

# ***WinPLC-Analyzer***

User Manual - English

**Version 3**

English



*PLC-Analyzer for S7 and S5 PLC's.*

# **WinPLC-Analyzer • User Manual • English**



## **WinPLC-Analyzer** User Manual

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## 1 Introduction

### 1.1 What is WinPLC7-Analyzer?

**WinPLC7-Analyzer** is a PLC-analyzer for S5 and S7 controllers. The analyzer can record certain statuses that occur in a PLC (operand statuses).

The status of the following operands can be recorded:

- Inputs (bit/byte/word/double word)
- Outputs (bit/byte/word/double word)
- Peripheral inputs (byte/word/double word)
- Flags (bit/byte/word/double word)
- Data from a data block (bit/byte/word/double word)
- Timers
- Counters

A recording can also be controlled by triggers that depend on operands or timers. **Cyclic exact recording** is supported by S7 controllers.

The trend of a signal can be assessed while it is being recorded. The waveforms of operands are displayed in graphical form so their relationships are easily recognized.

When you have connected a suitable modem (see menu item *Help->Display a list of compatible SMS-modems*) the software can send an **SMS** to inform service staff immediately when a problem is detected.

Several **search functions** are available to simplify the evaluation of the signals that are related to the operands.

### 1.2 Applications

**WinPLC7-Analyzer** is an invaluable tool to assist anybody who is concerned with commissioning of plant and machinery.

Possible applications include:

- Sporadic troubleshooting of machines and facilities
- Process optimization
- Tool required for commissioning, e.g. wiring checks
- Fault reports by means of SMS
- Comparison of planned and actual recordings from the plant



## 1.3 Which controllers are supported by the analyzer?

The following controllers are supported:

### S7 controllers

- Simatic® S7-300®
- Simatic® S7-400®
- Simatic® S7-1200®
- Simatic® S7-1500®
- VIPA System 100V, VIPA System 200V, VIPA System 300V, VIPA System 500V
- Other controllers compatible with S7 controllers

### S5 controllers

- Simatic® S5-90U
- Simatic® S5-95U
- Simatic® S5-100U, Simatic® S5-101U
- Simatic® S5-115U, Simatic® S5-135U, Simatic® S5-155U

Note: S5 controllers do not permit cyclic exact recording.

The drivers required for these controllers have already been implemented in the software.

## 1.4 Which drivers are supplied with the analyzer?

### Drivers for S7 controllers

- MPI adapter serial
- MPI adapter USB (with a virtual COM-port)
- MHJ-Netlink for MPI or Profibus connection
- Netlink-PRO for MPI or Profibus connection
- Ethernet (provided that the PLC has an Ethernet interface)
- Simatic® Net Hardware like CP5512, CP5611, SIEMENS USB Adapter, ...).  
It's only possible to use this driver if the Simatic® Net drivers are installed on your computer. For example if SIEMENS STEP7 or SIEMENS Prosave is already installed on your computer.

### Drivers for S5 controllers

- AS511 (PG socket via S5 adapter cable)



## 1.5 Terms and abbreviations

This manual uses the following terms and abbreviation:

|               |  |
|---------------|--|
| PLC           | Programmable Logical Controller. This refers to an S5 or an S7 controller.   |
| CPU           | The term CPU always refers to the CPU that is contained in the PLC.  |
| S5            | Simatic® S5  |
| S7            | Simatic® S7  |
| Operand       | This refers to an address in the PLC. Possible operands are: I5.7, MB10, MD50, etc.  |
| Project       | This refers to a <b>WinPLC-Analyzer</b> project  |
| Signal        | Recording or value of an operand   |
| Signal window | A summary of multiple operands in a single logging window  |
| Controller    | This refers to the connected PLC   |
| MPI           | <b>M</b> ultiple- <b>P</b> rotocol- <b>I</b> nterface. This refers to the programming interface of the S7 controller (PLC) |
| RS232         | The serial interface of a PC   |





## 1.6 New features in version 2 of WinPLC7-Analyzer

The new features are:

- **WinPLC7-Analyzer** can now use installed Simatic® Net driver to use CPU5512, CP5611 and more devices from SIEMENS.  
The Simatic® Net are installed if STEP®7 V5.x or Prosave is installed on your system.  
If you use **WinPLC7-Analyzer** on a SIEMENS PG you can also use this new feature.  
You can use the Simatic® Net driver with the new connection way "**S7-Simatic Net**" in **WinPLC7-Analyzer**.
- The new interface "Netlink PRO" is now supported.  
There exist a **new connection way: "S7-Netlink-PRO"**
- You can start the recording, even if the PLC is in STOP mode.
- If the PLC go to STOP mode the I stack and the B stack will be saved in a log file.  
So you examine the reason for the STOP mode. You can view the I stack with the system message dialog.  
For more information read chapter 12.8 "Evaluations of the system messages".

## 1.7 New features in version 3 of WinPLC-Analyzer

- **New recording type: Offline-recording.**  
With the offline-recording you can record "scan exact" and also "cyclic exact".  
While the recording you can disconnect the computer. Within the PLC the recording procedure is still working until the allocated memory of the PLC is full.  
With this recording type it is also possible to use various trigger (Time-trigger, recording trigger).
- In the "scan exact" recording type it is possible to save "**snapshots**" to the hard drive. A snapshot is a range of operands (example: MB0 to MB100) that are stored to the hard drive when the snapshot event comes up. So you can save and view additional informations in specific situations.
- The representation of the signals can be change to "**Standard**" or "**Small**". With this you can view more signals per screen.
- Improvements in the dialog "Start recording". Now you can see the status of the LEDs on the PLC module: RUN, STOP, SF, BF1, BF2. So you can see at once if a error LED is ON.
- **New dialog Tools->Settings.** In this dialog you can define your preferred representation, color and line width.
- New menu items in the context menu of the signal window:
  - All signals: Standard representation
  - Alle signals: Small representation



## 2 Installation

### 2.1 System requirements

- PC with a min. CPU clock rate of 500 MHz
- Windows XP
- Windows Vista
- Windows 7 (32 and 64 Bit)
- Windows 8 (32 and 64 Bit)
- 512 MB free RAM
- 1 GB of free space on the hard disk to save recorded signals

You can implement the PC-PLC connection by means of the following hardware:

- MPI-PC adapter serial
- MPI-PC adapter USB (using a virtual COM port)
- **MHJ-Netlink** (MPI or Profibus)
- **Netlink-PRO** (MPI or Profibus)
- Standard network adapter (subject to the PLC having an Ethernet interface)
- Driver for original SIEMENS adapters (**CP5512, CP5611, SIEMENS USB adapter, ...**).  
If Simatic® Net is installed on your system, you can also use SIEMENS MPI adapter with **WinPLC7-Analyzer**.  
Simatic® Net is automatically installed on your system if STEP®7 V5.x or Prodrive is installed.
- For S5 controllers: standard S5 cabling

### 2.2 Installation

Start the installation routine and follow the instructions displayed on-screen.

When the installation completes a start icon is placed on the desktop.

You can also find a start icon and a PDF file containing this user guide in the program group of **WinPLC7-Analyzer**.

### 2.3 Uninstalling

The program group of **WinPLC7-Analyzer** also contains an icon that you can use to uninstall the software.



## 3 Caution - danger



Please remember the following information when using the software:

- The recording of operand statuses places an additional load on the CPU of the PLC. This will cause a marginal increase in the cycle time of the PLC program.
- A small subroutine is required in the controller to perform cyclic exact recording. This program must be transferred to the controller when the recording is started. The code will be removed automatically after recording has been completed. These additional statements also increase the cycle time of the PLC.
- For CPUs running close to maximum capacity this means that the CPU could go to STOP mode when the cycle time is exceeded.



## 4 Getting started

The "Getting started" chapter is intended for those users who wish to start immediately. Here you find step-by-step instructions that you can follow easily. Triggers are not described in the "Getting started" chapter. Please refer to the chapter "**Recording PLC statuses**" if you require details.

### 4.1 Generating a new project

You can only start a recording within a project. For this reason you must generate a new project or open an existing project.

You can do this by means of the menu "**File->Open, generate project**".

Select this menu item and click the "New Project" button.

An input dialog will be displayed. Enter the name for the project into this dialog.

You can enter a name, e.g. "Plant18". The entered name can contain spaces.

Click OK when you have completed the new project name.

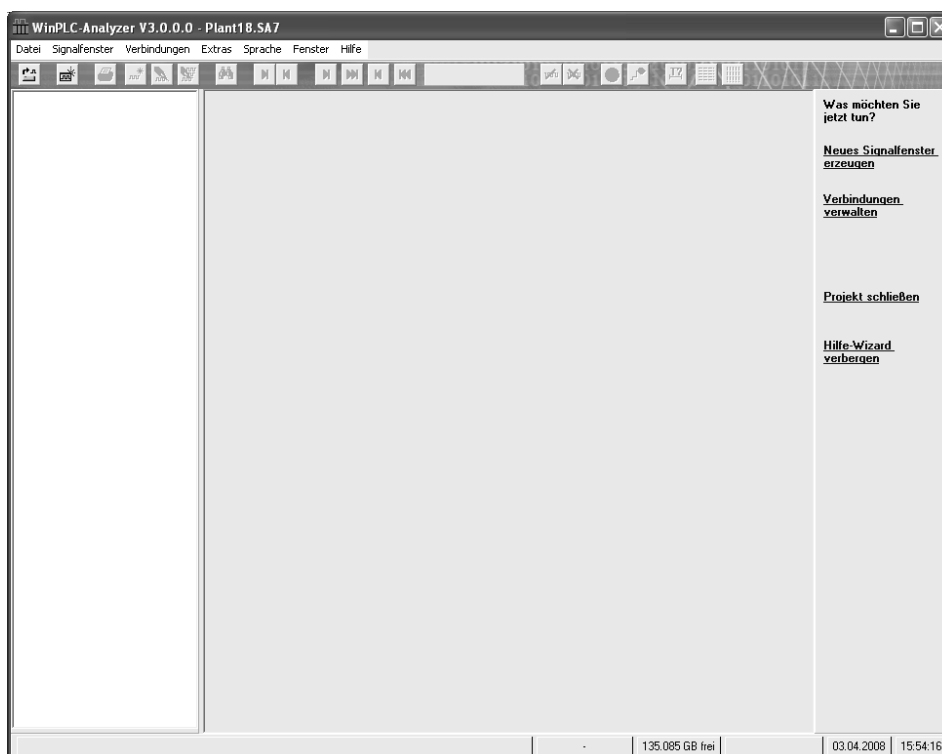


Fig.: New project with no signal windows

In order to start recording you must first generate a signal window. Select menu item "File->New signal window" and enter a descriptive name (e.g. Record1).

As a result, an empty signal window will be displayed:

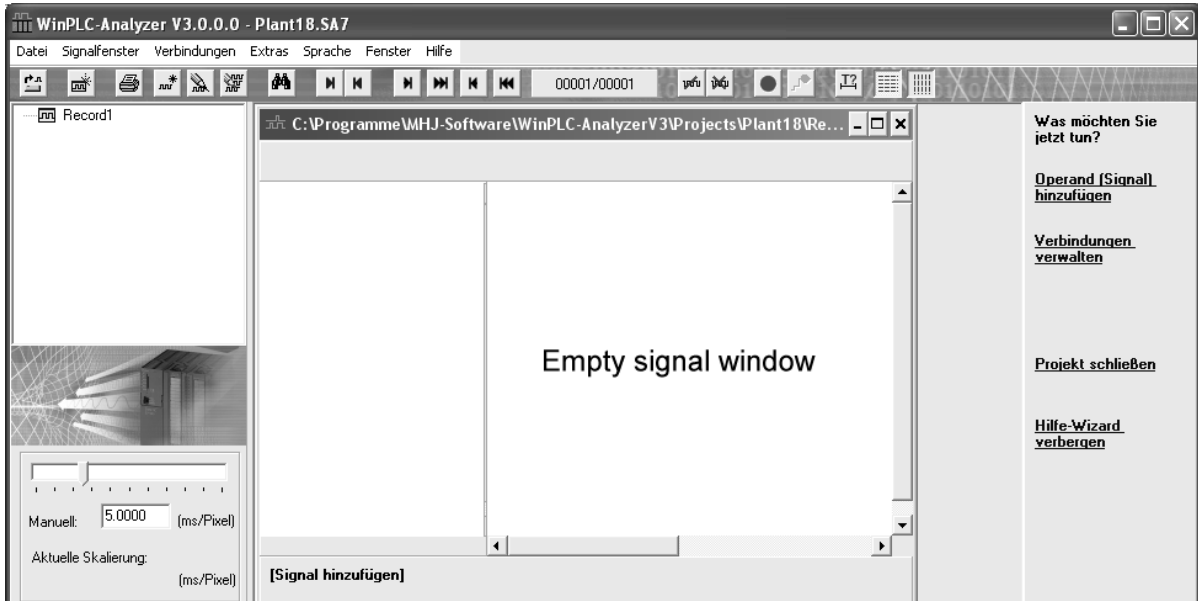


Fig.: Empty signal window

Before you can add operands to the signal window you must define the connection that will be used to establish the contact with the CPU.

For this reason we will first create a new connection.

## Brief details on projects:

A single project can be used to maintain several recordings. Each recording is accommodated in a separate signal window. The different signal windows within a project can be selected by means of a tree view.

## 4.2 Creating a new connection

Select menu item "Connections->Maintain connections". The "Maintain connections" dialog will be displayed.

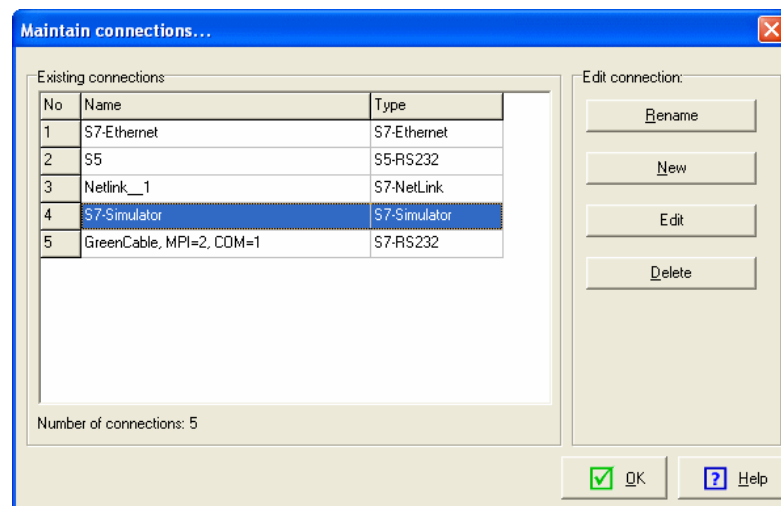


Fig.: "Maintain connections" dialog



We are assuming that the PC is connected to the PLC via a serial MPI adapter. This MPI adapter is connected to COM1 of the PC.

The respective MPI connection details are as follows:

- Baud rate RS232: 38400
- MPI-address of the S7-SPS: 2
- Baud rate in the MPI-ring: 187500

Create a new connection by clicking the **button "NEW"**.

Here you must enter a name. Please choose a meaningful name, for example "MPI adapter serial, COM1, MPI=2".

Select **"S7-RS232"** as the connection. The dialog box where you can specify the settings for the connection "S7-RS232" will be displayed when you click **"Next"**.

Enter the connection details shown above.

Fig.: RS232-MPI-connection settings

When the S7-controller has been connected to the PC you can verify that a proper connection can be established with the entered settings. Click on the button "Establish a test connection".

Click OK to confirm the dialog entries.

The new connection will now be added to the list of existing connections.



## 4.3 Adding operands to the signal window

You can add new operands to the signal window by selecting menu item "**Signal window->Add new signal**".

As an alternative you may click on the following button in the tool bar:

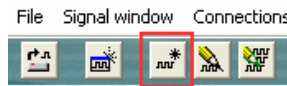


Fig.: Tool bar button "Add new signal"

The "New signal" dialog box will be displayed.

Here you will now create operands M10.0 to M10.7, MB20 and MW22.

Enter "**M10.0**" as operand. Type "**8**" into the field for "**Create several operands at the same time**". As the connection you select the connection that you have created above.

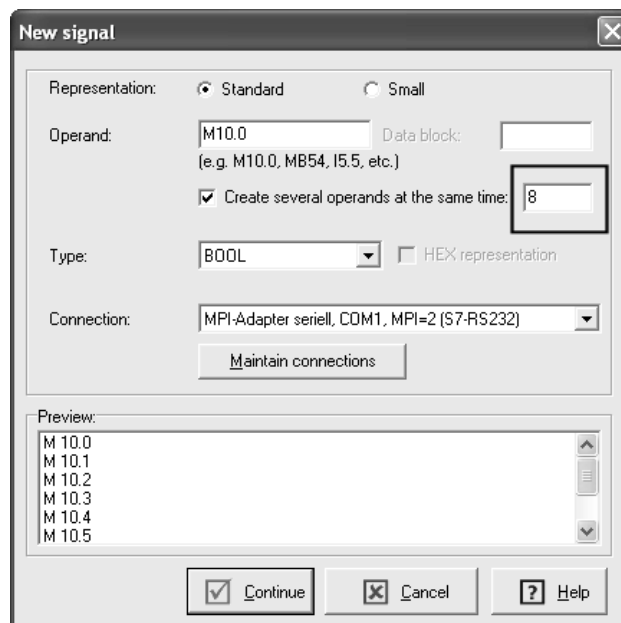


Fig.: Operands M10.0 to M10.7 will be added to the signal window

Click the button "**Continue**".

The dialog "Properties of the signal" will be displayed. Here you can enter additional settings. In our example we will accept the default settings. Confirm the dialog by clicking OK.

At this point flags M10.0 to M10.7 are already displayed in the signal window.

Continue by inserting operands "MB20" and "MW22".



The resulting screen will appear as follows:

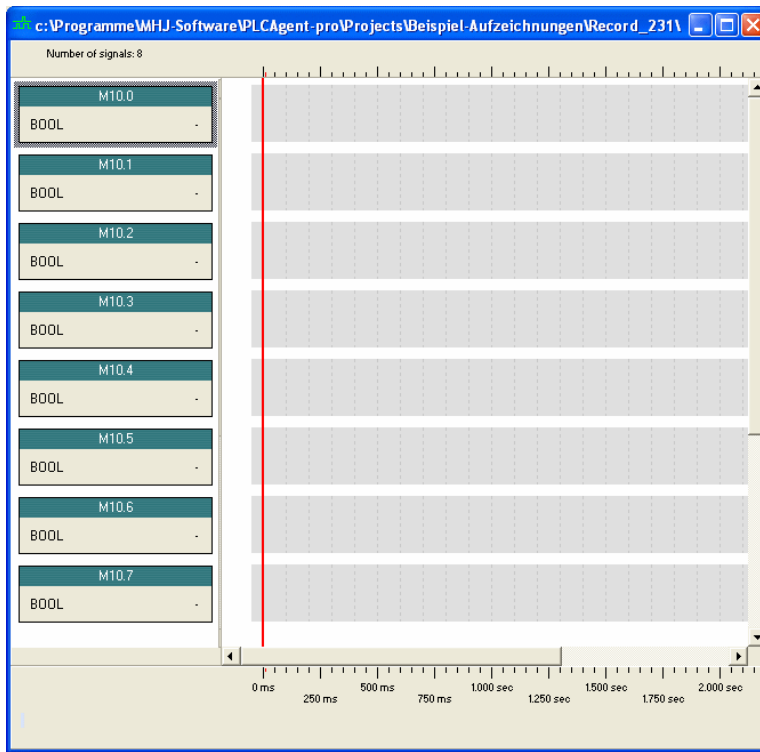


Fig.: Signal window with operands

You can change the sequence of the operands. Use the mouse to drag and drop the title of the respective operand. You can also change the sequence by means of the dialog "Signal window->Maintain signals" located under the tab "Signals".

## 4.4 Start (non-cyclic exact) recording

Select menu item "**Signal Window->Start recording**" to start recording or click on the red record button (mouse button) just below the menu bar.

Confirm the Start-recording dialog by a click on the first button "Start recording (scan exact)".

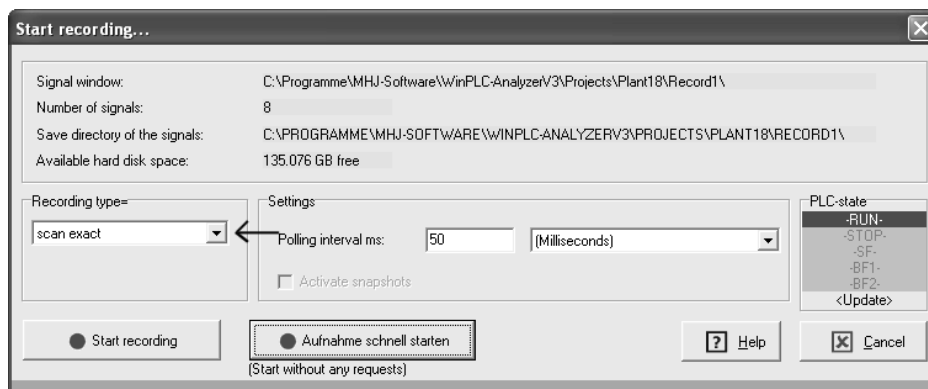


Fig.: "Start recording" dialog, "Scan exact" is selected





Before the actual recording is started a test is executed to verify that it is possible to establish a connection with the controller. If this test is successful the recording is started.

Please read the chapter "**Evaluation while recording is active**" for additional information.

## 4.5 Start cyclic exact recording

Select menu item "**Signal Window->Start recording**" to start recording or click on the red record button (mouse button) just below the menu bar.

On the dialog select the type "cyclic exact-dynamic" or "cyclic exact-permanent":

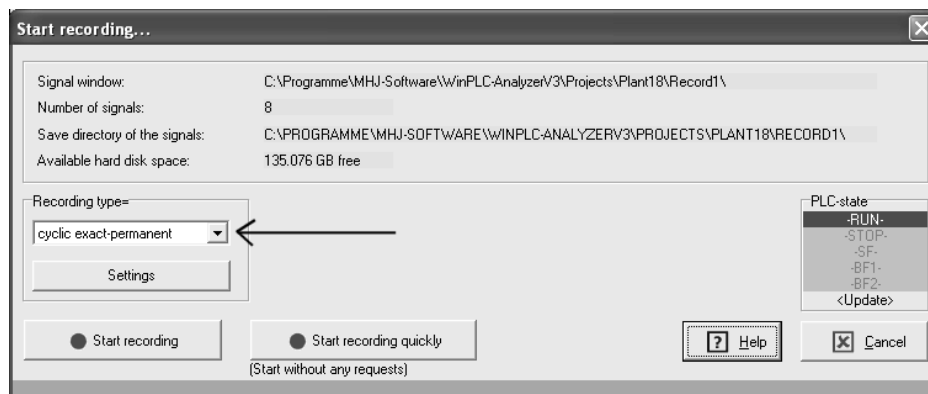


Fig.: Button for for cyclically exact recording

Confirm the Start-recording dialog by a click on the button "**Start recording**". The button "**Start recording quickly**" starts the recording process without any requests. The dialog "Prepare cyclic exact recording..." will be displayed:

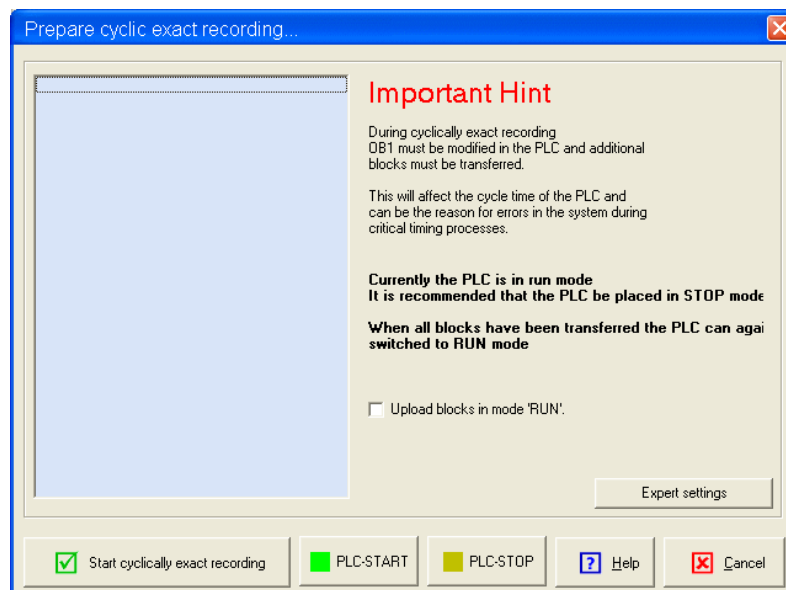


Fig.: "Prepare cyclic exact recording" dialog

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If the PLC is in RUN mode you should first change it to STOP mode by a click on the button "PLC-STOP".

If you do not want to change the RUN mode of the PLC place a check mark into the tick box **"Upload blocks in mode 'RUN'"**.

The blocks required for this process will be created when you click the button "Start cyclically exact recording".

Now the dialog "Confirm cyclic exact recording" appears:

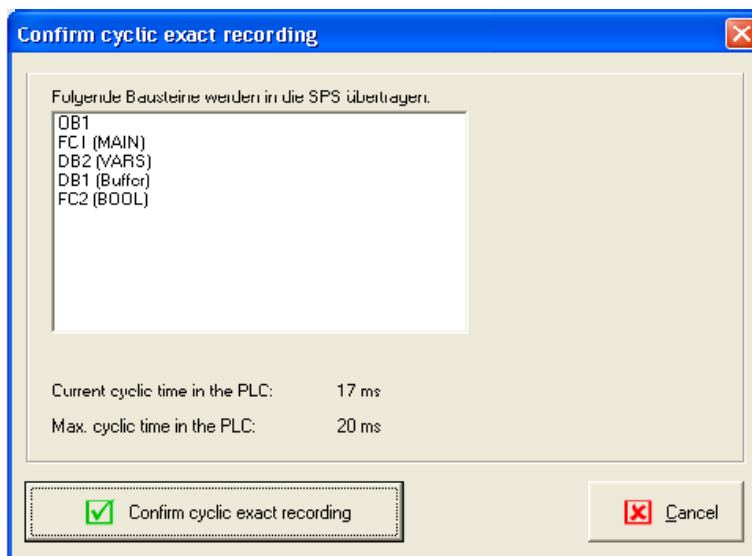


Fig.: Confirmation of the cyclic exact recording.

You can see all blocks that must be transferred into the PLC.

After pressing the button "Confirm cyclic exact recording" all blocks will be transferred into the PLC and the recording process starts.



## Important notes on cyclic exact recording:

- In order to start a cyclic exact recording OB1 must be modified in the PLC and additional blocks must be transferred into the PLC. The system should be placed into STOP mode before this process is started to avoid uncontrollable RUN-STOP transitions.
- Normally the PLC should not change from RUN mode during this process. It will change to STOP mode only when the following conditions occur:
  - the load on the PLC is very high with the result that the maximum cycle time is exceeded when additional blocks are transferred.
  - The recording trigger that you have defined in an STL statement contains commands that initiate STOP mode.



## 4.6 Evaluation while recording is active

Click on the following button if you wish to monitor the recorded values while recording is active:



Fig.: "Observing signal" button.

The "Observing signal" button displays current PLV values in the signal window.

When "Observing signal" is turned off you can page through the recording area by means of the following mouse buttons:



**1. 2. 3. 4. 5. 6. 7.**

Fig.: Mouse buttons to access recording areas

### Explanation of these buttons:

1. Next page
2. Previous page
3. Next area
4. Last area
5. Previous area
6. First area
7. Currently displayed area / Number of areas that exist

### Explanation of the term "area"

To be able to effectively handle large recording, these are subdivided into areas. Think of the recording as a printed book with several chapters. A chapter of this book is comparable with an area.

Lengthy recordings are subdivided into areas. The display indicates the number of areas in a recording.

If you should change the timescale, the recording in the display will be stretched or compressed as necessary. For this reason the areas are recalculated as soon as the timescale changes.



## 4.7 Evaluating a recording

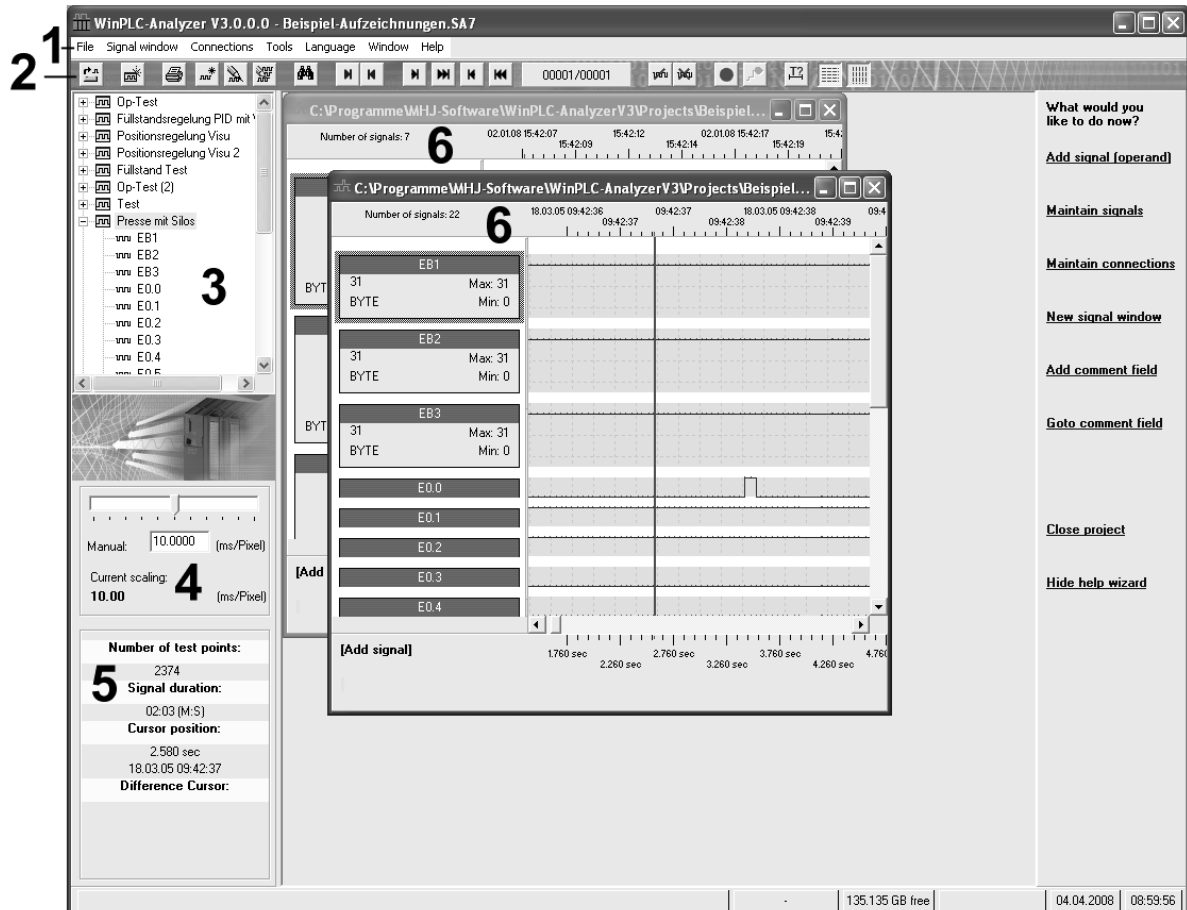
You have following evaluation options when a recording has been completed:

- Review the recording by means of menu item **"Signal window"**:
  - Next page
  - Previous page
  - Next Area
  - Previous Area
  - etc.
- Search using **"Signal window->Goto"**:
  - Goto Time Position
  - Search the recording for a measurement test point (in a specific operand)
  - Extended search covering multiple operands
- Comparison to other recordings using background signals. See chapter "Comparisons with background signals"



## 5 User interface

### 5.1 Overview



1. Menu bar  
Provides access to all the functions of the program.
2. Tool bar buttons  
Here you can issue the most important commands by a simple mouse click.
3. Signal window list  
Displays a list of those signal windows that exist in the project that you have currently selected.
4. Scaling  
Here you can change the timescale.
5. Information  
Displays important information related to the current signal window.
6. Signal window  
This window displays the current recording.



## 5.2 Signal window list

The signal window list displays a list of all the signal windows that exist in the current project.

**It is advisable that all the recordings for a specific plant/machine are saved in one and the same project.**

The advantage is that you can access older recordings quickly and easily.

In addition you can also compare the current recording with an earlier recording. The earlier reference recording is displayed in the background of the current recording.

If you select an entry in the list using the mouse and click the right mouse button the following entries are displayed in a pop-up menu:

|                                 |  |
|---------------------------------|--|
| <b>Open</b>                     | Opens the selected signal window.  |
| <b>Close</b>                    | Closes the selected signal window.   |
| <b>Delete</b>                   | Deletes the selected signal window. This is an irrevocable action.   |
| <b>Copy</b>                     | Copies the selected signal window.   |
| <b>Rename</b>                   | Renames the selected signal window.  |
| <b>New window</b>               | Generates a new signal window. This is also available in menu item <b>File-&gt;New signal window</b> .                     |
| <b>Use as background signal</b> | The signal window selected in the tree view window is inserted as background signal into the currently open signal window. |

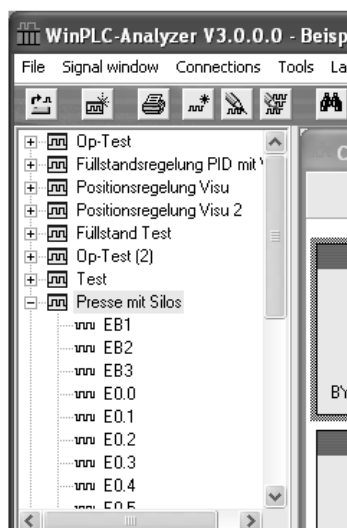
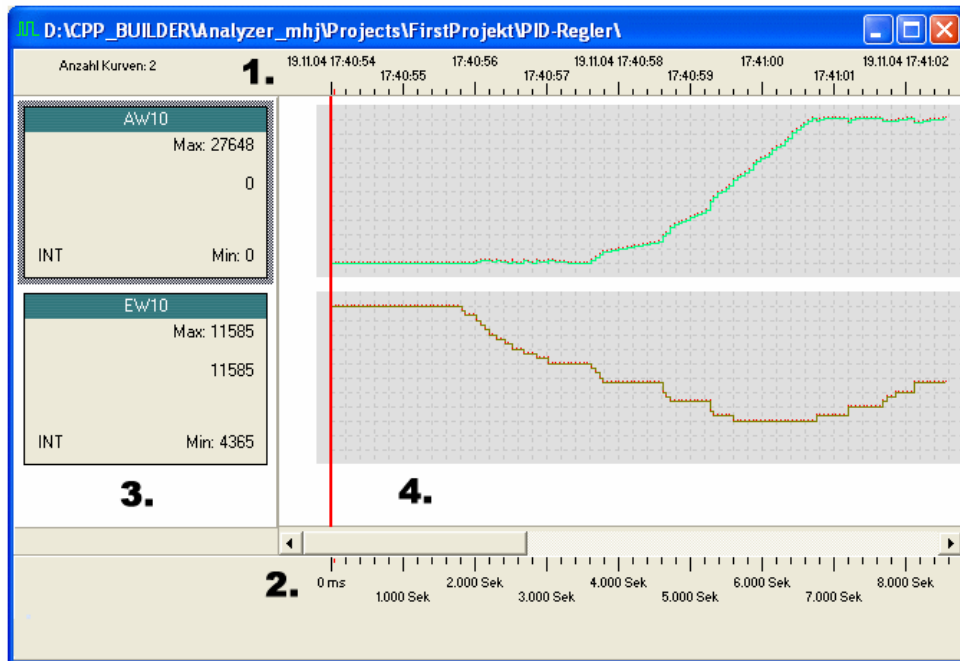


Fig.: Signal window list

You can read further details on background signals in the chapter "Comparisons with background signals".



## 5.3 Signal window



The signal window includes the following elements:

1. Absolute timescale with date and time.
2. Relative timescale showing the signal duration with respect to the starting time of the recording.
3. Information on the operands that are being recorded.
4. The recording of the operands.



Information on a single signal/operand is displayed on the left:

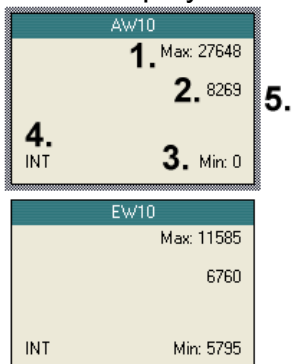


Fig.: Signal names

1. Maximum value of the signal
2. The value at the position of the time cursor
3. Minimum value of the signal
4. Number format of the signal
5. Selected signals are highlighted by a dark frame.

You can change the arrangement of the signals by using the mouse to "drag and drop" the different signal boxes:

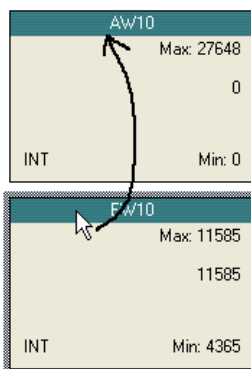


Fig.: Change the position by a "drag-and-drop" operation.

You can move the segment that is displayed (signal) within the current area by means of the scroll bar (just above the relative timescale):

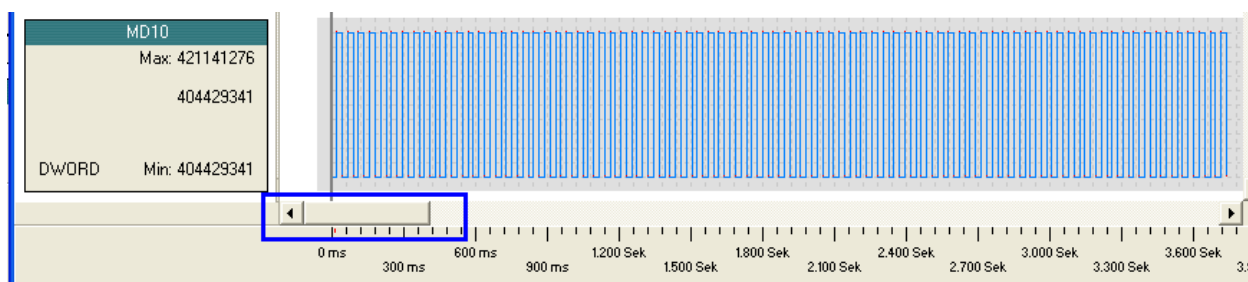


Fig.: The scroll bar





The following section describes the term "area":

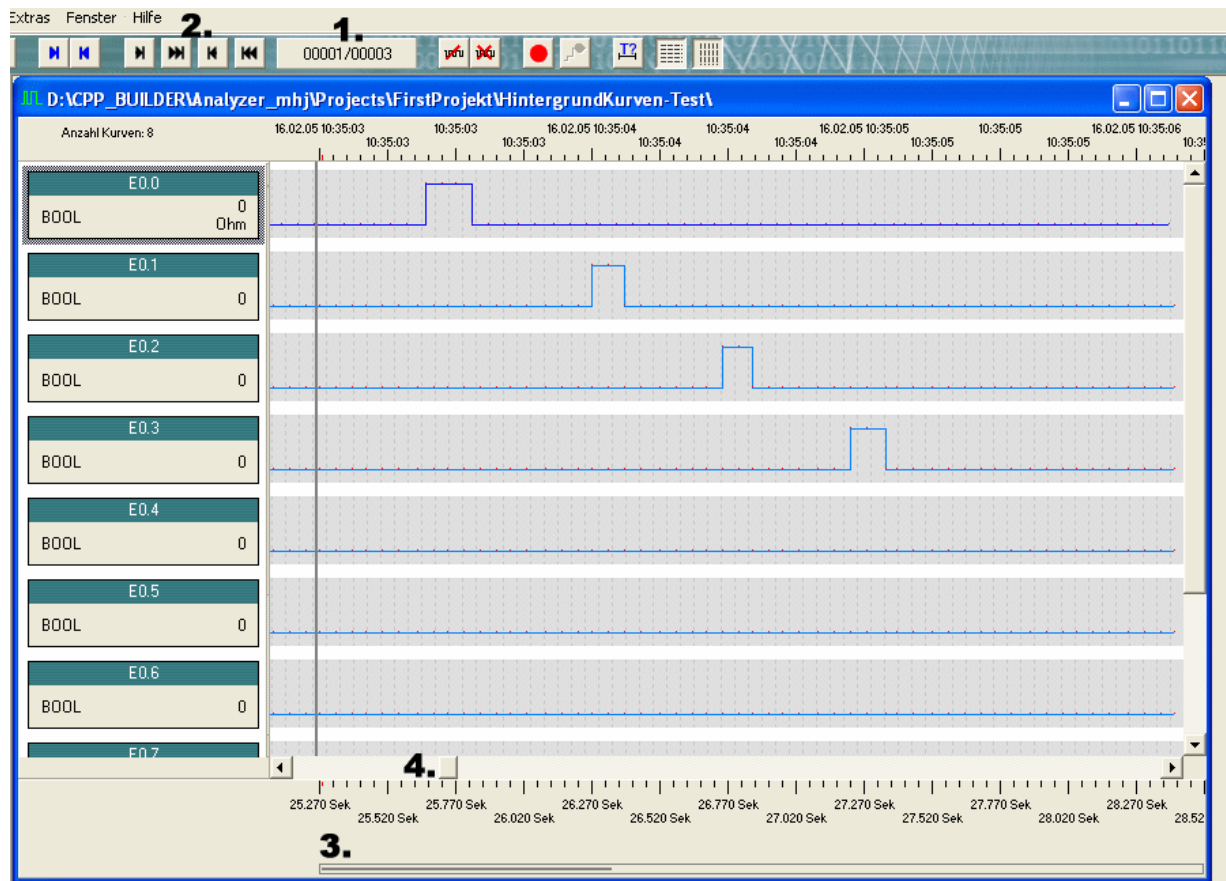
## 5.4 Subdividing a recording into areas

To handle large recordings effectively large recordings are **subdivided into areas**.

Think of the recording as a printed book with several chapters. A chapter of this book is comparable with an area.

To look through the entire recording, you first select the appropriate area and then you can review the current area using the scroll bar.

The following signal window shows details:



1. This window displays "Current area/ Total number of areas".
2. You can load the different areas by a click on these buttons.
3. This bar visualizes the subsection of the entire recording that is currently being displayed at the position of the scroll bar.
4. This is the scroll bar.



## 5.5 Scaling

The scaling settings can be used to expand or compress a recording.

If the value for "ms per Pixel" is increased the recording is compressed and the number of areas is decreased accordingly.

If the value for "ms per Pixel" is decreased the recording is expanded and the number of areas is increased accordingly.

You can use the slider to adjust the scaling from >0 to 20 ms/Pixel. You can also specify other values in the input box:

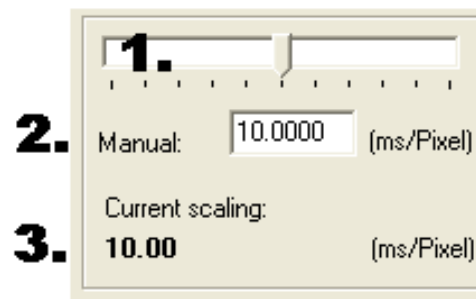


Fig.: Scaling settings

Explanation of the figure above:

1. Slider to adjust the scaling from >0 to 20 ms per Pixel
2. Manual input
3. Current value

The optimum scaling for non-cyclic exact recording is determined automatically. You can change the scaling while the recording is active provided that the number of areas is one.

The scaling can no longer be altered if the number of areas has increased to two (this is only possible after the recording has been completed.)



## 6 Connections

### 6.1 What are connections?

Connections provide access to S5- or S-7 controllers. The user generates the required connections for the entire project. These are available for selection when an operand will be recorded.

When a new recording is being planned it is possible to define the connection that will be used to access the controller for each individual operand. Every connection contains details on how the controller can be accessed.

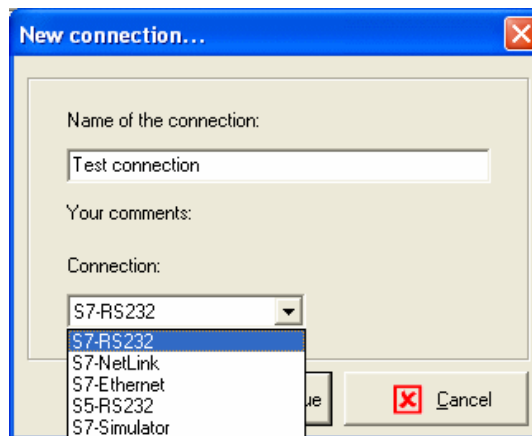


Fig.: New connection

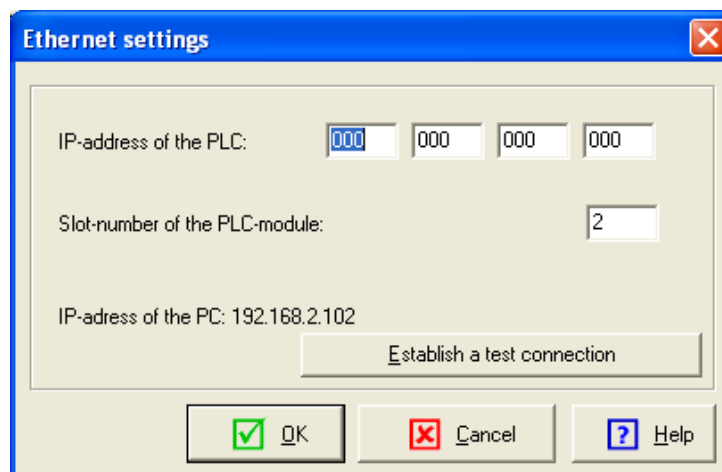


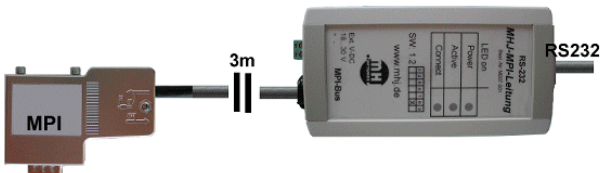
Fig.: Available settings for the "S7-Ethernet" connection



## 6.2 Connection types

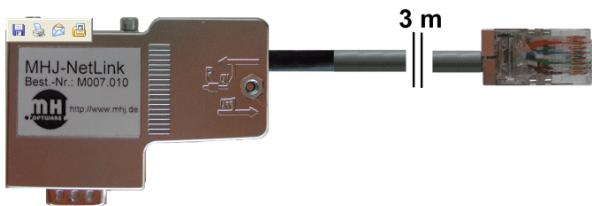
All possible connection types are described in this section.

### 6.2.1 Connections of the type "S7-RS232"



This connection type can be used to access an MPI-PC adapter (RS232). The serial Baud rate can be adjusted to a value ranging from 19200 to 115200 Baud. This connection type can also be used to access an MPI-USB adapter provided that this presents a virtual COM port.

### 6.2.2 Connections of the type "S7-Netlink"



This connection type can be used to define access to an MPI- or a Profibus interface. The Ethernet-protocol is converted to MPI by the MHJ-Netlink. The device is connected to a network hub/switch or directly to the network adapter in the PC/Notebook by means of a crossover cable.



## 6.2.3 Connections of the type "S7-Netlink-PRO"



With this interface you can connect to MPI- or PROFI-BUS. The NETLink-PRO adapter converts the ethernet protocols to the MPI/PB-DP protocol. You can connect this device to a network hub or -switch or directly to the network port on your PC or notebook. In this case you must use a crossover-patch cable. The NETLink-PRO can detect the baudrate on the profibus automatically and can handle up to 8 connections at the same time.

## 6.2.4 Connections of the type "S7-Ethernet"



This type of connection can be used when the S-7 controller is equipped with an Ethernet interface (directly on the CPU or by an additional Ethernet-CP.)

Advantages of this type of connection:

- Fastest type of connection.
- The load on the CPU during recording is not very high.

## 6.2.5 Connection of the type "S7-Simatic Net"

With this connection type existing SIEMENS interfaces (CP5512, CP5611, ...) can be used.

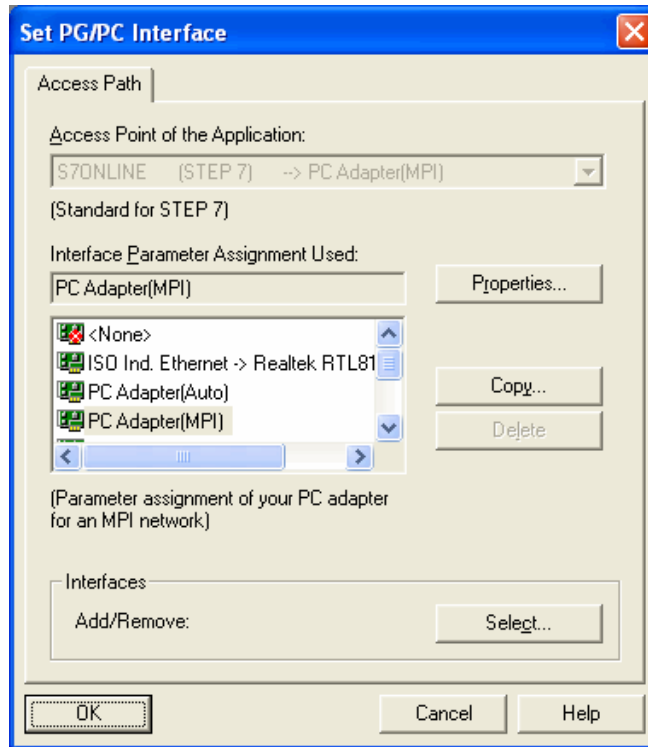
You can use this connection, if the SIMATIC® Net driver are installed on your system. These drivers are installed automatically, if STEP®7 V5.x or Prodrive is already installed. If you install **WinPLC7-Analyzer** on a SIEMENS PG you can use the onboard interfaces too.

All settings of these type of connection you must set up within the dialog "Set PG/PC Interface" in STEP®7 of SIEMENS.

# WinPLC-Analyzer • User Manual • English

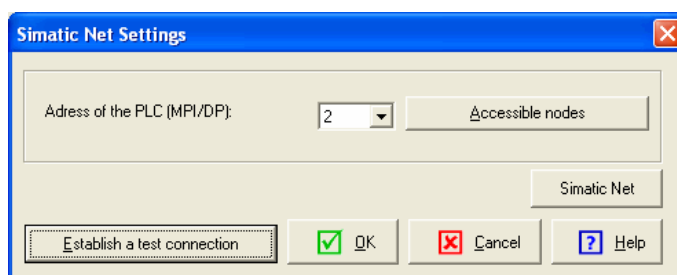


You can open this settings with the STEP®7 menu item "Options->Set PG/PC Interface".



The dialog "Set PG/PC Interface"

In **WinPLC7-Analyzer** you must only setup the MPI/DP adress. Open connection->Maintain connection and edit the "S7-Simtic-Net" connection:



Simatic Net settings in **WinPLC7-Analyzer**



## 6.2.6 Connections of the type "S7-Simulator"

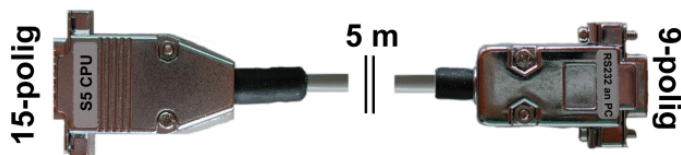
This type of connection is used to record operands from the software-PLC of **WinSPS-S7** or **WinPLC7**.

**WinSPS-S7** is a programming and simulation package for S7 controllers.

In this case **WinSPS-S7** or **WinPLC7** must have been started and at the same time set to simulator mode.

No additional settings are required.

## 6.2.7 Connections of the type "S5-RS232"



This connection provides access to a Simatic® S-5 controller via an S-5 connecting cable (RS232 on a PC, TTY on a PLC.)

## 6.3 New connection

You can generate a new connection using the "Maintain connections" dialog. Select menu item "Connections->Maintain connections".

The connection dialog will be displayed:

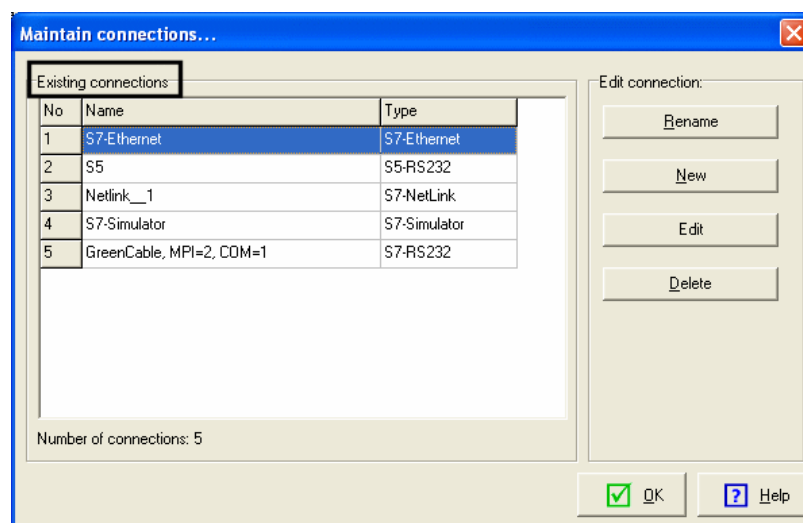


Fig.: "Maintain connections" dialog

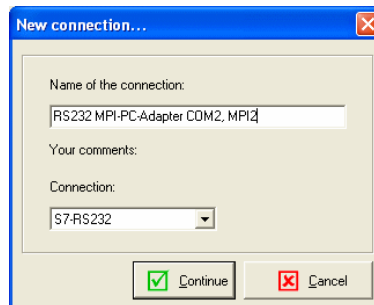
Click the "New" button to define a new connection.



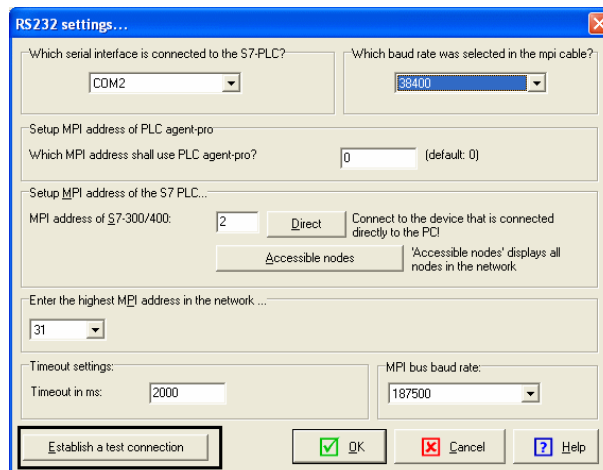
## Example: defining a connection for the serial MPI-PC adapter

The following section illustrates how you can define a new connection via a serial MPI-PC adapter.

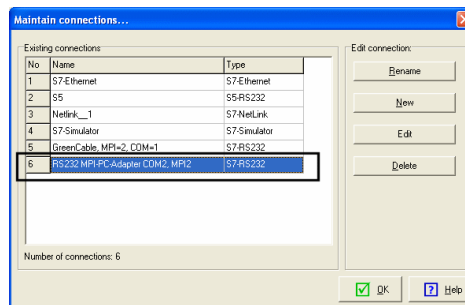
1. Click the button "New". The "New connection" dialog will be displayed:
2. Select connection "S7-RS232" and enter a meaningful name for the connection:



3. Click "Continue"
4. The configuration dialog for the "S7-RS232" connection will be displayed.  
When you have completed your entries you should verify the operation of the new connection by clicking on "Establish a test connection".



5. The new connection will appear in the connection list and it is available for general use.







## 6.4 Using connections

If you add a new operand to the signal window you must always specify the access path that will be used to load the operand from the PLC.

In this case you can simply use an existing connection:

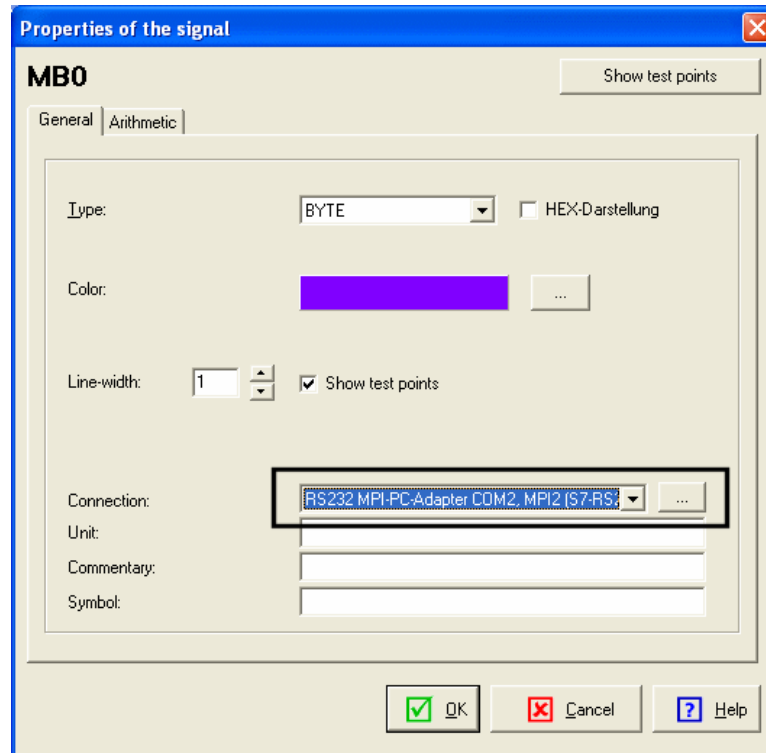


Fig.: "Properties of the signal" dialog



## 7 Adding operands to the signal window

Add the operands that you wish to monitor to the signal window.

The following operands are supported:

| Operand           | Format                      |
|-------------------|-----------------------------|
| Inputs            | Ix.y / IBx / IWx / IDx      |
| Outputs           | Qx.y / QBx / QWx / QDx      |
| Flags             | Mx.y / MBx / MWx / MDx      |
| Timer             | Tx                          |
| Counter           | Cx                          |
| Peripheral inputs | PIBx / PIWx / PIDx          |
| Data              | DBXx.y / DBBx / DBWx / DBDx |

You must open a signal window in order to be able to add operands.  
Select menu item "Signal window->Add new signal" or click the following button:

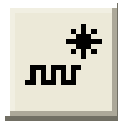


Fig.: "Add new signal" button

The "New signal" dialog will be displayed:

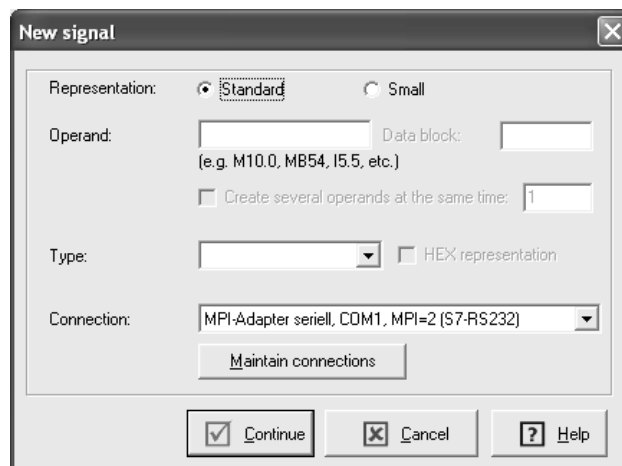


Fig.: "New signal" dialog



## Description of the input fields:

The 'New signal' dialog box contains the following fields and controls:

- 1**: Representation:  Standard  Small
- 2**: Operand:  [e.g. M10.0, MB54, I5.5, etc.]
- 3**: Data block:
- 4**:  Create several operands at the same time:
- 5**: Type:   HEX representation
- 6**: Connection:  MPI-Adapter seriell, COM1, MPI=2 (S7-RS232)
- Maintain connections:
- Buttons:

Fig.: "New signal" dialog.

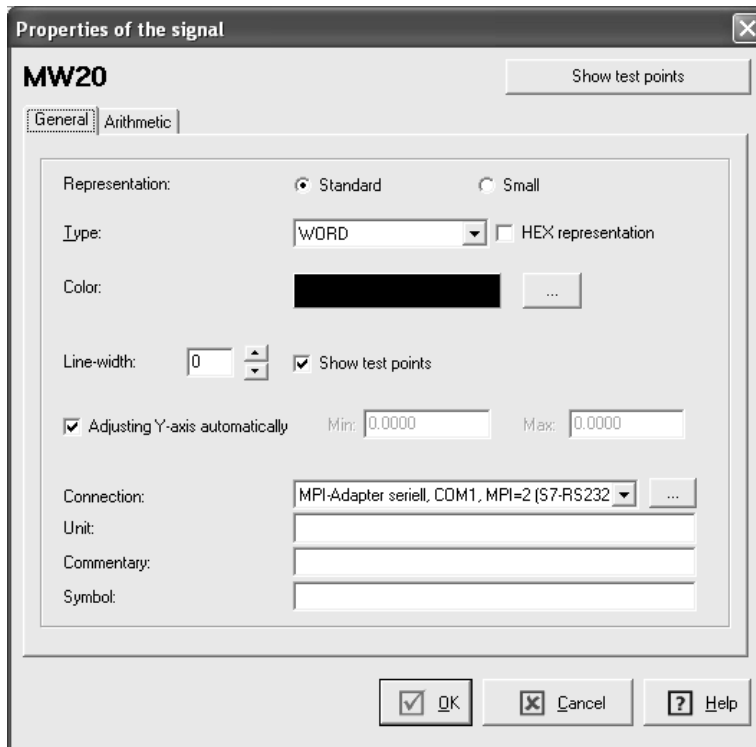
1. Define the representation: Standard: normal representation, Small: smaller representation
2. Here you can enter the required operand (e.g. M10.0)
3. Here you must enter the data block (e.g. DB2), provided that the operand is a data block operand.
4. Here you can enter the number of consecutive operands. For instance, if you should enter 5 here, then 5 consecutive operands will be inserted into the signal window.
5. Here you can select the data type. For instance, if you should have entered "MW10" as the operand, you could select either "INT" or "WORD".
6. Here you must select the respective connection, i.e. the connection that will be used to read the operand from the PLC.

When you have completed all fields click "Continue". The "Properties of the signal" dialog will be displayed.

You can enter additional settings for each operand in this dialog.



## "Properties of the signal" dialog:



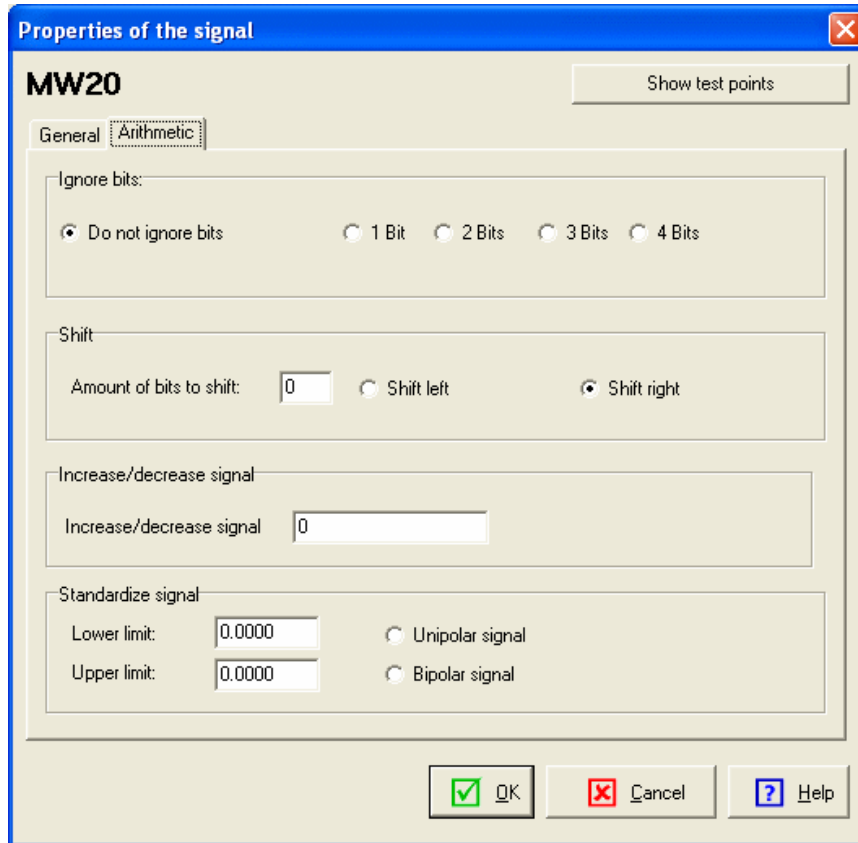
"General" tab

The following settings are available in the "General" tab:

| Setting          | Description  |
|------------------|--|
| Representation   | Standard or small representation.  |
| Type             | Here you can define the type of operand.   |
| Color            | Defines the color that will be used for the signal in the signal window.   |
| Line width       | You can use the line width to highlight certain operands.  |
| Show test points | Every test point is represented by a green dot (Pixel).  |
| Connection       | The connection determines the communication path that will be used to read the operand from the PLC.   |
| Unit             | Unit (e.g. degrees Celsius). The unit is displayed on the left side of the signal window.  |
| Commentary       | Additional commentaries on the operand. These are only displayed in this dialog.   |
| Symbol           | The symbol is also displayed in the title of the operand in the signal window. You can import an S5 or an S7 symbolic file using menu item <b>Signal window-&gt;Edit symbols</b> . |



Where operands  $\geq 8$  bits are concerned, the settings under the "Arithmetic" tab may be used to customize the test point as required by the display.



"Arithmetic" tab

## "Ignore bits" options

These settings can, for instance, be used to neutralize jitter in the low-order bits of analog signals.

## "Shift" options

Here you can shift test point values to the left or to the right by a number of bits.

## "Increase/decrease signal" options

A positive value raises the overall signal of the operand.  
A negative value lowers the signal.



## "Standardize signal" option

These settings are used to convert an analog value to match a physical area.

For a **unipolar signal** it is assumed that the analog value will be between **0 and 27648**. For a **bipolar signal** it is assumed that the analog value lies between **-27648 and 27648**.

Input fields "lower limit" and "upper limit" define the range to which the analog signal must be converted.

The analog value is converted according to the following formula:

$$\text{OUT} = [ ((\text{FLOAT}(\text{IN}) - \text{K1}) / (\text{K2} - \text{K1})) * (\text{HI\_LIM} - \text{LO\_LIM}) ] + \text{LO\_LIM}$$

K1 and K2 are defined in accordance with the settings (bipolar, unipolar). HI\_LIM is the upper limit, LO\_LIM is the lower limit.

## 7.1 Delete signals

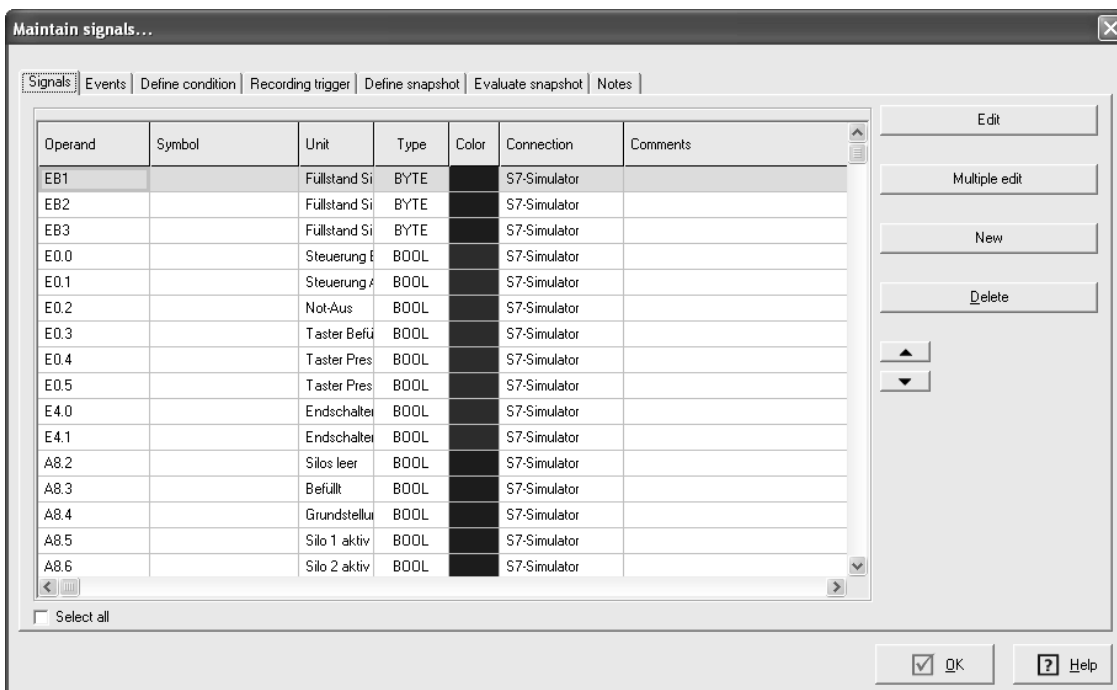


Fig.: "Maintain signals" dialog

Open the "Maintain signals" dialog to delete operands (signals) from the signal window (menu item Signal window->Maintain signals.)

Select the signals you wish to delete in the "Signals" tab and delete these signals by a click on the "Delete" button.

Press and hold the SHIFT key to select more than one entry.

You can also delete signals in the signal window. Select the signal and press CTRL and DEL at the same time.



## Hint:

Use the following procedure to change the color of multiple entries:

1. Select the entries
2. Click the "Multiple edit" button
3. Select a color and select "Apply"
4. Click OK

Proceed in a similar manner to change the connection path for multiple entries.

## 7.2 Move operands

You can move signals by means of the following buttons in the "Maintain signals" dialog:

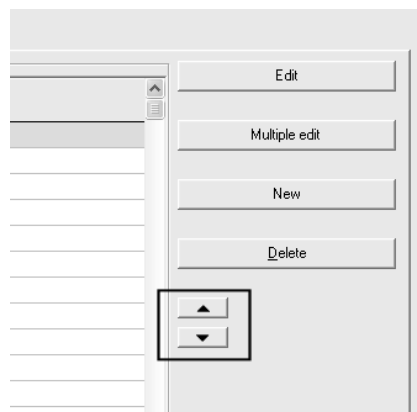


Fig.: Move operands

As an alternative you can also move the operands directly in the signal window:

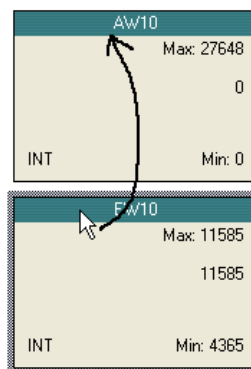


Fig.: You can change the position by a "drag-and-drop" operation.

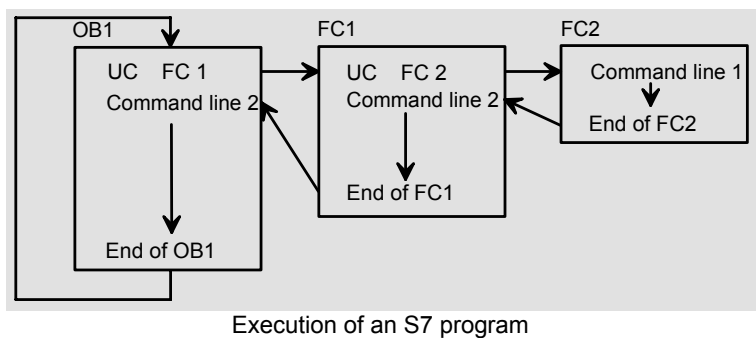


## 8 Recording PLC statuses

### 8.1 Principle of operation of a PLC

Your knowledge about the operation of a PLC is most important when you must understand a recording.

A PLC always processes individual commands in sequential from. An S7 controller executes a PLC program as follows:



OB1 (organization block No. 1) is executed during cyclic processing. It is common that calls to other blocks are issued from within OB1 (e.g. FC1, FB10).

A cycle of the program has been completed when the OB1 has been processed completely. The time required for a cycle is referred to as the **cycle time**. The cycle time depends on the size of the program in the PLC and the type of PLC.

Cycle times typically range from 1 to 100 ms.

**The maximum limit for the cycle time can be specified to a value of around 200ms. If this limit is exceeded the PLC will be placed in STOP mode.**

In addition to cyclic processing the cycle time is affected by other factors:

- Alarm controlled program execution (time OBs, cyclic interrupts, false alarms)
- Requests to the CPU issued by the **programming device** or by **WinPLC7-Analyzer**

**Longer cycle times mean that the reaction time of the PLC to external events increases.**





## 8.2 Types of recordings (cyclic exact / non-cyclic exact)

The software package **WinPLC7-Analyzer** supports 4 different types of recording:

- Scan exact recording (Non-cyclic exact recording)
- Cyclically exact recording-dynamic
- Cyclically exact recording-permanent
- Offline recording (Non-cyclically exact and cyclically exact recording)

The **non-cyclic exact recording** mode reads the different statuses of the operands at predetermined timing intervals from the PLC.

Timing intervals depend on the connection type and lie between app. 15ms (e.g. for a fast TCP-IP connection) and 200ms or more (for slow serial connections).

From these time intervals it is immediately obvious that the normal recording mode is not suitable for cyclic exact recording. With a typical cycle time of 5ms it is not possible to capture any change of status that occurs within two cycles.

Truly reliable recording can only be achieved by writing a subroutine to the PLC program that records the required operands in a data block. Subsequently the contents of this data block can be polled in a cycle.

Therefore, with cyclic exact recording the program in the PLC must be altered.

The software **WinPLC7-Analyzer** inserts a "UC FCx" command at the start of OB1 to issue a call to the subroutine that executes this function.

This does not normally disturb the execution of the original program.

**WinPLC7-Analyzer** supports three cyclic exact recording types:

### **Cyclically exact recording-dynamic**

In this case data is only available from the PLC, when the status of the operand has changed.

Every record (test point) is supplied with a time-stamp.

This type of recording is suitable for BYTE/WORD/DOUBLE-WORD operands that do not change in every cycle.

### **Cyclically exact recording-permanent**

In this case the PLC supplies data records after each cycle irrespective of the status of the operand.

This recording mode is predominantly suitable for Bit-operands that change in every cycle.



## **Off-line recording**

This recording type records the signals as long as free memory available in the defined data blocks.

The off-line recording is a modified "cyclic exact dynamic" recording. You can define a sample rate (polling interval). In this case it is a scan exact recording. If you define "0" for the sample rate, it is a cyclic exact recording.

After you start the off-line recording you can disconnect the computer or notebook from the PLC. While the recording process is active, the PC/notebook must not be connected to the PLC.

The possible recording time can be from seconds to hours. Depending on how often the signals change and how the sampling rate is set.

The possible recording time depends on:

- Free memory size in the PLC
- Sample rate
- Number of the signals



## 8.3 Non-cyclic exact recording

Non-cyclic exact recording is always employed when the process that must be recorded is slow (change of process  $\geq 0.5$  second.)

Non-cyclic exact recording is probably not required if, for example, the temperature curve of various heaters should be recorded.

### Advantages of "non-cyclic exact" recording:

- No changes necessary to the PLC program
- It is possible to control the data volume since the polling interval can be adjusted.

### Disadvantages of "non-cyclic exact" recording:

- Not suitable for applications on faster processors since it is not possible to record all the relevant statuses without breaks.
- The value between two test points is not available.

### Preparations for "non-cyclic exact" recording:

The following steps are necessary in order to start non-cyclic exact recording:

1. Open the signal window
2. If you have not entered any operands you must add operands (signals) now. See chapter "Filling the signal window with operands".
3. Defining recording triggers (see recording trigger chapter)
4. Now you can start the recording: *Signal window*->*Start recording*

The dialog "Start recording" will be displayed.

Select "scan-exact" and define the "polling interval". Then click on the button "**Start recording**" in order to start the process.

A test verifies that it is possible to establish a connection with the PLC. If successful, the dialog is closed and the signal window will be redisplayed.

**The default settings mean that the scroll bar is automatically shifted to the right so that current measurements are always visible.**

**If you want to move the scroll bar manually, i.e. if you wish to view earlier measurements, then you must turn off "Observing signal" using *Signal window*->*Observing signal off*.**



## 8.4 Cyclic Exact recording - notes

Cyclic exact recording is necessary when very short signals originating from the plant will be processed by the PLC. Cyclic Exact recording is also required when the status of an operand changes within a few cycles (e.g. for edge detection).

### Advantages of "cyclic exact" recording:

- Allows continuous recording of operands.
- Can be used to record very fast processes.

### Disadvantages of "cyclic exact" recording:

- The PLC program in the controller must be modified to implement cyclic exact recording.  
(This process is executed automatically by **WinPLC7-Analyzer**)
- The controller must provide a sufficient amount of free working memory (a minimum of 2 KB)
- The additional routine increases the cycle time (3 ms typically)
- High data volume if the status of the recorded operands changes frequently.



We recommend to switch the PLC in STOP mode before you start the cyclic exact recording.

Only if you know the machine well enough and if you can evaluate the risks, you should start the cyclic exact recording in "RUN" mode.

What are the risks?

- Because of the increase of the cycle time, the PLC can change into the STOP mode.
- If you use a trigger, the STL-trigger code can lead into the STOP mode of the PLC.
- In the PLC can exist an old firmware version that contains bugs. In this case the additional blocks can cause that the PLC changes to the STOP mode or that a master reset with restart is necessary.



## 8.5 Recording type "cyclic exact permanent"

In this recording type the current values of the signals are stored in **every cyclic into a ring memory**. WinPLC-Analyzer read this ring memory permanently and show the results on the screen.

The values are saved into the ring memory no matter whether these have changed or not.

Select this recording type in the dialog "Start recording". After this you can view the current settings via the button "Settings".

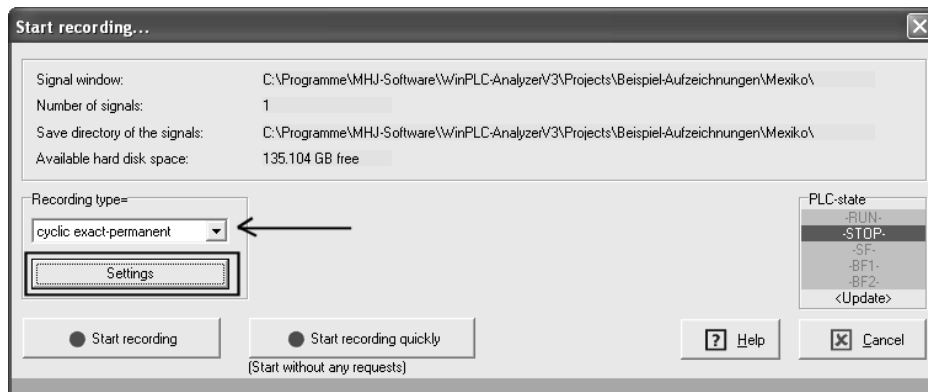


Fig.: Cyclic exact-permanent is selected

With the button "Settings" you can view the current settings to this recording type:

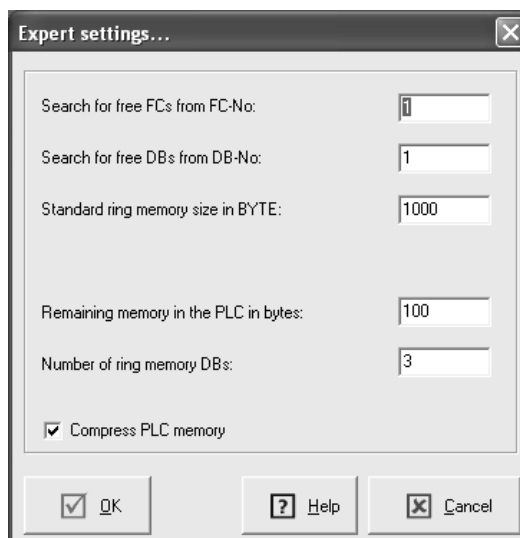


Fig.: Settings of "cyclic exact-permanent"



Descriptions:

| Setting                                  | Description  |
|--|--|
| Search for free FCs from FC-No           | At which FC number should the search for a free FC address be started?<br>Recommendation: 1  |
| Search for free DBs from DB-No           | At which DB number should the search for a free DB address be started?<br>Recommendation: 1  |
| Standard ring memory size in BYTE        | What size do you wish to assign to the ring memory that is used for the recording in the PLC?<br>Recommendation: 2000  |
| Remaining free memory in the PLC in BYTE | How much free memory should remain in the PLC?<br>Before any additional blocks are transferred a test verifies that this quantity will not be exceeded.<br>Recommendation: 100 |
| Number of ring memory data blocks        | How many data blocks should be used?<br>Recommendation: 3  |
| Compress PLC memory                      | Compress the PLC memory before transfer the blocks?<br>Recommendation: YES   |

The record can be started now by pressing the button "**Start recording**" or "**Start recording quickly**".

No more security queries follow, if the button "**Start recording quickly**" is used. WinPLC-Analyzer determine first, whether the PLC is in the STOP mode. If the PLC is in RUN mode and the button "**Start recording quickly**" is not used the following dialog appears:

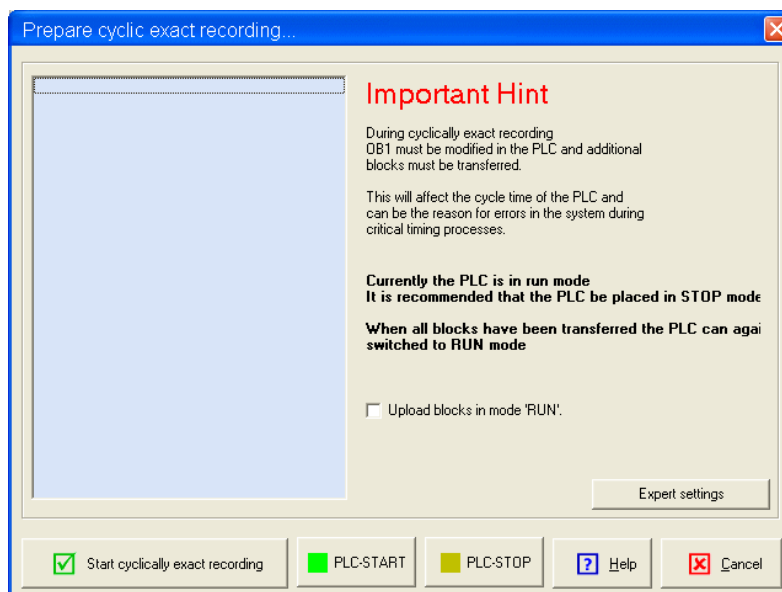


Fig.: Prepare cyclic exact recording



If you want to start the recording, when the PLC is in RUN mode, select the checkbox **"Upload blocks in RUN mode"**. Then press the button **"Start cyclic exact recording"**.

WinPLC-Analyzer tests now which blocks are in the PLC, whether sufficient working memory is available and what the current cycle time is.  
The necessary blocks are then transferred to the PLC.

After short time the trend of the signals appears on the screen.

**The default settings mean that the scroll bar is automatically shifted to the right so that current measurements are always visible.**

**If you want to move the scroll bar manually, i.e. if you wish to view earlier measurements, then you must turn off "Observing signal" using *Signal window->Observing signal off*.**



## 8.6 Recording type "cyclic exact dynamic"

This recording type checks in every cyclic of the PLC if one of the signal-values is changed. Only if one of the values is different, all values are stored into the ring memory.

These recording type is cyclic exact too. But in this type only changed values are stored into the ring buffer.

Therefore the amount of data which must be stored, is smaller if the values do not frequently change.

**If the values frequently change, the amount of data will be very huge because every value comes with a time stamp information. In this case the recording method "cycle exact permanent" should be used.**

WinPLC-Analyzer read this ring memory permanently and show the results on the screen. Select this recording type in the dialog "Start recording". After this you can view the current settings via the button "Settings".

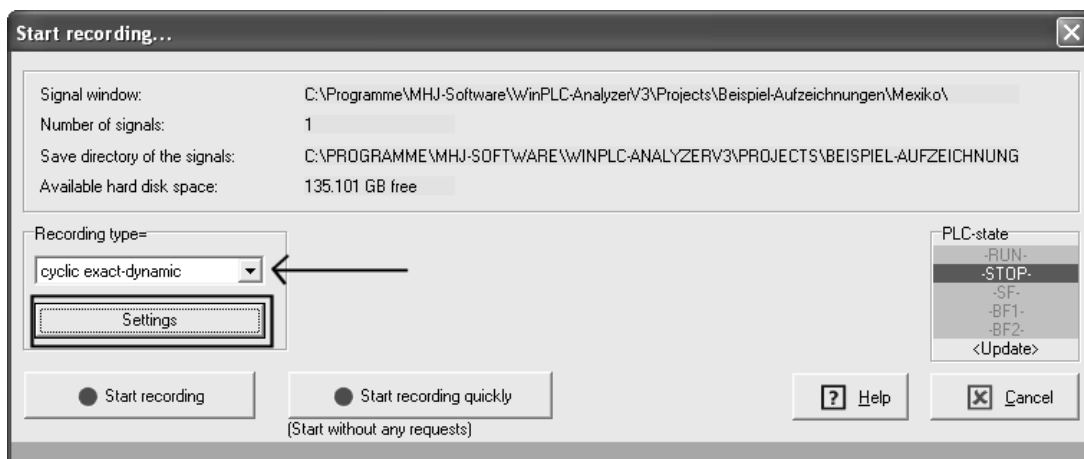


Fig.: Cyclic exact-permanent is selected

**With the button "Settings" you can view the current settings to this recording type:**

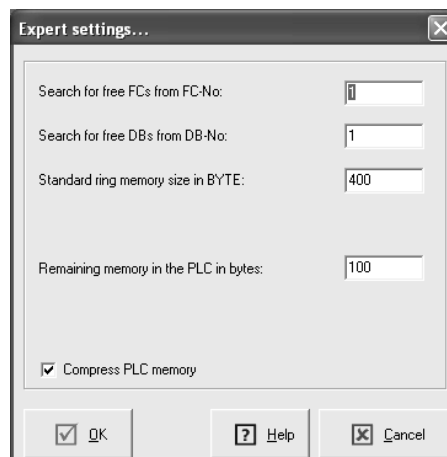


Fig.: Settings of "cyclic exact-dynamic"





Descriptions of the settings:

| Setting                                  | Description  |
|--|--|
| Search for free FCs from FC-No           | At which FC number should the search for a free FC address be started?<br>Recommendation: 1  |
| Search for free DBs from DB-No           | At which DB number should the search for a free DB address be started?<br>Recommendation: 1  |
| Standard ring memory size in BYTE        | What size do you wish to assign to the ring memory that is used for the recording in the PLC?<br>Recommendation: 2000  |
| Remaining free memory in the PLC in BYTE | How much free memory should remain in the PLC?<br>Before any additional blocks are transferred a test verifies that this quantity will not be exceeded.<br>Recommendation: 100 |
| Compress PLC memory                      | Compress the PLC memory before transfer the blocks?<br>Recommendation: YES   |

The record can be started now by pressing the button "**Start recording**" or "**Start recording quickly**".

No more security queries follow, if the button "Start recording quickly" is used. WinPLC-Analyzer test first, whether the PLC is in the STOP mode. If the PLC is in RUN mode and the button "**Start recording quickly**" is not used the following dialog appears:

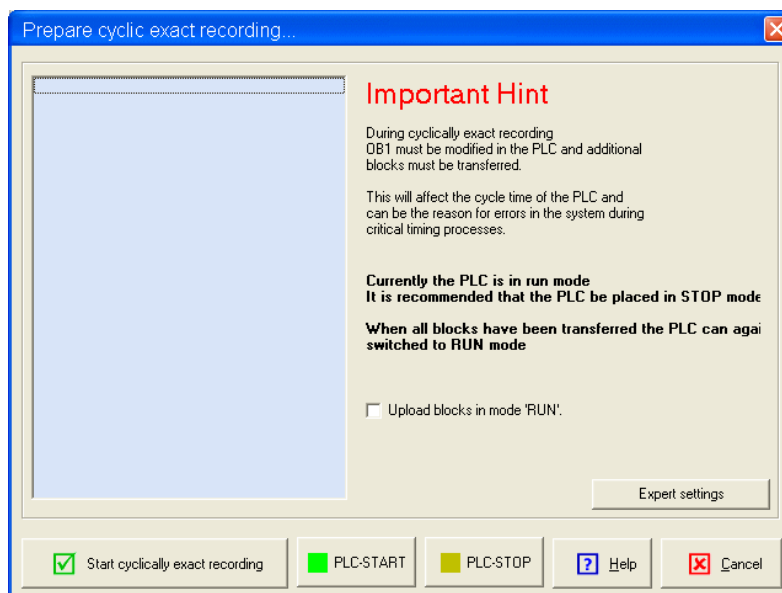


Fig.: Prepare cyclic exact recording

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If you want to start the recording, when the PLC is in RUN mode, select the checkbox "Upload blocks in RUN mode". Then press the button "Start cyclic exact recording". WinPLC-Analyzer inspect now which blocks are in the PLC, whether sufficient working memory is available and what the current cycle time is. The necessary blocks are then transferred to the PLC.

After short time the trend of the signals appears on the screen.

**The default settings mean that the scroll bar is automatically shifted to the right so that current measurements are always visible.**

**If you want to move the scroll bar manually, i.e. if you wish to view earlier measurements, then you must turn off "Observing signal" using *Signal window->Observing signal off.***



## 8.7 Recording type "Off-line recording"

The off-line recording is a modified "cycle exact dynamic" recording. It has two unusual features:

1. It is possible to record "scan exact" and also "cyclic exact". In case of "scan exact" you must define a polling interval that is greater than "0". If you want "cyclic exact" you must define as the polling interval "0".
2. The recording values are stored into data blocks within the PLC. If this data blocks are full with values then the recording will be stopped. **While the recording process the PC must not be connected to the PLC!**

If you select "Offline-recording" the edit field "Polling interval ms:" appears:

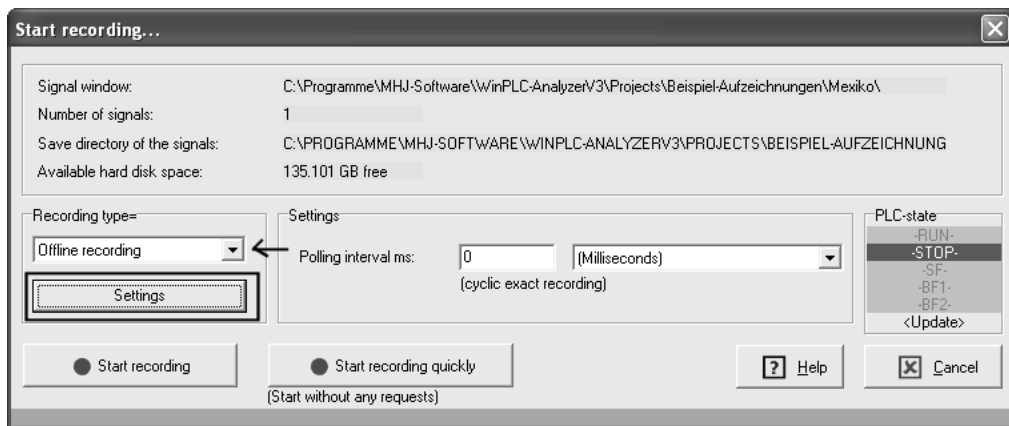


Fig.: Off-line recording is selected

With the button "Settings" you can view the current settings to this recording type:

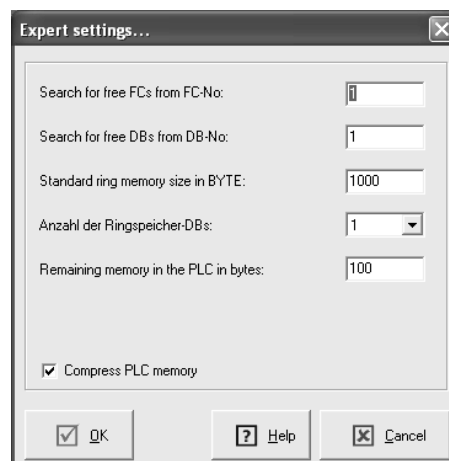


Fig.: Settings of "Off-line recording"



Descriptions of the settings:

| Setting                                  | Description  |
|--|--|
| Search for free FCs from FC-No           | At which FC number should the search for a free FC address be started?<br>Recommendation: 1  |
| Search for free DBs from DB-No           | At which DB number should the search for a free DB address be started?<br>Recommendation: 1  |
| Standard ring memory size in BYTE        | What size do you wish to assign to the ring memory that is used for the recording in the PLC?<br>Recommendation: 2000  |
| Remaining free memory in the PLC in BYTE | How much free memory should remain in the PLC?<br>Before any additional blocks are transferred a test verifies that this quantity will not be exceeded.<br>Recommendation: 100 |
| Number of ring memory data blocks        | How many data blocks should be used?<br>Recommendation: 3  |
| Compress PLC memory                      | Compress the PLC memory before transfer the blocks?<br>Recommendation: YES   |

The record can be started now by pressing the button "**Start recording**" or "**Start recording quickly**".

No more security queries follow, if the button "Start recording quickly" is used. It is checked first, whether the PLC is in the STOP mode. If the PLC is in RUN mode and the button "**Start recording quickly**" is not used the following dialog appears:

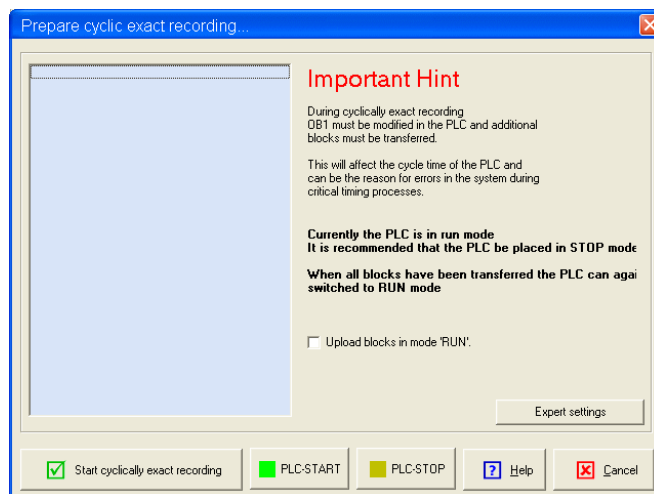


Fig.: Prepare cyclic exact recording



If you want to start the recording, when the PLC is in RUN mode, select the checkbox "Upload blocks in RUN mode". Then press the button "Start cyclic exact recording".

WinPLC-Analyzer inspect now which blocks are in the PLC, whether sufficient working memory is available and what the current cycle time is.  
The necessary blocks are then transferred to the PLC.

Now the recording was started in the PLC.

The signal window gives now information about the internal process.  
Select the checkbox "Updating always" to see the current status permanently.

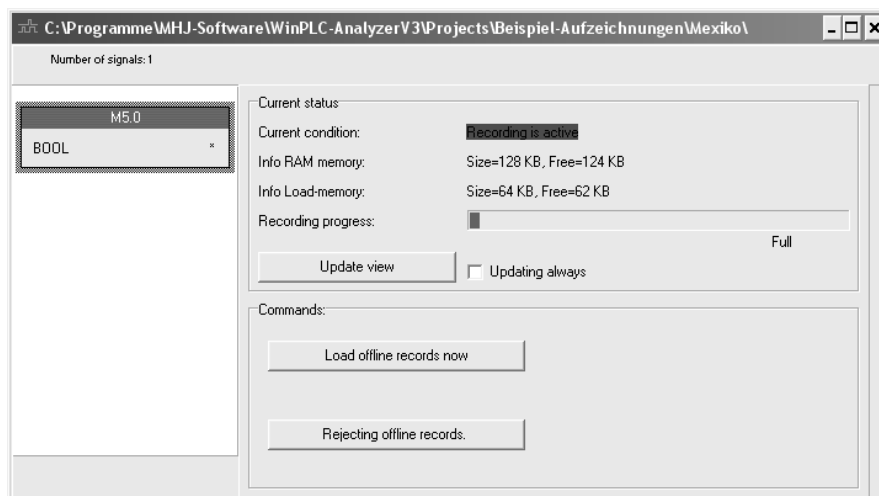


Fig.: Information to the recording process

While the Off-line recording is active, the signal windows looks like in the picture.

**In this state you can disconnect the PC from the PLC and close WinPLC-Analyzer. If you start WinPLC-Analyzer again and open the same project you can see this window again.**

Now you can load the results with the button "Load offline records now".  
Or you can reject the results with the button "Rejecting offline records".

In both cases the original PLC program will be restored.



## 9 Conditions

**WinPLC7-Analyzer** conditions consist of a sequence of STL statements. The result of the condition is a logical '0' or a logical '1'.

Conditions can be linked to the following actions:

- A message can be displayed in the message window
- An SMS can be transmitted
- It can be linked to the recording trigger

Conditions are a powerful tool since you can use almost all STL statements that are available in STEP®7. This also means that conditions can become very complex. A condition must always have a linear structure, i.e. no calls to other blocks are allowed.

You can define 10 different conditions. In addition, you can also define one condition for each recording trigger (cyclic exact and not cyclic exact).

You can define conditions in the tab "Define conditions" that is located in the **"Maintain signals"** dialog:

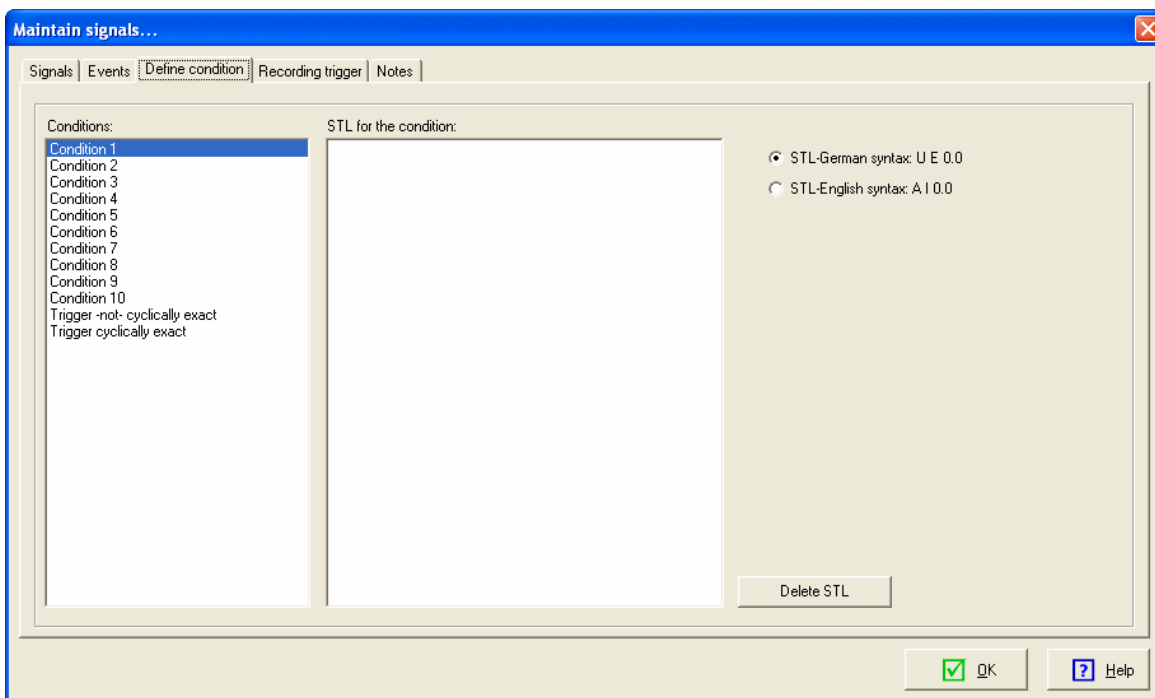


Fig.: The "Maintain signals" dialog is available in menu item "Signal window->Maintain signals".



The STL associated with a condition is processed by an integrated software PLC.



**Exceptions to this are conditions related to cyclic exact recording:**

These STL statements are processed by the real PLC.

For this reason it is important that you avoid including STL statements that can not be processed by the PLC and that would therefore result in the PLC changing to "STOP" mode.

Please remember the following hints when creating the STL:

- Calls to blocks (UC, CC, CALL) are not permitted.
- Avoid the use of data blocks, since these can cause "STOP" mode when invalid bad data addresses are encountered.
- Operands whose signals will be recorded by *WinPLC7-Analyzer* must **not** be described in the STL.

## 9.1 Defining a condition in order to issue a message

You can display a message in the message window (user messages) when a specific condition has been satisfied.

The following example defines condition No. 1 in the "Maintain signals" dialog. Open the tab "Define condition" and select Condition 1. Enter the following STL statements into the text field:

```
U E 0.0
U E 0.1
U E 0.2
= M 50.0
```

The following dialog box is displayed:

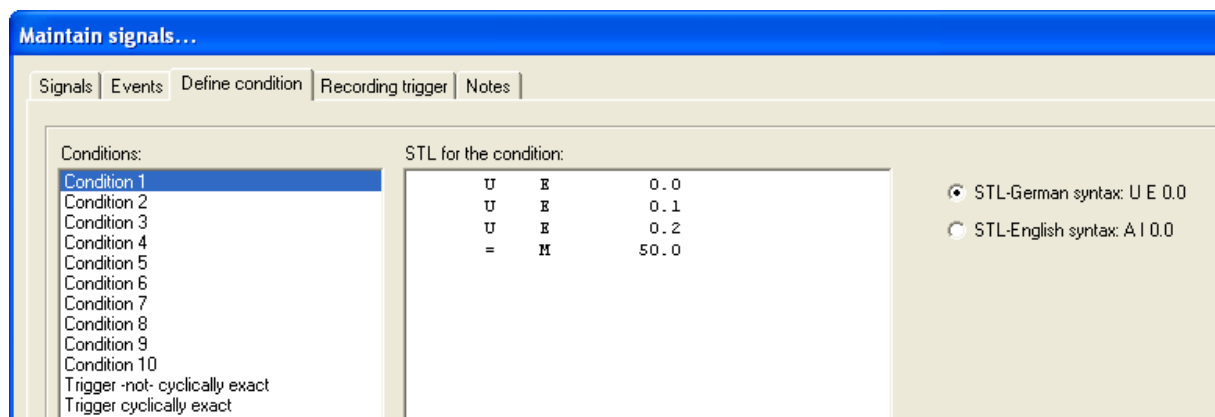


Fig.: Condition No 1 was defined.



This means that condition No. 1 is true when the status applied to the three inputs is '1' (E0.0, E0.1 and E0.2).

**It is important that these inputs are entered into the signal window.  
However, flag M50.0 must not be entered here!**

In order to send messages you now click on the "Events" tab in the "Maintain signals" dialog.

Set the Event-type to "Message" in line 0 and enter "Condition 1" into the respective field in the "Condition" column:

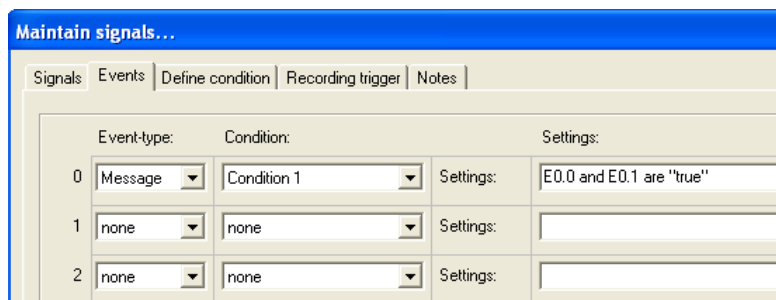


Fig.: A message was defined

As of now any message that you have defined will be displayed along with the date and time when the status of the three inputs changes to '1' (menu item Signal window->User messages).

## 9.2 Defining a condition in order to send an SMS

The procedure to send an SMS is similar.

We can use the same condition in order to send an SMS or we can define a new condition.

In this example we will use condition No. 1 that was previously defined.

Set the Event-type to "SMS" in line 1 and enter "Condition 1" into the respective field in the "Condition" column.

The "Properties" column will display the text:

**Target=<insert the target number>,Message=<insert the message>**

Enter the required telephone number for "Target=", i.e. the number to which the SMS must be sent.

Enter the actual short message text next to "Message".

Example:

**Target=0172xxxxxx,Message=this is the SMS message text**





The resulting dialog box is displayed as follows:

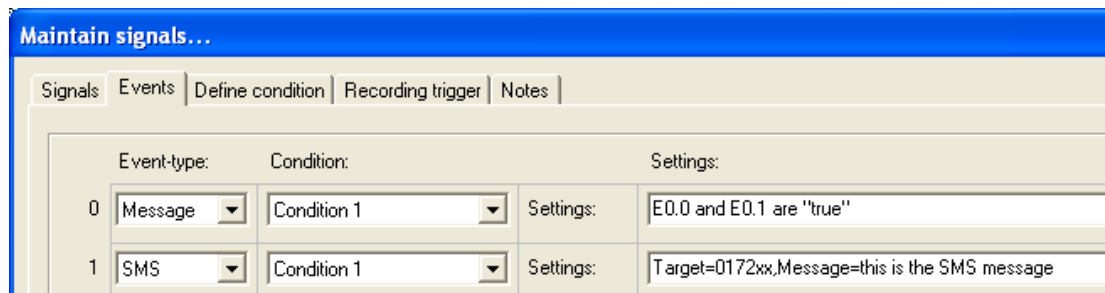
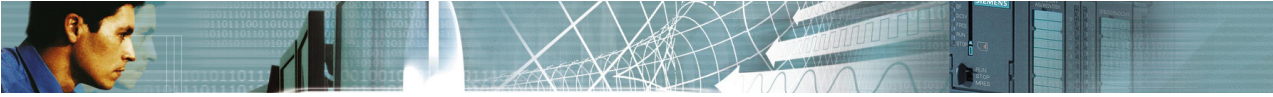


Fig.: An SMS was defined

The SMS will be dispatched when the status at three inputs is '1' (E0.0, E0.1,E0.2).

## Notes on "Send SMS"

- A specific modem is required to send "SMS" messages (see chapter Send SMS)
- You must configure and test the sending of SMS messages using menu item **Tools->SMS settings, Send SMS.**



## 10 Events

Events are used to execute a specific action when the defined event occurs.

The following events are available:

- Send SMS, when a specific condition has been satisfied
- Add a message to the message window (Signal window->Show user messages)

You can define up to 10 different events.

You can enter the respective settings in the "Events" tab in the "Maintain signals" dialog:

|   | Event-type: | Condition:  | Settings:                                     |
|---|-------------|-------------|---|
| 0 | Message     | Condition 1 | E0.0 and E0.1 are "true"                      |
| 1 | SMS         | Condition 1 | Target=0172xx,Message=this is the SMS message |
| 2 | none        | none        |   |
| 3 | none        | none        |   |
| 4 | none        | none        |   |
| 5 | none        | none        |   |
| 6 | none        | none        |   |
| 7 | none        | none        |   |
| 8 | none        | none        |   |
| 9 | none        | none        |   |

Fig.: Defining events in the "Maintain signals" dialog

An event is triggered when the respective condition becomes true.

Events provide a powerful tool. They can, for instance, be used to inform support staff on site or anywhere on the globe by means of a PC when specific conditions occur.

You can turn off events by setting the respective condition to "none".

The previous chapter "Conditions" contains an example on the configuration of an SMS event or a message event.



## 11 Recording trigger

### 11.1 Time controlled recording trigger

In the "Recording trigger" tab of the "Maintain signals" dialog you can determine at which time the recording will be started and at which time the recording will be stopped.

The dialog box below defines the following times to start recording and to stop recording:

Start recording:                    08.03.2005   15:28  
 Stop recording:                    08.03.2005   19:00

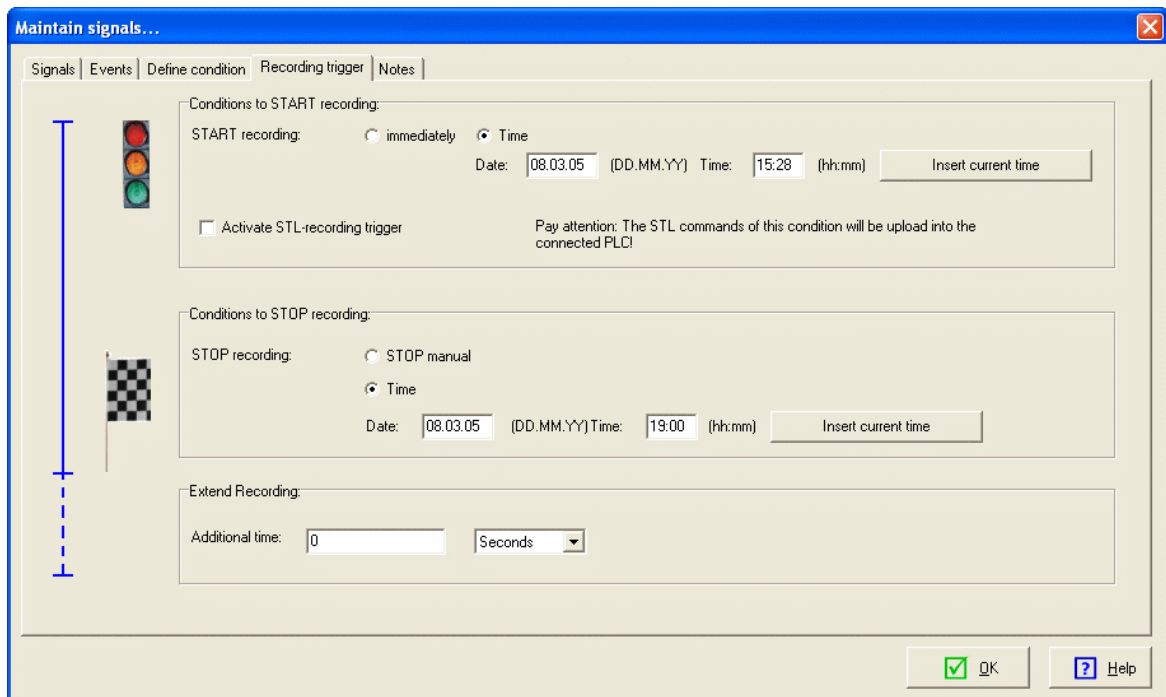


Fig.: Recording trigger settings

If you turn on recording by means of menu item **Signal window->Start recording** the following status window:

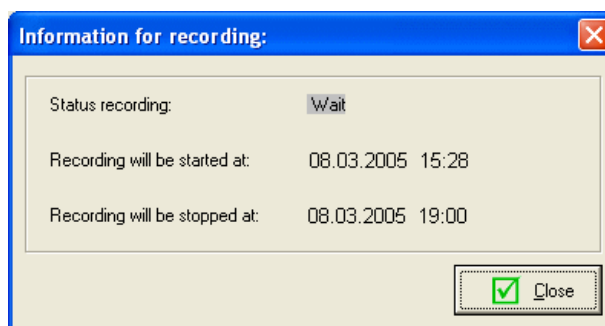


Fig.: Status window for recording



The status window indicates when the recording will be started.

You can also display this dialog using menu item **Tools->Show status recording-windows**.

## 11.2 Defining a recording trigger using the S7 statement list (STL)

Recording triggers are intended to reduce the volume of data that will be recorded or to exclude unwanted data from a recording.

Triggers are always defined as a STL (statement list). These can consist of any valid STEP<sup>®</sup>7 commands.

Here we distinguish:

- Recording triggers for non-cyclic exact recording
- and
- Recording triggers for cyclic exact recording

In case of a non-cyclic exact recording the STL statements are processed by the integrated software PLC.

**During cyclic exact recording the STL statements are processed by the real PLC.**

For cyclic exact recording it is therefore important to ensure that you do not use statements that could result in the PLC going to STOP mode.

To play it safe you should only use STL commands that perform read operations and that you only use operands that exist in the PLC.



## Cyclic exact recording triggers

Example of a recording trigger used for cyclic exact recording:

```

U E 0.0
U M 4.4
U M 50.2
O
U E 10.2
U E 10.3
BEB
    
```

These STL statements will only read from operands. For this reason this recording trigger and related statements will not place the CPU into STOP mode. The STL must be defined within the condition "Trigger -cyclically exact-":

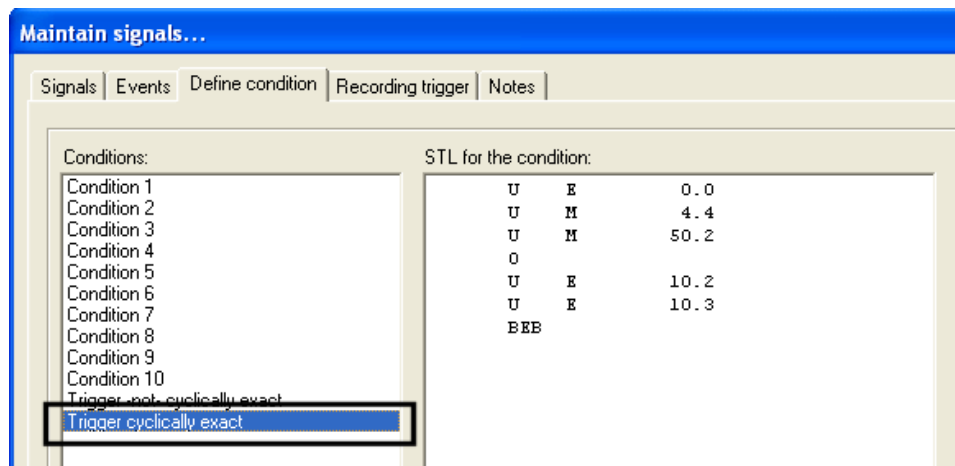


Fig.: Defining Trigger -cyclically exact-



### Please note:

If you should write to an operand (e.g. using a set command) here you would also change the status of the respective operand in the real PLC.

For the cyclic exact trigger it is important that the STL ends with the command "BEB" (BEC).

Please adhere to the following rules when you create the STL:

- You can only create a linear program, i.e. calls statements using the commands UC, CC, CALL are not permitted.
- Avoid statements that could change the status of operands.
- Avoid statements that could result in the PLC going to STOP mode (e.g. access to non-existent data blocks)



## Non-cyclic exact recording triggers

The STL statements of this recording mode access the internal software PLC and not the real PLC.

When recording is active, operand signals are transferred from the real PLC into the software PLC.

For this reason you should only read those operands that are recorded in the signal window.

Any operand recorded in the signal window must not be altered. If you do not comply with this rule, an error message will be issued and recording will not be started.

The STL must be defined within the condition Trigger -not cyclically exact-:

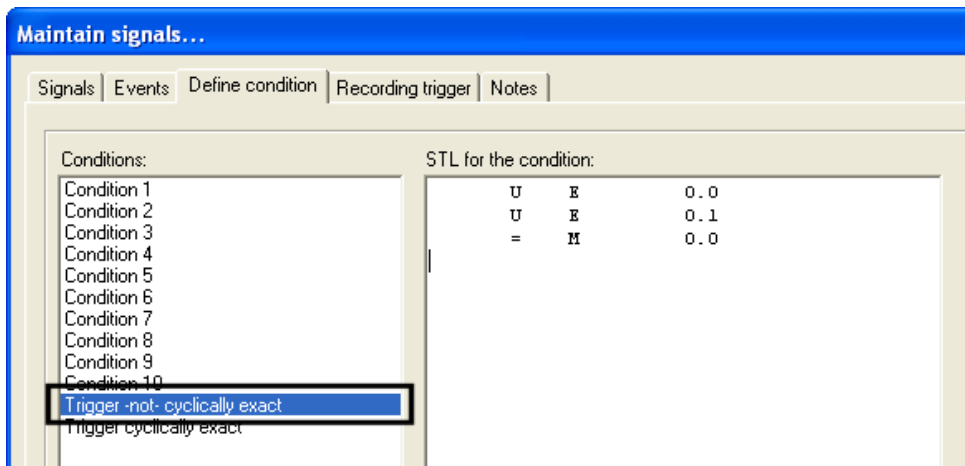


Fig.: Defining the trigger for not cyclically exact recording

## **Please adhere to the following rules when you create the STL:**

- You can only create a linear program, i.e. calls statements using the commands UC, CC, CALL are not permitted.
- Operands appearing in the signal window must never be altered.
- Avoid statements that could result in the PLC going to STOP mode (e.g. access to non-existent data blocks). In this case an error message will be issued and recording will not be started.



## 11.3 Activating the STL-recording trigger

Activate the STL trigger in the "Recording trigger" tab by means of the following check mark:

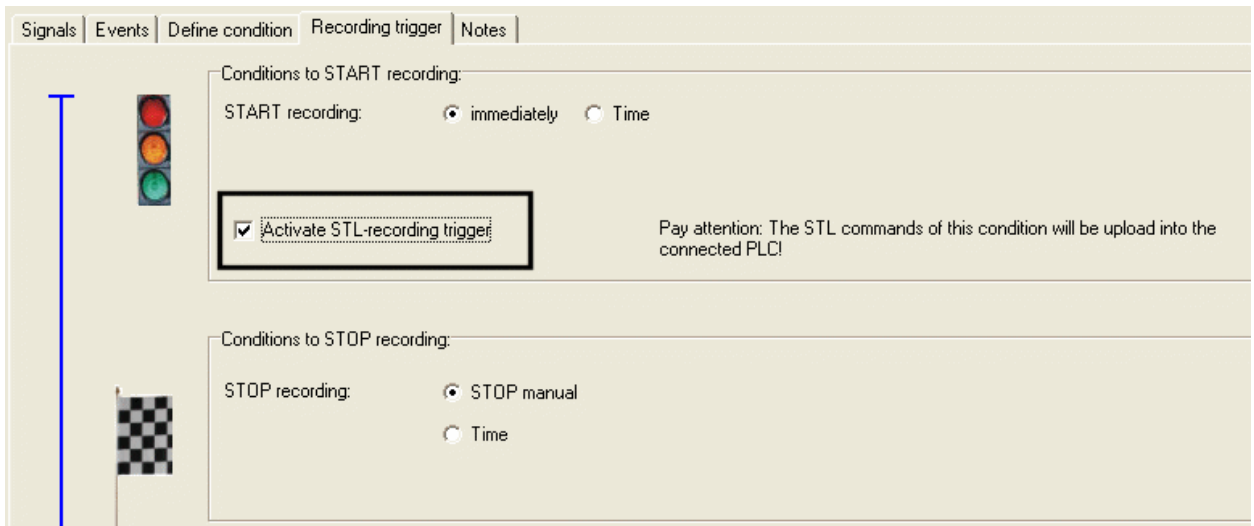


Fig.: Activating the STL-recording trigger.

The STL defined in the "Define conditions" will only be used when you have activated this check mark.



## 12 Snapshots

### 12.1 What are snapshots?

Snapshots are images of operand ranges at a particular time. One snapshot can contain whole and different operand areas.

#### Example:

One snapshot could consist:

- MB0 to MB100
- IB10 to IB 20
- QB 124 bis QB 134

**A snapshot is suitable, if you need additional information in a specific machine position.**

After the scan-exact recording you can examine additional to the signal trends the operands in the snapshot.

If you have defined a snapshot, you can use this in the scan exact recording. It is not possible to use snapshots in cyclic exact recording.

### 12.2 Define snapshots

You can define snapshots with the tabsheet "Define snapshot" in the dialog "Maintain signals".

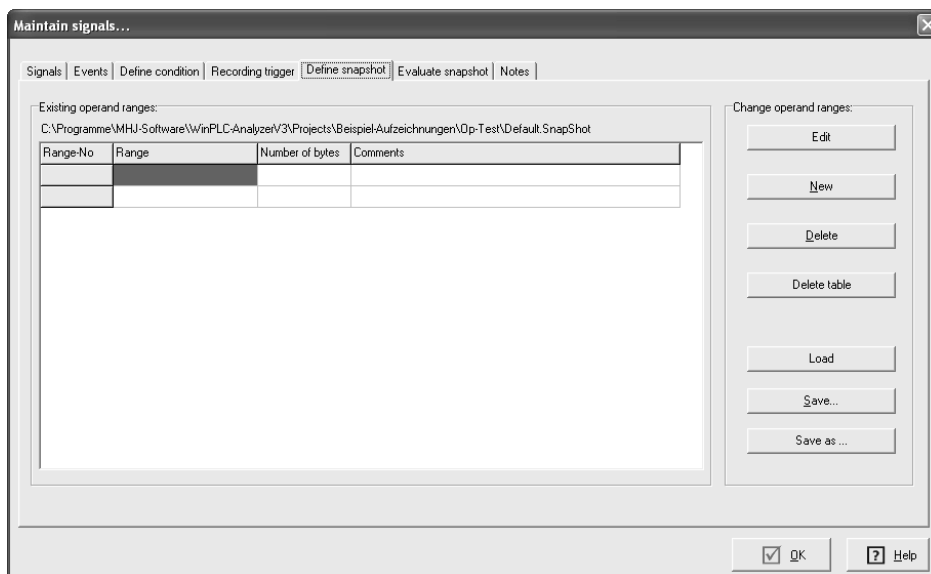


Fig.: Empty table





To create a new range, press the button "New":

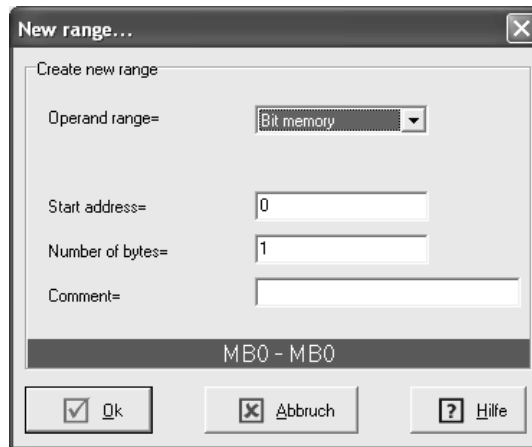


Fig.: Define a range of operands

In this dialog you can define the type of operand, the start address and the number of bytes.

You can use the following types of operands:

- Inputs and Outputs
- Bit memory (M)
- Timer
- Counter
- Data of data blocks
- Peripheral outputs

With the different buttons in this tabsheet you can define and edit multiple operand areas:

| Button       | Description                                      |
|--------------|--|
| Edit         | Edit the selected range.                         |
| New          | Create a new range in the table.                 |
| Delete       | Delete the selected range.                       |
| Delete table | Delete the complete table.                       |
| Load         | Load a snapshot definition from a file.          |
| Save         | Save the current table in the default file name. |
| Save as ...  | Save the current table in a specific file name.  |

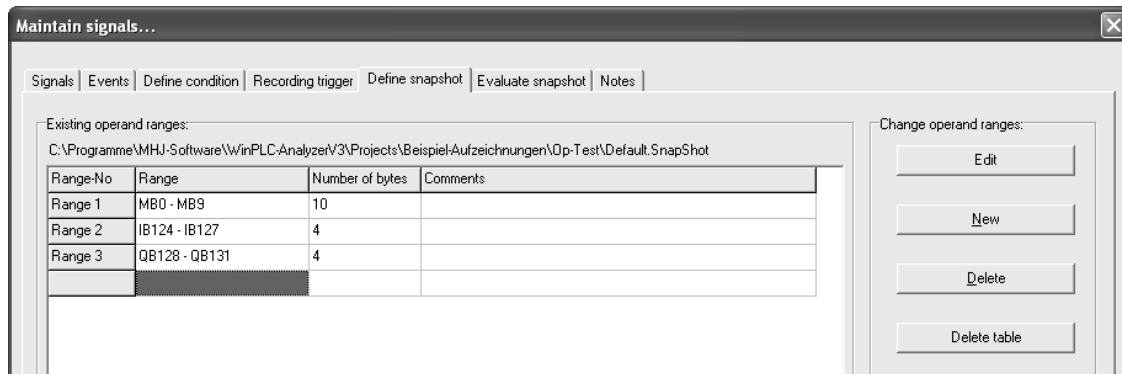


Fig.: example for a range definition

In the picture you can see three areas (ranges). At the bottom of the table you can see the size of the snapshot in bytes.

Consider that it takes some time to load the operand ranges from the PLC. In this short time the normal recording is stopped.

## 12.3 Define the event for the snapshot

To activate the snapshot mechanism you must define a snapshot event. At first you must write STL lines to define the trigger. This can be done in the tabsheet "Define condition".

In this example the snapshot should be created, when the operand M10.0 have the status '1'.

The short STL program for this is:

```
A M 10.0
= Q 100.0
```

Important thing is, that the operand "M10.0" exists as signal in the signal window. Only in this case the status of the operand is known.

The last line must always be an assignment to an output- or bit memory operand. You must use an operand that not exists in the signal window.

This STL-program is executed from a software PLC (not from the real PLC)!

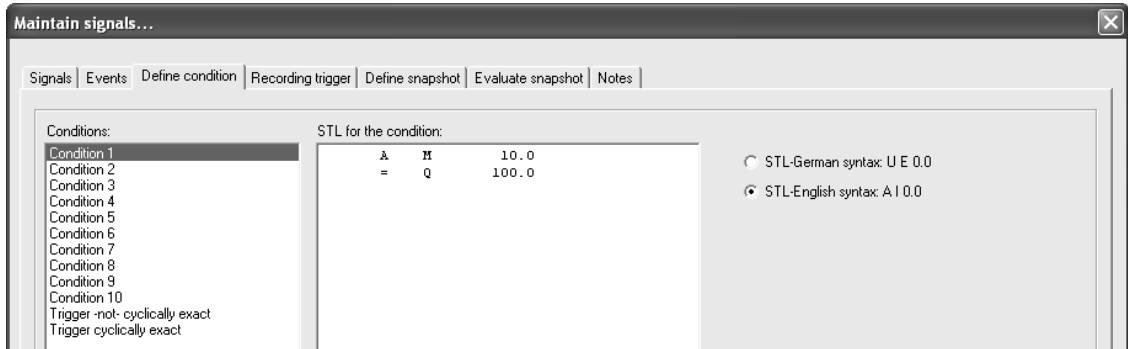


Fig.: Condition1 is finished

Now we switch to the tabsheet "Events" and edit the event with number 0:

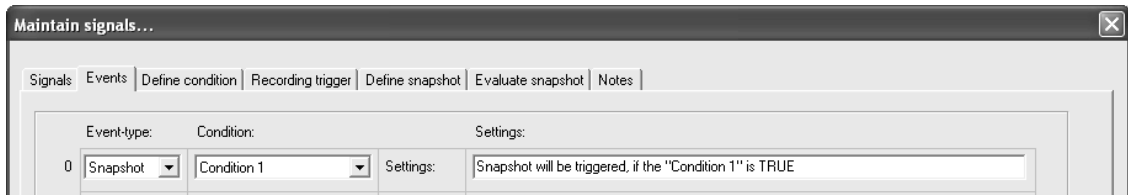


Fig.: Event 0 is changed to "Snapshot" and to "Condition1".

In the picture you can see that the "Event 0" have now the event type "Snapshot". The condition was changed to "Condition1". In the field "settings" you can place any comments.

This settings causes now that the snapshot is stored, if the "condition1" is true (M10.0 is '1').

## 12.4 Start recording and activate snapshots

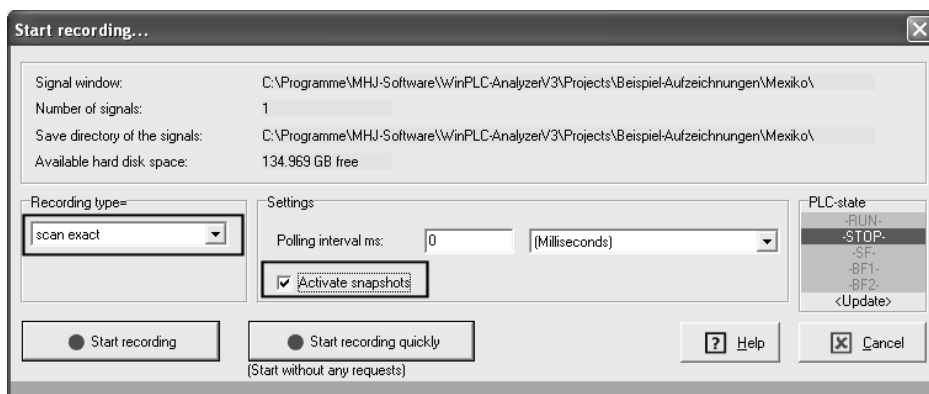


Fig.: Dialog "Start recording"

Select the recording type "Scan exact" and select the checkbox "Activate snapshots".

Now you can start the recording by pressing the button "Start recording".



## 12.5 Evaluate snapshots

You can see also the saved snapshots as yellow labels in the signal window.

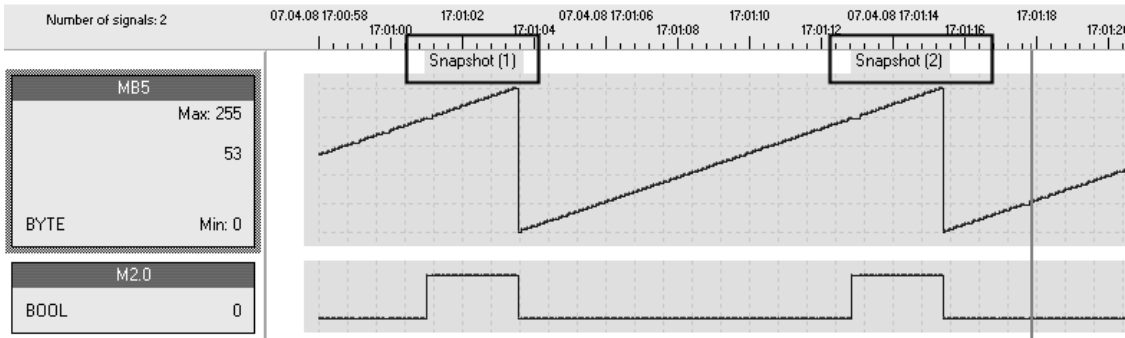


Bild: Snapshot labels in the signal window

If you make a **double click to a label** the tabsheet "Evaluate snapshots" appears.

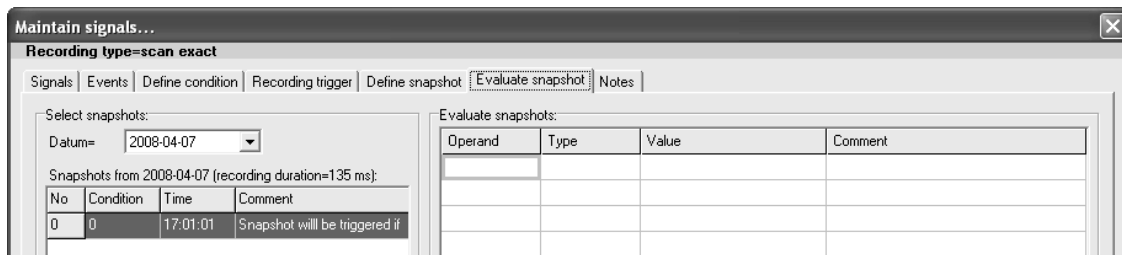


Bild: Tabsheet "Evaluate snapshot"

Now you can use this table **like a status variable table**. You can insert operands from your snapshots into the table: Select the column "Operand" and type in "MB5". When the MB5 belong to the snapshot, the value of this operand appears.

### Example:

The snapshot consists of the following operand ranges:

- MB0 - MB9
- IB124 - IB127
- QB128 - QB131



Then you can enter the following operands into the table:

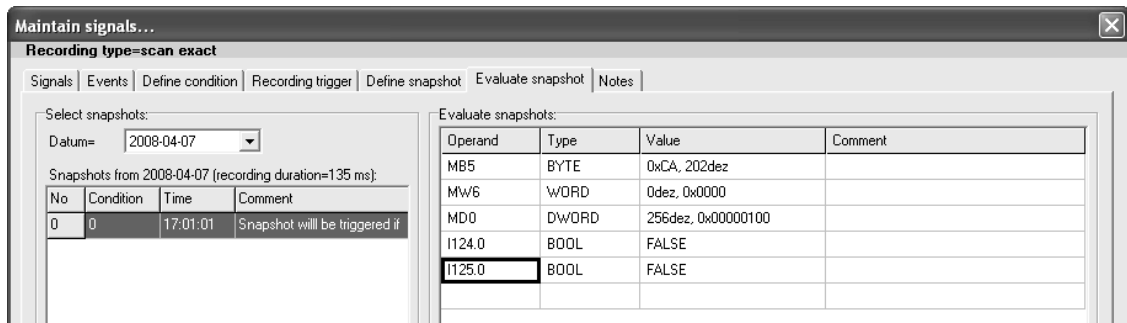


Bild: Tabsheet "Evaluate snapshot"

There exists two methods to evaluate snapshots:

1. Double-Click on a snapshot-label in the signal window, then only this snapshot appears in the left side of the tabsheet "Evaluate snapshots".
2. Open the dialog "Maintain signals" over the menu item "Signal window->Maintain signals". Select the tab-sheet "Evaluate snapshots". In this case **all snapshots** will appear in the left side. If you change the selection on the left side, you can see on the right side the current values of the operands.



## 13 Evaluation of recordings

When a recording has been completed you can use various tools to evaluate the result.

The most important properties of a recording are:

1. Number of signals.  
In the figure below this amounts to 220303 test points.
2. Timescale.  
In this figure this amounts to 12 hours 56 minutes and 57 seconds.
3. Current scaling.  
In this figure this is 41 ms pie Pixel.
4. Area subdivision of the recording.  
In this figure this amounts to a total of 38 areas. The current area is 1.

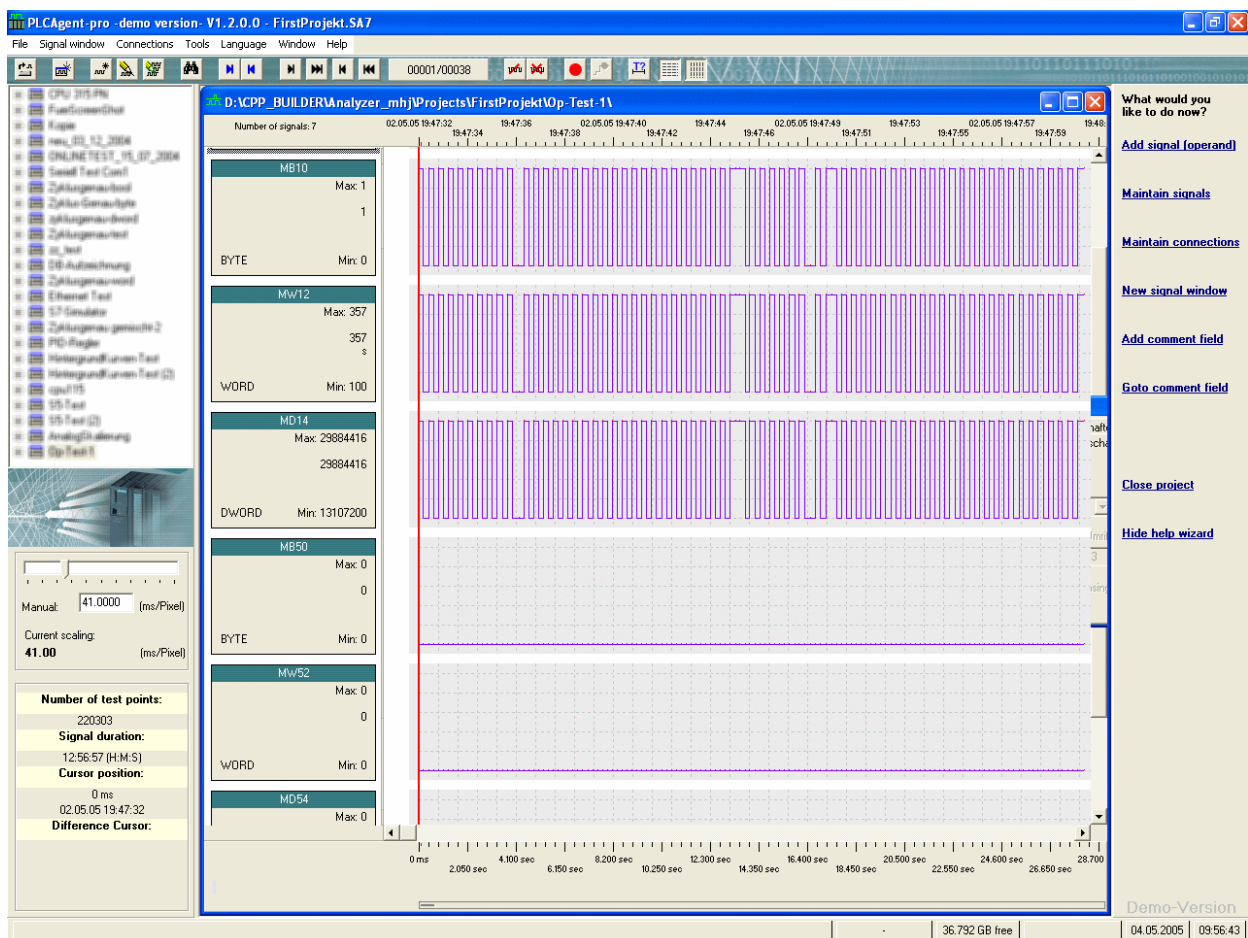


Fig.: Signal window with a recording

### Note:

Chapter "User interface" contains a detailed explanation of the term **area**.



## 13.1 Search for test points

You can search for specific test points in your recording using menu item "Signal window->Goto":

- Search for a specific date and time
- Search for a time position (offset)
- Search for the actual value of a specific operand
- Search for the test point sequence of a specific operand
- Search all operands

## 13.2 Search for date and time or an offset

This search relates to a single operand in the signal window. For this reason you must first select the operand in the signal window.

Open menu item "Signal window->Goto". In the "Goto time position" tab you can search for a specific time position:

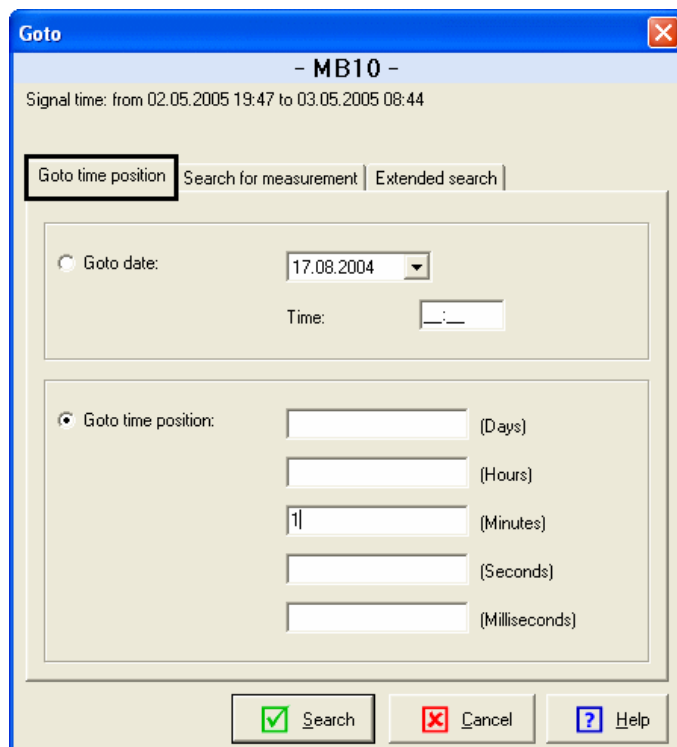


Fig.: Search for an absolute or a relative time position

Click the "Search" button to jump to the respective position in the signal window.



## 13.3 Search for the actual value of a specific operand

This search relates to a single operand in the signal window. For this reason you must first select the operand in the signal window.

Open menu item "Signal window->Goto". In the "Search for measurement" tab you can search for the required actual value:

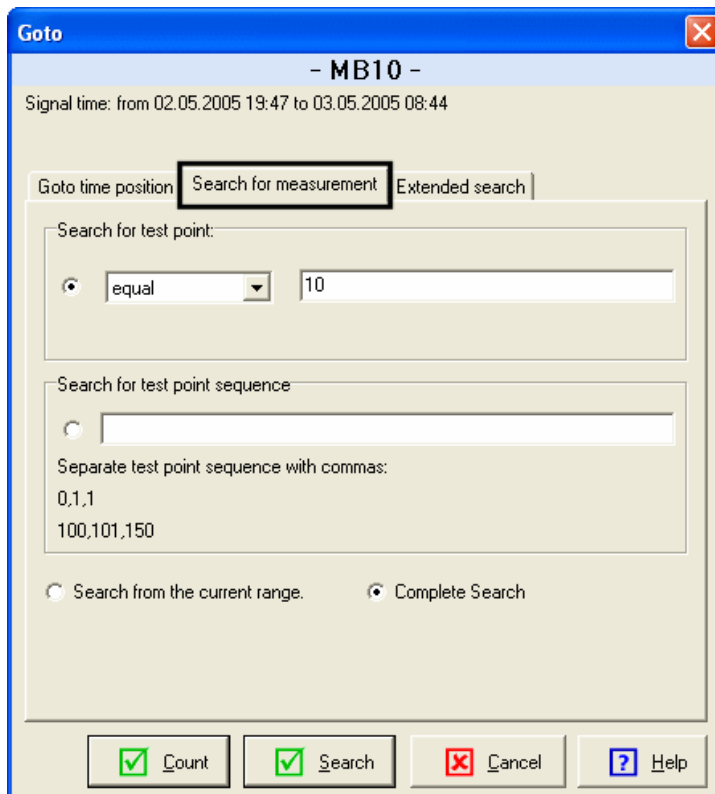


Fig.: Search for actual values

The "Search" button jumps to the next match in the signal window.

The "Count" button determines how many test points match the search expression.

The field "Search for test point sequence" issues a search for a specific sequence of actual values. Meaningful results are only produced when you use binary operands.





## 13.4 Extended search (covering all operands)

The extended search searches several operands located in the signal window. You can specify the respective conditions in the "Extended search" tab:



Fig.: Extended search (not yet specified)

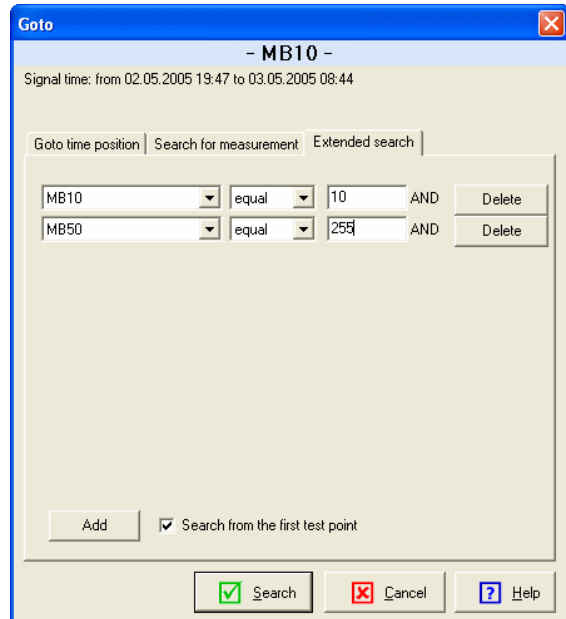


Fig.: This search will include two operands.

A click on "Add" inserts operands from the signal window that you wish to include in the search.

When you click "Search" any position in the signal window where a match is detected will be selected.



## 13.5 Measuring time

A simple and quick procedure can be used to measure times.

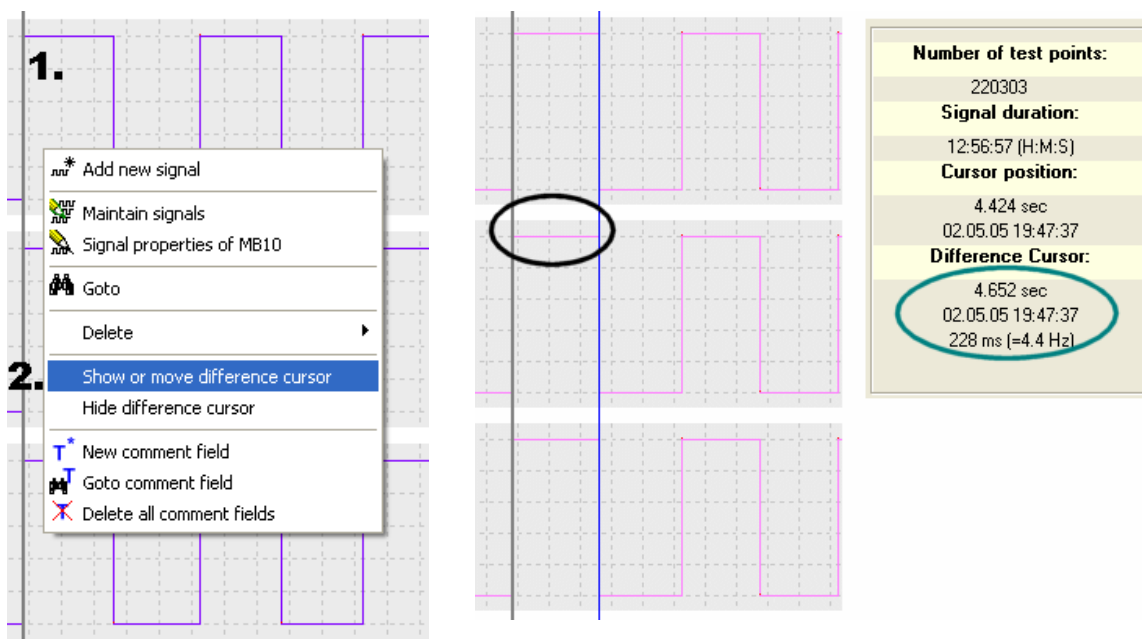
In order to determine a specific time you first position the time cursor (refer to Fig. 1.)

Press the right mouse key and select menu item **Show or move difference cursor**.

The difference cursor appears. You can move it by means of the mouse.

Move the mouse to the 2nd location and click the left mouse key.

The time interval will be displayed at the bottom left. The frequency (1.0 divided by the time interval) is also displayed in brackets.



- 1. Time cursor
- 2. Menu item difference cursor

Here the difference cursor has been moved.  
The panel at the right shows the respective interval.

To hide the difference cursor, press the right mouse key and select menu item **Hide difference cursor**.



## 13.6 Creating comment fields

You can specify comment fields to include labels in the signal window.

Procedure to create a new comment field:

Move the mouse pointer to the position where you want to create the comment field. Click the right mouse button to display the context menu. Select new comment field.

The comment field is displayed on-screen. Double-click the comment to change text and color.

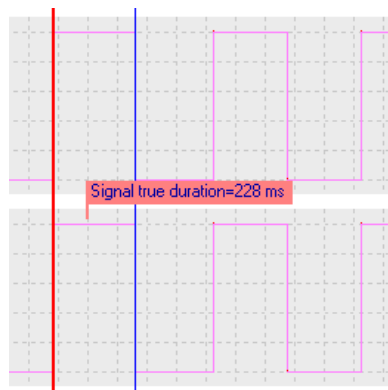


Fig.: New comment field

## 13.7 Goto comment field

You can also use comment fields as bookmarks.

Use comment fields to identify interesting sections of the record. Subsequently you can access the "**Goto comment field**" dialog using the context menu.

This displays a list with all the comment fields contained in the signal window. Now you can select the field you want to jump to.

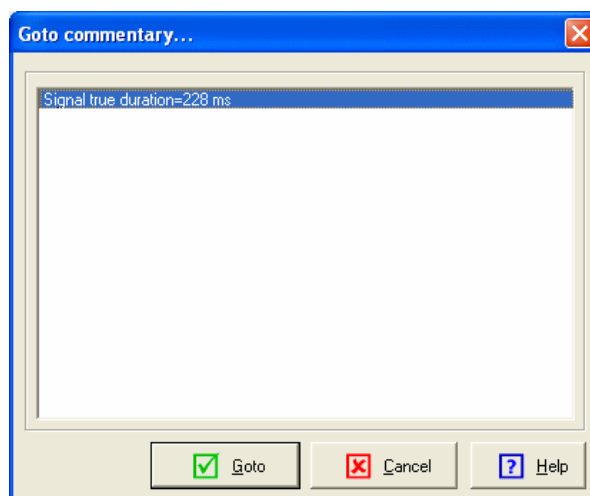


Fig.: Goto comment field dialog



## 13.8 Evaluations of the system messages

The analyzer log important events as system messages. You can view the system messages with menu item "Signal window->Show system messages".

Following events are logged as system messages:

- Recording start
- Recording end
- Communication errors
- PLC switch to STOP mode (new in version 2)
- PLC switch to RUN mode (new in version 2)

If the PLC switch to STOP mode, the I stack and the B stack is logged in a file. To view the I stack select a entry in the system message list with a STOP event and press the button "Show I stack".

**So you can examine the reason of the STOP event after recording.**



## 14 Comparisons with background signals

### 14.1 What are background signals?

Background signals are recordings that are included as background with the current record.

In this manner it is possible to graphically compare new recordings with old recordings. For some machines it makes sense to prepare a recording of the installation while it is operating properly in order to compare this **reference recording** with a current recording when failures occur.

On complicated installations a comparison of the two recordings can be used to quickly locate the source of the problem.

The default color for the background signal is yellow. You can change this color using menu item "**Tools->Color settings**".

Example of the representation including a background signal:

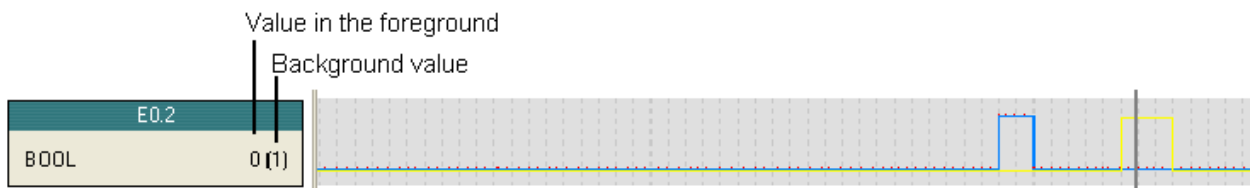


Fig.: Signal displayed with background signal

On the left you can see the measurement at the time of the time cursor. The value of the background signal is shown in brackets.

### Applications for background signals

- Comparing current recordings to earlier recordings
- Verifying that all the clock cycles of the machine match the times recorded earlier. This can be used to implement effective quality control measures.
- Simplification of the comparison of new recordings with the recordings that were made when the installation was commissioned when evidence is required.
- Quick recognition of mechanical wear and tear that affects the time response of the installation.
- Quick and simple verification of control optimizations.
- Location of errors that are caused by altered time responses of processes.



## 14.2 Displaying background signals

Procedure to compare a current recording with an earlier recording:

1. Open the signal window containing the current recording.
2. Search and select the recording for the comparison in the signal window list.
3. Click the right mouse key to display the context menu.
4. Select menu item "Use as background signal".

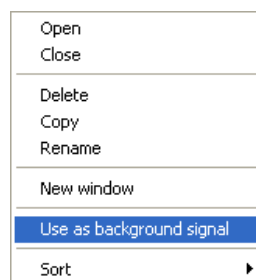


Fig.: Context menu with the entry *Use as background signal*

After verification the selected recording is inserted as the background signal into the current window.

The default color for the background signal is yellow.

You can also convert the current recording to a background signal:

select menu item ***Tools->Background signals->Move signals to background***

## 14.3 Deleting background signals

Select menu item ***Tools->Background signals->Delete background signals*** to delete a background signal.

When you confirm that you wish to continue the background signal will be deleted.



## 15 Send SMS (Short Message Service)

### 15.1 Which modems are supported?

SMS messages can only be transmitted with certain modems.

A list of modems is available in the "SMS settings, Send SMS" dialog. The system supports all the modems that are contained in this list:

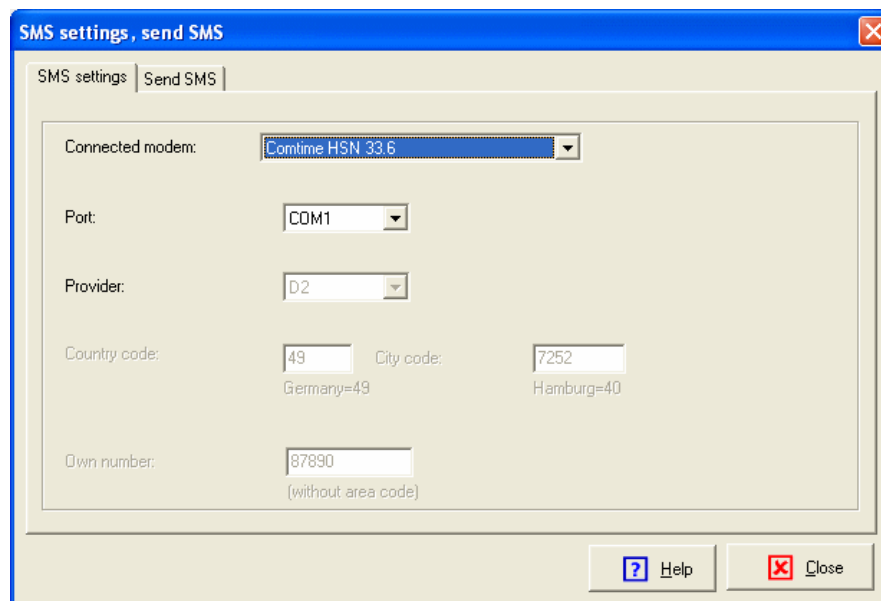


Fig.: Send SMS settings

**Note:**

Grayed out settings are not required for the selected modem.



## 15.2 Configuration

You must enter certain settings in the "SMS settings,..." dialog before the system can send SMS messages.

Select menu item **Tools->SMS settings, Send SMS** to display this dialog.

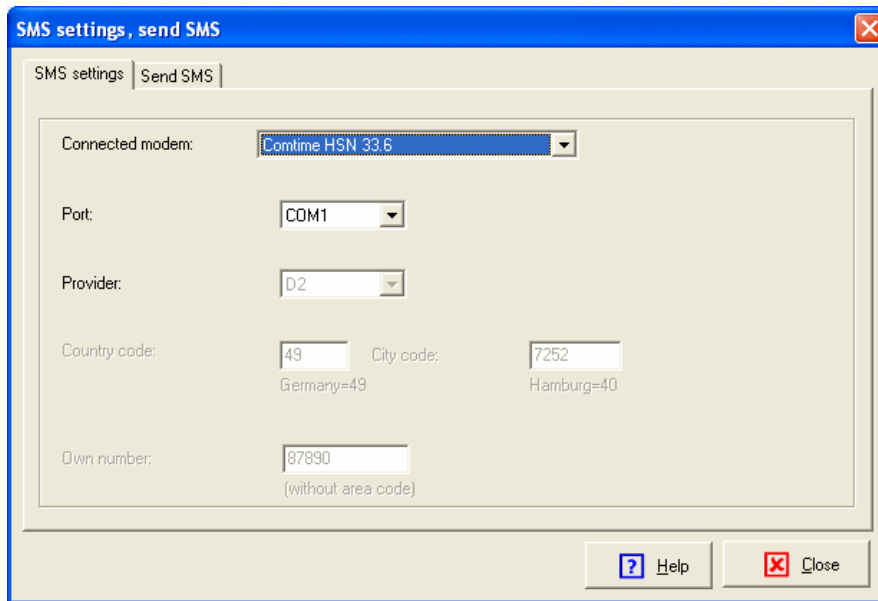


Fig.: SMS Settings, Send SMS dialog

The following settings are available:

| Setting         | Explanation  |
|-----------------|--|
| Connected modem | A list of modems that are available for use.   |
| Port            | Enter the serial port where the modem is connected.  |
| Provider        | Select the provider for the target number.   |
| Country code    | Enter the country code for the telephone number that will be used to send SMSs                                   |
| City code       | Enter the city code for the telephone number that will be send SMSs.   |
| Own number      | Enter the local telephone number (without city or country code) for the telephone number that will be send SMSs. |





## 15.3 Test SMS

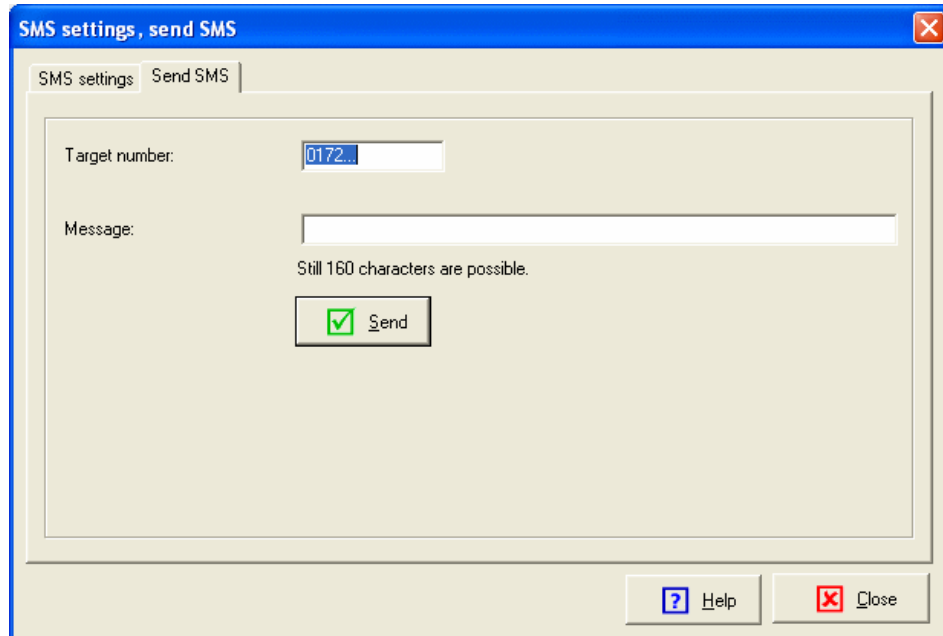


Fig.: Send a test SMS

You can send a test SMS from the "Send SMS" tab.  
You should do this at least once to test your settings.



## 15.4 Sending an SMS while a recording is active

An event can trigger sending of an SMS while a recording is active.  
You can define events in **Signal window->Maintain signals**.

The respective event is triggered when a condition should become "true" while a recording is active. If this event is an SMS event the SMS is transmitted.

The chapter on conditions contains details on the configuration of an event in order to send an SMS.

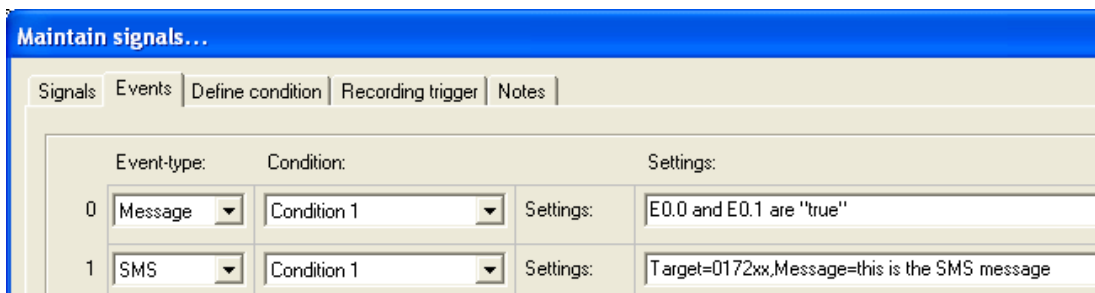


Fig.: Events can be configured in the "Maintain signals" dialog.



## 16 The most common questions

### **Which is the fastest communication interface for *WinPLC7-Analyzer*?**

A connection to an Ethernet-CP (or Ethernet on board) is the fastest communication link.

In *WinPLC7-Analyzer* this connection is called **S7-Ethernet**.

### **By how many milliseconds does the cycle time increase for cyclic exact recording?**

This depends on how many operands are recorded and which type of S7-CPU is being employed.

This is generally app. 3ms.

### **How much free memory must remain in the PLC to ensure that recording is possible?**

At least 1600 Byte of working memory are required.

At least 2300 Byte of load memory are required.

### **How can a new recording be started without overwriting the earlier recording?**

Start by creating a copy of the record and then use this copy for the new recording. Select an entry in the signal window list (at the left edge of the screen) and press the right mouse key. Then you select 'Copy'.

### **Can i use my SIEMENS interface CP5512 or CP5611 with *WinPLC7-Analyzer*?**

Yes, with version 2 of *WinPLC7-Analyzer*