"USB OSCILLOSCOPE" PROGRAM
USER MANUAL

CONTENT

1 PURPOSE

The main purpose of the "USB Oscilloscope" program (hereinafter referred to as Program) is monitoring, storage, analysis and measuring parameters of input signals, digitized by the USB-oscilloscope device (hereinafter referred to as Device).

2 COMMON KNOWLEDGES

This program works under Windows XP SP2 / SP3, Windows Vista, Windows 7, Windows 8, Windows 8.1, Windows 10 operation systems, based on x86 or AMD64 CPU family PC.

2.1 General functions

The program is used for simultaneous visualization, analysis and recording of the signals, digitized by the Device in real time. Data is stored as a continual time fragment. The fragment size is limited by a maximum file size, and is equal to 16 T bytes for NTFS or 4 G bytes for FAT32 file systems.

Program is equipped with tools for automatic analysis of recorded signals on the basis of the script core. The results of its work are text and graphical reports, marking and commenting of oscillogram specific points. There is a possibility to export analysis results to a text file.

Usage of plug-ins allows performing specific signals visualization and analysis with getting the graphics of the researched parameters changes in real time.

The program is equipped with the functions of printing and saving in a graphical format of selected oscillogram fragments and analysis results.

Emulation mode helps to visualize a signal dynamic, using the earlier recorded oscillogram file.

2.2 Minimal resource requirements

- CPU not less than Pentium III 1 GHz;
- graphic adaptor not less than SVGA 800x600;
- RAM not less than 1 G byte.

Attention! Be sure that the Device is connected to the USB-port of your PC before starting the real time signal monitoring. Please check the Device drivers to be properly installed.

3 HOW TO WORK WITH THE PROGRAM

3.1 Program general controls description

The Program main window (fig. 1) has the following control items:

1 - menu;
2 - popup menu;
3 - tool bar;
4 - control panel;
5 - status bar.

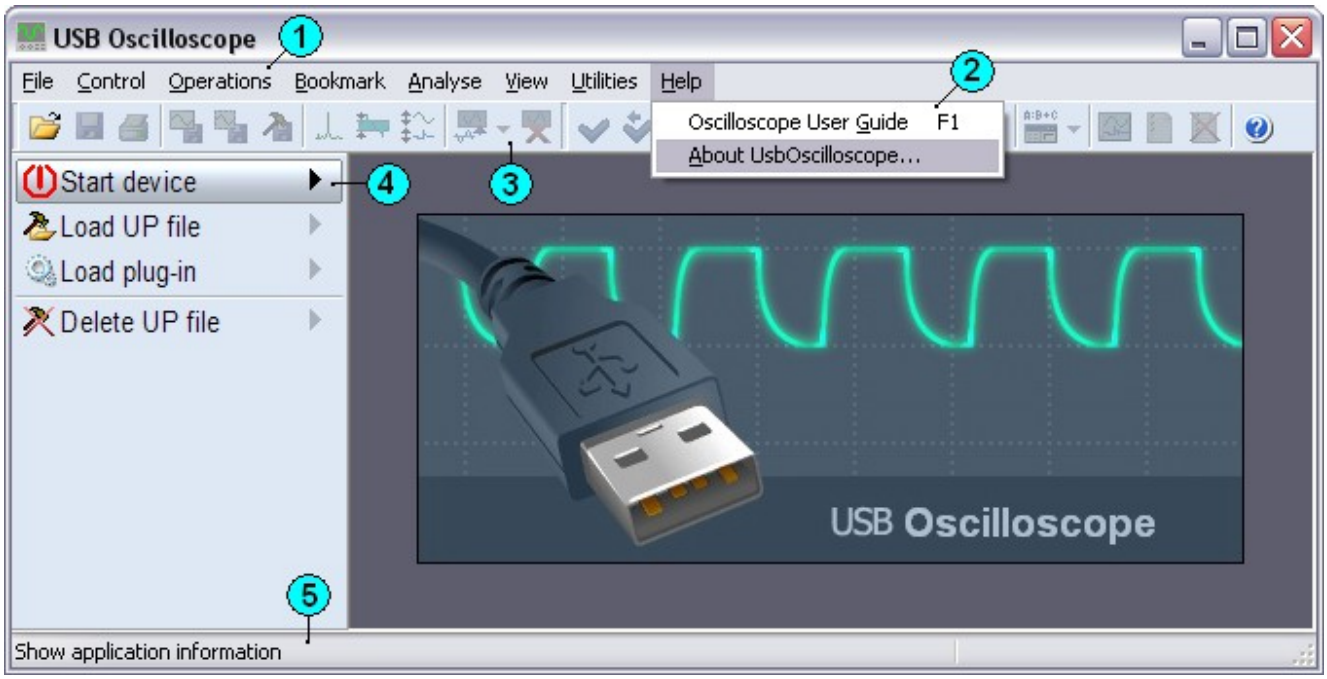


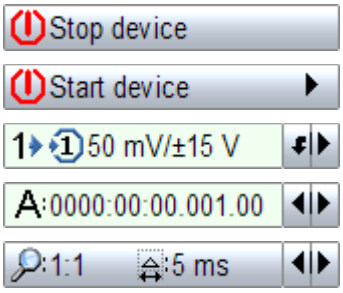
fig. 1. Program main window.

3.1.1 Menu (fig.1 [1]) contains elements, which are grouped according to their functionality into **popup menu** (fig.1 [2]). To call the required function it is necessary to activate the corresponding item of Program's menu and then to select the needed item in the popup menu. This operation can be performed with the help of the mouse cursor or by using the keyboard.

3.1.2 Toolbar (fig.1 [3]) contains control items for calling some Program functions. These items are presented as buttons with icons. Activation of the toolbar functions is carried out with the help of the Mouse cursor.

3.1.3 Control panel (fig.1 [4]) contains control items, placed in the direction from the top to the bottom. These items display the function name, one or a group of the controlled parameters and control buttons, placed in the right part of the item.

Control panel has the following types of items:



- simple button;
- popup panel or list control;
- popup panel control with fast function;
- parameter increase/decrease control;
- select/increase/decrease parameter control.

The choice of the active item of the control panel is performed by the mouse cursor or keyboard up/down arrow keys. The function of items like *button, popup panel or list control* is activated by clicking the left mouse button or the keyboard right arrow, “Space” or “Enter” keys.

The similar functionality has *popup panel control with fast function* item type. But in this case pressing of the button ▸ with the help of the mouse cursor is used to display popup panel, and the button ▸ can be used for the given item fast function execution. To call the fast function for the current item type with the help of the keyboard, it is necessary to press and hold the left arrow button at least for 0.5 seconds.

To change the parameter value for *increase/decrease control* item type, press ◂ / ▸ item buttons with the help of the mouse cursor. The same functions have keyboard left or right arrow keys.

Similar functionality has *select/increase/decrease control* item type. In addition the given item part has the central button. Pressing of this button with the help of the mouse cursor allows selecting one of the parameter values from the dropped list. The given function is duplicated by the “Space” or “Enter” keyboard keys.

3.1.4 Popup panel (fig. 2) is an extension of the control panel and contains control elements, grouped separately.

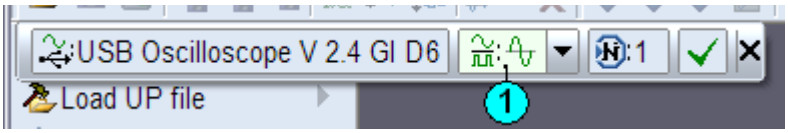


fig. 2. Popup panel.

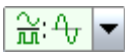
Use mouse cursor or keyboard left/right arrow keys to change the active item of the popup panel. The panel active item has the control part, placed in its right side ([1] fig.1). If it is not possible to activate items, they are temporary disabled. The last item of this panel is the close button. It can be used to close popup panel. Alternatively popup panel is closed by pressing the keyboard “Esc” key or by moving the active item out of leftmost item with the help of the left arrow key.

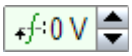
Popup panel has the following items types:

 - button;

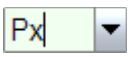
 - switch;

 - submenu;

 - select control;

 - increase/decrease control;

 - select/increase/decrease control;

 - text enter/select.

Press item body with the mouse cursor or use keyboard down arrow or “Enter” keys to execute *button, switch and submenu* items types function.

Press ▾ button in the right part of *select control* item type with the mouse cursor or down arrow or “Enter” keyboard keys to show options of the dropping list. Then use the mouse cursor or keyboard up/down arrow keys to activate the required item of this list. Press the left mouse button or keyboard right arrow or “Enter” keys to accept the selected item. Press keyboard left arrow or “Esc” keys to cancel any selection.

Press ▴/▾ buttons with the help of the mouse cursor or keyboard up/down arrow keys to change the value for *increase/decrease* item type.

Similar functionality has *select/increase/decrease* item type. In addition, the value for this item type can be selected from the dropped list. This list is shown when the middle part of item body is pressed with the mouse cursor or keyboard “Enter” key can be used instead.

The *text enter/select* item type helps to enter/select text or numerical values. This type of item is mainly controlled with the help of the keyboard. The keyboard left/right arrow and “Home”/“End” keys are used to move the caret, “Backspace” and “Del” keys help to edit the text. This item type supports standard clipboard functions.

General items of control and popup panels are controlled by four keyboard keys: arrow left, right, up, down.

Keyboard up / down arrow keys are used to select the active item of the control panel and left / right arrow keys help to control it. And vice versa: keyboard left / right keys are used to select the active item of the popup panel and up / down arrow keys help to control it. The active item of the dropped list can be changed with keyboard up / down arrow keys, right arrow key is used to select the item, left arrow key to cancel selection. In addition increase/decrease and switch type items can be controlled with mouse wheel rotation.

Control panel contains general set of control elements that control oscilloscope and view functions. Therefore it is possible to control Program’s general functions with four keyboard keys.

3.1.5 Status bar (fig.1 [5]) shows the current item information – its function description and hot keys combination for the given item.

3.2 Start oscilloscope

Use the "*Start device*" item of the control panel to initiate the oscilloscope start configuration, which can be done with the help of the start device control panel fig. 3.

fig. 3. Start device control panel.

Start device control panel items (fig. 3 from left to right):

- current device will be used as a data source ;
- current device mode (depends on which device is selected) can be one of:

- for analogue oscilloscope mode;
- for logic analyser mode;

- number of input channels
- manual sampling mode .

Use the button ✓ to accept current device settings and start it. Depending on the chosen device the given panel can have less items, described above or have additional ones.

Alternative methods for device running are to use UP files (see 3.9.2) or plug-ins (see 3.13.1) Program functionality.

3.3 Analogue oscilloscope mode

In the analogue oscilloscope mode the Program processes analogue signals, digitized by the current Device. The program window in this mode is shown on fig. 4.

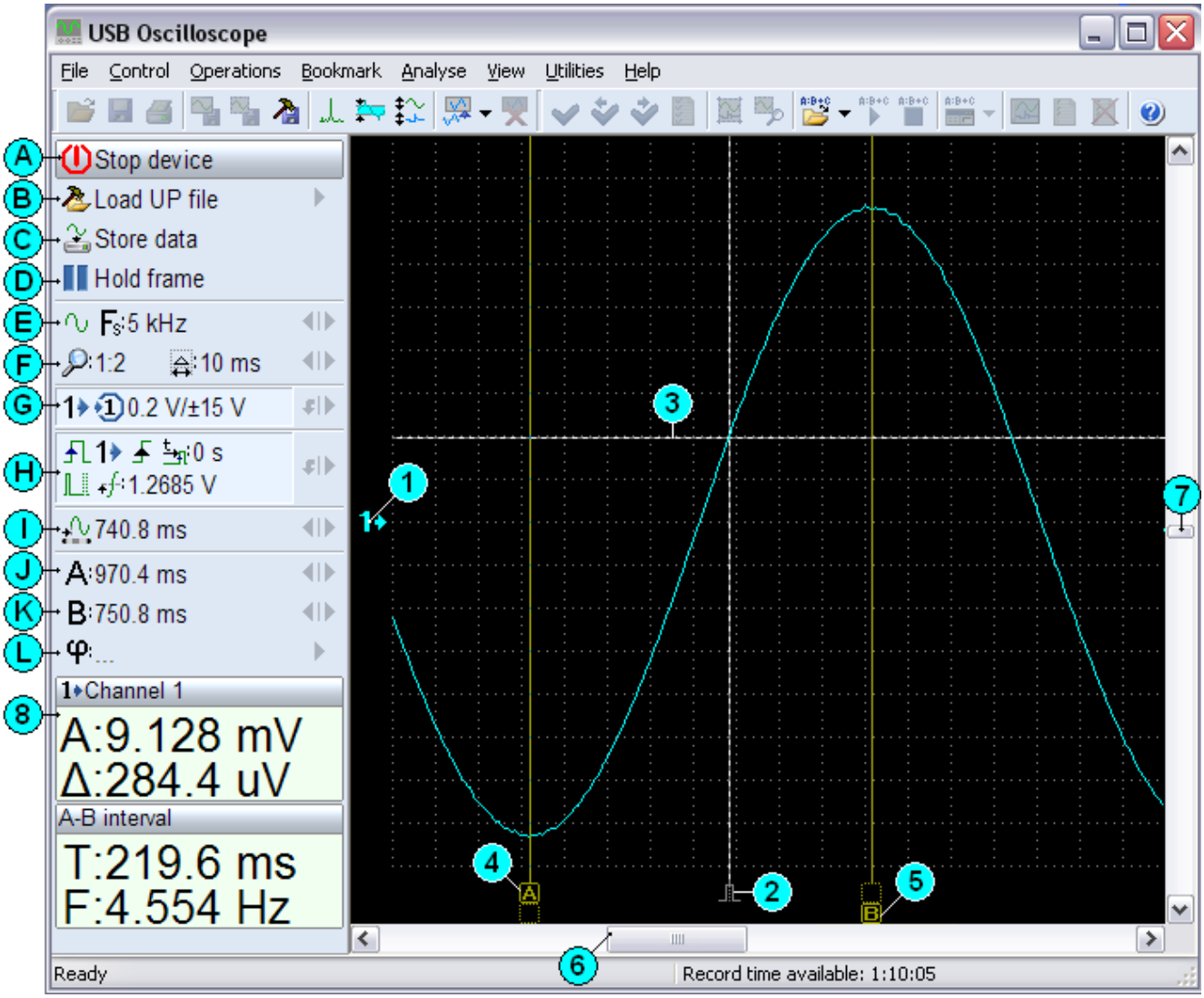


fig. 4. Program window in analogue oscilloscope mode

The Control panel has the following control items (fig. 4.):

[A] - stop device;
[B] - load user preset file;
[C] - switch on/of data recording;
[D] - stop/start frame (synchronization status);
[E] - sampling frequency control;
[F] - horizontal zoom control;
[G] - 1 - channel control;
[H] - synchronization parameters control;
[I] - horizontal scrolling control;
[J], [K] – markers A and B position control;
[L] – phase/off-duty factor measurement control.

Numbers on figure 4 show the following control items:

1 - pointer of channel 1 zero level vertical position;

2 - frame synchronization point horizontal offset;

3 - current synchronization level;

4,5 – measurement markers A and B accordingly;

6 - horizontal scroll bar control;

7 - vertical scroll bar control;

8 - measurement panel.

3.3.1 Sampling frequency control (time/div)

Sampling frequency is controlled by the item [E] fig. 4 of the control panel. Icon, placed in the left part of this item, displays current sampling mode:

 - frame;

 - sub frame (stroboscopic);

 - stream.

Devices, supporting different sampling modes, can change one of the above mentioned sampling modes, depending which sampling frequency is currently selected.

In the frame sampling mode data is transmitted from the Device as a small fragment of the input signal(s), captured in accordance with the conditions of synchronization frame by frame. Sub frame sampling mode is similar to frame one, but in this mode each portion of Device data is the part of the whole frame. In the stream sampling mode data is digitized continuously.

The current item dropping list displays a set of all possible for the current device sampling frequencies and corresponding time/div values, according to the current horizontal zoom value.

3.3.2 Horizontal zoom control

The value of the current horizontal zoom is controlled by the item [F] fig.4 of the control panel. Zoom value defines a number of samples, used for single oscillogram dot displaying. The item allows using the oversampling and in combination with the data display mode allows displaying the signal as average or peak values (see 3.3.5). The change of the zoom value gives the opportunity to compress or stretch signal horizontally without changing the sampling frequency. A zoom control item displays current zoom  and corresponded time/div  values (fig. 4. [F]).

3.3.3 Channel parameters control

Channel parameters are controlled by the item [G] fig. 4 of the control panel. Item body displays (from left to right):

- channel number 1;
- analogue input is used by this channel 1;
- vertical division value in terms of scale step;
- voltage range for analogue input is used for current channel.

When the signal inversion option is active, the vertical division value is displayed with the negative sign.

The item activates channel parameters control panel. The fast function of the given item sets the optimal vertical division value and centers the signal vertically.

3.3.4 Channel parameters control panel

Channel parameters control panel is shown on fig. 5.

fig. 5. The channel parameters control panel.

As it is shown on the figure above, the panel contains the following control items (from left to right):

- used analogue input number 1…8, or - when channel is temporary switched off;
- combination of input voltage range and input divider for chosen analogue input;
- vertical division value control;
- vertical offset value control in relative units;
- vertical offset value reset ;
- compensation mode for signal offset:
  - off compensation;
  - normal compensation mode;
  - manual compensation mode;
- signal offset compensation value in manual mode;
- automatic calculation of the signal compensation value ;
- switch on / off signal inversion;
- view mode: peak to peak or averaged;
- switch on / off channel subtraction;
- show / hide channel value display in measurement panel;
- channel color select;
- channel (input) name;
- show analogue input parameters adjusting panel.

The panel item, that defines the input voltage range, helps to select the combination of the input range (if this possibility is supported by the device/input, currently used) and input divider values, used for the current input. As it is shown on figure 5 the input voltage range is ±6 volts and the input divider is 1:10, or in other words it equals to ±60 volts.

Signal zero line offset depends from current compensation mode. When compensation mode is switched off , - signal zero line defines by relative offset only. Vertical relative offset defines signal offset from the center of the screen area defined for current signal (see 3.3.9 vertical composition of channels) in per cents of the screen height. In the rest of compensation modes, zero line position defines by two values. First is vertical relative offset. Second services to compensate constant offset of given signal. This value moves signal zero line so that signal informative part still on same place during vertical division value changing. Compensation mode and signal offset compensation value are associated with analogue input is currently selected.

The channel subtraction function helps to show the differential signal for two neighbor channels. This signal is calculated as a difference between the current cannel - **A** and the next channel - **B**, by formula: **A = A – B**. In addition when channel **A** has the inversion, the differential signal is also inverted, and when channel **B** has the inversion this inversion is used before the channels subtraction.

3.3.5 Synchronization parameters control

Synchronization parameters are controlled by the item [H] fig.4 of the control panel. This element displays current synchronization options (from left to right, from the top to the bottom):

- channel is used as a synchronization source ;
- front: - raise; - fall;
- minimal synchronization interval ;
- synchronization mode:

- auto-level;
- normal;
- wait;
- single;
- switch off synchronization;

- current synchronization level .

This item activates the synchronization parameters control panel. Fast function for this item helps to adjust synchronization level automatically.

3.3.6 Synchronization parameters control panel

Synchronization parameters control panel is shown on fig.6.

fig. 6. Synchronization parameters control panel.

As it is shown on figure above the panel contains the following items (from left to right):

- channel is used as synchronization source
- synchronization mode:
  - auto-level;
  - normal;
  - wait;
  - single;
  - switch off synchronization;
- front: - raise; - fall;
- synchronization level ;
- relative synchronization level ;
- synchronization level auto-adjusting ;
- level increasing threshold ;
- number of points for signal averaging ;
- minimal synchronization interval mode:
  - minimal interval for signal period;
  - minimal interval for signal impulse;
- minimal synchronization interval value ;
- minimal synchronization interval reset ;
- synchronization point offset ;
- synchronization point offset reset ;
- synchronization delay .

A single oscilloscope channel is used as a synchronization source. Four synchronization modes can be used for the synchronization, or the synchronization can be switched off. The synchronization modes description is below.

Normal mode always displays a signal, whether the synchronization point was found or not. If the synchronization point is not found during the synchronization delay time interval, the Program displays the not synchronized signal.

Auto-level mode is functionally similar to the normal mode. In this mode the synchronization level is controlled automatically, that is useful for the investigation of dynamically changing signals. The synchronization level in this mode is

calculated, depending on the signal amplitude parameters and current value of the relative level, which is defined by the item - . For example when the relative level equals to 50% it corresponds to the middle level from minimal and maximal signal values. The 10% value differs on 10% from the minimal toward the maximal signal level, and 90% is 10% less than the maximal signal level accordingly.

Wait mode in this mode screen data updates only when the synchronization point is found. In other words if there is no synchronization the signal on the screen is frozen until the next synchronization point is found.

Single mode is similar to the wait mode, screen data updates only when synchronization point is found. Then screen data is unchanged until synchronization will be restarted by "*Frame start*" button ([D] fig. 4) of the control panel.

Temporary **frame can be stopped or started** again with the help of the "*Stop frame*" button ([D] fig. 4).

Front and **synchronization level** defines general synchronization parameters. These parameters are used for searching the **synchronization point** – the point where the signal crosses the current level in a given front.

Synchronization level auto-adjusting is accessible in all synchronization modes except auto-level mode. The button of synchronization panel is used to run this function. During auto-level adjusting process, like in auto-level mode, Program evaluates the synchronization level from parameters of input signal (see description of auto-level mode).

Level increasing threshold is an additional selectivity parameter that determines the minimal increasing voltage of the signal at the synchronization point. Searching process continues, if the signal increasing voltage is less than the defined threshold value. Increasing of this parameter allows to ignore flat signal fronts and to synchronize on the steeper ones. The **number of signal averaging points** is also an additional selective parameter. It defines the number of points, used for signal averaging at the synchronizer input. Increasing of this parameter helps to filter noisy signals that give more stable synchronization for flat front signals. The given parameter is used in combination with the threshold value.

Thus, these selective parameters help to synchronize high frequency signals by increasing the value of increasing threshold or low frequency by increasing the number of signal averaging points.

The next parameter - **minimal synchronization interval**, helps to make an additional selection in the synchronization points set. It defines the value of the minimal time interval between two synchronization points. In other words, this parameter helps to synchronize signals that have a set of seriated fronts, and allows selecting the first front in series. The time interval inside series of fronts is always less than the interval between two series. Thus, if the value of the minimal synchronization interval is more than the time interval inside fronts series, the synchronization point will be chosen at first front in series.

Synchronization point offset defines offset of the synchronization point relatively to synchro-frame center. The change of this parameter allows moving synchronization point so that to place the signal fragment in the center of the synchro-frame. By default this point is placed in the center of synchro-frame.

Synchronization delay determines the time interval for synchronization searching process in normal and auto-level synchronization modes (see description for normal synchronization mode). If there is no synchronization, increasing of this parameter decreases the screen update frequency.

The parameters of level increasing threshold and numbers of signal averaging points can be inaccessible in the frame and sub frame sampling modes.

3.3.7 Horizontal scroll control

The horizontal scroll control is duplicated by item [I] fig.4 of the control panel.

This item displays the offset value of the leftmost point of the current screen in a frame or an absolute position of the current screen in a file. The offset value is displayed in terms of time or frequency for the spectrum analyser mode. This control item is supplied with dropping list that performs fast scrolling functionality with 10% resolution.

3.3.8 Active channels view parameters auto-adjusting

The Oscillogram screen is spitted vertically to display all active signals. Functionality of this function is similar to the channel view parameters adjusting, executed by the channel fast function (see 3.3.4). But in this case the function adjusts view parameters for all active channels simultaneously. Press the button  of the toolbar, menu option *“Operations\Arrange waves”* or Ctrl+G hot key combination to run this function.

3.3.9 Vertical composition of channels

The Program automatically divides the current height of the screen in such way to provide displaying of all active signals in the increasing order of the channel number. Thus each channel is displayed in the corresponding area. If necessary the given order can be changed with two ways. The first one is to drag the pointer of the channel zero level with the help of the mouse cursor with "Ctrl" key is held. This operation is performed in the following order: the "Ctrl" keyboard key is pressed and held, and then the channel zero level pointer is captured with the help of the mouse cursor, by pressing the left mouse button. The screen displays the window of the channels composition. The new order for the current channel is set by the movement of the item with given channel number into the required position. The screen displays at the same time current variant of the signals vertical composition. So in such way it is possible to change the order of the signals displaying or join current signal with other in the group. The operation is finished with the left mouse button releasing. If necessary it is possible to cancel any composition changes by pressing the "Esc" keyboard key. The second way to change the channels composition is to use the *“View/Channels composition”* menu option. The function of the given menu displays the described above channels composition window. By analogy with the previously described mechanism, the current channels composition can be changed by a simple dragging of the channel number item with the help of the mouse cursor. Alternatively the channel composition can be modified with the help of the keyboard. The channel number, which composition is changed, is set by the channel number "1", "2", etc. key

pressing, the arrow up/down keys change the current composition. The new composition is set by pressing the "Enter" key, the "Esc" key cancels any composition changes.

3.3.10 Analogue inputs calibration

Analogue input calibration panel is used for the current Device analogue input calibration process. The view of this panel is shown on fig. 7.

рис. 7. Analogue input calibration panel.

Panel contains the following control items (from left to right):
- volts on ADC step value;
- reference voltage for volts on ADC step value calculation;
- volts on ADC step value auto-adjusting;
- zero offset value ;
- zero offset value auto-adjusting;
- previous calibration values loading;
- current calibration values saving;
- current calibration values accepting.

Calibration can be done manually or automatically. In first case, volts on ADC step and zero offset values can be set by using corresponding items of the calibration panel. In automatic mode the Program calculates these parameters in accordance with the input signal level.

Automatic calibration is performed in the following order:

First of all the auto-adjusting of zero offset value is done. It is necessary to disconnect any input signals from the current input, and it is desirable to connect the input with the measuring ground. This function is run by the button of the calibration panel. Then the auto-adjusting of volts on ADC step value is performed. The reference voltage source must be connected to the calibrated input, and its voltage value must be entered or selected in the reference voltage value item of the calibration panel. The function is run by the button of the calibration panel.

Previous calibration values for current analogue input can be reloaded by the button of the calibration panel. Use the same button with the combination of “Ctrl” keyboard key to load device default values for the current analogue input. Use button of the calibration panel to save current calibration values. When the button of the calibration panel is used without saving, any changes will be used until the Device is stopped. When calibration panel is closed without saving, all changes are discarded.

The calibration of the analog input must be performed with the input divider value equal to 1:1 (x1). In other case the current input divider correction will be done for the current analogue input. This type of calibration can be used to

compensate input divider inaccuracy. It is strongly recommended to do input divider calibration only on calibrated analogue input. Only volts on ADC step value adjusting should be performed for input divider calibration. The result of this calibration is saved as a correction value for combination of current input divider and analogue input number.

In addition, Program has a set of functions, grouped in popup menu *“Control/Analog inputs parameters”*. The first function of this group is *“Load defaults”*. It helps to restore default values for all analogue inputs of the current Device. The next one is *“Save current”*. It is used for saving calibration values for all analogue inputs of the current Device. The *“Adjust zero offsets”* menu function helps to perform zero offset auto-adjusting for all active inputs of the current Device. Like in case with a single input zero offset adjusting this function requires as minimum disconnection of all active inputs from any signal sources.

The Current Device built in input dividers values can be changed with *“Set built-in divider”* menu item function.

3.4 Spectrum analyser mode

This mode is used to display spectrums of input analogue signals. The Program window in this mode is shown on fig. 8.

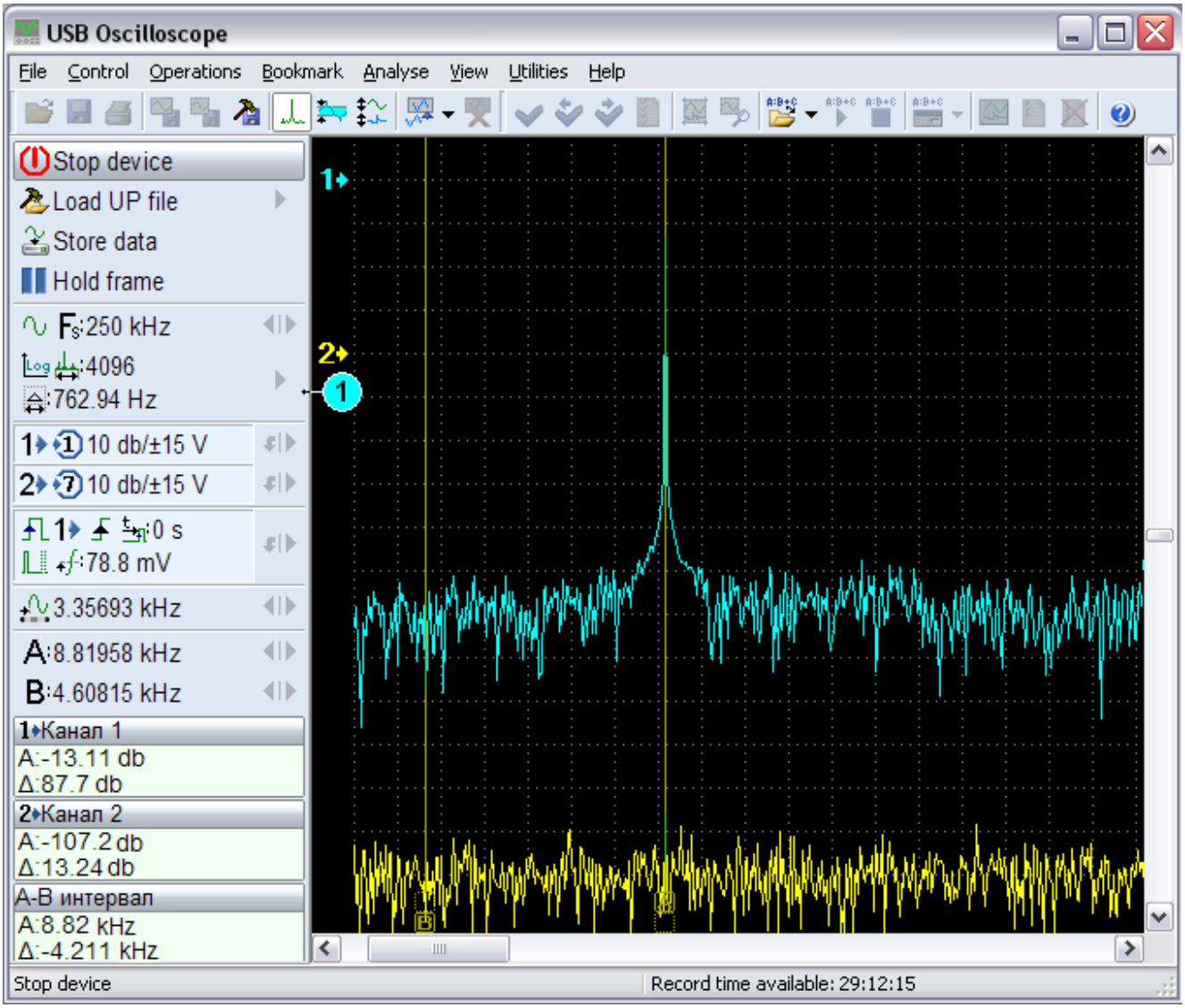


Fig. 8. Program window in spectrum mode

As it is shown on figure above, control panel in this mode is similar to the analog oscilloscope mode. Zoom control item is replaced with the spectrum analyser parameters control item [1] fig.6.

Analogue oscilloscope/spectrum analyser mode switching is performed with the toolbar button, *"View/View as spectrum"* menu item or Ctrl+W hot key combination. The synchronization control in this mode is unavailable. It is recommended to use analogue oscilloscope mode to set up synchronization parameters, and then switch Program in spectrum analyser mode. Horizontal scroll and marker A and B control items, display its values in terms of frequency. This is because horizontal screen axis in this mode represents frequency space.

3.4.1 Spectrum analyser parameters control

Spectrum analyser parameters are controlled by spectrum parameters control item [1] fig.8. This item displays the following items (from left to right):

- type of vertical scale is used:
  Lin - linear; Log - logarithmical;
- number of spectrum lines are currently used ;
- measurement scale step value .

This item activates spectrum parameters control panel.

3.4.2 Spectrum parameters control panel

Spectrum parameters control panel is shown on fig. 9.

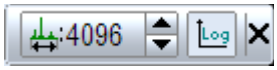


Fig. 9. Spectrum parameters control panel.

Panel contains the following control items (from left to right):

- current number of spectrum lines ;
- type of vertical scale:
  Lin - linear; Log - logarithmical;

The number of spectrum lines defines the number of dots in spectrogram. Increasing of the given parameter decreases the frequency step between two spectrogram dots, making it in such a way more detailed.

When the linear scale type is chosen, each dot of spectrogram represents amplitude value of current frequency component in the input signal in terms of volts. If the logarithmical scale type is chosen all spectrogram values are presented in db (decibel). In this case 0 db is assumed to the signal, which amplitude equals to the current input range (for instance, if the input range is ±15 V it is 30 V). Vertical scale step in this case is also defined in terms of db units.

3.5 Logic analyser mode

In this mode Program processes two levels logical signals, digitized by the Device. The view of the Program window in this mode is shown on fig.10.

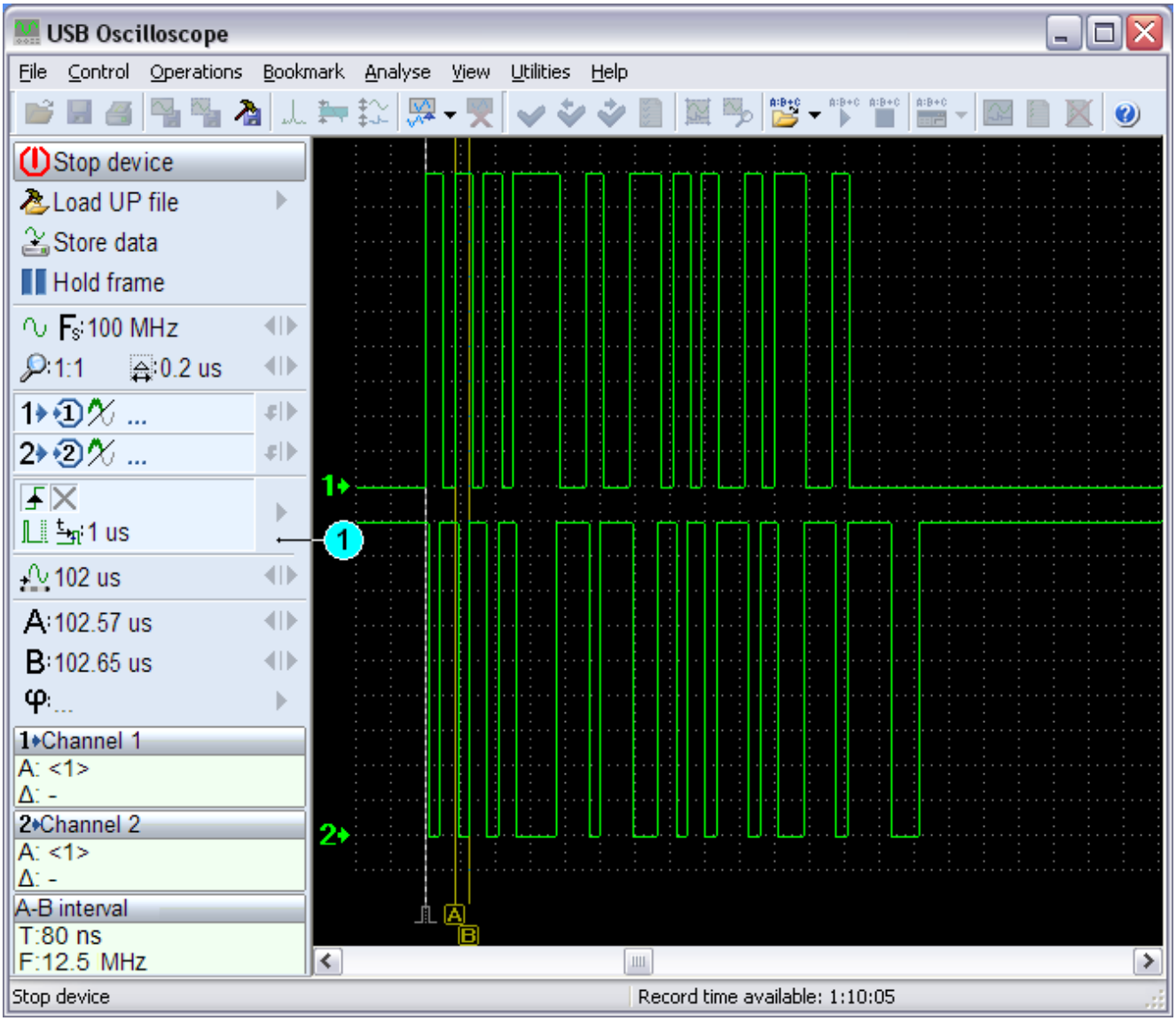


fig. 10. Program window in spectrum analyser mode

As it is shown on fig. 10 control panel has similar control items with analogue oscilloscope mode.

3.5.1 Logic analyser synchronization parameters control

Synchronization parameters are controlled by item [1] fig. 10 of the control panel. This element displays the following synchronization options (from the top to the bottom, from left to right):

- synchronization mask;
- synchronization mode:
- normal;
- wait;
- single;
- switch off synchronization;
- minimal synchronization interval value .

Synchronization mask is a condition or a combination of synchronization conditions for single or multiple channels. This element activates logic analyser synchronization control panel.

3.5.2 logic analyser synchronization control panel

Logic analyser synchronization control panel is shown on fig. 11.

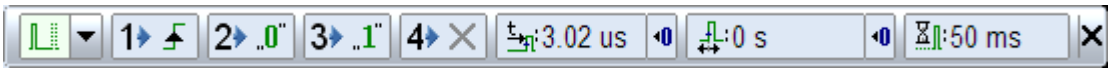


fig. 11. logic analyser synchronization control panel.

As it is shown on fig. 11, the panel contains the following items (from left to right):

- synchronization mode:
- normal;
- wait;
- single;
- switch off synchronization;
- synchronization condition control items for all active channels, with possible conditions:
- raise;
- fall;
- low level;
- high level;
- not important;
- minimal synchronization interval value ;
- minimal interval value reset ;
- synchronization point offset ;
- reset of synchronization point offset ;
- synchronization delay value ;

Synchronization condition mask is used to synchronize logic analyser signals. The mask defines any combination of the front and levels. Front condition can be set only for a single channel. Therefore the condition mask shown on fig. 11 is as follows: rising front on channel 1, low level on channel 2, high level on channel 3, the condition of channel 4 is not important. Minimal interval value defines minimal time interval between two synchronization conditions for the defined mask. The rest of items have identical functions to analog oscilloscope mode, see 3.3.6.

3.6 Data storing

Data storing function is available in all Program modes and does not depend on current signals visualization mode. The maximal file size is limited by the used file system. For instance FAT32 maximal file size equals to 4 G bytes, and for NTFS it is 16 T bytes. The maximum recording time is directly proportional to the available disk space, and inversely proportional to the sampling frequency. In other words, for the same resulting file size with increasing sampling frequency, the maximum storage time reduces and vice versa. The right part of the status bar displays the maximal storage time that is available for the current Program mode in the following format: H:M:S, where H - hours, M - minutes and S - seconds.

Data storage starts or stops by *"Store data"* item of the control panel. In stream sampling mode all data is stored as a continues time fragment. Data in frame mode is stored as separate frames. Therefore in the first case, the storage control item displays the total time of the stored data fragment, in the second one – the number of stored data frames.

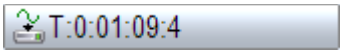


fig. 12. Storage control item during storage in the stream sampling mode.

The storage time is displayed in format H:M:S:tS see fig. 12, where H - hours, M - minutes, S - seconds, tS - tens of seconds. For the frame sampling mode, the data is stored only after data frame updating. The *"Stop frame"* function has no affect on data storage process.

3.6.1 Storage file location definition

By default data is stored into the Program root folder. This location can be changed with the help of *"Control/Data storage Options/Define storage location"* menu option. This option can be useful when there is no wish to store data on the system disk, where the available disc space is limited. Storage location changes will be available only after program restarting.

3.6.2 Maximal storage time limitation

Storage time can be limited with the help of *"Control/Data storage Options/Enable time limitation"* menu option. Storing will be automatically stopped after storage of the defined time interval see 3.6.3.

3.6.3 Storage time interval definition

Value of storage time interval is used for storage limitation or circling see 3.6.2 or 3.6.4. Use *“Control/Data storage Options/Storage time interval”* menu option to change this value.

3.6.4 Storing of predefined time interval

This storage option is activated by *“Control/Data storage Options/Cycling of data storage”* menu option. When the option is active data storage proceeds in such a way: first of all the defined time interval is stored, and then recording starts circling. Therefore when data storage is stopped, the file contains predefined time interval (see 3.6.3), which ends at the moment of storage stopping. In this case the storage control item displays firstly the current storage time of the accumulation process, and then the “R” flashing symbol for the circling stage.

3.6.5 Definition of markers during storage

Program allows setting up to 50 markers during data storage to define characteristic parts of oscillogram. It is necessary to pay attention to the fact that while “*Cycling of data storage”* option is active, all markers, indicating the fragment of the oscillogram, rewritten with new data portion, are destroyed.

3.7 Oscillogram view mode

This mode is activated each time after data storage ending, or binary oscillogram file opening (file with *.mwf - extension). This mode Program window is shown on fig. 13.

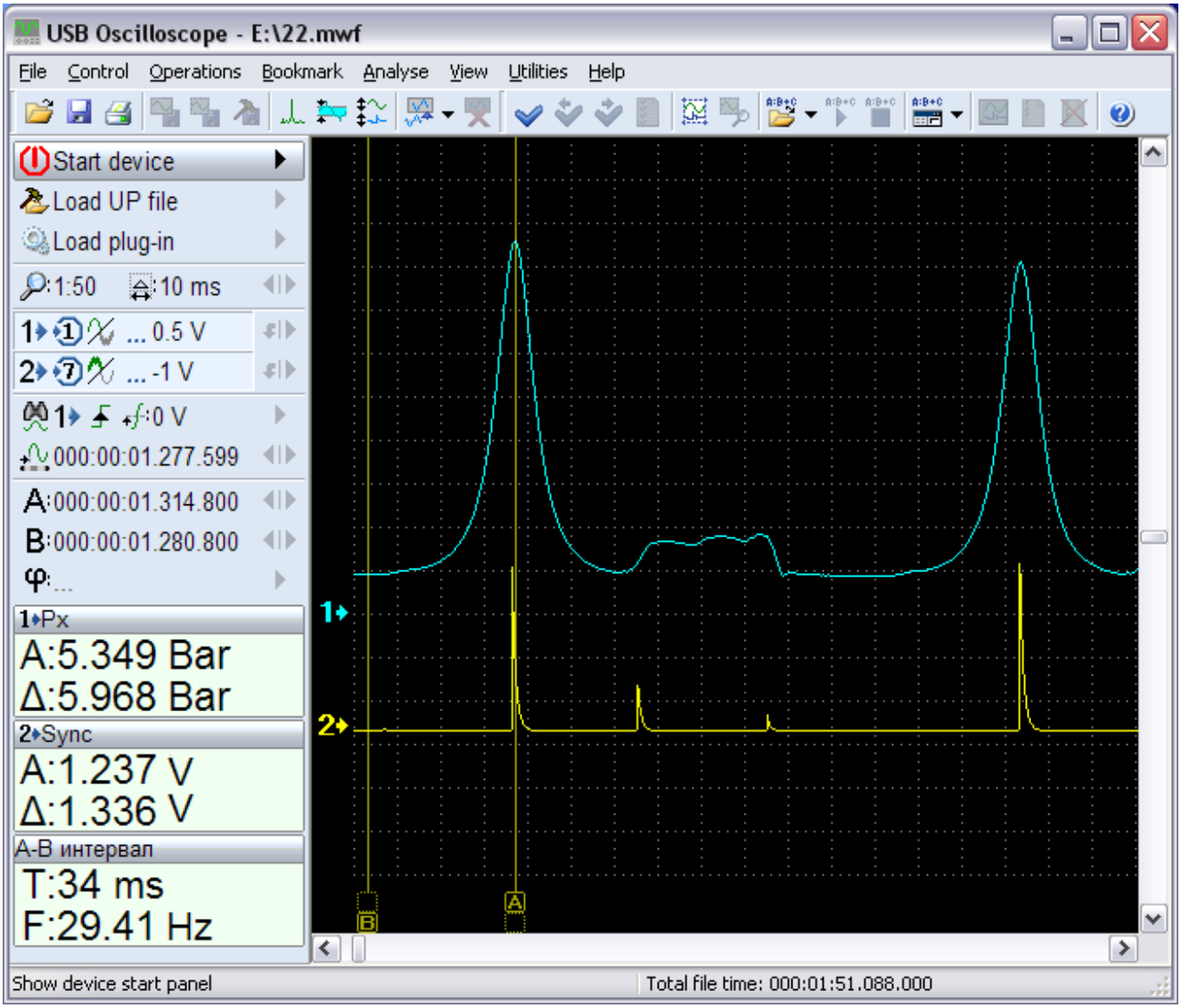


fig. 13. Program window in oscillogram view mode.

General control items in this mode are identical to the items described above. Synchronization control item in this mode is replaced by the search control item.

3.7.1 Oscillogram saving

All changes of view, channels settings, bookmark, level markers and etc., made by the user, can be saved in the oscillogram file. Toolbar button , *"File/File Save"* menu option or Ctrl+S hot keys combination can be used to save the oscillogram file. The Program is additionally supplied with *"File/File Save as.."* menu option that can be useful when the file name/location or data compression option should be changed. The data compression option can essentially reduce oscillogram file size, but it can increase file opening time during decompression. Definition of the

oscillogram file name, location and compression options is performed with the help of oscillogram saving dialog, shown on fig. 14.

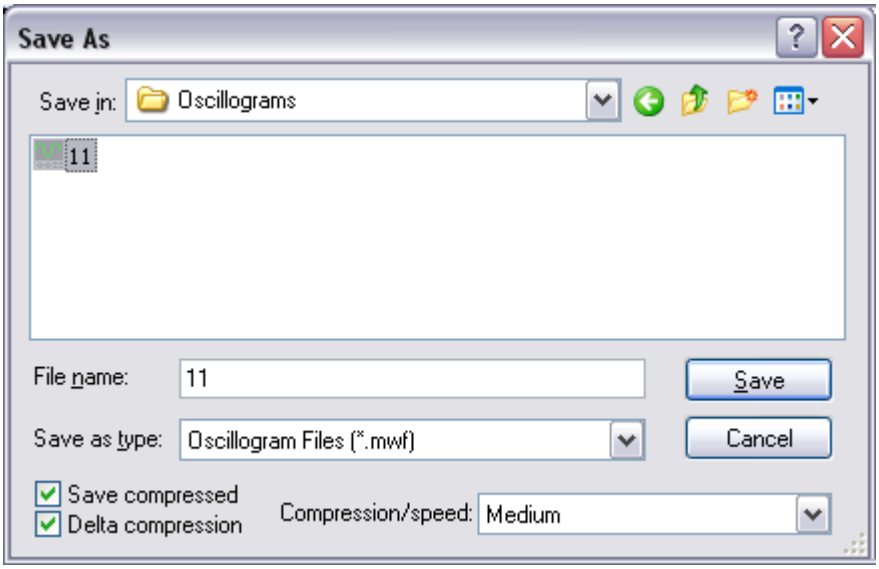


fig. 14. Oscillogram file save dialog.

As it is shown on fig. 14, data compression options are in the bottom side of the dialog. The *"Save compressed"* option allows to use or cancel data compression during oscillogram data saving. The *"Delta compression"* option controls additional compression option, used for analogue data compression. The *"Compression/speed"* option helps to select the compression rate, which will be used during data compression.

3.7.2 Searching in oscillogram file

This function is used for searching inside analogue or logic analyser oscillogram files. Searching function is unavailable in the spectrum analyser mode. Current settings of the searching function parameters are displayed by the corresponding item the control panel fig. 15 and 16.

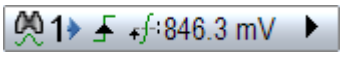


fig. 15. View of the searching control item for analogue data.

This item displays the following searching options (from left to right):
- channel that is used for searching 1;
- desired signal front , and - for any;
- signal crossing level (similar to synchronization level) .

fig. 16. View of the searching control item for logic analyser data.

By analogy with the synchronization elements for the login analyser mode the given item displays search condition mask for all active channels. The searching control item activates search parameters control panel.

3.7.3 Search parameters control panel

View of the search parameters control panels for two types of data is shown on fig. 17 and 18.

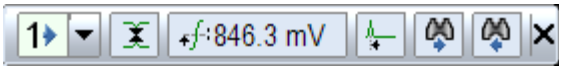


fig. 17. Search parameters control panel for analogue data.

Panel has the following control items (from left to right):

- channel is used for searching 1;
- desired signal front:
  - raise, - fall, - any;
- signal crossing level ;
- screen positioning variants for searching result:
  - on the left, - in the center, - on the right;
- run forward direction searching ;
- run backward direction searching .

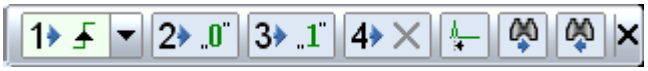


fig. 18. Search parameters control panel for logic analyser data.

The left side of this panel contains control items, which help to set the search condition mask for all active channels. It is possible to define any fronts (, ,) and levels (or) combinations. It is possible to use different front conditions for different channels at the same time. If the channel condition is not important then option is used. Other control items are identical to the described above for analogue data search.

In addition to buttons / search process can be initiated with the help of *“Operations/Search forward for signal condition”* or *“Operations/Search backward for signal condition”* menu options, Ctrl+F or Shift+F hot keys combination for forward and backward searching accordingly.

3.7.4 Selection of oscillogram fragment

Selection of oscillogram fragment is required for a set of different operations, and is performed with the following steps. Firstly set the mouse cursor so that it points at the selected fragment beginning or end position and press the left mouse button. Then the move the mouse cursor in the direction to the end or beginning position of the selected fragment accordingly, keeping the left mouse button pressed. Release the left mouse button to finish fragment selection operation. If the selected fragment is out of the single frame range, frame will be scrolled

automatically when the mouse reaches the area close to the screen left or right borders. It is possible to use “Page Up”, “Page Down”, “Home” and “End” keys during selection operation to scroll the screen in the required direction.

3.7.5 Horizontal auto-zooming

This function helps to evaluate the optimal zoom value for the selected oscillogram fragment, in order to place it in the center of the current screen size. The required oscillogram fragment must be selected before calling this function (see 3.7.4). The function is run with the help of the toolbar button , *“View/Selected area auto-zoom”* menu option or Alt+Z hot keys combination.

3.7.6 Saving of oscillogram fragment

The selected oscillogram fragment (see 3.7.4) can be saved as a separate file with the help of this function. The function is run with the help of the toolbar button or *“File/Save selection”* menu option. It is more appropriate to save informative parts of oscillogram than to save large oscillogram files instead.

3.8 Measurement tools

The general measurement items are the measurement panel and a pair of measurement markers A and B shown on fig. 19.

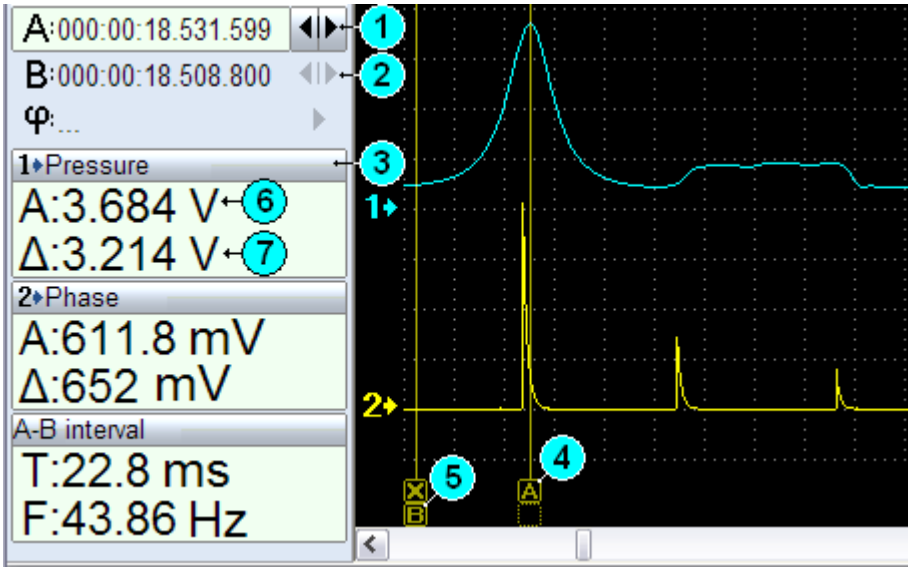


fig. 19. Measurement panel and A and B markers.

The A and B markers ([4] and [5] accordingly to fig.19) help to measure signal parameters in the dots, where markers lines cross a signal curve. These parameters are displayed in the corresponded items of the measurement panel, for each active channel.

3.8.1 Measurement panel

The measurement panel has values displays for each active channel. At the top of each values display there is a header, see [3] fig.19, showing the channel number and name. The values display body shows two values: the first one([6] fig.19) is the signal value for a dot where the line of marker A crosses a signal curve, the second one([7] fig.19) is the difference value between two values for dots where lines of marker A and B cross a signal curve. The last item of the measurement panel is A-B interval display. This item displays the time interval value between A and B markers, and its corresponding frequency. In the spectrum analyser mode this item displays the frequency for marker A position and difference of frequencies between A and B markers positions in the horizontal frequency scale.

The display settings popup menu can be shown by pressing the display header with the left button of the mouse. This menu contains options which help to display signal values as voltage, to recalculate them according to the channel name or to define the unit type recalculation directly from the presented list of the unit types. The concept of unit types will be considered later see 3.8.4. The values display for each channel can be hidden or shown again optionally see 3.3.4, the popup menu option *“Hide channel values”* has the identical function. It is possible to move the channel value display to the separate window with the help of *“Fly channel display”* popup menu option.

Measurement panel can be attached to the screen body, be displayed in a separate window or can be the part of the control panel. In the first two cases, the size of the measurement panel can be changed with the mouse cursor. The size of the channel value displays is changed according to the measurement panel size. Menu option *“View/Measuring Panel”* controls the measurement panel displaying in the screen body. Menu option *“View/Measuring window in control panel”* is used to display the measuring window as a part of the control panel. In this case, the size of the measuring window depends on the free space available on the control panel. The last option helps to increase the oscillogram view screen due to more rational usage of the available space. But it is not always possible due to the limited space of the control panel with small screen resolutions.

3.8.2 Measurement markers

The measurement markers A and B serve for the signals amplitude and time parameters measuring, as it was described above. There are several ways to move measurement markers: with the help of the control panel items [1], [2] fig.19, with the mouse cursor or keyboard. The non-fixed marker moves within the range of the screen, and stays on its place during the screen horizontal scrolling. The fixed marker is bound to a specific oscillogram dot, and moves with it during the screen scrolling. The cross on the marker handle is a sign of the marker fixation. As it is shown on fig. 19 marker A [4] is not fixed, marker B [5] is fixed. When markers are controlled by the control panel elements [1], [2] fig.19 their fix condition can be changed by pressing “Enter” keyboard key. To change the fix condition with the help of the mouse, move the mouse cursor to the squire that displays the marker fix condition and press the left mouse button. There is a

possibility to move markers by keyboard keys. Press and hold “Shift” or “Ctrl” keyboard keys to move markers A or B accordingly. The direction of moving is defined by the left or right arrow keyboard keys. It is possible to use the same functionality with “Shift” or “Ctrl” keyboard keys to catch markers A or B with the mouse cursor. Press the left mouse button while “Shift” or “Ctrl” keys are held, and the marker will move to the current position of the mouse cursor. Release “Shift” or “Ctrl” keyboard keys and move the marker to the required position, keeping the left mouse button pressed.

3.8.3 Signal phase and off-duty factor measuring

The program is supplied with the tool that helps with measuring of signal phase and off-duty factor. The control panel item shown on fig 20 [1], helps with this type of measurement.

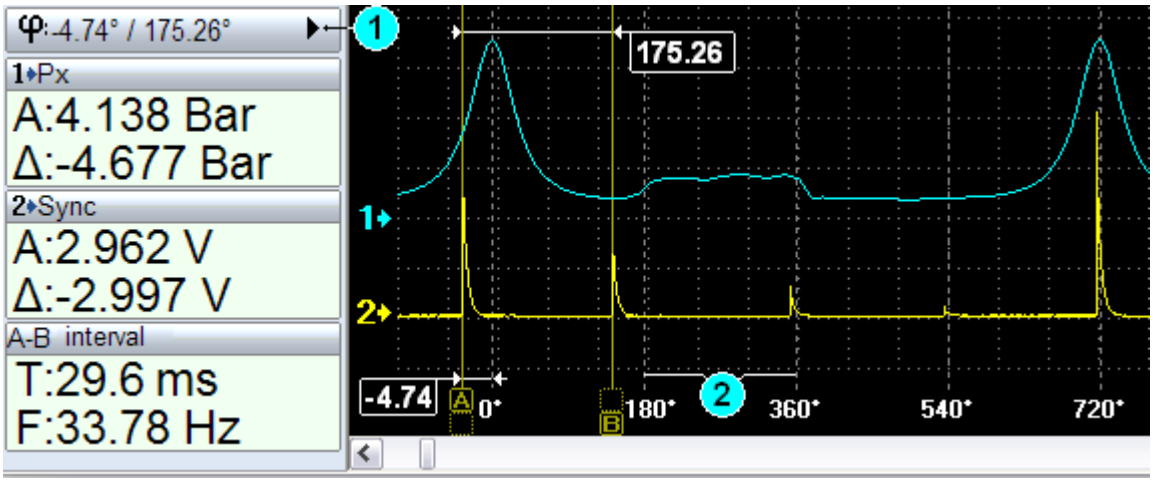


fig. 20. Phase measurement.

The phase or off-duty factor value measuring process starts from the interval definition. This interval should be the part or a multiple of the signal period, and is defined with the help of A and B markers. Then the phase/off-duty factor measurement panel is activates by item [1] fig. 20 of the control panel.

fig. 21. Phase/off-duty factor measurement panel

The first item of this panel fig. 21 helps to define the type of period, defined by markers A and B such as:

90, 180, 360, 720 degrees – for phase measurement;

100% - defines the whole period for off-duty factor measurement;

“----“ - off phase/off-duty factor measurement.

The next item of this panel shows the value of the full measurement scale. The program displays the phase/off-duty factor measurement scale ([2] fig. 20) when the period type is chosen. This scale stays attached to the interval, defined by A and B markers. The phase/off-duty factor value for any point of the oscillogram can be found by moving the marker A in relation to the defined scale. This value is

displayed as the first value of the item [1] fig. 20. The second value is the phase/off-duty factor difference value, according to the A-B interval. According to fig. 20 the impulse phase on channel 2 is shifted on -4.74 degree relative to the peak on channel 1, and the phase difference between markers A and B is 175.26 degrees. Select the option of the phase/off-duty factor control item to switch off phase/off-duty factor measurement.

3.8.4 Signal values recalculation and units types

The program is supplied with a tool that allows signal values recalculation into values, specified by units types with supplied rules. The unit type term means a set of parameters and rules description for the value recalculation. Descriptions for all units types are kept in external files and can be changed or updated by the user. Each type has a unique name that is used for the definition of the measurement panel values recalculation. As it was described in 3.8.1, unit type name can be chosen from the list of measurement panel channel display popup menu. By default, the unit type name is selected automatically, according to the channel name. In other words, if the defined channel name is identical to some unit type name, the Program will automatically use this type for the channel values recalculation. The unit type name can be chosen as a channel name with the button ▾ of the channel name control item on the channel control panel (see. 3.3.4).

3.8.5 User units types editing

The changing, addition or deletion of the User units types is performed with the help of “Units types setup” dialog fig. 22. This Dialog is activated by *“Control/Units types setup”* menu item or Ctrl+V hot keys combination.

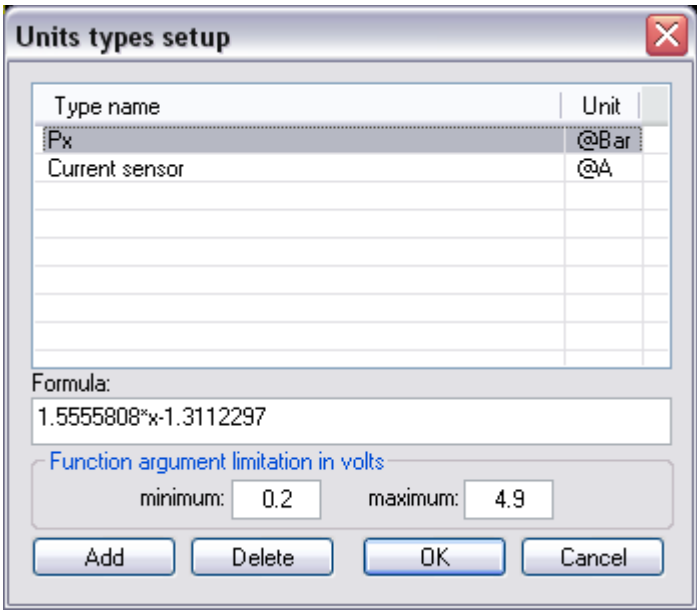


fig. 22. “Units types setup” dialog.

According to figure 22, the dialog has a list of all units types defined by the user. The left column of this list displays the unit type name, the right one – the

corresponding unit. The “@” prefix symbol will be replaced during the value formatting with n/u/m/k/m symbols for nano/micro/milli/kilo/mega according to the current value. If the “@” prefix symbol is not defined the value is displayed as the absolute value of the current unit. “Formula” field helps to define the formula, used for the value recalculation according to the current unit type. The formula input value is defined as “x” symbol. The program supports the next functions:

Function	Comment
abs(x)	Returns the absolute (always positive) value of x
acos(x)	Returns the arccos function value of x in radians
asin(x)	Returns the arcsin function value of x in radians
atan(x)	Returns the arctan function value of x in radians
cos(x)	Returns the cos function value of x
exp(x)	Returns the value of exponential function (e^x)
log(x)	Returns the value of natural logarithmic function of x
pow(x, y)	Returns the value of function x^y
round(x)	Rounds the value of x to integer
sin(x)	Returns the sin function value of x
sqrt(x)	Returns the squire root of x
tan(x)	Returns the tan function value of x

The next group of items is optional, and defines valid “x” values range for the current formula. If the current “x” value is out of the range, the value calculation is ignored, and the result is displayed as “…”.

Changing of the unit type name or unit values can be done with the double click of the mouse left button on the corresponding list item. Press “Enter” key to accept the entered value, or “Esc” key to cancel any changes. Any unit type recording is considered as finished if it has the valid name and formula values. The *“Add”* button helps to add the new item type record, *“Delete”* button is used to delete the active one. The *“Ok”* button is used to save all changes made by the user, *“Cancel”* button helps to cancel any changes.

3.9 User preset files

User preset files (UP) are used to run and configure Device and Program modules by previously saved preset file. These files keep Device and Program settings, made by the user for some tasks. UP files also keep plug-ins settings.

3.9.1 Saving of current settings in UP file

The current Device and Program settings can be saved with the help of the tool bar button , *"Control/Save user preset"* menu item or Alt+R hot keys combination. When calling this function, the program displays save user preset file dialog in Fig. 23.

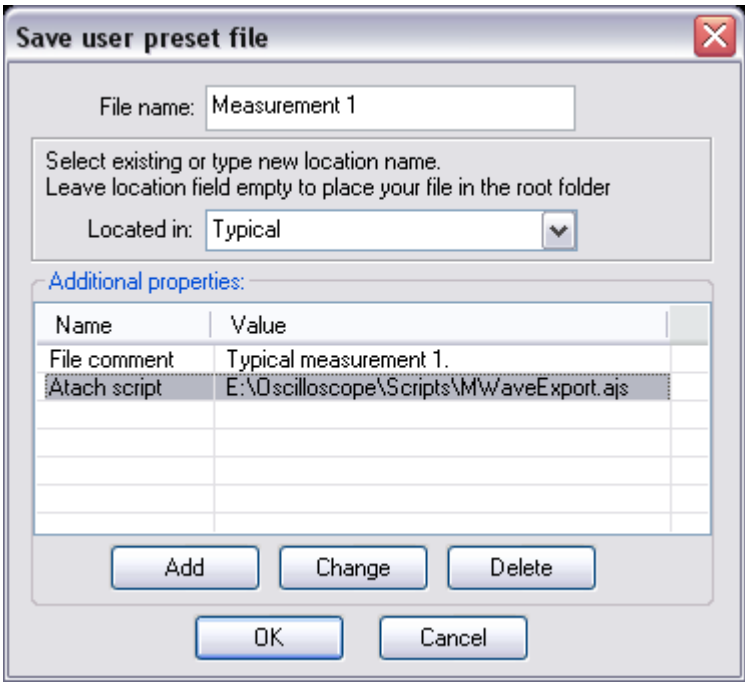


fig. 23. Save user preset file dialog.

The UP file name is the main parameter of this dialog. Parameter *"Located in"* helps to define the file location folder. This folder name can be entered to create a new folder, or it can be selected from the list of existed ones. The *"Additional properties"* list helps to define a set of parameters that will be applied in the mode initiated by the current preset file. When save preset function is executed for the mode that has been initiated by the UP file, save UP dialog displays the name, location and properties of this UP file. In this case the user can add corrections in the current file or save a new one by changing name/location parameters.

3.9.2 Loading or deleting UP files

UP files loading or deleting functions are controlled by the corresponded elements of the control panel. Functions of these control items show UP files dropping list. This list contains UP files or folders that contain UP files. Select the required file and activate the loading or deleting function with the left mouse button click, right arrow or "Enter" keyboard keys. Use the left arrow or "Esc" keyboard keys to move in the root list folder or for function canceling.

3.10 Marking of oscillogram

The oscillogram marking function is based on the usage of the bookmarks functionality. Each bookmark is related to a single oscillogram point and can be supplied with a comment. The bookmark list is stored in the oscillogram file. That will help with the search of the oscillogram characteristic points when the file is opened again. Bookmark markers can be set manually or automatically, when the analyser scripts are used (see 3.16). The bookmarks can be set manually while file viewing or recording.

3.10.1 Bookmark set or delete functions

The toolbar button , *"Bookmark/Set/Remove"* menu option or Ctrl+F2 hot keys combination can be used to set or delete the bookmark. The bookmark position is defined by the marker A position. When the current marker A position has the bookmark it will be deleted during the bookmark set/reset function. Use *"Bookmark/Delete all"* menu option to delete all bookmarks. Alternatively one or all bookmarks can be deleted with the help of the bookmarks list window see 3.10.2.

3.10.2 Bookmarks list window

The bookmarks list window is displayed at the bottom of the Program screen. This window is displayed automatically when the oscillogram file, containing the bookmarks, is opened. The bookmarks list window can be shown or hidden by the toolbar button , *"Bookmark/Show list"* menu option or Alt+F2 hot keys combination. The size of this window can be changed by moving the screen splitter with the mouse cursor. Activation of any item in the bookmark list moves the screen position to the position specified by corresponding bookmark. Oscillogram screen active bookmark changing is caused by the corresponding item activation in the bookmarks list window. The bookmarks list item can be changed by the mouse cursor or keyboard up/down arrow keys. The bookmarks list popup menu can be used to execute some bookmark functions. This menu can be activated with the mouse right button click inside the list window. The *"Delete"* and *"Change comment"* options of this menu perform corresponding operations with the list active item. The *"Find marker"* and *"Delete all"* popup menu options serve to find the marker by its comment and clear bookmark list accordingly. The marker comment can be changed alternatively by the double click of the left mouse button on the comment field of the required list item. Use "Enter" key to accept comment entering/changing, or "Esc" key to cancel it.

3.10.3 Navigation through oscillogram with the usage of bookmarks and search by comment

Oscillogram characteristic points navigation can be realized in two ways. The first one is using of bookmark list see 3.10.2. Using of toolbar buttons: and , *"Bookmark/Move to previous"* and *"Bookmark/Move to next"* or Shift+F2 and F2 keyboard hot keys is the second one. To find the marker by its comment *"Bookmark/Find"* menu option can be used.

3.10.4 Bookmark play function

During bookmark play function, Program moves oscillogram from one bookmark to another sequentially, and displays its comment in the popup window. This function is run by the *"Bookmark/Play"* menu option. Play function stops when the last marker is shown. The function can be stopped by using the "Esc" keyboard key.

3.11 Additional tools

This division describes a set of functions, used in different Program modes.

3.11.1 Using of level/range markers

The level/range markers are used to display a signal level or a range graphically for each channel separately. These markers are available in real time signal monitoring and oscillogram file view Program modes. Parameters of level/range markers are stored in the oscillogram and UP file types. To set, change or delete level/range marker, toolbar button , *"Operations/Set level (range) marker"* menu option or Ctrl+L hot keys combination should be used. Execution of this function shows level/range marker parameters dialog fig. 24.

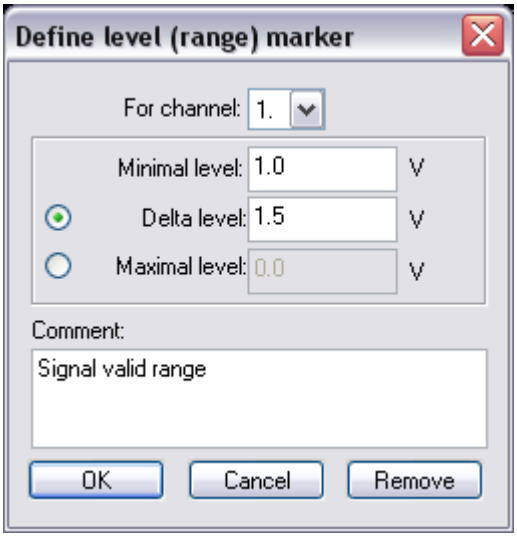


fig. 24. The level/range marker parameters dialog.

The *"For channel"* dialog item (fig. 24) allows defining a number of the channel which level/range marker will be accessed. The next group of items displays general parameters of the level/range marker for the current channel. The level marker is defined by *"Minimal level"* field of this dialog, *"Delta level"* parameter must be equal to zero. The range marker is defined by two values: *"Minimal level"* and *"Delta level"* or *"Maximal level"* optionally (see fig. 24). The level/range marker comment is the optional parameter, and can be defined by the *"Comment"* field of this dialog. Use *"OK"* button to accept all made modifications, or *"Cancel"* button to cancel them. Select the channel number and press *"Delete"* button to delete the marker for the chosen channel. Comments of the level/range markers, stored in the oscillogram file, are shown in the popup window when this oscillogram file is loaded. Use the close button placed in the right top corner of these windows to

close unnecessary comments. The *"View/Voltage marker(s) comment"* menu item or Shift+L hot keys combination can be used to show all level/range markers comment popup windows. The level of transparency for level/range markers is controlled by the function described in 3.12.3.

3.11.2 Oscillogram file description

There is a possibility to add the oscillogram file description text if needed. This description will be shown each time when the file is opened. The *"View/File description"* menu option can be used to change the file description. This function execution displays file description dialog window.

3.11.3 View options

Program view options are grouped in the popup menu *"View/View Options"*. The following options are defined in the current Program version. The *"White background"* option allows setting the oscillogram screen background color to white. The *"Show vertical scroll bar"* option allows switching on/off the vertical screen scrolling option.

3.12 Screen memory

Usage of screen memory helps to store (accumulate) the current signal shape into the screen memory. This function is available in all program modes.

3.12.1 Current screen remember function

The screen remember function is initiated by the toolbar button  or *"Operations/Remember screen"* menu option. It is possible to do continuous screen capturing, during real time signals monitoring. This function is activated by the *"Operations/Continuously screen capture"* menu option. The program screen memory accumulates the input signal changes mask, when this function is active. The same functions are used to stop this process. The screen memory is cleared automatically when channel view parameters, current mode or time division value are changed, during continues storage operation.

3.12.2 Saving, loading and clearing of the screen memory

The screen memory can be saved or loaded to or from the image file. These functions are initiated with the corresponding menu options *"Operations/Save screen memory"*, *"Operations/Load screen memory"* or *"Operations/Clear screen memory".* Screen memory save function adds a scale and the minimal required description of channel(s) parameters to the result graphical file.

3.12.3 Changing of screen memory transparency

The transparency value is used to get a better visualization effect for signals displaying on screen memory content background. The same value is used for level/range marker displaying. Extension (button ▾ at right side) of toolbar button  or *"Operations/Transparency level"* menu item can be used to change the

transparency value. The vertical bar moving of the transparency control window changes the transparency value.

3.13 Oscillogram printing

The toolbar button , *"File/Print"* menu option or Ctrl+P hot keys combination should be used to initiate the oscillogram printing process. The oscillogram print settings dialog fig. 25 is shown, when the print function is executed.

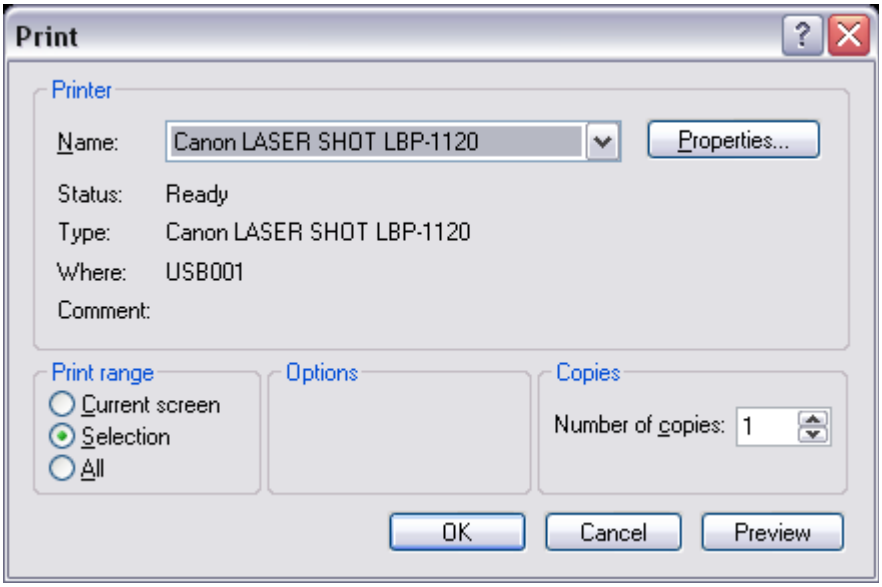


fig. 25. Oscillogram print settings dialog.

Print configuration starts with the selection of the printer which will be used for printing. Then choose the required *"Print range"* value from the following values: *"Current screen"*, *"Selection"* or *"All"*. According to this option the Program will print current screen data, the selected part of the oscillogram or the whole oscillogram file. Be careful with using the last option, this can cause printing of the big amount of pages. The *"Preview"* dialog button activates the preview window (see 3.13.1). The "*OK*" button is used to start printing process, *"Cancel"* button cancels printing.

3.13.1 Print preview window

The print preview window fig. 26 shows the graphic information that will be printed and allows the user to adjust it if necessary.

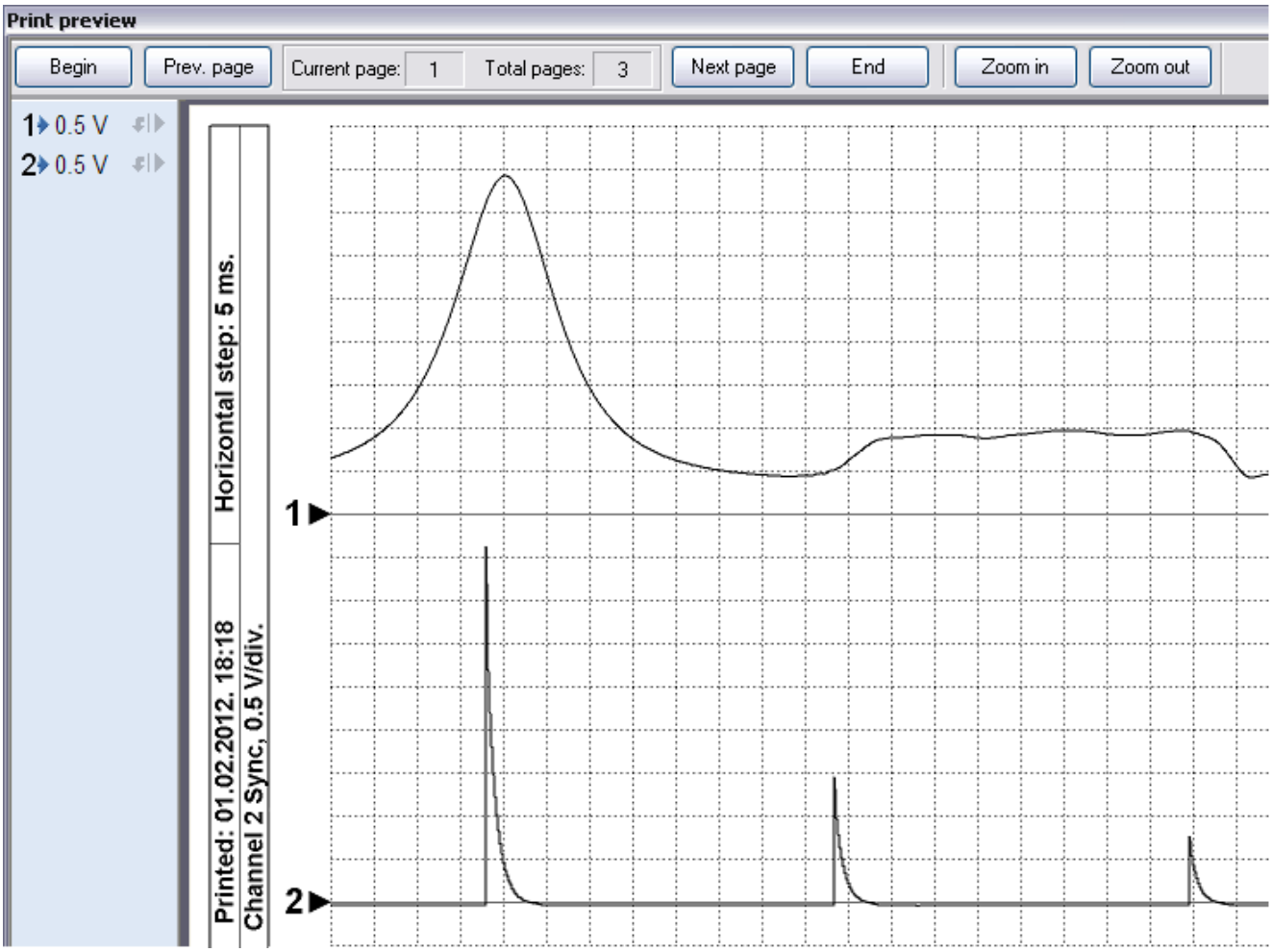


fig. 26. Print preview window.

The control panel, placed in the top of preview window, helps to control the page number and the current viewing zoom. The control panel of the signals parameters is placed in the left side of this window. This panel allows setting the optimal printing parameters for each channel signal. This panel has the same control items as the channel parameters control panel see 3.3.4.

3.14 Saving of oscillogram fragment in image file

This function allows saving the interesting fragment of the oscillogram in the image file, supplied with the required information of channels parameters.

3.14.1 Selecting of oscillogram area

This function allows selecting the required size of the rectangular area in the horizontal and vertical space of the oscillogram. The User defines horizontal and vertical sizes of the resulting image to optimize the view of signals in the defined rectangular space. It should be noted that the Program will increase the vertical size of the resulting image to add the required information. The area select function can be started from the horizontal fragment selection described in 3.7.4.

Then Program switches into the rectangular area selecting mode by pressing the toolbar button  . When the function is started with the usage of the toolbar button  directly (without horizontal fragment selection), the Program selects the area equivalent to the current screen size. Rectangular area size can be changed by simple moving of area borders with the mouse cursor. The popup window in this case displays sizes of the current area in dots.

3.14.2 Saving oscillogram fragment as a picture

In order to save the oscillogram fragment into the graphic file, it is necessary to select the rectangular area (see 3.14.1). The function is run with the help of the toolbar button  or *“File/Save as picture”* menu item.

3.15 Plug-ins

Plug-in term is used for external embedded modules, allowing to analyze the Device data stream in a real time, and to perform the signals visualization and parameters measuring. Using of plug-ins allows extending the Program functionality for real time specific signals processing. It is possible to create and use customer modules. The description of plug-in modules structure is not included into this document.

3.15.1 Using of Plug-ins

Loading of plug-ins modules can be done manually or automatically with UP files see 3.9.2. There are two ways for manual plug-in loading, depending on its type and functionality. The first way is when the Device is started in the required mode, and plug-in is loaded next. The second way is when plug-in is loaded first, and then plug-in configures and runs the current Device in the required mode. It should be noted that not all plug-in types can run the Device, therefore the second way can not be used for all plug-ins modules.

Use *“Load plug-in”* item of the control panel or list of items in the bottom of the *“Control”* menu to load the required plug-in. Plug-in control panel fig. 27 is placed at the bottom of the screen when plug-in is loaded.

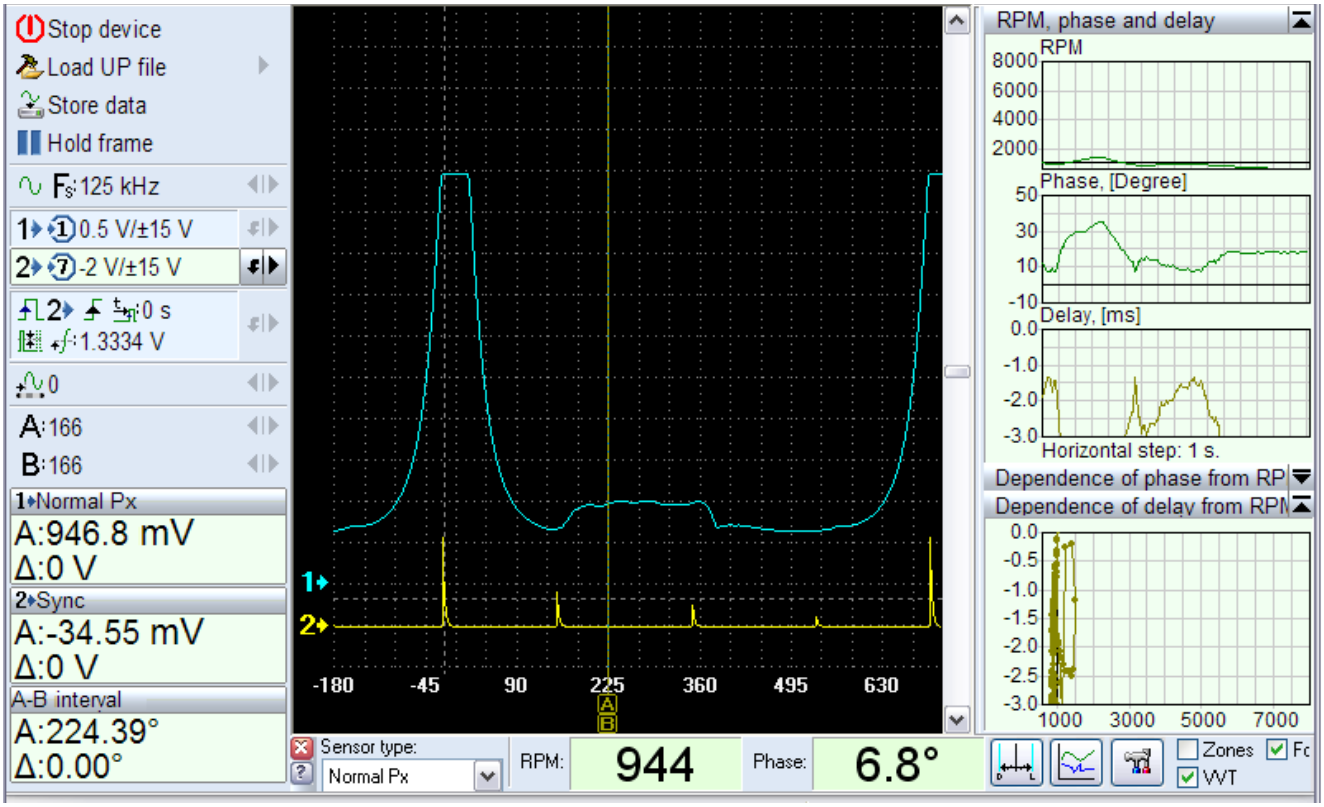


fig. 27. Program window when plug-in is loaded.

The Plug-in control panel contains items that control plug-in functionality and display investigated signal parameters. Some plug-ins can create the graphical panel (placed in the right side on fig 27), that displays data, processed by plug-in as graphics, diagrams and etc. The size of this panel can be changed with the help of the splitter moving to the left or right with the mouse cursor. As it is shown on fig.27, plug-in graphic panel can contain separate items. Each item has a header and a minimize button placed in the right side of it. This button can be used to hide or restore item context displaying. When the main part of the item header is pressed with the mouse left button, its context menu is displayed. When the plug-in module is loaded, some Program control items can be unavailable, depending on the current plug-in functionality.

3.16 Oscillogram data automatic analysis

Ability of the oscillogram automatic analysis is based on the integration of Program objects with the operation system script core. Program allows using a general set of JScript (Java Script) and VBScript (Visual Basic Script) functions and objects, and adds a set of own ones. Program's objects, integrated in the script core, allow accessing and analyzing of the oscillogram data, displaying results of this analysis in the text or graphical view, marking and commenting oscillogram specific points.

The script files are text or HTML files, which contain instructions for data processing and result visualization. In addition the Program is supplied with the encoded file type, used for source algorithm protection purpose. The current Program version supports two types of analysis. The first one is used for the analysis of the whole or selected part of the oscillogram, with receiving of all types of results and oscillogram marking. This type is based on the analyser script files. The second one is the functional extension of the Program interface, which extends Program abilities for a specific signal processing while oscillogram file viewing. This type is based on the analyser panel files. As well as plug-ins, analyser panels are integrated into the Program interface and have own control items, placed on a separate panel at the bottom of the screen. Program script objects and functions description are not included into this document.

3.16.1 Using of analyser scripts

Analyser script files are files with extension “*.ajs” - containing Jscript source, “*.abs” - for VBScript source or HTML files. The “*.abc” extension file is the encoded file type which can contain source of all described above types. The toolbar button  or *“Analysis/Open script”* menu option is used to load the script file. The toolbar button  , *“Analysis/Execute script”* menu option or Ctrl+A hot keys combination is used to run the script. The toolbar button  or *“Analysis/Abort script”* menu option is used to cancel the script execution. Toolbar buttons  ,  or *“View/Switch to oscillogram view”*, *“View/Switch to report view”* menu items or Alt+W, Alt+R hot keys combination can be used to switch oscillogram and report view modes accordingly. Use toolbar button  or *“Analysis/Delete report”* menu option to delete results of analysis. When the script creates several elements, placed in the report window, the tab control item on the top of the report window or Ctrl+Tab hot keys combination serves to switch active ones. The name of the current script file can be attached to the oscillogram file. In this case, the attached script file will be loaded each time when the oscillogram file is loaded. The *“Analysis/Attach current script”* menu option can be used to attach the loaded script file. To cancel any attached script use the *“Analysis/Detach script”* menu option. The *“Analysis/Run after load”* menu option activates script execution directly after loading.

3.16.2 Analyser panel usage

Analyser panel files have “*.apn” file extension, and “*.apc” for encoded analyser panel files. The toolbar button  or *“Analysis/Load analyser panel”* menu option is

used to load the analyser panel file. The running of the analyser panel file is performed directly after the file loading. The Analyser panel closing stops its script execution. The name of the current analyser panel can be attached to the oscillogram file with the *"Analysis/Attach current panel"* menu option. In this case the panel is loaded automatically when such oscillogram file is loaded. To cancel this attachment use the *"Analysis/Detach panel"* menu option.

3.16.3 Graphical results printing

This function serves to receive a printing copy of the graphics drawn as an oscillogram data analyze result. Printing function is initiated by the toolbar button , *"File/Print"* menu option or Ctrl+P hot keys combination. The graphics print setup dialog fig. 28 helps to configure the print function.

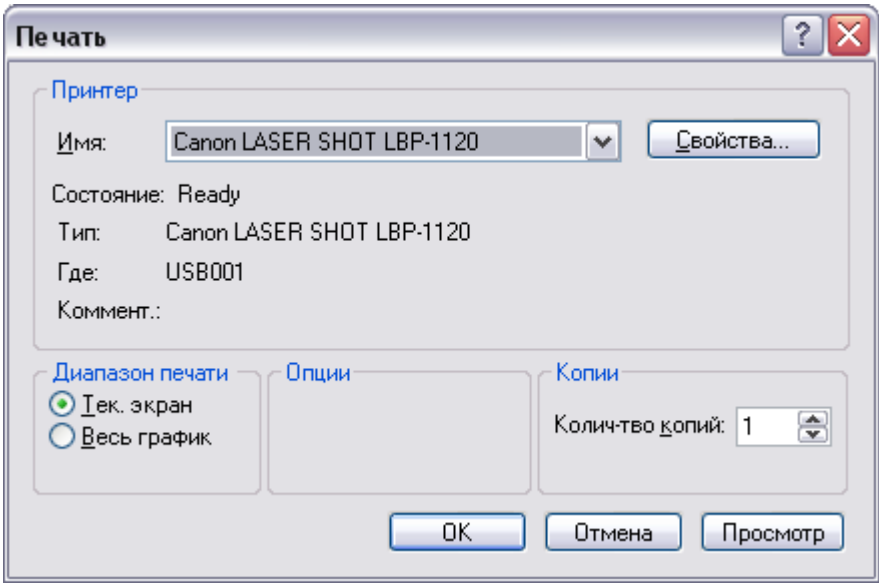


fig. 28. Graphics print setup dialog.

Print configuration starts with the selection of the printer which will be used for printing. Then the required *"Print range"* value should be chosen from the following values *"Current screen"* or *"Whole graphic"*. According to this option the Program will print the current screen view or the whole graphic. The *"Preview"* dialog button activates the preview window. The "*OK*" button is used to start the printing process, *"Cancel"* button cancels printing.

3.16.4 Saving of graphic in a picture file

This function helps to save graphical results of oscillogram data analysis, as a picture file. The function is initiated with the toolbar button or *"File/Save as picture"* menu option. The *"Save as picture"* dialog fig. 29 is used to configure function options.

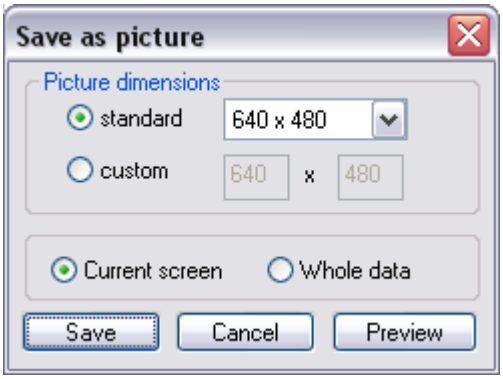


fig. 29. The *"Save as picture"* dialog.

As it is shown on fig. 29, the dialog has control items that serve to define the result image size, select what will be displayed in the result image *"Current screen"* or *"Whole data"* - for the whole graphic. The *"Preview"* dialog button activates the preview window. The "*Save*" button is used to save the picture file, *"Cancel"* button cancels it.

3.17 Emulation mode

This mode allows emulating the real time signal monitoring on the oscillogram file, previously stored without the real Device usage. This mode has several limitations in comparison with the real process. In spite of this it allows using the whole synchronization, measurement and plug-ins tools set, with the imitation of real signals.

3.17.1 Running of emulation

The required oscillogram file, which data will be used for emulation, should be loaded firstly before emulation mode can be started. As well as the real Device, the emulator is run by the "*Start device*" item of the control panel. The *"Program emulator"* item should be chosen as the data source Device fig. 30.

fig. 30. Start device panel with the *"Program emulator"* device.

The device mode and channels number items of this panel are inactive, they display the mode and number of channels in data source file, used for the emulation. The next item is used to switch on or off data circling option. This option allows circling of emulation mode when the emulator reaches the end of emulation source file.

3.17.2 Emulation activation

This option sets the emulator device as a default device. The *"Control/Activate emulation"* menu item is used to activate the emulation priority. It is necessary to use this option when the emulation mode should be used with UP-files or plug-ins loading. Otherwise, if this option is disabled, the Program will make attempts to run any available Device.