Operating manual

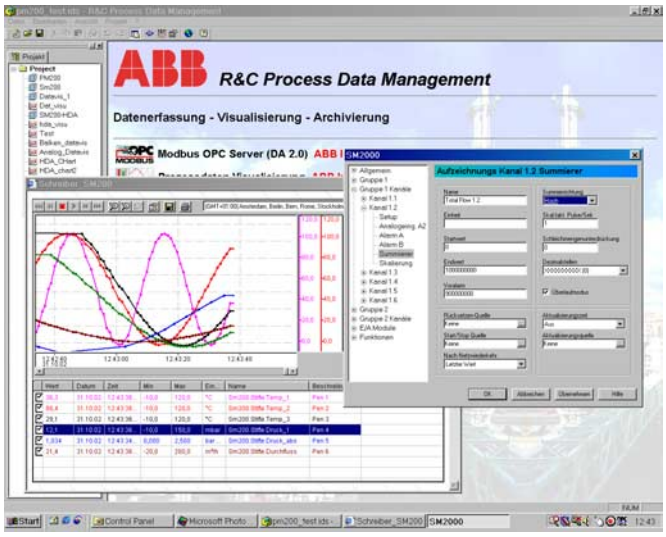
42/49-28 EN

CommunicateIT

Modbus OPC Server DA200M

R&C Process Data Management Software

IndustrialIT enabled



ABB

Modbus OPC-Server DA200M

Operating manual

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Content

1 Installation and maintenance

1.1 System requirements

The following hardware and software components are required to install and run the program properly:

- PC, IBM compatible, at least Pentium processor, 166 MHz,
- 64 MB RAM,
- 20 MB free hard disk space,
- SVGA card, at least 256 colors,
- Windows 98, NT
- CD-ROM drive for installing the program
- InternetExplorer Version 5.01 or higher

1.2 Starting the setup program

Insert the CD in your CD-ROM drive. The setup program will be started automatically. You can also start the setup program manually by following the instructions below:

On the CD you will find the Setup.exe program in the roots directory.

Double-click on Setup.exe to start the setup program. The Windows Installer dialog box appears. If the Windows installer should not yet be available on your system, it is automatically installed then. After this, your system needs to be restarted. After the restart the setup program will start again automatically to continue the installation. Note: Some systems do not permit an automatic restart of the setup program. In this case, manually start Setup.exe as described above.

1.3 Installing the program - installation steps

1.3.1 Language Selection dialog box

When the setup program has been started, the Language Selection dialog box will pop up. In this dialog you can select the language for both theR&C Process Data Management and the installation program.

Select a language from the list and confirm with OK to continue. (Note: The selected language can be the same as your system language, but does not need to be).

1.3.2 Welcome dialog box

A setup wizard started with a welcome screen will help you to install the program. To ensure proper installation it is strongly recommended to exit all other applications before running the setup program. Be sure that this is case before selecting "Next". Otherwise, the current setup procedure should be cancelled.

1.3.3 User Information and User Rights dialog box

Enter your full name and organization in the respective fields.

Note that special user rights can only be assigned by the system administrator of the PC on which the software is to be installed.

If the menu option "All users" is selected, the program will always appear in the start menu, no matter who is currently logged on.

When selecting the "Me only" option the program will only appear in the start menu when you are logged on under your personal account.

1.3.4 Target Folder dialog box

In this dialog you can define the target drive and folder in which the program is to be installed. Click on the "Browse" button to change the default drive and folder.

1.3.5 Installation Type dialog box

In this dialog box you can select to install Typical, All or Custom products.

Typical
Installs the R&C Process Data Management with the following products: Modbus, Visu, Konfi Device Type Manager (DTM) for Datavis for device configuration and control (Prog1 and Prog2 functionality)

All
Installs all products

Custom
Product selection as required. You can select the products you want to install from the next dialog box.

1.3.6 Starting the installation

When all necessary entries and settings have been made, you can start installation. The installation procedure may take some time. When installation is complete, a message appears indicating that the installation was successful. The menu item "R&C Process Data Management " is now available in the start menu.

1.3.7 Uninstalling or customizing the program

There are two possible ways to uninstall the program or to install/uninstall specific program components:

- Start the Setup.exe program or
- Select [Settings -> Control Panel -> Add/Remove Programs] from the Start menu and then double-click on the "R&C-Process-Data-Management " option.

In both cases the Setup program is started, and the Application Maintenance dialog box appears.

1.3.8 Application Maintenance dialog box

This dialog box provides several service and maintenance options for your program:

Customize
Add or remove components

Repair
Re-install or add components that have been purchased at a later time

Uninstall
Completely uninstall the program.

2 Workspace

2.1 R&C Process Data Management Software

The R&C Process Data Management Software from ABB Recording & Control includes the following PC software packages for measured value processing:

- Modbus OPC Server (DA 2.0 Standard),
- Device Bus OPC Server (DA 2.0 Standard) for devices that exclusively support the H&B Device Bus (from version 3 and higher)
- Process Data Visualization (OPC client)
- OPC HDA Server for recording and handling historical values (from version 3 and higher)
- R&C Process Web Server for process data visualization via the Internet (from version 3 and higher)
- FDT Device Configurator and Device Type Manager for device management and configuration

The following tasks for small automation applications are fully covered by this software:

- Process data acquisition
- Archiving (from version 3.0 and higher)
- Visualization
- Device management and configuration

All products of the R&C Process Data Management Software use the following standards and trends of advanced process automation:

- OPC (OLE for Process Control) for process data acquisition,
- OPC-HDA (Historical Data Access) for process data archiving (Version 3 and higher)
- Web and browser technologies (HTML, DHTML, JavaScript, ActiveX components technology, etc.) for process data visualization
- FDT (Field Device Tool) Standard for device configuration

Due to its compliance with the above-stated standards the R&C Software Suite is an open system providing the following features:

- trouble-free cooperation of different software packages
- preservation of you investment in already purchased ABB devices
- integration of bus-compatible devices from other vendors
- integration of OPC servers for other fieldbuses (e.g. Profibus, FoundationFieldbus, InterbusS etc.)

- free access throughout the network to all process data on recorders, controllers and indicators from process control systems or other visualization systems

2.2 Workspace and software concept

All software packages of the R&C Process Data Management Software share a common R&C instrumentation software library. The library is installed with the first product of the software suite, and may be updated if required when a new product of the R&C Process Data Management software package is installed. Among other items the library contains all communication components like OPC and FDT.

To ensure user-friendliness and convenient control all software packages use a common graphical user interface, the so-called workspace. This does not apply to the ProcessWebServer which does not need a user interface. The workspace is installed with the first product of the software suite, and may be updated if required when a new product of the R&C Process Data Management software package is installed.

2.3 Starting the workspace

The menu item "R&C Process Data Management Software " is available in the start menu under "Programs". Click on the "Workspace" menu item to start the program.

2.4 Workspace components

After starting the workspace the user interface appears (refer to the illustration). The project tree is displayed in the left section of the window. It is the main tool for navigating and for controlling the installed software packages. Moreover, it is the starting point for all functions related to data acquisition, visualization and device parameterization. The right sub-window is the Web browser display area, where any Web site selected can be displayed. The installed and licensed software packages are shown here by default.

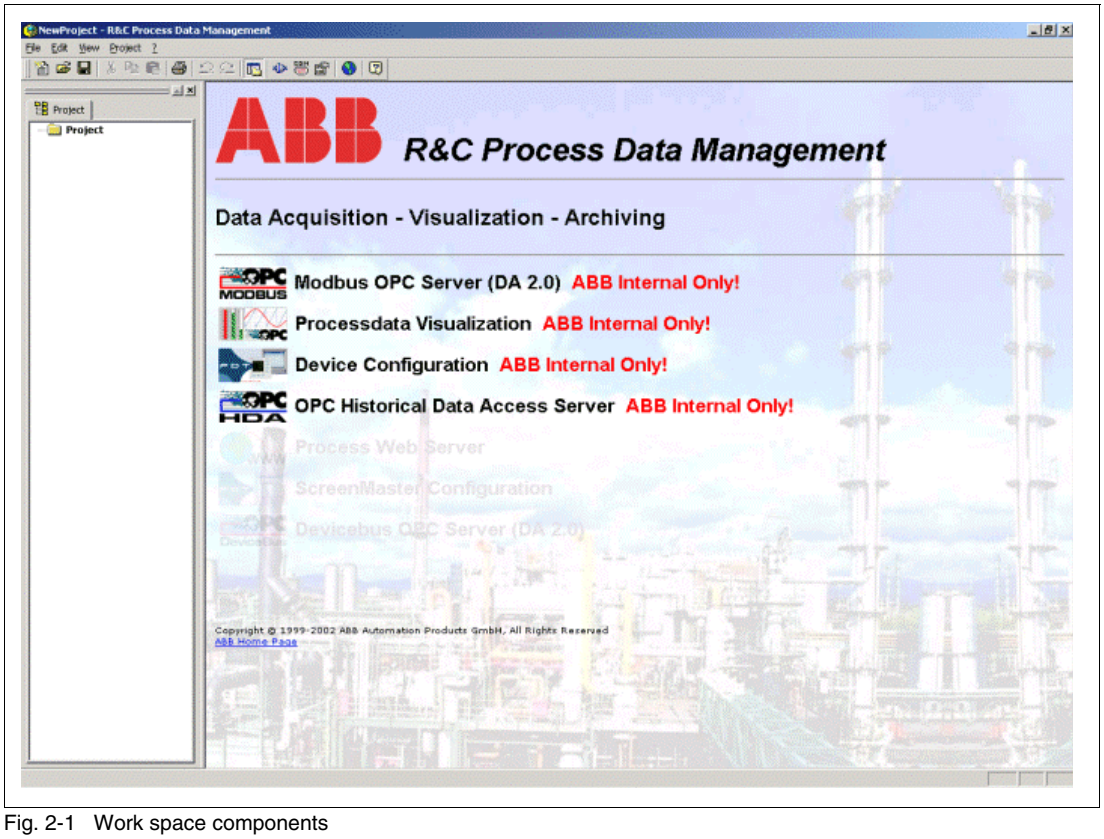

Fig. 2-1 Work space components

2.5 Project and project tree

The project tree is the main tool for navigating and is used for organizing and handling all devices, plants and applications in a structured hierarchy, as seen in the illustration.

Example

The example shows a plant hierarchy in the project tree. The project may contain any number of folders and subfolders. Devices, visualization pages and subfolders can be arranged in every folder such that they represent the structure of the actual plant.

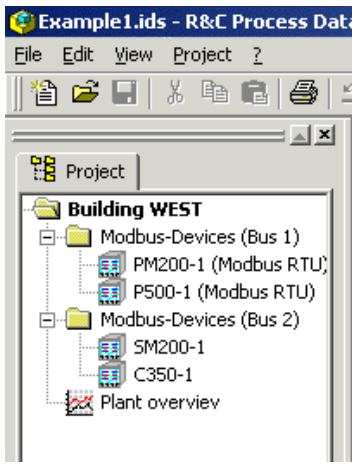

Fig. 2-2

2.5.1 Working with the project tree (Edit current project)

Upon loading or creation of a project the project tree can be designed or adapted freely to meet the requirements of the respective application. You can create hierarchies, change names, and add elements like plants, devices, servers or visualization pages.

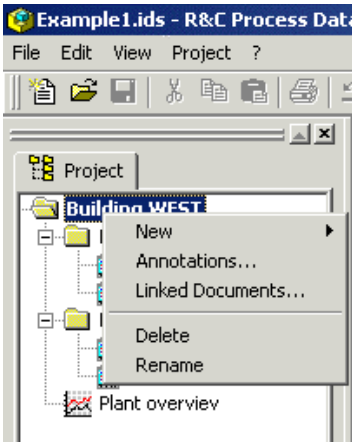

Fig. 2-3

All these action can be performed in the project tree. Right-click on the appropriate node in the project tree. A shortcut menu adapted to the respective node type appears, where all actions can be performed.

2.5.2 Editing the project name

Right-click on the root directory. Select "Rename" from the shortcut menu that appears. You can edit the project name directly in the tree view, then.

Note As a rule, every element in the project tree can be renamed in this way.

2.5.3 Creating a new element in the project tree

Right-click on the folder icon to open the shortcut menu. Then select "New". A pull-down menu with various options for creating a new project element will pop up. The following menu options can be selected:

Folder
Creates another hierarchy level, where other elements can be.

Device
Creates a new device. The device type can be selected from a device selection list. The selection list contains all Device Type Managers (DTMs) installed on your PC and the virtual devices like the R&C Modbus OPC Server.

External application
Permits to integrate any external 32-bit program, e.g. Paraline200. This feature is especially designed for supporting devices for which no DTM complying with the FDT standard exists yet.

Visualization page
Permits to create visualization pages by using one of the 11 pre-configured standard visualization pages as a template, and to integrate user-defined HTML pages.

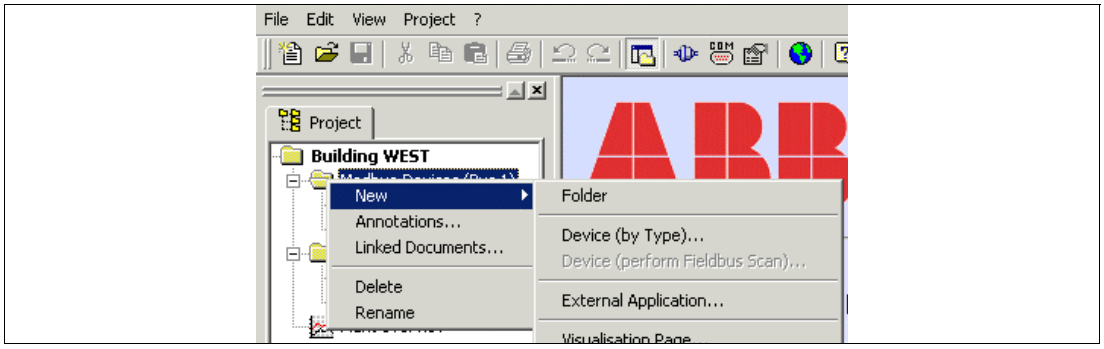

Fig. 2-4

2.5.4 Creating a device

Right-click on the folder icon to open the shortcut menu. Then select "New". A pull-down menu with various options for creating a new project element will pop up. Select "Device (by type)" to open the dialog box for selecting the device type (see the illustration (see Fig. 2-5).

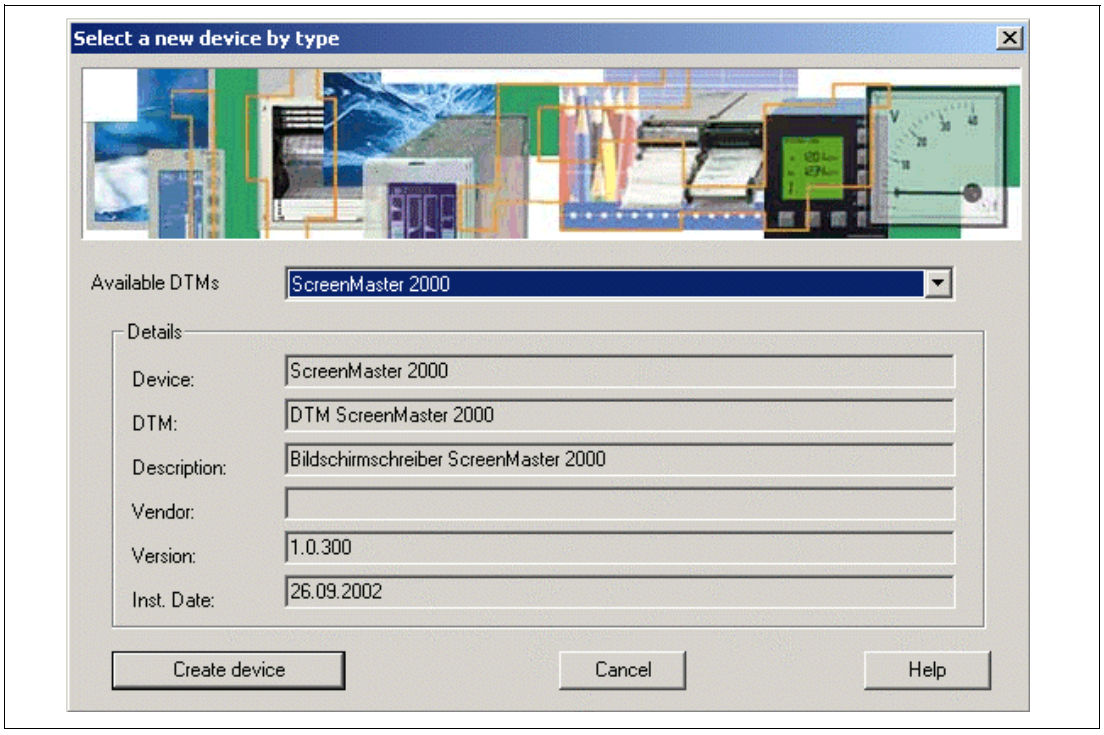

Fig. 2-5

Select a device from the list of available devices. Press the "Create device" button to confirm. The device will be created in the selected folder with the name "New device". Directly upon creation the edit mode will be active, i.e. you can change the node name according to your needs.

Note

The name is freely configurable, independent of the device type. Names like "Datavis-1", "Datavis (heater A)", or simply "Tag 01" are valid without any limitations.

Double-click on the menu item to start the device-specific Device Type Manager with all parameter definitions of the device. See topic "Device Type Manager" for details.

2.5.5 Integrating external applications

The program permits to integrate any external 32-bit program, e.g. Parapoint200. This feature is especially designed for supporting devices for which no DTM complying with the FDT standard exists yet. You can also integrate any other 32-bit program, e.g. Excel.

Right-click on the folder icon to open the shortcut menu. Under "New" a select list for creating a new project element can be called up. Select "External application". The dialog box for integrating external programs appears.

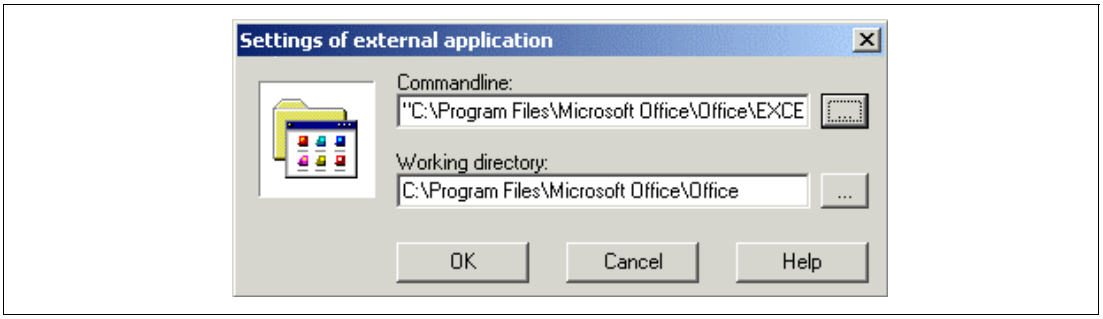

Fig. 2-6

Command line
Enter the program name with full path information in the command line.

Work directory:
If you don't want to use the program folder as your work directory, you can enter a path for your work directory here.

Confirm with OK. The new item appears in the tree. Double-click on the item to start your application.

Editing remarks

A remark can be stored for every node in the project tree. Select the "Remarks" menu item from the short-cut menu to open the Remarks dialog box.
You can enter simple texts without attributes in this dialog box. Confirm with OK. The text is taken over and allocated to the node.

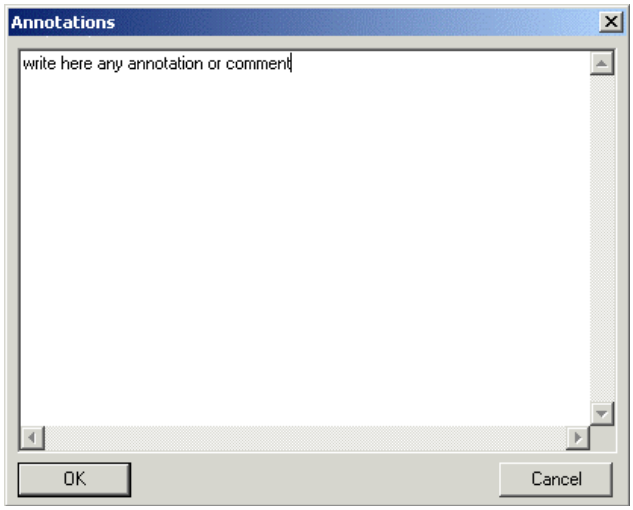

Fig. 2-7

Linked documents

Documents like operating instructions for the device, logs, etc. can be linked with every node. Click on the "Linked documents" menu item to open the "Documents linked with this element" dialog box where you can add, remove or open documents.

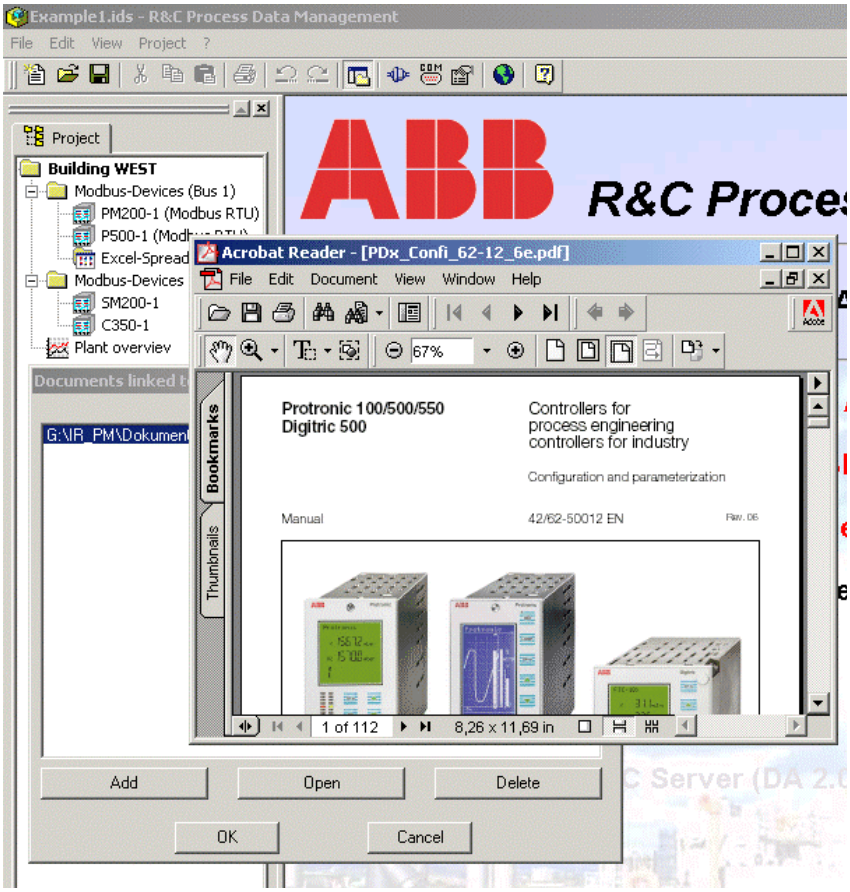

Fig. 2-8

2.6 File menu

The workspace offers a project management function for creating, loading and saving projects. This allows you to work with different projects. The file menu of the workspace (see illustration) is used for project management (see Fig. 2-1).

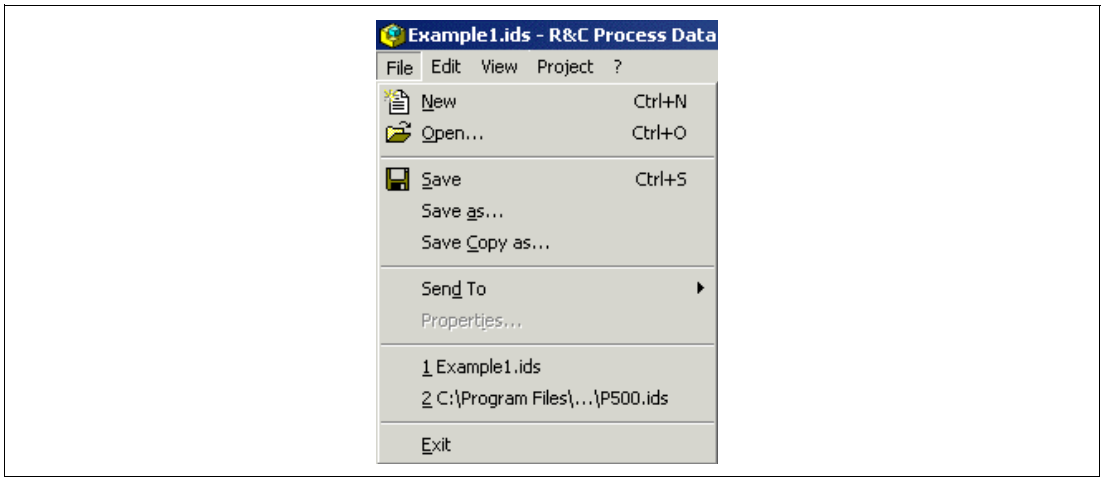

Fig. 2-9

2.6.1 Creating a new project

In order to create a new project open the File menu and select "New". If you have already opened a project and have not yet saved it, you will be asked if you want to save that project before creating a new one. If yes the File dialog box appears, if no the current project is closed without saving, and the new project is created immediately.
The new project is first created with the default name "New project", which can be changed as required. Refer to the topic "Editing the project name" for details.

2.6.2 Opening an existing project

In order to open an existing project open the File menu and select "Open...". If you have already opened a project and have not yet saved it, you will be asked if you want to save that project before opening another one. If yes the File dialog box appears, if no the current project is closed without saving. The "Open file" dialog box appears where you can select the respective file and then load it into the workspace. Project files have the extension ".ids".

2.6.3 Saving the current project

In order to save the current project open the File menu and select "Save". The project will be saved without further prompts. If the project is saved for the first time, the "Save as" dialog box will appear, where you can enter a new name for your project.

2.6.4 Saving a project under a new name

Select the "Save as..." menu option from the File menu if you want to save the current project under a new name. The "Save as" dialog box will appear, where you can enter a new name for your project. After this the project will appear in the workspace under the new name.

2.6.5 Saving a copy of the project

Select the "Save copy as..." menu option from the File menu if you want to save a copy of the current project under a new name. The "Save as" dialog box will appear, where you can enter a new name for your project. The project name that already exists in the workspace will not be changed.

2.6.6 Sending a project to

Under "File" -> "Send to" "E-mail address" you can send you project as an e-mail to an addressee. The mailing program is opened. A new mail is created automatically, and the project file (.ids) is already attached to it. Enter an e-mail address and send off the mail.

2.7 View menu

In the View menu you can adapt the workspace to your needs. You can select the dialog language and show/hide the toolbar, the status bar, and the project tree (Project view).

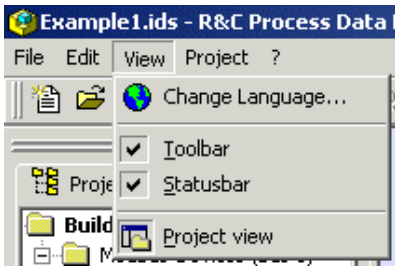

Fig. 2-10

2.7.1 Dialog language

Select the "Change language" menu item to change the dialog language. The "Change language" dialog window appears.

Fig. 2-11

Select a language from the list of installed languages and confirm with OK. The new language setting will be activated when the program is started the next time. Terminate/restart your program.

2.7.2 Showing/hiding the toolbar and status bar

Click on the "Toolbar" menu item to show/hide the toolbar.
Click on the "Status bar" menu item to show/hide the status bar.

2.7.3 Showing/hiding the project view

Click on the "Project view" menu item to show/hide.

2.8 Project menu

In the project menu you can set the project-specific parameters.

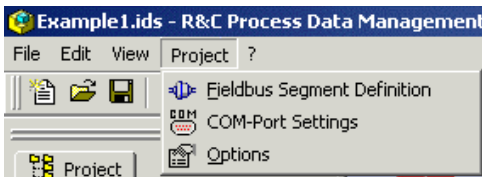

Fig. 2-12

2.8.1 Defining the fieldbus segments

A fieldbus segment represents the configuration of serial PC or bus segment interface. If the PC has several serial interfaces, you can define several fieldbus segments with different settings (e.g. for the baud rate). In the device configuration a fieldbus segment can be allocated to the respective device.

Select the "Define fieldbus segment" menu item from the "Project" menu.
A dialog box appears where the defined fieldbus segments are listed.

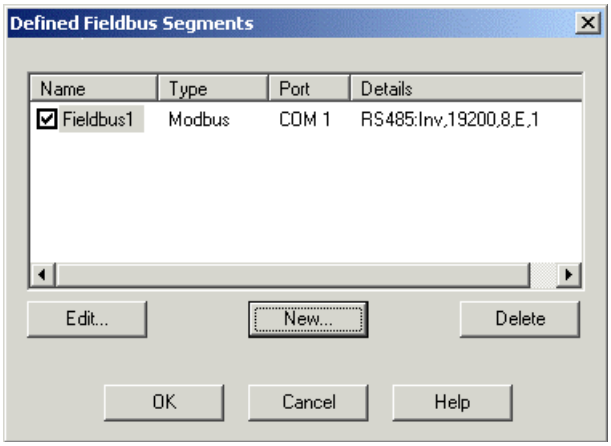

Fig. 2-13

Select the name of the link, the protocol (under fieldbus type) and the COM interface in the "Fieldbus segment" dialog box.

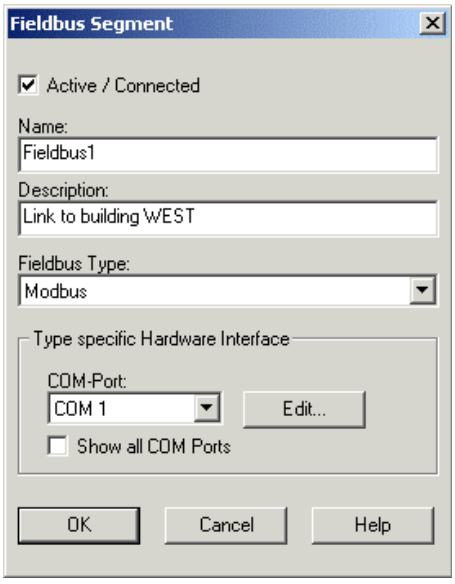

Fig. 2-14

Click on "Edit".
A window appears, where you can define the interface settings: RS 232 or RS 485, baud rate, etc.

Remark

Usually, RS 232 is the correct setting, even if the device is connected to the RS 232 interface of your computer via an RS 485 converter. RS 485 has to be selected only if a so-called hardware flow control is required, e.g. for a non-automatic RS 485/RS 232 converter.

2.8.2 Options

In the Project options dialog box you can define that the last accessed project is automatically opened when the workspace is started.

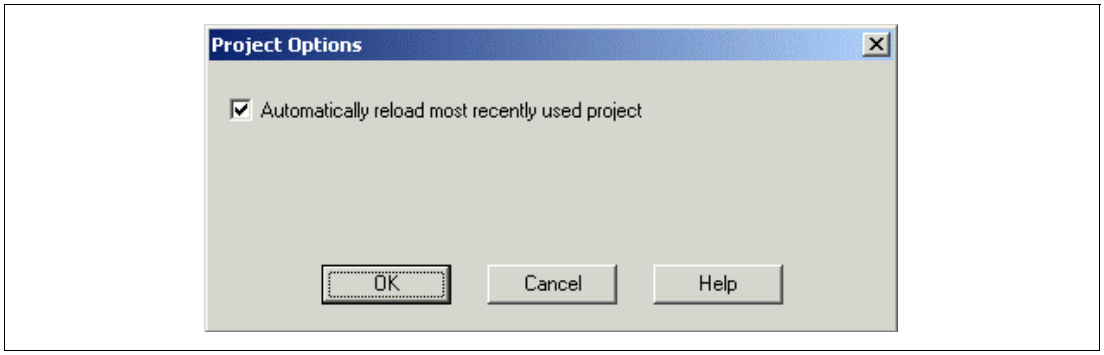

Fig. 2-15

2.9 Help Menu

The Help Menu contains the item Help and Register with that one can open the license dialog.

The Help for the License dialog can be opened by pressing the help button avaliable on this dialog.

Comment

The Licensing software is a common ABB software independent of the R&C Process Data Management. This is the reason why it has his own separate help.

3 OPC server for Modbus-RTU

3.1 OPC (OLE for Process Control)

What is OPC?

OPC is intended to standardize the data access via standardized interfaces.

In the beginning, every software and application engineer had to develop proprietary interfaces, servers or drivers to realize the data exchange with fieldbus devices. The problem was due to the great variety of different fieldbus devices, bus systems and data acquisition stations available on the market, which eventually resulted in proprietary solutions that were not compatible with each other. The OPC approach defines a common, open interface doing away with the need for special proprietary drivers. OPC permits standardized access to any fieldbus for all HMI, SCADA, and open control systems.

Thus, OLE For Process Control (OPC) provides for standardized data exchange between heterogeneous process automation instruments and the most different PC applications. Object Linking and Embedding (abbr. OLE) is a software interface that can implement and display the information from one program in another application. OPC is supported by the OPC Foundation who has worked out the technical specifications and has already more than 140 members, among them global players like ABB, Siemens, etc.

3.2 Modbus OPC DA Server

The Modbus OPC server scans process data from the fieldbus (Modbus) and makes them available to the PC world throughout the entire network via an OPC interface. Since OPC is a commonly used standard in the world of process automation, not only the process data management visualization components can be used, but - and this is the real benefit of OPC - all OPC-compatible client applications from any vendor.

3.2.1 Notes on installation

When the Modbus OPC server is installed, the work environment common to all R&C Process Data Management products is automatically installed with it. If the environment should already exist, e.g. because another product of this family has already been installed on the same system, it is updated if necessary.

3.2.2 Create a new Modbus RTU device

The project tree is used to create a node for each Modbus-compatible device. This node represents the device in the tree view, then.
Right-click on the folder icon to open the shortcut menu. Then select "New". A pull-down menu with various options for creating a new project element will pop up.

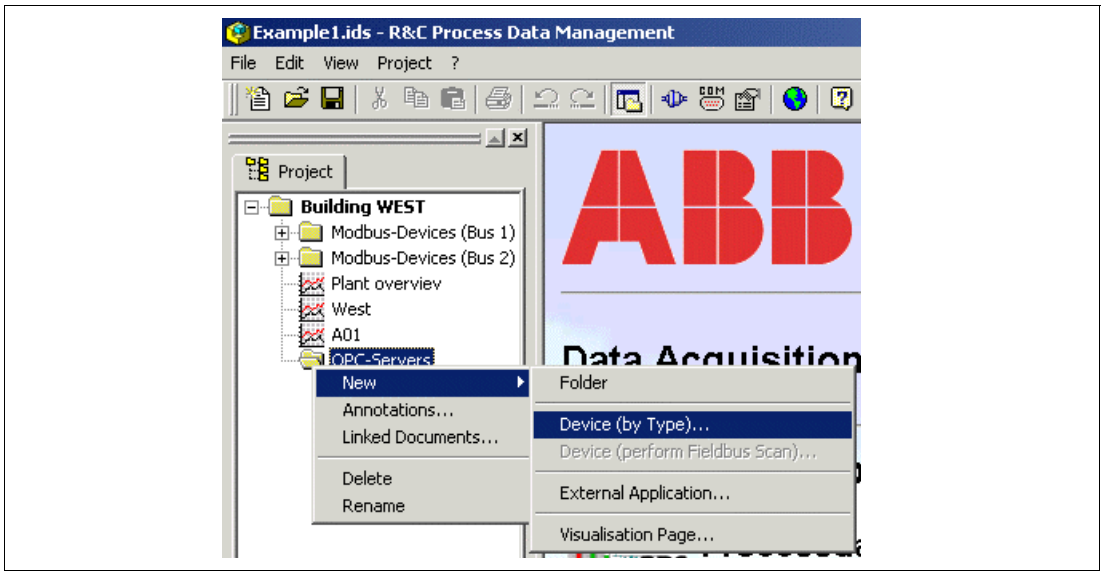

Fig. 3-1

Select "Device (by type)" to open the dialog box for selecting the device type (see Fig. 3-2).

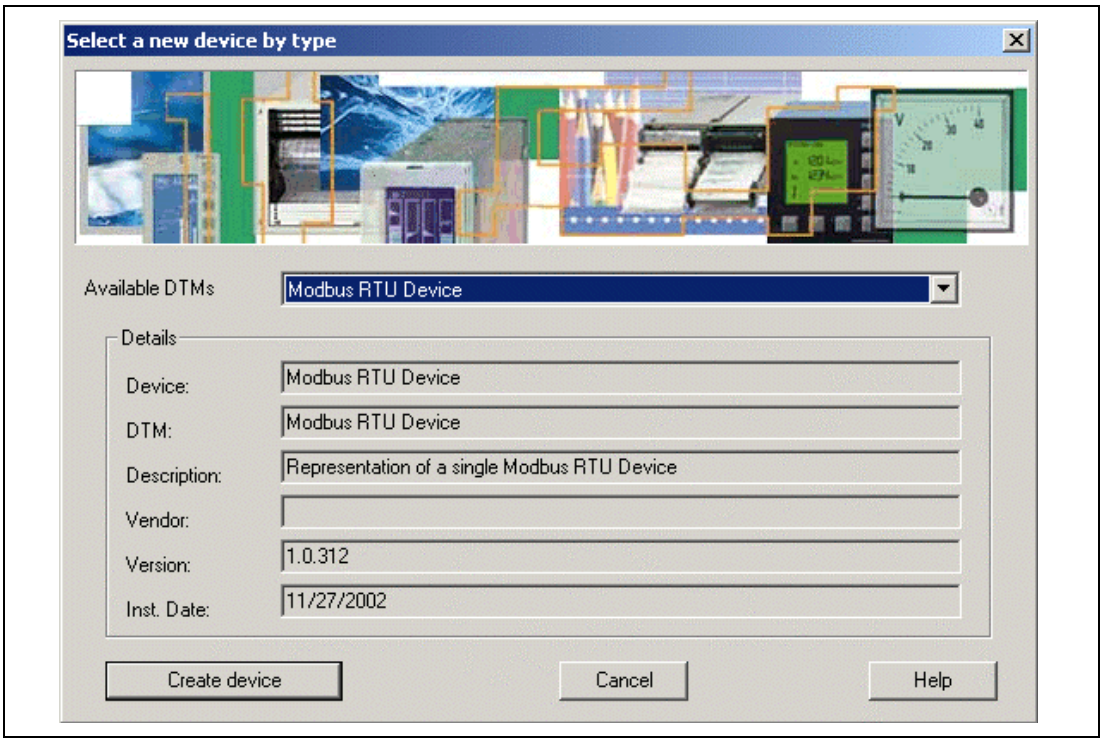

Fig. 3-2

Choose "Modbus RTU device" from the list box and click on the "Create device" button to exit the dialog

box and create a new Modbus device node in the project tree.
Directly upon creation the edit mode will be active, i.e. you can change the node name according to your needs.

Note

The name is freely configurable, independent of the device type. Names like "Datavis-1", "Sm2000 (Modbus RTU)" or simply "Tag 01" are valid without any limitations.

3.2.3 Modbus shortcut menu

Right-click on the Modbus device node to open the Modbus shortcut menu.

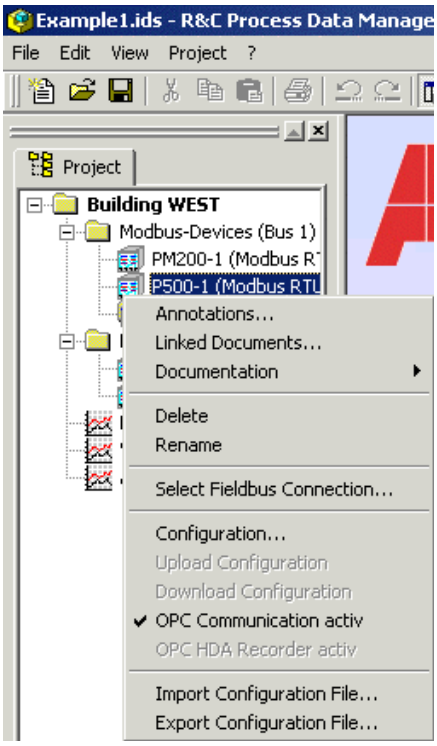

Fig. 3-3

The menu options "Remarks", "Linked documents", "Delete", "Rename", and "Select fieldbus connection" are general subjects and shall not be further described here. Refer to the online help of your work environment for details.

3.2.4 Configuration

Clicking on the "Configuration" option will open the Modbus Configuration dialog box.

3.2.5 OPC communication enabled

This switch is set to "enabled" by default (tick to the left of the text). Enabled means that the defined process variables of the device are available among the OPC names on the OPC server and can be addressed from an OPC client.

Disabling OPC communication may be useful when a configured device shall temporarily not be addressable for a certain reason.

3.2.6 Import configuration file

This import function allows you to load user-defined or predefined OPC Modbus configuration data sets. Configuration templates are available for the following device types:

Compact controllers:

- Digitric 100
- Digitric 500

- Protronic 100
- Protronic 500/550

High-voltage current transmitters:

- SU

Process recorders:
- Linemaster 200
- PointMaster100 and 200

3.2.7 Export configuration file

This function permits to export a created OPC Modbus configuration data set as a text file. This means you can re-use a definition created for a special Modbus device type as a template for other devices of the same type.

3.2.8 Modbus Configuration dialog box

Double-click on this menu item to open the Modbus Configuration dialog box where you can create or edit the Modbus parameters needed for communication with the device (e.g. bus address, Modbus registers, etc.).

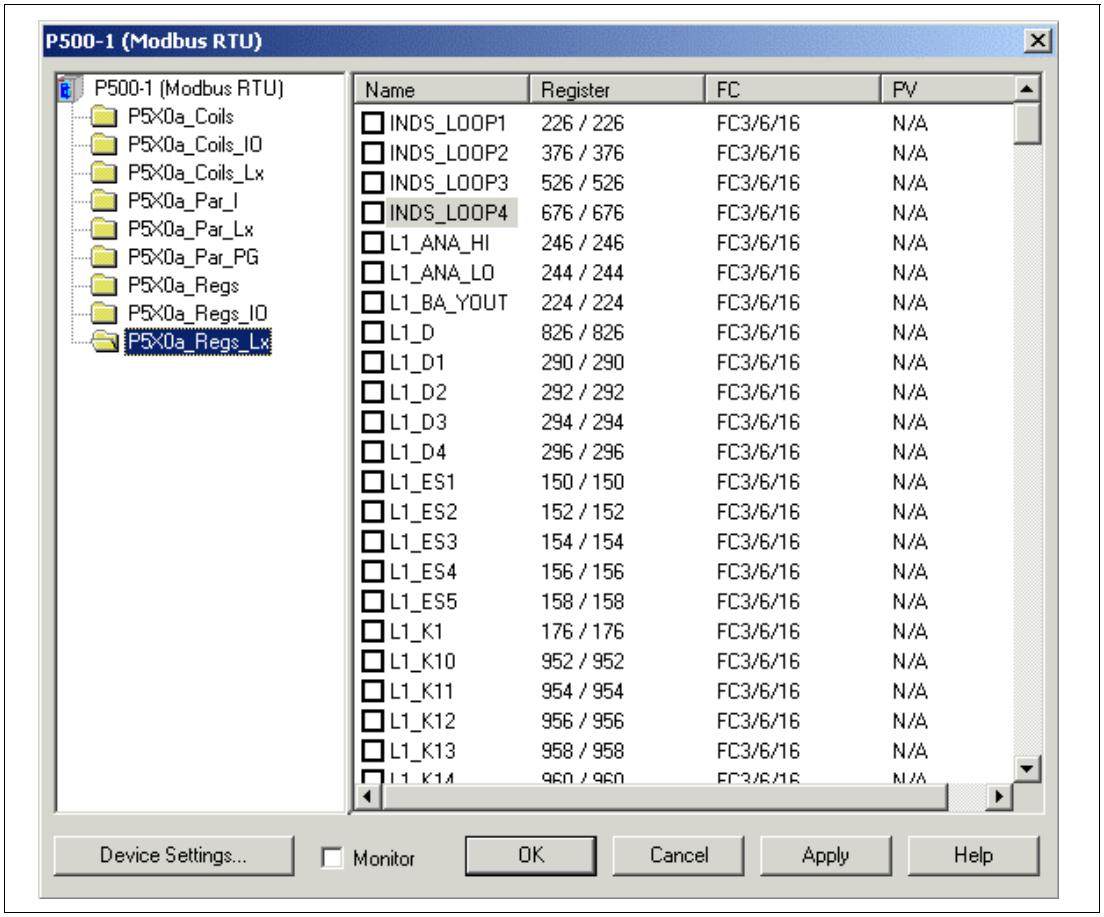

Fig. 3-4

In the left section of the window the tree view with the OPC groups or the Modbus register structure of the device is indicated. In the right section of the window the OPC elements and the references to the Modbus registers in the OPC item list are displayed.

OPC item list

Description of the list elements

Name
The OPC item name is the most right or last part of the hierarchically organized OPC item ID referred by the OPC client.0
Example

```
ABB.IM.OpcServer.1\P500-1 (Modbus RTU).P5X0a_Regs_Lx.L1_WSOLL0
```

To the left of the name you can find a checkbox. By checking/unchecking the box you can enable/disable an OPC item for browsing and accessing on the OPC server and in the OPC name area. Usually, a device has considerably more process variables than are needed for the respective application. For example Protronic 500 has approx. 1800 process variables; only some (e.g. 5 - 20) are polled at all.

Registers
The Modbus registers linked with the OPC item name.

FC
The Modbus function code (FC) for polling the Modbus registers.

PV
Current process value (PC), provided that the preview has been enabled.

Device settings
Click on the "Device settings" button to open the "Device properties" dialog box where the Modbus properties of the device are defined.

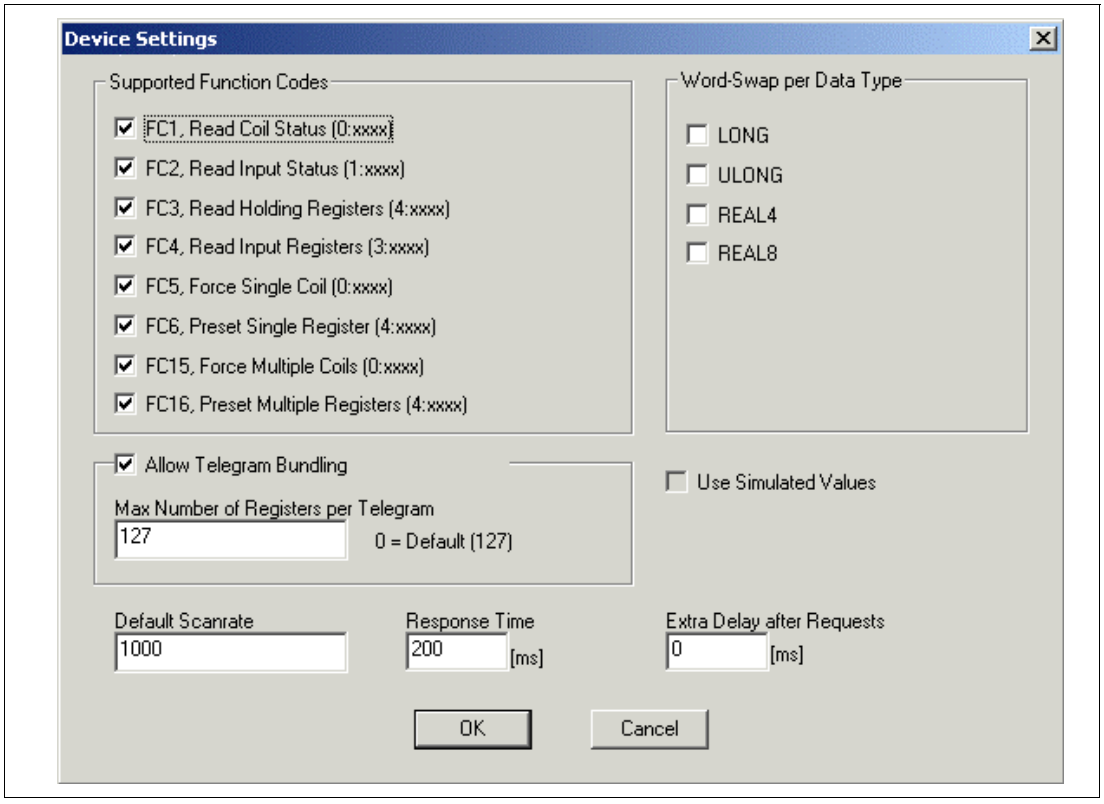

Fig. 3-5

Supported function codes
In the Modbus world the access type to a Modbus device is defined by using so-called functions codes of the bus protocol. Which function codes are supported can be derived from the Modbus specification of the device. Click on the checkbox to select the supported codes.

Word swap
For data types requiring more than 16 bits for display, e.g. LONG, ULONG, REAL4 and REAL8, various transmission orders for the 16-bit registers have become established for Modbus. In order to support all possible combinations, the Modbus server permits to change the register order during re-interpretation (word swap).
The following table gives an example for the re-interpretation of registers Reg101 to Reg104 with and

without word swap.

Data type	Interpretation without word swap	Interpretation with word swap
LONG	LOW HIGH |Reg101|Reg102|	HIGH LOW |Reg101|Reg102|
ULONG	LOW HIGH |Reg101|Reg102|	HIGH LOW |Reg101|Reg102|
REAL4	LOW HIGH |Reg101|Reg102|	HIGH LOW |Reg101|Reg102|
REAL8	LOW . . . . . .HIGH |Reg101|Reg102|Reg103|Reg104|	HIGH . . . . . .LOW |Reg101|Reg102|Reg103|Reg104|

LOW represents the least significant word, HIGH the most significant word..

Telegram bundling
If the Telegram bundling checkbox is ticked, the Modbus server compiles all subsequent registers in a telegram to improve the bus performance.

Example:
The registers 101,102, 103, 104, 107, 108 are to be polled from the Modbus device.

If telegram compilation is disabled, 7 request telegrams are transmitted, and 7 response telegrams are returned. Since a Modbus telegram frame consists of at least 8 bytes, performance is low.

If telegram compilation is enabled, the subsequent registers a polled within one and the same telegram, and only one response telegram is returned. In the example the registers 101 to 104 are polled together by a single telegram. The same is valid for the registers 107 and 108. This means that only two request and response telegrams have to be transmitted, and the performance is improved.

In the case described in the example it would also be useful to poll the unused registers 105 and 106 as well to save another request/response telegram.

Note

- Process variables with different scan rates cannot be compiled.
- The client (e.g. visualization) must really poll the registers. A definition in the OPC name area does not suffice for telegram compilation.

Default scan rate
This input field is used to define a default scan rate for all process variables. Note that it is also possible to make individual settings for every process variable (see OPC ItemID properties - Scan rate)

Use simulated values
not yet implemented

Response time
Defines the maximum time which the Modbus device may need to start responding to a transmitted request protocol. In case of time-out the request is cancelled.

Pause after request
Defines the waiting time after termination of a Modbus action (request telegram + response telegram or timeout) before a new request can be started.

Add new group
Within the OPC name area groups represent the logical arrangement of a device's process variables. The groups can be arranged in a hierarchy of arbitrary depth.

Right-click on a folder or group node to open the shortcut menu. Select the "Add new group" option. A group node called "New group" is created and added to the tree. Enter an unambiguous name for this group, e.g. a name representing the device structure. You can edit this name at any time by calling up the shortcut menu for the node.

Add new element
In the OPC name area the elements are the actual representation of the process variables, whose values and properties will then be accessed by an OPC client (e.g. visualization).

Right-click on the element area in the right section of the window (OPC item list). The respective shortcut menu will be opened. Select the "Add new element" option. The "OPC ItemID Properties" dialog box appears. Refer to the respective help window for details about this dialog box.

3.2.9 OPC-ItemID Properties dialog box

Usually, an interface description or the Modbus register description of the device is needed to fill in this dialog box.

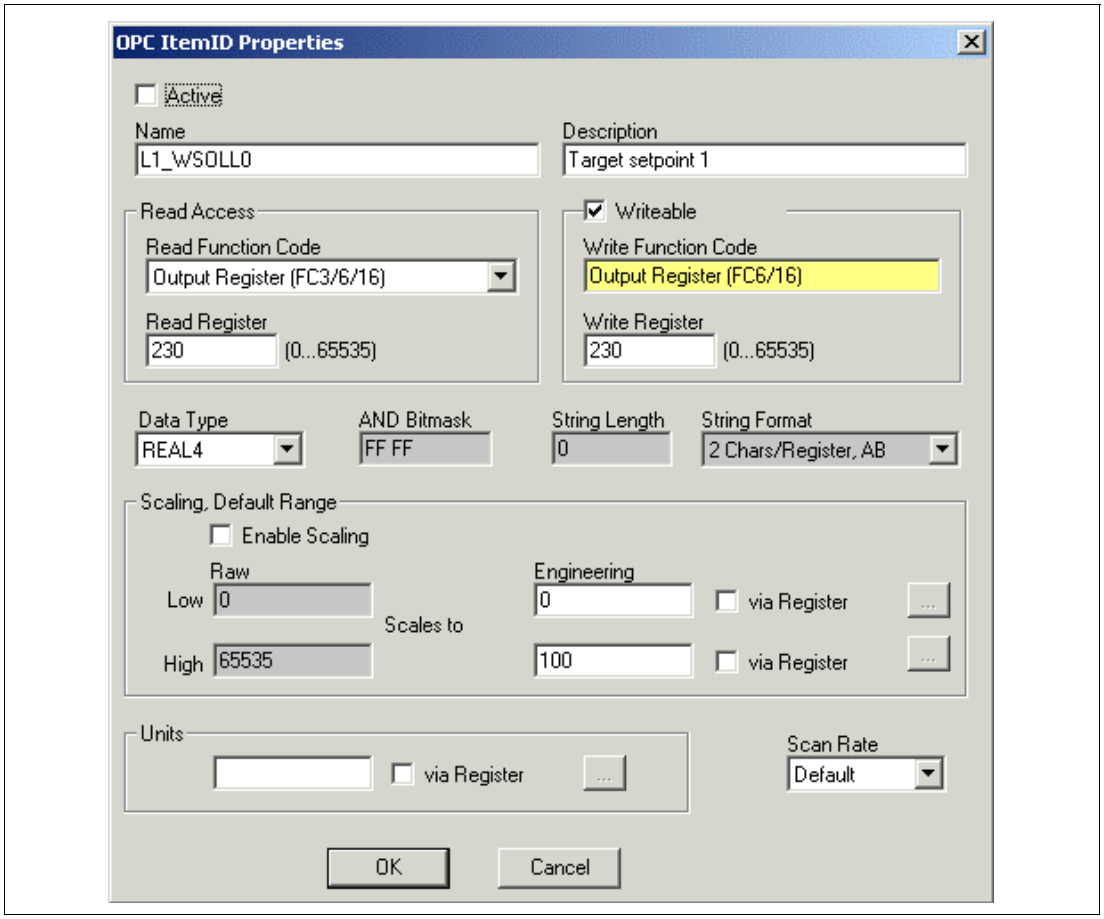

Fig. 3-6

Enabled

By checking/unchecking the box you can enable/disable an OPC item for browsing and accessing on the OPC server and in the OPC name area. Usually, a device has considerably more process variables than are needed for the respective application. For example Protronic 500 has approx. 1800 process variables; only some (e.g. 5 - 20) are polled at all.

Name

Under this name the process variable is stored in the OPC name area, together with the other group members.

Description

Used for easy identification of a process variable.

Read access to Modbus registers

Read function code

List box for selecting a function code (FC).

Refer to the Modbus description of the device for the function code for read access.

Read register

Address of the Modbus register. Refer to he Modbus description of the device.

The address area of the Modbus server permits values between 0 (0000H) and 65535 (FFFFH).

Note:

The Modbus register count of the devices is vendor-specific and, therefore, may be unambiguous. For some devices it starts with 1, i.e. the first Modbus register must have the register address 0, which is usually also used for bus communication.

The present Modbus OPC server works directly with the register addresses, starting with 0, and does not use the register numbers. Therefore, it is possible that an offset of 1 must be subtracted from the number stated in the register description, depending on the device.

Write access to Modbus registers

Writeable

Switch for selecting whether or not the Modbus register shall be writeable by using the OPC reference specified under "Name". If this feature has been enabled, it is possible to transmit values to the device via the Modbus OPC server, by using the bargraph display or the numerical display of the R&C visualization package (OPC client).

Write function code

Indicates the write function code for the selected read function code.

Write register

Address of the Modbus register which is to be written on. Refer to the Modbus description of the device for the register address.

Data type

The following data types are available for the Modbus communication:

Data type name	Description	Other common designations
SHORT	16 bit integer, signed, complement of 2	SHORT INT
USHORT	16 bit integer, unsigned	WORD
LONG	32 bit integer, signed, complement of 2	LONG INT
ULOG	32 bit integer, unsigned	DWORD
REAL4	4 byte floating point number (IEEE 754)	FLOAT
REAL8	8 byte floating point number (IEEE 754)	DOUBLE
BOOLEAN	1 bit within one register or one Modbus coil	COIL
STRING	Character string with fixed length	–

AND bit mask for BOOLEAN values

An AND bit mask can be used for Boolean values to filter specific bits of a Modbus register.

Example:

The bits B2 and B9 of the read register 120 (FC3) are evaluated for the Boolean process variable IO_ALARM. It shall be determined, whether or not the bit (B2 or B9) has been set.

```
REG120   01101101 10111111  6D BF
UND      00000010 00000010  02 02
         ──────── ────────  ─────
=        00000000 00000010  00 02
```

The result is interpreted as seen belowt:

```
Wert gleich   0  =>  FALSE
Wert ungleich 0  =>  TRUE
```

In this case the value of the process variable `IO_ALARM` is set to `TRUE` .

String length and character format

Modbus reads strings of constant, predefined length. In the "String length" input feld the number of characters to be read (Caution! Not the number of Modbus registers to be read) is defined.

Due to the 16-bit structure of Modbus registers the formats of character strings are device-specific and different. They can be defined by using the "Character format" list.

String format	Description	Example "SETP1", string length=3
1 character/register	1 character per register: the character resides in the low byte of the register	Register: |1 |2 |3 |4 |5 | Reg.-Byte: |HL|HL|HL|HL|HL| Example: | S| E| T| P| 1|
2 characters/register AB	2 characters/register: first character in high byte (H), next character in low byte (L) of the register.	Register: |1 |2 |3 | Reg.-Byte: |HL|HL|HL| Example: |SE|TP|1 |
2 characters/register BA	2 characters per register: first character in low byte (L), next character in high byte (H) of the register.	Register: |1 |2 |3 | Reg.-Byte: |HL|HL|HL| Example: |ES|PT| 1|

Remark

H: Register-High-Byte, L: Register-Low-Byte

Scaling, standardized range

Modbus devices often directly provide the physical measuring variable (e.g. temperature value in degrees Celsius) via the Modbus. Usually, no further scaling is required.

It is, however, also commonly used to output a standardized value (e.g. between 0 and 1 or between 0 and 65535, etc.), which covers the entire value range from the start of scale to the end of scale. To come to the physical value, the standardized value (raw value) must be mapped to the physical value, e.g. [0...1] corresponds to [-150 °C...+200 °C].

Standardized range

The standardized value range of a process variable is entered in the two input fields labeled "Technical". The standard range defines the start and end of scale values which are polled from the OPC server during initial configuration of a visualization page. These are then used for drawing the scale in the analog visualization elements (bargraph display, line chart, analog display).

Scale

Switch for defining whether or not the raw value is to be scaled.

Mapping function

The mapping function is defined by the raw value with "Start" and "End" that is mapped to the technical value with "Start" and "End". The following calculation formula is used:

$$T = \left[(Te - Ta) \times \frac{R - Ra}{Re - Ra} \right] + Ta$$

T phys. value
Ta phys. start of scale
Te phys. end of scale
R raw value from Modbus device
Ra min. raw value
Re max. raw value

Scaling via register

Instead of manually entering the start and end of scale values, these values can also be polled from the device via Modbus, provided that the device supports this functionality.

You can enable the "..." button for register definition by ticking "via register". Upon actuation of this button the "External scaling" dialog box appears where you can set the register, data type and register type for reading the scale.

Note

The scaling registers are static device data that are read once during the first OPC client access after the server has started.

To read the static register again, open the Modbus Configuration dialog box of the device and confirm with "OK". This will refresh the OPC name area for the respective device, and the registers are re-read.

Units
Defines the physical unit of the process variable (e.g. m³/h etc.).

The unit can also be read directly from the device as a string, provided that this function is supported by the Modbus device (refer to the device's Modbus description).

You can enable the "..." button for register definition by ticking "via register". Upon actuation of this button the "External unit" dialog box appears where you can set the register, string length and character format for reading the unit. Refer to "String length and character format" for more details.

Scan rate
The scan rate is defined for all process variables together under "Device settings"-"Default scan rate".

If a specific scan rate is to be defined for the process variable, this is done by using the "Scan rate" selection box.

The scan rate represents the minimum time intervals at which the Modbus server attempts to poll the process variables. This time interval can be prolonged, e.g. if the response times of the devices on the bus are too long and the total of all telegrams exceeds the scan rate time, or if a communication error occurs.

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