

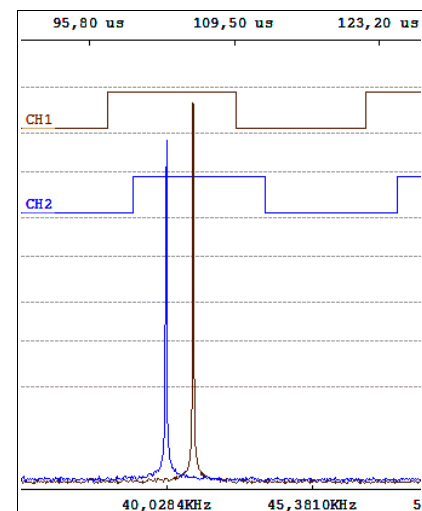
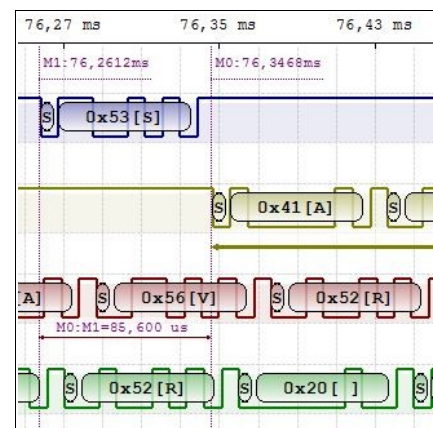
Characteristics:

Hardware characteristics

- ✓ Supported logic levels : **2.8V, 3V, 3.3V** and **5V**
- ✓ **Firmware update feature**
- ✓ **USB 1 & 2** without any drivers needed
- ✓ **20 Million Samples Per Second**
- ✓ **4 channels** for data capture/generation
- ✓ Simultaneous capture & generation
- ✓ **Trigger** condition and position fully adjustable
- ✓ **Live logic probe mode** : 50, 100 & 250ms refresh rate
- ✓ Allowed input voltage range : **-0,7V to 5.5V**
- ✓ Maximum number of samples per channel: **256k**

Software characteristics

- ✓ **Supported protocols** : UART, SPI, I2C, 1-wire, CAN, LIN 1.x & LIN2.x, Maple bus
- ✓ **User friendly waveform** navigation
- ✓ Wizard to generate PWM, FM, UART signals
- ✓ Export printer friendly images for easy integration into reports.
- ✓ **Frequencial analysis** using FFT
- ✓ Automatic and free software update
- ✓ Dual data view mode to compare various captures
- ✓ Save/Reload captured data with all decoding parameters, markers, and user comments.
- ✓ Configurable color profiles for the waveform view.
- ✓ Unlimited markers, time measurements, and waveform comments



Contents

| | |
|--|----|
| General description..... | 3 |
| Connecting and installing SCANALOGIC-2 device..... | 3 |
| PC software installation..... | 4 |
| Using the SCANALOGIC-2 | 4 |
| <i>Principle of operation</i> | 4 |
| <i>Connecting the probes</i> | 5 |
| <i>Status LED</i> | 5 |
| <i>Software Interface</i> | 5 |
| 1- The chart area..... | 6 |
| 2-The control panel..... | 6 |
| 3- The log area..... | 6 |
| User interface icons description..... | 6 |
| Configuration and starting a new data capture in Logic Analyzer mode | 8 |
| Mode of operation..... | 8 |
| Trigger option..... | 8 |
| Trigger position..... | 8 |
| Sampling rate and depth..... | 9 |
| Starting a new data capture..... | 9 |
| Logic probes mode..... | 9 |
| Using the protocol decoder..... | 10 |
| <i>Configuring protocol decoding</i> | 10 |
| <i>Byte Watch and Global decoder options</i> | 11 |
| Digital signal generation..... | 12 |
| FFT analysis (Frequencial Domain Analysis)..... | 15 |
| Dual View..... | 16 |
| Electrical Characteristics..... | 16 |
| Getting more Help..... | 16 |

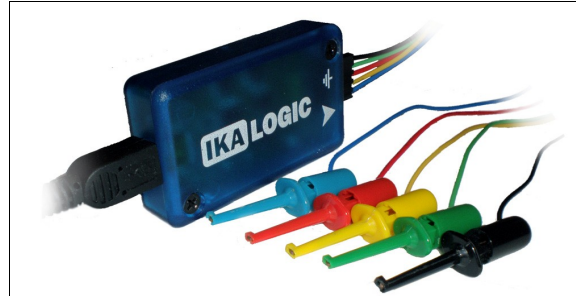


General description

SCANALOGIC-2 is a compact and portable logic analyzer and signal generator. It directly connects to a computer via an USB connection. The PC given software is used to display the signals and the decoding, generate signals and configure capture parameters (like trigger option, sampling frequency, etc.)

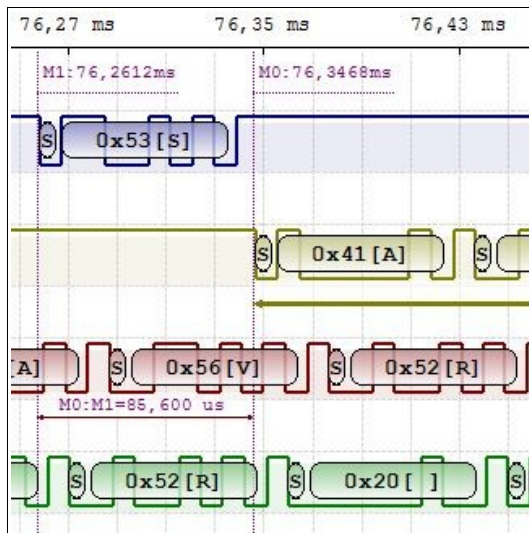
It's very simple to use, it is easily mastered by beginners and professionals, thanks to the intuitive PC software featuring all the scrolling and navigation options you would expect in any professional software.

SCANALOGIC-2 introduces new, very useful features, like the mixed mode, allowing you to generate/playback digital signals, while recording the response on other channels, all at the same time!



Some of the most important functions you can achieve with the SCANALOGIC-2 are:

- | | |
|----------|---|
| CAPTURE | <ul style="list-style-type: none"> Serial protocols sampling, decoding, debugging and analysis (like UART, SPI, I2C, 1-Wire, LIN bus, CAN, maple bus...). Analysis of PWM signals, their frequencies and envelopes (Using the Fourier analysis feature). Monitor logic changes on digital signal lines. Store the captured data on files, to send them over the internet to other users or for later analysis playback! Captures images of the signals with all the timings, decoded data and markers. The Dual View features allows you can easily visually compare different data captures. |
| PLAYBACK | <ul style="list-style-type: none"> Record serial data and play it back, as simply as you would record & playback a speech! Using the mixed mode you can record communication on one of the 4 channels, play it back while recording the response on the other channel |
| GENERATE | <ul style="list-style-type: none"> Generate all kind of PWM (pulse width modulation) signals to control motors drivers, RGB LEDs or other devices. Generate all kinds of FM (frequency modulation) signals. Can be used to test speakers or for ultrasound detection systems testing. Generate Serial data and pulses sequences to test your equipment/project using a very user friendly syntax. |



SCANALOGIC's software is designed to be easily used by students researchers and hobbyists. Therefore, it can quickly generate printer friendly, sharp clear graphs to be directly included in reports.

The software evolves constantly via online updates, allowing new features to be added like new protocols decoding and better visual effect.

The device supports **2.8V, 3.3V** and **5V** logic levels, works on **USB 1 or 2**, and does not need any driver to be installed, it's plug-n-play just like a mouse.

It can store up to **256K** sample per channel at a maximum rate of **20 MHz**, and has **4 channels** that can be configured as **inputs** or **outputs**. Trigger on any channel can be adjusted to **Falling edge, Rising edge** or **Logic state change**. Trigger position can be adjusted from 0 to 100%, allowing large amount of **pre-trigger** data to be analyzed.

Connecting and installing SCANALOGIC-2 device

SCANALOGIC-2 don't need any drivers to be loaded. As soon as you connect it with the USB cable to the PC, it is automatically recognized (exactly as a mouse or a keyboard, provided you have Windows XP or later). Once the probes are correctly connected (the black wire on the GND symbol) you can connect them to the signals that need to be tested/captured.



PC software installation

The latest version of the software can be freely downloaded on IKALOGIC's website: <http://www.ikalogic.com/scanalogic2/downloads.php>

The minimum operating requirements are:

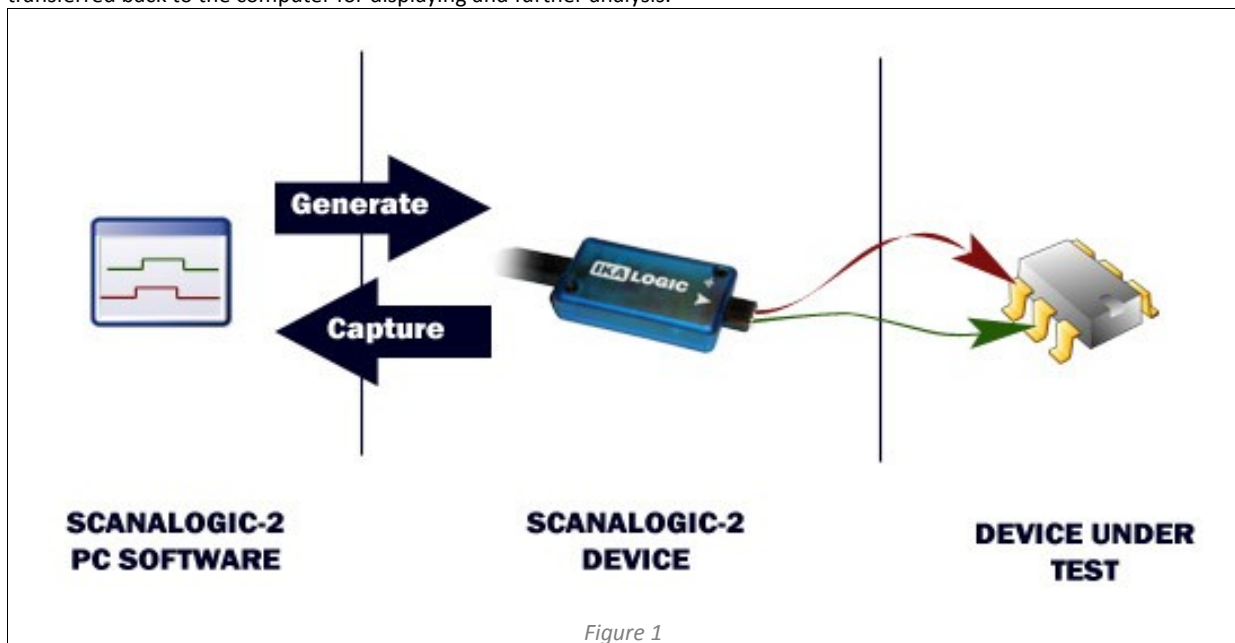
- Windows XP SP2 or later (WIN VISTA and 7, 64 and 32 bit supported)
- .NET Framework (Will be automatically downloaded)
- 512 Megabyte of RAM memory
- 10 Megabyte disk space

Two versions of the software are available, the online version and the offline version. Both versions are completely equivalent with the sole difference that the offline version can be downloaded, copied, and installed to any number of other computers that don't have an internet connection. The online version, however, needs an internet connection to complete.

Using the SCANALOGIC-2

Principle of operation

SCANALOGIC-2 can work in 4 different modes: Capture mode, Generator mode, Mixed mode and Live mode. When using mixed mode, the SCANALOGIC-2 logic analyzer captures data on the 4 channels and stores them on the memory of the device, then, data is transferred back to the computer for displaying and further analysis.

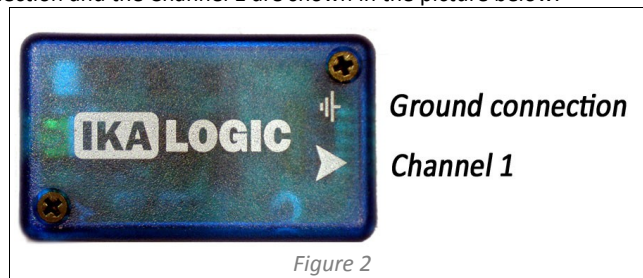


Connecting the probes

The probes connects to the device using a 5 pins connector. The probes are colored in the following order:

| Probe color | Fonction |
|-------------|-------------------|
| Blue | Channel 1 |
| Yellow | Channel 2 |
| Red | Channel 3 |
| Green | Channel 4 |
| Black | Ground connection |

The position of the ground connection and the Channel 1 are shown in the picture below:

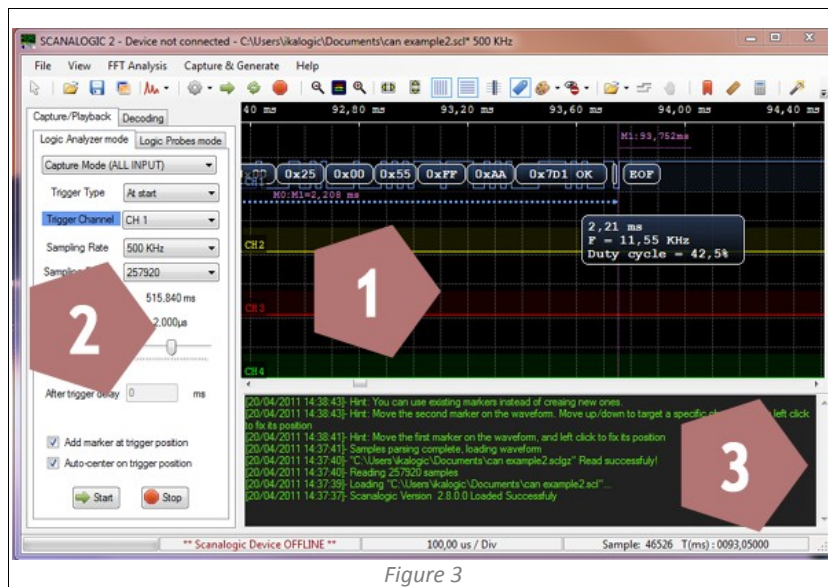


Status LED

The SCANALOGIC device has one yellow status LED, which can indicate different statuses:

- **LED Blinking one time per second** : Device is in stand by mode. All probes are in HI-Z (high impedance) mode.
- **LED Blinking very quickly** : Device is transferring data from or to the computer.
- **LED ON continuously** : Device is in generator mode

Software Interface



The user interface of the SCANALOGIC-2 software is composed of three different parts: the chart area (1) , the control panel (2) and the log area (3) as you can see in the picture above.



1- The chart area

As the name implies, this part of the software allows you to visualize the digital signals that are sampled, or the data that will be generated. You can move the chart right and left by simply clicking and dragging the waveform. You can also interact with this part of the screen using the mouse's right button. Depending on the circumstances, right buttons clicks will allow you to: Add marker, Add time selections, delete markers and time selections or move marker and time selections. The mouse wheel scrolling will allow you to zoom in and out. Pressing the CTRL button on your keyboard while zooming with the mouse wheel will allow much faster zooming.

When you are placing a marker, you can move the chart right and left by holding the mouse wheel button pressed while moving the mouse right/left.

2-The control panel

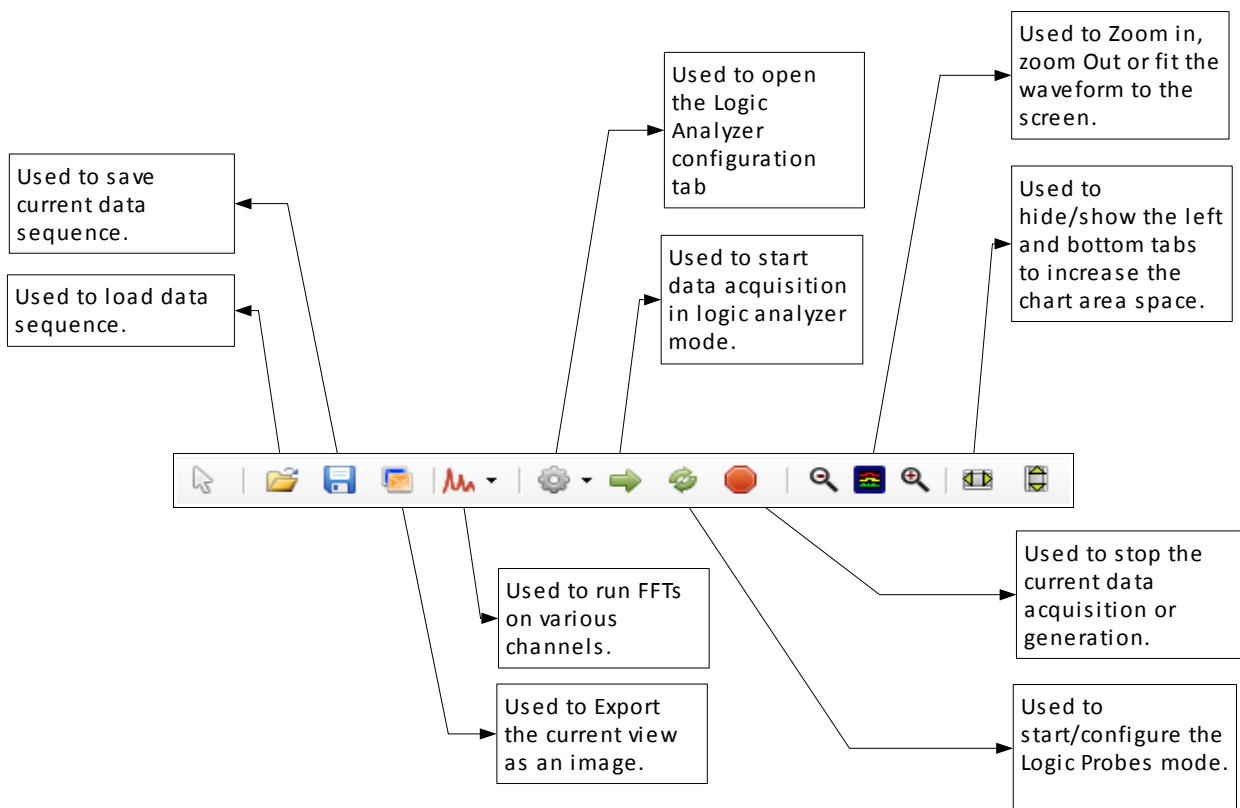
The control panel is mainly used to configure a data acquisition parameters ("Capture/Playback" tab) or to setup various protocols decoder ("Decoding" tab). Both tabs will be discussed in detail later in this document.

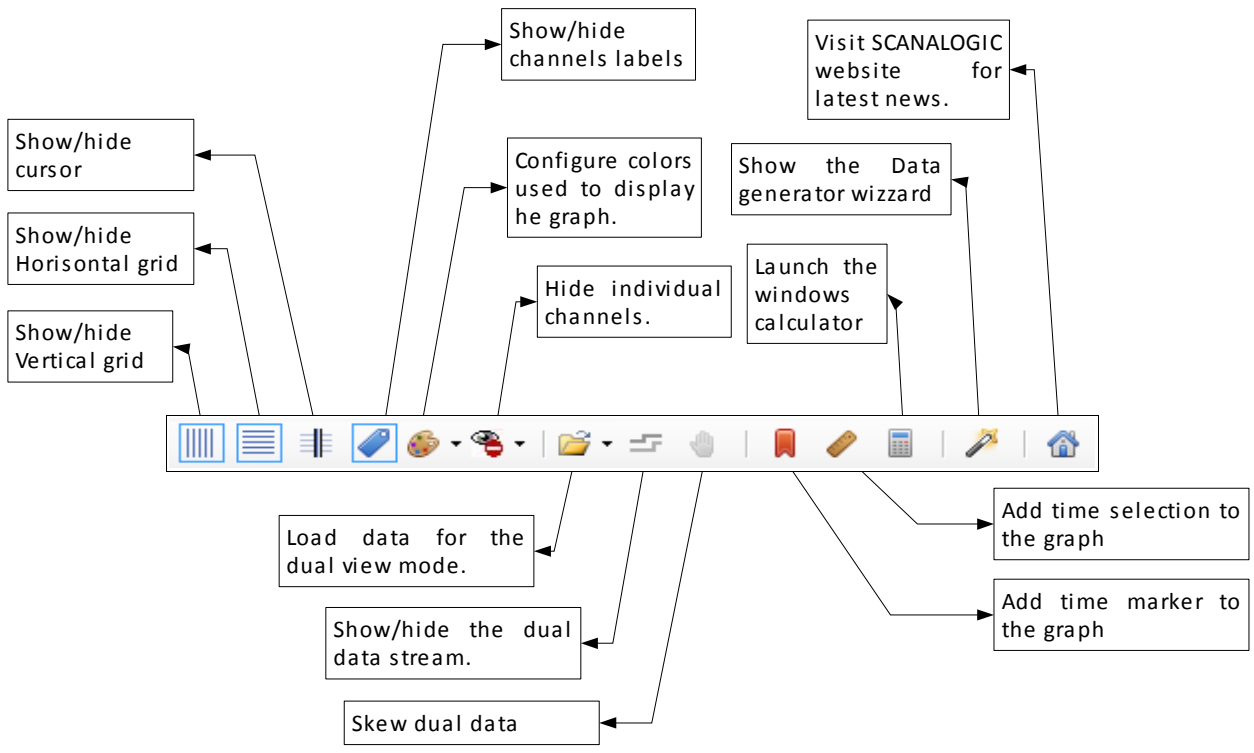
3- The log area

The Log area, is a place where a lot of information is injected to help you understand what is SCANALOGIC currently doing, to give you useful hints to help you placing markers and time selections and inform you of the time required to perform a certain task.

User interface icons description

The top tool bar groups a set of shortcuts icons to the most recurrent functions of the SCANALOGIC-2 logic analyzer. The following two schematics describe briefly the usage of each icon. The detail of each function or feature will be explained in detail in this document.





Configuration and starting a new data capture in Logic Analyzer mode

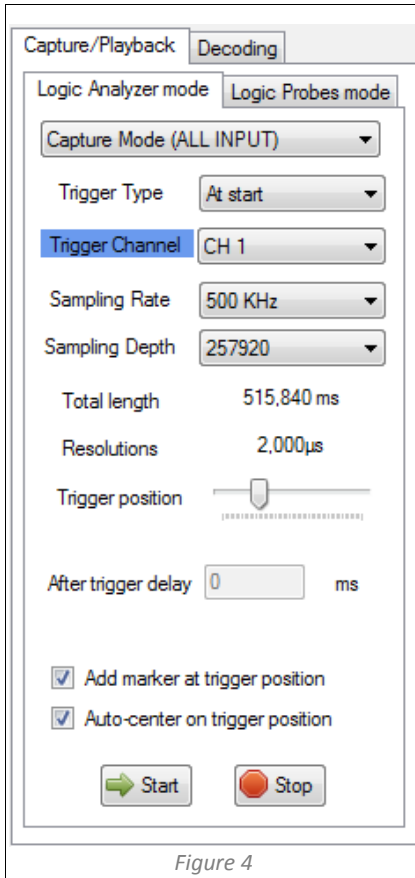


Figure 4

The device configuration tab (called "capture/Playback"), located at the left side of the screen is where you have to go prior to starting any sampling or data generation. We are going to illustrate the "Logic Analyzer" mode first, which is the most common mode to be used.

As you can see on that picture, this panel is composed of a series of list boxes, allowing you to setup your SCANALOGIC-2 device the way you want it to behave.

Mode of operation

The first list box allows you to choose from 4 modes of operation:

Capture Mode: In this mode, the 4 channels of the device work as a standard logic analyzer. They are all inputs.

Generator Mode: In this mode, the 4 channels of the device work as a generator. They are all outputs. The data generated is exactly the data you see in the chart area. If you don't see any data, then you need to create some data using the generator wizard () or capture some data first.

Mixed Mode: In this mode, 2 channels work as inputs, and the two other as outputs. This mode is useful to generate some data on a channel while watching some response on another channel.

Trigger option

The "trigger type" and "trigger channel" list boxes let you setup the trigger conditions:

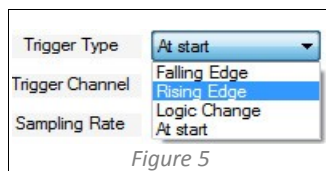


Figure 5

- **Falling edge** : Sampling start as soon as a HIGH to LOW transition is detected on the trigger channel.
- **Rising edge** : Sampling start as soon as a LOW to HIGH transition is detected on the trigger channel.
- **Logic change** : Sampling start as soon as a logic change is detected on the trigger channel
- **At start**: Sampling start as soon as you press the "start" button()

When choosing "ALL" as the trigger channel, you can only choose "Logic change" as the trigger type, and hence, any logic change on any channel will cause a trigger.

Trigger position

The "trigger position" slider, allows you to set the trigger position, in percentage of the sampling depth. That is, if you want to capture some of the signals before the trigger event, then you should move this slider to the middle or even to the right. The amount of "pre-trigger" data depend on you application and on the signals you're measuring.

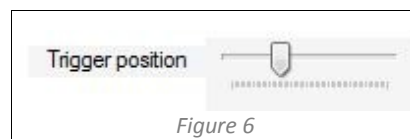


Figure 6

Be advised that the pre-trigger data is a ratio of the whole sampling buffer, meaning that if you have about 25% pre-trigger data,



then you have only 75% of the sampling buffer remaining to store the post-trigger samples.

Trigger options and trigger position only affect the Capture mode and mixed mode, but don't have any effect on the generator mode

Sampling rate and depth

The sampling rate determines the number of samples that will be captured per seconds, and the sampling depth determines the total length of the data that will be captured. This is also true for the generator and mixed modes.

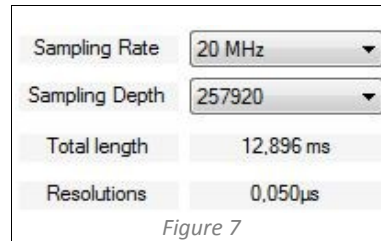


Figure 7

Starting a new data capture

Once all the parameters are correctly configured, press on the "start" button() to start a new data capture (or generation if you are in generator mode)

Logic probes mode

Logic probes mode allows you to use SCANALOGIC as 4 separate logic probes. In other words, it allows you to see the logic state of the 4 channels in real time.

Prior to using Logic probes mode, you need to define the rate at which SCANALOGIC will capture new data (Live scroll rate), and the amount of data to be kept in memory (Live scroll buffer)

Once you click on "Live scroll", the chart area will scroll from left to right, showing the logic level changes that occur on the probes in real time.

You can always pause/resume the scrolling using the "Pause" button.

Note that Logic probes mode is not to be used to decode data or to effectively take precise measurements. It's sole purpose is to show the actual logic state of the probes.

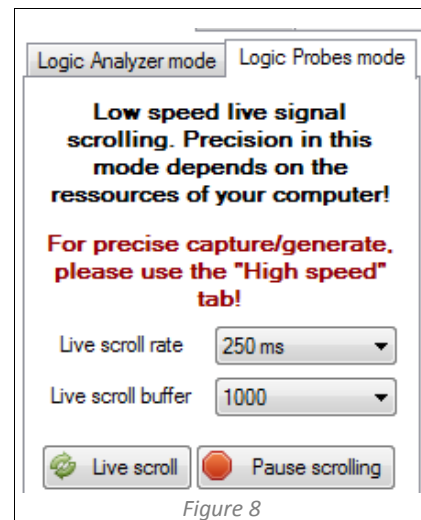


Figure 8



Using the protocol decoder.

The "decoding" tab, located at the left of the screen, allows you to decode various kinds of serial protocols like:

- UART
- SPI
- I2C
- CAN
- 1-Wire
- LIN1.x and LIN2.x
- Maple Bus
- Manchester Bi-phase

More protocols are added with periodic software updates that are released for free. IKALOGIC team is constantly working to add support for new protocols.

If you need to use SCANALOGIC-2 to decode a protocol that is not yet supported, please contact us and our engineers team will do its best to implement it.

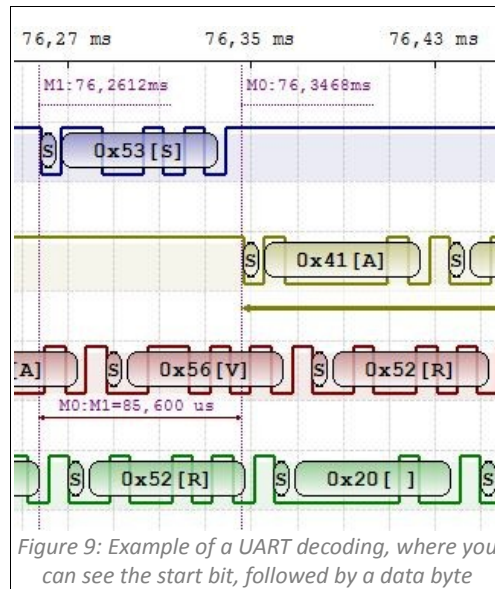


Figure 9: Example of a UART decoding, where you can see the start bit, followed by a data byte

Configuring protocol decoding

The functioning of the decoding feature for any protocol goes through those steps:

1- Capture the signals that need to be decoded (using the Logic Analyzer mode as described above). Make sure to choose a sampling frequency that is suitable with the signal to be decoded (The sampling frequency should be more than 2 times higher than the maximum frequency of your signal).

2- In the decoding tab, click on "Add" (see figure 10), then a new wizard will appear. Chose the protocol that you want to decode from the available tabs (like UART, SPI, I2C, CAN,etc.) and click "Next"

3- Depending on the specific protocol that you choose, you will be asked to setup the specific parameters that characterizes the protocol decoder (like the baud rate and bits order for a UART decoder)

4- When the decoder is correctly configured, Press the "Finish" button, then the decoded data should appear on the chart area, superposed to your original captured signals. Zooming in usually let you see more information about a specific data byte, like the meaning of a command, a check sum result, or an ASCII equivalent character.

When a decoder is configured and active, it will be visible in the list of active decoders (see figure 11). The check box next to the decoder name lets you show/hide the decoder. You can always double click on the decoder name from this list to modify its configuration. You can also permanently remove it by right-clicking on the decoder name a clicking "Remove decoder"

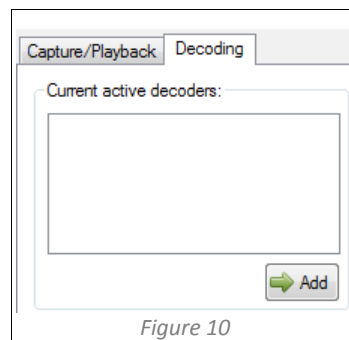


Figure 10

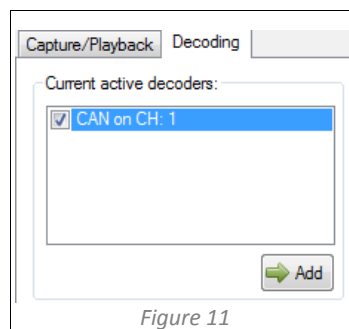


Figure 11



Byte Watch and Global decoder options.

Still in the decoding tab, the byte watch feature lets you highlight various data bytes, among the rest of the decoded bytes (see figure 12). This is useful when you are searching for some specific bytes in a continuous stream of bytes. It is composed of a table with 3 columns: Decimal, HEX and ASCII. You can enter the byte you need to highlight in any of those 3 forms, by simply entering the value in an empty cell, the others cells of the other formats will be completed automatically.

Figure 13 shows an example of the usage of the byte watch feature, where the bytes having the value of 0x25 or 0xFF are highlighted.

The global options (figure 12) specifies options that apply to all protocols decoding.

The “shade waveform” check-box is used to make the waveform less visible, this way the decoded data is emphasized.

When the “Show in HEX format” check-box is checked, the decoded data will be displayed in hexadecimal format.

Checking the “Show ASCII equivalent” box will tell the decoder to add the ASCII character equivalent for the data in between brackets '[.]'. Sometimes you need to zoom in (using the mouse wheel) in order to view the ASCII equivalent character.

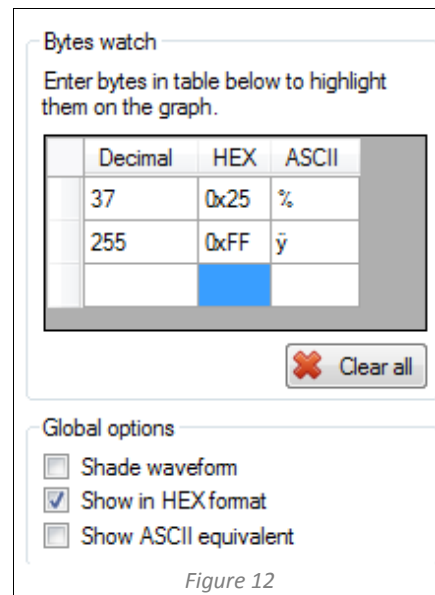


Figure 12

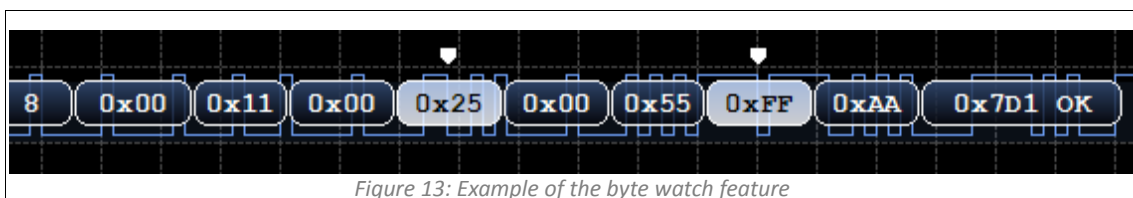


Figure 13: Example of the byte watch feature



Digital signal generation

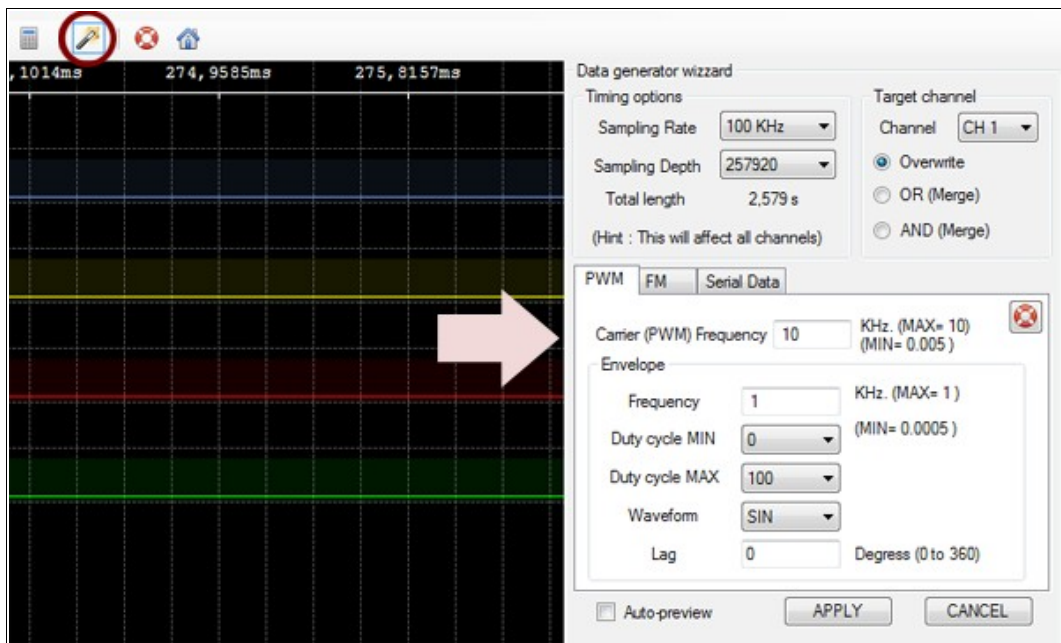
Data generation is done in two steps:

First, you have to "create" some data, using the data generator wizard

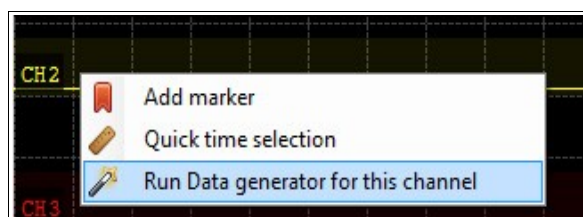
Then, you have to transfer this data to the device and start generating the data as electrical signals on the probes.

You can always click on "File> Start new data sequence" to clear all existing data and start new data generation.

The data generator wizard can be shown or hidden by clicking on this icon (). Once you click on that icon, the wizard will appear on the right side of the screen, as shown in the image below.



You can also access the data generator wizard by right clicking on one channel and selecting "Run data generator for this channel" as shown in the image below.




Once the data generator wizard is opened, you can set general timing options like sampling rate and sampling depth. Those two parameters will affect all the channels, exactly as if you would do it from the "device configuration" tab in the control panel.

The "Target channel" box allow you to choose the target channel, in which you want the generated data to appear. It also allows you to define the behavior in case of collision with existing data (Overwrite, OR, AND). SCANALOGIC data generator allows 3 kinds of data to be generated: PWM (pulse width modulation), FM (Frequency modulation) and Serial Data.



PWM and FM signals generation

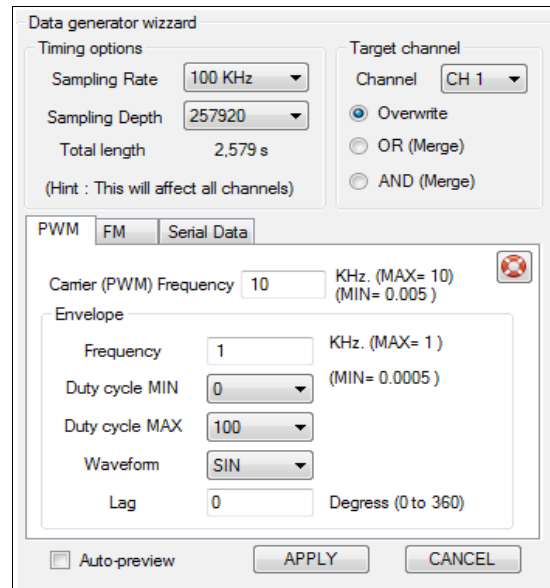
To create some PWM signals, you have to specify the parameters of the signals you want to generate.


In case you are confused between all those parameters, you can always click on this help button () and a helper pop-up screen will appear.

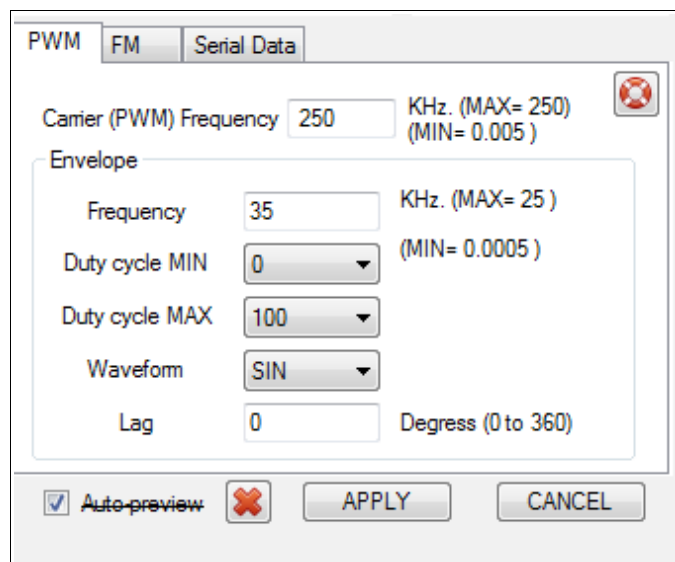
Checking the "Auto-preview" box will allow you to see the created signals in real time. This is useful to test the effect different parameters (like frequency, waveform and lag).


Please note that SCANALOGIC only generates digital signals, and the terms SIN, Triangle or SawTooth refer to the slope of variation of the duty cycle.

After you have obtained the desired result, you have to click on "APPLY" for the data you created to be taken in account.



When the auto-preview is checked, and some of the parameters are incorrect, the word "auto preview" will be struck through, and an error button will appear (), as in the following example:



Clicking on  will give you a message explaining the source of the error, which is in this case, an error in the Envelope frequency (because it is higher than the max value of 25).

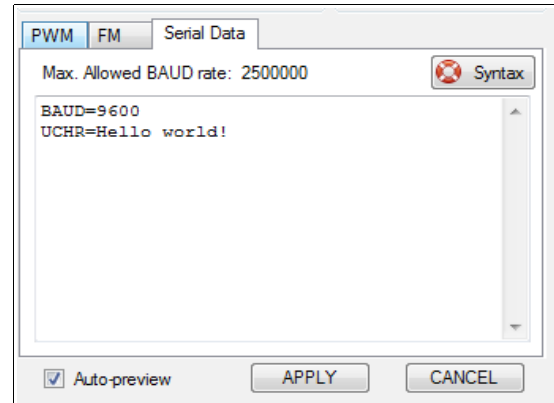


Serial data generation

The serial data generation is a tool that can let you create UART packets, or simply precise sequences of 1's and 0's (bit stream).

This tool uses a very simple syntax, that can be reviewed any time by clicking on the "Syntax" button.

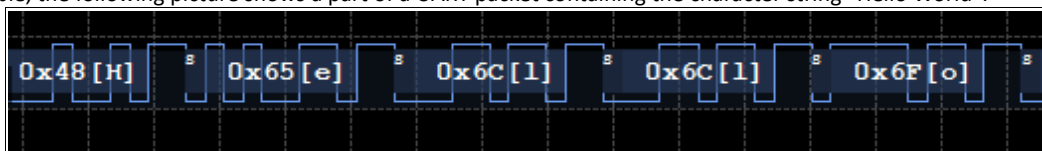
When generating serial data, the first thing you need to do is to set the BAUD rate (in case of UART data) or the BIT PERIOD (in case of bit stream).



The following series of example, shows the exhaustive list of possible commands to be used with the data generator:

```
// After the '/' you can insert comments till the end of the line (C style)
// You can mix UART mode commands with BIT STREAM commands
// If you don't set a parameter - default setting will be used
// BAUD= or PERIOD= must always be specified !!!!
//
//-----
// UART mode
//-----
//
BAUD=9600 // Max. allowed depends on sampling parameters!
USTOP=2 // Define the number of STOP bits (default 1 is used)
MSB_FIRST // Define the bit order (default LSB_FIRST is used)
PARITY=N // E-EVEN, O-ODD, N-NONE (default N is used)
POLARITY=0 // 0-Standard, 1-Inversed logic (default 0 is used)
U0xAA // generate a UART packet (start bit, 8 bits (for 0xAA), stop bits)
U170 // Same as U0xAA but using a decimal number
UCHR=Hello World
//Send a string of character as UART packets, each one having start bit and stop bit.
//
//-----
// BIT STREAM mode
//-----
//
PERIOD=1 // PERIOD=x.xx[ms] Min. allowed depends on sampling parameters!
//
b0 // generate a single bit with logic level 0
b1 // generate a single bit with logic level 1
b0=15 // generate a single bit with logic level 0 and the length of 15 periods
b1=22 // generate a single bit with logic level 1 and the length of 22 periods
B0xFF // generate 8 bits with the binary value of 0xFF (Hexadecimal)
B126 // generate 8 bits with the binary value of 126 (decimal)
```

As an example, the following picture shows a part of a UART packet containing the character string "Hello World":



After using the Data generator wizard, SCANALOGIC software automatically sets the device in OUTPUT mode, but you can always change it to mixed mode in the device configuration tab.

Finally, once you are satisfied with data being displayed on the chart area, you have to click on the start button (Start) in order to



effectively generate electric signal on the probes of the SCANALOGIC device. When you click on start, the content of the internal memory of the device will be filled with the generation data, which may take a dozen of seconds, before effective electrical signals are generated.

FFT analysis (Frequencial Domain Analysis)

The FFT (Fast Fourier Transformation) analysis allows you to establish in depth frequency analysis on some or all of the channels.

In case you are not familiar with, FFT, it will simply allow you to visualize the frequencies enclosed in a signal. For example, if you have a variable duty cycle PWM signals generated from some device, it's very difficult to measure the frequency of the carrier and the envelope, but with FFT, this becomes easily doable with a mouse click.

To start an FFT analysis, click on the corresponding channel as in figure 14. (FFT calculations might take a lot of time depending on your computer's configuration.). After the fft is done, you should see the result of the Frequencial Domain analysis as in figure 15.

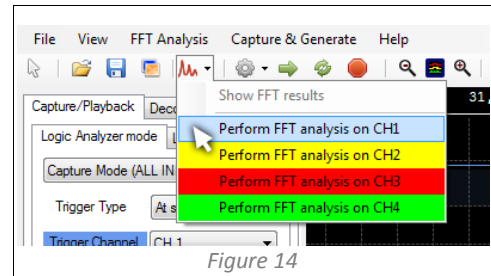


Figure 14

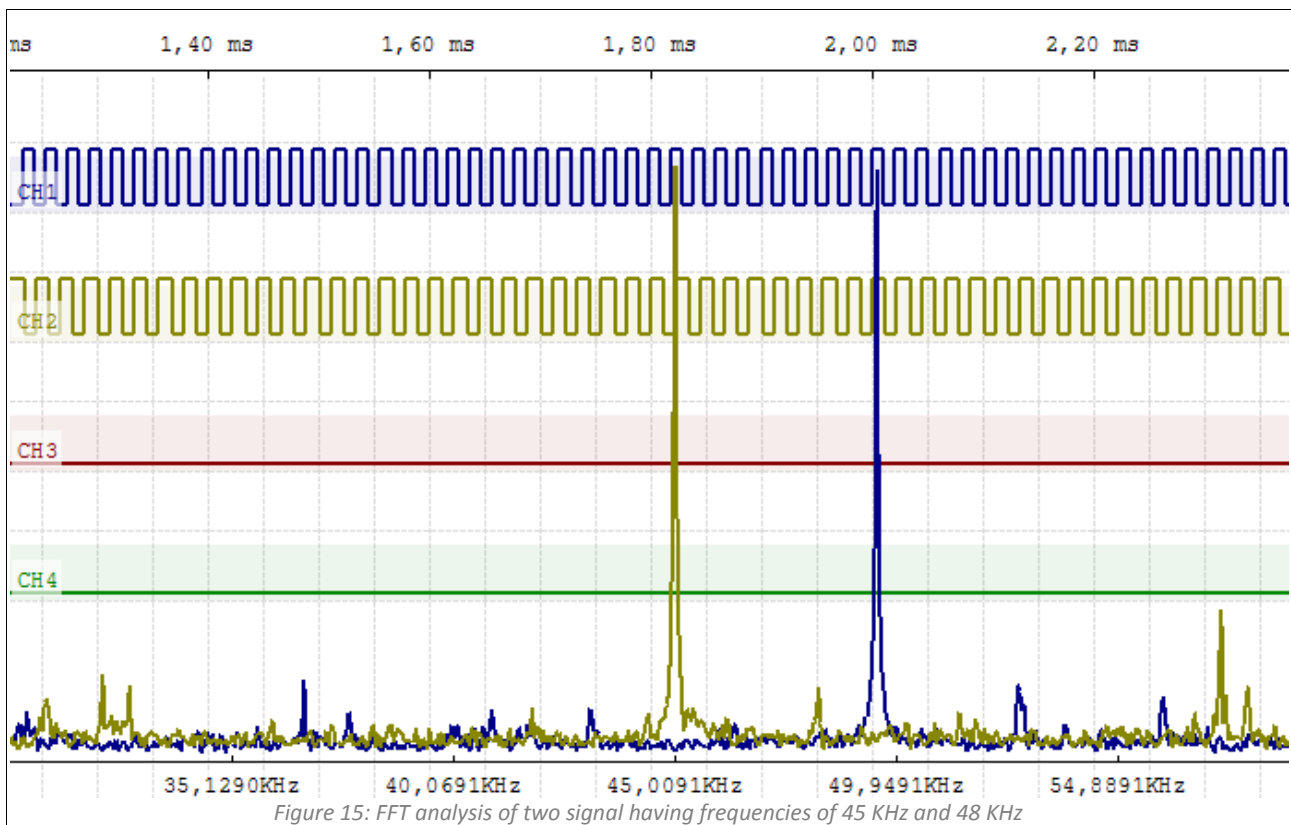


Figure 15: FFT analysis of two signal having frequencies of 45 KHz and 48 KHz

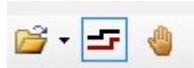
On the lower part of the graph, you can notice a frequency bar representing the frequencies of the different peaks in the waveform. In this case we can notice that the yellow signal have a peak frequency of about 45 KHz and the blue signal have a frequency of about 48 KHz.





Dual View

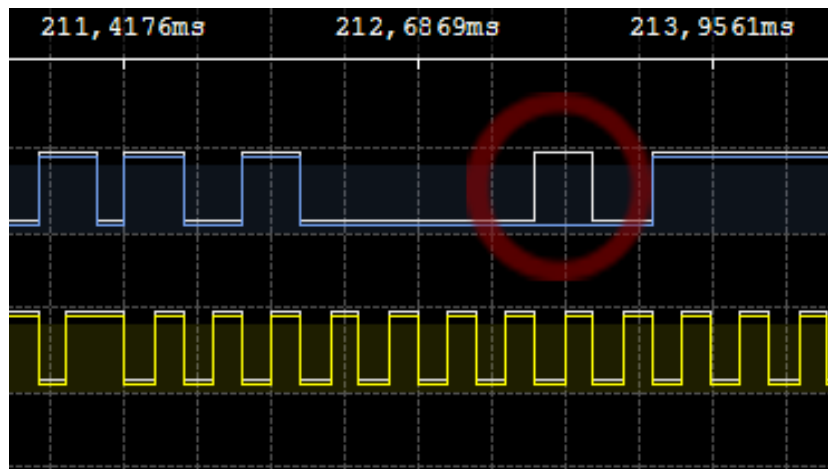
The dual view, is another innovative tool, that lets you display two different captures at the same time and examine the differences between them.

To use this tool, first you need to have some data loaded or captured, then, you can load dual data using open icon as shown in the picture below:



Note that the dual data must have the exact same sampling rate and depth as the original data. Once you have loaded the dual data, you can use this icon () to show or hide the dual data, or the hand icon () to skew the dual data right and left.

The following picture shows an example of the usage of the dual view tool. The white lines represent the dual data, and as you can see on the circled region, the blue (original) data has a missing pulse.



Electrical Characteristics

| Parameter | Value | Unit |
|---|-------|------|
| Maximum Input voltage on any channel (capture mode) | 5.5 | V |
| Minimum Input voltage on any channel (capture mode) | -0.7 | V |
| Output HIGH level (Generator mode) | 3.6 | V |
| Maximum Source or Sink current per channel (generator mode) | 25 | mA |
| Maximum input capacitance | 7 | pF |

Getting more Help

For more information please visit <http://www.ikalogic.com/scanalogic2/>

If you have ideas for new features you would like to see in the software's next updates, please share it on SCANALOGIC2's forum: <http://www.ikalogic.com/phpBB3/viewforum.php?f=22>

The forum also contains many post from fellow users that may be helpful.

