

# Oscilloscopes, logic analyzers ScopeLogicDAQ

ScopeLogicDAQ 2.0 is a comprehensive measurement system used for data acquisition. The device includes a two-channel digital oscilloscope and a logic analyser that communicates with a PC via USB 2.0 interface. Maximum sampling rate for digital signal reaches 400MHz; in case of analog signals, this value is 200 MHz per channel. ScopeLogicDAQ 2.0 is also equipped with a Pattern Generator module which allows defining and generating any sequence of digital signals and their simultaneous recording. The system features also an optional 'Logger' function, which allows to save recorded signals with sampling frequency of up to 5MHz. Measuring DAQ2 software, which cooperates with the device, can work under Windows 2000, Windows XP, Windows 7 and Windows 8 operating systems. ScopeLogicDAQ 2.0 comes in a strong, steel, stylish and ergonomically designed enclosure.



## Key features

Characteristics of analog channels:

- 2 analog channels
- Maximum sampling frequency of 200MHz per each channel
- Analog bandwidth of input path: 100MHz
- Voltage range of analog path: +/-20V (1:1 probe)
- ADC converter resolution - 8 bits

## Characteristics of digital channels:

- 16 digital channels
- Maximum sampling rate 400MHz
- Analog bandwidth of digital inputs 100MHz
- Available capacity of internal memory: 2M\*, 1M\*, 512k\*, 256k samples per channel (\* - optional)
- Function of recorder Logger allowing for continuous recording to PC with a sampling rate of up to approximately 5 MHz
- Function of digital signal generator Pattern Generator allowing for generation of any digital waveforms defined by the user with a unique function of registering generated and measured signals in real time
- An extensive two-level trigger system
- Ability to cooperate with an external clock
- Built-in square-wave signal generator with adjustable frequency and amplitude
- Input voltage range: -25V/Imax=100mA, +25V/Imax=100mA
- Adjustable threshold of logic "1" compatible with various digital standards (ttl, lvttl, lvcmos, etc.)
- Digital protocol analyser: BUS, RS-232, SPI, i2c, 1-wire
- Analysis of state machines
- The software allows for creation of a measurement project remembering any number of device configuration settings
- User-friendly, stylish and ergonomic user interface

## Navigator of measuring windows

DAQ2 software has a navigation window for running measuring windows for different devices of DAQ2 family. Thanks to the specialised navigation window, the user can make measurements with several DAQ2 devices at once or run a single device in several measurement modes simultaneously, with different configuration settings.

Individual configuration settings can be saved as separate files on the disk, so that they can be easily restored and the device can be restarted according to the priorly saved configuration. In the navigation window, using the device selector, it is possible to start a measuring window in one of available modes. The device selector shows all DAQ2 devices which are connected to a computer at a given time, including any available options and the size of RAM memory for each device. In addition, in this window there is an information console that records all actions that are performed between connected devices.

## Signal measurements window

DAQ2 software has a combined window for observation of analog\* and digital signals at the same time. Very ergonomic set of measurement cursors allows for flexible measurements on horizontal and vertical axes. Additionally, various magnifications (Zoom) of the recorded signal can be carried out as well as access to the analog\* level trigger can be gained simultaneously for 'A' and 'B' channel.

The combined window allows for synchronous observation of recorded signal waveforms and the relationship between them. Moreover, signal from the Logger module is displayed here as well as signal recorded by the Pattern Generator module.

## FFT measurement window

DAQ2 software facilitates easy switch to the FFT window of the measured signal.

The FFT is used to observe FFT charts for two analog input paths. In addition, measurements can be made using different time windows such as:

- Rectangle
- Triangle
- Flat top
- Hamming
- Blackman
- Gaussian
- Hanning
- Harris

In the FFT window it is possible to make band measurements between any pair of cursors on the graph. In case of these measurements, you can determine the signal effective value in a given bandwidth.

## Triggering conditions

ScopeLogicDAQ 2.0 works in the following operating modes:

- Auto - digital waveform is generated and recorded cyclically
- Single - digital waveform is generated and recorded one time after the trigger
- Repeat - digital waveform is generated and recorded cyclically after the trigger
- External - digital waveform is generated according to the external clock signal sent to the 'AUX' input

The device trigger system device is a 2-level system. Each trigger level can be set with independent triggering conditions. Additionally, the trigger can be delayed (Capture Delay) after the appearance of a specific trigger by setting the time interval measured from appearance of a specified triggering condition.

The trigger can be set to one of two levels: '1' and '2':

- Level1 - trigger according to Level '1' setting
- Level2 - trigger according to Level '2' setting
- Level1 or Level2 - trigger according to Level '1' setting or Level '2' setting
- Level1 then Level2 - trigger according to specified order: level '1' and then level '2'. In addition, it is possible to set time interval between Level '1' and Level '2'.

Available trigger modes within each level:

- Edge - Trigger on edge detection: rising, falling, any. It is also possible trigger after registration of a certain number of edges on any channel Edge Skip
- Pattern - Trigger after registration of a defined sequence of signals ('1', '0') with the ability to determine its length.
- Edge AND Pattern - Trigger in case of compliance of product of conditions
- Edge OR Pattern - Trigger in case of compliance of sum of conditions
- Analog level 'A' - Triger after edge detection on analog channel 'A'
- Analog level 'B' - Triger after edge detection on analog channel 'B'
- External - Trigger with edge on extra I / O (AUX)
- Force - 'manual' trigger forced by the user at any time

Under normal operation the user can take advantage of the Pre/post trigger slide located in the Options tab, which divides memory intended for recording the measured signal into two parts. The Pre trigger part is used to record signal before a particular trigger condition appears; the Post trigger part is used to record signal after a defined trigger condition appears.

### **Pattern Generator, generator of digital signal patterns**

The 16 channels of the ScopeLogicDAQ 2.0 device may be either input lines of the analyser or the output lines of the digital signal generator. Pattern Generator implemented in the ScopeLogicDAQ 2.0 system is a unique hardware solution that allows for simultaneous generation of digital signals and recording them to the analyser memory in real time. Such an implementation gives the user the possibility of real-time analysis of both signals generated and signals received by the device. The user also has the ability to trigger themselves from any lines, on which Pattern Generator is defined; additionally, there is a possibility of triggering from any combination of Pattern Generator signals or from any analyser line. Available Pattern Generator output voltage levels are: 3.3V, 2.5V

Pattern Generator works in the following configurations:

- 16-bit configuration allows for generation of any sequence of signals on 16 lines of the analyser
- 8-bit configuration allows for generation of any sequence of signals on 8 lines of the analyser; the other 8 lines may be used to record digital signals

Pattern Generator has the following modes:

- Auto - digital waveform is generated and recorded cyclically
- Single - digital waveform is generated and recorded one time after the trigger
- Repeat - digital waveform is generated and recorded cyclically after the trigger
- External - digital waveform is generated according to the external clock signal sent to the 'AUX' input

## Saving data to files

Recording data representing the measured electrical signals can be realized on two ways. The first is the registration data directly to a computer hard drive in a continuous mode, using Logger. Another method is to record the data measured by the device and stored in the internal memory of ScopeLogicDAQ. In this case, the data stored in the buffer can be saved in the following formats: \*.dad, \*.csv, \*.txt, \*.jpg, \*.png

The data stored in files \*.txt and \*.csv file can be easily imported and analysed in external programs such as LABWieV, or other applications, depending on the needs of the user.

## Logger, digital signal recorder

Thanks to the unique solutions implemented in the FPGA systems, ScopeLogicDAQ 2.0 allows for continuous recording of 2 analog channels and 16 digital channels to the computer hard drive with a sampling rate up to 5MHz. It depends on the size of memory inside the analyser, as well as the capabilities of the PC, to which the device is connected. Recording can be completed automatically after a certain period of time, when an error occurs or a specific disk space is used.

The rate of transfer of data to the computer and the time of recording of data to the hard drive is dependent on computer parameters and the operating system. During recording, the user can set parameters of refresh rate of the screen displaying the signal. In addition, the measurement time and the current logger's file size is displayed on a regular basis.

After the login process, it is possible to view the recorded file with samples of the signal for thorough analysis. Recording can be carried out in any of the available modes of operation.

## AUX input and output

ScopeLogicDAQ has a configurable 'AUX' terminal, which can be both input and output, depending on configuration set by the user. The 'AUX' output mode:

- Generator output - rectangular signal generator output signal of adjustable frequency and amplitude (3.3V or 2.5V)
- Trigger output - internal trigger signal output
- Buffer full, post trigger - output issuing signal, which indicates that signal recording memory is full

The 'AUX' input mode:

- Trigger input - input for external trigger, set both for the rising and falling edge of the signal
- External generator clock - input for external sampling clock, according to which signals are to be recorded

'AUX' input output is a convenient solution in cases when it is necessary to quickly produce a signal of known frequency and amplitude in the measurement system, or to couple the device with another DAQ2 device or another measurement system.