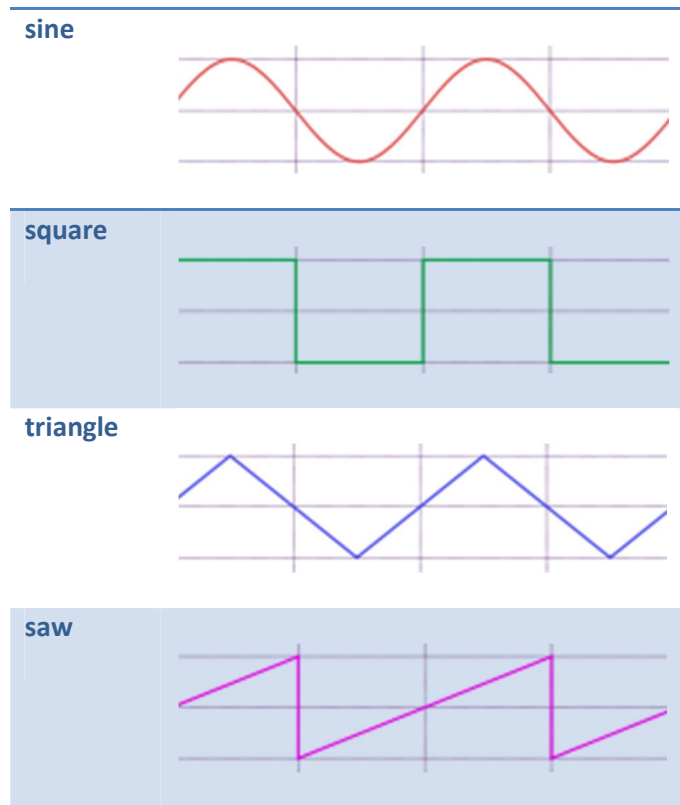
In the display window you can see:

- The start bit,
- Master read initialization,
- The address master wants to read from,
- The acknowledge bit,
- The transferred data and
- The stop bit.

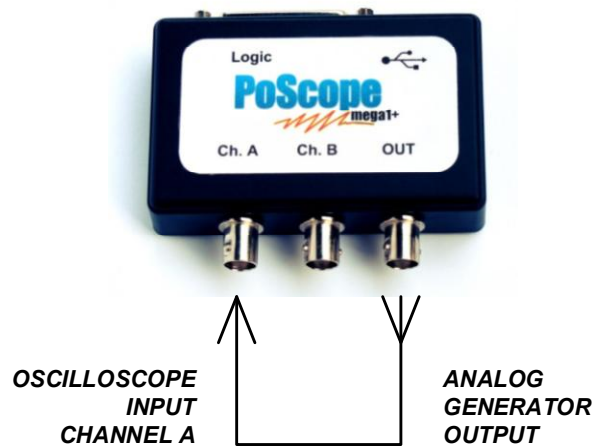
On places where you see little squares, there is not enough room for the package description. If you hover your mouse over that square, hint will show its full description.

FUNCTION GENERATOR (Only for Mega1+ devices)

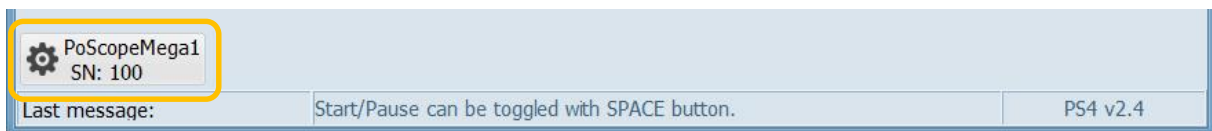
Function generator is capable of generating different types of periodical electrical waveforms over a wide range of frequencies, limited to **12,5kHz**. It can generate **sine, square, triangle and saw**, showed below. Function generator can be used in development, test and repair of electronic equipment, e.g. it can be a signal source to test amplifiers. Analog generator can be used only when device is set to analog DAQ mode.



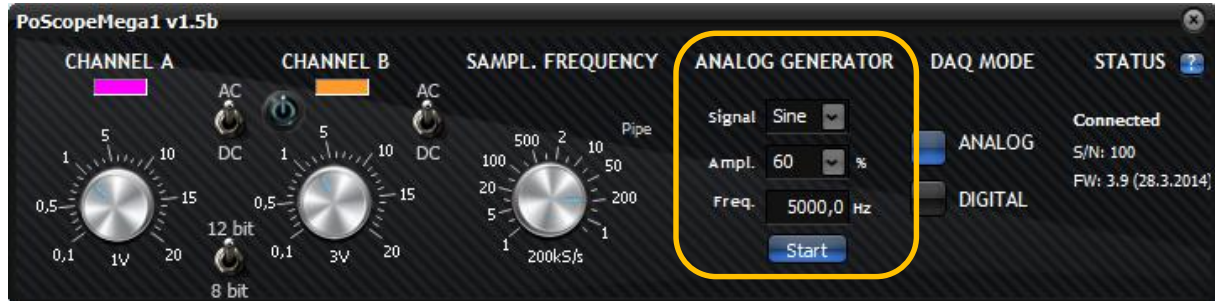
To show you the basic use of function generator, we connected two probes to the PoScope Mega1+, first one to the function generator output and the second one to oscilloscope channel A. We connected the signal and the ground connections of the two probes and ran the function generator at 5 kHz.



Open the PoScope Mega1+ plugin by clicking its icon in device buttons area of the PoScope4 software.



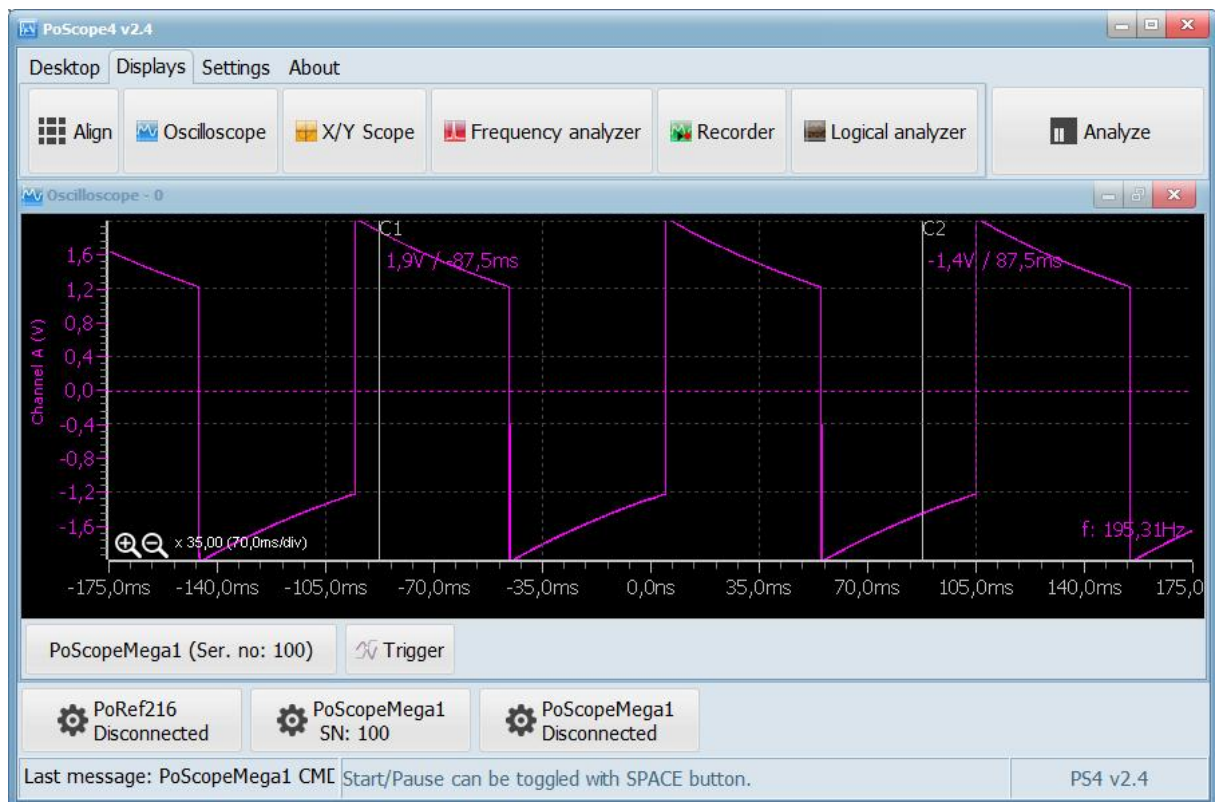
Find the analog generator controls on the right half of the Mega 1 plugin. Besides shape of the signal (sine, square, triangle, saw) and its frequency (limited to 12.5 kHz) you can also set its amplitude, expressed in % of 1.8Vpp.



The waveforms on the oscilloscope display will change according to the shape of selected signal on the analog generator part of the Mega1 controls.



Function generator sine waveform



Function generator square waveform



Function generator triangle waveform



Function generator saw waveform

TECHNICAL SPECIFICATIONS

Oscilloscope	
No. of channels	2 channels
Sample rate	1.0 MS/s (dual channel) 2.5 MS/s (single channel)
Input voltage	-20 V ... +20 V WARNING: Do not connect the oscilloscope to voltages higher than specified.
ADC resolution	12 bits
Triggering	Rising, falling, any
Spectrum analyzer	
No. of channels	2 channels
Sample rate	1.0 MS/s (dual channel) 2.5 MS/s (single channel)
Input voltage	-20 V ... +20 V
ADC resolution	12 bits
Window functions	Hamming Hanning Blackman Blackman-Harris, etc.
Recorder	
No. of channels	2 channels
Sample rate	200kS/s (dual channel) 12-bit mode 500kS/s (single channel) 12-bit mode 500kS/s (dual channel) 8 bit mode 1MS/s (single channel) 8 bit mode
Input voltage	-20 V ... +20 V
ADC resolution	12 bits
Triggering	Rising, falling, any
Advanced functions	Waveform record, Direct recording to PCM
Logic analyzer	
No. of channels	16 channels
Input voltage	0 ... 5.0 V
Triggering	Edge, level, mask (coming soon)
Decoding	I2C (UART, SPI, 1-WIRE coming soon)
Function generator	
No. of channels	1 channel
Waveforms	Sine, square, saw, triangle
Max. signal frequency	12,5 kHz
Physical characteristics	
Dimensions (w x d x h)	92mm x 74 x 23mm (incl. connectors)
Weight	76 grams
Connections	3x coaxial BNC connector 1x standard D-sub 25, female 1x standard USB type B, female
Current consumption	ONLY 60 mA

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