CINERAMA-SCOPE

User's Manual

1 Introduction

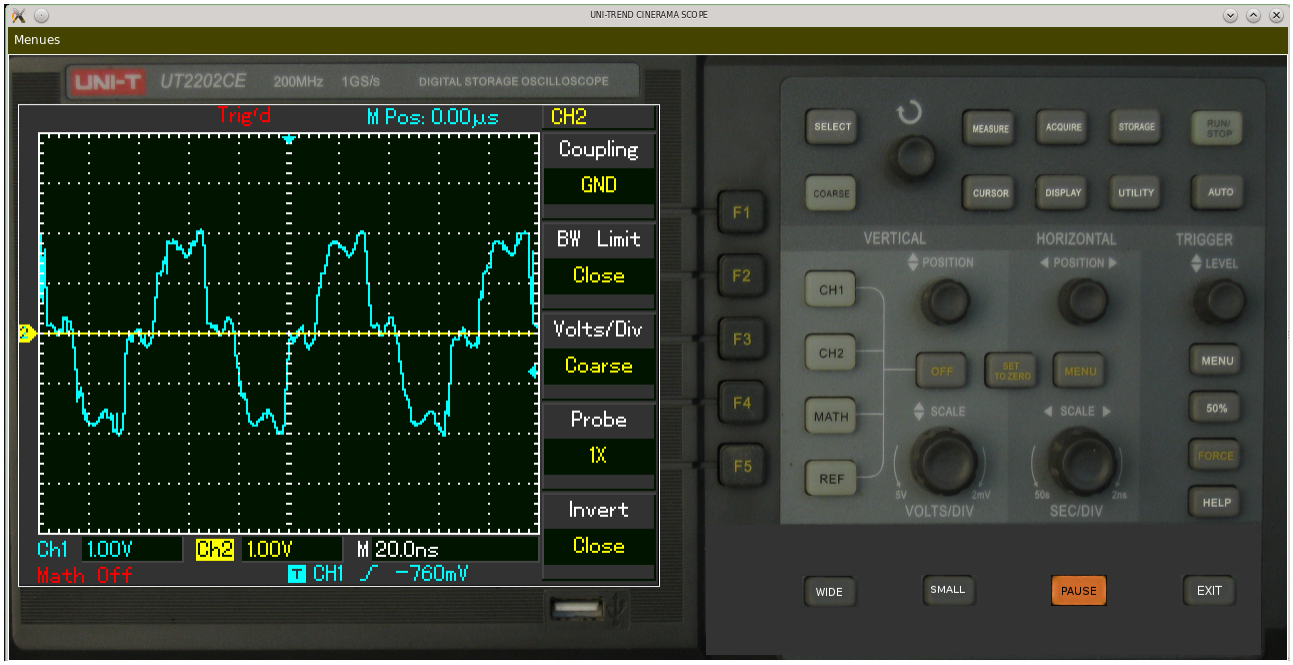
1.1 Concepts and Facilities

The Cinerama-Scope is a program to display the waveforms of a UNI-T Digital Storage Oscilloscope on a computer's monitor and control the DSO with mouse actions at the same time.

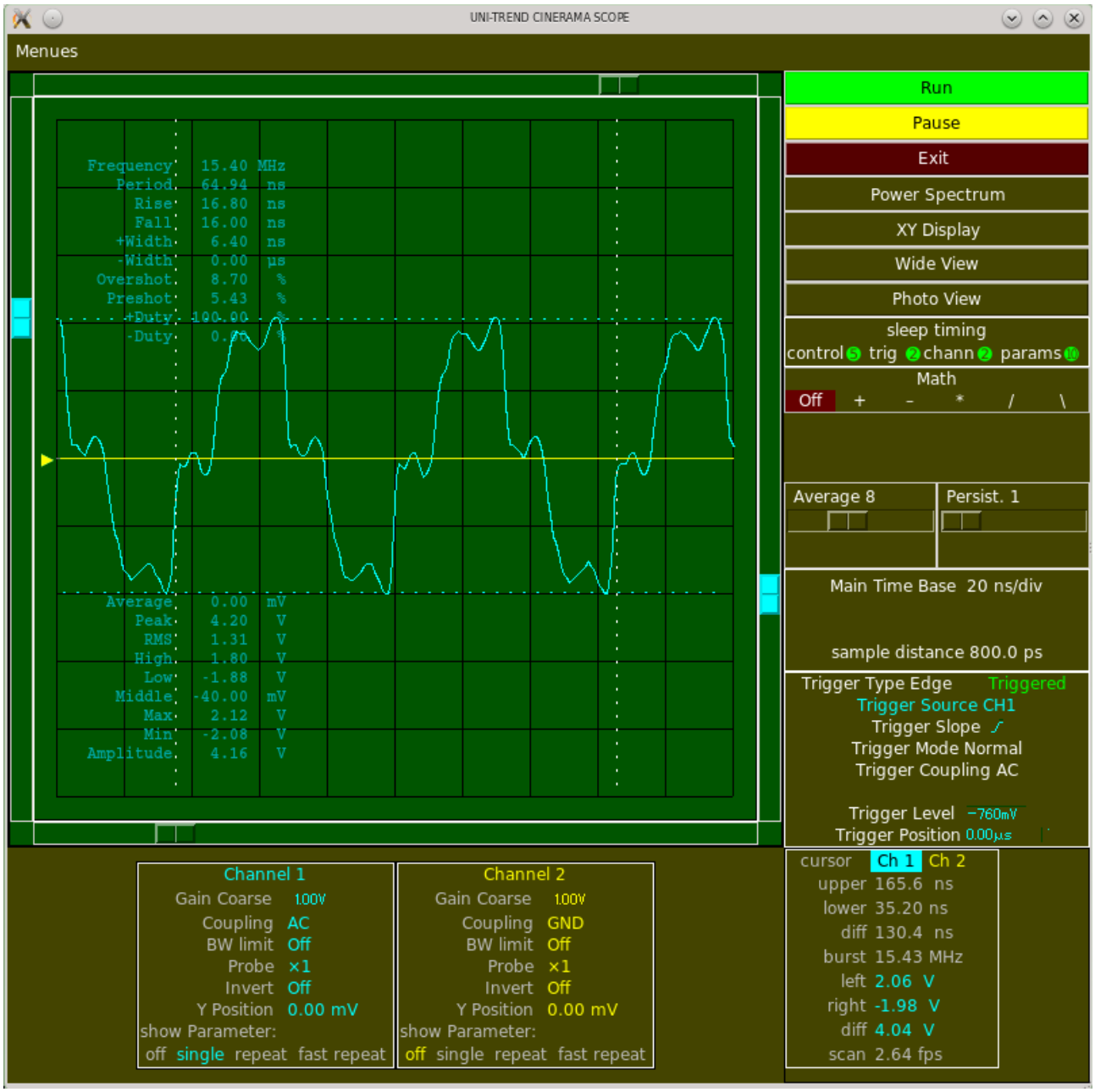
The program offers three views and user interfaces:

- A Photo View
- A Small View
- A Wide View

The **Photo View** displays a copy of the DSO's screen on a background from a photo of a DSO and provides all control facilities of the hardware by clicking on the buttons and knobs on the photo.



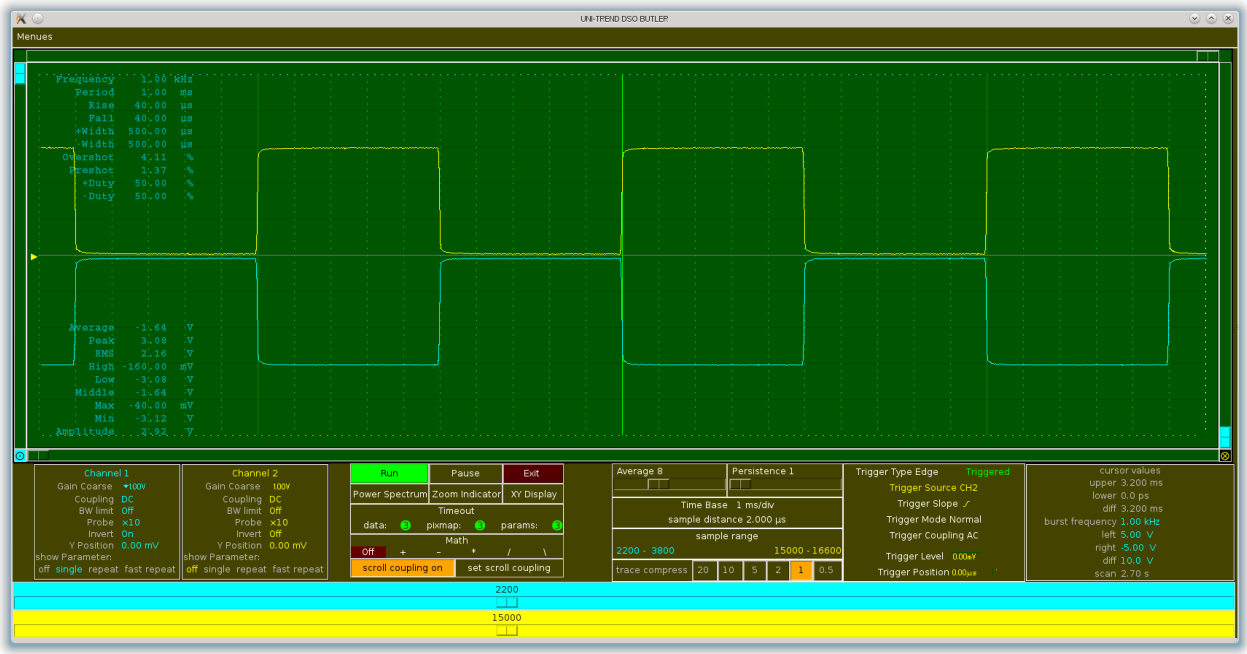
The **Small View** uses the transferred samples from the DSO to create a display with a wider range of y values and some enhancements. The available controls are limited to the more important ones but are arranged in a conventional layout and provide more comfortable operation.



The Photo View and the Small View use the same protocol as the Windows software from UNI-T and should work with any device from the UT2000 series with a 320 x 240 display. 800 x 480 displays will be supported if users contribute know how.

The **Wide View** uses a control sequence which the UNI-T software uses for acquiring samples in the “singlefresh” mode. These samples are 26112 bytes long but contain varying amounts of junk.

The UNI-T Software does not display these wide samples but writes them to a file if you select the File Save menu. This file contains still more junk. The whole complex looks like unfinished work and will show different results on different machines. Currently we cannot predict the outcome except for the UT2202CE. The possible users are kindly invited to contribute their experiences.



The width of the display may use all of available space, even spanning multiple monitors. The number of displayed samples may extend to some 10000, depending on time base.

The minimum display width is 1280 points.

1.2 Prerequisites

This program runs on a PC with Linux or Windows. There is a vague plan to port it to some single board computer.

The DSO must be connected to the computer via a USB 2 link.

You need Python 2.7 or Python 3 to run it. Python must have been built with Tkinter support.

The program uses the multiprocessing features of Python and so happily can use up to 3 processors.

Wide displays put a heavy burden on the cpu, a multi-core system is highly recommended.

The program cannot be controlled from the keyboard; the mouse must have a scroll wheel.

You need the following modules:

Tkinter, multiprocessing, ctypes, numpy, pyusb_1.0 and the usual standard modules.

Installation : Obtain the file mdso-0.9.6-tar.gz or a later version. Create a default directory for mdso, where it can put its configuration or result files and where it finds the photo.

Unpack the file to this directory, installation is not necessary.

1.3 Acknowledgments

The USB communication code was taken from the UT2XXX programs by Tomáš Košan (tk@k25.cz).

1.4 License

2 OPERATING INSTRUCTIONS

Generally functions which are controlled by pressing keys on the DSO are controlled by left clicking corresponding fields on the monitor.

Functions which are provided by turning knobs are substituted by scrolling on corresponding fields.

On the Photo View turning knobs is affected by clicking left or right.

The cursors are operated by dragging sliders.

There are some extensions to this.

2.1 Invocation

If your DSO is the only device from UNI-T connected the program will find and use it. Invocation is then quite simple (display width relates to Wide View only):

python mdso.py

will start the program with the display width last used.

python mdso.py -w

will start the program with maximum width and save it later.

python mdso.py -w 1920

will start it with the given width (select your option) and save it later.

If you have only one DSO but other types of devices from UNI-T too you should provide a text file PID.txt containing the product ID of your DSO. The contents should look like

0x0837

If you have more than one DSO online you must specify the USB bus and device of the intended DSO like:

python mdso.py -b 001 -d 002

(Linux only)

You should have a separate directory for each DSO for its history file. The language of the DSO must be English!

2.2 Windows

The following descriptions are for the Wide View. The Photo View does not need any tutorial, simply remember to select Pause before changing any setting.

The Small View is similar enough to the Wide View; so no special instructions are provided.

The program provides four windows:

- Scope Window
- Spectrum Window
- Diagnostic Window
- Scroll Indicator Window

The scope window is always present. The spectrum window is activated and deactivated by pressing the Power Spectrum Button. The diagnostic window is activated by a menu entry. The Scroll Indicator Window is activated and deactivated by the Scroll Indicator Button.

2.2.1 Scope Window

The scope window is divided vertically into two parts:

- The “CRT” area in the top
- The control area in the bottom

The bottom part is divided horizontally into the following areas:

- Two channel areas
- A button area
- A timebase area
- A trigger area
- A label area

2.2.1.1 CRT Area

The waveforms are displayed in the CRT area. The vertical scaling is 512 dots mapped to 256 sample values. Horizontal scaling can be selected with the compress control.

It is possible to display the parameter values of the two channels as requested in the channel area.

Displaying parameters significantly slows down the refresh of the waveforms.

Two vertical and two horizontal cursors can be positioned by sliders at the border of the CRT area.

The horizontal cursors visualize voltage levels, which are displayed in the label area. You select the channel for the values in the label area.

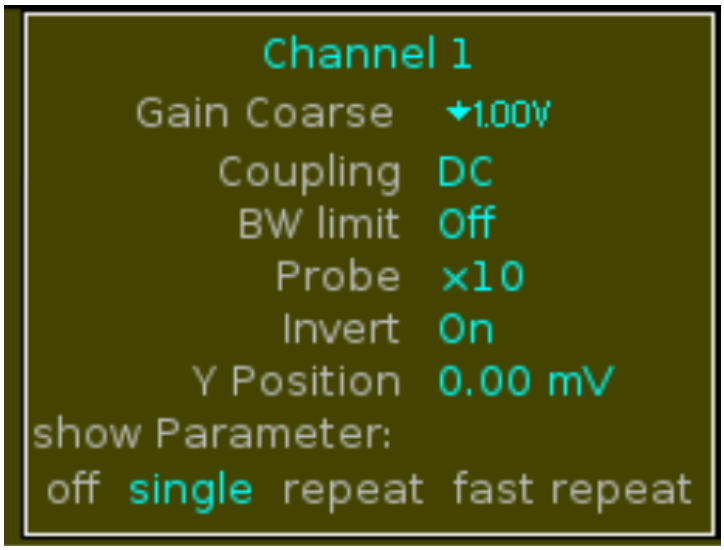
The vertical cursors visualize points in time, which are displayed in the label area.

Besides the actual waveforms a computed wave can be displayed as selected by the Math buttons.

Any number of reference waves can be created, deleted and displayed or hidden by menu entries.

More details on references will follow.

2.2.1.2 Channel Area

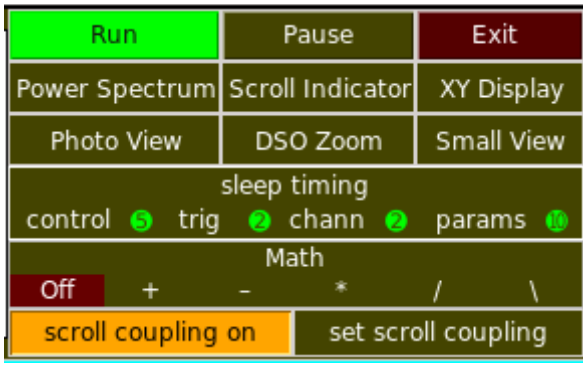


The channel areas provide functions for controlling Gain, Coupling, BW Limit, Probe Factor, Inversion, and Y-Position. Clicking the Gain field toggles coarse and fine. Clicking the Channel field right turns the channel off, clicking left turns it on.

Clicking Y Position resets it to zero.

The display of parameters can be controlled by the fields in the last line.

2.2.1.3 Button Area



Run Button

Clicking left on the Run Button toggles between Run and Stop. The indication on the monitor is not reliable because the DSO does not tell its state. Therefore, if the display is wrong, right clicking the button changes its appearance without affecting the DSO.

Pause Button

Clicking the Pause Button stops or restarts the refresh of waveforms and data.

This is helpful if you want to set a control from the DSO.

Turning knobs is much faster than scrolling.

Controls are still operational in Pause mode.

Exit Button

Clicking Exit terminates the program.

Power Spectrum

This Button shows or hides the power spectrum window.

Scroll Indicator

This button shows or hides a window to show the displayed area of the sample.

XY Display

A X-Y display is shown

Photo View

This selects the Photo View

DSO Zoom

This enables the Zoom mode of the DSO.

Small View

This selects the small View.

Sleep timing

The four indicators show the occurrence of timeout events or other errors. Excessive timeouts can be tuned by menu entries.

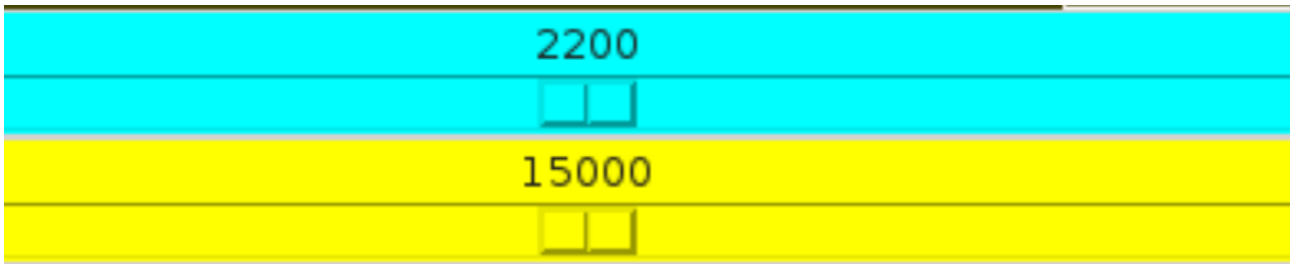
Math

You can select one of 5 math operations on the two channel values. The values used are not referred to the voltage levels but to the display base line. Normal operation is Ch1 op Ch2. “\” is Ch2 / Ch1.

Math is done on the computer, not the DSO.

Scroll Coupling

On the very bottom of the display are two sliders which select the displayed area of the sample.

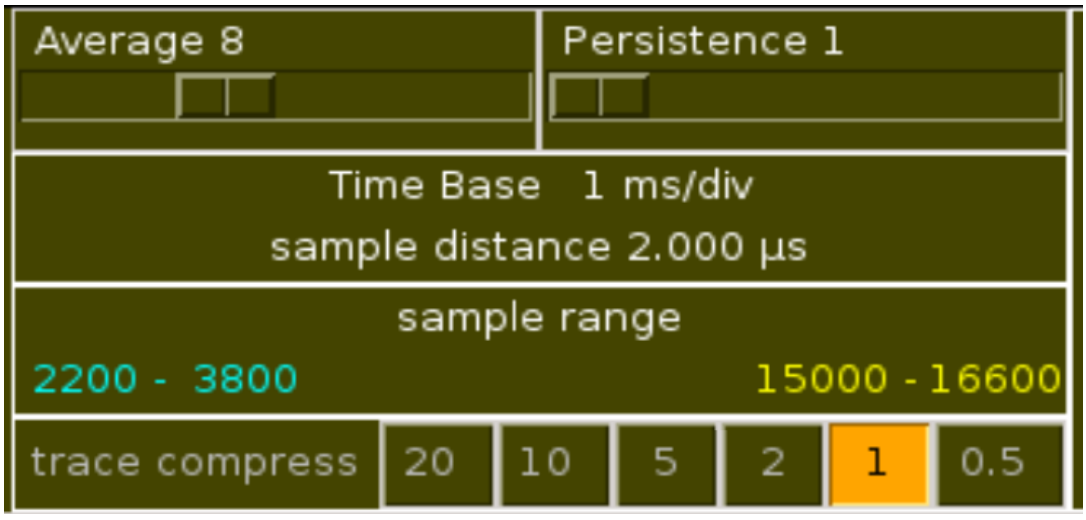


Normally the sliders are coupled so that both traces have the same time position. The numbers tell the first sample displayed. You may decouple the traces to accommodate different delays in the signal path or inspect different parts of the signals.

Set Scroll Coupling

If you want to keep a different scroll distance you may press this button.

2.2.1.4 Time Base Area



Besides the setting of the time base this area permits control of averaging and persistence.

Average

This Slider selects the amount of averaging. Right Clicking it clears the averaged value. Averaging is done on the computer. Changing controls clears the average.

Persistence

This slider controls the amount of persistence. Large values slow down the refresh rate.

Time Base

Scrolling changes the time base. Note: the display will not always change, but the grid lines will.

Sample Range

This label displays the first and last sample points of the traces. The positions 0 to 511 contain other data.

Trace compress

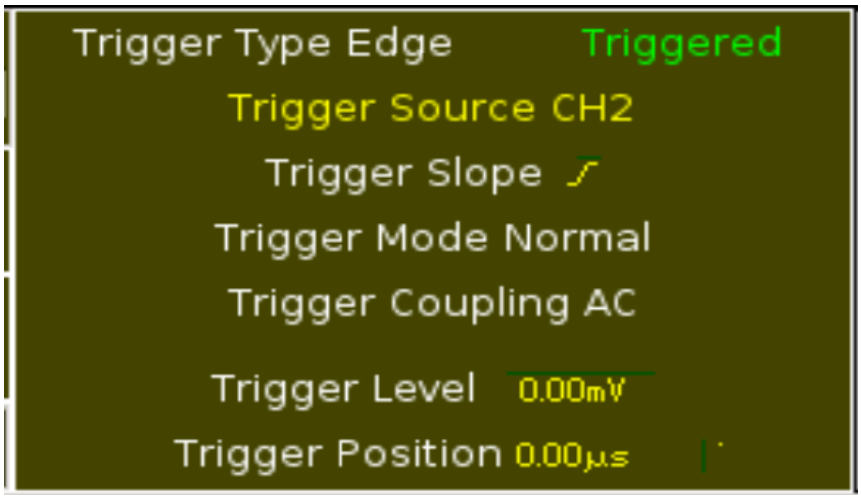
You may compress the trace horizontally to view larger parts of the sample.

2.2.1.5 Trigger Area

Clicking on the fields steps through the facilities.

Clicking Trigger Position positions the trigger point sample into the middle of the display.

Trigger Level and Trigger Position are controlled by scrolling the fields. The trigger Sample is indicated by a bright vertical grid line.



2.2.1.6 Label Area

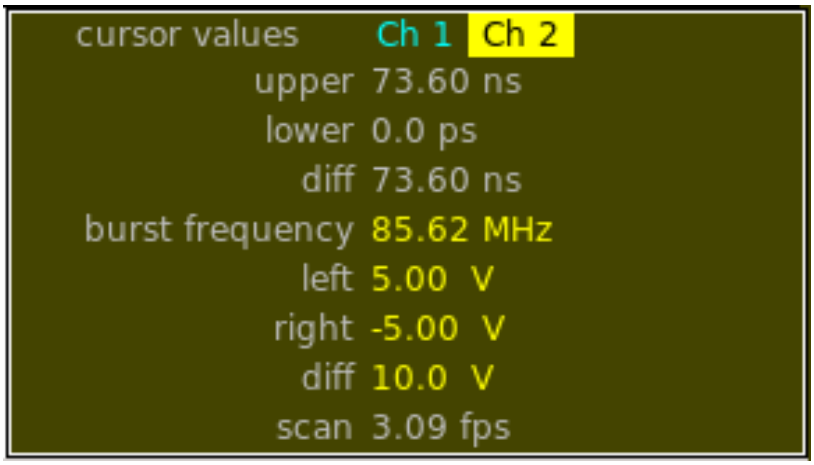
Here the cursor values are displayed.

The voltage levels are only valid if the gain mode is set to coarse.

Additionally the differences of the values are shown.

The burst frequency value is computed for the time range delimited by the horizontal sliders. See more later.

Scan shows the performance of the computer in frames per second (as in other computer games).



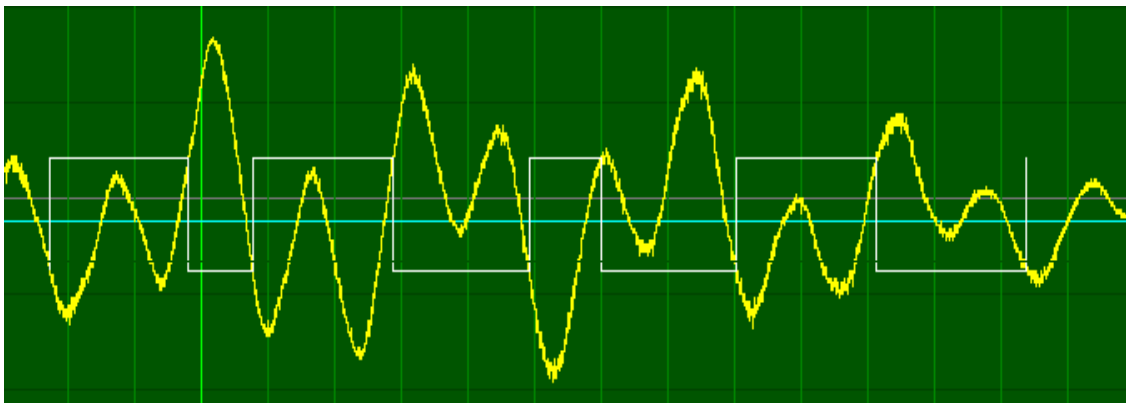
2.2.1.7 Burst Frequency Measurements

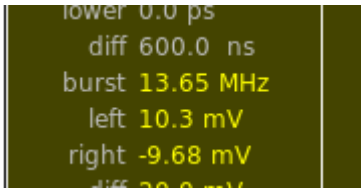
You can determine the frequency of a small part of a waveform such as ringing on unterminated cables.

First you select a time range with the horizontal cursors. The computed frequency will be displayed in the label area.

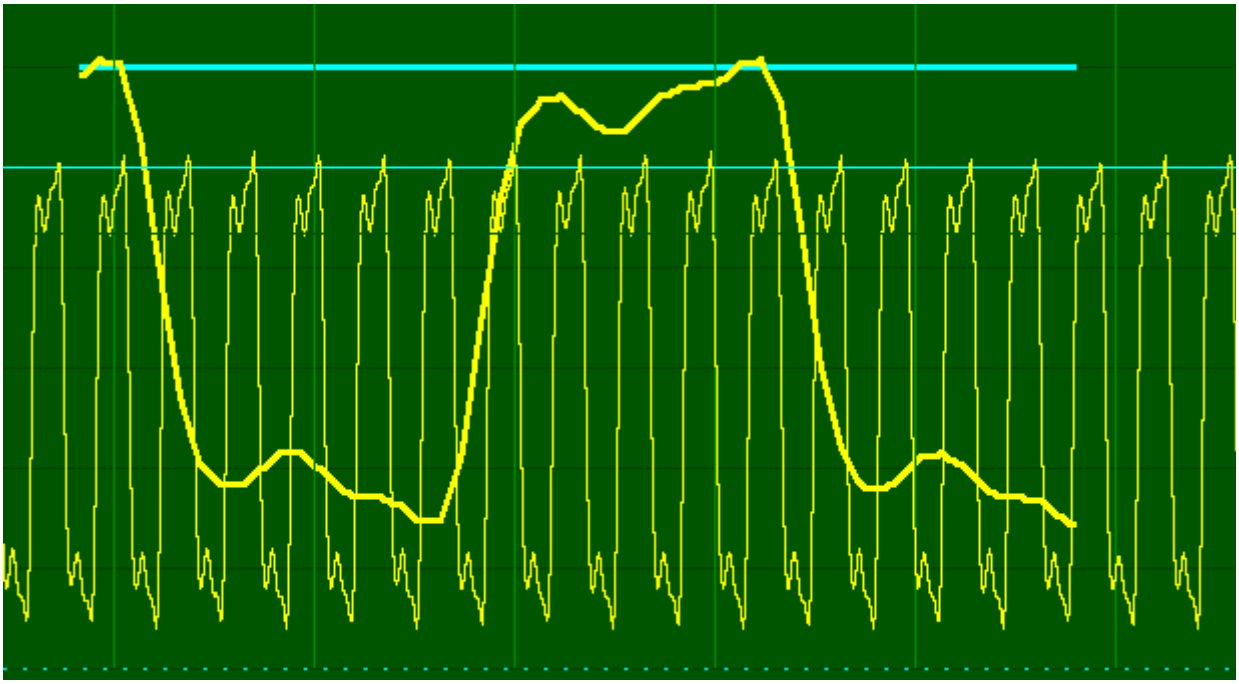
To help the algorithm you can set a hysteresis value. Click on the burst frequency field; a square wave will show up which tells you the base line for the zero crossings and the time points for the determination of the period. You can change the amount of hysteresis by scrolling on the burst frequency field. You can shift the hysteresis up or down by scrolling on the burst field with Control pressed.

You should select the time range as large as possible. For noisy signals averaging will help.



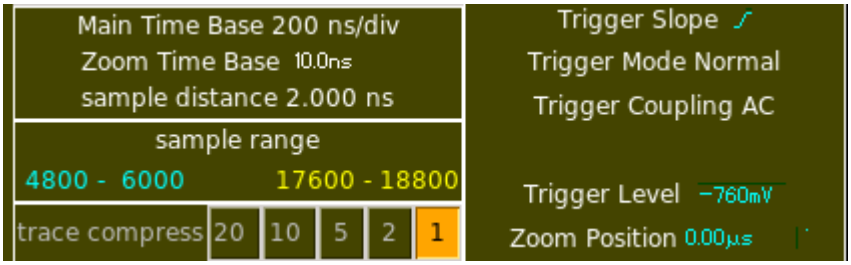


2.2.1.8 DSO Zoom



Selecting DSO Zoom superimposes a zoomed area over the normal display.

The Button Area display changes as follows:

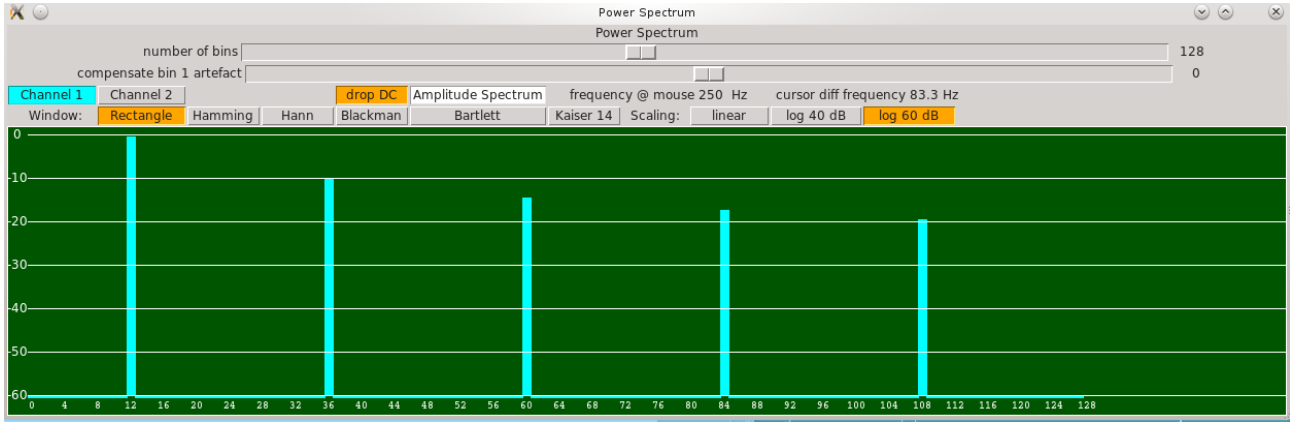


2.2.2 Spectrum Window

The Spectrum Window displays a power or amplitude spectrum of the selected waveform.

The time range for analysis is delimited by the vertical cursors of the CRT-Window.

The facilities are explained with the following screen shot.



2.2.2.1 Number of bins

This slider controls the number of partials displayed on the screen.

2.2.2.2 Channel Selector

These two buttons select the channel to be analyzed.

2.2.2.3 Window

Six windows can be selected.

For best results with the rectangle window select a time range which delimits an exact whole number of periods.

For a discussion of the window types consult Wikipedia.

2.2.2.4 Scaling

The possible selections should be self explanatory.

2.2.2.5 Drop DC

Does exactly this.

2.2.2.6 frequency @ mouse

If you click on the screen the frequency at this point is displayed.

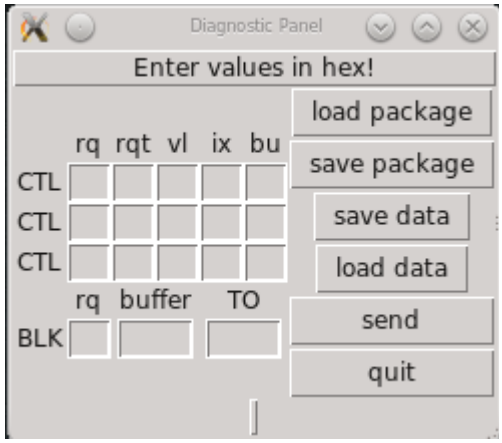
2.2.3 Diagnostic Window

The diagnostic window may be used to send arbitrary control sequences to the DSO.

Enter all values in hex. For repeated use the package may be saved and loaded.

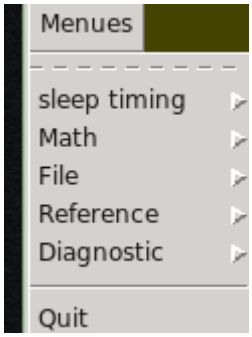
If the requests are a valid load pixmap command the pixmap will be displayed.

This is only for experiments. You need not care about it.

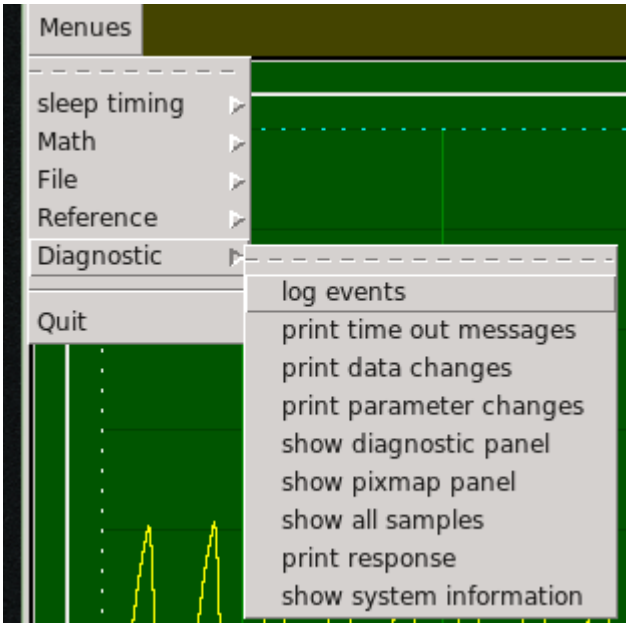


2.3 Menus

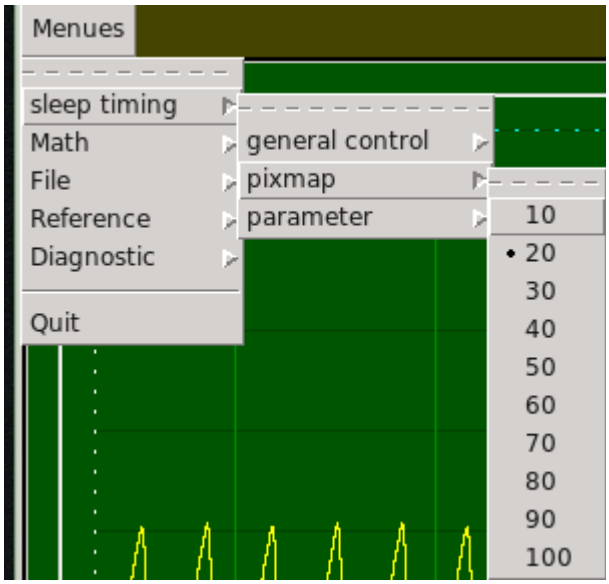
The main menu offers the following choices:



2.3.1 Diagnostic



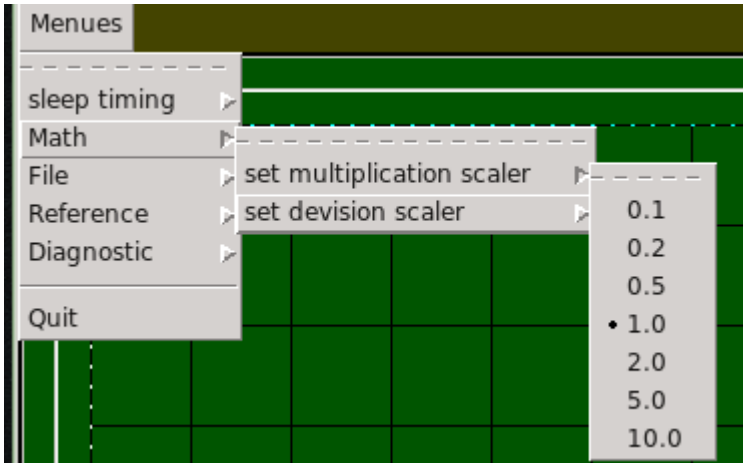
2.3.2 Timeout Tuning



The indicated values are sleep times in milliseconds.

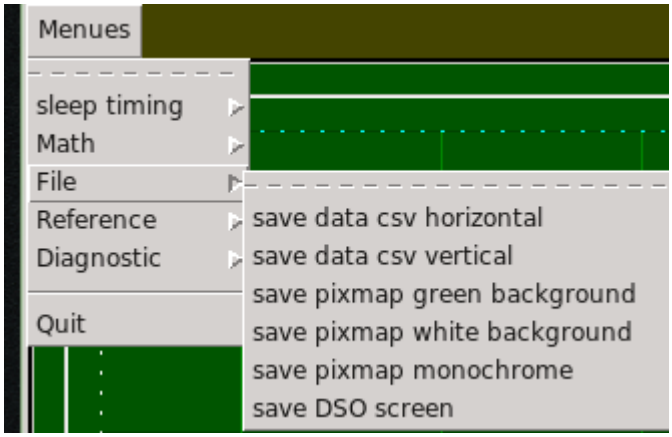
In the button area these values divided by ten are displayed in the LEDs.

2.3.3 Math



These values scale the computed waveform.

2.3.4 File

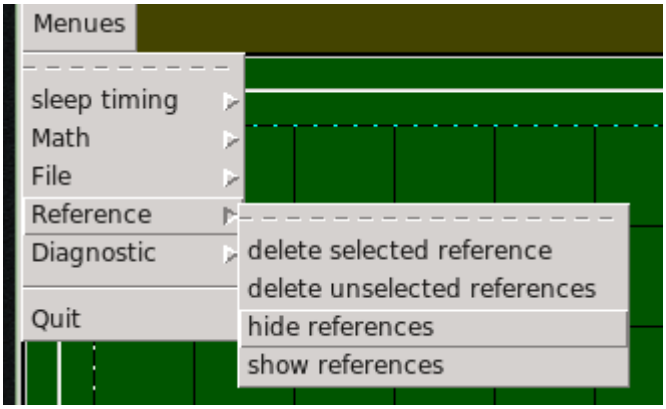


You may save the data of the waveform as cvs files for use in tables.

You may save a picture of the computer's CRT area.

You may save a screen shot of the DSO's screen area.

2.3.5 Reference



You create a reference by clicking on a waveform.

A color choose menu will pop up to define the color of the reference trace. Then an entry will show up to provide a caption for this trace. The caption can be dragged to a suitable place.

You may store any number of waveforms.

You can select one of them by clicking on it. The selected trace can be shifted up and down by the scroll wheels.

Clicking right deletes it.

Delete selected reference will do that.

Delete unselected references will delete all but the selected reference.

Hide and show will do this on all references.

3 Known Problems

Test Limitations

The program has only been tested on a UT2202CE. DSOs with a larger display will not work to satisfaction.

Only USB 2 connection is supported. If the program should crash you must kill the other processes of this application.

Timeout Problems

Since there is no documentation available on the USB protocol anything had to be designed by trial and error. The timing of the control messages is critical. There are menus to increase or decrease the sleep times.

Trigger Failure

If the trigger system is set up so that the DSO does not trigger, the program may spit a lot of error messages which do not help. Set the controls on the DSO so that it triggers.

Slow Sweep Speeds

Timebase values greater than about 5 ms / div do not work to satisfaction.

Single Sweeps

Single sweeps at maximum sweep rates show distorted traces.

Boot Sequence.

Do not boot the computer with the DSO connected and powered, the DSO may get confused. First boot and then start the DSO.

The program will sometimes show a dozen or so error messages after start up. If the messages do not stop then power off / on the DSO and restart the program.

The program needs read and write access to the DSO. If the protection is wrong the program will try to set the protection if you supply the root password (Linux only).

Getting Help.

Send mail to hermann-hamann@web.de. Don't expect prompt response, since I have no internet at home.

To ease error diagnostics start mdso with

python mdso.py | tee mdso.log

and send this logfile with your mail.

Also, from the diagnostic panel do a *show system information* command and send the file version.ppm.