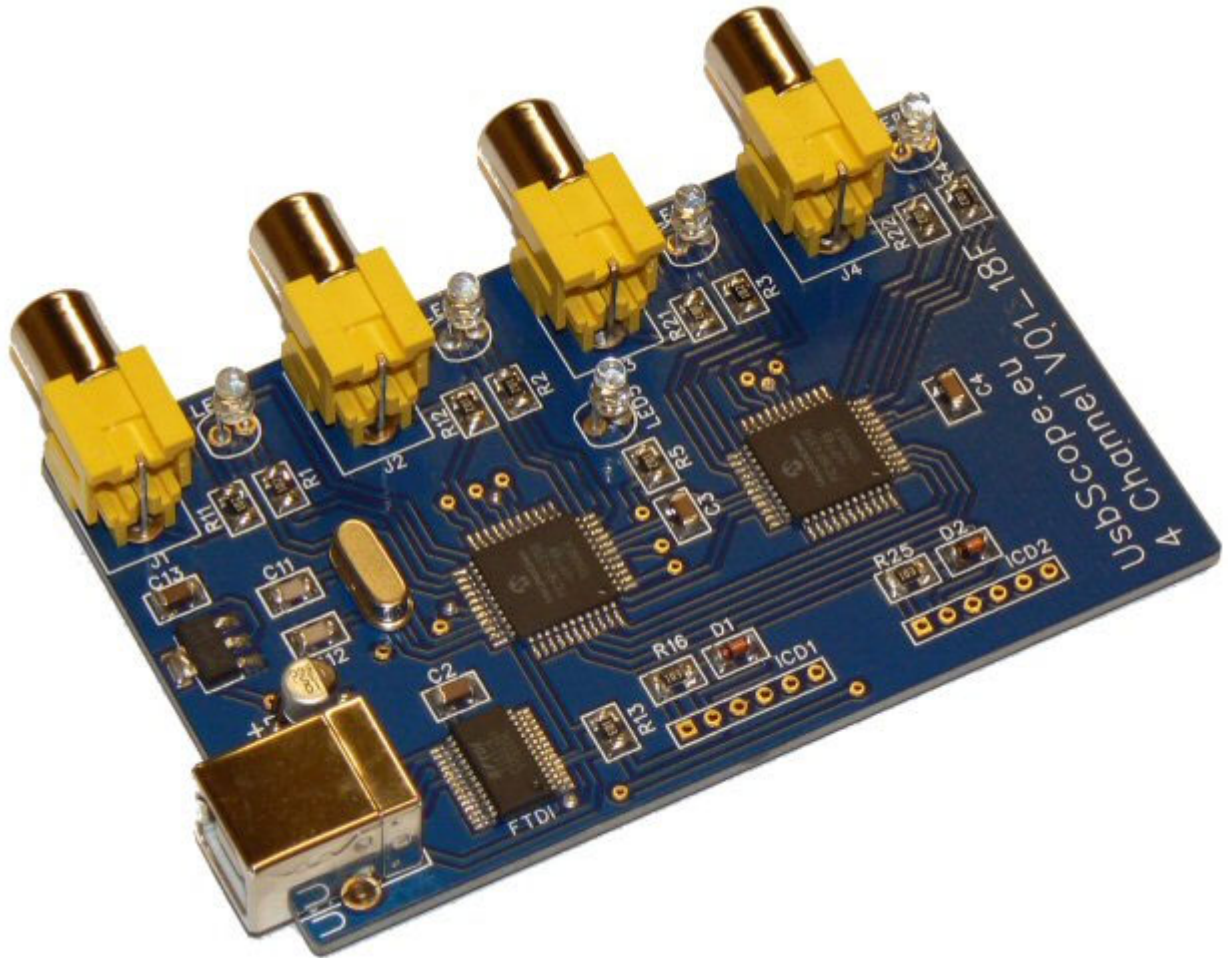




# UsbScope.eu Manual

Version 3.1 – 4 channel version





## Table of contents

<b>1</b>	<b>Introduction</b> .....	<b>3</b>
<b>2</b>	<b>Hardware description</b> .....	<b>3</b>
2.1	Specifications.....	3
2.2	PCB layout.....	4
2.3	Status LED's on 4 channel board .....	4
<b>3</b>	<b>Software Installation</b> .....	<b>5</b>
3.1	Downloading the program .....	5
3.2	Installing the FTDI USB driver .....	5
<b>4</b>	<b>Connecting hardware</b> .....	<b>6</b>
4.1	FTDI drivers .....	6
<b>5</b>	<b>Using the software</b> .....	<b>8</b>
5.1	Starting the main program .....	8
5.2	Low / high voltage warning.....	9
5.3	Starting a measurement .....	10
5.4	Setting the measurement frequency .....	11
5.5	Using the gauges .....	11
5.6	Setting the hardware measurement input range.....	12
5.7	Calibrating your oscilloscope .....	12
5.8	Setting the labels on the axis .....	13
5.9	Using the trigger function .....	13
5.10	Using zoom .....	14
5.11	Saving data to files .....	14
5.12	Loading data from files .....	15
<b>6</b>	<b>Contact information</b> .....	<b>15</b>



# 1 Introduction

This is the manual of the UsbScope.eu Oscilloscope. In this manual you will find more information on how to install the USB driver, test your hardware and use the software tools. This manual describes the 4 channel version (the 2 channel version is not available anymore).

## 2 Hardware description

### 2.1 Specifications

The scope is available with 4 measurement channels

- Input range 0V to +5V (easily changed by adding 2 resistors, see FAQ section)
- 10 Bit resolution
- 500 samples / channel
- 5 clear status LED's **Blue** / **Red**
- Full USB 2.0 compatible
- USB type B connector
- Powered from USB port, no batteries needed
- Power consumption < 50 mA
- Configurable trigger settings
- Sample time difference between channel 1 & 2 smaller < 5 usec
- Sample rates:

Sample rate	Channel 1	Channel 2	Channel 3	Channel 4
100 kHz	X	-	X	-
40 kHz	X	X	X	X
20 kHz	X	X	X	X
10 kHz	X	X	X	X
5 kHz	X	X	X	X
1 kHz	X	X	X	X
500 Hz	X	X	X	X
100 Hz	X	X	X	X
50 Hz	X	X	X	X



## 2.2 PCB layout

Main components on the board are indicated on the figure below.

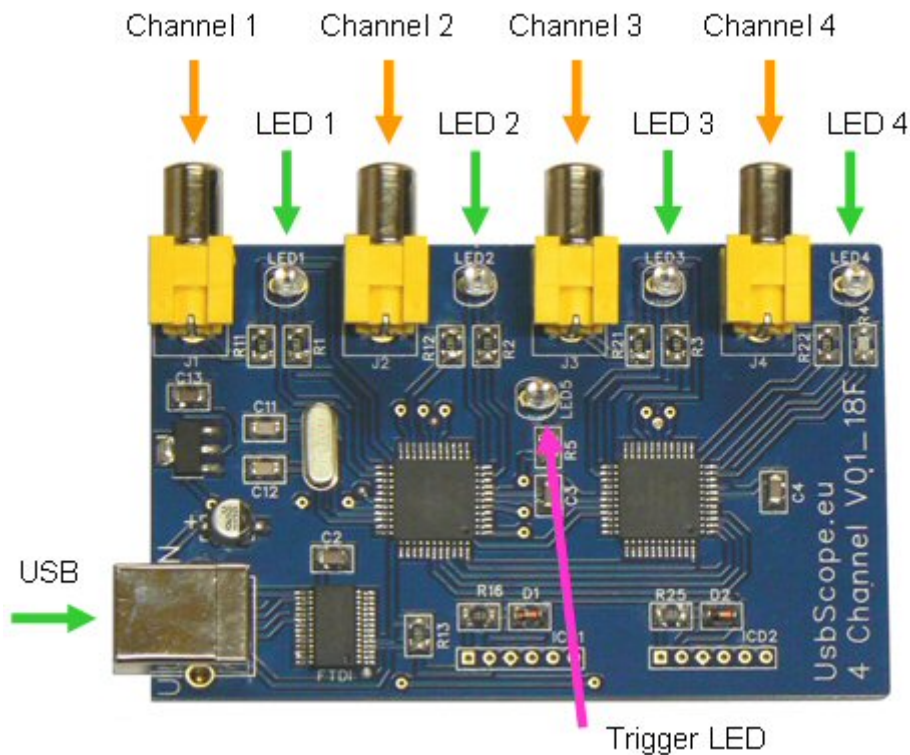


Figure 1, Hardware overview

## 2.3 Status LED's on 4 channel board

The board is equipped with 5 status LED's.

Table 2-1, PCB Status LED's

LED Number	LED Color	Status information
1	BLUE	Channel 1 idle, ready for measurement
	RED	Channel 1 busy with measurement
2	BLUE	Channel 2 idle, ready for measurement
	RED	Channel 2 busy with measurement
	OFF	Channel 2 not used (only at 100 kHz sample rate)
3	BLUE	Channel 3 idle, ready for measurement
	RED	Channel 3 busy with measurement
4	BLUE	Channel 4 idle, ready for measurement
	RED	Channel 4 busy with measurement
	OFF	Channel 4 not used (only at 100 kHz sample rate)
5	RED	Waiting for trigger condition on channel 1



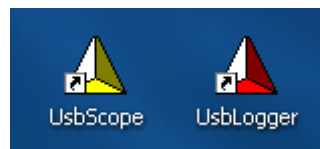
On power up of the scope unit, the status LED's will cycle ones (#1 on, #2 on, #3 on, #4 on, #5on) and then the blue LED's stay on to indicate that the unit is ready to be used. *These LED's do not indicate whether the USB driver is loaded correctly in Windows, or not.*

## 3 Software Installation

### 3.1 Downloading the program

The oscilloscope software to be used with this hardware can be downloaded from: <http://www.usbscope.eu/software.html>

1. Go to this web address and download the program ZIP file to your computer.
2. Extract the zip file using for example Winzip, Winrar or any other program that supports zip files.
3. Run the "Setup.exe" that was extracted from the zip file.
4. Follow the instructions that are displayed by the setup program.
5. When you have finished, 2 icons have been added to your desktop.



6. The Window's "Start" menu will have a new menu item named "UsbScope.eu".



### 3.2 Installing the FTDI USB driver

To install the FTDI USB driver for the USB Oscilloscope, open the "Start" Menu and point at the "UsbScope.eu" sub-menu. Select the "USB Driver Install".



## 4 Connecting hardware

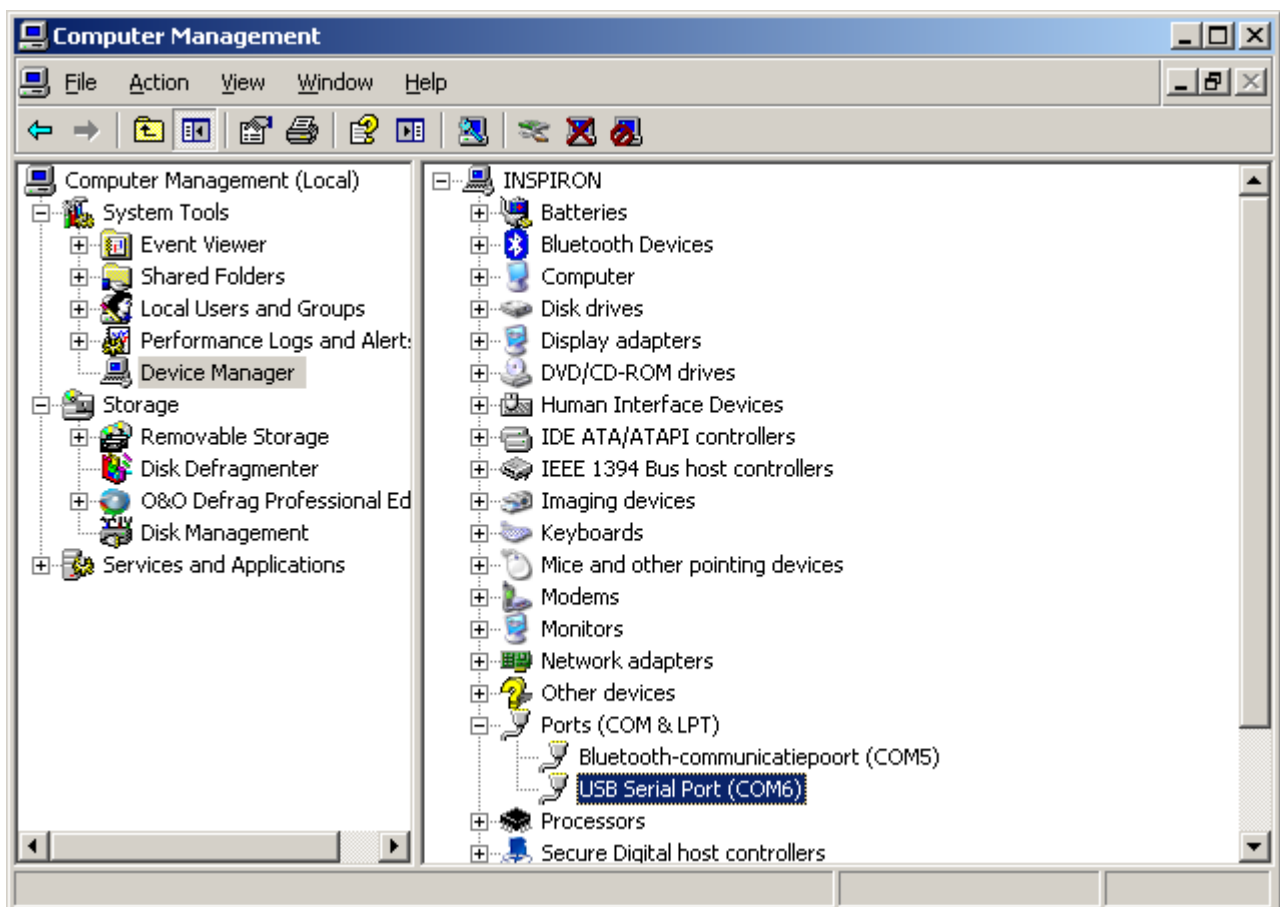
Connect your USB Oscilloscope hardware to a free USB port on your computer. This can be any port on the motherboard or any port on a USB hub. The computer will detect a new USB device and install the FTDI drivers. If the driver was installed correctly, you now can start using your scope.

### 4.1 FTDI drivers

The USB Oscilloscope uses an FTDI chip & drivers. Latest version of the drivers always can be downloaded from the FTD site:

<http://www.ftdichip.com/FTDrivers.htm>

In the windows “Computer Management”, the oscilloscope will appear as a new COM port.





If the program fails to detect the scope correctly, follow below instructions (menu “Debug, Show debug support”):

**Debug support page**

Follow the steps below to debug your UsbScope if it is not detected :

- 1) Install the USB driver that comes with the UsbScope software.
- 2) Connect the UsbScope to a free USB port.
- 3) The UsbScope will do a LED test. If not, there is no power or the device is broken. ● ● ● ●
- 4) Windows will detect the new USB device and install / load the driver.
- 5) Open the Windows device manager to check if the USB driver is loaded.
- 6) Open the section "Ports (COM & LPT)"
- 7) Check if you see an entry "USB-SERIAL CH340 (COMxx)" like the picture below.

8a) If you see this, your scope UsbScope driver has been loaded correctly and should work.  
Close the UsbScope program, restart the computer and start the program again.

8b) If you do not see any entry like this one, following can be wrong :

- A) The hardware of the USB port does not work correctly
- B) Windows loaded the wrong driver. Uninstall the USB driver and reboot.  
Re-install the driver and try again.

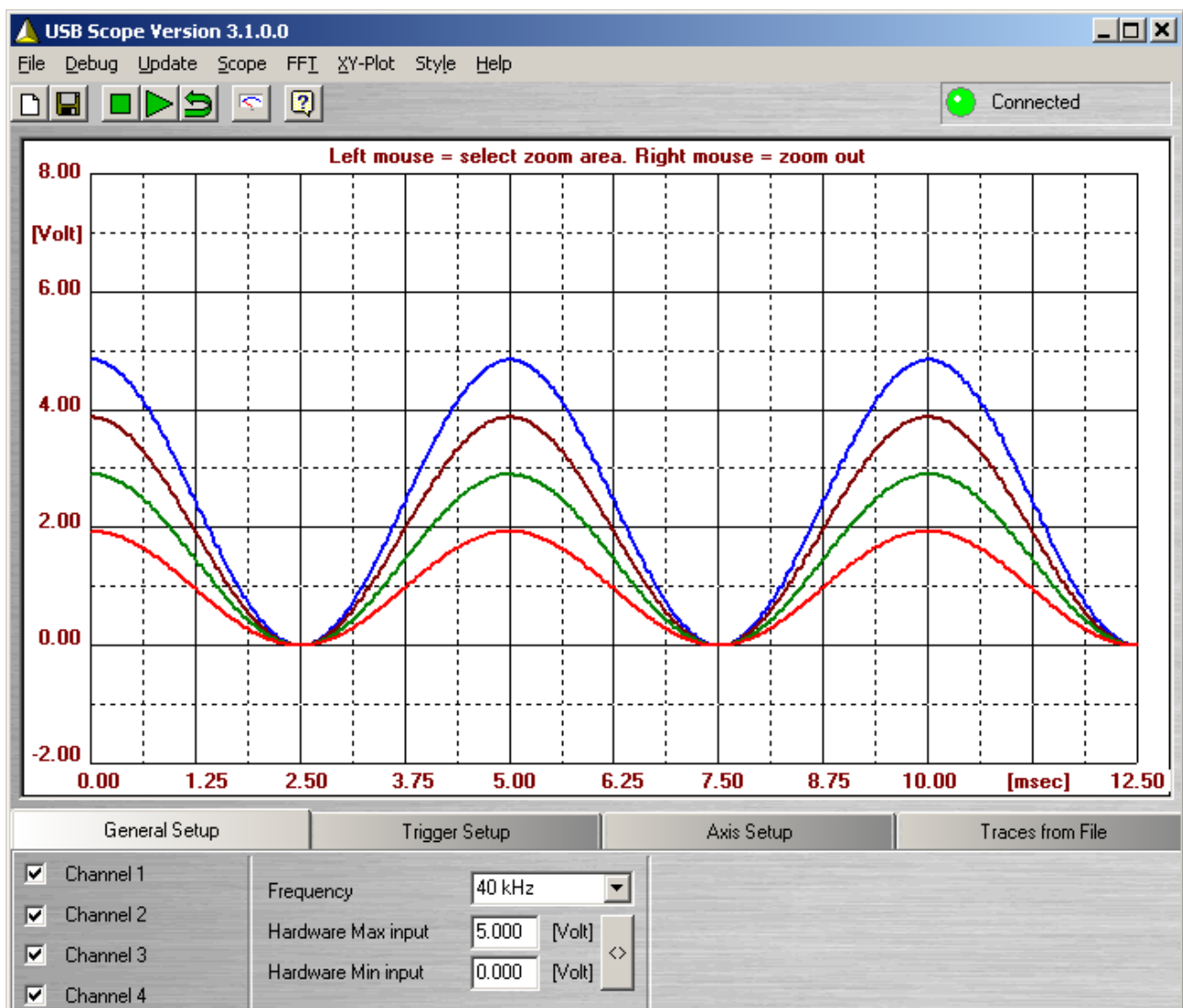


## 5 Using the software

### 5.1 Starting the main program

Start the oscilloscope software either from the desktop icon or from the Windows “Start” menu.

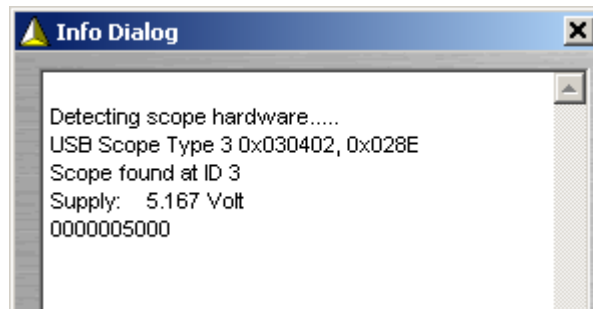
The UsbScope.eu main program will start. The screendump below shows a sine wave measurement on a 4 channel scope.







The “Info Dialog” will show some information about the program and the detected hardware.



In the **Info Dialog** some information is displayed about the detected scope. In this case, a type 0x03 USB oscilloscope is found. The string “0x030402” is a hardware identifier. If you ever have to report a problem with your scope, write down this string. To be able to support you optimal, we need to know this identifier.

## 5.2 Low / high voltage warning

Below warning will appear if your USB voltage is too low (or high).

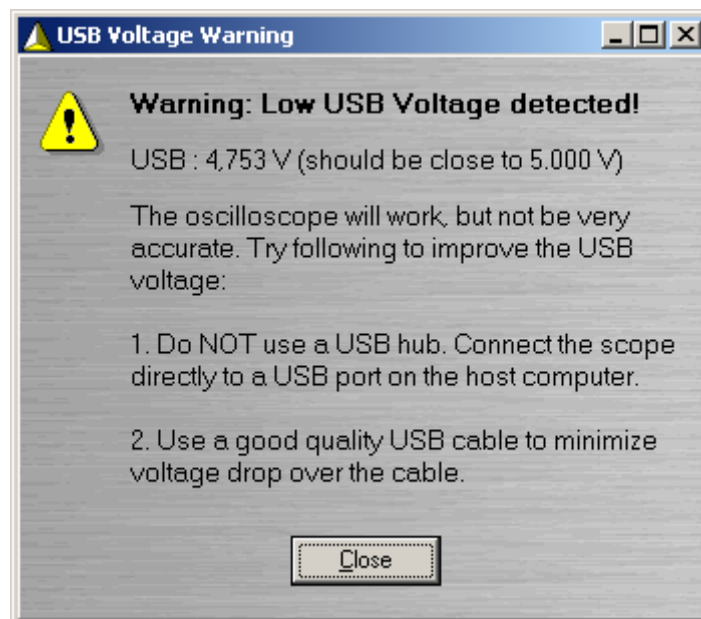


Figure 2, low voltage warning

As the oscilloscope uses the voltage from the USB port for reference, it is very important to have an accurate USB voltage. There are several options to improve oscilloscope accuracy:



1. Use a good quality USB cable. This will reduce the voltage drop over the cable.
2. Use an USB HUB with external power supply. In general, these will have a more accurate supply voltage then PC onboard USB hubs.
3. Use the voltage measured by the oscilloscope itself as the maximum measurement range. This will result in a very accurate oscilloscope. In the infodialog, read the measured voltage, then fill this voltage into the “Hardware Max Input” and press the “<>” button. Now the scope has maximum accuracy.

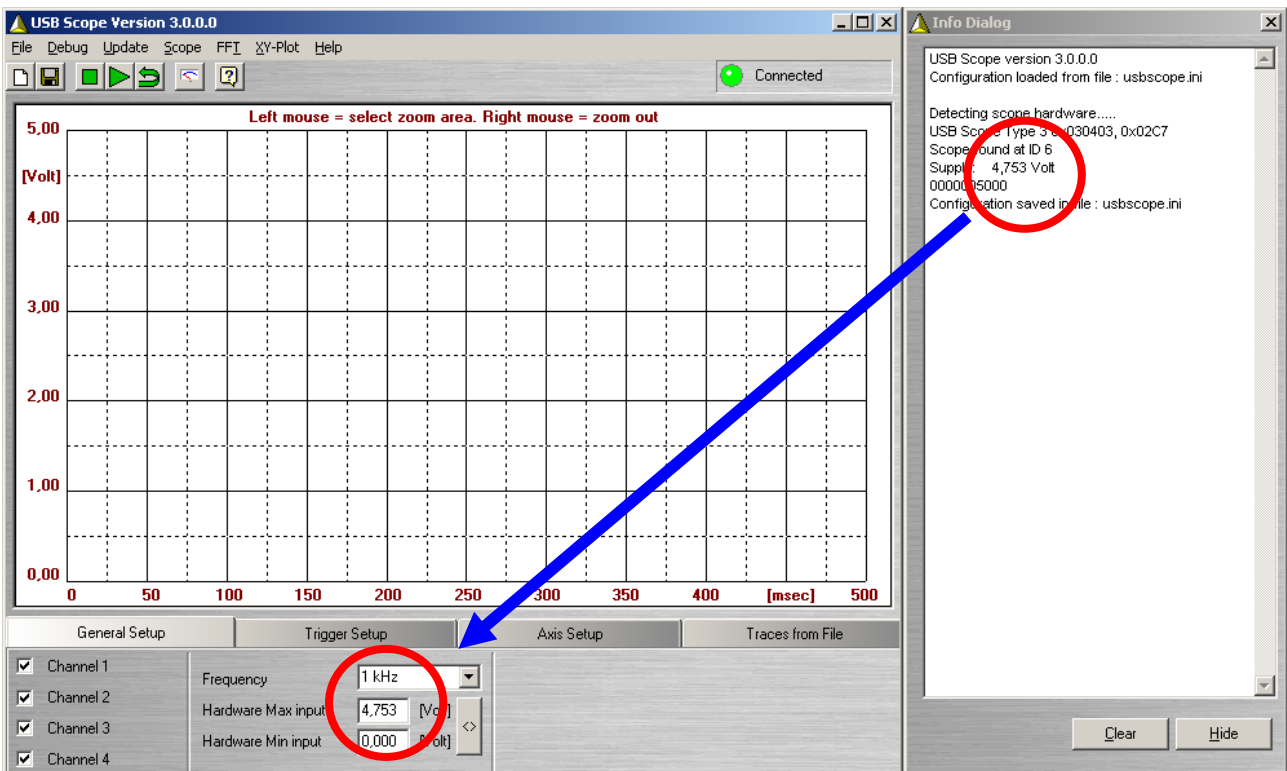






Figure 3, improve oscilloscope accuracy




### 5.3 Starting a measurement

If you hardware has been detected, you can start making measurements.

The buttons have following functions:

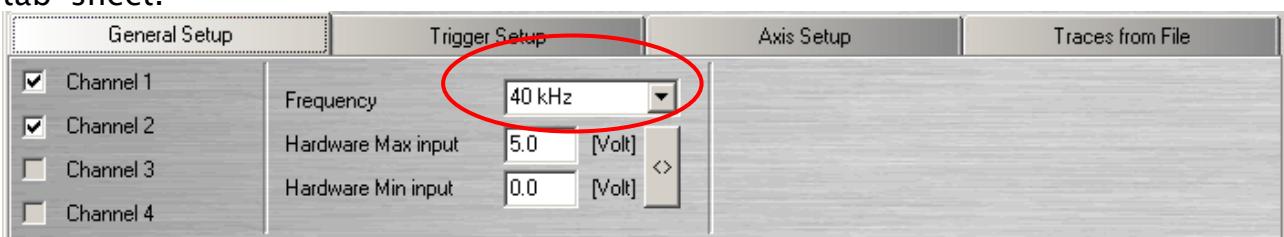
-  Clear measurement(s) window
-  Save measurement(s) to a file
-  Stop the measurement
-  Start a single measurement




-  Loop the measurement. The oscilloscope will continue to take measurements until the “Stop” button is pressed.
-  Opens the 4 gauges which will show live data.
-  Print hardware information to the Info Dialog

### 5.4 Setting the measurement frequency

Select the measurement frequency using the dropdown box in the “General Setup” tab-sheet.



### 5.5 Using the gauges

The oscilloscope program has the option to display 4 gauges with live data. Click the  button to open the gauges. With a 2 Hz update rate, the actual values for all channels are shown.

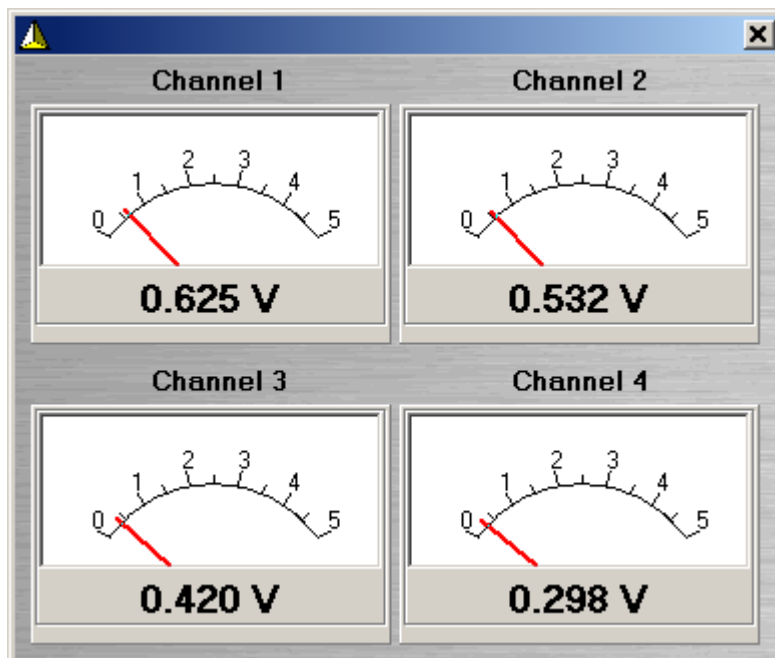
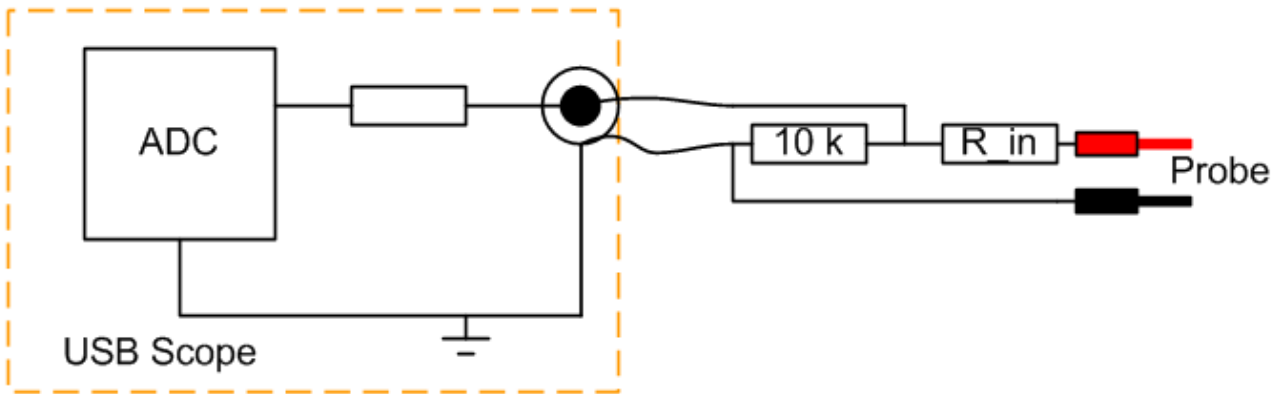


Figure 4, Voltmeter gauges



### 5.6 Setting the hardware measurement input range

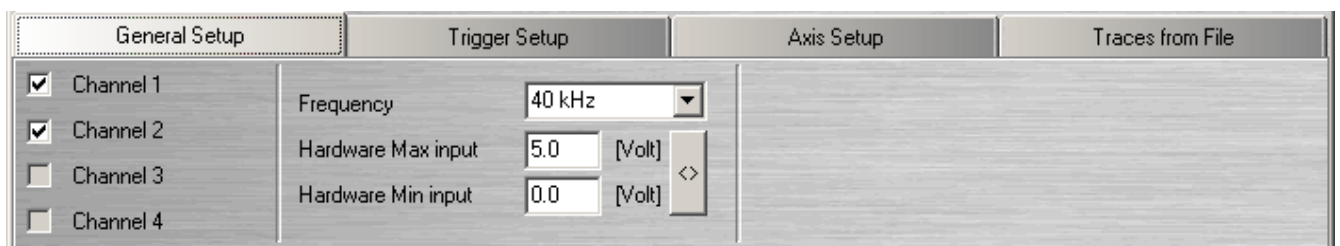
The oscilloscope has a default input range of 0 V – 5 VDC. You can change this by adding two additional resistors to the input of the oscilloscope. Figure below shows how these resistors have to be added to the wires of the measurement probes.



Add two resistor with the values as specified in the table below to change the input range accordingly. It is advised not to exceed the +15 V input range.

R_input value	Measurement range
no resistor	0 V to +5V
10 kOhm	0 V to +10 V
20 kOhm	0 V to +15 V

If you have changed the hardware voltage range that the oscilloscope can measure, you have to update the software too. Fill in the correct range in the “General Setup” tab sheet. You also can use these number to **calibrate** you scope hardware.



### 5.7 Calibrating your oscilloscope

In some special cases (especially after you have changed your input range settings), you might want to calibrate your oscilloscope. If you have a very accurate voltage source, connect it to the oscilloscope input and adjust the hardware input Min & Max until the scope reads the exact same numbers as your

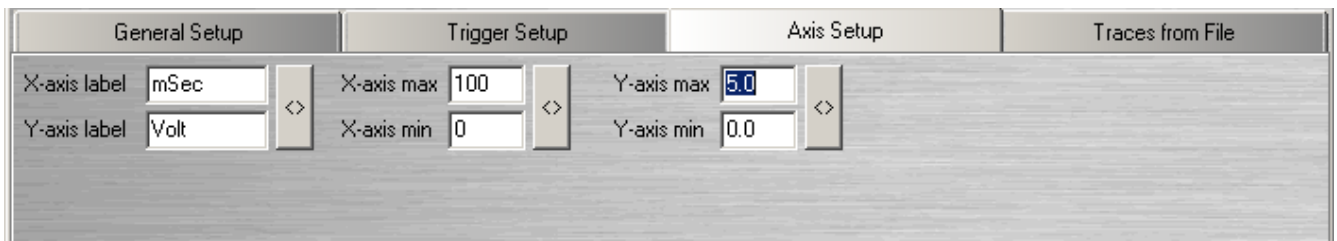


reference voltage source is generating. Remember that the oscilloscope has 10 bits resolution. At 5 VDC input range this equals to  $5/1024 = 4.88$  mV resolution. These are the smallest steps that can be measured.

**NOTE:** *ONLY use an USB hub with external power supply. The oscilloscope module is powered from the USB port and an USB hub without external power will influence the supply voltage, leading to an incorrect voltage reading of the scopes.*

## 5.8 Setting the labels on the axis

You can change the labels which are displayed on the horizontal and vertical axis in the “**Axis Setup**” tab sheet. Settings are stored in the configuration file.



## 5.9 Using the trigger function

This USB oscilloscope supports trigger functionality on channel 1 (only). If you want the measurement to wait until a certain trigger condition has been met, enable the trigger in the “**Trigger Setup**” tab sheet. Then set the “**Trigger Level**” to the desired value and select if the hardware has to trigger on a **rising** or **falling** edge. Press the “**Apply**” button once you have made your changes.



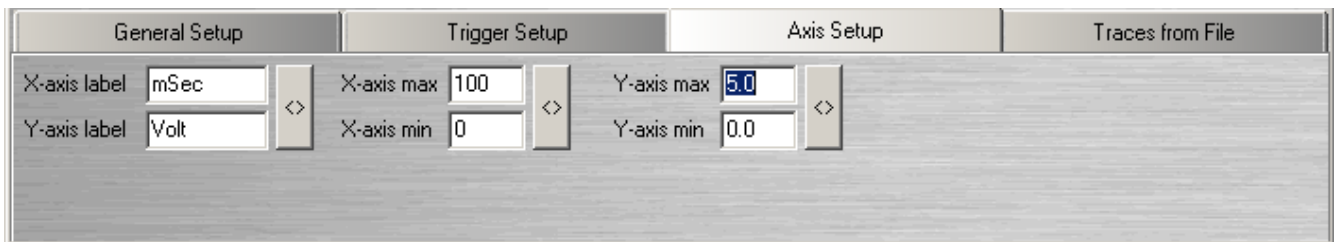
When you start a new measurement, the trigger LED (#3) will be on until the trigger condition has been met (in the above dialog the measurement will start as soon as the voltage on channel 1 rises up through 2.5 Volt).




### 5.10 Using zoom

There are 2 options to zoom into your measurement:

1. **Left click & drag** with your mouse on the area where you want to zoom in. A **right click** will reset the zoom to 100%.
2. Use the axis range settings on the “Axis Setup” tab sheet.

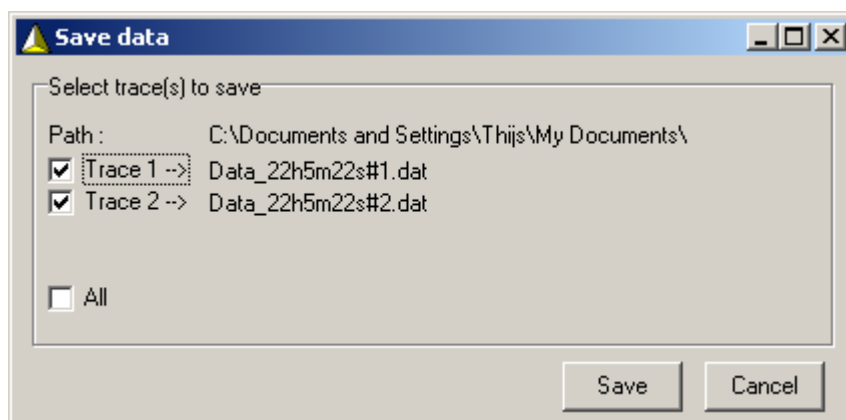


### 5.11 Saving data to files

If you want to save measured data to a file, you can do so by clicking on the  button or by selecting “**Save measurement**” from the **File** menu. A dialog will appear in which you can select the location and file name to save the data.

A second dialog will appear in which you can select which of the measured traces you want to save. Each trace will be stored in a separate file, so you can reload them independently.

Data files are simple TEXT files. You can edit them with a text editor or import them into Excel / Matlab / other.





## 5.12 Loading data from files

The program supports the option to load 2 independent measurements from file (previously save data files). To do so, select “ **Open Measurement 1**” or “**Open Measurement 2**” from the “**File**” menu. A file–open dialog will appear. Select the file with the data you wan to load and press open. The file will be loaded as trace 5 or 6.

The tab sheet “**Trace from file**” will show which files are opened. With the “tick–box” you can select to show / hide the loaded traces.



## 6 Contact information

If you have any questions regarding this product, you can find more information on our website:

<http://www.usbscope.eu>

It is also possible to email us at following address:

[info@usbscope.eu](mailto:info@usbscope.eu)