# User Manual Oscilloscope
## version 1.4
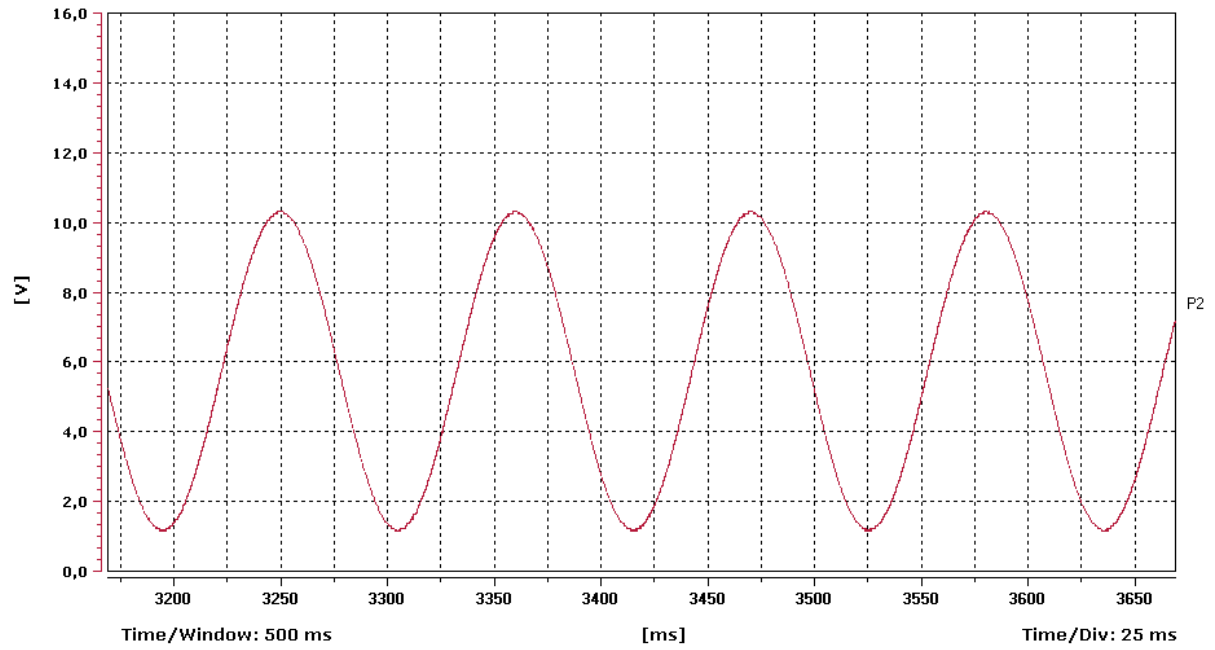


Time/Window: 500 ms    [ms]    Time/Div: 25 ms

**Table of Contents**

**Why Oscilloscope?**

- Digital multimeter is fully enough for control of circuits in static condition and for cases where the value changes gradually. But for dynamic control (the engine is running) and fault tracing of intermittent faults, the oscilloscope is a very powerful aid.

- In contrast to older analogue oscilloscopes for testing of high tension circuit in spark system, has a modern digital oscilloscope a variable high tension scale, that can show low and high tension (typically 0-5 V or 0-12 V) even a adjustable time scale, so every type of curves can be shown on an idealist way.

- The most oscilloscopes that has been designed for the car industry is light to carry and idealistic for use in the workshop. They can also be used inside the car while it is running for collecting dynamic data.

- Oscilloscopes screen can show shape, amplitude, frequency and pulse width as received signal. Through an effective draw voltage curve (vertically) in ratio to time (horizontal).

- It's easy to connect (normally only two cables) and the speed of testing can wide overstep time compared to a digital multimeter.

- This fast reaction render possible fault tracing of intermittent problems, even to observe the effect of parts in the system (for example when a multiplug loosen). Reaction time can at necessity be sufficient long for certain signals as throttle potentiometer.

- Later when the cause of an error has been diagnosed and taken cared of, the mechanic can verify it with a new oscilloscope test.

- The Oscilloscope can also be used to control the total condition of an engine system with catalytic converter by supervising the activity of the lambda sensor.

- The complicated electronic engine system that has been put together in catalytic converter cars is designed to keep the blend condition in tight tolerance, so that the lambdas can react on small changes in exhaust oxygen content and send back the information to the ECU in shape of a voltage signal. Through watching the lambda signal with the oscilloscope can uneven in the system performance discover. If the showed curve is satisfactory this is a reliable indication that the whole system is working correctly.

-The oscilloscope for the time being can receive information and is easy to connect and use. It renders possible display of a curve at the picture without special knowledge or experience. Interpretation of a curve makes it easier in high level the reference curve that is shown in this chapter

**Oscilloscope measure specification**

| Measure choice | Max input frequency / channel (Hz) | | |
|---|---|---|---|
| | USB | Serial cable RS232 | Bluetooth |
| P2 | 1300 | 500 | 350 |
| P2, P1 | 750 | 265 | 185 |
| P2, P1, (1-186) | 25 | 25 | 25 |
| P2, P1, (1-186)*2 | 19 | 19 | 19 |
| P2, (1-186) | 750 | 265 | 185 |
| P2, (1-186)*2 | 25 | 25 | 25 |
| P2, (1-186)*3 | 19 | 19 | 19 |
| (1-186) | 1300 | 500 | 350 |
| (1-186)*2 | 37 | 37 | 37 |
| (1-186)*3 | 25 | 25 | 25 |
| (1-186)*4 | 19 | 19 | 19 |

| Measure choice | Sample rate / channel (mS) | | |
|---|---|---|---|
| | USB | Serial cable RS232 | Bluetooth |
| P2 | 0,074 | 0,198 | 0,288 |
| P2, P1 | 0,13 | 0,374 | 0,544 |
| P2, P1, (1-186) | 4,035 | 4,05 | 4,05 |
| P2, P1, (1-186)*2 | 5,38 | 5,4 | 5,4 |
| P2, (1-186) | 0,13 | 0,374 | 0,544 |
| P2, (1-186)*2 | 4,035 | 4,05 | 4,05 |
| P2, (1-186)*3 | 5,38 | 5,4 | 5,4 |
| (1-186) | 0,074 | 0,198 | 0,288 |
| (1-186)*2 | 2,69 | 2,7 | 2,7 |
| (1-186)*3 | 4,035 | 4,05 | 4,05 |
| (1-186)*4 | 5,38 | 5,4 | 5,4 |

## Description Buttons

**Measure buttons**
With this set of buttons the user can start and stop the measuring.

► Play [F5]
The PLAY function starts the Oscilloscope to measure. When it starts it configures the graphs as it has been set to in the settings window. When you have started the Oscilloscope you have the possibilities to change the time axis, by using the SPAN buttons. The Settings Menu is hidden automatically when the button is pressed. To stop the oscilloscope press the STOP button.

■ Stop [F4]
The STOP function stops the Oscilloscope to measure. After the measure has stopped it is possible to go to the beginning, back, forward or to the end of the graph. It is also possible to increase or decrease the span of the x-axis. The SPAN buttons or the NAVIGATION buttons does this.

**Span buttons**
With this set of buttons the user can zoom in and out in the graph, either when the measuring is in progress or when it is stopped.

Zoom
When this button is pressed the SPAN buttons is being activated.

✦ Span +10 [F6]
One press on this button increase the span of the x-axis with 10 [ms].

++ Span +100 [F7]
One press on this button increase the span of the x-axis with 100 [ms].

− Span −10 [F3]
One press on this button decrease the span of the x-axis with 10 [ms].

-- Span −100 [F2]
One press on this button decrease the span of the x-axis with 100 [ms].

**Navigation buttons**
With this set of buttons the user can navigate forward or backwards in the graph, this is only possible when the measuring is stopped.

Scroll
When this button is pressed the navigation buttons is activated.

|◄ To the beginning
One press on this button shows the graph from the beginning.

◄◄ Back
One press on this button steps back in the graph window.

►► Forward
One press on this button steps forward in the graph window.

►| To the end
One press on this button shows the graph from the end.

**Cursor buttons**

You can use the cursor function to make custom voltage or time measurements on scope signals.

▶|◀ Cursor

This button lets the user select one of the following cursor functions.

**X** Value X

This cursor style displays the current x-axis value [ms].

|**X**| Period

This cursor style displays the value of the distance between the two displayed cursors when measuring two data points along the x-axis [ms].

**Y** Value Y

This cursor style displays the current y-axis value [V].

**↕Y** Peak to peak

This cursor style displays the value of the distance between the two displayed cursors when measuring two data points along the y-axis [V].

⊠ Hide Cursor

This function hides the cursor.

**Action buttons**

▼ Default Settings

The default settings button is setting the default values both on the x-axis and the y-axis. This is set out of the configuration in the settings window.

🖨 Print

The print function prints out the span that is visible in the graph. To make it more readable, the print is printed in black and white.

💾 Save

The save function saves the visible span of the graph into a .bmp file. This file can be opened in a standard picture-editing program.

↕↑ Menu Up/Down

With this function you can show or hide the settings menu. When you press PLAY button the settings menu hides automatically to show as much of the graph as possible. When you press the STOP button the settings menu shows automatically to make it easier to change the settings.
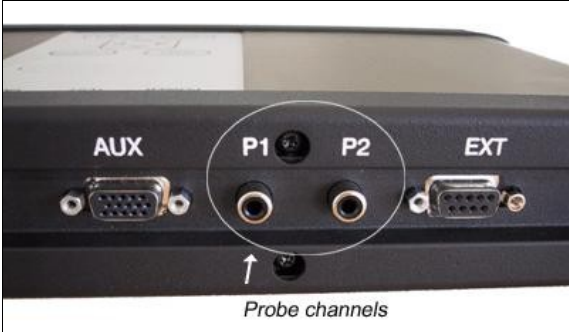
**X** Exit

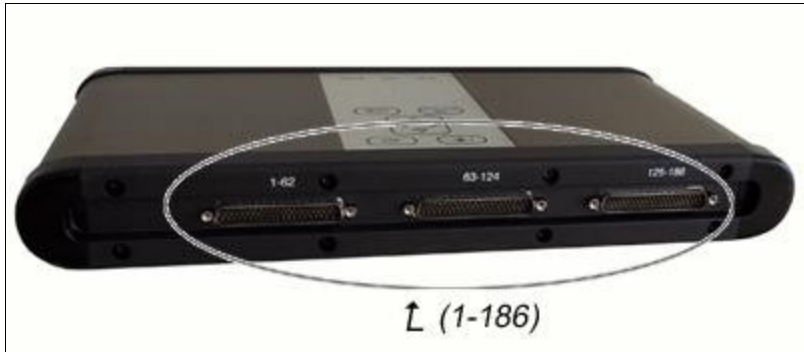This function terminates the application.

# Getting to Know your Oscilloscope

## Measure channels

There are two different types of measure channels:

Probe channels



Probe channels

Parallel channels



⅃ (1-186)

**Measure Settings**



The first selection the user has to do is the type of measure (1). There are eleven different types of measure options, which are:

- P2 (1 probe channel)
- P2, P1 (2 probe channels)
- P2, P1, (1-186) (2 probe and 1 parallel channels)
- P2, P1, (1-186)*2 (2 probe and 2 parallel channels)
- P2, (1-186) (1 probe and 1 parallel channels)
- P2, (1-186)*2 (1probe and 2 parallel channels)
- P2, (1-186)*3 (1 probe and 3 parallel channels)
- (1-186) (1 parallel channel)
- (1-186)*2 (2 parallel channels)
- (1-186)*3 (3 parallel channels)
- (1-186)*4 (4 parallel channels)

Note that P2 is the default probe channel, and has to be used when measuring on a single probe channel.
When one measure type is selected the Settings window (5) is filled with the number of channels in the selected measure type.
If a measure with a parallel channel is selected the next selection is the adapter cable (2). When this is selected the parallel channels is filled with the cable No in the settings window (5).
To be able to select a pin to the parallel channels the user has to select the specific channel in the settings window (5) and then make the selection in the Pin box (3).
There is also an option to choose different ranges, which are:
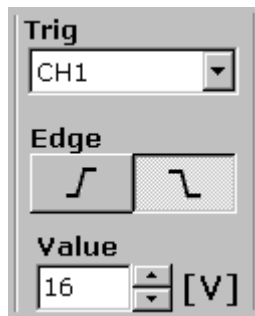
- 0 – 6 V
- -6 – 6 V
- 0 – 16 V (Default)
- -16 – 16 V
- 0 – 27 V
- -27 – 27 V
- 0 – 200 V (Only P2)

This selection is done in the Range box (4).
Note that P1 and all of the parallel channels always get the same range setting.
When all of the necessary settings is done the PLAY button is enabled, and the user can start to measure.

**Trig function**



With the Trig function the user have the possibility to see periodic signals in only one window.

In the Trigger menu there is a combo box where the user can select which channel to trig on. When a channel is selected a red line is showing in the graph. This line is representing the trig value. When the value is changed in the value settings the line is also moving. There is also a setting for which edge to trig at (Up edge or Down edge).

To start a measure with the trig function press down the PLAY button. If the function doesn't find a trig the trig line is red, but if the function finds a trig the trig line becomes green. The trig value and the edge setting can be changed during a measure.
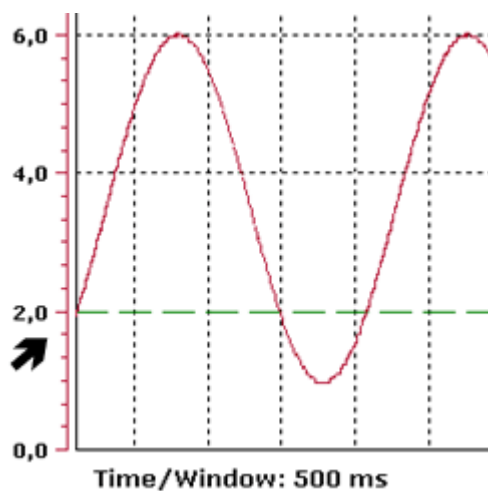
Up Edge                                                    Down Edge
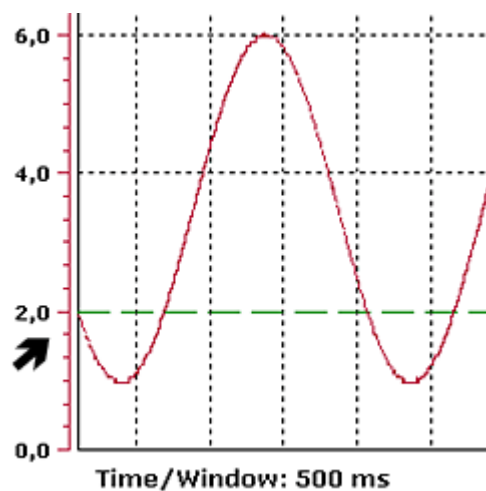
## Extra funktions

### Zoom

If the zoom button is pressed and the mouse pointer is moved over the x-axis or any y-axis the mouse pointer is changing shape.
 When this happens and it's on the x-axis, hold down the left mouse button and move the mouse left to zoom in, and move it to the right to zoom out. If the mouse pointer it's on a y-axis, hold down the left mouse button and move the mouse ahead to zoom out and in the opposite direction to zoom in. To set the settings back to the default settings press the default button.

### Scroll

If the scroll button is pressed and the mouse pointer is moved over the x-axis or any y-axis the mouse pointer is changing shape.
When this is happening and it's on the x-axis, hold down the left mouse button and move the mouse to the left to scroll the graph backwards, and move it to the right to scroll forward.
If the mouse pointer is on a y-axis, hold down the left mouse button and move the mouse ahead to scroll up and in the opposite direction to scroll down. To set the settings back to the default settings press the default button.

### Times

In the graph the oscilloscope shows two time stamps, this to simplify the analysing of the Graph.