

**USB Oscilloscope add-on
Spectrum analyzer
User's guide
Version 1.01**



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Warranty conditions

The ETC s.r.o. company guarantees reliable operation of the oscilloscope in compliance with this documentation during a period of 24 months from the date of purchase.

Should a malfunction occur during the warranty period, excluding errors for which ETC can not be held responsible, ETC guarantees the repair of the product or its replacement with a new or repaired one free of charge.

The ETC company shall not be responsible for malfunctions on the device caused by an accident, incorrect manipulation, unauthorized interventions or similar.

When requesting the warranty service, the customer should send the device in its original package to the dealer from whom it was purchased or directly to the ETC company. The warranty certificate together with a description of the defect or malfunction should be included in the package. The customer agrees that a new or repaired product to be shipped would be insured against damage or loss during the transport and that he will cover the costs for the shipment and insurance.

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Precautions (M520 and M570 series)

Please follow these recommendations to avoid any possible problems that might occur while using the oscilloscope of M520 or M570 series:

- read the User's Guide
- always connect device using cable, which is the part of package. If it is not possible, always use USB 2.0 cable.
- never connect signal with absolute voltage higher than 200V to measuring inputs. This value is valid for frequencies lower than 100kHz. Over this frequency, the voltage lowers with raising frequency. For example frequency 200kHz of 100V, 400kHz of 50V is the limit. However we do not recommend to connect voltage higher than 50V, because touching it can be dangerous for health.
- never connect voltage lower than -10V and higher than +13V to the external triggering input (frequency lower than 20kHz). Over 20kHz, voltage lower than -0.5V or higher than +4V is not recommended.
- never connect voltage to the oscilloscope ground, it may result in device or computer damage
- never disassemble device, since there are no user serviceable parts inside
- always use device in indoor laboratory environment
- never integrate device into any other system

Precautions (M595 oscilloscope)

Please follow these recommendations to avoid any possible problems that might occur while using the oscilloscope of M595:

- read the User's Guide
- always connect device using cable, which is the part of package. If it is not possible, always use USB 2.0 cable.
- never connect signal with absolute voltage higher than 200V to measuring inputs. This value is valid for frequencies lower than 100kHz. Over this frequency, the voltage lowers with raising frequency. For example frequency 200kHz of 100V, 400kHz of 50V is the limit. However we do not recommend to connect voltage higher than 50V, because touching it can be dangerous for health.
- never connect voltage lower than -10V and higher than +13V to the external triggering input (frequency lower than 20kHz). Over 20kHz, voltage lower than -0.5V or higher than +4V is not recommended.
- never connect voltage to the oscilloscope ground, it may result in device or computer damage
- never disassemble device, since there are no user serviceable parts inside
- always use device in indoor laboratory environment
- never integrate device into any other system
- always use the power adapter from the package. If it is not possible, always use power supply with 10 to 18VDC with min 7W output power with 2.1/5.5 central + DC connector.
- be sure, that free air flow is possible on the bottom side of the instrument. In other case the cooling of the instrument's circuitry would be impossible.

Precautions (M770 series)

Please follow these recommendations to avoid any possible problems that might occur while using the oscilloscope:

- read the User's Guide
- always connect device using USB cable, which is the part of the package.
- never connect voltage higher than 200Vp between the measuring ground and the input. This value is valid for frequencies lower than 100 kHz. Over this frequency, the voltage lowers with rising frequency. For example voltage of 100Vp with frequency 200 kHz is the limit. You can always connect voltage with peak value up to 4 times the input range set (32 time the sensitivity in v/div) independent on frequency.
- never connect voltage lower than -10V and higher than +13V to the external triggering input (frequency lower than 20 kHz). Over 20 kHz, voltage lower than -0.5V or higher than +4V is not recommended.
- the measuring ground is common for all of the measuring connectors. The voltage connected to one of these grounds appears also on the rest two of them. Do not connect different voltages to the grounds of the measuring connectors. It can destroy the measuring instrument and/or the measured device.
- when the voltage above 50V is connected to one of the measuring connector's ground, touching the rest of two of them can be dangerous for your health.
- when you connect the voltage higher then 50V to the measuring ground, please be sure, that the instrument is dry. If you brought the instrument from the colder environment please wait until it warms up to the temperature of the new environment.
- when the voltage higher than 50V is connected to the measuring ground, for safety reasons we recommend connect the chassis ground of the instrument (connector on the back side of the instrument) to the ground of the environment (i.e. main's ground, water pipe, etc...). The grounding cable is in the standard package.
- do not connect voltage higher than 500 Vp to the measuring ground. Also the $V * Hz$ factor should be lower than 50000. For example if the voltage is 500V its frequency should be lower than 100 Hz.
- never disassemble the device, since there are no user serviceable parts inside.
- always use device in indoor laboratory environment
- never integrate device into any other system

1. Installation

1.1. Requirements

Minimum configuration:

- PC PENTIUM compatible computer
- 128MB RAM
- CD-ROM
- VGA with resolution 800 x 600
- USB port 1.1
- mouse or other tracking device
- at least 20MB free space on the hard drive
- MS Windows 98 SE, ME, 2000, XP or Vista

Recommended configuration:

- PC PENTIUM compatible computer with speed of at least 1.6GHz
- 512MB RAM
- CD-ROM
- VGA with resolution at least 1024x768
- USB port 2.0
- mouse or other tracking device
- at least 20MB free space on the hard drive
- MS Windows 98 SE, 2000, XP or Vista

1.2. Hardware installation

Connect one side of the cable to the computer, other one to the device. Proceed with the software installation.

WARNING: Always use cable, which is the part of the package. Usage of the improper cable can disable communication with the computer.

1.3 Software installation

The software and the device drivers are located on the enclosed CD. Insert the CD into the CD-ROM drive. Then follow the instructions of the setup program that should launch automatically. If the CD autorun is not enabled in your computer's settings, please run file *autorun.exe* from the CD.

2. Basic information

2.1. Front and rear panel layout

2.1.1. Front panel layout

Channel A, channel B, external synchronization input / compensation generator output and LED are accessible on the front panel.



Fig. 2.1.1.1. – Front panel of the M570 series oscilloscope



Fig. 2.1.2.1. – Front panel of the M520 series oscilloscope



Fig. 2.1.3.1. – Front panel of the M590 series oscilloscope



Fig. 2.1.4.1. – Front panel of the M770 series oscilloscope

If the LED color is:

- green, the device is configured and there is no communication with a computer in this moment
- orange, the device communicates with a computer
- red, device is powered, but not configured

2.1.2. M770 series rear panel layout

Two connectors are available on the rear panel.

- USB connector for communication with computer (used for supplying device with power as well)
- banana jack (4mm) for optional ground connection. This connector is connected to the ground (chassis) of the host computer and should be connected to the

environment ground when the higher voltage than 50 V is connected to the instrument's measuring ground (shielding of the BNC connectors on the front panel).



Fig. 2.1.2.1. – M770 series rear panel layout

2.1.3. M595 oscilloscope rear panel layout

Two connectors are available on the rear panel.

- USB connector for communication with computer (used also for supplying a interface circuitry)
- Power connector for connection the auxiliary power source, which is usually the power adapter supplied in the basic package. The auxiliary power source should supply the voltage between 10 to 18VDC / 7W min. and connects to device by 2.1/5.5mm central + DC connector.



Fig. 2.1.3.1. – M595 rear panel layout

2.2. Basic terms

This Chapter explains the basic terms used throughout the text.

Click – Position the mouse cursor over the chosen object. Then press and release the left mouse button.

Double-Click – Two successive clicks.

Drag – Position the mouse cursor over the object you want to move. Then press the left mouse button and hold it down. The chosen object moves with the mouse cursor. After releasing the mouse button the object moves to the new location.

Enter the value into the edit box – Click the edit box. Use the keyboard to enter the desired value and confirm pressing “Enter”.

Insert the value into the edit box – Click the edit box. Use the keyboard to enter the desired value.

Set the value using the scroll bar – It is possible to change a value by simply dragging the scroll bar slider. Clicking the arrows of the scroll bar increases or

decreases the value by minimal steps. Clicking in between the slider and the arrows changes the value by larger steps.

Select the value from the combo box – Open the list of all possible values of the edit box by clicking it. Then set the desired value by clicking it.

3. Main window

The main window opens after the application starts. The controls in the this window allow you to use most of the analyzer functions.

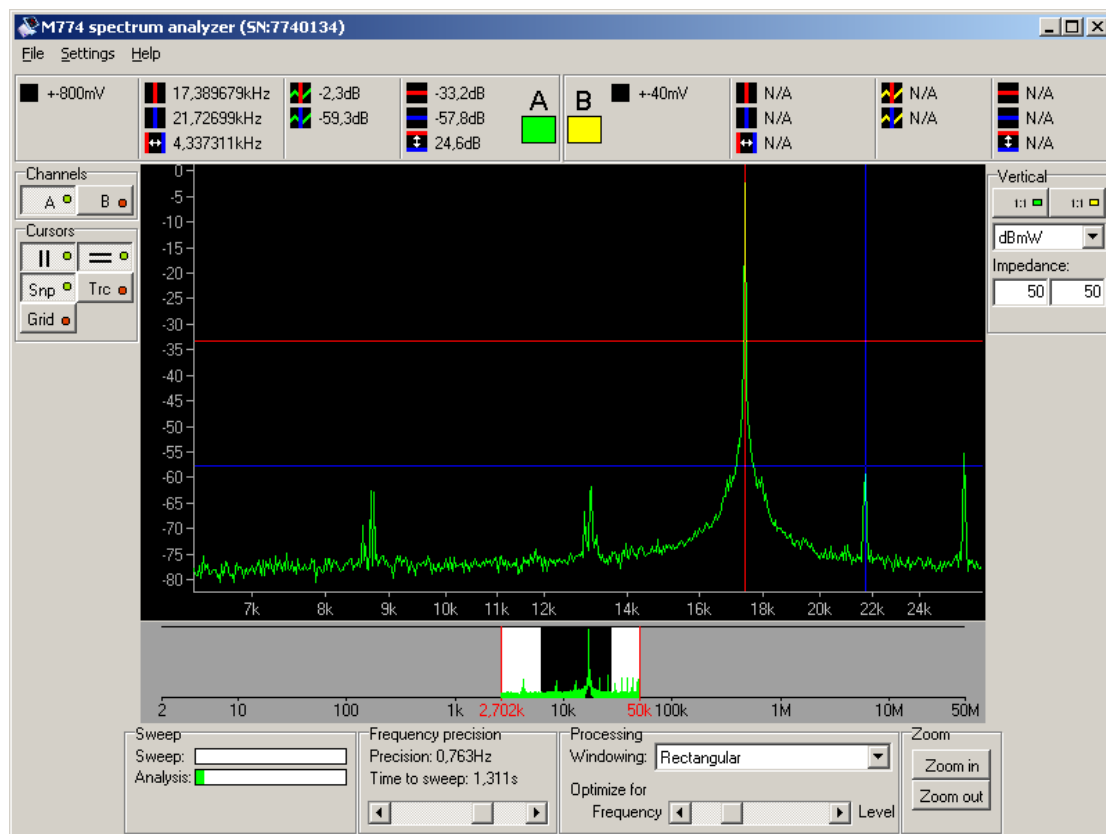


Fig. 3.1. – Main window

All controls connected to one of the channels have that channels color.

TIP: The channel color can be changed in the main menu.

3.1. Navigator

The navigator is located below main screen. It allows you to select the band to be analyzed by the software.

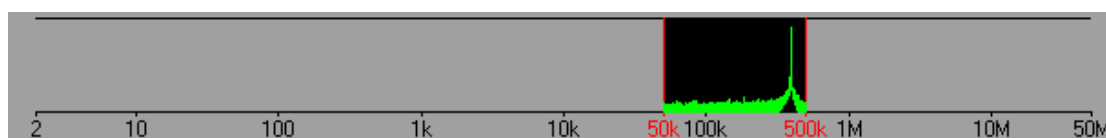


Fig. 3.1.1. – Navigator

The analyzed band is marked by two vertical lines. Drag any of them to change bandwidth.

The black square marks the position of the main screen in the bandwidth. Drag this square to change spectrum part displayed in the main screen.

3.2. Main screen

The main screen is located in the middle of the main window. This screen is used to display the spectrum.

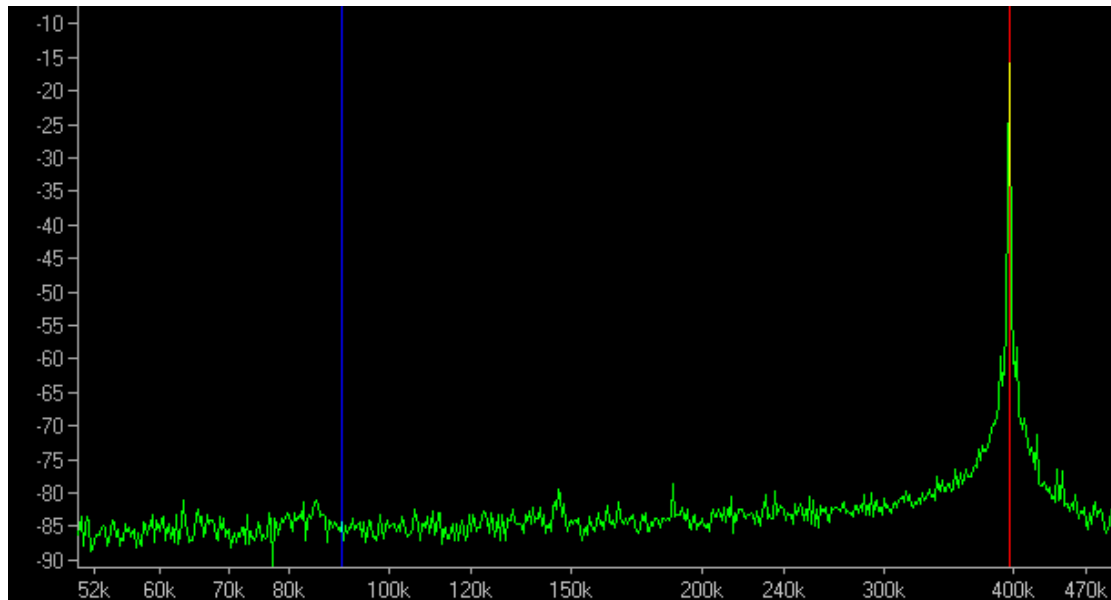


Fig. 3.2.1. – Main screen

Spectrum is displayed in the channel color. Both X and Y axis are logarithmic. Vertical range is adjustable as follows:

- drag top third of the vertical legend to set maximal displayed value
- drag middle of the vertical legend to move waveform vertically (range will remain intact)
- drag bottom third of the vertical legend to set minimal displayed value

The displayed spectrum part can be set using navigator or dragging the waveform on the screen.

You can zoom data in two ways:

- either click on the “Zoom in” or “Zoom out” button
- or set mouse pointer on the screen and spin the mouse wheel

TIP: Spin the mouse wheel on the screen to perform zoom. The frequency below mouse pointer remain on the same position (if possible).

Two vertical and two horizontal cursors are available. In case they are out of screen, the arrow in the cursor color appears on the side of the screen. Drag this arrow to move cursor back to screen.

3.3. Channel controls

The channel controls are located in the left of the main window.



Fig. 3.3.1. – Channel controls

Click the button to activate/deactivate respective channel.

3.4. Cursor controls

The cursor controls are located in the left of the main window.

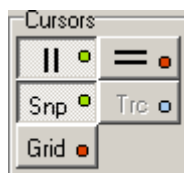




Fig. 3.4.1. – Cursor controls


Click  to activate/deactivate vertical cursors.

Click  to activate/deactivate horizontal cursors.

Click  to activate/deactivate “Snap” mode. While in this mode, the software automatically searches for peaks near vertical cursors. In case it detects any, it automatically sets the cursor position to peak.

TIP: The cursors holds peaks once positioned on them. They remain correctly positioned on the peaks even if the frequency of the peaks changes slightly.

Click  to activate/deactivate „Trace“ mode. While in this mode, the cursors are automatically set to the waveform level defined by the vertical cursor.

Click  to activate/deactivate grid.

3.5. Sweep progress

The progress bars are located in the bottom of the main window.

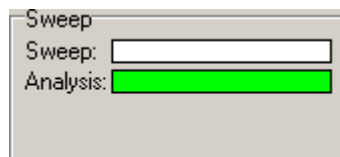


Fig. 3.5.1. – Progress bars

The software performs three tasks: data acquisition, analysis (using fast fourier transformation) and the data display. Data acquisition and analysis are performed parallel.

The “Sweep” progress bar indicates the data acquisition progress and “Analysis” progress bar indicates the analysis progress. Analysis always work with the data available on its start.

WARNING: In case the analysis is much slower than data acquisition, following behaviour can occur: when the acquisition parameters changes (bandwidth for example), analysis is performed twice on old data.

3.6. Frequency precision controls

Depending on the oscilloscope model, the frequency precision controls are available.

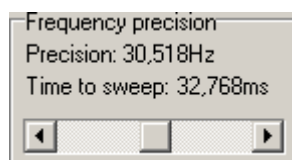


Fig. 3.6.1. – Frequency precision controls

Use scrollbar to set frequency precision.

The precision is displayed as "Precision". Total time required to acquire data with selected precision is displayed as "Time to sweep".

3.7. Processing controls

The processing controls are located in the bottom of the main window.

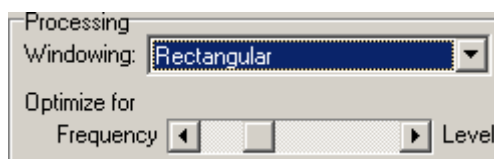


Fig. 3.7.1. – Processing controls

Use combobox "Windowing" to select windowing function. Following windows are available:

- Rectangular
- Triangular
- Blackman
- Hamming
- Hanning

We recommend to use rectangular window to achieve best vertical precision. If you measure spectrum, where are the spaces between harmonics very small, we recommend to use blackman window.

WARNING: The vertical precision of the harmonics is the best with rectangular window. Other windows very significantly reduce precision.

Use bottom scrollbar to change ratio between frequency precision and level precision.

3.8. Zoom controls

The zoom controls are located in the bottom of the main window.

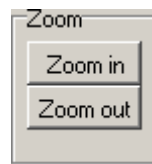


Fig. 3.8.1. – Zoom controls


Click “Zoom in” button to decrease data amount on the screen, click “Zoom out” to increase it.

3.9. Input controls

Input controls are located in the right of the main window.



Fig. 3.9.1. – Input controls

Click  to set probe attenuation connected to the input.

Select vertical units, which will be used to display harmonics.

In case the power unit is selected (dBmW), it is necessary to enter the value to the impedance edit box.

3.10. Information panel





Two information panels (one for channel A, other one for channel B) are located in the top of the main window.







Fig. 3.10.1. – Information panel

The information about oscilloscope range is located in the left of the panel. This range is set by the software automatically.

Following information are available:

-  - primary vertical cursor position
-  - secondary vertical cursor position
-  - difference between vertical cursors
-  - intersection level of the primary vertical cursor with waveform

-  - intersection level of the secondary vertical cursor with waveform
-  - primary horizontal cursor position
-  - secondary horizontal cursor position
-  - difference between horizontal cursors

3.11. Main menu

The main menu is located in the top of the main window. Following items are available:

File / Exit – terminates application

Settings / Options – opens window, which allows you to configure software

Help / Help – opens user's guide

Help / About – displays product information

3.11.1. Options window

Click the item in the main menu to open options window.

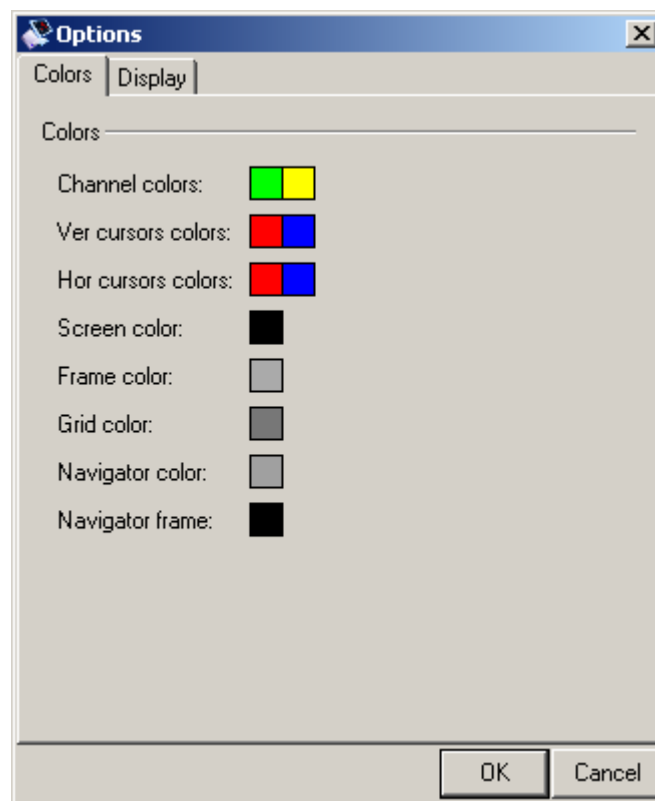


Fig. 3.11.1.1. – Options window

Following options are available:

Colors / Colors / Channel colors – click color of the channel to change it

Colors / Colors / Ver cursors colors – click color of the vertical cursor to change it

Colors / Colors / Hor cursors colors – click color of the horizontal cursor to change it

Colors / Colors / Screen color – click color of the screen to change it

Colors / Colors / Frame color – click frame color to change it

Colors / Colors / Grid color – click grid color to change it

Colors / Colors / Navigator color – click navigator color to change it

Colors / Colors / Navigator frame – click navigator frame color to change it

Display / Main screen / Display waveform in red when out of device bandwidth – if checked, the part of the waveform, which is out of the device bandwidth, is drawn in red