BlueDSO oscilloscope
user manual

The oscilloscope is the most frequently used, most flexible device for electric measurements. It visualizes an electric potential over time function, producing much more information than other potential and current measurement methods.

With an oscilloscope the following quantities can be either directly or indirectly measured: direct voltage, alternating voltage, direct current, alternating current, time, time delay, phase, phase difference, frequency.

With an oscilloscope the shape changes of an electric signal can be observed, both it's direct and alternating current components can be measured. With a multi-channel device, you can inspect and compare more electric signals at once.
In many cases, electric signals' complex mathematical analysis can be performed with a digital storage oscilloscope.

Technical data

The BlueDSO device is a 2-channel digital oscilloscope adapter with USB and Bluetooth connectivity.

- Inputs: 2 channels
- Input modes: DC, AC, GND
- Input impedance: 1Mohm/30pF
- Analog bandwidth: DC … 10MHz
- Measurable bandwidth: DC … 1MHz
- Sampling speed in real mode: 2Msps
- Maximal input voltage: 20Vpp
- Time range: 250 ns/div … 250 ms/div
- Realtime sampling mode in 5…250 ms/div time range
- Vertical accuracy: +/- 2.5%
- Trigger: CH1, CH2 or Line
- Data logger feature: Length of capturable and analizable data stream: unlimited, depending on the host computer's capacity
- Sampling time when logging: 250 us … 10 ms
- Markers: time and amplitude
- Communication: Can be used via USB or Bluetooth connection
- Power current: 150mA via USB connector
- Temperature range: 0 … 70 C
- Measures: 56 x 127 x 23mm

Intended use

The device is CAT III class intended for testing electrical quantities maximum 30 V relative to the earth potential, according to EN 61010-1. The device is measuring 2 independent input channels. The device can connect via BNC connectors.

- The device is CE compliant and conforms to the applicable European directives.
- Connect BNC connector of the probe to the device before the probe to the circuit to be tested would connect. When the measurement is complete, disconnect the probes from the circuit before the BNC connector disconnect.
- Do not exceed the maximum allowable input values. Do not touch any circuits or circuit parts where greater than 25 V AC or 35 V DC voltage tensions can arise! In this case when the voltage is over 25 V AC or 35 V DC will be caution! Already such tension touching may be a life-threatening electrical shock.
- Always check the integrity of the device and the probes before measurement. Be sure not to measure if the protective insulation is damaged.
- To prevention of the electrical shock, never touch the measurement points directly.

- Do not use the device just before a thunderstorm, during, or immediately after a thunderstorm (lightning! / High-energy surges!). Make sure that your hands, shoes, clothes, the floor, the meter and test leads, circuits and circuit parts, etc. absolutely dry.
- Do not use the instrument under unfavorable conditions (combustible gases, vapors, dust presence).
- Avoid use near strong magnetic or electromagnetic fields, near the transmitting antenna or RF generators, they falsify the measurement result.
- Use only appropriate probes and accessories which correspond to the product specifications.
- If you assume that the device can no longer be safe to use, you can put it out of use, and to prevent accidental operation.
- Do not turn on the device immediately if moved it from cold to warm. Then the condensation might ruin the device. Let the device is off while take over the room temperature.
- Do not leave packaging material lying around without supervision, because it can become a dangerous plaything in the hands of small children.
- Use the device only in dry areas. Avoid dampness around the device. It's the possibility of life-threatening electric shock!
- The industrial establishments should comply with the relevant professional body with the accident prevention rules for installing electrical equipment and materials.
- The schools and other educational institutions, hobby and DIY workshops, the device can only be used under the supervision of the expert personnel.
- Consult an expert when in doubt about the operation safety or connection of the device.
- Be careful with this product. It may be damaged if it drops or burns.
- Please note the enclosed detailed user manual.

The safe operation is ensure only if the device is technically impeccable condition. The user must adhere to safety precautions and warnings contained in the accompanying user guide.

The following symbols must be considered:

The exclamation point in a triangle in the operating instructions, information is to call the attention that should be necessarily taken into account.

The lightning symbol triangle contained electric shock, or reduction in electrical safety device warns.

Where the hand symbol is shown, there are specific ideas about their treatment and information.

The device is CE compliant and therefore complies with the relevant European directives.

CAT II

Overvoltage category II in domestic appliances for networked measurement.

CAT III

Class III overvoltage CAT II voltage range and measurements carried out of the building for electrical fittings. The device is fitted with protective insulation and complies II. protection class (double or reinforced insulation).

GROUND

Must be regularly check the technical safety of the device and the accessories, for example damage to the house, the measuring cable compression, in terms of breaking. Be sure do not operate the instrument when the case is in open position. !DANGER TO LIFE!

Do not exceed the maximum allowable input values. Do not allow your device to the input voltage is greater than 20Vpp. Do not touch any circuits and circuit parts where more than 25 V AC or 35 V DC voltages may occur. !DANGER!

List of accessories

1 pc. USB cable

2 pc. probes

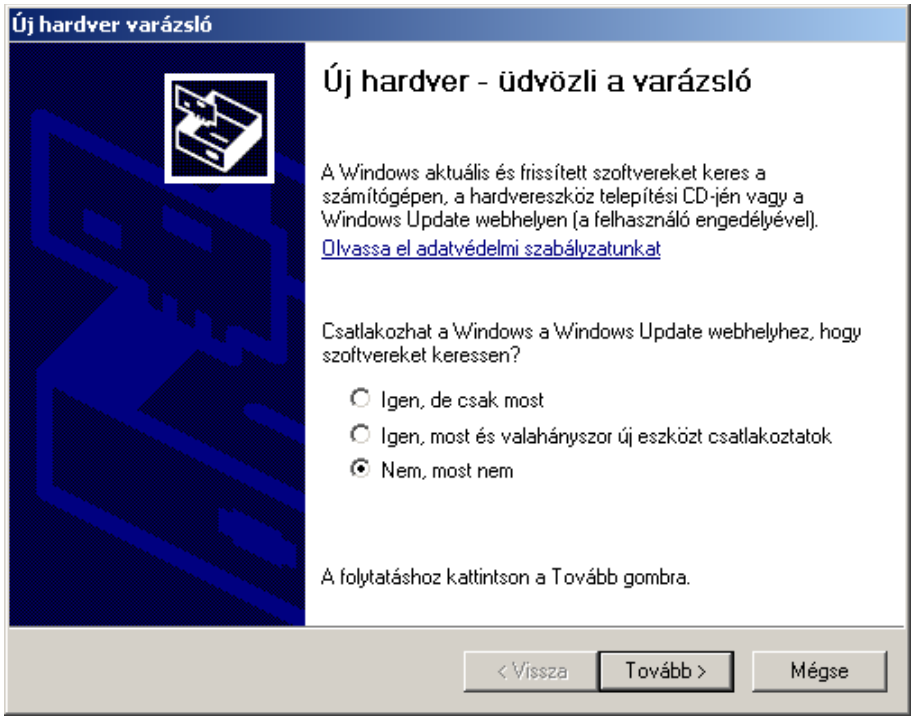
1 pc. CD disk

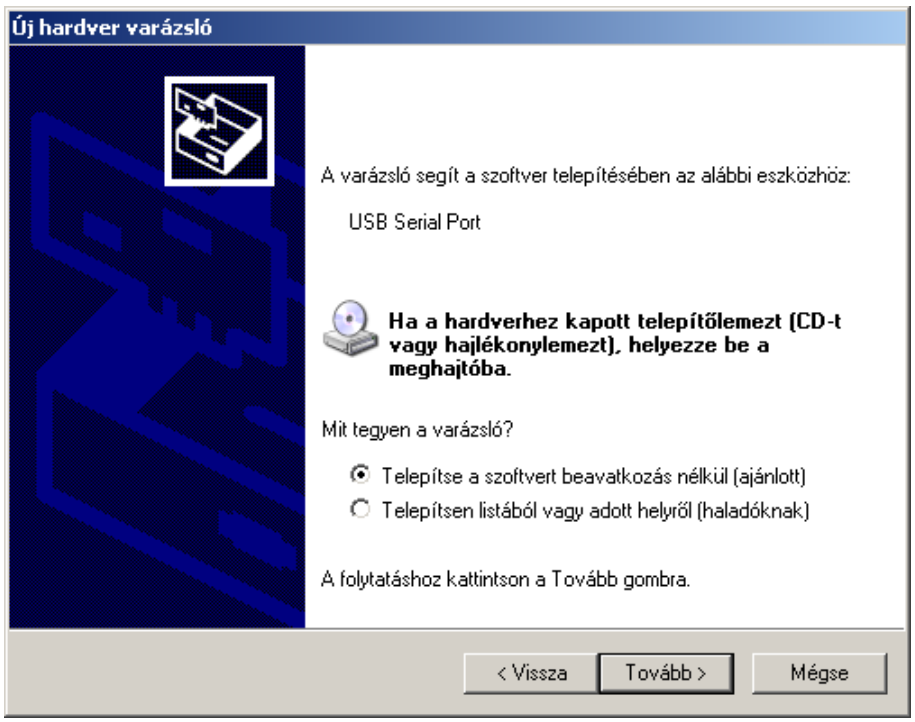
Install drivers for MS Windows

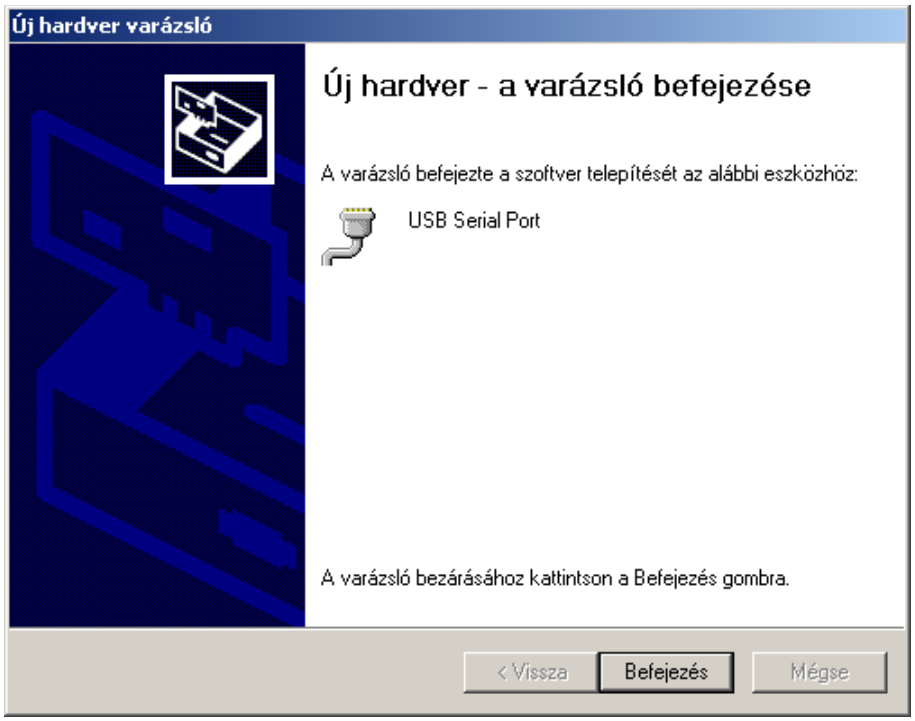
Installing the USB driver

The BlueDSO contains Microchip MCP2200 USB interface module. Recent versions of required drivers are available on the Microchip website. Use the Driver InstallationTool program to install the necessary drivers.

After installing the driver connect the device to your computer and follow the instructions on the new hardware configuration.



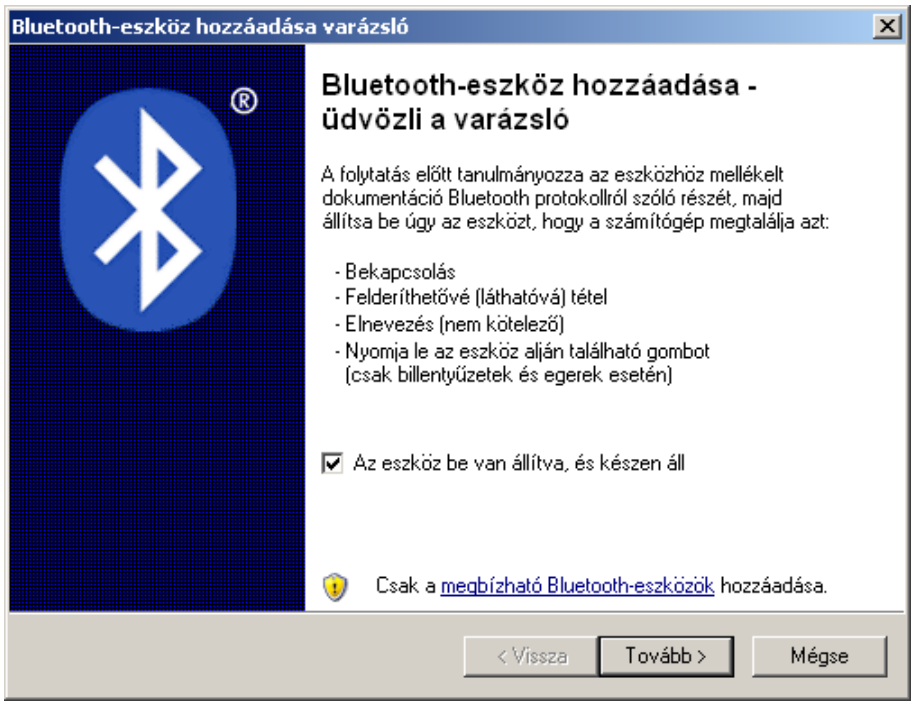

Új hardver varázsló
A varázsló segít a szoftver telepítésében az alábbi eszközhöz:
USB Serial Port
Ha a hardverhez kapott telepítőlemezt (CD-t vagy hajlékonylemezt), helyezze be a meghajtóba.
Mit tegyen a varázsló?
Telepítse a szoftvert beavatkozás nélkül (ajánlott)
Telepítsen listából vagy adott helyről (haladóknak)
A folytatáshoz kattintson a Tovább gombra.
< Vissza
Tovább >
Mégse

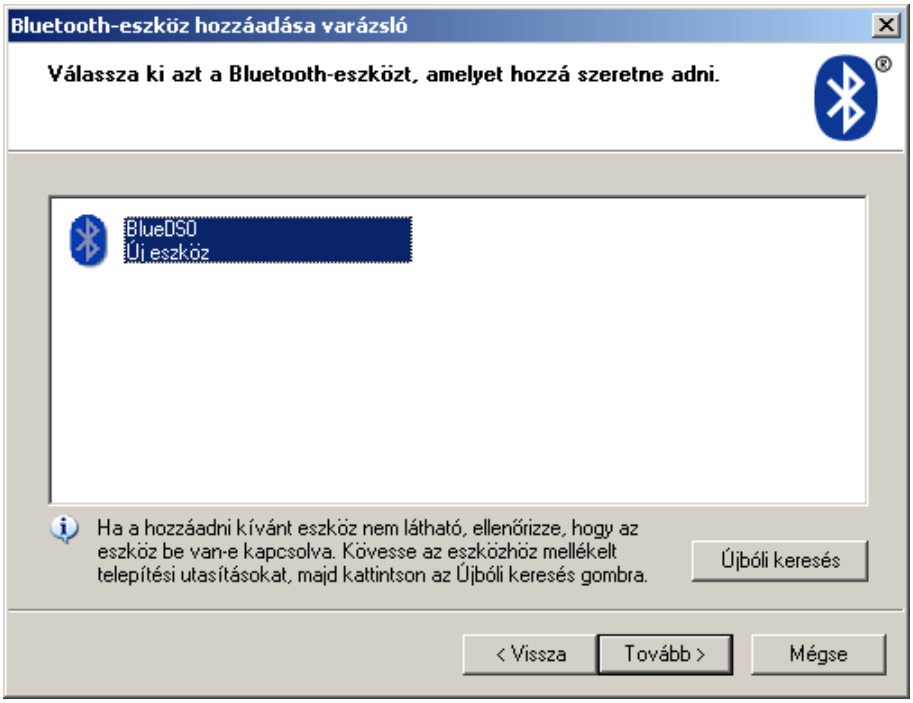

Új hardver varázsló
Új hardver - a varázsló befejezése
A varázsló befejezte a szoftver telepítését az alábbi eszközhöz:
USB Serial Port
A varázsló bezárásához kattintson a Befejezés gombra.
< Vissza
Befejezés
Mégse

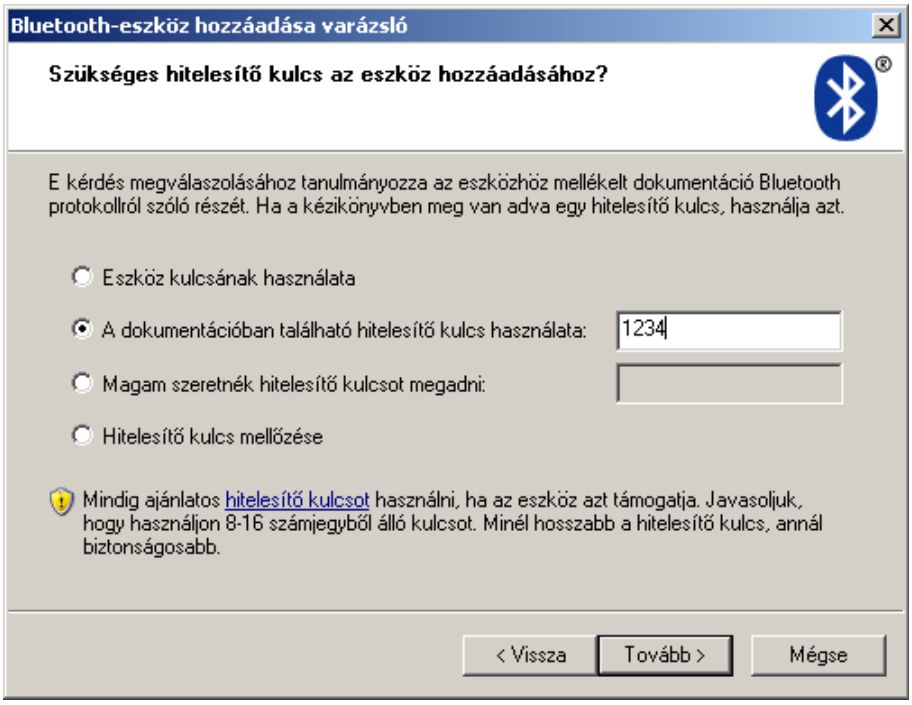
Set up the Bluetooth connection

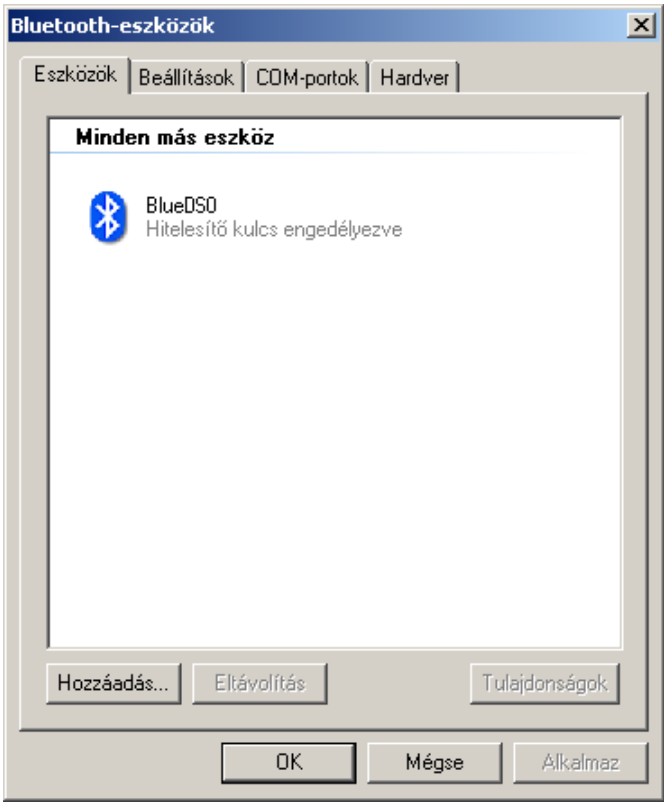
Check and set up the Bluetooth adapter in your computer as necessary in accordance with the instructions. Connect the device to the USB power adapter or to an other USB device via the USB cable for powering. When the device's Bluetooth unit is ready then dual LED flashes to indicate the status on the front panel.

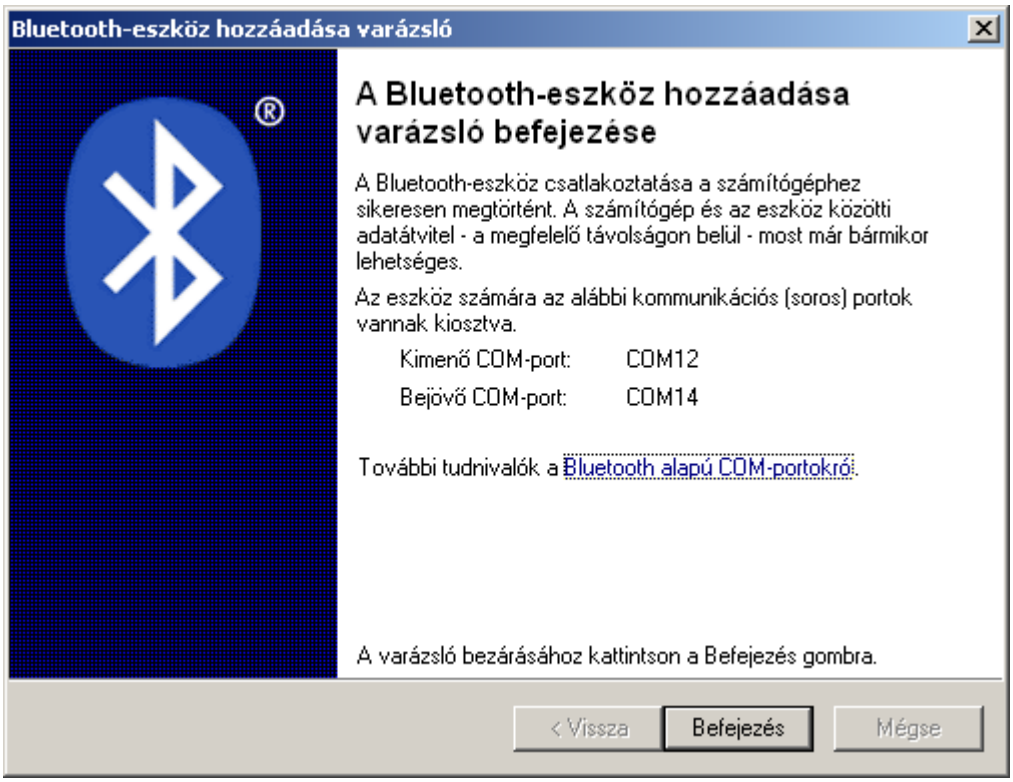
Add BlueDSO to the computer's Bluetooth device list. The required authentication key: „1234”.






Bluetooth-eszköz hozzáadása varázsló
Szükséges hitelesítő kulcs az eszköz hozzáadásához?
E kérdés megválaszolásához tanulmányozza az eszközhöz mellékelt dokumentáció Bluetooth protokollról szóló részét. Ha a kézikönyvben meg van adva egy hitelesítő kulcs, használja azt.
Eszköz kulcsának használata
A dokumentációban található hitelesítő kulcs használata:
1234
Magam szeretnék hitelesítő kulcsot megadni:
Hitelesítő kulcs mellőzése
Mindig ajánlatos hitelesítő kulcsot használni, ha az eszköz azt támogatja. Javasoljuk, hogy használjon 8-16 számjegyből álló kulcsot. Minél hosszabb a hitelesítő kulcs, annál biztonságosabb.
< Vissza
Tovább >
Mégse


Bluetooth-eszközök
Eszközök
Beállítások
COM-portok
Hardver
Minden más eszköz
BlueDSO
Hitelesítő kulcs engedélyezve
Hozzáadás...
Eltávolítás
Tulajdonságok
OK
Mégse
Alkalmaz


Bluetooth-eszköz hozzáadása varázsló
A Bluetooth-eszköz hozzáadása varázsló befejezése
A Bluetooth-eszköz csatlakoztatása a számítógéphez sikeresen megtörtént. A számítógép és az eszköz közötti adatátvitel - a megfelelő távolságon belül - most már bármikor lehetséges.
Az eszköz számára az alábbi kommunikációs (soros) portok vannak kiosztva.
Kimenő COM-port: COM12
Bejövő COM-port: COM14
További tudnivalók a Bluetooth alapú COM-portokról.
A varázsló bezárásához kattintson a Befejezés gombra.
< Vissza
Befejezés
Mégse

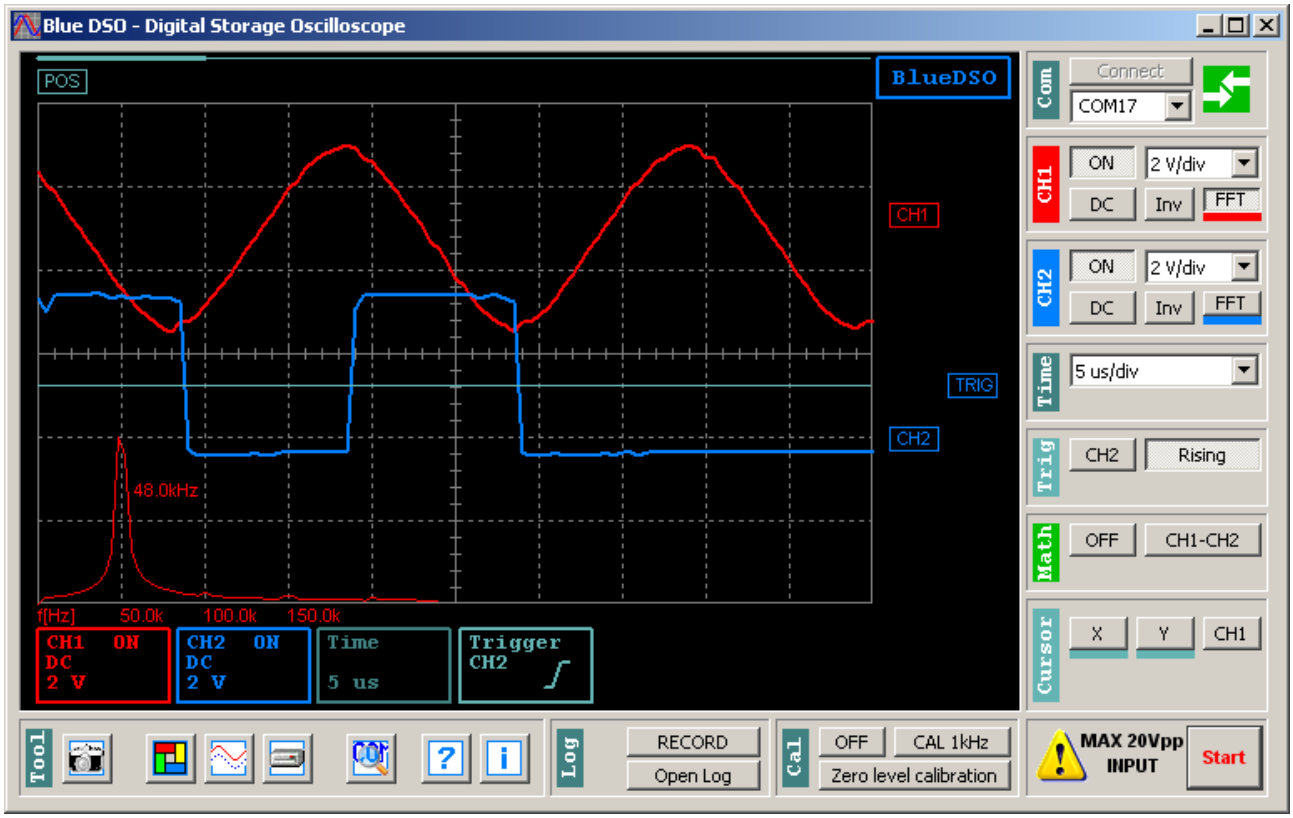
MS Windows utility

System requirements

WindowsXP SP3 or Windows7 or Windows8.x with USB or Bluetooth connectivity.

Turning it on

Connect the device to the computer or an USB power adapter with a USB cable. The front-side LED continuously glows as the device searches for connection over the USB cable. If the USB connection has been successfully established, the device will communicate via USB, otherwise the connection will be made over Bluetooth The USB channel selection is shown as single LED blinking, Bluetooth channel selection is shown as double LED blinking.



Connecting to the BlueDSO device:

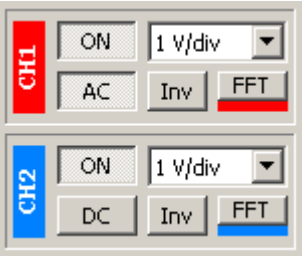
After connecting the device to an USB power supply, the blink of the front-side LED shows which type of communication has been selected.

After starting the BlueDSO utility, the computer automatically tries to connect via the most recently used communication port (COM port). When the connection successfully establishes, the icon in the "Com" field turns green. The icon turns yellow if the recent COM port exists, but it couldn't find a BlueDSO device on it. It turs red if the recent COM port does not exist on the computer.

If the automatic connection haven't been successful (e.g. at first time there is no information on recently used ports) and you know the port number, than you can select the port to use in the "Com" field. After that, you can establish connection by clicking the "Connect" button. The icon turns green if the connection was successful.

If the port number is unknown, you can search for it with the "Search BlueDSO" feature, which can be found on the toolbar. The software automatically connects and the icon turns green if any device have been found.

Input voltage dividers



The inputs' range can be set within the range of 100mV/div – 5V/div in the "CH1-CH2 field. The maximal voltage connected to the inputs is 20V peak-to-peak. Higher incoming voltage can lead to hardware failure.

The channels' signal's visualization can be turned off as needed (ON/OFF). This only turns off the visualization, not the detection, therefore triggering is possible for invisible channels.

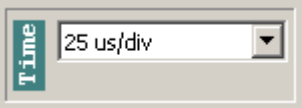
The DC component of the measured signal can be detached (AC/DC). The detachment occurs right on the input, before the input voltage divider, which ensures that the measurement unit's null-point would stay properly calibrated.

The phase of the visualized signal can be inverted (Inv). Phase inversion only affects visualization, the sensors are not affected.

The vertical position of the channels' signals can be set with the CH1, CH2 elements.

The spectrum of the analysed signal can be visualized by turning the fast Fourier transformation (FTT) on. The frequency is calibrated when showing the FTT. The amplitudes' relative position carries the important information.

Time base

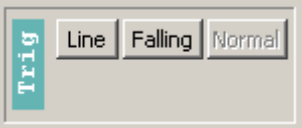


The time base used by the BlueDSO device can be set within the range of 250ns/div – 250 ms/div in the "Time" field. In 5us/div – 250ms/div range the device samples both channels' signal real-time, so any kind of periodic or transient signal can be observed with the device.

In the 250ns/div – 2,5us/div range the sampling is not real-time, the device does the so-called "Equivalent Time" sampling, therefore in this range only periodic signals' observation would result in useful information.

The horizontal position of the channels' signals can be moved with the POS draggable element, so transient signals can be observed beyond the display matrices' limitations.

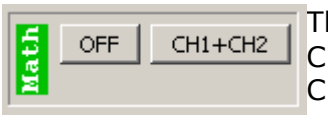
Trigger



Setting the trigger source (CH1 – CH2 – Line) and mode (Rising–Falling and Normal - Single) is possible on the "Trig" panel. Selecting CH1 or CH2 makes the trigger sensitive for that channel. If the source is set to "Line", the signal processing takes place without triggering. The "Falling" and "Rising" options make the trigger sensitive to the edge selected. In Single mode must be set timeout for single triggering.

Trigger level can be set with the TRIG draggable element.

Virtual channel



The “Math” virtual channel is the sum or difference of the CH1 and CH2 channels. The available operations are CH1+CH2, CH1-CH2 and CH2-CH1.

The vertical position of the “Math” channel can be set with the “MATH” draggable element.

Markers

In the "Cursor" panel will turn the horizontal and vertical markers and assign the Y marker to a channel. The markers accurate time difference and the voltage difference can be read from the display area of the lower information bar. The marker lines of the associated actuator elements (X1, X2, Y1, Y2) can be dragged to the desired position.

Calibration wave

Either a 1kHz or a 10kHz square wave can be connected to the device’s front-side “CAL” output on the “Cal” panel. The amplitude of the square wave is approx. 3.3V.

Data recording

Data capturing can be enabled with the “RECORD” button in the “Log” panel. In this case, the whole data stream registered will be saved. This functionality currently supports from 5 ms/div to 250 ms/div time bases. When using it with 5 ms/div setting, data sampling occurs every 250 us. Using this functionality with 250 ms/div selected, samping takes place in every 10 ms. The recordable data stream’s duration is only limited by your computer’s free storage, thus it can record several hours if you want. The recorded data stream can be read and analized with the software by clicking on “Open log” or use the BlueDSO log analizer.

Toolbar

Save display view: here you can make a snapshot of the graph display in .bmp or jpg format.

Setting the colours: various items’ colour can be adjusted by clicking the vertical bar on the corresponding panel. The “Restore default colour” button resets all the colour settings.

Graphing mode: the “Vectors/dots” button toggles visualisation to show the result either as a continuous line or a set of dots.

Save settings: here you can save your personal settings, therefore they will be restored on next launch.

Search BlueDSO: here you can search and connect to a BlueDSO device connected to your computer.

BlueDSO settings in Android

System requirements

Android version 2.3 or later with Bluetooth connection.

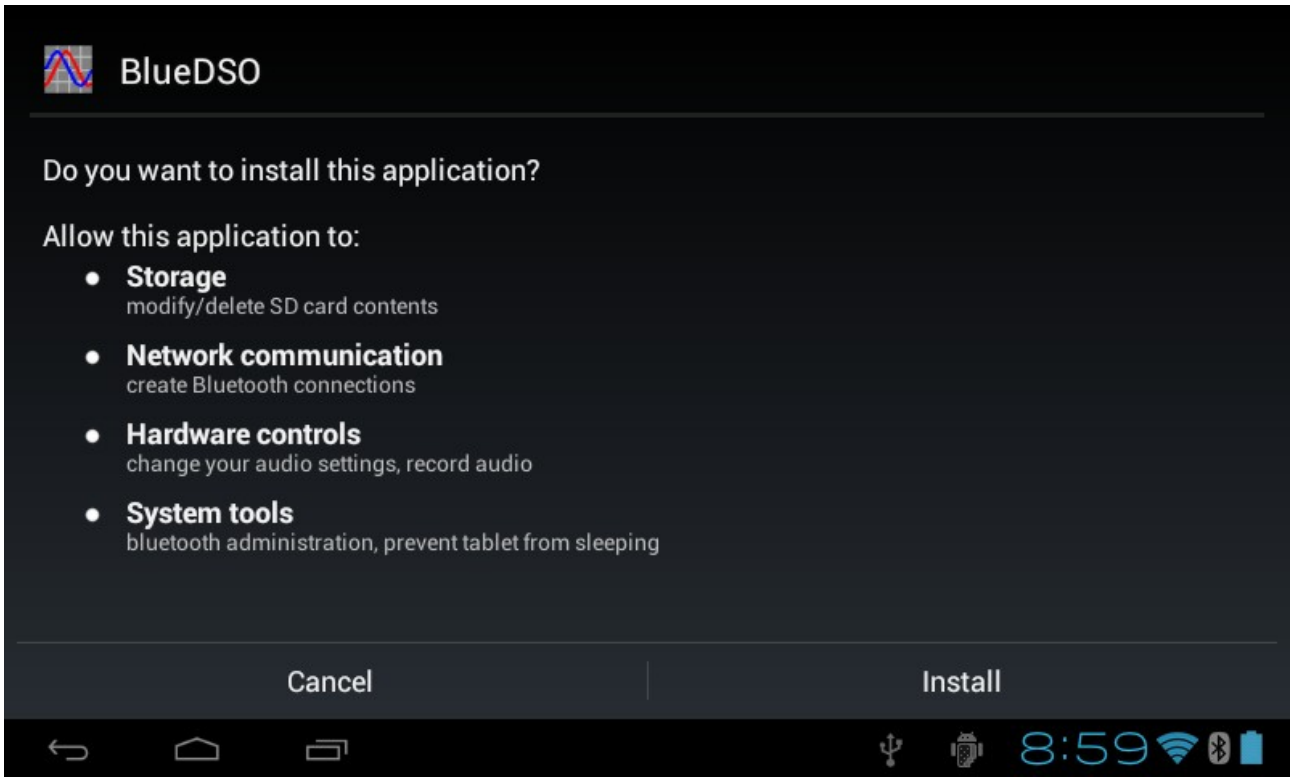
Installing the BlueDSO application

Copy the BlueDSO.apk application onto the Android device's SD card. Start the BlueDSO.apk for the installation.

Some Android devices, you may need to enable the "Unknown sources" option. This is can be performed in the device settings as described Manual.

The BlueDSO for android application communicates with the BlueDSO device via Bluetooth. In addition to this communication in any other communication channel does not work, it does not gather or transmit data.

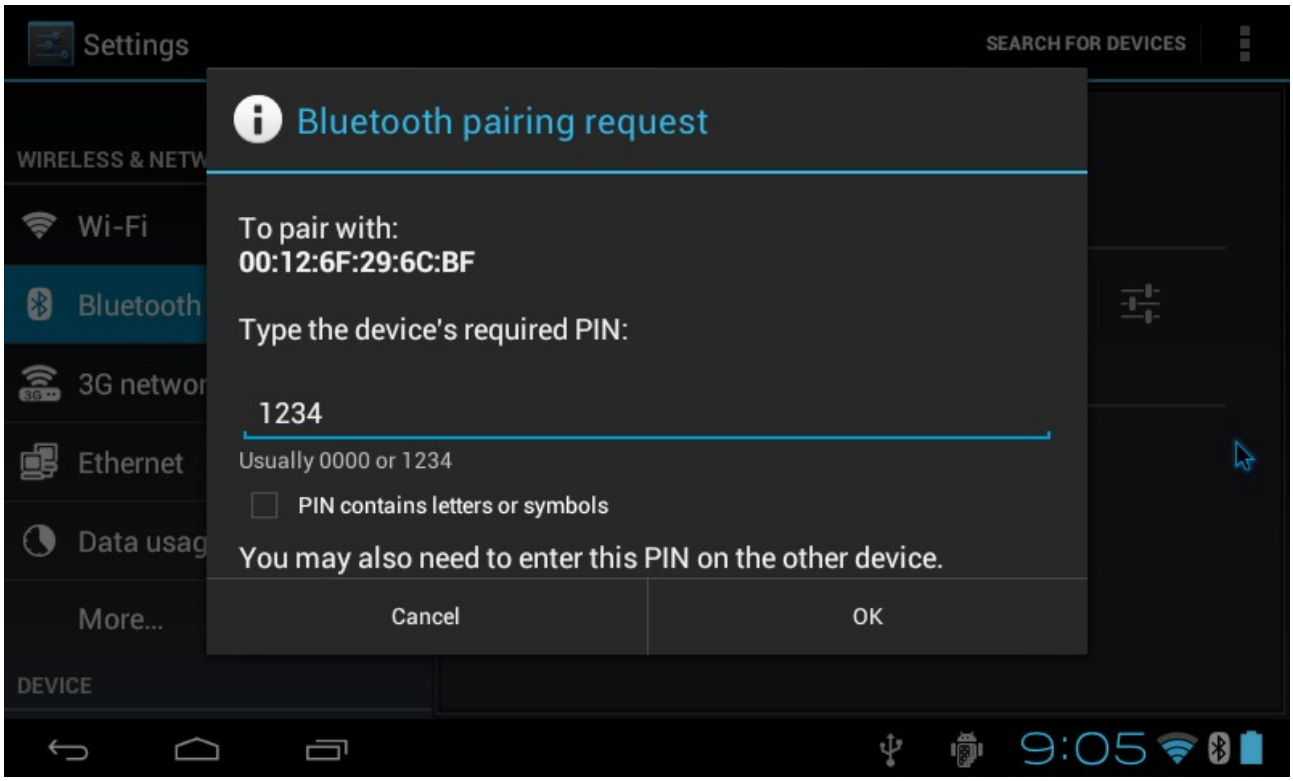
The program except the BlueDSO configuration settings can not be store data in the device.



Set up the Bluetooth connection

Check and set up the Bluetooth adapter in your Android device as necessary in accordance with the instructions. Connect the device to the USB power adapter or to an other USB device via the USB cable for powering. When the device's Bluetooth unit is ready then dual LED flashes to indicate the status on the front panel.

Add BlueDSO to the Bluetooth device list. The required authentication key: „1234”.



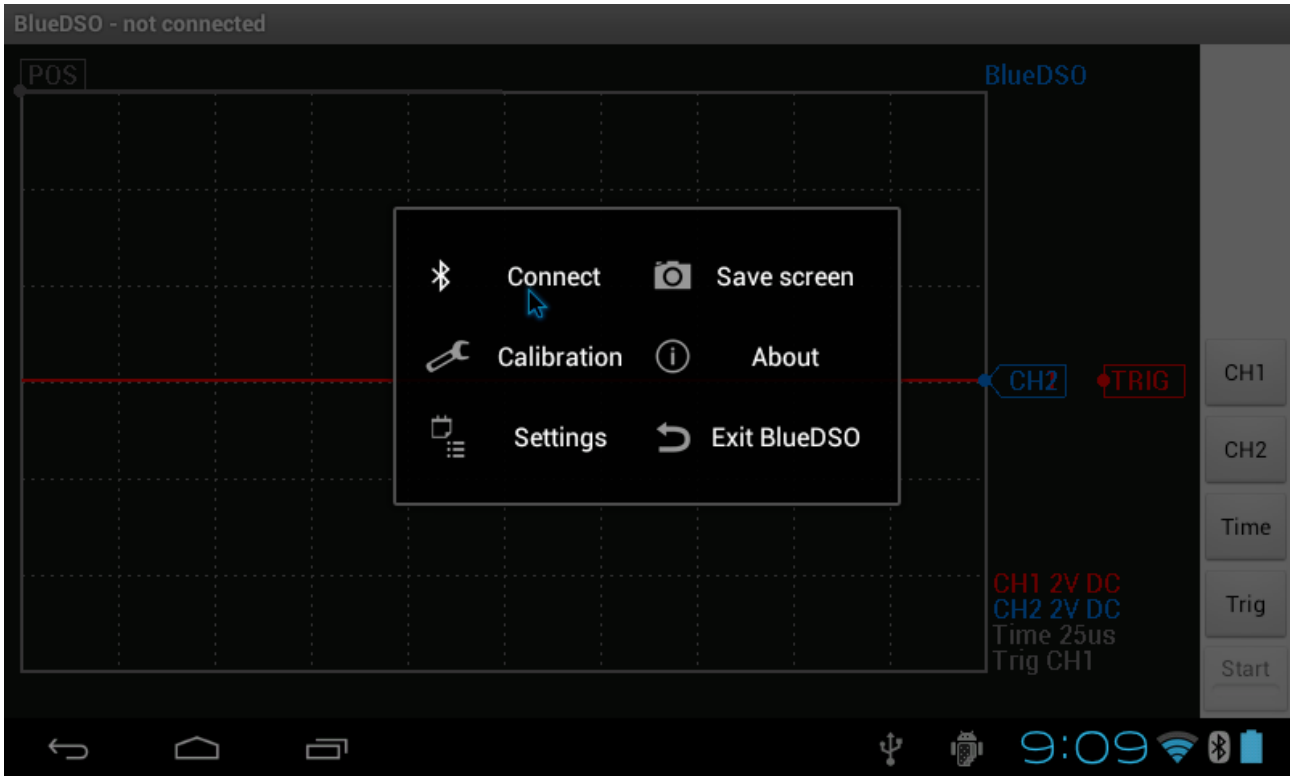
Android utility

Turn it on

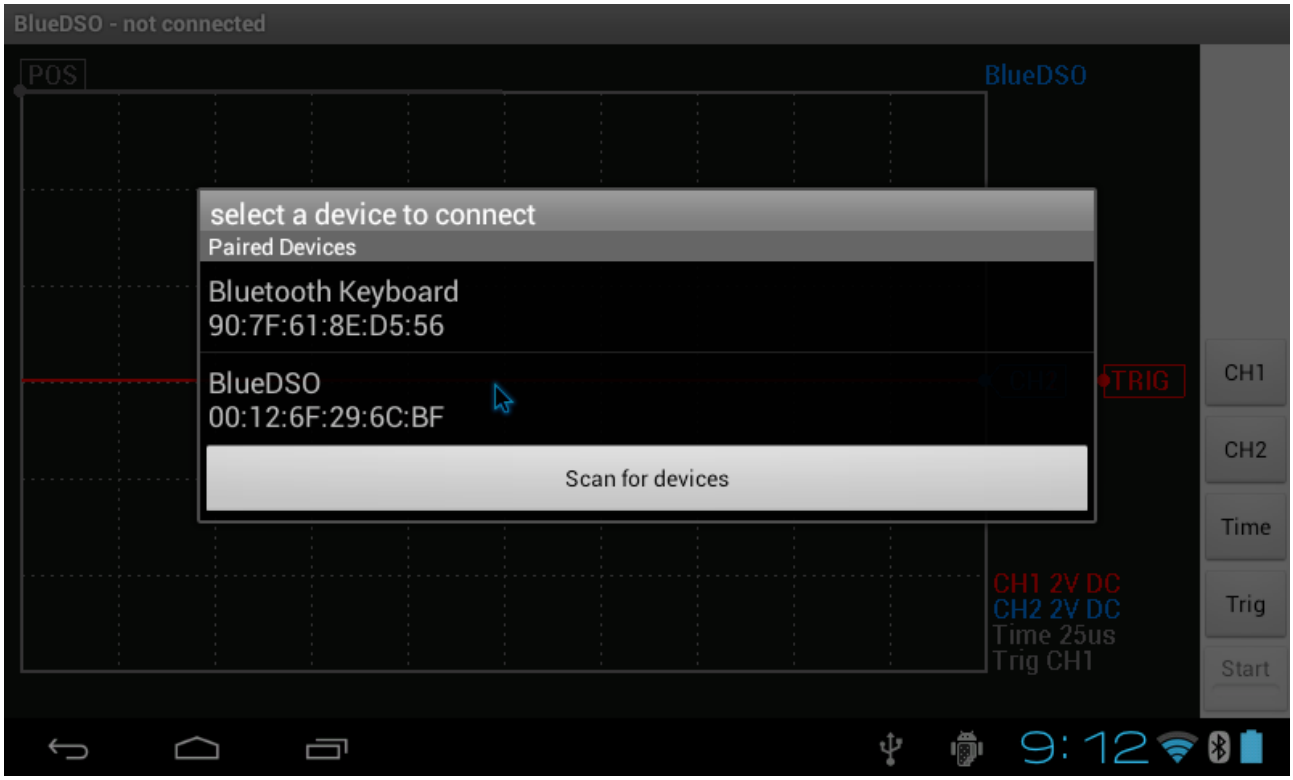
First, connect the device to a network adapter via USB. The frond-side LED will glow continuously, then double LED-blinking will inform you about Bluetooth channel selection.

Connecting to the BlueDSO device

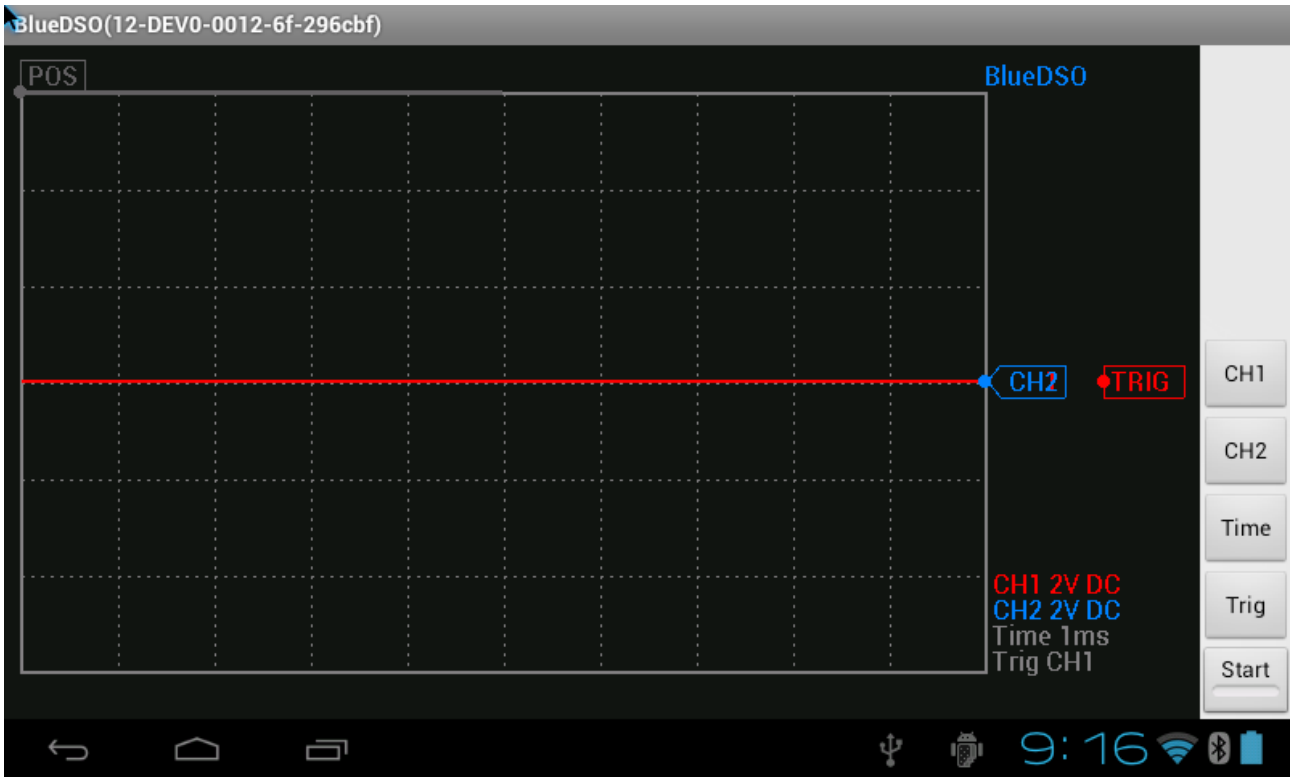
Touch the screen raster for call the main menu. Start the BlueDSO software, select the "Connect" icon from the main menu



and select the BlueDSO device to connect to.



On the title bar seen the serial number and the start button is enabled when you've successfully connected.

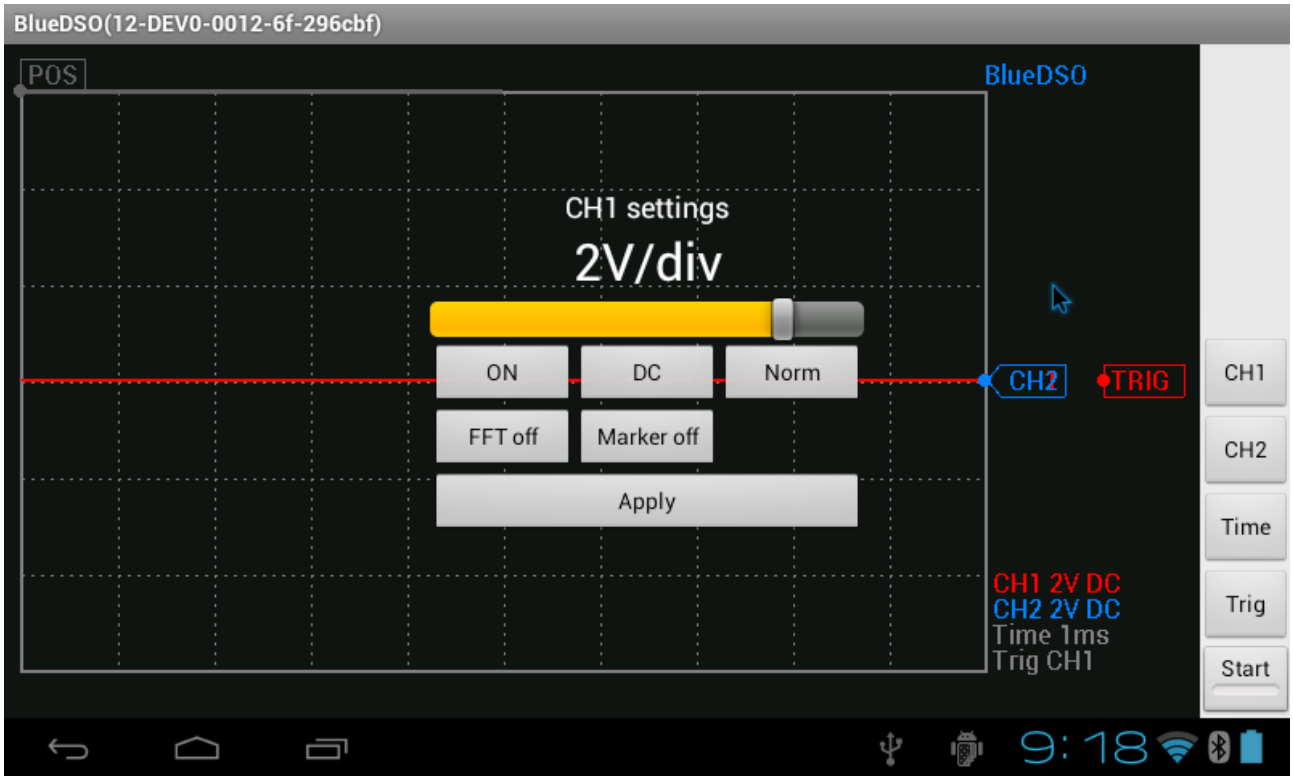


Buttons:

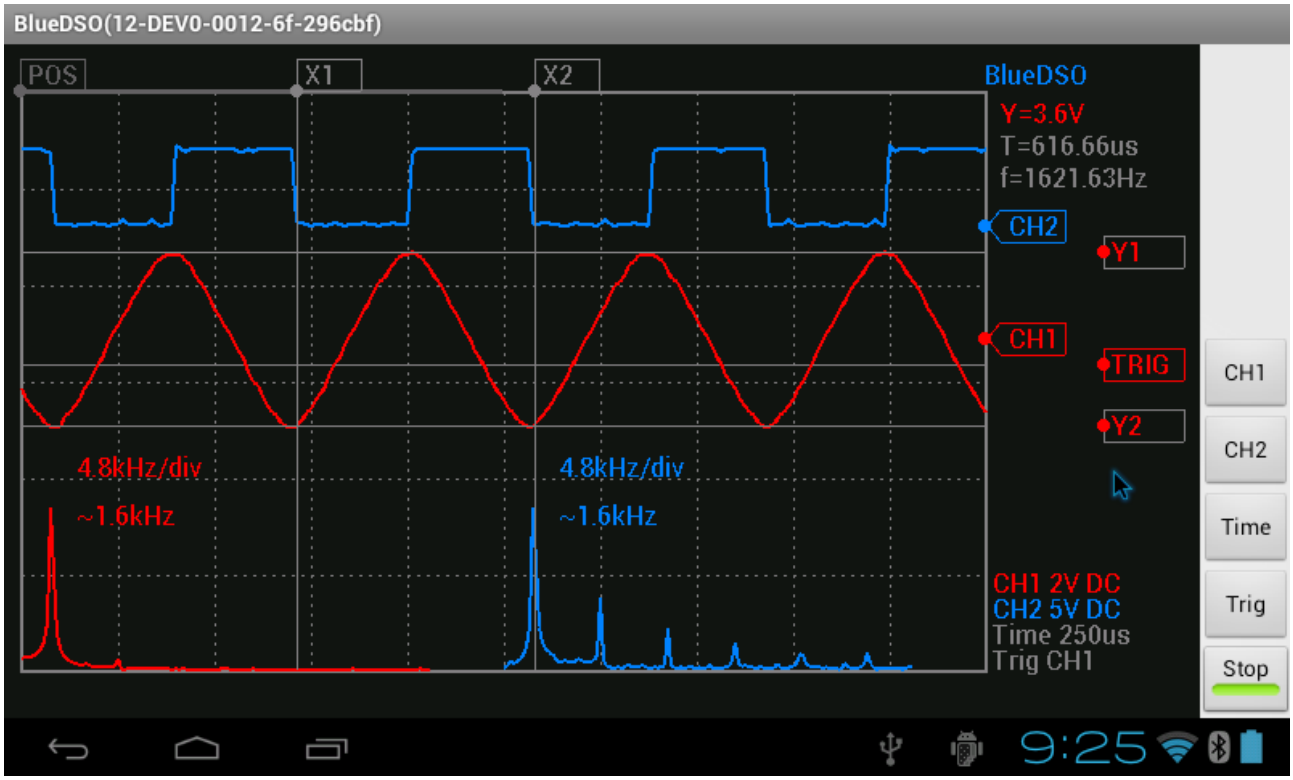
On the right-hand side of the BlueDSO for Android software there are four on-screen buttons for setting preferences and a fifth "Start" button for starting the measurment. These buttons allows you to change measuring range and set trigger conditions.

Input voltage dividers

When either CH1 or CH2 is selected, you can set the range of the selected channel with horizontal skip bar.



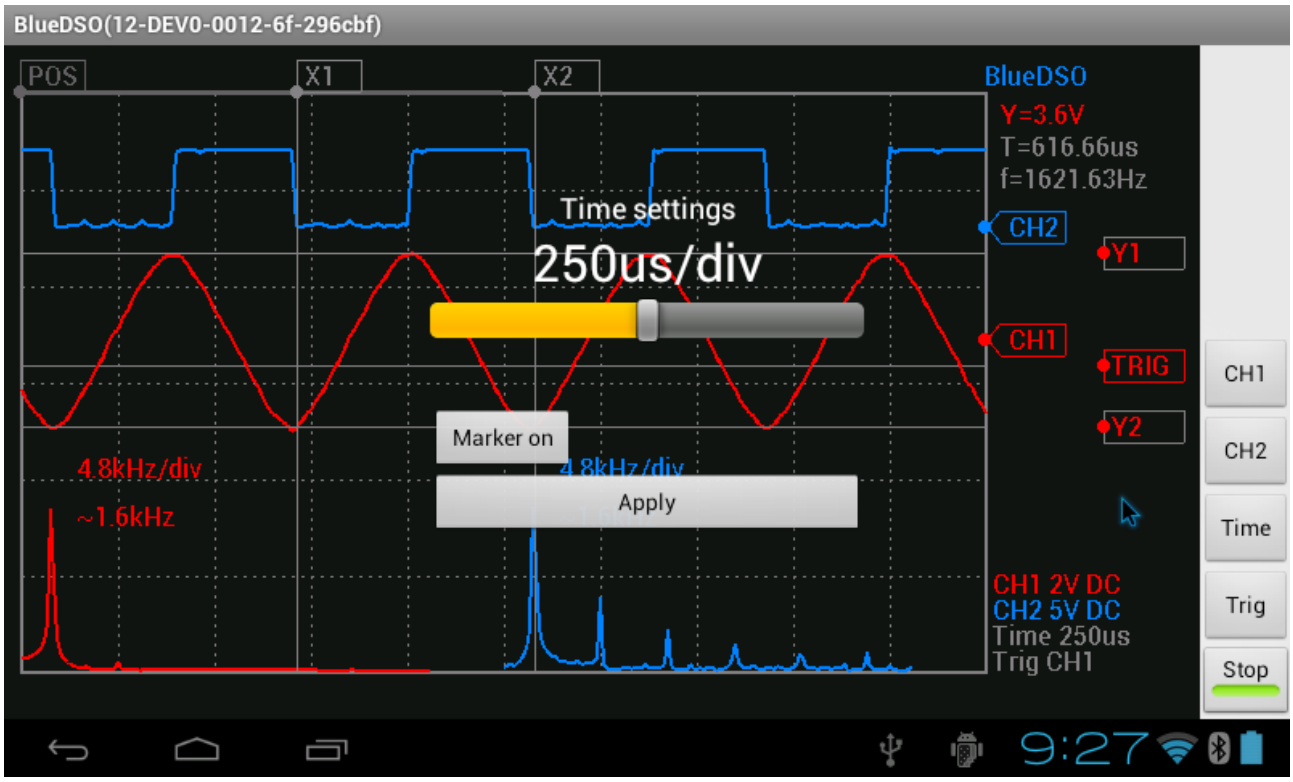
The ON-OFF button is used for turning the selected channel on/off, the DC-AC button is for enabling/disabling the galvanic isolation, which is inactive, when DC is selected, active it AC is selected. The Norm-Inv button is used for inverting the signal of the selected channel. The FFT button is used for turning on the Fast Fourier analisis, the Marker button is turning the vertical markers on/off.



The vertical position of the channels' signals can be moved with the CH1/CH2 draggable element.

Time base

When “Time” is selected you can set the time base used by the BlueDSO device in the range of 250ns/div – 250 ms/div. The time base used by the BlueDSO device can be set within the range of 250ns/div – 250 ms/div.



In 5us/div – 250ms/div range the device samples both channels’ signal real-time, so any kind of periodic or transient signal can be observed with the device.

In the 250ns/div – 2,5us/div range the sampling is not real-time, the device does the so-called “Equivalent Time” sampling, therefore in this range only periodic signals’ observation would result in useful information.

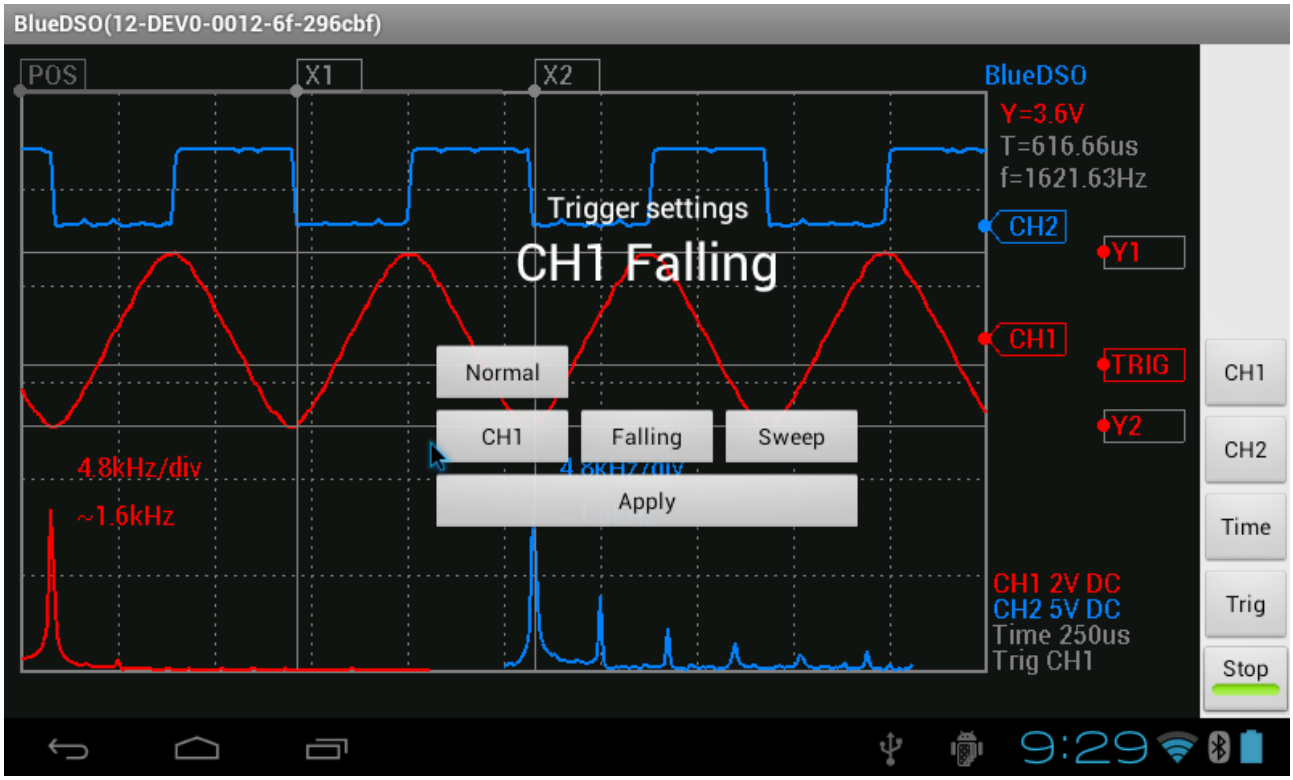
The Marker button is turning the horizontal markers on/off.

The horizontal position of the channels’ signals can be moved with the POS draggable element, so transient signals can be observed beyond the display matices’ limitations.

Use RECORD button to data stream recording between 5 ms/div - 250 ms/div time ranges. When using BlueDSO with 5 ms/div setting then data sampling occurs every 250 us. Using this functionality with 250 ms/div selected then samping takes place in every 10 ms. The recordable data stream’s duration is only limited by your device’s free storage, thus it can record several hours if you want. The recorded data stream can be read and analized with the software by clicking on “Open log” or use the BlueDSO log analizer.

Trigger

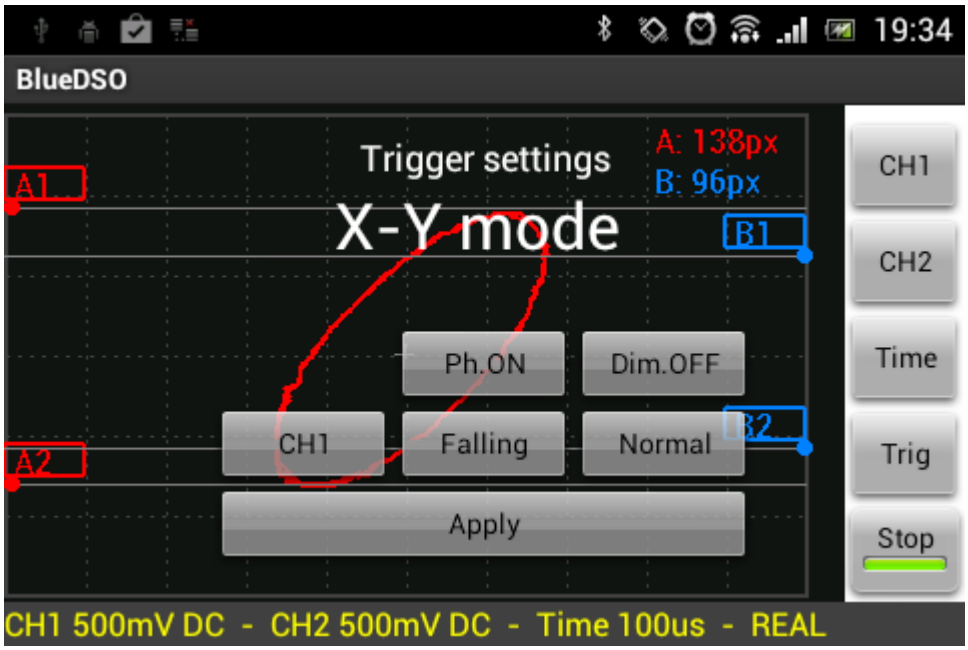
When “Trig” is selected, the trigger source (CH1/CH2/Line) and mode (Rising/Falling and Normal/Single) can be set. Selecting CH1 or CH2 makes the trigger sensitive for that channel. If the source is set to “Line”, the signal processing takes place without triggering. The “Falling” and “Rising” options make the trigger sensitive to the edge selected.



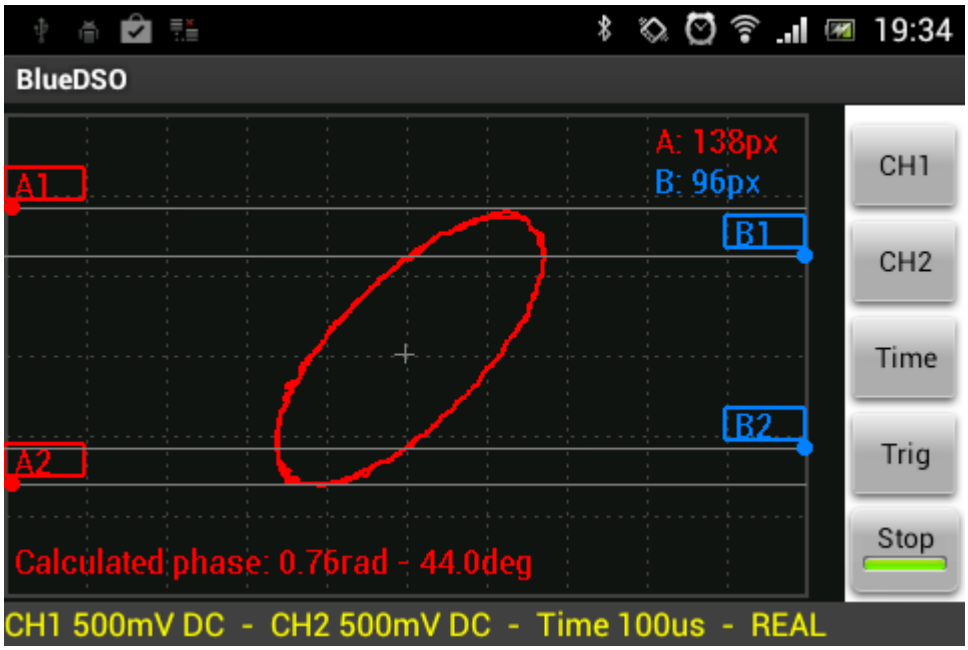
Trigger level can be set with the TRIG draggable element. In Single mode the delay button is set the timeout for single triggering.

X-Y mode, Lissajous curves

Use the "Sweep/X-Y" button to set this mode. In this case the horizontal direction of the CH1 and the vertical direction of the CH2 channel signal for drawing occurs. If the measurement signal is sinusoidal and the frequency is equal both channels then result is an ellipse.



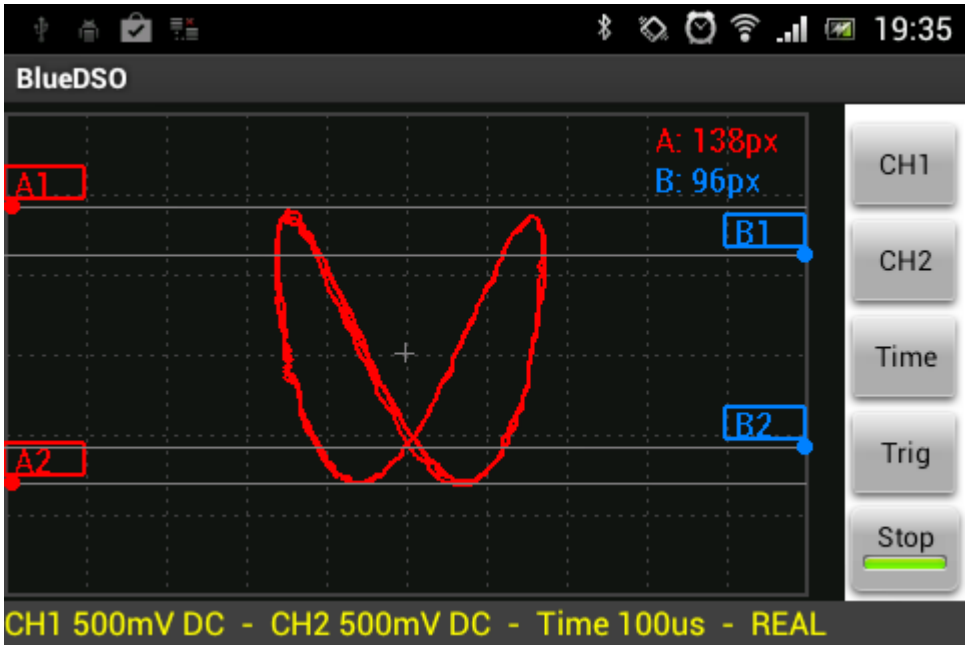
The ellipse dimensions are accurately determine the phase difference between the signals. To determine the phase difference must be set the center of the figure to the center of the grid. The figure is draggable on the grid by the center point. The markers A1 A2 set maximum vertical displacement of the ellipse and the markers B1-B2 set the vertical axial crossing.

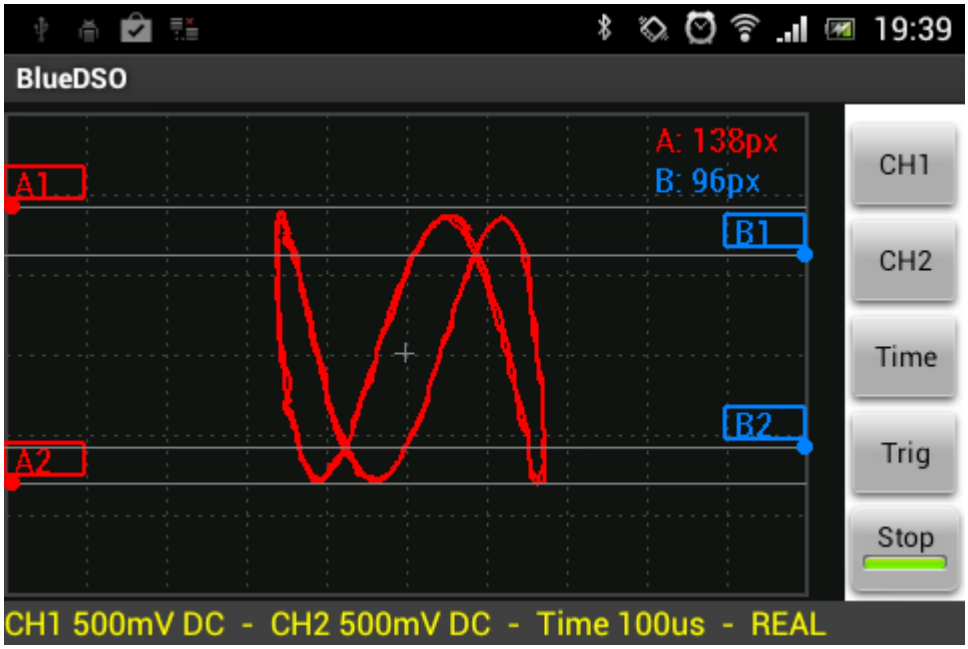


The amplitude of the channel signals can be different as well. Use "Ph.ON" button to show the calculated phase angle on the display. The phase is displayed in radians and in degrees too.

In this mode the frequency deviation can be measured. If the test signals frequency is equal to or one higher than the frequency of the integer multiple of the other, we see a fixed image on the display. The result curve is as much the loop, a multiplier number from two much frequency.

For different or not multiple frequencies are the displayed figure shows a continuous rotation. The frequency of rotation is determined by the frequency difference between the signals.





Markers

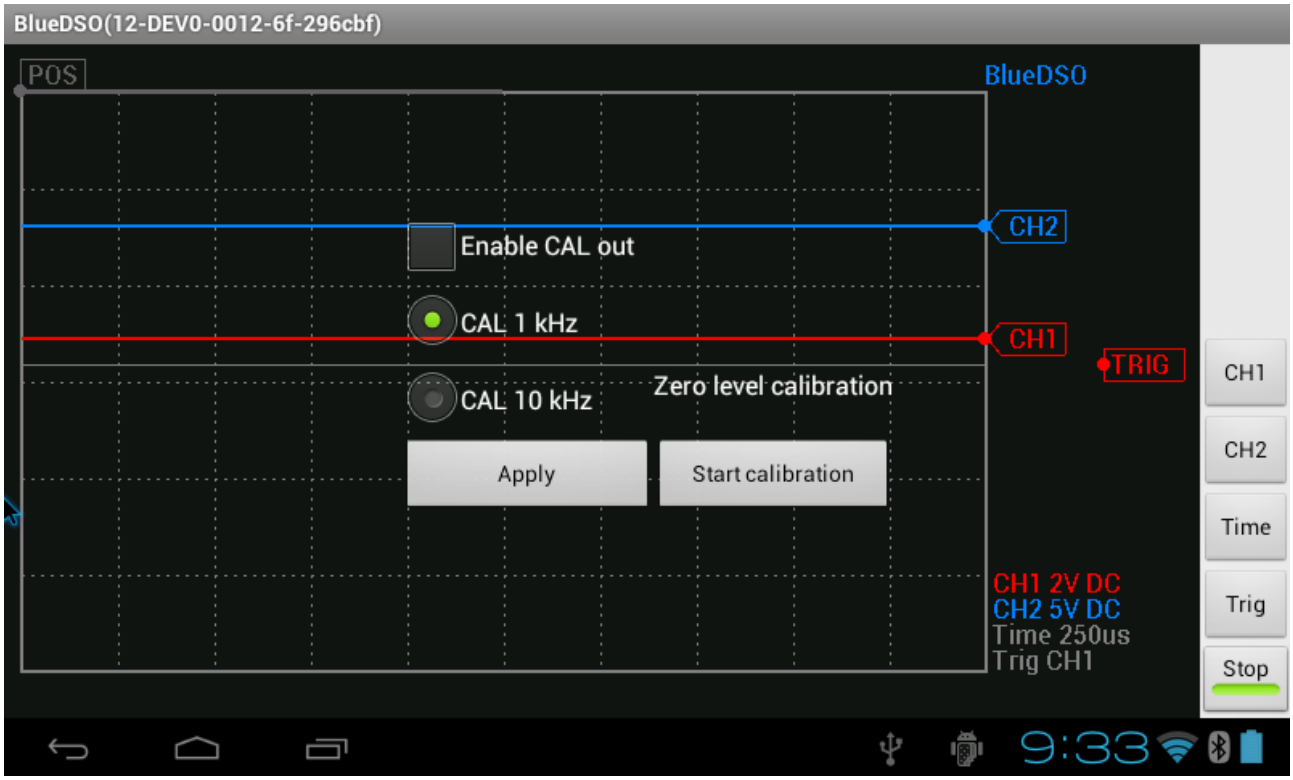
The vertical and horizontal markers makes it easy to read the displayed waveform parameters.

Set the position of the marker lines on the touch screen with the draggable elements

Calibration

Select „Calibration” icon in main menu.

Either a 1kHz or a 10kHz square wave can be connected to the device’s front-side “CAL” output by selecting the “Calibration” icon from the system menu. The amplitude of the square wave is approx. 3.3V.



”Zero level calibration” The feature can be achieved via "Start calibration" button. Here you can calibrate the zero level of analog amplifiers. After installing the program BlueDSO this setting should be carried out, as indicated by a warning is displayed.

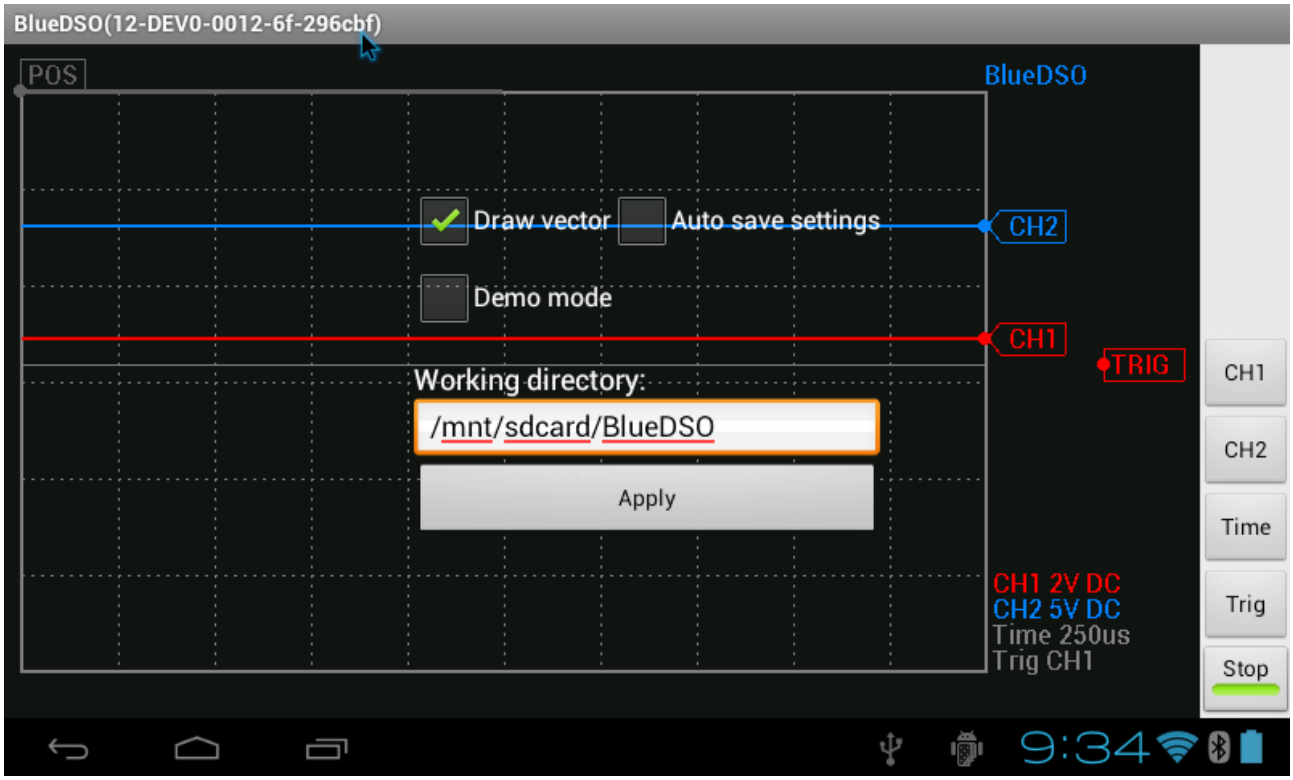
Very important! Remove all probes before start calibration.

Settings

Settings can be found in the system menu.

Auto save settings: with this option enabled, ranges and all other settings are saved automatically and restored on relaunch.

Draw vector: this option toggles visualisation to show the result either as a continuous line (checked) or a set of dots (not checked).



Can be specified by setting "Working directory" where to save the program data to be saved by the user.

By setting the "Demo Mode" of the application it can be used without BlueDSO device with limited options. Then the measuring signal is supplied to the Android device's microphone input through a simple voltage divider. In this case may be test waveforms in limited extent.

Save the screen shot.

Select "Save screen" icon from the main menu. In this time the display's picture is saved in the specified directory. The images are saved in JPG format. The file name is generated automatically.

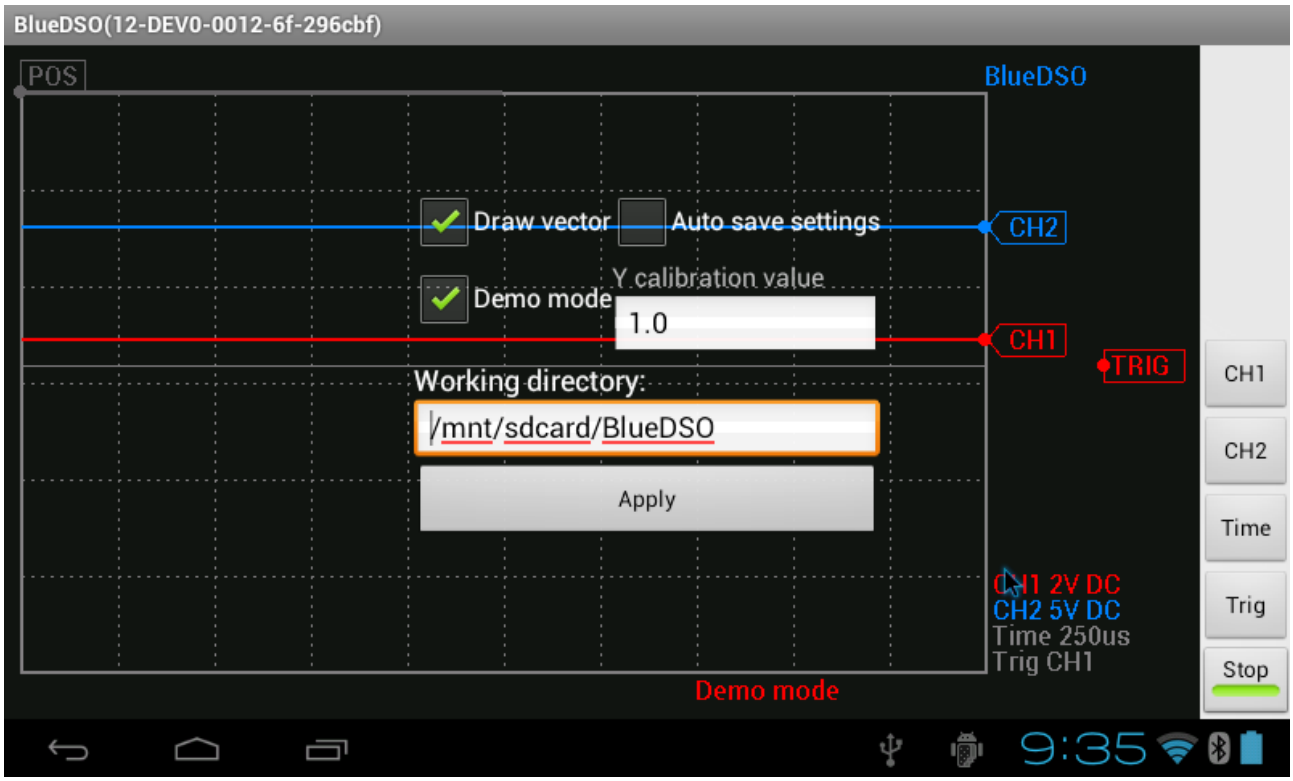
Demo mode

In this mode the BlueDSO application can be used with smartphone or other device via the microphone input without BlueDSO. The signal of the microphone input is shown as the CH1 channel. The same delayed signal will also be displayed on the CH2 channel. In demo mode the time base can be set between 25 us/div and 10 ms/div, because the sound system don't working on the wider range. To transmit the wider as 400-5000 Hz range signals and the signals with wider spectrum (eg. square wave) not really suitable.

Because the microphone input is very sensitive the measured signal must be divide via a voltage divider, so that the maximum input voltage let 0,2-0,3V. **Otherwise, the device**

may be damaged. The recommended value of the voltage divider resistors 100 kohms + 1.5 kohms. If your Android device detects a resistance about 1.5 kohms on the microphone input then it uses external microphone. In this case can be controlled by an external signal, otherwise the built-in microphone signal will displayed. This resistance value can vary by type of device.

If we want to measure near real values then the prepared voltage divider must be calibrate. The calibration is necessary, a known voltage, 1-2 kHz sinusoidal signal. This signal can be produced by a signal generator, or an installed generator application on another Android device . Connect this signal via voltage divider to the microphone input and measure the voltage with BlueDSO application.



The calibration value is determined by the measured and the real tension:

calibration value = Ureal / Umeas.

This number must be write with 1-2 decimals into the application "Settings" menu "Y calibration value" field. After setting through the voltage divider 0 - 2V voltage and approximately 400 Hz - 5 kHz frequency range between the limitations of the amplifier system accurate voltage are measured.