auto.spy analyzer

Getting started

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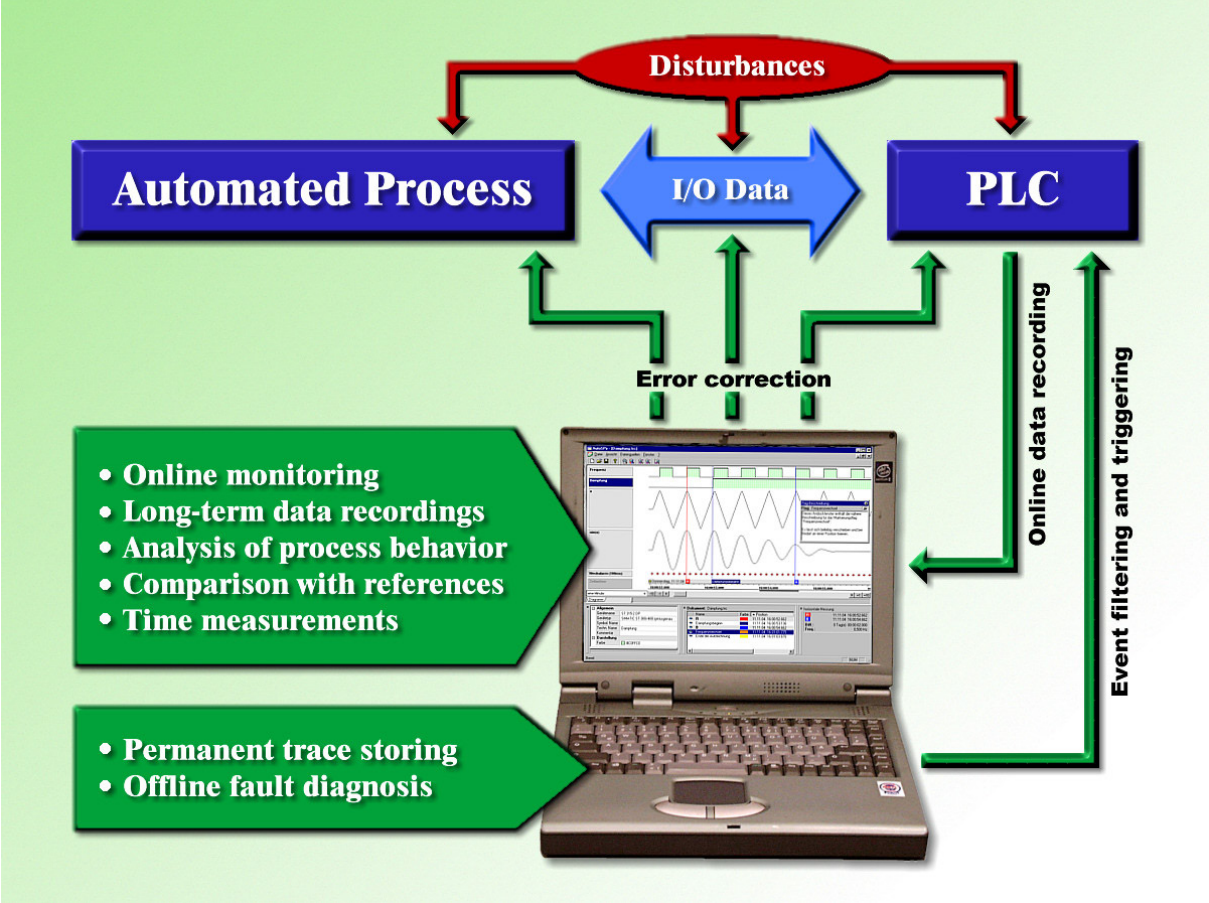
1 Introduction

The auto.spy analyzer is a powerful and versatile tool for testing during the development of control software for parameterization and optimization of a process during its installation or for analyzing sporadic PLC faults during plant operation. Its operation is similar to that of measuring instruments such as logic analyzers and tachographs: Suspect PLC signals can be easily selected, take notes and already evaluated graphically during recording. But with the advantage that you do not need a continuous paper despite high Messgenaugikeit.

In order to detect faults and eliminate acting on the process, the controller (PLC) and exchanged between two I/O data, all relevant signals (filtering) in the interesting periods (triggering) are examined with auto.spy. Errors can within process flows online and offline sources, recorded and then corrected by long-term monitoring, reference comparisons and time measurements.



The software auto.spy consists of a main application, which can be extended functionally arbitrarily for available plugins. This includes new device drivers for data acquisition to controllers or visualizations for individual signal representation and evaluation. The user can perform a plurality of records to the various controls at the same time in the same document as needed. The program is always to operate even if the device communication is hung or was interrupted.

For labeling and description of events in the signal trace flags are available which allow the orientation and the retrieval of specific time points in the trace. Using cursors periods and signal amplitudes can be measured. Many of these functions are available to the user in freely positionable and fixable dockers, which can be hidden if desired. The hierarchical navigation bar allows quick and precise access to any part of a signal trace, even if it contains data of several weeks or months.

2 Requirements

This quick guide will help you to get to know the most important functions of the auto.spy analyzer in a short time and thus be able to use the tool quickly and effectively. So you can follow the instructions well, the following conditions are helpful:

- The auto.spy analyzer (demo or full version) is installed properly.
- You have access to a programmable logic controller SIMATIC S7-300 or S7-400.
- The included STEP 7 Classic example project "S7_CycleTime" runs on the PLC.

2.1 Installation

Please make sure before installation that all system requirements are met.

auto.spy requires the following computer hardware:

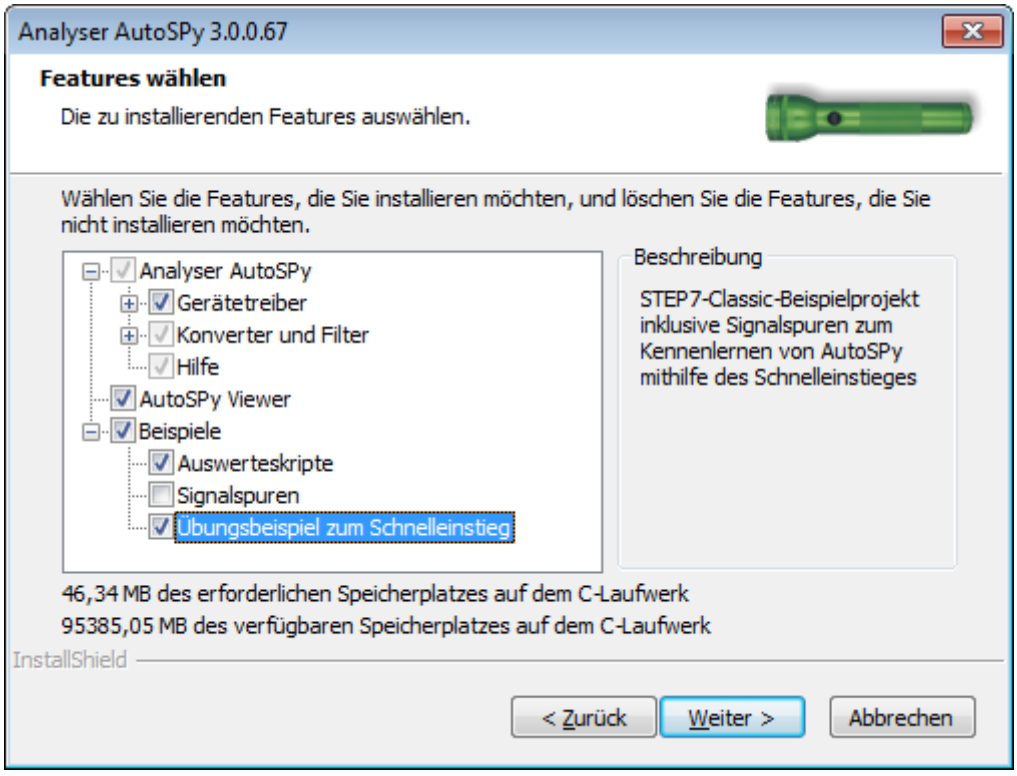
- Intel-compatible CPU 1 GHz or faster
- At least 8 GB RAM
- At least 1 GB free hard disk space

auto.spy supports the following operating systems:

- Windows 11
- Windows 10
- Windows 8 / 8.1
- Windows 7 (Service Pack 1)

Execution under Windows server operating systems is possible but at your own risk and without support!

To install, please start the installation program "autospy_setup.exe" and follow the instructions. So you can follow all the steps of the guide, select the setup type "Complete" or "Custom." In the latter case, please ensure that the feature "Tutorial for First Steps Guide" is selected.



During installation, a program group "auto.spy analyzer" is created in the Windows Start menu automatically on the program as well as various text documents can be, for example, this introductory guide called.

Exclusively for the full version you also need a HASP dongle for the USB port. However, before you connect the dongle to the PC, please install the appropriate HASP dongle driver. More information can be found in the document "Information on Copy Protection."

2.2 STEP7 sample project "S7_CycleTime"

The supplied sample consists of three components and is located after installation in the folder "Documents\auto.spy documents" the current user profile:

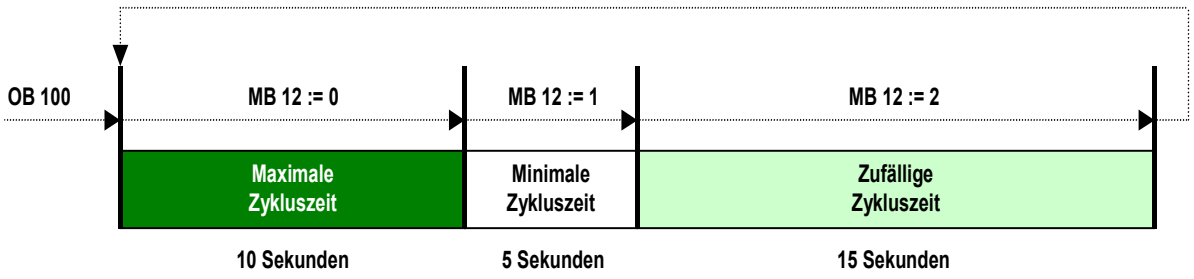
- the STEP7 Classic sample project "S7_CycleTime" in Various \ folder S7_CycleTime
- two sample records "S7 Cycle Time.astrace" and "S7 Alternating Bit.astrace" in the signal traces folders and related SDF symbol tables in Various

If possible, play the included STEP7 program on a blank control and solve a restart to allow the application to run. The used PLC must have no inputs or outputs. **Caution:** The control program manipulates the cycle time of the PLC and must not be used in a running system!

The sample application is used to demonstrate the recording and evaluation functionality of auto.spy and runs in three consecutive sections (see illustration) from:

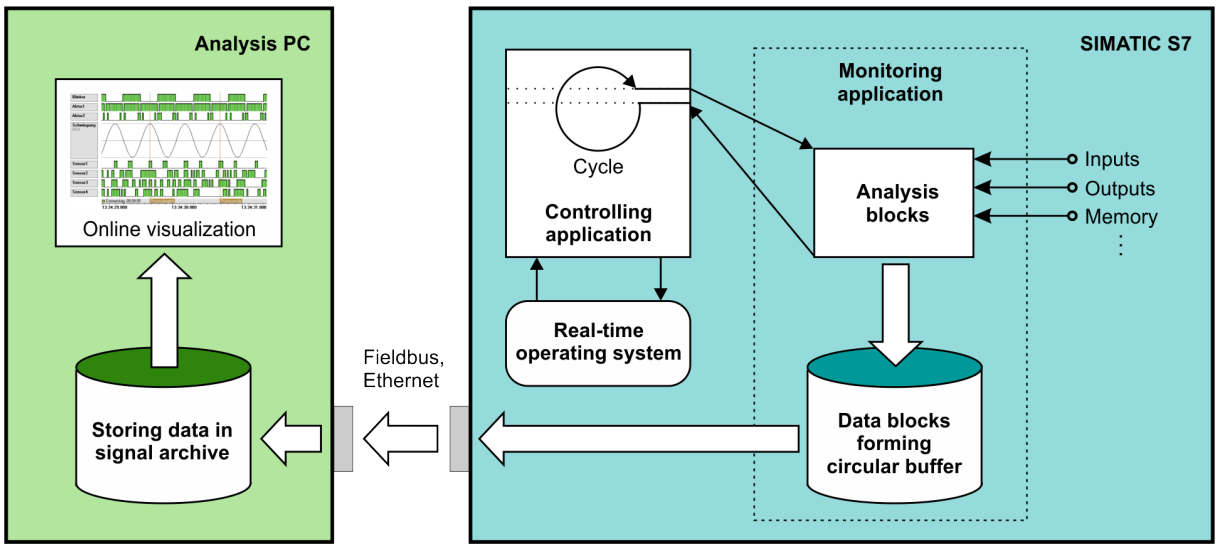
- The first cycle lasts 10 seconds, and increments a loop counter within each cycle until the configured maximum cycle time of the central unit and exceeded 80 (time-out) is called by the PLC of the OB.
- The second section takes 5 seconds, and almost produces no load, so that the PLC is operating almost at full speed, so with minimal cycle time.
- The third section will take 15 seconds, and varies in each cycle, the artificial delay between zero and the maximum cycle time of the first portion, ie occur strong load fluctuations as well as occasional time error alarms (OB 80) on.

Once the third section has been processed, the cycle starts from the beginning and thus operates with a lap time of 30 seconds. The flag byte contains the code 12 MB for each phase and can be used for the separation of the sections. Regardless of the particular phase, the flag bit M 20.0 is inverted in each cycle and stored, the cycle time of the previous cycle, which is present as a parameter of the OB 1, in the memory word MW 0th This application is used hereinafter for example recording of cyclic and asynchronous SPS signals.



3 Cycle-precise Data Logging

Subcycle more accurately detecting a data recording method is understood that provides a record of the desired signals accurately in each PLC cycle. This is accomplished is by a monitoring application of analysis modules and a data buffer generated at runtime of the plant and transferred before recording in addition to your control application to the PLC. In this case, a call to the first analysis block is prefixed to include the monitoring application in the cyclic processing of the PLC OB1 (see figure).



The analysis modules include the actual recording functionality. They are distinguished in each cycle to the operands that you have previously entered into the signal table. This data is stored in a circular buffer from data blocks whose size you can define. The analysis PC asks during the recording of the state of this buffer, and transfers the filled areas on its hard drive. At the same time some of the data is displayed (online visualization).

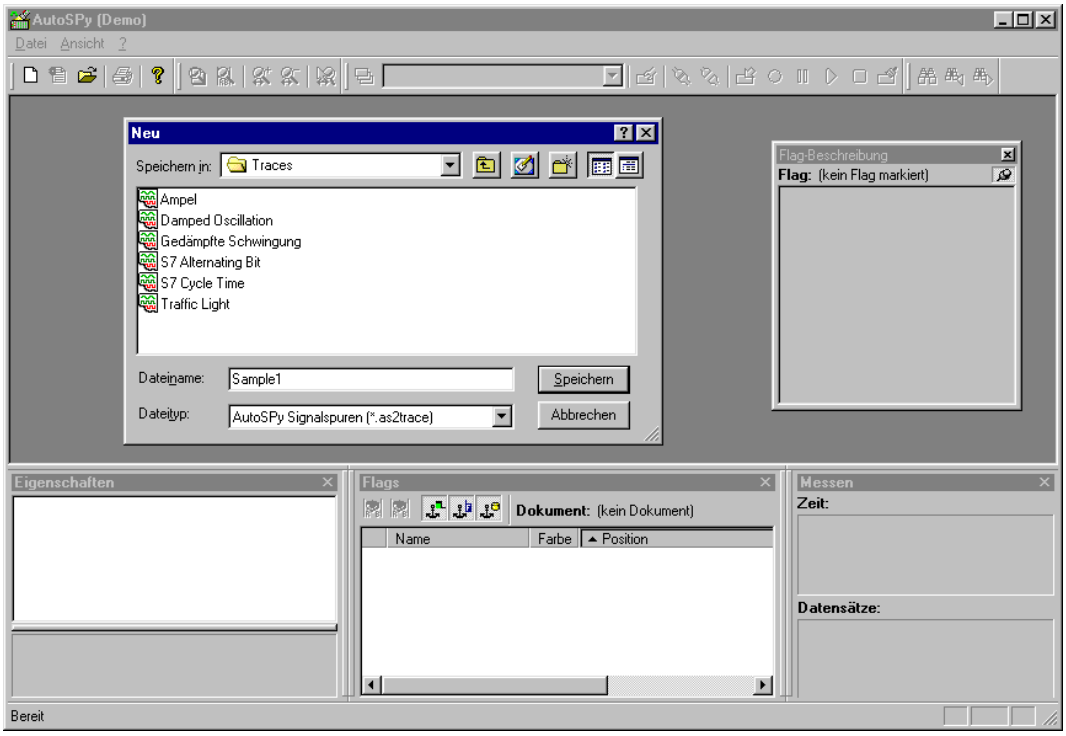
In contrast to abtastgenauen recording, for example, STEP 7 used for observing a variable table, one thus achieves a high measurement accuracy and can guarantee that no cycle is skipped in data collection. The sampling rate must not be given, but directly depends on the cycle time of the controller, that is, the recording works as fast or slow as the PLC itself.

Each recording can be divided into several steps and is described in the following sections. The two signal trace documents "S7 Cycle Time.astrace" and "S7 Alternating Bit.astrace" which refer to the signal trace folder created.

Avoid the simultaneous execution of multiple cycle-precise recordings on the same controller as this may eventually lead to the fact that the individual monitoring applications no longer be removed after the measurement! In addition, then other functions such as synchronous operation, even (see section 3.10), No longer run properly.

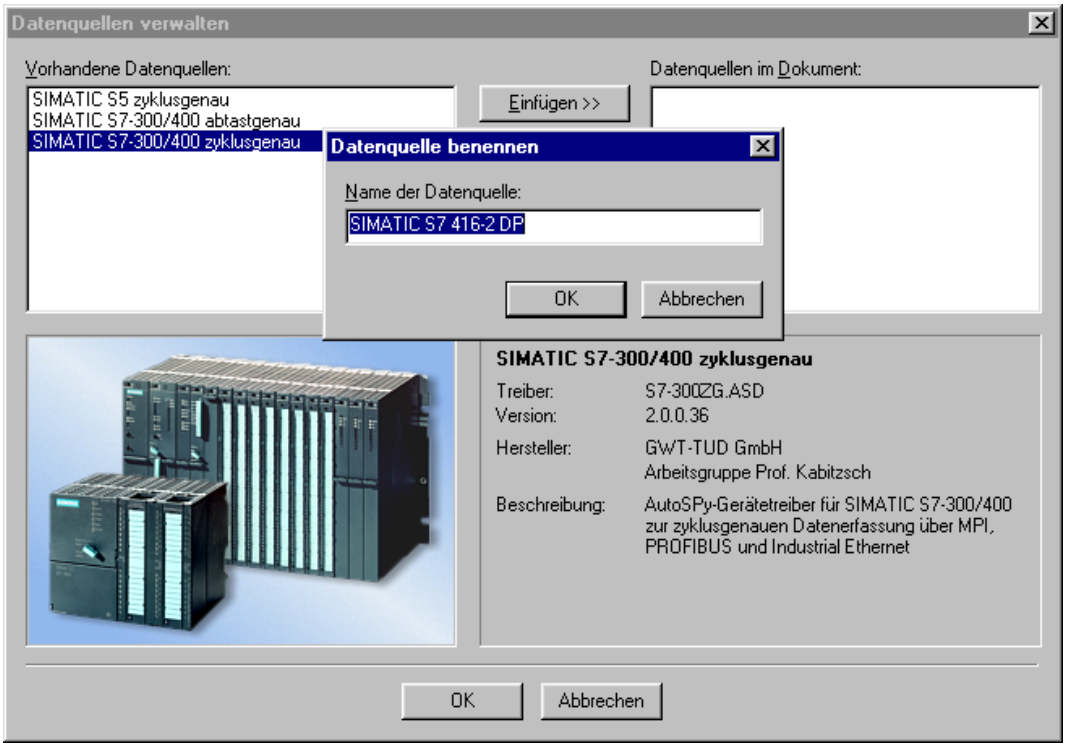
3.1 Create new signal trace documents

First start the auto.spy analyzer and select the menu item File | New. So you create a new, empty signal trace document. Name it **Sample1.astrace** and save it in the appropriate subfolder for signal traces.



3.2 Insert data sources

Next, you need to add for each device or each control from which you want to record signals, a data source to the document. for call the menu item data sources | Manage ... data sources so that the dialog below appears.



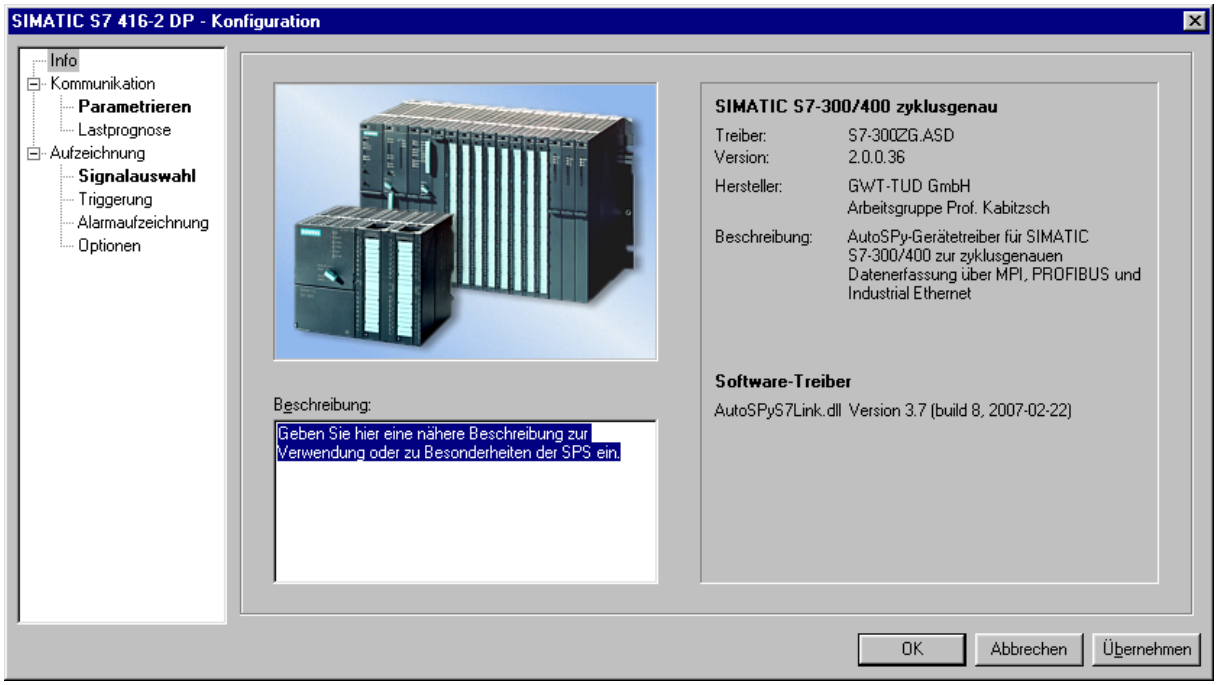
The left list contains an overview of all installed and licensed device drivers. Currently, the following device drivers are available for the auto.spy analyzer:

- SIMATIC S7-1200/1500 polling-precise
- SIMATIC S7-1200/1500 cycle-precise
- SIMATIC S7-300/400 polling-precise
- SIMATIC S7-300/400 cycle-precise
- SIMATIC S5 cycle-precise
- LabJack U12
- UNIGATE CL
- OPC
- Video

Highlight the desired type of the new data source and then press the "Add >>" button to insert a concrete instance of that type in the document. For subsequent differentiation of the individual device instances you must clearly identify the data source. We recommend assigning the names on the purpose of controlling such. B. "climate control" or "high-bay control". In our example, the name "SIMATIC S7 416-2 DP" is selected.
After confirming the name, the entry in the right list, which displays all device instances of the current document appears. By highlighting where individual entries, you can the information about the type of data source or display rename the source. You can delete a data source only as long as no data was recorded for it.
If you exit this dialog, your new data source in the menu data source is registered with the just given name. All further actions for this data source using this menu item (in the example data sources | SIMATIC S7 416-2 DP) or the toolbar "data sources" (see section 3.10) triggered.

3.3 Configure data sources

Before you can start recording, the data source must be configured. All adjustments necessary to be carried out in a central dialog that is started using the menu item **Configure...** a data source. About the properties tree on the left, you can select the individual settings categories that are then always shown in the right pane. All **bolded** sub-items must be fully parameterized, so that recording can be performed.

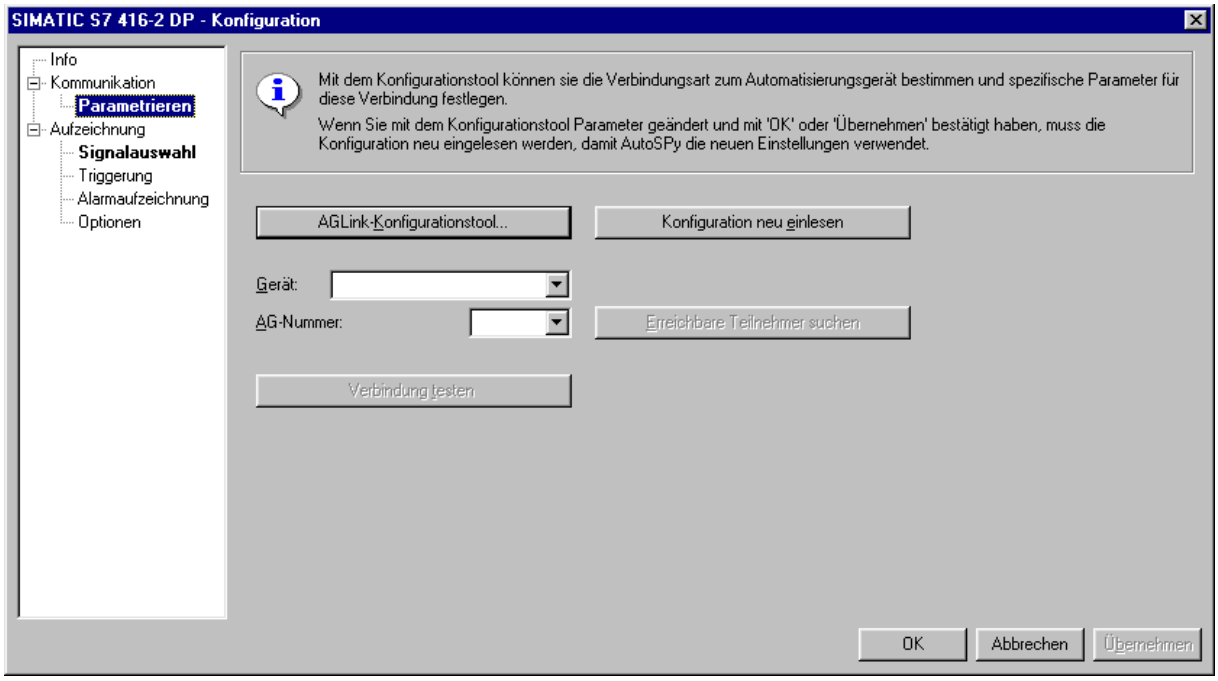


The dialogue starts with the info page, which provides information about the data source type, and also gives the possibility to enter a detailed description for this particular data source, such as for use and / or specificity of the connected controller.

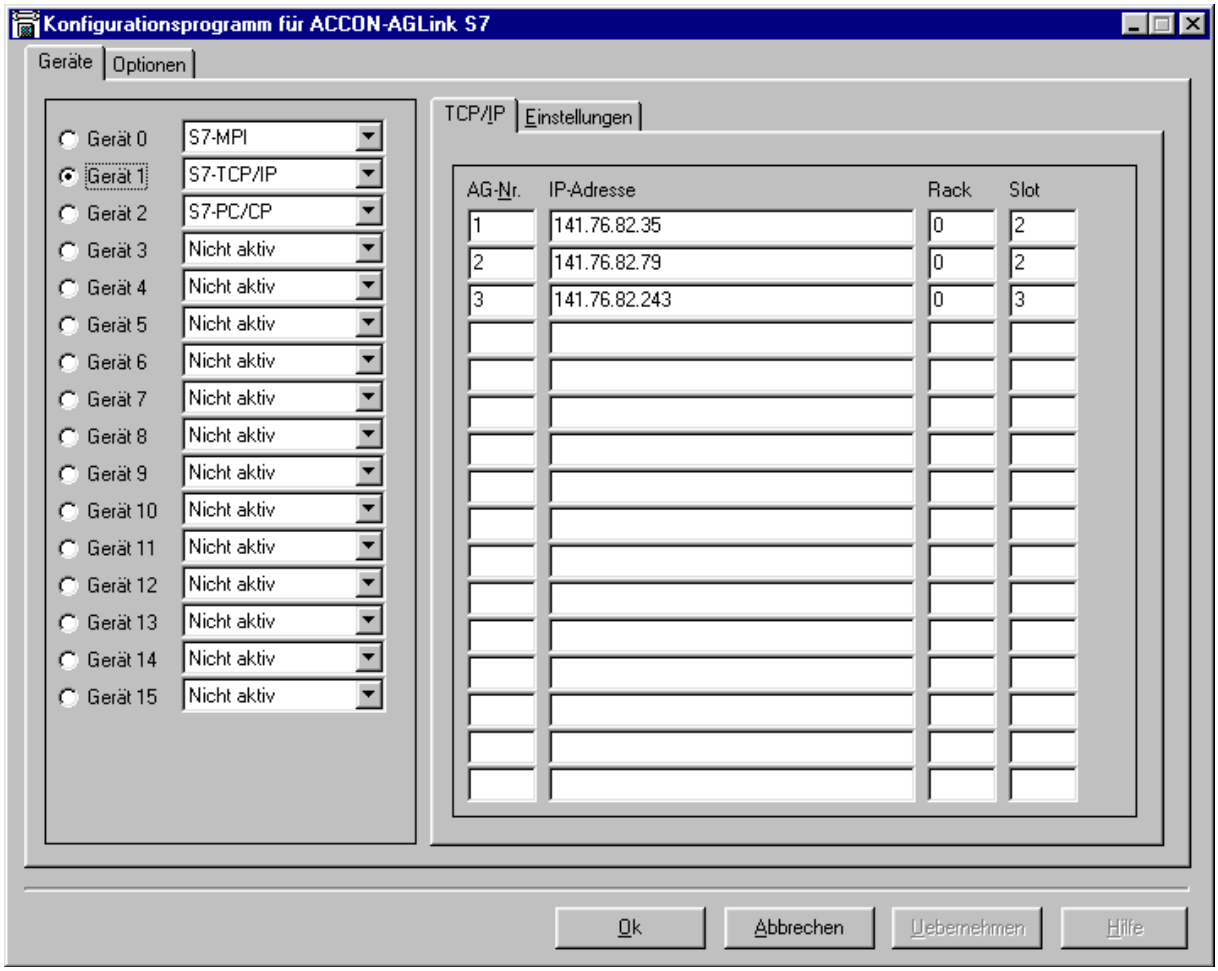
In the simplest case, you only need to tell auto.spy for data acquisition, what to record and how you are connected to your data source. All other options can be left at their default settings for now.

3.3.1 Set parameters for communication

The setting of connection parameters is done in two stages. On the "Parameter adjustment" of the configuration dialog, first start the AGLink configuration tool via the corresponding button.



the configuration program for the communication driver ACCON-AGLink S7, where you can set up all available on your analysis PC communications interface appears.

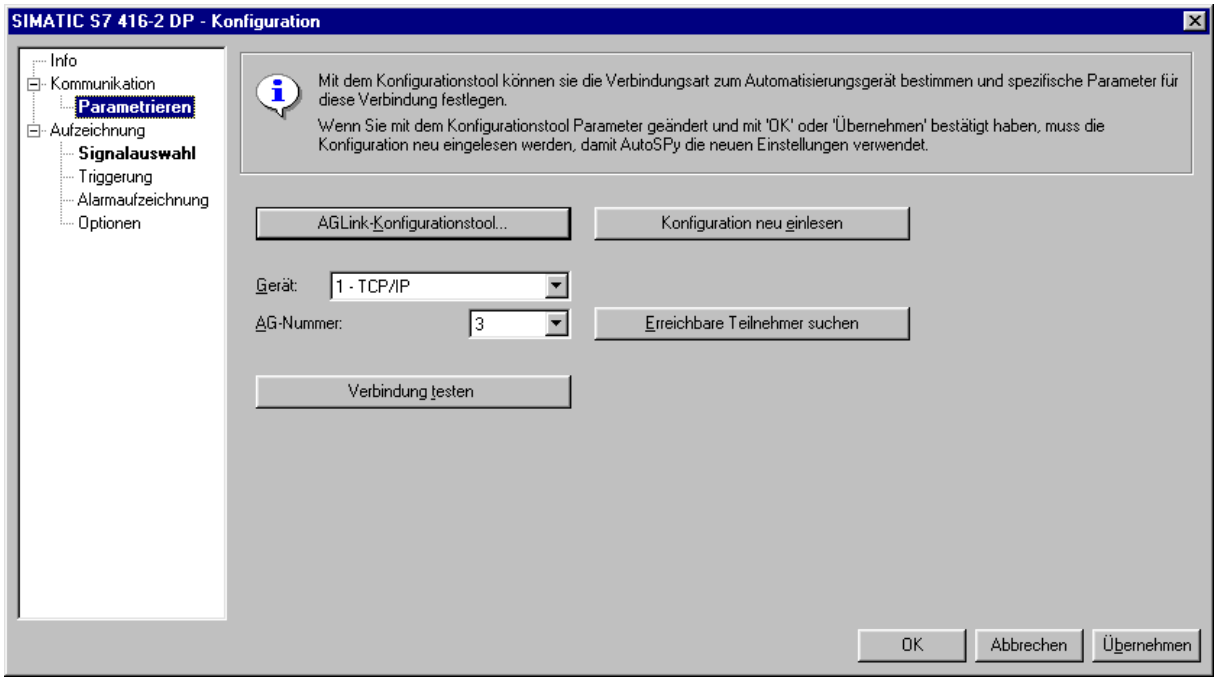


You can now left to select the desired communication device and select the type of the device in the corresponding selection list. In the tabs on the right side always suitable for the respective type Konfigurationsmöglicheiten are displayed. Once you make changes to the setting, the "Apply" button is active and you can save the changes to the selected device. "Abtastgenau SIMATIC S7-300 / 400 / cycle-accurate" for the device driver following communication devices are available:

- **S7 MPI** Serial MPI adapter such as the Siemens PC Adapter
- **S7-MPI / TS** attainable via modem connection MPI adapter such as the Siemens TS Adapter
- **S7 NetLink** for various NetLink communications adapter Deltalogic, Hilscher, including
- **S7 CIF / CIFX**for ACCON-PB / MPI card of Delta Logic and the PROFIBUS cards from Hilscher
- **S7 Softing** for PROFIBUS card from Softing
- **S7-TCP / IP** (Possible routing) for access to S7-300 / 400 via Ethernet network cards
- **S7 PC / CP** for communication via the PG / PC interface from Siemens (requires installation of Siemens products such as STEP 7, PRODAVE or SOFTNET)
- **S7-TCP / IP TIA**to access S7-1200 / 1500 Ethernet network cards

In the example, three communication devices were set and access via Industrial Ethernet three programmable controllers (AG) entered with a current AG number, the IP address of the Ethernet CPs and the rack and slot number of the CPU. Behind the AG with the number 3, the control SIMATIC S7 416-2 DP to be recorded from which hides.

If you have set up all the access routes, exit the program with "OK".



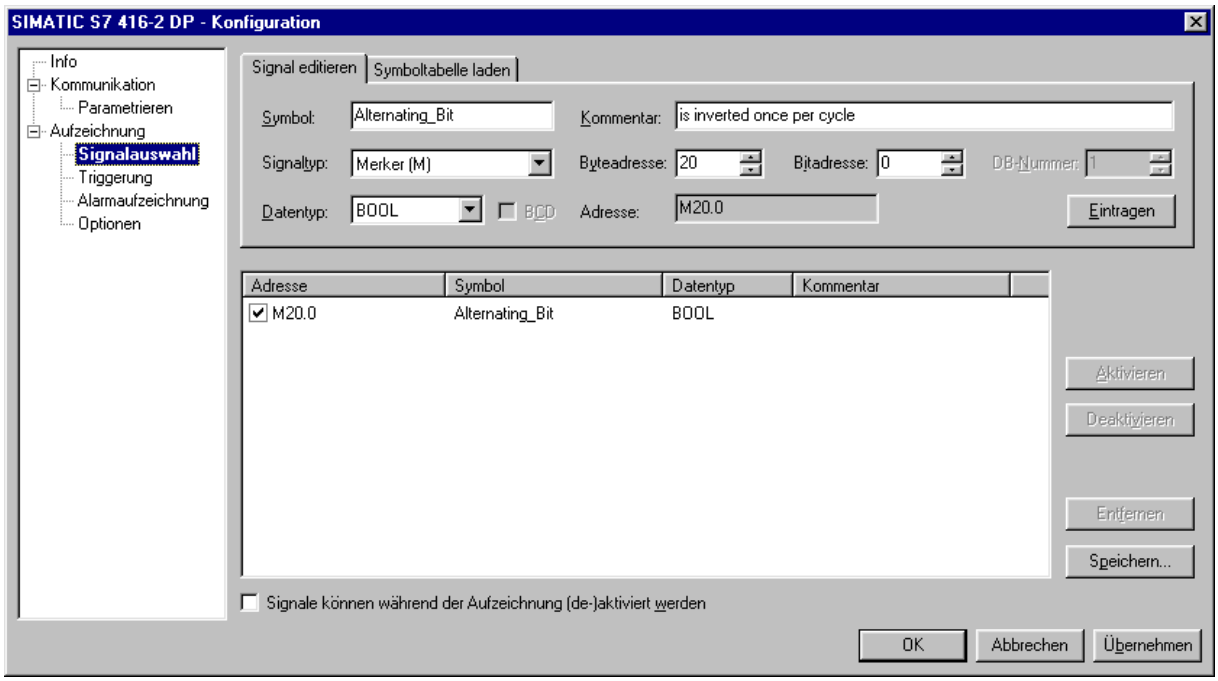
Once you are back in the configuration dialog of auto.spy, press the "Configuration Rescan" to take over the communication configuration of the ACCON-AGLink driver. Once you now select one of the communication devices offered, all accessible via this access nodes are polled automatically. Set the correct AG-number test the connection with the corresponding button. If the test is successful, press the "Apply" button to exit the parameterization of your data source.

The S7-400 in our example is addressed via Industrial Ethernet and has settings that have been stored under the AG-number 3.

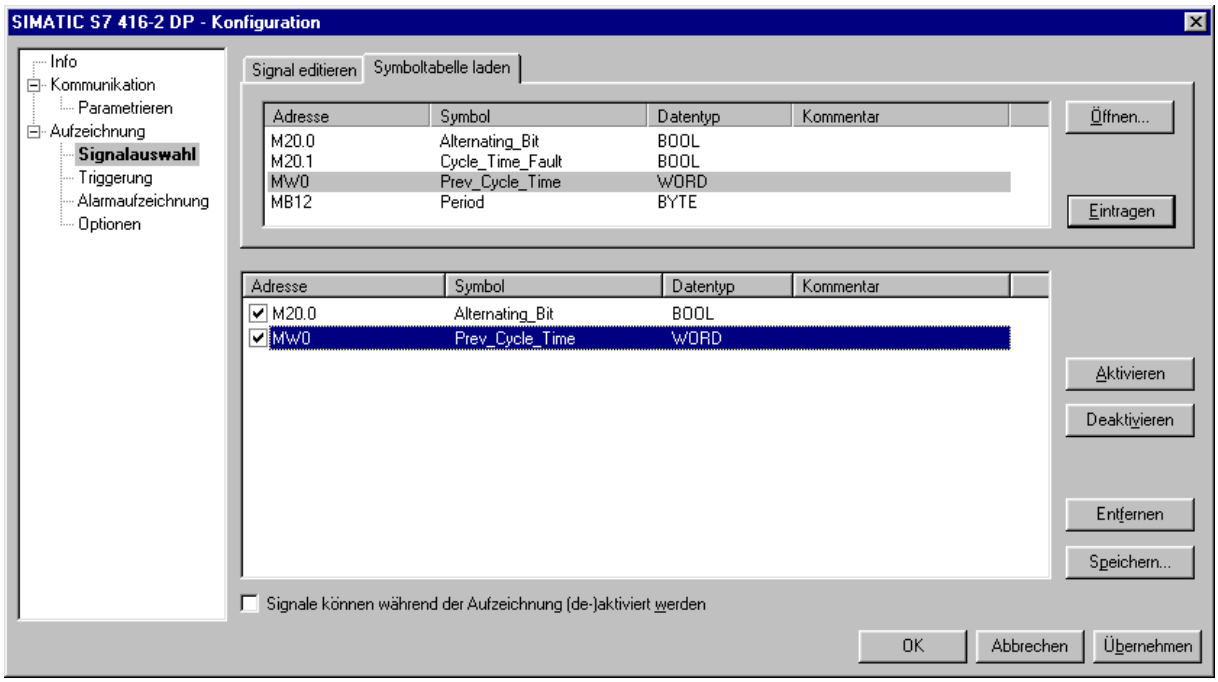
3.3.2 Select signals

The second important step in configuring a data source is the compilation of those signals which are to be recorded by the connected device. Click in the tree on the "Signal selection" and open so the appropriate dialog that allows selection of up to 512 signals in two different ways:

On the "edit signal" you will get the option to select all the information of a signal (symbol name, comment and address data) manually or enter. If you have set all the data, press the "submit" button to add this signal to the table in the lower half of the dialog.



A more convenient way to signal selection provides the "symbol table load", which allows you (Data Format System) can read exported STEP 7 symbol table and enter the desired, selected signals in the signal table one in SDF format. In the example, the symbol table "S7 Cycle Time.sdf" from the folder Various was used.



All listed in the table below signals having a check mark in front of the address designation shall be regarded as activated and are recorded in a recording. Although disabled signals are available in the

signal table but will not be included in a recording. Do you want during a recording individual signals enable / activate, turn on the appropriate radio button to below the signal list. However, this option requires a slightly increased memory and time required in the controller, so you should use this option only when necessary.

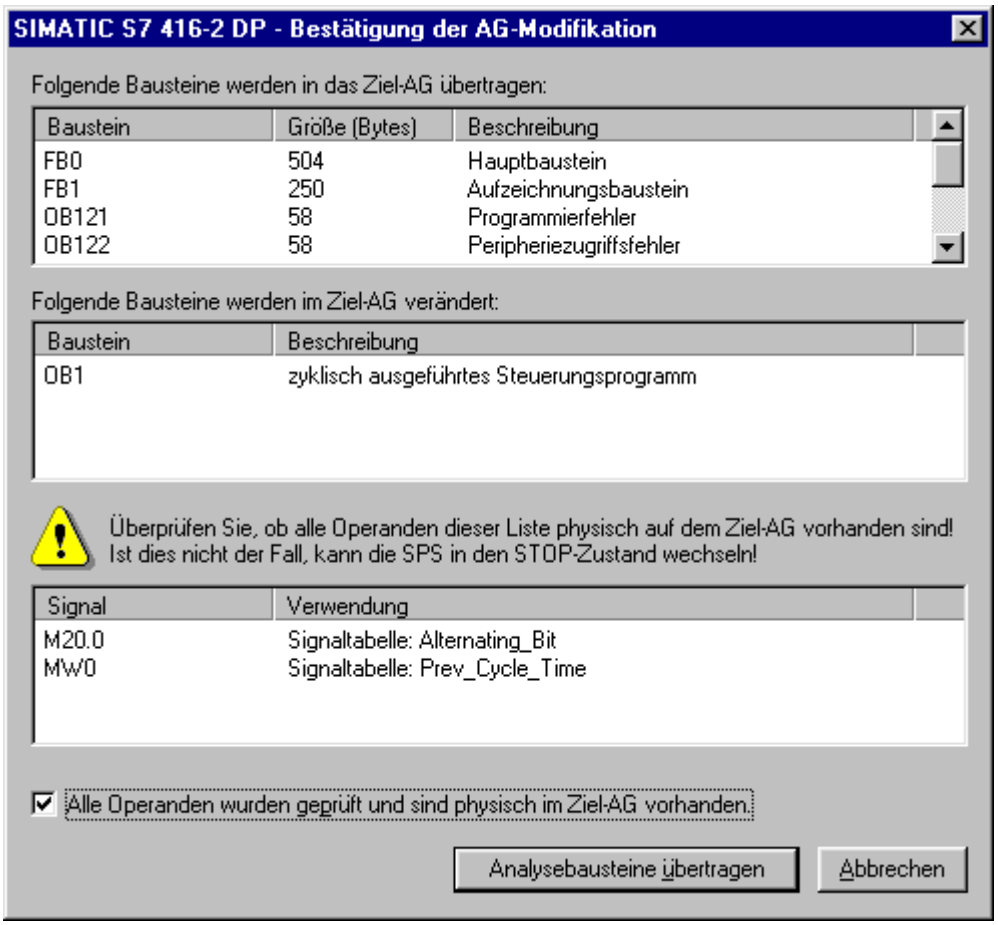
In the example, the alternate memory bit M 20.0 and the measured cycle time to flag word MW 0 selected for detection. So that the settings can be accepted and the dialog with the "OK" button to exit.

3.4 Connect and prepare recordings

Once all the settings have been made in the configuration dialog of a data source that can in the menu item data sources | <Data source name> | Connecting an online connection can be established to the respective control. For this, the configured access path is used (see section 3.3.1).

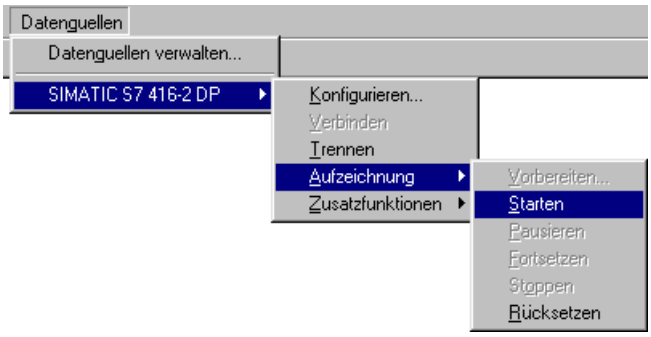
Then the point is data sources | <Data source name> | recording | Preparing ... available that queries the free resources in the control, the monitoring application (see page6) Generated and then showing you this confirmation dialog. It contains an overview of all modifications that have to be made to the program of the PLC, in three categories:

- Blocks of the monitoring application that is additionally transmitted to the controller
- existing blocks in which a block call must be inserted
- all (in the signal table see section 3.3.2), The trigger conditions (see section 3.8) And the alarm recording (see section 3.7) Used PLC operands



Check all proposed changes and the presence of all signals, including any input, output, data block and peripheral operands and agree to the changes in the program memory to by selecting the radio button in the lower part of the dialog. "Transfer Analysis Blocks" with the button will cause you to program the controller. Once this is successfully completed, the record is considered to be prepared and can be started.

Note: During programming, all the items of the data source are disabled (see picture left) to prevent operating errors. The refresh of the submenus can only take place when it is closed, which means you have to leave an opened during the current programming menu of a data source and rerun it, so that it can switch to the right shown condition. At this state, you realize that the record was successfully prepared.

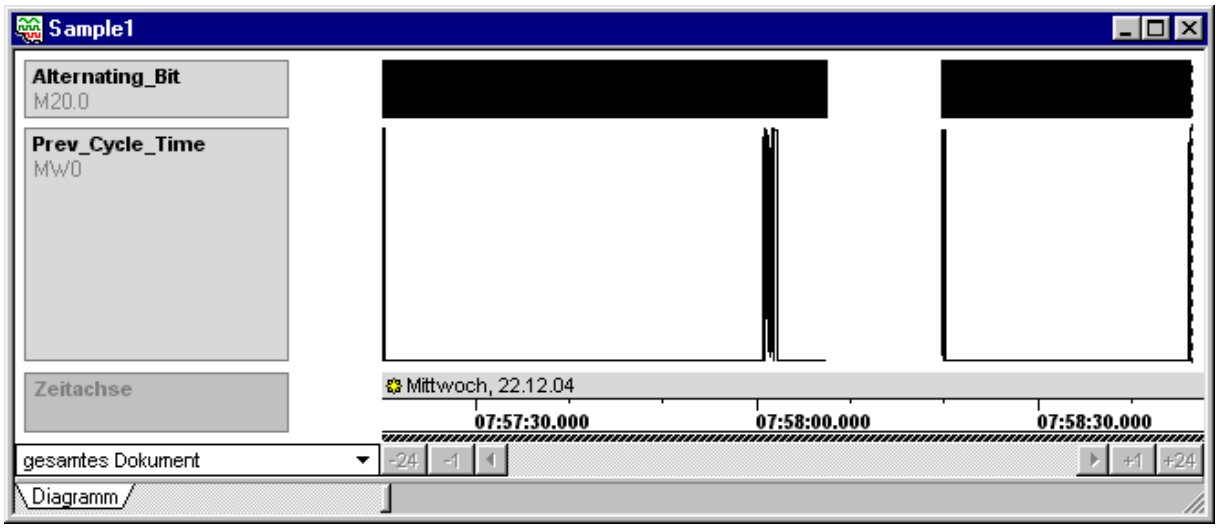


3.5 Start and stop recordings

Now run the first cycle-accurate data collection through and consider using the following menu items to their data source:

- **recording | Start** To start the data collection
- **recording | Pause** to interrupt the data collection
- **recording | Continue** for continuing an interrupted data acquisition
- **recording | To stop** to stop the data collection

After starting the recording, the names of all signals detected appear to the left in the signal trace window. The data are not individually during recording, but transferred in blocks from the PLC to the analysis-PC. so the refresh rate depends on the speed of your control: new data are the faster it works, the more often displayed on the screen.



Now draw some time, stop recording in between once and then stop the data collection. The monitoring application including all changes will automatically be removed from the PLC. You should now have a similar view (shown above) on the screen. You have successfully completed your first recording!

3.6 Reset recordings and disconnect

After installing auto.spy is preset to use the monitoring application is automatically removed from the control when stop data collection. You can change this behavior in the options of recording. Then you must remove the analysis modules manually. For this, the menu item is data sources | <Data source name> | recording | Resetting available. The following mechanisms ensure this functionality in addition from:

- You can not disconnect from the PLC as long as a record is prepared.
- You can include neither the document nor the entire application, as long as a connection is established at a data source.

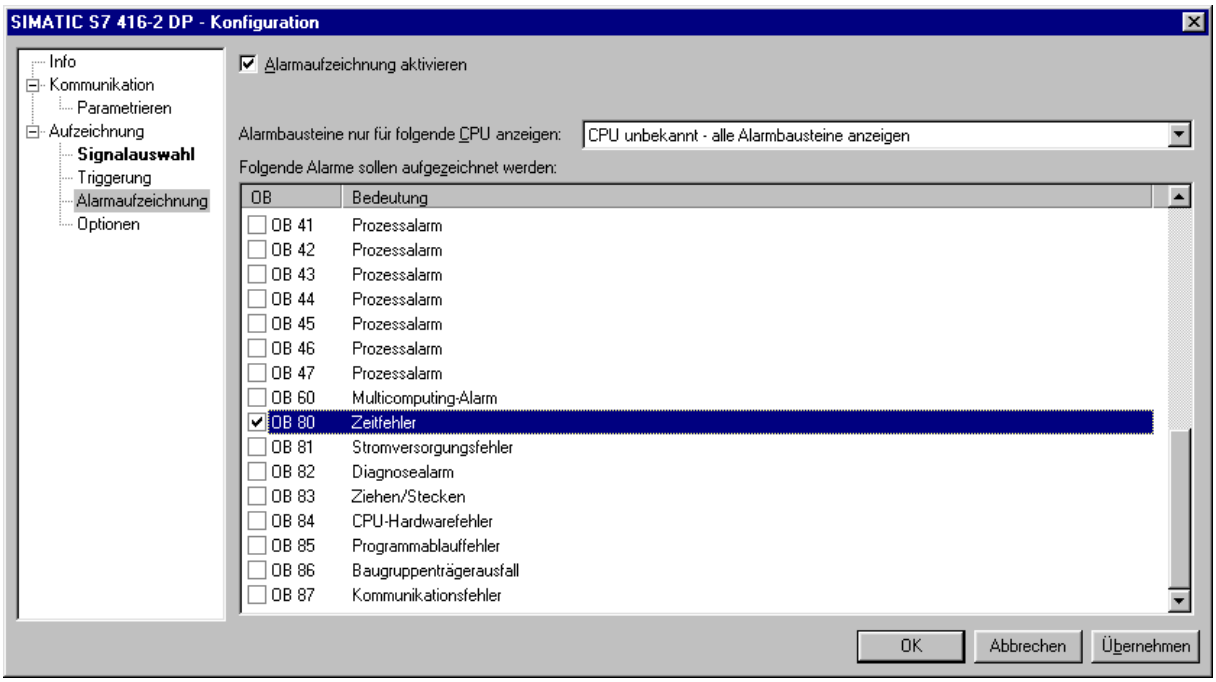
Disconnect now the connection to the data source with the menu item <Data Source Name> | Disconnect and close the document. Some possibilities for evaluating this recording are described in chapter3.10 described.

3.7 Log alarms

In addition to cyclic data acquisition, in which a record is stored in each program cycle the PLC of the signals of the signal exactly table, you will still be able to monitor the occurrence of alarms (interrupts). To understand an example of an alarm recording, please follow these steps:

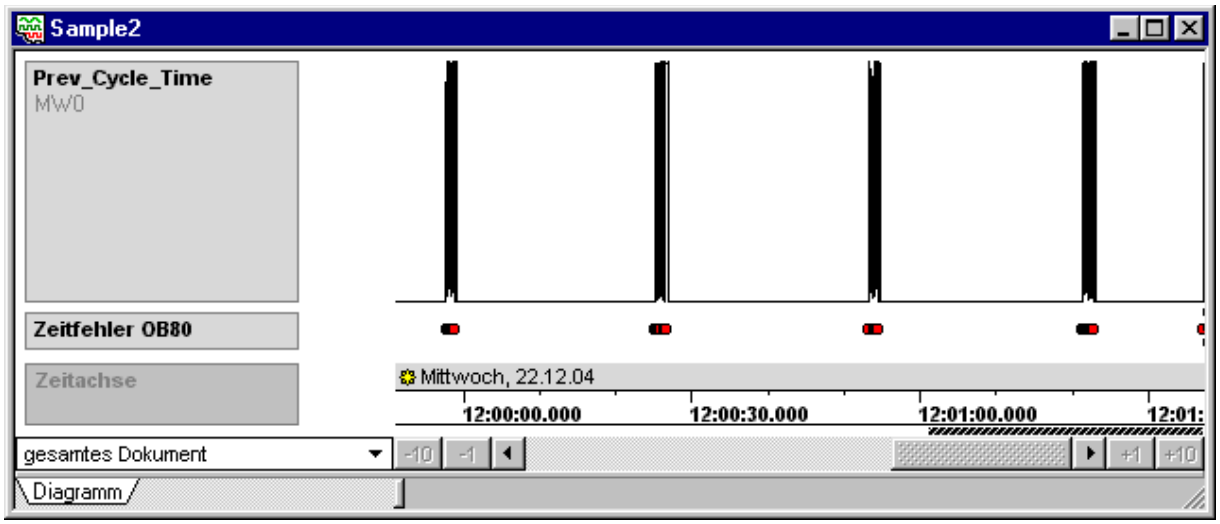
- Create a new signal trace document, you assign the name Sample2.astrace and save it in the appropriate folder signal traces (see section 3.1).
- Add a data source type "SIMATIC S7-300 / 400 cycle-accurate" in the new document and assign it a suitable name (see section 3.2). We call the data source again "SIMATIC S7 416-2 DP".
- Establish communication link to the controller (see section 3.3.1).
- Enter into the signal table of the data source, the flag word MW 0 with the symbol name "Prev_Cycle_Time" (see section 3.3.2).

Now change the configuration dialog to the Preferences page "Alarm recording" and activate the alarm recording by selecting the appropriate radio button. In the alarm list in the lower part of the dialog you can tick those alarms from which you want to log the occurrence. Because the sample application "S7_CycleTime" provoked timeouts, please select the OB 80 (time error) and close the dialog with "OK".



Note: Each monitored alarm also counts as a signal and thus accounted for in the amount of up to 512 signals can be recorded by a data source simultaneously.

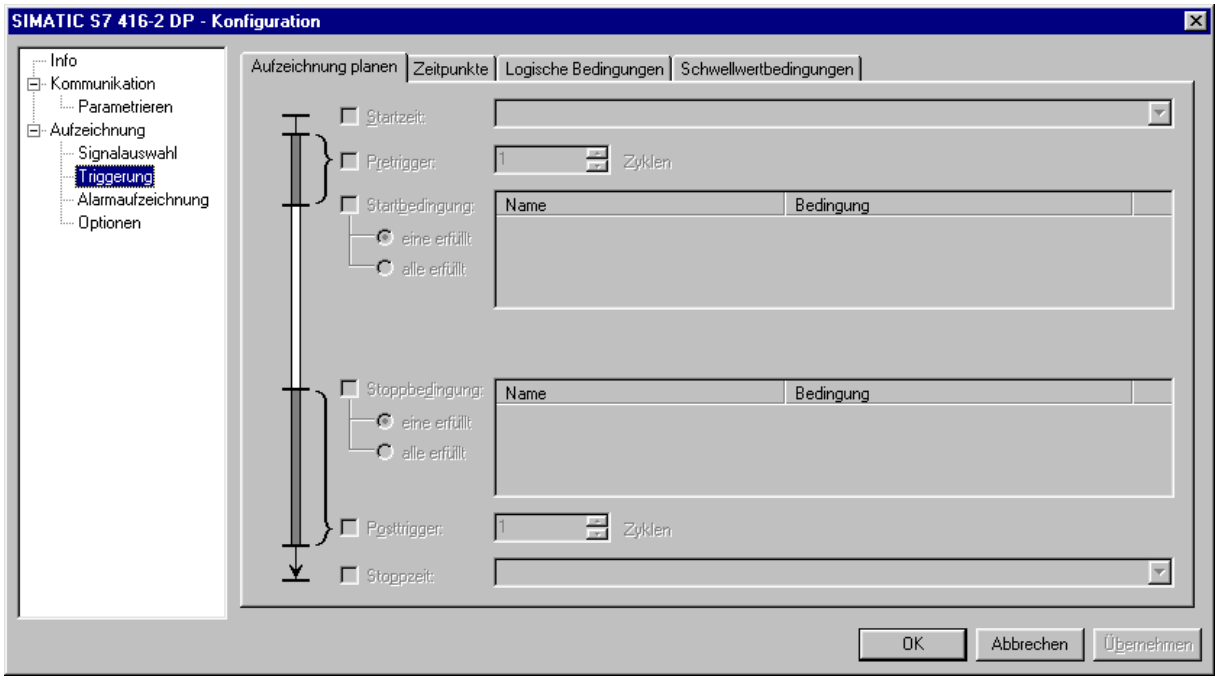
Draw these two signals now several minutes (see sections 3.4 and 3.5). You should then a similar view (see figure below) on the screen. The document can be used straight on to demonstrate the triggering.



3.8 Trigger recordings

To start data collection function of time or process conditions automatically or stop the device driver provides the ability to trigger recordings. The example of the STEP 7 application "S7_CycleTime" (see section 2.2) Will be demonstrated how the three time sections of the application can be recorded separately. To do this, the document Sample2.astrace (from the alarm recording see section 3.7).

Call in the configuration dialog of your data source and select the property page "Trigger". This dialog allows you to create a so-called recording schedule that specifies what conditions are used to start or stop and whether the pre- and post-history of an event trigger to be detected. Before creating the plan, you must specify the individual time or process conditions. Serve the other tabs.

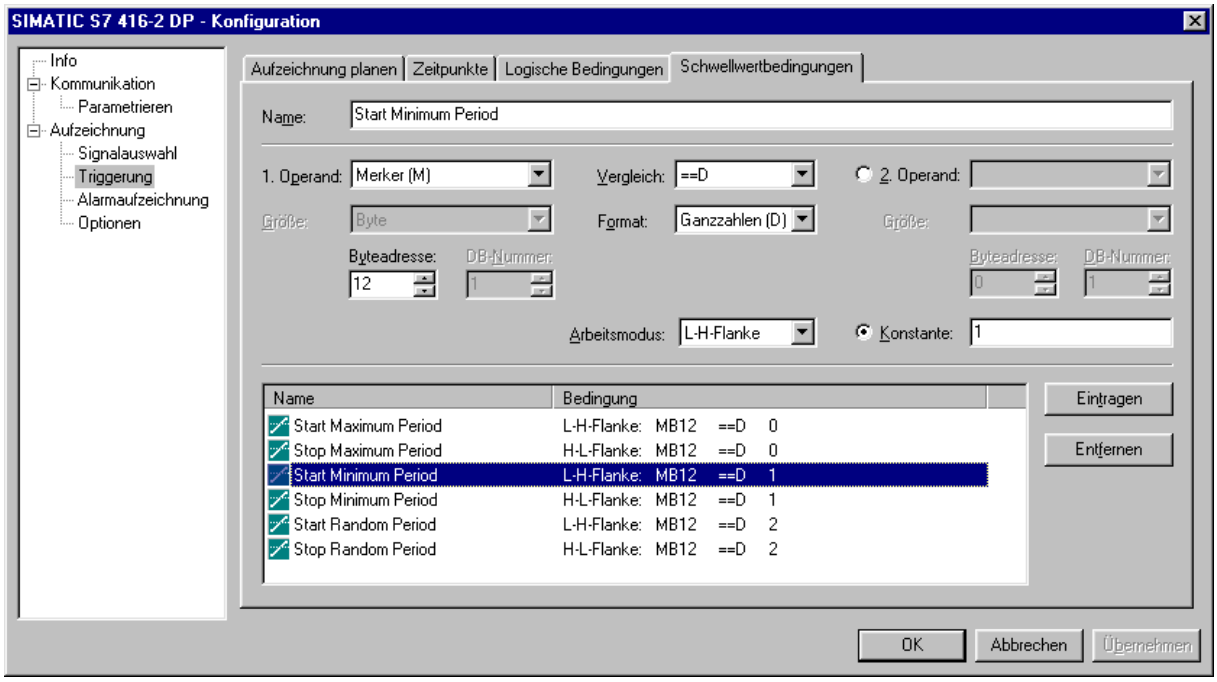


You can formulate three types of trigger conditions:

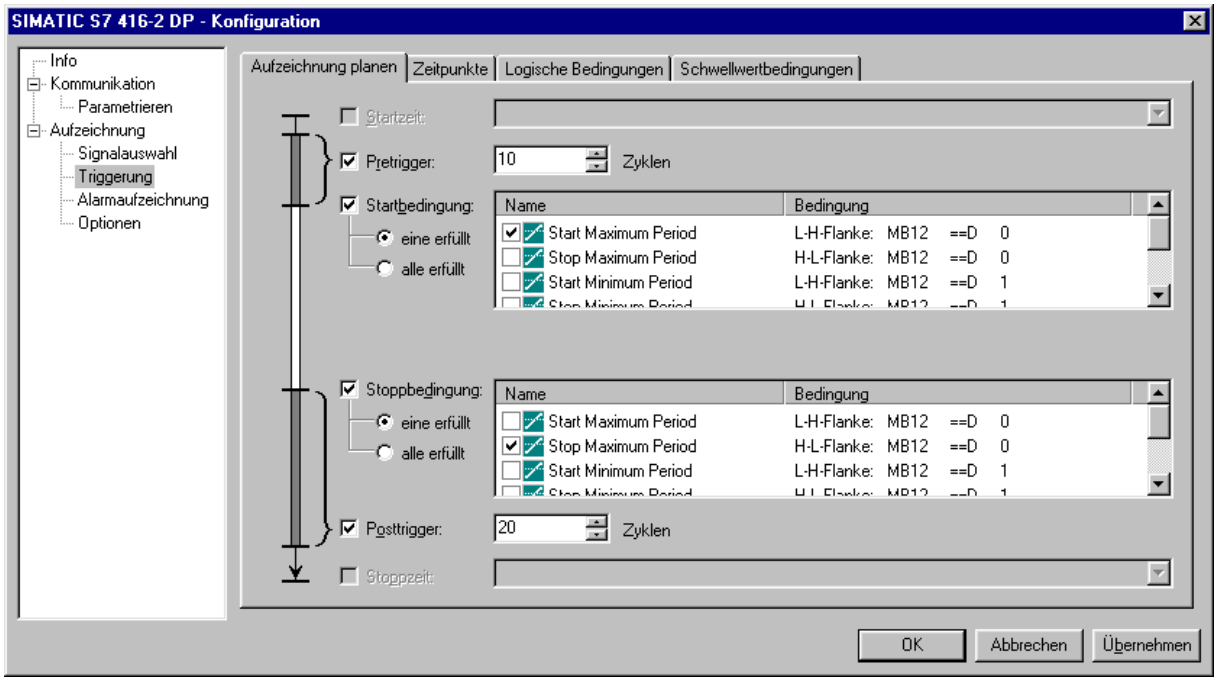
- Times (date and time of analysis PCs)
- Logical process conditions (Boolean links) and
- Threshold conditions (comparison of values and constants).

Process conditions (logic and threshold) are generally evaluated in the real-time controller.

The three chronological sections in the example can be distinguished on the state of the memory byte MB 12th Therefore useful to trigger on this condition threshold conditions. Assign all six conditions (each a start and a stop condition) first name and then set the operand comparison with a constant and the correct working mode (cross checking), so that you get the below result in the end.

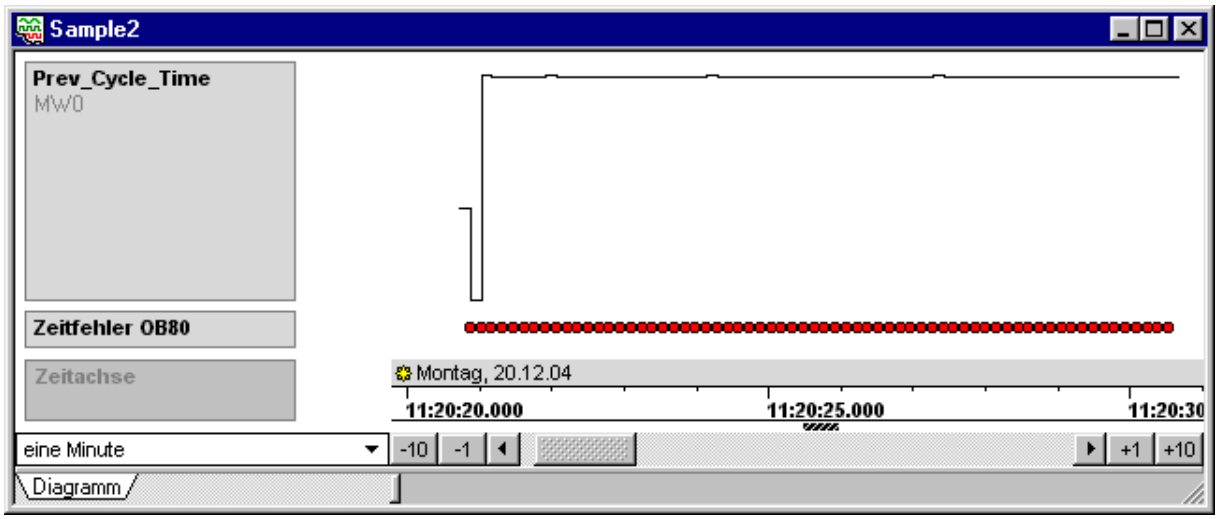


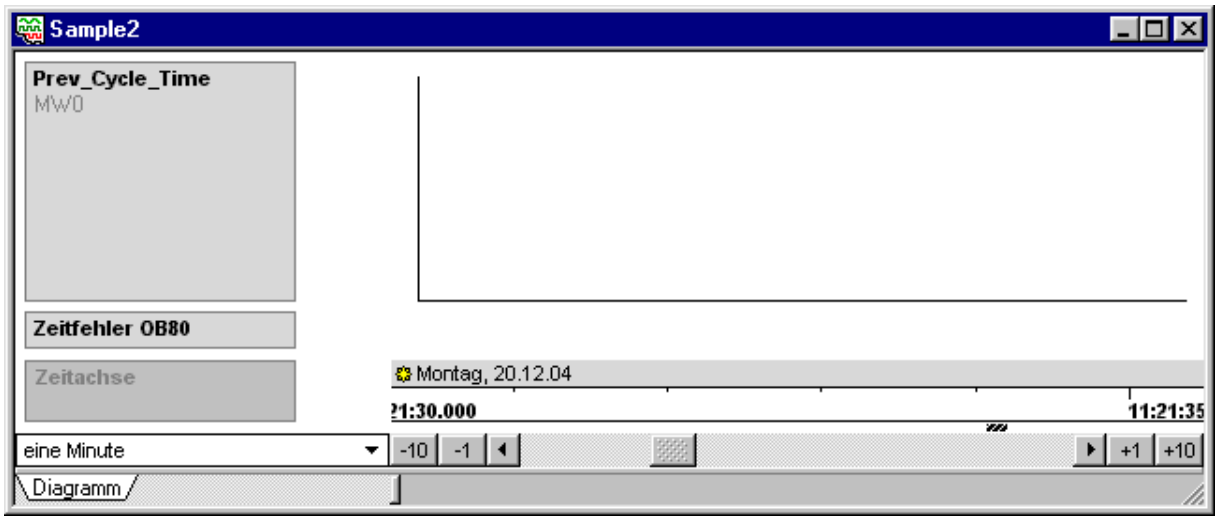
If you have completely formulated all partial conditions, go back to the tab "recording schedule" and configure the triggering finished (see picture).

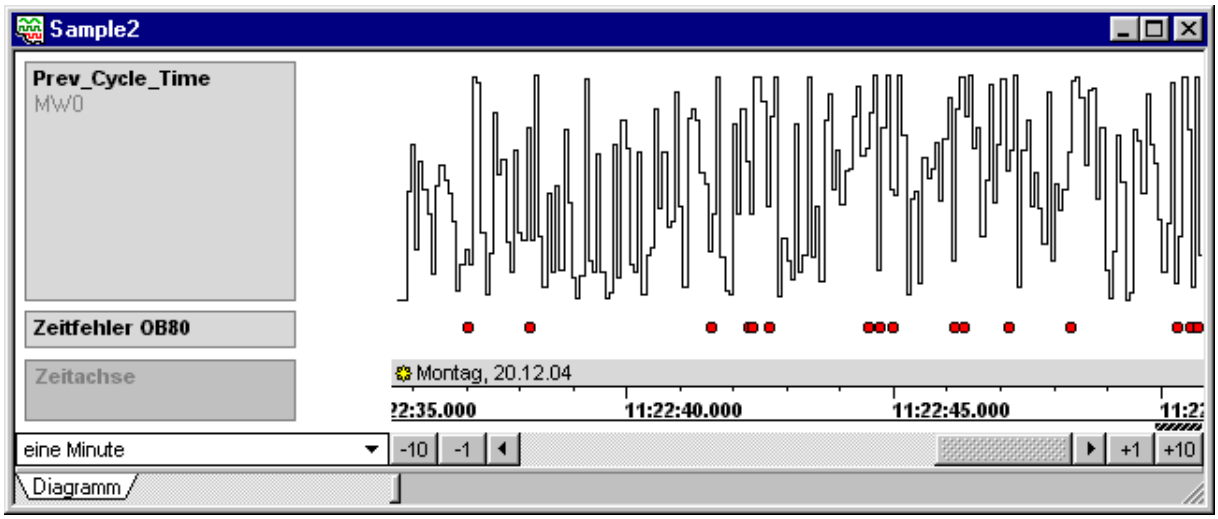


To limit the individual time sections "Maximum cycle time", "Minimum cycle time" and "Random cycle time", select the appropriate pair each threshold conditions as start or stop condition. You can use the settings "pre-trigger" and "post-trigger" either, or areas recognized immediately before and after the set conditions.

Draw the two signals now consecutively for three sections by selecting the next pair of trigger conditions between the individual records just in the work plan (see also sections 3.4 and 3.5). The recording stops after the occurrence of the stoppage condition each time automatically and removes the analysis modules. The signal data is arranged in chronological order in the document. You should then see on the screen is a similar view (see below pictures).

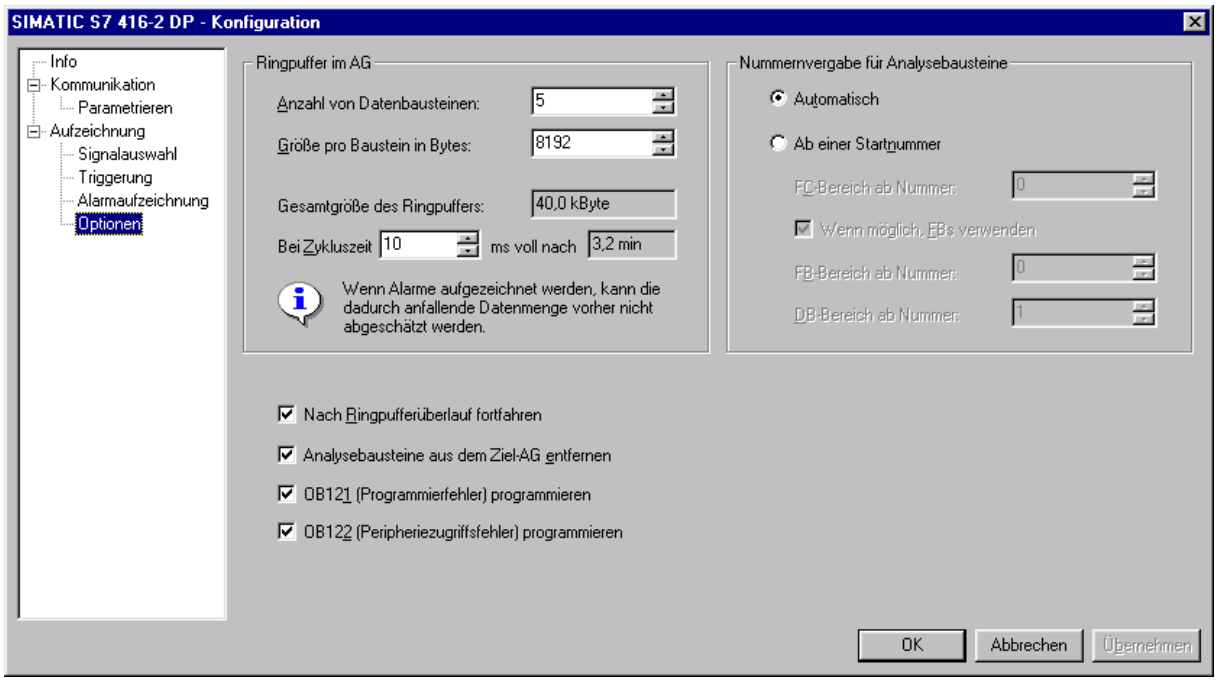






3.9 Options of recording

If the message "circular buffer overflows occurred" appears after a recording, go to the property page "Options" of the configuration dialog of a data source and increase the number and / or size of the data blocks from which the temporary ring buffer consists AG. So you can prevent briefly increased amounts of data. If the problem still persists, you must delete or disable signals to obtain a continuous recording without gaps. Over the corresponding radio button you can decide whether the recording should be continued or stopped by a ring buffer overflow here also.



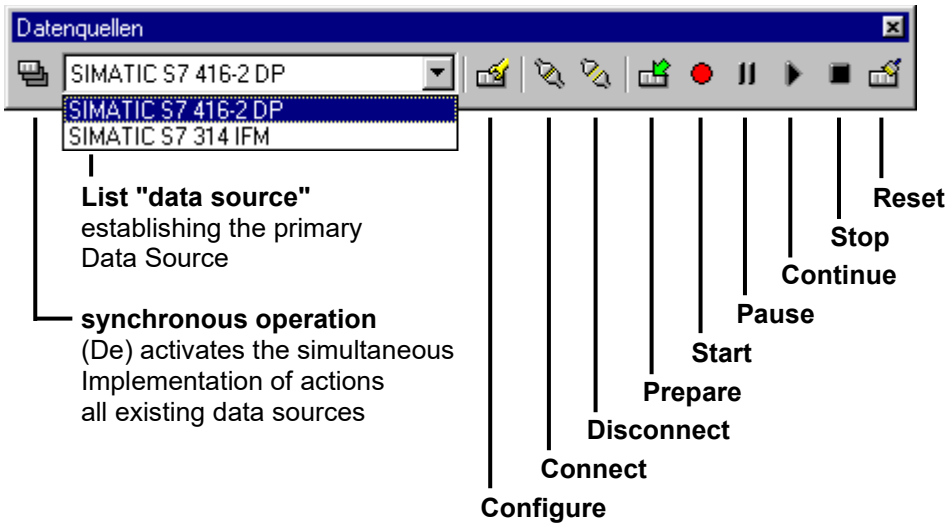
By default, the analysis modules after the stop of the recording will be removed from the controller. Via the associated option to change this behavior. Note, however, that you can not disconnect from the data source as long as the recording is prepared.

If you can program 122 (O access error) during the recording of the synchronous error alarms OB 121 (programming error) and OB, the detection of nonexistent PLC operands of type data block and the peripheral input is kept clean with an appropriate message - however, the control remains in state RUN , Prevent this measure, the PLC is accessing such operands (signal recording, triggering) to STOP. We therefore recommend that you have these two options always enabled. If the organization blocks included in the control application, they are not overwritten.

auto.spy automatically detects block numbers for assignment to the building blocks of monitoring application during preparation of the recording. Do you want this impressive number assignment-influence, you can make the appropriate settings here.

3.10 Synchronous handling of data sources

The "Data Sources" toolbar provides a number of buttons for quick access to all the signal trace document existing data sources. Once you add the document a new data source (see section 3.2), The selection list on the toolbar receives a new entry with the name you assigned. You now have the ability to specify a particular source as the primary data source to which are applied then all actions that can be triggered using the buttons in the right inguinal half. These actions include all the important functions for configuration and control of data recording and are equivalent to the same menu items in the Data Sources menu | <Data Source Name> usable.



To apply an action to multiple data sources, press the "Synchronous operation", which remains set until the next time you press button. The list of data sources is automatically disabled.

Once an action for at least one data source is executed, the corresponding button is activated on the toolbar. The two actions "Configure" and "Prepare" (recording) are for the synchronous control mode is not generally available. Actions are performed only for those data sources that they accept in their current state, otherwise ignore the command. Order in which the respective commands are issued to the sources, resulting from their order in the selection list. Occurs during the execution of an action fails, does not affect the synchronous operation of other data sources.

Example: In a signal trace document a synchronous start of data recording on three sources of data to be carried out with different states. The three sources are in this order from the menu or in the selection list on the toolbar:

- **SIMATIC S7 416-2 DP** is connected to the PLC, the recording is prepared
- **SIMATIC S7 314 IFM** is not configured yet (and has therefore no online connection)
- **SIMATIC S7 412-1** is connected to the PLC, which record is also prepared

After pressing the "Synchronous operation" button is the action "start" activated because two data sources connected to their respective control and their records are prepared. causes the actuation of the start button that first control S7 416-2 DP and then Control S7 412-1, a start command get sent. Even if the action at the first source (eg. As a result of a communication failure) fails, the third data source can perform the start of data collection properly. The second controller S7 314 IFM is ignored because it does not have a valid state for a recording.

4 Analysis of Signal Data

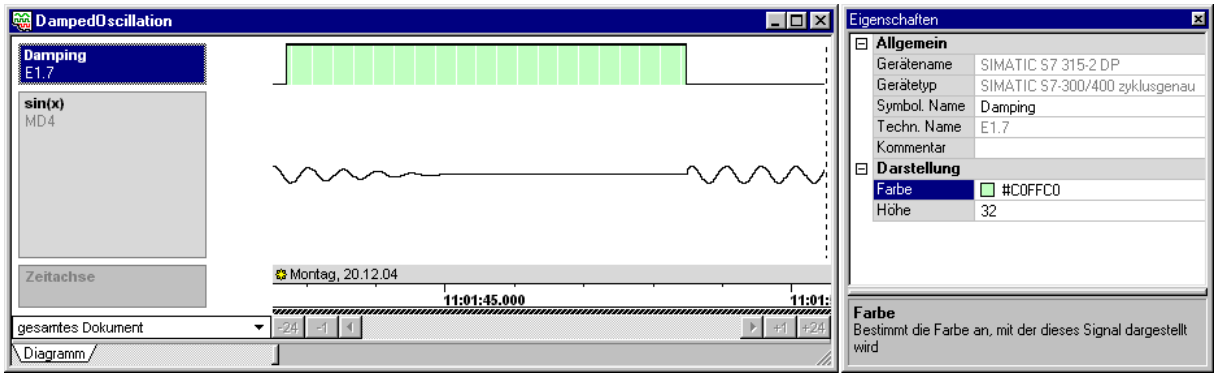
To emulate the evaluation options, you can either use the included samplesignal traces from the folder or signal traces in Chapter 3 use recorded signal traces.

4.1 Signal properties

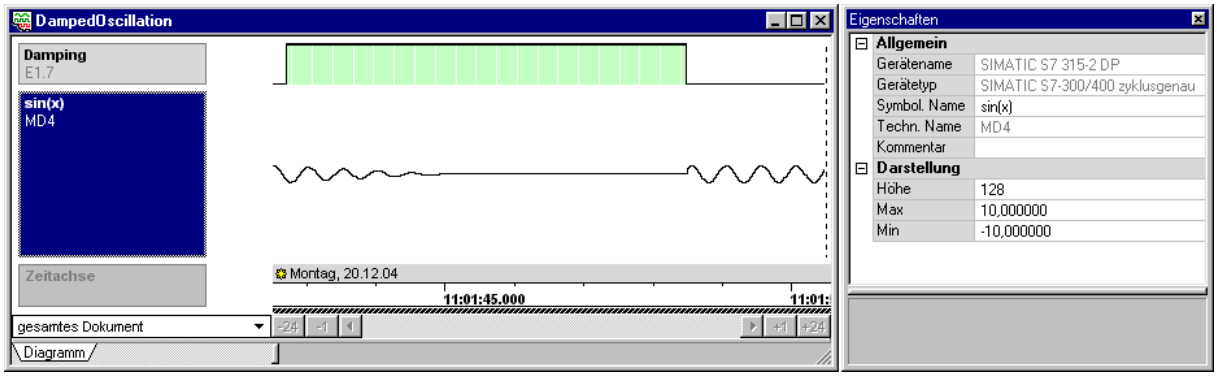
Each signal has properties to adapt the designation or presentation which are being displayed in the docking window "Properties" when you click the left mouse button in the signal trace window on the signal name. The term then turns blue. If you want to select multiple signals simultaneously, use the following combinations:

- **[Ctrl] + left click** for selecting non-contiguous signals
- **[Shift] + left click** for selecting a continuous signal block

Binary support the change of symbol names, color and level of representation. The color can be changed by entering the RGB color code or by selecting from the color palette. Click with the left mouse button on either the RGB value or the colored rectangle.

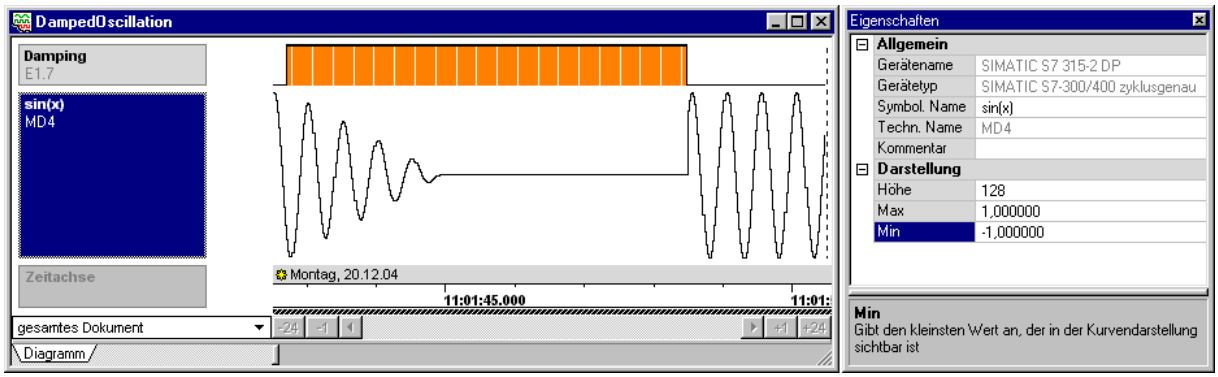


Higher-order signals support the change of height as well as representation of the specification of a minimum and maximum value to the drawing boundary (values zoom).



If you select several signals, the properties are displayed, which have all selected signals. These include the name and type of the device with which they were recorded.

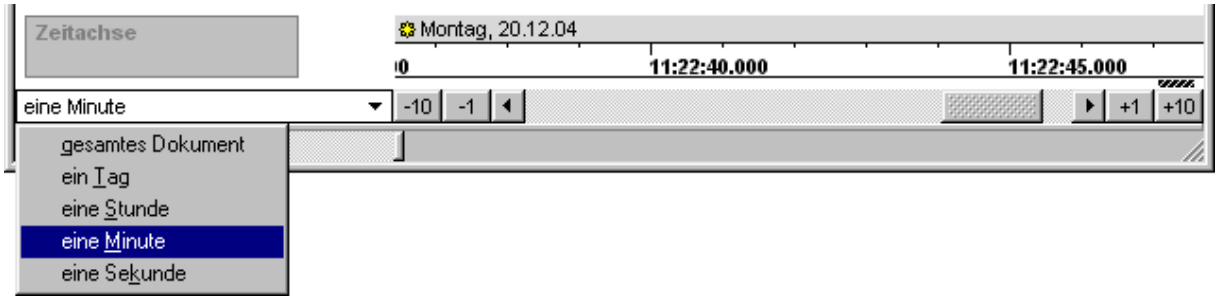
set to completely see the range of values of the signal; In the example, the signal color of the binary signal are set to orange, and the drawing region of the attenuated sine wave to [1 -1].



4.2 Navigate through the signal trace

The pictured below hierarchical navigation bar allows you to quickly move in very long signal traces. It consists of the selection list "scroll area" and the actual scrollbar. With the selection of the scroll area, you specify the time range of the scroll bar should include, when pulled to the grip from beginning to end. The buttons on the left and right of the jumping permit given to periods which are well adapted to the currently selected scroll area (in the example±1 and ±10 mins).

To go to the next adjacent time domain without a jump, click with the left mouse button on the handle of the scroll bar and drag it to the beginning or end of the scroll area and slowly beyond, without releasing the mouse button. Once you exceed the arrow keys, the trail begins to scroll to the left or right. The scrolling speed increases with increasing distance of the cursor. This way you can make with a little practice, a smooth transition between the adjacent time periods. When you move the cursor back to the handle of the scroll bar, stop the movement again.



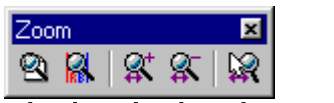
About this, the following key combinations for trace navigation are available:

- **[Right]** and **[Left]** arrow keys for moving forward and backward in the trace
- **[Shift] + [Right]** and **[Shift] + [Left]** show the next or previous screen in the chart view
- **[Home]** jumps to the beginning of the trace
- **[End]** jumps to the end of trace

Above the scroll bar you find an area indicator in the form of a small black bar that shows you through the length and position where you are in the trace and how big the cut is the one you are looking at. This element can not be operated.

4.3 Zoom functions

The "Zoom" toolbar provides several ways to reduce the time segment of the signal trace shown or enlarge.



Mouse Zoom [Z]
switches the mouse cursor in the motion mode, and allows zooming (left click) or zoom out (right mouse button) with a click; [ESC] or pressing the button to exit the mode

Zoom Out [-]
increases the time range represented

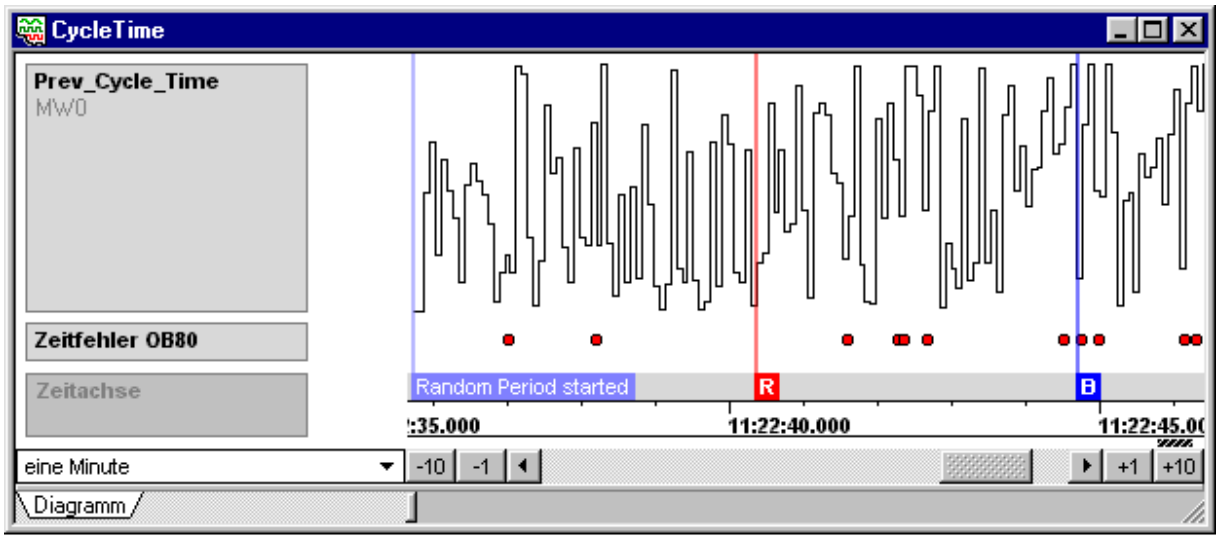
Zoom In [+]
reduces the time range represented

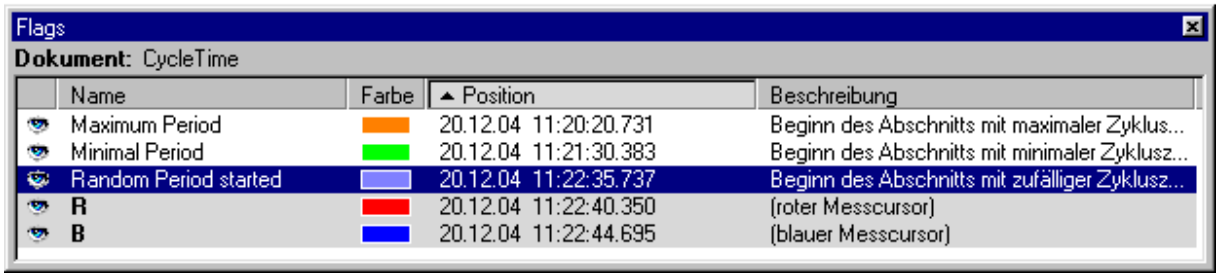
Cursor Zoom [C]
zooms in the area between the cursors R and B

View All [A]
shows the entire document (note: possibly large amounts of data)

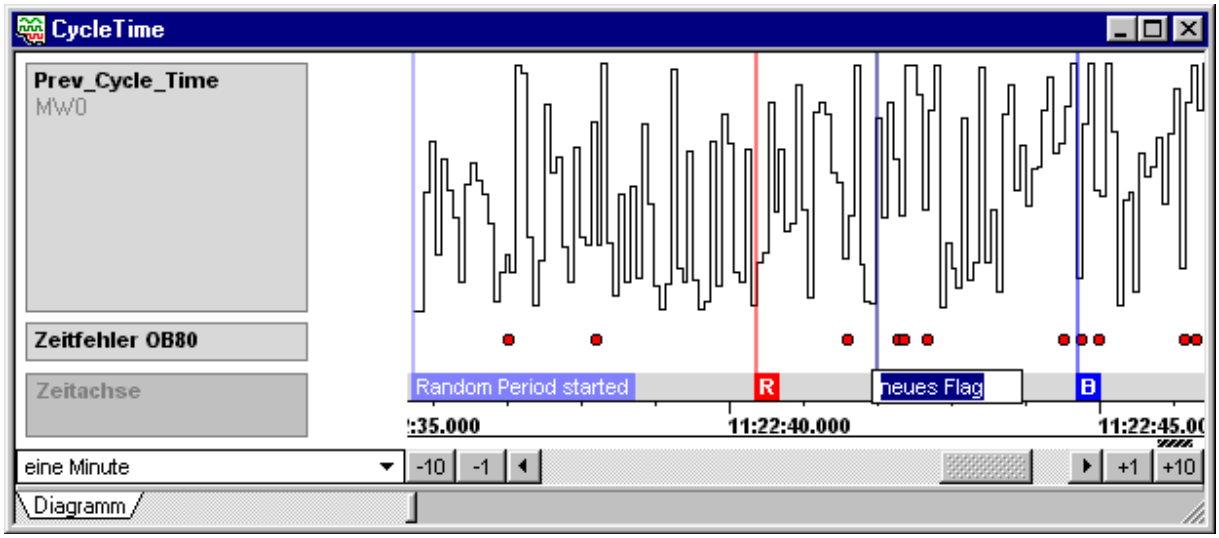
4.4 Mark points in time with flags

By setting so-called flags (flags, markers), you can mark individual events in the signal trace to later jump quickly back there or to save a further description of the event. docker shown below "Flags" is used for displaying and modifying all Flageigenschaften.



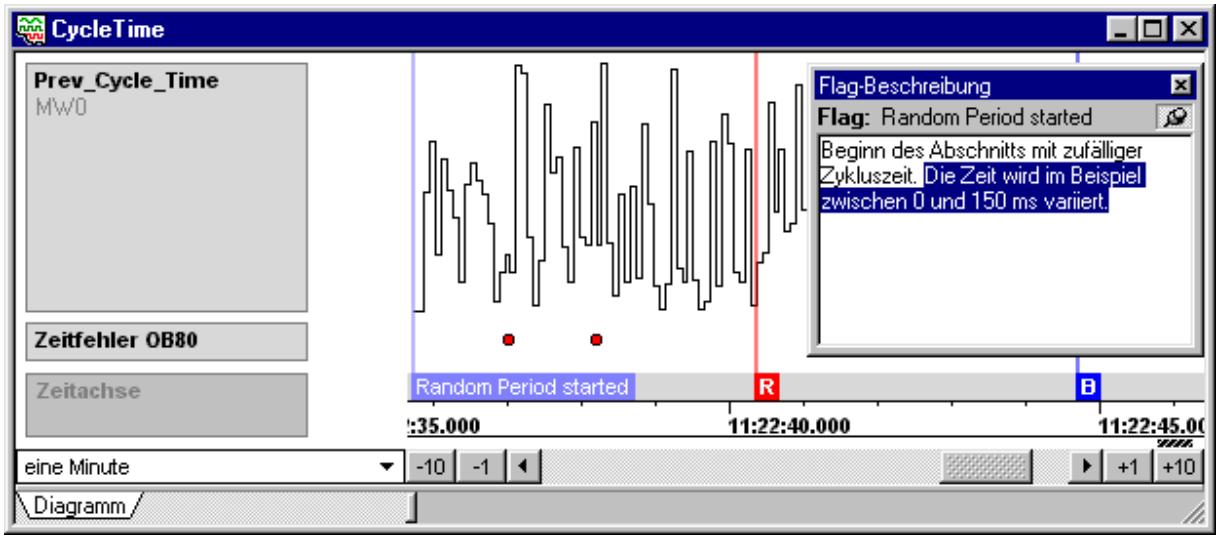


Flags are inserted with the [Ctrl] + left mouse click in the signal trace window. The default name for flags is "new flag". This can be changed by double-clicks on the name field, in the open box enters a new name and confirm with [Enter]. Moving flags is done by a left mouse click on the flag (the mouse pointer changes shape before) and then moving the mouse without releasing the mouse button.



By clicking the right mouse button on the name field or the entry in the flag list a context menu is displayed, via which all available actions can be applied to flags. These include: Change show or hide, rename, color and position, deletion and duplication. Double-click on the entry in the flag list to jump directly to the position of the flags in the signal trace document (context function "go to flag").

To illustrate interesting events in the trace closer or to indicate special features, you have the option mitzugeben the flag a description. From the context menu, select "Change Description" and the Aspect docker "Flag description" into which you can enter text. As long as the Pinnadel is right not plugged up, the window disappears as soon as you move the mouse pointer out of the window. However, using the needle, you can fix the window or at any location on the screen. This method is also applicable to the way all other docker.



The cursors R and B are two special flags, of which the name, color and description can not be changed. Their function is described in section 4.5 described in detail.

4.5 Use cursors for measuring

The measurement cursors R (red) and B (blue) are special flags that are used for measuring of time and value differences. By default they are set as follows:

- Measurement cursor R: left click in the signal trace window
- Measurement cursor B: right click in the signal trace window

All Flagaktionen except for changing the name, color and description can also be applied to the cursors. In addition, the temporal position and the distance are displayed in the docker "Measure" if both measurement cursors are set. If you select a signal in the signal trace window (see section 4.1) You get from the signal values and record numbers among the two cursors represented. In all three categories of information (time, values, records) one cursor is above the earlier time positioned on the trace.